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EDITORIAL PREFACE

How To Use The Volume Library

Inside the covers of this single book an impressive amount of information is contained. How are you going to get out of it the special facts you want? The key is at the back of the book in the complete classified index. Always look first in the Index for the subject you want—and do this even after you have become well acquainted with the contents and arrangement of the VOLUME LIBRARY.

When you want to know something, either you are after a quick short answer to a single question or you are looking for a broad complete picture. The VOLUME LIBRARY will satisfy both desires.

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Suppose, for instance, that you wish to know the latest developments in television. In the section called Industry and Trade you will find a description of the apparatus and the way in which it works, as well as the story of the successive stages in the development of modern television equipment. That much information will answer your immediate question, but it does not tell the whole story by any means. Elsewhere in the same section you will find the story of cathode-ray tubes and of radio broadcasting, both forming part of the background for television.

Then, in the book on Science, you will find explained the principles and theories of electricity, wave motion, light and sound from which the practical apparatus was built. In the Biographical Dictionary are accounts of the lives and careers of Roentgen, Hertz, Marconi, Zworykin and other pioneers who contributed to the success of television. The section on Government and Law discusses government control of communications and the use of radio and television for propaganda. A reading of the article on Censorship will also be helpful. A study of the Fine Arts section will explain the artistic background of popular entertainment and will demonstrate the reasons why artists in many fields are so carefully watching the progress of television. Under Mathematics will be found the formulas and methods needed for making practical computations of electric phenomena. And if there is doubt as to the pronunciation or exact meaning of such words as *kilocycle* or *electron,* they will be found in the Dictionary.

For the many years that the VOLUME LIBRARY has been in use in the homes of America, its usefulness has been greatly increased by:

(a) this combination of the values first of a dictionary and second of a cyclopedia or a series of textbooks;

(b) the Index that makes both kinds of information quickly available; and

(c) the selecting of material of fundamental importance, limited for the most part to topics met in the curriculum of American grammar schools and high schools.

This method has been preserved in the present revision and every effort has been made to improve both manner and matter. The present issue of the VOLUME LIBRARY keeps the plan that was so wisely laid out and so well executed a generation ago by a group of educators, mostly in the University of Michigan. This present issue is an entirely new work—every word has been rewritten, every part of the book replanned and remodeled, every single page reset and printed from new plates. The amount of labor has been incredible. No expense has been spared by the publisher, no effort has been spared by the editorial staff to make the remade VOLUME LIBRARY accurate, complete and up to date.

How the New Volume Library was Made

Information for the new VOLUME LIBRARY has been gathered in several co-ordinated and mutually supplementary ways. Briefly these are:

First, an editorial office staff, primarily working to plan, check and co-ordinate material for the new VOLUME LIBRARY, has rewritten, rearranged, adapted, clarified and corrected material secured from outside authorities.

Another task of the editorial staff was to tell a complete story. It was never enough that the facts should be checked and proved accurate and that in addition each sentence should be incapable of being misunderstood. Besides all that, every editor asked as he read each paragraph, "Is there anything more that anyone reading this would naturally want to know?" Especially in the sciences this issue of the VOLUME LIBRARY has the *pluses* that make all the difference, the little extra information that rounds out the story and makes information here answer the questions that rise to the curious reader's lips—"What then? How? Where? Did it work?"

Second, a large and varied group of outside authorities was persuaded to write on their specialties—following definite specifications laid down by the Managing Editor. The new VOLUME LIBRARY benefits greatly by the contributions of these experts who were chosen from every part of the United States and who represent not only the different localities and the various branches of education in the nation but also widely different points of view. In this respect the new VOLUME LIBRARY is in every sense of the word the co-operative labor of an association of educators from Maine to California. And, as has already been noted, the contributions of these many experts have been checked, remodeled and adapted to the special requirements of this great educational effort, the new VOLUME LIBRARY.

Third, even more far-flung and varied has been the assistance rendered by hundreds of individuals and organizations, industrial corporations in every part of the United States, representatives of government and trade in every part of the world. To letters and telephone calls and personal visits from the VOLUME LIBRARY editorial staff men and women in Europe, Asia and Australia as well as in both Americas gave answers, supplied the information and, particularly, furnished the illustrations that make the new VOLUME LIBRARY what it is today.

Where so many have helped and deserve thanks, it may serve to mention the special gratitude that the editors (and so the readers) of the VOLUME LIBRARY owe to the Print Department of the New York Public Library and to Miss Alice Franklyn and Miss Evelyn Grier of the Metropolitan Museum of Fine Arts, New York. But the British Museum in London and the Oxford University Press, both thousands of miles east of New York, and the Los Angeles Department of Education, as far west of our editorial offices, have been just as ready to cooperate. So have countless foreign consuls and diplomatic representatives in the United States and an even greater number of Federal, State and municipal officials.

Learning by Pictures

Even more than items of information the pictures in the new VOLUME LIBRARY are the fruit of this widespread co-operation of hundreds of individuals and corporations, chambers of commerce, boards of trade, travel bureaus. The illustrations gathered from these many sources make the new VOLUME LIBRARY an attractive and alluring book to look through, but they do far more than that, for they supplement the words of the text with quick, graphic appeal to the eye.

The reader will note a wide variety in the artistic style of the pictures. There are crude wood-cuts executed centuries ago by unknown artists; pencil drawings, etchings, steel engravings, paintings, pictures in charcoal and many other mediums. All these, together with the hundreds of photographs, give a refreshing variety to the pages that could not be had by limiting the style of illustration to one form, such as photographs or pen-and-ink drawings.

Of very special interest and value are the illustrations in the Biographical Dictionary, enlargements of postage stamps. These portraits are of high artistic quality and, coming from government sources, are completely authoritative. They serve as a means of interesting the stamp collector in history and biography.

Knowledge for National Happiness

"Knowledge is in every country the surest basis of human happiness," said President Washington in a message to Congress dated January 8, 1790.

This new issue of the VOLUME LIBRARY, summing up within the covers of a single book the knowledge of the world today, testifies to the whole world's interest in knowledge. The publisher and the editorial staff sincerely hope that the VOLUME LIBRARY will help to make better American citizens of the boys and girls who are in American schools and of those with little or no schooling who are trying to get an education.

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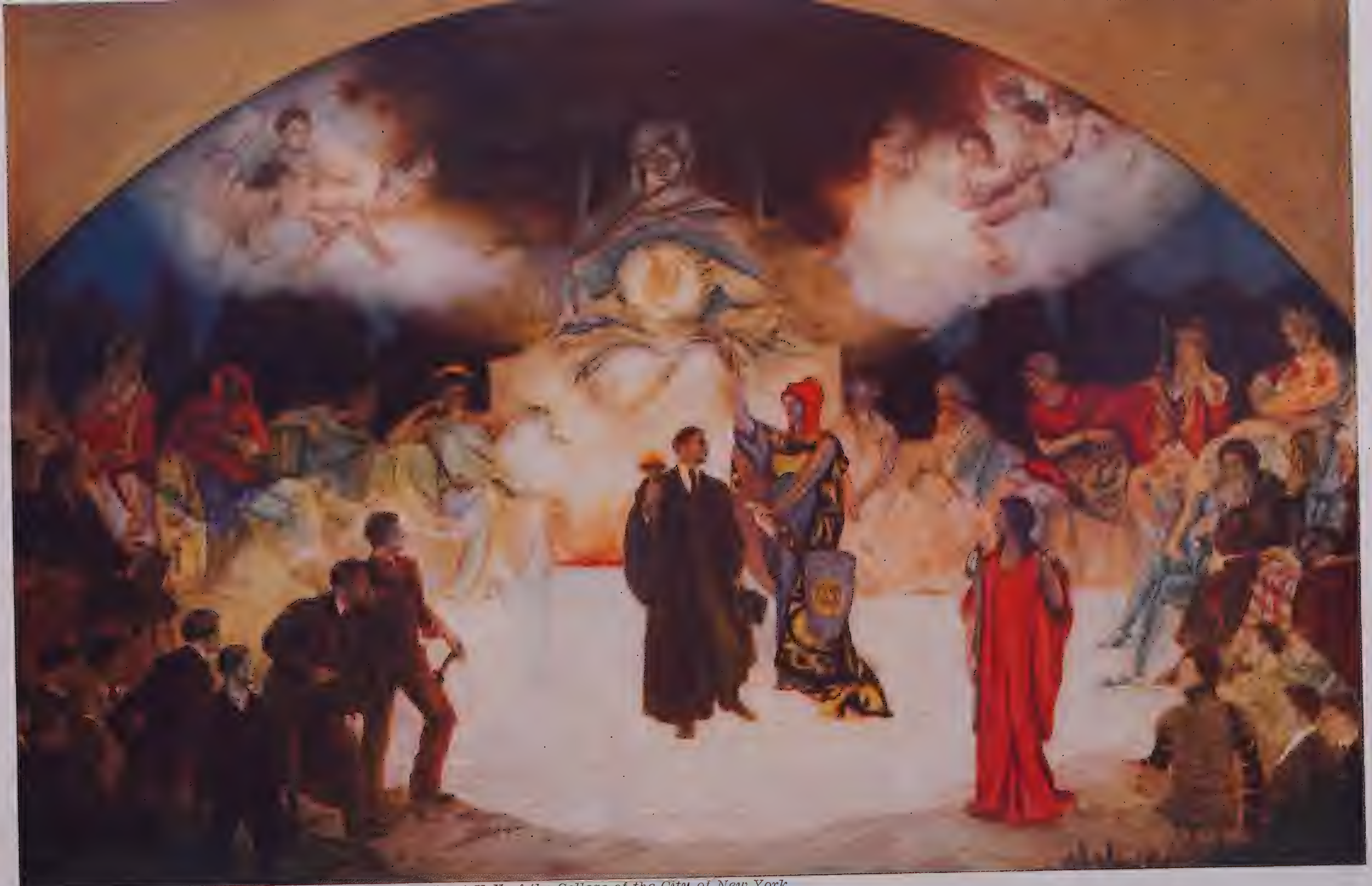

©Brown-Robertson, N. Y. *From a mural painting in the Great Hall of the College of the City of New York*

The Graduate by Edwin Blashfield

There are not many paintings that deal with education, but of the few that do exist, none is better known than this composition. It was made by the man who was called the "most scholarly of artists"—Edwin Howland Blashfield (1848-1936). It depicts a symbolic Alma Mater bidding the Graduate go forth in the world, carrying the torch that he has just lit at the altar. Discipline (Self-Control), a slender, upright figure in reds, holding a sword and scourge, stands looking at the young man whom she is to accompany henceforth in all his wanderings

Towering over the whole scene is a personification of Wisdom, who is presented in a human, benignant mood, protecting and presiding. Her placid head, covered with a fold of her mantle, is lighted from below by the flame of the square altar at her feet, and this light illuminates the globe that she holds on her knees. That we may know where we are, she presents the Western Hemisphere. On the luminous clouds to her right and left are little boys who symbolize, in the fine old fashion of allegorical decoration, various forms of instruction

To the left and right of Wisdom are seated figures representing the great universities of the world. Reading from the farthest left are: Alexandria, Rome, Cordova, Bologna, Athens, and to the right (below the throne of Wisdom): Bologna, Leyden, Paris, Heidelberg, Oxford. Below them the artist has painted figures of great scientists and writers and in the foreground Aspirants and Students

BOOK I: EDUCATION

VALUE OF AN EDUCATION

MILLIONS of boys and girls and older people, too, ask themselves from time to time what it is that makes the years of schooling worth while. This question is easy to answer in part, hard to answer in full; there are so many good reasons. However many we may name, boys and girls, teachers, and parents will think of many more.

One good reason why young people want to go to school is the joy and pleasure of it. Teachers, school officers, and parents try to make life happy and joyful.

School buildings and grounds are made beautiful, comfortable, and healthful. The architecture is good; the rooms are well heated and ventilated, the seats comfortable; floors, walls, and windows clean. Good pictures are on the walls. Trees, shrubs, flowers, and grass give character and interest to the grounds. Assembly halls, libraries, gymnasiums, playgrounds offer opportunity for profitable entertainment and games and plays of many kinds. For many children these "homes" of all the children are more attractive than their own homes.

Many schools have good bands, orchestras, choruses, and glee clubs. Many have provision for moving pictures and for showing interesting and instructive stereopticon slides of natural scenery, cities, industries, great buildings, paintings, and sculpture. Most city schools and many country schools have good cafeterias, or they provide hot lunches, and the food is wisely selected, carefully prepared, and skillfully served, at small cost. Children unable to pay are served just as other children, and without embarrassment.

The school day is not so long as to become tiresome. Programs give healthful and pleasing variety from beginning to end of the school day. Lessons requiring work at seats, shop work, library work, assemblies, and play periods are well balanced. Textbooks are written in attractive style, are beautifully illustrated, well printed, well bound. There are books for supplementary and general reading in school and at home. Teachers arrange outings for nature study, local geography, and frequent picnics. In school, on playgrounds, at entertainments, on outings, on the way to and from school, children make friends and enjoy their company and conversation. Who are happier and freer from care than groups of school boys and girls in class, at play, or on their way to and from school? Last but not least, teachers are men and women of fine culture, good manners, and pleasant speech, interested in children and their welfare. They usually dress well and do all that they can to add to the attractiveness of the school by their own personality. They are good persons to associate with.

No boy or girl should lose the joy and happiness to be found in school days. The loss would be irreparable. A wise man, a lover of children, Jean Paul Richter, said that the most important thing for any individual is a joyful, happy childhood; that if fathers could leave their children fortunes of millions of dollars, it would not offset the loss of a happy childhood. To assure this great boon to all children is one of the high purposes of our American public schools. The same spirit and policies, with necessary variety of application, extend through elementary school, high school and college. High school and college buildings are erected with the same lavish devotion that palaces of kings, temples, and cathedrals were once built, and their equipment is in keeping.

SCHOOL AND LIFE

A bright girl asked, Why not make school life just good living? This was a good question. More and more we are doing just that. In a general way, this is the best preparation for good and successful living. The poet Longfellow expressed this well in the lines,

> Build today, then strong and sure, with
> a firm and ample base,
> And, ascending and secure, shall to-
> morrow find its place.

But there are more special reasons for going to school—chiefly definite preparation for fuller and richer life, for making a living, for service to our fellow men individually and to society, to church and to state, for playing well our part in the world.

First among these reasons are health and physical vigor, hardihood, bodily control, and longer life. Life is good. Right-thinking boys and girls want to live long and well, with good digestion, good lungs, sound heart and steady pulse, muscles strong and obedient to the will, and steady nerves. They want to feel themselves able to plunge into the stream of busy adult life and swim against the current if necessary, however swift and strong that current may run, and not be condemned to stand forever shivering helplessly on the brink of action. They want to be able to do easily and well the work of men, to accomplish readily and with skill the tasks of women. They want to live effectively through life's full day; and to be gathered finally like grain at harvest time, fully matured.

One of the first duties of the school is to promote health by establishing right health habits; to teach children such knowledge of the laws of health, dependent on food, exercise, rest, sleep, and cleanliness, as will enable them to preserve their own health and to coöperate with health officers and other agencies in preserving and promoting public health. Most large school systems have well-equipped and well-staffed health departments, including physicians, dentists, oral hygienists, and nurses. All schools give health lessons in some form. They also give physical training for muscular control and hardihood. This is the underlying reason for such sports as football, baseball, basketball, volley ball, tennis, track activities, dances, and many forms of physical drill. As a result of teaching in the schools and of discoveries and practices based thereon, the average length of life in America has been lengthened twenty years. The health and vitality of men, women, and children have been greatly increased. Many epidemic diseases, such as smallpox, yellow fever, typhoid fever, scarlet fever, and diphtheria; and other widespread diseases such as tuberculosis, have been either wholly eliminated or much restricted. Aids in preventing many other diseases are known by the experts and in the research laboratories. When these recent advances have been fully tested and have become the common knowledge of the people through schools and other agencies of education, the average span of life will be still further increased, sickness still further reduced; bodily vigor and vitality will be more common, life more abundant. Going to school helps toward this.

All self-respecting men and women wish to make their own living. Of the products of the labor of their own hands and minds, they wish to give full return for all they receive and consume of the products of the labor of the hands and minds of others. They do not wish to be a burden to others, to be parasites, living at the expense of family and society, eating their bread in the sweat of the faces of other men. They wish to pay their way fully and contribute something, the more the better, to the common wealth, to the sum total of material, intellectual, and spiritual accomplishment slowly accumulating through the ages. They wish to make their living abundant and their contribution to the common wealth as large as it can be.

There is joy in producing. We like to create and transform. We like to feel our power over the forces of nature, to combine and direct them. We like to subdue the earth and have dominion over it. We rejoice in doing useful things skillfully and well, and in the feeling of independence and power these skills give us. "The arts and art tools give him who can handle them much advantage over them who cannot, as if his life were extended many years." Right education enables one to do at any age the best that may occur to him to do. It assures the glorious privilege of being independent.

Here again is a reason for going to school. Education makes wealth, but it makes far more than wealth. It gives us power to see relationships and possibilities, to understand and control the forces of nature. Right education makes for preservation of wealth from the destruction of war and other forms of violence. In school we study the great arts of peace. We learn of the soil and its tillage, of plant and animal life, of their cultivation and care, of physics and chemistry and biology, and some of their many possible forms of service. With good working knowledge of these subjects, we may advance into the laboratories of the great universities and other institutions of research, and discover new facts and relationships, new truths and their practical applications for human welfare. A few such discoveries may do more for human life and civilization than all the bloody victories of many warriors. Look up the life and work of such men as Pasteur, Walter Reed, Gorgas, Morse, Bell, Marconi, Edison, Faraday, Burbank, and others who through their research have enriched the lives of mankind and helped make new eras in world history.

MEN AND THE WORLD

Not only should we know the forces of nature and how to control them but also our fellow men and how to live and work with them. We should know their interests and activities, their purposes and aspirations, their hopes and fears, their joys and sorrows. We should know the institutions they have built to enable them to live together, to adapt themselves to changing circumstances through the ages and in different countries, and to obtain the best for themselves and their fellows. We should know how to make these institutions serve us, how to serve others through them, and how to preserve and improve them for those who come after us. Schools help us to this knowledge and this power.

There are many people of many kinds in the world. If one should start counting them at ten years old, counting one every second, day and night, he would be seventy years old before he finished the count. These people are of different races and colors, speak many different languages, live under many governments of different kinds. They inhabit mountains, plains, desert lands, small towns, and great cities. They live and work in tropical countries where there is no winter; in polar lands where winters are long and summers short; in the temperate lands between, with balanced winters and summers and constantly changing climate. The land masses and the islands on which they live are separated by great seas. Yet through the help of steamships, railways, highways and motor vehicles, telegraph, telephone, and radio, newspapers, magazines, books, written personal and business messages carried by well nigh world-wide postal systems—all direct or indirect results of the education of the schools—all these peoples are bound together in one world community, every group and individual dependent on every other group and individual. We are all neighbors and fellow workers. About all these peoples and their work and play, about ourselves and our work and play, we wish to know.

We begin to learn about these things when we learn to know the children of our school. We learn more on school excursions to nearby fields and forests, homes and barns, shops and stores, mills and manufacturing plants, observing and asking questions and making notes. Our interest is increased when we go to freight stations and see the goods that come in by rail and boat across land and sea from the ends of the earth; and when we see the products of farms and mills made ready for shipment to the ends of the earth in exchange for goods brought in. We get a better understanding of our complex and wide-flung interrelations from our formal geography lessons, illustrated with maps, globes, charts, pictures, and interpreted by experienced and skilled teachers. We then begin to see the world as a whole, its natural regions, its artificial political divisions. We see its peoples, our friends and neighbors and co-workers, engaged in their many and varied activities, on land and sea, in thronging cities, in densely populated industrial districts, on scattered farms, wandering with flocks and herds over semi-desert lands. We read of the world-wide commerce by which goods of one country are exchanged for goods of other countries. We take account of our food and clothing, of our homes and their furnishings, of all the things used in a day's living, and become more conscious of our dependence on other countries and peoples, of the interdependence of all peoples. We understand how we are bound up in the sheaf of life together, and that no good or ill can come to any of us without affecting us all. We feel our greatness and our littleness as part of the great complex whole. We get better understanding of our possible opportunities and inspiration, and practical guidance for more effective work and happier living.

These things we learn as geography. But our world is only one of nine or more worlds revolving about our great central sun; our sun only one of millions, some five thousand of which we can see as stars with our unaided eyes in our universe, which is in turn only one of many universes dimly seen through the largest telescopes. About this infinite display of the glory of creation and the power of the Creator, we learn something in lower school, much in college and university. Intelligent contemplation of the revolutions of planets, the

Courtesy Los Angeles City School Report, 1937

Building Toward the Future

swing of suns, and the drifting of universes cannot fail to inspire our minds with wholesome awe.

In school we make the transition from the little world of home and family life to the larger world of state and institutional life. We learn to know the school as a kind of governmental unity with its purposes, spirit, methods, and rules of work. We learn of the city, county, and state by which the school is supported and controlled. Through the help of books and teachers, this knowledge is extended to include all our institutions and systems of government—the methods by which they work and the means by which they are supported. We learn the value of fundamental (constitutional) and statute laws for the protection of life and property and freedom and opportunity. All this makes for good citizenship. Without schools our democracy would be impossible. We go to school that we may become good citizens, coöperating intelligently and effectively with our fellow citizens; that we may learn to do our part in the preservation and improvement of our constitutional governments.

The world and its life and work and institutions are not of today only. These have come to be as they are through long ages and by many changes. Nations have risen and fallen; great institutions have been built and destroyed; material wealth has been assembled and dissipated; peoples have migrated from one region to another, often dispossessing those whom they found in their new countries. Manners and customs, in foods, houses, governments, and religions, have changed constantly. Powerful states and great civilizations have developed and disappeared. Armies have marched, victories have been won for causes no longer considered important. Names of men once admired, honored, and feared have been forgotten. Yet there has been progress. Thoughtful men, prophetic souls, lovers of mankind, have from time to time pushed back the walls of darkness, listened in silence to the still small voices of knowledge and truth, and interpreted for us the eternal verities. Some have stood on the mountain tops, caught the glow of the ever-dawning new day, and reflected some of its rays through the shadows of the valleys. From their work, from their love and devotion, have come our most valuable institutions and our most helpful teachings.

In school we learn something of this long succession of generations of men and events. Teachers and textbooks help us group them, interpret them, win from them wisdom for our own daily life, and use this knowledge in doing our part wisely and well for those who are to follow us. There is a fine kind of pleasure in feeling ourselves a part of this ever-flowing stream of humanity. Thus to gain a sense of belonging in the history of the world is ample compensation for time and money and energy spent in attending school.

Chrysler Building, New York

Such Great Structures Can Be Built Only by Educated Men

ART AND SCIENCE

Through the ages, men and women of broad vision, fine feeling, keen insight, and much skill have enriched the world with their writings in prose and poetry of many kinds, on subjects of deep permanent human interest. These writings are preserved in hundreds of thousands of books. Every year, month, week, and day, floods of new books, magazines, and papers on subjects of current interest come from the press. Learning to read in the schools, and gaining power to interpret these books and papers, make it possible for us to become citizens of the world and of all time. Reading makes possible our participation in the world's most valuable heritage. It frees us from the prison walls of the now and here of time and space. It enables us to raise the dead, as it were, and make the best and wisest of all ages our companions. Without this power to read, one is poor indeed, even though he may own much material wealth.

Others have interpreted nature and life through painting, sculpture, and music. In school we have our eyes opened, our ears unstopped, to see and hear, our minds trained to understand, our souls attuned to feel and enjoy the masterpieces of these artists. We learn to see with their eyes, hear with their ears, think and feel with them. We learn to see beauty not only in painting and sculpture, but also in earth and sea and sky, in day and night, in changing seasons, in mountains, hills, and valleys, in fields, and forests, in the rhythmic motion of animals and birds, and of men, women, and children. We learn to "walk with beauty everywhere." We learn to find great interest and pleasure in church hymns and simple folk songs, as well as in the symphonies, oratorios, and great operas of the masters. Most of us can learn to express in some measure our own visions and feelings, in color, form, and motion and with musical instruments and voice. The possibilities of this richer life are among the good reasons for going to school.

In geology, which we may begin in the grades and continue in high school and college, we learn of the wonderful forces by which through the long ages the crust and surface of our earth, with oceans, continents, islands, mountains, plains, lakes, rivers, waterfalls, eroded hills, and fertile alluvial bottom lands, have come to be, making the earth a fit place to live and work. Fossils found in the rocks tell the story of the slow development of plant and animal life—a story no less appealing than the story of human civilization, a story which every inquiring person wishes to know.

Physics, chemistry, and biology, beginning with easy first-hand nature study, and continuing with the use of microscopes, test tubes, retorts, delicate balances, and exact mathematical calculations, open up new worlds all about us. The world of the infinitely small is no less wonderful than the infinitely large universe of planets and suns. So many and complex are the divisions of these subjects that no one can master more than a small part of them. But everyone can learn enough to begin to understand the wonderful miracles of common things. By coöperation and pooling our knowledge, we gain willing to produce, transport, and otherwise serve us so long as we control them intelligently. Most of our modern industries and businesses are built on such knowledge.

In school we learn also of our own bodies and minds, their organization and functions, and find ourselves to be the greatest miracle of all. So wonderful and complex are we that no one has yet learned more than a small part of the miracle. But on what we have learned is based all our science and art of medicine and of education, all that has permanent value in government and other social relations.

TOOLS FOR LEARNING

Little of these things could be learned, even with the best of teachers, without the tool subjects: reading, writing, spelling, grammar for mastery of language; arithmetic and algebra and geometry for understanding and practical mastery of number and form and their relations. Much time is given to these subjects in elementary and high schools. Without them we would be helpless even in the most common things of daily life. It is primarily for these that most boys and girls go to school. Teachers are constantly finding more effective, quicker, and surer ways of teaching them.

Children of today do not have such opportunities as children once had to learn at home and from parents, older brothers and sisters and neighbors a large variety of such practical things as: sewing, cooking, care of the home; handling tools, and making things of wood and metal; carpentry, painting, farming, gardening, care of livestock, and other things requiring skill of hand, patient attention, industrious effort, and much thinking. But these and the practical training they give are still important. All progressive schools give them place in their curriculums. Many children go to school chiefly for these.

Modern business requires shorthand, typing, filing, bookkeeping, accounting, and other skills learned best only in schools. Many schools are maintained only for teaching these skills and the principles and practice of commerce, banking, and clerical work. But these specialized schools demand for admission such general education as is given in elementary and high schools.

PROFESSIONAL TRAINING

An ever-increasing number of professions and occupations require for success good elementary and higher education, and professional and technical training for which this general education forms a necessary basis. Among these are the ministry, teaching, law, medicine, dentistry; civil, mechanical, sanitary, electrical, hydroelectrical, and other kinds of engineering; the army and navy, aeronautics; and many kinds of public service. The proportion of highly educated men and women required even in subordinate places in professional, commercial, and industrial life increases constantly and rapidly. A large group of young men, asked the question, Why go to school? replied unanimously, It is impossible to find employment without education. A diploma is a letter of credit addressed to the world.

And what is the challenge of the future? Children and youth now in school must soon take up tasks left unfinished by their parents, complete them, and undertake new and greater enterprises. Scientific discovery and the organization of knowledge are just begun; we are only learning how to discover and organize. In all phases of knowledge, gripping and thrilling discoveries will be made by those who are prepared. We are unskilled in the practical application and use of knowledge: in agriculture, manufacturing, transportation, communication; in preparing food, clothing, and shelter, and in control of temperature and moisture in the air; in protecting and promoting health, vigor, and control of body and mind. Our social and economic adjustments, our local, national, and international relations are all crude and inefficient. In place of destructive, selfish competition and warfare in industry, commerce, society, and international relations, we must learn to substitute constructive coöperation based on intelligent, well-informed good will. In the fine arts of literature, music, painting, sculpture, pageantry, the field of opportunity is greater than ever before. Above all, we must follow the way of religion in recognizing fully the fatherhood of God and the brotherhood of men; and in leading an ethical life, which fulfils all that the law demands, all that the prophets, seers, and idealists ever aspired to or hoped for, by doing unto others under all conditions and circumstances as we would have others do to us. Toward these high purposes education will help.

The only absolute good is the human good; all other values are only relative. Men and women, strong, sane, informed, wise, cultured, tolerant, possessed of good judgment, right appreciation, noble purposes, good will, and skilled to make these effective, are the most important things in the world. The development of such men and women, not alone through libraries and laboratories but also by contact of living human soul with living human soul, is the high purpose of our institutions of learning. We go to school for help in becoming such men and women.

All we learn becomes a part of us. Humanly speaking, the school and the society for which it prepares make the difference in men. The school helps to make well-rounded men and women, rightly adjusted to the world in which they live, motivated by worthy objectives, open-minded lovers of truth, active and earnest to make the truth prevail. Education leads one out of the world of ignorance, personal pride, and vanity, and into the world of sane reality. It gives freedom and breadth of vision. "No horizon shuts in the educated man." Literature and science, learned in school, awaken imagination, form the emotions, inspire ideals and purposes, guide the will, make character. Contact with sound knowledge, cultivated taste, and solid accomplishment inspires confidence and self-reliance; it helps make the democratic man who neither cringes before superiors nor looks down on inferiors, but recognizes his equals in all.

LEARNING TO LEARN

Learning to do well and promptly the routine work during the school years helps produce habits of exactness, thoroughness, and promptness, so necessary for manhood and for success in business. The constant repetition of the process of observing with precision, recording accurately, grouping and comparing recorded facts, and drawing from them just and rightly limited inferences, so absolutely necessary in science studies, reacts on students, making them in their daily lives open-minded, honest, accurate in thinking, modest and restrained in expression.

Comprehensive, exact, and well-organized knowledge, good judgment, just appreciation, right ideals and purposes help us in choosing useful occupations by which to support and express ourselves. Good health, skill, and strong will insure success in them. All these are products of the years at school.

We value our education because it offers us the fullest opportunity to live long, happily, and well, to enrich our lives and the lives of others, and to leave the world better for our having lived in it.

PHILOSOPHY AND PRACTICE OF EDUCATION

It is a far cry from the one-room log schoolhouse with its battered desks and benches to the modern imposing high school. It is a far cry from the old hornbook, *The New England Primer*, *Peter Parley's Geography* and McGuffey's *Eclectic Readers* to the vast textual and other equipment now placed in the hands of pupils. It is also a long way from the severe schoolmaster and the brutal penal code, the grinding, mechanical drill of abstract subject matter to the present friendly relationship of teacher and pupil and the free conditions of learning in the modern school. Yet it cannot be denied that the old system produced some great men.

The progress from primitive conditions to the present philosophy of education has been slow and arduous. Many minds and many forces in civilization have contributed to this progress. Today the philosophy of education is a body of well-considered professional knowledge and practice, commensurate with our theological, economic and political philosophies, in many respects more vital to the public welfare than any other system of thinking and planning.

Plato.—It may truly be said that all our modern thinking on education goes back to Plato. The very ideas we now put into practice after many years of experimentation and modification are partly Plato's. Plato expounded an educational theory based on the principle that real education dealt with an all-round development of the body, mind and spirit of the child. That is the core of modern belief and practice, although Plato emphasized the esthetic more than we do. In the primitive American school only the mind was considered. The method employed was that of drilling rules and facts into the minds of youth under fear of punishment. And these rules and facts had little relation to actual life. Boys and girls acquired their bodily training through home and farm chores and long walks over country roads. The church attended to their spiritual welfare—if listening to long, severe sermons and memorizing the catechism could be called spiritual development. Plato's ideal of education related the full, well-rounded development of the individual to that of the state. In other words, it was not only individual but social.

Spencer and Other Moderns.—Aristotle held that the state itself must be virtuous if the citizens are to be virtuous, and that schooling means the greatest good to the state. The state determines the character of its citizens. Nineteen centuries later, Comenius (1592–1670) stressed piety and morality with knowledge but insisted that the child was first of all an individual and should be treated as such. Then came Rousseau (1712-1770), from whom the whole program of naturalistic methods of education has proceeded. He assumed that in each child were inborn powers; that he was essentially good, and that all that was necessary was to surround him with the right learning conditions and let his mind unfold. He believed that all that entered human understanding came through the senses. Using his experimental child, Émile, he developed his theories at great length, and although much of his philosophy is impractical under modern conditions—because he educated Émile until the age of 15 in isolation from society—his theories nevertheless did reveal to educators the nature and the rights of children and the natural processes whereby real education takes place. Pestalozzi, Herbart and Froebel all applied some elements of Rousseau's theories, each in his own characteristic way. Johann Heinrich Pestalozzi (1746–1827) accepted the theory of innate powers and concentrated on studying the proper procedure to unfold these latent powers. Johann Friedrich Herbart (1776–1841) built on the sensory and moral emphasis in Pestalozzi. Friedrich Froebel (1782–1852) carried on the Pestalozzian theories into that program of "learning by doing" that is increasingly operative today.

Then came Herbert Spencer (1820–1903), who said, "to prepare us for complete living is the function which education has to discharge." He analyzed "complete living" into activities that preserve the individual, the home and the state. Recently Boyd H. Bode of Ohio State University added to the Spencerian concept the doctrine of "continual intellectual and spiritual growth"; that is, education is not static but in its very learning process is mobile and dynamic. Edward L. Thorndike of Teachers College, Columbia University, is one of the great authorities in the field of mental analysis and in the invention of tests and measurements to determine abilities and aptitudes, though his psychology is meeting criticism today. There are other alert minds that have contributed to educational philosophy and practice; Alexander J. Inglis, the man who so clearly defined the function of secondary education; Thomas H. Briggs, Ross Lee Finney, William C. Bagley, W. W. Charters, Helen H. Parkhurst, Harold Rugg, William H. Kilpatrick and John Dewey.

John Dewey.—John Dewey is generally considered to be one of the greatest modern educational philosophers. After 1920 his concern with political and economic problems elevated his philosophy above the narrow scientific dogmatism of earlier years. Educationally he thinks in terms of living experiences: education as a continuing process, social and economic efficiency, culture in a practical sense and schooling as a process identical with life and living and not as a period of preparation for future living.

This brief résumé indicates the vast change that has come over educational thinking during the past 100 years—or even 50 years—a change to a broad, comprehensive and richer notion of the values of the educational process. It has changed completely both the learning and the teaching process. Let us consider the three accepted levels of schooling: elementary, secondary and collegiate.

Elementary Education.—Elementary education from the preschool or nursery school to the junior high school is devoted primarily to instruction in the essentials of knowledge, shaping up specific skills and aptitudes, ascertaining individual differences, forming right hygienic, social and moral habits and beginning some vocational trends of thought. Vocational guidance has existed in the elementary schools of Brooklyn and New York since an initial appropriation of $250 was granted from public funds in 1910.

We now believe that the elementary school should fit itself to the child and not the child to the school. Health is a major considertion. Fear of punishment has been replaced with trust and confidence. Obedience is not autocratically imposed but is elicited by the natural process of appeal to the child's own conception of his best interests. Passive, abstract, factual learning has been replaced to some extent by activities, projects, units of work. The teacher is no longer a taskmaster but a friendly guide. Interest is assumed as the basis of real learning. The atmosphere of the school is inspiring, free, giving the child a sense of self-direction, personal pride and ambition. The rights of the child as an individual with potential powers that he can claim as his own and that are worthy of educing are now recognized. These principles are, of course, not yet universal.

The Progressive Education Movement. Perhaps the greatest influence in bringing these concepts to the fore is the progressive education movement. This movement took concrete form when the Progressive Education Association was organized at Washington in 1920. This idea has spread into an influence that is in process of reorganizing the whole field of elementary education, is attacking the more difficult problem of the secondary field and is even awakening the colleges to a more liberal construction of the subject matter of higher education. The following quotation explains the philosophy and procedure of progressive education; it is a general summing up of such characteristics as find expression in some part throughout all forward-looking education:

"The Child's Physical Well Being. One of the most important considerations of the school is the health of the pupils. Space in which to move about, light and air, clean well-ventilated buildings, attention to proper nutrition, access to the out-of-doors and greater use of it, are all necessary. There should be frequent use of adequate play grounds. The school should observe closely the physical condition of each pupil, and in co-operation with the home make abundant health available to every child.

"Opportunity for Full Development. Opportunity for initiative and self-expression should be provided in an environment rich in interesting mate-

rial, the free use of which will release the creative energies of the child.

“Social Development and Discipline. Group consciousness is developed in children through participation in the school as a community. Discipline should be a matter of self-mastery rather than external compulsion, and character development the result of social experience and of the recognition of spiritual forces and resources underlying all nature, life and conduct. A coeducational student body and a faculty of both men and women constitute a normal life situation for character and development.

“Beauty of Environment. The school should furnish an environment that is simple, natural and beautiful.

“Interest the Motive of All Work. Interest should be satisfied and developed primarily through (1) direct and indirect contact with the world and its activities, (2) use and application of knowledge thus gained, (3) correlation between different subjects, (4) the consciousness of achievement.

“The Curriculum. The Curriculum should be based on the nature and needs of childhood and youth, with the ideas of acquiring knowledge as far as possible through the scientific method of first-hand observation, investigation, experiment and independent search for material. Through these activities the world of books and abstract ideas is entered. The school should increasingly widen the circle of the child's world, leading him not only to appreciation of national ideals, but also to a realization of the interdependence of peoples and international good will.

“The Teacher as a Guide. The teacher should guide the pupil in observing, experimenting and forming judgments that he may learn how to use various sources of information, including life activities as well as books and how to reason about the information thus acquired, and how to express logically and effectively the conclusion reached. The teacher himself should be given latitude to express his own initiative and originality.

“Scientific Study of Pupil Development. The school should study and endeavor to meet the individual needs and capacities of each child. School records should not be confined to the marks given by teachers to show the advancement of pupils in their study of subjects but should also include both objective and subjective reports on those physical, mental, emotional and social characteristics which concern both school and adult life, and which can be affected by the school and the home. Such records should be used as a guide for the treatment of each pupil and should also serve to focus the attention of the teacher on the all-important work of child development.

“Co-operation Between School and Home. Since the child's life at school and at home is an integral whole, the school cannot accomplish its purpose without the active support and intelligent co-operation of the parents. Reciprocally the school should aid the home in problems concerned with the child.

“The School a Contributor to Educational Progress. The school should be an educational laboratory, where new methods are encouraged, and where the best of the past is leavened by the discoveries of the present, and the result freely added to the sum of educational knowledge.”[1]

Secondary Education.—The United States Bureau of Education in 1918 set forth seven objectives, called the seven cardinal principles of secondary education. These were: health instruction; command of the essentials—reading, writing and arithmetic; worthy home membership, the development through the social studies and the arts of those qualities that would make the student a worthy member of a family; training for the vocations; civic education or training in citizenship; worthy use of leisure; ethical character. Since that time other educational bodies and individuals have modified these seven principles or expanded them, but, whatever the terminology, the objectives are practically the same. Thomas H. Briggs, for example, added “exploration of pupils' interests, aptitudes and capacities; guidance, and study of pupils' racial background.” Others have stressed the need of ascertaining the emotional approach and reaction to given social situations that have a tendency to influence the disposition.

Whatever the theories, educators have generally concluded that the function of secondary education has two objectives: personal and social development. At one time there may have been some small measure of uncertainty as to what the peculiar function of the high school was; but it was generally conceded that its main objective was to prepare for college and university education. The American high school is to a certain degree an outgrowth of the academy.

The academies by the breadth of their curricula of *real studies* offered a more practical education for life than the high schools whose main purpose was to prepare for college. It sometimes became necessary for the academies to modify or amplify their curricula to meet the requirements of students desirous of fitting themselves for a particular college. Hence many denominational colleges came to have their own academies that acted as feeders to the college itself.

For a long time the students in the high schools looked forward to entry into college, and the curricula of the high schools was governed accordingly. However the time came when a large number of the students turned their minds away from college and toward the possibility of acquiring work immediately upon their graduation from high school. To meet this condition such courses as typewriting, stenography, bookkeeping, manual training and the like were introduced, but the high school retained English, history, science, foreign language, art and music courses.

Secondary education now looks after the *personal* aspect of training by extensive courses, guidance, supervision and athletics in order to promote sound health. Mental health is now sought by a study of the factors in the pupil's personal life that condition his thinking and emotional processes. *Mental hygiene* and *child psychiatry* are now common terms. Evidences of nervousness, untruthfulness, laziness, inattention, fear, sullenness and other maladjustments are studied so that they can be eliminated. The child's home life is studied, the physician's advice is sought, psychological clinics are held—anything that will help understanding of behavior is utilized. Likewise, special aptitudes are discovered and encouraged. Wholesome recreation in many forms is provided—sports and games, dramatics, art, glee and literary clubs, orchestras, social affairs, school newspapers and magazines. Extra-curricular activities assume large importance. The vocational phase is enlarged beyond the commercial subjects in the curriculum to courses in all phases of domestic science and household economy; and specialists help the boy and girl to find themselves and the type of work for which they seem to be best fitted. This is done by thinking through their desires and belief in their own abilities.

On the social side of secondary education we find, of course, training in good citizenship, provision for social situations that develop fine personalities, sound concepts of life values. Interwoven with both these objectives is consideration of certain principles whereby the individual may function intelligently in such situations as may call for co-operation, judgment, adaptability, fair play, concentration, initiative, interest, creative impulses and the like. The wise teacher understands that provision for the free play of these psychological factors in all the work of the school is essential to real advancement.

In recent years the *junior high school* has become an important unit of many school systems. It breaks up the conventional 8-year elementary school period at the end of the 6th year, when the child enters junior high school to remain usually for 3 years. He is then graduated into what corresponds to the 2d high-school year. American education has long been unfavorably compared with European education because it draws out the childhood years far beyond what is necessary; and the advantages of the junior high school thus lie in introducing more advanced subjects, such as Latin, algebra and geometry, at an earlier age; in allowing the students the more mature freedom of the high school; and in exploring the talents of children in early adolescence.

The field of secondary education is broad. This is its danger as well as its opportunity. It is its danger in that so much is attempted that little is accomplished. It is its opportunity in that it takes the pupil at the impressionable age of adolescence and is in a position to shape his destiny. In the changing thought about secondary education two new processes have been added: a revision of the teaching process; and the utilization of certain outside agencies that science has given to society.

Among the evils the new method of teaching is designed to correct are: the lock-step method of instruction based on a rigid curriculum; the spacing of the hours of the day into a pattern and the sharp differentiation of school subjects taught in such a way that pupils can see no relationship to any other subject. Educators devised methods that would break up these sharp divisions, reveal to young people the unity of all life and turn the subject matter into practical channels. One of the methods that is receiving a great deal of attention today is the *unit method* of teaching.

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[1] Progressive Education Association.

The Unit Method. The unit method of teaching takes the subject matter of the curriculum and unites it into meaningful wholes. For example, a student interested in the radio is given opportunity to build a radio, and in the process he relates the knowledge acquired in his physics and chemistry classes to a definite end. A unit of work is assigned or granted to a girl in the domestic-science section, a whole job in household planning that relates her knowledge of chemistry, biology, art and the crafts. A student of history who wants to understand more clearly the causes of industrial unrest at different stages of history has his work so planned that in this unit of work he delves into the factual history of the periods to be considered, their social and economic aspects, the geography of the countries and the political trends of the day. Even apart from the unit method of instruction, the high schools generally have come to treat history, geography, civics and economics under the term *social sciences.* This notion has brought about great revision of textbooks and methods of teaching.

The unit method has another value: it enables the school day to be so planned that the student is allowed to concentrate on his assignment until he completes it instead of having his hours broken up into unrelated activities. Dramatizations of history and literature are utilized as another method in this new way of teaching. Another great value is that the essential factors in the learning process are better stimulated. Educators of the Herbartian type agree that the learning process follows a certain pattern:

Preparation, the arousing of interest and purpose.

Presentation, the setting forth of the facts involved.

Association or comparison, the relating of ideas into a unified picture.

Generalization, the drawing of conclusions from knowledge acquired.

Application, the use of the knowledge in a practical, constructive situation. Such a process serves all the ends thought of by educational philosophers from Plato to Dewey.

Dewey, who was not an intellectualist like Herbart but believed in action as primary, enunciated the following five steps in reflective thinking: activity, problem, data, hypothesis and testing. This analysis is the basis of the new method. It may be comprised in one phrase, *purposeful activity.* The plan has been developed by such leaders as Carleton W. Washburne, in the public schools of Winnetka, Ill., and Helen Parkhurst, in her application of the Dalton Plan. Even in the kindergarten field it was used by the great teacher Maria Montessori. The schools associated with the *progressive* movement in education have generally reformed their curricula and methods along the lines emphasized by Dewey's philosophy.

The unit method in its different forms has several different names. The *problem method* is a name that emphasizes the inductive process of solving a problem. This concentration does not permit a very wide field of survey. The *project method,* one of the earliest devices, concentrates on a given, specific task and the necessity of pupils pursuing it until it is finished. It may be a single task, such as: solving a mathematical problem; a study of a single phase of history; a dramatization; building something; mastery of irregular French verbs. The only criteria for worthy projects are that they be practical, fruitful in knowledge and experience, applicable to the pupil's own experiences and interests and developed wholly by the pupils. Another term used for the unit plan is *contracts.* This means merely that the pupil contracts to accomplish the assignment in a definite period of time. The Winnetka and Dalton systems are contract plans. The *Morrison Plan* (named after Henry C. Morrison of the University of Chicago School of Education) is the same except that the content is selected so that the project will produce a fundamental change in the pupil's way of thinking or his attitude toward life and its problems. All these plans have brought about changes in textual material, the use of the *workbook* idea, charts, graphs, maps and the like.

Laboratory Training for a Profession

Antioch College, Yellow Springs, Ohio, employs the co-operative plan of alternate work and study. Work is in line with the student's plans for his vocation and may take place anywhere in the United States. This young man is spending his co-operative periods at an agricultural experiment station working on the breeding and development of tomato plants.

The schools have been quick to discover and use the motion picture and the radio.

Motion Pictures in Education. The motion picture has shown itself to be possessed of very real potentialities as an educational instrument. Educators have engaged in motion-picture research, practice and experiment with the result that *visual education* is now an adjunct to teaching in many schools. Without discussing the technical, scientific and pictorial values of the screen, even though the entertainment elements have often proved far from educational, it is clear that the industry and the technique are rapidly shaping up into a great educational ally. Surveys show that motion pictures are widely used in schools, both in auditorium gatherings and in classrooms. Organizations have been perfected to create and handle the material. Texts have been rewritten to tie in with screen presentation of historical, geographical and scientific material. Every effort is being made to study pupils' reactions as to improvements in interest, concentration, memory, apperception, correlation, increase in vocabulary and reading habits. Teachers who use motion pictures recognize that the stimulation is an *impression,* acquiring, as William James said, some *expression* in turn from the pupils.

Visual education has another form: actual visits to industrial plants, historical and literary shrines, public governmental buildings, museums, trips into the fields and woods to study rocks, game, birds, trees and flowers. Such visits have distinctive values of their own.

Radio in Education. The radio has deeply affected our entire home and social life. It brings directly to the home the significant features of the life of the word—political, commercial, religious, musical, literary, educational. The radio also has its hazards, notably the risk of accepting all that is heard over the radio as having sound educational values. Unless the schools, working through national agencies and the Federal Radio Commission, can have some choice in the type of speakers and material, these risks may become very great. But it is of real service to youth to hear the actual voices of significant persons on various topics of informing value. This actual speaking presence should make young people feel themselves a part of the national life and stimulate them to greater endeavor for their own development. Oral communication is man's oldest teaching device.

Psychological Tests and Measurements. Another factor that has contributed much to an understanding of pupils' potentialities and to improvement in the teaching process is the various measurement devices. Tests have been devised by such men as Thorndike, Terman, Seashore, Baker, Speer, Haggerty, Orleans, Stenquist, Courtis and many others to measure intelligence, aptitudes, attitudes, personality, character, appreciations, achievements, objectives and special talents. In determining what is called the I. Q. or intelligence quotient (the mental age divided by the chronological age), such ratings have been of great value in enabling teachers to secure a basis of understanding the individual's native intelligence. But so far as appreciations, aptitudes, talents and the like are concerned, many capacities and trends are not discovered by the tests; and it frequently happens that pupils develop unexpected directions of interests. Some pupils whose tests showed a low I. Q. have surprised and confounded their teachers by their brilliance in later life. For this reason some recent writers refer to "the wandering I. Q."

This measurement factor has been used on teachers as well as on pupils. Appraisals are made of personal traits, qualities of mind, personal habits and ideals of teachers in training in order that the best teaching equipment may be given to the individual school. The voice, social manner, dress, reading interests, skills in classroom technique, health habits, character, academic and professional training are all considered. The National Education Association a few years ago drafted a code of ethics for the teacher that comprises a recognition of the qualities indicated in the measurement factor as well as an outline of personal and professional behavior that should tend to elevate the profession.

College Education.—It is hard in the present confused state of competent opinion concerning college education to define its aim with positiveness. There are two widely different ideals.

In one ideal the theory of *general culture* predominates. The informed college student must learn to know the resources of a vast variety of special cultures and to choose intelligently between them. He must accumulate wisdom that can be applied later, must push on in mathematics because this is now the language of all the exact sciences. He must know Latin if he is to be a biologist, physician, lawyer or clergyman, and Greek can do him no harm. He should have an acquaintance with French and German in order to understand better the great world movements revealed by writers in these languages. He must have a general knowledge of the history of the world in its different countries. This lays a new demand on the teacher of history. It is not enough to know the past, but with the opening of the Near East and the Far East and with the widening of our own national interest to take in the remotest corner of the globe, the student must know the great problems of present-day administration and policy; his knowledge of the history of China, Japan, Europe, Africa and South America should make each a center of vital interest, so that in later life he will not only find himself aware of the important events in these fields but will have a wellspring of interest for them that will enable him to be a respectable citizen of the world as well as of his own land. The college student must know something of the great political, social, economic and religious movements of the day, something of the leaders and of the viewpoints of both sides. Never was a present more absorbing; never were national and international questions more important for every part and member of society.

There is danger that the college student today will be confused by the multiplicity of electives and perhaps be overwhelmed by a sense of how little he knows, for with true education this sense grows more rapidly than the sense of how much one knows. In every college there is room not only for the specialist but for men and women of wide learning who are devoted to the development of general ability and information on the part of the students.

The thoughtful student need not be confused if the relationship of one subject to another is shown. Physics and chemistry are not two subjects but rather two phases of the same subject, and as scientific knowledge progresses they are found to overlap more and more. A definite relationship can be found also between astronomy and geography, ancient history and music. The student who is shown these relationships has no helter-skelter accumulation of facts but rather a systematic outline of knowledge to which new facts can be added.

The other ideal of college education is *practical and vocational.* Thousands of young men and women today in this stage of their preparation have decided upon their field of work and are studying to make themselves more proficient in it. If they contemplate entering the legal profession, they study history and economics with special reference to the demands of that profession. If they purpose a medical career, they study biology and chemistry. For the ministry they study sociology and perhaps church history and Greek and Hebrew. Courses in English composition and literature are prerequisite to all professional study.

The present-day tendency is to combine these two ideals into one that is both cultural and practical. A truly educated person has something to do, can do it and understands the social significance of what he does. Professional schools are coming to require longer and longer periods of academic training before permitting enrolment for their professional education. The theory is that a good doctor, lawyer, engineer, architect or minister should know something besides the essentials of his profession, and that this preliminary collegiate education makes for a more able and successful future in the profession and for a well-rounded and happier life. The period of preprofessional training varies somewhat with the profession, the financial status of the university, the section of the country and the standards of the school faculty, though most of the first-class professional schools are now requiring an A.B. or B.S. degree or their equivalent.

There are several welcome signs in college education that indicate intelligent adaptation to a changed civilization. Professors are getting away from the lecture-testing methods. There is more of a tutorial, conference procedure, more of an effort to understand the needs of the students and to give individual help. There is also a greater spirit of liberalization, a breakdown of courses into more functional directions, better systems of housing so that the democratic social qualities can be cultivated and a marked spirit of experimentation with newer types of work, a freer atmosphere and more direct social and vocational objectives.

The *junior college,* taking in the first two college years, has now come into existence to bridge the gap better between the secondary school and the college and to provide some college training for those who cannot or do not wish to go further. Its courses are so well organized and its objectives so well defined that the usefulness of the junior college is unquestioned.

The presence in society of a large number of unemployed young people will probably lead to a longer period of both secondary and college training for an ever-increasing number. This tendency will offset a declining birthrate and restricted immigration, which has already affected the numbers in our elementary schools, by making adult education a function of the high schools and colleges.

The problem of the college, even if it is circumscribed in aim and equipment, or the university or even the professional schools of law, medicine, engineering or theology is the same: namely, how to equip the mind with usable knowledge; how to offer free play to the liberalizing influence of culture that makes for an intelligent and engaging personality; how to link the knowledge and skills of the past with the progressive experiences of the present; how to focus its entire span of activity into such professional aims and ends that the student will honor his career and society. In point of fact, the entire philosophy of education from the nursery school to the professional school is comprised in that function. Education is a never-ending process, as the whole adult education movement bears witness.

EDUCATIONAL PSYCHOLOGY

What is Psychology.—Psychology is connected with everything of importance in human life. We use psychology to get the things we want, to get along with other people, to master skills and studies without waste motion—and even to aid us in studying psychology. Psychology is concerned with our doing these things and quite as much with our enjoyment of them when we do them well or our disappointment when we fail.

Psychology actually grew out of the field of religion. Psychology means literally *the science* (ology) *of the soul* (psyche). Sometime before the birth of Christ men became interested in the qualities of human thought that place men above the animal world. For a time these qualities were all supposed to be a part of religion. Soon it became evident that the problems in psychology were not identical with the problems faced by the ministry. As a result, certain human capacities were called *mind* as distinguished from *soul.*

Consciousness.—About 300 years ago students of the mind became impressed with the importance of the things that we do on a conscious level. They turned their attention to *the psychology of the conscious mind.* More recently, particularly in the 20th century, students of psychology have found the study of consciousness too limited. It did not supply enough material or good enough material. The only direct way to study consciousness is to examine one's own mental experiences. Others can learn about our own consciousness only as we tell them about it. If we observe inaccurately, if we are biased in our viewpoint or if we wish to deceive, the picture is untrue.

Chance of Error.—The 20th-century psychologist has widened the field of psychology and has made its methods and results more accurate. When he studied only consciousness, he had to depend upon the personal reports of other people. A man says, for example, that he is fond of classical literature and that he spends many hours studying Shakespeare's plays. But when the psychologist visits this man's home, the only reading matter there is current copies of popular detective and romance magazines and a few best sellers in light fiction. Conversation with his host makes the psychologist more doubtful of his actual knowledge of the classics. Perhaps the host also mentions that he especially likes symphonic music on the radio. This time the psychologist has a device for checking up on the taste for radio programs. A recording meter is installed on the radio and a record of the listening habits is made. At the end of two weeks the record shows many hours devoted to dance music and light comedy programs. The only classical music of any sort is found on occasions when the radio ran into it—and then according to the record the radio station was quickly changed or the radio was turned off for the time.

Findings like these have raised many questions in the minds of investigators. When the radio owner is confronted with his record, he is very much surprised. His attitude convinces the experimenter that he has not been intentionally dishonest. He may try to make excuses, but little by little it dawns on him that he does not even know his own self. Why do people know so little about their own actions? The answer to that question is almost as important to the psychologist as the answer to the question: Why do people act as they do? Before he gets those answers he must find out a great deal more about what people actually do. Their own notions about what they do have been inaccurate in so many ways that it is necessary to check every report by actual observations of the facts. Then there is the task of finding out the real meaning of facts that have been observed.

Behavior.—The development of psychology has very largely been a process of getting a clearer picture of the field of psychology. Starting with religion, then mind and consciousness, we have finally arrived at a more specific definition. Psychology deals broadly with human *behavior.* What we call *mind* is the higher forms of mental behavior, but psychology is interested in physical behavior too—in internal physical behavior as well as outer conduct. The idea of mind as the main topic of psychology has been expanded to include activity of mind and body. Regardless of what mind is or how it functions, it is clear that physical responses give many cues to our psychological lives.

The interrelationship of mind-body behavior is very evident from a simple illustration. An adolescent boy is introduced at his own request to a young lady. He is conscious that she is attractive and that he likes her. But the social occasion creates obstacles that he has not learned to meet. In his embarrassment he forgets to remove his hat, becomes unable to say the things he intended, blushes, stands on one foot and fumbles with his necktie as he grins and manages to get out the word "Hello." Certainly these inner and outer physical reactions have an important bearing on his mind processes. The speeding up of his heart and the flushing of his face cause him much chagrin. If he is introduced to another young lady, the chances are that the situation will be repeated in much the same way—but it may be not quite so bad as the first time. This time he may remember to remove his hat, but he will probably blush and fumble around much as he did before. But he is learning. He will become mentally adjusted to these social occasions when he learns the appropriate outer responses and even the correct inner responses.

Behaviorism.—The group of psychologists that places most emphasis on the importance of observing human behavior is called *behaviorists.* They have made exceedingly important advances in the field of psychology and have provided much that can be called scientific today. Some of them seem to have discarded all ideas gathered through studying the conscious mind—and to have discarded the terms *consciousness* and *mind.* The behaviorist stresses the importance of environment and stimulus—we are what our surroundings make us. That is his mechanistic or mechanical explanation of behavior; and the argument against it is that human behavior cannot be explained or predicted by a formula. The extreme behaviorist considers that the process we call thinking is merely the muscular action of operating our vocal equipment. Silent thought would require only a very small activity of the muscles in the larynx. Some extreme views of the behaviorists are not acceptable to laymen nor to the great majority of psychologists. The same thing can be said of several other "schools of psychology." We will mention only two more of them here.

Gestalt Psychology.—The *Gestalt* psychology was a reaction from the work of the behaviorists, who had reduced human behavior to very simple elements. This oversimplification had a tendency to treat the individual as a sort of puppet who could make only certain specific responses to any given situation. The Gestalt psychologists said that an individual's behavior is a very complex pattern that grows out of many related elements. (The German word *Gestalt* means pattern or configuration.) Most of the practical situations in life are entirely too complex to be explained as little, simple, separate acts.

Another point that the Gestalt psychologists emphasize is that the individual has some power of self-determination that guides his actions; and that he is not (as the behaviorist seems to say) just a mechanical puppet responding to outside stimuli. If the Gestalt psychologist is right in saying that the individual controls his psychological behavior and is independent of environment and outside stimuli, then there will be countless behavior patterns and it will be very difficult to find any basis for explaining or predicting human reactions. But psychology is seeking a basis, and there can be no psychology without such a basis. Psychology is concerned with the relationship between our environment and our behavior, and there does seem to be some basis for predicting human responses from a knowledge of surrounding conditions and stimuli. If the mechanical viewpoint in behaviorist psychology gives the individual too little credit for self-determination, it seems likely the Gestalt psychologists have given the individual too much credit.

Psychoanalysis.—Another school of psychology, known as *psychoanalysis,* has aroused a great deal of interest and continues to attract many followers. Behaviorism and Gestalt psychology are based on different explanations of behavior. Psychoanalysis is not an explanation of behavior but a technique to make behavior different. The psychoanalyst studies systematically experiences of the patient, usually going back into the earliest remembered period of the patient's life. If all the related experiences can be recalled and brought into consciousness, the psychoanalyst can discover the cause of the patient's trouble and can remove it. Something wrong in childhood, though it seems trivial to the grown-up, may have caused a later mental problem.

For instance, imagine a very nervous young man being treated by a psychoanalyst. He suffers from undue anxiety over every responsibility and especially about his sister. He worries over anything unusual in the sister's behavior. The psychoanalyst finally learns that the patient dropped his baby sister many years before. Though the patient has forgotten this accident until it is recalled to him, and though the sister has been growing up as a perfectly normal, healthy young lady, his whole life has been affected. When the psychoanalyst recalls the insignificant cause, the trouble may vanish. But usually the patient must learn new habits and new attitudes. The psychoanalyst must help him shake off annoying habits that he has built up through the years. Psychoanalysts today concentrate as much on this re-education as on analyzing past experiences.

Each distinct school of psychology is likely to be known for certain minor views, and often these have little to do with the main idea of the school. Psychoanalysts stress the fundamental human drives that lead to mental conflicts if the force of the drive is disturbed. They have not agreed among themselves as to which impulses dominate, as shown by the fact that Freud stressed sex, Adler emphasized fear, and Jung has a long list of life urges. Much importance has been attached by psychoanalysts to dreams and other processes in the unconscious mind that are explained as devices for wish-fulfilment. If the nature of the wish is not obvious, it is interpreted by symbols. In this way Freud explains countless dream experiences as demonstrations of wish-fulfilment in the realm of the sex impulses.

Other Schools of Psychology.—The three just mentioned are the most spectacular and sharply contrasted schools. Other schools, equally important, are not so easily distinguished. Some place great emphasis upon the *motivating forces* of life and list more of these forces than psychoanalysis usually counts in. Some schools magnify the importance of training and education in contrast with inherited abilities and tendencies. Some psychologists emphasize the structure of the nervous system or the description of the behavior patterns that we exhibit. Other schools recognize a separate unit, the *self* or the *mind,* that directs the responses that a person makes.

THE FIELDS OF PSYCHOLOGY

All these disagreements need not discourage anyone who wants to know something about psychology. The disagreements usually resulted from different purposes and different fields of activity. From the many fields come the breadth and variety of modern psychology. Almost every field has contributed a great deal to the science. A quick look at the different fields shows their possibilities and contributions. The fields are often classified in pairs, each pair representing opposites in content but all definitely related and necessary for the complete understanding of the others: social and individual; adult and child; human and animal; abnormal and normal; pure and applied.

Social and Individual Psychology.—Social psychology studies the behavior of organized groups such as the community and of casual groups such as the mob in contrast to the behavior of the individual. Social behavior is important not only in itself but as it helps to explain the nature of the individuals in society. We find the ordinary person capable of getting very much excited in the presence of a group aiming at a common goal. If a mob is bent on violence, it may be surprising to see who will take the leadership and who will go to the greatest extremes in his actions. A timid person may call out for the victim's life and, encouraged by those around him, may suddenly become a leader in the attack on the quarry. The basis of mob and other social behavior is an important aspect of psychology. This will never be fully understood until it becomes clear just what processes go on in the minds of the individuals of the social units.

Child and Adult Psychology.—Child psychology is important for itself and for understanding the adult. Children and young people need a suitable environment and effective training for life. The adult cannot be adequately studied and understood unless the conditions of his childhood are known. Usually the child's behavior appears simpler than that of grown-ups and may be more easily controlled. For that reason it has been an especially useful field to the psychologist in learning more about the nature and processes of the individual adult.

Animal and Human Psychology.—Animal psychology is studied almost entirely for the purpose of understanding human behavior. The child is simpler and easier to control than the adult; the animal is much more so than any human—adult or child. Experimenters have spent many hours in merely observing simple routine habits of animals. They have observed the simpler habit patterns, have tried to discover underlying impulses and have worked patiently at the processes involved in learning. Animals can be put through a routine for many hours that would be next to impossible with children or other human beings.

An advantage in using animals for study is that they can be treated by various physical applications without the complications met in studying human beings. About the only restraint is humane precaution to reduce pain. A rat can be treated with various drugs, and parts of its brain or nervous system can be destroyed—to obtain necessary information for curing human ills—without producing severe pain. When the experimenter has concluded his study, he is free to destroy any specimens that cannot be cured or saved for later use.

Abnormal and Normal Psychology.—Abnormal people represent a great problem. Some kinds of insanity are still so little understood that the patient can get only limited help. Some types of insanity, like certain other human ailments, are probably incurable. Mental abnormalities may result from physical injuries that cannot be overcome. But great progress has been made in providing suitable surroundings for the unfortunate and in treating their afflictions.

A very valuable by-product of the study of insanity and abnormal people is the insight gained in the field of normal psychology. Certain peculiar forms of behavior are, in reality, exaggerated normal tendencies. The behavior of abnormal persons is often simpler than that of ordinary people. Through abnormal psychology it has been possible to discover a direct connection between certain parts of the body and the forms of behavior that they influence. Much of the knowledge of the functions of the human brain has been made possible through studying abnormal people or those whose brain has been injured in some way. The psychology of the normal human adult has been greatly enriched by observation made on the unfortunate group that is either insane or suffers from some mental abnormality.

Applied and Pure Psychology.—Today we find that intelligent people everywhere have a much clearer picture of the proper field of psychology. The reason is that psychology has been *applied* to the problems of their everyday life. Ordinary people have only a casual interest in most pure sciences (science studied for its own sake), until each science has been used to help them live more fully and happily. That is just what psychology is doing for many people today. Thus the ordinary person has come to use pure psychology and to benefit from knowledge of it.

The fields of psychology complement each other. The individual cannot be studied thoroughly without some attention to social groups and *social psychology.* Adult psychology is understood better in the light of *child psychology.* Human beings are vastly different from animals, and yet much of the theory of learning has come from the observation of *animal psychology* added to the understanding of the normal adult. The psychology of the normal person is better understood if the psychology of abnormal people is known.

These are the main fields of psychology; fields in which scientists specialize in order to get all important knowledge about ordinary human behavior. There are other sciences from which valuable information is gained, such as *physiology* and especially *neurology.* The latter deals with the physiology of the nervous system and may in time reveal the physical basis of human response.

Making a Relief Map of the United States, Spring Hill School, Litchfield, Connecticut

Modeling Greek Jars to Use in a Greek Play, Riverdale School, Portland, Oregon

Clothespins Made the Stockade Gate in a Model of Frontier Life, Horace Mann School, New York

Post Office
Hospital

Community Life—A Town Made by Children at the Shafor Boulevard School, Oakwood, Dayton, Ohio

Courtesy Santa Monica City Schools

Courtesy Toledo Museum of Art

CHILDREN LEARN BY DOING IN PROGRESSIVE SCHOOLS

All the activities shown on this page are the work of the children themselves. Little or no teacher guidance was necessary, and absorbing purposes obviated the need for discipline. Modern schools provide an environment in which children can initiate and carry out ideas out of their own experience or from their schoolbooks

ALL EDUCATION IS NOT FROM TEXTBOOKS

Homemaking Is an Important Part of the Curriculum, Skokie Junior High School, Winnetka, Illinois

How to Look One's Best—Part of a Personality Course, Straubenmuller Technical High School, New York

Seventh-Graders Learn the Mechanics of Banking, Montclair Academy, Montclair, New Jersey

Some Practical Presswork on the School Paper, Skokie Junior High School, Winnetka, Illinois

From the 38th Annual Report of the Superintendent of Schools, City of New York

A House Built in the Carpentry Shop, Brooklyn Technical High School, New York

The universal acceptance of education by Americans makes the problems of the school child interesting to everyone. The boy or girl under a fixed age must attend school regardless of his wishes or those of his parents. A strong pressure is exerted by teachers and parents alike to see that he maintains a set standard. Even stronger, though sometimes unnoticed, is the premium on scholastic success as a means of securing the social approval of classmates. Nowhere is the need for psychology more apparent, and nowhere is the successful use of psychology better demonstrated.

Intelligence Tests.—Intelligence tests have been successful in measuring ability to learn and ability for certain types of thinking. They have not given such a satisfactory measure of ability to meet new situations. Since the tests do measure ability to learn, they have proved very useful in placing children in the proper grades in the school system. Sometimes an older child is found to be less intelligent than the other pupils in his grade, regardless of age. If he is demoted one year, he quickly fits into the new situation and makes excellent progress. Sometimes it is found that children are too bright for the grade in which their age has placed them, and often when these children are promoted one or two years, they go along very nicely. What happened was that the ordinary work had been so easy that the child became bored and lost all incentives to do good work. The promotion and the increased difficulty of the work in the advanced grade were all that he needed to bring out his best efforts.

It would be a wonderful thing if the child's problem always worked out so easily. But there are new social problems for a child who has been moved back among younger pupils or placed among his elders. These new problems may cause him more trouble than the scholastic problems that he has just left behind. Some of the larger schools have tried keeping children of the same age in about the same grade and at the same time assorting the dull and superior pupils into separate groups. The dull children may be put into what is called an opportunity class. The brighter pupils may have extra work to enrich their course and to arouse new interest. Even so, it is still likely that the dull children will suffer some embarrassment from the taunts of their classmates.

There are many other interesting things about the intelligence tests. Though there have been many disagreements among the testers, it seems fairly safe to say that a person's intelligence increases steadily until he is about 15. By the time he is 20 he has probably reached the highest score he will ever make. After that there is not likely to be much change until a great deal later in life. This means that ordinary people are just as able to learn when they are mature as when they were much younger. The older child actually can learn much faster than the younger child, since he has developed more ability to learn. The main reason why old people seem to increase in wisdom is that they have had more chance to use their intelligence. They have had more experiences and may use better methods of thinking; but if they meet an entirely new situation, they are not likely to handle it much better than the young person who has just come of age.

Early Influences.—Some unproved ideas have grown up about the influence upon the child's interests and ability of certain conditions at birth or before birth. The results of intelligence tests give no reason for thinking that children born in any one month are any more gifted than those born in another month. The age of the parents at the time a child is born seems to have no direct influence on his intelligence test score. It also seems that the activities and the mental state of the mother before the child's birth do not have direct effect on the mental life of the child. This conclusion comes not from positive proof that there is no direct effect but from the utter lack of evidence to prove that there is an effect.

Learning How to Study.—As soon as a child finds his proper grade in the school system, he meets the problem of learning good methods of study. Usually when a child tries very hard, he is able to do passable work. If his hard work does not meet the standards, the trouble is often with his study habits. Instead of giving up the pupil as dull or stupid, the new attitude favors examining the situation to find out the cause of the trouble. Poor eyesight, hearing, diet and many other organic obstacles have caused children to be retarded in school. A doctor is usually able to supply the remedy in these cases. In much the same way the school supervisor or psychologist may be able to correct bad study habits and otherwise help the child to meet the school standards.

Almost everyone can afford the time to check his habits of learning according to proved principles of efficiency. He can learn more things, learn them better and save time as well. Even the brightest student, who has already learned fairly good study habits, welcomes any devices that will save time and effort on school work. Bright children have the advantage over others because they learn more easily and because they are likely to have picked up better study habits. Children of high ability usually learn that hard work is only one key to success. Another is using efficient methods. Hard work and good methods will enable almost any child to reach the standards expected of him in grade school. Because many schools are unable to spend much time on their most gifted children, there is little incentive for this group either to work hard or to pick up better methods of study.

Intend to Learn.—The first point emphasized in the principles of effective study is that of intending to learn. Adults, as well as children, do a great deal of reading without intending to remember what they have seen. Later they wonder why the material has been forgotten so easily. Actually most of it was never learned at all. Almost anyone will find that he can remember a much larger share of what he reads if he makes up his mind to find out what the author is saying.

Motivate Your Study.—Psychologists have been unable to agree on certain fundamental points about the learning processes. Much that we know about human learning has been gathered from observing animals. Animals and human beings both learn things more rapidly if the result is pleasant or leads to some reward. Some psychologists have formulated a law that a pleasant state of feeling tends to fix a habit. The pleasant experience is repeated, and soon the habit is thoroughly learned. Other psychologists point out that it is the repetition or exercise of the habit that makes it permanent. They argue that repetition is the only important principle of learning. But unless the correct method is repeated, repetition hinders learning instead of helping.

It is certain that a high degree of interest or a favorable state of feeling leads to quicker and easier learning. Whether this pleasant feeling actually makes ideas easier to retain or not, there can be no doubt that things learned under such conditions are more certain to be remembered. Thus the second important principle of efficient learning is that it should be well motivated. The work should be interesting, success should be highly pleasing, and there should be some form of reward, even if it is only the teacher's or classmates' approval.

Use Efficient Methods of Study.—The third principle of learning involves the actual methods used and must be suited to the material at hand. If a student is doing a reading assignment, it is usually desirable to read it first quite rapidly. This will give the general idea and will not require much time. If accurate recall of minor details is necessary, it may be desirable to read the assignment again with some emphasis on the details. Before the end of the study period it is important to close the book and to review the subject matter without assistance. This may be done orally or by making notes. It is quite obvious that this is a quick way to discover which things will be hard to remember. A brief recheck of the book will supply the missing items. Such procedure will probably enable the pupil to make a very high performance in recitation.

Psychologists have found that slow reading may be carried to the extreme. If we read too slowly, we are apt to lose interest as well as lose track of what the author is trying to say. Practice in rapid reading is a desirable thing. By going along more rapidly one is able to catch the high points under discussion even though some details may be missed. This is more than made up by the fact that most details can thus be tied up with the high points and fixed in the mind. Another advantage of rapid reading is that it helps to develop eye movement.

The movements of the eye are being

studied by means of exact scientific measures today. People who have perfectly normal vision may become very poor readers because of the faulty action of the eyes. One way to correct such faults is to do part of our reading on highly interesting or familiar material. By reading rapidly under such conditions it is possible to train the eyes to move along rapidly, smoothly and without back-tracking.

Divide Up Your Study Period.—The final principle deals with the distribution of study periods. This is very hard to work out in a general way, although some suggestions fit most school conditions. Ordinarily it is better if the study time can be split into at least two separate periods. Of course, if one is working problems in arithmetic, there is no object in stopping before a solution has been reached. If we return to the conditions of the reading assignment again, it will be easier to see how distribution can be made useful. The simplest way to split the study time on ordinary reading is to save a few minutes for review at some time close to the recitation period. If, for example, the student has read the assignment and reviewed it with the book closed, it may be best to repeat that review a few minutes before class time. Ordinarily this will require only a few minutes and will have several advantages. It will freshen up one's memory for the recitation. Again it will reveal which points are most easily forgotten. Also, because of the fact that some time has passed between the study periods, the material will tend to be remembered much longer. A student who uses the methods just described is not likely to require a very great amount of review before examinations.

In some types of learning, such as the practicing of skills, it may be possible to split the practice into uniform periods of time equally spaced. The actual time required to learn many skills can be greatly reduced by scientific planning of the spacing and duration of practice periods.

In summary, effective study habits may be said to center around four main ideas:

(1) The principle of always intending to learn, that is, to get what the author is driving at;

(2) The principle of motivation that may come from natural interest in the subject or from the reward that success will bring;

(3) The principle of using effective methods. The point most emphasized in this connection was that of reviewing or reconstructing the material studied, keeping the book closed except for looking up lost points;

(4) The principle of distribution of time. Its application will depend largely upon the material studied, but it is usually desirable to have at least a short review period several hours after the main time of study.

SOME UNSOLVED PROBLEMS

Do Animals Have Insight?—Underlying all the psychology of learning are many factors that are still poorly understood. Some authorities on psychology give the impression that human learning is all very much like the animals' habit learning. Even if they admit that human processes of learning are more complex than those of animals, some psychologists consider there is no essential difference. Other authorities actually credit animals with mental processes as complex as those of human beings. Some psychologists insist that higher animals exhibit insight, which is the ability to foresee the result of an act. Insight, on the other hand, is an important element in reasoning. By means of insight we avoid making incorrect decisions. It might be said that we try out several solutions to a problem mentally, but only when we discover the right solution do we put it into effect. It does occasionally happen that a chimpanzee can study a puzzle and discard wrong solutions without actually trying them out. But there are many situations in which the most intelligent chimpanzee seems utterly unable to display any insight. We do not need to settle all the debated questions in order to make useful applications of psychology. It is probable, however, that when such points are agreed upon, it will be possible to improve the use of psychology in its many applications.

Are Proverbs True?—Proverbs are often called folk psychology. Almost every proverb has some basis in fact. Therefore it would be unwise to attack proverbs generally and we will use only one as an example. Let us take the proverb "Practice makes perfect," and find out how accurate it really is. Suppose we apply this axiom to unskilled labor. The word unskilled suggests that no skill is required in certain kinds of work. Now anyone who has done manual work knows that older men often exhibit skill in almost any kind of work. A young man may spend many tedious and agonizing hours working at a simple job like digging a ditch or lifting bags of grain. He may go on this way indefinitely until an old hand at the job watches him in action. One or two simple suggestions may suddenly transform his task into an art and a pleasure. Practice did not benefit the beginner a great deal until he was helped by some expert coaching. Practice leads to fixing the habits that are practiced. It would be more nearly correct to say that *practice makes perfect the thing practiced.* Certainly those who attempt to learn to type or to play a piano without coaching do not become highly proficient by mere practice. Only an occasional genius is able to achieve a high level of proficiency by using a faulty technique. The person with ordinary ability can ill afford to take the chance of attempting to learn anything well without having guidance as well as practice along the way.

What Is the Value of Hypnosis?—Perhaps the most spectacular if not the only really mysterious phenomenon of psychology is hypnosis. This is a high degree of suggestibility that can be induced in almost anyone who is willing. The hypnotist aids the subject in relaxing and takes charge of him after the hypnotic sleep has been reached. The subject is capable of putting on a performance showing amazing mental and physical powers. Today it appears that these powers are all within the realm of natural law, and that most of them can be learned for use while awake.

Like so many other mysterious ideas, hypnosis fell into disrepute. The fact that it is regularly demonstrated by men of recognized scientific standing leaves no doubt of its genuineness. It merely remains to see that it is used by those who understand it best and who will not use it to cover up fake stunts. Hypnosis is widely used by European doctors and appears to be gaining some use in the United States. Its application is limited by the fact that drugs can be used to secure much the same medical results with greater certainty.

THE PSEUDO SCIENCES

So long as psychology was thought of as a pure science of human thinking it was common for the layman to associate with it all the pseudo sciences of *physiognomy, phrenology, palmistry, graphology* and even the occult practices of clairvoyants, astrologists, numerologists and spirit mediums. Many people still believe in the existence of premonitions, intuition, mental telepathy and mind reading. For the most part the psychologist of today doubts the reality of any of these concepts. At least he has found them of little use in the practical problems of human adjustment to environment.

Unlike the proverbs, many of these ideas are entirely lacking in any grain of truth. Some of them have grown out of traditions and several are merely pastimes for the majority who study them. It may be interesting to take each of these faulty ideas separately and see just how much genuine science there may be in it.

Physiognomy.—One of the oldest pseudo sciences is physiognomy, which is concerned chiefly with the features of the face. This is a very interesting subject to study and becomes a pleasant pastime. Everyone of us learns to pay some attention to the faces of strangers whom we meet. We size people up and are often so prejudiced by this first impression that we never change it.

Actually there is no scientific basis for any of the character-reading systems that are based on the size and shape of the features. Even the traditional square jaw and high forehead fail to withstand scientific analysis. Except for these traditional ideas there is very little agreement between different systems of face reading. One system names 108 specific parts of the face and defines a meaning for each. Experts, using their own systems, have been unable to show any skill in judging character or ability from photographs. Even when the subjects appear before them the physiognomists have been unable to show the value of their methods. Of course, when the physiognomist gets the subject to talk, he may be able to gain considerable insight into character and ability. But if the subjects keep from talking, the physiognomist can tell nothing of importance by examining the face.

These remarks about physiognomy are all aimed to disprove any of the systems that have yet come into wide usage. We might well ask what the physiognomists have discovered that might prove their case. The answer is that they have never put up a case of any scientific interest. Their reasoning goes something like this: "Everybody knows that a square jaw is a sign of aggressiveness" or "People having noses with a narrow bridge have rich artistic gifts. For example, look at Madam So and so," orpossibly, "President X Y Z is dominant, fearless and decisive. He has high cheekbones, close-set eyes and long ear lobes, so therefore everyone who has similar features must have those same qualities." All this is ridiculous in the realm of science for two important reasons. One is that science would base its conclusions upon thousands of cases chosen at random instead of upon one or two convenient specimens. The other is that there is nothing about the structure and function of the human body to make these assumptions at all likely. Traits of character and mental abilities seem unlikely to be bedded in lumps of bone, fat, muscle and skin on the face.

Phrenology.—The discredited practice of phrenology was worked out on the likely theory that character and ability are based upon the structure of the nervous system and especially the brain. That is about as far as the scheme is accurate, for these mental traits are supposed to be revealed by the bumps or protuberances on the skull. Each projection is supposed to lie over an area of the brain that operates one specific human trait. If a trait is prominent, that area of the brain is supposed to grow or expand. When a part of the brain expands, it is supposed to push out the skull at that point. All three of these principles are known to be false. Character traits and mental abilities are not localized in limited, known brain areas. There is no known relation between the size of the normal human brain or any of its parts and the quality of that brain. Finally, since the brain floats in a quantity of liquid, it is evident that any local expansion would increase the general liquid pressure and would result in a pathological condition.

Graphology.—There has been an occasional serious study of graphology or handwriting, but it seems doubtful if graphology will ever reveal very complete information about the temperament and personality. But, unlike the three pseudo sciences just discussed, there is something to be said on the scientific side for handwriting analysis.

Fortunetelling.—Clairvoyance is the simple practice of fortune telling based on no known system. Literally, clairvoyance means insight or ability to see what is not sensed. It is frequently associated with *astrology,* which reads the future in the stars and planets. *Numerology* is based upon numbers and their combinations. These are simple schemes used by entertainers who are not taken seriously by any but the more gullible or ignorant people. It is true that fortunetellers sometimes make forecasts difficult to explain. They are shrewd psychologists and with a few questions can quickly find the victim's frame of mind and the problems that he wishes to have solved. The fortuneteller usually gives his "information" in general terms that the subject is eager to apply to his troubles. He wants to believe, so rejects the errors and wrong guesses made by the fortuneteller.

Transference of Ideas.—Intuition refers to ideas gained from some supernatural or hereditary source. *Premonition* is a special type of intuition in the form of a warning of some coming event. *Mental telepathy* means the exchange of ideas without the use of words or other known devices. In *mind reading* one person is supposed to read the thoughts of another merely by signs revealed in his face or other cues besides language. It is not so specific as mental telepathy and is sometimes supposed to be based on the same methods.

These four notions have all arisen from the same cause, namely, the awareness of ideas of unknown origin. This gives rise to mystery, and the quick solution is the assumption of some equally mysterious power. If a person has been puzzled about how he gained an idea, it is easy to accept some such explanation. It satisfies his curiosity and provides him with a fascinating story to tell his friends. But the scientist is not so easily satisfied. When he examines such experiences he usually finds some perfectly simple explanation. He finds, for example, that the man who was killed in a stunt flight had often predicted his own end. Why then call it a premonition that caused him to predict his death on this last flight?

Psychologists have long known that we react to cues that we do not consciously notice. This is illustrated by two men who were walking down a New York avenue. One man began to talk to the other about the purchase of some fishing equipment that they had once discussed. After they had gone several blocks the second man asked the first if he had known that they passed the very store where they had planned to make the purchase at some later date. The first man answered that he had not the least idea that they were in the same neighborhood. Yet it is certain that the sign came within his range of vision, and the psychologist is inclined to believe that this gave him an unconscious suggestion of the idea.

An impressive amount of evidence is being gathered to support the reality of mental telepathy, but science is very rigid in its requirements, and before an idea can gain acceptance it must be verified by many independent investigators.

Spiritism.—Scientists have been loath to challenge the spirit mediums who communicate with people after death. Some people insist that this activity belongs to religion and should not be questioned. A few scientific check ups have been made and always with the same result. The medium has been exposed, sometimes publicly. But people who believe in spirit messages are not easily discouraged. They may acknowledge the exposure as a fact but reaffirm their belief in spirit communication through mediums.

EDUCATION IN THE UNITED STATES

The Fundamentals of American Education.—Each of the forty-eight states has been free to develop an educational system appropriate to its needs. Although there is abundant federal coöperation in educational activities, there is no central or national authority responsible for education in the United States. Thus, the children of our nation are educated in forty-eight different and distinct systems. In spite of this independent development and organization of our educational agencies, however, we find a number of fundamental elements common to all. National unity and understanding through a multitude of school systems is a distinguishing characteristic of the United States, and results from the common basic purposes of our schools.

Almost from the first, *compulsory maintenance* of free public schools was accepted by the people as a fundamental factor in a democratic government. Gradually, during the first half of the nineteenth century, this principle was incorporated in the school laws by most of the states of the Union. Today the American people hold that not only compulsory maintenance but also *compulsory attendance* is essential to the general welfare of the nation. Between the years 1852 and 1918, the various states accepted this principle, and now compulsory attendance laws are universal in the states.

Although it is the public schools that afford a universal opportunity for education, private schools and parochial schools exist along with the public schools, and parents are free to send their children to the schools of their choice. This policy has been practiced from the first, and recently has been made secure by the Supreme Court of the United States.

An important characteristic of our educational system is the readiness with which it enlarges its scope. Originally, it was restricted to children between the ages of six and fourteen, and to the teaching of the 3 Rs. Today it includes secondary and higher education, with a definite tendency to extend the privileges of public education upward and downward, to adults and to pre-school children. Educational statesmen are becoming conscious that the general welfare of the nation demands these extensions.

The Aims of American Education.—Education today must have a very broad interpretation. It must be thought of as designed to qualify the child to assume responsibilities in a complex social and industrial order and to develop through life as an increasingly valuable member of society.

In recent years, the schools have extended their scope; they teach not only the fundamental processes, such as reading, writing, spelling, and arithmetic, but also the fundamental facts of the social, political, economic, industrial, and religious aspects of life. Much of our educational endeavor has utilitarian motive. Parents are anxious to have their children prepared to participate in some gainful occupation early in life. To this desire the schools have been responsive, both in selecting subjects and in devising methods of instruction. So strong is the utilitarian demand that our educational system is judged to a considerable extent on the basis of the material success of school children in later life.

Equality of Opportunity.—It is the doctrine of the perfectibility of man, widely discussed in France during the Eighteenth Century and brought to our country by the founders of our government, which explains the early development of a system of schools characterized by equality of opportunity. Very early in our national history laws were passed abolishing the rate bill and the fuel tax, and opening the privileges of free schools to all boys and girls on equal terms.

During the first half of the nineteenth century the tuition academy was replaced by the free public high school, and made to articulate closely with the elementary school on the one hand and with the college or university on the other. All traces of sectarian and other types of class control were removed. Thus there was developed an educational ladder free from the evils of the two-class or dual system common in aristocratic and monarchical Europe. A single or unitary school system free to all on equal terms is a significant achievement of American democracy.

Local Control.—Although our school systems have been created and legalized by laws enacted by state legislatures, they are under the immediate control and supervision of local boards of education. Each state has delegated to the local boards responsibility for the schools. Some 145,000 of these school boards exist in the United States, all interested in educating the children of the nation. One result of this plan of organization has been the creation of schools that are sensitive to the will of the people. In a very real sense, our schools are "folkmade," in contrast with school systems dictated and imposed from above.

The Contribution of the American Schools.—The public schools, in the judgement of the well informed, have made and are making valuable contributions to national welfare. They aid in perpetuating the principles of democracy and in fostering the conception of liberty guided by law. They point out the difference between freedom and license, and are instrumental in teaching ideals of fidelity, truth, honor, and virtue. They also contribute to fusing the many divergent elements into national solidarity.

PRIVATE SCHOOLS

In a certain sense, private elementary schools may seem to set up class and other distinctions. Actually this is not so, since all private schools stress the public duties of their pupils, and conform in all respects to the democratic standards of the public schools. Practically the only contact that public authorities have with private schools is the examination of their registers, made necessary by compulsory attendance regulations. All states permit the establishment of private schools. It is true that since the World War a few states have forbidden private schools to use a foreign language as the principal language of instruction. They are, however, virtually unrestricted. This freedom has been guaranteed by the United States Supreme Court. Recently the state of Oregon attempted to compel all children to attend public schools. The Supreme Court of the United States held that this was unconstitutional, and that parents have a right to educate their children in other than public schools. "The child is not the mere creature of the state."

There are three general types of private schools—experimental, preparatory, and denominational. *Experimental schools* are established primarily to evaluate new theories of education, new courses of study, and new methods of instruction. Special attention is given in these schools to the physical well-being of the child, to the growth of group consciousness through participation in the school as a community, and to the development of initiative and self-expression by appealing to the interests and capacities of the child. These schools are either independent or are attached to a university school of education. They have been able to advance practice in education in many directions, whereas the public schools for the most part have less opportunity for experiment.

Preparatory schools exist primarily for the purpose of preparing boys and girls for college. These schools are usually rather rigidly restricted by college-entrance requirements. Both curriculum and methods of instruction reflect the influence of college conditions and domination.

The *denominational schools* exist in large measure to further church loyalties and to provide religious education. They are more numerous than either of the other types. Eleven of the leading denominations in the United States provide educational facilities for their children. They control nearly 2,200 secondary schools and about 6,225 elementary schools. The Roman Catholic Church leads all other denominations in its zeal and loyalty to this type of education.

However, the total enrollment in all private schools, including both elementary and secondary schools, is less than 10 per cent of the entire enrolment in the schools throughout the nation.

Collegiate and professional education have been generously cared for by both private and denominational support. This has been true throughout our history. The states were tardy in providing higher education, and in one of the first attempts to do so the state of New Hampshire endeavored to abrogate a charter of an endowed college by converting Dartmouth into a state university. It was the Supreme Court of the United States, in this instance, which set forth the principle that a charter of a college is a contract and cannot be set aside by an act of the legislature. Made secure in their rights by this decision, the private and denominational colleges and universities have made phenomenal growth. Merely the recall of such names as Harvard, Yale, Princeton, Chicago, Columbia, Northwestern, Stanford is sufficient to direct attention to the invaluable contributions of private and denominational colleges. Through research and professional studies, they have improved living conditions, alleviated suffering, added to the wealth of the nation, and contributed large stores to our scientific and cultural heritage.

PUBLIC SCHOOLS

Certain aspects of public education in the United States are directed by the Federal Government; many of the most important divisions are directed by the states; and a number of aspects are directed by local governments. The administrative machinery through which each of these three political units cares for its responsibility is interrelated with that of the other two.

The Federal Government and Education

Although the Constitution of the United States is silent on the question of education, the Federal Government has in a century and a half developed extensive educational responsibilities. Despite the fact that there is no generally recognized national system of education, the Federal Government is engaged in a large number of general and special educational enterprises. This interest in educational activities extends to the legislative, judicial, and executive branches of the Government.

Most of the administrative units of the ten executive departments are charged with educational responsibilities more or less closely related to their specific duties. In addition, thirty-seven independent establishments of the Federal Government are directly or indirectly responsible for certain educational duties. Each of the ten executive departments provides schools or classes to train its own personnel. Also United States citizens living in the territories and outlying possessions, or in Federal areas and reservations must look to a Federal agency for education. While it is not possible from information available to give a detailed account of the Government's interest in education, it is clear that there is scarcely an aspect of education which does not to some extent receive the Government's attention. In one or another part of the country, the Federal Government provides both liberal and vocational education for youth and adult, and offers instruction in the primary grades as well as the most advanced graduate and professional studies. Where local provision has not been made, the Federal Government provides intelligent consideration for the physically, mentally, and socially handicapped; and races and cultures of every degree of advancement are included in its comprehensive program of studies.

The absence of uniformity in the Government's educational policies and practices is a striking fact. In some parts of the country, the Government has complete control of both policy and program. In other parts, the regional or local authorities are virtually independent. Sometimes the Government pays all the cost; in other instances it pays only a part; then again it pays no part of the cost. In some of its educational efforts, it provides buildings; in other cases it does not. From these citations, it must be clear that the Government's interest in education is comprehensive but not organized in accordance with a systematic plan.

Congress and Education.—The Congress of the United States, acting under the authority of the "general welfare" clause of the Constitution, has from time to time appropriated public lands and money for the support and extension of education. This is a practice of long standing. As early as 1787, Congress gave the Ohio Land Company certain designated tracts of land for educating the children living within the limits of the purchase. On many subsequent occasions, Congress has aided education by similar appropriations. In 1837 the surplus revenue was distributed to the states; much of it found its way into the school funds of the states. In 1863 Congress appropriated large tracts of Western land to the states to encourage the study of agriculture and engineering. The list of government appropriations for education could be extended at great length.

Today Congress is appropriating large sums of money to the Executive Department, to states, and even to private institutions for educational purposes. Congress directs that this money shall be used to promote education in its broadest sense—"to inform the people, to change their attitudes, and to perfect their skills."

Congress also creates and finances commissions and surveys to study and report on the general educational conditions of the nation. In recent years, three commissions thus appointed and financed have carefully studied the present condition of secondary education in the United States, the preparation of teachers for public schools, and the problems of public-school finance.

Further, Congress prescribes subjects for instruction for people living in special Federal areas, in the territories, in the District of Columbia, and at the Military Academy in West Point and the Naval Academy in Annapolis. Congress also operates a printing office in Washington for publishing government documents; many of these are distributed gratis to the people of the nation, and all others are sold through the Superintendent of Documents at a very nominal price. Attached to the Government Printing Office is an apprentice school for employees of the office.

Courtesy Los Angeles City School Report, 1937

Corrective Teaching

This little girl has a speech defect, and is being taught to speak correctly by observing and copying the teacher's lip movements in the mirror

The Library of Congress, under the direction of Congress, was established in 1800 and has become a national depository for books and other records of culture. With books, manuscripts, and records numbering more than 7,500,000 items, it compares favorably with the largest libraries in the world. All American publications that secure the privileges of copyright in the United States are in the Library: a copy must be sent to the Library of Congress to secure copyright protection. And the Library issues index cards for all copyrighted publications. Through purchase and other means, the Library of Congress has become the owner of many rare and special collections of books, rich in history, political science, and official documents. It is also the general depository of books printed for the blind, which are distributed to local communities through the coöperation of the states. It supports a general library service, and through the facilities of the inter-library loan system special service is rendered scholarship by loaning to other libraries books for use of investigators throughout the nation. Through its exchange of public documents with other nations, it coöperates in general international education.

The Federal Courts and Education.—Through injunctions and decisions the Federal courts have at various times determined educational policies. The Dartmouth College case and the Oregon case are two illustrations of specific instances. The last-mentioned case declared unconstitutional a state law requiring all children to attend public schools.

The Executive Branch and Education.—As might be expected, the Executive Department of the national Government has many more contacts with education than either of the other branches.

THE PRESIDENT.—The President of the United States may indirectly influence the principles and practices of education in areas under the jurisdiction of Congress and the Executive Departments. To Congress he may recommend educational policies, and even encourage their adoption by his personal interest. In appointing the cabinet officers, who head Executive Departments, he has an opportunity to modify educational policies as well as all other executive policies.

In 1929 the National Advisory Committee on Education was requested and was appointed by the President of the United States. This committee was directed to analyze the activities of the Federal Government in the field of education and to inquire into the public policies involved. The Report of the Committee, presenting its findings and recommendations, was published in 1931.

One more illustration may be given to show how the President of the United States may use his office to modify educational policies. In 1862 the Morrill Act was signed by President Lincoln. By signing this Act, the President, in coöperation with Congress, changed fundamentally the policy of the Federal Government toward education in the states. Prior to this date, the Federal Government had granted land and money to the states for educational purposes without designating how the gifts should be used. With the Morrill Act, there went a definite prescription as to the manner in which the gift should be used. The money must be employed to teach agriculture and mechanical arts. In all subsequent grants of Federal aid for education, the Government has exercised the right to supervise its expenditures. In time the Federal Government has gradually extended its control over many phases of education formerly purely local.

The Executive Departments.—A recent analysis of the ten branches of the Executive Department of the Federal Government shows that each one is charged with definite educational responsibilities. A complete list of all educational agencies supported by the Government is not yet available. It should be remembered that these educational agencies have been organized as the complexity of the Government increased, and a new educational agency is always allocated to the department most directly concerned. As a consequence, confusion of agencies sometimes results.

Department of Agriculture.—The Department of Agriculture coöperates with the states in providing Experiment Stations to further research in different phases of agriculture. Experiment Stations resulted from the passage of the Hatch Act (1887). According to the terms of the Act, Federal aid for experiments in agriculture became available. The sum of $15,000 annually was allotted each state and territory for the purpose of establishing Agricultural Experiment Stations in order "to promote scientific investigations and experiments respecting the principles and application of agricultural science."

In 1906 the Adams Act provided each state an additional $15,000 annually, "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States." By the Purnell Act (1925), each state is to receive an additional $60,000 a year as long as the law remains in force. In this instance, appropriations must be made annually by Congress, and the money "shall be applied only to paying the necessary expenses of conducting investigations or making experiments bearing directly on production, manufacture, preparation, use, distribution, and marketing of agricultural products, and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural life, and for printing and disseminating the results of said researches."

Reference to these three Acts—Hatch, Adams, and Purnell—serve a dual purpose. The acts indicate the real interest the Government has for agricultural education and also show that the Government is increasing its control over the expenditure of money granted the states for educational purposes.

In 1914 the Smith-Lever Coöperative Agricultural Extension Act became a law. This law was the outcome of the Report of the Country Life Commission appointed by President Theodore Roosevelt. The Commission had been appointed to study the life needs of the rural people and to recommend improvements. The Commission recognized both the necessity and the possibility of providing agencies for improving rural life and making the country a more satisfactory place in which to live. To realize this objective, it was thought proper for the Federal Government to aid the states in the "diffusion among the people of useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same."

The Smith-Lever Act provides that this work shall be under the direction of the United States Department of Agriculture, in coöperation with agricultural colleges in each state. The work must include "instruction and practical demonstrations in agriculture and home ecomonics," and the publication of information on these phases of rural life.

The cause of adult education looking toward the improvement of rural life has been greatly stimulated. For the purpose of financing agricultural extension, three types of national aid have been granted the states. The sum of $10,000 a year is provided each state and the Territory of Hawaii for printing and distributing information. The sum of $500,000 a year goes to the maintenance of agricultural agencies. The sum of $4,000,000 a year is allotted to rural extension work. The last two appropriations are distributed to the state in the proportion that the rural population in each state bears to the total rural population of the United States. It should be noted, however, that each state must appropriate out of its own revenues a sum equal to all national aid received.

The following statistics will furnish a good average basis for evaluating this type of adult education; the figures are for a recent year. The administration of the Smith-Lever Act required the services of 6,179 agents, distributed as follows:

County Farm Advisors	2,616
Home Demonstrators	1,287
Boys' and Girls' Club Work	251
Negro Extension Work in the South	290
Other Extension Service	1,735

Competent authority estimates that, during the same year, the Agricultural Extension Service provided for by the Smith-Lever Act benefited 2,000,000 farmers, 650,000 farm women, and 500,000 farm boys and girls in club work.

The 4-H Clubs with a membership of nearly a million boys and girls in farms and rural communities are under the supervision of the Federal Department of Agriculture and the agricultural colleges of the individual states. In these clubs education is definite and practical. Its object is better farming and better living standards.

In addition, the Department of Agriculture collects and distributes information concerning animal and plant industry, soils, chemistry, entomology, agricultural economics, public roads, forests, and the weather. The huge number of the Department's publications constitute a library of adult education for farmers and farmers' wives.

So the Department of Agriculture conducts an extensive educational program dealing with problems of general agriculture and rural life. As a consequence, thousands of farmers and their families have come to understand the significance and the relation of their lives to that of the nation as a whole. In scores of instances, rural life has been modernized, and in the place of constant drudgery, new pleasures, new hopes, and new ambitions have come into the farmer's home.

The War Department.—Recognizing that the national defence in a modern state requires the service of intelligent and adequately trained officers, the Federal Government through the War Department has developed a system of formal and practical education looking toward this end. The oldest and most extensive part of this system is the United States Military Academy at West Point, which was opened July 4, 1802, with ten cadets present. Today the maximum authorized strength for the corps of cadets is 1,374, selected from all parts of the United States. The education of these cadets is provided for in a four-year course, largely technical and professional. The course includes mathematics, physics, chemistry, English, Spanish, history, and economics, as well as many subjects directly related to military science. Upon graduation, the cadets, or regular students, are commissioned in the army as second lieutenants. The location of the institution is historical, for it was the key to the Hudson and kept the British from splitting the colonies in two. Authorities tell us that it is the greatest military school in the world. Its buildings and grounds represent a money value of $30,000,000.

The War Department supervises and directs several other educational units besides West Point. In coöperation with colleges and high schools, it provides courses for the Reserve Officers Training Corps.. Grants are made for training the National Guard and provision is made also for forty-nine Citizens' Military Training Camps. These camps are attended by young men between the ages of seventeen and twenty-nine, who receive instructions in the rudiments of military science and citizenship, with special attention to physical development.

The Army War College, where special attention is given to problems of interest to the Army, Navy, and Marine Corps, is located in Washington. There the War Department maintains also the Junior Reserve Officers' Training Corps.

The Navy Department.—An extensive system of general and technical education is supervised and maintained by the Navy Department. At the United States Naval Academy in Annapolis, officers of the regular navy are trained. Students in this school are styled *midshipmen* and are selected chiefly by competitive examination. The personnel is nearly 2,000. All students except four Filipinos must be citizens of the United States. They must not be under sixteen nor over twenty-one years of age on April 1 of the calendar year in which they enter. Adequate height, weight, and physical condition are important considerations for admission. At the time of entrance, applicants must be unmarried and remain so during the entire course; a midshipman who marries before graduation is dismissed from the service. Each is paid $780 a year, and at the time of his admission is required to sign articles by which he binds himself to serve in the United States Navy during the pleasure of the President of the United States unless officially discharged. The course of instruction is four years of technical and general subjects. Upon graduation, midshipmen are commissioned as ensigns in the navy or are assigned by the Secretary of the Navy to minor positions in the Marine Corps or the Staff Corps of the Navy.

In coöperation with six universities—Harvard, Yale, Northwestern, Georgia School of Technology, Univer-

FARM AND HOME ACTIVITIES OF 4-H-CLUB BOYS AND GIRLS

Photos from U. S. Department of Agriculture

Dressmaking at a Local Achievement Day, Lawrence County, Missouri

Preparing a Tomato-Canning Demonstration, Holmes County, Mississippi

Club Members Judging a Shropshire Sheep, Seneca County, New York

Demonstration in Judging Holstein Dairy Cows, Deschutes County, Oregon

4-H JUNIOR
DAIRY SHOW

Members Exhibit Their Guernsey Dairy Calves, Springfield, Massachusetts

A Garden Club Inspects a Member's Garden, Yellowstone County, Montana sity of Washington, and the University of California—the Navy Department supervises courses for the Naval Reserve Officers' Training Corps. Students enrolled in these courses may apply any earned credit in these courses toward a degree granted by the university. Instruction is given in navigation, seamanship, ordnance and gunnery, tactics, international law, communication, and marine engineering.

Courtesy U. S. Indian Service

Government School for Shoshone Indian Women

A well-equipped kitchen on a Wyoming reservation helps in teaching home-canning methods

The Navy Department also maintains a graduate school at Annapolis and at seven civil universities—University of California, University of Michigan, Harvard University, George Washington University, Carnegie Institute of Technology, Massachusetts Institute of Technology, and Rensselaer Polytechnic Institute. These courses are designed for line officers who are due for their first "tour on shore duty." At Newport, Rhode Island, the Naval War College offers a one-year course for officers. In coöperation with Harvard University, a two- or three-year course in international law is provided for senior naval officers.

The Naval Prison Schools, School System of Guam and of American Samoa, Naval Medical and Dental schools, Engineering Experiment Stations, Research Laboratories, Hydrographic and Topographic Surveys, and the Naval Observatory are under the jurisdiction of the Navy Department. The Department provides also for exchange of students with foreign naval and military schools.

Department of the Interior.—The Department of the Interior has supervision over the education of Indians and native Alaskans. This includes temperance instruction, which is required by law in Indian and colored schools of the territories. The Department also has charge of education in the Virgin Islands and in Hawaii, and of the nurses' schools in Washington for the Freedmen's and St. Elizabeth's hospitals. The Columbia Institution for the Deaf and Howard University for Negroes, both in Washington, are under this Department.

Another important educational feature developed by the Department is the National Park Service, in connection with which schools and courses are maintained for rangers, guides, and attendants. In each of the national parks, guides and naturalists are present to give instruction on all phases of the natural history of the park. Through formal lectures and excursions, these naturalists acquaint tourists with the outstanding features of the park.

The Geological Survey, under the Department of the Interior, has mapped the geological structure of the United States, and this is an educational factor of importance both in college and in adult business activity.

Perhaps the best-known educational agency of the Department of the Interior is the Office (formerly Bureau) of Education, which is under the immediate direction of the United States Commissioner of Education. The Office of Education does not supervise education in the states, but gathers and publishes statistics of public and private schools in America. These statistics are analyzed, and trends of education in the nation at large are pointed out through the frequent publication of official bulletins. Without exercising legal authority over the schools in the states, the Office of Education makes a distinct contribution to the sympathetic understanding of educational problems essential to national welfare.

In October, 1933, the duties of the Office of Education were extended to include the work formerly done by the Federal Board of Vocational Education, which administered the Smith-Hughes Act (1917) and the Smith-Bankhead Act (1920), the former promoting vocational education; the latter, civilian rehabilitation.

By Federal appropriations, the Smith-Hughes Act encourages secondary education in the subjects of agriculture, industrial arts, and home economics. To share in this type of education, the state must match the Federal appropriations dollar for dollar. The money thus supplied is used to pay salaries of teachers, to provide training schools for vocational teachers, and to promote research in vocational education. In 1929 the Smith-Hughes Act was supplemented by the George-Reed Act, which promotes vocational education in institutions below the college level, including agriculture, trade, and industry.

The Smith-Bankhead Act (1920) provides a program of vocational rehabilitation for those disabled through accidents—in factories, on the farm, in the street, or in the home—or from disease. More than 398,000 persons in this country are permanently disabled. It is known, however, that 79,000 of this number—men and women—who are unable to return to their jobs or follow their professions may be restored to gainful occupations and economic independence through reëducation. During one recent year, 30,000 of these disabled persons were in process of rehabilitation under the provisions of the Smith-Bankhead Act. It is clear that the funds are not adequate to meet the needs of all. The Federal Emergency Relief Administration has made available funds for a much needed expansion of the rehabilitation program.

Other Departments.—The other executive departments—State, Treasury, Labor, Commerce, Post Office, and Justice—participate in educational activities, but to a lesser extent. The Department of State provides the Foreign Service School, edits the laws of Congress and treaties with foreign countries, and maintains a division for collecting and distributing current political and economic information. It aids also in the exchange of students with foreign countries and in making available information of international character.

The Treasury Department has charge of the American Printing House for the Blind and coöperates with the states in distributing books for the blind. It also provides an academy for the Coast Guard, a school for clerks and stenographers in the Internal Revenue Office, and training for those connected with public health. In addition, the Treasury Department promotes research through the National Institute of Health, and on financial and economic problems.

The Department of Justice contracts with industrial schools in the states to aid in the education of Federal prisoners, and supports a national training school for the youths committed to an Industrial Reformatory.

The Post Office Department aids

education in the nation by supplying free mailing privileges to Land Grant Colleges, the Agricultural Extension Service, Experiment Stations, and to schools for the blind.

The Department of Labor distributes textbooks for citizenship training in public schools and for naturalization requirements. It also gathers and publishes statistics and other information relating to child welfare, women in industry, and labor conditions. It accredits American schools for foreign students, and promotes industrial welfare organizations.

The Department of Commerce determines vocational standards for airplane pilots, merchant-marine officers, and radio operators. Through the Bureau of Standards, Coast and Geodetic Survey, and research in connection with mines and minerals, in which certain universities assist, the Department makes worth-while contributions to scientific knowledge. Even more important is the work of the Department of Commerce in furnishing information to businessmen—a very valuable kind of adult education. Especially in the last ten years it has gathered for the use of sales managers, advertising men, and others data on current sales volume in different parts of the country and by different types of retail outlets.

ndependent Federal Establishments.—Congress has from time to time created a number of independent commissions and institutions, and many of them have found it desirable or necessary to engage in specific educational activities. *The Civil Service Commission* determines the vocational standards for the personnel of the Federal Government, including those engaged in educational and intellectual pursuits. It examines candidates for teaching positions in the Indian Service and in the Philippines. It provides training for government examiners and promotes research in personnel procedure and administration. Finally, it operates a bureau to exchange the research findings with foreign psychological laboratories.

The Interstate Commerce Commission supplies instruction to its new employees, and the United States Veterans Administration trains nurses, attendants, and field agents. In the District of Columbia, the Federal Government provides a school system for the District, the National Library for the Blind, and the Columbia Polytechnic Institute for the Blind. The Pan-American Union provides a division for intellectual coöperation.

The Smithsonian Institution, under the supervision of the Government, was founded in 1846 with money provided by the will of James Smithson, an Englishman, for the increase and diffusion of knowledge. Throughout its history, the Institution has conducted and encouraged important scientific researches and investigations. Several scientific publications are issued and distributed free to libraries, learned societies, colleges, and universities throughout the world. The Institution also has charge of the National Museum, the National Gallery of Art, including the Freer Gallery of Art, the International Exchange Service, the Bureau of American Ethnology, the National Zoölogical Park, and the Astrophysical Observatory.

Eight other independent boards and commissions authorized by Congress are active in promoting research and in collecting and disseminating useful knowledge.

From the outset, the Federal Government has taken steps to keep citizens informed concerning governmental policies and achievements. The debates in Congress have been made public; the decisions of the courts have been published; and the executive departments have from time to time disclosed their transactions. Information of a general or technical character has been collected and disseminated. The results of research have been interpreted and made available.

The Federal program of education has been both liberal and vocational, and has extended to all levels of education—from the kindergarten to the post-graduate and professional. It has dealt with all conditions of life and with all races and cultures. The Government has accepted in full measure that sentence in the Ordinance of 1787 that asserts: "Religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged."

STATE AND LOCAL SCHOOLS

As already stated, the Constitution of the United States is silent on the question of education, but by implication the Tenth Amendment placed education among the duties of government assigned or reserved to the states. During the course of the nineteenth century, each of the states by its Constitution and by appropriate legislation assumed this responsibility and organized a system of public education.

The present forty-eight systems of schools have been organized under widely different circumstances and have been responsive to the local, political, economic, and social demands. Yet they are characterized by a single common purpose—the development and perpetuation of our basic national ideas. Only on rare occasions has the Federal Government found it necessary to use its constitutional authority over the states to check or correct an educational tendency contradictory to the ideals of the nation.

Development of the State Systems of Education.—The development of these forty-eight systems of education was slow of realization, and it required the major part of the last century to complete the task. Strong opposition had to be overcome, despite the fact that practically all the founders of our nation not only favored the plan of public education but even declared that the future of our government was safe only when supported by public schools. The public school, they declared, was the hope of our country.

What were the obstacles that retarded the development of our public education? Many people objected to financing education by assessing a general tax. To make such an assessment was confiscation of private property, the opponents of the plan declared. The pauper-school idea had come to occupy a prominent place in the thinking of people who said only paupers were entitled to free instruction. Others asserted that the cost of education should be borne by the parents in proportion to the number of children educated. This plan overlooked the sound principle that education is for the community as well as the individual. Each of these obstacles was in time surmounted, and the public schools became entirely free.

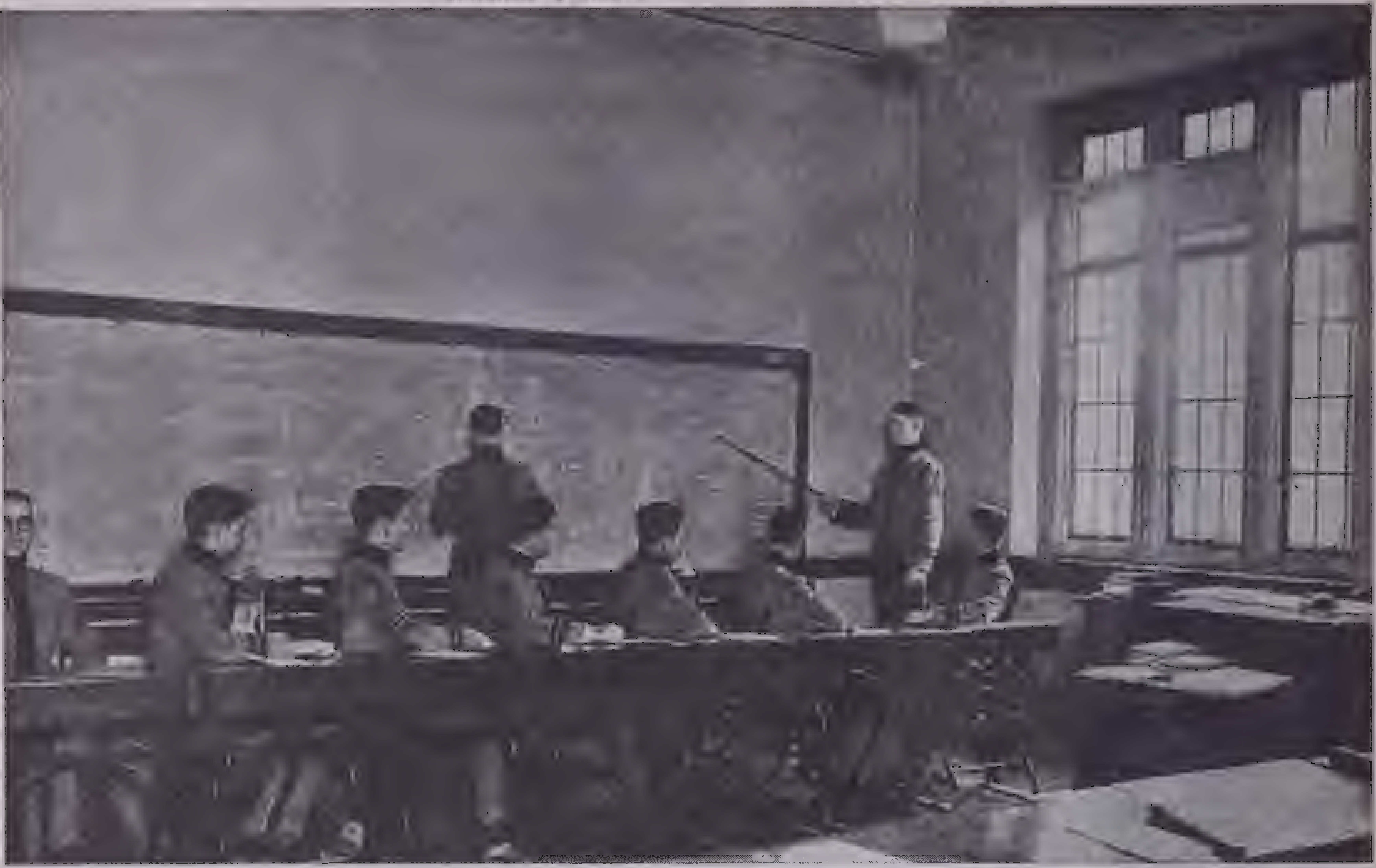
A dispute developed over the control of the schools. The local township and district boards insisted on full control of the schools. Educational statesmen, however, pointed out the advantages of larger units of control. This issue precipitated a long and bitter controversy in Ohio, Massachusetts, and other states. Control of education was demanded also by denominational interests. Those influenced by sectarianism insisted that parochial schools were essential for religious instruction. In time, the question of control of schools was settled by placing their general supervision under the authority of the state, leaving to the local units the responsibility of financing them, hiring teachers, and enforcing the regulations decreed by the state authorities.

To round out our present public-school system, it was necessary to extend the system beyond the teaching of the 3 R's. The thought of expanding the free school to include secondary (high school) education grew slowly and did not become generally popular till the opening of the twentieth century. Secondary education has now become universal in the United States and is everywhere accepted as an integral part of the public-school system.

These decisions were not fashioned by a super-power—whether philosophical or legislative—and imposed on the people from above. They appeared as the educational consciousness of the people matured. Some of them were decided at the ballot box, others by the action of the direct representatives of the people. It may be claimed with great justice, therefore, that our system of education better expresses the will and voice of the people than any other national system in the world.

In determining the details of administration and supervision, the states have found it necessary to yield to the strong demand for local autonomy—a principle of government which had been diligently cultivated during the colonial and early national periods. It was therefore found necessary to place the immediate administration and supervision of schools in the hands of local authorities—the district, township, county, and city boards. This fact helps to explain our 145,000 school boards, and why the people cling to them.

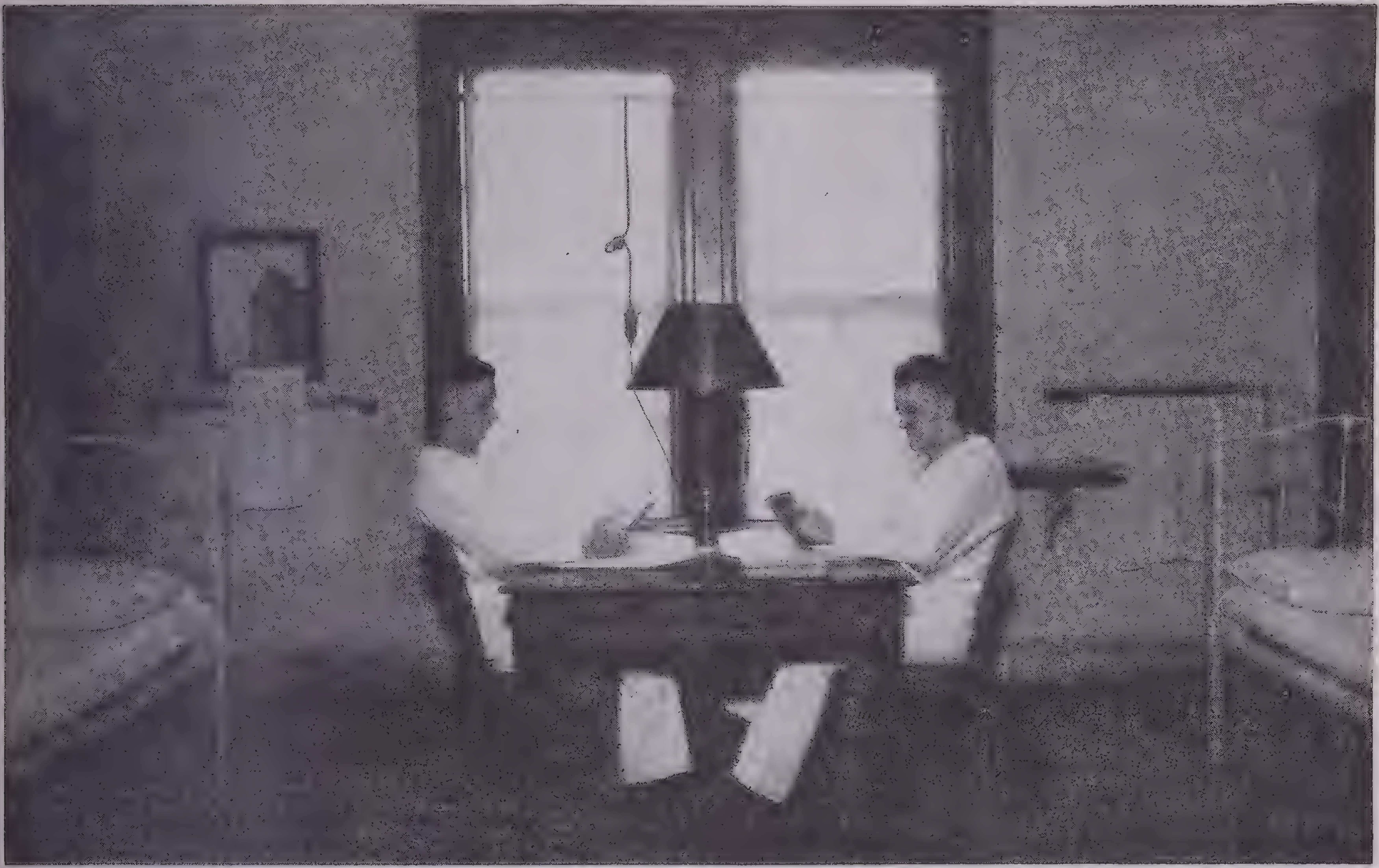
The Organization of the State and Local School System.—The source of school authority, as we have seen, is placed in the state, and this is supported by many decisions of the courts. The courts have frequently declared that



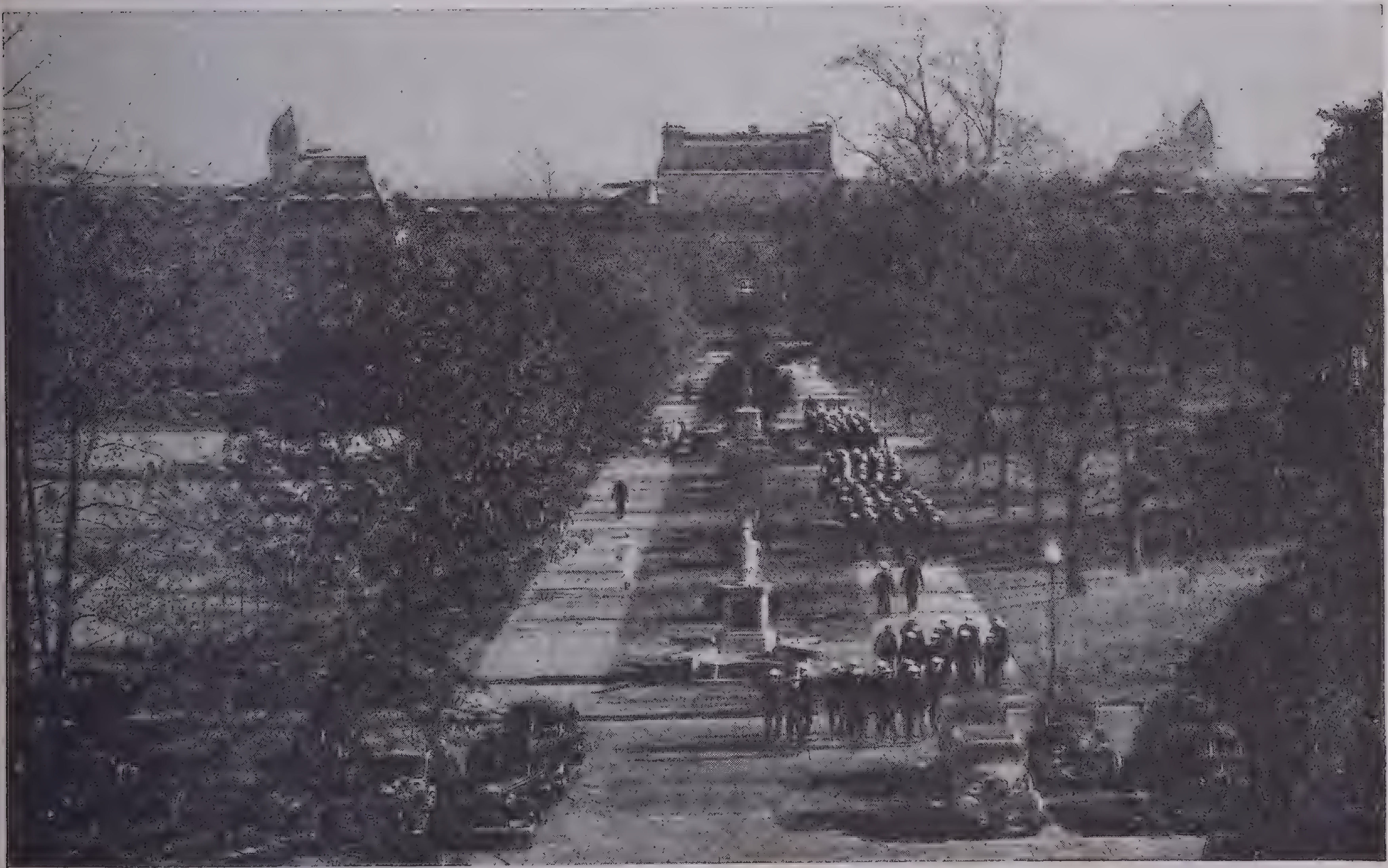
Demonstrating the Curves of Projectiles in a West Point Classroom

Photos by Signal Corps, U. S. Army

Washington Hall—The Cadet Mess Hall, Armory and Drawing Academy



Shipshape is this Midshipmen's Room in Bancroft Hall, the Dormitory



In Orderly Formation Midshipmen March to Bancroft Hall at Annapolis "the whole state is interested in the education of the children of the state." This larger unit can meet this grave responsibility more fully than individual communities could. In brief, it is the state that requires that our children be educated, and insists that the advantages be constantly improved and the standards raised. Throughout our national history, the state has been the active unit in promoting and controlling education.

The State Office.—Each state elects or appoints a principal school officer. In more than two-thirds of the states this chief school officer is elected on partisan ballots. In other states he is appointed by the governor or by a state board of education. In twenty-eight states, he is called the Superintendent of Public Instruction. In eleven states he bears the title, Commissioner of Education. Director of Education, State Superintendent of Free Schools, State Superintendent of Education, are some of the other titles used.

The duties of the state office are many. It collects and publishes educational statistics and other information; prepares and distributes blanks and forms; interprets and enforces the school laws of the state; apportions state school funds; supervises the training and certification of teachers; recommends textbooks; approves courses of study; inspects and accredits schools; and supervises agricultural and vocational education. The present tendency is to increase the powers and duties of this office. Most of the states impose other important duties on the office. It has charge of the education of the blind and deaf, and in some states acts as censor of the moving pictures shown in the state. It may also sponsor visual and radio education.

State Boards of Education.—In the organization of a state school system, a state board of education is frequently found. The board may select the Commissioner of Education, determine the general school policy of the state, exercise general supervision over the schools, decide what new work shall be attempted, adopt rules and regulations for the general control of the schools, and recommend to the legislature the needs of the schools. In some instances, it acts as a textbook commission to select and adopt books to be used in the state. A great variety of other duties may be performed by state boards. Their duties have been described as legislative, while those of the commissioner or superintendent are executive.

The County and Education.—In the forty-eight states there are approximately 3,100 counties. Forty out of the forty-eight states make use of the county as a subordinate unit for school administration; the New England states, Delaware, and Nevada furnish the exceptions. The educational machinery delegated to the counties is administered by county superintendents and county boards of education. Not all counties have both types of administrators. The county board of education is sometimes omitted.

At the time the office of county superintendents was established, its primary functions were statistical, financial, and clerical. It was an agent of the state, and performed the task of relating the state office of education to the many small school districts into which the county was divided. The county office kept a record of the boundary lines of the school districts, supervised the expenditure of the school money, enforced the laws relating to the certification of teachers, collected information regarding attendance, and visited the schools as occasion permitted. The work of the county office in early days required no special preparation or professional training, consequently it was the practice to select the superintendent by popular vote. This method persists in many localities, although the changes in the work of the office now make technical knowledge essential.

In recent years, many of the duties formerly performed by the township and district boards have been transferred to the county office, and new duties have been created and imposed by the legislature on the county office. In consequence, the duties of the county superintendent are fundamentally changed. Today supervision of instruction in the rural schools is a primary duty requiring careful professional preparation, as other duties demanding technical knowledge have been imposed. The county officer must aid in the preparation of the financial budget and in the selection of textbooks and teachers.

The County Board of Education.—The duties of the County Board of Education vary. In some states, it has only advisory power, with very little or no power to enforce decrees. In other states, it has in addition definite functions in the administration of schools. The board in these states is responsible for the certification of local teachers and the adoption of courses of study. Usually, the boards of this type are composed of members drawn from the best teachers of the unit, and they are paid for the work they do.

In a few states the county is the unit for school purposes. In these states all the schools of a county outside the cities are consolidated into one county-wide school system. A small board of education is selected by the people, and it has the same duties and powers as a city board of education. This board selects and appoints the county superintendent of schools, and determines his salary and term of office.

The county board, upon the recommendation of the superintendent, appoints all principals, teachers, janitors, and other assistants for the county. All salaries are fixed by the board. It also furnishes all supplies, pays all bills, and levies taxes necessary for the county schools. Further, this board may establish new schools or consolidate existing schools; may establish high schools and construct buildings for them; it holds titles to all school property in the county; and may provide for such special schools as the community requires. Such organization of schools is found in Maryland, Georgia, Florida, Louisiana, and Utah. In these states, the organization of the best city schools is applied to the organization of the rural schools.

In 1933 West Virginia made a radical change in the organization of its schools. All local districts were abolished, and the control and supervision were vested in the County Board of Education, with five members elected by the voters for a term of four years. This board is empowered to abolish unnecessary schools, to consolidate others, and to provide adequate transportation for children living more than two miles from the school. The law provides that this board shall select the county superintendent, who becomes its executive officer. Steps were also taken to equalize the cost of education by having the state assume specific financial responsibilities.

In most states, however, a different school unit prevails. Outside New England and the county-unit states just mentioned, the counties are subdivided into small administrative units; these units are the township or the district. These small units persist despite the accumulation of evidence pointing to their inefficient management of the schools. Due to the inequality of the distribution of wealth and of population, to improvement of highways and methods of transportations, and to other social changes, many educators argue that the small-unit school system is no longer needed and should be replaced by larger school units for rural populations; but the tradition of local autonomy holds this reform in check.

The City Organization.—The city school district does not share the limitations of the small rural districts. The population is usually sufficiently large and compact to constitute a working unit, and local wealth is usually sufficient to make it possible to finance an adequate—even superior—school system for the community. The present shift in economic conditions may, however, make necessary a modification of the present method. In such units, it is possible to provide for special needs of the community by introducing modified and diversified curriculums and even new types of schools.

The city unit is never independent of the state educational system, and must meet at least the minimum standards set by the state. City boards of education represent the state as well as the people. Their powers and duties are fixed by law and are subject to change. They must establish and maintain the types of schools required by law, and may not establish others. They are, however, independent of the local civil authorities. City charters and city councils cannot prescribe school regulations and standards.

An important fact to be remembered is that schools are not political institutions, despite events which sometimes point in that direction. City boards of education are charged with the responsibility of financing education under their jurisdiction. They must provide funds through taxation and other means to maintain adequate buildings and to pay the staff of teachers. They engage a superintendent, whose duties are many. The superintendent appoints teachers, recommends textbooks, and formulates the general rules and policies of the schools. All these functions are performed by him with the approval of the board of education.

Special Types of State and Local Schools.—Under local and state administration, several types of special schools and classes have been evolved, each designed to aid some particular group of children needing special instruction:

Schools for the Blind.—Eighty institutions devoted to the task of educating the blind in the United States are reporting to the Federal Office of Education. Forty-seven of these are state schools; twenty-one are city schools; and ten are private or private schools aided by state funds. The Philippine Islands and Puerto Rico each reports one school.

Schools for the Deaf.—All but four American states provide for the education of the deaf. Statistics show that nearly 170 schools are providing education for deaf children. Of this number, 69 are state schools, 16 are private schools, and 83 are in city systems. Approximately 18,000 pupils are enrolled. The cost of educating the deaf is relatively high—about $500 a year per pupil in state schools and $329 in private schools.

The education of the deaf is one of the most difficult undertakings of our entire educational plan, but when successful it yields large returns to the individual and to society. The normal-minded deaf child can be trained for any type of work that does not require hearing. Gallaudet College, in Washington, D.C., is the only institution in the world devoted to the higher education of the deaf.

Education of the Feeble-Minded.—Schools for the feeble-minded are of three types—state, private, and city day schools. About 51 state, 30 private, and 218 day schools for the feeble-minded make official reports to the Federal Office of Education. The state institutions care for approximately 50,000 feeble-minded children; the private institutions, 2,500; the city schools have 50,000 in their special classes. These children are instructed in elementary household duties, manual training, agriculture, and the trades. It is estimated that approximately 2 per cent of all school children are of a grade of intelligence sufficiently low to make special classes highly desirable. The problem of the feeble-minded is only partially solved.

Schools for Crippled Children.—State and private institutions have taken an interest in the needs of crippled children. Private institutions, as early as 1861, made provision for this group. City boards of education have more recently done so. In 1907 Massachusetts opened the first state institution in the United States for the care and education of crippled children. Today, several cities make provision for children with physical deformity, affording them special curriculums, special seats, and transportation.

Open-Air Classes.—Recently, interest has developed in children whose physical condition is run down and who are threatened with tuberculosis and other ailments. Boston, New York, and Chicago have provided several classes to restore such children to normal health. It is estimated that more than 100 schools for this purpose have been organized in the United States.

Industrial Schools for Delinquents.—These schools are reformatory in purpose, and receive their students from commitments made by the juvenile and other courts. Good authority estimates that 173 such schools exist in the United States. In a recent year, 158 of these schools made official reports to the Federal Office of Education. In that year, these schools enrolled a total of 84,317 pupils—65,174 boys, and 19,143 girls.

Seventy-five per cent of all pupils were taught some trade or occupation.

Schools for Epileptics.—Some progress has been made in segregating epileptic children. They may be mentally bright, but usually are dull and unable to progress with other children of their age. After the convulsions, there usually follows a period of confusion and stupidity, making the child unfit for any mental work. They are thus retarded in their progress, and are entitled to special consideration.

THE PRINCIPAL DIVISIONS OF THE SCHOOL SYSTEM

We turn now to consider the major subdivisions of our educational system. We shall discuss first the schools for the very youngest children, then describe in turn Kindergarten, Elementary School, Junior and Senior High School, College, and University.

The Preschool or Nursery School.—The nursery school is a recent extension of educational endeavor, and is prompted by psychological and educational research. So far, nursery schools have been mainly private in character. They are promoted on the theory that the growth of the child—physical, mental, and linguistic—should be carefully guided during the preschool period. Children from sixteen months to the age of four years are admitted. The work of the nursery school has not been standardized, but a variety of activities is the rule. These schools should be distinguished from day nurseries, of which there are about six hundred. The day nurseries are supported by philanthropic, religious, and welfare organizations. They are attached to social settlements, to industries, and in one instance (Los Angeles), to public schools.

Courtesy Los Angeles City School Report, 1937

Outdoor School for Tuberculous Children

These children are learning and winning their way back to health at the same time

The Kindergarten.—The kindergarten is of German origin. It was developed by Froebel, and introduced into the United States in 1855 by Mrs. Carl Schurz, who had studied with Froebel. The first public kindergarten was opened in St. Louis by Susan Blow at the invitation of W. T. Harris, then superintendent of the city schools and later U. S. Commissioner of Education. Since then, kindergartens have been supported by public and private schools, but are found generally in large cities. The enrolment of children between the ages of four and six in kindergartens totals about 700,000.

In these schools, little or no attempt is made to teach the fundamental subjects of the elementary curriculum. The instruction is based on two basic principles of Froebel—motor expression and social participation. The activities include play, dramatization, games, and constructive and creative work in music, art, and handwork. For a while, the kindergartens did not articulate with the primary grades; they were governed by different aims and principles. The abrupt change between kindergarten and primary grades is now passing by combining them into a single unit of three or four years under one supervisor, making the transition gradual.

Elementary Schools.—Usually this unit of education includes the years from six to twelve or fourteen, and is charged with the responsibility of teaching the basic, or tool, subjects—reading, writing, spelling, arithmetic, and written and oral expression. In the early days, the 3 Rs were thought to be sufficient for the child, but in our day this original curriculum has been expanded and enriched to include something of the history and literature of our country and of the world, the elementary laws of science, and the basic facts of geography. These constitute the groundwork of a liberal education. Approximately 20,000,000 children between the ages of six and fourteen are each year educated in the elementary schools. The large majority of these are in public schools. Perhaps not more than 10 or 12 per cent are in private and denominational schools.

The public elementary schools are cared for by approximately 145,000 local boards of education. Each board is required to provide an elementary school patterned after standards set up by the legislature. The standards are not uniform throughout the nation. The years of schooling in these schools vary from six to nine in different sections of the country. In some instances, they articulate with a junior high school, beginning at twelve years of age; in other cases, they articulate with the four-year high school, beginning at thirteen or fourteen years of age.

Some of these schools are housed in the most modern buildings equipped with many appliances designed to promote health and recreation; the worst are in mere shacks, with no equipment except a rusty stove, broken desks, and a barren playground. Some schools have highly intelligent and well-trained teachers, with pupils carefully graded according to interests and needs; other schools are taught by poorly trained teachers with little natural ability and limited acquired qualifications, and have a heterogeneous group of children. The average school attendance per pupil varies from approximately 98 days in one locality to 171 days in another—from a scant five months to better than eight and one-half months. The average annual cost per pupil also shows wide variation—from $34.35 to $144.56. In our city systems, the total annual cost per pupil varies from $25.27 to $216.77 These data reveal the absence of equality of opportunity in the elementary schools of the United States, despite our proclaimed equal opportunity for all. A central agency, if created, might help to equalize educational opportunity.

Inequality in opportunity is emphasized when the compulsory attendance laws are studied. Compulsory attendance laws exist in every state; however, local conditions have resulted in a wide difference in practice. The requirements of these laws vary from state to state. The length of required attendance in any one school year varies from no minimum (in Alabama) to nine and one-half months (in Connecticut). There is also a great difference in the strictness with which the laws are enforced. Except in more populous areas, the enforcement is likely to be lax, with the consequent irregular attendance, especially in rural districts, where it is often increased by unfavorable climatic conditions, distance, poor transportation facilities, inadequately trained teachers, out-of-date curriculums, and unattractive buildings and surroundings.

On the whole, however, our elementary schools, both rural and city, are well organized. Pupils and teachers are grouped into fairly satisfactory units, and are directed by qualified principals or other supervisors. The majority of teachers have been trained in institutions using modern theory of education and pre-employment practice. These teachers are for the most part supplied with elementary curriculums constructed by modern methods and by scholars familiar with the needs of the child and of society. In recent years, competent administrators have used fairly accurate methods of grouping children in terms of interests and abilities. Changes and adjustments in our elementary schools are frequent, for the purpose of adapting schools to modern social, political, economic, and industrial requirements.

What, then, is the aim of our elementary education? Attempts have been made to answer this question from many points of view, ranging from the traditional disciplinary conception to the modern utilitarian view. A theoretical discussion of the topic frequently leads to meaningless abstractions and confusion. Perhaps the present purpose can be served best by listing certain essential characteristics that each child should have on leaving school. One widely used list includes the following: health, with knowledge and habits to preserve it; ability to use accurately the fundamental processes in basic subjects; ideals and knowledge that will make the child a worthy member of his or her home and community; skills leading to a satisfactory vocation; ideals and knowledge which lead to valuable citizenship; ability to use leisure time in a worthy manner; and ethical character, including religious attitudes. To these may be added ability to appreciate the fine and musical arts and to apply skill and taste to the problems of food, clothing, and shelter.

Secondary Education.—This level of education begins at twelve, thirteen, or fourteen years of age, depending on the tradition in different sections of the country, and ends after four or six years of instruction. In general, it articulates very closely with the elementary schools on one side and with college on the other. The chief administrative officer is a principal or superintendent. Since 1900, high schools have become exceedingly popular with the people and are housed in substantial and even palatial buildings with adequate equipment and apparatus.

In the main, we have three types of high schools, depending on organization. They may be four-year schools, six-year schools, or two schools of three years each. In the last case, the first three-year period is known as the junior high school; the last three years as the senior high school. The junior and senior high schools may be under the same principal, or each school may have its own principal.

The high schools are financed and controlled by local boards of education, but they are to a degree standardized by state and regional authorities. These authorities regulate the length of the school term; the curriculum and the qualifications of teachers; the size of the classes and the length of recitation periods, the library and laboratory equipment and other items of detail. West of New England, the high school articulates very closely with the colleges. In New England and in some private colleges elsewhere, entrance examinations are required.

In most states, high school attendance is optional. At present, approximately 50 per cent of those of proper age attend some high school. In the judgment of many educators, all boys and girls of high school age should be enrolled in our high schools. On the contrary, a few are expressing the conviction that the enrolment in high schools should be restricted, but this proposal will probably meet with little support.

In the last fifteen or twenty years, high school administrators have sought to provide for each boy and girl an appropriate education, its character determined by his or her abilities and interests. This has resulted in offering a large number of theoretical and utilitarian subjects. So responsive has the high school been to the needs of the child and to the demands of society that our secondary schools provide more than 300 different combinations of subjects or courses. Many of them have been constructed with vocational needs of boys and girls in mind. High schools with a single aim, however—agricultural, commercial or vocational—are rarely found.

The Junior High School.—The function of the junior high school differs from that of the senior high school and the four-year high school. The junior high school is an exploratory, or "testing out," period. The pupils are given an opportunity to discover themselves and to select those general fields of knowledge best satisfying the interests and abilities of each. In general, the curriculums have been modified by reorganizing the content of traditional subjects and by introducing new subjects. The reconstructed curriculums include general science, general mathematics, general English, and the social sciences.

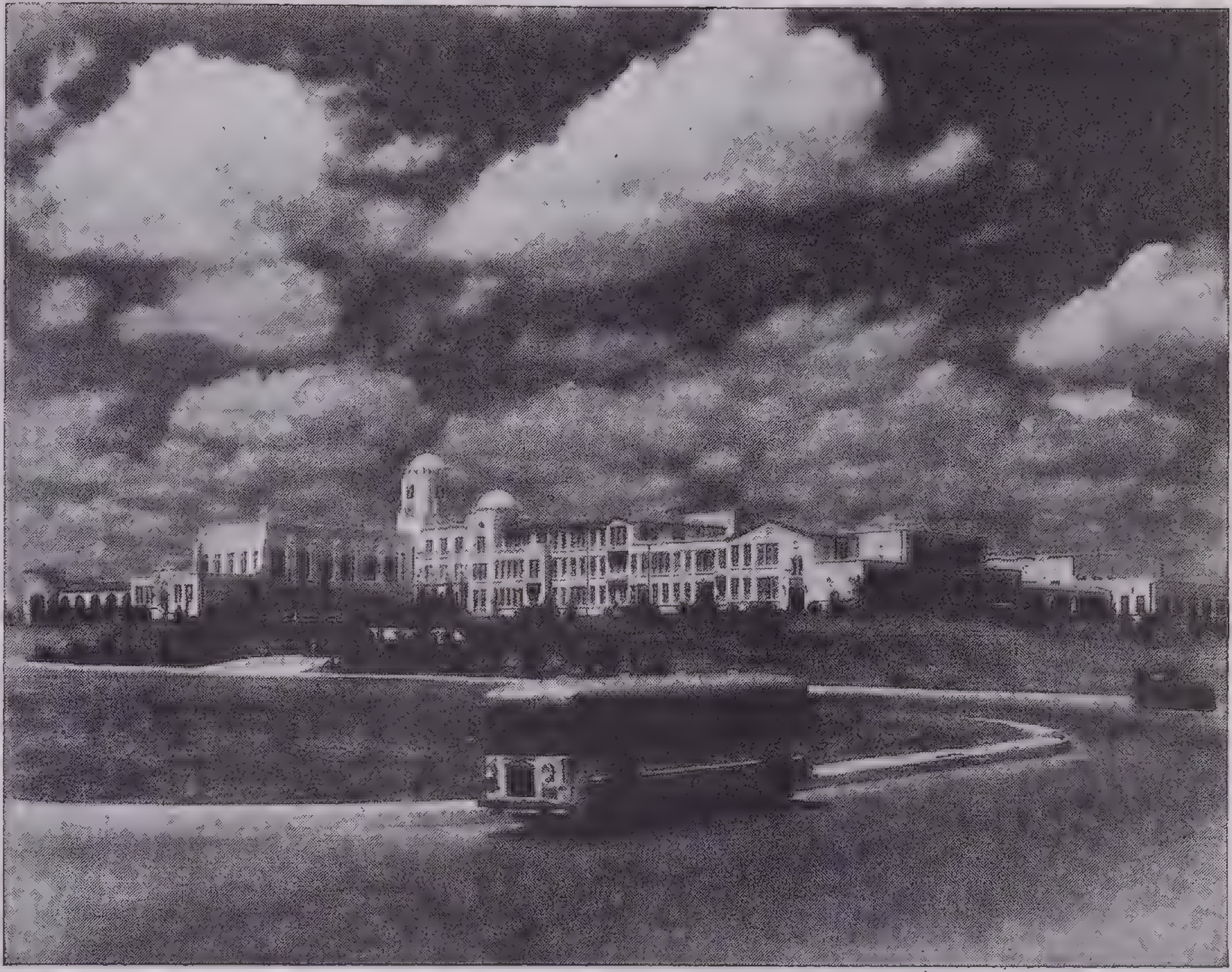
The Senior High School.—In the senior high school and in the traditional four-year high school, the curriculums have incorporated some of the exploratory purpose of the junior high school, but have shown a decided drift toward supplying differentiated curriculums. There is a strong tendency to group the subjects around some vocational need, such as home economics, art, printing, commerce, industrial art, and so on. An example of this tendency is found in the Detroit high schools, which offer thirty-one different curriculums. In the small high schools, the same tendency prevails—only to a lesser degree. Recently, 200 small high schools were studied with the thought of gaining information concerning the number of courses offered. A total of 469 courses were counted. One hundred eighty-six of these were college preparatory; 92 normal preparatory; 65 commercial; 53 agricultural; and 44 vocational, industrial, and manual training. The remainder were distributed among nine other fields of specialization.

Teaching in High Schools.—In a recent year, reports were received from 22,237 high schools, of which 54 per cent were small high schools, with an enrolment of fewer than 100 students and employing not more than six teachers. Approximately 30 per cent of the high schools have fewer than three teachers. Even these small staffs were teaching from 22 to 37 subjects. It is clear that the effort to meet the interests of all children and local demands is shared by the small high schools. It is scarcely necessary to point out that this extensive program is in danger of yielding superficial and disappointing results.

The enthusiasm for secondary education is further attested by an examination of the compulsory school laws. In seven states, the law requires full-time attendance up to the age of eighteen—Ohio, Oklahoma, Washington, Oregon, Idaho, Utah, Nevada. Five states—Wyoming, North Dakota, South Dakota, Mississippi, and Maine—require full-time attendance up to sixteen.

Teachers in the high schools are trained in state teachers' colleges, in colleges of liberal arts, and in universities. This preparation, in most instances, requires four years beyond the high school course, and the pursuit of both academic and professional subjects. There is a tendency in some localities to add one year of graduate work to the above minimum. Teachers in high schools have on the whole a scholastic preparation far superior to that of elementary teachers. They receive correspondingly higher salaries.

Higher Education.—In addition to the extensive provisions for higher education made by private and philanthropic contributions, most of the states have at great expense established institutions of higher learning. These institutions are financed primarily by appropriations made from state revenue (taxes), and supplemented by fees paid by students. They are administered by officers directly responsible to the state, under the general supervision of some governing board.


Courtesy San Antonio Chamber of Commerce

A Modern High School

Thomas Jefferson High School, San Antonio, Texas

The form of administration varies from state to state. In several states, each state institution of higher learning has its own board of control and administration officers. Just now, however, a tendency to consolidate all state institutions of higher learning in a state under a single administration is gaining headway. North Carolina furnishes an excellent example of this tendency. The three state institutions of that state—the State University at Chapel Hill, the Woman's College at Greensboro, and the State College of Agriculture and Engineering at Raleigh—have been merged into an administrative unit with a single president.

In general, the state provides three types of institutions to promote higher education—teachers' colleges, land-grant or state colleges, and state universities. The teachers' colleges are devoted primarily to training teachers for elementary and secondary schools. The land-grant (sometimes called state) colleges, owe their origin to the Morrill Act of 1862, and are in part supported by the Federal Government. They are engaged in advancing a knowledge of agriculture and of engineering.

State universities provide for both liberal and technical education—colleges of liberal arts and professional schools. In general, the curriculums for the undergraduates in our state universities are organized around a group of general or cultural requirements, supplemented by majors and minors. The purpose of majors and minors is to stimulate and encourage a fair degree of intensive study in a restricted field—the beginnings of specialization. In the graduate schools of the state universities, specialization, research, and professional studies are stressed. Schools of law, medicine, business administration, education, and others are maintained. In some instances the land-grant college and the state university are located on the same campus and are under a single administration. The University of Illinois is an example of this type of organization.

In recent years there has been an attempt to organize the college, or undergraduate, work into two divisions—the junior college and the senior college. The curriculum of the junior college aims to supply an opportunity for growth and development, to advance the student to professional studies, or to lead to a vocational course. The senior college, with its two-year curriculum, supplies additional opportunities for advanced education and permits considerable specialization in the initial steps toward professional studies.

Adult Education in the United States.—Adult education has not been carefully organized or generally provided for. Although some interest was manifested in the early nineteenth century, only recently has there been any serious effort to organize and finance the education of mature men and women. Certain courses in vocational training and equipment for citizenship are available in many communities. But there is little opportunity for general adult education. For this work, a new type of teacher as well as a new type of textbook is necessary. Yet there is every likelihood that in response to the clear indications of widespread desire for further educational opportunities, public education will be expanded to provide for adult education.

HISTORY OF AMERICAN EDUCATION

When the early settlers entered into the heritage of the New World they brought with them no small measure of the Old. In time the inheritance of the Old World was to be considerably modified as the problems of the New World conditioned their thinking and their ideals.

Although under normal conditions the individual "relearns the accumulated experience of the past," nevertheless there are times and occasions when the past has little or nothing to offer by way of advice or of solution to problems that have arisen out of the life of today.

The early settlers of the 17th century, whether of Virginia or of New England, made no effort to divest themselves of their Old World intellectual equipment or religious ideals. Virginia gentlemen sought to make their colonial life as near a pattern of the aristocratic life of England as was possible; and the Puritans of New England sought even more earnestly to establish their ideal commonwealth, the vision of which had come to them in their Old World home.

As early as May 26, 1619, the records of the Virginia Company contained the approval of a project, by King James I, to build a college in Virginia "for the training and bringing up of infidels' children to the true knowledge of God and understanding of righteousness." In Massachusetts a law of 1646 expressed the conviction of "the necessity and singular use of good literature in managing the things of the greatest concernment in the commonwealth." "Good literature" referred, of course, to the Bible.

The Massachusetts law of 1647 went even further than this in making it an indictable offense for any township to refuse to establish and maintain schools. The preamble to this law expressed the solemn injunction that was deemed to be imposed upon them: "It being one of the chief projects of Satan to keep men from a knowledge of the Scripture," and the further obligation, "that learning may not be buried in the graves of our forefathers." Thus we see that the earliest concern about education was born out of religious convictions.

In the Southern Colonies.—In Virginia, which may be taken as the most representative of the southern colonies, the religious motive became inseparably associated with the aristocratic conception of orders in society. Here the Established Church, the form of government and the more or less rigid distinctions between classes all conspired to stress education in terms of the classical tradition both in secondary training as well as in college. Tutorial instruction was most highly favored in elementary training as well as in secondary. The clergy held their catechetical class for the young and taught them the dogmas of the Church. Private dame schools (taught by women) offered instruction in the three Rs for a compensation that was as meager as the instruction. The children of the poor could have a modicum of industrial training, but there was no public elementary-school system.

In consequence learning was in the hands of a small number of the élite, practically a single class in society. It was many years before *The Southern Literary Messenger* could say: "The promotion of the general well-being of society by a cultivation of the heart and intellect is impliedly required of Americans, from the nature and structure of our government." (May 1, 1836.)

But this democratic ideal, as far as the southern colonies were concerned, did not enter into their scheme of things and was thoroughly alien to it. When the mother country was torn between the cause of Charles I and the Cromwellians, the Virginia gentlemen were attached to the cause of Charles. The nobility, the clergy and the gentry of England were horrified at his execution, and many of them fled to the colony of Virginia where they were made welcome at the mansion of Governor Berkeley. In 1670 Governor Berkeley expressed the prevailing sentiment of his class when he wrote, "I thank God there are no free schools, and I hope we shall not have them these hundred years; for learning has brought disobedience and heresy and sects into the world."

This hope that the privileges of education would be restricted to a class did not mean a neglect of education. Highly educated men were brought over from England as tutuors for the young colonial gentlemen of the South and gave them the finest education available at the time. Those who could not afford a private tutor but could afford the fee for instruction at a private school received a more or less sound educational training according to the standard of the school. Poorer children had access to the church charity schools, and the poorest were sometimes apprenticed to a trade or more often were sent into agriculture.

Virginia gentlemen and the clergy had as early as 1619 shown an intense interest in establishing an institution of higher learning. But until 1692 their efforts, due to one cause and another, did not materialize the plan. At this time, however, a gift of £2000, 20,000 acres of land, the right to some colonial taxes granted by the king, large donations from interested and wealthy planters and material support granted by the Assembly made possible the founding of William and Mary College in Virginia. In 1749 Washington College (now Washington and Lee University) was founded in Virginia. And by this time there had been a notable increase in "free schools," with a greatly improved curriculum.

In the Middle Colonies.—A different type of school came to be established in the middle colonies. New Netherland, that area lying between the Delaware and the Connecticut rivers, was under Dutch control from 1621 to 1674.

The Reformation, which had torn Europe asunder during the 16th and 17th centuries, played a large part in the early history of our country; and no more striking illustration of this fact can be found than in the character of the various settlements within this New Netherlands territory. Greatly mixed as the peoples were, almost all of them represented some form of the Protestant revolt. New York had its Dutch and English, with a fair sprinkling of other peoples. Into New Jersey came English, Swedes, Germans, Irish and Dutch. Into Pennsylvania came English and Germans and groups of other nationals.

The general type of school prevailing throughout this period in the middle colonies is called *parochial,* because the elementary school was associated with the local church, and the teaching of the three Rs was combined with religious instruction.

The coming of the Dutch into the Hudson Valley meant among other things the transplantation of Dutch ideas of education into the colony. There was no necessity for them, as for many of the New England colonists, to improvise forms of education to meet their new conditions. The charter of the Dutch West India Company (1629) required the colonists and wealthy landowners to "support a minister, a schoolmaster, and a comforter of the sick." All were required to pay a tax for this purpose, and the fund was supplemented by the Company, but the Company reserved to itself exclusive selection of the schoolmasters.

The Dutch colonists never founded a college and did not found a Latin grammar school until more than 20 years after the elementary schools came into existence, but this must not be taken as indicating their lack of interest in education. They were deeply interested in establishing elementary education, particularly in the bread-and-butter studies.

After the English conquest of the Dutch colony the new English settlers had nothing to offer in the way of education that was half as good as the system enjoyed by the Dutch, inferior though that was. As in England, so in the English colonies in America, the English sent their children to private schools, engaged private tutors or allowed the children to grow up without a formal rudimentary education.

In 1702 the people of New York evinced an increased interest in education by passing a law for public support of a schoolteacher. In 1732 the income from licenses issued to hawkers and peddlers was used to found a school for the teaching of Latin, Greek and mathematics. Both ventures were doomed to languish and fade away.

During the 18th century the Society for the Propagation of the Gospel in Foreign Parts—an Anglican missionary society—undertook the responsibility of educating the poor of New York, as it had done in several of the other English colonies. Its primary intent was to rear the poor in the atmosphere of religion by teaching the catechism of the Anglican Church and its ritual. To this was added instruction that would enable the children "to write a plain and legible hand in order to the fitting them for useful

Employments; with as much Arithmetic as shall be necessary to the Same Purpose."

The lack of a public-school system in New York was due to the notion that free schools had the stigma of charity. Free education was only for those who were too poor to pay for it; and those who received such education were the recipients of charity granted them by their betters. A more democratic appreciation of the significance of education was delayed for many years. In the interval free public education was "despised by the rich and shunned by the poor." The American poor could not look with any measure of favor upon any system of education that offended their self-respect or restricted their spirit of independence.

Maryland during the early and middle years of the 17th century was (as George Bancroft said) "Unsurpassed for happiness and liberty; a mild and liberal proprietory conceded every measure which the welfare of the colony required." But its schools were exclusively parochial and conformed to the established position of the Catholic Church in that matter. A law was passed in 1696 that created a corporation to establish county schools. Unfortunately only one school, King William's School at Annapolis, came into being as a result of that law.

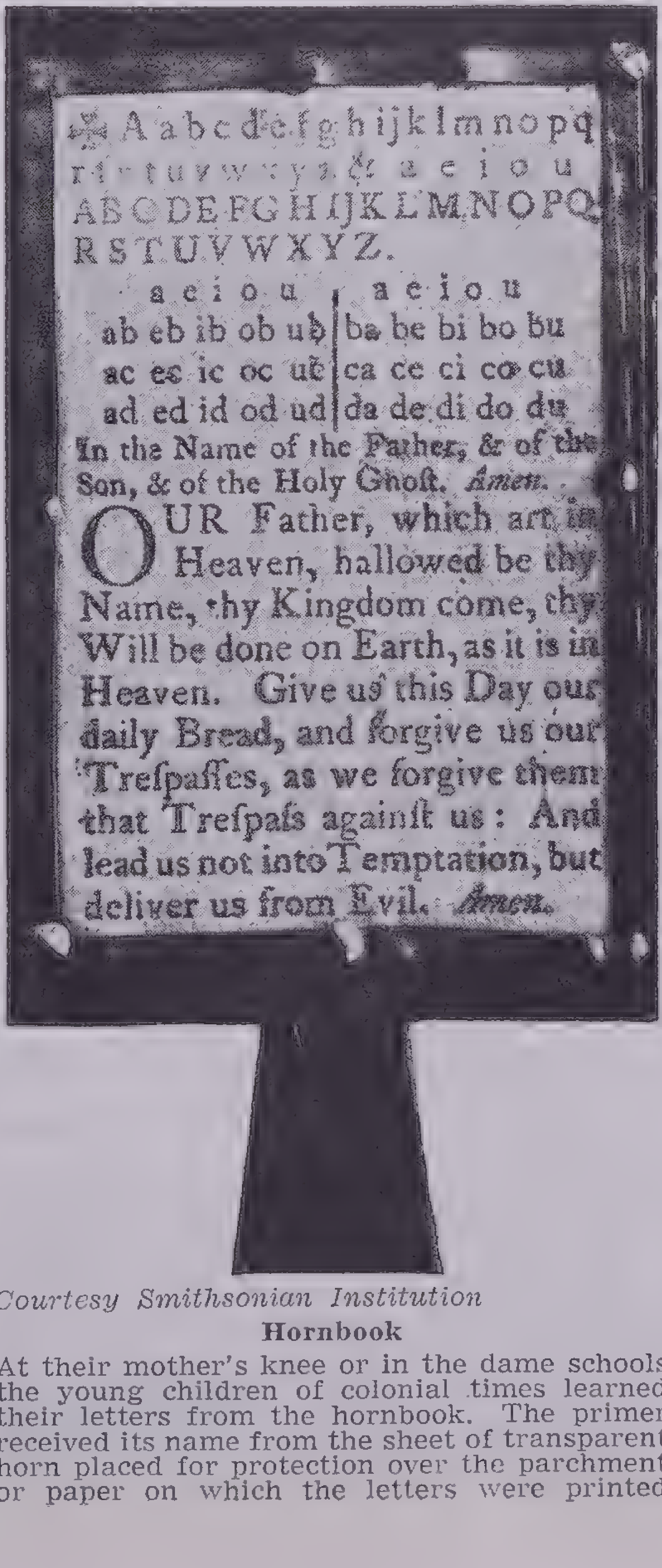
As early as March 1, 1660, the representatives of Maryland called into being a "lawful assembly, without dependence upon any other power in the province." Henceforth no authority was to be recognized except that of the Assembly and of the king of England. But it was not until 1723 that this Assembly voted a sum of money to establish county schools, which were to be governed by boards of visitors in each county. But though the poor could take advantage of the instruction offered in these Latin grammar schools without cost, those able to pay were required to do so. Doubtless this was one of the main reasons for the failure of these schools to achieve any distinction previous to the Revolution. Even as late as 1797 the complaint was voiced that King William's School at Annapolis was the only adequately endowed school in Maryland. It was considered a sad commentary on education in Maryland that, "two-thirds of the little education we receive are derived from instructors who are either indentured servants or transported felons." In an advertisement of the times a reward was offered for "the return to his master of a run-away schoolmaster, of a pale complexion, with short hair. He has the itch very bad, and sore legs . . . he is a great taker of snuff and very apt to get drunk."

Colonial education in Pennsylvania reflects the mixed character of its population, drawn there as much by the gentle rule of William Penn, of the Society of Friends, as by the attractions of agriculture. Several Protestant sects, such as the Lutherans, German Reformed, Moravians, Mennonites and others, found a congenial home in the tolerant atmosphere of Pennsylvania, and so did many Roman Catholic settlements. No one section of these religious groups was strong enough in numbers or influence to impose its will upon others. Hence the control and content of education were determined entirely by each religious group. The only schools were parochial, and they were financed and governed by the local church in accord with its purposes and ideals.

The absence of any general movement for a free public-school system as comprehensive as the commonwealth lasted until 1834, when opposition was finally overcome. But even in 1938 a religious sect in Pennsylvania was offering passive resistance to the educational policy of the state, which runs counter to the primitive notions of this particular religious sect.

The spirit of tolerance pervading Pennsylvania became one reason for the firm establishment of the parochial-school system of education. Another reason was to be found in the mixed character of the population, more mixed than any other section of America. Each group carried over into the New World many of the prejudices of the Old; and too often the prejudices blinded them to advantages that could be gained by unified action.

The most numerous element in the population of Penn's colony was the German. Benevolently disposed people in London organized in 1754 the Society for the Promotion of Christian Knowledge among the Germans in America. The Society established free schools; but the independent Germans resented the idea of charity and feared that their children might lose their racial inheritance by too close an association with English culture. Most of these German groups grew less and less concerned with education for their children, with the notable exception of the Moravians who earnestly labored to keep alive the love of learning among their coreligionists.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In the Name of the Father, & of the Son, & of the Holy Ghoſt. Amen.
OUR Father, which art in Heaven, hallowed be thy Name, thy Kingdom come, thy Will be done on Earth, as it is in Heaven. Give us this Day our daily Bread, and forgive us our Treſpaſſes, as we forgive them that Treſpaſs againſt us: And lead us not into Temptation, but deliver us from Evil. Amen.

Courtesy Smithsonian Institution

Hornbook

At their mother's knee or in the dame schools the young children of colonial times learned their letters from the hornbook. The primer received its name from the sheet of transparent horn placed for protection over the parchment or paper on which the letters were printed

This general system of parochial education was true of New Jersey, as of New York, during the Colonial era. As Doctor Cubberley says, "Each parochial group did as it wished, and private and church effort, in pay and charity schools, provided practically all the educational facilities available until well into our national period."

The Contribution of New England.—The earliest form of that educational system that became distinctively American is not to be found in the Southern or in the Middle Colonies but among the Puritans of New England. Among this people and in this area are to be found the beginnings of our American public-school system.

Whatever faults the Puritans had, a disposition to carry over into the New World the credulities, the prejudices and the conservativeness of the Old World was not among them. On practically every subject, save their religious convictions, they were more progressive than any group of their times. Their legislative enactments were much milder than those of any other religious group.

No feature of Puritan life was more significant than their concern for their posterity. This fact, illustrated in many aspects of their private and community life, was especially notable in their estimation of the value of education. Their customary observance of this value soon became a law that stipulated that "none of the brethren shall suffer so much barbarism in their families as not to teach their children and their apprentices so much learning as may enable them to read the English tongue" to the end "that learning may not be buried in the graves of our forefathers."

This responsibility was too great to be allowed to repose entirely on the basis of personal will. Hence the famous Massachusetts law of 1642 directed that the "chosen men" of each town must ascertain from time to time whether parents and masters were diligent in their educational undertakings. But there is no mention of a school system in the law.

The more famous Act of 1647 greatly remedied this and other defects, for the enactment required:

1. That every town having 50 householders should appoint a teacher of reading and writing and provide wages for him.
2. That every town having 100 householders should provide a grammar school to fit youths for the university.

These two laws and the willingness of the New England colonists to apply them constitute the real foundations upon which the free public-school system of our country rests. Horace Mann said of the Act of 1647: "It is impossible for us adequately to conceive the boldness of the measure, which aimed at universal education through the establishment of free schools. As a fact it had no precedent in the world's history." Among other things there emerges the unique claim that the state has a right to enforce by taxation and otherwise the obligation resting upon parents of educating the youth. And also that the state has a right to raise money by taxation to provide such education as it may require.

There had been carried over from England the idea and form of a secondary (grammar) school, which advanced the education of the child from the dame-school standard to prepare him for the university. The most famous of all these schools was the Boston Latin School, founded in 1635 and still in existence. Several other towns—Salem, Roxbury and Cambridge, for example—followed the lead of Boston. After the law of 1647 all the towns of Massachusetts had secondary schools.

The First Colleges.—In 1636 the General Court of the Massachusetts Bay Colony founded a college at Newtowne, which later became Immanuel College, Cambridge. The grant of £400 from the Legislature was hardly sufficient to keep the young college afloat; so that the gift of 260 books by John Harvard to the young college was not only a munificent gift according to the standard of the times, but it added immeasurably to the intellectual resources of the colony. Thus Harvard College is not only the parent of the modern private university but of the state-supported institutions as well.

In the South there followed the College of William and Mary, at Williamsburg, Va., in 1693. Yale College at New Haven, Conn., came into being in 1701; and from this date on we find nine colonial colleges beginning their careers: the College of New Jersey, now Princeton; the University of Pennsylvania, at Philadelphia; King's College (Columbia University) in New York; Rhode Island College (now Brown University at Providence); Queen's College (Rutgers University) at New Brunswick, N.J. and Dartmouth College at Hanover, N.H.

When independence from the mother country had been won, private colleges began to spring up, such as Bowdoin, at Brunswick, Maine; Dickinson at Carlisle, Pa.; Williams at Williamstown, Mass.; and state universities such as the University of Georgia at Athens and the University of North Carolina at Chapel Hill.

At the same time academies and preparatory schools sprang up, such as: Nazareth Hall in Pennsylvania, 1759; Phillips Andover in Massachusetts, 1778; and Phillips Exeter in New Hampshire, 1781. The main purpose of these schools was to prepare the youths for entrance into college or university.

The early colleges were largely planned to train ministers for the churches. Many of these came to be founded by denominational groups who were at variance with the Established Church of England, either on doctrine or form of public worship. Consequently the studies in these colleges accorded with the beliefs of the respective denominations and were in no case identical with the curricula of the universities of Cambridge and Oxford in England, which were in a large sense educational adjuncts of the Established Church of England.

In the plan formulated by Benjamin Franklin for the University of Pennsylvania, as also in the plan of Thomas Jefferson for the University of Virginia, provision was made for a much broader and more practical course of studies, which would serve not only the interests of "gentlemen" but also the practical necessities of a democratic people living under a democratic government.

Log Schoolhouse

The McGuffey School at Greenfield Village, Dearborn, Michigan, is a good example of the one-room schoolhouse of early frontier settlements. It is built of logs taken from the homestead of William Holmes McGuffey (compiler of the *McGuffey Eclectic Readers*) near West Alexander, Pennsylvania

An American System.—By 1800 most of the states in the Union had made some legislative provision for a free public system of education, though the laws were so vaguely drawn that the execution of the provision was for some time delayed. Meanwhile some of the best minds in the country were concerned with ensuring the stability of democratic government by means of popular and free education. These included such men as Benjamin Franklin, Benjamin Rush and Noah Webster. All these men worked over the plans and ideas enunciated by Thomas Jefferson during the revolutionary era.

Jefferson's plan was the first definite proposal for a modern state-school system that envisioned the future of American democracy as an educated democracy. His plan made provision for local self-government expressing itself in county, township and community responsibility. The voters were to be authorized to choose sites, hire teachers and plan the courses of study. The academic status of the teacher and the course of studies were to be approved by a superintendent of education elected for the purpose. The plan made provision for a high-school system based on the requirements of the community judged by the enrolment in the elementary schools.

The one great stumbling block against the execution of Jefferson's plan at the time of its presentation was the union of Church and State that then existed. After the Revolution and the abolition of a state church the way was open for a gradual adoption of the scheme.

In the latter part of the 18th century and early part of the 19th, religion began to recede somewhat into the background, and a more secular view of life emerged. One item in this change was the great influence of a wide group of thinkers in France, England and America, whose ideals of life were frankly in terms of human betterment, here and now, using man's own resources to achieve that betterment. Then came the Industrial Revolution, which deeply affected every aspect of life and which encouraged men to look to themselves rather than to their stars for their true destiny.

During this transitional period our American school system became more and more democratic in outline and prospect. But it was not until the middle of the 19th century that real progress was made.

This broader view of education owed much to a few commanding personalities of the time. Notable among them were: De Witt Clinton of New York, better known for his advocacy of the Erie Canal; Governor Oliver Wolcott of Connecticut; James G. Carter of Massachusetts; Archibald D. Murphey and Calvin H. Wiley of North Carolina; Thaddeus Stevens of Pennsylvania, the famous leader in Reconstruction policies; Catherine Beecher, Mary Lyon and Emma H. Willard, the pioneers in women's education; and above all, Horace Mann (1796–1859) and Henry Barnard (1811–1900).

Increasing the complexity of the problems of education were such factors as the growth of the Industrial Revolution in the United States; the emergence of a more democratic type of people with the opening of the Western territories and the election to the Presidency of the unlettered Andrew Jackson. Men became more and more deeply concerned with the definite need for a system of education that should be free, thoroughly practical and as widespread as the country itself.

Education was now seen as a function of the Government. Governor Clinton of New York, in 1826 stated that the encouragement ef education was the first duty of the Government. Daniel Webster of Massachusetts said: "Open the doors of the schoolhouses to all the children of the land. On the diffusion of education among the people rests the preservation and perpetuation of our free institutions."

The association of such personalities with such a demand for popular education enabled the movement to gain headway against opposition. The marvelous invention of the printing press was never used to better purpose than when it was used to issue better textbooks for some subjects and new textbooks in others. Noah Webster's spelling books and dictionaries represented a new American spirit and new ideals. Equally important at a later period were the famous McGuffey readers, which were used in almost all midwestern public schools.

To the textbooks for the schools there were added the educational journals for teachers and educators as well as for government officials and those interested in the problems of education in the general public. Albert Picket and his son, who had issued various textbooks, now published a school journal called *The Academician.* William Russell published in

Boston *The American Journal of Education;* Horace Mann issued his *Common School Journal;* and Henry Barnard published his *Connecticut Common School Journal.* Many others followed the lead given.

Broader Views.—Surveys were undertaken to discover educational methods employed in foreign countries and to expound the philosophies of European leaders of education. The report made by Horace Mann in 1843, after an extended visit to Europe, was the most notable of its time. In a short while various institutes and conventions were held in different states, to which teachers and leaders in education gathered in order to advance their educational knowledge and abilities, to exchange views and to discuss their educational problems. To the benefits thus gained there were added those that issued from the many lyceum courses, popular lectures and public forums. Many of the leading personalities of the time gave these lectures; for example, Edward Everett, Henry Ward Beecher, Wendell Phillips, Ralph Waldo Emerson, Oliver Wendell Holmes, Horace Greeley and George William Curtis.

The awakening to the need of general education with opportunities for the underprivileged as well as for the well-to-do; the idea that courses of study should include many new things not contained in the educational philosophies of their forbears; that teacher training was necessary, and that state support was imperative—this program would have been futile unless an increasing public approval and support were forthcoming. This support, since it included taxation on an increasing scale, was naturally slow in getting under way. Individuals and groups with their own selfish interests or peculiar educational notions opposed the imposition of taxes for the support of the schools and delayed the progress of a free tax-supported system of education for many years. Notwithstanding the opposition, the great leaders of educational reform waged a ceaseless battle for free schools in the various legislatures as well as on the platform. A great part of the battle was won by 1837. By this time every state in the Union made some provision in its financial budget for financing the schools within their areas.

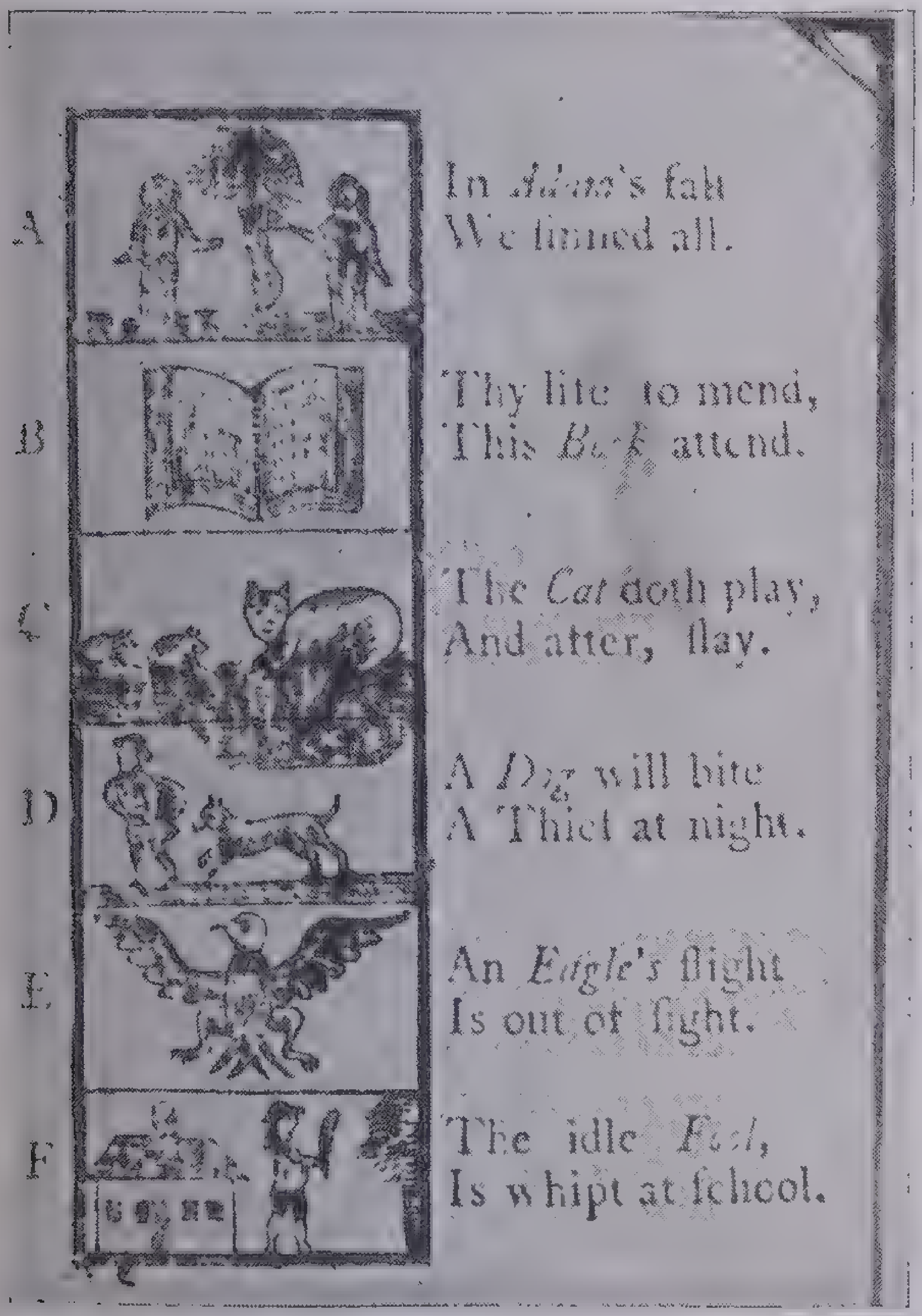
Local Organization.—At this point in educational advancement there emerged the necessity for appointing state superintendents of education. In 1813 New York state appointed Gideon Hawley as the first state superintendent of education. Then came the state of Maryland, and then Michigan. Other states followed. There devolved upon the superintendents of the time not only duties for the whole state but many duties that are now undertaken by county and city school superintendents. They had to formulate the curricula for the various schools, supervise the entire system and present to the legislatures annual reports, which were in themselves educational treatises of a high order.

The first city to appoint a superintendent was either Buffalo, N.Y., or Louisville, Ky., in 1837. Providence, R.I., had the first superintendent of city schools who gave his full time to the office.

Normal Schools.—Since education had emerged as one of the major problems of the times it was inevitable that serious attention would be given to the great question of teacher training. The probability is that the earliest effort to meet this need was in the private school of Samuel McCorkle, near Salisbury, N.C. In 1785 he had devised courses for training teachers, and teachers he sent out had a fair professional equipment.

Many writers in educational journals had mentioned from time to time the necessity for this training. But when Samuel R. Hall stated baldly that there was no seminary in existence devoted entirely to teacher training, the matter was taken up with the determination to remedy the condition.

Thomas H. Gallaudet drafted a concrete plan; James G. Carter secured a grant from the Massachusetts Legislature, and the first State Normal School was opened at Lexington on July 3, 1839. Meanwhile Hall had started a school of his own in 1823 and had written the first textbook on education in America and the first in the English language. Other states,



A In *Adam's* fall
We ſinned all.

B Thy life to mend,
This *Book* attend.

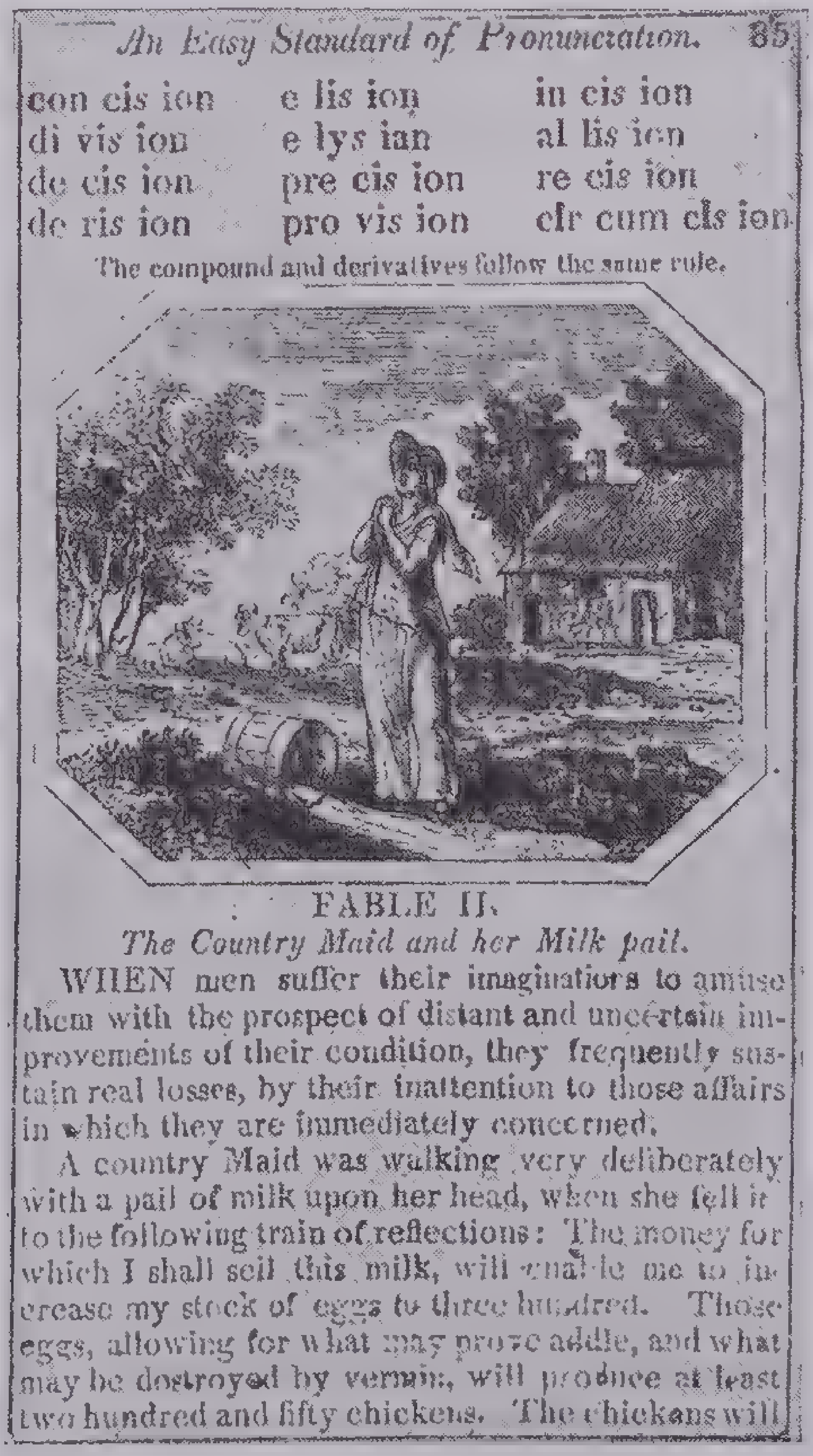
C The *Cat* doth play,
And after, ſlay.

D A *Dog* will bite
A Thief at night.

E An *Eagle's* flight
Is out of ſight.

F The idle *Fool*,
Is whipt at ſchool.

Courtesy American Antiquarian Society



An Easy Standard of Pronunciation. 85

con cis ion e lis ion in cis ion
di vis ion e lys ian al lis ion
de cis ion pre cis ion re cis ion
de ris ion pro vis ion cir cum cis ion

The compound and derivatives follow the same rule.

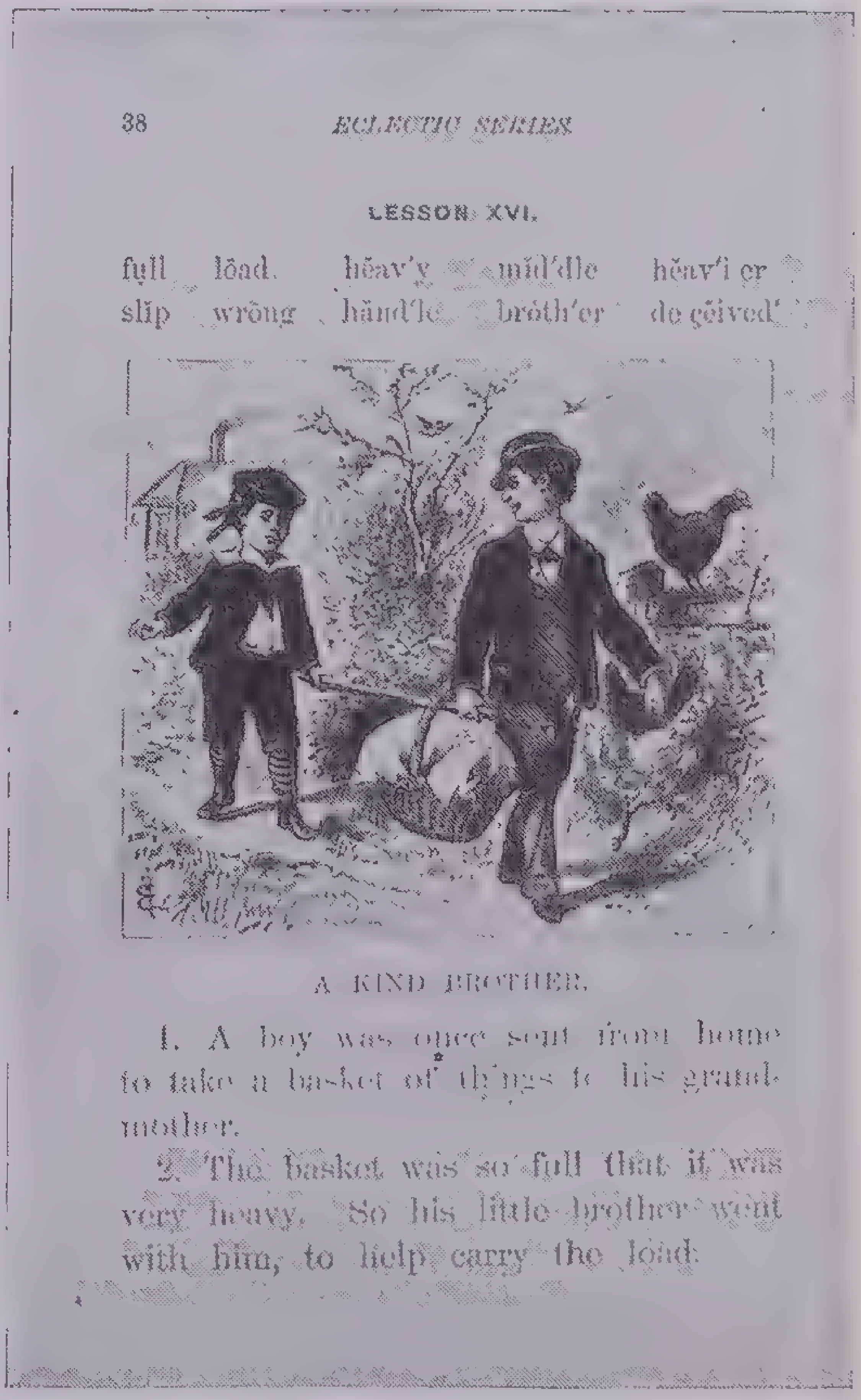
FABLE II.

The Country Maid and her Milk pail.

WHEN men suffer their imaginations to amuse them with the prospect of distant and uncertain improvements of their condition, they frequently sustain real losses, by their inattention to those affairs in which they are immediately concerned.

A country Maid was walking very deliberately with a pail of milk upon her head, when she fell it to the following train of reflections: The money for which I shall sell this milk, will enable me to increase my stock of eggs to three hundred. Those eggs, allowing for what may prove addle, and what may be destroyed by vermin, will produce at least two hundred and fifty chickens. The chickens will

Courtesy American Book Company



38 *ECLECTIC SERIES.*

LESSON XVI.

full lōad. hĕav'y mĭd'dle hĕav'i er
slĭp wrŏng hăn'dle brŏth'er de çēived'

A KIND BROTHER.

1. A boy was once sent from home to take a basket of things to his grandmother.

2. The basket was so full that it was very heavy. So his little brother went with him, to help carry the load.

Courtesy American Book Company

Pages from Three Famous American Schoolbooks

At the left is a page from *The New England Primer,* probably first printed at Boston or Cambridge in the 1600s. The *Primer* was the most widely read of all children's books during the 17th and 18th centuries; every little bookseller in New England printed one or more editions. It contained the rhymed alphabet, Roman and Arabic numerals, the names of biblical books, Lord's Prayer, Creed, Ten Commandments, the Shorter Catechism, texts of Scripture, "The Duty of Children" and the nursery prayer, "Now I Lay Me Down to Sleep." In the center is shown a page from Noah Webster's *American Spelling Book,* better known as the Blue-Back Speller, first published in 1783. Webster was annoyed at the unsuitability of the English textbook used in the school where he taught at Goshen, New York, and set to work to write a better one, an American book for American schools. All during the 1800s it was sold in every dry-goods store and supplied to every crossroad's store; its record today is over 75,000,000 copies. At the right is a page from William Holmes McGuffey's *Second Eclectic Reader.* The minds and the ideals of Americans who grew up in the 19th century and the first years of the 20th were shaped by these readers, the First and Second of which were published in 1836, the Third and Fourth in 1837, the Fifth in 1844 and the Sixth in 1857. Estimated sales of the McGuffey *Readers* reach 122,000,000 copies. They are still sold today

Connecticut, Michigan, New Jersey, Pennsylvania, Rhode Island, followed the lead, and teacher training became an established function of education. President Caldwell of the University of North Carolina opened the way in the South.

At first the courses of study were confined to the fundamentals of teaching. Today the courses contain not only methods of instruction for each subject taught in each grade of the school but courses in psychology, pedagogy, sociology and the arts. Practically every state has enough normal schools to meet the needs of its educational program.

Our normal schools have usually provided a two-year course. A recent tendency has been to extend the course to 4 years by broadening the curriculum and including a great amount of new material that the times have disclosed as necessary for an intelligent citizenry. On the satisfactory completion of the 4 years' work a bachelor's degree will be granted. The normal schools with 4-year courses will be renamed teachers colleges, taking the title from Teachers College of Columbia University. All the state universities and many other universities have fully manned and well-equipped departments of education. They all offer to properly qualified students a wide range of courses that may be taken during the summer sessions.

In no country today, except France, is the matter of training teachers to give the best service possible to the schools on such a high plane of efficiency as in the United States. It is the work of such institutions that has brought the profession of teaching school out of the lowly status of Colonial times to the dignified position it holds today.

Besides the means for training teachers, every state has its annual teacher institutes, its state associations of teachers (some of them grouped into sections) and its annual convention. The main purpose is to bring the teachers together for the exchange of ideas and experiences and to take advantage of the contributions of experts in the educational field.

High Schools.—The first American high school was established in Boston in 1821. New York city followed in 1825; but it was the bill passed by the Massachusetts Legislature in 1827 that provided the real impetus for the high-school movement in the United States. By 1840 a dozen high schools were built in Massachusetts, and the movement was spreading rapidly to every state. Today the high school is an integral part of every large local school system. The business and professional world expects from every boy or girl who seeks a position a high-school diploma or its equivalent from a good private secondary school. Entrance into any higher type of school is predicated on the possession of such a diploma or its equivalent. The high schools have affected requirements for college entrance, for increasing numbers enter college by way of the high school.

Covering a decidedly formative period, the high school has caused a revision of the elementary school years to provide for a *junior high school;* and at the same time the curriculum of the high school has been changed to provide for those who cannot go to college, and the movement to establish junior colleges has been stimulated.

One of the greatest problems confronting the educator of today relates to the high school. There are many more high schools throughout the country, and there has been a tremendous expansion in the content of the curriculum. No country before ours has ever entered on such a huge program of free education of high-school grade for every child in the country who is in a position to take advantage of it. In consequence the high school has become more or less a catchall. With elaborate school plants, laboratories, auditoriums, stages, art studios, music rooms, rooms for teaching all phases of domestic science, gymnasiums, athletic fields, recreational rooms; with courses of study ranging from Latin and algebra, history and English to vocational courses in the trades and commercial subjects; with highly specialized teachers and extracurricular activities of all sorts; the high school is the last word in conventional schooling for the majority of people. Naturally the staggering costs of this tremendous enterprise bear heavily on many communities. If the tax-conscious public is willing to continue to bear this burden, it will probably require some assurance that it is all worth while, and that the quality of the product that the high schools turn out justifies the expense to bring it about.

Higher Education.—All except one of the early American college institutions grew out of religious or sectarian motives. This was the school in Philadelphia known as Franklin's Academy. It was established in 1751 and later became the University of Pennsylvania. Franklin wanted a school founded on love of truth for truth's sake, not to exploit any form of religious dogma. He wanted it scientific and secular. He did not believe in choosing students for family prestige but only on the basis of mental ability and seriousness of purpose. This view of education had much to do with the spirit in which later colleges came into being. But America was slow to grant charters to such institutions. In 1769 George III had granted a charter to Dartmouth College. The Legislature of New Hampshire tried to amend it. The Supreme Court of the United States in 1819, basing its decision on the celebrated plea of Daniel Webster, counsel for the college, declared the act of the Legislature unconstitutional. This important case had far-reaching effects on the permanent rights of colleges to granted charters. At the present time we find colleges and universities (some of them under the boards of various denominations), state universities, professional schools (many of them privately endowed) in every state of the Union. Annual costs of these institutions of higher learning run into many millions of dollars. In 1936–37 almost 1 out of every 100 persons in the United States was attending college, and this total of 1,250,000 did not include enrolments in normal schools and state teachers colleges. There has also been a tremendous growth in the numbers of those who attend the graduate departments in our larger universities for the doctorate degree.

In the list of American colleges and universities many are coeducational, and there are a number devoted exclusively to the education of women. At first women's education in the United States was confined to female seminaries and academies. In 1833 Oberlin College at Oberlin, Ohio, opened its doors, and for the first time women were received on the same basis as men. In August 1841 three women who had entered in 1837 were graduated from Oberlin, the first to receive degrees in the arts under the standards then prevailing in the best men's colleges. Two early teachers who pioneered in women's education were Emma Willard (1787–1870) who founded the Emma Willard School at Troy, N.Y., and Mary Lyon (1797–1849) who established in 1837 a seminary in South Hadley, Mass., which in 1888 became Mount Holyoke College.

In 1853 Antioch College in Ohio was opened to women as well as to men, and in 1855 Elmira College in New York became the earliest women's college in an Eastern state. Other early women's colleges were Vassar at Poughkeepsie, N.Y. (1864); Wellesley, Wellesley, Mass. (1875); Smith, Northampton, Mass. (1871); Bryn Mawr, Bryn Mawr, Pa. (1885); Goucher, Baltimore (1885) and Barnard, New York city (1889).

Progressive Education.—Within the last few years a great change has come over the attitude of the general public towards the whole matter of education. This is doubtless due to the great changes that have deeply affected all our social life and our economic system. There is an equally great change in the attitude of educators, and this results from the new problems that confront us all in our daily lives. There is great unrest in industry, in capital and in labor. A severe economic depression has caused the Federal as well as the state governments to place on the shoulders of our educators additional burdens. Government, through financial aid to adults, has given us our WPA classes and the National Youth Administration. Adult education has come to be an essential feature of our national life, entirely aside from the regular work carried on within the normal system. New techniques have had to be developed; and a fresh approach to old problems as well new has had to be devised.

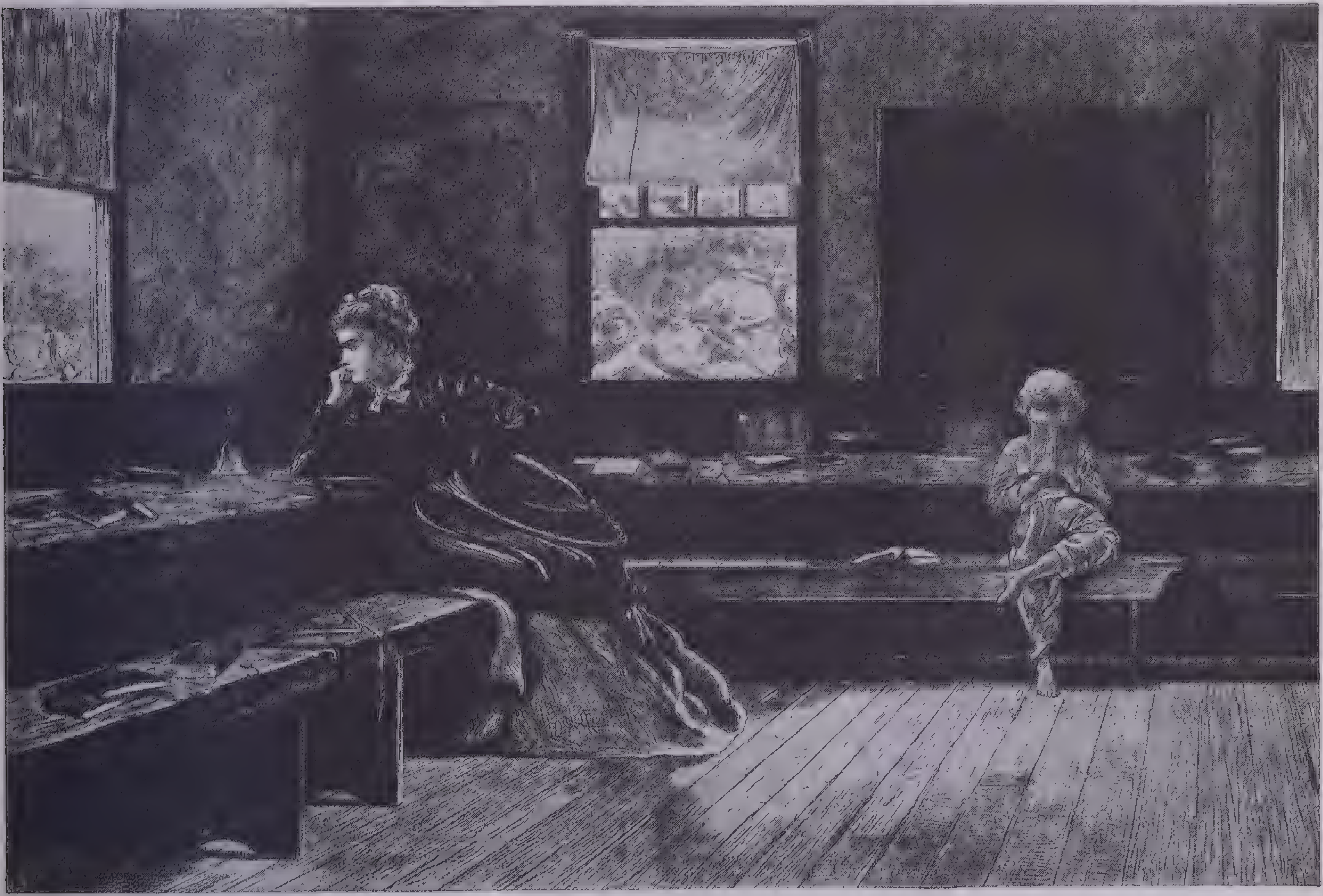
Adult education, now enrolling one-sixth of our entire population, has become a nationwide enterprise, based on the modern theory that education does not cease with the formal schooling of early years. A large number of our universities offer extension work to those who are unable to attend classes. Many foundations grant financial as well as educational assistance to many educational enterprises. More attention than ever is being given to the education of the Negro and the Indian.

The minds of many educators were more or less prepared for the new emergency by their attachment to the "progressive education" viewpoint. This movement has attempted to stimulate school officials, educators and teachers to a deeper appreciation of the child's nature. While so-called *mass education* is necessary and inevitable, attempts have been made to correct its most patent deficiencies. Increasing attention is being given to the individual child: his emotional as well as his intellectual nature is considered: school life is being brought into closer affiliation with the kind of life the child lives as well as with the life of the community within which he lives.

Men and Methods.—The great leaders of educational reform in our country, including such men as Dewey, Bode, Bagley, Horne, Butler, Thorndike, Snedden, Terman and others, have not only drawn heavily upon their own resources but have also used with discrimination the contributions of the great European educational reformers—Pestalozzi, Froebel, Herbart—and the later educational masters of America, such as Francis Wayland Parker, Granville Stanley Hall, William James and Charles William Eliot. A great deal of original work is being done under the leadership of Dr. John Dewey and his followers, as well as in the schools of education in our universities. The cause of education has been greatly benefited by the type of men who have occupied the office of United States Commissioner of Education, from William Torrey Harris (1835–1909) to the present time.

Education has been put on a more scientific basis: first by many measurement devices used to ascertain abilities, skills and aptitudes on the part of teachers and pupils; and secondly by numerous surveys made with money provided by the General Education Board and the Carnegie Foundation. The content and format of textbooks have been greatly improved. Many business firms are devoted wholly to supplying the great quantities and types of school materials needed in this greatest of all our industries. The Office of Education of the United States is a great clearinghouse of statistical data on education. The National Educational Association serves as a medium between the teaching body and the public. Educational magazines discuss every phase of the educational life of our country, as well as those features of education peculiar to the teaching and administrative sides. Radio is becoming increasingly important as an adjunct to classroom teaching.

National attention has been directed to the solution of many educational problems that the depression of the '30s brought to the surface. During this time teachers' salaries were lowered, the supply of needed educational materials was curtailed and schools in many cities, villages and rural areas were actually closed. Some critics recommend increased Federal supervision over our schools and more Federal funds for their maintenance, as well as a Federal Department of Education with the United States Commissioner of Education sitting in the President's Cabinet. However these controversial subjects may be solved, one thing appears certain: we shall continue along the same general lines of educational development that have characterized our educational history for many years—its essentially democratic tendency. We are dedicated to the proposition that "not only elementary education but also higher education in all its branches shall be placed at the disposal of every individual whose intellectual capacities might enable him to profit by it."



From a drawing by Winslow Homer in Harper's Weekly, June 28, 1873

The Noon Recess

Showing a Schoolroom of the 1870s

CHARACTERISTICS OF THE SCHOOL CHILD

What are children like when they first go to school? To what extent are a child's character and personality determined before he has any schooling? What are the traits, qualifications and limitations that boys and girls bring to school? And what is the relationship between these personal qualities and the systematic education offered at school? In order to answer these questions, let us consider some important characteristics of children.

Abilities.—Boys and girls have many fundamental abilities when they first go to school. Some are natural abilities, like seeing and hearing. Others, which have to be acquired, vary according to the child's previous experience. Some children can sing, draw or dance; others can do elementary gardening, cooking or sewing; but their most important ability, the ability they all have, is their ability to learn. All boys and girls who can draw do not draw equally well. Nor do they all like to draw the same things. Some children learn much more readily than others, and nearly all children learn some things more easily than others.

By learning we mean more than merely acquiring knowledge. From one point of view, schooling consists of absorbing information about many matters; and unquestionably the abilities to understand readily and to remember clearly are infinitely valuable from early childhood through life. Equally important are the abilities to think logically and systematically and to see things in proper proportion to one another. These abilities are often looked upon as characteristic of adults only, but their beginnings can be recognized in very young school children, and under careful guidance intellectual abilities and receptiveness will develop naturally in almost all children. In addition to these, children have many important physical abilities also, such as strength, agility and poise. A very important part of learning is developing these physical abilities so that the growing child will have increasingly good health, good muscular co-ordination and skill in athletic games and sports, which are valuable both for developing the child's body and for giving him confidence in his powers of endurance.

Physical ability also reveals itself in the child's use of his hands in craftwork and in handling tools, clay, wood, metal and other materials. These skills are valuable both for the muscular co-ordination that they develop and for the contribution that they make toward a sense of accuracy.

Besides intellectual and physical abilities, children have social abilities that are of the utmost importance. They have the ability to work and play co-operatively with other children and to follow the suggestions of parents and teachers. Many children come to school with these emotional abilities still in the first formative stage. No part of their ability to learn is more important than the ability to fit themselves into the work and play of a group, to wait for a turn when necessary, to do what has been requested, to give suggestions and to lead the group in some activity when the occasion arises.

Likenesses and Differences.—Children are alike in many of their traits, yet notably different in many ways. These likenesses and differences are the result of many factors. Heredity plays an important part since children inherit many aptitudes and tendencies and interests from their parents and forefathers. The environment in which the child lives is also a determining factor: a city child who lives in an apartment house, goes up and down in an elevator and crosses streets crowded with traffic differs somewhat from a child who has grown up in the country with fields, woods, brooks nearby; but automobiles, moving pictures and the machinery used in modern agriculture make country life and city life more alike than ever before.

Heredity and general environment account for many characteristics of children, but these characteristics are greatly modified by the people with whom the children come in contact. A young child often imitates the traits of those about him and reveals good or bad qualities that are not fundamental in the child's character. Both at home and at school good example will help to strengthen the good qualities and lessen the undesirable traits.

Children differ in many ways, in ability, disposition and interests, in strength and health, but they also have many likenesses, such as common knowledge, curiosity, power of imagination, innate desire for companionship and activity and ability to obey simple commands, all of which help in awakening a social spirit. Other likenesses, however, tend to work against quick assimilation into a group. Children are naturally self-centered: the world as they know it is built around them and for them. It is not easy for them to understand another's viewpoint. A child who has brothers and sisters is more likely than an only child to grasp the necessity for co-operation.

Children are restless, unable to concentrate for more than short periods. As they see only one aspect of a thing or an idea at a time, their conclusions often seem illogical, and their ideas of time and of cause and effect are vague. Asked to draw a man, they will make each part separately; they do not first outline the whole man. Physical likenesses also are present in normal children; they can talk, eat, laugh, cry, walk, run, jump, skip and throw, but all do not do these things equally well, and so differences arise.

Differences are often simply a matter of the degree of skill or cleverness shown. For instance, children who have had access to gymnastic equipment have greater muscular control and greater confidence in their physical abilities than those who have never played on such equipment. Again, differences may be more fundamental. One child may have a definite conception of the difference in meaning between *mine* and *yours*. Another, an only child who has had little companionship, may have only the faintest notion of this difference. One little boy is afraid of the dark, another is afraid of dogs; one is shy and timid with strangers, another is eager to be friendly. The purpose of the school is to smooth out the rough edges, to encourage the shy, to make the fearful forget their fears and to curb a too selfish enthusiasm. At school the children come in contact with many others of the same age and learn that their own peculiarities and desires must often be submerged in those of the group. With the proper encouragement, underlying likenesses are strong enough to weld individuals into a group without sacrificing individual personality.

Knowledge.—The knowledge that children possess in common even before they come to school is the basis upon which formalized education builds. Before entering the first grade in school the average child has a vocabulary of over 2,500 words. He speaks in simple phrases; that is, he can identify a great many things by name and conceive simple relationships among them. This knowledge aids him in acquiring more: for example, the teacher defines new words with words that are already familiar.

The child has some conception of nature, but it is very incomplete. Darkness means bedtime. A cat is distinguishable from a dog. But even his conception of cat is not wholly correct, for he has seen only one or two varieties. He knows how to use his larger leg and arm muscles, but is not yet adept at operating the smaller muscles necessary to use crayons or scissors.

At school the peephole through which he has seen the world begins to widen. He notices for the first time a sunset or the color of a bird. He learns that numbers do not stop at ten, that the day is divided into hours and that there are other boys and girls of his own age whose abilities and personalities differ from his. He learns not only facts but methods, and these methods will eventually enable him to make new use of the knowledge he already possesses and to discover many facts that are new to him.

Curiosity.—Curiosity is one of the child's most valuable traits and normal children have it in abundance. They pour out questions in avalanches, often without waiting for answers; but a hasty or vague reply only provokes more questions. Their curiosity extends to everything within sight and hearing. They want to know why is it five o'clock, why is it bedtime, why does the cat scratch when its tail is pulled, what is a movie, what is God, what is tomorrow. They want stories read to them, and want to know what is in the captions under pictures. Because they are curious about all these things, they are eager for school.

One child differs from another in the amount and nature of his curiosity. One may be fascinated by worms and crawling things, another by a newly acquired puppy, a third by the different coins and their uses. Because their attention is easily distracted, one line of investigation is rarely carried through to an end, and their rapid shifting of interest may bewilder an adult. It is in school that most children first learn the self-discipline of concentrating curiosity upon one subject long enough to make a thorough study of it. If this curiosity has been first aroused to a high point and then frequently stimulated, the task will be joyful and satisfying and work will be done cheerfully that would otherwise be considered drudgery.

Imagination.—A child's imagination is confusingly full of a number of things that he has not yet properly catalogued. Animals, houses, bugs, the things he has seen, the talk he has heard, the softness of his bed, the bitter taste of a medicine, the smell of a flower, all have entered his brain in quick succession. Because he has no ready-made cubbyholes into which to classify them, they sometimes are a little mixed. He has no standards by which to differentiate between the real and the unreal, the important and the trivial, the fearful and the ridiculous. He imagines tigers in his bedroom and has not had enough experience to know how improbable that is. He says that he saw a cow as big as a house and believes what he is saying because a house is big and a cow is big, and he finds these two alike in size because he has no intermediate standard of measurement.

This wonderful power of his to create fantastic fairy tales and dream worlds entirely unhampered by any physical impossibilities is not wholly fortunate. It may lead to foolish fears (especially at night) and to unconscious lying, which may later become entirely conscious. If this imagination is accompanied by an aroused observation and a continual addition of new facts from the real world, it will prove a powerful stimulus to learning. The parents and the teacher should not stifle imagination by too much enforced memorizing or by a contempt for original judgments. The child who is encouraged to make full use of his imagination in a healthful manner will easily accept and absorb into his imaginings newly discovered realities and will not feel the need of seeking refuge in a dream world.

Accuracy.—Accuracy comes only as a result of long practice, whether it is a question of mental reasoning or physical prowess. A small child is often inaccurate simply because he has not had sufficient practice in his various activities, such as speaking, drawing, cutting or throwing. When he is asked to describe an experience, he is likely to exaggerate certain incidents almost beyond recognition. He does not do this from a deliberate desire to concoct a good story but because he has mixed up in his memory the real and the imagined occasioned by the real. Moreover, he eagerly makes use of any suggestions given to him, either directly or as questions, because they fill out his own meager and confused memory and because they spare him the unpracticed effort of putting his experiences into words.

Thinking and conclusions that seem inaccurate are often simply incom-

Schoolroom of the Early 1800s

Scene from a motion picture *The Headless Horseman,* based on Washington Irving's *The Legend of Sleepy Hollow,* with Will Rogers playing the schoolmaster, Ichabod Crane. The teacher's raised desk, the rough-plastered walls and the wooden benches of early American schoolrooms have been accurately recreated. The class dunce sat on the footstool for punishment plete, because the child's knowledge of facts is limited and he cannot carry on any sustained mental process. Once having reached a conclusion, he implicitly believes it is true because there is nothing in his memory at the time that contradicts it. His drawing of the side view of a table somewhat resembles a signboard because in his efforts to be accurate he concentrates on the aspect of the table with which he is most familiar—a large, flat surface. He has, however, a sufficient sense of reality to laugh at a caricature picturing a man with an enormous head. He is often better than an adult at catching mistakes in pictures or typographical errors in words, because he pays more attention to the details of a picture or to the letters of a word than the adult, who after a glance unconsciously supplies from experience the correct details and letters. As the child's experience widens and he becomes more practiced in the use of his muscles and in the correct observation of his world, his accuracy of movement and thought greatly increases.

Frankness.—Frankness is a natural and desirable trait in children, but as soon as possible they should be shown its social implications. One day a young member of a family falls into disgrace for informing an important guest that he does not like him or by loudly inquiring why the guest does not depart. The next day perhaps he is praised for telling a young lady how pretty she is. In both cases he only says what he thinks, and it is hard for him to see the difference between one type of frankness for which he is scolded and another for which he is praised.

By the time he enters school his frankness has already been somewhat modified. He may have been scolded or laughed at until he is somewhat fearful of stating his opinions or conclusions. Having been unreasonably punished for an admitted misdemeanor, he may hesitate to admit another. On the other hand, a child who already has a well-developed conception of *yours* may refuse to tattle upon a playmate, a brother or a sister. He may have found that unflattering remarks about his playmates and relatives have been consistently discouraged. A child who enters school with this limitation on frankness well in mind makes and keeps friends easily because he has developed a measure of self-control and lost a measure of his self-absorption. During his school years his conception of himself as one of a social group becomes crystallized, and he is able to avoid more surely the frankness that never considers the feelings of another.

Industry.—All children bring to school interests and ambitions of some kind plus a positive yearning for new things to make and to do. They find idleness boring and they continually seek new methods and new materials. In order to secure the best results, they need to have a definite goal and time to become acquainted with the new materials and actions. They are easily fatigued and can attend to any one problem only for short periods of time, but they recognize appreciation and are eager for suggestions. If a child has had companionship, he knows the feeling of rivalry and puts forth great efforts to outdo another. He makes little or no distinction between play and work, devoting his entire attention and interest impartially to either tag or dishwashing but tiring of either very quickly.

Every child becomes physically and mentally active when interest is aroused, although children vary greatly in the amount of time they are willing to give to one activity, in the intensity of their absorption in what they do and in the readiness with which they grasp new suggestions and incorporate them into their play. One girl may spend 20 minutes drawing, while a second tires of this activity in 5 minutes but is willing to play longer with building blocks. Listlessness, lack of interest, a desire to sit still are indications of ill health. A normal child, whenever he is not sleeping, wants to be up and seeing, doing, thinking and making. That is why children are eager to go to school where they are provided with new and constantly changing activities. This eagerness can be conserved and renewed from year to year by taking into consideration and attempting to satisfy the child's natural need and desire for new and diversified interests.

Consideration.—Kindliness is a natural quality of children. A child wants those around him to be happy because he models his moods more or less on theirs and quickly senses annoyance or sorrow. But he also wants his own way and all the attention he can get, and as a result his kindliness is sometimes overshadowed by curiosity or jealousy. The boy who pulls the cat's tail does not necessarily want to hurt the cat but is trying to find out what will happen, simply to grab at something or to gain attention. By the time he is ready for school, however, the child usually has learned that he cannot do everything he wishes, either because it is impossible or because it conflicts with the interests of others.

For, although kindliness is innate, consideration for others develops slowly, because the very idea that another has sensibilities and possessions that must be respected has to be acquired. Children with brothers and sisters of nearly the same age are readier than others to share their toys and the attention of their parents or teachers, to learn the habit of giving and to think how a contemplated action will affect others. A child of five will take a sister, aged three, for a ride in a wagon, warn her not to cross streets and watch that she does not wander off. Such supervision cannot be entirely reliable because the older child will often become wholly involved in his own activities, but so far as it goes it does show a great deal of consideration. Children have a distinct feeling for fairness. They resent unfair treatment to themselves and in a group they soon learn that there must be some sacrifice of self so that everyone may have the same chance. Children willingly perform small courtesies, if they understand the reasons for what they are asked to do and if they are thanked for doing it. Consideration for others is encouraged in school by example and by such group activities as baseball and dramatic performances, which require close cooperation for successful results.

Independence.—All through grammar school, children are dependent upon adults for food, clothing, shelter and the satisfaction of many of their most important desires and needs; but starting at five or six with the ability to eat, dress and undress, wash teeth, faces and hands and take care of their toys without help, their responsibilities and their independence yearly increase. The self-reliance that a child manifests at the age of five or six is in a large measure dependent upon his home training. If he has been left alone a great deal or with others of his own age, he is likely to be more independent than children who are constantly under parental observation. If he has been left entirely alone, he has had to make decisions of his own and use his ingenuity to do for himself whatever he wanted done. If he has been much with children of his own age, he has had to stand up for his rights without adult aid. He has perhaps had certain responsibilities, such as keeping the cat out of the pantry or watching a baby brother so that he does not fall from his high chair. The successful accomplishment of such trusts gives him pride and confidence in himself and in his worth to others.

When they are not discouraged or ridiculed, children do much original thinking; but if their opinions are greeted with shouts of laughter or a not-worthy-of-notice attitude, they will learn to keep their opinions to themselves or they will simply stop trying to think and will assent to whatever is told them. It is better for a child to argue as a result of his own independent thinking and observation that the sun goes around the earth than for him humbly to accept an older person's assertion that the earth revolves around the sun. A meek child is often pointed out as an example of perfection, but his independent companion who gets into more mischief and has ideas of his own will prove more resourceful later on. The too dependent child, suddenly forced to think for himself, will be at a disadvantage.

The Human Body.—The child prepared for school has already a great measure of control over his body. He has learned to use his leg muscles in walking and running, to use his arms in drawing, block building, throwing and such fundamental processes as eating, washing and dressing, and he has acquired some control of the bodily functions. His fingers have not yet sufficient skill for fine work in drawing, tracing, cutting, pasting or sewing. A little farsighted, he cannot concentrate long on close work. He wants and needs much and varied exercise, which should be counteracted by regular rest periods. Some of his acquired physical abilities, such as walking, are already automatic or are rapidly becoming so, and he need no longer give his entire attention to them, and so becomes free to concentrate upon other things. He has relatively little resistance to disease, and his hearing, eyesight and teeth should be carefully watched.

Learning muscle co-ordination is one of the child's most important tasks in the early school years. He is intensely interested in improving his muscular skills and in school he finds opportunity for briefly sustained but often repeated practice, encouragement and friendly competition. He becomes eager to perfect his technique and to excel. His bones are comparatively soft and not easily broken, and his muscles, though untrained, are exceedingly supple because they are all in constant use and a few have not yet been developed at the expense of others through the development of habits of movement and posture. It takes more concentration for him than for an adult to go down stairs, but he easily performs gymnastic feats that an adult could duplicate only after long and painful practice. It is important that the child learn at once the correct use of his muscles in posture to prevent forming bad habits that become increasingly difficult to break. A healthy child is apt to be a happy child, well fitted for his part in school and life.

Personality.—The whole child is not the mere sum of his recognizable parts, any more than the whole man is so much calcium, so much hydrogen, so much iron. At five the child is already a distinct personality, composed of a great many abilities, feelings and thoughts that are peculiar to him alone. He is like others of his own age and he is unlike them, not only in his present powers of thinking and doing but in his capacity for future growth. He is a distinct personality, but not at all the man he will be, for his future character will be still further modified by his education and by the circumstances of his later life. His first conscious movements were imitations of others, and he will continue to imitate both the good and the bad as long as he lives. Therefore, the right example is always necessary—particularly so until he has formulated standards of behavior of his own.

At five, right and wrong are still abstractions except as they apply to such things as eating with one's fingers or brushing one's teeth. Morality and virtue are scarcely even words. A child's personality is not good or bad, but he may already be magnetic or self-effacing. He is composed in varying degrees of all the elements here discussed: knowledge, curiosity, imagination, accuracy, frankness, industry, consideration, independence and health. All these are present as he sets off upon the first great adventure—school. He is individual and yet so unformed that the next few years are of the utmost importance in determining his adult character. School becomes his biggest worry and his biggest pleasure. A deep knowledge of children and boundless sympathy can make a teacher a great possible influence for good, for she has access to the child over long periods of time and under favorable conditions. The child as he comes to school is like a bit of sculpture whose shape has just emerged from the original block of material. Throughout his years of schooling he should increase his store of knowledge and his ability to use his knowledge; and he should also develop the fine traits he has and acquire the well-rounded character he would like to have.

CURRICULUM

Schools have come into existence as a means of helping fathers and mothers give their children a better education than they themselves could give them. The school does this by teaching the children certain things which teachers and other adults think cause them to become better able as they grow up to take their places in the world. What is being taught in schools is usually arranged in what we call subjects such as, for instance, arithmetic, history, geography, bookkeeping or spelling. All the subjects taught in a school are called the school's *curriculum* or *course*—something that is run over (curriculum in Latin means a racecourse). We speak of the curriculum of an elementary school or of the high school. In the first case we refer to all the subjects taken year by year from the lower to higher grades in an elementary school. In the second case we use the term to cover all the subjects offered to all the pupils of a high school. In any case the word curriculum is used to include the several kinds of subjects taught in school just as the one word fruit can be used to cover the apples, peaches, pears, and plums on a fruit stand. The definition commonly used by educators is the one appearing in *Junior-Senior High School Administration,* a book written by Johnston, Newlon and Pickell. They defined curriculum as "any systematic and schematic arrangement of courses (or subjects) which extends through a number of years. . . ."

THE ELEMENTARY CURRICULUM

The elementary school is the one which the youngest children enter and attend until they are old enough to go to high school or to junior high school. Where junior high schools exist, the elementary school requires six years for completion or seven if there is a kindergarten.

Prime Importance of Reading.—The curriculum of the elementary school is designed to help a young pupil acquire the skills fundamental to learning. Since the next period of his life will be spent in school where he is expected to be learning, the first responsibility of the school is to be sure that he learns how to do the things that will be most helpful to him both in and out of school hours during the school years. This means that reading is very important since the ability to read is so necessary if one is to be able to succeed with his school work. It is not surprising, therefore, to find that in the primary or lower grades of an elementary school more time is spent upon teaching children to read than upon anything else. This emphasis continues until the pupils are so well started in reading that they can go ahead rather independently.

Reading is a most important skill to acquire for another reason—because it contributes in so many ways to successful and happy living throughout life. It is known that lack of ability to read accounts for more failures in school than any other cause. In later life also, lack of reading ability is a great handicap in business and other phases of living. Everyone should have every opportunity to learn to read when young and every child should be encouraged to make every effort to learn to read.

With good teaching most children learn to read well enough to succeed in school. Many faults contributing to poor reading are often unwittingly formed. A good teacher of reading watches for these and "breaks" pupils of them by showing them how to do it correctly. Some faults persist even into high school, however, but such books as Carol Hovious' *Following Printed Trails* (D. C. Heath & Co.) will help any high school pupil who has trouble with his reading to correct his faults. The finest contribution made by the elementary school curriculum is the cultivation of the ability and desire to read.

Expanding the Curriculum.—Reading, together with arithmetic and writing, constitute what is often called *the Three Rs,* and in times past were (with spelling) about the whole of the elementary or common school curriculum. In pioneer days when the amount of schooling any one pupil received was much less than now, there was no more time than was needed for these three Rs.

Later when more families could afford to keep their children in school for longer periods of time, and when greater progress could be made each year because terms were longer, there was a demand for the addition of other subjects to the elementary school curriculum. Geography, history, civics, music and art eventually found their way in until now a good elementary school is expected to provide opportunity for its pupils to have some training in all of these fields. This means that in America now, where every child is required to attend at least the elementary school, nearly all have a chance to learn something about the principal fields of knowledge. Every child can learn something about the world and its peoples as they exist today with special emphasis upon our own country through geography. He can learn something of the history and government of our country and of other nations of our time. He can learn how to count quickly—for addition, subtraction, multiplication and division are in reality short ways of counting—and he can find out the answer to the question, "How many?" and, "How much?" He can learn to write and spell so he can set down his thoughts for the use of others or of himself at a later date. In all these things his ability to read plays a most important part. He also can learn something about reading music and how to sing it, as well as try out his ability at drawing and other forms of art work. Thus by the end of the elementary school a pupil has a chance to acquire the most basic skills of learning, and besides he is introduced to the art, music, history and literature of our people. Thus he has laid the foundation for a very broad education if he cares to go ahead with it. Only boys and girls in the poorer areas of our country where parents cannot afford to support good schools do not have an opportunity to get this kind of elementary education. It is the hope of our country that soon we may be able to find ways of furnishing every boy and girl in this broad land with the very best kind of elementary school education.

Timetable Method.—If you had gone into any room in any village school a half century ago, you would have found a daily program posted somewhere on the walls. It probably would have started something like this:

9:00 to 9:10	Opening Exercises
9:10 to 9:30	A Class Reading
9:30 to 9:50	B Class Reading
9:50 to 10:00	Penmanship
10:00 to 10:15	A Class Spelling
10:15 to 10:30	B Class Spelling
10:30 to 10:45	Recess

It would have continued on marking off the whole school day into short periods of a few minutes each during which each class would have its recitation in each of its subjects while the other class studied for its next recitation.

Activity Curriculum.—In some schools the timetable plan is still followed in the elementary grades, but more and more a new plan is being introduced in an effort to make school work more interesting and pleasant and thus increase the amount of learning accomplished by the pupils. In the new way of organizing the curriculum, the class of pupils is first interested by the teacher in something until they find themselves really wanting to know more about that thing than they now know. So under the encouragement and guidance of the teacher they lay plans for learning more about it.

Let us say that a class of young pupils through the teacher's encouragement have decided that they want to know where the postman gets the letters that he delivers to their houses. They have seen him bring the mail but have only a very vague idea of the post office and the postal service. The teacher now begins to carry out plans that she has laid long since. The children read some stories about the postman or better still they tell stories to each other about what they have learned about him and his letters and stamps and mailboxes and all. These stories are then written or printed out by the pupils so they can be read to each other from time to time. Gradually all the pupils learn to read, write and spell a whole group of words which are new to them. They make a trip to the post office to see how letters mailed by one person are collected and made ready to deliver to another. They learn about stamps, what they cost, why they must be used, where to put them and why they are cancelled. They want to send some letters. They write them, address the envelopes, buy stamps, make change and mail the letters. Perhaps they set up a little post office in their schoolroom where they can buy make-believe stamps and mail and get letters from their classmates. It is all great fun for the pupils, but all the time the teacher has been planning and arranging so that they were learning to read, spell, write, add, count and make change, just as much or more than they would have done had they been following a fixed timetable on the wall. The teacher has included some geography by showing how letters can be sent far away; and she has tried to show how an honest, faithful postman by doing his work well every day helps make those whom he serves better off than they would have been without him. This type of elementary school curriculum is often referred to as the *activity* type of curriculum because when it is well carried on all the children are very busy at their school work. It commonly creates a great deal of interest among the pupils, and since people usually work at things in which they are interested and give close attention if interested, many learn more from this type of experience in school than they would learn if they were simply studying subjects out of textbooks. Many teachers think that in time all schools will abandon the timetable on the wall in favor of this newer way of organizing the school curriculum. Whatever the means, the goal will continue to be the provision of opportunity to acquire the basic tools and elements of a good general education to the degree permitted by the maturity of each pupil.

THE SECONDARY CURRICULUM

College Preparation.—Our present secondary or high schools developed by adapting earlier types of schools found in this country and in Europe to our needs in this country. In Europe and in colonial days in this country the commonly accepted idea was that only those going to college would attend school beyond the elementary grades; and the curriculum of the secondary school was designed with this end in view. Since only those preparing for what we call the professions went to college in those times, the secondary school curriculum could logically include only those subjects that prepared for the kind of work these students would be expected to be able to do in college. The ministry and law were the principal types of professional education, and the secondary school curriculum of Europe and early America was built largely around the study of Latin and Greek and the literatures of these two peoples. An idea of what a typical, prerevolutionary secondary school curriculum was like can be secured from the following note by a clergyman of the 18th century:

"In the sixth year I began Greek and for the first time attempted English composition, by translating Caesar's Commentaries. Master allowed us to read poetical translations, such as Trappe's and Dryden's Vergil. I was half-way through Vergil when I began Greek with Ward's Greek Grammar. After Cheever's Latin Accidence we took Ward's Lily's Latin Grammar. After the Greek grammar we read the Greek Testament and were allowed to use Beza's Latin translation. Then came Homer's Iliad, five or six books, using Clark's translation with notes, and this was all my Greek education at school. Then we took Horace, and composed Latin verses using the Gradus ad Parnassum . . . I never saw a map except in Caesar's Commentaries, and did not know what that meant."

The following is a copy of the curriculum in the Boston Latin Grammar School in 1789, the earliest secondary school in this country.

Boston Latin School, October 15th, 1789
1st Class:
  Cheever's Accidence
  Corderius's Colloquies, Latin and English Nomenclator
  Aesop's Fables, Latin and English
  Ward's Latin Grammar or Eutropius
2nd Class:
  Clarke's Introduction, Latin and English
  Eutropius, continued
  Selectae e Veteri Testamento Historiae or Castilio's Dialogues
  The making of Latin from Garretson's Exercises
3rd Class:
  Caesar's Commentaries
  Tully's Epistles or Offices
  Ovid's Metamorphoses
  Virgil
  Greek Grammar
  The making of Latin from King's History or the
  Heathen Gods
4th Class:
  Vergil, continued; Tully's Orations
  Greek Testament; Horace
  Homer; Gradus ad Parnassum
  The making of Latin continued [1]

In the first example note that even English is absent. In the second, which was a later school, English appears, but the now familiar high school science, history, mathematics, music, art and vocational arts are all missing.

Franklin's Practical Ideas.—From the earliest days of our country, however, there was a demand from the common people lead by businessmen and labor groups for the inclusion in the secondary school curriculum of more practical subjects. As a result, another type of secondary school, the academy, came into existence. Benjamin Franklin was instrumental in planning, organizing and opening the first of this type in Philadelphia in 1751. His ideas of a suitable curriculum for the secondary schools of America are summarized in the following quotations:

"[It] . . . should promote the welfare of its students when they should go forth to the duties of active life." It should have a building with "a

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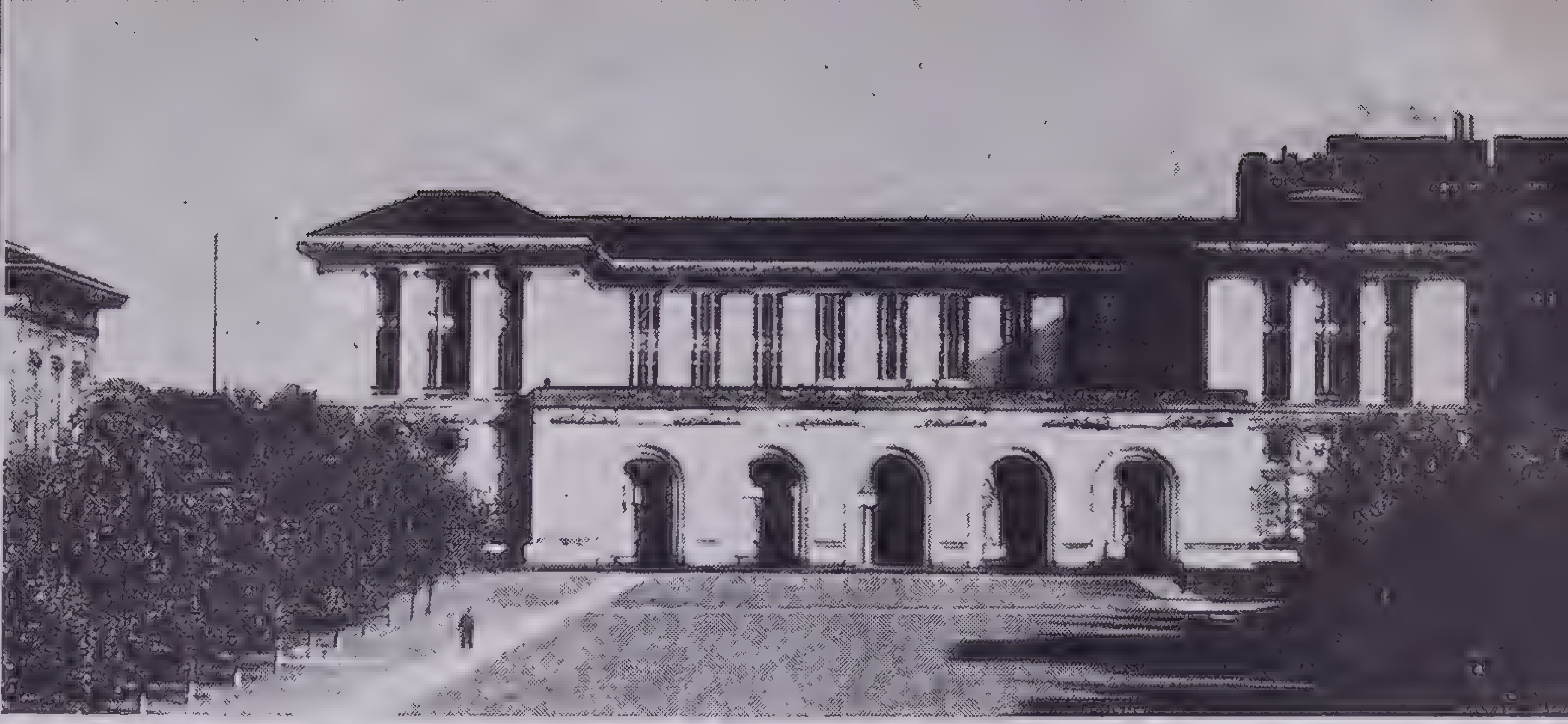
[1] Inglis, Alexander James, *Rise of the High School in Massachusetts.* 1911.

Keating Hall, Fordham University, New York



College of Fine Arts, Carnegie Institute of Technology, Pittsburgh, Pennsylvania

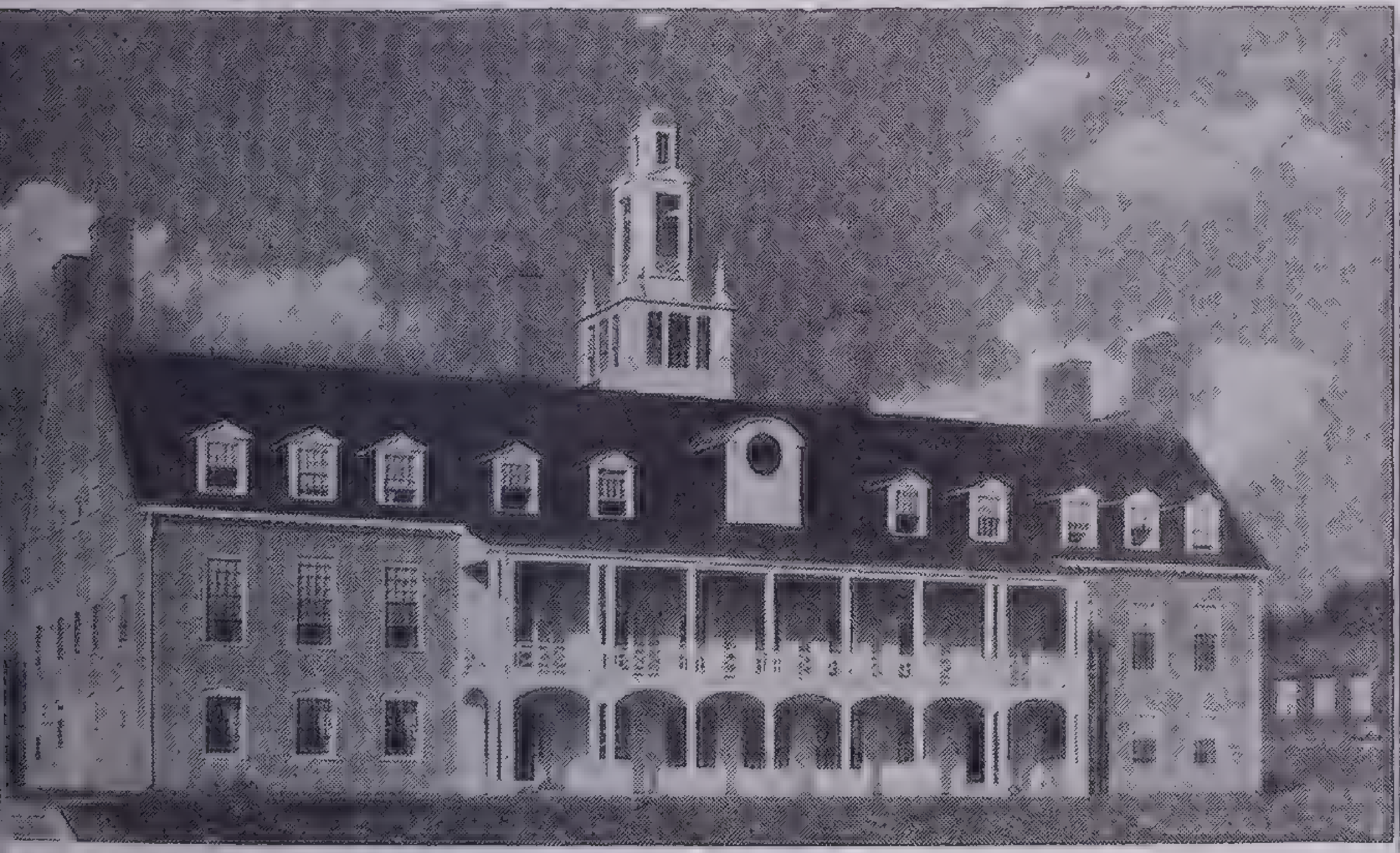
Galen Stone Carillon Tower, Wellesley College, Wellesley, Massachusetts

Administration-Library Building, University of Texas, Austi

SOME AMERICAN COLLEGE BUILDINGS

low: Commons Building, Bennington College, Bennington, Vermont
Memorial Union Building, Indiana University, Bloomington, Indiana

Below: Women's Residence Hall, University of Washington, Seattle, Washingto
Memorial Union Building, Purdue University, Lafayette, Indiana



Ansonia High School
Ansonia, Connecticut
William Lescaze,
Architect

Below:
Corona Avenue School,
Los Angeles, California
Richard J. Neutra,
Architect

Modern Architectural Design in American Schools and Colleges

Study Hall, College of Engineering, University of Kentucky, Lexington. Designed by the Staff of the College of Engineering

Photo courtesy Owens-

garden, orchard, meadow, and a field or two" in which the study of husbandry and science should be promoted and the boys "frequently exercised in running, leaping, wrestling, and swimming" and be equipped with "a library, maps of all countries, globes, some mathematical instruments, an apparatus for experimenting in natural philosophy (science) and mechanics, prints of all kinds, prospects, building and machines. . . .

"As to their studies, it would be well if they could be taught everything that is useful and everything that is ornamental. But art is long and their time is short. It is, therefore, proposed that they learn those things that are likely to be most useful to them and most ornamental, regard being had to the several professions for which they are intended."

Great emphasis was laid on English in its several branches—grammar, composition, oral reading and literature, especially that which was recent. The pupils were to make declamations, repeat speeches, and deliver orations of their own, and their style formed by "writing letters to each other, making abstracts of what they read, or writing the same things in their own words." All were to be taught drawing, "with some of the first principles of perspective," penmanship, modern literature, arithmetic, elementary geometry and astronomy, the several sciences with practice exercises in agriculture and horticulture, and also commerce, industry and mechanics. Franklin advocated a course in general history, including geography, chronology, ancient customs and morality, this to be "followed by the best modern histories, particularly of our mother country, then of these colonies, which should be accompanied with observations on their rise, increase, use to Great Britain, encouragements, discouragements, etc., the means to make them flourish, secure their liberties, etc."

Franklin desired to exclude all foreign languages, but in deference to those whose wealth and influence were needed he wrote: "Though all should not be compelled to learn Latin, Greek and the modern foreign languages, yet none that have an ardent desire to learn them should be refused, their English, arithmetic and other studies absolutely necessary not being neglected."

Many of these subjects were not acceptable to the colleges of that day for college entrance, so the Academy carried college-preparatory courses side by side with this more practical "English course." Because of shortage of funds and other reasons, the emphasis in their curriculum gradually shifted to the college-preparatory basis. A few subjects like science and mathematics were added to the old foreign language subjects, and the curriculum of the academies began to be less and less satisfactory to the kind of people who had been interested in its founding.

The High School.—This led in time to another attempt to broaden and liberalize the secondary curriculum through the establishment of the *high school*. The first was the English high school, with a broader curriculum than the academy. The conflict continued between the strictly college preparatory curriculum and the curriculum that prepared directly for active life. The influence of the colleges themselves, of patrons who wanted their own children prepared for college and of those interested in keeping the taxes for schools low have all combined to make it seem more important and desirable to keep the college preparatory subjects as the center of the high school curriculum.

The Election System.—Since 1900 the secondary curriculum has been rapidly broadened, especially by the *elective system* under which students can pick one of several courses besides the college-preparatory course and can select within the course they choose part of the subjects they study. Nowadays in city high schools where the size of the school makes it possible without prohibitive expense, the curriculum has been broadened until one may select from college-preparatory, general, technical, commercial, arts, music and vocational courses. Under each of these courses, the pursuit of any of which leads toward graduation, there are two groups of subjects. One group is *required* for all students. This includes English and American history and usually some form of mathematics and science. The other group is composed of subjects any one of which is *elective* at some time by any student in the course. These electives range in a large high school through every conceivable type of subject matter within the comprehension and ability of high school students.

Some high schools list in their curriculum as many as 140 to 150 separate subjects and boast that were one person to undertake to get credit in all of them, he would spend the best part of a lifetime in school. Such a wide program is chiefly justified by three facts. First, the continuance by nearly all boys and girls of their education into the high school years means that the school must provide more interests than before when many did not stay in school so long. Second, study and research have expanded the fields of knowledge so that more courses are needed if any one field is to be as adequately covered as it once was. Third, vocational pursuits have become more numerous and more highly specialized, and they demand the more specialized education which many of these courses provide.

Within the last decade this tendency to add courses to the high school curriculum has slowed down somewhat, chiefly because the first and third of these factors are not expanding at so rapid a rate as before. Then, too, there is the belief among educators that the splitting of fields of knowledge into smaller and smaller segments was carried too far to serve the purposes of high school education in the best way. Therefore, natural science, which has been split up into physical science and biological science—the former split again into chemistry and physics, and the latter into botany and zoology—now is often presented in two courses in which is included much of what was presented in the four. In one of these general science courses, usually taught in the 8th or 9th grade, the emphasis is ordinarily on the physical sciences; and all the biological sciences are represented in the other. The intention is to show some of the principles of both branches of science applied in life situations before the more detailed study of narrower fields of science is begun. This situation is typical of what has been done in other fields, and new fusions and combinations of subjects are at present being tried by many high schools.

Ways and means have not yet been found to make it possible at a reasonable cost for the many small high schools in America to offer their students a selection from this vast array of high school subjects that is in accord with the needs and abilities of its students. But it seems to be largely settled that the high school curriculum should not be composed of the few subjects calculated to serve the needs of one-sixth of all high school students who go to college; and that the course should be broad enough to meet the needs of the five-sixths who do not go to college. This means that an important point has been won in the battle to democratize the secondary school curriculum. The good high school now and in the future must make every effort to provide each youth who seriously desires an education with the opportunity to learn what suits his capabilities and interests.

Guidance Programs.—The theory behind a broadened and enriched high school curriculum deserves the highest praise, but this type of curriculum complicates educational problems. A youth faced with such a wide choice of subject matter has a much more difficult decision to make in selecting the particular subjects he will take than he would have were the choice not so wide. The broader the curriculum, the more difficult the decision. To assist the pupil in making this and other decisions related to his education, the better schools have instituted a guidance program. In schools where this service has been well developed and where it is carried on by competent workers there is valuable advice available to any student who is in doubt about his electives. The full value of a high school education can be secured only when it is tailor-made to suit the individual student's needs.

The great emphasis that is laid on subjects in the curriculum calls for a word of caution lest readers get the wrong impression. Many students look upon subjects and mastery of them as ends in themselves. This is a very mistaken idea. School subjects are expected to help a student improve himself and his ways of living.

OBJECTS OF THE CURRICULUM

What are some specific gains to be expected from a well-chosen curriculum? What should elementary and secondary education give to the youth of today? It should give these powers and abilities:

1. **To be and to stay healthy.**—No one wants children to be sickly or grow up into adults who are constantly in poor health. Ill-health costs both the person who is affected and the community in which he lives. He cannot work or earn and therefore he cannot spend; and his sickness may contribute to another's ill-health. So certain subjects in the curriculum teach how to keep good health. Safety is emphasized because accidents have the same ill effects as illness. Though one learns many facts about health in hygiene, physiology, biology and general science, much of the value of studying these subjects is lost unless the student applies what he learns to his own ways of living.
2. **To speak and write English reasonably well.**—English is our native language. Everyone who lives here should have an opportunity to learn to speak and write it and should try to acquire the ability to use it correctly. Every citizen gets along better if he can read, write and speak English well. So pupils who study reading and English in school but do not improve their reading and speaking habits are losing a valuable opportunity for themselves. The same argument could be made for arithmetic and its study as for English. It is one of the essential skills of successful daily living in our day and age.
3. **To be a good citizen.**—No one is safe or happy in a state or community of bad citizens. Being a good citizen is largely a matter of learning how to act at home or school, on the street or highway and in large and small groups with other people so that what one does or says does not injure others. A bad citizen deliberately acts so that the happiness and welfare of others is impaired, and a poor citizen unknowingly and unintentionally acts the same way. Such school subjects as civics, history and literature show the student how to conduct himself in his relations with other individuals and groups so that he does not interfere with their rights or welfare. Unless one thinks of these subjects as a means of learning how to be a better citizen and of developing a desire to be one, much of the purpose of teaching them is lost though one may have memorized countless facts about the subjects.
4. **To be vocationally efficient.**—To the youth old enough to begin thinking about self-support, many high schools offer subjects that will help him. Some are basic to professional preparation in college; others prepare for a skilled vocation. In either case these subjects are offered because it is an advantage to the individual to be prepared to work for his own living and an advantage to the community to have well-educated workers. The pupil who takes these subjects with no thought except to make a credit toward graduation deprives himself of the real value for which the subject was inserted into that school's curriculum. The pupil who makes so little effort in any subject that he can perform the skills of a vocation only in a poor fashion loses the value of the course to himself and becomes a workman of little value to anyone else. Besides he may help create a false idea of the value of such subjects in school, and that may deprive other students of the chance to take the subject.

These four illustrations suggest some of the important purposes that communities have in mind when they tax themselves for the support of schools. The subjects of the curriculum are taught because they contribute to the realization of these purposes. Those subjects that are most likely to help all students attain one or more of these goals are the subjects all students should be required to take. A subject that will help some pupils but not all should be listed as an elective. Each subject is there because it seems to serve these purposes for some students. The wise choice of studies increases the chance that these goals will be achieved, but by themselves the subjects never get any student to these goals. The student has to help. He has to study, to exert himself to get the subject and to apply it. If he is willing to apply himself, to do extra work at home not required of him, to read, to look up references and get appropriate extra practice and experience, the subjects of a school's curriculum will become the means through which the ends for which schools are maintained will be realized.

CHOOSING A CAREER

Before making a choice of life work, keen self-analysis and an appreciation of your relation to the world of action are essential. The occupations and professions lie open and their requirements and possibilities can easily be evaluated, but it is a harder task to fit oneself into the proper niche in the vast field of human activity. If you feel inadequately equipped to form a correct judgment, the suggestions brought together here will help you in measuring yourself.

Self-Measurement.—Measurements of human ability can do very little more than indicate qualifications and limitations, since most individuals have potentialities they know little about and many do not reveal their true abilities in standard tests, because the tests make no allowance for temperament and emotional traits.

The native capacities of the average person are rated at 100. Those who rate definitely above the average in capability, resourcefulness and native ability by a standard intelligence test have an intelligence quotient (called I.Q. for short) of 110, 120, 130 or 150 (never higher than the last figure, except in the case of those approaching genius). Those whose I.Q. is 95, 90 or lower are below the average in natural endowment.

If a ten-year-old shows the same ability as the average child of ten, then his I.Q. is 100; but if he shows the ability of those in a normal group of five-year-olds, then his I.Q. is 50. An intelligence quotient simply denotes the ratio of mental age to actual age. If the ten-year-old with a mental age of five has an I.Q. of 50, then it will be seen that the ten-year-old with the mental age of twelve has an I.Q. of 120; and the twelve-year-old with mental age of nine has an I.Q. of 75.

Because native mental ability rarely increases after the age of sixteen, when experts estimate the intelligence quotient of adults they figure the mental age of sixteen as a base. Therefore, a person of twenty-one whose mental age also is twenty-one has an I.Q. of 131 (21 divided by 16 and the quotient multiplied by 100, since 100 is taken as the index); whereas, a person of twenty-one years with the mental age of twelve has an I.Q. of 75 (12 divided by 16 times 100).

Practical Application.—This I.Q. rating is significant in choosing an occupation or profession, though it is not to be understood that the method described for determining mental aptitudes works unfailingly. The human mind and human characteristics are so complicated that in certain cases I.Q. estimates may be inaccurate and misleading; but in the great majority of cases they are useful indicators.

With an I.Q. of 100 you have a good foundation on which to build. A somewhat lower figure presents no real cause for discouragement; you may have to work harder and apply yourself more diligently to the task, but you can succeed in well-chosen life work. Education is at your command, and many natural hindrances can be overcome.

Should you feel that ambition will not be satisfied unless you become a physician, if you have already examined the field to a certain extent, now thoroughly examine yourself also. As a physician, you would be in a highly competitive field, where there are many of superior attainments. Can you hold your own with them? If you have an I.Q. of 100, you are handicapped: with only the average mental quotient, you are likely to be outdistanced by those rating 120, 130 or even higher. You will be able to compete on equal terms only with those of like native ability—unless you have remarkable determination and perseverance. Thus it is with all the professions, in any of which the possession of a mind above the average gives greatest promise of public recognition.

Some Vocational Requirements.—If a certain field of work appears attractive, it does not necessarily follow that it should be selected. Its advantages and disadvantages should be surveyed, and capacity to achieve success in it must be considered.

A college education is useful in any field of work, though it may not be essential. Certain educational requirements, however, must be met in any vocation. Is your education sufficient to assure a successful career in the preferred work? Is the proposed occupation one that is likely to offer employment throughout a lifetime? Twenty-five years ago telegraphy seemed to offer a secure haven, but more recent invention has decreased the demand for telegraph operators by nearly 50 per cent and there is no longer any work for telegraphers in newspaper offices. What is the prospect in connection with the means of livelihood under consideration? Is the demand for service steady, or is it fluctuating or seasonal?

If a trade seems to offer the best possibility, how long is the period of apprenticeship? Is the trade open to all who choose to enter it so that it is likely to be overcrowded or is it taught to a limited number, thus promising constant employment and good wages?

Factors of Profit.—Another angle is, does the proposed occupation offer social satisfactions? Certain qualities in human environment and contacts, opportunities to cement valuable friendships, conditions that make you proud of your work help tremendously toward success. Financial returns are not the only aim and end to be considered. With wealth as the only positive and predetermined goal, you would be likely to suffer keen disappointment. Vast accumulations of money seldom come to the independent worker; with few exceptions, great riches are piled up from the labor of others. Get rich if you can, but it is just as good advice to recommend setting your goal as a reasonable competence in an occupation that offers all needed compensations of life and provides for the later years.

The struggle to become wealthy does not appeal to everybody. The writers, painters, sculptors, musicians, preachers, philosophers, scientists, all have another notion of what life means. They want to understand, enjoy and share the world they live in. To get and to give the largest possible number of the finest possible satisfactions appears to them to be an end that justifies their means of living.

You do not have to be a devotee of the arts or of philosophy to understand what the compensations of living should be. No matter what life work is chosen, it can be ennobled and out of it may flow the real joys of living. Fullness of life, not wealth, is the true measure of success.

SURVEY OF OCCUPATIONS AND PROFESSIONS

Here is a group of brief surveys picturing some of the realities that you are practically certain to encounter:

Accounting.—Even enterprises conducted upon a strictly cash basis cannot entirely eliminate this phase of business, for bills of goods must be checked and paid for, cash must be counted and some system of accounting, however simple, must be followed.

The accountant is much more than a bookkeeper, but complete knowledge of the science of bookkeeping is the foundation stone of his career. A great part of his accounting knowledge may be obtained in special schools, but he must add to this theoretical course a wealth of wide practical experience in the business field before he can reach the top in his profession.

An accountant must have precise ability to read the condition of a business from an analysis of its books of record. He must be able to learn from them what weak points exist in the institution, what departments show losses and the reasons why losses are incurred. Work of this sort calls for the naturally analytical type of mind. The accountant may be called upon to inaugurate systems of cost accounting, to point out incorrect methods of bookkeeping and to establish systems that will disclose pertinent facts about the business. The competent accountant must be an expert auditor, know business and corporation law, be able to picture the conditions of a business by means of charts and graphs, and familiarize himself to the point of full understanding with the details of the enterprise whose condition he is analyzing. Check your abilities in all these particulars to determine whether you would make a successful accountant.

The accountant who is also a tax expert is likely to find increasing demand for his services from the complicated and highly technical nature of some phases of the taxing system, particularly the income tax. The accountant who wishes to specialize in this field will seek special training in taxation.

The commercial course in any good high school or commercial college will offer much that is needed, and there should be special reference to the methods used in a specific kind of business if the student is likely to specialize in his accounting practice. Only those who have a strong liking for mathematics will succeed as accountants.

Various studies are recommended as preparation: partnerships, cost accounting, analysis of accounts, corporate organization and accounting, auditing, graphs, American business law and special accounting for railroads, mines, banks, brokers and cities.

The income of a certified public accountant whose reputation is well established over a wide area may be substantial, but for accountants in general the return is moderate.

Opportunities occur in almost every business organization, those for the expert accountant being fewer but paying better.

Acting.—Acting is age-old. Its long, historic past enrolls many talented and distinguished men and women of the stage and its 20th-century present glitters with the stars of screen and radio also. In comparison with the great number of those who enter the field of acting, very few attain the success hoped for. This fact should be seriously weighed if you are considering the stage or motion pictures as a career.

Here, as in music, much depends upon natural ability. Study and training can do much to develop that ability, but it is only when special talent is present that there is likelihood of outstanding results. If you have real talent that becomes evident early, seize every opportunity for expressing it under wise supervision. Well-coached school, college and community stage performances provide excellent means of exercising an ability that later may warrant professional training. Moreover, such outlets may well serve to indicate the direction in which your greatest ability lies—what kind of roles suit you best, and so on.

Even though you may have native acting ability, you should take into account numerous other important considerations—voice, physique, features, temperament, memory and ability and willingness to persevere. A voice that training cannot render pleasing and effective, a physique that would make impossible a good stage presence, a nervous temperament—any of these things is a definite handicap; and unless you are physically strong, professional acting should not be considered, as both the preparation and the work itself call for unusual stamina.

If you possess many of the necessary qualifications, have evidenced some real talent and possess a definite desire to act, then you may well enter upon a course in one of the accredited schools for acting and prepare thoroughly and systematically for a career that has been intelligently selected. The preparation for motion pictures is much the same as for the stage.

Acting is, of course, only one of the professions connected with the stage and screen. There are also those of the *theatrical producer,* who must be a person of sound judgment, combining enthusiasm for the stage with practical managing ability; the *director,* who guides the actors in their rehearsals and sees the play as a whole; and the *scene designer,* who must be able to use color and form in large masses and produce the illusion of distance by the proper use of perspective. These and many others have important places in the arts of both motion pictures and the theater. Opportunities in the former are more dazzling, but the legitimate stage still rewards its best talent with fair financial returns.

Advertising.—The field of advertising is widely diversified, and its activities are variously controlled—by publishers, agencies and department stores. Salesmen, space buyers, writers, artists and executives are among those employed. An advertising executive is in charge of the advertising department of a manufacturer—or he is the head of an advertising agency. This is an organization that engages in the preparation of copy and illustrations for the public announcements of its clients (customers), and directs the publication of these advertisements in newspapers, magazines, circulars and catalogues, on billboards and electric signs, in street cars, subways and busses and on the radio. The most important qualification, after general educational requirements are satisfied, is knowing the psychology of salesmanship—understanding human nature and its reaction to any sales situation. Training is available in special and college courses, usually in schools of business.

Courtesy Los Angeles City School Report, 1937

Art: Learning to Draw from a Model

The copy writer phrases the message that the public is to read. The copy, subject to the approval of agency executives and of the client concerned, must be brief, sincere and persuasive, so the writer must know a great deal about the manufacture and uses of the product he promotes and should prepare himself by means of courses in effective writing especially designed to sell. A position as copy writer serves also as a steppingstone to an executive's chair.

In advertising you must view a commodity through the eyes of the ultimate consumer. You must know how to create a demand where no demand exists or to increase a demand that is small. Your most difficult task is to arouse public interest in a new product, especially if excellent products of the same kind are already familiar to the public.

The space buyer determines what newspapers or magazines shall be selected as mediums for an advertising campaign. The determining factors here are numerous. Where do the people live who are most likely to be interested in the article advertised? How much of it should a community be able to consume? What is being used now in place of it? The answers to these questions are often secured through the agency's well-organized research department, and many beginners in advertising get their start as members of a field staff collecting market information or making statistical analyses of field reports.

An interesting feature in some advertising agencies is the radio department, where a staff especially skilled in selecting, writing and directing radio features co-operates with representatives of the sponsor or advertiser whose products the agency is promoting. The radio field requires special training, for in radio work the appeal is to the ear instead of to the eye. The qualities that make a person successful in entertaining, particularly the gifts of showmanship, are helpful in many branches of advertising, especially in commercial broadcasting.

An entirely different field of advertising is the sale of advertising space or time on the air. Every publication and every type of advertising medium has its own advertising problems and advertising activities: promoting its service and securing advertising contracts. In this branch of advertising there is a great opportunity for the intelligent salesman and in all the artist plays an important role.

Architecture.—Among the oldest of the arts, architecture has served as the monument of achievement and registered the degree of civilization and culture attained by various peoples of the world. The great Egyptian temples and pyramids, the remains of Assyrian and early Greek and Roman structures and the Gothic cathedrals and Renaissance palaces of Europe still inspire many of the details of modern steel skyscrapers, office buildings, medical centers and apartment houses, and the less towering edifices that house factory and school, college and university.

To become a successful architect you must understand the engineering aspects of construction as well as the art of designing, and possess full knowledge of every element to be considered in the construction of bridge or building, arch or tower, or even the architectural base for a monument or statue.

When your plans for a building are completed, you will have designated and portrayed every detail of construction for the guidance of those who will oversee actual building operations. Sometimes you will also become the contractor. In any event, you will be responsible to the owner that the building will proceed according to plan and specifications.

You must know higher mathematics; must be able to figure variability by expansion and contraction, strains, pressure, pulls and thrusts. You must be qualified to pass judgment on labor and materials for many different trades. You must know also how to compute prices of all the various materials that enter into construction, and must know the strength and durability of one material as compared with another. You can see, therefore, that besides being an artist equipped to handle the details of mechanical drawing and water-color work for sketches, an architect must possess a scientific mind. His art comprises a fascinating combination of the esthetic and the practical; it is an interesting profession, requiring imagination and originality, and the ability to design creatively. Technical education in a good school that features an architectural course is necessary.

As an architect you may expect variable financial returns. The demand for services is rarely steady, as it necessarily depends on activity in building construction, which is more or less periodic.

Art.—Among the arts, we shall consider here specifically painting and sculpture. Discussions of architecture, designing and commercial art appear separately elsewhere in this section.

Although it is true of almost any occupation that a strong liking and natural ability for it add to the possibility for efficiency in its performance, this is true in the highest degree of the fine arts. It is hard to imagine, for example, a successful artist in oil or water-color painting and other mediums who never had a definite love of beauty and the ability to recognize and differentiate values in form, color, light and shadow.

As the term *fine arts* includes painting and sculpture, it is well to consider the meaning of the word *fine* in this application, for it bears an important relation to the aim, purpose and procedure of the true artist. Remember that fine art—true art—involves far more than following certain rules and techniques of performance in order to produce a good picture or statue; it combines technical ability, skill in execution and a certain fineness of judgment or taste in the selection of theme or subject, so that the whole effect appeals to the finer instincts and emotions of mankind.

Though painting and sculpture are imitative, dealing in forms with which we are familiar, the true artist does far more than imitate—he creates, for by his interpretation and individual expression he stirs the imagination and arouses in others emotions similar to those that inspired him. Painting is concerned with form and color; sculpture may include both, but its usual expression is through form alone.

If you seriously consider painting or sculpture as a career, first be certain that you are able and eager to contribute something of the spirit and nature emphasized above. Training should be thorough and under the best instructors available. For the true artist study never ends, for art is a reflection of life and its many changes, and the sincere artist, as he studies and matures, is able to contribute increasingly beautiful and valuable ideas through the medium that he has chosen.

Many well-known artists confine their work to one of the *graphic arts*—etching, engraving or lithography. The fundamental requirement for each of these is superior ability to draw, as lines upon waxed copper, or steel or stone must be executed with surety and precision, correction being less simple than for work upon other material. Training in an art school or under a private teacher is requisite to gain knowledge and mastery of the tools, processes and techniques involved. The work requires a strong instinct for art plus a sense of dramatic values in strong contrasts, in effective balance of mass and space and a thorough understanding of rhythm and composition. The instinct for art must be applied also when inking and wiping the plate preparatory to printing, for much of the beauty of the finished product depends upon this process. Prints have found a ready market at prices varying according to the merit of the work or the reputation of the artist.

Banking.—The growth of wealth beyond the individual's power of protecting it had as its most natural consequence the establishment of places of safekeeping available to all, with reliability and strict accounting the first essentials. Investment of funds soon developed, and out of this evolved a system of banking. Its constantly increasing intricacies and ramifications have broadened its service to the public, eventually developing such facilities in the United States as the Clearing House and the Federal Reserve System.

You probably look upon a position in a bank as very desirable, and there is much about a banking connection that is in its favor. The work is pleasant; the work day is not unduly long, although it is seldom shorter than that for general office work, because the staff does a large part of its work after the bank is closed to the public in midafternoon.

A clerkship in a bank offers a position that is interesting and comparatively secure, although clerkships in banks are not financially more desirable than those in other businesses; nor are the tellers who receive the money and cash the checks in an especially favored salary class. The officials—president, vice presidents, and directors—are, of course, more highly paid, but the path that leads from a clerkship to the higher posts is often long and discouraging, for promotions are usually far apart. The banker with private capital at his command, however, is often in a position to make advantageous investments through his wide personal contacts and knowledge of financial and business conditions in general.

If you have banking in view as a profession, supplement your general education with special studies in economics, public finance, business management, the theory and practice of banking and bank accounting. Opportunities are most numerous in large cities and applicants are especially chosen for dependability, integrity and personality, as well as for general training.

Brokerage.—A broker buys and sells any commodity, especially stocks and bonds, for others, for a fee.

Should you desire to adopt brokerage as a career, be sure that you are qualified for a financial occupation that is technical in nature, constantly demands a broad knowledge of business and industrial conditions and exacts a heavy toll in both physical and mental energy by reason of competition with keen minds under conditions of unusual stress. You should be conscious of responsibility as an agent to whom clients look for unbiased and expert advice on a procedure about which they may be poorly informed and which may involve their economic security. Your preparation for brokerage should include a good course in business economics, with special attention to finance and investments.

As a broker you must know the constantly changing values and prices of hundreds of securities; also all the various business and industrial conditions that affect those values and prices. You must know the conditions that may affect them and must be able to foresee, as far as is humanly possible, those changes in the stock market that spell caution on the one hand and action on the other. You must constantly study conditions, trends and tendencies in the financial and business situations, and must be able to analyze them with clear judgment.

There is much of interest in the brokerage business, and no little excitement and spirit of adventure, for the broker deals with the great stream of money and securities that surge in and out of various financial centers, where thousands of others also are matching wits for profit. More and more, brokers are seeking to understand and interpret business conditions in their larger aspects and to aid clients in making investments of permanent worth and of sufficient variety to offer general financial security. Such advisory brokers are known as investment counselors. Among other types are the insurance broker, who acts as an agent for persons seeking insurance, or as go-between for his client and an insurance company; the real-estate broker who arranges for the sale and lease of land and houses; the ship broker, who acts as agent in the sale of ships and furnishes information as to available cargo space and current shipping rates. What has been said of the necessary qualifications, preparation and responsibilities of stock brokers applies also to the others. Each must fit himself by special study for his specific field.

Business Management.

Business Financing.—Whether a large business will show satisfactory profits depends to a great extent upon the financial management. This means more than the treasurer's handling of the funds, for the constructive financial planning, financing the business, involves and includes a broad view of current operations and future plans for income and outgo of money. This highly responsible work may be carried on by any one of a number of the officials of the company—the president, a vice president or a financial manager. In any event, the financing is usually in the hands of one person, so that the responsibility may be centralized.

The financial manager must watch income and expenditure, maintain a reasonable balance between them and be able to judge when a temporary excess of expenditure over income may in the end be the better part of wisdom. For example, his information of conditions and his judgment of the future may convince him that an expansion of his plant will more than repay what it would cost; and this advice may bring the firm unexpected profits. On the other hand, his expert analysis of the business outlook may tell him that the wisest thing to do is to cut down production, even though some competitors are increasing theirs; and this foresight may save the firm a great deal of money. Again, he is the one who will advise increasing or reducing the number of items manufactured. Always the expert financial manager will take a long-range view and decide what will benefit the firm financially in the long run.

This work calls for ability in financial matters, a wide and thorough understanding of business conditions, cool judgment and ability to win others tactfully to a given point of view. This last is important because often the financial manager may have to convince his associates or his superiors of the merit of an action the wisdom of which may at first appear doubtful.

Preparation for this work should include a thorough course in general business with special emphasis on financial management and business forecasting. The larger manufacturing and commercial firms offer the best-paying positions for the financial manager, so that his field usually lies in industrial and trading centers.

Credit Management.—The position of credit man deserves individual mention because it has recently assumed great importance in the business world and offers considerable financial return to the man who can prove his worth in credit management.

The credit man must judge whether those who desire to make payment for their purchases at the end of a stated period, rather than at the time of sale, should have a credit account with his organization; and, if so, how much credit in terms of dollars and cents should be allowed. This alone is a heavy responsibility; for, if the credit man misjudges many applicants' ability or willingness to pay, the firm is liable to suffer heavy losses. The credit man is responsible also for the collection of what is due on credit accounts. He must be able to judge whether the excuses that people give for not paying are genuine and to give sympathetic consideration to valid delays, without permitting customers to lose sight of their obligations.

To become a successful credit man you must have a thorough grounding in general business with special preparation in the particular type of business selected. You must have a very specialized knowledge of credits and collections with their relations to business conditions, and also an unusual understanding of human nature—ability to analyze individuals accurately. Opportunities are greatest in large cities where there are many firms that sell on credit or installment—manufacturers, department stores and large houses supplying various commodities.

Efficiency Management.—In any business, a fundamental requirement is efficiency—the utmost accomplishment through the greatest possible co-ordination and co-operation between all parts of each department as well as between the various departments.

Production, sales, financing and accounting are the four main divisions of a business. The production department manufactures the goods The sales department sells them and often is in charge of promoting their sale through advertising. The financing department governs the policies of income and expenditures in relation to expansion or curtailment of business, increase or decrease in the number of products manufactured and so on. The accounting department keeps careful, detailed record of the condition of the business, improves the bookkeeping methods if possible, and through constant analysis endeavors to discover where losses may be occurring and to make recommendations regarding their prevention.

Efficiency or scientific management consists in analyzing the entire structure and operation of a business to discover faults and weaknesses, waste in mechanical processes or human effort, mistakes in production or operating policies and methods, unwise choices in personnel or in the assignment of work to those who would be more valuable in other capacities. Scientific management means checking the sales methods and management to disclose possibilities for improvement and analyzing the accounting system to make sure that it affords an accurate check on the current condition of the business. These are some of the tasks of the efficiency expert, as the man who trains himself to do this highly exacting work is usually called. Efficiency management calls for an extremely thorough training in modern business and industrial structure and methods—a training that must be both broad and deep. If you wish to become an efficiency expert, you must have a natural liking for mathematics, statistics and scientific methods, including the analysis of complicated problems. You must be expert also in getting along with people, in understanding and analyzing their reactions; for, even when invited to make an analysis of a business, your suggestions must be presented in a manner that indicates full appreciation of the qualifications of those whose work and organization you have been requested to analyze. Your field lies in active business centers.

Courtesy Los Angeles City School Report, 1937
Rapid Calculation: Young People Train for Business Careers

Personnel Management.—One of the most important and vital of all the factors of efficiency in any organization is the matter of personnel management—the careful selection of individuals who compose the working staff. Only in comparatively recent years have business and industry come to realize just how important this factor is. Only recently, therefore, has the work of personnel management been developed and emphasized, and with it the position of personnel manager, which pays an excellent salary.

As personnel manager of a large organization, you would have two principal tasks, both of great importance: (1) to engage new workers to fill the places of those who leave or are dismissed; (2) to study unceasingly the relation between each employee and his particular work in all its phases, with a view to increasing the total efficiency of the organization.

To accomplish the first of these duties, you must have a real aptitude for judging human nature accurately on the basis of a brief interview. Though the applicant for a position submits a written record of former employment, a brief face-to-face discussion with him furnishes a great deal of information that is essential to determine whether he should be hired.

The second of your principal tasks as personnel manager—the study of the employees in relation to their work—will be even more important. You will need to study the worker and his work, suggest better methods of doing it, smooth out difficulties that slow down operations, and perhaps improve the worker's attitude toward his work, his fellow workers and his superiors and also study each worker in relation to another possible position in the organization in which he may do even better work. If you can make a worker happier and more efficient by shifting him to a different position, both he and the organization gain, for the efficiency of the firm is definitely connected with the contentment and the efficiency of its workers.

Being a personnel manager is a man-sized job that requires expert knowledge and skill, but it is a fascinating occupation if you like to deal constantly with people as well as with the impersonal factors in business. There is a great satisfaction in helping to promote the highest efficiency of the business and the happiness and welfare of the workers.

As personnel manager, you should have: first, a real liking for your fellow men and women; and, second, a careful preparation that includes a good foundation in methods of business organization, with special reference to personnel and the psychology of the worker. Your work will lie in many fields of activity, but principally in large enterprises, such as manufacturing and retailing firms, newspaper and magazine publishing houses and employment bureaus.

Production Management.—The production of goods and commodities is a process complicated by numerous factors and conditions, some of them difficult to predict. Production management requires broad and expert knowledge in order to bring about the highest efficiency and the best results possible in the manufacturing department of a business. The responsibility of the production manager, therefore, is great. He must constantly, carefully and analytically supervise all the processes of manufacturing, to see that they are proceeding smoothly. He must make sure, too, that there is proper co-ordination of all the processes. If, for example, there is delay due to the use of improper methods or machines at any point in the manufacturing process, the production manager must analyze the situation, quickly get at the exact causes and reasons, eliminate them and set the manufacturing process to functioning smoothly again. He must see that the right machinery is used, that the right men are running it and that it is kept in good repair; and must recommend when it should be replaced by more modern and more efficient equipment. He must be sure there are no flaws in the product, that it is perfect in all details, before it is offered to the public. He must make certain that manufacturing costs are kept as low as possible, but, at the same time, that the quality of the product does not suffer.

In brief, the production manager must know all the factors and processes that make for the greatest possible efficiency in production. He should have preparation that includes thorough grounding in production methods and knowledge of the properties and characteristics of the materials used in the field of manufacture in which he plans to specialize. He should also have the type of mind that likes to analyze difficult problems and that has patience and persistence even in the face of great handicaps.

Manufacturers are the chief employers of production managers, but many other types of business have production departments that also offer opportunities to the production manager.

PROMOTION MANAGEMENT.—Promotional activities consist in expanding, forwarding and aiding a business in all its relations with the public, and the management and direction of such activities constitute promotion management.

The promotion manager is responsible for supervising and fostering all plans and methods designed to bring the company and its products favorably before the public. He sees that public interest is not allowed to wane. Not only must he thoroughly understand the sales and advertising aspects of the business but he must see to it that they do not duplicate effort, that they are well co-ordinated and that there is between these departments that kind of wholehearted cooperation that alone can accomplish the desired results. In some concerns the work of promotion will be executed inside the organization under his supervision; for other organizations the work of promotion is done by an advertising agency and the promotion manager is the link between his own concern and the agency. He keeps the public informed as to the character of the firm, its products and its service, and makes clear to the members of his organization that it is their obligation and privilege to keep faith with the public by seeing that the firm lives up to all its promises.

Should you pursue this work, your duties as promotion manager will be to supervise the different kinds of advertising—newspaper, magazine, outdoor, radio, window display and so on—and to see that all are definitely planned and carried out in such a way that each will strengthen and promote the good effects of the others. Along with all this, you will plan also any publicity, that is, magazine and newspaper articles, and occasionally arrange special gatherings open to those who care to attend, which will maintain and increase public interest in the firm and its various activities. You will advise concerning sales campaigns and co-operate with the sales manager in directing them.

You must thoroughly study consumer needs and wants and constantly consider possibilities of increasing consumer interest and demand, sometimes planning changes in the product to conform to changing styles or changing needs. You must understand prices, especially in their relation to a sound advertising appeal, and above all, you must know how to obtain and hold the public's good will.

Training for promotion management should include thorough grounding in general business management, with special attention to promotion methods and policies and with particular emphasis upon the branches of manufacturing and merchandising with which you will deal. You should possess the type of mind that is both analytic and synthetic, to be able to break down large problems into smaller parts and then to build a new plan or solution from the detailed data that you have gathered from observation, study and experience. In many respects you must combine the qualities of the teacher and the showman.

The technique of promotion is applied also to selling services, and is most common for department stores, the theater, cruises and recreational travel, real-estate developments, air transportation and many other services as distinct from actual commodities. The purpose of promotion is essentially the same for a service as for a manufactured commodity. Similar, though less highly organized, activities also find a place in connection with those products and services that are offered not to the individual but to other business firms or manufacturers. For instance, a certain type of loom or a system of keeping business records may be promoted among its potential users. Business shows, trade fairs, buildings for permanent trade expositions and trade magazines are the most familiar methods in this connection.

Although the prime object of promotional activities is strictly commercial to increase profits, the wise promotion manager soon learns that this can best be accomplished by bringing commodities or interests to the attention of people who can actually benefit greatly by using them or knowing about them.

Manufacturers and large distributing concerns are most in need of the services of well-trained promotion managers, so that opportunities are found in industrial or trade centers.

Civil Service.—Civil service refers to that group of persons holding nonelective posts under the Federal Government (excepting posts in the army and navy) to which they have been appointed on the basis of a competitive examination. As the advantages of continuous tenure of positions uninfluenced by political considerations and changing administrations have been increasingly demonstrated, state and city governments have adopted civil-service rules for the employment of subordinate workers. The continued employment of the civil-service worker is contingent only on his continued efficiency and good conduct.

In the commercial courses of any good high school or business college you can study the subjects needed in the particular field of civil service that you wish to enter. In the Federal Government, these positions are under the control of the Civil Service Commission with headquarters in Washington. When a position is vacant, a notice is publicly displayed in every post office in the country, telling when and where examinations will be given for filling the posts. These examinations are held in many cities throughout the nation. A request to the Civil Service Commission at any time will bring a printed list of the positions for which the next examinations are to be held. Appointments to positions are made from among the applicants passing examinations in the order of ranking marks on the examination.

Yearly salaries in the Federal Civil Service range from about $1,000 to about $5,000, although the great majority of positions pay about $1,500. Provision is made for retirement on pension. About equal numbers of men and women are appointed. Hundreds of thousands of Federal Civil Service positions occur in locations ranging from Washington, D.C., to the farthest reaches of America's insular possessions. From stenographic services to forestry is a wide step, but both services and hundreds of types in between are included.

Commercial Art.—Some form of commercial art is required in the production of almost every commodity, so that the field for industrial or applied art is constantly enlarging. It offers many opportunities to the artist of even moderate talents, for it requires not genius or masterly proficiency but merely well-trained ability to draw, taste in color and composition and the clever originality of treatment that goes far toward making work salable. The really able artist also will find in commercial work of all sorts a field for his genius.

ART IN ADVERTISING.—One of the largest and best-paid commercial art activities is drawing for advertising, the steady development of which within recent years has opened up a very lucrative field for artists who can plan the layout of an entire advertisement so that it is well and harmoniously composed—and for those who make the finished drawings that illustrate the advertisement.

In advertising art there are many techniques and many styles from photographic realism to the bold imaginative treatment of the advertising poster. One interesting field is the design of packages and containers not merely for beauty but also for quick identification, for good display on counter and shelf and for use and convenience in the home. Those who engage in art work of this sort are called commercial artists. Lettering and display card writing are among their minor activities, especially for retail stores. In such stores window dressing and other displays are artists' work.

ILLUSTRATION.—The term illustrator more directly defines the artist who prepares illustrations, either in line or wash drawings, to enhance the pages of books or magazines. As color has come into greater use in magazine illustration the field of the illustrator has been widened and much first-class painting and drawing is bought by magazine publishers. Financial returns for such work vary even more than for advertising art. A good illustrator makes an excellent living.

THE CARTOON.—The newspaper artist who expresses his bent for humor, pathos or personal appraisal through the medium of black and white is called a cartoonist. He must have an instinct for translating to his drawings subtle but pungent criticisms of important occurrences of the day in the political, historical and social worlds. That he may render his drawings satirical, humorous or strikingly descriptive, as occasion may warrant, his imagination must be vivid, and his insight, sense of humor and understanding of human nature must be above the average.

Cartoonists often attain national, or even international, fame as creators of characters that appear daily or weekly in so-called comic strips, in which the amusing doings or high adventures of their heroes and heroines—as well as villains—entertain millions of readers. Newspapers of small towns usually run syndicated comic strips and cartoons. The number of professional cartoonists is increasing rapidly, perhaps because the good ones are among the highest-paid people in the newspaper field. A similar technique has had a great vogue in recent advertising—another field for the cartoonist.

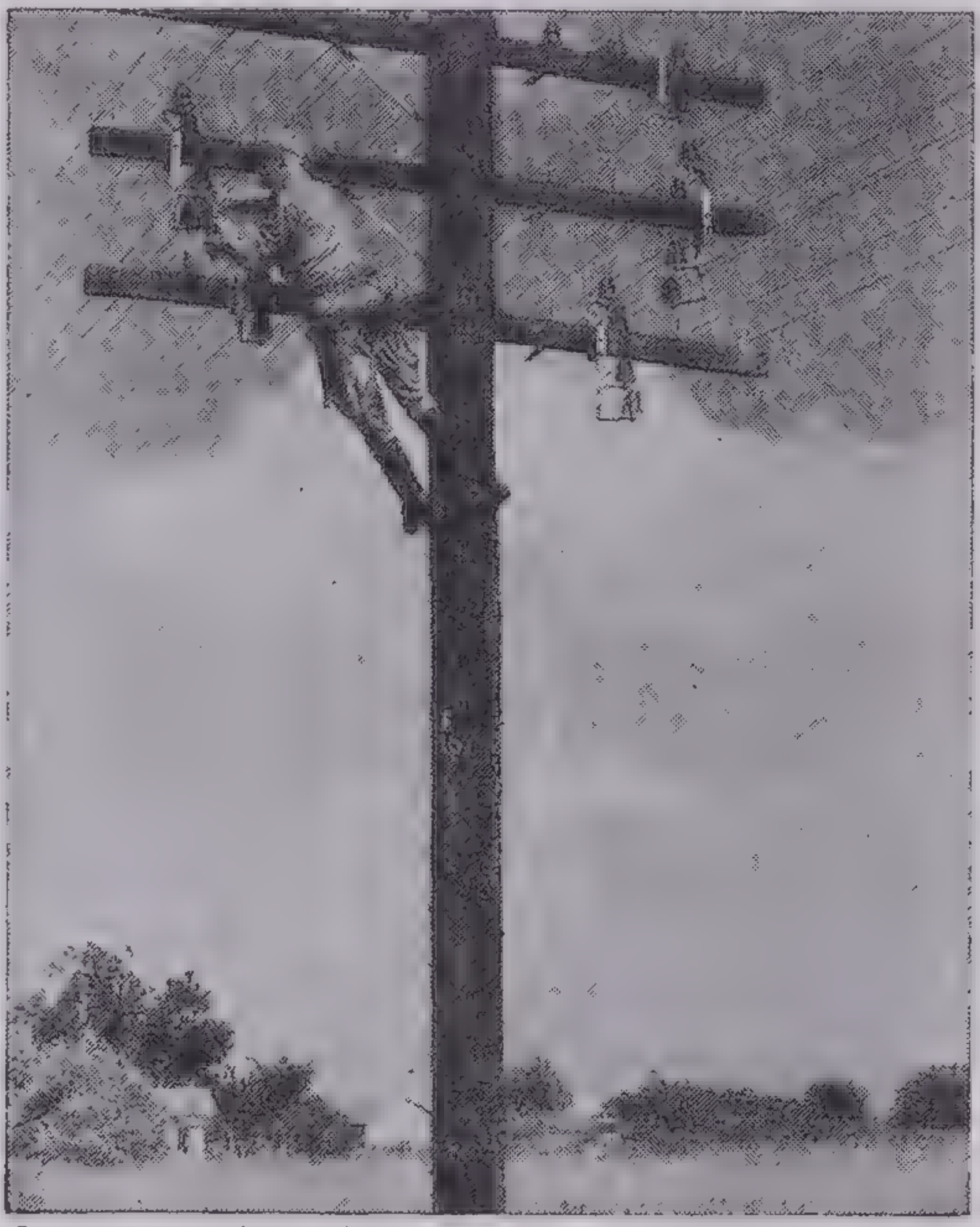
A modern expression that has developed out of this work is the animated cartoon so popular in the motion pictures; this field remains uncrowded, for surpassing mental agility and technique are requisite.

Opportunities to pursue any form of commercial art prevail in cities where advertising agencies, syndicates, publications of all kinds, and organizations using posters, another specialized form of commercial art, are located.

Communications.—Communications include mail, telegraph, telephone and radio. The whole subject is fascinating in its historical development from the Indian signal fire to round-the-world radio communication and from the transcontinental pony express to transoceanic telephone conversation.

These activities and modern transportation systems have made possible the great progress of modern business and civilization by reducing time and space and drawing together the nations of the world. These activities have a constantly growing future, especially radio, the youngest member of the communications family, for radio engineering is constantly at work in a field whose surface has barely been scratched.

The first qualification for this work is the scientific attitude of mind and a real spirit of pioneering and achievement. As a result of this mental attitude, some important scientific discoveries have been made by persons whose work was not primarily scientific. Occupation in any of these fields offers you an unusually interesting opportunity to keep abreast of progress along modern scientific frontiers. Specific preparation will depend upon the particular type of work chosen, but a good business background is necessary.



Courtesy American Tel. & Tel. Co.
Telephone Lineman

The telephone and mail systems provide the greater number of positions, with the telegraph companies next; but radio opportunities provide better pay and a more promising future, though requirements and training for radio are more exacting.

Dentistry.—Not so very long ago, every dentist included in his practice all the four divisions of dentistry—diagnosis, repair, extraction and replacement with artificial dentures. Today there is much specialization. In large cities more than a third of the dentists do no extracting but send patients to extracting specialists. In cities where mechanical dentists have established their specialty, the dental surgeons usually engage these skilled workmen to construct all the bridgework and dental plates required by their patients. So wherever these two facilities exist, the average dentist confines his personal work to diagnosis, fillings, taking the casts necessary for bridgework and plates and adjusting these to the mouth after the mechanical dentists have prepared them. Many country dentists now have their mechanical work done in a neighboring city, so a large part of the actual work in dental practice is done by mechanics whom the patient never sees.

The orthodontist is a dental specialist whose work is to correct the position of irregular teeth. This work is more remunerative than that afforded by other phases of dentistry.

To engage in general dental practice, or particularly extracting, you should have an even temperament, extremely steady nerves and such an absorbing interest in the work that the trying phases of it do not disturb you or interfere with skilful performance. Few careers offer greater assurance of a comfortable income than dentistry, but dentists seldom rise to affluence.

Requirements for graduation in dentistry are on a higher level than formerly. Some good dental schools admit students who are graduates of accredited high schools; others of higher standards require a college degree before entrance. The courses vary from three to four years.

The demand for dental treatment is now so universal that opportunities may be found in almost any locality. You may remain in your home town or seek a new environment, establish an independent practice or associate yourself with a partner or a company of dentists.

Designing.—Since the instinct for decoration first moved the cave man to embellish his tools, the shelter in which he lived, his apparel, objects of worship and of personal adornment, designing, with the same purpose, has occupied the artists of all ages. Its scope was widened with every new development in civilization—after the cave, the building; after fetishes and amulets of wood or stone, the silver or gold statues and jewelry with precious gems. There has been an evolution in the designs, from the simple wave and the spiral to geometric intricacies, interlacings, conventionalized floral and animal motifs and the dynamic, rhythmic, modernistic patterns with their abstract designs.

For designing as an occupation, one must combine the artistic with the practical or the technical. In the professional use of the term designers are creative artists who devote themselves to giving new form, new character, new distinction to the products of industry. The field for designing includes enterprises of all sorts. Every home reveals countless examples of design in its furniture, accessories and equipment of all sorts. Industrial art calls for designs for every kind and type of manufactured article, from lamps or trays to streamlined trains, from costumes to automobiles, from the simplest utensils to the most elaborate requirements in the work of the architect, the construction engineer, the interior decorator and the landscape architect. Modern product design calls for a knowledge of engineering and of salability as well as of art. More and more design is tied up with function, improving the product (as in streamlining) rather than merely decorating it. Designing for

Courtesy 38th Annual Report of the Superintendent of Schools, New York

Dress Design: A Vocational School Student in New York

wood-block printing, used on a large-scale in wallpapers and fabric decoration and on a small scale for greeting cards, is another field. The union of beauty with utility is more and more insisted upon; and if as a designer you can effect this combination, you will be handsomely rewarded for work that is always a pleasure. One indication of the importance of design in modern life is the fact that certain types of designs may be protected from unauthorized copying.

Naturally, the studies that aid you in designing will depend on the special types of product in which you may be interested, but you should have a thorough preparation in the foundation principles of good draftsmanship and a comprehensive course in a school of art and design. A combination of creative and accurate mechanical abilities is essential. If rhythm, balance and harmony have a strong appeal, you are likely to become a good designer when well trained.

Designers find their best opportunities in urban centers where there are many manufacturing concerns, dress-pattern publishers and interior decorating firms, the products of all being based upon the work of the designer. Embroidery, jewelry, leather decoration, metal and mosaic work, pottery, stenciling, stained glass, textiles, wood carving and minor crafts further broaden the field of designing. These art crafts, or applied arts, are taught in both public and private art schools. Special courses in the various applied arts are usually arranged to follow general training in drawing and design. Artists of high talent have dignified the pursuit of some of the applied arts, notably in silver and gold work, mosaics and stained glass.

Studios in the larger cities employ artists to supply designs for geometric and landscape windows and for glass mosaic murals. Demand is created by new homes, public buildings and churches, and by new windows, perhaps memorials, in old churches.

Dietetics.—The fact that few things are more important to one's physical welfare than the diet has come to be definitely recognized in recent years, with the result that extended study and experimentation have increased our knowledge of the properties of foods as well as our understanding of their effects upon the human body in health and sickness. This knowledge, which is constantly being enlarged, forms the science of dietetics. It is often made a special subject of study by doctors and nurses, who aid in educating the public to appreciate the vital relation between diet and the individual's highest efficiency, degree of resistance to disease, and underweight or overweight.

The dietitian is not necessarily a doctor or nurse. Appropriate courses of instruction are given in colleges and universities. The study of chemistry forms an important part of the training. You may specialize in some phase of the work that proves to be of particular interest; for instance, the diet requirements of children.

As a dietitian, you would supervise the selection and preparation of foods and indicate what foods and methods of preparation are best suited to the needs of the people to be served. The work is pleasant, interesting and of inestimable value from the standpoint of both individual and public health. The remuneration is usually good and excellent opportunities are to be found everywhere the public eats—in hotels, restaurants, hospitals, colleges, camps and in transportation services such as steamships, trains and airplanes. You may also combine some such position with private consulting practice or become a consultant or department editor on a newspaper or a specialized magazine.

Editorial Work.—The determination of what written matter shall and what shall not be published is editorial work; it includes planning, examining, selecting, revising and preparing for publication all kinds of written matter, or copy.

The editor-in-chief of a newspaper or magazine has the large problem of planning, selecting and approving material for publication. He or other editors prepare leading articles or editorials, expressing the point of view or policy of the newspaper or magazine on important matters of current interest. Similarly, the editor-in-chief in a publishing house supervises the selection, the acceptance or rejection of manuscripts under consideration for publication in book form.

COPY EDITING.—An important phase of editorial work is the careful study of the copy to improve it in presentation and to make it more interesting and easier to understand. This very close attention to editorial details is called *copy editing* to differentiate it from editorship, the work of selection (*see* EDITORSHIP).

The copy editor must make a detailed analysis of a manuscript, studying it with regard to proportion, general style, choice of words, accuracy of statement, organization and arrangement of material, illustrations and so on. Having evaluated it as a whole, the copy editor indicates on the manuscript the omission of parts that are weak or inappropriate; breaks paragraphs that are too long; adds a strengthening paragraph here or there; improves transitions from one part to another; rearranges material to increase emphasis or clearness; substitutes better words and phrases in many instances; edits the punctuation to make the meaning clearer and more effective; and expands or cuts so that proper proportion is observed—the important parts receive more space and the relatively unimportant parts less.

In addition, he makes suggestions for illustrations, if desired; thoroughly checks statistics, dates, statements of fact, names, titles and quotations. In book work, he arranges running heads for the top of the pages, and checks footnotes; marks the copy for size and style of type to be used; makes up a table of contents and arranges for an index.

Many copy editors are also proofreaders. After the printer has set the copy in type and submitted proofs (printed impressions), they are carefully read and compared with the manuscript by the proofreader, who makes any necessary corrections and then returns the proofs to the printer for correcting the matter and pulling revised proofs, which also are read by the proofreader or editor.

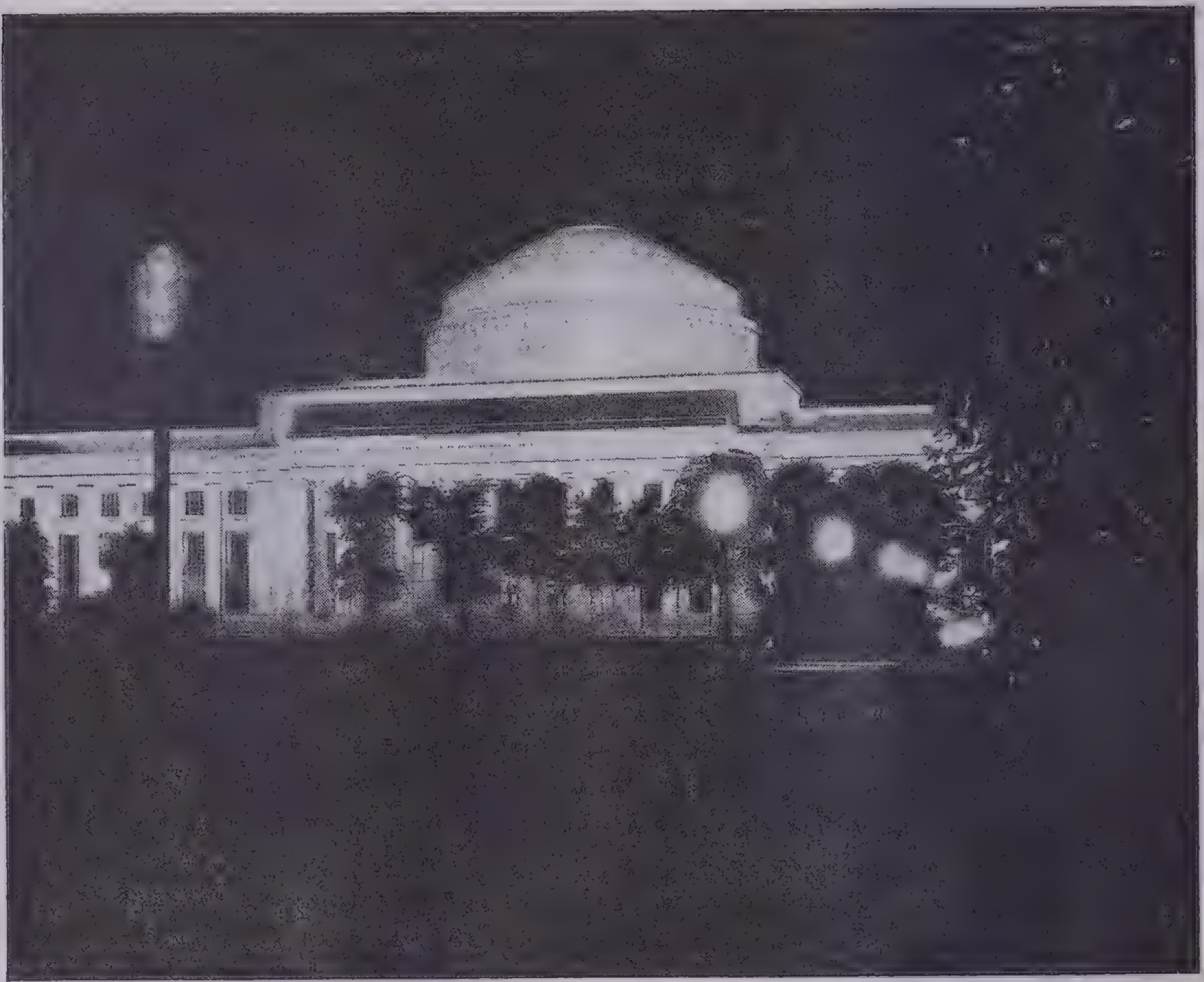
Sometimes the work in an editorial office calls for the translation of a manuscript from some foreign language. This demands the editorial technique noted above and an expert knowledge of the original language of the manuscript.

As a copy editor, you must be an expert in the use of English; must know layout (arrangement of text, illustrations, etc.); typography (type and style in its arrangement); the best processes for reproducing illustrations, charts and diagrams, both in black and white and in color; the best arrangement and type for title pages, tables of contents, running heads, chapter headings, footnotes, captions and indexes.

For editorial work, you must have a good education, with special preparation in language, composition, literature, editing and typography, and a natural taste for the world of books. Most editors devote all their time to the work of one organization. The salary in most instances is moderate. Some editors do free-lance work at fees agreed upon for the individual assignments and sometimes they establish editorial offices of their own with assistants for various aspects of the work. There is a very real satisfaction in work of this sort, for it affords an opportunity constantly to broaden one's mental horizon and to take part in advancing and spreading knowledge.

Editorship.—The editor-in-chief carries the principal responsibility for determining whether material shall be published. As the editor of a newspaper, you must judge the appropriateness and timeliness of news; must know where and how to obtain (through reporters or through special news channels or agencies) news that may be difficult to get, and, having obtained it, you must know whether your paper should print it. You must know especially well the particular field of which you are in charge (politics, international affairs or the drama, for instance) and must be able to write effective editorials and special articles and to direct the activities of the reporters.

As an editor in a publishing house, you pass judgment on material submitted for publication. You may assign to manuscript readers the preliminary reading of the vast number of manuscripts submitted, but the final decision as to acceptance or rejection rests with you. You confer with authors of exceptional promise to encourage the very fullest expression of each author's abilities. You must be alert to discover new authors of talent and marked ability, and should recognize at a glance the originality and distinctiveness of style that make material particularly valuable for publication. You must always be able to put yourself in the author's place; yet you must also have a definite standard and must maintain the best traditions of the publishing house with which you are associated.



One of America's Great Engineering Schools—The Main Educational Group of the Massachusetts Institute of Technology, Cambridge

Should you become the editor of a magazine, you would have some of the problems of the newspaper editor and some of those of the publisher's editor. You must know good authors and good writing as soon as you find them and must constantly search for new authors and new material that will increase interest in the magazine you edit. You must be able to plan the contents of each issue effectively, so there will be a well-arranged balance between articles and stories of various kinds, with sufficient contrast to appeal to many readers. You must be ready to publish material, sometimes at very short notice, that has special timeliness in relation to certain current events. You must be able to give the magazine a point of view and a personality, so that readers will turn to it from month to month with a sense of continuity.

For editorship, an inclusive education and a wide knowledge of human nature acquired through varied experience are more important than highly specialized training. Clear and accurate critical ability, a fully developed sense of proportion and an appreciation of both ideas and forms of expression are essential. The salaries of editors of special prominence may be high, but for the most part an editor's earnings are limited. Nevertheless the work often brings a full measure of recognition and satisfaction. Newspapers, periodicals, book publishers and occasionally authors who desire their manuscripts corrected and revised provide editorial opportunities.

Engineering.—Originally the term *engineering* was applied only to the direction and control of machines or engines, but now it has been extended to all the arts and sciences that make the sources of power in nature and the properties of matter contribute constructively to the comfort and security of mankind.

If you have an inclination toward some phase of engineering and follow the lead suggested by your developing taste and talents and are adapted to its requirements, you will find yourself embarked on an interesting and remunerative career.

For most of the engineering professions, you must have a love of outdoor life, tireless energy, ability to command men, a knowledge of many aspects of mathematics and the physical sciences and full technical training in your special branch of engineering. That engineering is looked upon as one of the surest avenues to success is indicated by the fact that, although admission to colleges for general courses has increased about 50 per cent within 25 years, attendance at engineering schools has increased more than 400 per cent.

The chief specialized divisions of engineering call for separate consideration:

Civil Engineering.—The work of the civil engineer includes designing, constructing and maintaining such public works as roads, bridges, viaducts, canals and tunnels. Some civil engineers limit their activity to one or two of these groups.

Mechanical Engineering.—The mechanical engineer's field embraces constructing, operating and maintaining the machinery required in industry and building, including all types of machines that use or produce mechanical power.

Structural Engineering.—The structural engineer plans and supervises the erection of city skyscrapers, factories of all sorts, oil refineries, cement plants and all other buildings that present important structural problems. Elevators and other structural appliances also come within his field.

ELECTRICAL ENGINEERING.—The electrical engineer is concerned with the theory and practice of generation, transmission and utilization of electrical energy.

CHEMICAL ENGINEERING.—The chemical engineer has a tremendously important place in the industrial world. He seeks and develops improved methods for the preparation and purification of foodstuffs, medicines, dyes, materials for textiles, soaps and adhesives and creates new synthetic compositions.

MINING ENGINEERING.—Excavating and working mines of all kinds, where operations are conducted far below the surface of the earth, present engineering problems that call for specialized training.

OTHER BRANCHES.—Engineering has been subdivided by the developing arts and sciences into further recognized vocations and professions, each of which concerns itself with special engineering projects. Agricultural, hydraulic, heat and ventilation (air conditioning), irrigation, marine, illumination and sanitation engineering are the more important special fields.

Exporting and Importing.—The exchange of goods between one country and another is a far-reaching activity, since international trade is a great factor in international relations and domestic business. Good will between nations is increased by friendly economic interchange and decreased by economic rivalry. Every country is dependent in some degree on the raw materials or manufactured articles of other countries.

The business of importing is purchasing, ordinarily in large quantities, the products of foreign countries. Exporting is the sale of domestic products to foreign countries.

Work in an exporting and importing house calls for a continual grasp of world-wide business conditions. Training for such work, buying, selling and shipping in quantity, calls for a sound knowledge of general economics, commercial geography, international relations, foreign exchange. Many schools of business conduct special courses in exporting and importing. Opportunities lie in seaports and great manufacturing and shipping centers that facilitate sending and receiving goods of every description.

Farming.—Agriculture began when the primitive tribesman first stirred the earth with a stick and dropped seed into the ground; it has grown in importance with the march of the centuries. The choice of farming as a life work makes you one of a group of vast importance in the economic life of the world. If you succeed, you become one among the most independent, even though you may suffer setbacks from natural disturbances such as periodically visit all countries.

The farmer who conducts his enterprise on the same acres and with exactly the same methods his grandfather employed is merely engaged in an occupation; one who is alive to agricultural progress and takes advantage of the scientific methods raises the standard of farming to an engineering science.

You should not become a farmer unless you love the soil. You should be determined also to achieve success by thorough scientific study that will make you master of your environment. Your training and knowledge should be as complete as those of any other modern engineer. You should spend the required time in a good agricultural college and after being graduated should keep well informed, through the many reliable sources available, concerning new phases of farm life as they develop. As a modern farmer, you must know soils and methods of soil improvement; understand climatic conditions; master the details of raising, harvesting and marketing crops; and know livestock and dairying, fruits and their storage and marketing, truck farming and poultry raising and how to care for and keep farm machinery in repair. You must be a good business manager and should study everything that will help toward success.

It is essential that the farmer consider the special adaptability of his region for certain types of farming. Where he lives will determine whether he should devote his time to raising cattle or growing fruit, wheat, corn or cotton. Farmers near great cities ordinarily do truck farming for their local market.

One of the great satisfactions of farming is that it renders a family self-sufficient in considerable measure and offers a well-rounded way of life. Ownership or tenancy of land provides opportunities in all parts of the United States.

Forestry.—A young man who likes the life of the woods and realizes the great importance of preserving our forests for their beauty, their value as natural resources and their protection against drought and dust can find congenial employment in forestry, usually in government employ, federal or state.

There are eight district foresters, one in charge of each of the eight national forest areas. The forest rangers are responsible to their respective district foresters, who in turn are directly supervised by the head of the Forestry Service in Washington, D.C., known as The Forester. Each forest ranger has charge of at least 100,000 acres. In addition to his task of guarding against fires, he has authority over the use of pasture land in his section, marks the timber that may be cut, keeps records of the timber areas deforested, and supervises the cutting and reforesting in his section.

There is little opportunity to make forestry an independent business, though some large private estates have nurseries and forests. The Civil Service Commission in Washington will provide information respecting the schedules of pay and requirements for examinations preparatory to entering the Forestry Service.

Insurance.—Losses of life and property from death, sickness, storm, flood, fire, theft and accident have been such a threat to business and personal security that a method of covering these losses at least in part has been developed. It is insurance. It involves a legal promise to pay a certain sum of money to the insured, who, for a specified payment or premium, receives a receipt or contract (called a policy) stating the terms and conditions under which the promise will be fulfilled. Though insurance cannot prevent losses, it does guarantee in return for certain sums paid by the insured, to pay him or a beneficiary named by him for the losses, when they occur.

The insurance company profits because it receives a large number of payments from insured persons of whom only a few have losses for which the company must pay. The insured person benefits by being able, for a comparatively small fee, to transfer to an insurance company all the financial risk of various kinds of loss.

If you have a liking for figures and ability to meet people, you may do well to consider this field. For background a good business course will be of great advantage. In most large insurance companies the selling of insurance is ordinarily the first work undertaken and salesmen are trained in the company's own preparatory course. The remuneration for this work is generally in the form of a commission—a certain percentage of the total amount of premiums on the policies sold. The salesman may be advanced to a managerial position in which he oversees the activities of a group of salesmen, and the higher executive positions are often filled by men whose ability has been proved in the less important posts.

There are many kinds of insurance, and although some insurance companies handle all types, most companies specialize in one or more of the following kinds: life, fire, burglary, marine, automobile, accident, sickness, public liability, explosion, steam-boiler, tornado, fidelity and surety bonds, sprinkler-leakage, plate-glass, and riot. A new type of policy, group insurance (to protect employees, members of a firm, or partnership and other groups), demands a particularly high-grade salesman and pays large commissions because group policies pay big premiums. There is insurance against almost any kind of risk imaginable, the premium or charge being in proportion to the risk assumed by the company. The probable risks and the insurance rates are carefully worked out by the actuary, whose work requires special training in mathematics.

The insurance business has grown steadily, and it offers a career of large possibilities to one who has a liking for business details that are to a considerable degree mathematical and technical or to one who has a highly developed ability in meeting strangers and interesting them in his services.

Interior Decoration.—This profession has arisen with the growing realization of the increased character and interest that a home, office or public building has if it is well furnished and shows in its decoration an understanding of the elements of harmony. Interior decoration includes all the details that relate to beauty and harmony in a dwelling or other building. Furniture, floors and floor coverings, curtains, draperies and other fabrics, lighting fixtures and accessories of all sorts should be selected with an appreciation of the plan and layout of the whole interior, of color, texture, quality and durability and with a sense of fitness and suitability for the type of occupant. Although many people have excellent taste in these matters, an interior decorator brings expert training and knowledge to solve the problems that arise. He is familiar with the trend of the times, the markets from which he must buy and the traditions of various countries and periods; his experience and professional skill will enable him to give individuality and attractiveness to a room, a whole house or a large building.

Photo by U. S. Forest Service

On the Fire Line

United States Forest Ranger at an emergency radio station in a forest fire

This occupation will appeal to anyone of artistic taste and temperament. The financial rewards usually are excellent and women are peculiarly well fitted for this work. Preparation should include a study of art, architecture and design and preferably a course at a school of interior decoration.

Cities and suburban communities of wealth afford the best-paying field for the interior decorator, who may find employment with a decorating firm, or establish himself independently. Furniture and department stores also offer salaried positions in their interior decorating departments.

Journalism.—Few professions combine as many interesting activities as are found in journalism. The newspaper reporter begins his career, nearly always, as a junior or "cub" reporter, and for a time may be little more than a minor assistant to the veterans of the staff.

Journalism is a first-rate vocation for a wide-awake young man or woman who can find the way through the tangle of 20th-century society, business and politics and learn to present ideas in a forceful, popular way. Yet only those well prepared through education and natural endowment and possessing an instinct for news should enter this field of work. The novice must be prepared for a hard, steady grind at the start, gathering news only about the most routine and minor daily occurrences; but young people of high ideals can aid in raising both cultural and ethical standards through newspaper work, for their field is vast.

The ability to express oneself readily, rapidly, forcefully, is a necessary qualification. Schools of journalism offer valuable courses, but early apprenticeship on a newspaper is highly desirable. Newspaper management, as distinguished from editorial activities, requires business training.

As a rule, reporters are not well paid; financial rewards are, of course, higher when one rises successively through the ranks to the posts of city editor, news editor and managing editor. Very high salaries are paid to journalists who show special ability in particular fields, so that the public comes to look for their signed articles on politics or economics, or in such special fields as the theater, music, sports. Foreign and war correspondents often become internationally famous. Some columnists have a large following—national, if their writings are syndicated—thanks as much to their own interesting personalities, as to the subjects with which they deal or the style they use.

The daily newspapers, weeklies and monthly periodicals provide a wide field of opportunities. Because the great metropolitan newspapers seldom have a place for the inexperienced applicant, it is usually necessary to be content for a time with a post on some less important paper. If one obtains such a post in a city or large town near the metropolis, he is then in a good position to observe the trends of the larger papers, make contacts and perhaps acquire some local reputation that will make the next step easier. Teaching journalism adds another avenue of income for experienced journalists.

Landscape Architecture.—Planning and planting the outdoor surroundings or setting for a dwelling, school or other building is landscape architecture, which does for the exterior what the architect and interior decorator do for the interior. The best landscape architect is by nature artistic and possesses that sixth sense of the esthetic fitness of things that no amount of teaching or training can inculcate. Yet, at the same time, he must know thoroughly the habits, needs and characteristics of plants of all sorts, and such practical and decorative outdoor features and furniture as fountains, garden sculptures, lanterns, tea or summer houses, sundials, benches.

Grass, flowers, shrubs, trees, steppingstones, paths, walks, and driveways are the materials the landscape architect uses. He must be an experienced gardener. All his study of plants will be of little value to him unless he has actually raised and cared for them himself; for the success of his landscaping depends only in part on his ability as a designer—his designs will not come into being unless the growing, living things of which they are composed thrive and produce the effects that he intends. He must know the exact time at which flowering plants bloom and all those variations in color, shape, size and texture that determine the effectiveness of the scene he wishes to create; and he must know which plants can best withstand unfavorable environments. He must be both an artist and a very careful and practical judge of plants, climate and growing conditions. The profession affords a good income; a successful landscape architect commands high fees for laying out the grounds of an estate or country club, and smaller gardens and foundation plantings bring lower but more numerous returns.

Law.—The profession of law at its best is highly important for the protection of people and their property everywhere. When rights are in jeopardy or freedom is threatened, it is usually only through the aid of a lawyer that a client can assure himself of the full benefits of the law of the land. Law and government are so closely interwoven that many high governmental positions are filled from the legal profession. Competition in the law is even greater than in other professions. The preparation for law practice consists ordinarily of three years of study at a law school that in most instances presupposes a full undergraduate college course.

For success at the bar, one must possess: a keen, analytical mind, well

Courtesy Connecticut Publicity Commission

Law Schools Old and New

At the left is the first law school in the United States, a tiny building at Litchfield, Connecticut, built by Tapping Reeve in 1784 and carried on by him and his successor, Judge James Gould, until 1833. It was attended by over 1,000 students who came from every state in the new republic. Of this number 26 became United States Senators, 90 Congressmen, many judges in high courts and 3 Supreme Court justices. At the right is Leche Hall, new law school of Louisiana State University at Baton Rouge, an example of the many splendid structures where present-day law students receive their training

adapted to pierce the intricacies and obscurities of the law and of complicated cases and situations; ability to think, write and speak with logic, clarity and forcefulness; persuasive powers and the ability to impress his fellows with his sincerity. A strong, magnetic personality is a great asset.

Law falls broadly under two main heads called *public* and *private*. The former has to do with the many relationships between the state and its citizens, and includes various special fields for lawyers, notably criminal law, since any criminal act in the eyes of the law is an offense against the public and the state. City, state and national attorneyships have to do with public law.

Private law deals with private persons and property, including commercial and business law. If a young lawyer is not fitted for pleading in the courts, he may select a law practice that calls mostly for briefing (analyzing and drawing up briefs), or any of the special branches for which he is better fitted. Affiliating with a large, well-established law firm is a very good way to start.

The aspirant to a position of political power finds the study of law practically indispensable. Judges, of course, must have been trained as lawyers, and a thorough knowledge of law is exceedingly valuable also in business. *International law* is a special phase in which there are comparatively few experts, and attention to it may well reward the farsighted individual, particularly one looking forward to a diplomatic career.

Library Work.—A liking for books and for association with the reading public attracts many young people to library work. At first, the library worker ordinarily undertakes one of the many routine tasks there are in every library. The properly equipped and experienced clerk or assistant looks forward to promotion to an interesting and well-paid executive position as librarian, assistant librarian, secretary, treasurer or branch-library supervisor.

The library worker must have exceptional capacity for accurate attention to detail and unflagging energy to continue a steady routine that has little mental stimulation; for, though one must have acquired a wide store of knowledge about books to be able to answer inquiries intelligently, the monotony of handling books is unrelieved in a great part of library work by any contact with the content of books. The library worker who must meet the borrower of books or the seeker for information will find that ready understanding and helpfulness are valuable traits to cultivate.

The designations of the several departments—shelf, classification, and cataloguing—suggest their routine duties of care, arrangement and card catalogue writing, respectively. Upon the work of cataloguing, the usefulness and efficiency of the entire library system very largely depend. The order department selects and purchases new books; the loan and reference departments are in direct contact with the public.

The salaries in public libraries are classified and graded according to position, with provision for gradual advancement; the hours are reasonable; and vacations are excellent. In a private or organization library, the remuneration is likely to be better, with more duties assigned to one person and correspondingly greater responsibility.

Opportunities for library work are seldom lacking, especially for the graduate of a good library school. Such schools are conducted in various colleges, universities and large libraries. They are usually very thorough, and some give a Bachelor of Library Science degree. In addition to the public libraries, there are: many large private collections; special libraries of medicine, theology, law, science, history, art, education; business libraries in publishing, advertising and insurance companies and many other large commercial, industrial and scientific organizations that must have their source material always at hand; museum, state, and municipal libraries; and school, college and university libraries.

Manual Trades.—The following list mentions some of the leading trades for both men and women. For most of them, one can obtain specialized training in a trade or manual training school. Some of these trades command excellent pay. A number of the trades listed come under the general class of building and contracting and several rank as art crafts.

Automobile servicing
Bookbinding
Cabinetmaking
Carpentry
Cooking
Dressmaking
Electric wiring; equipping
Embroidering
Engine operating
Glassworking
House painting
Letter embossing
Lithography
Machinist's work
Masonry
Metal working
Millinery
Motion-picture operating
Plastering
Plumbing
Radio servicing
Seamanship
Sewing
Steamfitting
Steel working
Stone cutting
Tailoring
Tinsmithing
Typesetting
Woodcarving

Opportunities in the manual trades are widespread; but urban centers where building operations and industrial activities are greater provide more plentiful openings.

Mechanical Drawing.—The clerical member of the arts family, highly useful in bringing the creative ideas of designers into workable form for the guidance of workmen, mechanical drawing requires patient exactness and training in the theory of mechanics and in conventional drawing. For architectural drafting one must have facility in mechanical drawing and an understanding of architectural terms that will enable him to interpret the architect's designs and convey definite information to artisans and workmen through accurate drawings and detailed specifications.

Although there is constant need for skilled mechanical draftsmen, ambitious young men and women usually consider their knowledge of mechanical drawing as only the first stage in their progress toward a career in architecture or engineering.

Medicine.—The profession of medicine probably offers the greatest of all fields for human service, for promoting the general welfare of mankind. Among its contributions are: modern preventive medicine with its serums and antitoxins to conquer contagions, infections and epidemics and its employment of nutritional aids or vitamin foods to prevent and cure such deficiency diseases as pellagra, rickets and beriberi. So wonderful, indeed, are the miracles of modern medicine, that even apart from its broad humanitarian interest it offers one of the most enthralling pursuits among all the sciences.

The self-analysis that should precede any decision as to the choice of a career should be especially rigid for a prospective medical student. Should you contemplate entering this field you should answer the questions, "Does the world need and will it support another mediocre doctor? Does it not demand the expert today?" Qualities especially desirable in the practicing physician are quick discernment and judgment, a scientific mind, retentive memory, calm nerves, great physical endurance, warm human understanding, sympathy—not emotional but reasoning—and eagerness to relieve suffering and save life.

The completion of a three-year college course is requisite for entrance in any of the leading medical schools, and there the course requires three or four years. The graduate physician must then serve one year as a hospital interne to gain practical experience. A doctor is often nearly thirty years old before he is fully equipped for regular practice. This long preparation is justified by the responsibility that a doctor assumes.

If you are to become a physician you must choose between being a general practitioner and being a specialist. In cities, specialization is widely adopted, because of its excellent financial returns and considerable freedom from exacting routine. In small communities, the demand is for a general practitioner who is able to treat a wide variety of both physical and mental ills. He, too, may attain the higher brackets of income.

There are many subdivisions in the field of medicine. Some of the many specialists are: the bacteriologist, who determines the cause of certain diseases by analyses for bacteria; the dermatologist, who treats skin diseases; the diagnostician, who renders a decision upon what disease afflicts a patient. Other experts include the internist, or medical practitioner, who treats disease with medicines, as opposed to operative treatment; the neurologist, who treats diseases of the nervous system; the obstetrician, whose work concerns pregnancy and childbirth; the oculist, who treats diseases of the eye and prescribes glasses to correct defective vision, and the optometrist, who tests the sight and fits glasses. There are also the oto-rhino-laryngologist, who treats diseases of the ear, nose and throat; the pediatrician, who specializes in diseases of children; the pharmacist, whose work it is to dispense medicines and fill doctors' prescriptions, and the physiologic chemist, concerned with the various chemical changes that affect the health of animals and plants. Still other specialists are the psychiatrist, who treats various mental disorders, and the surgeon, who operates for the treatment of diseases and the removal of abnormal tissue not remediable by internal medicine. In a field all his own is the veterinary, who treats domestic animals and pets.

BACTERIOLOGY.—The study of bacteria, or plant microorganisms (many of which have the power of motion), became a science under Pasteur and was greatly developed by Koch. Bacteriology has several fields of application: agricultural, with dairy, soil and food bacteriology; medical, which treats of disease-breeding germs; sanitary or disease-preventing bacteriology; pathologic, which treats of the effects and toxins produced by bacteria; and systematic bacteriology, classifying and giving the relationships of bacteria, of which there are three forms—rod-, ball- and spiral-shaped, or *bacillus, coccus* and *spirillum,* respectively. Their infinitesimal size, 1/600 to 1/50,000 of an inch, the smallest of all organisms, makes these microbes a laboratory study requiring the strongest microscope, hence the name, *microorganism;* but some of them, called *ultra microorganisms,* defy even the microscope.

Courtesy Los Angeles City School Report, 1937

Manual Trades: The Electric Welder

To become a bacteriologist, you should have the investigative and scientific type of mind with high power of concentration and plenty of patience; you must possess also courage to face the ever-present danger from infection when dealing with virulent organisms, several notable medical bacteriologists having sacrificed their lives in pursuing their studies and research.

As applied to the diseases of man, bacteriology sometimes forms a course in premedical college work; or it may be a graduate course for specialists in any one of its phases. It is important in animal husbandry, agriculture and forestry, as all animals, many plants and some trees are attacked by destructive diseases caused by bacteria. On the other hand many microorganisms are conducive to the health of animals and plants, and others serve to fertilize and benefit the soil, thus aiding mankind.

Among the diseases proved to be the result of bacteria are influenza, lobar pneumonia, the plague, diphtheria, dysentery, cholera, syphilis, jaundice, tularemia and typhoid and yellow fevers. Subsceptibility to such diseases is greatly increased by exposure, overfatigue and malnutrition, as the body's resistance is thereby lowered. Serums and antitoxins to combat these maladies have been developed from horses and other animals; other serums afford indications in the diagnosis of certain diseases and bacteria vaccines are of value in producing immunity.

Medical research laboratories of universities and such organizations as the Rockefeller Institute and the Columbia Presbyterian Medical Center both in New York, offer unusual opportunities for well-advanced bacteriologists to distinguish themselves in research. Agricultural experiment stations open another avenue of activity in this science as applied to plants and animals.

DIAGNOSTICS.—The branch of medicine concerned especially with deciding from its symptoms what a malady is, is called diagnostics, and a specialist in the work is a diagnostician. A patient suffering from a disease the cause or origin of which is not clear is sent by his physician to such an expert. Having succeeded in determining the nature and cause of the illness by means of tests, experiments and analyses, the diagnostician reports upon the case to the regular physician, giving him the detailed technical findings.

Diagnostics requires the investigative mind; it calls for the type of person who derives interest and pleasure from constant study and research. A diagnostician should be also a keen psychologist.

For this work, in addition to a general medical course, you must pursue post-graduate study of nervous afflictions and of special diseases that are rare and difficult to diagnose. The financial returns for this branch of medical work are usually substantial. There are few special diagnosticians because the average physician usually makes his own diagnoses.

NEUROLOGY.—The branch of medicine that deals with the nervous system and its various disorders and diseases is called neurology. As a neurologist, you must be more than a medical doctor and nerve specialist if you are to be successful; you must be a good psychologist, a careful reader of human nature. As you will have to treat many a patient whose condition is the reflex of an unconscious mental attitude, you must become expert in discriminating between those nervous troubles for which you may employ psychotherapy (treatment through suggestion and without medicine) and those manifestations of actual disease or serious disorder of the nervous system for which you must be able to make a prompt and definite diagnosis and give medical treatment. Because the quick tempo of life today causes severe nervous strains, neurologists are in demand and have numerous patients of both types seeking their advice and aid. As the steady drive of city life is particularly conducive to nervous disorders, urban centers offer

Courtesy U. S. Office of Education *Courtesy 38th Annual Report of the Superintendent of Schools, New York*

Training for Two Important Manual Trades

Students at the Central High School of Needle Trades, New York, prepare for jobs in merchant tailoring and millinery. New York, the center of the garment industry, offers many such vocational courses at these

neurologists the largest opportunity for service.

Ophthalmology.—That branch of knowledge that concerns the eye, its structure, function and diseases is called ophthalmology. Practicing in this field are: the oculist, a regularly licensed physician who restricts his activities to the eye and its various affections, and the optometrist, not a physician or legally permitted to use drugs in eye examinations, who discovers the physical condition of the eye through very exact measurements and tests and may prescribe glasses to correct defective sight but is not allowed to treat eye diseases. For treatment, he turns over any case he discovers to a regular physician or an oculist.

Perfect sight is so rare that almost everyone is a prospective patient; and as increasing age is the great factor in eye changes, patients return again and again to the same oculist if his work is satisfactory. Both the oculist and optometrist may reasonably anticipate professional and financial success in any desired location. The higher city prices are the result of increased costs of practice there, and lower returns in smaller places are equalized by lower expenses.

Otorhinolaryngology.—This compound word (the first three divisions referring to ear, nose and throat, respectively) designates the total knowledge about the structure, functions and diseases of the ear, nose and throat, which are so closely related that they are usually studied together. Since a disturbance of one so quickly affects the others, a specialized knowledge of all three is essential. The ear, nose and throat specialist treats the structural troubles of these organs, as well as diseases affecting them.

Like other specialists, the ear, nose and throat expert must complete the regular course of medicine and then pursue the special studies that will fit him for practicing this branch of medicine.

Qualifications for this work vary somewhat from those already outlined for the general medical student because the extreme sensitiveness and delicacy of the organs involved require corresponding characteristics in the practitioner treating them—keen sight for examinations, delicacy of touch, great skill, precision and steady nerves for operations.

In a large city, there usually is an ear, nose and throat hospital that affords excellent opportunity for such specialists on its staff, and where they can take their patients when hospitalization is necessary. A metropolitan area is more suitable for this specialist, as smaller populations provide a practice too limited for a livelihood. The work is largely office practice and is usually well paid. In the field of research, such widespread but unconquered maladies as hay fever, the common cold and influenza still offer opportunities for these specialists to distinguish themselves by discovering effective methods of treatment or prevention.

Pharmacy.—Compounding drugs for medicine was one of the many tasks of the physician in the days before specialization. It became an independent profession in the 18th century. Knowledge of pharmacology, that is, the science of drugs and remedies, is essential to both physician and pharmacist because certain drugs are incompatible—cannot be put together or used together—and therefore should never be prescribed for combination in one remedy.

Except in outlying districts where no drugstore is accessible and the doctor himself must fill prescriptions, most physicians rely upon the hospital or neighborhood pharmacist for this highly responsible work, which calls for extreme care and certainty about the drugs and perfect accuracy in weights and measures. Besides these qualities, as a pharmacist you should have: high ethical standards; and a knowledge of the details of pharmaceutical jurisprudence and the legal requirements affecting the practice of the profession, which includes observance of the Pure Food and Drugs Act and laws governing the sale of narcotics and harmful compounds.

A high school education or its equivalent is necessary for matriculation in a college course in pharmacy, which requires from four to five years and embraces the study of chemic. pharmacy (the composition and preparation of all medicines), whether of galenic (vegetable) or mineral drugs; pharmacology—materia medica and toxicology; the United States Pharmacopoeia; and prescriptions and types of incompatible drugs.

Opportunities for a pharmacist are practically world-wide, especially if he acquires several languages. He may seek employment in the wholesale or retail drug business; may become a research worker, a hospital, army or navy pharmacist, a public health technician or a government narcotic inspector; or he may serve as a drug salesman or as a teacher of his science. He will be fairly well paid in any branch of practice he may choose.

Physiological Chemistry.—The physiological chemist must carry on constant research, tests and experiments to extend knowledge of the relation between chemistry and the various branches of biology, and to employ chemical discoveries to combat and eliminate disease, to improve and maintain health and increase the span of life. Preparation calls for a high degree of specialization in both biology and chemistry, and a medical course is invaluable, for the physiological chemist should know the human body and its functionings in both health and disease. The necessary qualifications include a scientific and investigative mind, ability for concentrated research and a practical bent that will help to apply new truths for the benefit of mankind. The physiological chemist who makes important new discoveries greatly increases his earning power. Opportunities lie in experimental, medical and chemical research laboratories in many cities.

Psychiatry.—The term psychiatry is applied to the branch of medicine that deals with the treatment of mental disorders. Great progress has been made along these lines, especially since the World War, during and after which an unusual number and variety of mental disorders were diagnosed and treated. Formerly, insanity was commonly considered a special affliction whose cause and effect were both purely mental, but the modern psychiatrist (mental specialist) realizes that mental troubles often are distinctly and directly the effect of some physical cause, the removal of which will bring about cure. He therefore takes into account the physical condition and history of a patient, studying the individual's relation to the particular mental disorder manifested.

Institutions for the care of the mentally afflicted also give the most careful attention to all the physical factors and conditions that may have a bearing upon a patient's possible cure. Dental and surgical care, massage, special diets and baths, all play their part in bringing about results that formerly would have been considered almost miraculous. The old principle of close confinement has given way to pleasant occupation in schools and manual-training shops and regular exercise in the open air and sunshine. Attendants in modern institutions, chosen for intelligence and kindliness, play an important part in effectual treatment of the patients.

Preparation for a successful career in psychiatry requires, in addition to the regular medical course, a high degree of specialization relative to the mind and its ailments so that the psychiatrist may be an expert on both body and mind and understand every possible development from the close relationship between them. His qualifications should include a zest for the close study and analysis of difficult cases and a kindly and sympathetic nature. City and country are rather equally affected in regard to mental disorders: the isolation and loneliness of the country react upon the mind as harmfully as the strain of city life. As hospitalization is required in most cases and the great city and state institutions care for the largest number of cases, these provide the largest field for the services of psychiatrists, but there are also many private sanitariums for mental patients, and many receive treatment from a psychiatrist in their own homes, some cases demanding full-time attendance.

William A. Welsh Medical Library, Johns Hopkins University
Johns Hopkins at Baltimore, Maryland, has an outstanding American medical school.

SURGERY.—The very gradual development of present-day surgery from the restorative manipulation of the human body by the ancients has involved almost startling innovations in operations by hand and by instrument and has resulted in great successes. Today, surgery is often in the spotlight of attention, and its fame through the works of notable surgeons attracts many medical students to specialize in one or more of its branches, among which are: cerebral (brain), aural (ear), abdominal, orthopedic (corrective) and plastic (remodeling).

Besides the will to serve humanity that should form the urge to consider any phase of medicine as a profession, the would-be surgeon must possess other special qualities—steady nerves, perfect emotional control, manual and mental precision, deftness, swiftness and surety. His preparation must include not only the general course in medicine, with pathology and diagnosis, but special emphasis on such phases as anatomy, heart conditions, anesthesia and surgical technique, the expert use of the X ray and radium and the care and treatment of patients before and after an operation and during convalescence.

Urban areas offer larger practices than rural districts, but the good surgeon may have a large practice in a small town for his fame will attract patients.

VETERINARY MEDICINE.—Though it is rather recent in its higher development as an independent branch of medicine, veterinary medicine dates far back to ancient civilized peoples whose use of horses in war and peace made medical care essential. Veterinary medicine now requires a five-year course of study and carries a doctor's degree. Supplementary work may include courses in animal husbandry, dairying, chemistry, pharmacy, botany, zoology, entomology and other related subjects. Comparative anatomy of most of the domestic animals and poultry, clinical and physiological laboratory work and toxicology form the major subjects of the course. Entrance requirements are a four-year high school or preparatory course or the equivalent as shown by examination. Passing examinations in biological science, general chemistry and English composition will admit the student to the second-year class.

A prospective veterinarian should possess a scientific, inquiring mind and an understanding and a liking for animals. He should have good judgment, be able to use his hands deftly and have steady nerves. Surgery, as well as medical treatment, is practiced by the veterinarian.

His sphere of activity has various ramifications that increase his opportunities; by civil service examination graduate veterinarians are eligible for appointment to the United States Department of Agriculture and to the army with rank from second lieutenant to and including colonel. He is needed in private practice in thrifty farming districts and where livestock is bred and marketed; he may teach or do research work at an experiment station or a college, do biological work at a commercial laboratory or obtain a packing-house engagement. Municipal, state and United States milk and meat inspectors are veterinarians appointed for sanitary and laboratory work in animal disease prevention and control. Employment as a superintendent by a large dairy or stock farm offers satisfactory returns to numbers of veterinarians. The demand in general has grown beyond the supply.

Ministry, The.—The profession of the clergy offers an incomparable avenue to social service with a unique balancing of rewards and sacrifice—rewards in the consciousness of service to God and mankind in the realm of the spirit and sacrifice of the possibly greater financial or worldly gain to be found in other professions. A minister of the Gospel is not expected to seek material riches, though special ability in oratory, evangelizing or social work often carries a dynamic clergyman to fame and fortune.

Perhaps more than others in the community, the pastor may experience a keen satisfaction in leadership and enjoy self-approval from an honest devotion to the spiritual and temporal needs of his parishioners.

A clergyman may be a great leader and usually has an extraordinary opportunity to interpret religion and to bring to public attention its significant moral and ethical aspects, as applied to important issues of the day.

The clergyman must know people and their affairs intimately; he must perform christenings and marriage ceremonies and conduct funeral services; he must confer with the troubled and sick, advise them and comfort those in sorrow; he must interest himself in public welfare, education, philanthropy and good citizenship. His duty as a minister demands that he be a constant student, always learning and enlarging his outlook.

If you would enter upon this rewarding path, you should have godliness, broad sympathies, compassion, earn-fitness to lead others to spiritual heights. Preparation for the ministry ordinarily includes college education with emphasis on theology, history, sociology, literature and public speaking. The divinity schools and seminaries offer the requisite training for ministers of various faiths. Only the young person who feels a definite call to work of this sort should prepare for the ministry. In various denominations, women are eligible to enter this profession.

Music.—As a profession, music must be studied assiduously. Good teachers and the use of good instruments from the beginning promote success, for both method and sensitiveness to tonal qualities are important even when learning the rudiments. Success in music depends first upon the individual's being gifted in that direction with a sensitive ear for tones, a sense of rhythm and quick emotional reactions. Training alone can never bring outstanding attainment, whether it be for voice, instrument or composition.

Early musical instruction and expression are desirable, for they alone can reveal talent. If talent for both vocal and instrumental music is apparent, it may be wise to develop both expressions and to postpone deciding which will be most desirable as a career. In any branch of music, one may elect to become performer or instructor, or both; but it is not necessary to be an accomplished performer to be a creditable and successful teacher. If you plan to make singing a career, great care should be taken in the selection of the first vocal teacher. Faulty instruction not only may fail to develop the finest latent possibilities but may cause permanent harm to the vocal organs.

Perseverance and ambition are requisite to a public career in music; so also are sensitiveness to emotion and ability to interpret another's many moods if a musician is to attain the heights in his profession.

Excellent private teachers, music schools and conservatories in the United States now enable students to obtain the best training in America. Normal schools train music supervisors for public schools, and universities maintain departments of music and confer a degree.

Given marked ability and the proper instruction, a singer may become a prima donna or the leading tenor in opera with a large income; but opera stars are rare in the firmament of music, comparatively few singers having superlative talent. The church choir, radio program, light opera and singing picture furnish well-paid outlets for average talent.

Talent for music composition creates a profession in and of itself; the composer, usually pursues also some kindred activity, such as leading an orchestra, performing his compositions as soloist upon a chosen instrument or teaching.

Many more opportunities are open to instrumentalists of comparatively modest talent than to singers of corresponding ability, among them being positions such as church organist, accompanist, pianist and orchestral player. A position with an orchestra pays a fair salary, and soloist talent is sometimes discovered and the musician is promoted from a minor place. Besides the possibility of becoming a soloist, there is also that of becoming a conductor. It is important that every opportunity be taken for public appearance during the period of training, by joining some organization for young musicians that may ultimately lead to professional engagements.

Newsphoto

Training for the Merchant Marine

Transmitting messages by blinker telegraph aboard the New York State Merchant Marine Academy training ship, Empire State, in Long Island Sound, New York. Here young men are trained to become deck and engineer officers on ships of the American merchant marine. Pennsylvania, California and Massachusetts also maintain state nautical schools

Navigation.—Navigation requires a thorough knowledge of mathematics (including trigonometry and logarithms); plotting charts, sounding and keeping the log; methods of reckoning latitude and longitude and use of the compass; nautical astronomy, meteorology, international rules and signals, marine surveying, winds and cyclonic storms, ice and its movements, tides and ocean currents. These subjects may be studied in special courses.

The most important officer of a ship is the captain; his subordinate officers are the mates. The first mate is the captain's chief assistant and has a large part of the responsibility for proper management of the vessel and its cargo. Next in rank are the second mate and the third mate; some large vessels carry four or more mates. (The word *officer* is often used instead of *mate* to describe these men, and they are then spoken of as *first officer, second officer* and so on.) The officers of a ship are licensed according to rank. Promotion depends largely on merit and, of course, upon the holding of an appropriate license.

The field is large, for in addition to ocean-going vessels there are many large ships, chiefly freighters, on the Great Lakes. The tremendous development of modern ocean liners, their great speed and size and the vastly increased number of passengers carried have increased proportionately the responsibilities of officers. The work is not highly remunerative even for the captain.

Because the operation of modern vessels depends so largely upon mechanical devices, an officer's life is likely to be monotonous. Self-control, an alert mind and sound judgment are indispensable for meeting such emergencies as storm, fire, collisions and other accidents.

If you are strongly fascinated by the sea and by the idea of visiting the far ports of the world, if you have a strong body and well-balanced mind and equip yourself thoroughly for the work you will find navigation an interesting and worth-while career.

Nursing.—The field of nursing has broadened with our developing modern social structure, and new responsibilities devolve upon trained and competent nurses. Bedside ministration once embraced the whole duty of a nurse, but now extended opportunities for assisting the public and for earning equitable financial rewards include social service and public-health education. Though nursing embraces opportunities for a limited number of men, it is a profession for which women are particularly fitted and in which they have achieved notable success. Women generally possess the deep sympathy toward the sick and devotion to an ideal of service that are outstanding attributes of the highest type of nurse. Highly important to the patient and to the nurse's own professional success are the nurse's personal qualifications. These should include great physical stamina, an alert mind, quick perception, sound judgment, a cheerful and kindly disposition, unselfishness, gentleness, steady nerves, self-control and ability to attend carefully to a great many details.

Hospitals and medical centers maintain training schools for nurses, graduates from which find employment on private cases and in hospitals, social settlements, industrial establishments, clinics or physicians' offices. The Red Cross Society employs nurses whose services are rendered to communities stricken by fire, pestilence or flood. Their work approaches that of the physician in responsibility and offers many opportunities for outstanding public service.

The public-health or district nurse is in charge of school inspection and visits the pupils in their homes to promote correction of juvenile defects. Under a directing physician she has oversight also of health centers and dental, tuberculosis and mother-and-baby clinics, in which she conducts classes to instruct mothers in the care of children; she also teaches home nursing. Under a health officer, the public-health nurse assists in promoting general vaccination against communicable diseases, arranges for an adequate milk supply for undernourished children and supervises the system of supplying hot lunches to children in schools. In short, she promotes the health of the community from the centers of home and school, and is especially concerned with dietetics and nutrition.

Politics.—Since politics has to do so vitally with public welfare, many public-spirited young men and women look forward to a career in this field as their opportunity for the broadest public service.

Politics involves the methods and means of public administration, and the contests for power and authority, national, state and local. Through politics the candidates are selected for office, their merits are publicized to win votes, and the public is informed about office-holders and public measures and policies.

The political mechanism operates through the various party committees—county, state, or national—collecting and disbursing funds, obtaining new party members, supervising election campaigns and carrying on special work for primary elections and party conventions. Through a local party club or one of these committees, the novice must seek entrance into politics. When he has proved his ability and worth in modest roles, opportunity to advance to more important posts presents itself, and eventually he may be nominated by his party for some important state or national post or may seek appointment in the diplomatic service. In America, training for diplomacy is not so definite as in various other countries, since distinguished private citizens are frequently chosen by the President to be ambassadors and foreign ministers. Such posts, however, may be made an objective by ambitious young men and women, especially as diplomacy is beginning to be a career, even in America.

The demands, both physical and mental, upon the political aspirant are exacting. He needs endurance, keen intellect, forceful personality, tact, urbanity and an enthusiastic temperament balanced by adequate self-control and good judgment. Preparation for a political career should include the study of political theory and ethics, party politics, governmental and administrative policies, economics, sociology and public speaking (a pleasant voice and forceful delivery are valuable political assets). A broad understanding of these subjects may be supplemented, as occasion requires, by more advanced studies—jurisprudence and constitutional, administrative and international law.

The remuneration usually is not great. This career offers power, position, distinction and opportunity for broad public service.

Printing.—The important and valuable work of printing bears close relation to almost every other, for the mass of printed material constantly issued by thousands of organizations concerns practically every commercial and intellectual activity. Printing makes it possible to educate and instruct people and persuade them to adopt various courses of action.

The prospective printer should possess the equivalent of a high-school education and a mind that is capable of steady application to detail, for printing is a mass of detail from start to finish. He should like indoor work and be ready for night duty, as much of the work, such as that on the great morning newspapers, must be done at night. The compositor, or typesetter, must know composition by both hand and machines—linotype (on which a line of type is set and cast in one piece of type metal) and monotype (on which the single letter is cast and set). The master printer or foreman of the composing room must understand handling men and be a clever artisan with a broad knowledge of type sizes and styles (faces) and of make-up—how to arrange and combine the different types to the best advantage. He must learn the work of the imposing stone, upon which the galleys are made into signatures and forms ready for the press and the actual printing, or making impressions. The best preparation for a printer is apprenticeship in a printing plant, large or small, to learn the details by doing the work from the very beginning.

Innumerable technical details must be mastered by the printer who wishes to run a business of his own, for to succeed in the printing business is to master a craft that is also an art. The highly competent printer who is efficient in layouts, color work and other details is in demand and commands a high price for his work.

Printing offers to the progressive individual many opportunities, from simple jobwork to the most elaborate and artistic bookwork. Newspaper and printing plants in the larger cities provide the larger field for compositors and master printers, but country newspapers and individual job offices present many average possibilities. The Government Printing Office in Washington, D. C., is the largest in the world; positions there are obtained by civil service examinations.

Publishing.—The various ways of presenting printed matter for the public's purchase constitute the business of publishing, and include newspapers, magazines, tracts and books. Newspapers (*see* JOURNALISM *above*) usually maintain their own printing plants, as do some periodicals; but the great majority of book publishers send out their manuscript copy to a printing establishment and bindery for printing and the other necessary processes of bookmaking. A publisher may do general work or confine his output to some special branch, such as novels, textbooks, medical or religious treatises, dictionaries, catalogues, directories or reprints. Embarking in this business, as in other fields, involves a large or small investment according to the size of the organization and method of operation.

Qualifications for a publisher embrace college training, a broad general culture, keen business acumen and special knowledge of book-production costs, advertising, merchandising, the general book market and competing firms. If the publisher is to serve also as editor-in-chief, writing and editorial experience are necessary. Establishing a general policy and a standard of merit for judging manuscripts; seeking author contacts; doing the final reading and deciding upon the acceptance of manuscripts; making printing contracts and decisions as to styles and editions; and selecting his staff are among the duties he may need to assume.

The editorial and sales departments in a publishing house are interdependent. Should the publisher desire to delegate some of his duties to an assistant, the editorial department includes a managing editor in addition to a copy editor, and a first reader (who reads every manuscript and returns those that are found to be unacceptable by reason of the publisher's established rules of merit and desirability, and standards of presentation

Photo by Alfred Eisenstaedt, courtesy Life

Capping Services, a Ceremony in the Life of a Student Nurse

After successfully completing four to six months of a probationary or preclinical period, the student nurse receives her cap. The cap serves notice to the hospital world that she is an accepted student in the nursing school. The nursing course usually lasts three years. Upon graduation the young nurse must pass state board examinations before she can be licensed or registered. In this picture the director of the Roosevelt Hospital School of Nursing, New York, is performing the capping ceremony and content). The manuscripts to be given further consideration are passed to a second and more discriminating reader, who reads, attaches criticisms and passes them on to the editor-in-chief for decision. The copy editor prepares manuscripts for the printer.

The sales department supervises the advertising and sale of their publisher's books, and confers with the editorial department in order to work out the most effective methods to apply in selling. The editorial department, having prepared the material for publication, is thoroughly familiar with it and can make suggestions for effective selling appeals.

Both these departments of a publishing house offer work for young people who are especially drawn to editorial activities or sales promotion (details of which are given under their respective headings elsewhere in this article). Profits for the owner of a well-managed publishing business are generous; the sale of books to all classes of individuals and organizations is greater than ever before.

Radio.—The most modern and revolutionizing form of communication, radio, though it does not compete with the telephone for continuous service in two-way conversations, does transmit communications that would be impossible by any other means, as from ships at sea, far-off airplanes, isolated expeditions, or other such sending and receiving stations. Radio engineering and radio operation are new fields of activity closely related to work for telephone and telegraph companies.

Radio broadcasting as distinct from radio communication has created many new phases of work—professional and nonprofessional, creative and manual. As every form of entertainment and amusement that can be produced by sound is in demand for radio programs, and as this branch of entertainment is highly commercial, radio broadcasting offers rich rewards to writers, readers, speakers, singers, poets, dramatists, musicians, dancers, actors, comedians and lecturers. In addition, the mechanical details of broadcasting have presented many new activities for radio engineers, electricians, mechanicians and managerial experts.

In the United States the air is allotted in different wave lengths by governmental permits to companies that establish broadcasting stations. The stations sell the use of broadcasting facilities for a stated period (usually 15 minutes) to advertisers or to others who wish to broadcast, and provide a studio for the presentation of the planned program, whether for a single address, a play, a full orchestra concert or an opera. An advertiser, known as the *sponsor,* usually arranges through an agency for performers to present a series of appearances or programs that may be given weekly, daily or oftener, extending through many weeks. Broadcasting chains have regular bureaus of entertainment talent like theatrical booking agencies.

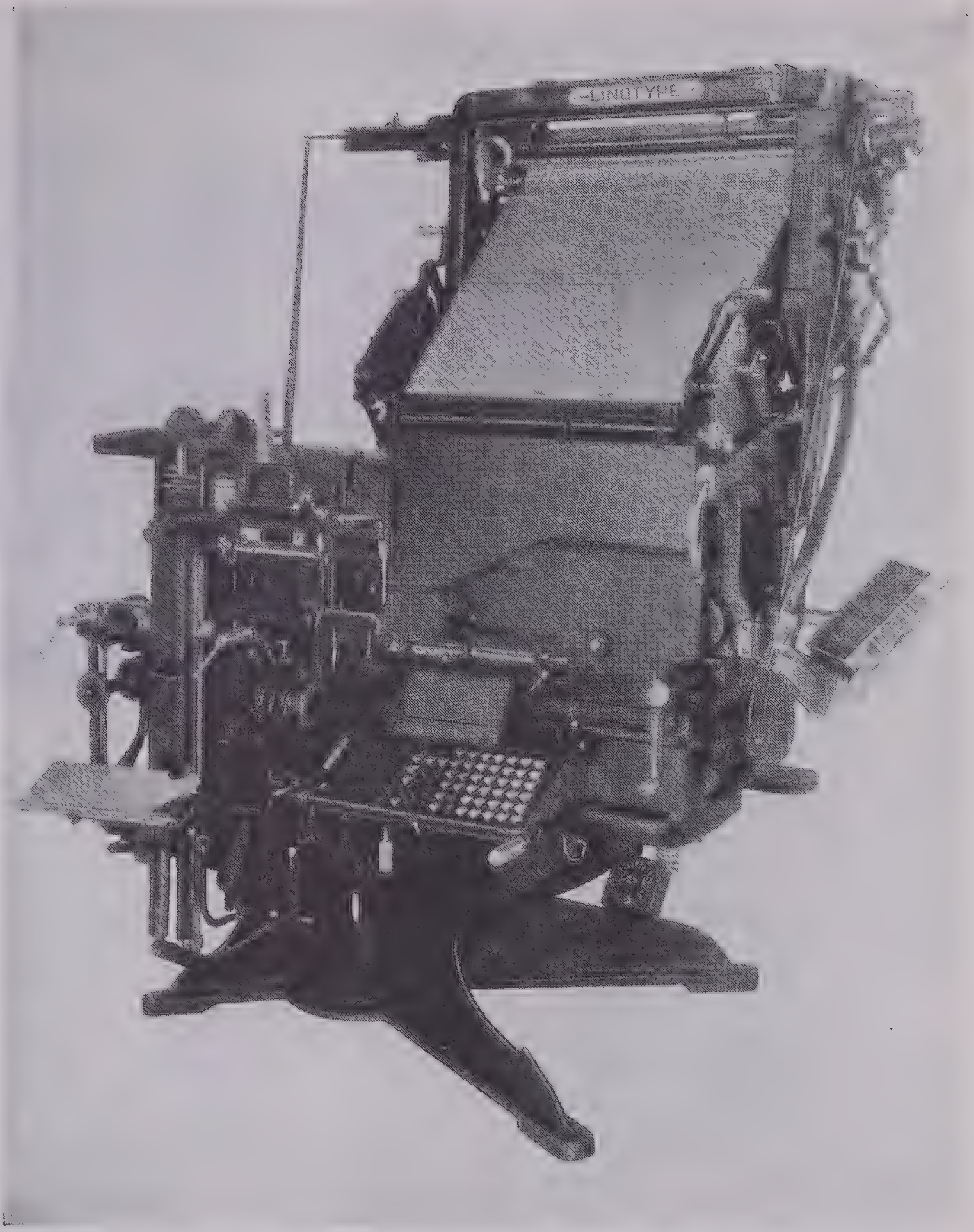
A prospective radio entertainer seeks an engagement from a broadcasting station or chain of stations or from the advertising agency that handles the radio broadcasting of different clients. The entertainer submits a script or an outline and subsequently obtains a direct personal interview. As in other phases of entertainment and publication, the best-known popular artists and writers are most in demand at the highest rate of pay; but there are opportunities for previously unknown and inexperienced aspirants with original ideas, unheard singers and actors with little stage experience.

The requirements of radio writing are peculiar. An unseen audience must be impressed quickly. Action of varied length and scene must be packed into a short time and settings must be imagined as they cannot be seen. New schools for various forms of radio writing—descriptive, persuasive, narrative, dialogue and drama—have drawn many students who, for a moderate fee, are taught the essential technical details of radio work. In addition to entertainers, there are news reporters, commentators and the announcers who are daily and nightly features on the air, and each speaker reads into the microphone from a script written by himself or someone else.

Qualifications for creative radio work include imagination and good education; and for the speaker, excellent enunciation and diction, a carrying voice, self-confidence, enthusiasm and showmanship.

Real Estate.—The transfer of houses and lands from one owner to another now constitutes one of the most extensive, well-organized, and wealth-producing business activities in America —*real estate.* Its various ramifications include farm and country, beach and camp, and mining and industrial properties; the subdivision of large tracts into building lots and their sale for new development in suburban areas; and already improved suburban and city properties, both residential and business.

The varied features that attract young men and women to consider this field as a permanent occupation in-



Printing: The Complex Mechanism of a Linotype Machine

Courtesy National Broadcasting Company

Radio Engineer at the Master Control Board

The nerve center of the Radio City broadcasting studios is the 27-foot-long master-control board with its 3,700 lights and keys. Every program, no matter where it originates, goes through this desk to be put on the air. The engineer can tell from the lights whether a studio has a program on the air, is being used for rehearsal or is idle and can even tell what microphone is being used. The radio engineer hooks up and disconnects studios, handles the telephone circuit for the networks and sees that a program from any point is sent through telephone circuits to the local transmitting station to be broadcast

clude wide contacts, stimulating competition and pioneering work in bringing new sections under development. As a real-estate salesman you should possess, in addition to qualifications for general salesmanship (*see* SALESMANSHIP *below*), some that are particularly applicable to selling real estate. As you must spend more time with your client than is the case in most other selling businesses, you should be tactful and interesting, understanding thoroughly the temperaments and interests of various types. You must possess an excellent memory, for you will have to produce from it facts and figures concerning numerous pieces of property.

A thorough course in salesmanship is the proper preparation before entering a real-estate firm. It should be supplemented with special study of the particular problems connected with property transfers. Beginning in a large real-estate office where thorough grounding in all departments may be gained furnishes an opportunity to decide on which department to specialize.

The owner or manager of a real-estate firm should be able to select good salesmen and to conduct his business so as to attract the best type of owners and purchasers. Vision as to the future of localities where he acquires property for subdivision, and ability to buy and sell at the right moment are requisite. Moderate investment often brings high returns; though losses sometimes occur after boom operations, the element of chance in steady real-estate operations is not ordinarily great.

A new and steady market for real estate is sometimes created by changed conditions; for example, the exodus of farmers from small, worn-out farms and their resale to city people for summer homes; and the building of railroads and highways through sections previously isolated from communication, as in parts of the West and South. Mild climate is a large factor in the activity in real estate in the South; and the adaptability of certain localities to winter or summer sports helps promote real estate. Bad labor conditions or insufficient facilities for transportation or power may cause the relocation of industrial plants and raise real-estate values in the newly occupied areas. Real-estate dealers, therefore, must watch for new trends and be ahead of any general movement toward a place in order to acquire properties for profitable resale.

Retail Selling.—There are a million and a half retail stores in the United States—one to each 20 families, or 87 people. One out of every eight employed persons is engaged in the retail business. These figures show the wide opportunities for careers in retailing, especially when it is remembered that there is more to the business than the actual selling itself. The customer in the modern department store sees only the salespeople, but behind the scenes are buyers, managers, advertising experts and other specialists, all concerned directly or indirectly with the same task—providing the public with the goods it needs.

If you want a department store career there is one basic thing to keep in mind: retail selling is an extremely personal thing, built on human relationships and governed by the laws of human psychology. To do an efficient job in a retail store you must know people and must like to deal directly with them. The shy, self-centered person who does not care for human contacts has no place in retailing.

No matter which of the store's departments you wish to enter, the best beginning is to get experience as a salesman. Here you will learn the psychology of selling; the public's response to selling methods; the best ways of helping and guiding people in making their purchases. You cannot later become a buyer, or write store advertising, unless you know how and why people buy.

When you go to a department store to ask for a job you will be interviewed by a personnel manager; and here, by the way, is another specialized occupation in which you may be interested. While he talks to you the personnel manager is forming an opinion about you on a number of points. He wants to be satisfied as to your health, for store work is physically wearing. He listens carefully to your voice and manner of speech, for you must make a good impression on customers; for the same reason he is estimating your general appearance, personality and manners. He wants to know also whether you are dependable, honest, likely to coöperate, and whether you have initiative enough to do things without waiting to be told to do them.

One very important point on which you are judged is whether you have an alert mind, for retail selling nowadays is not a matter of pushing merchandise across the counter and making change. A machine could do that. Retail stores want people who are willing to learn selling methods; people who have the store's interests at heart; people intelligent enough to be tactful in contacts with the public. The modern salesman can never say "I don't know" to any question of a customer. He must learn a great deal about materials and methods of manufacture, so that he can point out the advantages of the goods he sells, and show what makes the differences between grades of merchandise. He must, besides, be able to adjust his selling method to the needs and character of the individual customer. These things require study and application; if you are not willing to make the effort you cannot hope to rise from the ranks in a department store, or compete successfully as owner of a small shop.

Once you have become a good salesman you are ready to choose the branch of retailing in which you want to make a career. Perhaps you enjoy dealing directly with the customers; in that case you will want to become a floor executive or department manager. You may become expert in judging goods and workmanship, and have a feeling for fashions. If so you may become a buyer. You will want to go into the advertising department if you have the knack of selling with words.

Large stores often maintain research departments for testing the ingredients and wearing qualities of the goods offered for sale. If you have scientific training and a flair for publicizing your findings, that may be the place for you. Young people with artistic abilities may find a variety of things to do in a department store. There are drawings to be made for advertisements and counter displays. Windows must be trimmed, and plans made for displaying merchandise effectively on the counters.

There is no limit to the opportunities in retailing, but no young person will win advancement if he regards selling as merely a "fill-in" job while waiting for promotion.

Salesmanship.—The necessary personal qualifications for salesmanship are perseverance, cheerfulness, persuasiveness and a liking for people. A good salesman must understand how to approach and deal with all kinds of people, must know individual psychology and must be able to win a hearing by straightforwardness rather than by strategy. Occasionally there may be a natural salesman with the instinct or unconscious wit to apply the principles of psychology without realizing it, but modern business experience has proved that in most cases the successful salesman is a product of careful training and hard work.

Preparation may be made through a special school or college course in salesmanship. Many firms that depend upon salesmen for success in marketing their product give them an intensive training that includes lectures and a course in required reading and is aimed to give them a full knowledge of the commodity and supplement ability to stress the best points and principal uses, so that there will be a direct appeal to the customer. The salesman should acquire also a knowledge of various phases of commercial law and of credit.

Salesmanship presents a field of ample possibilities. It probably is the most extensive commercial activity; all industry and the whole mercantile world are quite dependent upon it. Because this is true and because selling principles may be applied in any field, an efficient salesman is not necessarily confined to any particular type of business or locality and may change either or both if conditions make it seem advantageous. Salesmanship is an art in which the advanced study of the principles of selling may bring large financial returns. It calls for loyalty, ability to analyze one's mistakes and correct them and the willingness to profit by criticism.

In few other vocations is remuneration based so definitely on ability. Some salesmen receive a straight salary, others a stated salary plus commissions, and some are paid only commissions on sales. The young person who rises high as a salesman has before him the further objective of a sales manager's position, which offers work of a wide scope and interest.

Manufacturers of every commodity from pins to automobiles require the services of salesmen; so also do insurance and advertising companies, schools and colleges, book and periodical publishers, and producers of every other commodity and service.

Scientific Research.—The maintenance of public health, the advancement of technology and the discovery of new truths are the three main objects of scientific research. The chief fascination of a scientist's work lies in the third of these phases, and our century differs from all others chiefly because so many discoveries have been made through research.

If you select this field you must have a distinctly scientific type of mind with determination, patience and the persistence to pursue to the utmost all the possibilities of a scientific problem. Preparation should include college training in the specialized scientific field in which your research is to be undertaken—archeology, biology, chemistry, medicine, psychology and so on—and special instruction in modern research methods and facilities.

Once a new substance, principle or technique has been created or demonstrated, the question of practical utilization looms large. Few men can afford to engage in scientific research for its own sake; therefore most laboratory workers are employed at a modest salary by an institution; but they find intense personal satisfaction in their work.

If the scientific research worker can put his discovery or creation into a form that will fill a popular need, and if he can protect, manufacture, and market it himself, he is practically certain of financial success. Many individuals, however, who make highly valuable discoveries in scientific research, reap no special rewards from their findings, since they work for organizations that require them to contract that all their discoveries or inventions shall be the exclusive property of the company.

Opportunities in the laboratories of universities, medical schools, museums, societies, expeditions, industrial plants and a few private institutions are available to scientific research workers.

Secretarial Work.—The work of a secretary ordinarily includes more responsibility than that of a stenographer. In most instances, the secretary is thoroughly informed as to the requirements of the executive's work and is responsible for seeing that details of its execution are not delayed or overlooked. Some details of the work are usually assumed by the secretary, and in the employer's absence the secretary handles a great many of his business affairs or arranges to have them deferred until his return.

A good general education, adaptability and mental alertness are among the first requisites. Other essential characteristics include ability to master details, to absorb facts, policies and methods and to carry out suggestions and instructions faithfully, eagerness to grapple with new problems, discretion and quick understanding. To be of the greatest value, a secretary should have a thorough knowledge of English grammar and composition. A secretary able to handle routine correspondence without dictation commands a better salary.

Two things to which a good secretary must give constant study and attention are: the various exacting details of the position itself; and, equally important, the human factor —dealing tactfully with many people, often under difficult conditions.

Business and professional secretaryships are more readily available to women than to men, but the work offers an interesting and fairly remunerative occupation for either if well equipped by temperament and training, and it is often the first step toward higher and better-paid posts.

Many schools offer courses in secretarial work, and such preparation is most helpful; but when one's general education is broad enough, the additional course in stenography and typewriting will often be sufficient preparation, since quickness to assimilate routine enables one to gain much of the detail taught in secretarial courses. Many secretaries start as stenographers and advance to the more responsible post. Every conceivable business or profession offers opportunities in this field, and promotion is often rapid.

Social Service.—Social betterment and industrial progress for underprivileged classes are the principal objectives of social service, and these activities have increased very decidedly in the last quarter-century. A wider public interest in the aims of social service has been aroused, greater funds have been placed at the disposal of social-service organizations, regular courses of study in the work have been developed, and a larger number of social-service workers well equipped for real accomplishment have entered this field.

The center from which this work is ordinarily carried on and in which many community activities are conducted is the social settlement. The workers, both men and women, live in the houses of the social-settlement community in order to come into daily contact with the conditions they wish to study and improve.

The various activities of social service as it touches the life of the community and of the individual may be inferred from the fact that a well-planned social settlement has physical, social, educational, religious, philanthropic, and esthetic departments.

If you plan to enter social service, you should have a broad social outlook and should make a thorough study of sociology and psychology, motherhood and child training, nutrition and dietetics, first aid and physical care. Training should include phases of the drama, the dance, music and art to be employed as means of social betterment for the underprivileged. A course in a school of training for social service is advisable but not indispensable. The remuneration for the work is now generally adequate; formerly the work was undertaken gratis mostly by those who had independent incomes.

In localities where no regular social settlement is maintained, sometimes the district nurse or a private philanthropist carries on social-service activities, but the best place to seek occupation as a social-service worker is in a settlement in a large city or in hospitals, churches and charitable organizations.

Statistics.—Gathering related facts, figures and instances concerning a given subject for the express purpose of drawing conclusions in the form of general truths, is called statistical work, and statistics means the actual data.

The statistician is far more than merely a compiler of facts and figures. The most important part of his work begins after he has collected the data, for only then can he properly classify and relate them, interpret, draw deductions, establish conclusions and thus reach general truths that may be of great importance in the particular field in which he is working.

To become a successful statistician, you must possess a keenly analytical and logical mind and must have thorough training in mathematics and statistical methods as well as in the specialized field in which you will work. In addition, you must understand how to construct exact and accurate charts, graphs and tables that will aid in the presentation of your report. The tabular matter is accompanied by a text explaining the deductions, conclusions and summaries. Statistical report writing is one of the most difficult of all forms of composition.

The statistician plays an important role in scientific and commercial research and is well paid for his services. The activities of most large business and industrial corporations offer opportunities for such work, as many of them maintain statistical departments. Insurance companies, banks and other institutions dealing in investments have specialized statistical departments. The United States Census Bureau, other Federal departments and various magazines that publish statistics provide further avenues of employment.

Teaching.—If you consider teaching as a career, you will find that patience, understanding, sympathy, kindliness combined with firmness, a definite ability to hold the students' interest and a real enjoyment of knowledge for its own sake are the most important qualifications to cultivate.

A good teacher thinks constantly in terms of the future as well as the present. The skilled kindergartner, for instance, considers her task not merely as guiding a group of small children for a certain number of hours a day, but as an opportunity to aid them at that very impressionable age in such a way that their future may be better for her expert aid. In brief the well-trained teacher, in whatever grade or institution, sees that the main task is to prepare students to become valuable members of society.

Almost everywhere today those who would enter the teaching profession must possess exceptional mental equipment. The necessary preparation includes a normal school education, which must be continually supplemented by further study. The states now prescribe minimum qualifications by stipulating that teachers must be educated in state teachers' colleges (which are maintained at public expense), or in professional departments of colleges and universities, after which they must often serve a year's apprenticeship at teaching. In some isolated communities, a high school graduate may secure appointment, after examination, to teach a rural school; but most states require normal school training.

The opportunities for teachers are multiplied by the institutions of learning already mentioned, by extension and evening classes, technical, summer, manual training and commercial schools, secretarial, business, trade and normal schools and tutoring in private homes. When you consider the great variety of subjects from which you may select your specialty as a teacher, you realize what a wide choice lies before you.

Courtesy Los Angeles City School Report, 1937

Teaching: A Career Requiring Patience, Understanding, Interest in the Individual

Transportation Services.—Carrying commodities or people from one place to another by railroad, bus, automobile, steamship, airplane, dirigible or any other vehicle is termed transportation. Modern transportation includes a vast network of facilities extending all over the world, involving thousands of miles of railways, highways, waterways and air routes. Over these, goods worth billions of dollars and millions of people are carried to hundreds of thousands of communities.

The qualifications for this sort of work are as various as the types of tasks in transportation. In any case they include accuracy and good judgment. For those whose contact is directly with the public, courtesy and an attitude that will encourage patronage and good will are needed; and, for the high official, broad vision is requisite. A good education and a thorough business course vastly improve possibilities of promotion and aid one to reach a position where the financial returns are excellent.

Preparation varies somewhat according to the particular field selected, or the specialty chosen in any field. For a high career in transportation, it should include a comprehensive and specialized business course with emphasis on the relations between production, transportation and prices and a study of the comparison of rates for transporting goods in various ways and by various routes. Other important topics are: trade factors, influences and channels; advantages of location with respect to transportation facilities; transportation terminals and their problems; problems of competition between different kinds of transportation, both passenger and freight; and matters relative to classes of employees, salaries and wages in transportation circles. Effective advertising for transportation companies and personnel management in special relation to transportation employees are other subjects for the transportation expert to digest.

It is evident, then, that the great systems of transportation offer opportunities almost unlimited in extent and variety; and for the individual who makes the most of his opportunities there may be not only financial independence but affluence. In transportation you have before you an expanding field, and one that challenges the progressive mind to constant search for improved methods, means and equipment, and new ways of rendering better service to a world-wide public that is constantly increasing its transportation needs.

AVIATION.—There are many opportunities for careers in aviation. Air travel increases each year, partly because of popular interest and confidence; partly because engineers and research men have found ways of extending the usefulness of flying.

Most young men with an eye to a

Newark Airport, New Jersey

Transportation: "Traffic Cops" of the Airport

By radio the men in the control tower send off the large passenger planes on the minute, keep the incoming pilots informed when and where they can ground

career in aviation probably think first of piloting, but there is no shortage of trained flyers. In fact, commercial air lines employ as pilots only graduates of the army and navy flying schools. Such men are superbly trained, and when they leave the army service are experienced in handling big ships of the types now used by the air lines. Radio men, too, are often graduates of the service schools, although many are civilians.

Most of the opportunities in aviation, therefore, lie in the scientific, engineering, construction, traffic, mechanical and secretarial activities. The larger universities now train meteorologists, who are invaluable to the men who pilot the big ships. Accurate information as to weather conditions to be met by each ship throughout its course is essential to the safety of plane, passenger and cargo. Every airport and airplane company has its meteorological staff.

Engineers and draftsmen are in demand. The men who design and build airplanes are graduates of engineering schools that give courses in aeronautical engineering, now a highly specialized subject. There is a surprisingly large number of women doing such work.

Engineers interested in research may work on the development of new planes, in the laboratories maintained both by transport lines and construction companies. There is constant experimentation with radio apparatus and with instruments that permit safe piloting even under the most adverse weather conditions.

Traffic, the handling of the schedules and supervision of flying routes, is interesting work for those who want a career in aviation but who are better equipped as executives than as pilots or engineers.

Welders, riggers, riveters, sheet metal workers, workers with precision instruments and other skilled mechanics are wanted by airplane shops throughout the United States. The intelligent graduate of a high school, technical school or college giving mechanical or craftsmanship training, can start as an apprentice in the machine shops and work up to a master mechanic's place.

There are fewer jobs in aviation for women than for men. The most sought after post is that of hostess on one of the transport liners. To qualify, a girl must be a graduate nurse under 25 years of age, must be not over 5 feet 5 inches tall and weigh no more than 125 pounds. There are also hostesses at the airports themselves, but most of them are women flyers well known in aviation. At present there are no women actually piloting transport planes. The huge offices maintained by air lines and manufacturers offer many opportunities to men and women clerks, bookkeepers, stenographers and secretaries.

MOTOR TRANSPORTATION.—Vast strides in the commercial importance of trucking as a means of freight transportation date back only as recently as 1936. The tremendous increases in the number of trucks seen on the highways and in the cargo value transported during the last few years supply us with true indications that trucking is one of the major fields to which those interested in advertising, promotion and other commercial careers may look for really profitable futures.

The increase in the number of well-paved, well-mapped and well-marked transcontinental highways is one of the chief contributing factors to the speed, efficiency and safety of freight transportation by trucks. As speed and safety increase, the number of cargo tons greatly increases, and there is an increasing demand for salesmen equipped to sell service rather than any tangible product of agriculture or industry.

When trucking first came to the attention of the public as a freight transportation medium, it could scarcely have been called an industry because of its loose organization. Operators with enough money to make down payments on trucks bought them and hired drivers while they looked for markets that would warrant an increase in the number of cars they put on the road. Then profits multiplied so rapidly that nearly overnight the need for specialization in personnel developed.

The driver of a transcontinental truck does not need or have the special skill and training that the engineer of a crack railroad express train does, but he must have a special alertness for the problems and contingencies of the road. And so the personnel manager and the terminal superintendent must also be specially equipped and able to recognize qualities in men who may have had no previous experience and who have had little education by which the personnel manager may be guided in his choice.

Trucking organizations now maintain such large office headquarters that they offer new opportunities for women office workers looking forward to executive jobs.

Writing.—Civilization and culture probably owe more to the profession of writing than to any other, since without writers and their output (vastly increased by printing), the whole process of education would be handicapped, slow and difficult; so writing has always stood high among the learned professions.

This field offers diverse and interesting avenues for those of both average and more abundant endowments, as well as for those of almost directly opposed capabilities—for both analytical and synthetic methods are employable, fanciful and factual materials are equally in demand, routine, as well as dramatic, treatment has its place, and both commonplace and esthetic needs must be served.

Any writer needs all the education he can acquire, in and out of college and in many varieties of experience and phases of life, for his knowledge and culture will control the quality and range of his work in content and taste, in presentation and treatment.

As with music and art, if you are to make writing a career, you must have at least some native talent for this form of expression—artistry with words, ability to convey thought clearly, interestingly and easily. As a creative writer, whether of fiction, poetry or drama, you must be discerning, highly imaginative, emotionally sensitive and capable of constructing a plot, delineating character and entering into the feelings of those portrayed. Though the descriptive, discursive or critical writer need not possess all these qualities, he must be discerning, reasoning, accurate, analytical, interesting, informative and able to paint vivid word pictures. If you contemplate a career in any branch of writing, you should consider: First, your native ability to express thought effectively in any given style, your affinity for a particular kind of writing and the opportunities and rewards to be expected from that branch of work. Further, you must take into consideration the training required—for in the majority of cases a special course in writing or experience gained in the more easily available writing posts is necessary to success.

Though it is not essential, a college education, especially one that includes emphasis upon languages, rhetoric, diction and literature, gives a most desirable groundwork for writing. The technique or mechanics of any phase of such work may be learned at a school of creative writing. There are special schools for journalistic work, the essay, the short story and novel, scenario writing for the screen and writing radio scripts (the manuscript from which the radio speaker reads his part). For news and other material newspapers pay space rates (so much a column) and lump sums for special features. Magazines pay by the word for articles and specified amounts for stories. Book publishers pay royalties—that is, a certain percentage of the price of each copy sold and will only assume the expense of publishing those manuscripts that they think show promise of ready sale.

Among opportunities for the young writer are newspaper reporting or comment on sports, fashion, cookery or current events; articles on timely topics, magazine feature or personality articles and short stories; and advertising or publicity work, which is often well paid and is valuable training for more creative writing. In the field of more permanent work, the especially talented, well-trained or experienced writer may turn to such forms as the novel, the drama and verse; or to such descriptive writing as biography or history, discursive writing on scientific, philosophic or religious subjects, or criticisms of art, music, literature, the theater, motion pictures, government and politics. Each of these calls for knowledge of its special field, as well as the ability to say arresting or provocative things entertainingly.

Every phase of writing offers fair opportunity to writers with originality and ideas that they express well. There are so many good writers nowadays that mediocre ones have very little chance.

BIBLIOGRAPHY

Education

W. E. Bain, *Parents Look at Modern Education,* Appleton-Century, N.Y., 1935, $2.50

Paul H. Hanus, *Adventuring in Education,* Harvard Univ. Press, Mass., 1937, $2.00

W. B. Pitkin, *How We Learn,* McGraw-Hill, N.Y., 1931, 92¢

W. B. Pitkin, Newton and Langham, *Learning How to Learn,* McGraw-Hill, N.Y., 1935, 92¢

D. B. Leary, *Living and Learning,* Farrar & Rinehart, N.Y., 1931, $2.25

Psychology

H. A. Overstreet, *About Ourselves,* W. W. Norton, N.Y., 1927, $3.00

E. D. Martin, *Psychology,* Appleton-Century, N.Y., 1930, $2.25

F. L. Ruch, *Psychology and Life,* Scott, Foresman, N.Y., 1937, $2.75

H. E. Garrett, *Great Experiments in Psychology,* Appleton-Century, N. Y., 1930, $2.50

K. A. Menninger, *The Human Mind,* Knopf, N.Y., 1937, $3.50

Alfred Adler, *Understanding Human Nature,* Garden City Pub. Co., Garden City, N.Y., $1.00

Starch, Stanton and Koerth, *Controlling Human Behavior,* Macmillan, N.Y., 1936, $2.90

J. B. Watson, *Behaviorism,* Norton, N.Y., 1925, $3.00

Edgar J. Swift, *Psychology of Childhood,* Appleton-Century, N.Y., 1930, $2.25

A. T. Jersild, *Child Psychology,* Prentice-Hall, N.Y., 1933, $3.00

Wm. T. Hornaday, *Minds and Manners of Wild Animals,* Scribners, N.Y., 1923, $2.50

Munn, *Animal Psychology (An Introduction),* Houghton Mifflin, Boston, 1933, $3.25

P. S. Achilles, *Psychology at Work,* McGraw-Hill, N.Y., 1932, $1.00

L. F. Shaffer, *Psychology of Adjustment,* Houghton Mifflin, Boston, 1936, $3.00

Jean Shepard, *Human Nature at Work,* Harpers, N.Y., 1938, $2.50

Henry C. Link, *The New Psychology of Selling and Advertising,* Macmillan, N.Y., 1932, $3.00

J. G. Jenkins, *Psychology in Business and Industry,* John Wiley & Sons, N.Y., 1935, $2.50

Donald Laird, *How to Use Psychology in Business,* McGraw-Hill, N.Y., 1936, $4.00

S. L. Pressey, *Psychology and the New Education,* Harpers, N.Y., 1933, $2.75

D. B. Lucas and C. E. Benson, *Psychology for Advertisers,* Harpers, 1930, $3.50

History of Education

G. H. Palmer, *Alice Freeman Palmer,* Houghton Mifflin, Boston, 1924, $2.25

E. I. F. Williams, *Horace Mann (Educational Statesman),* Macmillan, N.Y., 1937, $2.00

Thomas Woody, *Educational Views of Benjamin Franklin,* McGraw-Hill, N.Y., 1931, $1.50

C. F. Arrowood, *Thomas Jefferson and Education in a Republic,* McGraw-Hill, N.Y., 1930, $1.50

W. B. Curry, *Education in a Changing World,* Norton, N.Y., 1935, $2.00; McLeod, 1935, $2.50

Caldwell and Courtis, *Then and Now in Education,* World Book Co., Yonkers, N.Y., 1923, $2.20

W. Goodsell, *Pioneers of Women's Education in the U.S.,* McGraw-Hill, N.Y., 1931, $1.50

E. A. Irwin and L. A. Marks, *Fitting the School to the Child,* Macmillan, N.Y., 1924, $2.00

Vocations

Rita Halle, *Which College,* Macmillan, N.Y., 1934 (2d rev. edit.), $2.50

L. W. Smith and G. L. Blough, *Planning a Career,* American Book Co., N.Y., 1936, $1.60

Harry D. Kitson, *How to Find the Right Vocation,* Harpers, N.Y., 1929, $2.50

W. B. Pitkin, *New Careers for Youth,* Simon & Schuster, N.Y., 1934, $1.50

Joseph Cottler and H. W. Brecht, *Careers Ahead,* Little, Brown, Boston, 1935, $1.25

Edw. L. Bernays, *Outline of Careers,* Doubleday-Doran, Garden City, N.Y., 1927, $5.00

R. Babson, *New Ways to Make Money,* Harpers, N.Y., 1930, $2.50

Earl Lockhart, *My Vocation,* Wilson, N.Y., 1938, $2.50

H. W. Hepner, *Finding Yourself in Your Work,* Appleton-Century, N.Y., 1937, $2.75

Iona M. R. Logie, *Careers in the Making,* Harpers, N.Y., 1938, $1.50

R. P. Gallagher, *Courses and Careers,* Harpers, N.Y., 1930, $1.40

M. B. Wade, *Pilgrims of Today,* Little, Brown, Boston, 1916, $1.65

H. R. Cades, *Jobs for Girls,* Harcourt, Brace, N.Y., 1930, $2.00

Adah Peirce, *Vocations for Women,* Macmillan, N.Y., 1934, $2.00

Helen Ferris and Virginia Moore, *Girls Who Did,* E. P. Dutton, N.Y., 1927, $2.00

Catherine Filene, *Careers for Women,* Houghton Mifflin, Boston, 1926, $2.00

F. Maule, *She Strives to Conquer,* Funk & Wagnalls, N.Y., 1934, $2.00

R. L. Cooley, *My Life Work,* McGraw-Hill, N.Y., 1930: office and store trades, $1.50; building and metal trades, $1.75; printing and servicing, $1.50; representative industries, $1.75

Baker, Kennedy and Malott, *On Going Into Business,* McGraw-Hill, N.Y., 1936, $2.00

L. M. Klinefelter, *Electrical Occupations,* E. P. Dutton, N.Y., 1937, $2.00

E. E. Calkins, *The Advertising Man,* Scribners, N.Y., 1922, $1.25

J. H. Hammond, *The Engineer,* Scribners, N.Y., 1924, $1.25

T. Williams, *The Newspaper Man,* Scribners, N.Y., 1922, $1.25

C. L. Slattery, *The Ministry,* Scribners, N.Y., 1921, $1.25

J. M. T. Finney, *The Physician,* Scribners, N.Y., 1923, $1.25

Irene Kuhn, *Assigned to Adventure,* Lippincott, Phila., 1938, $3.00

Victor Heiser, *An American Doctor's Odyssey,* Norton, N.Y., 1936, $3.50

Katherine Fowler, *The Gold Missus,* Norton; N.Y., 1938, $3.00

Robert Van Gelder, *Front Page Story,* Dodd, Mead, N.Y., 1937, $2.00

Sara Pennoyer, *Polly Tucker, Merchant,* Dodd, Mead, N.Y., 1937, $2.00

Thomas H. Uzzell, *Writing as a Career,* Harcourt, Brace, N.Y., 1938, $2.00

Brenda Ueland, *If You Want to Write,* Minton Balch, N.Y., 1938, $1.75

· *Book* · *II* ·

KINDERGARTEN

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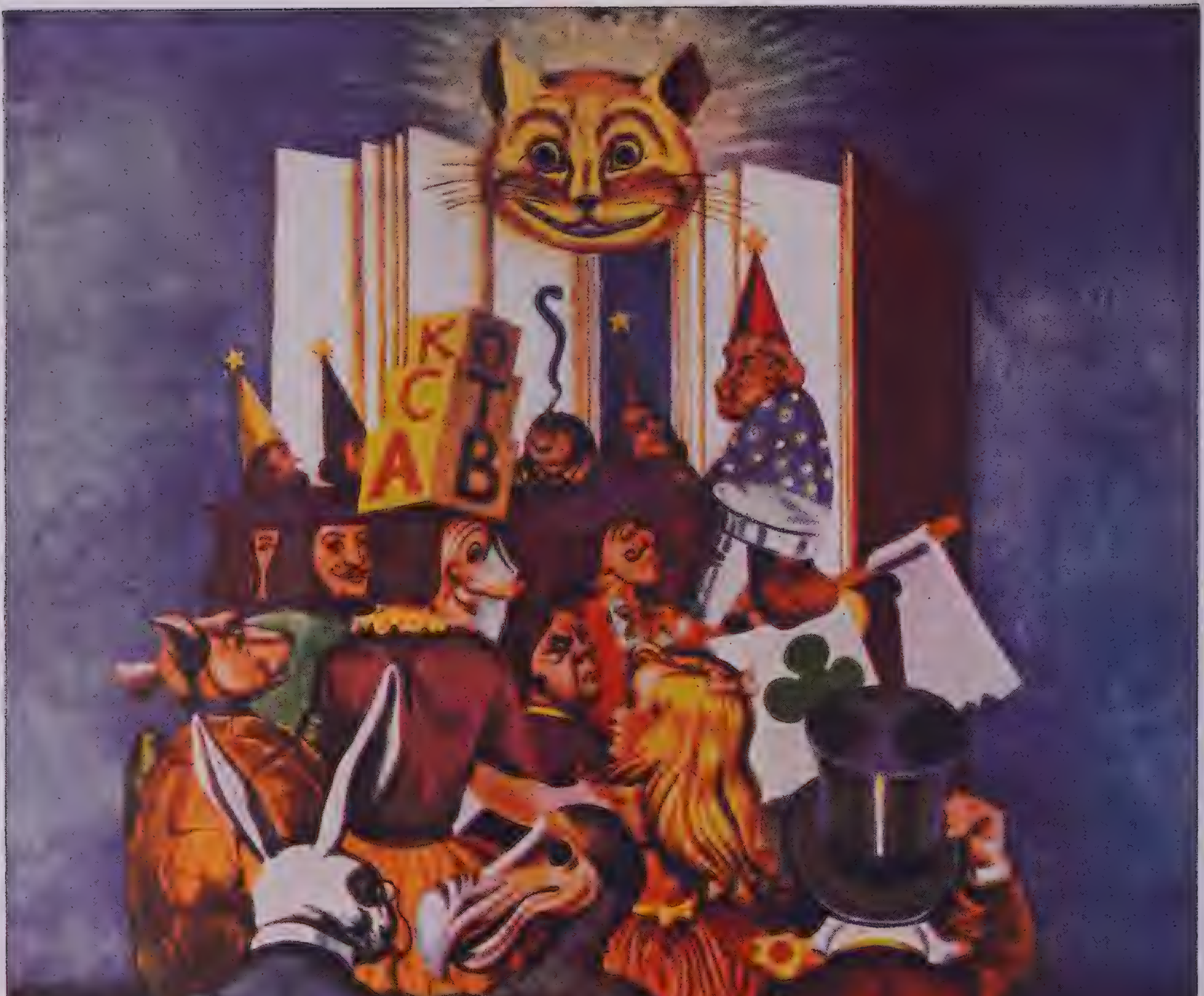


From a mural painting by Abram Shampanier for Gouverneur Hospital, New York, executed under the auspices of the WPA Federal Art Project

Storybook People

The Cheshire Cat of *Alice in Wonderland* grins down over the storybook people trooping toward their homes within the pages of books. Among them can be seen the White Rabbit, the Dodo, the Mad Hatter, the Mock Turtle, the Red Queen and her Headsman—and Alice. In the background are Father William, the card characters and a number of fairy-tale people

BOOK II: KINDERGARTEN

MODERN KINDERGARTEN METHODS

THE MODERN kindergarten is an active, busy place. It is a small community planned for children, and in this community the children learn to live happily and constructively together. Parents often ask, "Is it essential that I send my four- or five-year-old child to kindergarten? What does he learn in kindergarten? Wouldn't it be just as well to wait another year or two and send him to first grade? How shall I tell a good kindergarten from a poor one?"

A DAY IN A KINDERGARTEN

Equipment of a Kindergarten.—The answer to all these questions lies in a visit to a well-planned, well-organized, progressive kindergarten. One day spent in such a situation will show most clearly some of the things that children learn and what kindergarten experience may do for them. As we watch the children at play, it is well to keep one outstanding thought in mind: Society today is organized in a way that makes it absolutely essential that people should live and work together. All the activities of the kindergarten are planned with this in mind. Four- or five-year-old children are individual rather than social, and we must give them an opportunity to be individuals; but they must also begin to learn their relationship to other people. In the home the child does not have as many opportunities for this as he does when he is playing with a group of children of his own age. The kindergarten teacher is trained in child psychology, and knows how to direct children's activities so that they will be educational and worth while.

We enter the kindergarten room before the children arrive. It does, indeed, seem to be a place planned for children. It is bright, sunny, attractive. There are small tables and chairs, a large sandbox, a piano. There are various arrangements of climbing bars and ladders, much provision for activity, for five-year-old children must be active. There is a workbench with tools; there are cupboards with materials; there are shelves filled with large wooden blocks. One corner is arranged as a play corner with doll furniture, a doll carriage and dolls. A bookcase is well filled with attractive picture books and storybooks.

The Day Begins.—Now the children are coming in. They have taken off their wraps in an adjoining cloakroom. Not all the children arrive at once. The first comer remarks joyfully, "I got here first!" He goes over and begins to climb on the "jungle gym." This little boy lives in an apartment where he cannot have a great deal of physical activity, and climbing and hanging on the bars of the jungle gym gives him much-needed exercise. More children are coming in. They all find something to do, for this first period is one in which every child is free to choose his own activity. Some begin to play with blocks; others go to the workbench with an air of great purpose; some use materials at the tables; a group is playing in the play corner. After they are well established, let us see what is happening.

A group of boys is playing with blocks. They are making a railroad station and tracks. A toy train runs on the tracks. Their talk is very interesting. It shows that they are doing good clear thinking as they work.

"The station must have a platform."

"I'm going to make a signal."

"Let's have a switch here."

"I'll build a tunnel."

The teacher comes over to see what they are doing. She talks with them, perhaps giving a suggestion or getting suggestions from them to make the play more valuable.

Over in the play corner, there seems to be a good deal of trouble. The children have organized a "family." They are cooking imaginary meals on the toy stove, serving them at the little table. The trouble is made by one member of the family whose behavior at table does not meet with the approval of the others. The teacher watches for a while to see if the children can settle it themselves. The dispute continues, so she gives a suggestion which helps the play to continue in a more organized way.

In another part of the room several children are playing "airport." They have made small wooden airplanes and have outlined a landing field on the floor with blocks, building several hangars. Now they "fly" around the room with the airplanes held high above their heads. They go very close to the group who are playing house. Soon the members of the "family" in the house complain that the airplanes are flying too close to them, and making too much noise. The teacher calls the airport group together and discusses with them the fact that airplanes are not allowed to fly low over houses and annoy the people who live in them. The children are very much interested, and when they go back to their play there are no more complaints from the "family." Two airplanes, however, try to land in the same space on the landing field and there is some confusion. This leads to a discussion of the care that aviators must take to avoid collisions, and of the way that airplanes land. Again the play is improved.

At the workbench, a number of children are carrying out some very interesting plans of their own. They saw and hammer most efficiently, occasionally needing help from the teacher, but on the whole working very independently. John is making a bridge. Peter is making a garage for his toy cars. Jean is making a doll's bed. Philip has a plan all his own: he is making a curious square object on legs—he says it is a camera. Some of the children who have finished their work at the bench have gone to another table to paint their wooden products.

In all parts of the room there is activity. The quietest place of all is at the table, where several children sit looking at picture books. At another table Mary is modeling with clay, and Hazel and Joan are drawing. They are talking to one another. We hear them making plans:

"I'm going to work with wood tomorrow," says Hazel. "I'm going to make a box for my mother."

"I'm going to make a dress for my doll."

A Formal Session.—After about an hour the teacher tells the children that it is time to put their work away. Unfinished work is put in each child's own locker or in another place provided for it. The children are most efficient in cleaning up. Some of them sweep up the sawdust around the workbench and hang up the tools. Others wash the tables that have been used for clay work. The dolls are left in good condition. Of course the teacher helps with all this, but the children are astonishingly efficient.

Now it is time for a story. The children bring chairs and sit in groups with the teacher. For a little while they talk over some of the work they have been doing. They are eager, however, to get to the story. Sometimes the teacher tells a story, but today she is going to use a picture book. It is a picture book showing life on the farm during four seasons. The children discuss it eagerly and ask many questions, some of which are answered by the teacher and some by other children.

"How does the farmer milk the cow?"

"What is a churn?"

"Why does he put corn in the silo?"

"Why do they spray the trees?"

A number of children have had interesting experiences on farms and tell about them. One little boy constantly breaks into the conversation. The teacher has to help him to wait his turn to talk.

After the story the children go to

the toilet, wash their hands, and set the table for lunch. It is a very simple lunch of orange juice or milk, with—in some cases—a cracker. It is a time that gives a great deal of opportunity for learning how to behave at the table and how to have pleasant, constructive conversation. Again one child tries to monopolize the conversation and has to be helped to see that he is only one of a group. He is an only child, and at home everyone is willing to listen to him all the time.

With young children who are so active, periods of rest are essential. Some kindergartens are fortunate in having folding cots on which children may relax. In others each child has a washable rug which he places on the floor and lies on for a period of from ten to twenty minutes. The children do not lie absolutely still, but they relax and lie there quietly.

After rest the children gather around the piano for music. They ask for favorite songs. Barbara says, "I've made up a song," and sings an original one. This is a period for singing, for listening to music, for rhythmic activity. The children skip, march, gallop, play that they are rabbits, horses, elephants. Muscles that have not previously come into play are being used as they play animals on all fours. There are many suggestions as to activities that might be tried. It is a time for free, joyous activity and for exchange of ideas.

The rest of the morning may be spent out of doors, or the children may draw, dramatize or go on an excursion. On this particular day the children are going with the teacher on a short excursion. So many of them are interested in trains that they are walking over to a place where they can see the railroad track. A freight train comes by. The children and teacher discuss it. Again one is amazed at the variety of their knowledge, the intelligence of their questions. There are other things besides information that one gains on an excursion: one has to learn how to conduct oneself in public places, observe rules for crossing the street and so forth. Now back to the kindergarten again and home for lunch.

Lessons for Life.—This, of course, is only a sample morning, and there are many things we have not seen. We have, however, seen the children learning to adjust themselves to one another, to share and take turns, to do their own planning and working out of problems, to take certain responsibilities and to recognize organization. We have seen them gaining actual information and having rich opportunities for creative work. Now it is worth while to consider in detail some of the activities that make up the kindergarten curriculum. In communities where no kindergarten is available, many of these activities may be carried on in the home.

One thing to be kept in mind is that the organization we have just been watching is one in which the children have spent several months in kindergarten. It has been built up slowly but surely under the guidance of a skilful teacher. If we were to visit on a first day, we would see a very different picture. A few children might be crying, because this first break with the home is a difficult one for them. These are the children who especially need to learn independence. These are children who have never shared playthings, so there is a good deal of quarreling and snatching. All of them have to learn to respond to organization, to follow group directions.

One thing to be kept in mind is that this is only the organization of *one* kindergarten. The essential features of the organization, however, should be that they give the child plenty of opportunity for free bodily activity, plenty of opportunity for doing his own planning and thinking. Some kindergartens of the old, formal type do not give the child enough freedom, and in these kindergartens the teacher does most of the planning.

What Constitutes a Good Kindergarten.—To summarize the essentials of a good kindergarten:

1. It must give opportunity for children to move around freely. Young children cannot sit still for long periods of time.
2. It must provide materials which will exercise the large muscles. There should be no materials that require the use of the child's smaller muscles (such as those of the fingers), as they are not sufficiently developed. Close work also causes eye strain.
3. There should be plenty of material with which the child can do creative thinking, can carry out his own ideas—material that he *enjoys* using.
4. There should be many rich experiences which will broaden the child's outlook, enrich his thinking.

The actual curriculum of the kindergarten can best be explained through a series of questions:

Does the kindergarten have a real curriculum such as is found in the rest of the school?—Decidedly. The kindergarten curriculum is informal, but it is carefully planned, and the beginnings of all the school subjects are found in it.

What is the most important part of the kindergarten curriculum?—This is difficult to determine. The most important part is perhaps all those experiences which help children to live constructively with other children. These experiences may be termed Social Study.

What does Social Study include?—It includes all the child's relationships with other children, the beginnings of civics. It also includes information about the world in which the child lives, for we cannot live constructively in a world of which we are ignorant.

From the first the child is learning to respond to organization and to help to make his own rules for organization. If children playing around the sandbox spill sand on the floor, the teacher calls a group meeting and discusses with the children what can be done about it. Instead of making a rule herself, she helps them to see why some rule is needed and gets from them suggestions as to what is to be done about the matter.

Sometimes it is a larger social problem that is approached in this way. The situation of a group of children playing "gangster" or "war" calls for serious group discussion. The teacher discusses with the children the undesirability of even playing at shooting, and tells what serious consequences have sometimes followed when children have formed the habit of playing with guns. The question of war also comes up for frank and free discussion.

The many interests of children give a great deal of opportunity for the kindergarten group to acquire valuable information. Children interested in airplanes may perhaps make an airplane of blocks or boxes; they may play airplane after their own fashion, talk with one another and with the teacher about airplanes, look at pictures of various types of aircraft, go on an excursion to see an airplane. All the things that children are most interested in appear in their play—train, boat, store, house. All of these are opportunities for rich educational experience. Social study is not to be thought of as an isolated part of the curriculum. It is a part of every activity. In the children's interests, we see the beginnings of history and geography; toy boats go "up the river to Albany"; the children compare present-day trains with "old-fashioned trains." All this is laying a sure foundation for later work.

Children seem to spend a good deal of time in kindergarten playing house, boat, train, fire engine and many other things of this sort. Is this play valuable? Is it a part of the curriculum?—It is a very valuable part of the curriculum. A great deal of the child's play is dramatic. He is constantly playing that he is someone or something else. Aside from the enjoyment that the child gets from dramatic play, the play has a distinct educational value. It is the child's way of "trying out" life. When he sees someone engaged in an activity that interests him, he imitates that activity and tries the experience on himself. It is his way of understanding a new experience, of getting to know how it *feels*. Much of the value of dramatic play lies in the fact that children not only play alone but play *together*. There must be a constant give and take, a willingness to share materials and not always to take the leading part.

We find children of this age playing house, store, post office, fireman, hospital—all kinds of community activities.

Some of the materials that aid children's dramatic play are the following:

a. Dolls and materials for doll play.—Both boys and girls should play with dolls, and boys should not be made self-conscious about this. Both boys and girls enjoy sweeping, washing and housekeeping play.

b. Blocks.—There should be a good durable set of large wooden blocks. Project Play Blocks are an excellent set. The Hill Floor Blocks make good houses for children actually to get inside of. If there are no blocks, packing boxes make satisfactory houses, trains and boats.

c. Toys.—Wooden toys, such as a train, boats, airplane, wooden people, wooden animals, suggest things to play. Wooden toys may be used to present the episodes in Alice Dalgliesh's story, "The Little Wooden Farmer," and various other stories.

d. Materials for "dressing up."—Home and kindergarten should provide a variety of materials for dressing up—squares of colored cloth, small aprons and odds and ends of brightly colored material.

Sometimes the children dramatize a story that they have heard. They enjoy dramatizing stories, but these should be carried through in the simplest way without any thought of playing to an audience. Occasionally the children suggest "giving a show" or "playing theater," and some of the children act as audience. Elaborate performances for an adult audience are not desirable, as they require too much rehearsing and tend to make the children self-conscious. Among the stories which are great favorites of children and are simple enough for them to dramatize are the following:

- "The Little Red Hen."
- "Little Black Sambo."
- "Peter Rabbit" (more difficult; sometimes the children play only part of this).
- "Pelle's New Suit."
- "The Three Bears" (also more difficult, and perhaps played only in part).
- "The Gingerbread Boy."
- "The Three Little Pigs."

These stories will all be found in the group of stories for children printed later in this section.

Children of this age are more interested in the *action* of stories than they are in the words, so their dramatization is sometimes entirely carried through in action or with a very little conversation.

Does the kindergarten give opportunity for language development?—Almost every activity of the day provides opportunity for this. The children are constantly adding new words to their vocabularies and having rich meaningful experiences which give them something to talk about. Conversations around the luncheon table are most interesting and stimulating. The children learn to take turns, for at first they all tend to talk at once. Shy children who do not talk very much are encouraged to do so. Emphasis is placed on having something of real interest to talk about and telling it so that other children can understand and enjoy it. The children also make up stories and tell them to a small group. Dramatic play gives much opportunity for language and vocabulary development.

The beginnings of written language are seen when the children dictate to the teacher a letter to a child who is absent. This gives fine opportunity for discrimination as to things that would be of interest to the child who is to receive the letter. Then, too, the children often dictate stories that they originate or ask to have a story written about a picture they have drawn. This activity should be spontaneous, not forced by the teacher.

What form of art experience do children have in kindergarten?—In the first place the kindergarten room itself should be colorful and well arranged. Good pictures, flowers, plants, colorful materials, all help to make the room attractive. Fine picture books give art experiences. Then the child himself has many opportunities to experiment with and express himself through art materials. A good-sized easel with large sheets of unprinted newspaper, large brushes and jars of poster paint in the primary colors are the most desirable materials for painting. If no easel is available, sheets of paper thumb-tacked to a large sheet of heavy cardboard or compo board will answer the purposes.

The kindergarten teacher does not give the child lessons in painting or try to give him much technique. She shows him how to hold his brush, how to wipe the paint off on the edge of the jar so that it will not drip, how to keep colors from running into each other. She is interested in his painting and talks to him about it, carefully avoiding saying, "What *is* that?" and letting the child *tell her* what he is painting. Painting and drawing are a form of language, a way of telling about the things a child sees. He may not even be painting anything in particular, simply experimenting with color. He has little idea of rela-

Bay Window Scene in a Modern Kindergarten

Each of these youngsters at the Shafor Boulevard School, Oakwood, Dayton, Ohio, follows his own playtime preference tive size, and flowers growing beside a house are likely to be as large as the house. He has no idea of perspective and is not ready for training in this.

A good box of crayons and sheets of 6″ × 9″ manila paper give the child opportunity to express himself through drawing. Little children go through a scribble stage in which their scribbles represent different objects to them, though looking like nothing at all to the grown-up. By the time a child is five, he usually can draw some recognizable objects. He knows what his pictures represent, and sometimes he tells interesting stories about them.

Clay is still another art medium. Most kindergarten supply houses now carry a good quality of clay mixed ready for use. At first the children like to experiment with clay by rolling, patting and pounding it. They soon begin to make simple objects such as cakes, pies, balls and, later, more interesting things. Here again they should not be given technique ahead of their ability. The teacher shows them how to smooth the clay, how to join pieces together so the object will not fall apart when dry. When the clay is dry, it may be painted with the same poster paints used at the easel or with water colors.

Are there any science experiences suitable for a child of kindergarten age?—The kindergarten child asks innumerable questions, and he is intensely interested in natural phenomena. He wants to know where rain comes from, what ice is, why the sun dries up water, how fish breathe under water and many other things.

The kindergarten provides for experience with plants and animals. Many plants may be grown indoors, in water or in window boxes or in a tray arranged as an indoor garden. Some kindergartens are fortunate in having an outdoor garden, where children may plant quick-germinating seeds and watch their growth. Certain pets may be permanent in the room—goldfish, small turtles, a canary; others, such as rabbits, guinea pigs, mice and frogs, may be kept for a shorter period. No pets should be kept in a room unless adequate provision is made for their care. Excursions to the zoo to see wild animals, to parks or woods to see spring birds, enrich the children's experience. These actual experiences are supplemented by pictures of flowers, birds, animals and stories about them.

All the literature used in connection with science experiences should be true to fact. Children do not need fanciful nature stories, and these are confusing to them. Through contact with animals and plants, children not only develop a friendly feeling toward them and an interest in them but at the same time learn in a very natural way something of the facts of the development of life. A pair of mice or rats may be kept long enough to produce a family, and the children's questions about the baby animals should be answered frankly and intelligently.

Children of this age are not too young for simple scientific experiences, such as: noticing the rise and fall of the mercury in a thermometer; seeing how a magnet picks up nails; putting a pan of water out to freeze, a pan of water to evaporate; melting ice. A number of simple science experiences suitable for young children are given in *We Look About Us,* by Agnes Burke and Gerald Craig (Ginn & Company), the first book of a series of science readers.

Does the kindergarten teach the 3 Rs?—There is no formal work in reading, writing and arithmetic, but there is a great deal of informal work which prepares the child for further work in first grade.

Contacts with attractive picture- and storybooks develop in the children the *desire* to read that is so important as a forerunner of beginning reading. Sometimes the children "read" stories to one another that they have memorized or make up stories to go with the pictures in favorite books. While reading is not emphasized, everything is done to give children experiences that will develop a readiness for reading. Names are printed clearly on the children's lockers and on all their belongings. There are animal-stamping outfits and a hand printing set with large letters for those children who are interested. Sometimes the children need in their play signs such as "Grocery Store," "No Parking." These are printed for them to copy, or they are helped to make them with the printing set. Reading and writing go very closely together, and children are always interested in learning to print their own names and sometimes other words. Most important of all in kindergarten is the background of experience that the children are gaining. This makes reading more meaningful later on.

There is no formal arithmetic, but many informal opportunities present themselves for using numbers and for counting. The children learn number terminology through actual experience. "This piece of wood is twice as long as that one." "This block is taller than that one." A project such as the grocery store gives a great deal of experience in using numbers, though at kindergarten age children have vague ideas of relative prices and of the value of money.

Counting is an activity that children enjoy. They like to count the number of children sitting at a table, the number of times they have done a certain thing, and they also enjoy counting as a rhythmic activity. There is the beginning of the desire to tell time. Some children learn this while they are in kindergarten. Most of the children learn the large divisions of time, such as nine o'clock, twelve o'clock, if there is a clock in the room.

How does the kindergarten introduce the child to literature?—Most children come to kindergarten with some knowledge of books and stories, and they are eager for more experience of this sort. There should be a bookcase and a reading table to encourage the children to look at books by themselves, as well as a time for listening to stories read or told by the teacher.

Books and stories used in kindergarten are very simple and deal chiefly with everyday experiences. Some fanciful stories are used, but these are of the simpler type, and the traditional fairy tale is better kept for a later age. It is desirable to have a number of books with fine illustrations by outstanding artists. There should also be a number of books of the informative type, to which the children can go for suggestions to aid in their work or play. Sometimes one sees a child at the workbench making a wooden airplane, with the airplane book spread open beside him; the children who are building a farm with the blocks consult the farm book for suggestions.

Poetry is important, and many poems should be used with the children in a free and natural way, but there should be no forced memorizing. A child loses all his joy in poetry if he is forced to memorize poems and recite them for the entertainment of adults. The best time to use poems is when they fit in with some experience the children are having—a rain poem on a rainy day, a swing poem when the children are swinging.

Stories which are the greatest favorites of children are included later in this section. Other suggestions for the kindergarten library are:

Short, simple stories for four-year-old children, or for the beginning of the year with five-year-olds:

The Little Family, by Lois Lensky (Doubleday).
Whiffy McMann, by Berta and Elmer Hader (Oxford).
Ask Mr. Bear! by Marjorie Flack (Doubleday).
The Little Red Chair, by Marian Walker (Macmillan).
The Little Wooden Farmer, by Alice Dalgliesh (Macmillan).
Little Elephant, by Hamilton Williamson (Doubleday).
Karl's Wooden Horse, by Annie Bergman (Laidlaw).
Peggy and Peter, by Lena Towsley (Farrar & Rinehart).

Somewhat *more advanced picture stories,* some of which are included later in this section and have been suggested above for dramatization, are:

Angus and the Ducks, by Marjorie Flack (Doubleday).
Angus and the Cat, by Marjorie Flack (Doubleday).
Angus Lost, by Marjorie Flack (Doubleday).
The Story About Ping, by Marjorie Flack (Viking).
Pelle's New Suit, by Elsa Beskow (Harper).
Snipp Snapp Snurr and the Red Shoes, by Maj. Lindman (Laidlaw).
Snipp Snapp Snurr and the Gingerbread, by Maj. Lindman (Laidlaw).
Peregrin and the Goldfish, by Tom Seidemann Freud (Macmillan).
The Choosing Book, by Alice Dalgliesh (Macmillan).
Little Black Sambo, by Helen Bannerman (Stokes).
Peter Rabbit, by Beatrix Potter (Warne).

Among informative books are:

My Blue Book, by Helen Read (Scribner).

The Farmer in the Dell, by Berta and Elmer Hader (Macmillan).
Over Land and Sea (Samuel Gabriel).
My Automobile Book (Samuel Gabriel).
Railway Book (McLoughlin).
The Second Picture Book of Animals (Macmillan).

Collections of stories and poems:
Told Under the Blue Umbrella, stories (Macmillan).
Sugar and Spice, poems, by Mary Tileston (Little, Brown & Co.).
Ring-a-Round, poems, by Mildred Harrington (Macmillan).
When We Were Very Young, by A. A. Milne (Dutton).
Ring-o-Roses, Mother Goose, by L. Leslie Brooke (Warne).

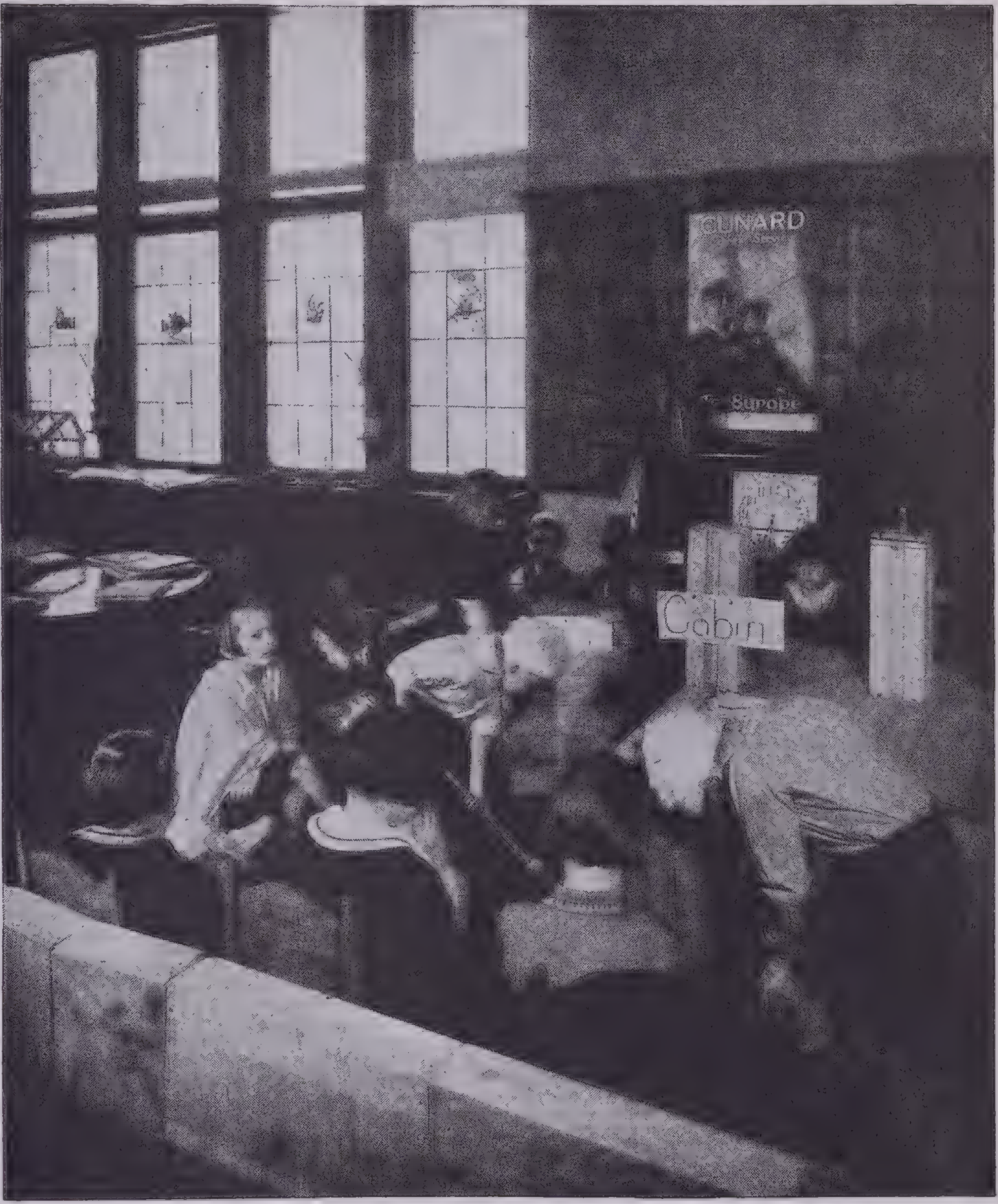
Kindergarten children also enjoy the old folk tales, such as "The Three Bears," "Three Little Pigs," "Three Billy Goats Gruff." They like to listen to stories about their own experiences, especially stories in which their own names are included.[1]

How does the kindergarten provide for musical experience?—Children of this age are naturally active and rhythmic, so the approach to music is through rhythmic activity. The teacher watches the children's natural activities, then provides music which fits these. Several children, for instance, may be jumping up and down; the teacher encourages these movements and supplies appropriate music. Other children may be skipping, running, hopping. These activities also may be used in a rhythmic way. The children suggest many things to play: "Let's play bunny," "Let's play we are horses," "I saw an elephant in the circus"; all these are leads which the teacher is quick to follow. Rhythmic work may have a close connection with the child's dramatic play.

While it is desirable to have a piano or phonograph for rhythmic work, it is possible to use a drum or, preferably, a tom-tom, for many rhythmic activities. A tom-tom is excellent to use *before* playing the piano, at the beginning of the children's rhythmic experience.

Songs that kindergarten children sing should be very simple and within range of the child's voice or should have an easily carried melody such as that of old folk songs, for example, "Lavender's Blue."[2] The content of the song should be simple, easily understood by the children and interesting to them. There are several beautifully illustrated songbooks. These add interest to musical experience. Children who have difficulty with singing may be helped by tone play, such as matching tones, or the child's imitation of a boat whistle.

Musical experiences need not be limited to singing or rhythmic activity. There should be ample opportunity for listening to good music and for experimenting with different types of musical instruments. Among the instruments suitable for musical experience are Swiss bells, on which easy melodies may be played, and a *good* xylophone, used for the same purpose. Cheap musical instruments or those with inaccurate pitch are to be avoided. Then, too, there are instruments which the child can use in a very simple rhythmic way. These include wrist bells (several bells sewed on a piece of webbing which fits the wrist), tambourines and triangles. The beginnings of a simple "orchestra" may come through use of several of these instruments, but work of this kind should not be too formalized. All too often the "kindergarten band" is a formally organized activity used for showing off the children's supposed musical progress. As in other phases of kindergarten work, the child's own development is the first consideration.



What They Do on the Big Ships—A Kindergarten Activity

Children of the Bronxville, New York, public school carried on this activity through one entire semester. It was child-suggested and came as the result of telling summer experiences in the kindergarten circle, early in the fall. One child recounted an experience he had had in going through one of the large ships when his grandfather went to Europe. Several other children had either visited ships or had seen boats that summer, and the interest grew until the children had constructed with blocks a ship which contained all the features of an ocean liner. They learned the different classes on a ship, the duties of the officers and men and many other facts that would be of future interest and use

Collections containing songs suitable for kindergarten use are these:
Singing Time, by Satis N. Coleman and Alice Thorn.
Songs to Sing, by Edna Shaw.
First Year Music, by Hollis Dann.
Our Old Nursery Rhymes, illustrated by W. L. LeMair.
Little Songs of Long Ago, illustrated by W. L. LeMair.
This Way and That, illustrated by Edna Potter (a book of singing games).

Books containing music for rhythmic play and listening include:
Rhythms of Childhood, by Crawford and Fogg.
First Year Music, by Hollis Dann.
Rhythms for Children, by Jean Taylor.

What other materials do the children use in their creative work?—A great variety of materials, including wood, cloth, paper, scissors, paste. These are used by the children to

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[1] *First Experiences with Literature,* by Alice Dalgliesh (Scribner), discusses fully the use of literature in kindergarten.

[2] This and other famous old folk songs will be found in the group of songs in this section.

Around the Fireplace on a Quiet Winter Morning

Kindergarten children of the Shafor Boulevard School, Oakwood, Dayton, Ohio, read, paint, play house or just sit and look

carry out their own ideas. Some children are naturally more creative with materials than are others; these will find many original uses for material. Some follow the suggestions originated by others or will need stimulation from the teacher. At the beginning of the year when the children are interested in trying out their new surroundings and are likely to flit from one activity to another, very few materials should be provided. Gradually materials such as clay and wood may be added. With woodwork the children should be shown how to use tools with safety to themselves and others; with clay they should be allowed much opportunity to experiment but should be shown how to smooth the clay and how to join pieces together.

Children who have not had much experience with materials are likely to go through a stage where they manipulate and experiment with materials. Clay is rolled and patted and pounded; the first objects made are likely to be "snakes" and "pies" and "balls." Wood will be sawed for the pleasure in the activity; nails will be pounded into boards for the same reason. The first objects made of wood are likely to be suggested by the shapes of pieces of wood found in the wood box, so it is a good plan to start with a wood box filled with miscellaneous pieces of wood in many sizes and shapes.

Adults must not be impatient with this first experimental stage nor expect very definite results. Before long most children will begin work with some definite idea in mind. Later, as they become interested in group activities, many materials will be used to carry out these activities. The fruits and vegetables for the grocery store call for paper or clay; the playhouse needs curtains and furniture.

Sewing is an imitative activity. Children usually want to sew because they see grown-ups sewing. It is not an activity on which small children should spend long periods of time, for it is close work and may involve eye or muscle strain. Sometimes the children may want to make costumes for themselves. They should have large-eyed needles and coarse thread, and the needles should be threaded for them. Stitches should not be too small, and in general the sewing process should be made as easy as possible.

Colored paper is another medium for experimentation. Children love to cut paper. Where wood is not available, paper and cardboard boxes have a variety of uses, though they are never quite as satisfactory for construction work as the more durable wood. Excellent trains and wagons may, however, be constructed from cardboard boxes and milk-bottle tops. Paper lends itself to many decorative uses: costumes may be decorated with cut paper; parts of costumes may be made from crepe paper. Christmas-tree decorations made from colored paper are more satisfactory than the traditional glass balls. Christmas cards, valentines, birthday cards—all these are uses for paper. Children also enjoy making small scrapbooks.

There are other kindergarten materials with which the child does manipulative, rather than creative, work, though these materials do give some opportunity for experimentation in design. There are color pegs to be placed in holes in a peg board, large colored wooden beads to be strung, small colored blocks to be used in making designs. These are good materials for the beginning of the year when the children like to manipulate material, but they have not very extended educational possibilities.[1]

What provision is made for the teaching of health and hygiene?—While children of this age should not be made overconscious of their own health, there are certain hygienic habits which it is important to emphasize, and a good deal of health information which may be given incidentally. The children should understand the real reason for precautions to be taken with regard to colds and contagious diseases and the reason for keeping fingers and other objects out of their mouths, using individual towels and drinking cups, washing their hands before eating and after going to the toilet. They may have the very simplest explanation of the fact that germs are carried when hygienic precautions are not taken.

Food difficulties may often be overcome by conversations about the types of food needed for good health. Too often parents do not give straightforward information of this kind. A little boy who refused cod-liver oil had never been told that cod-liver oil takes the place of the warmth of sunshine in the winter. A simple explanation of this entirely overcame the difficulty. Sometimes cooking carrots, spinach or other vegetables at school and eating them with satisfaction overcomes a special food dislike.

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[1] Places where these materials may be obtained are mentioned in *Permanent Play Materials*, by Charlotte Garrison, author of our article, "Educational Playthings"

Are there any formal games suitable for use in kindergarten?—There are a few formal games that are simple enough for little children to enjoy, but children of this age should not be required to play together in a large group for any length of time. After they have had a good deal of experience in playing together informally, games such as the following may be enjoyed:

Ring-around-a-rosy
Drop the Handkerchief
London Bridge
Here We Go Round the Mulberry Bush
The Farmer in the Dell
Looby Loo
Little Sally Waters[1]

It is often better to use with young children a simplified form of a game. "London Bridge" may be played without the competitive element. A still simpler form of this is—

> Open the gates as high as the sky
> And let the king and his men go by.

Two children form an arch; the others go through it. One child is occasionally caught by the "gates," but there is no more organization than this.

The work of the primary grades usually centers around some large group interest. Do such group interests exist in the kindergarten?—Decidedly so, though the interests are not as centralized as they are in the grades, for kindergarten children are individual, and they like to play in small groups. Four-year-old children seldom develop a large group interest, while, in the latter part of the year, five-year-old children have many such interests.

A group of kindergarten children built a grocery store, using the Hill Floor Blocks. (If these blocks had not been available, packing boxes would have answered the purpose.) They named the grocery the "Snow White Grocery Store," and one child painted a sign for it. The children made paper fruit and vegetables to sell in the store, and there was a great deal of discussion about buying and selling. A visit to a grocery store helped to make their ideas clearer and supplied suggestions for more things to do. The social science reader, "Mr. Brown's Grocery Store," also added to the children's experience. Almost all the children in the room were interested in the grocery store, and they participated in the activity of buying and selling. Naturally certain social problems arose, as everyone wanted to sell, and there were times when many children tried to crowd into the grocery at once. Whenever such difficulties arose, a group meeting was called to formulate suggestions for better play.

Another group of children made an ocean liner of the large blocks. (Here again packing boxes would answer the purpose.) As they built the liner, they felt more and more the necessity for accurate information about liners, and books and pictures had to be consulted. How many funnels do liners have? How are the funnels painted? Where does a ship keep its anchor? What are portholes? What flags does a ship fly? These are only a few of the questions that arose. When the liner was ready to "sail," a great many more problems presented themselves, and interest extended to the countries to which the liner was going.

One very interesting and worthwhile group activity which took place in a five-year-old kindergarten group was the making and selling of newspapers. Bobby and Billy decided to have a newspaper stand. They made a crude one from wood, painting a sign which said, "Bobby and Billy's Newspaper Stand." All the children in the group became interested and joined in the activity. The children painted the newspaper heading and the pictures for the papers, dictating the "news" to the teacher. This led to an interest in newspapers, the things we find in them and keen enjoyment of news pictures from the Sunday picture supplement. When the newspapers were made, Bobby and Billy set up their stand and sold papers to adults and other children. The twenty cents they made was given by common consent to the unemployed.

In these group interests we see all phases of subject matter. They are an excellent preparation for the group work which the children will be doing in first grade. Small group interests, however, in which three or four children play together, are equally as valuable as the large ones—sometimes more so. Group activities should not extend over a long period of time. A week or two weeks is sufficient. Children lose interest and have to be stimulated by the teacher if the interest extends over too long a period.

What tangible results should be expected at the end of the kindergarten year?—By the end of the year, the children should show physical, mental, social and emotional growth. The records that the teacher has kept of each child's development will show how he has progressed. Great changes often occur in children. The following brief summaries show some of the changes that took place in children during a year in kindergarten:

Joan was a very shy child. When she came to kindergarten, she did not join in any activities or play with any other children. She stood at one side, or wandered about the room, scowling if anyone looked at her. Gradually the teacher interested her in materials, helped her to feel her ability to do things, encouraged the children to ask her to join in their play. By the end of the year, Joan was a normal, happy little girl, participating in everything, with much of her self-consciousness overcome.

John was an active little boy who had practically no feeling for the rights of others. If he played in a group, there was always trouble, for John took the best materials or toys for himself and used every method to gain his own ends—pushing, slapping, fighting. The teacher talked with him about this, showing him that other children soon would not want to play with him. This did not, however, make much impression, but soon the other children began to ostracize him. The teacher also adopted the method of removing him temporarily from the group whenever he hurt another child. John's mother co-operated by following the same method at home. By the end of the year John was able to play with a group of children with only occasional difficulty.

Jim was a timid little boy who was afraid of almost any physical activity. He would not go downstairs without holding someone's hand, would not jump even from a small height. The teacher worked with him slowly but constantly, encouraging him first to try the lower bars of the climbing ladders, to jump off one step, to walk across the walking beam, holding her hand. Gradually, she withdrew her support and Jim became more independent. By the end of the year, he could go down steps alone, could climb to the top of the jungle gym and showed great pride in his accomplishments.

Each child is considered as an individual. The resourceful child is given much opportunity to work out his creative ideas; the child with little originality is encouraged to do more original thinking; the shy child is helped to gain confidence in himself; the overconfident child is helped to take his place in relation to other children. By the time the children are ready for first grade, many physical and emotional difficulties should at least be partly overcome, if not entirely so.

There are other aspects of kindergarten work which are not included in the actual plan for work with the children but which have a very close connection with the work.

Records.—In order to know what the children are doing and how they are growing, the teacher must keep some form of record of their progress. These records are talked over with the parents. They show how the child is growing in his ability to be a good member of a group, to contribute to discussion, to plan his work and so forth. The teacher also keeps a record of the activities that have gone on in the kindergarten, so that she may see which are valuable and enable her to plan new directions for her work.

Parent-teacher Relationships.—It is essential that parents and teachers should work closely together, so that the child's whole day will be organized in somewhat the same way. Conferences between parent and teacher are helpful to both. The teacher needs much information about the child that she can gain from the parent; the parent can get many helpful suggestions from the teacher. If kindergarten work is to be of real benefit to a child, some consistent plan must be followed throughout the day, not one course of procedure for home and one for kindergarten. If Mary has tantrums and they are wisely handled both at home and at school, she will soon outgrow them. Inconsistent treatment will mean that she will develop different ways of acting in various situations.

In most kindergartens, regular times are set aside not only for individual conferences between parent and teacher but for group meetings. At these meetings the parents and teachers of the whole kindergarten group discuss the things that children are learning at home and at school and problems concerning them. There may be an outside speaker on some topic, such as health, nutrition, clothing, discipline, art or the literary or musical experiences of children.

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[1] The music and words for many of these games and several others will be found in the group of songs in this section.

Health.—When children come together in a group, it is most essential that their health be watched carefully and contagious diseases guarded against. Most good schools provide medical supervision, a school doctor and nurse who give physical examinations and to whom the children go for first aid or to be readmitted after illness. As the common cold is so contagious and also may be the forerunner of several of the contagious diseases of childhood, it is most important that children with any sign of a cold should be excluded from school. If the right attitude is built up in parents with regard to this, and they are urged to be responsible for keeping children with colds at home, the group will have a much better health record than a group in which such precautions are not observed.

It is also important for children of kindergarten age to spend as much time out of doors as possible, and a kindergarten with facilities for outdoor play should use them at all convenient periods. In fine weather, it is possible to have almost all activities out of doors. The outdoor playground should be well equipped, so that the children will have plenty of constructive activity. When there is no kindergarten, parents should consider the possibilities of any backyard or outdoor play space. It does not take expensive equipment to make a backyard an ideal place in which to play.

THE HOME KINDERGARTEN

Mothers who cannot send their young children to kindergarten, but who wish them to have valuable educational experiences, may organize a small kindergarten or play group in the home. The description of the kindergarten curriculum which precedes this discussion offers many suggestions for worth-while experiences. These may be adapted to the home kindergarten.

The equipment of a home kindergarten need not be expensive. It can be very simple. There should be low tables and chairs. As the children will spend a good deal of time sitting in the chairs, it is best to get chairs of a recognized make, planned expressly for good posture. The chairs should be the right height, so that the children can sit in them comfortably, with feet resting on the floor.

A low cupboard or set of shelves is essential for keeping the materials with which the children are to work. On one shelf there should be pieces of newspaper cut to a convenient size for protecting the table when children are painting, and clay boards or squares of oilcloth for clay work. A part of the cupboard should be set aside as a place to keep their smocks or work aprons and their unfinished work. If this space can be divided into individual lockers, so much the better. In a small group of children, or with a family of children, it is possible for each child to have his own work tray, which he can get out and use without asking help from an adult. This tray may contain scissors with blunt ends, a jar of paste, a paste brush, a box of crayons and perhaps a paint box and brushes.

Cleaning up after work is an important habit to form, and the right facilities for this must be provided. On a set of low hooks (in the cupboard or beside it), there should be a small broom, a long-handled dustpan, a small mop and a cloth which can be dampened and used for wiping tables. Paper towels should be available for wiping up water or paint that may be spilled.

A piano or phonograph is almost a necessity, though a good deal of rhythmic work may be done with a drum or tom-tom. There are a good many phonograph records which are made especially for children. Other musical instruments, such as bells and tambourines, are desirable.

One corner of the room should be arranged for doll play. A low screen will form the walls of a good playhouse. This may be made of a clothes horse covered with burlap. Doll furniture should be simple and strong. This may be made by the children. The very simplest form of construction should be used in making doll furniture: a chair, for example, being made with a seat, a back and four legs; a bed in the same way; a table with a top and legs.

Blocks are among the most important pieces of equipment, and a good set of blocks should be provided. These should be unpainted blocks of white wood, large enough for satisfactory building. Shelves for the blocks, or a box on casters, also must be provided, so that they may be kept in an orderly way. Smaller colored blocks also are popular with children.

A satisfactory bookcase, with books, and a library table and chairs are conducive to good beginning "reading" habits.

Provision for physical activity must be made. If the children can go out of doors to play, this is not so essential, but in the city it is most desirable. If the space is small, a "doorway gymnasium" with swing, rugs, trapeze and horizontal bar is most satisfactory. Attractive plants and pictures add to the appearance of the room.

A Day's Program.—Here is a suggestion for a time schedule. It is only tentative and should be rearranged to fit the individual situation. The group may be organized for an hour or for two hours only. Below is a three-hour schedule:

9:00–9:45 A.M.—The children arrive, remove their wraps and hang them up (low hooks necessary). During this first period they select the materials they wish to use and use them in any way that appeals to them. The adult in charge takes an interest in all their activities, answers questions and gives suggestions and help when necessary.

9:45–10:10 A.M.—The children put away their materials, then bring their chairs together in a group for story or discussion.

10:10–10:40 A.M.—The children go to the toilet and wash their hands, then set the table for lunch. A good midmorning lunch is orange juice, with perhaps a cracker. Milk may be taken by those children who seem especially to need it. Often, a child who does not care for milk will drink it in company with other children. Lunch time may be one of the most educational periods of the day, for it gives opportunity for interesting conversation on many topics. There is opportunity for learning courtesy and table manners, but all of this should be incidental, and a meal period should never be a time for direct criticism.

10:45–11:00 A.M.—A fifteen-minute rest is desirable. If cots are not obtainable, the children may rest on bath mats or rag rugs spread on the floor. The room should first be aired; then the windows closed, to avoid draughts. Rugs should be marked with a name tag at the top, so that the children will always put their heads at the same end and always put the same side of the rug on the floor.

11:00–11:25 A. M.—The children sit around the piano or phonograph. During this period they listen to music, take part in rhythmic activity and sing. It is also a good time for interesting conversation and discussion.

11:25 A.M.–12:00 M.—This is a period which may be used in a variety of ways. These are suggestions:

1. Outdoor play: The children should be out of doors as much as possible in fine weather.
2. Using materials, such as those for drawing or painting, at the tables.
3. Dramatic play.
4. Simple games (outdoors, if possible).
5. Excursions to places of interest in the neighborhood. All the possibilities for interesting excursions should be considered.

12:00 M.—The children get their wraps and put them on with as little assistance as possible. In all their work, whether it is with an individual child or with a group, it is important to see that the child is forming good habits of thinking, of workmanship, and of social living.

A few books that will give an understanding of young children and that help in the organization of a home kindergarten are:

Happy Childhood, John E. Anderson, Ph.D. (Appleton-Century).

Healthy Childhood, Harold C. Stuart (Appleton-Century).

Busy Childhood, Josephine C. Foster (Appleton-Century).

A Conduct Curriculum, Agnes Burke and others (Scribner).

MATERIALS FOR THE HOME KINDERGARTEN

Furniture and other permanent equipment.—

Tables, chairs and blackboard.

A piece of apparatus for physical activity—jungle gym, hi-low gym or tower gym.

- Closet or shelves for keeping materials
- Bookcase
- Sandbox, with toys for use in the sand
- Piano or victrola
- Block box or shelves for blocks
- Workbench and tools. Tools should include substantial hammers, good quality saws, ruler, brace and bit, screwdriver, nails.

Materials which encourage dramatic and constructive play.—

- Dolls (Durable washable dolls are best)
- Doll furniture (including stove)
- Doll carriage
- Dishes
- Laundry set
- Screen for playhouse
- Blocks—large wooden blocks
- Wooden train, truck, auto, boat
- Wooden animals and people
- Sand toys (molds, containers, spoons, trees, houses, people, animals)

Housekeeping materials.—

- Small broom
- Dustpan with long handle
- Small mop
- Cloths for wiping tables—dishcloths are good for this
- Small electric iron
- Dishpan
- Mop
- Soap saver
- Small dish towels
- (A small carpet sweeper also is enjoyed by children.)

Materials for nature-study and science.—

- Ruler
- Scales
- Thermometer (large, so children can easily see changes)
- Weather house (small house barometer in which little man or woman comes out to indicate weather)
- Calendar (large, hung where children can easily see it)
- Magnet
- Magnifying glass
- Prism (this hung in a sunny window makes a rainbow on floor.)
- Fish globe
- Japanese garden
- Garden tools (for outdoors)

Materials for manipulative play.—

- Peg board (a board with holes and colored pegs to fit into the holes)
- Wooden beads (large wooden kindergarten beads for stringing)
- Stone tiles (these are for making designs and may be obtained from floor tiling companies)
- Picture puzzles (simple ones, not too many pieces)
- Printing set (sets of rubber stamp animals for printing; also alphabet)
- Musical instruments (drum, xylophone, bells, tambourines, etc.)

Materials for construction and creative work.—

For Clay Modeling:

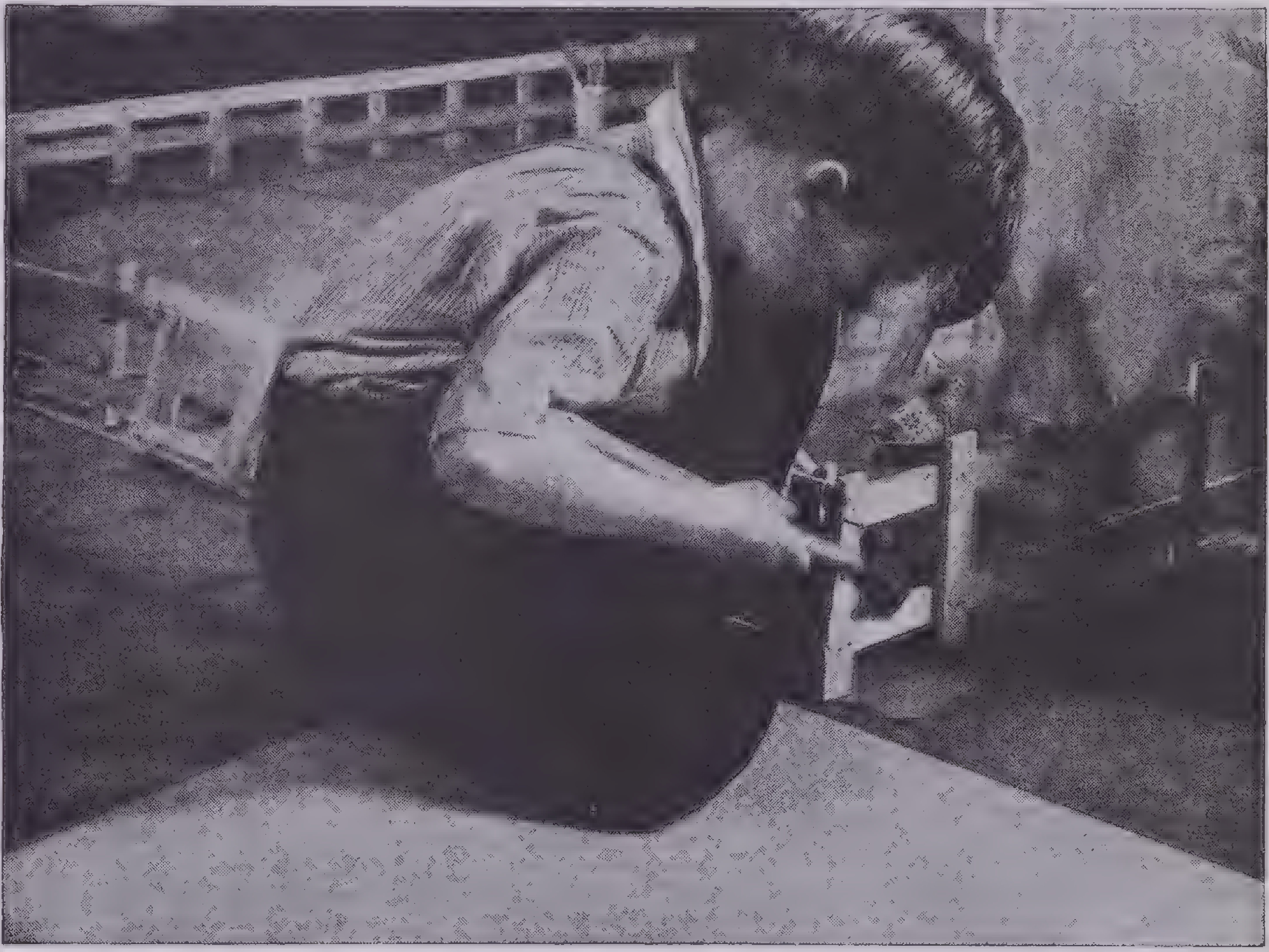
- Clay, good quality, ready-mixed
- Clay boards
- Stone crock in which to keep clay

For Woodwork:

- Soft pine boards cut in convenient lengths—36x1x1", 36x1x½", 36x2½", 36x4x½", 36x6x½"; also cylinders of soft wood with diameters of 2", 1", ½". These are used for smoke stacks and chimneys. Button molds make excellent wheels.
- Hammers, adze eye (No. 3)
- Saws, Disston cross-cut, short blade
- Brace and bit
- Screwdriver
- Nails, flat-head wire nails, in assorted sizes

For Sewing:

- Sewing box containing large-eyed embroidery needles, coarse thread, pincushion, pins, scissors


Courtesy Santa Monica, Calif., City Schools
A Kindergarten Workman Builds His Fence

- Colored cloth (cambric)—scraps of colored material, unbleached muslin

For Painting:

- Large easel with jars for paint
- Japanese paint brushes
- Unprinted newspaper
- Jars of poster paint in primary colors

For Drawing:

- Manila paper
- Crayons

For Cutting and Pasting:

- Blunt scissors
- Jars of paste with small brushes or sticks for pasting
- Colored paper (obtainable in packages)
- Silver and gold paper

Many of these materials are now obtainable in five-and-ten-cent stores. All of them are carried by kindergarten supply houses.

THE OUTDOOR PLAY GROUP

A backyard or any outdoor play space may be made a place for educational play experiences. A group of mothers may arrange the supervision of this among themselves. The play of small children should always be supervised by an adult. If children are simply turned loose out of doors, they are likely to be physically active all the time and to come in from play tired and cross. Children need exercise, but they also need periods of rest, for they very quickly burn up their energy. This means that when they are playing out of doors for a long period there should be materials and toys which suggest quieter play, as well as those which suggest physical activity. On a cool day, if the children are spending all their time in too-quiet activities, the adult may need to suggest that they play a game or have a scooter race. On a hot day, if the children are too active, the suggestion may be that they blow bubbles or play house.

A backyard does not need expensive equipment to make it a good place to play. Children like to climb, so if there are no trees, provide a ladder or other climbing equipment. Packing boxes of various sizes and a sawhorse are inexpensive materials in which children find endless play possibilities.

Materials for active play.—

- Toys, such as a scooter, express wagon, hoop, ball.
- A swing (an old automobile tire makes a good swing.)
- Something to climb. (A low horizontal ladder is good.)
- Long substantial wooden boards. (The children will use these in a variety of ways. They will stand them against the fence and run or slide down them.)
- A seesaw. (The kind with an immovable board is best, as there will not be pinched fingers. Children, however, will improvise their own seesaw if boards are provided.)
- A slide. (A slide is a desirable, but somewhat more expensive, piece of material. Children of-

ten improvise a slide with boards. The boards should be smooth or there is danger from splinters.)

Materials for less active play.—

Packing boxes, large and small. (The children will use these for houses, boats, wagons.)

A sandbox. (There is perhaps nothing out of which children get so much enjoyment.)

The outdoor sandbox should be low and large enough so that the children can get inside; not under cover, as it needs the germ-destroying rays of the sun. On a very hot day it may be possible to put up temporary shade, such as a large garden umbrella. We do realize, however, the importance of sunlight for little children. They should spend some time playing in the direct sunshine with as little clothing as possible, but with their heads covered. There should be a tarpaulin cover for the sandbox at night and in wet weather. Sand play will be much more valuable if there are many sand toys, such as spoons and spades for digging, and containers for sand, a rolling pin, molds for "pies." Other materials are a village with little wooden houses and trees and animals.

These materials should not all be given to the children at once. At first they should have the simpler materials for digging; the others may be added gradually. In this way interest in the sandbox may be kept alive, and sand play will be a growing interest throughout the year.

Facilities for water play.—Children do not have enough opportunity to play with water. If there is a brook nearby, they should have many opportunities to play in it, wearing rubber boots if it seems unwise for them to wade with bare feet. A small concrete pool in which the children may "fish," sail boats and build docks would be a fine addition to any backyard. There are attractive, inexpensive water tanks which may be purchased. A zinc-lined sand table may be filled with water, but even a large pan of water has play possibilities. If children are suitably dressed, play in water will not hurt them or their clothes. Rubber aprons will protect dresses and suits. The backyard is a fine place to blow bubbles, for there is space to chase them.

Other materials.—On warm days, children may have a table in a shady place at which they can draw, model or paint or use wood and tools. In fact most of the indoor occupations may be transferred outdoors in hot weather. Dolls and doll furniture may move into the backyard; so may blocks and toy animals. Cooking on the doll's stove is favorite outdoor play. Making a garden of their own is a delightful and educational experience for children.

In winter, the backyard has other possibilities. The sandbox and playhouse must be put aside, but sleds and a snow shovel take their place. Children should be warmly and suitably dressed, so that they may have the experience of coasting, of shoveling snow and of making snowballs and snow men.

EDUCATIONAL PLAYTHINGS

For little children, play is the business of life, as work is for adults; and good toys are as necessary for children's play as good tools, good materials, good equipment are for adult work. Good toys make play full of rich, vital and joyful experiences.

Selection of Toys.—An environment and materials which encourage wholesome and creative play aid the child in finding ways to interpret the physical and social life surrounding him; it is through constructive play that the child has opportunities for proper physical, intellectual and social development and thus day by day becomes a more and more useful member of society even while he is a child.

In selecting playthings for children, certain fundamental qualities and characteristics must be sought. All toys, if they are to hold the interest of the child, must have a "do with" quality—the toy must be one with which the child can experiment and through this experimentation produce creative results.

Value of Simple Playthings.—Children want to understand their playthings, and a toy that is simple, easily used, easily taken apart and put together is more satisfactory in every way to a child than the elaborate mechanical toy of which he cannot understand the workings, and which will be broken and useless if he does more than wind the key and watch it go.

Courtesy Los Angeles City School Report, 1937

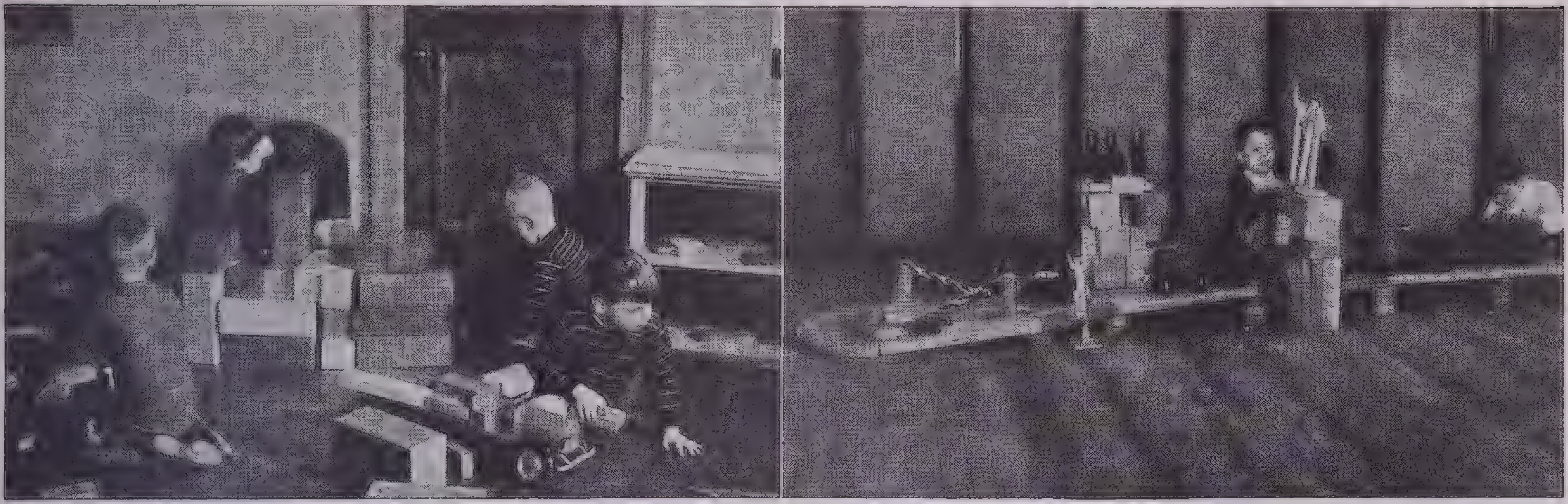
Young Children Need Little Equipment for Their Play

The elaborate toy, such as the fully furnished doll house, the doll supplied with a trunk full of fussy, flimsy, unpractical clothes and toilet articles, the grocery store with every detail perfect, may be rather overwhelming and interesting to the child only for a short time. Then they are pushed aside and forgotten; whereas if the little girl is given materials and encouraged and helped to make her own doll house and simple furniture, or the boy his own grocery store, the pleasure and profit will be far greater, and the child's interest in using them more lasting.

Characteristics of Good Toys.—Toys must be well made, very strong and of some nonbreakable material if they are to withstand the constant vigorous and inexpert handling which they are sure to get if they are worth while and embody the qualities which make them interesting to children. As far as possible, toys should be of such material, finish and workmanship as will allow thorough washing and sterilization—especially those playthings designed particularly for the use of very little children.

Toys should be gay and attractive in appearance as well as durable. Good line, proportion, material and workmanship all help to make the plaything artistic, while bright-colored paint adds to the interest and effectiveness of many toys, although certain wooden toys are more suggestive and attractive when left unpainted. Only nonpoisonous paints and dyes should be used on children's toys.

Toys should be realistic, representing as faithfully and simply as possible the things children see and use



Blocks Make Buildings and Railroads

Unsupervised or free play brings out constructive and creative abilities in preschool age children. At the left, nursery school children in a Winnetka, Illinois, public school build with blocks. At the right, kindergarten children in the Ethical Culture School, New York, make a railroad system with signals and crossing gates

in the world around them; thus toy animals should resemble real animals and not be grotesque caricatures of them; dolls should be pretty, childlike in feature, natural and simply and attractively dressed, and not oddities or overly sophisticated.

Toys should be large enough to be easily handled and manipulated; playing with tiny toys, such as small blocks or small beads, may strain the smaller muscles and cause nervous tension; but handling, pushing, pulling, grasping and lifting larger toys is of definite physical benefit. Care must be taken not to go to the other extreme and give the children toys which are too heavy and unwieldy to handle easily.

Toys which embody humorous characteristics and possibilities without being grotesque are great favorites. These toys are hard to find, but there are some constructive materials which can be put together in all sorts of fantastic and funny combinations without being ugly or gruesome, and there are some good picture puzzles with funny pictures.

There should be some toys or playthings which satisfy the child's dramatic interest and can be used as properties in his dramatization of social situations in the life around him. Dolls, housekeeping playthings, toy animals, trains, boats, automobiles, the sandbox and simple materials for "dressing up" and fanciful play are all valuable in his life.

Many playthings at one time are too confusing and overstimulating. It is better for a child to have a few, good, well-chosen playthings, with a new toy added from time to time as the child's interest grows.

Blocks.—Probably blocks are the playthings which stimulate the best form of dramatic play, and they offer the best early opportunity for experiments in construction. Perhaps nowhere in the toy world has there been such a change and development for the better as there has been with blocks. Instead of sitting at tables handling a few small blocks which hold very limited possibilities of play, children nowadays build on the floor, exercising their whole bodies in lifting, carrying and placing big blocks—blocks large enough to make real things of such size, form and combinations of construction as they need in their play.

There are available some sets of blocks with which children can build structures big enough and strong enough to get into and use in their dramatic play.

The children can build their own playhouse with as many rooms as are needed to accommodate the group. They can build a two-story house with a staircase or an elevator. They can build their own automobile or truck which will move on wheels provided in the set of blocks. They can make their own train or boat big enough to take almost any number of children.

Think of the satisfaction in this type of block building, of the possibilities for valuable social contacts and adjustments, for physical exercise, for planning and construction! Above all, consider the possibilities of children making their own usable playthings and of being able to change, reconstruct and build over whenever their play needs demand!

Opportunity for Experimenting.—Young children enjoy and benefit from playing with toys which give them much opportunity to handle, manipulate and experiment in a simple way; they like to put things together, to put one thing into another, to put a smaller object into a larger one. Materials such as large peg boards, nests of blocks, wooden beads, simple sets of colored wooden tablets which can be strung on a stick or laid out in patterns, large stone tiles for making simple designs, are all interesting to them as simple materials for experimentation. They also enjoy as they grow older things such as scales, measuring cups of different proportions, rulers, a magnet, thermometer, an artiscope and a magnifying glass. These afford opportunity for further, more exact handling and experimentation and stimulate an interest in additional scientific study.

Opportunity for Physical Activity.—Very definite care should be taken to provide playthings and apparatus especially designed for physical activity—a few well-chosen pieces of apparatus which will give opportunity for all-round exercise. It is wise to keep a balance in this selection and provide equipment for climbing, swinging, hanging, pulling, balancing and similar play. This type of play material is particularly necessary for the city child whose opportunity for vigorous exercise is likely to be more limited than that of the country child, both in the house and out of doors.

Many large pieces of apparatus are available now for schools and playgrounds and for those who have large nurseries, such as the jungle gym, the tower gym, the high-low gym, low parallel bars, climbing rope, seesaw, rocking boats and slide. For those who have only limited space there are excellent compact combinations of swing, swinging bars and rings.

Place for Keeping Toys.—A convenient place for keeping playthings is necessary. A set of low, open shelves is suggested—these shelves made wide enough to hold the large toys and close enough together to provide ample space for everything without having to pile one plaything on another. If children have a convenient place for their toys, they can soon be taught to keep them in order and learn to be responsible for their own belongings.

Playthings for Later Years.—Children who, when young, have used and experimented with the kind of toys and play materials which we have been discussing, will continue as they grow older to want playthings which enable them to pursue constructive, experimental, scientific and artistic activities. They will continue their interest in construction, but soon, instead of using blocks, they will use materials which offer more exact and elaborate possibilities, such as erector and meccano. They will be interested in more elaborate puzzles and materials which call for careful handling, and they will enjoy using the magnifying glass, the microscope and simple sets of materials which are available for first experiments in chemistry and physics.

Play and Life.—The selection of children's playthings is both important and fascinating to parents who realize that the interests, habits and attitudes of life are set up in the early years and that the play life of the little child is setting the pattern for future development.

MOTHER GOOSE RHYMES

For the Very Youngest

Pat-a-cake, pat-a-cake, baker's man;
Make me a cake as fast as you can:
Pat it and prick it and mark it with B,
Put it in the oven for Baby and me.

* * *

This little pig went to market;
This little pig stayed home;
This little pig had roast beef;
This little pig had none;
This little pig said, "Wee, wee, wee,"
All the way home.

* * *

Dickory, dickory, dock;
The mouse ran up the clock;
The clock struck One,
The mouse ran down,
Dickory, dickory, dock.

Ride a cock-horse to Banbury Cross,
To see a fine lady upon a white horse;
With rings on her fingers and bells on her toes,
She shall have music wherever she goes.

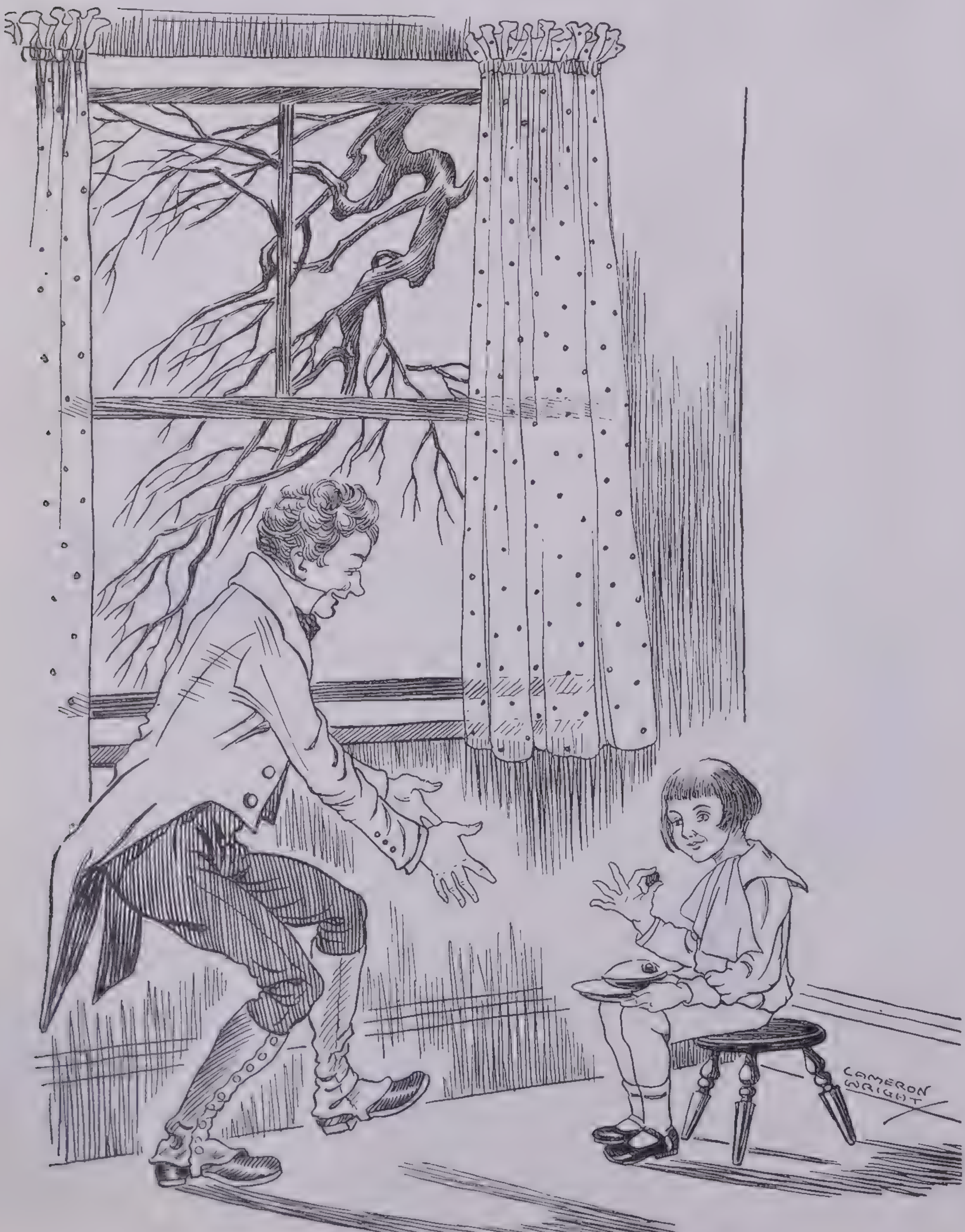
* * *

Pease porridge hot,
Pease porridge cold,
Pease porridge in the pot,
Nine days old.

Some like it hot,
Some like it cold,
Some like it in the pot,
Nine days old.

* * *

Rain, rain,
Go away,
Come again
Another day.
Little Johnny
Wants to play.



To market, to market, to buy a fat pig,
Home again, home again, dancing a jig;
Ride to the market to buy a fat hog,
Home again, home again, jiggety-jog.

* * *

Hippity hop to the barber shop,
To buy a stick of candy,
One for you and one for me,
And one for sister Annie.

* * *

I love little pussy, her coat is so warm,
And if I don't hurt her, she'll do me no harm;
So I'll not pull her tail, nor drive her away,
But pussy and I together will play.

* * *

Little Jack Horner
Sat in a corner,
Eating his Christmas pie
He put in his thumb
And he took out a plum,
And said, "What a good boy am I!"

* * *

Bye, baby bunting,
Daddy's gone a-hunting,
To get a little rabbit skin
To wrap the baby bunting in.

* * *

Hickety, pickety, my black hen,
She lays eggs for gentlemen:
Sometimes nine,
Sometimes ten.
Gentlemen come every day,
To see what my black hen doth lay.

* * *

Ring-a-ring of roses,
A pocketful of posies,
Tisha! Tisha!
We all fall down.

* * *

For Kindergarten and Later

Baa, baa, black sheep,
Have you any wool?
Yes, sir, yes, sir,
Three bags full:
One for my master,
And one for my dame,
And one for the little boy
Who lives in the lane.

* * *

Tom Tom, the piper's son,
Learned to play when he was young;
But the only tune that he could play,
Was "Over the hills and far away."

* * *

Curly locks! Curly locks! Wilt thou be mine?
Thou shalt not wash dishes nor yet feed the swine;
But sit on a cushion and sew a fine seam
And feast upon strawberries, sugar and cream.

Little Miss Muffet
Sat on a tuffet,
Eating her curds and whey.
Along came a spider
And sat down beside her,
And frightened Miss Muffet away.

* * *

Little Boy Blue, come blow your horn,
The sheep's in the meadow, the cow's in the corn.

Where's the little boy that tends the sheep?
He's under the haystack, fast asleep.

* * *

Little Bo-peep has lost her sheep,
And can't tell where to find them.
"Leave them alone, and they'll come home,
And bring their tails behind them!"

Little Bo-peep fell fast asleep
And dreamt she heard them bleating.
But when she awoke, she found it a joke,
For they were still a-fleeting.

Then up she took her little crook,
Determin'd for to find them;
She found them indeed, but it made her heart bleed,
For they'd left their tails behind them.

* * *

Jack and Jill went up the hill
To fetch a pail of water;
Jack fell down and broke his crown,
And Jill came tumbling after.

* * *

Mary had a little lamb,
Its fleece was white as snow;
And everywhere that Mary went
The lamb was sure to go.

* * *

Jack be nimble,
Jack be quick,
Jack jump over the candlestick.

* * *

See, saw, Margery Daw,
Johnny shall have a new master:
He shall have but a penny a day,
Because he can't work any faster.

* * *

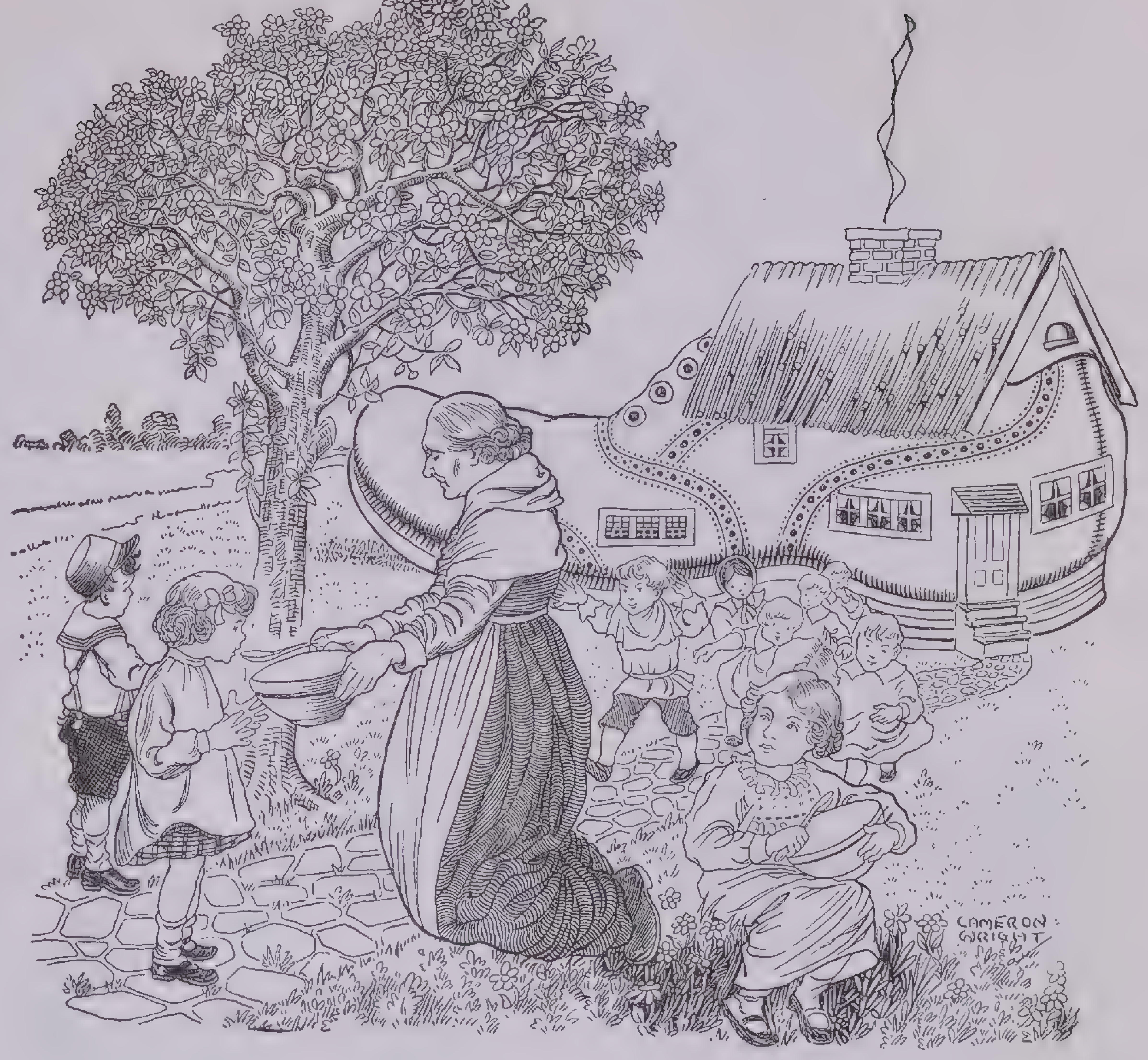
Tom, Tom, the piper's son,
Stole a pig and away he run!
The pig was eat, and Tom was beat,
And Tom went howling down the street.

* * *

"Willy boy, Willy boy, where are you going?
I will go with you, if I may."
"I am going to the meadows to see them mowing,
I am going to see them make the hay."

* * *

Bobby Shaftoe's gone to sea,
Silver buckles on his knee;
He'll come back and marry me,
Pretty Bobby Shaftoe.



Polly put the kettle on,
Polly put the kettle on,
Polly put the kettle on,
And let's drink tea.

Sukey, take it off again,
Sukey, take it off again,
Sukey, take it off again,
They've all gone away.

* * *

There was an old woman who lived in a shoe,
She had so many children she didn't know what to do.
She gave them some broth without any bread.
She whipped them all soundly and sent them to bed.

* * *

There was a little girl
Who had a little curl
Right in the middle of her forehead.
When she was good,
She was very, very good,
But when she was bad—
She was horrid.

* * *

Georgie Porgie, pudding and pie,
Kissed the girls and made them cry.
When the boys came out to play,
Georgie Porgie ran away.

Little Tommy Tucker,
Sing for your supper;
What shall he sing for?
White bread and butter.
How can he cut it
Without any knife?
How can he marry
Without any wife?

* * *

Wee Willie Winkie runs through the town,
Upstairs and downstairs in his night-gown,
Rapping at the window, crying through the lock,
"Are the children in their beds, for it's now eight o'clock?"

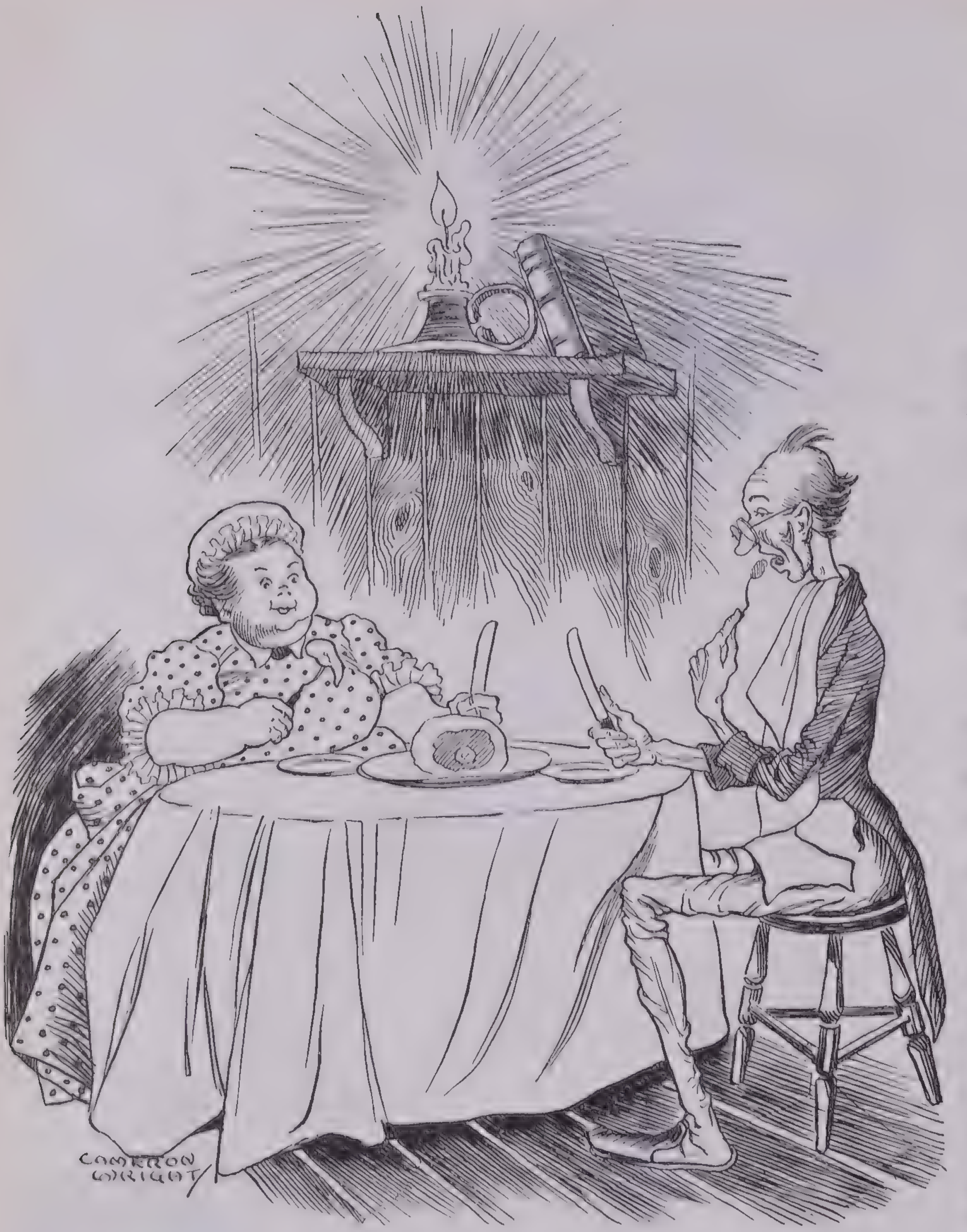
* * *

Girls and boys, come out to play,
The moon doth shine as bright as day.
Come with a whoop, come with a call,
Come with a good-will or not at all.
Up the ladder and down the wall,
A halfpenny roll will serve us all.
You find milk, and I'll find flour,
And we'll have a pudding in half an hour.

* * *

Sing a song of sixpence,
A pocket full of rye;
Four and twenty blackbirds
Baked in a pie;

When the pie was open'd
The birds began to sing;
Was not that a dainty dish,
To set before the king?



"Jack Spratt could eat no fat,
His wife could eat no lean,
And so betwixt them both,
They licked the platter clean."

* * *

Pussy-cat, Pussy-cat, where have you been?
I've been to London to look at the Queen.
Pussy-cat, Pussy-cat, what did you there?
I frighten'd a little mouse under the chair.

* * *

Mistress Mary, quite contrary,
How does your garden grow?
With silver bells and cockle-shells,
And pretty maids all in a row.

* * *

Simple Simon met a pieman
Going to the fair.
Says Simple Simon to the pieman,
"Let me taste your ware."

Says the pieman to Simple Simon,
"Shew me first your penny."
Says Simple Simon to the pieman,
"Indeed I have not any."

Simple Simon went a fishing
For to catch a whale.
All the water he had got
Was in his mother's pail.

Simple Simon went to look
If plums grew on a thistle.
He prick'd his fingers very much,
Which made poor Simon whistle.

* * *

Peter, Peter, pumpkin-eater,
Had a wife and couldn't keep her.
He put her in a pumpkin-shell,
And there he kept her very well.

* * *

Little drops of water,
Little grains of sand,
Make the mighty ocean
And the pleasant land.

Old Mother Hubbard
Went to the cupboard
To get her poor dog a bone;
But when she came there,
The cupboard was bare,
And so the poor dog had none.

* * *

Old Mother Goose, when
She wanted to wander,
Would ride through the air
On a very fine gander.

* * *

Humpty Dumpty sat on a wall,
Humpty Dumpty had a great fall.
All the King's horses and all the King's men
Couldn't put Humpty back again.

* * *

Hey! diddle, diddle,
The cat and the fiddle,
The cow jumped over the moon.
The little dog laughed
To see such sport,
And the dish ran away with the spoon.

* * *

There was a crooked man, and he went a crooked mile,
He found a crooked sixpence against a crooked stile;
He bought a crooked cat, which caught a crooked mouse,
And they all lived together in a little crooked house.

* * *

All around the cobbler's bench
The monkey chased the weasel;
The monkey thought 'twas all in fun,
Pop! goes the weasel!

* * *

Lady bird, lady bird, fly away home,
Your house is on fire, your children are gone;
All but one, and her name is Ann,
And she crept under the pudding pan.

* * *

One little, two little, three little Indians,
Four little, five little, six little Indians,
Seven little, eight little, nine little Indians,
Ten little Indian boys.

Ten little, nine little, eight little Indians,
Seven little, six little, five little Indians,
Four little, three little, two little Indians,
One little Indian boy.

* * *

Three little kittens
Lost their mittens,
And they began to cry:
"Oh, mother dear,
We very much fear
That we have lost our mittens!"
"Lost your mittens,
You naughty kittens!
Then you shall have no pie."
"Mee-ow, mee-ow, mee-ow,
And we can have no pie!
Mee-ow, mee-ow, mee-ow!"

A diller, a dollar,
A ten o'clock scholar,
What makes you come so soon?
You used to come at ten o'clock,
But now you come at noon.

* * *

Rub a dub dub,
Three men in a tub;
The butcher, the baker,
The candlestick-maker;
And they all jumped over a hot potato.

* * *

Eena, meena, mina, mo,
Catch a nigger by his toe,
If he hollers, let him go,
Eena, meena, mina, mo.
O—U—T spells out!

* * *

One, two,
Buckle my shoe.
Three, four,
Shut the door.
Five, six,
Pick up sticks.
Seven, eight,
Lay them straight.
Nine, ten,
A good fat hen.
Eleven, twelve,
Dig and delve.
Thirteen, fourteen,
Maids a-courting.
Fifteen, sixteen,
Maids a-kissing.
Seventeen, eighteen,
Maids a-waiting.
Nineteen, twenty,
My platter's empty.

* * *

When the wind is in the east,
'Tis neither good for man nor beast.
When the wind is in the north,
The skillful fisher goes not forth.
When the wind is in the south,
It blows the bait in the fishes' mouth.
When the wind is in the west,
Then 'tis at the very best.

* * *

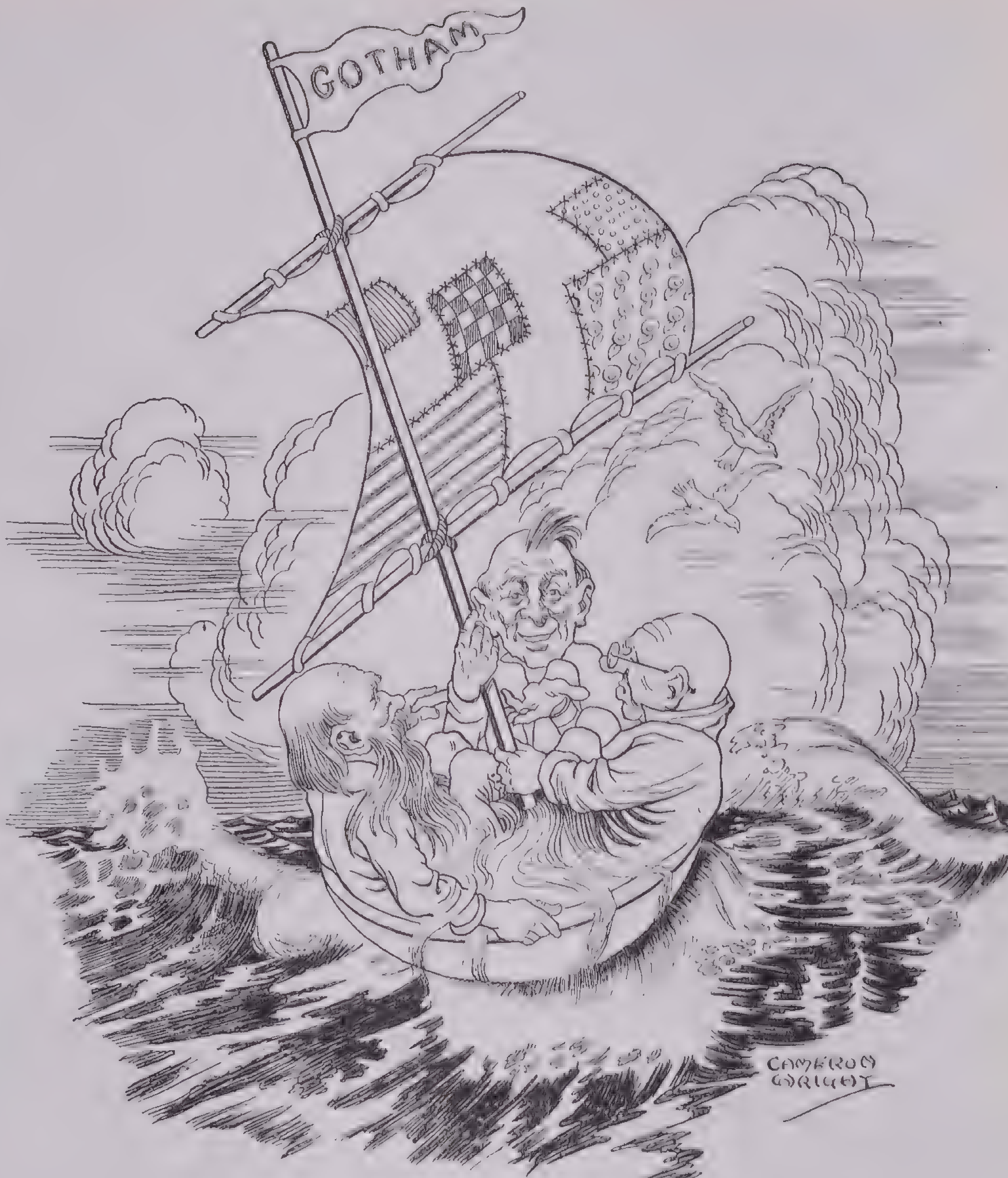
Monday's child is fair of face.
Tuesday's child is full of grace.
Wednesday's child is full of woe.
Thursday's child has far to go.
Friday's child is loving and giving.
Saturday's child works for its living.
But the child that is born on the Sabbath day
Is bonny and bright and good and gay.

* * *

Thirty days hath September,
April, June and November:
February has twenty-eight alone;
All the rest have thirty-one,
Excepting leap-year, that's the time
When February's days are twenty-nine.

* * *

Three wise men of Gotham,
Went to sea in a bowl,
If the bowl had been stronger,
My song had been longer.



A FROG HE WOULD A-WOOING GO

A frog he would a-wooing go,
Heigho, says Rowley,
Whether his mother would let him or no,
With a rowley, powley, gammon and spinach.
Heigho, says Anthony Rowley.

So off he set with his opera hat,
Heigho, says Rowley,
And on the road he met with a rat,
With a rowley, powley, etc.

When they came to the door of Mousey's hall,
Heigho, says Rowley,
They gave a loud knock, and they gave a loud call.
With a rowley, powley, etc.

"Pray, Mrs. Mouse, are you within?"
Heigho, says Rowley,
"Oh, yes, kind sirs, I'm sitting to spin."
With a rowley, powley, etc.

"Pray, Mrs. Mouse, will you give us some beer?"
Heigho, says Rowley,
"For Froggy and I are fond of good cheer."
With a rowley, powley, etc.

But while they were all a-merrymaking,
Heigho, says Rowley,
A Cat and her kittens came tumbling in.
With a rowley, powley, etc.

The Cat she seized the Rat by the crown,
Heigho, says Rowley,
The kittens they pulled the little Mouse down.
With a rowley, powley, etc.

This put Mr. Frog in a terrible fright;
Heigho, says Rowley,
He took up his hat, and he wished them good night.
With a rowley, powley, etc.

As Froggy was crossing it over a brook,
Heigho, says Rowley,
A lily-white Duck came and gobbled him up.
With a rowley, powley, etc.

So here is an end of one, two, three—
Heigho, says Rowley,
The Rat, the Mouse and little Froggy.
With a rowley, powley, etc.

Peter Piper picked a peck of pickled peppers;
A peck of pickled peppers Peter Piper picked;
If Peter Piper picked a peck of pickled peppers,
Where's the peck of pickled peppers Peter Piper picked?

* * *

Old King Cole
Was a merry old soul,
And a merry old soul was he;

He called for his pipe,
And he called for his bowl,
And he called for his fiddlers three.

Every fiddler, he had a fiddle,
And a very fine fiddle had he;
Twee tweedle dee, tweedle dee, went the fiddlers.

FOR OLDER CHILDREN

THE HOUSE THAT JACK BUILT

This is the house that Jack built.
This is the malt
That lay in the house that Jack built.
This is the rat
That ate the malt that lay in the house that Jack built.
This is the cat
That killed the rat that ate the malt that lay in the house that Jack built.
This is the dog
That worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the cow with the crumpled horn
That tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the maiden all forlorn
That milked the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the man all tattered and torn
That kissed the maiden all forlorn that milked the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the priest all shaven and shorn
That married the man all tattered and torn that kissed the maiden all forlorn that milked the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the cock that crowed in the morn
That waked the priest all shaven and shorn that married the man all tattered and torn that kissed the maiden all forlorn that milked the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.
This is the farmer sowing his corn
That kept the cock that crowed in the morn that waked the priest all shaven and shorn that married the man all tattered and torn that kissed the maiden all forlorn that milked the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built.

* * * * * *

THE QUEEN OF HEARTS

The Queen of Hearts,
She made some tarts,
All on a summer's day.
The Knave of Hearts,
He stole the tarts
And took them clean away.

The King of Hearts
Call'd for the tarts
And beat the knave full sore.
The Knave of Hearts
Brought back the tarts
And vow'd he'd steal no more.

* * *

Twinkle, twinkle, little star—
How I wonder what you are!
Up above the world so high,
Like a diamond in the sky.

When the blazing sun is gone,
When he nothing shines upon,
Then you show your little light,
Twinkle, twinkle, all the night.

Then the traveler in the dark
Thanks you for your tiny spark;
He could not see which way to go,
If you did not twinkle so.

As your bright and tiny spark
Lights the traveler in the dark:
Though I know not what you are,
Twinkle, twinkle, little star.

* * *

DAME WIGGINS OF LEE

AND

HER SEVEN WONDERFUL CATS

Dame Wiggins of Lee
Was a worthy old soul
As e'er threaded a needle
Or washed in a bowl.

She held mice and rats
In such antipathee,
That seven fine cats
Kept Dame Wiggins of Lee.

The rats and mice scared
By this fierce-whiskered crew,
The seven poor cats
Soon had nothing to do;

So, as anyone idle
She ne'er loved to see,
She sent them to school,
Did Dame Wiggins of Lee.

The master soon wrote
That they all of them knew
How to read the word "milk"
And to spell the word "mew,"

And they all washed their faces
Before they took tea.
"Were there ever such dears?"
Said Dame Wiggins of Lee.

He had also thought well
To comply with their wish
To spend all their play time
In learning to fish—
For titlings; they sent her
A present of three,
Which fried were a feast
For Dame Wiggins of Lee.

But the Dame soon grew tired
Of living alone;
So she sent for her cats
From school to come home.

Each rowing a wherry,
Returning you see:
The frolic made merry
Dame Wiggins of Lee.

The Dame was quite pleas'd,
And ran out to market;
When she came back
They were mending the carpet.

The needle each handled
As brisk as a bee.
"Well done, my good cats!"
Said Dame Wiggins of Lee.

To give them a treat,
She ran out for some rice;
When she came back,
They were skating on ice.

"I shall soon see one down,
Aye, perhaps, two or three,
I'll bet half a crown,"
Said Dame Wiggins of Lee.

When springtime came back,
They had breakfast of curds
And were greatly afraid
Of disturbing the birds.

"If you sit like good cats,
All the seven in a tree,
They will teach you to sing,"
Said Dame Wiggins of Lee.

So they sat in a tree
And said "Beautiful! Hark!"
And they listened and looked
In the clouds for a lark.

Then sang by the fireside
Sym-pho-ni-ous-ly
A song without words
To Dame Wiggins of Lee.

They called the next day
On the tomtit and sparrow
And wheeled a poor sick lamb
Home in a barrow.

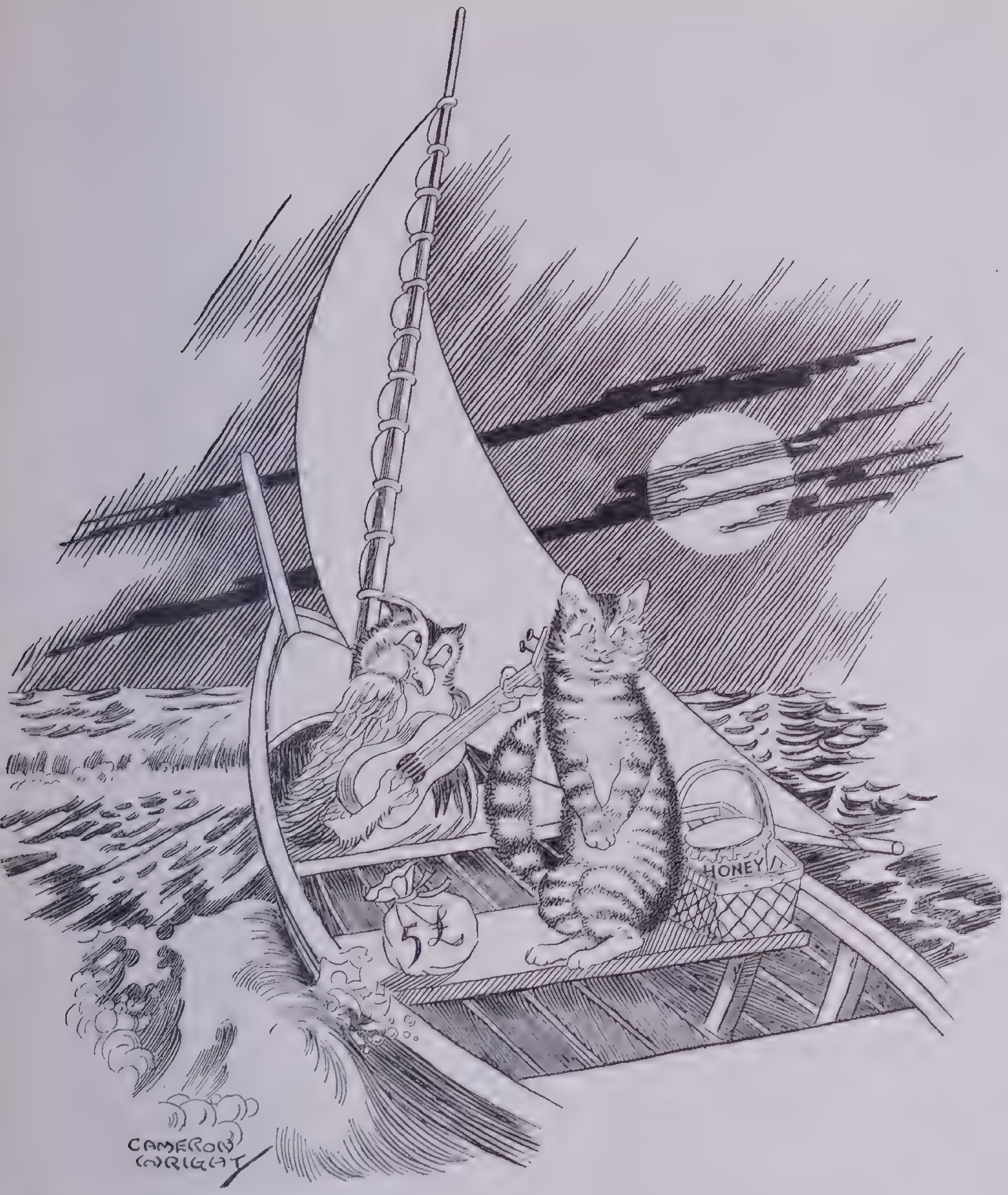
"You shall all have some sprats
For your humanitee,
My seven good cats,"
Said Dame Wiggins of Lee.

While she ran to the field
To look for its dam,
They were warming the bed
For the poor sick lamb:

They turned up the clothes
All as neat as could be.
"I shall ne'er want a nurse,"
Said Dame Wiggins of Lee.

She wished them good-night
And went up to bed:
When, lo! in the morning,
The cats were all fled.

But soon—what a fuss!
"Where can they all be?
Here, pussy, puss, puss!"
Cried Dame Wiggins of Lee.



The Dame's heart was nigh broke,
  So she sat down to weep,
When she saw them come back
  Each riding a sheep:

She fondled and patted
  Each purring Tommee:
"Ah! welcome, my dears,"
  Said Dame Wiggins of Lee.

The Dame was unable
  Her pleasure to smother
To see the sick lamb
  Jump up to its mother.

In spite of the gout
  And the pain in her knee,
She went dancing about,
  Did Dame Wiggins of Lee.

The farmer soon heard
  Where his sheep went astray
And arrived at Dame's door
  With his faithful dog Tray.

He knocked with his crook,
  And the stranger to see,
Out of window did look
  Dame Wiggins of Lee.

For their kindness he had them
  All drawn by the team,
And gave them some field-mice
  And raspberry cream.

Said he, "All my stock
  You shall presently see,
For I *know* the cats
  Of Dame Wiggins of Lee."

He sent his maid out
  For some muffins and crumpets;
And when he turned round
  They were blowing of trumpets.

Said he, "I suppose
  She's as deaf as can be,
Or this ne'er could be borne
  By Dame Wiggins of Lee."

To show them his poultry,
  He turned them all loose,
When each nimbly leap'd
  On the back of a goose,

Which frighten'd them so
  That they ran to the sea
And half-drown'd the poor cats
  Of Dame Wiggins of Lee.

For the care of his lamb
  And their comical pranks
He gave them a ham
  And abundance of thanks.

"I wish you good-day,
  My fine fellows," said he.
"My compliments, pray,
  To Dame Wiggins of Lee."

You see them arrived
  At their Dame's welcome door;
They show her their presents
  And all their good store.

"Now come in to supper
  And sit down with me,
All welcome once more,"
  Cried Dame Wiggins of Lee.

* * * * * *

THE OWL AND THE PUSSY-CAT

By Edward Lear

The Owl and the Pussy-Cat went to sea
  In a beautiful pea-green boat,
They took some honey, and plenty of money,
  Wrapped up in a five-pound note.
The owl looked up at the stars above
  And sang to a small guitar,
"O lovely Pussy! O Pussy, my love,
  What a beautiful Pussy you are,
      You are!
  What a beautiful Pussy you are!"

Pussy said to the Owl, "You elegant fowl!
  How charmingly sweet you sing!
O let us be married! Too long we have tarried.
  But what shall we do for a ring?"
They sailed away for a year and a day,
  To the land where the Bong-tree grows,
And there in a wood a Piggy-wig stood,
  With a ring at the end of his nose,
      His nose,
  With a ring at the end of his nose.

"Dear Pig, are you willing to sell for one shilling
  Your ring?" Said the Piggy, "I will."
So they took it away and were married next day
  By the Turkey who lives on the hill.
They dined on mince and slices of quince,
  Which they ate with a runcible spoon;
And hand in hand, on the edge of the sand,
  They danced by the light of the moon,
      The moon,
  They danced by the light of the moon.

* * * * * *

From

UNDER THE WINDOW[1]

By

Kate Greenaway

In go-cart so tiny
  My sister I drew;
And I've promised to draw her
  The wide world through.
We have not yet started—
  I own it with sorrow—
Because our trip's always
  Put off till tomorrow.

* * *

Little wind, blow on the hill-top,
  Little wind, blow down the plain:
Little wind, blow up the sunshine,
  Little wind, blow off the rain.

---

[1] By arrangement with Frederick Warne & Co., Inc.

From

A CHILD'S GARDEN OF VERSES

By Robert Louis Stevenson

THE LITTLE LAND

I have just to shut my eyes
To go sailing through the skies—
To go sailing far away
To the pleasant Land of Play.

* * *

THE SWING

How do you like to go up in a swing,
Up in the air so blue?
"Oh, I do think it the pleasantest thing
Ever a child can do!"

"Up in the air and over the wall,
Till I can see so wide,
Rivers and trees and cattle and all
Over the countryside—

"Till I look down on the garden green
Down on the roof so brown—
Up in the air I go flying again,
Up in the air and down!"

* * * * * *

BED IN SUMMER

In winter I get up at night
And dress by yellow candle-light.
In summer, quite the other way,
I have to go to bed by day.

I have to go to bed and see
The birds still hopping on the tree,
Or hear the grown-up people's feet
Still going past me in the street.

And does it not seem hard to you,
When all the sky is clear and blue,
And I should like so much to play,
To have to go to bed by day?

* * *

THE WIND

I saw you toss the kites on high
And blow the birds about the sky;
And all around I heard you pass,
Like ladies' skirts across the grass—
O wind, a-blowing all day long,
O wind, that sings so loud a song!

I saw the different things you did,
But always you yourself you hid.
I felt you push, I heard you call,
I could not see yourself at all—
O wind, a-blowing all day long,
O wind, that sings so loud a song!

O you that are so strong and cold,
O blower, are you young or old?
Are you a beast of field and tree,
Or just a stronger child than me?
O wind, a-blowing all day long,
O wind, that sings so loud a song!

* * *

FOREIGN CHILDREN

Little Indian, Sioux or Crow,
Little frosty Eskimo,
Little Turk or Japanee,
O! don't you wish that you were me?

You have seen the scarlet trees
And the lions over seas.
You have eaten ostrich eggs
And turned the turtles off their legs.

Such a life is very fine,
But it's not so nice as mine.
You must often, as you trod,
Have wearied *not* to be abroad.

You have curious things to eat,
I am fed on proper meat;
You must dwell beyond the foam,
But I am safe and live at home.

Little Indian, Sioux or Crow,
Little frosty Eskimo,
Little Turk or Japanee,
O! don't you wish that you were me?

* * *

MY BED IS A BOAT

My bed is like a little boat;
Nurse helps me in when I embark;
She girds me in my sailor's coat
And starts me in the dark.

At night, I go on board and say
Good night to all my friends on shore;
I shut my eyes and sail away
And see and hear no more.

And sometimes things to bed I take,
As prudent sailors have to do;
Perhaps a slice of wedding cake,
Perhaps a toy or two.

All night across the dark we steer;
But when the day returns at last,
Safe in my room, beside the pier,
I find my vessel fast.

* * *

BLOCK CITY

What are you able to build with your blocks?
Castles and palaces, temples and docks.
Rain may keep raining, and others go roam,
But I can be happy and building at home.

Let the sofa be mountains, the carpet be sea,
There I'll establish a city for me:
A kirk and a mill and a palace beside,
And a harbor as well where my vessels may ride.

Great is the palace with pillar and wall,
A sort of a tower on the top of it all,
And steps coming down in an orderly way
To where my toy vessels lie safe in the bay.

This one is sailing and that one is moored:
Hark to the song of the sailors on board!
And see on the steps of my palace, the kings
Coming and going with presents and things!

Now I have done with it, down let it go!
All in a moment the town is laid low.
Block upon block lying scattered and free,
What is there left of my town by the sea?

Yet, as I saw it, I see it again,
The kirk and the palace, the ships and the men,
And as long as I live and where'er I may be,
I'll always remember my town by the sea.

RAIN

The rain is raining all around,
It falls on field and tree,
It rains on the umbrellas here
And on the ships at sea.

* * *

HAPPY THOUGHT

The world is so full of a number of things,
I'm sure we should all be as happy as kings.

* * *

TIME TO RISE

A birdie with a yellow bill
Hopped upon the window-sill,
Cocked his shining eye and said:
"Ain't you 'shamed, you sleepy head!"

* * *

MY SHADOW

I have a little shadow that goes in and out with me,
And what can be the use of him is more than I can see.
He is very, very like me from the heels up to the head;
And I see him jump before me, when I jump into my bed.

The funniest thing about him is the way he likes to grow—
Not at all like proper children, which is always very slow;
For he sometimes shoots up taller like an india-rubber ball,
And he sometimes gets so little that there's none of him at all.

He hasn't got a notion of how children ought to play,
And can only make a fool of me in every sort of way.
He stays so close beside me, he's a coward you can see;
I'd think shame to stick to nursie as that shadow sticks to me!

One morning, very early, before the sun was up,
I rose and found the shining dew on every buttercup;
But my lazy little shadow, like an arrant sleepy-head,
Had stayed at home behind me and was fast asleep in bed.

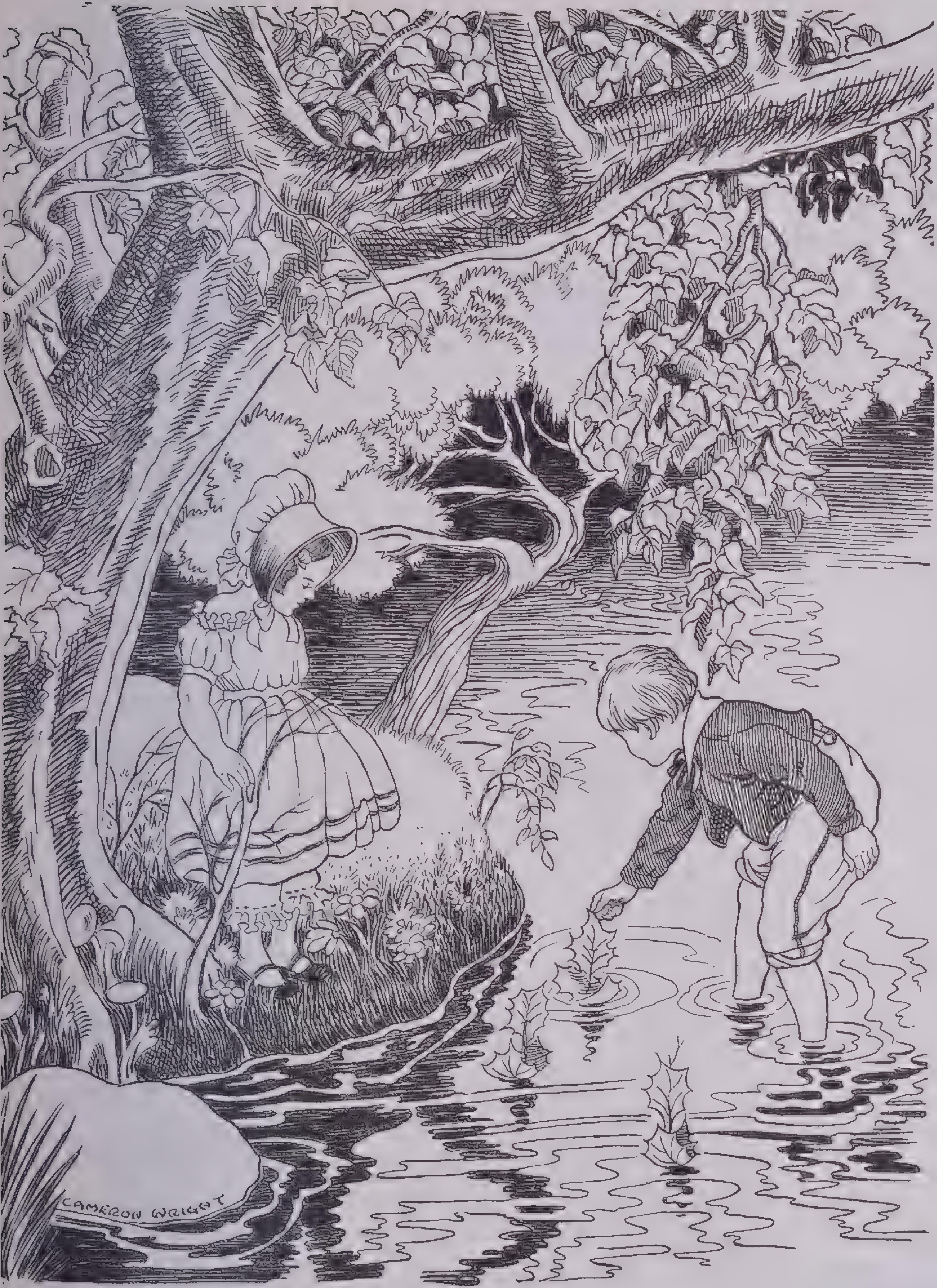
* * *

WHERE GO THE BOATS?

Dark brown is the river,
Golden is the sand,
It flows along for ever,
With trees on either hand.

Green leaves a-floating,
Castles of the foam,
Boats of mine a-boating—
Where will all come home?

On goes the river
And out past the mill,
Away down the valley,
Away down the hill.



Away down the river,
A hundred miles or more,
Other little children
Shall bring my boats ashore.

* * *

From
SING-SONG[1]
By Christina Rossetti

Who has seen the wind?
Neither I nor you:
But when the leaves hang trembling
The wind is passing thro'.

Who has seen the wind?
Neither you nor I:
But when the trees bow down their heads
The wind is passing by.

A frisky lamb
And a frisky child
Playing their pranks
In a cowslip meadow:

The sky all blue
And the air all mild
And the fields all sun
And the lanes half shadow.

* * *

On the grassy banks
Lambkins at their pranks;
Woolly sisters, woolly brothers,
Jumping off their feet,
While their woolly mothers
Watch by them and bleat.

* * *

Growing in the vale
By the uplands hilly,
Growing straight and frail,
Lady Daffadowndilly.
In a golden crown,
And a scant green gown
While the spring blows chilly,
Lady Daffadown,
Sweet Daffadowndilly.

* * *

Love me,—I love you,
Love me, my baby;
Sing it high, sing it low,
Sing it as may be.

Mother's arms under you,
Her eyes above you;
Sing it high, sing it low,
Love me—I love you.

* * *

Is the moon tired? she looks so pale
Within her misty veil:
She scales the sky from east to west,
And takes no rest.

Before the coming of the night
The moon shows papery white;
Before the dawning of the day
She fades away.

* * *

Lullaby, oh lullaby!
Flowers are closed and lambs are sleeping;
Lullaby, oh lullaby!
Stars are up, the moon is peeping;
Lullaby, oh lullaby!
While the birds are silence keeping,
(Lullaby, oh lullaby!)
Sleep, my baby, fall a-sleeping,
Lullaby, oh lullaby!

* * * * *

THE ROCK-A-BY LADY FROM HUSHABY STREET
By Eugene Field

The Rock-a-By Lady from Hushaby Street
Comes stealing; comes creeping;
The poppies, they hang from her head to her feet,
And each hath a dream that is tiny and fleet—
She bringeth her poppies to you, my sweet,
When she findeth you sleeping!

There is one little dream of a beautiful drum—
"Rub-a-dub!" it goeth;
There is one little dream of a big sugar plum,
And lo! thick and fast the other dreams come
Of popguns that bang, and tin-tops that hum,
And a trumpet that bloweth!

And dollies peep out of those wee little dreams
With laughter and singing;
And boats go a-floating on silvery streams,
And the stars peek-a-boo with their own misty gleams,
And up, up, and up, where the Mother Moon beams,
The fairies go winging!

Would you dream all these dreams that are tiny and fleet?

---

[1] The seven poems from "Sing-Song" by Christina Rossetti are reprinted by permission of The Macmillan Company, publishers.

They'll come to you sleeping;
So shut the two eyes that are weary, my sweet,
For the Rock-a-By Lady from Hushaby Street,
With poppies that hang from her head to her feet,
Comes stealing; comes creeping.

* * * * * *

WYNKEN, BLYNKEN AND NOD

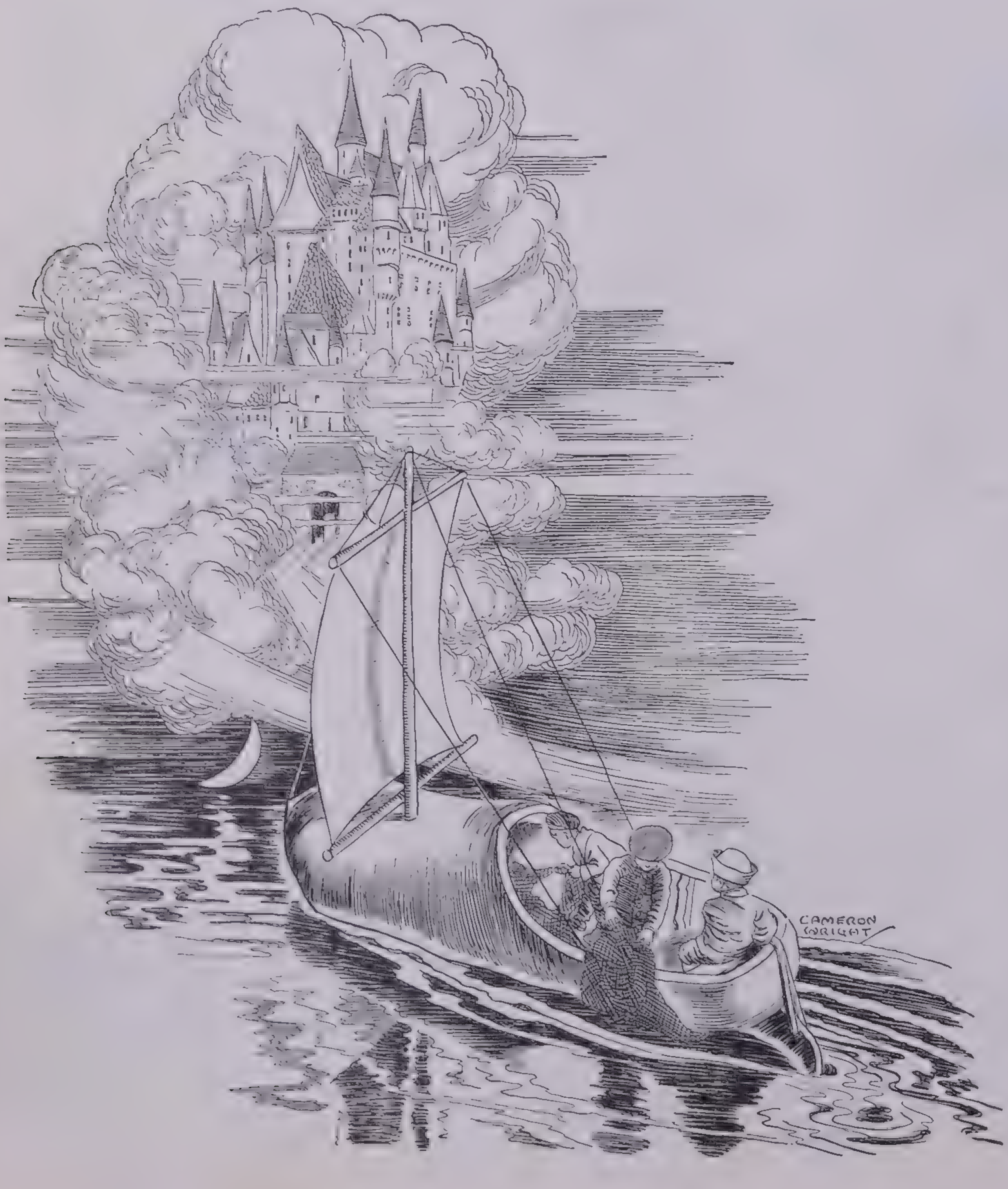
By Eugene Field

Wynken, Blynken and Nod one night
Sailed off in a wooden shoe—
Sailed on a river of crystal light
Into a sea of dew.
"Where are you going, and what do you wish?"
The old moon asked the three.
"We have come to fish for the herring fish
That live in this beautiful sea;
Nets of silver and gold have we,"
Said Wynken,
Blynken
And Nod.

The old moon laughed and sang a song,
As they rocked in the wooden shoe;
And the wind that sped them all night long
Ruffled the waves of dew;
The little stars were the herring fish
That lived in the beautiful sea.
"Now cast your nets wherever you wish—
Never afeard are we!"
So cried the stars to the fishermen three,
Wynken,
Blynken
And Nod.

All night long their nets they threw
To the stars in the twinkling foam—
Then down from the skies came the wooden shoe,
Bringing the fishermen home;
'Twas all so pretty a sail, it seemed
As if it could not be;
And some folk thought 'twas a dream they'd dreamed
Of sailing that beautiful sea.
But I shall name you the fishermen three:
Wynken,
Blynken
And Nod.

Wynken and Blynken are two little eyes,
And Nod is a little head,
And the wooden shoe that sailed the skies
Is a wee one's trundle-bed;
So shut your eyes while mother sings
Of wonderful sights that be,
And you shall see the beautiful things
As you rock on the misty sea
Where the old shoe rocked the fishermen three—
Wynken,
Blynken
And Nod.



* * * * *

THE YEAR'S AT THE SPRING

By Robert Browning

The year's at the spring,
And day's at the morn;
Morning's at seven;
The hill-side's dew-pearl'd;
The lark's on the wing;
The snail's on the thorn;
God's in His heaven—
All's right with the world.

* * * * *

THE PIPER

By William Blake

Piping down the valleys wild,
Piping songs of pleasant glee,
On a cloud I saw a child,
And he laughing said to me:

"Pipe a song about a lamb!"
So I piped with merry cheer.
"Piper, pipe that song again;"
So I piped: he wept to hear.

"Drop thy pipe, thy happy pipe;
Sing thy songs of happy cheer!"
So I sang the same again,
While he wept with joy to hear.

"Piper, sit thee down and write
In a book that all may read."
So he vanished from my sight;
And I plucked a hollow reed,

And I made a rural pen,
And I stained the water clear,
And I wrote my happy songs
Every child may joy to hear.

* * *

THE NIGHT BEFORE CHRISTMAS

By Clement Moore

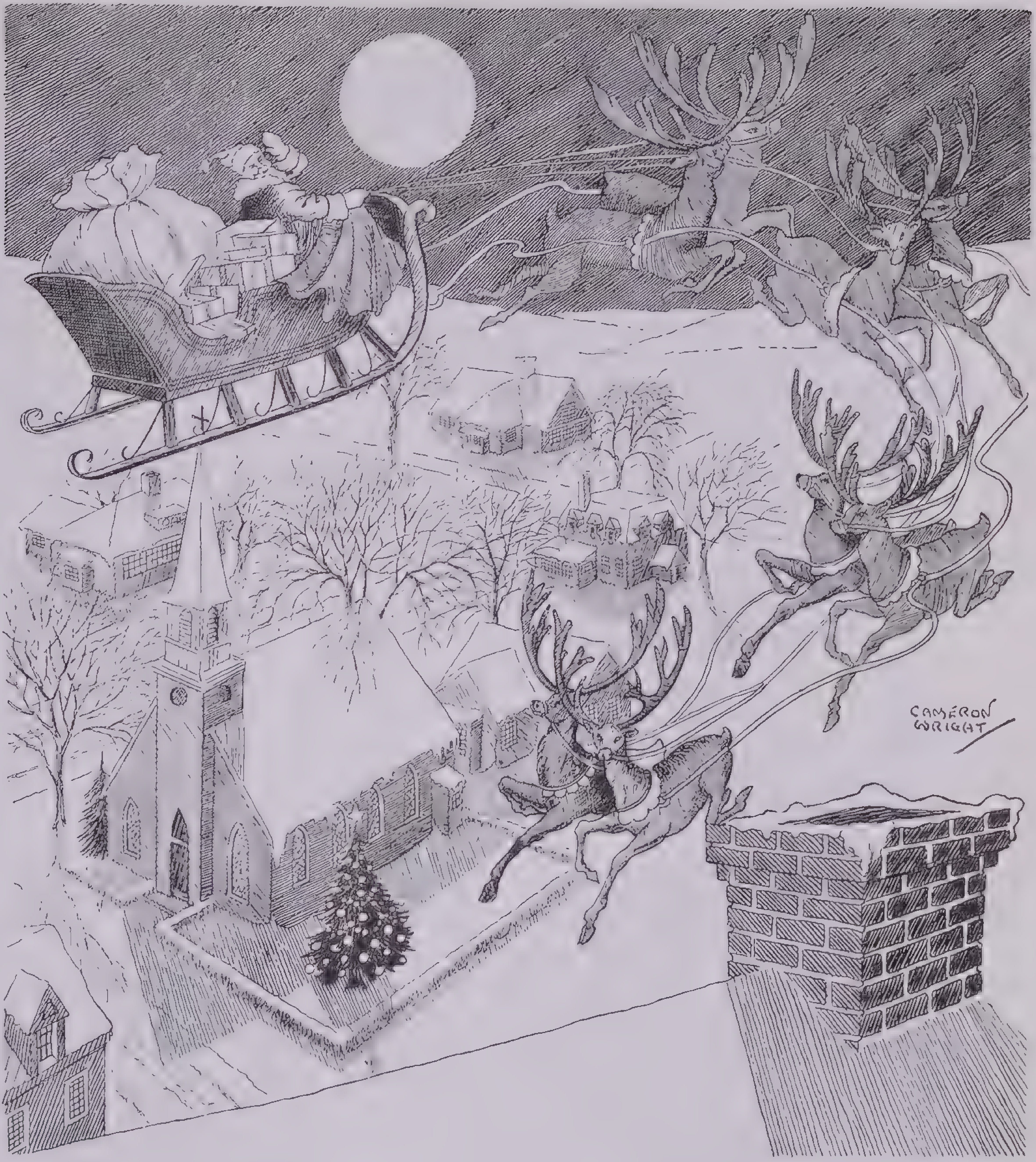
'Twas the night before Christmas,
When all through the house
Not a creature was stirring,
Not even a mouse.

The stockings were hung
By the chimney with care,
In hopes that St. Nicholas
Soon would be there.

The children were nestled
All snug in their beds,
While visions of sugar-plums
Danced through their heads.

Mamma in her kerchief
And I in my cap
Had just settled our brains
For a long winter's nap.

When out on the lawn
There arose such a clatter
I sprang from my bed
To see what was the matter.



Away to the window
I flew like a flash,
Tore open the shutters
And threw up the sash.

The moon on the breast
Of the new fallen snow
Gave a lustre of mid-day
To objects below,

When what to my wondering eyes
Should appear—
But a miniature sleigh
And eight tiny reindeer!

With a little old driver,
So lively and quick,
I knew in a moment
It must be St. Nick.

More rapid than eagles,
His coursers they came,
And he whistled and shouted
And called each by name:
"Now, Dasher, now, Dancer,
Now, Prancer, now, Vixen!
On, Comet! On, Cupid!
On, Donner and Blitzen!

To the top of the porch,
To the top of the wall,
Now, dash away, dash away,
Dash away, all!"

As dry leaves before the wild hurricane fly,
When they meet with an obstacle, mount to the sky:
So up to the house-top the coursers they flew,
With the sleigh full of toys, and St. Nicholas, too.

And then, in a twinkling,
I heard on the roof
The prancing and pawing
Of each little hoof.

As I drew in my head,
And was turning around,
Down the chimney St. Nicholas came
With a bound!

He was dressed all in fur
From his head to his foot,
And his clothes were all tarnished
With ashes and soot;

A bundle of toys
He had flung on his back,
And he looked like a peddler
Just opening his pack.

His eyes, how they twinkled!
His dimples, how merry!
His cheeks were like roses,
His nose like a cherry.

His droll little mouth
Was drawn up like a bow,
And the beard on his chin
Was as white as the snow.

The stump of a pipe
He held tight in his teeth,
And the smoke, it encircled
His head like a wreath.

He had a broad face,
And a little round belly
That shook when he laughed
Like a bowlful of jelly.

He was chubby and plump—
A right jolly old elf,
And I laughed when I saw him
In spite of myself.

A wink of his eye
And a twist of his head
Soon gave me to know
I had nothing to dread.

He spoke not a word
But went straight to his work
And filled all the stockings,
Then turned with a jerk—

And, laying his finger
Aside of his nose
And giving a nod,
Up the chimney he rose.

He sprang to his sleigh,
To his team gave a whistle,
And away they all flew
Like the down on a thistle.

And I heard him exclaim
Ere he drove out of sight:
"MERRY CHRISTMAS TO ALL,
AND TO ALL A GOOD NIGHT!"

* * * * *

SWEET AND LOW

By Alfred Tennyson

Sweet and low, sweet and low,
Wind of the western sea;
Low, low, breathe and blow,
Wind of the western sea!
Over the rolling waters go,
Come from the dying moon and blow,
Blow him again to me,
While my little one,
While my pretty one
Sleeps.

Sleep and rest, sleep and rest,
Father will come to thee soon;
Rest, rest, on mother's breast,
Father will come to thee soon.
Father will come to his babe in the nest,
Silver sails all out of the west,
Under the silver moon.
Sleep, my little one,
Sleep, my pretty one,
Sleep!

* * *

THE PUZZLED CENTIPEDE

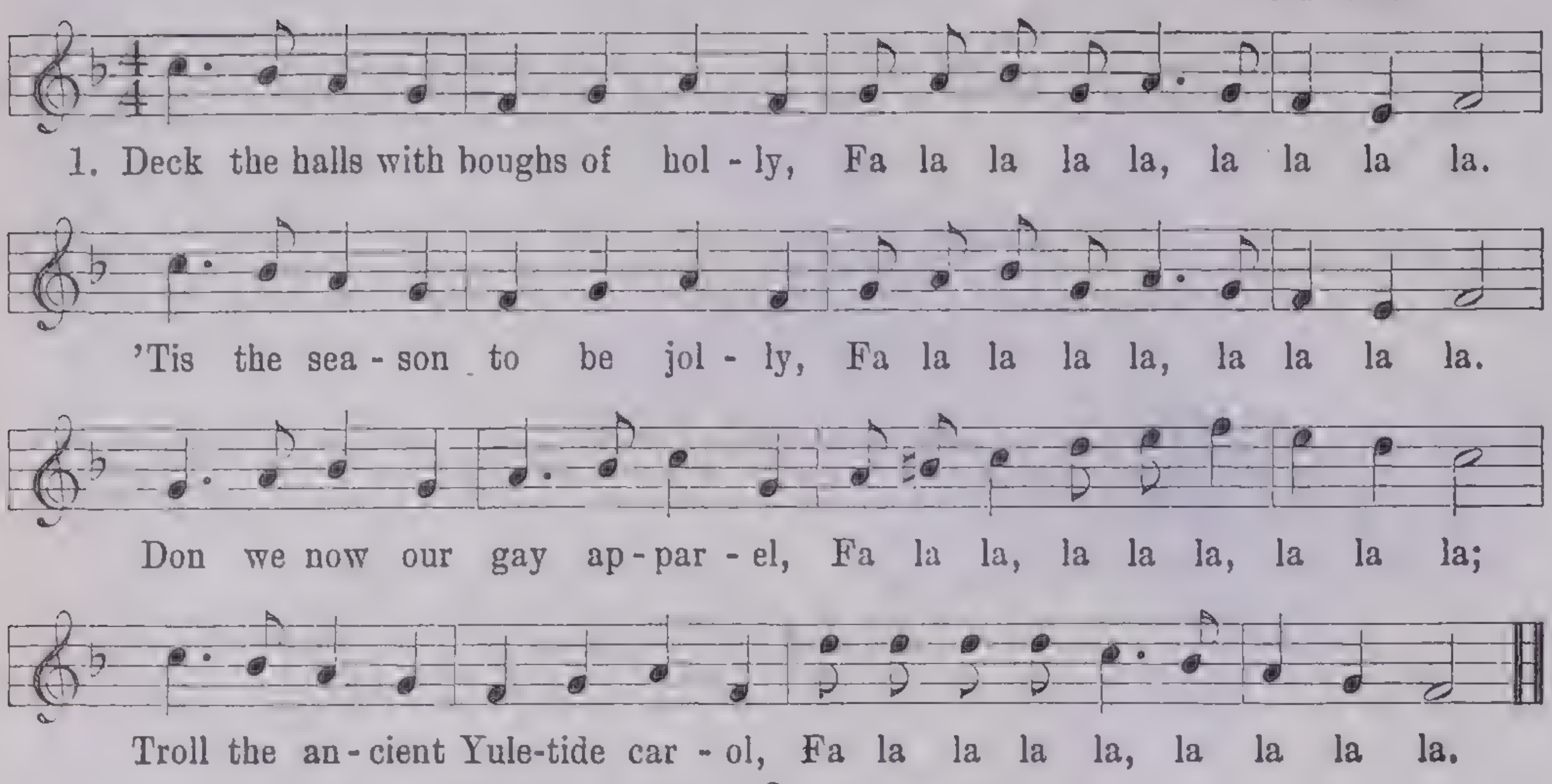
A centipede was happy quite,
Until a frog in fun
Said, "Pray, which leg comes after which?"
This roused her mind to such a pitch,
She lay distracted in the ditch
Considering how to run.

* * *

As Tommy Snooks and Bessy Brooks
Were walking out one Sunday,
Says Tommy Snooks to Bessy Brooks,
"Tomorrow will be Monday."

DECK THE HALLS

Old Welsh Air


1. Deck the halls with boughs of hol - ly, Fa la la la la, la la la la.
'Tis the sea - son to be jol - ly, Fa la la la la, la la la la.
Don we now our gay ap - par - el, Fa la la, la la la, la la la;
Troll the an - cient Yule-tide car - ol, Fa la la la la, la la la la.

2

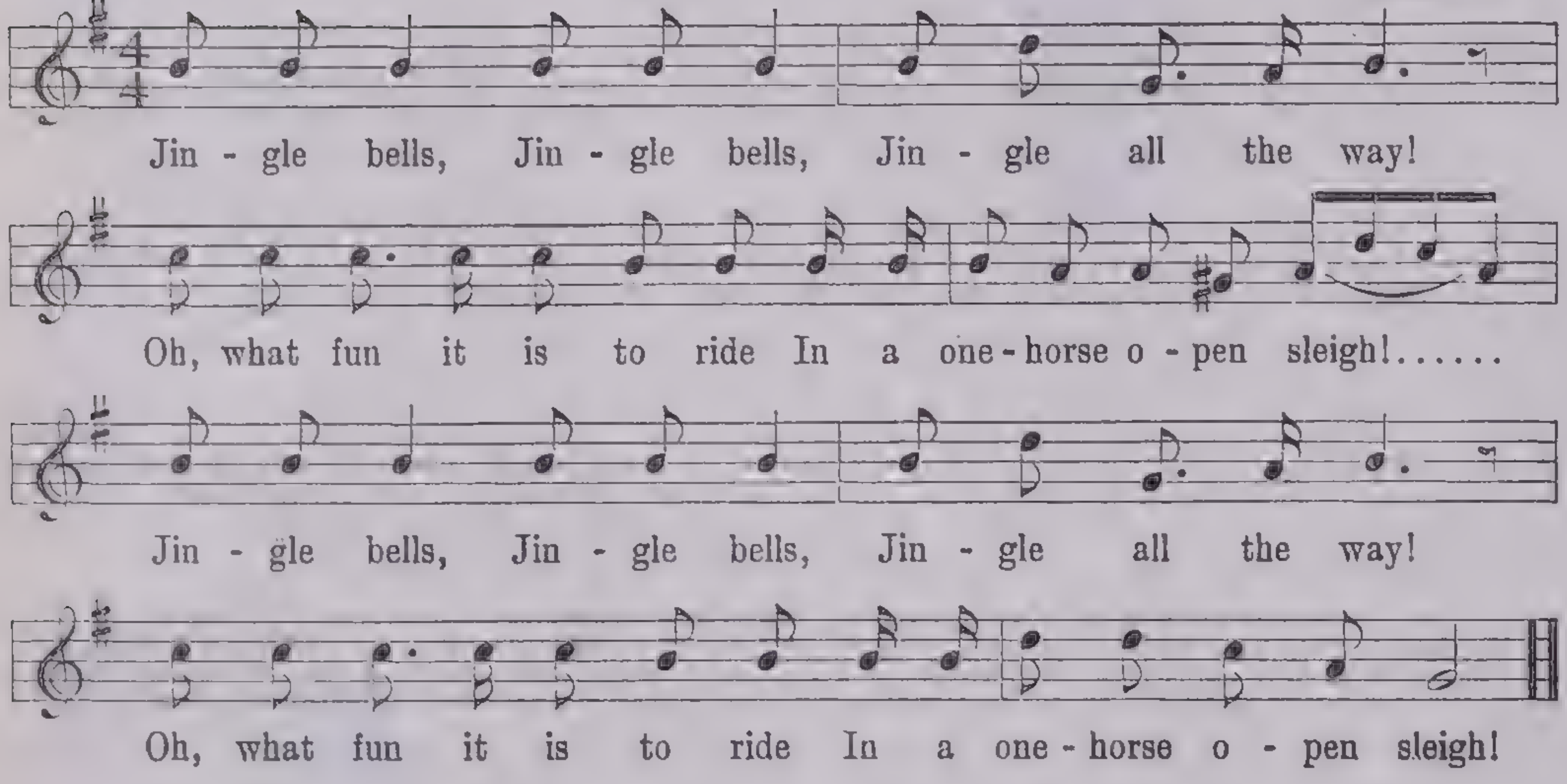
See the blazing Yule before us, Fa la la, etc.
Strike the harp and join the chorus, Fa la la, etc.
Follow me in merry measure, Fa la la, etc.
While I tell of Yuletide treasure, Fa la la, etc.

3

Fast away the old year passes, Fa la la, etc.
Hail the new, ye lads and lassies, Fa la la, etc.
Sing we joyous, all together, Fa la la, etc.
Heedless of the wind and weather, Fa la la, etc.

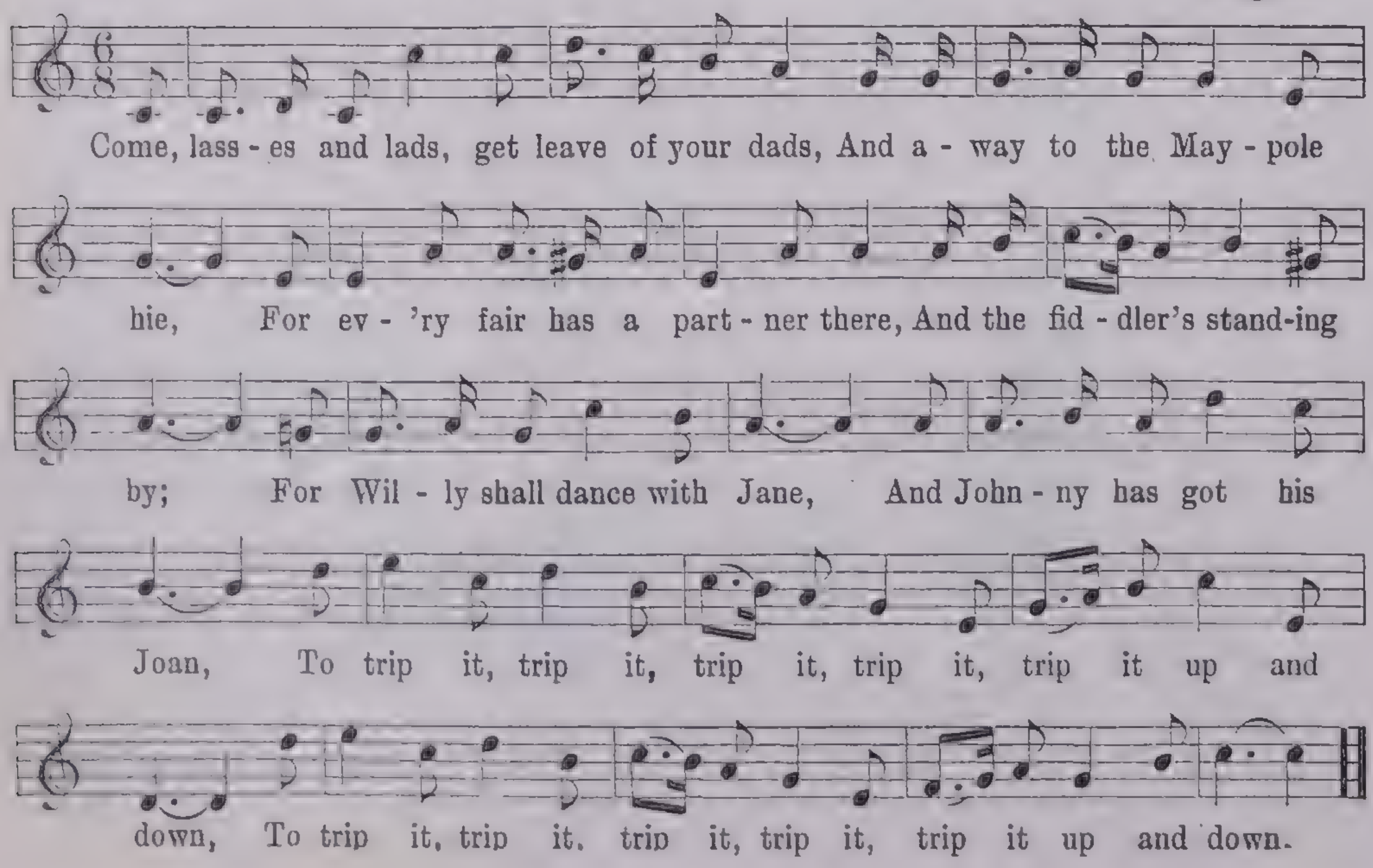
JINGLE BELLS

J. PIERPONT


Jin - gle bells, Jin - gle bells, Jin - gle all the way!
Oh, what fun it is to ride In a one - horse o - pen sleigh!......
Jin - gle bells, Jin - gle bells, Jin - gle all the way!
Oh, what fun it is to ride In a one - horse o - pen sleigh!

COME, LASSES AND LADS

English


Come, lass - es and lads, get leave of your dads, And a - way to the May - pole
hie, For ev - 'ry fair has a part - ner there, And the fid - dler's stand-ing
by; For Wil - ly shall dance with Jane, And John - ny has got his
Joan, To trip it, trip it, trip it, trip it, trip it up and
down, To trip it, trip it, trip it, trip it, trip it up and down.

SONGS AND SINGING GAMES

INTRODUCTION

The following songs have been carefully selected for this volume as typical examples of songs that have stood the test of time and are still universally popular. They are suited to children of almost any age, and no child should pass the age of eight or ten without having sung and learned every song in this collection. It has been the aim of the editors to include various kinds of songs in order that music for different interests and activities of children might be made available to them. There are:

1. Five Seasonal Songs: *Deck the Halls* and *Jingle Bells* for winter; *Come Lasses and Lads* for springtime singing; *Harvest Home,* a characteristic autumn song; and *Row, Row, Row Your Boat* (a *round*), which is very popular in summer.
2. Two modern songs for very young children which represent the everyday interests of the present time: *The Postman* and *Down by the Station.*
3. Six Game Songs, with directions for playing the games: *The Farmer in the Dell; Here We Go Round the Mulberry Bush; London Bridge; Oats, Peas, Beans and Barley Grow; Round and Round the Village* and *The King of France.*
4. Five traditional English songs: *Lavender's Blue, Oh! Dear! What can the Matter be? Where are You Going To? Old King Cole* and *Rock-a-bye Baby.* All these furnish not only good song material but good dance music as well.
5. Four sense games: *Sight, Smell, Taste* and *Touch.*

Five Seasonal Songs

DECK THE HALLS

Although this old song is of Welsh origin, it is an especial favorite of American children, and our Christmas festivities do not seem complete without it.

JINGLE BELLS

Everywhere in America this old sleighing song is sung in the wintertime, even in the balmy South where the snow seldom falls.

COME, LASSES AND LADS

This merry old English song furnishes a jolly dance for groups of any age. It is very effective when played on the violin out of doors—with singing also—while children dance on the grass, as they did in the days of Merrie England.

HARVEST HOME

The music of *Harvest Home* was written in the late 17th century by England's greatest composer, Henry Purcell. For more than two hundred years this has been one of the standard autumn songs.

ROW, ROW, ROW YOUR BOAT

This is a four-part *round,* and the singers should be divided into four groups.

The first group starts the song, and when they have reached the word *gently,* the second group starts at the beginning of the song. When the second group reaches the word *gently,* the third group begins at the beginning; and when the third group reaches the word *gently,* the fourth group begins. Sing through the song at least twice. The first group will finish first, and the fourth group will have to sing the last phrase alone after all the others have finished. If every one keeps on the tune and starts at exactly the right time, the result will be very pleasing harmonies.

Two Modern Songs

THE POSTMAN

The Postman is suited to children from three to five years of age. Most children will enjoy acting it out as they sing.

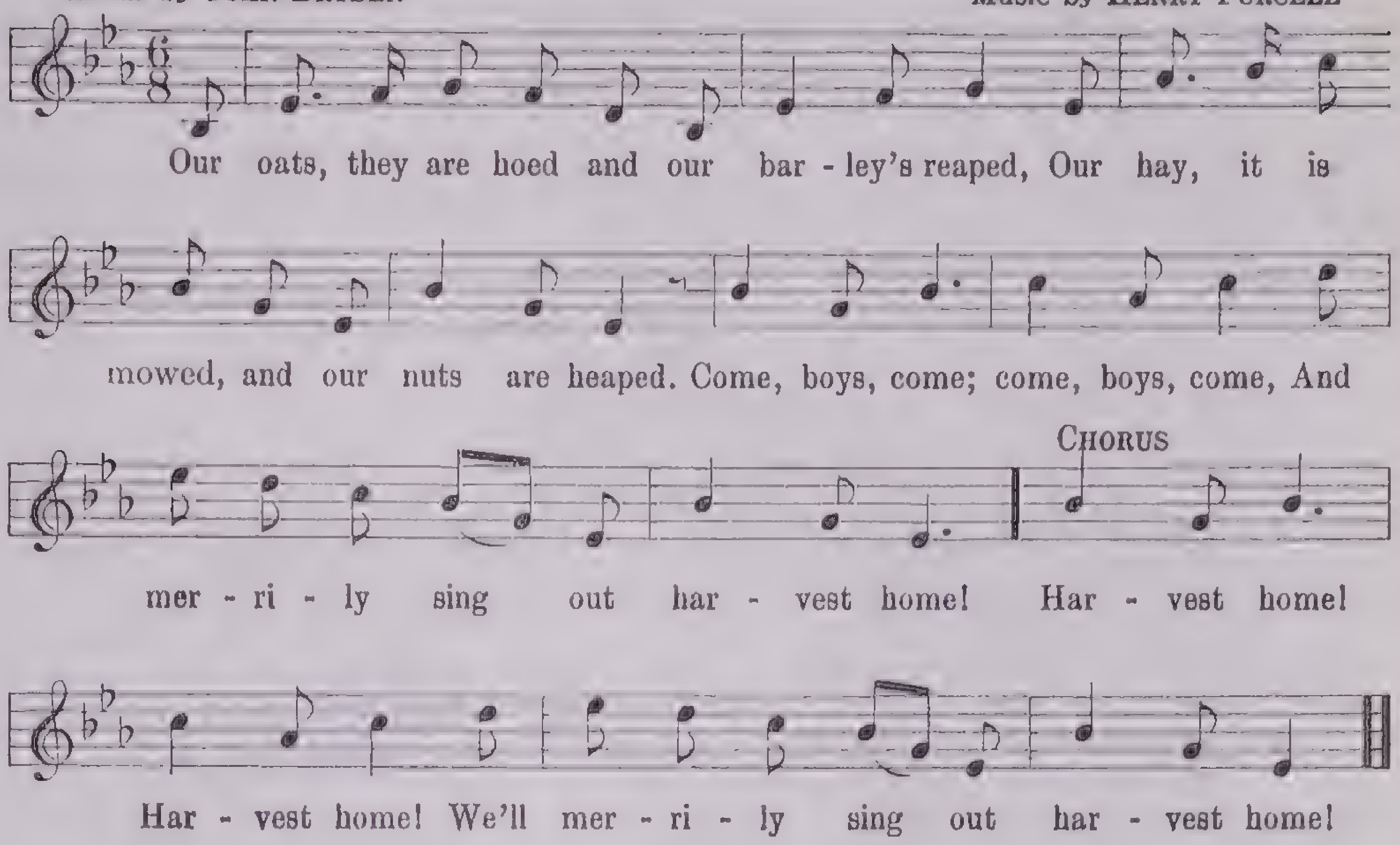
DOWN BY THE STATION

Down by the Station may be sung and dramatized by children of nursery school and kindergarten age by using a row of chairs to represent the train.

HARVEST HOME

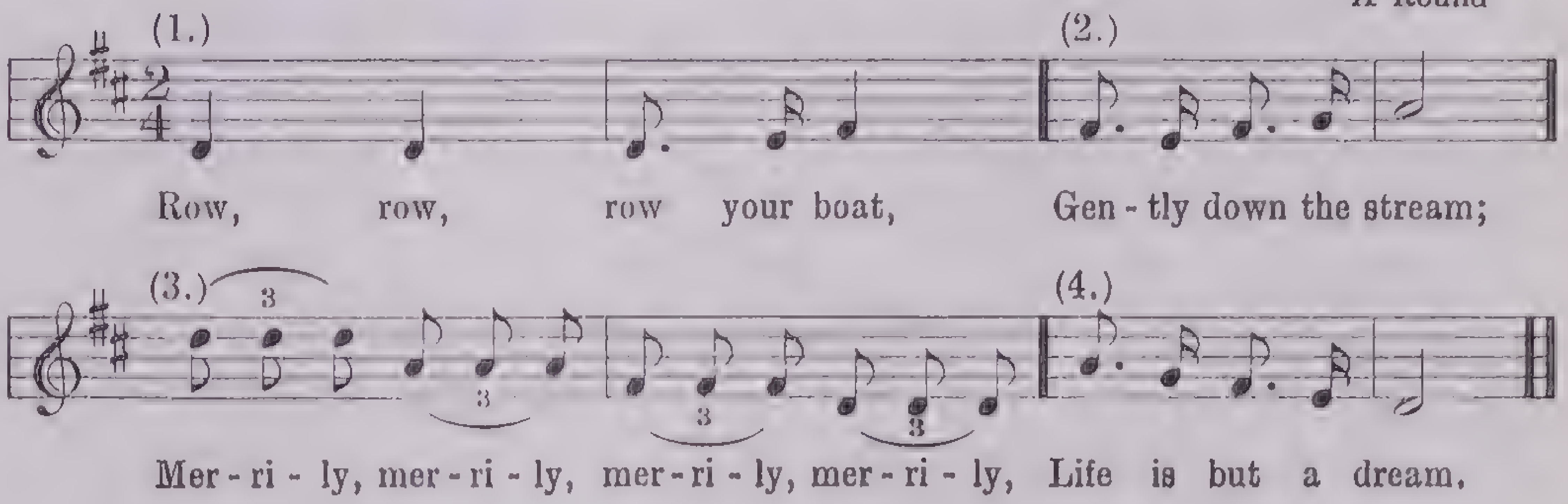
Words by JOHN DRYDEN

Music by HENRY PURCELL

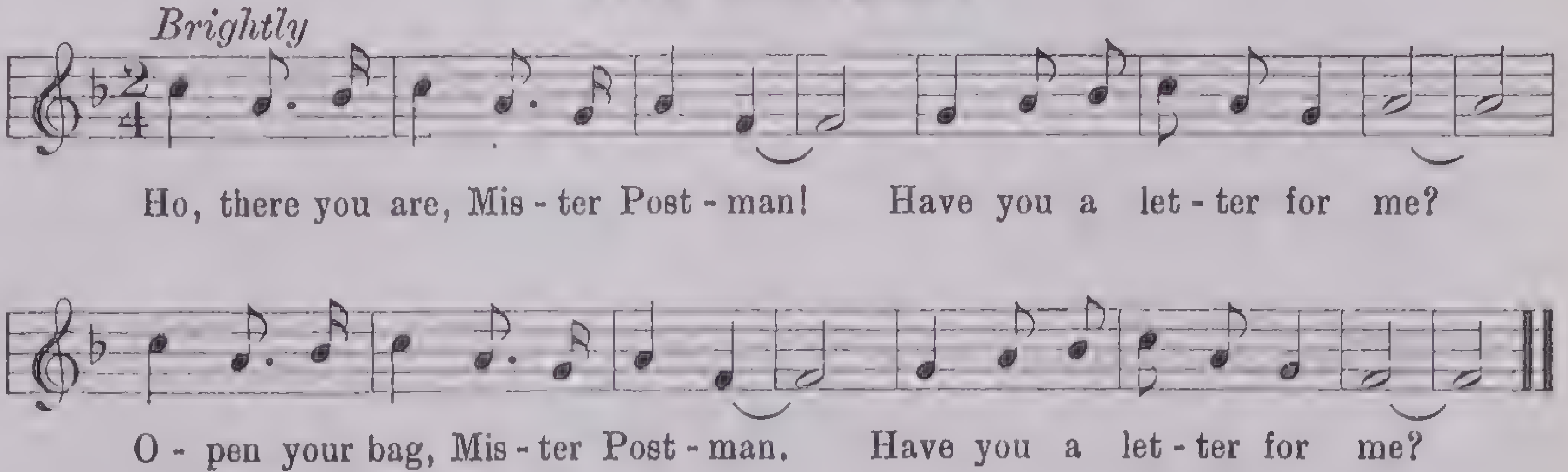

Our oats, they are hoed and our bar - ley's reaped, Our hay, it is
mowed, and our nuts are heaped. Come, boys, come; come, boys, come, And
mer - ri - ly sing out har - vest home!
CHORUS
Har - vest home!
Har - vest home! We'll mer - ri - ly sing out har - vest home!

ROW, ROW, ROW YOUR BOAT

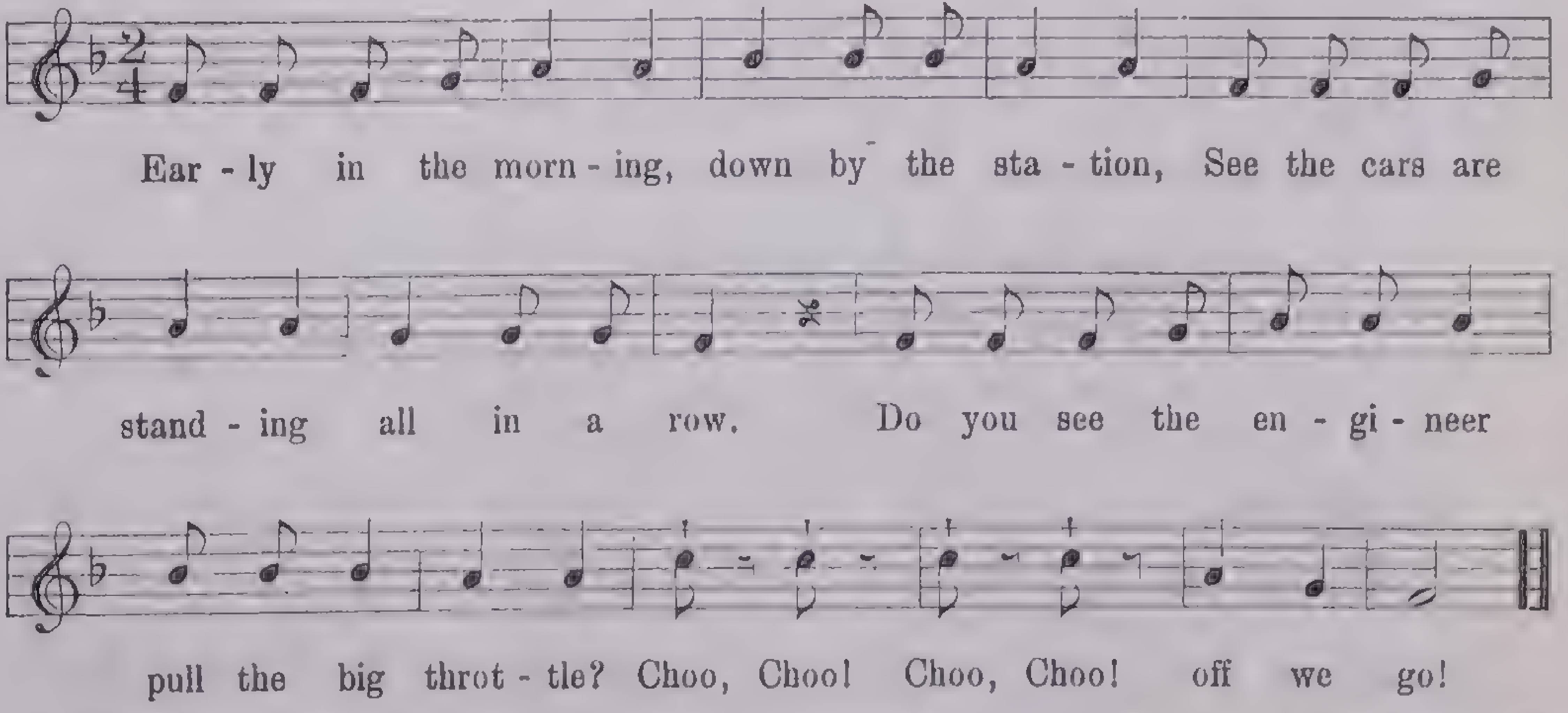
A Round


(1.)
Row, row, row your boat,
(2.)
Gen - tly down the stream;
(3.)
Mer - ri - ly, mer - ri - ly, mer - ri - ly, mer - ri - ly,
(4.)
Life is but a dream.

THE POSTMAN[1]


Brightly
Ho, there you are, Mis - ter Post - man! Have you a let - ter for me?
O - pen your bag, Mis - ter Post - man. Have you a let - ter for me?

DOWN BY THE STATION[1]


Ear - ly in the morn - ing, down by the sta - tion, See the cars are
stand - ing all in a row. Do you see the en - gi - neer
pull the big throt - tle? Choo, Choo! Choo, Choo! off we go!

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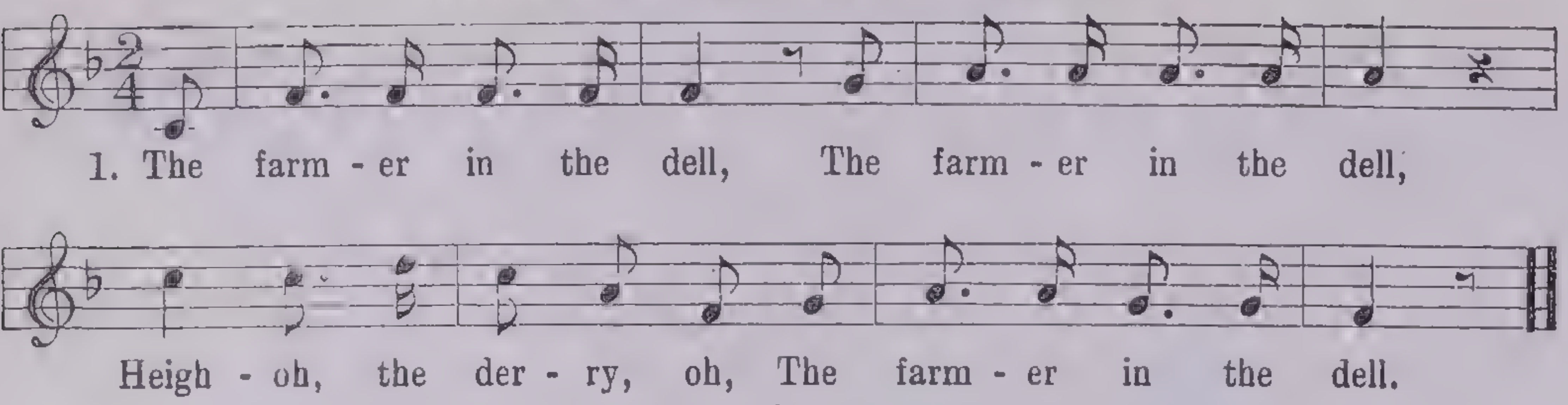
[1] Reprinted from "Singing Time" (by Satis N. Coleman and Alice G. Thorn), by permission of the authors and the John Day Company, Inc.

THE FARMER IN THE DELL


1. The farm - er in the dell, The farm - er in the dell,
Heigh - oh, the der - ry, oh, The farm - er in the dell.

2
The farmer takes a wife,
The farmer takes a wife,
Heigh-oh, the derry, oh,
The farmer takes a wife.

3
The wife takes a child,
The wife takes a child,
Heigh-oh, the derry, oh,
The wife takes a child.

4
The child takes a nurse,
The child takes a nurse,
Heigh-oh, the derry, oh,
The child takes a nurse.

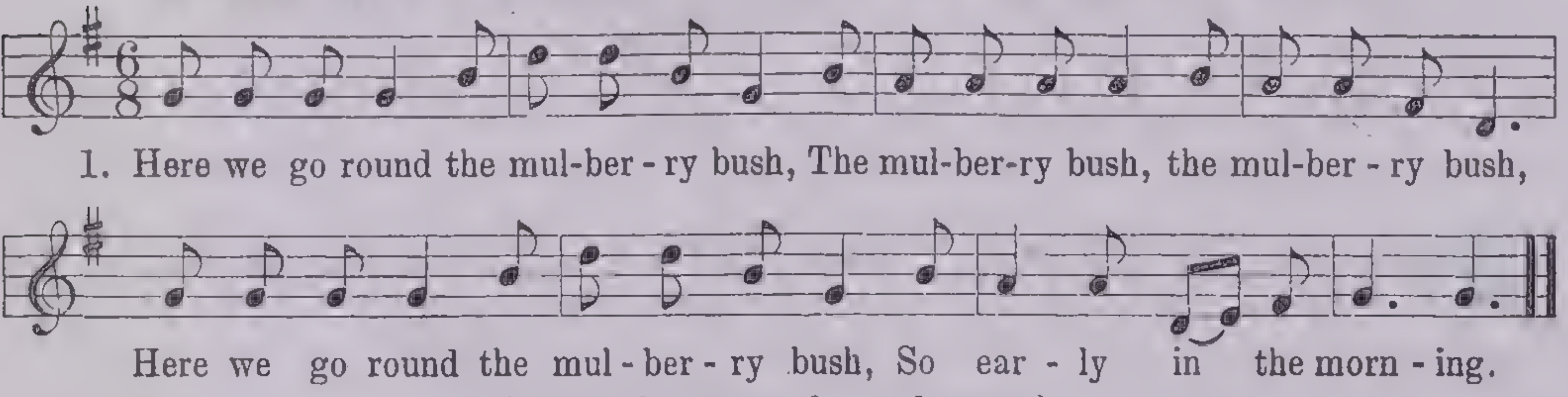
5
The nurse takes a cat,
The nurse takes a cat,
Heigh-oh, the derry, oh,
The nurse takes a cat.

6
The cat takes a rat,
The cat takes a rat,
Heigh-oh, the derry, oh,
The cat takes a rat.

7
The rat takes the cheese,
The rat takes the cheese,
Heigh-oh, the derry, oh,
The rat takes the cheese.

8
The cheese stands alone,
The cheese stands alone,
Heigh-oh, the derry, oh,
The cheese stands alone.

HERE WE GO ROUND THE MULBERRY BUSH


1. Here we go round the mul-ber - ry bush, The mul-ber-ry bush, the mul-ber - ry bush,
Here we go round the mul - ber - ry bush, So ear - ly in the morn - ing.

(Repeat first verse after each stanza)

2
This is the way we wash our clothes,
We wash our clothes, we wash our clothes;
This is the way we wash our clothes,
So early Monday morning.

3
This is the way we iron our clothes, etc.,
So early Tuesday morning.

4
This is the way we scrub the floor, etc.,
So early Wednesday morning.

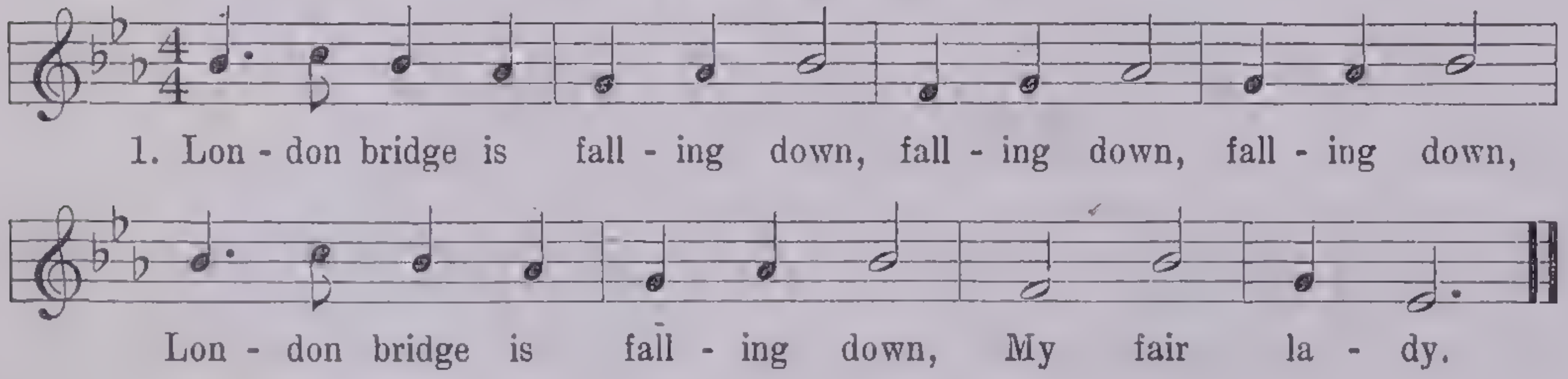
5
This is the way we mend our clothes, etc.,
So early Thursday morning.

6
This is the way we sweep the house, etc.,
So early Friday morning.

7
This is the way we bake our bread, etc.,
So early Saturday morning.

8
This is the way we go to church, etc.,
So early Sunday morning.

LONDON BRIDGE


1. Lon - don bridge is fall - ing down, fall - ing down, fall - ing down,
Lon - don bridge is fall - ing down, My fair la - dy.

2
Build it up with iron bars, iron bars, iron bars,
Build it up with iron bars, my fair lady.

3
Iron bars will bend and break, bend and break, bend and break,
Iron bars will bend and break, my fair lady.

4
Build it up with gold and silver, etc.

5
Gold and silver'll be stolen away, etc.

6
Get a man to watch all night, etc.

7
Suppose the man should fall asleep, etc.

8
Get a dog to bark all night, etc.

9
Suppose the dog should meet a bone, etc.

10
Get a cock to crow all night, etc.

Six Singing Games

THE FARMER IN THE DELL

One child is chosen to stand inside the circle to represent the farmer in the dell, while the circle moves around him, singing. In the second verse where the farmer "takes a wife," he touches or beckons to another child who joins him inside the circle. In each verse, the newcomer chooses the next one. In the last verse, every one except the "cheese" returns to the circle, they all clap hands, and the game is repeated.

In one variant of the game, the children of the circle stand still, and those on the inside march around, the last one chosen marching at the front.

HERE WE GO ROUND THE MULBERRY BUSH

This is a game for children of all ages, from the time they can walk steadily and move around in a circle. During the singing of the first verse, all take hands and circle around as they sing, stepping quietly and slowing gradually. During the phrase, "So early in the morning," the circle stops, hands are loosened, and each child spins around rapidly in place.

Each verse following is acted out according to the words, each child making the motions he thinks best suited to the lines, but keeping the motions in rhythm with the swing of the song. After each verse, the first verse is sung again, and the children move around in a circle and spin at the end.

At Christmas time, the words may be sung: "Here we go round the Christmas tree"; or if played out in the garden, "Here we go round the apple tree," etc.

LONDON BRIDGE

"London Bridge" is one of the oldest and most popular of folk games. The famous London Bridge which is responsible for this game is the one built in the 13th century, the planning and building of which took almost a hundred years.

Two players represent the bridge by standing face to face with hands clasped and held high. The others form a line, holding each other by the hand or by the dress, and pass under the "bridge." Before the game starts, the two persons forming the bridge decide on two metals which they will represent, usually silver and gold, but those in the line do not know which is silver and which is gold. The children representing the bridge sing the first verse while the others march under. As the last one passes under, their arms come down and he is caught. He is then asked to choose silver or gold, and he belongs to the side he chooses. The line of marchers sing the second verse, and again the last one is caught and joins a side. The two groups alternate singing the verses, and the song is repeated until all the children in the line have been caught and have lined up behind their leaders (the makers of the bridge). Each child holds the one in front of him by the waist, and a tug of war takes place between the two lines. The side which pulls the others across a given line is the winning side.

OATS, PEAS, BEANS AND BARLEY GROW

This is a game that is played in every civilized country on the globe, and it has been traced back for more than 500 years. In playing it, one member is chosen to represent the farmer, who stands in the center, and the others clasp hands and circle about him as they all sing the first verse. During the singing of the second verse, they all stand still, and each one goes through the motions suggested by the words: sowing the seed with a broad sweep of the arm; standing erect with folded arms; stamping the foot; clapping the hands; and turning around at the end of the verse.

For the second verse, clasp hands and circle around while singing the first two lines, and stand still for the last two while a partner is chosen.

While singing the third verse, the members of the circle shake warning fingers to the two inside the circle. The last one chosen remains in the center while the game is repeated.

ROUND AND ROUND THE VILLAGE

The children form a circle, clasping hands, with one child outside the circle. The children in the circle stand still and represent the houses of the village. While the children of the circle sing the first verse, the outside child skips around the circle as many times as it may require for the completion of the verse. During the second verse, the clasped hands are raised high to represent windows of the houses, and the outside child winds in and out trying to complete the circle by the end of the verse.

During the singing of the third verse, the child remains inside the circle and selects a partner, and they bow to each other at the fourth line of the song. At the beginning of the fourth verse, the first child dashes outside the circle, and the partner chases him around the circle. At the end of the verse, they stop and bow to each other. The chosen partner now remains outside the circle to run around the village in a new game.

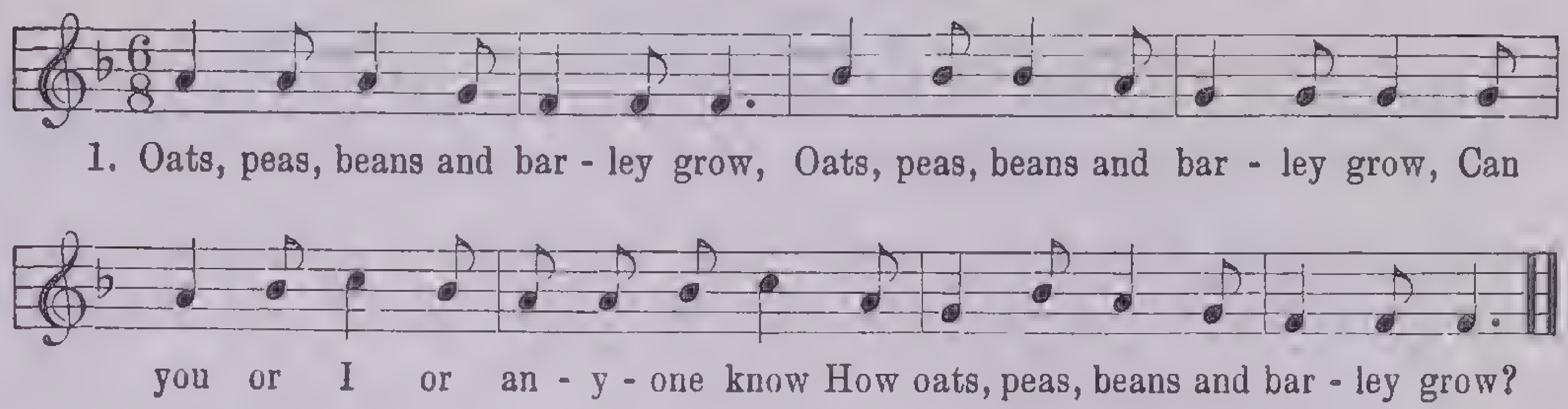
In a large group of children, two or three may be chosen to go round the village, choose partners, etc., at the same time.

THE KING OF FRANCE

The players stand in two rows, facing each other. The leader of each row stands in the middle as king.

The first verse is sung alone by one of the kings who marches out toward the line opposite him and marches back to his place, singing as he goes. Then the two lines sing and march forward toward each other and back again, imitating what the king has done. In the second verse, the other king marches out singing, gives salute and marches back again. Then both lines sing and imitate him. The two kings take turns as leader, throughout all the verses, both lines always imitating, as nearly as possible, the song and motions of the king. When played by older children, interest is added to the game if the kings put in motions that are difficult to imitate. Other verses may be added.

OATS, PEAS, BEANS AND BARLEY GROW

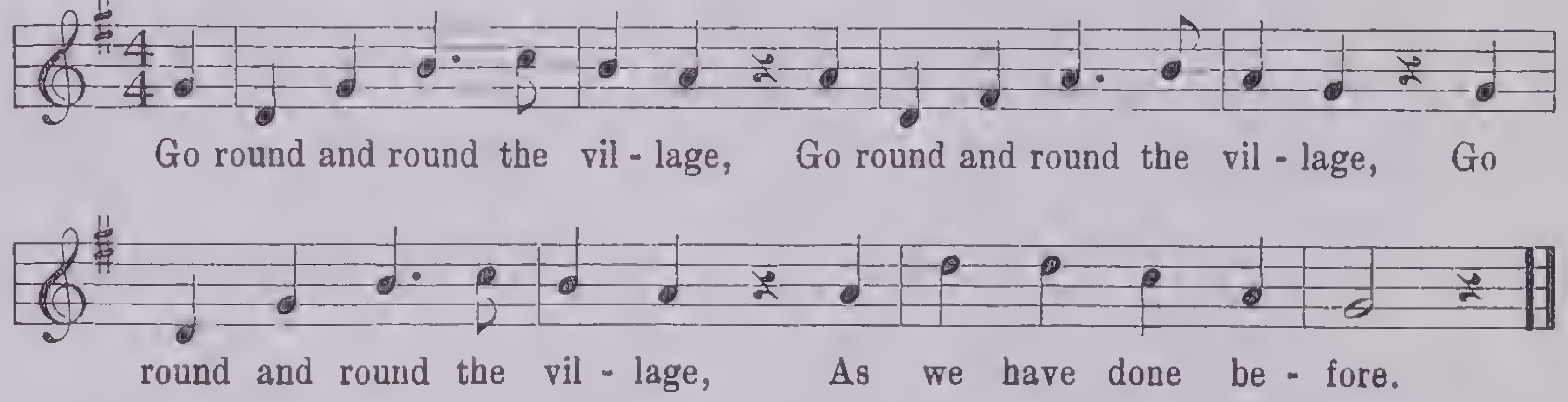

1. Oats, peas, beans and bar - ley grow, Oats, peas, beans and bar - ley grow, Can
you or I or an - y - one know How oats, peas, beans and bar - ley grow?

2
Thus the farmer sows his seed,
Thus he stands and takes his ease,
Stamps his foot and claps his hands,
And turns around to view his lands.

3
Waiting for a partner,
Waiting for a partner,
So open the ring and choose one in,
Make haste and choose your partner.

4
Now you're married you must obey,
You must be true to all you say.
You must be kind, you must be good,
And keep your wife in kindling wood.

ROUND AND ROUND THE VILLAGE

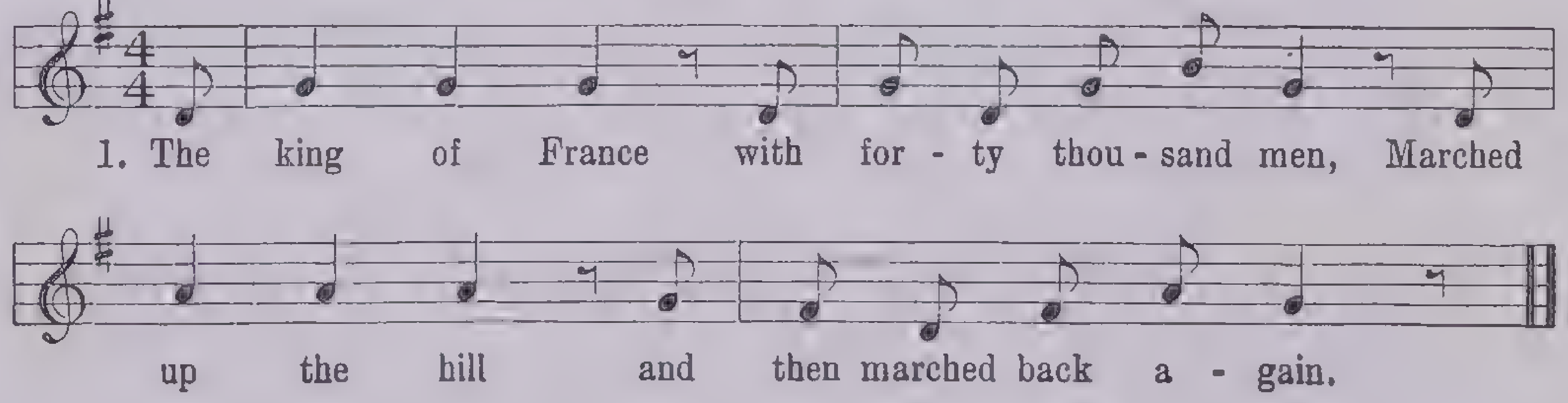

Go round and round the vil - lage, Go round and round the vil - lage, Go
round and round the vil - lage, As we have done be - fore.

2
Go in and out the windows,
Go in and out the windows,
Go in and out the windows,
As we have done before.

3
Now stand and face your partner,
Now stand and face your partner,
Now stand and face your partner,
And bow before you go.

4
Now follow me to London,
Now follow me to London,
Now follow me to London,
As we have done before.

THE KING OF FRANCE


1. The king of France with for - ty thou - sand men, Marched
up the hill and then marched back a - gain.

2
The King of France with forty thousand men
Gave salute, and then marched back again.

3
The King of France with forty thousand men
Beat their drums, and then marched back again.

4
The King of France with forty thousand men
Blew their horns, and then marched back again.

5
The King of France with forty thousand men
Waved their flags, and then marched back again.

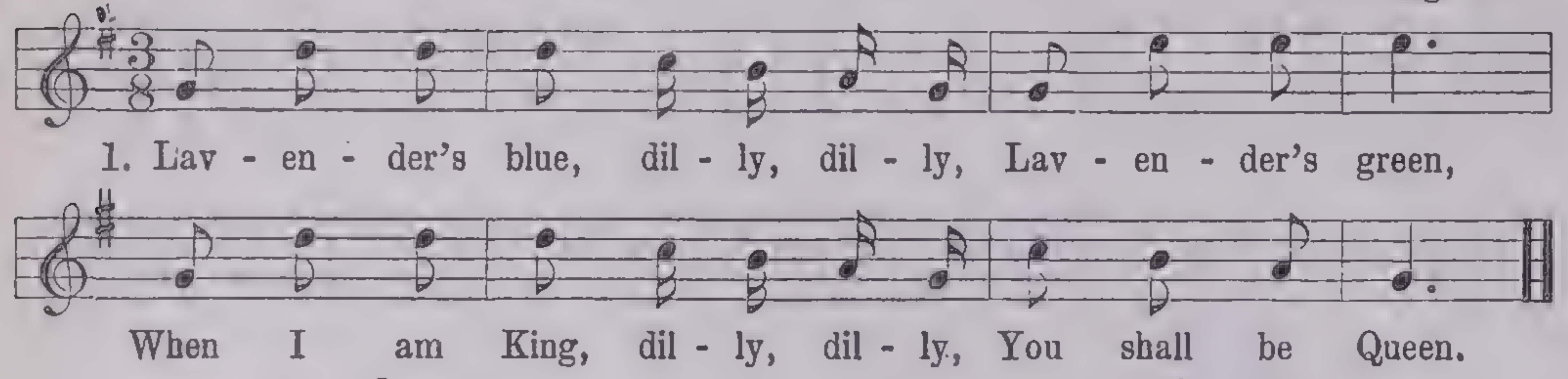
6
The King of France with forty thousand men
Drew their swords, and then marched back again.

7
The King of France with forty thousand men
Shouldered arms, and then marched back again.

8
The King of France with forty thousand men
Pranced on their horses, and then marched back again.

LAVENDER'S BLUE

Old English

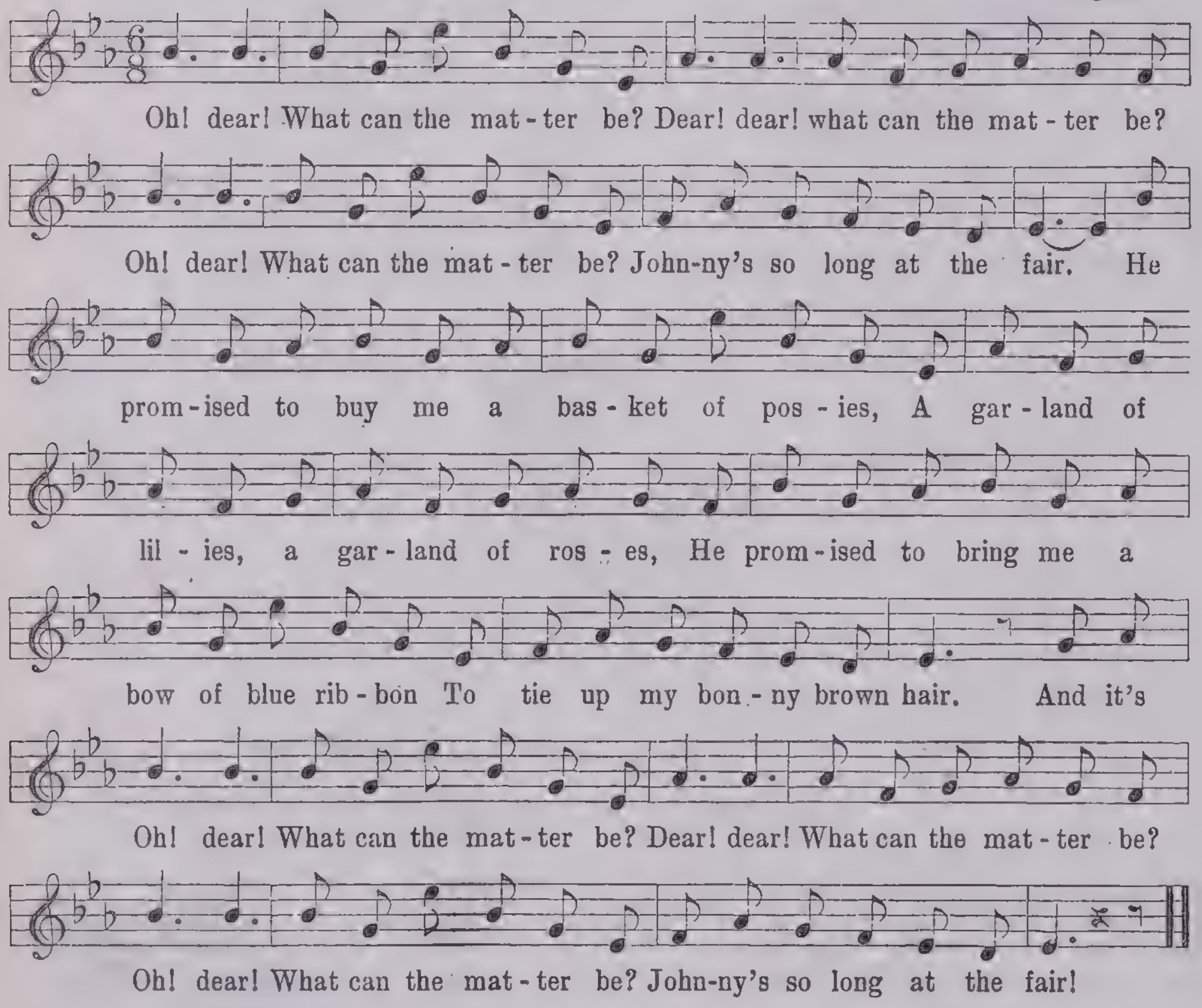

1. Lav - en - der's blue, dil - ly, dil - ly, Lav - en - der's green,
When I am King, dil - ly, dil - ly, You shall be Queen.

2
Call out your men, dil-ly, dil-ly,
Set them to work,
Some to the plow, dil-ly, dil-ly,
Some to the cart.

3
Some to make hay, dil-ly, dil-ly,
Some to cut corn,
While you and I, dil-ly, dil-ly,
Keep ourselves warm.

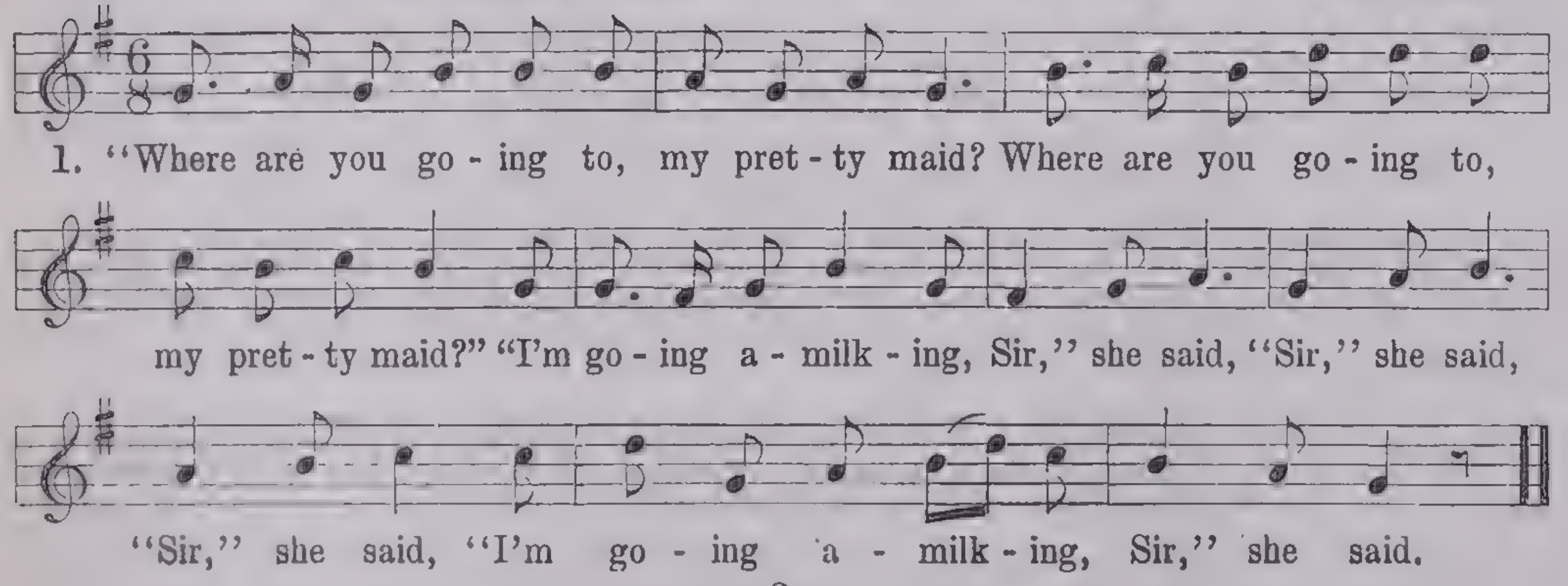
OH! DEAR! WHAT CAN THE MATTER BE?

English


Oh! dear! What can the mat - ter be? Dear! dear! what can the mat - ter be?
Oh! dear! What can the mat - ter be? John-ny's so long at the fair. He
prom - ised to buy me a bas - ket of pos - ies, A gar - land of
lil - ies, a gar - land of ros - es, He prom - ised to bring me a
bow of blue rib - bon To tie up my bon - ny brown hair. And it's
Oh! dear! What can the mat - ter be? Dear! dear! What can the mat - ter be?
Oh! dear! What can the mat - ter be? John-ny's so long at the fair!

WHERE ARE YOU GOING TO?

Old Song


1. "Where are you go - ing to, my pret - ty maid? Where are you go - ing to,
my pret - ty maid?" "I'm go - ing a - milk - ing, Sir," she said, "Sir," she said,
"Sir," she said, "I'm go - ing a - milk - ing, Sir," she said.

2
"May I go with you, my pretty maid?
May I go with you, my pretty maid?"
"Yes, if you please, kind Sir," she said,
"Sir," she said, "Sir," she said,
"Yes, if you please, kind Sir," she said.

3
"What is your fortune, my pretty maid?" etc.
"My face is my fortune, Sir," she said, etc.

4
"Then I can't marry you, my pretty maid," etc.
"Nobody asked you, Sir," she said, etc.

Five Folk Songs

LAVENDER'S BLUE

This is an old song that is sung and loved by children of all English-speaking peoples. The tune may be played as a slow waltz, or, if played rapidly, it furnishes good music for skipping.

OH! DEAR! WHAT CAN THE MATTER BE?

When played briskly, this tune is a good dance for almost any form of hopping or skipping steps. Play it in various ways and let the children respond to it in any kind of bodily movement they wish. The dances that children improvise are far better for them than trying to follow adult directions in their movements.

WHERE ARE YOU GOING TO?

This makes excellent music for skipping, if played rapidly with two strong accents in each measure. If it is acted out, the milkmaid may skip for a while before the song begins; and after the song is finished, both the maid and the "Sir" may skip in opposite directions. Half the group may take the part of the maid, and the other half sing and act the part of the man.

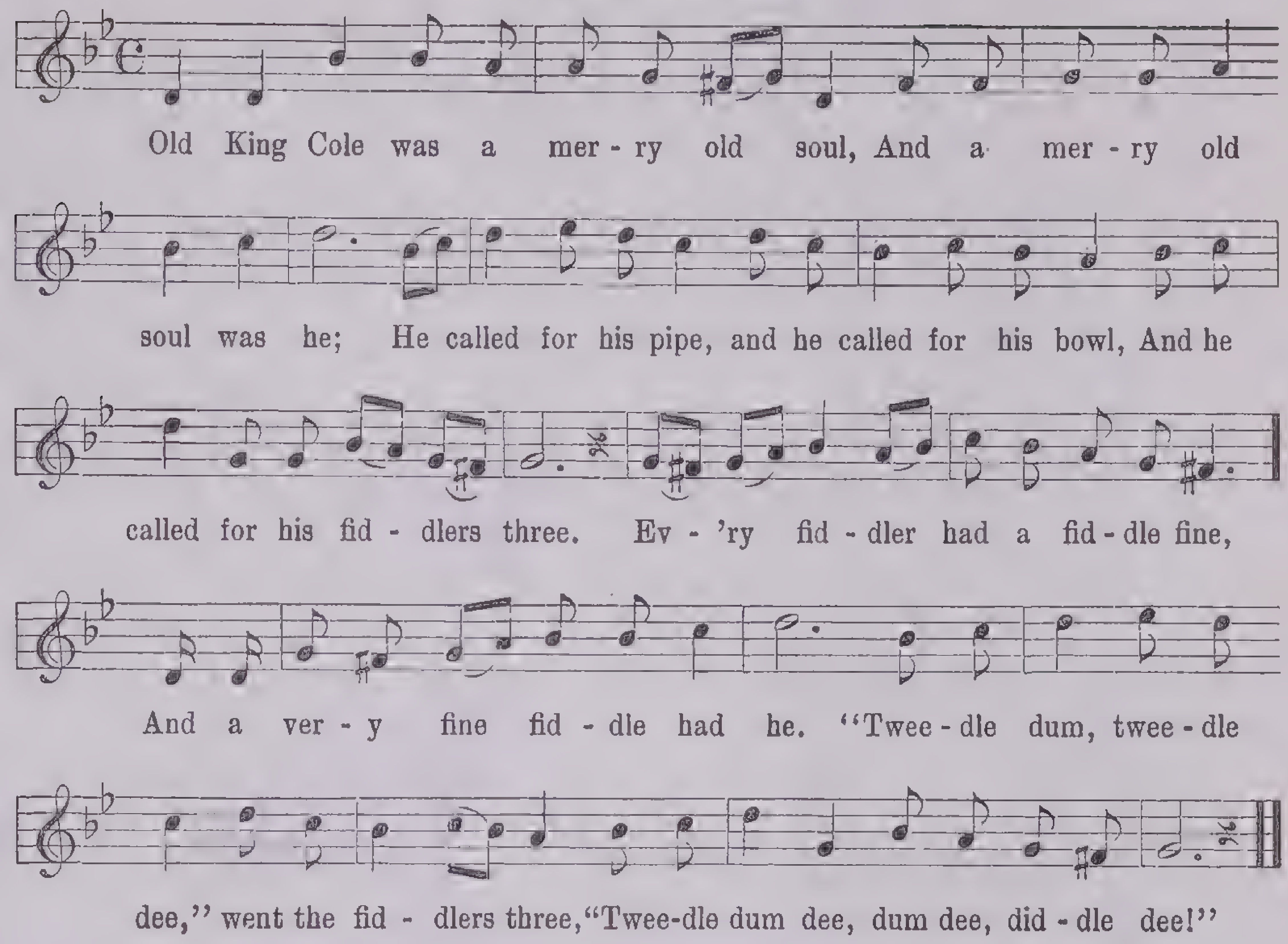
A slow, walking step (two steps to each measure) is also suitable for this music if the children prefer it to skipping. Let the children make their own plans for acting the song.

OLD KING COLE

In dramatizing this song, one child may be selected for the king, to sit in a large chair, with a crown upon his head; one child to bring the pipe; another to bring the bowl; and three fiddlers who pretend to play fiddles. The rest of the children sing while the actors play the pantomime.

At the end of the song the children, actors and all, may dance to the tune played either on the piano or the fiddle. It may be played slowly for a dignified, paradelike dance; or if played rapidly, a skipping step would suit very well.

OLD KING COLE

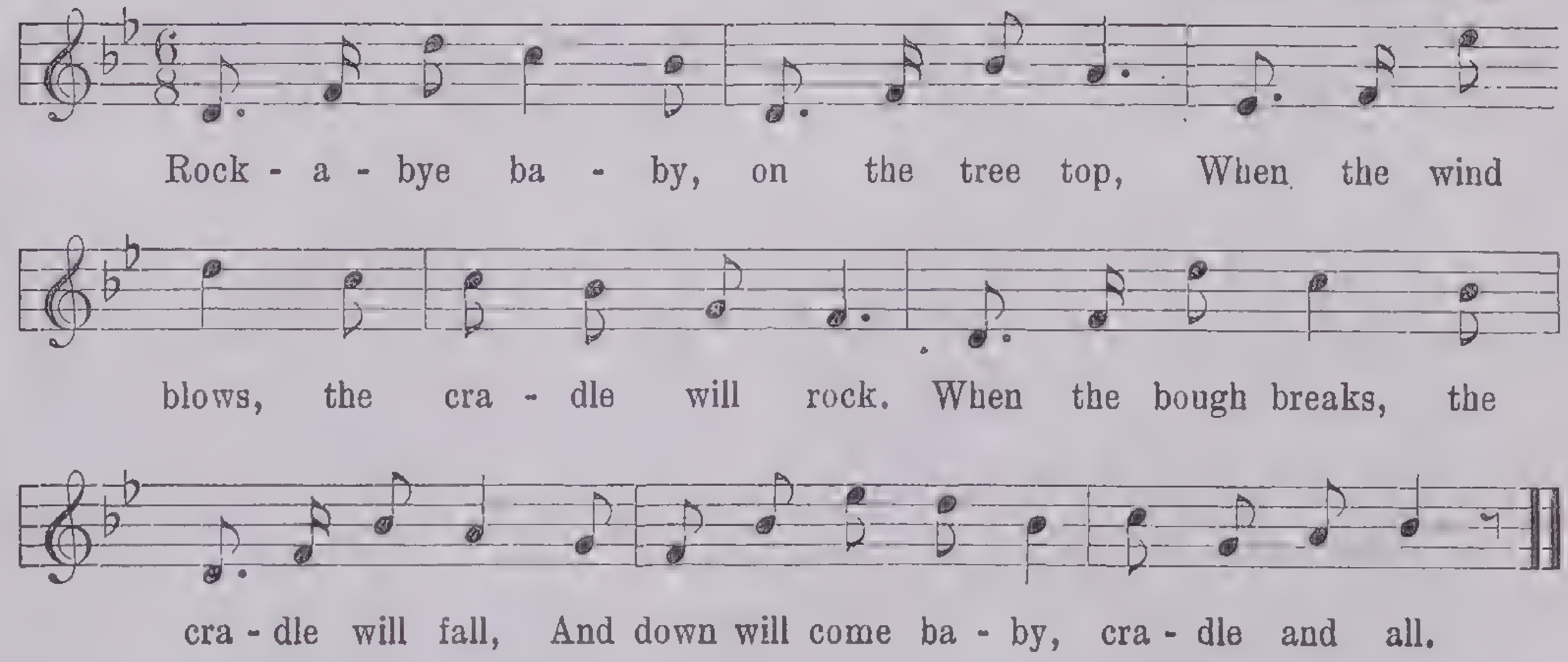

Old King Cole was a mer - ry old soul, And a mer - ry old
soul was he; He called for his pipe, and he called for his bowl, And he
called for his fid - dlers three. Ev - 'ry fid - dler had a fid - dle fine,
And a ver - y fine fid - dle had he. "Twee - dle dum, twee - dle
dee," went the fid - dlers three, "Twee-dle dum dee, dum dee, did - dle dee!"

ROCK-A-BYE BABY

For generations babies have been rocked to sleep with this old song. Its swinging rhythm brings very naturally a rocking rhythm of the arms and body. Some children will wish to swing their entire bodies to and fro to this music; others will swing from the waist up; but probably most of them will wish to hold an imaginary baby in the arms and move the arms back and forth in a gentle, rocking motion. It should be played very smoothly and languidly. The children may sing and sway at the same time and continue swaying to the music after the song is finished.

ROCK-A-BYE BABY

An Old Cradle Song


Rock - a - bye ba - by, on the tree top, When the wind
blows, the cra - dle will rock. When the bough breaks, the
cra - dle will fall, And down will come ba - by, cra - dle and all.

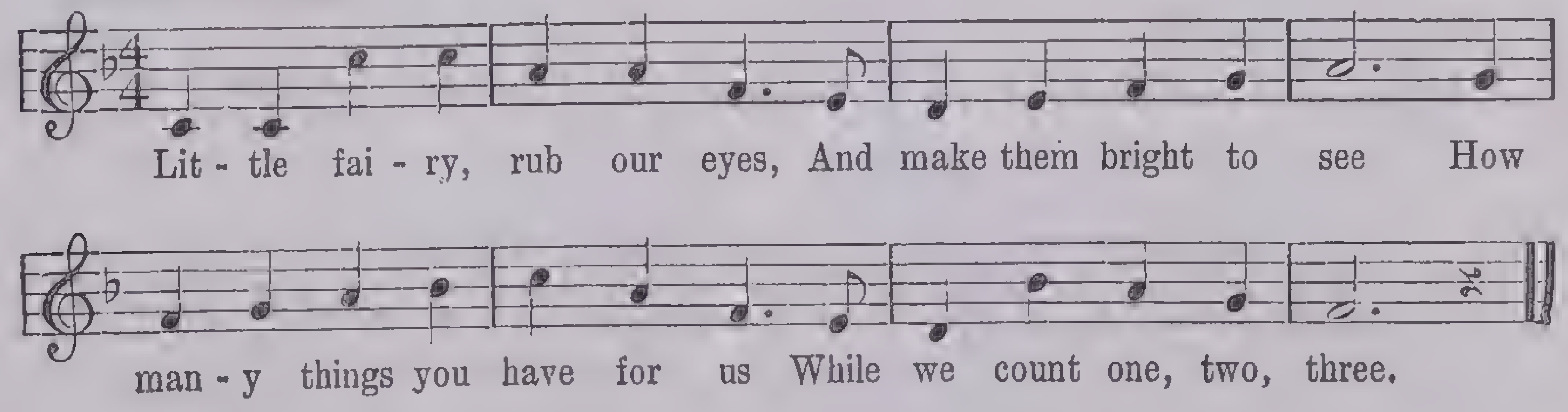
Sense Games

SIGHT

Place a number of objects in front of the children, who are standing in a row or circle with their eyes closed, and cover the objects with a cloth. When all is ready, have them open their eyes and sing, lifting the cloth only during the last measure. When the cloth is on again, let each one tell what he saw.

SIGHT

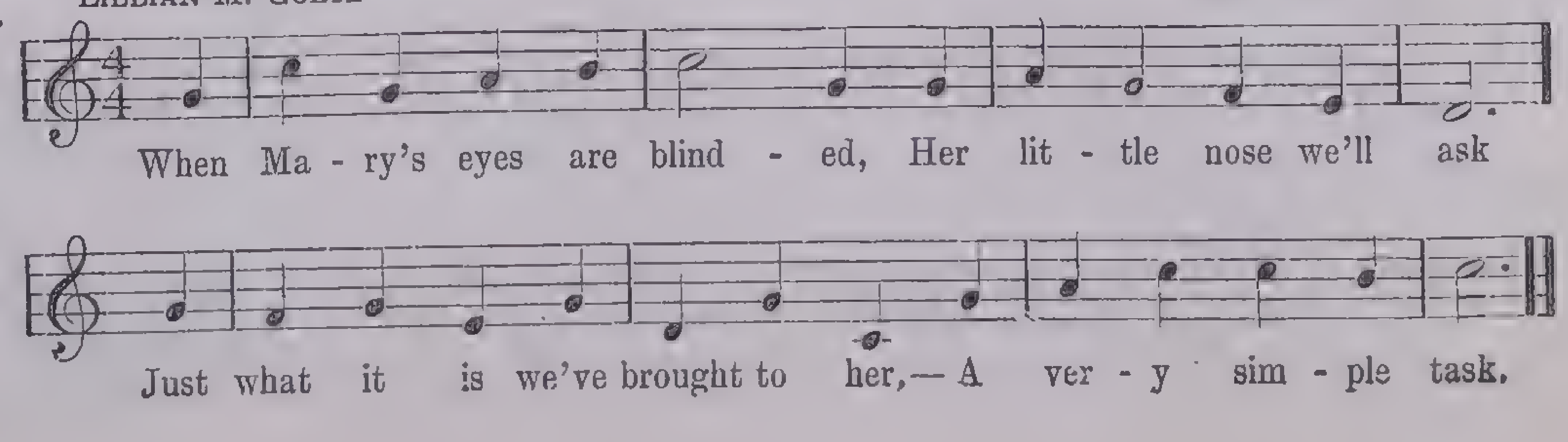
Lillian M. Goetz


Lit - tle fai - ry, rub our eyes, And make them bright to see How
man - y things you have for us While we count one, two, three.

SMELL

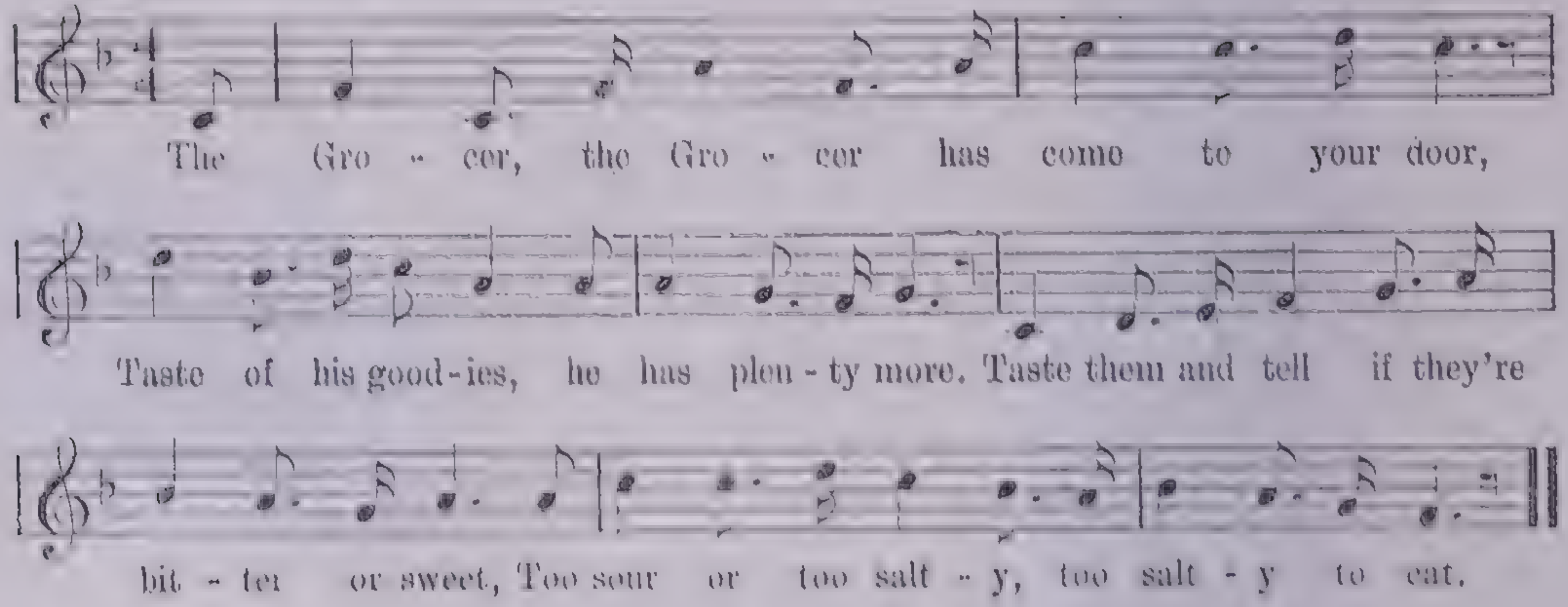
Lillian M. Goetz

Mrs. John D. Kay


When Ma - ry's eyes are blind - ed, Her lit - tle nose we'll ask
Just what it is we've brought to her,— A ver - y sim - ple task.

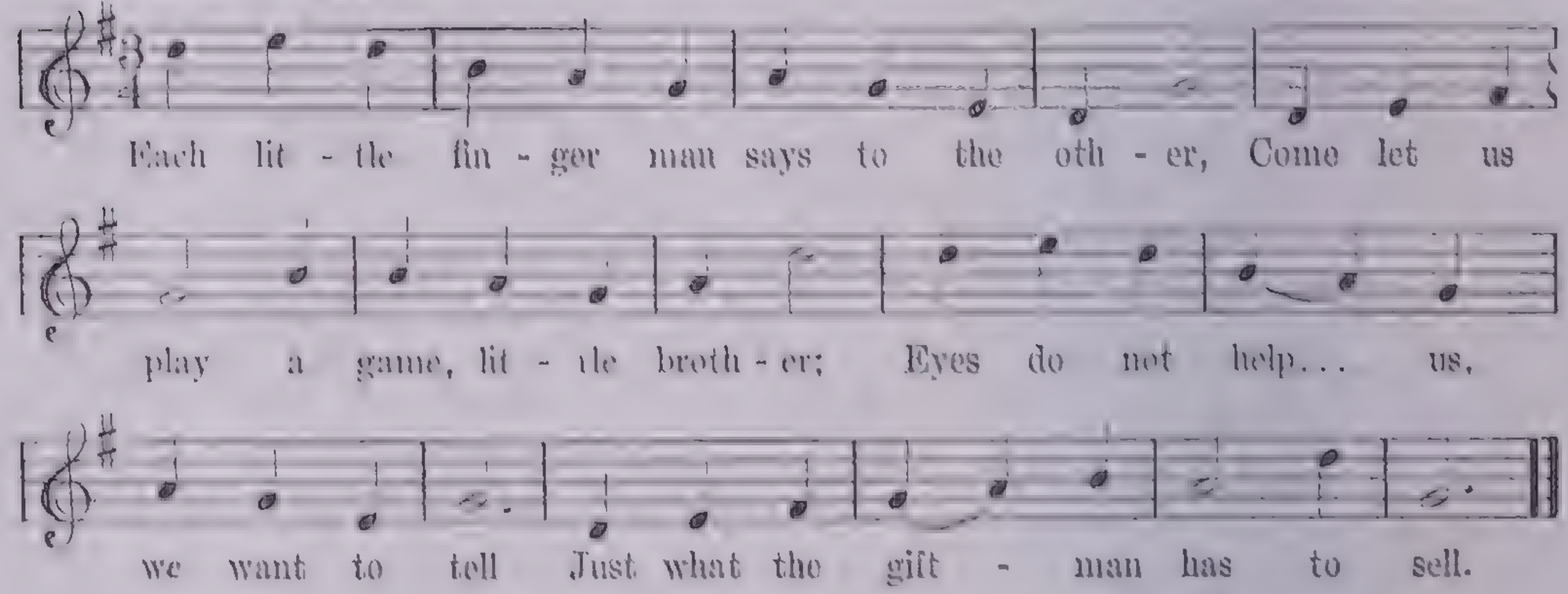
TASTE

Lillian M. Goetz — Mrs. John D. Kay


The Gro - cer, the Gro - cer has come to your door,
Taste of his good-ies, he has plen - ty more. Taste them and tell if they're
bit - ter or sweet, Too sour or too salt - y, too salt - y to eat.

TOUCH

Lillian M. Goetz — Arranged by Mrs. John D. Kay


Each lit - tle fin - ger man says to the oth - er, Come let us
play a game, lit - tle broth - er; Eyes do not help... us,
we want to tell Just what the gift - man has to sell.

TOUCH

The children stand with their hands behind them, while the gift-man walks up and down with his bag singing and placing some object in each pair of hands. When the children all have something, they feel of the object and tell its name or what it is like.

STORIES

THE LITTLE RED HEN

One day as the Little Red Hen was scratching in a field, she found a grain of wheat.

"This wheat should be planted," she said. "Who will plant this grain of wheat?"

"Not I," said the Duck.
"Not I," said the Cat.
"Not I," said the Dog.

"Then I will," said the Little Red Hen. And she did.

Soon the wheat grew to be tall and yellow.

"The wheat is ripe," said the Little Red Hen. "Who will cut the wheat?"

"Not I," said the Duck.
"Not I," said the Cat.
"Not I," said the Dog.

"Then I will," said the Little Red Hen. And she did.

When the wheat was cut, the Little Red Hen said, "Who will thresh this wheat?"

"Not I," said the Duck.
"Not I," said the Cat.
"Not I," said the Dog.

"Then I will," said the Little Red Hen. And she did.

When the wheat was all threshed, the Little Red Hen said, "Who'll take this wheat to the mill?"

"Not I," said the Duck.
"Not I," said the Cat.
"Not I," said the Dog.

"Then I will," said the Little Red Hen. And she did.

She took the wheat to the mill and had it ground into flour. Then she said, "Who will make this flour into bread?"

"Not I," said the Duck.
"Not I," said the Cat.
"Not I," said the Dog.

"Then I will," said the Little Red Hen. And she did.

She made and baked the bread. Then she said, "Who will eat this bread?"

"Oh! I will," said the Duck.
"And I will," said the Cat.
"And I will," said the Dog.

"No, no!" said the Little Red Hen. "I will do that." And she did.

THE STORY OF LITTLE BLACK SAMBO

Once upon a time there was a little black boy, and his name was Little Black Sambo.

And his Mother was called Black Mumbo.

And his Father was called Black Jumbo.

And Black Mumbo made him a beautiful little Red Coat and a pair of beautiful little Blue Trousers.

And Black Jumbo went to the Bazaar, and bought him a beautiful Green Umbrella, and a lovely little Pair of Purple Shoes with Crimson Soles and Crimson Linings.

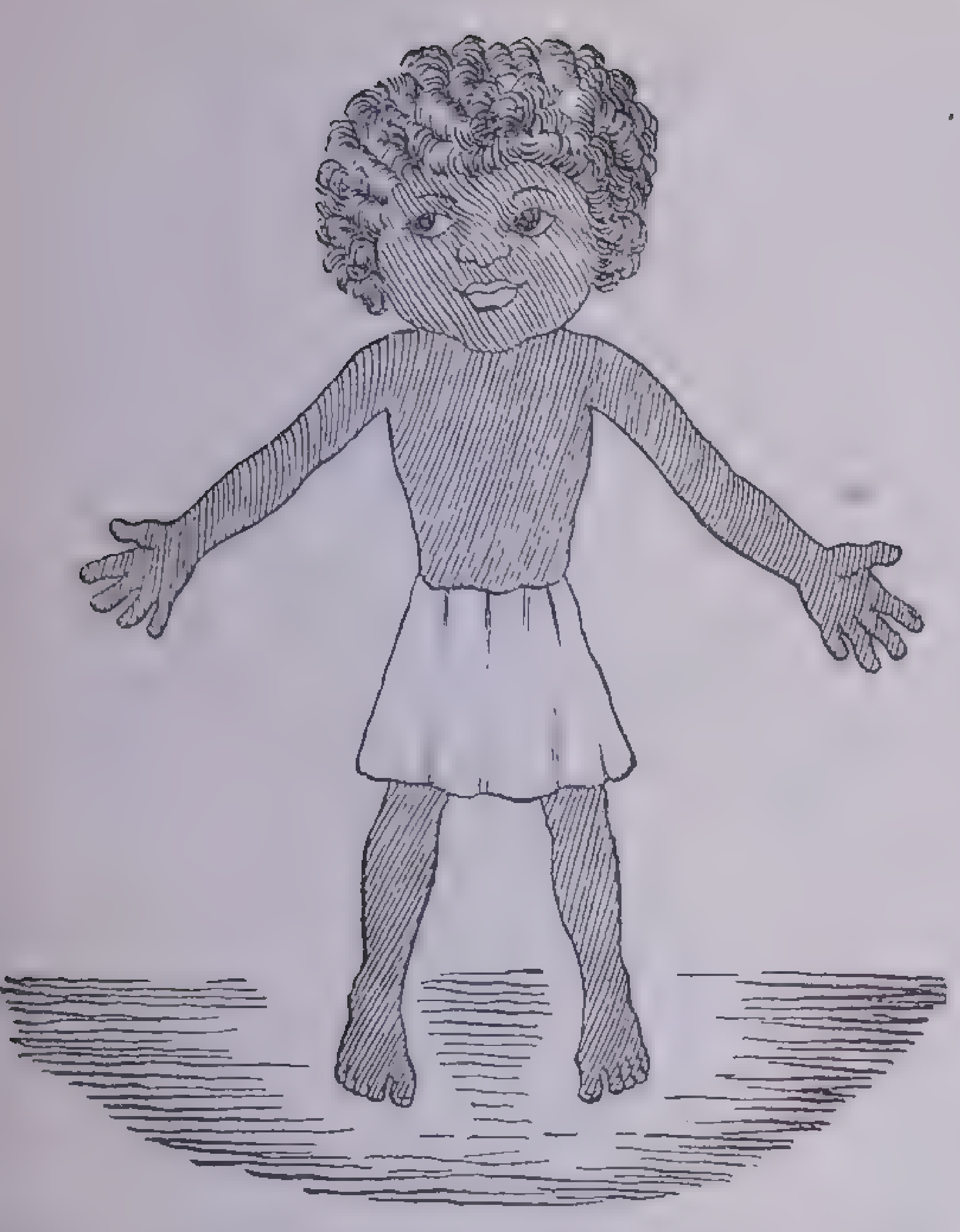
And then wasn't Little Black Sambo grand?

So he put on all his Fine Clothes, and went out for a walk in the Jungle. And by and by he met a Tiger. And the Tiger said to him, "Little Black Sambo, I'm going to eat you up!" And Little Black Sambo said, "Oh! Please Mr. Tiger, don't eat me up, and I'll give you my beautiful little Red Coat." So the Tiger said, "Very well, I won't eat you this time, but you must give me your beautiful little Red Coat." So the Tiger got poor Little Black Sambo's beautiful little Red Coat, and went away saying, "Now I'm the grandest Tiger in the Jungle."

And Little Black Sambo went on, and by and by he met another Tiger, and it said to him, "Little Black Sambo, I'm going to eat you up!" And Little Black Sambo said, "Oh! Please Mr. Tiger, don't eat me up, and I'll give you my beautiful little Blue Trousers." So the Tiger said, "Very well, I won't eat you this time, but you must give me your beautiful little Blue Trousers." So the Tiger got poor Little Black Sambo's beautiful little Blue Trousers, and went away saying, "Now *I'm* the grandest Tiger in the Jungle."

And Little Black Sambo went on and by and by he met another Tiger, and it said to him, "Little Black Sambo, I'm going to eat you up!" And Little Black Sambo said, "Oh! Please Mr. Tiger, don't eat me up, and I'll give you my beautiful little Purple Shoes with Crimson Soles and Crimson Linings."

But the Tiger said, "What use would your shoes be to me? I've got four feet, and you've got only two; you haven't got enough shoes for me."



From Helen Bannerman: The Story of Little Black Sambo, by permission of The Macmillan Company, publishers

Little Black Sambo

But Little Black Sambo said, "You could wear them on your ears."

"So I could," said the Tiger: "that's a very good idea. Give them to me, and I won't eat you this time."

So the Tiger got poor Little Black Sambo's beautiful little Purple Shoes with Crimson Soles and Crimson Linings, and went away saying, "Now *I'm* the grandest Tiger in the Jungle."

And by and by Little Black Sambo met another Tiger, and it said to him, "Little Black Sambo, I'm going to eat you up!" And Little Black Sambo said, "Oh! Please Mr. Tiger, don't eat me up, and I'll give you my beautiful Green Umbrella." But the Tiger said, "How can I carry an umbrella, when I need all my paws for walking with?"

"You could tie a knot on your tail and carry it that way," said Little Black Sambo. "So I could," said the Tiger. "Give it to me, and I won't eat you this time." So he got poor Little Black Sambo's beautiful Green Umbrella, and went away saying, "Now *I'm* the grandest Tiger in the Jungle."

And poor Little Black Sambo went away crying, because the cruel Tigers had taken all his fine clothes.

Presently he heard a horrible noise that sounded like "Gr-r-r-r-rrrrrr," and it got louder and louder. "Oh! dear!" said Little Black Sambo, "there are all the Tigers coming back to eat me up! What shall I do?" So he ran quickly to a palm-tree, and peeped round it to see what the matter was.

And there he saw all the Tigers fighting, and disputing which of them was the grandest. And at last they all got so angry that they jumped up and took off all the fine clothes, and began to tear each other with their claws, and bite each other with their great big white teeth.

And they came, rolling and tumbling right to the foot of the very tree where Little Black Sambo was hiding, but he jumped quickly in behind the umbrella. And the Tigers all caught hold of each other's tails, as they wrangled and scrambled, and so they found themselves in a ring round the tree.

Then when the Tigers were very wee and very far away, Little Black Sambo jumped up, and called out, "Oh! Tigers! why have you taken off all your nice clothes? Don't you want them any more?" But the Tigers only answered, "Gr-r-rrrrr!"

Then Little Black Sambo said, "If you want them, say so, or I'll take them away." But the Tigers would not let go of each other's tails, and so they couldn't say anything but "Gr-r-rrrrr!"

So Little Black Sambo put on all his fine clothes again and walked off.

And the Tigers were very, very angry, but still they would not let go of each other's tails. And they were so angry, that they ran round the tree, trying to eat each other up, and they ran faster and faster, till they were whirling round so fast that you couldn't see their legs at all.

And they still ran faster and faster and faster, till they all just melted away, and there was nothing left but a great pool of melted butter (or *ghi*, as it is called in India) round the foot of the tree.

Now Black Jumbo was just coming home from his work, with a great big brass pot in his arms, and when he saw what was left of all the Tigers he said, "Oh! what lovely melted butter! I'll take that home to Black Mumbo for her to cook with."

So he put it all into the great big brass pot, and took it home to Black Mumbo to cook with.

When Black Mumbo saw the melted butter, wasn't she pleased! "Now," said she, "we'll all have pancakes for supper!"

So she got flour and eggs and milk and sugar and butter, and she made a huge big plate of most lovely pancakes. And she fried them in the melted butter which the Tigers had made, and they were just as yellow and brown as little Tigers.

And then they all sat down to supper. And Black Mumbo ate Twenty-seven pancakes, and Black Jumbo ate Fifty-five, but Little Black Sambo ate a Hundred and Sixty-nine, because he was so hungry.

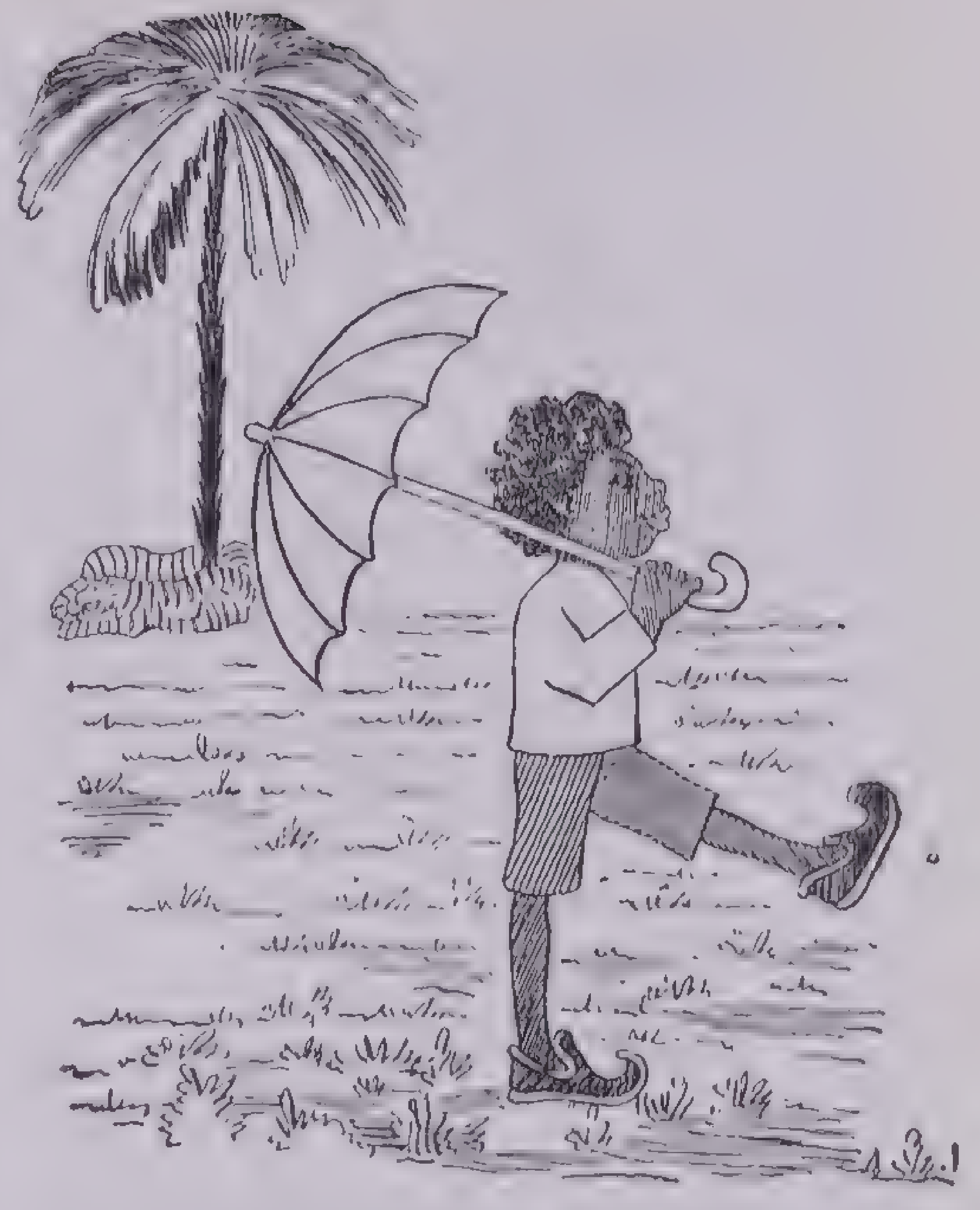
—*Helen Bannerman*[1]

THE LITTLE PINE TREE

In the woods there grew a little pine tree, and its leaves were long, slender, green needles. It was very little, indeed, and although there were many other trees around it, it felt quite alone as there were no other pine trees near by.

The little pine tree was proud of its fine, green needles when the other trees in the forest were bare, and the snow was white on the ground. But in summer time, when the other trees had beautiful, large, green leaves, the pine tree thought that it would be nice if it could have large leaves also.

"I wish that I could have beautiful large leaves, but leaves which are more beautiful than those of any of the other trees," it thought. "If I could have my wish, I would have leaves of shining gold."



From Helen Bannerman: The Story of Little Black Sambo, by permission of The Macmillan Company, publishers

So Little Black Sambo put on all his fine clothes again and walked off.

The little pine tree slept through the night, and in the morning when it awoke it had leaves of shining gold.

"How very beautiful I am," it thought. "How my leaves glisten in the sun! Now I shall always be happy."

In the afternoon a man came through the woods along a path which passed by the little pine tree. When he came to the little tree and saw the beautiful golden leaves, he stopped and picked them all and put them into the bag which he was carrying and took them home with him. Then the poor little tree had no leaves.

"What shall I do?" it cried. "I will not wish for gold leaves again. If I could have another wish, I would have leaves of glass. They would sparkle in the sun, and no one would take them away."

Again the little pine tree slept through the night, and when it awoke the next morning it had leaves of sparkling glass.

"How beautiful I am now," it thought, "my leaves are of clear crystal and they tinkle as the wind passes through them."

All through the morning, the little tree was very happy. But, in the afternoon, black clouds hid the sun, and the rain came down, and the wind turned cold and harsh. The little tree shivered. It shook and shook, and when the storm was over, all of the glass leaves had been broken and had fallen to the ground. Again the poor little tree had no leaves.

"What can I do now?" it cried. "A man took my leaves of gold, and the storm broke my leaves of glass. If I could have still another wish, I would have large green leaves like the other trees in the forest."

Once more the little pine tree slept through the night and when it awoke the next morning it had beautiful, large, green leaves.

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[1] *The Story of Little Black Sambo,* by Helen Bannerman, is included by arrangement with Frederick A. Stokes Company, publishers of the authorized American edition.

"Now I am like the other trees and as beautiful as they are," it thought.

The little tree was happy once more. But soon a goat came along the path looking for something to eat. The little tree was so small that the goat could easily reach the leaves, and they looked so good and juicy that he nibbled at each of the branches and ate up all the leaves.

"Alas!" cried the little tree, "a man took my leaves of gold; the storm broke my leaves of glass; a goat ate my large green leaves! If I could have just one more wish, I would have my long green needles again."

Toward evening, the little tree fell asleep and again slept through the night. And when it awoke in the morning it had its long slender green needles again. The birds flew to the little pine tree, and they were as happy as it was that it was covered again with long green pine needles.

"Gold leaves, glass leaves, and large, green leaves are very fine;" thought the little tree, "but there is nothing so good for a little pine tree as its own long needles."

—*An Old German Legend.*

THE THREE LITTLE PIGS

Once upon a time there was an old sow who had three little pigs, and as she had not enough for them to eat, she had to send them out to seek their fortunes.

The first little pig had not gone very far when he met a man with a bundle of straw, and he said to the man:

"Please, man, give me that straw to build me a house."

The man gave the straw to the little pig, and the little pig built a house of straw, and lived in it.

By and by an old wolf came along and knocked at the door of the little straw house, and called:

"Little pig, little pig, let me come in!"

"No, no, by the hair of my chinny chin chin, I'll not let you in," answered the little pig.

"Then I'll huff and I'll puff and I'll blow your house in," said the wolf.

So he huffed and he puffed, and he blew the house in, and he ate up the little pig.

The second little pig had not gone very far when he met a man with a bundle of sticks, and he said to the man:

"Please, man, give me those sticks to build me a house."

The man gave the sticks to the little pig, and the little pig built a house of sticks, and lived in it.

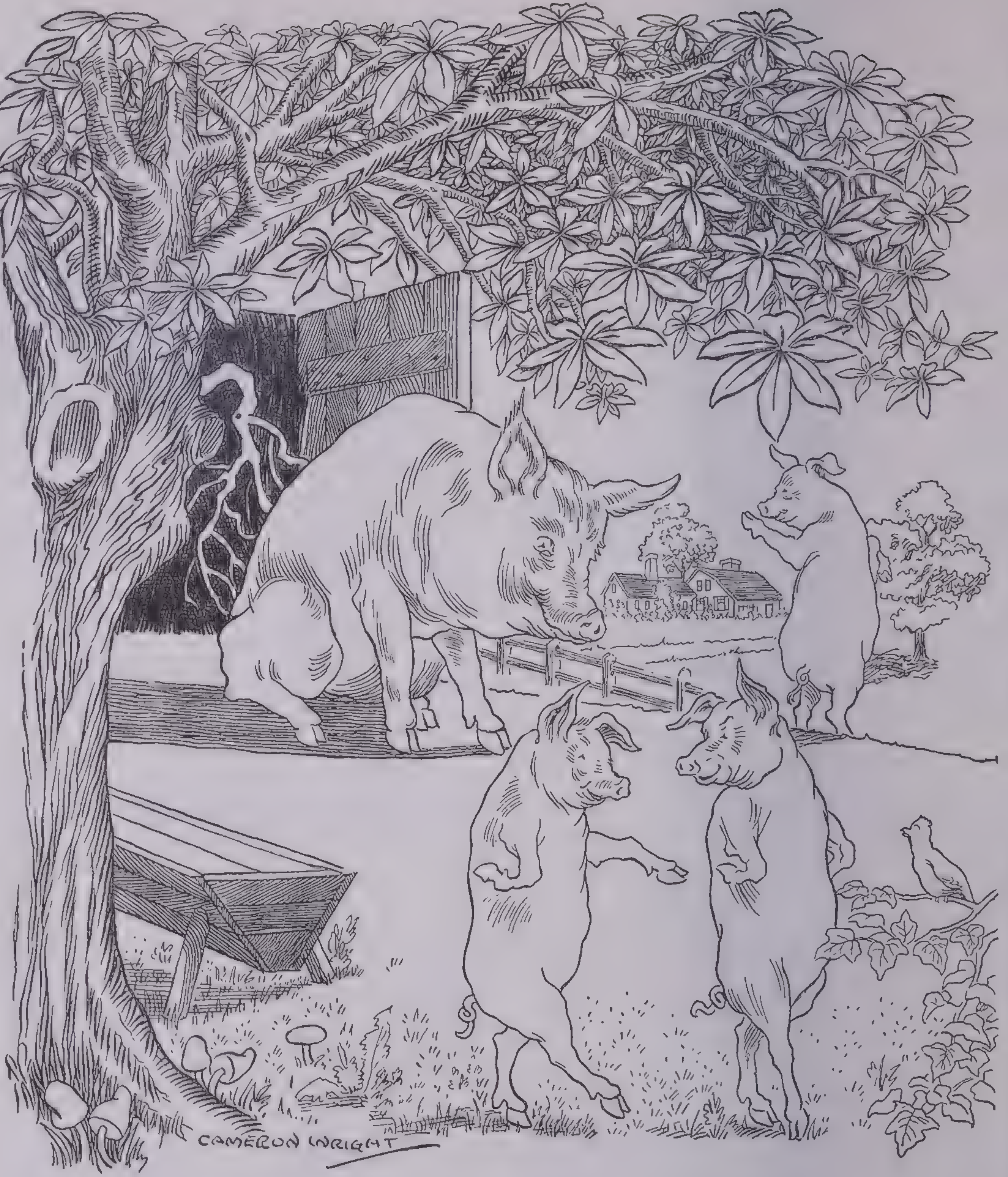
By and by the old wolf came along, and knocked at the door of the little house of sticks, and called:

"Little pig, little pig, let me come in!"

"No, no, by the hair of my chinny chin chin, I'll not let you in," answered the little pig.

"Then I'll huff and I'll puff and I'll blow your house in," said the wolf.

So he huffed and he puffed, and he blew the house in, and ate up the second little pig.



The third little pig had not gone very far when he met a man with a load of bricks.

"Please, man, give those bricks to build me a house."

The man gave the bricks to the little pig, and the little pig built a house of bricks, and lived in it.

By and by the old wolf came along and knocked at the door of the little brick house, and called:

"Little pig, little pig, let me come in!"

"No, no, by the hair of my chinny chin chin, I'll not let you in," answered the little pig.

"Then I'll huff and I'll puff and I'll blow your house in," said the wolf.

So he huffed and he puffed, and he puffed and he huffed, but he could not blow the little brick house in.

When the old wolf found that with all his huffing and puffing he could not blow the brick house down, he called:

"Little pig, I know where there is a nice field of turnips."

"Where?" asked the little pig.

"In Farmer Smith's field," said the wolf. "If you will be ready tomorrow morning at six o'clock, I will call for you and we will go together and get some turnips for dinner."

"Very well," said the little pig, "I will be ready."

Now the little pig got up at five o'clock, and went to Farmer Smith's field for the turnips and was back before six.

When the wolf came, he called, "Little pig, little pig, are you ready?"

"Ready!" said the little pig, "I have been and come back again, and I have a nice potful of turnips for dinner."

The old wolf was very angry at this, but he said, "Little pig, I know where there is a nice apple tree."

"Where?" asked the little pig.

"Down in Merry Garden," answered the wolf. "If you will be ready at five o'clock tomorrow morning, I will call for you at your house and we will go together and get some apples."

"Very well," said the little pig, "I'll surely be ready."

The next morning the little pig got up at four o'clock and hustled off for the apples, hoping to get back before the wolf came, but he had a long way to go and when he was coming back whom should he see in the road just ahead of him but the old wolf.

"Little pig, did you get there first?" called the wolf. "Are the apples nice?"

"Yes," said the little pig, "I will throw you one." And he threw it so far from the road that while the wolf was running to get it, the little pig passed him and reached home safely.

The old wolf was furiously angry, but he went away.

The next day he came again and said to the little pig, "Little pig, will you go with me to the Fair at Shanklin this afternoon?"

"Yes," said the little pig, "what time will you be ready?"

"At three o'clock," said the wolf.

Well, the little pig went off to Shanklin before noon, and bought a butter churn which he needed very much. He was almost home again when he saw the old wolf coming. The little pig was frightened and did not know what to do. He got into the big butter churn to hide and as he pulled the lid over him, the churn fell over and began rolling down hill and went rolling, rolling, with the little pig inside. The rolling churn frightened the wolf so much that he ran home without going to the Fair. When the churn stopped rolling, the little pig peeped out and saw that he was near his house and the wolf was gone, so he got out, picked up the churn and again got home safely.

A little later, the old wolf came to the house again, and called through the door, telling the little pig how sorry he was that he could not keep his promise to go to the Fair, and told how he had seen a frightful wooden thing rolling down the hill making a terrible noise.

"Hah!" said the little pig, "I frightened you then! I had been to the Fair and bought a butter churn, and when I saw you I got into it and rolled down the hill."

Then the wolf was terrifically angry, angrier than ever before, and he called out that he would eat up the little pig and that he would come down the chimney to get him.

As soon as the little pig heard him say this, he made a blazing fire in the fireplace; and when the wolf began to climb up to the chimney, he put a big potful of water over the fire to boil. And just as the wolf climbed into the chimney, the little pig took the lid off the pot and the wolf fell into the scalding water. Then the little pig quickly put the lid on again, and that was the end of the old wolf, for the little pig had him for supper, and lived happily ever afterwards.

THE GINGERBREAD BOY

A little old woman and a little old man once lived all alone in a little old house in the country. One morning the little old woman decided to make a gingerbread boy.

When the little old woman opened the oven to see whether the gingerbread boy was done, out jumped the little gingerbread boy, looking all brown and good to eat. He saw that the door of the house was open, and he ran away as fast as his legs would carry him.

The little old woman and the little old man ran after him as fast as they could.

The little gingerbread boy laughed, and called to them:

"I am a gingerbread boy, I am.
I can run away from you, I can."

And the little old woman and the little old man could not catch him.

The little gingerbread boy ran on and on, until he came to a cow by the roadside.

"Stop, little gingerbread boy," said the cow; "you look good to eat."

The little gingerbread boy laughed and called to the cow:

"I am a gingerbread boy, I am.
I've run away from a little old woman and a little old man.
I can run away from you, I can."

And the cow ran after the gingerbread boy, but couldn't catch him.

The little gingerbread boy ran on, and on, until he came to a horse in a pasture.

"Please stop, little gingerbread boy," said the horse, "you look very good to eat." But the little gingerbread boy laughed out loud, and called to the horse:

"I am a gingerbread boy, I am.
I've run away from a little old woman and a little old man, and a cow.
I can run away from you, I can."

And the horse ran after the gingerbread boy, but couldn't catch him.

By and by, the little gingerbread boy came to a barn full of threshers.

"Don't run so fast, little gingerbread boy," cried the threshers, "you look very good to eat." But the little gingerbread boy laughed louder than ever, and as he ran he called to the threshers:

"I am a gingerbread boy, I am.
I've run away from a little old woman and a little old man, and a cow, and a horse.
I can run away from you, I can."

And the threshers ran after the gingerbread boy, but couldn't catch him.

Then the little gingerbread boy hurried on until he came to a field full of mowers.

"Wait a bit! wait a bit, little gingerbread boy," called the mowers, "you look very good to eat." But the little gingerbread boy ran faster than ever and called to the mowers:

"I am a gingerbread boy, I am.
I've run away from a little old woman and a little old man, and a cow, and a horse, and a barn full of threshers.
I can run away from you, I can."

And the mowers ran after the gingerbread boy, but couldn't catch him.

Soon the little gingerbread boy saw a fox lying quietly near a fence.

"Where are you going?" asked the fox, without getting up. But the little gingerbread boy didn't answer him. He ran on, and called:

"I am a gingerbread boy, I am.
I've run away from a little old woman and a little old man, and a cow, and a horse, and a barn full of threshers, and a field full of mowers.
I can run away from you, I can."

"I would not catch you if I could," said the fox. But the fox ran after him.

On and on ran the little gingerbread boy until he came to a river, and the fox was close behind. The gingerbread boy could not swim. "Jump on my tail, and I'll take you across," said the sly old fox.

So the little gingerbread boy jumped on the fox's tail, and the fox began swimming across the river. But the fox had gone only a few strokes when he turned his head and said: "You are heavy on my tail, and you may fall off. Jump on my back."

So the little gingerbread boy jumped on the fox's back. After swimming a little farther, the fox said: "I'm afraid you will get wet on my back. Jump on my shoulder."

So the little gingerbread boy jumped on the fox's shoulder. When they were near the other side of the river, the fox said: "My shoulder is tired. Jump on my nose."

So the little gingerbread boy jumped on the fox's nose. But just then they reached the other bank. The sly old fox opened his mouth wide, and in went the little gingerbread boy!

"Dear me!" said the gingerbread boy, "I am one-quarter gone." And then he said: "Now, I'm half gone!" And then, "I'm three-quarters gone!" And then he said: "Oh, dear; I'm all gone!"

And the little gingerbread boy was all gone.

THE THREE BEARS

In a far-off country there was once a little girl who was called Goldilocks, because her hair was curly and shone like gold. She liked to roam in the open, and one day she started off into the woods to gather wild flowers and into the fields to chase butterflies. She wandered on and on taking little heed of the way until she found herself in a lonely spot, where she saw a snug little house. It was the house in which three bears lived, but they were not at home.

First, Goldilocks looked in at the window and then she peeped in at the keyhole, and seeing nobody inside, she lifted the latch. The door was not fastened, so little Goldilocks got in easily and looked about, wondering what sort of people lived there.

Now the three bears had gone out for a walk in the woods a little before this, leaving their breakfast porridge cooling. They were the great big father bear, and the middle-sized mother bear, and the little wee bear.

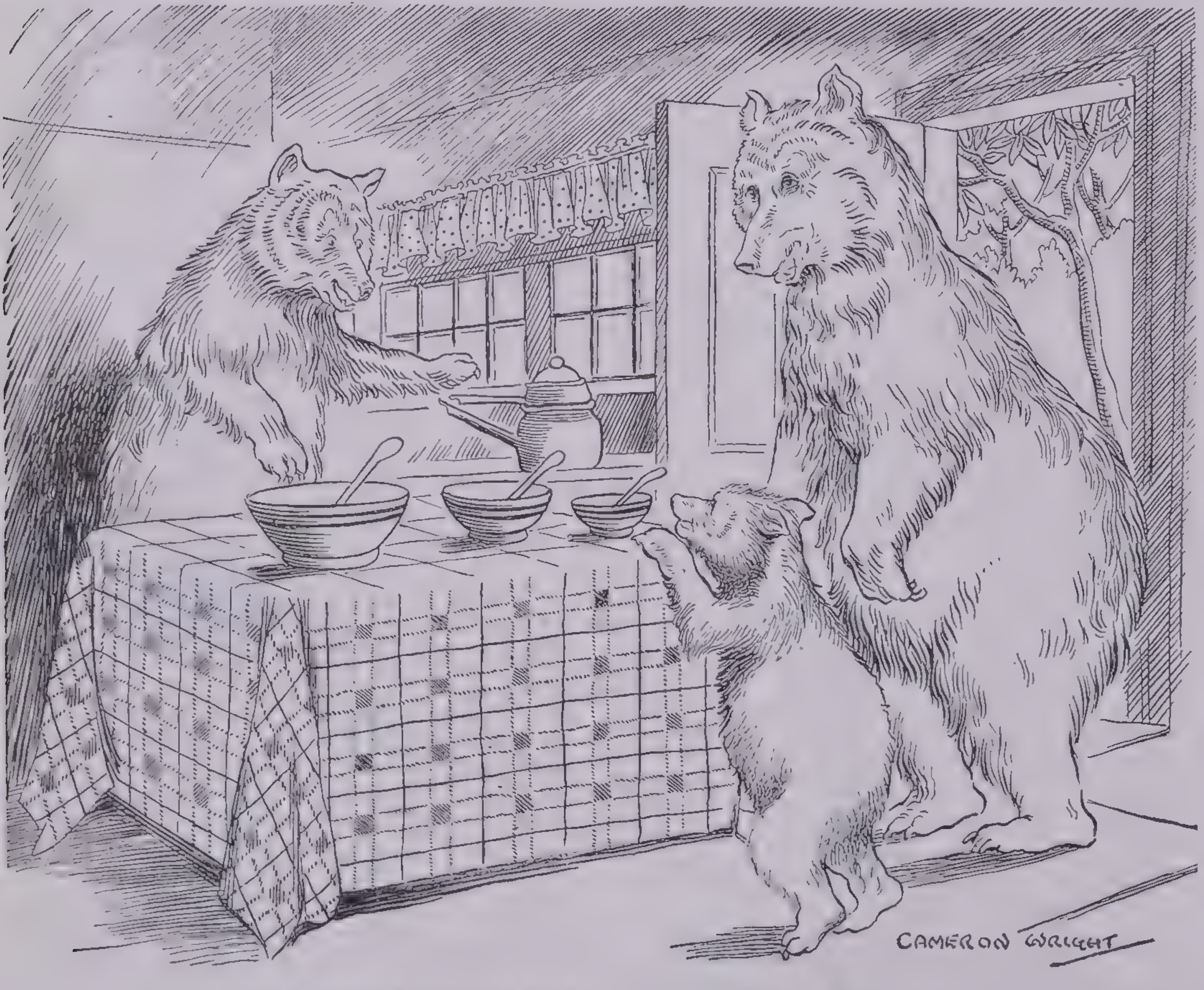
Goldilocks went into the kitchen, and on the table she saw three bowls of porridge, and she was well pleased. First she tasted the porridge in the great big bowl, which belonged to the Great Big Bear, and found it too hot for her. Then she tasted the porridge in the middle-sized bowl, which belonged to the Middle-sized Bear, and found it too cold. And then she tasted the porridge in the little wee bowl, which belonged to the Little Wee Bear, and it was just right, and she ate it all up.

Goldilocks went into the parlor, and there were three chairs. First, she sat down in the great big chair, which belonged to the Great Big Bear, and found it too hard for her. Then, she sat down in the middle-sized chair, which belonged to the Middle-sized Bear, and found it too soft. And then, she sat down in the little wee chair, which belonged to the Little Wee Bear, and it was just right, but she sat down in it with such force that she broke it and down she fell—plump—upon the floor.

By this time, Goldilocks was tired, and she went upstairs into the bed-chamber in which the Three Bears slept. First, she lay down upon the great big bed, which belonged to the Great Big Bear, and found it too high for her. Then she lay down upon the middle-sized bed, which belonged to the Middle-sized Bear, and found it too broad. And then she lay down upon the little wee bed, which belonged to the Little Wee Bear, and it was just right, so she covered herself up comfortably and fell fast asleep.

By this time, the Three Bears thought their porridge would be cool enough; so they came home to breakfast.

When the Great Big Bear went to his porridge, he said in his great big voice:



"SOMEBODY HAS BEEN TASTING MY PORRIDGE!"

Then the Middle-sized Bear looked at her bowl, and said in her middle-sized voice:

"SOMEBODY HAS BEEN TASTING MY PORRIDGE!"

Then the Little Wee Bear looked at his bowl, which was quite empty, and he said, in his little wee voice:

"Somebody has been tasting my porridge and has eaten it all up!"

Then the Three Bears, knowing that someone had been in their house, began to look about. They went into the parlor, and the Great Big Bear seeing that his hard cushion was not straight, said in his great big voice:

"SOMEBODY HAS BEEN SITTING IN MY CHAIR!"

And the Middle-sized Bear seeing that her soft cushion had been flattened out, said in her middle-sized voice:

"SOMEBODY HAS BEEN SITTING IN MY CHAIR!"

The Little Wee Bear went over to his chair and cried out in his little wee voice:

"Somebody has been sitting in my chair, and has broken it all to pieces!"

Then the Three Bears went upstairs to their bed-chamber. And the Great Big Bear seeing that his pillow was all rumpled, said in his great big voice:

"SOMEBODY HAS BEEN LYING IN MY BED!"

And the Middle-sized Bear, seeing that the covers of her bed were out of place, said in her middle-sized voice:

"SOMEBODY HAS BEEN LYING IN MY BED!"

Then the Little Wee Bear went to his bed, and cried out in his little wee voice:

"Somebody has been lying in my bed, and here she is!"

At that moment, Goldilocks woke up. When she saw the Three Bears standing there looking at her, she jumped out of the bed and ran to the window; and seeing that it opened right onto the ground, she quickly climbed out, and ran away as fast as her legs could carry her. And the Three Bears never saw anything more of her.

THE UGLY DUCKLING

It was so glorious out in the country; it was summer; the cornfields were yellow, the oats were green, the hay had been put up in stacks in the green meadows, and the stork went about on his long, red legs, and chattered Egyptian, for this was the language he had learned from his good mother. All around the fields and meadows were great forests, and in the midst of these forests lay deep lakes. Yes, it was really lovely out in the country.

In the midst of the sunshine, there lay an old farm, with deep canals about it, and from the wall down to the water great burdocks, so high that little children could stand upright under the loftiest of them. It was just as wild there as in the deepest wood, and there sat a Duck upon her nest; she had to hatch her ducklings; but she was almost tired out before the little ones came; and then she so seldom had visitors. The other ducks liked better to swim about in the canals than to run up to sit down under a burdock, and cackle with her.

At last one egg-shell after another burst open. "Piep! Piep!" it cried, and in all the eggs there were little creatures that stuck out their heads.

"Quack! quack!" they said; and they all came quacking out as fast as they could, looking all round them under the green leaves; and the mother let them look as much as they chose, for green is good for the eyes.

"How wide the world is!" said all the young ones, for they certainly had much more room now than when they were in the eggs.

"Do you think this is all the world?" asked the mother. "That stretches far across the other side of the garden, quite into the parson's field; but I have never been there. I hope you are all together," and she stood up. "No, I have not all. The largest egg still lies there. How long is that to last? I am really tired of it." And she sat down again.

"Well, how goes it?" asked an old Duck who had come to pay her a visit.

"It takes a long time with that one egg," said the Duck who sat there. "It will not burst. Now, only look at the others; are they not the prettiest little ducks one could possibly see? They are all like their father; the rogue, he never comes to see me."

"Let me see the egg which will not burst," said the old visitor. "You may be sure it is a turkey's egg. I was once cheated in that way, and had much anxiety and trouble with the young ones, for they are afraid of the water. Must I say it to you? I could not get them to venture in. I quacked and I clacked, but it was no use. Let me see the egg. Yes, that's a turkey's egg. Let it lie there, and teach the other children to swim."

"I think I will sit on it a little longer," said the Duck. "I've sat so long now that I can sit a few days more."

"Just as you please," said the old Duck; and she went away.

At last the great egg burst. "Piep! piep!" said the little one, and crept forth. It was very large and very ugly. The Duck looked at it.

"It's a very large duckling," said she; "none of the others look like that. Can it really be a turkey chick? Well, we shall soon find out. It must go into the water, even if I have to thrust it in myself."

The next day, it was bright, beautiful weather; the sun shone on all the green trees. The Mother Duck went down to the canal with all her family. Splash! she jumped into the water. "Quack! Quack!" she said, and one duckling after another plunged in. The water closed over their heads, but they came up in an instant, and swam beautifully, and they were all in the water, for the ugly gray Duckling swam with them.

"No, it's not a turkey," said the Mother Duck; "look how well it can use its legs, and how straight it holds itself. It is my own child! On the whole it's quite pretty, if one looks at it rightly. Quack! quack! come with me, and I'll lead you out into the great world and present you in the duck yard; but keep close to me, so that no one may tread on you, and take care to keep away from the cats!"

And so they came into the duck yard. A terrible riot was going on there, for two families were quarreling about an eel's head, and the cat got it after all.

"See, that's how it goes in the world!" said the Mother Duck; and she whetted her beak, for she, too, wanted the eel's head. "Only use your legs," she said. "See that you bustle about, and bow your heads before the old Duck yonder. She's the grandest of all here; she's of Spanish blood—that's why she's so fat. And do you see that she has a red rag round her leg? That's something particularly fine, and the greatest distinction a duck can enjoy: it signifies that people do not want to lose her, and that she's to be known by animals and by men too. Shake yourselves—don't turn in your toes; a well-brought-up duck turns its toes quite out, just like father and mother—so! Now bend your necks and say 'Quack!'"

And they did so; but the other ducks round about looked at them, and said quite boldly:

"Look there! Now we're to have these hanging on, as if there were not enough of us already! And fie! How that Duckling yonder looks; we won't stand that!" And one duck flew up at it, and bit it in the neck.

"Let it alone," said the mother; "it does no harm to anyone."

"Yes, but it's too large and peculiar," said the Duck who had bitten it; "and, therefore, it must be shown its proper place."

"Those are pretty children that the mother has there," said the old Duck with the rag round her leg. "They're all pretty but that one; that was rather unlucky. I wish she could make it over again."

"That cannot be done, my lady," replied the Mother Duck. "It is not pretty, but it has a really good disposition, and swims as well as any other; yes, I may even say it swims better. I think it will grow up to be pretty, and become smaller in time; it has lain too long in the egg, and therefore is not properly shaped." And then she pinched it in the neck, and smoothed its feathers. "Moreover, it is a drake," she said, "and, therefore, it is not of so much consequence. I think he will be very strong; he makes his way already."

"The other ducklings are graceful enough," said the old Duck. "Make yourself at home; and if you find an eel's head, you may bring it to me."

And now they were at home. But the poor Duckling which had been the last to creep out of the shell and looked so ugly, was bitten and pushed and jeered, as much by the ducks as by the chickens.

"It is too big!" they all said. And the turkey cock, who had been born with spurs, and therefore thought himself an emperor, blew himself up like a ship in full sail, and bore straight down upon it; then, he gobbled and grew quite red in the face. The poor Duckling did not know where it should stand or walk; it was quite melancholy because it looked ugly and because the whole yard made fun of it.

So it went on the first day, and afterwards it became worse and worse. The poor Duckling was chased by every one; even its brothers and sisters were quite angry with it, and said, "If the cat would only catch you, you ugly creature!" And the mother said, "If you were only far away!" And the ducks bit it, and the chickens beat it, and the girl who had to feed the poultry kicked at it with her foot.

Then it ran and flew over the fence, and the little birds in the bushes flew away in fear.

"That is because I am so ugly!" thought the Duckling; and it shut its eyes, but flew on further; and so it came out into the great moor, where the wild ducks lived. Here it lay the whole night long; and it was tired and sad.

Toward morning, the wild ducks flew up and looked at their new companion.

"What are you?" they asked; and the Ugly Duckling turned in every direction, and bowed as well as it could. "You are remarkably ugly!" said the Wild Ducks. "But that is nothing to us, so long as you do not marry into our family."

Poor thing! it certainly did not think of marrying, and only hoped to obtain leave to lie among the reeds and drink some of the swamp water.

Thus it lay two whole days; then there came two wild geese, or, properly speaking, two wild ganders. It was not long since each had crept out of a shell, and that's why they were so saucy.

"Listen, comrade," said one of them. "You're so ugly that I like you. Will you go with us, and become a bird of passage? Near here, in another moor, there are a few sweet, lovely wild geese, all unmarried, and all able to say 'Quack!' You've a chance of making your fortune, ugly as you are."

"Piff! paff!" resounded through the air; and the two ganders fell dead in the swamp. "Piff! paff!" it sounded again, and the whole flock of wild geese rose up from the reeds. And then there was another report. A great hunt was going on. The sportsmen were lying in wait all round the moor, and some were even sitting up in the branches of the trees, which spread far over the reeds. The blue smoke rose up like clouds among the dark trees, and was wafted far away across the water; and the hunting dogs came—splash! splash!—into the swamp, and the rushes and the reeds bent down on every side. That was a fright for the poor Duckling! It turned its head, and put it under its wing; but at that moment a frightful, great dog stood close by the Duckling, and thrust out his nose close against the Duckling, showed his sharp teeth, and then—splash! splash!—on he went without seizing it.

"O, Heaven be thanked!" sighed the Duckling. "I am so ugly, that even the dog does not want to bite me!"

And so it lay quite quiet, while the shots rattled through the reeds and gun after gun was fired At last, late in the day, all was still; but the poor Duckling did not dare to rise; it waited several hours before it looked round, and then hastened away out of the moor as fast as it could. It ran on over field and meadow; such a storm was raging that it was difficult to get from one place to another.

Toward evening, the Ugly Duckling came to a miserable little peasant's hut, so dilapidated that it did not itself know on which side it should fall; and that's why it remained standing. The storm whistled round the Duckling in such a way that the poor creature was obliged to sit down to keep from falling; and the wind blew worse and worse. Then the Ugly Duckling noticed that one of the hinges of the door had given way, and the door hung so slantingly that the Duckling could slip through the crack into the room; and that is what it did.

Here lived a woman, with her Cat and her Hen. And the Cat, which she called Sonnie, could arch his back and purr; he could even give out sparks; but for that, one had to stroke his fur the wrong way. The Hen had quite little, short legs, and, therefore, she was called Chickabiddy Shortshanks; she laid good eggs, and the woman loved her as her own child.

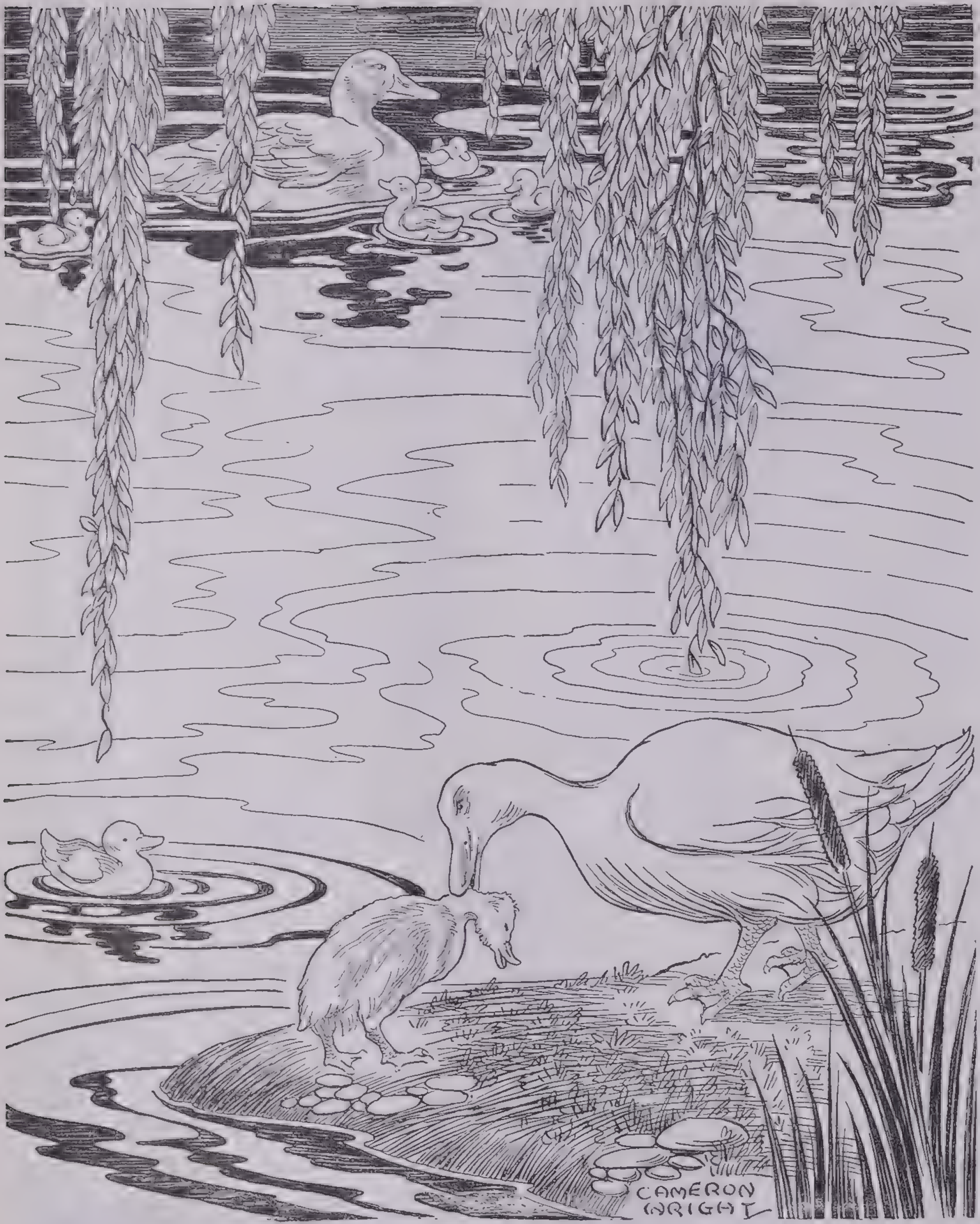
In the morning, the strange Duckling was at once noticed, and the Cat began to purr and the Hen to cluck.

"What's this?" asked the woman, and looked all round; but she could not see well, and, therefore, she thought the Ugly Duckling was a fat duck that had strayed. "This is a rare prize!" she said. "Now I shall have duck's eggs. I hope it is not a drake. We must wait to see."

And so the Ugly Duckling was admitted on trial for three weeks; but no eggs came. And the Cat was master of the house and the Hen was the lady, and always said, "We and the world!" for she thought they were half the world, and by far the better half. The Ugly Duckling thought one might have a different opinion, but the Hen would not allow it.

"Can you lay eggs?" she asked.

"No."



"Then will you hold your tongue!"

And the Cat said, "Can you curve your back, and purr, and give out sparks?"

"No."

"Then you will please have no opinion of your own when sensible folks are speaking."

And the Ugly Duckling sat in a corner and was sad, then the fresh air and the sunshine streamed in; and it was seized with such a strange longing to swim on the water that it could not help telling the Hen of it.

"What are you thinking of?" cried the Hen. "You have nothing to do, that's why you have these strange fancies. Lay eggs, or purr, and they will go away."

"But it is so charming to swim on the water!" said the Ugly Duckling, "so refreshing to let it close above one's head, and to dive to the bottom."

"Yes, that must be a mighty pleasure, truly," said the Hen. "I fancy you must be crazy. Ask the Cat about it; he's the cleverest animal I know; ask him if he likes to swim on the water, or to dive. I won't speak about myself. Ask our mistress, the old woman; no one in the world is cleverer than she. Do you think she has any desire to swim, and to let the water close above her head?"

"You don't understand me," said the Ugly Duckling.

"We don't understand you? Then pray who is to understand you? You surely don't pretend to be cleverer than the Cat and the woman. I won't say anything of myself. Don't be conceited, child, and thank your Maker for all the kindness you have received. Did you not get into a warm room, and have you not fallen into company from which you may learn something? But you are a chatterer, and it is not pleasant to associate with you. You may believe me, I speak for your own good. I tell you disagreeable things; and, by that, one may always know one's true friends! Only take care that you learn to lay eggs, or to purr and give out sparks!"

"I think I will go out into the wide world," said the Ugly Duckling.

"Yes, do go," replied the Hen.

And so the Ugly Duckling went away. It swam on the water, and dived, but it was slighted by every one because of its ugliness.

Now came the autumn. The leaves in the forest turned yellow and brown; the wind caught them so that they danced about and up in the air; it was very cold. The clouds hung low, heavy with hail and snowflakes, and on the fence stood the raven, crying, "Croak! croak!" for mere cold; yes, it was enough to make one feel cold to think of this. The poor little Duckling certainly did not have a good time. One evening, the sun was just setting in his beauty when a whole flock of great, handsome birds came out of the bushes; they were dazzlingly white, with long, flexible necks; they were swans. They uttered a very peculiar cry, spread forth their glorious great wings, and flew away from that cold region to warmer lands, to fair open lakes. They mounted so high, so high! and the Ugly Duckling felt quite strangely as it watched them. It turned round and round in the water like a wheel, stretched out its neck toward them, and uttered such a strange, loud cry that it frightened itself. O! it could not forget those beautiful, happy birds; and as soon as it could see them no longer, it dived to the very bottom, and when it came up again, was quite beside itself. It knew not the name of those birds, and knew not whither they were flying; but it loved them more than it had ever loved anyone. It was not at all envious of them. How could it think of wishing to possess such loveliness as they had? It would have been glad if only the ducks would have endured its company. The poor, ugly creature!

And the winter grew cold, very cold! The Ugly Duckling was forced to swim about in the water, to prevent the surface from freezing entirely; but every night the hole in which it swam about became smaller and smaller. It froze so hard that the ice cracked, and the Ugly Duckling was obliged to use its legs continually to prevent the hole from freezing up. At last it became exhausted, and lay quite still, and thus froze fast into the ice.

Early in the morning a peasant came by, and when he saw what had happened, he took his wooden shoe, broke the ice crust to pieces, and carried the Duckling home to his wife. Then, it came to itself again. The children wanted to play with it; but the Duckling thought they wanted to hurt it, and in its terror fluttered up into the milk pan, so that the milk spurted down into the room. The woman clasped her hands, at which the Ugly Duckling flew down into the butter tub, and then into the meal barrel and out again. How it looked then! The woman screamed, and struck at it with the fire tongs; the children tumbled over one another in their efforts to catch the Ugly Duckling; and they laughed and they screamed! It was well that the door stood open, and the poor creature was able to slip out between the shrubs into the newly fallen snow, and there it lay quite exhausted.

But it would be too sad if I were to tell all the misery and care which the

Ugly Duckling had to endure in the hard winter. When the sun began to shine again and the larks to sing, it lay out on the moor among the reeds. It was a beautiful spring. The Ugly Duckling forgot its troubles for a time. It tried to sing, but could make only a harsh croaking sound. It swam, dived and ruffled its feathers in the warm sunshine.

Then, all at once, the Duckling could flap its wings; they beat the air more strongly than before, and bore it strongly away; and before it well knew how all this happened, it found itself in a great garden, where the elder trees smelt sweet, and bent their long green branches down to the canal that wound through the region. O! here it was so beautiful, such a gladness of spring! and from the thicket came three glorious white swans; they rustled their wings, and swam lightly on the water. The Ugly Duckling recognized the splendid creatures, and felt a strange sadness.

"I will fly away to them, to the royal birds! and they will beat me, because I, that am so ugly, dare to come near them. But it is all the same. Better to be killed by *them* than to be pursued by ducks, and beaten by fowls, and pushed about by the girl who takes care of the poultry yard, and to suffer hunger in winter!" And it flew out into the water, and swam toward the beautiful swans. These looked at it, and came sailing down upon it with outspread wings. "Kill me!" said the poor creature, and bent its head down upon the water, expecting nothing but death. But what was this that it saw in the clear water? It beheld its own image; and, lo! it was no longer a clumsy, dark-grey bird, ugly and hateful to look at, but a—swan!

It matters not if one is born in a duck yard, if one has only lain in a swan's egg.

It felt quite glad at the thought of all the want and misfortune it had suffered, now that it realized its happiness in all the splendor that surrounded it. And the great swans swam around it, and stroked it with their beaks.

Into the garden came little children, who threw bread and corn into the water; and the youngest cried, "There is a new one!" and the other children shouted joyously, "Yes, a new one has arrived!" And they clapped their hands and danced about, and ran to their father and mother; and bread and cake were thrown into the water; and they all said, "The new one is the most beautiful of all! so young and handsome!" and the old swans bowed their heads before him.

Then he felt quite ashamed, and hid his head under his wings, for he did not know what to do; he was so happy, and yet not at all proud. He thought how he had been persecuted and despised; and now he heard them saying that he was the most beautiful of all birds. Even the elder tree bent its branches straight down into the water before him, and the sun shown warm and mild. Then, his wings rustled, he lifted his slender neck, and cried rejoicingly from the depths of his heart:

"I never dreamed of so much happiness when I was the Ugly Duckling!" —*Hans Christian Andersen.*

HANSEL AND GRETEL

Near a great forest there lived a poor woodcutter and his wife, and his two children; the boy's name was Hansel and the girl's, Gretel. They had very little to eat, and once, when there was a great famine in the land, the woodcutter could hardly earn the daily bread. As he lay in bed one night thinking of this, and turning and tossing, he sighed heavily, and said to his wife:

"What will become of us? we cannot even feed our children; there is nothing left for ourselves."

"I will tell you what, husband," answered the wife; "we will take the children early in the morning into the thickest part of the forest; we will make them a fire, and we will give each of them a piece of bread, then we will go to our work and leave them alone; they will never find the way home again, and we shall be rid of them."

"No, wife," said the man, "I cannot do that; I cannot find it in my heart to take my children into the forest and to leave them there alone; the wild animals would soon come and devour them."

"O you fool," said she, "then we will all four starve"; and she gave him no peace until he consented.

"But I pity the poor children," said the man.

Hansel and Gretel had not been able to sleep for hunger, and had heard what their stepmother had said to their father. Gretel wept bitterly, and said to Hansel,

"It is all over with us."

"Do be quiet, Gretel," said Hansel, "and do not fret; I will find some way to help us." And when the parents had gone to sleep, he got up, put on his little coat, opened the back door, and slipped out. The moon was shining brightly, and the white pebbles that lay in front of the house glistened like pieces of silver. Hansel stooped and filled the little pocket of his coat as full as it would hold. Then he went back again, and said to Gretel,

"Be at ease, dear little sister, and go to sleep quietly; God will not forsake us," and he laid himself down again in his bed.

When the day was breaking, and before the sun had risen, the wife came and awakened the two children, saying:

"Get up, you lazybones; we are going into the forest to cut wood."

Then she gave each of them a piece of bread, and said:

"That is for dinner, and you must not eat it before then, for you get no more."

Gretel carried the bread under her apron, for Hansel had his pockets full of the pebbles. Then they all set off together on their way to the forest. When they had gone a little way, Hansel stood still and looked back toward the house, and this he did again and again, till his father said to him,

"Hansel, what are you looking at? Take care not to lose your footing."

"Oh, father," said Hansel, "I see my little white kitten, sitting on the roof and bidding me good-by."

"You young fool," said the woman, "that is not your kitten, but the morning sun shining on the chimney."

Of course, Hansel had not seen his kitten, but he had taken a pebble from his pocket every now and then and had dropped it on the road.

When they reached the middle of the forest, the father told the children to collect wood to make a fire to keep them warm; and Hansel and Gretel gathered brushwood enough for a little mountain. Then they set it on fire, and when the flame was burning quite high, the wife said:

"Now lie down by the fire and rest yourselves, children, and we will go and cut wood; and when we are ready we will come and fetch you."

So Hansel and Gretel sat by the fire, and at noon they ate their pieces of bread. They thought their father was in the wood all the time, as they seemed to hear the strokes of the axe; but it was only a dry branch hanging on a withered tree that the wind moved to and fro. After they had stayed there a long time, their eyelids closed with weariness, and they fell fast asleep. When at last they awoke, it was night, and Gretel began to cry, and said:

"How shall we ever get out of this wood?" But Hansel comforted her, saying:

"Wait a little while longer, until the moon rises, and then we can easily find the way home."

And when the full moon rose, Hansel took his little sister by the hand, and followed the track of the pepples which shone like silver, and showed them the road. They walked on, the whole night through, and at the break of day they came to their father's house. They knocked at the door, and when the wife opened it and saw that it was Hansel and Gretel she said:

"You naughty children, why did you sleep so long in the wood? We thought you were never coming home!"

But the father was glad, for he had been sorry to leave them in the woods alone.

Not long after this, there was a great famine in the country again, and the children heard their mother say at night to their father:

"Everything is gone once more; we have only half a loaf left, and after that, the tale comes to an end. The children must be off; we will take them farther into the wood this time, so that they cannot find the way back again; that is our only hope; there is no other way to manage."

The man felt sad at heart, and he thought:

"It would be better to share one's last morsel with one's children."

But the wife would not listen to him, and only scolded and reproached him.

Again the children were awake, and heard all that was said. When the parents were asleep, Hansel got up to go out and get more pebbles, as he did before, but the wife had locked the door, and Hansel could not get out. However, he comforted his little sister, and said:

"Don't cry, Gretel, and go to sleep quietly, and God will help us."

Early the next morning the wife

came and pulled the children out of bed. She gave them each a little piece of bread—less than before; and on the way to the wood Hansel crumbled the bread in his pocket, and often stopped to throw a crumb on the ground.

"Hansel, what are you stopping for?" asked the father.

"I am looking at my little pigeon sitting on the roof, to say good-by to me," answered Hansel.

"Silly boy," said the wife, "that is no pigeon, but the morning sun shining on the chimney."

Hansel went on as before, and strewed breadcrumbs all along the road.

The woman led the children far into the wood, where they had never been before in all their lives. And again there was a large fire made, and the mother said:

"Sit still there, you children, and when you are tired go to sleep; we are going into the forest to cut wood, and in the evening, when we are ready to go home we will come back here and fetch you."

So when noon came Gretel shared her bread with Hansel, who had strewn his along the road. Then they went to sleep, and the evening passed, and no one came for the poor children. When they awoke, it was dark night, and Hansel comforted his little sister, and said:

"Wait a little, Gretel, until the moon comes up, then we shall be able to see our way home by the crumbs of bread that I have scattered along the path."

So when the moon rose they got up, but they could find no crumbs of bread, for the birds of the woods and of the fields had come and picked them up. Hansel thought they might still find the way, but they could not. They went on all that night, and the next day from morning until evening, but they could not find the path out of the wood, and they were very hungry, for they had nothing to eat but a few berries which they had picked. And when they were so tired that they could no longer drag themselves along, they lay down under a tree and fell asleep.

It was now the third morning since they had left their father's house. They were always trying to get back to it; but instead, they only found themselves farther in the wood. About noon, they saw a pretty snow-white bird sitting on a bough, and he was singing so sweetly that they stopped to listen. And when he had finished, the bird spread his wings and flew before them, and they followed after him until they came to a little house. The bird perched on the roof, and when they came nearer they saw that the house was built of bread, and roofed with cakes; and the window was of transparent sugar.

"We will have some of this," said Hansel, "and make a fine meal. I will eat a piece of the roof, Gretel, and you can have some of the window—that will taste sweet."

So Hansel reached up and broke off a bit of the roof, just to see how it tasted, and Gretel stood by the window and bit at it. Then they heard a thin voice call out from inside:

"Nibble, nibble, like a mouse,
Who is nibbling at my house?"

And the children answered:

"Never mind,
It is the wind."

And then they went on eating, without troubling themselves further. Hansel, who found that the roof tasted very nice, took down a great piece of it, and Gretel pulled out a large round windowpane, and sat down and began to eat it. Then the door opened, and an aged woman came out, leaning upon a crutch. Hansel and Gretel were very frightened, and let fall what they had in their hands. The old woman, however, nodded her head, and said:

"Ah, my dear children, how came you here? You must come indoors and stay with me. No harm will come to you."

So she took them each by the hand, and led them into her little house. And there they found a good meal laid out, of milk and pancakes, with sugar, apples, and nuts. After that she showed them two little white beds, and Hansel and Gretel lay down on them, and thought they were in heaven.

The old woman, although her behavior was so friendly, was a wicked witch, who lay in wait for children, and who had built the little house on purpose to entice them. When they were once inside, she used to kill them, cook them, and eat them, and then it was a feast day for her! When she knew that Hansel and Gretel were coming, she gave a spiteful laugh, and said triumphantly:

"I have them, and they shall not escape me!"

Early in the morning, before the children were awake, she got up to look at them, and as they lay sleeping so peacefully with round, rosy cheeks, she said to herself:

"What a fine feast I shall have!"

Then she grasped Hansel with her withered hand, and led him into a little stable, and shut him up behind a grating; and though he fought and screamed, he could not get out. Then she went back to Gretel and shook her, crying:

"Get up, lazybones; fetch water, and cook something nice for your brother; he is outside in the stable, and must be fattened up. And when he is fat enough I will eat him."

Gretel began to weep bitterly, but it was of no use; she had to do what the wicked witch bade her.

And so the best food was cooked for poor Hansel, while Gretel got nothing but crab shells. Each morning the old witch visited the little stable, and cried:

"Hansel, stretch out your finger, that I may tell if you will soon be fat enough."

Hansel, however, used to hold out a little bone, and the old witch, who could not see very well thought it was Hansel's finger, and wondered very much why it did not get fatter. When four weeks had passed and Hansel remained so thin, she lost patience and could wait no longer.

"Now then, Gretel," she cried to the little girl, "be quick and draw water; be Hansel fat or be he lean, tomorrow I must kill and cook him."

Oh how the tears flowed down over Gretel's cheeks as she went to fetch the water.

"Dear God, pray help us!" she cried; "if we had been devoured by wild beasts in the wood, at least we should have died together."

"Stop your complaining," said the old witch; "it is of no avail."

Early next morning Gretel had to get up, make the fire, and fill the kettle.

"First we will do the baking," said the old witch; "I have heated the oven already, and kneaded the dough."

She pushed poor Gretel toward the oven, out of which flames were already shining.

"Creep in," said the witch, "and see if it is properly hot so that the bread may be baked."

As soon as Gretel was inside, she meant to shut the door upon her and let her be baked, and then she would have eaten her. But Gretel saw what she was going to do and said:

"I don't know how to do it; how shall I get in?"

"Stupid goose," said the old witch, "the opening is big enough, do you see? I could get in myself!" and she stooped down and put her head in the oven's mouth. Then Gretel gave her a push, so that she went in farther, and she shut the iron door upon her, and put up the bar. Then Gretel ran away, and went straight to Hansel, opened the stable door and cried:

"Hansel, we are free! the old witch is dead!"

Then out flew Hansel as soon as the door was opened. How happy they both were! how they danced about, and kissed each other and laughed for joy. And as they had nothing more to fear they went over the old witch's house, and in every corner there stood chests of pearls and precious stones.

"These are better than pebbles," said Hansel, filling his pockets, and Gretel, thinking she also would like to carry something home with her, filled her apron full.

"Now, away we go," said Hansel, "if we can only get out of the witch's wood."

When they had walked an hour or two, they came to a great lake.

"We can never get across," said Hansel, "I see no stepping-stones and no bridge."

"And there is no boat either," said Gretel; "but here comes a white duck; if I ask her she will help us over." So she cried:

"Duck, duck, here we stand,
Hansel and Gretel, on the land,
Stepping-stones and bridge we lack,
Carry us over on your nice white back."

And the duck came accordingly, and Hansel jumped on her back and told his sister to come too.

"No," answered Gretel, "that would be too heavy for the duck; we can go separately, one after the other."

And that is what they did. Afterwards, they went on happily, until the wood grew more and more familiar, and at last they saw in the distance their father's house. Then they ran till they came up to it, rushed in at the door, and fell on their father's neck. The man had not spent one happy moment since he left his children in the wood; but his cruel wife had gone away and not come back. When Gretel opened her apron, the pearls and precious stones were scattered all over the room, and Hansel took one handful after another out of his pocket. Thus all their troubles were ended, and they lived in great joy together.

—*From Grimm's Household Stories.*

THE TALE OF PETER RABBIT

Once upon a time there were four little Rabbits, and their names were: Flopsy, Mopsy, Cotton-tail, and Peter.

They lived with their mother in a sandbank, underneath the root of a very big fir tree.

"Now, my dears," said old Mrs. Rabbit one morning, "you may go into the fields or down the lane, but don't go into Mr. McGregor's garden; your father had an accident there—he was put in a pie by Mrs. McGregor."

Then old Mrs. Rabbit took a basket and her umbrella, and went through the wood to the baker's. She bought a loaf of brown bread and five currant buns.

Flopsy, Mopsy, and Cotton-tail, who were good little bunnies, went down the lane to gather blackberries; but Peter, who was very naughty, ran straight away to Mr. McGregor's garden, and squeezed under the gate!

First he ate some lettuces and some French beans; and then he ate some radishes; and then, feeling rather sick, he went to look for some parsley.

But round the end of a cucumber frame, whom should he meet but Mr. McGregor! Mr. McGregor was on his hands and knees planting out young cabbages, but he jumped up and ran after Peter, waving a rake and calling out, "Stop thief!"

Peter was most dreadfully frightened; he rushed all over the garden, for he had forgotten the way back to the gate. He lost one of his shoes among the cabbages and the other shoe amongst the potatoes.

After losing them he ran on four legs and went faster, so that I think he might have got away altogether if he had not unfortunately run into a gooseberry net, and got caught by the large buttons on his jacket. It was a blue jacket with brass buttons, quite new.

Peter gave himself up for lost, and shed big tears; but his sobs were overheard by some friendly sparrows who flew to him in great excitement and implored him to exert himself. Mr. McGregor came up with a sieve which he intended to pop upon the top of Peter; but Peter wriggled out just in time, leaving his jacket behind him, and rushed into the tool-shed, and jumped into a can. It would have been a beautiful thing to hide in, if it had not had so much water in it.

Mr. McGregor was quite sure that Peter was somewhere in the tool-shed, perhaps hidden underneath a flower pot. He began to turn them over carefully, looking under each.

Presently Peter sneezed—"Kertyschoo!" Mr. McGregor was after him in no time, and tried to put his foot upon Peter who jumped out of a window, upsetting three plants. The window was too small for Mr. McGregor, and he was tired of running after Peter. He went back to his work.

Peter sat down to rest; he was out of breath and trembling with fright, and he had not the least idea which way to go. Also he was very damp with sitting in that can. After a time he began to wander about, going lippity-lippity—not very fast, and looking all around.

He found a door in a wall; but it was locked, and there was no room for a fat little rabbit to squeeze underneath.

An old mouse was running in and out over the stone doorstep, carrying peas and beans to her family in the wood. Peter asked her the way to the gate, but she had such a large pea in her mouth that she could not answer. She only shook her head at him. Peter began to cry.

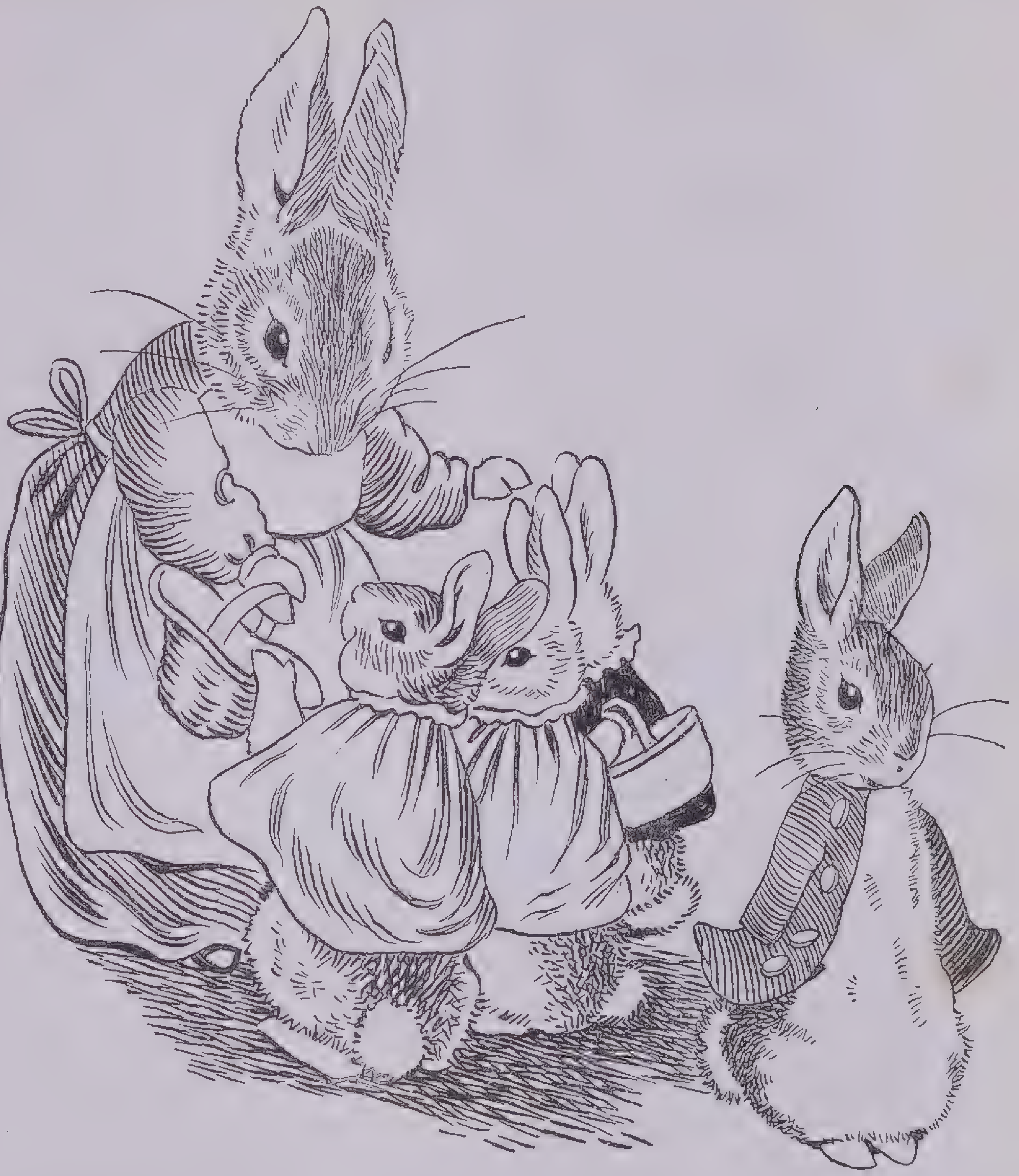
Then he tried to find his way straight across the garden, but he became more and more puzzled. Presently he came to a pond where Mr. McGregor filled his watering cans. A white cat was staring at some goldfish; she sat very, very still, but now and then the tip of her tail twitched as if it were alive. Peter thought it best to go away without speaking to her; he had heard about the ways of cats from his older cousin, little Benjamin Bunny.

He went back toward the tool-shed, but suddenly, quite close to him, he heard the noise of a hoe—scr-r-ritch, scratch, scratch, scratch. Peter scuttered underneath the bushes. But presently, as nothing happened, he came out, and climbed upon a wheelbarrow, and peeped over. The first thing he saw was Mr. McGregor hoeing onions. His back was turned toward Peter, and beyond him was the gate!

Peter got down very quietly off the wheel-barrow, and started running as fast as he could go, along a straight walk behind some black-currant bushes. Mr. McGregor caught sight of him at the corner, but Peter did not care. He slipped underneath the gate and was safe at last in the wood outside the garden.

Mr. McGregor hung up the little jacket and the shoes for a scare-crow to frighten the blackbirds.

Peter never stopped running or looked behind him till he got home to the big fir tree. He was so tired that he flopped down upon the nice soft



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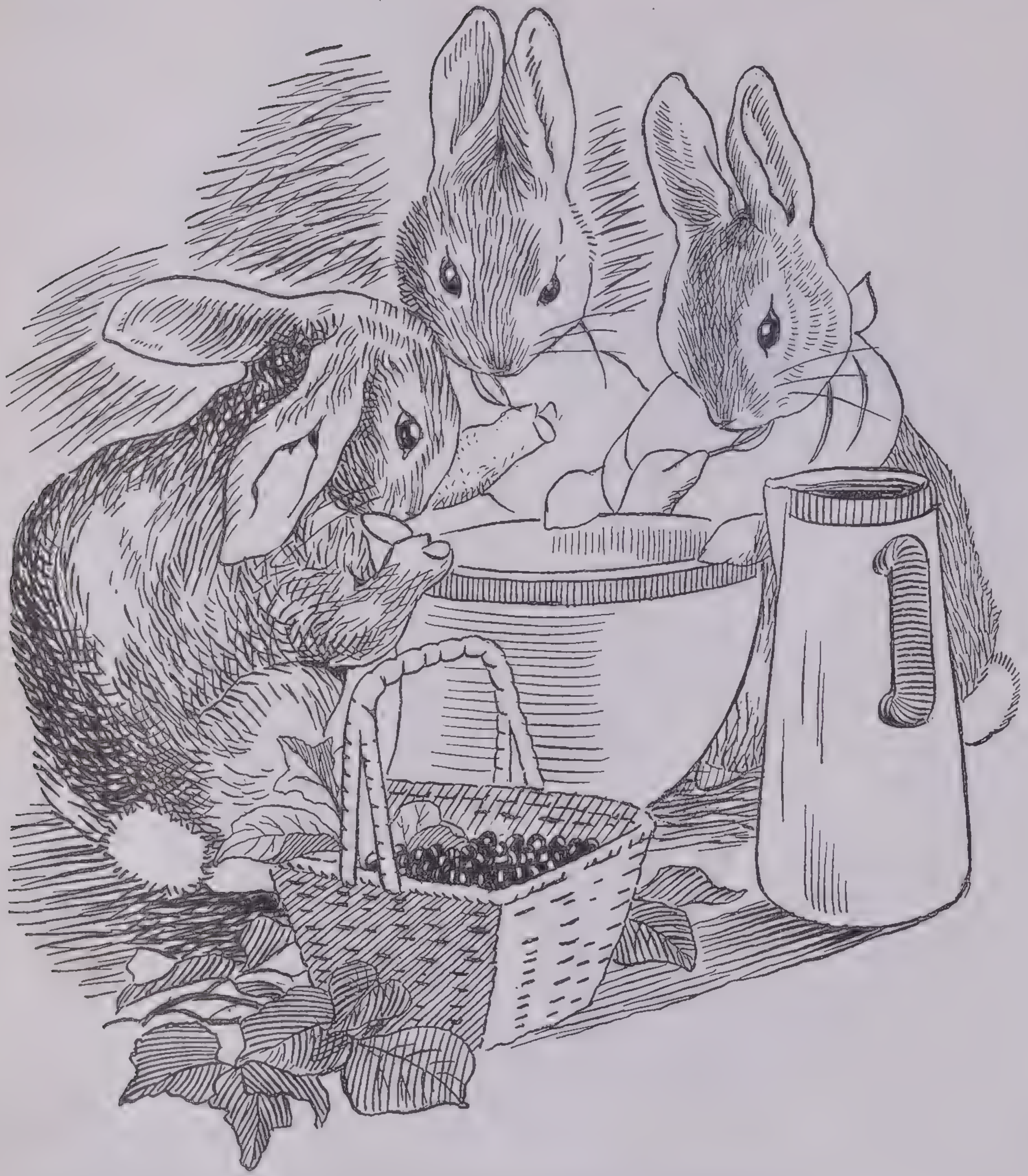

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sand on the floor of the rabbit-hole, and shut his eyes.

His mother was busy cooking; she wondered what he had done with his clothes. It was the second little jacket and pair of shoes that Peter had lost in a fortnight!

I am sorry to say that Peter was not very well during the evening. His mother put him to bed, and made some camomile tea, and she gave a dose of it to Peter, who made a face when he tasted it. "One tablespoonful taken at bed-time!" But Flopsy, Mopsy, and Cotton-tail had bread and milk and blackberries for supper.

—*Beatrix Potter*[1]

LITTLE GOLDEN HOOD

You know the tale of poor Little Red Riding Hood, that the wolf deceived and devoured, with her cake, her little butter can, and her grandmother; well, the true story happened quite differently, as we know now. And first of all, the little girl was called and is still called Little Golden Hood; secondly, it was not she, nor the good granddame, but the wicked wolf who was, in the end, caught and devoured.

The story begins something like the tale.

There was once a little peasant girl, pretty and nice as a star in its season. Her real name was Blanchette, but she was more often called Little Golden Hood, on account of a wonderful little cloak with a hood, gold and fire colored, which she always had on. This little hood was given her by her grandmother, who was so old that she did not know her age; it ought to bring her good luck, for it was made of a ray of sunshine, she said. And as the good old woman was considered something of a witch, everyone thought the little hood rather bewitched too.

And so it was, as you will see.

One day the mother said to the child: "Let us see, my little Golden Hood, if you know how to find your way by yourself. You shall take this good piece of cake to your grandmother for a Sunday treat tomorrow. You will ask her how she is, and come back at once, without stopping to chatter on the way with people you don't know. Do you quite understand?"

"Yes, mother," replied Blanchette gayly. And off she went with the cake.

But the grandmother lived in another village and there was a big wood to cross before getting there. At a turn of the road under the trees, suddenly "Who goes there?"

"Friend Wolf."

He had seen the child start alone, and the villain was waiting to devour her, when at the same moment he saw some woodcutters who might observe him, and he changed his mind. Instead of falling upon Blanchette he came frisking up to her like a good dog.

" 'T is you! my nice Little Golden Hood," said he. So the little girl stops to talk with the wolf, who, for all that, she did not know in the least.

"You know me, then!" said she; "What is your name?"

"My name is Friend Wolf. And where are you going thus, my pretty one, with your little basket on your arm?"

"I am going to my grandmother, to take her a good piece of cake for her Sunday treat tomorrow."

"And where does she live, your grandmother?"

"She lives at the other side of the wood, in the first house in the village, near the windmill with the red sails, you know."

"Ah! yes! I know now," said the wolf. "Well, that's just where I'm going; I shall get there before you, no doubt, with your little bits of legs, and I'll tell her you're coming to see her; then she'll wait for you."

Thereupon the wolf cuts across the wood, and in five minutes arrives at the grandmother's house.

He knocked at the door: toc, toc.

No answer.

He knocks louder.

Nobody answers.

Then he stands upon end, puts his two fore paws on the latch, and the door opens.

Not a soul in the house.

The old woman had risen early to sell herbs in the town, and she had gone off in such haste that she had left her bed unmade, with her great nightcap on the pillow.

"Good!" says the wolf to himself, "I know what I'll do."

He shuts the door, pulls on the grandmother's nightcap down to his eyes, then he lies down all his length in the bed and draws the curtains.

In the meantime the good Blanchette went quietly on her way, as little girls do, amusing herself here and there by picking Easter daisies, watching the little birds making their nests, and running after the butterflies which fluttered in the sunshine.

At last she arrives at the door.

Knock, knock.

"Who is there?" says the wolf, softening his rough voice as best he can.

"It's me, granny, your Little Golden Hood. I'm bringing you a big piece of cake for your Sunday treat tomorrow."

"Press your finger on the latch, then push and the door opens."

"Why, you've got a cold, granny," said she, coming in.

"Ahem! a little, my dear, a little," replied the wolf, pretending to cough. "Shut the door well, my little lamb. Put your basket on the table, and then take off your frock and come and lie down by me; you shall rest a little."

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[1] *The Tale of Peter Rabbit,* by Beatrix Potter, is included by arrangement with Frederick Warne & Co., Inc., publishers of the authorized American edition.

The good child undresses, but observe this: She kept her little hood upon her head. When she saw what a strange figure her granny cut in bed, the poor little thing was very much surprised.

"Oh!" cried she, "how like you are to Friend Wolf, grandmother!"

"That's on account of my nightcap, child," replies the wolf.

"Oh! what hairy arms you've got, grandmother!"

"All the better to hug you, my child."

"Oh! what a big tongue you've got, grandmother!"

"All the better for answering, child."

"Oh! what a mouthful of great white teeth you have, grandmother!"

"That's for crunching little children with!" And the wolf opened his jaws wide to swallow Blanchette.

But she put down her head, crying:

"Mamma! mamma!" and the wolf only caught her little hood.

Thereupon, oh, dear! oh, dear! he draws back, crying and shaking his jaw as if he had swallowed red-hot coals.

It was the little fire-colored hood that had burnt his tongue right down his throat.

The little hood, you see, was one of those magic caps that they used to have in former times, in the stories, for making oneself invisible or invulnerable.

So there was the wolf with his throat burned, jumping off the bed and trying to find the door, howling and howling as if all the dogs in the country were at his heels.

Just at this moment the grandmother arrives, returning from the town with her long sack empty on her shoulder.

"Ah, brigand!" she cries, "wait a bit!" Quickly she opens her sack wide across the door, and the maddened wolf, with his eyes shut tight, springs in head downward.

It is he now that is caught, swallowed like a letter in the post.

For the brave old dame shuts her sack, so; and she runs and empties it in the well, where the vagabond, still howling, tumbles into the water and is drowned.

"Ah, scoundrel! you thought you would crunch my little grandchild! Well, tomorrow we will make her a muff of your skin, and you yourself shall be crunched, for we will give your carcass to the dogs."

Thereupon the grandmother hastened to dress poor Blanchette, who was still trembling with fear in the bed.

"Well," she said to her, "without my little hood where would you be now, darling?" And, to restore heart and legs to the child, she made her eat a good piece of her cake, and drink a good draught of wine, after which she took her by the hand and led her back to the house.

And then, who was it scolded her when she knew all that had happened?

It was the mother.

But Blanchette promised over and over again that she would never more stop to listen to a wolf, so that at last the mother forgave her.

And Blanchette, the Little Golden Hood, kept her word. And in fine weather she may still be seen in the fields with her pretty little hood, the color of the sun.

But to see her you *must rise* early.

THE STRAW, THE COAL, AND THE BEAN

In a village dwelt a poor old woman, who had gathered together a dish of beans and wanted to cook them. So she made a fire on her hearth, and that it might burn the quicker, she lighted it with a handful of straw. When she was emptying the beans into the pan, one dropped without her observing it, and lay on the ground beside a straw, and soon afterward a burning coal from the fire leaped down to the two.

Then the straw began and said, "Dear friends, from whence do you come here?"

The coal replied, "I fortunately sprang out of the fire, and if I had not escaped by main force, my death would have been certain—I should have been burned to ashes."

The bean said, "I too have escaped with a whole skin, but if the old woman had got me into the pan I should have been made into broth without any mercy, like my comrades."

"And would a better fate have fallen to my lot?" said the straw. "The old woman has destroyed all my brethren in fire and smoke; she seized sixty of them at once, and took their lives. I luckily slipped through her fingers."

"But what are we to do now?" said the coal.

"I think," answered the bean, "that as we have so fortunately escaped death, we should keep together like good companions, and lest a new mischance should overtake us here, we should go away together, and repair to a foreign country."

The proposition pleased the two others, and they set out on their way in company. Soon, however, they came to a little brook, and as there was no bridge or foot-plank they did not know how they were to get over it.

The straw hit on a good idea, and said, "I will lay myself straight across, and then you can walk over me as on a bridge."

The straw thereupon stretched itself from one bank to the other, and the coal, who was very impetuous, tripped quite boldly on to the newly built bridge. But when she had reached the middle, and heard the water rushing beneath her, she was afraid, and stood still and ventured no further. The straw, however, began to burn, broke in two pieces, and fell into the stream. The coal slipped after her, hissed when she got into the water, and breathed her last.

The bean, who had prudently stayed behind on the shore, could not help laughing at the event, and laughed so heartily that she burst. It would have been all over with her, likewise, had not a tailor, who was traveling in search of work, sat down by the brook to rest. As he had a compassionate heart he pulled out his needle and thread, and sewed her together. The bean thanked him most prettily, but as the tailor used black thread, all beans since then have had a black seam.

HANS IN LUCK

Hans had served his master seven years, and at last said to him: "Master, my time is up; I should like to go home and see my mother; so give me my wages." And the master said: "You have been a faithful and good servant, so your pay shall be handsome." Then he gave him a piece of silver that was as big as his head.

Hans took out his pocket handkerchief, put the piece of silver into it, threw it over his shoulder, and jogged off homeward. As he went lazily on, dragging one foot after the other, a man came in sight, trotting along gayly on a capital horse. "Ah!" cried Hans aloud, "what a fine thing it is to ride on horseback! He trips against no stones, spares his shoes, and yet gets on he hardly knows how." The horseman heard this, and said: "Well, Hans, why do you go on foot, then?" "Ah," said he, "I have this heavy load to carry; to be sure it is silver, but it is so heavy that I can't hold up my head, and it hurts my shoulders sadly." "What do you say to changing?" said the horseman: "I will give you my horse, and you shall give me the silver." "With all my heart," said Hans; "but I tell you one thing—you'll have a weary task to drag it along." The horseman got off, took the silver, helped Hans up, gave him the bridle into his hands, and said: "When you want to go very fast, you must smack your lips loud, and cry 'Jip.' "

Hans was delighted as he sat on the horse and rode merrily on. After a time he thought he should like to go a little faster, so he smacked his lips and cried "Jip." Away went the horse full gallop; and before Hans knew what he was about he was thrown off, and lay in a ditch by the roadside; and his horse would have run off if a shepherd who was coming by, driving a cow, had not stopped it. Hans soon came to himself, and got up on his legs again. He was sadly vexed and said to the shepherd: "This riding is no joke when a man gets on a beast like this, that stumbles and flings him off as if he would break his neck. However, I am off now once for all: I like your cow a great deal better; one can walk along at one's leisure behind her, and have milk, butter, and cheese every day into the bargain. What would I give to have such a cow!" "Well," said the shepherd, "if you are so fond of her, I will exchange my cow for your horse." "Done!" said Hans merrily. The shepherd jumped upon the horse, and away he rode.

Hans drove off his cow quietly and thought his bargain a very lucky one. "If I have only a piece of bread, I can, whenever I like, eat my butter and cheese with it; and when I am thirsty, I can milk my cow and drink the milk: what can I wish for more?" When he came to an inn, he halted, ate up all his bread, and gave his last penny for a glass of beer: then he drove his cow towards his mother's village: and the heat grew greater as noon came on, till he began to be so hot and parched that his tongue clave to the roof of his mouth. "I can find a cure for this," thought he, "now will I milk my cow and quench my thirst;" so he tied her to the stump of a tree, and held his leathern cap to milk into; but not a drop was to be had.

While he was trying his luck and managing the matter very clumsily, the uneasy beast gave him a kick on the head that knocked him down, and there he lay a long while senseless. Luckily a butcher soon came by, wheeling a pig in a wheelbarrow. "What is the matter with you?" said the butcher, as he helped him up. Hans told him what had happened, and the butcher gave him a flask, saying: "There, drink and refresh yourself; your cow will give you no milk, she is an old beast good for nothing but the slaughterhouse." "Alas, alas!" said Hans, "who would have thought it? If I kill her, what would she be good for? I hate cow beef, it is not tender enough for me. If it were a pig, now, one could do something with it; it would, at any rate, make some sausages."

"Well," said the butcher, "to please you I'll change, and give you the pig for the cow." "Heaven reward you for your kindness!" said Hans, as he gave the butcher the cow, and took the pig off the wheelbarrow, and drove it off, holding it by the string that was tied to its leg.

So on he jogged, and all seemed now to go right with him. The next person he met was a countryman, carrying a fine white goose under his arm. The countryman stopped to ask what o'clock it was; and Hans told him all his luck, and how he had made so many bargains. The countryman said he was going to take the goose to a christening. "Feel," said he, "how heavy it is, and yet it is only eight weeks old. Whoever roasts and eats it, may cut plenty of fat off it, it has lived so well!" "You're right," said Hans, as he felt it in his hand; "but my pig is heavy, too." Meantime the countryman began to look grave, and shook his head. "Listen, my friend," said he, "your pig may get you into trouble; in the village I have just come from, the squire has had a pig stolen from his sty. I was very much afraid, when I saw you, that you had the squire's pig; it will be hard for you if you are caught, because you will be thrown into the horsepond."

Poor Hans was badly frightened. "Good man," cried he, "help me out of this scrape; you know this country better than I; take my pig and give me the goose." "I ought to have something into the bargain," said the countryman; "however, I will not be hard upon you, as you are in trouble." Then he took the string in his hand, and drove off the pig by a side path, and Hans went on his way homewards, free from care.

As he came to the last village, he saw a scissors-grinder, working away at his grinding, and singing. Hans watched him for a while, and then said, "You must be well off, master-grinder, you seem to be so happy." "Yes," said the other, "mine is a fine trade; a good grinder always has money in his pocket. But where did you get that splendid goose?" "I did not buy it, but exchanged a pig for it." "And where did you get the pig?" "I gave a cow for it." "And the cow?" "I gave a horse for it." "And the horse?" "I gave a piece of silver as big as my head for that." "And the silver?" "Oh! I worked hard for that seven long years." "You have done well in the world hitherto," said the grinder; "now if you could find money in your pocket whenever you put your hand into it, your fortune would be made." "That is true: but how is that to be done?" "You must turn grinder like me," said the other, "all you want is a grindstone; the rest will come of itself. This one is a little the worse for wear: I would not ask more than the value of your goose for it; will you buy?" "How can you ask me such a question?" said Hans; "I should be the happiest man in the world if I could always have money in my pocket; what more could I wish for? Take the goose!" "Now," said the grinder, as he gave him a rough stone that lay by his side, "this is an excellent stone; manage it properly, and you can make a rusty nail cut with it."

Hans took the stone and went off with a light heart, and he said to himself: "I must have been born under a lucky star, for everything that I wish for comes to me of itself."

Meantime he began to feel tired, for he had traveled ever since daybreak; he was hungry, too, for he had given away his last penny in his joy at getting the cow. At last he could go no further, and the stone tired him very much; so he dragged himself to the edge of a pond, that he might drink and rest; so he laid the stone carefully by his side on the bank: but as he stooped down to drink, he forgot it, pushed it a little and down it went into the pond. For a while he watched it sinking in the deep clear water, then sprang up for joy, and again fell upon his knees, and thanked heaven for taking away his only plague, the heavy stone. "How happy am I," cried he: "no one was ever so lucky as I am." Then he got up with a light and merry heart, and went on free from all his troubles, till he reached his mother's house.

GULLIVER AND THE LILIPUTIANS

Once there lived a lad in England who was very fond of the sea. He would watch the ships come in and out of the harbor, and at last he hired himself out to be a sailor on one of the ships. In those times they had not steamships with choo-choo engines, and smokestacks, oh no! but only vessels that were driven by the wind blowing against their sails; and they were so much smaller than the big steamers you know that the winds often played with them and drove them hither and thither, and sometimes threw them on the rocks and smashed them all to pieces.

Well, this young man, Gulliver was his name, was on one of these little sailships when a big storm came and hurled the ship hither and thither, and at last broke it up against the rocks of a strange land. All on board, the captain, and the sailors, and the boys, perished in the sea. Only Gulliver escaped. A big wave threw him upon the land, and the shock was so great that he knew nothing of himself. He lay on the shore like one dead. Yes, he did.

At last he awoke. But what was his wonder and fright when he saw the sun shining in his eyes, and he knew he was alive, and wanted to rise up, to find that he could not move. No, not even his hand, or his little finger. He could not turn his head from side to side. He just had to lie quite still. Then he heard a strange whispering all about him, and at last he felt something crawling up his side. And then, would you believe it: he saw something, or somebody, he did not know what it was, standing on his chin, looking straight into his eyes—and he did not know whether he, or the little man he saw there, must have looked more frightened. The little man was not more than six inches tall, about as long as daddy's hand, from the wrist to the tip of his long man finger. But the little man had a real head and real eyes, and was dressed like a fine gentleman, only his coat, and his trousers, and his hat, were, oh, so tiny and small. And he spoke to Gulliver in a strange language which Gulliver did not understand, and his voice was so faint that he could hardly hear him anyway.

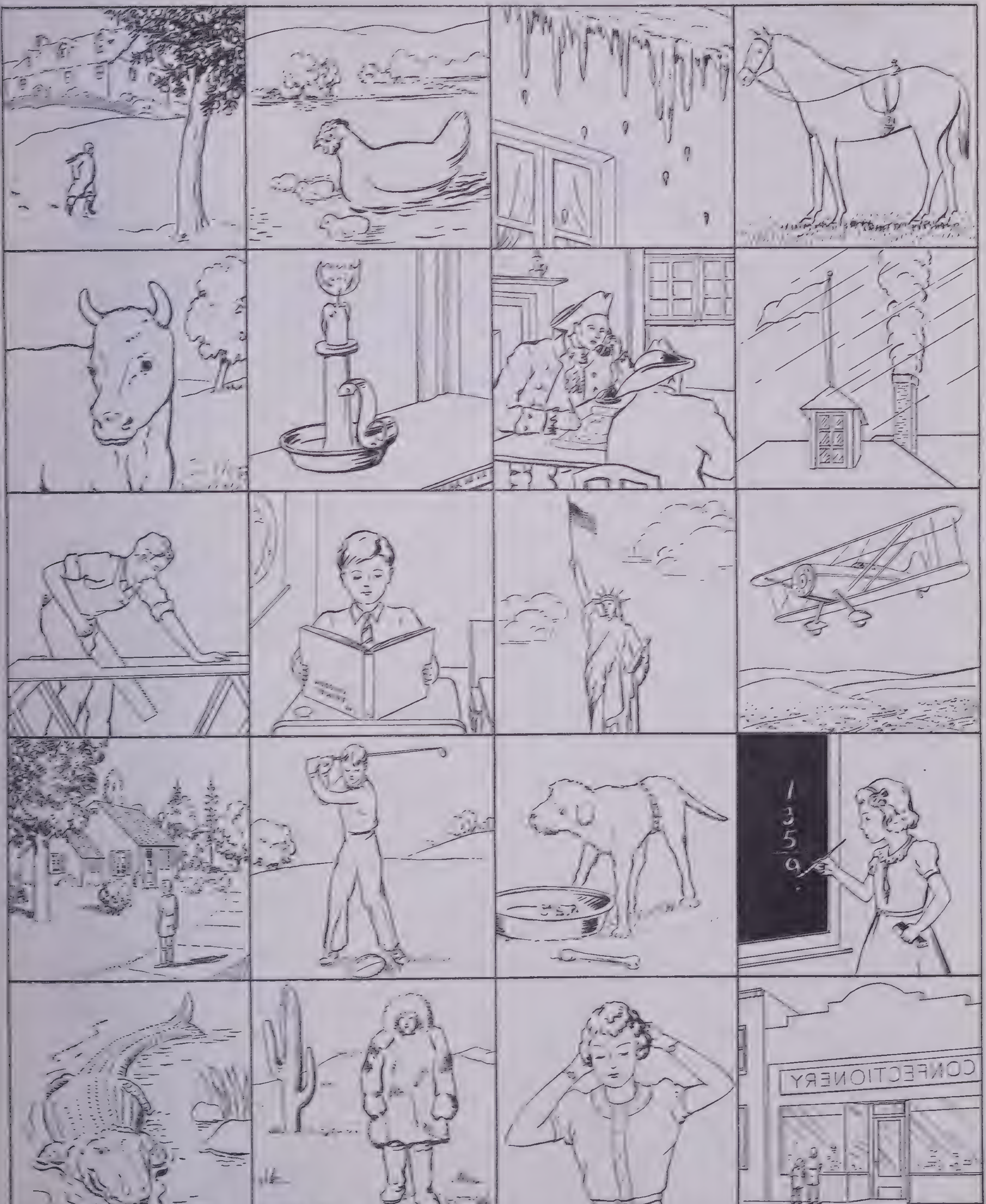
When Gulliver tried to say that he did not understand, and to ask what it all was about, and why he could not move, the little man looked so scared, oh, so scared, and held his tiny hands to his tiny ears—yes, he even fell back and nearly broke his little neck in his fall from Gulliver's chin. For you see, Gulliver's voice must have sounded like thunder to the little man, and the breath from Gulliver's mouth like a strong wind. And so Gulliver lay there, unable to move, and did not know what to make of it. He certainly had never seen such little people before.

Then, he heard a rip-rip-rip—and he felt that he could move his left arm. Then more of rip-rip-rip, and he could move his right arm. Then more and more of rip-rip-rip, and rip-rip-rip; and at last he could move his head, and raise his shoulders, and then his body, and finally he could rise up in his whole bigness. The little people had thought they might find out what had come to them, in another way.

When Gulliver had stood up, he looked about him, but he could not see anybody or anything. Just the blue sky above him. Then he looked down on the ground; he saw bushes which looked like little trees, quite perfect, but oh, so much smaller than the trees he used to know. Of course, he could not see, at first, any of the little people one of whom had been scared off his chin by his words, for they had all hidden away when they saw that big giant of a man rise up like a huge mountain. In a little while, however, when they saw that Gulliver did not do anything wicked, or violent, but just stood there, they peeped out from behind the trees, and he could see little faces and little bodies which looked too funny for anything, just like little doll babies.

When he spied them, he sat down on the ground to see them better, and talked to them in the softest tone of his voice, and smiled at them. Of course, they did not understand what he said, but they thought he looked

WHAT IS WRONG?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THERE IS A MISTAKE IN EACH PICTURE. CAN YOU FIND IT?

From Elsa Beskow: Pelle's New Suit (Harper & Brothers)

Then Pelle went to his grandmother and said: "Grandmother dear, please spin this wool into yarn for me!" "That I will do gladly, my dear," said his grandmother. "If while I am spinning it you will tend my cows for me."

friendly and would do them no harm. So they ventured out and at last he saw so many of them, he could hardly count them: soldiers in gay uniforms, many on horseback, and fine ladies and gentlemen all dressed up in silks and gold, and women and children—oh, you ought to have seen those children! They were so very, very tiny, not larger, some of them, than your own little finger, and even smaller—those that had been brought there in their little gocarts. Gulliver wondered at them prodigiously, yes, prodigiously. For think of it, what tiny little heads they had, and such tiny little eyes, and such tiny little noses, and such tiny little mouths and lips, and such tiny little tongues, and such tiny, tiny, tiny little teeth! And their tiny little hands and tiny little fingers, and tiny little feet. And their clothes, such tiny little coats, and trousers, and skirts, and stockings and shoes!

And you ought to have seen the horsemen on their fiery steeds! Well, they were so small and tiny that it was quite a jump when one of them vaulted across Gulliver's left foot which he had moved too far over! A whole regiment of cavalry marched through between Gulliver's legs—as through a big, tall arch.

Then Gulliver saw what had bound him tight: millions and millions of little, fine threads, like silk, had been woven about him, and there was a little ladder on which the little man had climbed up to his chin, lying on the ground. And he saw that all the people of the land near by had come to see the big monster that had come to them from out of the sea, and he understood that they had been afraid, and had tied him while he did not know anything of himself, and was asleep, so that he might not hurt them. And he was thankful to them that they now trusted him for he knew he must look to them like a big, *big*, BIG giant. Well, he could pick up several of them in one hand, and put them into his pocket without feeling any weight, and if he was not careful he could walk over them with his big feet and crush a dozen of them at a time. Of course, they were afraid. But he was so careful that they soon knew he would not hurt them, and they showed him all around.

And what he saw was very wonderful. He saw their little houses, with the tiny little doors and windows; and their tiny little rooms smaller than those in your own doll's house, with tiny little beds, and tables and chairs, oh, so small! And think of the tiny little plates and cups and spoons and knives and forks. Well, the carpet in one of their biggest rooms was not any bigger than your little handkerchief!

And he saw their city which looked just like one made up of the toy houses you buy in the store. Their highest steeple was not any taller than the post of mamma's bed.

And then the tiny little cows they had! When the little milkmaid had milked one there was just enough milk to fill a fair-sized thimble. Now think, how many cows they had to milk to give Gulliver just one good glassful! And their tiny little dogs and cats! And the tiny little hens—oh! you will hardly believe how tiny their little eggs were. How big do you think they were? Well, just about like peas, and you may imagine how many Gulliver could eat for his breakfast.

Yes, they had a hard time, these little people, to feed their big giant guest, but they did their best. And they built him a house. Ten thousand workmen had to work at it for oh, so many days; and they had to cut down a hundred big forests with a thousand trees in each one of them, to make the walls and the roof. And then the house was small for Gulliver. But he made the best of it.

And they thought that Gulliver might help them in their trouble. For by this time he had learned enough of their language to understand what they said to him. And they told him of their enemies, on an island across the sea, who were coming to attack them with their big fleet of ships. Gulliver laughed when he saw the great fear of these people who had told him that they were the Liliputians.

He made them describe to him where the enemy lived, that there was a big stretch of deep sea between their own land of Liliputia and the land of the enemy. Of course, the sea looked big and deep to them, but it was not much more than a pond to Gulliver.

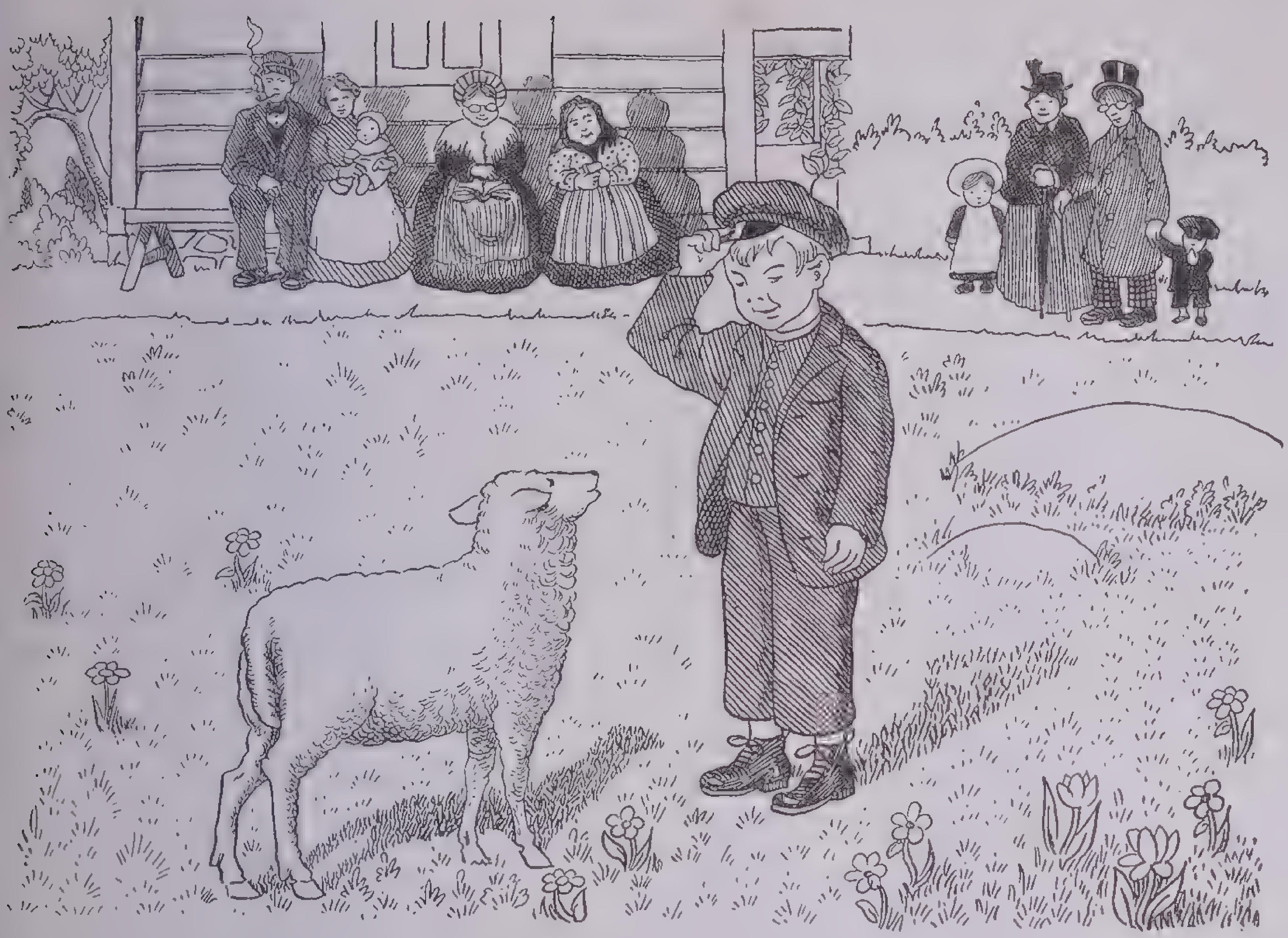
So he asked them for a hundred pieces of their strongest rope. Their rope, indeed, was so thin that it looked more to Gulliver like cotton thread, such as mamma uses in sewing. But he twisted every two of the pieces together so that they made a stronger thread, and then started out.

He rolled up his trousers and waded into the sea. By the shore were collected all the men, women and children of Liliputia, watching their big friend on his trip across the deep sea. They were trembling after all for they had never seen anything like it, and they did not know whether the enemy would kill him.

At first, the water only wetted his feet, then it came up to his knees, and finally it reached his waist. But it was not any deeper than that. After he had passed the deep stretch, and was out of sight of the Liliputians, he began to rise again out of the water, as it became more shallow towards the other shore. And so, his legs began to show above the water down to the knees, then his feet only were covered, and then he came quite close to the land on the other side.

And there he saw another crowd of little people assembled on the shore, shouting and screaming in terror. For they did not know what was happening to them, seeing such a big man mountain rising from the sea. And in the harbor of their city there lay fifty warships at anchor—big ships for them, but just like the toy boats you swim in the lake, to Gulliver. And everywhere were soldiers with bows and arrows and spears. And when they saw Gulliver they shot their arrows at him and threw their spears at him. But their arrows were only as big as pins, and their spears as long as darning needles; and neither their arms nor their bows were strong enough to harm Gulliver. Whatever of their spears and arrows reached him felt only like little pin pricks, and he did not mind them.

Then he took out of his pocket the fifty pieces of twisted string and tied one end of each to one of the enemy's warships, holding the other end in his left hand. And when he had tied them all to the fifty pieces of string he started back again, dragging the fifty



From Elsa Beskow: Pelle's New Suit (Harper & Brothers)

And on Sunday morning Pelle put on his new suit and went to his lamb and said: "Thank you very much for my new suit, little lamb." "Ba-a-ah," said the lamb, and it sounded almost as if the lamb were laughing.

warships of the enemy with him. Now you ought to have seen the startled faces of the distressed enemy; and their cries and shouts and screams when they saw their big fleet of fine warships pulled away, and the soldiers with all their bows and spears could not stop Gulliver. But it served them right, for the Liliputians had done no harm to them, and the enemy just wanted to sail over and take all their goods away from them. The Liliputians only wanted to live in peace.

And so Gulliver, with the enemy's fleet in tow, waded back to Liliputia. First the water reached to his knees, then up to his waist, and then, coming up on the other side, he saw the Liliputians waiting for him on the other shore, on roofs of buildings, on the docks, and everywhere. And when they perceived Gulliver coming home to them with the mighty fleet of the enemy dragging behind him they gave a big shout of joy and welcomed him gratefully. They came to meet him, and took the arms away from the enemy soldiers, and fastened their ships to their own docks, and were happy that they could now be without fear.

They never forgot Gulliver's help but made him live in comfort while he stayed with them, and did all they could to show him how much they thought of the great help he had given them.

PELLE'S NEW SUIT

There was once a little Swedish boy whose name was Pelle.

Now, Pelle had a lamb which was all his own and which he took care of all by himself.

The lamb grew and Pelle grew. And the lamb's wool grew longer and longer, but Pelle's coat only grew shorter!

One day Pelle took a pair of shears and sheared off all the lamb's wool.

Then he took the wool to his grandmother and said:

> "Granny dear, please card this wool for me!"
>
> "That I will, my dear," said his grandmother, "if you will pull the weeds in my carrot patch for me."

So Pelle pulled the weeds in Granny's carrot patch and Granny carded Pelle's wool.

Then Pelle went to his other grandmother and said:

> "Grandmother dear, please spin this wool into yarn for me!"
>
> "That I will gladly do, my dear," said his grandmother, "if while I am spinning it you will tend my cows for me."

And so Pelle tended Grandmother's cows and Grandmother spun Pelle's yarn.

Then Pelle went to a neighbor who was a painter and asked him for some paint with which to color his yarn.

> "What a silly little boy you are!" laughed the painter. "My paint is not what you want to color your wool. But if you will row over to the store to get a bottle of turpentine for me you may buy yourself some dye out of the change from the shilling."

So Pelle rowed over to the store and bought a bottle of turpentine for the painter, and bought for himself a large sack of blue dye out of the change from the shilling.

Then he dyed his wool himself until it was all, all blue.

And then Pelle went to his mother and said:

> "Mother dear, please weave this yarn into cloth for me."
>
> "That will I gladly do," said his mother, "if you will take care of your little sister for me."

So Pelle took good care of his little sister, and his mother wove the wool into cloth.

Then Pelle went to the tailor:

> "Dear Mr. Tailor, please make a suit for me out of this cloth."
>
> "Is that what you want, you little rascal?" said the tailor. "Indeed I will, if you will rake my hay and bring in my wood and feed my pigs for me."

So Pelle raked the tailor's hay and fed his pigs. And then he carried in all the wood.

And the tailor had Pelle's suit ready that very Saturday evening.

And on Sunday morning Pelle put on his new suit and went to his lamb and said:

> "Thank you very much for my new suit, little lamb."
>
> "Ba-a-ah," said the lamb, and it sounded almost as if the lamb were laughing.

—*Elsa Beskow*[1]

THE NOSE

Did you ever hear the story of the three poor soldiers, who, after having fought hard in the wars, set out on their road home, begging their way as they went?

They had journeyed on a long way, sick at heart with their bad luck at thus being turned loose on the world in their old age, when one evening they reached a deep gloomy wood through which they must pass; night came fast upon them, and they found that they must, however unwillingly, sleep in the woods; so to make all as safe as they could, it was agreed that two should lie down and sleep, while a third sat up and watched lest wild beasts should break in and tear them to pieces; when he was tired, he was to wake one of the others and sleep in his turn, and so on with the third, so as to share the work fairly among them.

The two who were to rest first soon lay down and fell fast asleep, and the other made himself a good fire under the trees and sat down by the side to keep watch. He had not sat long before suddenly up came a little man in a red jacket. "Who's there?" said he. "A friend," said the soldier. "What sort of a friend?"

"An old broken soldier," said the other, "with his two comrades who have nothing left to live on; come, sit down and warm yourself." "Well, my worthy fellow," said the little man, "I will do what I can for you; take this and show it to your comrades in the morning." So he took out an old cloak and gave it to the soldier, telling him that whenever he put it over his shoulders anything that he wished would be fulfilled; then the little man made him a bow and walked away.

The second soldier's turn to watch soon came, and the first laid himself down to sleep; but the second man had not sat by himself long before up came the little man in the red jacket again. The soldier treated him in a friendly way as his comrade had done, and the little man gave him a purse, which he told him was always full of gold, let him draw as much as he would.

Then the third soldier's turn to

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[1] *Pelle's New Suit*, by Elsa Beskow (written in Swedish), is included by permission of Harper & Brothers.

watch came, and he also had the little man for his guest, who gave him a wonderful horn that drew crowds around it whenever it was played; and made everyone forget his business to come and dance to its beautiful music.

In the morning each told his story and showed his treasure; and as they all liked each other very much and were old friends, they agreed to travel together to see the world, and for a while only to make use of the purse. And thus they spent their time very joyously, till at last they began to be tired of this roving life, and thought they should like to have a home of their own. So the first soldier put his cloak on, and wished for a fine castle. In a moment it stood before their eyes; fine gardens and green lawns spread around it, and flocks of sheep and goats and herds of oxen were grazing about, and out of the gate came a fine coach with three dapple-gray horses to meet them and bring them home.

All this was very well for a time; but it would not do to stay at home always, so they got together all their rich clothes and servants, and ordered their coach with three horses, and set out on a journey to see a neighboring king.

Now this king had an only daughter, and as he took the three soldiers for princes, he gave them a kind welcome. One day as the second soldier was walking with the princess, she saw him with the wonderful purse in his hand. When she asked him what it was he was foolish enough to tell her;—though indeed it did not much signify, for she was a witch and knew all the wonderful things that the three soldiers brought. Now this princess was very cunning and artful; so she set to work and made a purse so like the soldier's that no one would know one from the other, and then asked him to come and see her, and made him drink some wine that she had got ready for him, till he fell fast asleep. Then she felt in his pocket, and took away the wonderful purse and left the one she had made in its place.

The next morning, the soldiers set out home, and soon after they reached their castle, happening to want some money, they went to their purse for it, and found something indeed in it, but to their great sorrow when they had emptied it, none came in place of what they took. Then the cheat was soon found out; for the second soldier knew where he had been, and how he had told the story to the princess, and he guessed that she had betrayed him. "Alas!" cried he, "poor wretches that we are, what shall we do?" "Oh!" said the first soldier, "let no gray hairs grow for this mishap; I will soon get the purse back."

So he threw his cloak across his shoulders and wished himself in the princess's chamber. There he found her sitting alone, counting the gold that fell around her in a shower from the purse. But the soldier stood looking at her too long, for the moment she saw him she started up and cried out with all her voice: "Thieves! Thieves!" so that the whole court came running in, and tried to seize him. The poor soldier now began to be dreadfully frightened in his turn, and thought it was high time to make the best of his way off; so without thinking of the ready way of traveling that his cloak gave him, he ran to the window, opened it, and jumped out; and unluckily in his haste his cloak caught and was left hanging, to the great joy of the princess, who knew its worth.

The poor soldier made the best of his way home to his comrades on foot and in a very downcast mood; but the third soldier told him to keep up his heart, and took his horn and blew a merry tune. At the first blast, a countless troop of foot and horse came rushing to their aid, and they set out to make war against their enemy. Then the king's palace was besieged, and he was told that he must give up the purse and cloak, or not one stone would be left upon another. And the king went into his daughter's chamber and talked with her; but she said: "Let me try first if I cannot beat them some other way." So she thought of a cunning scheme to overreach them, and dressed herself as a poor girl with a basket on her arm; and set out by night with her maid, and went into the enemy's camp to sell trinkets.

In the morning, she began to wander about, singing so beautifully that all the tents were emptied, and the soldiers ran round in crowds and thought of nothing but hearing her sing. Amongst the rest, came the soldier to whom the horn belonged, and as soon as she saw him she winked to her maid, who slipped quietly through the crowd and went into his tent, where it hung, and stole it away. This done, they both returned safely to the palace; the besieging army went away, the three wonderful gifts were left in the hands of the princess, and the three soldiers were as penniless and forlorn as when the little man with the red jacket found them in the wood.

Poor fellows! They began to wonder what they could do now. "Comrades," at last said the second soldier, who had had the purse, "we had better part; we cannot live together, let each seek his bread as best he can." So he turned to the right and the other two to the left; for they preferred to travel together. Then on he went till he came to the wood where they had met with such good luck before. He walked on a long time, till evening began to fall, when he sat down beneath a tree and soon fell asleep.

In the morning, when he awoke, he was delighted to see that the tree was laden with beautiful apples. He was hungry enough, so he soon plucked and ate first one, then a second, then a third. A strange feeling came over his nose; when he put the apple to his mouth something was in the way. He felt it, and found that it was his nose, which had grown till it hung down on his breast. It did not stop there, but grew and grew. "Heavens!" thought he, "when will it have done growing?" And well might he ask, for by this time it had reached the ground as he sat on the grass, and it kept on growing till he could not bear its weight, or raise himself up; and it seemed as though it would never end, for already it stretched its great length all through the wood.

Meantime his comrades were journeying on, till suddenly one of them stumbled against something. "What can that be?" asked the other. They looked, and could think of nothing that it looked like but a nose. "We will follow it and find the owner," said they; so they traced it till at last they found their poor comrade lying stretched out beneath the apple tree. What could they do? They tried in vain to carry him. They caught a horse that was passing by, and raised him upon its back; but it soon tired of carrying such a load. They sat down in despair, when up came the little man in the red jacket. "Why, how now, friend?" said he, laughing; "well, I must find a cure for you, I see." So he told them to gather a pear from a tree that grew close by, and the nose would come all right again. No time was lost, and the nose was soon brought to its proper size, to the poor soldier's great joy.

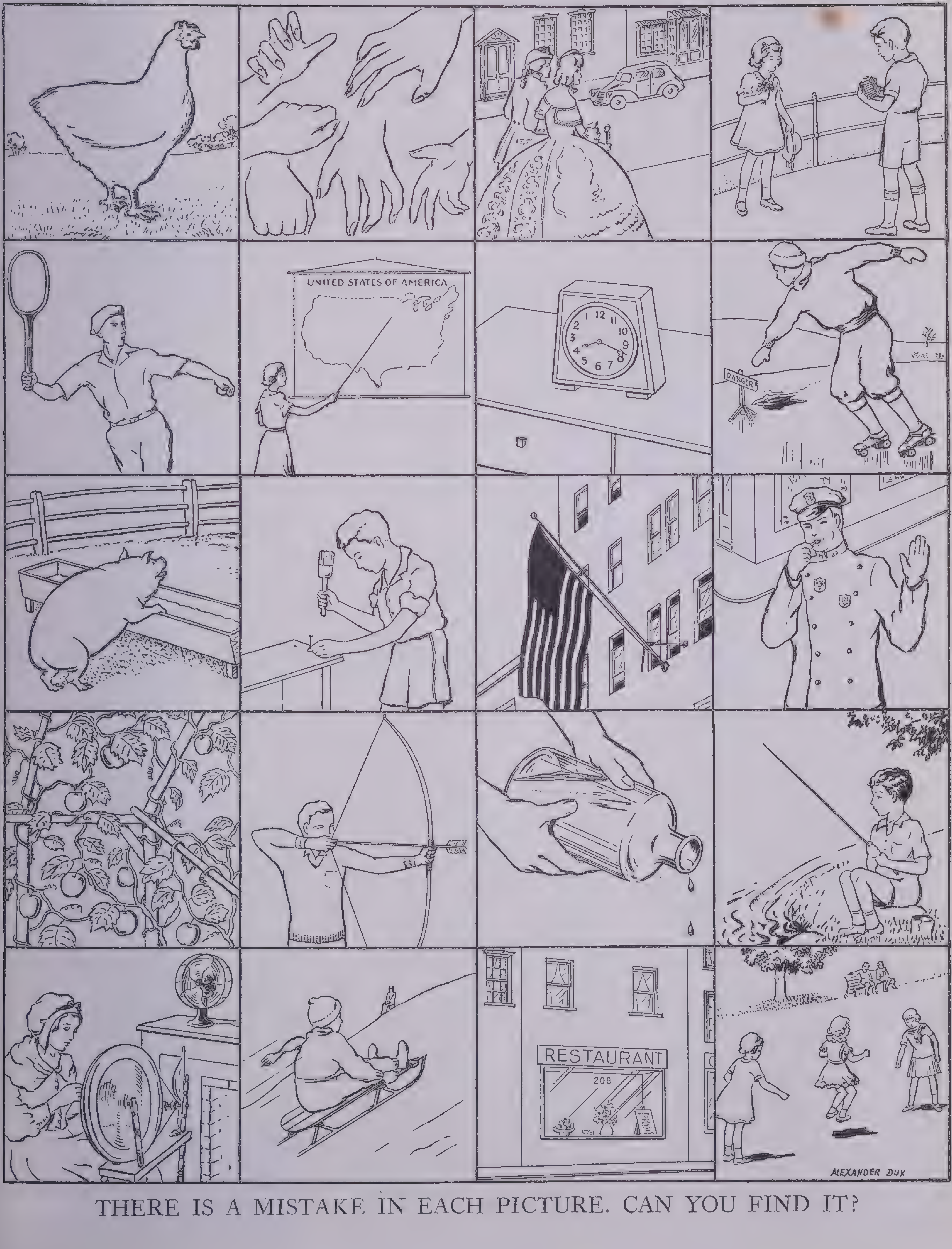
"I will do still more for you," said the little man; "take some of those pears and apples with you; whoever eats one of the apples will have his nose grow just as yours did; but if you give him a pear, it will become natural again. Go to the princess and get her to eat some of your apples; her nose will grow twenty times as long as yours did, and you will get what you want of her."

They thanked their old friend heartily for all his kindness, and it was agreed that the poor soldier who had already tried the power of the apple should undertake the task. So he dressed himself as a gardener, and went to the king's palace, and said he had some remarkable apples to sell. Everyone that saw them was delighted and wanted to taste them, but he said they were for the princess only; and she soon sent her maid to buy his stock. They were so fine that she soon began eating them, and had already eaten three when she too began to wonder what ailed her nose, for it grew and grew, down to the ground, out of the window, and over the garden, nobody knows where.

Then the king issued a proclamation that whoever would heal this dreadful disease should be richly rewarded. Many tried, but the princess got no relief. And now the old soldier dressed himself very sprucely as a doctor, and said he could cure her; so he chopped up some of the apple, and to punish her a little more gave her a dose, saying he would call tomorrow and see her again. The morrow came, and as, of course, the nose had been growing fast all night, the poor princess was in a dreadful plight. So the doctor chopped up a very little of the pear and gave it to her, and said he was sure that would do her good, and that he would call again the next day. Next day came, and although the nose was a little smaller, yet it was still bigger than when the doctor first attended her.

Then he thought to himself, "I must frighten this cunning princess a little more before I shall get what I want of her;" so he gave her a little more

WHAT IS WRONG?


UNITED STATES OF AMERICA
DANGER
RESTAURANT
208
ALEXANDER DUX

THERE IS A MISTAKE IN EACH PICTURE. CAN YOU FIND IT?

of the chopped apple, and said he would call on the morrow. The next day the nose was much bigger than before, and the doctor said: "Something is working against my medicine, and is too strong for it; but I know through my art what it is; you have stolen goods about you, and if you do not return them, there is no hope for you." But the princess very stoutly denied this, so the doctor said: "Very well, you may please yourself, but I am sure I am right, and if you do not do as I say, you will die." Then he went to the king and told him how it was. "Daughter," said the king, "send back the cloak, the purse, and the horn that you stole."

So she ordered her maid to fetch all three, and gave them to the doctor, and begged him to give them back to the soldiers. As soon as he had them safe, he gave her a whole pear to eat, and the nose returned to its proper shape. Then the doctor put on the cloak, wished the king and all his court a good day, and was soon with his two brothers, who lived from that time happily at home in their palace, except when they went out in their coach with the three dapple-gray horses.

FABLES

The Fox, the Cock and the Dog—One moonlight night a Fox was prowling about a farmer's hencoop, and saw a Cock roosting high up beyond his reach. "Good news, good news!" he cried.

"Why, what is that?" said the Cock.

"King Lion has declared a universal truce. No beast may hurt a bird henceforth, but all shall dwell together in brotherly friendship."

"Why, that is good news," said the Cock; "and there I see some one coming, with whom we can share the good tidings." And so saying he craned his neck forward and looked afar off.

"What is it you see?" said the Fox.

"It is only my master's Dog that is coming towards us. What, going so soon?" he continued, as the Fox began to turn away as soon as he had heard that news. "Will you not stop and congratulate the Dog on the reign of universal peace?"

"I would gladly do so," said the Fox, "but I fear he may not have heard of King Lion's decree."

Cunning often outwits itself.

The Wind and the Sun.—The Wind and the Sun were disputing which was the stronger. Suddenly they saw a traveler coming down the road, and the Sun said: "I see a way to decide our dispute. Whichever of us can cause that traveler to take off his cloak shall be regarded as the stronger. You begin." So the Sun retired behind a cloud, and the Wind began to blow as hard as he could upon the traveler. But the harder he blew the more closely did the traveler wrap his cloak round him, till at last the Wind had to give up in despair. Then the Sun came out and shone in all his glory upon the traveler, who soon found it too hot to walk with his cloak on.

Kindness effects more than severity.

The Fox and the Lion.—When first the Fox saw the Lion, he was terribly frightened and ran away and hid himself in the wood. Next time however, he came near the King of Beasts; he stopped at a safe distance and watched him pass by. The third time they came near each other the Fox went straight up to the Lion and passed the time of day with him, asking him how his family were, and when he should have the pleasure of seeing him again; then turning his tail, he parted from the Lion without much ceremony.

Familiarity breeds contempt.

The Fox and the Crow.—A Fox once saw a Crow fly off with a piece of cheese in its beak and settle on a branch of a tree. "That's for me, as I am a Fox," said Master Reynard, and he walked up to the foot of the tree. "Good day, Mistress Crow," he cried. "How well you are looking today: how glossy your feathers; how bright your eyes. I feel sure your voice must surpass that of other birds, just as your figure does; let me hear but one song from you that I may greet you as the Queen of Birds." The Crow lifted up her head and began to caw her best; but the moment she opened her mouth the piece of cheese fell to the ground, only to be snapped up by Master Fox. "That will do," said he. "That was all I wanted. In exchange for your cheese I will give you a piece of advice for the future:

"Do not trust flatterers."

The Fox and the Cat.—A Fox was boasting to a Cat of its clever devices for escaping its enemies. "I have a whole bag of tricks," he said, "which contains a hundred ways of escaping my enemies."

"I have only one," said the Cat; "but I can generally manage with that." Just at that moment they heard the cry of a pack of hounds coming toward them, and the Cat immediately scampered up a tree and hid herself in the boughs. "This is my plan," said the Cat. "What are you going to do?" The Fox thought first of one way, then of another, and while he was debating the hounds came nearer and nearer, and at last the Fox in his confusion was caught up by the hounds and soon killed by the huntsmen. Miss Puss, who had been looking on, said:

"Better one safe way than a hundred on which you cannot reckon."

The Fox and the Stork.—At one time the Fox and the Stork were on visiting terms and seemed very good friends. So the Fox invited the Stork to dinner and for a joke put nothing before her but some soup in a very shallow dish. This the Fox could easily lap up, but the Stork could only wet the end of her long bill in it and left the meal as hungry as when she began. "I am sorry," said the Fox, "the soup is not to your liking."

"Pray do not apologise," said the Stork. "I hope you will return this visit and come and dine with me soon." So a day was appointed when the Fox should visit the Stork; but when they were seated at table, all that was for their dinner was contained in a very long-necked jar with a narrow mouth, in which the Fox could not insert his snout, so all he could manage to do was to lick the outside of the jar.

"I will not apologise for the dinner," said the stork.

"One bad turn deserves another."

The Fox and the Grapes.—One hot summer's day a Fox was strolling through an orchard till he came to a bunch of grapes just ripening on a vine that had been trained over a lofty branch. "Just the thing to quench my thirst," quoth he. Drawing back a few paces, he took a run and a jump, and just missed the bunch. Once again he jumped up, but with no greater success. Again and again he tried after the tempting morsel but at last had to give it up and walked away with his nose in the air, saying: "I am sure they are sour."

It is easy to despise what you cannot get.

The Wolf in Sheep's Clothing.—A Wolf found great difficulty in getting at the sheep owing to the vigilance of the shepherd and his dogs. But one day it found the skin of a sheep that had been flayed and thrown aside, so it put it on over its own pelt and strolled down among the sheep. The Lamb that belonged to the sheep, whose skin the Wolf was wearing, began to follow the Wolf in the Sheep's clothing; so, leading the Lamb a little apart, he soon made a meal of her and for some time he succeeded in deceiving the sheep and enjoying hearty meals.

Appearances are deceptive.

The Ant and the Grasshopper.—In a field one summer's day a Grasshopper was hopping about, chirping and singing to its heart's content. An Ant passed by, bearing along with great toil an ear of corn he was taking to the nest.

"Why not come and chat with me," said the Grasshopper, "instead of toiling and moiling in that way?"

"I am helping to lay up food for the winter," said the Ant, "and recommend you to do the same."

"Why bother about winter?" said the Grasshopper; "we have got plenty of food at present." But the Ant went on its way and continued its toil. When winter came the Grasshopper had no food and found itself dying of hunger while it saw the ants distributing every day corn and grain from stores they had collected in the summer. Then the Grasshopper knew:

It is best to prepare for the days of necessity.

The Dog and the Shadow.—It happened that a Dog had got a piece of meat and was carrying it home in his mouth to eat it in peace. Now on his way home he had to cross a plank lying across a running brook. As he crossed, he looked down and saw his own shadow reflected in the water beneath. Thinking it was another dog with another piece of meat, he made up his mind to have that also. So he made a snap at the shadow in the water, but as he opened his mouth, the piece of meat fell out, dropped into the water and was never seen more.

Beware lest you lose the substance by grasping at the shadow.

The Hare and the Tortoise.—The Hare was once boasting of his speed before the other animals. "I have never yet been beaten," said he, "when I put forth my full speed. I challenge anyone here to race with me."

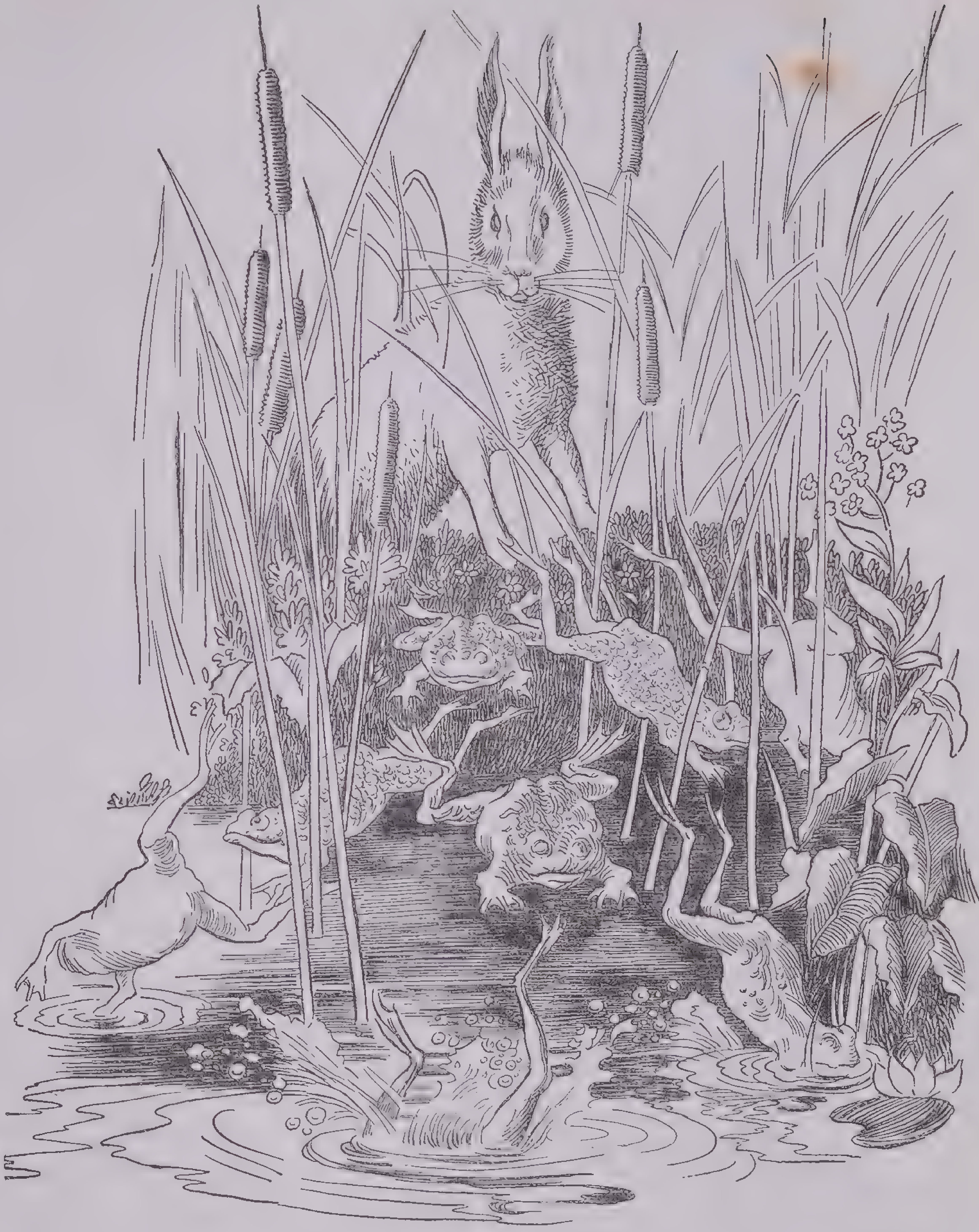
The Tortoise said quietly: "I accept your challenge."

"That is a good joke," said the Hare; "I could dance around you all the way."

"Keep your boasting till you've beaten," answered the Tortoise. "Shall we race?"

So a course was fixed and a start was made. The Hare darted almost out of sight at once but soon stopped and, to show his contempt for the Tortoise, lay down to have a nap. The Tortoise plodded on and plodded on, and when the Hare awoke from his nap, he saw the Tortoise just near the winning post and could not run up in time to save the race. Then said the Tortoise:

"Plodding wins the race."



The Hares and the Frogs.—The Hares were so persecuted by the other beasts they did not know where to go. As soon as they saw a single animal approach them, off they used to run. One day they saw a troop of wild Horses stampeding about and in quite a panic all the Hares scuttled off to a lake hard by, determined to drown themselves rather than live in such a continual state of fear. But just as they got near the bank of the lake, a troop of Frogs, frightened in their turn by the approach of the Hares, scuttled off, and jumped into the water. "Truly," said one of the Hares, "things are not so bad as they seem."

There is always some one worse off than yourself.

The Dog in the Manger.—A Dog looking out for its afternoon nap jumped into the Manger of an Ox and lay there cosily upon the straw. But soon the Ox, returning from its afternoon's work, came up to the Manger and wanted to eat some of the straw. The Dog in a rage, being awakened from its slumber, stood up and barked at the Ox and whenever it came near, attempted to bite it. At last the Ox had to give up the hope of getting at the straw and went away muttering:

"Ah, people often grudge others what they cannot enjoy themselves."

The Town Mouse and the Country Mouse.—Now you must know that a Town Mouse once upon a time went on a visit to his cousin in the country. He was rough and ready, this cousin, but he loved his town friend and made him heartily welcome. Beans and bacon, cheese and bread were all he had to offer, but he offered them freely. The Town Mouse rather turned up his long nose at this country fare and said: "I cannot understand, Cousin, how you can put up with such poor food as this, but of course you cannot expect anything better in the country. Come you with me and I will show you how to live. When you have been in town a week, you will wonder how you could ever have stood a country life."

No sooner said than done: the two mice set off for the town and arrived at the Town Mouse's residence late at night. "You will want some refreshment after our long journey," said the polite Town Mouse and took his friend into the grand dining room. There they found the remains of a fine feast, and soon the two mice were eating up jellies and cakes and all that was nice. Suddenly they heard growling and barking. "What is that?" said the Country Mouse. "It is only the dogs of the house," answered the other. "Only!" said the Country Mouse. "I do not like that music at my dinner."

Just at that moment the door flew open, in came two huge mastiffs, and the two mice had to scamper down and run off. "Goodbye, Cousin," said the Country Mouse. "What! going so soon?" said the other. "Yes," he replied:

"Better beans and bacon in peace than cakes and ale in fear."

The Lion and the Mouse.—Once when a Lion was asleep, a little Mouse began running up and down upon him. This soon wakened the Lion, who placed his huge paw upon him and opened his big jaws to swallow him. "Pardon, O King," cried the little Mouse; "forgive me this time, I shall never forget it. Who knows but that I may be able to do you a turn some of these days?" The Lion was so tickled at the idea of the Mouse being able to help him that he lifted his paw and let him go. Some time after the Lion was caught in a trap, and the hunters, who desired to carry him alive to the King, tied him to a tree while they went in search of a wagon to carry him on. Just then the little Mouse happened to pass by and seeing the sad plight the Lion was in, went up to him and soon gnawed away the rope that bound the King of the Beasts. "Was I not right?" said the little Mouse.

Little friends may prove great friends.

The Four Oxen and the Lion.—A Lion used to prowl about a field in which Four Oxen used to dwell. Many a time he tried to attack them; but whenever he came near, they turned their tails to one another, so that whichever way he approached them he was met by the horns of one of them. At last, however, they fell a-quarreling among themselves, and each went off to pasture alone in a separate corner of the field. Then the Lion attacked them one by one and soon made an end of all four.

United we stand, divided we fall.

The Frog and the Ox.—"Oh father," said a little Frog to the big one sitting by the side of a pool, "I have seen such a terrible monster! It was as big as a mountain with horns on its head and a long tail, and it had hoofs divided in two."

"Tush, child, tush," said the old Frog, "that was only Farmer White's Ox. It isn't so big either; he may be a little bit taller than I, but I could easily make myself quite as broad; just you see." So he blew himself out and blew himself out and blew himself out. "Was he as big as that?" asked he.

"Oh, much bigger than that," said the young Frog.

Again the old one blew himself out and asked the young one if the Ox was as big as that.

"Bigger, father, bigger," was the reply.

So the Frog took a deep breath and blew and blew and blew and swelled and swelled and swelled. Then he said: "I'm sure the Ox is not as big as. . . ." But at this moment he burst.

Self-conceit may lead to self-destruction.

The Ass in the Lion's Skin.—An Ass once found a Lion's skin that the hunters had left in the sun to dry. He put it on and went toward his native village. All fled at his approach, both men and animals, and he was a proud Ass that day. In his delight he lifted up his voice and brayed, but then everyone knew him, and his owner came up and gave him a sound cudgeling for the fright he had caused. And shortly afterward a Fox came up to him and said: "Ah, I knew you by your voice."

Fine clothes may disguise, but silly words will disclose a fool.

The Lion's Share.—The Lion went once a-hunting along with the Fox, the Jackal and the Wolf. They hunted and they hunted till at last they surprised a Stag and soon took its life. Then came the question how the spoil should be divided. "Quarter me this Stag," roared the Lion. So the other animals skinned it and cut it into four parts. Then the Lion took his stand in front of the carcass and pronounced judgment: "The first quarter is for me in my capacity as King of Beasts; the second is mine as arbiter; another share comes to me for my part in the chase; and as for the fourth quarter, well, as for that, I should like to see which of you will dare to lay a paw upon it."

"Humph," grumbled the Fox as he walked away with his tail between his legs; but he spoke in a low growl:

"You may share the labors of the great but you will not share the spoil."

The Goose with the Golden Eggs.—One day a countryman going to the nest of his Goose found there an egg all yellow and glittering. When he took it up, it was as heavy as lead, and he was going to throw it away because he thought a trick had been played upon him. But he took it home on second thoughts and soon found to his delight that it was an egg of pure gold. Every morning the same thing occurred, and he soon became rich by selling his eggs. As he grew rich he grew greedy; and thinking to get at once all the gold the Goose could give, he killed it and opened it only to find—nothing.

Greed oft o'erreaches itself.

The Tree and the Reed.—"Well, little one," said a Tree to a Reed that was growing at its foot, "why do you not plant your feet deeply in the ground and raise your head boldly in the air as I do?"

"I am contented with my lot," said the Reed. "I may not be so grand, but I think I am safer."

"Safe!" sneered the Tree. "Who shall pluck me up by the roots or bow my head to the ground?" But it soon had to repent of its boasting, for a hurricane arose which tore it up from its roots and cast it a useless log on the ground, while the little Reed, bending to the force of the wind, soon stood upright again when the storm had passed.

Obscurity often brings safety.

The Bat, the Birds and the Beasts.—A great conflict was about to come off between the Birds and the Beasts. When the two armies were collected together, the Bat hesitated which to join. The Birds that passed his perch said, "Come with us"; but he said: "I am a Beast."

Later on, some Beasts who were passing underneath him looked up and said: "Come with us"; but he said "I am a Bird." Luckily at the last moment peace was made, and no battle took place, so the Bat came to the Birds and wished to join in the rejoicings, but they all turned against him and he had to fly away.

He then went to the Beasts, but had soon to retreat, or they would have torn him to pieces. "Ah," said the Bat, "I see now:

He that is neither one thing nor the other has no friends."

The Jay and the Peacock.—A Jay venturing into a yard where Peacocks used to walk, found there a number of feathers which had fallen from the Peacocks when they were molting. He tied them all to his tail and strutted down toward the Peacocks. When he came near them they soon discovered the cheat and striding up to him pecked at him and plucked away his borrowed plumes.

So the Jay could do no better than go back to the other Jays, who had watched his behaviour from a distance; but they were equally annoyed with him and told him:

"It is not only fine feathers that make fine birds."

The Shepherd Boy.—There was once a young Shepherd Boy who tended his sheep at the foot of a mountain near a dark forest. It was rather lonely for him all day, so he thought of a plan by which he could get a little company and some excitement. He rushed down toward the village calling out "Wolf! Wolf!" and the villagers came out to meet him, and some of them stopped with him for a considerable time.

This pleased the boy so much that a few days afterward he tried the same trick, and again the villagers came to his help.

Shortly after this a Wolf actually did come out from the forest and began to worry the sheep, and the boy of course cried out "Wolf! Wolf!" still louder than before.

But this time the villagers, who had been fooled twice before, thought the boy was again deceiving them, and nobody stirred to come to his help. So the Wolf made a good meal off the boy's flock, and when the boy complained, the wise man of the village said:

"A liar will not be believed even when he speaks the truth."

Androcles.—A slave named Androcles once escaped from his master and fled to the forest. As he was wandering about there, he came upon a Lion lying down moaning and groaning. At first he turned to flee but finding that the Lion did not pursue him, he turned back and went up to him.

As he came near, the Lion put out his paw, which was all swollen and bleeding, and Androcles found that a huge thorn had got into it and was causing all the pain. He pulled out the thorn and bound up the paw of the Lion, who was soon able to rise and lick the hand of Androcles like a dog.

Then the Lion took Androcles to his cave and every day used to bring him meat from which to live; but shortly afterward both Androcles and the Lion were captured, and the slave was sentenced to be thrown to the Lion, after the latter had been kept without food for several days.

The Emperor and all his Court came to see the spectacle, and Androcles was led out into the middle of the arena. Soon the Lion was let loose from his den and rushed bounding and roaring toward his victim. But as soon as he came near to Androcles, he recognized his friend and fawned upon him and licked his hands like a friendly dog.

The Emperor, surprised at this, summoned Androcles to him, who told him the whole story. Whereupon the slave was pardoned and freed, and the Lion let loose to his native forest.

Gratitude is the sign of noble souls.

BIBLIOGRAPHY

Dalgliesh, Garrison and Sheehey, *Horace Mann, the Five-Year-Old Kindergarten,* Teachers College, N.Y., 1937, $1.85

Clouser and Millikan, *Kindergarten-Primary Activities Based on Community Life,* Macmillan, N.Y., 1929, $1.50

N. R. Jordan, *Home Toy Shop,* Harcourt, Brace, N.Y., 1937, $2.00

Play and Playthings, Child Study Assn. of America, N.Y., 1930, 20¢

Joseph Lee, *Play in Education,* Macmillan, N.Y., 1905, $1.80

R. Alschuler, *Two to Six,* Morrow, N.Y., 1933, $1.50

C. G. Garrison, *Permanent Play Materials for Young Children,* Scribners, N.Y., 1926, $1.25

R. Hanson, *Some Educational Activities for the Young Child in the Home,* U.S. Dept. of Education Pamphlets, Government Printing Office, Washington, D.C., 1934, 5¢

D. Van Alstyne, *Play Behavior and Choice of Play Materials of Pre-School Children,* Univ. of Chicago Press, Chicago, 1932, $1.50

A. Dalgliesh, *First Experiences in Literature,* Scribners, N.Y., 1937, $1.50

A. Dalgliesh and E. Rhys, *The Land of Nursery Rhyme,* E. P. Dutton, N.Y., 1932, $3.00

V. Kirkus and Frank Scully, *Fun in Bed for Children,* Simon & Schuster, N.Y., 1935, $1.75

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LANGUAGE and GRAMMAR

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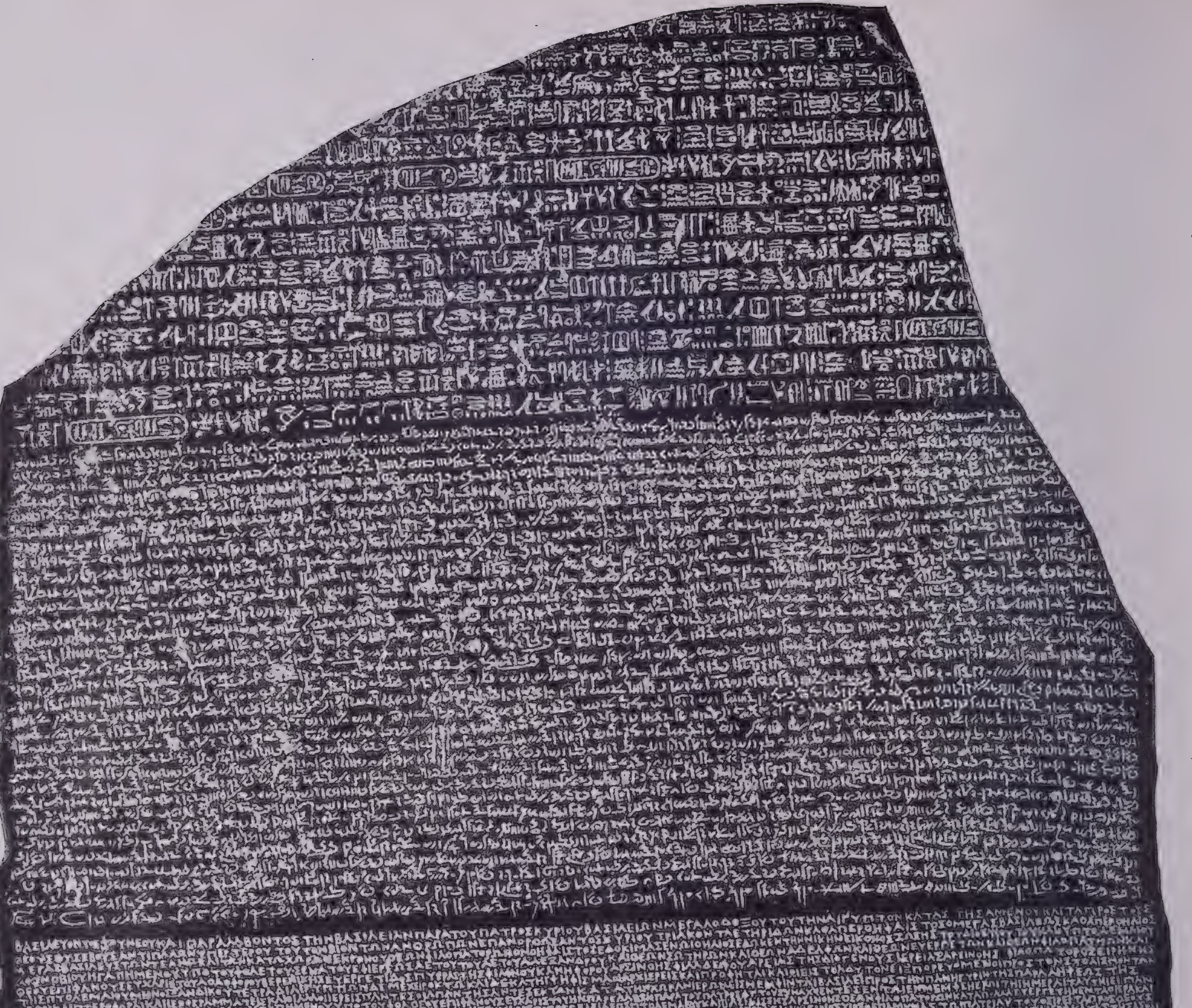


The Rosetta Stone—Key to Ancient Egyptian Hieroglyphics

In August, 1799, a French Officer of Engineers discovered at a spot on the Nile in Africa near the town of Rachîd—or as Europeans call it, Rosetta—a famous slab of black basalt. Its inscription, written in two languages, Egyptian and Greek, has proved the key to most of our knowledge of the peoples of ancient Egyptian dynasties who lived hundreds of years before the birth of Christ. Immediately on the discovery of the stone, English and French scholars started to unravel its mystery and the greater mystery of the meaning of the hieroglyphics on the obelisks, buildings and statues of the Nile Valley. From the inscription Jean François Champollion was able to formulate a system of grammar and general decipherment that is the foundation whereon all later Egyptologists have worked. The top section above shows the 14 lines which survived of hieroglyphic characters, the center 32 lines of demotic characters—hieroglyphic writing in use in the Ptolemaic Period—and the bottom 54 lines in Greek letters. The inscription is a decree passed by Egyptian priests to celebrate the first anniversary of the coronation of their king in 196 B.C. The demotic section gives the original form of the decree, and the hieroglyphic and Greek versions were made from it. The Rosetta Stone is now in the British Museum, London

BOOK III: LANGUAGE AND GRAMMAR

THE NATURE OF LANGUAGE

Our everyday speech is a thing that we are apt simply to take for granted without stopping to reflect about it; but when we do begin to think about language, we soon realize that far from being a commonplace thing it is a mystery—mysterious in its origin and mysterious in its infinite potentialities. It is no wonder that the ancients thought it of divine origin. When, however, we take a modern scientific attitude toward human speech, one of the first things observed is that language is not a natural thing like breathing or walking, but is something that has to be taught and learned. We speak rightly of our mother-tongue, because most of us do indeed first learn to speak as our mothers teach us. Afterwards we enlarge and extend our acquaintance with language by imitating the speech of the various members of the family, of our playmates and of other persons whom we meet in our daily life.

Language a System of Symbols.—This learning process is necessary for each generation, because, as a little reflection reveals, no natural connection exists between words and what they stand for. What we English-speaking folk call *bread,* the French call *pain,* and the modern Greeks, *psomi.* Likewise, the animal that we call *horse* is in German called *Pferd,* in French *cheval,* in modern Greek *alogo,* names utterly at variance with one another. Each language is a particular system of sound symbols.

We call a horse a *horse* because in the community where we were brought up it is the custom to name it so; and if we did not conform to the custom but used a word of our own, we should not be understood. When King Richard in Shakespeare's play cried out, "A horse! a horse! my kingdom for a horse!" he would certainly have lost all chance of saving himself had he used any other word but *horse,* for he was speaking to Englishmen. Language is, then, an arbitrary and conventional system of sound symbols by means of which the members of a given speech community, occupying a greater or less extent of territory, communicate with one another or, as it were, signal to one another their desires, thoughts and feelings.

From a slightly different point of view we may say also that language or speech is a form of human behavior in response to stimuli, since there can be no language without a social group whose members interact and stimulate one another to linguistic response.

The speech community may be distinct from the nation or political state. In Canada, for example, there are two principal speech communities, the English and the French; and in Great Britain besides the English-speaking groups there are the Welsh speech community in Wales and the Gaelic speech community in the Highlands of Scotland. On the other hand, in the case of some of the great, historic languages the speech community may far transcend the boundaries of nations. Our own English speech community is rapidly becoming almost a world-wide linguistic unit.

Language is the peculiar possession of man. Many animals, to be sure, do signal to one another by cries and other utterances in a way that is akin to language, and so we speak loosely of a cat language or bird language. Such sound signs, however, are not articulate speech in the true sense. When Homer speaks of human beings, he calls them "men who have articulate speech."

The origin of language is quite unknown; its beginnings lie too far back in the misty past of prehistoric ages. Among the various interesting theories is the idea that men first learned to talk by imitating the sounds that other animals make, sometimes called the bowwow theory; again, that human speech developed from the natural cries of joy, sorrow, surprise or some other emotion, which is known as the pooh-pooh, or interjection, theory. We have no means of proving these theories, however, and perhaps the most probable view is that language came into being by a very slow process in response to varied stimuli of early man's environment. This modern scientific view was anticipated by the Roman poet, Lucretius, and probably by his master, Epicurus.

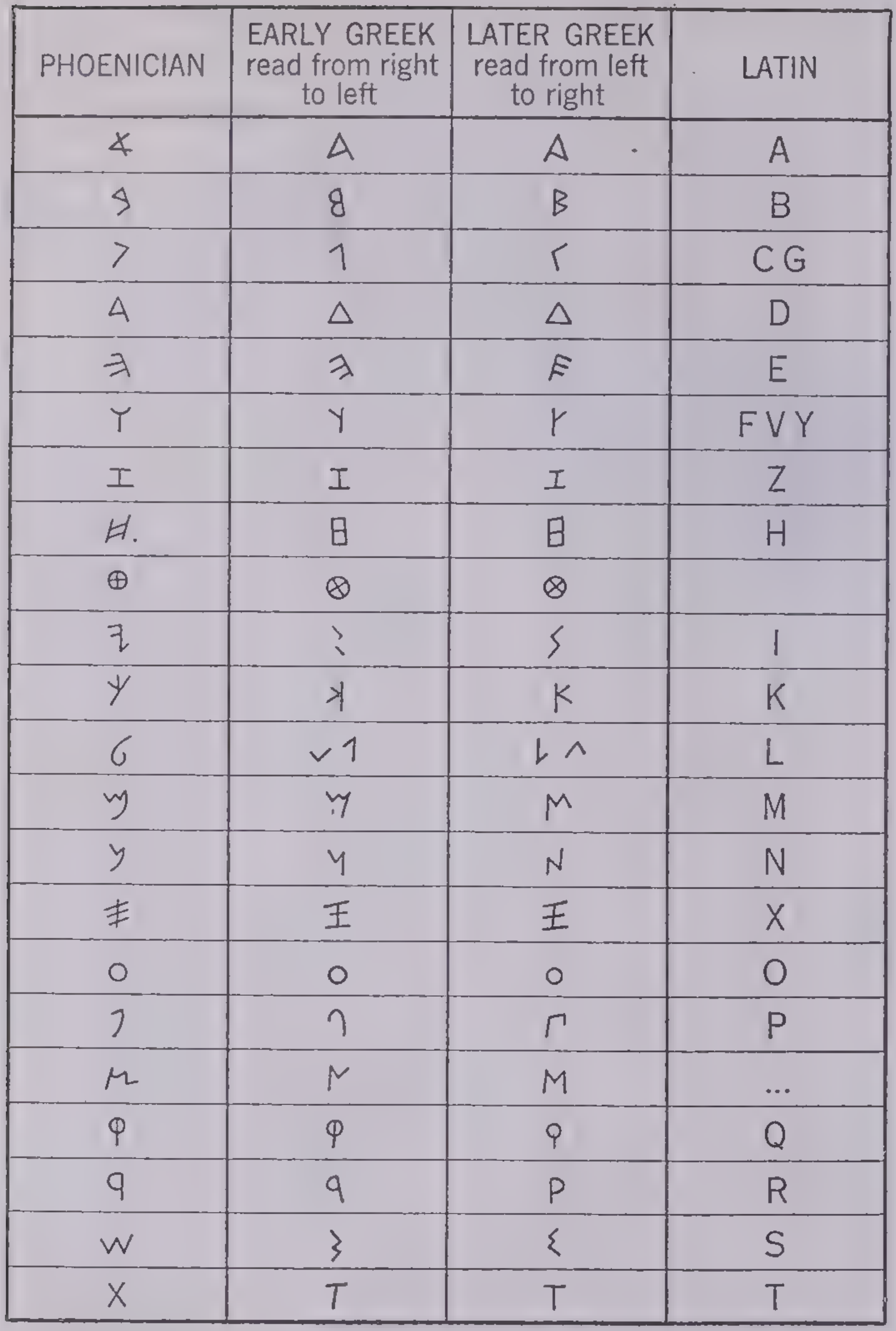
Whatever its origin, there can be no question of the unique importance of language in the ascent of man from savagery and barbarism. It has been said that man is the only *tool-using* animal. Of all his tools, language is certainly the most useful. In his evolution the possession of this wonderful instrument has given him the edge on other animals. Man has not the strength of the tiger or the speed of the ostrich; so only by associating together in tribes have human beings been able to overcome their physical inferiority; and tribal life is largely dependent on language.

As tribes develop into states the importance of language increases rather than diminishes. To the Greeks, the common possession of their beautiful Greek speech was the very closest bond. All non-Greek-speaking peoples they called *barbaroi,* barbarians, stammerers, makers of strange sounds. Latin became the imperial language of an imperial people, and of all the conquests by the Romans none was so important for the future of civilization as the conquest by the Latin language. Modern nations, too, cherish their languages as the highest expression of national culture.

In the complexity of modern civilization language has indeed become the indispensable cement of human society. The study of languages, therefore, in the truest sense is the most *social* of all studies; and to the individual, as well as to the nation and to the world, language is of supreme importance as the vehicle of thought and the medium of one of the highest, if not the highest, of the arts—the art of literature.

The Sounds of Language.—Language, as we have said, is primarily a system of sounds. The letters or other signs with which it is written are only symbols. This distinction is of fundamental importance; for instance, it is not a question of how you pronounce the letter *a,* but rather of what sound or sounds the letter *a* is a symbol. In the English language, the letter *a* represents various sounds, as is quite clear if we think of the words *father, man, tall, fate, America.* The combination of letters *ough* represents altogether different sounds in the words *bough, tough, although* and *through.*

To gain a clear idea of language we must learn something about how speech sounds are produced. A wonderful music box, called the *larynx,* is in our throats. It is a veritable stringed instrument, such as a violin, for in the larynx are two flat, whitish membranes stretched horizontally from back to front, which are made to vibrate when the breath coming from the lungs is forced between them, producing the sound that we call *voice.* Not all speech sounds have voice, but all vowel sounds do and also some of the consonant sounds. These marvelous membranes, the vocal cords, to whose varying vibrations we owe not only all the beauty of the singing voice but also the melodious and ringing qualities that give charm to a well-modulated speaking voice, can actually be seen in a phonetics laboratory by means of an instrument called the *phonolaryngoscope.* If you have not access to such an instrument, you can convince yourself of the existence of the vocal cords by pressing a fingertip against your Adam's apple as you pronounce the vowel *a* (as in *father*), for the vibration of the vocal cords will be distinctly felt.


PHOENICIAN
EARLY GREEK read from right to left
LATER GREEK read from left to right
LATIN
A
B
CG
D
E
FVY
Z
H
I
K
L
M
N
X
O
P
...
Q
R
S
T

Adapted from James Henry Breasted: Ancient Times

The Evolution of the Alphabet

The modern European alphabet, which is used in writing English, is simply the Latin alphabet with *I* split into *I* and *J*, and *V* split into *V*, *U* and *W*

The larynx, with its vocal cords, is by no means the only organ of speech, though it is one of the most important. E. H. Sturtevant says, "Speech is produced by the expulsion of the breath through the passages of the throat, mouth and nose, while these are modified in various ways." In the broadest sense, therefore, various parts of the body including the diaphragm, lungs and windpipe have to do with the production or modification of the breath stream. In a narrower sense, however, the organs of speech are the larynx, including the vocal cords, the pharynx (a cavity between the epiglottis, or lid of the larynx, and the mouth), the mouth, including the lips, teeth, roof and tongue, and finally the nasal cavity.

When the breath has free and uninterrupted passage through the throat and the mouth or the mouth and nose, the speech sounds produced are vowels. All other speech sounds are consonants (from Latin *consonans, consonantis,* sounding with). No sharp line, however, can be drawn between vowels and consonants. In pronouncing the vowel *i* in machine, the front of the tongue is raised and brought near the palate, still leaving room for the free passage of the breath; but if the tongue is raised still higher, so that audible friction is produced as the breath escapes, the sound becomes a consonant similar to the *ch* in German *ich*. So, too, whispered vowels are not true vowels, but approach the nature of consonants.

Voiced and Unvoiced Sounds.—All speech sounds may quite accurately be classified as either *voiced* or *unvoiced.* This is because the parts of the larynx are so flexible that the vocal cords may either be stretched taut leaving only a narrow space between them or left slack. When the vocal cords are stretched, as the breath is expelled through the throat it causes them to vibrate and so produces the musical sound called voice; when the vocal cords are relaxed, leaving a wider passage between them, there is no such vibration, hence no voice. The space between the vocal cords is called the glottis. All speech sounds that are accompanied by vibration of the vocal cords are called *voiced;* those not so accompanied are called *unvoiced, voiceless* or *breathed.* All true vowels are voiced. Consonants go largely in pairs, like the following, the first of which in each pair is voiceless, the second, voiced: *p, b; t, d; k, g; f, v; th* (as in *thin*), *th* (as in *this*); *s, z; sh* (as in *she*), *zh* (as in *vision*); but the *m, n* and *ng* are always voiced.

Consonants are also classified according to the manner of production and the place of articulation. So mobile are the organs of speech that by modifying their shape and position at an infinite number of places an infinite variety of speech sounds may be produced. In any one language, however, only a limited number of speech sounds is used. In pronouncing certain consonants the breath stream is first completely stopped and then suddenly released, as in making the sound *p* or *b* we first shut off the current of air by pressing the lips firmly together. When the lips are parted, the air behind them is expelled with a faint explosive sound. Similarly, in producing the sounds *t* or *d* the breath stream is temporarily stopped by placing the blade of the tongue against the ridge above the upper teeth; and in pronouncing *k* or *g* (in *go*) the breath stream is stopped by raising the back of the tongue toward the soft palate. Such consonants are called *stops, explosives* or *mutes.* In producing certain other consonants the breath stream is only partially obstructed and a narrow passage is left free through which the breath escapes with a slight rubbing sound. Such consonants are called *fricatives* and include the English *w, f, v, th, s, z,* and *y; l* and *r* also may be classed as fricatives.

All speech sounds that are formed with the nasal passage open are called *nasals.* If both mouth and nasal passages are freely open, we have nasal vowels like those we hear in the French words, *bon, bien.* In English, nasal consonants such as *m, n* and *ng,* are produced by having the nasal passage open (through raising the uvula), while the mouth passage is closed. The nasal consonants and also *l* are so sonorous that they sometimes take the place of vowels and form the chief elements in a syllable; thus we have syllabic *m* in *prism,* syllabic *n* in *heaven,* syllabic *l* in *table.* Consonants are also characterized according to the place of articulation as: *labial* (formed by the lips), *p, b, m, wh* and *w; labiodental* (formed by placing the lower lip against the upper front teeth), *f, v; dental* or *alveolar* (formed by putting the tongue between the upper and lower front teeth or against the ridge above the upper teeth), *th, t, d, n, l, s, z, sh, zh, r; palatal* (formed by raising the surface of the tongue toward the hard palate), *y* in *yield* or *yes;* and *velar* (formed by raising the back of the tongue toward the soft palate or velum), as *k, g, ng.* The sound of *h* is hardly a true consonant; it is merely a more or less forcible emission of breath through the open glottis, and is sometimes called a *glottal.* All these matters will be made clearer by studying the accompanying table of English consonants.

TABLE OF ENGLISH CONSONANTS

	Labial	*Labio-Dental*	*Dental, or Alveolar*	*Palatal*	*Velar*
Stops:					
Voiceless	p		t		k
Voiced	b		d		g
Fricatives:					
Voiceless	wh	f	th (thin) s, sh		
Voiced	w	v	th (this) z, zh l, r	y	
Nasals:					
Voiced	m		n		ng

The distinguishing qualities of vowels result in part from the position of the tongue as the sounds are being articulated and in part from the varying shape of the pharynx, which acts as a kind of resonating chamber. Vowels produced when the front of the tongue is raised more or less toward the hard palate are called *front vowels,* those articulated by arching the back of the tongue toward the soft palate are known as *back vowels.* Usually the *i* and *e* sounds are front vowels, *o* and *u* sounds are back vowels, and the various *a* sounds occupy a middle position. Vowels are distinguished also as *open* or *close* according to the degree of openness of the passage left between the tongue and the roof of the mouth as their various sounds are uttered. This distinction is rather difficult to seize, since the position of the tongue in pronouncing vowels is very fluctuating. The above classifications of vowels will be made clearer by a glance at the following vowel triangle.

		Front	*Back*	
Close	(machine)	i	u	(rule)
	(tire)	i	u	(pull)
	(say)	ay	ow	(low)
	(ten)	e	o	(obey)
	(mat)	a	aw	(saw)
Open	(task)	a	a	(father)

Each language has its characteristic sounds, or *phonemes,* which are represented more or less inadequately by alphabetic symbols. So it often happens that two or more letters are employed to represent a single sound, as in the French word, *beau, eau* representing a simple *o* sound. On the other hand, a sound that is really complex may be represented by a single alphabetic character, as in German *zu,* in which *z* stands for *ts.* Among combinations of letters in English that represent single sounds are: *ph* (*f*), *th* (voiced or unvoiced), *ng* (a velar-nasal sound with no real *g* sound in it), *ck* (*k*) and *sh* (a kind of sibilant, or hissing, sound); whereas, the single letter *j* (as in *judge*) stands for *dzh,* and *x* (as in *ox*) stands for *ks.* As an example of the arbitrariness of English spelling, note that the two final sounds of the word *judge* (represented by *dge*) are the same as the two initial sounds (represented by *j*).

The English *ch* serves as symbol for three different sounds or combinations of sounds: for *k* (as in *character,* a word borrowed from the Greek), for *sh* (as in *charade,* of French origin) or, most commonly, for *tsh* (as in both the two beginning and the two final sounds in *church*). The same combination of characters, *ch,* in German *ach* and Scottish *loch* is the symbol of a single guttural sound that is nonexistent in English. Similarly, *ch* in German *ich* and the letter *chi* in ancient Greek represent a palatal sound that is not found in English. The combination *gh* in English spelling, though not so variable a symbol as *ch,* still may represent the single fricative *f* (as in *rough*) or may represent a guttural sound that existed in Old English but is now lost (as in *through*). Obviously, then, every language has its own sounds, of which letters are only the imperfect symbols.

Hebrew	Greek	Russian	Gaelic
א (a)	Α α (a)	А а (a)	A a (a)
בּ (b)	Β β (b)	Б б (b)	B b (b)
ב (v)	Γ γ (g)	В в (v)	C c (c)
ג (g)	Δ δ (d)	Г г (g)	Ꝺ ꝺ (d)
ד (d)	Ε ε (ĕ)	Д д (d)	E e (e)
ה (h)	Ζ ζ (z)	Е е (ĕ)	Ꝼ ꝼ (f)
ו (v)	Η η (ē)	Ж ж (zh)	Ᵹ ᵹ (g)
ז (z)	Θ θ (th)	З з (z)	H h (h)
ח (kh)	Ι ι (i)	И и (ē)	I ı (i)
ט (t)	Κ κ (k)	К к (k)	L l (l)
י (y)	Λ λ (l)	Л л (l)	M m (m)
כּ (k)	Μ μ (m)	М м (m)	N n (n)
כ (kh)	Ν ν (n)	Н н (n)	O o (o)
ך (kh *final*)	Ξ ξ (ks)	О о (o)	P p (p)
ל (l)	Ο ο (ŏ)	П п (p)	Ꞃ ꞃ (r)
מ (m)	Π π (p)	Р р (r)	S ꞅ (s)
ם (m *final*)	Ρ ρ (r)	С с (s)	Ꞇ ꞇ (t)
נ (n)	Σ σ ς (s)	Т т (t)	U u (u)
ן (n *final*)	Τ τ (t)	У у (u)	
ס (s)	Υ υ (u)	Ф ф (f)	
ע (ē)	Φ φ (f)	Х х (kh)	
פּ (p)	Χ χ (kh)	Ц ц (ts)	
פ (f)	Ψ ψ (ps)	Ч ч (ch)	
ף (f *final*)	Ω ω (ō)	Ш ш (sh)	
צ (ts)		Щ щ (shch)	
ץ (ts *final*)		Ы ы (ay)	
ק (k)		Ь ь (*final*)	
ר (r)		Э э (ĕ)	
שׁ (sh)		Ю ю (yu)	
תּ (t)		Я я (ya)	
ת (s)		Ѳ ѳ (f)	
		Й й (*final*)	

Principal Alphabets with English Equivalents

Hebrew is nearest the Phoenician original. Greek was derived direct from the Phoenician. Russian is modified and developed from Greek. The Gaelic of Ireland is a simplified Roman

The Alphabet.—Our modern alphabet seems very simple. We speak of a child's learning his A B C's as the very beginning of education. Yet in spite of its apparent simplicity the alphabet is the culmination of a very long evolution and is one of the most marvelous and far-reaching achievements of the human mind. We hear words as wholes. When we hear the word *man,* for instance, we do not naturally separate the sound of *m* from the sound of *a* or the sound of *a* from that of *n.* To become conscious of the separate sounds, or phonemes, of a given language, and so feel the need of a separate symbol for each sound involves a very difficult feat of abstraction.

Our modern English alphabet came to us directly from the Romans who in turn got it from the Greeks. Its pre-Greek history, in spite of recent discoveries and researches, is still obscure. It must have had an Eastern Mediterranean origin, and it is probable though not certain that it was a development from the Egyptian hieroglyphics. Other theories connect it with Babylonian cuneiform, the Cyprian syllabary or the Minoan writing of Crete. The most probable development may be sketched as follows. In very early times (before 3000 B.C.) the Egyptians developed from their sacred picture writing a series of signs that were used with phonetic value, that is, to represent sounds. From ideograms (signs for ideas) they invented phonograms (signs for sounds). This had come about because the sign 〰, for example, could stand not only for water but also for the sound *n,* since *n* was the most prominent sound in the Egyptian word for water. (Our N still has the shape of conventional water ripples.) Similarly the picture sign representing the mouth (()) also had the phonetic value *r.* Thus, in the time of the Old Kingdom (3500–2700 B.C.), the Egyptians had already evolved a series of twenty-four alphabetic signs. These signs stood only for consonants, no indication for the vowels being used. The Egyptians did not perceive the priceless value of their discovery; they continued to use their old pictorial signs, standing for ideas, along with the phonetic signs.

From Egypt use of the alphabetic signs apparently spread to the neighboring peninsula of Mt. Sinai. In 1906 some very early inscriptions (about 1500 B.C.), written in a purely alphabetic script, were discovered in the Sinaitic peninsula by Sir W. Flinders Petrie. This Sinai script seems intermediate between Egyptian hieroglyphic and the early Semitic alphabets. The Greeks had settled in the Aegean basin probably long before 1500 B.C., and apparently borrowed an early type of Semitic alphabet either from the Phoenicians or from some other Semitic peoples with whom they came in contact in Asia minor. This seems fairly certain because the names used by the Greeks for their letters, *alpha, beta, gamma, delta,* and so forth, correspond closely to the Semitic names seen in the Hebrew alphabet—*aleph, beth, gimel, daleth.*[1]

From whomever the Greeks obtained the alphabet, they improved and completed it by using a few characters of the Semitic alphabet for which there were no sounds in Greek speech, for the vowels, so that these sounds no longer had to be guessed in reading.

The Greek alphabet was carried to Italy by colonists, was adopted by the Latins and adapted to their language, and through the medieval Latin manuscripts this Latin alphabet was transmitted to modern European nations. Modern Greece, however, still uses the ancient Greek alphabet, and Russia and a few other Slavonic peoples use the Cyrillic alphabet derived directly from the Greek.

Inflected Languages.—Perhaps the most distinguishing feature of early Indo-European speech—that language of which most European languages, including our own English, are modern developments—is that each word not only carried its core meaning but in many instances also showed by its form its relation to the other words in the sentence. Thus in Greek, a typical Indo-European language, the word *pateres,* meaning *fathers,* indicates by the ending *-es* that it is the subject of the sentence; another form of the same word, *pateras,* shows by the ending *-as* that it is the direct object of a verb; *paterōn* expresses the possessive, *fathers'* or *of fathers;* and *patrasi* means *fathers* as the indirect object, *to* or *for fathers.* A language that indicates by such changes in form the relation of the word to other words in the sentence is called an *inflected* language and this modification of words to show their construction, or syntactical relationship, is called *inflection* (from Latin *inflexio,* a bending).

Courtesy Metropolitan Museum of Art

Egyptian Hieroglyphics

Section of a papyrus from *The Book of the Dead* (*c.* 1300 B.C.), a collection of formulas, prayers and hymns that were believed to enable the soul to pass successfully to Amenti, region of the dead

Even among inflected languages there is a great difference in the degree of inflection. The early Indo-European speech was highly inflected: a single verb had several hundred different forms. The tendency in the development of the various Indo-European languages, as they departed farther and farther from the parent speech, has been toward greater simplicity. Languages with a relatively large amount of inflection are sometimes said to be synthetic (from Greek *synthetikos,* putting together) because they put together in a single word several distinct ideas. In Latin, for example, the one word, *vidēbimus,* combines a verbal idea *vidē-* (see), the idea of future time, *-bi-* (shall) and that of the first person plural, *-mus* (we). It means see-shall-we, or, as we say in English in three separate words, we shall see. Similarly, the word *vīderās* combines *vīd-* (seen), *-erā-* (had) and *-s* (you, singular)—seen-had-you, or you had seen. Ancient Greek and ancient Sanskrit, the classic language of India, are more highly synthetic than Latin, Sanskrit being the most synthetic of the three.

Most of the modern Indo-European languages, being less highly inflected, are said to be analytic (from Greek *analytikos,* tending to break up). In French, for instance, the verb is partly synthetic and partly analytic. Two words, *nous verrons,* are used to express the idea *we-shall-see.* The idea *we* is a separate word, *nous,* and is implied also in the ending *-ons;* but *shall* and *see* are inextricably blended in one word, *verrons. Tu avais vu* (you had seen) in modern French is fully analytic: *tu* (you, singular), *avais* (had), *vu* (seen). French is also completely analytic in expressing the syntactical relation of nouns, prepositions being used instead of the ancient case endings. French personal pronouns are inflected, but the only noun and adjective inflections retained in French are those expressing gender and number, as in *doux* (sweet) when modifying a masculine singular noun, but *douce* when modifying a feminine singular noun; *cheval* (horse), *chevaux* (horses).

Verbs are more fully analytic in German than in French; compare *wir werden sehen* (we shall see). But German nouns and adjectives are inflected; for example, as subject of a verb, the form is *der gute Mann* (the good man); as direct object of a verb it becomes *den guten Mann;* and as possessor, *des guten Mannes.* English as spoken today is still less highly inflected than either German or French, though in the time of King Alfred, Old English was as highly inflected as modern German.

In Alfred's code of laws he translates into Anglo-Saxon the Ten Commandments. Here is the Fourth Commandment—from a manuscript about 1,000 years old: Gemyne thæt thū gehalgige thōne ræstedæg; wyrceath ēow siex dagas and on tham siofothan restath ēow. The interlinear that follows points out some of the inflected forms:

Gemyne	**thaet**	**thu**
Mind	that	thou (possessive, *thīn;* objective, *thē*)

gehalgige	**thōne**	**ræstedæg;**
make holy (*ge-* with an adjective forms a verb—like *be* in *belittle*)	the (objective singular masculine of the demonstrative)	restday; (singular, stem *dæg*)

wyrceath	**ēow**	**siex**	**dagas**
work (*-th,* plural ending)	you (objective plural of *thū,* thou)	six	days (plural has stem *dag-*)

and	**on**	**tham**	**siofothan**	**restath**	**ēow.**
and	on	the (dative singular of the demonstrative)	seventh	rest	you.

Conjugation of Verbs.—The various forms used in inflecting the verbs of any language can be grouped together in *conjugations* and the verbs are said to be *conjugated.* Latin has four regular conjugations, presenting certain differences of inflection. The conjugations are made up of *moods* and *tenses* of the verb, with the forms used for each person (*I, you, he, we, you, they*) in each tense. A mood (or mode) expresses a certain way of looking at the action. In Latin, the indicative mood states a fact; the subjunctive mood expresses will or wish and various other ideas; the imperative mood expresses a command or entreaty; and the infinitive mood is a noun form of the verb. In Greek and in some other languages another mood, called the optative, is used to express a wish and in several special uses. In modern languages the terms *potential* mood and *conditional* mood are sometimes used. In English, a verb phrase, such as *I might go,* is said to be in the potential mood; and *if I should go* is in the conditional.

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[1] These names make plain the change from picture writing to signs that stood for a single sound. *Aleph,* the Semitic word for *ox,* was represented by the picture of an ox head, which was read *aleph;* then the picture became the sign for the first sound in the word and this sign also was called *aleph. Beth,* Semitic for house, was expressed by the picture of a house, which became also the sign for the initial sound in the word; so that the Semites called their letter B by the name *beth.*

When the Greeks acquired these letters, they adopted with slight changes most of the Semitic names, though the names meant nothing in Greek. Thus Semitic *aleph* became Greek *alpha* and finally the English A; and Semitic *beth* became the Greek *beta* and finally the English B.

Tenses express the time of an action or state as past, present or future and also very often certain other aspects of the verbal idea. Thus the imperfect tense in Latin describes the action not only as past but also as continuing; for example, *audiebat* (he was listening), imperfect, is distinguished from *audivit* (he heard), historical perfect. This important distinction is reflected in the modern Romance languages. In French, for instance, the imperfect tense, *elle chantait* (she was singing), is contrasted with the past definite, *elle chanta* (she sang).

In Latin the indicative mood has six tenses: present, imperfect, future, perfect, pluperfect (past perfect) and future perfect; and the subjunctive mood has four, lacking the future and future perfect. Greek has a special tense called the *aorist,* an indefinite past that expresses the action of the verb simply as occurring without any implication about its continuance.

Declensions.—The inflections of nouns, pronouns and adjectives are called *declensions* and such words are said to be *declined.* The name *case* is given to each of the different forms assumed in declension. As an illustration we may take the Latin noun, *rēx.* The nominative (subject) case in the singular is *rēx* (king); the genitive (possessive) case, *rēgis* (king's or of a king); the dative (indirect object) case, *rēgī* (to or for a king); the accusative (direct object of a verb) case, *rēgem* (king); and the ablative (chiefly used with certain prepositions) case, *rēge.*

Other important terms used with regard to inflection are root, stem and ending. Root may be defined as the simplest element, or base, from which a word derives; stem, as the part of a word to which the endings are appended. Root and stem are sometimes but not always identical. *Vid* (see), for example, is the common root of the Latin verb forms, *vidēbimus* and *vīderās,* previously cited. An ending, or termination, is a syllable or syllables added to modify the meaning of a stem. In the word *vidēbimus* (we shall see), *vidē-* is said to be the present stem of the verb, *videō* (I see), and *-bimus* is the future ending for the first person plural. Similarly, *rēg-* is called the stem of the noun *rēx,* and a given form (e.g., *rēgī*) may be separated into the stem *rēg-* and the ending for the dative case, *-ī*. Sometimes, however, stem and ending are so completely fused that they cannot be separated.

Etymology.—Knowledge of the roots of words is important, as often we can recognize the meaning of a new or strange word if we know its root through having seen or used it in another word. A knowledge of Latin and Greek roots is a great help to understanding English scientific and literary words.

In the English words *microscope, telescope, telephone, telegraph, phonograph,* you readily recognize the meaning of several roots: *micro-,* small; *tele-,* far; *-scope,* see; *-graph,* write; *-phone,* sound. Even if you had never before seen or heard the word *microphone,* you could analyze the two parts or roots as meaning *small* and *sound* and have some conception of its full significance—that a microphone enlarges small sounds as a microscope enlarges small visions.

Table I

English	*Old English*	*German*	*Dutch*	*Danish*
man	mann	Mann	man	Mand
father	fæder	Vater	vader	Fader
mother	mōdor	Mutter	moeder	Moder
brother	brōthor	Bruder	broeder	Broder
sister	sweostor	Schwester	zuster	Soster
house	hūs	Haus	huis	Hus
bread	bréad	Brot	brood	Brod
water	wæter	Wasser	water	Vand
one	ān	ein	een	een
two	twēġen, twā	zwei	twee	to
three	thrīe	drei	drie	tre
seven	seofon	sieben	zeven	syv
eight	eahta	acht	acht	otte
nine	nigon	neun	negen	ni
foot	fōt	Fuss	voet	Fod

Analyzing the word *etymology* itself, you know that the root in the last two syllables means science of, because you know the words *biology* (science of life), *theology* (science of God) and other such words. The first part of etymology means true thing, so etymology is the science of true meanings.

Relation of English to Other Languages.—The English language, originally a West Germanic dialect, is still Germanic in its structure. It is thus closely related to the other modern Germanic languages: namely, Dutch, German, Danish, Norwegian and Swedish. Through cultural relations of the English people in historical times our language borrowed so many words chiefly of Latin origin, either directly from the Latin or through French as an intermediary, that its vocabulary was transformed. It has been well said that modern English might be more accurately characterized as an Anglo-Latin, rather than an Anglo-Saxon, language. English has also borrowed a great many words from the Greek language, especially words of significance in the fields of art, science and philosophy. The Greek element in English has been rapidly increasing in recent times, as thousands of scientific terms and names of modern inventions have been taken into English from Greek sources.

The accompanying tables will clarify these vocabulary relations. Table I gives the cognates (words found in two or more languages that have descended from a common parent speech) in several kindred Germanic languages of fifteen common English words.

Table II indicates the vast enrichment of English through derivatives from Latin, Greek and other sources; it gives also the corresponding Greco-Latin derivatives in three modern Romance languages, showing our common cultural linguistic heritage.

The following are examples of English borrowings or derivatives from less common sources:

zenith, from Arabic *samt*
nabob, Urdū nawwāb, deputy governor, from Arabic *nā' ib*
pundit, Sanskrit *paṇḍita,* learned
fakir, Arabic *faqīr,* poor; poor man
azure, Old French *azur,* from Persian *lajward, lāzhward,* from Latin *lapis lazuli* (*l* dropped as if it were the article *l'*)
wigwam, American Indian word
wampum, American Indian word
gas, word coined by a modern scientist
ampere, from the name of a French scientist.

Change of Meaning.—The letters of the alphabet came from Greece, Phoenicia and Egypt. The sounds we speak in certain words today have a definite relation to slightly different sounds in cognate words in Latin, Greek or Sanskrit thousands of years ago. Do words themselves mean the same now as then or have their meanings changed? Are there any general principles that govern this change?

The meanings do change. Though no rules of change exist, certain fairly well-defined types of change may be recognized.

Meanings become broader and more general—*manufacture* once meant making by hand (from Latin *manus,* hand, as in *manual*); now it means merely *making* and, as the commonest form of making now is making by machinery, the word has assumed that meaning.

Meanings become specialized or

Table II

English	*Greek*	*Latin*	*French*	*Italian*	*Spanish*
human		humanus	humain	umano	humano
divine		divinus	divin	divino	divino
reason		ratio, rationis	raison	ragione	razón
spirit		spiritus	esprit	spirito	espíritu
art		ars, artis	art	arte	arte
state		status	état	stato	estado
nation		natio, nationis	nation	nazione	nación
civil		civilis	civil	civile	civil
liberty		libertas	liberté	libertà	libertad
medicine		medicina	médicine	medicina	medicina
music	μουσική	musica	musique	musica	música
drama	ζϱᾶμα	drama	drame	dramma	drama
theater	Θέατρον	theatrum	théâtre	teatro	teatro
philosophy	φιλοσοφία	philosophia	philosophie	filosofia	filosofía
physics	φυϐικά	physica	physique	fisica	física
arithmetic	ἀριβμητική	arithmetica	arithmétique	aritmetica	aritmética
history	ἱστορία	historia	histoire	storia	histora

narrower—*antique* means old; and so did another form of the same word, *antic.* Then antic was narrowed down to mean the queer old clown in the comedy. Because the clown cut capers and did grotesque things, those capers were called *antics.*

Meanings are sometimes altered by usage; one generation interprets a word favorably; the next unfavorably. The original meaning of *imp* was bud or shoot; hence it came to mean son or offspring. A 16th-century prayer book refers to praying for the king and "his beloved son Edward, our prince, that most angelic *imp.*" Nurserymen still use *imp* to mean a plant graft; but the expression, *imp of Satan,* gave *imp* unpleasant connotations, so that it now means a small devil or mischievous person, an offshoot of Satan!

An example of a lowly word coming to mean something admirable is the modern English word *knight,* from Old English *cniht,* meaning a male servant.

The branch of language study that deals with the meanings of words and their changes is called *semantics.* The comparative study of different languages to trace their similarities and relationships, the precise recording of sounds and the attempt to discover how they have changed, the investigation of roots and of inflectional endings and the analysis of changing significances—all these make up the new science that is only a century old and that, like most sciences, owes much to the central notions of biology—evolution, growth, change, similarity. We never stop learning our own language so long as we are mentally alive. Through countless generations our mother speech, as well as many a tongue from which it has borrowed and to which it is related, has grown and goes on growing and changing like the living organisms we study in botany or zoology.

LEARNING TO READ, WRITE AND SPELL

Man alone, of all animals, has a language that he can *speak, read* and *write.* Our language, heard, spoken and read, is so familiar to us from childhood that we seldom give a thought to how different our life would be without it. Imagine for a moment how the world would seem if you should awaken some morning unable to speak, read or write or to understand the speech of anyone else. Now imagine everyone else in this same condition and you can see that our schools, trade, industry, commerce and every other activity of modern life would stop as if by magic. This can never actually happen, but the imaginary picture shows how dependent we are upon the language skills of speaking, reading and writing. The great importance of teaching these skills properly in school and at home has induced teachers and research workers to devote years to studying *how* children learn to talk, read, write and spell. They have determined what will handicap or retard a child and the best way to remove these handicaps. They have found that learning the language skills is like learning golf, tennis or swimming—there is a right way, and there are many wrong ways to do it. If the right way is followed, the average child learns rapidly and enjoys the satisfaction of accomplishment. If a wrong way is followed, he learns more slowly, he is discouraged and sometimes, like slicing in golf, learns a cumbersome, inefficient method of reading or writing that hinders him all the rest of his life. Let us look at the results of some of these researches on how we learn the language skills.

Learning To Talk.—At birth an infant makes babbling, gurgling sounds that are the beginning of spoken language. When he wants something, he cries; when he is satisfied, he remains quiet. During the second year, as his bones, muscles and nerves mature, he gains more control over his tongue, lips, vocal cords and other organs of speech. At the same time he constantly hears the speech of others, both of children and adults. He finds that whenever candy is in sight, somebody makes the peculiar sound, *candy.* He then finds that if he makes that peculiar sound when no candy is in sight, as often as not somebody produces some. He makes the sound to get the candy, and if he always gets it simply by saying "ca" or "can" or "cannie," he will be very slow in learning the right sound. Sometimes in talking to a child, parents use the child's sound to refer to certain objects. When they do so they are deliberately teaching him incorrect sounds or baby talk. They are tripling his job of learning, for he must unlearn the wrong sound before he can learn the right one.

This process of learning, or associating a certain word or sound with each object or activity, continues month by month and year by year. The average child has at least as many words in his speaking vocabulary as indicated in the table[1] below:

Age of child	Number of words in vocabulary
2½	700
3	1,100
3½	1,500
4	1,900
4½	2,000
5	2,500
5½	2,700
6	2,800

Some children have difficulty in learning to talk and those who stutter and lisp have not learned to make the sounds of speech correctly. It is estimated that in the United States there are 1,000,000 stutterers and 10,000,000 who lisp or have other speech disorders. These irregularities seriously affect a child's mind and feelings, and many scientific studies have been carried on to discover the cause and cure for such speech defects. It has been found that there are four times as many boys as girls who stutter; that stuttering usually begins when the child is four or five years old; that it becomes more and more fixed as the child grows older and that it is very much easier to remedy the defect in its early stages than after the stutterer reaches the age of sixteen or seventeen. Left-handed children who are required to become right-handed are very likely to become stutterers after the shift to the nonpreferred hand. The reason for this is found in the physiology of the brain and nervous system. It is too technical to be discussed here; but the evidence clearly shows that many, perhaps a majority, of stutterers are not using their left hands, as they preferred when they were babies. Extensive training in the use of the originally preferred hand is usually followed by a marked improvement in speech.

Lisping and difficulties in articulation are other disorders of speech that interfere with the process of learning to talk. These are sometimes due to poor organs of speech, such as crooked teeth or harelip, but more often to slovenly habits of using the tongue and lips. One condition, known as a *lateral lisp,* is caused by speaking with the tongue in one side of the mouth rather than in the center where it belongs. One can easily demonstrate this to himself by uttering a few words with his tongue in one side of the mouth cavity. This condition is treated by calling the child's attention to the position of his tongue and training him to hold it in the center of his mouth when he speaks.

Another difficulty in learning to talk arises when one speech sound is substituted for another. This occurs when the child in the early stages of speech happens upon a wrong setting of his vocal organs for a certain sound and learns this wrong setting so well that it becomes a part of his speech. Many children four or five years old pronounce *s* for *f.* It is unfortunate that such substitutions stay in the child's speech for years when they can be eliminated in a very short while by proper instruction. If the parent or teacher will tell the child to bite his lower lip and blow, he cannot avoid saying *f.* The production of most of the other sounds of speech is equally simple.

Poor hearing also is sometimes the cause of difficulty in learning to talk. The organs of speech of a deaf mute are usually quite perfect, but he cannot use them properly because he has never heard the sounds of speech uttered by other people and therefore is unable to produce these sounds himself. Children who are hard of hearing often confuse various sounds, mispronounce others and produce jumbled speech; but to them, because their hearing is inadequate *their speech seems all right.* Such children must be taught how to use their tongue, lips and other vocal organs if they are to produce the sounds of speech correctly.

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[1] Smith, Madorah Elizabeth, *An Investigation of the Development of the Sentence and the Extent of Vocabulary in Young Children* (Univ. Iowa Studies, *Studies in Child Welfare,* 1926, 3, No. 5; 90 cents.)

The importance of giving the child proper instruction when he is learning to talk has only recently been recognized. Most adults of today learned to talk by hit-or-miss methods. Their speech was like Topsy in *Uncle Tom's Cabin*—it "just growed." As a result we have entirely too large a number of speech defectives, even in the more advanced sections of the country. The next generation will see the number of such defectives reduced to a fraction of what it is at present. Many school systems, particularly in the larger cities and the more progressive communities, are employing a specially trained teacher who devotes all his time to the prevention and correction of disorders of speech.

Learning To Read.—Reading and speaking are similar in many ways—both are language skills; both involve associating a symbol of some kind with objects and situations and activities. In the case of speech, this symbol is the word we hear, but in reading it is the word we see. When the sound *candy* is associated with something good to eat, an element of speech has been learned. When the printed or written letters *candy* are associated in the same manner, an element in reading has been learned. We may define reading as the process of associating various combinations of letters with specific objects, situations and activities.

Ordinarily speech is well along in its development before reading is begun. The child must therefore associate two things with the printed symbol that he meets in his reading lesson—namely, the object itself and the sound that stands for it. For example, a child may be taught that the printed word *candy* stands for the sound *candy* and hence for something good to eat. Twenty-five years ago reading was taught almost entirely by this method. It is now realized that learning to read in this manner results in word reading or word sounding. Each word must be implicitly pronounced before its meaning is fully grasped. It is the natural result of a method that associates the sound of the word with the printed symbol and with the meaning.

The newer method of teaching reading eliminates the middle step. The child is taught to associate the printed symbol with the meaning and to pay little attention to the sound of the word. This is accomplished by presenting the words in meaningful groups, phrases and short sentences. The material deals only with situations and activities that are familiar to the child from his past experience. The very first lessons introduce reading as a thought-getting, not as a word-sounding, process.

Even with the most improved methods of instruction all children do not learn to read with the same ease. Among a thousand children taken at random from the sixth grade, a few—perhaps ten or a dozen—do not read any better than the average first-grade pupil. At the other extreme, a few very good pupils read as well as the average high-school graduate. The poor readers have been carefully studied because a majority of failures in the lower primary grades are due to difficulties in reading. Children differ in intelligence just as they do in height, weight or strength, and if a child is very low in mental ability he is likely to be poor in reading as well as in other school subjects. It has been found, however, that a great many children who are retarded in reading are not at all below normal in intelligence. What are some of the things that may cause a child of normal or even above normal intelligence to have difficulty with his reading? They may be specified under several headings:

1. Faulty Vision.—Reading is a *visual* skill. Everything we read comes to us through our eyes. If a child has poor eyes, he is likely to be a poor reader. The two eyes must work together like a well-trained team of horses. For most efficient vision, the eyes must look at exactly the same point at the same time. Some children have what is known as *overconvergence,* which means that the eyes turn in slightly more than they should. In extreme cases this is cross-eyedness and is very obvious; but in mild cases it is not obvious and simply reduces the child's reading efficiency. The opposite condition is known as *underconvergence,* which means that the eyes do not turn in as much as they should. A third state, known as *lateral imbalance,* occurs when the right eye sees a word higher or lower than the left eye sees it.

Another visual defect is *astigmatism.* The eye is really very similar to a small camera, with a lens in front and a surface similar to a film in back. If the lens is thicker on one side of the eye than it is on the other, vision is astigmatic—the image on the back of the eye is distorted, and the eye muscles are under constant strain trying to force the image into its normal shape. *Far-sightedness,* the inability to focus sharply on near objects, subjects a reader to constant strain because what he sees is fuzzy and out of focus.

Most of these visual defects may be remedied by muscle exercises or properly fitted glasses. The important thing is to discover the defect before it has handicapped the child's reading. Many school systems now give visual tests to all pupils and advise those who have serious defects to consult a competent eye specialist.

2. Faulty Perception.—Sometimes a child will have difficulty in remembering and recognizing words even though his vision, as far as the eyes are concerned, is quite satisfactory. The word *cat,* for example, may have no meaning to him even though he has seen it many times before and can readily name the letters c-a-t. This happens when the relation between the visual symbol and the object has not been thoroughly learned.

In ordinary reading one does not look at every word but at groups of words. The eyes stop four or five times in reading across a line of print on a page of standard size. Each stop or fixation lasts about a quarter second and the movement or jump from one fixation to another requires only about one twenty-fifth second. It has been shown by experiment that during this jump the eye sees practically nothing—that perception of the words takes place only during fixation. One must therefore recognize the meaning of several words—perhaps an entire phrase—in the quarter second while the eye is looking at only a single word in the center of the phrase. These experiments show why word reading is inadequate, and why a good reader must be able to understand several words at a glance. Several methods have been worked out to improve this ability. One of the most common is to present cards by the flash method. Each card contains a short sentence or group of words. The card is presented for just an instant, and the child does not have time to read each word. This kind of practice develops ability to grasp the meaning of several words at a single glance.

Another kind of difficulty in perception is known as *reversals.* Some readers will read a word like *bid* as *did,* reversing the letter *b* and seeing it as *d.* Reversals may result in whole words being read backwards. For example, *saw* may be read as *was* and *not* as *ton.* When this happens, the reader usually does not know that a mistake has been made. The experience of some teachers indicates that this difficulty occurs more frequently in left-handed than in right-handed children. It is also associated with word reading. If a pupil has been taught to read by groups of words, a reversal is not so apt to occur because the meaning of a word read backwards does not make sense with the rest of the phrase.

3. Beginning to Read Too Early.—A child should not learn to walk until his bones and muscles have developed enough to hold him in an upright position. In like manner a child cannot learn to read properly until the muscles of his eyes and general mental ability have reached a certain level of development. At the age of five the average child has grown and developed to the point where he is ready to read. Most children are not ready before the age of five, and some are not ready until the age of seven or eight. Whether a child has reached the proper level can be determined by visual tests and by watching his progress when reading lessons are begun. If it is apparent that he is not improving, only harm can come from forcing, coaxing or punishing. If he has not sufficiently developed to learn correctly, he will learn incorrect methods and habits that will handicap him later. A more serious result of trying to teach the child who is not yet ready is that he acquires a permanent dislike for reading and his interest can later be reawakened only with great difficulty.

4. Reading Made Unpleasant.—We know from many experiments in psychology that a person makes little or no effort to learn anything new unless it gives him some kind of satisfaction. A child finds little satisfaction in the assurance that if he learns to read he will be able to read books like his mother and father when he grows up. Neither does it give him much pleasure to know that if he does *not* do well with his reading

lesson he will have to stay after school; but if the teacher explains that the day's reading lesson tells how to make a kite, every boy in the class will do his best because the lesson teaches something that he wants very much to know. What goes on in the class, as well as the reading material itself, should be made interesting and a source of pleasure and satisfaction. In one school a boy had difficulty in pronouncing certain sounds. Every time he was called upon to read aloud, several pupils giggled and made fun of him. He soon began to hate reading and made no progress in it until removed to another class. In all learning, interest and effort are more easily aroused by praising what is done right than by criticizing what is done wrong. Some criticism may be necessary but it should be used sparingly and with some understanding of child psychology.

These various causes of poor reading do not always work one at a time. Frequently some combination of conditions is the cause of the difficulty. In order to provide special help for those who are below average, a number of universities and colleges now give a reading test to all students when they enroll for their freshman year. Not long ago the tests revealed that one student entering a large state university could read no better than the average second-grade child. He could not read such words as *baby* and *vague*, although he readily understood these words when they were spoken. One's first reaction to such a case is that only a very stupid boy could be such a poor reader at the age of seventeen. Yet the truth is that he was considerably above the average in intelligence. He had to be above average to get through high school without being able to read properly! After careful analysis it was found that he had originally been taught to read by words rather than by thought-groups and to associate each written or printed word with the sound and then with the meaning; but he had not been taught how to pronounce strange combinations of letters, and so he could not make the necessary step from the printed word to the vocal sound for that word. This handicap prevented him from developing any skill or interest in reading, but his intelligence was so high that he was able to go through the grades and through high school by listening carefully to discussions in class and thereby picking up enough information to carry him along. He received special training and in less than three months learned to read so well that he became superior to the average member of his class.

Courtesy American Optical Co.

Photographing a Child's Eye Movement

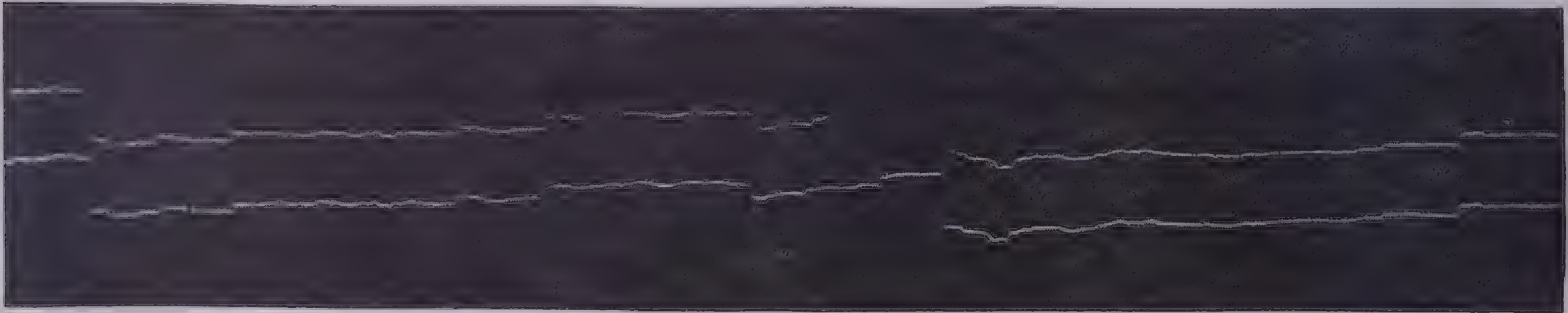
A binocular eye-movement camera records the reading ability of pupils. In the machine a beam of light is reflected from the eyeballs. As the eyes move in reading the vertically traveling film records their movements and fixations in a double steplike graph

Many other factors besides those here discussed are related to reading ability. As one may suspect, there is a definite relation between defective reading and defective speech. Nearly 10 per cent of the defective readers also stutter or stammer, while only 1 per cent of normal readers have this defect in their speech. About 18 per cent of defective readers have an articulatory disorder such as baby speech, lisping or mispronounciations; but these defects are found in only 7 per cent of normal readers. It has already been mentioned that reversing letters or words, that is, reading them backwards, seems more frequent in left-handed than in right-handed children. Shifting from the preferred to the nonpreferred hand, which is likely to cause stuttering, is likely to cause poor reading also. In one study of reading-defect cases, 4 per cent were found to have shifted from the use of one hand to the other, but a history of such a shift could be found in only 2 per cent of normal readers. In the same way that we are right- or left-handed, we are also right- or left-eyed, and this is another factor related to reading ability.

You can easily demonstrate this for yourself by a very simple test. In the center of an ordinary sheet of paper about 8 inches square, tear a hole the size of a quarter or half-dollar. Hold this in both hands at the level of your waist and quickly raise it up to your face so that is becomes a mask with you looking through the hole at some object in the distance. You will find that you automatically raise the paper into a position so that only one eye can see through the hole. If you are right-handed, the chances are that you will place the hole in front of your right eye, indicating that you are also right-eyed. If you are left-handed, you are more likely to favor your left eye. In making this test with a large number of people, it was found that about 65 per cent automatically raised the paper so that the hole was in front of the right eye (which meant they were right-eyed). A rather large proportion of defective readers has been found to exhibit a mixed eye-and-hand preference; that is, they are right-handed and left-eyed or left-handed and right-eyed. Just why this combination should be associated with poor reading is not definitely known, but it is supposed that since reading, writing and speaking all are language functions, they can be most efficiently developed in connection with one side of the body and nervous system.

Poor reading is sometimes caused by defective hearing. The modern method of teaching reading makes little use of actual sounds and relies almost entirely on what the eye sees; still there is some association of the sounds with the printed words. In one test it was found that poor readers make about three times as many mistakes in hearing speech sounds as children who can read satisfactorily. This does not mean that all poor readers are deaf or that deafness causes poor reading. It means, rather, that there is a relation between the ability to read (get information from the printed page) and to hear (get information from the sounds of speech). If a person is low in one, he is apt to be low in the other.

Finally, a great deal of study has been made of the relation between two fundamental aspects of reading that are called *speed* and *comprehension*. Speed refers to the number of words per minute that can be read; comprehension refers to how well the material is understood. A good reader is satisfactory in both speed and comprehension; a poor reader may be poor in both or poor in one and good in the other. Anyone can double or triple his speed of reading if he is not concerned with comprehension, and nearly everyone can improve his comprehension if he greatly reduces his speed.



Courtesy American Optical Company

What the Camera Records: Eye Movements of a Slow, Inefficient Reader

The great number of fixations in this graph shows a poor recognition span, and the long step for each line shows sluggish eye movement, facts that mark reading ability below the norm for first-grade pupils with one term of instruction

Neither procedure results in any real improvement in reading. Improvement results only if both factors are increased or if one increases and the other remains constant.

Ordinarily, speed and comprehension can be measured only by using a separate test for each. In one test that is used to measure speed alone, the child is instructed to begin reading at a given signal, to continue until he is stopped and to follow the instructions that he reads. He then reads material[1] that begins as follows:

> With your pencil make a dot over any one of these letters, F G H I J, and a comma after the longest of these three words: BOY MOTHER GIRL Then, if Christmas comes in March, make a cross right here.......... but if not, pass along to the next question, and tell where the sun rises. . . . . If you believe that Edison discovered America, cross out what you just wrote, but if it was some one else, put in a number to complete this sentence: A horse has..........feet. Write yes no matter whether China is in Africa or not..........; and then give a wrong answer to this question: How many days are there in the week? ....

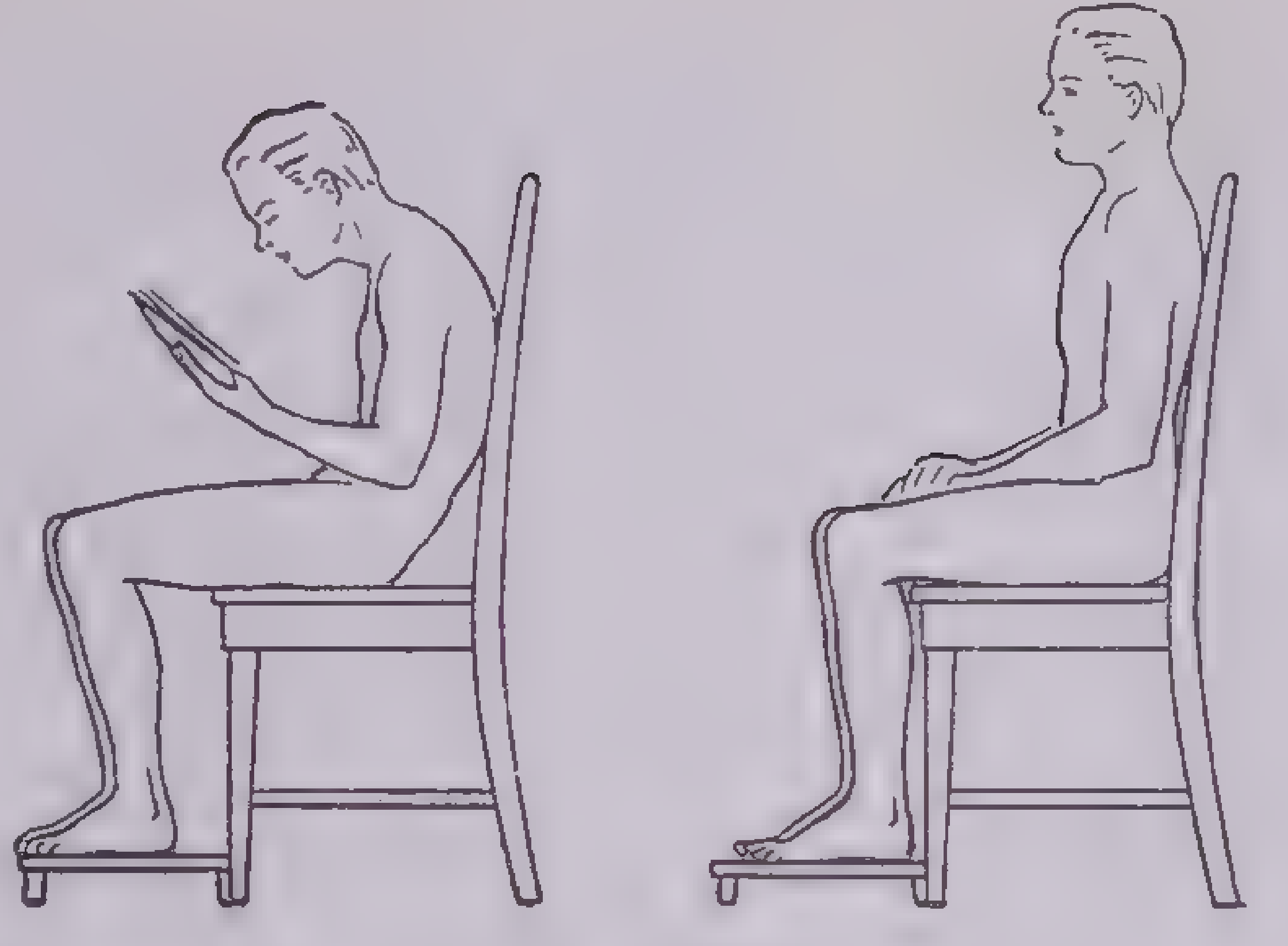
At the end of a given time the stop signal is given and the reading rate is determined by the amount covered. Comprehension in all readers is kept at a certain level by the requirement to follow instructions and write in the crosses, letters or underlinings as indicated.

Comprehension is measured by a slightly different test. The child has a certain period of time to study a paragraph and a number of statements about the material that is discussed in the paragraph, about which he is instructed: "All the statements below the paragraph are true, but some of them are not learned from the paragraph. Draw a line through the statements that are *not* learned from the paragraph. Put a C in front of those learned from the paragraph." A test of this type is shown below:

A READING COMPREHENSION TEST[2]

The crow's beak is wonderful. Of course, lips are better on people in many ways than beaks would be; but we cannot do one-tenth as many things with our mouths as the crow does with his. To be sure, we do not need to, for we have hands to help us. If our arms had grown into wings, though, as a bird's arms do, how should we ever get along in this world?

( ) 1. Crows are usually black.
( ) 2. Crows have beaks, and people have mouths.
( ) 3. Crows can do many more things with their beaks than people can do with mouths.
( ) 4. Crows are always getting into mischief.
( ) 5. The crow's arms have grown into wings.
( ) 6. People do not need beaks because they have hands to help them.
( ) 7. People fly in airplanes.
( ) 8. The crow eats a great deal.
( ) 9. Crows have feathers.
( ) 10. We do not need beaks because we have hands.



Sitting Posture

The boy reading shows incorrect posture. At the right is illustrated correct posture

In this test, the amount of time is constant for all children, and those having the greatest ability to comprehend what they read are quickly spotted by their ability to identify the statements according to the above instructions.

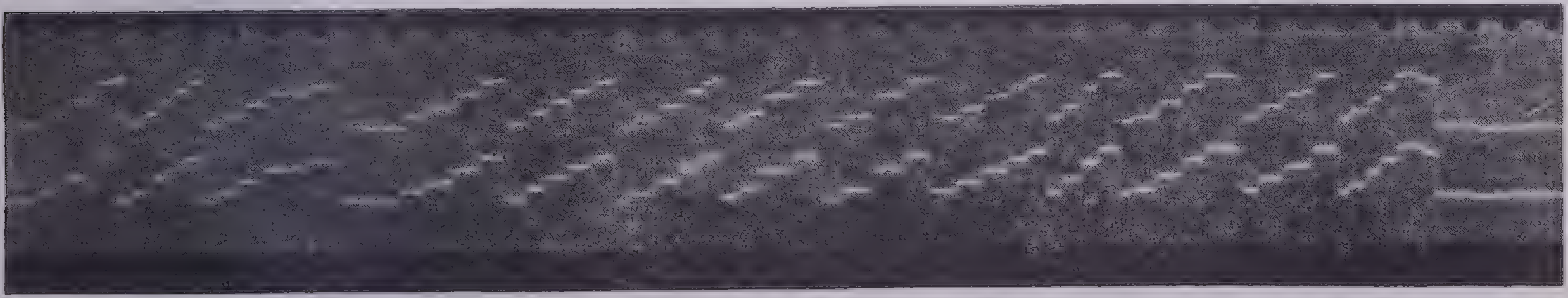
Learning To Write.—The developing child must learn not only to talk and to read but also to write. Writing also is a language skill; it involves associating various objects and situations with words that are written. What we know of the activities of the past is largely dependent upon the preservation of what men and women of those times wrote. In the modern world much writing is done by means of the typewriter and therefore the development of a high degree of skill in handwriting is perhaps not so important as it once was, yet an inquiry among a number of business firms in a large city indicated that even today many employers demand a certain skill in handwriting before an applicant will be employed.

The conditions that favor economical learning have been determined, and progressive school systems base classroom drill upon these principles.[3] The child begins to write almost as soon as he begins to read. He reads and writes the same things, learning to make the written symbols as he learns to recognize the printed symbols for the words and phrases. At first writing is done at the blackboard or on large sheets of paper with a blunt pencil. The child's earliest writing is much larger than it will be later on, because the muscles of his hands and fingers have not yet developed so he can make the finer movements necessary in ordinary writing.

From the beginning care is taken to provide each child with a comfortable seat so that he may sit squarely facing the desk with his head erect, his feet flat on the floor, the elbows two or three inches from the body and his trunk reasonably erect. We are apt to think that writing is done only with the hand and fingers; really it is done with the entire body. Psychological experiments have shown that when any part of the body is subjected to excessive strain or muscular tension, the effect irradiates or spreads to other parts of the body. A body position that is in any way uncomfortable or demanding, not only unduly tires the child but actually reduces the efficiency of the muscles of the fingers and hand.

A left-handed child should be allowed to write with his left hand. To insist that all children learn to write with the right hand is most unwise, for a child who is naturally left-handed if he is forced to use his right hand is very likely to develop a disorder in speech or reading; and he may never learn to write very well with his right hand because he is handicapped from the start. If the schoolroom is equipped with table-arm chairs, a certain number of them having the table on the left arm should be provided.

The paper is placed directly in front of the child and tilted about 30 degrees to the left[4]. The pen is held easily and lightly in a position that is natural to the form of the individual hand. The movements in writing are of two kinds—across the page and up and down. Accordingly there must be two kinds of hand movements. The sideward movement is one of the most important aspects of writing. If it is not even and smooth, the letters will vary in slant, their spacing will be uneven, and their proper formation will cause undue exertion. The sideward movement is properly made by swinging the arm like a pendulum or lever with the fulcrum at the elbow or the resting place of the arm on the table. The movement should be even



Courtesy American Optical Company

What the Camera Records: Eye Movements of Rapid, Efficient Reader

The graph illustrates the co-ordinated, rhythmical eye movements and short steps that mark the reading habits of a high school girl who is a quick and efficient reader. It typifies good reading habits

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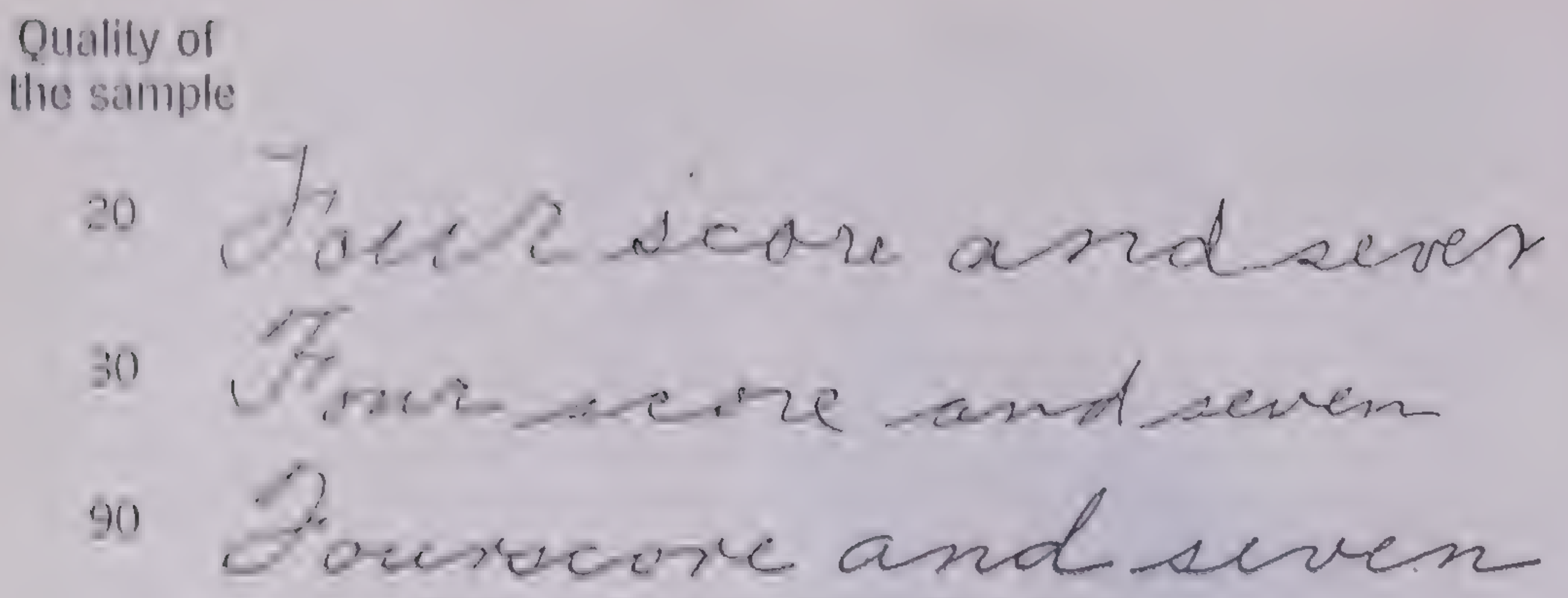
[1] Woodworth and Wells, *Directions Test* (Chicago: C. H. Stoelting Co., 1911; 80 cents for 100 tests.)

[2] Ingraham-Clark, *Diagnostic Reading Test* (Los Angeles: So. Calif. School Book Depository, 1929; $1 for 25 tests.)

[3] Based on material from Freeman and Dougherty, *How to Teach Handwriting* (Boston: Houghton Mifflin Company, 1923; $2.)

[4] This statement and other recommendations in this section should be reversed for the left-handed child.



Grades in the Ayres Handwriting Scale[1]

and smooth, not jerky or abrupt. Many books on teaching handwriting give exercises to develop the proper sideward movement of the arm and to maintain it while the activities of the fingers and hand take place.

The vertical or up-and-down movements are largely formed by movements of the fingers. At one time an attempt was made to teach writing by forcing the arm to make both the sideward and up-and-down movements. Experiments have shown that the arm movements are poorly adapted in most persons to the proper execution of the vertical stroke. To execute the up-and-down movements properly by moving the arm requires a great deal of practice, and only a few children ever develop enough skill to write satisfactorily in this way. Most children revert immediately to finger movements as soon as the writing lesson is finished, and if only arm movements have been practiced during the lesson, the time has been wasted. The theory of modern education is to teach what the children later use, not what they may or ought to use.

As in other skills that involve activity, the rhythm of writing movements is very important. Experiments have shown the most efficient rate of writing and the nature of the rhythm for each letter. The speed should slow down whenever the direction of movement changes, and in good writers this happens even though the letter being written does not require a complete stop of the pen. For example, in the letter *m* the stroke should slow down for the curve at the top. A poor writer may fail to slow down at such places or he may tend to slow down in other places where the speed of the movement should remain unchanged. The proper rhythm and timing for each letter can be developed most readily by counting exercises that have been carefully worked out to follow the timing used by the best writers. Ordinary rapid counting is of little use, because the rhythm of each letter must be dealt with separately.

Learning to write, like any other skill, depends upon practice and repetition. This does not mean that blind and humdrum drill will cause improvement. In fact experiments in the psychology of learning have shown that unless practice is carefully controlled with a clear idea of the goal in mind, it will simply stamp in the wrong way to do a thing rather than develop skill in the right direction. Someone has rephrased the old maxim, "Practice makes perfect," to read, "Practice makes perfect errors," and this is certainly what happens if a child practices his mistakes over and over again while he is going through his drill. The teacher should devote a large part of each practice period to pointing out mistakes, analyzing errors and indicating in what way the form and pattern of the letters may be improved. She should also be on the alert for incorrect body posture, wrong position of the paper and faulty movements of the hand or arm.

The practice period should always deal with the whole process of writing, but the pupil's attention should be centered on one or more specific movements that he is seeking to improve. It is very important to practice these movements in the normal writing situation. If they are practiced separately, the child will master them quickly but the learning will not carry over to normal writing. Consider, for example, the smooth, swinging movement of the forearm in moving across the page. This can be quickly mastered by itself, but unless it is learned in the actual writing situation, it does not become a part of the total combination of movements.

The two major elements in writing are *speed* and *quality*. The teacher should emphasize both these factors but should not place undue emphasis on either. If speed is held to be the primary objective, poor habits of letter formation will be acquired and it will be very hard to remove these when the child later tries to improve the quality of his work. When accuracy is overemphasized, an entirely different writing movement is employed from that which will be most efficient later on when writing at a normal speed.

One of the important tools used in studying how children learn to write is a scale, or yardstick, for measuring handwriting ability. The Ayres Handwriting Scale[1] serves this purpose and furnishes an actual grade for various qualities of writing. Samples from this scale are reproduced below.

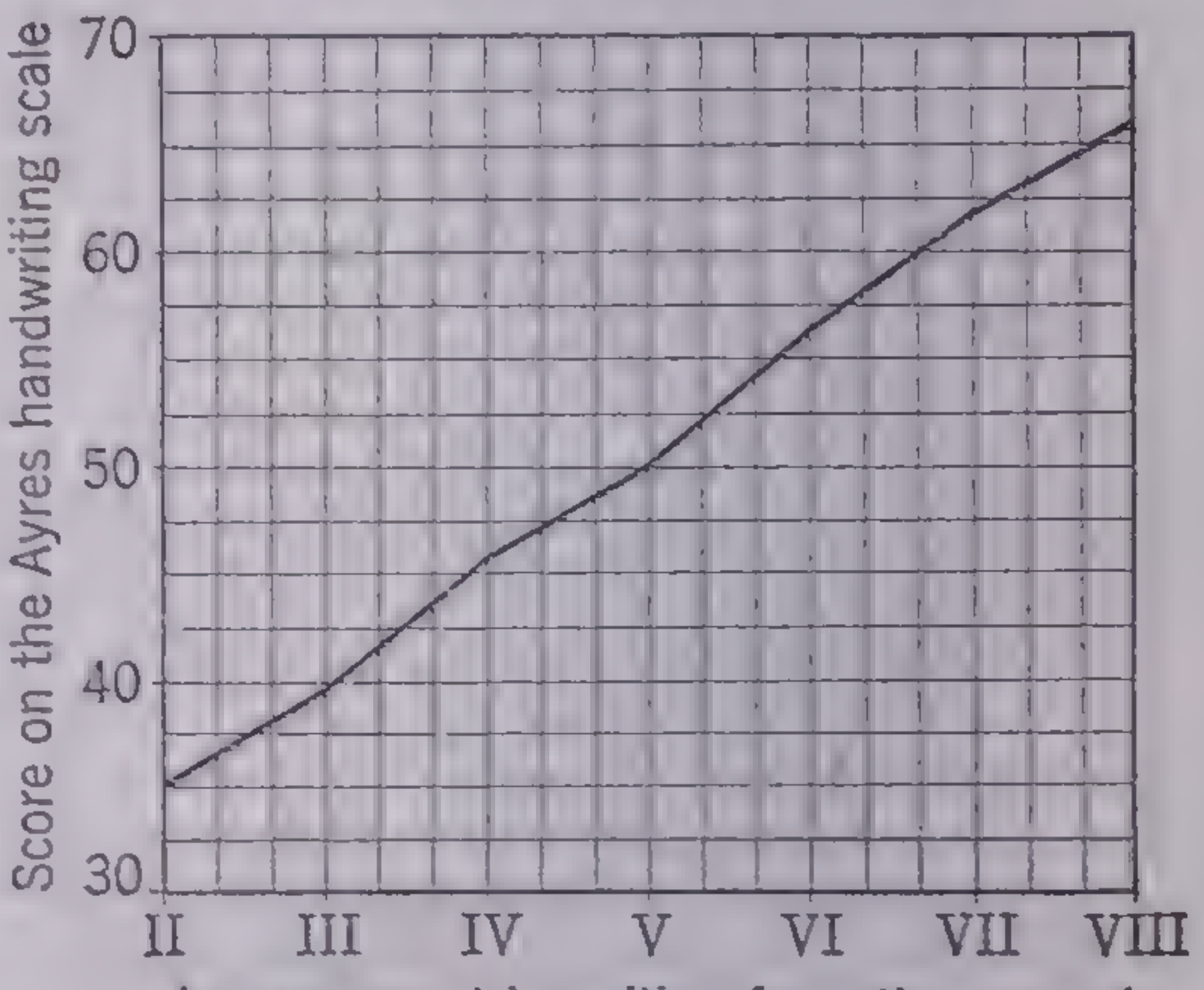
Scales of this type have been used to measure the improvement of handwriting under different conditions of instruction and practice. This scale enables the teacher or parent to measure the quality of handwriting and is the starting point for any program of improvement. When one is in contact with only a few children, he does not know whether they are above or below average or whether they are improving at a satisfactory rate. By using such a scale the progress of their handwriting can be checked from time to time. If they are found to be below normal, a special effort can be made to develop more interest in writing and special methods of instruction can be used.

As measured by this scale, there is continuous improvement in handwriting from the second to the eighth grade. This is shown in the accompanying graph.[2]

Modern school systems use all these principles of teaching, measuring and improving writing. As a result, children learn to write more quickly, more efficiently and with much less difficulty than in earlier times when writing was learned largely by trial and error.

Learning To Spell.—Spelling may be thought of as a part of writing. It is usually studied as a special subject, because it deals with the position of letters in words, whereas writing deals with the skill of the fingers, hand and arm in forming the letters of words. A child begins to learn spelling when he begins to read and write. In his first reading he recognizes a word because he sees the pattern of letters; and it is this pattern that makes up the spelling of a word. Also in his earliest writing he learns the correct position of the letters, and this is really a lesson in spelling. Research has shown that special instruction in spelling by itself is necessary if many words are to be learned thoroughly. There has been a great deal of carefully conducted and rigid experimentation on how children learn to spell. Until fifty years ago, spelling lists for school children were compiled with very little study. It was felt that if a number of new words were presented each day or each week, the child would learn these with equal readiness and would thereby acquire a satisfactory spelling vocabulary. In contrast to this approach, every modern spelling course is based upon the results of extensive research. Some of the major principles that have been brought out are as follows:

1. *The words most commonly taught*



Improvement in writing from the second to the eighth grade

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[1] New York: Russell Sage Foundation (1917); 10 cents. Samples of the other grades—40, 50, 60, 70, 80—are given in the original.

[2] Based on material from Freeman and Dougherty, *How to Teach Handwriting* (Boston: Houghton Mifflin Company, 1923; $2).

should be those that are most commonly used. No child can be expected to learn to spell all the words in the English language. Someone must make a choice for him and decide which words he must learn to spell and which he may omit. In making this choice it is only reasonable to select for study the words that are most commonly used and omit those he will only occasionally need. In one study[1] it was found that the three words most commonly used make up 10.2 per cent of all words used and that the 100 words most commonly used make up 58.8 per cent of all words used. The detail of this study shows for the commonest words the following percentages of all words used:

3	commonest,	10.2 per cent	of all
10	"	26.0 per cent	"
25	"	36.0 per cent	"
50	"	46.0 per cent	"
100	"	58.8 per cent	"
200	"	69.9 per cent	"
300	"	75.3 per cent	"
500	"	82.5 per cent	"
1,000	"	89.9 per cent	"
1,500	"	93.2 per cent	"
2,000	"	95.3 per cent	"
3,000	"	97.6 per cent	"
4,000	"	98.7 per cent	"
5,000	"	99.2 per cent	"

From this table we see that if a child learns to spell correctly only the 100 most common words, he will be equipped to handle over half the words that he ordinarily needs to use; and that if he learns the most common 5,000, 99 per cent of all words he will need have been provided for. Modern spelling lists are based upon researches like these and every word presented is one that the child will really need to use.

2. *Drill upon words should be in proportion to their difficulty.* One may think at first glance that the more letters in a word, the more difficult it is, and that words with the same number of letters are equally difficult. This is not true. For example, in one investigation the word *meeting* was misspelled in only 5.7 per cent of the times it was used, though the little word *too* was misspelled in 55.2 per cent of the times. In this case the longer word is clearly the easier to spell; much more drill should be devoted to the shorter word. In the same investigation, *opinion* was misspelled in 46 per cent of the attempts, but *personal* was misspelled in only 14.5 per cent. Differences in the relative difficulty of words have been carefully studied, and spelling courses are planned so that more time is devoted to those words that are the hardest to spell.

3. *Certain mistakes are more common than others.* The most common misspelling of *company* is *copany;* of *truly, truely.*[1] Every other word that is commonly misspelled has a certain error or type of error that is likely to be made. Hence in teaching a word it is possible to concentrate upon doing correctly the thing that the pupil, if left to his own devices, is most apt to get wrong. The teacher knows the hard spot, so to speak, of each word that is taught and she can take particular pains to teach this part correctly from the start.

The above statements, show that the modern method of teaching spelling is based upon scientific investigation and is not a hit-or-miss procedure. Principles of efficient learning have been applied to spelling as well as to handwriting and to many other skills. We know from psychology that practice periods should not be too long. After 15 or 20 minutes the average pupil begins to tire and to lose interest. In almost any subject he accomplishes less during the second 15 minutes of study than during the first 15 minutes. This is particularly true in learning to spell. One investigation revealed that pupils in schools that use a 15-minute spelling period learn as much by the end of the year as pupils in other schools where a longer period is used.

Another tendency in the modern schoolroom is to deal with each child as an individual. The things that are difficult for one child may be easy for another. To require all children to give equal drill to all words is clearly not in line with this principle of individual instruction. The capable teacher studies each child carefully, determines what kind of material is particularly difficult for him and arranges his study and practice periods so that the learning will be where it is most needed. When they are taught in this way children develop more evenly and with fewer gaps in their learning than when all are taught the same thing at the same time.

Many principles of psychology are applied in teaching children to spell, but none is more important than the notion of *overlearning.* Suppose you have drilled on a given word until you can spell it correctly. How long will you remember how to spell this word? If you stop drill as soon as you can spell the word without making an error, experiments show that you will forget how to spell it very soon; but if you practice on it for a while *after* you seem to know it perfectly, you will remember it for a very long time. Practicing a thing that you already know is overlearning. At the moment it seems to be a waste of time and you may ask the question: Why practice something that you already know? The reason is that such practice stamps it into your nervous system so that it will remain. All spelling courses are arranged so that a child continues drill upon the words *after* they are learned. Some words require more overlearning than others. The proper amount for all of the more common words has been determined, and a modern course of spelling carefully distributes the drill according to these results.

These improved methods of teaching children to speak, read, write and spell are typical of the modern schoolroom. No longer do we assume that a teacher can present the material in any old way and expect the child to learn. In spelling, it is not how *many* words are presented but *how* they are presented that determines the number learned. Modern schools are different from the schools attended by our parents and grandparents. They teach more effectively and more interestingly. Schools have become a place where children not only learn but have a good time while they are learning, and this has become possible largely because methods of teaching speech, reading, writing and spelling have been greatly improved in recent years.

GRAMMAR

A knowledge of the rules and principles of English grammar gives one basic help toward correct expression. It does not take the place of hearing and reading and speaking one's language; but it does add assurance and precision to speech. As a musician tunes his ear to good music by listening intelligently but becomes a good musician himself by diligent practice, so all of us may become fluent and skilful in the use of English not only by associating ourselves with good literature and those who speak correctly, but by speaking and writing according to accepted rules of good usage.

Grammar is based upon the classification of words into parts of speech and the relation of these parts of speech in sentences. Each language has its rules of grammar. However, when we speak of grammar without naming a foreign tongue we refer to our own language.

There are eight different parts of speech: Noun, Pronoun, Verb, Adjective, Adverb, Conjunction, Preposition, Interjection. *Nouns* and *Verbs* are far more important than the other parts of speech, as they are used to make the base of the sentence. *Pronouns* serve as substitutes for nouns. *Adjectives* and *Adverbs* are used to modify or add to the meaning expressed by nouns and verbs. *Conjunctions* are used as connectives. *Prepositions* express a relationship between a noun and some other part of the sentence. *Interjections* are words that express our emotions or feelings. They have no grammatical relation to other parts of speech used in a sentence.

Each part of speech will be discussed under the following headings: Definition, Kinds, Forms, Syntax or Construction. *Definition* means the identification of one part of speech as distinguished from another. *Kinds* are the classifications of the various parts of speech. *Forms* are the changes made to indicate different uses or meanings, they are sometimes called the *inflections* of a word. *Syntax* means the relation of words, phrases and clauses to other parts of the sentence. In a grammatical sense *construction* means the same thing.

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[1] P. G. McKee, *Language in the Elementary School* (Boston: Houghton Mifflin, 1934; $2.10).

A study of the structure of the sentence as a whole will follow the study of the parts of speech in their various uses. This process is called *Sentence Analysis.*

PARTS OF SPEECH

Nouns

Definition: A noun is a word used as the name of a person, a place, a thing, an action, a condition or a quality: *John, Maryland, house, jumping, happiness, charity.*

Kinds: Proper, Common, Concrete, Abstract, Collective.

A *proper* noun is the name of some particular person, place or thing: *Henry, Boston, Tuesday, June.*

A *common* noun is the name of a member of a class of persons, animals, places or things: *girl, town, church, tree, music, sleep.*

A *concrete* noun names something that occupies space or may be perceived through the senses: *tree, stick, stone, desk, water, sky.*

An *abstract* noun is the name of a quality, a condition or an action: *greatness, cruelty, hardihood.*

A *collective* noun names any group or collection of persons, animals or things taken as one: *army, tribe, crowd, herd, team.*

Forms: Nouns may be inflected as follows: *Number* (Singular, Plural); *Gender* (Masculine, Feminine, Neuter); *Person* (First, Second, Third); *Case* (Nominative, Accusative or Objective, Genitive or Possessive).

Singular number means one; *plural* number, more than one. The plural of a noun is usually formed by adding *s* to the singular (*boy, boys; tiger, tigers; rose, roses*) or, if the noun ends in *s* or the sound of *s* (*ch, sh, x, z*), by adding *es*; *dress, dresses; church, churches; box, boxes; waltz, waltzes.*

Nouns ending in *y* preceded by a consonant, change *y* to *i* and add *es: quantity, quantities.*

The following nouns ending in *o* add *es: cargo, hero, buffalo, potato, tomato, volcano.* Many nouns from foreign languages ending in *o* add *s: solo, alto, piano, basso, soprano.*

Many nouns ending in *f* or *fe* change *f* or *fe* to *v* and add *es*: *leaf, life, knife, thief, wife.*

Some nouns form their plurals irregularly: *child, children; foot, feet; man, men; ox, oxen; mouse, mice; goose, geese.*

Certain nouns use the same form for both singular and plural: *sheep, deer, trout* and in some senses *hair, fish, fowl.*

English has taken over the plurals of many foreign words along with the singular. Both in spelling and pronounciation, the English fashion is to be preferred where a choice is given.

Singular	Plural
alumnus (mas.)	alumni
alumna (fem.)	alumnae
analysis	analyses
animalculum	animalcula
antithesis	antitheses
appendix	appendixes, appendices
automaton	automatons, automata
axis	axes
bacillus	bacilli
bacterium	bacteria
bandit	bandits, banditti
basis	bases
beau	beaus, beaux
cactus	cactuses, cacti
cherub	cherubs, cherubim
crisis	crises
curriculum	curriculums, curricula
datum	data
dilettante	dilettanti
erratum	errata
focus	foci
formula	formulas, formulae
fungus	fungi
genius	geniuses, genii
genus	genera
gymnasium	gymnasiums, gymnasia
hippopotamus	hippopotamuses, hippopotami
hypothesis	hypotheses
index	indexes, indices
larva	larvae
madame	mesdames
medium	mediums, media
memorandum	memorandums, memoranda
monsieur	messieurs
nebula	nebulae
oasis	oases
phenomenon	phenomena
radius	radii
seraph	seraphs, seraphim
stimulus	stimuli
tableau	tableaus, tableaux
terminus	termini
thesis	theses
vortex	vortexes, vortices

Gender is a term referring to the form of word used to indicate sex. *Masculine* gender means male; *feminine,* female; *common,* either sex; *neuter,* absence of sex. The difference in gender may be indicated by the use of a different word: *man, woman; sir, madam; son, daughter; boy, girl; buck, doe.* Sometimes the difference in sex is shown by a prefix: *he-goat, she-goat; manservant, maidservant.* Sometimes a suffix effects the change: *hero, heroine; executor, executrix; count, countess; duke, duchess.*

Person is the term that indicates the speaker, the person spoken to or the person spoken of. Nouns are not inflected for person; personal pronouns are inflected for person: *I* am; *you* are; *he* is. Observe also that the different forms of the verb *be—am, are, is*—indicate person.

Syntax or Construction: Its case indicates the use or syntax of a noun or a pronoun in a sentence.

A noun is in the *genitive* or *possessive case* when it implies ownership or a possessive relationship: *Edith's* book; *cow's* horns; the *year's* events; *Longfellow's* poems. The genitive of most singular nouns is formed by adding the apostrophe and *s.* Certain nouns ending in *s* or the sound of *s* take only the apostrophe: for *conscience'* sake, *Moses'* law. Plurals ending in *s* take the apostrophe only: boys', ladies', horses', babies'. Plural nouns not ending in *s* form the possessive by adding *'s; men's, children's.*

A noun or a pronoun is in the *nominative case* when used in the following relationships:

Subject of the sentence: *John* came. *I* went home.

Predicate nominative: John is *captain.* It was *she* who called.

Direct address: as Come here, *John.*

A noun or pronoun is in the *objective* (or *accusative*) *case* when used as follows:

Direct object: He wrote this *letter.* We saw *them.*

Object of a preposition: We walked to the *station.* They spoke to *us.*

Indirect object: I told *Betty* a story.

A noun or pronoun is called the *direct object* and is in the *objective case* when it is directly affected by the action of the verb: Henry tore his *coat.* A noun is an *indirect object* when it is less directly affected by the verb action: I told *Betty* a story. Here *story* is the direct object. The indirect object may be expressed with the preposition *to*: I told a story to Betty.

Pronouns

Definition: Pronouns are words used as substitutes for nouns: *I, he, my, that, who.*

Kinds: Pronouns may be Personal, Possessive, Relative, Interrogative, Adjective.

A *personal pronoun* is one that indicates by its form the first, second or third person, that is, the speaker, the person spoken to, or the person, place or thing spoken of: *I, you, he, she, it.*

Possessive adjectives are those used to express a possessive relationship: *my, thy, your, his, her, its, our, their. Possessive pronouns* are formed from these adjectives: *mine, thine, yours, his, hers, ours, theirs.* In the sentence, Our school is larger than theirs, the word *our* is an adjective: *theirs* is a pronoun, standing for their school.

A *relative pronoun* (*who, that, which, what*) is one in the subordinate clause that refers to a noun in the principal clause and establishes a relationship between the subordinate and principal clauses. The relative pronoun *that* is used to refer to persons, animals and things. The man *that* was elected was my uncle. The horse *that* was injured has been shot. The book *that* I bought was written by Mark Twain. *That* is preferred when the relative clause is restrictive; *who, whom* and *which* are used in *nonrestrictive* clauses. *Who* refers to persons only: This man, *who* was so kind, lives next door. *Which* (used to refer to animals and things) is a *nonrestrictive* relative pronoun used to introduce clauses that add new meanings: The house, *which* I approached, was large. The whale, *which* is the largest of mammals, lives in the ocean. Such clauses should be separated from the rest of the sentence by commas. *What* is sometimes a *condensed* or *indefinite relative* pronoun: He bought *what* he wanted. Expanded, this sentence might read: He bought *that which* he wanted.

An *interrogative pronoun* is one used in asking a question: *who, whom,* *which, what. What* is he doing? *Which* one is needed?

An *adjective pronoun* is a word, commonly used as an adjective, which may take the place of a noun: *This* (adjective) hat is mine. *This* (pronoun) is mine. Other adjective pronouns are *that, these* and *those. This* and *these* refer to persons or objects near by; *that* and *those* refer to someone or something at a distance. These adjective pronouns are all definite—like a pointing finger. The *indefinite* adjective pronouns are *each, every, any, all, none, either, neither, both, many, several, some, such, other.* They may be used as adjectives or as pronouns.

Distributive adjective pronouns are singular in grammar and logic but have a plural suggestion. They must be used with singular verbs and other singular pronouns: *Every* man does *his* best. *Each* must do *his* duty.

Forms: Some pronouns are inflected for gender, number and case—especially the personal pronouns and the relative and interrogative pronouns that refer to persons.

Personal Pronouns

First Person

	Singular	Plural
Nom.	I	we
Gen.	my *or* mine	our *or* ours
Acc.	me	us

Second Person

	Singular	Plural
Nom.	you	you
Gen.	you *or* yours	your *or* yours
Acc.	you	you

Third Person

	Singular			Plural
	Mas.	Fem.	Neuter	All Genders
Nom.	he	she	it	they
Gen.	his	her *or* hers	its	their *or* theirs
Acc.	him	her	it	them

Old Style

	Singular	Plural
Nom.	thou	ye *or* you
Poss.	they *or* thine	your *or* yours
Obj.	thee	you

Note that the genitive may be either an adjective or a pronoun. *My* (adjective) hat. The hat is *mine* (pronoun). *His* (adjective) hat. The hat is *his* (pronoun).

Relative and Interrogative Pronouns have a very simple dehclension:

	Sing. and Plural	Sing. and Plural
Nom.	who	which
Poss.	whose	whose
Obj.	whom	which

Syntax or Construction: The pronoun must agree with its antecedent (that is, the noun to which it refers) in *person* and *number*. The case form depends upon the use or syntax. For example, one may say: Robert, *who* came yesterday, lives in Boston. Robert, *whose* home is in Boston, came yesterday. Robert, *whom* we saw, lives in Boston. The person and number of the relative pronouns here used agree with the antecedent Robert, but the case forms are changed as the use is changed. Note that agreement in person is shown only by the form of the verb in the relative clause and only if the pronoun is the subject of the verb. Robert, who *is* here, was in Boston yesterday. I, who *am* here now, was there yesterday.

Adjectives

Definition: An adjective is a word used to modify (describe or limit) the meaning of a noun or pronoun: *good, fast, glad, twelve, southern.*

Kinds: Descriptive (Proper and Common), Limiting, Numeral, Verbal.

A *descriptive* or qualifying adjective denotes kind or quality: a *blue* sky, a *good* girl, a *pleasant* day.

Limiting adjectives restrict the meaning of the noun: a *few* girls, *many* buildings. The *Articles* (*a, an, the*) are included in this class of adjectives. It should be remembered that *a* is used before words beginning with a consonant sound; *an* before a vowel sound: *a* top, *an* Indian.

A *numeral* adjective points out or indicates number of quantity: *Six* days, *Third* street. Numeral adjectives are of two kinds: *cardinals* (those used in simple counting), one, two, three; and *ordinals* (those indicating rank or succession), first, second, third.

A *verbal* adjective is one that is derived from a verb: *forgotten* days, *whistling* boy, *singing* birds, *running* water.

Forms: Adjectives are not inflected for number except in the case of numerals and certain pronominals: *this, these; that, those; my, our.* Adjectives have no person, gender or case. They are inflected, however, for *comparison.* This change indicates the degree of limitation or quality expressed. The *positive* degree is the simplest form: *large, beautiful, little.* The *comparative* degree denotes a degree higher or lower than the positive: *larger, more beautiful, less confident.* The *superlative* degree denotes the highest or the lowest degree that can be expressed: *largest, most beautiful, least confident.* The comparative and superlative forms are made by adding *-er* or *-est* to the positive or (usually in words with several syllables) by using *more* and *most* or *less* and *least.*

Syntax or Construction: An adjective may be used to modify nouns and pronouns directly (as illustrated above); indirectly or appositively (The girls, *all dressed up,* went to the party); to complete the meaning of a verb (They were *afraid*); and to complete the predicate and modify the object (He painted the fence *white*).

Verbs

Definition: A verb is a word used to assert something about a subject. It is the part of speech of prime importance, for without an asserting word there could be no sentence. Examples of commonly used verbs are *run, think, swim, buy, see, go.*

Kinds: Verbs are classified as Transitive or Intransitive; Regular or Irregular; Auxiliary and Linking or Copulative.

A *transitive* verb expresses action that is received or seems to be received by some person or thing. This receiver may be used as an object: John bought a *book* (active); or as subject: A *book* was bought by John (passive).

An *intransitive* verb is one the action of which is not received: the wind *blows;* we *walked* briskly.

A *regular* verb is one that forms its past tense and past participle by adding *d* or *ed* to the present: *walk, walked, walked.*

An *irregular* verb is one that forms its past tense and past participle irregularly: *go, went, gone; bring, brought, brought; burst, burst, burst.* (Irregular verbs are sometimes called *strong* forms; and regular verbs, *weak* forms.)

An *auxiliary* verb is one that is used as a helping verb: I *have* run; the bread *was* baked; I *may* come; I *might* go. *Have, was, may* and *might* are here used as auxiliaries with the principal verbs *run, baked, come, go.*

A *linking* verb is one used to connect or link a subject with a predicate nominative or a predicate adjective: This *was* the man; he *is* happy. The principal linking verbs are *be, become, seem, appear, grow.*

Forms: Verbs have Voice, Mood (or Mode), Tense, Person and Number.

A verb is in the *active* voice when it represents the subject as acting: John *caught* the ball.

A verb is in the *passive* voice when it represents the subject as acted upon: The ball *was caught* by John.

Mood (or Mode) means the manner of assertion made by a verb.

If the speaker asserts a fact or asks a question, he uses the *Indicative* Mood: I *walk;* Is he *walking?*

If the speaker commands or entreats, he uses the *Imperative* Mood: *Leave!* Please *go* at once.

If he expresses a wish, a prayer, a doubt, a supposition, a condition contrary to fact, a likelihood, a concession, a purpose, he uses the *Subjunctive* Mood:

May Thy will be done. (wish or prayer)

If the day *should be* clear, we shall go (doubt or supposition).

If he *had taken* my advice, he would have passed (condition contrary to fact).

If I *were* he, I would take the position (condition contrary to fact).

I *had gone* (or *should have gone*) but for you (likelihood).

Though he *slay* me, yet will I trust him (concession).

Answer briefly, so that you *be not misunderstood* (purpose).

Note: The distinctive forms of the subjunctive are gradually passing out of use. The nursery rhyme says: if this *be* I; but in ordinary speech we say: If this *is* I. The King James Version of the Bible says: Though he *slay* me, yet will I trust him; but everyday speech would use, not the distinctive subjunctive form *slay* for the third person singular, but the auxiliary: even if he *should slay* me.

Verbs are inflected according to *tense;* that is, the time indicated by the verb. Following are examples of the various tenses:

Present: *I move*
Past: *I moved*
Future: *I shall move*
Present Perfect: *I have moved*

(action completed in present time)
Past Perfect: *I had moved* (action completed in past time)
Future Perfect: *I shall have moved* (action to be completed in future time)

This simple distinction can be made between *shall* and *will:* to express simple future time *shall* is used with the first person and *will* with the second and third persons; to express determination *will* is used with the first person and *shall* with the second and third persons. *I shall go* means I am going; and *he will go* means he is going—a simple future. But *I will go, he shall go,* imply "no matter what." If a drowning man says: I shall drown; no one will help me—he means that he expects to drown because nobody is going to help. But if he says: I will drown. No one shall help me—he means that his mind is made up, he is determined to drown, he will let no one help him.

The conjugation of a verb is the orderly statement of all its persons and tenses in both voices and numbers, in all moods, as the following table shows:

Conjugation of the Verb "Be"

Principal Parts

Present Infinitive: to be
Past Tense: was
Past Participle: been

INDICATIVE MOOD

Present Tense

Singular	Plural
1st Person, I am	We are
2d Person, You are	You are
3d Person, He is	They are

Past Tense

I was	We were
You were	You were
He was	They were

Future Tense

I shall be	We shall be
You will be	You will be
He will be	They will be

Present Perfect Tense

I have been	We have been
You have been	You have been
He has been	They have been

Past Perfect Tense

I had been	We had been
You had been	You had been
He had been	They had been

Future Perfect Tense

I shall have been	We shall have been
You will have been	You will have been
He will have been	They will have been

SUBJUNCTIVE MOOD

Present Tense

(If) I be	(If) We be
You be	You be
He be	They be

Past Tense

(If) I were	(If) We were
You were	You were
He were	They were

Present Perfect Tense

(If) I have been	(If) We have been
You have been	You have been
He have been	They have been

Past Perfect Tense

(If) I had been	(If) We had been
You had been	You had been
He had been	They had been

IMPERATIVE MOOD

Present Tense

Singular	Plural
Be (you)	Be (you)

Infinitives

Present	Present Perfect
To be	To have been

Participles

Present	Past or Perfect	Pres. Perfect
Being	Been	Having Been

Gerunds

Present	Present Perfect
Being	Having been

Conjugation of the Verb "See"

Principal Parts

Present	Past	Past or Perfect Participle
See	Saw	Seen

ACTIVE VOICE
INDICATIVE MOOD

Present Tense

Singular	Plural
1st Person, I see	We see
2d Person, You see	You see
3d Person, He sees	They see

Past Tense

I saw	We saw
You saw	You saw
He saw	They saw

Future Tense

I shall see	We shall see
You will see	You will see
He will see	They will see

Present Perfect Tense

I have seen	We have seen
You have seen	You have seen
He has seen	They have seen

Past Perfect Tense

I had seen	We had seen
You had seen	You had seen
He had seen	They had seen

Future Perfect Tense

I shall have seen	We shall have seen
You will have seen	You will have seen
He will have seen	They will have seen

SUBJUNCTIVE MOOD

Present Tense

(If) I see	(If) We see
You see	You see
He see	They see

Past Tense

(If) I saw	(If) We saw
You saw	You saw
He saw	They saw

Present Perfect Tense

(If) I have seen	(If) We have seen
You have seen	You have seen
He have seen	They have seen

Past Perfect Tense

(If) I had seen	(If) We had seen
You had seen	You had seen
He had seen	They had seen

IMPERATIVE MOOD

Present Tense

See (you)	See (you)

Infinitives

Present	Present Perfect
To see	To have seen

Participles

Present	Present Perfect
Seeing	Having seen

Gerunds

Present	Present Perfect
Seeing	Having seen

PASSIVE VOICE
INDICATIVE MOOD

Present Tense

1st Person, I am seen	We are seen
2d Person, You are seen	You are seen
3d Person, He is seen	They are seen

Past Tense

I was seen	We were seen
You were seen	You were seen
He was seen	They were seen

Future Tense

I shall be seen	We shall be seen
You will be seen	You will be seen
He will be seen	They will be seen

Present Perfect Tense

I have been seen	We have been seen
You have been seen	You have been seen
He has been seen	They have been seen

Past Perfect Tense

I had been seen	We had been seen
You had been seen	You had been seen
He had been seen	They had been seen

Future Perfect Tense

I shall have been seen	We shall have been seen
You will have been seen	You will have been seen
He will have been seen	They will have been seen

SUBJUNCTIVE MOOD

Present Tense

(If) I be seen	(If) We be seen
You be seen	You be seen
He be seen	They be seen

Past Tense

(If) I were seen	(If) We were seen
You were seen	You were seen
He were seen	They were seen

Present Perfect Tense

(If) I have been seen	(If) We have been seen
You have been seen	You have been seen
He have been seen	They have been seen

Past Perfect Tense

(If) I had been seen	(If) We had been seen
You had been seen	You had been seen
He had been seen	They had been seen

IMPERATIVE MOOD

Present Tense

Be (you) seen	Be (you) seen

Infinitives

Present	Present Perfect
To be seen	To have been seen

Participles

Present	Past	Present Perfect
Being seen	Seen	Having been seen

Gerunds

Present	Present Perfect
Being seen	Having been seen

Progressive Form, Verb "See"

(Action thought of as continuing or "progressing")

ACTIVE VOICE
INDICATIVE MOOD

Present Tense

1st Person, I am seeing	We are seeing
2d Person, You are seeing	You are seeing
3d Person, He is seeing	They are seeing

Past Tense

I was seeing	We were seeing
You were seeing	You were seeing
He was seeing	They were seeing

Future Tense

I shall be seeing	We shall be seeing
You will be seeing	You will be seeing
He will be seeing	They will be seeing

Present Perfect Tense

I have been seeing	We have been seeing
You have been seeing	You have been seeing
He has been seeing	They have been seeing

Past Perfect Tense

I had been seeing	We had been seeing
You had been seeing	You had been seeing
He had been seeing	They had been seeing

Future Perfect Tense

I shall have been seeing	We shall have been seeing
You will have been seeing	You will have been seeing
He will have been seeing	They will have been seeing

SUBJUNCTIVE MOOD

Present Tense

(If) I be (*or* am) seeing	(If) We be (*or* are) seeing
You be (*or* are) seeing	You be (*or* are) seeing
He be (*or* is) seeing	They be (*or* are) seeing

Past Tense

(If) I were seeing	(If) We were seeing
You were seeing	You were seeing
He were seeing	They were seeing

Present Perfect Tense

(If) I have been seeing	(If) We have been seeing
You have been seeing	You have been seeing
He have (*or* has) been seeing	They have been seeing

Past Perfect Tense

(If) I had been seeing	(If) We had been seeing
You had been seeing	You had been seeing
He had been seeing	They had been seeing

IMPERATIVE MOOD

Present Tense

Be (you) seeing	Be (you) seeing

Infinitives

PRESENT	PRESENT PERFECT
To be seeing	To have been seeing

Participles

PRESENT	PRESENT PERFECT
....	Having been seeing

Gerunds

PRESENT	PRESENT PERFECT
....	Having been seeing

The Conjugation of a Regular Verb

CONJUGATION OF THE VERB *Move* IN THE ACTIVE VOICE

Principal Parts

PRESENT TENSE	PAST TENSE	PAST PARTICIPLE
move	moved	moved

INDICATIVE MOOD

Present Tense

SINGULAR	PLURAL
1st Person, I move	We move
2d Person, You move (thou movest)	You move
3d Person, He moves	They move

Past Tense

I moved	We moved
You moved (thou movedst)	You moved
He moved	They moved

Future Tense

I shall move	We shall move
You will move (thou wilt move)	You will move
He will move	They will move

Present Perfect Tense

I have moved	We have moved
You have moved (thou hast moved)	You have moved
He has moved	They have moved

Past Perfect Tense

I had moved	We had moved
You had moved (thou hadst moved)	You had moved
He had moved	They had moved

Future Perfect Tense

I shall have moved	We shall have moved
You will have moved (thou wilt have moved)	You will have moved
He will have moved	They will have moved

SUBJUNCTIVE MOOD

Present Tense

(If) I move	(If) we move
you move	you move
he move	they move

Past Tense

(If) I moved	(If) we moved
you moved	you moved
he moved	they moved

IMPERATIVE MOOD

Present Tense

Move (you or thou)	Move (you)

Infinitives

PRESENT	PERFECT
To move	To have moved

Participles

PRESENT	PERFECT
Moving	Having moved

PASSIVE VOICE
INDICATIVE MOOD

Present Tense

1st Person, I am moved	We are moved
2d Person, You are moved (thou art moved)	You are moved
3d Person, He is moved	They are moved

Past Tense

I was moved	We were moved
You were moved	You were moved
He was moved	They were moved

Future Tense

I shall be moved	We shall be moved
You will be moved (thou wilt be moved)	You will be moved
He will be moved	They will be moved

Present Perfect Tense

I have been moved	We have been moved
You have been moved (thou hast been moved)	You have been moved
He has been moved	They have been moved

Past Perfect Tense

I had been moved	We had been moved
You had been moved (thou hadst been moved)	You had been moved
He had been moved	They had been moved

Future Perfect Tense

I shall have been moved	We shall have been moved
You will have been moved (thou wilt have been moved)	You will have been moved
He will have been moved	They will have been moved

SUBJUNCTIVE MOOD

Present Tense

(If) I be moved	(If) We be moved
You be moved (Thou be moved)	You be moved
He be moved	They be moved

Past Tense

(If) I were moved	(If) We were moved
You were moved	You were moved
He were moved	They were moved

IMPERATIVE MOOD

Be (you, thou) moved	Be (you) moved

Infinitives

To be moved	To have been moved

Participles

PRESENT	PAST	PERFECT
Being moved	Moved	Having been moved

Synopsis of a Verb:—A table of all forms of verb in a given person, number, voice and mood is called a *synopsis.*

Third Person, Singular Number, Active Voice, Indicative.

THIRD PERSON, SINGULAR NUMBER, ACTIVE VOICE, INDICATIVE

Mood of Verb "See"

Present Tense	He sees
Past Tense	He saw
Future Tense	He will see
Present Perfect Tense	He has seen
Past Perfect Tense	He had seen
Future Perfect Tense	He will have seen

SUBJUNCTIVE MOOD

Present Tense	(If) He see
Past Tense	(If) He saw
Present Perfect Tense	(If) He have (*or* has) seen
Past Perfect Tense	(If) He had seen

INDICATIVE MOOD

IN THE THIRD PERSON, SINGULAR NUMBER, PASSIVE VOICE

Present Tense	He is seen
Past Tense	He was seen
Future Tense	He will be seen
Present Perfect Tense	He has been seen
Past Perfect Tense	He had been seen
Future Perfect Tense	He will have been seen

SUBJUNCTIVE MOOD

Present Tense	(If) He be (*or* is) seen
Past Tense	He were seen
Present Perfect Tense	He have (*or* has) been seen
Past Perfect Tense	He had been seen

Note two other verb forms, the *infinitive* and the *participle.* The *infinitive* is not a mood. It does not assert action; it names action: *to move, to be. To,* when used with a verb, is called the sign of the infinitive and should not be separated from its verb. The *participle* names action and therefore has the property of both a noun and a verb.

Syntax or Construction: A verb may stand alone or in verb phrases. The infinitive is a verbal noun. It may be the subject of a sentence (*To run* is good exercise), the direct object (He tried *to play*) or appositive (It is good exercise *to run*). The participle has all the uses of the adjective: *Reading* exercises, *running* water, *past* performances, *hurried* preparation. The present participle is often used as a noun and is called a *gerund.* The gerund may be used as subject, direct object, predicate nominative, appositive or object of a preposition: *Running* is good exercise. *Driving* a car recklessly results in accidents.

The benefit of *running* a long race is better wind. The danger of *driving* recklessly is great. The gerund is sometimes used in the plural: His *comings* and *goings.* The genitive is sometimes used: Reading for *reading's* sake.

Principal Parts of Common Irregular Verbs

Present	*Past*	*Past Participle*
am	was	been
arise	arose	arisen
awake	awoke	awakened
bear	bore	borne
beat	beat	beaten
bet	bet	bet
begin	began	begun
bind	bound	bound
bite	bit	bitten
blow	blew	blown
break	broke	broken
bring	brought	brought
buy	bought	bought
catch	caught	caught
choose	chose	chosen
cling	clung	clung
come	came	come
creep	crept	crept
cut	cut	cut
dig	dug	dug
do	did	done
draw	drew	drawn
drink	drank	drunk
drive	drove	driven
eat	ate	eaten
fall	fell	fallen
feed	fed	fed
find	found	found
fight	fought	fought
flee	fled	fled
fling	flung	flung
fly	flew	flown
forget	forgot	forgotten
forsake	forsook	forsaken
freeze	froze	frozen
get	got	got *or* gotten
give	gave	given
go	went	gone
grind	ground	ground
grow	grew	grown
hang	hanged *or* hung	hanged *or* hung
have	had	had
hew	hewed	hewn
hide	hid	hidden
hit	hit	hit
hold	held	held
hurt	hurt	hurt
keep	kept	kept
know	knew	known
lay	laid	laid
lead	led	led
lie	lay	lain
ride	rode	ridden
ring	rang	rung
rise	rose	risen
run	ran	run
see	saw	seen
seek	sought	sought
sell	sold	sold
shake	shook	shaken
shine	shone *or* shined	shone *or* shined
shrink	shrank	shrunk
sing	sang	sung
sink	sank	sunk
smite	smote	smitten
speak	spoke	spoken
spin	spun	spun
spring	sprang	sprung
stand	stood	stood
steal	stole	stolen
stick	stuck	stuck
sting	stung	stung
stink	stunk	stunk
stride	strode	stridden
string	strung	strung
strive	strove	striven
swear	swore	sworn
swim	swam	swum
swing	swung	swung
take	took	taken
teach	taught	taught
tear	tore	torn
tell	told	told
think	thought	thought
throw	threw	thrown
weave	wove	woven
win	won	won
wind	wound	wound
wring	wrung	wrung
write	wrote	written

ADVERBS

Definition: An adverb is a word used to modify a verb, an adjective or another adverb: He went *quickly;* he did *very* well.

Often adverbs are formed from adjectives by adding the syllable *-ly: wise, wisely; quiet, quietly; soft, softly.*

Kinds: As to form, adverbs are simple (*gladly*); *compound* (*outside*); phrasal (*arm-in-arm*).

Adverbs express *manner.* They may be classified as they express *degree, negation, time and order, place and motion:*

Degree: very, too, hardly, little, enough, almost, partly, quite. He gave me *too* little; the record is *partly* true.

Negation: no, not, never. He *never* spoke the truth.

Time and order: again, last, first, secondly, always, yesterday. He was *first* on the list. John is *always* late.

Place and motion: there, in, out, below, up, down, here, hence. He placed the book *there;* I slid *down.*

Forms: Adverbs have no person, number, gender or case; but like adjectives they have three degrees of comparison—Positive, Comparative, Superlative: *carefully, more carefully, most carefully; quickly, less quickly, least quickly.*

Syntax or Construction: Adverbs tell how, when or where; they qualify verbs, adjectives or other adverbs: She sang *sweetly;* her song was *very* sweet; she sang *very* sweetly.

PREPOSITIONS

Definition: A preposition is a word used with a noun or pronoun to show the relation of the noun or pronoun to some other word or words in the sentence: Go *to* school; come *to* me.

Kinds: There are three kinds of prepositions:

Simple: at, by, for, in, but, with, of, from. He came *into* the house; she brought Mary *with* her.

Compound: beside, underneath, without, within, into, notwithstanding, providing, concerning. He sat down *beside* her; Harry came *without* any money.

Phrasal: instead of, out of, on account of, in spite of, because of. You go *instead of* George; we went *in spite of* the rain.

Forms: Prepositions are not inflected.

Syntax or Construction: A preposition with its object is called a prepositional phrase. When the phrase modifies a noun or pronoun it is called a *adjective phrase:* The work *of th day* is done. When it modifies a verb an adjective or an adverb it is calle an *adverbial phrase:* The boys hav gone *to school.*

CONJUNCTIONS

Definition: A conjunction is a word tha connects words, phrases or clauses John *and* Mary; down the street *an* into the house she went; he came *bu* she did not see him.

Kinds: There are two kinds of conjunc tions, Co-ordinate and Subordinate.

Co-ordinate conjunctions connec words, phrases or clauses of equa rank: *and, likewise, also, however nevertheless, but, still, or* and th pairs *either* and *or, neither* and *nor*

Subordinate conjunctions connec clauses of unequal rank, that is, con nect a subordinate clause to a mai clause, for example:

Where, wherever, whence, whithe (indicating place)—Go *where* yo please.

When, whenever, while, until, be fore, after (indicating time)—I shal go *when* it is time.

As, how (indicating manner)—He plays the game *as* the rules require.

For, since, because (indicating cause)—He went *because* he was tol to.

So that, lest, in order that (indicat ing purpose)—I scolded him *in orde that* he might learn to obey.

If, unless, provided (indicating con dition)—*If* it rains, I shall not go.

Though, yet (indicating concession) —*Though* it seems unlikely, I believ it.

Than (indicating comparison)— John is taller *than* William.

Forms: Conjunctions are not inflected.

Syntax or Construction: Conjunction may be used to introduce noun, ad jective and adverbial clauses as wel as to connect words and phrases *Whatever was said* is all right (nou clause); He *who would succeed* mus work (adjective clause—usually in troduced by the relative pronouns) The carpenter works *when he feel like it* (adverbial clause).

INTERJECTIONS

Definition: An interjection is a wor used to express sudden or strong feeling: *Alas! Oh! Pshaw!*

Interjections have no division int kinds and forms, nor do they have an syntax or construction.

SENTENCE ANALYSIS

A sentence is a group of words ex pressing one complete thought. Ever sentence has two parts, a subject an a predicate. In the sentence, The city of Honolulu is warmed by the trade winds of the Pacific, *city* is the simple subject and *The city of Honolulu* is the complete subject. The simple predicate is *is warmed,* and the complete predicate is *is warmed b the trade winds of the Pacific.* The subject of a sentence is that abou which something is said. The predicate is that which says something about the subject. The main wor in the subject is a noun or pronoun the main part of the predicate is a verb or verb phrase. The simple subject or simple predicate and modifiers make the complete subject or the complete predicate. The word *substantive* is the name given to a noun or pronoun or to any word group that is used in place of a noun. This word group may be a noun clause, an infinitive or a participial phrase.

Phrases and Clauses.—A *phrase* is a group of words used as a single part of speech and that has neither subject nor predicate. It may be prepositional, as *of the house;* participial, as *having written a letter;* or infinitive, as *to go.* Any of these forms may be used as an adjective, an adverb or a noun; for example, *To suffer in silence* is the hardest test (infinitive phrase used as a noun); The boy *in the fifth seat* recited (prepositional phrase used an an adjective); They ran *to overtake us* (infinitive phrase used as an adverb).

A *clause* is a group of words that contains a subject and predicate. It is a *principal* clause if it is used to make a simple sentence or to help make a compound sentence or a complex sentence. Clauses may also be *subordinate.* Such clauses are used as nouns, adjectives or adverbs in complex sentences. *The lightning flashed and the thunder roared* is a compound sentence made up of two principal clauses. *That my friend has lost his watch is true* is a complex sentence that contains a subordinate clause used as subject of the principal clause. *The man who is honorable is respected* is a complex sentence made up of a principal clause, *The man is respected,* and a subordinate clause, *who is honorable,* used as an adjective.

Sentences containing but one subject and one predicate are called *simple* sentences: The man rode a horse. *Complex* sentences contain one principal clause and one or more subordinate clauses: I will come when he goes. *Compound* sentences are made up of two or more principal clauses: The rain fell and the game was stopped.

Sentences are also classified as: *Declarative,* if they merely state facts: James hurt his foot. *Interrogative,* if they ask questions: Will he come? *Exclamatory,* if they express sudden or strong emotion: Mary, come here at once! Alas, what a calamity!

The *analysis of a simple sentence* consists of finding the subject and predicate, telling the word and phrase modifiers of these elements and analyzing the phrases used as modifiers.

Beyond the other side of the garden I heard a loud noise. This is a simple, declarative sentence. The subject is *I,* without modifiers. The complete predicate is *heard a loud noise.* The verb is *heard;* the noun *noise* is the direct object of the verb and is modified by the article *a* and the adjective *loud.* The predicate verb is modified by the prepositional phrase *beyond the other side,* used adverbially. *Side* is the object of the preposition *beyond* and is modified by the article *the* and the adjective *other* and by the prepositional phrase *of the garden,* used adjectively. *Garden* is the object of the preposition *of* and is modified by the article *the.*

The analysis of a *complex sentence* consists of stating the kind of sentence, principal clauses, subordinate clauses (kinds, relation to the principal clause), complete and simple subjects of each principal clause, complete and simple predicates of each principal clause, phrases, word modifiers of each principal clause; subjects, predicates, phrases, word modifiers of each subordinate clause.

When he turned abruptly to his right, he saw the beautiful and imposing sunset.

This is a complex declarative sentence, consisting of one principal and one subordinate clause. The principal clause is *he saw the beautiful and imposing sunset.* The subordinate clause is *when he turned abruptly to his right.* This is an adverbial clause of time, modifying the verb *saw* in the principal clause. *When* is a conjunction connecting the subordinate with the principal clause.

The complete subject of the principal clause is *he. He* is also the simple subject. The complete predicate is *saw the beautiful and imposing sunset. Saw* is the simple predicate. *Sunset* is the direct object of the verb *saw. Beautiful* and *imposing* are adjectives modifying *sunset. And* is a conjunction connecting *beautiful* and *imposing.*

He is both the simple and complete subject of the subordinate clause. The complete predicate is *turned abruptly to his right. Turned* is the simple predicate. *Abruptly* is an adverb modifying *turned. To his right* is an adverbial phrase modifying *turned.*

The *analysis of the compound sentence* consists in finding the co-ordinate members and the conjunctions connecting them and in analyzing each co-ordinate member as a simple or a complex sentence.

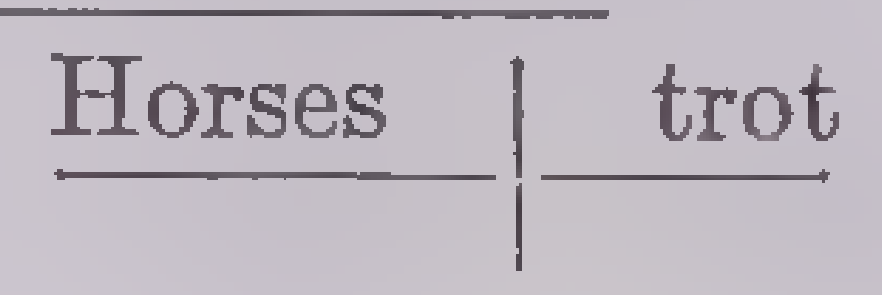
The leaves are falling, and the swallows will soon be gone. This is a compound declarative sentence. The first co-ordinate clause is *The leaves are falling;* the second co-ordinate clause is *the swallows will soon be gone. And* is the co-ordinate conjunction. *Leaves,* modified by the definite article *the,* is the simple subject, and *are falling* is the predicate. In the second clause *swallows,* modified by *the,* is the simple subject; and *will soon be gone* is the complete predicate. *Be gone* is modified by the adverb *soon.*

Parsing.—To parse[1] a sentence is to give each word in the sentence its classification as a part of speech and its form or inflection.

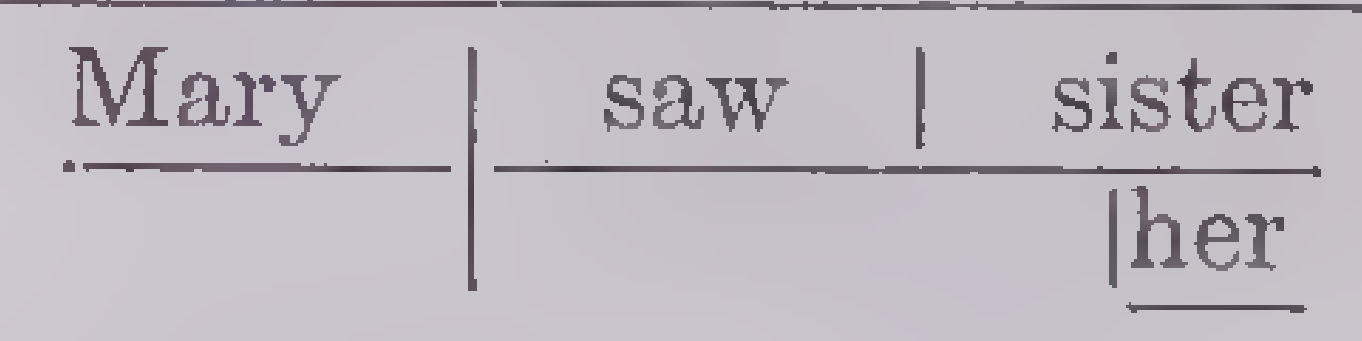
Turning abruptly to his right, he saw the beautiful and imposing sunset. *Turning*—verb, regular, intransitive, active, participle, present, modifies the subject *he. Abruptly*—adverb, manner, positive, modifies *turning. To*—preposition, simple, used in phrase *to his right,* modifying *turning. Right*—noun, common, third, singular, neuter, object of preposition *to. He*—pronoun, personal, agrees with antecedent (understood) in third, singular, masculine. *Saw*—verb, irregular, transitive, active, indicative, past, agrees with its subject *he* in third, singular, predicate of sentence. *Beautiful*—adjective, descriptive, positive, modifies the noun *sunset. And*—conjunction, co-ordinate, connects the two adjectives *beautiful* and *imposing.*

Diagrams.—Sometimes the relation of the parts of speech in sentences may be understood better by means of diagrams. Following are illustrations of simple forms of the diagram:

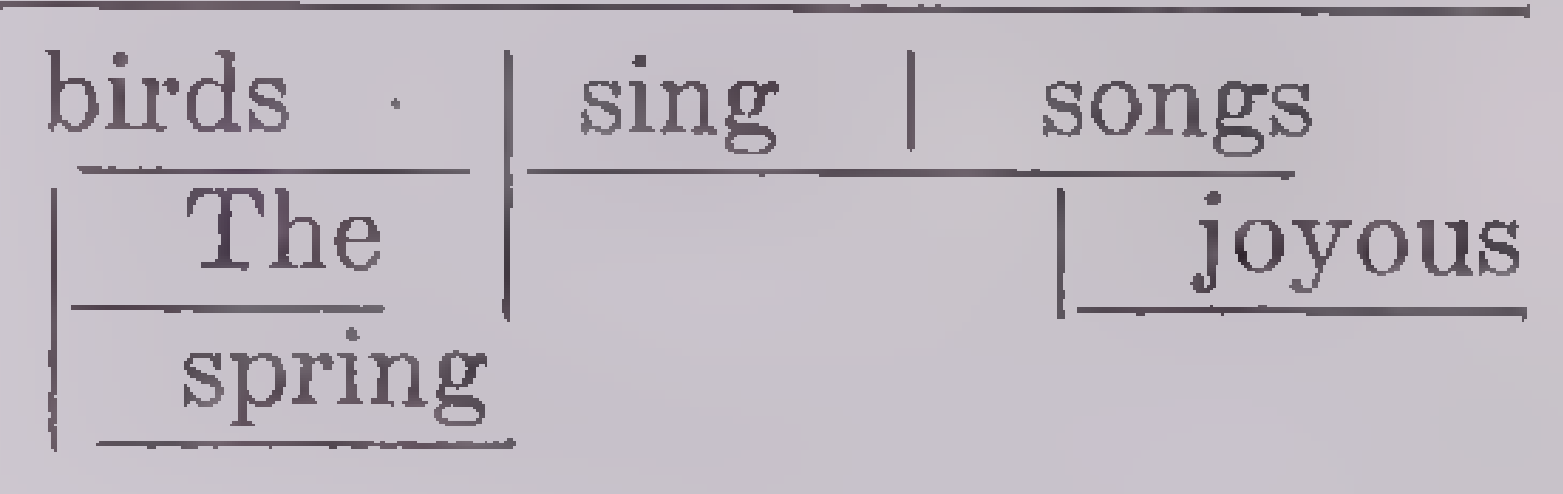
1. *Subject and predicate.*—



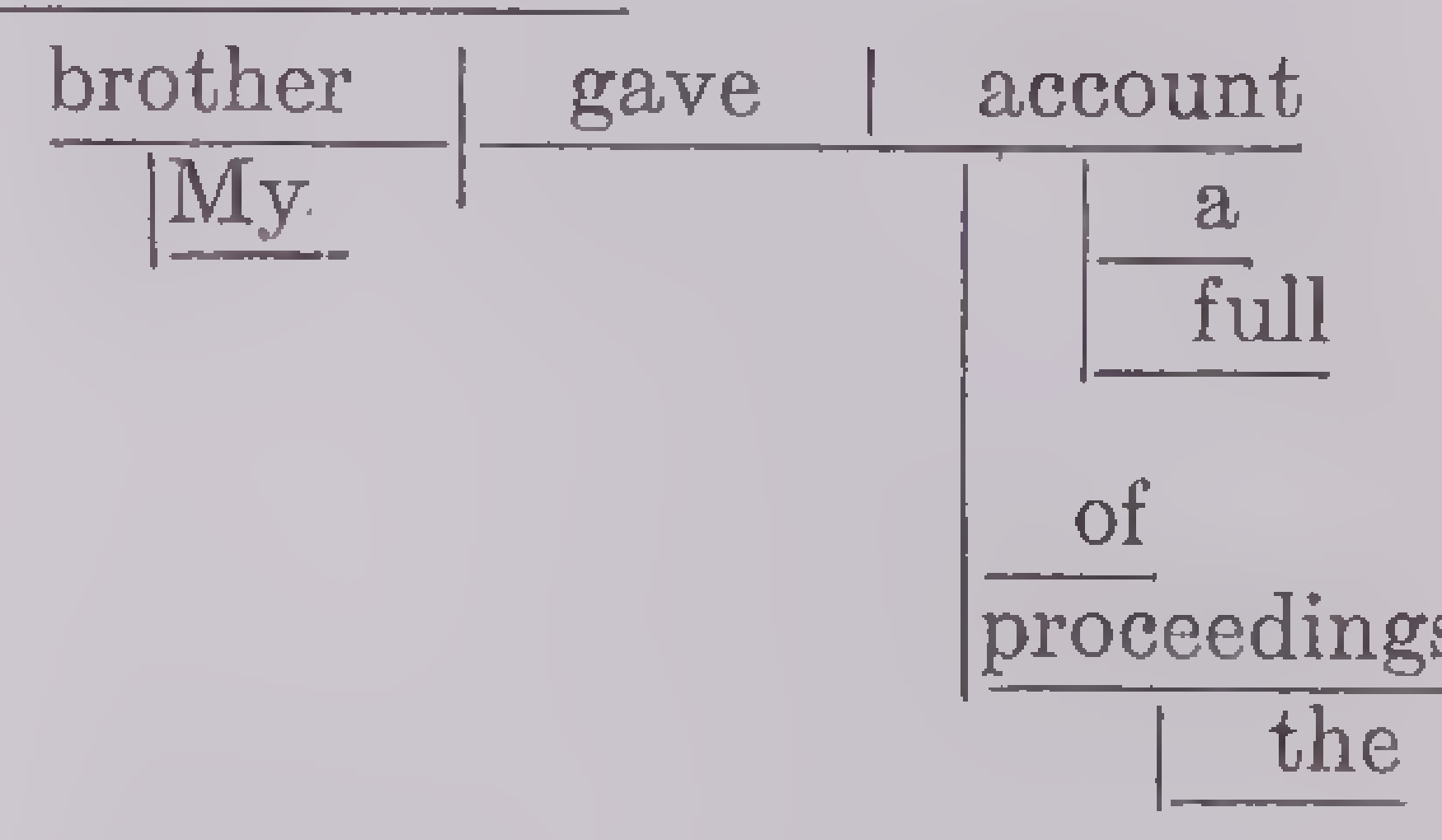
2. *Subject, predicate and direct object.*—



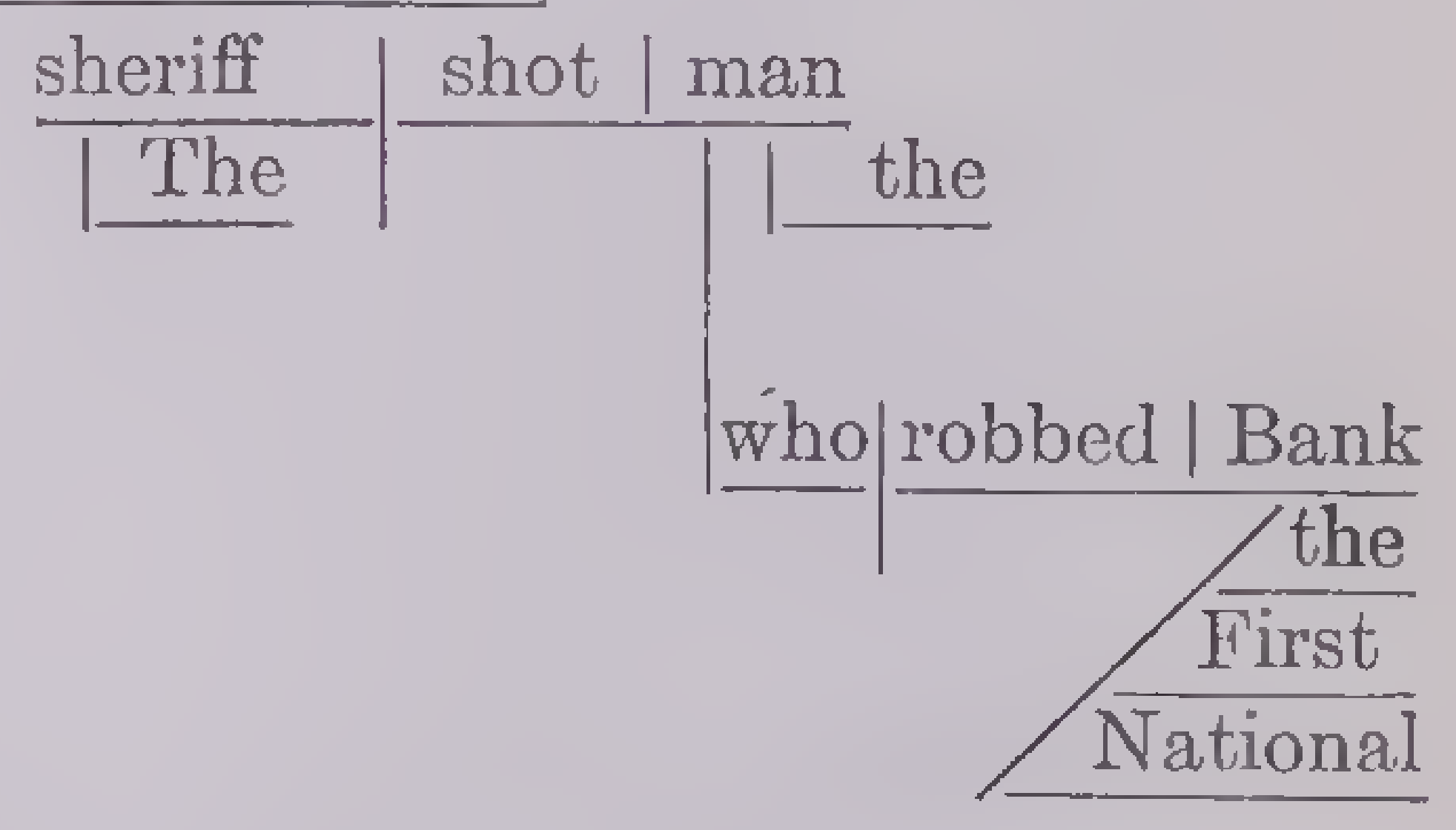
3. *Object complement and adjective.*—



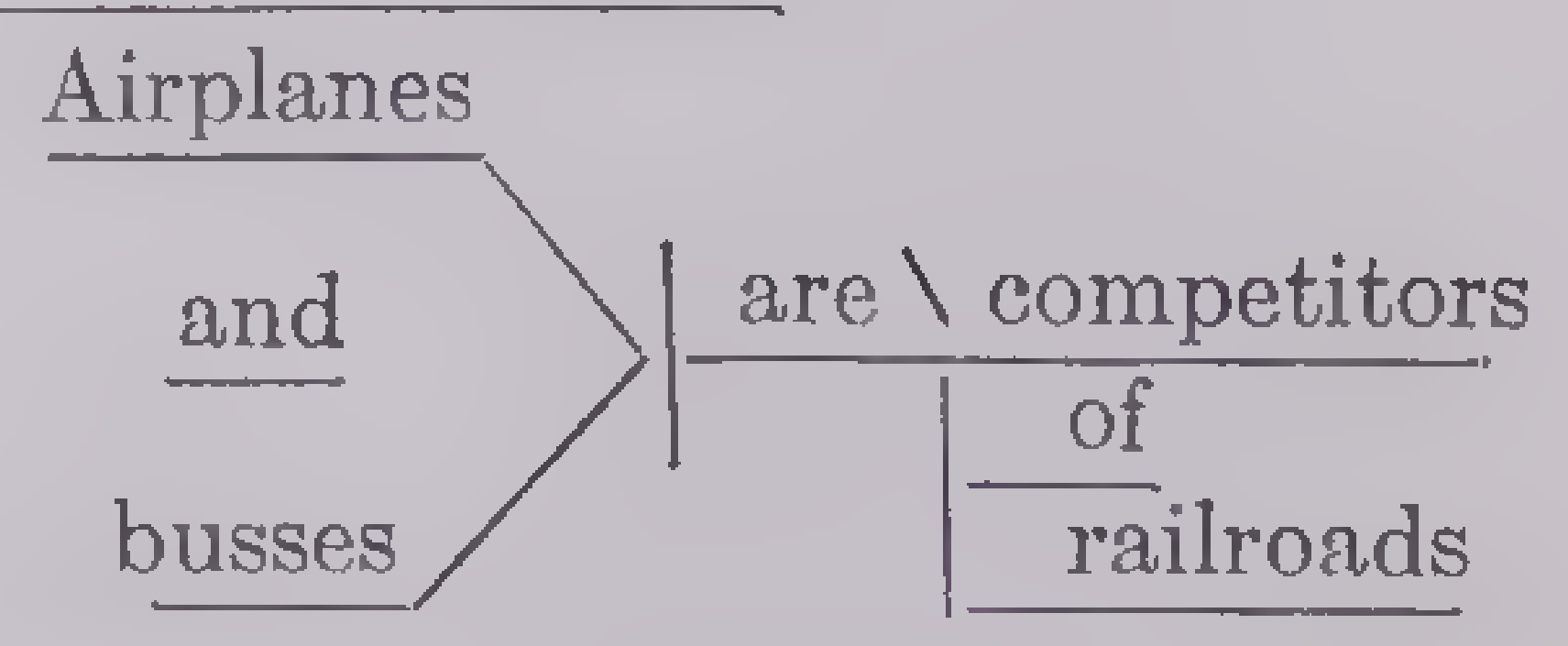
4. *Adjective phrase.*—



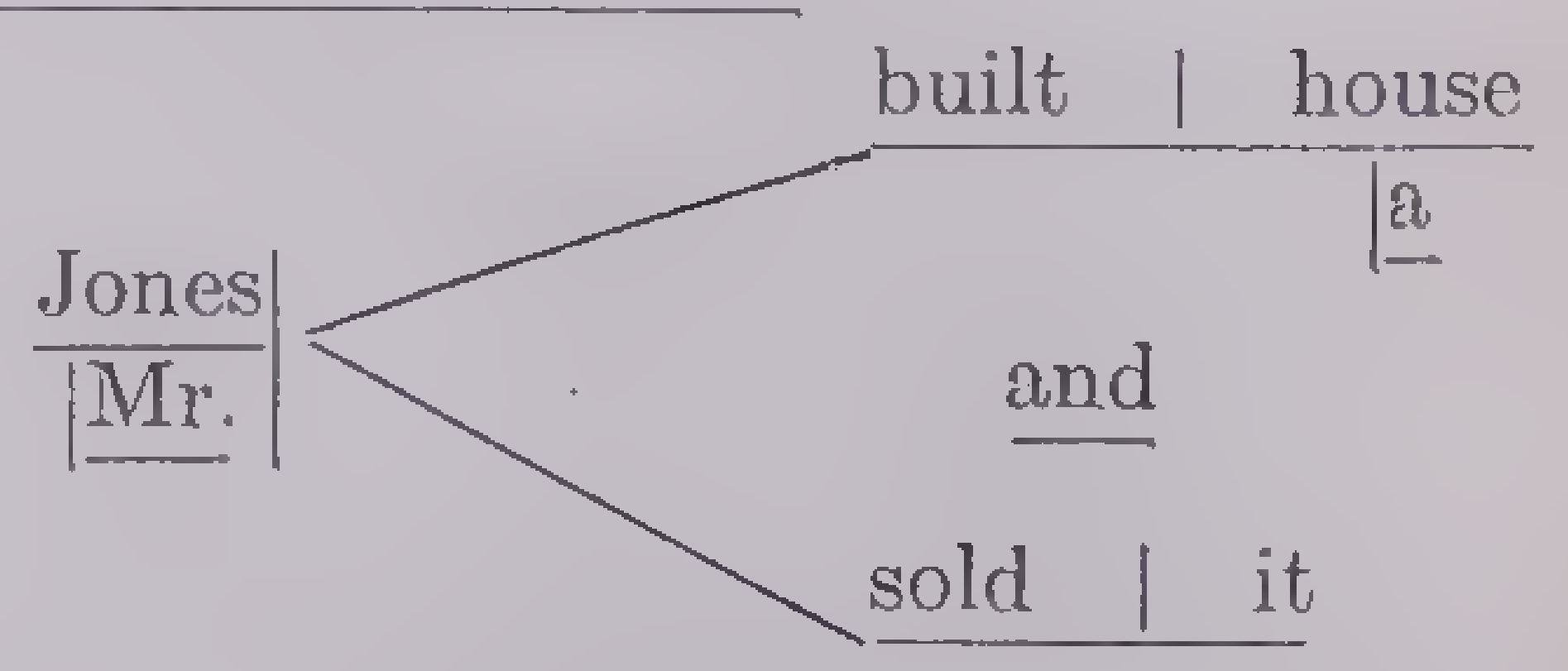
5. *Adjective clause.*—



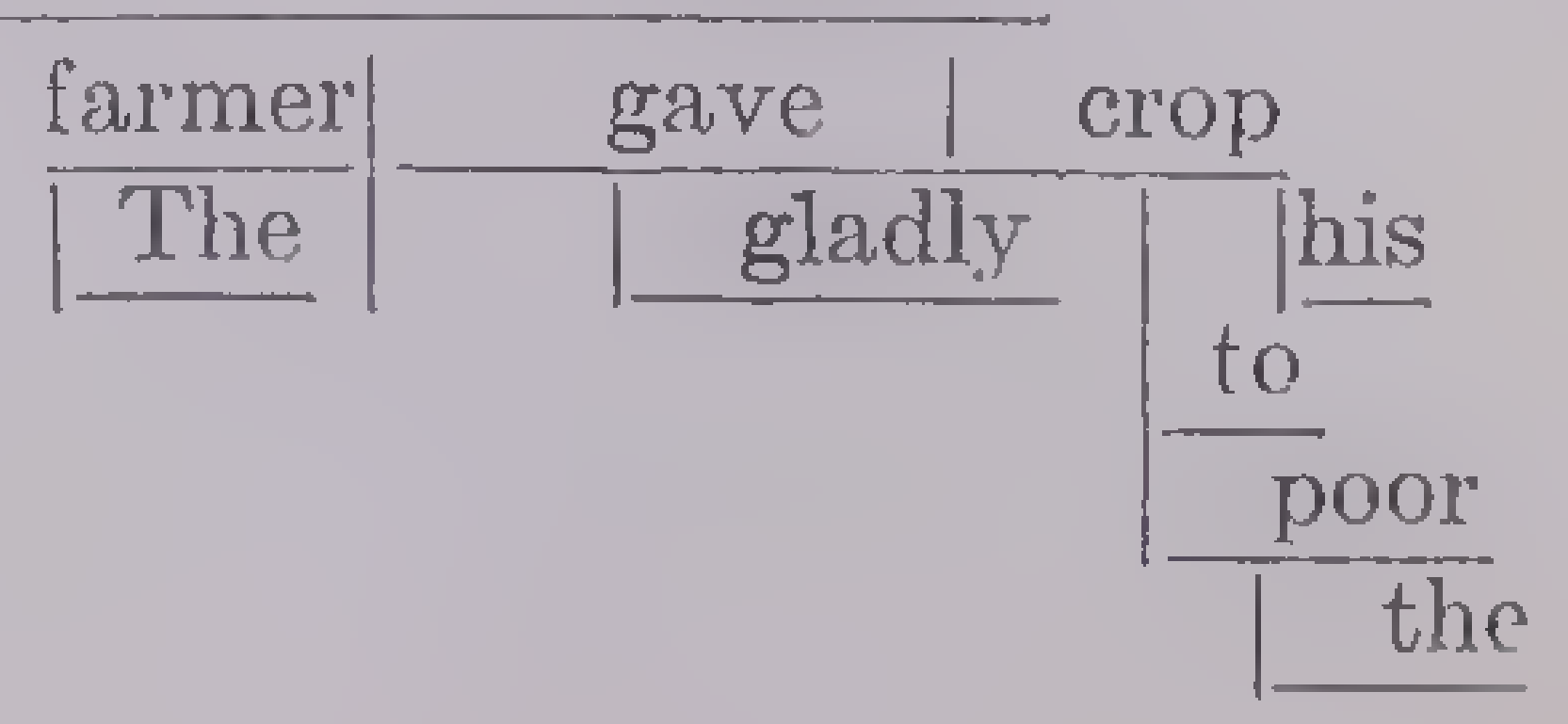
6. *Compound subject.*—



7. *Compound predicate.*—



8. *Indirect object and adverb.*—



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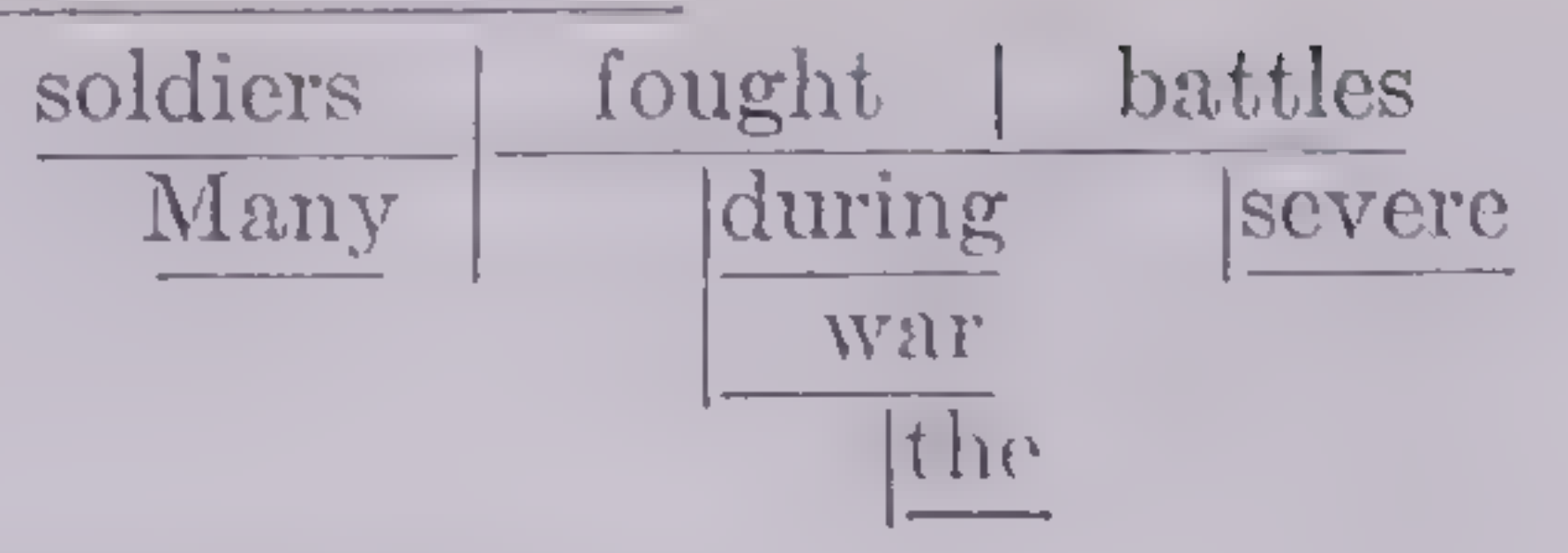
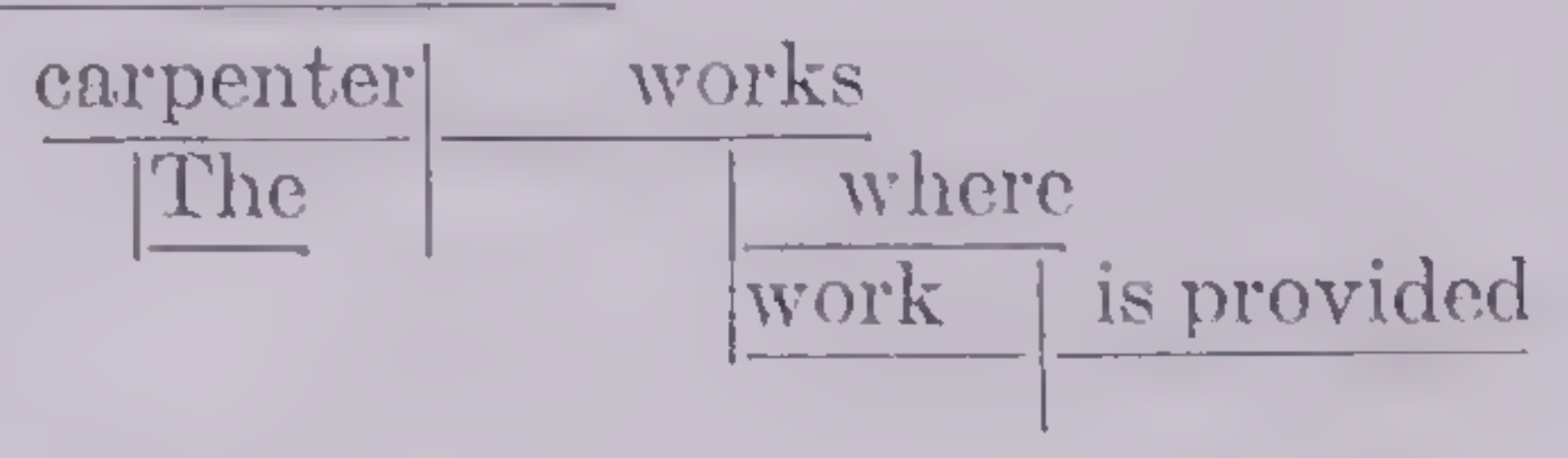
[1] To parse seems to have meant originally answering the question: "Quae pars orationis?" or the shorter form "Pars?" meaning "What part of speech?" Latin was long used in grammar classes—whether the language studied was Latin or English.

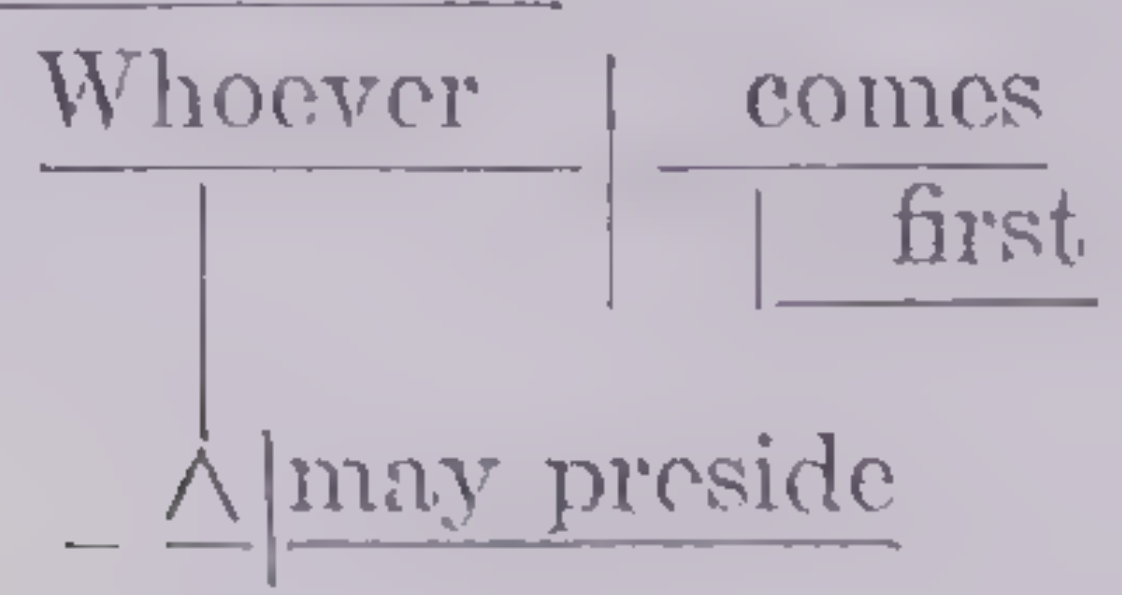
9. *Adverbial phrase.*—



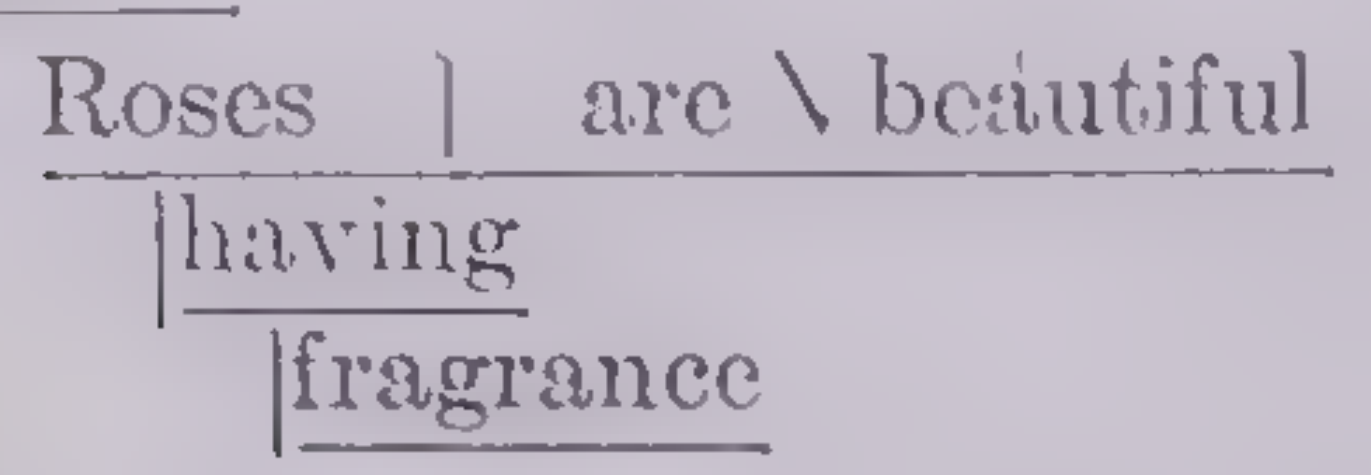
10. *Adverbial clause.*—



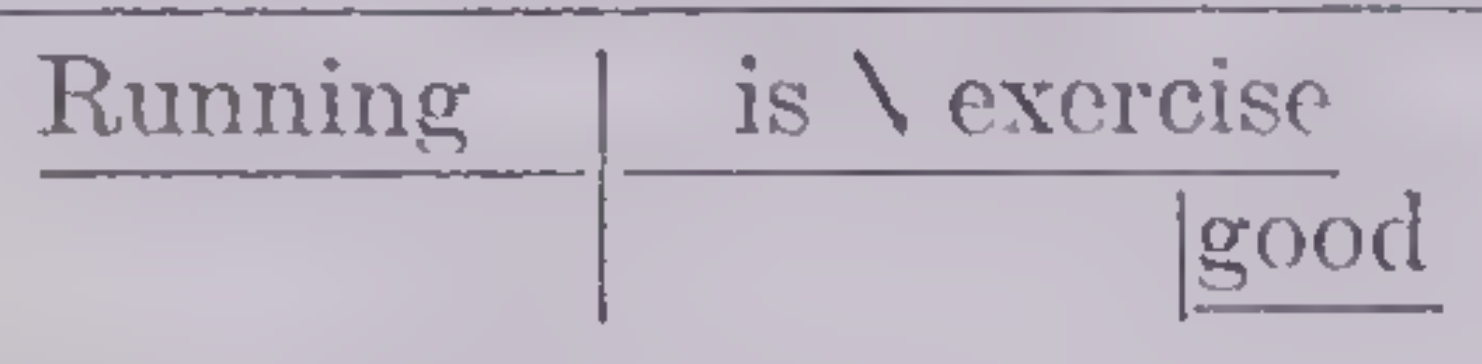
11. *Noun clause.*—



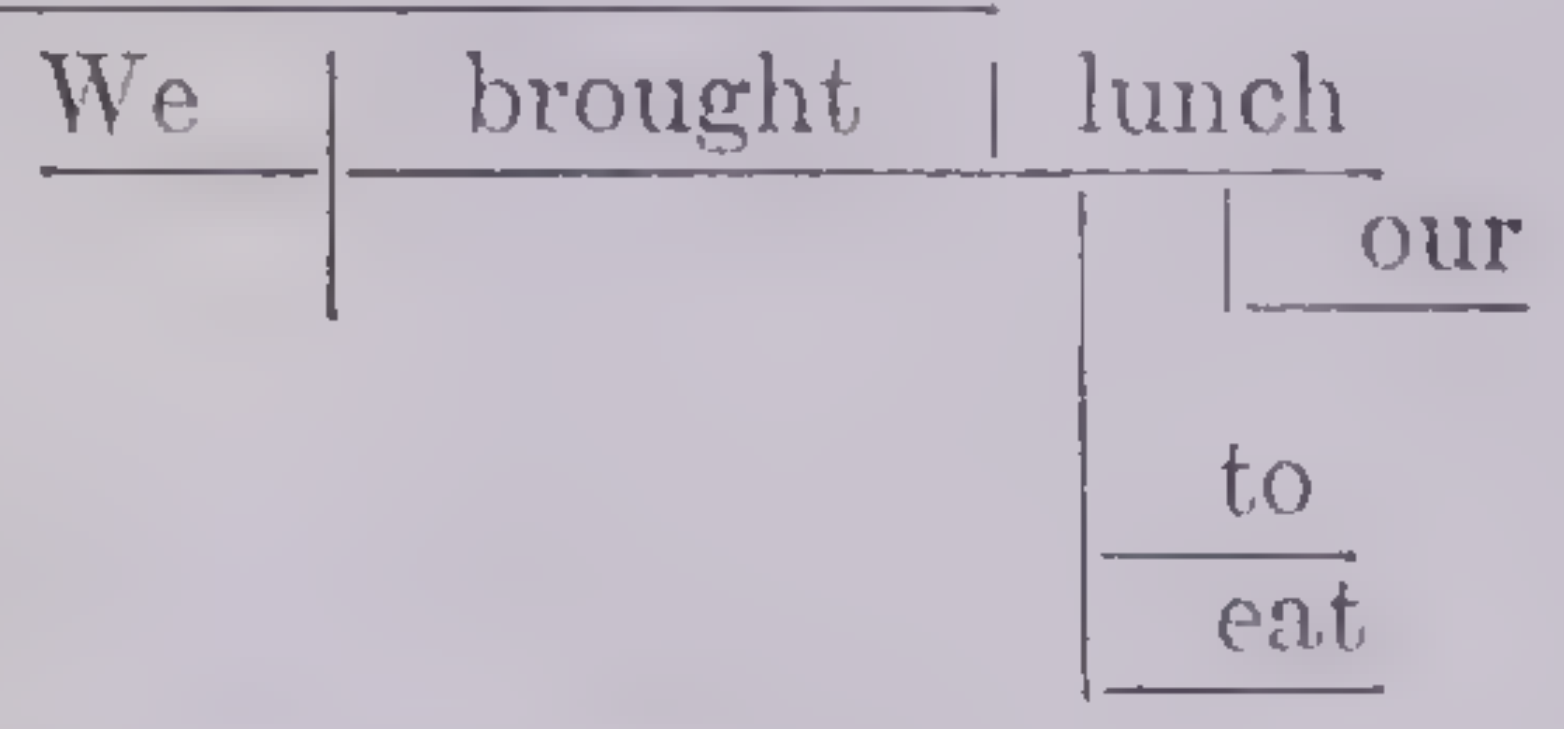
12. *Participle as adjective, and predicate adjective.*—



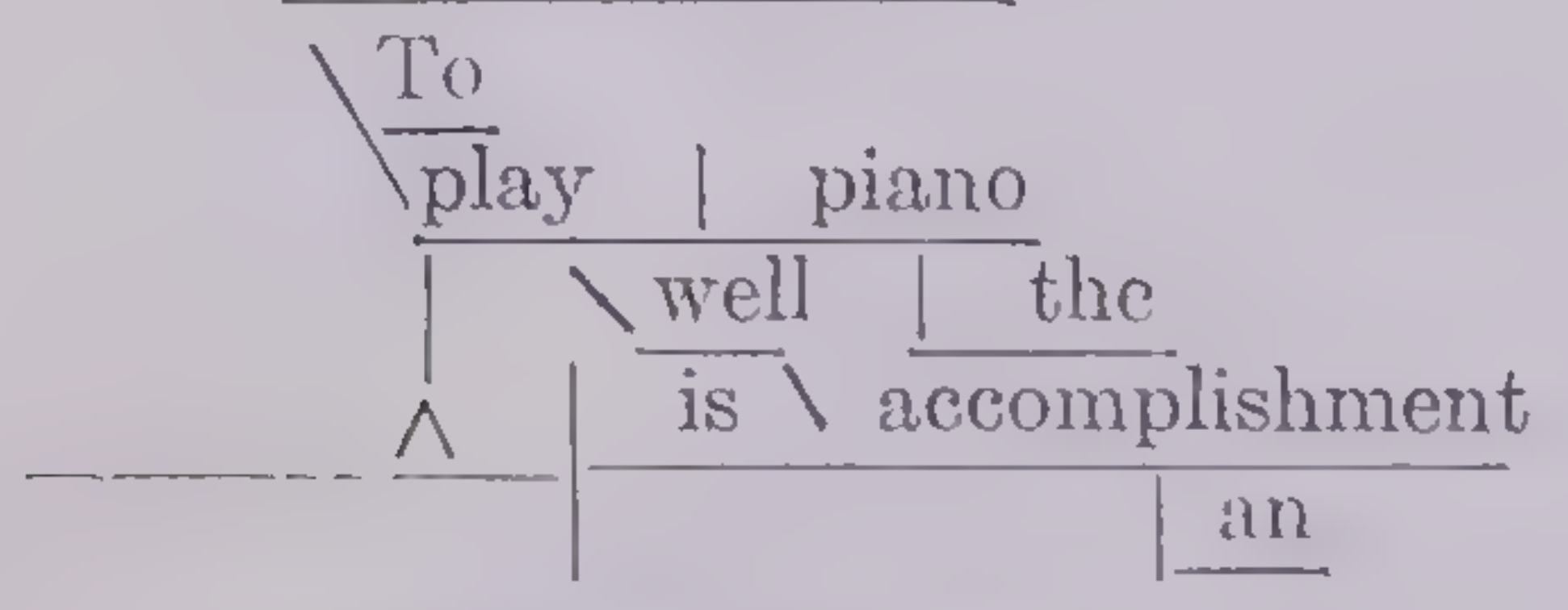
13. *Participle as noun, and predicate noun.*—



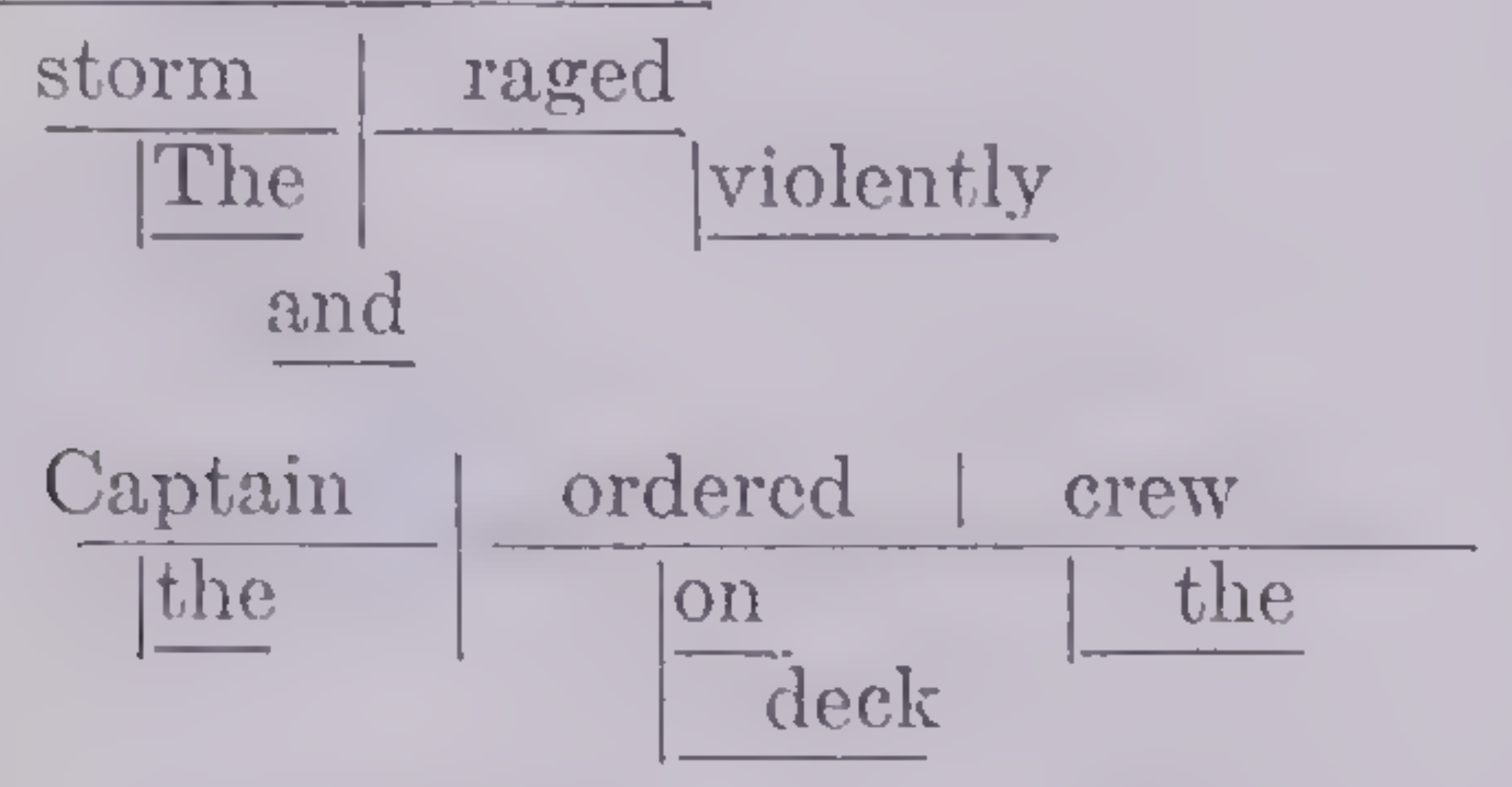
14. *Infinitive as adjective.*—



15. *Infinitive as noun.*—



16. *Compound sentence.*—



SUMMARY OF SYNTAX

Definitions, Uses, Formal Rules, Examples

(Rules are numbered for Reference.)

A *noun* is the name of a person, place, object or idea.

A *pronoun* is a word used in place of a noun.

Nouns and pronouns are called *substantives.*

1. The *subject* of a verb is in the *nominative case.*

Transitive verbs express action received by some person or thing.

2. The direct *object* of a transitive verb is in the *accusative* (*objective*) *case.*

Whom shall I fear?

3. Intransitive verbs are often followed by substantives that rename their subject. A substantive so used agrees in case with the subject to which it refers.

It is *I*. *Whom* do you take me to be?

A substantive that helps to complete a verb but renames the object of the verb is in the *accusative* (or *objective*) *case.*

The class elected him president.

4. The *object of a preposition* is in the *accusative* (or *objective*) *case.*

Give it to *me*. The cat is under the *stove*.

5. An indirect object is in the *accusative* (or *objective*) *case.* (Dative object.)

Bring *me* a chair.

Infinitives and participles do not really assert action or being, but they imply it, and in this sense may have subjects.

6. The subject of an infinitive is in the *accusative* (or *objective*) *case.*

She has *me* to protect her.

We thought *him to* be honest.

7. An appositive is a noun or pronoun used as explanatory of or equivalent to another noun or pronoun.

8. An appositive takes the case of the substantive to which it is attached.

The book was his, *Peter's*. (Possessive)

'Tis I, *Hamlet,* the *Dane*. (Nominative.)

Give it to me, your *brother*. (Accusative or objective.)

9. A noun or pronoun *independent by address* is in the *nominative case.* (Vocative.)

"Men of Athens,—Him declare I unto you."

"Mr. President, I rise to a point of order."

10. A noun or pronoun used *independently with a following adjective, adverb or phrase* may best be regarded as in the objective case, since it is virtually the object in a prepositional phrase from which the preposition is omitted.

Hat in hand, he stood waiting.

Beard unkempt, clothes threadbare, he looked down and out.

Fences down, weeds everywhere, the place was desolate.

11. Nouns or pronouns showing ownership are in the *genitive* (or *possessive*) *case.*

John's farm, *your* shoes.

12. When an inanimate thing is personified, the *gender* of its noun or pronoun is *determined by custom.*

She's a good old boat! (Feminine.)

The *sun* is hiding *his* head. (Masculine.)

13. *Collective nouns* are *plural* when their units act separately as individuals; *singular* when the units act together as one. *Plural titles* are in this sense *singular nouns.*

The class has had its picture taken. (All together.)

The class have had their pictures taken. (Each person by himself.)

The Newcomes is by Thackeray.

14. *Nouns used adverbially* to measure time or distance are in the *accusative* (or *objective*) *case.* (*Adverbial objective.*)

We walked an *hour,* traveled four *miles.*

15. A *substantive* used as an exclamation is commonly held to be *nominative.* But if the exclamation repeats an idea already used, it will take the case of the term repeated.

We shall be rich. We! think of that!

"We'll make you do it!" *Me!* I guess not!

16. A *pronoun* must agree with its antecedent in *number, gender* and *person.* Collective nouns take singular pronouns when the units act separately.

The Ship of State has refused to obey *her* rudder.

That is *he whom* you seek. (All three are in 3d person, masculine gender, singular number.)

The *case* of a pronoun does not depend upon its antecedent, but upon its use in the sentence.

A *verb* is a word which *asserts.* (Tells something of its subject.)

17. A verb agrees with its subject in person and number.

I *am*	She *goes*
You *are*	They *go*
He *is*	

18. A compound subject with *and* takes a singular verb if the idea of the combined subject is of *one* thing; if the compound subject is made of parts acting separately, the verb is *plural.*

Blaine and Cleveland *were* of opposing parties.

The sum and substance of the matter *is* this.

19. A *distributive* subject with *each, every, everyone, either, neither,* etc. requires a verb in the *singular:* a *disjunctive* subject with *either-or, neither-nor* takes a verb in the *singular* if the substantives are singular.

Either the book *or* the teacher *is* wrong.

Each of us must use *his* own judgment.

20. *Nouns plural in form* but singular in meaning commonly take a verb in the *singular.*

Hydraulics *is* a practical study nowadays.

Mumps *is* contagious.

The news *is* discouraging.

21. When the subject acts upon an object, the verb is in the *active voice.* When the subject is a receiver or product of action, the verb is *passive.*

The hunter *shot* the deer. (Active.)

The deer *was shot* by the hunter. (Passive.)

22. The *indicative mood* is used in questions and in simple assertions of facts or matter thought of as possible fact.

Were you there?

You *were* there.

If you *were* there, I did not see you.

(See subjunctive mood, rule 24.)

23. The *subjunctive mood* expresses a *wish,* or a *condition contrary to fact.*

Would he *were* here!

If he *were* here, we would know about it.

(Implying denial. He has not been here.)

24. The *imperative* mood states a *command* or request.

Please *go* at once.

The subject of an imperative verb is *you* understood; the you is seldom expressed, unless the mood is emphatic.

25. *Infinitives* may be used as *subject, object* of verb, *attribute complement, object of preposition, appositive, adjective modifier, adverbial modifier* or in an *independent phrase.*

26. Gerunds (verbal nouns in *ing*) have the *uses of nouns* together with the power of implying action, being or condition.

Examples have been given under *uses of Verbals.*

27. *Participles* may be used as *adjectives, adverbs, subjective complements, objective complements, following a preposition* or in *absolute phrases.*

28. The comparative degree of adjectives and adverbs, not the superlative degree, is used in comparing two persons or things.

He is the *taller* of the two; in fact, the tallest of the three.

29. A *co-ordinating conjunction* connects words, phrases or clauses of like rank, grammatically independent of each other.

I shall come if I can *and* if the weather is good.

30. A subordinate conjunction joins a dependent clause to a principal one.

Make hay *while* the sun shines.

31. Interjections commonly have no grammatical relations in the sentence. In certain constructions, however, the interjection seems to have a phrasal modifier.

"Ah! for the pirate's dream of fight!"

32. Verbs *become, feel, look, seem, smell, taste, sound, grow* take an *attribute complement* to describe the subject and an adverb to modify the assertion of the verb.

He grew *tall:* poisonous mushrooms taste *good.*

"He looks *well*" may describe his own condition, and so the word *well* may be a predicate adjective relating to the subject; or the sentence may mean that he *searches thoroughly,* in which sense *well* is an *adverb* modifying looks.

33. Assertions of Simple Futurity take the form.

I, we	shall
You	will
He, they	will

Assertions of Strong Purpose, Promise, Threat, Consent

I, we	will
You	shall
He, they	shall

34. Adjectives should not take the place of adverbs, nor adverbs the place of adjectives.

35. The six tenses of English verbs in the Active Voice, Indicative Mood, are built up from the *principal parts* as follows:

Present Tense, Past Tense as in *Principal Parts. Future Tense, shall* or *will* (Rule 34) with *Present Infinitive* (less "to").

Present Perfect, have or *has* with *Past Participle Past Perfect, had* with *Past Participle.*

Future Perfect, shall or *will* (Rule 34) with *Present* Perfect, the *have* form.

36. The six tenses of English verbs in the Passive Voice, Indicative Mood, invariably use the past participle of the given verb, preceded by an appropriate form of the verb *be.*

37. *Gerunds,* being verbal nouns, are modified by *adjectives* and *possessive pronouns.*

Now do it without *my* (not me) watching you.

Common Errors in Syntax.—(Numbers refer to rules in the preceding summary. Correct forms are given first.)

This is the *better* of the two—not this is the *best* of the two. (28)

You and *I* did it—not *you* and *me* did it, nor *me* and *you.* (1)

We boys will be there—not *us* boys will be there. (1)

It was *I, she, he, they*—not *me, her, him, them.* (2)

We believed it to be *her, him, them*—not *she, he, they.* (3)

Between you and *me*—not between you and *I.* (4)

She is taller than *I* (am)—not she is taller than *me.* (1)

It was known to be *he*—not *him.* (3) *He* agrees with *it.*

Let *everybody bring his* own lunch—not *their* own. (13) (16)

We should all bring *our* lunches. (Action concerted.) (16)

Every boy and girl should do *his* best. (16) *Their* would be incorrect.

Each of us *has his* problems—not *have their.*

The actor *whom* you saw was Otis Skinner—not *who.* (2)

Whom did you call for?—not *who.* (4)

Whom did you select?—not *who.* (2)

Who do you suppose it is? (3) *Who* agrees with *it.*

Who do you think I am?—not *whom.* Agrees with *I.*

Whom did you take me to be? (3) *Whom* agrees with *me.*

The tree looks *beautiful*—not *beautifully.* (32)

The apple tastes *good*—not *well.* (32)

The tune sounds *harsh.* (32)

Roses smell *sweet*—not *sweetly.* (32)

She looks *charming*—not *charmingly.* (32)

We *shall* be drowned if we go there—not *we will be.* (33)

I *shall* be pleased to help you—not *will* be. (33)

The senate *has* adjourned—not *have* adjourned. (13)

There *are* all sorts of graft in town—not there *is* all sorts. (17)

Here *are* wealth and beauty—not here *is.* (17)

Neither of the men *shows* signs of giving in—not neither *show.* (17)

In both cases, there *are* bad birth and misfortune—not there *is.* (17)

One class of poets *believes* in symbolism—not *believe.* (17)

He is one of the best *actors that have* ever been here—not *has.* (16) (17)

Let *him* who will come—not let *he.* (2).

I *saw*—not I *seen.* (35)

I *did*—not I *done.* (35)

We *have gone*—not *have went.* (35)

We *were*—not we *was.* (17)

You *began* it—not you *begun* it. (35)

The wind *blew*—not the wind blowed. (35)

The glass is *broken*—not *broke.* (35)

We *have come*—not *have came.* (35)

He *has drunk* a glassful—not *has drank.* (35)

I've *forgotten*—not *forgot.* (35)

Have *spoken*—not have *spoke.* (35)

Somebody *has stolen* my hat—not has *stole.* (36)

Say it *slowly*—not *slow.* (32)

We can do that as *easily* as you please—not as *easy.* (32)

We chose the foreman *who* we thought could handle the men—not *whom.* (1)

Now skate without *my* helping you—not *me* helping. (37)

We ought to keep still about *his* being here—not *him* being. (37)

PUNCTUATION

Definition.—The word *punctuation* is derived from the Latin, *punctum,* a point. Punctuation originally consisted only of dots or points and still means marking with points. Internal punctuation separates words, phrases and clauses according to their interrelations and their meaning, which may be completely altered by inserting a mere comma. External punctuation separates the sentences themselves: with a period (.) after a declarative sentence; a question mark (?) after an interrogation; an exclamation point (!) after an exclamatory sentence; and a colon (:) after a transitional sentence.

Origin and Development.—Ancient Greek inscriptions were in continuous lines without punctuation and without spacing between the words. Points were first introduced to indicate the major pauses; but as early manuscript books were read mostly by scholars, punctuation was considered almost unnecessary.

The first system of very simple pointing by dots or tiny circles came into use in Alexandria in the 4th century B.C. The grammarian Aristarchus (d. *c.* 150 B.C.) amplified the meaning of the single dot by varying its position, placing it high to serve as a full stop; midway with the line for a slight pause (subsequently indicated by the comma); and low on the line for a semistop.

The introduction and spread of printing necessitated an accurate and more extended arrangement of arbitrary signs of punctuation. The famous Italian printer, Aldus Manutius (1450–1515) of Venice perfected for use in printing a system of pointing practically the same as we use today. The art of printing multiplied the number of readers, and those with little education were helped to quicker understanding of the printed page by careful punctuation.

Double punctuation or the use of two points together (such as the period, colon or comma with the dash or parentheses) was long practiced but is now avoided except in certain instances with the second of a pair of dashes or parentheses. The period and dash are still used together following a paragraph heading and between a quotation and its source (on the same line):

Ancient Egyptian Culture.—The tombs of the kings . . .

Life is real, life is earnest.—LONGFELLOW.

Two Styles in Modern Pointing.—Punctuation may be *close* and stiff, with points inserted wherever possible; or it may be *open* and easy with only the points necessary for clarity. Open punctuation is now considered the best usage, though in textbooks, laws and technical matter there is still a tendency to use many points. Close punctuation was governed by rhetoric; points were used according to natural pauses. Open punctuation is mostly grammatical to emphasize sentence structure and meaning. The rules that are given here are illustrated by examples of the correct use of punctuation.

The Period

Use the period or full stop—

After sentences other than direct questions and exclamations.

He asked what I intended to do. (The indirect question is never followed by a question mark.)

After most abbreviations.

The contract between Mrs. Harriet Blank and Mr. Henry Block, entered into Jan. 10, 1940, in Los Angeles, Calif., will expire at the end of a year.

After Roman numerals used to enumerate.

I. Addition.
II. Subtraction

Between a whole number and a decimal.

The increase was 2.5 times what it was last year.

In a series of three to indicate an ellipsis.

This book, . . . widely discussed, is ultramodern.

In a series of four (suspension periods) after an unfinished sentence.

"Wait a moment so I may. . . . " She collapsed before she could complete the sentence.

Through a full line to indicate the omission of a line, paragraph or stanza.

"My country 'tis of thee
. . . .
Of thee I sing."

In close succession (leaders) connecting items with their prices in a statement or in tabular matter.

2 Dining chairs.. $15.00
4 Cushions.. 12.50

Do not use a period—

After most contractions (as distinct from abbreviations).

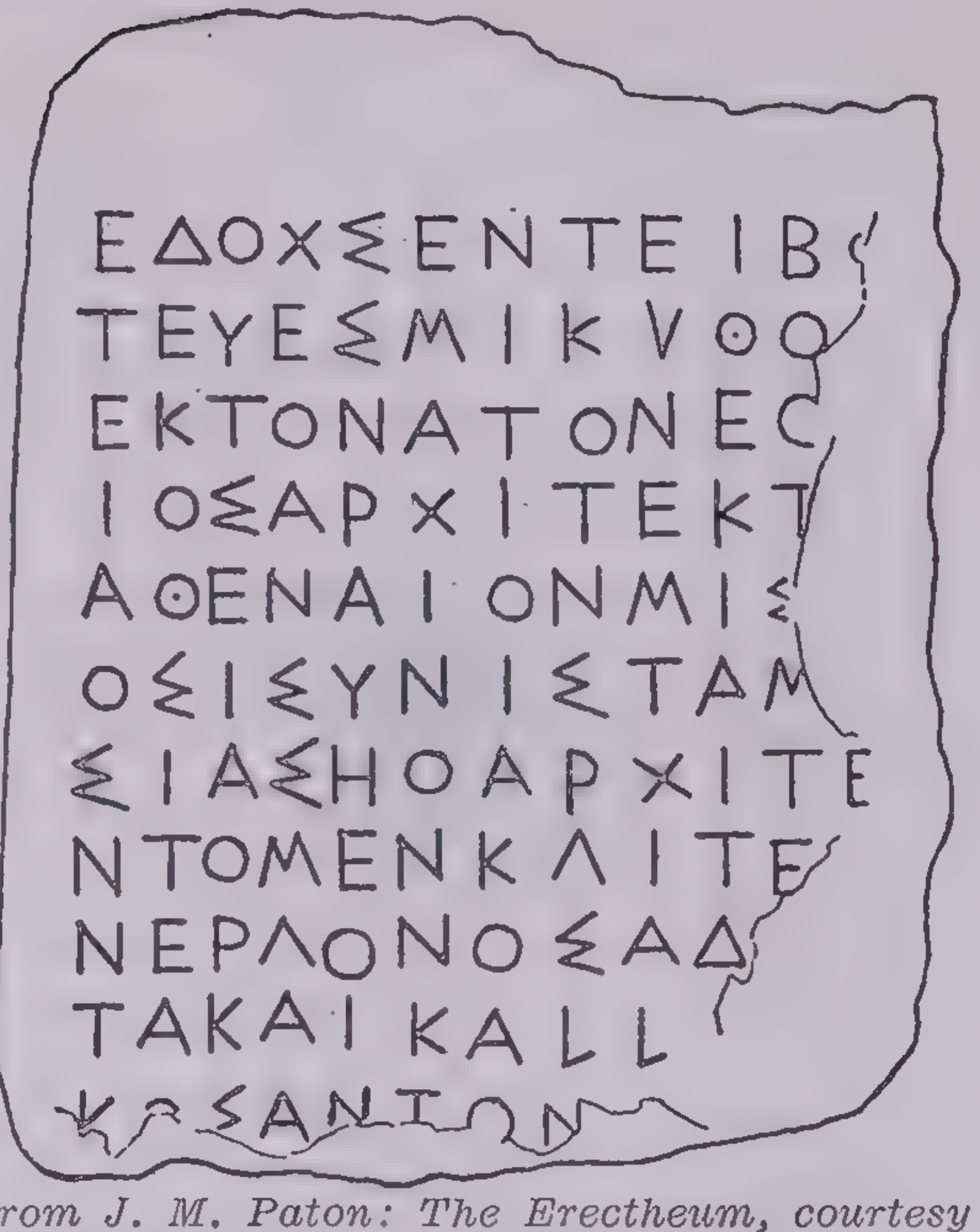
Special classes meet on the 2d and 4th Tuesdays. Rob't Andrews, Sec'y, spoke.

After the abbreviation *cent* for centum.

The bank paid 3 per cent interest.

After chemical symbols.

Water, H_2O, occurs frequently in chemical compounds.



From J. M. Paton: The Erectheum, courtesy Harvard University Press

Greek Inscription

This stone, which formed part of a building commission's report in 409 B.C., shows words run together without punctuation

After Roman numerals that do not enumerate.

The Louis XIV period is described in Vol. IV, *The History of Furniture.*

After book sizes.

The publisher decided upon 8vo for one book and 4to for the other.

In display headlines or titles.

THE PRACTICE OF TYPOGRAPHY

After a signature in a letter.

Sincerely yours,
Margaret Manners

After items in lists.

We send you the following goods—
3 Pairs of gloves
2 Felt hats
12 Turnover collars

Interrogation Point

Use the question mark—

After a direct question.

(1) What would you have me say in reply?

(2) Did prohibition prohibit? was the debated question.

(3) The topic discussed was: Who will be the next president?

After an uncertain date.

The Italian, Cristoforo Columbo (1446?–1506), we call Christopher Columbus.

In parentheses after a word or phrase to express doubt of the accuracy of the term.

His accomplishment (?) was the ability to move his ears voluntarily.

Do not use a question mark—

After an indirect question.

He inquired whether I wished to go.

After an interrogative sentence expressing a request.

Will you please let us know immediately.

Exclamation Point

Use an exclamation point—

After expressions of surprise, alarm, appeal, command or other strong emotion.

O Jane! how could you!
Fire! fire! the house is on fire!
Help! help! I am sinking!
Awake! arise! flee to save yourselves!
Bravo! Encore!

NOTE: In Spanish, inverted interrogation or exclamation points precede such sentences and the regular points follow them.

Do not use the exclamation point—

Too freely, as repeated exclamations weaken the effect.

After the vocative *O*. (It is not separated by any point from the word that follows it.)

O Lord, Thy will be done.

Quotation Marks

Use double quotation marks (" ")—

To enclose a short direct quotation (borrowed expression).

"Give me liberty; or give me death."

At the beginning of all paragraphs and also at the close of the final paragraph of a long quotation in text type. (Quotation marks are not used if the quoted matter is set in smaller type.)

"It is a foul to strike a ball with both hands or to touch the ball twice in one attempt at batting.

"Since only the server can score, fouls by the hand-in forfeit the ball, while fouls by the hand-out score for the server.

"The officials of handball are a referee and a scorer."

For the titles of poems, ballads, hymns and short stories. For the names of ships, either double quotation marks or italics may be used.

"The Raven"
"Drink To Me Only with Thine Eyes"
"The Black Cat"
"Lead, Kindly Light"
"The Queen Mary" or *The Queen Mary*

Use single quotation marks (' ')—

To enclose a quotation within a quotation.

"Lives there a man with soul so dead
Who never to himself hath said,
'This is my own, my native land!'?"

Do not use quotation marks—

For Bible excerpts.

Thy rod and thy staff, they comfort me.

For adages or proverbs.

A stitch in time saves nine.

In Foreign Composition.—In both French and Spanish, instead of our regulation quotation marks, guillemets (« ») are used; they are centered on the line and separated by a space from the words following the first pair and preceding the last.

« *D'abord il faut faire quelques achats* », *répondait la femme.*

« *Nuestro grupo de románticos—dice—, aunque leyera y estudiara asiduamente* . . . »

In German the first pair of quotation marks are a pair of normal commas on the line, and the closing marks are inverted commas superior to the line.

Der Mann ſagte: „Geſtern im Theater ſah ich ein gutes Drama.“

The Colon

Use a colon—

After a transition preceding explanatory, defining and enumerating expressions.

Among those who attended the function were the following: Senators Brown and White, General Jones, the Reverend Mr. Wright and members of the local press.

After the salutation in a letter.

My dear Mr. White:

After a word introducing a long quotation.

In his *Origin of the Species*, Darwin says: In the future I see open fields for far more important researches. Psychology will be securely based on the foundation already well laid by Mr. Herbert Spencer, that of the necessary acquirement of each mental power and capacity by gradation. Much light will be thrown on the origin of man and his history.

Between figures indicating chapter and verse in a biblical quotation.

He quoted John 3:16.

Between figures expressing time in hours and minutes.

The appointment is for 4:15 P.M.

Between numbers of volume and page in references so cited.

The article appeared in *Harper's*, 15:129.

Do not use a colon—

After such introductory words as *namely* and *for instance* (use a comma).

(1) His suggestion, namely, to go abroad, was most welcome.

(2) Different methods were established; for instance, that of rating students by intelligence tests.

The Semicolon

Use a semicolon—

To separate independent clauses without a conjunction.

Elizabeth insisted; her husband agreed.

To separate long co-ordinate clauses that include commas or have a conjunctive adverb.

The argument began quietly; but it soon reached a point, though with no such intention on the speaker's part, where many in the audience were rising in excitement; consequently the problem was to calm the disturbance.

To separate phrases and clauses introduced by a colon.

The rise in the city's population is shown by these figures: 1936, 459,763; 1938, 601,356.

To separate items in lists or references for which the comma is insufficient for clarity.

Atlantic Monthly, XI, 3–7; XV, 56.

Before the introductory phrases *that is, for example, for instance, to wit.*

A local advantage was extensively advertised by the Chamber of Commerce; that is, the abundance of iodine in the garden vegetables of the region, said to benefit the health of consumers.

The Comma

Use the comma—

Between words, phrases or clauses in place of a connective.

They bought apples, peaches, plums and pears.

In school, in college and in business gracious manners to all alike reveal good breeding.

The boys ran, the girls followed.

The rich and the poor, the high and the low, the well and the sick, received courteous consideration.

Red, green, blue or yellow may be used for the markers.

Between antithetical clauses.

The higher the altitude, the lower the temperature.

Between proper names of different persons.

For Robert, John obtained numerous favors.

Between unrelated numbers.

In 1938, 75 students won scholarships there.

Between the hundreds, thousands and so on in numbers having more than three digits.

1,500; 5,908,762.

Between words repeated for emphasis.

Realization of his hopes now seemed close, close at hand.

Between the parts of an inverted name in a bibliography or list.

Whittier, John

Between the parts of a date line.

Wednesday, June 23, 1940.

Between the two words where an ellipsis occurs.

Coffee needs cream; tea, lemon.

After the mild interjection *Oh.*

Oh, I wish I were in a sunnier clime.

After a conditional, temporal or other dependent clause that precedes the main clause.

(1) If you will come, we shall be glad to see you.

(2) When he heard the doctor's words, he became hopeful of recovery.

(3) As you cannot be induced to break the contract, nothing is to be gained by further discussion.

After an inverted expression.

What we see, we believe.

After a participial or absolute phrase.

Being without funds, he could not complete the course.

After an expression that otherwise would cause ambiguity.

Some time before, she applied for the position.

After the complimentary closing in a letter.

Cordially yours,
James Sutter

Before titles or their abbreviations following personal names.

Don Macarthur, Esquire; Upton Simms, Ph. D.

Before the connective in a compound sentence in which the subject changes in the second clause.

She conceded the point, and he knew she was right.

Before a short direct quotation.

The professor said, "Psychology should be applied in business and social contacts."

Before and after a nonrestrictive phrase or clause.

(1) The watchman, asleep in his chair, was unaware of the intruder.

(2) The driver, who was not licensed, caused an accident.

Before and after a word or phrase contrasted with what immediately precedes.

Honor, not gain, should be the first consideration.

Before and after a parenthetical word, phrase or clause.

(1) They decided, however, to continue the journey.

(2) His record, in general, received approval.

(3) Business integrity, as you will soon realize, is a valuable asset.

Before and after an appositive.

Miss Holmes, the teacher, was highly recommended.

Before and after a vocative.

To be sure, Edith, you are free to go.

Do not use a comma—

In page numbers of more than three figures:

The definition is on page 2569 in *Webster's Dictionary.*

Between figures expressing units of weights and measures.

The purchase included 2 lb. 8 oz. of glue and a dresser 2 ft. 5 in. high; delivery was made 3 hr. 15 min. after the sale.

Between figures designating a year.

Egypt had a great civilization as early as 5000 B.C.

Between two adjectives modifying each other and a noun.

She wore a brilliant blue costume.

Before *and* or *or* in series.

Her mother chose her wardrobe, books and associates.

Between appositive nouns the first of which is common, the second proper.

The scientist Einstein came to live in America.

The play *Abie's Irish Rose* ran for years.

NOTE: If the order is reversed, commas are used before and after the second noun (*see above*).

After a main clause followed by an adverbial clause completing the meaning.

She was happy because her lover had come back.

After introductory adverbs or adverbial phrases.

Undoubtedly he was mistaken in his estimate of many of his contemporaries.

Before or after a restrictive clause.

The man who would believe that is certainly a fool.

NOTE: *In close punctuation* (as distinct from the open style) *the comma is used—*

Before *and* or *or* in series.

(1) They selected roses, tulips, and hyacinths for the garden.

(2) John's gift was to be books, a radio, or a bicycle.

After an introductory adverb or adverbial phrase.

Inexorably, time and the law effected his removal.

To separate an independent clause used as subject or as predicate.

(1) Whatever is, is right.

(2) The principle recommendation is, the firm is reliable.

The Dash

Use a pair of dashes—

To set off an abrupt break in thought or construction.

If he must know—although nothing will be gained by it—then tell him.

To set off explanatory terms or phrases.

Edison's inventions—the electric light, the phonograph, a cooling system and numerous other inventions—were revolutionizing.

Use a single dash—

Before a final summarizing.

Subtle qualities of mind, appreciation of the finest shades of color, variations of form and expression and keen susceptibilities—these abilities made him an artist of the first order.

Before the source of a quotation.

Life is real, life is earnest.—LONGFELLOW.

Before an anticlimax, a climax or any surprise.

"Die and endow a college—or a cat."

Between a run-in question and answer.

Q. Were you present?—A. Yes, I was there.

Between the year of one date and the month of a succeeding date:

August 9, 1939—March 2, 1940.

Instead of repeating the name of an author in an index or a bibliography.

Wells, H.G., *The Outline of History*, 250
—, *Mr. Britling Sees It Through*, 252

After a side heading.

THE BABYLONIANS.—Their architecture reveals. . . .

To indicate an uncompleted word or sentence.

He supplied the ending of the word *ho*— in the game.

"Come here, Honoré, why—" She did not finish speaking.

To indicate time as continuing (after a given date).

Statistics, 1937—, are now available.

To indicate the omission of *to* between months or years or between page numbers (in these instances, the shorter dash is used).

May–September, 1939 (but, *From* May *to* September, 1939).

The subject is explained on pp. 7–10.

To indicate the omission of hundreds in consecutive years or page numbers.

He was in college 1936-38 but did not return.

Look up the references on pp. 103–9; 211–16.

Parentheses

Use a pair of parentheses to enclose—

An interpolated phrase when the break in the sentence structure is very definite.

The change voted (not unanimously) will soon be effective.

Explanatory phrases in court examinations and similar proceedings.

District attorney (to the witness):

Q. Have you seen this before (holding up Exhibit A)?

A. (After examining the object) I think—

Counsel for the defense (interrupting): I object.

Explanatory word not a part of a title.

The article appeared in *The* (Georgetown) *Times.*

Meanings of words.

The use of guillemets (French quotation marks) is limited.

A reference, whether in the body of a sentence or at the end.

The angle ABC (*see* Fig. 4) is a right angle.

Proof is given in this chapter (pp. 1–3).

Figures or letters that designate divisions in a sentence or treatise arranged for study.

The experiment requires (1) a Bunsen burner, (2) distilled water and (3) a large retort besides the chemicals.

Brackets

Use a pair of brackets to enclose—

An explanatory note not the author's.

[The opinions expressed are the author's and do not represent the policy of this periodical.—Editor.]

"America is active in peace." [Applause.]

An editorial note in a quotation.

"They [the Republicans] are enlisting their best speakers for the campaign."

The correction of an error.

He came on Friday, the 14th [13th].

Parenthetical matter within parentheses.

(He says [*see* his *History of New York*] that Hudson was here at an earlier date.)

Continued and concluded lines.

[*Continued on page 75*]
[*To be concluded*]

Do not substitute brackets for parentheses.

The Brace

Use the brace—

To group words, lines or figures relating to a preceding term or statement.

$$\text{Main topics}\left\{\begin{array}{l}\text{Religion}\\\text{Politics}\\\text{Sociology}\end{array}\right.$$

To group terms or figures for a summary.

$$\left.\begin{array}{lr}\text{1st ward} & 910\\\text{2d ward} & 1{,}007\\\text{3d ward} & 595\end{array}\right\}\text{Total, } 2{,}512$$

The Apostrophe

Use the apostrophe—

As a sign of the possessive.

Cat's eye
Cows' horns
Lewis and Clark's expedition
For Jesus' sake

(*Its*—the possessive of it—*theirs* and similar pronouns have no apostrophe.)

To show contraction or omission.

Don't (colloquial)
I'll
it's (it is)
mornin' (dialect)
'80s

NOTE: *In close punctuation the apostrophe is used—*

To form the plural of figures, letters and years.

The 5's and 3's look much alike.
Mind your p's and q's.
First study the three R's.
In retrospect, the 1890's are most amusing.

(There is a growing tendency to omit the apostrophe in all these cases.)

Do not use the apostrophe—

In firm, institution or association names that otherwise would take the possessive form.

Teachers College
Educators Association
Merchants and Mechanics Bank
(Exception: Young Women's Christian Association.)

Before abbreviated words that have become common colloquial usage.

phone
possum
varsity
cello
cellist

The Hyphen

Use a hyphen (-) between—

Compound adjectives or nouns and between double vowels.

(1) She wanted to take a round-the-world trip.
(2) The author attempted a cross-section of life.
(3) The clauses were co-ordinate.

Two syllables of a word divided at the end of a line, when lack of space necessitates its conclusion on the next.

The museum was open to the public free except on Monday.

Diacritical Marks.—Symbols to aid in pronunciation are called *diacritical marks.* They include the acute accent (as in *résumé*) and the grave accent (as in *Molière*) marking different pronunciations in French and used in English for many borrowed French words. The grave accent is also used to show that a syllable is pronounced, as in *blessèd, armèd.* The acute accent is commonly used in dictionaries to show which syllable has the stress; for example, *quin'-tu-plets,* to show that the first not the second syllable is accented.

The diaeresis (¨) in English indicates that the second of two vowels is pronounced separately. It is omitted when the word is divided between the vowels at the end of a line. (A hyphen, to separate double vowels, as in co-ordinate, is often used in place of the diaeresis.) In German the sign (¨) is called an *Umlaut.* The diaeresis or sometimes a tiny *e* is used over *a, o* or *u* to show that the *a* is really *ae,* the *o* really *oe,* the *u* really *ue,* and should be so pronounced; as in *Männerchor* or *Maͤnnerchor* for Maennerchor, *Müller* for Mueller.

The circumflex (ˆ) over a vowel originally showed a rising and a falling accent. In most French words taken over in English a vowel with a circumflex stands in a syllable where a consonant has dropped out; as in *fête* (which was *feste* [*feast*] in Old French); and *bête* (which was *beste* [*beast*] in Old French).

The tilde or til is used in English words from Spanish or Portuguese, especially proper names. The tilde (~) in Spanish words is written over the letter *n* to show that it has a palatal sound: cañon is pronounced *canyon.* In Portuguese the same sign, called *til* in that language, is used over a vowel to show that it has a nasal sound; for example, *bõ* is pronounced like the French *bon;* and João is Portuguese for John.

The breve (˘), indicating a short sound, and macrom (-), the long sound, are used to show pronunciation.

The cedilla (¸), which gives the *s* sound to *c,* is used in French to show that the letter *c* is not pronounced like *k,* as it otherwise would be before *a, o, u;* for example, *façade* and *François.*

FIGURES OF SPEECH

Figures of speech are pictures in words. *Figure* in this phrase does not mean number but pattern, design or picture. Figures of speech are picturesque expressions used for the purpose of making language more striking and more effective. Literal speech is language that says just what it means. Figurative language conveys or implies meaning by the use of imaginative comparisons, of skilfully devised phraseology or of contradictory inference. Poetry is full of figurative language, and so is our everyday speech with its nicknames and proverbs. An old name for figures of speech is *tropes,* which originally meant turns or twists. There is a famous verse:

His mouth he scarce could ope
But out there flew a trope.

A SIMILE expresses likeness between persons or things that are in most respects unlike. The comparison is definitely expressed, usually with the words *like* or *as,* sometimes by *than* and *seem.*

As the hart panteth after the water brooks, so panteth my soul after thee, O God. —*42d Psalm.*

My love is like a red, red rose—*Old Song.*

Once let slavery get planted in a locality by ever so weak or doubtful a title, and in ever so small numbers, and it is like the Canada thistle or Bermuda grass—you cannot root it out. —*Abraham Lincoln.*

A METAPHOR implies a likeness between two persons or objects usually unlike, without using any special words to indicate the comparison, but just by calling one the other. Omitting *like* or *as* from a simile usually leaves a metaphor; and the insertion of those words in a metaphor produces a simile.

Thy word is a lamp unto my feet, and a light unto my path. —*19th Psalm.*

The Lord is my shepherd.—*23d Psalm.*

We are no other than a moving row
Of magic shadows-shapes that come and
go. —FITZGERALD, *Rubaiyat.*

In the last resort all men talk by signs. To talk by statues is to talk by signs; to talk by cities is to talk by signs. Pillars, palaces, cathedrals, temples, pyramids, are an enormous dumb alphabet, as if some giant held up his fingers of stone.—G. K. CHESTERTON.

An ALLEGORY is an elaboration of a metaphor into a lengthy narrative, as in Bunyan's *Pilgrim's Progress*, which is based on the metaphor: A man's life is a journey through this world to Heaven.

A man had a plain strong-bow with which he could shoot far and true. He loved his bow so well that he would needs have it curiously carved by a cunning workman. It was done, and at the first trial the bow snapped. —From an old German legend.

PERSONIFICATION attributes human life or characteristics to inanimate objects; it speaks of these inanimate objects as if they were human or personal. "Necessity is the mother of invention" is both metaphor and personification.

Laughter holding both his sides.
—JOHN MILTON in *L'Allegro.*

The sea waves sobbed with sorrow.
—WHITTIER.

His life was gentle, and the elements
So mix'd in him, that Nature might stand up
And say to all the world, This was a man!
—SHAKESPEARE.

The FABLE is an extension of the figure of personification, a simple story or anecdote in which animals or inanimate objects talk and act like human beings, and which ends with a moral that applies to the story. In the Old Testament there is a famous fable in the 9th chapter of the book of Judges, how the trees chose a king. Some fables have been condensed into a phrase, like "dog in the manger" to mean grudging to others what one cannot enjoy himself; "wolf in sheep's clothing" to mean a villain pretending innocence; the "lion's share" to mean all of something; the "lion and the mouse" to suggest that little friends may prove great friends.

The PARABLE (from a Greek word that means comparison) is an extended simile or metaphor, a simple story that might be true (unlike the fable) from which a moral or spiritual lesson can be learned. Some parables, especially those of Jesus in the New Testament, have been condensed into phrases—the good Samaritan and the prodigal son.

APOSTROPHE is speaking *to* inanimate objects as if they were human and personal or to absent persons as if they were present.

Thou hast taught me, Silent River,
Many a lesson, deep and long.—LONGFELLOW.
Hence, loathed Melancholy!—JOHN MILTON.
O death, where is thy sting? O grave,
where is thy victory? —ST. PAUL.

VISION represents absent or remote things as present. It is, therefore, a modified form of apostrophe. Note the following:

Is this a dagger, which I see before me,
The handle toward my hand?—SHAKESPEARE.

METONYMY is the use of a sign for the thing meant, the use of one name for another which it suggests. Thus, when you read

The pulpit is a great power,

you know that *pulpit* is used as a sign for the man in the pulpit and his sermon. In like manner you say

The press is powerful.
The pen is mightier than the sword.
The bottle stole his wits away.
His soft heart was better than his soft head.

SYNECDOCHE is that form of metonymy that states a part for a whole, or a whole for a part. In the Lord's Prayer,

Give us this day our daily *bread*

means all food and not just the one kind. In the following examples *hands* mean men and *head* means the whole animal:

Twenty hands are employed in the factory.
He had one hundred head of cattle in the drove.

ANTITHESIS is the suggestion by words and their arrangement of a contrast between ideas.

Man proposes; God disposes.
Deeds show what we are; words, what we should be.

CLIMAX (from a Greek word meaning ladder) is the arrangement of phrases or details of subject matter so that they are increasingly important or striking. The following, from Cicero's oration against Verres, illustrates:

It is an outrage to *bind* a Roman citizen; to *scourge* him is an atrocious crime; to *put him to death* is almost parricide; but to *crucify* him—what shall I call it?

The opposite of this figure is ANTICLIMAX, an arrangement of items in which the last is least important or striking.

And thou Dalhousie, the great god of war,
Lieutenant colonel to the Earl of Mar.
—POPE.

APHORISM (originally, a definition), is the condensation of great thought within the range of a brief and memorable expression. *Maxim, adage, apothegm, precept, proverb, dictum, saw* are other terms for a brief, pithy saying.

Be not the first by whom the new is tried,
Nor yet the last to lay the old aside.
—ALEXANDER POPE.

EPIGRAM, like aphorism, is the name given to any pointed and condensed saying. In its Greek original it meant an inscription for a monument or statue. Inscriptions must be brief and should be pointed. Epigrammatic expression has come to connote wit and brilliance especially in verse. It is best illustrated and defined by the famous Roman poet Martial, author of many epigrams:

Three things must epigrams, like bees,
have all—
A sting, and honey, and a body small.

EUPHEMISM (from the Greek meaning speaking well) is using a pleasant or agreeable word instead of the natural and disagreeable one. The Romans said *Vixit*, he has lived, instead of *Mortuus est*, he died. We speak of passing on—rather than say dying.

INTERROGATION is a question to which no answer is expected or required. (A rhetorical question, it is called.) The answer is implied.

Who hath believed our report? and to whom
is the arm of the Lord revealed?
—ISAIAH 53:1.

Who is here so base that would be a bondman? . . .
Who is here so rude that would not be a
Roman? —SHAKESPEARE.

What! Gentleman, was I not to foresee? or, foreseeing was I not to endeavor to save you from all these multiplied mischiefs and disgraces? Was I an Irishman on that day that I boldly withstood our pride? or on that day that I hung down my head, and wept in shame in silence over the humiliation of Great Britain? I became unpopular in England for the one, and in Ireland for the other. What then? What obligation lay on me to be popular? —EDMUND BURKE.

HYPERBOLE (from a Greek word meaning overshooting) is deliberate exaggeration used for the purpose of producing some startling or alarming effect. All figures of speech are to some extent hyperbolical, and hyperbole makes use freely of other figures to accomplish its arresting effects. Such everyday exaggerations as *starving to death, dressed to kill, a perfectly lovely book* and *mad as a hornet* are hyperbole.

We were in our own sight as grasshoppers, and so we were in their sight. . . . The children of the east lay along the valley like locusts for multitude; and their camels were without number, and as the sand which is upon the seashore for multitude.
—OLD TESTAMENT.

The opposite figure is *understatement*, which the old rhetoricians called *meiosis* or *litotes*. Paul called himself "a citizen of no mean city," another way of saying "a famous city."

IRONY (from a Greek word meaning dissimilation) implies the opposite of what it expresses. A remarkable series of ironical interrogations is to be found in the last chapter of the book of Job in the Old Testament:

"Where wast thou when I laid the foundations of the earth? . . . Canst thou bind the sweet influence of the Pleiades, or loose the bands of Orion? . . . Canst thou draw out leviathan with an hook?"

No doubt but ye are the people, and wisdom shall die with you. —JOB.

There are several methods of heightening the effect of speech or writing that depend less on the pictures or figures they convey to the mind's eye than on the word sound.

ONOMATOPOEIA is *suiting the sound to the sense.* Such words as *bang, clang, jingle, tingle, ugh* are onomatopoeic words. In Tennyson's "The Passing of Arthur" these words sound like what they describe:

His own thought drove him like a goad.
Dry clash'd his harness in the icy caves
And barren chasms, and all to left and right
The bare black cliff clang'd round him, as
he based
His feet on juts of slippery crag that rang
Sharp-smitten with the dint of armed heels.

ALLITERATION is the trick of using several words that begin with the same sound or sounds. It was as necessary as meter to early English poetry and is frequent in our everyday phrases like kith and kin, friend or foe, fish, flesh or fowl, mind and matter, tried and true. Shakespeare in *The Tempest* begins a lovely song:

Full fathom five thy father lies.

ASSONANCE is the repetition of similar vowel sounds in the last syllable or the accented syllable of several words. It differs from rhyme because the whole syllable is not identical—the vowel sounds are the same but the consonants are different. "Baby Mary is lazy" is an example of assonance: the vowel sounds in three words are the same.

Rhyme is the repetition of identical sounds at the end of words. It is common in everyday phrases like *near and dear, high and dry;* and it is a characteristic of most European poetry, marking the end of the verse or metrical scheme.

COMPOSITION AND THE PRINCIPLES OF WRITING

Composition is putting together individual units so as to form a unified and effective whole. It is the essential operation in all forms of art—in painting, music and architecture—as well as speech and writing. Remember this; it will help you when you speak or write. The most important aid to effectiveness is arrangement—arrangement of ideas, arrangement of sentences and arrangement of words in sentences. You may know all the words in the dictionary and all the rules of grammar and still not be able to write well if you do not compose well. The dictionary can hardly be called a composition, but it is useful and effective because it is carefully arranged in alphabetic order. Good writing is writing that says what the writer wants to say in such a way that the reader will understand it, believe it, enjoy it and, when the writer so desires, act in accordance with its suggestions. This is what we mean by effective writing: it produces an effect upon the reader, it gets results. Results in any field of action are best achieved by order. In driving a nail, the force of the blow is not nearly so important as the combination of holding the nail straight and firmly at the point where it is to be driven, holding the hammer at the proper balance and delivering the blows accurately and rhythmically. This principle holds for oral as well as for written composition. Most of us speak more than we write, but writing is the main topic here. Compared with speech, writing is more complex, more premeditated and more entirely dependent upon words and composition.

The Tools of the Writer.—The tools of the writer are words and sentences. Words must be articulated into sentences before they will convey connected ideas. There must be a subject and something said about it—a predicate—to every sentence. Both these elements may be qualified, and the predicate may contain an object; but a sentence must contain a subject and a predicate. Even the imperative, "Listen!" unmistakably implies the subject, *you.* The forms of words and the relationships between them in sentences are governed by the rules of grammar, and those rules that are most frequently operative and most frequently violated will be discussed presently.

Choice of Words.—Words should be simple, precise, concrete and should conform to good usage and the idiom of the language. The choice of words will give clarity and forcefulness or obscurity and lack of color to your style. Each word should be considered not only for itself but for the associations it has come to have in people's minds. Should you wish to describe the tropics, first acquire a suitable vocabulary—words that will create for your reader a mosaic of warmth and brilliance, with a background of the luxuriant tropical flora, heavy exotic fragrances, the constellations that distinguish its night skies from ours and the subtle charms of its people. To contrast this, compile a word list that you would find adequate to picture a cold, forbidding, cruel climate where summer is brief and nature unproductive, and where the people reflect these conditions in their lives and emotional reactions. Remember that every descriptive adjective has its opposite; study both of them.

For Simplicity.—When one writes there is a tendency to choose words not generally used in speech. Avoid it. Write, "I live [not *dwell*] in Springfield." Either word conveys the meaning, but the former is natural and alive, the latter artificial and stiff. This does not mean that you should not use long or unusual words; but when a common word suits your meaning just as well, use it. Do not strain to avoid repetition by substituting words like *bovine* for cow, *tome* for book, *aperture* for window. Ordinarily a word should call attention not to itself but to what it means.

For Precision.—Precision or discrimination between words of like sound or related meaning can be acquired by scrupulous attention to definition and usage. The writer should train himself to recognize readily the differences between: obtain and attain; secure and procure; survive and recover; apt, likely and liable; imaginary and imaginative; poetry and verse; fact and truth; democracy and republic; human and humane; effective, effectual and efficient; grief and grievance; act, action and activity; last and latest; education, schooling and culture; accurate, correct, exact and precise; start and begin; politic and political. Constant study of the dictionary, especially what it says about synonyms, or words of nearly the same meaning, is the best training.

One of the worst enemies to precision is the lazy use of a familiar general word for specialized meanings that it only vaguely suggests. Many slovenly writers use the word *have* to denote all the meanings accurately expressed by own, hold, keep, buy, inherit, acquire and display. The same is true of the words *be, do* and *go.* This blunder is due partly to the writer's insensitiveness to fine shades of meaning or to his careless use of words. Many people read with the same lack of alertness. Such people, properly speaking, can neither read nor write well.

For Concreteness.—A word is concrete when it suggests an image, appeals to the senses. Whenever possible, give the preference to concrete words. Our common words are more accurate than those less used because they are more closely connected with life. *Home* conveys many images; *domicile* calls up few. The specific word is more concrete, more picturesque than the general, as *strode* or *strutted* than walked. Use by preference the common names of things and the more specialized verbs of action.

Idioms.—Every language has its idioms—peculiar forms that are in a way the meat and kernel of it, yet often illogical, capricious and not amenable to rules or principles. No one knows English who does not know its idioms; yet few suggestions can be given as to how they can be learned. They must be acquired by close attention, comparison and careful study of prepositions. We indicate here a few idiomatic expressions by way of illustration. In English we greet one another with "How are you?" or "How do you do?"; in French, *"Comment vous portez-vous?"* ("How do you carry yourself?"); in German one says, *"Wie geht's?"* ("How goes it?") or *"Wie finden Sie sich?"* ("How do you find yourself?"); in Arabic, *"Salām 'alaikum"* ("The peace be on you").

Much of our idiom centers about prepositions, as: The cars stop at [not *on*] Adams Street. The window is in [not *on*] the west wall. We shall have the privilege of hearing [not *to hear*] a noted speaker. We go into the room and move about in it. We have confidence in and confide in a person, but confide a secret to him, because we have a high regard for him on account of our long intimacy with him. A single verb in combination with various prepositions takes on different meanings, as in: The party broke up. The car broke down. The burglar broke into the safe while the sergeant was breaking in the new recruit, whose wife had just broken out with the measles. The girl broke off her engagement. The executive put off his departure, put up with the delay and finally put over the deal. The man makes out a check and his wife makes up her mind. There are many other types of idioms, for instance, we say, seems to be or looks as if [not *looks to be*]. You may be called down for your mistakes; called for to go on a motor trip; called up on the telephone; called in for consultation; called on by a visitor or for assistance; and called to a bedside. The verb live takes many prepositions, as: He lives in a city, at a hotel, on his income, by his work, up to certain standards, with his family, within his means, out his days and to an advanced age.

The Sentence as Composition.—The sentence is the unit of composition. You never set out merely to write a sentence; you wish to say something about something; so you must know what your material is; that is, you know what you want to express, but you have not yet composed it. The first thing you must do is decide upon a subject. This seems simple, but a great many incorrect sentences result from the writer's choosing the wrong subject, or not sticking to the one he has chosen. In an expression such as, "On preparing to leave, the ax could not be found," grammar calls the first phrase a *dangling participle;* but the real trouble was not with the writer's grammar but with his thought. He started out with a person in his mind as the subject of his sentence, someone who was preparing to leave. Then, after he had passed the first phrase, he thought about something else, the ax. What he had in his mind was something like this: "We prepared to leave. The ax could not be found." The two ideas were so closely related by the fact that they happened at the same time, that he thought they should be expressed in one statement. In order, however, to construct the sentence correctly, he must decide whether *we* or *ax* is the subject, and then stick to it. He may write either: "On preparing to leave, we could not find the ax," or "The ax could not be found when we prepared to leave." The first statement probably is nearer what he wanted to say, but both sentences are correct, consistent and intelligible compositions.

From a Library of Congress mural by John W. Alexander
Evolution of the Book: The Cairn

When there are many elements to be included in one sentence, your problem is to decide which is the main idea and how the rest are related to it. Take, for instance, the following series of short sentences: "We came to a path. It led off the wagon road. It led through the woods. This path apparently was not much used. It was a narrow path." These statements are all clear and they are all correct, but they are not composed. In order to make a sentence of them one has to decide which is the most important statement and what relation the others bear to it. Suppose we write it: "We came to a narrow path, apparently not much used, that led off the wagon road and through the woods." Four of the sentences are reduced to modifiers, one becomes an adjective, one a participial phrase, one a relative clause and one an adverbial phrase. The result is a unified impression made up of five distinct elements. The problem of composing a sentence is chiefly the problem of determining in your mind in what relationship the elements stand to each other.

The word that causes the most trouble in sentence composition is *and*. Remember, *and* expresses simple addition; it is only a verbal plus sign. Do not rely on it to express time, place, purpose and result; for these relationships we have *when, where, in order that* and *consequently*. The chances are that you will write correct sentences if you keep your mind on the fact that such a sentence makes just one statement to which every element in the sentence must be accurately related.

Begin with the subject. Such a beginning will keep you out of many difficulties. Do not be afraid to write a simple, direct statement. What it lacks in variety, it generally gains in clearness and emphasis. More sentences are ineffective because they try to say too much than because they say too little.

One form of the error of writing too much in one sentence calls for special attention because it occurs so frequently. It is generally called the *comma blunder*. The name makes it seem an error in punctuation, but the punctuation is only the mechanism by which the error is shown. Like most mistakes in sentence structure, it is the result of not thinking. The comma blunder is the error of writing two complete sentences in one and separating them by a comma. It would be even worse without the comma. The greatest stumbling block comes when the second statement begins with a personal pronoun (*he, they, it*) or a conjunctive adverb (*then, therefore*), or when there is a close relation of cause and effect, or a contrast, between the two statements. The following sentences are correctly punctuated: "Come on, laddie. It's time to go home." "Tom wasn't afraid. He was simply waiting for the right moment." "You'd better not try that bridge. It isn't safe." "He would not take the crown; therefore 'tis certain he was not ambitious." "Be sure you're right; then go ahead." In writing dialogue be specially careful to avoid the comma blunder. The only exception to the rule here stated is the case of the series form, in which short statements are sometimes separated merely by the comma; e.g., "I have fought a good fight, I have finished my course, I have kept the faith."

AGREEMENT BETWEEN SUBJECT AND VERB.—Grammatical correctness requires that a verb agree with its subject in number; that is, both must be singular or both plural. This rule is generally known and observed, but certain circumstances frequently produce confusion. The writer is sometimes misled when the verb comes before the subject. Notice the following: "Here were [not *was*] the banking facilities of the colonies." "Coupled with the demand for the teaching of patriotism have [not *has*] come suggestions as to what course such instruction should take." "There exist [not *exists*] in many localities certain superstitions not found elsewhere." Any question in your mind about the number of the verb in such sentences is easily answered by recasting the sentence to begin with the subject. Subjects joined by *and* commonly require a plural verb. "There are [not *there is* or *there's*] my friend Barton and his wife coming toward us."

A plural noun coming between the subject and the verb sometimes creates confusion. "The sound of his steps was gradually lost." "The size of the plates varies with the current capacity of the battery." A collective noun is to be construed as plural when its parts are thought of separately. "The crowd were throwing up their hats and shouting with excitement." "The crowd was headed by a sailor."

AGREEMENT BETWEEN PRONOUN AND ANTECEDENT.—Pronouns have no meaning by themselves. Whatever meaning they have is reflected upon them by their antecedents. Consequently each must agree with its antecedent in number. "The criminal is an enemy of society, and society must constantly fight against him [not *them*]." The indefinite pronouns, *each, everybody, anyone, one* are singular. "Everybody must have plenty of time if he is [not *they are*] to do good work."

The pronoun takes its case from its own office in the sentence, irrespective of the case of its antecedents. If it is the subject, it must be nominative; if it is the object of verb or preposition, it must be objective. "He saw the boys who are going to the circus." "The boys whom he saw are going to the circus." Here we may remind you that the pronoun must always refer definitely to its antecedent. This means that it must be furnished with an antecedent. In the sentence, "There is no use writing to John; he will not answer it," there is no antecedent for *it*. The word *letter*, implied by *writing*, was in the mind of the writer, but it is not expressed, so the sentence is incorrect. "He invited me to join him in a bear hunt, which I readily accepted." Here the antecedent of *which* is the noun implied in the verb, *invited;* but, to make matters worse, *hunt* affords a grammatical antecedent that reduces the sentence to nonsense. All good writing is grammatical. If you do not feel that you have mastered grammar, study its essentials; then put them into practice. Knowing the rules of grammar is of no value until you have become so used to writing and speaking grammatically that you never think of the rules. The good sentence is much more than grammatical—it is clear and forceful.

PUNCTUATION.—Punctuation is a mechanical means for assuring the clarity of the written sentence. The marks aid the eye by separating words that would cause confusion if read in close connection. When you speak, you punctuate with your voice. In the written sentence, the vocal stops are indicated by punctuation, the common marks of which are the comma, the semicolon and the period. They are all marks of separation. For the ordinary minor separations between words, phrases and closely related clauses, we use the comma. When the parts to be separated are more nearly self-sufficient units, we use the semicolon. The period, of course, usually marks the end of a complete statement. The other punctuation marks are used for special purposes that can be easily understood. Punctuation is of no importance for its own sake. You use it only to make sure that you convey your true meaning to the reader. It is particularly necessary that it be indicated, because people read much more rapidly than they listen, and always tend to read a word in close connection with what immediately precedes. Consider the sentence: "They left, strangely moved by what they had seen." The comma after *left* prevents giving the impression, "They left strangely." If that is what you want to convey, however, you place the comma after *strangely* to be sure of making that meaning clear.

PARAGRAPH.—The way to develop your ideas in writing can best be shown here by discussing the function of the paragraph. The paragraph is a device that permits the writer to develop an idea through a series of relatively short, closely related sentences, and at the same time by its physical form enforces on the reader the unity of the group. Remember that the paragraph is not a vehicle for stating an idea. That is the function of the sentence. The paragraph affords the means for developing the idea. It is, therefore, an invitation to do what most beginners do not do, to give the idea room. Do not try to say everything in one sentence. If you do, you will write a crammed, involved, weak sentence, and you will choke your idea. State your topic in a sentence. Then explain it; restate it, perhaps in different terms or from another point of view. Justify it, amplify it with evidence or illustration; and finally point its connection with what has gone before or what is to come next. This will give the separate sections of your composition sufficient body to impress themselves upon the reader, and will keep you from writing a series of disjointed statements that are not really a composition.

Whenever you find yourself writing a series of one- or two-sentence paragraphs, you have before you visual evidence that you are writing disconnectedly. What probably is taking place is this: you are not perceiving the relationship between your topics, and you are therefore not composing your material. If every item that demands a sentence appears to you to be a topic, then every one of them demands that it be developed and your essay must be many times longer. In a composition a sentence that does not itself demand development must belong to the development of some other topic, or it does not belong in the composition. A paragraph of less than three sentences generally has no unity of idea.

Three varieties of the short, one-sentence paragraph are permissible: First, in writing dialogue, whatever is said by a single speaker at one time, together with identifying or brief explanatory remarks by the writer, is put into a paragraph by itself. This practice is not at present consistently followed, but it is a great convenience to the reader. Second, when the point is of such supreme importance that you want to drive it into the reader's mind, you can emphasize it visually by printing it separately. This device is useful only for short, direct sentences and must be used sparingly. Third, between larger sections of the composition use a short transition paragraph to point the connection between what has gone before and what is to follow. This transition paragraph does not connect the two single paragraphs between which it stands but the larger groups of paragraphs, one before and one after the transition.

The connection between paragraphs should be logical. It is frequently desirable to express it by means of such words as *moreover*, *besides*, *notwithstanding* or *as a result* at the beginning of the succeeding paragraph. The particular usefulness of such words is that they point the direction in which the reader's thought is to turn. A more subtle and firmer coherence may be achieved by concluding one paragraph with the idea that you intend to consider and develop in the next.

The order of paragraphs is determined in great part by the logical sequence of ideas, but it can be managed to advantage by constructing your outline with an eye to the climax. The development of the subject should be so started that by following the logical sequence the most important, most conclusive, most impressive idea will be the last to be presented. The reverse order would frequently satisfy the demands of logic just as well, but it would not be emphatic; the composition would not make so vigorous an impression.

The Principal Forms of Writing. All that has been said applies to all types of writing. A few special applications of these points to certain special forms may be cited. It is traditional to divide writing into exposition, description, narration and argument. In actual practice we use the different forms together. The object of the first three is to tell, that of argument is to convince.

EXPOSITION.—The term exposition includes all forms of writing that convey information—history, biography, travel, all scientific writing, most essays and letters—in fact, practically all writing that is not creative is expository. Exposition in writing has to do with the point of view and purpose of the writer. Since its object is to inform, the first essential of expository writing is clearness. All that has been said, therefore, about arrangement of material applies with particular force to exposition. Closely allied to order and of equal importance is proportion. Give your most important facts or ideas more space and elaboration than the others. If every stage in a process or every move in a journey is treated as if it were equally important, nothing will stand out, and the reader's impression of the whole is likely to be jumbled.

Many beginners in exposition do not write clearly because they lack full knowledge of the subject and rely more on the reader's knowledge than on the clearness of their own writing. This attitude is fatal. When you set out to explain a subject to anyone, you must assume that you know more about it than he does. Do not patronize your reader, but don't forget that for the moment you are telling him. If you are writing a report for a teacher, your writing will suffer unless, for the purposes of the report, you and the teacher exchange places. If the reader is to have confidence in the author, the author must first have confidence in himself.

A popular variety of exposition is the familiar essay, the type in which the author, no matter what his subject, really writes about himself, his own impressions, reactions and ideas. A composition on radiators will tell what they are, how they are made and how they work. In a familiar essay on radiators you may tell something about your liking for them on a cold morning, your exasperation with them when you move the furniture, your interpretation of their moods when they gurgle and hiss. In the familiar essay no one can anticipate what the writer will say. It follows, therefore, that a familiar essay will be interesting only if the author has an interesting mind. Do not think that because the style of the familiar essay is chatty and the material digressive that it needs no plan. It needs a very definite plan, but the plan must never show.

DESCRIPTION.—Description is the form of writing that appeals to the senses. Most descriptions are addressed to the sense of sight, although hearing is often called upon, and the other senses to a lesser extent. The first important thing is to choose your point of view. If you are to take your reader to the back of a house, do not start by describing the front of it. When you have chosen your point of view, stick to it. Never change it without saying so. Give your reader a general picture first, and then proceed to the details. If you give him the details first, he will seldom be able to put them together.

In undertaking any kind of writing, never forget that you know more about what you mean to say than your reader does, and that what seems perfectly clear to you, may not be so to him. Above all, in writing description, use a concrete vocabulary—words that vivify the reader's imagination and cause him to see, hear, smell, touch or taste according to your descriptions. It does not suffice to say a scene is beautiful; you must present to the reader the sense impressions that made you conscious of its beauty so that he too will feel it. What a word suggests, the image it brings to mind, its connotations—always important—are particularly so in description. Words suggest much more than their precise meaning. Purple, for instance, may suggest royalty, power, wealth, or, in various contexts, evening, death, distance. As a writer, say all that you can to give the reader the right suggestion and to prevent wrong impressions. Finally, be accurate; do not describe what you do not see, but present accurately what you do see, as you see it.

Narration.—Material presented as a sequence of events in time is narration. The outline, therefore, is inherent in the material. Events must follow each other as they actually did. You do not have to start at the beginning, but if you don't, you must relate the events that led up to your starting point as soon as they are necessary to the understanding of what happened afterwards. (This is the cutback method of motion pictures.)

Narration must almost always be supplemented by description. As events do not happen in a vacuum your reader will always make up a scene for them if you do not give him one. Never let him see your events happening in the wrong scene. In writing description and narration it is well to remember that the reader's imagination always runs ahead of you, and that you must keep it from going the wrong way. You can accomplish this by choosing and emphasizing the most significant details.

One of the most important elements in narration is proportion. All the events in a series are not of equal importance, so you must choose those that seem to you to be the most important, and treat them more fully than the rest. Relate less important events to an important one by making them lead up to it and away from it.

Argument.—The object of argument is to convince. Conviction is brought about by the logical presentation of evidence, and the outline is, therefore, of first importance. The outline should be actually a brief of the composition, so that by reading the outline one can grasp the whole argument. The outline should start with the proposition to be proved, and every successive point should be expressly related to the preceding by some such word as *for, hence, therefore*. The outline should read something like the demonstration of a proposition in geometry. Most written argument is of the informal variety in which there is no clear line between exposition and argument.

All exposition of ideas and all criticism is really argument. Ideas and judgments must be supported by evidence if they are to be impressive. You can write on the devastation of war from facts; but if you write on the futility of war, you must marshal your facts so as to prove the idea that you have derived from them. The evidence consists of facts, and the presentation of them is exposition; the argument consists in the arrangement of those facts and their application to the idea. Do not omit the evidence; assertions without substantiating facts do not convince. Use only evidence that is relevant to the subject. To write a good argument you must always have more knowledge than you can use. Learn to discard all material that is not directly applicable to the point you intend to make. Do not try to make too many points. Decide on one, or, at most, a few that seem to you to be fundamental to the truth of your proposition and establish them. Argument is of special importance in public speaking.

Relation Between Forms of Writing.—Narration, description and exposition are combined in almost all creative writing; the dominant method determines to a considerable extent the form of writing that results. Thus fiction is primarily narration; essays and articles are primarily expository, although an account of a journey or other experience may be mainly descriptive. Much more important than the individual forms is the appreciation of the aim and object of your composition. Use the most effective means of attaining that object. Remember that the special forms almost never appear separately. Narration and description are often the most effective methods of exposition, and all three forms are used in argument. Do not let yourself be hemmed in by forms and formulas. The more persistently you keep your mind on what you want to say and why you want to say it, the better you will write.

From a Library of Congress mural by John W. Alexander

Evolution of the Book: Hieroglyphics

Creative and Informative Writing.—Though writing takes many forms, they all group themselves into two varieties—creative and informative. Creative writing includes drama, novel, story, essay and poetry. Informative writing includes articles, reports, lectures, sermons, criticisms, debates and most letters. The fundamental difference between the two varieties is that creative writing aims to present its matter as happening as an experience; whereas informative writing aims to tell the reader something about its subject or to convince him of the writer's opinion. Stephen Vincent Benét's treatment of the battle of Gettysburg in *John Brown's Body* is creative; the same subject matter in a history textbook is informative. The fundamental principles of good writing are common to both varieties. By far the greater part of our writing, however, is informative; therefore we shall treat these fundamental principles chiefly as they relate to informative writing.

Writing the Composition.—In writing, the problems that involve the composition as a whole are: (1) how to begin, (2) how to develop the several phases of the matter clearly and emphatically and (3) how to stop. Your outline is the fundamental guide in solving these problems, but some particular advice may be of use. We shall not stress the formal terms, *introduction* and *conclusion,* as we want to avoid the implication that every composition must have a structurally independent introduction and conclusion. That is not necessary.

The characteristics of good writing are correctness, fluency and coherence. Of these, coherence is the only characteristic that applies to the composition as a whole. Since the starting point of writing is neither the words nor the sentences, but the subject matter, which implies the whole composition, we shall first consider the coherence of the composition as a whole, beginning with the subject.

The Subject.—The first step in organizing your composition is determining its subject. Do not confuse *subject* with *topic*. Filling stations, for example, may be taken as a topic; but before you can make it a subject you must decide what you will say about filling stations. You can make your subject "How To Make a Filling Station Pay," "Filling Station Architecture" or "The Filling Station as a Social Institution." Choosing a subject is often only narrowing a topic by deciding how you will treat it. This narrowing is governed by the time and space at your command, but these conditions really affect chiefly the fullness with which you may treat your subject. Narrow your topic so that you may focus your attention on what you want to say and what impressions you want your reader to get. When you have done this, you are still not ready to write until you have made your outline.

Outlines.—Making an outline is the process of deciding what you have to say about your subject. The best way to start is to make a sentence of which the subject is your topic and the predicate, a summation of your ideas about the topic, as: "Filling stations can be made to pay by honest dealing, careful attention to details and constant courtesy not overdone." The way to do this is to think through your material or ideas until you have discovered just what you want your reader to be impressed with. Remember, if you cannot write a sentence about your topic, you cannot write a composition about it. When you have made such a sentence, decide how you will develop each point in it by example, explanation, argument or whatever device seems best. This will show you what material you can use and what you must discard. You will always know more about your topic than will be relevant to your subject, and you must decide what is irrelevant, and be willing to leave it out. Do not try to say everything at once. Stick to your point. The outline will tell you what that point is and how you can make it. It does not matter what form you use in writing your outline, but it is best that every element in it be a sentence. Topics without predicates generally mean that we do not know what we are to say about them; but they always deceive us into thinking that we do.

Never allow yourself to believe that you cannot make or cannot follow an outline. An outline is only the record of your thinking through your subject. If you cannot think through it, you cannot write about it. It is the thinking that is hard, not the writing. You cannot write until you know what you are going to say, and making the outline is the process of deciding what to say. The next thing to do is to say it, nothing more and nothing less. You are now ready to start to write with good assurance that your thought, at least, will be coherent.

How To Begin.—Obviously, the place to begin is at the beginning. The inexperienced writer is afraid to begin simply and directly. Apparently he wants to back into his subject or to creep up on it through tedious and indirect byways. Many compositions are improved by omitting the first paragraph.

Tell your reader what you wish to say, so that he will understand your object and be interested in how you are to accomplish it. No one is interested in puzzling over involved statements. In all your writing remember that your reader is not a mind reader; that what is perfectly clear to you after you have thought long enough upon a subject to write about it, is utterly unknown to him. He does not know, for instance, what your title means to you until you have told him, and if you do not tell him quickly, he will lose interest and stop reading. He must know in a general way, but clearly, the point you intend to make, if he is to understand the elements in its development and to remember them clearly enough to be left with a vigorous impression at the end. It is hard enough to "put Humpty Dumpty together again" if you saw him before his fall; if you never saw him whole, it is practically impossible. All this does not mean that you should begin bluntly, but even a blunt beginning is ever so much better than a hesitating or a foggy one.

It is not necessary to begin with the theme sentence that stands at the beginning of your outline. It is often a cumbersome, unwieldy sentence, and serviceable to you only because it sums up your thought. The content of that sentence, however, must be expressed at the beginning of your composition. Sometimes it will be simple and compact enough to use almost as it stands. Lytton Strachey begins his essay on Gibbon with the sentence: "Happiness is the word that immediately rises to the mind at the thought of Edward Gibbon." Everything in the essay explains, expands and enforces this idea. More often you will require a paragraph to state the content of that sentence clearly and interestingly.

Arousing Interest.—Use your beginning to arouse interest, as well as to point the way. If you can link your subject matter with something very familiar to the reader, do so; but do not allow your allusion to grow into a little essay of its own. Perhaps your idea conflicts with some well-established belief, such as that human nature does not change; present that conflict, but only with the purpose of arousing interest in your proposition. Do not allow yourself to become involved in an argument outside the point you must make. Sometimes—and this is particularly true of speeches—your best beginning will be an anecdote or an experience that dramatizes your point. Such a story should be short, vivid and directly to the point, not dragged in as in the ordinary after-dinner speech. There are many ways of beginning, but always the purpose is: first, to tell the reader what you intend to do; second, to arouse his interest in how you are to do it. The amount of introductory material that you can use is limited sharply by the amount of space at your command. Obviously you do not want to take nearly as much space to state your point as you do to explain, develop and enforce it.

How To End.—The chief difficulty about the end of a composition is recognizing it. Many writers, and particularly many speakers, seem not to know when they have said all they intended to say. When you have covered your material and made your point, stop. Do not worry it; do not ruin your climax with repetitions, apologies or irrelevant rhetoric. Particularly, if you have come to an effective and obvious stopping place, do not think that you must write a conclusion. The end of your composition should enforce the whole idea, but it will often do this without a formal conclusion. In an argument it is well to sum up briefly the evidence by which you have supported your contention; but even then, as always, your conclusion should be brief. The arrangement of your material, which you decided upon before you ever started to write, will show you when you have come to the end. Compositions are ruined more often at the beginning and the end than at other points—simply because people are not willing to begin at the beginning and stop when they are through.

IMPORTANCE OF CORRECT ENGLISH

An extensive knowledge of the exact meanings of English words accompanies outstanding success in this country more often than any other single characteristic. It seems to be true that a large vocabulary is typical of successful individuals.

—Johnson O'Connor,
in *The Atlantic Monthly.*

Experts at Stevens Institute recently studied the characteristics of a large group of successful Americans. What had they in common that would explain their common success? The answer was: a large vocabulary, a gift of using words accurately and forcibly. Big business executives have this faculty to a greater degree than college professors!

Language makes our complicated civilization possible, and the more the student knows about language the better he will be fitted to win for himself a high place in life. Language is always useful, in all forms of work and play. The person who has a mind well stocked with words, who can readily choose the right word to express his meaning and who is gifted with the ability to use language that unfolds beautiful pictures and striking sentiments is admired and respected wherever he goes. The possession of a large and accurate vocabulary makes literature more enjoyable, a hobby more fascinating, friendship more interesting and all of life more satisfying, for it gives a man the power to understand what he reads and hears and to express more accurately and forcefully what he himself thinks.

Many people are profoundly unconscious of the vital need of words and of the continual reliance upon them to carry on even the business of life, to say nothing of its intellectual pleasures. They are content with a pitifully scanty list of words, seldom expressing exactly what they mean. Too often we hear speech filled with trite phrases and coarse, inappropriate slang, speech in which the same terms are used to express sharply contrasting ideas, shallow and surging feelings. Swell, lousy, awful, fierce and lovely are for some the stock of adjectives drawn upon to describe even the deepest emotion and the loftiest aspiration.

Language a Tool.—Words are merely the names for ideas, feelings and things; tools by which to express oneself to others. But how often some opportunity is lost, some great experience withheld, some wrong inflicted because the right tool was not used. To have power with words, one must know how and when to use them and how to pronounce them correctly.

Every day brings new experiences that test your ability to understand, to organize and to communicate to others your reactions. Without words you are helpless. Language, then, should be considered a tool, highly complicated and very efficient when correctly used. It can become hard, shining, sharp steel—or it can be soft, dull lead. To keep it sharp and efficient it must never be carelessly used or neglected.

So important is this power with words that it makes those who possess it distinguished and outstanding among their fellows. A man is known by his vocabulary and the use he makes of it. Keats, for example, is world-famous because his word images defined his own magical thinking and highly developed sense impression. Similarly in prose, a practical, simple, utilitarian style defines Franklin in the same manner that a graceful, fanciful and intriguing style points to Stevenson.

From a Library of Congress mural by John W. Alexander

Evolution of the Book: The Pictograph

A vocabulary should be large enough to be adapted to any occasion and to any hearer or reader. An amusing story by O. Henry well illustrates this point. A little girl in a newspaper office asked the literary editor to tell her the story of Jack, the Giant Killer. He told the story but after he had finished she asked again if he would please now tell her the story of Jack. The sports editor also tried to tell the story, but still she could not understand. Then the man who knew all about railroads recited the nursery tale in the language of railway transportation; but no one in the newspaper office could tell the story in a way that would interest and reach a child.

How To Use the Dictionary.—When trying to find the exact word to express fully the thought in mind, turn to the dictionary and see how many words are given there to express the varied shades of meaning suggested by the main idea. English, because it has inherited words from both the Germanic and Romance tongues, is particularly rich in them and therefore great care is necessary in selecting just the right word. *Home* for instance is Germanic in origin and *domicile* Latin or Romance and while in fact they mean the same, yet what a distance lies between them! Think of the dictionary not as a dull mechanical thing but as one of the greatest achievements of mankind, a whole living, throbbing language imprisoned in a single book! When rightly used the dictionary may be fascinating, exciting, even inspiring. You need not be a slave to it. Often the context of a passage will indicate the meaning of a new word and even give a better understanding of its shade of meaning than the dictionary; but to pronounce this word correctly and make it a part of your active vocabulary, you will find the dictionary an invaluable aid.

For those interested in language itself—how it came to be, how meanings changed, why one word has several meanings and many words mean almost the same thing; why the spelling is as it is and how it is affected by pronunciation, why new words are added and others become obsolete—for these people the dictionary needs no recommendation. The origin of a word gives a valuable clue to its meaning and to its imagery or picture-making quality. The science that treats of root words and original meanings is called *etymology* and it can be intensely interesting. English boasts a particularly rich heritage. A few English words are of Celtic origin, contributed by the people inhabiting Britain before the coming of the Romans. A few others, such as *camp* and *street* and *mile,* were left by the Romans themselves. When the Angles and the Saxons overran the land, they incorporated into their own language these Celtic and Latin words. The Danish invasion added still other words—*by* (which meant town and is now found as a suffix in town names) and perhaps the adjective *same.* When the Normans conquered England in 1066, the English language was principally Germanic with only the few Celtic words and the few Latin words that had been left by Caesar's soldiers and by the Latin-speaking missionaries and priests. The Normans brought with them their French tongue that actually was only a Latin dialect. Neither Anglo-Saxon nor French was able to absorb the other and the two became welded together into one. As a result the grammar was greatly simplified, inflections and declensions were dropped and in many cases there were two words of the same meaning—a plain Germanic word and a fancy Latin word for the same thing, as pig and pork, calf and veal. Gradually these words have come to have slightly different meanings, pig and calf referring to the living animals, pork and veal to their flesh, respectively.

Through the ages English has been continually enriched by the addition of new words, some invented to supply a particular technical need, such as *rayon;* others borrowed from foreign languages—*chauffeur, pajamas, seersucker.* The histories of the following words, even as they are given in an unabridged dictionary, are highly interesting: *artesian, bootlegger, calico, cereal, derrick, fad, meander, panic, shrapnel, sofa, tweed, vaudeville, zeppelin.*

A knowledge of such origins helps in the choice of a particularly applicable word and in an understanding of the two sorts of meanings inherent in many words—the one definitely expressed and the other implied or suggested. The first is the *denoted* meaning and is actual, factual, precise; the second is *connoted* and is figurative and picturesque. Some words have both kinds of meaning; some have only a denoted meaning. *Residence* has not the figurative, connotative and emotional value of *home. Country* has the definite meaning of a certain section of territory but also all the implications of patriotism, love and enthusiasm suggested by the phrase "my country." Likewise *fatherland* means infinitely more than *nation; village,* more than *town;* and *love,* more than *affection.*

Good Usage.—Involving as it does an understanding of the constant evolution of language, caused by changing customs and interests, good usage cannot be memorized from a dictionary, grammar or even a book on the subject. A few rules may serve as guideposts, but good usage cannot be learned from a few sentences. For best results look up a word in an unabridged dictionary and examine the quotations given there to see how the great masters of English have used the word.

Except in realistic dialect avoid certain classes of words; they include: *localisms*—I reckon [suppose], sunup [sunrise], tuckered [tired] out, right smart of [large amount of], some [very] chilly; *vulgarisms*—ain't [am not], might of [have] been, hadn't ought [ought not], must of [have], most [almost] everybody; *improprieties*—leave us be [let us alone], the balance [rest] of the morning, an invite [invitation], real [really] pleasant; *slang terms*—except in rare, colorful instances; *colloquialisms*—anyhow [at any rate], quite [rather] warm, right away [at once], handy [skilful], a nice [pleasant] time; *pretentious and affected terms*—fistic encounter [fist fight], tonsorial parlor [barber shop], culinary department [kitchen]; also *foreign terms—de trop* [superfluous], *cuisine* [cookery], *sub rosa* [very con-

fidentially], *nil admirari* [no enthusiasms], or *Zeitgeist* [spirit of the age]. Except when one is writing for a special group of readers, difficult technical terms like *tort, metabolism* and *isothermic* are out of place and may not be understood.

Words in Use.—Words are of little value unless used with exactness in well-made sentences giving form to a complete idea or thought. In speech, attention must be paid to correct pronunciation so that a single mispronounced word will not detract from the thought. It is a joy to listen to a speaker whose well-constructed sentences move easily from thought to thought or to read a passage that is fluent and clear. No author or speaker is at his best until he has gained complete mastery of his technique, a complete knowledge of the uses of words.

Literature, which is the printed or "frozen" language, is much more than a succession of words; but the words themselves must be completely understood before the meaning of the whole can be grasped. An academic course entirely devoted to the study of Shakespeare's use of words does not destroy appreciation of his poetical qualities, great dramatic skill and amazing knowledge of human nature but gives a truer understanding and enjoyment not only of Shakespeare's plays but of English literature as a whole.

In oratory, debate and every other type of speech-making, a particular effort must be made for clarity and simplicity of sentence structure, because the listener must understand at once or not at all. He cannot reread or stop to figure out eccentricities of style. A speaker should choose his words with care, keeping always in mind what he wants to say and to whom he is to say it. Words in themselves are important, but it is the use a man makes of them that distinguishes him.

How To Correct Errors.—Correct speech is not a trifle to be easily and quickly acquired. Facility and accuracy come only at the price of constant attention and care. Never be satisfied with communicating thought in a crude approximation of your real meaning, followed by "Oh, you know what I mean!" when you cannot find the words for what you wish to say. A determined attempt to refrain from this form of mental laziness is the best insurance against slovenly speech.

In general the errors made by most people of average intelligence are few and readily corrected. Reading the masterpieces of literature, studying the words and their organization into sentences, as well as the thought, is excellent practice. Give conscious daily attention not only to your own speech but to the speech of others. A man's speech is judged by the worst he does—not by the best. If you wish to use words with correctness and effectiveness on occasion, you must always do so.

A list of words and phrases frequently misused is given below. Study and practice a bothersome word in its correct sense again and again until it is firmly fixed in mind. It will be a study rich in rewards, for language is a storehouse of history and knowledge that offers to the treasure hunter a fortune more fabulous than that of Midas.

WORDS AND PHRASES OFTEN MISUSED

Ability, Capacity. Ability is the power of doing; capacity the faculty of receiving. The ability is in me to do him good. Men's capacities have never been measured.

Abortive means premature, not brought to completion. A plan or an effort but not an act may be abortive.

About should not be used instead of almost. The day is almost [not *about*] gone.

Above, an adverb or preposition, should not be used as an adjective. Say, "The foregoing [not *above*] statement is true"; or "The statement that appears above is true."

Accept, Except. Accept means receive; except means exclude.

Accidently is not a word; the correct form is accidentally.

Accompanied by, Accompanied with. A man is accompanied by his dog; his remark may be accompanied with a grimace.

Ad. Avoid using this abbreviation for advertisement in formal writing and speaking.

Adapted to, for, from. A play is adapted for children; adapted to the taste of children; and may be adapted from a story for children.

Addicted to, Subject to. Addicted to means strongly disposed to; said of a habit or indulgence. Do not confuse with the phrase, subject to, which means exposed to some agency. A man may be addicted to opium, but subject to attacks of rheumatism.

Administer should not be used in the sense of deal. We deal blows; we administer medicine, oaths of office, affairs of state and the like.

Affect, Effect. Affect means influence or pretend; effect means bring about; as: He affected intoxication and affected the audience strongly. I shall effect a reform.

Aggravate means to make worse or to increase in intensity. Say, "The climate aggravates the disease." "His conduct annoys [not *aggravates*] me."

Agree with, Agree to. We agree with a person but agree to a bargain.

Ain't is an indiscriminate contraction for are not, am not and is not. It should not be used except in writing dialect.

Allow is frequently misused for think. Say, "I think [not *allow*] that I shall go to town."

All-around is not recognized by good usage; all-round is the correct expression.

All the, as in all the farther, all the higher, all the faster and similar expressions, should not be used for as far as. Say, "This is as far as [not *all the farther*] I can go." All the, with an adverb, means by that amount, just so much; as: Climbing the hill was all the more difficult because the snow was deep.

Allusion, Illusion. Allusion means a reference; illusion means a deceptive appearance; as a Biblical allusion; an optical illusion.

Alone, Only. That is alone which is unaccompanied; that is only of which there is no other. "He suffered alone" means that no one was with him. "Only he suffered" means that no other person suffered.

Alongside means by the side of, close to, near to. Do not use the preposition, of, after alongside. The ship came alongside [not *alongside of*] the wharf.

Already, All ready. Already means by this time or beforehand; all ready means wholly ready; as: I have already invited him. Dinner is all ready. We are all ready for dinner.

Alright is not a word; use the two words, *all right*.

Alternative should not be used when you refer to more than two things, as in a series. The expression, "He had this alternative left to him," presents a choice between two possibilities.

Altogether, All together. Altogether means wholly, entirely; all together means collectively, in a group; as: He is altogether honest. The king sent the people all together into exile.

Amateur should not be used to mean one who is new or unskilled at a business, a novice. An amateur may be skilled in something he likes but does not pursue as a business; as: He is an amateur photographer.

Anxious means concerned or worried, but not eager. To say, "I am anxious for your safety," is correct; but say, "I am eager [not *anxious*] to hear this concert."

Anybody, Anyone, Anything are singular forms and should always be referred to by singular pronouns, as: Anybody can do as he pleases. Anyone is at his best here.

Anybody else's, Anybody's else. Usage favors the first form, which is correct according to analogy of similar cases that throw the *'s* to the last word of a unified expression, generally nouns in apposition.

Anyplace is not a word; use the two words, *any place*.

Appreciate means to rate at its true value. In such an expression as, "I appreciate your services highly," the adverb, highly, is superfluous, not needed.

Apt, Likely, Liable. Apt means fit; likely means probable; liable suggests unpleasant probability; as: She expressed herself in apt and gracious words. It is likely that we cannot go. If he exposes himself to the weather, he is liable to contract a cold.

As—as, so—as. The first form is correct in affirmative, and the second in negative, propositions; as: We are as wise as our teachers. I am not so young as I used to be.

As I take it is a colloquial expression. Say instead, "As I understand it," or "As it seems to me."

As though is often used incorrectly for as if. Say, "He walked as if he were lame." If the ellipsis is supplied it is easy to see why this is correct—He walked as (he would walk) if [not *though*] he were lame.

Audience is not correct when you mean spectators. An audience listens; spectators see what occurs; as: The preacher had a good audience. Many spectators were at the ball game.

Auto is an abbreviation not desirable in formal writing.

Avocation, Vocation. One's regular work is his vocation; his hobby is his avocation; as: His vocation was teaching; his avocation, collecting antiques.

Avoid is often used incorrectly for prevent. Say, "He will receive no increase in pay if I can prevent [not *avoid*] it."

Aware of, Conscious of. We are aware of a fact, but conscious of our feelings.

Awful, Awfully should not be used as intensives or for supposed force; awful means that which inspires awe, as: The awful mysteries of the world unseen.

Bad, Badly. Badly should not be used for very much or for bad. Say, "I need money very much [not *badly*]"; "I feel bad [not *badly*]."

Balance means the excess of one thing over another and should not be used to mean remainder or what is left. It is correct to say, "He has a large balance (excess of credits over debits) in the bank." "We ate what was left [not *the balance*] of the cake."

Bank on, Take stock in are colloquial phrases and should not be used in the sense of rely upon, trust in, receive as trustworthy or confidently expect. Say, "I rely upon [not *bank on*] your co-operation." "I trust in [not *take stock in*] the new plan."

Because should not be used for the fact that. Say, "The fact that [not *because*] he is absent is no reason why we should not proceed."

Been to is incorrect. Say, "I have been in [not *to*] New York," or "I went to New York." You go to but cannot be to a place.

Begin, Commence, Inaugurate, Initiate vary in meaning; as: We begin the day with breakfast; we commence important work; we inaugurate a campaign; we initiate a policy.

Beside, Besides. Beside means by, near; besides means in addition to, moreover; as: The tree stands beside the house. I have more besides this. She was tardy; besides, she was insolent.

Between is used only of two persons or things; it should not be confused with among, which is used of more than two; as: Between you and me it is understood; among all our friends it is an open secret.

Blame it on is a vulgarism used incorrectly to mean accuse or suspect. Say, "He accuses, suspects or blames [not *blames it on*] me."

Both alike is redundant (that is, has an unnecessary word). In such expressions as: They are both alike; the two boys both have blue eyes, the word *both* should be omitted.

Bran new is often used incorrectly for brand new.

Bring, Fetch, Take. Bring means convey to this point, but is often confused with take; fetch means go and bring; take, remove from here or elsewhere to another place; as: Bring me your books; take these to your teacher. Fetch the racquets from the house.

Bust, Busted are vulgar terms for burst. Say, "The balloon burst." "The bank failed."

But what is incorrectly used to mean that. "I know nothing but what you told me," is correct; but say, "I do not doubt that [not *but what*] he will succeed."

Calculate is often vulgarly used for think or suppose. To calculate means to arrive at or reckon by a mathematical process; as: We calculate costs or the distance from earth to moon. We think that it will rain.

Caliber means the diameter of a body, especially of the hollow inside a cylinder. Figuratively it means capacity of mind. Say, "He has a mind of great caliber"; but "His work is of high order [not *caliber*]."

Can, May are two forms often misused. Can suggests power or ability; may, permission. "Can I take your place?" means "Am I able to do it?" "May I take your place?" requests permission.

Cannot help but is a confusion of two phrases, can but and cannot help. Say, "I can but believe you" or "I cannot help believing you"; never "I cannot help but believe you."

Case, Instance. We note the case (circumstances) of Mr. Jones; we refer to a special instance (example) of need in his experience.

Caused by should be used only to refer definitely to a noun. Say, "His disappointment was caused by the lateness of the train." It is incorrect to say, "He was disappointed, caused by the lateness of the train." The noun, disappointment, should be used instead of the verb, disappointed. Then the word *caused* will have a definite reference.

Censor, Censure have different meanings; to censor is to remove anything objectionable from written, printed or photographed material; to censure is to criticize harshly.

Character, Reputation. One's character is what he really is; one's reputation is what people think and say of him. To have a good character and a poor reputation, or vice versa, is possible but not likely.

Charge, meaning to accuse, takes the preposition, with; as: They charged him with [not *of*] many crimes.

Claim means to demand, as one's due. Say, "I claim my right." "He asserts [not *claims*] that he is your brother."

Clerk is not a verb. Say, "John is a clerk [not John *clerks*] for Smith & Co."

Compare to, Compare with vary in meaning. We compare a strong man to an oak; we compare one city with another.

Complected, Complexioned are dissimilar in meaning. Complected refers to complex weaving; complexioned to the type of complexion, as, light complexioned.

Congregate together is a redundant expression, as the words mean the same thing. In such expressions as: "A large crowd congregated together," the word *together* should be omitted.

Considerable is not an adverb. Say, "He has improved considerably [not *considerable*]."

Continual, Continuous have similar but different meanings; continual means frequently repeated; continuous means uninterrupted, without break as to time and space and is the stronger word. Thus we may say that the flow of a stream is continuous; that the clanging of a bell is continual; that the continual showers drenched the ground.

Convict, Convince. Convict is always used of something wrong, and refers to an outer condition. Say, "The man was convicted of the crime." Convince refers to inner judgment and may be used of either right or wrong. Say, "I am convinced that you are right and that he is wrong."

Correspond to, Correspond with. One act or quality corresponds to another. We correspond with another when we exchange letters with him.

Could of is an illiterate form arising from slovenly pronunciation. The correct expression is could have; so also with may have, must have, would have [not *may of, must of, would of*].

Council, Counsel. A council is an assembly or body of people gathered for consultation; counsel means advice, usually given by a counselor (attorney); or, as a verb, to give advice.

Couple means a pair or mates; as: The young couple is living on the hill. A couple of hours, a couple of loaves and other such expressions are incorrect.

Credible, Creditable. Credible means worthy of belief; as, "Dr. Cook's story is not credible." Creditable means worthy; as, "He made a creditable address."

Cute is used as slang; choose a word in good usage such as pretty, vivacious, lively, amusing, dainty, piquant, engaging or some other word of more definite meaning than cute.

Data is the plural of datum, which is seldom used. Compare stratum, strata; erratum, errata.

Definite, Definitive differ widely in meaning. Definite means specific; definitive means final; as: A definite (specific) answer was given, but it was not definitive (final).

Demean is often inaccurately used for bemean (to lower), but means to behave oneself; as: He demeaned himself properly.

Depot, Station are regarded in America as interchangeable; but in England a depot is a place where goods or stores are kept; and the place where a railway train stops for passengers is called a station.

Die of. Patients die of [not *with* or *from*] a disease.

Differ from, with. One thing differs from another in appearance; a person differs with another in opinion.

Different from is preferred to different than. Than is a conjunction; the idea of separation implied by different calls for the preposition rather than a word of comparison.

Directly should not be used to mean as soon as. Say, "We left directly (meaning immediately) after they came"; but not "Directly they came we left."

Disinterested, Uninterested. Disinterested means impartial; uninterested means lacking interest.

Disremember is provincial for forget and should not be used.

Donate as a verb is not approved by all authorities; give and present are better words to use.

Done is a gross error when used as the past tense of do. Say, "I did [never *done*] it."

Done, Finished. These words do not mean the same. Say, "The job was well done for the house is now finished." Done means performed; finished means completed.

Don't is the contraction of do not; never use it instead of does not, for which the contraction is doesn't. Avoid using contractions in formal writing.

Don't think. Say, "I think it will not rain" [not "I *don't think* it will rain]."

Double negatives in English are commonly used but are gross errors. Say, "I didn't know anything [not *nothing*] about it." "I have [not *haven't*] never been there."

Drownded is not a word—say drowned.

Due, Owing. Due means what ought to be paid; as: "The note is due next month." Owing means the same as on account of; as: "It was owing to his daring that the insurrection was checked."

Each is singular in number and should be used with a singular noun and verb. Say, "Each comes in his [not *their*] turn."

Each other, One another. The first phrase refers to only two; the second, to more than two.

E'er, e'en, ne'er, o'er and simliar contractions are legitimate in verse but should not be used in prose.

Elegant means refined, in good taste. Avoid it as a much misused and overused word.

Emigrant, Immigrant are often confused. Emigrants are people going out of a country; immigrants are people coming into a country.

Endorse or **Indorse.** Say, "Endorse or indorse a note" [not *endorse on the back of*], as the word endorse means to write upon the back of. Endorse is the spelling now more common in American usage.

Equally as well. The word *as* is unnecessary. Say, "Equally well."

Etc., an abbreviation for the Latin *et cetera,* means: and other (things). As *et* means and, the phrase and etc. is a repetition and incorrect. Do not write ect.; the correct abbreviation is etc.; but do not use it in formal writing.

Every takes a verb in the singular number; as: Every man was at his post.

Everyone, Everybody, Everything are words of singular number and should always be referred to by singular pronouns; as: Everyone should mind his own business. Everybody has his troubles. Everything is in its place.

Evidence, Testimony, Proof. Evidence is anything that tends to convince; testimony is evidence given by witnesses; proof is whatever establishes the truth of a proposition.

Except, Unless. Except should not be used for unless. Say, "Unless [not *except*] I am delayed, I shall arrive at three."

Existing truths should always be expressed in the present tense. Say, "Galileo taught that the world is [not *was*] round."

Expect refers only to the future and should not be used to mean think or suppose. Say, "I think [not *expect*] I was there at three o'clock." "I suppose [not *expect*] you had a pleasant time yesterday."

Fail is not correctly used unless there is an effort to succeed. He failed to come means that he tried to come but could not—not that he did not come.

Few and **a few** differ in meaning. To say, "Few persons like Mr. Jones," means that he is generally disliked; but the statement, "A few persons like him," means that he has some friends.

Fine should be used sparingly as an adjective and never as an adverb. Choose a more exact and less common word.

Firstly is not the approved form; first is preferred as both adjective and adverb.

First-rate may be correctly used as an adjective, as: He has a first-rate place. The expression, "He did first-rate," is incorrect.

Fix. Be sure that you intend to convey the idea of fastening firmly when you use the word *fix;* it should not be used to mean repair, arrange or set up. Say, "He stopped to repair [not *fix*] the machine"; but "The built-in furniture was fixed to the wall."

Former, Latter, unless followed by a noun (as, the former ruler or the latter member), are avoided in formal English and should never be used except to refer to one of *two*.

Funny means humorous, mirthful and should not be used in the colloquial sense to describe something strange or curious.

Get means to obtain by voluntary effort; it does not signify mere possession. Say, "I have not a cent [not I have not *got* a cent]."

Get over is often incorrectly used for survive, recover or refute. Say, "He recovered from [not *got over*] the disease." "He refuted [not *got over*] the statement."

Get to go is a common expression in some parts of America but should be avoided. Say, "I was unable to go," or "I was prevented from going [not I did not *get to go*]."

Give in the passive must be used carefully. Say "He received [not *was given*] a present." It is all right to say "The present was given."

Go and has a legitimate and effective use, as in the phrase, "Go thou and do likewise"; but it should not be used when only one action is meant. Say, "He ran [not *went and ran*] away."

Good deal, Great deal are correct expressions, as: I have walked a great deal. The boy liked play a good deal better than school.

Good, Well. Good should not be used as an adverb. Say, "You sang well [not *good*]." "Did you sleep well [not *good*] last night?" Note that *well* is an adjective in the sense of healthy.

Guess expresses conjecture; it should not be used for think, suppose or expect. Say, "I was to guess in which hand he held the money"; but "I think [not *guess*] I shall go."

Had better, Had best, Had rather are grammatical and fully approved by good usage. Had better is preferable to would better; but one may use had best or would best, had rather or would rather with equal correctness. Say, "You had better not stay long." "They had best (or would best) attempt no violence." "I had rather (or would rather) go than stay."

Had of is illiterate. Say, "I wish I had [not *had of*] known about it."

Had ought is incorrect; no form of the verb to have can be correctly used as an auxiliary with ought. Use should or ought not. Say, "He should not [not *hadn't ought to*] have gone."

Hain't is a dialect vulgarism; there is no such contraction for have not or has not.

Hanged, Hung. Hanged is the correst past tense and past participle of hang, meaning put to death by hanging. Say, "He was hanged on the gallows." Hung is the correct past tense for other meanings of the verb hang; as: The pictures were hung.

Healthy, Healthful are not interchangeable. A man in good health is healthy; a good climate is healthful.

Help should not be followed by the word *but* when used in the sense of avoid; it should be followed by a gerund. Say, "I cannot help regretting [not *help but regret*] the change."

How should not be used for what or for the phrase, What did you say?

Human should not be used as a noun. Say, "The house was not fit for human beings [not *humans*] to occupy."

Hygienic, Sanitary. Both words mean pertaining to health. Use hygienic when the condition is a matter of personal habits or rules; use sanitary when the condition is a matter of surroundings (as water or food supply or sewage disposal) or the relations of numbers of people.

If I were. This subjunctive form should be used in all cases in which the conditions are contrary to fact. Say, "If I were you (which I am not), I should go. "If I were a man (which I am not), I should practice law." Use the indicative in cases of uncertainty; as: If I was (meaning uncertainty) in town that day, I did not see you."

Imply, Infer. We imply a meaning in what we say; we infer a meaning from another's remark; as: My words implied confidence in him. I infer from what you say that you are pleased.

In, Into. Use in to signify resting in a place; use into to signify motion toward a place; as: He was standing with his hands in his pockets. I put my hands into my pockets. I came in an automobile. The stranger walked into the room.

Inaugurate means to induct into office or to make a ceremonious beginning, but should not be used in speaking of the simpler things of life or to mean commence or begin.

In back of is a vulgarism, though the similar expression, in front of, is approved. Say, "She sat behind [not *in back of*] me."

Infinitive, Split. The cleft or split infinitive (that is, having an adverb between its two parts) is avoided by careful writers. Say, "He was in a position to observe accurately [not *to accurately observe*]."

Ingenious, Ingenuous. A person is ingenious if he is clever, resourceful; he is ingenuous if he is open and candid.

Initiate suggests ceremonious form and should not be used instead of the word *begin.* Say, "The candidates were initiated into the lodge."

Inside of is an Americanism for the word *within* in time expressions. Say, "It will disappear within [not *inside of*] a week."

Instants, Instance. Instants means moments of time; instance means an example.

It's is the contraction of it is, and should not be written for the possessive, its.

Kind of a. The *a* is superfluous.

Later, Latter. Later means more late; latter means the second in a series of two. Do not use it to refer to the third or fourth of a series; say *last.*

Lead, Led. Led is the past tense, and lead is the present tense of the verb to lead.

Learn, Teach are often misused. To learn is to receive instruction; to teach is to give instruction. Say, "Will you teach [not *learn*] me my lesson?"

Leave, Let. Leave means to cause to remain, or to abandon; let means to permit, and requires the objective case. Say, "Leave your books here." "Leave the place at once." "Let him and me [not *he and I*] go."

Lend, Loan. Lend is a verb; loan a noun; as, I lend a man a dollar, and he receives the loan.

Less, Fewer. Less has to do with amount or quantity; fewer refers to the number of things or persons; as: He had less money and fewer clothes than he needed. Fewer people than usual attended the meeting.

Lie, Lay are often used incorrectly. To lie is neuter (intransitive) and designates a state; to lay is active (transitive) and denotes an action upon an object; it means cause to lie; as: A thing lies on the table. Someone lays it on the table. He lies buried with his fathers. We laid him in the tomb. In the same manner we say, "A thing lies by us until we bring it into use." "We lay it by for some future purpose."

Some confusion may arise from the fact that the word lay appears in both verbs—as the past tense of the intransitive verb, lie (principal parts: lie, lay, lain), and as the present tense of the transitive verb, lay (principal parts: lay, laid, laid), as illustrated by these sentences:

The book now lies on the table.	I now lay the book on the table.
Yesterday it lay on the table.	I laid it there last night.
It has lain there often before.	I have laid it there daily for some time.

Like, As. Like has a prepositional use; as is a conjunction. Say, "It looks as if [not *like*] it was caused by fire." "My brother looks like me." "He acted as if he were insane." "Do it as I do."

Literally. Do not use literally to mean figuratively. Say, "I was figuratively [not *literally*] tickled to death."

Locate should not be used to mean settle; it is used transitively to mean fix or place in a position; as: He located a claim. They settled in Virginia.

Lose, Loose. Lose means to cease having; loose, as a verb, means to set free; and as an adjective, free, not bound.

Lose out should not be used in formal speech or writing; omit out.

Lot, Lots are too frequently used for a great many, a great deal or much. Say, "He had a great deal [not *lot*] of money left to him." "She looks much [not a *lot*] like her brother. The word *lots* means distinct parts or portions; as: He divided his land into lots.

Lunch is an authorized form as both noun and verb.

Mad should not be used for angry.

Majority, Plurality. In a loose sense, majority means the greater part; more strictly, it means the number by which votes cast for one candidate or measure exceed those cast by the opposition. A plurality is the excess of votes received by one candidate over his closest competitor. In an election A receives 500 votes; B, 400 votes; and C, 300 votes. A has a plurality of 100 but no majority.

Might of is a vulgarism for might have.

Monstrous means abnormal or deformed and should not be used to mean large or immense. Say, "It was a monstrous creature." "The crowd was enormous."

Most, Almost should not be used interchangeably. Say, "Most of my friends are artists." "Almost [not *most*] all members were present."

Much should not be used for very. Say, "My work is very [not *much*] different this year." "She was much [not *very*] pleased."

Mutual, Common. We may have friends in common, but the best modern usage forbids the expression, mutual friends. We may have mutual (reciprocal) plans or feelings, such as hatreds or admirations.

My being is the correct form; the possessive case is required with the gerund. Say, "He did not know of my [not *me*] being there." "There is little chance of his [not *him*] winning the game."

Myself should not be used for I. Say, "John and I [not *myself*] are friends."

Near should not be used for nearly. Say, "He was not nearly [not *near*] to unselfish as his brother."

Neglect, Negligence. Neglect is a distinct act; negligence is a habit.

Neither—nor, Not—or. Say, "Neither the man whom his associates had suspected nor [not *or*] the one whom the police had arrested was the criminal." "She could not paint a good picture or [not *nor*] play the violin well."

Nice is a generally misused word; it means delicate, discriminating, fastidious; as: the works of a watch show nice construction. A man may be nice in his manners. The word should not be used to mean agreeable or charming; to say, "I had a nice time," is colloquial.

Nicely should not be used to mean well. Say, "The sick man is doing well [not *nicely*]."

Not as I know of is incorrect. Say, "Not that I know of."

Notorious, Famous. The first implies an undesirable quality; the second, something desirable or worthy. Say, "He was a notorious brigand." "She was famous for her charities."

Noways is incorrectly used for nowise. Say, "He was nowise [not *noways*] to blame."

Nowhere near is a vulgar expression for not nearly.

Nowheres is the vulgar form for nowhere.

O, Oh. Of these interjections, O is used with a noun in direct address and is not separated from the noun by punctuation; Oh, more commonly used, is followed by a comma or an exclamation point; as: Hear, O king, what thy servants would say. Oh, dear!

Observance, Observation. Observance means the practice of observing, as a custom; observation means any act of seeing or noting.

Of should not be used for have; the correct forms are: should have, may have, ought to have.

Off of. In most cases of is superfluous. Say, "The man fell off [not *off of*] the roof."

O.K. means all right, but is a hackneyed expression.

Only is often misplaced; it should immediately precede the word or expression that it limits. Say, "I have only [not *only have*] three dollars." "She sang only [not *only sang*] for us." "She only sang" would mean she did nothing else but sing.

Onto is colloquial. Say, "I get on [not *onto*] a horse"; but "They passed on to (two words) the next gallery."

Orate is an unauthorized form commonly used to mean to give an oration.

Over should not be used in the sense of more than. Say, "I have more than [not *over*] a hundred dollars." "The stick is more than [not *over*] a yard long."

Over with is a crude expression for over; omit with. Say, "Their troubles were over [not *over with*]."

Pants. Trousers is the approved term in correct usage. Pants (from pantaloons) has found colloquial and commercial acceptance.

Part, Portion. A part of a thing is any single section; a portion is an allotted part.

Partake does not apply to eating a meal alone, as the word means to take or share with another.

Partially means with partiality; also it is sometimes used in the sense of partly; as: I have only partially examined the paper.

Participles are not correctly used with conjunctions. Use the complete verb not the participle. Say: "When it is found [not *when found*], make a note of it."

Party applies only to a group of people, not to one person. If you mean an individual, say, "The person [not *party*] you sent to me arrived."

Patron means one who shows consideration or favor. A charity ball or the arts may have patrons, but the word is incorrectly substituted for customer.

Pellmell means mixed or mingled together, therefore the term cannot properly be applied to an individual. To say, "He rushed pellmell out of the house" is obviously wrong.

Per should be used only with Latin nouns, as *per diem, per annum.* With English nouns use *a,* as a day, a year or a pound. The only exception is in formulas and scientific phrases, like "revolutions per minute."

Phenomena is the plural of phenomenon. Say, "It was an interesting phenomenon [not *phenomena*]."

Phone is colloquial and should not be employed in formal writing. Use the complete word *telephone.*

Pled, a colloquial form, should not be used for pleaded. Say, "He pleaded for pardon."

Plenty, a noun, is not in good use as an adjective or adverb. "He had plenty of [not *plenty*] resources." "He had resources in plenty [not *resources plenty*]."

Posted should not be used in the sense of informed. Say, "He is a well-informed [not *well-posted*] man." "If I had been better informed [not *posted*], I could have passed the test."

Practical means related to actual use as opposed to the theoretical or ideal. Do not confuse with practicable, which means capable of being put into practice. A practical scheme (that is, valuable or sensible) may not be practicable until a better opportunity presents itself.

Presume means dare or presuppose and should not be used to mean think or believe. Say, "I may presume too much"; but "I think [not *presume*] he is right."

Preventive is the correct form [not *preventative*].

Principal, Principle. Principal as an adjective means chief or leading; as a noun, a sum of money or the chief official of a school; principle, always a noun, means element, general truth, uprightness; as: The principal of the school is a man of the highest principles; he teaches the principles of physics.

Privilege, Right. A privilege is a special advantage granted or conceded; a right is one's due; as: We grant many privileges, but we claim our rights.

Proof, Evidence. In a law court, proof is evidence sufficient to establish a fact; evidence is whatever is brought forward in an attempt to establish as a fact what has been asserted; as: The evidence against the prisoner was extensive, but hardly proof of guilt. In ordinary speech, the word *proof* is sometimes loosely used as a synonym for evidence.

Propose, Purpose. Propose means to put forward for discussion or consideration; purpose means intend; as: I purpose going to town to propose a plan to my business partner.

Proposition means a thing proposed; as: His proposition was accepted. Do not use loosely, as in the sentence: A berth in a sleeping car is a good proposition during a railway journey at night.

Proved, Proven. Scotch law has a verdict, "not proven." The word *proved* is correct in any other use.

Provided, Providing. Say, "I shall vote for him provided [not *providing*] he is a candidate."

Quite is used in the sense of fully, completely; as: I am quite satisfied; but do not say, "There was quite a crowd," or "I have quite a few friends."

Raise is often misused to mean rear or bring up. We raise chickens, but we rear children.

Rarely ever is a crude expression for rarely or hardly ever.

Real should not be used adverbially in the sense of very. Say, "I am really (or very) [not *real*] tired."

Reckon is provincial for think. Say, "I think or believe [not *reckon*] he will come soon."

Recommend should not be used as a noun; recommendation is the proper word. Say, "The teacher gave him a good recommendation [not *recommend*]."

Relatives, Relations. Say, "My mother and other relatives [not *relations*] are visiting me." "Friendly relations with neighbor nations should be cultivated."

Replace means restore to its place and should not be used in the sense of take the place of.

Respectful, Respectable, Respective differ greatly. He was respectful to his aunt, a respectable old woman, though their respective social positions (position belonging to each) were widely separated. Yours respectfully [not *respectively*] is correct as the complimentary closing of a letter.

Retire should be avoided in the sense of going to bed.

Reverend, as a title should not be used without the words *the* and *Mr., Dr.* or *Father*. The correct form is: The Reverend Mr. (Dr. or Father) Brown [not *Reverend Brown*]. This rule also applies to the title, Right Reverend.

Rise, Raise. Rise is an intransitive verb; raise is a transitive verb. I rise to go home. I raise vegetables. I raise the stone from the ground. Both words are used as nouns: raise only in the sense of an increase in pay as: He gave his servant a raise.

Same is no longer used as a pronoun except in legal documents. Say, "He saw her drop the purse and restored it [not *same* or *the same*] to her."

Scarcely should not be used with a negative.

Seldom ever is crude for seldom or hardly ever.

Set, Sit, like lie and lay, are often confused in their use. To set is both transitive and intransitive; to sit is intransitive. I set the hen, but she sits on her eggs, and is correctly called a sitting hen, though often incorrectly spoken of as a setting hen. The verbs are correctly used as follows: My dress sits well. We shall sit up, that is, not go to bed. Congress sits. We set down figures, but we sit down on the ground. We set a post, set glass, set milk, set the sails, set a broken bone, set a clock, set a price, set jewels, set an example. The sun sets, one sets out to go places, the current sets to the north; one sets forth or sets off; winter sets in.

Shall, Will are perhaps more commonly misused than are any other words in English. The rules with regard to the use of these words are: In declarative sentences, shall is used in the first person and will in the second and third persons to express simple futurity; as: I shall come. You will come. He will come. In questions, however, shall is used rather than will in the second person to indicate simple futurity; as: Shall you come? In the first and third person, will is the correct word; as: Will I come? Will he come? To say, "Shall I come?" would be to ask permission to come. "Shall he come?" would be a request that he be allowed to come. In other cases, shall and will express purpose or determination on the part of the speaker—will in the first person and shall in the second and third persons.

Shape should not be used loosely to mean manner or condition. Say, "They executed the maneuvers expertly or in an expert manner [not *in good shape*]." "He is in good condition and thoroughly prepared [not *in good shape*] for the debate."

Should, Would in general follow the rules for shall and will. In clauses expressing a condition, should is used in all three persons. If I should try, I should succeed. If he should come, he would meet you. (Should here expresses a condition.) Should is also used in all three persons to express a sense of duty. He or I should come home early. Should here expresses duty.) Would is sometimes used to express a customary action; as: He would come up to the window to look out.

Show up is a vulgarism when used intransitively in the sense of appear, attend, come or be present; and when used transitively in the sense of show or expose.

Sight, usually with of, is colloquial and crude for many, much, a great deal; as: A great many [not a *sight of*] strawberries were shipped.

So is much used in a manner that is loose, vague and often unnecessary. As an intensive, so has been called the feminine demonstrative; as: I was so surprised. Say, "I was much surprised," or, "I was surprised." As a connective, the frequent use of so is the mark of a beginner.

Some should not be used as an adverb. Say, "She was somewhat [not *some*] better the next day." "He did some studying [not *studied some*] that night."

Somewheres is crude for somewhere; never add the *s*.

Speciality is an erroneous spelling of the word *specialty*.

Species, Specie. Species has the same form for both singular and plural and means a particular sort or kind of plant or animal, as: He discovered a new species of sunflower. Specie means money in coins. The exchange was in specie.

Splendid means brilliant and should not be used to refer to what is only ordinarily good or commonplace.

Stationary, Stationery. Stationary is an adjective meaning fixed; stationery is a noun meaning writing materials.

Statue, Stature, Statute. Statue means a carved or molded figure; stature means height; statute means a law.

Stimulant, Stimulus, Stimulation. Stimulant is a concrete element or force to rouse us; stimulus is any general influence with the same purpose; stimulation is the effect produced.

Stop is wrongly used for stay. We stop at the roadside; we stay with a friend or at a hotel.

Such is: (1) To be completed by that, rather than by so that, when a result clause follows; as: There was such a crowd that [not *so that*] he did not find his friends. (2) To be completed by as (rather than by that, who or which) when a relative clause follows; as: I shall accept such arrangements as [not *that*] may be made. He called upon such soldiers as [not *that*] would volunteer for this service to step forward.

Sunday should not be used as a verb. Say, "He spent Sunday [not *he Sundayed*] at home."

Superior than is not in good use; superior to is preferred.

Sure is frequently misused for surely. Say, "He will surely [not *sure*] be here."

Suspicion is not a verb, though so used in dialect. Use suspect instead; as, I suspect [not *suspicion*] him of misrepresenting things.

Swell used as an adjective is a vulgarism that should be avoided.

Take is a colloquialism when used for study. Say, "I studied [not *took*] Spanish and chemistry."

Take and is often unnecessary, sometimes crude or redundant. Say, "He sharpened [not *took and sharpened*] the ax."

Tend, in the sense to look after, takes a direct object without the preposition to. Attend, however, is followed by to. The grocer's assistant tends [not *tends to*] the shop. I shall attend to your wants in a moment.

That for So. Say, "He was so [not *that*] independent, he could not tolerate interference."

That there is incorrect for that. "I want that [not *that there*] box of berries."

Them should not be used as an adjective pronoun. Say, "Those [not *them*] boys are here."

Then is not an adjective. Say, "Then the President [not *the then President*] was Mr. Taft."

Thence is not used with the preposition, from, as it means from that place. Say, "He departed thence at noon."

These kind, Those sort violate agreement or concord; kind and sort are singular nouns and should be modified by singular adjectives. Say, "This kind or that sort is what I prefer."

This here is incorrect; omit the word *here*.

Those. Do not carelessly omit a relative clause after those. Faulty: He is one of those talebearers. Correct: He is one of those talebearers whom everybody dislikes.

Through is often misused in the sense of finished. Say, "I have finished [not *am through with*] my breakfast."

Till should not be carelessly misused for when. Say, "I had scarcely strapped on my skates when [not *till*] Henry fell through an air hole."

Transpire means to leak out, to become known; it should not be used to mean happen. To say, "It transpires that the couple had been married for a year" is correct.

Try and should not be used for try to. Say "Try to come [not *try and come*]."

Two first, Two last are incorrect. Say, "The first two and the last two sentences were long."

Unique means the only one of its kind. We cannot correctly say, then, that something is "very unique."

Up. Do not use needlessly after such verbs as end, rest and settle.

Used to is the correct form [not *use to* or *usen't to*]. Say, "I used to live there." "You used to travel."

Verbal is misused for oral. He would not write her a note, but sent her an oral [not *verbal*] message. Verbal means in words; therefore both a note and an oral message are verbal.

Very should be accompanied by much when used with the past participle. He was very much [not *very*] pleased with his reception.

Wait on is a vulgarism for wait for. Say, "If I am not there, do not wait for [not *wait on*] me."

Want, Need. Want as a verb expresses both the desire for a thing and the fact that the thing is lacking; need expresses the necessity for a thing. A man may want an automobile, though he may not need one.

Want to should not be used in the sense of should or had better. You should [not *want to*] keep in good physical condition."

Wa'n't should not be used as a contraction for was not or were not except in writing dialect.

Ways is often incorrectly used for way. Say, "I walked a long way [not *ways*] with her."

When should not be used for that in such a sentence as: It was in the afternoon that [not *when*] the races began.

Where should not be used for that in such a sentence as: I see in the paper that [not *where*] our team lost the game.

Which should not be used for who or that in referring to persons. Say, "The friends who [not *which*] had loved him in his boyhood were still faithful to him."

While is often incorrectly used for although or and. Say, "Although [not *while*] I believe you are honest, I cannot vote for you." While means during the time that; as: while I was musing, the fire burned low.

Who. Do not use who in the objective case. Say, "Whom [not *who*] do you want to see?"

Win out is colloquial and should not be used in formal writing or speaking.

Without, Unless. Without is a preposition and should not be used to take the place of the connective, unless. Say, "I shall not go unless [not *without*] my father consents"; or "I shall not go without my father's consent."

Worse should not be used for more. Say, "I fear one thing more [not *worse*] than any other—fire.

Worst kind, Worst way are vulgarisms used in the sense of very much.

Would have should not be used for had in if clauses. Say, "If you had [not *would have*] spoken boldly, he would have granted your request."

Would of is a vulgarism for would have.

You was is incorrect. Use you were for both singular and plural.

Yourself is intensive or reflexive; do not u when the personal pronoun will suffice.

LETTER WRITING

A letter is not a mere lifeless document; it is a living, personal message. It takes the place of a personal interview or friendly conversation and therefore must have all the spontaneity and directness of speech. It must not be stilted or unnatural.

Many writers of both business and personal letters forget this requirement and write in trite terms and hackneyed phrases. Too many letters are the result of imitation and not of original thinking; for example, business letters frequently begin as follows:

> Dear Sir:
>
> Your esteemed favor of the 10th inst. to hand and contents duly noted. In reply to same, beg leave to state. . . .

Contrast with this the directness and naturalness of a more original opening:

> Dear Sir:
>
> We are glad to answer your letter of March 10. After reading your letter it gives us much pleasure to tell you. . . .

Almost anyone can think of a number of conventional words and phrases that he is likely to use unless he stops to reflect that they are merely imitative and contribute nothing to the genuine expression of a personal message.

Jargon.—Some of these common examples of jargon are:

even date *for* today's date
proximo *for* next month
ultimo *for* last month
favor *for* message
advising us *for* telling us
by the undersigned *instead of* by me or us
in re *for* concerning or about
pursuant to *for* in accordance with or following
as per your order *for* following your instructions
matter in hand *for* your question about the shipment
enclosed herewith *for* inclosed
under separate cover *for* in another package
trusting to hear from you *for* we shall be grateful for your reply
thanking you, we beg to remain *for* thank you
oblige *for* it will be a favor to us

No letter can be successful if it is not carefully adapted to the reader. This means that the writer must know a good deal about his reader before he starts. He must take into account the reader's background and experience, personal tastes and prejudices, sex, vocabulary, financial and social standing, geographical location, occupation and temperament. In other words, the writer must put himself in the reader's place. He must say to himself, "How would this letter affect me if I were reading it, not in my own character but in the personality of the other man?"

Adaptation.—In other words the letter must be appropriate to the reader in the choice of words, in the ideas included and in the general tone. Is that possible? How can one adapt the letter to a reader whom he does not know personally. It is not impossible. The letter to be answered gives a good deal of information and guidance—if one will only look for it and apply the principle of adaptation. For example, a large bank received a letter from a Mr. C. Kawhahata, asking for information on the method of closing out his account. A clerk in the bank wrote an answer to Mr. Kawhahata without looking for internal evidence in the depositor's letter and without paying any attention to this principle of adaptation. The clerk's letter read this way:

> Mr. C. Kawhahata,
> Hotel Royal,
> New York City.
>
> Dear Sir:
>
> We have before us your favor of March 10, in which you state that you desire to close your account as of March 14 and request information as to the proper procedure.
>
> In this connection we should advise that your account will be ruled off and statement of account sent you as of the close of business March 25, which should be reconciled with your records and if found correct, check drawn upon us for the balance shown by us.
>
> Very truly yours,
> The Blank Bank
> by J. H. Smith

Fortunately an officer of the bank saw Smith's letter before it was mailed to Mr. Kawhahata and substituted the following letter. Note the difference.

> Mr. C. Kawhahata,
> Hotel Royal,
> New York City.
>
> Dear Mr. Kawhahata:
>
> We are very glad to give you the information about the method of closing your account that you requested in your letter of March 10.
>
> At the close of business March 25 a statement of your account will be prepared and mailed to you. Please compare this with your own records. If they agree, you can then draw a check for the balance. If there are any differences between our statement and your checkbook record, please come in to adjust them.
>
> We trust that your decision to close your account was made because you are changing your residence or business plans. If our service has been unsatisfactory in any respect, we assure you there is nothing we should welcome more heartily than your criticism. We are always trying to improve our service, and we shall appreciate any suggestions you may have.
>
> Any time that we can serve you or your friends we shall be delighted to see you in the bank or to hear from you.
>
> Cordially yours,
> The Blank Bank
> by Edward B. Jones

Getting Good Will.—How did the officer get the necessary information for his improvement on the unadapted letter? In the first place the name of the correspondent is clearly Oriental. It matters not whether the exact nationality is revealed; it is well known that all Orientals lay what seems to the American to be extreme emphasis upon the forms of politeness. Also it is likely that a foreigner needs simpler and more explicit instructions than does one who is more familiar with our routine of banking. These two facts are sufficient in themselves to warrant the difference between the two letters. Notice not only that the second letter accomplishes its obvious purpose but also that it creates a friendly feeling. It is axiomatic that all business correspondence should have two purposes: First, the immediate objective and, second, the maintaining of good will so that a large body of potential customers is always assured. We learn from these letters that a close scrutiny of all details will tell the letter writer much more about his reader than appears on the surface.

No letter can be entirely successful unless it shows evidence of certain qualities, essential to all correspondence. These are the famous "Five Cs" of the textbooks: Clearness, Conciseness, Courtesy, Character and Correctness.

Clearness.—No message is of value unless it is clearly understood by the one to whom it is addressed. Too often the letterwriter's motto seems to be, "Perhaps my letter will be understood." His slogan should be, "I'll write a letter that cannot possibly be misunderstood."

In general there are three causes for misunderstanding. First, writing may be ambiguous; that is, the words may say something quite different from what the writer intended. For example, a man with all good intentions offered this testimonial to the efficacy of a patent medicine. "I continued to take your medicine. Fortunately, I was completely cured, after having been brought so near to the gates of death by your infallible remedy." Another ambiguity: A New York attorney was protesting in a newspaper letter that he was often mistaken for a shyster who happened to have the same name. In the course of his protest he made this astounding statement: "My friends have been very much surprised when I have told them that I am not the Mr. Smith who follows these unethical practices."

Ambiguity may result from several kinds of carelessness. It may be grammatical inaccuracy—misplaced phrases, carelessness with pronouns, illogical sentence structure. It may occur when one's thought processes are not clear. It is a safe generalization that if one is a clear, logical thinker, his writing also will be clear.

Other violations of clearness are found in writing that is vague or indefinite and in writing that is obscure. For example, "Our periodical reaches the best class of readers" is vague; whereas, "Over 61 per cent of our readers are listed in *Who's Who*" is definite and clear.

Obscurity arises from serious faults in expression, particularly the habit of burying a simple meaning under a mass of pretentious words. A good example of obscurity is the following sentence taken from an official letter: "And I thought I made it clear that in answer to the requests I sent out to department heads to save and have before me when I took office a statement of further economies they were going to effect, and that I had received many letters, some of which showed further economies, and others have gone to the limit in the matter of those already made."

Conciseness.—The second essential quality of a letter, conciseness, is often confused with brevity. It is true that letters should be brief—but not too brief to express the meaning. No letter is really concise unless it gives the reader full opportunity for complete understanding. The letter writer should ask himself two questions as he considers his finished product: "Are all the essentials of my letter included?" "Are any nonessentials included?" The answers to these questions will settle immediately any doubts whether the principle of conciseness has been observed.

Courtesy.—The third essential characteristic would seem at first thought to be too obvious to mention. It is a lamentable fact, however, that many letters are lacking in genuine courtesy. The matter-of-fact nature of the material of business correspondence frequently induces a matter-of-fact tone that verges on the abrupt. Courtesy does not consist in the observance of conventional forms of politeness; it is created only by a genuine interest in the reader and consideration for him. Just as in a personal conversation the considerateness of one person for another promotes mutual good will and a spirit of co-operation, so in the letter a kindly interest evokes a cordial response. Note the absence of courtesy in the following letter that was actually sent to a customer by the manager of a chain of restaurants:

Miss Grace Does,
48 West White Street,
New York City.

Dear Madam:

I am always sorry if anybody has any trouble at any of our restaurants. They are planned with the intention of making people happy and comfortable, both as to food and service, but we must frankly tell you that we cannot alter the rules governing the fifty-cent luncheon.

Considering the times and the prices, you are getting an amazing value. If you are not satisfied, I would certainly suggest that you go elsewhere. I would also suggest that if you wish a dessert before it gets out, that you come a little earlier.

If you are still desirous of remaining a patron of the Blank Restaurant, we can do nothing but uphold our very wise rule in saying that no substitutions can be allowed even though things do run out. We are running on too narrow a margin of profit to allow people to wander all over the menu and choose what they feel like choosing in the way of substitutions.

Yours truly,

Character.—The next essential is hard to define. Character is best understood when one thinks of it in terms of its synonym personality. Some persons are endowed with qualities that make them attractive to others, and good writing conveys to the reader its own subtle charm. There is no formula that can be followed in acquiring this extremely valuable trait. But one may be very sure that it is the result of what one authority has called, "The infinite capacity for taking pains." Good writing is the result of years of careful preparation and a thorough mastery of the tools of one's trade. The master writer, like the master craftsman, does not have to strain and struggle for his effects. He reaches them by the natural, easy manipulation of his vocabulary, of sentence structure and of word patterns. The secret of attractive writing is simplicity and directness. As Schopenhauer says, "Nothing is more difficult than to express deep things in such a way that everyone must necessarily grasp them." Good sense is the source and origin of good style. Simplicity is a mark of truth and also of genius.

It is very hard to give a formula for a warm, friendly tone in correspondence. The following example illustrates a spontaneous and natural style with all the elements of cordiality:

Dear Mr. Dash:

Many, many years ago the traveler leaving his hotel would go with the words "Good-by, good luck and come again!" ringing in his ears.

I like that. It's one of those things that make me long for the good old days. And in these modern days of speed I want you to feel the same way—that we were glad to have had you here, and that our latch string is always out. Which is, after all, another way of saying 'Good-by, good luck and come again!"

Cordially yours,

This letter, sent by a hotel several days after an out-of-town guest had departed, has all the qualities that would induce a friendly feeling for the hotel and insure a return registration on another visit.

Correctness.—The quality of correctness has been placed last on this list because it relates to so many phases of correspondence. There are so many ways in which correctness must be observed. Grammatical correctness is fundamental. No one can possibly hope to write good letters unless he is schooled in the precepts of good English. Familiarity with parts of speech and the requirements of punctuation, knowledge of good sentence structure and the possession of good diction all help guarantee correctness.

Many letter writers suffer from a self-imposed handicap by looking upon grammar as difficult, mysterious and complex. Nothing is farther from the truth. Grammar is actually extremely simple. Anyone who is capable of understanding the simplest mechanical device, anyone who regards himself as able to "put things together" may easily master grammatical principles. If he thinks of the sentence as a little machine of only seven working parts, he will not find the sentence difficult to understand or to construct. The phrase, *parts of speech,* actually means what it says. Parts of speech are *working parts,* just as truly as spark plugs, leading wires, fuses and lamp sockets. The sentence is a vehicle, a little transporting machine; it is used to convey an idea from the mind of one man to the mind of another. Its parts, when they are properly fitted together and each part is performing its own particular function, assure us that our meaning will get safely to its destination. When they are fitted together improperly, they "blow the fuse" of our meaning, just as surely as connecting the wrong two wires will blow an actual fuse. There cannot be anything mysterious or complicated about a little piece of machinery like this. If the writer will obtain a practical guide to grammatical correctness that does not try to be deep or scholarly, and if he will study it with the same care that he studies the manual or instruction book that comes with his car or radio, he will discover that he can operate the sentence machine with perfect safety and complete facility.

One of the most striking illustrations of correctness is found in the correct mechanical makeup of a letter. The businessman is careful of his grooming, realizes the value of neatness, presses his clothing, manicures his nails, keeps his shoes shined and cultivates a courteous, tactful manner. He should be just as careful about the grooming of his letter. He is careful with his person so that he may make a good impression on the people he meets. A slovenly letter makes about the same impression upon a reader that unkempt personal appearance makes upon society.

A letter that is correct in mechanical makeup is first of all neatly arranged upon the paper. It observes the artistic principles of balance and proportion. Paper stock should be of correct size and of good quality. Careful attention should be paid to margins, spacing, paragraphing, legibility and neatness. One should be conscious of the fact that the letter as a whole is made up of unit parts, each one of which must be displayed in accordance with the rules of conventional correctness.

Physical Form.—It should be remembered that there are two systems of punctuation of letter parts, both of which are recognized as correct by the business, professional and social worlds. The so-called *open system* of punctuation permits the omission of punctuation marks at the ends of lines in the heading, the inside address and the complimentary close. The so-called *close form* requires the insertion of these marks.

Besides there are two recognized methods of arranging the individual units:

The *block form,* in which the successive parts adhere to a uniform margin.

And the indented form, in which the lines are indented in regularly and successively increasing amounts, and the first line of each paragraph is indented.

Examples of Letter Parts

Heading, Block Form.—

(Close punctuation)	(Open punctuation)
482 Cameron Avenue,	1983 Main Street
Blanktown, Iowa,	Cartersville, Missouri
January 18, 1928.	May 18, 1938

Indented Form—

(Close punctuation)	(Open punctuation)
482 Cameron Avenue,	1983 Main Street
Blanktown, Iowa,	Cartersville,
January 18, 1938.	Missouri
	May 18, 1938

Inside Address, Block Form.—

(Close punctuation)	(Open punctuation)
Jones and Avery,	The Bay Company
Counsellors-at-Law,	887 Anderson Drive
165 Magnolia Avenue,	Detroit, Michigan
New Orleans, La.	

Indented Form.—

(Close punctuation)	(Open punctuation)
Jones and Avery,	The Bay Company
Counsellors-at-Law,	887 Anderson Drive
165 Magnolia Ave.,	Detroit, Mich.
New Orleans,	
La.	

Salutation. The salutation of a letter is always written flush with the left-hand margin. The punctuation after the salutation in a business letter is the colon.

Example: *Gentlemen: Dear Sir:*

In a social or personal letter the punctuation following the salutation preferably should be a comma.

Example: *Dear John, My dear Smith,*

The customary salutations for individuals in business letters are *Dear Sir* or *Dear Madam;* or, more friendly and therefore more desirable when writing to customers, *My dear Mr. Smith;* or, slightly more personal and friendly, *Dear Mr. Smith.* In addressing a corporate company the salutation should be *Gentlemen.* If the letter is sent to a group of individuals, such as a firm of lawyers, the salutation may be either *Gentlemen* or *Dear Sirs;* or to a group of women, either *Ladies* or *Mesdames.*

The most formal salutation is *Sir:*

The gradation of formality in salutations is as follows: *Sir, My dear Sir, Dear Sir, My dear Mr. Smith, Dear Mr. Smith, My dear Smith, Dear Smith, Dear Joseph.*

For business letters the usual forms of *complimentary close* are *Yours truly, Yours very truly, Very truly yours,* all somewhat formal. Increasingly used and more desirable when writing to customers are, *Cordially yours, Sincerely yours.* Sometimes also the close may be *Faithfully yours* or—to show more deference—*Respectfully* or *Respectfully yours.* Examples:

Complimentary Close, Block Form.—

(Close punctuation)	(Open punctuation)
Very truly yours, John F. Smith, Vice-President	Very truly yours John F. Smith Vice-President

Indented Form.—

(Close punctuation)	(Open punctuation)
Sincerely yours, John F. Smith, Vice-President	Sincerely yours John F. Smith Vice-President

The example that follows is in the block form. Open punctuation is used in this letter.

594 Central Avenue
Dayton, Ohio
March 3, 1938

Mr. Adrian M. Halstead
145 Earle Street
Albany, N. Y.

Dear Mr. Halstead:

I am certainly pleased to learn that you are coming to New York on a business errand. As you know, the Automobile Show opens next Saturday. I am sure that you will enjoy a visit to this interesting exhibit. Mrs. Avery and I are looking forward with much pleasure to taking you and Mrs. Halstead to see the new models.

We have tickets to the evening performance of "Elmer the Great" at the Booth Theater. We hope you will have dinner with us at Delmanville's Restaurant and be our guests as long as you stay in the city.

Sincerely yours
Waldo H. Baker

Letter to Rewrite.—Using the preceding letter as a guide, the student of correspondence may find it helpful to correct the following letter that is literally teeming with errors. From the heading to the signature, small errors abound. Close attention should be given to all letter parts and the correct forms substituted for the mistakes.

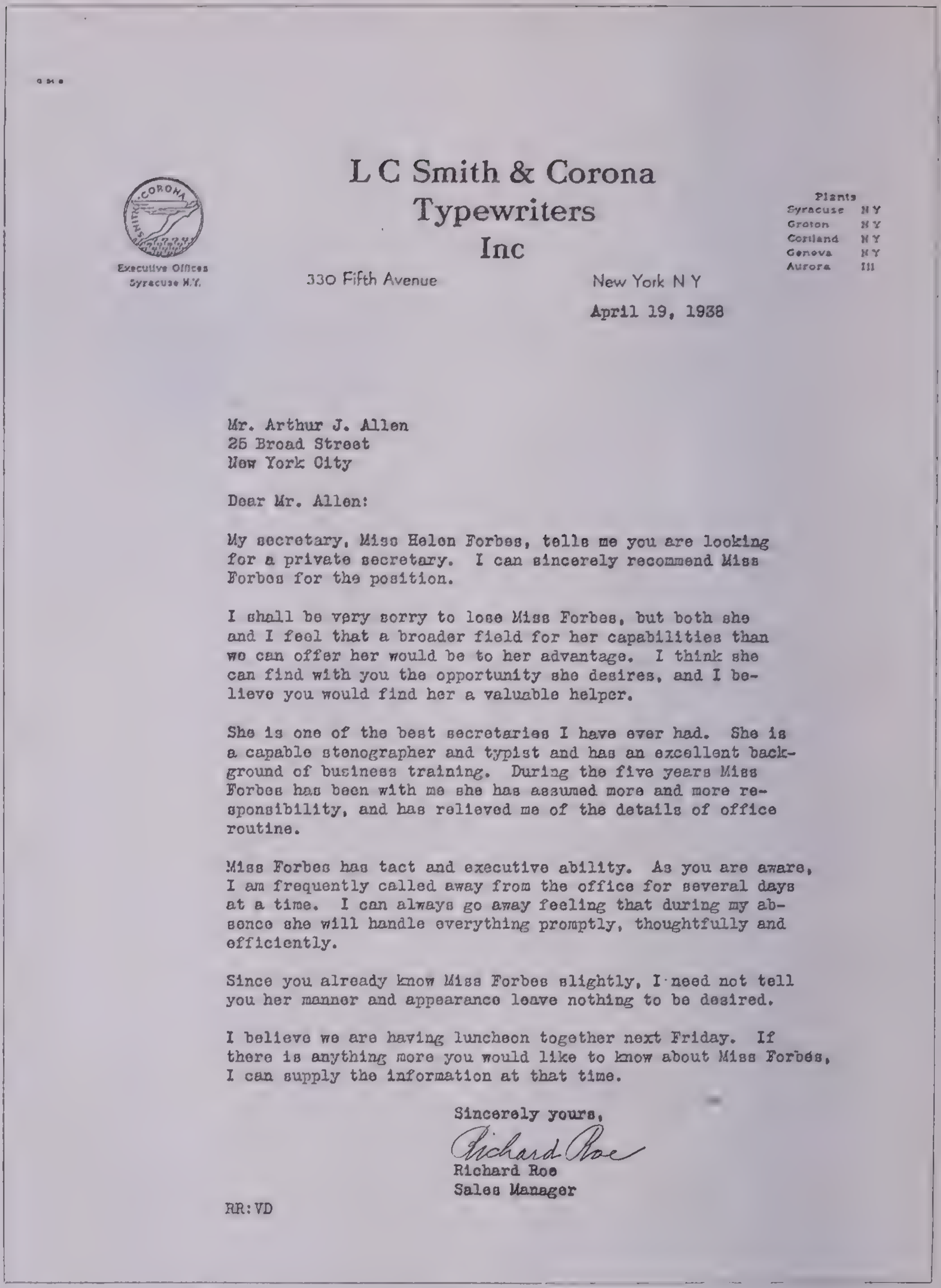
Two-fifty Central Ave
Dayton,—O,
3/4/38

Mister Chas. Brown,
14 Black St., City.

Dear Sir;

Your favor of recent date to hand and in reply beg permission to state that in re your favored inquiry we are at a loss to understand the nature of your complaint. If in reference to same you mean to ask for names of those who have already found it possible to use our product as per instructions previously given, we are glad to comply with your request. Just write to Fritz and Le Brun and to Jones-McBiddle Co. and said concerns will be glad to reply to same. Hoping that this information was what you had in mind,

we remain
Cordially yours,
H. C. Blank Company
by Mr. J. T. Myers, Pres.



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April 19, 1938

Mr. Arthur J. Allen
25 Broad Street
New York City

Dear Mr. Allen:

My secretary, Miss Helen Forbes, tells me you are looking for a private secretary. I can sincerely recommend Miss Forbes for the position.

I shall be very sorry to lose Miss Forbes, but both she and I feel that a broader field for her capabilities than we can offer her would be to her advantage. I think she can find with you the opportunity she desires, and I believe you would find her a valuable helper.

She is one of the best secretaries I have ever had. She is a capable stenographer and typist and has an excellent background of business training. During the five years Miss Forbes has been with me she has assumed more and more responsibility, and has relieved me of the details of office routine.

Miss Forbes has tact and executive ability. As you are aware, I am frequently called away from the office for several days at a time. I can always go away feeling that during my absence she will handle everything promptly, thoughtfully and efficiently.

Since you already know Miss Forbes slightly, I need not tell you her manner and appearance leave nothing to be desired.

I believe we are having luncheon together next Friday. If there is anything more you would like to know about Miss Forbes, I can supply the information at that time.

Sincerely yours,
Richard Roe
Richard Roe
Sales Manager

RR:VD

Courtesy L. C. Smith and Corona Typewriters, Inc.

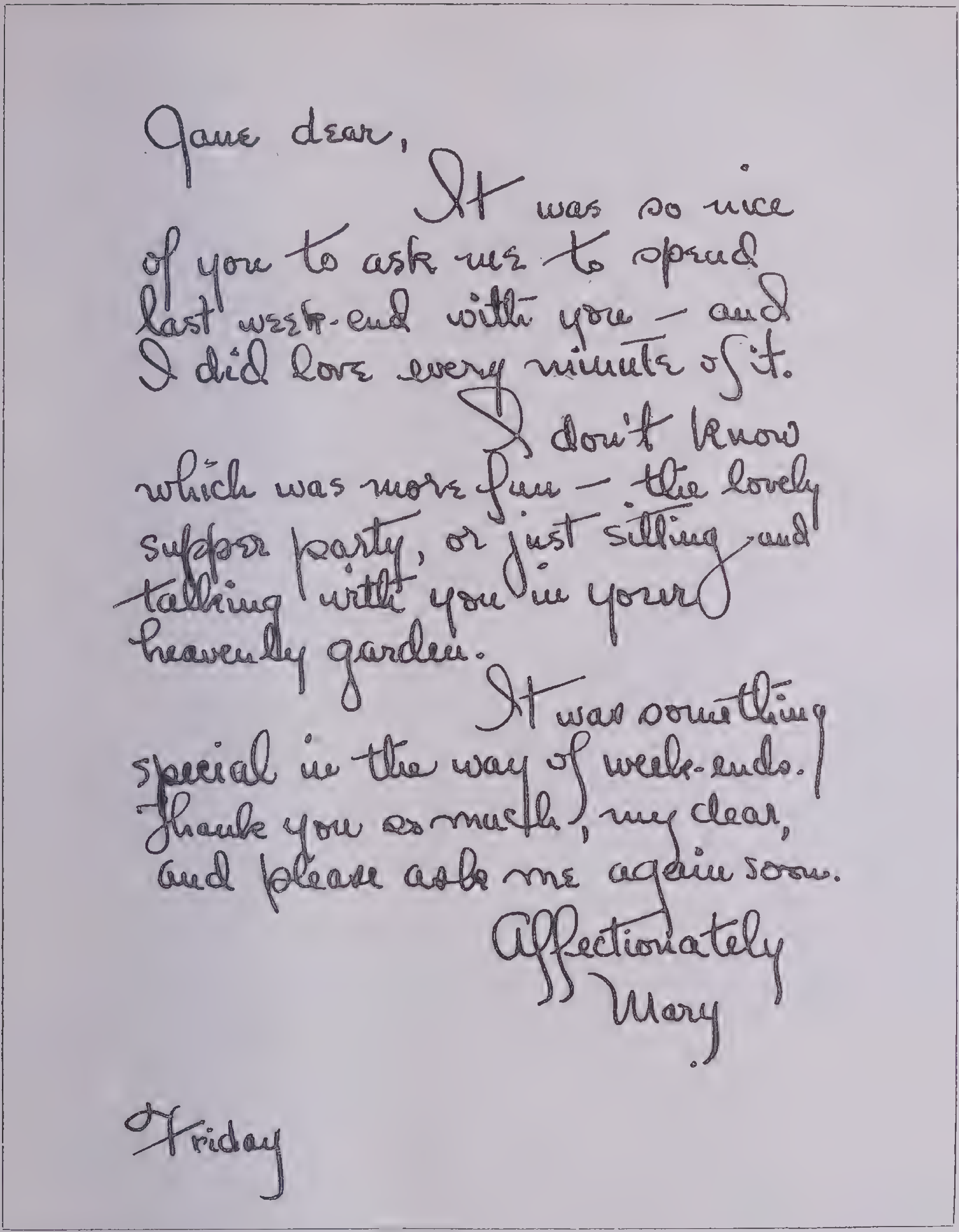
This Business Letter, in the Block Style, Is Well Spaced

Correcting this letter is an opportunity to apply all the principles that have been so far presented. Attention should be paid to the form, the punctuation, the use of abbreviations, the grammar and the possible lack of spontaneity and naturalness. The five essential qualities are noticeably absent, and they should be introduced into the improved version.

Planning.—From what has been said it is easy to see that writing letters is not a casual, hit-or-miss performance; it is the result of careful planning in order to achieve a desired effect.

The writer must go through a definite thought process before he attempts to begin the first sentence of his letter. What is the nature of this thought process that should precede all forms of letter writing? First, the writer must *select;* that is, he must determine the main purpose of the letter and discard all material that will not actually help him accomplish that purpose. No writer can succeed unless he defines clearly to himself just what it is that he wants the reader to do. He must include only material that is definitely relevant to that purpose.

After the process of *selection* is the process of *arrangement.* In orderly and logical manner the ideas, reasons, facts, arguments and appeals that are relevant to the accomplishment of the purpose must be marshaled in their most effective order. The writer must determine upon an effective sequence of his ideas. He must recognize that in the very nature of things some ideas should be presented to the reader in the beginning of a letter,



Jane dear,

It was so nice of you to ask me to spend last week-end with you – and I did love every minute of it.

I don't know which was more fun – the lovely supper party, or just sitting and talking with you in your heavenly garden.

It was something special in the way of week-ends. Thank you so much, my dear, and please ask me again soon.

Affectionately
Mary

Friday

Courtesy Eaton Paper Corporation

A Well-Written and Well-Spaced Personal Letter

Some authorities hold that a personal letter should always be handwritten, while others say that typewriting is permissible

some in the middle and some at the end. He must see the harm that may be done by violating this natural order. He must seek to lead the mind of the reader easily and naturally from the consideration of one idea to the discussion of another.

The writer must also be sure that too much stress is not laid on unimportant ideas and that sufficient stress is laid on those statements that demand the closest attention. Emphatic ideas must be given their proper *position* in the letter, and a *proportionate* amount of space must be given to important and unimportant ideas. Many a letter fails of its purpose because the writer has unintentionally stressed one thought at the expense of another.

Check Lists.—The following five questions should be satisfactorily answered before any letter is begun.

1. What is the purpose of the letter I am about to write?
2. What action, if any, do I want the reader to take?
3. What can I say that will aid in accomplishing this purpose?
4. How can I say it to make the best effect on the reader?
5. How shall I arrange my ideas in order to accomplish my purpose?

After a letter has been written, it should be checked carefully against the answers to these five questions.

A practical list of *Don'ts* and *Dos* will be helpful:

1. *Don't* use the trite and worn-out words and phrases against which a warning has already been given.

   Do be natural and sincere.

2. *Don't* close a letter with vague participial phrases, such as *Thanking you, we remain;* or *Hoping that . . . .*; and other stiff and meaningless combinations.

   Do try to make the close of a letter like the good-by you would say to a friend face to face.

3. *Don't* make a letter short at all costs.

   Do write well-proportioned letters that completely and clearly convey your message.

4. *Don't* use unsightly abbreviations in the text of the letter, in datelines and inside addresses.

   Do be brief—but not to the point of informality or discourtesy.

5. *Don't* mix different methods of mechanical arrangement, using first block and then indented form or punctuation that is sometimes close and sometimes open.

   Do be consistent in this matter of form.

6. *Don't* write long, loose sentences full of weak, straggling phrases and clauses, strung together in haphazard fashion and connected by co-ordinate conjunctions. Avoid the *and* and *but* habit.

   Do make each sentence a unit—one idea, one fact at a time.

7. *Don't* use preliminary dangling phrases that violate rules of grammar—like "Replying to your recent letter, the goods will be shipped at once."

   Do be grammatical, simple, clear.

8. *Don't* forget that pronouns are potential sources of ambiguity and obscurity.

   Do write so that every pronoun clearly and unmistakably points back to the noun for which it stands.

9. *Don't* use unfortunate phrasing that has an unintended negative suggestion—like "Wouldn't you like your business to be as efficient as the businesses of your competitors?"

   Do be careful to think how what you write will sound.

10. *Don't* use words that carry a negative suggestion—like "We cannot understand why you did this" or "We are astonished at your letter."

    Do be constructive and positive. Say, for example: "We are confident you will agree with us" or "We are sorry that we did not make this plain in our other letter."

11. *Don't* write from your own point of view. Too many letters stress the it-is-our-policy attitude.

    Do remember that "you" or the customer's name helps a letter more than many repetitions of *I, we* and *our*. Get the *you* habit.

12. *Don't* use long, pretentious words.

    Do use short and simple ones. Say *tell* or *say*—not *advise* or *state.* Say *sell*—not *market* or *merchandise.* Say *buy*—not *purchase.* Say *about*—not *regarding.* Say *we are sorry*—not *we express our deep regrets.*

13. *Don't* confuse words of similar sounds but different meanings, like *proposition* for *proposal, except* for *accept, effect* for *affect.*

    Do be sure of the meaning of words—and use the word everyone understands.

14. *Don't* always use the same transitional connectives over and over again.

    Do get in some variety. *But, however, on the other hand* can be interchanged; so can *therefore, for this reason* and *consequently;* or *furthermore* and *in addition.*

Illustrative Letters.—The letters that follow illustrate various types of correspondence, but they are not to be taken as models. They indicate how certain situations are handled effectively, and they conform to the principles that have previously been described.

Letter of Introduction

Dear Mr. Smith:

I am glad to introduce to you the bearer of this letter, a good friend of mine, Mr. Henry R. Biddle, the proprietor of the Biddle Hardware Company of this city.

Mr. Biddle is making an extended stay in Blanktown to investigate sources of supply for the retailers who are members of our Chamber of Commerce. When he told me of his intended trip, I immediately thought of you; I was sure you would be happy to give him some assistance, advice or information.

Both he and I will be grateful for any courtesies you may show him.

Sincerely yours,

Letter of Application for a Position

Box 482 *Times Register*,
Blanktown, N. Y.

Gentlemen:

I believe that my proficiency in stenography and typewriting, and my general education and ability qualify me for the position of stenographer in your organization.

I am eighteen years of age, a graduate with honors of the Blanktown High School and the holder of a certificate of merit in both stenography and typewriting. I am able to take dictation at an average speed of 125 words a minute and to typewrite neatly and accurately at the rate of 60 words a minute.

My temperament is such that I am able to get along nicely with others. In high school I was co-editor of the school paper and secretary of the senior class.

Will you let me know when it would be convenient for you to have me call? My home address is 121 Euclid Avenue, and my telephone number, 8787.

Yours very truly,

Letter of Congratulation

Dear Lester,

I was delighted to read in yesterday's *Palladium* of the honor that has come to you in your election to the Town Council.

Those of us who are interested in seeing Blanktown continue its efforts to provide efficient, progressive government rejoice that a man of your capabilities has been selected. We all know that you will do a highly creditable job.

Congratulations and best wishes!

Sincerely,

Letter of Recommendation

Dear Mr. Overstreet:

It is a pleasure to send you this letter in behalf of the son of a very good friend of mine, Mr. John F. White, who is seeking a connection with a commercial bank in Dashtown.

He has excellent qualifications for a position with any organization. Mr. White made an enviable record in high school, both in his studies and in student activities. He seems to have unusually good judgment, and I believe that he would in every way be a desirable employee.

If you can place him in your bank or assist him in any way to fulfill his ambition, I shall indeed appreciate your courtesy.

Faithfully yours,

Letter of Sympathy

Dear John,

At a time like this all your friends join in extending to you the sympathy that we hope in some measure will console you in your great loss. Mary and I knew your mother and loved her, and we can imagine how much you must miss her.

Sincerely yours,

Letters of Invitation

(Informal)

Dear Edmund,

Two very good friends of mine, Edgar S. Smith and William Z. Brown, are coming down from Blanktown next Saturday morning. They were very boastful when I last saw them about their ability to do better on our golf course than we can ourselves.

I should like very much to have you as my guest to play a round with them in the afternoon and to join us at dinner in the clubhouse in the evening.

I trust I may have the pleasure of your acceptance.

Sincerely yours,

(Formal)

The Blankboro National Bank
cordially invites you to attend
the dedication of its
Smith Street Branch
Four Hundred and Twenty Smith Street
on the afternoon of
Tuesday, December the twenty-second
Nineteen Hundred and Thirty Eight
at half after four o'clock

Letters of Acceptance

(Informal)

Dear Harry,

I am very glad indeed to accept your kind invitation to play golf next Saturday afternoon and have dinner afterwards at the Club.

If my recollection is correct, both Edgar and William are accomplished golfers. Here's hoping we can defend the reputation of the Grassy Bank Club.

Sincerely,

(Formal)

Mr. Richard Barnes accepts with pleasure the kind invitation of The Blankboro National Bank to attend the dedication of its Smith Street Branch, Four Hundred and Twenty Smith Street, on the afternoon of Tuesday, December the twenty-second, Nineteen Hundred and Thirty Eight, at half after four o'clock.

Letters of Regret

(Informal)

Dear Harry,

I can think of nothing I'd rather do than play golf with you and Edgar and William next Saturday afternoon and to dine with you in the evening.

Unfortunately I shall be unable to accept your kind invitation because I have promised to go to Blankville for the annual meeting of my alumni association.

I trust that the opportunity will soon present itself for me to team with you in defense of the laurels of Grassy Bank.

Sincerely yours,

(Formal)

Mr. Richard Barnes regrets that a previous engagement prevents his acceptance of the kind invitation of The Blankboro National Bank to attend the dedication of its Smith Street Branch, Four Hundred and Twenty Smith Street, on the afternoon of Tuesday, December the twenty-second, Nineteen Hundred and Thirty Eight, at half after four o'clock.

Letter of Complaint

Gentlemen:

I wonder if you could take steps to ascertain whether it would be possible to revise the time schedule for busses stopping at Vandeveer Avenue?

Several times I have had to wait as long as fifteen minutes because the bus connecting with the Grand Avenue trolley has not waited for its arrival. It seems to me that if the busses left two minutes after the hour instead of on the hour, the difficulty would be overcome.

I shall be grateful for your consideration of this request.

Very truly yours,

Letter of Adjustment

Dear Mr. Hapgood:

We are glad you have written to us concerning the time schedule followed by our Vandeveer Avenue bus line. As you know, we are doing everything possible to make the bus schedules convenient to the greatest number of users.

Although we have been fairly certain that the on-the-hour connection has met with general approval, we are asking our traffic department to investigate the possibility of carrying your suggestion into effect.

As soon as a report is made to us, we shall communicate with you. Meanwhile please be assured that we appreciate your suggestion.

Very truly yours,

Letter Asking Payment

Gentlemen:

These are difficult times for all of us. Our own creditors are showing anxiety, and we have had to tell them to be patient while we are building up our bank balance sufficiently to be able to pay them in full. They understand our difficulties and are helping us to find new ways of converting our goods into cash.

We want to help you to clear up that balance of $285 that you owe. We have already sent two routine notices, but this is a personal letter, the purpose of which is to show you that we have a friendly interest in keeping your account alive.

True, we want our money, but we also want to keep a good customer. Won't you let us know what we can do to help you raise some money with which you can begin payment of this balance? If you will just let us know what the difficulty is, I'm sure we can help.

We have some new lines in stock that I think you would be interested in, and they are made to sell at much higher prices. Let us hear from you today.

Yours very truly,

Letter of Inquiry

Gentlemen:

I am interested to learn more about the accommodations at your hotel for a family party of five who are trying to decide where to spend the month of August on vacation. A suite of three rooms would meet our needs. What rates can you make to suit a modest budget, and what will these rates include in the way of service?

Please send a road map of the country showing the exact location of the hotel and, if possible, a floor plan showing the location of rooms available.

Sincerely,

Summary.—In summary, it may be said that the art of letter writing requires first and foremost that the writer be able correctly and intelligently to use the materials of good English in order to make favorable impressions upon the mind of his reader. There is no short-cut method of learning this art. Serious and interested, in fact enthusiastic, attention to the rules of grammar and rhetoric must be made a habit. After one has acquired a degree of confidence in his ability to use the tools of expression, he may expect to improve in effectiveness. What has been written in this article points the way, by general instruction and example, to an appreciation of the comprehensive scope of the whole field of letter writing. But this coverage is by no means complete; many other helpful principles may be learned by the person who is desirous of perfecting himself in letter writing. Yet, if the fundamentals here explained are adhered to, one may expect that his messages will carry to their readers the stamp of personableness, clarity and good sense that are everywhere demanded of correspondence.

Differences between Spoken and Written Style.—Though the writer and the public speaker have much in common, the processes of writing and speaking are quite different in nature. A good writing style may not be an effective speaking style. Spoken composition and written composition differ chiefly in the following respects:

(1) In speaking, the meaning must be instantly understood. Thought is carried through the ear, not through the eye as in writing. The hearer, therefore, must get the speaker's thought at the moment of utterance or not at all. There is no second chance. Because a speaker must make his thoughts readily and immediately understood, step by step, he must pay particular attention to such elements of composition as clearness, simplicity, conciseness, concreteness, comparison, restatement and illustration.

(2) In speaking, language is aided by voice and action. Meanings are conveyed not by words alone (as in writing) but also by the inflections of the speaker's voice and by expressive gestures.

(3) In speech composition organizing the material is more definitely in the foreground than in writing: main points are more obvious; connective words and phrases are more apparent.

(4) A speaking style demands the frequent use of the elements of personal address. The public speaker has a specific audience, the writer has not. Usually, a writer is impersonal, a speaker personal. Because a definite audience is present on an actual occasion, the speaker must adjust and adapt his discussion of a subject to the personal interests, desires, beliefs, motives and wants of that audience. To do this necessitates the frequent use of *we, our, us, you, your.*

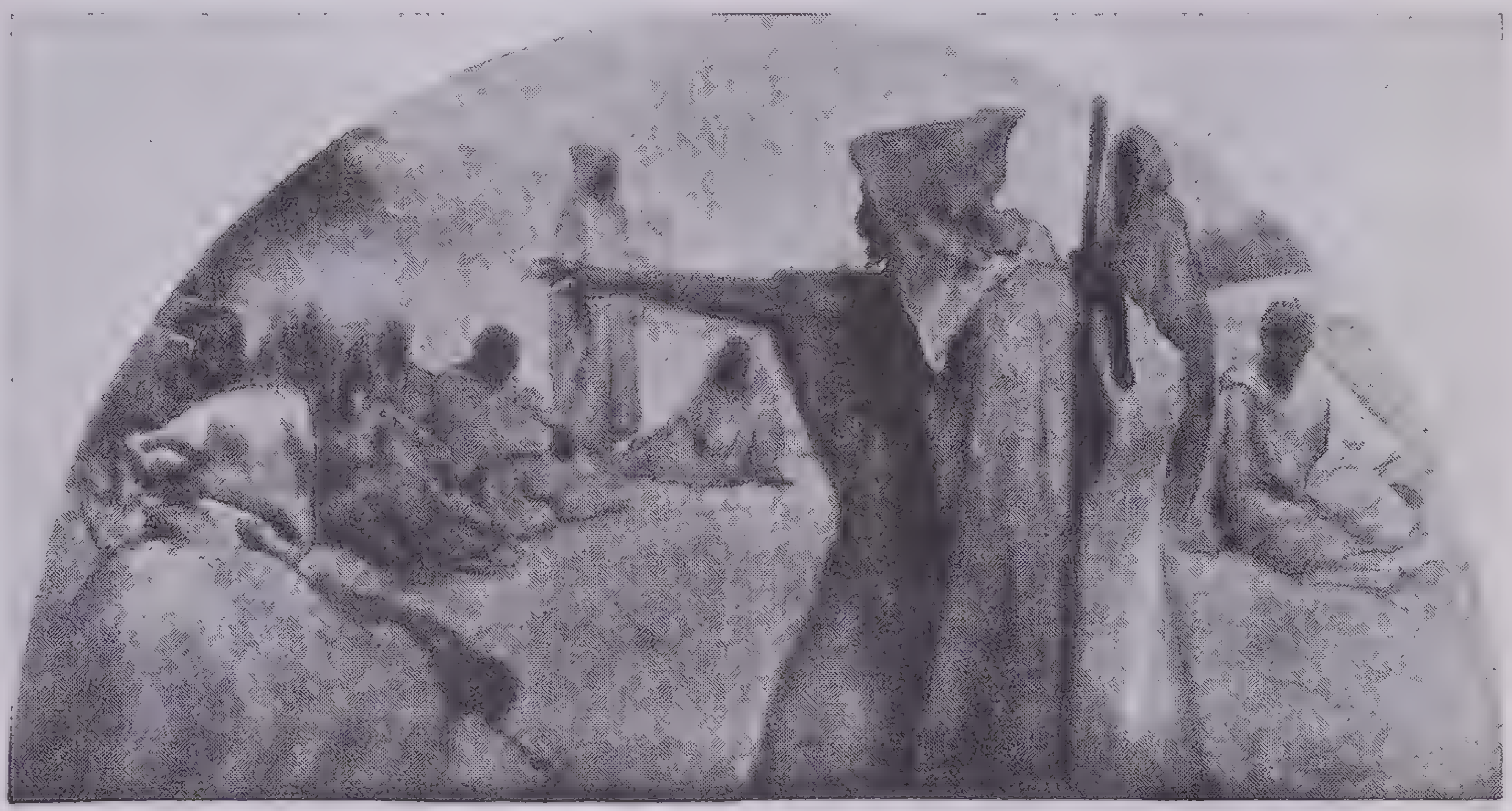
(5) Spoken style requires greater sentence variety than written style. Sufficient variety in sentence length and form will make it easier for the hearer to follow the speaker's thought. Without variety there will be monotony, and monotony creates listlessness, disinterest, sleepiness and boredom. Sentences that are extremely long, complicated or involved should be avoided because an audience will not follow the thought to the end. Theodore Roosevelt and William Howard Taft were masters of the short sentence. Besides varying the length of sentences, a speaker should mingle declarative, imperative, exclamatory and interrogative sentences. Many a speaker's style suffers from a continuous use of declarative sentences. Direct questions add pointedness. A study of the speeches of Abraham Lincoln reveals a most effective use of questions. Variety and interest will be increased also by using balanced, periodic and, occasionally, loose sentences.

Fundamentals of the Speech Process.—The spoken word holds an increasingly important place in our public and private life because it is man's most-used medium of expression and communication. Private speaking and public speaking have the same purposes of communication between fellow beings. A realization that public speaking is an enlargement and extension of the processes used in private speaking is an invaluable aid to one learning how to speak in public. It is like enlarging a picture. In the enlargement every detail has a little more significance; yet it is the same picture.

The speaker engaged in this process of communication in public is concerned with five fundamental factors. They are within him. They are his potential power. He cannot escape their use. These five essentials are: thought, emotion, language, voice, gestures. First of all a speaker is a thinker, a mind. Then he is an emotional being who can feel as well as think. While thinking of the reasons for peace, he can feel the horrors of war. He can likewise create these responses in his hearers because all human beings are fashioned after the same pattern of intellectual and emotional behavior. Language furnishes the symbols with which to shape and mold thoughts and emotions. Words become the speaker's tools. Here it is well to remember that simplicity in language is more to be desired than ornamentation. The speaker's voice and body should function as servants of mind and emotion. Through the medium of language they are constantly carrying messages from the speaker to his audience. Speaking effectively in public, then, becomes largely a matter of co-ordinating and developing these five fundamental factors. Successful speaking demands that they work together for good.

Lack of confidence on the part of a public speaker may be due to a lack of proper co-ordination of his powers. The five forces may not be working well, singly or collectively. The result is timidity, inhibitions, fear, stage fright, repressions. Repression enslaves a speaker, expression gives him freedom. A speaker who himself freezes up will never thaw out his audience.

Confidence can be built up in these specific ways: (1) By thinking positively, not negatively. Thinking "I can" instead of "I cannot." (2) By being thoroughly prepared to speak. (3) By thinking more of the subject, less of oneself. (4) By developing a keen sense of communication. (5) By controlling, not eliminating, nervousness.


From a Library of Congress mural by John W. Alexander
Evolution of the Book: Oral Tradition

Adjustment to the Speech Situation.—The first factor to consider in a speech situation is the nature of the occasion that demands the speech. An unvarying rule of all speaking is that it must be carefully planned and adjusted to fit the occasion. Whether it be the high school assembly program on Friday, the pulpit on Sunday, the service club on Monday, the parent-teachers meeting on Tuesday, or the monthly meeting of the Community Welfare League on Wednesday—in every case the same vital question is pertinent—will the speech meet the requirements of the occasion? One must consider such things as, how the group has come together, the time limits of the meeting, who the other speakers on the program are, the formality or informality of the occasion.

The second factor is the audience. The presence of the audience is the reason for the speech. Audiences, therefore, must be analyzed. Consideration should be given to such matters as audience size, age, interest, prejudices, sex, fixed beliefs, impelling motives, social levels, occupations and wants. A speaker must ask: Will my audience be a mixed group with general interests or will it be a special group with concerted interests? Will it be conservative or radical? What will be its probable attitude toward me and my subject? Audience attitudes may be classified as interested, indifferent, opposed, hostile.

Building the Speech.—The five essential steps involved in speech construction are: the purpose, the method, the material, the structure, the style.

Purpose.—Determining the exact purpose is a matter of first importance. Purposeless speaking will be ineffective because it will win no definite response. To secure a response from an audience is the general purpose of all public speaking. In fact, we are justified in classifying public speaking as a useful art because it can be used to attain definite ends. The definite purposes, or ends, are five in number: (1) to inform, (2) to stimulate, (3) to entertain, (4) to secure belief, (5) to induce action.

Method.—There are four methods of presenting a speech: the extemporaneous, the impromptu, the memory, the manuscript. By extemporaneous speaking, we mean that the exact wording of the thought and all the details of delivery are left to the time of speaking, though the general content may have been carefully prepared. To be free from papers and notes will aid directness and fluency. Impromptu speaking is on the spur of the moment without any special preparation either for content or form. The memory method means writing out the speech in full, fixing it in the mind and speaking it exactly as written. It is little used. In using the manuscript method, the speaker reads his speech. This method is not desirable except on very formal occasions, or when exact scientific reports are required, or in radio broadcasting, when a very definite effect must be produced and timing is of the utmost importance.

Material.—In all speaking, there is a what and a how. What is said constitutes the material, the content, the subject matter. The main kinds of material are: facts, examples, statistics, cases, illustrations, ideas, testimony. These materials must be handled in such a way that through analysis and reasoning the components become well mixed and amalgamated. Speech materials may be secured by thinking, reading, conversing, observing, reflecting, interviewing, traveling and reasoning.

To be interesting, a speaker must use interesting material and present it in an interesting manner. The attention of the hearer cannot be ignored. How can attention be captured? By interest. What things are interesting? A public speaker will have little difficulty in creating interest in his hearers if he will judiciously draw upon these interest factors in selecting his material: concreteness, activity, novelty, curiosity, suspense, humor, conflict, imagery. If these elements are woven into substantial material drawn from adequate sources and if the whole is brought well within the experiences of members of the audience, interest will not lag.

Structure.—The structure of the speech means its framework. A well-organized speech has three divisions: introduction, body, conclusion. An outline is essential in order to give a speech correct structure. An outline is the plan—it is the blueprint. It serves as a guide during preparation and delivery. It insures orderly and systematic arrangement of material. It determines the inclusion and exclusion of material. A carefully thought-out plan, systematically arranged on paper and then firmly fixed in the mind, is an insurance policy against chaos and confusion. The principal kinds of outline are: (1) topical—a selective arrangement of points; (2) chronological—a time-order arrangement; (3) logical—dependent on reasoning. In any outline a few main heads well developed, built up with specific points, enlarged upon with illustrations will be far more effective than the mere enumeration of a large number of main or subheads.

Style.—Style is the manner of expression. It is the manner in which words are used to give form to thought. Style clothes the thought that the outline surveys. Style involves such principles as clearness, coherence, unity, emphasis, economy, figures of speech, rhythm and climax.

Mastery of these principles depends largely upon the speaker's command of words. For the discriminating thinker, words are priceless tools. To insure a flexible speaking style, improve the vocabulary. Of the four vocabularies—reading, writing, hearing and speaking—the speaking vocabulary usually is the most meager, yet it is the one most needed.

The speaking vocabulary can be enlarged in these specific ways: (1) by alertness and vocal responsiveness to environment; (2) by intelligent reading aloud; (3) by conversing with people of education and culture; (4) by gaining a knowledge of other languages; (5) by practice in writing; (6) by reading good literature; (7) by deliberate use of a dictionary.

Delivery of a Speech.—Effective delivery begins with mental attitude and mental processes. The speaker's mental attitude must be one of sureness and confidence in himself and in his ability to interest an audience in his subject. There is no place for inferiority complexes; no place for apologies. The mental process must show power of concentration. The mental relationship between speaker and audience must be based on the idea of genuine communication, which implies having business to transact with the audience—an exchange of ideas. A communicative speaker looks his audience in the eye. He talks directly to and with it and not at, over, under or away from it. Communicative speaking will have the natural, earnest, direct manner of the best conversation—heightened and amplified as circumstances may require. It should be true and sincere, not artificial, exhibitory or bombastic.

The voice does more than carry the speaker's message: it reflects his personality. The sound of the voice constantly creates favorable or unfavorable impressions on the listener. The speaking voice should be distinct, pleasing in tone quality, varied in emphasis, well modulated, capable of responsive changes in force, rate and pitch; it should be expressive in revealing relative thought values and shadings of emotion; it should have resonance and rhythm. To insure correct articulation in uttering words, there must be precision in the use of the several articulators—lips, teeth, tongue and palate. Four aids to articulation are; relaxed throat, loose jaw, nimble tongue and flexible lips.

Controlled bodily actions convey intended and desirable meanings. Uncontrolled bodily actions convey unintended and undesirable meanings. As an agent of delivery, a speaker's body will convey thought and emotion through poise, posture, gesture, facial expression and movement. At all times, speaking is enlivened and made more forceful by expressive action properly motivated and co-ordinated.

Types of Public Address.—A speech of *introduction* (that is, introducing another speaker) should be formal or informal according to the exact nature of the occasion. The subject matter may be pertinent personal facts about the person being introduced. It should not be too personal and never exaggerated. Reference should be made to the cause the person represents, his field of activity, his outstanding achievements. A speech of introduction should be courteous, gracious and personally considerate. It should bring together in a brief, fitting and sympathetic manner the audience and the person introduced.

The *eulogy* is an address in praise of an individual—living or dead; for example, at a memorial service, a birthday or other anniversary. It should be an appreciative and understanding appraisal of the person's character and achievements.

Dedication addresses are delivered when public buildings are completed, when historic events are commemorated, when statues or monuments are unveiled. In this type of speech, the ambitions, loyalties, sacrifices, sentiments and ideals of the group play an important part. The speaker voices the thought of the group and the mood of the occasion. In selecting material he can be guided by these points: What causes lie behind the dedication? To what is the object being dedicated? In what significant ways can the past, present and future, as they relate themselves to the object dedicated, be linked together?

The *after-dinner* speech is a type universally used. There are two kinds—serious and humorous. The five steps in speech composition given in the section, "Building the Speech," should take care of the serious type. The humorous after-dinner speech, intended purely for enjoyment, is somewhat more difficult to prepare and present. Humor is so elusive and so individual that rules avail little. Suggestions may help. Be brief, spontaneous, imaginative, original, ingenious, light in touch, sparkling if possible and, above all, amusing.

The *lecture* is the longest form of public address. In its preparation the speaker can use in fullest measure the five-point plan of speech building. Particular attention should be given to renewing and sustaining interest during the last half of the address. The lecturer will appeal to such impelling motives as security, happiness, self-preservation, altruism, power, affection, sentiment, pride, property rights, duty, opportunity and social welfare. The lectures of Wendell Phillips, Henry W. Grady, Theodore Roosevelt, Woodrow Wilson and Elihu Root are well worth studying for their fine points of speech composition.

Group Discussion.—The growth of group discussion is proof that speaking is for the many rather than the few. Most significant among the forms of group discussion are: (1) parliamentary, (2) round-table, (3) panel, (4) town-meeting, (5) open forum. Any of these forms may be used by social, educational, business, religious, literary or political groups in a free discussion of questions of common interest to the members of the group. To function well, such meetings should be presided over by a competent chairman who will keep the discussion within bounds and see to it that all members are given a fair hearing.

The five main values found in group discussion are: (1) It provides an adequate outlet for exchange of ideas because all the members may participate. (2) It is democratic, in that majority and minority beliefs are given a hearing. (3) It develops a sense of consideration for the opinions and viewpoints of others. (4) It leads to intelligent action by bringing out points of weakness and of strength. (5) It quickens the responsibilities of citizenship.

From a Library of Congress mural by John W. Alexander
Evolution of the Book: The Manuscript

Debating.—Debate is the presentation of each side of a controversial question by opposing speakers under definite rules of procedure. The debater uses exposition only slightly, advancing his case by means of *argument,* the process of influencing the beliefs and actions of others by means of conviction and persuasion—conviction by appeal to reason; persuasion by appeal to emotion.

A *proposition* (an assertion that must be supported or overthrown) is necessary in debating. A mere topic, such as Socialized Medicine, cannot be debated; but one can debate the complete statement, "Resolved, That a plan of socialized medicine should be adopted in the United States." The proposition should be simple, clear, brief, complete, timely, evenly balanced. It should be stated affirmatively.

Analysis means discovering the meaning, approaches, boundaries and issues of the proposition. Five steps are usually involved: (1) cause for discussion, (2) history of the question, (3) definition of terms, (4) exclusion of irrelevant material, (5) finding and stating the main issues.

The brief is a survey of the argument. It is a logical outline in amplified form giving the complete plan of the case for one side of the proposition. The following rules for brief making are important: (1) The brief should have three divisions—introduction, discussion and conclusion. (2) Every point in the brief should be a complete statement. (3) The relation of main and subordinate points should be indicated by proper symbols. (4) The introduction should be analytical, not argumentative. (5) The logical connections between points may be shown with such words as *for* or *because.*

Proof is the sufficient reason for accepting or rejecting the truth or falsity of the proposition. The purpose of debate is to prove or disprove the proposition. To prove a thing requires evidence. Evidence, then, is all the materials used for proof. This evidence may be found in facts, examples, cases, incidents, analogies, statistics or testimony. To be sound, all evidence must be in the form of accepted truths. Accuracy demands that exact *sources* of evidence be given. The debater deals with the evidence by means of a reasoning process. Reasoning connects the links in the chain of evidence so that justifiable conclusions can be drawn. Most proof is not complete, only approximate. Consequently, a debater should try to establish a reasonable probability. Instead of saying, "We have proved beyond the possibility of a doubt," say, "From this evidence it is reasonable to conclude."

Refutation is the attempt to answer and overthrow the opposing argument. It should be direct, clear, forceful, convincing and extemporaneous. Points should be brought to a focus quickly, argued with brevity, concluded logically. Refutation in rebuttal must be adapted with great care to the argument of the opposition exactly as it was presented. It should have the flexibility, the give and take that characterizes the most effective debating.

Formal Debating.—In formal debating there are usually two (sometimes three) speakers on each side of the question. The speakers who support the proposition (defined above) constitute the affirmative side. The speakers who attack the proposition constitute the negative side. Each speaker is permitted a certain definite length of time for the presentation of his subject. After both the affirmative and negative sides have presented their prepared speeches, each side has an opportunity for rebuttal, or opportunity to answer, challenge and, if possible, overthrow the arguments presented by the other side. Since prior to the debate the speakers on one side have not seen the addresses prepared by the other side, rebuttals must be largely extemporaneous, for they should be directed specifically against the arguments presented by the opposing side. A certain amount of material in rebuttal, however, can be prepared in advance from the speaker's general knowledge of the proposition. In most debates, each speaker is given an opportunity for rebuttal, although in some instances only one rebuttal is permitted for each side.

Affirmative Case.—The first affirmative speaker should fully analyze the proposition and then establish at least one of the main issues. The second affirmative speaker should do three things: (1) refute one or more points presented by the first negative speaker; (2) briefly restate what was proved by his teammate; (3) prove the remaining issue or issues. Because of the rule that no entirely new point may be presented in the rebuttal speeches, the last affirmative speaker must complete the affirmative case. An affirmative case should show: (1) what is wrong with the present situation; (2) that the affirmative proposal is the right remedy.

Negative Case.—In preparing to meet an affirmative case, a negative team may choose any one of these courses: (1) defend the present system; (2) propose changes in it; (3) offer a counter plan different from that of the affirmative. Preceding or during the main argument each negative speaker should devote some time to refutation in attacking the arguments of opponents.

Teamwork.—On both sides close teamwork is necessary to insure consistency and accurate adaptation. In the interests of clearness, emphasis and convincingness, it is well for the last speaker on each side, in both the main arguments and the rebuttals, to summarize the case up to that point. The last affirmative speaker should review the essentials of the entire debate using comparison and contrast to show points of weakness and of strength.

Time Limits.—In interscholastic debating the main speeches usually are ten minutes in length and the rebuttals five. Class debates on simple propositions may be limited to seven-minute main arguments and three-minute rebuttals; or the main speeches may be eight minutes, with one five-minute rebuttal on each side. Usually the order of speaking in rebuttal is reversed, the negative opening the discussion and the affirmative closing it.

THE STUDY OF FOREIGN LANGUAGES

Enrolment in Foreign Languages.—The chief foreign languages studied in the United States are modern French, German and Spanish and ancient Latin. Italian is taught in a few large cities, and Swedish and Norwegian are found on some school programs in Minnesota and North Dakota. A large proportion of boys and girls in New England and in the Middle Atlantic States study French or German; Spanish is strongest in the southwestern states, in California and in the Northwest. Latin has a large proportion of the foreign-language enrolment in the South and in the Middle Atlantic, North Central and West Central States. In general, modern languages have a higher percentage of enrolment in the larger cities, whereas Latin is the language usually taught in the smaller schools that offer only one foreign language. The students of ancient langues, such as Greek, in public and private schools are few in number.

Why Do American Boys and Girls Study Foreign Languages?—The main reasons are: college entrance requirements and school curricula; wishes of parents and a social tradition; the general belief that foreign-language study helps to improve the knowledge of English and to promote accuracy; and the natural curiosity of many pupils about foreign languages and the desire to know what they are like.

Students who intend to become doctors or lawyers realize that Latin will be useful in their professional studies. Many boys and girls feel that a modern language may be of service in business, or in professional work and in travel. They may wish to read the work of French and German investigators in the natural and social sciences who are producing books and articles of value; also the many great literary works produced in France, Italy, Germany and Spain that are not translated into English. The large Spanish-speaking population of Mexico and of Central America and South America makes a knowledge of Spanish commercially valuable to business and professional men and women in the United States.

The Value of Foreign-Language Study.—Various attempts have been made to measure the usefulness and the good effects of foreign-language study. Most school and college graduates consider foreign languages of service in a variety of ways. It has been shown in several cases that foreign-language students surpass nonforeign-language students in progress in English, in knowledge and understanding of foreign countries and in their general culture. In a group of travelers, those who have learned at least one foreign language have a better background historically and culturally and usually take a keener interest and greater pleasure in the varied aspects of life abroad, even in countries whose languages are strange to them. The background that produces this effect may be acquired in other ways, but foreign-language study seems to be the most direct avenue of approach.

It should not be forgotten that the values to be gained from foreign-language study vary with the mastery of the language. The most that can be expected from average American students of a modern language is: first, ability to read those works of fiction, drama, history and the social and natural sciences, that are not unusually difficult in vocabulary, style and thought; second, ability to understand the foreign language in short sentences spoken slowly and simply; third, ability to write the language intelligibly, if not correctly, in simple, short sentences dealing with familiar topics; fourth, ability to speak intelligibly in short sentences, leaving a good deal to the listener to supply; fifth, an enlarged vocabulary in English and a better understanding of language structure; and, sixth, increased desire to learn more about the foreign country and what the country and its people mean in the world today.

The ability to read a foreign language will always be greater than the ability to write, speak or understand it by ear. This is the case also in English. All these abilities tend to disappear with disuse. We often meet persons abroad who once lived in the United States or in England but have almost forgotten their English because they have not used it. Here at home are many thousands who passed through grammar school and learned to read English but have read so little that they are almost illiterate now. During enlistment and draft for the World War it came out clearly that many thousands of young men called for service had never really learned to read their native language in school or had largely lost their ability to read through lack of practice. Consequently, even if foreign-language students attain in school the abilities listed above, they cannot expect to retain those powers unless they exercise them. Reading a modern language is the easiest and readiest form of practice. Reading helps us to increase our vocabulary and our knowledge of the foreign country and its contribution to civilization. That much is a real gain, even if we make no progress in understanding the spoken language or in speaking or writing it.

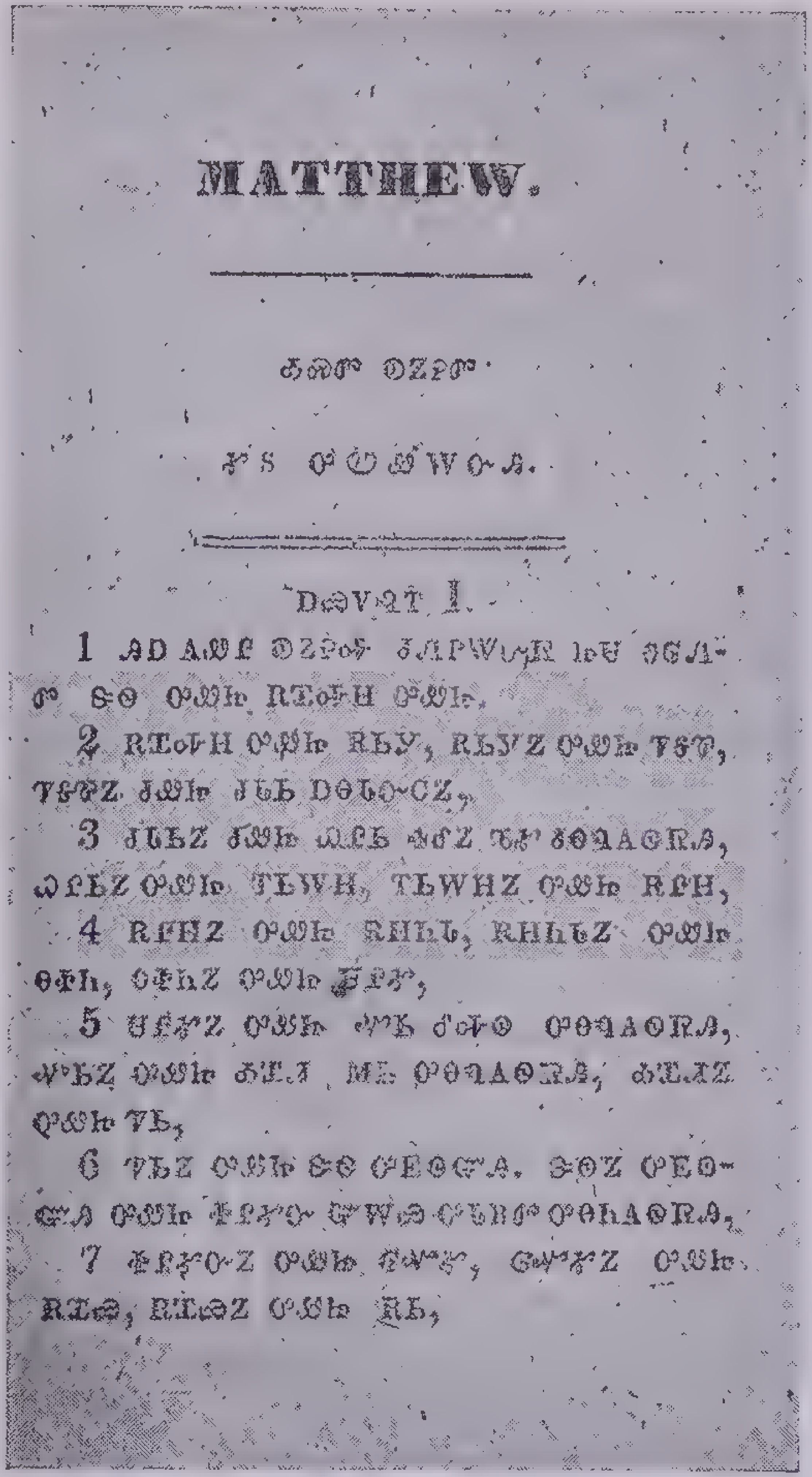
Suppose a boy or girl asks the question, "What marketable value will I get from the study of a modern language carried to the point you have indicated?" One can answer immediately that aside from teaching and a few other specialized jobs, a student should not expect a job on the strength of his foreign-language equipment. Neither will his knowledge of history, English or mathematics give him a place on a pay roll. He may become a successful lawyer, doctor, journalist, banker, merchant or farmer without knowing anything about the French partitive, the inverted word order in German or the position of object pronouns in Spanish. Likewise, in few such occupations would he use quadratic equations, his knowledge of *Macbeth,* of the American Revolution, of geography or physics. Very rarely do any of these subjects operate directly in practical affairs. Few business houses employ people solely because of their knowledge of a foreign language. There are not enough places in the Department of State, nor as foreign newspaper correspondents, nor as representatives of American firms abroad to absorb many foreign-language experts yearly; but professional men—architects, engineers, journalists, librarians, musicians, artists, doctors, teachers and specialists—all need firsthand contact with the intellectual and artistic output of two foreign countries at least. In a leading university, of nearly 600 candidates for higher degrees in one calendar year, 38 per cent failed the reading test in French that all candidates must pass. Not long ago the deans of seventy-nine medical schools in the United States and Canada expressed distress that so few of their students could read French and German. Similarly, heads of international banking houses regret that so few young men whom they engage can read and understand financial reports and economic discussions written in foreign languages.

Furthermore, we should remember that language is one of the most remarkable and complex forms of human behavior. It is at the same time the most wonderfully flexible and the most definitely fixed of instruments, both for our own thinking and for the expression of thought to others. As one authority puts it: "The division of labor and, with it, the whole working of human society depends upon language." Although in childhood we spend a long period to develop skill in using speech for communication, and then in learning to read, we rarely think of our own language as being the most wonderful and precious instrument that we possess. We do not think about its structure, its kinship with other languages, its origin, how it has developed and is developing with every passing moment. We take it for granted, as during many centuries men took for granted the outer world and the human body. We discuss vigorously questions of correct and incorrect English, such as "ain't," "it's me," "who did you see?" We rarely go farther.

The best way to acquire a fresh outlook on English is to study a foreign language, ancient or modern, which gives us a basis of comparison and invites attention to the way our language is made, to the ways in which its sounds are produced, to the different forms words have according to their relations to one another and to the way and the order in which they come together to express meaning. We learn then that certain words and expressions that can hardly be translated into English are characteristic of a given people, like the French *savoir faire, savoir vivre* and *goût,* the German *Gemütlichkeit,* the Spanish *caballero, hidalgo, simpático* and *mañana por la mañana y mañana será otro día.* The Frenchman's *"Donnez-vous la peine de vous asseoir"* ("Take the trouble to sit down"), and the Spaniard's welcome to his home, which he assures you is *"Su casa de V."* ("Your house") indicate a civilization founded on more ceremony than ours. They give us a clue to certain aspects of French and Spanish character and a suggestion of the way we should conduct ourselves when in those countries. Even a little reflection on the way kindred words behave in two or more languages of the same group—English cent (hundredth part), French *cent* (hundred) and Spanish *ciento* (hundred); English mansion, French *maison* (house); English alumnus, Spanish *alumno* (pupil); English hound, German *Hund* (dog)—opens our eyes to possibilities that a one-language person is likely to ignore. These examples are drawn from the modern languages, but when we recall that the first three are all derived from the Latin, it is clear that the study of that language provides as rich or even richer material for such comparisons.

Foreign-language study forms habits of close observation and attention to details and gives an opportunity to exercise powers of inference—that is, divining the meaning of the unfamiliar words or phrases in a sentence by our knowledge of the familiar words. The reader may go astray now and then, but he may do that in reading his native tongue, or in studying mathematics or any other subject that involves reasoning. Reading a foreign language provides an excellent opportunity to use our powers of inference and thus to exercise our intelligence.

Foreign-language study has a number of values if the content of the course and the teaching procedure are suitable: First, it calls the student's attention to language, to the way sounds are made, to the way words are put together in order to express meaning, to words themselves—their meanings, their formation and their relationships to words in other languages. Second, it provides practice in assembling words as one would the parts of a machine, and in fitting them together in accordance with certain rules. Doing this calls not only for much care in following directions but for painstaking accuracy. Even a small oversight or modification may quite alter or even spoil the result. Third, it provides one of the best ways of enlarging the vocabulary, improving the powers of expression and increasing the power to read and understand English. Fourth, it brings forcibly to the attention many of the most characteristic features of another country and another civilization, stimulates interest, provokes curiosity and therefore contributes to a broader outlook. The student is encouraged in his desire to travel and to observe understandingly the life of other peoples. Fifth, it opens up to the student who really attains the aims of the course an avenue that can lead him directly to literature and writings in all possible fields of interest and of knowledge. It also brings him to a point where he can readily increase his oral ability to the degree where it will be useful for speaking and writing. Many students acquire all these values—except oral ability—without residence in a foreign country. Sixth, it allows the student to take advantage of any necessity or opportunity in his profession or business to utilize this knowledge of a foreign language. Seventh, it enables a student more easily and successfully to take up a second or third language later, even though the new language may belong to a different family from those which he has already learned. In the United States, we have always turned toward Europe in our educational and intellectual affairs, and toward the languages of western Europe that are nearest our own in structure and in vocabulary; but if circumstances lead a foreign-language student to look across the Pacific and to deal in person with the peoples there, he will find that experience with a western European language, ancient or modern, has given him a highly useful running start in pursuing the study of an Oriental language.



MATTHEW.

Courtesy American Museum of Natural History

The Bible in the Cherokee Syllabary

Sequoya (*c.* 1770–1843), a Cherokee Indian half-breed, created in 1821 a syllabary of 86 characters to represent the sounds of the Cherokee language, by which the people of his tribe learned to read and write their language. The Gospel according to St. Mathew, first published in 1829, was the first book printed in Cherokee

The Choice of a Foreign Language.—What foreign languages are most advantageous to American boys and girls? If only one ancient language is on the student's program, Latin comes first. If it is skilfully taught, the study of this highly inflected language—the declensions of nouns and adjectives, the conjugations of its verbs, the uses of its cases and tense forms and moods, the patterns into which the sentence structure falls—is an experience unequaled for precision and definiteness. When we remember that nearly half the ten thousand commonest words used in English speech and writing come from the Latin, we see what light this study throws on the origin and meaning of English words. Latin teaching is being reorganized and today, even in a second-year course, the easy Latin that pupils read helps them to form an idea what Roman civilization was like in its family relationships, its government, its religion and in its organization of a world conquered for glory, for power, for trade. Thus they get a concept of an imperialism like that which agitates the world today. Later, when they read Cicero and Livy, they become aware also of the sources of English and French style down into the 19th century and of the background to the speeches in which Mussolini exhorts the Italians today. It is a commonplace to call Latin a dead language, but like most of the great dead, its ghost still walks the western world. Only those who have studied the language know that the mighty spirit still lives and still speaks today, although in accents that Cicero, Caesar and Vergil would not have understood. If Latin were to disappear from our schools, this voice would still speak on, even though no ear were tuned to catch it. The people of the western world would have cut themselves off from a great segment of their past, like a man forgetting his youth and ignorantly disregarding forces and conditions that made him and his forefathers what they were.

The study of Greek, never as widespread as Latin, has lost ground in American secondary schools. Other subjects have crowded it from the course of study, especially as there has been an increase in the secondary school enrolment of students not preparing for college; but Greek, almost a model language in its structure, has much to interest ambitious young people. Greek literature is rich and varied in history, philosophy, the drama and lyric and epic poetry. From Greek even more than from Latin is drawn the terminology of modern natural sciences. The study of Greek makes for an educated man's understanding of English, besides offering an educational experience that exercises the pupils' best powers of memory, inference and attention to detail. Even more than in Latin, the parts of a sentence in Greek are bound together according to definite patterns indicated by the cases of its nouns and the tenses and moods of its verbs. The student of Greek gets all the training values of an experience with a highly inflected language, that is, one in which the relations of the words to one another are indicated by their endings.

Of modern languages, the student must usually choose among French, German and Spanish. For many years only French and German were taught in our schools. Spanish began to gain ground at the time of the Spanish-American War in 1898, when we became really aware of the vast Spanish-speaking regions south of our borders. Our bordering Mexico and the considerable Spanish-speaking population of our southwestern states give the Spanish language certain practical advantages. Although there are many French-speaking citizens in Louisiana, and the French of Quebec are not far away, these centers have not influenced language study so much as have the Spanish centers. Enough German-speaking centers still exist in various parts of the country to give German, as it were, a home market; and this is even more obviously true of Italian in view of the large Italian population in cities like New York, Chicago and San Francisco; but the Italian immigrant groups were not of the type to bring with them to America so high a degree of culture nor so much interest in education as the class of immigrants from Germany. For the same reason the Spanish-speaking population in our West and Southwest would not have given a strong impetus to the study of Spanish had it not been based on the tremendous commercial importance of the Latin-American countries south of the Rio Grande.

Unquestionably French and German have certain advantages over the other modern languages for most American students. Both countries, like Spain, have produced great literatures. In addition, both have made important contributions to art, music, philosophy, the natural sciences, education, government and to commerce in all its forms. A reading knowledge of these two languages is required of candidates for higher degrees (M.A., Ph.D.), in high-grade American universities, because technical writings (science, engineering, etc.) in French and German are usually not translated into English, so that the specialist in almost any field must have a reading knowledge of both languages. The writings of other European scientists —Russian, say, or Scandinavian—are usually published in French or German versions. As a spoken language, French is more widespread than any other except English. The traveler who speaks English and some French will find someone to whom he can make his wants known in almost any hotel, store, train, steamboat or trolley car in Europe.

French, Italian and Spanish all belong to the Romance group of languages, in which Portuguese and Rumanian also are included. These languages developed from the Latin spoken by Roman soldiers and Roman colonists in these countries and adopted by the original inhabitants during the centuries they were subjects of the far-reaching Roman Empire. Therefore these languages resemble one another in many respects, although they sound very little alike when spoken. They have also many points of resemblance to English, not in structure but in vocabulary, because English and these languages owe a common debt to Latin, and because English has had close contacts with these languages through many centuries. German is nearer to English in structure than the Romance languages, and nearer also in a certain element of the vocabulary (for example: *Haus,* house; *Hund,* dog; *Mann,* man; *Buch,* book; *Hand,* hand; *Weib,* woman; *Maus,* mouse), but when we get away from such simple words, which we call the Anglo-Saxon element in English, the German vocabulary is less like the English than is Latin, French, Italian or Spanish. Furthermore, since German sentences are longer and more complex than English, and German word order is different from ours, we find German more difficult to learn than a Romance language. But an American will learn more quickly to pronounce German intelligibly than French, because our vocal organs when we speak our own language behave more nearly like those of a German than like the vocal organs of speakers in Romance countries.

In the Romance languages, the articles, nouns and adjectives do not change for the different cases; that is, when subject or object or to express possession. The verbs, however, have a much more elaborate set of endings for the different tenses than in English. Learning the verb forms and how to use them is the big task in these languages. German, on the contrary, has a full set of declensions, or changes of form, for articles, pronouns, adjectives and nouns; but German verbs are more like English verbs and demand less study than verbs in the Romance languages.

The German language as a whole, however, calls for more study of forms than the others, consequently, some people think it is more difficult for the beginner than French or Spanish. Others consider this an advantage, not just because study of the language is more difficult, but because it gives to the student a kind of experience and training that the Romance languages do not give. They think also that this experience and training is especially valuable for those who do not study Latin. In view of the close relationship between German and English, students of German can form a much better idea of what the English language was before the Norman conquest of England in the 11th century, for after 1066 the influence of the French spoken by the Normans gradually brought about important changes in the language used in England at that time, especially in introducing in the sentence the word order and much of the vocabulary of the Norman French.

The Age for Beginning.—Teachers often discuss the question, "At what age should foreign-language study begin?" It is probable that in most cases the freshman or sophomore year in high school is early enough to begin Latin or Greek. The very nature of the languages and the way in which they are usually taught seem to demand at least this degree of maturity on the part of the student. The increased rate of progress in knowledge and in understanding is enough to make up for what an earlier beginning would contribute. However, the revision of the Latin course of study made in a number of recently published textbooks enables pupils to begin earlier. This is an advantage, for in these subjects, as in most others, much depends on the choice of material and the way in which it is presented.

In the case of modern languages, the situation is different, especially if speaking ability is the main object. It is true that in most cases where pupils are tested by written examinations, high school pupils rank higher than pupils who begin in junior high school. They read better, make fewer mistakes in writing and have a larger vocabulary and a better knowledge of grammar. On the other hand, oral work prospers more with younger students because they are less interested in subject matter and are amused and entertained by the sort of play involved in oral practice on a new language. The difficulty is, however, that early beginning in public junior high schools usually involves an early dropping of the language in the high school years. Though the average beginner in junior high school studies the language a year longer than if he began in high school, he learns less because he is not able in the earlier years to acquire a real power to do much with the language except commit phrases to memory and get a good accent.

Beginning a modern language in junior high school—or earlier—has great advantages if the language is continued at least two years in high school. Otherwise, it is better to wait until the high school period is reached, even if we suppose that attainment in speech will suffer by the delay. This supposition is based on reasoning rather than upon observed facts. The real point is this: At what stage in the child's school life can he best spare enough time for language study to make it worth while? School authorities at present do not seem to know what to do with the junior high school program. They call it an exploratory period, and the exploring frequently seems to be just pottering with various subjects and doing very little with any of them. Now if foreign-language study in junior high school were open to all students with an I.Q. score of 90–100 and above and were then carried on for at least two years in the next school stage, the results would be beneficial to the junior high school program and to the student, for he would have spent his time on a genuine subject matter of universal interest and importance in itself and in its bearing on other things. The adoption of such a plan would call for a revision of the subject matter of the modern-language course, with less emphasis in the earlier period on grammar and more on reading, pronunciation, hearing and speaking. Naturally the speaking exercises should be planned with care; certain topics in grammar that now are prominent in the course of study from the beginning should not appear until later in a course that has been carefully revised in accordance with this theory.

Courtesy Metropolitan Museum of Art

Cuneiform Characters

Cuneiform writing at the base of an alabaster slab from the palace of King Ashurnasirpal at Nimrud in ancient Assyria. At the top of the slab is carved a winged being pollinating a sacred tree. The Sumerians of the lower part of the Euphrates developed cuneiform script

Length of Period for Foreign-Language Study.—How long must foreign-language study continue in order that the results may be clear gain in terms of attainment in the language?

If speaking means expressing one's opinions, relating an incident, explaining a situation, understanding a Frenchman or a German when he is conversing at normal speed, then to speak a language is the most difficult to attain of all langauge abilities, as every student of the subject knows. Persons often live for years in a foreign country, hire taxis, ride on streetcars, do shopping, order meals, travel on trains and read newspapers, but never become fluent enough to carry on a connected conversation at normal speed.

Except in the case of mature students who learn more quickly and cover much more ground than the usual class, two years is the minimum period for a modern or an ancient language, and three years is more than a half better than two. Especially if speaking ability is an aim, the student cannot in a shorter time fix good habits of pronunciation and of handling sentence patterns; and he cannot acquire sufficient control of vocabulary, idiomatic expressions and changes in word forms. Indeed, it may be said positively that only able and industrious students can make real progress in these particular respects in as short a period as two high-school years. Furthermore, except in college, a two-year period rarely permits enough reading to produce ready reading ability, which in turn is necessary in order that the student may attain even a superficial impression of literature. The skill and the knowledge acquired with so much labor soon fades away with lack of use. Many students enter college after two or three years' study of a foreign language but do not continue the subject. They thus abandon the language at the time when their previous efforts would pay them the largest dividends.

In two high-school years a fairly good and reasonably industrious pupil can acquire a reading vocabulary of 2,000 to 3,000 words frequently used in books and a speech vocabulary of 500 to 600 words, if the content of a modern language course is properly chosen and skilfully taught. He can learn to pronounce intelligibly, to recognize all the important forms of common articles, adjectives, pronouns, nouns and verbs, and to understand immediately how they contribute to the meaning of a given sentence. Having done this, he should be able to read a suitable text at the rate of 125 to 200 words a minute. He should understand slow and simple speech, and himself be able to use a small group of more or less fixed expressions. Such attainment is the maximum that he can expect in two years, and is above what the average pupil usually attains.

In a succeeding year or two he can push his reading ability to a point closer to what it is in English, get acquainted with more mature literary words, learn more about the country and its people, extend the vocabulary he uses in speech and in writing, improve his pronunciation and in general reach a point where his knowledge of the language becomes a part of himself.

With Latin and Greek the situation is different. This is partly because forms and sentence structure are more complex; partly because the Latin and Greek authors usually read in school do not produce the varied kinds of simple and entertaining story material that are plentiful in the modern languages and partly because the subject matter taught in these languages is more remote from the young people of the present day. Julius Caesar's account of the war in Gaul, Cicero's speeches in the Roman senate and Xenophon's account of the retreat of his army in Asia Minor contain no love stories, no humorous incidents, no accounts of children's adventures or of the kinds of situations with which we are familiar. A revision of the Latin course of study, however, has resulted in supplying much easy and interesting reading material, even in the first two years, which places this subject more nearly on a par with the modern languages. The whole range of Latin literature has been skimmed to find material suitable for young people. Thus the pupil gets a truer picture of the Romans and finds them in many respects as human and as varied in their interests and characters as if they were living today.

Few students of Latin and Greek reach the point of reading Caesar and Cicero, Vergil and Horace, Juvenal, Xenophon and Homer in the way they can read Victor Hugo and Molière in French, Goethe and Schiller in German, Cervantes and Alarcón in Spanish, or Manzoni and Verga in Italian. In three years, however, they can learn the forms of the ancient languages, can recognize them and use them in simple sentences, can read many pages of the simpler texts now made available in most recent textbooks, and can learn a great deal about the origin and meanings of English words and about the civilization and history of Greece and Rome and their meaning for the world today. Further than this they can hardly expect to go in the high-school period unless they continue the subject for the full four years.

The First Foreign Language.—The question is often asked: In the case of a pupil who will study an ancient and a modern language, which should he begin first? In many schools it is the practice to permit pupils to study a modern language only after one or two years of Latin. Teachers of modern languages are always glad to have Latin students in their classes, because Latin training assures better progress in a second language, especially a language that has developed from Latin. The Latin student is familiar with grammatical terms and their meanings and has had practice in analyzing sentences into their parts. A student who has successfully completed a period of Latin study and wants to go into another foreign language usually has what is called linguistic ability and has also a taste for this kind of subject.

A commonsense analysis of the situation points to choosing a modern language as the first foreign language. As we have seen, a pupil can learn in a short time to make a wider use of a Romance language or of German than of Latin or Greek. In the case of younger pupils with little interest in grammatical analysis, a modern language can be taught more informally, utilizing play activities, especially those that lead to speaking practice. A pupil can more quickly reach the point of reading a modern language with some ease and thus get the satisfaction of having definitely accomplished something. Furthermore, the experience gained in studying a modern language is valuable preparation for the study of an ancient language, and a modern language begun in junior high school can be carried on long enough to be beneficial and still leave enough time for three years of Latin or Greek in high school.

CLASSIFICATION OF LANGUAGES

The languages of the world are classified either by their form or their family relation as morphological or genealogical.

Morphological.—Comparison of the outward forms (morphology) of languages, show that there are six types:

1. *Root-Isolating,* Chinese and Siamese-Burmese, the words of which have only one syllable and no inflection whatever; they may be used both as nouns and as verbs. Word order alone indicates the value of the various parts of a sentence.
2. *Stem-Isolating,* groups that include the Austronesian or Malayo-Polynesian languages. They are without inflection, number or gender, and various types of verbs are formed by means of prefixes, infixes and suffixes.
3. *Co-ordinating,* forms that embrace the Ancient Egyptian of the hieroglyphic texts; modern Egyptian, called Coptic, and the Bantu group of more than 100 languages spoken in central and South Africa. The modifying words (like our prefixes and suffixes) remain separated from the modified word just as in English the article *the* is separated from the noun to which it belongs.
4. *Agglutinative,* the Turco-Mongol-Tungus, Finno-Ugric and Dravidian of southern and central India which have inflectional elements attached to the word stem without loss of identity, as shown by the Hungarian word, *ember* (man), *ember-ek* (men), *ember-nek* (to the man), *Magyar-ember* (a Hungarian).
5. Inflectional, the Hamito-Semitic and Indo-European, having word stems and suffixes or prefixes fused to such a degree that it is often difficult to analyze the word.
6. *Polysynthetic* or *Incorporating,* early Mexican and Eskimo, in which subject, object and verb of a sentence are embodied in one compact form so that the entire sentence appears as one long word.

Genealogical.—More popular at present is the genealogical classification based on the principle of family relationship (mother, daughter and sister languages). Latin is the mother language of all the modern Romance tongues (Italian, French, Spanish, Portuguese, Rumanian and others) because they developed from it. English is a member of the larger Germanic or Teutonic family of languages. It includes also German, Dutch, Swedish, Danish, Norwegian and other branches, all grandchildren of the same dead language of which we have no written documents. It was still spoken about 2,000 years ago when the ancestors of the English people had not yet left the Continent. Their Primitive Germanic speech was a sister language of Latin and Greek (and others), and their mother language is called Primitive Indo-European or Primitive Indo-Germanic, names for this whole family. The name *Aryan,* formerly used for this group, is now applied to the Indo-Iranian division only.

The Indo-European languages have been more thoroughly studied than any other group because the peoples speaking them are among the foremost of ancient and modern history. The scientific method developed for the study of the Indo-European languages has been applied to other languages. Attempts have been made even to build up a complete genealogical tree for all the languages of the world to trace them back to the original language of mankind. It is possible that all languages come from one and the same original language, but we have no means to prove this.

Primitive Indo-European speech that was current between 3000 and 1500 B.C. was already many thousand years removed from the original language of mankind which, according to conservative estimates, must have existed 30,000 to 50,000 years ago. Primitive Indo-European had at least one sister language, of which we have recently found records—the Hittite, an ancient language of Asia Minor, known to us from cuneiform inscriptions that begin around 1900 B. C. Though we have no written records of Primitive Indo-European, by using our knowledge of its sister language, Hittite, we are now able to reconstruct the common parent of Primitive Indo-European and Hittite. The names Indo-Hittite and Primitive Indo-Hittite have been introduced for this hypothetical language.

Of present-day language families that border upon Indo-European, some may be distantly related. The Hamito-Semitic and the Finno-Ugric languages show a slight resemblance to Indo-European. Some scholars believe in the original unity of the Indo-European and Finno-Ugric, of the Indo-European and Hamito-Semitic or of all three families; but other authorities are opposed to such theories. Recently kinship of Indo-European and Korean has been asserted, but not very convincingly. Linguistic relationship does not imply racial kinship (blood relationship), since languages can be transferred from one race to another. The American Negroes did not change their race when they dropped their original African language and accepted an Indo-European tongue. Race and language are two independent concepts.

I. THE INDO-EUROPEAN LANGUAGES

Indo-European languages are divided into two groups—Eastern and Western—with differences typified by the words *centum* and *satem* meaning hundred. The original Western or primitive Indo-European had a guttural *k* sound in the word, but in the Eastern languages this became a sibilant *s*—*satem* in Avestan. In the Western languages the *k* sound was kept—Latin *centum* (pronounced *kentum*), for example. Tocharian, an extinct *centum* language in Chinese Turkestan, is the only exception to this division. Though it is farthest east of all these languages, it belongs to the *centum* group of the West. It probably was introduced into Chinese Turkestan by emigrants from the West.

INDO-IRANIAN or ARYAN. Spoken by people who occupy the great plateau of Iran (Persia) and the valleys of the Euphrates and the Tigris.

Indic or Sanskrit. Old Indic included Vedic Sanskrit (a collection of hymns, of which the oldest part is called Rig-Veda, which forms the basic part of the scriptures of the Brahman religion) and Classical Sanskrit (100 B. C.–800 A. D.). Middle Indic (or Prakrit) from 300 B. C. on grew out of Old Indic. Pali, the language of the Buddhist scriptures, was a literary form of Middle Indic and as such sterile and without offspring. Modern Indic languages comprise a total of more than 230,000,000 speakers. Among them are Marathi, 19,000,000; Hindi, 63,000,000; Bihari, 36,000,000; Bengali, 50,000,000; and Gypsy, the language of the Gypsies, an emigrant offshoot of a northwestern Indic dialect.

Iranian. Avesta (Old Bactrian) contains as its sole known literature the sacred books of the Zoroastrian (Parsi) religion. Old Persian contains the rock inscriptions of King Darius the Great and his successors. Modern Persian, a standard language of high prestige, is spoken by perhaps 8,000,000 people.

ARMENIAN. Spoken today by nearly 4,000,000 people in Asia Minor; the oldest written records in Armenian date from the 5th century A. D.

THRACO-PHRYGIAN. Thracian is known from a single inscription (*c.* 400 B. C.) found in the western part of the Balkan Peninsula. Phrygian, in Asia Minor, is known from one set of inscriptions dated as early as the 8th century B. C. and from another set from the first centuries of our era.

ILLYRIAN. These languages were spoken round the Adriatic in ancient times and are now known to us only from scant inscriptions or proper names. Albanese, the only modern survival, has been recorded only since the 17th century and is spoken (mainly in Albania) by about 1,500,000.

SLAVIC. The earliest literary documents of this group are translations in Old Church Slavic (or Old Bulgarian) of the second half of the 9th century. The manuscripts are in two scripts—Glagolitic, the older, and Cyrillic, the younger, both derived from the Greek alphabet.

West Slavic. Lechic, a hypothetical language without written records, is the source of Kasubian, Polish and Polabian. Kasubian is spoken by about 100,000 people in the Polish Corridor near Danzig. Although closely related to Polish, Kasubian is itself a distinct tongue. Polish, recorded since the 14th century, is spoken by nearly 21,000,000 people, more than a million of them living in the United States. Polabian died out in the 18th century. Wendish (or Sorbian, Lusatian) survives as a speech island of some 30,000 persons in Upper Saxony. Bohemian (or Czechoslovak), includes Czech, a language with a rich literature of five centuries, and Slovak, with a literature begun only in the 20th century. The two dialects are spoken by about 11,000,000 people. The oldest records date from the 13th century.

South Slavic. Slovene (or Slovenian) is spoken by about 1.5 million people, mainly in northwestern Yugoslavia and was first recorded in the 11th century. Serbo-Croatian is spoken by about 8,500,000 in Yugoslavia. The Orthodox Serbs use Cyrillic, and the Roman Catholic Croats employ Latin characters. Bulgarian is spoken by some 5,000,000. The earliest texts (10th and 11th centuries) are termed Old Bulgarian or Old Church Slavic.

East Slavic. White Russian is spoken by 6,500,000 people around Minsk. Ukrainian (or Ruthenian, Little Russian) is spoken by about 34,000,000 people in southern Russia, Poland, Czechoslovakia and Rumania. Russian (or Great Russian) is spoken by some 80,000,000 people in European Russia and Siberia and has been recorded since the 12th century.

BALTIC. The Baltic group is so closely akin to Slavic that the two are frequently classed together as Balto-Slavic. In the Baltic group are: Old Prussian, spoken in East Prussia and West Prussia until the second half of the 17th century; Lithuanian, spoken by about 2,700,000 people, 400,000 of them in the United States, with written records dating from the 16th century; Lettish, spoken in Latvia by about 1,500,000 people, with written records since the 16th century.

TOCHARIAN. A language of Central Asia known from manuscript fragments of the 6th century A. D. found in Chinese Turkestan.

GREEK. Our own civilization owes much to the Greek language, since it was the means of transmitting to us the high civilization of the ancient Greeks. It comprises the ancient and modern Greek literary languages and dialects. The ancient Greek dialects are known from many inscriptions, beginning in the 7th century B. C.; from fragments of writing on papyrus beginning in the 4th century B. C. and from a copious literature, whose oldest compositions, the Homeric poems

I. INDO-EUROPEAN

- Primitive Indo-European
  - Satem Languages
    - INDO-IRANIAN (ARYAN)
      - Indic (Sanskrit) . . . Old Indic: Vedic Sanskrit, Classical Sanskrit . . . Middle Indic (or Prakrit), Pali
        - Marathi
        - Hindi
        - Bihari
        - Bengali
        - Gypsy
      - Iranian
        - Avesta
        - Old Persian . . . Modern Persian
    - ARMENIAN
    - THRACO-PHRYGIAN
      - Thracian
      - Phrygian
    - ILLYRIAN . . . Albanese
    - SLAVIC
      - West
        - Lechic
          - Kasubian
          - Polish
          - Polabian
        - Wendish
        - Bohemian
          - Czech
          - Slovak
      - South
        - Slovene
        - Serbo-Croatian
        - Bulgarian
      - East
        - White Russian
        - Ukranian
        - Russian
  - Centum Languages
    - BALTIC
      - Old Prussian
      - Lithuanian
      - Lettish
    - TOCHARIAN
    - GREEK
    - ITALIC
      - Oscan and Umbrian
      - Sabellian
      - Latin . . . Romance languages
        - Portuguese
        - Spanish
        - Catalan
        - Provençal
        - French
        - Italian
        - Ladin
        - Rumanian
    - LIGURIAN
    - CELTIC
      - Gallic
      - Gaelic
        - Irish
        - Scottish
        - Manx
      - Britannic
        - Cornish
        - Welsh
        - Breton
    - GERMANIC
      - North . . . Old Norse
        - Swedish
        - Danish
        - Norwegian
        - Icelandic
      - East . . . Gothic
      - West
        - German
          - Low German
            - Dutch
            - Afrikaans
          - High German
        - Anglo-Frisian
          - Frisian
          - Anglo-Saxon
          - Middle English
          - Modern English

II. HAMITO-SEMITIC

- **Hamito-Semitic**
  - **Semitic**
    - Babylonian-Assyrian
    - West Semitic
      - Northern branch
        - Canaanite
        - Moabite
        - Phoenician
        - Hebrew
        - Aramaic
      - Southern branch
        - South Arabic
        - Arabic
        - Ethiopian
          - Tigré
          - Tigriña
          - Amharic
  - **Hamitic**
    - Egyptian (Ancient Egyptian and Coptic)
    - Berber
      - Libyan
      - Tuareg
      - Kabyle
    - Cushite
      - Somali
      - Galla

Some of the Semitic peoples (Hebrews, Phoenicians, Assyrians and Arabs) have played very prominent parts in the world's religious and commercial history and have made great literary contributions (the Bible and the Koran).

III. FINNO-UGRIC

(Figures indicate the number speaking the language.)

- **Finno-Ugric**
  - Finnic-Lapponic
    - Lapp, 30,000
    - Baltic-Finnic
      - Finnish, 3,000,000
      - Esthonian, 1,000,000
      - Karelian, Olonetsian } 208,000
      - Vepsian, Ludian } 26,000
      - Livonian, near extinction
      - Ingrian, Votian } 14,000
  - Mordvinian, 1,000,000
  - Cheremiss, 375,000
  - Permian
    - Votyak, 18,000
    - Zyrian, 258,000
  - Ugric
    - Ob-Ugrian
      - Ostyak, 18,000
      - Vogul, 5,000
    - Hungarian, 10,000,000

Some investigators believe that the Samoyede family of languages, spoken by some 180,000 persons east of the Ostyak area along the Yenisei River, Siberia, is related to Finno-Ugric. Others go even farther and believe that Finno-Ugric and Samoyede are related to Turko-Tatar (or Altaic), Mongolian and the Tunguse-Manchu languages, forming together with them the Ural-Altaic family.

(*Iliad* and *Odyssey*), are at least 2,700 years old. Today Greek is spoken by some 7,000,000 persons, mainly in Greece.

Italic. This family includes the ancient Latin, Sabellian, Umbrian and Oscan. Latin in time entirely absorbed the other three. Umbrian and Oscan were two closely related dialects of ancient Italy. Oscan is preserved in over 200 inscriptions ranging from 300 to 90 B. C. Umbrian was spoken in the district that is still called Umbria. Latin, the ancient dialect of the city of Rome, became the language of the Roman Republic and Empire and at its height was used throughout much of western Europe and the Mediterranean basin. In spite of the breakup of the Roman Empire, Latin continued to be the language of the literary and scholarly classes for many centuries. It is still the official language of the Roman Catholic Church.

From a type of Latin spoken by the masses and called Vulgar Latin came the Romance languages: Portuguese, spoken by 36,000,000 people chiefly in Portugal and Brazil, and connected with Spanish through Galician, as a written language dates from the end of the 12th century. Spanish is spoken by about 65,000,000 people living in Spain, Central America and South America (except in Brazil) as well as by some 100,000 Jews expelled by the Inquisition and scattered over the former Turkish Empire (Judaeo-Spanish). The literary language is based on the Castilian dialect and has a very important literature. Catalan, closely akin to Provençal, is spoken by 4,000,000 people in Catalonia and French Roussillon, with Barcelona and Perpignan as their respective centers. Provençal, spoken in southern France, takes its name from the region of its origin, Provence, originally a Roman province. It forms a natural connection between French and Italian and is perhaps more closely allied with Italian than with French. From its word for *yes,* it is frequently termed the *langue d'oc,* as French is called the *langue d'oil* (Modern French, *oui*) and Italian the *lingua de si.* Provençal was definitely established as early as the 9th century. It was the language of the troubadours early in the 10th and 11th centuries. Today Provençal is represented by numerous patois.

French is spoken by about 45,000,000 people in France, Belgium, Switzerland and eastern Canada. It has had three stages of development: Old French (842–*c.* 1300) its earliest text, the Oaths of Strasbourg; Middle French (*c.* 1300–1550) and Modern French (after 1500, especially after 1636). Modern French has a rich literature and has been the diplomatic language of the world since the 16th century. Its world-wide importance reached its climax in the 18th century. Since that time it has lost something of its former prestige, and its place has been taken by English.

Italian in its literary form has developed from the old Tuscan dialect that gained its literary pre-eminence through the writings of Dante, Petrarch and Boccaccio in the 14th century. Although literary Italian is read and spoken by all educated people in Italy, there still remain numerous dialects throughout the peninsula, and natives of southern Italy do not readily understand the dialect of northern Italy. Italian is spoken in various dialects by 41,000,000 people in Italy, Corsica, Malta, southern Switzerland, northern Africa, a small region in southeastern France, in Argentina and the United States of America. Ladin (or Raetian, Raeto-Romanic), spoken by some 44,000 people in the Swiss canton of Graubünden and by 500,000 people living south and southeast toward Frioul, appeared first as a literary language in the 16th century. Rumanian is spoken by 14,000,000 people in Rumania; its origin dates in the second century of our era when the Emperor Trajan conquered Dacia and colonized it with Romans.

Ligurian. This ancient widespread linguistic family centering in northern Italy round the present Riviera is very little known, but it was undoubtedly the most important language of central and southwestern Europe before the expansion of Celtic and Italic.

Celtic. History and evidence of place names show that Celtic was in earlier times spoken over a large part of Europe, including what is now Bohemia, Austria, southern Germany, Switzerland, northern Italy and France. It was superseded in these regions by Latin as a result of Roman conquests and by Germanic languages as a result of the great migrations in the early centuries of our era. Gallic (or Gaulish) was the language of ancient Gaul. We have a few scant inscriptions dating from *c.* 100 B. C. Gaelic or Goidelic: Irish is known from a manuscript literature beginning in the 8th century of our era; a few inscriptions on stone

(Ogham) are perhaps much earlier. It is now spoken by some 400,000 people. Scottish (or Scotch Gaelic), an offshoot of Irish, is spoken by some 150,000 people. Manx is spoken on the Isle of Man as a home language, besides English, by a few hundred people. Of Britannic, Brythonic or British, Cornish has been dead since 1800; its earliest records date from the 9th century; Welsh (or Cymric) is spoken in Wales by about 1,000,000 people; Breton (or Armorican) is spoken in Brittany, France, brought there from Britain, perhaps as early as the 4th century.

Germanic. Primitive Germanic, spoken between 1000 B. C. and 200 A.D., represents on the whole that branch of the Indo-European group that remained longest in or near the original territory of the Indo-Europeans. Though at the earliest stage it did not as yet differ much from Primitive Indo-European, about 500 B.C. it underwent radical changes that brought about its definite Germanic characteristics. The most important change in the sound structure of the language is known as the Germanic consonant shift or Grimm's law.

As a result of this change we find, for instance, that the consonants *f th h* that are used in the English language are modern developments of the Indo-European consonants *p t k*, while the modern English consonants *p t k* go back to Indo-European *b d g*.

Indo-European:	*p*	*t*	*k*	*b*	*d*	*g*
English:	*f*	*th*	*h*	*p*	*t*	*k* (*c*)

The Indo-European form of these consonants is preserved in Greek and Latin. Thus, *p* and *t* in Latin *pater* appear as *f* and *th* in English *father; c* (= *k*) in Latin *cornu* or *cor* appears as *h* in *horn* and *heart; t* in Latin *tres* appears as *th* in *three; d* in Latin *duo* or *decem* appears as *t* in *two* and *ten; g* in Latin *gelidus* or *gens* or *genu* appears as *k* (*c*) in *cold, kin* and *knee*, respectively. (There are more particulars to Grimm's law not mentioned here and there are also exceptions to the rule given here.)

North Germanic or Scandinavian. The oldest records of this branch are the Runic inscriptions, some of which date as far back as the 4th century A. D. The language of the oldest period (before 1050) was Old Norse. The bulk of the very valuable and extensive Old Norse literature was composed during the 10th and 11th centuries, chiefly in Iceland. During the 9th and 10th centuries great numbers of Danes and Norwegians settled in northern England and greatly influenced the formation of the English language. Old Norse is divided into East Norse (Swedish and Danish) and West Norse (Norwegian and Icelandic). Today Scandinavian languages are spoken by some 15,000,000. The present-day standard languages are Icelandic, Danish, Dano-Norwegian, Norwegian Landsmaal and Swedish. Iceland was settled by Norwegians a thousand years ago and its language, spoken by some 100,000 people, has come to differ markedly from the other Scandinavian languages.

IV. INDO-CHINESE OR SINO-TIBETAN

- **Indo-Chinese**
  - Chinese (400,000,000)
    - Mandarin
      - North Chinese (Peiping)
      - Middle Chinese (Nanking)
      - West Chinese (Szechwan)
    - Central Coastal group
      - Shanghai
      - Ningpo
      - Hankow
    - Kiangsi
    - South Chinese
      - Foochow
      - Amoy-Swatow
      - Cantonese-Hakka
  - Tai ... Siamese, 7,000,000
  - Tibeto-Burman
    - Tibetan
    - Burmese
    - Bodo-Naga-Kachin
    - Lo-lo

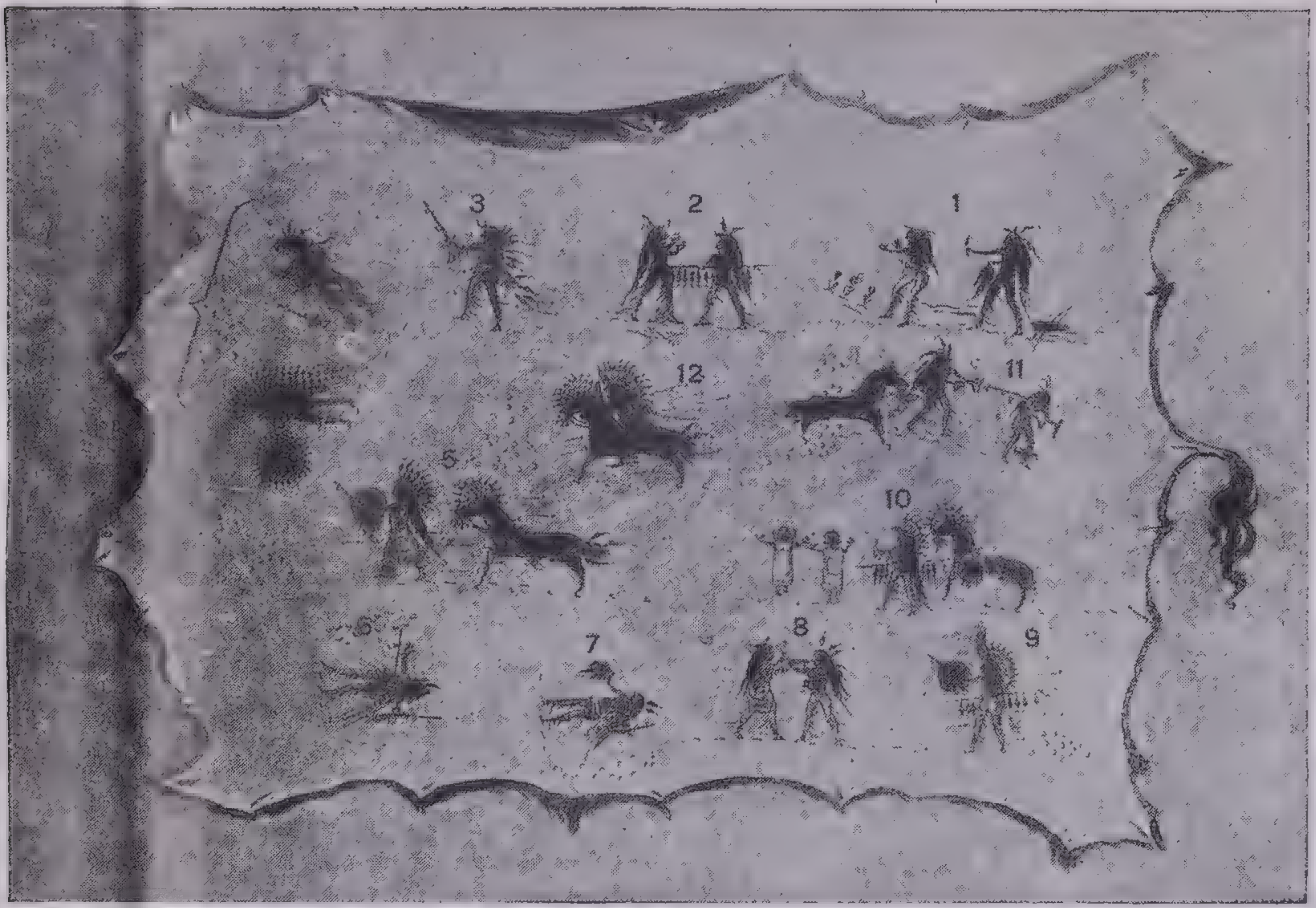
V. DRAVIDIAN

The Dravidian family of southern India and Ceylon includes, besides many lesser languages, Tamil (18,000,000), Malayalam (6,000,000), Kanarese (10,000,000), Telugu (24,000,000) and Brahui (174,000), far off from the rest in the mountains of Baluchistan. In the cultivated dialects the influence of Sanskrit is very noticeable owing to geographical proximity.

VI. THE AUSTRIC FAMILY OF LANGUAGES

- **Austric**
  - **Austroasiatic**
    - Malacca ... Semang
    - Central group
      - Sakai (Senoi)
      - Khasi
      - Nicobar and others
    - Mon-Khmer family (in parts of southeastern Asia)
    - Munda family ... 3,000,000 speakers on the southern slope of the Himalayas and round the plateau of Chota Nagpur in central India
    - Cham and others
  - **Austronesian (or Malayo-Polynesian)**
    - Indonesian (or Malayan)
      - Malay, 3,000,000
      - Formosan
      - Javanese, 20,000,000
      - Sundanese, 6,500,000
      - Maduran, 3,000,000
      - Balinese, 1,000,000
      - Philippine languages
        - Visaya, 2,750,000
        - Tagalog, 1,500,000
        - and others
      - Malagasy, 3,000,000 (in Madagascar)
    - Melanesian
      - Solomon Islands
      - Fiji Islands
    - Micronesian
      - Gilbert Islands
      - Marshall Islands
      - Caroline Islands
      - Marianas
      - Island of Yap
    - Polynesian
      - Maori
      - Samoan
      - Tahitian
      - Hawaiian
      - Easter Island

East Germanic, the language of the Goths, Vandals and Burgundians, has long been extinct. East Germanic settlers seem to have preserved their language in the Crimea and elsewhere on the Black Sea until the 18th century. Gothic was spoken in the various Gothic kingdoms on the Baltic Sea, the Black Sea, the Adriatic and the Mediterranean. Almost the only source of our knowledge of the language is found in the fragments of a Bible translation made in the 4th century by Ulfilas (*c.* 311–381), bishop of the Visigoths. Since Gothic is the oldest Germanic language known its study is of great importance to anyone interested in the history of the English language. The inflectional forms occurring in Gothic are much closer to the original Germanic forms than are those used in Old English. Gothic, therefore, is very useful in



Courtesy American Museum of Natural History

Picture Writing of the Mandan Indians

A robe of Mah-to-toh-pa, a Mandan chief, which depicts his military life appears in George Catlin's *Manners, Customs, and Condition of the North American Indians* (1841). Numerals have been added to each episode of the story to aid the reader in following the translation:

1. He kills a Sioux chief.
2. He kills a Cheyenne chief with a lance.
3. He kills a Cheyenne after his party left him wounded and bleeding.
4. He kills a Cheyenne chief whose wife tried to help him, but Mah-to-toh-pa kills her too.
5. Mah-to-toh-pa and a party of Arikaras are fired at by Sioux. The Arikaras fled, but Mah-to-toh-pa kills one of Sioux.
6. Mah-to-toh-pa's brother was killed by a Arikara with a lance. Mah-to-toh-pa takes the lance and later kills the Arikara with it.
7. He kills an Arikara.
8. He kills a Cheyenne who challenged him to single combat. First they fight with guns on horseback, then bows and arrows, and then singlehanded.
9. Minitaris and Mandans attacked by Assiniboins. All fled but Mah-to-toh-pa who killed an enemy and captured 60 horses.
10. He kills two Ojibway women.
11. Assiniboin attacked by Mandan and Minitaris. He kills an enemy.
12. Mah-to-toh-pa is wounded in battle. He took no scalps but his valor was so great that the chiefs awarded him the honor of victory.

tracing the history of English words and forms.

West Germanic. After the breakup of the Primitive Germanic unity, the western tribes still remained together for some time, forming the area of West Germanic dialects. Later these developed into two major divisions—German and Anglo-Frisian.

German has developed through three periods—Old High German (750–1100), Middle High German (1100–1450) and New High German (after 1450). There are many German dialects: (1) High German, subdivided into Upper German (Alemannian and Bavarian) and Middle German (East Franconian, Rhenish Franconian and Middle Franconian); (2) Low German (Low Franconian, Low Saxon and Plattdeutsch). In the Netherlands a Low Franconian dialect is the literary and official language known to us as Dutch. The language of the Dutch colonists in South Africa became independent and is now called Afrikaans. Flemish is the Low Franconian spoken in the northern half of Belgium. The total number of people speaking Dutch or Flemish is about 13,000,000. Yiddish (Judaeo-German), the language spoken by many of the Jews in eastern Europe and by some of their descendants in other parts of the world (about 10,000,000), is based on an East Franconian dialect of the Middle Ages. The modern literary German originated in the 14th century. At that time the imperial chancery and many of the lesser courts in Germany adopted German in place of Latin as the official language. Naturally in the intercourse between the imperial and other courts the imperial dialect was adopted.

The so-called imperial dialect was that used by the local court of the emperors, who at that time were living at Prague. So a High German dialect became the *Kanzleisprache,* chancery speech or official language of Germany. Through the work of Luther this language was given its greatest impetus toward widespread usage. In his translation of the Bible he used the language of the Saxon chancery. Gradually one part of Germany after another adopted this as the written language. The German language is spoken by about 90,000,000 people in Germany, Switzerland, Austria, Italy, Czechoslovakia, Rumania, Russia, Poland, Lithuania, Latvia, Luxembourg, Alsace-Lorraine, the United States, Brazil and Argentina.

Anglo-Frisian was spoken by the Anglians, Saxons, and Frisians who invaded the British Isles in the 5th century and introduced there the language that became English. Frisian, however, is still spoken by some 350,000 persons on the coast and coastal islands along the North Sea. English has had three periods of development Old English or Anglo-Saxon (after 675–*c.* 1100), Middle English (1100–1500) and Modern English (after 1500). Its first records date from the 7th century. Old English had four main dialects: Northumbrian, Mercian, West Saxon and Kentish. In the course of centuries English has absorbed a multitude of Scandinavian, Norman-French and cosmopolitan words; but in its structure it is to this day quite as purely West Germanic as it was in Old English times. It is spoken by about 170,000,000 people in the British Isles, the United States, Canada, Australia, New Zealand, South Africa and all the dependencies of England, such as India and Egypt. English is the commercial language of a large part of the world today and its influence in this field is steadily growing. If we count the important factor of foreigners speaking English, it is the most widespread of languages. Local dialects are of small extent and for the most part they are mutually intelligible.

VII. OTHER FAMILIES

Papuan, on New Guinea and adjacent islands.

The Australian language.

The Hyperborean family of languages in the extreme northeastern corner of Asia.

The Sudan languages (455 in all) spoken by the Negro population (some 50,000,000) of central Africa, little known and not all belonging to the same family; best known among them: Wolof and Ful in Senegal and French Sudan, Hausa in the central region, Nubian in the east (round Khartoum).

The vast Bantu family of languages (more than 100) spoken by 50,000,000 people south of the African Sudan: Luganda, Swahili, Kafir, Zulu, Subiya and Herero.

Southwestern Africa has two unrelated linguistic areas: the Bushman, with some 50,000 speakers, and the Hottentot, which is spoken by some 250,000.

The Caucasian languages in the Caucasus region.

Japanese (with 56,000,000), Korean (with 17,000,000), Basque (only surviving form of ancient Iberian) in the Pyrenees Mountains and Etruscan (extinct for 2,500 years) in Italy are so far unclassified.

VIII. NATIVE AMERICAN LANGUAGES

Eskimo. The language spoken from Greenland over Baffinland and Alaska to the Aleutian Islands and the east coast of Siberia.

American Indian. In Central America and South America about 15,000,000 Indians speak a number of languages whose relationships are unknown. More than 20 independent families have been set up for Mexico and Central America and about 80 for South America. The Mayan family in Yucatan was the bearer of an ancient civilization. The Arawak and Carib families prevailed once in the West Indies. Quichuan was the language of the Inca civilization.

In North America the territory north of Mexico was inhabited, before the coming of the white man, by nearly 1,500,000 Indians. In this same territory today the number of speakers of Indian languages is some 250,000, and their languages are tentatively grouped in 24 to 50 entirely unrelated families. Many have already died out. A few of the largest families are:

Algonquian: in eastern and central Canada (Micmac, Montagnais, Cree); in New England (Penobscot, Massachusetts, Natick, Narraganset, Mohican, Delaware); around the Great Lakes (Ojibwa, Potawatami, Menominee, Sack, Fox, Kickapoo, Peoria, Illinois, Miami); and in the western United States (Blackfoot, Cheyenne, Arapaho).

Athapascan: in northwestern Canada, in California (Hupa, Mattole); with a large area in the Southwest (Apache, Navaho).

Iroquoian (surrounded by Algonquian): Huron (or Wyandot); languages of the Iroquois type (Mohawk, Oneida, Onondaga, Cayuga, Seneca, Tuscarora); Cherokee.

Muskhogean: Choctaw, Chickasaw, Creek, Seminole.

The Siouan family: Dakota, Teton, Ogalala, Assiniboin, Kansa, Omaha, Osage, Iowa, Missouri, Winnebago, Mandan, Crow.

The Uto-Aztecan family:

Uto-Aztecan	PIMAN (east of the Gulf of California)	
	SHOSHONEAN (southern California and eastward)	Ute Paiute Shoshoni Comanche Hopi
	THE NAHUATLAN FAMILY (in Mexico)	Aztec

Artificial Auxiliary Languages.—There have been more than 40 attempts to create a universal language that might serve as a means of communication for all peoples of the earth. This artificial language is not to replace existing tongues but to be a secondary language useful as a means of ready communication between people with different native tongues. Within each country the mother tongue with its great historical and literary tradition will continue to be the principal language. Most early attempts to construct such a language were based not on an existing language but upon the inventor's personal method of classifying ideas and creating words for them. An example of this type of auxiliary language is Ro, invented in 1904 in the United States by the Reverend P. Foster. The most successful creations, however, have been based on one or more existing languages.

Volapük, invented in 1879 by Father Schleyer of Baden, Germany, and based on English, was very popular for a time. Even more successful was the creation of Esperanto in 1887 by Ludwig Zamenhof of Warsaw. Both Volapük and Esperanto were too complicated for their stated purpose. Other attempts that followed include: Ido (1907), a modified form of Esperanto; Esperanto II; Latino sine flexione (Latin without endings); Occidental and Novial. To be of any use, a constructed language must be easier to learn than the existing natural languages of world importance—English, French, German, Spanish, Russian. This goal can be reached by simplifying the grammatical structure. In vocabulary Latin roots are advantageous because they are fundamental in all the Latin languages of Europe (Italian, French, Spanish, Portuguese, Rumanian) and they are found also in the technical vocabularies of English and most other European languages. Of all constructed languages Novial (New International Auxiliary Language), invented in 1923 by the Danish linguist Professor Otto Jespersen, seems to be the one best suited for its purpose. Its grammar is simplified to the utmost with almost no inflection. The vocabulary is taken from the languages of western Europe. To stimulate public interest in favor of a constructed language, the International Auxiliary Language Association (Iala) was founded in 1924, with headquarters in New York and a European office at The Hague, Netherlands. Activity has been focused on the attempt to choose from the various proposed languages the one easiest to learn, most accurate and most efficient.

DICTIONARY OF ABBREVIATIONS

A., *a.* Adjective
a, @. (Lat. *ad.*) To; at
A. A. A. S. American Association for the Advancement of Science
A. A. G. Assistant Adjutant General
A1 First Rate (at Lloyd's)
A. B. (Lat. *Artium Baccalaureus.*) Bachelor of Arts
Abbr., *Abbrev.* Abbreviated, Abbreviation
Abp. Archbishop
A. C. (Lat. *Ante Christum.*) Before Christ
Acad. Academy
Acc., *acc.* Accusative
Acc., *Acct.* Account
A. D. (Lat. *Anno Domini.*) In the year of our Lord
Ad., *advt.* Advertisement
A. D. C. Aide-de-camp
Adj. Adjective
Adj. Adjutant
Adj. Gen. Adjutant General
Ad lib., *Ad libit.* (Lat. *ad libitum*), At pleasure
Adm. Admiral; Admiralty
Admr. Administrator
Admx. Administratrix
Adv. Adverb
Æ., *Æt.* (Lat. *Ætatis.*) Of age, aged
A. G., *Adjt. Gen.* Adjutant General
Ag. (Lat. *argentum.*) Silver
Agr., *Agric.* Agriculture, Agricultural
Agt. Agent
A. L. of H. American Legion of Honor
Al. Aluminum
Ala. Alabama
Alas. Ter. Alaska Territory
A. M. (Lat. *Artium Magister.*) Master of Arts
A. M. (Lat. *ante meridiem.*) Before noon
Am., *Amer.* America, American
Amer. Phil. Soc. American Philosophical Society
Amt. Amount
An. (Lat. *anno.*) In the year
Anat. Anatomy, anatomical
Anon. Anonymous
Ans. Answer
A. P. Associated Press
App. Appendix
Approx. Approximate, approximately
Apr. April
Aq. (Lat. *aqua.*) Water
A. R. A. Associate of the Royal Academy
Arab. Arabic, Arabian
Arch. Architecture
Archeol. Archeology
Arith. Arithmetic, arithmetical
Ariz. Arizona
Ark. Arkansas
Arr. Arrive, arrives, arrived, arrival
Art. Article
Assn. Association
Assoc. associate
Asst. Assistant
A. S. S. U. American Sunday School Union
Assyr. Assyrian
Astrol. Astrology
Astron. Astronomy, astronomical
Atty. Attorney
Atty. Gen. Attorney General
Aug. Augustus; August
Avoir. Avoirdupois
b. Born
B. A. Bachelor of Arts
Bal. Balance
Bap., *Bapt.* Baptist
Bar. Barrel; Barometer
Bart., *Bt.* Baronet
Bat., *Batt.* Battalion
Bbl., *bbls.* Barrel, barrels
B. C. Before Christ
B. C. L. (Lat. *Baccalaureus Civilis Legis.*) Bachelor of Civil Law
Bdls. Bundles
Berks. Berkshire
Bib. Bible, biblical
Biog. Biography, biographical
Biol. Biology, biological
B. LL. (Lat. *Baccalaureus Legum.*) Bachelor of Laws
B. M., *B. Mus.* (Lat. *Baccalaureus Musicæ.*) Bachelor of Music
Boh. Bohemian, *or* Czech
Bot. Botany, botanical
Bp. Bishop
Br., *Bro.* Brother
Brig. Brigade
Brig. Gen. Brigadier General
Brit. Britain
B. S. Bachelor of Science
B. Sc. (Lat. *Baccalaureus Scientiæ.*) Bachelor of Science
Bt. Baronet
B. T. U. British Thermal Unit
Bucks. Buckinghamshire
Bush. Bushel
B. V. M. Blessed Virgin Mary
Bvt. Brevet
bx., *bxs.* Box, boxes
C. Cent, cents; Centigrade; Consul; Centime, centimes
Calif. California; Calendar
Cam., *Camb.* Cambridge
Cantab. (Lat. *Cantabrigiensis.*) Of Cambridge
Caps. Capitals
Capt. Captain
Card. Cardinal
Cath. Catharine; Catholic
Cav. Cavalry
C. B. Companion of the Bath
C. E. Civil Engineer
Cent. (Lat. *centum.*) A hundred; Centigrade
Centig. Centigrade
Cf. (Lat. *confer.*) Compare
c. ft. Cubic feet
C. G. Coast Guard; Consul General
C. G. S. Centimeter, Gram, Second
C. H. Courthouse
Ch. Church; Chapter
Chap. Chapter
Chem. Chemistry, Chemical
Chron. Chronicle; Chronology
C. I. Order of the Crown of India
C. I. E. Companion of the Order of the Indian Empire
Civ. Civil
Cl. Chlorine
Clk. Clerk
cm. Centimeter
C. M. G. Companion of the Order of St. Michael and St. George
Co. Company; County, Cobalt
C. O. D. Cash on delivery; Collect (*payment*) on delivery
Col. Colonel; Colossians; Column
Coll. College; Collection; Colleague
Colo. Colorado
Com. Commander; Commerce; Commissioner; Committee; Commodore; Common
Commdr. Commander
Commsr. Commissioner
Comp. Compare, comparative; Compound, compounded
Con., *contra* (Lat.) Against
Cong. Congregation, Congregational, Congregationalist; Congress
Conj. Conjunction
Conn. Connecticut
Cor. Corinthians
Corn. Cornwall, Cornish
Corp. Corporal; Corporation
Cos. Cosine
C. P. A. Certified Public Accountant
Cr. Credit, creditor
Cres. Crescendo
C. S. A. Confederate States of America
C. S. I. Companion of the Star of India
csks. Casks
ct. (Lat. *centum.*) A hundred
Ct. Court
Ct., *Conn.* Connecticut
Cu. (Lat. *cuprum.*) Copper
cub., *cu. ft.* Cubic, cubic foot
cwt. A hundredweight; Hundredweights
d. (Lat. *denarius*, *denarii.*) A penny, pence
d. Died

Dan. Danish
Dat. Dative
D. C. District of Columbia
D. C. L. Doctor of Civil (*or* Canon) Law
D. D. (Lat. *Divinitatis Doctor.*) Doctor of Divinity
D. D. S. Doctor of Dental Surgery
Dec. December; Declination
decim. Decimeter
Def. Definition
Deft. Defendant
Deg. Degree, degrees
Del. Delaware
Del. (Lat. *delineavit.*) He (*or* she) drew it
D. Eng. Doctor of Engineering
Dep., *Dept.* Department
Deut. Deuteronomy
Dict. Dictionary; Dictator
Dis., *Disct.* Discount
Dist. District
Dist. Atty. District Attorney
Div. Divide, dividend, division, divisor
D. Lit., *D. Litt.* Doctor of Literature
D. M., *D. Mus.* Doctor of Music
D. O. Doctor of Osteopathy; Doctor of Optics
do. (Ital. *ditto.*) The same
doz. Dozen
Dpt. Deponent
Dr. Debtor; Doctor; Dram, drams
D. Sc. Doctor of Science
Du., *Dut.* Dutch
Duo. 12mo. Duodecimo (12 leaves to a sheet)
D. V. (Lat. *Deo volente*). God willing
D. V. S. Doctor of Veterinary Surgery
dwt. (Lat. *denarius*, and English *weight.*) Pennyweight, pennyweights
E. East, eastern; English; Edinburgh
ea. Each
Eben. Ebenezer
E. C. Established Church
Eccl., *Eccles.* Ecclesiastes; Ecclesiastical
Econ. Economy
Ed. Editor; Edition
E. E. Electrical Engineer
E. E. M. P. Envoy Extraordinary and Minister Plenipotentiary
e. g. (Lat. *exempli gratia.*) For example
E. I. East Indies, East Indian
Elec., *Elect.* Electric, electricity
Emp. Emperor, empress
E. N. E. East-northeast
Eng. England, English
Eng., *Engin.* Engineer, engineering
Eng. Dept. Department of Engineers
Eph. Ephesians; Ephraim
Epiph. Epiphany
Epis. Episcopal
E. S. E. East-southeast
Esq., *Esqr.* Esquire
et al. (Lat. *et alibi.*) And elsewhere
et al. (Lat. *et alii*, or *aliæ*, *alia.*) And others
etc., *&c.* (Lat. *et cæteri*, *cæteræ* or *cætera.*) And others, and so forth
Ethnol. Ethnology, ethnological
et seq. sq. or *sqq.* (Lat. *et sequentes* or *et sequentia.*) And the following
Etym. or *Etymol.* Etymology
Exec. Executor
Execx. Executrix
Exod. Exodus
Ez. Ezra
Ezek. Ezekiel
E. & O. E. Errors and omissions excepted
F. Fellow; Folio; Fahrenheit
f. Farthing, farthings
f., *fem.* Feminine
f. Franc, francs
Fahr. Fahrenheit
F. C. S. Fellow of the Chemical Society
Feb. February
Fec. (Lat. *fecit.*) He (*or* She) did it
Fem. Feminine
Feud. Feudal
F. F. V. First Families of Virginia
F. G. S. Fellow of the Geological Society
F. I. C. Fellow of the Chemical Institute
Fig. Figure, figures; figurative, figuratively
Fl. Flemish; Florin, florins; Flourished
Fla. Florida
F. M. Field Marshal
Fo., *Fol.* Folio
F. O. B. Free on board
For. Foreign
Fr. France, French; Francis; Francs
F. R. A. S. Fellow of the Royal Astronomical (*or* Asiatic) Society
F. R. C. P. Fellow of the Royal College of Physicians
F. R. C. S. Fellow of the Royal College of Surgeons
F. R. G. S. Fellow of the Royal Geographical Society
F. R. H. S. Fellow of the Royal Horticultural Society
F. R. H. S. or *F. R. Hist. S.* Fellow of the Royal Historical Society
Fri. Friday
F. R. M. S. Fellow of the Royal Microscopical Society
F. R. S. Fellow of the Royal Society
Ft. Fort; Foot, feet
F. Z. S. Fellow of the Zoölogical Society
F. & A. M. Free and Accepted Masons
Ga. Georgia
G. A. General Assembly
Gal. Galatians
gal. Gallon, gallons
G. A. R. Grand Army of the Republic
G. B. Great Britain
G. C. B. Grand Cross of the Bath
G. C. M. G. Grand Cross SS. Michael and George
G. C. S. I. Grand Commander of the Star of India
Gen. General
Gen. Genesis; Genitive
Gend. Gender
Genit. Genitive
Gent. Gentleman, gentlemen
Geo. George; Georgia
Geog. Geography, geographical
Geol. Geology, geological
Geom. Geometry, geometrical
Ger., *Germ.* German
Gi. Gill, gills
G. M. Grand Master
G. O. P. Grand Old Party (Republican)
Gov. Governor
Gov. Gen. Governor General
Govt. Government
G. P. O. General Post Office
gr. Grain, grains; Gross
Gr. Greek
Gram. Grammar, grammatical
gtt. (Lat. *gutta* or *guttæ.*) Drop *or* drops
H. Hour, hours; Hydrogen
Hants. Hampshire
H. B. M. His (*or* Her) Brittanic Majesty
Heb., *Hebr.* Hebrew, Hebrews
H. H. His (*or* Her) Highness; His Holiness (the Pope)
Hhd. Hogshead, hogsheads
H. I. H. His (*or* Her) Imperial Highness
Hind. Hindu, Hindustan, Hindustani
Hist. History, historical
H. J., *H. J. S.* (Lat. *his jacet*, *hic jacet sepultus.*) Here lies, Here lies buried
H. M. His (*or* Her) Majesty
H. M. S. His (*or* Her) Majesty's Service, Ship, *or* Steamer
Hon., *Honble.* Honorable
Hos. Hosea
H. P. Half-pay; High-Priest; Horse power
H. R. H. His (*or* Her) Royal Highness
Hund. Hundred, hundreds
Ia. Iowa
Ib., *Ibid.* (Lat. *ibidem.*) In the same place
Icel. Iceland, Icelandic
Id. (Lat. *idem.*) The same
Ida. Idaho
i. e. (Lat. *id est.*) That is
I. H. S. (Lat. *Iesus* [or *Jesus*] *Hominum Salvator.*) Jesus the Savior of Men
Ill. Illinois
Imp., *Imperf.* Imperfect
Imper. Imperative
in. Inch, inches
Incog. (Ital. *incognito*, *incognita.*) Unknown
Ind. India, Indian; Indiana
Indic. Indicative
Inf., *Infin.* Infinitive
Ins., *Insur.* Insurance
Insp. Inspector
Insp. Gen. Inspector General
Inst. Instant; the present month; Institute, institution
Int. Interest
Interj. Interjection
Intrans. Intransitive
Int. Rev. Internal Revenue
Introd. Introduction
I. O. O. F. Independent Order of Oddfellows
I. O. R. M. Improved Order of Red Men
I. O. U. I owe you
i. q. (Lat. *idem quod.*) The same as
Ir. Ireland, Irish
Is., *Isa.* Isaiah
Isl. Island
It., *Ital.* Italic; Italy; Italian
Jan. January
J. C. D. (Lat. *Juris Civilis Doctor.*) Doctor of Civil Law
Jer. Jeremiah
J. G. W. Junior Grand Warden
Jon., *Jona.* Jonathan
Josh. Joshua
J. P. Justice of the Peace
Jr. Juror; Junior
Judg. Judges
Jul. July; Julius; Julian
Jun. June
Jun., *Junr.* Junior
K. King; Knight
Kan., *Kans.* Kansas
K. B. Knight of the Bath
K. B. King's Bench
K. C. King's Counsel; Knights of Columbus
K. C. B. Knight Commander of the Bath
K. C. M. G. Knight Commander of St. Michael and St. George
Ken., *Ky.* Kentucky
K. G. Knight of the Garter
K. G. C. Knight of the Grand Cross
Ki. Kings
kilom., *kilo.* Kilometer
K. of P. Knights of Pythias
K. P. Knight of St. Patrick
Ks. Kansas
K. T. Knight of the Thistle; Knight Templar
Ky. Kentucky
L. Latin; Lake; Lord; Lady
L., *l.*, £. (Lat. *libra.*) Pound, pounds (sterling)
L., *lb.*, ℔ (Lat. *libra.*) Pound, pounds (weight)
La. Louisiana
Lam. Lamentations
Lat. Latin; Latitude
lb. Pound, pounds (weight)
l. c. Lower case (in printing)
l. c., *loc. cit.* (Lat. *loco citato.*) In the place before cited
Lev. Leviticus
L. H. D. (Lat. *Litterarum Humanorum Doctor.*) Doctor of Humanities
L. I. Long Island
Lib. (Lat. *liber.*) Book
Lieut., *Lt.* Lieutenant
Lieut. Col. Lieutenant Colonel
Lieut. Gen. Lieutenant General
Lieut. Gov. Lieutenant Governor
Linn. Linnæus, Linne, Linnean
Liq. Liquor, liquid
Lit. Literally; Literature, literary
Lit. D. or *Litt. D.* (Lat. *Literarum Doctor.*) Doctor of Literature
LL. B. (Lat. *Legum Baccalaureus.*) Bachelor of Laws
LL.D. (Lat. *Legum Doctor.*) Doctor of Laws
Lon., *Long.* Longitude
l. s. d. (Lat. *libra*, *solidi*, *denarii.*) Pounds, shillings, pence
Lt. Lieutenant
m. Married; Masculine; Meter, meters; Mile, miles; Minute, minutes
M. Monday; Morning; Monsieur
M. (Lat. *mille.*) Thousand
M. (Lat. *meridies.*) Meridian, Noon
M. A. Master of Arts
Mac., *Macc.* Maccabees
Maj. Major
Maj. Gen. Major General
Manuf. Manufactures, manufacturing
Mar. March; Maritime
Marq. Marquis
Mas., *Masc.* Masculine
Mass. Massachusetts
Math. Mathematics, mathematical
Matt. Matthew
M. B. (Lat. *Medicinæ Baccalaureus.*) Bachelor of Medicine
M. C. Member of Congress; Master of Ceremonies
Mch. March
M. D. (Lat. *Medicinæ Doctor.*) Doctor of Medicine
Md. Maryland
Mdse. Merchandise
M. E. Mining Engineer; Mechanical Engineer
M. E. Methodist Episcopal
Me. Maine
Mech. Mechanics, mechanical
Med. Medicine, medical; Medieval
M. E. S. Methodist Episcopal South
Messrs. (Fr. *messieurs.*) Gentlemen
Mex. Mexico
Mfd., *Mfs.* Manufactured, manufactures
Mfg. Manufacturing
M. F. H. Master of Foxhounds
Mich. Michigan
Min. Mineralogy, mineralogical; Minute, minutes
Minn. Minnesota
Miss. Mississippi
Mlle. (Fr. *mademoiselle.*) Miss
MM. (Fr. *messieurs.*) Gentlemen
mm. Millimeters
Mme. (Fr. *madame.*) Madam
Mo. Missouri; Month
mo. Month
Mon. Monday
Mont. Montana
M. P. Member of Parliament
M. P. P. Member of the Provincial Parliament
Mr. Master, Mister
Mrs. Mistress (when abbreviated pronounced mis'sis)
MS. Manuscript
MSS. Manuscripts
MT., *Mts.* Mount, mountains
Mus. Museum; Music, musical
Mus. B. (Lat. *Musicæ Baccalaureus.*) Bachelor of Music
Mus. D., *Mus. Doc.*, *Mus. Doct.* (Lat. *Musicæ Doctor.*) Doctor of Music
N. Noon; North; Noun; Number; New; Neuter
N. A. North America, North American
N. B. New Brunswick; North Britain (*i. e.* Scotland)
N. B. (Lat. *Nota bene.*) Note well, Take notice
N. C. North Carolina
N. D., *N. Dak.* North Dakota
N. E. New England; Northeast
Neb. Nebraska
Neh. Nehemiah
Nem. con. (Lat. *nemine contradicente.*) No one contradicting, unanimously
Neth. Netherlands
Neut. Neuter
Nev. Nevada
New Test., *N. T.* New Testament
N. F. Newfoundland
N. H. New Hampshire
N. J. New Jersey
N. M. New Mexico
N. N. E. North-northeast
N. N. W. North-northwest
No. (Lat. *numero.*) Number
nol. pros. (*nolle prosequi.*) To be unwilling to proceed
Nom. Nominative
Non seq. (Lat. *non sequitur.*) It does not follow (as a consequence)
Nos. Numbers
Nov. November
N. P. Notary Public
N. S. New style (since 1752); Nova Scotia
N. T. New Testament
Num., *Numb.* Numbers
N. W. Northwest
N. W. T. Northwest Territory
N. Y. New York
N. Z. New Zealand
O. Ohio; Old
ob. (Lat. *obiit.*) He (*or* she) died
Ob., *Obad.* Obadiah
obit. (Lat. *obitur.*) He (*or* she) died
Obj. Objective
Obs. Obsolete
Oct. October
Oct., *8vo.* Octavo
O. F. Odd Fellows
O. H. M. S. On Her Majesty's Service
O. K. "All correct"
Okl. Oklahoma
Old Test., *O. T.* Old Testament
O. M. Old Measurement
O. M. I. Oblate of Mary Immaculate
O. R. C. Officers' Reserve Corps
Oreg. or *Ore.* Oregon
O. S. Old Style (previous to 1752)
O. S. B. Order of St. Benedict
O. S. F. Order of St. Francis
O. T. Old Testament
O. U. A. M. Order of United American Mechanics
Oxon. (Lat. *Oxonia*, *Oxoniensis.*) Oxford; of Oxford
oz. Ounce
P. Page; Participle; Past; Pole; Port
Pa. Pennsylvania
Part. Participle
Pathol. Pathology
P. C. Police Constable; Privy Council, Privy Councilor
P. D. Police Department
Pd. Paid
P. E. Protestant Episcopal
P. E. I. Prince Edward Island
Penn. or Penna. Pennsylvania
Per., *Pers.* Persia; Persian; Personal
Per cent, *per ct.* (Lat. *per centum.*) By the hundred
Perf. Perfect
Phar., *Pharm.* Pharmacy
Ph. B. (Lat. *Philosophiæ Baccalaureus.*) Bachelor of Philosophy
Ph. D. (Lat. *Philosophiæ Doctor.*) Doctor of Philosophy
Ph. G. Graduate in pharmacy
Phil. Philip; Philippians; Philosophy, philosophical
Phys. Physics, physical; Physiology, physiological
Physiol. Physiology, physiological
Pinx., *Pxt.* (Lat. *pinxit.*) He (*or* she) painted it
Pk. Peck
Pl. Place; Plate; Plural
Plup., *Plupf.* Pluperfect
Plur. Plural
P. M. (Lat. *post meridiem.*) Afternoon
P. M. Past Master; Postmaster
P. M. G. Postmaster General
P. O. Postoffice
Pop. Population
Port. Portugal, Portuguese
Poss. Possessive
pp. Pages
p.p. Past (*or* perfect) participle
P. P. Parish priest
P. P. C. (Fr. *pour prendre congé.*) To take leave. [*T. T. L.*]
p. pr. Present participle

Pr. Present; Priest; Prince
P. R. Prize Ring
prep. Preposition
Pres. President; Present
Prof. Professor
Pron. Pronoun; Pronounced, pronunciation
Pro tem. (Lat. *pro tempore.*) For the time being
Prov. Proverbs, proverbial, proverbially; Provincial, provincially; Provost
Prox. (Lat. *proximo.*) Next, *or* of the next month
P. S. (Lat. *post scriptum.*) Postscript
Ps., *Psa.* Psalm, psalms
Psychol. Psychology
Pt. Part; Payment; Point; Port; Pint
pwt. Pennyweight
Q. E. D. (Lat. *quod erat demonstrandum.*) Which was to be proved
Q. E. F. (Lat. *quod erat faciendum.*) Which was to be done
Q. M. Quartermaster
Q. M. Gen. Quartermaster General
qt. Quart
q. v. (Lat. *quod vide.*) Which see
R. Railway; Réaumur; River
R. (Lat. *recipe.*) Take
R. A. Royal Academy, Royal Academician; Rear Admiral; Royal Arch; Royal Artillery
R. C. Roman Catholic
R. E. Royal Engineers; Royal Exchange
R. E. Reformed Episcopal
Réaum. Réaumur
Recd. Received
Recpt. Receipt
Ref. Ch. Reformed Church
Reg., *Regt.* Regiment, regimental
Rep., *Repub.* Republic; Republican
Rev. Revelation; Reverend
R. F. D. Rural free delivery
Rhet. Rhetoric, rhetorical
R. I. Rhode Island
R. I. P. (Lat. *requiescat in pace.*) May he (*or* she) rest in peace
Riv. River
R. M. Royal Mail; Royal Marines
R. M. S. Royal Mail Steamer; Royal Mail Service
R. N. Royal Navy
R. N. R. Royal Naval Reserve
Rom. Roman, Romans
R. O. T. C. Reserve Officers' Training Corps
R. R. Railroad
R. S. V. P. (Fr. *répondez s'il vous plaît.*) Answer, if you please; Please reply
Rt. Right
Rt. Hon. Right Honorable
Rt. Rev. Right Reverend
R. V. Revised Version
Ry. Railway
S. Saint; Saturday; Section; Shilling; Sign; Signor; Solo; Soprano; South; Sun; Sunday; Sabbath
s. Second, seconds; See; Singular; Son; Succeeded
S. A. South Africa; South America
Sab. Sabbath
Sam., *Saml.* Samuel
S. A. S. (Lat. *Societatis Antiquarierum Socius.*) Fellow of the Society of Antiquaries
Sat. Saturday
S. C. South Carolina
S. caps., *Sm. caps.* Small capitals (*in printing.*)
Sc. B. (Lat. *Scientiæ Baccalaureus.*) Bachelor of Science
Sc. D. (Lat. *Scientiæ Doctor.*) Doctor of Science
Sc. M. Master of Science
Scrip., *Script.* Scripture, scriptural
Sculp., *Sc.* (Lat. *sculpsit.*) He (*or* she) engraved it
S. D., *S. Dak.* South Dakota
S. E. Southeast
Sec. Second
Sec., *Sect.* Section
Sec., *Secy.* Secretary
Sen. Senate, senator
Sen. Doc. Senate Document
Sep., *Sept.* September
Seq. (Lat. *sequentes*, *sequentia.*) The following or the next
Serg., *Sergt.* Sergeant
Sh., *S.* Shilling, shillings
Sing. Singular
S. J. Society of Jesus
Soc. Society
S. of Sol. Song of Solomon
s. p. (Lat. *sine prole.*) Without issue
S. P. C. A. Society for the Prevention of Cruelty to Animals
S. P. C. C. Society for the Prevention of Cruelty to Children
sp. gr., *s. g.* Specific gravity
S. P. Q. R. (Lat. *Senatus Populusque Romanus.*) The Senate and People of Rome
sq. Square; *sq. ft.* Square foot, feet; *sq. in.* Square inch, inches; *sq. m.* Square mile, miles; *sq. yd.* Square yard; *sq. rd.* Square rod
Sr. Senior; sir
SS. Saints
SS. (Lat. *scilicit*), namely; (*Lat. semis*), half
S. S. Sunday School
S. S. E. South-southeast
S. S. W. South-southwest
St. Saint; Stone; Strait; Street
S. T. D. (Lat. *Sacræ Theologiæ Doctor.*) Doctor of Divinity
Str. Steamer, steam vessel
Subj. Subjunctive
Suff. Suffix
Sun., *Sund.* Sunday
Sup. Superior; Superlative; Supplement; Supine; Superfine
Supt. Superintendent
Surg. Surgeon, Surgery
Sur. Gen. Surgeon General
S. W. Southwest
Syn. Synonym, synonymous
T. Tenor; Ton; Tun; Tuesday
Tenn. Tennessee
Ter. Territory
Tex. Texas
Thess. Thessalonians
Thurs. Thursday
Tim. Timothy
T. N. T. Trinitrotoluene (high explosive)
Topog. Topography, topographical
Tp. Township
Tr. Translation, translator, translated; Transpose; Treasurer; Trustee
Trans. Transaction; Translation, translator, translated
Treas. Treasurer
Trig., *Trigon.* Trigonometry, trigonometrical
Tu., *Tues.* Tuesday
U. Utah
U. K. United Kingdom
Ult. (Lat. *ultimo.*) Last; Of the last month
Univ. University
U. P. United Press
U. S. United States
U. S. A. United States of America; United States Army
U. S. M. United States Mail; United States Marine
U. S. M. A. United States Military Academy
U. S. N. United States Navy
U. S. N. A. United States Naval Academy
U. S. S. United States Senate; United States Ship *or* Steamer
Ut. Utah
Ux. (Lat. *uxor.*) Wife
V. Verb
V., *vs.* (Lat. *versus.*) Against
V. (Lat. *Vide.*) See
Va. Virginia
v. aux. Verb auxiliary
V. C. Vice-Chancellor; Victoria Cross
v. def. Verb defective
v. i. Verb intransitive
Vice-Pres. Vice-President
v. imp. Verb impersonal
v. irr. Verb irregular
Vis., *Visc.* Viscount
Viz. (Lat. *videlicet.*) Namely; to wit
v. n. Verb neuter
Voc. Vocative
Vol. Volume
Vols. Volumes
V.-P. Vice-President
v. r. Verb reflexive
V. Rev. Very Reverend
Vs. (Lat. *versus.*) Against
V. S. Veterinary Surgeon
v. t. Verb transitive
Vt. Vermont
W. Wednesday; Week; Welsh; West, western
Wash. Washington
w. c. Water closet
W. C. T. U. Women's Christian Temperance Union
Wed. Wednesday
w. f. Wrong font (*in printing*)
W. I. West Indies
Wis., *Wisc.* Wisconsin
Wk. Week
W. Lon. West Longitude
Wm. William
W. N. W. West-northwest
W. S. W. West-southwest
Wt. Weight
W. Va. West Virginia
Wyo. Wyoming
X. Christ
x. An unknown quantity
Xmas. Christmas
Y., *Yr.* Year
Yd. Yard
Yds. Yards
Y. M. C. A. Young Men's Christian Association
Y. M. H. A. Young Men's Hebrew Association
Yr. Their; Year; Younger; Your
Yrs. Years; Yours
Y. W. C. A. Young Women's Christian Association
Zach. Zachary
Zech. Zechariah
Zeph. Zephaniah
Zool. Zoology, zoological

DICTIONARY OF PREPOSITIONS

This list attempts to guide the student to the correct idiomatic use of English prepositions by indicating the common use and by distinguishing between the meanings of different prepositions used with the same verb or verbal phrase.

Abide *in* (a place), *with* (a person), *by* (a promise)
Abound *in* (a quality), *with* (products, things)
Abstinence *from*
Accompanied *by* (literally), *with* (figuratively)
Accordance *with*
Account *for* (something that needs explaining), *to* (somebody responsible)
Accountable *to* (a person), *for* (a thing)
Adequate *to, for*
Admission (access) *to,* (entrance) *into*
Admit *of, to*
Advantage *over* (person), *of* (certain superiority)
Affinity *to, with, between*
Agree *with* (a person), *to* (a proposal), *on* or *upon* (things or conditions)
Analogy *to, with, between*
Angry *with* (a person), *at* (a thing)
Answer *for* (an act), *to* (a person)
Antipathy *to, between*
Anxious *about, for*
Apologize *to* (a person), *for* (an act)
Appeal *from* (one) *to* (another) *for* (aid, justice)
Apprehensive *of* (danger), *for* (one's life)
Argue *with* (one), *against* (a person or view), *for* (a person or view), *on* (a subject)
Arraign *for, by*
Arrange *with* (one), *for* (something)
Ask *of* (a person), *for* or *after* (a person or thing), ask one *to* (a party)
Associate *with*
Bear *upon* (in sense of be related to), *with* (in sense of be patient with); bear witness *against, in favor of*
Betray *to* (a person), *into* (an act)
Blush *at* (one's vices), *for* (one)
Born *to* (good luck), *into* (the world), *of* (woman), *with* (gifts, charm, a silver spoon)
Call *on, upon, at, for*
Careful *of, for*
Careless *of, about*
Certify (one) *of* (a fact)
Change *for, with*
Charge *on* or *against* (a person); charge (one) *with* (some act)
Clear (land) *of* (trees), (a man) *from* (debt), (a ship) *for* (action)
Coincide *with* (one) *in* (opinion)
Communicate *to, with*
Compare one *to* another—you say it is like; compare one *with* another—you ask if it is like
Conceive *of;* conceive (a purpose or ill-will) *against* (one)
Concerned *at* or *about* (a present or past worry), *for* (something expected or feared), *in* (some personal involvement)
Concur *with* (a person), *on* or *in* (his ideas)
Confer (bestow) *on, upon*
Confer (consult) *with* (one) *on, upon* (a question)
Confide *in* (usually intransitive), *to* (usually transitive)
Conformable *to, with*
Conformity *to, with*
Consist *of* (parts), *in* (nature, character)
Consistent *with* (a standard), *in* (certain respects)
Consult *with* (a person), *about* (a thing)
Contend *with* (a person), *against* (odds), *for* (a prize)
Contest *with*
Conversant *in, with*
Convert *to* (a belief), *into* (another form)
Copy *from* (a model), *after* (an artist)
Correspond *to* (something related), *with* (a person to whom one writes)
Deal *in* (goods), *with* (customers), *with* (difficulties)
Decide *on, upon, in favor of, against*
Denounce (one) *for* (misconduct), *for* or *as* (a traitor)
Depend *on* (a person), *upon* (a fact)
Derive *from* (especially intransitive)
Despair *of*
Die *of* (disease), *by* (sword, famine), *for* (some cause)
Differ *with* (a person), *in* (opinion), *from* (a person or thing), *in* (some quality)
Difference *between* (things), *in* (respect); *on* (questions)
Different *from*
Difficulty *in, concerning, of* or *about*
Diminish *from* (a total), *by* (the difference or degree)
Disabled *from* (work), *by* (accident)
Disappointed *of* (a thing not obtained, a hope), *in* or *with* (a thing obtained)
Discouragement *to* (vice), *at* (obstacles)
Dispose *of* (goods), *to* (a person), *for* (money), *among* (the poor)
Dispute *with* (a person), *between* (two persons), *among* (several)
Disqualify *for, from*
Dissatisfied *with*
Dissent *from*
Distinguish (one) *from* (another); *between* (two); *among* (more than two)
Divide *between* (two), *among* (more than two)
Dwell *in, at, near* (a place), *on* or *upon* (a subject)
Eager *in* (pursuit), *for* (the object pursued), *after* (the object)
Embark *in* (a ship), *for* (a port)
Employ *in* (activity), *on* or *upon* (a task), *to* (advantage)
Encounter *with*
Endowed *with* (natural gifts), *by* (God, Nature)
Engaged *in* (a project), *with* (associates), *for* (a social appointment)
Enjoin *on* (a person; *upon* is more formal, stiffer), *from* (the forbidden action)
Enter *on* or *upon* (an adventure), *into* (a place, the spirit of something)

Envious *of* (person or thing), *at* (the sight of something)
Equal *to* (anyone), *with* (some standard), *in* (certain respects)
Exception *to* (a rule), *of* (instances not under the rule), *against* (object of objection)
Expert *in* (an art), *at* (practicing the art)
Exposed *to* (danger), *for* (sale)
Expressive *of* (sentiment, purpose), *to* (person)
Fall *from* (grace, high estate, horse, ladder), *under* (suspicion), *on* (evil days, better luck, one's face, the ice), *in* (values, prices)
Fight *with* (an opponent), *against* (opposition), *for* (victory)
Filled *with* (material), *by* (one who fills)
Founded *on* or *upon* (actual basis, *on* a rock), *in* (figurative and general basis, *in* truth and honesty)
Free *in* (conduct), *from* or *of* (fault), *with* (money), *for* or *to* (all)
Friendly *to, toward*
Frown *at* (usually person), *upon* (usually thing)
Fruitful *of, in* (both used figuratively, *in* good works, *of* trouble)
Glad *of* (something), *at* (something or *at* hearing something), *to* (hear)
Glance *from* (one) *to* (another), *at* or *upon* (person or thing)
Glow *with* (pride, rage, color)
Grapple *with* (opponent, difficulty)
Grateful *to* (a person), *for* (a favor)
Greedy *of* (gain, power); *for* and *after* are commoner, less picturesque
Grieve *at, over* or *about* (something annoying), *for* (something lost)
Happen *to* (a person), *on* (a lucky find)
Hold *in* (check), *against* (opposition), *for* (a partisan cause), *to* (the right), *by* (a handle), *on* (a course)
Impatient *at* (a person, specific act), *of* (control, interference, interruption), *for* (accomplishing a purpose), *to* (accomplish)
Incentive *to*
Incorporate *in* or *into* (something much larger and more important), *with* (something that may be no larger)
Indulgent *to* (a person), *of* (his faults)
Influence *over* (an inferior), *with* (a superior), *on* (any person), *in* (a respect)
Inform *of, about, concerning*
Inquire *of* (a person as source), *for* or *after* (a person, how or where he is), *for* (information), *about* (a fact)
Inseparable *from*
Intermeddle *with*
Intervene *between* (two persons), *in* (a matter)
Intrude *on, upon* (a person), *into* (a meeting)
Invested *with* (dignity), *in* (6 per cent bonds)
Irritated *with, by, at*
Join *with* (an equal), *to* (something larger), *in* (effort)
Lean *on* or (more formal) *upon* (both physically and figuratively), *against* or *on* (of physical effort), *to* (an opinion)
Leave *to* (an heir, an umpire, one's judgment), *for* (one's use, another, good and all), *by* (train, steamer), *at* (a certain time)
Liberal *to* (persons), *of* (advice, money)
Live *in* (a house, plenty, affluence), *with* (the family), *on* (money, earnings)
Long *for* and (more poetically) *after*
Meditate *on* or (more formal) *upon*
Meet *with* (a person, an accident), *for* (a purpose), *by* (appointment, chance)
Mingle *with* (another component), *among* (friends, a crowd)
Necessary *to, for*
Part *from* (someone), *with* (something)
Partiality *to* (a thing), *for* (a person), *against* (either)
Pass *by* (the name of another, majority vote), *for* or *as* (what it is not), *into* (a proverb)
Patient *with* or *toward* (persons), *of* (heat and cold), *under* (suffering)
Pay *for* (services), *to* (the person served), *in* (money)
Peculiar *to*
Peculiarity *of*
Penetrate *into* (the center), *through* (to the other side)
Persevere *in* (a course), *to* (the very end)
Pertain *to* or (more formal) *into*
Pity *for, upon, toward*
Play *on* (a musical instrument), *upon* (one's sentiment or sympathy), *at* (a game), *with* (children, edged tools, fire)
Prefer *to, before, above*
Prejudice *against, for*
Preserve *from* (danger), *for* (better things)
Presume *on, upon*
Prevail *on, upon* or *with* (to persuade); *over* or *against* (to overcome)
Prey *on, upon*
Pronounce *against* (a person or an idea), *on* (a thing)
Provide *with* (food, protection), *for* (the table), *against* (future need)
Quarrel *with* (others), *among* (themselves), *over* or *about* (possession)
Questioned *on* or more formally *upon* (a subject), *by* (interrogator)
Reckon *on, upon, with*
Reduce *to* (powder, order), *by* (half, force of arms), *under* (one's authority)
Reflect *from* (a surface), *on* or *upon* (someone to be blamed, something to be pondered)
Regard *for* (a person), *to* (a topic)
Remark *on* (a person), *upon* (a fact)
Remonstrate *with* (a person), *against* or *on* (a fault), *for* (an action)
Remove *from* (one place), *to* or *into* (another)
Repent *of* or *for* (what is wrong), *at* (leisure)
Repose *on* or *upon* (a bed, person to be trusted), *in* (something trustworthy)
Resemblance *to* (one thing), *between* (two), *among* (more than two)
Rest *in* (peace), *with* (responsible authority), *on* or *upon* (something dependable, one's oars)
Rove *about, over, in*
Rush *against, on, upon*
Seek *for* or *after* (what one wants), *from* (one who has it)
Sink *into* or *in* (the water), *beneath* (the waves, a heavy burden)
Stay *in* (the house), *at* (home), *with* (the family)
Stick *to* (a friend, an envelope, one's knitting, one's heels), *at* (work, nothing, home), *in* (the mud, the mind, one's throat), *by* (a cause)
Strive *with* (a foe), *against* (temptation, odds), *for* (mastery, prize)
Supply *with* (material, food), *for* (person helped, a time)
Take *to* (the boats, the woods, horse), *for* (granted, certain, a fact, a friend), *in* (hand), *into* (account, one's head, one's own hands), *on* or *upon* (oneself), *to* (heart, task, pieces), *with* (a grain of salt, equanimity)
Tax *with* (carelessness), *for* (revenue), *on* (income, profits)
Thanks *for* (kindness, memories), *to* (the giver)
Thirst *after* or *for* (something craved)
Touch *at* (a port), *in* (a single point), *on* or *upon* (a subject)
Trace or track or trail *to* (a hiding place), *by* (clues)
Trade *with* (the enemy, a store), *in* (goods bought or sold), *for* (cash), *on* (one's fears, weakness)
Train *for* (a contest), *on* (a diet, a wall), *in* (the right way)
Treat *to* (a dinner), *of* (a topic), *for* (a disease)
Tremble *with* (cold, weakness), *for* (one's safety), *from* (emotion), *before* (majesty)
Trespass *on* or *upon* (property, privacy), *against* (law)
Truckle *to* or *under* (one who is feared)
Trust *to* (luck), *in* (God), *with* (life, fortune)
Turn *against* (a friend), *for* (the better), *to* (something different, somebody able to help), *on* or *upon* (pursuers, this piece of evidence)
Use *to* (advantage), *for* (a purpose)
Vary *from* (something different), *in* (certain respects)
Visit *with* (friends), *upon* (the guilty)
Wait *at* (a place), *on* or *upon* (a guest), *for* (the train)
Whistle *for* (a wind), *at* (crossings), *to* (a dog)
Wink *at* (a fault, a pretty girl)
Witness *to* (a will), *of* (an accident)
Work *at* (a task), *for* (a taskmaster, a living), *into* (one's confidence, a new job), *on* or *upon* (a dupe)
Zeal *for* (the cause), *in* (good works)

BIBLIOGRAPHY

Alphabet, Language and Grammar

Sterling North, *The Zipper ABC Book,* Rand McNally, Chicago, 1937, $1.35
Helen Sewell, *ABC for Everyday,* Macmillan, N. Y., 1930, $1.00
M. Lipman, *Letters for the King,* Nelson, N. Y., 1934, 48¢
M. Lipman, *Pictures for the King,* Nelson, N. Y., 1934, 48¢
M. Lipman, *Chatterlings in Wordland,* Blue Ribbon, N. Y., 1936, $1.00
H. W. Van Loon, *Around the World with the Alphabet,* Simon & Schuster, N. Y., 1935, $1.00
H. Ilin, *Black on White,* Lippincott, Phila., 1932, $1.50
Wm. A. Mason, *A History of the Art of Writing,* Macmillan, N. Y., 1928, $4.00
O. Jespersen, *Growth and Structure of the English Language,* Appleton, N. Y., 1923, $2.00
Edward Clodd, *The Story of the Alphabet,* Appleton-Century, N. Y., 1938, $1.25
G. H. Vallins, *Words in the Making,* Macmillan, N. Y., 1925, $1.25
H. L. Mencken, *The American Language,* Knopf, N. Y., 1923, $6.00
G. H. McKnight, *Modern English in the Making,* Appleton-Century, N. Y., 1928, $3.00
W. A. Craigie, *English Spelling—Its Rules and Reasons,* Crofts, N. Y., 1937, $1.25
G. H. McKnight, *English Words and Their Background,* Appleton-Century, N. Y., 1923, $2.50
J. M. Howard and A. Hawthorne, *Language Garden,* Macmillan, N. Y., 1929, 98¢
H. F. Scott *et al., Language and Its Growth,* Scott, Foresman, N. Y., 1935, $2.00
Greenough and Kittredge, *Words and Their Ways in English Speech,* Macmillan, N. Y., 1920, $2.10
H. S. Treble and G. H. Vallins, *An ABC of English Usage,* Oxford, N. Y., 1937, $1.50
L. E. Smith, *Making Words Work for You,* Blue Ribbon, N. Y., 1936, $1.29
E. N. Teall, *Meet Mr. Hyphen and Put Him in His Place,* Funk & Wagnalls, N. Y., 1937, $1.50
W. L. Mason, *How to Say It—Correctly,* Blue Ribbon, N. Y., 1932, $1.00
E. Partridge, *Slang Today and Yesterday,* Macmillan, N. Y., 1935, $3.50

Letter Writing

J. M. Clapp, *Personal Letters in Business,* Ronald Press, N. Y., 1935, $3.00
J. M. Clapp, *Doing Business by Letter,* Ronald Press, N. Y., 1935, $3.00
K. M. Monro and S. A. Taintor, *Handbook of Social Correspondence,* Macmillan, N. Y., 1936, $2.50
L. C. Lockley, *Principles of Effective Letter Writing,* McGraw-Hill, N. Y., 1933, $3.00
Burd and Miller, *Business Letters, Their Preparation and Use,* McGraw-Hill, N. Y., 1930, $4.00
McCloskey, *Handbook of Business Correspondence,* Prentice-Hall, N. Y., 1932, $1.50
Babenroth and Ward, *Modern Business English,* Prentice-Hall, N. Y., 1933, $4.00
Hotchkiss and Kilduff, *Advanced Business Correspondence,* Harpers, N. Y., 1935, $2.25

Public Speaking

H. W. Taft, *Kindred Arts: Conversation and Public Speaking,* Macmillan, N. Y., 1929, $2.50
Bautain, *Art of Extempore Speaking,* Blue Ribbon, N. Y., 1935, 98¢

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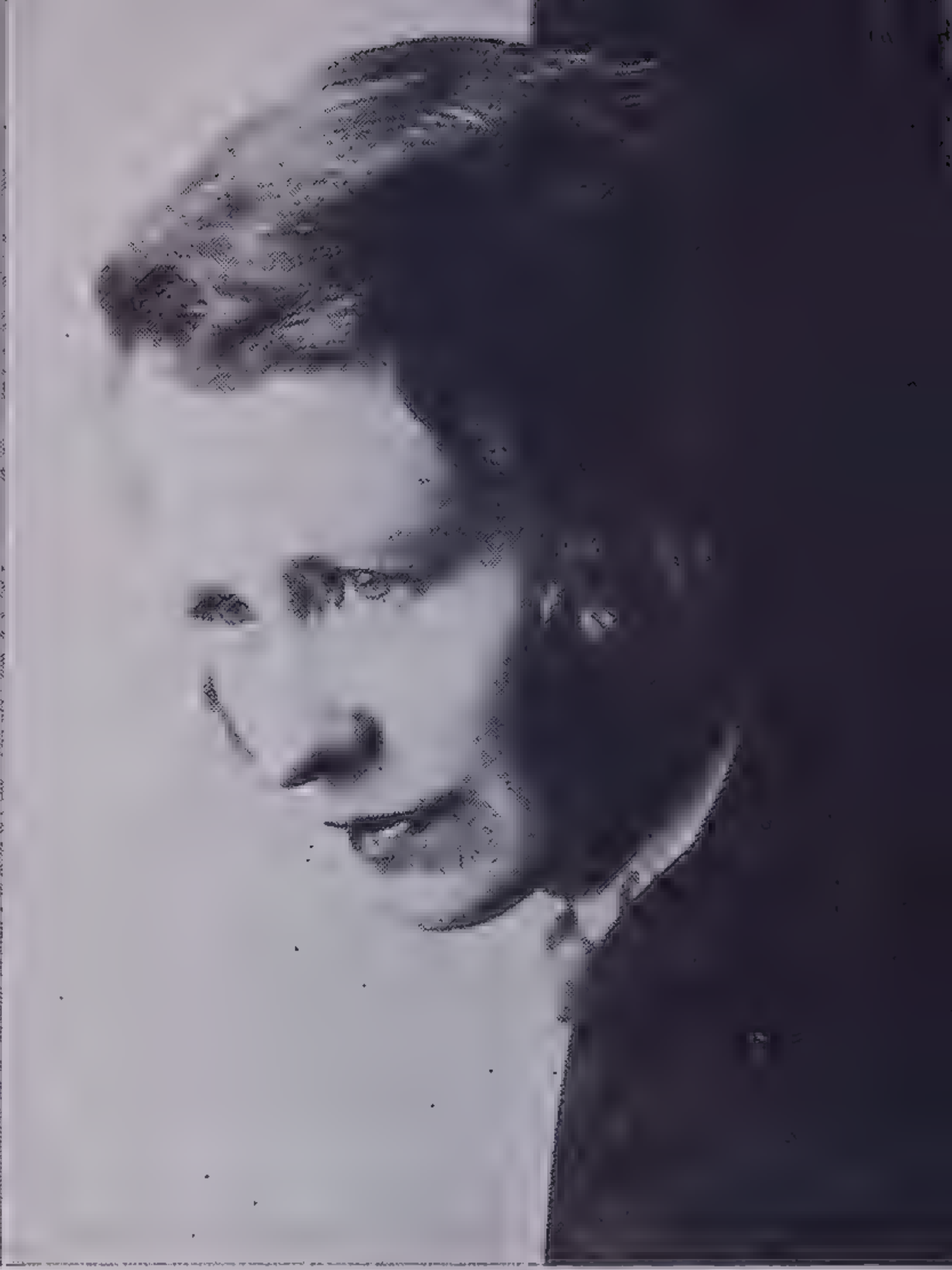
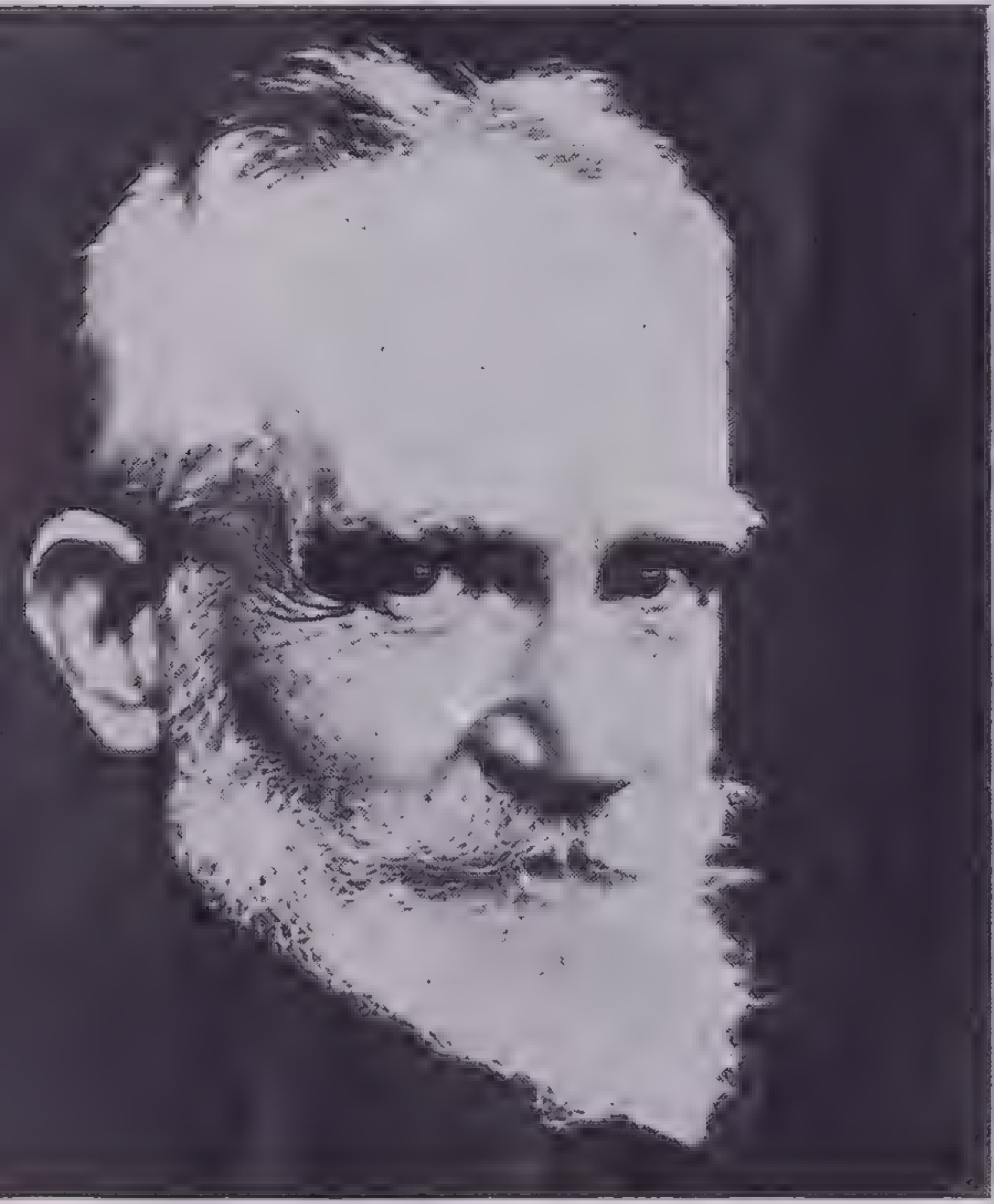
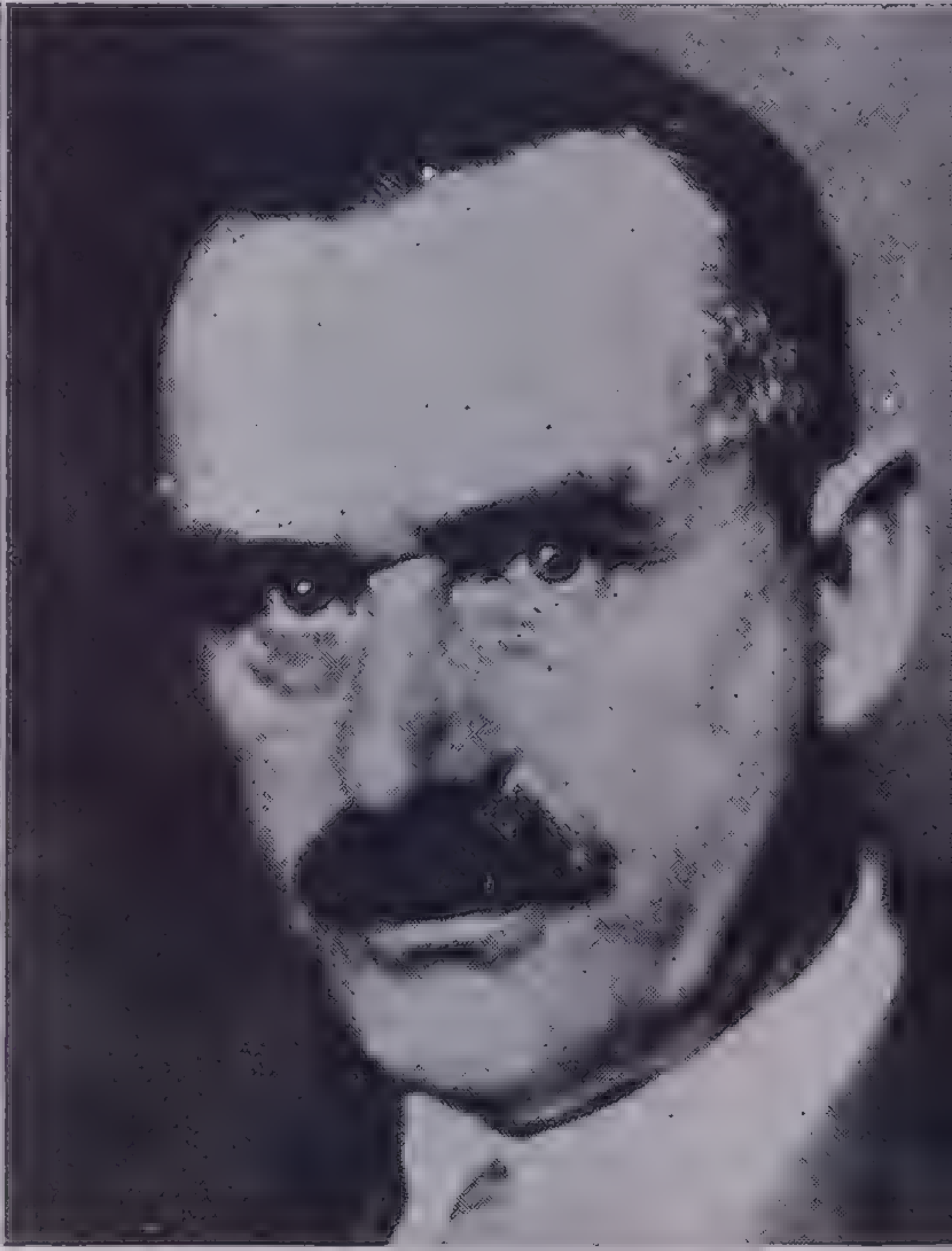


Edna St. Vincent Millay
American poet



George Bernard Shaw
Irish dramatist and critic

Romain Rolland
French novelist and critic



Thomas Mann
German novelist

otos by Underwood and Underwood
Eugene O'Neill
American dramatist

From a portrait by Harald Slott-Moeller
Sigrid Undset
Norwegian novelist

Sinclair Lewis
American novelist

Some Outstanding Writers of the Twentieth Century

BOOK IV: LITERATURE

GENERAL ASPECTS OF LITERATURE

A good many people nowadays have come to look on literature as the caviar and olives of the dinner of life. That is too bad, for literature is still the bread and butter and the roast of the feast. It was so in the days before there were any books at all, and it is so today when there are hosts of them. Literature is an essential part of life, as necessary as salt. Men can get along without swift vehicles to ride in, without good clothing and comfortable houses. They can even go without commerce and agriculture, without security and peace. But they must have poetry. If there are no books to store it up for them, there will rise up men who can create it orally, without writing, and other men who can carry it in their heads, in memory, and hand it on to the generations to come. The two works of Homer, the Iliad and the Odyssey, were so carried hundreds of years in men's memories and recited by rhapsodists at the ancient Greek banquets. The Homeric tales of heroes and gods in rhythmed lines were the best part of the feast, better than the roasted oxen and the fiery wine. They did the listeners who heard them more good than their food, made them stronger of body and more enduring of spirit, better fighters and better rulers of the people.

Poetry Built a Glorious Greece.—For here is a mystery, and one of the major ones of all human life since the dawn of history: the actions of life put into beautiful rhythm and beautiful words can create new life, and poets can prepare people for great battles in war and the far greater battles in peace better than great kings and commanders and makers of law. Poetry is itself a law of life, and one of the major ones. It can build a nation.

It built Greece. First, there was a handful of shepherd kings clinging to a thin-soiled, rocky peninsula. Their life was hard and full of trouble. They had no unity and no security. Their chief calling was war. And one day a man among them—tradition says he was blind, and maybe that was the reason he had time to do it—took one of the petty wars they waged and made it over in his mind. His name was Homer. He took a tenth-rate town with low walls and built its walls up so they brushed on the stars. He took a beautiful captive that town had inside it, and he made her face over into the loveliest face that ever was on earth, "the face that launched a thousand ships." He took the wild and wilful gods that had come into men's minds from the powers of vegetation and the sun and moon, and he made them into more magnificent men than those that walked on the everyday earth. And the men who fought that war he made taller and handsomer and braver than any Greek king ever had been. He put all these people he had created into a long story of violence and bloodshed and battle. And the song that poet had made of the Trojan War was remembered and repeated after him. Greek warriors heard it and they went out inches taller for having heard it and fought ten times as well. And they built up their houses and towns higher and whiter and lovelier as the years went by. That old war fought in Homeric music created shining cities, codes of law, better citizens, new poetry, plays that held Greek citizens spellbound for centuries and made them more merciful men. That war fought by a poet had life in it, as real war never does, being full of death. It made men feel good about life. It made them feel good about suffering, even, and blind chance and bad luck, the oldest and youngest enemies of man. By building men like gods moving to the music of hexameter lines, Homer built actual men into godlike men of valor and justice and patience. And the greatest civilization the world has known, the Greek, flowered in law and poetry and art and architecture beside the Mediterranean, to become the teacher of all later European nations.

The Troy of history was a dirty little town of Asia Minor, full of quarrelsome and small people living in mean and dark and inconvenient houses. But the Troy of poetry is a city of topless walls, of splendid men and women doing splendid deeds of strength and tenderness, a shining city that has actually built better cities over the face of the earth. The geographic Troy is not the real one. The Troy of literature is the real one. That is what literature means.

Poetry Ennobled the Cruel North.—It was the same story among our Germanic ancestors. Before they had any written laws or written books, when they were still half-savage clans fighting all their lives in the forests and by the bleak North Sea, they had their epics, Beowulf, the later Nibelungen cycle of stories, the long Norse sagas. These long tales told of men's bravery in the face of bitter weather, forest darkness and fear and sudden death. And these songs, older than history, older than all science, older than the Christian religion, kept these northern races alive, kept them strong and trained them to become the stout ancestors of the northern European nations of today. Their real leaders were cruel; they stole and lied and butchered. But these leaders in their songs were noble men, they loved the right, loved their warriors as a father loves his children, and died gloriously for their people. Beowulf got his death slaying the dragon that molested the folk. Poetry once again improved upon life.

Come forward a thousand years more, and in the Borderland between England and Scotland you will find another race of men who lived by fighting and raiding and slaughter. Suffering and sudden death were always in their midst. They had no books, no sufficient laws, no economic security. Their houses were hovels. But though they did without things to eat and wear, they could not do without literature.

They had a whole bagful of ballads, narrative songs of battle and love, songs made up orally by unknown poets, and they handed them on by word of mouth for generations. In these songs, they found the solace and beauty that life could never give them. The men and women in them were handsomer and braver than they were, they did shining acts of pure heroism and devotion, they loved like kings and queens. Things came by mystic threes and sevens, birds talked, harps played by themselves, fairies danced before green hills, roses came up out of lovers' graves and twined together, the youngest children in a family had all the good luck. The horses were covered with silver and gold and tinkling bells. The sails of their ships were silk and the masts beaten gold. And literature once again kept dull and drab life going.

Jump another five hundred years, and in the Appalachian Mountains among the descendants of the men of Daniel Boone you will find American people doing without books, save the Bible, doing without towns and courthouses and schools, but not doing without poetry. They had kept the Border ballads, and sang them to make life worth living. And the ballads actually made them over into men who lived like Robin Hood and the Douglas and Lord Percy of the songs. And Maine lumberjacks and Western cowboys put up with hard food and hard lodging; but they had to have their songs in which men whom poets had made taught them how to work and ride like Cavaliers.

This, then, is the salt of life, literature. Men have cherished and preserved it since the morning of civilization. It is older than history, than science, than law, than most religions, even. Life cannot get on without it. It is more necessary than geography, chemistry, physics or economics. For it corrects life. It improves upon it. It corrects its mistakes, rejects, selects and rearranges. It takes the inconsequential, haphazard and disappointing experience and makes a design of it, with a beginning, a middle and an end. It gives living a purpose and a point. It is art, in brief. It takes inferior and dull men and makes them over into Falstaff and Don Quixote.

Dick Whittington of the story is a better boy than the real one who became Lord Mayor of London. Literature takes savage outlaws and makes them over into Robin Hood and Achilles.

Life is full of anticlimax and lost motion. Literature never is. It improves the material on which it feeds—experience. The best definition of literature is this: Literature says the best that can be said about life. This definition will fit Shakespeare's plays as well as the story of Cinderella. For Shakespeare in his tragedies shows how men may shine the brighter in the face of hate and disaster. Violence and bloodshed, even, can be builders of life. War can be noble when set to the music of singing words. Sorrow can be a pleasure and give delight in a song or story. Tears can teach us in a poem.

For literature does not exist for its own sake. It exists to improve us, to give us fuller and better lives. It adds new strings to the harp of the human heart, like music and art. It is oratory. It exhorts to do something with our living. A poem of Wordsworth entreats us to fit ourselves into the pageant of the seasons and the winds and the stars. Robert Frost urges us to look at stone walls and birch trees closely, to see the astounding loveliness that is there that can make us feel better about ourselves. Every good novel or play ought to make us love human nature more. For the poet or novelist has taken pains to select the best and most striking of the human actions and thoughts and shape them to a pattern of courage, loyalty, or mercy or love.

The forms of literature are many, but the end of them all is one and the same: to make life endurable and worshipful and better.

The First Poetry Was Oral.—Poetry came first, for poetry was closest to singing and easiest to remember. It existed orally for hundreds of years in the form of the epic. It was always accompanied by music, usually of stringed or impact instruments. All epics are more or less alike, whether they are Hindu or Greek or Nordic. The Ramayana and Mahabharata of India tell of deeds of national importance done by great and strong heroes aided by the gods, just as the Homeric epics do. The theme is war. And the wars are fought for the good of the hero's people. Beowulf sought to rid the world of monsters of the Northland just as Odysseus sought to destroy Mediterranean ones. The beast Grendel and Circe who changed men into beasts are villains of the same blood. Epics were the only literature the human race possessed for many years.

Later on, poetry turned to private subjects, as culture advanced, to love especially, to friendship, merrymaking and drinking, and to farewells at the edge of the grave. Poetry became lyric. It was still accompanied by music—of the lyre; hence its name. This fact of music should never be forgotten. It accounts for Campion's and Herrick's grace and simplicity of wording as it does for Sappho's clarity and simplicity in her Greek line. Our ancestors in Europe sang a good deal of their lyric poetry until quite modern times.

The forms of the Greek lyric poem became very varied. Aeschylus and Sophocles and Euripides invented most intricate ones in their plays. The varieties in metre and stanza of Sappho, Alcaeus and Anacreon were inherited by the Roman Horace and Catullus. The hexameter line, the six-foot line distinguished by its dactyl foot—so named because it was like the human finger with a long joint and two short ones—was combined with a line of iambic and spondaic feet—a short and a long syllable, and two long ones, respectively—in the elegiac form so much used by the Roman poet Ovid.

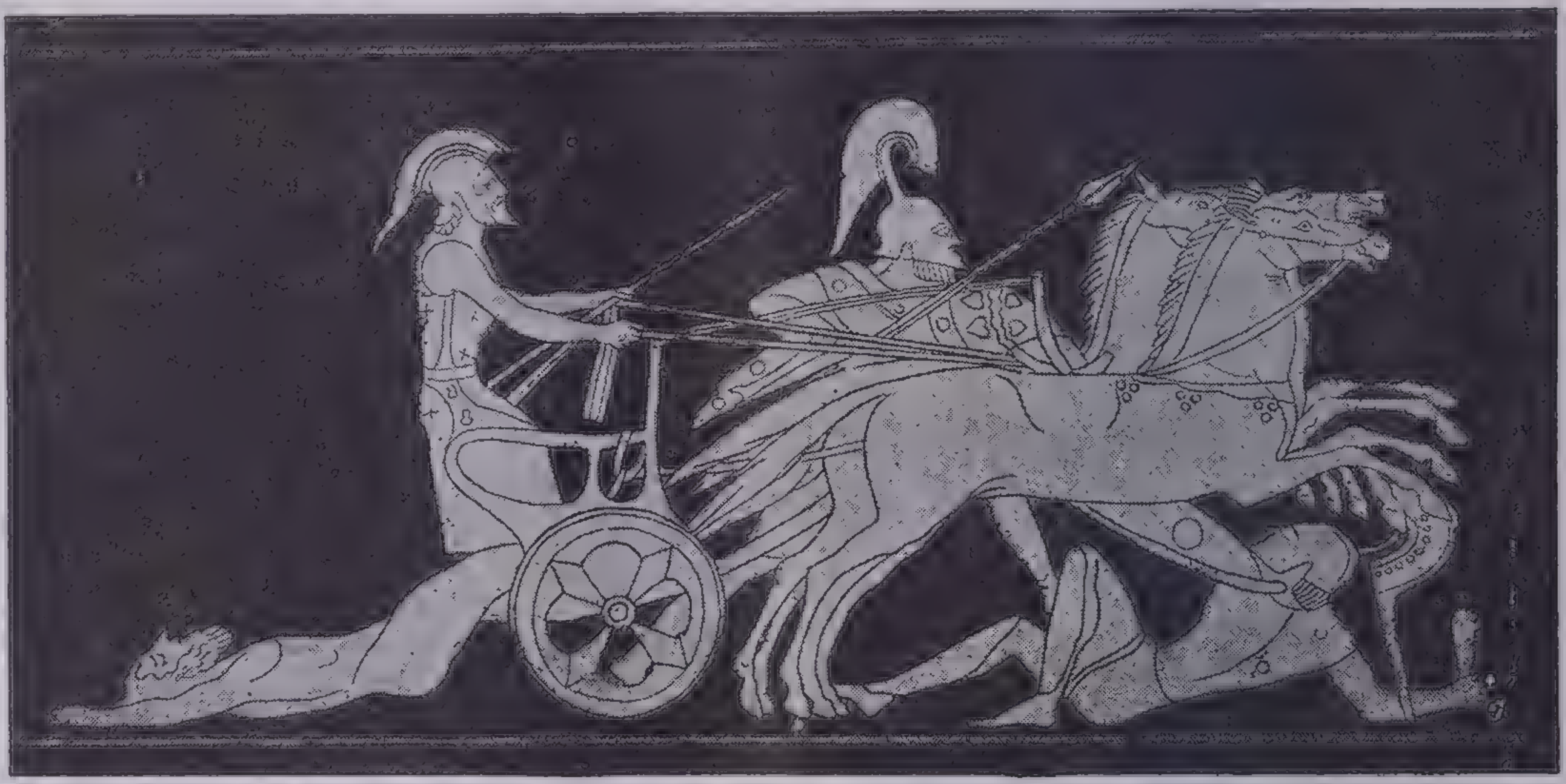
When Rome fell and the dark came over Europe, poetry did not die out. The Christian church, which had followed the Roman roads and legions over a continent, developed most elaborate hymns. Rhyme, the most notable device in most modern poetry, was developed by the medieval church. These old hymns are tissues of lovely, intricate double rhyming and of fresh figures of speech. The recurring sound patterns alone make them pleasing even to one who cannot understand the Latin:

Dies irae, dies illa,
Solvet saeclum in favilla.
Teste David cum Sibylla.

These church hymns are the ancestors of modern lyric poetry. They set the troubadours of France off, set the wandering medieval university students off, on their songs of love and spring and woman's beauty, until all France and Germany and England rang with songs of sheer joy in living. Then the Renaissance came and the recovery of the lyric poets of Greece and Rome, Anacreon, Pindar and Horace. And the ancient forms and new ones covered western Europe with poetry. The Italians developed the sonnet, especially Petrarch in his poems to Laura, and this lyric form, usually devoted to the theme of the passion of love, became the universal form it still is to this day. The Elizabethans were particularly in love with it. Shakespeare's sonnets to his Dark Lady are among the best. Sir Philip Sidney wrote exquisite ones, on his Stella:

With how sad steps, O Moon, thou climb'st the skies!
How silently, and with how wan a face!
What! may it be that even in heavenly place
That busy archer his sharp arrows tries?
Sure, if that long-with-love-acquainted eyes
Can judge of love, thou feel'st a lover's case:
I read it in thy looks; thy languish'd grace
To me, that feel the like, thy state descries.
Then, even of fellowship, O Moon, tell me,
Is constant love deem'd there but want of wit?
Are beauties there as proud as here they be?
Do they above love to be loved, and yet
Those lovers scorn whom that love doth possess?
Do they call 'virtue' there—ungratefulness?

The sonnet is the most intimate of all modern lyric forms and the most intricate. It has fourteen lines, and these lines have an involved rhyme scheme and a linking of each turn of the thought. Milton and Wordsworth have written some of their finest poetry in the sonnet.



The Body of Hector Dragged Behind Achilles' Chariot
This scene from the *Iliad* was painted on an ancient Greek vase

The Greeks gave the later Europeans a song of triumph, used first by Pindar for the celebration of victory in chariot racing, the ode, a lyric with a combination of short and long, slow lines. It was a favorite with Renaissance poets. Milton used it even in celebration of the birth of the Christ Child:

No war or battle's sound
Was heard the world around,
The idle spear and shield were high up hung;
The hookèd chariot stood
Unstain'd with hostile blood,
The trumpet spake not to the armèd throng,
And kings sate still with awful eye,
As if they surely knew their sovran Lord was by.

The ancient classical epic, even, was revived by Ariosto and Tasso, and John Milton in *Paradise Lost* celebrated the whole epic history of the Christian religion, the creation and fall of man, in this old form.

Later Gardens of Poetry.—The old Greek and the old Germanic epics were seedbeds for whole later gardens of poetry. They scattered the seeds of an ideal of heroic conduct over the world of western Europe, and new songs came up where these seeds fell; lovers sprang up like the ancient princes, and women replaced battles as the burden of the poets' songs. But there was another source of poetry greater even than the ancient pagan epics. It was a book of the Near East. It was a summary of thousands of years of living and singing under the bright stars of Palestine and Arabia, among lonely deserts where rocks and cedars, springs of sweet water and the grazing sheep were the precious jewels of life. It was an epic of the discovery, behind the figure of the primitive patriarch who loved all his descendants like sons and daughters, of a single loving God. It was the poem of that ancient Hebrew religion, and it was a magnificent poem of a new religion that had flowered from the old—a religion in which Jehovah had become a human Redeemer.

As Christianity spread out of Palestine along the Mediterranean and northward through the forests, it took this hymn of life with it. And the hymn was worked into the very stones and bones of the northern Germanic nations. Other religions have their source books, but none of them has so eloquent a Scripture as the Bible. The Bible was at the roots of the medieval hymns, at the roots of all the best writing of the Middle Ages. The Hebrew of the Old Testament is as beautiful poetry as Homer; the Greek New Testament and the Latin Vulgate of St. Jerome are splendid in rhythm and imagery, too. But probably of all the translations of this greatest inspirer of European civilization, the English is the finest. It is the finest because the minds of the English "Secretaries of the Holy Ghost" were the minds of great poets, and Wycliffe and Coverdale and Tyndale lived the rhythms and imagery of the poetry they translated into English.

> If I take the wings of the morning, and dwell in the uttermost parts of the sea; even there shall Thy hand lead me, and Thy right hand shall hold me.

Most of the English poets, from Langland on, have learned much of the art of poetry from the Bible. The verse of the English Scriptures is a kind of free verse; it has stanzas, but there is no regular length to the lines; yet the rightness of the fall of the words within a phrase, the sweep and cadence of the sentences lift it to the level of the greatest poetry of all. Surely, the first great makers of blank verse, Marlowe and Shakespeare, learned from the Bible. Milton in *Paradise Lost* and *Samson Agonistes* echoes in his figures and phrases the eloquence of the Psalms and Proverbs. William Blake found his chief literary model in the sentences of Job and other books of the Scriptures. The mystical poets have used Revelation and Daniel for a source. Wordsworth and later English poets have followed the biblical rhythms. And that greatest poet America has yet produced, Walt Whitman, has modeled on the Bible, not only the rhythmic phrases of his symphonies of American occupations and scenery, but also the very grandeur and vigor of his hymn in praise of the glory and oneness of all life. Without the Bible, English poetry would not be the rich and stately harmony that it is.

One of the happiest of all the Greek inventions was the pastoral poem. The Greeks, whose civilization was built upon sheep herding, as was that of the ancient Hebrews, discovered the beauty of sheep and the beauty of simple living among plain country people. It was like a glimpse of the Golden Age men had always dreamed of—men and maidens dancing and making love and tending their flocks in a colorful rustic setting. It was a dream come true. Theocritus began the pastoral poetry with his Idylls. The Roman Vergil carried it on in his Eclogues, widening his interest to the life of all country people and their art of living humbly and well. After the pastoral had been discovered by the Italians of the Renaissance, it spread like a wildfire over the rest of Europe. Spencer introduced it into England in his *Shepheardes Calender,* and it became a popular English form. Even cold England was full of Corydons and Amaryllises,

> Dancing in the chequer'd shade.

The simple life was the one that makes men happiest.

> And the milkmaid singeth blithe,
> And the mower whets his scythe,
> And every shepherd tells his tale
> Under the hawthorn in the dale.

And this song of the simple life, borrowed from the Greeks, spread out into songs of praise of the rightness of country living and the serenity and beauty of country things in the later poetry of nature, such as that of Wordsworth and Robert Frost.

So the garden of lyric poetry has grown richer and richer. The Middle Ages gave us the ballad, the lyric that tells a story; the ballade, the lyric that is a letter; and other French forms like the rondel, with its returning rhymes, and the rondeau, with its two rhymes only, a good example of which is "In Flanders Fields." Then there was the couplet, both four-footed and five, developed especially by Chaucer, the father of English poetry, which leads the mind on by a constant connection of lovely sounds at the end of all the lines.

One of the most famous of all lyric forms is the Renaissance blank verse of the English. It is iambic pentameter and it has no rhyme at all. This is the "mighty line" that Marlowe developed in his tragedies and handed on to Shakespeare to use in his. It is full of a rhythm as right as rain or the beat of a man's heart. It is as though the actors who speak it were men tall as gods:

> Have I not made blind Homer sing to me
> Of Alexander's love and Oenon's death?
> And hath not he that built the walls of Thebes
> With ravishing sound of his melodious harp,
> Made music with my Mephistophilis?

It is finer speaking than men ever do. On the edge of the grave, the great Elizabethan heroes of literature speak like princes:

> *O lente, lente currite, noctis equi!*
> The stars move still, time runs, the clock will strike,
> The devil will come, and Faustus must be damned.

The lyric poet may sing in the rare words and the high-sounding phrases. Or he may tell us to make the most of life in the easiest and commonest phrases:

> Gather ye rosebuds while ye may,
> Old time is still a-flying,
> And this same flower that smiles today
> Tomorrow will be dying.

The range in the lyric is all the way from the simplest statement of the beauty of life in the ballads, such as,

> She has kissed him by the candlelight
> And the charcoal burning red.

to the most elaborate fancy of Keats,

> Where the nightingale doth sing
> Not a senseless, tranced thing,
> But a divine melodious truth;
> Philosophic numbers smooth;
> Tales and golden histories
> Of heaven and its mysteries.

The Poet Seeks the Secret Beauty.—But always, in all of it, there is an improvement on life itself, lovelier fields than ever shone in any sunlight, more picturesque people, brighter birds, taller trees and a mysterious voice speaking in everything. The landscape of Milton's "L'Allegro" is like one seen through a jewel. Things are seen to swim in a translucent radiance, as those landscapes our grandmothers used to look at through the glass bead at the end of an ivory pencil. Mowers and milkmaids are just where the poet wants them, and they do the right things at the right time, as mowers and milkmaids seldom do in real life. When a poet wishes to have a rooster crow, to wake up his hero, the rooster is right there ready —not *a* rooster but *the* rooster—and he does not have to explain him,

> Then up and crew the red, red cock,
> And up and crew the gray.

The poet does not have to tell how that bird that announces the morning came to be there. He simply reaches out and puts him there. The poet is not bound by any laws of time or space. If he is writing of the birth of the Saviour, he puts into his song every lovely thing he can find, from the world's ends. A ship is a beautiful thing. He will have that. Three ships are more beautiful than one. So he puts in three. And he has all three of them sail right up to Bethlehem, though that town, in geography, has no seacoast. It does not matter to the poet. He brings the sea up to the town. Bells are splendid things, too, so he puts them in, a thousand years before they are invented. And he makes an archangel the pilot, and John, the Disciple, not born yet, a grownup sailor!

> I saw three ships a-sailing there,
> —A-sailing there, a-sailing there,
> Jesu, Mary and Joseph they bare
> On Christ's Sunday at morn.
>
> Joseph did whistle and Mary did sing,
> —Mary did sing, Mary did sing,
> And all the bells on earth did ring
> For joy our Lord was born.
>
> O they sailed in to Bethlehem!
> —To Bethlehem, to Bethlehem!
> Saint Michael was the steresman,
> Saint John sate in the horn.

Poetry is after the secret beauty in the heart of things, and the poet is bound by the law of his being to use finer words and figures of speech than he uses in conversation on the Mondays and Tuesdays and Wednesdays of life. He is telling of

> a sense sublime,
> Of something far more deeply interfused,
> Whose dwelling is the light of setting suns,
> And the round ocean and the living air,
> And the blue sky, and in the mind of man.

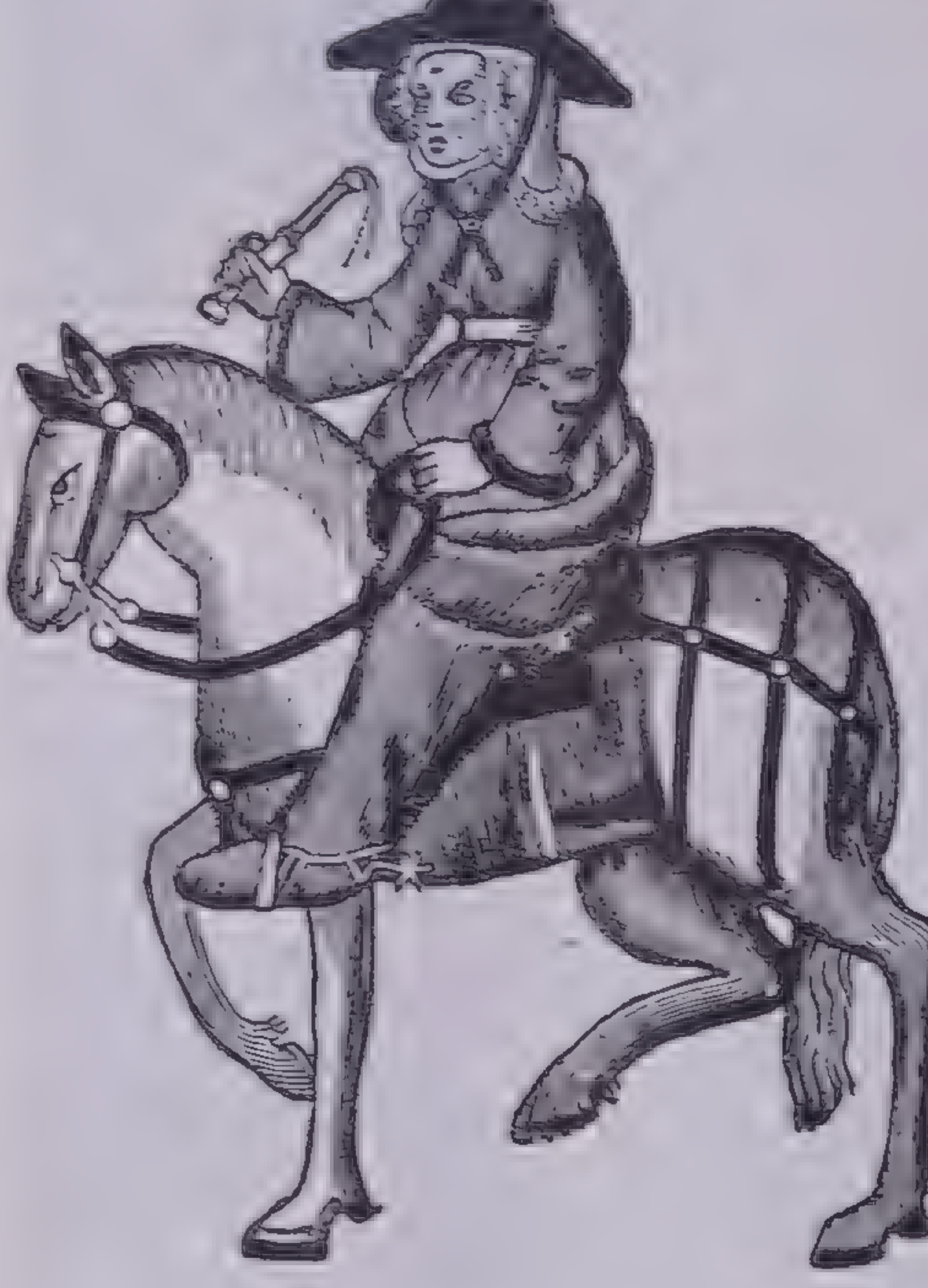
The poet is looking for the light on the road to Damascus, and he goes out to look for it with a passion deeper than any he ever experiences even in the best moments of living.

Poets have sought, too, as civilization has grown more complex, to compose symphonies on the laws of being and the relation of man to the infinite. One such symphony the ancient Mediterranean world saw in the Roman Lucretius's exposition of the evolutionary philosophy of Epicurus, *De Rerum Natura*. In it, though the poet makes man an ephemeral accident of flowing atoms, his description of the miracle of man's ascent to civilization and of the lovely dance of light through the universe turns his pessimism into a noble hymn. Once again, more than a thousand years later, another inhabitant of the Italian peninsula summed up the genius of his era. Dante, in his *Divine Comedy*, explored the three estates of the medieval universe and charted the progress of man's soul, in a fierce dream of fear and loneliness and loveliness, led by the law of love up to the feet of God. And, finally, a modern German poet, Goethe, in his *Faust*, the history of the progress of another soul, codified the romantic modern faith in rich experience as the proper road to salvation. In this philosophic poetry, as in the epic and the lyric, the search is for the ideal above the actual movement of life.

The Birth of Prose.—Prose literature, too, is in the nature of an improvement on life. Prose came into being as oratory, in Greece and elsewhere. The speech to rouse men to good action led very quickly to the celebration of past actions in well-composed sentences. And so history began. It came to be the major form of literature in the latter days of Greece, in the hands of Thucydides and Plutarch. It flourished all through Roman times. Livy, Tacitus and Suetonius wrote of the greatness of Rome. Letters and treatises on science also were features of Latin literature.

But it was left to modern times to develop prose as a literary medium as universal and as vital as poetry. With the Renaissance came the Italian novella, as written by Boccaccio, the story of love and adventure told in prose. The pastoral was put into prose, too, as in Sidney's *Arcadia*. And tales of travel and adventure sprang up in this medium, such as *Don Quixote* by Cervantes. In fact, the prose tale soon took over the whole material of the ancient epic. Defoe and Swift developed the narrative of travel, the memoir and historical type of story. Richardson, Fielding, Smollett, Sterne and Goldsmith all brought in the elements of everyday living and the color of contemporary events. These 18th-century men really established the novel form, as we know it today, the most universal of all modern mediums. The hero of the novel, unlike the ancient epic figure, came more and more to be the average man, the man from middle-class or lowly life, or even the scapegrace, the footloose, or, as the Knight of la Mancha, the humorous figure. Perhaps the princes of all the scapegraces are those Renaissance French heroes, those bundles of lustiness who poked coarse fun at the church and learning and men's bodies, the characters of François Rabelais.

Laughter in Literature.—This new element of humor, in fact, entirely unknown in the old verse narratives, whether the epic or the romantic tales of knights in the Middle Ages, came to be one of the most characteristic features of the new novel form. The ancients had laughter in their literature, in plays like those of the Greek Aristophanes and the Roman Plautus, but their laughter was at the expense of mankind and not in defense of it. Laughter is perhaps the greatest modern literary discovery. The modern comic spirit, as presented in the philosophy of George Meredith, deals with the art of making people feel good about life rather than impatient with it. The greatest celebrator of this essence of the comic in human nature probably is the 17th-century French playwright, Molière. He made men smile, and glow in the midst of their smiling, at their absurd seriousness in love and manners and morals. But comedy in the new novel form, as it developed, has rather tended to drain the life out of comedy as a play.



From the Ellesmere MS. of the Canterbury Tales

The Wife of Bath

New Heroes and Heroines.—This turning of the novel to ordinary people and events probably is the most significant feature of literature in modern times. Literature has grown steadily democratic, as democracies have risen in different leading countries and as the reading public has steadily grown, thanks to the spread of schools for all and the rise of newspapers. The old kings and princes of the epics and romances were replaced by the new heroes and heroines of the 18th-century novel; a practical middle-class Englishman, Robinson Crusoe; a ship's doctor, Lemuel Gulliver; a servant girl, Pamela; a happy-go-lucky and good-natured foundling, Tom Jones; and the lovable, modest vicar of Wakefield.

In the 19th century, Dickens put all the lowly men, women and children of the great city of London and the English countryside into his novels. Hawthorne wrote of domestic tragedies in the lives of obscure descendants of the Puritans, making morality into romance. Melville wrote of common sailors. And the great Russians, Turgenev, Tolstoy and Dostoevski, made obscure and common Russians citizens of the whole world. The appeal of the novel became as wide as life. Harriet Beecher Stowe helped bring on the American Civil War with her story of a southern slave, Uncle Tom. The Russian novelists aroused the sympathies of nations for the oppressed people of their country, and their books probably did more than any other thing to bring about the Russian Revolution and the overthrow of czardom.

Today the novel is just as vital a part of life. The novelists are entering the innermost rooms of the human mind by the light of modern psychology. And yet the epic breadth is still often found in this form. Willa Cather has written a whole New World symphony in covering the different kinds of North Americans, those of the Middle West, those of the hot Southwest and those in cold Canada. Her three greatest books are *My Antonia, Death Comes for the Archbishop,* and *Shadows on the Rock.* Thomas Mann, the German novelist, in his *Magic Mountain* has written a symphony of mysterious and amazing life that goes on quietly under cover of life, in silence. And always the characters and happenings of the novel, though growing closer and closer to everyday life, are better or worse, clearer and more single than the things that are done every day and the people who do them. For, in spite of realism, literature is still literature, not life. It is better than mere living. If it were not, then there would be no need for it.

A distinctly modern offshoot of the novel is found in the short story. The form is a testimony to our desire for a pattern or design that we so often miss in actual life. Hawthorne and Poe and O. Henry perfected this type of brief narrative in which the characters are few but sharply etched and the background is often more important than the characters themselves. Poe's *Fall of the House of Usher* and Hawthorne's *Great Stone Face* are as artistic as any poem could be. The short stories of today are full of sharp tragedy and comedy and local color, and they go well with our energetic and rapid living and hunger for excitement. The short story is the most thoroughly American literary form.

The Widening Vistas of Prose.—The prose treatise of the old Greeks and Romans has grown enormously in range and appeal. The growth began in the 17th century. Religion, philosophy, science, even insanity and angling for trout were treated in books full of splendidly rhythmic sentences decorated with rich illustrations and figures of speech. Burton's *Anatomy of Melancholy,* Sir Thomas

Browne's *Religio Medici* and Walton's *The Compleat Angler* are classics read today because, though they treat subjects scientifically, they are full of imagination and emotion. With the coming of the periodical and the newspaper, the treatise has turned into the brief article. Though much of the rich rhythm and color of the older treatise has gone, the article is one of the most vital features of our life in the present.

Another prose form that the Greeks and Romans originated has been vastly developed in modern times, the biography. Beginning as brief sketches of types of people, patterned on the classical Theophrastus, the 17th-century biography grew in the hands of Izaak Walton and Clarendon and Aubrey, and culminated in such works as Boswell's magnificent study of the great Doctor Johnson in all his moments and moods, big and little, and the 19th-century *Life of Scott* by Lockhart. Biography today is even more literary than in the past, for Strachey, Maurois and the other biographers have not only turned away from the idea that a life of a man should be all state papers, in two volumes and with an epitaph but they have attempted to explain the personality of a man as well as his actions. They, too, have used the modern psychology to illuminate figures of the past. Emil Ludwig's biography of Napoleon, Strachey's of Queen Victoria and Maurois's *Ariel,* the life of Shelley, are peaks in this new range of modern biography.

The same trend toward everyday living seen in the novel has gone on in the play. The tragedies of the kings and the high-born of the ancient Greeks and of Marlowe and Shakespeare in Elizabethan England have been replaced by the tragedies written about obscure or average men and women by Ibsen and Eugene O'Neill. Prose, nearer always to the language used every day, has replaced poetry in most modern plays. But the modern tragedy, like the ancient, still proves that man is a creature both pathetic and noble. However obscure his beginnings, as Lincoln's in Drinkwater's play, he has a kind of kingliness in him.

Modern Europe has produced an entirely new prose type in the personal essay. This is a short and often whimsical treatment of familiar subjects of common interest. The Frenchman Montaigne began this attempt to say something both brief and wise about life. Bacon followed Montaigne. Addison and Steele did their best writing in this medium, in the *Tatler* and *Spectator* papers producing Sir Roger de Coverley, Will Honeycomb and their friends. Johnson and Goldsmith carried on in their footsteps. But it was left to the 19th century and Hazlitt, Hunt and especially Charles Lamb to bring the personal essay to something well-nigh perfection. In the *Essays of Elia,* Lamb has made all humanity feel good about old china, roast pork, chimney-sweepers, puns and children that might have been born. Americans also have made men glow with the essay. Washington Irving, Oliver Wendell Holmes in his breakfast-table philosophy, and today's great lover of all that is human, Christopher Morley, as well as the wise and witty Agnes Repplier, have made the form their own.

A Life Beyond Life.—Literature, thanks to periodicals, public libraries and the schools and colleges, has come to mean more and more to more people today than at any time before in the world's history. There are more books and more and more readers. This is a proof, if any last one were needed, that people find in the people made of ink and paper a life beyond life, a romance and wholeness that they miss in life when they live it themselves. For literature is something like religion. Indeed, it has replaced some religions, as it did in ancient Greece. It is a pattern in which human beings may come nigh to perfection. We can worship humor, without any of its awkwardness in real life, in Don Quixote's running at windmills and in Tom Sawyer's getting his friends to pay for the privilege of whitewashing his aunt's fence. A Huckleberry Finn is a major blessing in a book. That is where he belongs. In life he is often a major calamity. Lady Macbeth's place is in a play, not in the house next door. We can sympathize with her on the stage, and so can grow gentler for her very ungentleness. These people are too dark or too bright to live in the common light of day. They are people who can look and act like gods. It is in literature that we look for them. They are the stuff that dreams and literature are made of.

LITERATURE OF POWER

Books of power do not necessarily have in them the element of beauty. Yet it is worth while from time to time to speak in awe and reverence of the power of books.

There are, of course, strong books and weak books, beautiful books and ugly books. Here are some brief observations concerning a few books that, regardless of artistic merit, have had a powerful effect upon the Western and especially the American world of affairs.

Some years ago a gentleman addressing the New York Library Association listed fifteen books as having had a more decisive effect on human history than Creasy's fifteen decisive battles. In his list he undertook to set off the *Iliad* against the Battle of Marathon, Shakespeare against the defeat of the Spanish Armada and Darwin's *Origin of Species* against the Battle of Waterloo. Such suggestions are stimulating but in no way accurate.

In some ways certain books are more powerful by far than any battle, for they have given direction to the human spirit throughout the ages. They have changed human institutions and some of them have caused the shedding of much blood. Many of these books have broken up old disciplines and have offered new freedoms, which in turn have resulted in new disciplines that later on offered a shining mark for a revolutionary new book.

The Bible.—Undoubtedly, the most powerful book of all the ages is the Bible. It has caused the shedding of millions of gallons of blood and has soothed hundreds of millions of aching hearts. The fiery example of insurgent prophets shouting "Thus saith the Lord" has caused many a man to battle for social justice with superhuman strength. The humble example of the long-suffering Christ has caused many millions to live calmly and hopefully in the most difficult circumstances. The vigor of a Saint Paul has given extraordinary energy to many thousands of evangelists.

Yes, here is a book that has proved itself more potent by far than any decisive battle or army or empire. Reinforcing the Bible with great power in producing a Christian discipline are such books as Saint Augustine's *City of God* and Thomas à Kempis's *Imitation of Christ*. In this last we find the individual human soul striving desperately to discipline itself by continuous meditation into what was conceived to be the Christian mold. Thomas Aquinas, the great Dominican scholastic, in his *Summa* assembled the most powerful logical presentation of the Christian doctrine that has ever been put together in one book. The *Summa* today not only has a most powerful effect in the Catholic Church but also in neo-scholasticism, which is having something of a revival outside of the Catholic Church.

It seems that all powerful systems of thought inevitably set up their oppositions, and so we find the careful scholasticism of the Middle Ages provoking many books to make fun of the detailed reasoning of the scholars and the corruption of the clergy. Of these the most influential perhaps was Erasmus's book *The Praise of Folly*.

Breaking the Chains of the Middle Ages.—Many were the books in the 16th century that endeavored to break the old molds. Don Quixote laughed chivalry out of court. Translations of the Bible into native tongues freed the spirit of theological inquiry.

John Milton in England wrote his *Areopagitica* in defense of free speech, and ever since that time English-speaking people have had a tolerance for freedom of expression that cannot be found elsewhere in the world. The Protestants who reached out for a new freedom found it necessary to impose on themselves a new individualistic discipline. To this end Calvin wrote his *Institutes* and John Bunyan his *Pilgrim's Progress*.

The books that really launched the spirit of the Middle Ages out into the field of matter more effectively than any others were Francis Bacon's *Novum Organum* and Copernicus's book on the revolutions of heavenly bodies. These two books coming shortly after the discovery of America aroused the imaginations of men in a new direction. From such books and Newton's *Principia* have sprung the scientists whose devotion to truth is as pure and lofty as that of any priest.

Books That Gave Men Freedom.—With the rise of the scientists also came the rise of the humanists who, like Rousseau, Thomas Paine and Voltaire, wrote their books on the rights of man. Paine and Voltaire had in them a streak of sarcasm, bitterness, satire and humor that stirred men's minds. Thomas Paine's pamphlet *Common Sense* probably did more to arouse the Americans to revolt against England than any other book. He was a hell-raiser. Alexander Hamilton and James Madison were builders. The *Federalist* essays they wrote were a determining force in bringing about the ratification of the Constitution.

A New Social Philosophy.—In the late 18th and early 19th centuries the doctrine of individualism and competition was set forth in a really powerful way for the first time. The economists and the rising manufacturers rebelled against the limitations of mercantilism, and their views were expressed by Adam Smith in his *Wealth of Nations,* by Ricardo and by John Stuart Mill. Darwin in his *Origin of Species* and Herbert Spencer in his *Social Statics* both expounded the doctrine of natural selection and survival of the fittest. Thus the groundwork was laid for Nietzsche's *Zarathustra* and the violence of the modern German approach based on the doctrine of the superiority of certain germ plasms.

The forces that Darwin, Adam Smith and John Stuart Mill let loose in the biological and economic worlds, combined with those originated by Hegel in the philosophic world, produced in the mind of Karl Marx one of the most powerful books of the 19th century, *Das Kapital.* Whether we like it or not, everyone in the world today is different because of *Das Kapital.* Without *Das Kapital* there would have been neither the communist nor the fascist experiments. More than any other book of the 19th century, all of us today are living under the shadow of *Das Kapital.*

Of all the American religious books of the 19th century it seems probable that *The Book of Mormon* was the most powerful. It reached perhaps only 1 per cent of the people of the United States, but it affected this 1 per cent so powerfully and lastingly that all the people of the United States have been affected especially by its contribution to opening up one of our great frontiers.

The same may also be said for *Science and Health* and perhaps for several other books of this type, even though the great majority of Americans have been affected by them only indirectly.

20th-Century Books of Power.—When it comes to the books of the 20th century, it is difficult for anyone to choose the most powerful with any certainty. In the United States Frederick J. Turner's *The Frontier in American History* has undoubtedly caused many of the most thoughtful Americans to consider most carefully changes that the passing of the frontier would inevitably bring upon us.

Probably there would also be some unanimity of opinion among the more thoughtful Americans with regard to the lasting effect on the psychology of the American people of the pragmatic philosophy of William James. Even more significant probably is Sigmund Freud with his *Interpretation of Dreams.*

Thorstein Veblen's *The Theory of the Leisure Class* and *The Theory of Business Enterprise* must be classed among the most powerful produced in the United States in this century. Some of the most respectable economists, like Wesley C. Mitchell of Columbia University, as well as some of the most radical of the left-wingers, have been deeply influenced by Thorstein Veblen. He is one of the few American writers that have appeared thus far in the 20th century who will rank higher fifty years hence than he does today.

Among the most powerful books of the 20th century Max Weber's *Protestant Ethic* has had a tremendous influence both directly and indirectly. Perhaps Weber and his disciple, R. H. Tawney in England, have derived the spiritual basis for capitalism a little too exclusively from the self-denying Protestant discipline that so many individuals have developed in their personal lives. Though in many parts of the world capitalism owes much of its spiritual vitality to personal Protestant discipline, yet it is derived in almost equal measure from the philosophies that found their origin in Adam Smith's *Wealth of Nations,* John Stuart Mill's writings and Darwin's *Origin of Species.*

Books of Warning.—Ferrero's book published in 1913, *Ancient Rome and Modern America,* brought a lesson from history—that the cities of the United States might thoughtlessly commit suicide in the same manner as the city of ancient Rome through the process of destroying the life on the land.

Equally significant a quarter of a century ago was Flinders Petrie's book *Revolutions in Civilization.* In this little book is found the essence of that which Spengler developed at such great length a decade later in his *The Decline of the West.* But whether the source is Spengler or Petrie, there is now a widespread belief in many quarters that civilizations almost of necessity are characterized by Spring, Summer, Fall and Winter, and that each of these periods has its spiritual, artistic and material expressions.

Probably some of the most powerful books of the future, though they will recognize the fact of rhythm in civilization, will in effect be written as an offset to the fatalism of this approach.

History, Science, Fiction.—Among 20th-century American books, Charles Beard's *An Economic Interpretation of the Constitution of the United States* is certain to be looked on by the next generation of historians as one of the significant books of the early part of this century. While there is ground for disagreeing with Beard on some of his points, both his friends and his critics must agree that this book has caused thousands of people in the United States to look at the Constitution in a far more vital and human way than would otherwise have been the case.

In the field of 20th-century science it is too soon to say whether any of the books will compare in their revolutionary effect with those of Darwin, Bacon, Newton and Copernicus. Perhaps Einstein's book on relativity or Gregor Mendel's paper rediscovered in 1900, which gave us the new science of heredity, will deserve to rank with these older books. Despite the new physics and the new astronomy, however, science continues in the main to be the natural unfoldment of the approach created by men of the type of Bacon, Newton, Copernicus and Darwin.

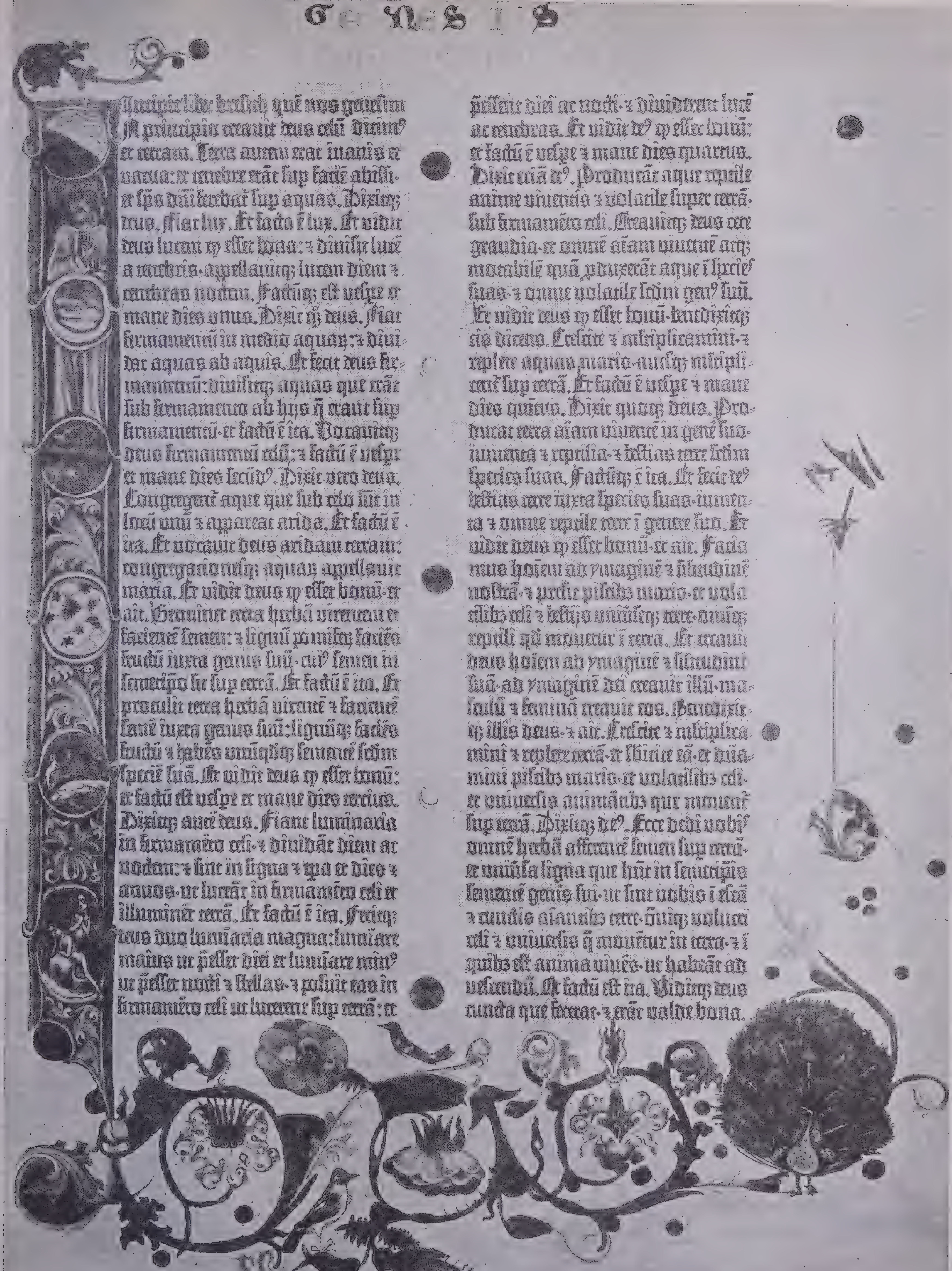
The influence of novels is usually passing, and yet we cannot fail to recognize the extraordinary significance of Dickens's novels as they aroused the moral indignation of the English-speaking people with regard to social conditions. *Uncle Tom's Cabin* undoubtedly had a powerful effect.

In the United States the most powerful novel of the century, not from an artistic point of view but from a social point of view, is Upton Sinclair's *Jungle.* From this book came much of the packing inspection and pure-food work in which the Department of Agriculture engages to protect the American public.

Future Books of Power.—These are some of the powerful books of the past. How much more interested we shall be in the powerful and significant books of the future. Most young people of the next generation are not going to read the *Origin of Species* or the *Wealth of Nations* or *Das Kapital* or any of the other powerful books of the past if they can possibly avoid it. But those books did something to the minds of the 19th and early 20th centuries, however dull they are. We always speak in reverence of them, though few of us ever tried to dig anything out of them. Let us hope the young people of the coming generations will read the new powerful books of the future.

The stage is now being set for some of the most powerful books that the world has yet seen. Humanity everywhere is hungry both for a new freedom and a new discipline. The books that played their part in producing modern capitalism, fascism and communism do not have in them sufficient food for the human soul.

Humanity is infinitely more decent than the infamous acts of the last



Courtesy New York Public Library

The First Text Page of Gutenberg's 42-Line Bible

Johann Gutenberg of Mainz printed the Bible in Latin during the years 1455 and 1456. It was the first important printed book, and Gutenberg was the first European to print from movable type cast in molds. His original plan was to use a 40-line column but later found that it was possible to get 42 lines to a page, and only the first dozen or so pages appear with 40 lines (like the illustration) or 41 lines. This original edition of the Bible was printed on 1,282 paper and vellum pages in an edition of either 200 or 300 copies. Only 45 copies are known to exist today, some incomplete; of these, 11 are in the United States. The page reproduced here (from the copy in the New York Public Library) is from a facsimile edition issued under the direction of Paul Schwenke at Leipzig based on copies in the Royal Library, Berlin, and the Provincial Library, Fulda. The pages are illuminated in gold and in color after the manner of medieval books written by hand.

generation or so would indicate. Modern science and modern technology both tell the story of one world. They tell the need of integrating, synthesizing and co-ordinating knowledge on a higher plane. Such integration is necessary to prevent modern civilization from committing suicide by losing control of its own inventions.

The truly significant books of the immediate future in both the economic and scientific fields will deal with co-ordination and synthesis. Efforts will be made to co-ordinate science with economics, government and philosophy. More and more humanity is feeling disappointment in the destructive and unbalanced effects of analytical science and laissez faire economics. More and more humanity senses the need for co-ordination of our vast detailed knowledge in application to the economic, physical and spiritual life of the individual and the nation.

The future requires powerful books to point the way for a new co-ordination of knowledge in the service of the economic and artistic and spiritual needs of man. The parts must be brought together in the service of the whole in a way that will maintain the vitality of the parts.

The science and economics of the 19th century cost us our sense of ultimate human values. Surely these ultimate values will be brought back to us in a more vivid and well-balanced way than ever before. Great and powerful books are now unconsciously in the making in the minds of scientists and other students of human affairs. As they emerge, they are bound to create these new and greater human values in terms of an abiding and all-permeating sense of the general welfare.

HISTORY OF LITERATURE

GREEK LITERATURE

In the story of Western culture the literature of the ancient Greeks holds a unique place. To begin with, its forms and standards vitally affected the literature of the Romans, and through the Romans they had an influence on the whole modern world. Some literatures—for example, that of India—though containing much of value have somehow been isolated from the general course of what to us is world-literature. Not so with that of the ancient Greeks; for it first helped to determine the literary forms of Latin, which for over a thousand years was the language of culture; and later, when Greek literature came to be known directly to western Europe, it was a prime factor in that mental awakening called the Renaissance. Hence, even had Greek literature lacked a decided intrinsic value, it would have been and still would be important.

But it also commands attention because of its quality. In epic, lyric and dramatic poetry, in historical, rhetorical and philosophic prose, the ancient Greeks set a pattern of excellence. Of their best work, only a relatively small amount is left, and the high repute of their writing depends upon the outstanding character of these scant remains. Their language was an instrument that served them well, with its large vocabulary, its flexible structure, its adaptability to delicate shadings and fine distinctions. Ease in compounding words lent richness to its prose; a combination of long and short syllables gave to its poetry a varied music.

Ancient Greek literature at its best has a simplicity akin to that of ancient Greek architecture. Its prose is economical and concise, without flamboyance or "purple patches." Its poetry lacks idle ornament and has a directness quite unlike the naïveté of the folk song—a directness based on the conscious omission of nonessentials. Neither prose nor verse has anything of the bizarre or *précieux*. Greek literary forms were native to the Greeks themselves, not deriving in any but minor particulars from foreign models. Greek critical sense developed them. The Ionian, Aeolian and Dorian tribes each contributed its share.

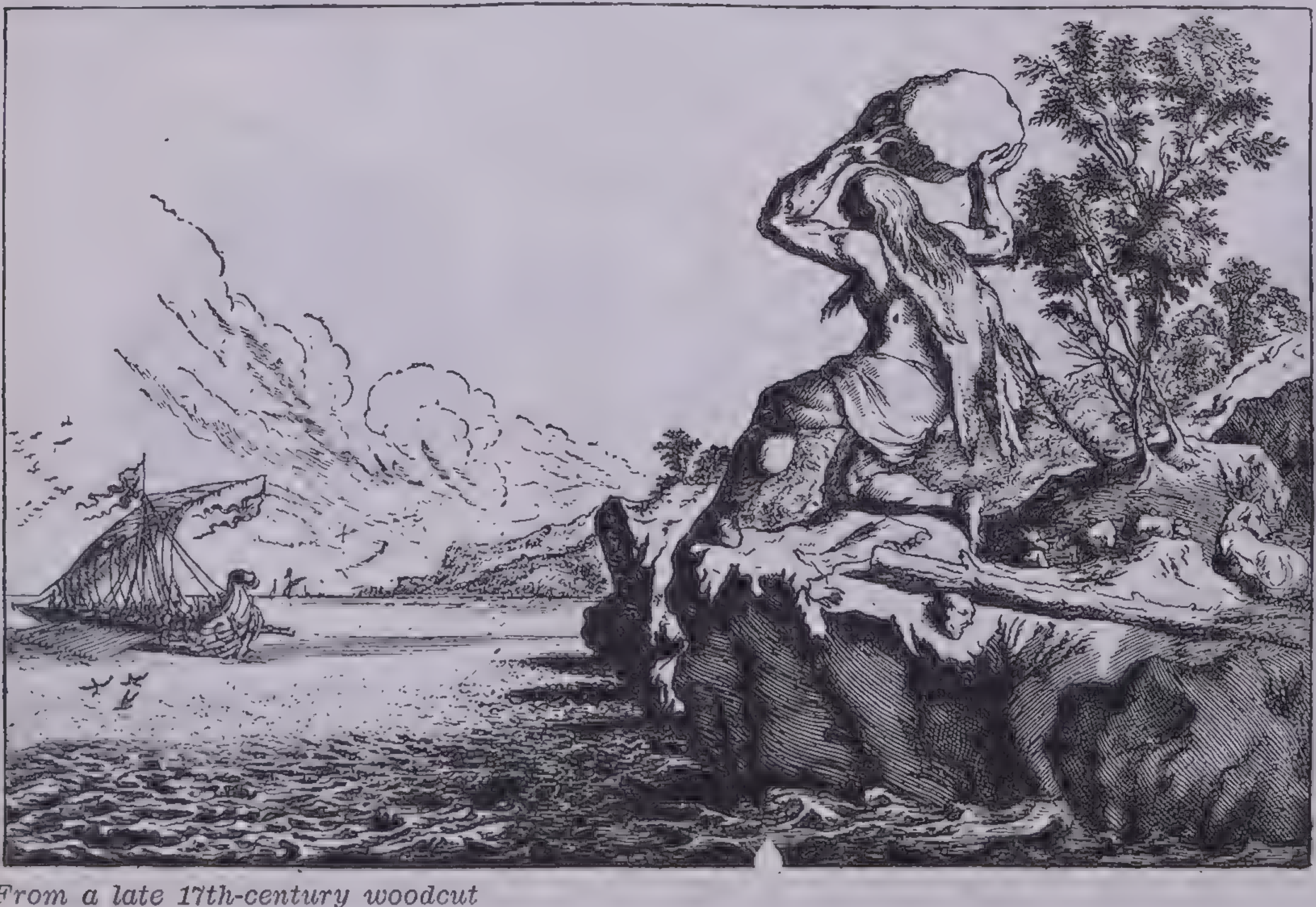
For the sake of convenience, ancient Greek literature may be divided into three periods:

1. *The Early Period,* from remote antiquity to about 475 B.C.
2. *The Attic Period,* from about 475 B.C. to 300 B.C.
3. *The Period of Decline,* from 300 B.C. to 529 A.D.

The first of these three is marked by epic, elegiac, iambic and lyric poetry, and the beginnings of a literary prose; the second, by poetic drama, both tragic and comic, and by historical, oratorical and philosophic prose. The third may be subdivided into (*a*) the Alexandrian period and (*b*) the Graeco-Roman period. The literature of the decline has small value.

THE EARLY PERIOD

Homer and Epic Poetry.—Among the Greeks poetry reached a high degree of artistic finish long before prose did. Of course there was a workaday prose—the kind that Molière's Jourdain was surprised to discover he had been speaking all his life. But literary prose was quite a different thing. The Greek literature extant begins with the *Iliad* and the *Odyssey,* which date from the 9th or 8th century B.C. But before these there were poems of which we can know but little—"songs of the seasons" and hymns, connected with religion; ballads of warfare, chanted by minstrels in the houses of chiefs. It was ancient tradition that the *Iliad,* which tells of the wrath of Achilles, an episode in the famous siege of Troy, and the *Odyssey,* which tells of the wanderings of Odysseus after that siege and of his home-coming, were written by a blind poet named Homer, from the Greek coast of Asia Minor. For a long time, beginning at the end of the 18th century, the *Iliad* was the storm center of the so-called Homeric controversy; some critics asserted that it was first written down in the time of Peisistratus (560–527 B.C.) and was a composite of numerous short poems by various authors. Critical opinion now seems to lean toward the view that the style of the *Iliad* is that of a great creative poet, indebted to tradition for his meter, for certain formulaic language and for episodes in the



From a late 17th-century woodcut

The Odyssey: Polyphemus Attempts to Wreck Odysseus' Ship

story. Certain interpolations have been made by editors, but in the main the *Iliad,* as well as the *Odyssey,* implies a single author; although some believe that the same author did not write both. Both are representatives of epic poetry. To the Greeks an epic meant a heroic narrative in hexameter verse. We know that by the 6th century B.C. a recitation of these poems was an established feature of the Panathenaea (held every four years), when they were delivered in a kind of recitative by a rhapsodist who had dispensed with the harp accompaniment of the earlier minstrel and held a laurel branch as a symbol of inspiration. For the Greeks, Homer was *the poet.* The simplicity, the pathos and the nobility of these poems have been an unceasing challenge to translators. The version of the *Odyssey* by T. E. Shaw (Lawrence of Arabia), published in 1932, was the 28th English rendering.

To various shorter poems of much later date (*The Battle of the Frogs and the Mice; Jack-of-All-Trades;* the *Homeric Hymns*) Homer's name was anciently attached. After Homer's time, several Ionian poets, forming what is called the "Cyclic" school, wrote poems intended to be supplementary to the *Iliad* and the *Odyssey.*

Hesiod (8th century B.C.) of Boeotia gave a new slant to the *epos* in his *Works and Days,* the earliest example we have of what we should call didactic poetry. Written for his brother Perses, who he thought was in need of advice about farm management, this is a sort of Countryman's Year. Hesiod has been termed the first European poet to write of Nature for its own sake. It was he who introduced into literature the "five ages of man" and Pandora's box. Attributed to him was the *Theogony,* an attempt to reduce to a system the fugitive legends of gods and goddesses. For a long time in Greece the epic in the style of the *Iliad* and the *Odyssey* and didactic poetry that gathered up lore and tradition in the manner of Hesiod were all-sufficient. But as oligarchies succeeded to monarchies, and democracies to oligarchies, individuals began to voice their thoughts and feelings; and they did so in two new verse forms suited to their needs, the Elegiac and the Iambic.

Elegiac and Iambic Meters.—An elegy was often but by no means always a lament for the dead. It might deal with almost any reflective theme that moved the poet to direct expression (Gray's *Elegy* is an English example). The elegiac meter was formed by following a hexameter with a pentameter (a verse of five feet, a hexameter with its last foot lopped away), making an elegiac distich or couplet. A musical accompaniment was furnished by the flute. Coleridge's version of Schiller gives in English an impression of this distich:

In the hexameter rises the fountain's silvery column,
In the pentameter aye falling in melody back.

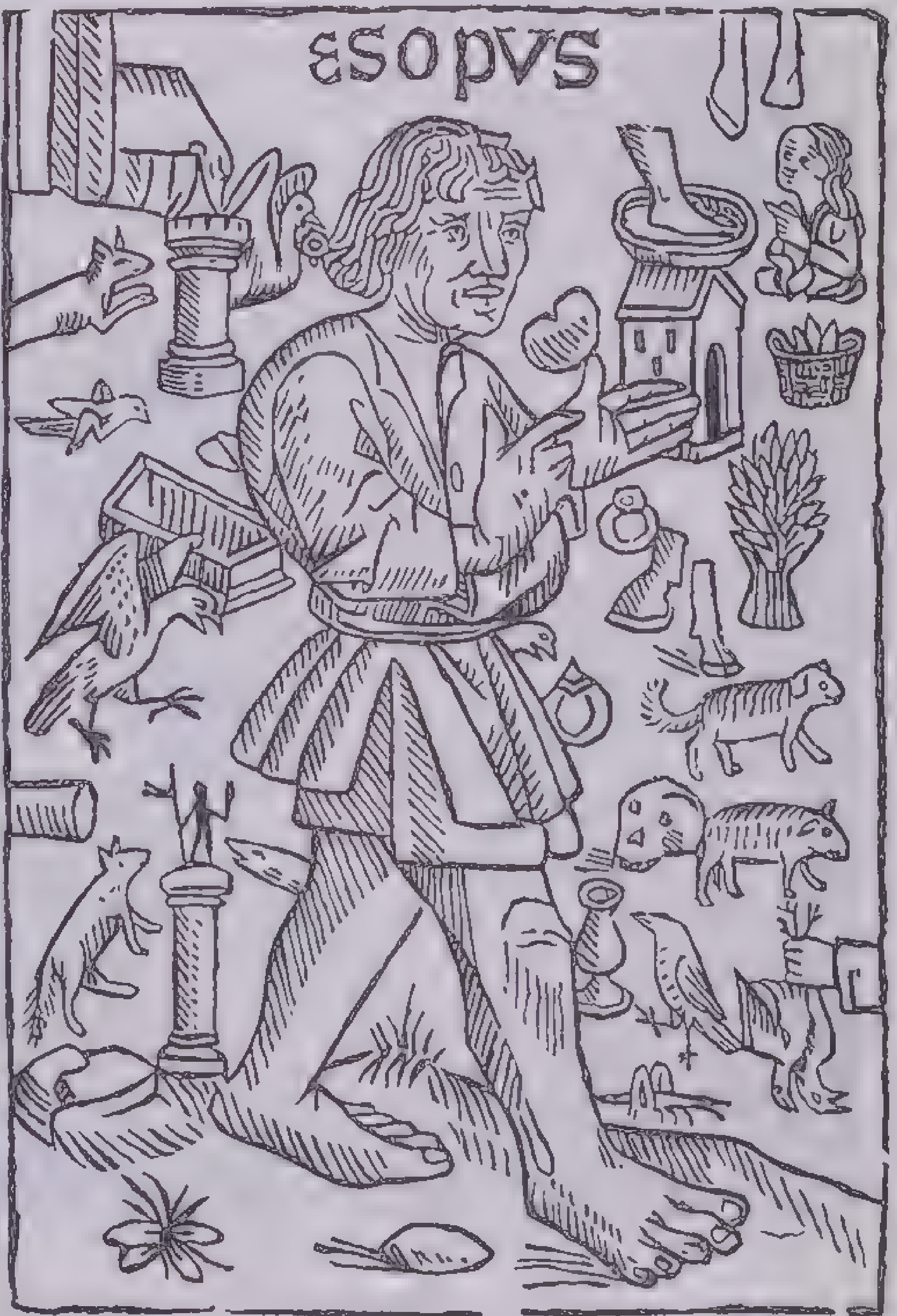
Iambic meter was based on the *iambus,* a foot or measure consisting of two syllables, of which the first was short and the second long. Iambic verse was with the ancient Greeks the next most popular after the epic hexameter. Iambics are also well suited to the English language and are the basis of English heroic verse. These two Ionian forms occupy a place between the Ionian epic and the lyric of the Aeolians and the Dorians. Among the noteworthy elegists were Tyrtaeus and Callinus, warlike in their themes; Archilochus, sometimes martial, sometimes mourning for the dead; Mimnermus of Colophon; Solon, the lawgiver and patriot, who was likewise a pioneer of Athenian letters; Xenophanes; Phocylides and Theognis, who were chiefly devoted to gnomic sayings—in other words, proverbial philosophy. Best known in modern times is undoubtedly Simonides of Ceos, who was employed by the Greek states to write epitaphs for those who fell in the battles of his time. The inscriptions were called *epigrams,* and natural limitations forced conciseness upon the author. Hence arose a literary type—a brief lyric, epigrammatic in style though not intended for an inscription. Perhaps the most famed of Simonides' epigrams was that "On the Spartans Who Fell at Thermopylae":

Stranger, unto the men of Sparta tell
That here, obedient to their laws, we fell.
—G. B. Grundy

Of the lyricist Timocreon he wrote: "Having eaten much and drunk much, and having said much evil of other men, here I lie, Timocreon the Rhodian." Iambic verse was written by Archilochus, Hipponax and Simonides of Amorgus, all of whom are satirists. Fables, narratives in which animals are made the vehicles of wisdom, were frequently written in iambics, although Aesop, to whom so many of them were attributed, was regarded merely as an ingenious storyteller who had put nothing down in writing, either verse or prose.

Lyric Poetry.—Elegiac poetry now tended toward a specific use in the epigram, and iambics were in time to find their place chiefly in the drama. Personal expression was to reach its ultimate form in lyric poetry—although that term was not known to the Greeks, who called it *melic* poetry. On the technical side, Greek lyric poetry has two distinguishing marks. It is *strophic*—that is, it is written not in successive lines of the same metrical arrangement but in stanzas. (As is the case in English verse, the stanza may vary from the common four-line structure to one of considerable intricacy and length.) It is *logaoedic*—that is, it is written not in successive feet (or measures) of the same metrical length but in some one of various combinations of common and triple time (dactylic and trochaic rhythms). To this second rule there are exceptions, but in the main it is true. In the chanting of lyric poetry the instrument used to accompany the voice was the lyre, to which Terpander had added three strings, giving it thus the compass of an octave. Aeolians and Dorians had each a part in the development of the lyric; and long afterward the grammarians of Alexandria fixed upon a list of nine great lyrists, whose work extended over almost precisely two centuries (from the middle of the 7th century B.C. to the middle of the 5th). These were: Alcman, Alcaeus, Sappho, Stesichorus, Ibycus, Anacreon, Simonides, Pindar and Bacchylides.

Of the work of the first seven we have only fragments. A papyrus discovered in Egypt by natives in 1896 has, through the efforts of scholars, restored to us a number of complete poems by Bacchylides; and we have a moderately large collection of Pindar's odes. Alcman (Doric for Alcmaeon), Stesichorus, Ibycus, Simonides, Pindar and Bacchylides wrote their lyrics in the manner of the Dorian school; that is, these poems belonged to a form intended for chanting not by one voice but by a chorus. And in them the personal character of the lyric in its strict sense had been for the most part lost because of their public use. For they were written either for public worship or for other important occasions of public assembly. Pindar's 44 *epinicia* (odes of victory), in honor of victors in the Isthmian, Nemean, Olympic and Pythian games, are made difficult for modern readers by their wealth of local allusion and their detailed treatment of obscure mythology. They are metrically skillful, and in selected portions we may appreciate their vigor, bold imagery and lofty tone. Ibycus is known in modern literature through Schiller's ballad *Die Kraniche von Ibykus,* which retells the story of how the cranes avenged his murder.



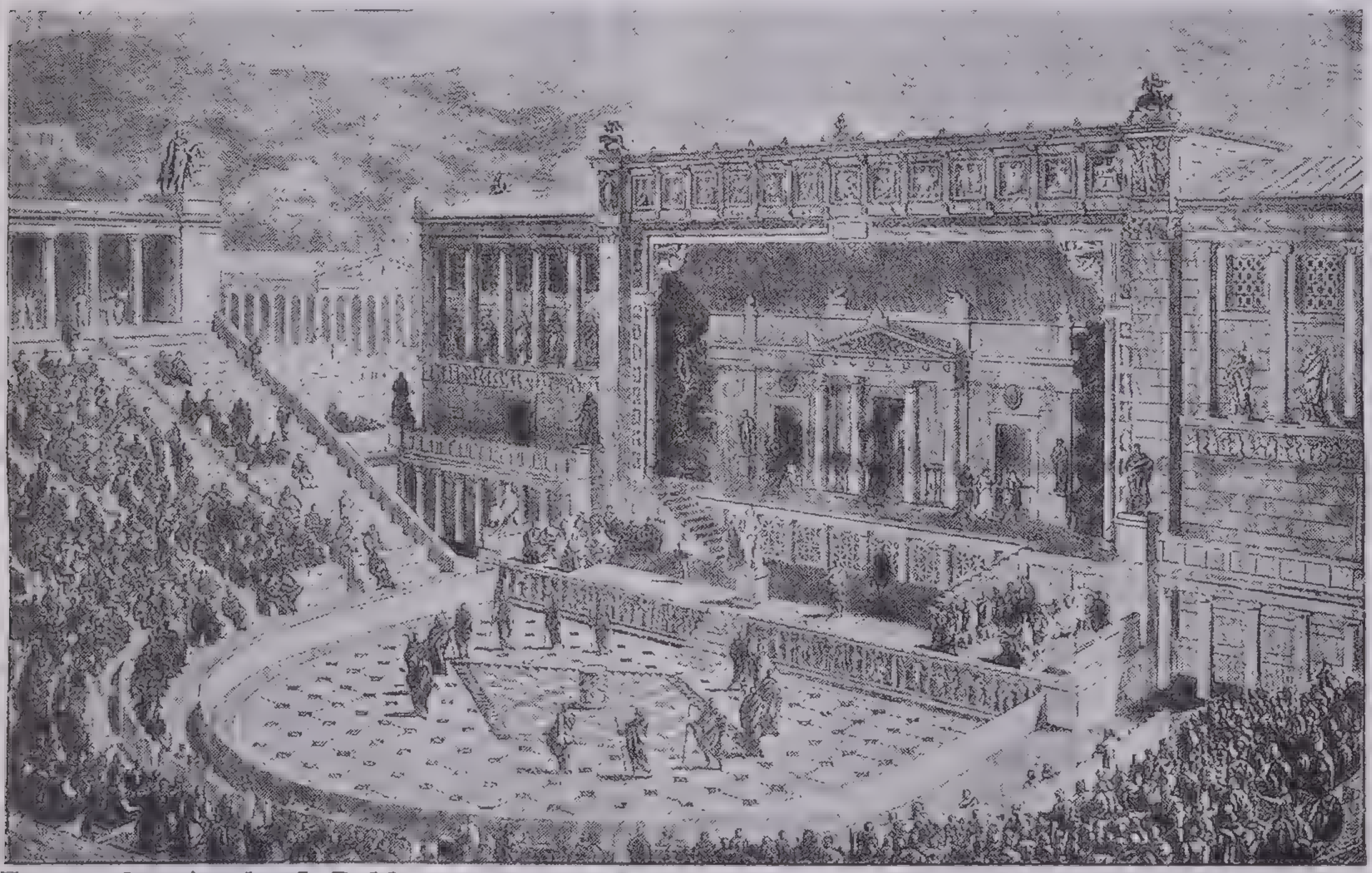
Frontispiece to William Caxton's Fables of Aesop

Aesop, The Greek Fabulist

Alcaeus, Sappho, Anacreon.—In general, however, less interest has been shown in modern times in the Dorian than in the Aeolian school of lyric poetry. The chief representatives of the Aeolian school were Alcaeus, Sappho and Anacreon.

Alcaeus of Mitylene was forced by the active part he had taken in civil strife to spend a part of his life in exile but later was allowed to return. His poems included hymns to the gods; partisan songs; love songs, of which the imitation by Horace (*Odes* III, 12) gives an idea, and convivial songs, of which Horace also has imitations in *Odes* I, 9, 18, 37. Their metrical finish was noteworthy. It was Alcaeus who introduced into literature the figure of the "ship of state," which has been doing duty ever since.

The other leader of the Aeolian school, Sappho, was so highly esteemed that temples were built in her honor, her head was struck upon coins and she was known as the *Tenth Muse.* "Sappho," said Strabo, "is a kind of miracle; for within the memory of man there has not, so far as we know, arisen any woman worthy even to be mentioned along with Sappho in the matter of poetry." Greek critics held that she excelled all others in lyric poetry in fine and consistent balance between finish of style and a personal expression of feeling. Among the moderns, J. W. Mackail, professor of poetry at Oxford, has written: "The sole woman of any age or country who gained and still holds an unchallenged place in the first rank of the world's poets, she is also one of the few poets of whom it may be said with confidence that they hold of none and borrow of none, and that their poetry is, in some unique way, an immediate inspiration." Of her nine books of lyrics only broken fragments remain. She is supposed to have invented the Sapphic stanza.



From a drawing by J. Buhlmann

Where the Plays of the Great Greek Dramatists Were Produced

The Theater of Dionysus at Athens, in which 30,000 spectators could be accommodated, was completed in 340 B.C. To the left are seats for the audience and part of the colonnade; in the foreground the orchestra, proscenium and stage. The action of the play took place both on the stage and in the half circle below.

Of Anacreon we have only two complete poems, besides a few remains. His bent was more toward social enjoyment as was evidenced in his festive songs. In connection with this Anacreontic tradition, it may be of interest to note the American national air *The Star-Spangled Banner* is actually used at third hand; for it was taken from the older song *Adams and Liberty,* which had borrowed it from Samuel Arnold's English drinking song *To Anacreon in Heaven.*

THE ATTIC PERIOD

A new form of Greek poetry now arose, with elements taken from that which had preceded. Its home was Attica. It would be impossible here to explain how this new form, *dramatic* poetry, had its origin. It may only be said that it was a development of a choral hymn (*dithyramb*) honoring the god Dionysus and sung about an altar. Originally the leader of the chorus might take the part of a messenger or even of Dionysus himself and tell an adventure to the chorus, which in turn responded. Next, dialogue was introduced between the leader of the chorus and a selected member of the chorus, who was called by a name that became the usual word for "actor" (*hypocrites*). Aeschylus (525–456 B.C.) brought in a second actor, making the dialogue entirely independent of the chorus, and thus was the real founder of *tragedy.* Forthwith the choral song became secondary to the dialogue. Soon the theater of Dionysus below the Acropolis in Athens was begun—drama's first established home in Greece.

Aeschylus.—As an indication of the amount of Greek literature that has been lost to us, it may be stated that of some eighty works by Aeschylus, only seven are extant: *Agamemnon, The Choephorae* (*Libation-Bearers*), *The Eumenides* (*Furies*), these constituted a trilogy; *Prometheus Bound, The Suppliants, The Seven against Thebes* and *The Persians.* Of these, the *Prometheus,* the second member of a trilogy of which the first and third parts have been lost, is generally accounted the most impressive; *Agamemnon,* the most varied and most richly poetical. Aeschylus is distinguished for elevated phraseology, noble austerity of treatment and a background of profoundly moral sentiment. Of *Prometheus* it has been said: "No work of a similar lofty character certainly has ever been so extensively popular." (J. S. Blackie)

Sophocles.—Sophocles (496–406 B.C.) enlarged the scope of dramatic action by introducing a third actor; and in the design of his plots, the charm of his style, his insight into character and a certain ideal beauty, he has been considered the artist par excellence of the ancient Greek drama. With him, drama became more dramatic and less lyric than it had been with Aeschylus. It is a striking fact that of his 123 dramatic works, only seven remain. These are: *Ajax, Electra, Oedipus Tyrannus, Antigone,* the *Trachiniae* (*The Maidens of Trachis*), *Philoctetes* and *Oedipus at Colonus.* Sophocles succeeds in being more human than Aeschylus. His sufferers move to pity, his martyrs command admiration. To him, it was well with them because their wills were strong, and because there was a higher morality and a diviner justice than appeared in the old traditions of the gods. The *Oedipus Tyrannus* was named by Aristotle in his *Poetics* as an ideal play, and our modern critics have been practically agreed in awarding it the supreme place in Greek tragedy. In his case, as in that of Aeschylus, we must remember that we have only the text of the plays. The music is gone and, lacking musical accompaniment, the meters suffer in modern ears; and even the text bears the marks of ignorance in transcription, and it belongs to a world that even the learned can only imperfectly apprehend. Yet these plays have not lost their power. To modern poets they have spoken as they did to Matthew Arnold, who, as he listened to the full tide on Dover Beach, reflected,

> Sophocles long ago
> Heard it on the Aegean. . . .

Euripides.—Euripides (*c.* 480–406 B.C.) deprived Greek tragedy of much of its ideal character, bringing it closer to everyday life. In his hands it approached in some ways nearer to the modern world, often sacrificing dignity for human interest or even amusement. He had a skeptical attitude toward the myths and traditions which his predecessors took as they received them. He was often picturesque, often expert in pathos. Of his 92 dramas, we have 18, including the *Phoenissae, Medea, Hippolytus,* the *Bacchae* and *Iphigenia among the Taurians.* Elizabeth Barrett Browning called him—

> Our Euripedes, the Human,
>   With his droppings of warm tears,
> And his touches of things common
>   Till they rose to touch the spheres.

Greek Comedy and Aristophanes.—The Attic Greeks first wrought the drama into an art form. They were the first to develop not only tragedy but *comedy,* which sprang originally, like tragedy, from the worship of Dionysus, but from its merrymaking side—an expression of joy over the return of spring after winter's gloom. Greek comedy has been divided into the Old, the Middle and the New. To the Old comedy belonged Cratinus, Crates, Pherecrates, Eupolis, Phrynichus and, chief of them all, Aristophanes (*c.* 450–*c.* 385 B.C.). Works are extant of none of these save Aristophanes, and of the 44 works commonly attributed to him, only 11 remain. These are placed by scholars in three groups: (a) The *Acharnians, Knights, Clouds, Wasps,* and *Peace;* (b) the *Birds, Lysistrata, Thesmophoriazusae* and *Frogs;* (c) the *Ecclesiazusae* and the *Plutus.* This grouping is to indicate the decreasing employment of political and personal satire. At his freest, Aristophanes made unsparing attack upon the gods, Athenian institutions, the politicians, the philosophers and others. In the *Clouds,* the most read and most frequently edited of his works, he poked fun at Socrates. Representatives of the Middle comedy were Antiphanes, Anaxandrides and Alexis. They mark a transition toward other interests, and find subjects of ridicule in the Pythagoreans, the Platonic academy, the rhetoricians, the orators. With Menander (342–291 B.C.) we reach the leading dramatist of the New comedy. He wrote about 105 comedies, and we have fragments of seven. His works resembled what is in modern times called the "comedy of manners," were produced as late as Plutarch's time (*c.* 46–*c.* 120) and were imitated by the Roman writers Terence and Plautus. St. Paul quotes Menander when he says that evil communications corrupt good manners.

Greek tragedy, though intended for performance before crowds in the open air and therefore in a sense "popular," was not written down to the intelligence of the lowest common denominator. It was no idle pastime, even for Athenians, but demanded close attention and mental focus; and through such discipline the Greeks, though doubtless great talkers, became also good listeners and critics. The Old comedy, in spite of its carnival boisterousness, served, in a time when there was neither daily nor periodical press and when pamphleteering was unknown as a medium of public criticism.

LITERARY PROSE

Herodotus.—A Greek prose literature really began with Herodotus (*c.* 484–*c.* 425 B.C.). Before him there had been Ionian prose writers called *logographoi,* as distinguished from the makers of verse. These prose writers compiled early myths or described the geography and the peoples of foreign lands. Their work was no more literature than were the old Saxon chronicles. Herodotus seems to have been the first Greek to whom it occurred that it might be possible to make facts interesting. His travels in various countries were extensive for that age and were undertaken in a spirit of inquiry. The central theme of his *History,* which is written with a sense of unity, is the struggle between Asia and Greece—the rise and fall of Persia; and this is constantly referred to as a divine arrangement by which overweening power and arrogance and riches meet their Nemesis. In his traveller's tales he sometimes repeats the inventions of dragomans, but moderns have often had occasion to confirm the truth of his statements.

Thucydides.—It has been said about historical writing that if Herodotus was the first artist, Thucydides (*c.* 455–*c.* 400 B.C.) was the first thinker. His subject was the Peloponnesian War, of which he was a contemporary; and his idea was that this would have value beyond that of a reasonably accurate story of important events: It would have continuing significance on the general theory that history is likely to repeat itself. He leaves divine agency to Herodotus and is concerned with human affairs. Into the mouths of his characters he put speeches that in substance were supposed to be approximately faithful but in style were his own. It was said that the orator Demosthenes studied Thucydides so carefully that he copied out this history eight times.

Xenophon.—Another historian is Xenophon (*c.* 434–*c.* 355 B.C.), who is probably at his best in his *Anabasis* (or *Retreat of the Ten Thousand*), in which he tells the story of Greek mercenaries who, marching to help a pretender seize the Persian throne, are compelled by the pretender's death to make their way home as best they may. This reveals his knack at writing lively narrative with a convincing air of reality. So, too, does the *Memorabilia,* recollections of Socrates, whom he had listened to and admired—abounding in superficial detail but without philosophic content. The *Hellenica,* designed as a continuation of Thucydides' history, is lacking in the organic unity found in both Thucydides and Herodotus. Xenophon's *Cryopaedeia* (*The Education of Cyrus the Elder*) is more romance than history.

Oratory.—Oratory had in Greece a decided influence on the structure of literary prose; hence attention must be given to it in any survey of Greek literature. Even in Homer, eloquence was regarded as essential to a hero: Achilles was trained to be a "speaker of words." In the Attic period any citizen who desired to take a part in Athenian affairs or even to plead in his own defense in a court of law found a study of public speaking rather necessary. Antiphon and Andocides were leading representatives of the earliest school of Attic oratory. Lysias undertook to provide speeches for those who had to plead in the courts and did not wish to rely on their own skill. He therefore dispensed with much of the rhetorical technique that had been in vogue and used the simpler language of common life, though with an art that concealed art. Simplicity, clarity and smoothness made him in his own day the pattern of the "conversational" style. In antiquity, 425 of his speeches were known; we have 34 attributed to him—not all complete. Isocrates (436–338 B.C.) established a flourishing school of oratory. His style of prose, midway between that of the earliest school and that of Lysias, was favored in Greece from the second half of the 4th century B.C. Studied at Rhodes, it became the model for the Roman Cicero and thus helped to mold the oratory of modern speakers down at least to the middle of the 19th century. Demosthenes (383–322 B.C.) was considered the foremost orator of Greece. His name became familiar in connection with stories of how he overcame natural disadvantages—strengthening his voice by declaiming against the roar of the ocean and correcting his utterance by speaking with pebbles in his mouth. The most famous of his speeches were the twelve *Philippics* denouncing King Philip of Macedonia. The word *philippic* has passed into English speech as synonymous with invective. "Philip," cried Demosthenes, "a man who not only is no Greek, and no way akin to the Greeks, but is not even a barbarian from a respectable country—no, a pestilent fellow of Macedon, a country from which we never get even a decent slave." It is only natural that in modern times Demosthenes should have been appreciated less as a stylist than as an effective, if not profound, orator.

Philosophy.—Philosophic prose is represented by Plato (427–347 B.C.) and Aristotle (384–322 B.C.). As a prose stylist Plato received in Greek literature a place similar to that which as a philosopher he occupied among Greek thinkers. In longer passages of interpretation he achieves a poetical quality that employs the finest shadings of the language; in the ordinary give and take of his *Dialogues* he is dramatic, satirical and shrewd. All of his writings have the dialogue form except the *Apologia,* Socrates' address to his judges. It was a natural form for him to use, because it imitated the actual manner of Socrates' discussions with his pupils. The *Republic,* "the first of all Utopian books," is the younger Plato's envisioning of a city-state in which life should be conducted on a new and better plan. Cicero's *De Republica* is patterned after it. In it, as in the lifelike delineation of persons whose views he wished to defend or combat, Plato showed high literary gifts. Aristotle is of interest to literature through his *Poetics,* which is the pioneer extant work of literary criticism, although of its two books the first, dealing with tragic and epic poetry, alone remains. The first two of the three books of his *Rhetoric* treat of language and style.

THE PERIOD OF DECLINE

When the empire of Alexander had broken up into separate monarchies, the externals of the old Greek life persisted but civilization was not the same. It was not Greek but what has been styled Hellenistic—Hellenic in outward form but not Hellenic in spirit. Egypt fell to the share of Ptolemy, one of Alexander's generals, and its new capital, Alexandria, became the center of the Hellenistic world. The Museum founded there was really the first university in the world, and even more important was the great library there established. The scholars of Alexandria attended painstakingly to the preservation and copying of manuscripts of Greek literature.

Greek was the language of educated persons to such an extent that many of the Jews in Egypt were no longer able to understand Hebrew, and so the Septuagint version of the Old Testament was undertaken. Among the Alexandrian poets were: Callimachus (*c.* 310–*c.* 240 B.C.), who was connected with the library; Apollonius Rhodius (*c.* 295–*c.* 215 B.C.), author of the epic *Argonautica;* Theocritus (*c.* 310–*c.* 245 B.C.), a pastoral or bucolic poet whose *Idylls* showed a fresh and true sense of natural beauty and were imitated by Vergil in the *Bucolics* and the *Georgics.* From him the customary affectedness of the Alexandrian school is largely absent. Bion and Moschus were other pastoral poets often mentioned with Theocritus.

After the conquest of Greece by the Romans, Greek literature found a welcome in Rome. Educated Romans commonly spoke and wrote Greek. Such men as Cicero, for example, were familiar with Greek books. Among those who wrote in Greek during this Greco-Roman period were: Polybius, author of a universal history glorifying Roman power; Diodorus Siculus, whose *Historical Library* was a history of the world down to Caesar's Gallic war; Lucian, whose satirical *Dialogues* have more of the old Greek manner than have any other works of his time; Josephus (*Jewish Archaeology*); Plutarch, whose *Lives* of noted Greeks and Romans have been universally popular; the Stoic philosopher Epictetus; the Emperor Marcus Aurelius, who during his campaigns wrote a volume of reflections on the conduct of life; and the two Neo-Platonists Plotinus and Iamblichus. As for poetry, the best of it that has survived may be found in that collection of short pieces known as the *Greek Anthology.*

The Greek Anthology.— This *Anthology* has come to be regarded as one of the most valuable relics of ancient literature. It is made up of short pieces, mostly in the elegiac couplet, written by a host of authors, many unknown, over a period of 17 centuries (*c.* 700 B.C. to 1000 A.D.). *Epigram* originally meant inscription, but the term was later extended to include brief lyrics of epigrammatic form. To the Greeks an epigram was not what it is with us—a sententious expression, prose or verse, with a "sting" at the close. Always in poetic measure, it aimed at economy of means and felicity of style but not at striking ideas or surprise endings.

The pieces in the *Anthology* bear to the massive examples of Greek literature much the same relation that the engraved gems, smaller bas-reliefs and figurines bear to Greek sculpture. They deal in simple, vivid fashion with the joys, sorrows, changes, humors and pathos of everyday life. Many are epitaphs or memorials. They include examples of satire, as:

All hail, seven pupils of Aristides the rhetorician, four walls and three benches.
—Unknown (J. W. Mackail, trans.)

Patriotism:

If the best merit be to lose life well,
To us beyond all else that fortune came:
In war, to give Greece liberty, we fell,
Heirs of all time's imperishable fame.
—Simonides, on the Athenian dead at Plataea (W. G. Headlam, trans.)

Love:

On the stars, thou gazest, my Star; would I were heaven to look at thee with many eyes.
—Plato (J. W. Mackail, trans.)

Philosophic content:

I care not for the lands with pastures deep,
Nor wealth of gold with jealous eyes I see;
Nor, having what's enough, I more would reap.
Too much of anything's too much for me.
—Alpheus (G. B. Grundy, trans.)

LATIN LITERATURE

In a strict sense, according to some authorities, there is not and never was a Roman literature. According to others, the ancient literature we know as Latin was a characteristic expression of Rome. To deny originality to the Romans would be a mistake. In statecraft and jurisprudence they were decidedly original. In practically all other fields they had a way of fitting to their own uses the achievements of others. Indeed, the Greek Posidonius (c. 135–45 B.C.) thought that this aptitude was one of the determining causes of their political growth.

This assimilative gift was nowhere else more clearly in evidence than in the case of their written language. The very characters they used were borrowed from the Greeks of Cumae, the oldest Greek colony in Italy. The developed Latin alphabet became the alphabet of all Romance and Germanic languages. When a Latin literature arose, its forms were in the main directly copied from Greek originals. As the poet Horace said (*Epistles,* II.1,156–157), Greece, though conquered, had been conqueror too. In the epic (Ennius, Vergil), in tragedy (Livius Andronicus, Pacuvius, Accius), in comedy (Plautus, Terence), in history (Sallust), Latin writers followed Greek patterns. Such authors as Lucretius, Cicero, Vergil and Horace were heavily indebted to the Greeks. Latin metric copied the Greek; and as for vocabulary, Horace admitted that

"New words, if from a Grecian source,
Aptly applied, are welcomed as of course."

Nevertheless, as time passed, the Romans did imprint their own character on their literature, sometimes to a marked degree. Satire, as an independent poetic style, they claimed for their own. If Terence, Sallust and Propertius were apish, Plautus, Tacitus and Lucretius were more strongly individual. The Horace of the *Epistles* was more original than the Horace of the *Odes;* and the letter writer Cicero was less derived than Cicero, the adapter of Greek philosophy. The Romans contributed their own notions and turns of speech. Though they did not quite attain Greek flexibility and grace, they had clearness, dignity and force.

But Roman literature was not an organic development. For 1,500 years the Romans appear to have done without a literature. But even in remote times they had their formulaic prayers and chants for public worship; these were metrical, for in an age when writing was known to but a few, meter was an aid to memory. To judge by traces remaining in their proverbs and magical runes, they employed both alliteration and rhyme. That old Italian metric was accented like the English; Latin poetry was afterward quantitative, like the Greek. A verse of high antiquity has been preserved—called by later poets the *Saturnian,* a term indicating something like our "antediluvian." The Saturnian has been likened by Macaulay to the English measure of

"The queen| was in| her par|lor,|| eating| bread and| honey."

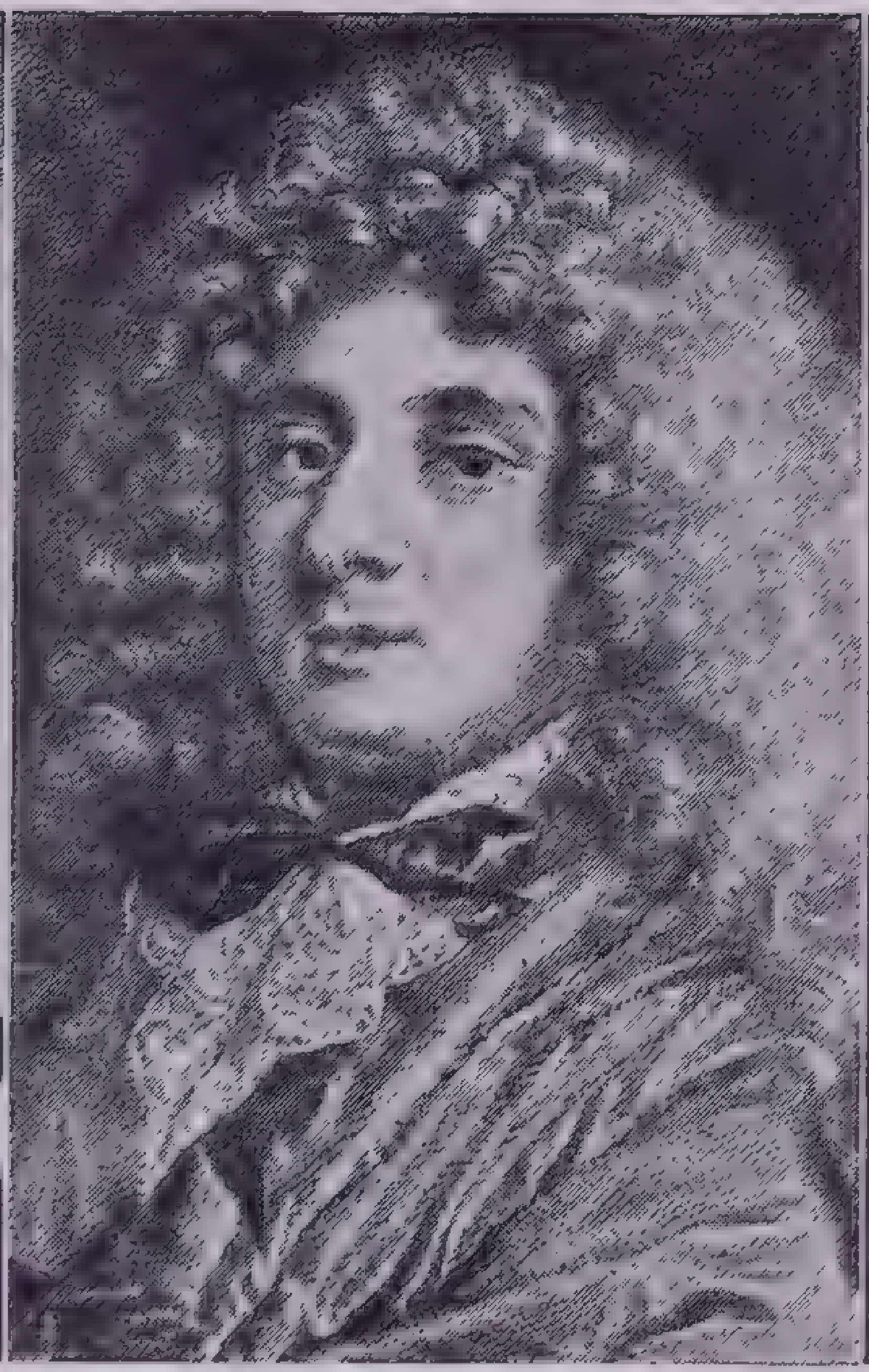
There were mourning-chants and *fescennine* verses full of ridicule and rough humor. But no artistic literary use was ever made of these various ancient motives.

It is only in the oldest remains of the Roman law that we can get any insight into the independent Roman mind as it was before Greek works became known to it. The first Roman book was really a code of laws engraved on 12 tablets. The first Roman personality that we may term literary was Appius Claudius Caecus, who translated from the Greek a collection of maxims (*sententiae*) into the old Saturnian verse. He wrote also what may be called the first Latin work in prose—a speech, the pioneer specimen of Roman oratory as a branch of literature.

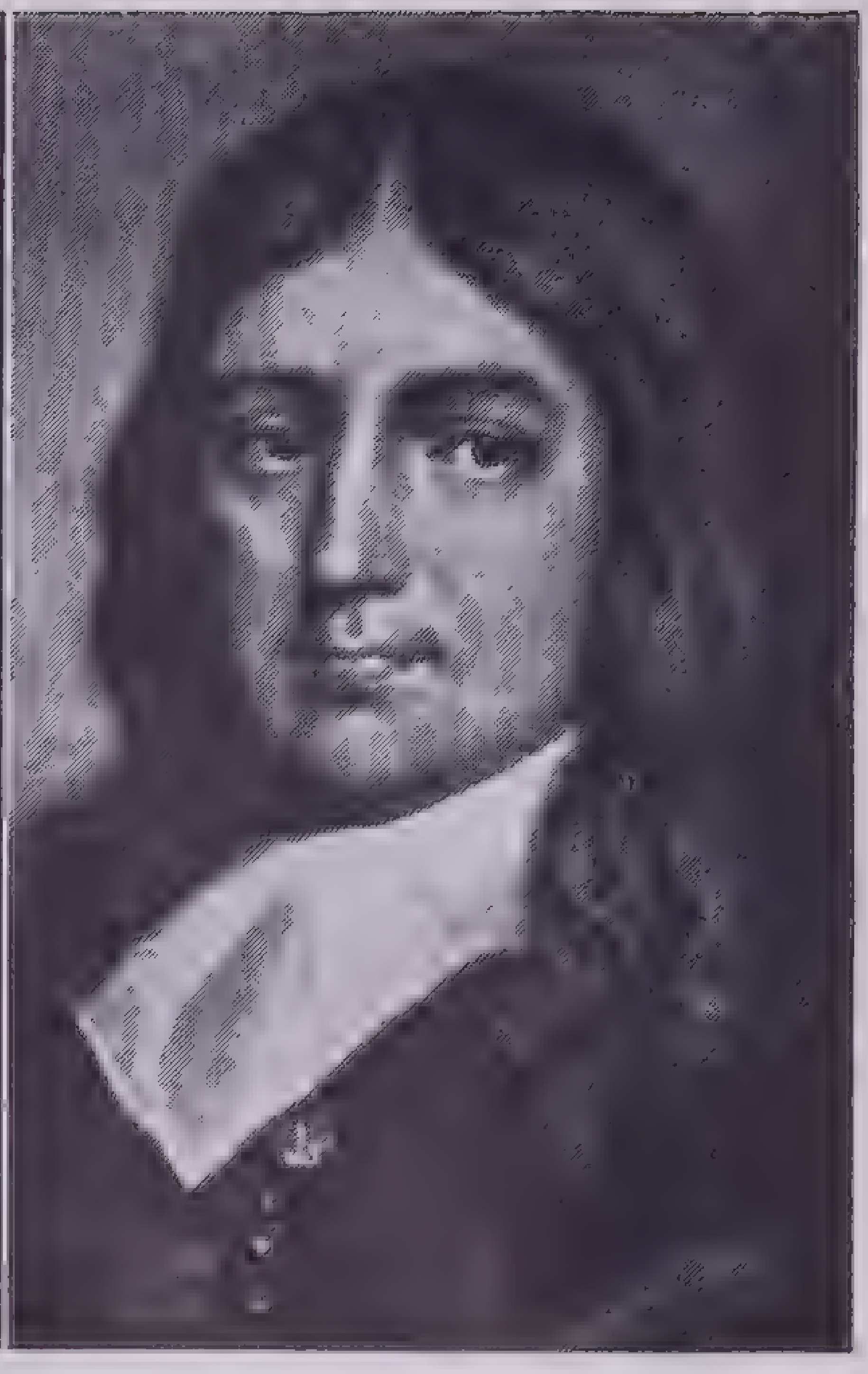
Livius Andronicus.—Appius Claudius was, however, an isolated figure, and it is only with L. Livius Andronicus (active 240–207 B.C.) that we reach the real beginning of Latin literature.

Livius Andronicus had a school in Rome and for use in the study of the Latin language he translated the *Odyssey* (already a textbook in Greek schools) from Greek into Latin. He did not employ the hexameter measure of the original. Latin had too many long syllables and Greek hexameter too many shorts to make such a transfer easy for an inexperienced versifier. So Livius fell back on the Saturnian jog trot that Appius Claudius had previously tried, and his version, though Cicero likened it to primitive attempts at sculpture, was a favorite text as late as the Augustan period. During the First Punic War the Romans had got acquainted with Greek drama in Sicily. Livius translated and adapted Greek plays, following as well as he could the Greek iambics and trochaics; and these plays were so well received that drama (*ludi scaenici*) became a feature of the Roman games. Gnaeus Naevius (active 235–204 B.C.) also adapted Greek tragedy and comedy, but with greater originality. In tragedy he introduced the *fabula praetextata,* for which he drew upon the legendary or contemporary history of Rome, and in which characters wore the *toga praetexta,* the garb of Roman magistrates. Comedy (*fabula palliata,* from the Greek *pallium* or mantle worn by the actors) was his prefer-

Hans Christian Andersen (1805-75)
Denmark

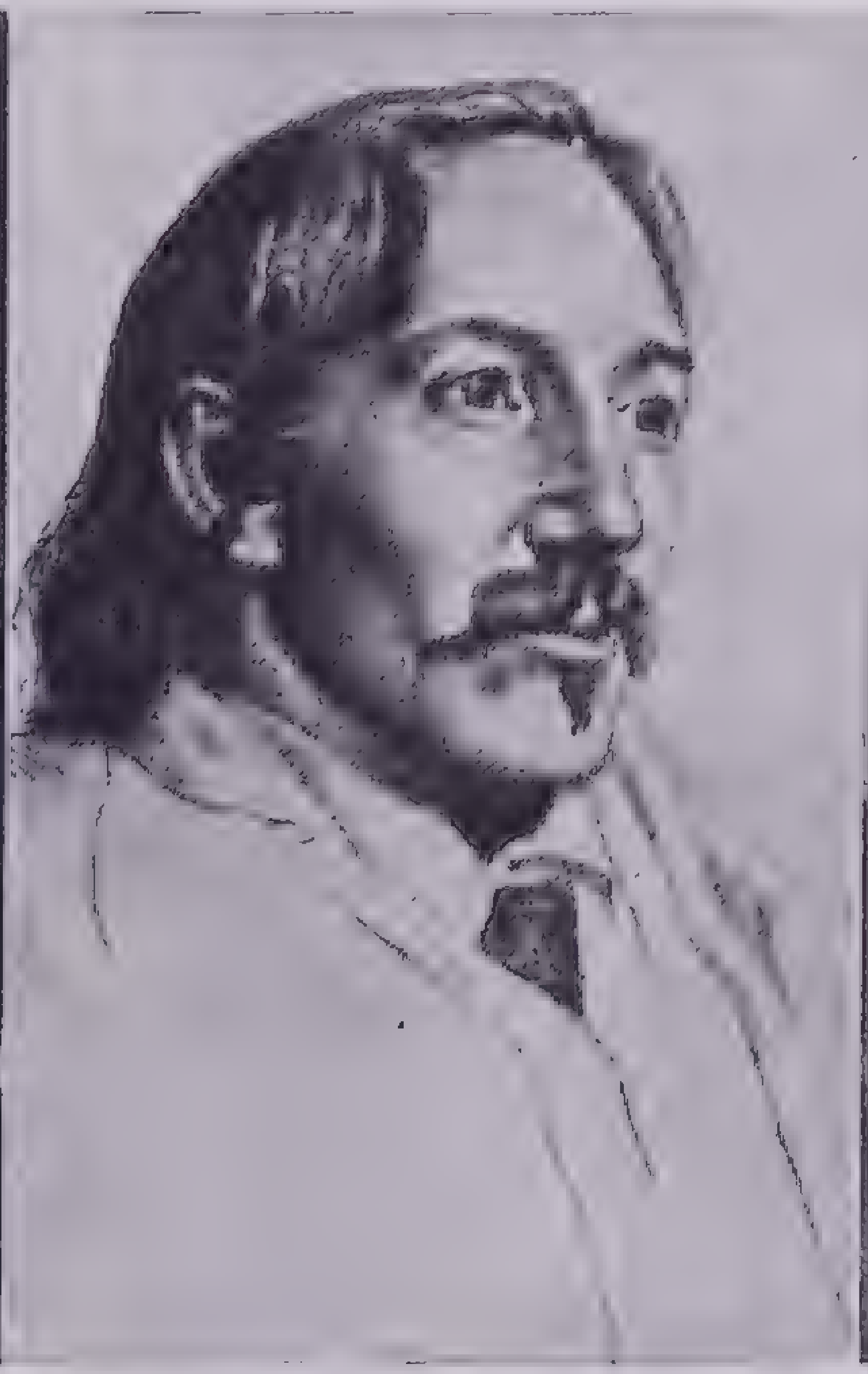

Molière (1622-73)
France

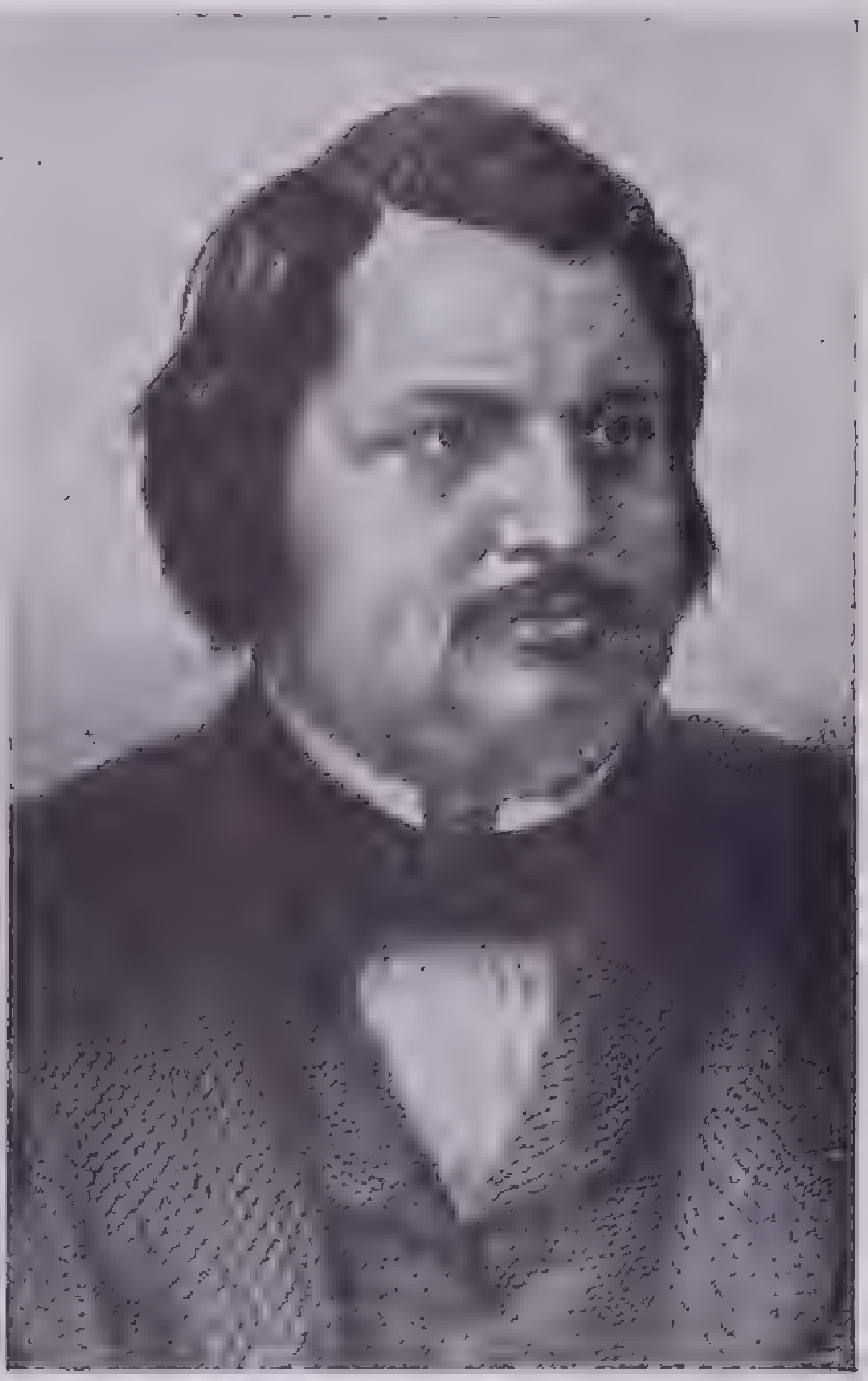
Sir James Matthew Barrie
(1860-1937) Scotland


John Milton (1608-74)
England

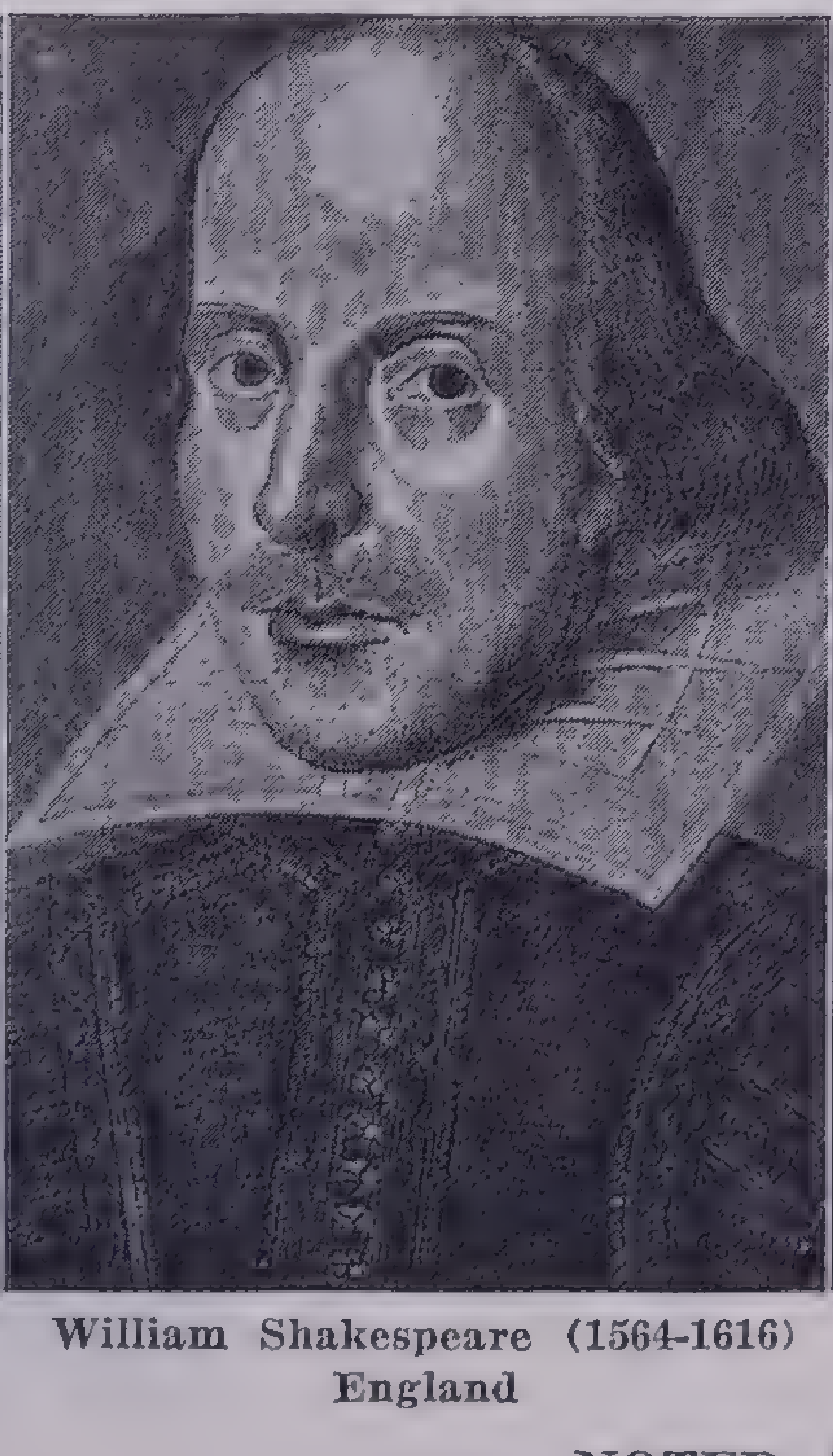
Maurice Maeterlinck (1862-)
Belgium

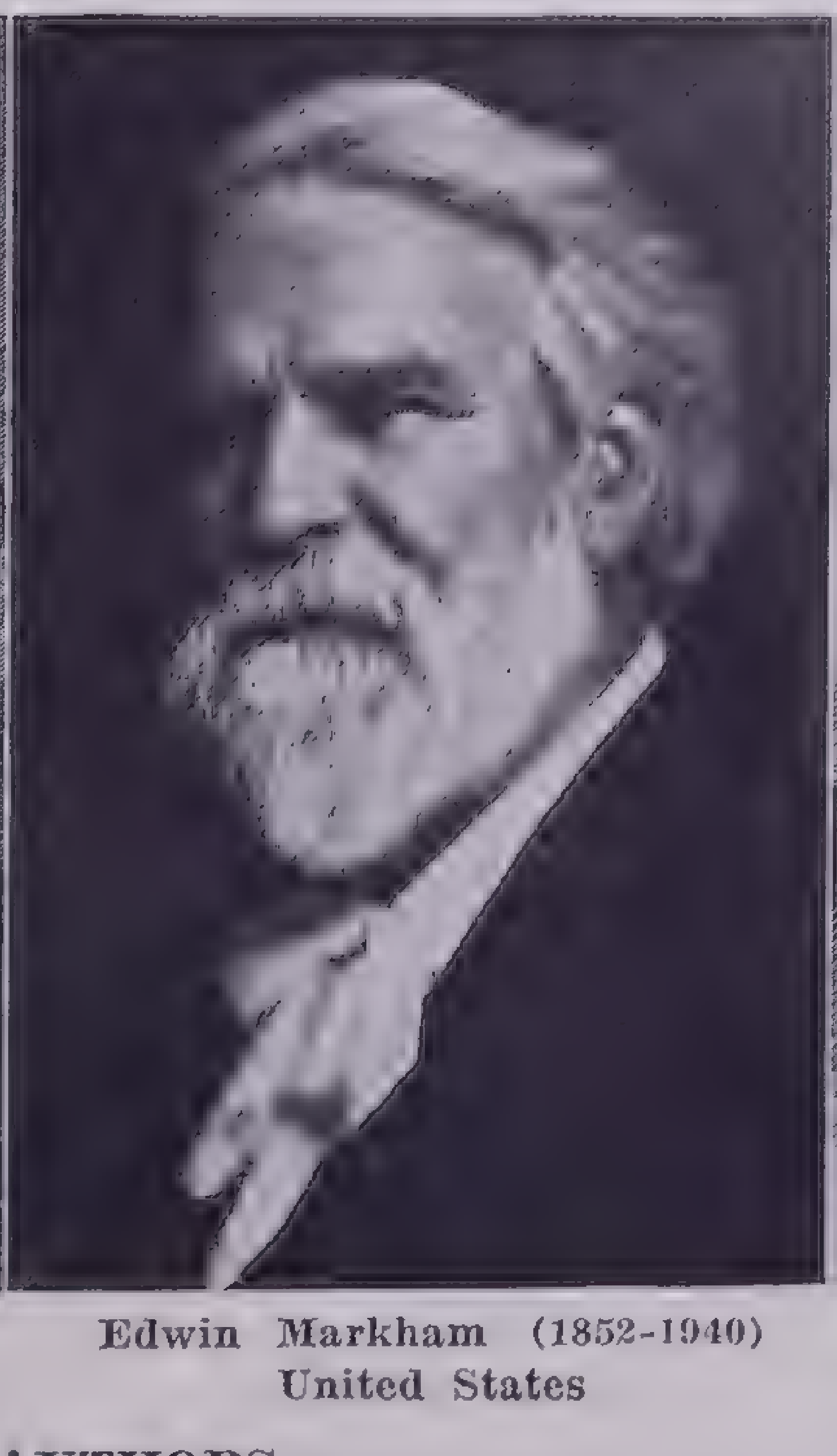
Anton Pavlovich Chekhov
(1860-1904) Russia


Robert Louis Stevenson (1850-94)
Scotland


Honoré de Balzac (1799-1850)
France

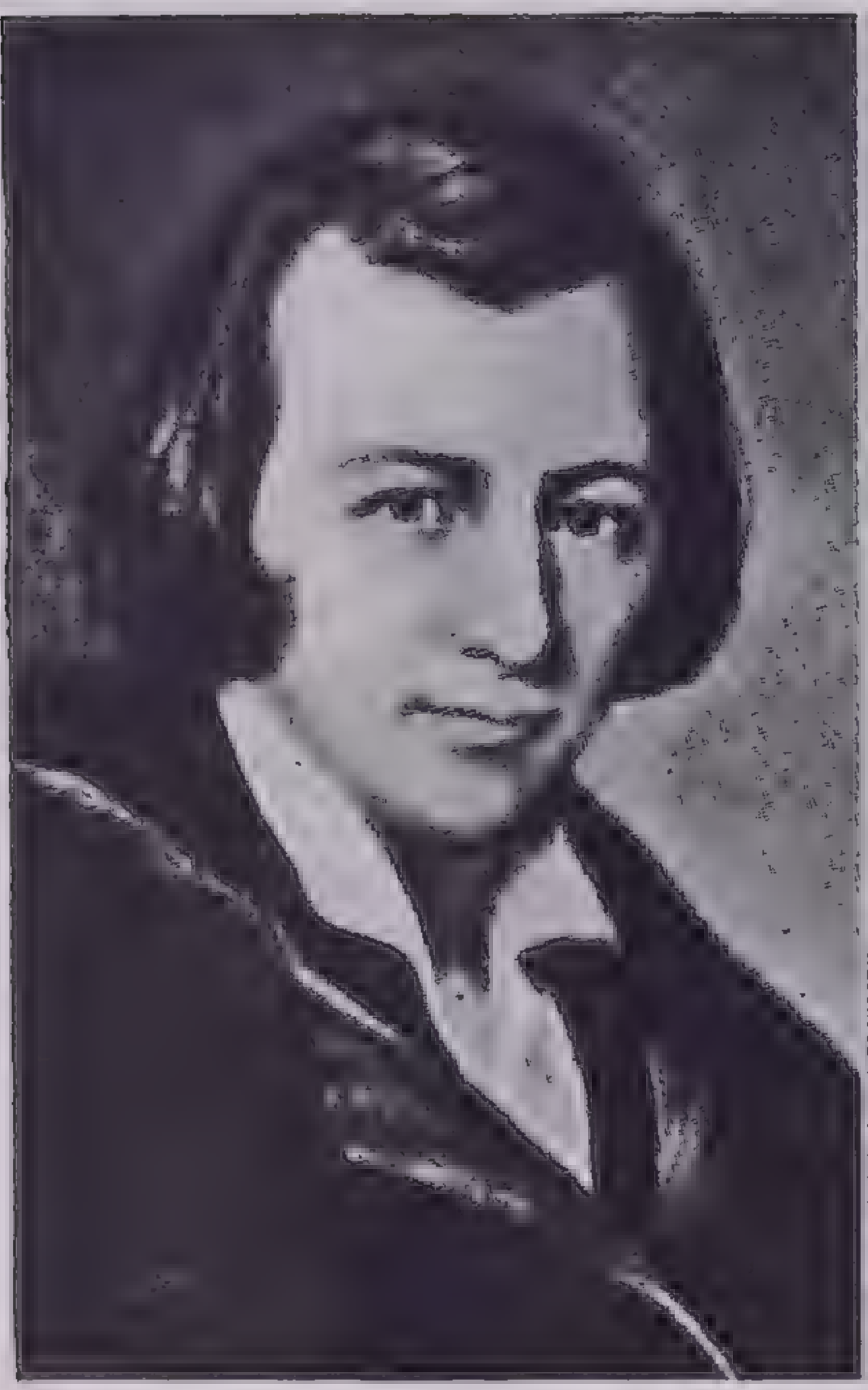
Gerhart Hauptmann (1862-)
Germany


William Shakespeare (1564-1616)
England


Edwin Markham (1852-1940)
United States

Harriet Beecher Stowe (1812-96)
United States

NOTED AUTHORS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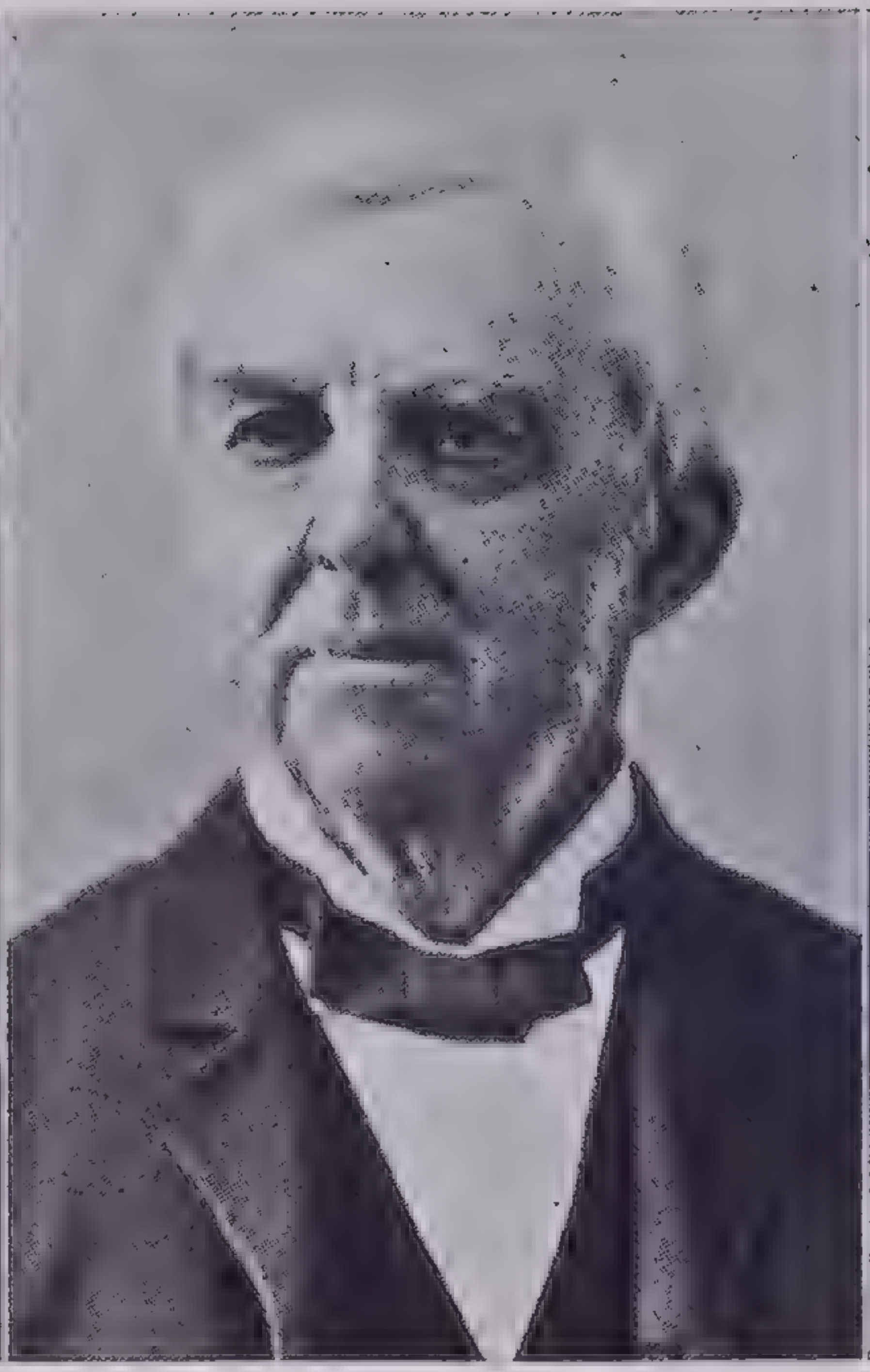
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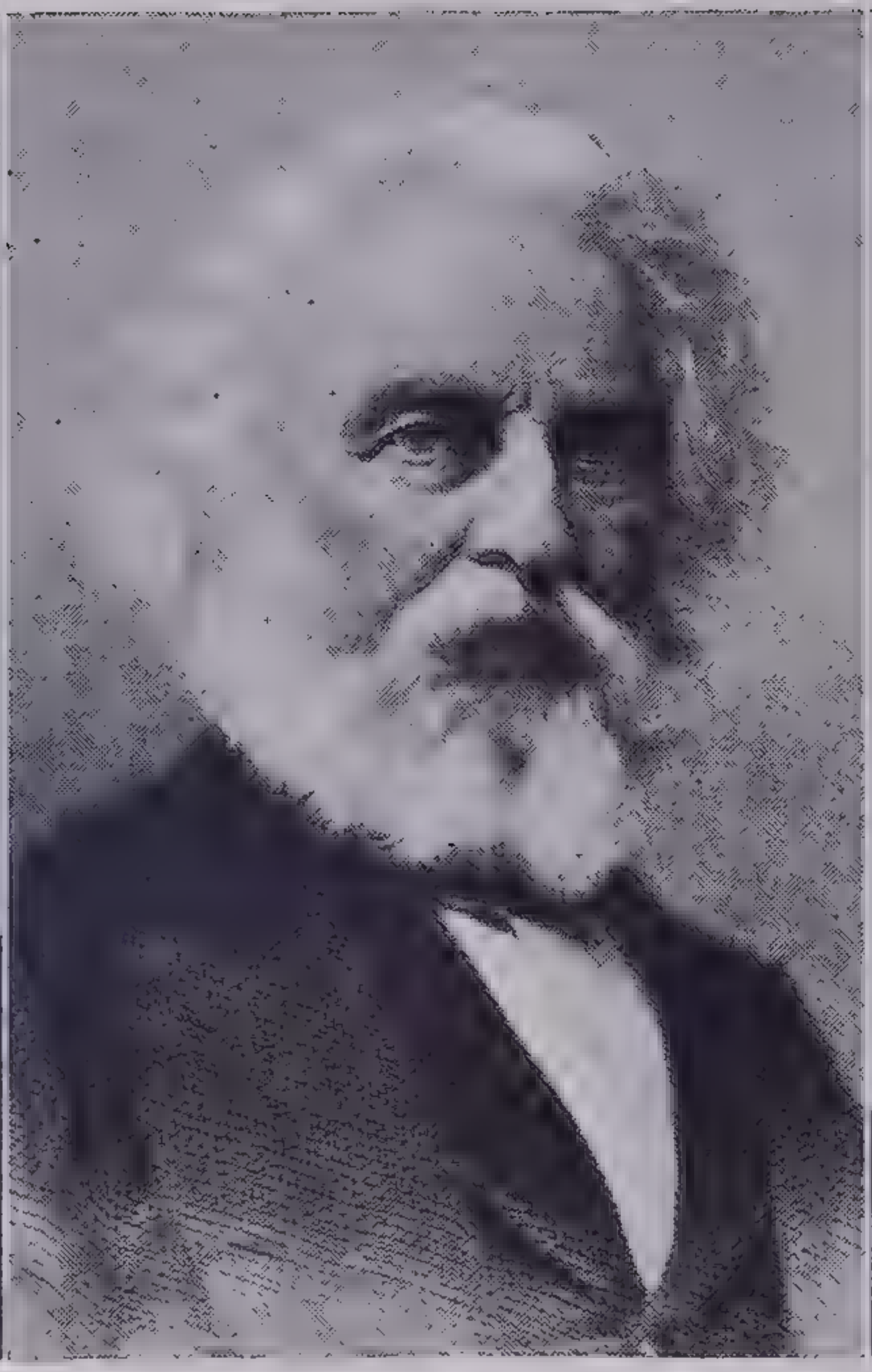
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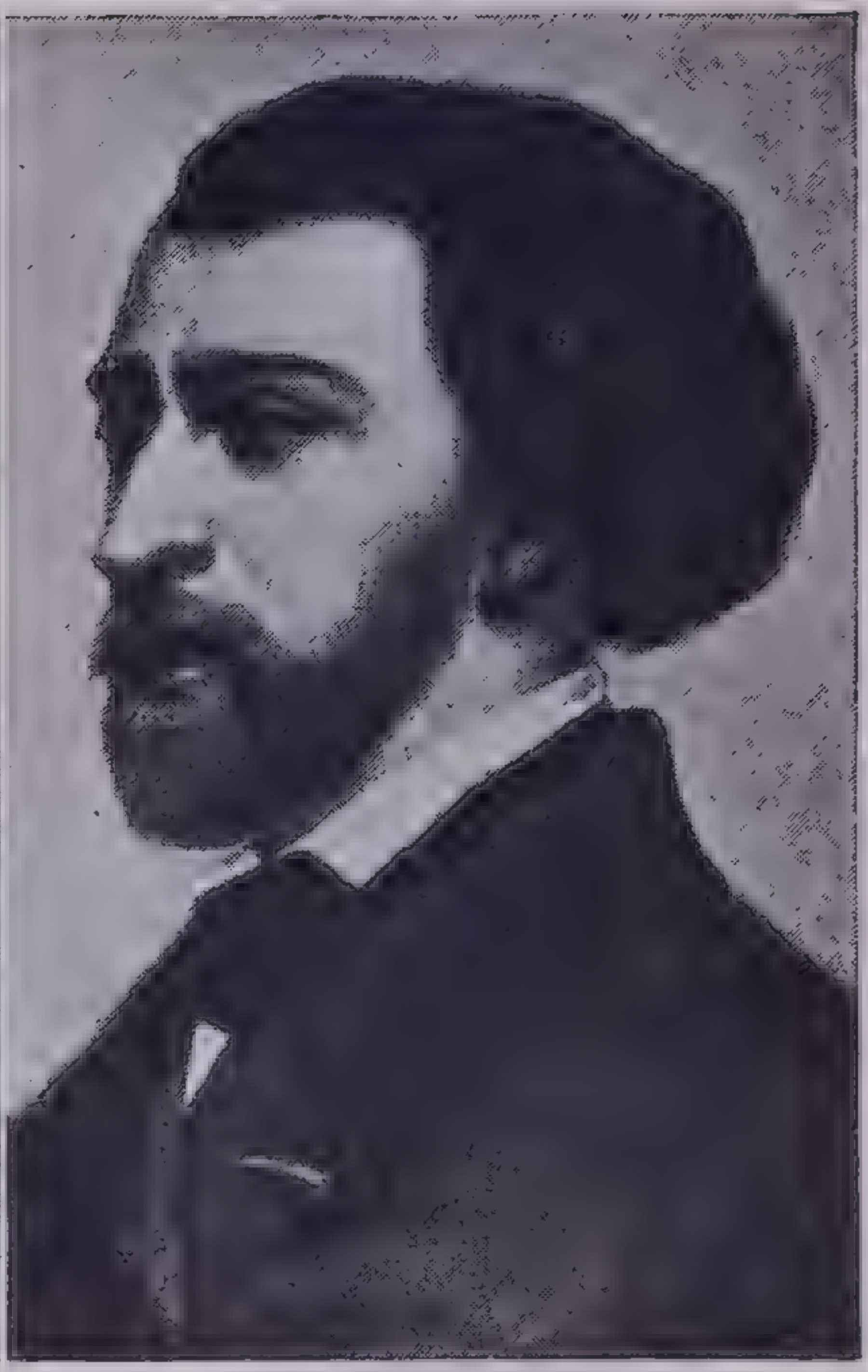
(1807-82) United States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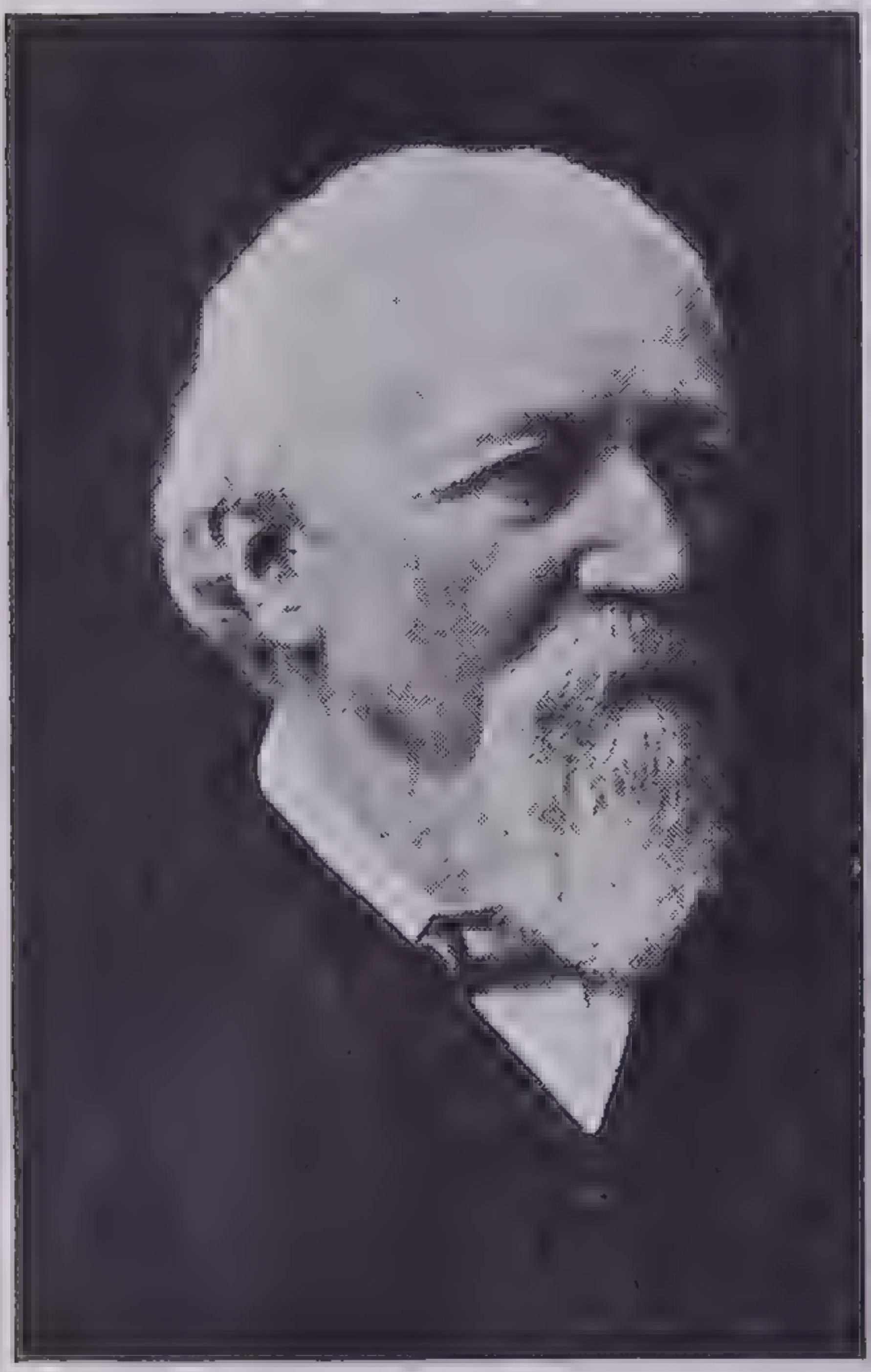
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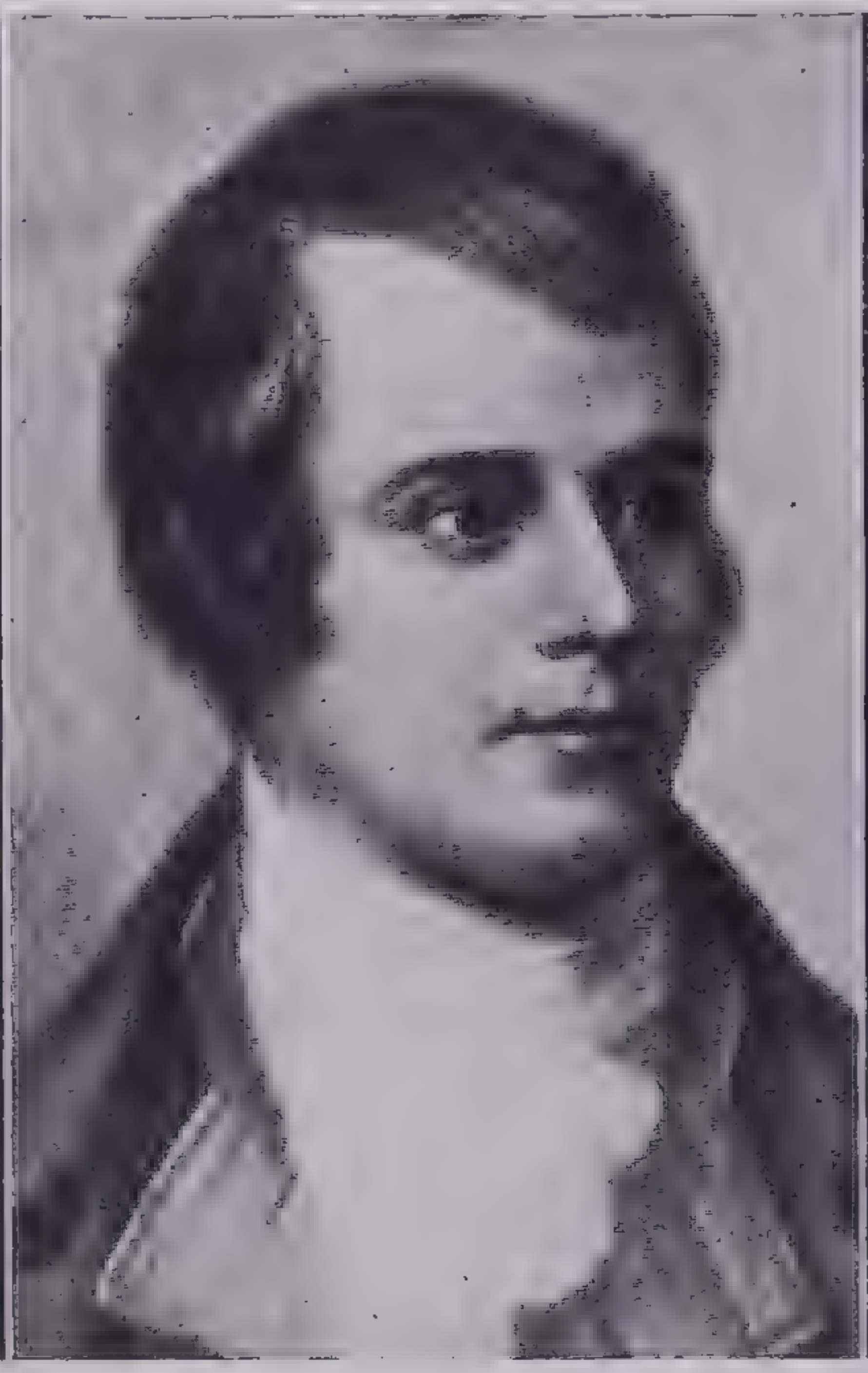
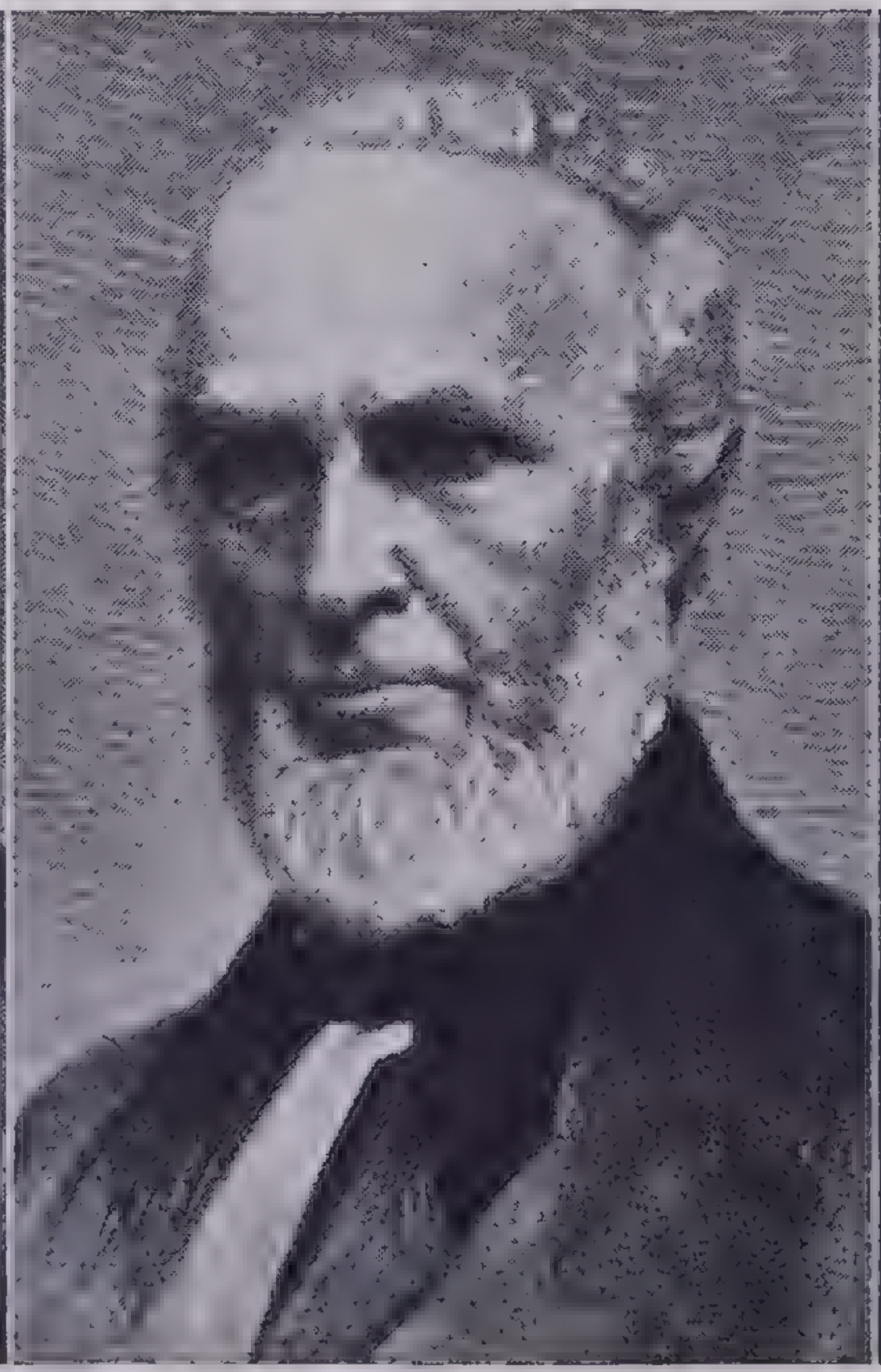

Robert Burns (1759-96)
Scotland

Johann Wolfgang von Goethe
(1749-1832) Germany

Dante Alighieri (1265-1321)
Italy

Aleksandr Pushkin (1799-1837)
Russia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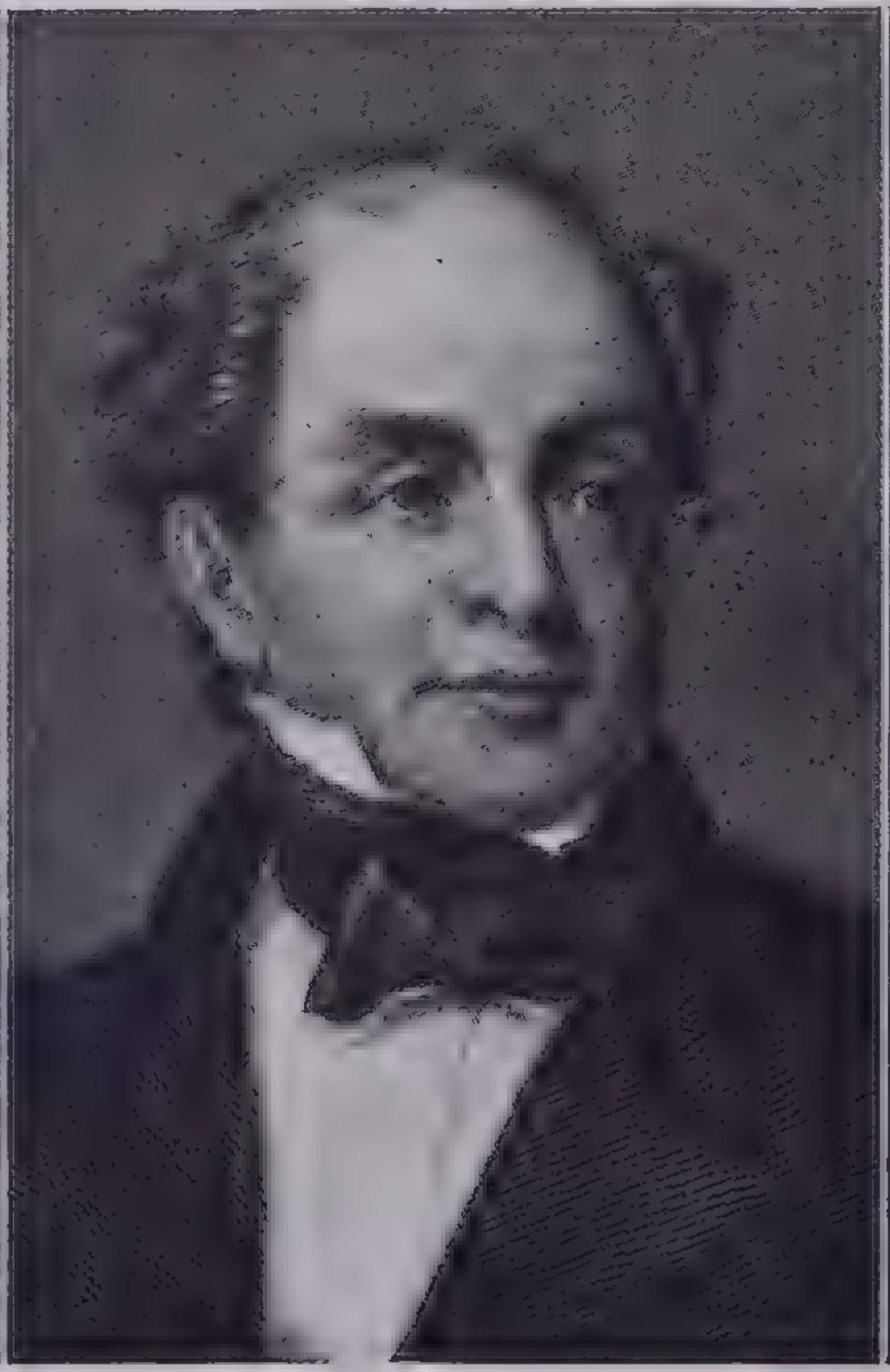
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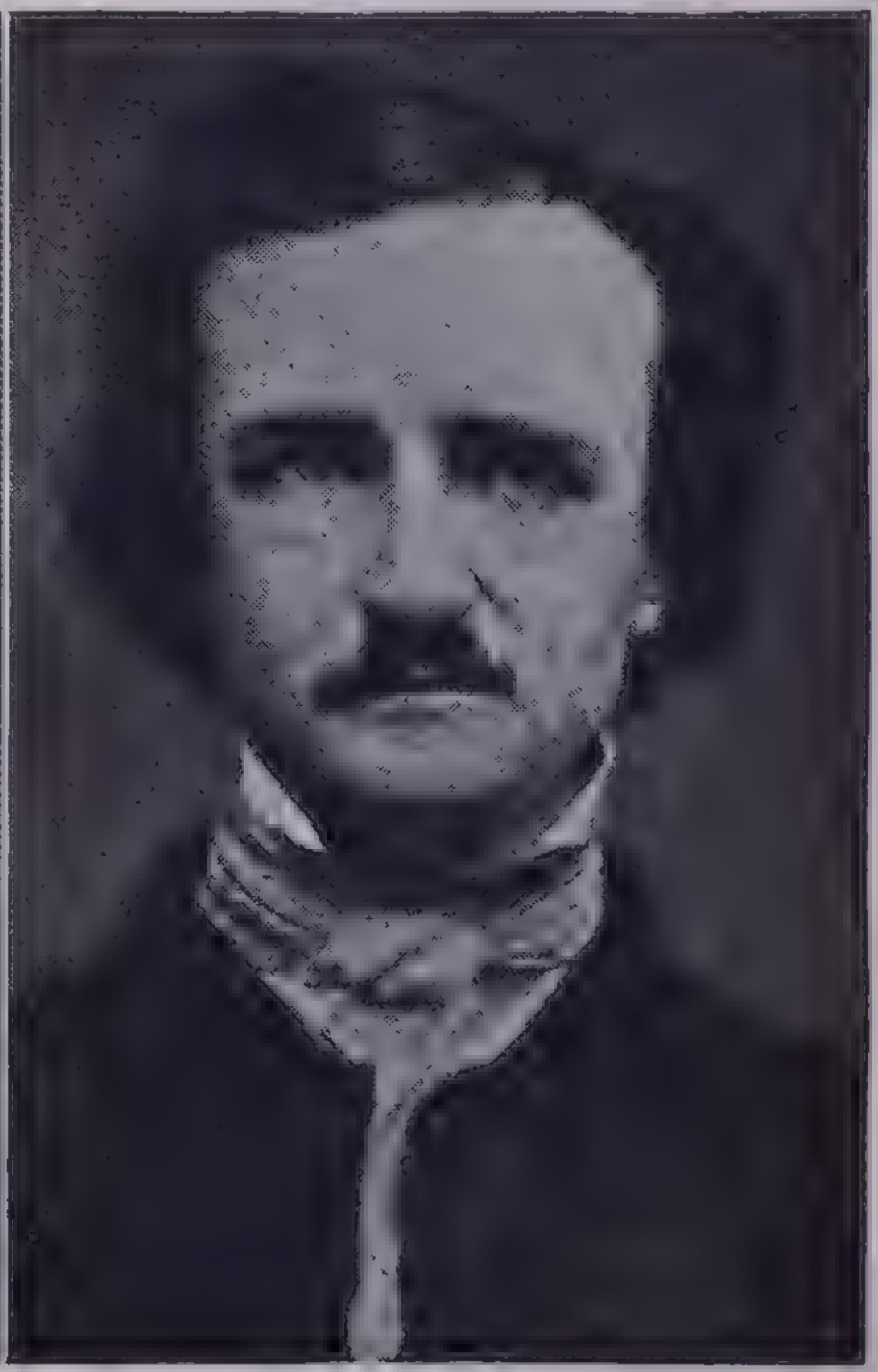
Ireland


Edgar Allan Poe (1809-49)
United States

EUROPEAN AND AMERICAN POETS

ence; and he might have been in a fair way to transplant the Old comedy of Athens to the Roman stage, but his pointed allusions to men and affairs were displeasing to the governing class and he was first imprisoned, then exiled. As an exile he wrote in Saturnian rhythm an epic on the First Punic War, in which he had served.

Plautus.—A bent toward a national literature was shown also by T. Maccius Plautus (active 204–184 B.C.). Twenty of his plays, all that Roman critics thought genuine, have survived, making him the first Roman writer whose works we have in anything like their original extent and form. Plautus came up to Rome from an Umbrian village and, like Shakespeare, was for a time employed around the theatre. His comedies held the Roman stage until the time of Diocletian and were widely popular. They give us a good idea of what the *fabulae palliatae* really were like. Plautus followed the Attic New comedy but was careful to avoid the displeasure of the authorities. He used what may strike us as a very artificial convention. The life he pictured was quite remote from that of Rome. Scenes and characters were Greek, and the characters were derived from what already were stock figures of Greek playwrights. At the same time there were constant allusions to Roman localities, manners and laws; and mingled with borrowed words is the colloquial speech of the author's own place and day. The best of Plautus' works, though lacking art, have comic vigor, lively dialogue (sometimes interlarded with puns) and amusing episode. St. Jerome, after weeping for his sins, turned to Plautus for relief; and the early Renaissance discovered in the Plautine drama a treasure-trove of material. Among the titles are *Aulularia, Captivi, Menaechmi, Miles Gloriosus, Rudens and Trinummus.*

Quintus Ennius.—Plautus traveled but a short way in the direction marked by Naevius; and Quintus Ennius (239–169 B.C.) decided for all time the victory of Greek influence in Latin literature. He was a Calabrian from Magna Graecia, a section of Italy in which were important Greek colonies and where Greek became perfectly familiar to him. A veteran of the Second Punic War, he settled in Rome in 204 B.C., taught Greek and Latin and devoted his best energies to the spread of Greek culture. He was perhaps the most learned man in Rome at that time. The comedies he wrote were of slight value, but the few hundred lines remaining of at least 25 tragedies have led scholars to ascribe to him in this field both eloquence and pathos. More significant was his *Annales,* in which he attempted a national epic on the Homeric pattern but covered altogether too much territory and so failed of an artistic result. He broke from the Saturnian meter and yoked Latin to the Greek dactylic hexameter, which from that time definitely replaced the other. It was rough going, but the poem (of which we have about 600 lines) had a kind of austere dignity and helped to establish rules of good usage for Latin pronunciation.

Cato.—Latin prose is usually said to have begun with M. Porcius Cato 234–149 B.C.), the very same exclusive bigot that ended every one of his speeches before the senate with *Delenda est Carthago* ("Carthage must be destroyed"). He long fought any Greek cultural influence and not until his old age did he learn the Greek language. It was then he began work upon his *Origines* (Origins), in which he traced the early history of the Romans and other Italian tribes and then sketchily brought events down to his own time. It was pointed out by contemporaries that the author made some display of his knowledge of Greek etymologies and sought to connect Rome historically with Greece. Cato also published speeches, and these were highly praised by Cicero, whose own style was utterly different. Only his *De Re Rustica* (On Agriculture), a treatise on farming, has reached us, and that not exactly as he wrote it.

Terence, Caecilius and others.—Caecilius Statius (c. 195–168) translated Menander straight, without trying to insert material of his own or from other comedies. Of Caecilius we have only fragments. Of Terence (P. Terentius Afer, d. 159 B.C.) we have all that the ancients had—six comedies, four of which are derived from Menander. The *Andria* (produced in 166 B.C.), his first play, was as characteristic as any of the later ones, which include the *Phormio* (162) and the *Adelphi* (160). Terence was inferior to Plautus in comic power but superior in plot construction, logical character development and smoothness of dialogue. Less popular with the theatregoing public, he was more highly esteemed by fastidious readers. The life he depicted was strictly Greek with none of Plautus's excursions into Roman manners or local touches. His method is rather that of what the moderns term sentimental comedy, never profound but ordinarily urbane. During the Middle Ages he was read and was taught in schools. In modern times, writers on drama studied his technique, as did Lessing, for example, in the *Hamburgische Dramaturgie.*

Contemporary with Terence was Marcus Pacuvius (*c.* 220–130 B.C.), a writer of tragedies, some from the Greek, others in the style of the *fabulae praetextatae* that Naevius had invented. The epithet *doctus* (learned) was applied to him, and he was praised for his elevated tone. Somewhat later was Lucius Accius (170–*c.* 85 B.C.), with whom the young Cicero frequently talked. Accius was sometimes inclined toward post-Euripidean tragedy, maintained upon the contemporary Greek stage; sometimes he used older material already presented by Ennius; but experts seem to agree that he left tragedy no further advanced. Despite the attention then paid in Rome to rhetoric, philology, criticism and literary history—Accius himself wrote in verse on such things—Latin tragedy had in form remained far behind Latin comedy. It was not with tragedy that the Romans were to achieve notable things in serious verse.

Of the 30 books of the *Satires* of Gaius Lucilius (*c.* 180–102) there remain only something like 1,000 fragments, mostly couplets or isolated lines. In the opinion of scholars, the loss is much to be regretted. For here was the work of the founder of what has been considered the most truly original and distinctive expression of Latin literature. Written chiefly in hexameters, these satires (the word *satura,* according to the grammarians, meant originally a mixture or medley) were outpourings on this and that: on a trip to Sicily (model for Horace's well-known trip to Brundisium); on poets, and especially dramatic poets; on Roman society, the state, the author's political opponents. Carelessly done, loquacious, unpoetical, they suited a certain old-fashioned Roman taste.

Annalists such as L. Calpurnius Piso went ahead with their compilations, but there was an example of something better in L. Caelius Antipater's account of the Second Punic War. Cornelius Sulla and other public men wrote memoirs. L. Aelius Stilo, a teacher of Cicero, issued studies in philology, and Mucius Scaevola explored the mazes of the law. Only in oratory, however, did Latin prose really flourish at this time. Since Cato's day, oratory had developed greatly. Public men studied it, with Greeks at first for teachers and with Greek exercises. Afterwards Latin schools were opened. At the time of the revolution of the Gracchi, political speeches were revised and used as pamphlets in the factional war. Among the writers of oratorical prose in this era were Gaius Laelius, P. Scipio Aemilianus, Gaius Gracchus, Marcus Antonius and Lucius Crassus. If more had endured of this prose than scattered fragments, we should be able to traverse the development from Cato to M. Tullius Cicero (106–43 B.C.).

Cicero.—To enter here into the much-discussed personal history of Cicero (so large a part of which is also part of the history of Rome) would be as unnecessary as it is impossible. In the chaos that ended the Roman republic he was, if not always consistent, a figure essentially nobler than those about him: a man who sought to avert the evil day and who deserved better of his country than to have his severed head and hands nailed up in the Forum. We can but wish that this humane scholar might have fallen on a less brawling age. Cicero's position in both Latin and general literature has been firmly established. As a prose stylist, he brought Latin to a point it never surpassed. He enriched its straitened vocabulary and coined for it many words, chiefly by translating them from Greek or by copying Greek forms. He took its cramped phrases and made them full, easy, even rhythmical. Its churlish obscurity he transformed into an abundant clearness. He showed that it might have not simply blunt vigor but also an air of good manners. More than this, he invented a prose that is still so readily discernible in living speech that it has been termed the language of civilized mankind.

First of all, Cicero was an advocate, a pleader. That fact led to his political career, and it is a reason for considering his speeches before his other writings. As a rule, these speeches were delivered, if they were judicial, before a jury in a court of inquiry (*quaesitio*); if political, before the senate or the people. Later, they were written out by Cicero from his notes. A few were issued without having been delivered at all. His invective in the tradition of Demosthenes (he had studied Greek eloquence at Athens and Rhodes) was sometimes highwrought but not too much so for Roman liking. In private life he was thought a great wit, but his fondness for joking in public was criticised, just as modern politicians have been criticised for the same thing; and even his pathos was scórned by his adversaries. Leaning in his own views toward the skeptical New Academy, Cicero wrote transcriptions of the Greek speculative philosophy; These were dialogues, in which the followers of various schools expounded their beliefs. In the same fashion he treated of moral and political philosophy, but with illustrations from Roman life and history. These works furnished handbooks for the Romans on the various subjects, and they have continued to be read for their charm of style. In numerous books on rhetoric, Cicero deals with the education of an orator; the subject matter, form and delivery of speeches, the history of Roman oratory and the character of an ideal public speaker. We have some 800 letters of Cicero (a few are *to* him), and the collection gives us a portrait of the man himself and our chief source for the history of the period.

Fifty-eight of Cicero's orations have survived in complete, revised form, and there are fragments of 17 others. Of these the *Pro A. Licinio Archia* (61 B.C.) in defense of an old Greek poet's claim to Roman citizenship is doubtless the most pleasing, though the four *In Catilinam* (63 B.C.) made more noise. The dialogue *De Senectute* (Old Age) has probably been the most read of all the Ciceronian writings. Other works in philosophy were the *Hortensius,* which directed Augustine's thoughts to the serious life, the *De Officiis* (Duties), and the *De Republica,* containing the famous Scipio's Dream, paraphrased by Chaucer in the *Parliament of Foules.*

Varro, Caesar and Sallust.—M. Terentius Varro (116–27 B.C.), a contemporary prose writer, evidently did not profit much by Cicero's labors. Of his works we have a small part of a crabbed treatise *De Lingua Latina* (The Latin Language) and the *De Re Rustica* (Agriculture). Augustine drew upon Varro's *Antiquitates* (Antiquities) for the *City of God.*

While he was crossing the Alps Julius Caesar (100–44 B.C.) wrote a study of the Latin language and dedicated it to Cicero. This, with other writings of his, has been lost. We have his account of the Civil War (to the beginning of the war at Alexandria) and his *Commentarii* (Notes or Memoranda) on the Gallic War, written to persuade the Romans that the conquest of Gaul was a necessary defensive measure. Calculated simplicity of language and an appearance of utmost candor make of this in one sense a work of art, although from its cloak of reserve the vanity of the man at times peers out.

C. Sallustius Crispus (86–36 B.C.) broke away in his *Catilina* and in *Iugurtha,* an account of the Jugurthine War, from the cut and dried style of the annalists and sought to be another Thucydides. Like some English-writing historians and biographers of our own day, he put into the mouths of historical persons words for which he had no record whatever and to those persons ascribed motives and notions for which he had no evidence. Cicero's style may have been somewhat lavish; Quintilian remarks (X,1,106) that not a word could be added to a Ciceronian period, but he also says (IV,2,45, and elsewhere) that Sallust's tightness and abruptness make him difficult for the general reader.

Lucretius.—In a letter written in 55 B.C., Cicero mentions a poem *De Rerum Natura* (The Nature of Things), published not long before. T. Lucretius Carus (98–55 B.C.), a student of Epicurus, wrote in hexameters this interpretation of the Epicurean system, which he hoped thus to make more intelligible and attractive, and through which he believed men might be freed from superstitious dread. It was a heroic task. As poetry the work is extremely uneven, keeping through long passages at a prosy dead-level, then suddenly rising to full-voiced beauty of description, like Wordsworth's, or to some burst of insight. Vocabulary and style are considerably archaized, and the influence of Ennius is seen. In modern times, Lucretius has been hailed as a scientist and compared to Leonardo da Vinci or Sir Isaac Newton. Henry F. Osborn (*Men of the Old Stone Age,* 1916) quotes freely from Lucretius regarding primitive man. It is safe to say that, with all its defects, this is the greatest of didactic poems. Familiar words of Lucretius are: "What is food to one man may be fierce poison to others," and "Continual dropping wears away a stone."

Catullus.—Quite a different sort of poet was Valerius Catullus (87–c. 54 B.C.), a provincial from Verona, town of the Montagues and Capulets. In his way, he was learned enough. He had studied the Alexandrian Greeks, especially Callimachus; he knew Greek mythology; he could attempt the rare and difficult galliambic meter. Better, however, than his translations and copies of Greek originals are the lyrics, full of naturalness and with a "clearness as of the terrible crystal," whatever their theme or mood. Contemptuous, rueful, tender or gay, always he has that forthright simplicity. Of the moderns, Burns has been compared to him, and in insolent satire there is a strong resemblance; but Heine is far nearer to being a counterpart. There are poems to Clodia, graceless specimen of a moneyed aristocracy; and to his country home on Lake Garda; verses of occasion, and generous expressions of sympathy; 10 faultless lines at his brother's grave—one of the best-known pieces of Latin literature; cameolike squibs; outbreaks of high disdain toward the powers-that-be.

Here are Catullus's lines at the tomb of his brother.

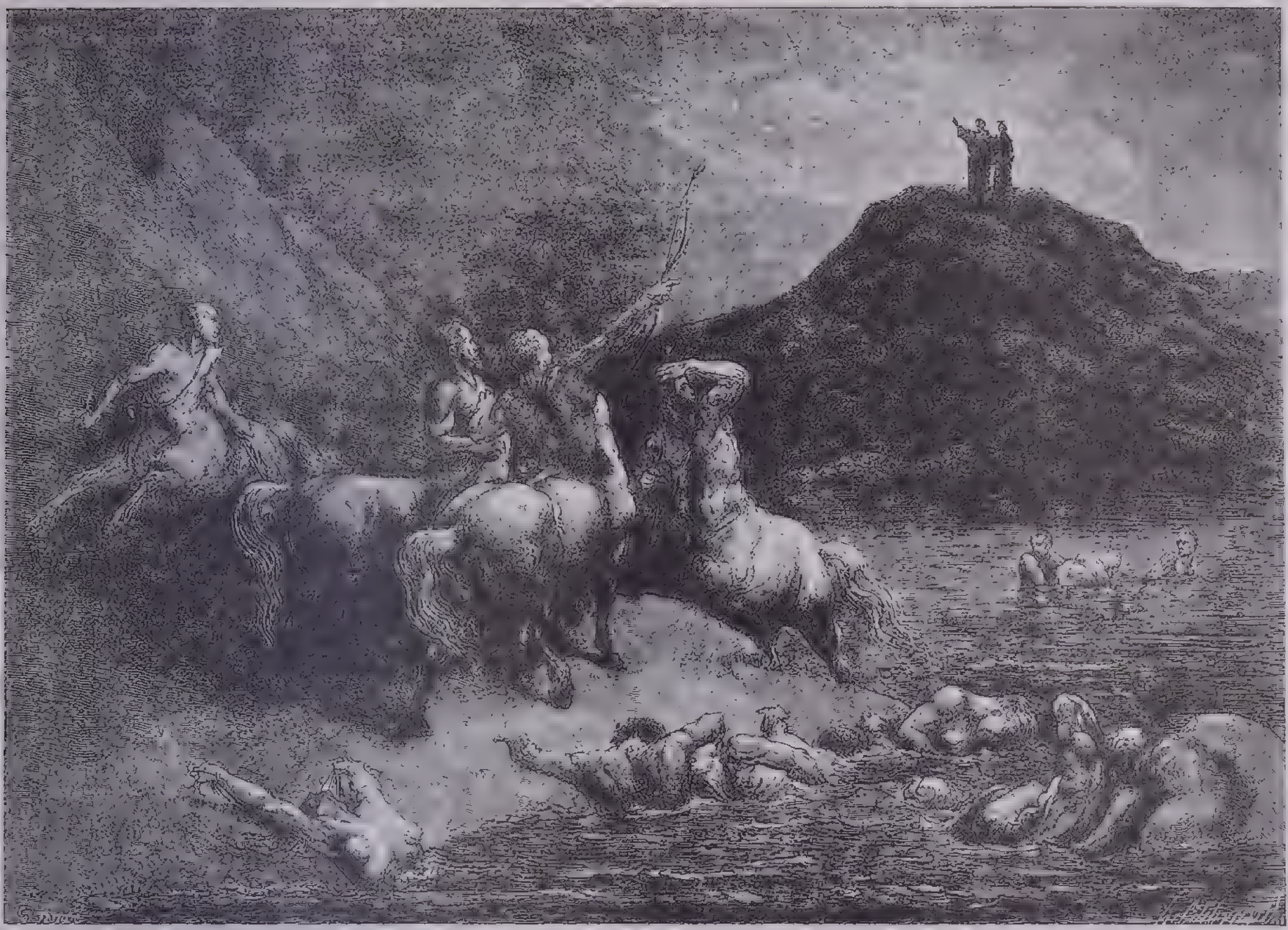
Multas per gentis et multa per aequora uectus
  aduenio has miseras, frater, ad inferias:
ut te postremo donarem munere mortis
  et mutam nequiquam alloquerer cinerem.
quandoquidem fortuna mihi tete abstulit ipsum,
  heu miser indigne frater adempte, mihi,
nunc tamen interea haec prisco quae more parentum
  tradita sunt tristi munere ad inferias,
accipe fraterno multum manantia fletu,
  atque in perpetuum, frater, aue atque uale.

These Latin verses have been translated for the Volume Library as follows:

Through many lands and over many a sea,
  Brother, I come fulfilling grievous trust,
The final tribute thus to render thee
  And call in vain upon thy speechless dust,
Since fate has claimed thee undeservedly
And death has torn asunder thee and me.
So now the gifts our fathers brought of yore,
  Memorials of those beloved when living,
  These, drenched with tears, I give to thee; and giving,
I bid thee hail—farewell—for evermore!

Vergil.—We pass now from the Ciceronian to the Augustan age and to other outstanding names in Latin poetry—first of which is that of Vergil (P. Vergilius Maro, 70–19 B.C.), who might be called the poet laureate of the new emperor. Vergil was from near Mantua and hence like Catullus a provincial. He studied Epicurean philosophy and first became known in Rome through his *Bucolics* (or *Eclogues*), 10 pastorals of no great length—echoes, often paraphrases, of Theocritus and the Alexandrian school in general. Shepherds with Greek names inhabit now Lombardy, now Sicily and Arcadia; their songs or contests are mingled with thinly disguised references to Roman politics and Vergil's contemporaries. The hexameter is used with a variety and delicacy new to Latin. One of the *Eclogues* (the fourth, addressed to Pollio) made a great impression in Christian times because, with imagery often surprisingly like that of Hebrew writers, it proclaimed a golden age akin to that of Messianic prophecy. Pope's *Messiah* is a sacred eclogue in the style of Vergil.

Vergil was introduced at court; Maecenas, minister of Augustus, became his patron. It is said that



From a drawing by Gustave Doré

The Divine Comedy: Dante and Vergil Encounter the Centaurs in Hell

"... I beheld
An ample foss, that in a bow was bent,
As circling all the plain; far so my guide
Had told. Between it and the rampart's base
On trail ran Centaurs, with keen arrows arm'd,
As to the chase they on the earth were wont.

... Around
The foss these go by thousands, aiming shafts
At whatsoever spirit dares emerge
From out the blood, more than his guilt allows. . . ."

—Canto XII (Henry Francis Cary, trans.)

Maecenas gave Vergil the idea of the *Georgica* (Georgics), an agricultural poem in four books, often regarded as his most original and inventive work. In it he drew from no particular author, although here and there the influence appears of Hesiod, Theocritus, Ennius and Lucretius. It is didactic, evidently intended to glorify the labors of country life and promote Italian agriculture. But it presents sympathetically the pleasures and rewards of country life and extols the character of the old yeomanry; and in its incidental descriptions and passages it succeeds in being as entertaining as any poem of such nature and range may hope to be. The versification is skilful and melodius. To the *Georgics* Vergil had devoted seven years; to his next work, *The Aeneid,* he gave the remainder of his life. This is a kind of Latin *Odyssey,* telling of the wanderings of Aeneas after the fall of Troy, and how eventually he reached Italy and established a new realm. Of the 12 books, the first 6 are the most interesting, and the sixth shows the poet more independent of Homer than elsewhere and at the top of his artistry. In versification, indeed, one turning from the Vergilian hexameter to that of the Homeric poems is likely to feel the technical superiority of Vergil, whom Tennyson called "Wielder of the stateliest measure ever moulded by the lips of man." There is, too, a fusion of philosophy with narrative, of pathos with conflict, that gives Vergil a charm all his own. Uncompleted lines mark the fact that Vergil did not live to revise this epic. The guide of Dante in the lower world, Vergil was for the Middle Ages the poet of poets. In popular tradition he became a magician, the center of strange lore.

Horace.—With Vergil's name that of his friend and coworker Horace (Quintus Horatius Flaccus, 65–8 B.C.) is naturally associated. Horace wrote *Satires,* which according to our later usage, were not satirical (they were even less so than those of Lucilius had been) but rather *causeries* on a variety of topics, with the hexameter treated somewhat informally; and *Epistles,* lifelike pictures of Roman society and seasoned comment on Roman life, mingled with practical maxims on human conduct. Even better known are his *Carmina* (Odes), in which he displays a facility in Greek lyric meters not equalled in Latin literature. These *Carmina* include some *vers de société,* probably no more heartfelt than its countless imitations have been; but most of them reveal courtesy, good humor, kindliness and a certain mellow sagacity, the combination of which has made Horace a favorite in modern times as well as in his own day. He does not scale any idealistic heights but within his limits he is good company. No other Latin poet has been more translated, copied and alluded to in English literature.

Elegiac Poets; Ovid.—The elegy, a personal form without social implications, was in vogue during the later portion of Augustus's reign. The representatives of this elegiac school were Albius Tibullus and Sextus Propertius. Quintilian thought Tibullus especially correct and elegant, though he admits that some chose Propertius (X, 1, 93). In Tibullus there is, to be sure, delicacy and refinement; but these are certainly not the strong points of Propertius, who, though decidedly more original than Tibullus, is often pedantically heavy and obscure. Not so Ovid (Publius Ovidius Naso, 43 B.C.–17 A.D.), whose facile readability appealed to many who found Lucretius, Vergil or Horace too arduous. As late as Elizabeth's more or less spacious days, Ovid was greatly admired by English readers. The best of him is contained in the *Epistolae Heroidum* (Epistles of Heroines) and the Metamorphoses, but even at his best his surface brilliance cannot hide his shallowness.

Livy, Seneca and Other Prose Writers.—Best of Augustan prose writers is the historian Livy (Titus Livius, 59 B.C.–17 A.D.), whose *Annales* covered the history of Rome from the founding of the city to 9 B.C. Of its 142 books, 35 have been preserved. As a historian he was, even judged by the standards of his day, remarkably lacking in anything like scholarship, but his style has been called by one modern writer, H. A. J. Munro, the finest prose ever written.

With the Claudian period we enter that later time when Latin Literature became to so large an extent mere rhetorical exercise. Gatherings were held for the purpose of hearing authors read extracts from their books. Lucius Annaeus Seneca (3–65 A.D.), for a while preceptor of Nero, and last great representative of Stoic philosophy is important. He was a writer of great interest to the early Christians. His *Moral Essays* (On Providence, On Tranquility of Mind, On Happy Life and others) are full of substance. The prose departs from the periodic structure of Cicero's, being more broken and direct. The *Satiricon* of Petronius (T. Petronius Arbiter) is a curious medley of a book, best known for the episode of "Trimalchio's Dinner." It has been a leading source of knowledge of the *sermo plebeius,* or common speech, of Rome. The *Pharsalia* of Lucan (M. Annaeus Lucanus, 39–65 A.D.) is an epic on the war between Pompey and Caesar; in spots it is rhetorically effective but not to be mentioned with *The Aeneid.* Aulus Persius (34–62 A.D.) wrote satires, full of borrowings from Horace, in a style that has been likened to what the later Carlyle's might have been, had Carlyle written in verse; but marked by Stoic earnestness. Pliny the Elder (23–79 A.D.), who died in the eruption of Vesuvius, compiled a *Natural History* almost wanting in literary value but crammed with miscellaneous information.

Quintilian (*c.* 35–95 A.D.) in his *Institutio Oratoria* (The Training of the Orator) embodies much sensible literary criticism in readable form. In its tenth book it has a survey of Greek and Roman authors. It was Martial (M. Valerius Martialis, d. 102 A.D. ?) who gave to the *epigram* its present connotation of pointed wit; the Greek epigram was more inclusive. His highly-polished lines dealt crisply with the surface life of his own day.

Tacitus, Juvenal, Pliny the Younger and Others.—One of the leading historians of all time was Cornelius Tacitus (*c.* 55–116), whose *Agricola* and *Germania* are studies, respectively, of the life of his father-in-law and of the geography of Germany and the life and customs of its tribes. His *Historiae* and *Annales* have come down in very incomplete form but we have enough of them to know that for strength and dramatic vividness (especially in the Annales) few historians in any language are his equals. Juvenal (Decimus Junius Juvenalis, *c.* 55–*c.* 130 A.D.) in his satires is a savage moralist comparable to Dean Swift. Samuel Johnson's *London,* which first made him known as a man of letters, and his *Vanity of Human Wishes,* are both imitations of Juvenal. The letters of Pliny the Younger (Plinius Caecilius Secundus, 62–113 A.D.) show us a different side of Roman life, taking us among gentlefolk of culture and good taste. Those sent by Pliny, when he was governor of Bithynia, to the Emperor Trajan, give us an understanding of Rome's provincial administration. One of them (with the emperor's rescript) throws light on Rome's attitude toward the early Christians and its treatment of them.

This review of classical Latin literature closes with Suetonius (Gaius Suetonius Tranquillus, *c.* 75–*c.* 150 A.D.), whose *Lives of the Caesars* abound in biographical detail supplementary to the work of Tacitus and all sorts of unedifying gossip; and Aulus Gellius (second half of the 2d century), whose *Attic Nights* is a booklover's melange of antiquarian lore, grammatical discussions and literary chitchat.

ENGLISH LITERATURE

The great periods of English literature are practically the same as the major eras of English national expansion and development; both have the same continuity of growth and the extent of the influence of English literature may be measured by the far-flung reaches of the nation and of the language itself. In that influence we see those alert and vital characteristics that have made the Anglo-Saxon a symbol of culture and progress and given him the enterprise to carry his colonies and intellectual gifts to the ends of the earth.

In the beginning of this wide span of English literature, the first impetus to learning and the pursuit of letters was given by King Alfred the Great, who ruled from 871 to 901. After the lapse of several centuries the works of Chaucer represent a period of marked social reform in the reign of Richard II (1377–98). Another whirl of the wheel of time and the great dramas of Shakespeare are the literary expression of the cultural and political influences of the Renaissance felt throughout the civilized world during the reign of Queen Elizabeth (1558–1603). Milton very clearly typifies the reaction of the period of reform that swept England under the Commonwealth (1649–60); and Dryden, Addison and Steele represent the era of criticism and comment, influenced by French thought, that followed the Restoration of Charles II (1660–85).

Less than a hundred years afterwards, the spirit of Romanticism dominated English literary expression during the reigns of the four Georges (1714–1830), especially in the poetry of the Lake School and in Scott's novels. The distinguished Victorian authors—Tennyson, the Brownings, Thackeray, Carlyle, Ruskin and many others—show the trend of the social, political and ecclesiastical life of that reign (1837–1901), which, however, held the seeds that were to be sown and come to flower in the sharply contrasting manners and thought of the 20th century, with its brilliant and varied writers from Wells and Shaw to Maugham and Masefield.

Broad Survey.—For convenience in considering English literature, it may be roughly divided into four broad periods: Anglo-Saxon or Old English, 450–1100; Middle English, 1100–1550; Modern English, 1550–1900; and 20th Century. These periods may be subdivided into others for the sake of emphasizing the developments of certain special periods, such as the Norman Conquest and the Renaissance.

Britain has been the home of several races, all Indo-European, each contributing something to the English language. The Celts or Britons, who were in Britain when the island first became known to the civilized world through Caesar's Roman invasion (55 B.C.), are traceable through fewer than a hundred words in the language; they include those ending with *don,* from Celtic *dun,* a fortress, as in *London.* The Celts' descendants still inhabit Scotland, Wales, Ireland and parts of England. The Romans left ruins that still supply mute testimony of their occupation—roads, villas and baths; a few of their words were retained, notably *chester* (found as part of many names of places), from the Latin word *castra,* or camp. Then came the Teutonic invasion by Angles, Saxons and Jutes; and from Anglo-Saxon speech the English language developed its sturdy root and branch upon which Norman speech was subsequently grafted.

Anglo-Saxon or Old English Period, 450–1100.—As these adventurers from the Continent were without the art of writing and had no literature, they depended instead upon their minstrels' songs, which passed from generation to generation as unwritten legends; but as a written language was gradually developed, these minstrels' works were written and preserved. They were rudely metrical and highly poetical.

Many of these old song manuscripts are in the British Museum, London, among them *The Fight of Finnsburg, Doer's Lament, Widsith* and *Beowulf,* the most notable of this early verse. *Beowulf,* an epic poem more than 3,000 lines long, contains episodes of dramatic interest expressed with force and beauty in rhythmical and alliterative language, simple and yet powerful in its use of images and figures of speech. The following lines (slightly modernized), describing the abode of Grendel and his mother, are typical:

> They dwell in a wilderness by wolves haunted,
> Where the fen-path winds in windy headlands
> And the mountain waterfall is mist-shrouded.

Christian poetry by Caedmon and Cynewulf, the rustic authors, was the next contribution to early English literature. Caedmon, an unlettered herdsman in a monastery, had a strange dream, in which a voice commanded him to sing "the beginning of created things." He at once began to recite in verse form the story of creation, the history of Israel and the coming of Christ. He told his strange story to the abbess, who declared that "heavenly grace had been bestowed on him," and that night in the great hall had him repeat word for word what he had chanted by command from the strange voice. Caedmon died about 680, and his poem was the first attempt to put the story of the Bible in language that the common people of England could understand.

Cynewulf, the first English poet who wrote on separate religious subjects, is the author of *Christ,* a devotional, allegorical poem; *Elene,* a story of finding the true cross; *Juliana,* a saint's legend; and *Judith,* the Bible story of the killing of Holofernes.

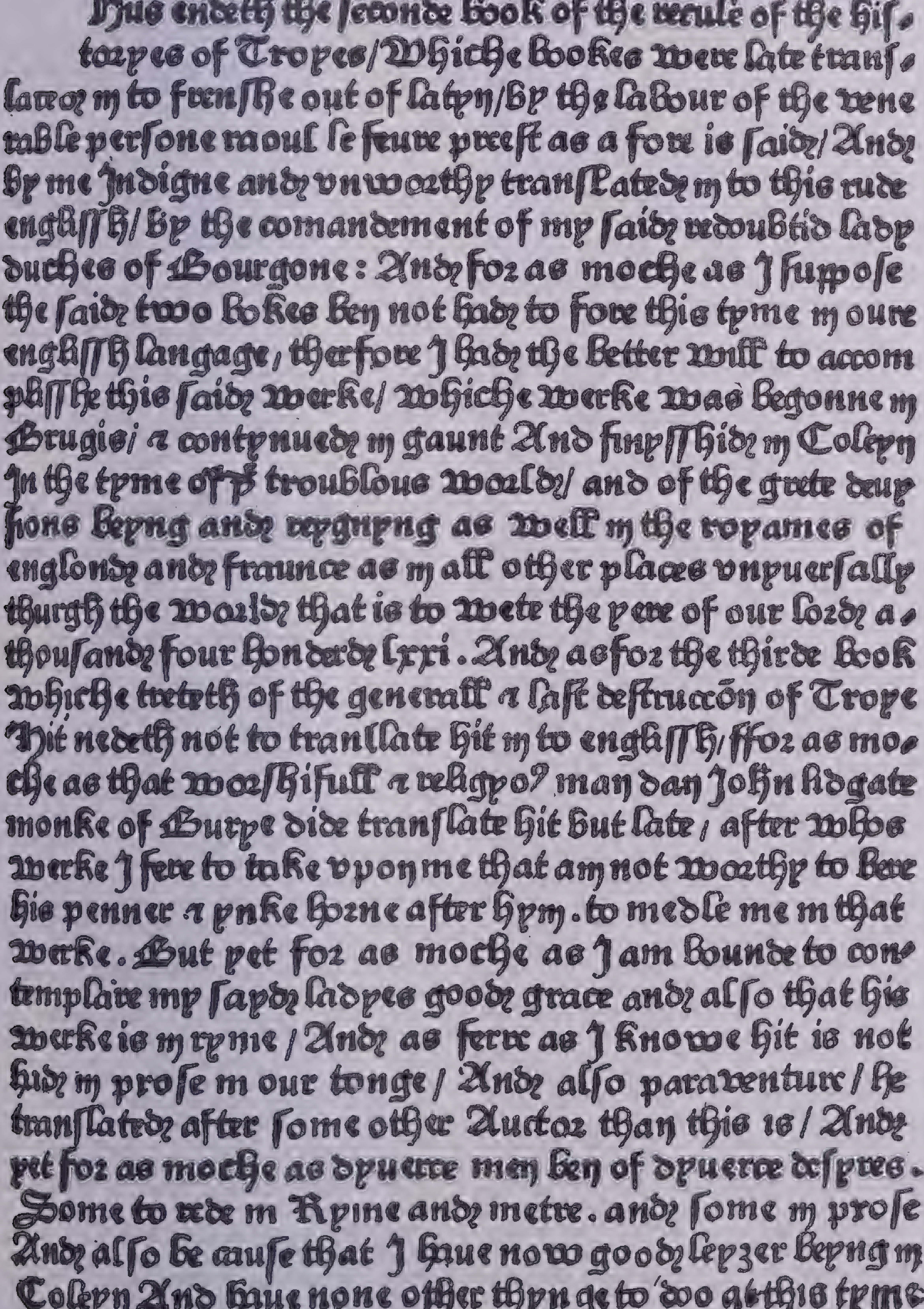
The Venerable Bede wrote in priest's Latin the *Ecclesiastical History of Britain.* King Alfred was the force behind the scholars who translated from Latin Bede's *History* and Boethius's *On The Consolation of Philosophy* into the everyday English, or Anglo-Saxon, of the period. Alfred established schools so that the youth could learn to "read the new English tongue perfectly," and he has been called the "Father of English Prose" because he encouraged the use of everyday English and because he collected the *Anglo-Saxon Chronicles,* histories that had been written in different parts of the country at different times. The great part of these Chronicles as we now have them tells the story of England before Alfred's own time. Later continuations carried it on to 1154.

The Norman Conquest, 1066.—The Norsemen, kinsmen of the Danes who were harassing England, had settled in the northern part of France, which was called Normandy after them. They quickly adapted themselves to the language and civilization of northern France and began to make themselves felt as a great power. Under Duke William late in the 11th century they looked around for new lands to conquer and found England the least powerful and most unprotected prey.

William therefore crossed the English Channel and after defeating King Harold of England on the field of Hastings (1066) was hailed William the Conqueror. Norman French became the official language of the government that the Conqueror established in England—the feudal system that was so characteristic of western Europe at the time replacing the Saxon barons and bishops with Norman lords and churchmen. French customs prevailed at court; scholars still wrote in Latin and spoke French with the nobility, but the old-fashioned Anglo-Saxon customs and language were retained by the unlettered.

In time, however, a common speech was developed and gradually a new language emerged. It opened the way to a new expression in native literature that reflected the influence of the culture, spirit and interests of the Continent—the literature of chivalry and romance suggested by the stories and poems sung by the French minstrels; it dealt with adventurous deeds, heroic episodes and enchanting scenes. Mysticism and the supernatural supplied the background and musical accompaniment was used to arouse the listeners. The new forms must have seemed strange to the plain, simple Saxon, whose interests lay with the homely things of toil, his battle with the elements, domestic life and religious worship.

These prose and lyrical romances brought from France centered about three subjects—the exploits of King Arthur and the Knights of the Round Table, Emperor Charlemagne and his peers and the legends of Alexander the Great and Troy and Aeneas.



Thus endeth the ſeconde book of the recule of the hiſtoryes of Troyes/ Whiche bookes were late tranſlated in to frenſhe out of latyn/ by the labour of the venerable perſone raoul le feure preeſt as a fore is ſaid/ And by me Indigne and vnworthy tranſlated in to this rude engliſſh/ by the comandement of my ſaid redoubtid lady duches of Bourgone: And for as moche as I ſuppoſe the ſaid two bokes ben not had to fore this tyme in oure engliſſh langage, therfore I had the better will to accompliſſhe this ſaid werke/ whiche werke was begonne in Brugis/ ⁊ contynued in gaunt And finyſſhid in Coleyn In the tyme of yͤ troublous world/ and of the grete deuyſions beyng and reygnyng as well in the royames of englond and fraunce as in all other places vnyuerſally thurgh the world that is to wete the yere of our lord a thouſand four honderd lxxi. And as for the thirde book whiche treteth of the generall ⁊ laſt deſtruccōn of Troye Hit nedeth not to tranllate hit in to engliſſh/ ffor as moche as that worſhipfull ⁊ religyo⁹ man dan John lidgate monke of Burye dide tranſlate hit but late/ after whos werke I fere to take vpon me that am not worthy to bere his penner ⁊ ynke horne after hym. to medle me in that werke. But yet for as moche as I am bounde to contemplaire my ſayd ladyes good grace and alſo that his werke is in ryme/ And as ferre as I knowe hit is not had in proſe in our tonge/ And alſo paraventure/ he tranſlated after ſome other Auctor than this is/ And yet for as moche as dyuerce men ben of dyuerce deſyres. Some to rede in Ryme and metre. and ſome in proſe And alſo be cauſe that I haue now good leyzer beyng in Coleyn And haue none other thynge to do at this tyme

From The Book, courtesy of Douglas C. McMurtrie

Page of William Caxton's Recuyell of the Hystoryes of Troye

The first book printed in English did not appear in England but at Bruges on the Continent. It was published sometime between 1474 and 1476

Though Celtic in origin, the legend of King Arthur has a British background and the first record of this great and chivalrous king is credited to Geoffrey of Monmouth. His *History of the Kings of Britain* (1147) was translated into French verse by Wace, a Norman, and retranslated into English by a monk named Layamon, who called his work *The Brut.*

Middle English, 1100–1550.—This period was one of transition from old to new: the disturbing effects of the Norman Conquest pass away with the establishment of a permanent form of English speech and nationality as Norman and Saxon speech and interests are knit together. The era was marked by the Hundred Years' War between England and France, notable for the English victories of Crécy, Poitiers and Agincourt; the romantic career of Joan of Arc in France; the development of the English parliamentary system that checked the abuses against which the peasants (led by Wat Tyler) revolted, and which brought together the gentleman, the burgess and the villein or tenant—all having an influence upon the writers of the day.

GEOFFREY CHAUCER (1340–1400).—If he was not the Father of English Poetry, Chaucer was the first to employ the iambic pentameter that became the standard form of English heroic verse, and his works definitely established the combined grammatical forms, diction and sentence structure of the French and Saxon tongues into the fundamentals of the English language. Chaucer was the first English story teller; his work combines narrative skill with clever characterization and portrays with wit and understanding of human nature the interests common to all men. Though Chaucer was of humble birth, his native talents gained recognition at the court of Edward III, where he became valet to the king and married the queen's lady-in-waiting. His position led to several diplomatic trips to France and Italy, where his keen observation and studious bent seized upon rich material for his literary works. In addition to being a courtier, diplomat and traveler, Chaucer became a scholar, and his wide sympathies gave sanity and justice to his ideas and opinions.

The works of Chaucer fall into three periods that reflect the various influences of his foreign travels, residence and study, as well as his knowledge of native English types. Chief among his translations from the French (1369–80) are: *Roman de la rose,* a French allegory in which a lady is represented as a rosebud; her lover desires to pluck the rose but is thwarted by various figures symbolizing the opposition of her parents, envy, her modesty, riches and the like; and *Death of Blaunche, the Duchess,* which commemorates the death of the wife of John of Gaunt, Chaucer's first patron. Other stories derived from the French are *Life of Saint Cecyle, Story of Constance, Twelve Tragedies* and *Complaint of Mars.* During his period of Italian influence (1380–85) Chaucer wrote *Troilus and Criseyde,* a story of the fall of Troy; and *Parlement of*

Foules, an amusing allegory of a parliament of birds hearing cases in which notable personages are caricatured. Chaucer's *Hous of Fame* was similarly inspired; his *Legende of Goode Women,* about women famous for constancy, was never finished.

In Chaucer's English period (1380–85) his great masterpiece, *Canterbury Tales,* was produced; it has to do with a motley group of Londoners on their annual pilgrimage to the shrine of St. Thomas à Becket at Canterbury. The *Prologue* introduces the characters and tells of their stopping overnight at the Tabard Inn in Southwark on the south side of the Thames, London. In the evening the host, Harry Bailey, suggests that they beguile the journey the next day with stories, the teller of the best story to receive a supper at the end of the journey. Twenty-four tales were told by the pilgrims—a doctor, lawyer, tradesman, monk, nun, priest, country parson, sailor, miller, carpenter, yeoman, an Oxford scholar, a summoner, cook, knight, squire, prioress, farmer, friar, plowman and the lusty Wife of Bath. The stories are equally varied, ranging from serious homilies and poetic romances to ribald adventures. The *Canterbury Tales* gives Chaucer a high place in literature as a realist who cleverly depicts the foibles and virtues of mankind with wit, pathos and profound human philosophy.

Works by Chaucer's two contemporaries, Lydgate and Hoccleve, show them as imitators, but both were prolific in the use of various verse forms of the day and wrote with charm and poetic insight.

John Gower's *Confessio Amantis* ("Confession of a Lover," 1385–93), was the first allegory in romantic verse in the English language. The ballad form of verse was attempted first by Scottish writers, among them John Barbour, who wrote of episodes in the life of the great hero, Robert Bruce. Two other Scottish poets of this period were James I, who wrote a collection of love poems, *The King's Quair,* and Gavin Douglas (*c.* 1474–1522), whose translation of Vergil's *Aeneid* was the first complete version made in Britain.

Church worship remained largely pagan in character, the clergy preyed upon the poor and spiritual life was at a low ebb. John Wycliffe so felt the oppression of these conditions that he took steps to bring about social and religious reforms. His followers, the Lollards, prefigured the Protestants of the Reformation. Wycliffe's translation of the Bible in 1384 was the first made in the English language. To William Langland is attributed the 14th-century allegorical poem, *Piers Plowman,* attacking the evils of the day and urging that society can be reformed only if each man will do his duty in his own sphere of life—the peasant at his plow, the knight defending his country, the priest leading his flock by word and deed and the king ruling with justice.

An event of surpassing importance in this period was the introduction of the printing press into England (1476) by William Caxton, a silk merchant of Bruges. He was a lover of literature and was quick to foresee the enormous impetus the printing press would give to the creation and spread of books. His first book printed in the English language was the *Recuyell* (summary) *of the Historyes of Troye* (1474 or 1475), which he himself translated from the French. He printed the works of Chaucer and Gower and Sir Thomas Malory's *Morte d'Arthur* (1485), which is the great English version of the story of Arthur, Guinevere and Lancelot.

The Renaissance, c. 1525–80.—The Renaissance, or New Birth, that had commenced earlier on the Continent began in England about 1525 and served as a transition between the Middle and Modern periods of English literature. It is called the *Renaissance* because the medieval spirit had largely disappeared and was replaced by a revival of interest in classical literature. Printing was extended, America had been discovered and the globe circumnavigated, and increased trade and various inventions had opened up new interests for man. Scholars began to translate with new zeal the classics of Greek and Latin; the poets Dante, Petrarch and Boccaccio were widely read; grammars and dictionaries appeared; the universities gave increased attention to philosophy, art, science, history. The period well represents a new birth in learning, and its local activities in art and literature gave England a new joy in living, new appreciation of art and the enjoyment of the beautiful in life as stimulated by the great Italian Renaissance that had given the world Petrarch and Michelangelo.

There was a keen rivalry for eminence in writing ballads and inventing new verse forms and the storytelling art that had been introduced by Chaucer was cultivated by other writers. Religious reformation also swept England and there were successive translations of the Bible, notably that by William Tyndale (d. 1536); and from medieval church pageantry, a mighty literary art sprang up—the drama. All in all, this astonishing period may be called the beginning of modern civilization. It was during these years that our own New England and Virginia were settled and they, too, felt this vital influence. Livelier imaginations stirred men to braver deeds and fresher philosophies of living, to more beautiful concepts of intellectual and emotional experiences, to greater achievements in the realms of literature, science, invention and commerce.

In addition to experiments in newer verse forms, the Renaissance in England brought the use of blank verse, or unrhymed iambic pentameter, by Wyatt and Surrey, who translated Vergil's *Aeneid* and also introduced the Italian sonnet into English literature (*c.* 1575). In Latin, Sir Thomas More wrote *Utopia* (1516), describing a Nowhere, the ideal community of his hopes and dreams. Sir Thomas North translated Plutarch's *Lives of the Noble Grecians and Romans* (1579), which became a source book for the dramatists. Sir Walter Raleigh led the minor Elizabethan poets and wrote *The History of the World* (1614); John Lyly and his *Euphues, or the Anatomy of Wit* (1579) led the same poets to invent manifold ways of saying the same thing. Sir Philip Sidney published his best-known book, *Arcadia* (1590), a novel in highly ornate prose freely interspersed with verse. Contemporary with him was the great Edmund Spenser (*c.* 1552–99), whose love of beauty, sound and color in language are evident in his *The Shepheardes Calender* (1579) and *The Faerie Queene* (1590–96), landmarks in the creation of English poetry. *The Faerie Queene* is a long, allegorical treatment of chivalry, love, morality and the supernatural. Through it runs a constant strain of beautiful imagery, presented in a unique eight-line stanza afterwards called *Spenserian.*

English Drama, 1580–1642.—The English theater owes its origin to the church. As all services were read in Latin, the priests conceived the idea of enacting some of the simpler stories of the Bible so that all might understand them. These simple plays took two forms; *miracle* plays or episodes from the Bible that had either an actual miracle or dramatic content like *Noah's Flood* and *The Second Shepherd's Play;* and *morality* plays in which abstract ideas such as Truth, Righteousness, Mercy and Peace were personified, their dialogue representing the triumph of right over wrong. The best-known morality play is *Everyman,* a profound and stirring play of Dutch origin that is presented even today.

In time the church gave the plays outside the church instead of inside, and various guilds took them up, so that certain plays became identified with different towns, especially Coventry, York and Chester. These plays were presented on vans that moved from one village green to another. To give variety, another type of entertainment was introduced, the *interlude,* corresponding somewhat to present-day vaudeville. This form met with such success that it was developed into a longer play structure. Among the early comedies were *Ralph Roister Doister* (1551) by Nicholas Udall; *Gammer Gurton's Needle* (1556) by William Stevenson; *The Arraignment of Paris* by George Peele; and *The Honorable History of Friar Bacon and Friar Bungay* (1592) by Robert Greene. Various plays were written around the Robin Hood theme. In contrast, a number of writers essayed tragedy, such as *Cambyses* by Preston (1537–98), and *Gorboduc* (1562) by Sackville and Norton. Those with historical background are *James the Fourth* by Robert Greene, and *The Spanish Tragedy* by Thomas Kyd (*c.* 1558–94). Ideas in Christopher Marlowe's plays, *Dr. Faustus* (*c.* 1588), which had a revival in New York in 1937, and his *Jew of Malta* (*c.* 1592), were sufficiently impressive to be used by later and more important men, including Shakespeare, with whom Marlowe is thought to have collaborated and whom he greatly influenced by the beauty of his verse and the power of his imagination. "Before Marlowe," said Swinburne, "there was neither genuine blank verse nor a

Courtesy Associated British & Irish Railways, Inc.

Shakespeare's Birthplace, Stratford upon Avon

This gabled and half-timbered house on Henley Street is generally considered to be the place where the dramatist was born in April, 1564

genuine tragedy in our language." All this experimentation in the dramatic form led the way to the great work of Shakespeare and his immediate contemporaries.

William Shakespeare (1564–1616).—We know very little about the life of this greatest figure in English literature, but we do know that Shakespeare was born in Stratford, April 23, and died there on the anniversary of his birth. He was the son of humble but highly respected parents and received his formal education in the Stratford village grammar school, then ran away to London. Perhaps he had watched the London players who went out to entertain Queen Elizabeth at Kenilworth Castle near by, and wished to attach himself to the London theater. He succeeded in this, first by doing menial tasks; next, he held scripts; then by suggesting revisions he won the privilege of taking small parts; and finally he wrote the plays. He married Ann Hathaway in 1582 and became influential in London by developing the Lord Chamberlain's Dramatic Company, which later became the King's Company.

Shakespeare had an interest in the Globe and Blackfriars theaters and lived and worked in the atmosphere of the theater. It is not recorded that he ever traveled, but he amassed a great store of learning by reading translations from the French and Italian classics and poring over contemporary books of all sorts; his principal sources include *Chronicles of England, Scotland and Ireland* (1578) by Holinshed, and the translation of Plutarch by North. He associated with both high and low in the teeming life of London; he enjoyed many triumphs and suffered numerous losses; though he became wealthy through real estate holdings, he suffered from the caprices of writers and the frailty of friends.

The entire span of Shakespeare's plays reflects his personal experience as well as profound insight into human nature. He was the epitome of that vital period in English history we call Elizabethan. His early plays are rich in comedy, and the style is gay, fanciful, brimming with figures of speech and poetic allusions. They represent a life of youthful enthusiasm, flushed with prosperity and public applause. Then follow the tragedies, somber in style, philosophic in treatment, reflecting the sorrows and troubles of a career turbulent with the storm and stress of life. The final group, embracing historical plays and comedies, reflects the poet's period of retirement, and the style shows full maturity of thought. The following outline presents the probable periods and the types of various groups:

1590–94.—
  Comedies: *Love's Labour's Lost, Comedy of Errors, The Two Gentlemen of Verona*
  Histories: *Henry VI, Richard III, King John*
  Tragedies: *Titus Andronicus*
1594–1600.—
  Comedies: *A Midsummer Night's Dream, The Merchant of Venice, The Taming of the Shrew, Merry Wives of Windsor, Much Ado About Nothing, As You Like It, Twelfth Night*
  Histories: *Richard II, Henry IV, Henry V*
  Tragedies: *Romeo and Juliet, Julius Caesar*
1601–09.—
  Comedies: *Troilus and Cressida, All's Well That Ends Well, Measure for Measure, Pericles*
  Tragedies: *Hamlet, Othello, King Lear, Macbeth, Timon of Athens, Antony and Cleopatra, Coriolanus*
1610–13.—
  Comedies: *Cymbeline, The Winter's Tale, The Tempest, The Two Noble Kinsmen*
  Histories: *Henry VIII*

The plays record a great range of poetic thought, pungent philosophy and the consummate dramatic quality of Shakespeare's master mind; they present many scenes of great imaginative power, virile characterization and surpassing beauty and indicate deep moral insight. The characters Shakespeare created, such as Portia, Hamlet, Lear, Lady Macbeth, Iago, Rosalind, Beatrice and Benedict, Viola, Falstaff, Henry V, Brutus, Cordelia, Prospero and Ariel, are very real and cleverly drawn and rank with the fictitious personages of all time. Shakespeare wrote two narrative poems that alone would have given him high rank as a poet—*Venus and Adonis* (1593) and *The Rape of Lucrece* (1594). His more personal *Sonnets* (1609) carry on the best traditions of the Italian school as well as introduce new rhyming schemes. His lasting influence upon the English language and literature is considered second only to that of the Bible, and has been great also in many foreign countries, including Japan.

Shakespeare's influence stimulated contemporary playwrighting and held the drama in a dominant position. Beaumont (1584–1618) and Fletcher (1579–1625) wrote a sensational tragedy, *The Maid's Tragedy,* and an amusing comedy, *The Knight of the Burning Pestle.* Only Shakespeare surpassed them in the rich power of fancy. Philip Massinger's *A New Way To Pay Old Debts* (1625) is a realistic portrayal of greed, and John Webster's *The Duchess of Malfi* (*c.* 1616) ranks as the best post-Shakespearian tragedy. Webster's plays were full of terror. The greatest scholar (who was also a dramatist) of the Elizabethan period, however, was Ben Jonson. He wrote *Every Man in His Humour* (1598) in which Shakespeare, who was Jonson's intimate friend, is one of the characters; and all Jonson's plays are filled with the characteristically Elizabethan idea of humors, strongly marked types of erratic personality. Jonson wrote also the incomparable lyric, "To Celia" ("Drink To Me Only with Thine Eyes"). In his dedication in the First Folio edition of Shakespeare's plays, Jonson wrote, "He was not of an age, but for all time."

SIR FRANCIS BACON (1561–1626).—Well born and educated at Cambridge, Bacon was the most outstanding contemporary of Shakespeare. Bacon became a barrister, traveled abroad, was knighted by James I, became Lord High Chancellor and was made a peer. Such a distinguished career had its temptations and Bacon was convicted of bribery and the betrayal of justice, deprived of office, fined and banished from London. Whatever his political faults and offenses, this stigma has not blinded the world to the evidences of his great mind. Bacon was a scientist—maybe the first of modern scientists—scholar, philosopher and prolific writer; most of his works he composed in Latin as well as in English. His *Novum Organum* (1620) and *The Advancement of Learning* (1623) are two parts of an uncompleted work, an exposition of pure scientific reasoning of a new type; *The New Atlantis* (1627) projects a scientific and philosophical idealism—another Utopia—but his more widely known *Essays* (1597), brief, expressive, filled with the wisdom of a mind broad, deep and full, established his place in English literature.

King James Bible (1611).—The last great literary product of the Elizabethan era was the King James version of the Holy Bible, begun in 1604 and completed in 1611 by 54 scholars who revised and compared previous versions, especially the Bishops' Bible of 1568, the Geneva Bible of 1560 and others back to the Tyndale Bible (1525–34) and the Wycliffe Bible (1382 and 1397). On the life of the 17th century, on the thought of the 18th century and even on the style of the 19th century there is no influence to compare with this authorized version of the English Bible. Authors as unlike as Ruskin, Kipling and Lord Dunsany are profoundly influenced by its phrases, its imagery and its rhythms. It was not merely a precursor of the Puritan period of the early 17th century, but like the poetry of Shakespeare and Milton and the prose of Bunyan it was a symbol of a new unity in English speech and letters.

The Puritan Age, 1616–60.—The Elizabethan era with its stormy, adventurous, versatile exponents was the bright, almost gorgeous, flowering of the bold spirit of the Renaissance—man's passionate interest in this world. It was followed by a splendid preoccupation—on the part of at least one English group, the Puritans, the followers of Cromwell—with man's relation to God. It was a period of political controversy and the great Civil War, which ended with the execution of Charles I in 1649 and the ten-year Protectorate under Oliver Cromwell. The theaters had been closed in 1642. In 1660 the kingdom was restored and England's Puritan period was over. Its literature was not distinctively political or Puritan. It could boast of noble prose. The philosophical *Religio Medici* (1643) and *Hydriotophia* or *Urn-Burial* (1658) by Sir Thomas Browne were read in translations on the Continent and are still prized by those who love majestic phrase and quaint grandeur. Jeremy Taylor (1613–67), a great preacher, was on the King's side in the Civil War and was repeatedly imprisoned for his loyalty to the Stuart cause; but he is the foremost literary representative of the pulpit in this whole period, the author of the pious books, *Holy Living* (1650) and *Holy Dying* (1651), a pleader for toleration and the master of musical, powerful, picturesque prose. Izaak Walton's *Compleat Angler* (1653) and his biographies of eminent clergymen who were also famous fishermen were written in an easier simpler style than English literature had known before. A few lovely lyrics were written by Edmund Waller (1606–87), notably "Go, Lovely Rose"; and Robert Herrick (1591–1674), a country parson, is famous for the charm of his countless brief lyrics and tiny epigrams published in *Hesperides and Noble Numbers* (1648). The metaphysical poets, Herbert, Donne and Cowley wrote abundantly in mystical strain. Donne, who influenced the prose writers and both the Cavalier and the metaphysical poets of his own time, is reflected also in such 20th-century poetry as that of the American, T. S. Eliot, and others, who aroused an interest in Donne's poetry by numerous critical studies and commentaries on his work.

John Milton (1608–74).—The son of a London law stationer of means, Milton was educated at Cambridge and sent abroad on a "grand tour." He returned to England to use his pen, if not his sword, in the cause of the Civil War and accepted the post of Secretary to Cromwell. His career, something like that of Bacon, was political, diplomatic, studious and literary. As with Shakespeare's works, Milton's too, fall into distinct periods:

Before the Commonwealth, 1606–40.—*L'Allegro* and *Il Penseroso* are companion studies, respectively, of a man in a social, and then in a meditative, mood. They are marked by fine descriptive passages and abound in imagery. *Lycidas* ranks with the finest elegies written; in form it is like a Greek pastoral. *Comus* is a masque, or play of allegorical ideas and phrases, set to music, written to celebrate the inauguration of the Earl of Bridgewater as Lord Deputy of Wales.

The Commonwealth, 1640-60.—Milton's political, educational and ecclesiastical pamphlets were cogent utterances, expressing ideas on divorce, politics and freedom of speech far ahead of his time. *Aeropagitica* is considered the most famous. His *Sonnets* (only 20 in English) expressed ideas other than those of love and sentiment: far better than his pamphlets they express his thoughts on political questions. Wordsworth called the sonnet in Milton's hand "a trumpet; whence he blew soul-animating strains—alas, too few!"

Retirement, 1660–74.—During this period Milton wrote *Paradise Lost* and *Paradise Regained,* magnificent epics telling the story of the creation of the world, the loss of Eden and its recapture through the Coming of Christ. The descriptions are brilliant, the conceptions inspiring, and the language luxuriant. *Samson Agonistes,* the story of Samson, is in the form of a Greek tragedy and abounds in many scenes of dramatic fervor and poetic beauty but is not comparable to his greatest work, *Paradise Lost.*

Milton is the typical literary figure of Cromwell's time, engrossed in politics and in religion, but a lover of beauty and music and a creator of music and beauty—quite different from the common and mistaken notion of the character of Cromwell's followers.

The passing of Milton, long blind and solitary, came after the close of the era that had given rise to much of his independent thought and expression, and the literature of the succeeding period had already begun to take on the color and tone of the Restoration.

The Age of Criticism, 1660–1784.—The Restoration of Charles II to the throne, although marked by reopening the theaters and greater freedom in social life, did not mean a return to the Elizabethan mode of thought but an experimentation with the French style and form of literary expression. Charles II, returning from France, had brought something of the court of Louis XIV, with Versailles as its center of wit, science and literature, where Corneille and Racine in tragedy, Molière in comedy and Boileau-Despréaux in criticism were men of the hour. The French style, therefore, was the model to emulate; so the plays of Congreve, Otway, Wycherley and Farquhar savor of French smartness; but soon the neoclassicism of the time gave evidence of a different English quality.

John Dryden (1631–1700).—Born in Northamptonshire and educated at Westminster and Cambridge, Dryden sought a literary career in London. He is best known for his political satire in biblical manner, *Absalom and Achitophel* (1681), attacking the earl of Shaftesbury for his attempt to make the duke of Monmouth heir apparent to the throne. In *The Hind and the Panther* (1687), two years after the Catholic James came to the throne Dryden defended the Roman Catholic faith to which he had become converted. His satires are brilliant with well-defined rhythm and incisive picturizations. His "Alexander's Feast" and "St. Cecilia's Day" are Pindaric odes with remarkable metrical beauty. In his prose essays he set a mark for clarity and polish worthy of present-day emulation. Dryden was made Poet Laureate in 1670. His later years were devoted to translating the classics (Vergil, Juvenal and many others). Before he became a satirist he wrote dozens of plays, both comedies and tragedies —*Marriage à la Mode* (1672) and *The Conquest of Granada* (1669–70). Shakespeare's *Antony and Cleopatra* supplied the subject for Dryden's *All for Love* (1678), an attempt to rewrite Shakespeare and make him observe the rules of dramatic unity!

This period of rationalization followed fixed rules for composition, analysis and more or less artificiality of phrasing that resulted in the creation of fixed types in the writing pattern. It produced other writers worthy of note who do not come under the rule of academic composition—notably Samuel Pepys (1633–1703), whose only publication during his lifetime was *Memoirs Relating to the State of the Royal Navy* (1690), but whose reputation rests on his *Diary* (covering the years 1660 to 1669 and not published till 1825), with its lively, chatty intimacy, much imitated in our own time. Samuel Butler's *Hudibras* (1663–64–78) amused the public by its ridicule of the Puritans. John Bunyan's *Pilgrim's Progress* (1678–84) remains an unsurpassed allegory, describing in simple clear English the adventure of redemption, an expression of the soul of English Protestantism in the period of Cromwell and the generation after.

Alexander Pope (1688–1744).—The time of Pope is often referred to as the Augustan Age because its writers were fond of comparing themselves to Vergil, Cicero and Horace, who wrote during the reign of Augustus in Rome. It was marked by the development of the two-party system in England—the Whigs and the Tories—the growth of British colonies in America, a friendly rivalry with France in the arts and the encouragement of civil and religious liberty. The literature of the period was not imaginative nor sentimental but adhered to the theory that life should be appraised by reason, using the great classics as models. The style, therefore, was cold and formal. One innovation that contributed to discussion and the communication of ideas was the coffeehouse that quickly became a London institution where men gathered to enjoy talking about literature, politics and what not. Pamphlets and periodicals began to flourish.

Alexander Pope, afflicted with a frail body and a sensitive spirit, was the outstanding writer of the early part of this period. His writings were caustic and brilliant. He was primarily a satirist and a moralist. His verse, employing rhymed couplets, is fluent and witty but not passionate or profound. He set forth his ideas on style in his *Essay on Criticism* (1711); he caricatured the follies of society in his amusing, if exaggerated, *The Rape of the Lock* (1714); he lashed back at his critics and contemporaries in *The Dunciad* (1728); he translated the *Iliad* (1715) in "correct" verse; and he gave to English literature a masterpiece in his *Essay on Man* (1733–34). Pope is the author of many such aphorisms as:

> A little learning is a dangerous thing,
> Drink deep, or taste not the Pierian spring.
>
> Be not the first by whom the new is tried,
> Nor yet the last to lay the old aside.

Jonathan Swift (1667–1740).—Born in Ireland and educated at Trinity College, Dublin, Swift worked his way from poverty to literary and political eminence fighting a morose spirit, many disappointments and a persistent pessimism. Although the author was an ordained clergyman in the Church of England, Swift's *Tale of a Tub* (1704) is a satire on sectarian beliefs. His *Battle of the Books* (1704) pictures a controversy between the claims of classic and modern literature. *Gulliver's Travels* (1726), though it was written to satirize the vices and follies of mankind, became a classic enjoyed for its imaginative quality. The *Journal to Stella* is an intimate record addressed to Esther Johnson, 14 years younger than himself, to whom he gave his affection and confidences; it relates Swift's own doings and contemporary public events and reveals his less gloomy moods.

Daniel Defoe (1660–1731).—The son of a London butcher named Foe, Daniel disliked the name and modified it to Defoe, which he distinguished by becoming an innovator of literary forms. A radical pamphleteer, he was frequently imprisoned, and various ironical contributions from his pen were inspired behind bars or in the pillory. Thus it was that he founded the first critical *Review* (1704–13) and became the forerunner of Addison, Steele and many successors; and created and established the novel, with its realistic portrayal of the manners and customs of the time. Defoe's first story, *Robinson Crusoe* (1719), is the best known. He published many other works, among them *Captain Singleton* (1720), *Moll Flanders* (1722), still an outstanding novel, and *The Journal of the Plague Year;* both the last two are imaginative, but *The Journal* is so convincing that it has often been considered purely historical.

Joseph Addison (1672–1719), Richard Steele (1672–1729).—These two writers represent the essay, a most readable and charming form of prose. Their lives and literary careers were interwoven. Addison's birth and education offset the emotionalism and engaging human qualities of the more humbly reared Steele, an Irishman. Steele founded, wrote and published that varied and attractive journal, *The Tatler* (1709–11), and its sequel, *The Spectator* (1711–12), on both of which Addison collaborated. Accounts of the affairs of that worthy fictitious country gentleman, Sir Roger de Coverley, created by both Addison and Steele, captivate the present-day reader just as they did readers in those far-off days. Earlier, Steele had tried his hand also at plays, of which *The Conscious Lovers* (1722) was the best. Addison's tragedy, *Cato* (1713), was successful then—but is not now. He is better known today for his famous hymn, "The Spacious Firmament on High" and as a contributor to *The Spectator*.

Poetry of the period was written by: Matthew Prior, the first to write light and witty *vers de société;* Edward Young, whose *Complaint, or Night Thoughts* (1742–44) expressed religious Romanticism in blank verse; James Thomson, whose *Seasons* (1730) was utilized as a setting for a Haydn oratorio, and whose *The Castle of Indolence* (1748) ranked high for its Spenserian stanza; and John Gay, who wrote the first English comic opera, *The Beggar's Opera* (1728), which is still played.

The Age of Johnson, 1744–84.—Samuel Johnson, born in 1709 the son of a poor bookseller in Lichfield, was forced to leave his studies at Oxford by his poverty. He tried to teach school, but his group of boys, headed by David Garrick, the future actor, did little but mimic his grotesque mannerisms. This handicapped man then went to London and became a literary hack; he first gained attention by his poem, *London* (1738), which gave him considerable prestige. *The Vanity of Human Wishes* (1749) is considered his best poem. Dr. Johnson was the literary arbiter and autocrat of his day. Recognizing the popularity of Addison and Steele in their periodical essays, he started another series, *The Rambler* (1750-52) and *The Idler* (1758-60), not so sparkling in style or so colorful in characterization as their predecessors. To secure funds to defray the expenses of his mother's funeral, Johnson wrote in the incredibly brief time of one week, *Rasselas, Prince of Abyssinia* (1759), a pedantic novel. From 1747 to 1755 Johnson was busy on his *Dictionary of the English Language.* Another monumental work by Johnson is *The Lives of the Poets* (1781), which passed judgment on a century of English poetry.

Johnson was at his best in conversation, notably at The Club, among whose members were Sir Joshua Reynolds, Garrick, the actor, Bishop Percy, the collector of ballads, Adam Smith, the political economist, Boswell, Fox, Burke and Gibbon. Johnson outshone them but held the affection of them all, though he was often rude, blunt and dogmatic. He expressed his prejudices freely, and his intolerance of radicals, medievalists, atheists and the Scottish was pronounced. He was a Tory, a devout churchman and a classicist. He thought that a serious literature should be preserved in Latin, and even his own daily speech showed a preference for Latinized derivatives. Lord Macaulay's estimate of Johnson concludes, "He was both a great and a good man."

In his group at The Club and at the famous eating house, The Cheshire Cheese, on Fleet Street, was James Boswell, who made notations of everything Johnson said, plied him with hypothetical questions and followed him like a shadow. The result was Boswell's *The Life of Samuel Johnson, LL. D.* (1791), remarkable not only for its exhaustive record of Johnson's ways and words but as a portrayal of the personages, manners and thought of the day. It is one of the great biographies of all literature.

The impetus given to fiction at this time came from Richardson and Fielding. Samuel Richardson (1689–1761) wrote in letter form, *Pamela, or Virtue Rewarded* (1740) and *Clarissa Harlowe* (1744–48), both excellent examples of skill in depicting social intrigue. Henry Fielding (1707–54) made his first success with *Joseph Andrews* (1743), burlesquing Richardson's *Pamela;* his masterpiece, *Tom Jones* (1748), is remarkable for characterization, plot, style and humor. Laurence Sterne's *Tristram Shandy* (1759) and *Sentimental Journey* (1768) and Tobias Smollett's *The Adventures of Roderick Random* (1748), *The Adventures of Peregrine Pickle* (1751) and *The Expedition of Humphrey Clinker* (1771) excel in realism.

Oliver Goldsmith (1728–74), poet, novelist and dramatist, whom Garrick called "Noll" and said he "wrote like an angel but talked like poor Poll," contributed to fiction *The Vicar of Wakefield* (1765), which Johnson sold for him to pay his landlady. Goldsmith was another of those lovable Irishmen whose writings so enliven English literature. In his appealing poem, *The Deserted Village* (1770), he vividly depicts the scenes of his home; in his drama *She Stoops to Conquer* (1773), he established the comedy form still employed—plot structure, suspense, climax, humor and characterization. . . . Richard Brinsley Sheridan (1751–1816) followed the dramatic initiative of Goldsmith in two delightful plays, *The Rivals* (1775) and *The School for Scandal* (1777); and in his day was famous as an orator in Parliament. . . . Fannie Burney's *Evelina* (1778), first in the field of fiction delineating family life, won the praise of contemporary men of letters such as Johnson and Scott.

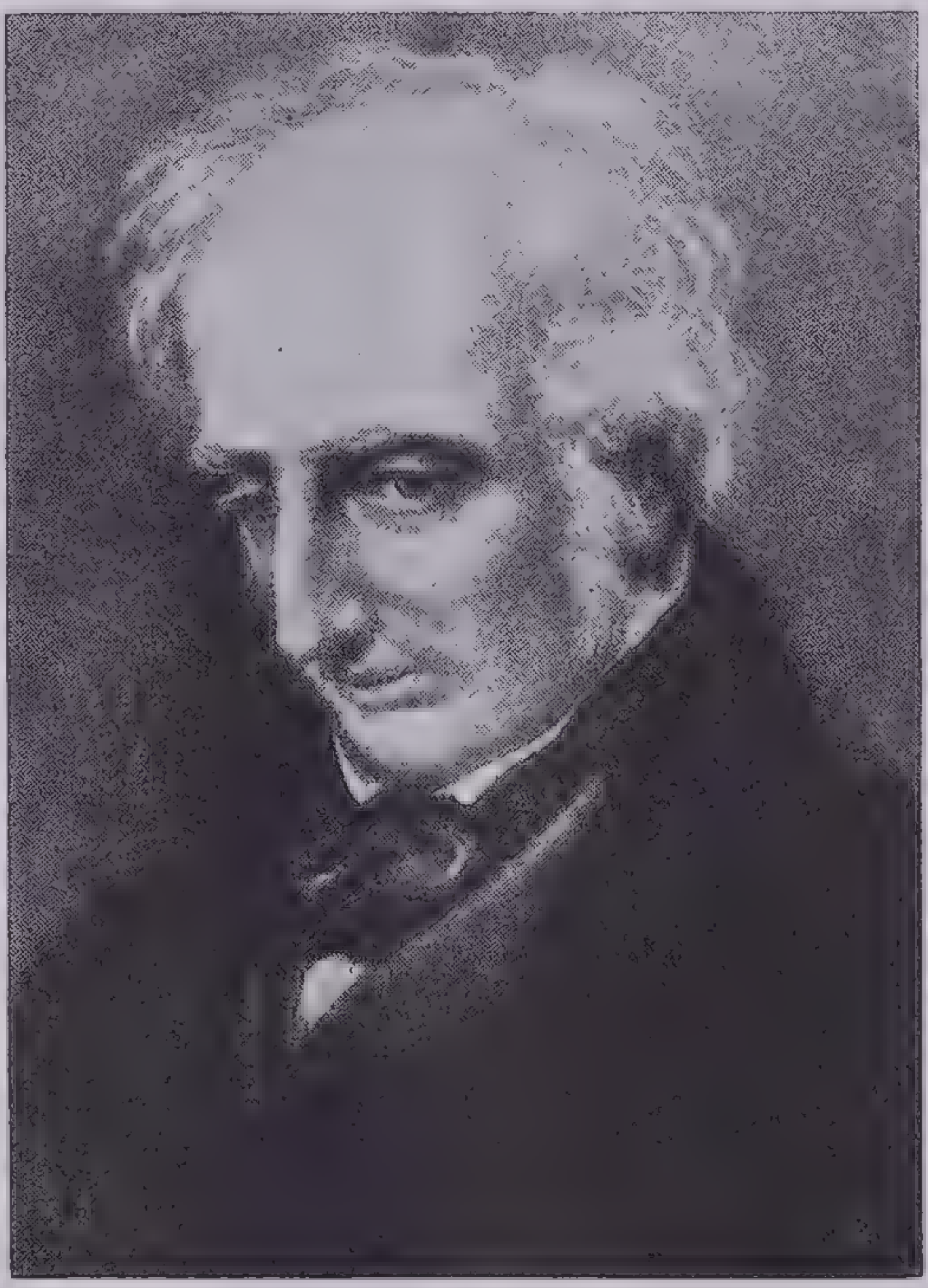
The Johnson period produced two great historians: the Scottish David Hume (1711–76), the first to consider social and literary, as well as political, aspects in his *History of England* (1754–62); and Edward Gibbon (1737–94), whose *History of the Decline and Fall of the Roman Empire* is an exhaustive and discriminating work. . . . Adam Smith's *Wealth of Nations* (1776) established political economy as a science and is still its cornerstone. . . . Edmund Burke (1729–97) was a contemporary statesman of literary quality among whose many papers and speeches the one entitled "On Conciliation with America" stands out as a model of argument, polished in style, noble in sentiment. He was the chief British friend of America in her struggle for freedom. . . . Sir William Blackstone (1723–80) wrote the famous *Commentaries on the Laws of England*.

The Elegy Written in a Country Churchyard (1750) by Thomas Gray (1716–71) attained the rank of a classic, not only in elegiac verse but in its lofty utterance in such lines as, "The paths of glory lead but to the grave"; "Far from the madding crowd's ignoble strife"; and "Full many a gem of purest ray serene." His contemporary, William Collins (1721–59), wrote the ode, "To Evening," and the oft-quoted "Ode Written in 1746," beginning, "How sleep the brave who sink to rest." His style was simpler and less affected than that of most poets of the period.

Transition from Classicism, Late 18th Century.—Early evidences of break with classicism were expressed by James Macpherson (1736–96) in *Fragments of Ancient Poetry* (1761) and *Temora* (1763), purporting to be translations from the Gaelic of Ossian but created by Macpherson himself. In similarly conceived verses, the much discussed Rowley Poems by Thomas Chatterton (1752–70), the unfortunate but precocious boy who won posthumous fame for his poems, *The Bristowe Tragedie* and *Aella,* which he had pretended were copied from old church manuscripts; in Bishop Percy's *Reliques of Ancient English Poetry* (1765). . . . Horace Walpole's ghost romance, *The Castle of Otranto* (1765), with mystery scenes laid in his own Gothic castle, stimulated a revival in the arts and was the first romantic novel and the precursor of the modern mystery story.

The poetry of this period represents many writers who exemplified the love of man and nature, and held less formal and more liberal concepts than their predecessors. To consider in turn those best known: William Cowper (1731–1800), in *The Task* (1785), wrote a blank-verse poem in six books, a charming description of rural scenes with a note of "enthusiasm of humanity"; he is known also for famous hymns, the humorous poem, "John Gilpin," and the heroic ballad, "The Royal George." . . . George Crabbe's *The Village* (1781), in heroic verse, presents the scene of the laboring class with directness and realism. . . . William Blake, artist and poet, mystic and symbolist almost to the point of insanity, escaped from classicism completely in his lyrics, *Songs of Innocence* (1789) and *Songs of Experience* (1794), which he illustrated with strange, powerful drawings.

Robert Burns (1759–96).—This simple uneducated Scottish peasant did more than any other poet of his time to break the hold of convention on literature and arouse the world to a new appreciation of nature and the common qualities in man. Through poverty his life was hard, though he was eventually acclaimed in fashionable circles. His verse is simple, exuberant, melodic and genuine. His best-known poems are "The Cotter's Saturday Night," "Tam O'Shanter," "To a Mouse," "To a Mountain Daisy," "The Jolly Beggars," and many lyrics that are still sung—"Flow Gently Sweet Afton," "Bonnie Doon," "Auld Lang Syne" (1788) and many others. Some of his songs were rewritten—with a transforming magic—from old Scotch poems. He died before he was thirty-eight.



Underwood & Underwood

William Wordsworth

The Age of Romanticism, 1800–32.—Romanticism in a literary sense meant a turning from classicism and the revival of medieval thought; an interest in nature and mythology, a return to old ballads and to Spenser and Shakespeare as models. It followed the lure of the beautiful, strange and picturesque in all countries. Cowper, Blake and Burns at home had prepared the way. In Europe the works of Schiller and Goethe in Germany and of Rousseau in France had set examples for the English Romanticists.

William Wordsworth (1770–1850), Samuel Taylor Coleridge (1772–1834).—Their joint *Lyrical Ballads* (1798) stirred England both by their theories of a new poetry and by their revolutionary character. The book has been called "the most important event in English poetry since Milton." They created The Lake School of poets, as they and other poets lived for the most part in the Lake District of England. Wordsworth attended Cambridge University, traveled on the Continent, became interested in the French Revolution and returned to England to become a Conservative. He then retired to his favorite district to give the world the creations of his philosophic and poetic mind. His poetry had three main liberalizing tendencies—revulsion against artificial poetic diction; a treatment of human nature with truth and appreciation of its inherent goodness; and investing nature with a philosophic content that approaches pantheism. Among his shorter lyrics are "The Solitary Reaper," "I Wandered Lonely as a Cloud," "To the Daisy" and "She Was a Phantom of Delight." His greatest work, "Intimations of Immortality from Recollections of Early Childhood," an ode, shows high imaginative vision. His sonnets are singularly beautiful and fine, and he was the first to write sonnet sequences or series. His longer poems, *The Prelude* and *The Excursion,* seem dull to most readers and in all his poems except the very shortest and best there are dull lines. But he is a great poet.

Coleridge was the chief exponent of Romanticism and of the poetic principles espoused by Wordsworth and differed from him principally in a love of the supernatural and romantic. Coleridge was even more carried away by the dream of a new society and thought of founding, with Southey, a community of poets and philosophers in America. He and Southey married sisters and the necessity of earning their living became of paramount importance. Coleridge spent some time in Germany, learned the language and became imbued with German philosophy. He is best known by the highly imaginative and haunting, "The Ancient Mariner," "Kubla Khan" (1797), which presents a vivid picture of the Mongol dynasty in China, and "Christabel," another supernatural narrative that represents good and evil in conflict. Coleridge was a great literary critic as well as a fine poet. . . . Robert Southey (1774–1843), friend and brother-in-law of Coleridge, left ample evidence of his talent in 109 volumes. He was a master of prose but is remembered for a few short poems, "Inchcape Rock," "The Battle of Blenheim," and "The Cataract of Lodore," with sound imitating sense comparable to Poe's "The Bells."

Sir Walter Scott (1771–1832).—Born in Edinburgh of a prominent family, Scott early became a great student of Scottish life, scenery, legends and ballads. He was an indefatigable worker, soon acquired literary skill and fluency and became a leader in the Romantic school in both poetry and prose. Soon affluent, Scott built his home, Abbotsford, on the Tweed River, where he lived surrounded by his friends, but kept assiduous hours at his desk. His longer narrative poems, *The Lay of the Last Minstrel* (1805), *Marmion* (1808), and *The Lady of the Lake* (1810) are still read and enjoyed because of their flowing couplets and dramatic episodes. Scott's novels are discussed below with those of his contemporaries in fiction.

George Gordon, Lord Byron (1788–1824).—Byron was temperamental and extremely sensitive, a poet of high-strung feeling, stubborn convictions and oversentimentality. His life was stormy, bitter, restless. He was master of a wide range of poetry—lyric, satiric, descriptive, narrative and dramatic. Among the best-known lyrics are "She Walks in Beauty," "When We Two Parted," "Maid of Athens" and "Fare Thee Well." His longer works include: *English Bards and Scotch Reviewers* (1809), a diatribe against his critics; *Childe Harold's Pilgrimage* (1812–18), picturing his travels on the Continent; *The Giaour* (1813), the story of a Moslem slave; *The Corsair* (1814), about piracy in the Greek archipelago; *Manfred,* suggested by *Faust; Cain,* the biblical story; and *Don Juan* (1819–24), Byron's masterpiece, an epic-satire and brilliant exposé of social corruption, British cant and the poet's own passionate life. To many, Byron is best known by his poem, *The Prisoner of Chillon* (written 1817), depicting the imprisonment of François de Bonivard in the Castle of Chillon for his political views.

Underwood & Underwood

Percy Bysshe Shelley

Percy Bysshe Shelley (1792–1822).—Highly intellectual and ethereal in his poetic concepts, Shelley was also very independent of spirit. He was university bred, but was expelled for writing the tract, *The Necessity of Atheism* (1811). He lived in Switzerland, but subsequently removed to Italy, where he was drowned in the Bay of Spezia. His works cover a wide range. His lyrics include: "Ode To the West Wind," "Adonais" (in memory of Keats), "To a Skylark," "The Cloud," "Hymn To Intellectual Beauty." Among his longer poems are *Queen Mab* (1813), *The Revolt of Islam* (1817–18), *The Cenci* (1819), an Italian tragedy, and *Prometheus Unbound* (1820). Shelley's great prose work, *The Defence of Poetry* (1821), an essay in the field of criticism, is still studied.

In 1816 Shelley married Mary Godwin (1797–1851), the daughter of William Godwin and Mary Wollstonecraft. She wrote *Frankenstein* (1818), a unique novel describing a monstrous mechanical contrivance that wrought havoc for its maker. The book gave her fame.

John Keats (1795–1821).—Keats was of humble parentage and had been apprenticed to a surgeon; but a volume of Spenser's *The Faerie Queene* fell into his hands and thereafter those "realms of gold" possessed him. He gave up surgery for poetry, and the world is indebted to him for *Endymion* (1818), with its oft-quoted line, "A thing of beauty is a joy forever," *The Eve of St. Agnes and Other Poems* (1820) and such shorter poems as "On First Looking into Chapman's Homer," "Ode To a Nightingale," "Ode on a Grecian Urn," "To Autumn," "La Belle Dame sans Merci." His odes have been called "too perfect for criticism." The same could be said of his sonnets. Keats was a victim of tuberculosis and his life was a bright light that burned out quickly; he died before he was twenty-six and lies buried near the ashes of Shelley in the Protestant Cemetery in Rome.

Thomas Moore (1779–1852).—Born in Dublin, Moore wrote many hymns and songs that have long been favorites, notably, "Come, Ye Disconsolate," "Oft in the Stilly Night," "The Harp That Once through Tara's Halls," "Believe Me, If All Those Endearing Young Charms" and "'Tis the Last Rose of Summer." *Lalla Rookh* (1817), an Oriental romance, is the best known of Moore's longer poems; he also wrote in prose, notably a biography of his friend, Lord Byron.

Among the minor poets of the period are Thomas Campbell (1777–1844), who wrote "Ye Mariners of England"; Mrs. Hemans (1793–1835), author of *Songs of the Affections;* and Thomas Hood (1799–1845), who wrote comic verse of great worth and the serious poems, "Bridge of Sighs" and "The Song of the Shirt," which show his sympathy with the sad state of factory workers.

The prose writers of the Romantic Period were equally prolific. Periodical literature was coming into its own in *The Edinburgh Review, Blackwood's Edinburgh Magazine* and *The Quarterly Review.* Most of the essayists found their way to fame through these publications. Prose style became a matter not of rules but of personality. Coleridge left an admirable body of prose criticism in his commentary on the plays of Shakespeare. . . . Charles Lamb's *Essays of Elia* (1823) still attracts readers, and the *Tales from Shakespeare* (1807), on which he and his sister, Mary Lamb, collaborated, delights children of all ages. Lamb was witty, romantic and whimsical; his style is fluent and engaging. His friend, William Hazlitt, essayist of taste and distinction, wrote *Characters of Shakespeare Plays* (1817), *Lectures on the English Poets* (1818) and *The Spirit of the Age* (1825). *Imaginary Conversations* (1824–46), by Walter Savage Landor, gives in dialogue form interesting light on people of historical days. He wrote many short poems with marvelous finish and beauty, brief lyrics and epigrams in the manner of the Greek poets.

Underwood & Underwood

John Keats

Thomas De Quincey (1785–1859).—A precocious child who ran away from home, De Quincey later met Coleridge and Wordsworth and became established with them at Grasmere in the Lake District, and there began the literary work that made him famous. His *Confessions of an Opium Eater* (1821) gave evidence that he was at his best in the world of fancy, a master of atmosphere and of rhythmic prose. . . . Leigh Hunt (1784–1859) became a journalist and for years edited *The Examiner,* a radical weekly that gained considerable popularity but occasioned Hunt's imprisonment for two years. Though a poet of poets, as shown by his narratives *The Story of Rimini* and *Hero and Leander* and by "Abou ben Adhem" and the famous rondeau, "Jenny Kissed Me," he was also a novelist, dramatist and (best of all) essayist.

Of the fiction in this Romantic Period, Scott's novels are foremost. To pay off a debt incurred from a publishing venture with the House of Ballantyne, Scott wrote one novel after another. No man worked harder. Up at five in the morning, he worked until midafternoon, then took a long walk accompanied by his faithful dogs, or entertained friends. He allowed nothing to disturb this routine. In consequence, he wore himself out, but not before he had given the world masterpieces of romantic fiction. Among Scott's historical novels are such Scottish, English and Continental titles as *Waverley* (1814), *Old Mortality* (1817), *The Legend of Montrose* (1819), *Ivanhoe* (1819), *The Monastery* (1820), *The Abbott* (1820), *Kenilworth* (1821), *The Fortunes of Nigel* (1822), *Quentin Durward* (1823) and *The Talisman* (1825). Other novels include *Guy Mannering* (1815), *The Antiquary* (1816), *The Black Dwarf* (1817), *Rob Roy* (1817), *The Heart of Midlothian* (1818) and *The Bride of Lammermoor* (1819). Scott is one of the world's great masters of narration.

Among Scott's noteworthy contemporaries were: Ann Radcliffe, whose *The Mysteries of Udolpho* (1794) expresses a Gothic element in fiction; the Scottish Jane Porter, who wrote *Thaddeus of Warsaw* (1803) and *The Scottish Chiefs* (1810); William Godwin, author of the novel with a purpose, *The Adventures of Caleb Williams* (1794); Maria Edgeworth, creator of books for children; Mary Mitford, author of *Our Village* (1823); and Jane Austen (1775–1817), a clergyman's daughter whose youth was spent at his vicarage, Steventon, in Hampshire. There she wrote but did not then publish her most famous novel, *Pride and Prejudice* (1813). *Sense and Sensibility* (1811) was the second story written but the first published and, like the others, appeared without her name. *Mansfield Park* (1814) and *Emma* (1816) appeared while Miss Austen still lived; *Persuasion* (1818) and *Northanger Abbey* were published after her death. Her great gifts were delineation, creating living characters and satirizing commonplace social happenings.

The Victorian Era, 1832–81.—The Reform Act had reorganized Parliament and had given the people wider representation in the House of Commons; trade unions were permitted, religious tolerance advanced, municipal reform and better housing were effected; the age of machinery arrived, trade and commerce grew, emigration was encouraged and science found new methods to search for truth. In literature the Victorian era rivaled the Elizabethan or the time of Queen Anne.

THOMAS CARLYLE (1795–1881).—In many ways Carlyle was the most important literary figure of this period, largely because he was an earnest, gloomy prophet with a picturesque style and a peculiar personality. The son of a Scottish mason, Carlyle was intended for the ministry but on graduation from Edinburgh University he turned his attention to teaching and writing. He lived at Craigenputtock, a lonely farmhouse that he had inherited, and at a London home in Chelsea. Carlyle's greatest works are *Sartor Resartus* (1833–34), glorifying the gospel of work; his dramatic and powerful *The French Revolution* (1837); *Heroes and Hero Worship* (1840), essays on great men; *Past and Present* (1843); *Oliver Cromwell's Speeches and Letters* (1845); the *History of Frederick the Great* (1858–65) and *Reminiscences,* which contains the paper on his great attachment to his brilliant and self-sacrificing wife, Jane Welsh, to whose devotion his success is partly attributable, for she gave up her own potential literary career to become his companion and incentive. Carlyle was greatly influenced by German philosophy and even by German style. He hated sham and thought most new ideas in politics and social science were shams. Today much of his work seems reactionary and bitterly pessimistic.

THOMAS BABINGTON, LORD MACAULAY (1800–59).—After a precocious childhood, Macaulay first came to literary fame by his brilliant essay on Milton in the *Edinburgh Review,* followed by similar sketches of Byron, Addison, Pitt, Warren Hastings, Bunyan, Doctor Johnson, Goldsmith and many others. Macaulay's *History of England* (1848–55) is one of the most interesting histories ever written—maybe because it is so partisan. Its sale in America once rivaled that of the Bible. The *Lays of Ancient Rome* (1842), historic and heroic ballads, is his most popular work. Macaulay was a statesman, an orator and a great administrator in India.

JOHN RUSKIN (1819–1900).—Ruskin early developed art appreciation under his father's tutelage and the fine arts became his chief interest. *Modern Painters* (1843–60) is an authoritative treatise still much used; his *Seven Lamps of Architecture* (1849) and *The Stones of Venice* (1851–53) evidence his attention to economics and social reform. Other works are *Unto This Last* (1862), *Time and Tide* (1867), *Ethics of the Dust* (1866), *Sesame and Lilies* (1865), *The Crown of Wild Olives* (1866) and *Fors Clavigera* (1871–84). He wrote also *The King of the Golden River* (1851), a delightful fairy story for children, and *Praeterita* (1885–89), an autobiography. Ruskin was a stylist who wrote with wit and imagination; he was a reformer and an artist, among the first to rebel against Victorian restrictions. His production was voluminous but masterly, each work distinctive and significant.

MATTHEW ARNOLD (1822–88).—The son of Thomas Arnold, a famous master of Rugby, Matthew continued to be closely identified with education. For thirty-five years he was Inspector of Schools and during 1857–67 was professor of poetry at Oxford, of which he was a graduate. He published a number of volumes of poetry. Famous single poems are: "Thyrsis," a pastoral elegy; "Sohrab and Rustum," an episode from the Persian epic of Firdausi; the sonnet on Shakespeare and the melodious poem, "The Forsaken Merman." *Culture* and *sweetness* and *light* were watchwords with Arnold. He hated Philistinism—a term he coined for modern conventionalism and deafness to new ideas, especially spiritual and esthetic ideas. He wrote *Culture and Anarchy* (1869), *Literature and Dogma* (1873) and many essays.

JOHN HENRY NEWMAN (1801–90).—An Anglican churchman and one of the founders of the Oxford Movement in the Church of England, Newman later joined the Roman Catholic Church and was made a cardinal (1879) by Pope Leo XIII. He wrote the famous hymn, "Lead, Kindly Light," and in clear precise prose wrote *The Idea of a University Defined* (1873), the matchless *Apologia pro Vita Sua* (1865), justifying his religious beliefs, and *The Grammar of Assent* (1870).

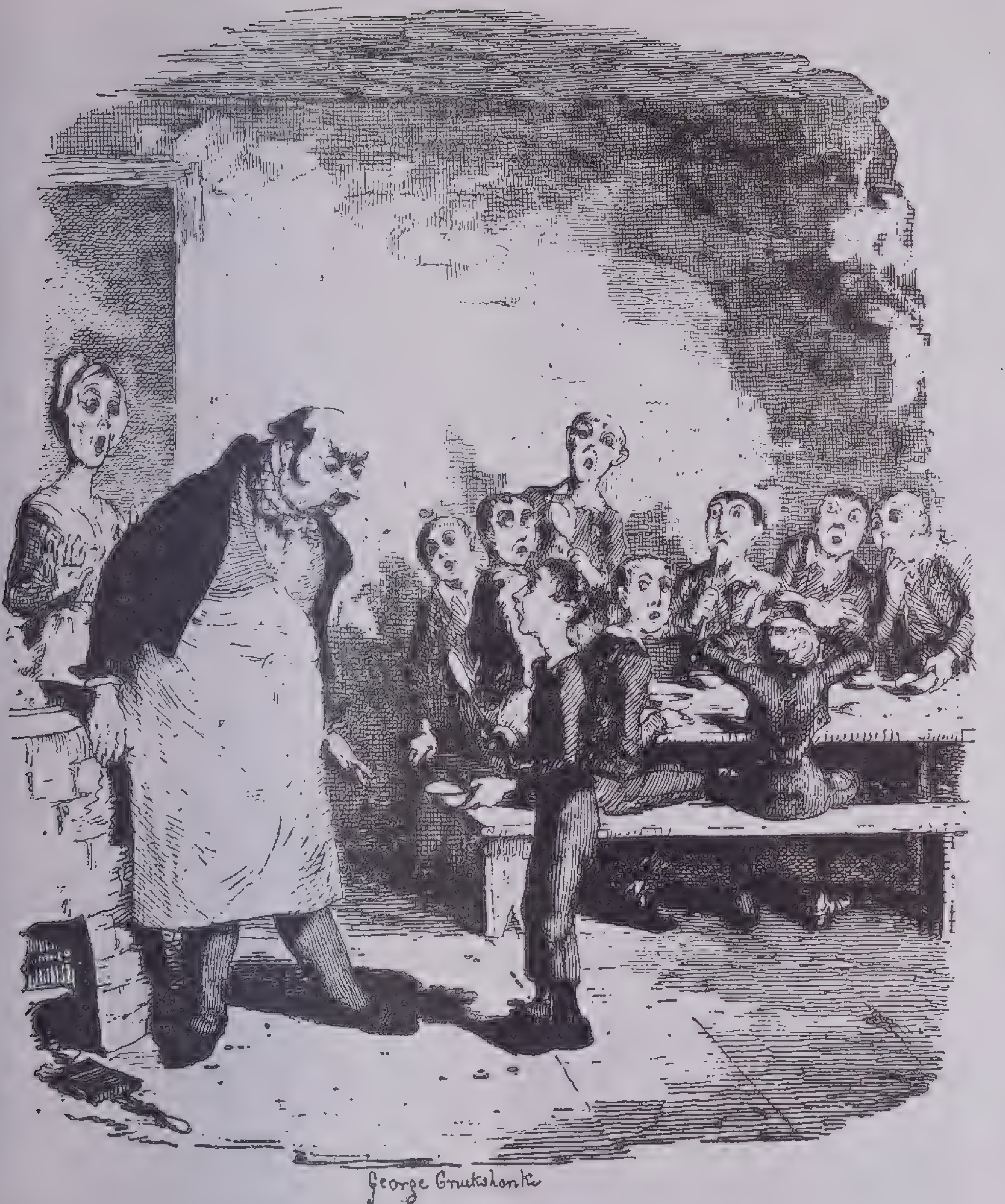
Other prose writers of the time include: John Stuart Mill, who wrote *Principles of Political Economy* (1848) and various expository works; John Richard Green, author of *A Short History of the English People* (1874), and James Anthony Froude, who also wrote on English history and is the author of *Short Studies on Great Subjects* (1867–82), biographical sketches of English notables; Walter Pater, essayist and critic who was almost poetic in his rhythmical phrasing in *Marius the Epicurean* (1885), *Imaginary Portraits* (1887), *Appreciations* (1889) and *Greek Studies* (1895); and Andrew Lang, the many-sided genius of *Letters to Dead Authors* (1886), various translations, biographical sketches, some folklore and various fairy books.

Three notable figures in science contributed works in support of highly revolutionizing theories during this period: Charles Darwin (1809–82), in his *The Origin of Species* (1859), reconstructed the biological world through the doctrine of evolution; John Tyndall (1820–93), in *Heat Considered as a Mode of Motion* (1863), presented something new in physics; and Thomas Henry Huxley (1825–95), in *Evidence as to Man's Place in Nature* (1863), *Lay Sermons* (1870) and *Essays on Evolution and Ethics* (1893), strengthened the idea of evolution. . . . Herbert Spencer (1820–1903) was the outstanding philosopher of the day and one of the first writers on sociology. His best-known works are *Social Statics* (1851); *Principles of Psychology* (1855); *Education: Intellectual, Moral, Physical* (1861); *First Principles* (1862); and *Principles of Ethics* (1879).

What the historical romance was to the Middle Ages, what the drama was to the Elizabethans, the novel was to the Victorian Era—not only the chief form of literary expression but a medium for influencing public opinion in society, politics and even in theology. The novel with a purpose flourished; but so did pride in craftsmanship and writing for sheer entertainment.

CHARLES DICKENS (1812–70).—Dickens' childhood was unhappy and miserable. When he was seventeen he learned stenography and obtained work as a reporter. His early menial work and later contacts as a police court reporter gave him live material to write about and two lecture trips to America added to it. His style, range of subjects and characters drawn firsthand from the streets and haunts of London made him an outstanding novelist of the time.

Sketches by Boz (1836), his first work, gave but small indication of what his future would develop, but its success encouraged the author to publish his first novel, *Pickwick Papers* (1837), which brought him immediate and lasting fame. *David Copperfield* (1850) portrays scenes of his own boyhood, and *Nicholas Nickleby* depicts his school life. *Oliver Twist* recalls Dickens' experiences among the poor of London; *Little Dorrit* (1858) reveals the prison life to which his father was subjected; and *Bleak House* (1853) delineates his life in a law office. *Martin Chuzzlewit* crystallizes Dickens' unflattering impressions of America and Americans; and *Dom-*



From a drawing by George Cruikshank

Charles Dickens: Oliver Twist
Oliver asks for more

bey and Son (1848), *The Old Curiosity Shop* (1840), *Hard Times* (1854), *Great Expectations* (1861) and *Our Mutual Friend* (1864) give firsthand observations Dickens made at different periods of his life.

A Tale of Two Cities (1859) is a stirring novel of the French Revolution with scenes laid in England and France. *A Christmas Carol, The Chimes* and *The Cricket on the Hearth* have become yuletide classics. Cockney traits in many of his characters will always amuse Dickens' readers. The people of his books are remembered and treasured though they are too eccentric to be real.

WILLIAM MAKEPEACE THACKERAY (1811–63).—Born in Calcutta, India, educated at Charterhouse and Cambridge, Thackeray traveled widely and was at home with the aristocracy of any country. After studying law he became editor of the *National Standard* in 1833, but the following year was off to Paris to study art. Continuing to contribute to newspapers, however, when necessity arose he earned his living with his pen. His first real success came with the serial publication of *Luck of Barry Lyndon* (1844). Among his most eminent works that appeared in the succeeding score of years are *Vanity Fair* (1848), *Pendennis* (1850), somewhat autobiographical, *Henry Esmond* (1852), *The Newcomes* (1855) and *The Virginians* (1858). His characterization is vivid. In his great assemblage of sharply drawn characters, Major Pendennis, Henry Esmond, Colonel Newcome, Barry Lyndon and the incomparable Becky Sharp stand out. Thackeray's style is restrained but graphic and somewhat cynical; he detested sham, affectation and snobbery. He wrote also criticism and light verse—*The English Humorists of the Eighteenth Century* (1853) and *Miscellanies in Prose and Verse* (1855).

Among Victorian novelists who are now known chiefly by one or more successful and outstanding works though they were more widely read in their day, are: Edward George Bulwer-Lytton (1803–73), whose exciting and dramatic *Last Days of Pompeii, Eugene Aram,* and the plays, *Richelieu* and *The Lady of Lyons,* are representative; Charles Reade (1814–84), who championed ill-treated prisoners in *It Is Never Too Late To Mend* (1856) and wrote *Peg Woffington* (1853), a story of the 18th century, and *The Cloister and the Hearth* (1861), a far better story of the 15th century; Anthony Trollope (1815–82), who habitually wrote just so many words an hour and gave his formula for doing so, and whose stories of English clerical life, *The Warden* (1855), *Barchester Towers* (1857), *The Last Chronicle of Barset* (1867) and many others are the best of their class; and Wilkie Collins (1824–89), whose thrilling mystery stories, *The Woman in White* (1860) and *The Moonstone* (1868) have never been without readers.

Other authors who are now remembered for a single book are: Richard Doddridge Blackmore (1825–1900), for his stirring romance, *Lorna Doone* (1869); Dinah Mulock (1827–87), for *John Halifax, Gentleman* (1857), the story of a self-made man; and Samuel Butler (1835–1902), biologist and opponent of Darwin, for his partly autobiographical novel, published after his death, the bitter and powerful story entitled *The Way of All Flesh* (1903). The late 19th century found a reading public diverted with two inimitable stories by Lewis Carroll (pen name of Charles Lutwidge Dodgson, 1832–97), *Alice's Adventures in Wonderland* (1865) and *Through the Looking-Glass and What Alice Found There* (1872), written for children but charged with shrewd comment upon manners that delights their elders and a wit surprising in the teacher of mathematics who wrote these books.

THE BRONTË SISTERS: CHARLOTTE (1816–55); EMILY (1818–48); and ANNE (1820–49).—Daughters of a poor curate at Haworth, England, motherless after 1821, they were educated at a school for clergymen's daughters and at Roe Head and in Brussels. Charlotte later taught in two of these schools and was twice a governess. Emily also taught but was too frail to live away from home. As the three sisters at first published their poems jointly under the pen names of Currer, Ellis and Acton Bell and then used these names individually for their novels (Currer Bell—Charlotte; Ellis Bell—Emily; Acton Bell—Anne), the public did not know who they were until 1848. Emily wrote one story, *Wuthering Heights* (1847); Anne wrote two, *Agnes Grey* (1847) and *Tenant of Wildfell Hall* (1848), not so good as her sisters' work. Charlotte's *Jane Eyre* (1847), lately dramatized, contributed something new and living to the Victorian novel and achieved the greatest success; it made her famous as Currer Bell! Then over her own name she wrote *Shirley* (1849), a portrait of Emily, and *Villette* (1853). No family in English literature was so talented or wrote so much in a half-dozen years.

CHARLES KINGSLEY (1819–75).—A clergyman, friend of Carlyle and Mill and champion of the working class, for which he advocated and promoted improved sanitation and other benefits, Kingsley wrote several novels with a purpose—notably *Alton Locke* (1849) and *Yeast* (1849); the historical novels *Hypatia* (1853) and *Westward*

Ho! (1855)—the scenes of the first are laid in Alexandria, Egypt, in the 5th century; the second is a story of Elizabethan sea dogs on the Spanish Main—and the children's books, *The Heroes* (1856), a book of Greek myths; *Water-babies* (1863) and a popularized natural history, *Madam How and Lady Why* (1869).

George Eliot (pen name of Mary Anne Evans; 1819–80).—As Dickens and Thackeray treated low and high society respectively, George Eliot gave the world masterpieces about the life of the English middle class. Born on a farm near Coventry, she strove to educate herself by studying languages and reading widely to match the intellectual progress of her brother. She went to London to help edit the *Westminster Review*, and from that time, through the stimulus of George Henry Lewes, whom she later married, to write fiction.

She was a moralist and a keen psychologist with extraordinary powers of character analysis, and the fault of being overserious. After her first book, *Scenes from Clerical Life* (1857) she wrote *Adam Bede* (1859), *The Mill on the Floss* (1860) and *Silas Marner* (1861). The second period of her writing was less successful: in *Romola* (1862–63), a Florentine novel, *Felix Holt* (1866), *Middlemarch* (1872) and *Daniel Deronda* (1876), she entered new fields that she did not know so well—history and politics. One of her poems, "O Might I Join the Choir Invisible" still lives.

George Meredith (1828–1909).—The son of a tailor, educated in Germany, Meredith was first a journalist and then a publisher's reader. He is best known as an intellectual psychological novelist, but some critics think him a great poet too. His novels include *The Ordeal of Richard Feverel* (1859), *Beauchamp's Career* (1876), *The Egoist* (1879), *Diana of the Crossways* (1885) and *The Amazing Marriage* (1895). His finest poems were in *Modern Love* (1862). In both prose and verse his style is difficult. His works never became popular but they have been greatly admired by a few.

Thomas Hardy (1840–1928).—A native of Dorsetshire, England, the locality his novels picture so vividly, Hardy was an architect's apprentice before he became a writer of pessimistic fiction. Among his great novels are *Far From the Madding Crowd* (1874), *The Return of the Native* (1878), *Tess of the D'Urbervilles* (1891) and *Jude the Obscure* (1895). He afterwards devoted himself chiefly to verse, which he preferred: *The Dynasts* (1904–8), his crowning work, a dramatic poem on England during the Napoleonic Wars, and the lyric volumes, *Satires of Circumstance* (1914) and *Winter Words* (1928). Hardy also wrote many short stories, of which "The Three Strangers" ranks among the best in English.

Robert Louis Stevenson (1850–94).—Though belonging to the late Victorian era, Stevenson prefigured the 20th-century writers in fiction, technique, style and his engrossing interest in his craft. Born in Edinburgh, Scotland, he studied law at the university there, was admitted to the bar in 1875 but did not practice. His delicate health led him to travel instead and he soon began contributing to the *Cornhill Magazine* essays that later appeared in book form as *Familiar Studies of Men and Books* (1882). Among his early stories in the same publication were "A Lodging for a Night" and "New Arabian Nights." He wrote verse of many sorts—the oft-quoted "Requiem" that Sidney Homer set to music; *A Child's Garden of Verses* (1885); and the varied lyrics of *Underwoods* (1887). He is best known for his stories of adventure: *Treasure Island* (1882), *Kidnapped* (1886), *The Master of Ballantrae* (1889) and *The Ebb Tide* (1894). *Doctor Jekyll and Mr. Hyde* (1886) is probably the most popular of all stories of the horror of good and bad in a single man. Besides he wrote several volumes of essays and travels and some of the best letters that an author's friends ever received. No author of his time had so varied a literary appeal or so picturesque and attractive a personality.

Contemporary with Stevenson were George Gissing (1857–1903), William Ernest Henley (1849–1903) and Oscar Wilde (1856–1900). Gissing's realistic *New Grub Street* and *The Whirlpool* are representative of his style and interest. Henley, critic, poet and playwright, wrote *A Book of Verses* (1888) and with Stevenson three plays. He is most famous for his poem "Invictus," with the lines:

> My head is bloody, but unbow'd . . .
> I am the master of my fate:
> I am the captain of my soul.

Courtesy Museum of Modern Art

Alfred, Lord Tennyson

An early example of photography made by the collodion (wet plate) process

Wilde, Irish wit, esthete, iconoclast, holds an uncertain niche in literature and the literary worth of his productions is constantly challenged. His plays, *Lady Windermere's Fan* (1892), *A Woman of No Importance* (1893) and *The Importance of Being Earnest* (1895) are witty, ironic, smart. His *Ballad of Reading Gaol* (1898) and *De Profundis* (1905) are probably the most read of his works.

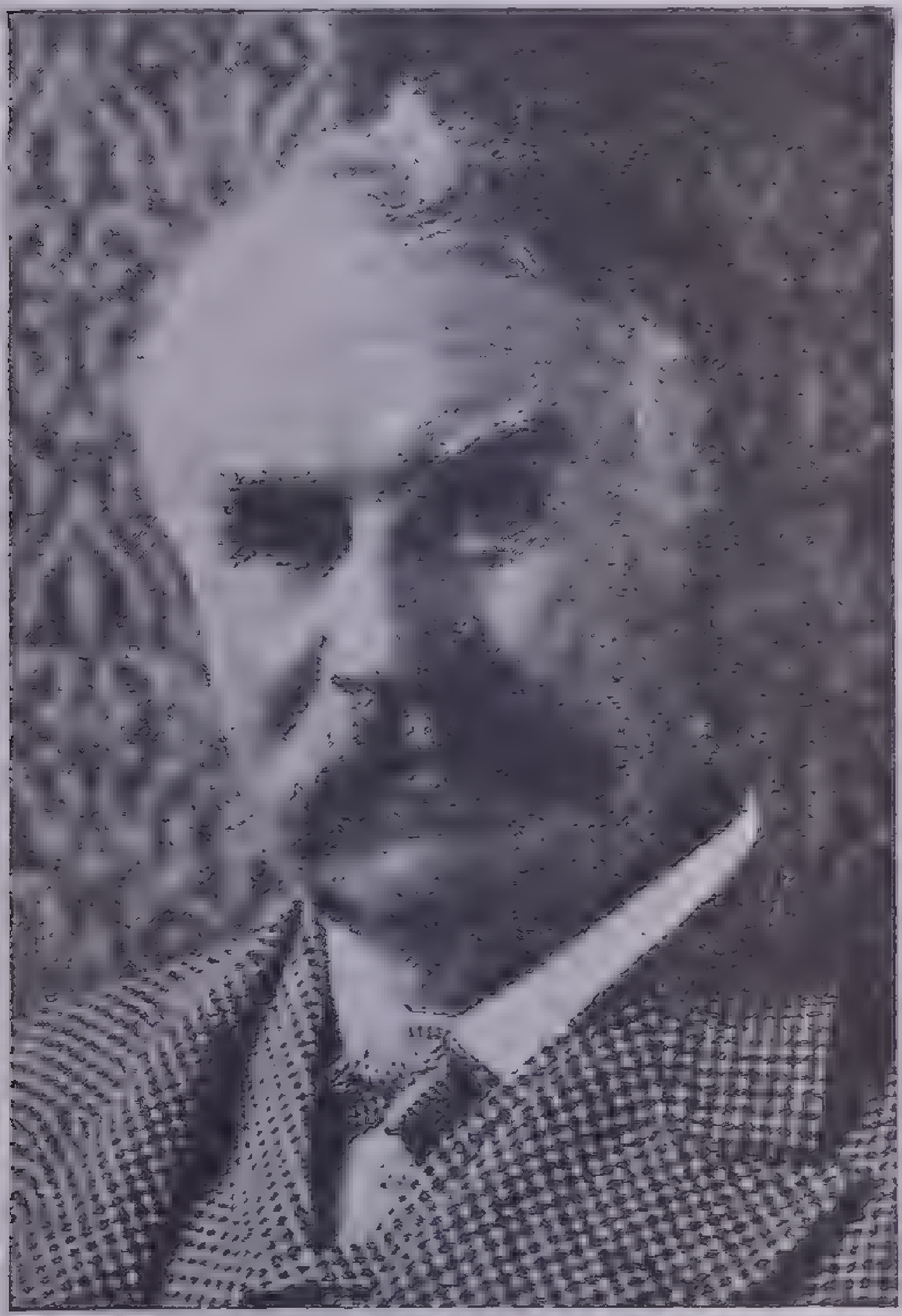
Victorian poetry attained great distinction largely because of its un-Victorian range and depth of subject matter. Of the poetic forms previously created, the sonnet, for example, could scarcely be improved upon; narrative verse also had developed its pattern; and lyric poets had established various rhythms and definite stanza forms; but with the tremendous impetus given to philosophic and scientific thought, poets began to demand a freedom that later on was to break all restraint, both as to form and content.

Alfred Tennyson (1809–92).—Conventionally educated and early inclined to poetry, Tennyson published his first volume of poems when only twenty-one. The book was not well received, but nine years later, his second volume brought him instant recognition. For the next 50 years he was a popular favorite. On the death of Wordsworth he was made Poet Laureate. He touched divers subjects and employed many poetic forms. His *Poems* (1842), included "Ulysses" and "Locksley Hall," themes to which he gave deep poetic beauty. Among the longer poems are *The Princess* (1847), a semidramatic story of woman's claim to intellectual parity with man, in which some of the choicest songs in the English language occur—"Sweet and Low," "Tears, Idle Tears," and "Ask Me No More." Tennyson's *Idylls of the King* (1854) retells the Arthurian legends; *In Memoriam* (1850) is a profound inquiry into the meaning of life and death. His lyrics and his figures of speech, alliteration and rhythm are at their height in *Maud and Other Poems* (1855) and *Enoch Arden* (1864).

Elizabeth Barrett Browning (1809–61).—A wealthy merchant's daughter, Elizabeth Barrett was educated as few women of her time had the good fortune to be, and her superior talents turned her training in the Greek and Latin classics to excellent use, for she became the most important woman in English poetry. She possessed strong emotions and significant ideas, as well as the independence of thought and action to use them effectively. Her verse attracted the poet Browning, and outwitting her protesting and selfish father (who enjoyed her society and wished her to remain at home), Browning married her in 1846 (the story of which was dramatized and adapted to the screen under the title, *The Barretts of Wimpole Street*). The Brownings lived happily in Florence, Italy, and her *Casa Guidi Windows*, written there, shows her as Browning's equal as a poet. In *Aurora Leigh* (1856), which she considered her highest achievement, she expresses all the passion of an intense and sensitive soul. Her *Sonnets from the Portuguese* are the love lyrics addressed to Browning during their courtship. The sadness of some phases of her life and the seriousness with which she regarded her work are reflected in the tenor of her verse.

Robert Browning (1812–89).—Well educated by private tutors, Browning studied both art and music, then chose poetry as his field of expression; both his esthetic sense and feeling for rhythm are evident in all he wrote. His work shows fine dramatic power and imagery, subtlety of thought and dominant sympathy for man. His longer narrative poems (like *Sordello* and *The Ring and the Book*) are often difficult reading. He tried too hard for brevity and force; but he was a master in both the short lyric and the longer more philosophical poems—a remarkable range. He had a particular gift of characterization and a rough vigorous power that presents a strong contrast with Tennyson's sweetness and calm. Among his single poems the best-known are: "The Pied Piper of Hamelin," "Pippa Passes," "How They Brought the Good News from Ghent to Aix."

Contemporary with the Brownings were the artists and poets Dante Gabriel Rossetti and William Morris, called Pre-Raphaelites because they strove to revive the ideals of Italian painters before Raphael. Rossetti (1828–82) was of Italian descent and primarily a poet of mystic passion and exquisite workmanship. His *Ballads and Sonnets* (1881), and the individual poems, "Sister Helen," "The White Ship," "The King's Tragedy," "The House of Life" (a sonnet sequence), were painter's verse, rich in color and music. His best-known work, "The Blessed Damozel" (1848), he wrote before he was twenty. . . . William Morris (1834–96), designer, printer, Socialist and poet, wrote *The Life and Death of Jason* (1867), *The Earthly Paradise* (1868) and *Sigurd the Volsung* (1877), narrative epics colored by his knowledge of Norse poetry. . . . Algernon Charles Swinburne (1837–1909) stands out strikingly in this group, by which he was strongly influenced, as a poet whose verse has the quality of sensuous, haunting beauty with a wealth of imagery; his verse resembles Byron's. Among his most distinguished works are *Atalanta in Calydon* (1865), *Poems and Ballads* (1866), *Songs before Sunrise* (1871) and *Lyonesse* (1881); he wrote also many love lyrics and ballads and critical essays in passionate prose. His favorite subjects were revolt, the sea, children, cats. . . . Edward FitzGerald (1809–83) is best known for his exquisite translation, *The Rubáiyát of Omar Khayyam* (1859–68); Francis Thompson (1859–1907), for "The Hound of Heaven" and other mystic verse; Edward Robert Bulwer-Lytton (pen name, Owen Meredith, 1831–91), for *Lucile;* William Sharp (pen name, Fiona Macleod, 1855–1905), for "From the Hills of Dream" (1896) and his leadership in the Celtic revival; and Henry Austin Dobson (1840–1921), for his many bright and graceful lyrics and rondeaus.


Underwood & Underwood

Sir William Schwenck Gilbert

SIR WILLIAM SCHWENK GILBERT (1836–1911).—Playwright and poet, Gilbert became world-famous for his work in collaboration with Arthur Sullivan in the popular and humorous light operas, *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1880) and *The Mikado* (1885), of which he wrote the librettos. After a break with Sullivan, Gilbert's work lost in quality and charm.

The Twentieth Century.—Literary production in England by the 20th century embraced fields of thought and styles of expression that are unexcelled. Its amazing stimulation and growth were due to many causes, foremost of which was doubtless the gradual development of literary forms built up through the years from the days of Chaucer. Public opinion and individual reactions, however, had been remolded by national and international events: The Berlin Congress in 1878 had reshaped political thought; the assassination of the Czar of Russia had sounded an ominous warning; Gladstone's conversion to home rule for Ireland in 1895, Livingstone's and Stanley's work in Africa, the Boer War, 1899–1902, and England's building up colonial empires in Africa and India had very marked effects on English thought and literary expression. Improved rail and water transportation and the invention of the telegraph and telephone helped to eliminate time and space and brought the world's nations closer together; general education, social reforms, labor organizations and, more than all, the increased output of books, magazines and newspapers that quickly disseminated new ideas made writing specialized and literature complex. Ibsen in Norway and Tolstoy in Russia had wielded strong influence. The writers of English fiction had acquired a new style, greater subtlety, more acute insight into human nature and problems and a genuine sympathy with human frailty and suffering.

One group of writers was well established before the close of the 19th century but their work extended into the 20th century. Henry James (1843–1916), the American expatriate, wrote in a painful, elaborate style many psychological, intellectual novels contrasting English and American manners and customs. Among his earlier works are *A Passionate Pilgrim and Other Tales* (1875), *Daisy Miller* (1878) and *The Portrait of a Lady* (1881). Later novels are *What Maisie Knew* (1897), *The Wings of a Dove* (1902) and *The Ambassadors* (1903). Much autobiographical material appears in his *A Small Boy and Others* (1913) and *Notes of a Son and a Brother* (1914). . . . Sir Edmund Gosse (1849–1928), biographer, critic and poet, for 10 years librarian of the House of Lords, wrote biographies of Congreve, Donne, Swinburne and Ibsen, many critical essays and the autobiographical *Father and Son.* . . . Henry Arthur Jones (1851–1929), playwright and letter writer, won his first success with *The Silver King* (1882); the subsequent *Liars* and *Mrs. Dane's Defense* enhanced his reputation. . . . Mrs. Humphry Ward (1851–1920) was well known by her *Robert Elsmere* (1888) and *David Grieve* (1892) before her *Eleanor* (1900), *The Marriage of William Ashe* (1905) and *The War and Elizabeth* (1918) and other novels.

Underwood & Underwood

Sir Arthur Sullivan

Also of this group are George Moore (1852–1933), novelist of the modern Irish movement (sponsored by Yeats and Lady Gregory) who studied art in Paris, wrote poetry—*Pagan Poems* (1872) and *Flowers of Passion* (1878)—and then attempted to reform English fiction on French models. *The Mummer's Wife* (1885), *Esther Waters* (1894) and *Evelyn Inness* (1898) were the first of his strikingly new novels. *The Brook Kerith* (1916) treats the life of Christ in familiar everyday fashion. Even more typical of the man and his style are *Confessions of a Young Man* (1888) and *Hail and Farewell* (1911–14).

JAMES M. BARRIE (1860–1937).—Of Scottish birth and education, Barrie became both novelist and playwright. He contributed to late Victorian literature *Auld Licht Idylls* (1888); the well-known and loved *The Little Minister* (1891); *Sentimental Tommy* (1896); and to the succeeding period the highly successful plays, *The Admirable Crichton* (1902), *Peter Pan* (1904), *What Every Woman Knows* (1908) and *Dear Brutus* (1917).

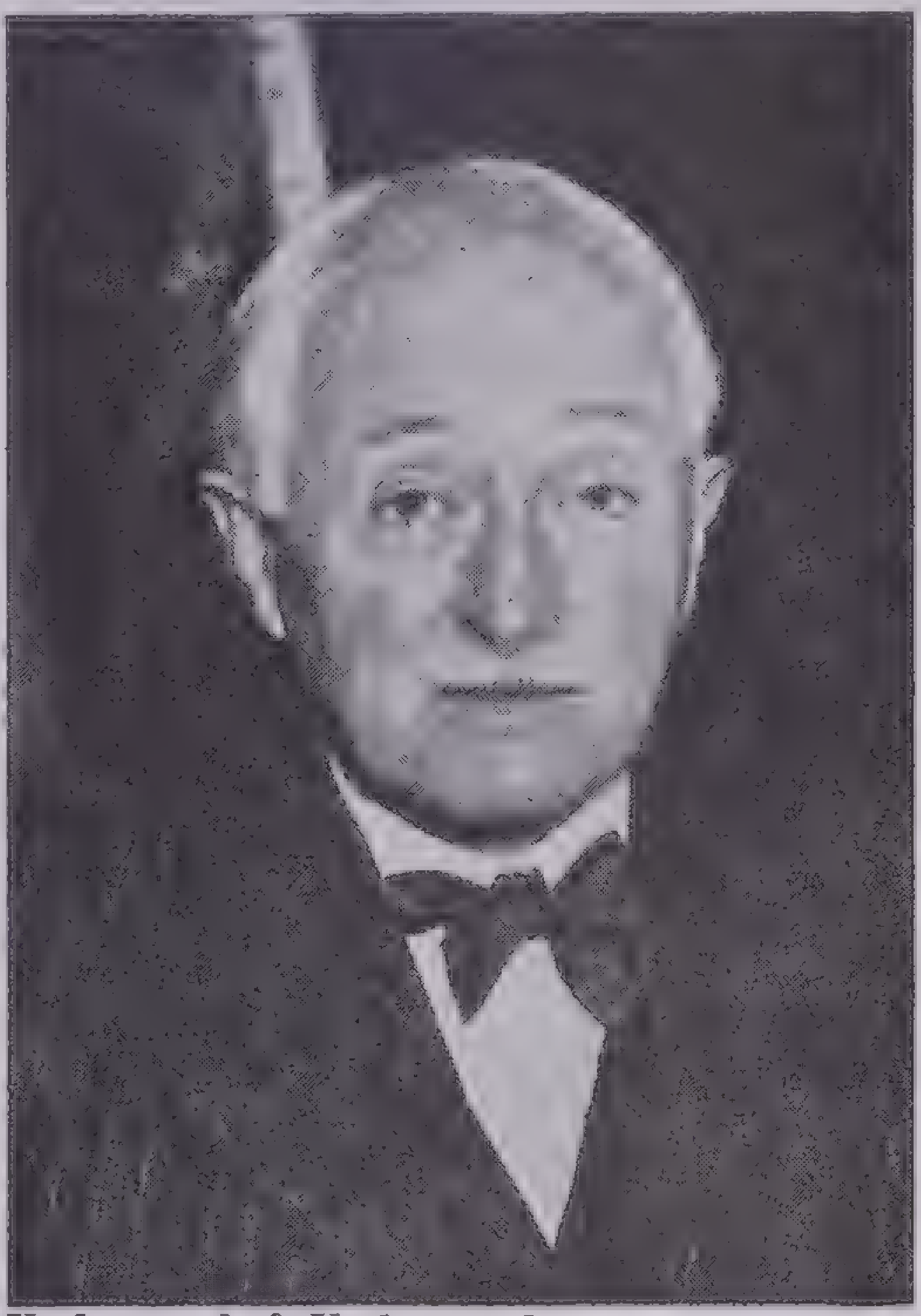
GEORGE BERNARD SHAW (1856–).—No younger figure of 20th-century English literature has ever succeeded in thrusting aside this older and irrepressible but brilliant Irish Socialist, novelist, playwright and critic. He wrote several novels long ago and many books on socialism. His clever, witty dramas delighted English readers and American playgoers long before they were permitted on the English stage in the early 1900's. Prominent among Shaw's early plays are *Arms and the Man* (1894), *Mrs. Warren's Profession* (first played in 1902) and *Candida* (1897). For Ellen Terry he wrote *Captain Brassbound's Conversion* (1900). His plays, *Man and Superman* (1903), *Back to Methuselah* (1921) and *Saint Joan* (1923), and his elaborate, expository prefaces to the plays made him a much-talked-of man. He received the Nobel Prize in 1925. He was the most original and controversial literary figure of the day and his keen sense of the comic, his caustic wit and consuming desire to upset traditional views in all phases of thought and living have kept him in the public mind for a full half century.

Joseph Conrad (1857–1924).—This foreign-born writer is noted for his command of clear, fluent English, a language he learned late in life. The son of a Polish writer, he was bred to the sea and wrote only after retiring from it. His fascinating stories include *Almayer's Folly* (1895), *The Nigger of the Narcissus* (1897), *Lord Jim* (1900), *The Rescue* (1920) and *The Rover* (1923)—all stories of the sea, but with the adventure of character and psychology, not of episode.

Sir Arthur Conan Doyle (1859–1930).—A young doctor who wrote to occupy his spare time when his early practice was small, Doyle in 1887 became popular overnight with *A Study in Scarlet,* a detective story with Sherlock Holmes, a new type of mystery solver. He wrote book after book about Holmes, and a successful play starred William Gillette as Holmes. Later a series of the Sherlock Holmes episodes were put on the air. Doyle wrote several excellent historical romances: *Micah Clarke* (1888) about Monmouth's Rebellion; *The White Company* (1891), a story of mercenaries in the 14th century; and *The Exploits of Brigadier Gerard* (1896), about the Napoleonic Wars. He was a British Government propagandist in the Boer War and the World War and lectured and wrote on spiritualism.

Herbert George Wells (1866–).—Sociologist, novelist, historian, the son of a professional cricketer and a lady's maid, Wells gained his education in the Royal College of Science and the University of London through scholarships and was graduated with honors. His early stories dealt largely with scientific speculation in the manner of Jules Verne, as in *The Stolen Bacillus.* He next wrote several novels of a prophetic type—*Anticipations* (1901), *In the Days of the Comet* (1906) and *The War in the Air* (1908), many incidents of which subsequently took place. Following these came a series concerned with portraying contemporary life, including *Ann Veronica* (1909) and *The Passionate Friends* (1913). His stirring story of the World War, *Mr. Britling Sees It Through* (1918) aroused wide interest. Two years later he published both *Russia in the Shadows* and his monumental *Outline of History,* followed by the *Science of Life* (1929) with J. S. Huxley; the last two works have been more widely read than others of the same type. Well's *Experiment in Autobiography* (1934) is a frank revelation of his life. Many of his books have found great favor in the United States, where he has traveled and lectured.

John Galsworthy (1867–1933).—Outstanding in both fiction and the drama, Galsworthy became world-famous for his series of novels, *The Forsyte Saga,* the entertaining history of an engaging family, distinguished in style and revealing deep human insight and fine characterization. Galsworthy's plays have been translated into various languages. *Strife* (1909) and *Loyalties* (1922) put him in the first rank of playwrights. His *Caravan* is a collection of short stories. The Order of Merit was bestowed on him in 1929 and in 1932 the Nobel Prize.


Underwood & Underwood

John Masefield

Among other 20th-century writers are: Gilbert Keith Chesterton (1874–1936) who won distinction for his fine critical work, novels, stories, plays and ability as an illustrator. His amazing versatility ranged from discussions of the Roman Catholic Church, to which he became an ardent convert, through well-considered essays on men and things, to novels, poems, whimsicalities and detective stories. He wrote *The Man Who Was Thursday, The Ballad of the White Horse* (1911), *New and Collected Poems* (1929), *Come To Think of It* (1930) and the Father Brown detective stories. . . . Arnold Bennett (1867–1931), prolific critic and novelist, wrote *How to Live on Twenty-four Hours a Day* (1907), *The Old Wives' Tale* (1908), a great novel, *The Card* (1911) and other stories of the Five Towns in northern England. . . . May Sinclair is best known by her *The Divine Fire* (1904), her first novel.

Twentieth-century English poetry, though not voluminous, has definite distinction in both the older and the newer phases. Among its earlier poets, Alfred Edward Housman (1859–1936), wrote only two small volumes, *A Shropshire Lad* (1896) and *Last Poems* (1922), simple, stark verse of a young man's disillusionment. . . . Maurice Hewlitt (1861–1923), poet and novelist, wrote narrative poems, *The Song of The Plow* (1916) and *The Village Wife's Lament* (1918), and English and Italian historical fiction, *The Forest Lovers* (1897), *Richard Yea-and-Nay* (1900) and *The Fool Errant* (1905).

Few 20th-century writers have enjoyed such world popularity as Rudyard Kipling (1865–1936), whose verse and fiction have universal appeal and great variety of subject. He was born and reared in India, and much of his work is colored by his life there and by British imperialism; it includes *Kim, Plain Tales from the Hills, The Jungle Book, The Just So Stories, Barrack-Room Ballads* and *Departmental Ditties.* His famous "Recessional," "Danny Deever" and other poems set to music are popular songs. Kipling received the Nobel Prize in 1907. . . . Alfred Noyes (1880–), poet, dramatist and fiction writer, lectured and taught in America as professor of English literature at Princeton University. His verse includes the trilogy on scientific discovery: *The Watchers of the Sky, The Book of Earth* and *The Last Voyage* (1922–30), *A Tale of Old Japan,* set to music as a cantata by Coleridge-Taylor, many ballads and the striking poem "The Victory Ball." His other work embraces essays, plays, a novel, short stories and biographies of William Morris (1908) and Voltaire (1936).

Irish poets who contributed verse of deep poetic beauty, sometimes mystic, often tragic, include: William Butler Yeats (1865–1939). who received the Nobel Prize in 1923, was one of the founders of the Abbey Theatre, Dublin; wrote for it *Kathleen ni Houlihan* (1902), *The Green Helmet* (1910) and other plays in prose and verse; and also wrote several volumes of poetry, including *Responsibilities* (1914), *The Wild Swans of Coole* (1917) and *The Tower* (1927). . . . George William Russell (1867–1935), painter, poet and leader of the co-operative movement who signed himself Æ, wrote the tragedy, *Deirdre* (1907). . . . John Millington Synge (1871–1909), artist, director of the Abbey Theatre, wrote various Abbey Theatre plays including *The Playboy of the Western World* (1907) which was mobbed by patriotic Irishmen who disliked its picture of Irish character. . . . Padraic Colum (1881–), poet and dramatist, resident in America after 1914 and exponent of the modern Irish literary movement, wrote in verse *Wild Earth* and *Creatures,* edited the *Anthology of Irish Verse* (1921) and wrote the novel, *Castle Conquer,* and the *Myths of the World.*

Two notable English poets of this epoch are Masefield and Brooke. John Masefield (1878–), whose lyrics and narrative poems include *Salt-Water Ballads* (1902), *The Everlasting Mercy* (1911), *The Widow in the Bye Street* and *Sonnets and Poems,* is the author also of plays, novels, two stories for boys (*Jim Davis* and *Sard Harker*) and two remarkable studies of Shakespeare. Masefield was made Poet Laureate in 1930. . . . Rupert Brooke (1887–1915) poet, world traveler, was a victim of blood poisoning while serving in the World War. In his two small volumes of verse, *Poems* (1911) and *1914 and Other Poems* (1915) are gems like "Grantchester," "The Great Lover," "The Soldier" and "The Dead."

Contemporary prose writers whose names are everywhere familiar include: Hilaire Belloc (1870–), French by birth, who studied at Oxford and became a naturalized English citizen in 1902. He has been called the foremost Catholic scholar outside the clergy. Belloc wrote on war, politics, history, literature—and books to make children behave better. His works include *Robespierre* (1901), *The Path to Rome* (1902), *Marie Antoinette* (1910), *Europe and the Faith* (1920), *Joan of Arc* (1920), *Napoleon* (1932), *Essays of a Catholic Layman in England* (1931) and biographies of William the Conqueror, Charles I, Cromwell and Milton. . . . William Somerset Maugham (1874–), novelist, playwright and short-story writer, won fame with his novels *Of Human Bondage* (1916) and *The Moon and Sixpence* (1919), a story based on Gauguin's life. "Miss Thompson," a story of the South Seas in *The Trembling of a Leaf* (1921), was dramatized as *Rain.* Other popular Maugham plays include *Our Betters* (1923) and *The Constant Wife* (1927). His novel, *Cakes and Ale* (1930), gained much interest for its thinly veiled portraits of literary personages. . . . Sir Philip Gibbs (1877–), famous news correspondent during the World War, wrote in the cause of world peace several novels and historical volumes including *Now It Can Be Told, The Cross of Peace, European Journey.*

The Imagist School.—Promoted by post-war poets, the Imagist School experimented in forms but wrote mostly in the unrhymed so-called free verse (French, *vers libre*). The Imagist asserts the right of full freedom in the choice of subject, language and treatment and makes bold use of direct, unrestrained diction and imagery. He is free from all vagueness and mysticism—an unrestraint not always of beauty but oftener of harsher reality. The movement soon extended to the drama and was as eagerly embraced by prose writers following the lead of Joyce.

Of the Imagist poets, Wilfred Wilson Gibson (1878–) is the earliest; his *Daily Bread* (1910) and *Highland Dawn* (1932) show the development that came through various intervening volumes concerned with the underprivileged and those lacking expression. . . . Siegfried Sassoon (1886–) in his *Counterattack* (1918) presents a graphic interpretation of the futility and brutishness of war. . . . Richard Aldington (1892–) led the Imagist poets with *Images Old and New* (1915). He later published other volumes of verse, and among novels, *The Colonel's Daughter* (1931). In 1913 he married the American, Hilda Doolittle (pen name, H. D.), who also became one of the leading Imagists and wrote *Hymen* (1921) and *Red Roses for Bronze* (1931).

James Joyce (1882–), Irish novelist and poet, wrote *Chamber Music* (1907), *Dubliners* (1914), the autobiographical *A Portrait of the Artist as a Young Man* (1916) and a play, *Exiles* (1918), before his unconventional novel *Ulysses* (1922) introduced the custom of writing everything that comes into the stream of consciousness.

Other Contemporaries.—John Cowper Powys (1872–), critic, novelist and short-story writer, is the author of *Visions and Revisions; Wolf Solent,* for which, perhaps, he is best known; and *Autobiography* (1934). He spent some time in America. One brother, Theodore Francis Powys (1875–), a stark realist, wrote *Black Bryony.* Another brother, Llewellyn Powys (1884–), traveled in America and contributed his impressions in *The Verdict of Bridlegoose;* and also visited Palestine and wrote *A Pagan's Pilgrimage;* Alyse Gregory Powys, his American wife, wrote *She Shall Have Music,* a novel.

Among leading contemporary dramatists are: Harley Granville-Barker (1877–), who produced various Shaw plays and became widely known in America for his striking stage settings; he wrote the plays *Waste* and *Madras House;* Rudolf Besier (1878–), who collaborated with Wells on *Kipps* (1912) and with Walpole on *Robin's Father* (1918), wrote *Secrets* (1922) and *The Barretts of Wimpole Street* (1931). The versatile, brilliant and suave Noel Coward—playwright, actor, composer, director—also is a favorite in America for his *Design for Living, Play Parade* and the tremendously stirring *Cavalcade.*

The novelist and critic, Virginia Woolf (1882–), cofounder with her husband, Leonard Woolf, of the Hogarth Press, used the stream-of-consciousness method in much of her work. Her novels include *Mrs. Dalloway* (1925) and *The Waves* (1931); her books of criticism are *The Common Reader* (1925) and *The Second Common Reader* (1932). She wrote a biography of Mrs. Browning's spaniel, *Flush* (1933). . . . Hugh Seymore Walpole (1884–), novelist and biographer, achieved early success, though not with his first work—two novels written while at Cambridge. His war service in Russia provided material for *The Dark Forest* (1916) and *The Secret City* (1919); his novels include *Portrait of a Man with Red Hair* (1925) and *Vanessa* (1933), the last of a tetralogy. He wrote biographies of Conrad and Trollope and several books for children.

David Herbert Lawrence (1885–1930) wrote controversial novels disapproved and suppressed in both England and America because of their frank presentation of the psychology of sex. Among his books are *Sons and Lovers* (1913) and *The Woman Who Rode Away* (1928).

No woman in recent English literature became so well known and admired through so brief and meteoric a career and so slender but strong a passport to fame as Katherine Mansfield (pen name of Kathleen Beauchamp, 1890–1923). One of her short stories, "The Fly," has been ranked with the world's best fifteen. Among her few works are *Bliss* (1920) and *The Dove's Nest* (1923). Her *Journal* covers the years 1914–22. . . . Aldous Huxley (1894–), novelist, poet, essayist and biographer, is best known through his *Point Counter Point* (1928). He wrote a play, *The World of Light* (1931) and a biography of T. H. Huxley, his distinguished grandfather, and he edited the letters of D. H. Lawrence.

Rebecca West (pen name of Cecily Fairfield, 1892–), leading woman journalist, critic and novelist, besides being well known to London and New York newspaper readers established a high reputation for her critical studies of the work of such literary figures as Henry James and D. H. Lawrence and for her novels, *The Return of the Soldier* (1918), *The Judge* (1922) and *Harriet Hume* (1929). She is the author also of two volumes of essays, *Strange Necessity* (1928) and *Ending in Earnest* (1931); and of *The Harsh Voice* (1935).

Victoria Mary Sackville-West (1892–), poet and novelist, received the 1927 Hawthornden Prize (founded in 1919 by Alice Warrender as an award to imaginative young writers) for *The Land* (1926), a book of verse; her novels include *The Edwardians* (1930) and *Family History* (1932. . . . Robert Ranke Graves (1895–) published *Poems* (1914–26, 1926–30) and several prose works, including *Lawrence and the Arabian Adventure* (1928) and two novels about the Roman Emperor Claudius. . . . Edmund Charles Blunden (1896–) wrote *Halfway House* (1932), a book of verse, several volumes of criticism and *Undertones of War* (1928).

English literature still maintains the British tradition for clarity of thought and shows a constantly increasing variety of subject matter.

AMERICAN LITERATURE

American literature today is a sturdy adolescent, capable at last of standing on its own feet and filled with new ideas and aspirations. At first it was only natural that the forms in which American thought found expression should be derived from England. English speech, English writing and English culture dominated. English Puritanism had a tremendous influence not only upon the early writers but also upon the general tone of American thought and action. The effects of English romanticism were seen in early fiction and in the poetry of Poe. Nevertheless, all the while, America was breeding a literature of her own, born out of the storm and stress of creating a nation, of reconstructing it after a devastating Civil War and of opening up a vast virginal West where a new native culture could develop.

American literature, so closely allied with the political growth of the country, may be divided into the following periods: the Colonial Period, 1607–1750; the Revolution, Period of Controversy, 1750–1815; the Period of Romanticism, Democracy and the Civil War, 1815–65; the Period of Reconstruction and Growth, 1865–1900; Twentieth Century Literature, 1900–.

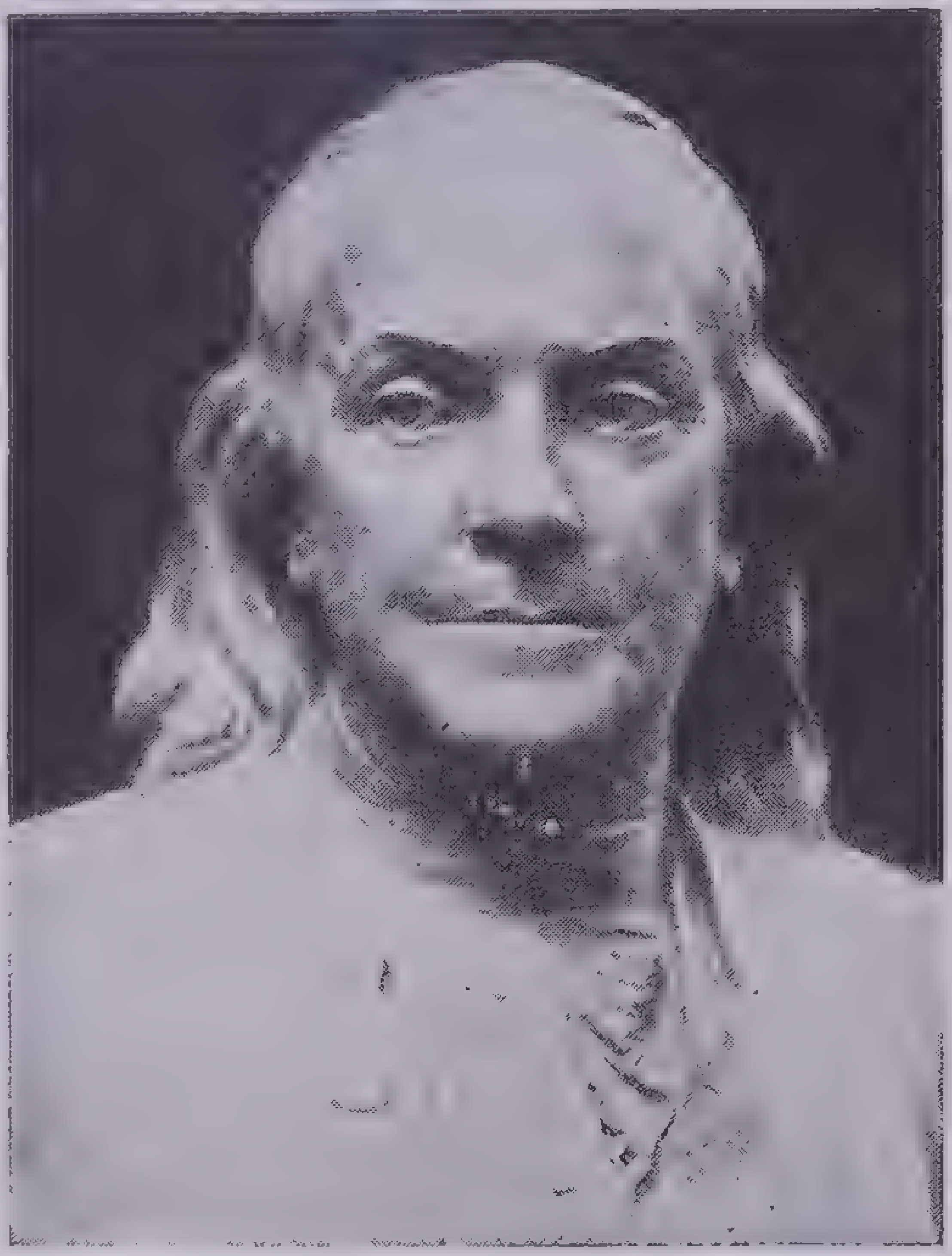
Colonial Period, 1607–1750.—To create a great literature, any country must have a folklore and a highly developed nationality and civilization. Colonial America had neither. Traditions come only after generations of men have lived, fought and died. Literature is written only if romantic deeds and scenes rich in historic background exist. Culture is bred only when a nation is orderly, at peace and devoted to the arts. Our New England pioneers, struggling with hostile Indians and an unfriendly soil and climate, had little time to write. The business of making a living engrossed their time and effort.

The few books that were written were largely concerned with descriptions of life in the New World. Shortly after the landing of the Pilgrims in 1620, William Bradford, second governor of Plymouth Colony, wrote *The History of Plimouth Plantation,* a detailed and dramatic account of the colonists' impression of this "weather-beaten face," of fights with the Indians, sicknesses, labors with the soil, social and religious customs, trade and the struggle to educate their youth. Another substantial and valuable history was Governor John Winthrop's *The History of New England.* Samuel Sewall, one of the judges who pronounced death upon the people of Salem who were accused of witchcraft, recorded that survival of medievalism in his *Diary,* written tersely and with real pictorial value.

In the South conditions were even less favorable for book printing because the people were not congregated in towns nor bound together by such strong religious interests as in New England. Captain John Smith wrote *The Generall Historie of Virginia* (1624) and also an account of his personal adventures. William Byrd's *The History of the Dividing Line* is a record of his commission to establish the boundary between Virginia and North Carolina.

Theology engrossed the attention of the New England colonists and permeated their literature. An exception was Anne Dudley Bradstreet, whose work, though conventional, captured something of the Elizabethan flavor. *The Day of Doom* by Michael Wigglesworth is a direful and fiery picture of Judgment Day. Quotations from it were used in *The New England Primer,* a textbook of couplets attempting to teach theology and the alphabet at the same time. The *Bay Psalm Book* proves that the Puritans were not averse to music if it was set to religious verse.

The two great theologians of the period were Cotton Mather and Jonathan Edwards. Both represent New England Calvinism in its severest form. Both were powerful preachers and writers, absolutely relentless in their insistence that the wrath of God and the doom of eternal punishment descends on those who sin. Mather's *The Ecclesiastical History of New England* is not a mere church history but a running commentary on life, sin, death and rules of conduct. Edwards' treatises are more intellectual, restrained and logical. The first president of Princeton College, he is known as an educator as well as a theologian and philosopher.



Underwood & Underwood

Benjamin Franklin

From the statue by Robert Ingersoll Aitken in the Hall of Fame, New York.

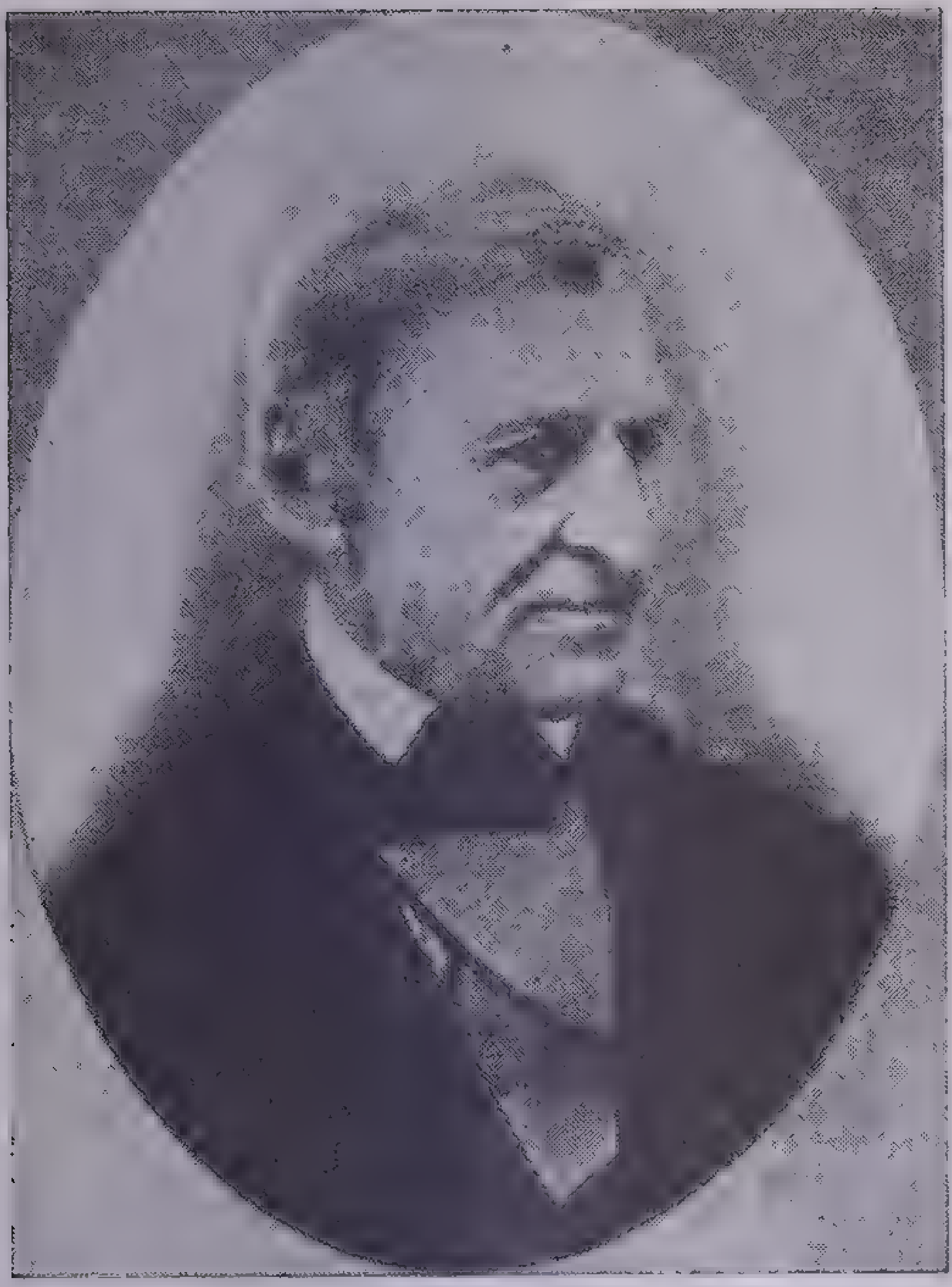
Revolution or Period of Controversy, 1750–1815.—The events that led to the Revolutionary War turned the attention of the American people from the contemplation of an afterlife to consideration of their immediate future. The exciting business of breaking away from English rule and setting up an American government brought forth patriotic verse, impassioned oratory and many political documents.

Poetry was written not by idle observers but by men active in politics, education or diplomacy. The Hartford Wits were a group of young men attempting to write good *English* literature. Later almost all took an active part in the Revolution and wrote such patriotic poems as "The Conquest of Canaan" by Timothy Dwight, which pictured the young nation as a slumbering giant; and "The Columbiad" by Joel Barlow. Francis Hopkinson's "Battle of the Kegs" is a fine satirical poem at the expense of the British. John Trumbull's "Ode to Sleep" marked the advent of lyrical poetry, which flowered later in the work of Philip Freneau, whose "Eutaw Springs," "To a Honey Bee," "The Wild Honeysuckle" and "The Indian Burying Ground" are lyrics of real skill and charm. Frank Moore has made an excellent collection of these poems, entitled *Songs and Ballads of the American Revolution.*

The struggle for independence, the Revolutionary War and the drafting of the Declaration of Independence and of the Constitution developed a group of orators not excelled in the English Parliament for clarity of thought and conviction. Among the statesmen who made American history and contributed vital examples of oratory were: Thomas Paine, the much misunderstood liberal, whose vigorous political pamphlets, *Rights of Man* and *Common Sense,* contributed much to the forces that brought about a break between the colonies and the mother country; James Otis, whose speech against the writs of assistance inflamed the colonists against taxation without representation; Patrick Henry, whose "Give me liberty or give me death" rang across the sea; George Washington in his *Farewell Address;* John Adams, John Randolph, Benjamin Franklin and Thomas Jefferson, author of the immortal *Declaration of Independence.* In prose exposition, Alexander Hamilton, James Madison and John Jay collaborated on *The Federalist,* a collection of essays explaining the proposed Federal Constitution and advocating its adoption, a first attempt in the literature of political science.

In nonpolitical prose the work of BENJAMIN FRANKLIN (1706–90) is outstanding. Franklin rose by his own efforts from poverty to wealth, from obscurity to world-wide honor. He was scientist, inventor, editor, diplomat, philosopher and writer. He was our representative in England before the Revolution and in France during the war. *Poor Richard's Almanack* is a storehouse of his wit, wisdom and practical information. Franklin's *Autobiography* is a clearly written account of his earlier life, particularly interesting when read in conjunction with some of his excellent letters. His literary contemporaries included John Woolman, the Quaker preacher whose *Journal* is still read in England as well as in America for its piety and purity of style; Charles Brockden Brown, our first internationally known novelist, and St. John de Crèvecœur, farmer and adventurer. Brown's novels show the influence of English Romanticism in their preoccupation with the strange and mysterious; they also contain a hint of psychological analysis, foreshadowing the work of Poe and Hawthorne. His style is stilted but his descriptions are vivid and his characterizations convincing. He also contributed to the early literary magazines that generally took their material from English sources. Crèvecœur's *Letters from an American Farmer,* written in an easy flowing style, are interesting and accurate observations on rural life.

Period of Romanticism, Democracy and the Civil War, 1815–65.—This period was marked by increased literary output and the establishment of fixed schools in fiction, poetry and philoso-



Underwood & Underwood
Ralph Waldo Emerson

phy—all against a background of lingering deference to European culture. Politically the period was one of struggle to make unity and democracy out of a hard-won national independence. The virile life of the vast West created the necessity for new standards of living and new modes of thought. Towns springing up in isolated sections were bound together by improved transportation and growing industries; but at the same time dialects, social backgrounds and traditions began to differentiate the New Englander, the Southerner and the Westerner. Such economic questions as the tariff, money, banking and, most of all, slavery, became part of political discussion and legislation. Much of this discussion crept into literature; but quite apart from economics and politics, literature was now for the first time extensively cultivated for its own sake.

Washington Irving (1783–1859), a genial and versatile author, traveler and diplomat, was American by birth, education and affection for American scenes and institutions, but much of his work was in the English manner. He did, however, give to the world the first evidence of a native American literary folklore in his *Sketch Book* stories, *Rip Van Winkle* and *The Legend of Sleepy Hollow.* He had previously contributed to the engaging *Salmagundi Papers* and written the delightfully humorous *Knickerbocker's History of New York.* Besides the two famous legends of the Hudson, the *Sketch Book* contains discerning and charming essays on places visited abroad. Irving used the sketch—short and concentrated—in an attempt at originality and so became a godfather of the short story, which was to become the most distinctive contribution of American literature.

James Fenimore Cooper (1789–1851) invested American scenes and characters with the glow of romantic adventure. He introduced to a reading public that included all of Europe the American woodsman, the American Indian and the American sailor—romantic, adventurous figures of the New World and of his own time, capable of rivaling and replacing Scott's heroes of the Middle Ages. Like Scott, Cooper is remembered for his vivid imagination, his story-telling ability, his sense of scenic and dramatic values and the heroes he created.

The Southerner, William Gilmore Simms, wrote adventurous historical tales somewhat in the Cooper manner, of which the best known is *The Yemassee,* a story of Indian warfare in Carolina. Very different from Cooper's sea stories, however, are those of Herman Melville, whose *Moby Dick* is not only stirring and gripping but at the same time a mystic allegory of the pursuit of an ideal. Because of its underlying philosophy and symbolism it has been called the first great American novel and is still much read. Another sea story, historically important for its accuracy and the interest it aroused in California, is Richard Henry Dana's *Two Years Before the Mast,* an exciting account of his personal experiences.

New England now became the center of American culture. Emerson, Thoreau, Bronson Alcott and Margaret Fuller wrote philosophy and critical essays; Hawthorne, novels and short stories; Longfellow, Whittier, Lowell and Holmes, poetry. Somewhat outside the New England tradition was William Cullen Bryant, poet and journalist in New York. Still farther removed were Sidney Lanier, poet of the South, Edgar Allan Poe and Walt Whitman, whose work carries over into the next period.

Ralph Waldo Emerson (1803–82) was the most profound thinker America had yet seen. Scholar, teacher, minister, traveler, lecturer, poet and essayist, he appealed to all who would seek truth for its own sake, forsake tradition and blaze new trails. He was the leader of an idealistic philosophy, termed *Transcendentalism,* which particularly emphasized the power and force of the individual and the essential unity of nature. His philosophy was not consistent but possessed ecstasy, optimism and tremendous enthusiasm, as expressed in such essays as *Self-Reliance, Heroism, Love, Friendship* and *Compensation.* Emerson's *The American Scholar* urges a national self-consciousness and the abandonment of servile adherence to European standards and forms. With Hawthorne, Thoreau and others, Emerson was interested in Brook Farm, a New England attempt at communal living that was unsuccessful. His poetry, largely philosophical, was strongly influenced by his study of Hindu, Persian and ancient Greek literature. Emerson was hailed in England by Carlyle and others as a great prophet and his influence reaches to the present day.

Associated with Emerson at Concord was the eccentric yet clear-headed philosopher, Henry David Thoreau (1817–62). He, too, was a strong individualist and cried out against the financial and political demands of society. He retired to the shores of Walden Pond, there to build a hut with his own hands and to raise his own food—not to escape from civilization but to find it. He did not believe in government and his philosophy of passive resistance—an Oriental rather than an American idea—has had a tremendous influence upon the thought of the world. In *Walden* he shows us not only the philosopher but the pure naturalist, keenly interested in the ways of nature and of animal life.

Bronson Alcott was another Concord sage, though his "Orphic Sayings" were never articulate enough to provide substantially for his family of "Marmee, Meg, Jo, Beth and Amy," described by his gifted daughter, Louisa May, in *Little Women, Little Men* and other universally loved novels. He was greatly interested in new methods of education and in the establishment of another communal settlement, Fruitlands.

Margaret Fuller was one of the first American women to take an active interest in literature and philosophy. She was extremely well educated and a brilliant conversationalist. For two years she edited the *Dial,* a magazine devoted to the philosophical and poetical expressions of Transcendentalism, and contributed much of its content. Through her translations she introduced German thought and philosophy to America.

Nathaniel Hawthorne (1804-64) reflected New England surroundings just as Irving represented urban New York and Cooper rural New York. Hawthorne's early life in Salem made him conscious of 17th-century New England in such of its practices as Salem witchcraft; and his later life in Concord brought him in touch with the metaphysics of Emerson, Thoreau and Bronson Alcott, though he never entirely accepted them. He gave literary prestige to the short story and firmly established it as an artistic medium, finding a ready market in the periodicals that were yearly increasing in number. Through all his tales runs the thread of some moral law. His characters are largely symbolic of ideas, but his settings are realistic

Underwood & Underwood
Louisa May Alcott

and in the mood he wishes to create. Some of his stories are fantastic; some, pure allegory; others, like *The Great Stone Face,* show great simplicity and fine technique; still others, such as *A Rill from a Town Pump,* are wholly engaging. Hawthorne's novels also reflect his interest in the mental and the mystic. His most significant works, *The Scarlet Letter* and *The House of the Seven Gables* are fine studies of Puritan psychology.

By all estimates, Henry Wadsworth Longfellow (1807–82), scholar, teacher and traveler, was the most popular poet of his day, in England almost as much as in America. His poetry has a European flavor and a scholastic background. His popular narrative poems, *Evangeline, The Courtship of Miles Standish* and *Hiawatha,* are American in content but not in feeling. His sonnets, which required concentration of thought and form, are far better poetry than his lyrics and narratives.

James Russell Lowell (1819–91), like Longfellow, was pre-eminently a scholar. He was much interested in politics and was for many years American Minister to England. His opposition to the Mexican War and the institution of slavery was expressed through the medium of a typical Yankee talking to all and sundry in the famous *Biglow Papers* in both verse and prose. Included in this collection is the delightful poem "Courtin'." *A Fable for Critics* is a collection of racy light verse characterizing his literary contemporaries. Of particular importance is his use of dialect, and the poems in which this is present are much fresher and more original than his formal compositions.

Oliver Wendell Holmes (1809–94), a Bostonian who was distinctly democratic in his sympathies, studied law and medicine and became a great physician and teacher of anatomy. His poetry is memorable particularly for its humor and patriotic feeling, as in "The Height of the Ridiculous," "The Deacon's Masterpiece" and "Old Ironsides." He also wrote the inspiringly beautiful "The Chambered Nautilus" and several noble hymns. A genial, shrewd and apposite commentator, he wrote in prose *The Autocrat of the Breakfast Table,* an unrivaled collection of chatty, diverting comments on life and affairs. His novels were less successful but show a doctor's concern with psychological aspects.

Of this group of New England poets, John Greenleaf Whittier (1807–92) was the most American in his choice of subjects and style of writing. He took an extremely active part in the Abolitionist movement and no single American poem is so full of righteous scorn as Whittier's "Ichabod," an attack on Daniel Webster for his speech on the seventh of March supporting the Compromise of 1850. Among his lyrics and narratives are "The Barefoot Boy," "The Shoemakers," "The Huskers," "Corn Song," "Maud Muller," "Skipper Ireson's Ride," "Barbara Frietchie" and the New England idyl, "Snow-Bound," all American in subject and tone and all contributing to an American treasury of tradition and folklore.

William Cullen Bryant (1794–1878) was born in New England but departed from its tenets in his emphasis on nature. "Thanatopsis," written when the author was seventeen, is a melancholy poem about death with no Christian hope in it—a pantheist's or nature-lover's religion. He was influenced by such British poets as Gray, Coleridge and Young in choosing as his theme fundamental concepts and the beauty of nature. He wrote, with an austere and dignified touch appropriate to the "High Priest" of Nature, such poems as "Forest Hymn," "The Evening Wind" and "To a Waterfowl," which is comparable in style and spirit to Shelley's "Skylark." He was noted also as a scholar, politician and influential journalist.

Edgar Allan Poe (1809–49) was a solitary and brilliant figure in American literature. Born and educated in the South, he had none of the Puritanic qualities of the New England writers. With Hawthorne he contributed much to the development of the American short story, particularly to the detective and mystery story, with *The Gold Bug, The Purloined Letter* and others. He was a critic of considerable ability and in his review of Hawthorne's *Twice-Told Tales* did much to clarify and define the properties of a short story. Perhaps more than any other writer he sounded the possibilities of the morbid—a characteristic that is Latin rather than Anglo-Saxon, Continental rather than American—and his influence in Europe, particularly in France, was tremendous. Horror, despair, the gruesome, the uncanny, the supernatural are all present in his stories and to a lesser extent in his poetry. His poetry, more subjective and revealing than his prose, shows spiritual aspirations, melancholic insight and surcharged emotion. Outstanding poems are "Lenore," "Eulalie," "The Bells," "Annabel Lee" and "The Raven." No one but Coleridge at his best or Swinburne now and then wrote such magically metrical lines with such mysteriously singing sounds.

In the South were Sidney Lanier and Stephen Foster. Lanier was a master of melody who knew poetic form as only a musician can. His "The Marshes of Glynn" and "Song of the Chattahoochee" are marked examples of rhythmic beauty. Foster perpetuated American folklore in such songs as "Oh, Susannah," "Old Black Joe," "Swanee River" and "Camptown Races," for which he wrote both words and music.

On the background of this full flowering of literary excellence fell the sinister shadow of a Civil War. The questions provoked by slavery, state rights and the rapid westward expansion produced oratory unrivalled in any nation. John C. Calhoun, Henry Clay, Edward Everett and Daniel Webster argued brilliantly and forcefully on the explosive questions confronting the nation. Harriet Beecher Stowe's *Uncle Tom's Cabin,* a violently partisan and prejudiced story, helped to fan the abolitionist flames. Such stirring songs as "Maryland, My Maryland" by James Ryder Randall and "The Battle Hymn of the Republic" by Julia Ward Howe became popular.

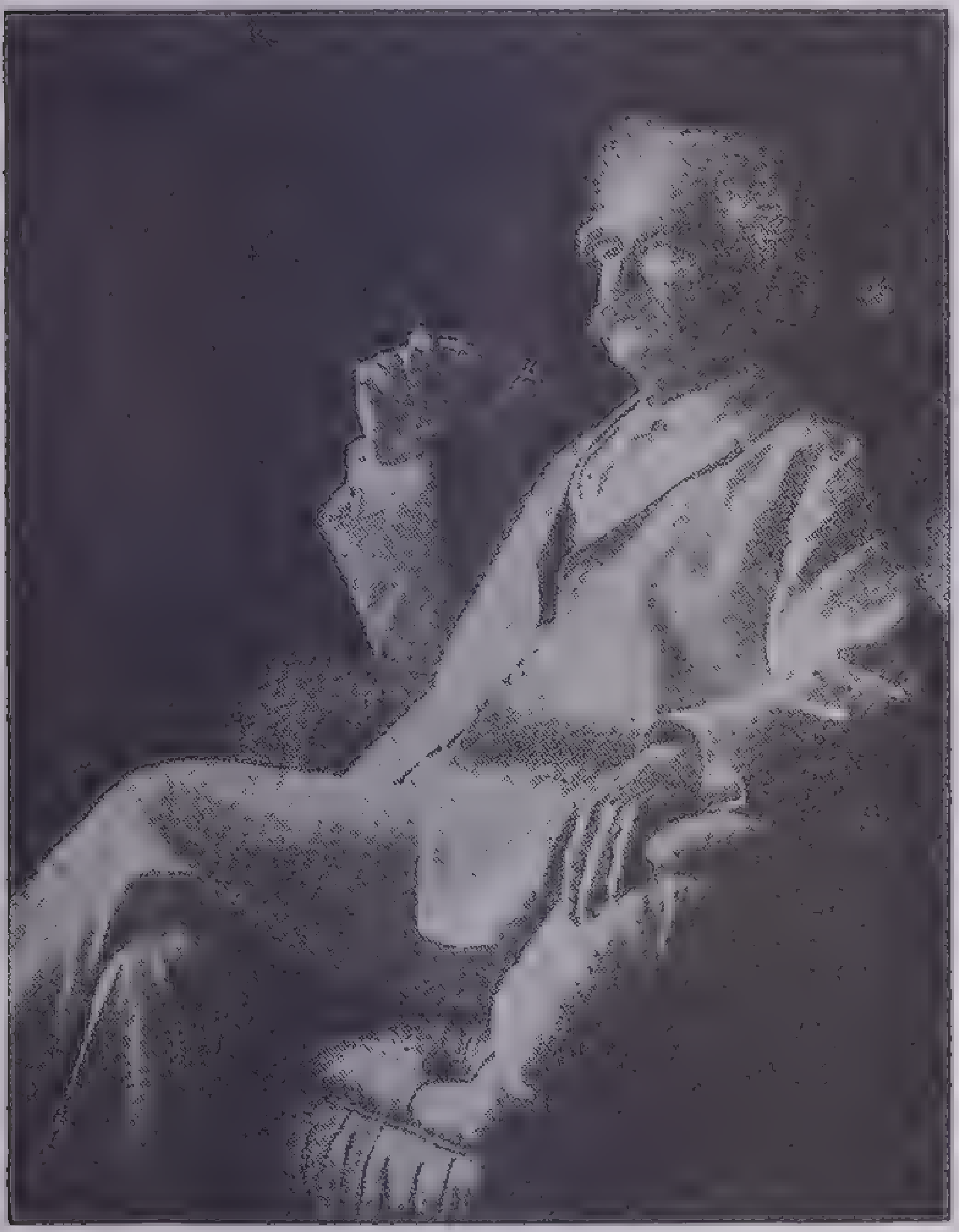
In this period came the classics of American historical writing: George Bancroft's *History of the United States,* William H. Prescott's *History of the Conquest of Mexico* and *The Conquest of Peru,* John L. Motley's *The Rise of the Dutch Republic* and Francis Parkman's *The Oregon Trail.*

Lincoln's *Gettysburg Address* stands alone in all literature for simplicity, diction, perfection of pattern and cogent utterance.

Period of Reconstruction and Growth, 1865–1900.—The Civil War had caused a new American self-consciousness. This was expressed most fully and most perfectly by Walt Whitman (1819–92). Many found him coarse, crude and impossible, but a few (among them Emerson) recognized his greatness and his significance for American literature. Discarding all the conventions of poetic form, subject matter and elegance in the choice of words, he captured in his strong rhythms the very beat and essence of American life, its passion for liberty, its faith in man and democracy. His genius, as expressed in his single volume of poetry, *Leaves of Grass,* won wide acclaim in Europe before it was wholeheartedly acknowledged here. At the same time in New England Emily Dickinson also was breaking away from tradition and expressing in new poetic forms the otherwise hidden fire that was in her. Since she did not permit any of her work to be published until after her death, it was not influential until early in the next century when it gave impetus to the American Imagist movement. The popular and conventional poets of the period were Eugene Field with his "Little Boy Blue" and other poems for children; and James Whitcomb Riley with his enchanting folk poems of the Mid-West.

In prose the most significant development was that of local color or regional fiction, in both the short story and the novel. From the Far West came the saga of the mining camp, the scouts, the adventurers, the gold seekers. Bret Harte's short stories, *The Luck of Roaring Camp* and *The Outcasts of Poker Flat* rudely interrupted the genteel literary tradition of the East. Short stories describing local conditions and characters poured in from all over the country. Joel Chandler Harris delighted children and made a real contribution to the folklore of the American people with his Uncle Remus stories. George W. Cable wrote *Old Creole Days,* containing stories of Louisiana. Sarah Orne Jewett described old folks in old New England towns. Alice French (Octave Thanet) wrote of the changing frontier. The magazines that were becoming cheaper and more numerous supplied an eager market for these stories.

The novel was both regional and romantic. Edward Eggleston in *The Hoosier Schoolmaster* and other stories of early Indiana and Hamlin Garland in *Main Travelled Roads* and his autobiographical *Son of the Middle Border* wrote with great realism. Helen Hunt Jackson in *Ramona* told a story of the Pacific coast Indians; Thomas Nelson Page gave evidence of great literary skill in his novels of Virginia, *In Old Virginia* and *Red Rock;* and James Lane Allen wrote *A Kentucky Cardinal.* In these and in Owen Wister's *The Virginian* and in Jack London's *The Call of the Wild,* the romantic tendency of the earlier part of the century is still evident. It is still more vividly present in such historical novels as Lew Wallace's *Ben Hur, a Tale of the Christ,* Mary Johnston's *To Have and to Hold* and her other stories of early Virginia, in *Hugh Wynne,* a story of the Revolution by S. Weir Mitchell, physician, and in *Janice Meredith* by Paul Leicester Ford, historian.



Underwood & Underwood

Mark Twain

Head and shoulders above all these in style and in breadth of understanding and interest was SAMUEL CLEMENS (pen name, Mark Twain), 1835–1910. Born and reared in the Mid-West, familiar with the Far West and for many years a resident of the East his knowledge of America in the Gilded Age of expansion and enterprise was both intimate and complete. His short stories, novels and essays are filled with humor that is sometimes satirical, but always human and wholly delightful. His use of dialect is judicious and expert. *Tom Sawyer* and *Huckleberry Finn* are beloved stories of American youth. *The Prince and the Pauper* and *A Connecticut Yankee in King Arthur's Court* are combinations of vivid imagination, uproarious humor and good common sense. The best of his writings are frankly and completely American with no trace of European imitation.

Important in the development of the novel were WILLIAM DEAN HOWELLS and HENRY JAMES. Both achieved a more finished style in combination with a truer, less romantic realism than any American writer before them. Both showed great interest in manners and significant details and thus foreshadowed the psychological novel. Henry James was more cosmopolitan than American and finally became an English subject, conceiving America as provincial, with no artistic insight and no understanding of culture as it was exemplified in Europe. Howells showed an acute awareness of those problems inherent in the unparalleled expansion of industry that in the first decade of the next century were to become almost the sole consideration of American literature. In *The Rise of Silas Lapham,* Howells pictures a typical American businessman of the time—good-hearted but uncouth and uneducated—and thus brings up the problem of social manners and culture in relation to money and its possession. Other novels that heralded the growing interest in social problems were *The Bread-Winners* by John Hay, an unsympathetic treatment of a labor strike, and Edward Bellamy's *Looking Backward,* an imaginative comparison between the world as he knew it in 1887 and as it might be in 2000. Henry Adams in *Mont-Saint-Michel and Chartres* and *The Education of Henry Adams* attempted to evolve a philosophy of education and unity out of the constantly changing complexities of his time. William James, brother of Henry James and the leading American philosopher of the period, accepted this myriad reality with delight and paid less attention to unities and abstractions.

The end of the century was marked by some fine prose written by men of affairs. Theodore Roosevelt possessed with his many other gifts considerable literary talent that was displayed in his writings on natural history and on American history, notably in *The Winning of the West* (1889–96). Woodrow Wilson, too, before he became President, had written a standard textbook on government, *The State* (1889), the political essays entitled *An Old Master* (1893) and the critical essays, *Mere Literature* (1893). A few years later, former President Grover Cleveland with none of the educational advantages of Roosevelt or Wilson wrote two books that rank with theirs—on politics, *Presidential Problems* (1904); and on sport, *Fishing and Hunting Sketches* (1906).

Already in this period there was evidence of a new movement in the novel, a movement that would not reach its height until the second and third decades of the 20th century. This was an intensified realism with a strong dash of psychology and was first evident in the two short novels by Stephen Crane —*Maggie: A Girl of the Streets* and *The Red Badge of Courage*—and in the first novels by Frank Norris—*McTeague* and *Vandover and the Brute,* two unpleasantly realistic stories of character degeneration.

Twentieth-Century Literature.—The 20th century produced written material in quantities never before equaled. To satisfy a constantly enlarging reading public and to provide entertainment for newly acquired leisure, more newspapers, magazines and books were printed than ever before. Literature entered upon a period of great originality and varied experimentation. The American tradition and spirit needed to be more fully defined and expressed. Writers and critics followed Emerson's fifty-year-old admonitions and dared to attempt and acknowledge an American language and literature distinct from that of the British Isles. Local-color stories placed increasing emphasis on the underlying American psychology and tradition of the different localities. Young writers who had journeyed to Europe in search of inspiration and a cultural background were forced to return to America for a fresh outlook and new enthusiasm.

Boisterously America entered upon the era of trusts and big business, of fortunes quickly won and lost, of growing labor organization. As a result American literature was for a time almost wholly interested in social problems, in industry, money and labor. It was literature with the definite purpose of criticising and correcting abuses in a country advancing so rapidly in material production and prosperity that it took no time to think or to form a philosophy.

The Novel.—This form of fiction, romantic now only in the books of such popular writers as Harold Bell Wright and Gene Stratton Porter, convincingly showed its interest in the actual problems of the day. *The Pit* by Frank Norris, although written in a melodramatic fashion, is a sincere description of gambling on the wheat market. Upton Sinclair's *The Jungle,* a crusading denunciation of the Chicago stockyards, remedied some abuses. Winston Churchill, in *Mr. Crewe's Career* and other novels, attacked political corruption in New England under the guise of exciting stories. Regional fiction became less highly colored, more convincing and human in Booth Tarkington's enjoyable analyses of young and old in Indiana; in Willa Cather's Midwestern stories; in Joseph Hergesheimer's more sophisticated historical novels; and in Julia Peterkin's portrayal of South Carolina Negroes in *Scarlet Sister Mary* and other stories. Sinclair Lewis described minutely a Midwestern town and its people in *Main Street* and *Babbitt,* placing emphasis on their pettiness and intellectual stagnation. He received the Nobel Prize in Literature for 1930.

Theodore Dreiser has applied his interest in social problems to writing novels of scientific and psychological realism. His characters are remorselessly compelled by fate and by their own complexes to be what they are. Although not a skilful writer, he has invested his novels with a tragic hopelessness that is highly effective. James Branch Cabell put his protest against the moral inhibitions of the late 19th century into an individual mixture of fantasy and philosophy. In short stories and novels Sherwood Anderson painstakingly described the effects of an industrial civilization upon individuals.

The Lost Generation of the World War broke away most completely from old accepted forms, rejected old ideals without substituting new ones and became thereby both cynical and skeptical. Already Gertrude Stein had attempted complete objectivity and had become almost incomprehensible. Punctuation, grammar and the use of words became eccentric and entirely personal. The novels of John Dos Passos, F. Scott Fitzgerald, E. E. Cummings portrayed the frenzy and instability of life during and after the war, the bitter disillusionment of the time. Ernest Hemingway's *A Farewell to Arms* is less eccentric, and is valuable for its clarity of style, accuracy of observation and emotional power.

The Short Story.—Short stories were turned out in mass quantities, most of them journalistic in style. O. Henry (real name, William Sydney Porter) wrote succinct and sharply cut portraits and incidents, usually with a surprise ending, and achieved immense popularity. More powerful and better written was *Ethan Frome* by Edith Wharton, a long short story of New England, perfect in its composition and almost legendary in its plain truth of characterization and description—a story very different from her novels that are Continental in manner and largely concerned with upper-class society.

The World War brought a sense of living for the day and a desire for hurried change best satisfied by the short story, which became the dominant literary form. Former sports writers brought to it fresh phrases and word uses, swift and pungent description. Among them was Ring Lardner, a master in the accurate written reproduction of speech sounds. From the lumber camps of the Northwest came tales of Paul Bunyan, a legendary hero of enormous size and strength, whose marvelous deeds, as recorded by Esther Shephard, James Stevens and others, have become a part of American mythology. Leading novelists also wrote short stories for magazines and newspapers and raised the general level of magazine stories.

Poetry.—In poetry the 20th century brought increased freedom in form and subject matter. The realism and the sociological interests so prominent in the novel were apparent in poetry also. Edwin Markham in *The Man with the Hoe* cried out against the slave makers of the centuries. Edgar Lee Masters in *Spoon River Anthology* gave brief epitaphs on men, real and fancied, of a small midwestern town. Edwin Arlington Robinson put into poetry with a philosophic tinge discerning observations on the American character. A more romantic, vigorous and original realism is in the poetry of Vachel Lindsay and Carl Sandburg. Lindsay, a 20th-century wandering minstrel, tramped the country singing his songs wherever opportunity arose. In them, mostly in ballad style, he marvelously captured the gay throbbing heart of a new land and a new people. Carl Sandburg, singing of the bold and vigorous energy of the Western plains and cities, found poetry in machines and in dirty wind-swept cities, in high-flung girders and in factory workers. The poetry of Robert Frost, without the hurried rhythm of Sandburg and Lindsay, told of simple New England commonplaces and achieved strength from the positive truth of Frost's observation and recording.

More sophisticated and self-conscious poetry was written first by the Imagists and later by T. S. Eliot and Ezra Pound. The Imagists, represented by Amy Lowell, John Gould Fletcher and others, attempted concentration of thought and expression and the elimination of "sweet nothings." This school, influenced by the Oriental forms of China and Japan, forgot cosmic themes and abstractions and attempted to give clear and brief impressions of little things. Thomas Stearns Eliot, who became an English citizen in 1927, and Ezra Pound (also resident in England) became greatly fascinated by the myriad connotations of words. Their poetry presupposes a great deal of literary knowledge and imagination in their readers. Eliot's is strongly rhythmic and highly stimulating. *The Wasteland,* in which the note of despair and disillusionment is strong, turned his young disciples against him. A return to more conventional forms was made by Robinson Jeffers, Conrad Aiken, William Rose Benét, Stephen Vincent Benét and Edna St. Vincent Millay. Stephen Vincent Benét's *John Brown's Body* is a long narrative poem of the Civil War, remarkably well sustained, exciting and pleasurable. Miss Millay's work is intensely lyrical but somewhat lacking in vigor and reality.

In clever, rollicking verse that often contains a bite, such rhymsters as Arthur Guiterman, Dorothy Parker and Ogden Nash have made fun of modern manners.

For Stage, Screen and Radio.—The American theater of the early 20th century was more remarkable for its elaborate scenic and lighting effects than for its drama. Producers such as David Belasco and Florenz Ziegfeld became world famous. Only recently have such dramatists as the following gained a similar distinction: Maxwell Anderson, in flowing prose that is almost poetry, has written of the great Southwest, old New England, a Dutch legend of the Hudson. In collaboration with Laurence Stallings, he wrote *What Price Glory?* probably the best American war play. Marc Connelly in *The Green Pastures* dramatized Roark Bradford's *Ol' Man Adam an' His Chillun,* a faithful and sympathetic account of the Southern Negro's conception of the Bible stories. Elmer Rice in *Street Scene* admirably captured the petty reality of a New York City street and its inhabitants. Eugene O'Neill, who received the Nobel Prize in literature for 1936, showed not only his versatility but his mastery of dramatic technique and desire for experimentation in such widely different plays as *The Emperor Jones, Strange Interlude* and *Mourning Becomes Electra.*

The Little Theaters, motion pictures and the radio furnish a large and growing market for new plays. The Federal Theater Project, started as a relief measure, has convincingly proved the nation's interest in drama and provided opportunity for the trial of new forms and methods, placing emphasis upon content rather than upon external furnishings. The possibility of a new dramatic technique suitable for radio broadcasting is just being realized, and work along this line is being done by the poets Archibald MacLeish and Stephen Vincent Benét.

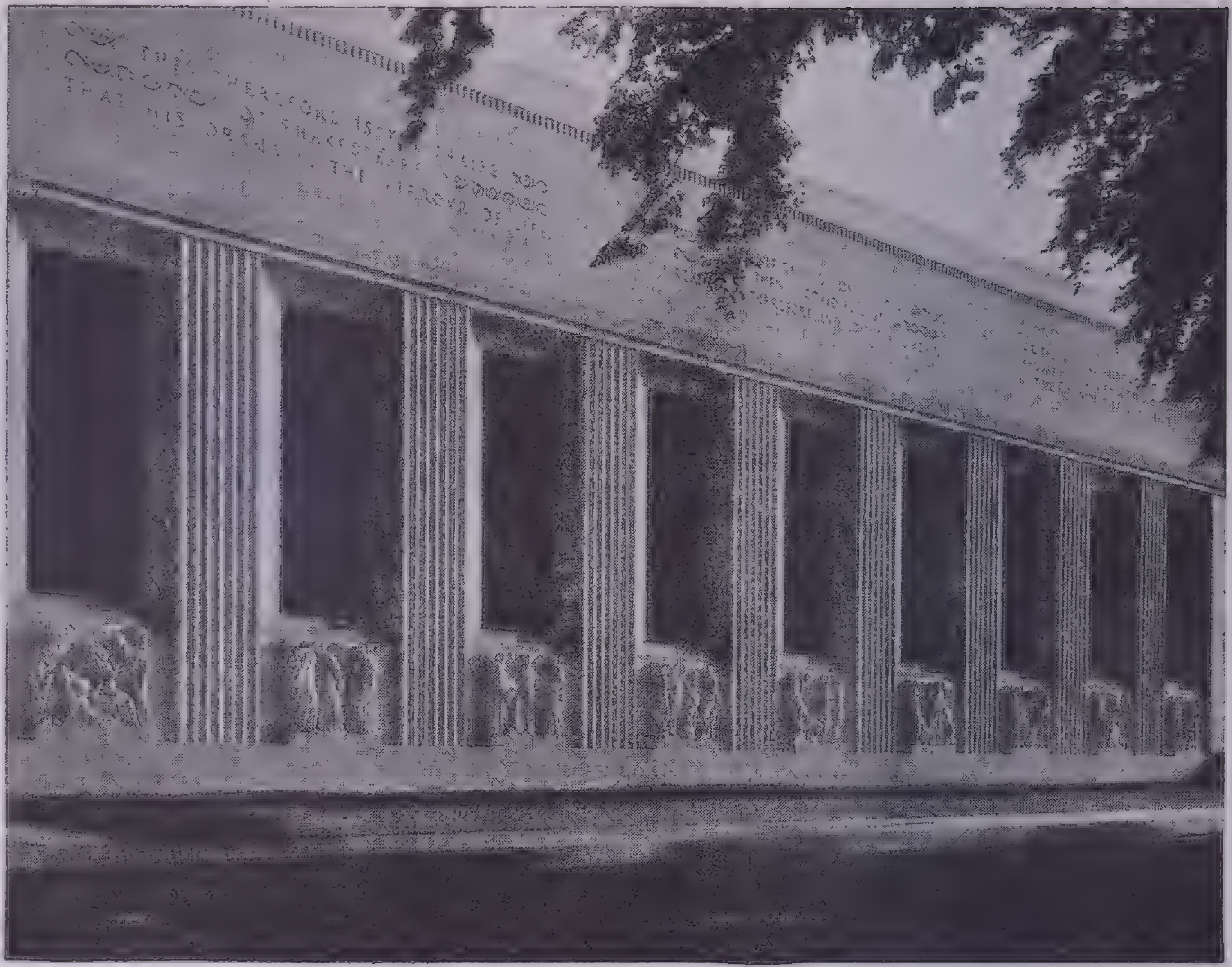


Photo by Theodor Horydczak

The Folger Shakespeare Library, Washington, D. C.

Above is shown the façade of the building that houses the largest and finest collection in existence of the books, manuscripts and objects of art relating to William Shakespeare. It includes within its scope the entire literature of the Elizabethan Age. The interior is Elizabethan to furnish an appropriate setting for the collections. The Folger Shakespeare Library was assembled by Henry Clay Folger (1857–1930) who spent most of his life and a considerable fortune in collecting material about the dramatist

The Field of Criticism.—This phase of American literature expanded with the coming of greater periodical and journalistic opportunities, growing from the complacent and skilfully drawn essays of Stuart Sherman to the caustic and provocative comment of H. L. Mencken. *The Saturday Review of Literature,* edited by Henry Seidel Canby, has done much to popularize and give literary value to the art of criticism. Vernon Louis Parrington has made serious studies of early American literature. Mencken has contributed a valuable analysis of the American language as distinct from the English of Great Britain. Van Wyck Brooks in *America's Coming-of-Age* and *The Flowering of New England* shows facility of expression and understanding of the problem America faces in creating a literature peculiarly her own. Lewis Mumford, Ludwig Lewisohn and Joseph Wood Krutch also have recognized and discussed the problem. John Dewey attempted to make philosophy and education compatible with the new industrialism. George Santayana, philosopher and author, analyzes the American temperament in *Character and Opinion in the United States.* In political criticism Walter Lippmann is outstanding for the clarity of his prose; and Mark Sullivan for his series on America since the turn of the century.

Journalism.—The newspaper columnists, writing in a provincial and personal or sophisticated and flippant tone, contributed a new brand of humor and comment, sometimes satirical, sometimes whimsical. Will Rogers, the best-loved American humorist since Mark Twain, tickled the world with his frank comments and good-natured but keen satire on the news of the day and the people who made it. Others possess some special knowledge or interest to which they bring original expression or the power to see and record the less obvious aspects of daily life.

Modern Biography.—Of particular interest in the recent flood of biographies are William Allen White's penetrating character study of Woodrow Wilson; A. J. Beveridge's life of John Marshall; Carl Sandburg's two-volume biography of Abraham Lincoln; N. W. Stephenson's life of Lincoln; Hervey Allen's *Israfel,* a complete and authoritative biography of Edgar Allan Poe; the critical biography of Herman Melville by Lewis Mumford and the study of Mark Twain by Van Wyck Brooks. Short and vivid are the unusual character studies or psychographs written by Gamaliel Bradford. *The Autobiography of Lincoln Steffens* is a unique account of a philosopher and a man of action who was brought into close contact with municipal politics. Other noteworthy autobiographies (by Americans of foreign birth) are: Jacob Riis's *The Making of an American,* Edward Bok's *The Americanization of Edward Bok* and Michael Pupin's *From Immigrant to Inventor.* Of interest too are the personal records of roving reporters.

The New Approach to Science and History.—Well-written books on science, history and business, popular in manner but scholarly and accurate, mark 20th-century American literature; it has escaped the old rigid classifications and explored new paths to cope with the complexity of 20th-century life. In science, Paul de Kruif's *Microbe Hunters;* Logan Clendening's *The Human Body;* William Beebe's *Galapagos* and *Half Mile Down;* George Amos Dorsey's *Why We Behave Like Human Beings;* Hendrik Willem Van Loon's *The Story of Mankind* and *Van Loon's Geography;* Luther Burbank's *Harvest of the Years* (with Wilbur Hall); Alexis Carrel's *Man, the Unknown;* and Victor Heiser's *An American Doctor's Odyssey* are all peculiarly American in that they are good literature and at the same time tools for getting information on matters of practical importance. These books are the work of true scientists who have been able to put into words the fascination they find in their work.

New approach and new interest were brought to history by such books as Claude Bowers's *Jefferson and Hamilton* and *The Tragic Era;* Frederick Lewis Allen's *Only Yesterday,* Mark Sullivan's *Our Times,* Charles Merz's *The Great American Band Wagon,* Thomas Beer's *The Mauve Decade,* James Harvey Robinson's *The Mind in the Making* and Charles and Mary Beard's *Rise of American Civilization,* which consider not only the historical standbys—government and politics—but also the forces of economics, personalities and culture—literature, art, science. These histories are frankly interpretations as well as factual recording, and to this they owe much of their interest. The complications and miracles of American business and finance are discussed in such books as Frederick L. Allen's *The Lords of Creation,* John Thomas Flynn's *God's Gold* (*Story of Rockefeller and His Times*), Gustavus Myers's *History of the Great American Fortunes* and in the numerous biographies of such masters of industry as William Randolph Hearst, J. P. Morgan and Henry Ford.

American literature has explored every corner of life—there are books about typography—Douglas McMurtrie's *The Golden Book;* about journalism—George Seldes's *You Can't Print That!;* about snakes—Raymond L. Ditmars's *Snakes of the World;* about a typical Midwest city—Robert and Helen Lynd's *Middletown;* about ships—H. W. Van Loon's *Ships and How They Sailed the Seven Seas;* about rivers—Robert P. Tristram Coffin's *Kennebec;* about everyday business—Jesse Rainsford Sprague's *The Making of a Merchant*—all characterized by sound and vital writing as well as by accurate knowledge; and all indicating the enormously varied literature that has grown up outside the regular furrows in an attempt to keep the reader abreast of the doer.

FRENCH LITERATURE

After ancient Gaul, conquered by Caesar (57–52 B.C.), became a Roman province, the Gauls gradually adopted the language of their conquerors and modified it into a popular or vulgar Latin that had two forms: the *langue d'oil* in the north and the *langue d'oc* in the south. The Franks and other Germanic tribes that invaded Gaul in the 4th and 5th centuries exerted little influence on the language of the Gallo-Romans but gave their name to the country—France. French, a dialect of the *langue d'oil,* gradually became the national language as the kings extended their rule from Paris over the entire country.

The Middle Ages.—Medieval French literature is astonishing for its richness and variety. It reflected a colorful and active society characterized in religion by the great scholastic theology of the mystic Bernard de Clairvaux (1091–1153) and the rationalist Pierre Abélard (1079–1142). The Provençal literature of the south reached a high point in the 11th and 12th centuries when the influence of its songs and cult of courtly love spread to Spain, Portugal and Italy. From the 11th to the 13th century epics sung by wandering minstrels reigned supreme in northern France. One type, the *chansons de geste,* centered mainly around Charlemagne and old French history and featured heroic deeds, both historical and fanciful. The Arthurian cycle, composed of stories about King Arthur and his knights, emphasized Christian and chivalric ideals of courage, loyalty, love and charity. The epics of antiquity told of the fabulous deeds of Alexander, Aeneas and other heroes of classical antiquity. Most famous of the *chansons de geste* is *La Chanson de Roland,* written in the early 12th century, a story of Charlemagne and his legendary nephew Roland, fighting for Christianity against the Moors of Spain. Chrestien de Troyes (*c.* 1140–*c.* 91) was the principal author of the Arthurian romances and his *Chevalier au Lyon, Tristan* and *Percivale* were widely read and translated by the German poets Wolfram von Eschenbach and Gottfried von Strassburg. The *lais* of Marie de France (12th century) are short love poems with the same subject matter. The most famous, the *Lay of the Honeysuckle,* is a story of Sir Tristram.

In the 12th and 13th centuries the lower classes and the nobility as well delighted in disrespectful and mocking poetry, particularly in the gay and witty though often coarse verse tales known as *fabliaux* and in the satirical animal epic *Le Roman de Renart* ("History of Reynard the Fox") and its successors.

From the 13th to the 15th century French drama was either religious or comical. Miracles, relating some wonderful deeds of saints or martyrs, and mysteries, taken from scriptural incidents and usually from the life of Christ, formed the serious drama, though comic scenes were generally inserted in the most religious plays. The *Jeu de la feuillée* and the *Jeu de Robin et Marion* by Adam de la Halle (13th century) are perhaps the earliest examples of the farce and the comic opera. Later came moralities filled with allegory, the satirical and generally political *soties,* which were plays with allegorical characters, and above all the farces. Of these short plays, without much plot and dependent on surprise and ridicule for laughter, the best known is *L'Avocat* (or *Maître*) *Pierre Patelin* written about 1465, a play about a lawsuit against a shepherd. In it occurs the famous phrase, *"Revenons à nos moutons,"* now a proverb for "Get back to the subject."

The first important prose works were historical chronicles. Geoffroi de Villehardouin (*c.* 1160–*c.* 1213), a practical chevalier, wrote about the Fourth Crusade. Jean de Joinville (*c.* 1224–1317), frank, brave and loyal, wrote an interesting account of the life of St. Louis. Jean Froissart (*c.* 1337–*c.* 1410), poet and historian, wrote about the Hundred Years' War. Philippe de Comines (*c.* 1445–*c.* 1509), a sceptical and ambitious diplomat, described Charles the Bold and Louis XI from firsthand acquaintance.

The 15th century brought the end of chivalry and feudalism, the sudden use of prose for all literary forms, the growth of a middle class (*bourgeois*) and the infiltration of bourgeois ideals and emotions into literature. These trends are well illustrated in the prose novel *Le Petit Jehan de Saintré* by Antoine de la Salle (1398–1461). This romance, though chivalrous in form, is filled with the bourgeois spirit and shows the end of the idealization of women and the growing importance of money.

The end of the medieval period, like the beginning, produced some splendid poetry—lyric now instead of epic. Charles d'Orléans (1391–1465), a captive in England for 25 years, wrote graceful and sincere little poems lacking great force or purpose. François Villon (1431–*c.* 63), a great poet and a carefree vagabond whose life was rich with adventure and romance, shows in his poetry a robust love of life, the medieval fear of death and a vivid realism and interest in man. Villon was one of the most romantic personalities of all time and his poetry is a perfect reflection of the man. His ballade with the refrain "Où sont les neiges d'antan?" ("Where are the snows of yesteryear?") is famous. Villon's works are full of underworld slang—and of bold poetry.

Effect of the Renaissance, 16th Century.—The coming of the Renaissance or revival in literature and in the arts was hastened by the wars of Francis I in Italy (putting the French in contact with Italian, and through it with Roman and Greek, civilization), by the invention of printing—the first book left French presses in 1470—and by the growth of the cities and the middle class. The Renaissance was accompanied by the Protestant Reformation in religion. Francis I and his sister Margaret of Navarre, herself an able poet, greatly encouraged artists and men of letters. Through study of the ancient classics, men regained faith in themselves and their abilities and a new love of nature and of living.

The outstanding poet of the first part of the century was Clément Marot (1495–1549). His verse is light, harmonious and sometimes ironical but rarely as forceful as that of Pierre de Ronsard (1524–85) who, as head of the literary society, the *Pléiade,* and author of the epic poem *La Franciade,* was considered the greatest poet of his time. The Pléiade also included Joachim du Bellay (1524–60), Remi Belleau (1528–77), Jean Antoine de Baïf (1532–89), Étienne Jodelle (1532–73), Claude Joseph Dorat (1734–80) and Pontus de Thiard (1521–1605). Their purpose was to bring order out of the current language confusion, and their manifesto was the *Deffense et illustration de la langue française* by du Bellay, which set forth these objectives: to enrich the language, set up poetic standards, cultivate classic forms such as the sonnet and the ode, emphasize the need of work as well as genius and imitate the ancient Greeks and Romans. Du Bellay contributed some lovely sonnets; Ronsard, sonnets, odes and epics; Jodelle, *Cléopâtre,* the first tragedy modeled after the classical with a regular plan, acts and scenes, the unities of time, place and action, a chorus and character study. Robert Garnier (1534–90) continued along the same line. Religious dramas disappeared after 1548 when the Parliament of Paris forbade the representation of mysteries because they had assumed too great freedom.

In prose Jacques Amyot (1513–93), linguist and scholar, made an excellent translation of Plutarch, the basis of the first English versions. The very essence of the Renaissance lies in the work of François Rabelais (*c.* 1490–1553). His five-volume masterpiece, concerned with the activities of the giant Gargantua and his son Pantagruel, is an uproarious satire filled with strong constructive advice in educational, social and political affairs. The book presents Rabelais's deep interest in nature and man, Renaissance freedom and at times coarseness of thought and expression and an extraordinary richness and variety of language—for Rabelais invented or combined words to suit his pleasure.

The Swiss John Calvin (1509–64), a moving force in the Reformation, put his stern and implacable doctrines in a firm, vigorous and concise style. His influence on prose literature as well as on religious thought was enormous. The religious struggle (1560–98) between the Catholics and the Protestants brought fanaticism on both sides and disillusionment from the first high hopes of the Renaissance. Ronsard wrote martial odes; Agrippa d'Aubigné (1552–1630) upheld the rights of the Calvinists in the satirical poem *Les Tragiques* and his memoirs. The *Satire Ménippée* appeared in 1594; it is remarkable political satire directed against the Holy League that had been formed to combat the Huguenots.

Michel de Montaigne (1533–92) was the great original thinker of the end of the century. In his essays he made a keen though sceptical study of the human mind and heart. He stressed importance of the individual and is still read not only for his polished style but for a philosophy that inspired man to try to understand himself. His ideas on the education of children are still significant. Montaigne's essays were translated into English as early as 1603. His motto was one of doubt, *"Que sais-je?"* ("What do I know?").

Writing memoirs became fashionable; of particular interest are those of François de la Noue (1531–91), a Huguenot soldier nicknamed *Bras de Fer* or Iron Arm; Blaise de Montluc (1503–77), a military governor; Agrippa d'Aubigné; Pierre de Bourdeilles de Brantome (*c.* 1535–1614), historian; Margaret of Valois (1553–1615), wife of Henry IV; Sully, the great minister; du Bellay, critic and poet.

The Classical Age.—The first part of the 17th century was a period of reform and reorganization—in society, religion, language and literature. Paris became famous for its *salons* soon to be imitated all over Europe. Most famous and productive was the salon of Mme de Rambouillet (1588–1665). All sorts of people congregated there—nobles, fine ladies, princes and princesses, bourgeois authors and artists—and they had a very definite purpose: to refine the language and make it suitable for polite society; to master it as a literary and conversational medium; to give mutual encouragement and criticism. Later this movement was carried too far, especially in the provincial salons outside Paris, and resulted in the *précieux* (fantastic, strained) literature, so elegant and filled with such pretentious phrases that it became ridiculous and fair prey for Molière's wit. On the whole the influence of the salons was beneficial and produced a remarkably varied literature—sonnets, letters, word portraits, madrigals and almost every other type of lyric poetry, besides the pastoral romances showing Italian influence. The novels of Mlle de Scudéry (1607–1701) are impossibly long and filled with heroic and incredible adventures. The *Astrée* by Honoré d'Urfé (1568–1625) is a long account of an idealized pastoral community on the banks of a lovely river. Its people are cultured shepherds and shepherdesses, given to involved amorous and literary discussion. The style is rich and ornate but clear.

Inevitable reaction and satire were supplied by the realistic novels of Paul Scarron (1610–60) and Antoine Furetière (1619–88). The coarseness and crudity of their style well illustrates the debt French literature owes to the salons. More formal and exact reform was brought about by François de Malherbe (1555–1628), a disciple of Ronsard, who defined the different forms of literature and gave rules for their execution. His own poetry is eloquent and correct but a little cold. The founding of the French Academy (the most famous cultural society in the world) by Cardinal Richelieu in 1635 marked the beginning of the great age of French classicism.

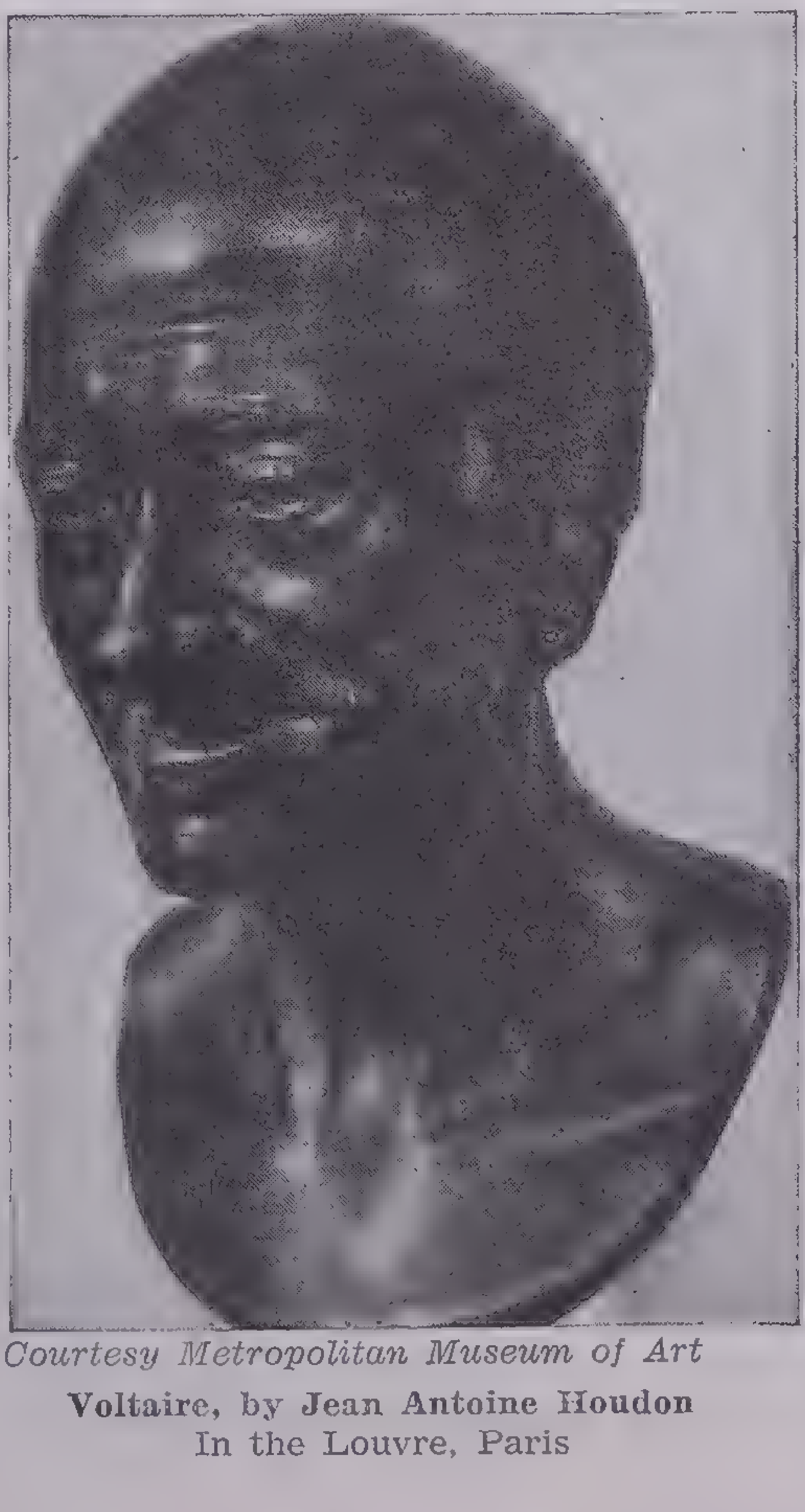
Outside the main literary streams but influential was the reform within Catholicism itself, particularly the Jansenist movement that soon incurred the hatred of the Jesuits and emphasized the necessity of divine grace because men cannot be masters of their emotions. Blaise Pascal (1623–62), a mathematical wizard when still very young, later became a Jansenist and in his *Lettres écrites à un provincial* ("Provincial Letters") and *Pensées* ("Thoughts") he did most to strengthen and make immortal their cause. The polished perfection of his irony and the beauty of his style are highly important in the development of French literature. In his emphasis on the insignificance of man and the limitations of his reasoning powers he was directly opposed to another great mathematician, René Descartes (1596–1650) and his followers, known as Cartesians. Starting from the famous phrase *Je pense, donc je suis* ("I think; therefore I am"), Descartes came to the conclusion that a man is no more than his thought and that a man's reason is necessarily truth—notions that greatly affected French literature especially in the 18th century.

In 1661 Louis XIV started his personal rule. At his court in Paris and later at Versailles he gathered about him poets, orators, dramatists, artists and musicians and almost the entire nobility of France. Under his benevolence French classicism, based on the theories and plays of classical Greek and Rome but national in interpretation and universal in truth, reached its greatest glory. The French interpretation of the three unities, as perfected in this century, had a tremendous and often stifling influence upon the drama not only of France but also of Germany and Spain. The great French dramatists themselves—Corneille, Racine and Molière—did not always attain the ideal—that the action of the play be confined to 24 hours, that there be little or no change of scene, and that the plot be continuous and single. Pierre Corneille (1606–84) founded classical poetic tragedy with the *Cid* (1636), which, although it was criticized by the Academy for not perfectly obeying the three unities, has these characteristic traits—exclusion of the comic, forceful psychological analysis, clarity and nobility of style and a logical and simple plot whose climax results from the characters' own thoughts and actions. *Horace* (1639 or '40), *Cinna* (1640) and *Polyeucte* (1643) followed, all showing the triumph of will power over emotion. Corneille's comedy *Le Menteur* (1643) is witty and amusing, but his other tragedies do not measure up to the four just mentioned.

Jean Baptiste Racine (1639–99) brought French tragedy to its fullest perfection. His characters are more human and lovable than Corneille's and his poetry more harmonious. His first great tragedy *Andromaque* appeared in 1667 and was followed in 1668 by his only comedy *Les Plaideurs*. The historical plays *Brittannicus* (1669), *Bérénice* (1670), *Bajazet* (1672) and *Mithridate* (1673) are based on Roman, Near Eastern and Persian history. His *Iphigénie* (1674) and *Phèdre* (1677) have subjects from Greek tragedy, particularly Euripides. Racine became more and more interested in the Jansenist movement and after 12 years of dramatic inactivity wrote the two religious plays *Esther* (1689) and *Athalie* (1691).

Molière (real name, Jean Baptiste Poquelin; 1622–73) is perhaps the greatest comic dramatist in the history of the world. His portrayals of men and women and their faults and virtues are as true and applicable today as they were nearly three centuries ago. Some of his plays, like *Tartuffe,* the study of a religious hypocrite, and *Le Misanthrope* come very close to tragedy but it was Molière's genius to see and emphasize the ridiculous, using laughter as a corrective. An actor himself, Molière was for 12 years the director of a troupe of strolling comedians. His *Les Précieuses ridicules,* making fun of the elegant affectations of the time, was played in Paris in 1659 and won for him the favor and support of Louis XIV. His greatest plays in verse are *Tartuffe* (1664), *Le Misanthrope* (1666) and *Les Femmes savantes* (1672), which last criticises pedantry by showing the hilarious results of a smattering of education. In prose his greatest works are *L'École des femmes* (1662), *Le Festin de Pierre* based on the Spanish character, Don Juan (1665), *L'Avare* (1668), *Le Bourgeois gentilhomme* (1670) and *Le Malade imaginaire* ("The Imaginary Invalid," 1673). He died immediately after playing the title role in this final play. Molière was an accurate observer, a master of his art and rich in common sense.

Jean de la Fontaine (1621–95) in his poetic *Contes* and *Fables* is unique and perfect. Like Molière he had a grand sense of humor but a touch of bitterness and scepticism. The *Fables* have become children's classics, though only an adult can derive full enjoyment and meaning from these enchanting tales so perfectly expressed.


Courtesy Metropolitan Museum of Art

Voltaire, by Jean Antoine Houdon

In the Louvre, Paris

French classicism is not entirely dependent upon poetry for its glory. The short novel *La Princesse de Clèves* by Marie Madeleine de Lafayette (1634–92) is a charming analysis of a woman's heart, the first in French literature to consider true love rather than its fanciful idealization. It is truly classic in brevity, clarity and unity of action. The letters of Mme de Sévigné (1626–96) are models of prose composition and give an accurate and human picture of the court of Louis XIV and other aspects of 17th-century society. The *Sentences et Maximes Morales* of La Rochefoucauld (1613–80) are striking in their originality, conciseness and wit; bitter and pessimistic in their satire. The Cardinal de Retz (1614–79) led an exciting and dangerous life as an enemy of Mazarin and because he was ambitious in his own behalf. His memoirs reveal a lively and interesting though complicated style. Jean de La Bruyère (1645–96), a Parisian bourgeois and tutor of the duke of Bourbon, in his *Caractères* (1688) wrote brief, often satirical, character sketches of prominent types, describing in a few chosen phrases an entire personality. The charming fairy stories of Charles Perrault (1628–1703) are still children's classics.

Magnificent sermons and funeral orations were delivered by Bossuet (1627–1704), who dared put into them scathing criticism of the nobles and their customs and at times even of the king. For his pupil, the young heir to the throne, he wrote the remarkable *Discours sur l'histoire universelle.* Fénelon (1651–1715), also a religious orator, wrote for his pupil, the duke of Burgundy, the educational and utopian novel *Télémaque* (1699). Fléchier (1632–1710), Bourdaloue (1632–1704), Mascaron (1634–1703) and Massillon (1663–1742) also helped to make religious oratory a significant manifestation of the century.

Nicolas Boileau-Despréaux (1636–1711) formulated the classical ideal—literature should be natural, reasonable, truthful—in *L'Art Poétique* (1674), but his own short poems and the longer mock-heroic poem *Le Lutrin* (1674) are of doubtful value.

From 1685 to 1715 came repeated signs of the breakup of the classical ideal. The French version of the Italian quarrel between the ancients and the moderns raged bitterly, headed by Boileau and Perrault, respectively. Fénelon had severely criticized the absolute monarchy that had done so much to make classicism possible. La Bruyère, Saint-Simon (1675–1755) and Le Sage (1668–1747) were ruthless in their attacks on the contemporary top-heavy setup of society with almost the entire nobility dependent on the monarchy for support. The memoirs of the duke de Saint-Simon, particularly concerned with the final years and the death of Louis XIV, are among the best in a literature rich in memoirs. In the interests of free thought and the broader spread of knowledge, Pierre Bayle (1647–1706) compiled his dictionary, a forerunner of the 18th-century encyclopedias, and Bernard de Fontenelle (1657–1757) started the task of making science fashionable. When Louis XIV died in 1715, French had become an almost universal language, and French dress, manners and art were imitated in every corner of the civilized world.

The Age of Enlightenment, 1715–89.—French literature of the 18th century, compared with the preceding high eloquence and nobility of thought and poetry, was sensible, sceptical and scientific. The philosophy of Descartes gained ascendancy over that of Pascal. The salons were more formally literary. The influence of the Englishmen Newton, Locke and Richardson was strong, and toward the close of the period German literature with its philosophical and historical overtones began to make itself felt in France.

Though they did not want it, the philosophers and historians of the 18th century made the Revolution possible. The two greatest men of the century—Voltaire and Rousseau—present an amazing contrast in personality and thought. François Marie Arouet de Voltaire (1694–1778) had a long and eventful life, part of it spent in prison and part in exile in England. His writings, with a few brilliant exceptions—*Zadig, Candide,* the tragedies *Zaïre* and *Mérope,* parts of his *Dictionnaire philosophique* and some of his *lettres philosophiques*—are seldom read today; but Voltaire's prestige and influence in 18th-century France was enormous. He was considered then a great dramatist and a great poet, worthy successor of the French Classic writers; but he is remembered today for sharp satire, impassioned pleas for political, literary and religious freedom, his bitter fight against all forms of fanaticism, his belief in science and reason, his introduction of English scientific thought and his magnificent attempts to bring these matters to the attention of the whole French people. His histories, particularly *Siècle de Louis XIV,* attained immense popular success that has to some extent survived. His prose is clear, trenchant and witty.

If Voltaire was the fullest and most perfect expression of his own century, Jean Jacques Rousseau (1712–78) was the parent of the future. In the *Contrat Social* (1762) he gives his theory of government—that in the long ago men banded together and of their own free will delegated authority to one of their number to act as representative of the state; therefore the monarchy is not of divine origin but a gift of the people. In *Émile, ou De l'Éducation* (1762), a long treatise novel, he introduces revolutionary ideas of education—succinctly that a child should be truly the child of nature, should grow and learn from the inside and not have learning plastered upon him from the outside. Though some of Rousseau's ideas were exaggerated and impracticable, his work marks the beginning of modern educational methods.

That the whole trend of the century was toward popular enlightenment and the spread of knowledge is evident in the success of the encyclopedists, led by Denis Diderot (1713–84) and d'Alembert (1717–83), whose works plainly prove their desire to reform church and state. Charles de Montesquieu (1689–1755) wanted to make actual laws (not ideal ones—in contrast to Rousseau) understandable to the people in his *Esprit des Lois* ("Spirit of the Laws"). His *Lettres persanes* are admirable and witty comments on contemporary morals and politics. The *Natural History* of Georges de Buffon (1707–88), in accordance with the spirit of the times, is both scientific and literary.

Eighteenth-century drama was far behind that of the preceding century. Voltaire essayed tragedy and many of his plays won immediate popular success. Diderot has been called a miniature Racine. Comedy was more successful in the hands of Marivaux (1688–1763), author of the charming *Jeu de l'Amour et du Hasard* ("Game of Love and Chance"), and in those of Beaumarchais (1732–99), who created the amazing servant, Figaro, in *Le Barbier de Séville* and *Le Mariage de Figaro,* plays influential as propaganda for the Revolution. The work of the only great lyric poet of the period, André de Chénier (1762–94), shows a renewal of interest in Greek antiquity—a movement evident also in painting and sculpture.

In contrast to drama and poetry, the novel showed definite improvement. *Gil Blas* by Alain René Le Sage (1668–1747), though long and episodic, is a dramatic and effective satire whose hero resembles the Spanish picaro, a clever rogue forced to live by his wits and not too particular about his methods. The novels of Marivaux, especially *La Vie de Marianne* (1731–40; in eleven parts), like his plays are first of all entertaining and they also have an elaborate analysis of sentiment. From his name a French noun *marivaudage* has been formed to mean artificially witty and sentimental. *Manon Lescaut* by the Abbé Prévost (1697–1763) is something new in French literature as it succeeds in successfully combining the portrayal of strong passion with full recognition and analysis of actual problems and necessities of everyday life. Signs of a new age became apparent in Rousseau's long novel *Julie, ou la Nouvelle Héloïse* (1760) and in the short *Paul et Virginie* by Bernardin de Saint-Pierre (1737–1814). Rousseau imitated the English novelist Richardson by composing a novel entirely of letters, but he was entirely original in his real love for nature and in his belief that primitive man was good and had been corrupted only through his contact with society. This love of nature and passion for the primitive coupled with his belief in the importance of personal ideas and emotions (as seen in his autobiographical *Confessions*) made him the father of the coming romantic movement. *Paul et Virginie* emphasizes the goodness of nature and of those who grow up with it and adds a new note—interest in the exotic.

Literature during the Revolution and the First Empire was largely confined to oratory (Mirabeau, Danton, Napoleon) and militant journalism (Camille Desmoulins). In 1792 Rouget de Lisle (1760–1836) wrote *La Marseillaise,* the stirring song that became the French national anthem.

Romanticism, 1800–1850.—French romanticism was the result of many influences—a new France created by the Revolution and the Empire, greater knowledge of foreign lands and peoples, the personal influence of Rousseau, contact with German, English, medieval and Oriental literatures and rebellion against the impersonal and regulated art of the 17th century and the rationalism of the 18th century. Its effect on French literature was that of a strong tonic, though its truest representatives were the sentimental *enfants du siècle* (children of the century), who felt themselves lost in a new world. François René de Chateaubriand (1768–1848) in creative writing and Mme de Staël (1766–1817) in criticism and theory were the predecessors of the great romantic heyday (1820–50). Chateaubriand opened up a new road in his beautiful and almost poetic descriptions of nature, in his attempt to replace reason by faith and in his oversentimental unhappiness and discontent with himself and the world. His principal works are *Le Génie du christianisme* (1802), with its delightful American episodes published separately, *Atala* (1801) and *René* (1802), *Les Martyrs* (1809), *Les Natchez* (1826), also laid in America, and *Mémoires d'Outre-tombe* ("Memories from beyond the Grave," 1849–50), personal recollections.

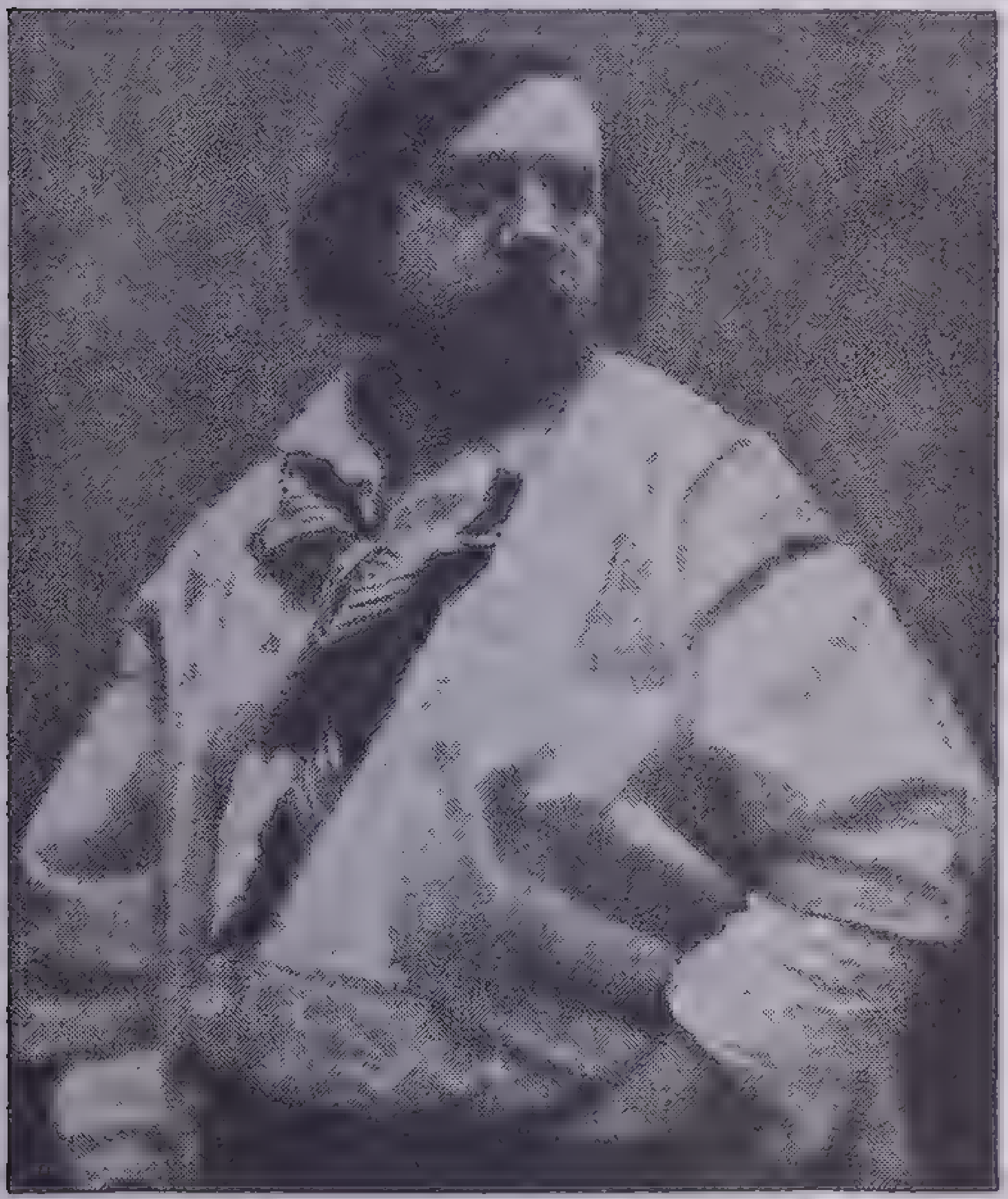
Mme de Staël in her two most famous critical essays *De la Littérature* (1800) and *De l'Allemagne* (1813) called the attention of French writers and thinkers to German Literature, which had reached a high point under the leadership of Goethe and Schiller. Mme de Staël's own novels are now little read, but her theories opened up new vistas.

With romanticism lyric poetry flourished as it had not since the Middle Ages—in *Méditations* and *Harmonies* by Alphonse de Lamartine (1790–1869), poems filled with a soft melancholy and a love of nature and its solitudes; in *Les Nuits* ("Nights") by Alfred de Musset (1810–57), spontaneous, sincere, passionate; in the collected *Poems* (1837) by Alfred de Vigny (1799–1863), bitter, symbolical, stoically unhappy; and in the many volumes of superb poetry by Victor Marie Hugo (1802–85), whose figure dominated the century in every type of creative writing. All these poets escaped from the restraints of old rules of versification and gave free rein to their personal inspiration, giving fresh and beautiful color to French poetry. Lamartine, Vigny and Hugo also wrote ambitious epics that are often symbolically and eloquently beautiful—Lamartine's *Chute d'un ange,* Vigny's *Le cor* and *Moïse,* Hugo's *La Légende des siècles.* Pierre Jean de Béranger (1780–1857) was a popular and prolific song writer.

The drama also broke its classical

bonds, following the theories of Stendhal (real name, Henri Beyle; 1783–1842) in his *Racine et Shakespeare* (1823) and of Hugo in the preface to his play *Cromwell* (1827). Hugo's dramas show his abilities as a poet rather than as a dramatist, for in his desire to escape from the classical he neglects characterization and inner motivation for rich décor and physical action. Vigny's *Chatterton* (1835) has a romantic hero but is classic in its psychological analysis. Musset, the most vivacious of the *enfants,* is unique for his wholly delightful short comedies. The plays of Alexandre Dumas (1802–70) are lacking in finesse but rich in action and color.

Adolphe (1815) by Benjamin Constant (1767–1830) and *Obermann* (1804) by Étienne de Sénancour (1770–1846) are highly subjective novels in which the authors give their own feelings of love and futility searching analysis. Influenced by Walter Scott and by the general renewed interest in French history, Vigny wrote a historical novel *Cinq-Mars* (1826), and Hugo the unforgettable *Notre Dame de Paris* (1831).



Courtesy Museum of Modern Art

Théophile Gautier

Vigny also wrote the fine prose sketches *Servitude et grandeur militaires;* Lamartine wrote *Confidences* and the short tale *Graziella;* and Musset contributed *La Confession d'un enfant du siècle* (1835). Alexandre Dumas won the hearts of youth with his thrilling *The Three Musketeers* (1844) and *The Count of Monte-Cristo* (1844). George Sand (Mme Dudevant; 1804–76) after experimenting with other types turned to stories of peasant life, which under her romantic hand became poeticized and lovely. Charles Nodier (1780–1844) and Gérard de Nerval (1808–55) specialized in fantastic and symbolic tales.

Interest in history brought new methods of historical writing. Augustin Thierry (1795–1856) went back whenever possible to original sources and was perhaps the first to do real research. Jules Michelet (1798–1874) brought life and interest to history in his "resurrections of the past." François Guizot (1787–1874) contributed the exact and philosophical *History of Civilization in Europe* (1828). Henri de Tocqueville (1805–59) visited America and his interesting study of democracy *De La Démocratie en Amérique* (1835–9) resulted. Lamennais (1782–1854) and Lacordaire (1802–61) tried to make catholicism more human and democratic. Edgar Quinet (1803–75), scholar, poet and prophet, also Michelet and Hugo were filled with high hopes for a new age of freedom, equality and happiness for all. Both Quinet and Hugo spent many years in exile for their liberal politics.

On the fringe of the romantic movement is the poetry of Théophile Gautier (1811–72) and the prose of Stendhal, Mérimée and Balzac. Gautier was more interested in form and precision of wording than the romantics. Stendhal, born in Grenoble, Switzerland, from choice spent many years in northern Italy. His two novels, *Le Rouge et le Noir* ("Red and Black," 1830) and *La Chartreuse de Parme* (1839), written in a clear and analytical style, are fast-moving and accurate in characterization. Prosper Mérimée (1803–70), sophisticated and accomplished, is remembered for his short stories, particularly *Carmen,* the basis of Bizet's opera of that title, and *Colomba,* a story of Corsican honor; all are moving and colorful in their well-written perfection. Honoré de Balzac (1799–1850) takes his place with Hugo and Flaubert as one of the great novelists of the century. His ambitious scheme for a *Comédie humaine* (his title for his combined works) to cover all the aspects of contemporary French life was almost carried out. His novels are filled with strong three-dimensional life and his people seem actual acquaintances that are met time and again in the various novels. His portrayals of provincial and middle or lower-class Parisian life are best: *Eugénie Grandet, Le Père Goriot, La Cousine Bette.*

Realism and Naturalism, 1850–90.—The Revolution of 1848 and the overthrow of the Second Republic in 1852 brought despair to the utopian hopes of the romantics and ushered in a new generation of authors. Auguste Comte (1798–1857) built a constructive philosophy out of natural science and introduced a new science considered most important of all—sociology. In the *Histoire des origines du Christianisme,* including the *Vie de Jésus,* Ernest Renan (1823–92) showed the effect of a combined religious and scientific training. He sought to explain religion logically without detracting from its spiritual qualities. Hippolyte Taine (1828–93) gave impetus to the naturalist movement in literature by his definition of man as a mass of sensations and impressions capable only of putting together and explaining the single natural facts of his experience. In his *L'Histoire de la littérature anglaise* (1864) he made man a product solely of his race, time and environment.

Everywhere science was praised and practiced—Darwin was widely discussed; Claude Bernard (1813–78) in physiology and Louis Pasteur (1822–95) in bacteriology made great strides forward in the fight against disease. In criticism Sainte-Beuve (1804–69) was master; his study of Port-Royal, home of the Jansenist movement, and his essays, *Causeries du lundi,* show his interest in personalities and in the relation of literature to social facts; they also reveal a keen discernment and a finished style. The fruits of all this philosophical and scientific activity were evident in poetry, drama, the novel and the short story.

The Parnassian school in poetry, so called from Mount Parnassus, legendary home of Apollo and the Muses, emphasized precision in form and vocabulary, restraint and accuracy in detail and analysis rather than confession of emotion. Illustrative of these ideals is the poetry of Leconte de Lisle (1818–94), José Maria de Heredia (1842–1905) and Sully Prudhomme (1839–1907). The genius of Charles Baudelaire (1821–67) was not fully recognized before his death. Influenced strongly by Edgar Allan Poe, Baudelaire in turn had an enormous influence upon modern poetry. His *Les Fleurs du mal* (1857; "Flowers of Evil") was beautifully translated by George Dillon and Edna St. Vincent Millay in 1936.

The theater showed a growing tendency to portray reality without any softening or idealization—in the comedies of bourgeois life by Émile Augier (1820–89) and in the social drama, still somewhat romantic in the plays of Alexandre Dumas, Fils (*La Dame aux camélias* ("Camille"); but bitterly realistic in those of Henri Becque (1837–99). Of less importance are A. E. Scribe (1791–1861) said to have created modern vaudeville, and Victorien Sardou (1831–1908), remembered for *Madame Sans Gene* (1893). Eugène Labiche (1815–88) leavened his fantasies with bits of good sense and is still beloved for *Le Voyage de M. Perrichon* (1860). The operas of Jacques Offenbach (1819–80) with librettos by Henri Meilhac (1831–97) and Ludovic Halévy (1834–1908) were original expressions of the Second Empire (1852–70).

In the novel Gustave Flaubert (1821–80) firmly established realism in *Madame Bovary* (1856) and *L'Education sentimentale* (1869), where he attempts and achieves accurate reproduction of what might really have happened, attaining a remarkable compromise between art and truth. His style is clear and precise, for each word was chosen with the greatest care. That Flaubert had another, more romantic, side is evident in *La Tentation de Saint Antoine* and *Salammbô* (a story of ancient Carthage), filled with the richness of his vocabulary and imagination.

Realism soon concentrated on the unpleasant and depressing sides of life and became what is called *naturalism.* Guy de Maupassant (1850–93), a disciple of Flaubert, brought to his short stories complete objectivity, sincere observation, exactitude in description and a never-failing knowledge of the possibilities and limitations of his medium. He is the master short-story writer of French literature. Alphonse Daudet (1840–97) in his novels attacking contemporary society was more spontaneous and personal. His delightful series on *Tartarin de Tarascon* shows that laughter had not disappeared from French letters. Jules (1830–70) and Edmond Goncourt (1822–96) carried naturalism to its logical end, attempting to construct novels entirely from firsthand observation or experience. They also aroused interest in 18th-century France and in Japanese culture.

Émile Zola (1840–1902) had too much imagination to be classed as a pure naturalist. He regarded literature as a scientific experiment. His handling of crowds is particularly excellent. Joris Karl Huysmans (1848–1907) first wallowed in the depths of naturalism, then found a morbid satisfaction in spiritualism and finally died a good Catholic.

Standing in sharp contrast to the theories and practice of the realists was still the figure of Victor Hugo. Two volumes of poetry *Les Contemplations* (1856) and *Les Châtiments* (1853) contain some of the loveliest lyrics in the French language and *Les Miserables* (1862) is the crowning achievement of the romantic novel. Hugo, a popular but not a profound philosopher and thinker, was a complete master of language. His death in 1885 was an occasion of national sorrow. He was greatly influenced by English thought, and Swinburne and other English revolutionaries adored him.

Modern Movements.—The discouragement and disillusionment that followed the Franco-Prussian War of 1870–71 and a decline in material prosperity brought a new type of literature and an almost complete abandonment of the old realism based upon worship of science. Foreign influences were strong—Freud, Wagner, Nietzsche, Tolstoy and Dostoevski all left their imprints upon French literature. There was a revival of music and of conversation in salons reminiscent of the 17th century. The influence of Pascal emphasizing human life and faith finally replaced that of Descartes. Henri Bergson (1859–), who received the Nobel Prize in 1927, denied that science was all-powerful. He emphasized intuition and belief and gave art a new purpose, the expression of intuition and instinct. Bergson's influence was great and particularly noticeable in the revival of Catholicism, featured by many dramatic conversions. Literary and dramatic criticism flourished in the hands of Francisque Sarcey (1828–99), Ferdinand Brunetière (1849–1906), Jules Lemaître (1853–1914), Gustave Lanson (1857–1934) and Julien Benda (1867–).

In poetry the symbolists—Stéphane Mallarmé (1842–98), Paul Verlaine (1844–96), Jean Arthur Rimbaud (1854–91)—abandoned conventional syntax and meters for more personal expression. Their poetry is essentially vague, fluid, musical, often abstract and filled with veiled symbols. Their successors are Émile Verhaeren (1855–1916), Henri de Régnier (1864–), the Comtesse de Noailles (1876–1933), Paul Claudel (1868–) and Paul Valéry (1871–). Claudel, an ardent Catholic and essentially mystic, sought a hidden reality. Valéry's poetry is purely intellectual; he seems to sit apart from a physical world and set himself word problems in space. In 1920 the dadaist movement denied everything because it felt incapable of solving anything. It was essentially an outgrowth of the World War and could not last long. Poets turned again to symbolism and Catholicism, and, as with Jean Cocteau (1891–), to a new classicism.

Drama turned from its preoccupation with bourgeois life and customs to the poetic fancies of Edmond Rostand (1868–1918), beloved for *Cyrano de Bergerac, L'Aiglon* and *Chantecler;* and of Maurice Maeterlinck (1862–), Belgian poet and philosopher and winner of the Nobel Prize in 1911. Claudel wrote mystic and symbolic plays like *L'annonce faite à Marie* ("Tidings Brought to Mary," 1912). François de Curel (1854–1928) in *Terre inhumaine* and Eugène Brieux (1858–1932) in *La Robe rouge* (1900) and *Maternité* (1904) contributed to the drama of ideas. Georges de Porto-Riche (1849–1930) and Henri René Lenormand 1882–) investigated psychological motives and effects. Jean Giraudoux (1882–) wrote witty and striking fantasy in *Amphitryon 38* (1929) and *La Guerre de Troie n'aura pas lieu* ("The Trojan War Shall not Take Place," 1935).

Underwood & Underwood

Émile Zola

The novel was the most important literary form in both quantity and quality. Subject matter divides roughly into interest in customs—Parisian, provincial and foreign—and interest in psychology and analysis. Form varies from the soft fluidity of Pierre Loti and the musical sensitiveness of Proust to the exotic brilliance of Giraudoux, and the classical restraint and clarity of Gide.

Pierre Loti (real name, Julien Viaud; 1850–1923), a naval officer, wrote naturally and easily of the far corners of France and the world, putting into his style and his books an elusive melancholy, an inescapable feeling of the passing of time and the instability of all earthly things. The Tharaud brothers, Pierre Benoît, Paul Morand and others write of little-known places and people, describing them carefully but with enthusiasm. Pierre MacOrlan and Giraudoux pass swiftly from the land of reality to that of fantasy and back again. The poor and often ugly sides of life are forcefully scrawled in the work of André Chamson, Pierre Hamp and Henri Barbusse, whose books on the war are brutal in their very truth. Charles Péguy (born a peasant) was at once an ardent Catholic and an ardent socialist and filled his writing with force and purpose. Paul Bourget, Maurice Barrès and Edouard Estaunié evidence the continuation of the tradition of careful analysis and discussion.

François Mauriac and André Maurois (best known in America for his biography of Shelley, *Ariel,* 1923), and the American-born Julien Green are interested in emotions, feelings and thoughts rather than external or physical action. Mauriac tries sincerely to portray the essential evil at the heart of man, evil that only true religion can overcome. Sidonie Gabrielle Colette, in a rich and concentrated prose, analyzes her own thoughts and feelings. The prose of Francis Jammes is highly poetical and filled with subtle music. His subject matter and characters are treated with sympathy and understanding. Master in analysis and presentation of the unconscious and subconscious whims of the mind was Marcel Proust (1871–1922) in the novels making up his *A la recherche du temps perdu* "Remembrance of Things Past"). His prose is intricate, beautiful and unique in all literature.

Anatole France (real name, Jacques Anatole Thibault; 1844–1924), sceptical and mocking, was the literary giant of the early 20th century. He pointed out the inconsistencies and failures of government and religion, brought high-flown ideals crashing to earth, yet has an inescapable charm and fascination that will keep him a center of controversy far into the future. In 1921 he received the Nobel Prize.

André Gide (1869–) is even more destructive of accepted standards because his novels seem to question whether moral values exist, whether good can be distinguished from evil. In contrast to his explosive subject matter his style is classically pure and lucid. Georges Duhamel (1884–), who as a doctor saw and felt all the horrible waste of war, has imbued his work with his strong interest in humanity. His books *Civilisation* (1918) and *Les Plaisirs et les jeux* (1926) reveal him as a scientist highly sensitive to human emotions.

Romain Rolland (1866–), pacifist and idealist is known throughout Europe and the English-speaking world for his *Jean Christophe* (1904–12) series. Jules Romains (1885–) in his long series entitled *Les Hommes de bonne volonté* ("Men of Good Will") produced silhouettes of the soul of Paris. He is a leading force in unanimism, the study of the soul of a crowd or group, where people are not individuals but only parts of the groups to which they belong. Roger Martin du Gard, winner of the Nobel Prize in 1937, is best known for his somewhat philosophical study of manners and customs *Les Thibault* (1922–28).

GERMAN LITERATURE

Old High German Period, to 1100.—Before 800 the most famous evidence of early Teutonic speech is the Bible translations in Gothic made by Ulfilas (*c.* 311–381), bishop of the Goths. Poetry and song were present but were not written. Out of the *Völkerwanderung* (migration of peoples) in the 5th century came a whole series of epics, filled with mythological characters and superb heroes. The oldest saga of which there are written records (*c.* 800) is the *Hildebrandslied* ("Lay of Hildebrand"). Encouraged by Charlemagne, the monasteries produced Christian poetry in German as well as in Latin. The *Heliand* ("Saviour") and the *Gospel Book* of Otfried (*c.* 810–*c.* 880) were versions of the life of Christ; the *Gospel Book* was the first in which rhyme appears. Also from the monasteries came the Wessobrunn Prayer; *Muspilli,* a description of Judgment Day; and the *Ludwigslied,* a historical ballad. Other works from the cloisters and courts though written in Latin are German in thought and feeling: the *Waltharilied,* a short epic by Ekkehard of St. Gall; the moralizing dramas of Roswitha (*c.* 932–1002), a nun of Gandersheim, written to replace the pagan plays of Terence; the *Ruodlieb,* oldest chivalric romance in Germany; and *Ecbasis Captivi* ("The Flight of the Captive"), the first animal epic, featuring the fox, wolf, bear and other creatures, a type of literature popular throughout the Middle Ages and forerunner of the famous French *Roman de Renart* and the fables of La Fontaine.

Middle High German Period, 1100–1350.—In the 12th and 13th centuries contemporary with the powerful Hohenstaufen emperors came the first great period of German literature. Chivalry was at its height—characterized by tournaments, idealization of women, a new concept of love (*Minne*) and all the adventurous ideas brought back by the crusaders. The poet priests and monks were rivaled by wandering lay musicians who produced *König Rother* (*c.*1160), the *Alexanderlied* (*c.* 1130) and *Herzog Ernst* (*c.* 1180). New epics grew up—about Dietrich von Bern (Theodoric the Great) and Charlemagne, and about mythical heroes like Gudrun, Siegfried and Percival. To folk poetry belong the greatest of them all, the *Nibelungenlied* (*c.* 1200), a masterful mixture of old hero stories, both pagan and Christian; and the *Gudrunlied,* which combines a number of Scandinavian legends and probably belongs to the same cycle as *Beowulf,* presenting a graphic picture of the life of the early vikings.

In the court poetry the influence of French epics and French ideals of chivalry is evident. *Der arme Heinrich* by Hartmann von Aue (*c.* 1170–*c.* 1210) is the finest in style. Wolfram von Eschenbach (1170–1220) wrote *Parzival,* a mystical epic of Percival, count of the Grail. Gottfried von Strassburg wrote *Tristan,* the lovely and tragic story of Tristan and Isolde that has been treated time and again in German, French and English literature. In the *Minnesang* (lyric poetry) Walther von der Vogelweide (*c.* 1170–*c.* 1228) was master, the best German lyricist before Goethe and the first national poet, singing of church and emperor, of winter and spring and of beautiful women. Legends based on the superstitions and beliefs of the Middle Ages sprang up—legends of the saints, of a Wandering Jew, of a Dr. Faustus.

Transition Period, the Reformation and the Renaissance, 1350–1700.—With the growth of towns and the middle class, the old heroic and chivalric epics were out of touch with the times. Parodies, elaborate allegories and satires became popular; but the form of literature that was to be the favorite of the people for centuries was the *Volksbucher,* prose versions of the old tales.

Drama emerged slowly from its religious connections. In the latter part of the 15th and early 16th centuries the *Minnesang* became the *Meistergesang* (song of the masters), poetry that was taught in schools and written according to strict rules in contrast to the freedom of rhythm and thought that characterized the *Minnesang.* Hans Sachs (1494–1576), a Nürnberg cobbler, the greatest and most prolific of the Meistersinger, is celebrated in Wagner's opera of the same name; but the true vitality of the age lay in the folk poetry that included songs on every subject—war, love, spring—also hymns and fanciful ballads. In prose the animal fables and epics and short humorous anecdotes found high favor. Best and most telling of the humorous satires is the *Narrenschiff* ("Ship of Fools") by Sebastian Brant (1457–1521). In the same century universities were founded in Prague, Vienna, Heidelberg, Erfurt.

The atmosphere that made the Reformation possible resulted mostly from the activities of the mystics and the humanists. Meister Eckhart (*c.* 1260–1327) proclaimed the mystical relations of the soul to God and the necessity of individual interpretation of religion. Although most of their writings were in Latin, the humanists were influential because they, too, emphasized the value of the individual. Martin Luther (1483–1546), joining the fervor of mysticism with the learning of humanism, posted his theses against indulgences on the door of the Castle Church of Wittenberg in 1517, inaugurating the Reformation. The movement thus started by Luther inspired much written argument and satire. Luther himself did most to give form and unity to the German language in his translation of the Bible, a work whose influence on the German literature and language is comparable to the influence of the King James Bible upon English. His hymns, too, won world-wide recognition and are still widely sung in Protestant churches. Ulrich von Hutten (1488–1523), a knight of Franconia, and Philipp Melanchthon (1497–1560), both humanists, turned their learning to the service of the Reformation. Thomas Murner (1475–1537), a Franciscan monk of Strasbourg, attacked Luther in his bitter satire *On The Great Lutheran Fool* (1522). Johann Fischart, a satirist almost Murner's equal in power, defended the Reformation and achieved fame through his German version of Rabelais' satire on French manners and customs. Toward the end of the 16th century English comedians introduced English plays into Germany, giving the theater there a fresh impulse. The national spirit hardly had time to assert itself before it was swept away by the Latin imitations of the Renaissance and the disaster of the Thirty Years' War.

The most important influence of the period that followed was Martin Opitz (1597–1639), a Silesian whose *Buch von der deutschen Poeterey* ("Book of German Poetry," 1624) formulated rules observed with little variation for a hundred years and did for the German language what Ronsard and the Pléiade had done for French. Literary societies were formed to purify and regulate the language. Paulus Gerhardt (1607–76), a great preacher and hymn writer, escaped from this tightening influence and like Luther modeled his hymns on the popular ballads. Andreas Gryphius (1616–64), the best German dramatist of the 17th century, was strongly influenced, particularly in his tragedies, by Seneca and the stiff Dutch plays of Hooft and Vondel. His comedy, *Herr Peter Squentz,* reminiscent of *A Midsummer Night's Dream,* is fresher and more interesting than are his tragedies.

In the novel, French and Spanish influences were strong. Comparable to the Spanish *Lazarillo de Tormes* and the later French *Gil Blas* was *Der abenteurliche Simplicissimus* ("Adventurous Booby," 1669) by H. J. Christoffel von Grimmelshausen (*c.* 1620–76), dealing with the turbulent time of the Thirty Years' War. Near the end of the Renaissance, Gottfried Wilhelm Leibnitz (1646–1716), the first great German philosopher, foreshadowed the great period that was to come.

Die Blütezeit (Flowering Age, 1700–1832).—After the devastation of the Thirty Years' War had in some measure been forgotten, a new feeling of nationalism and unity was inspired by common pride in Frederick the Great. In literature the struggle between those who emphasized form and adherence to rules after the manner of the French 17th-century writers and those who insisted upon the importance of content and poetic inspiration ushered in the new age.

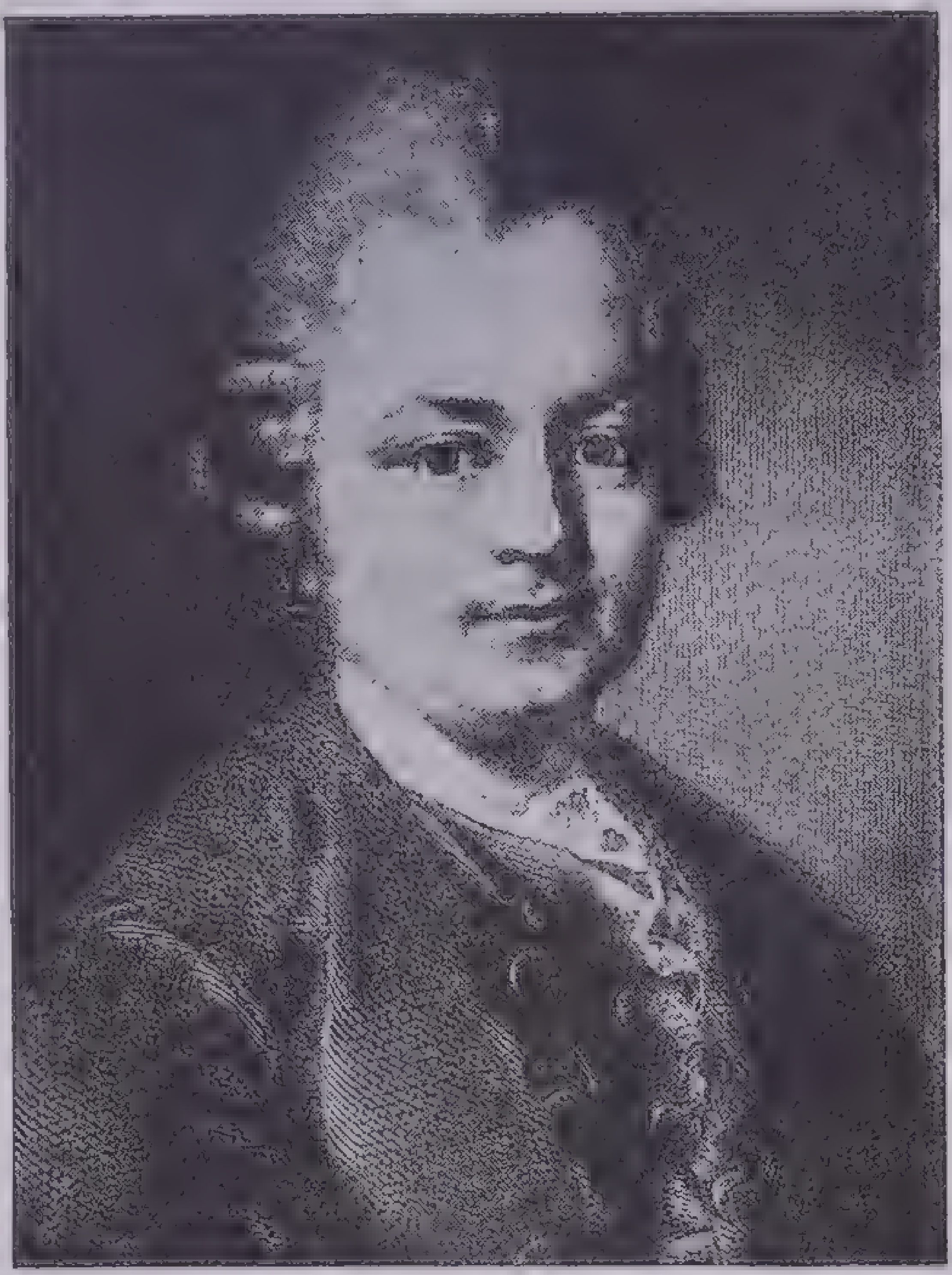
Johann Christoph Gottsched (1700–66) in his *Kritische Dichtkunst* ("Critical Art of Poesy," 1730) attempted to set up new standards based on French classicism that was itself an attempt to imitate Greek models. The Swiss poets J. J. Bodmer and J. J. Breitinger emphasized instead English models and medieval German poetry. With the appearance of the epic *Der Messias* ("The Messiah") by F. G. Klopstock (1724–1803), German literature definitely found itself. Klopstock's epic and his *Odes* show the strong influence of Milton and of Macpherson's *Poems of Ossian* and effectively introduce again into German literature feeling, melody and the love of nature and of country. Albrecht von Haller (1708–77) in *Die Alpen* (1734) and E. C. von Kleist (1777–1811) in *Der Frühling* (1749) followed his example. J. J. Winckelmann (1717–68) in *History of Ancient Art* (1764) gave impetus to a new classical movement based upon Greek rather than French art.

Gotthold Ephraim Lessing (1729–81) in *Hamburgische Dramaturgie* (1767–8) counseled the switch of attention from the French stage to Shakespeare and German folk drama and himself furnished models for a new German drama—particularly *Minna von Barnhelm* (1767), a new ideal of domestic comedy; *Emilia Galotti* (1772), a new type of national tragedy; and *Nathan der Weise* (1779), an imperishable evangel of brotherhood and religious toleration. He established the use of the iambic pentameter in poetic drama and in *Laokoon* (1766) introduced a new method of art criticism.

Immanuel Kant (1724–1804) superbly carried on the philosophic tradition started by Leibnitz. In his *Critique of Pure Reason* (1781) Kant substituted critical philosophy for the old dogmatic metaphysics; the *Critique of Practical Reason* (1788) demands obedience to the moral law; and the *Critique of Judgment* (1790) lays the foundations of modern esthetics. Kant was the inspiration of the transcendentalist movement that so strikingly influenced the group of New England writers led by Ralph Waldo Emerson.

J. G. von Herder (1744–1803) was the theorist and apostle of the literary revolution known as the *Sturm und Drang* (storm and stress), whose followers threw aside literary fetters and emphasized the freedom and sacredness of the individual. Attracted to the subject by Rousseau, Herder aroused interest in primitive man and his evolution and recognized and encouraged the best national elements of German literature.

Johann Wolfgang von Goethe (1749–1832) and **Johann Christoph Friedrich von Schiller** (1759–1805) are to German literature what Shakespeare and Milton are to English, Molière to French, Cervantes to Spanish and Dante to Italian. While studying at Strasbourg, Goethe became acquainted with Herder, who interested him in English literature (particularly in Shakespeare) and in the Middle Ages. In the next few years (1772–5) Goethe produced unexcelled examples of the *Sturm und Drang*, including: *Götz von Berlichingen*, a play depicting the struggle of a medieval knight against the new order; *Die Leiden des jungen Werthers* ("Sorrows of Young Werther"), a short novel of disillusionment whose influence in Germany and France was phenomenal; the *Urfaust*, the first draft of his classic poem, and many perfect lyrics. Schiller wrote dramas filled with symbolism and high ideals. Among these dramas are: *Die Räuber* (1781), *Kabale und Liebe* ("Intrigue and Love," 1784) and *Don Carlos* (1787), composed in iambic blank verse and hinting a departure from the ideals of the *Sturm und Drang*.



Underwood & Underwood

Gotthold Ephraim Lessing

In 1775 Goethe was invited to Weimar, and, in the years that followed, this little town became the center of German culture. Herder, C. M. Wieland (tutor of the young heir, Karl August) and later Schiller went there to live. Wieland's interest in medieval Germany was revived by Goethe and Herder, and as a result he wrote *Oberon* (1780), his well-known verse romance. Goethe was soon entrusted with much of the government of the little state and though he wrote very little he became interested in practical affairs and in the arts and sciences, all of which proved useful to him later. On a visit to Italy his understanding and appreciation of Greek classical art deepened and crystallized. *Egmont* (1788) is in the nature of a transition drama; *Iphigenie auf Tauris* (1787) and *Torquato Tasso* (1790) are purely classical. *Wilhelm Meisters Lehrjahre* ("Wilhelm Meister's Apprenticeship"), his greatest novel, also appeared at this time.

While Goethe was governing Weimar, Schiller had become deeply interested in history and in Kant's philosophy; and in 1794, when Goethe and Schiller became close friends, each was able to contribute to the development of the other. Both wrote masterful ballads. Schiller, urged on by Goethe, turned again with greater surety and power to poetic drama, producing the trilogy *Wallenstein* (1799), *Maria Stuart* (1801), *Die Jungfrau von Orleans* (1802), *Die Braut von Messina* (1803), using a Greek chorus, and *Wilhelm Tell* (1804). Goethe wrote the beautiful pastoral *Hermann und Dorothea* (1798), and once more turned to *Faust*, of which the first part was concluded (1808) only three years after Schiller's death.

The new century brought a new version of *Sturm und Drang* called romanticism, an international phenomenon emphasizing not only the rights of the individual, but patriotism and interest in the Middle Ages. Its philosophers were J. G. Fichte (1762–1814) and F. W. J. von Schelling (1775–1854). A. W. von Schlegel, theorist and critic, contributed a superb translation of Shakespeare. His brother Friedrich von Schlegel wrote the best novel of the romantic school, *Lucinde*, dealing with the limitations of conventional society. Jean Paul Friedrich Richter's novels were highly popular at the time but not of much permanent value. The work of Ludwig Tieck (1773–1853) shows the close connection between the *Sturm und Drang* and romanticism. Heinrich von Kleist and F. L. Zacharias Werner were the best of the poet dramatists. Johann Ludwig Uhland wrote popular ballads, patriotic poems and treatises on German legends. J. von Eichendorff (1788–1857) is remembered for his masterful lyric poems *Wanderlieder* and a gay, picaresque novel *Aus dem Leben eines Taugenichts* ("The Life of a Good-for-nothing"). Goethe alone succeeded in combining classicism and romanticism—in *Dichtung und Wahrheit*, the story of his life, in numerous shorter poems and in *Faust*, the long dramatic poem of a soul that gained redemption through ceaseless striving.

From Goethe to Nietzsche (1832–1900).—The influence of the philosophy of G. W. F. Hegel (1770–1831) now began to replace that of the romantic thinkers, although romantic influence was still felt in the universities, which became productive in philology, history, science and law. The group known as "Young Germany," including Heinrich Heine, Karl F. Gutzkow, Heinrich Laube and others, was formed for political as well as literary reasons. Heine's *Die Harzreise* ("Travels in the Harz Mountains," 1826) and *Buch der Lieder* (1827) still show the romantic influence. Laube gained wide fame as manager of the *Burgtheater* in Vienna. Some of the best prose produced by this group is found in the *Briefe aus Paris* ("Letters from Paris," 1830–33) by Ludwig Börne. Outside this circle the influence of Walter Scott's work resulted in many historical novels, but they were of little lasting value. Besides tragedies, K. L. Immermann wrote *Münchhausen* (1838–9), a novel distinguished for its description of Westphalian peasant life. A. von Platen Hallermund, belonging neither to the romanticists nor to Young Germany, proved himself a master of the sonnet in his

Sonette aus Venedig (1825). Franz Grillparzer (1791–1872), the greatest Austrian dramatist, combined in his plays *Sappho* and *King Ottokar's Rise and Fall* something of both romanticism and classicism. His *Der Traum, ein Leben* has been called an Austrian *Faust.*

The influence of Arthur Schopenhauer (1788–1860) and his philosophic pessimism was quickly felt and as the century progressed that influence gathered increasing force and became evident in the work of Germany's outstanding poetess Annette von Droste-Hülshoff (1797–1848), in the poetry of the Austrian Nikolaus Lenau (1802–50), and in the changing subject matter of the novel and the drama. Social and political problems were treated by Friedrich Spielhagen (1829–1911) and by Gustave Freytag (1816–95). Freytag's comedy *Die Journalisten* (1852) is one of the best in modern German; and his novel *Soll und Haben* ("Debit and Credit," 1855) sets forth the virtues of the German merchant class as contrasted with those of the nobility.

Friedrich Hebbel (1813–63) introduced psychological motives and understanding into the drama; and Otto Ludwig in *Der Erbförster* ("Hereditary Forester," 1850) foreshadows later realism. The provincial novel that had its fling in all the civilized countries of the world was well represented in Germany by Berthold Auerbach, poet of the Swabian Black Forest; by Fritz Reuter, a Meklenburg poet, writing in the Low German of the North; by Theodor Storm in his novels of north Germany; by the Swiss poet and novelist Gottfried Keller (whose romantic and autobiographical novel *Der grüne Heinrich* [1854–5] is in the same tradition as Goethe's *Wilhelm Meister*); and by Paul Heyse, long the central figure of the Munich school of poets, in his short stories portraying Italian peasant life. Another manifestation of the same trend was the popular interest in American life and people aroused by the novels of James Fenimore Cooper.

A brilliant interlude in this pessimistic atmosphere and in the shadow of the coming realism was the establishment of a national theater at Bayreuth by Richard Wagner (1813–83). Wagner's music dramas, *Tristan und Isolde, Die Meistersinger von Nürnberg, Der Ring des Nibelungen* and *Parsifal* have never been equaled in the perfect unity of their music and story.

Das Kapital (1867–94) by Karl Marx (1818–83) became a profound influence the world over. Historical science—especially in the work of L. von Ranke (1795–1886)—and literary criticism took on new importance. Schopenhauer's influence was fading and the rout was complete with the advent of Friedrich Wilhelm Nietzsche (1844–1900), who proclaimed once more the power and heroic force of the individual. *Also sprach Zarathustra* ("Thus Spake Zarathustra," 1883–91), his greatest book in prose (he also wrote admirable lyrics), left an indelible impression on the literature and spirit of his time.

Underwood & Underwood

Stefan Zweig

Realism and Reaction.—The influence of French and Russian realism, though mild, is noticeable in the work of Wilhelm Raabe (1831–1910); in that of the Austrian Marie von Ebner-Eschenbach (1830–1916); and in a stronger form in the novels and plays of Hermann Sudermann, especially *Frau Sorge* (1887); in the early work of Gerhart Hauptmann (1862–), notably the play, *Die Weber* ("The Weavers," 1892); and with a different slant in the plays of Frank Wedekind (1864–1918). Naturalism or intensified realism is evident in Hauptmann's *Fuhrmann Henschel* (1898); in Max Mell's short novel *Barbara Naderer* (1914); and in the poetry of Arno Holz (1863–1929). Almost at once a new movement was evident—authors no longer attempted photographic portrayal of what they saw but gave their subject a personal interpretation, still, however, without any ethical suggestion. Beauty of form and of content was all-important. In poetry Stefan George (1868–1933) attempted to imprison pure sense impressions. *Buddenbrooks* (1901) by Thomas Mann (1875–) is a family history and pure realism in the beginning but evolves toward an impressionistic outlook. In his monumental novel *Der Zauberberg* ("The Magic Mountain," 1925) he abandons realism for philosophical speculation and tells the story of mental awakening in the midst of physical defeat and sickness. In the drama the new movement is best exemplified by the plays of the Austrian, Hugo von Hofmannsthal (1874–1929). Hauptmann's work reproduced to an amazing extent the changing ideas of his time, which now grew more and more symbolic and subjective, becoming a search for a true reality beyond the evident reality. Literature acquired deep ethical undertones, very important in the poetry of Rainer Maria Rilke (1875–1926) and in the play *Das Reich Gottes in Böhmen* by Franz Werfel (1890–). Georg Kaiser (1878–) in *Gas* (1918–20) and Ernst Toller (1893–1939) also succeeded in expressing this literary philosophy in dramatic form.

The 20th century is characterized by an enormous amount of experimentation in respect to both form and content. Stefan Zweig (1881–) and Emil Ludwig (1881–) have written brilliant if not always strictly accurate historical biographies. Powerful historical novels distinguish Lion Feuchtwanger (1884–). Jakob Wassermann (1873–1934) emphasized the psychological in such thrilling stories as *Caspar Hauser,* and *Aufruhr um den Junker Ernst.* The plays of the Austrian Arthur Schnitzler (1862–1931) show a doctor's interest in the pathological and extraordinary and are at the same time a facile and accurate reflection of Viennese life. *All Quiet on the Western Front* (1929) by Erich Maria Remarque (real name, Cramer; 1898–) is starkly realistic. Felix Timmermans (1886–), a Flemish novelist, fought his way back from bitter disillusionment to beautiful and meaningful simplicity in *Das Jesuskind in Flandern.* Friedrich Griese (1890–) in *Winter* and Ernst Emil Wiechert (1887–) in *Hirtennovelle* ("Shepherd's Story") added mysticism, inner force and beauty to realism. Heinrich Mann (1871–), brother of Thomas Mann, satirized the old regime in the series entitled *Das Kaiserreich.* Ina Seidel in *Das Wunschkind* (1930) and Hans Carossa in *Der Arzt Gion* ("Dr. Gion," 1931) emphasized the healing and constructive forces in man as well as in nature.

ITALIAN LITERATURE

The Latin language dominated Italy long after it had disappeared from the secular life of the rest of Europe. In Italy alone lay schools existed throughout the Middle Ages. In the 11th and 12th centuries wandering minstrels brought songs and stories in the Provençal dialect from southern France; a little later Arthurian romances and tales of antiquity composed in French invaded Italy and stirred Italian poets to emulation. At first they, too, wrote in the popular language of Provence or of France, but finally in the 13th century a few translations and original writings appeared in Italian, the popular everyday language of Italy. The Italian dialects were descended from Latin much as French and Provençal were descended from Latin. These dialects differed considerably in the various parts of Italy and many centuries passed before Italy attained a single language even for literary use. Lyric poetry flourished in such cities as Venice, Turin, Ferrara and Mantua and in the so-called Sicilian school under the patronage of Frederick II (1194–1250). The subjects were chivalric adventures and the poems were called *Chansons de Geste* (from the French). Many were written in the Tuscan dialect, perhaps the purest descendant of the Latin language and the dialect that gradually became the literary language of all Italy—partly through the political and cultural importance of Florence.

Guido Cavalcanti (d. 1300), a friend

of Dante, was a Florentine poet, mystic and scholar as evidenced in his *Donna mi prega,* a poem on the meaning of love. Cino da Pistoja 1270–1336), too, made love his subject. Brunetto Latini (*c.* 1212–94) reflected the popular interest in allegory in *Tesoretto.* Prose boasted, besides numerous translations, a collection of tales by Francesco Barberini (1264–1348) and the *Composizione del mondo* by Ristoro d'Arezzo (13th century), a discussion of astronomy and geography, which shows surprisingly original observation. The religious revival of the 13th century was most perfectly personified by St. Francis of Assisi (1182–1226), whose exalted piety and love of nature found expression in the religious hymn *Cantico del Sole.* The beautiful stories that grew up about his life became known as the *Little Flowers of Saint Francis.*

Dante, Petrarch, Boccaccio.—The three great writers whose works determined for all time the integrity and fame of the Italian language and literature are Dante Alighieri (1265–1321) in epic poetry, Francesco Petrarch (1304–74) in lyric poetry, particularly the sonnet, and Giovanni Boccaccio (1313–75) in fiction.

Dante was born in Florence and first saw Beatrice Portinari, whom he later glorified as the ideal of womanhood, at the age of nine. He studied at various universities, was a friend of Guido Cavalcanti and a pupil of Brunetto Latini. He was banished from his native city in 1302 and died in exile in Ravenna. Dante's glory springs from the *Vita nuova* ("New Life"), written partly in prose and partly in verse and giving an account of the poet's ethereal love for Beatrice; from the *Convivio* ("Banquet," *c.* 1307), written after the death of Beatrice when the poet sought consolation in philosophy; and most of all from the *Divina Commedia* ("Divine Comedy"), a great epic divided into three parts—Inferno, Purgatorio and Paradiso. Through the first and second of these realms the poet wanders with Vergil (typifying reason) as his guide; through the third the glorified Beatrice conducts him. Into this magnificent work Dante puts his comments on contemporary people and events and his blame or praise of historical characters. It is one of the world's great poems.

Petrarch foreshadowed the Renaissance in his enthusiastic search for original Latin manuscripts and in his masterful imitations and translations of them. Nevertheless, it is not the Latin works of Petrarch but the Italian lyrics that are treasured as a world heritage. What Beatrice was to Dante, Laura was to Petrarch. He composed many sonnets and songs in her honor and these he divided into two groups—*To Laura in Life* and *To Laura in Death.* The series of six allegorical poems called *I trionfi* ("Triumphs") have Laura as their theme but were undoubtedly inspired by Dante's *Divine Comedy.*

Boccaccio developed Italian prose as Dante and Petrarch had developed Italian verse. As a lecturer on Dante, whose biography he wrote, and a friend of Petrarch, Boccaccio was familiar with the best literary traditions of his time, but in contrast to the two great poets his portrayal of women was realistic rather than ideal. His greatest work, the *Decameron,* is a collection of 100 prose stories, ten stories for each of ten days, told by a mixed group who went in 1348 to a villa outside Florence to escape the plague. Boccaccio was a master in the art of story-telling and his book became both the storehouse and the model for many a future writer, especially Chaucer and Shakespeare.

The end of the 14th century and the beginning of the 15th century was on the whole a period of preparation for the glory of the Renaissance. Latin scholars were busy and a new philosophy of living taken from the ancients upset medieval religious ideals and practices.

Leon Battista Alberti (1404–72), though remarkably proficient in Latin and Greek, wrote also in Italian. He was extremely versatile and did good work in painting, music and architecture.

The Role of Literature in the Italian Renaissance.—The interest aroused by Petrarch in the classic Greek and Latin writers had not died, and the work of collecting, translating and studying the old masters assumed tremendous proportions in the 15th century. Academies were founded at Florence, Naples and Rome to carry on the work. In general men of letters were both scholars and creative writers, often artists and statesmen besides. The great literary patron of the age, a poet and scholar in his own right, was Lorenzo de' Medici or Lorenzo the Magnificent (1449–92), prince of Florence. He drew about him at his court a great group of writers, scholars and artists. Perhaps the most brilliant scholar of the age was Angelo Poliziano (1454–94), called Politian in English. His lyric tragedy *Orfeo* and his narrative poem *La Giostra* are brilliant in style and conception; he was the first to use the octave stanza with any success.

Niccolo Machiavelli (1469–1527) wrote numerous books including *Mandragola,* a good comedy of character, and a *History of Florence,* but he is best-known for his realistic studies of political theory *The Prince* and *Discourses on Livy. The Prince* has aptly been called a manual for despots. In it Machiavelli expounds a theory of the nonmoral character of the state and urges that expediency alone be the criterion by which the actions of rulers be judged. Machiavelli's cynical penetration into human character and his profound analysis of the forces that control politics make his work particularly significant today when the nonmoral diplomacy of fascism and *Machtpolitik* is dominant throughout Europe. As Machiavelli outlined the duties of a prince, Baldassare Castiglione (1478–1529) described those of the perfect gentlemen or courtier in the *Libro del Cortegiano.* This courtier is described as extremely versatile and willing to use all his talents in the service of his prince.

Another great historian was Francesco Guicciardini (1483–1540). His account of the period following the death of Lorenzo de' Medici shows great skill in observation and recording. Artists like Benvenuto Cellini (1500–71), Leonarda da Vinci (1452–1519) and Michelangelo (1475–1564) contributed to literature as well as to art—Cellini wrote a famous autobiography; Leonardo wrote on arts and science; and Michangelo's sonnets are famous. Giorgio Vasari (1511–74) left a record of the great creative geniuses of his time in his *Lives of Eminent Artists.* The martyred Dominican preacher, Girolamo Savonarola (1452–98) in his fiery sermons and pamphlets tried to arouse the people against the excesses and pagan spirit of the times. The tales of Matteo Bandello (1480–1562) were later used as source material by English Elizabethan dramatists. Il Lasca (Antonio Grazzini; 1503–84) is remembered for his tales and prose comedies.

Poetry was many-sided and brilliant. Luigi Pulci (1432–84) in *Morgante Maggiore* and Matteo Boiardo (1434–94) in *Orlando innamorato* took material from the old chivalric legends and injected it with satire, humor and 16th-century digressions. Pastoral poetry with its idealized pictures of a simple and calm life attracted many writers, particularly Jacopo Sannazaro (1458–1530) who produced a masterpiece in *Arcadia* (1504). Lyric poetry for the most part followed in the path of Petrarch, and women like Vittoria Colonna (1490–1547) as well as men like the Cardinal Pietro Bembo (1470–1547) tried their hand at it. The first wild excitement of the escape from the rigid theology of the Middle Ages brought a weakening of faith and lowered ideals of morality. This attitude of doubt and ridicule is well expressed in the mock-heroic poetry (called Bernesque) of Francesco Berni (1497–1536) and his followers—a style imitated in the 19th century by Lord Byron.

The greatest writers of the period were Ludovico Ariosto (1474–1533) and Torquato Tasso (1544–95). Ariosto continued Boiardo's *Orlando innamorato,* the story of Roland and Charlemagne, in *Orlando furioso* (1516), a vast romantic poem of nearly 40,000 lines, rich in invention and description and full of dreamlike chivalry and adventure—the work of a master craftsman completely absorbed in his creation and oblivious to the world about him. Torquato Tasso lived in an age of reverence for ancient scholars, and in his great epic *Gerusalemme liberata* ("Jerusalem Delivered") he attempted to follow the rules of Aristotle. His theme is the capture of Jerusalem by the crusaders under Godfrey of Bouillon in the 11th century, and the epic is elevated in tone, dignified and melodious in language and of thrilling interest. Tasso also wrote the beautiful pastoral poem *Aminta* (1572). Tasso was never quite able to adjust his genius to the practical world, even as he could not perfectly succeed in his attempt to combine classic rules with Ariosto's wealth of imagination.

Italian drama now became important for the first time, though most of it even in this century closely followed Latin models. Machiavelli's comedy *Mandragola* and some comedies by Ariosto and Tasso were worthy of their genius, although each did his best work in other fields. The poetic pastoral drama *Pastor fido* (1590) by Giovanni Battista Guarini (1537–1612) is an excellent picture of an Italian society becoming decadent and artificial in its manners and customs. The comedies of Pietro Aretino (1492–1557) are bold and often abusive in their satire.

The 17th and 18th Centuries.—The immediate period after Tasso was one of increasing decadence, for the vitality and élan of the Renaissance had worn itself out and new inspiration was lacking. Giordano Bruno (1548–1600), Tommaso Campanella (1568–1639) and Galileo Galilei (1564–1642) were tortured or imprisoned for their philosophical and scientific beliefs. The poetry of the Seicentisti (16 hundreds), headed by Giambattista Marini (1569–1625) was overdecorated and complex. A profusion of words partly concealed the lack of ideas, particularly in the poetry of Gabriello Chiabrera (1552–1637). Late in the century the Academy of Arcadia was founded in protest against Marinism, but it succeeded only in introducing a new refinement and delicacy of form. The work of Claudio Monteverde (1567–1643) and Pietro Francesco Cavalli (1599–1676) established the lyric drama or opera as a magnificent popular spectacle and a high form of artistic expression.

Secchia Rapita ("The Rape of the Bucket"), a mock heroic poem by Alessandro Tassoni (1565–1635), is strongly satirical and provides the model for Boileau's *Le Lutrin* and Pope's *Rape of the Lock*. Salvator Rosa (1615–73), musician, painter and poet, criticized the artificiality and overelegance of his time.

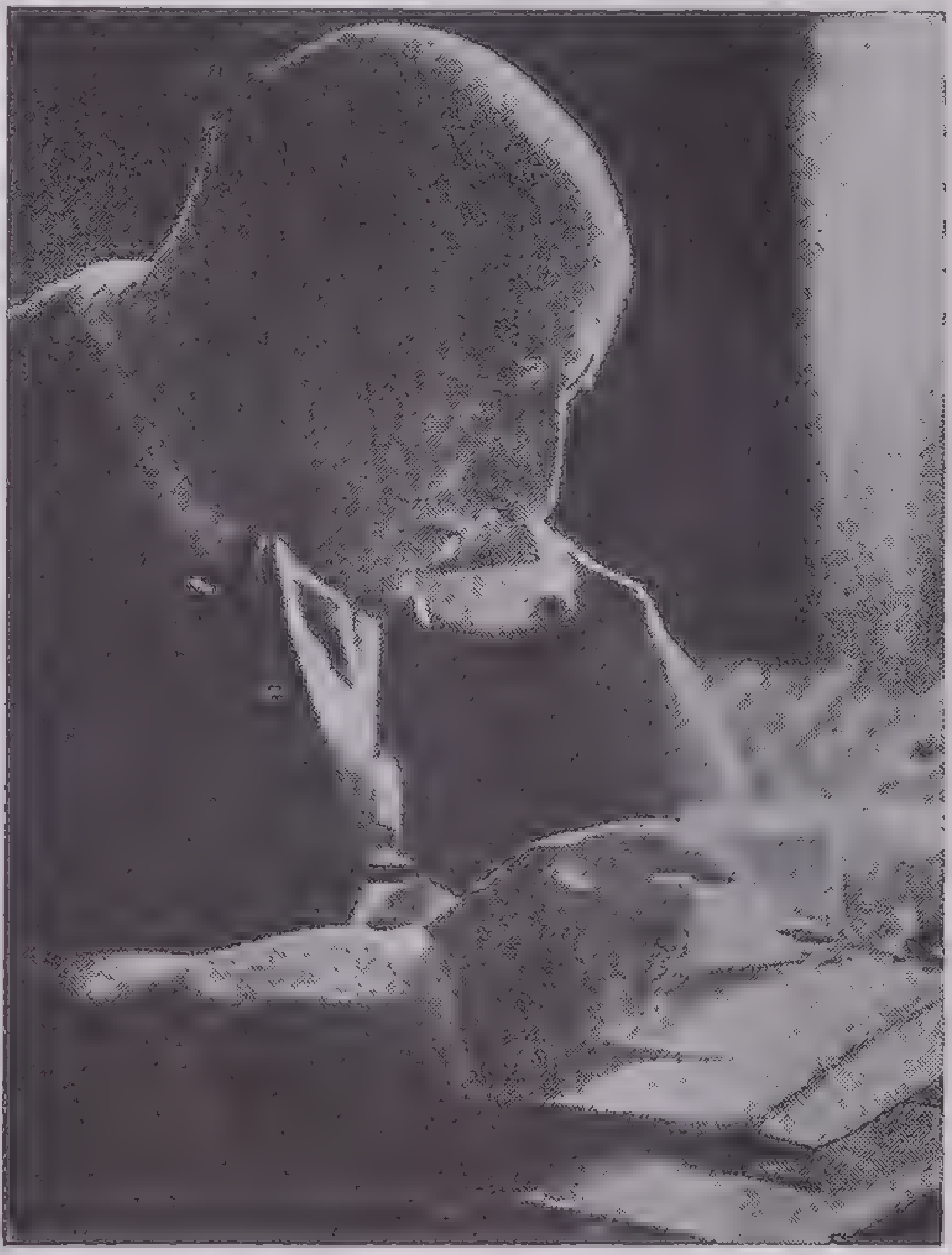
In the 18th century Giovanni Battista Vico (1668–1744) studied the historical progress of man; Ludovico Muratori (1672–1750) and Scipione di Maffei (1675–1755) collected and commented upon the original sources of Italian history and recommended that writers turn again to the ancients—but with caution. Giuseppe Parini (1729–99), disgusted with the elegant frivolities and foolish ways in which the nobility wasted time, wrote *Il Giorno* ("The Day"), criticizing these practices severely by seeming to praise them.

In drama Italy had now produced great quantity if not quality. Drama took two forms—rude popular plays and artificial plays written by men of culture for other men of culture. In popular drama the early commedia dell' arte was performed by actors trained to improvise lines and actions from a written plot. This form was defended by Carlo Gozzi (1720–1806) who wrote some delightful fairy-tale comedies. The musical dramas of Pietro Trapassi Metastasio (1698–1782) are far above the ordinary opera text in both plot and poetry. The true drama of the century is seen in the comedies of Carlo Goldoni (1707–93) and in the tragedies of Vittorio Alfieri (1749–1803). Alfieri, who symbolizes the growing Italian desire for freedom of thought and political independence, created modern Italian tragedy on classical models. He observed the Greek unities, introduced only a few characters and had very little action, often picturing the triumph of popular liberty and the downfall of a tyrant. Goldoni replaced the old commedia dell' arte and its fixed types with plays that owe much to the influence of Molière. He is remarkable for his power of characterization and his skill in creating plot interest, though he wrote so rapidly that the form is rough. The end of the century was characterized by a great burst of patriotism, interest in the classics and the *purismo* movement, an attempt to purify the language by eliminating the many gallicisms that had crept in. This interest in language revived the quarrel for supremacy between the dialects of Tuscany and Lombardy.

Modern Italian Literature.—The drama in the 19th century owed much to Ugo Foscolo (1778–1827) and to Alessandro Manzoni (1785–1873); but the fervid patriot Foscolo was greater in his poem *I Sepolcri* ("Sepulchers," 1807) and in the *Lettere di Jacopo Ortis;* and Manzoni became famous for his historical and realistic novel *I Promessi Sposi* ("The Betrothed," 1825). Vincenzo Monti (1754–1828) also wrote for the theater, but his poems best reflect his changing political ideals. His translation of the *Iliad* is remarkably good.

The greatest Italian poet of the early 19th century and one of the best prose writers was Giacomo Leopardi (1798–1837), pessimistic and deeply and truly melancholy. A romantic poet of the period was Silvio Pellico (1789–1854), who is better known, however, for the thrilling story of his imprisonment for liberal political beliefs—*Le mie prigioni* (1832). The romantic movement in Italy was not as it was in France an abandonment of the classics but a fresh understanding of them. Even in the work of Manzoni, the acknowledged head of the romantic movement, realism is prominent.

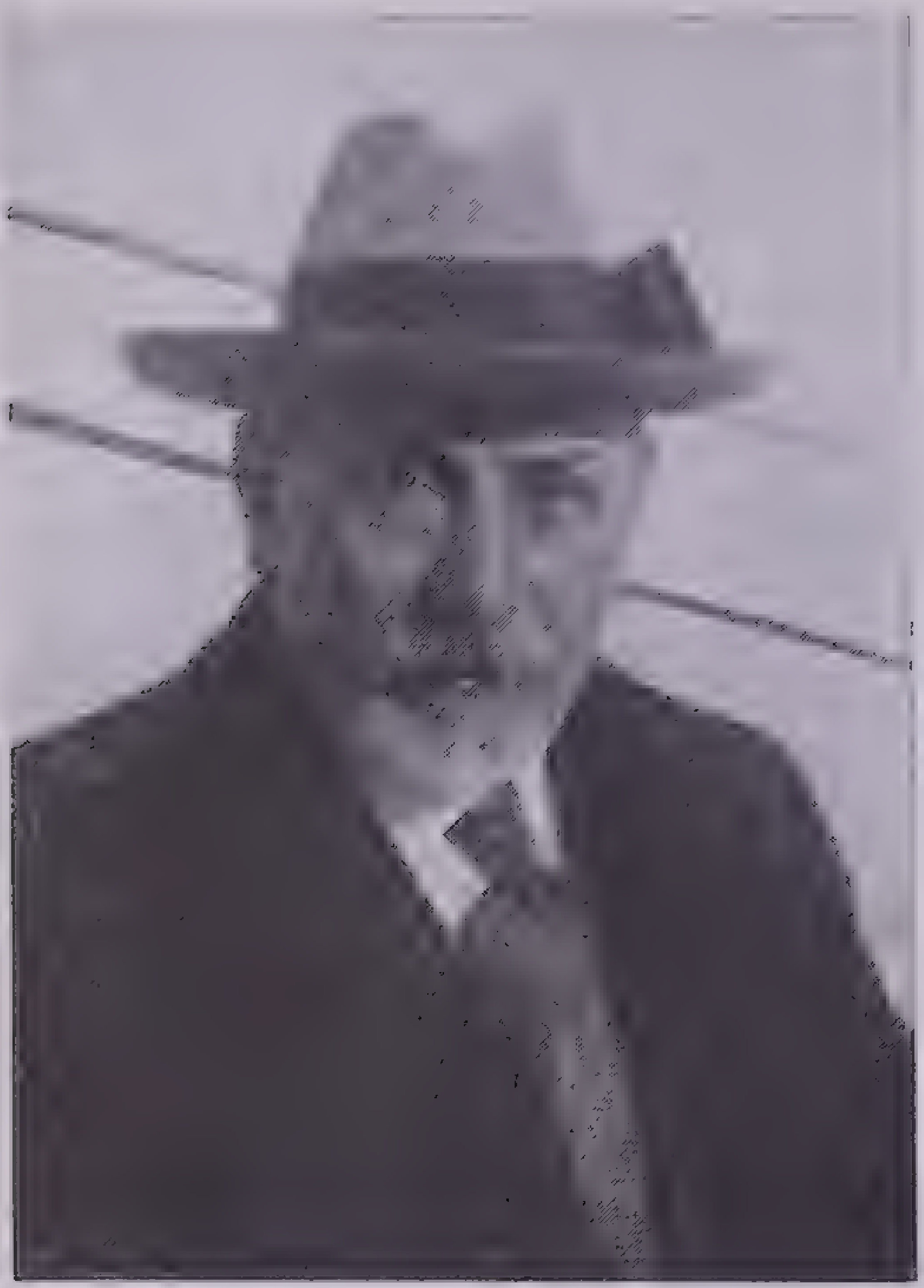
After 1821 the movement for political independence and unity, called the Risorgimento, was dominant in all forms of Italian life. In poetry G. Giusti (1809–49) made use of satire, and Aleardo Aleardi (1812–78) was a melodious but sentimental patriot. More lasting work was done in the novel—by Massimo T. d'Azeglio (1798–1866), statesman and painter besides, and by Francesco Guerrazzi (1804–73); both used historical subjects to portray their political theories. Vincenzo Gioberti (1801–52) and Giuseppe Mazzini (1805–72) wrote political and philosophical treatises, fired by the ideal of a united and independent Italy. Gioberti first urged rule by the pope and later by a monarch; but Mazzini, idealist and republican to the core, could be content only with a true democracy. Both were at various times exiled and imprisoned for their beliefs. The best literary expression of the time was that of Giosuè Carducci (1836–1907) whose various volumes of poetry show deep sincerity, delight in the classics and belief in the new ideals of individual freedom. They won for him a Nobel prize in 1906.


Underwood & Underwood
Gabriele d'Annunzio

In Italy as in the rest of Europe the novel and the short story became increasingly important and showed such realistic tendencies as interest in localities and in dialect. Of this type were the novels of Giovanni Verga (1840–1922), who is best known in America for his tale *Cavalleria Rusticana,* the libretto of the opera by Pietro Mascagni (1863–); of Luigi Capuana (1839–1915); of the Neapolitan Matilde Serao (1856–1927); and of the Sardinian Grazia Deledda (1875–1936), winner of the Nobel prize in 1926. The novels of Antonio Fogazzaro (1842–1911) have a larger background.

The poetry of Giovanni Pascoli (1855–1912) is a record of fleeting impressions. Giuseppe Giacosa (1847–1906) was both poet and dramatist. In literary criticism Francesco de Sanctis (1818–83) had introduced a new philosophy regarding literature as a reflection of social and moral conditions. His work was carried on by Benedetto Croce (1866–) who has greatly influenced younger writers. Pasquale Villari (1827–1917) and other great teachers contributed scholarly research in the history of literature and of government. Edmondo de Amicis (1846–1908) won fame for his travel stories and for the novel *Il Cuore,* translated as "An Italian Schoolboy's Journal."

The two great names of modern Italian literature are Gabriele d'Annunzio (1864–1938) and Luigi Pirandello (1867–1936). Giuseppe Chiarini (1833–1908), poet and critic, early recognized the value of d'Annunzio's poetry. In the course of his active and prolific life d'Annunzio wrote novels, dramas, short stories and poetry. His writing shows the influence of the great Russian novelists


Underwood & Underwood
Luigi Pirandello

and of the German philosopher Nietzsche. His plays are noted for their brilliance of color, movement and sound. Pirandello, too, was versatile; for he wrote poetry, novels, short stories and finally the plays that brought him world fame and a Nobel prize in 1934. His theme is the unstable and changing quality of life and truth, the denial of any sound and solid reality. Man for him is a thousand things, but never what he thinks he is. This viewpoint is ably portrayed in *Così è se vi pare* ("Right You Are If You Think You Are," 1918) and in *Sei personaggi in cerca d'autore* ("Six Characters in Search of an Author," 1921). Also important in the theatre are Rosso di San Secondo (1887–) and Roberto Bracco.

In the novel, Carlo Dossi (1847–1910), original but rough, Alfredo Panzini (1863–), gently ironical, and Italo Svevo (Ettore Schmitz; 1861–1928) did good work. Renato Serra (1885–1915), a remarkable young critic, was killed in the World War. Giuseppe Antonio Borgese (1882–) wrote a novel *Rube* (1921) that was translated into English, but he is better known as a dramatist and critic. Giovanni Papini (1881–) was a philosopher and critic whose conversion to orthodox Catholicism changed his literary approach and the subject of his writings. He is best known for his *Life of Christ* (1921), his life of St. Augustine (1929) and a study of Dante (1933).

Italian life and literature were most strikingly affected by the changed views of another writer, the journalist Benito Mussolini (1883–), teacher, writer on socialism, opponent of the Italian expedition against Tripoli in 1911—and then turned by the World War and its after-effects to violent nationalism and to the Fascism that his name has made famous. No small part of Mussolini's wonderful influence was due to his ability as a writer and speaker and particularly to that Italian gift of rhetoric and showmanship in which he surpassed even d'Annunzio, who also used his literary gifts for political purposes. Mussolini wrote editorials, pamphlets, plays and fiction before he became a political power. His war diary (published in English in 1920) and his autobiography (English, 1928) are better literature than Hitler's *My Battle* and are equally important in contemporary history.

PORTUGUESE LITERATURE

Portugal is rich in lyric poetry, in histories and in tales of conquest and exploration. The first lyric poets in the early 13th century were influenced by the Provençal literature of southern France. Poet kings gathered about their courts many singers. In the 14th century prose was used in genealogies and religious stories, but Fernão Lopes (*c.* 1380–*c.* 1459) was the first to give it real distinction. There may have been an early Portuguese version of *Amadis de Gaula,* antedating the Spanish version, but it has not survived. The chronicles of Ruy de Pina, successor of Lopes, are remarkable for their truthful portraits of Portuguese kings. The court poetry collected in the *Cancioneiro Geral* (printed in 1516) is superficial in tone with no hint of the contemporary discoveries of new worlds by Portuguese explorers, but it does show the beginning of Spanish influence. In the drama Gil Vicente (*c.* 1470–*c.* 1536) succeeded in founding a national theater, but through lack of talent and the destructive efforts of the Inquisition his successors were unable to continue the work.

Influence of the Renaissance.—In the 16th century under the stimulus of the Italian Renaissance, Portugal could boast of the pastoral poems of Bernardim Ribeiro (*c.* 1482–*c.* 1552); the work of Sá de Miranda (*c.* 1485–1558), who introduced the sonnet, canzon and ode and imitated Roman and Greek comedy; the sonnets of António Ferreira (1528–69), modeled closely on those of the Latin masters; and the prose plays of Jorge Ferreira de Vasconcellos, reminiscent of the Spanish *Celestina* but Portuguese in spirit.

Pastoral and chivalric romances were popular. The great Spanish prose pastoral *Diana* was written by the Portuguese, Jorge de Montemayor (*c.* 1520–61); and the *Palmeirim de Inglaterra* (1567) by Moraes won the praise of Cervantes. The glory of the age, however, lay in its histories and in the national epic, *Os Lusiadas* ("The Lusiads"), by Luís de Camoëns (*c.* 1524–80), which celebrates in dramatic narrative the discovery of the route to India by Vasco da Gama and which made Portuguese a poetical tongue. Historians had a wealth of material, for their fellow countrymen were exploring various quarters of the globe—Ethiopia, Arabia, Brazil, Persia, India. Outstanding is *Da Asia* (1778–88) by João de Barros who, with Camoëns, gave new form and beauty to the Portuguese language. The *Historia tragico-maritima* is the moving story, simply told, of 12 sea disasters. Perhaps best of the travel books is the *Peregrinação,* written in his old age for his children by Fernão Mendes Pinto (*c.* 1509–83), who has been called *Prince of Liars.*

The 17th century was a period of Portuguese intellectual decadence and of Spanish cultural and political dominance. The chief lyricist, Francisco Manuel de Melo (1611–66), wrote much in Spanish though he made a genuine effort to throw off its influence. Native historians lacked critical judgment and the sense of proportion; but excellent religious prose was contributed by António Vieira (1608–97) and Manuel Bernardes. A translation of the Bible by Padre Ferreira de Almeida was important in the development of the language. Sincere and beautiful are *The Letters of a Portuguese Nun* by Mariana Alcoforado.

French Influence.—In the 18th century French influences replaced Spanish. Academies were founded—the Academy of History (1720) and the Royal Academy of Sciences (1780). Of more literary importance were the two Arcadias (1756 and 1790), named after an Italian literary society, which advocated a more formal literature and attempted to purify the language. Garção's *Cantata de Dido* shows the influence of Horace and Boileau; Quita wrote pastoral poetry comparable to that of Ribeiro; and Barbosa du Bocage (1765–1805) was a master of the sonnet.

An unsuccessful attempt was made to revive the drama of the people. Of special interest are the stinging satires of Nicolão Tolentino de Almeida (1745–1811). A new period was heralded by Francisco Manoel do Nascimento (1734–1819), an ardent advocate of Italian classicism, who late in life turned to romanticism—destined to bring new life and interests to Portuguese literature.

The two most talented exponents of romanticism—de Almeida-Garrett (1799–1854), poet and dramatist, and Herculano (1810–77), novelist and historian—were exiled for several years for their political views. Led by Almeida-Garrett the drama turned to medieval history and customs. The novel, too, was largely historical under the influence of Walter Scott. In the work of A. F. de Castilho (1800–75) romanticism lost its fresh enthusiasm to elegance of form. Toward the end of the 19th century a new movement appeared that combined a revolt against romanticism with the rapidly growing interest in science, social problems and popular manners and customs, and some of the best poems ever written in Portuguese were the result. Irony appeared in *Rimas* by João Penha, and rebellion against the church in *Anti-Christo* by Gomes Leal.

Camillo Castello Branco inaugurated the modern novel of manners; and Eça de Queiroz was the first to write in the manner of the French naturalists. In the 20th century this tendency was reversed. The later works of Queiroz and the trilogy by Manoel Ribeiro (*A Catedral, O Deserto, A Resurreição*) show a return to the church and to belief in its teachings in place of scepticism and doubt. The work of Paul Brandão is almost classic in its plainness and power.

The histories of Portugal by Herculano and Fortunato de Almeida, as well as other research and writing, both philosophical and factual, continued the excellent historical tradition.

RUSSIAN LITERATURE

The early Russian literature of the 11th century was almost entirely translations from Greek religious writing. Secular literature was largely confined to historical chronicles. Only fragments of traditionary tales in rhythmic verse, somewhat similar to English, Spanish and Scandinavian ballads, have survived from this period. One great epic, *The Discourse of the Campaign of Igor,* is marked by great vigor and rich imagery. A wealth of oral folk literature, not extensively published until the 19th century, is best known for its *byliny,* unrhymed narrative poems about legendary or historical characters.

Influences from the West.—After 1650 the influence of the West replaced that of Greece and Byzantium, particularly under the helping hand of Peter the Great; but Russian literature did not become important in itself until the middle of the 18th century with the widespread interest of the upper classes in French manners and culture. The new era begins with Antiokh Cantemir (1708–44), who imitated Horace and Boileau, and with Mikhail Lomonosov (1711–65), a versatile critic and scientist, an influential literary theorist and a writer of magnificent odes. Another great poet whose work though it is in a classic mold throbs with strong life was Gabriel Derzhavin (1743–1816). In the theater French influence was predominant, particularly in the plays of Aleksandr Sumarokov (1718–77). The popular literature of the day shows a rude and ready and often delightful realism, reaching a high point in the comedies of Denis Fon-Vizin (1744–92) and in the *Fables* (1809) of Ivan Krylov (1768–1844). Aleksandr Griboyedov (1795–1829) in his comedy *Göre ot Uma* ("Woe from Wit," 1825) took a first step in the direction of a social problem play.

The political and social revolt inherent in the French Age of Enlightenment (18th century) also awoke echoes in Russia. Satirical journals edited by Nikolay Novikov (1744–1818) were strong enough to provoke the wrath of Catherine II. The strongest influence in the new reform of the Russian language was that of Nikolai Karamzin (1766–1826), who abandoned many old words, introduced new ones and showed a tendency to soften the roughness of the preceding age. His theories are strongly reminiscent of Rousseau.

Between Karamzin and Pushkin was Vasili Zhukovski (1783–1852), famous for his excellent translations into Russian of ancient and modern poets. Idol of Russian literature is Aleksandr Pushkin (1799–1837), whose poetry and prose are rare in their combination of beauty and strength. His historical drama *Boris Godunov* became world famous and the verse-novel *Evgeni Onegin* (1823–31) had a great influence on later Russian writers. Pushkin was head of a group of poets, nominally romantic, but more practical and sure of their medium than many contemporary European romantics. The philosopher of the group was Evgeni Baratynski (1800–44).

Beginning of Social Criticism.—As the century progressed intellectual agitation for the freedom of the serfs and for other liberal reforms increased. One group, the Slavophils, demanded that Russia find in her native history and customs the answers to her problems; the other upheld the necessity and value of introducing western methods. Foremost among the advocates of western influence was the critic Vissarion Byelinski (1810–48). The historian Sergyey Solovev (1820 79) presented a convincing case for westernization in his extensive history of Russia. Mikhail Katkov (1818 87), journalist and editor, though in his youth an advocate of the same ideas later became an ardent and influential Slavophil.

The Sea Gull

A scene from the Theatre Guild production of Anton Chekhov's play. At the left is *Boris Trigorin* (Alfred Lunt); *Irina Arkadina* (Lynn Fontanne) is seated in the center; at the right is *Dr. Eugene Dorn* (John Barclay)

Eloquent and romantic in its expression of revolt against the contemporary society, though sometimes bombastic, is the poetry of Mikhail Lermontov (1814–41). His novel *A Hero of Our Times* (1840) is prophetic—in its analysis of character and situation—of prose masterpieces to follow. More perfect in form and execution is the poetry of Feodor Tyutchev (1803–73), who has been called second only to Pushkin. The folk songs of Aleksyey Koltsov (1808–42) are popular and vital though the work of a single artist and not of a people.

The Masterpieces of Russian Literature.—The middle of the century brought the beginning of the great age of Russian prose literature—when the novels of Turgenev, Dostoevski and Tolstoy became an original and worthy part of world literature. The inaugurator of this golden age was Nikolay Gogol (1809–52) who combined romantic exaggeration with interest in the sordid and mean sides of life. By his work he called attention to the evils of Russian society, to social problems badly in need of solution, to people and places who had not before been thought worthy of consideration.

Ivan Goncharov (1812–91) in *Oblomov* (1858) wrote a magnificent character study of an intellectual. Aleksyey Pisemski (1820–81) described with force and conviction the illiterate classes. Ivan Turgenev (1818–83) in *A Sportsman's Sketches* (1847–52) took the peasant as his subject. Sergei Aksakov (1791–1859) described in animated detail life in East Russia (*A Family Chronicle,* 1856) and his own childhood (*Years of Childhood,* 1858). A little later Mikhail Saltykov (1826–89) in *The Golovlev Family* (1876) exposed the abusive practices of the country squires. These Russian problem novels, particularly those of Turgenev, differ from the American problem novels of the early 20th century in their deeper psychological understanding, wider application and perfection of style. These universal qualities are present to an even greater degree in the work of Lev (Leo) Tolstoy (1828–1910) and Feodor Dostoevski (1821–81). Tolstoy's great novels *Anna Karenina, War and Peace* and *Resurrection* picture the ever-changing kaleidoscope of life without sacrifice of individual characterization. The tragic but never depressing novels of Dostoevski, *The Idiot, Crime and Punishment* and *The Brothers Karamazov* stand alone in all literature for their portrayal of the human soul.

Drama, too, became more vigorous and more concerned with the realities of everyday life—in the work of Alexsandr Ostrovsky (1823–86) and in Pisemski's *A Hard Lot* (1858). In the work of Ivan Nikitin (1824–61) and then more perfectly and completely in that of Nikolay Nekrasov (1821–77), poetry became realistic and went to peasant life for its inspiration. Aleksyey Tolstoy (1817–75) contributed at the same time some delightful nonsense poetry and blank verse.

Early Twentieth-Century Literature.—The short stories of Vladimir Korolenko (1853–1921) show a sense of humor and narrative ability, but prose in general declined until it received fresh impetus through the short stories of Anton Chekhov (1860–1904) and the novels of Maxim Gorky (1868–1936). Chekhov's work is pervaded by a sense of sorrow and disillusionment but also by a spirit of sympathy and understanding. *The Cherry Orchard* is the most famous of his plays. Gorky was a revolutionist, volatile, irrepressible and virile, and his books express the man. Alexander Kuprin (1870–) was more conventional in his stories of army life. Leonid Andreev (1871–1919) and Mikhail Artsibashev (1878–1927) looked at life and found it wanting in higher values and ideals. Andreev is best known in America for the play *He Who Gets Slapped.* Artsibashev's novels are sensational and uninspiring in subject matter but were for a time immensely popular. Ivan Bunin (1870–) in *The Village* and *Sukhodol* returned to the study of provincial Russian life showing vividly the state of affairs that culminated in the Revolution. Bunin received a Nobel Prize in 1933.

Foreign trends away from realism and toward expression of the poet's own ego together with the influence of the philosophical and mystical poetry of Vladimir Solovev (1853–1900) resulted in the work of the Russian symbolist poets. Dmitri Merezhkovski (1866–), once famed as a religious philosopher, probably made his most valuable contribution to Russian literature by sponsoring western ideas. Among the best of the symbolists, whose work combines native Russian realism with phantasy and symbolism, were Feodor Sologub (1863–1927) and Alexander Blok (1880–1921). Sologub's famous novel *The Little Demon* (1907) has similar characteristics.

Literature of the Revolution and the Soviet.—The World War and the revolution that followed produced several interesting poets, of whom the best known is Boris Pasternak (1890–), and the political oratory and philosophy of Nikolay Lenin (1870–1924) and Leon Trotsky (1877–1940), who on Lenin's death became a rival of Stalin and was forced into exile.

After the Revolution novelists attempted portrayal of masses of crowds rather than individuals. Most famous and original writer of this type of fiction was Boris Pilnyak (1894–), whose *The Naked Year* (1922) is a story of the Revolution. Mikhail Pokrovsky (1868–1932) was successful in applying Marxist principles to historical writing, interpreting Russia's past in a new light.

Soviet literature in recent years has been largely propaganda, but some work of value, particularly in fiction (for example, *And Quiet Flows the Don,* 1934, by Mikhail Sholokov), has been produced. The work of M. Ilin in the field of education is unique. His short books on how things came to be—*Turning Night Into Day, What Time is It?, Black on White,* telling the stories of lighting, clocks and printing—were written for children but are equally delightful for adults. Of all art forms the Soviet has probably contributed most to the theater and the motion picture—in methods and style of presentation rather than in writing.

CANADIAN LITERATURE

Canada has not yet produced a literature distinctly her own. The land is very thinly settled and a great deal of hard physical work is still being done. Moreover, the most thickly populated part of Canada is stubbornly bilingual. Neither the French nor the English will yield to the other and as a result there are French and English Canadian literatures. In both, individuals, rather than schools or movements, are important. English Canadian literature has been influenced by that of the United States; and French Canadian, by the literary fashions of France. Very little has been undertaken in the drama, with the exception of Charles Heavysege's *Saul* (1857), a powerful tragedy. Canadians have joined in the widespread production of short stories but have contributed little fresh impact or coloring to make their work outstanding. An exception is Marjorie Pickthall's book of short stories, *Angels' Shoes* (1922). Most notable productions have been in history, political biography and books of exploration and travel.

History and the Essay.—In English are the highly interesting journals or first-hand accounts of such men as Henry Hudson, who discovered what is now called Hudson's Bay in the search for a passage from east to west; James Cook, who attempted to find a navigable passage across North America from the Pacific to the Atlantic; George Vancouver, who adventured on the west coast; Alexander Mackenzie, who first crossed overland to the Pacific; Simon Fraser, who went down the river that now bears his name; and David Thompson, who explored the Columbia River valley. The best of many excellent secondary histories, as the work of Canada's most competent historians and writers, are *Canada and its Provinces* (1913 *et seq.*), edited by A. G. Doughty and Adam Shortt, and the *Chronicles of Canada* (1920 *et seq.*), edited by G. M. Wrong and H. H. Langton. *The Makers of Canada* (1926), also a joint undertaking, includes the biographies of such great Canadian statesmen as Sir John Macdonald, Sir Wilfred Laurier and Sir George Étienne Cartier and the lives of the early explorers. Not much has been done with the literary essay, although the work of Goldwin Smith and Stephen Leacock is noteworthy. Smith, an Englishman who came to America in protest against England's imperialistic policy, strongly advocated the union of Canada and the United States. His work was scholarly, but his opinions were unpopular. Stephen Leacock, professor, lecturer and economist, contributed to *The Makers of Canada,* wrote *Elements of Political Science* and several delightful books of essays, remarkable for their spontaneous humor.

Poetry.—Canada's best-known English poet was Bliss Carman, whose poems portray the lure of the open road and a singing love of nature. Archibald Lampman also put a musical quality into his praise of nature. The poetry of William Wilfred Campbell shows his deep patriotic and imperialistic sympathies and that of George Frederick Cameron is remarkable for its technical perfection. W. H. Drummond, brought into close contact as a physician with the small farmers of French origin, the *habitants,* captured in his poetry the engaging dialect, the joys and sorrows of this class. Robert W. Service wrote popular ballads of the Yukon and the Far West, *Songs of a Sourdough* (1907). John McCrae won wide acclaim for his poem of the World War, *In Flanders Fields.*

The Novel.—Canadian novels have been mainly historical and regional. Among the first was John Richardson's *Wacousta* (1832), a story of the War of 1812. Thomas Chandler Haliburton in the guise of Sam Slick, a Yankee clockmaker, amusingly caricatured both New Englanders and his fellow Nova Scotians in sketches (1837-44) filled with excellent characterizations but weak in plot structure. In the second half of the century, historical novels were written by William Kirby (*The Golden Dog, a Legend of Quebec*) and by Gilbert Parker (*The Seats of the Mighty* and *When Valmond Came To Pontiac*). Charles W. Gordon (Ralph Connor) described the life of the miner and the lumber worker in the Canadian Northwest. Lucy M. Montgomery (Mrs. McDonald) described life on Prince Edward Island in the charming *Anne of Green Gables;* and Frederick W. Wallace wrote of Nova Scotia and its clipper ships and fishermen. Ernest Thompson Seton's stories of wild life are loved by all children. Martha Ostenso wrote of prairie life in the Middle West, and Mazo de la Roche described a Canadian family in her *Jalna* series.

French Contributions.—Like the English, the French have excelled in history and political biography. Exciting journals were left by Jacques Cartier, Samuel de Champlain and René de La Salle. François-Xavier Garneau's *L'Histoire du Canada* (1845–52) although somewhat prejudiced is still highly regarded, as is the work of Antoine Gérin-Lajoie who contributed *Dix ans d'Histoire du Canada, 1840–50.* Raymond Casgrain described single historical events or episodes, such as *Montcalm et Lévis* (1891), and Benjamin Sulte wrote a more detailed *L'Histoire des Canadiens-Français* (1884). A more scientific approach was used by Thomas Chapais in his *Cours d'Histoire du Canada* (1923).

Étienne Parent, editor of *Le Canadien,* the first French Canadian newspaper, made it a successful and revealing expression of French Canada. With Octave Crémazie, a poet whose verse is strongly patriotic, and the historian Garneau, Parent founded *Les Soirées Canadiennes,* a periodical designed to preserve the folklore and popular songs of French Canada. Not until about 1860 in Quebec was a conscious effort made by a group of writers toward improvement in literary technique. The group was headed by Casgrain but the most famous member was Louis Fréchette, whose work was crowned by the French Academy. *Les Fleurs boréales* (Flowers of the Far North) and *Les Oiseaux de neige* (Birds of Snow) contain the best examples of his lyric poetry. His epic, *La Légende d'un Peuple* (1887) celebrates the history of the French Canadians. Twentieth-century poets, influenced by French movements, showed an interest in introspection—Albert Lozeau's *L'Ame Solitaire;* in symbolism—Paul Morin's *Le Paon d'Email;* and in the realities of everyday life—Blanche Lamontagne's *La Vieille Maison.*

In 1863 Philippe de Gaspé published his novel, *Les Anciens Canadiens,* filled with deeds of heroism and adventure. It was followed in 1864 by Gérin-Lajoie's *Jean Rivard,* a well-liked story about the French Canadian farmer, his love of the soil and his heroism in toil. The 20th-century novels by Laure Conan—*L'Oublié* (1902) —and Harry Bernard—*La Terre Vivante* (1925)—show the growing interest in psychology. *Maria Chapdelaine* (1913) by Louis Hémon, a young Frenchman who spent some time in Canada, is a beautiful and sincere story of the Lake St. John country. In the essay, Arthur Buies, editor and journalist, was outstanding; and Camille Roy did pioneer work in literary criticism.

SPANISH LITERATURE

The Latin language was early carried to the Spanish Peninsula and several well-known Latin writers were Spaniards: Seneca, Lucan, Martial, Quintilian and the Christian poet Prudentius. The present Spanish or Castilian language is descended from Latin. Besides Castilian, Catalan in the east and Basque in the north are still vigorous and well exemplified in fine literatures.

The Middle Ages.—The *Cantar de mio Cid* (12th century) is an epic celebrating the mighty achievements of the first national hero of Spain, Ruy Díaz de Bivar (1040–99), known as the Cid. The poem depicts in rugged simplicity and vividness the life and manners of that turbulent age when the Christians of northern Spain were fighting to regain territory lost to the Moors.

That wandering minstrels sang songs and ballads here as in France and Germany is recorded in the 13th-century *Crónica general,* prepared under the direction of Alfonso the Wise (1221–84). Very few such songs remain, except in the *romances,* which were popular tales set to music and conserved by the common people. These *romances* played an important role in the development of Spanish literature.

Spain was the gateway through which the learning of the East passed on to western Europe and this Oriental influence is evident in *Conde Lucanor* by Juan Manuel (1282–*c.* 1349), a collection of prose tales, fables and anecdotes usually pointing a moral but doing so in a wholly charming manner. The *Libro de buen amor* ("Book of True Love"), by Juan Ruiz (*c.* 1283–1350), archpriest of Hita, is a perfectly frank account of his love affairs, very well told and showing his remarkable ability in creating characters.

Influence of Dante and the Renaissance.—In the 15th century under the influence of Dante, much moralizing poetry was written; it was without much value in itself but evidenced the attempt to escape from the crudeness of everyday life and to refine the language. The ideal of the century was Iñigo López de Mendoza, Marquis de Santillana (1398–1458), who combined to a remarkable degree the diverse abilities of soldier, statesman, author, scholar, critic, collector and translator. The chivalric romance was represented by *Amadis de Gaula,* partly written in the 15th century by Garci Rodriguez de Montalvo, who seems to be the first known writer about the adventures of Amadis, although the stories were popular in all northwestern Europe long before this time. In 1499 *La Celestina,* a novel in dialogue, was printed and immediately won well-deserved popularity. This story of a go-between in affairs of the heart is a vivid and honest account of life toward the close of the Middle Ages. Its heroine Celestina is universal in appeal because of her frankness, wit and good nature and as a true product of Spanish society at that time.

The Renaissance brought the development of two types of fiction—the pastoral romance from Italy and the picaresque novel; also an interest in classical and in old Spanish poetry; the beginnings of a secular drama; and the first grammars and vocabularies. One of the first pastorals to appear in Spain was *Diana* by Jorge de Montemayor (1520–61). He had a host of followers, among them Cervantes in *La Galatea* and Lope de Vega in *Arcadia.* Fresher, more vital and much more typically Spanish is the first great picaresque novel, *Vida de Lazarillo de Tormes* (1554), introducing the picaro, a fascinating rogue obliged to live by his wits. In contrast to other Renaissance fiction this book is written in almost conversational style. In its honest presentation of facts it is a remarkable social criticism.

El Siglo de Oro or Golden Age, 1550–1650.—Spaniards governed most of the New World and much of the Old. Spanish ships sailed round the world, and Spain became supreme in learning, literature and political power, challenged occasionally only by English ships and English men of letters. Cervantes, Lope de Vega and Calderón de la Barca took Spanish literature to new heights and gave it world-wide importance.

MIGUEL DE CERVANTES SAAVEDRA (1547–1616), greatest genius of Spanish literature, was Shakespeare's contemporary. The story of his life is more exciting than fiction, a tale of military service, slavery in Africa, captivity and poverty in his native land. His works consist of the pastoral romance *La Galatea,* numerous plays and masterful dramatic interludes, 12 tales, a posthumous novel and the immortal *Don Quixote* (1605–15). Cervantes intended *Don Quixote* as a chivalric romance that would make ridiculous the already involved and exaggerated novels of adventure so popular at the time and thus put a stop to them. Instead he brought them long-lasting fame, for his two protagonists Don Quixote and Sancho Panza became so real that they bore Cervantes away with them and shaped the story to suit themselves. Don Quixote, the idealist, the optimist, comes to know and finally to accept reality through his friendship with Sancho Panza, servant extraordinary; while Sancho, hard-headed, practical and wholly unimaginative in the beginning, eventually gains something of his master's ability to make life good and true and beautiful. Don Quixote and Sancho have laughed themselves into the hearts of men the world over.

Other noteworthy fiction is found in the picaresque novels or tales about rogues: *Historia de la Vida del Buscón* (1626) by Francisco Gómez de Quevedo y Villegas and *El Diablo cojuelo* (1641) by Luis Vélez de Guevara, presenting a series of animated portraits of 17th-century Spanish life with all its good and bad aspects faithfully reproduced. The *Vida del Buscón* is in the same tradition as *Lazarillo* but is more bitter in its criticism of society and more sophisticated in style.

The poetry of the 16th century, outside the drama, was of two kinds—that which followed the Italian tradition and that which clung to the old Castilian models. Most poets attempted both kinds. In the 17th century Luis de Góngora y Argote (1561–1627) gave his name to a new style that heralded the coming decadence—an artificially involved and overdecorated prose and poetry that made use of double meanings and other literary tricks.

The most inclusive and popular manifestation of the Golden Age was its drama, which was as much of and for the people as for the royal court. Dramatists of the 15th century had taken definite steps to disengage the drama from religious miracle plays and pageants, as shown particularly through the work of the Portuguese Gil Vicente (*c.* 1470–*c.* 1536), who wrote various plays in Spanish; also that of Bartolomé de Torres Naharro;

both made use of the humor of character and dialect. The first real impetus toward a popular drama came with the plays and skits by Lope de Rueda (*c.* 1510–*c.* 1565), credited with founding the theater in Spain.

Like Shakespearean drama in England, this Spanish drama did not bother with the narrow rules of Greek tragedy and was content with unity of action or character. In the plays (1583) of Juan de la Cueva (*c.* 1550–*c.* 1610) use is made of the old Spanish *romances.*

Lope de Vega Carpio (1562–1635), known simply as Lope to all Spaniards, realized the full significance and possibilities of the *romances* in Spanish drama. His astounding productivity has probably never been equaled in the annals of literature. Leading an extremely active life as soldier and statesman, even going with the Armada to England, he still managed to write some 2,200 plays in addition to numerous epics, lyrics and tales. For this reason his work is more brilliant in its entirety than in single parts. In the wide range covered by his plays, Lope captured the whole psychology, feeling and life of the Spanish people. His aim was not perfection of form or plot but emotion and interest. His characters are representative of the Spanish masses yet they are men rather than symbols.

Pedro Calderón de la Barca (1600–81) wrote plays different both in form and in spirit. Calderón, unlike many of his literary contemporaries, led a tranquil life, devoting his energies to literature and religion. This is evident in his choice of subjects, many of them religious and allegorical, and in the philosophic undertone in all his plays. This and the sonorous and beautiful though somewhat rhetorical poetry in which he wrote made him popular throughout Europe, especially in Germany. His theme is most often honor, though love and jealousy also play important parts. Calderón's characters, in contrast to those of Lope, are symbols rather than individuals.

Other dramatists, whose work resembles Lope's rather than Calderón's are: Guillén de Castro y Bellvis (1567–1631) whose *Mocedades del Cid* ("Youth of the Cid") inspired Corneille's tragedy; Tirso de Molina (real name, Gabriel Téllez; 1571–1648) who in *El Burlador de Sevilla* created the character of Don Juan; Juan Ruiz de Alarcón y Mendoza (1588–1639), Spanish-Mexican poet whose *La Verdad sospechosa* ("Suspicious Truth") is a comedy based upon character rather than on situation or dialogue; and Francisco de Rojas-Zorilla (1607–*c.* 48) whose *Del rey abajo ninguno* ("None beneath the King") is a fine illustration of the intricacies of codes of honor.

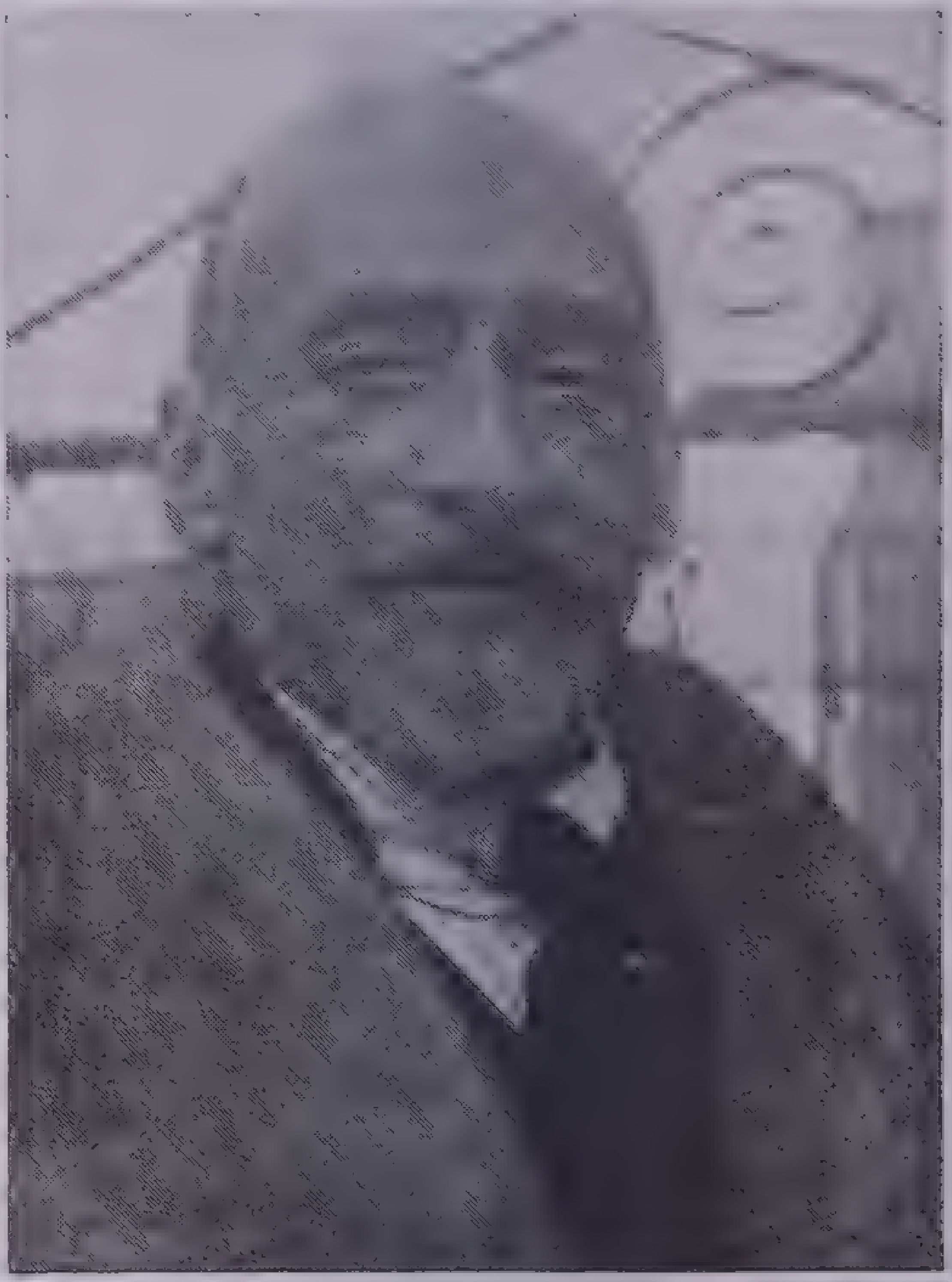
History and philosophy also flourished. A great wealth of historical material resulted from Spain's extensive conquests and extension of power in Europe. The philosophers were busy studying the ancients, producing social satires or experiencing the depths of religious mysticism. Among those of the last type were Santa Teresa (1515–82) and St. John of the Cross.

The Period of French Influence.—After the death of Philip II in 1598, Spanish power, wealth and prestige declined. French influence in Spain became more and more marked until in 1700, with the accession to the Spanish throne of Philip V, grandson of Louis XIV of France, French domination was complete in literature and in government. The Spanish Royal Academy, modeled on the French Academy, was founded and its members began work upon a Castilian grammar. Almost alone is the work of Ramón de la Cruz, whose theatrical sketches are amusing reflections of the Spanish lower and middle classes.

Early in the 19th century Spain succeeded in throwing off the French yoke in government but not in literature. The victory over Napoleon was followed by a long succession of civil wars that were not conducive to a rebirth of literary activity. Perhaps best of the early 19th-century dramas is *The Maidens' Consent* and other work of Leandro Fernández de Moratín (1760–1828), a follower and translator of Molière. The romantic movement was represented by the Duke of Rivas (1791–1865), José Zorrilla y Moral (1817–93), José de Espronceda (1810–42) and the early plays of José Échegaray (1832–1916); but romanticism was fundamentally unsuited to the Spanish temperament and did not prove as fruitful as the contemporary movements in France, Germany and England.

After 1850 some evidence of new national feeling and a departure from French imitation was seen in the poetry of Gaspar Nuñez de Arce (1834–1903), Salvador Rueda (1857–), Vicente Medina (1866–) and Rosalia de Castro, whose work is mostly in the Galician dialect; but the real vitality of the period lay in its novels. The international movement toward realism and interest in local customs found expression in the work of Fernán Caballero (1797–1877), Pedro Antonia de Alarcón (1833–91) and José Maria de Pereda (1833–1906). Juan Valera y Alcala Galiano (1824–1905) tempered his realism with idealism and poked fun at contemporary society. Emilia Pardo Bazán (1852–1921) and Armando Palacio Valdés (1853–1938) intensify realism into naturalism. Of a different sort is the work of Benito Pérez Galdós (1845–1920), whose *Episodios nacionales* are vigorous and swiftly moving historical novels. For a time Galdós was attracted by French naturalism, but he finally turned to contemporary psychological problems and was particularly successful in writing about life in Madrid. José Échegaray (*c.* 1832–1916) handled social problems in his later plays and received the Nobel Prize in 1904.

The 20th Century.—With the Spanish-American War in 1898 came a more conscious effort to create a purely Spanish literature. José Martínez Ruiz (pen name, Azorín; 1876–) brought a finely chiseled style to his critical interpretations of Spanish life and literature. Pío Baroja (1872–) wrote refreshing novels characteristically Basque in their individuality of judgment and style. The novels of Ramón Pérez de Ayala (1880–), which are often studies in psychology, are exciting and attention holding. Gabriel Miró is unique in his delicate tracery of feeling and exquisite choice of words. Marcelino Menéndez y Pelayo and Ramón Menéndez Pidal did invaluable work in research on old Spanish poetry and prose. In philosophy and criticism the outstanding figure is Miguel de Unamuno (1864–1936), whose mysticism and fine understanding are known in translations throughout the world. More practical in his criticism of current phenomena is José Ortega y Gasset (1883–). The work of Vicente Blasco Ibáñez, especially *The Four Horsemen of the Apocalypse,* is of cosmopolitan rather than Spanish importance.



Underwood & Underwood

Jacinto Benavente

The plays of Jacinto Benavente (1866–), who received the Nobel Prize, 1922, show the wide range of his interests and complete mastery of his medium. The Alvarez Quintero brothers (Serafín and Joaquín) are famous for their comedies of manners. Facility in composition and understanding of psychology are evident in the plays of Gregorio Martínez Sierra (1881–) and his wife. Most typically Spanish are numerous short plays set to music, survivals of the old interludes formerly given between the acts of longer plays.

Though somewhat influenced by French movements modern Spanish poetry is deeply steeped in Spanish tradition. Unamuno and Pérez de Ayala have been successful in poetry as well as in prose. Others, best known for their poetry, are Antonio Machado, Juan Ramón Jiménez, and Ramón del Valle Inclan.

The 20th century is above all important for its renewed interest in Spanish history—its heroes, customs and folklore; but just when it seemed probable that Spain might regain something of her old literary glory, civil war again interrupted intellectual and cultural pursuits.

LATIN-AMERICAN LITERATURE

The literature of Mexico, Central America and South America must be considered in the light of Spanish heritage, for, with the exception of Portuguese and various native dialects, Spanish has been the chief language below the Rio Grande for more than four hundred years. At first histories in prose and in epic form predominated, many of them written by Spanish priests and soldiers, a few by Indians. Among the last is the *Comentarios reales* by the Inca, Garcilaso de la Vega (*c.* 1537–*c.* 1616), who, besides the legend and romance of Peruvian history, gave the Indian version of the Spanish Conquest.

In Mexico.—In 1539 a printing press was set up in Mexico, and from it the first book in America was printed, a little Christian catechism by the first bishop of Mexico. In 1551 Mexico City and Lima, Peru, obtained university charters. Surprisingly great literary activity followed in the 17th century. The Jesuits translated the works of Lope de Vega into native Indian dialect; Gonzáles de Eslava wrote plays about Mexican life. In Spain the Mexican-born Juan Ruiz de Alarcón y Mendoza ranked among the great dramatists of the Golden Age. Bernardo de Balbuena (1568–1627), first bishop of Puerto Rico, achieved fame for his long poem on American subjects, *Grandeza mexicana.* The nun Juana Inés de la Cruz (1651-95) wrote some fine verse. The 18th century furnished little important literature. The 19th century produced Manuel E. Gorostiza (1789–1851), popular for his comedies of manners; and two disciples of the Spanish romanticists, Ignacio Rodríguez Galván (1816–42) and Fernando Calderón y Beltrán (1809–45), who were poets and dramatists. The most valuable work of the 19th century, however, was done by the historians José Fernando Ramírez and Lucas Alamán. Manuel Carpio is remembered for his vigorous and charming verse, and the Indian Ignacio Manuel Altamirano for his work as journalist, poet and novelist.

In South America.—In the latter part of the 18th century Colombia won renown through the writings and work of a group of scientists, led by José Celestino Mutis (1732–1808) and Francisco José Caldas (1741–1816). The early 19th century was significant for its vast amount of revolutionary prose and poetry. In his journal *El pensador mexicano* and his novel *El periquillo sarniento,* José Joaquín de Lizardi (1774–1827) helped arouse the desire for independence. Ecuador is represented by José Joaquín de Olmedo (1780-1847) and his *La victoria de Junín, Canto a Bolívar,* the work of a truly great writer.

Venezuela cherishes Andrés Bello (*c.* 1780–1865), one of the greatest of Spanish-American scholars, whose *Silva a la agricultura de la zona tórrida* is an excellent georgic reminiscent of Vergil.

The influence of romanticism is visible in the poetry of the Colombian José Eusebio Caro and of the Argentinian Juan María Gutiérrez; also in the novels *Amalia* by José Mármol and *María* by Jorge Isaacs. Another Argentinian, Olegario Víctor Andrade (1838–83), became famous for *Atlántida* and other poems; and his native land was also the birthplace of the Gaucho poetry that preserves the color and tang of the South American cowboy.

In Peru, Ricardo Palma (1833–1919) contributed beautifully written historical anecdotes; and José Santos Chocano (1867–   ) put into poetry the new interest in nationalism and patriotism that had been urged by the Uruguayan José Enrique Rodó. Felix Rubén Darío (1867–1916), born in Nicaragua, inaugurated a poetic movement whose interest in form has much in common with the early 20th-century experimental poetry in England and America. More numerous in the 20th century are novels (by Carlos Reyles, Enrique Larreta, Rufino Blanco Fombona) and short stories (Manuel Ugarte) with extremely varied form, subject matter and evidence of individual style.

Cuba honors José María de Heredia y Campuzano (1803–39) for his ode to Niagara and "Himno del desterrado" ("Hymn of the Exile").

DICTIONARY OF LITERARY ALLUSIONS

Abbot, The, a novel by Sir Walter Scott (published 1820), a stirring tale dealing with the imprisonment of Mary Stuart, Queen of Scots, in Lochleven Castle and her escape. The abbot is Father Ambrose (Edward Glendinning), abbot of Kennaquhair. This novel is a sequel to *The Monastery.*

Abottsford, the estate of Sir Walter Scott, near Melrose on the banks of the River Tweed in Scotland. He purchased it in 1812 and lived there, 1824–32. Several rooms are now kept open for sightseers, among them the library and Scott's workroom, both lined with thousands of books.

Abou Ben Adhem, a short poem by Leigh Hunt. In a dream Abou Ben Adhem saw an angel writing in a book the names of all those who loved the Lord, and he asked if his name were there. Upon being told that it was not Abou said, "Write me as one who loves his fellow men." The next night he dreamed again; the angel once more opened the book, "And lo, Ben Adhem's name led all the rest."

acrostic, any piece of writing, but usually verse, in which sets of letters taken in a certain order spell a word or words. Sometimes a series, composed of the first letter in each line, spells the word or words; sometimes the final letter of each line is used; occasionally letters from the middle of the lines are chosen. If only one set of letters spells a word, the verse is a simple acrostic. If the verse contains more than one hidden series, it is called a double acrostic. The 119th Psalm (in Hebrew) is the most famous acrostic in world literature.

The word *violet* is formed by the first letter from each line of the following verse, reading downward:

> **V**ying with the arbutus for modesty and grace,
> **I**nnocent as gleeful smiles on happy childhood's face—
> **O**ther flowers demand our love and entrance to our thought—
> **L**ove seeks her in her hiding place and spends itself unsought.
> **E**arly springtime blossom in your modest garb of blue,
> **T**hink not that summer's gorgeous bloom can steal our love from you.

Adam Bede, a novel by George Eliot, published in 1859. It tells of the love of Adam Bede, a carpenter, for Hetty Sorrel, a pretty dairymaid, who does not love him and is betrayed by Arthur Donnithorne, the local squire. Bede marries Dinah Morris, a Methodist preacher, who befriends Hetty. *Adam Bede* is often regarded as the best of the author's works. Dickens said that reading it marked an epoch in his life.

Admirable Crichton (Krī′tun), any paragon of all-round excellence; a name applied to James Crichton (1560–85), a Scottish prodigy of learning and swordplay, who became famous in France and Italy, confounding older scholars by his brilliance. James M. Barrie wrote a play with this title, published 1902. A butler, named Crichton, on a world tour with the three daughters of a British nobleman, is shipwrecked on a desert island, becomes the natural leader of the group, falls in love with Lady Mary, one of the daughters, and becomes engaged to her. But when they are rescued by a passing ship, though Lady Mary rebells against going back to the old conventions, Crichton insists that things must be as they were before the shipwreck. On the island, he says, there has been "as little equality" as there is in England!

Adonais, a poem by Percy Bysshe Shelley (published 1821), an elegy on the death of John Keats. It mourns the death of Keats, condemns the critics whose reviews were thought to have hastened his death and ends on a joyous note, hailing Keats into the company of the immortals.

Aeneid, The, an epic poem in Latin hexameters by Vergil. It tells the story of the flight of Aeneas from Troy after it was captured by the Greeks and of his adventures on land and sea and in the underworld until he came to the river Tiber, where he founded the Roman state.

Aesop's Fables, a collection of very short stories in which animal characters behave and speak like human beings, showing the weaknesses and foibles of human nature. Each fable ends with a moral. They are attributed to Aesop, a deformed Phrygian slave who lived about 620–560 B.C. He was freed by his master and is said to have won fame for his wisdom at the court of Croesus, king of Lydia. There is a legend that Aesop saved the throne for Peisistratus, king of Athens, by telling his fable of *King Log and King Stork* to the discontented mob that was threatening to dethrone him.

Aesop's Fables are the stories that everyone knows. *The Ant and the Grasshopper, The Fox and the Grapes, The Dog and the Bone, The Lion and the Mouse, King Log and King Stork* are familiar to every child.

Probably Aesop never put his fables in writing. The stories themselves are centuries older than Aesop and of Oriental origin. Babrius in the 1st century B.C. put them into Greek verse and Phaedrus in the 1st century A.D. translated them into Latin. In the 14th century, Maximus Planudes, a monk, collected 144 fables, and from these all the later collections known as Aesop's have been taken. La Fontaine translated them charmingly into French verse in the 17th century.

Ah, Wilderness!, a play by Eugene O'Neill, produced and published in 1933. The scene of the action is "a large small-town in Connecticut," and the story is that of the youthful romantic awakening of Richard Miller. A phrase from the Rubáiyát supplies the title.

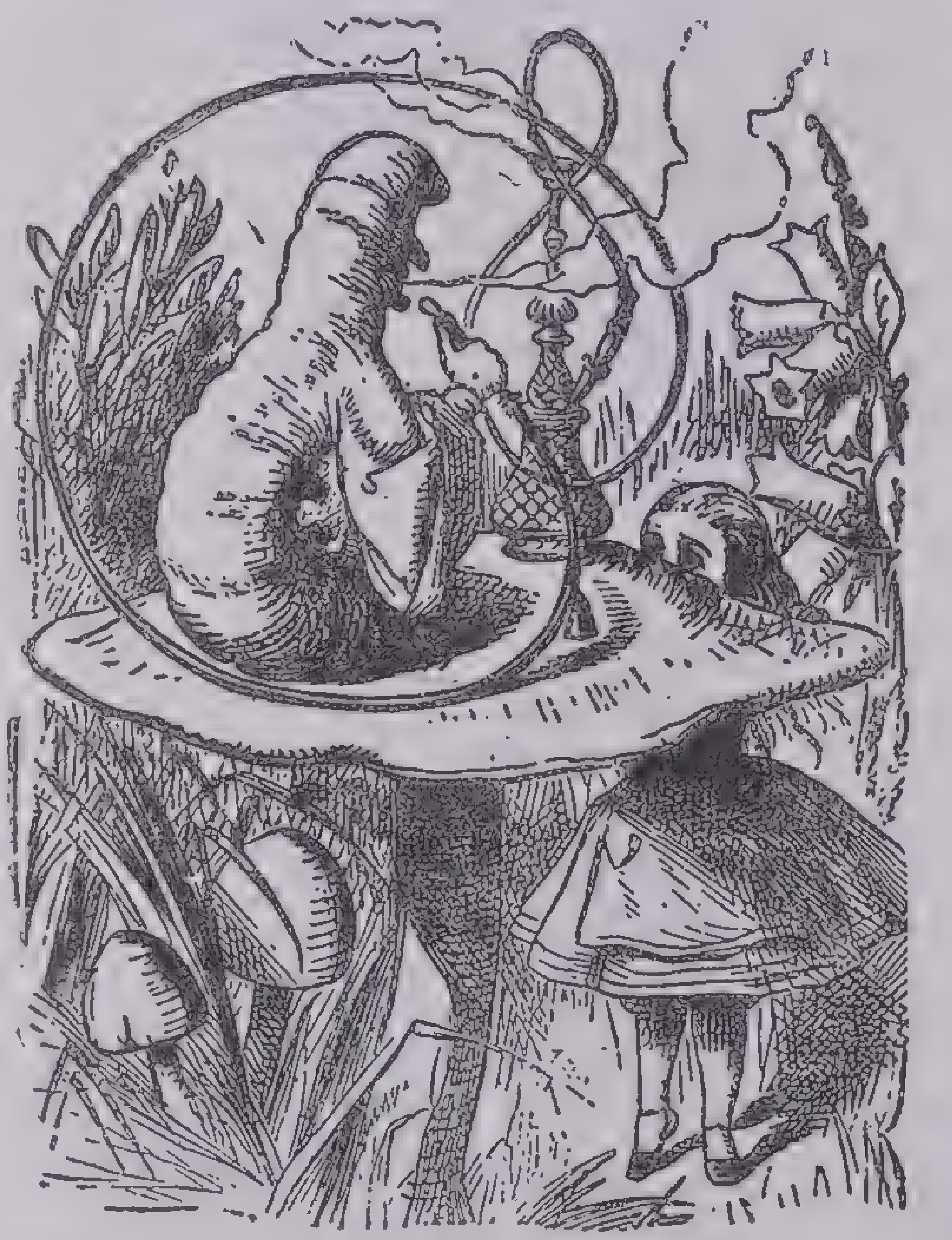
Alexandrian Age, the period of learning and literary activity in Egypt from 306 B.C. to 30 B.C., when Alexandria, Egypt, was the cultural center of the world. The great Alexandrian Library, containing the largest collection of manuscripts (700,000, it is said) of ancient times, was founded during the reign of Ptolemy Soter of Egypt about 275 B.C. and enlarged by his successors.

The Alexandrian period was distinguished by great scientists and mathematicians—Euclid, Archimedes, Diophantus—and the last of the Greek poets, Callimachus, Theocritus and Apollonius Rhodius.

Alice's Adventures in Wonderland, a whimsical, mock-serious story for children by Lewis Carroll, published 1865. Lewis Carroll was the pen name of Charles L. Dodgson, a mathematician of Oxford University, England. The book was illustrated by Sir John Tenniel. Alice dreams that she follows an entrancing White Rabbit down a rabbit hole and finds herself in a strange land where she meets the Mad Hatter and the March Hare, poor Bill (the lizard), the Duchess, the Cheshire Cat and its grin, the terrifying Queen of Hearts and many other strange personages. *Through the Looking Glass,* published 1871, is a sequel in which Alice dreams again. This time she steps through a looking glass into a chessboard country, where the kings and queens and knights of chess come to life. Humpty Dumpty, Tweedledum and Tweedledee, and the Walrus and the Carpenter are the most famous characters in this fantasy. In both books there are many parodies of famous poems.

allegory, a story with a literal meaning that suggests a deeper figurative meaning. The characters often personify ideas or qualities, a type of person or even a nation. The actions symbolize other more significant actions. An allegory is far more than a metaphor; it calls for greater length of figurative expression and a more sustained imagination on the part of both author and reader. Fables and parables are simple allegories with but one idea or moral to be put over. The long allegory can be narration or description, poetry or drama.

John Bunyan's *Pilgrim's Progress* is the most famous allegory in English—the story of Christian's trials and troubles as he seeks the Celestial City. Maeterlinck's *Blue Bird* is an allegorical fantasy about happiness with the lesson that happiness is not far away but here at home and to be found in acts of kindness.



From a drawing by Sir John Tenniel

Alice Meets the Caterpillar

From *Alice's Adventures in Wonderland* by Lewis Carroll

alliteration, the beginning of two or more consecutive words, or words near together, with the same letter or sound. Fire and flame, time and tide, spick and span are instances of alliteration in everyday phrases.

Alliteration was the base of ancient German and Old English versification, in which each line broke into two halves with most of the accented syllables beginning with the same sound. A line from the Old English lay *The Battle of Brunanburh* illustrates this rule:

We'rene wi'code ‖ wa'est ofer Pan'-tum.
(The warriors went west over the river Pantum).

In all English poetry there is considerable use of alliteration—for example:

"*F*ull *f*athom *f*ive thy *f*ather lies"
a line from a song in Shakespeare's *Tempest;* and
"Where Alph the sacred *r*iver *r*an
Through caverns *m*easureless to *m*an
Down to a sunless sea."
(From Coleridge's *Kubla Khan.*)

ana, a collection of the sayings of a famous person or a collection of anecdotes concerning him. This was the original meaning of the suffix, as in Johnsoniana, material about Johnson. The term has been extended to include a collection of bits of information on any subject. Americana, for instance, means the collected information about America. The suffix has developed into a separate word.

Anabasis, Xenophon's history of the 10,000 Greek mercenaries who marched with Cyrus the Younger against his brother Artaxerxes II, king of Persia, in 401 B.C. It is a stirring account of the march inland (Anabasis, going upcountry) and of the retreat (in Greek, Katabasis, march to the coast, going down) from Persia through Armenia to the Black Sea. Xenophon, the author, accompanied the expedition.

Anacreontics, short poems in praise of wine and women in the style made famous by the Greek poet Anacreon (*c.* 563–478 B.C.) and his imitators. The verse form is usually a line of seven syllables, the first, third, fifth and last being accented. Several English poets wrote this sort of verse, among them Abraham Cowley and John Phillips in the 17th century and Tom Moore at the beginning of the 19th.

anacrusis (Greek, upbeat, unstressed), an unaccented syllable beginning a line of verse that normally begins with an accented syllable; or an extra unaccented syllable at the beginning of a line that normally begins with an unaccented syllable. The word *To* beginning the second line of the following quotation is an example of anacrusis:

"Is' it time" they rise and cry
"To le'ad our hosts again?"
(From Margaret Widdemer's *The Old Kings.*)

The new interpretation of English meter would not explain this syllable as an extra sound but would say that for variety the unaccented and the accented syllable had the same time together as an accented syllable usually has—an eighth note plus a dotted quarter to equal a half note. Or, even more simply, *to lead* is pronounced as a single syllable *t'lead.*

anapest, in versification, a metrical foot containing three syllables: two unaccented syllables followed by one accented syllable.

I am mon'/ arch of all' / I sur /vey'.
(From William Cowper's *Verses Supposed to be Written by Alexander Selkirk.*)

Ancient Mariner, The Rime of the, a poem by Samuel Taylor Coleridge, first published in 1798 in the *Lyrical Ballads* of Wordsworth and Coleridge. It is a narrative poem in simple ballad form with a somewhat allegorical idea. The teller of the story on a voyage in the south polar seas had shot an albatross, a bird the sailors considered a sign of good fortune. The dead albatross was hung on the Mariner's neck, and a curse killed the crew and left him in fear and terror. The curse vanishes and the bird falls from his neck when he blesses the beauty of the strange sea creatures. The moral is

> He prayeth best who loveth best
> All things both great and small.

Anglo-Saxon Chronicle, a history of England down to 1154 A.D., the first prose work in Old English. The chronicle of England to the year 892 was collected from different local sources by order of Alfred the Great, who himself may have dictated the parts relating to his own time. The work was continued under Edward; and there is a full account of the Danish wars up to 924. The sections dealing with the years 925–75 contain the famous lay on the Battle of Brunanburh and several other poems, but the main narrative is in prose.

Anna Karenina, a novel by Leo Tolstoy, translated from Russian into English in 1886. This is one of the world's greatest novels. Wedded to a selfish husband much older than herself, Anna Karenina falls in love with Count Vronsky, a brilliant young officer, and sacrifices her position, home and child for him. When he tires of her, she commits suicide.

anthology, literally, a collection of flowers, hence a collection of beautiful or representative passages from literature. Florilegium, the Latin equivalent for the Greek anthology, was used in the same sense.

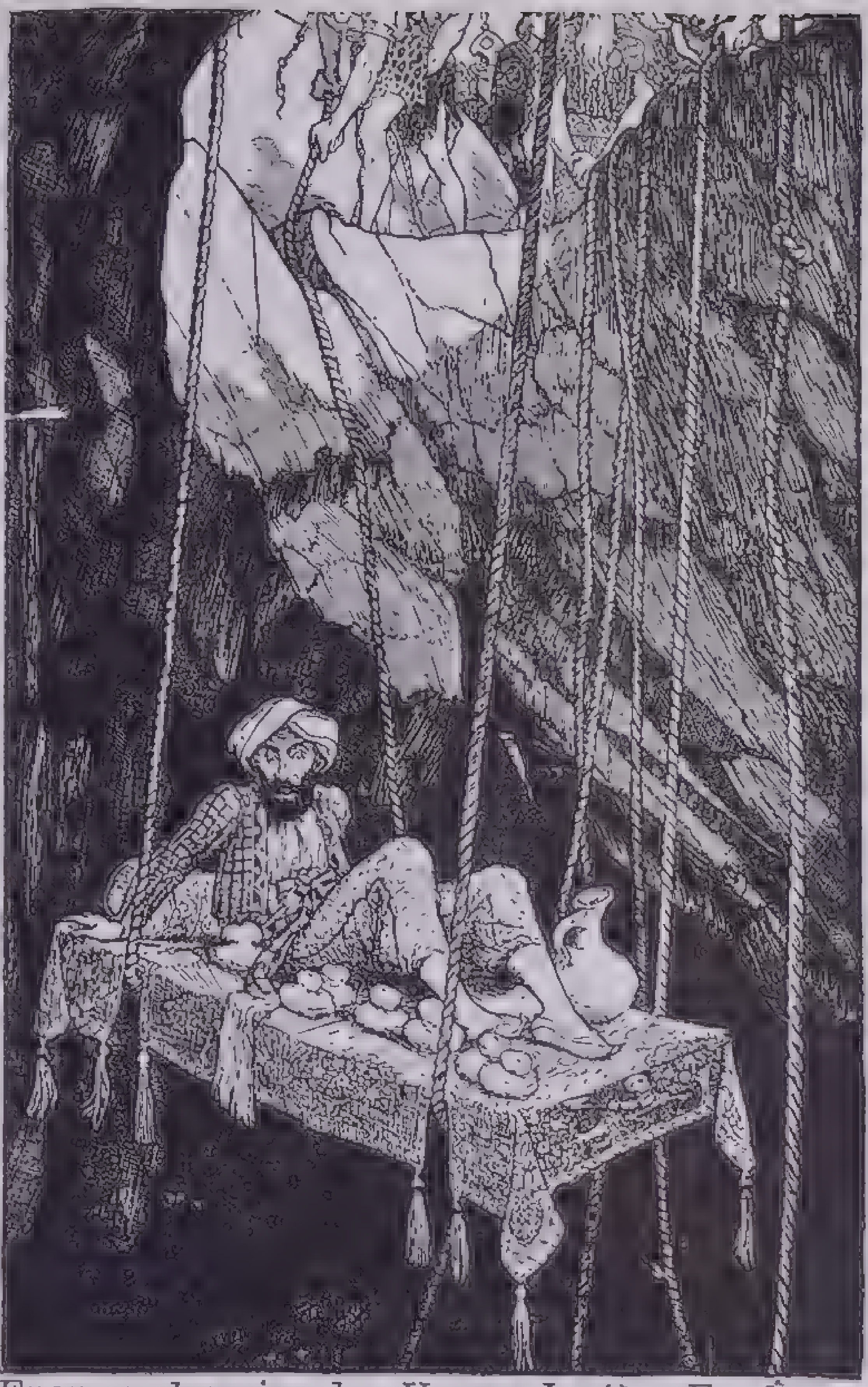
The most famous was *The Greek Anthology,* a collection of 4,500 short Greek poems begun by Meleager about 60 B.C. continued by Philippus of Thessalonica, who first applied the word *anthologia* to the collection, and continued and enlarged by various other poets and sophists until about 1320 A.D.

Of the modern anthologies, Palgrave's *Golden Treasury of Songs and Lyrics* (1861 and 1896) is one of the most famous. Sir Arthur Quiller-Couch compiled the Oxford Books of English Verse, Ballads, Victorian Verse and English Prose; and Bliss Carman compiled the *Oxford Book of American Verse.* Mark Van Doren has compiled a big anthology of world poetry.

aphorism, a short sentence stating some truth or bit of human wisdom so pithily and vividly that it sticks in the memory. "He is a fool that cannot conceal his wisdom" is an aphorism from *Poor Richard's Almanack.*

Arabian Nights' Entertainments, a collection of about 250 stories of Oriental origin, known also as *The Thousand and One Nights* or *A Thousand Nights and A Night.* They were written in Arabic but the stories themselves are the popular stories of Arabian, Indian and Persian folklore. They were first translated into French by Antoine Galland in 1704–17. Edward William Lane made an abridged translation from the Arabic into English in 1840. The complete translation (1885–88) by Sir Richard Burton is the most famous of all.

The stories are told each night by Scheherazade, who marries a sultan who had been killing his newly married wives each morning after the wedding. Scheherazade stops her narrative at the most exciting point so that the sultan spares her life until the next night. On the thousand-and-first night he decides she is too good and clever to be put to death and that he cannot live without her.



From a drawing by Henry Justice Ford, courtesy Longmans, Green & Co.

Sindbad Is Lowered Into the Cavern
A scene from *The Arabian Nights' Entertainments*

Many famous stories are contained in the *Arabian Nights.* Among the most widely known are those of the Porter of Bagdad, Aladdin, Ali Baba and the Forty Thieves and the Voyages of Sindbad the Sailor.

archaism, the use of old-fashioned or outmoded words or expressions in speech or writing. *Albeit* is an archaism, meaning even so, although. Others are: *haply,* by chance; *meseems,* it seems to me; *prithee,* I pray you, *wight,* a living person, *yclept,* named or called. Such words give an ancient effect especially in poetry.

Arden, an ancient forest in Warwickshire, England, famous in song and story. Most of the scenes in Shakespeare's *As You Like It* take place in Arden.

Ariel, in *The Tempest* by Shakespeare, a spirit of the air who had been bewitched and imprisoned in a pine tree on a lonely island. Prospero, shipwrecked on the island, discovered Ariel, released him and employed him to help work his own magic spells.

Artful Dodger, a youthful character in Dicken's novel *Oliver Twist,* so named because of his skill in dodging the police.

Arthurian Legend, all the material concerning Arthur of Britain in folklore, legend and romance. The historical Arthur has been placed in the 6th century and coupled with the battle of Badon (518) by Nennius in his *History of the Britons,* written in Latin in the 8th century, and by the *Annales Cambriae,* an ancient Welsh chronicle in Latin, written in the 10th century.

Arthur appears as a mythical hero of superhuman prowess in the *Black Book of Carmarthen,* a 12th century manuscript of ancient Welsh poetry, and as fairy king and warrior slaying monsters and surrounded by superhuman knights in the *Red Book of Hergest,* a 14th century Welsh manuscript containing the *Mabinogion* and five stories about Arthur. Two of these are of Celtic origin and very ancient: *Kilhwch and Olwen* and the *Dream of Rhonabwy.*

Geoffrey of Monmouth in his *History of the Kings of Britain,* written in Latin (12th century), produced the Arthur of romance, son of Uther Pendragon, husband of Guinevere, conqueror of western Europe, who fell in the battle of Camlan after killing his traitorous nephew Modred. Wace, the Norman-French poet, added the Round Table to the story. Layamon translated Wace into English in his *Brut* and added a wealth of color and incident and fairy detail.

Stories of Arthur and his knights were spread all over Europe as early as the 11th century by wandering British bards. There are 12th century carvings of Arthurian scenes on the door of the Modena cathedral.

The great cycle of written Arthurian romance in Europe, however, developed after the 12th century. Chrestien de Troyes wrote an *Erec,* an *Yvain* and the great story of Perceval, the *Story of the Grail.* Wolfram von Eschenbach's *Parzival* is the source of Wagner's. Robert de Boron contributed a *Merlin,* a *Perceval* and *Joseph of Arimathea,* which developed later into the vast *Story of the Holy Grail.* Numerous manuscripts of unknown authorship exist dealing with all this material. Later came a prose *Lancelot,* a *Quest of Galahad,* a *Morte d'Arthur,* followed by a 14th-century verse *Morte d'Arthur* in England and by Sir Thomas Malory's long English prose *Morte d'Arthur* in the 15th century, which was the source for all later writers. Tennyson in *Idylls of the King,* William Morris in *Defense of Guinevere,* E. A. Robinson in his *Lancelot* and his *Tristram,* have drawn for the most part on Malory. The story of Tristram and Iseult was not linked with Arthur until rather late.

As You Like It, a comedy by Shakespeare, first produced about 1599, published in 1623. Duke Frederick's niece Rosalind, disguised as a boy, and Frederick's daughter Celia, dressed as a rustic lass, flee to the forest of Arden and there they meet Orlando who had fallen in love with Rosalind and is now living with her banished father, the rightful duke. Rosalind, as the boy Ganymede, prays Orlando to make love to her "as if she were his Rosalind." Oliver comes to the forest in pursuit of his brother Orlando and is saved by him from a lion, and the two become reconciled. Oliver falls in love with Celia. Touchstone, the court jester, loves Audrey, a simple country maid. The play ends with four weddings under a tree in the forest, and Frederick returns the dukedom to his brother.

The melancholy Jacques and the jester Touchstone are minor characters.

Athos, Porthos and Aramis, "the three musketeers" of Louis XIII of France, in Alexandre Dumas's romance.

Aucassin and Nicolette, a French romance written in the 12th century, translated and adapted into English by Andrew Lang, Swinburne, Laurence Housman and others. It is the love story of Aucassin, son of the Count of Beaucaire, and Nicolette, a Saracen captive maiden. They are separated by the count but after many adventures they are happily reunited.

Augustan Age, the reign (27 B.C.–14 A.D.) of Augustus Caesar, when Latin literature reached its highest development and greatest purity under the patronage of Augustus and his minister Maecenas. The great writers of the period were Vergil, Horace, Ovid and Livy.

The reign of Queen Anne (1702–14) is called the Augustan Age of English Literature, a period marked by Steele, Swift, Pope and Addison.

In France the term is applied to the reign of Louis XIV (1643–1715) when Corneille, Racine and Molière wrote their brilliant plays.

Auld Lang Syne (old long since, old time's sake), a poem written by Robert Burns in 1788, from what he could remember of an old man's singing. The refrain was familiar throughout Scotland long before Burns used it. The song is included in a collection of old Scottish songs compiled by James Johnson, 1787–1803.

Auld Reekie (old smoky), an epithet of Edinburgh, Scotland, on account of its smoky chimneys.

Aurora Leigh, a novel in blank verse by Elizabeth Barrett Browning, published in 1856. Aurora Leigh loves her cousin Romney Leigh but will not marry him because he wants her only to help him in his philanthropic schemes. When he loses his fortune and his sight, they finally understand each other. Many literary and socialistic theories are described in the poem.

autobiography, the life history of a person written by himself. *The Confessions of St. Augustine* (late 4th and early 5th centuries) is probably the world's greatest spiritual autobiography. Cellini's *Autobiography of Benvenuto Cellini* is a vivid picture of the Italian Renaissance and some of its outstanding personages, as well as of the great artist. Rousseau's *Confessions* published in 1782 was the first great introspective (inward-looking) autobiography. Among the most famous modern autobiographies are: Benjamin Franklin's *Autobiography* (1868), Leo Tolstoy's *Confessions* (1882), George Moore's *Memoirs of My Dead Life* (1906) and *Hail and Farewell* (1911–14), Henry Adams's *The Education of Henry Adams* (1906), Edward Bok's *Americanization of Edward Bok* (1920), Mark Twain's *Autobiography* (1922) and the *Autobiography of Lincoln Steffens* (1931).

Autocrat of the Breakfast Table, a series of essays by Oliver Wendell Holmes, published in the *Atlantic Monthly* in 1857–8. The essays are conversations around a boardinghouse breakfast table. The Autocrat comments on art, science, travel and philosophy, with occasional remarks by the Landlady, the Young Man Called John, the Schoolmistress, the Old Gentleman Opposite, the Poor Relation and others. *The Wonderful One-Horse Shay, The Chambered Nautilus, The Old Man Dreams* and other poems by Holmes are in *The Autocrat.*

Avon, Swan of, an epithet given to Shakespeare by Ben Jonson.

Bab Ballads, light verse, written and illustrated by Sir William S. Gilbert, collected in book form 1869–73. The ballads are humorous and satirical, and many of them are songs in the Gilbert and Sullivan operas; for instance, *Patience, Iolanthe, Ruddigore.*

Babbitt, a novel by Sinclair Lewis, published in 1922. The hero is a small-town businessman, George F. Babbitt, who rebels against the materialism of Zenith, his home town, but has to renounce his ideals. Babbitt has come to mean the typical American businessman.

ballad, a short narrative poem in simple stanza form and of unknown folk authorship. Ballads deal with folk legends and heroes and events. The grim and tragic stories bear testimony to their primitive origin, for the true ballads were handed down orally from generation to generation. There were no written ballads before the 15th century, but the ballads themselves are centuries older.

The typical ballad stanza is the simplest of verse forms. It has four lines, of which the first and third are unrhymed and have four accents each; the second and fourth are rhymed and contain three accents each. (Fourteen accents in the four lines.) Occasionally ballads are found in rhymed couplets each couplet having seven accents. But the stanza form of *Sir Patrick Spens* illustrates the typical ballad stanza:

The king' sits in' Dumfer'ling toun'
Drink'ing the blood'-red wine';
"O where' will I' get guid' sailor'
To sail' this ship' of mine' ?"

Probably no ballad was ever composed by a group. An individual made up the song, and the group adopted it. Soldier marching songs, cowboy songs and seamen's chanties of later times originated in the same way.

Francis J. Child, a Harvard professor, collected the *English and Scottish Popular Ballads* (1882–98). Some of the best known of these are *Sir Patrick Spens, The Twa Corbies* (The Two Crows), *Edward, Edward, The Twa Sisters* with its refrain of "Binnorie, O Binnorie," *Barbara Allen* and the tragic *Lord Randal.*

American ballads are of two kinds: those descended from the old Scottish or English ballads, which immigrated with the early settlers, and those that have sprung up spontaneously among the various folk types in America. These are the hillbilly songs of the southern mountaineers, cowboy ballads and songs of the cattle trails, of logging camps and lumberjacks and miners. The popular and widespread *Frankie and Johnny* ballad is of Negro or barroom origin.

Sir Walter Scott and W. E. Aytoun wrote ballad romances on themes from Scottish and Border history.

Lord Macaulay in the *Lays of Ancient Rome* (1842) attempted to reproduce historical legends of early Rome—"Horatius" is the best known, and in "Ivry" and "Naseby" he applied the same method to French and English history.

Later ballads are not historical but nearly always fictional. John Davidson's *Ballad of Hell,* Oscar Wilde's *Ballad of Reading Gaol* and Keats's *La Belle Dame Sans Merci* are modern art ballads.

Banquo, in Shakespeare's *Macbeth,* a thane of Scotland and a general in the army of Duncan, king of Scotland. To thwart a prophecy that Banquo would beget kings, Macbeth, who had already murdered Duncan and seized the throne, murdered Banquo and was thereafter tormented by Banquo's ghost.

Barbara Frietchie's House
Frederick, Maryland

Barbara Frietchie, a poem by John Greenleaf Whittier recounting an incident supposed to have occurred at Frederick, Maryland, during the Civil War. Barbara was a patriotic old woman who refused to lower the Union flag from her home when the Confederates under General Jackson entered the town, and he would not permit his troops to molest her.

Barkis, in *David Copperfield* by Charles Dickens, the stage driver who married Peggotty, the faithful old nurse of David Copperfield. Barkis is famous for his repeated proposal of marriage, "Barkis is willin'."

Barmecide Feast, in the *Arabian Nights,* the story of the beggar Shacabac, who was invited to a feast by one of the Barmecides, a wealthy Persian family. The host enjoyed a hearty meal, but only empty dishes were placed before the hungry beggar. But he praised the food, declared that the wine had gone to his head and he attacked his host. Then he got a fine dinner. So *Barmecide feast* means an imaginary banquet or imaginary plenty.

Barrack-Room Ballads, a collection of poems by Rudyard Kipling, published in 1892, portraying the life and spirit of the common British soldier stationed in India. Many of the poems—*Danny Deever, Gunga Din, Boots, The Road to Mandalay,* for instance—have been set to music.

Barretts of Wimpole Street, The, a play by Rudolf Besier (1931), the love story of Robert Browning and Elizabeth Barrett. Katharine Cornell played Elizabeth on the stage. In the movie version Norma Shearer was Elizabeth and Charles Laughton was her narrow, selfish father.

Battle Hymn of the Republic, a poem by Julia Ward Howe, published in the *Atlantic Monthly* in 1862 and sung to the tune of "John Brown's Body." It was a favorite with Union soldiers in the Civil War.

Becky Sharp, the heroine of Thackeray's *Vanity Fair.* Spirited, clever, selfish, unscrupulous, she charmed many lovers, made a good marriage, won her way to the social position she craved, lost her husband by her intrigues and was brought low again at last, notorious and disreputable. She is portrayed in sharp contrast to Amelia Smedley, a pretty, spiritless, unintelligent girl, whose eventual happy marriage was engineered by Becky Sharp.

belles-lettres (French for fine or beautiful literature), artistic, esthetic or imaginative literature, literature as art, contrasted with practical, informational or scientific writings. Short poems, fiction, drama and, especially, light essays of appreciation are considered belles-lettres.

Ben Hur: A Tale of the Christ, a romance by Lew Wallace, published in 1880. Judah Ben Hur, a wealthy young Jew, is condemned to the Roman galleys, but after many exciting adventures, including the famous chariot race, again becomes a power in his land. He meets Jesus of Nazareth and becomes one of his followers. The book is full of excitement and romance, and its historical and religious setting made the story popular on the stage and in the movies.

Beowulf, an Old English (Anglo-Saxon) epic poem. The story consists of five episodes: (1) Beowulf with a small band of followers goes to aid Hrothgar, king of the Danes, and kills Grendel, a monster that is ravaging the land. (2) Grendel's mother seeks to avenge her son, but Beowulf follows her to her underwater lair and kills her. (3) Beowulf returns home loaded with gifts and rewards to recount his adventures, and on the death of Hygelac becomes king of the Geats. (4) In his old age Beowulf loses his life in combat with a fire-dragon that is devastating his kingdom. (5) His people, grieving, place his body on a great funeral pyre and bury the dragon's treasure with his ashes. The poem shows a spirit of self-sacrifice and nobility unusual in primitive compositions. The customs and ideals of the people revealed in the narrative give us a good idea of primitive Germanic civilization in the early 6th century. The only manuscript of the poem was written about 1000 A.D.

bibliography, a list of books and articles on a special subject or a certain author. For instance, a complete bibliography of Sir Walter Scott includes the titles of everything that Scott wrote with dates of publication, all editions and formats, and every book about Scott or any of his works and all magazine articles and monographs about him.

In a more general sense bibliography is the serious study or descriptive history of all manuscripts and books and their making, including references to authors and editions, the materials used in their make-up and the dates and styles of their printing.

Biglow Papers, The, political satires by James Russell Lowell. The first series (1846–48) opposed the Mexican War; and the second (1862–66) took the Northern and abolitionist side in the Civil War. The principal character is Hosea Biglow, whose New England dialect gives the poems in *Biglow Papers* a quaint, homespun character. Contrasted with this simple homespun style are the long learned prefaces and footnotes by the Rev. Homer Wilbur, full of pedantry and classical allusions.

biography, the written history of the life of a person. Modern biography tries to record the development of a personality, to portray individuals as they really were.

Even in early times there was a certain variety in biography but it was mostly written for political or moral purposes in Greek and Roman times and much later.

In the 4th century B.C. Xenophon wrote a defense of his master Socrates that is called *Memorabilia*—a title something like *memoirs* as it is used today. In the 1st century A.D. Plutarch wrote his *Parallel Lives,* comparing the careers of a score of Romans with the same number of Greeks, pair by pair, and countless later writers (Shakespeare among them) drew on this work for facts and characterization. In Latin: Cornelius Nepos (1st century B.C.) wrote brief lives of illustrious men in a simple clear style; Tacitus, the great historian, wrote a life of his father-in-law Agricola that is a classic; and Suetonius's *Twelve Caesars* (written about 120 A.D.) is gossipy and full of scandal. These are samples of what is called "antique biography," written to emphasize certain moral qualities or to teach a political lesson.

Biography in English begins in the 16th century with William Roper's *Life of Sir Thomas More* and George Cavendish's *Life of Cardinal Wolsey.* In the 17th century Izaak Walton wrote the *Lives* of Donne, Hooker, Herbert and others that are the forerunners of modern personal biography. James Boswell's *Life of Samuel Johnson* (1791) is interesting, personal, detailed and minute. Johnson's own *Life of Cowley* was written, he said, because in a former biography "all was confused and enlarged through a mist of panegyric."

In modern biography Lytton Strachey in *Eminent Victorians* (1918) and *Queen Victoria* (1921) stands out as a portrayer of human beings in whole truth, regardless of popular tradition. Gamaliel Bradford's *American Portraits* (1920) were the first of many spiritual portraits that he called *psychographs.*

Other outstanding modern biographies are: André Maurois's *Ariel* (1923), the life of Shelley, and one of Disraeli (1927); Hervey Allen's *Israfel* (1926), a life of Edgar Allan Poe; Carl Sandburg's *Abraham Lincoln, The Prairie Years* (1926); and Catherine Carswell's *Life of Robert Burns* (1930).

Black Beauty, the autobiography of a horse, by Anna Sewell, published in 1877. Black Beauty, a finely bred horse, crippled by a drunken groom, is sold to a livery stable, becomes a workhorse, is finally sold into good hands and ends his days in peace. It was the first popular book on kindness to animals and had a huge sale.

blank verse, any verse without rhyme; usually iambic pentameter, the most common metrical form in English dramatic and epic poetry. Iambic pentameter has five metrical feet to a line, each foot having one unaccented syllable followed by one accented syllable. It was first used by Henry Howard, Earl of Surrey, in his translations from the *Aeneid* in the 16th century. The first English drama written in blank verse was Sackeville and Norton's tragedy *Gorboduc* in 1562. Then Christopher Marlowe used it in his tragedy *Tamburlaine* in 1589. Shakespeare adopted and perfected it. No one since has written more beautiful, vigorous or moving blank verse than Shakespeare or more majestic than Milton in *Paradise Lost.* These lines from Tennyson's *Morte D'Arthur* in *The Idylls of the King* illustrate the flow of blank verse:

> "So like a shatter'd column lay the king;
> Not like that Arthur who, with lance in rest,
> From spur to plume a star of tournament,
> Shot thro' the lists at Camelot, and charged
> Before the eyes of ladies and of kings."

Bleak House, a novel by Charles Dickens published serially, 1852–53. It satirizes the injustice of delay in the Court of Chancery. The case of Jarndyce and Jarndyce in which the fortunes of Richard Carstone and his cousin Ada Clare are at stake, in the courts so long that it has eaten up in costs the whole fortune involved, suddenly comes to an end. Among the minor characters: Mrs. Jellyby is devoted to foreign missions but neglectful of her own family; Mr. Chadband is a pious hypocrite; the irresponsible Harold Skimpole is a parody on the poet and critic Leigh Hunt; and Boythorn is patterned on another poet, Walter Savage Landor.

Blithedale Romance, The, a novel by Nathaniel Hawthorne, published in 1852. The scene is the Brook Farm Institute, an experiment in community living.

Bluebird, The, a dramatic fantasy by Maurice Maeterlinck (1909). The allegory of the pursuit of the Blue Bird means that happiness is close at hand in acts of kindness and cannot be held like a possession but must be forever sought and won anew.

Bottom, Nick, the weaver in Shakespeare's *Midsummer Night's Dream.* During a rehearsal for *Pyramus and Thisbe* Puck puts an ass's head on Bottom, and then the fairy queen awakes and falls in love with him be-

From the Warner Bros. motion picture, A Midsummer Night's Dream

Shakespeare: A Midsummer Night's Dream
Nick Bottom and Titania

cause Oberon has put love drops on her eyes.

Bounty, Mutiny on the, the first of three novels by Charles B. Nordhoff and James H. Hall, published in 1932. It tells the story of the mutiny of the crew of H. M. S. *Bounty* against the cruelty of their commander, William Bligh. They were bound for the West Indies from Tahiti with a cargo of breadfruit trees. On April 28, 1789, they seized William Bligh and set him adrift in an open boat with 18 men who had refused to mutiny. *Men Against the Sea* (1933) tells of the heroic 4,000-mile voyage of Bligh's men in the open boat and their arrival in Batavia. *Pitcairn Island* (1934) is the story of the 25 mutinous members of the crew who sailed the *Bounty* back to Tahiti. Eight of them, under the leadership of Fletcher Christian, embarked again with a number of Tahitians and landed on Pitcairn Island where they founded a colony. This part of the story was celebrated by Byron in his poem *The Island.* Sir John Barrow's *The Mutiny and Piratical Seizure of H. M. S. Bounty,* published in 1831, was the first written narrative of the whole story. The three splendid, stirring novels of Nordhoff and Hall, for all their art, were written with strict adherence to the actual records.

Brobdingnag, in *Gulliver's Travels* by Jonathan Swift, the second strange country visited by Gulliver. Brobdingnag was inhabited by people of gigantic stature and all aspects of life were on the same scale.

Brook Farm Institute (1841–47), an unsuccessful attempt to found an ideal community in New England where all the members should labor with their hands and share their intellectual life. Hawthorne's *Blithedale Romance* is a realistic picture of this community.

caesura (literally cutting), the pause or break in the middle of a line of verse: indicated by double verticals, ||. In Greek and Latin poetry the caesura occurs without regard to any pause in the sense of the line. The caesura in the first line of Vergil's *Aeneid*

> Arma virumque cano || Trojae qui primus ab oris

is a masculine caesura, as it follows the accent. A feminine caesura is one that follows an unstressed syllable. In English verse, both old and modern, the caesura comes about the middle of a line and usually where the sense causes a natural rhetorical pause. Examples of the caesura:

> Werene wicode || waest ofer Pantum.

(From *The Battle of Brunanburh* in the *Anglo-Saxon Chronicle.*)

> I will speak out aloude || I care not who heare it.

(From Udall's *Ralph Roister Doister.*)

> Hanging so light || and hanging so high
> On the topmost twig || that looks up at the sky.

(From Coleridge's *Christabel.*)

Caliban, in Shakespeare's *Tempest,* son of the witch Sycorax and a slave to Prospero. He was a deformed crude creature meant to typify a primitive savage. Robert Browning's poem "Caliban upon Setebos" is the savage's idea of God.

Call of the Wild, The, a story of the Alaska gold fields by Jack London, published in 1903. Buck, the dog, was stolen as a pup from his home, shipped to Alaska and trained as a sled dog. When his master John Thornton was murdered, Buck ran away into the forest to live with the wolves.

Canterbury Tales, The, a collection of 23 stories written in verse by Geoffrey Chaucer, English poet of the 14th century. The Prologue describes 31 typical medieval folk of different social stations, who agree to entertain themselves on their pilgrimage to Canterbury by telling stories as they ride. Some of the stories are coarse, some refined, some humorous, some tragic. Typical of the language are these lines from the Prologue:

> For him was lever have at his beddes heed
> Twenty bokes, clad in blak or reed.

The most widely known of the tales are the Knight's, the Clerk's and the Nun's.

From the Metro-Goldwyn-Mayer motion picture, Mutiny on the Bounty

Mutiny on the Bounty
Fletcher Christian prevents the mutineers from killing Captain Bligh

Captains Courageous, a romance by Rudyard Kipling, published in 1897. Harvey Cheyne, the spoiled son of an American millionaire, fell overboard while crossing the Atlantic and was picked up on the Grand Banks by a fisherman in a dory from the schooner *We're Here.* Disko Troop, the old schooner captain, put Harvey to work, and the discipline of the hardy life and the fine spirit of the fishermen worked Harvey's salvation. He returned home a changed boy, healthy and with new ideals.

Carmen, a novel by Prosper Merimée, published in 1847, the basis of the opera *Carmen* by Bizet. Carmen, a beautiful Spanish gypsy girl, ensnares Don José, a cavalry corporal, while he is taking her to prison. He helps her escape, kills her husband, begs her to run off to America with him, kills her when she refuses and then gives himself up to the law. In the opera version Don José kills Carmen in tragic jealousy over her infatuation for a bullfighter.

Carton, Sidney, the hero of Dickens's *Tale of Two Cities,* a dissipated and unprincipled man, takes the place of a condemned prisoner, Charles Darnay, to whom he bears a striking resemblance. This saves Darnay and secures the happiness of Darnay's beautiful wife, with whom Carton is in love.

Casabianca, a poem by Mrs. Felicia Hemans. Casabianca was a 10-year-old boy whose father was in command of the frigate *Orient* during the Battle of Abukir (1792). He blew up his ship to prevent its being captured by the English. The child refused to leave his father and went down with the ship. The poem opens with the well-known line,

> The boy stood on the burning deck.

Castle Rackrent, a novel by Maria Edgeworth, published in 1801. It recounts the follies of an Irish family through several generations. The story lacks plot but has humor and depicts character well.

chanson de geste, literally, a song of great deeds; any epic poem in Old French, written in the 11th to the 15th centuries by poets called *trouvères* in northern France and *troubadours* in southern France, and spread by wandering minstrels called *jongleurs.* They depict the life of chivalry, especially the Emperor Charlemagne, his various wars and the heroic deeds of his paladins. The oldest, most famous and finest is the *Chanson de Roland.* Others are *Ogier the Dane, The Pilgrimage to Jerusalem, Bertha Greatfoot* and *Huon de Bordeaux.*

Chanson de Roland (The Song of Roland), an Old French *chanson de geste.* It recounts the fight of Roland, the most famous of Carlemagne's paladins, against the Saracens. Ro-

Courtesy Hispanic Society of America

The Cid Campeador

The romantic hero of Spanish literature is shown here in the bronze equestrian statue by Anna Hyatt Huntington. The Cid, whose real name was Ruy, or Rodrigo, Diaz, lived in the 11th century and had an adventurous career in the wars against the Moslems

land's army was treacherously ambushed at the pass of Roncesvalles in 778. There Roland and his companions fought until every man was killed, and at last, fatally wounded, Roland sounded his horn for help. The call was heard by Charlemagne 30 leagues away. He came and destroyed the Saracens.

Charge of the Light Brigade, a poem by Alfred Tennyson immortalizing an incident of the Battle of Balaklava in the Crimean War. An error in transmitting orders sent a brigade of 673 English cavalrymen on a charge against Russian guns that could result only in their slaughter.

Cheshire Cat, in an old English phrase, "Grin like a Cheshire cat," a simile for a broad, toothy smile. Nobody knows the origin of the comparison. In Lewis Carroll's *Alice in Wonderland* the Cheshire Cat talks to Alice, then vanishes—first, absolutely and immediately; and then by degrees until there is no cat left—just the grin!

Child's Garden of Verses, A, a collection of poems for children by Robert Louis Stevenson, published in 1885. It contains the simple and charming *Where Go the Boats, My Shadow, The Lamplighter, The Unseen Playmate* and the famous dedication to Alison Cunningham, his childhood nurse.

Chillon, a famous castle on the shores of Lake Geneva, Switzerland. It was the prison of Count Bonivard, who defended Switzerland against the Duke of Savoy in the 16th century. The Duke imprisoned Bonivard in one of its dungeons in 1530 for six years. This historic incident is the theme of Byron's *The Prisoner of Chillon.*

Christmas Carol, A, a story of Christmas by Charles Dickens, published in 1843. Old Scrooge, a "clutching, covetous old sinner" and Tiny Tim, the crippled child of Bob Cratchit, Scrooge's clerk, are two of the main characters. It is the story of Scrooge's regeneration: how the spirit of Christmas changed him from an unfeeling money-lover to the kind and benevolent human being who sent a turkey to the Cratchit family and made their Christmas full and merry.

Cid, The (the lord, from a Moorish word), the great national hero of Spain of the 11th century. He is immortalized in the 12th century *Poem of the Cid,* in a 13th century Spanish chronicle and in scores of ballads. Corneille's most famous drama, *The Cid,* celebrates the legend of the hero.

Classicism, the principles and qualities of Greek and Roman literature, especially when used as a standard for later works. The principles of classicism are pure and correct language, simple but elegant style, clearness, balance and orderliness of thought and expression. In an unfavorable sense, classicism means too great conventionality, a sacrificing of ease or spirit to the form of the writing; and it is contrasted with romanticism or naturalism.

Classics, literary productions of surpassing excellence. They represent the highest standards in literature. Specifically, the classics are the works of the ancient Greek and Roman writers. In general the classics are those works that have stood the test of time and remain beloved and valuable through all times, whether their style is classic or romantic.

Cloister and the Hearth, The, a historical novel by Charles Reade, published in 1861. It portrays the wanderings through Holland, Germany, France and Italy of Gerard, father of the distinguished Dutch scholar Erasmus, and thus gives a vivid picture of Europe in the 15th century.

comedy, a play written in an entertaining manner and having a happy ending. It contains light, clever dialogue and amusing situations. Sometimes the term is applied in a literary sense to any composition that treats life truly and seriously but does not leave the reader with a sense of tragedy.

Compleat Angler, The, a discussion of fishing by Izaak Walton, first published in 1653. It is written in dialogue form and contains advice on angling, songs and personal reflections. The Full title is *The Compleat Angler, or the Contemplative Man's Recreation.*

Comus, a masque by John Milton presented in 1634 at Ludlow Castle, for the Earl of Bridgewater. The triumph of virtue over evil is the theme. Virtue is embodied in the Lady, who is lost in the wood and lured to the home of the enchanter Comus, a son of Circe. She refuses to drink his potion and is rescued by the Attendant Spirit with the aid of Sabrina, the water nymph.

Confessions of an English Opium Eater, Thomas De Quincey's account of his own experience, published in 1822. It tells how much opium he could take in a day, what the effects were, how various trivial events of his life, glorified and distorted by the influence of the drug, became the material of his dreams, and how in fear of death he gradually reduced his dosage and almost overcame the habit. This book, first published without his name, brought De Quincey a ready market for his writings and assured his literary success.

Cotter's Saturday Night, a poem by Robert Burns, written in 1785, picturing the Scottish laborer's family gathered around the hearth to rest and worship.

Count of Monte Cristo, The, a novel by Alexandre Dumas, the elder, published 1841–5. Edward Dantès is unjustly imprisoned for 20 years through the false accusations of two rivals and the corruption of a magistrate. In prison he learns the secret hiding place of an enormous treasure on the Island of Monte Cristo. He escapes from his dungeon, finds the treasure and establishes himself as Count of Monte Cristo. Then he spends years seeking out his false accusers to satisfy his revenge against them.

couplet, two consecutive rhyming verses. The most usual type is the heroic couplet, 10 syllables to a line, in iambic pentameter.

> A perfect judge will read each work of wit
> With the same spirit that its author writ.
> (From Alexander Pope's *Essay on Criticism*.)

Courtship of Miles Standish, The, a poem by Henry W. Longfellow, published in 1858, portraying life in Plymouth Colony. Miles Standish, captain of Plymouth, sends young John Alden to Priscilla Mullins to ask her hand in his behalf. Priscilla, guessing Alden's own feelings, says, "Why don't you speak for yourself, John?" and they are married.

Coverley, Sir Roger de, a courtly old gentleman of Worcestshire, presented by both Addison and Steele in many of the *Spectator* papers. He was named for his great-grandfather who was said to have invented the old country dance called the Sir Roger de Coverley. Addison described him as "a gentleman that is very singular in his behavior, but his singularities proceed from his good sense."

Crane, Ichabod, a Yankee schoolmaster in Washington Irving's *Legend of Sleepy Hollow* in *The Sketch Book.* He was in love with beautiful Katrina Van Tassell, but he was terrified out of the neighborhood by his rival, Brom Bones, who pursued him one night disguised as the Headless Horseman.

Cranford, a novel by Mrs. Gaskell, first published serially, 1851–53. It describes the life of gentility in a little Cheshire village in the 19th century. Miss Matty Jenkyns and her sister Deborah, Miss Betty Barker, Miss Pole, Miss Forrester and others are described with sympathetic humor. *Cranford* is one of the most charming novels ever written.

Crawley, Rawdon, in Thackeray's *Vanity Fair,* the good-hearted gambling young cavalry officer whom Becky Sharp secretly married. He was the son of Sir Pitt Crawley and was disinherited by his aunt when his marriage was discovered. He was devoted to Becky and left her only after her intrigue with Lord Steyne.

Cricket on the Hearth, The, a Christmas story by Charles Dickens, published in 1846. A singing contest between a cricket on Dot Peerybingle's hearth and a kettle hanging on the crane give the title to the story. The singing contest is won by the cricket, and two love stories end happily. Edward Plummer returns from South America just in time to prevent his old sweetheart, May Fielding, from marrying an ill-natured old man, Tackleton, and dispels the suspicions Tackleton has wrought between the happy Dot and John Peerybingle.

Crisis, The, a novel by Winston Churchill, American fiction writer, published in 1901. It tells the story of a Northern officer and a Southern girl during the Civil War. The scenes are laid in and near St. Louis, Mo., and Lincoln, Sherman and Grant are introduced.

criticism, the art of judging and pointing out the perfections and imperfections of works of art. Appreciation is as much a part of criticism as is flaw detection. The true critic must have knowledge, taste, sympathy and no personal prejudices.

The chief objects of literary criticism are (1) to judge, (2) to interpret, (3) to give personal impressions of books. Matthew Arnold defines criticism as "a disinterested endeavor to learn and propagate the best that is known and thought in the world."

Crossing, The, a historical novel by Winston Churchill, detailing the adventures of a young man during the westward movement of settlers across the Alleghenies into Kentucky and Tennessee from the coastal colonies during the Revolutionary War. George Rogers Clark is the hero.

cycle, all the poems, romances and narratives dealing with a certain hero, his followers and deeds. For instance, all the prose and verse romances that have built up the legend of King Arthur and his Knights of the Round Table constitute the Arthurian cycle. The series centering around Charlemagne and his paladins is called the Charlemagne cycle. The Nibelungenlied is another cycle.

Cyrano de Bergerac, a play by Edmond Rostand, written in 1898. Cyrano, a poet and soldier in the age of Louis XIII, falls in love with Roxanne but she loves Christian, a member of Cyrano's company. Cyrano, knowing his suit is hopeless, gives himself to the service of the lovers, writes marvelous poems and letters to Roxanne in Christian's name and even woos her one night in the dark. And Roxanne falls in love anew with "the soul" of her lover. Christian is killed in war; Roxanne retires to a convent. Years later Cyrano is injured and dies attended by Roxanne, who too late learns who her real lover was.

dactyl, a metrical foot of three syllables: one accented syllable followed by two unaccented syllables.

The first five feet of each of the following lines are dactyls:

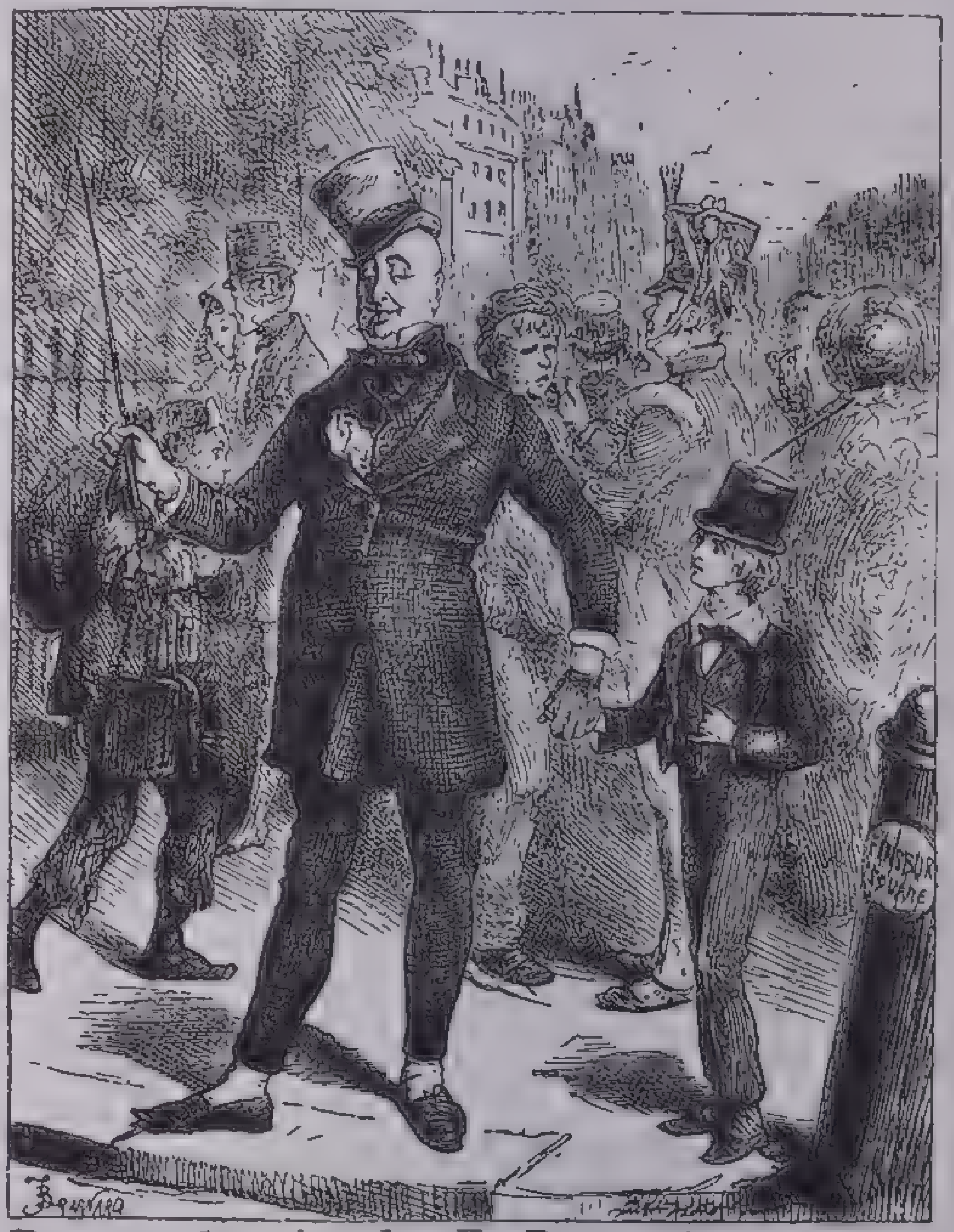
> Still′ stands the | for′est pri|me′val; but | where′ are the | hearts′ that be|neath′ it
> Leaped′ like the | roe′ when he | hears′ in the | wood′land the | voice′ of the | hunts′man?
> (From Longfellow's *Evangeline.*)

In classical meter the dactyl consists of a long followed by two short syllables regardless of accent. The name comes from the Greek word for finger—three syllables like the finger's three joints.

Daisy Miller, a short novel by Henry James, published in 1878. An American girl from Schenectady is traveling in Europe with her mother. Without realizing the difference between European and small-town conventions, the mother allows her daughter the same freedom she had at home. The book reveals how the integrity of a self-respecting American girl was misjudged in the light of a more ancient, artificial code.

d'Artagnan, in *The Three Musketeers* by Alexandre Dumas, a gentleman of Gascony who joins the king's musketeers and becomes the stanch friend of the three comrades Athos, Porthos and Aramis.

David Copperfield, a novel by Charles Dickens, published in 1849–50. It tells the story of the hero David, his sad childhood and bitter experiences as schoolboy and apprentice, the new home found for him by his aunt Betsy Trotwood, the loss of his child-wife Dora, his success as an author and his later business prosperity and second marriage to Agnes Wickfield. David's nurse Peggotty and her husband Barkis, Little Em'ly, his tyrannical stepfather Mr. Murdstone, his landlord Mr. Micawber, Uriah Heep, Mr. Dick and other characters are famous examples of Dickens's ability in characterization. *David Copperfield* was Dickens's own favorite among his works and is known to be autobiographical.



From a drawing by F. Barnard

Charles Dickens: David Copperfield

". . . Mr. Micawber impressing the names of streets, and the shapes of corner houses upon me as we went along, that I might find my way back easily in the morning."

David Balfour, a novel by Robert Louis Stevenson, published in 1893 and at first entitled *Catriona.* It is a sequel to *Kidnapped.* It tells how David tried and failed to free James Stewart, falsely accused of the murder of Colin Campbell, how Alan

Breck escaped from Scotland to Europe, and how David loved and married Catriona Drummond.

David Harum, a novel by Edward Noyes Westcott, published in 1899. David Harum was a country banker, shrewd, humorous and keen at driving a bargain, especially in horse trades. His dry wit and everyday philosophizings were widely quoted for many years.

Decameron, The, a collection of 100 tales by Boccaccio, an Italian novelist and poet of the 14th century. A group of ladies and gentlemen isolated themselves on a country estate to escape the plague then raging in Florence. Each member of the group told one story a day for ten days. (*Decameron* is Greek for ten days.) Boccaccio revealed himself in these tales as one of the greatest storytellers of all time; these famous tales are the source of many stories used by countless later writers, including Chaucer and Shakespeare.

Decline and Fall of the Roman Empire, a monumental history of Rome from the time of Trajan to the fall of Constantinople in 1453, by Edward Gibbon, published in 6 volumes in 1776–83. It is a moving panorama of the events of the world through about 13 centuries, when barbarism was conquering civilization. Gibbon spent many years in research in every capital of Europe, and so exhaustively did he pursue his theme that the *Decline and Fall* is considered one of the greatest historical works in the English language. It is learned, full of detail, somewhat prejudiced by Gibbon's antipathy to Christianity and his distrust of all noble motives. His book is still a first-class authority.

Desdemona, the heroine of Shakespeare's *Othello,* the beautiful young wife of Othello, the Moor, whom he strangled in a fit of jealousy.

Deserted Village, The, a poem by Oliver Goldsmith, published in 1770. It describes Auburn, Goldsmith's native village in Ireland, which was depopulated to make part of the large private estate of a noble. The village parson and the schoolmaster are sympathetically portrayed. The poem praises the charm and virtue of rural life in contrast with commerce and wealth and its results.

Dhu, Roderick, in Scott's *Lady of the Lake,* a Highland chieftain and outlaw, cousin of Ellen Douglas and a suitor for her hand in marriage.

Diana of the Crossways, a novel by George Meredith, published in 1885. Diana, the heroine, is continually coming to the crossways; that is, she is always having to choose which of two difficult paths to take. Her difficulties are those of love, marriage, divorce and money matters. Diana has wit, beauty and a capacity for loyalty. Her betrayal of a state secret to a newspaper is an incident the historical probability of which has caused much discussion. That her character was modeled upon that of Mrs. Norton, granddaughter of Richard Brinsley Sheridan, is now denied.

dimeter, a verse having two metrical feet.

> This doth' remain'
> To ease' my pain'.
>
> —George Peele

Divine Comedy, The, the great poetical work of Dante, written in the 14th century. The work is in three parts, describing the world beyond life: the Inferno (Hell), Purgatorio (Purgatory) and Paradiso (Heaven).

The poem presents Dante as a traveler through Hell and Purgatory under the guidance of the old poet Vergil. Hell seemed to him a pit of descending circles to which the various classes of sinners were assigned. And here Dante recognized and spoke with many old friends and famous personages of history and legend. Purgatory seemed a rising mountain within whose circles sinners were classified according to their repentance. Paradise was a world of light, reached only by repentance and purification. His own redemption Dante attributes to the influence and inspiration of his beloved and ideal Beatrice, who stands beside him at last in Paradise.

The poem is an allegory of the progress of the Christian soul, a record of Dante's own spiritual struggle and a learned discourse embracing most of the philosophical and scientific knowledge of the day.

Dixie, a patriotic song composed by Daniel D. Emmett in 1859. Dixie or Dixie Land means the South or the southern states collectively. It was adopted as a war song by the Confederate states during the Civil War and has since lived on as a favorite in all parts of the United States.

Doll's House, A, a play by Henrik Ibsen, published in 1879. Nora, the heroine, is a woman of restricted education who has been carefully protected and brought up without knowledge of the world. The result is that she is only a pretty, though devoted, doll in the house of her husband. She makes tragic mistakes and finally, at the end of the play, leaves the house to learn for herself the wisdom women need. The play is a protest against undue restriction of woman's sphere.

Dombey and Son, a novel by Charles Dickens, published in 1847–48. Mr. Dombey neglects his gentle daughter Florence, but takes great pride in Paul, his son. His pride is shattered by misfortunes. Mrs. Dombey, a second wife, humiliates him by deserting him; Paul dies while he is still a little boy; Mr. Dombey's business fails. Meanwhile Florence, who has gained the friendship of some plain seafaring people, marries one of them, Walter Gay. Her good fortune and faithfulness relieve Mr. Dombey's old age. Among the minor characters are Cap'n Cuttle, Solomon Gills and Susan Nipper, Florence's servant.

Donatello, in Hawthorne's *Marble Fawn,* a young Italian count who bears a marked resemblance to the famous statue of a faun by Praxiteles. His character is that of a carefree pagan until he falls in love with Miriam and murders a man for her sake. Then he develops into a conscience-stricken member of civilized society and gives himself up to justice.

Don Juan, a character famous in literature as the type of licentious adventurer. The legend developed around the name of Don Juan Tenorio of Seville and was first used in Spanish drama in the late 16th century. After seducing the daughter of the governor of Seville, Don Juan killed her father in a duel. Later he jestingly invited the statue of the dead man to a banquet, whereupon the statue grabbed him and delivered him to the devil. Mozart's opera *Don Giovanni* was founded on this story. Byron's poem *Don Juan* follows neither the legend nor the character type. Byron's Don Juan is altogether charming though unprincipled, and his adventures carry him to Greece, Turkey, Russia and England.

Don Quixote de la Mancha, a famous satirical romance by Cervantes, published in two parts, 1605 and 1615. The two chief characters are Don Quixote, a poor country gentleman crazed by reading stories of chivalry, and Sancho Panza, an ignorant but shrewd country fellow, his servant. The pair go adventuring and Don Quixote's insane attempt to conduct himself always as a knight leads them into many ridiculous situations. To his disordered mind windmills are giants and hotel wenches are beautiful princesses. After long wanderings the odd pair return to the village from which they set out and Don Quixote regains his sanity. The book was a burlesque on the chivalric romances and sentiments of the preceding age. But it was also far more; it was a searching discourse on life itself, and is still considered universally applicable.

Dr. Jekyll and Mr. Hyde, The Strange Case of, a novel by Robert Louis Stevenson, published in 1886. Dr. Jekyll, a London physician of good reputation, has discovered a drug that will change him from a kindly, sane man to a hideous person of cruel and criminal instincts. This wholly evil self he calls Mr. Hyde. The story portrays the struggle between good and evil in human nature. Eventually Mr. Hyde takes complete possession of the good doctor and commits a murder. The drug loses its power of restoring the better self, and in despair the poor man commits suicide.

drama (from a Greek word meaning action), a form of literary composition in prose or verse in which a story representing life and character is presented in dialogue and action, and is intended to be given by actors on a stage. Drama has developed into several different types: tragedy, comedy, melodrama, opera, burlesque, farce.

Duncan, in Shakespeare's *Macbeth,* the king of Scotland who was murdered by Macbeth.

East Lynne, a novel by Mrs. Henry Wood, published in 1861. It was made into a remarkably successful stage play, a melodrama, and in 1932 was shown as a moving picture. It is typical of the popular novel of the period.

Lady Isabel Vane, orphaned and bankrupt, was loved by two men, one noble, the other totally unworthy. She married the finer man, but later ran off with the other. Conscience-stricken, however, she left him and returned in disguise to her old home. Her husband had married again, and she hired herself out as nurse to her own children. Her husband recognized her and forgave her on her deathbed.

eclogue, a short pastoral poem, especially one by Vergil. The word originally meant selection, but Vergil's pastorals (*Bucolia*) were published as Eclogae, and the word got a special meaning.

Eddas, two ancient works in Old Norse or Icelandic. The first, the Poetic or Elder Edda, erroneously attributed to Saemund the Wise, was compiled between the 10th and 13th centuries, and is a collection of Old Norse poems explaining the creation of the world and celebrating old Norse gods and heroes—the main source of our knowledge of Norse mythology. The second or Prose Edda was written by Snorri Sturluson, an Icelandic historian and statesman of the early 13th century. Its subject matter is Norse mythology of the versification of the skalds, the ancient Icelandic poets.

Education of Henry Adams, The, the autobiography of Henry Adams, privately printed in 1906 and published in 1918. It is written in the third person and so seems remote and objective. All the political and literary ideas of his environment Henry Adams found worthless as a preparation for life; his years at Harvard seemed to him wasted; his courses in European universities never told him what to do in a present world. He was schooled in Washington Civil War politics; he was secretary to his father who was Minister to England; he became a teacher of history at Harvard and editor of the *North American Review,* but he abandoned everything to become a full-time writer and "watcher of the times."

Egoist, The, a novel by George Meredith, published in 1879. The story centers in Sir Willoughby Patterne and his self-centered search for a woman sufficiently perfect to become his wife. There is little action but much analysis of the hero's conceitedness as revealed in his ungenerous treatment of Laetitia Dale, who had long been fond of him and who finally accepted him.

elegy, any short poem of lament, deeply meditative or pathetic in tone. The outstanding example of this type is Gray's *Elegy Written in a Country Churchyard.* Elegy in the modern sense has become restricted to a lament for the dead. Among the greatest elegies of this type in the English language are Milton's *Lycidas,* Shelley's *Adonais* on the death of Keats and Matthew Arnold's *Thyrsis* on the death of Clough.

Elegy Written in a Country Churchyard, a reflective poem by Thomas Gray, published in 1751. The churchyard mentioned is Stoke-Poges in Buckinghamshire, England. The poem reflects upon fleeting fame and inevitable death. It is full of famous phrases.

Elizabethan Age, the period roughly covered by the life of Queen Elizabeth in England (1558–1603) and the years directly following marked great literary output and brilliant achievement, especially in poetry and drama. Shakespeare is the brightest name of the age; yet even his fame does not obscure such great writers as Edmund Spenser, Sir Philip Sidney, Michael Drayton, Christopher Marlowe, George Chapman, Francis Bacon, Thomas Dekker, Ben Jonson, John Donne, Beaumont and Fletcher, Robert Herrick and many others.

Emma, a novel by Jane Austen, published in 1816. It tells how a clever, self-sufficient girl intent on marrying off her protegée develops into an appreciative woman finally aware of her own failings.

Emperor Jones, The, a one-act play (in eight scenes) by Eugene O'Neill, produced in 1920 and published in 1921. Its action takes place on a West Indian island "as yet not self-determined by White Marines." The leading character is a Negro, a former Pullman porter who arrived as a stowaway and in 2 years became emperor. He was strikingly impersonated by the Negro actor Charles Gilpin.

Enoch Arden, a narrative poem by Alfred Tennyson, published in 1864. Through the accident of shipwreck Enoch Arden does not reach home for 10 years. His wife, long faithful, is finally convinced that he is dead, marries again and once more has a happy home. When Enoch returns, he sees through a window his wife and children and the new husband in a happy scene. He realizes that no good can come from revealing himself. His wife is blameless, and he would not cause her sorrow. He therefore resolves to live alone and unknown until his death.

epic, a long narrative poem celebrating the deeds of the heroes of history or legend. The ancient Greek *Iliad* and *Odyssey* of Homer typify the ancient epic. Vergil's *Aeneid* is the most famous of ancient Roman epics. Out of Iceland came the great epic fragments of the *Elder Edda;* but the Old English *Beowulf* stands out as the most perfect and important epic in all Teutonic literature, although the German *Hildebrand* and *Nibelungenlied* are equally famous. *The Song of Roland* is the greatest epic of France; the *Poem of the Cid* is Spain's. There have been no great modern epics since Milton's great *Paradise Lost,* which is often ranked with the *Iliad* and *Odyssey.*

epigram, originally, an inscription (usually in verse) on a monument; hence, a short poem expressing one pointed thought, often satirical and usually ending with a witticism or a surprise. The greatest of classical writers of epigrams were the Roman poets Martial and Catullus. Coleridge wrote:

> What is an Epigram? a dwarfish whole,
> It's body brevity, and wit its soul.

Any thought tersely and pointedly expressed in prose or verse, usually in one sentence, which sometimes seems contradictory, may be called an epigram. "Where ignorance is bliss, 'tis folly to be wise" is an epigram of this type.

epithalamium, among the ancient Greeks, a wedding poem, originally sung in chorus at the door of the bridal chamber. Theocritus wrote a marriage song of Helen, and Catullus composed an epithalamium of great beauty. Edmund Spenser's *Epithalamium* on the occasion of his own marriage (1595) is the most famous in English literature. John Donne wrote several fine poems of this type.

Erehwon, a satirical Utopian novel by Samuel Butler, published in 1872. The title is the reverse spelling of Nowhere—and Nowhere is the literal translation of Utopia. In the strange country of Erehwon disease is a crime and moral ills are matters of concern to be cured. The book is a satire on hypocrisy, the church, parental tyranny and the unintelligence of society in general. In Erehwon machinery had become so highly developed that the people had abolished it, lest it "take charge of life" and destroy mankind.

Erin, the ancient name of Ireland.

essay, a literary composition on any subject, usually in prose. There are three kinds of essay: the formal, polished essay on a specific subject, the purely technical and scientific exposition and the personal essay. The finest of the personal type are the *Essays* of Montaigne in French and the *Essays of Elia* by Charles Lamb in English.

The essay was invented by Montaigne in 1571. He chose the word *essais* to designate his writings as attempts, trials or experiments. The first of Montaigne's *Essays* came out in 1580, the fifth in 1588. They were first translated into English by John Florio in 1603. They were a new kind of writing, dealing with any subject or idea that came to the author's mind. They were brief or rambling, full of interruptions and personal moods and opinions on life and men, formless yet bound together by the personality of the author.

Francis Bacon was the first of the English essayists. He put out a volume of ten essays in 1597; the 1625 volume contained 58 including *Greatness of Kingdoms, Truth, Death, Friendship, Gardens, Reading.* They are personal opinions and reflections, brief and with more literary form than Montaigne's. Abraham Cowley is called the father of the English essay. His *Discourses by Way of Essays* (1668) contains the famous "Of Myself," a perfect example of the personal essay. The *Tatler* and *Spectator* papers (1709–14) of Addison and Steele and the *Essays of Elia* (1820–23) by Charles Lamb are delightful examples of the personal essay. Macaulay's essays (1843–44), dealing with literary and historical topics, and Matthew Arnold's *Essays in Criticism* (1865 and 1888) are polished, impersonal and formal, attacking Philistinism and preaching sweetness and light. Ruskin's essays on economic and social reform and on the appreciation of art are beautiful, picturesque prose. *Sesame and Lilies* (1865) is his best-known collection. Late in the century came the essays of Robert Louis Stevenson, notably *Virginibus Puerisque* (1881) and *Familiar Studies of Men and Books* (1882).

Ralph Waldo Emerson's *Essays* of 1841 and 1844 on such subjects as *Self-Reliance, Compensation, The*

Courtesy Canadian National Railways

The Church at Grand Pré, Nova Scotia, and Monument to Evangeline
The church has been reconstructed as it was in 1755 when the Acadians were exiled

Over-Soul, Fate and *Power* are New England transcendental sermons—with no trace of the whimsy of the personal essay. Max Beerbohm, Hilaire Belloc and G. K. Chesterton are prominent among 20th century essayists.

Essay on Man, an essay in rhymed couplets by Alexander Pope, published in 1732–34. It attempts to explain the nature of man, his place in the universe and his relation to mankind and to God. The style is epigrammatic, and many phrases and couplets are famous quotations.

Essays of Elia, a collection of essays by Charles Lamb, published in 1820–23. These are semi-autobiographical essays full of humor and pathos and personal whimsy, easy and brilliant in style. The range of reminiscence and fancy is indicated by some of the titles: *Christ's Hospital, South-Sea House, Old China, Poor Relations, Dissertation upon Roast Pig, Dream Children.* Lamb took the name Elia from an Italian clerk in the South-Sea House of London, where Lamb worked.

Evangeline, a narrative poem by Henry Wadsworth Longfellow, published in 1847, one of the few long poems in English composed in hexameters (the verse of the *Iliad* and the *Aeneid*). The scene is first laid in Grand Pré, Acadia (Nova Scotia), from which the French settlers were expelled by the British in 1755. They were widely scattered through the English and French settlements to the south. Evangeline became separated from Gabriel, her lover, who was sent to one of the French settlements on the lower Mississippi River in Louisiana. In her search for him she finally reached his Louisiana farm only to learn that he had moved west. After many years of quest Evangeline became a sister of mercy, and in an almshouse she found her Gabriel, ill and dying.

Eve of Saint Agnes, The, a poem by John Keats, written in 1819. Madeline believed in the old legend that a maid would dream of her lover on St. Agnes's Eve. An old servant secretly admitted Madeline's lover to her chamber, although he was a foe of her kinsmen. She dreamed of him and woke to find him beside her. The pair escaped together from the castle unseen by the drunken revelers of the night's feast.

Faerie Queene, a long poem by Edmund Spenser, of which Books 1-3 were published in 1590 and Books 4-6 in 1596. There are only six complete books, though Spenser planned to write twelve. The Faerie Queene, Gloriana, symbolizes glory and Queen Elizabeth. Her 12 knights symbolize abstract virtues and at times specific subjects. The Red Cross knight symbolizes holiness and the Anglican Church. Other knights represent temperance, chastity, friendship, justice, courtesy, constancy and so on. The poem has some passages of rare beauty but is dull reading on the whole, with many allusions meaningless to modern readers.

Fagin, in *Oliver Twist* by Charles Dickens, an unscrupulous old Jew who employs pickpockets and thieves and teaches boys to become adept in his profession. The name is used of any thief or trainer of thieves.

Falstaff, Sir John, a famous character in Shakespeare's Henry IV. He is a fat old knight, a jesting, bragging drinker with enough shrewd wit to get out of all his scrapes. Dr. Johnson said that Falstaff "makes himself necessary to the prince by perpetual gaiety and by unfailing power of exciting laughter."

farce, a dramatic work intended only to be funny and excite laughter. The word comes from the Latin *farcire,* to stuff. In medieval France the actors used to stuff comic byplay and sentences into the religious dramas to lighten the text. The modern farce is purely a light comic drama of highly improbable plot or characterization, sometimes satirical but usually only laugh-provoking.

Farewell Address, George Washington's, George Washington's farewell message to the American people, issued Sept. 17, 1796, during the last days of his presidency. Alexander Hamilton wrote the first draft, but Washington reshaped it and it is spoken of as Washington's own. It is still quoted and revered as embodying the basic fundamentals and ideals of Americanism. A famous passage follows:

> Be Americans. Let there be no sectionalism, no North, South, East or West; you are all dependent one on another, and should be one in union . . . . . . Beware of the baneful effects of party spirit and of the ruin to which its extremes must lead. Do not encourage party spirit, but use every effort to mitigate and assuage it. Keep the departments of government separate, promote education, cherish the public credit, avoid debt. Observe justice and good faith toward all nations; have neither passionate hatreds nor passionate attachments to any; and be independent politically of all. In one word, be a nation; be Americans and be true to yourselves.

Fathers and Sons, a Russian novel by Ivan S. Turgenev, published in 1862. It is a story of the struggle between old and new political and social forces in Russia, as represented by the sons and fathers. Turgenev called the young hero of his novel a *nihilist,* meaning only that he rebelled against all and any authority. Its widespread use as a political term started with this book. The novel portrays the state of society and the mind of the people that later upset old Russia.

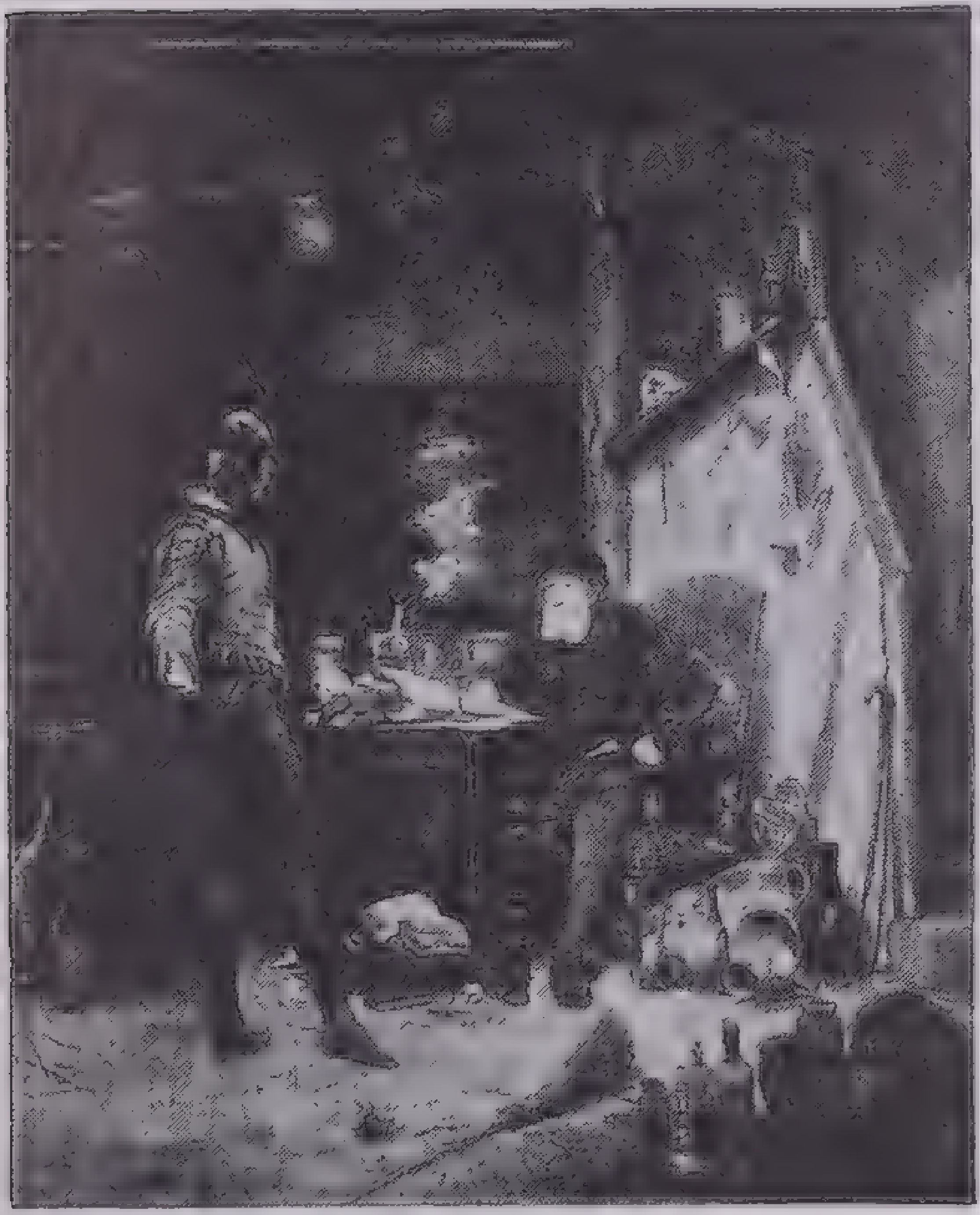
Faust, in German legend, a 16th-century conjurer who sold his soul to the devil in return for a certain number of years of happiness and knowledge and power. He appeared in numerous ballads, sermons and Faust books from 1543 on. In 1587 the *History of Dr. Johann Fausten* was published by Johann Spies, which was translated into many languages and appeared in English as *The History of the Damnable Life and Death of Dr. John Faustus.* On this translation Christopher Marlowe based his famous drama *The Tragicall History of Doctor Faustus,* first acted in 1588 and published in 1604. He presents Faustus as a man appealing and human in his zest for the fulness of life and in his remorse when the devil gets him in the end.

Goethe's great drama *Faust* was published in two parts, one in 1808, the second in 1832. It symbolizes the search of the human soul for lasting satisfaction. Faust makes a bargain with Mephistopheles (the devil) to become his if Mephistopheles can give him just once joy so great that to the passing moment he will cry "Oh, stay, thou art so fair." The drama reveals the accumulation of bitterness and discontent that nothing but earthly pleasures brings to the human mind. When at last Faust would hold one moment fast and does cry, "Stay, thou art so fair," it is because he has lost himself in a great and selfless deed. This vitiates the bargain, since the devil had not given him this satisfaction. Thus the soul of Faust is saved.

fiction, all imaginative literature in narrative or drama form. The term embraces drama, short stories, novels and romances. The term is often used as a synonym for novel. Even in historical novels the plot is imaginative and the detail is not historically accurate. Many narrative and dramatic poems are fiction, but the term usually refers to prose.

foot, in versification, a unit of meter. A foot consists of a group of two or three syllables of which one is accented. The principal feet used in English poetry are:

iambus, unaccented plus accented,
trochee, accented plus unaccented,
dactyl, accented plus two unaccented,
anapest, two unaccented plus one accented.



From a drawing by A. Jacomin

The Devil (Mephistopheles) and Faust

Forsyte Saga, The, a trilogy of novels by John Galsworthy: *The Man of Property* (1906), *In Chancery* (1920) and *To Let* (1922). The Forsytes were an upper middle-class English family. Their story is traced from 1886 through the late Victorian age into the first 20 years of the 20th century. It is a story of the possessive instinct, embodied in Soames Forsyte, the man of property. He was determined to have what he wanted from life and to exercise his power over his possessions: his property and investments, his wife. The destructive influence of possessiveness on the lives of others, reaching far into the next generation is revealed, and how it turned upon Soames himself to strip him of all he sought. The state took over his investments and his wife became a free personality. *The Forsyte Saga* is the most important of Galsworthy's works. The story was continued in another trilogy called *The Modern Comedy* (1929); and the Forsyte family appears in several other stories by Galsworthy.

Four Horsemen of the Apocalypse, a novel by Vicente Blasco Ibáñez, published in Spanish in 1916 and in English in 1918. It is a World War story up to the Battle of the Marne. A wealthy don from Argentina has moved to Paris; his family has relatives who are Germans, and thus French and German psychology during these stirring times is vividly contrasted. The Four Horsemen are War, Famine, Pestilence and Death. The story culminates in the old man's joy that his son Julio has enlisted with France at last and in the boy's death in the trenches.

Frankenstein, a romance by Mary Wollstonecraft Shelley, wife of the poet, published in 1818. Frankenstein, a young medical student, has discovered the principle of life, constructs a being in the likeness of a man out of bones he has collected and endows it with life. The monster thus created is lonely and unhappy; his frightful appearance creates fear and loathing in all who meet him; and he demands that Frankenstein create a companion for him. When Frankenstein refuses, the monster turns upon his creator with hatred and pursues him to his death. The monster is never seen again.

free verse, verse that is rhythmical without formal meter, stanza or rhyme. The French term *vers libre,* meaning free verse, was adopted by a modern school of poets in Europe and America who sought to liberate poetry from conventions and rules that hamper the scope of poetry. Cadence is the term used for a new kind of internal rhythm in poetry following the rhythms of natural human speech, yet aiming also at variety and balance. Cadence accomplishes a kind of metrical regularity by the use of one constantly recurring line form or a constantly recurring strophe—like a refrain. The influence of the King James version of the Bible had something to do with free verse—a metrical English based on an Oriental poetry form without meter and rhyme but with parallelism and powerful figures of speech.

Walt Whitman's *Leaves of Grass,* is an early and influential example of free verse. Other exponents of the school are Amy Lowell, Carl Sandburg, Ezra Pound and T. S. Eliot.

Gallegher and Other Stories, a volume of short stories by Richard Harding Davis published in 1891. Gallegher in the title story is a quick-witted boy in a newspaper office who turns amateur detective and has many thrilling adventures.

Gettysburg Address, the short address delivered by Abraham Lincoln at the dedication of the Gettysburg National Cemetery, November 19, 1863. The orator of the day was Edward Everett, who spoke for more than an hour. Lincoln intended to say little, and his speech was only 267 words long. Brief, eloquent, moving, unforgettable, it is one of the supreme pieces of American literature. The whole address follows:

"Fourscore and seven years ago, our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But in a larger sense we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it far above our poor power to add or detract. The world will little note, nor long remember, what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us,—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion,—that we here highly resolve that these dead shall not have died in vain,—that this nation, under God, shall have a new birth of freedom,—and that government of the people, by the people, for the people, shall not perish from the earth."

Gilbert and Sullivan operas, a series of comic operas—a remarkable collaboration. The lyrics were by Sir William S. Gilbert and the music by Sir Arthur Sullivan. They were sometimes called the *Savoy operas* because after 1882 they were produced at the Savoy Theatre in London. Many of them are satires on current topics or social customs of the day. They are absurdly whimsical with fantastic rhymes and remarkable patter in the recitatives and songs. Some of the verse had been published separately in *Bab Ballads* (1869 and 1873). The music is light and charming with an occasional suggestion of Sullivan's church-music style. The titles are: *Trial by Jury* (1875), *The Sorcerer* (1877), *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1879), *Patience* (1881), *Iolanthe* (1882), *Princess Ida* (1884), *The Mikado* (1885), *Ruddigore* (1887), *The Yeomen of the Guard* (1888), *The Gondoliers* (1889), *Utopia, Limited* (1893) and *The Grand Duke* (1896).

Gog and Magog, two huge wooden statues in the Guildhall, London, said to represent two old giants of Albion, or ancient Britain. British legend says that after their race was destroyed by Brute and his followers, Gog and Magog were taken to London to be porters of the palace gate. Geoffrey of Monmouth mentions a giant Goemagot who was killed by Corineus; and the two statues are said to represent Goemagot and Corineus. In William H. Ainsworth's great historical novel *The Tower of London,* two gigantic brothers, porters in the service of Mary Tudor, Queen of England, are named Gog and Magog.

Gold Bug, The, a short story by Edgar Allan Poe, published in 1843. Two men living in a rude house on Sullivan's Island, off shore from Charleston, S. C., discover an old parchment covered with mysterious figures and signs. It is a cipher, which, when solved, leads them to great treasure buried by the old pirate, Captain Kidd.

golden age, any period of great progress and high attainment in the civilization, literature or art of any country. In England the golden age is unanimously considered the Elizabethan age (*c.* 1550–1630).

Golden Ass, a collection of stories in 11 books by Apuleius, written in the 2nd century A.D. It is written in the form of an autobiography by one Lucius, who by mistaken enchantment was changed into an ass. The poor beast had to wander far and wide in search of the charm that would restore him to human shape, and in his wanderings encountered many strange people and adventures. The famous story of *Cupid and Psyche* is in this book. The stories comprise a masterly medley of humor, fantasy and realism.

Goneril and **Regan,** in Shakespeare's tragedy *King Lear* the two elder daughters of the king.

Great Expectations, a novel by Charles Dickens, published in 1861. Pip, a village boy who longed for riches and social station, suddenly received from an unknown source wealth and the chance for an education. In his pride he turns his back on his humble friend Joe Gargery, the blacksmith. But Pip's benefactor turned out to be an escaped convict to whom he had once smuggled food when a small boy, and the old man's touching gratitude and love humbled Pip. The convict was captured, his wealth taken by the state, and Pip's "great expectations" vanished into thin air. After years of hard work he married Estella, his childhood love, whose arrogance had also been humbled by the years.

Green Mansions, a romance by W. H. Hudson, published in 1916. It is a story of the South American tropical forest and the beautiful bird-girl, Rima, who is loved by Mr. Abel. After an idyllic courtship, Rima decides to return to civilization with Abel and find her mother's people. But the discovery that they have been destroyed overwhelms her, and she flees back to her beloved forest. She is captured by the superstitious savages, who think she is an evil spirit, and is burned to death. Abel returns home to live with the memory of his love. No description of the book can convey its magical charm.

Grimm's Fairy Tales, a collection of folk tales (collected 1812–15) by the brothers Jakob and Wilhelm Grimm of Germany. They were translated and published in English in 1823 as *German Popular Stories.* The collection contains the loved and familiar stories of *Hansel and Gretel, Cinderella, Faithful John, The Goose Girl, Tom Thumb, The Frog Prince, Snow White* and many others.

Grundy, Mrs., a person constantly referred to in Thomas Morton's comedy *Speed the Plough.* The other characters when discussing their possible actions, always ask, "What will Mrs. Grundy say?" Fear of the unfavorable opinion of the old lady, who never appears, deters them from following many wholesome natural inclinations. She personified the conventional public opinion that is dreaded by most people.

Gulliver's Travels, a satire by Jonathan Swift, published in 1726. In four parts it tells of the hero's voyages to imaginary lands: Book I, to the island of Lilliput, the land of the pygmies; Book II, to Brobdingnag, the land of the giants; Book III, to various countries, chief of which is Laputa, the home of eccentric scholars; and Book IV, to the country of the Houyhnhnms, a land where horses with an intelligence superior to that of mankind, carry on an ideal government. The first book is a satire on English politics and ecclesiastical controversies. Book II is an indictment of civilized government and human institutions in general. Book III reveals the deceptions of great learning. Book IV is the peak of all satires on human nature and its follies, vices and weaknesses. Its simple style and remarkable imagination have made it a children's story book now that the satire is forgotten.

Hamlet, a tragedy by William Shakespeare, first published in 1603. Hamlet, Prince of Denmark, urged to seek vengeance by the ghost of his murdered father, defers action and indulges in bitter and melancholy indecision. He discovers the truth of the murder by a court play, breaks his engagement with Ophelia, kills her father by mistake instead of his uncle, the king, and is sent to England by the king to be put to death. But he is captured by pirates and returned to Denmark. There he finds that Ophelia, mad with grief, had drowned herself. Hamlet is killed by a poisoned sword in a fencing match with Laertes, Ophelia's brother, but stabs the king before he dies and thus at the last moment avenges his father.

Hard Times, a novel by Charles Dickens, published in 1854. It satirizes extreme reliance upon statistics and a mechanical understanding of human relations. Its best known characters are Thomas Gradgrind, who worships statistics, and Josiah Bounderby, a conceited, self-made man who holds in contempt the humble life from which he came. Mr. Gradgrind is finally awakened to the worthlessness of his material ideals by the misery of his daughter, Louisa. But Mr. Bounderby to the very end can see no flaw in himself.

Heep, Uriah, a character in Charles Dickens's *David Copperfield,* a very 'umble person whom the reader despises for his abject attitudes. His hypocrisy is exceeded only by his treachery and his diabolical cunning.

Henry IV and **Henry V,** two historical plays by William Shakespeare. *Henry IV* was produced about 1597, *Henry V,* in 1599. Both plays deal with the character of Henry V. In *Henry IV,* part 1, the gay life of young Prince Hal is described; in part 2 his reflections upon his manner of life are given; and in *Henry V* the patriotism and wisdom of his character as king are set before us. The action of *Henry V* covers the years from 1414–20, including a treacherous plot upon the king's life by three of his nobles, a campaign in France, the battle of Agincourt and the king's courtship of the French princess, Katherine. The play is remarkable for its patriotic passages and its delineation of typical soldiers, some, like Fluellen the Welshman, Macmorris the Irishman and Jamy the Scot, from different parts of Henry's kingdom; others, like Pistol, Nym and Bardolph, from the scum of the army.

Henry Esmond, a novel in the first person by William Makepiece Thackeray, published in 1852. It is the story of Esmond's life, of his love for Lady Castlewood and his courtship of the beautiful Beatrix Esmond, of his military career, of his part in bringing the Pretender to England when Queen Anne was dying, of the failure of his political hopes, of his disillusionment in Beatrix and finally of his marriage to Lady Castlewood, Beatrix's mother, and their emigration to America. *The Virginians* is a sequel to *Henry Esmond.*

heptameter, a line of poetry containing seven metrical feet. Example: Oh, East is East, and West is West, and never the twain shall meet.—Rudyard Kipling.

hexameter, a line of poetry containing six metrical feet. Example:

> And looking o'er the hedge, before
> me I espied
> A snow-white mountain lamb with
> a maiden at its side.
> (From Wordsworth's
> *The Pet Lamb.*)

Dactylic hexameter is the meter of Greek and Latin epic poetry—the *Iliad, Odyssey* and *Aeneid.* In English it has been imitated in Longfellow's *Evangeline.*

Hiawatha, a poem by Henry Wadsworth Longfellow, published in 1855, written in an eight-syllabled trochaic verse imitated from the Finnish epic *Kalevala.* It embodies many legends and traditions and much of the culture of the North American Indians in the life of Hiawatha, son of Wenonah "and the West Wind, Mudjekeewis." He is reared by his grandmother, "daughter of the moon, Nokomis," marries Minnehaha and becomes the culture hero of his people. He teaches them the culture of maize (Indian corn), picture writing and many other things. With the coming of the white priest he departs for the islands of the blest,

> To the kingdom of Pomenal,
> To the land of the Hereafter.

House of the Seven Gables, a novel by Nathaniel Hawthorne, published in 1851. The story is laid in old Puritan Salem. Poor old Hepzibah Pyncheon who lives in the house of seven gables has had to open a shop because of her poverty. Her old brother Clifford arrives home, his mind weakened by 30 years of unjust imprisonment. Judge Pyncheon, his cousin, who engineered Clifford's arrest, continues to persecute the old man, threatening now to confine him in an asylum. But the malicious judge dies of apoplexy in time for old Hepzibah and Clifford to have a few years of peace.

Huckleberry Finn, The Adventures of, a chronicle of boy life on the Mississippi by Mark Twain (S. L. Clemens), pub-

Courtesy New England Council

House of the Seven Gables, Salem, Massachusetts

This house, built in 1669 by John Turner, is said to have inspired Nathaniel Hawthorne's novel. It was owned by three generations of Turners followed by three generations of Ingersolls, the last of whom, Miss Susan Ingersoll, was Hawthorne's cousin

lished in 1884. It is a sequel to *Tom Sawyer*. Huck and his pal, Tom Sawyer, run away from home and adventure down the Mississippi River on a raft. Until their final return up the river, thrilling, funny and pathetic incidents succeed one another in rapid succession. Besides telling a purely entrancing boy's story, the book is a remarkable picture of the great river, the life along its banks and the old social order of those days and its problems.

Hypatia, a historical romance by Charles Kingsley, published serially in 1851 and in book form in 1853. The scene is Alexandria in the 5th century A.D. The Roman order is passing. Christianity in both its fanatic and its finer aspects is contrasted with Greek philosophy made sane and new and beautiful through the personality of the lovely, learned Hypatia. Hypatia was finally torn to pieces and burned by a mob of fanatic Christians who were fearful of her influence. Hypatia was a real person, a Neoplatonic philosopher and daughter of the geometrician and astronomer, Theon. She was seized in her lecture room in March 415 by a mob of Christians, tortured and burned to death.

iambus or **iamb,** a metrical foot of two syllables, of which the second is accented. Example:

And I′ | awoke′ | and found′ | me here′.
(From *La Belle Dame Sans Merci* by
John Keats.)

idealism, the imaginative or subjective treatment of the subject matter in literature, contrasted with the true-to-life or photographically realistic treatment. The idealistic writer or artist tries to depict human nature as it might be or ought to be instead of as it is. Idealism is the opposite of realism.

idyl or **idyll,** originally, a little picture or description in prose or verse of pastoral or rustic life. Idyls are usually short poems and take their name especially from the *Idyls* of the Greek pastoral poet Theocritus of the 3rd century B.C. His *Idyls* were imitated by Vergil and other Roman poets, and they are the type from which the modern definition of the word is taken. Wordsworth's *Michael* and Burns's *Cotter's Saturday Night* are true modern idyls. Sometimes *idyl* is used of longer poems, especially if they are sentimental; Tennyson's *Idylls of the King* is the best example in recent literature. The idyl cannot be considered a literary form—the term is not sharply defined.

Idylls of the King, a group of 12 connected narrative poems in blank verse by Alfred Tennyson, published between 1859 and 1885. They tell the story of King Arthur and his knights. Tennyson took his material largely from Malory's *Morte d'Arthur,* but drew also on Layamon's *Brut,* Geoffrey of Monmouth's *History of the Kings of Britain* and Lady Charlotte Guest's translations from the Welsh. His own addition was that Arthur symbolized the perfect knight and king and that his ideal kingdom was undermined by disillusionment and deceit. The *Idylls* are: *The Coming of Arthur, Gareth and Lynette, The Marriage of Geraint, Geraint and Enid, Balin and Balan, Merlin and Vivien, Lancelot and Elaine, The Holy Grail, Pelleas and Etarre, The Last Tournament, Guinevere* and *The Passing of Arthur.*

Iliad, The, an ancient Greek epic poem attributed to Homer and classed as one of the greatest masterpieces of the world's literature. It tells the story of the 10 years' siege of Troy by Greek armies which sought to bring Helen, the most beautiful of mortal women, back to Sparta, whence she had been carried away by Paris, a Trojan prince. The epic tells of the pitched battles, of individual combats, of the great Greek warrior, Achilles, sulking in his tent, of the fight between Achilles and Hector, during which Hector is slain.

Il Penseroso, a poem by John Milton written in 1632. The word means the pensive or melancholy man. The poem is a companion piece to *L'Allegro* and describes the pleasures of meditative life.

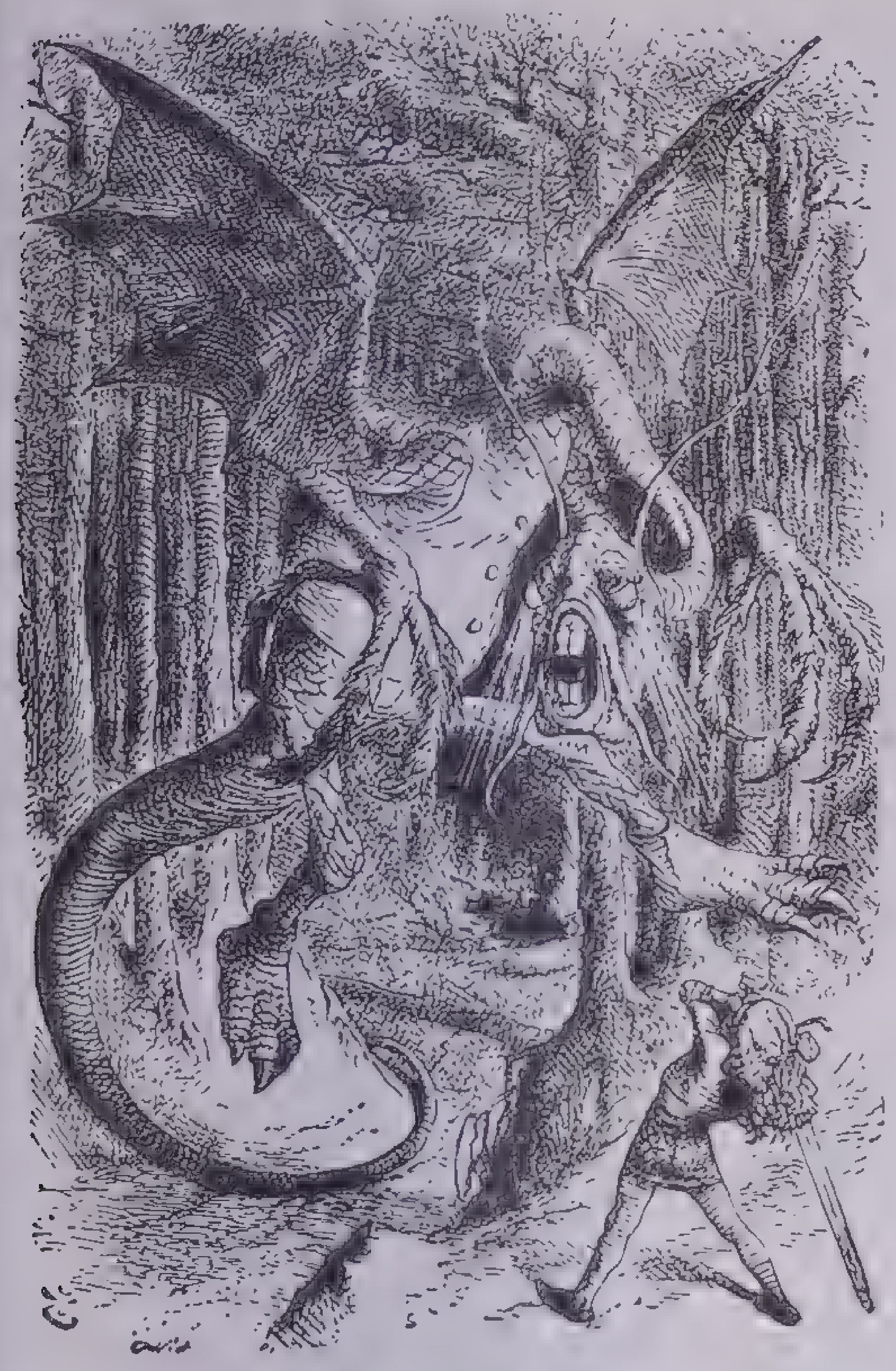
impressionism, the treatment of scenes, characters and emotional reactions in the simplest manner possible, without elaboration of detail or explanation, but as directly as actual impressions are experienced. The term as applied to literature is borrowed from painting and specifically from a school of French painters in the 1860s—Monet, Manet, Renoir, Pissaro, Degas and others—who tried to paint things as they appeared rather than as the artists knew they were. So in painting, impressionism is the recreation of the instant sense impression, of what was true to the artist in the fleeting moment, without detail or reference to permanent fact. In music, it is a kind of description through the creation of moods.

In Memoriam, a series of poems by Alfred Tennyson, published in 1850, but written at intervals from 1833 to 1850. They were inspired by grief for the death of his intimate friend Arthur H. Hallam, who died in 1833, and they record the varying moods and thoughts of Tennyson's sorrow, overwhelming grief and sense of loss gradually deepening into spiritual communion and greater love. The title is Latin and means a memorial.

Innocents Abroad, a book by Mark Twain, published in 1869, telling the experiences of a group of Americans traveling through Europe, Egypt and the Holy Land. Their hard-headed valuation of everything on its own merits makes the book uproariously funny and at the same time a subtle criticism.

Intimations of Immortality from Recollections of Early Childhood, a poem by William Wordsworth, published in 1807. It is an argument for immortality based on childhood memories of pre-existence, which fade year by year yet persist through adult life as intuitions or *intimations.* "Our birth is but a sleep and a forgetting." The human soul comes from afar

" . . . trailing clouds of glory do we
come
From God who is our home:
Heaven lies about us in our infancy!
Shades of the prison-house begin to
close
Upon the growing boy."



From a drawing by Sir John Tenniel

The Jabberwock and the Beamish Boy

"The Jabberwock, with eyes of flame,
Came whiffling through the tulgey wood,
And burbled as it came!"

Wordsworth laments that with manhood the vision fades "into the light of common day" but rejoices that nothing can wholly abolish or destroy that strange innate memory.

Ivanhoe, a novel by Sir Walter Scott, published in 1819. Its scene is laid in England in the 12th century, a period of adjustment between the Normans and the Saxons. The Saxon hero, Wilfred of Ivanhoe, a retainer of Richard Coeur de Lion, has been disinherited by his father because he loves his father's ward, Rowena. His successive adventures as a victor in a brilliant Norman tournament, wounded prisoner in Front-de-Boeuf's burning castle and champion of his noble Jewish benefactress Rebecca in her trial for witchcraft end with his marriage to Rowena. Among the characters are Cedric, Athlestane and Rowena, Gurth the swineherd and Wamba the jester, Isaac and Rebecca, Locksley or Robinhood and his band of outlaws, the Norman nobles, De Bracy, Front-de-Boeuf and Bois Guilbert, Prince John and King Richard himself.

Jabberwock, an imaginery monster in *Through the Looking Glass* by Lewis Carroll, the subject of a famous poem "Jabberwocky" found by Alice in a Looking-Glass book. The poem contains many imaginative coined words, and the first two lines are famous:

'Twas brillig and the slithy toves
Did gyre and gimble in the wabe.

Jane Eyre, a novel by Charlotte Brontë, published in 1847. It tells the story of the orphan Jane and her unhappy childhood; her life as a governess; her strange wooing by Mr. Rochester, the father of her pupil, a man with a mysterious past; her discovery that he had an insane wife whom he kept under guard in a room of his house; the burning of the house, the blinding of Rochester in an attempt to rescue his wife from the flames and his subsequent marriage to Jane. The novel describes Lowood, the charitable school where the Brontë sisters actually spent several wretched years. A plain heroine gifted with wit and character and a fascinating, unhappy hero not drawn in the gallant mode made the book famous at once, and its appeal has continued to the present day.

Jerusalem Delivered (*Gerusalemme Liberato*), an Italian epic poem, story of the First Crusade, written by Torquato Tasso late in the 16th century. Tasso's revision was published in 1593. It was first translated into English in 1594. The most famous translation is by Edward Fairfax (1600) entitled *Godfrey of Bulloigne.* The poem is in 20 cantos and relates the capture of Jerusalem from the infidels by Godfrey of Bouillon and his crusading army at the end of the 11th century. Three sets of lovers augment the story. Rinaldo, Prince of Este, plays the heroic role in the capture of the city, though he lived 100 years later.

John Gilpin, The Diverting History of, a poem by William Cowper, published in *The Task* in 1785. He wrote it one night in 1782 after his sister told him the story to drive away his melancholy. After 20 years of married life John Gilpin and his wife agreed to take a holiday. The family set out for a nearby town tavern in a chaise, with John Gilpin astride a borrowed horse. As soon as the horse began to trot, Gilpin lost control of it, dashed hatless, wigless and capeless through Edmonton and on to Ware, 10 miles beyond, where he turned the horse around but could not stop until he got back home.

John Halifax, Gentleman, a novel by Dinah Mulock, published in 1857. John Halifax, an orphan at the age of 11, becomes "one of nature's noblemen," rich and famous.

Joseph Andrews, a novel by Henry Fielding, published in 1742. It tells the story of a virtuous servingman, Joseph Andrews. The book was begun as a parody on Richardson's Pamela, the story of a virtuous long-suffering maidservant. Fielding makes his hero, Joseph Andrews, the brother of Pamela. Its most famous character is Parson Adams, a lovable country clergyman.

Julius Caesar, a tragedy by William Shakespeare, produced about 1599 and first printed in 1623. It deals with the assassination of Caesar and the battle of Philippi. Caesar, at the height of his power in 44 B.C., is warned to beware the ides of March, but proceeds to the Senate house, where he is stabbed by the conspirators. The mob hears Brutus deliver a speech justifying the murder of Caesar, but it turns to Antony when he appeals to Caesar's love for them and reads his will. Civil war follows, and Antony and Octavius finally defeat Brutus and Cassius at Philippi.

Because Shakespeare chose to make Brutus the hero of his play, he was forced to overemphasize the ambition of Caesar.

Lucas & Pritchard photo

A Modern Production of Shakespeare's Julius Caesar

BRUTUS: I kiss thy hand, but not in flattery, Caesar:
Desiring thee, that Publius Cimber may
Have an immediate freedom of repeal.

CAESAR: What, Brutus!

CASSIUS: Pardon, Caesar, Caesar pardon,
As low as thy foot does Cassius fall
To beg enfranchisement for Publius Cimber.

CAESAR: I could well be moved, if I were you,
If I could pray to move, prayers would move me,
But I am constant as the northern star; . . . —Act III, Scene 2

Left to right: *Brutus* (Orson Welles); *Metellus Cimber* (Stefan Schnabel); *Casca* (Hiram Sherman); *Julius Caesar* (Joseph Holland) and *Cassius* (Martin Gabel) in the Mercury Theater production of *Julius Caesar*

Brutus is the real hero of the play. He loves Caesar and joins the conspiracy only after he is convinced that Rome must be rid of Caesar. Even Antony believes in Brutus's integrity of purpose when he says:

> "He only in a general honest thought
> And common good to all, made one of them."

Jungle Books, two collections of animal stories by Rudyard Kipling, published in 1894 and 1895. The scenes are laid in the jungles of India. Most of the stories are about the boy Mowgli who was lost from his native village and reared by a she-wolf along with her own cubs. His education by the beasts of the jungle, his troubles and adventures and his final unwilling return to his own kind form the subject matter of a series of entrancing tales. Other stories in the collection have to do with the fabulous white seal of northern waters, little Tomai of the elephants and others. Kipling endows the animals with speech, yet they retain all their own characteristics and never become unnatural personifications.

Justice, a tragedy by John Galsworthy, published in 1910. The love of William Falder for the wife of a man who mistreats her causes him to forge a check to get money to give her release from her husband. He is caught, tried, sentenced to imprisonment. After his release he is arrested again for a failure to report to the authorities. In despair he kills himself. The play was a powerful criticism of certain prison conditions then existing in England.

Kalevala (literally, from the land of Kaleva), the mythological songs and poems of Finland, heard from the peasantry and collected by Zacharias Topelius in 1822 and again by Elias Lönnrot in 1835. Lönnrot enlarged his collection to 22,793 lines for the second book in 1849. The poems are fundamentally lyric, of mythical and heroic subject matter, and date back to very ancient times. The collection is named for the three sons of Kaleva, a Finnish giant: Wainamoinen, god of music and inventor of the harp, Ilmarinen, the smith, and the hero Lemminkainen. Their adventures warring in the far north make up most of the story. There are some sections of great lyrical beauty, such as the description of the creation of the world. An English translation by W. M. Crawford appeared in 1887, and the powerful meter used by Lönnrot had been adapted to English in Longfellow's *Hiawatha* (1855).

Kenilworth, an historical romance by Sir Walter Scott, published in 1819. Its scenes are laid in Elizabethan England. Queen Elizabeth is the central character, surrounded by the famous men of her day, Lord Burleigh, Edmund Spenser, Sir Walter Raleigh and the Earls of Surrey and Leicester. Leicester is the favorite of the queen; rumors of a marriage are in the air, Leicester, however, is secretly married to Amy Robsart, whom he keeps hidden and guarded. The complications arising from this state of affairs come to a head at the great pageant in honor of the queen at Leicester's castle at Kenilworth, with the result that Amy is murdered by Leicester's unscrupulous confidant and follower, Richard Varney. When Leicester confesses his marriage, Elizabeth, feeling duped both as queen and woman, is enraged and disgraces him.

Kidnapped, a novel by Robert Louis Stevenson, published in 1886. The hero of the book, David Balfour, is sent to sea by a treacherous and cruel uncle. There he meets Alan Breck, a spirited and hardfighting Jacobite. They have wonderful adventures on sea and in the Highlands.

Kim, a novel of India by Rudyard Kipling, published in 1901. An Irish orphan, Kim (Kimball O'Hara) grew up in the native quarter of Lahore and became unofficially attached to the British Secret Service in India. Kim fell in with an old Buddhist lama of Tibet whom he accompanied through India in search of the river of Immortality. Eventually members of his father's old Irish regiment found Kim and he was adopted by them and sent to school.

King Lear, a tragedy by William Shakespeare, produced in 1606 and published in 1608. The plot deals with the ingratitude of King Lear's daughters, Goneril and Regan, between whom he has divided his kingdom, and the fidelity of his daughter Cordelia, whom he has disinherited because, despising hypocrisy, she would not protest that she loved him more than her duty. The ungrateful daughters rob the old king of his power, prejudice him against Cordelia and deprive him of all but the bare necessities of life. Their cruelty drives him out into a violent storm one night with a few faithful friends, and in grief he goes insane. Cordelia, however, comes to his aid with an army. Then follows in rapid succession the violent deaths of Goneril, Regan, Cordelia and King Lear.

Koran or **Qurân,** the sacred book of the Mohammedan religion, written in Arabic. It contains the recitations or revelations of Mohammed, delivered orally by him and taken down by scribes or memorized by some of his followers. The final authorized version was put together (660 A.D.) by Zaydibn Thabit, Mohammed's secretary, at the order of the Caliph Uthman. The Koran is probably the most influential book in all human history except the Bible.

Kubla Khan, a poem by Samuel Taylor Coleridge, published in 1816. The subtitle is *A Vision in a Dream.* Coleridge fell asleep over a book of voyages describing strange lands and awoke realizing that he had composed a poem in his sleep. He began at once to write it down but he was interrupted before he finished and could not recapture the vision to complete the poem. The existing fragment, however, about 55 lines, presents the vision of the magical place where Kubla Khan ordered his palace to be built.

> It was a miracle of rare device,
> A sunny pleasure-dome with caves of ice!

Lady of the Lake, a narrative poem in six cantos by Sir Walter Scott, published in 1810. Ellen, daughter of the outlawed Lord James of Douglas, lives with her father in hiding with Roderick Dhu, a Highland chief, near Lake Katrine. The king (possibly James V) visits them disguised as Fitz-James and falls in love with her, but Ellen loves Malcolm Graeme. Roderick is wounded in a fight with the king. Ellen secures her father's pardon and marries Malcolm. The poem contains several of Scott's finest short lyrics.

Lady or the Tiger, The, a short story by Frank R. Stockton, published in 1882. A princess of a barbaric kingdom secretly loved a young man. When the king learned of this, he condemned her lover to face the wild beasts in the arena, but on the tearful supplication of the princess consented to give him one chance for his life. He was to be placed alone in the arena, facing two doors. Behind one would be a beautiful woman; behind the other, a tiger. If he chose the one concealing the lady, he must marry her; if he chose the one concealing the tiger, he would be devoured. The princess, who had discovered which door concealed the lady and which the tiger, gave her lover a signal which door to choose, but the story does not tell which door it was!

Lady Windermere's Fan, a play by Oscar Wilde, produced in 1892. Lady Windermere decides to leave her husband because he is in love with another woman. She does not know that the other woman is her own mother whom she had not seen since she was a child. The mother finds Lady Windermere's letter of farewell and seeks her out in the rooms of her lover, Lord Darlington. Lord Windermere finds his wife's fan in Darlington's room, and the mother takes the blame for its being there, saying that she herself picked up the fan by mistake. Lord Windermere is then reconciled with his wife.

Lake poets, the three English poets, Coleridge, Wordsworth and Southey, so called because they lived in England's Lake District, a hilly lake region in Cumberland, Westmoreland and Lancashire. The term *Lake school* was first applied to them in ridicule in an article in the *Edinburgh Review* in 1817.

L'Allegro, a short poem by John Milton written in 1632. *L'Allegro* is Italian for the cheerful one. The poem is an idyl in praise of the delights of life in country and town. It is a companion piece to *Il Penseroso.*

Last Days of Pompeii, The, a novel by Bulwer-Lytton, published in 1834. It tells a thrilling story of the ancient city of Pompeii before it was buried by the great eruption of Vesuvius in 79 A.D. It describes gladiatorial contests, banquets, the baths and other scenes from ancient Roman life.

Last of the Mohicans, The, a novel by James Fenimore Cooper, published in 1826. The subject of this story is the French and Indian War in northern New York. The hero is Uncas, a noble young Indian. The other principal character is Natty Bumppo, nicknamed Hawkeye, a woodsman whose knowledge of the forest and of Indian character is complete and whose skill with the rifle is unmatched. Indian treachery, bloody fighting, heroic rescues and hairbreadth escapes follow one another in rapid succession. This is one of the *Leatherstocking Tales.*

Lays of Ancient Rome, a collection of narrative poems by Thomas Babington Macaulay, published in 1842. The series contains the famous *Horatius,* describing the valiant defense of the bridge into Rome by Horatius Cocles against the Tuscans. In the edition of 1848 ballads dealing with French and English history were added.

Leatherstocking Tales, novels of early frontier life by James Fenimore Cooper, all having the same hero, Leatherstocking or Natty Bumppo. The series contains: *The Pioneers* (1823), *The Last of the Mohicans* (1826), *The Prairie* (1827), *The Pathfinder* (1840) and *The Deerslayer* (1841). These books were popular throughout Europe and were translated into the principal languages.

Legend of Sleepy Hollow, The, a short story by Washington Irving, published in *The Sketch Book* in 1820. It narrates the midnight adventures of Ichabod Crane—an ungainly schoolmaster of timorous heart—with a spectral, headless horseman whom he encountered while he was riding home from a party at the home of Katrina Van Tassel, to whom he was paying suit. After his wild race with the headless horseman Ichabod disappeared from the community. Katrina soon afterwards married Brom Bones, a daredevil horseman, who "looked exceedingly knowing" whenever the story of Ichabod was mentioned.

Les Miserables, a novel by Victor Hugo, published in 1862. The title means the wretched ones. Jean Valjean, the hero, is an ex-convict; for stealing a loaf of bread he had been sentenced to the galleys. The generous sympathy of a bishop who befriends him after he is released changes Valjean's whole life and character. He is hounded by Javert, a detective, and when his notoriety as an ex-convict threatens the happiness of Cosette (daughter of a woman Valjean had befriended), the noble Valjean disappears. Cosette and her lover Marius, learning of Valjean's self-sacrifice, search for him and find him as he is dying.

Life of Samuel Johnson, a biography of Samuel Johnson by James Boswell, published in 1791, perhaps the most famous biography in the English language. Boswell began to make notes and collect material for the *Life* when he first met Dr. Johnson in 1763 and set to work at once after Johnson's death in 1784. Boswell's own fame rests almost entirely on this biography of his friend; Johnson's fame is rooted deeply in this book, since his conversations are of more note than his writings.

Life on the Mississippi, an autobiographical story by Mark Twain, published in 1883, picturing his life as a pilot up and down the great river before the Civil War.

limerick, a five-line jingle, usually nonsensical. The meter is anapestic. The 1st, 2d and 5th lines each contain 3 feet and rhyme with one another. Lines 3 and 4 each contain 2 feet and rhyme with each other. The name is thought to come from an old custom of singing extempore nonsense verses at parties to which the chorus was always the same: "Will you come up to Limerick?" Often the limerick has a place name in the first line. Example:

> There was a young lady from Niger
> Who smiled as she rode on a tiger;
> They came back from the ride
> With the lady inside,
> And the smile on the face of the tiger.

Edward Lear's *Book of Nonsense* (1848) contains many limericks.

Little Men, a story for and about boys by Louisa May Alcott, published in 1871. It pictures life in the small boys' school conducted by the Jo of *Little Women* and her husband. *Little Men* is a sequel to *Little Women.* It was followed by *Jo's Boys.*

Little Minister, The, a novel by Sir James M. Barrie, published in 1891, and a play, produced in 1897, with Maude Adams taking the part of Babbie. The little minister, Gavin Dishart, falls in love with the fascinating but mysterious Babbie in Thrums, a village of stern, orthodox Scottish weavers.

From the R.K.O. motion picture, Little Women

Louisa May Alcott: Little Women

Beth, Amy, Jo and Meg listen as Mrs. March reads a letter from their soldier father

Little Women, a story for girls by Louisa M. Alcott, published in 1868. It is about four New England girls, Jo, Meg, Beth and Amy March and was written largely from Miss Alcott's own experiences.

Lochinvar, the hero of a ballad in Scott's *Marmion.* Young Lochinvar loves a lass who is betrothed against her will to a man described in the poem as a laggard. While dancing with her just before the wedding ceremony, Lochinvar asks the girl to flee with him, and she is very willing. Before the outraged bridegroom or her father can stop them the two escape on the horse that Lochinvar had waiting.

Looking Backward, a romance by Edward Bellamy, published in 1888. It is a fantastic story describing the strange experiences and impressions of a Bostonian, Julian West, who goes into a sleep in 1887, awakens in the year 2000 and sees great changes in economic and social conditions.

Lorna Doone, a romance by Richard D. Blackmore, published in 1869. The scene is Exmoor, a county in southwestern England. The time is during the reign of Charles II and James II. The brutal Judge Jeffreys figures in the story. Lorna Doone is the daughter of a family of aristocratic robbers and smugglers. The hero, John Ridd, has many exciting adventures among the outlaws and at last becomes the protector of Lorna against her own kin.

Lycidas, a poem by John Milton, written in 1637. It is an elegy, in which he laments the death of his friend, Edward King.

lyric poetry, the most emotional and musical of the three divisions of poetry, the others being dramatic and epic or narrative poetry. A lyric always expresses emotion, the personal hopes and joys, sorrows and fantasies of the author. It is always comparatively short because great emotion cannot long be sustained. It is usually composed of several stanzas. But sonnets are lyrics, as are also odes, hymns, elegies and the like.

The word *lyric* comes from the Greek *lyra,* an ancient musical instrument of the harp type; and lyrics were originally intended to be sung to the accompaniment of the lyre. They are not now written with that particular intention. Most modern lyrics are written only as confessions of inner experience, meant to be read.

Macbeth, a tragedy by William Shakespeare, first printed in 1623. Macbeth and Banquo, warriors in the army of Duncan, King of Scotland, on their way home from a victory, met three weird sisters. The witches prophesied that Macbeth would first become thane of Cawdor and then king of Scotland and that Banquo would beget kings. The immediate fulfilment of the first prophesy fired the ambition of Macbeth and Lady Macbeth to the point of murdering Duncan. Duncan's two sons fled and Macbeth took the throne. To forestall the prophecy concerning Banquo, Macbeth murdered him also. But Banquo's ghost began to haunt Macbeth. Suspicion began to waken against him, and Lady Macbeth betrayed herself in sleep-walking delirium. Macduff, thane of Fife, took the field against him with strong forces.

Again, in terror of mind, Macbeth consulted the three witches. They told him to beware of Macduff, but that he would not be overthrown till Birnam Wood moved to Dunsinane. This strange prophecy was literally fulfilled. Macduff marched on Macbeth and as the army passed through

Birnam Wood, each man cut off a bough of a tree. Thus Macduff approached Dunsinane in the guise of Birnam Wood. Macbeth was killed and Malcolm, the son of Duncan, became king of Scotland.

Mahabharata, the great Bharata story (*maha* means great), one of the two great epic poems of India (the other being the *Ramayana*). It describes the conflict between two families (descendants of Bharata) for a kingdom in northern India, the Pandavas, five strong brothers and their 100 cousins, the Kauravas. After taking the kingdom the Pandavas abdicated in remorse and went off seeking Indra's heaven. These events are supposed to have happened in the 12th century B.C. The poem as we now have it was probably written 900 or 1,000 years later, in the 2d century. Social and ethical questions, scientific facts, the philosophy and morality of ancient India are described with the story of the family feud. It includes the great sacred lay, the *Bhagavad-Gita,* the summary of Hindu philosophy.

Main Street, a novel by Sinclair Lewis, published in 1920. It portrays the prosaic, humdrum life of a small Minnesota town.

Malaprop, Mrs., the pompous old aunt of Lydia Languish in Sheridan's comedy, *The Rivals*. She uses words so incorrectly that her name has become proverbial for such mistakes as the following: "Headstrong as an allegory on the banks of the Nile"; "precipitate one down the prejudice." The name is from the French phrase *mal à propos,* inappropriate. *Malapropism* means this incorrect use of words or a word or phrase inappropriately used.

Man and Superman, a comedy by George Bernard Shaw, published in 1903. The leading male character is John Tanner, a social revolutionist, utterly opposed to society's conventions and above all determined not to be enmeshed in love and marriage. But Ann Whitefield changes all that. The play is a lively satire on "the tragicomic love chase of the man by the woman."

Man Without a Country, The, a short story by Edward Everett Hale, published in 1863. It is about a captain in the navy on trial for some misdemeanor, who said he hoped he might never hear the name of the United States again. For punishment he was compelled to live forever on board a ship, never touching a port. He died broken-hearted and a fervent patriot. Walter Damrosch wrote an opera on this theme, produced at the Metropolitan Opera House in New York in the 1937–38 season.

Marble Faun, The, a novel by Nathaniel Hawthorne, published in 1860. It is the story of four artists in Modern Rome. Donatello is a young Italian count who bears a close resemblance to the famous statue of a faun by Praxiteles. His character is that of an innocent carefree pagan until he falls in love with Miriam and murders a man who has been persecuting her. Then he develops into a conscience-stricken member of civilized society and gives himself up to justice.

Marjorie Daw, a story by Thomas Bailey Aldrich, published in 1867; it is written in a series of letters. Marjorie Daw is an imaginary girl created for the pleasure of an invalid, John Flemming, by his friend Edward Delaney.

Marmion, a poem by Sir Walter Scott, published in 1808. It paints the manners of feudal times in the heroic style. The poem opens in August, 1513, and ends with the Battle of Flodden Field about a month later. There are six cantos, describing the clangor of arms, troops on the march, drawbridge, portcullis and the other appurtenances of a medieval castle, the intrigues of guilty love and the brutality of medieval punishment. The poems ends on the battlefield and its deeds of valor.

mask or **masque,** an ancient form of drama in which the actors wore enlarged figures of heads to identify the characters and magnify the voices. Dance, dumb show and costume were emphasized over plot or character portrayal. The characters were usually mythological or allegorical. Masks were extremely popular in England in the 16th and 17th centuries and found their greatest exponent in Ben Jonson. One of Jonson's masks, *Pleasure Reconciled to Vertue,* suggested to John Milton the idea for his mask *Comus*.

Meistersinger, a German word meaning mastersingers, applied to societies or guilds of workingmen in Germany from the 14th to the 16th century. They organized to differentiate themselves from the wandering minstrels and devoted themselves to the cultivation of music and poetry. They were pedantic and artificial, especially in their later period. Hans Sachs, author of many meistersongs and plays, figures in Wagner's opera *The Meistersinger of Nürnberg,* which is an answer to Wagner's critics, likening them to the narrow hidebound musicians of the olden times.

melodrama, originally a play with some music and singing and a highly sensational plot. Now a melodrama is any play with striking, exaggerated incidents and violent emotion. *East Lynne* is a typical melodrama.

Merchant of Venice, The, a comedy by William Shakespeare, printed in 1600. Bassanio borrows money from his friend Antonio, the merchant of Venice, in order to court Portia, a rich heiress of Belmont. Antonio, in turn, has borrowed 3,000 ducats from Shylock, the Jewish moneylender, and has promised to forfeit a pound of his flesh if he does not repay it. Antonio's payment is deferred when his ships are delayed by storms, and Shylock demands the pound of flesh nearest Antonio's heart. Portia, disguised as a lawyer, frees Antonio and disgraces Shylock through a legal quibble: he may have the flesh but can shed no blood in taking it. Shylock's goods are declared forfeit for plotting against a citizen of Venice.

meter, systematic rhythm in poetry; the arrangement of syllables in a poem so that each line contains a certain number of accented syllables of metrical feet. The various meters, named for the number of feet in a line, are: monometer, dimeter, trimeter, tetrameter, pentameter, hexameter, heptameter, octameter.

Midsummer Night's Dream, a comedy by William Shakespeare, printed in 1600. The scenes are laid chiefly in a wood near Athens in the legendary days of King Theseus. The king's courtiers mingle incongruously in the play with the fairies and a group of clownish artisans. The plot is concerned with two pairs of lovers whose tangled affairs are finally straightened out by fairy intervention. The dignified court scenes, the clumsy attempts of the artisans to present a play, the pranks of Puck and the songs and dances of the fairies combine to make a very novel and delightful play. Almost as famous as the play is Felix Mendelssohn's music for it.

Mill on the Floss, The, a novel by George Eliot, published in 1860. The author portrays in a powerful manner the characters of Maggie Tulliver and her brother Tom, children of the miller, and Maggie's unhappy love affairs and misunderstandings with her brother. The book ends with the flood of the Floss and the death of Maggie and Tom, drowned together and reconciled at last.

minnesinger, one of the lyric poets, singers and musicians of Germany who flourished 1150–1350. The word literally means a singer of love songs (from *minne,* love and *singers,* to sing). The minnesinger was usually of noble birth and the songs had to do with courtly love, the worship by a knight of some woman, often far above him in rank. The rules were rigid: the lady's name could not be mentioned or even indicated. The minnesingers wrote both words and music to their songs, which were sung in the courts before knights and ladies. Contests were often held. As the minnesong developed the subject matter enlarged; there were not only songs of courtly love but songs on political and religious themes, crusading songs, fables turned to lays and sacred hymns. The greatest of the minnesingers was Walther von der Vogelweide in the early 13th century.

miracle plays, medieval short dramatic pieces representing Biblical scenes or especially, saints' lives, given at first in the church as a serious part of the service and later outside the church in market places, courtyards and at fairs. Famous examples are *Abraham and Isaac* and *The Harrowing of Hell.* the actors were members of the local handicrafts, the guilds or trades-unions. The surviving Miracles are known by the towns in which they were produced: York, Wakefield, Coventry, Chester. In England these plays were called *mysteries,* especially those dealing with the birth, death or resurrection of Christ. Sometimes robust humor and a sense of the comic were introduced into the religious stories, and the plays were finally forbidden inside the church.

Modern Comedy, The, a series of three novels by John Galsworthy, published in 1929. It is a sequel to the *Forsyte Saga* and includes *The White Monkey* (1924), *The Silver Spoon* (1926) and *Swan Song* (1928).

Ionsieur Beaucaire, a novel by Booth Tarkington, published in 1900. The scenes are laid in and near Bath, England, in the 18th century. The hero is ostensibly a French barber, in love with an English lady. In all his difficulties he gives such a good account of himself that he is suspected of being more than a barber, and when the denouement comes he is discovered to be Philippe of Valois. His presence in England and his disguise are accounted for by the fact that he fled from France to escape an undesirable marriage with a princess who had been chosen for him.

Ioonstone, The, a novel by Wilkie Collins, published in 1868. The story tells of a strange diamond stolen from the forehead of an Indian idol, cursed by its Brahmin custodians in order to destroy all its unrightful possessors, bequeathed to an English girl and finally restored to its place after being instrumental in mystery and murder. It was one of the first great mystery stories in English.

norality plays, medieval dramatic poems of the 15th century, developed from the miracle plays. The characters are abstractions, personifications of Sin, Hate, Pride, Folly, Lust and the like. The best-known, most imaginative and poetic, is *Everyman,* which has been successfully produced on the modern stage. It is didactic in purpose but genuinely human, representing symbolically the whole life of Man. Other typical moralities are Lindsay's *Satyre of the Three Estaits* and Skelton's *Magnificence.*

Iorte d'Arthur, a long, prose narrative embodying the whole Arthurian legend, translated from the French into English and marvelously woven together and expanded by Sir Thomas Malory about 1470. It was printed by Caxton in 1485. It recounts the reign of Arthur from the glorious beginning to the ruin of the Round Table, the quest of the Holy Grail, Lancelot's failure to find it because of his sin, Gawain's failure because of his weariness and Galahad's success because of his purity. Tennyson's *Idylls of the King* is based chiefly on Malory's narrative.

Mother Goose's Tales and Mother Goose's Melodies, a collection of nursery rhymes and stories published in England in 1760 by John Newbery, the first publisher of children's books. It includes the familiar *Baa, Baa, Black Sheep, Little Boy Blue, Patty Cake, Patty Cake* and countless others. Mother Goose herself is a mysterious, untraceable figure who probably comes out of French folklore. The title was taken from Charles Perrault's *Tales of My Mother Goose,* which were first translated into English in 1729. But the later English Mother Goose collections contain many rhymes and stories out of English tradition as well as French, such as *Puss in Boots* and *As I Was Going to St. Ives.*

Munchausen, Baron, a great boaster and teller of tall tales in which he is the central figure. The original character is supposed to have been taken from real life, a German officer, Karl Friedrich Hieronymus von Munchausen (1720–97), who told great stories of his campaigns with a Russian army against the Turks. The Munchausen tales were written by Rudolph Eric Raspe (1737–94), a German living in England. His book was published in English in 1785 and translated into German in 1787 by the poet Gottfried Bürger.

Nicholas Nickleby, a novel by Charles Dickens, published first in serial form in 1838–39. It attacked the cheap, uninspected private schools of Yorkshire and advocated the establishment of national schools. The story is a record of the adventures of young Nicholas Nickleby when he started out in the world. Wackford Squeers, head of Dotheboys Hall, in which Nicholas was for a time employed as a teacher, was one of those whom Dickens referred to as forming "the worthy cornerstone of a structure which, for absurdity and magnificent high-handed *laissez-aller* neglect, has rarely been exceeded in the world."

Nigger of the Narcissus, The: A Tale of the Sea, a story by Joseph Conrad, published serially in the *New Review,* issued in book form in 1897. It appeared in the United States in that year as *The Children of the Sea: A Tale of the Forecastle.* It has to do with the voyage of an East Indiaman homeward from Bombay. Always in the background is the vast changing panorama of the sea. The characters are members of a queerly-assorted crew, among whom is the Nigger, the giant James Wait. "Mr. Conrad," said James Payn, "has, in this book, introduced us to the British merchant seaman, as Rudyard Kipling introduced us to the British soldier." The preface is a noteworthy essay setting forth the author's *credo* as a man of letters.

Notre-Dame de Paris, a romance by Victor Hugo, issued in 1831. The time is at the close of the reign of Louis XI, that able but unscrupulous monarch who likewise appears in Théodore de Banville's play *Gringoire* and in Sir Walter Scott's *Quentin Durward.* The scene is 15th-century Paris, and the action is centered in the great cathedral that looks out over the medieval city. In a manner that is sometimes fanciful to the point of wild extravagance, the characters are caught up in the toils of fate.

novel, a fictional narrative in prose, longer than the short story or novelette; commonly applied to a story in which plot and characters are kept within the possible limits of real life and do not stray away into the domain of the fantastic or the marvelous. Joseph Conrad defined the novel as "a conviction of our fellowmen's existence strong enough to take upon itself a form of imagined life clearer than reality."

octameter, a verse having eight measures or metrical feet.

ode, in ancient usage, a lyric poem designed to be chanted or sung; in modern usage, a sustained lyric having a dignified subject and written in an elevated tone.

Odyssey, The, a Greek epic poem commonly attributed to Homer and regarded as of later date than the *Iliad.* It pictures the adventures of Odysseus (Ulysses) during 10 years of wandering after the Trojan War as he seeks to return to his native island of Ithaca. He escapes many dangers and finally appears as a beggar in his own house, which he finds overrun by a group of insolent suitors of his faithful wife Penelope. He slays the suitors and is welcomed to his own again.

Old Curiosity Shop, The, a novel by Charles Dickens, the first serial to appear in his periodical *Master Humphrey's Clock,* which he established in 1840. As a matter of fact, the shop has little to do with the story except to provide a title and a setting; for Little Nell and her aged grandfather, who keeps it, flee from it to a series of hardships and adventures. Bret Harte's poem "Dickens in Camp" tells of a reading from this story beside a campfire in the "dim Sierras."

Oliver Twist, a novel by Charles Dickens, published in 1837-38, and named from its leading character, a workhouse orphan who runs away to London. After experiences in the underworld he is befriended by a Mrs. Maylie and eventually adopted by Mr. Brownlow. Two of the book's characters, Fagin and Bill Sikes, are among the best-known figures in English literature. Said the author: "I wished to show, in little Oliver, the principle of Good surviving through every adverse circumstance, and triumphing at last."

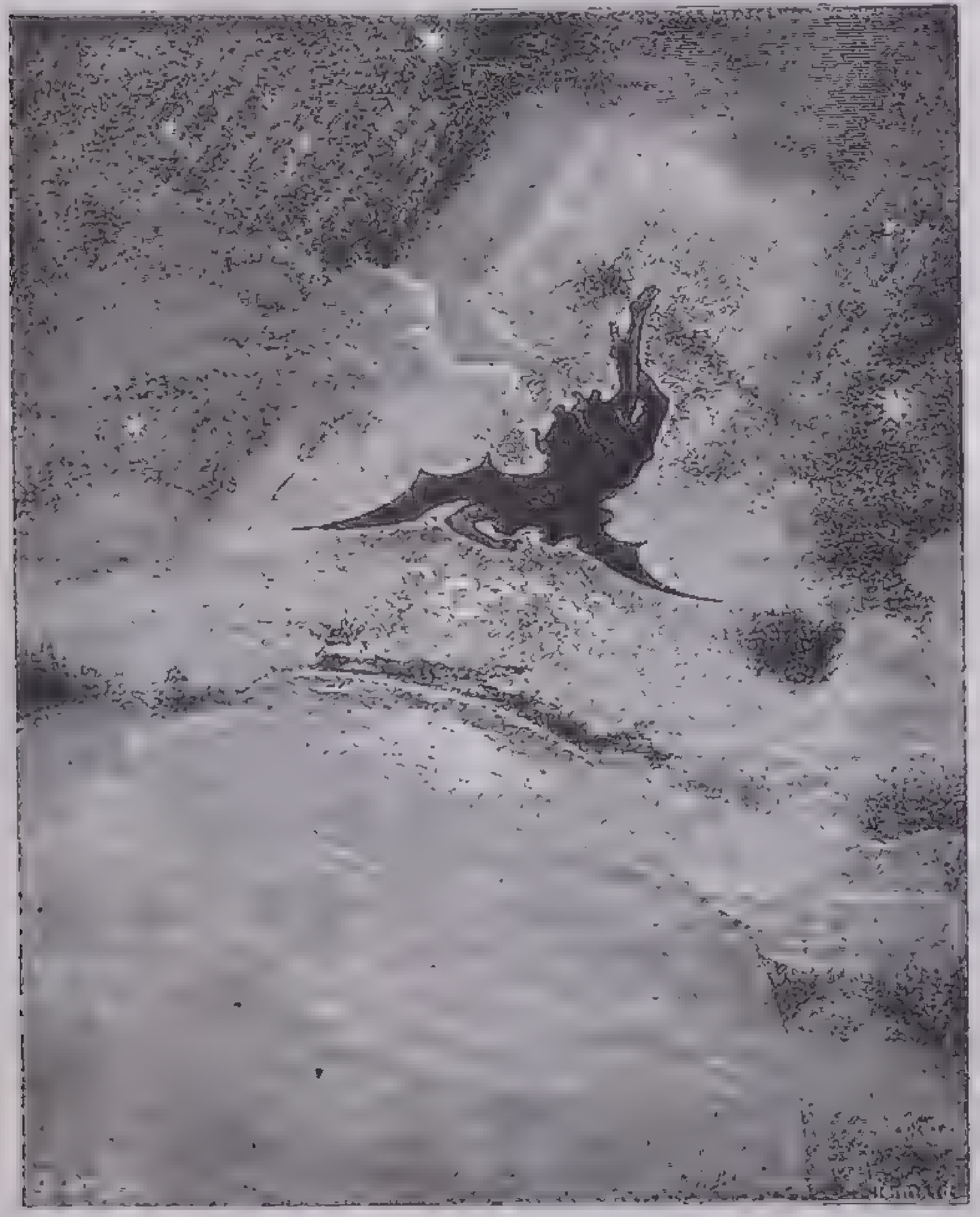
Ordeal of Richard Feverel, The, one of the major novels of George Meredith, published in 1859. It is the story of a young man reared according to a "system" that quite overlooked human nature. Richard marries Lucy, a farmer's daughter, but in spite of this idyllic episode he comes to grief, and the book, though it has comedy passages, closes tragically. The *Ordeal* has been highly praised as a character study. The original version is preferred to the revision by the author for his authorized edition of 1897.

Origin of Species, The, a scientific work by Charles Darwin, published in 1859. In it he records the results of years of scientific observation in all parts of the world and expounds what is known as his theory of evolution—and especially the idea of natural selection. (The full title is *On the Origin of Species by Means of Natural Selection.*) This epoch-making book aroused controversy of which echoes still persist.

Othello, a tragedy by Shakespeare, produced in 1604, printed in a quarto edition in 1622 and in a folio edition in 1623. Its plot was taken from a story by Giovanni Giraldi. Othello, a Moor in the Venetian service, deceived by the lies and insinuations of the villain Iago, becomes enraged at his wife Desdemona and smothers her. The play is ranked with *Hamlet, King Lear* and *Macbeth.* Othello, "one not easily jealous, but being wrought, perplexed in the extreme," has been portrayed by many eminent actors, of whom perhaps the greatest in the rôle was Tommaso Salvini. Operas by Rossini (1816) and by Verdi (1887) were based on Shakespeare's work.

Outline of History, The, a world-history by H. G. Wells (with the advice and editorial help of Ernest Barker, Sir H. H. Johnston, Sir E. Ray Lankester and Prof. Gilbert Murray), published in the U. S. in 1920. It is described by the author as "an attempt to tell, truly and clearly, in one continuous narrative, the whole story of life and mankind so far as it is known today." Readable in style, it was written primarily to justify Wells' contention that *"history as one* whole is amenable to a more broad and comprehensive handling than is the history of special nations and periods, a broader handling that will bring it within the normal limitations of time and energy set to the reading and education of an ordinary citizen."

Pamela, or Virtue Rewarded, the first of the novels of Samuel Richardson; published in 1740. Told in the form of letters (a characteristic of all Richardson's fiction), the story describes how Pamela Andrews, an upright serving-maid, when pursued by Mr. B——, indignantly evades him, but eventually consents to become his wife. The picture of 18th-century English society is hardly flattering. Henry Fielding's *The Adventures of Joseph Andrews and His Friend Abraham Adams* (1742) was begun as a satire on *Pamela* but outgrew the author's original intention. Critics view *Pamela* as the beginning of the modern analytic novel in English. Unlike the Pamela of Sidney (*Arcadia*) or of Pope (*Epistle to Mrs. Blount*), Richardson's heroine accented her name on the first syllable.



From a drawing by Gustave Doré

Paradise Lost: Satan Flies Toward Earth

". . . Satan toward the coast of Earth beneath,
Down from th' Ecliptic, sped with hop'd success." Book 3

Paradise Lost, an epic poem in blank verse by John Milton, published in 1667. Its purpose is "to justify the ways of God to man." First, the poem relates how some of the angels revolted against God and were cast out of Heaven into Hell to punish their rebellion. They decide to revenge themselves upon the Almighty by invading the earth and leading man to sin. Satan, chief of the fallen angels, corrupts Adam and Eve, the first human beings, and brings about their expulsion from the Garden of Eden. This expulsion is the "loss of Paradise," which gives the poem its title. *Paradise Lost* is regarded as the greatest epic in the English language.

Paradise Regained, a blank-verse epic poem in four books by John Milton, published in 1671. Its subject is the Redemption. When he returned to Milton the manuscript of *Paradise Lost,* the young Quaker Thomas Elwood remarked: "Thou hast said much here of Paradise Lost, but what hast thou to say of Paradise Found?" After this query, says Elwood, Milton "made no answer, but sat some time in a muse." The poem was a favorite with Milton and admittedly has many beauties, but it was never so well known as its great predecessor.

parody, a literary form in which a serious composition (especially a poem) or the general manner of a serious author is imitated in phraseology and style by means of a travesty dealing with a comically dissimilar theme or one remote from the characteristic subjects of the author in question. Owen Seaman said that parodies might range from "the lowest, a mere verbal echo" to the highest, which was to be looked upon as "pure criticism." Bret Harte's *Condensed Novels* (1867) are remarkable parodies in prose.

Patterne, Sir Willoughby, the leading character of George Meredith's novel *The Egoist* (1879). He is a person utterly lacking in a sense of humor, and is pilloried for his blind smugness and monumental conceit.

Paul et Virginie (Paul and Virginia), a short romantic novel by Jacques Henrí Bernardin de Saint-Pierre, published in 1789. Its scene is laid chiefly in the island of Mauritius (a French possession from 1715 to 1810) in the Indian Ocean. The book was an example of the 18th-century "return to nature" in European literature. It quickly passed through numerous French editions and was translated into many other languages. Napoleon is said to have taken a copy of it with him on his Italian campaign.

Peer Gynt, a metrical drama by Henrik Ibsen, published in 1867. It has been stated that Ibsen intended it to be a satire on what he deemed failings of his fellow-countrymen. Peer Gynt is, however, not a mere symbol but a human individual who, after a life of aimless wandering, returns home to discover meaning in life through the agency of Solveig, the drama's heroine. Richard Mansfield produced this work on the American stage in 1907. The musical suite based upon it by Edvard Grieg is well known.

Pendennis, a novel by W. M. Thackeray, published in 1850. It is a character study of Arthur Pendennis, a well-meaning but spoiled and rather unheroic young man, and traces his career first at the university and afterward as a writer and would-be man-of-the-world in London. Only after he has been jilted by the flirtatious Blanche Amory does he awake to a real sense of values. The plot is simpler than in Thackeray's other novels, and the book introduces the figure of Major Pendennis, Arthur's uncle, a convincingly drawn type of elderly dandy. Like some others of Thackeray's novels it was illustrated by the author himself.

Penrod, a story by Booth Tarkington, published in 1914. It is an intimate study of a boy's contacts and his relations with his elders and with other children. The scene is a small town of the Middle West.

pentameter, a verse having five measures or metrical feet. In English poetry, blank verse and the heroic couplet are traditionally in iambic pentameter.

Pepys' Diary, a record in cipher by Samuel Pepys, translated and first published in 1825. It is a "gossipy chronicle" of his daily doings and gives his impressions of men and events between the years 1660 and 1669. No other book throws such a true light on the manners and customs of the period of the Restoration.

Peter Ibbetson, a romance by George Du Maurier, published in 1891, the first novel of this distinguished English artist. Material world and dream world are so blended that the reader can scarcely distinguish between them. Peter spends his childhood happily in the French country near Paris, where his favorite playmate is the little girl Mimsey Saraskier. His parents die and his coarse and brutal uncle takes him to England, where he attends school and becomes an architect. He falls in love with Mary, the unhappily married Duchess of Towers, whom he discovers to be the Mimsey of the old days. Enraged by infamous lies told by the uncle about Peter's mother, Peter attacks the fellow and, rather by accident than intentionally, kills him. Peter's death-sentence is commuted to imprisonment for life. He and Mary meet again only when he is "dreaming true," though thinking of himself as awake, and then he treads "the old obliterated ways as in a waking dream." Deems Taylor wrote an opera with the same title and plot.

Peter Pan, the central character in Sir James Barrie's fairy play of the same name, an elflike little personage who refuses to "grow up." Joyous and lighthearted little Peter so captivates audiences that the play is regularly repeated in London at Christmas time, and in honor of a literary creation that has brightened a serious world a statue of Peter has been placed in Kensington Gardens. Maude Adams found in *Peter Pan* one of her greatest stage successes.

Père Goriot, Le, a novel (published in 1835) by Balzac; in its style one of the most brilliant of his many works. It is in effect a prose version of Shakespeare's *King Lear.* Goriot is a retired French merchant; the Countess de Restaud and the Baroness de Nucingen take the places of Regan and Goneril, but there is no representative of Cordelia. The book is merciless in its characterizations.

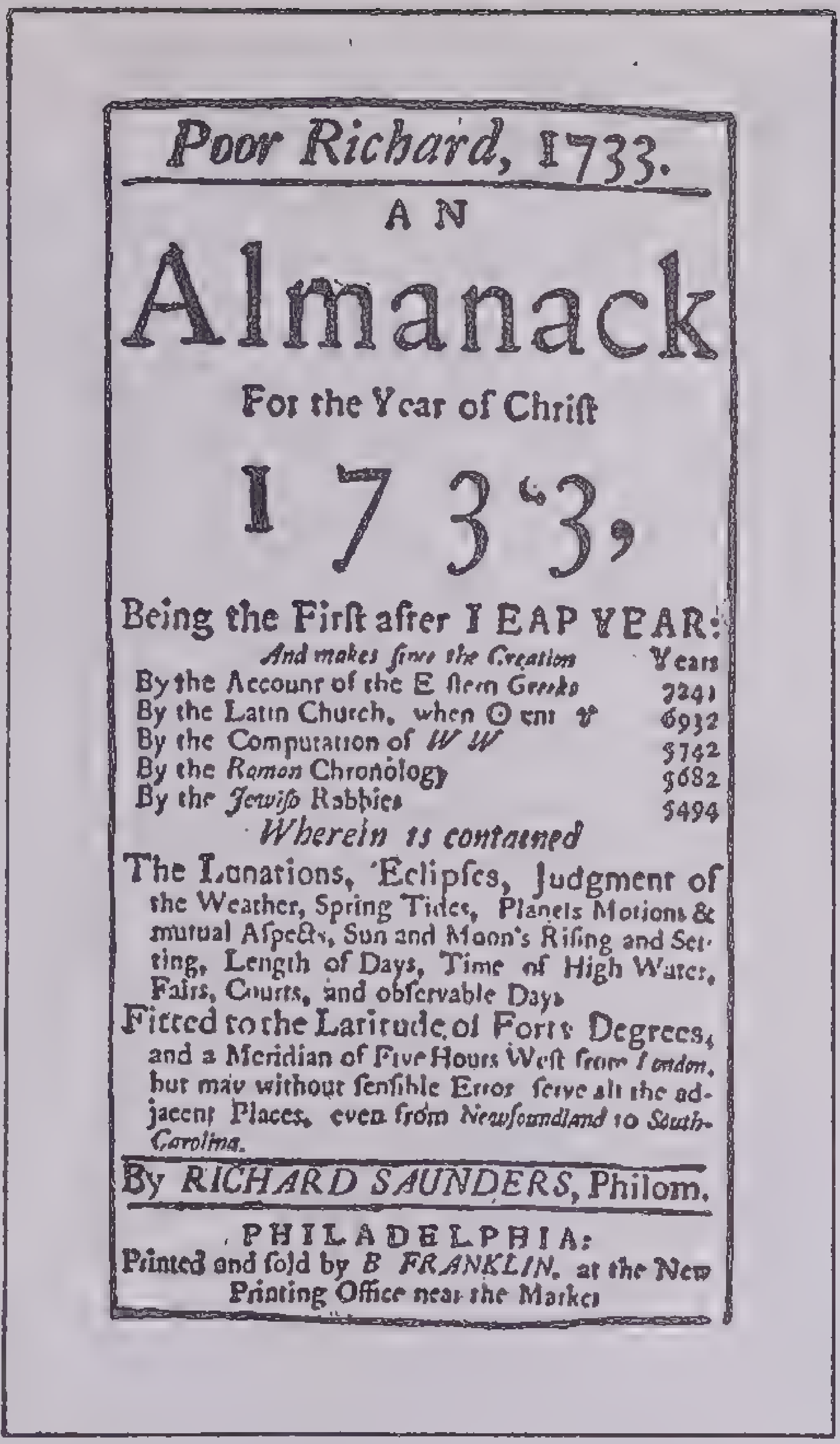
Pickwick Papers, The (more correctly *The Posthumous Papers of the Pickwick Club*), a story by Charles Dickens, issued in parts in 1836–37. It is made up of a series of incidents in the adventurous travels of Samuel Pickwick, Esq., founder and president of the Pickwick Club, and his three cronies, Augustus Snodgrass, Tracy Tupman and Nathaniel Winkle. It introduces a host of other characters, including Alfred Jingle, an eccentric strolling actor; Sam Weller, Pickwick's valet; and the landlady, Mrs. Bardell, whose suit against Pickwick for breach of promise provides one of the most amusing episodes of the book. The *Pickwick Papers* brought fame to Dickens, then only twenty-four. Says F. T. Marzials: "Everybody laughed over it. Everybody talked about it. Everybody felt, confusedly perhaps, but very surely, that a new and vital force had arisen in English literature."

Piers Plowman, The Vision of, an English satirical and allegorical poem of the 14th century; ascribed, from internal evidence, to William Langland (or Longland). It was first printed in 1550. Piers did not have the vision; it was a vision about him. The full title is *The Vision of William concerning Piers the Plowman, together with Vita de Do-Wel, Do-Bet et Do-Best, secundum Wit et Resoun.* The author on a May morning falls asleep upon the Malvern hills and has a dream about the humanity of his day. This poem, which is written in several dialects (with the Midland dialect most favored), throws considerable light on contemporary institutions, both religious and social. W. W. Skeat edited the text in 1887.

Pilgrim's Progress, The, an allegory by the English preacher John Bunyan, of which the first part was issued in 1678. It describes the adventures of its hero, Christian, on his way from the City of Destruction to the Celestial City. He fights with Apollyon, looks on Vanity Fair, passes the castle of Giant Despair and, after these and many other trials, attains to the Delectable Mountains and crosses the Black River to the Shining Gate. It is now supposed that this famous book was written by Bunyan in 1675, while he was a prisoner in the old jail on Bedford bridge. An eighth edition, the last with the author's improvements, appeared in 1682. *The Pilgrim's Progress* with its plain, direct Anglo-Saxon style was welcomed by the common people and was as popular in New England as in the author's own country. A "musical miracle play" by the American composer Edgar Kelley is based on it. A second part by Bunyan (1684), little known, tells of a similar journey by Christiana, Christian's wife.

Pit and the Pendulum, The, a short story by Poe in which one who had been a prisoner of the Inquisition describes the kinds of torture to which he was subjected in the dungeons of Toledo, from which he was rescued in the nick of time by the arrival of a French army.

Plain Tales from the Hills, a collection of short stories of life in India by Rudyard Kipling, published in 1888, when he was 23 and on the staff of the *Lahore Civil and Military Gazette.* It marked the arrival of a distinctive talent and introduced that remarkable trio Mulvaney, Ortheris and Learoyd, privates in B Company of a line regiment, whose adventures were later recounted in their own volume, *Soldiers Three.*



Poor Richard, 1733.

AN

Almanack

For the Year of Chriſt

1 7 3 3,

Being the Firſt after LEAP YEAR:

And makes ſince the Creation	Years
By the Account of the Eaſtern Greeks	7241
By the Latin Church, when ☉ ent. ♈	6932
By the Computation of *W. W.*	5742
By the *Roman* Chronology	5682
By the *Jewiſh* Rabbies	5494

Wherein is contained

The Lunations, Eclipſes, Judgment of the Weather, Spring Tides, Planets Motions & mutual Aſpects, Sun and Moon's Riſing and Setting, Length of Days, Time of High Water, Fairs, Courts, and obſervable Days.

Fitted to the Latitude of Forty Degrees, and a Meridian of Five Hours Weſt from *London*, but may without ſenſible Error ſerve all the adjacent Places, even from *Newfoundland* to *South-Carolina.*

By *RICHARD SAUNDERS,* Philom.

PHILADELPHIA:
Printed and ſold by *B. FRANKLIN,* at the New
Printing Office near the Market.

From John Clyde Oswald: Printing in the Americas

Benjamin Franklin's Almanac

Title page of the famous almanac, published 1732-57. Not wishing to appear as both author and publisher, Franklin borrowed a pen name from an English almanac by Richard Saunders. To the prosaic recital of days, weather and the tides, he added the maxims of Poor Richard,—such well-quoted lines as:

Early to bed, Early to rise, makes a Man
healthy, wealthy, and wise.
God helps Them that help Themselves.
Keep thy shop, and thy shop will keep thee.
Diligence is the Mother of Good Luck.

Poet Laureate, a title held through letters-patent from the English Crown by the official poet of the British court. The only duty now laid upon one thus chosen is to commemorate in poetry any national event deemed by him worthy of a literary tribute. The honorarium is an annual payment of £72 plus an allowance of £27 "in lieu of a butt of sack"—the butt itself having formerly been given. Bernard Andreas, Edmund Spenser, Samuel Daniel, Ben Jonson and Sir William Davenant all had some kind of recognition as court poets. The official laureateship began with the appointment of John Dryden and following is the list of laureates from that time:

Name	*Born*	*Ap't.*	*Died*
John Dryden	1631	1668	1700
Thomas Shadwell	1642	1689	1692
Nahum Tate	1652	1692	1715
Nicholas Rowe	1674	1715	1718
Rev. Laurence Eusden	1688	1718	1730
Colley Cibber	1671	1730	1757
William Whitehead	1715	1758	1785
Thomas Warton	1728	1785	1790
Henry James Pye	1745	1790	1813
Robert Southey	1774	1813	1843
William Wordsworth	1770	1843	1850
Alfred, Lord Tennyson	1809	1850	1892
Alfred Austin	1835	1896	1913
Robert Bridges	1844	1913	1930
John Masefield	1874	1931	——

poetry, that form of literature which seeks to express action, feeling or thought in an imaginative form with the aid of rhythmical (and usually metrical) language more heightened than that of prose.

Poor Richard's Almanac, a series of almanacs by Benjamin Franklin published regularly from 1732 to 1757. Many of the best-known American proverbs are from this source; among them is, "Honesty is the best policy." The *Almanac* did much in establishing habits of common sense among the colonists. It was treasured year after year in the new land where reading was scarce, and the homely truths of *Poor Richard* found ready lodgment in the hearts of thrifty souls.

Portia, (*a*) in Shakespeare's *Julius Caesar,* the wife of Marcus Brutus. Grieving that Octavius and Antony have "made themselves so strong," in Brutus's absence she swallows live coals and dies; (*b*) the principal female character in Shakespeare's *The Merchant of Venice,* a "rich heiress," living at her country seat of Belmont, near Venice. By the terms of her father's will her suitors are compelled to choose from three caskets (gold, silver, lead). One of these contains her portrait, and he that chooses it is to be her husband. Bassanio, choosing the lead one, is successful. In the courtroom scene Portia appears as special defense council for Antonio, Bassanio's friend. The part was a favorite one with Ellen Terry and other well-known actresses.

Pride and Prejudice, the first novel by Jane Austen, written in 1796 (when she was 21) and published in 1813. The scene is laid in the English countryside; and though the plot is slight, the intimate drawing of the book's middle-class characters is done with humor and charm. Prejudice is repre-

From the Warner Brothers motion picture, The Prince and the Pauper

Mark Twain: The Prince and the Pauper

The young king and Tom Canty finally prove their identities sented by Elizabeth Bennet; Pride, by Mr. Darcy, her wealthy suitor.

Prince and the Pauper, The, a romance by Mark Twain (S. L. Clemens), published in 1881. The plot hinges on the close resemblance between Tom Canty, a poor street boy, and the young prince who later became Edward VI of England. By a clever device the two are made to change places—the prince to wander with Sir Miles Hendon, a disinherited knight; Tom to undergo numerous difficulties because he is ignorant of court etiquette and of the whereabouts of the Great Seal. On the morning of Tom's coronation in the Abbey, the prince reappears, forbids the ceremony, with Tom's aid identifies himself and is duly made king. He rewards Tom and Sir Miles and reigns the more justly and wisely for his experience of humbler life.

Princess, The, a narrative poem by Tennyson, published in 1847; with the subtitle "A Medley." It has to do with an imaginary princess who establishes a university in which women are to learn how to be independent of men. The lyric interludes (such as "Sweet and low," "The splendor falls on castle walls," "Ask me no more") and the incidental song "Tears, idle tears" are among the finest things in Tennyson's works. Sir W. S. Gilbert's *The Princess* was styled by him "a respectful parody" of Tennyson's "exquisite poem."

Prometheus Bound, a drama by Aeschylus, of uncertain date; the only surviving member of a trilogy. In it Prometheus, now bound to the rock by order of Zeus, expresses his defiance and, his will still unbroken, disappears in earthquake and whirlwind.

Prometheus Unbound, a lyrical drama by Shelley, issued in 1820. It was suggested by the title of a lost drama of Aeschylus, in which Prometheus was unchained from the rock to which Zeus had confined him in punishment. Prometheus, in Shelley's hands, is not the god who invoked his own torture by bringing fire to men but represents mankind thirsting after liberty and gifts of the spirit, yet condemned to torture.

prose, any style of language that is not verse, whether it be ordinary, everyday speech or writing or constructively and artistically managed.

proverb, a brief saying presenting in epigrammatic form a bit of traditional wisdom.

Puck of Pook's Hill, a volume of stories by Rudyard Kipling, published in 1906. The children Una and Dan, in a meadow, acting what they remembered of *Midsummer Night's Dream* (with Una as Titania and Dan as Puck, Bottom and all three fairies), encountered Puck himself. Through his kind offices they had glimpses of English history in the making and learned that England "is not any common Earth."

Punch and Judy, a puppet show in which the leading characters are Punch, a humpbacked, hook-nosed fellow who does outrageous and tragic things with the utmost nonchalance, and his wife Judy, whom he beats to death. The origin of Punch is to be found in the clown of the old Neapolitan comedy, and the name is simply an abbreviation of the Italian Punchinello.

Purple Land, The, by W. H. Hudson, a book of adventures in South America. Perhaps in this book, even more than in *Far Away and Long Ago, Green Mansions* and *Birds and Man,* other books dealing with South America, Hudson displays his powers of description and character analysis and his knowledge of ornithological life. "Without apparent effort"—to quote John Galsworthy—"he takes you with him into a rare, free, natural world, and always you are refreshed, stimulated, enlarged, by going there."

Pygmalion, a play by Bernard Shaw, dated by him 1912. Prof. Henry Higgins, student of phonetics and author of *Higgins's Universal Alphabet,* takes from the London streets Eliza Doolittle, a flower girl who utters "depressing and disgusting sounds," and by his intensive training so alters her speech and manner that at a garden party she is able to pass as a duchess. She falls in love with him and he realizes that she has become a necessary part of his life; so one does not need to take too seriously Higgins's observation that Eliza, his friend Pickering and he "will be three old bachelors together." In the U. S. the piece was first presented in New York on October 12, 1914. It is a modern variation of the old myth of Pygmalion's statue of a beautiful girl that came to life when he admired it so warmly.

Quality Street, a play by Sir James Barrie. Quality Street is a little English country town where, in the period of the Napoleonic Wars, the maiden sisters Phoebe and Susan Throssel keep a dame school. After 10 years of absence at the front, Valentine Brown, with a captain's commission but without his left hand, returns to make to Miss Phoebe (with various amusing contretemps) the avowal she had hoped for long ago. The play's first presentation in the United States was in New York on November 11, 1901, with Maude Adams in the role of Phoebe.

quatrain, a four-line stanza with any of the following schemes of rhyming: *a, a, b, b; a, b, a, b; a, a, b, a; a, b, b, a; a, b, c, b.*

Quentin Durward, a novel by Sir Walter Scott, issued in 1823. It gains its title from the name of a brave young Scotsman who takes service in the Scottish Guards of the French King Louis XI. The king selects him to conduct two vassals of Duke Charles of Burgundy, Isabelle of Croye and her aunt, to the bishop of Liège; the royal scheme is to have William de la Marck, a notorious outlaw, waylay Quentin's party, seize Isabelle and marry her. Quentin succeeds in delivering Isabelle to the bishop, but William attacks the castle of Liège and murders the bishop, Quentin and Isabelle escape, and Isabelle returns to Burgundy. Duke Charles eventually awards her hand to Quentin. This book had a great European success, particularly in France.

Quo Vadis (Latin for "Whither Goest Thou?), the most popular work of the Polish novelist Henryk Sienkiewicz, published in the United States in an English translation in 1896. It is a story of life in Rome in the days of Nero and draws strong, sometimes melodramatic, contrasts between the dying civilization of Rome and the new faith of Christianity, just coming into prominence. The title is derived from an ancient legend that relates how Peter, fleeing from Rome, met Jesus on the Appian Way and cried, "Lord, whither goest Thou?" (*Domine, quo vadis?*); to which the answer was, "To Rome, to be crucified again." Whereupon Peter turned back to encounter martyrdom.

Ramayana, an epic poem of India, probably dating from about the beginning of the Christian Era. Its 24,000 stanzas are attributed to a poet called Valmiki. They relate the deeds of Rama, a mythological hero.

Rambler, The, a periodical in the manner of the *Spectator* of Addison and Steele, published in London by Dr. Samuel Johnson. It was issued on Tuesdays and Saturdays from March 20, 1750, to March 14, 1752. All the numbers were written entirely by Johnson except five; and of these, one was by Samuel Richardson, author of *Pamela.*

Ramona, a novel by Helen Hunt Jackson (writing under the pseudonym H. H.), published in 1885. It exposes the treatment received by the American Indians at the hands of the whites and appeals for justice. The same theme had occupied the author in her historical work *A Century of Dishonor* (1881). The scene is southern California in the last days of Mexican rule, when the American *gringos* are beginning to settle in the country. Ramona, a half-breed (Scottish and Indian), elopes with Alessandro, a young Indian of fine character, and the story is the story of their progressive misfortunes through the greed and covetousness of the newcomers. It is filled with local color. Californians took to pointing out for visitors the *hacienda* in which Ramona lived, the chapel in which she prayed and other imaginary spots, but they disregarded the book's real significance.

Rasselas, a romance by Samuel Johnson, published in 1759. It recounts the adventures of Rasselas, an imaginary prince of Abyssinia. According to national custom, the royal family was confined in the Happy Valley between towering mountains. Rasselas, curious as to what the outside world contained, escaped with his sister Nekayah and the poet Imlac, and the three wandered far, in the endeavor to find what place or condition could offer most happiness in life. They finally decided there were objections to almost every supposedly desirable and attractive situation, and determined to return. The name Rasselas or Rasalas means head of the lion in Arabic and is the name of a star in the constellation *Leo.*

Raven, The, a poem by Edgar A. Poe, published in 1845 in his volume *The Raven and Other Poems.* It was widely quoted and reprinted and discussed, became part of the repertory of every elocutionist and to the popular mind was better known than anything else Poe wrote, whether in verse or prose.

realism, in literature, the doctrine and practice of the realists of representing persons and things with alleged scientific faithfulness and in unsparing detail, no attempt being made to modify or to select; opposed to the idealism of the romantic school.

Rebecca, in Scott's *Ivanhoe,* the daughter of Isaac of York. Her charity in nursing the sick, devotion to her old father, bravery and dignity before a court of unjust accusers, determined resistance to the advances of Brian de Bois-Guilbert and generous renunciation of any possible claims upon Ivanhoe, the man she loves, make her a memorable character.

Rebecca of Sunnybrook Farm, a story by Kate Douglas Wiggin, published in 1903. Rebecca goes to live in a distant village with two maiden aunts. The elder of these is austere and dominating; the younger possesses milder attributes but is helpless before her older sister. Rebecca meets with a cold reception and only her buoyant spirit enables her to bear the indignities put upon her. It is her task to wear down the old lady's resistance to good impulses, but with the professional and friendly aid of a young country doctor the miracle is accomplished.

Red Badge of Courage, The, a story by Stephen Crane, published in 1895, when the author was about 24. It is a study of a man's feelings in battle, written by one who had never been in a battle. Henry Fleming, a raw country boy, enlists at the outset of the Civil War. The book describes his mental states as he waits for action, his panic under fire and the development of a new frame of mind in one who had been "an animal, blistered and sweating in the heat and pain of war."

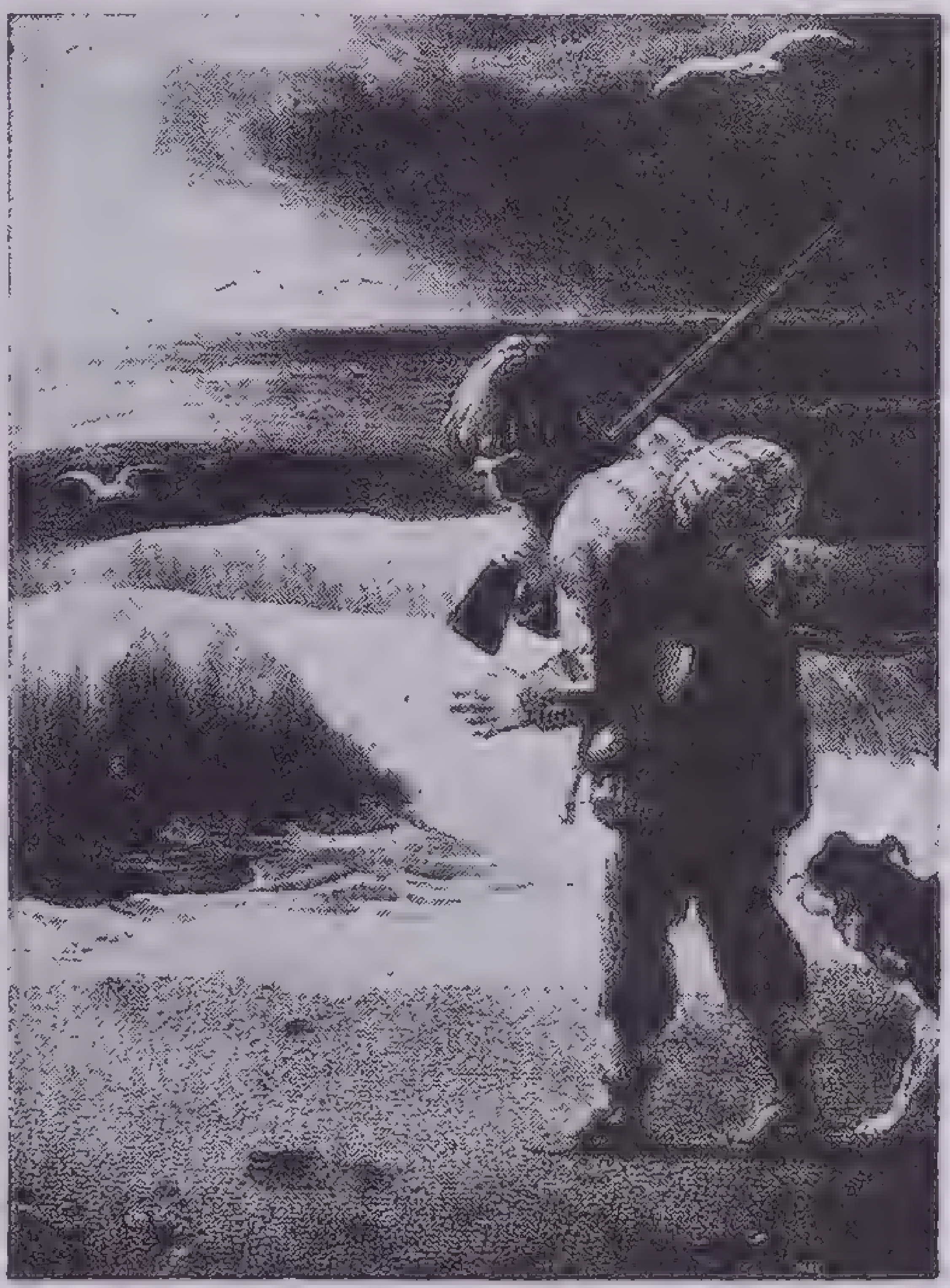
Renaissance, the period of transition from medieval to modern times, distinguished by the revival of letters and of art.

Rescue, The: A Romance of the Shallows, a novel by Joseph Conrad, published in 1920. The shallows are those of the sea that "foams and murmurs on the shores of the thousand islands, big and little, which make up the Malay Archipelago." An atmosphere of exotic lagoons and wooded shores, "far east and still mysterious," surrounds this book. Captain Lingard (King Tom) of the brig *Lightning,* Captain Jörgenson, late of the bark *Wild Rose,* Mrs. Travers; d'Alcacer, and native folk such as Wasub and Immada and Belarab are among the characters involved in a tangle of adventure. This is the story that, when it was seven-eighths done, Conrad laid aside for 20 years until he devised an ending that satisfied him.

Return of the Native, The, the sixth novel of Thomas Hardy, published in 1878. The time is "between 1840 and 1850;" the scene is Egdon Heath in Hardy's Wessex country. The "native" is Clym Yeobright, who has been a jeweler in Paris but wishes to lead a broader and less selfish life, returns to the village in which he was born and there plans to open a school and improve local conditions. His philanthropic schemes are interrupted when he falls in love with Eustacia Vye, an exotic creature, "the raw material of a divinity," with whom he leads a troubled existence. Eustacia drowns herself, and Clym, his sight impaired, finds his vocation as an itinerant open-air preacher and lecturer. A group of Hardy's rural characters lends flavor to the story.

Rewards and Fairies, a group of stories by Rudyard Kipling, published in 1910. Una and David renew their acquaintance with Puck, begun in *Puck of Pook's Hill,* and learn more about past days in England. In this volume appeared the much-quoted poem *"If—."*

rhyme, a correspondence in sound between two or more syllables or groups of syllables; usually taken to refer to *end-rhyme,* the correspondence between the final feet of two or more lines. A *leonine rhyme* occurs when there is a correspondence between the syllables at the first natural break or pause in a line and those at the end of the line (also called an *internal rhyme.* Sometimes the word is spelled *rime.*



From a drawing by Thomas Stothard

Daniel Defoe: Robinson Crusoe

"It happened one day, about noon, going towards my boat, I was exceedingly surprised with the print of a man's naked foot on the shore, which was very plain to be seen in the sand . . ."

rhythm, in prosody, the cadence of verse, dependent upon a succession of long and short syllables.

Ring and the Book, The, a dramatic poem by Robert Browning, the longest of his works, originally published in four volumes in 1868–69. One day the poet had bought in Florence for eight pence an old book giving the court records of a murder trial in seventeenth-century Rome. The events of the tragedy are rehearsed in the poem six times from different points of view by as many different persons; outside opinions and criticisms are offered; the condemned man has his last words. The whole is divided, with the poet's prologue and epilogue, into 12 books—a remarkable constructive effort, rich in philosophic wisdom.

Rip Van Winkle, a short story by Washington Irving that appeared in his *Sketch Book of Geoffrey Crayon,* (published in seven parts, 1819–20). Rip, a good-natured, likable ne'er-do-well, on a hunting excursion falls in with a dwarf who leads him into the fastnesses of the Catskills. The dwarf proves to be a member of a band of little men. Rip drinks the liquor they proffer and falls asleep. He wakes 20 years later to find himself an old man with a long white beard. Having made his way back to the village he discovers that his wife is dead, that many changes have taken place and that a republic has been declared. Joseph Jefferson's best-known part was that of Rip in a play adapted from Irving's story by Dion Boucicault and somewhat altered by the actor himself.

Rivals, The, a comedy by Richard Brinsley Butler Sheridan, produced in 1775, when its author was 24. The rivals are Captain Absolute (*alias* Ensign Beverley) and Bob Acres, contenders for the hand of Lydia Languish. Acres sends a challenge to the unknown Ensign Beverley, but when he reaches the field of honor and discovers that Beverley is none other than his good friend Absolute, he declines to fire. Styled a coward, he declares, "I don't mind the word 'coward;' 'coward' may be said in a joke; but if he called me 'poltroon'—." He abandons all claims to Lydia's favor, and she is forthwith married to Absolute, whom she had known as Beverley and with whom she had been intending to elope.

Robinson Crusoe, a children's classic, by Daniel Defoe, published in 1719. It is one of the most famous stories for boys ever written. Early in the story Robinson Crusoe, sole survivor from a wreck, crawls upon the beach of a deserted island, with only his native wits and the gifts of fortune to save him from starvation. He first rescues from the wrecked vessel tools and provisions which will be of use to him; next he organizes his time and energy, builds a home, plants crops and tames wild creatures. At last Crusoe sees the print of a human foot on the sand of his shore one day. The footprint is that of a savage whom Crusoe names Friday and adopts as a servant. The island is invaded by savages and later by European sailors. All Crusoe's resourcefulness is needed to save his life, but he eventually masters the situation and sails back to England in prosperity. The secret of the book's success lies chiefly in two features: (1) the minute details which make it seem like a record of actual experience, and (2) the ingenuity of Crusoe in fighting a battle for life, alone, under primitive conditions. Crusoe is supposed to have had an original in the Scottish sailor Alexander Selkirk (1676–1721), who at his own request was put ashore on the island of Juan Fernandez off the coast of Chile in 1704 and lived there alone until 1709. Defoe places Crusoe's island somewhere "upon the coast of Guiana, or the north part of Brazil."

Rochester, Edward Fairfax, a character in Charlotte Brontë's *Jane Eyre;* the owner of Thornfield Hall, where Jane becomes a governess. His is a strange, paradoxical nature, but Jane's eventual marriage to him turns out most happily for both.

romance, in prose fiction, a form distinguished from the novel or tale in that it adheres less closely to verisimilitude and freely idealizes.

romantic movement, in modern literature, a marked tendency at the close of the 18th century and the beginning of the 19th to revert to medieval standards of free idealism and to employ even the most fantastic and extravagant methods; opposed, in this sense, to classicism.

Romeo and Juliet, a tragedy by Shakespeare; printed surreptitiously in 1597, issued in corrected form in 1599. "A pair of star-cross'd lovers" between whose families lies an ancient grudge supply the main plot. The scene is Verona, except the first portion of the fifth act, which is at Mantua. The story had filtered down from Italian and French sources. Shakespeare found it in Arthur Brooke's poem *The Tragicall History of Romeus and Juliet* (1562) and in a prose version *The Palace of Pleasure* (1566–67) by William Painter. This play of young love, "the first bewildered, stammering interview of the heart," gives us the mingled grace and brutality of medieval manners. Among its characters is Mercutio, kinsman to the prince of Verona and gallant gentleman, who as he dies exclaims, "A plague o' both your houses!" The dramatic fifth symphony (1839) of Berlioz found inspiration here, as did Gounod's opera *Roméo et Juliette* (1867).

Romola, a novel by George Eliot, published serially in the *Cornhill Magazine* in 1862–63 and in book form in 1863. It is a story of Florentine life at the close of the 15th century. In its crowded pages appears Savonarola, the great religious and social reformer. In spite, however, of the amount of historical detail that the author wrought into the book, interest centers not in Florentine history but in the moral degradation of one of the characters—Tito Melema, a Greek who wanders into the city one morning, a shipwrecked and friendless stranger, but establishes himself in the favor of influential persons, marries Romola and becomes a man of importance. His rise is accompanied by a gradual deterioration, until at the end of the story he is utterly unscrupulous, all through seeking his own interest and taking the easiest way, whether right or wrong. In tracing Tito's debasement through his own actions, George Eliot is illustrating her own saying: "Our deeds determine us as much as we determine our deeds."

Rosalind, a character in Shakespeare's *As You Like It;* daughter of the banished duke and in love with Orlando. She dresses as a boy and goes to the forest of Arden. Mischievous when she teases Orlando about his love and always witty, gay and vivacious, she is, as Professor Dowden says, "a figure which quickens and restores our spirit as music does."

Rowena, The Lady, in Scott's *Ivanhoe*, the ward of Cedric the Saxon; in love with Wilfred of Ivanhoe, to whom she is married in York minster in the presence of King Richard.

Rubáiyát, The (Quatrains), verses by Omar Khayyám, a Persian philosopher and poet belonging to the second half of the 11th century A.D. and the first quarter of the 12th. The verses record melancholy reflections upon life in vivid and simple figures, likening existence to a day's rest in a journey, or man to a clay pot. The prevailing reflection is that since life is brief and the future uncertain, one should enjoy the present with feast and song. The English poet Edward FitzGerald published in 1859 a translation of these quatrains into English verse of commanding beauty. Liza Lehmann's song cycle *In a Persian Garden* is based on selections from the FitzGerald version.

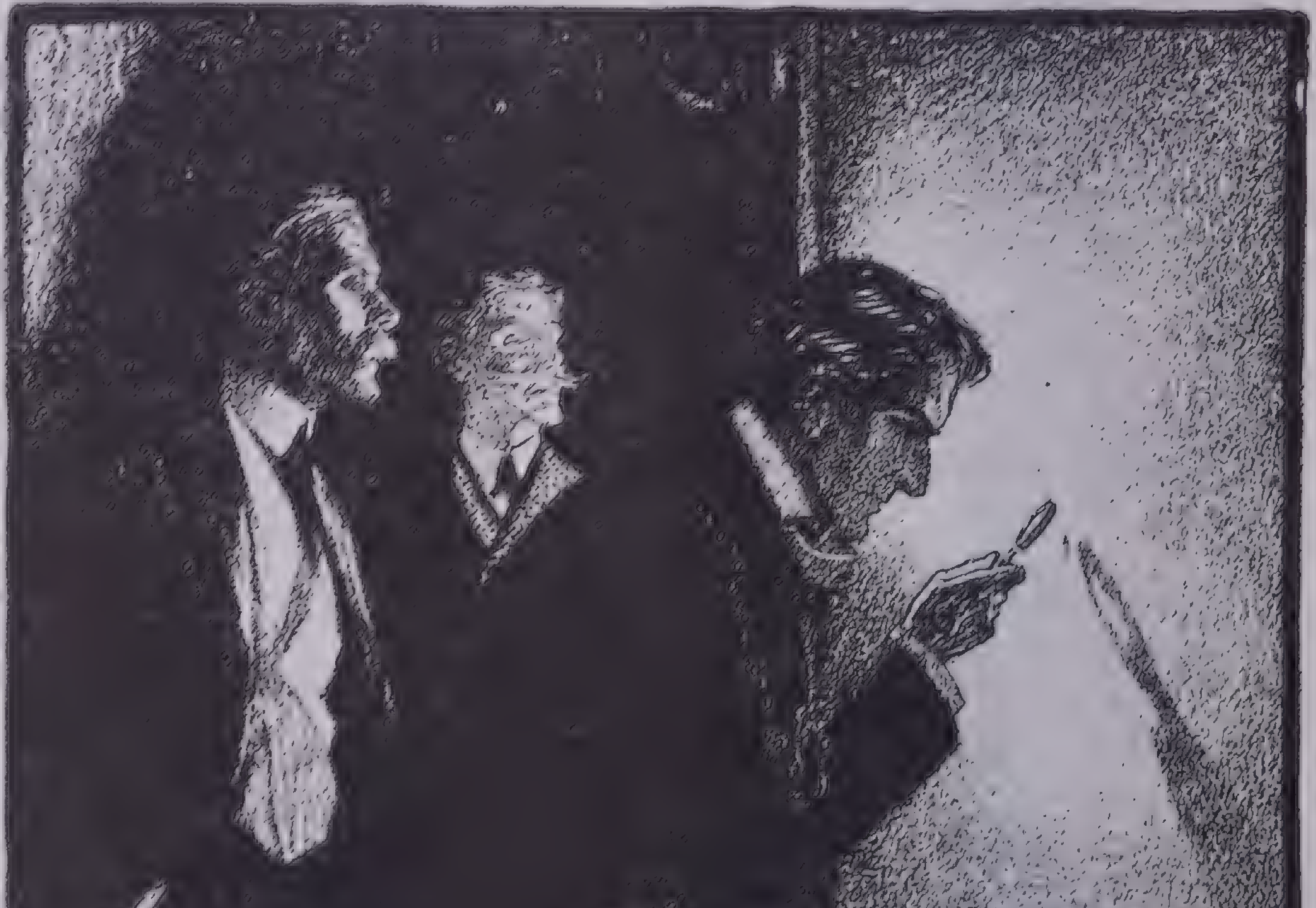
saga, strictly, a Scandinavian hero story or myth; by extension, any legend or record of ancient history.

satire, in modern literature, any composition, whether in verse or prose, in which ridicule is employed against human beings and their ways.

Scarlet Letter, The, a novel by Nathaniel Hawthorne, published in 1850. Its scene is laid in 17th-century Boston. The heroine is Hester Prynne, who refuses to name the father of her child Pearl. She is forced to stand on the pillory and to wear a scarlet letter A (for adulteress) on the bosom of her dress. Taking up her home on the verge of the wilderness, she devotes her life to deeds of mercy, while Pearl grows up a lonely, elfin creature. At last, after a powerful sermon, the father, the Rev. Arthur Dimmesdale, publicly declares his guilt and dies in Hester's arms. The lofty atmosphere of this book and its pure style made it a 19th-century classic.

Scottish Chiefs, The, a romance by Jane Porter, published in 1810. It centers around the martial exploits of Sir William Wallace, the Scottish national hero, and Robert Bruce is also introduced. It begins in 1296 with the murder of Wallace's wife by English soldiers.

Sense and Sensibility, a novel by Jane Austen, written in 1797–98, later revised and published in 1811. Here, as in her other books, she paints with incomparable fidelity on—to use her own words—a "little bit (two inches wide) of ivory," the middle-class English life she knew. The story reveals how easily sentiment may decline into sentimentality, and is rather a character study than an out-and-out romance like *Pride and Prejudice*. It has its share of what Scott referred to as "the exquisite touch which renders commonplace things and characters interesting."



From a drawing by Frederic Dorr Steele, courtesy Collier's

Sir Arthur Conan Doyle: The Adventure of the Norwood Builder

Dr. Watson, Lestrade, a detective, and Sherlock Holmes examine a thumb print

Sentimental Journey Through France and Italy, A, fanciful sketches of continental wanderings, part of what was intended to be a longer work, by Laurence Sterne; published in two volumes in 1768 just before his death. While he was looking at the Bastille, the tourist heard a voice, "I can't get out!" It proved to be the voice of a caged starling, but the tourist, imagining a prisoner who had been confined 30 years, wept bitterly. At a place near Crécy he wept over a dead ass. On other occasions he wept freely. "God tempers the wind to the shorn lamb," often attributed to the Bible, occurs in this book.

Sentimental Tommy, a novel by Sir James Barrie, published in 1895. Tommy is Thomas Sandys, a young Scot with a real literary gift but a tendency to dramatize his life (himself as hero) and a lack of emotional stability. He lives in a world of poses and illusion and conscious pretense and has done so ever since he was a lad and proclaimed that the Auld Licht kirk of Thrums was bigger and lovelier than St. Paul's. The book has humor of a rather grim sort, and the other characters are drawn with much truth. *Tommy and Grizel* (1900) continues the record of Tommy's fortunes.

Sesame and Lilies, the collective title of a group of three lectures by John Ruskin. Of these the first two, *Of Kings' Treasuries* and *Of Queens' Gardens,* were issued together in 1865 (the second having first appeared as a pamphlet in 1864); the third, *The Mystery of Life and Its Arts,* delivered in Dublin in 1868, was later added and a long preface, dated 1871, was written for the three. The theme of the first is the use and value of good books; of the second, the right education of girls; of the third, some of Ruskin's ideals for the conduct of life.

sestet, (*a*) the second portion (the last six lines) of a sonnet; (*b*) any stanza of six verses.

She Stoops To Conquer, a comedy by Oliver Goldsmith, first produced in 1773. It is said to have been founded on an incident in the author's own life. In the play, Marlow, a bashful young man, is on his way to the estate of Hardcastle, whose daughter has been named to him as a desirable wife. Tony Lumpkin, the squire's stepson, directs Marlow to the Hardcastle home, saying that it is an inn at which he may remain overnight. On arriving there, Marlow treats Hardcastle as a landlord and the daughter, the girl whom he had actually come to court, as a barmaid. But she is so favorably impressed with him that she allows him to believe her, though not a barmaid, a poor relation. Thus "she stoops to conquer" and gains a husband.

Sherlock Holmes, the clever detective of Baker Street, hero of Sir Conan Doyle's *A Study in Scarlet, The Sign of Four, Adventures of Sherlock Holmes, Memoirs of Sherlock Holmes, The Return of Sherlock Holmes, The Hound of the Baskervilles, The Valley of Fear, His Last Bow* and *The Case Book of Sherlock Holmes.* The quick-witted, resourceful, nonchalant Holmes and his slow-minded foil Doctor Watson make an effective pair. The character of Holmes, according to Doyle himself, was in part drawn from Dr. Joseph Bell of the Edinburgh Infirmary, who had some of the deductive gifts that Holmes displayed in so superlative a degree. William Gillette, who long played the leading role in his own drama *Sherlock Holmes,* strikingly realized Holmes in person and manner.

Shropshire Lad, A, a book of poems by Alfred Edward Housman, published in 1896. It is a series of lyrics, 63 in number, having both an outward and an inner unity because their background is the region of Wenlock Edge and the Severn and "the wild green hills of Wyre," and because they are direct personal expressions with a local center there but universal in their significance. Simple in their verse forms and their phrases, with not one overwritten line yet never commonplace, they brought a new speech into English poetry; and this was admitted even by those who did not wholly enjoy Stoic philosophy.

Shylock, the Jewish moneylender in Shakespeare's *The Merchant of Venice.* He may be viewed as an "inexorable dog" who hates all Christians and plots against their lives, loves his money and oppresses his young daughter Jessica; or he may be pitied because he belongs to an abused race and stands alone in the play, opposed to all the other characters and deserted even by his daughter. Some actors to whom the role of Shylock has been assigned have portrayed him in the first-named light; but Sir Henry Irving, perhaps the greatest interpreter of the part, made his audiences more friendly toward the old man against whom the entire populace had turned.

Sigurd the Volsung and the Fall of the Niblungs, The Story of, an epic poem by the versatile William Morris, published in 1877. William Sharp once wrote: "The breath of the North blows across these billowy lines as the polar wind across the green waves of the North Sea. The noise of waters, the splashing of oars, the whirling of swords, the conflict of battle, cries and heroic summons to death, reecho in the ears."

Silas Marner, a novel by George Eliot, published in 1861. "In the old days there were angels who came and took men by the hand and led them away from the city of destruction. We see no white-winged angels now. But yet men are led away from threatening destruction; a hand is put into theirs; . . . and the hand may be a little child's". This is the theme of the novel, which shows the redemption of Marner, a miserly weaver, by his love for a little child. He has been robbed of his hoard of gold, but is recompensed by finding Eppie upon his threshold. Eppie turns out to be the unacknowledged daughter of Godfrey Cass, the village squire, by an unfortunate first marriage.

skald, a minstrel of the ancient Scandinavians who composed and sang or recited poetry in honor of heroes and their deeds.

Sketch Book of Geoffrey Crayon, Gent., The, collection of sketches and tales by Washington Irving, published in seven parts in 1819–20. Famous among the stories in the volume are "Rip Van Winkle" and "The Legend of Sleepy Hollow" (the account of Ichabod Crane, Katrina Van Tassel and the headless horseman).

Sohrab and Rustum, a narrative poem in blank verse by Matthew Arnold, called by him "an episode." It appeared in his first series of *Poems* in 1853 with "The Scholar-Gipsy" and other notable verse. "Sohrab and Rustum" tells how the Persian warrior Rustum (Rustam) unwittingly engages in personal combat with his natural son Sohrab, challenger for Rustum's Tartar foes, and mortally wounds him before learning of their relationship. The story comes from the Persian epic the *Shahnamah* (Book of Kings).

sonnet, a poem of 14 lines (customarily in iambic pentameter) arranged in accordance with a prescribed rhyming scheme. There are two leading forms, the Italian (or Petrarchan) and the Shakespearean (or Elizabethan).

Sonnets from the Portuguese, a sonnet sequence by Elizabeth Barrett Browning, published in 1850. It had been printed (but not published) in 1847 as Sonnets by E.B.B. The sonnets are the artistic expression—"the very notes and chronicle," Edmond Gosse called them—of her betrothal to Robert Browning, who declared them to be "the finest sonnets written in any language since Shakespeare's." The present title was suggested by Browning for the edition of 1850 because Mrs. Browning, whose looks were Latin rather than English, had been dubbed by certain intimate friends "The Portuguese."

Spectator, The, an English periodical that succeeded Richard Steele's *Tatler.* From March 1, 1711, to December 6, 1712, it was issued daily (Sundays excepted) by Addison and Steele; from June 18 to December 20, 1714, three times a week by Addison alone. The first series comprised 555 numbers, of which 236 were by Steele, 274 by Addison, the others by various friends. (Pope's *Messiah* was originally written for it.) It gained a certain unity through the idea of an imaginary club and through the presence of the Spectator himself—observer, critic, philosophical teacher. It contained stories and character sketches (including the Sir Roger de Coverley papers); essays on fashion, manners, morals, religion; critiques of literature and the drama. So popular was the work that it could be found upon every breakfast table and in every coffeehouse. Its effects upon English thinking and English manners were decided.

spondee, a metrical foot consisting either of (*a*), in Latin and Greek verse, two long syllables, or (*b*), in English verse, two accented syllables.

Spoon River Anthology, a book of verse by Edgar Lee Masters, issued in book form in 1915. It originally appeared from week to week in *Reedy's Mirror* in 1914–15. Its plan was novel. A succession of the departed inhabitants of an Illinois small town speak from the quiet in which "all, all are sleeping on the hill," and thus they draw vignette portraits of themselves and their former neighbors. Among these voices is introduced that of Anne Rutledge in what is the best and most quoted expression of the series.

Stalky & Co., a story by Rudyard Kipling, published in 1899. It has to do with student life in England and is based on the author's own experiences at the United Services College, Westward Ho, North Devon. Stalky & Co. were Stalky, McTurk and Beetle, "the resourceful three," companions for 7 years. Beetle, editor of the college paper, who enters journalism, is Kipling himself.

stanza, a group of lines of verse arranged in accordance with a definite scheme. It is often, but incorrectly, called a verse.

Strange Interlude, a play by Eugene O'Neill, produced and published in 1928. It received the Pulitzer prize for 1927–28. It aroused discussion through use of a technical device by which the drifting thoughts of the characters break through the regular dialogue and find utterance in an adaptation of an old-time soliloquy.

stream of consciousness, a phrase employed in describing a method by which in fiction writing the author, instead of epitomizing or briefly suggesting a character's thoughts, unwinds them in a jumbled and seemingly endless continuum.

Tale of Two Cities, A, a novel by Charles Dickens, first published serially in *All the Year Round* from April to November, 1859. The two cities are London and Paris, the time is just before and during the French Revolution. Dr. Charles Darnay, nephew of a heartless French marquis, hastens to Paris to aid an old family servant. His wife Lucie and his father-in-law Dr. Manette follow him. Soon they and two friends, the solicitor Jarvis Lorry and the bohemian Sidney Carton, who has long loved Lucie Manette, find themselves caught in the maelstrom of the Terror. Darnay is sentenced to death as an aristocrat, but Carton by a stratagem takes his place in prison and dies by the guillotine. The scene of the execution, with the knitting women calmly numbering the numerous victims as time and again the knife falls, is justly famous.

Tales of a Wayside Inn, a group of narrative poems by Henry W. Longfellow. The first part appeared in 1863; the second, in 1872 (as one of the *Three Books of Song*); the third, in 1873 (as the chief part of *Aftermath*). The arrangement is under the fiction of a company of storytellers at the Red-Horse Tavern in Sudbury, Mass. Probably the most famous of the stories is the landlord's tale, *Paul Revere's Ride*. The inn still stands, a memorial to the poet.

Talisman, The, a novel by Sir Walter Scott, published in 1825. It tells a story of the Third Crusade. Palestine, during an interlude in the fighting, is the scene of its action. Two noble adversaries, Richard the Lion-hearted and Saladin meet when the sultan, in the guise of a physician, attends the king. The plot has to do with the soldierly exploits and the courtship of the Prince of Scotland, disguised as Sir Kenneth of the Couchant Leopard, who wins the hand of Lady Edith Plantagenet. The love story is in Scott's best romantic vein. The romantic effect is heightened by descriptions of the splendor of the armies, of a great sandstorm on the desert and of marvelous feats of swordsmanship.

Tam O'Shanter, a famous poem by Robert Burns, first published in the Edinburgh edition of 1793. It tells in Burns's best vein of the uncanny experiences of

honest Tam o'shanter
As he frae Ayre ae night did canter

on a market night, after tarrying overlong by a tavern ingle. Pursued by warlocks and witches and knowing they dare not cross a stream, he urged his mare Maggie across Doon brig, but one witch managed to seize Maggie by the tail, leaving "scarce a stump."

Tanglewood Tales, a collection of stories by Nathaniel Hawthorne, published in 1853. It is a "second Wonder-Book" and continues the series of versions of old Greek myths begun in *A Wonder-Book* (1851). The six stories tell of Theseus and the Minotaur; the Pygmies that battled with the cranes; Circe's palace, where the companions of Odysseus were changed to swine; Ceres and Proserpine; the dragon's teeth and the voyage of Jason and his Argonauts.

Tatler, The, a periodical founded by Sir Richard Steele and edited and published by him in London from 1709 to 1711 under the pseudonym "Isaac Bickerstaff, astrologer." This name he borrowed from Dean Swift, who had assumed it in a controversy with one Partridge, an almanac maker. Of the *Tatler* papers, Steele and Addison together wrote 34; Addison, 41; Steele, the remainder of the 271 numbers. The *Tatler,* issued three times a week, contained political and social news in addition to the essay.

Tempest, The, a romantic drama by Shakespeare, first performed in 1611, first printed in the folio of 1623. It was thus among his last plays. The scene is laid on an enchanted island, apparently Bermuda. The chief character, Prospero, a magician, is a model of magnanimity. Caliban, deformed aborigine with something of human intelligence but no moral sense, contrasts most sharply with Ariel, a sprite who serves Prospero. The plot opens with a tempest, caused by Prospero's magic. This tempest brings to the island Prospero's brother Antonio, who had usurped the throne. After a day of marvels Prospero regains his dukedom, and all sail away to Italy. There are some beautiful songs in the play. Robert Johnson in 1612 wrote music for "Full fathom five" and "Where the bee sucks," and Henry Purcell wrote music for an opera on the same theme produced in 1756 by David Garrick.

Tess of the D'Urbervilles; a Pure Woman, a novel by Thomas Hardy, first published in 1891. Tess Durbeyfield, a beautiful English village girl is a lineal descendant of the aristocratic d'Urbervilles. Alec, a son of that family, pursues Tess and by accident, through no fault of hers, she becomes his victim. A child is born, whom she names Sorrow, but he soon dies. Some years later Angel Clare marries Tess, but he leaves her when on the wedding day she tells him of her past. He experiences a change of heart and tries again to win her love, but Alec seeks to claim her and prevent any reconciliation. Tess kills him, and she and Clare flee, hoping to reach a port whence they may escape. They are overtaken at Stonehenge, and Tess is hanged.

tetrameter, a verse having four measures or metrical feet.

Thanatopsis (A Vision of Death), a reflective poem by William Cullen Bryant, written when he was only 18, published in the *North American Review* in 1817. Its theme is consolation upon thought of death. It has sometimes been asserted that with *Thanatopsis* American poetry had its real beginning.

Three Musketeers, The (*Les Trois Mousquetaires*), also sometimes called *The Three Guardsmen,* a romance by Alexandre Dumas the Elder, published in 1844. It is the first part of a trilogy of which the other two parts are *Twenty Years After* and *The Vicomte de Bragelonne.* These three stories cover the period from 1625 to 1665 and deal with the adventurous career of d'Artagnan, who comes from Gascony to Paris to seek his fortune with a raw-boned horse, a box of magic salve and three crowns in money. In *The Three Musketeers* he manages on his first day to get himself into duels with Athos, Porthos and Aramis, the most dangerous members of the musketeer crops of Louis XIII. He wins the friendship of all and thenceforth the four share both good and evil fortune amid stirring events in the days of Richelieu.

To Have and To Hold, a novel by Mary Johnston, published in 1900. It is a historical romance dealing with life in colonial Virginia in the early 17th century. The hero is Ralph Percy, an English gentleman, who chooses a wife from "indentured" serving-maids newly arrived from England. She turns out to be Jocelyn Leigh, the king's ward, who has fled in disguise to avoid marriage with Lord Carnal. Carnal traces and follows her, his endeavors to seize her and get rid of Ralph Percy provide many adventures, but eventually all ends well.

Tom Brown's School Days, a story by Thomas Hughes (by An Old Boy, says the title page), published in 1857. It has been termed the best story of school life ever written and relates the experiences of the hero at Rugby, including his acquaintance with the famous headmaster Dr. Thomas Arnold. Cricket, football, fagging and bullying and poaching receive much attention. The character of Arthur, one of the boys, is based on that of Arthur Stanley (later dean of Westminster) as he was in student days. *Tom Brown at Oxford* (1861), a sequel, takes the hero to college.

Tom Jones (properly, *The History of*

From the Metro-Goldwyn-Mayer motion picture, Treasure Island

Robert Louis Stevenson: Treasure Island
Long John Silver and Squire Trelawney have an argument

Tom Jones, a Foundling), a novel by Henry Fielding, published in 1749. The hero, Tom Jones, is a foundling who grows up into an impulsive, frank and generous boy. He loves Sophia Western, daughter of the local squire, but has a rival, Blifil, a malicious hypocrite. Tom gets into various escapades, is disinherited, has several discreditable adventures with women; but through all his wanderings remains frank, well-intentioned, and kind of heart. At the end of the story he is discovered to be the rightful heir to a fortune. He reforms, marries Sophia and launches upon a virtuous and happy career.

Tom Sawyer, The Adventures of, a story by Mark Twain (Samuel L. Clemens), published in 1875. It is the first of three works of fiction by him dealing with the Mississippi River and the folk of the Mississippi Valley. (The other two are its sequel, *The Adventures of Huckleberry Finn,* and *Pudd'nhead Wilson.*) With spontaneous humor and a wealth of picturesque and authentic detail, veracious character drawing and racy wisdom, the author describes the vanished life of the old steamboating days he knew so well.

Tommy and Grizel, a novel by Sir James Barrie, published in 1900. It continues the study of "Sentimental Tommy," Thomas Sandys, the gifted young Scot whose ever-shifting moods and fondness for make-believe in which he is cast as hero render him an object of constant thought by the patient Grizel, who long endures his flirtations with other women. Finally his affair with Lady Pippinworth nearly breaks Grizel's heart but she nevertheless enters into a hasty marriage with him—and the result is that proverbially ascribed to hasty marriages.

tragedy, that form of dramatic composition in which a theme of solemn or pathetic character is set forth in action usually proceeding to a fatal outcome and in language of an elevated quality, whether verse or prose.

Treasure Island, a story by Robert Louis Stevenson, published in 1883. The hero is Jim Hawkins, a boy whose father keeps a seaside tavern. At the tavern lives a terrible old seaman who guards the secret of the burial place of pirate treasure. A murderous gang is after this secret, but the old man dies without revealing it, and the map of Treasure Island passes into the possession of Hawkins. Friends of his proceed to fit a vessel to seek the treasure, but their purpose leaks out, and some of the pirate gang enlist in the crew. Mutiny on board ship, cold-blooded murders, strategy and fighting, on sea and ashore, form the material of the remaining story, until the treasure is found. The book has all the best features of a good pirate yarn, including a diabolical villain, Long John Silver, the one-legged cook. It is one of the most captivating yarns ever written.

Trilby, a novel by George Du Maurier, published in 1894. It is a story of life in the Latin Quarter of Paris. Trilby O'Ferrall is a laundress and artist's model and the comrade of three artist friends—Taffy, the Laird and Little Billee, who are all more or less in love with her. Svengali, a repulsive bohemian musician, acquires hypnotic control over her and by this means develops her voice; and she wins fame as a singer while he makes a fortune. When he suddenly dies, her power leaves her. The book, like Du Maurier's other two novels, was illustrated by himself.

trimeter, a verse having three measures or metrical feet.

triolet, an eight-line stanza with two rhymes, the 1st line repeated as the 4th and 7th and the 2d line is repeated as the 8th line.

triplet, a group of three lines of verse rhyming together.

trochee, a measure or metrical foot consisting (*a*) in the classical languages of a long syllable followed by a short; (*b*) in English of an accented syllable followed by an unaccented.

Troilus and Cressida, a tragedy by Shakespeare, produced about 1600, printed (twice) separately in 1609 and in the folio of 1623. Like Chaucer's *Troilus and Cressida,* it is derived not from classic myth but from later romancers. The plot is slight. The scene is Troy and the Greek camp before it. In spite of fine passages, the piece has not been highly ranked among Shakespeare's works nor has it held the stage. It contains the line: "One touch of nature makes the whole world kin."

troubadour, one of a group of lyric poets that arose in Provence, in southern France, towards the close of the 11th century.

trouvère, one of a class of poets of northern France who wrote narrative poetry during a period extending from the 11th century to the 14th.

Twelfth Night, or, What You Will, a comedy by Shakespeare, printed in 1623. The name is derived from the old custom of devoting the twelfth night after Christmas to sports and games. The scene is a city in Illyria and the neighboring seacoast. The poet satirizes the conceited and languishing Malvolio, at the same time winning our admiration for the wholehearted and faithful Viola. The humor runs from vulgar but droll scenes showing Sir Andrew Aguecheek and Sir Toby Belch in their cups to those of refined comedy with witty dialogue, in which Viola has the leading part. The plot is one of mistaken identity in which four lovers are involved in ludicrous situations.

Twice-Told Tales, two collections of stories by Hawthorne, first published, as he says, "in Magazines and Annuals, extending over a period of ten or twelve years," later assembled in book form in 1837 and 1842. They include such pieces as "The Gentle Boy," "The Great Carbuncle," "A Rill from the Town Pump" and "Legends of the Province House."

Two Years before the Mast, a narrative of sea life by Richard Henry Dana, published in 1840. Forced by eye-trouble to give up his studies, Dana shipped as a foremast hand in the brig *Pilgrim* on a voyage around the Horn to California. He returned in the ship *Alert.* The book gives the hardships and adventures of the common seaman of that time. William Cullen Bryant termed it "equal to *Robinson Crusoe.*"

Typhoon, a volume of four short stories by Joseph Conrad, published in 1902. Like *Youth,* these were written in the period following *The Nigger of the "Narcissus"* and preceding *Nostromo.* Besides the title story, the other three are "Amy Foster," "Falk: A Reminiscence" and "To-morrow." An American edition is called *Falk and Other Stories.* Captain MacWhirr in *Typhoon* has by many been placed among the most interesting examples of Conrad's character drawing.

Uncle Remus, an old Negro, the creation of Joel Chandler Harris, who uses him in *Uncle Remus: His Songs and His Sayings* (1880) and *Nights with Uncle Remus* (1883) as narrator of plantation folklore. Uncle Remus usually tells his stories to a little boy, who listens with consuming interest and asks questions with enthusiasm. The animals, such as Br'er Fox, Br'er 'Possum and Br'er Rabbit, talk and reveal their natural characteristics, somewhat in the style of the animal fables of Aesop. The stories were in great part collected by Harris from legends and tales handed down through generations of Negroes. Some of the stories evidently came from Africa.

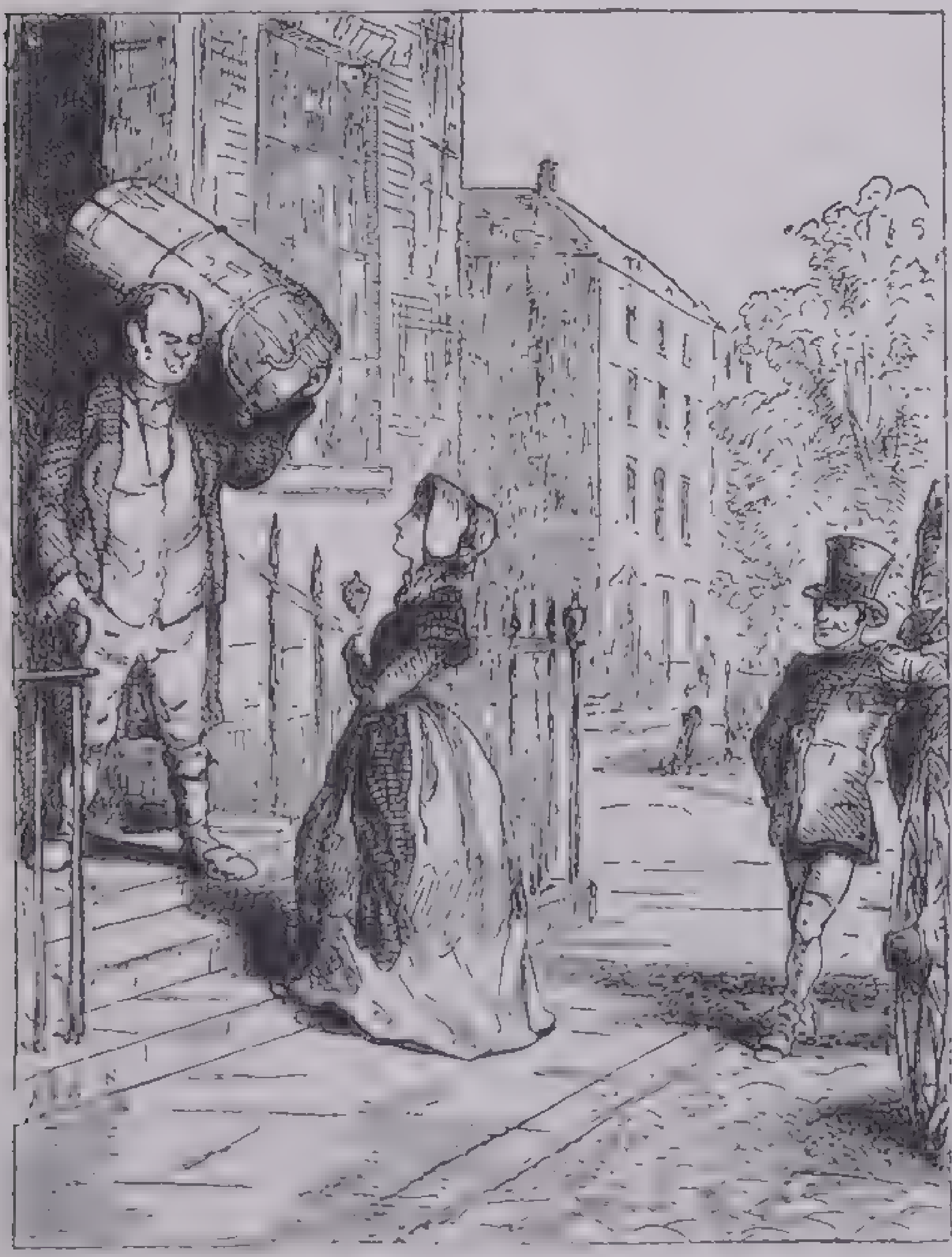
Uncle Tom's Cabin, a novel by Harriet Beecher Stowe, published serially in the *National Era* in 1851–52 and in book form in 1852. Judged by its influence upon human life, it must be rated one of the great books of all time. It was read very widely at the time of its publication and had a considerable effect in winning freedom for the negro race in America.

The story depicts the horrors of slavery by tracing the history of Uncle Tom, a faithful old slave, who is sold because of his master's loss of fortune. First he goes to a kind master and has a happy life; but after a few years he has the misfortune to be sold once more, this time to a cruel master, Simon Legree, who tyrannizes over him and finally, in a burst of wrath, has him so severely flogged that he dies from his wounds. Famous passages in the book describe the escape of Eliza, a fugitive slave, from the bloodhounds; the death of Little Eva, daughter of one of Tom's masters; and a slave auction.

In dramatic form, *Uncle Tom's Cabin* was long a favorite of the American theater.

Utopia, a political romance by Sir Thomas More, published in Latin in 1516, and in English translation in 1551 and 1683. Utopia (meaning *no place*) is a country supposed to have been visited by Raphael Hythloday, lately returned from America, whither he had gone as a companion of Amerigo Vespuccio. In Utopia the life is communistic. None is in need, none desires more than he can use. The happiness of the community is above that of the individual. All except the aged or sick must work, but the hours of work are made as few as possible. Education is general, war is detested, laws are scarcely necessary. The pictures painted were in amazing contrast to the conditions of life then current in England, and the volume created endless discussion. From this book, *utopian* came to be applied to any scheme that men desired to characterize as impossible or too idealistic.

Vanity Fair, a novel by William Makepeace Thackeray, first published in 1847–48. The setting is the fashionable world of England at the beginning of the 19th century. In its subtitle this novel is called a story "without a hero." The complete title, accordingly, informs the reader that the world will be depicted as a mart like that in *Pilgrim's Progress,* where only baubles and trinkets are for sale and all at high prices, a place where no man is really heroic, no man without his folly. Becky Sharp, a clever adventuress, is the leading character. Although she had disreputable parents, she succeeds through her own efforts in getting well married, in living lavishly by evading creditors and in winning her way into smart society. At last her husband, Rawdon Crawley, catches her in a compromising situation with Lord Steyne, an old rake, unmasks her and leaves her. Thereafter she sinks into a cheap, vagrant life, trying more or less in vain to seem respectable. The more admirable characters in the book are Amelia Sedley, sweet-natured but weak, and Dobbin, faithful and honest though a bit dull.



Rebecca Makes Acquaintance with a Live Baronet
One of Thackeray's own illustrations to his *Vanity Fair*

Vedas, the ancient Brahmanical sacred books of India, written in Sanskrit. They are designated in four groups, as the Rig-Veda (hymns), Yajur-Veda (liturgy), Sama-Veda (liturgy) and Atharva-Veda (hymns and thoughts). The first-named is the oldest. Reference is made to these usually as the Four Vedas. They were not written at the same time, it is known, but were composed by many hands, probably between the years 2000 and 1500 B.C., and therefore represent the slow development of religious thought in India. *Veda* signifies knowledge or science.

verse, in general, metrical composition as differentiated from prose; specifically, one metrical line composed of a number of feet. *Verse* is often, but incorrectly, used for *stanza.*

vers libre (literally, "free verse"), a term originating in France and used to describe the method of modern French poets who deliberately infringed upon the rules of conventional French prosody.

Vicar of Wakefield, The, a novel by Oliver Goldsmith, published in 1766. The hero of this book is Doctor Primrose, a benevolent, lovable country clergyman. The story tells of the misfortunes which fall upon the Vicar's family, of the follies of Moses, a blundering son, of the worldliness of the mother and daughters, of the family's loss of property and of the elopement of Olivia, one of the daughters, with a philandering squire of the neighborhood. Throughout the troubles that beset him the Vicar maintains a steadfast, hopeful composure. At the end misfortune gives way to prosperity and happiness. The character of the Vicar—a smiling Job—is the great feature of the work. He has been called one of the highest compliments ever paid to human nature.

Victorian Age, the historic period of Queen Victoria, during whose reign (beginning in 1837) many important literary personages appeared in England. Among these were Landor, Carlyle, Newman, Matthew Arnold, Tennyson, George Eliot, Trollope, William Morris, Thackeray, Dickens, Macaulay, Bulwer-Lytton, Disraeli, the Brontës, Froude, Kingsley, Ruskin and the Brownings.

Viola, the heroine of Shakespeare's *Twelfth Night.* Disguised as a page (under the name of Cesario), she enters the service of Orsino, Duke of Illyria, the man she loves. To him she is loyal, even when he bids her help him to woo Olivia.

Virginian, The, a novel by Owen Wister, published in 1902. It is a story of life in the western United States, with authentic local color; abounding in humorous episodes but also possessing in Trampas a first-class villain who makes plenty of trouble.

Virginians, The, a novel by W. M. Thackeray, published in 1859, a sequel to *Henry Esmond.* The young George Washington and Braddock's campaign come into the story of Henry Esmond's grandsons. The scene is first Virginia and then London. Beatrix Esmond reappears as the Baroness Bernstein, much older but no wiser or better than in *Henry Esmond.*

Virginibus Puerisque and Other Papers, a volume of essays by Robert Louis Stevenson, published in 1881. Here we have not Stevenson the storyteller but Stevenson the persuasive moralist. *Virginibus puerisque* is a Latin tag from Horace and means "for girls and boys."

Vision of Sir Launfal, The, a poem by James Russell Lowell, published in 1845. In the old English legends Sir Launfal was one of King Arthur's Knights of the Round Table. In this poem on the night before he was to set out on a noble quest he dreamed that though he could win fame and glory in the field and satisfy his debt to the poor by almsgiving, yet the best service he could render mankind was at his own gate, giving himself with his alms.

Walden or Life in the Woods, a work by Henry D. Thoreau, published in 1854. It gives an account of an experiment in simple living. Thoreau tells how he went to live on the shore of Walden Pond, near Concord, Mass. He built a hut with his own hands; he raised beans and other vegetables for his food. By simplifying his life, he was able to support himself with a few hours' labor each day, and to have the major part of his time for reading, walking, writing and the observation of birds, beasts and flowers. He wrote the book not with the idea of arguing that all men should live as hermits in the woods, but as an illustration of the fact that luxury is not essential to high-mindedness and quiet happiness.

Water Babies, The, a fairy tale by the Rev. Charles Kingsley, published in 1863. This has been termed "one of the few perfect fairy stories in the language." It has been said of it that "Even its moralities cannot wither it, nor its educational intention stale its infinite variety."

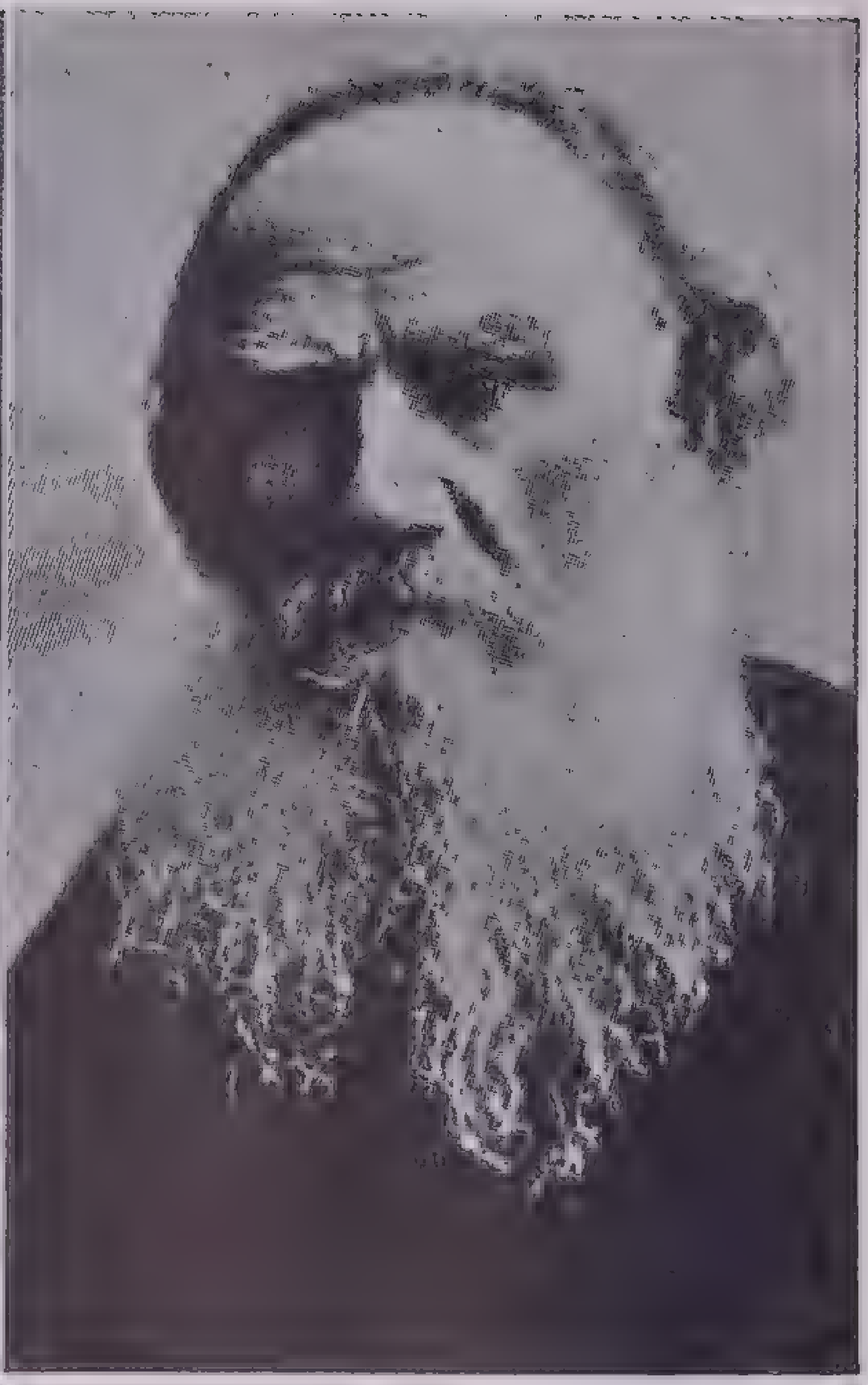
Waverley novels, The, the collective title given to the historical romances of Sir Walter Scott, the name being used because *Waverley,* published anonymously in 1814, was the first of the series. The others until 1827 appeared as "by the author of *Waverley,*" and then Scott's authorship was revealed.

Way of All Flesh, The, a novel by Samuel Butler (1835–1902). He began it about 1872 and until 1884 "was engaged upon it intermittently." It was posthumously issued in 1903, with two missing chapters (the fourth and fifth) supplied by R. A. Streatfield "in a form which I believe does not differ materially from that which he finally adopted." The story has to do with passages in the lives of members

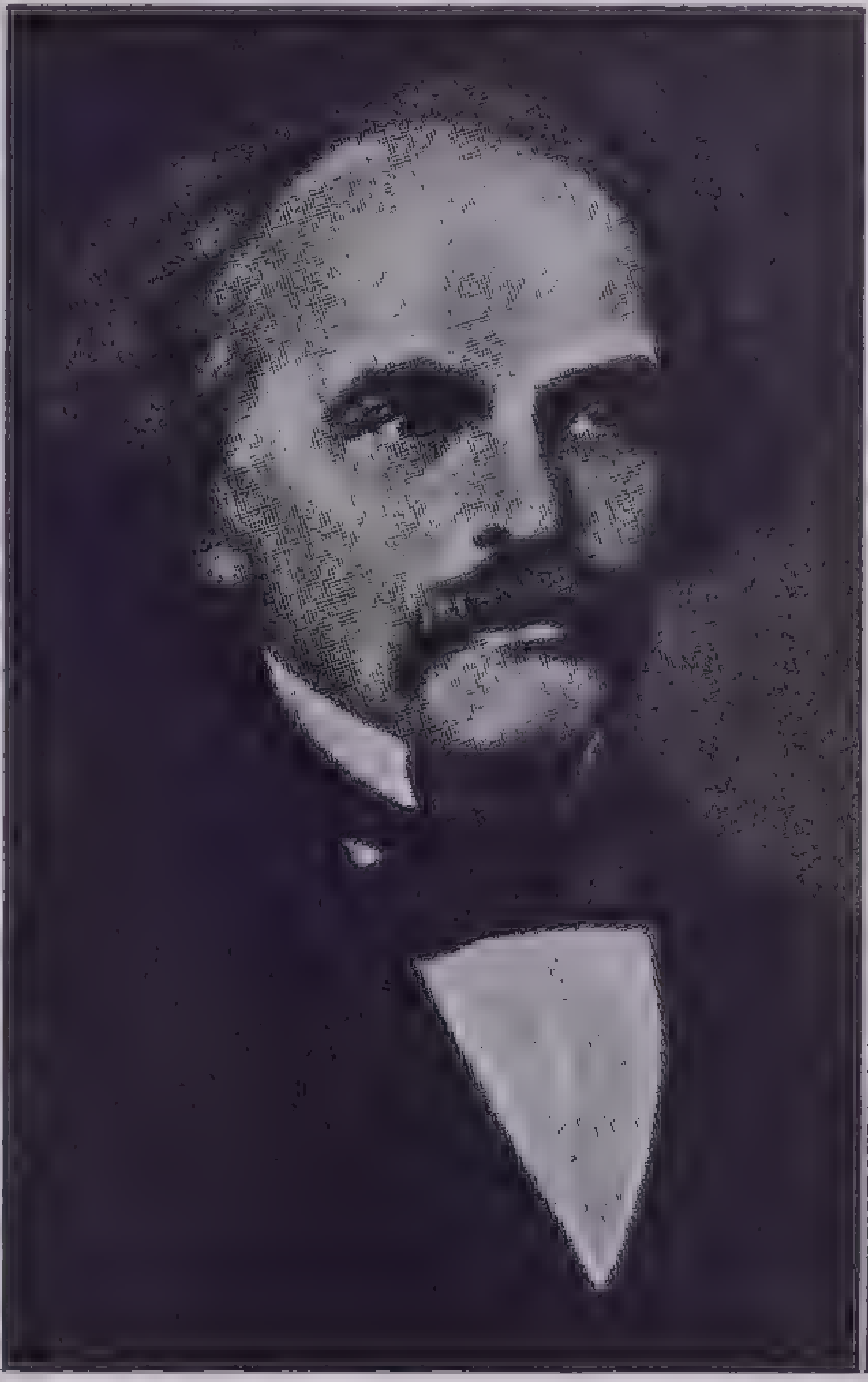
Alexandre Dumas, pere (1802-70)
France

Miguel de Cervantes Saavedra
(1547-1616) Spain

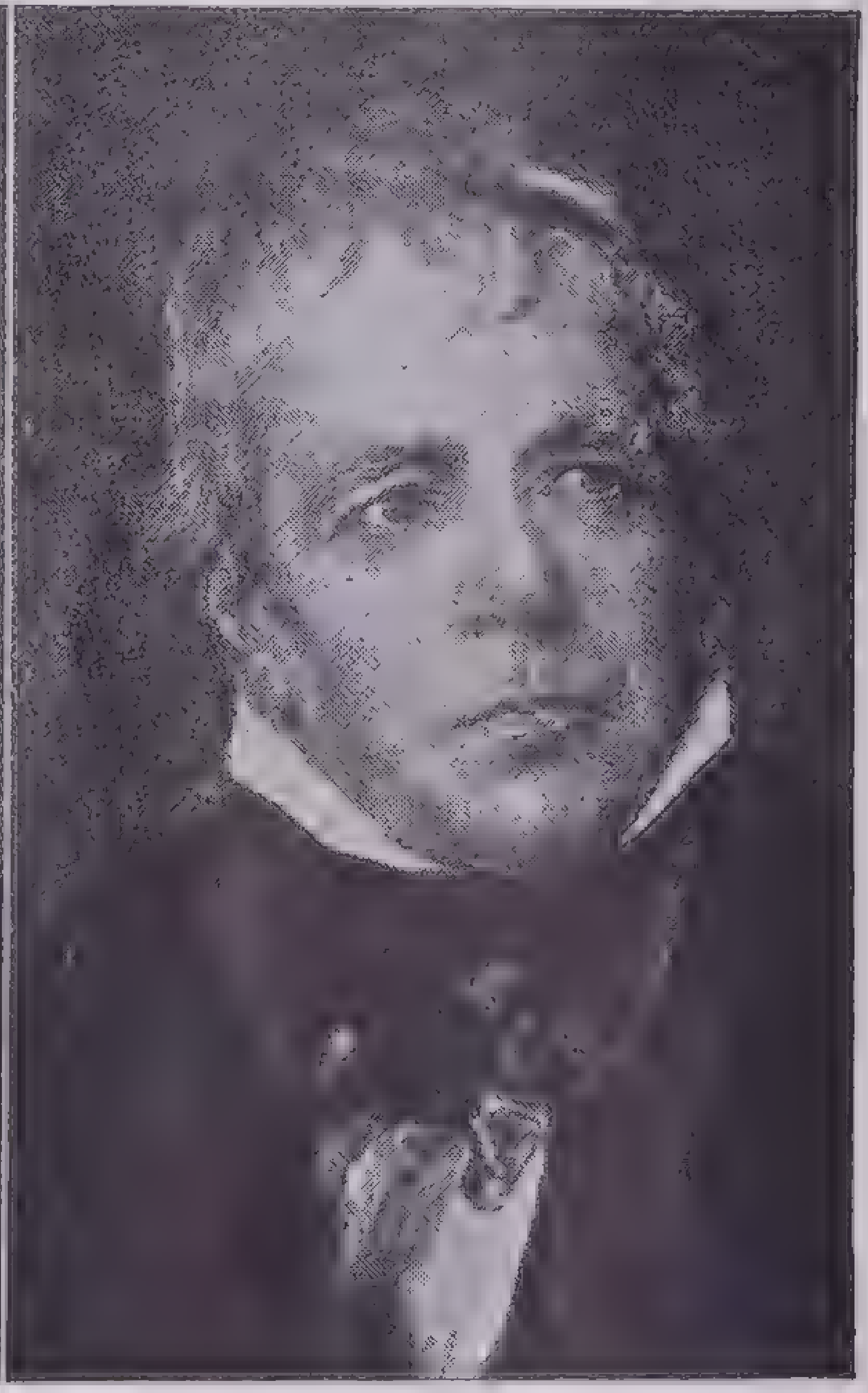
Giovanni Boccaccio (1313-75)
Italy


Count Lev Tolstoy (1828-1910)
Russia

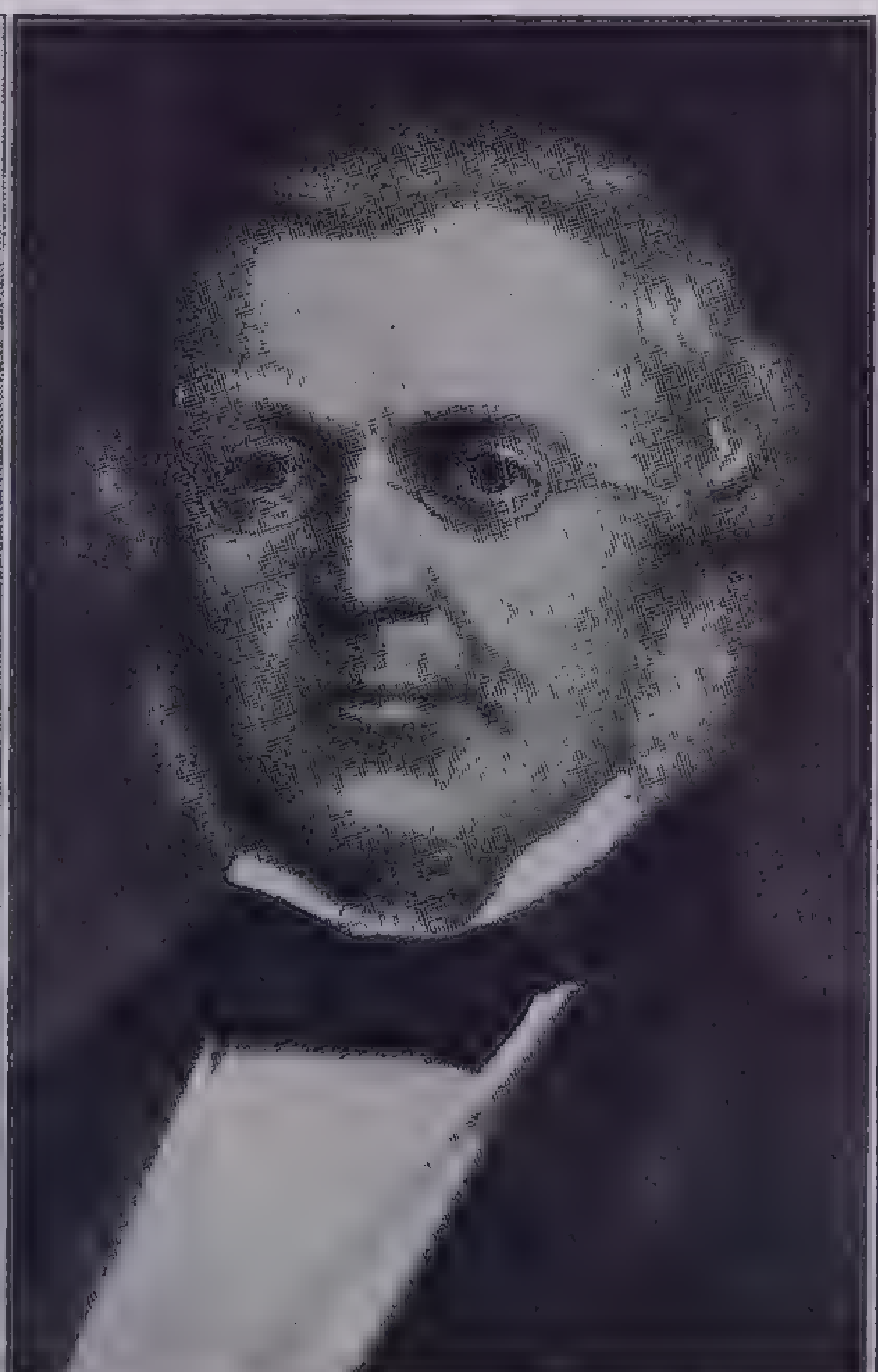
Victor Hugo (1802-85)
France


Nathaniel Hawthorne (1804-64)
United States

Washington Irving (1783-1859)
United States


Sir Walter Scott (1771-1832)
Scotland

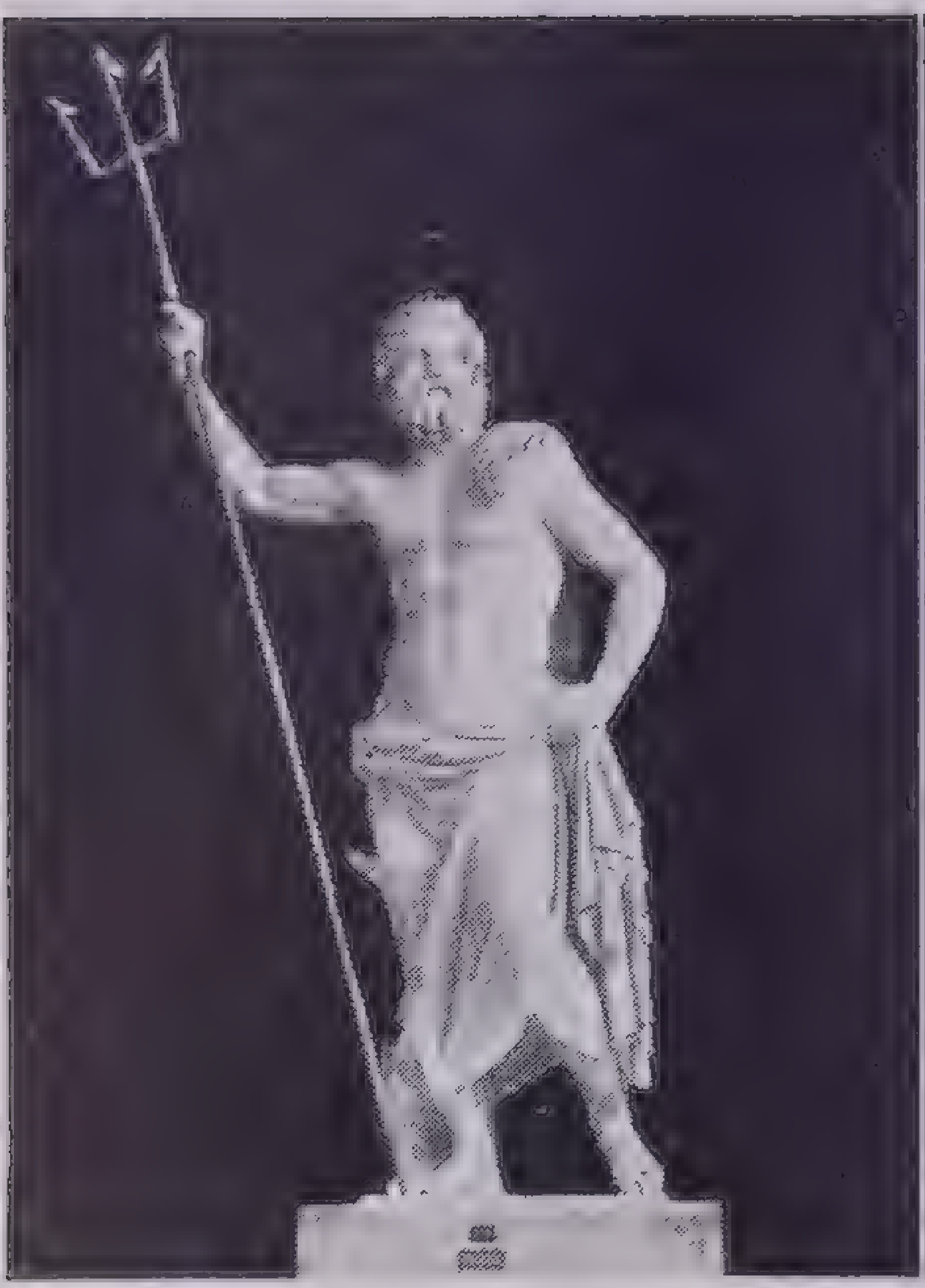
Henrik Ibsen (1828-1906)
Norway

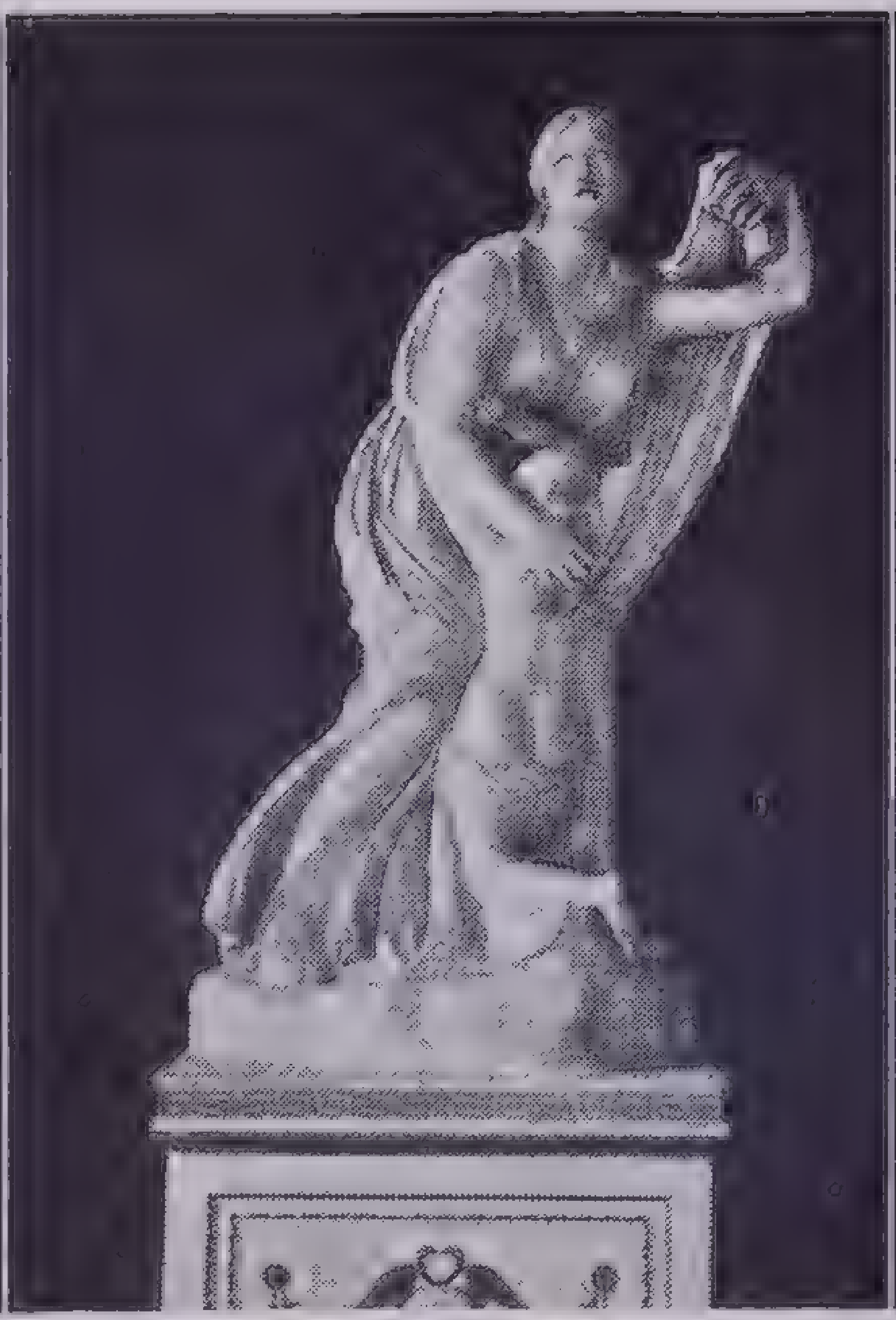

William Makepeace Thackeray
(1811-63) England

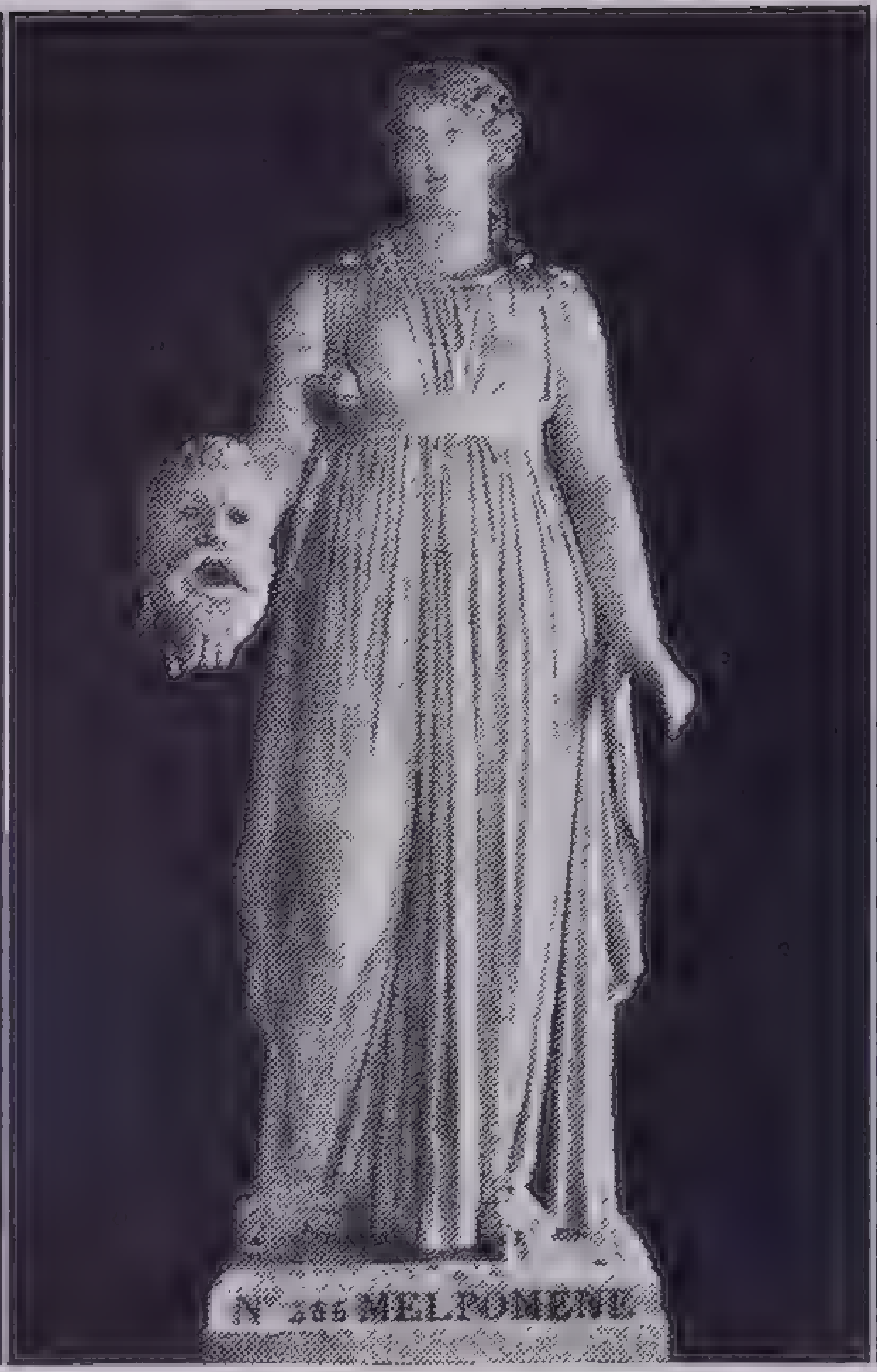
Johann von Schiller (1759-1805)
Germany

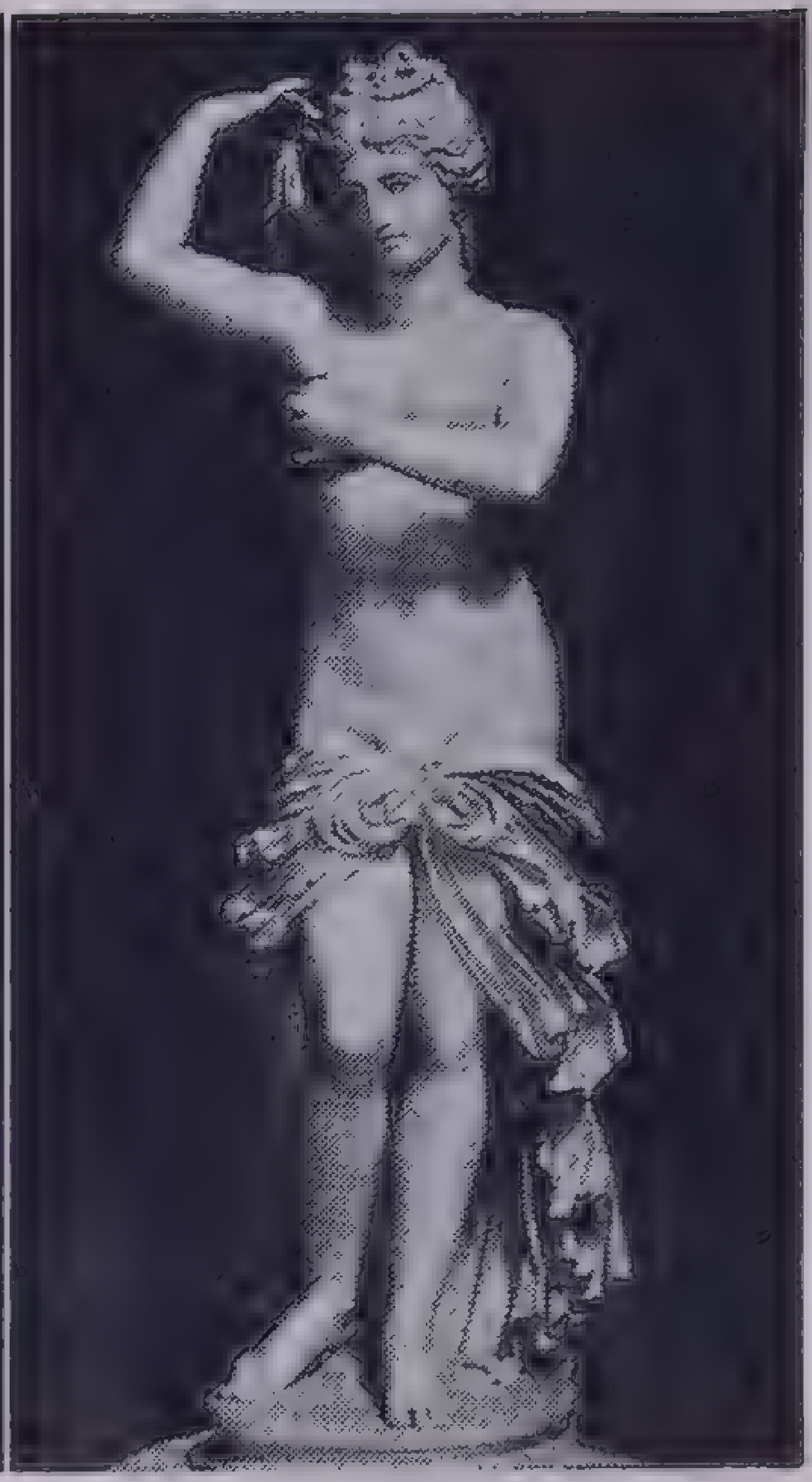
Paul von Heyse (1830-1914)
Germany

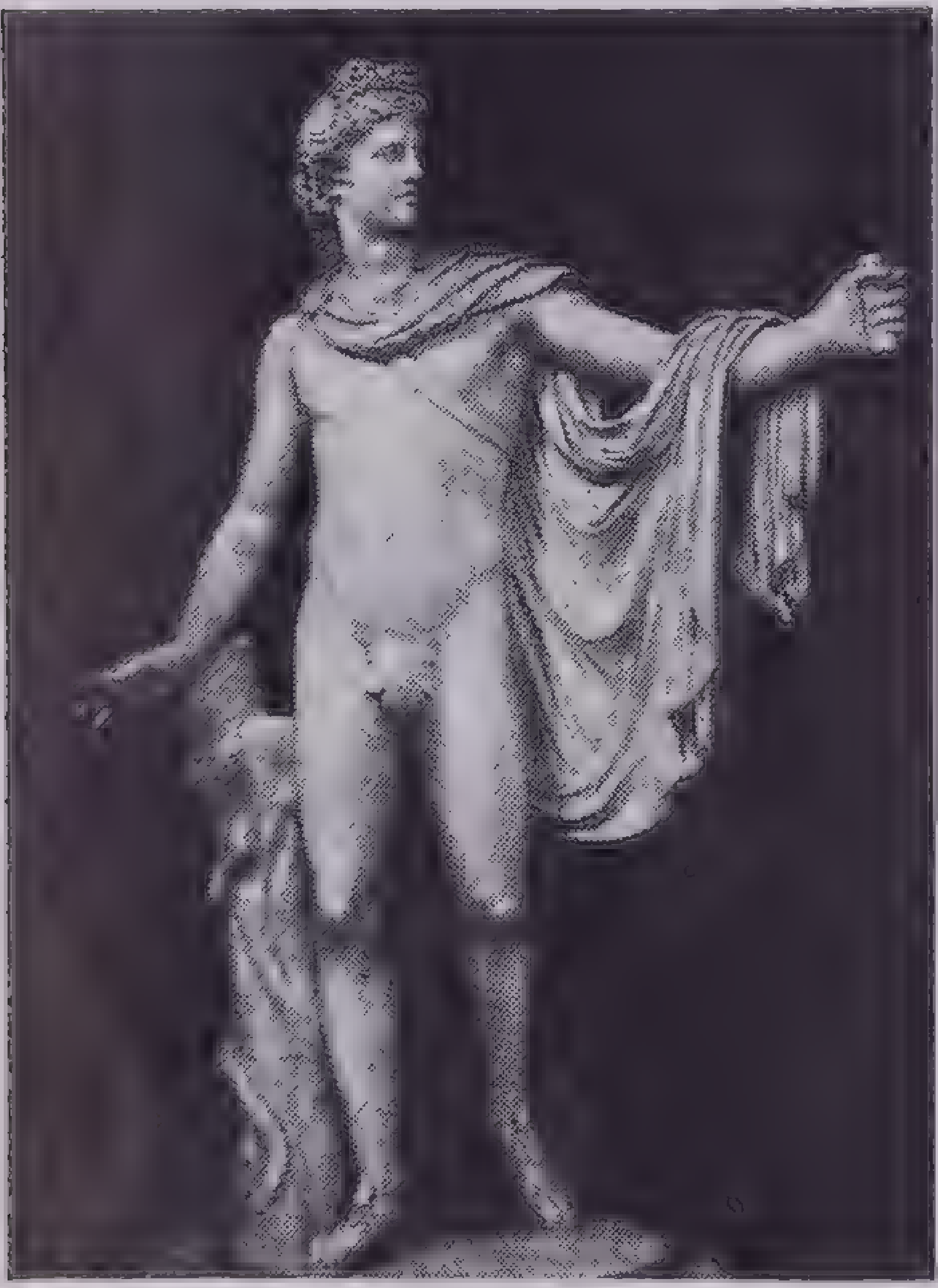
Famous Writers, European and American

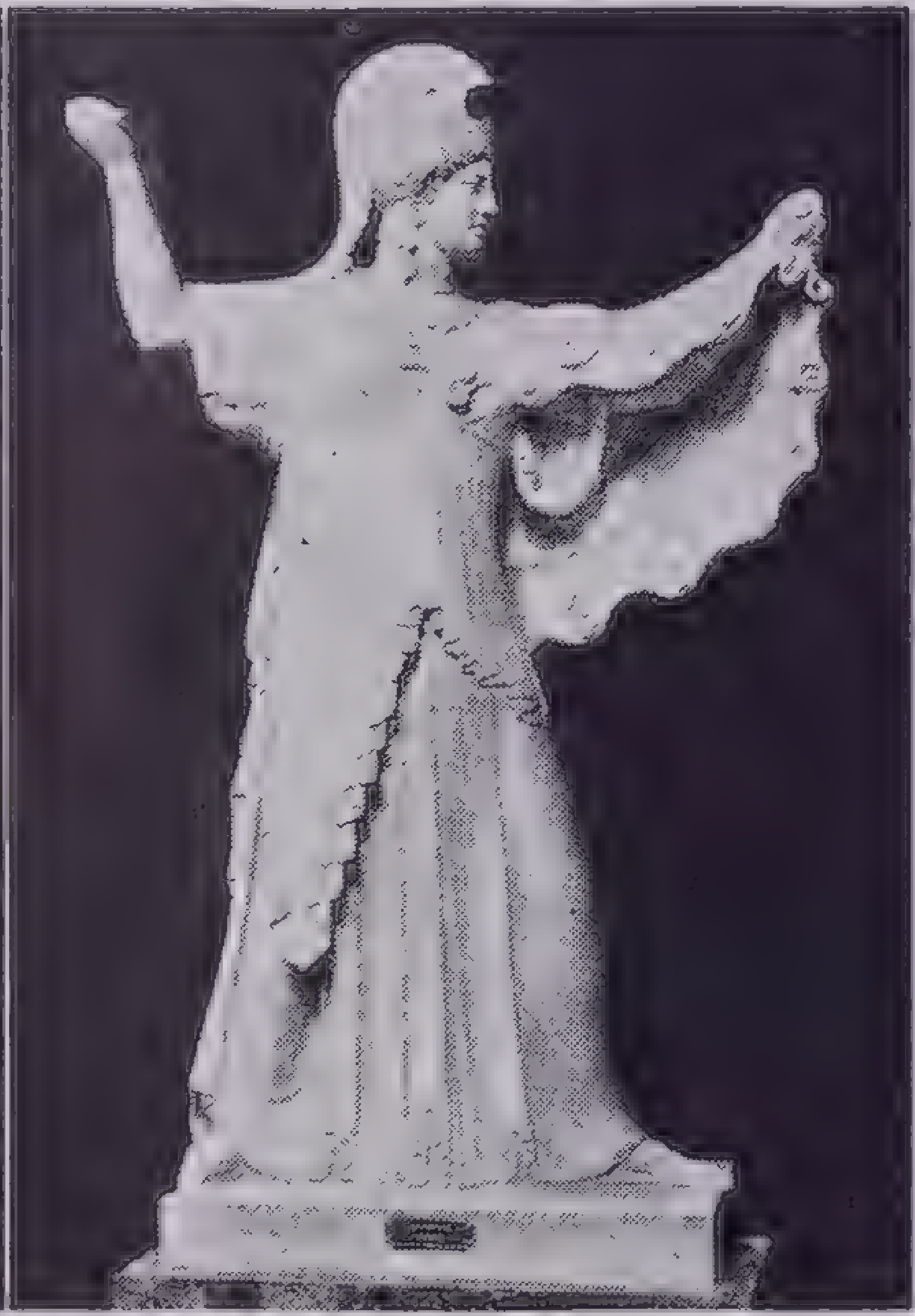

Poseidon (Neptune) from Melos
National Museum, Athens

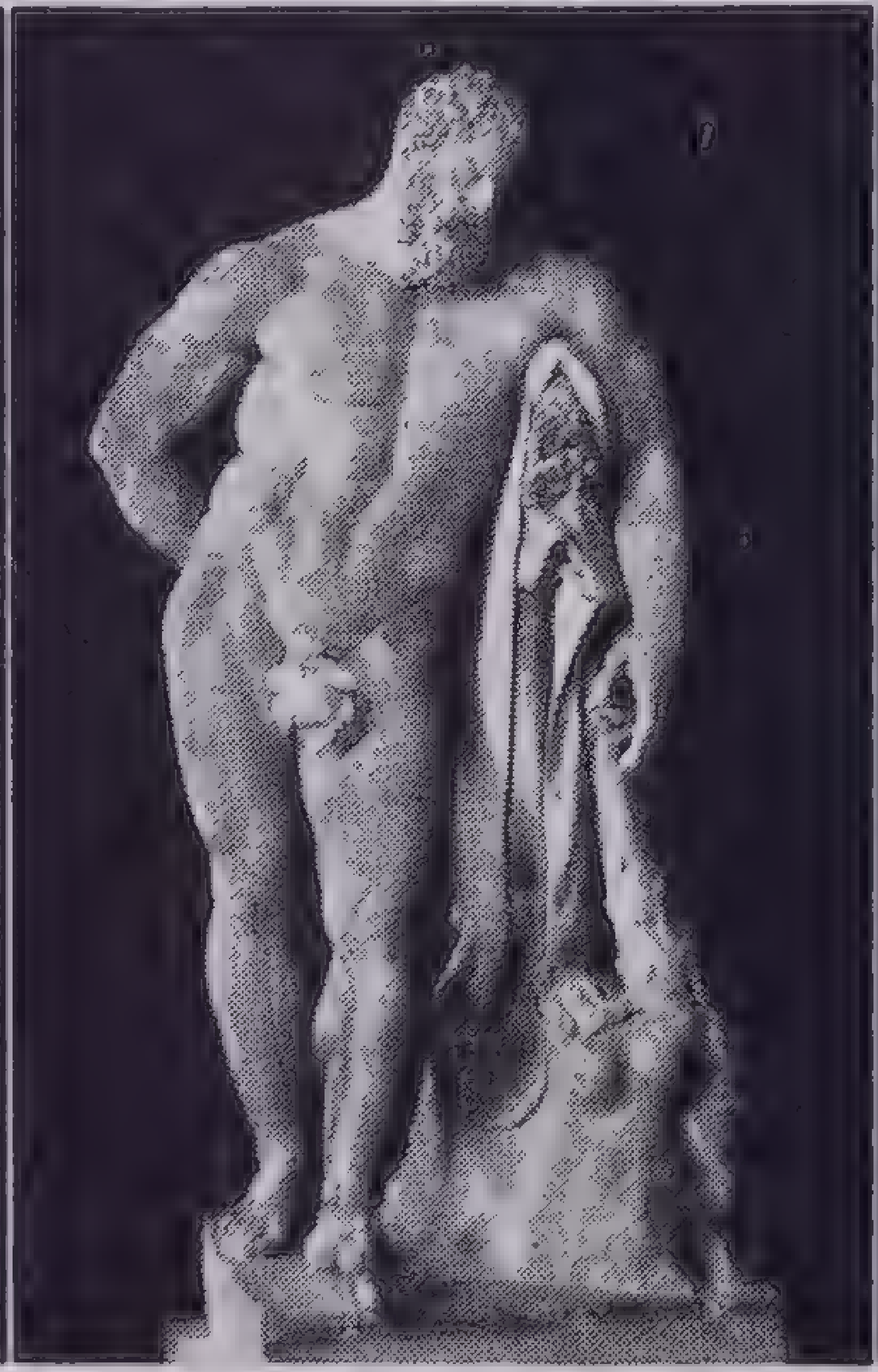

Niobe and her Youngest Daughter
Uffizi Gallery, Florence

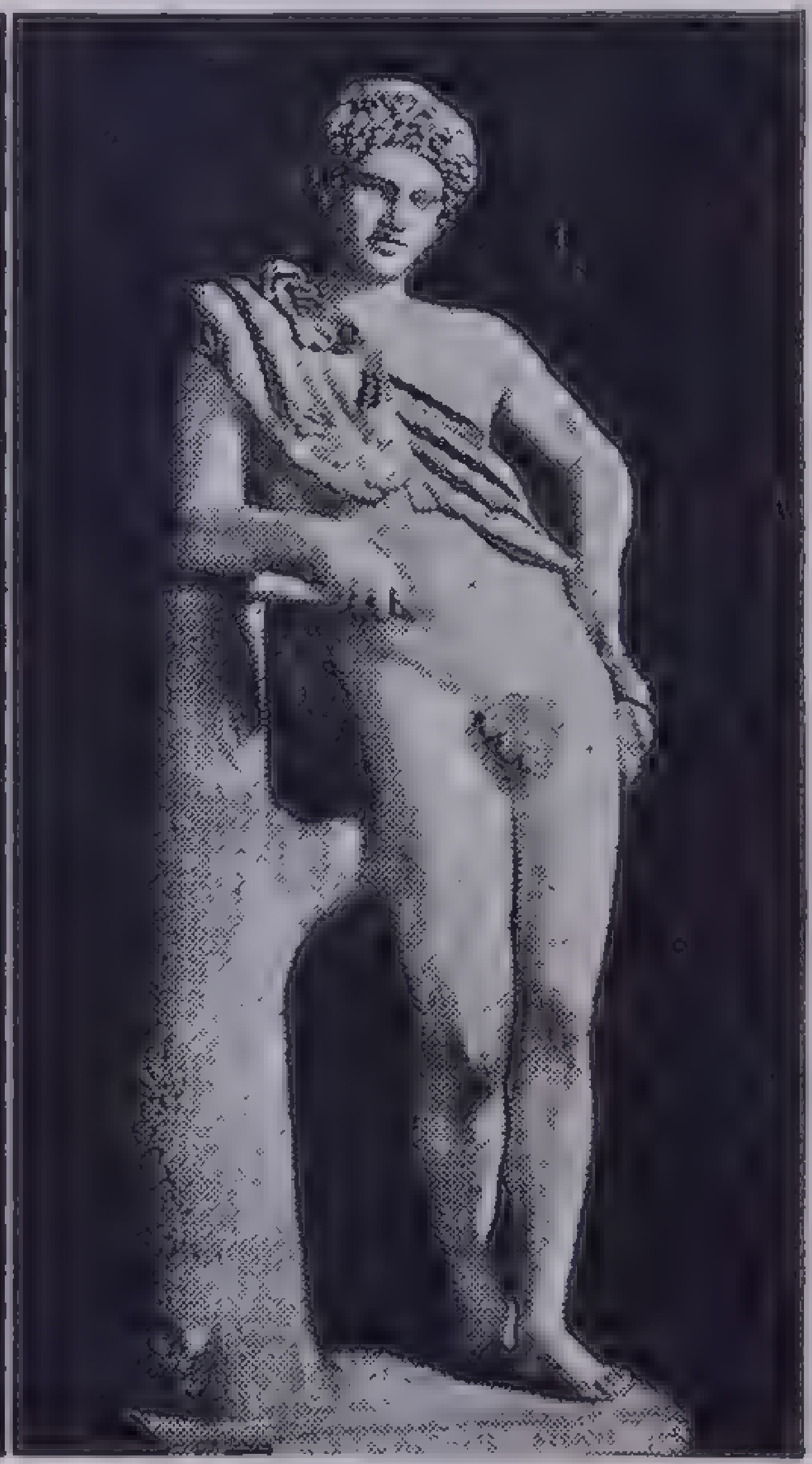

Melpomene, Muse of Tragedy
Louvre, Paris

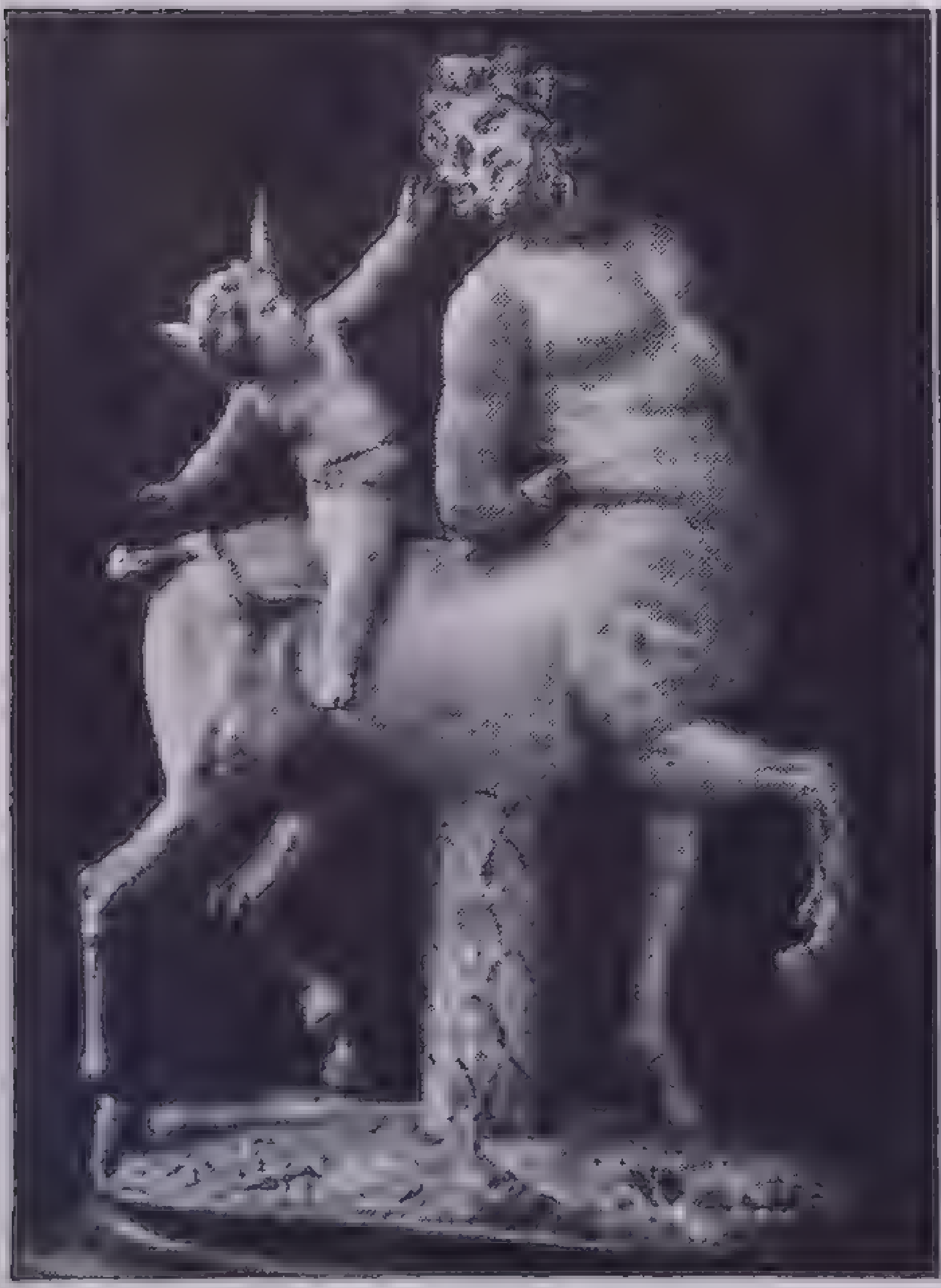

Aphrodite (Venus)
Vatican Museum, Rome

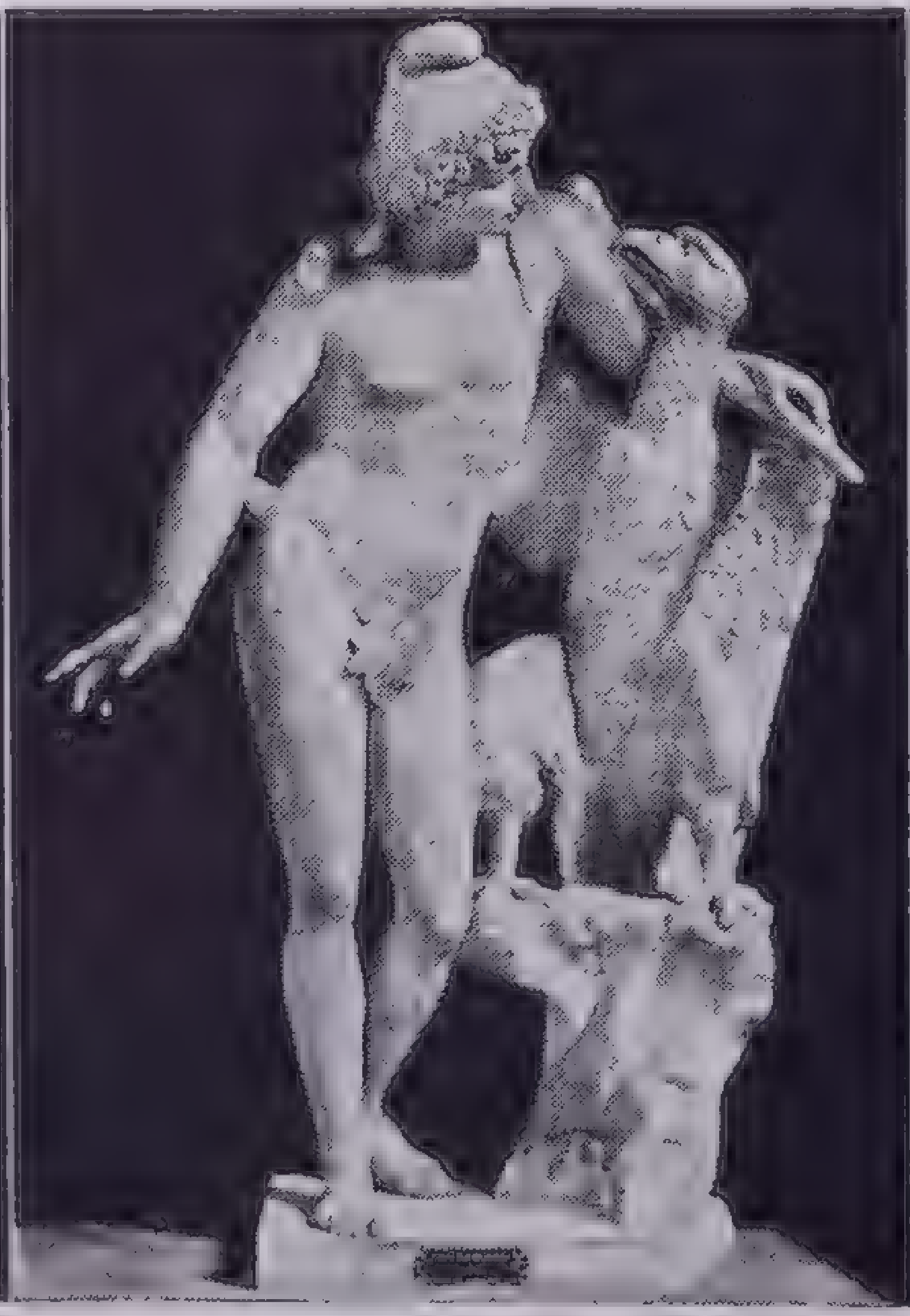

Apollo Belvedere
Vatican, Rome

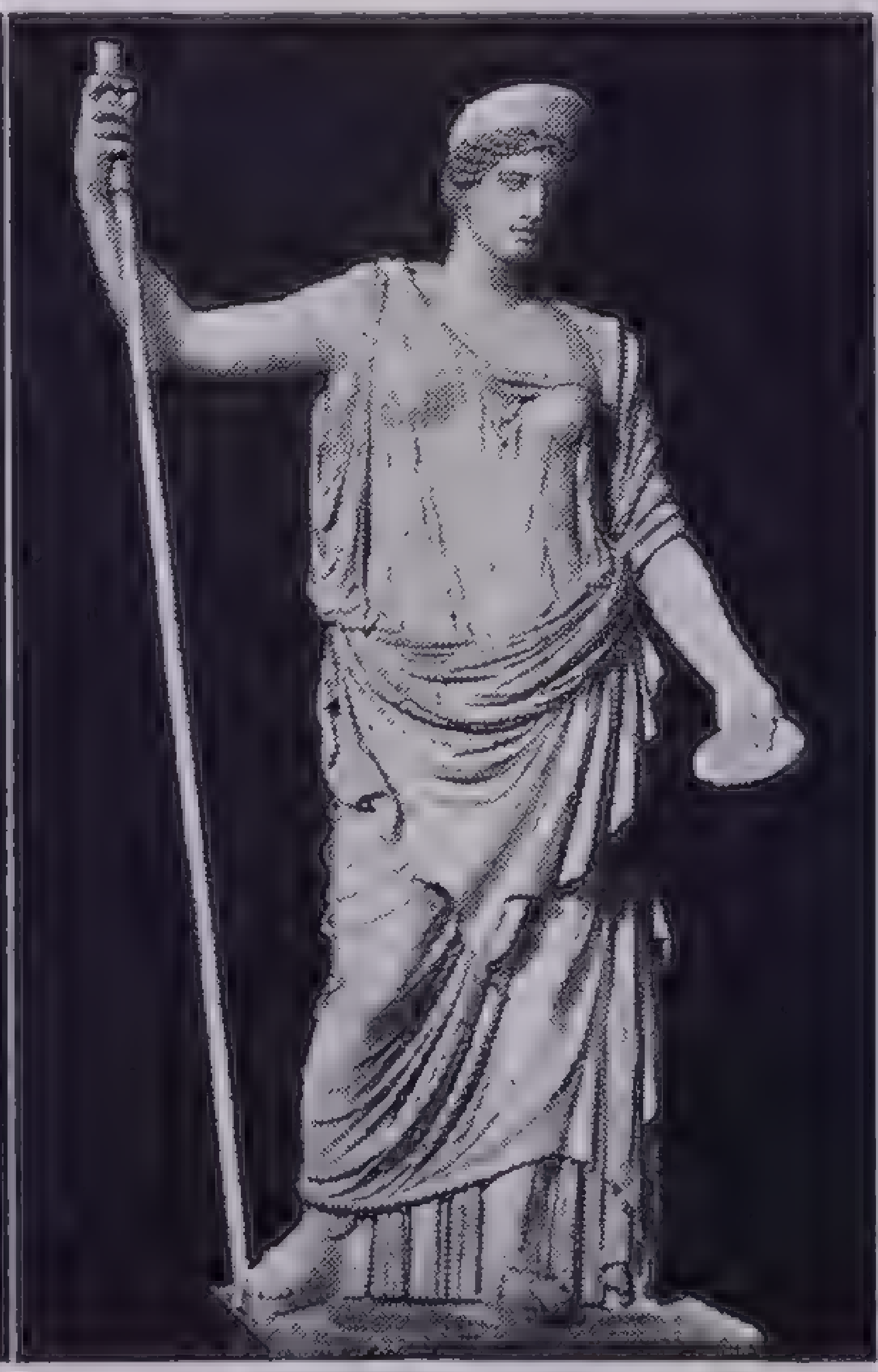

Athena (Minerva) from Herculaneum
National Museum, Naples

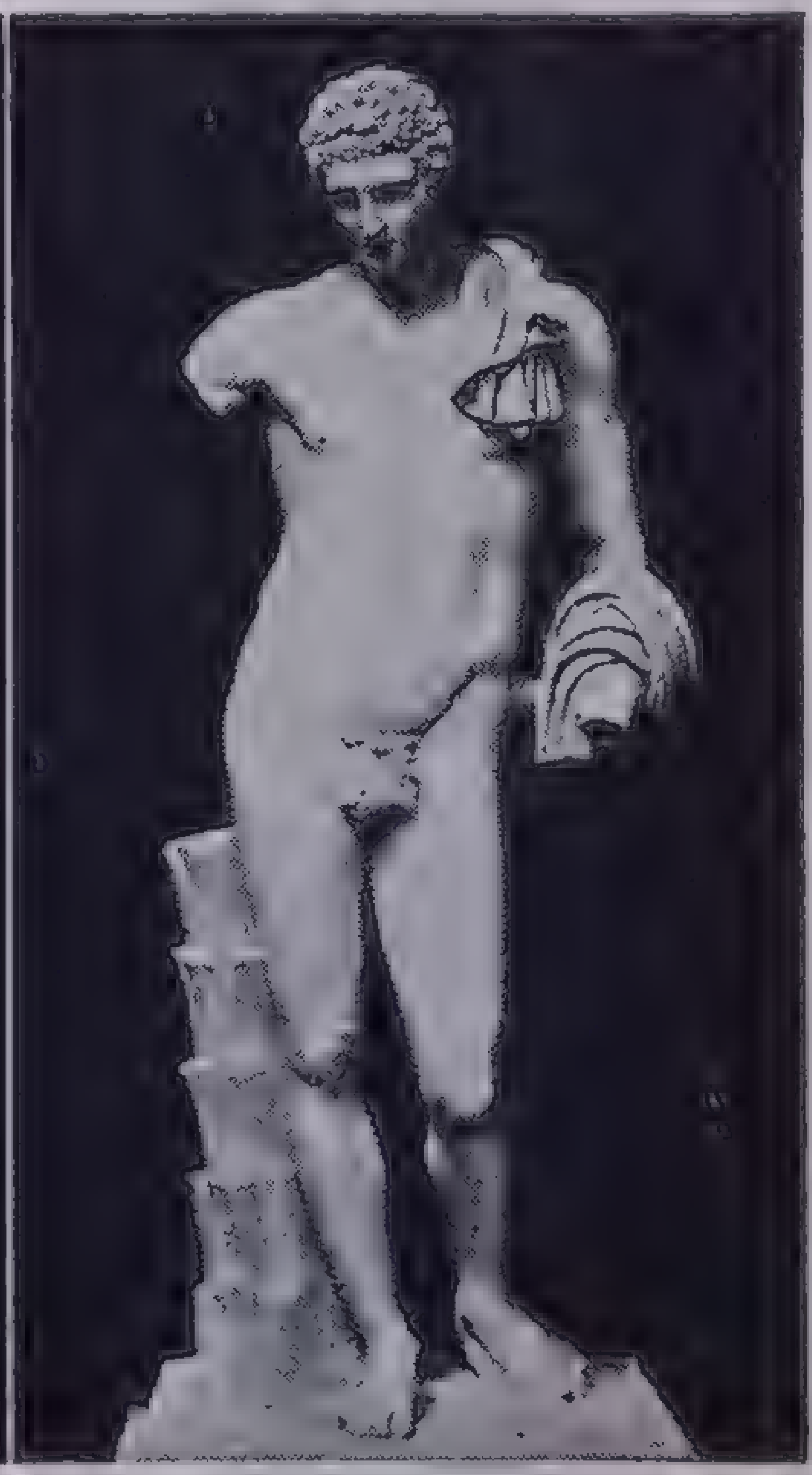

Herakles (Hercules) Farnese
(Copy after Lysippus)
National Museum, Naples


The Marble Faun
(Copy after Praxiteles)
Capitoline Museum, Rome


Centaur and Eros (Cupid)
Louvre, Paris


Ganymede with Eagle
National Museum, Naples


Hera (Juno) Barberini
Vatican Museum, Rome


Hermes (Mercury)
of the Belvedere
Vatican Museum, Rome

Mythology in Greek Sculpture

of the Pontifex family from the year 1807 but is principally concerned with Ernest Pontifex, born in 1835. The main part of the book takes him down to 1867 but the last chapter is supposed to be added as a kind of postscript in 1882. Bernard Shaw termed this novel an extraordinary study of English life, acknowledged his own indebtedness to it, decried the neglect of it and added, "Really, the English do not deserve to have great men."

Wee Willie Winkie and Other Stories, a collection of short stories by Rudyard Kipling, published in 1888; originally one of a series of paper-bound "railway" volumes issued in India, where Kipling began his career. Here may be found the earliest examples of Kipling's stories dealing with children, a type of his work that "exhibits a very winning aspect of the author."

Weller, Sam, in Dickens' *Pickwick Papers,* the cockney boots at the White Hart and afterward valet to Mr. Pickwick, to whom he is wholeheartedly devoted. He is a shrewd, merry, imperturbable and sometimes impudent fellow whose mother wit is unfailing.

Wessex Tales, seven stories by Thomas Hardy, first gathered and issued under that title in two volumes in 1888. They are: The Three Strangers, A Tradition of Eighteen Hundred and Four, The Melancholy Hussar, The Withered Arm, Fellow-Townsmen, Interlopers at the Knap and The Distracted Preacher.

Westward Ho!, a novel by Charles Kingsley, published in 1855. The story tells the adventures of Sir Amyas Leigh, a sailor in the days of Queen Elizabeth. His first voyage was around the world with Sir Francis Drake. Afterward he went to South America to find Rose Salterne, an English girl who had married a Spaniard. After some fighting he and his men have to abandon their ship and strike inland.

For many months the men tramp over the continent, fighting, accumulating gold and rescuing a white girl from the Indians. They return to England at last taking Ayanacora, the white girl, with them. Amyas goes out again soon afterwards to fight against the Spanish Armada and loses his eyesight from being struck by lightning just after the fight is won. He then returns home and marries Ayanacora. The book gives a good picture of the seafaring of the period. Famous persons introduced include Sir Walter Raleigh, Sir Richard Grenville and Edmund Spenser.

Wonder Book, A, a collection of stories by Nathaniel Hawthorne, designed primarily for young folks and published in 1851. In it he retells a half dozen of the old Greek myths: those of King Midas, the Gorgon's head, Pandora's box, the apples of the Hesperides, Philemon and Baucis (who entertained Zeus and Hermes) and the Chimaera (that fire-breathing monster slain by Bellerophon). The series was continued in *Tanglewood Tales.*

Wuthering Heights, the one novel by Emily Brontë, published in 1847, when she was 28. The scene is the moorland of the West Riding of Yorkshire; the time, the early years of the 19th century. The leading character is Heathcliffe, "a man's shape animated by demon life," one of the most wholeheartedly inhuman creatures ever presented in fiction. Though there are bits of humor in the broad Yorkshire of the eccentric old servant Joseph, yet over most of the book, as Charlotte Brontë wrote, "there broods 'a horror of great darkness'," a fierceness of mood that is unrelieved until the few lines of the closing paragraph are reached. Much of the story is supposed to be told by Nelly Dean, an old housekeeper.

Yahoo, in Swift's Gulliver's Travels, part four, one of an imagined race of brutes in human form. They are subject to the Houyhnhnms (pronounced *Whin-hims*), a community of horses possessing intelligence and reason but free from the conflicts of human existence.

Youth: A Narrative; and Two Other Stories, a volume of three long novelettes by Joseph Conrad, published in 1902. The "two other stories" are "Heart of Darkness" and "The End of the Tether." The first American edition was dated 1903. *Youth* is based on a voyage made by Conrad to the East after he had gone to England and obtained a mate's certificate. "Heart of Darkness" he described as part of the "spoil I brought out from the centre of Africa, where, really, I had no sort of business." From it was derived John Powell's *Rhapsodie Nègre.* It has been ranked among the greatest short stories in English.

DICTIONARY OF MYTHOLOGY, LEGEND and FOLKLORE

Myth.—A myth is a story. It is supposed to be true, but no one can remember or find out its beginning. All we are sure of is that the myths come out of the far, far past of humanity, and man made them himself to answer the questions that have troubled his heart since time began. How did the world come to be? And what is man? Where does the wind come from? Whose awful wrath can fell a tree with lightning? Whose voice roars in the storm? The sun, the moon, the stars, all the marvels of the universe have made men wonder. Flowers grow; fire burns; people are born and die. "Why?" says the mind of man. "How?" "Who?"

And because men cannot bear to live with these questions unanswered, every people in the world has its own myths, explaining the facts of nature or how some ancient custom came to be, where man got his dear beliefs and how he learned to live his life. Thus myths really belong to the religious rites and faiths of all the people in the world. And the word *myth* usually implies a story connected with some religion.

There are five kinds of myths. The *culture myth* is a story about a god or animal or a race-hero who gave some priceless gift to humanity, like fire or medicine or music. The story of Prometheus, how he created man and later stole fire from heaven and gave it to him for his use and comfort, is a culture myth. *Nature myths* are built around some fact of nature. They personify the elements and all natural phenomena. There are stories of a sun god in every land; everywhere the moon has its deity. Nymphs and dryads inhabit pools and forests. Hyacinths sprang from the blood of a beautiful youth of that name. The four seasons, the seas and rivers have their gods and goddesses. There is no end to them. The third kind of myth tells of the birth and genealogy of the gods and goddesses. The fourth kind explains the *reason* why certain rites and customs began and are cherished.

There is still another kind of myth, the *hero-myth,* which reveals better than any other kind how myths begin and how they grow. Take Beowulf, for instance. Without doubt there was a Beowulf, young and valiant hero of the Geats in Sweden. The names of the kings and many of the warriors with whom he associated are historical names. Without doubt Beowulf was an extraordinary fighter; he was a marvellous swimmer; he was afraid of nothing. In many retellings it was easy for the story of a brave and bloody fight to take on color and elaboration until the hero became a hero of superhuman strength performing supernatural deeds. Not only was he strong and fearless, but he delivered the Danes from the dread marsh-stalker Grendel, who devoured 30 men in a night. Not only could Beowulf swim and dive, but he killed Grendel's mother, the water-demon, in an under-water fight. In stories of this kind it is an easy step from supernatural deeds to supernatural parentage. No mere human being could perform such feats; the man must be the son of a god. How else account for the unbelievable?

The hero-myths in the world are uncountable. And man is still making them. Witness the strange tales that have grown up around the name of T. E. Lawrence, Lawrence of Arabia. These stories are far more than the inevitable legends that follow the name of a hero. They have already begun to take on a supernatural phase, both in Arabia and in England.

Folklore.—No definite line can be drawn between myth and folklore. No one can say exactly where one leaves off and the other begins, except that folklore is ages older. A people have to become fairly civilized before they formulate a definite mythology. But folklore has existed since the most primitive times; it exists today among all primitive peoples and also among the rural and unlettered classes of all highly civilized nations.

Folklore represents the growth of the human mind. It is the spiritual history of the race. Everything that man has learned or done with his hands, everything he has discarded or held fast, everything he has feared or loved or hoped can be found in folklore. There are folk songs and ballads, folk dances, folk customs, folk superstitions and beliefs, folk tales, riddles, rimes and proverbs. All these things represent the way of life and the spirit of a people, their wisdom and their attitudes, the things they believe now and the things they have believed and passed through. The most profitless superstitions and fears exist in folklore side by side with some of the deepest truths of humanity.

Folklore contains in its proverbs all the wisdom the human mind and heart has gathered through the centuries. They are the sum total of human experience. The proverbs of every land come down out of the remote past. "Where there's a will there's a way." "A soft answer turneth away wrath." "He that conquers himself conquers an enemy." These are samples of folk wisdom. "One swallow does not make a summer" has been said for 2000 years. "Time and tide wait for no man." "Hope deferred maketh the heart sick." These are lessons learned.

But it is the folk tale that gives us the fullest picture of the human race with all its strange, devious ways and beliefs, its fears and bravados and its dreams. Probably not half the folk tales in the world have been unearthed and written down. It takes scholars like the German brothers Jacob and Wilhelm Grimm to collect and retell and make immortal the folk tales of a nation. But a wealth of human story has been tapped. There are thousands of folk tales in print today. And there is no literature anywhere more charming and more revealing.

Cinderella is probably the most beloved folk tale in the world. People everywhere love to think that the oppressed will suddenly be given love and riches. And that is the gist of the story in all its versions: a little household drudge, neglected and cruelly treated, is suddenly transformed into the exquisite, beautiful girl whom the prince loves and seeks and marries—to the chagrin of her tormentors, of course. The Cinderella story exists among the folk of all nations in both hemispheres. There are 345 known variants from Alaska to the Cape of Good Hope.

Legend.—A legend is a popular story rooted in history, but which has been elaborated beyond the point of verification. There is little doubt that Robin Hood was a real person, but the stories which have grown up around his name are legends. Charlemagne, king of the Franks, is no legend, but the songs and stories celebrating his grandeur and the exploits of his paladins are among the most famous legends in the world. Alfred is one of the greatest kings in English history, but no one can verify the legend that he sat with troubled mind and forgot to turn the loaves by the fire in the old woman's hut. The story of William Tell is a legend. So is the story of Bruce and the spider.

Fable.—A fable is pure fiction that often embodies supernatural events or circumstances. It is a moral story with a lesson to put over and differs from allegory by its brevity. But the characteristic of most fables is the fact that the characters are beasts who talk and act like human beings. For this reason fables are often called bestiaries.

Many fables are satires. All the weaknesses and pettinesses of human nature are bestowed upon the beasts and held up and mocked for all to feel ashamed of. Everybody knows about the fox who could not reach the luscious grapes and therefore decided they were sour! "Sour grapes" is a familiar jibe at those ungenerous souls who belittle what they cannot have.

Fables, like folk tales and legends, are an ancient form of story. There are no bona fide modern ones. The most ancient are the fables of India collected in the Sanskrit *Panchatantra.* The most famous are the Greek fables of Aesop, which were so widely translated as to be the source of nearly all the fables in Europe. Aesop's *Fables* contain the stories of the fox and the grapes, the hare and the tortoise, the lion and the mouse, and all the others that every child knows best.

Dictionary of Myth, Folklore, Legend and Fable[1]

Abdiel (ab' di el), in Milton's *Paradise Lost,* the only one of Satan's angels who would not join the revolt against heaven.

Achates (a kā' tēz), in Vergil's *Aeneid,* a Trojan, faithful friend of Aeneas. After the fall of Troy he followed Aeneas through all his wanderings and hardships with such fidelity that his name has become the synonym for a loyal friend.

Acheron (ak' ẽr on), in Greek mythology, the River of Woe, one of the four rivers of Hades. In the *Odyssey* it was the principal or boundary river of Hades over which Charon ferried the souls of the dead on their journey from the upper to the lower world. It also is used to mean the region of Hades itself.

Achilles (a kil' ēz), the hero of the *Iliad,* son of Peleus, king of Thessaly, and Thetis, a sea goddess. He was the bravest of the Greeks in the Trojan War. When he was born, Thetis plunged him in the Styx, to make his body invulnerable, but she forgot the heel by which she held him. To save him from death in the Trojan War, she sent him to the court of King Lycomedes, where he was dressed as a girl and played with the princesses. But Troy could not be taken, and Odysseus, in the guise of a merchant, went to find him out. Jewels and arms he laid out for sale before the beautiful girls. The one who chose arms he knew was Achilles; and the youth gladly went off with him to war. A young slave girl named Briseis fell to the lot of Achilles one day in a division of booty among the warriors. And when Agamemnon stole her away, Achilles refused to fight again. But death of his friend Patroclus roused him. He went out to slay Hector who had slain his friend. Three times around the walls of Troy he dragged the body of Hector, the great Trojan hero. Achilles was killed by Paris, who shot him in the heel with an arrow.

Actaeon (ak tē' on), in Greek mythology, a famous hunter who offended Artemis. One story is that he came upon her bathing, another that he boasted of being a better hunter than she. For punishment she changed him into a stag, and he was killed by his own dogs.

Admetus (ad mē' tus), a king of Thessaly whom Apollo served nine years as a shepherd. He was the husband of Alcestis.

Adonis (a dō' nis; a don' is), in Greek mythology, a beautiful youth beloved by Aphrodite. When he was killed by a wild boar, the grief of the goddess moved Persephone, Queen of Hades, to allow him to spend six months of the year on earth and six in the underworld. His death and return symbolize winter and summer, and his worship embodied a midsummer festival. Shakespeare's poem, *Venus and Adonis,* tells the love story of the youth and goddess.

Aegir (â'gir; ē'gir), in Teutonic mythology, the god of the sea.

aegis (ē'jis), the symbolic shield of Zeus and Athene.

Aegisthus (ē jis' thus), the youth whom Agamemnon left to guard his kingdom while he was off to the Trojan War. Aegisthus fell in love with Clytemnestra, Agamemnon's wife, who returned his passion. Together they murdered Agamemnon on his return and planned to do away with his son Orestes also. But Orestes was saved by his sister Electra. She encouraged him to avenge their father's death by killing the faithless pair, Aegisthus and Clytemnestra. This story has been made immortal by three Greek tragedians: Aeschylus in his great poetic trilogy, the *Oresteia;* Sophocles in his *Electra;* and Euripides in two tragedies, *Electra* and *Orestes.*

Aeneas (ē nē'as), the son of Anchises and Aphrodite, and one of the heroes of the Trojan War. He married Creusa, daughter of Priam, king of Troy. When Troy was taken and in flames, Aeneas departed bearing his old father on his shoulders and leading his little son Ascanius by the hand. Creusa followed them but was lost. The wanderings of Aeneas from this point on are celebrated in Vergil's great Latin epic the *Aeneid.* With a fleet of 20 ships he sailed from Troy

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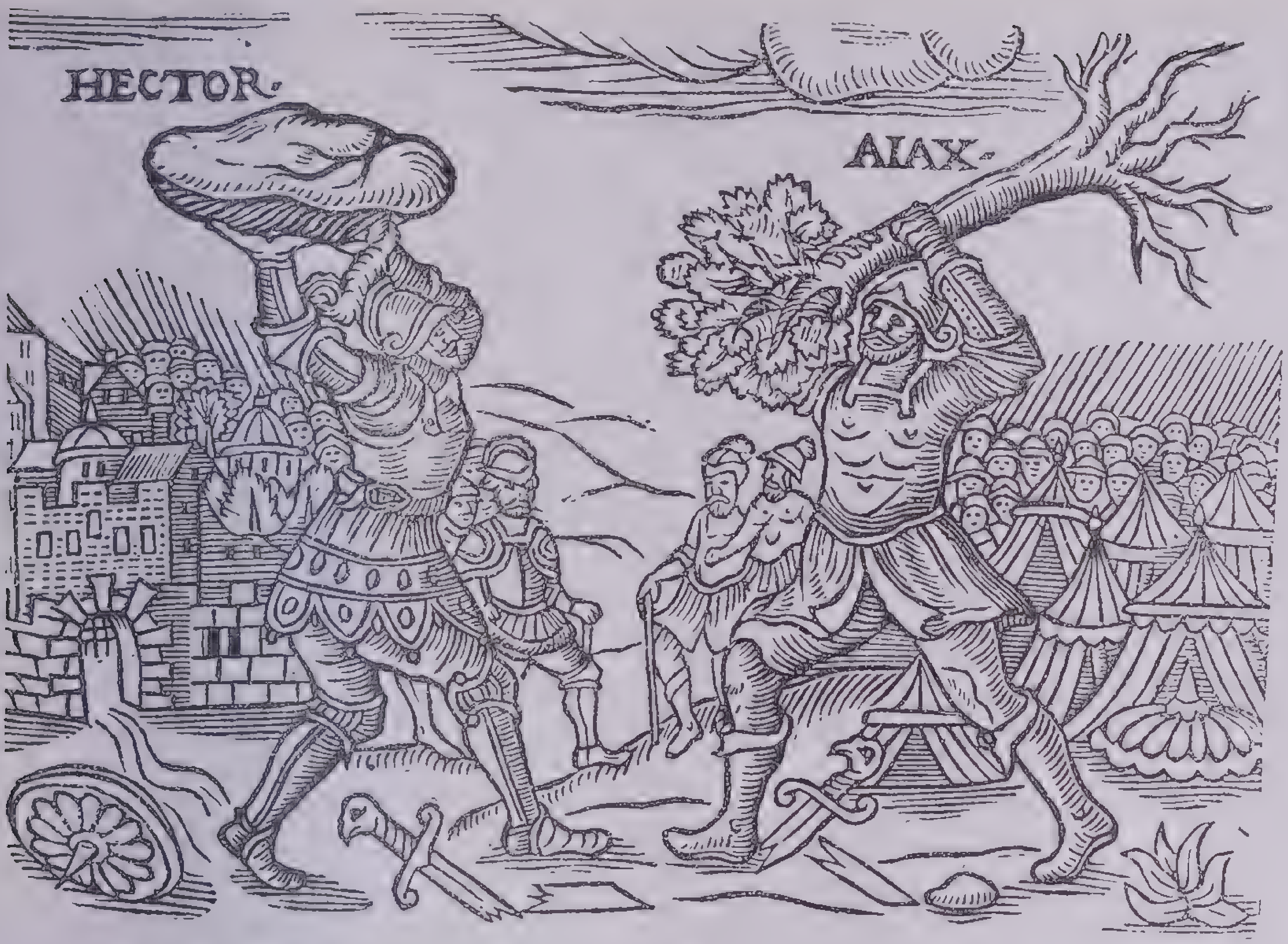
[1] The scheme of pronounciation used here is explained in detail at the beginning of the dictionary in the VOLUME LIBRARY. The general plan is given below:

fāte fat final câre färm ȧsk sof*a*; mē met novel fingẽr; līne pin; gō ôrder not no͞on good; ūse but tûrn menü; thin *th*en.



From a woodcut printed by Nicholas Okes at London, 1632

Hector and Ajax in Combat on the Fields of Troy
In Homer's *Iliad,* one episode relates that Ajax, who after Achilles was the greatest Greek hero, challenged Hector, the hero of Troy, to battle

seeking a new home. He was shipwrecked on the coast of Africa, where Dido, queen of Carthage, begged him to remain. She fell deeply in love with him and took her own life in grief when the gods commanded him to take up his travels again. After seven years of adventure and hardship, Aeneas came to the river Tiber. Here he married Lavinia, daughter of Latinus, king of Latium, and founded the city of Lavinium. Aeneas is the legendary ancestor of the city of Rome, for his son founded Alba Longa where Romulus and Remus were born and which was superseded by Rome itself.

Aeolus (ē′ ō lus), in Greek and Roman mythology, the god of the winds. He lived on an island where he kept his four sons, the winds, in a cave. One day Odysseus in his wanderings came to this place, and the kindly Aeolus gave him the four winds tied up in a leather bag, with a command to the fair winds to blow the wanderers home. But one night while Odysseus slept, his sailors decided they too must share the treasure in the mysterious leather bag. They untied the string; the fierce winds rushed out and drove the ships back to Aeolus. He was so disgusted at this stupidity that he would not help them further.

The story of Aeolus is a *culture myth.* He is supposed to have taught men how to sail ships and read the signs of the winds and weather.

Aesculapius (es kū lā′ pi us), the Roman god of medicine. See *Asclepius.*

Aesir (â′ sir; ē′ sir), in Teutonic mythology the collective name of the gods. There were 13 of them: Odin or Woden and his wife Frigga. Balder, the god of light; Tyr (war); Thor or Donar, the thunder-god, symbolizing strength; Braji (poetry); Forseti (justice); Loki (fire or evil); Vali; Vitharr; Hermod; Hoenir, the strong; Hoder, the blind; and Heimdall, the watcher. Their abode was Asgard.

afreet (af′ rēt; a frēt′), in Arabian mythology, an evil spirit or demon; a jinni. It is also spelled afrite.

Agamemnon (ag *a* mem′ non), king of Mycenae, husband of Clytemnestra and brother of Menelaus, king of Sparta, whose wife Helen had been carried off to Troy. Agamemnon was the leader of the Greeks in the Trojan War. When Troy fell, Priam's daughter the prophetess Cassandra fell to his lot and he took her home with him. She foretold his death at the hands of Clytemnestra and her lover, and was herself killed by Clytemnestra. *Agamemnon* is the title of the first of the three great dramatic poems in the Orestes trilogy by Aeschylus.

Aganippe (ag *a* nip′ ē), in Greek mythology, a fountain near Mount Helicon. Its waters were supposed to give poetic inspiration, and therefore the fountain was sacred to the Muses.

Ajax (ā′jaks), one of the Greek heroes of the Trojan War. On the death of Achilles, Ajax and Odysseus were rivals for the arms of the dead hero. They fell to Odysseus, and Ajax, maddened by jealousy, killed himself. This is one story. Another is found in Sophocles's tragedy *Ajax,* which tells how Ajax, blinded with insane disappointment, mistook a flock of sheep for the sons of Atreus and slew them all. When his reason returned, he was so ashamed of his deed that he killed himself with his sword.

Ajax the Less, one of the Greek heroes in the siege of Troy. Except for Achilles, none was swifter than he. He was skilled with the spear, but he was a great boaster. On his way home he was shipwrecked, but Poseidon cast him on a great rock. Instead of giving thanks, he bragged that he had saved himself. So Poseidon split the rock, and Ajax the Less was drowned.

Aladdin (a lad′ in), in the *Arabian Nights,* the son of a poor tailor who finds a magic lamp and ring. Two jinni, servants of the lamp and ring, come to do the bidding of the new owner. Aladdin gains great wealth, marries the Sultan's daughter and builds a marvelous palace.

Alberich (äl′ bẽr ik), in Teutonic folklore, the king of the elves. In the German *Nibelungenlied* he is the dwarf who guards the treasure of the Nibelungs. In Wagner's opera *The Rhinegold* Alberich is king of the Nibelungs. He steals the gold of the Rhine Maidens from the bottom of the Rhine and from it makes a magic ring. When it is stolen from him, he puts a curse upon it that brings disaster to all its unrightful owners.

Albion (al′ bi un), the ancient, poetic name for England.

Alcestis (al ses′ tis), in Greek mythology, the wife of Admetus. Apollo had secured the promise of the gods that Admetus need never die, but on condition that when his death-day came, another should offer to die in his place. Alcestis willingly gave her life for her husband. But the grief of Admetus was so great that Hercules brought her back from the lower world. Her story is the subject of Euripides's play *Alcestis* (which is translated in Robert Browning's *Balaustion's Adventure*), and Chaucer included her in his *Legend of Good Women.*

Alcmene (alk mē′ nē), the mother of Hercules.

Alecto (*a* lek′ tō), one of the Furies.

Alectryon (*a* lek′ tri on), in Greek mythology, a youth whom Ares set to watch for the dawn. But the boy fell asleep and did not call him. For punishment Ares changed him into a cock, doomed forever to wake and crow at sunrise.

Ali Baba (ä′lē bä′bä), in the *Arabian Nights,* a poor woodcutter who one day overheard the magic word by which the Forty Thieves entered their treasure cave. "Open Sesame" said Ali Baba, too, when the thieves were gone; and he entered, loaded his donkey with gold and went home. His brother also went to the cave. But he forgot the word, could not get out and was found and killed by the thieves. At last the robber captain discovered who it was still knew their secret. He hid his men in leather jars that he brought to Ali Baba's house. They intended to jump out and kill him while he slept. But Morgiana, the little servant girl, killed them all with boiling oil.

Allan-a-Dale (al′ an *a* dāl′), in English legendary ballads, the youngest of Robin Hood's companions. He is aided by the famous outlaw to save his sweetheart from marrying an aged knight. Allan-a-Dale is Robin Hood's minstrel in Scott's *Ivanhoe.*

Allhallows (ôl hal′ ōz), All Saints' Day, Nov. 1. Allhallows' eve (Hallowe'en), Oct. 31, was the last day of the year in the old Celtic calendar. It was the night when witches and spirits were abroad and was called the Night of Samhain, the Night of Death. The death of the old year was celebrated with rejoicing in the store of fruits and other foods laid up for the coming winter. Hallowe'en bonfires are still lighted in the hills of Scotland. It is celebrated in nearly all countries with festivity and the observance (mock or genuine) of many folk superstitions.

Amalthea (am al thē' *a*), the nurse of Zeus (Jupiter), who fed him goat's milk from the horn of a goat. This horn became the horn of plenty or *cornucopia.* In some stories the goat was named Amalthea.

Amazons (am'*a* zonz), a race of warlike women who lived in Pontus near the Euxine Sea. No men were allowed to live among them, and all the boys who were born were either killed or sent to a neighboring country to live with their fathers. In Vergil's *Aeneid,* the Amazons fought against the Greeks in the Trojan War, and their queen was killed by Achilles. One of the Twelve Labors of Hercules was to steal the girdle of their queen Hippolyte.

Amphion (am fī' on), in Greek mythology, a son of Zeus. He built the walls of Thebes by the sound of a lyre that Hermes had given him. The stones fell into their places with the enchantment of the music.

Anchises (an kī'sēz), the father of Aeneas.

Androclus (an'drō klus) or **Androcles** (-klēz), in Roman legend a runaway slave who hid in a lion's cave in Africa. Without fear he pulled a painful thorn from the lion's paw. In later years, Androclus was captured and thrown to the lions in the arena. But instead of attacking him, one old lion fawned upon him and caressed him. And Androclus and his lion were set free. Bernard Shaw wrote a play based on this story, *Androcles and the Lion.*

Andromache (an drom' *a* ke), the wife of Hector. After the capture of Troy and the death of Hector, the Greeks threw her little son Astyanax from the walls of the city, and she was taken captive by Neoptolemus, son of Achilles. Later Andromache became the wife of Helenus, brother of Hector. She is the subject of a tragedy by Racine, based on the *Andromache* by Euripedes.

Andromeda (an drom' ē d*a*), a princess of Ethiopia, whose mother boasted that she was more beautiful than the daughters of Poseidon. In wrath Poseidon sent a sea monster to lay waste the land. Andromeda was chained to a rock in the sea as a sacrifice to be devoured by the creature. Perseus, flying home from his victory over the gorgon Medusa, saw the beautiful maiden and saved her life. He had with him the head of Medusa and one look at it turned the monster into stone. Andromeda was then married to Perseus. Corneille used her story in a French tragedy.

Andvari (än' dwä rē), in Norse mythology, a dwarf who was robbed of his treasure and his magic ring by Loki. He could change himself into a fish, and it was while he was a pike that Loki caught him and got the ring.

Antaeus (an tē us), one of the giant sons of Poseidon and Gaea (Earth). He could not be beaten as long as he touched the ground, for he received new strength from his mother, Earth. Hercules discovered the secret of his strength and lifted the giant into the air and strangled him.

Antigone (an tig 'ō nē), in Greek legend, a daughter of Oedipus, king of Thebes, who guided her blind father in his exile. Her two brothers Eteocles and Polynices killed each other in a struggle for the throne. Their uncle Creon, new king of Thebes, forbade the burial of Polynices. But Antigone buried his body by night. For this Creon ordered her to be buried alive. But Antigone took her own life before it could be done. Sophocles's tragedy *Antigone* tells her story.

Anubis (*a* nū' bis), in Egyptian religion, the god who leads the dead to the lower world. He is usually represented as a human figure with the head of a jackal.

Aphrodite (af rō dī' tē), in Greek mythology, the goddess of love and beauty and fruitfulness. Hesiod says she was born of the foam of the sea; but in the *Iliad* she is the daughter of Zeus and Dione. In the *Odyssey* Hephaestus was her husband, and Ares her lover. She was the mother of Eros and of Aeneas by Anchises. She is identified with the Semitic Goddess of love and fertility Astarte (Ishtar) and with the Roman goddess Venus.

Apis (ā' pis), in ancient Egyptian religion, the sacred bull worshipped as the incarnation of Osiris.

Apollo (*a* pol' ō), the god of youth and manly beauty, son of Zeus and Leto; also called Phoebus. He was the god of poetry and music, and the grasshopper was sacred to him as the symbol of song. Orpheus was his son. He was also god of healing and could avert disease or evil. Asclepius, god of medicine, was his son. In Homer, Apollo is the god of prophecy; his oracles were unerring and were honored everywhere. The one at Delphi was the most famous. Apollo was later identified with Helios, the sun god; and Artemis, his twin, was goddess of the moon. The Romans took over the worship of Apollo from the Greeks.

Apollyon (*a* pol'yun), the destroying angel; the angel of the bottomless pit. In Bunyan's *Pilgrim's Progress,* he was vanquished by Christian when he stood is his way.

Arachne (*a* rak'nē), a Lydian maiden of great skill as a weaver. So beautiful and perfect was her work that she challenged Athene to a contest. Athene accepted and the two sat down to weave. When Athene looked upon Arachne's web she saw that the girl had woven in the stories of the loves of the gods—Leda and the swan, Europa and the bull, Danae in her tower and the stars falling on it. The work was beautiful, but Athene ripped it into shreds to punish the maiden for her impiety and for daring to challenge her. Then Arachne was in despair and went and hung herself. But Athene changed her into a spider, hanging by a thread from her own web and forever spinning. Arachne means spider.

Arcadia (är kā'di *a*), an inland plateau of central Greece, shut in by mountains. The ancient inhabitants were shepherds and simple mountain folk. It is celebrated in the literature of many languages as a place of pastoral pleasure and contentment and rest, and has come to symbolize the ideal country of lost or unattainable happiness.

Ares (ā'rēz; âr'ēz), the Greek god of war and battle, son of Zeus and Hera. In Homer's *Odyssey,* Ares was the lover of Aphrodite, whose husband Hephaestus caught him in a net and held him up to be laughed at by the gods. The Romans later identified Ares with their war-god Mars.

Arethusa (ar ē thū'za), a nymph who was loved by the river-god Alpheus. To help her escape, Artemis changed her into a spring, which ran under land and sea to the island of Ortygia. One of the stories says that Alpheus followed her. The upper part of the river Alpheus really does flow underground.

Argonauts (är' gō nôts), the band of adventurers who sailed with Jason in the ship *Argo* to Colchis to find the Golden Fleece. When Jason demanded his kingdom back from his uncle Pelias, the usurper, Pelias agreed to give it up if Jason would bring back the Golden Fleece. Some time before this his two cousins Helle and Phrixos had been driven from home by the enmity of their stepmother Ino. But their own mother Nephele sent Phrixos a winged ram with a golden fleece on which he and his sister Helle escaped over the sea. Helle fell off and was drowned in the strait that bears her name, the Hellespont; but Phrixos arrived safely, sacrificed the ram, and hung the Golden Fleece in the grove of Ares on the farther shore of Colchis. Here it was guarded by a never-sleeping dragon.

Jason sailed with his companions in the *Argo* and after many adventures they came to Colchis. Aeetes, king of Colchis, would not give up the fleece. He demanded first that Jason yoke his fire-snorting bulls, plow the field of Ares and sow it with the dragon's teeth, from which he expected armed men to rise and kill Jason. But Aeetes's daughter Medea, the enchantress, fell in love with Jason and helped him perform his tasks. Jason took the fleece and sailed home again on the *Argo.* He took Medea with him as his wife, and with her help, he and the Argonauts escaped from the pursuing wrath of Aeetes.

Argus (är'gus), in Greek mythology, a monster with a hundred eyes, which Hera set to watch Io, of whom she was jealous. Zeus, deeply in love with Io, had changed her into a cow but did not succeed in keeping Hera from finding her out. Zeus ordered Hermes to kill the monster. So Hermes played upon the lyre until all the hundred eyes were closed, then he cut off the monster's head. Hera put the eyes of Argus in the tail of the peacock, her sacred bird.

Argus, in the *Odyssey,* the faithful dog of Odysseus, who recognized his master when he returned from 20 years of wandering.

Ariadne (ar i ad′nē), the daughter of Minos, king of Crete. She fell in love with Theseus, an Athenean youth, sent as a sacrifice to be devoured by the Minotaur. Before he entered the labyrinth, she gave him a clue of thread with which to find his way out. Theseus slew the Minotaur and returned to her, following the thread. She fled with him away from Crete, but he abandoned her on the island of Naxos. One story says she died of grief, another that Dionysus found her sleeping there and made her his wife.

Ariel (âr′i el), in Shakespeare's *Tempest,* the airy spirit who served the magician Prospero; in Milton's *Paradise Lost,* one of the rebel angels.

Artemis (är′tē mis), in Greek mythology, goddess of the hunt, of nature and of chastity. The oldest conception of Artemis was as a harvest goddess. When Oenus of Calydon did not present her with a harvest offering, she sent the terrible Calydonian boar to ravage his fields. She was goddess of nature, especially wild nature. Her festivals were celebrated with all kinds of animals and fruits. The bear especially was associated with her. The hind was sacred to her. She was also protectress of women and children and goddess of childbirth.

In Homer, Artemis was the daughter of Zeus and Leto and the twin of Apollo. The idea of Artemis as goddess of chastity did not appear until she became the counterpart of Apollo. She was never worshipped as goddess of the moon, though naturally she became identified with the moon-goddess Selene when Apollo became identified with the sun-god Helios. The Romans took over the worship of Artemis and identified her with their own Diana.

Arthur (är′thẽr), a legendary king of Britain of the 6th century. Arthur was an historical Celtic general who warred against the Saxons, a traditional folk hero-king, a fairy king, and the point of departure for a great cycle of medieval romance in prose and verse, Celtic, French, German, English.

Nennius, in his *History of the Britons* in Latin (8th century), mentions 12 battles in which Arthur led the Britons (Celts) against the Saxons. At the battle of Badon "960 men fell in one day . . . and no one overthrew them but Arthur alone, and in all the battles he came out victorious." William of Malmesbury in his *Deeds of the Kings of England* in Latin (1125) mentions Arthur twice and deplores the "wild stories" that had even then grown up around his name.

Geoffrey of Monmouth's *History of the Kings of Britain* also in Latin (1147) gives the framework of the story on which all the later elaborations were hung. In the 400 years between Nennius and Geoffrey the folk-mind had been busy with the legend, and there were more stories in the land than Geoffrey could tell. Geoffrey may have used some Celtic sources now unknown.

Arthur was the son of Uther Pendragon, king of Britain, and Igraine of Cornwall. The elves brought gifts to his cradle: long life and virtue. Very young he became king of Britain, conquered the Scots and the Saxons; Ireland and Iceland, and kingdoms on the continent. He married Guinevere and held his court at Caerleon on Usk. He went to war against the Emperor of Rome and left Modred, his nephew, to guard his kingdom and his wife. Rome was about to fall when Arthur heard that Modred had taken the throne and Guinevere. He hurried home to punish Modred, killed him in the battle of Camlan and was himself mortally wounded. He was taken to Avalon to be healed, and Guinevere entered a nunnery.

To the incident of Arthur's death Celtic folklore adds that some day he will wake and deliver his people from the English. The king asleep in the mountain who will some day rise and retake his kingdom is one of the beloved themes of folk lore, and Arthur still sleeps in many a mountain in Wales. In fact the belief and the hope were so strong that Arthur would come to deliver the Celts (or Britons) of Wales and Cornwall from English rule, that Henry II was prompted to discover a tomb for Arthur—*not* in a mountain but at Glastonbury, with which Avalon was later identified.

The Norman-French poet Wace also added to the story the idea that Arthur would return from Avalon to save his kingdom, along with many other new details, including the Round Table. Wace's poem is the source of Layamon's English *Brut* (13th century), which transformed Arthur from a Celtic to an English king, that the people might have a folk hero to rally to and rival their Norman conquerors. Layamon added for the first time most of the fairy material: the three fairy queens who attended his birth and death, the sword Excalibur given to Arthur by the Lady of the Lake, his magic spear, the fairy boat in which he sailed to Avalon attended by three queens, one of them his fairy sister, Morgan Le Fay.

The Arthur of the romances (developed from the 12th century on by Chrestien de Troyes, Robert de Boron, Wolfram von Eschenbach and others, is only a lay figure. His court of splendor is the background of the romances, his marvelous knights, their loves and adventures and their quest of the Holy Grail are the subject matter. Guinevere and Lancelot, Gawain, Perceval (Parsifal), Elaine of Astolat, Sir Galahad, Merlin, Vivian, Tristan and Iseult—these are the people whose stories word for word remain the most vividly human and realistic and moving stories in the world. And these are the stories Sir Thomas Malory retold and blended in his famous prose *Morte d'Arthur* (1470), the source of all later Arthurian material. Wagner's operas *Parsifal* and *Tristan and Isolde,* Tennyson's *Idylls of the King,* William Morris's *Defense of Guenevere,* Edwin A. Robinson's *Tristam* are some of the modern handlings of the narratives.

Ascanius (as kā′ni us), the son of Aeneas.

Asclepius (as klē′pi us), the Greek god of medicine (Roman Aesculapius). He was educated by the centaur Chiron, who taught him the art of medicine and how to heal with herbs. When he learned to bring the dead to life, Zeus killed him. Many temples were raised in ancient Greece for his worship; and those who slept in the temple dreamed what to do to be cured.

Asgard (as′gärd), in Norse mythology, the abode of the gods. It could be reached only by the rainbow bridge, Bifrost.

Astarte (as tär′tē), the Semitic goddess of love and fertility; the same as the Babylonian Ishtar, identified by the Greeks with Aphrodite, and as the moon-goddess with Selene and Artemis. In the Old Testament she is called Ashtaroth.

Astyanax (as tī′*a* naks), in Greek mythology, the son of Hector and Andromache, slain by the Greeks.

Atalanta (at *a* lan′ t*a*), in Greek mythology, a beautiful maiden who challenged all that came to woo her to a foot race. Death was the penalty of defeat. She would marry only the youth who could outrun her. All who dared to race with her were defeated and put to death, until Hippomenes came. One by one he threw in her path three golden apples that Aphrodite had given him. While Atalanta turned aside to pick them up, Hippomenes won the race and Atalanta for his wife. Another story says that Atalanta took part in the hunt for the Calydonian boar and was the first to wound the beast. Swinburne's poetic drama *Atalanta in Calydon* treats of this incident.

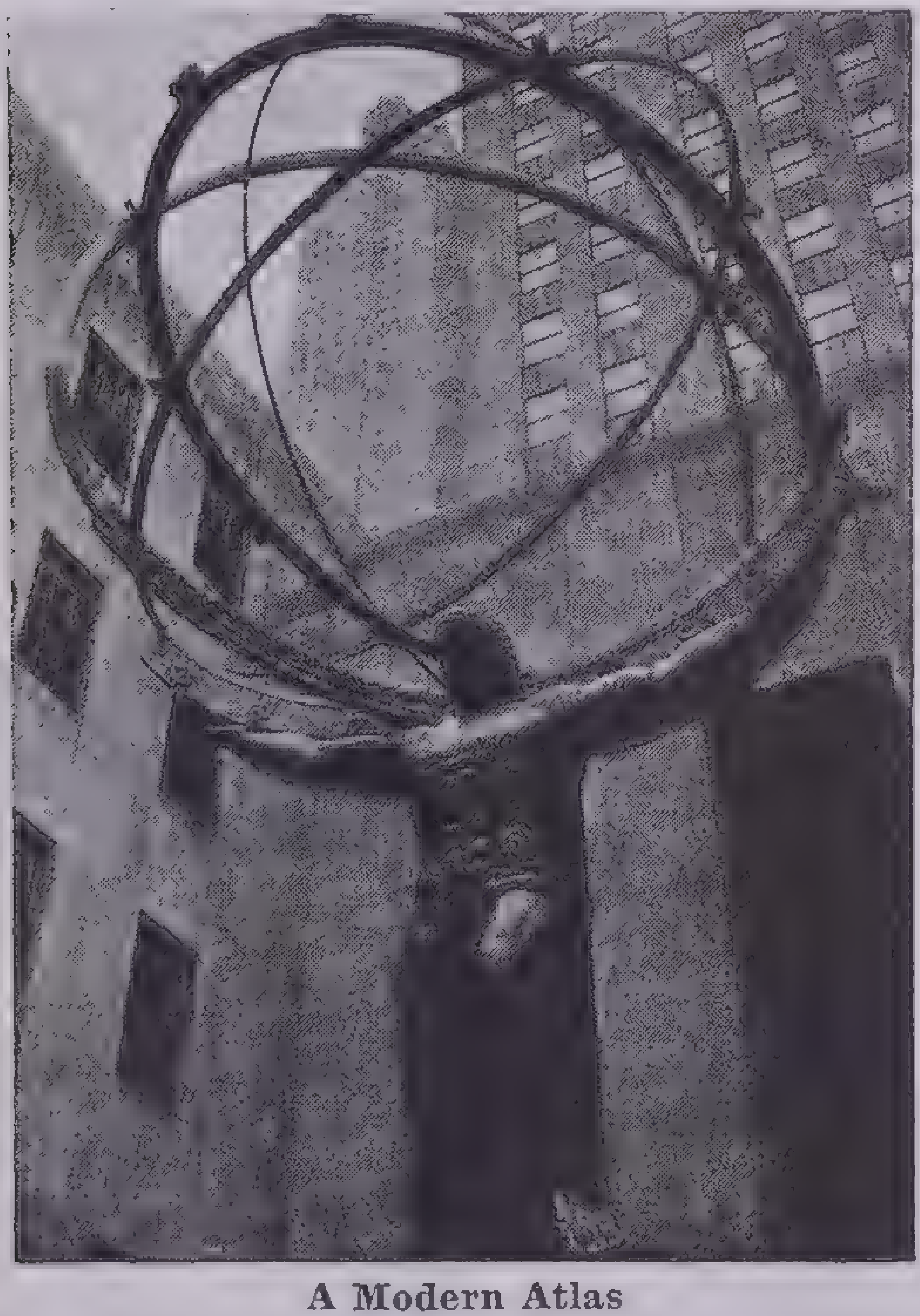
Atalanta
A bronze statue by Paul Manship

Ate (ā′tē), a daughter of Zeus, goddess of discord and strife.

Athena (*a* thē′n*a*) or Athene (-nē), in Greek mythology, the goddess of wisdom, industry and war; also called Pallas Athena. She was the daughter of Zeus and Metis and was born full grown and fully armed from the brain of Zeus. She quarreled with Poseidon over naming the capital of Attica. The gods decided to name the city for whichever one gave mankind the most useful gift. Poseidon split the ground with his trident and produced the horse; Athena's spear struck the bare rock and produced the olive. To her was given the reward, and the city was named Athens.

In Homer's *Iliad* she is goddess of counsel and law, of war, of cities and of women's arts, spinning and weaving. Later she became a goddess of peace and industry and took on certain aspects of the earth-goddess of agriculture. The Romans identified Athena with their goddess Minerva.

Atlantis (at lan'tis), a fabled island in the Atlantic Ocean, west of the Pillars of Hercules. Plato and Pliny both mention it. Plato said it was larger than Asia Minor and Libya and described it as an ideal state. According to the story it was a powerful empire 9000 years before Solon was born and its people overran the kingdoms of the Mediterranean. An earthquake sank it into the sea and shoals still mark the place. Renaissance geographers tried to identify it with the Canary Islands, America, etc. There has always been much scientific speculation as to the actual existence of the Lost Continent. Sir Francis Bacon's *The New Atlantis* is a political treatise on an ideal state.



A Modern Atlas

This 45-foot statue by Lee Laurie stands in the forecourt of the International Building in Rockefeller Center, New York

Atlas (at'las), one of the Titans. In the *Odyssey* he is the one who "keeps the tall pillars which hold heaven and earth apart." His name was given to a mountain ridge in northwest Africa, and Ovid tells the story of a king of that region named Atlas, who refused a welcome to Perseus. In return Perseus showed him the Gorgon's head and Atlas was turned to stone, a high rocky mountain, doomed forever to support the heavens (or the world) on his shoulders.

Atli (ȧt'lē), in Norse legend, a terrible king whose story and personality are based on the historical Attila, king of the Huns. Atli married Gudrun, by whom he was murdered to avenge the death of Sigurd. In the German *Nibelungenlied,* Atli is called Etzel.

Atropos (at'rō pos), the eldest of the three Fates in Greek mythology, whose shears cut the thread of human life.

Augean (ô jē'an) **Stables,** in Greek mythology, the stables of Augeas, King of Elis, in which he kept thousands of oxen. The stables had never been cleaned. One of the Twelve Labors of Hercules was to clean them. He did it in one day by turning the course of the river Alpheus through them. Augeas had promised Hercules one-tenth of the herd for the job. When he refused to pay, Hercules killed him.

Aurora (ô rō'r*a*), the Roman goddess of the dawn, corresponding to the Greek Eos.

Auster (ôs'ter), the south wind, also called Notus.

Avalon (av'*a* lon), in Celtic mythology, the kingdom of the dead. Its name, Isle of Apples, was symbolic of joy. To magic Avalon Arthur was borne to be healed, and Avalon was later identified with Glastonbury in Somerset as Arthur's burial place.

Avernus (*a* vûr'nus), a small lake in Italy within the crater of an extinct volcano, believed by the ancients to be the entrance to the infernal regions because of the foul smelling vapors that rose from it.

ba (bä), in Egyptian religion, the immortal soul, pictured as a bird with a human head.

Baal (bā'al) or **Bel** (bāl), ancient Semitic god of fertility, bestower of the gifts of nature. The word means literally lord or god and there were many Baals, belonging to different tribes and places, as the Tyrian Baal, Babylonian Baal, etc. His cults developed into an orgiastic form of nature worship.

Bacchus (bak'us), the Greek god of wine. See *Dionysus.*

Balder (bôl'dẽr), in Teutonic mythology, the god of light, son of Odin and Frigga. Frigga exacted a vow from all creation never to harm Balder. Iron, stone, fire, water, trees, beasts and birds all promised. But Frigga forgot to ask the mistletoe. The other gods used to amuse themselves by hurling things at Balder. Arrows, stones, spears or battleaxes could not injure him. But Loki, the mischief maker, cut off a twig of the mistletoe and made a dart of it. "Here" he said to the blind Hodur, "you too may do as the others do." And he directed the aim of Hodur. Balder was pierced by the mistletoe dart and fell dead. Hermod rode straight to the underworld to pray Hela (death) to restore Balder to the grieving gods. Hela agreed to let Balder return to life if all things in the world would weep for him. If one thing did not weep, Balder could not return. Hermod went back with his message. All things on earth wept. But Loki, disguised as an old hag, would not weep. Matthew Arnold's "Balder Dead" tells the story of Hermod's journey to the underworld and Loki's refusal to weep.

Balmung (bäl'moong), in the *Nibelungenlied,* Siegfried's sword; called Nothung in Wagner's operas.

Balor (bal'ôr), in Celtic mythology, king of the Fomors (sea giants). He had one evil eye that destroyed anything it looked upon. His eye was put out and Balor was killed by Lugh, the sun god, in the battle of Moitura between the Fomors and the Tuatha de Danann (the Irish gods).

banshee (bän'shē), in Gaelic folklore, a female spirit whose wailing warns certain families that one of them is about to die. In Gaelic, *bean* (pronounced bän) means woman; *sid* (pronounced shē) means fairy or spirit.

basilisk (bas'i lisk), a reptile of ancient fable, dragon, lizard or serpent, hatched from a cock's egg by a serpent. It was fatal to come within range of its breath or its look.

Baucis and **Philemon** (bô'sis; fi lē'mon), in Greek and Roman mythology, an aged woman and her husband, very poor, who lived in Phrygia. Zeus and Hermes, travelling in disguise, were welcomed and fed in the cottage of the old pair; and not until the pitcher returned to the table many times miraculously filled did Baucis and Philemon realize they were entertaining gods. Their humble cottage was changed into a temple. Their prayer to die together that neither might be left alone was granted, and they were changed into trees that grew at the gate of the temple.

Bedivere (bed'ĭ vēr), one of the knights of the Round Table, sole survivor with his brother and King Arthur of the battle against Modred in which Arthur was mortally wounded. It was Bedivere who threw the sword Excalibur back into the lake and carried Arthur to the ship that bore him off to Avalon.

Beelzebub (bē el'zē bub), a god of the ancient Philistine city of Ekron; literally, god of flies. Beelzebub probably was a deity who could disperse flies and thus prevent plagues and diseases. In the New Testament he is called a prince of demons. In Milton's *Paradise Lost* he is one of the fallen angels, next in rank below Satan.

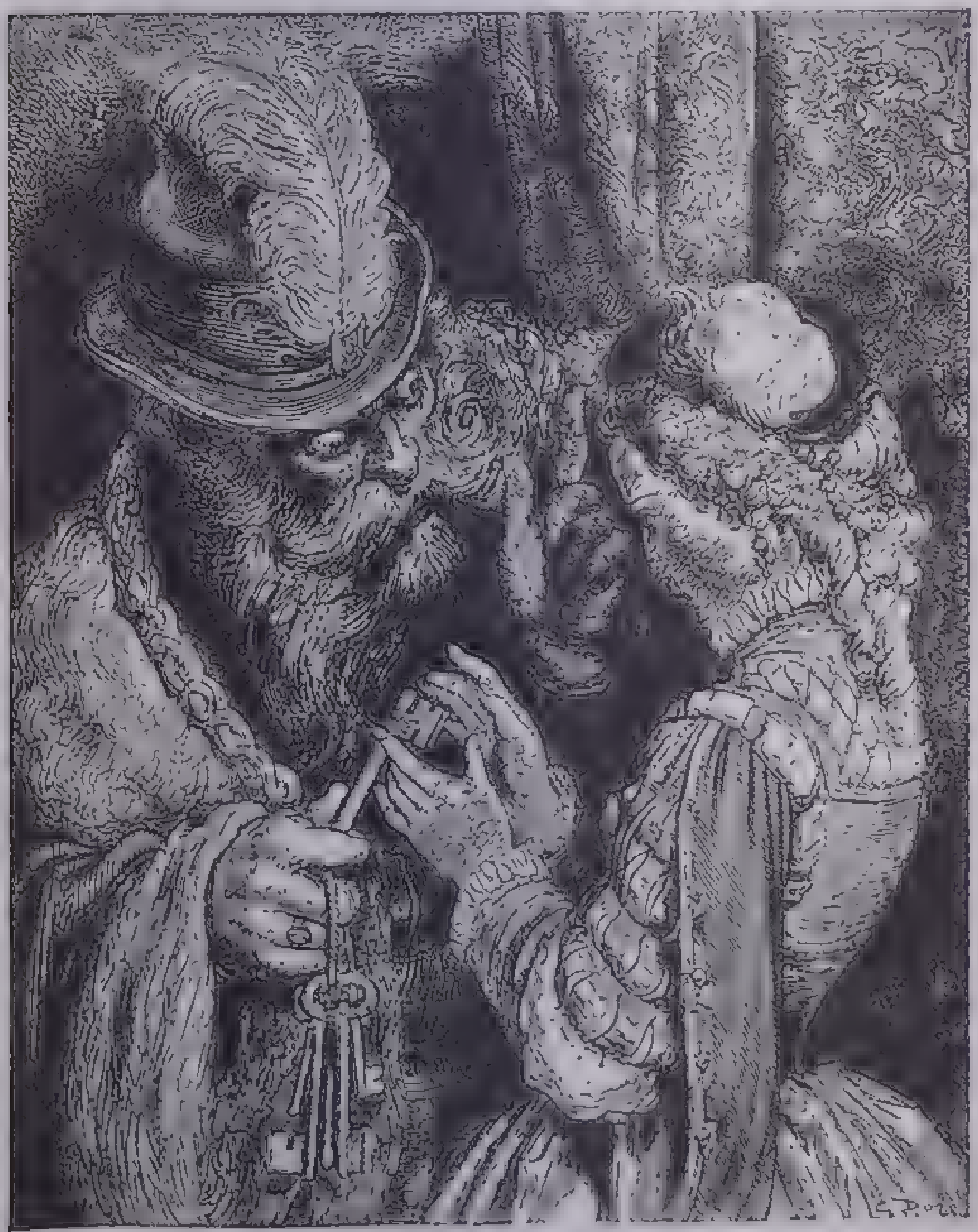
Belial (bē'li al; bēl'yal), personification of evil; the devil. The word seems to mean worthless. In the New Testament, Satan is called Belial. In Milton's *Paradise Lost* Belial is one of fallen angels.

Bellerophon (be lẽr' ō fon), son of Glaucus, king of Corinth. He committed murder, and fled to Proetus, king of Argos, for protection. Antæa, Proetus's wife, fell in love with Bellerophon, and when he rejected her advances, she accused him to the king. Proetus sent him to Iobates, king of Lycia, with a secret message asking that he be put to death. Iobates sent him to kill the terrible Chimaera, sure he would meet his death. But Bellerophon killed the Chimaera with the aid of the winged horse Pegasus. After other trials, in which he was successful, Iobates saw his worth and gave him his daughter in marriage. Hawthorne tells this story in his *Wonder Book.*

Bellona (be lō′na), the Roman goddess of war.

Beowulf (bā′ ō woolf), mythical, semi-historical warrior hero of the Anglo-Saxon epic poem *Beowulf,* who delivered Hrothgar, king of the Danes, and his people from the monster Grendel. For twelve years Grendel had walked into Hrothgar's great mead hall named Heorot and devoured sometimes 30 warriors in one night. With 14 companions came Beowulf across the sea. He was the nephew of Higelac, king of the Geats. Single-handed he wrestled with the grim stalker from the marshes and tore off his arm. Grendel fled to his den to die. The next night his mother, the water-hog, came to avenge her son and seized on Aeschere, Hrothgar's counsellor. Beowulf followed her to the bottom of the sea. It was a terrible underwater fight; but Beowulf killed her and cut off the head of Grendel who was lying nearby. He swam ashore with nothing left but the hilt of the sword in one hand and the head of Grendel in the other. He returned to his own people, laden with rich gifts.

Years later Beowulf became king of the Geats and ruled for 50 years. In the fiftieth year a fearful dragon began to burn and lay waste the land, and no one dared to approach it. The old king himself, with eleven companions, went out to destroy it. At sight of the fire-breathing monster his companions fled, save Wiglaf who thought only of Beowulf. Beowulf fought without fear, but his sword broke and the dragon sank his poison-fangs in the old king's neck. Then Wiglaf wounded the monster and Beowulf killed it, but he had received his own death wound. Then he commanded that his barrow be built on the high sea cliff, and here his body was burned with the treasure from the dragon's hill.



From a drawing by Gustave Doré

Bluebeard and Fatima

"As for this little key here, it is the key of the little room at the end of the lower hall; open everything, go every place, but—as for this little room—I warn you not to enter it, and I warn you that if you should happen to open it, you can expect anything of my anger."

Bifrost (bēf′rost), in Norse mythology, the rainbow bridge over which the gods passed between earth and heaven.

Bladud (blā′dud; blȧd′ud), legendary king of Britain, father of King Lear.

Blarney (blär′ni) **Stone,** an inscribed stone in Blarney Castle, near Cork, Ireland. There is an old belief that those who kiss the Blarney Stone will thereafter possess "a cajoling tongue and the art of flattery or of telling lies without shame."

Bluebeard (bloo′bērd), a rich old man with an ugly blue beard who murdered his wives one after the other and hid them in a locked room. The story is built around the forbidden door (or forbidden chest) motif, one of the world-wide motifs of folklore, in which curiosity is inevitably punished. But the story is familiar to modern readers largely through the French *Stories of Times Past* of Charles Perrault, first translated into English in 1729.

Old Bluebeard married one young wife after another, and they mysteriously disappeared. Fatima was the name of the seventh. She did not want to marry him but at last consented. Soon after the wedding Bluebeard went off on a journey, leaving with Fatima all the keys of the castle. She could unlock all the treasure; she could go into all the rooms but one. One mysterious door he commanded her not to unlock. But after she had seen all the treasure and all the rooms, Fatima wanted to know what was in this last room. She unlocked the door and discovered the bodies of Bluebeard's dead wives. Overcome with terror, she dropped the key, which became stained with blood. She could not wash it off, though she scrubbed and scrubbed. Bluebeard came back, saw the spot on the key and condemned Fatima to death for her disobedience. But Fatima's brothers arrived just in time to save their sister, and they speedily put an end to Bluebeard.

bogle (bō′gl; bog′l), in Scotland and northern England a goblin or ghost. It is also spelled bogey, bogie, bogy.

Boreas (bō′rē as), in Greek mythology, the *north wind;* called *Aquilo* in Roman mythology.

Bors (bôrs) **Sir,** one of the knights of the Round Table who sought the Holy Grail.

Bragi (brä′gē), in Teutonic mythology, the god of poetry, one of the sons of Odin and Frigga.

Brahma (brä′ma), the chief god of Hindu mythology, the supreme soul or divine reality of the universe. In later Hinduism he became personified as the creator in the great Hindu triad, with Vishnu, the preserver, and Siva, the destroyer.

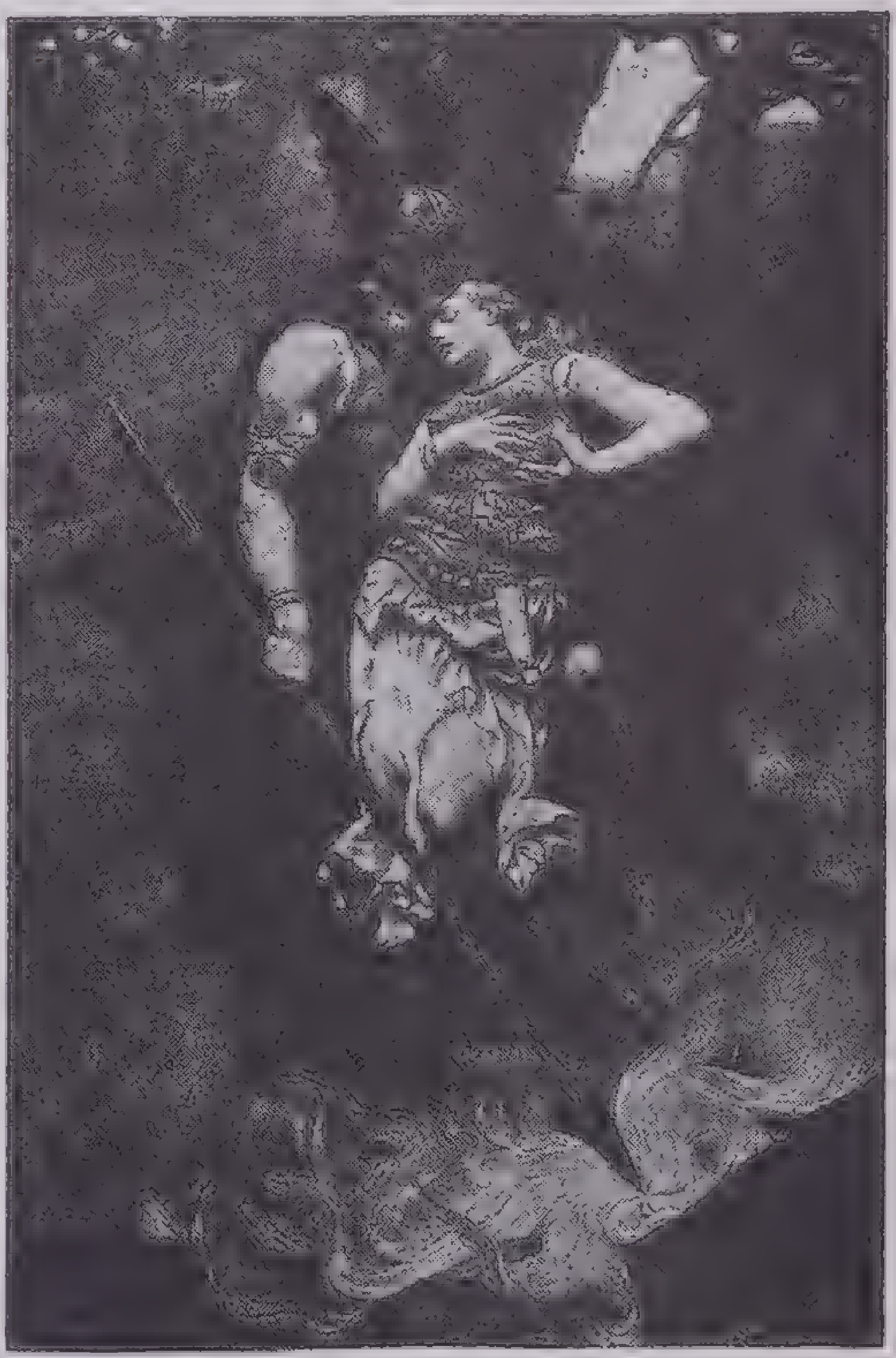
Bran (bran), in Celtic mythology, god of the underworld, son of the sea god Lir. As a mythical king of Britain he commanded his people to bury his head in the White Mountain London with the face toward France. While it lay there, he said, no enemies could land on the island. When Arthur dug it up, the Saxon invaders came.

Briareus (brī âr′ē us), in Greek mythology, a giant with 100 hands.

Bronze Age, in classical mythology, the third era of the world, in which warfare prevailed. It followed the Silver Age.

brownie (broun′ĭ), a friendly goblin of Scotch folklore who performed the household tasks or farm chores at night.

Bruce and the Spider, a Scotch legend that tells how Robert the Bruce, weary and discouraged and in hiding, took new heart to drive the English out of Scotland. He was crowned King of Scotland in 1306 but he was driven from his throne by the English. He took refuge on the isle of Rathlin off the coast of Ireland. One day he was watching a spider mending her web. She would slip down and hang from the beam by her thread and climb laboriously up again. She would slip down and climb up, slip down and climb up, but she never ceased to labor. Thus Bruce learned patience and perseverance and courage. With a small band of followers he sailed back to Scotland to rout the usurpers. It took seven years. Bruce himself led the Scots in the great battle of Bannockburn (1314), which was the end of the English in Scotland.



From the painting by Konrad Dielitz

Wotan's Farewell to Brunnehilde

Brunhild[1] (broon′hilt), in the *Nibelungenlied,* Queen of Iceland, overcome by Siegfried in trials of strength and given as wife to Gunther. Siegfried, to tame her, stole her ring and girdle and gave them to his own wife Kriemhild. Brunhild in hate persuaded Hagen, Gunther's retainer, to kill Siegfried.

In Wagner's operas of the *Ring of*

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[1] Spelled: Brynhild in the *Volsunga Saga;* Brunhild in the *Nibelungenlied;* Brunnehilde in Wagner's *Ring of the Nibelungs.*

the Nibelungs, Brunnehilde is a daughter of Wotan and youngest of the Valkyrie. She disobeyed her father by trying to aid Siegmund in his fight with Hunding and was condemned to become a mortal woman and sleep within a magic ring of fire until a hero worthy of her should penetrate it and find her. Brunnehilde slept on her mountain until Siegfried, Siegmund's son, grew up and went through the fire and woke her. Their love was perfect until in his adventures a magic drink was given him that caused him to forget Brunnehilde, wed Gudrune and promise Brunnehilde to Gunther. In despair Brunnehilde reproached him, but the magic held him, and he did not love her. Later at a banquet Siegfried drank another magic potion, suddenly remembered Brunnehilde, called her name and was killed by Hagen. Brunnehilde rode into the flames of his funeral pyre and died with him.

In the *Volsunga Saga,* Brynhild was beloved by Sigurd, who forgot her to marry Gudrun. She was wed to Gunnar but brought about Sigurd's death in order to die with him.

Brut (bro͞ot) or **Brutus,** legendary first king of Britain (great-grandson of Aeneas) who founded New Troy (London). He was the ancestor of Bladud, Lud, King Cole, Vortigern and Arthur. His story is told in Geoffrey of Monmouth's *History of the Kings of Britain,* Wace's *Brut* and Layamon's *Brut.*

Cacus (kā'kus), a giant son of Vulcan. He stole the cattle of Geryon as Hercules was driving them home and dragged them backwards into his cave so that their tracks would seem to be leaving it. But Hercules heard their lowing, found them and killed Cacus.

Cadmus (kad'mus), in Greek mythology, son of Agenor, king of Phoenicia. In the search for his sister Europa, whom Zeus had carried off, he slew a dragon and sowed its teeth across a plain, from which armed men sprang up. They fought among themselves until only five were left. With these five Cadmus founded Thebes. He is said to have given the letters of the alphabet to Greece.

Caduceus (k*a* dū'sē us), a winged staff entwined by two serpents. As the staff of Hermes, herald of the gods, it became the symbol of heralds—and later of physicians.

Calliope (k*a* lī'ō pē), the Greek Muse of epic poetry.

Callisto (k*a* lis'tō), a nymph beloved by Zeus. Hera in jealousy turned her into a bear. She was about to be killed by her son Arcus when Zeus suddenly raised them both into the heavens, as the constellations, the Great and Little Bear, which never set.

Calydonian (kal i dō'ni an) **Boar,** in Greek mythology, the terrible boar sent by Artemis to ravage the fields of Calydon, as a punishment to Oenus for failing to honor her with a harvest offering.

Calypso (k*a* lip' sō), in the *Odyssey* a sea nymph, ruler of the island Ogygia, who found Odysseus shipwrecked on her coast. She offered him immortality if he would stay with her, but he would not. She kept him seven years and then allowed him to depart.

Camelot (kam'e lot), the seat of Arthur's court. It has been variously identified by tradition with Winchester, Queen's Camel in Somerset, Caerleon on the river Usk and Camelford in Cornwall.

Canute (k*a* nūt') or **Cnut** (k'no͞ot'), Danish king of England (1017–35) and of Denmark. English legend says that to rebuke the flattery of those around him, Canute sat down by the edge of the sea and commanded the rising tide to come no farther. But the tide rolled in and the waves broke over Canute. Then he exhorted those who called him great to witness that he could not stay by his command "so much as this small portion of water."

Carbonek (kör'bō nek), the castle where Galahad, Perceval and Bors found the Holy Grail.

Cassandra (k*a* san'dr*a*), a daughter of Priam, king of Troy. When she was young, she was left asleep in the temple of Apollo and her ears were purified by serpents so that she could understand the voices of nature. Apollo gave her the gift of prophecy; but, when she refused his love, he ordained that no one should believe her prophecies. She warned the Trojans to send Helen home to Greece; she warned them against the Wooden Horse; but nobody would heed her words. Upon the capture of Troy she fell to the lot of Agamemnon, returned to Greece with him and was killed by Clytemnestra.

Cassiopeia (kas i ō pē'y*a*), in Greek mythology, the boastful mother of Andromeda.

Castor and Pollux (kas'tẽr; pol'uks), twin brothers, called the Dioscuri, that is, sons of Zeus. They took part in the voyage of the Argonauts and thus became the patrons of sailors and navigation. Castor was famous for his skill in managing horses, and Pollux for his boxing. The gods rewarded their fidelity to each other by placing them together in the heavens. Their constellation is called Gemini, the Twins.

cat of Losanne, a monster cat killed by King Arthur.

Cecrops (sē'krops), the first king of Attica and founder of Athens, which was originally called Cecropia.

Centaurs (sen'tôrs), a race of the mountains of Thessaly, half horse, half man. The famous battle of the Centaurs with the Lapithæ arose from a quarrel at the marriage feast of Hippodamia and Pirithous, king of the Lapithæ. The Centaurs were driven out of the country.

Cerberus (sẽr'bẽr us), the three-headed dog that guarded the entrance to Hades. He prevented the living from entering the lower world and the dead from leaving. Those of the upper world who got by him had to lull him to sleep with music or pacify him with a cake.

Ceres (sē'rēz), the Roman goddess of growing things, especially of food plants and agriculture; mother of Proserpine. The Romans very early superimposed on her worship that of the Greek Demeter.

changeling (chānj'ling), in British folklore, a child of the fairies or elves left in place of a stolen human baby. This superstition is especially prevalent in the Scottish Highlands, where, to this day, a new-born child is carefully watched till the day of its baptism. After that it cannot be stolen by the fairies. A deformed, sickly or idiot child is often thought to be a changeling and cruelly treated.

Chanticleer (chan'ti klẽr), the name (meaning sing clear) of the cock in *Reynard the Fox* and other medieval beast fables. Chanticleer figures in Chaucer's *Nun's Priest's Tale.* He is the hero of Edmond Rostand's drama *Chanticleer.*

Chaos (kā'os), the formless void that existed before the creation of the world. Chaos and Love united, and from the union the gods, men and all things were born. Chaos was the mother of Erebus and Night.

Charis (kā'ris), in Homer's *Iliad,* the wife of Hephaestus. Later the name was applied to any one of the three Graces or Charites.

Charlemagne (shär' lẽ mān), king of the Franks (768–814); emperor of the West (800–814), son of Pepin. Charlemagne, his splendid court and his 12 peers or paladins (like the British Arthur and his knights) are the center of a vast cycle of romance and legend. These romances are called *Chansons de gestes* or songs of heroic deeds, and the *Song of Roland* is the best known to modern readers.

Charlemagne figures as a warrior, a strong and just ruler and champion of Christianity. Roland and Oliver, Turpin, Ogier the Dane, William of Toulouse and Ganelon the traitor are the paladins best known to us. The various romances (or *chansons*) celebrate the wars against the Saxons, wars in Italy and in Spain, wars with Charlemagne's own vassals and against the Saracens, his pilgrimage to Jerusalem, his innocent wife Blanchefleur, falsely accused, and (the high peak of the cycle) the defeat of his rear guard at Roncesvaux, Aug. 15, 778.

Charon (kā'ron; kâr'on), in Greek mythology the boatman who ferried the souls of the dead across the river Styx or Acheron. The fare was a small coin called an obol; and it was the custom to place one in the mouth of a dead person to pay his way to Hades.

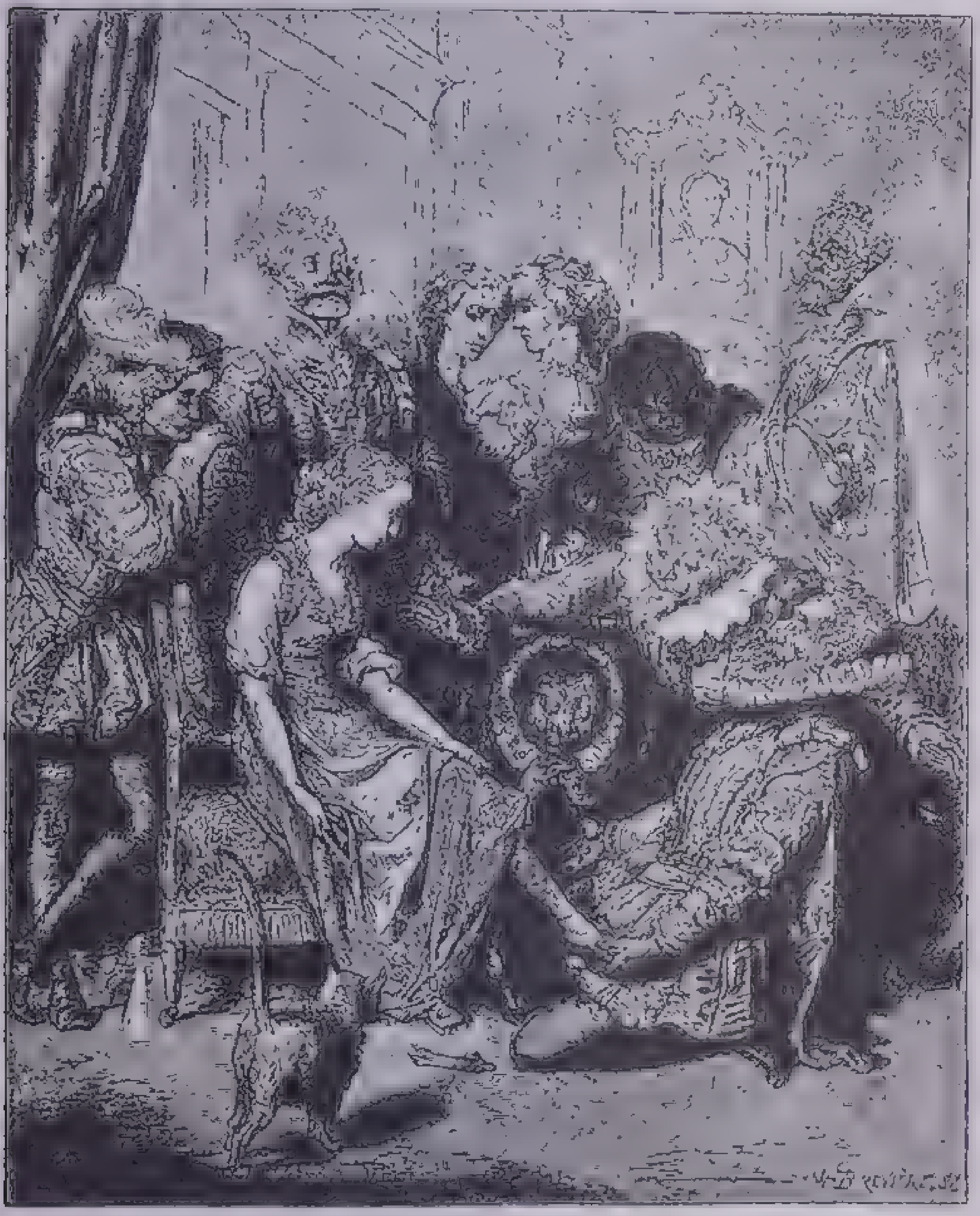
Charybdis (k*a* rib'dis), in Greek mythology a greedy and thieving woman who stole the oxen of Hercules and as punishment was turned into a terrible gulf and whirlpool by Zeus. She was placed opposite the monster Scylla in the strait between Italy and Sicily. There she remained a menace to mariners and sucked down several of the ships of Odysseus. "Between Scylla and Charybdis" means between two dangers, one of which can hardly be avoided.

Children of Ler or Lir (lâr), in Celtic mythology and legend, one of the "three sorrows of story telling." Ler was the Celtic sea god. He had three beautiful children whom Aeife (ē'f*ȧ*), their jealous stepmother, changed into swans. For 900 years they wandered on the lakes of Ireland until St. Patrick came and drove away the old gods. Then the three swan-children of Ler were restored to human form and converted to Christianity. But they were so old that they died almost immediately.

Chimaera (ki mē′r*a*), in Greek mythology a female monster with a lion's head, goat's body and dragon's tail, perpetually vomiting flame. It was killed by Bellerophon with the help of the winged horse Pegasus.

Chiron (kī′ron), in Greek mythology, a wise centaur, skilled in medicine, who taught Asclepius the art of herbal healing. Many of the heroes of Greece were his pupils. He was accidentally wounded by Hercules and placed in the heavens by Zeus as the constellation Sagittarius.

Cinderella (sin der el′*a*), in world folklore, a little household drudge, cruelly treated, who attained wealth and married a prince with the aid of a supernatural guardian. The story is probably of Oriental origin and exists in more than 300 variants from Alaska to South Africa. But the most familiar version is from the French of Charles Perrault, first translated into English about 1729. Cinderella was a young girl, hated and mistreated by her stepmother for being more beautiful than her own two ugly daughters. Kept in rags and overworked, she was not allowed to go to the king's ball. But her fairy guardian saw to it that she got there. She outshone everyone else and the prince fell in love with her. But each night at midnight she had to run home and he never found out who she was. On the third night she lost one little glass slipper by which in the end the prince identified her and they were married.


From a drawing by Gustave Doré

Cinderella Tries on the Glass Slipper

"He asked Cinderella to be seated and drawing the slipper on her little foot, he saw that it went on with no trouble. "It is she," he said, "It fits!""

Circe (sûr′sē), in the *Odyssey*, a sorceress who lured travelers to her island of Ææa and turned them into beasts with magic herbs. When Odysseus landed there, his comrades were changed into swine. Circe could not harm Odysseus, for he was protected by the herb *moly*, which Hermes had given him. He compelled her to restore his companions to human form and dwelt with her there for a year.

Clio (klī′ō), the Greek Muse of history.

Clotho (klō′thō), in Greek mythology, the youngest of the three Fates. She presided over the birth of human beings.

Clytemnestra (klī tem nes′tr*a*), in Greek legend, a sister of Castor, Pollux and Helen of Troy. She was the wife of Agamemnon and mother of Orestes, Iphigenia and Electra. When Agamemnon returned from the Trojan War, she murdered him with the help of her lover Aegisthus. She was killed by her son Orestes, to avenge the murder of his father.

Clytie (klī′tē), in Greek mythology, a sea nymph, the emblem of constancy. She loved the sun god Apollo, and when he left her, she was turned into a sunflower, which now every day turns its face to the sun.

cockatrice (kok′*a* tris). Same as *basilisk.*

Cole, King. See *King Cole.*

Conchobor (kong′kō wur or kon′oor), king of Ulster, uncle of Cuchulain.

Creusa (krē ū′s*a*), (1) a princess of Corinth and wife of Jason, whom Medea killed with the gift of a poisoned robe; (2) daughter of Priam, king of Troy, and wife of Aeneas.

crocodile tears, insincere tears. In ancient fable crocodiles were said to weep while they devoured their prey.

Crœsus (krē′sus), a 6th-century king of Lydia, considered the richest man in the world. He boasted of his happiness, and Solon rebuked him saying that Crœsus knew not his end. Just as he was about to be burned alive by Cyrus, his conqueror, he called on Solon's name. Cyrus was touched by his story and set him free.

Cronus (krō′nus), in Greek mythology, son of Uranus (heaven) and Gaea (earth). His wife was Rhea. He was warned that a child of his own would overthrow him, so he swallowed his children as soon as they were born, first Hestia, then Demeter, Hera, Hades and Poseidon. But Rhea saved the infant Zeus by giving Cronus a swaddled stone to swallow. When Zeus grew up, he made Cronus give up his brothers and sisters, rebelled against him and dethroned him.

Cuchulain (ko͞o *ch*ul′ in′), the hero of the Ulster cycle of old Irish mythology and legend. He was the son of Lug (Lo͞o), the sungod, and nephew of Conchobor, king of Ulster, and is believed to have lived in the 1st century A.D. When he was seven years old, he performed amazing feats. At the age of 12 he guarded the possessions of Culain, the smith of Ulster, to make up to him for having killed his hound; and he thereby received his name: Cu (hound) + Culain (of Culain). He married Emer, the daughter of a druid. He saved Ulster single-handed against the forces of Connaught in the War for the Brown Bull or the Cattle Raid of Cuailnge (Cooley). He was killed by magic in a last battle at the age of 27. Lady Augusta Gregory's *Cuchulain of Muirthemne* is the finest modern reworking of the legends.

Cupid (kū′pid), in Roman mythology, the god of love, son of Venus. He is pictured as a winged, naked boy with bow and arrows. A dart from his bow would create love in the breast of whatever god or mortal it wounded. The story of Cupid and Psyche begins with his wounding himself with one of his own arrows.

Cybele (sib′e lē) or **Cybebe** (si bē′bē), the great nature goddess of ancient Anatolia; identified by the Greeks with Rhea.

Cyclopes (sī′klō pēz), a race of one-eyed giants, who dwelt in Sicily. The word is Greek for round-eyed; Cyclops is the singular form. In the *Odyssey,* they were huge man-eating shepherds. They labored for Hephaestus under Mount Etna, helping to forge the thunderbolts of Zeus.

Daedalus (ded′*a* lus), a skilled Athenian inventor. The Greek word means craftsman. In jealousy he killed his nephew, a too-apt pupil, and fled with his son Icarus to Crete. There he built the labyrinth for King Minos, and later he and his son were shut up in the labyrinth for an offense to Minos. Daedalus made wings for them both of feathers and wax, whereby they escaped. But Icarus flew too near the sun; the wax of his wings melted, and he fell into the sea, thereafter named the Icarian Sea. Daedalus reached Sicily.

Damocles (dam′ō klēz), a flattering attendant of Dionysius, tyrant of Syracuse in the 4th century B.C. Dionysius grew weary of having his own happiness extolled and invited Damocles to taste of a ruler's happiness. At the banquet Damocles looked up and saw a sword above his head hanging by a single hair.

Damon (dā′mon), in Greek legend, the true friend of Pythias. Pythias, condemned to death by the tyrant Dionysius of Syracuse, asked leave to go home to arrange his affairs. Damon offered his own life as pledge for his friend's return. Pythias returned just in time to save Damon from being put to death in his place. Dionysius was so impressed with their devotion that he pardoned Pythias.

Danae (dan′ā ē), in Greek mythology, a daughter of Acrisius, king of Argos. To prevent the fulfilment of an old prophecy that he would die at the hand of her son, Acrisius shut her up in a brazen tower. But Zeus fell in love with her and visited her there concealed in a shower of gold. Perseus was their son. Acrisius set the mother and child adrift in a boat and they were carried to the island of Seriphos.

Danaides (d*a* nā′*i* dēz), the fifty daughters of Danaus, king of Argos. He had been warned that he would die at the hands of his sons-in-law and commanded his daughters to kill their husbands on their wedding night. They all obeyed but one. The other 49 were sent to Hades to dip water in a sieve forever.

Danu (*th*ăn′o͞o; dän′o͞o), in Celtic mythology, the mother of all the gods.

Daphne (daf′nē), in Greek mythology, a river nymph who was pursued by Apollo. As she fled she prayed the gods to allow her to escape, and she was changed to a laurel tree.

Deianira (dē *ya* nī'*ra*), the beautiful wife of Hercules, whom he won by feats of strength. In their travels they came to a river that Hercules forded with ease, but Deianira he gave to the centaur Nessus to carry over. Nessus was so won by her beauty that he tried to run off with her. Hercules shot a poisoned arrow after him that gave him a mortal wound. Nessus, dying, told Deianira that his blood-stained robe was a charm to hold the love of her husband. Deianira believed him and years later, when she thought she had cause, sent Hercules the centaur's garment. When it touched his flesh it burned and clung to him. Dying and in agony he hurried home, ascended his funeral pyre and lit the torch. Deianira in grief for what she had mistakenly done hung herself.

Deirdre (dâr'drē), heroine of an old Irish legend, one of the "three sorrows of story telling." When Deirdre was born a druid prophesied that she would bring death to heroes. But because of her great beauty, Conchobor, king of Ulster, marked her for his wife and had her brought up in secret. By accident she met Naoise one of the three sons of Usnech (ŏŏsh'nĕ*ch*) in the forest, loved him and fled with him and his brothers to Scotland. Years later Conchobor sent them a message of pardon and called them home. In spite of Deirdre's warning not to go, they returned to Ireland. The three sons of Usnech were at once most treacherously slain and Deirdre killed herself in grief. This is most beautifully told in Lady Augusta Gregory's *Cuchulain of Muirthemne*. William Butler Yeats used the story for his play *Deirdre*. James Stevens wrote a novel *Deirdre*. The unfinished poetic drama *Deirdre of the Sorrows* by John Millington Synge is the finest rehandling of the material.

Delphi (del'fī), a town in ancient Greece near the foot of Mt. Parnassus, famed for the temple and oracle of Apollo. From a cleft in the ground inside the temple came forth sulphurous vapors that were supposed to inspire the priestesses.

Demeter (dē mē'tẽr), the Greek goddess of agriculture, fertility and marriage. She was the mother of Persephone, whom Pluto carried off to the underworld. The grief of Demeter moved Zeus to allow Persephone to return to her mother for half of the year and remain the other half with Pluto. This symbolizes the sowing of seed (while Persephone is underground) and the growth of grain (when she returns to the upper world.) The Romans identified Demeter with Ceres.

Deucalion and **Pyrrha** (dū kā' li ŏn; pir'*a*), King and Queen of Thessaly, sole human survivors of the Deluge. One story says they took refuge on the peak of Mt. Parnassus, another that they were nine days in a ship which landed there. They were told by an oracle to cast the bones of their mother behind them to repeople the world. Their mother they understood to be the earth. So they cast stones behind them, and the stones became men and women.

deva (dā'v*a*), in Persian folklore a malignant spirit or demon.

Devil (dev'l), the personification of evil in all folklore and in all formal religions. He has many names and many shapes. In ancient Babylon he was a dragon named Tiamet, in Egypt a serpent called Apap. The Hindus call him Siva. He is the Satan of the Hebrew and Christian religions, referred to at times also as Abaddon or Beelzebub. He was the serpent who tempted Eve and is considered the enemy, tempter and deceiver of mankind. This devil figures as Lucifer in Milton's *Paradise Lost*.

In the Old Testament book of Job, Satan "presents himself before the Lord" and insists that Job's piety depended on his health and wealth. Satan is allowed to tempt Job by taking both health and wealth from him. This notion of Satan seems to explain the words devil and diabolic, for in Greek *diabolus* means the accuser or slanderer.

In the folklore of all uncivilized peoples, calamity, disease, death, everything the primitive mind could not understand or explain, was the work of the devil and his servants.

In the Middle Ages he came into his own. One had only to look out the window to see him pass in the form of a cat, a black dog, a goat or a fiddler who danced men and women to their ruin. Sometimes he was a toad to be placated with a saucer of milk lest he harm the household. Stories, beliefs and personal encounters abounded. Martin Luther threw an ink bottle at him.

But the elegant gentleman devil with horns and pointed ears, long black cloak and tail and cloven hoof is a fairly late development. His is the outgrowth of the medieval story of a man who sold his soul to the devil in exchange for power. This devil is the Mephistopheles of Marlowe's *Doctor Faustus*, Goethe's *Faust* and Gounod's opera, *Faust*.

Diana (dī an'*a*), Roman goddess of forests and protectress of women in childbirth. She was a very ancient Italian goddess whose priest, the king of the woods, became priest only by killing his predecessor in single combat. Diana (Artemis) of Ephesus was goddess of fruitfulness, the great mother. The Greeks took over the worship of the Greek Artemis and identified it with their own Diana cults. In later literature Diana became goddess of the chase and of the moon.

Diarmait (dēr'mat), in the Fenian cycle of old Irish legend and romance, hero of the romance *The Pursuit of Diarmait and Grainne*. Diarmait was the nephew of Finn MacCumal. Grainne, Finn's chosen wife, fell in love with Diarmait and the two fled together. After long and fruitless search Finn finally caused the death of Diarmait.

Dido (dī'do), a princess of Tyre, queen and founder of Carthage. Her husband was murdered by her brother for his wealth; but Dido fled from Tyre with the treasure. She landed in Africa and bargained for as much land as the hide of a bull would cover. She had it cut into thin strips and with them enclosed enough ground to erect her citadel. A neighboring king named Iarbas coveted the city, demanded her hand in marriage and threatened war should she refuse. Rather than marry him she built her funeral pyre and killed herself. In Vergil's *Aeneid* Dido is a contemporary of the wandering Aeneas, and it is for the love of him and in grief at his leaving her that she takes her own life. She is also called Elissa.

Diomedes (dī ō mē'dēz), in Greek mythology, a tyrant of Thrace, who fed his mares on human flesh, was overcome by Hercules and fed to his own horses. Another Diomedes was a Greek hero in the Trojan War. He entered Troy and helped Odysseus steal the sacred Palladium, without which the Trojans felt unable to defend themselves.

Dione (dī ō'nē), in the *Iliad*, the mother of Aphrodite by Zeus; in Hesiod, a daughter of Oceanus.

Dionysus (dī ō nī'sus), in Greek mythology, god of nature and all growing things, especially of the grape and wine. He is also called Bacchus. He was the son of Zeus and Semele and was brought up in secret by the nymphs to save him from the jealous malice of Hera. When he grew up, he travelled through the world teaching men the arts of civilization, especially the cultivation of the grape. The wild, orgiastic aspects of his cult were strongly resisted in many places. Many stories depict the sad fate of those who opposed him; those who favored him received the gift of the vine, that is, the making and use of wine. The satyrs were his companions and he himself often took on the form of panther, tiger or goat.

Dioscuri (dī'os kū'rī). See *Castor and Pollux*.

Dis (dis), the god of the under world in Roman mythology, identified with the Greek Pluto.

dragon (drag'un), a fabulous monster, pictured as a winged fire-breathing serpent or lizard: in Teutonic mythology called a *fire-drake*. It had one head or many heads, legs or no legs; but everywhere it was essentially a snake. And everywhere it was a bringer of destruction, a guardian of treasure, kidnapper of maidens fair and demander of sacrifices (usually human) for the use of benefits, such as bridges and castles. Many a hero in the myths and folk tales of the world has killed his dragon: Hercules, Thor, Apollo and Perseus, Siegfried, Sigurd, Beowulf, Arthur, Tristram, St. George. In Christian legend the dragon is the symbol of Satan, overcome by the archangel Michael. Many saints are pictured standing upon a dragon, in symbolism of their having conquered evil.

dryads (drī'adz), the wood nymphs of Greek mythology. They lived and died with the trees in which they dwelt.

dwarfs (dwôrfs), in Teutonic mythology, small supernatural beings who dwelt in the bowels of the earth, little old brown men with long white beards and child stature. They were sometimes helpful, more often malicious, and possessed great knowledge and cunning. They were master metal workers and forged the weapons of the gods. They made Thor's hammer and the great chain which held the wolf Fenrir.

Echo (ek'ō), in Greek mythology, a mountain nymph whose incessant talking so annoyed Hera that she deprived her of the power of speech. She could speak only when she was spoken to; and then could only repeat the last words said to her. Another story says that she pined away for love of Narcissus until only her voice was left.

Elaine (ē lān'), in Arthurian legend: (1) The fair maid of Astolat who died for love of Lancelot. (2) The mother of Galahad by Lancelot, daughter of King Pelles.

Electra (ē lek'tr*a*) the daughter of Agamemnon and Clytemnestra who inspired her brother Orestes to avenge their father's murder by killing Clytemnestra and her lover Aegisthus. She married Pylades.

elf (elf), in Teutonic mythology, a superhuman being inferior in power only to the gods. There were two kinds, the elves of light, who dwelt in Alfheim and were friendly to mankind, and the elves of night, the earth-dwelling dwarfs. In more modern literature an elf is a sprite or a fairy.

Elysium (ē lizh'i um), the Elysian Plain or the Elysian Fields, in Greek mythology the abode of the good after death, situated in the West, something like the islands of the Blessed. In Vergil's *Aeneid* the abode of the blessed is a part of the underworld but it has its sun and stars.

Emer (āv'ēr), in the Ulster cycle the most beautiful and learned young girl in Ireland, wife of Cuchulain.

Endymion (en dim'i on), in Greek mythology, a beautiful shepherd boy with whom Selene fell in love while he lay sleeping. She bestowed on him eternal sleep that she might forever watch him. Keats's poem *Endymion* is based on this story.

Eos (ē'os), the Greek goddess of the dawn; same as the Roman Aurora. Every morning she rose in the east from the couch of her husband Tithonus to announce the rising sun.

Erato (er'*a* tō), the Greek Muse of love poetry.

Erebus (er'ē bus), in Greek mythology, the region of darkness that is the entrance to Hades. Vergil calls it a part of the lower world.

Erinyes (ē rin'i ēz), in Greek mythology the three avenging spirits of Furies who torment wrong-doers. A later conception of them is as snaky-locked women driving their victims to madness.

Eris (ē'ris; er'is), the Greek goddess of discord. She was not invited to the wedding of Peleus and Thetis, and in spite threw a golden apple among the guests, marked "To the fairest." Hera, Athene and Aphrodite each claimed it and appealed to Zeus to decide. He sent them to young Paris, a shepherd on Mt. Ida. Each one made a great promise to win his favor, but when Aphrodite promised him the fairest of all women for wife, to her he gave the prize. Thus Eris with her apple caused even greater strife, for when Paris beheld Helen, the wife of Menelaus, he fell in love with her and carried her off to Troy. And from this elopement arose the Trojan War.

erlking (ûrl'king'), in Teutonic folklore, the king of the elves, especially inimical to children. In later German legend, his home was the Black Forest. Goethe wrote a poem on this subject, set to music by Schubert and translated into English by Sir Walter Scott.

Eros (ē'ros; er'os), the Greek God of love; same as the Roman Cupid.

Eteocles (ē tē'ō clēz), in Greek legend, the son of Oedipus and brother of Polynices. He usurped the throne of Thebes which he was supposed to hold in alternate years with his brother. Polynices marched against him to reclaim his right, accompanied by seven heroes. In this war, called the Seven Against Thebes, the two brothers killed each other in single combat. Aeschylus wrote a tragedy on this story.

Etzel (et'sel), in German legend the name given to Attila, king of the Huns; called Atli in Norse legend.

Eumaeus (ū mē'us), the swineherd of Odysseus who helped him to slay the suitors of Penelope.

Eumenides (ū men'i dēz), in Greek mythology, a name meaning "the kindly ones," a propitiatory name for the Furies.

Euphrosyne (ū fros'i nē), one of the Graces.

Europa (ū rō'p*a*), in Greek mythology, a daughter of Agenor, king of Phoenicia, with whom Zeus fell in love. He took on the shape of a beautiful bull and mingled with the cattle of Agenor. Europa noticed and caressed him. When she climbed upon his back, he plunged into the sea and swam off with her to Crete. She became the mother of Minos, Sarpedon and Rhadamanthus.

Eurus (ū'rus), the east wind.

Eurydice (ū rid'i sē), the wife of Orpheus.

Eurystheus (ū ris'thūs), the king of Mycenae who imposed on Hercules the Twelve Labors.

Euterpe (ū tûr'pē), the Greek Muse of music.

evil eye, in folk superstition, an eye having the power to work harm with its glance. Fear of the abnormal is at the root of this belief. Fear of an ugly, deformed eye was extended to eyes in which no flaw was visible. In Latin countries a blue eye is thought to have strange powers; in the north a black eye is feared. In Ireland the shamrock is a charm against its malice. In some places, spitting will avert its influence.

Excalibur (eks kal'i bēr), the sword of King Arthur; also called Caliburn. The ancient Celtic story is that Arthur drew it out of a rock from which no one else could budge it. In Malory's *Morte d'Arthur* it was given to him by the Lady of the Lake. When Arthur died, he bade Sir Bedivere hurl it into the lake. A hand rose from the water to receive it and vanished.

Fafnir (fäv'nir), in Norse mythology, the dragon who guarded the treasure of the dwarf Andvari. He was killed by Sigurd.

fairies (fâr'iz), in world folklore from earliest times to the present day a race of supernatural beings possessed of magic powers. They resemble men and women usually, though many have the power to assume strange or animal shapes. The stories of classic Greek and Roman writers about such beings were the formal expression of a still older folk belief. Homer's human warriors wooed many a fairy love (nymph, nereid, siren). And all the fairy-wife, demon-lover stories of India and Europe, even the animal-bride stories of the North American Indians, are variants of the same most ancient motif.

From the Warner Bros. motion picture, A Midsummer Night's Dream

Fairies

The folklore of all peoples has its fairies. Persian folklore has its beautiful, kindly peris and malignant devas; the Arabs and Moors, their genii or jinns; Egyptian lore, its seven hathors who appeared at the birth of a child to predict its future. In Italy fairies were called *fata,* and their home was supposed to be in the Himalayas. All supernatural, magical beings are called fées in Charles Perrault's presentations of French folktales. Germany is full of kobolds, dwarfs, elves and nixes (water sprites). Scandinavian story contributes nisses and trolls to the other Germanic conceptions. The woods and mountains and caves of England too are full of fairies, pixies, sprites, pucks and elves. Goblins are the household spirits there, akin to the Scotch brownies. Kelpies too inhabit the waters of Scotland.

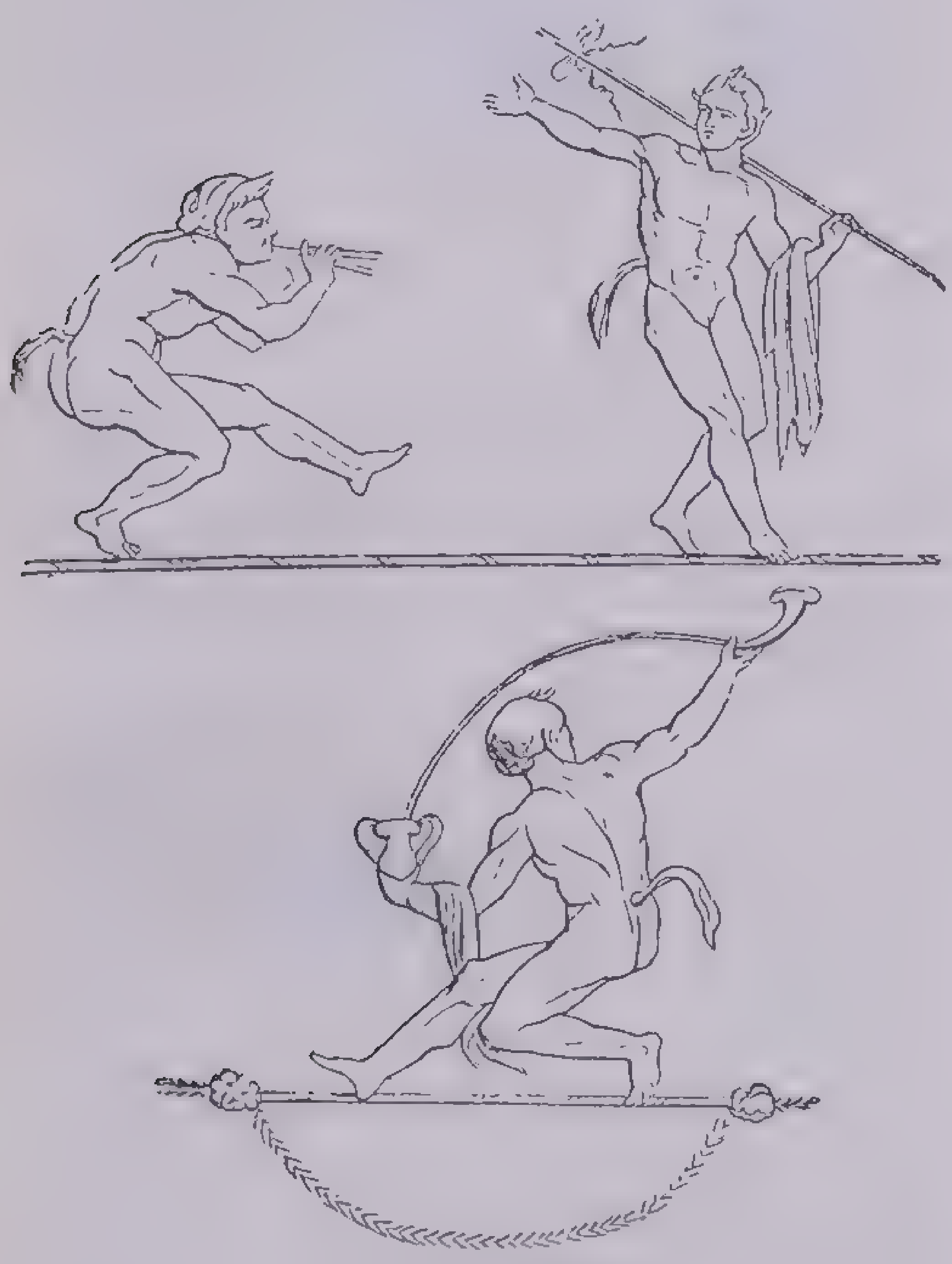
But the Irish fairies have colored all other modern fairy lore. These fairy folk were the *sid* (shē) who lived in the raths (earth mounds) or fairy hills of Ireland; and belief in their presence is far from dead. They were of human stature and very beautiful. They had their kings and cities, their armies and musicians. Music especially was their gift. They had great herds and wonderful horses. And they appeared to men often in the shape of animals, but seldom in their own shapes.

The tiny, dainty fairies of Shakespeare's *Midsummer Night's Dream* have nothing in common with the fairies of folklore. But they have given rise to a whole cult of flowery juvenile literature.

Fata Morgana (fä'tä môr gä'n*a*), (1) in Arthurian legend the fairy Morgan or Morgan le Fay, Arthur's sister and wife of King Uriens; (2) a mirage said to resemble a distant towered city, seen at the strait of Messina between Sicily and Calabria, so called because said to be the work of the fairy Morgan.

Fates (fāts), in classical mythology the female spirits that presided over human destiny. The Greeks called them Moirai. They were the daughters of Zeus, three sisters: Clotho, who spun out the thread of human life; Lachesis, who measured its length, and Atropos, the inflexible one, who cut it. Aeschylus attributed to the Fates power over men and gods alike. The Romans called them Parcae. In Teutonic mythology, they were the Norns, or the Weird Sisters.

Fatima (fä'tē m*a*), the seventh and last wife of Bluebeard.



Dancing Fauns

From the decorated walls of Pompeii

faun (fôn), in Roman mythology, a lesser rural god, half-man, half-goat. Sometimes fauns are pictured with human bodies, pointed ears, small horns and a goat's tail. Hawthorne's novel *The Marble Faun* is a character study of a young man of innocent, pagan temperament who resembles the marble Faun of Praxiteles.

Faunus (fô'nus), a Roman nature god, protector of animals and herds; identified with the Greek god Pan.

Faust (foust), in German legend a learned man who sold his soul to the devil in exchange for a certain number of years of fulfilled desire and power. There *was* an obscure Dr. Faust of the 16th century, a quack and conjurer, believed to be in league with the devil. Even the dog who followed him was thought to be the devil himself. Marlowe's great drama *Doctor Faustus* follows the legend and gives the man to the devil in the end. Goethe's *Faust*, however, portrays a spiritual development utterly lacking in the original. The mind of Faust found no ultimate fulfilment in what the Devil could give him. In human service he forgot self and his soul was saved.

Fenrir (fen'rir), in Norse mythology, a monster son of Loki; also called the Fenris-wolf. The gods kept him bound with the magic chain Gleipnir. He escaped on the judgment day, swallowed Odin and was killed by Vitharr.

Finn or **Fionn MacCumal** (fin mak ko͞ol), the hero of the Fenian cycle of old Irish legend and romance, believed to have lived in the 3rd century. He was the father of the bard Oisin and the leader of a band of warriors and hunters of marvelous strength and achievement, which he organized for King Cormac (*c.*250 A.D.). Finn himself was noted for generosity and wisdom. The deeds of these heroes, the Fianna, who wandered through Ireland protecting it against invaders, make up the subject matter of the cycle. The most famous of the Fenian stories is of the search for Diarmait, Finn's trusted nephew, who eloped with Grainne, Finn's promised wife. Lady Augusta Gregory's *Gods and Fighting Men* tells all these tales. Finn is the original of Fingal in Macpherson's forged Ossianic poems. James Stephens's *Irish Fairy Tales* is a charming presentation of the subject matter.

Flora (flō'r*a*), the Roman goddess of flowers. Her festival, the Floralia, was celebrated on April 28.

Flying Dutchman, a phantom ship whose captain for his blasphemy was doomed to sail the seas and make no port till the day of judgment. Sailors believe that it haunts the waters off the Cape of Good Hope, and to see it in time of storm means disaster. Marryat's *Phantom Ship* is based on this legend; so is Wagner's opera *The Flying Dutchman*.

Fomors (fō'wôrz), in Celtic mythology, the sea-giants who were older than the gods. They were vanquished at the battle of Moitura by the Tuatha de Danann, the ancient Irish gods.

Forseti (fôr'se tē), in Teutonic mythology, one of the sons of Odin, probably a personification of justice.

Fortuna (fôr tū'n*a*), the Roman goddess of fortune in Roman mythology and (under the name Fors Fortuna) of chance.

Fountain of Youth, in medieval legend a magic fountain in Asia in which Alexander the Great and his army bathed and were suddenly restored to youth and strength. The Indians of the West Indies believed there was such a fountain on an island named Bimini. While he was seeking this island, Ponce de Leon discovered Florida in 1513.

Frey (frā) or **Freyr** (frār), the Norse god of fertility, crops and peace. He was one of the Vanir and brother of Freya. His marriage with Gerth (or Gerda), the frozen earth, symbolized the coming of spring.

Freya (frā'*a*) or **Freyja** (frā'y*a*), the beautiful Norse goddess of love and night; often called the Venus of the North. She was one of the Vanir, sister of Frey. She was forever being promised to one giant or another in exchange for some favor. In Wagner's opera, *The Rhinegold*, Alberich's cursed magic ring was offered to the giants as a substitute for Freya.

Friar Rush (frī'ẽr rush), in German folklore, the devil in friars' garb, who entered a monastery to seduce the monks.

Friar Tuck (frī'ẽr tuk), the fat outlaw friar who was Robin Hood's confessor. Scott's *Ivanhoe* presents him as the jovial, fighting friar.

Frigga (frig'g*a*), wife of Odin, queen of the heavens and goddess of marriage. With Odin she ruled heaven and earth. She was often confused with the Norse goddess Freya. Friday is Frigga's day.

Furies (fū'rēz). See *Erinyes; Eumenides*.

Gabriel (ga'bri el), in Jewish and Christian legend, one of the seven archangels. He is the announcer of God's messages to men. In Milton's *Paradise Lost* he is "chief of the angelic guards."

Gaea (jē'*a*) or **Ge** (jē), the earth goddess, wife of Uranus and mother of the Titans; identified with the Roman Tellus.

Galahad (gal'a had), the chaste and perfect knight who achieved the quest of the Holy Grail. He was the son of Sir Lancelot and Elaine, the daughter of Pelles.

Galatea (gal a tē'*a*), in Greek mythology, (1) sea nymph beloved by Polyphemus, the Cyclops. She herself loved Acis, a shepherd boy, whom the jealous giant crushed under a rock. Acis was transformed into a river, which gushed from beneath the rock. (2) The name of the beautiful statue carved by Pygmalion, with which he fell in love. His ardor and prayers brought her to life.

Ganelon (gȧ n lôn'), in the Charlemagne romances, the count of Mayence, the sly and treacherous knight who plotted against all the others and brought about the defeat of the rear-guard in the pass of Roncevaux.

Ganymede (gan'i mēd), a Phrygian shepherd boy, so beautiful that Zeus sent an eagle to bring him to Mt. Olympus to become cup-bearer to the gods.

Gareth (gar'eth), a knight of the Round Table, nephew of King Arthur and brother of Gawain.

Garm (gärm), in Norse mythology, the watchdog of Hel.

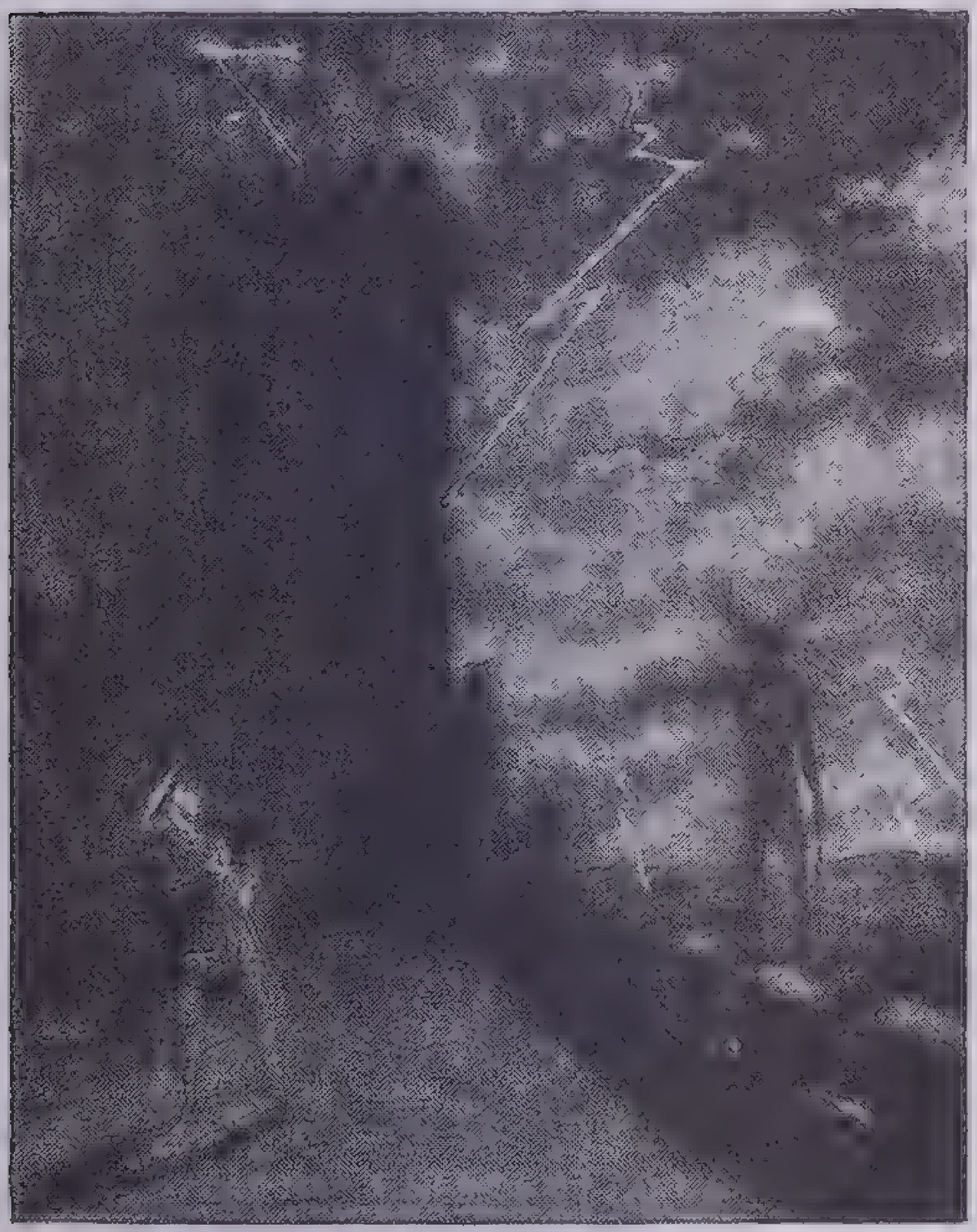
Gawain (gä'win), a knight of the Round Table, nephew of King Arthur. He went to Rome (later versions say to Brittany) in pursuit of Sir Lancelot with Arthur and was killed immediately upon their return to Britain to recover the kingdom from Modred. Gawain, the perfect knight, brave, courteous and pure, was hero of the 14th-century poem, *Gawain and the Green Knight*.

Gemini (jem'i nī). The twins; see *Castor and Pollux.*

genius (jēn'yus), in ancient Roman belief, the guardian spirit of a person, family, nation or place. Each person at birth was believed to be attended by a spirit that presided over his character and destiny. In Eastern religions two spirits were believed to be at war for a man's soul. Everyone was accompanied by a good and evil genius, which were responsible for his good and evil thoughts, deeds and fortunes. The later guardian angel idea is a variant of the same belief. The plural of genius in this sense is genii.

Geryon (jē'ri on), in Greek mythology, a three-headed, three-bodied monster, possessor of many oxen. Hercules killed him and stole away the oxen.

ghost (gōst), in folk belief since the beginning of time, a spirit or demon, an apparition, a specter. A ghost is usually believed to be the disembodied spirit of a dead person, inhabiting an unseen world but able to appear to certain people or at certain times in bodily semblance. The shades of classical mythology are identical with ghosts. Ghostlore is the same the world over. Ghosts guard treasure or they haunt their former neighborhoods in penance for a crime. Sometimes their survivors by a favor can give them peace. A poor ghost will wander on a road for centuries until some fearless and merciful passer-by says "God bless you." But it is dangerous to speak to them or answer them, still more dangerous to touch them. They can pass through material barriers at will, and often are seen by animals when they are invisible to the human eye. Dogs howl or cower when they pass. At cockcrow they must vanish and return to their unseen world.



From a drawing by George Cruikshank

The Ghost of Herne the Hunter

Herne the Hunter is the spectral hunter of medieval legend who is said to have walked at midnight by an aged oak in Windsor Forest. In this picture, an illustration for Harrison Ainsworth's *Windsor Castle,* Herne appears to Henry VIII and warns him that his reign will be bloody and his death fearful. Shakespeare also introduced the spirit of Herne into *The Merry Wives of Windsor*

ghoul (go͞ol), in Eastern folklore an evil spirit of revolting and terrifying habits. It is believed to open graves and feed on corpses.

giants (jī'ants), in Greek and Roman, Teutonic and Celtic folklore, monstrous, manlike beings of superhuman strength and powers, but ungodlike characteristics. They preceded the gods, who overthrew them. The Greek mythological giants were the sons of Gaea (earth) and Uranus (heaven) or of Gaea and Tartarus (hell).

The giants warred against the Olympian gods and were conquered and confined. Briareus, the hundred-handed, Enceladus, who covered nine acres lying down, and the fire-breathing Typhon were all buried alive under Mt. Aetna. The giants of Teutonic mythology were the Gotunns who fought against the gods on the Judgment Day. In Celtic mythology, the gods vanquished the Fomors or sea giants.

Glaucus (glô'kus), a Greek fisherman who was changed to a sea-god by a magic herb and fell in love with the water-nymph Scylla. To punish Glaucus for his fidelity to the indifferent Scylla, Circe transformed her into the fearful monster who devoured mariners.

Gleipnir (glāp'nir), in Norse mythology the magic chain made by the dwarfs, which held Fenrir until the Judgment Day. The chain was made of the sound of a cat's footstep, the beards of women, stone roots, the breath of fish and bird spit. It looked like a silken string, but it held the monster until the appointed time.

gnome (nōm), a fabulous, diminutive being supposed to dwell within the earth and guard mines and quarries. Late Germanic folklore has confused gnomes with dwarfs and elves.

goblin (gob'lin), an ugly, grotesque little spirit, evil or mischievous.

Godiva (gō dī'va), in English legend, the wife of Leofric, Earl of Mercia in the 11th century. When Leofric put a heavy tax on the townspeople, Godiva pleaded with him to lighten it. He laughed and promised to do so if she would ride naked through the streets at noon. Immediately she sent word through the town of the condition on which the people would be freed of their hard burden. She told the people to stay at home and close their shutters. With grateful hearts the people did so, all except one ungallant fellow, henceforth called Peeping Tom, who was struck blind. Leofric also kept his promise.

Golden Age, in classical mythology the first era of the world when truth and innocence and ideal happiness prevailed. There was no law, nor need for any; there were no weapons, no wars. It occurred during the reign of Saturn, the oldest Italian god of agriculture and civilization.

Golden Fleece, the fleece of the winged ram on which Phrixos escaped from Thebes to Colchis. In the grove of Ares on the shores of Colchis Phrixos hung the Golden Fleece. It was claimed by King Aeetes and guarded by a dragon. Jason came seeking it and with the help of Medea's enchantments secured it and escaped.

Gordian knot (gôr'di an not), a knot tied by Gordius, King of Phrygia, so intricate and complicated that no one could untie it. An oracle prophesied that whoever should master it would rule all Asia. Alexander the Great cut it with one stroke of his sword. To "cut the Gordian knot" means to solve any problem with bold, unconventional action.

Gorgons (gôr'gunz), in Greek mythology, three snaky-haired sisters, horrible monsters with brazen, scaly bodies and long tusks. One look at them would turn the beholder to stone. Of the three, Medusa, the most famous, was slain by Perseus.

Graces (grās'ez), three beautiful daughters of Zeus, called *Charites* in Greek and *Gratiae* in Latin. They were Aglaia (Brilliance), Euphrosyne (Joy) and Thalia (Bloom). They accompanied the Muses and often Aphrodite, Eros or Dionysus.

Grail. See *Holy Grail.*

Grendel (gren'del), in the Old English epic poem *Beowulf,* the man-eating monster from whom Beowulf delivered the Danes.

griffin (grif'in), a fabulous monster with a lion's body, and wings and head of an eagle, believed by the Greeks to guard the gold of Scythia.

Gudrun (good'ro͞on), in the *Volsunga Saga,* sister of Gunnar. She turned the love of Sigurd from Brynhild to herself by a magic drink. After his death she was married to Atli.

Guinevere (gwin'e vēr), in Arthurian legend, the wife of King Arthur, beloved by Lancelot. After the love of Guinevere and Lancelot was betrayed to the king, Guinevere entered a nunnery. William Morris's "Defense of Guenevere" and Tennyson's poem "Guinevere" in his *Idylls of the King* treat the old story.

Gunnar (go͞on'när), in the *Volsunga Saga* the king of the Niblungs to whom Sigurd married Brynhild. Gunnar was the brother of Gudrun.

Gunther (goon'tẽr), in the *Nibelungenlied* a prince of Burgundy for whom Siegfried won Brunhild as wife. Gunther was the brother of Kriemhild.

Hades (hā'dēz), in Greek mythology: (1) The God of the lower world, in later myth called Pluto; (2) the dim and gloomy lower world, abode of the dead. It was surrounded by four rivers: the Styx, over which Charon ferried the shades of those duly buried; the Acheron or river of woe; Phlegethon, the river of fire; Cocytus, the stream of lamentation; and, in later myth, Lethe, the waters of forgetfulness. Cerberus guarded the entrance. Tartarus was the section in which the wicked suffered torment. The land of the blessed where Aeneas meets the dead heros of Troy in the sixth book of the Aeneid is a part of the underworld.

Hagen (hä'gen) (1), in the *Nibelungenlied* Gunther's grim uncle who killed Siegfried; (2) in Wagner's *Ring of the Nibelungs* the son of Alberich, who killed Siegfried in an effort to obtain the magic ring of the Nibelungs.

Hallowe'en (hal ō ēn'), the evening of October 31. See *Allhallows.*

Harpies (här'pēz), in classical mythology three ugly, foul winged monsters with the faces of women and bodies of vultures. The word *Harpy* comes from a Greek word which means to snatch; the Harpies were believed to snatch the souls of the dead, plunder travelers of their goods and carry off or defile the food of offenders.

Hebe (hē′bē), in Greek mythology, a daughter of Zeus and Hera, and goddess of youth. She served as cupbearer to the gods until Hercules was received among them, when she was given to him in marriage and Ganymede succeeded to her office.

Hecate (hek′*a* tē), in Greek mythology goddess of the morn and night, of the earth and the underworld. She was represented in triple form with three heads, six arms and holding a torch. In later literature she was the goddess of magic and sorcery, presided over crossroads and was visible to dogs who howled at sight of her.

Hector (hek′tẽr), in the *Iliad,* the son of King Priam and Hecuba of Troy, the bravest of the Trojan heroes in the Trojan War. He married Andromache. When Hector killed Patroclus, the friend of Achilles, Achilles arose from his tent, slew Hector and dragged his body at his chariot wheels three times around the walls of Troy and into the camp of the Greeks.

Hecuba (hek′ū b*a*), the wife of King Priam of Troy and mother of Hector, Paris and Cassandra. When Troy was taken, she fell to the lot of Odysseus and was taken to Greece. She figures in two plays by Euripides, *The Trojan Women* and *Hecuba.*

Heimdall (hām′däl), the watchman of the Norse gods who guarded the bridge Bifrost to keep the giants from getting into Asgard, the abode of the gods. He himself was one of the Vanir. His senses were so keen that he could hear the wool grow on a sheep's back; he could hear the grass grow; he could see a hundred leagues in any direction as well by night as by day. He and Loki killed each other at the end of the world.

Hel (hel) or **Hela** (hel′*a*), in North mythology, the goddess of the underworld or death. She was the daughter of Loki. Odin cast her into Niflheim to thwart her evil doings. Here she ruled over nine worlds, to which she allotted the dead. All those who died of sickness or old age were sent to her, but those who died in battle were sent to Valhalla.

Helen of Troy, the most beautiful of all women, the daughter of Zeus and Leda. She had many suitors whom she bound by oath to protect her and take up her cause at any time. She married Menelaus, King of Sparta, from whose side she was seduced by Paris. Paris won her with the help of Aphrodite who had promised him the fairest of all women for his wife. The pair fled to Troy together, whereupon Menelaus summoned the Greek heroes, Helen's old suitors, to make war on Troy and win Helen back. After the fall of Troy and the death of Paris, Helen returned to Sparta with Menelaus.

Helios (hē′li os), the Greek sun-god, later identified with Apollo. He was the father of Phaethon. Daily he drove his chariot drawn by four horses across the sky.

Helle. See *Argonauts.*

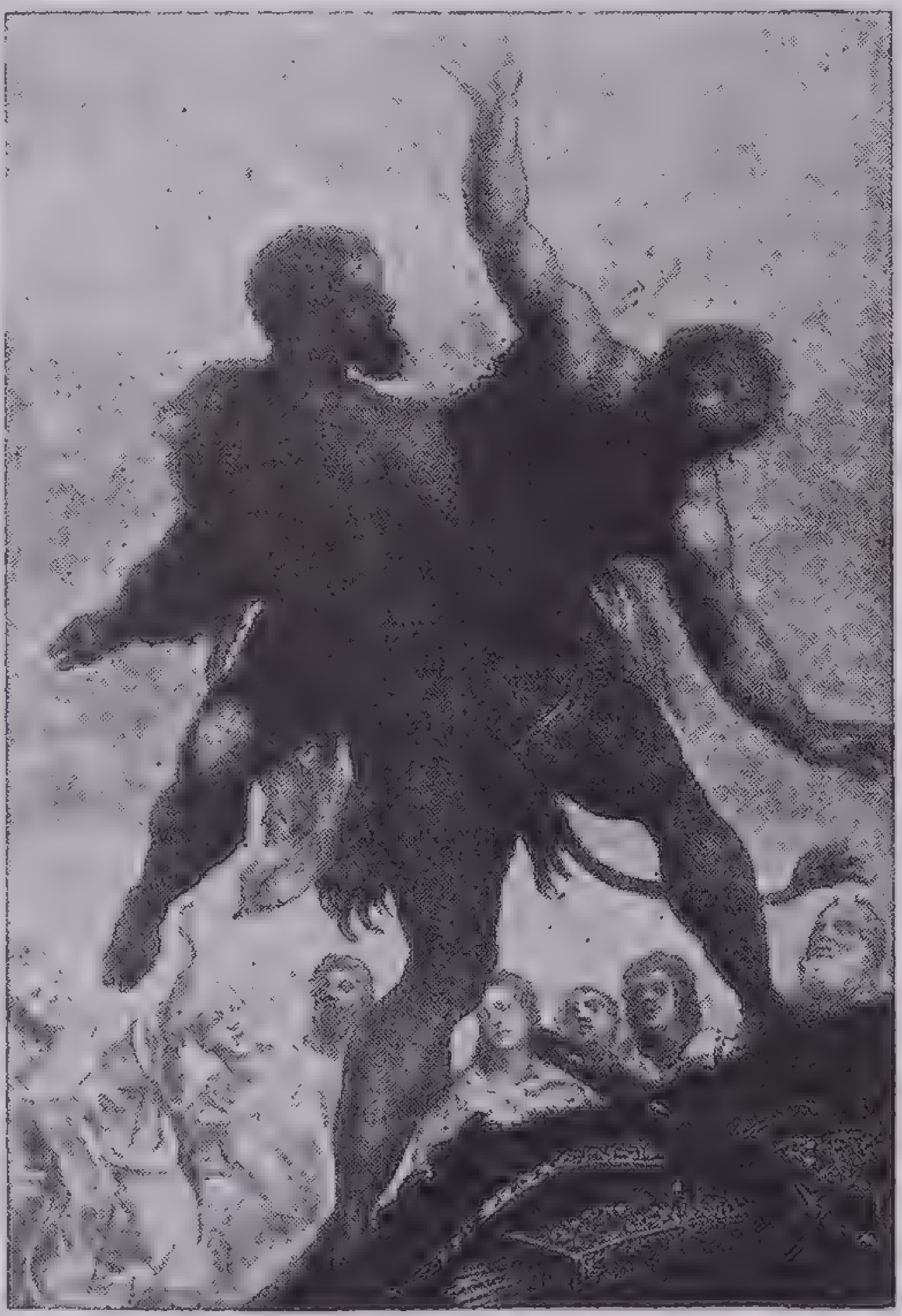
Hellen (hel′en), son of Deucalion and Pyrrha, mythical ancestor of the Hellenes or Greeks.

Hephaestus (hē fes′tus), in Greek mythology, the god of fire, master smith of the gods and patron of mortal metalworkers. He was the son of Zeus and Hera. For taking his mother's part in a quarrel Zeus hurled him out of Olympus; and forever after he limped having hurt his leg in the fall. In the *Iliad,* his wife is Charis; in the *Odyssey,* Aphrodite. His forges were believed to be under the volcanoes. He made Pandora, the first woman, and he fashioned the armor of Achilles. He was identified with the Roman Vulcan.

Hera (hē′r*a*), the sister and wife of Zeus and queen of the gods. She was the mother of Ares, Hebe and Hephaestus. She was the goddess of women and marriage and the protectress of wives. Story after story pictures her as a jealous wife working out her resentment on the other loves of Zeus and their children. She became identified with the Roman Juno.

Heracles (her′*a* klēz), the Greek form of Hercules.

Hercules (hûr′kū lēz), the most celebrated of the Greek heroes, of miraculous strength and prowess. He was the son of Zeus and Alcmene. Hera's jealousy was so great that she sent two huge serpents to destroy the baby, but he seized and crushed them in his cradle. In obedience to an oracle he became the servant of Eurystheus, King of Argos, who imposed on him twelve almost impossible tasks, which he successfully performed. The Twelve Labors of Hercules are:



Courtesy Wadsworth Atheneum, Hartford, Conn.

Hercules and Antaeus by Il Tintoretto

(1) He killed the terrible Nemean lion and brought its skin to Eurystheus.

(2) He killed the monstrous nine-headed Hydra which had been ravaging Argos.

(3) He cleaned the Augean stables in one day.

(4) He captured the swift golden-horned stag of Arcadia.

(5) He brought back the wild boar of Erymanthus to Eurystheus.

(6) He killed the terrible flesh-eating birds of Stymphalus.

(7) He captured the fierce bull of Crete.

(8) He took the mares of Diomedes which ate human flesh.

(9) He stole the girdle of Hippolyte, Queen of the Amazons.

(10) He killed the monster Geryon and stole his cattle.

(11) He secured some of the golden apples from the gardens of the Hesperides.

(12) He grabbed Cerberus, the watchdog of Hades, and dragged him into the upper world.

There are innumerable stories recounting the feats of Hercules. He married Deianira, in a fit of insanity killed his friend Iphitus and was bound as a slave to Omphale who set him to women's work. He died from the poison of the cloak of Nessus which Deianira sent him, believing it a love charm. He was made immortal, was forgiven by Hera and was married in heaven to Hebe.

Hercules, Pillars of, two headlands opposite each other at the Strait of Gibraltar, supposed to have been raised up by Hercules in his travels to find the cattle of Geryon. They were Calpe (Gibraltar, in Europe) and Abila (Sierra Bullones in Africa).

Hermes (hûr′mēz), the son of Zeus and Maia, messenger and herald of the gods. He conducted the dead to Hades. He was the god of science and invention and invented the lyre by fastening strings across a tortoise shell. He was the guardian of travelers, roads and commerce, was gifted with trickery and was the protector of thieves. He stole the cattle of Admetus from under the nose of Apollo and tricked away Aphrodite's girdle. He is represented wearing a winged cap and winged sandals and carrying the winged caduceus. He was identified by the Romans with their god Mercury.

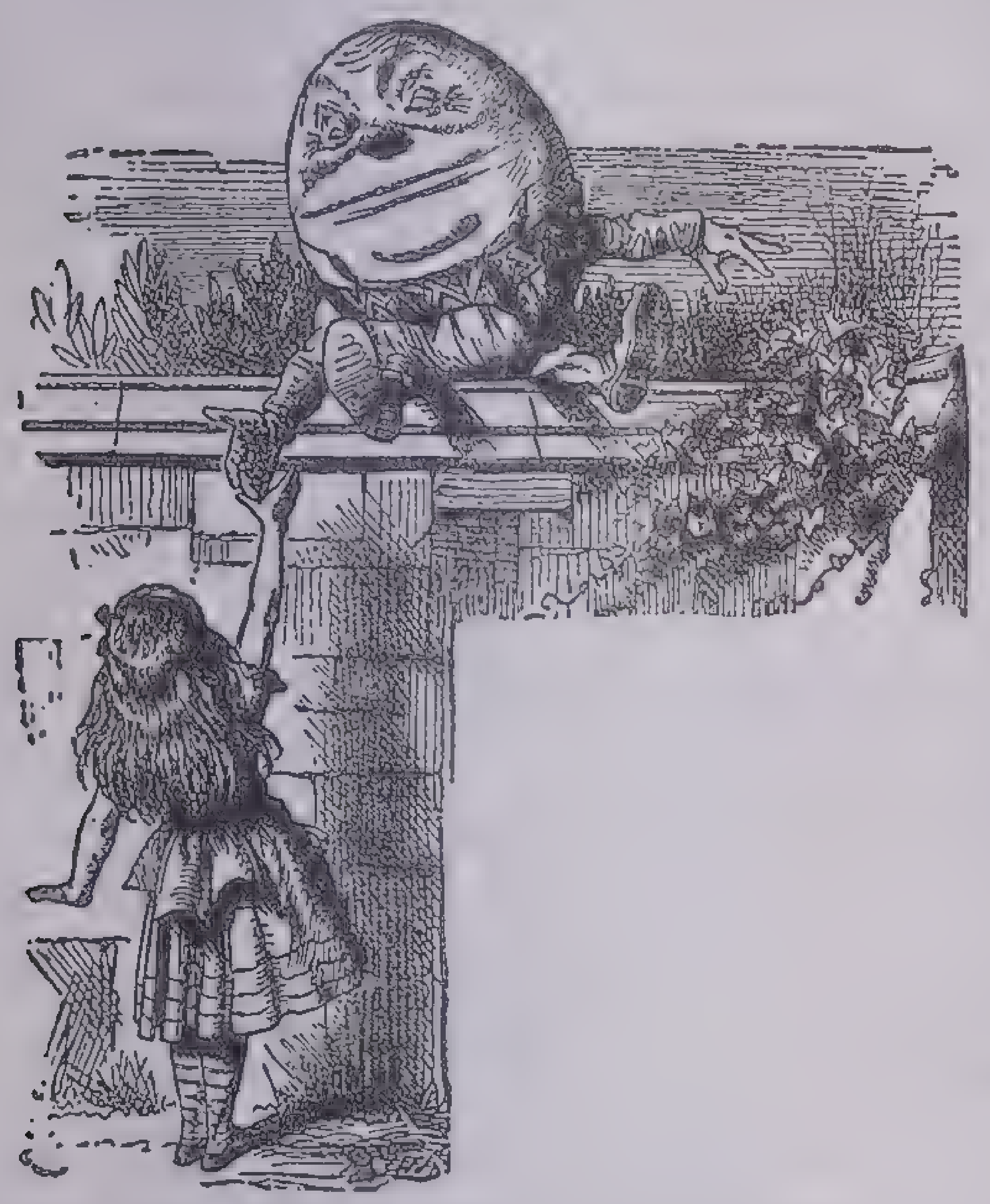
Hermione (hûr mī′ō nē), the daughter of Menelaus and Helen, betrothed to Orestes. She was first married to Neoptolemus, the son of Achilles, whom Orestes killed to regain his bride.

Hero (hē′rō), a beautiful priestess of Aphrodite in the temple at Sestos on the European side of the Hellespont. She was dearly beloved by Leander, a youth on the opposite shore who used to swim across to her every night. One night in a storm he was drowned, and Hero in despair threw herself into the waters and perished also.

Hesperides (hes per′i dēz), the daughters of Hesperus, the Evening Star. They were beautiful nymphs appointed to guard the golden apples given by Gaea to Hera on her wedding day. The wonderful garden of the Hesperides beyond the sea was guarded by a dragon that never slept. To secure some of the golden apples was one of the Twelve Labors of Hercules. He succeeded with the help of Atlas, according to one story; by killing the dragon, according to another.

Hestia (hes'ti *a*), in Greek mythology, goddess of the hearth and home; identified with Vesta by the Romans.

Hippolyte (hi pol'i tē), Queen of the Amazons. To steal her girdle was one of the Twelve Labors of Hercules. He gave her in marriage to Theseus.



From the drawing by Sir John Tenniel

Alice Meets Humpty Dumpty

From *Through the Looking Glass* by Lewis Carroll

Hippolytus (hi pol'i tus), son of Theseus and Hippolyte. His stepmother, Phaedra, fell in love with him and hanged herself in shame and despair when he repulsed her. She had accused Hippolytus to Theseus of trying to seduce her. Hippolytus fled from his father's wrath to the shore, where his horses took fright at the sea monster sent by Zeus to destroy him. Hippolytus was dashed to death among the rocks. Euripides' *Hippolytus* is based on this version of the story.

Hippomenes (hi pom'e nēz), the youth who won Atalanta in the foot race.

hobgoblin (hob'gob lin), a mischievous imp; a name given to Puck or Robin Goodfellow.

Holger (hol'gẽr). Danish national hero. See *Ogier*.

Holy Grail, the platter or cup used by Christ at the last supper, in which Joseph of Arimathea miraculously preserved the blood from the wounds of Christ. The word *grail* seems to be derived from *cratalis,* cuplike). Joseph brought it to Britain where it was guarded for generations. It fed or healed those who saw it, but vanished at the approach of an impure person. It disappeared when its keepers became sinful, and thereafter became the quest of many and many a knight. It could be found only by the chaste and perfect knight. Only Perceval, Bors and Galahad were worthy to achieve the quest. In late Arthurian legend Galahad became the one perfect and successful quester; and it is through Tennyson's *Idylls of the King,* following Malory's *Morte d'Arthur,* that we are familiar with Galahad in the leading role. In the older Grail cycle, however, two romances name Gawain as the quester and winner; seven name Perceval; and only one, Galahad.

Long before there was a story of Christ's cup or platter, in many parts of the world there were legends and myths about the search for a talisman or charm that would bring health to a sick king and his people.

Horus (hō'rus), the Egyptian god of the sun and day, son of Osiris and Isis.

Humpty Dumpty (hum'ti dump'ti), the egg of the famous nursery rhyme and riddle. The name is applied to any person or thing that cannot be mended, once it is broken.

Hyacinthus (hī'*a* sin'thus), a beautiful youth whom Apollo and Zephyrus both loved. Hyacinthus loved Apollo. One day while they were playing at quoits together, Zephyrus, in jealousy, turned the quoit as it left Apollo's hand, so that it struck and killed Hyacinthus. Apollo caused a flower to grow from his blood and named it Hyacinth.

Hyades (hī'*a* dēz), seven nymphs, daughters of Atlas, who killed themselves by weeping for the death of their brother Hyas. Zeus raised them to a constellation in the heavens—a sign of rainy weather.

Hydra (hī'dr*a*), in Greek mythology, the nine-headed monster slain by Hercules as one of his Twelve Labors. Every time a head was cut off two more grew in its place. With the help of Iolaus, Hercules burnt the necks with a torch as soon as the heads were off, and buried the ninth, the immortal head, under a rock.

Hymen (hī'men), the Greek god of marriage.

Hyperion (hī pẽr'i on), a Titan, father of Helios the sun, Eos the dawn, and Selene the moon. In late myth the name was given to Apollo—so Hyperion is a proverb of manly beauty.

Hypermnestra (hī pẽrm nes' tr*a*), the only one of the fifty Danaides who disobeyed her father's command to kill her husband.

Iapetus (ī ap'ē tus), one of the Titans, father of Prometheus and Atlas and grandfather of Deucalion, and thus the forefather of humanity. He may be the same as Japhet, son of Noah, ancestor of western nations.

Icarus (ĭk'*a* rus), the son of Daedalus.

ichor (ī'kôr), in classical mythology the fluid that ran through the veins of the gods instead of blood.

Ida, Mt. (ī'd*a*), a celebrated mountain in N. W. Asia Minor, overlooking ancient Troy, from whose top the gods watched the Trojan War. From the slopes of Mt. Ida the eagle stole Ganymede; and there to Paris, tending his flocks, came the three goddesses, Hera, Athena and Aphrodite, for his judgment on their beauty. There was another Mt. Ida in Crete where the infant Zeus was concealed and brought up.

Idomeneus (ī dom'e nūs), a king of Crete who fought with the Greeks against Troy. While he was returning home, his ship was overtaken by a great storm, and Idomeneus vowed, if he was delivered, to sacrifice to Poseidon the first object he saw on landing. This was his own son, but Idomeneus kept his vow. He was banished from Crete by his subjects for this cruel act.

Igdrasil. See *Yggdrasil.*

Igraine (ē grān'), the mother of King Arthur.

Ilium (il'i um), the Greek name for the city of Troy.

Indra (in'dr*a*), the good and greatest god of Vedic mythology, god of the air, giver of rains, enemy of the powers of evil. In later Hinduism he became subordinate to Brahma, Vishnu and Siva.

Io (ī'ō), a maiden beloved by Zeus, whom he changed into a cow to conceal her from the jealous Hera. Hermes killed the monster Argus, whom Hera set to watch her rival. Thereafter Hera sent a gadfly to torment Io. It drove her far and wide over the face of the earth. When she reached the banks of the Nile, she was restored to her human shape.

Iphigenia (if i jē nī'*a*), in Greek legend, a daughter of Agamemnon and Clytemnestra. Her father offered her as a sacrifice to Artemis at Aulis to procure favorable winds on the voyage to Troy. But Artemis pitied her, snatched her away from the knife and the people beheld a goat in her place. Artemis carried her to Tauris and made her a priestess in her temple. Iphigenia was required to sacrifice all strangers who came to Tauris. She was about to sacrifice her own brother Orestes and his companion Pylades, when she recognized them. The three escaped together, stealing away the statue of the goddess with them. Aeschylus used her story in his great Agamemnon trilogy. She is the subject of Euripides' *Iphigenia in Tauris.* Racine and Goethe also based dramas on her story.

Iris (ī'ris), the goddess of the rainbow, on which she traveled back and forth from heaven to earth as the messenger of Zeus and Hera.

Iron Age, in classical mythology, the last age of the world, following the Bronze Age. Iron was discovered; weapons were made; gold was coveted; violence and bloodshed followed. Truth and honor gave way to fraud and crime. Selfishness and love of gain completed the ruin of the world and the gods fled.

Iseult (ī sōōlt') or **Isolde** (i sōld'; in German, ē zol' d*a*), the king of Ireland's daughter, wife of King Mark of Cornwall and the true love of Tristram. She cured Tristram of his wounds in Ireland, and he so praised her beauty to King Mark on his return, that Mark sent him back to ask for the hand of Iseult on his behalf. On the ship returning to Cornwall the pair unwittingly drank of a magic love potion which bound them in love forever. Iseult was married to Mark, but nothing could break her love for Tristram. In time the lovers were discovered to the king, and Tristram was stabbed by King Mark. Another version says that Tristram left the court and went to Brittany where he married Iseult of the White Hands. When he lay dying of incurable wounds, he sent for Iseult of Ireland to come and heal him. The ship that was to bring her was to hoist white sails if Iseult were on board. When it appeared with white sails flying, Iseult of the White Hands, jealous and brokenhearted, told him the sails were black. Tristram died in grief and Iseult of Ireland died upon his breast. In Wagner's opera, *Tristan and Isolde*, there is no second Isolde.

Ishtar (ish'tär), the Babylonian goddess of love and fruitfulness; the earth-mother. See *Astarte.*

Isis (ī'sis), the great Egyptian nature-goddess and goddess of motherhood, wife and sister of Osiris. She was represented with the head of a cow.

Ithunn (ē'*th*ōōn), in Teutonic mythology, the wife of Bragi. She kept in a box the apples of youth which the gods tasted whenever they felt old age creeping on.

Ithaca (ith'*a* k*a*), the island kingdom of Odysseus and Penelope in the Ionian Sea.

Ixion (iks ī'on), in Greek mythology, a king of the Lapithae in Thessaly. He refused to pay his father-in-law the stipulated wedding price, whereupon the old man stole some of Ixion's horses. Ixion invited him to feast and caused him to fall into a burning pit. For this deed his own people avoided him and denied him all human companionship. Zeus pitied him and took him to heaven, where he fell in love with Hera and bragged of seducing her. For this ingratitude Zeus consigned him to Tartarus to be bound to a wheel forever revolving.

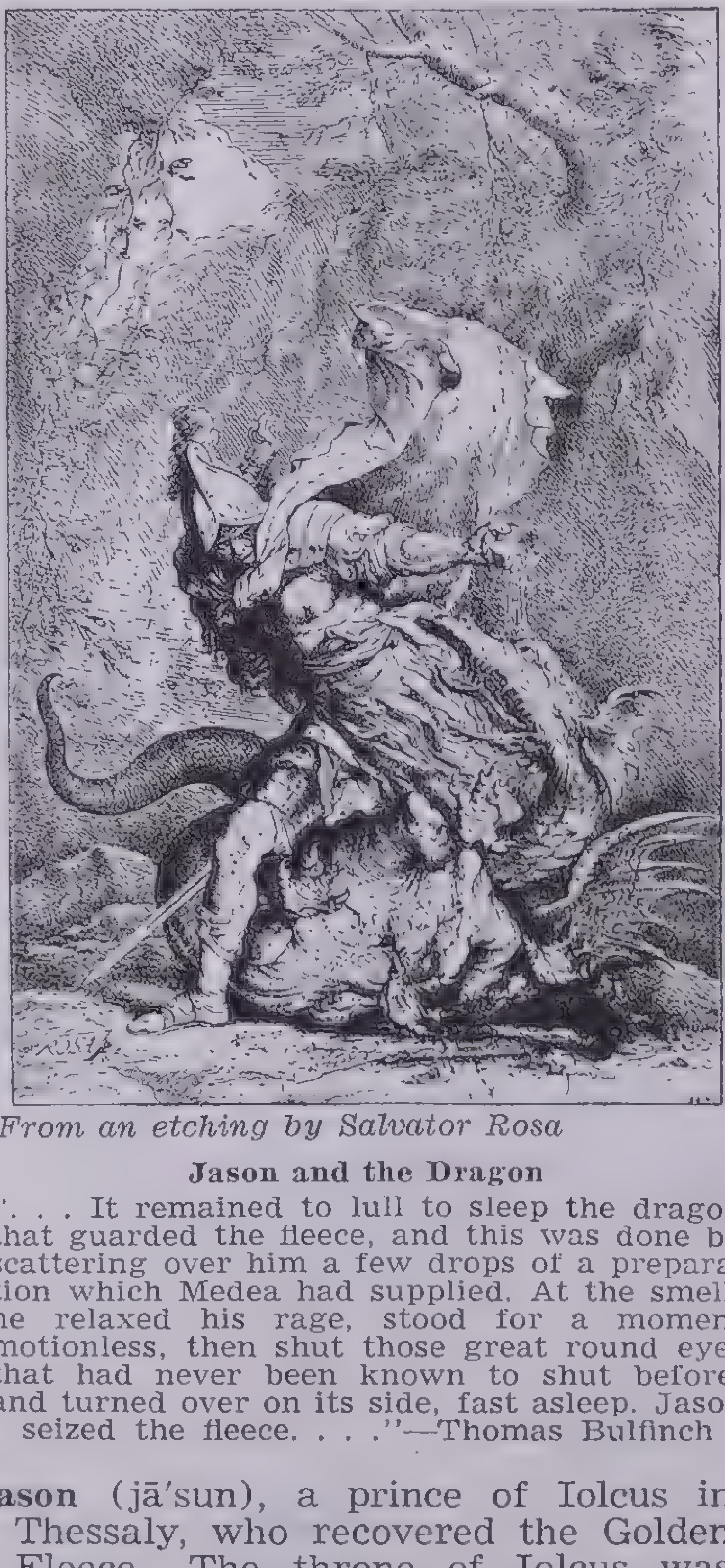
Jack and Jill, two children of a famous old nursery rhyme. The rhyme is perhaps based on the ancient Norse myth of two children who were compelled by their father to draw and carry water all day. The moon pitied and rescued them, and the marks on the moon were believed to represent the two children with their pail.

Jack and the Beanstalk, the title of a famous nursery tale based on a world myth. Jack and his mother were so poor that they had to sell their cow. Jack set out for market and sold the cow to a butcher for a handful of beans. His mother was so angry she threw the beans out the window. One of them took root and overnight grew into the sky. Jack promptly climbed the vine and came to a wide, strange country where a fairy sent him to the house of a giant. There by trickery he stole a red hen (that laid golden eggs) and bags of diamonds and gold. When the giant discovered him, Jack fled home down the beanstalk with the giant in chase. Jack reached the ground and quickly chopped down the vine. The giant fell and was killed, and Jack and his mother lived in plenty ever after. This story is known among the North American Indians and South African natives. The beanstalk is something like Yggdrasil, the old Teutonic world tree, which connected heaven and earth.

Jack the Giant Killer, the title and the hero of an old English nursery tale based on a British story first translated by Geoffrey of Monmouth. Jack was a farmer boy of Arthurian times. He killed the giant of Cornwall by tricking him into a deep pit. With the help of a cloak that made him invisible, boots of marvelous speed and a magic sword, he killed all the giants in the land.

Jamshid (jam shēd'), in Persian mythology the king of the peris. For boasting that he was immortal he was condemned to take on human shape. He became a splendid and powerful king of Persia and reigned for 700 years. But again he grew arrogant and boastful, was doomed to wretched wanderings and was finally killed by the usurper of his throne. In Firdausi's *Shah Namah* Jamshid is a culture hero who taught mankind the arts of medicine, metalworking and navigation.

Janus (jā'nus), the early Italian god of doorways, gates and entrances and the patron of all beginnings. He may have been a king of ancient Latium whose stronghold was on the Janiculum (the door hill) across the Tiber from the Seven Hills of Rome. Janus is represented with two heads facing in opposite directions, evidently symbolizing the two faces of a door. In the Forum a double tower gate dedicated to him was never closed except in time of peace. He was supposed to stand there guarding the state in wartime and giving luck to the outgoing armies. The first hour of each day was sacred to him as the patron of all beginnings; so were the first day of each month and the first month of the year. January is named for him.



From an etching by Salvator Rosa

Jason and the Dragon

". . . It remained to lull to sleep the dragon that guarded the fleece, and this was done by scattering over him a few drops of a preparation which Medea had supplied. At the smell, he relaxed his rage, stood for a moment motionless, then shut those great round eyes that had never been known to shut before, and turned over on its side, fast asleep. Jason seized the fleece. . . ."—Thomas Bulfinch

Jason (jā'sun), a prince of Iolcus in Thessaly, who recovered the Golden Fleece. The throne of Iolcus was usurped by Pelias, his uncle, who agreed to give it up to Jason if he would bring back the Golden Fleece from Colchis. This Jason did with the help of Medea, daughter of the king of Colchis. He married Medea, but later forsook her to marry Glauce (or Creusa). Medea caused the death of her rival with a poisoned robe and murdered the children of Jason. Jason died of grief.

jinn (jin), plural of jinni.

jinni (ji nē'), in Arabian folklore a demon inhabiting wild and desolate places and representing the hostile elements. In Mohammedan literature jinn are supernatural beings, both good and evil, constituted of fire and able to assume all manner of shapes. They are subject to control by the possessor of a magic ring, lamp or other object.

Jocasta (jō kas't*a*), the mother and wife of Oedipus.

John Henry, in American folklore, the famous Negro steel driver, buried in Big Ben Tunnel, West Virginia, with his 12-pound hammer in his hand. In some versions of the story the hammer weighed 40 pounds. John Henry was the most powerful and fastest of the Negro gang at work on the tunnel through the Alleghenies. So fast did he work that a boy had to stand by with a pail of cold water to keep his hammer cool. He was never seen without the hammer in his hand; he named it Lucy after his sweetheart. His boss bragged to a steam drill salesman that he needed no such modern contraption, because for power and speed one of his workmen could beat a steam drill any day. A bet was laid and John Henry rose to the boast. He picked his spot, beat the steam drill down through the rock and died with his hammer in his hand.

Johnny Appleseed, the popular name of John Chapman (1775–1847), American frontier hero, who wandered for 40 years through Ohio, Indiana and Illinois tending apple orchards he had previously planted and teaching frontier settlers how to start and cherish apple trees. In his youth he owned a nursery in western Pennsylvania where he sold or gave away apple tree saplings. He salvaged seeds from cider presses, dried and collected them by thousands in little bags which he gave away to the families of covered wagon trains traveling westward. He paddled down the Ohio with two canoe loads of these little bags, planting orchards in promising spots or giving seeds away to solitary settlers. He went as far as Marietta, Ohio, now the center of one of the finest apple regions in the United States. Johnny Appleseed has become one of the few great American culture heroes; and a wealth of story has grown up around this ragged, solitary roamer, bringing forth fruit in the wilderness: tales of amazing woodcraft, amazing physical endurance, immunity to snakebite, charming wild beasts and healing the sick in lonely places.

Jormungand (yôr'moon gänd), in Norse mythology, a huge sea serpent, the second child of Loki; also called the Midgard Serpent. Odin cast her into the ocean which surrounds the world. There she grew and grew until she encircled the whole earth with her tail in her mouth. She killed Thor and was killed by him at the end of the world.

Joseph of Arimathea (jō'sef, är i m*a* thē'*a*), the rich councilor who gave burial to the body of Christ. In British legend he came to Britain teaching

Christianity and founded the monastery at Glastonbury. He was believed to have brought the Holy Grail to Britain.

Jotunn (yô'toon), a giant of Norse mythology. Jotunnheim (yō' toon hām) was the abode of the giants on the edge of the world.

Jove (jōv), a variant of Jupiter, the principal god of Roman mythology.

Juggernaut (jug'ẽr nôt), in Hindu mythology, one of the names of Krishna, the eighth incarnation of Vishnu. The name means lord of the world. His idol is at Puri in Orissa, British India. At the time of the famous Juggernaut festival the image is placed in a huge, towering car and dragged in procession by thousands of pilgrims from the temple to what is known as his country house. The distance is only about a mile but the trip takes several days through the crowded streets. The reports that hundreds of devotees throw themselves under the car to be crushed to death are false. An occasional fanatic thus destroys himself, but self-destruction is contrary to the ideas of Vishnu worship.

Juno (jōō'nō), an ancient Italian pre-Roman goddess representing the female principle of life. As her cult developed, she became the savior of women in all their trials, goddess of marriage and childbirth and protectress of female slaves. In Roman mythology, Juno was the wife of Jupiter, goddess of the sky and queen of the gods. Like him she was the deity of the state. Later she became identified with the Greek Hera.

Jupiter (jōō'pi tẽr), the elemental sky god of ancient Italian and Roman mythology. His name apparently means sky father. Jove is a shorter form. He sent light and heat, rain and thunderbolts and was worshipped from the tops of hills. He was the husband of Juno and became the state deity of Rome. He was connected with oaths, treaties, duty and all matters of conscience. Later the Romans identified him with the Greek Zeus.

Kama (kä'm*a*), in Vedic mythology the desire of the mind or the creator who fulfils desire. In later Hinduism Kama is the god of love, like Cupid. He is represented as riding on a parrot, with bow and arrows, each arrow tipped with a flower.

Kay, Sir (kā), the boastful, ill-humored seneschal of King Arthur.

kelpie (kel'pi), in Scotch folklore a spirit of the water, said to haunt lakes and streams and especially fords and crossings. It may take on various shapes but usually appears in the shape of a horse. It is seen only by those about to drown; for it comes as a warning of death by water.

King Arthur. See *Arthur.*

King Cole or **Coel** (kōl), a legendary king of Britain of the 3rd century. He is mentioned in Geoffrey of Monmouth's *History of the Kings of Britain,* is the subject of John Masefield's poem *King Cole* and is the "merry old soul" of the nursery rhyme.

King Lear (lēr), a legendary king of Britain who undertook to divide his kingdom among his three daughters according to the measure of their love for him. He divided it between the two elder, for the youngest daughter Cordelia said she loved him no more than her duty in one version, no more than salt in another. She was turned off penniless and married the king of France. Lear was driven mad with grief by the neglect and heartlessness of his two elder daughters. But Cordelia re-entered England with her husband at the head of an army and restored the kingdom to Lear. Legend says that he ruled again for three years, and Cordelia after him for five, until the sons of her sisters took her throne and her life. Shakespeare's tragedy *King Lear* ends with the defeat of Cordelia's army.

King Log and King Stork, in Aesop's fable two kings sent to the frogs by Jupiter. When the frogs prayed for a king, Jupiter sent them King Log. They were impressed at first but lost respect for him when they found they could hop upon his back. When they complained to Jupiter of his inactivity, he sent them King Stork, who kept them hopping and devoured them.

Klingsor (kling'zōr), in the Grail legends the magician who set snares and seductions in the way of the questing knights. He was finally overcome by Parsifal.

Knecht Ruprecht (kne*ch*t rōō'pre*ch*t), in German folklore a spirit overseer of children, who appears to them sometime before Christmas. He promises rewards to the good and threatens the bad with a whip. It is a German village custom for one villager to masquerade as Knecht Ruprecht on Christmas Eve and pass from house to house delivering the gifts previously conveyed to him in secret by the parents.

Knight of the Swan, in German legend Lohengrin; in French legend Helias, the grandfather of Godfrey de Bouillon. In Icelandic saga the knight of the swan was named Helis.

kobold (kō'bold), in German folklore a household spirit, often performing services and favors but of a mischievous disposition; and sometimes a gnomish underground spirit inhabiting caves or mines.

Kriemhild (krēm'hilt), in the *Nibelungenlied* a princess of Burgundy, the wife of Siegfried. The hoard of the Nibelungs was her marriage portion. After Siegfried was slain by Hagen, Kriemhild married Etzel, King of the Huns. She lured her brothers to Etzel's court and caused them to be slain to avenge the death of Siegfried. She killed Hagen with Siegfried's sword.

Krishna (krish'n*a*), a Hindu god, the warrior incarnation of Vishnu. He was the brave, clever and invincible warrior who saved mankind from all tyrants. The *Bhagavad-Gita* is the Song of Bhagwan, The Blessed One, that is, Krishna. He cast out fear with the doctrine that Brahma (spirit) pervades all things and therefore men could not really die. Emerson summarized this teaching of Krishna in his short poem *Brahma.*

Kriss Kringle (kris kring'gl), the personification of the German spirit of Christmas; St. Nicholas or Santa Claus. The name derived from *Christkindl,* meaning the little Christ child.

Kundry (koon'dri), in the Grail legends a beautiful enchantress who helped Klingsor seduce the questing knights. In Wagner's opera *Parsifal,* her spells were broken and she was finally redeemed by Parsifal.

labyrinth (lab'i rinth), in Greek mythology the great maze in Crete built by Daedalus for King Minos to confine the Minotaur.

Lachesis (lak'e sis), the second of the three Fates in Greek mythology, the one who determined the length of the thread of human life spun by Clotho.

Ladon (lā'don), in Greek mythology the dragon that guarded the golden apples in the garden of the Hesperides. He was killed by Hercules.

Lady of the Lake, the lady beloved by Merlin, the enchanter; also known as Vivian and Nimue. To get rid of the doting Merlin she shut him up forever in a bush by magic that he himself had taught her. She stole away the infant Lancelot, reared him in her fairy kingdom and later brought him to Arthur's court. In Malory's *Morte d' Arthur* she gave Arthur the sword Excalibur. Sometimes identified with Morgan le Fay, she was one of the three fairy queens on the ship that bore Arthur to Avalon.

Laertes (lā ûr'tēz), father of Odysseus.

Lancelot (làn'se lot) or **Lancelot of the Lake,** the most famous knight of the Round Table. Secretly he loved Guinevere, Arthur's queen, and she loved him. Lancelot went in disguise to tilt in a three-day tournament, was wounded, was carried to the castle of Astolat and was nursed by the fair maid Elaine, who fell in love with him and died for love of him. The guilty love between Lancelot and Guinevere was finally revealed to the king. Lancelot escaped with the queen to his own castle, where he was besieged by Arthur and Gawain. He gave up the queen to Arthur and fled to Brittany, where Arthur and Gawain pursued him. In the king's absence Modred endeavored to seize Arthur's throne and queen. Arthur hastened home to fight for his own, and in the last battle he and Modred killed each other. Lancelot came hurrying to Arthur's side to help his king. But he was too late, Arthur was dead. Guinevere entered a nunnery, and Lancelot went into a monastery. He lived penitent for six years and died shortly after the death of Guinevere. In Malory's *Morte d' Arthur* Lancelot was one of the knights who sought the Holy Grail. He was allowed to behold it but for his sins could not achieve the quest.

The story of Lancelot's love for Guinevere was developed only in late Arthurian romance, not before the 12th century. In the older version of the Lancelot story, Lancelot was the son of Ban de Benoic, who died of sorrow on being driven from his kingdom. His wife laid the infant Lancelot on the bank of a lake while she stooped to comfort the dying king. The Lady of the Lake snatched him away and brought him up among her maidens. At the age of 15 he returned to the mortal world to have many adventures. He won a three-day tournament, rescued a princess from the castle of the dead and married her, regained his father's throne and died an aged man.

Laocoön (lā ok'ō on), a priest of Apollo in Troy, who warned the Trojans not to accept the Wooden Horse from the Greeks. While he was offering a sacrifice to Poseidon, he had a vision of his two sons being attacked by two serpents from the sea. He rushed out to save them, but the serpents crushed him and his sons. The Trojans interpreted this as Athena's punishment to Laocoon for suspecting the Wooden Horse. Vergil tells the story in the *Aeneid*. It is the subject of a famous statuary group in the Vatican. In 1766 Lessing wrote an essay on art entitled *Laokoon*.

Courtesy Metropolitan Museum of Art

Laocoön and His Sons

This statue was the work of Agesander, Polydorus and Athenodorus, in the year 100 B.C. It is now in the Vatican, Rome

Laomedon (lā om'ē don), the king for whom the walls of Troy were built by Apollo and Poseidon. Laomedon refused to pay the two gods when the work was done. In vengeance they sent a sea monster to ravage the land. To appease the gods Laomedon chained his daughter Hesione to a rock for the monster to devour. Hercules offered to rescue the maiden and kill the monster for the price of six horses. But when the deed was accomplished, Laomedon refused to give him the horses, and Hercules killed Laomedon.

Lapithæ (lap'i thē), a people of Thessaly, best known for their battle with the centaurs and the story of their ill-fated king, Ixion.

lares (lā'rēz), in Roman religion originally tutelary spirits presiding over the fields and homes, later regarded as ancestral spirits. The *lar familiaris* was the guardian of the family; *lares compitales* presided over crossroads; *lares praestites* were the guardian spirits of the city.

Latinus (l*a* tī'nus), the legendary king of ancient Latium, ancestor of the Latins. In Vergil's *Aeneid* he was the king of Latium who welcomed Aeneas at the mouth of the river Tiber, and father of the Lavinia whom Aeneas married.

Launcelot. See *Lancelot.*

Leander (lē an'dĕr), see *Hero.*

Leda (lē'd*a*), the mother of Castor and Pollux and Helen of Troy. Zeus saw her bathing in a river and took the shape of a swan in order to make love to her.

Lemnos (lem'nos), an island in the Aegean Sea, sacred to Hephaestos, who was believed to have landed there when Zeus hurled him out of Olympus. At one time all the women on the island killed all the men. The Argonauts found only women inhabiting the island when they touched there.

leprechaun (lep'rē *ch*on), in Irish folklore a fairy shoemaker. Human beings see him at times in the shape of an old man. It is believed that when he is caught he will lead one to hidden treasure.

Lethe (lē'thē), one of the rivers of Hades. To drink of its waters brought forgetfulness of the past to the souls of the dead. The word means oblivion.

Leto (lē'tō), the mother of Apollo and Artemis. Hesiod says she was Zeus's first wife. Later myth counts her as one of his many loves. Hera was so jealous of her that she sent a python to torment her. Zeus gave her the floating island of Delos and anchored it to the bottom of the sea so that she might live in peace; and here Apollo and Artemis were born. The Roman name for Leto is Latona.

Lilith (lil'ith), in Jewish folklore a female demon of the night; a vampire. She was especially malignant towards children. In medieval Rabbinical literature Lilith was Adam's first wife, displaced by Eve on whom she worked vengeance by threatening her children. Her spirit became more and more evil. In Goethe's *Faust* Lilith figures as a witch in the Walpurgis Night scene.

Lir or **Ler** (lēr), in Celtic mythology the god of the sea, one of the Tuatha de Danann. The name is spelled Llyr in the Welsh, Cornish and Breton versions. In British legend Lir was a king of Britain, the father of Bran and the mythical founder of Leicester, Lircestre. Shakespeare's *King Lear* is based on this legend.

Little John, one of the devoted companions of Robin Hood, second only to him in skill with the bow and arrow. He was dubbed Little John for his great height. He is a character in Scott's *Ivanhoe.*

Little Red Riding Hood, in European folklore a little girl who went to visit her grandmother and was eaten by the wolf who had crept into the grandmother's bed. In the German version the child escaped. The story is known in English translations from the French Charles Perrault and the German of the Grimm brothers.

Llyr. See *Lir.*

Lohengrin (lō'en grin), a knight of the Grail, son of Parsifal, who was called to the aid of Elsa, princess of Brabant. He was borne from the castle of the Grail to Antwerp in a boat drawn by a swan. He defeated Count Telramund, Elsa's accuser, and married Elsa on condition that she never ask his name. Years later she broke the promise, and he had to tell it. The swan boat appeared again on the Rhine, and Lohengrin departed, leaving behind him his sword, horn and ring. This is the story followed by Wagner in his opera, *Lohengrin.* In very old French legend the same story is built around the knight Helias, who was one of seven children turned into swans by a cruel grandmother.

Loki (lō'kē), in Norse mythology one of the Aesir, the god of evil and fire, the mischief-maker. Hel, Jormungand and Fenrir were his offspring. He tricked the blind god Hoder into killing Balder and refused to weep to ensure Balder's release from Hel, goddess of death.

Lorelei (lô're lī), in German legend a beautiful siren whose song lured boatmen to their death. She haunted a certain rock in the Rhine, which today bears her name.

Lot (lot), the husband of Arthur's sister Morgan. He was king of Orkney and Lothian and father of Gareth and Gawain. Geoffrey of Monmouth called him king of Norway.

Lotophagi (lō tof'*a* jī), the Lotus Eaters, in the *Odyssey* a race of people visited by Odysseus in his wanderings. They ate only the fruit of the lotus, which caused forgetfulness of home and a state of dazed langor and contentment. Those of Odysseus' crew who tasted the lotus while they were ashore had to be bound and dragged home. Tennyson's poem *The Lotus-Eaters* describes the experience.

Lucifer (lū'si fẽr), in Semitic mythology the morning star, which fell from heaven. The name was given to Satan, the fallen archangel. In Milton's *Paradise Lost* Lucifer is the fallen rebel. Lucifer is a Latin word meaning light-bearer or morning star; it is used in Isaiah 14:12 of the "son of the morning . . . fallen from heaven."

Lug or **Lugh** (loo*ch*), in Celtic mythology god of the sun and light and fires, one of the Tuatha de Danann. He was the father of Cuchulain.

Luna (lū'n*a*), the ancient Italian moon-goddess, later merged with the Diana of Roman mythology.

Maia (mā'y*a*), one of the Pleiades, the seven daughters of Atlas. She was the mother of Hermes by Zeus. A Roman goddess Maia, wife of Vulcan, gave her name to the month of May.

Maid Marian, the lady of English folk May Day games and morris dances in which Robin Hood also figures. The late Robin Hood ballads and legends adopted her as his companion and sweetheart in Sherwood Forest. She was identified with Matilda Fitzwater.

Mammon (mam'un), in the New Testament the personification of wealth and greed; from an Aramaic word meaning wealth.

Manannan (mon'an *a*n), the Celtic sea-god, son of Lir, for whom the Isle of Man was named; sometimes called Manawyddon.

manes (mā'nēz), in Roman mythology the gods of the lower world and the shades of the dead. Gods and shades alike were considered divine. Ancestral or parental spirits were worshiped with offerings of garlands, food and wine.

manito (man'i tō) or **manitou** (man'i-to͞o), among the Algonquian Indians of North America the great pervading spirit and force of all nature, having both good and evil attributes.

Manu (ma'no͞o), in Hindu mythology the ancestor of mankind. During the world flood he was saved by Vishnu in his incarnation as the fish Matsya.

Mark (märk), in Arthurian legend the king of Cornwall, Tristram's uncle and the husband of Iseult.

Mars (märz) in Roman mythology the god of war. He became identified with the Greek Ares. March is his month.

May Day, the first day of May, celebrated with festival and merrymaking in England and all over Europe since medieval times: since 1899 observed as an international Labor Day. The medieval English May Day was observed by all classes from humblest villager to the royal court. Everyone was up before the sun to go "a-maying" or "to bring in the May." They went out to the forests and returned laden with flowers and branches of trees. One tall, straight tree was brought in, stripped of its branches, painted, decorated with streamers and flowers and set up as the center of all the games, plays and dancing for the rest of the day. Most of the May Day dramas were of a merry, comic nature. The most famous of the English May Day plays presented the characters of the Robin Hood ballads, centering around Maid Marian and Robin Hood. Maypoles were forbidden by the English Puritans as heathenish in 1644; but they came into their own again with the Restoration.

The emotional basis of May Day in all countries is the high spirit of spring, joy in the renewal of life and the creative urge in the plant and animal world. The old Roman Floralia (April 28–May 3), a festival in honor of Flora, a fertility goddess, was celebrated in colorful costume with dances and plays. And the Floralia probably goes back to a still more ancient festival of the Latin goddess Maia, who was worshiped as a source of life.

Medea (mē dē'*a*), a famous enchantress, daughter of the king of Colchis. She fell in love with Jason when he came seeking the Golden Fleece and used her magic to help him secure it. She made sure their escape to Greece by casting the body of her brother in the way of her pursuing father. She restored Jason's father to youth and health but refused to do the same for Pelias, the usurping uncle, after she had induced his daughters to boil his body in a caldron. For this she and Jason were forced to flee to Corinth, where they lived happily for a number of years until Jason deserted her and married Creusa (or Glauce). Medea murdered the children of Jason and killed her rival with a poisoned robe. Euripides wrote a tragedy centered on Medea.

Medusa (mē dū'*sa*), in Greek mythology the most famous of the three Gorgons. She was beheaded by Perseus, who escaped being turned to stone by looking at her in the mirror of a shield given to him by Athena. Perseus presented her head to Athena when he returned the shield.

Meleager (mel ē ā'jẽr), in Greek mythology the son of Oeneus, king of Aetolia in Calydonia. When he was born, the Fates declared he would live until the brand on the hearth was burned away. His mother quickly snatched it, put out the fire and hid the brand. Meleager lived to join the Argonauts and kill the Calydonian boar. He presented its head to Atalanta because she was the first to wound it. This infuriated his two uncles, who wanted the prize for themselves, and in the quarrel which followed Meleager killed them both. When Meleager's mother was told that her son had killed her two brothers, in a flash of resentment she hurled the fateful brand into the fire. As it burned, Meleager died.

Melpomene (mel pom'e nē), the Greek tragic Muse.

Melusina (mel ū sē'n*a*), in French folklore and romance the fairy guardian of the house of Lusignan. She was the daughter of the fairy Pressina. For wrongs done her mother she shut her father up in a mountain. For this he condemned her to take on the shape of a fish (or serpent) from the waist down every Saturday. She could be freed from this enchantment only by marrying a man who would promise never to see her on Saturdays. Count Raymond of Poitiers loved her dearly and willingly made the promise. She brought him wealth and power and built him the castle of Lusignan. But in time his jealousy and curiosity overcame his faith, and he spied on her. He saw his beautiful wife take on her mermaid form and she was doomed to leave him, returning only as a wailing ghost to warn descendants of the family of death or disaster.

Memnon (mem'non), a king of the Ethiopians, nephew of Priam of Troy. He was killed by Achilles in the Trojan War, and the grief of his mother Eos moved Zeus to grant him immortality.

Menelaus (men e lā'us), a king of Sparta, brother of Agamemnon and husband of Helen of Troy.

Mentor (men'tôr), the faithful friend and counselor to whom Odysseus entrusted his household and the education of his son Telemachus when he left for the Trojan War.

Mephistopheles (mef i stof'e lēz), in medieval European demonology one of the seven lords of hell, a development of an ancient Semitic conception of evil, coming through the Chaldeans, Babylonians and Jews. He was the devil to whom Faust sold his soul in exchange for aid and power. In the numerous Faust legends Mephistopheles was a combination of the Christian devil, the kobolds of German folklore and the most ancient powers of darkness and destruction.

Mercury (mûr'kū ri), the ancient Italian god of commerce; identified by the Romans with the Greek Hermes about 495 B.C.

Merlin (mûr'lin), the great magician and seer who aided Arthur in many marvelous ways. He put sleep on the huge knight in the pass who nearly killed Arthur. At one time when Arthur was opposed by eleven kings and one duke, Merlin caused all the tents of the enemies to fall down, and in the panic which followed Arthur conquered his foes. By his help too, Arthur won Guinevere for wife. Merlin made the Round Table and led Arthur to the sword that he took from the marvelous hand and arm that rose out of the lake.

Merlin fell fatally in love with Vivian, the fairy Lady of the Lake, who beguiled him into teaching her the charms and spells whereby she "detained him forever more" in a tower that he himself could not unmake. Thus Merlin was lost to the world forever. Arthur sent knights to search for him, but he was never found. Only Gawain heard his voice coming from a smoke in the forest, charging him to tell Arthur the time had come for the quest of the Holy Grail.

The more ancient Merlin of the Britains was a boy of no mortal father, who revealed to Vortigern the reason why the foundations of his citadel fell down time after time as soon as they reached a certain stage. It was built over a den of dragons, Merlin said, and their perpetual fighting shook the earth. Vortigern ordered workmen to dig and see. Two huge dragons were disclosed, one pure white, one red. The white one killed the red and then disappeared. From this Merlin prophesied that Vortigern would be slain by his enemies. This happened, and Uther Pendragon, the father of Arthur, took the throne. Merlin remained his counselor and Arthur's after him until he was lost to the world by Vivian's spell.

Courtesy Swedish Travel Information Bureau

The Little Mermaid

A memorial to Hans Christian Andersen depicting the little mermaid of his story stands near the water's edge in the harbor of Copenhagen. The statue is by Edvard Eriksen

mermaid (mûr'mād), in Teutonic folklore and that of the British Isles a being of the sea or lakes with the body of a beautiful woman but the tail, fins and scales of a fish below the waist. Fairy tales are full of these wonderful beings. They had the power of prophesy and were able to grant temporary superhuman gifts to mortals. They fell in love with human beings sometimes and either came to live on earth in human form until some spell was broken or lured their loves to dwell with them in a realm below the waves. Stories of mermaids and mermen abound in the folklore of nearly all seaboard peoples; and the nereids or sea nymphs, the tritons and sirens of classical mythology personified the same idea. Hans Christian Andersen's lovely story *The Little Mermaid* tells how a mermaid in love with a prince longed for and strove to win a human soul. Matthew Arnold's poem *The Forsaken Merman* pictures the loneliness of a merman and his children whose human mother left them to return to human ways.

Midas (mī'das), the King of Phrygia to whom Dionysus granted that all he touched would turn to gold. He soon tired of the gift when he discovered that the bread he would eat and the wine he would drink turned to hard and solid gold as soon as he touched it. In fear he prayed for the golden touch to be removed from him; and Dionysus bade him wash in the river Pactolus. He did so and was cured, but the sands of the river were turned to gold.

When Midas said he preferred Pan's music to Apollo's, Apollo punished him by giving him ass's ears. Midas kept them covered so that no one but his barber knew the shameful secret. The barber, unable to keep it to himself, dug a little hole in the ground and whispered into it, "King Midas has ass's ears." Reeds grew in that place and forever after whispered when the wind blew, "King Midas has ass's ears."

Midgard (mid'gärd), in Norse mythology the middle earth, halfway between heaven and hell, the abode of mankind. It was surrounded by the great ocean, where lived Jormungand, the Midgard Serpent, who encircled the world.

Mimir (mē'mēr), in Norse mythology the giant who lived beside the root of the world tree, Yggdrasil. Here he drank from the spring which flowed from the root of the tree. And the waters gave him wisdom and all knowledge of the past and the future.

Minerva (mi nûr'*va*), an old Italian goddess of wisdom, patroness of all the handcrafts and arts. She was the daughter of Jupiter and one of the triad, with him and Juno, worshiped as guardians of the state. She became identified with Greek Athena.

Minos (mī'nos), the son of Zeus and Europa and king of Crete. He was the founder of the Cretan laws and so great was his justice that after death he was made a judge in Hades. Another story makes him the tyrant who exacted yearly tribute from the Athenians of seven youths and seven maidens to feed the monster Minotaur. Minos kept the Minotaur in the labyrinth built for him by Daedalus. He shut Daedalus up in the labyrinth for some offense and when he escaped pursued him to Sicily. There Minos was killed by the daughter of King Cocalus, who poured boiling water in his bath.

Minotaur (min'ō .tôr), a monster of Crete, half human, half bull. It was the son of Pasiphae (wife of King Minos) and a white bull which Poseidon had sent to Minos. The bull was so beautiful that Minos spared its life instead of sacrificing it to the god. To imprison this monster, Daedalus built the labyrinth; to feed it, Minos demanded a yearly tribute of Athenian youths and maidens. It was finally killed by Theseus with the help of Ariadne.

Mithras (mith'ras), the Persian god of light who fought on the side of truth in the eternal struggle between the powers of good and evil, light and darkness.

Courtesy German Railroads Information Office

Mäuserturm on the Rhine

This is the Mouse Tower of the legend

Mnemosyne (ne mos'i nē), one of the Titans, the goddess of memory. She was the mother of the nine Muses by Zeus.

Modred (mō'dred), a knight of the Round Table, nephew of King Arthur. He seized the kingdom and the queen in Arthur's absence. Modred was killed by Arthur but he gave the king his mortal wound.

Moira (moi'*ra*), in Greek mythology the fate of a person; later, any one of the three Fates. The plural is Moirai (moi'rī); in Latin, Parcae.

Moloch (mō'lok), an ancient Semitic god to whom living children were sacrificed. In Milton's *Paradise Lost*, Moloch was one of the fallen angels.

Momus (mō'mus), in Greek mythology the personification of mockery and ridicule. He jeered at gods and men alike.

Morgan le Fay (môr'gān lē fā), the fairy (fay means fairy) sister of King Arthur and wife of King Uriens of Gore, whom she tried to kill in his sleep. She schemed for the death of Arthur also, but he killed the traitor who came to do her bidding. She was one of the three queens in the fairy boat which bore the wounded Arthur away to Avalon. In the Charlemagne legends she was the enchantress Morgana who lived in a lake. She fell in love with Ogier, the Dane, and restored him to strength and youth after he was 100 years old.

Mouse Tower, a strong toll tower on the river Rhine known as the *Mäuserturm.* During the great famine in 970 A.D. Hatto, archbishop of Mainz, is said to have shut up the poor in a barn and burnt them to save grain for the rich. Suddenly set upon by hordes of mice he fled across the Rhine and took refuge in the big toll tower. But the mice pursued him by thousands, swam the river and ate him alive in the tower.

Muse (mūz), any one of the nine daughters of Zeus and Mnemosyne, goddesses of the arts and sciences. They were: Clio (history), Euterpe (music), Thalia (comedy and pastoral poetry), Melpomene (tragedy), Terpsichore (dancing and choruses), Erato (lyric and love poetry), Polyhymnia (sacred song), Urania (astronomy) and Calliope (epic poetry).

Myrmidons (mûr'mi donz), soldiers from Thessaly who fought under Achilles in the Trojan War. When a plague wiped out all the inhabitants of the island Aegina, the king prayed Zeus to repeople his kingdom with citizens as numerous as the ants that marched about their business in a nearby oak. The prayer was granted and all the ants rose up to human form. The old king named them Myrmidons, the Greek word meaning ants.

naiads (nā'adz), in Greek and Roman mythology the water nymphs or lesser goddesses of springs and fountains, rivers, brooks and lakes.

Narcissus (när sis'us), a beautiful youth for whose love Echo died. He fell in love with his own reflection in a pool, pined away with longing for the unattainable image and was changed into the flower that bears his name. Narcissism means self-admiration.

Nausicaa (nô sik'ā *a*), in the *Odyssey* the daughter of Alcinous, King of the Phaeacians. She found the shipwrecked Odysseus on the shore, clothed him and took him to her father, who entertained him royally and provided him with a ship to return home.

Nectar (nek'tēr), in Greek mythology the drink of the gods.

Nemean lion (nē mē'an lī'un), in Greek mythology the terrible lion which devoured the herds and ravaged the valley of Nemea. It was killed by Hercules as one of his Twelve Labors.

Nemesis (nem'ē sis), the Greek goddess of vengeance and retribution. Especially did her punishments overtake the proud and arrogant.

Neptune (nep'tūn), an ancient Italian god of fresh water streams and springs. He was worshiped and importuned in midsummer in time of heat and drought. About 399 B.C. the Romans identified him with the Greek sea-god Poseidon.

nereids (nē rē'idz), mermaid daughters of Nereus, a wise old god of the sea. There were said to be fifty daughters in all; Thetis, the mother of Achilles, was the most famous.

Nessus (nes'us), in Greek mythology the centaur who tried to run off with

Deianira, the wife of Hercules, and was shot by him with a poisoned arrow. The dying centaur told Deianira that his blood was a love charm. Years later she steeped her husband's robe in this blood to hold his love, but the garment poisoned him.

Nestor (nes'tôr), in the *Iliad* an aged counselor of the Greeks at the time of the Trojan War. So great was his wisdom and eloquence in extreme old age that any very wise old man is now called a Nestor.

Nibelungs (nē'be loongz), a race of dwarfs in Norway who owned and guarded the treasure of jewels and gold and the magic ring later won by Siegfried. In the *Nibelungenlied,* they are the kings of Burgundy who secured the hoard. The secret of its hiding place was lost when they were all killed.

Niflheim (niv'l hām), in Norse mythology the world of mist and cold and darkness where Hel reigned. It was divided into nine regions to which she allotted the souls of all the dead except those who died in battle. Yggdrasil, the world tree, was rooted in Niflheim.

Nimue (nim'oo *a*). See *Lady of the Lake.*

Niobe (nī'ō bē), in Greek mythology the proud mother of ten sons and ten daughters, whose pride was most cruelly punished. She bragged of her children to Leto, the mother of only two, Apollo and Artemis. To punish her, Apollo killed all her sons and Artemis killed all the girls. Niobe's grief was so great that in pity the gods changed her into stone. The spring which flows from the rock bears witness that Niobe still weeps.

nix (niks), in Teutonic mythology a water spirit, sometimes seen in human form, sometimes part fish, part human. The female water sprite is a nixie or nixy.

Norns (nôrnz), three goddesses, the fates of Teutonic mythology, who presided over the destiny of gods and men. They lived by the spring of fate at the root of Yggdrasil. Their names were Urth, Verthandi and Skuld (past, present and future).

Notus (nō'tus), the south wind: also called Auster.

nymphs (nimfs), in classical mythology the spirits of mountains, forests, trees and streams, the ocean and little springs. They were beautiful goddesses, often marrying human beings. The nymphs of the ocean were the oceanids. The nereids were sea nymphs, especially of the Mediterranean Sea. The nymphs of rivers, lakes and springs were naiads. Mountain nymphs were called oreads. Dryads were the nymphs of forests, groves and trees.

Nyx (niks), the ancient goddess of night in Greek mythology, a daughter of Chaos: same as Nox, the Roman goddess of night.

Oberon (ō'bẽr on), in medieval folklore, the king of the fairies or elves. He is the Alberich (Auberich, Auberon) of German and French medieval romance, or his son. In *Huon de Bordeaux* he is king of the fairies. The Oberon of Shakespeare's *Midsummer Night's Dream* is a dainty, diminutive being, quite unlike the powerful Alberich of folklore.

oceanids (ō sē'*a* nidz), the ocean nymphs, daughters of Oceanus, who personified the great river which encircled the earth, and fathered the 3,000 rivers of the world.

Odin (ō'din), the supreme god of Norse mythology, husband of Frigga and father of Balder, Thor, Bragi, Hoder, Tyr, Vali, Vidar, Hermod and others of the Aesir. He was the god of war and reserved the glories of Valhalla for heroes slain in battle. Odin was god of wisdom and to become so, paid Mimir one eye for a drink from the spring of knowledge (Mimir's well) at the foot of Yggdrasil. Two ravens attended him, Hugin and Munin (thought and memory). He is the Woden of Teutonic mythology. Wednesday is Woden's day.

Odysseus (ō dis'ūs), in the *Iliad* and *Odyssey* a king of Ithaca and one of the foremost of the Greek chiefs in the Trojan War. He was one of the suitors of Helen of Troy but married Penelope, whom he was so loath to leave when he was called to rescue Helen from the Trojans that he feigned madness to avoid the obligation of going to war. His ruse was discovered; he had to go to Troy; and he distinguished himself in valor and wisdom during the years of the siege of Troy. On the death of Achilles the arms of that hero were awarded to Odysseus.

The *Odyssey* describes the ten years of wandering and hardship he encountered on his voyage home from the war. He touched upon the shores of the Lotus Eaters in Africa. He escaped death from the one-eyed Cyclops Polyphemus only by his own courageous trickery in blinding the giant and concealing himself beneath one of the Cyclops's sheep as they crowded out of the cave. He remained one year with Circe, the enchantress, and seven years with the ocean nymph Calypso on her island. He braved the dangers of Scylla and Charybdis, heard the sirens sing while he was bound to the mast and thus escaped them. He was shipwrecked on the shores of Phæacia and there cared for by Nausicaa and her father, who gave him ships to continue his voyage home.

At last he reached Ithaca to find his wife surrounded by a host of unworthy suitors, each coveting the kingdom. With the aid of his son Telemachus and his faithful herdsman Eumæus he slew them all and reigned another good sixteen years. Telegonus, his son by Circe, came seeking his father, and unwittingly killed him in a quarrel before he knew who he was. Odysseus was called Ulysses by the Romans.

Oedipus (ed'i pus), the son of Laius and Jocasta, King and Queen of Thebes. Having been warned that he would die by the hand of his son, Laius thought to destroy the newborn child and hung him by his heels on a tree in the forest. From this incident probably he was named Oedipus (Greek, swell foot). A passing herdsman found the infant and saved his life; and Oedipus was adopted and reared by the king of Corinth. In his young manhood he was told by the oracle at Delphi that he was destined to kill his father and wed his own mother. Horrified he fled from Corinth, met Laius in his wanderings and killed him in a quarrel.

Finally Oedipus came to Thebes where the sphinx was daily devouring the inhabitants. This winged, woman-headed monster was wont to ask one riddle a day of whom she chanced to meet and to devour the hapless one who could not answer it. Oedipus answered instantly the famous question put to him, and the monster killed herself. Creon, the king, had promised the kingdom and his sister Jocasta for wife to whomever should free the city of this peril. Thus Oedipus unknowingly married his own mother and by her had two sons Eteocles and Polynices and two daughters Antigone and Ismene. When the truth of their relationship was revealed to them, Jocasta hanged herself, and Oedipus put out his own eyes and went into exile to Colonus in Attica, followed and cared for by his faithful daughter Antigone. This story is the basis of Sophocles's famous trilogy, *Oedipus Tyrannus, Oedipus Coloneus* and *Antigone.*

Oenone (ē nō'nē), the mountain nymph in Mount Ida who loved Paris and lived happily with him there until he deserted her for Helen of Troy. She prophesied the fall of Troy and bade Paris come to her for care and healing when wounded. He received a mortal wound when the city was taken and had himself borne to Oenone. She refused to heal him, but quickly repented and hurried after him, only to find him dead. In grief she killed herself.

Ogier (ō jiẽr') or **Olger** (ōl'ger) **the Dane,** one of Charlemagne's knights. When he was 100 years old, this great warrior was carried away to Avalon where Morgan le Fay restored his youth. Every 200 years he is sent back to France to defend the right. Holger Danske is the Danes' name for their national hero.

ogre (ō'gẽr), in European folklore and fairy tales an awful, flesh-eating giant.

Oisin (u shēn'), a warrior and bard of 3d century Ireland, the son of Finn Mac Cumal. There are legends of his conversations with St. Patrick after 432 A.D. His great age is explained by the story that he spent some 200 years with Niam (nēv), daughter of the sea-god Manannan, in the fairyland of youth. *The Wanderings of Oisin,* by William Butler Yeats, uses this material. Oisin is the Ossian of James Macpherson's Ossianic poems; but the matter and spirit of the legends were completely altered by Macpherson.

Old Man of the Sea, in the *Arabian Nights* an old man who induced Sindbad the Sailor to carry him on his back across a stream of water. But he was not the weak and helpless creature he seemed. He twined his arms and legs around Sindbad's body and would not get off. Sindbad was forced to live with this unlovely burden until he finally got the old man drunk, dislodged him and killed him.

Oliver (ol'i vẽr), one of the paladins of Charlemagne. He was the true friend and companion of Roland and his equal in arms but more prudent. Three times Oliver urged Roland to sound the horn for help at the Battle of Roncevaux, but Roland would not do so until it was too late.

Olympus (ō lim'pus), a mountain in Macedonia, the abode of the great gods.

Omphale (om'*fa* lē), the Queen of Lydia whom Hercules served as a slave for three years to expiate a murder. He weaved and spun at her side in woman's garb.

Ops (ops), an ancient Italian goddess of fertility and agriculture; in later Roman mythology she was identified with the Greek Rhea. The Latin word means wealth or resources.

oracle (or'*a* kl), in classical mythology a place set aside where men might go to question or consult the gods in regard to the future and the conduct of human affairs. The answer was given through the voice of a priest or priestess, often in terms so symbolical that it had to be interpreted. The oracle of Apollo at Delphi was the most famous among the Greeks.

oreads (ōr'ē adz), in Greek mythology nymphs of the mountains.

Orestes (ō res'tēz), in Greek legend son of Agamemnon and Clytemnestra, who avenged the murder of his father by slaying the murderess, his mother and her lover Aegisthus. To cleanse himself of the murder, he was told to bring the statue of Artemis from Tauris to Greece. Having arrived in Tauris, Orestes and his friend Pylades were to be sacrificed, as were all strangers, to Artemis. Iphigenia, the priestess assigned to perform the sacrifice, recognized her brother Orestes and saved his life. The three escaped together in the night, bearing the statue of Artemis with them. To regain his betrothed Hermione, who was married to Neoptolemus, Orestes killed his rival. He became king of his father's kingdom of Mycenae.

Orion (ō rī'on), a young and beautiful hunter, beloved by Eos and slain in jealousy by Artemis. Another story says that Artemis herself loved him and was tricked into shooting him by Apollo. After his death he became a constellation in the heavens.

Ormazd (ôr'mazd) or **Ahura Mazda** (ä hoo'r*a* maz'd*a*), the supreme god of Persian religion, creator of the world and man. He was the principle of good in the eternal struggle against the powers of evil. The name means wise lord.

Orpheus (ôr'fūs), in Greek mythology a poet and musician of Thrace, son of Apollo and the muse Calliope. He received from Apollo the lyre on which he played so marvelously that he charmed the wild beasts and could make the trees and rocks move and the rivers stand still. When Eurydice, his wife, died from a serpent bite, Orpheus followed her to Hades and begged to be allowed to bring her back. Pluto was so moved by his music that he consented, but on condition that Eurydice follow behind and Orpheus never look back. Orpheus promised; but just as they were leaving the world of gloom, he gave one backward look to see if she were really there. Eurydice vanished again to the realm of the dead, and Orpheus, inconsolable, returned home and vowed never more to associate with women. In revenge the Thracian women tore him to pieces and threw his head in the river Hebrus.

Osiris (ō sī'ris), ancient Egyptian god and judge of the dead. He was the brother and husband of Isis and father of Horus. As ruler of Egypt he taught civilization to his subjects. He was killed by his brother Set (Typhon) but was avenged by Isis and Horus, who defeated Set and set up the worship of Osiris all over Egypt.

Ossa (os'*a*), a mountain in Thessaly. In the Greek myth the giants piled Ossa upon Pelion (a neighboring peak) in an attempt to take Olympus in their war against the gods.

paladins (pal'*a* dinz), the twelve peers of Charlemagne, inmates of his palace and his companions at arms. The word *paladin* meant palace dweller first and then warrior. The most famous of the twelve were Roland and Oliver, Ganelon the traitor, Ferumbras and Ogier the Dane.

Pales (pā'lez), the guardian god (female or male) of shepherds and their flocks, herdsmen and cattle. The festival of Parilia or Palilia was celebrated April 21, the day Rome was founded.

Palladium (p*a* lā'di um), in Greek mythology the famous statue of Pallas Athena, believed to have fallen from heaven during the building of Troy. It was a prized possession, for no harm could befall the city that contained it. Odysseus with the help of Diomedes carried it off before the fall of Troy.

Pallas (pal'as), an epithet of Athena; perhaps it meant brandisher or shaker, for Athena carried a spear.

Pan (pan), in Greek mythology the god of nature, forests and fields and wild life and the patron of flocks and shepherds; associated especially with the pastures of Arcadia. He is represented in human shape with the legs and horns of a goat. He invented the panpipe or shepherd's pipe, a musical instrument made of reeds, which he named syrinx for the beautiful nymph whom he loved and who fled, leaving him "nought but a lovely sighing of the wind." Pan was feared by lonely travelers in the woods, and the mysterious fear that comes from no known cause is called a *panic* fear.

Pandarus (pan'd*a* rus), a son of Lycaon, who aided the Trojans in their war with the Greeks. He broke the truce that had been agreed on by the contending armies. He was later killed by Diomedes.

Pandora (pan dō'r*a*), in Greek mythology the first woman, created by Hephæstus at the command of Zeus, to punish mankind for the possession of fire, which Prometheus stole from heaven. Each god gave her a gift: Aphrodite gave her beauty, Hermes a subtle tongue and Zeus a closed box, which he told her to give to her husband but never to open. Zeus intended her for a wife for Prometheus, but he would not have her. His brother Epimetheus, however, was less suspicious of a gift from the gods and married her. In time Pandora gave way to curiosity and opened the forbidden box. All the evils of humanity were thus let loose in the world. Hope alone remained to lighten the heart of man.

Parcae (pär'sē), in Roman mythology the three Fates.

Paris (par'is), a son of Priam, king of Troy. When he was born, Hecuba, his mother, dreamed that she gave birth to a flame that burned Troy; whereupon Priam cast the infant out to die on Mount Ida. He was saved and reared by the shepherds of the mountain, and there he lived happily with the nymph Oenone, until he was sought out to judge who was the fairest of the three goddesses, Aphrodite, Hera and Athena. Paris gave the prize, the golden apple of Eris or Discord, to Aphrodite, who promised him the most beautiful woman in the world for his wife. She kept the promise by helping him win and carry off to Troy Helen, the wife of Menelaus of Sparta. Thus Paris fulfilled the prophetic dream and caused the Trojan War and the destruction of Troy. He was killed by an arrow shot by Philoctetes the day the city was taken.

Parnassus (pär nas'us), a mountain in Greece near Delphi, sacred to the Muses of Greek mythology and to Apollo.

Parsifal (pär'si fäl), in Wagner's opera *Parsifal,* the knight who found the sacred spear that alone could heal Amfortas of his wound. Amfortas, king of the Grail castle and the stainless knights who were keepers of the Holy Grail, had been seduced by Kundry, the enchantress sent by the wicked Klingsor to persecute the knights of the Grail. Through her wiles, Amfortas lost the spear and received a fatal wound from Klingsor. Parsifal, the innocent youth reared in simplicity, came to the castle and proved to be the "stainless fool" destined to recover the sacred spear and heal the king. Kundry's charms beset him, but he resisted her and thus broke the power of Klingsor. Parsifal redeemed Kundry and eventually replaced Amfortas as the guardian of the Holy Grail. Parzival and Percival are other forms of the name.

Paul Bunyan (pôl bun'yan), the hero of lumber-camp folklore of the American Northwest. He was a huge lumberjack "mightiest of loggers," performing amazing and impossible feats. Paul Bunyan was born in Maine, turned up in Michigan, walked out to Oregon because the trains were so slow in the old days. The Colorado Canyon is the scratch in the ground where he dragged his pick behind him, carelesslike, on his way.

Paul Bunyan was the greatest logger that ever swung an ax. Two cuts were all he ever made for one tree. Often he made one cut on the forward swing of his ax and cut the tree behind him on the backward swing. He never felled them as he went along but waited until he had cut a whole section; then with one push the whole section would go down. He invented the grindstone. Before that the woodsmen had to sharpen their axes by rolling a rock down hill and running along beside it.

His most prized possession and companion was Babe, the Blue Ox, whose breadth between the horns was 42 ax handles plus a plug of Star tobacco. He had a huge appetite for hot cakes, with a second preference for baled hay. But no one could fool him into eating shredded wheat, even if it was baled. Paul peeled his logs by hitching the ox to one end of a log and holding onto the bark at the other. When Babe pulled, the log came out slick and clean. But how Paul and Babe straightened the road into camp is the most famous of the tall tales. The road was 22 miles long and so crooked it crossed itself eleven times and had three S curves. First Paul told funny stories to the blue ox to get him in a good humor, then he hitched him to one end of the road and pulled the whole thing straight. He found then it was only 8 miles long, so he rolled up the other 14 miles and sold them to Chicago for a boulevard—Michigan Boulevard, named for the state it came from.

The stories of Paul Bunyan are living myths, told, retold and added to year after year. He still swings his ax in the northwest forests, and the only reason he is never seen is because he is too swift for the eye to catch.

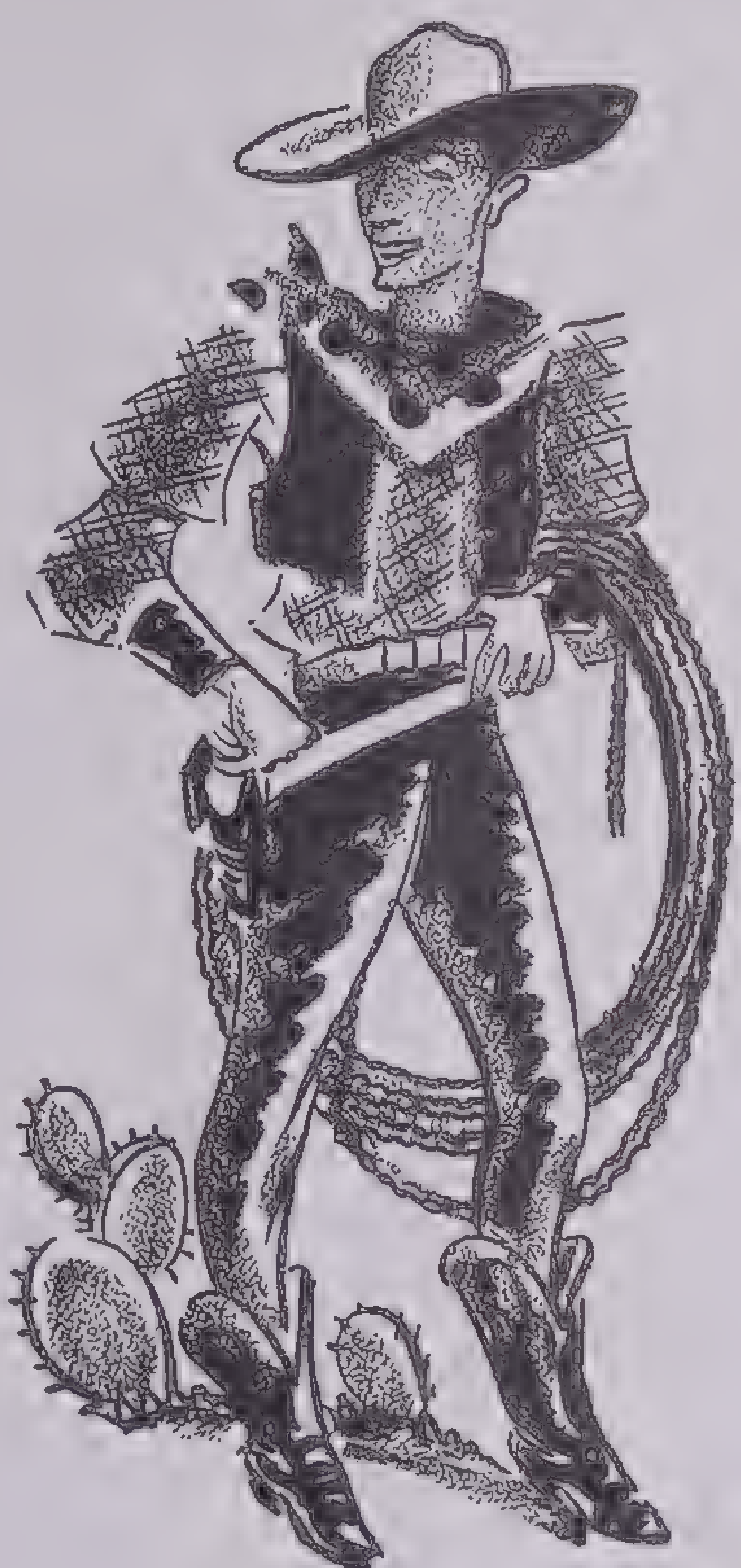
Pax (paks), the personification of peace in Roman mythology.

Pecos Bill (pā′kōs bil), the hero of cowboy folklore of the American West. He was born in eastern Texas. When his parents migrated westward, Bill fell out of the wagon as they were crossing the Pecos River. He was a year old then and lived with the coyotes until he was ten. In fact he thought he was a coyote himself, "just a coyote with a bad case of mange." One day a cowboy came along and asked him why he wore no clothes, and this was the first inkling Bill had that he was a human being. After talking to the cowboy Bill decided he would like to take up human ways, so he mounted one of the cowboy's horses and the pair headed for civilization. The horse carried him 11 miles and then collapsed; so Bill put the exhausted creature across his shoulders and carried him in. And that's how he arrived at his first camp.

Pecos Bill became the greatest cow hand of the West. He rode a huge horse that he fed on dynamite and nitroglycerine. No other man could ride him, but Bill could ride anything from a catamount to a cyclone. The only way a cyclone could throw him was to rain out from under him. He invented the lariat and taught the cowboys to rope cattle. He invented the six-shooter and all the best "cuss" words in the language. He wrote all the cowboy ballads and taught them to the cowboys of the West. He even directed all the first wild West movies, but that was on the side. One of the deeds he is loved for most was saving the cattle country from a Pacific tidal wave. When Bill heard it was coming, he hastily threw up a few breastworks—now called the Rocky Mountains.

Bill married a squaw named Slue Foot Sue. He loved her because she was such a fine rider. And it was she who named his famous horse the Widow-Maker. Sue had a sharp tongue at times, and one day Bill, in a fit of aggravation, slung her up into the sky. But he sent her farther than he meant to; in fact, he sent her so far that he realized she would starve to death before she came down. So being a merciful man, he shot her to put her out of her misery.

After this Bill was so lonely that he rode away and took to drinking nitroglycerine. This pepped him up considerably until he got used to it. Then someone told him that fish hooks would add strength to his drink, and he got in the habit of taking one with each drink. One night, feeling extra low, he swallowed a handful. They struck together inside him, and that one little spark was the end of Pecos Bill. The place where they picked up the pieces is to this day called the Burned Lands.



From James Cloyd Bowman: Pecos Bill, Albert Whitman and Co., publishers

Pecos Bill
From a drawing by Laura Bannon

Pegasus (peg′*a* sus), the winged horse born from the blood of Medusa at the moment Perseus cut off her head. Athena gave him to the Muses, and his name today symbolizes flights of poetic fancy. When Bellerophon was sent to destroy the chimaera, Athena gave him the golden bridle by which alone a mortal could tame Pegasus. At the sight of the bridle the beautiful horse came gladly to Bellerophon's hand. He allowed himself to be mounted and unflinchingly braved the fire-breathing chimaera in the fight until Bellerophon killed it.

Peleus (pē′lūs), a king of Thessaly who married Thetis, the sea nymph, and became the father of Achilles. At their wedding Eris threw the golden apple among the guests that led to the judgment of Paris, the abduction of Helen and the Trojan War.

Pelias (pē li′as), the uncle of Jason, who usurped the throne of Iolchos. He sent Jason to search for the Golden Fleece. His daughters boiled him in a cauldron expecting Medea to restore him to youth and strength, but she refused to do so.

Pelion (pē li′on), a mountain in Thessaly. The giants piled Ossa, another mountain, on top of it, in trying to take Olympus from the gods.

Pelops (pē lops), a son of Tantalus. His father once invited the gods to a feast and served to them the cut up body of his son. They recognized it as the flesh of Pelops, however, refused to eat it and restored him to life.

penates (pē nā′tēz), the Roman household gods who presided over the material welfare of the family. The pantry was sacred to them. Their worship was related to that of Vesta and the lares, but they differed from the lares in being gods instead of the deified spirits of family ancestors.

Penelope (pē nel′ō pē), the wife of Odysseus. Although she received no word from her husband after the Trojan War, she believed that he would surely return. Year after year she held off the horde of suitors who surrounded her, coveting the kingdom. She would make her decision, she said, when she had finished weaving a winding sheet for her father-in-law Laertes. She unraveled each night the work she had done in the day. Penelope's Web is still an epithet given to any never-finished task. After 20 years Odysseus returned to her and destroyed the suitors.

Percivale or **Perceval** (pûr′si val), a knight of the Round Table and one of the seekers of the Holy Grail. He caught a glimpse of it along with Galahad and Bors. The original Perceval stories, however, are more deeply rooted in folklore, and in these he was the son of a widow, brought up in ignorance of his noble lineage and reared in the forest to save him from the knowledge and dangers of chivalry. One day he met a company of knights and in admiration of them determined to seek knighthood. He attracted much attention at Arthur's court with his beauty and innocence and eventually became one of the finest of knights. These legends do not link him up with the quest of the Grail. He first appears as a Grail hero in Chrétien de Troyes's *Perceval;* but he is the perfect knight who achieves the quest in seven later Grail romances. He is the hero of Wolfram von Eschenbach's *Parzival.* For the version of the story in Wagner's opera, see *Parsifal.*

peri (pē′ri), in Persian mythology a superhuman being, originally considered the offspring of fallen angels and thought to be of evil influence. Later, peris were regarded as beautiful and kindly fairies.

Persephone (pẽr sef′ō nē), the daughter of Zeus and Demeter. She was carried off by Pluto to be his wife and queen of Hades. The grief-stricken prayers of Demeter moved Zeus to let Persephone return to life, but only if she had eaten nothing since her arrival in the lower world. It was discovered that she had eaten a small piece of pomegranate and was therefore in bondage to Hades. She was allowed to spend half of the year with her mother but was compelled to return to Pluto for the other half. Her return to life symbolizes the growth of grain; her sojourn in the lower world, the planting of seed. The Romans called her Proserpine.

Perseus (pûr′sūs), the son of Zeus and Danae. The boat in which Danae and her child were set adrift came safely to the island of Seriphos where Polydectes was king. He fell in love with Danae, and in later years, wishing to be rid of Perseus, assigned him to bring back the head of the Gorgon Medusa. But the gods were on the side of the youth. Athena gave him her shield bright as a mirror so that he could approach the Gorgon without looking in her face, for all who gazed upon Medusa were instantly turned to stone. From Pluto he received the helmet which made him invisible. Hermes loaned him his winged sandals. Thus equipped Perseus was able to come upon Medusa while she slept and cut off her head.

Flying home he sought a night's rest with Atlas on the western edge of the world. Atlas however had been warned that a son of Zeus would steal the fruit of his gardens and refused him, whereupon Perseus turned the Gorgon's head toward him and left Atlas turned to stone. Continuing his journey, from above Ethiopia he saw a beautiful maiden chained to a rock in the sea. This was Andromeda, sacrificed to the sea monster sent by Poseidon to punish Cassiopeia's pride in her daughter. Perseus killed the beast and received Andromeda for his wife. Her uncle Phineus came to the wedding feast to take her from Perseus. But Perseus with the Gorgon's head turned him and his attacking band to stone and returned to Seriphos with his wife. He arrived in time to save his mother from the mistreatment of Polydectes. Again with Medusa's head he petrified the king and his court. After this he returned the gifts of the gods and gave to Athena the head of Medusa for her shield. Later in a game of quoits he accidentally killed an old man, one of the onlookers, who turned out to be Acrisius, his grandfather. Thus he fulfilled the prophecy that Danae's father would be killed by Danae's son. He refused the throne of Argos to which he fell heir by this mishap but exchanged it for another kingdom where he founded the city of Mycenae.

Phaedra (fē′dra), the wife of Theseus who fell in love with her stepson Hippolytus and to punish him for his indifference accused him to his father of trying to seduce her. The wrath of Theseus caused the death of Hippolytus, and Phaedra killed herself in grief and remorse. Racine based his tragedy *Phèdre* on this.

Phaethon (fā′e thon), the son of Helios the sun-god. He begged to be allowed to drive his father's great four-horse chariot across the sky. Helios reluctantly consented, doubting his strength. The boy soon lost control of the fiery horses; the chariot dipped too near the earth and scorched it, and the whole world would have been burned had not Zeus killed Phaethon with a thunderbolt. He fell into the river Po, where his sisters wept on the bank until they were changed into poplars.

Phaon (fā′on), a boatman of Mitylene, for whose love Sappho is said to have leaped from the Leucadian rock. Phaon is famous as the old and ugly boatman who would take no pay for ferrying an old and ugly hag over to Asia. The ugly hag proved to be Aphrodite in disguise; and out of gratitude she gave him youth and beauty.

Philemon. See *Baucis and Philemon*.

Phlegethon (fleg′ē thon), the river of fire in Hades.

Phoebe (fē′bē), name for Artemis.

Phoebus (fē′bus), a name for Apollo, apparently meaning shining.

phoenix (fē′niks), a fabulous bird, the Egyptian sun-god. It was large, very beautiful, always male and there were never two in the world at once. It was believed to live for 500 years. At the end of that time it built a nest in which it burned itself alive. From the ashes rose the new, young phoenix, who flew with the burned nest and ashes of his forebear to Egypt and deposited them on the altar of the sun-god.

Pied Piper of Hamelin, a gaily clad piper who rid the small town of Hamelin in Brunswick of a plague of rats. The town was overrun with them and the people were in desperate plight. The piper offered to rid the town of the rats, and the mayor promised him 1,000 guilders if he could do so. Up and down the streets he played his pipe and the rats came in hordes and followed him. He led them to the river Weser, and they all plunged in and were drowned. But when the piper claimed his reward, the mayor and the town council would give him only 50 guilders. So up and down the streets he piped again, and this time the children came running. Joyously they followed the merry music and the piper led them away to a door in a hill which closed behind them. And none of them were ever seen again. Robert Browning's poem has made this story famous.

pixy, pixie (pik′si), in English folklore a fairy or sprite who mischievously leads people astray.

Pleiades (plē′ya dēz), The seven daughters of Atlas: Alcyone, Celaeno, Electra, Maia, Merope, Sterope, Taygeta. They were raised to a constellation in the heavens after their death. Merope shines dimmer than the others, out of shame for having married a mortal.

Pluto (ploo′tō), in Greek mythology the god of the lower world: also called Hades. By the Romans he was called Dis. When the three sons of Cronus and Rhea cast lots for their kingdoms, to Zeus fell the heavens, to Poseidon the sea, and to Pluto the lower world. He was a stern god, without softness or pity. The music of Orpheus seeking Eurydice was the only thing ever known to have moved him. Persephone was his wife; Cerberus, his watchdog.

Plutus (ploo′tus), in Greek mythology the god of wealth. He was the son of Demeter and was thought to be blind because he bestowed wealth indiscriminately without consideration of merit.

Pluvius (ploo′vi us), an epithet of Jupiter. It means sender of rain.

Polyhymnia (pol i him′ni a), the Greek muse of sacred poetry and memory.

Polynices (pol i nī′sēz), a son of Oedipus. See *Eteocles*.

Polyphemus (pol i fē′mus), a Cyclops, a gigantic shepherd in whose cave Odysseus and twelve of his companions were shut up when they had been shipwrecked on the coast of Sicily. He devoured the men at the rate of two a day. Odysseus escaped only by getting the giant drunk, blinding his one eye with a burning torch and concealing himself beneath one of the sheep as the flocks left the cave to graze. Polyphemus loved the sea nymph Galatea. She spurned him for a shepherd boy named Acis, whom Polyphemus crushed under a huge rock.

Prometheus Brings Fire to Mankind

A bronze figure by Paul Manship, 18 feet high, in the Plaza of Rockefeller Center, New York

Polyxena (pō lik'sē n*a*), the daughter of Priam and Hecuba of Troy, beloved by Achilles. Achilles was shot in the heel by Paris while suing for her hand. His shade appeared demanding her of the Greeks after the fall of Troy; and she was slain on his tomb.

Pomona (pō mō n*a*), an ancient Italian goddess of fruit trees, beloved by Vertumnus.

Poseidon (pō sī'don), the Greek god of the sea and all waters. He was a son of Cronus and Rhea and brother to Zeus and Pluto. He lived in a golden palace below the sea and was the creator of storms or fine weather. He created the first horse and was worshiped as a god of horses. Wherever his trident struck the earth, either a horse or a spring sprang forth. Poseidon was on the side of the Greeks in the Trojan War because Laomedon of Troy had refused to pay him for building the walls of that city. The Romans identified him with their Neptune.

Priam (prī'am), the last of the Trojan kings. He had fifty sons and twelve daughters, among them Cassandra, Hector, Paris and Polyxena. He was killed by Neoptolemus, the son of Achilles, when Troy was taken.

Prometheus (prō mē'thūs), a son of the Titan Iapetus and a brother of Atlas and Epimetheus. In some stories Prometheus was the creator of mankind; and in all stories, the great culture hero, founder of civilization. He stole fire from heaven in a hollow fennel stalk and gave it to man, teaching him its many uses: how to melt up ores, to fashion tools, weapons and agricultural implements, to keep warm and to coin money. To punish him Zeus chained him to a rock on Mount Caucasus, where a vulture fed perpetually on his liver. It was renewed each night, only to be devoured anew each day. Zeus would gladly have freed him for the knowledge of the one secret that Prometheus withheld, for Prometheus was a prophet and knew by what means Zeus would be dethroned. (The name may mean forethought.) As Prometheus would not tell, he was doomed to bear his torment until some immortal was willing to die in his place. Chiron, the wise centaur, consented to do this; Hercules killed the vulture; and thus Prometheus was freed. Aeschylus celebrated the story in his tragedy *Prometheus Bound*. Shelley's poetic drama *Prometheus Unbound* tells the story of his liberation.

Proserpina (pro sûr'pi n*a*) or in English **Proserpine** (pros'ur pīn). See *Persephone*.

Proteus (prō tūs), a lesser Greek sea-god, tender of the flocks of Poseidon. He had great wisdom and could foretell the future. But he would not answer questions unless compelled to. When he was seized he would rapidly change from one terrifying shape to another—so protean means rapidly changing. But if his questioner held him fast, he would at last resume his own form and give the true answers.

Psyche (sī'kē), the youngest of a Greek king's three daughters, so beautiful that the people's mouths were full of her praises and the altars of Aphrodite herself became neglected. In jealousy Aphrodite told her son Eros (or Cupid) to inspire Psyche with love for the lowest of mortals. But at sight of her, the boy fell in love himself. He visited her only by night and warned her never to try to learn his name or to behold him. Their happiness might have continued, but Psyche could not resist the taunts of her sisters that her lover must be some hideous monster. And one night she brought a lamp so that she might see him while he slept. So great was her joy at his beauty that her hand shook and a drop of burning oil fell on his shoulder. He awoke and departed in reproach and anger.

Left alone, Psyche wandered through the world seeking her lost love. Aphrodite imposed on her many difficult and impossible tasks, which she performed only with the help of the gods. The last was to bring from Hades some of the beauty of Persephone in a box that she was forbidden to open. She opened it, of course, hoping to make herself more beautiful for her lover. But the box contained only a deep and senseless sleep, which took possession of her and from which she was saved only by Cupid himself. At last in answer to Cupid's prayers, Zeus gave her immortality and the lovers were reunited forever.

In Greek the word *psyche* means soul. And the story of Cupid and Psyche is often considered an allegory of the soul in search of love, taught by suffering and attaining true happiness at last.

puck (puk), in English folklore a hobgoblin, usually of evil intent. In medieval times he became merely a mischievous fairy, often called Robin Goodfellow. The Puck of Shakespeare's *Midsummer Night's Dream* was a mischievous fairy, a servant of Oberon.

Pygmalion (pig mā'li on), a king of Cyprus and a famous sculptor. He fell ardently in love with the statue of a beautiful maiden that he had carved; and Aphrodite heard his prayers and gave the statue life. The statue was named Galatea. *Pygmalion and Galatea* is the title of a comedy by W. S. Gilbert. William Morris's poem *Earthly Paradise* also tells the story, and G. B. Shaw wrote a drama *Pygmalion*.

Pyramus (pir'*a* mus) and **Thisbe** (thiz' bē), a pair of lovers in ancient Babylon whose parents would not consent to their marriage. They plighted their troth through a chink in the high wall which separated the two houses. One night they agreed to run away and planned to meet outside the walls of the city beneath a mulberry tree. Thisbe arrived first. Terrified by a lion, she ran and hid in a cave. But she dropped her veil, which the lion trampled and smeared with his blood-stained jaws. When Pyramus arrived and saw the veil, he thought Thisbe was dead and killed himself with his sword. When Thisbe ran out of the cave and saw Pyramus dying, she fell upon his sword and died with him. Forever after the mulberry tree bore only red fruit. This tragic story is grotesquely played by Bottom and others in Shakespeare's *Midsummer Night's Dream*.

Pyrrha (pir'*a*). See *Deucalion*.

Pythias (pith'i as). See *Damon*.

Python (pī' thon), in Greek mythology the great serpent born from the mud and slime which covered the earth after the Great Deluge. It lay in a cave on Mount Parnassus, and there Apollo killed it.

Ra (rä) or **Re** (rā), the supreme god of Egyptian mythology, the god of the sun.

Ragnarok (rag'n*a* rok), in Norse mythology the end of the world and all the gods. It was the day of the great battle between the Aesir and the powers of Hel and Loki. Odin was killed by the wolf Fenrir, who in turn was slain by Vitharr, Odin's son. Thor and the Midgard Serpent fought to the death. Tyr and Garm, the watchdog of Hel, destroyed each other. Loki and Heimdall fought until both were killed. Surt, the chief of the giants, killed Frey. The sun and the earth fell into the sea, and the sky was consumed by fire. But Balder returned from the realm of the dead. Two mortals named Lif and Lifthrasir (Life and the Desire of Life) survived to repeople the world; and a new and happier era was born.

Rahu (rä'hoo), in Hindu mythology the demon dragon who followed the sun and moon about the sky. Whenever he caught one of them he swallowed it and caused an eclipse.

Remus. See *Romulus*.

Reynard the Fox (ren'ērd), the hero of a series of beast fables or bestiaries widespread through France, Germany, Holland and England in the Middle Ages. The most ancient redaction known was written in Latin in Flanders about 940. Scholars (especially the Grimm brothers) testify that the fables are rooted in very ancient Teutonic true animal folklore—that is, the animals did not originally typify men. The Reynard fables, however, were satires or parodies on chivalry, the government and the nobles, the church, monks and nuns. The characters are: Reynard the fox, Bruin the bear, Noble the lion, Baldwin the ass, Tibert the cat, Isengrim the wolf, Grimbert the badger, Chanticleer the cock, Partlet the hen and various others. In all the versions Reynard typifies all that is shrewd and crafty in man or society. He is self-seeking and thoroughly unscrupulous, brought to judgment but escaping his just deserts by his foxiness.

Rhadamanthus (rad *a* man'thus), a son of Zeus and Europa. So great was the justice of his own life that after death he was made one of the judges in Hades, along with Minos, his brother.

Rhea (re'*a*), a Titan, daughter of Uranus (heaven) and Gaea (earth), sister and wife of Cronus and mother of the gods. She was also known as Cybele.

Rhinegold or **Rheingold** (rīn'gōld), the cursed treasure of the Nibelungs.

Robin Goodfellow. See *Puck*.

Robin Hood, the romantic outlaw of English ballad and legend who lived with his merry men in Sherwood Forest, robbing the rich to help the poor. He was a yeoman and the idol and ideal of the common people; a hunter and an archer of marvelous skill, fearless and free, merry, lusty, generous and chivalrous and swift to right injustice. His true story is an unsolved riddle, but there is now little doubt that there was a Robin Hood. Perhaps he was one of the earls of Huntingdon, born at Locksley in Nottinghamshire in the 12th century. He figures as Locksley in Scott's *Ivanhoe*.

roc (rok), in Arabian folklore a bird of prodigious size and strength. It fed its young on full-grown elephants. In the *Arabian Nights* a roc that bore Sindbad the sailor out of the Valley of Diamonds.

Roland (rō'land), the nephew of Charlemagne and the most famous of his paladins. The *Chanson de Roland* celebrates his friendship with Oliver, whom he met first as an adversary in battle. The two were so equal in arms that neither could defeat the other, and in mutual admiration they became brothers and companions. From this story comes the phrase "a Roland for an Oliver" meaning worth for worth. In 778 in Charlemagne's expedition into Spain against the Saracens, Roland distinguished himself as a champion of Christianity. When the army was returning through the Pyrenees, Ganelon, the traitor, had Roland put in charge of the rear guard. In the pass at Roncevaux they were set upon by a horde of Saracens and were outnumbered and destroyed. The main army was already far in advance, but not beyond the sound of Roland's magic horn, called Olivant. Three times Oliver begged him to sound the horn for help; but Roland wanted the glory of the fight for themselves and would not blow the call for relief until it was too late, and they were slain. But at last when Charlemagne heard Olivant calling and hastened back to find his favorite warriors dead, he fell with wrath upon the Saracen army and destroyed it to a man. Ganelon was examined and discovered in his treacherous scheme and put to death.

Romulus (rom' ū lus), the legendary founder and first king of Rome. He was the son of Mars and Ilia and the twin of Remus. The two infants were cast into the river Tiber by Amulius, Ilia's uncle, who had usurped her father's throne. The twins were found and suckled by a she-wolf and fostered by wild hill shepherds. In later years they found their grandfather and restored him to his throne after they had killed Amulius. They decided to found a new city on the spot where the she-wolf had found them; and Romulus, of whom it was foretold that he would be the first king, laid the first stones. When Remus laughed and leaped over them, Romulus in anger killed him for his ridicule.

Round Table, the great table of King Arthur around which all the knights could sit in equality without dispute of precedence or honor. The most ancient Celtic stories ascribe marvelous powers to it: It could seat 1,600 knights, yet Arthur could fold it up and carry it with him. Later legend says Merlin made it for Uther Pendragon, Arthur's father, and that Arthur continued the order of knights already established round it. A still later story says that Merlin made it for Arthur with thirteen seats, and that in the thirteenth, the Siege Perilous, no man could sit and live except the one knight destined to achieve the quest of the Holy Grail. There is a huge round table fixed in the hall of Winchester Castle (Camelot) with 25 seats, and local legend holds that this was the famous board of the Arthurian legend.

St. George, the patron saint of England. He was a Roman soldier beheaded by Diocletian in 303 for adhering to Christianity. He was adopted as the patron saint of England by Edward III after the crusades. The legend of his slaying a dragon probably symbolizes the conquest of evil, as it does in many paintings of saints.

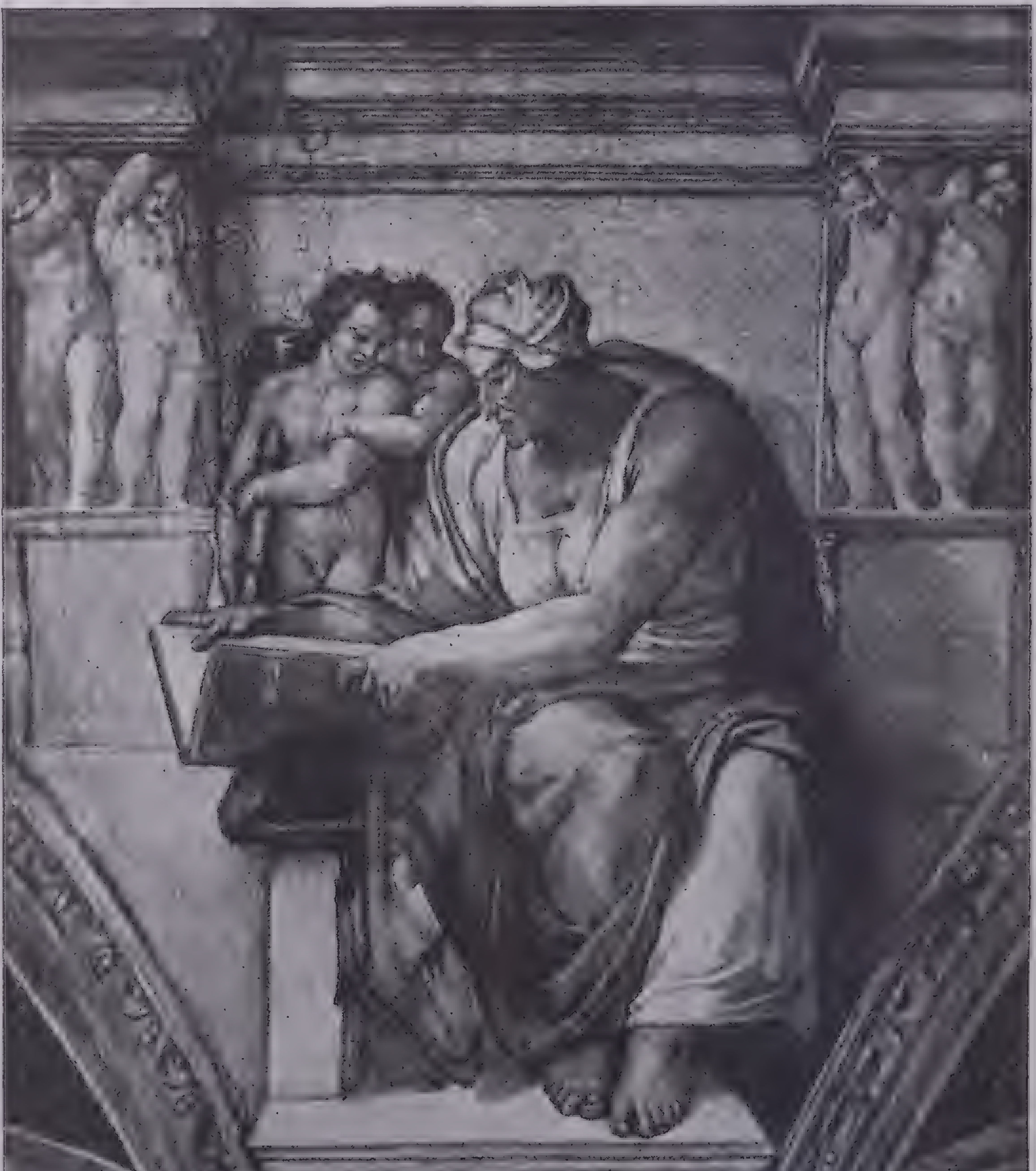
St. Nicholas (nik'ọ̄ l*a*s), the patron saint of Russia, and of children, sailors and thieves. He was a bishop of Myra in Asia Minor in the 4th century. As the guardian of children and bestower of gifts at Christmas time, his name has become Santa Claus.

Santa Claus (san't*a* klôz). See *St. Nicholas.*

Satan (sā'tan). See *Devil.*

Saturn (sat'ẽrn), an ancient Italian god of seedtime and agriculture. His reign of peace and happiness was called the Golden Age.

satyr (sat'ẽr), in Greek mythology a minor woodland god, having human form but the tail and ears of a horse. Roman mythology depicted satyrs as faunlike, with the horns and legs of a goat. They were companions of Dionysus, ever gay and making merry.



Courtesy Metropolitan Museum of Art

The Cumaean Sibyl by Michelangelo

Sibyls and prophets alternate in Michelangelo's great series of frescoes on the ceiling of the Sistine Chapel, Rome. The sibyls pictured are the Erythraean, Delphic, Persian, Cumaean and Libyan

Scylla (sil′*a*), a nymph who was turned into a monster and became a perilous rock in the strait between Italy and Sicily, opposite the whirlpool Charybdis. She was loved by the sea-god Glaucus, who implored the enchantress Circe for a charm to melt her indifference. But Circe herself fell in love with Glaucus and in jealousy poisoned the bath of Scylla with herbs. The maiden was terrified in the pool to find herself suddenly surrounded by barking and gaping jaws. She tried to run, only to discover the monsters were part of herself. In despair she hurled herself into the sea and forever after was avoided as a danger to ships and sailors.

Selene (sē ′lē′nē), the Greek goddess of the moon, like Luna in Roman mythology. She was the daughter of Hyperion, sister of Helios the sun and Eos the dawn. She was loved by Pan, but herself loved the shepherd boy Endymion, to whom she gave the gifts of perpetual youth and perpetual sleep. In later mythology she became identified with Artemis (Roman, Diana).

Semele (sem′e lē), a daughter of Cadmus, beloved by Zeus, by whom she became the mother of Dionysus. Zeus had promised to grant whatever she might ask, but when Semele asked to behold him in the glory in which he appeared before the gods, he warned her not to persist in the perilous wish. She insisted, however, and was consumed by his lightning; but Zeus saved the infant Dionysus.

Set (set), the Egyptian god of evil, called Typhon by the Greeks. He killed his brother Osiris.

Seven Against Thebes. See *Eteocles.*

Seven Sleepers of Ephesus (ef′e sus), seven Christian youths of Ephesus in Asia Minor. In 250 A.D. Decius, Emperor of Rome, ordered all Christians to renounce their faith or be put to death. The seven youths fled from the torturers and hid in a cave in the mountains. But they were followed, and Decius ordered them to be walled up alive. A miraculous sleep fell upon them from which they were awakened about 200 years later by a shepherd who found the cave and rolled away the rocks from the entrance. One of the seven went into the town to buy food. He attracted attention by his ancient style of dress or his ancient money and was taken before a magistrate and questioned. He told his story and led the people to the cave where his companions were found alive and young. When the Emperor Theodosius II heard the story, he came to the cave to see with his own eyes. The youths told him they were a sign to him to believe in the resurrection, and again they fell into a sleep to last until the Judgment Day.

sibyls (sib′ilz), inspired prophetesses of classical mythology. Of ten sibyls the Cumaean, the Delphian and the Erythraean were the most famous. Apollo fell in love with the Cumaean sibyl and offered to grant any wish she might name. She asked to live as many years as there were grains of sand in her hand, but forgot to ask for youth to last the years. When Aeneas came to her for guidance to find his father in the lower world, she was already 700 years old. More and more shriveled she grew with the centuries until only her prophetic voice remained. At one time she went to Tarquin Superbus, a legendary king of Rome, and offered him nine prophetic books for a certain price. He refused to buy them, whereupon the sibyl burned three and offered him the remaining six for the same price. Again he refused. She burned three more. Then Tarquin was afraid they would all be destroyed and he paid the whole price for the remaining three. These Sibylline Books contained prophetic sayings written by the sibyl. They were kept in the temple of Jupiter at Rome and consulted in times of national danger. They were lost when the Capitol burned, 82 B.C.

sid or **sidhe** (shē), the fairyfolk of Ireland.

Siege Perilous, the seat at Arthur's Round Table in which it was perilous for any knight to sit except the one destined to achieve the quest of the Holy Grail. When Galahad, son of Lancelot, arrived at Arthur's court, the people marveled to see him take his place unharmed in the Siege Perilous.

Siegfried (sēg′frēd), in the *Nibelungenlied* the hero who won the treasure of the Nibelungs, the magic sword Balmung and a cap that made him invisible. He helped Gunther win Brünnhilde, queen of Iceland, for wife; and he himself married Kriemhild, the sister of Gunther. Siegfried was killed by Hagen for the sake of the Rhine gold treasure.

In Wagner's operas *The Valkyrie* and *Siegfried,* Siegfried was the son of Siegmund. He broke through the magic fire where Brünnehilde slept on her mountain and won her but drank a magic drink and forgot her to marry Gudrune. He gave Brünnehilde to Gunther. Siegfried was killed by Hagen who coveted the magic ring of the Nibelungs, which Siegfried wore. Brünnehilde had helped to plot this slaying in order to die with him on his funeral pyre.

Sigurd (zē′goort), in the *Volsunga Saga* the hero who killed the dragon Fafnir, loved and won Brynhild, forgot her by a magic drink and married Gudrun, giving Brynhild for bride to Gunnar. He was killed by Gunnar's brother and Brynhild killed herself to join him. Sigurd in the Norse myths corresponds to Siegfried in the *Nibelungenlied.*

Silver Age, in classical mythology the second age of the world, following the perfect Golden Age and preceding the Bronze Age. Zeus ruled during the Silver Age and divided the year into seasons. Then men first knew cold and heat and learned to plow and toil for livelihood. They lost the innocence and unmixed happiness of the Golden Age. They took on pride, and their reverence for the gods grew so dim that Zeus destroyed the whole race.

Sindbad the Sailor (sind′bad), in Arabian folklore and especially in the *Arabian Nights* a young man of Bagdad who lost his wealth and set out on a series of voyages. He had many marvelous adventures. He built a fire on a floating island that turned out to be a whale. He barely escaped from cannibals in one land and came to another where his companions were driven mad from eating the native food. These adventures are like Odysseus' escape from the Cyclops and his visit to the Lotus Eaters. Sindbad married in a strange land and was buried alive with his dead wife but escaped at last from the caverns of the dead. The most famous of his adventures are those with the roc and the Old Man of the Sea.

sirens (sī′renz), in Greek mythology a group of sea nymphs whose singing was so sweet that sailors, hearing it, leapt into the sea and were drowned. Homer says there were two sirens; later writers mention three. Odysseus, being warned against them by Circe, plugged the ears of his sailors with wax and had himself lashed to the mast with orders to his men not to unloose him no matter how desperate his signals. Thus Odysseus and his companions sailed safely by. The Argonauts escaped them only because Orpheus was on board and played the sweeter and more magical music. After these failures, the sirens drowned themselves.

Sirius (sir′i us), in Greek mythology the dog of the hunter Orion, set in the heavens as a star, and called the Dog Star.

Sisyphus (sis′i fus), in Greek mythology a wily king of Corinth, husband of Merope. His punishment in Hades was to roll a huge rock to the top of a hill. Just before he reached the top, it would roll down again, and Sisyphus would have to begin his labors anew.

Siva (sē′v*a*) or **Shiva** (shē′v*a*), the third god of the supreme Hindu triad, the destroyer. He personified not only the powers of destruction but the regeneration and restoration also, which according to Hindu philosophy, always follow after destruction. He was god of the arts: letters, music and especially dancing. His images often represent the cosmic dancer.

Sleipnir (slāp′nēr), in Norse mythology Odin's swift eight-legged horse that could outrun the wind.

sphinx (sfingks), in Greek mythology a winged, woman-headed monster who preyed upon the citizens of Thebes. (The strange word seems to mean strangler). She devoured them at the rate of one a day. She would ask a riddle of anyone she met and devour him if he could not answer it. An oracle foretold that if once the riddle were answered, the spell would be broken and the sphinx would kill herself. Oedipus in his wanderings came to Thebes and was stopped. "What creature walks on four legs in the morning, two at noon and three in the evening?" the sphinx asked. "Man," said Oedipus, explaining that a babe creeps, a grown man walks upright and the aged totter on a stick. The sphinx at once dashed her head against a stone and died, and Oedipus received the reward offered by the king.

The Greek sphinx had nothing to do with the Egyptian statues called by the same name.

Styx (stiks), the principal river of Hades, believed to encircle the lower world seven times. Over this river Charon ferried the souls of the dead. It was held in such terror and reverence that even the gods swore their irrevocable oaths by its name.

Syrinx (sir′ingks), in Greek mythology a water nymph of Arcadia who fled from the love of Pan. She was transformed into the reeds from which he fashioned the panpipe, which he named for her.

Tannhäuser (tän′ hoi zẽr), in German legend a knight and minnesinger of the 13th century whose wanderings led him to the Venusberg, a mountain in Germany. There he beheld a beautiful woman who lured him into a cave. It was Venus, and for seven years he lived with her in her enchanted land of pleasure within the mountain. At length he repented, left the court of pleasure and made a pilgrimage to Rome to seek forgiveness of his sins. But Pope Urban told him that he could no more be forgiven than the dead staff in his hand could put out leaves. In despair Tannhäuser turned away, forgetting his staff, and returned to the Venusberg. In a few days the dry staff miraculously bloomed, and the Pope sent messengers far and wide seeking Tannhäuser with a message of forgiveness. But he was never found.

Tantalus (tan′t*a* lus), a son of Zeus and father of Pelops. For his offenses against the gods, he was condemned after death to stand in water up to his chin. Whenever in his great thirst he tried to drink, the waters would rush away. Luscious fruits hung low over his head, but whenever he reached for them they were suddenly withdrawn. From the story of Tantalus comes the word *tantalize.*

Tartarus (tär′t*a* rus), in Greek mythology the lowest and deepest of the regions of Hades, reserved for the torments of the wicked.

Telemachus (te lem′*a* kus), the son of Odysseus and Penelope; he went in search of his father, who did not return from the Trojan War. He did not find him, but returned to Ithaca in time to help Odysseus and Eumaeus destroy the suitors who surrounded Penelope.

Themis (thē′mis), an ancient Greek goddess often identified with Gaea, earth. She was the mother of Prometheus. Hesiod calls her a daughter of Uranus and Gaea and mother of the Fates. She personified justice, and her name is Greek for justice, order, right.

Theseus (thē′sūs), a son of Aegeus, King of Athens. He was brought up in the house of his mother in Troezen and when of age went to seek his father. On the way he had many adventures, of which the most famous was his slaying Procrustes, who had only one bed and used to fit all guests to it by cutting them or stretching them to its length. Aegeus was at that time married to Medea, who tried to persuade her husband to poison the stranger when he appeared at his court. But Aegeus recognized his son by the sword at his side and proclaimed him the heir to his throne. Theseus volunteered to free Athens from the yearly tribute of youths and maidens it paid to the Cretan Minotaur. With the help of Ariadne, by whose clue he threaded the labyrinth, Theseus killed the Minotaur and won and carried off Ariadne. He had promised his father that the ship, which put out for Crete under the black sails of mourning, should return under white sails if he had been successful. But he forgot his promise, and when the old king, watching for his son from a high cliff, saw the black sails returning from the sea, he hurled himself down in grief from the cliff and was killed.

Then Theseus, King of Athens, went against the Amazons and married their Queen Hippolyte by whom he had a son Hippolytus. After her death he married Phaedra. His friendship with Pirithous, a king of the Lapithae, is one of the most famous friendships of story. Theseus helped him in the battle of the Lapithae with the centaurs at the time of his marriage to Hippodamia, and when she died, followed his friend to Hades to help him carry off Persephone. But they were caught by Pluto and chained to a rock. Hercules eventually came and freed Theseus but Pirithous had to remain in the lower world. Theseus was killed by Lycomedes, King of Scyros, who pushed him into the sea.

Thetis (thē′tis), one of the nereids, the wife of Peleus and mother of Achilles.

Thisbe. See *Pyramus.*

Thor (thôr), in Norse mythology, the god of thunder, a son of Odin. He was the god of strength and a defender in time of war, a friend of humanity but a stern enemy of the giants. The sound of thunder was from the rolling wheels of his chariot; the thunderbolt was his hammer, which always returned to his hand after being hurled. Thor and the Midgard Serpent killed each other at Rognarok, the last day of the world. Thursday is Thor's day.

Thoth (thōth; tōt), the Egyptian god of wisdom and magic, who invented letters and numbers and was the scribe of the gods.

Titans (tī′tanz), the children of Uranus and Gaea. The sons were Oceanus, Cocus, Crius, Hyperion, Iapetus and Cronus. The daughters were Thea, Rhea, Themis, Mnemosyne, Phoebe and Tethys. The children of Cronus and Rhea were Zeus and the Olympian gods. Cronus dethroned Uranus, and Zeus dethroned Cronus. In this struggle the Titans fought against the gods, were defeated and confined under Tartarus.

Tithonus (ti thō′nus), a son of Laomedon, the founder of Troy. Eos fell in love with him and used her influence with the gods to make him immortal, but she forgot to ask for eternal youth. When he grew old and ugly, she changed him into a grasshopper.

Tom Thumb, in English ballad and legend the inch-high son of a plowman in the time of King Arthur. Once he was swallowed by a cow and once by a giant. He rode in a horse's ear, hid in a cheese and escaped pursuit through a keyhole. He fell into the sea and was swallowed by a fish, which was caught and taken to King Arthur's cook. The cook saved his life, and he was presented to the king and knighted He was killed in the end by a spider.

Tristram (tris′tram). See *Iseult.*

Triton (trī′ton), a merman of Greek mythology, son of Poseidon, usually represented as blowing on a conch shell to raise or calm the waves.

Trojan War (trō′jan), in Greek legend the war in which Agamemnon, brother of Menelaus, led the Greeks against Troy to recover the beautiful Helen, whom Paris had carried off. They besieged the city for ten years and finally entered it by the ruse of the Wooden Horse. This is the war celebrated in the *Iliad;* in Greek the city was called Ilium.

troll (trōl), in Teutonic folklore a supernatural being, either gigantic or dwarfed and misshapen, conceived of as malignant and to be avoided.

Troy. See *Trojan War.*

Tuatha de Danann (thōō *a* ha dā dȧ′nan), the ancient Irish gods, literally the people of Danu. They invaded Ireland in clouds of mist and defeated the Fomors in the great battle of Moitura. When they were defeated by the Milesians, the Tuatha de Danann went to the fairy land of youth and became the *sid,* the fairyfolk of Ireland.

Typhon (tī′fon), in Greek mythology the hundred-headed fire-breathing giant, son of Tartarus and Gaea. He was thought to be the creator of dangerous winds. He made war against the gods, was struck down by the thunderbolt of Zeus and confined under Mount Aetna, whose volcanic eruptions were long thought to indicate Typhon's struggles for freedom.

Tyr (tür), in Norse mythology, the war-god, a son of Odin; in Teutonic mythology, called Tiu (tē′ ōō).

Ulysses (ū lis′ēz), the Latin form of Odysseus.

Uranus (ū′r*a* nus), in Greek mythology the personification of the sky or heaven, wedded to Gaea, earth, and father of the Cyclops, Furies and Titans. He was dethroned by his son Cronus.

Uther (ū′thẽr), a legendary king of Britain and father of King Arthur. See *Merlin.*

Valhalla (val hal′*a*), the great hall of Odin in Asgard, where the souls of heroes slain in battle were received with rejoicing and honor. The word means hall of the slain. There they fought and hewed each other to pieces for the glory of eternal battle and were forever restored to partake of eternal feasting and merrymaking.

Valkyries (val kir′ēz), in Norse mythology the war maidens, messengers of Odin. They rode through the air above the scene of battle, selecting the warriors worthy to be slain and carrying them to Valhalla. The name probably meant choosers of the slain.

vampire (vam′pīr), in European folklore the ghost or risen body of a dead person who returns at night to suck the blood of the living.

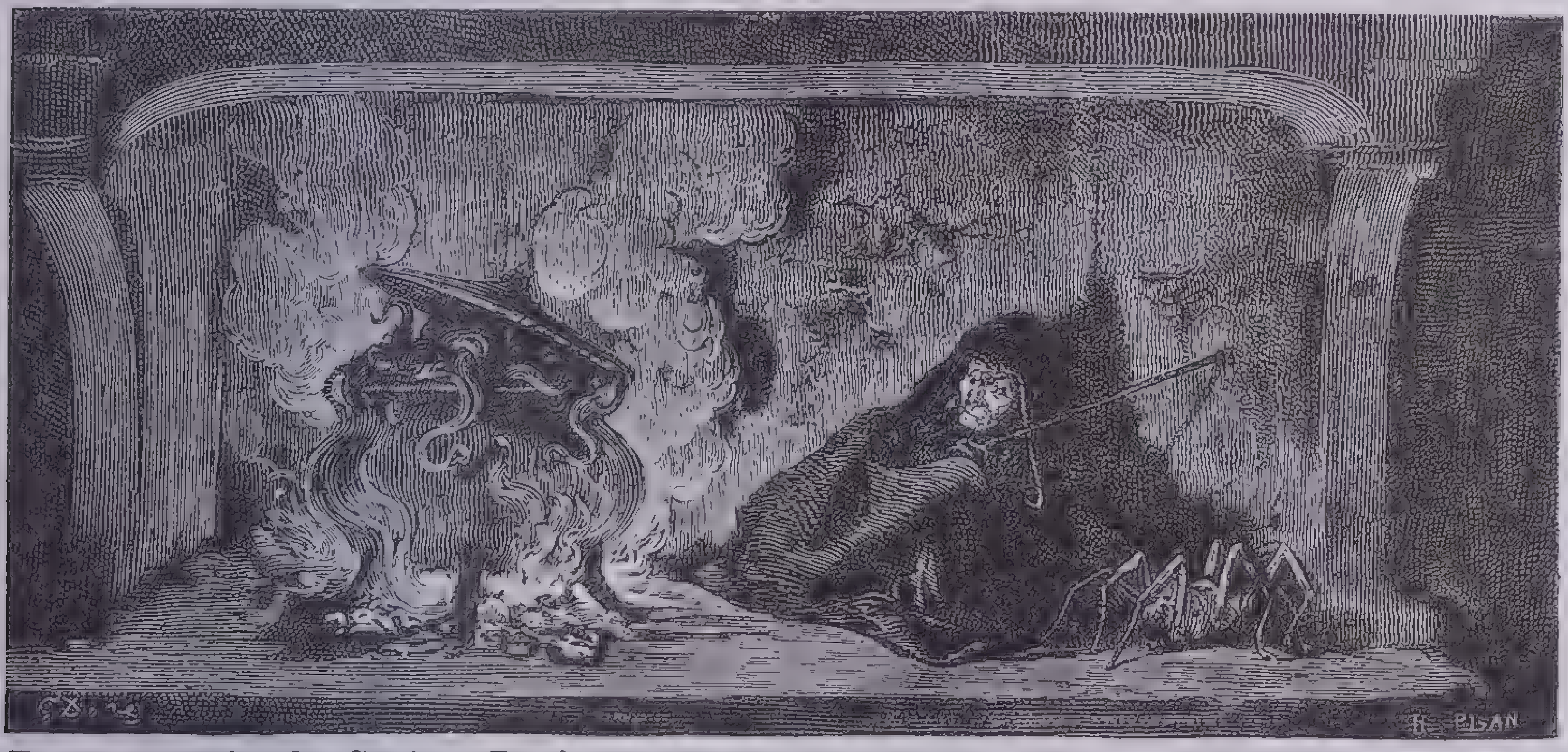
Vanir (vä′nir), a race of Teutonic gods more ancient than the Aesir. They were gods of the air, and among them were Njorth, Frey and Freya, who were later counted among the Aesir.

Venus (vē′nus), an ancient Roman goddess of beauty, thought especially to preside over the beauty of nature and gardens. She was not a goddess of love until she became identified with the Greek Aphrodite.

Vesta (ves'*t*a), the Roman virgin goddess of the fire and hearth, not only for the home but for the state. The fire in her temple was never allowed to go out and was tended by a group of six virgins, chosen for their beauty and lineage. They were sworn to thirty years of vigilance and chastity, and were buried alive if they broke their vows. Vesta was identified with the Greek Hestia.

Vishnu (vish'nōō), the second god of the supreme Hindu triad, the preserver. The name means the worker, the active one. He dwelt on earth in nine incarnations or avatars, of which the most famous were as Matsya, the fish that saved Manu from the deluge; Krishna, the warrior who saved mankind from tyrants; Rama, who killed the giant Ravan, enemy to gods and men. It is believed that his tenth incarnation is still to come. This will be Kalki, who will save humanity from the present age of wickedness.

Vivian (viv'i an), in Arthurian legend, the lady love of Merlin. See *Lady of the Lake.*



From a drawing by Gustave Doré

The Witch Watches as the Magic Brew Boils in the Caldron

Vulcan (vul'kan), in Roman mythology, the god of fire and metal working; identified with the Greek Hephaestus.

Walpurgis Night (väl pŏŏr'gis), in German folklore the eve of May 1st (May Day), when the devil and the witches were believed to hold a riotous festival on the Brocken peak in the Harz Mountains. Goethe's *Faust* has a famous scene describing Walpurgis Night.

Wandering Jew, in medieval legend a Jew who mocked and laughed at Jesus on his way to the cross. He was condemned to wander on the face of the earth until the second coming of Christ. The legend is the subject of a poem by Goethe and a novel by Eugene Sue.

Wayland (wā'land) **the Smith,** the supernatural blacksmith of Teutonic and English legend; the Volundr of the Norse Eddas and the Wieland of German epic. He forged the famous magic sword Mimung with which Hoder killed Balder. He is a character in Scott's *Kenilworth.*

werewolf (wēr'woolf), in very ancient and almost world-wide folklore a human being turned wolf in form and nature. The change took place by enchantment imposed from without or by the will and power of the person himself because he desired to eat human flesh. He would prey upon his victims in wolf form by night and assume human shape again by day. In countries like India where the Tiger, instead of the wolf, is the natural enemy of man, the were-animal is a tiger. In South America it is the jaguar.

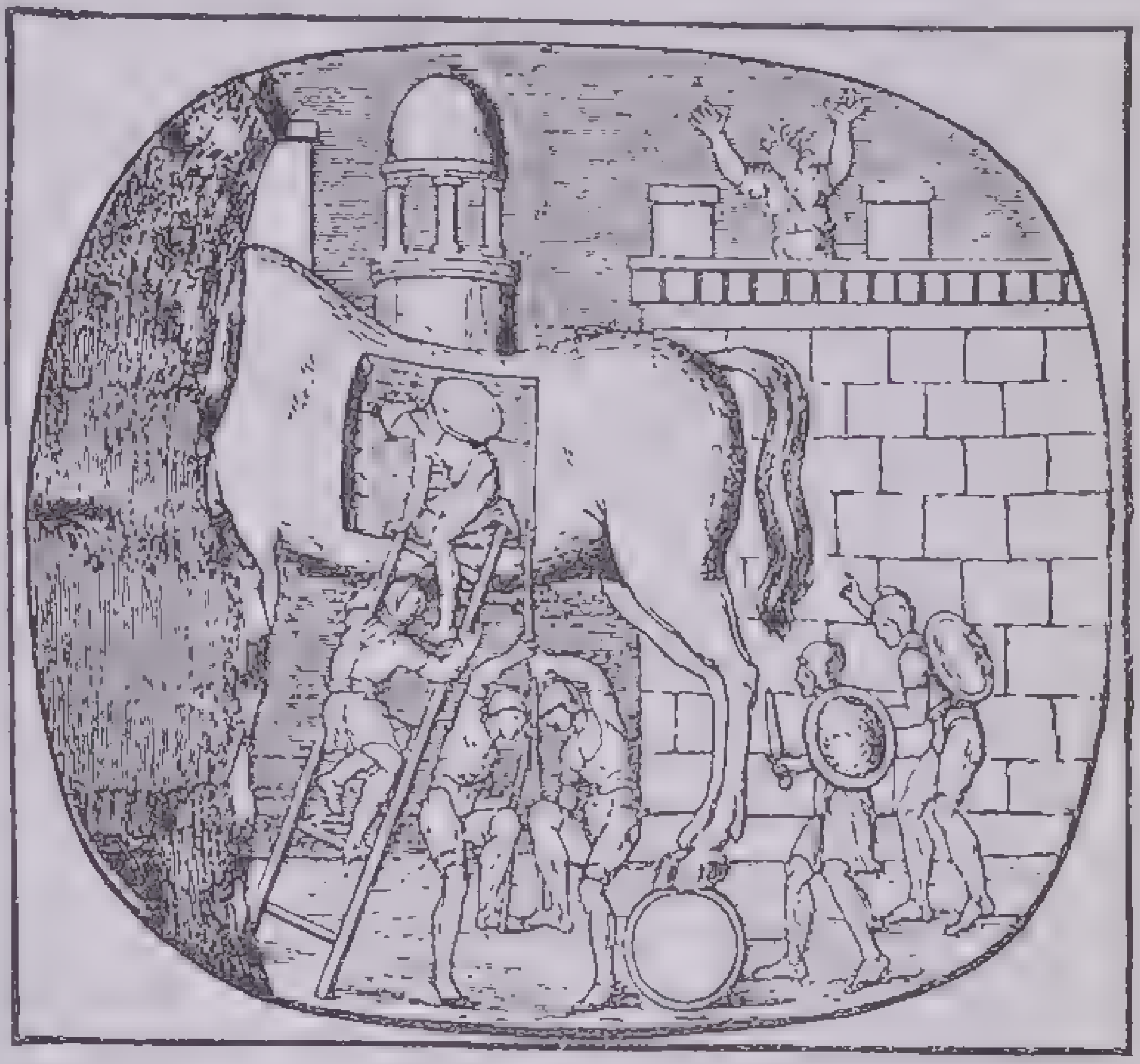
William Tell, a legendary Swiss patriot about the 14th century. He would not do obeisance to the cap of Gessler, an Austrian governor, which had been elevated on a pole for the people to honor. He was arrested and ordered to shoot at an apple placed on the head of his own son. This he did with such true marksmanship that the boy was unhurt. Then with unbelievable swiftness he drew a second arrow and shot Gessler. Thus the people were encouraged to rise against the Austrians. This story is the subject of a tragedy by Schiller and of an opera by Rossini.

witch (wich), a human being with magical knowledge and powers; a sorcerer or sorceress. Belief in witches and wizards and their power to work spells goes back to the most primitive beginnings of all races. In medieval times witches were believed to be in league with the devil, and people suspected of witchcraft were hunted down and put to death in Europe and America well into the 18th century.

Witches were supposed to be able to foretell future events with the help of various animals known as their "familiars." They cast spells and charms, both good and evil, by means of magic words and motions and the use of symbolic objects.

Woden (wō'dn), the Anglo Saxon (Old English) form of the Norse name Odin.

Wooden Horse of Troy, the great image of a horse offered as a gift by the Greeks to the Trojans, the trick by which they entered Troy. Outside the walls of the city they built a horse hollow and huge enough to hold an army. They filled it with warriors and then departed as if to embark for Greece. One of their number, Sinon, gave himself up to the Trojans and then urged Priam to accept the gift, assuring him it was left in exchange for the Palladium, which Odysseus had stolen from its place in the city. Then the Trojans dragged the monstrous gift inside the walls. Sinon at night released the Greek warriors, who took and burned the city.



The Wooden Horse of the Trojan War

From an engraving on a Greek gem

Yggdrasil (ig'dr*a* sil), in Norse mythology, an ash tree, the great world tree binding together heaven and earth and hell. It was rooted in hell, where a dragon forever gnawed at the roots. Its trunk supported the world and the top of it reached beyond heaven. It was the tree of life; and it was the tree of knowledge, for Mimir's well of wisdom sprang from its roots. It was the tree of fate, for beneath it sat the Norns presiding over human destiny. An eagle sat in the top and the squirrel Ratatook ran up and down it, carrying strife.

Zephyrus (zef'i rus), in Greek mythology, the personification of the west wind; called Favonius in Latin.

Zeus (zūs), the supreme god of Greek mythology; identified with the Roman Jupiter. Zeus was the youngest son of Cronus and Rhea. Rhea saved him from being devoured by his father and gave him into the keeping of her priests on Mount Ida in Crete. With the sound of their cymbals they drowned the baby's crying and prevented Cronus from discovering him. When he was grown, he overthrew his father and established the Olympian gods, his brothers and sisters, who had been swallowed at birth by Cronus. He married his sister Hera and had many human loves. Zeus was primarily king of the gods and heaven, the sky-god and especially the thunder-god. The thunderbolt was his weapon, and he was worshiped on mountain tops. His worship later took on moral and social aspects and eventually embodied legal and political ideas as well. Zeus was god and protector of the state. He was god of personal and public oaths; murder was abhorrent to him. In his final religious and spiritual aspect, he was regarded as father and creator of the world and men.

BOOKS, PERSONS AND PLACES OF THE BIBLE

Introduction.—The Protestant Bible is a collection of sixty-six books. With these, the Roman Catholics include a number of other books, called collectively the *Apocrypha*. When the early Christians were deciding whether a book should be included in the Canon, that is, whether it should be included with the books of the Old Testament that they regarded as the inspired Word of God, or whether it should be regarded as profitable for reading but not inspired and therefore placed in the Apocrypha, they determined the matter by certain tests. These were: whether the book was written in Hebrew; whether it dated back at least as far as the time of Nehemiah; and whether it was mentioned in the New Testament. The books of the Apocrypha are those that did not qualify in one or another of these tests.

The first thirty-nine books of the Protestant Bible compose the *Old Testament*, while the *New Testament* consists of the remaining twenty-seven books and carries the record on from the birth of Christ to about the end of the first century A.D. The material in the Bible was composed at different times during a period of more than a thousand years. The Old Testament was written almost wholly in Hebrew, the New Testament wholly in Greek. The Authorized or King James Version of the Bible in English was completed in 1611. The Revised Version, made during 1881–85, is based upon the King James Version, but is a more accurate translation.

In looking up any name in the following list, if the student does not at once realize the relation of what is said to the general course of events, he should turn to the brief sketch of the history, which is given under the heading *Israel*, because the name Israel more than any other stands for the great tradition of which the Bible is the incomparable and monumental record. The purpose of the individual entries, which are arranged in alphabetical order, is to state the most familiar associations concerned with each name, without reference to any religious lesson to be derived, or to the opinions of scholars regarding authorship and other such questions.

Reference and Abbreviations.—A reference is to the chapter in which occurs the first important mention of the name. When the number of a verse is added, it follows a colon. Thus, "II Kings 6:8" means the eighth verse of the sixth chapter of Second Kings. The abbreviations used are the familiar ones, such as: O.T. for Old Testament; N.T. for New Testament; Gen. for Genesis; Ex. for Exodius; Dt. for Deuteronomy; Sam. for Samuel; chap. for chapter; *c.* for *circa* (Latin for "about").

Aaron, brother of Moses, the first high priest and ancestor of the priests and high priests of Israel. He was spokesman for Moses in appealing to Paraoh (Ex. 7). In the wilderness, when Moses was on Mount Sinai, Aaron set up a golden calf for the people to worship (Ex. 32). He died on Mount Hor (Num. 20).

Abel, a shepherd, second son of Adam and Eve. God accepted his sacrifice but not that of his brother Cain, at which Cain grew angry and killed Abel (Gen. 4).

Abigail, wife of Nabal and later of David (I Sam. 25).

Abner, a general of King Saul and later of David (I Sam. 17).

Abraham or Abram (meaning exalted father or "father of a multitude"), founder of the Hebrew race and the first patriarch; he was born in Ur, a city in Chaldea. Divinely called to be the founder of a new nation, he migrated to Canaan and was exceedingly prosperous.

Absalom, son of David, rebelled against his father but was defeated in battle. When he tried to escape, "Absalom was riding upon his mule, and the mule went under the thick bows of a great oak, and his head caught hold of the oak, and he was taken up between heaven and earth; and the mule that was under him went on" (II Sam. 18:9). He was found and killed.

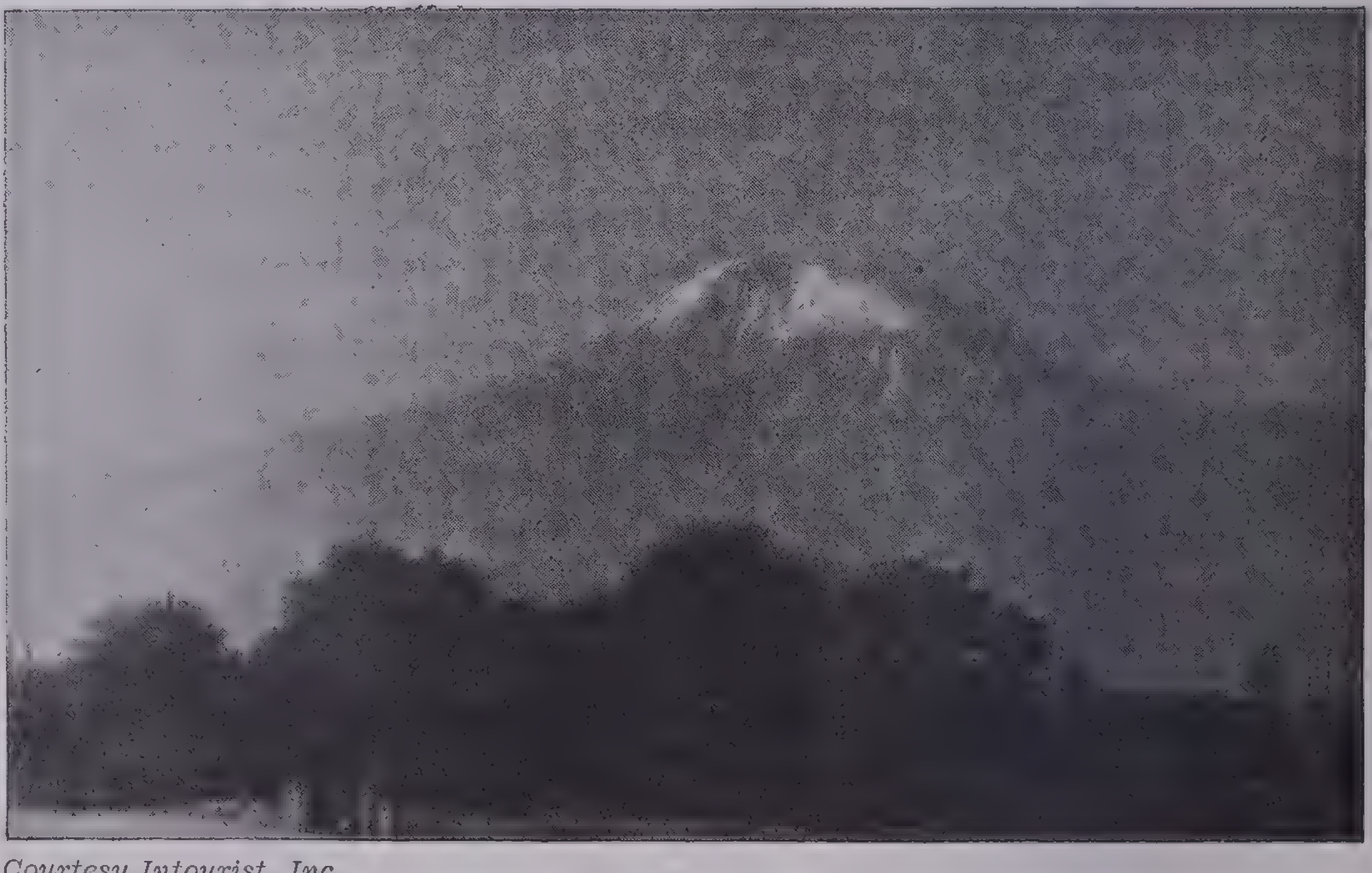
Acrostics in the Bible lose their distinctive form by translation. There were 22 letters in the Hebrew alphabet. The 119th Psalm has 176 verses, 22 groups of eight verses, each of the eight beginning with the same letter of the alphabet. Proverbs 31:10–31, is 22 verses on the ideal woman, each verse beginning with a letter of the Hebrew alphabet in order. The whole book of Lamentations is a series of acrostics—each chapter has 22 verses, one for each letter of the alphabet; but the third chapter has 66 verses, three for each of the 22 letters.

Acts of the Apostles, the fifth Book of the N.T., gives an account of what happened to the disciples of Jesus after His death. It was written by Luke as a sequel to his Gospel. The first 12 chapters trace the history of the Church in Palestine from Pentecost to the death of Herod, with Peter as the central character. The remainder of the book deals chiefly with the work of Paul. His conversion (chap. 9) is the most graphic and significant of the events narrated.

Adam, the first man; the name means "the man." The biblical narrative says God made Adam out of the dust of the earth, placed him in the Garden of Eden and gave him dominion over all the rest of the animal creation. When he disobeyed God's command not to eat of the fruit (usually spoken of as an apple) of the tree of the knowledge of good and evil, he was driven out of the Garden of Eden and forced to get his food by his own labor. This is called the Fall of Man, and Adam's sin is supposed to have been the origin of all later sin (Gen. 2). Figuratively the name Adam is used to mean original sin or unregenerate nature. The "Old Adam" is contrasted by St. Paul with the "new Adam," man redeemed.

Ahab, a king of Israel (876–855 B.C.), one of the most wicked of the kings. His wife Jezebel, a Phoenician princess, wished to induce the Israelites to worship Baal. At her encouragement, Ahab took Naboth's vineyard from him, and Naboth was stoned to death. For this, Elijah prophesied that Ahab would die and "in the place where dogs licked the blood of Naboth shall dogs lick thy blood, even thine." The deaths of Ahab and Jezebel were in accord with Elijah's predictions (I Kings 17).

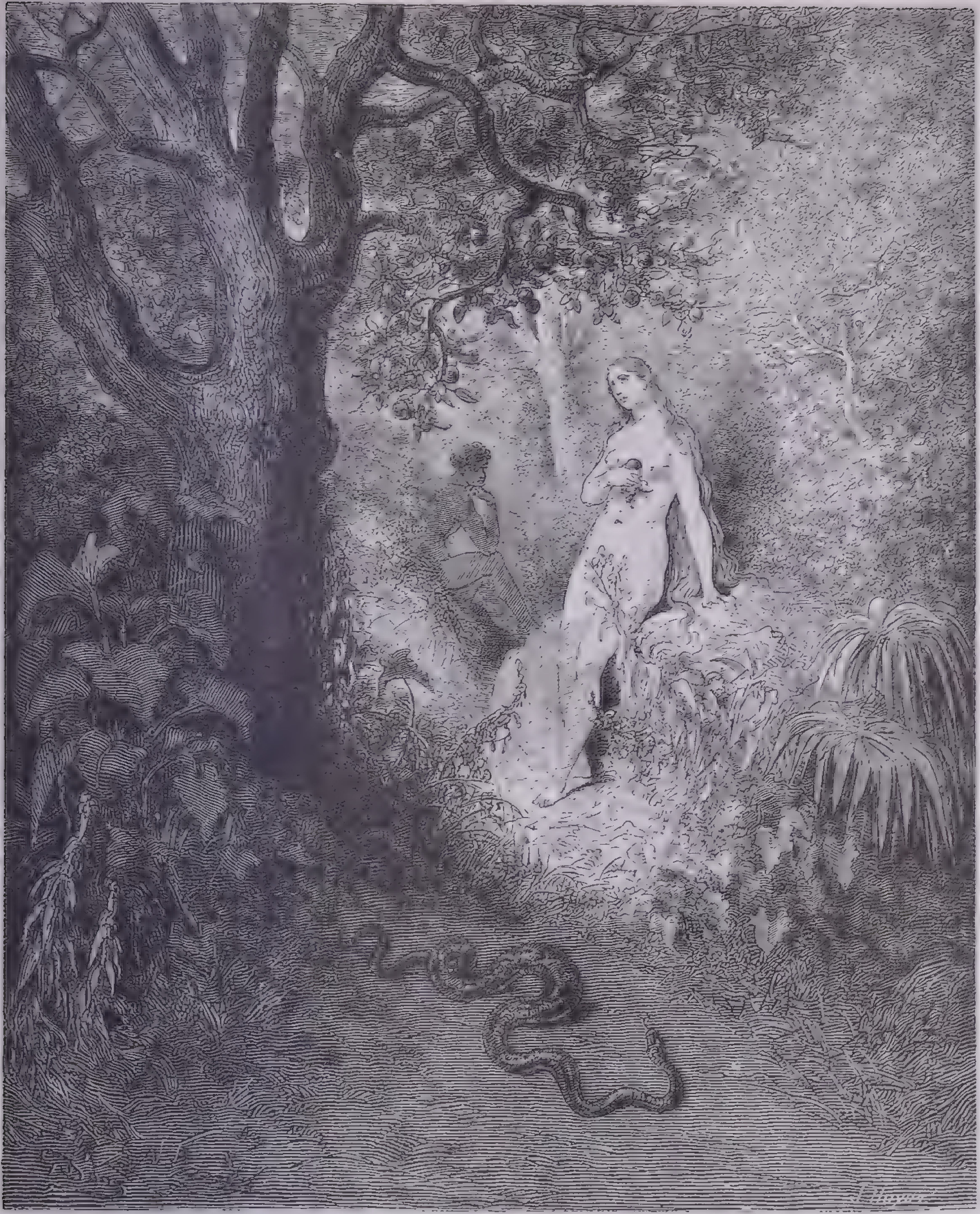
Ahasuerus, king of Persia in the Book of Esther.



Courtesy Intourist, Inc.

Mount Ararat

The mountain on which, according to tradition, Noah's ark rested after the flood is on the boundary between Turkey and the Armenian Republic of the U.S.S.R. The Armenians, who claim descent from Noah, have named it *Masis Leusar*, or mountain of the ark. The mountain has two volcanic cones, called Great Ararat and Little Ararat. The picture shows Great Ararat, 17,090 feet above sea level and perpetually crowned with snow



From a drawing by Gustave Doré for Paradise Lost

Adam and Eve and the Serpent

". . . her rash hand in evil hour
Forth reaching to the Fruit, she pluck'd, she eat:
Earth felt the wound, and Nature from her seat
Sighing through all her Works gave signs of woe.
That all was lost. Back to the Thicket slunk
The guiltie Serpent. . . ."

—*Paradise Lost,* Book 9

Ahithophel, counsellor of Absalom in his conspiracy against David (II Sam. 15).

Amos, the first prophet whose writings have come down to us, was a shepherd at Tekoa, in Judah. About the year 750 B.C., he went to Samaria, the capital of the northern kingdom of Israel, and proclaimed the coming destruction of that kingdom. During a long period of peace and prosperity, Israel had become corrupt, and Amos told the people that God would bring the Assyrians down upon them as a punishment for their sins. He preached the doctrine of righteousness with tremendous force, and was highly indignant at the heartless treatment of the poor amid the luxury and vice he saw all about him. The Book of Amos shows a loftier conception of God than had ever been expressed before.

Ananias, a member of the early Church who sold a piece of property and pretended that he gave the whole amount he received to the Church, while in reality he kept back a part of it. His wife Sapphira shared in the deceit. Peter denounced Ananias, who "fell down and gave up the ghost." His name has been given to liars (Acts 5).

Andrew, brother of Peter, was sent to Jesus by John the Baptist and was the first one called to be a disciple (Mark 13). Tradition says he brought the Gospel to Scythia, which lay north of the Black and Caspian seas, and he has therefore become the patron saint of Russia and Scotland.

Apocalypse, from a Greek word meaning revelation, uncovering, disclosing; is a variant title for the Book of Revelation.

Apocalyptic Literature, the Book of Revelation and other works not accepted in the Biblical canon that reveal the future and promise the coming of a Messiah and a heavenly kingdom. There are apocalyptic passages in the book of Isaiah.

Apocrypha, from a Greek word meaning hidden, secret, spurious, applied to books of the Bible of uncertain authorship and authority. Famous O.T. apocryphal books are Ecclesiasticus, Wisdom of Solomon, Judith, Tobit, Maccabees.

Apollyon, the angel of the bottomless pit (Rev. 9:11); the name is Greek and means destroying or the destroyer.

Apollos, Paul's friend and fellow worker, "an eloquent man, and mighty in the scriptures" (Acts 18).

Ararat, the mountain on which Noah's ark rested after the Flood (Gen. 8).

Armageddon, the place of the final conflict between the forces of good and evil (Rev. 16:16).

Artaxerxes, the name of two kings of Persia: Artaxerxes I., who ruled from 465 to 425 B.C. and who stopped the rebuilding of Jerusalem (Ezra 4); and Artaxerxes II., king from 405 to 361 B.C., who sent Ezra back to Jerusalem (Ezra 7) and allowed Nehemiah to rebuild the city (Neh. 2).

Assyria, the great empire of which Nineveh was the capital. The Assyrians conquered the northern kingdom of Israel, destroyed Samaria in 722 B.C. and took the people into captivity. Under Sennacherib in 701 B.C., they invaded and devastated the southern kingdom of Judah but failed to take Jerusalem. With the fall of Nineveh in 612 B.C., Assyria passed under the control of the Medes and Persians.

Baal, primarily the god of agriculture, worshipped by the people of Canaan when the Israelites settled among them. Baalim is the Hebrew plural meaning many Baals. Each separate region had its own god Baal, supposed to care for the growth and ripening of the crops and fruit of that region. The word means lord, owner, prince.

Babel, Tower of, begun in prehistoric times by some unknown king but left unfinished, the tower was intended to reach up to heaven; but the work was interrupted through the confusion that arose when God caused the workers to speak in different languages (Gen. 11). The Tower of Babel (that is, of Babylon) was afterwards completed by Nebuchadnezzar and was 325 feet high. Its ruins served for centuries as a brick quarry, but only a great hole where the foundation stood now remains.

Babylon, the capital of the Babylonian Empire. The Babylonians succeeded the Assyrians in their supremacy over Asia after the fall of Nineveh in 612 B.C.; so when Jerusalem was destroyed in 586 B.C., the Jews were carried in captivity to Babylon. In 538 B.C., Babylon was taken by Cyrus the Great, and his Persian Empire succeeded to the position of supremacy. Figuratively the name of the city stands for luxury, wickedness and a place of captivity.

Balaam, a heathen soothsayer in the early days of the conquest of Canaan by the Israelites. He was summoned by Balak, king of the Moabites, and told to curse the Israelites. The ass on which he rode saw an angel in the way and refused to go on. Balaam was therefore led to bless the Israelites instead of cursing them (Num. 22).

Barabbas, a robber and murderer who was released instead of Jesus (Mark 15).

Barnabas, a good-hearted Jew with Greek culture who was associated with Paul in his ministry. He was sent to Antioch and later went with Paul to Jerusalem (Acts 11).

Bartholomew, one of the Twelve Apostles (Matt. 10).

Baruch, friend and secretary of Jeremiah, who dictated his prophesies to Baruch, who read them to the people. The prophesies aroused the wrath of King Jehoiakim, who had Baruch arrested and the roll burned; but Baruch rewrote it. With Jeremiah, he was taken to Egypt. I and II Baruch are Books in the Apocrypha, addressed to the Exiles, to whom they were intended to give encouragement and comfort.

Bath-sheba, wife of Uriah, and afterwards of David, and the mother of Solomon (II Sam. 11).

Beelzebub, a god of the Philistines (II Kings 1). In the N.T. a prince of demons (Matt. 12:24). The name seems to mean Lord of the Flies.

Beersheba, a residence of the patriarchs on the extreme southern boundary of the territory held by the twelve tribes of Israel. As Dan was at the extreme north, the saying "from Dan to Beersheba" indicated the entire extent of the territory (Gen. 21; Judg. 20).

Bel and the Dragon, one of the stories in the Apocryphal part of the Book of Daniel. Bel was an earth god, like Baal.

Belshazzar, the last king of Babylonia according to the famous account of the handwriting on the wall (Dan. 5).

Benjamin, the youngest and favorite son of Jacob. The tribe of Benjamin united with that of Judah to form the kingdom of Judah after the death of Solomon.

Bethany, a town near Jerusalem, where Jesus came on His last journey. It is given as the scene of His ascension (Luke 24).

Bethel, the place where Jacob had his dream (Gen. 28). After the division of the kingdom, it was the most important shrine of the northern kingdom. The word means house of God.

Bethlehem, the birthplace of Jesus, five miles southwest of Jerusalem.

Boaz. See *Ruth*.

Caiaphas, the high priest before whom Jesus was tried (John 18).

Cain, the oldest son of Adam and Eve, and the first Biblical murderer. After murdering his brother Abel, Cain became a fugitive and vagabond, and a mark was put on him so no one should kill him (Gen. 4).

Calvary. See *Golgotha*.

Cana in Galilee, the place where Jesus performed the miracle of turning water into wine (John 2).

Canaan, the original name of Palestine. The Canaanites were conquered by the Israelites and probably afterwards intermarried with them.

Canticles, another name for *The Song of Songs;* from Latin *canticulum*, little song.

Capernaum, a city of Galilee, where Jesus took up His residence after He left Nazareth (Matt. 4).

Carmel, Mount, a promontory in the northwest part of Palestine, overlooking the Mediterranean. It was closely associated with the lives of Elijah and Elisha, was regarded with veneration, and was famous for its beauty and fertility.

Chaldea, the seacoast region south of Babylonia. The Chaldean kings became kings of Babylonia *c.* 626 B.C., and the names *Babylonian* and *Chaldean*, as used in the Bible, mean very much the same thing. The greatest king was Nebuchadnezzar.

Christ. See *Jesus*.

Chronicles. The book of I and II Chronicles give the history of the children of Israel from á priestly point of view (*c.* 300–200 B.C.), the story of the Chosen Nation reconstituted as the Jewish Church. The Chronicles cover the whole story from Adam to the end of the Exile (538 B.C.), condensing the early material but repeating at length, with interpolations, much of what we find in the four books comprising Samuel and Kings. The new material in Ezra and Nehemiah is a continuation of the same narrative.

Colossians, Epistle of Paul to the, emphasizes how adequate the mission and teaching of Jesus is to the Church and the world. The worship of angels is especially attacked. Colossae was a city in Phrygia on the main route from Palestine to the East.

Corinthians, Epistles to the. Paul lived in Corinth for 18 months, apparently because it offered special opportunities for carrying on his work among the Gentiles. Both epistles were written by Paul in 55 or 56 A.D. In I Corinthians, he rebukes the Church for having factions and disputes; then he writes of marriage as being wise and honorable; then of regard for others' opinions even though one may not agree with them (as in the case of eating meat offered to idols); then of matters regarding public worship. The 13th chapter is the famous one about faith, hope and charity (that is, love). The later chapters of II Corinthians indicate that many people in the Church were hostile to Paul, over which Paul showed his grief.

Cornelius, in Acts 10 "a devout man and one that feared God." He and his household were baptized and admitted to church membership though they did not conform to all the regular requirements. Peter was blamed for this but vindicated himself on the basis of visions he beheld.

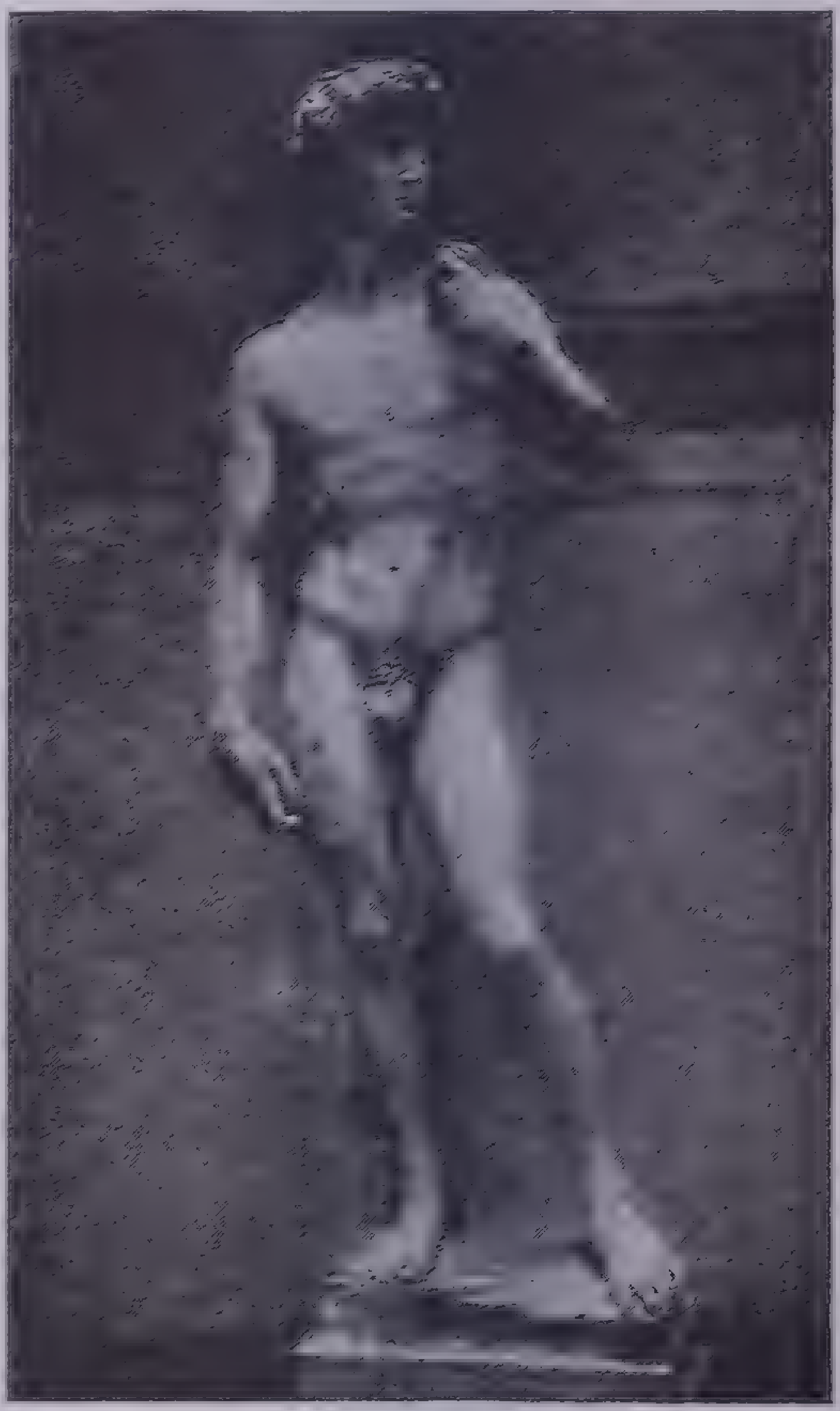
Cyrus, king of Persia (538–529 B.C.), captured Babylon in 538 B.C. and permitted the Jews who had been held in captivity to return to Jerusalem (Ezra 1).

Dagon, a god of the Philistines (Judg. 16). The Hebrew word means little fish. He was a fish god.

Damascus, the capital of Syria. It was taken by the Assyrians in 732 B.C. The name is often used to stand for the whole country of Syria. It was on his journey to Damascus that Paul had his vision and was converted (Acts 9).

Dan, son of Jacob and ancestor of one of the Twelve Tribes. The tribe's position was in the extreme north of the territory. So "Dan to Beersheba" means from one end to the other.

Daniel, the hero of the Book of Daniel, a devout Jew who lived in Babylon and was capable of interpreting dreams. He interpreted Nebuchadnezzar's dream of the image made of gold, silver, brass and iron, with feet of clay (chap. 2). His friends Shadrach, Meschach and Abednego were cast into the fiery furnace because they would not worship the image the king had set up, but they came out uninjured (chap. 3). Daniel explained the meaning of the handwriting on the wall at Belshazzar's banquet (chap. 5), and in the lions' den remained unharmed (chap. 6). The rest of the Book (chaps. 7–12) relates a series of four visions Daniel saw that are concerned with the history of the empires from the time of Nebuchadnezzar to the triumph of the Maccabees in 165 B.C.



Courtesy Metropolitan Museum of Art

David
The Academy of Fine Arts, Florence, Italy, has this statue by Michelangelo

David, king of Israel, lived about 1000 B.C. The youngest son of Jesse, he grew up on a farm near Bethlehem. In his youth he was a shepherd, and because of his delight in music he learned to play the harp. Called to the court of King Saul, he played to the troubled king to quiet him. He soon became popular, and one of the most famous of all friendships grew up between him and the king's son Jonathan. While he was still a youth, he had his famous fight with the Philistine giant Goliath, whom he killed with a stone from a sling. This made him immensely popular. He married Saul's daughter Michal, but Saul soon became jealous of David's growing power and popularity and sought to kill him. David escaped and became leader of a wild and lawless band of men. On one occasion he saved Saul's life. After Saul's death David became king. He conquered the stronghold of Jerusalem and made it the seat of his government. Here he brought the Ark of the Covenant and so made Jerusalem the religious as well as the political center of Israel. The early years of his reign were filled with wars of conquest.

His love for Bath-sheba led him to give command that her husband Uriah should be placed in "the forefront of the hottest battle" and then be deserted. Uriah was accordingly killed, and David married Bath-sheba, for which he was sternly rebuked by the prophet Nathan. When his son Absalom rose in rebellion and was defeated and killed, David was overcome with grief. Though so much of David's life was occupied with wars, he was able to organize his government, to develop a sense of loyalty in his people and to unite them in their religious attitude. David was brave, generous, kindly and just, but he had many human weaknesses. David was famous as a poet. His lament at the death of Saul and Jonathan (II Sam. 1) is one of the most moving poems in the world's literature. Many Psalms are attributed to him. The gospels of Matthew and Luke both trace the descent of Jesus from King David, and O.T. prophecies of the Messiah say that he is to come from the house of David.

Dead Sea, referred to as the Salt Sea (Gen. 14) and by other names elsewhere in the Bible, but not by its present name. It is nearly 50 miles long by 10 wide. The consistency of the water makes it possible for one to sit up in it without sinking.

Deborah, a prophetess and judge of Israel. With Barak she caused the defeat of the Philistines in the Battle of Kishon, and celebrated the victory in one of the finest and most stirring songs ever written (Judg. 5).

Delilah, the Philistine woman whom Samson loved and who by betraying him caused his loss of strength and his capture by his enemies (Judg. 16).

Deuteronomy, the fifth book of the O.T.; the word means second law. The main portion of the Book consists of the farewell of Moses to Israel in which he gave out and explained the laws that were to govern the people and told what would befall them if they disobeyed. Deuteronomy ends with an account of the death of Moses. When it was found and read to the people in 621 B.C., it produced a great reform. It had tremendous influence on the prophets and historians who wrote after that time.

Diana, the Latin name of a Greek goddess who had a great temple at Ephesus so vast and magnificent that it was included among the Seven Wonders of the World. When Paul came to Ephesus to preach a new religion, the Ephesians tried to silence him by shouting "Great is Diana of the Ephesians" (Acts 19:21–41).

Ecclesiastes, a Book of the O.T.; so called from its nameless author who calls himself the preacher—Koheleth in Hebrew, Ecclesiastes in Greek. It is one of the Wisdom books. The author at first identifies himself with King Solomon, but he soon drops this idea and continues simply as Koheleth, the preacher. He says that in nature and in human affairs there is endless repetition and weariness, that all is vanity or emptiness. Therefore, he says, "Eat, drink and be merry." Many bits of wisdom of a more religious tone are thought to have been added by later writers.

Ecclesiasticus, the most remarkable Wisdom books of Apocrypha. It contains good advice on many subjects. It is supposed to be the wisdom of Jesus (Joshua), son of Sirach.

Eden, a luxuriant and ideal garden where Adam and Eve were placed and where everything they could want was provided (Gen. 2). Many people have sought to discover from the description where it was located. The only clue is that it contained a river which divided into four rivers, one of which was the Euphrates. This does not correspond to any place that can now be identified.

Egypt, at the time when the Israelites had their independent kingdom, was the powerful kingdom on the south, and was the rival for world supremacy of Assyria, the great empire to the northeast. After the Israelites under the leadership of Moses escaped from their bondage in Egypt and founded a strong kingdom, the Egyptians realized that this new state could be of great value to them in their conflict with the Assyrians; Isaiah, however, distrusted their offers of friendship. After many reversals of fortune in the struggle between Egypt and the northern empires, Cambyses, son of Cyrus, brought Egypt under Persian dominion in 525 B.C. It regained independence in 414 B.C., but later was brought under Greek control.

Eli, the high priest of the sanctuary at Shiloh in Samuel's childhood (I Sam. 1).

Elijah, the great prophet of the northern kingdom in the time of King Ahab. He prophesied the drought that would result from Ahab's sins, and then went to the brook Cherith, where he was fed by the ravens (I Kings 17). Next, at Zidon, he performed the miracle of keeping full the widow's cruse of oil and jar of meal, no matter how much was taken out, and restored her son to life. After ending the drought, Elijah retired to Mount Horeb, where he heard the "still small voice" in which God spoke after the earthquake and fire (I Kings 19). His last conflict with Ahab was when he denounced him for taking Naboth's vineyard. According to the Scriptural account, Elijah did not die but was taken up to heaven in a chariot of fire (II Kings 2). He was fearless and uncompromising but often despondent. His great accomplishment was in leading the people away from idolatry. In the N.T., it is said that he appeared with Moses at the transfiguration of Christ (Matt. 17).

Elisha, recipient of Elijah's mantle when the chariot of fire appeared, thereafter became Elijah's successor as a prophet and performed many miracles, the most famous being the curing of Naaman, the leper (I Kings 19). He was very patriotic.

Enoch, the father of Methuselah, and supposed not to have died but to have been "translated." The Biblical account (Gen. 5:24) substitutes for the usual "and he died" the strange statement, "And Enoch walked with God: and he was not: for God took him." A very important noncanonical Hebrew apocalyptic work, written at least in part during the second century B.C., is known as the Book of Enoch. It tells the story of the fall of the angels and predicts the coming of the Son of Man.

Ephesians, Epistle to the, the fifth of Paul's epistles and apparently addressed to Christians living in Asia Minor; it seems to have been a circular letter, to be read in various churches in turn and not merely in the church at Ephesus. It consists largely of moral reflections and exhortations, especially urging unity between Jews and Gentiles. Its best-known passage is the comparison of the Christian to the soldier with the whole armor of God, the breast-plate of righteousness and helmet of salvation (chap. 6:10–17).

Ephraim, son of Joseph and ancestor of one of the strongest tribes in the northern kingdom, the strength and central position of which led to the frequent use of the name for the whole kingdom.

Esau, the first-born of the twin sons of Isaac and Rebekah, is represented as a hairy man (Esau is Hebrew for hairy), a hunter and a man of the field. He sold his birthright to his twin brother Jacob for a mess of pottage; and Jacob, pretending to be Esau, deceived their dying father Isaac into giving him the blessing Isaac intended for Esau. Esau afterwards forgave Jacob.

Esther. The Book of Esther relates how a Jewish maiden named Esther became the queen of the monarch Ahasuerus (Xerxes), and was able, with the help of her cousin Mordecai, to save her people from the destruction planned for them by Haman, the king's favorite counselor; and of how Haman was hanged on the gallows he had prepared for Mordecai.

Euphrates, a great river in Babylonia.

Eve, wife of Adam, made from Adam's rib (Gen. 2). She was beguiled by the Serpent to eat the fruit of the forbidden tree.

Exodus, the second Book of the O.T., named from the Greek word meaning escape or way out, tells of the escape of the Israelites from Egypt under Moses, of their life in the wilderness and their constitutional history. The Ten Commandments are given in chap. 20.

Ezekiel, one of the Jews carried into captivity to Babylon in 597 B.C. Here he became the religious leader of the exiles and prophesied the destruction of Jerusalem; after this took place in 586 B.C., he prophesied its rebuilding and future greatness. The most admired of his narrated visions is that of the Valley of Dry Bones (Ezek. 37).

Ezra and Nehemiah, originally one Book, consisting of personal memoirs incorporated in a later chronicle and forming a continuation of I and II Chronicles. Ezra and Nehemiah were among the descendants of the Jews who remained in Babylon when Cyrus permitted those who wished to do so to return to Jerusalem. Discouraging reports of how things were going in Judea reached the Babylonian Jews, and both Ezra and Nehemiah, though not at the same time, received permission to return from the Persian monarch Artaxerxes. Nehemiah, the king's cupbearer, acted as governor and rebuilt the walls of Jerusalem. Ezra returned with about 1,500 Babylonian Jews and was the religious leader of the people. He calls himself the priest and the scribe. After his return a great assembly was called, and he read the book of the law of Moses to the people "from early morning until midday," and "gave the sense, so that they understood the reading" (Neh. 8:3, 8). This brought on a great reform. Ezra bitterly opposed intermarriage of the Jews with people of surrounding nations.

Gabriel (Hebrew, man of God), the archangel, announced to Zacharias that he would be the father of John the Baptist and to Mary that she was to be the mother of Jesus (Luke 1).

Gad, son of Joseph and ancestor of one of the Twelve Tribes.

Galatians, Epistle to the, addressed to the people of Galatia, a Roman province in Asia Minor settled by the Gauls, or Celts, *c.* 300 B.C. The epistle was written by Paul on receipt of disturbing news as to the pride and jealousy that had developed in the churches and the growing disbelief and hostility to Paul under the guidance of false teachers. Paul writes frankly of his own life and mission and follows with a careful analysis of the principles of Christian faith and the need of being free from the Jewish law.

Galilee, the upper portion of Palestine. The Sea of Galilee, closely associated with the ministry of Jesus and His disciples, is the largest fresh-water lake in the country—13 miles long by 8 miles wide. It is a clear, bright-blue body of water, and the surrounding hills make a beautiful landscape.

Gath, one of the principal cities of the Philistines, of which David sang in his lament when Saul and Jonathan died, "Tell it not in Gath" (II Sam. 1:20).

Gaza, an important Philistine city. The story of Samson's carrying off the gates of the city (Judg. 16:3) now gives it its chief fame.

Genesis, the first Book of the O.T. (a Greek word meaning beginning), describes the creation of the world and of man, and carries the Biblical narrative down to the death of Joseph.

Gethsemane, a garden, probably on the slope of the Mount of Olives, where Jesus often went with His disciples (Mark 14).

Gideon, one of the judges of Israel, called Jerubbaal (Let Baal plead) because Gideon cast down the altar of Baal (Ju. 6). Against the Midianites he led an army of 32,000 men and by two tests reduced their number to 300 picked men. Armed with trumpets and lamps in pitchers the 300 threw the Midianites in panic by blowing the trumpets and breaking the pitchers. *Gideon's Band* is a proverb for picked men. The *Gideons* are an organization of American commercial travelers, founded in 1899, to place copies of the Bible in hotel guest rooms and Pullman cars.

Gilead, the name given to a large but not clearly defined section of Palestine east of the Jordan. It is a hilly region of beautiful scenery and was noted for its rich balsam—Balm of Gilead—that was used for the treatment of wounds; the phrase is now a figurative expression meaning anything that will sooth pain.

Gilgal, a place near Jericho where Joshua and his followers first encamped after crossing the Jordan. From that time on it was a religious and military center. Afterward it became one of the chief shrines of the northern kingdom (Josh. 5; Amos 4:4).

Gog and Magog are names (Ezek. 38) and (Rev. 20) of a prince and a land, respectively, opposed to God and His people.

Golgotha, or Calvary (Hebrew and Latin words meaning place of a skull), the scene of the Crucifixion (Matt. 27:33; Luke 23:33). The hill supposed to be the actual site of Calvary is now an Arabian cemetery. Looking across at it from the Mount of Olives, one sees a formation that is curiously like a skull. This may have given the place the name Golgotha.

Goliath, the Philistine giant whom David fought and slew (I Sam. 17).

Gomorrah. See *Sodom.*

Goshen, the northeastern part of Egypt, where the Israelites lived before their escape.

Great Sea, biblical name for the Mediterranean.

Habakkuk, a minor prophet who wrote of the devastations caused by the Chaldeans, asking why God permitted such things to be and praying and prophesying that the spoiler would be despoiled and that "the earth shall be filled with the knowledge of the glory of Jehovah, as the waters cover the sea" (Hab. 2:14).

Hagar, handmaiden of Sarah and mother of Ishmael (Gen. 16).

Haggai, a prophet who urged the rebuilding of the Temple after the Israelites returned from the Exile. The Book of Haggai dates from 520 B.C.

Ham, one of the sons of Noah and supposedly the ancestor of the Egyptians and of other peoples of North Africa (Gen. 10).

Haman. See *Esther.*

Hannah, mother of Samuel (I Sam. 1).

Hebrews, Epistle to the, primarily an argument in favor of Christianity as the final and true religion, rather a sermon on faith than a letter. It is not certain that Paul wrote it, and the precise group to whom it was addressed is not known.

Hebron, a frequently mentioned city near Jerusalem, where David had his seat of government before he moved it to Jerusalem (II Sam. 5). Absalom made it the headquarters for his rebellion (II Sam. 15:10).

Hermon, Mount, a beautiful, snow-capped mountain, 9,200 feet high, about 50 miles north by northeast of the sea of Galilee. It appealed strongly to the poetic imagination of the people, is often referred to in the Psalms and was believed by some to be the Mount of Transfiguration (Mark 9:2).

Herod the Great became king of Judea (subject to Rome) in 39 B.C. He rebuilt the Temple at Jerusalem and made it one of the finest buildings of antiquity. He also rebuilt Samaria and other cities. Though cruel, he kept his country at peace. He caused his wife Mariamne to be put to death on account of his jealousy, and this has made him a tragic figure in modern literature. He is the Herod of the "slaughter of the Innocents" (Matt. 2); and as he died in 4 B.C., it has been suggested that our calendar is incorrect and that the Christian era should begin at that date. At his death, the kingdom was divided among his three sons, of whom Herod Antipas is the Herod usually referred to in the Gospels. It was he who imprisoned John the Baptist and had him beheaded (Mark 6), and to him Pilate sent Jesus (Luke 23).

Herodias, wife of Herod Antipas. See *John the Baptist.*

Hezekiah, king of Judah (720–692 B.C.), joined the neighboring countries to resist the Assyrians, which led to the invasion of the country, the plundering of many of the cities and almost to the capture of Jerusalem. He was devout and carried out many religious reforms, but was wavering and unwise in his political policy (II Kings 18).

Hilkiah, high priest in the reign of Josiah, who discovered in the Temple the Book of the Law (II Kings 22).

Hiram, king of Tyre, who aided Solomon in the building of the Temple (I Kings 5).

Holy Ghost or Holy Spirit, the Third Person of the Trinity.

Holy Land, a name given to Palestine because of its religious associations.

Horeb. See *Sinai.*

Hosea (785–725 B.C.), one of the minor prophets and the book he wrote. After Amos prophesied the destruction of the northern kingdom, Hosea saw the same catastrophe approaching and called the people to repent. He believed that if they repented, God would forgive and spare them. He spoke of the love of God for His people as like that of a husband and a father. Hosea is the most tender of all the prophets.

Isaac, son of Abraham and Sarah. The story of how Rebekah came to be Isaac's wife gives a delightful glimpse of old customs (Gen. 24). He lived long and prospered and seems to have had a quiet and uneventful life.

Isaiah (750–695 B.C.) not only very great as a prophet and poet but was the leading statesman of his time. He opposed joining the league against Assyria (Is. 7) and thus may have kept Jerusalem from sharing the fate of Damascus and Samaria. He bitterly opposed seeking aid from the Egyptians, whom he did not trust. His faith that God would save Jerusalem led him to advise Hezekiah not to surrender the city to Sennacherib when he was besieging it in 701 B.C., and this postponed the downfall of Judah for over a century. Beginning with the 40th chapter, the Book of Isaiah is a prophecy in exalted poetry that is so appropriate to the time when Cyrus was about to permit the exiles to return to Jerusalem that most scholars have no doubt in giving it this date. Much of it has been taken by Christians to refer to the coming of Jesus.

Ishmael, son of Abraham and Hagar, and ancestor of the Ishmaelites, by which term perhaps the Arabians are meant (Gen. 21). Ishmaelite is proverbial for an outcast.

Israel, a name given to Jacob after he wrestled with the angel (Gen. 32:28); the Hebrew word seems to mean contender with God. The Children of Israel were the sons of Jacob and their descendants. The name Israel was applied to the Twelve Tribes until the division of the kingdom after Solomon's death; from then on it was applied to the northern kingdom and the southern kingdom was called Judah. The Israelites are supposedly of Arabian stock, and in Genesis there are many references that indicate their kinship with other Arabian peoples. According to the Biblical account, they came down to Egypt in a time of famine and remained there for a long period as a subject race. Then, under the leadership of Moses, they made their great Exodus—their *going out*—and wandered in the wilderness of the Arabian Peninsula until they were able to gain a foothold in Canaan. There they established themselves under the leadership of Joshua but were for many years at war with other nations and clans who occupied this fertile region. For a time they were subdued by the Philistines, but they broke away and became an independent nation under their first king, Saul. Under their next king, David, they became the strongest state between Egypt on the south and Syria on the north; and under the third and last king of the united nation, Solomon, they were at last peaceful and rich.

When Solomon died, ten tribes under Jeroboam established an independent northern kingdom, while the two tribes of Judah and Benjamin remained loyal to Rehoboam, son of Solomon, and formed the southern kingdom of Judah. The northern kingdom fell, and its capital, Samaria, was captured and destroyed by the Assyrians in 722 B.C. and the people carried into captivity. They are called the Lost Tribes, because nothing more is known of them. They probably intermarried with other peoples and lost their racial and religious identity. The Jews of the present time are descended from the two tribes of the southern kingdom. This kingdom passed under the control of the Babylonian Empire when it became supreme. When the Jews of the southern kingdom were carried into captivity in 597 B.C., and more of them when Jerusalem was taken and destroyed in 586 B.C., they went to Babylon. There they remained till 538 B.C., when Cyrus the Persian took Babylon and permitted the Jews to return.

After the exile, Judea, as it was then called, remained subject to Persia until 333 B.C., when it passed with other Persian dominions into the hands of Alexander the Great, and it remained under Greek control until 142 B.C., when it again became independent under the Maccabees. Later quarrels led to calling in the Roman general Pompey who entered Jerusalem in 63 B.C. Judea then became a Roman province, which it continued to be in N.T. times. The two chief facts to have in mind regarding the history of Israel are (1) that as a buffer state between Egypt and the northern empires in their struggle for world supremacy, it was bound to lose its independence; and (2) that the Jews of the southern kingdom were able to keep themselves an unmixed race and remain true to their religion when those of the northern kingdom did not, because the Babylonians kept their captives together and the Assyrians had scattered their captives; and because, during the extra century and more that Jerusalem stood after Samaria fell, the Jews formulated their religion and rose to a higher conception of God under the guidance of their great prophets, especially Isaiah and Jeremiah.

Jacob, the younger of the twin sons of Isaac and Rebekah. With his mother's help, he tricked Isaac into giving him the blessing that was intended for Esau (Gen. 27). Jacob fled to escape Esau's rage. At Bethel, he saw the vision of the angels and the ladder (Gen. 28). He served his Uncle Laban seven years to win Rachel for his wife, and then Laban said he must first take the older daughter Leah; so Jacob served seven more years for Rachel. Then with his two wives he returned. In his old age he went with his family to Egypt where the Children of Israel grew up in bondage.

Jael, heroine of a war in the time of the Judges (Ju. 4 and 5). When Sisera, leader of the Canaanites against Israel, was fleeing for his life, she offered him hospitality and while he slept killed him by driving a nail in his temple.

James, son of Zebedee, brother of John and one of the Twelve Apostles. He was killed by Herod (Acts 12:2). Tradition says that he went as a missionary to Spain, hence he became the patron saint of that country. (The Spanish for St. James is Santiago.) St. James the Less may be the same as James, son of Alphaeus, another of the Twelve Apostles, who probably wrote the Epistle of James. This Epistle is composed almost wholly of exhortations and warnings bearing upon practical religious living.

Japheth, third son of Noah (Gen. 10:1). His descendants were supposedly people of Indo-European stock.

Jehu, king of Israel (*c.* 842–814 B.C.), revolted against the house of Ahab and murdered the kings of both Israel and Judah. It was said of him, "For he driveth furiously" (II Kings 9:20), and so to "drive like Jehu" has become a proverbial expression.

Jehovah, meaning "I am," the name by which God revealed Himself to Moses (Ex. 3). Only the consonants JHVH were used in the Hebrew as the holy name was not to be spoken, and scholars say that the correct pronunciation may be Yahweh.

Jephthah, judge of Israel, vowed to sacrifice the first of his household to meet him if he returned victorious from the coming battle. He was victorious, and the first one to meet him was his own daughter (Judg. 11).

Jeremiah, among the greatest prophets, began to prophesy in 626 B.C., when the Scythians were devastating Judah; he considered this God's punishment and called the people to reform. In 605 he wrote a stirring poem occasioned by the Battle of Carchemish, calling more urgently for reform. For his unpopular teachings, which were regarded as unpatriotic, he suffered great indignities and persecutions. After the destruction of Jerusalem in 586 B.C., Jeremiah was taken to Egypt, where, tradition says, he was put to death. As a poet, he is intense and impassioned. What makes him one of the most significant figures of all time is the personal and spiritual interpretation that he gave to the Jewish religion in place of the more national outlook of his predecessors.

Two books of the O.T. are attributed to him: Jeremiah, a prophecy of the captivity with autobiographical details; and Lamentations, five poems on the sufferings of his people. In popular speech Jeremiah means one who wails or laments, and a jeremiad is a sorrowful story.

Jericho, the first city of importance captured by the Israelites in their conquest of Canaan. According to the Biblical account, its walls fell down as a result of the Israelites' marching around the city and blowing their trumpets (Josh. 6).

Jeroboam, first king of the northern kingdom (*c.* 937–915 B.C.). He led the revolt of the Ten Tribes against Rehoboam, son of Solomon (I Kings 11). Jeroboam II (*c.* 781–740 B.C.) was the king under whom the northern kingdom became prosperous but corrupt.

Jerusalem, the greatest and most sacred city of Palestine. It was captured by David, made resplendent by Solomon and in 586 B.C. destroyed by Nebuchadnezzar. After the Exile it was gradually rebuilt but was destroyed again by Antiochus Epiphanes in 168 B.C. Rebuilt again and beautified by Herod the Great, Jerusalem was completely destroyed by Titus in 70 A.D. and even ploughed under, so it was an entirely new city that was rebuilt by Hadrian in the year 136. In the seventh century it was captured by the Arabs and became a holy place for the Mohammedans. The Crusaders took it in 1099, but it was in the hands of the Turks from 1517 to 1919, when it was occupied by the Allies in the World War.

Jesse, father of *David* (I Sam. 16).

Jesus, called Christ or the Christ, a Greek translation of the Hebrew Messiah, meaning Anointed. The Hebrew form of the name Jesus was Joshua, which meant the Lord is deliverance or salvation. The story of His life is told in the Four Gospels.

Jethro, father-in-law of Moses (Ex. 3).

Jezebel. See *Ahab.*

Joab, nephew of David and commander of his armies. A faithful but cruel soldier (II Sam. 14).

Job, the patriarch, who suffered many misfortunes but was restored to health and prosperity in greater measure than before, because he had stood the test patiently and unquestioningly. In the Book of Job, O.T., he debates this problem of evil, why God sends suffering, with his three friends, Eliphaz, Bildad and Zophar, who maintain that he must have sinned greatly to be afflicted as he is. When these three are silenced, a younger man, Elihu, takes up the argument. Then God answers Job out of the whirlwind. The poetic quality and dramatic power of the Book of Job have hardly been surpassed.

Joel, one of the minor prophets, tells of a great locust plague in terms that suggest an invading army; its poetry is magnificent. The date of the prophecy is uncertain.

John, the "beloved Apostle," is given as the author of the Fourth Gospel, three Epistles and Revelation. The Gospel According to St. John differs from that of Matthew, Mark and Luke in being not so much a biography of Jesus as a beautiful interpretation of His life and significance to the world with special stress on the idea that the Christ is the Word of God made flesh. The first Epistle, a friendly and persuasive talk about the Christian faith and the Christian life, is one of the most beautiful and most loved books in the N.T. The other two epistles are the shortest books in the Bible, each consisting of but one very short chapter.

John the Baptist, cousin and forerunner of Jesus, called the people to repent and prepare for the Messiah. He baptized his followers in the Jordan, and Jesus came to him and was baptized (Mark 3). He is called the Baptist because he baptized Jesus and many others. When Herod Antipas married Herodias, his brother's wife, John denounced him, saying that the marriage was not lawful. At this, Herodias was extremely angry and sought to have him killed. Her daughter Salome danced before King Herod and pleased him so much that he offered her anything she would ask. Herodias told her to ask for the head of John the Baptist, and the king reluctantly granted the request. Figuratively the phrase John the Baptist means any forerunner of a great man or movement, especially if the forerunner is greatly overshadowed by what he announces.

Jonah, a prophet who did not want to obey God's command to go to Nineveh and prophesy its destruction and so started in the opposite direction and took a boat for Tarshish. When a storm arose, Jonah said it was on his account and had the sailors throw him into the sea. The Book of Jonah says that the Lord prepared a great fish (it is spoken of as a whale only in a reference in Matt. 12:40), which swallowed Jonah, and in it he remained for three days. He prayed to God, and God heard him. After his release, Jonah went to Nineveh, made his prophecy and sat outside the city to see if it would be destroyed. But the people of Nineveh repented and God spared them, at which Jonah was angry. God rebuked him for pettiness.

Jonathan, son of Saul and friend of David (I Sam. 18).

Joppa, a seaport in Palestine.

Jordan, the famous river of Palestine. By crossing it, the Israelites began their real conquest of Canaan. The baptism of Jesus and the association of the river with so much of the history of Israel has made it the most sacred of all streams to Christian people.

Joseph, the youngest son of Jacob, until the birth of Benjamin, and his favorite. His brothers were jealous of him, and they sold him to a band of Midianites who took him to Egypt. Here he interpreted Pharaoh's dream as meaning that seven years of plenty would be followed by seven years of famine, and thus the Egyptians were prepared when the famine came. Joseph rose to great power and influence, and when the famine came and his brothers arrived to buy food it was to him that they had to appeal. They did not recognize him, but after a series of tests Joseph revealed himself and became reconciled to them. Then he had his whole family come and settle in Egypt (Gen. 37–50).

Joseph, husband of the Virgin Mary.

Joseph of Arimathaea, a rich man who received and buried the body of Jesus in his own sepulcher (Mark 15:43).

Joshua, the successor of Moses as leader of the Israelites and their commander in the conquest of Canaan. The O.T. Book of Joshua gives an account of this conquest.

Josiah, king of Judah (638–609 B.C.). When the Book of the Law was discovered in the Temple and read to him, he instituted a great reform. He was killed in the Battle of Megiddo attempting to resist an invasion of the Egyptians (II Kings 21).

Jotham, the youngest of the 70 sons of Gideon and the only one who escaped when his brother Abimelech killed all the others and set himself up as King. Jotham opposed this in his Fable of the Trees, in which a bramble was selected to be their king (Ju. 9).

Judah, son of Jacob and ancestor of the tribe that united with that of Benjamin to form the southern kingdom. (For the history of Judah, see *Israel*.)

Judas, one of the Twelve Disciples, named only in Mark 3:18, possibly called Thaddaeus and Labbaeus in other places. The name is a Greek form of Judah.

Judas Iscariot, the Apostle who betrayed Jesus and then hanged himself (Matt. 26). Iscariot seems to mean the man who came from Kerioth, a village in Palestine.

Judas Maccabaeus. See *Maccabees*.

Jude, Epistle of, written by Judas, brother of James; does not say to whom the letter is addressed; it was evidently to people among whom false teachings and false practices had grown up.

Judea, a name given to Palestine after the Exile.

Judges, The Book of, received that name because it deals chiefly with the men who judged Israel; they were the rulers of the people for four centuries before the establishment of the kingdom. The Book begins with the story of the death of Joshua and closes with records of the time of Samuel.

Judith, the heroine of the Apocryphal Book of Judith; she was a beautiful Jewish widow of the city of Bethul when it was beseiged by Holoferne a general of Nebuchadnezzar. Sh went to his tent, and when he was a drunken sleep cut off his head. Th Jews were inspired by his death defeat their enemies and free the city.

Kings, I and II, historical books th continue the narrative in I and Samuel. They begin with recountin the death of David and appointmen of Solomon as his successor and en with the taking of Jerusalem and th carrying of the Jews in captivity Babylon.

Laban, uncle of Jacob and father Jacob's wives, Leah and Rachel.

Lamentations, a book of poetic lament over the fall of Jerusalem and consequent sufferings of the Jews, authorship of which is assigned to Jeremiah

Lazarus, brother of Mary and Martha raised from the dead by Jesus (Joh II). In His parable of the rich ma and the beggar, Jesus gives this nam to the beggar (Luke 16).

Leah, Jacob's wife.

Lebanon, a mountain range in Syria tha extends about 100 miles, parallel t the Mediterranean. The famous cedars of Lebanon were used by Solomon in building the Temple (I King 5). A few groves still remain.

Levi, son of Jacob and ancestor of th tribe that had no territory of its ow but supplied the priests and th priests' helpers, called Levites, fo the other tribes (Josh. 18:7).

Leviticus, the third Book of the O.T. the laws and ordinances to gover the priests and people in their religious observances. The word mean having to do with the Levites.

Lot, kinsman of Abraham, settled in the plain of Jordan. When Sodom and Gomorrah were to be destroyed, he was warned by an angel to fly from that region with his household and not to look back. Lot's wife did look back and was turned to a pillar of salt (Gen. 13 and 19).

Luke, a Gentile, probably a Greek (as the name is Greek, not Hebrew), a physician, a friend and co-worker with Paul and author of the Third Gospel and of the Acts of the Apostles. Both are addressed to Theophilus, apparently a man of rank who was not familiar with the situation. The Gospel according to St. Luke is like Matthew's Gospel because both have material that is not in Mark.

Maccabees, Jewish patriots of the 2d century, B.C., notably Judas, called Maccabeus, which apparently means the hammer. He was one of five sons of Mattathias, a priest, who led a Jewish revolt against the Syrians under Antiochus Epiphanes (ruled 175–164 B.C.) when the Syrians desecrated the Temple. Maccabeus succeeded in retaking the Temple, which he purified and rededicated. He was included among the Nine Worthies listed in the Middle Ages. When killed in 161 B.C., his brother Jonathan continued his successes, and his brother Simon won independence for the nation in 142 B.C. The apocryphal books, I and II Maccabees, give a clear and interesting account of these wars.

Magdalene, or Mary of Magdala, the woman from whom Jesus cast out seven demons (Luke 8). She is usually identified with the sinner who anointed His feet (Luke 7).

Malachi, the last Book in the O.T.; the Hebrew word means messenger, and nothing else is known of the prophet who wrote it. It deals chiefly with the need of keeping the law and with the coming judgment that will separate the wicked from the righteous.

Manasseh (1) first-born son of Joseph and ancestor of one of the twelve tribes called by his name; (2) a King of Judah (II Kings 21).

Mark, John Mark (or Marcus), author of the Second Gospel. His mother was named Mary and he worked with Paul. Very little is known about him. His Gospel is the shortest and is generally believed to be the earliest written of the Four.

Martha, the practical sister of Mary, the loving one (Luke 10:38–42).

Mary, Among several of this name in the Gospel narrative are included: Mary Magdalene (see *Magdalene*); Mary, the sister of Martha (see *Martha*): Mary, the mother of James and Joses, was one of those who witnessed the Crucifixion (Mark 15:40); the Virgin Mary, mother of Jesus, a descendant of the House of David espoused to Joseph at the time of the Annunciation (Luke 1:26–38) and worshiped in the Catholic Churches; with the Infant Jesus, she has been the subject of many of the world's greatest paintings.

Matthew, one of the Twelve Apostles and author of the First Gospel, was a publican (tax gatherer or customs officer) when Jesus called him (Matt. 9:9). The Gospel According to Matthew begins with the genealogy of Jesus and His nativity (chap. 1), which is followed by an account of the slaughter of the innocents, the visit of the Three Wise Men and the flight into Egypt (chap. 2); the work of John the Baptist and baptism of Jesus (chap. 3); the temptations in the wilderness and the calling of the first four Apostles (chap. 4); the Sermon on the Mount (chaps. 5–7), including the Lord's Prayer (chap. 6:9–13); Christ's healing of the sick, quieting of the waters and casting out devils (chap. 8); His teachings, with various parables and miracles (chaps. 9–16); the Transfiguration, prophesy of the Passion and later ministry (chaps. 17–20); His triumphal entry into Jerusalem and His work following that (chaps. 21–25); the conspiracy against Him, the Last Supper, His betrayal by Judas and Peter's denial (chap. 26); His appearance before Pilate, the mockery and crown of thorns, the crucifixion and burial (chap. 27); the announcement of the Resurrection by the angel and the appearance of Jesus to His disciples with His last words to them (chap. 28).

Matthias, chosen to take the place of Judas among the Twelve Apostles (Acts 1:26).

Medes, the people of Media, a country between the Caspian Sea and Persia, extending from Assyria on the west to the great desert on the east. The Medes took Nineveh in 612 B.C. but were subdued by the Persians under Cyrus in 550 B.C. The Medes and Persians are associated in the Book of Daniel.

Melchizedek, a priest and king who bestowed a blessing on Abraham (Gen. 14:18). The combination of priest and king is an ideal twice referred to (Pss. 110; Heb. 7).

Melita, an island in the Mediterranean Sea where Paul was shipwrecked (Acts 27).

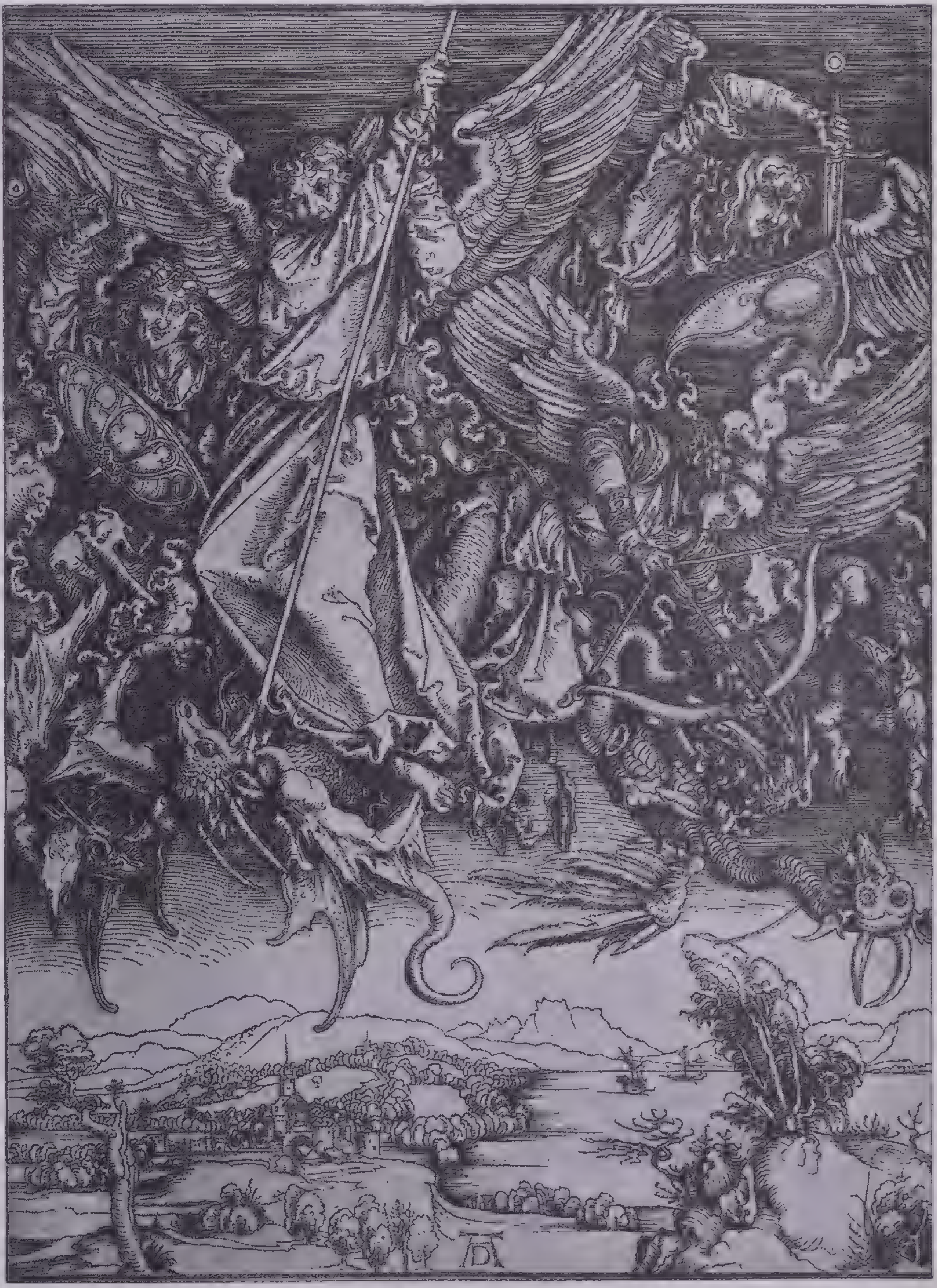
Messiah (Hebrew, the anointed) or **Messias** (Greek form of the Hebrew word), the Lord's anointed, a title both of the Kings of Israel, especially Saul and David, and of the expected savior of Israel prophesied throughout the O.T. (Is. 9:1–6, 11:1, 40:1–11, 61:1) and usually connected with the line of King David. The Messianic prophecy of the O.T. contains the most exalted imagery and the fondest hopes of the great prophets—a common heritage of the pious Jew and the Christian believer. The Gospel of Matthew points out the different ways that Jesus fulfilled these prophecies. Jesus' title, the Christ, is a Greek translation of the Hebrew *Messiah*.

Methuselah, grandfather of Noah, reputedly the oldest man, said to have lived to be 969 years old (Gen. 5:27).

Micah, a contemporary of Isaiah who prophesied that the coming destruction of Samaria and Jerusalem, to take place on account of the sins of the people, would be followed by an age of deliverance and restoration.

Michael, the archangel, guardian of the nation of Israel (Dan. 10:13, 21); leader of the heavenly forces in casting out the dragon (Rev. 12:7).

Michal, youngest daughter of Saul and wife of David (I Sam. 18), whose life she saved (I Sam. 19).



Courtesy Metropolitan Museum of Art

St. Michael and the Angels

This is one of Albrecht Dürer's series of 15 woodcuts depicting scenes from the Apocalypse. It shows the archangel Michael and his angels battling the demons of Satan (Revelation 12: 7–9)

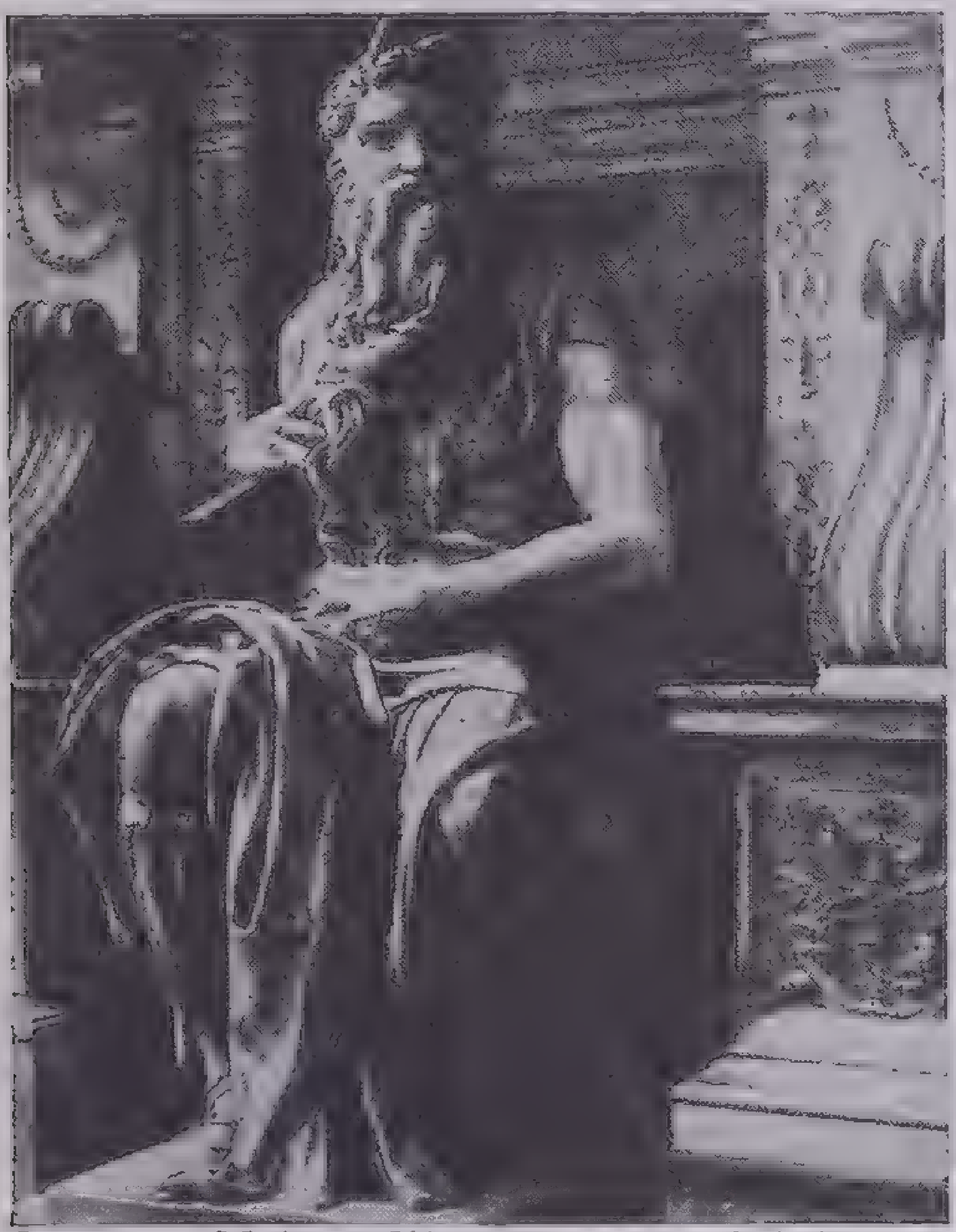
Midianites, an Arabian people sometimes identified with the Ishmaelites. A band of them carried Joseph to Egypt (Gen. 27). Moses found refuge with them and married the daughter of their priest Jethro (Ex. 2). They appear later as a hostile people against whom Gideon fought (Judg. 7).

Miriam, a prophetess, sister of Moses and Aaron, led the people in a celebration after crossing the Red Sea (Ex. 15:20). With Aaron, she rebelled against the authority of Moses; she became leprous thereafter but was healed at Moses' intercession (Num. 12).

Mizpah (meaning watch tower) is a name applied to several places. When Jacob made his covenant with Laban, he gave the name to a heap of stones set up as a witness and said, "The Lord watch between me and thee, when we are absent from one another" (Gen. 31:49), and in this sense the word is still used.

Moab, a region near the Dead Sea. The Moabites were said to be descended from Lot. They were conquered by David but broke away after the death of Solomon and were later among the most bitterly hated of the peoples that surrounded Judah.

Mordecai, cousin of Esther.



Courtesy Metropolitan Museum of Art

Moses

The statue by Michelangelo stands in the church of San Pietro in Vincoli, Rome

Moses, the great leader of the Israelites in their escape from Egypt and in their wanderings until they reached the Promised Land of Canaan and began its conquest. When the Egyptians were killing every male child to prevent the Israelites from becoming too powerful, the mother of the new-born Moses hid him in an ark of bulrushes on the brink of the river Nile in order to save him. Here he was found and adopted by Pharaoh's daughter. When he was grown, he killed an Egyptian for smiting a Hebrew, and fled to the land of Midian, where he married Zipporah, daughter of Jethro, a priest (Ex. 2). In a burning bush that was not consumed by the fire, God told him to deliver his people (Ex. 3). With his brother Aaron he appealed to Pharaoh to release the Israelites, and seven plagues were sent to induce Pharaoh to agree.

With each plague Pharaoh agreed, but he afterwards refused. Finally, by killing the first-born of the Egyptians, though no Israelites died (the origin of the Passover), Moses gained consent, and the Israelites crossed the Red Sea, the waters of which divided for them to pass (Ex. 14). On Mount Sinai Moses received the Ten Commandments (Ex. 20). He continued as leader and lawgiver of the people, in spite of much murmuring and discontent. He brought water from a rock (Num. 20) and made a brazen serpent by which people were healed (Num. 21). He died on Mount Nebo, overlooking the "Promised Land" into which he was not permitted to go (Dt. 34). He became the great hero of the people throughout their later history and stands today as one of the most commanding figures of all time. The first five books of the Bible, called the Pentateuch, were attributed to him. In Numbers 12:3 it is said, "Now the man Moses was very meek, above all the men which were upon the face of the earth." This accounts for the expression "as meek as Moses." But on many occasions he showed himself far from meek.

Mount of Olives, a hill near Jerusalem. It was here that Jesus often went with His disciples (Matt. 26:30).

Naaman. See *Elijah.*

Naboth. See *Ahab.*

Nahum, one of the minor prophets. The Book of Nahum is an exultant chant of magnificent poetry written in anticipation of the fall of Nineveh.

Naomi. See *Ruth.*

Nathan, the prophet who rebuked David (II Sam. 12).

Nathanael, called by Jesus "an Israelite, indeed, in whom is no guile!" (John 1:47.)

Nazareth, a city in Galilee, the home of Jesus in his childhood and youth.

Nebo, the mountain from which Moses viewed the Promised Land (Dt. 34).

Nebuchadnezzar (or, more correctly, Nebuchadrezzar), Chaldean king of Babylonia (605–562 B.C.). He defeated the Egyptians at the battle of Carchemish in 605 B.C. and thus established his supremacy in western Asia. Soon thereafter he went to Palestine and received submission from King Jehoiakim. But misled by Egypt and in spite of Jeremiah's protests, Judah revolted against Nebuchadnezzar, who took Jerusalem and carried the leading Jewish families to Babylon in 597 B.C. This is sometimes called the First Captivity. The Second Captivity came in 586 B.C., when Zedekiah, vassal king appointed by Nebuchadnezzar, rebelled and thus brought about the destruction of Jerusalem and the taking to Babylon of nearly all the Jews who were left. Nebuchadnezzar was really a great ruler, constructive and just.

Nehemiah. See *Ezra.*

Nicodemus, a Pharisee and ruler of the Jews who came to Jesus by night and received answers to his questions (John 3). He assisted Joseph of Arimathaea in preparing the body of Jesus for burial (John 19:39).

Nile, the great river of Egypt.

Nimrod, the "mighty hunter" who built Nineveh (Gen. 10).

Nineveh, capital of Assyria, the city of Jonah's mission.

Noah, the hero of the flood story (Gen. 6–10).

Numbers, the fourth Book of the O.T. (so named because it contains a census of the people), records various incidents concerning the Israelites during their wanderings in the wilderness.

Obadiah, a minor prophet who wrote of the doom of Edom, which he attributed to the way the Edomites treated the Israelites when Jerusalem was taken.

Ophir, a place famous for its fine gold (I Kings 9:28; 10:11; Job 28:16).

Palestine, previously called Canaan, the country occupied by the Israelites. It lies between the Mediterranean Sea and the Arabian Desert and was the inevitable route for travelers in time of peace and for armies in time of war between Egypt and the empires of the North. The northern part is very fertile and beautiful.

Patmos, the island where John had the vision of which he wrote (Rev. 1:9).

Paul, originally Saul, was born in Tarsus, a city in the southeastern part of Asia Minor. He went to Jerusalem to be educated as a Rabbi. Christianity first appeared to him as a menace to his own religion as a Jew, and he persecuted Christians, even taking part in the martyrdom of Stephen (Acts 22:19). On the road to Damascus he had the vision that caused his conversion (Acts 9). His various journeys and missionary work are related in the Book of Acts and are frequently referred to in the Epistles. Paul encountered much hostility and was twice imprisoned; he spent two years in Rome, and according to tradition was put to death during a persecution of the Christians by Nero, *c.* 64 A.D. His great work was in interpreting and systematising the Christian religion and extending it to the Gentiles, thus laying the foundation of the world religion that it has since become.

Pentateuch, Greek for five books, the first five books of the O.T., called the Five Books of Moses or the Law of Moses: Genesis, Exodus, Leviticus, Numbers and Deuteronomy.

Persia, the empire that succeeded Babylonia to supremacy in Asia. Cyrus took Babylon in 538 B.C., and permitted the Jews to return to Jerusalem, thus ending the Exile. Of the Persian monarchs, the Bible names Cyrus (Isa. 45), Darius I (Hag. 1), Xerxes ("Ahasuerus"; Esther 1) and Artaxerxes 1 (Ezra 7; Neh. 2). The Persian empire passed into Greek control with the conquest by Alexander the Great in 333 B.C.

Peter, Simon, a citizen of Capernaum, where he was a fisherman, was one of the earliest to become a disciple of Jesus and one of the first to be chosen as an Apostle. His impulsiveness and occasional lapses from complete faith appear in his failing to walk on the water (Matt. 14:28–31), his cutting off the ear of the high priest's servant (John 18:10) and his denial that he knew Jesus (Mark 14:62–72). Peter was the first to whom Jesus revealed Himself after His death. He took a leading part in the early history of the Church and is the central character of the first part of the Book of Acts. Later in life he went to Rome, where, according to tradition, he was the first bishop of the Roman Church, founder of the line of Popes and suffered martyrdom. The First Epistle of Peter was written to give encouragement to persecuted Christians in Asia Minor, and is hopeful in tone; the Second Epistle is mainly concerned with the second coming of Christ.

Pharaoh, the title of the king of Egypt. The pharaoh from whom the Israelites fled was probably Ramses II (1292–25 B.C.). Pharaoh Necho II (609–593 B.C.) defeated Josiah at Megiddo in 609 B.C. but was defeated at Carchemish by Nebuchadnezzar in 605 B.C.

Philemon, Epistle to, a short, personal letter from Paul asking Philemon to take back a runaway slave and promising to make good whatever loss the slave had caused him.

Philip, one of the Twelve Apostles (Mark 3:18).

Phillippians, Epistle to the, written by Paul during one of his imprisonments; he had gone to Philippi in answer to the call to "come over to Macedonia and help us" (Acts 16:9), and the letter is based on this personal acquaintance. It expresses his love, joy and peace, and, unlike most of the epistles, attacks no error either of doctrine or of practice.

Philistines, when the Israelites gained a foothold in Canaan, the Philistines were a people in possession of the seacoast and most of the territory between them and Egypt. The Israelites were at first conquered by the Philistines but broke away under Saul and gained control over them under David. After this they were generally at peace and often in alliance.

Pilate, the Roman procurator of Judea, seemed desirous of freeing Jesus when He was brought before him, and asked, "What evil hath he done?" When the Jews insisted that Jesus should be crucified, he washed his hands, saying, "I am innocent of the blood of this just person" (Matt. 27).

Poetry of the Bible does not have the form we are accustomed to in verse. There is no rhyme and nothing just like our idea of meter. One element in Hebrew poetry was parallelism—the same idea repeated in different forms; opposite ideas placed in striking nearness; or a combination of both these rhetorical devices as in these lines in the 87th Psalm:

(a) The Lord is my light and my salvation,
  (b) Whom shall I fear?
(a) The Lord is the strength of my life:
  (b) Of whom shall I be afraid?

Repetition like our refrains and choruses is common: "for his mercy endureth forever," in Psalm 136; "Why art thou cast down, O my soul," in Psalms 42 and 43. The great poetry books of the Bible are the Psalms, Lamentations and Song of Songs.

Potiphar, an officer of Pharoah whose wife tempted Joseph and who was led by her false story of what happened to cast him into prison (Gen. 39).

Prophecy in the Bible does not mean prediction, foretelling, but rather speaking in behalf of another—as in Ex. 7:1 when God tells Moses: "Aaron thy brother shall be thy prophet." The prophet is usually God's mouthpiece. The earlier prophets—Elijah and Elisha—were men of action, reformers. The later prophets—Amos, Isaiah and Jeremiah, notably—were also great writers, true poets. Their books are contributions to the literature of the world.

Proverbs, a book of maxims and longer poems of wisdom, many of which have been attributed to Solomon.

Psalms, a book of lyrical religious poems, attributed to David. The Psalter or Book of Psalms was used as a hymn book in the Second Temple. Hebrew poetry is based on parallelism of thought and expressions, instead of upon meter and rhyme, as in English poetry. The Psalms express both personal and national feeling, and often rise to heights of exaltation and beauty that have made them the most revered and loved of all poetry.

Queen of Sheba, Arabian queen who visited Solomon (I Kings 10).

Rachel. See *Jacob.*

Rahab, a woman of Jericho who aided the spies of Joshua. (Josh. 2.)

Rebekah. See *Isaac.*

Red Sea, the body of water that separates Egypt and Arabia. When its waters parted for them to pass, the Israelites escaped from bondage (Ex. 14).

Rehoboam, son of Solomon and king of Judah (937–920 B.C.). He told those who asked him to reduce the taxes they had paid under Solomon that instead of doing so he would greatly increase them. This led to the revolt of the 10 northern tribes under Jeroboam and left only two tribes to form Rehoboam's kingdom of Judah (I Kings 12).

Reuben, son of Jacob and ancestor of one of the tribes.

Revelation, also called the *Apocalypse* (which is Greek for revelation), the last Book in the N.T.; it was written by St. John the Divine on the Island of Patmos and addressed to the churches of Asia to encourage them in their faith. The highly figurative language makes it difficult to interpret. It is concerned with Satan's attempt to destroy the Church, the great judgment and the final overthrow of Satan, who is to be cast into the bottomless pit while the Church lives on as the Bride of the Lamb.

Romans, Epistle to the, the first of Paul's epistles, deals mainly with the idea that only righteousness is acceptable to God, and that one can be made righteous, can be justified, by faith through Christ's sacrifice.

Ruth, a charming idyll that tells of the devotion of a Moabite woman Ruth to her Israelitish mother-in-law Naomi and of Ruth's second marriage to Boaz, a wealthy Jew. The story ends with the statement that David was descended from Ruth and Boaz, which has been regarded as an argument in favor of intermarriage.

Salome, the daughter of Herodias whose dancing resulted in the execution of John the Baptist.

Samaria, the capital of the northern kingdom, was destroyed by the Assyrians in 722 B.C. In N.T. times, Samaria was one of the three main divisions of Palestine, between Judea on the south and Galilee on the north.

Samson, the strong man of the Bible. The story of his adventures recounts his slaying a thousand Philistines with the jawbone of an ass, his carrying off the city gates of Gaza, his confiding to Delilah that his strength lay in his long hair—which led her to shear it while he slept, so that he was captured by the Philistines, was blinded and forced to grind in the prison house. When he recovered his strength, he pulled down the pillars of the house, in which there were great crowds of people, thus killing more Philistines in his death than he had in all his life before. He is included among the judges of Israel (Judg. 13–16).

Samuel, an early prophet and the official judge or leader of Israel before the establishment of the monarchy. Even when he was a child under the care of the priest Eli he heard the voice of God and foretold the destruction of Eli's house. By divine command he anointed Saul to be king; and when Saul proved unworthy, David was anointed by Samuel. The Books I and II Samuel deal chiefly with the lives of Samuel, Saul and David.

Sarah, sometimes called Sarai, wife of Abraham (Gen. 12).

Sargon, King of Assyria (722–705 B.C.), who took Samaria in 722 B.C.

Satan, the Devil, called in Revelation "the old serpent" and hence identified with the tempter of Eve. In Job he is a cynical and skeptical being who has special jurisdiction on the earth. Matthew represents him as tempting Jesus (chap. 4); and Peter, as walking about like a roaring lion "seeking whom he may devour" (I Pet. 5:8). The ordinary conception of Satan today is based largely on Milton's *Paradise Lost.*

Saul, the first king of Israel, is represented as brave and patriotic but given to brooding and to fits of violent jealousy. For his life in connection with David, see *David.* Saul freed his people from the Philistines but fell in battle while fighting against them at Mount Gilboa.

Saul of Tarsus, the name of Paul before his conversion (Acts 9).

Sennacherib, king of Assyria (705–681 B.C.). In 1701 he invaded Palestine and laid waste many cities but failed to take Jerusalem. Supposedly, while besieging that city, a plague broke out in his army, forcing him to withdraw. This is the usual explanation given of II Kings 19, where it is said that the angel of the Lord smote 185,000 in a single night.

Septuagint (from the Latin word *septuaginta,* meaning 70), the Greek version of the O.T., supposed to have been made in Alexandria by 70 scholars in the 3rd century B.C. It is the version used in the N.T. for quotations from the prophets and the Psalms. This version is often referred to by the Roman numeral LXX, a short way of writing Septuagint.

Seth, third son of Adam (Gen. 4:25).

Shem, oldest son of Noah (Gen. 5:32), regarded as the ancestor of the Jews and other Semitic peoples.

Shiloh, the place where the Tabernacle was set up (Josh. 18:1) and the Ark of the Covenant remained when not carried into battle (I Sam. 4:3). Here the Lord revealed Himself to Samuel (I Sam. 3:21). The place is frequently mentioned elsewhere in the Bible.

Silas, a companion and friend of Paul, who was also a prophet (Acts 15:32).

Simeon, son of Jacob and ancestor of one of the tribes.

Simon, name of nine men referred to in the N.T.: (1) Simon Peter; (2) the Canaanite, one of the Twelve Apostles; (3) a brother of Jesus (Matt. 13:55); (4) a leper in Bethany (Mark 14:3); (5) the man who carried the Cross on the way to Calvary (Mark 15:21); (6) a Pharisee in whose house Jesus commended the woman who anointed His feet with ointment (Luke 7:36–50); (7) the father of Judas Iscariot (John 6:71); (8) a tanner at Joppa with whom Peter lodged (Acts 9:43); and (9) Simon Magnus (Acts 8:9–24).

Sinai, Mount, also called Horeb, the peak on which Moses talked with God and received the Ten Commandments; it is in the southern part of the Arabian peninsula (Ex. 3:1 and 19:11).

Sodom and Gomorrah, cities, usually described as having been near the Dead Sea, destroyed because of their wickedness (Gen. 19).

Solomon, son of David and last king of the Jews as a united nation. He became king in 971 B.C., and during his reign he greatly extended his dominion by peaceful alliances, which were often sealed by marriage. Thus he is credited with 700 wives and 300 concubines (I Kings 11:3), but many scholars regard this as a manner of indicating a large or perfect number, 7 and 3 often being used in this sense. He built a gorgeous palace for himself, and many people, including the Queen of Sheba, were dazzled by his magnificence. Solomon in all his glory is still famous. In building the Temple of Jerusalem, he gave the Jews an inspiration that long outlasted the Temple itself; but he himself was led astray by his wives to worship other gods. He was credited not only with great riches but with great wisdom, and much of the Book of Proverbs was attributed to him. The account of his reign is given in I Kings.

Song of Songs, called in the Authorized Version *The Song of Solomon,* also often called *Canticles,* now is usually regarded as a group of marriage songs written probably in the 3d century B.C. Many religious interpretations have been given it from time to time, and many attempts have been made to reconstruct the story suggested by the poems. One of these is that Solomon took into his harem a young woman about to be married to a simple country youth, and that she escaped and returned to her lover. The poetry is rich and fervid.

Stephen, the first Christian martyr, anticipated Paul in asserting the universal scope of Christianity (Acts 6).

Susanna, the heroine of an apocryphal addition to the Book of Daniel, represented as the wife of a rich Jew of Babylon. Two men grossly slandered her because she resisted them. By examining her accusers separately, Daniel discovered their falsity and had them punished, and Susanna's name was cleared.

Syria, the country north of Palestine, of which Damascus was the capital. It was conquered by Assyria, and Damascus was destroyed in 732 B.C. After the death of Alexander the Great, Syria was one of the four great divisions of the Greek Empire.

Tarsus, birthplace of Paul in southeastern Asia Minor.

Thaddaeus, one of the Twelve Disciples, apparently sometimes called Judas (not Iscariot) and sometimes Lebbaeus.

Thessalonians, Epistles to the, two letters written by Paul to the Church at Thessalonica, a city in Macedonia. They show his affection for his converts and his indignation at those who are hindering the spread of Christianity.

Thomas, the "doubting Apostle," refused to believe in the Resurrection until he had seen and touched Jesus with his hand (John 20:24–29).

Tigris, a great river in Babylonia that joins the Euphrates.

Timothy, Paul's disciple and fellow worker, whom he calls "my own son in the faith" (I Tim. 1:2), and "my dearly beloved son" (II Tim. 1:2). Paul's two epistles to him, I and II Timothy, N.T., are filled with friendly advice about carrying on their work.

Titus, Epistle to, a letter of advice from Paul to one of his assistants.

Tobit, an apocryphal book that tells the story of a good man named Tobit who lost his eyesight but had it restored. The central part of the story is concerned with the journey of Tobit's son Tobias and his marriage to a woman whose seven previous husbands had all been killed by an evil spirit. The angel Raphael is sent to banish the evil spirit and to cure the blindness of Tobit.

Vulgate (from the Latin *vulgata,* meaning in popular, everyday speech), the Latin translation of the Bible begun in the 5th century A.D. by St. Jerome, based on earlier Latin translations from the Greek version (Septuagint) of the O.T. In 1546 it was declared the standard for Roman Catholic church services. The Douay Bible, the English version for Roman Catholics, published in 1582–1610, was made from the Vulgate.

Wisdom Literature, a name applied to several books of the Bible, all philosophy in the form of observation. Sometimes the philosophy is in brief proverbs as in the Book of Proverbs, sometimes in essays as in Ecclesiastes. James and John are Wisdom epistles and some scholars call Matthew's gospel a Wisdom gospel.

Wisdom of Solomon, a book of the O.T. Apocrypha, not proverbs but rather discourses on Wisdom as the governing power of the world and its salvation.

Zacchaeus, a publican "little of stature" who climbed a tree to see Jesus as He passed (Luke 19).

Zechariah, one of the minor prophets, who, with Haggai, urged the rebuilding of the Temple after the Jews returned from the Exile. His prophecy is given in the form of visions. Only the first eight chapters of the Book of Zechariah are usually assigned to him.

Zephaniah, a minor prophet. The occasion of his prophecy was the invasion of the Scythians in 626 B.C., who caused terrible destruction and desolation wherever they went. Zephaniah asserts that the great Day of Jehovah had come upon His people as a result of their sins.

WEIGHTS, MEASURES AND DISTANCES OF THE BIBLE

Dry Measure

1 *log* = 0.46 quart (early), 0.51 quart (later)
1 *choenix* = 2 logs
1 *cab* = 2 choenices
1 *ephah* = 18 cabs
1 *omer* = 1/10 ephah
1 *seah* = 1/3 ephah
1 *homer* (*kor*) = 10 ephahs

Liquid Measure

1 *log* = 0.54 quart (early), 0.59 quart (later)
1 *hin* = 12 logs
1 *bath* = 6 hins
1 *kor* = 10 baths

Weights and Coins

1 *gerah* = 11.2 grams troy
1 *bekah* = 10 gerahs
1 *shekel* = 2 bekahs
1 *mina* (*maneh*) = 50 shekels
1 *talent* (*kikkar*) = 60 minas

Long Measure

1 *digit* = 0.75 inch
1 *palm* = 4 digits
1 *span* = 3 palms
1 *cubit* = 2 spans
1 *fathom* = 4 cubits
1 *reed* = 1.5 fathoms
1 *furlong* = 60 reeds
1 *mile* = 8 furlongs

Day and Night (Ancient)

Morning till about 10 A. M.
Heat of day till about 2 P. M.
Cool of day till about 6 P. M.
First watch till midnight
Middle watch till 3 A. M.
Morning watch till 6 A. M.

Day and Night (New Testament)

Third hour: 6 to 9 A. M.
Sixth hour: 9 to 12 midday
Ninth hour: 12 to 3 P. M.
Twelfth hour: 3 to 6 P. M.
First watch, evening: 6 to 9 P. M.
Second watch, midnight: 9 to 12 P. M.
Third watch, cockcrow: 12 to 3 A. M.
Fourth watch: 3 to 6 A. M.

Approximate Modern Equivalents

Bath, a liquid measure, 9.8 gallons, later 10.7 gallons.

Bekah (split), a weight, about 112 grams troy or half a shekel.

Cab (hollow), a dry measure, 1.86 quarts, later 2.04 quarts.

Choenix, a dry measure, about 0.98 quart.

Cool of day, from 2 to 6 P. M.

Cubit (originally the length of the forearm from the elbow to the tip of the fingers), a long measure, 17.58 inches.

Day, Ancient: morning till about 10 A.M.; heat of day till about 2 P. M.; cool of day till about 6 P.M.

Day, New Testament: third hour, 6 to 9 A. M.; sixth hour, 9 to 12 midday; ninth hour, 12 to 3 P. M.; twelfth hour, 3 to 6 P. M.

Day's journey, 24 miles.

Digit (the width of a finger), 0.75 inch.

Ephah (measure of corn), a dry measure, 1.05 bushels, later 1.15 bushels.

Fathom (spread of arms), a long measure, about 6 feet.

Furlong (length of a furrow), a long measure, 220 yards, ⅛ mile.

Gerah (a bean), a small weight, 11.2 grams troy.

Heat of day, from 10 A. M. to 2 P. M.

Hin, a liquid measure, 1.62 gallons, later 1.78 gallons.

Homer, a dry measure, 10.48 bushels, later 11.49 bushels.

Hour, see *Day*.

Kikkar, see *Talent*.

Kor (round vessel), a dry measure, see *Homer;* also a liquid measure, 97.5 gallons, later 107.0 gallons.

Log, a liquid measure, 0.54 quart, later 0.59 quart; also a dry measure, 0.46 quart, later 0.51 quart.

Mile (thousand paces), a long measure, 8 furlongs.

Mina or maneh, a varying weight and money unit, in Palestine usually 50 shekels.

Morning, from 6 A. M. to 10 A. M.

Omer, a dry measure, 0.42 peck, later 0.46 peck.

Palm (width of the hand), a long measure, 3 or 4 inches.

Reed, a long measure, 10.25 feet; or 6 cubits, 8.79 feet.

Sabbath-day's journey, 2,000 cubits.

Seah (grain), a dry measure, 1.40 pecks, later 1.53 pecks.

Shekel (weight), a weight or a coin of this weight; the ordinary gold shekel of about 252⅔ grains would now be worth about $20.00; the silver shekel of about 224½ grains, about $0.72½.

Span (extended hand), a long measure, about 9 inches.

Talent or kikkar (round mass of metal), a weight and a sum of money; the ordinary gold talent, weighing about 108 lbs., would now be worth about $60,000; a silver talent, weighing about 96 lbs., about $2,000.

Watch, a measure of time through the night. Ancient: first watch till midnight, middle watch till 3 A. M., morning watch till 6 A. M.; New Testament: first watch, evening, 6 to 9 P. M.; second watch, midnight, 9 to 12 P. M.; third watch, cockcrow, 12 to 3 A. M.; fourth watch, morning, 3 to 6 A. M.

DICTIONARY OF SOBRIQUETS AND PSEUDONYMS

Abe (Honest Abe, Old Abe), Abraham Lincoln.

Achitophel, the name given by Dryden in his vigorous political satire *Absalom and Achitophel* to Anthony Ashley Cooper, first Earl of Shaftesbury. This was in allusion to the Biblical Ahithophel (*Hebr.* 1, "brother of folly"), the politician whose activities and fate are described in II Sam., 15-17. In Dryden's work, Charles II is David, and James, Duke of Monmouth, is Absalom.

Adams, Stephen, Michael Maybrick

Adeler, Max, Charles Heber Clark

Adirondack Murray, Rev. William H. H. Murray, whose *Camp Life in the Adirondack Mountains* (1868) first called attention to the Adirondacks as a resort.

Admirable Doctor, The, Roger Bacon

Adonais, the name given by Shelley (in an elegy of that title, published in 1821) to John Keats.

Aeon, Henry Timrod

Agate, Whitelaw Reid

Aglaius, Henry Timrod

Alcon, R., Emily Brontë

Alexander the Corrector, Alexander Cruden, author of a *Concordance of the Holy Scriptures,* who assumed this title because he felt himself divinely appointed to correct British morals.

Anacreon Moore, a name sometimes given to Thomas Moore, who published (1801) a translation of the odes of Anacreon.

Angelic Doctor, The, Thomas Aquinas

Angell, Norman, Ralph Norman Angell Lane

Anstey, F., T. Anstey Guthrie

Apostle of the Indians, Rev. John Eliot

Appleseed, Johnny, John Chapman, who carried from the cider mills of Pennsylvania great quantities of apple seeds to plant them in pioneer Ohio and thus provide orchards for the settlers.

Arp, Bill, Charles Henry Smith

Astrophel (Greek, "star-lover"), the name assumed by Sir Philip Sidney in *Astrophel and Stella,* a cycle of 110 sonnets. "Stella" was Penelope Devereux, sister of the second earl of Essex. Spenser wrote the elegy *Astrophel* in memory of Sidney.

Attic Bee, Plato; Sophocles

Attic Muse, Xenophon

Austrian Hyena, The, Julius Jakob von Haynau, an Austrian general notorious for his cruelty.

Autocrat of the Breakfast-Table, The, a pen name of Dr. Oliver Wendell Holmes; first used by him in articles for the *New England Magazine* of November 1831 and February 1832; revived when he undertook to "shake the same bough again" in a series of 12 papers for the *Atlantic Monthly,* beginning in its first number—that for November 1857. These papers were issued in book form in 1858 and in a new and revised edition (with notes) in 1882.

Ayrshire Bard, The, Robert Burns

Baldy Smith, Gen. William Farrar Smith, a Union officer in the Civil War.

Bard of Avon, The, Shakespeare

Bard of Rydal Mount, The, William Wordsworth.

Bassetto, Corno di, George Bernard Shaw

Beau Brummell, George Bryan Brummell

Beau Nash, Richard Nash, less often styled "King of Bath."

Bell, Acton, Anne Brontë

Bell, Currer, Charlotte Brontë

Bell, Ellis, Emily Brontë

Bell, Lilian, Mrs. Arthur Hoyt Bogue

Bell-the-Cat, Archibald Douglas, fifth Earl of Angus. A meeting of Scottish nobles to overthrow the earl of Mar, favorite of James III, was likened by Earl Gray to the meeting of the mice to hang a bell on the cat's neck. "Who," said he, "will bell the cat?" "I," answered Douglas, "am he that will bell the cat."

Bentzon, Th., Marie Thérèse Blanc

Bettine, Elisabeth Brentano (wife of Ludwig Achim von Arnim). The name was used by her in correspondence with Goethe.

Bickerstaff, Isaac, Esq., Astrologer, the name used by Steele as editor of *The Tatler.* It had previously been employed by Dean Swift in an amusing controversy with one Partridge, an almanac maker.

Biglow, Hosea, James Russell Lowell, as author of *The Biglow Papers.*

Billings, Josh, Henry Wheeler Shaw

Bion, Robert Southey

Birmingham, George A., Rev. James Owen Hannay

Black Jack, Gen. J. A. Logan; Gen. J. J. Pershing

Blacksmith, The Learned, Elihu Burritt, for his linguistic acquirements.

Blind, Mathilde, Mathilde Cohen

Blind Tom, Thomas Wiggins, a negro pianist

Bluff Hal, Henry VIII of England

Bly, Nellie, Elizabeth Cochrane. She made a famous trip around the world.

Bowers, B. M., Mrs. Bertha M. Sinclair-Cowan

Boz, Charles Dickens; used by him for his *Sketches by Boz.* It was derived from Moses, a nickname for Dickens's brother Augustus. Moses, "being facetiously pronounced through the nose, became Bōses, and being shortened, Bōz." By the public the name has been generally pronounced Bŏz.

Bozzy, a nickname bestowed on James Boswell by Dr. Samuel Johnson.

Breitmann, Hans, Charles Godfrey Leland

Brick Pomeroy, Marcus Mills Pomeroy

Briscoe, Margaret Sutton, Mrs. A. J. Hopkins

Buffalo Bill, William F. Cody

Buntline, Ned, Edward Zane Judson

Burlington Hawkeye Man, The, Robert J. (Bob) Burdette

Calumet, Francis Hopkinson

Carleton, Will, Frederick Orrin Bartlett

Carmen Sylva, the pen-name of Elizabeth, Queen of Rumania.

Carroll, Lewis, Rev. Charles Lutwidge Dodgson

Carter, Nick, J. Russell Coryell

Caryll, Ivan, John Carl

Caskoden, Edward, Charles Major

Castlemon, Harry, Charles A. Fosdick

Catholicus, Cardinal Newman

Cato, Alexander Hamilton

Cavendish, Henry Jones

Chapman, Maristan, John Stanton Higham Chapman and Mary Hamilton Chapman

Chinese Gordon, Charles George Gordon, an English soldier who commanded (1863) a Chinese force against the Taiping rebels and was adviser (1880) to the Chinese government. Later, when in Egypt, he was known as Gordon Pasha.

Citizen King, The (*Le Roi Citoyen*), Louis Philippe, King of the French, 1830-48.

Cleishbotham, Jedediah, the assumed compiler of *Tales of My Landlord,* by Sir Walter Scott.

Close, Upton, Josef W. Hall

Clutterbuck, Capt. Cuthbert, the assumed editor of *The Abbot, The Fortunes of Nigel* and *The Monastery,* by Sir Walter Scott.

Connor, Ralph, Rev. Charles W. Gordon. It is said that the name was intended to be Cannor—*Can* for Canada, *Nor* for Northwest—but was altered by an editor.

Conrad, Joseph, Teodor Josef Konrad Korzeniovski

Conway, Hugh, Frederick John Fargus

Coolidge, Susan, Sarah C. Woolsey

Corelli, Marie, Mary Mackay

Corn-law Rhymer, Ebenezer Elliott

Cornwall, Barry, Bryan W. Procter

Craddock, Charles Egbert, Mary N. Murfree

Crayon, Geoffrey, Gent., Washington Irving, as the author of *The Sketch-Book.*

Crib, Tom, Thomas Moore

Crichton, The Admirable, a name given to James Crichton, a versatile young Scottish scholar and swordsman, distinguished as linguist and Latin poet, who at 21 successfully disputed with the learned professors of the University of Padua. The name was used by Sir James Barrie as the title of a play—the Crichton being in this case Lord Loame's butler, who, when Lord Loame's yacht *Bluebell* was wrecked, became leader of the survivors on their desert island in the Pacific.

Crinkle, Nym, Andrew C. Wheeler

Croaker and Co., the style under which Fitz-Greene Halleck and Joseph Rodman Drake wrote for *The Evening Post* of New York (1819) the series of poems, chiefly humorous, known as "the Croaker pieces," dealing with the politics of the time.

Crosby, Fanny J., Frances Jane Van Alstyne (Mrs. Alexander Van Alstyne)

D'Ache, Caran, Emmanuel Poiré

Dale, Alan, Alfred J. Cohen

Danbury News Man, The, James M. Bailey

Danby, Frank, Mrs. Julia Frankau

Deaf Smith and soldier, Erastus Smith, Texas pioneer.

Democritus Junior, the name under which Richard Burton published his *Anatomy of Melancholy.*

Dinesen, Isak, Baroness von Blixen-Finecke

Dizzy, a popular name for Benjamin Disraeli, Earl of Beaconsfield.

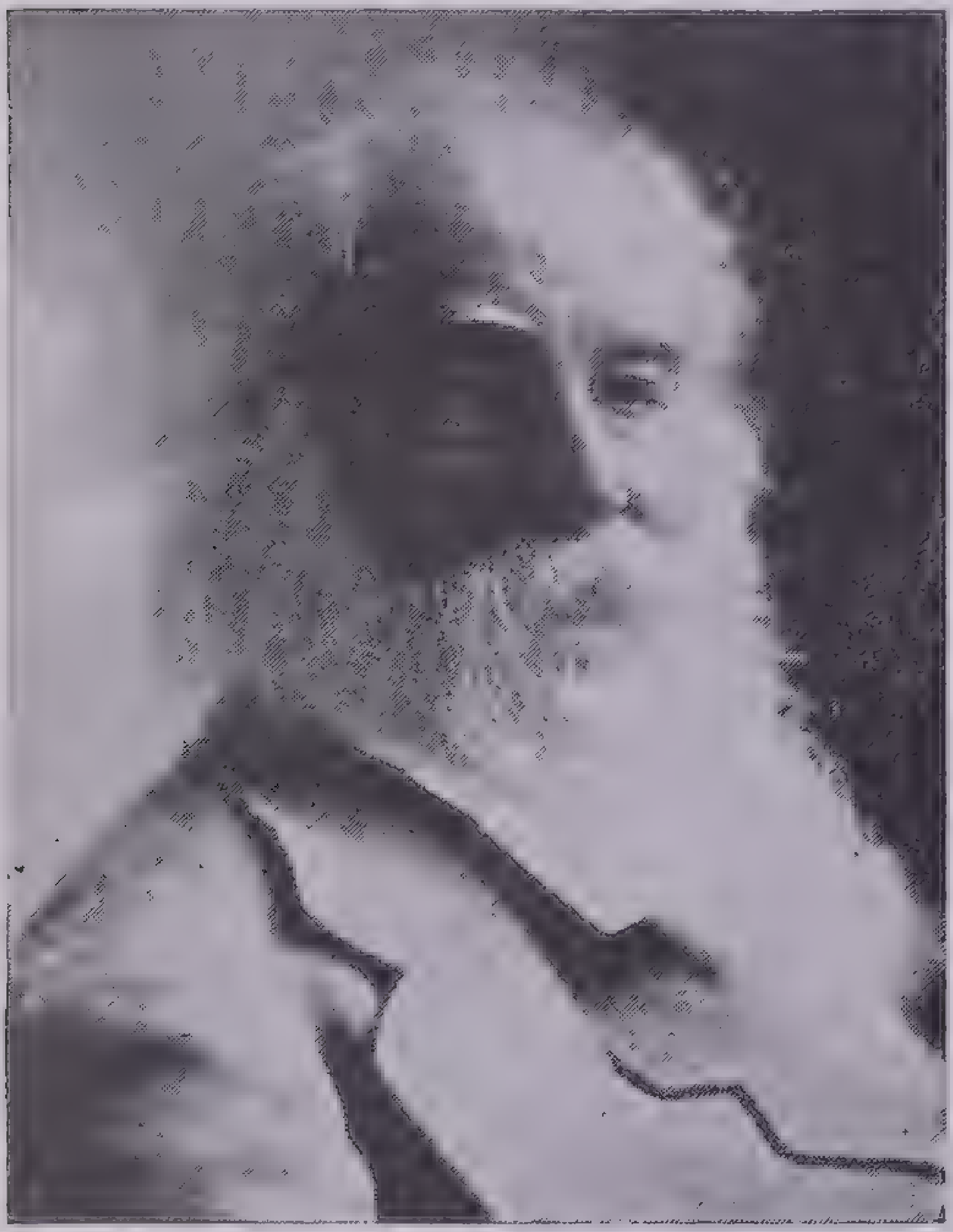
Doesticks, Q. K. Philander, Mortimer M. Thompson

Dooley, Mr. (Martin), Finley Peter Dunne, American journalist, who came thus to be known from the name of his character, an Irish-American saloonkeeper of the Archey road, Chicago, whose pungent and searching remarks on current topics appeared weekly in American newspapers and later were collected into volumes.

Downing, Maj. Jack, Seba Smith, who under this name wrote a series of letters for the Portland (Me.) *Daily Courier* and another for the *National Intelligencer* of Washington, D. C.

Drapier, M. B., the signature used by Dean Swift for a series of letters published by him in 1724 and known as "Drapier's letters." These urged the Irish people not to accept the copper halfpence coined by one William Wood, to whom George I had granted a patent. Profits accruing through the difference between the nominal and real value of the coin were to be divided between Wood and the duchess of Kendal, the king's mistress, whose influence had obtained the privilege. A reward was offered for the discovery of the author of the letters, and the patent was eventually cancelled.

Droch, Robert Bridges, American critic and editor.



Underwood & Underwood

Walt Whitman, The Good Gray Poet

Duchess, The, Mrs. Margaret Hungerford

Duncan, Sara Jeanette, Mrs. Everard Cotes

Elia, the name used by Charles Lamb in contributing to the *London Magazine* a series of essays. It had been the real name of a clerk in the South Sea House, where Lamb also was employed in 1780-92.

Eliot, George, the name adopted by Mary Ann (Evans) Lewes (later Mrs. John Walter Cross) when she began to write for *Blackwood's*. She chose George because it was her first husband's Christian name, Eliot because it was "a good, mouth-filling, easily pronounced word."

Ettrick Shepherd, The, a name often given to James Hogg, Scottish poet.

Expounder of the Constitution, an epithet popularly applied to Daniel Webster, who, especially in his second reply to Hayne and his reply to Calhoun ("The Constitution is not a compact between sovereign states"), did so much to clarify and define opinion against nullification.

Fancy, One of the, Thomas Moore

Father Abraham, Abraham Lincoln

Father of His Country, The, Cicero; Washington

Father of History, The, Herodotus

Father of Medicine, The, Hippocrates

Fern, Fanny, Mrs. Sara (Willis) Parton

Fighting Bob, Rear-Admiral Robley D. Evans

Flynt, Josiah, Josiah Flynt Willard

Forester, Frank, Henry William Herbert

Fort, Paul, Frank R. Stockton

Fra Elbertus, Elbert Hubbard

France, Anatole, Jacques Anatole Thibault

Fritz, Der alte (Old Fritz, Old Fred), Frederick II of Prussia

Gath, George Alfred Townsend

Gay, Joseph, John Durant Breval

Gentleman with a Duster, A, Harold Begbie

Good Gray Poet, The, an epithet applied to Walt Whitman, originally by the American author William D. O'Connor in a pamphlet of that title (1866). It was derived from Whitman's appearance at that time—"the flowing hair and fleecy beard, both very gray, and tempering with a look of age the youthful aspect of one who is but forty-five."

Gordon, Julien, Mrs. Julia Grinnell Cruger

Gorki, Maxim, Alexi Maximovitch Pyeshkov

Grace Darling of America, The, Ida Lewis

Graduate of Oxford, A, the name under which John Ruskin published his *Modern Painters.*

Grand, Mme. Sarah, Mrs. Frances E. McFall

Gray, Maxwell, Mary G. Tuttiett

Grayson, David, Ray Stannard Baker

Great Commoner, The, William Pitt

Great Elector, The, Frederick William, Elector of Brandenburg.

Green, Anna Katharine, Mrs. Charles Rohlfs

Greenwood, Grace, Mrs. Sara Jane Lippincott

Grile, Dod, the name under which Ambrose Bierce published his *Fables of Zambi the Parsee* in *Fun.*

Gulliver, Lemuel, Dean Swift

Gyp, Comtesse de Martel de Janville

Hall, Holworthy, Harold Everett Porter

Hamilton, Gail, Mary Abigail Dodge

Hans Pfaal, Edgar A. Poe

Harland, Marion, Mrs. Mary V. Terhune

Hawthorne, Alice, Septimus Winner

Hay, Ian, John Hay Beith

Hegan, Alice Caldwell, Mrs. Cale Young Rice

H. H., Helen Hunt Jackson

Hobbes, John Oliver, Mrs. Pearl (Richards) Craigie

Hodge, Toby, Charles McIlvaine

Hoosier Poet, The, James Whitcomb Riley

Hope, Anthony, Anthony Hope Hawkins

Howadji, George William Curtis

Idiot, The, John Kendrick Bangs

Incorruptible, The, Maximilien Robespierre

Ingoldsby, Thomas, Esq., the name under which the Rev. Richard H. Barham published his satirical *Ingoldsby Legends.*

Iron Duke, The, Arthur Wellesley, Duke of Wellington.

Ironquill, Eugene F. Ware

Iron, Ralph, the name under which Olive Schreiner (Mrs. S. C. Cronwright) at the age of 20 published her *The Story of an African Farm.*

Ironside, Edmund (Eadmund) II, King of the West Saxons.

Jean Jacques, Jean Jacques Rousseau

Jim Crow Rice, Thomas D. Rice

Johnson, Benjamin F., of Boone, James Whitcomb Riley

Josiah Allen's Wife (Samantha Allen), Marietta Holley

J. P. Mowbray, Andrew C. Wheeler

J. S. of Dale, Frederick J. Stimson

June, Jenny, Jane Cunningham Croly (Mrs. D. G. Croly)

Kane, Saul, Siegfried Sassoon

Kata Phusin (Greek, "according to Nature"), the pseudonym under which John Ruskin published his *The Poetry of Architecture* in the *Architectural Magazine* of London.

Kerr, Orpheus C., Robert Henry Newell

King-maker, The, an epithet popularly applied to Richard Nevil, Earl of Warwick.

Kirke, Edmund, James Roberts Gilmore

Kit, Prof. John Wilson. It is a diminutive of Christopher, Wilson's regular pseudonym being Christopher North.

Knickerbocker, Diedrich, the name under which Washington Irving published his *A History of New York from the Beginning of the World to the End of the Dutch Dynasty* (2 vols., 1809), a burlesque that satirized top-lofty antiquarians and poked good-natured fun at the burghers.

Last of the Tribunes, The, Cola di Rienzi, for a time head of the municipality of Rome, with the title of tribune of the people.

Last of the Troubadours, The, Jacques Jasmin, Provençal poet (also sometimes called *The Barber-Poet*).

Laughing Philosopher, The, Democritus of Abdera, who was said to laugh at mankind's follies.

Lee, Vernon, Violet Paget

Leslie, Frank, Henry Carter (founder of *Frank Leslie's Illustrated Newspaper*).

Leviathan of Literature, The, a sobriquet of Dr. Samuel Johnson, from the rotund, imposing, sometimes unwieldy style of his prose. Leslie Stephen refers to him as "this literary Behemoth."

Liberator, The, a title of Simon Bolivar, officially conferred on him by New Granada (now Colombia), Peru and Venezuela.

Light-Horse Harry, Henry Lee, commander of "Lee's legion" in the Revolutionary war.

Lion of the North, The, a name given to Gustavus Adolphus of Sweden.

Little Corporal, The, Napoleon Bonaparte

Little Giant, The, Stephen A. Douglas

Little Mac, Gen. George B. McClellan

Littlepage, Cornelius, the name under which James Fenimore Cooper published *Satanstoe.*

Little Phil, Gen. Philip H. Sheridan

Lothrop, Amy, Anna Bartlett Warner, sister of Susan Warner.

Loti, Pierre, Louis M. J. Viaud

Lucky Baldwin, Elias J. Baldwin

Luska, Sidney, Henry Harland

Lyell, Edna, Ada Ellen Bayly

Maartens, Maarten, Joost M. H. Van der Poorten-Schwarz

M'Connachie, the name given by Sir James Barrie (in his rectorial address *Courage*) to "the unruly half of myself: the writing half."

Maclaren, Ian, Rev. John Watson

Macleod, Fiona, William Sharp

Mad Anthony, Gen. Anthony Wayne

Madman of the North, The, a nickname of Charles XII of Sweden.

Maid of Orléans, The, Joan of Arc, who was thus called because she raised the siege of Orléans by the English.

Maitland, Thomas, Robert Buchanan

Malet, Lucas, Mary St. Leger (Kingsley) Harrison (Mrs. William Harrison).

Man of Destiny, The, a grandiose epithet sometimes applied to Napoleon Bonaparte, whose vast egotism caused him to view himself as predestined to be a new Caesar. Nevertheless, said Victor Hugo, "God was bored by him."

Mansfield, Katherine, Kathleen Murry (Mrs. Middleton Murry)

Mantuan Swan, The, Vergil, a native of Mantua

Market Gardener, R. D. Blackmore, who was thus known among the people of Dartmoor.

Marlitt, E., Henriette Eugénie John

Marschall Vorwärts (Marshal Forward), a nickname of Gebhard von Blücher.

Martin, George Madden, Mrs. Attwood R. Martin

Marvel, Ik, Donald G. Mitchell

Maurois, André, Émile Herzog

May, Sophie, Rebecca Sophia Clarke

McManus, Blanche, Mrs. Francis M. Mansfield

Meredith, Owen, Edward Bulwer Lytton, first Earl of Lytton.

Merriam, Florence A., Florence Merriam Bailey (Mrs. Vernon Bailey).

Merriman, Henry Seton, Hugh Stowell Scott

Merry Monarch, The, Charles II of England

Mill-boy of the Slashes, The, Henry Clay (with reference to his early life and surroundings in Hanover county, Virginia).

Miller, Joaquin, Cincinnatus Heine Miller

Miller, Olive Thorne, Mrs. Harriet Mann Miller

Monk Lewis, Matthew Gregory Lewis (from his best-known work, *Ambrosio, or the Monk*).

Morning Star of the Reformation, The, John Wycliffe

Mother Ann, the name given by her followers to Ann Lee, founder of the Society of Shakers.

Mühlbach, Luise, Klara Müller Mundt (Frau Theodor Mundt).

Mulock, Miss, Mrs. George L. Craik, Jr. (Dinah Maria Mulock).

Nasby, Petroleum V., David Ross Locke

Nesbit, E., Mrs. Edith Nesbit Bland

North, Christopher, Prof. John Wilson

Novalis, Friedrich von Hardenberg

Nye, Bill, Edgar Wilson Nye

O. Henry, William S. Porter

Oldboy, Felix, John Flavel Mines

Old Buck, James Buchanan

Old Buena Vista, Zachary Taylor (also sometimes called *Old Zach*).

Old Bullion, Thomas Hart Benton (on account of his arguments in favor of "hard money").

Old Fuss-and-Feathers, Gen. Winfield Scott

Old Hickory, Andrew Jackson

Old Noll, Oliver Cromwell

Old Public Functionary, An, an epithet applied to himself by James Buchanan.

Old Rough-and-Ready, Zachary Taylor

Old Rowley, a nickname of Charles II of England, said to have been taken from the name of his favorite race horse, commemorated in the "Rowley mile" of the Newmarket course.

Old Sleuth, Harlan P. Halsey

Oldstyle, Jonathan, the name under which Washington Irving wrote squibs for the *Morning Chronicle.*

O'Neill, Rose Cecil, Mrs. Harry Leon Wilson

Optic, Oliver, Rev. William T. Adams

Orczy, Baroness, Mrs. Montagu Barstow

O'Reilly, Private Miles, Charles G. Halpin

O'Rell, Max, Paul Blouet

Orinda, The Matchless, the name bestowed by contemporaries upon Katharine Philips (Mrs. James Philips), English poet, who used Orinda as her signature.

Ouida, Louise de la Ramée (said to have been from the childish pronunciation of Louise by a younger sister).

Oxenham, John, William Arthur Dunkerley

Pansy, Isabella Macdonald Alden

Parley, Peter, Samuel G. Goodrich

Partington, Mrs., Benjamin P. Shillaber

Pathfinder (of the Rocky Mountains), The, John Charles Frémont

Peacemaker, The, Henry Clay

Pennsylvania Farmer, A, John Dickinson

Perkins, Eli, Melville D. Landon

Perry, Edgar A., Edgar Allan Poe

Phoenix, John, George H. Derby

Pindar, Peter, John Wolcott

Plon-Plon, Prince Napoleon Joseph Charles Paul Bonaparte (1822-91); said to have been a euphemism for *Craint-Plomb* (Bullet-fearer), alluding to his supposed cowardice in the Crimean War.

Plumed Knight, The, an epithet bestowed on James G. Blaine by Robert G. Ingersoll in a speech at Cincinnati in 1876.

Poet-Naturalist, The, Henry D. Thoreau

Poor Richard (Richard Saunders), a nickname of Benjamin Franklin, from his *Poor Richard's Almanac* (1732-57).

Porte Crayon, Col. David H. Strother

Pretender, The Young, Charles Edward Louis Philip Casimir Stuart

Prout, Father, Francis Mahony

Q, Sir Arthur Quiller-Couch

Quad, M., C. B. Lewis

Quaker Poet, The, John G. Whittier

Queen, Ellery, Frederick Denny and Manfred Lee

Quinn, Dan, Alfred Henry Lewis

Rail-Splitter, The, Abraham Lincoln

Reid, Christian, Frances C. Tiernan

Riddell, John, Corey Ford

Rives, Amélie, Princess Amélie Troubetskoi

Rock of Chickamauga, The, Gen. George H. Thomas

Rohmer, Sax, Arthur Sarsfield Ward

Sage of Monticello, The, a name given to Thomas Jefferson from his country estate of Monticello (Italian, "little mount") in Albermarle County, Virginia, not far from Charlottesville.

Sailor King, The, William IV of England

Saki, Hector H. Munro

Sand, George, Baroness Dudevant (Armandine Dupin, whose first writing was done in collaboration with Jules Sandeau, with the signature Jules Sand. One St. George's day Sandeau urged her to write independently, and from that time she used the pen name George Sand.

Saunders, Marshall, Margaret M. Saunders

Saunders, Richard, Benjamin Franklin, as the editor of *Poor Richard's Almanac.*

Schreiner, Olive, Mrs. S. C. Cronwright

Scourge of God, The, Attila the Hun

Seraphic Doctor, The, Bonaventura (Giovanni di Fidenza)

Sidney, Margaret, Harriett Mulford Lothrop (Mrs. Daniel Lothrop)

Single-speech Hamilton, William Gerard Hamilton, whose maiden speech in Parliament was his only one of consequence.

Sinjohn, John, the name under which John Galsworthy published his first three books —*Jocelyn, Villa Rubein* and *A Man of Devon.*

Slick, Sam, the name of a character in the works of T. C. Haliburton, who adopted it as a pseudonym.

Squibob, John P., George H. Derby

Stella, the name given to Esther Johnson by Dean Swift.

Stendhal, Marie Henri Beyle

Stern, Daniel, Marie de Flavigny, Comtesse d'Agoult.

Stirling, Arthur, Upton Sinclair

Stockley, Cynthia, Mrs. H. E. Pelham-Browne

Stonewall Jackson, the name by which Gen. Thomas J. Jackson of the Confederate Army was universally known from the time of the Civil War. It arose through the words of Gen. Bernard E. Bee, who, to encourage his brigade of South Carolinians at the first battle of Bull Run, cried out, "Look at Jackson—there he stands like a stone wall!"

Stretton, Hesba, Sarah Smith

Subtle Doctor, The, Duns Scotus

Sunset Cox, Samuel S. Cox, from an article by him in the *Ohio Statesman.*

Swan of Lichfield, The, Anna Seward

Swedish Nightingale, The, Jenny Lind (Mme. Otto Goldschmidt)

Teufelsdröckh, Herr, the imaginary author of the *Life and Opinions of Herr Teufelsdröckh,* of which Carlyle's *Sartor Resartus* purported to be an adaptation. Teufelsdröckh (literally, "Devil's dirt") was a popular German name for asafoetida, and Carlyle remarked: "I sometimes think the book *will* prove a kind of medicinal *asafoetida* for the pudding stomach of England."

Thanet, Octave, Alice French

Thumb, Tom, Charles S. Stratton

Tippecanoe, William Henry Harrison, from his victory of Tippecanoe in 1811.

Titcomb, Timothy, J. G. Holland

Titmarsh, Michael Angelo, the name used by Thackeray for several years as a signature to tales, sketches and essays contributed by him to *Fraser's Magazine.*

Traprock, Walter, George S. Chappell

Trask, Katrina, Kate Nichols Trask (Mrs. Spencer Trask)

Twain, Mark, the pen-name of Samuel L. Clemens, by which he was better known than by his real name. It was derived from the call of the leadsman, "Mark twain!" (that is, the depth is two fathoms) on Mississippi steamboats when Clemens was a pilot.

Uncle Remus, the imaginary narrator of the folklore stories of Joel Chandler Harris.

Unconditional Surrender Grant, Gen. U. S. Grant

Vandegrift, Margaret, Margaret Thomas Janvier

Van Dine, S. S., Willard Huntington Wright, who used this pen name for his detective fiction.

Virgin Queen, The, Queen Elizabeth of England

Voltaire, a name assumed in 1718 by François Marie Arouet.

Wagstaff, Simon, the pseudonym used by Dean Swift in publishing his *Polite Conversation.*

Ward, Artemus, Charles Farrar Browne

Warden, Florence, Mrs. Florence A. P. James

Wash, Redbarn, an anagrammatic pen name of Bernard Shaw.

Watanna, Onoto, Winifred Reeve

Weale, Putnam, Bertram Lenox Simpson

West, Rebecca, the pen name of Cecily Fairfield, taken directly from the name of a character in Ibsen's *Rosmersholm.*

Wetherell, Elizabeth, Susan Warner

Widow Bedott, The, Frances M. Whitcher

William the Testy, Willem Kieft, third governor of New Netherlands

Wilson, J. Arbuthmot, (Charles) Grant (Blairfindie) Allen

Winfield, Arthur M., Edward Stratemeyer

Winter, John Strange, Mrs. H. E. V. Stannard

Wizard of Menlo Park, The, Thomas A. Edison

Wizard of the North, The, an epithet applied to Sir Walter Scott in tribute to the charm of his writings.

Yorick, the pen name under which the Rev. Laurence Sterne published his *A Sentimental Journey.*

Zadkiel, William Lilly; Lieut. Richard J. Morrison

GREAT LIBRARIES

American		Number of Volumes	European		Number of Volumes
Library	City		Library	City	
Library of Congress	Washington	5,395,000	National Public Library	Leningrad	5,000,000?
New York Public Library	New York	3,730,000	National Library	Paris	4,500,000
Harvard University	Cambridge, Mass.	3,689,000	Public Lenin Library	Moscow	3,900,000?
Yale University	New Haven	2,450,000	British Museum	London	3,750,000
Cleveland Public Library	Cleveland	1,920,000	Prussian State Library	Berlin	2,130,000
Boston Public Library	Boston	1,683,000	Bavarian State Library	Munich	1,670,000
Chicago Public Library	Chicago	1,565,000	University and Regional Library	Strasbourg	1,300,000
Los Angeles Public Library	Los Angeles	1,491,000	Bodleian	Oxford	1,260,000
Cincinnati Public Library	Cincinnati	1,130,000	National Library	Vienna	1,250,000
University of Chicago	Chicago	1,120,000	Cambridge University	Cambridge, Engl.	1,250,000
Brooklyn Public Library	Brooklyn	1,108,000	National Library	Madrid	1,210,000?
University of Illinois	Urbana, Ill.	1,053,000	National Library	Naples	1,000,000

PARALLEL OUTLINES OF WORLD LITERATURE

In., Indian; Per., Persian; Arab., Arabian; Dan., Danish; Swed., Swedish; Ic., Icelandic; Nor., Norwegian; Sp., Spanish; It., Italian; Port., Portuguese; Russ., Russian.

TABLE I. FROM THE BEGINNING TO THE BIRTH OF CHRIST

Date	Egyptian	Babylonian and Assyrian	Hebrew	Indian and Persian	Chinese	Historical Events
B.C.	*Moral Precepts* of Ptah-hotep. Hieroglyphic records on tombs.	**King Sargon.** — *Tablets.*—Semitic kings in Babylonia.				B.C.
3000 to 2000	*Book of the Dead*—A collection of prayers, mythical in character, dealing with the future of the soul. *Song of the Yarper*—A funeral drinking song.	**Hammurabi** (c. 2100). —*Code.*			*The Five Classics* form the oldest known Chinese literature. They are: 1. *Book of Changes,* philosophy.	2700. Chaldean literature. 2234. Astronomical observation in Babylonia.
2000 to 1000	*Pentaur*—An epic prose poem of battle. *Papyrus Ebers* (c. 1550)—A medical treatise. *Amarna letters*—Clay archives of two kings.		*Oldest Songs of the Old Testament.* — The Song of Deborah. Many of the psalms.	*The Four Vedas* are the oldest Indian literature. Written from B.C. 1500 to 500, they are the sacred books of the Hindus. The *Rig-Veda* is the oldest.	2. *Book of History,* before 650 B.C. 3. *Book of Rites.* 4. *Spring and Autumn,* by Confucius. 5. *Book of Poetry.* **Lao-Tse.** — The founder of Taoism.	2000. Chaldean rule over Syria. Mycenaean civilization.
	Classic Greek					
1000 to 500	**Homer.** — *Iliad* and *Odyssey* — Epic poems containing the story of the siege of Troy and the wanderings of Ulysses. The greatest classic epics. **Hesiod.**—Epic poems; *Theogony; Shield of Heracles; Works and Days.*	668–608, Golden Age of Assyrian literature.	*Joel, Amos, Hosea* — Minor prophets. *Psalms* — Sacred poems. *Isaiah*—greatest of Hebrew prophets. *Jeremiah*—The book of lament.	*The Zend-Avesta,* the bible of Zoroastrianism, is the oldest Persian literature known. The *Puranas* are second in point of age.	**Confucius.** — The most famous of all the sages of China. His doctrines were ethical and political.	776. First Olympiad. 753. Founding of Rome.

TABLE I. FROM THE BEGINNING TO THE BIRTH OF CHRIST—Concluded

Date	Classic Greek	Hebrew	Indian and Persian	Chinese	Historical Events
1000 to 500 B.C. *Cont.*	**Alcaeus.**—Originated meters in his varied lyrics. **Sappho.**—Leader of the Aeolian lyric poets, noted for her graceful style. **Anacreon.**—A lyric poet who sang of wine, love and good companions. **Alcman.**—Founder of the Dorian lyric school. **Ibycus.**—Early lyric poet. **Xenophanes.**—Poet and founder of Eleatic philosophy.	*Songs of Solomon*—Hebrew pastoral poems.	*Ramayana* (In.) —The second great epic of the early Hindu religion. *Brahmanas* (In.) —Writings to interpret the Vedas.		B.C. 586. Babylonian captivity. 492. Persian war.
500 to 400	**Pindar.**—*Triumphal Odes*—The great Dorian lyric poet. **Simonides** and **Bacchylides.** Masters of the choral ode. **Thucydides** and **Herodotus** developed the writing of history into an art. **Aeschylus.**—*Orestia.* **Sophocles.**—*Oedipus Rex.* **Euripides.**—*Bacchae, Alcestis.* These three Athenians produced the best tragic dramas of classic Greek. **Aristophanes.**—*Lysistrata, Frogs*—Master of classic Greek comedy; known for his unbridled satires.	*Job*—A drama of the soul. *Ruth* — An idyl of Jewish life in the period of the judges.	*Upanishads* (In.) —Speculations on the nature of the world and man. The *Vedangas* (In.)—Treatises on science and philosophy.	*The Four Books* rank next to the classics as masterpieces of early Chinese literature. Best of these is the Book of **Mencius,** second in rank among the Chinese sages.	490. Marathon; age of Pericles. 431–404. Peloponnesian War.
400 to 300	**Plato.**—*Republic*—Athenian teacher and philosopher, the master of prose dialogues. **Demosthenes, Aeschines, Isocrates, Lysias, Antiphon** and **Isaeus** were the great orators of the Golden Age of Greece. **Aristotle,** critic, teacher and philosopher, developed logic and the scientific method. **Xenophon.**—*Anabasis.*	*Malachi* — A minor prophet. *Daniel*—The apocalyptic prophet. *Chronicles* and *Ezra.*	**Panini's** *Sanskrit Grammar.*		390. Gauls sack Rome. 336–323. Alexander the Great.
	Alexandrine Greek	Latin			
300 to 200	**Theocritus.**—The creator of bucolic poetry in Greek. **Callimachus.**—A minor poet, but a master of mechanical style. **Eratosthenes.**—Leading science writer of his era. *Septuagint version of Scriptures*—A translation by Greek scholars of the Hebrew Scriptures. **Apollonius.**—Scholar who wrote minor epics.	**Livius Andronicus.**—Translator; introduced Greek literature to Rome. **Plautus.**—*Comedies*—Dramas full of broad coarse wit; a model for later dramatists. **Ennius.**—*Annales*—The father of Latin poetry. **Cato the Censor.**—*De Re Rustica*—Father of Latin prose, opposed the Greek influence.			264–241. First Punic War. 218–201. Second Punic War.
200 to 100	**Bion.**—A bucolic poet, noted for sharp comments and exaggerated style. **Moschus.**—Wrote elegant bucolic idyls. **Polybius.**—Detailed, accurate but prosy history.	**Terence.**—Six *Comedies*, adapted from the Greek, marked by broad humor. **Lucilius.**—*Satires*—Daring in language and in subject. **Cicero.**—*Letters, Orations*—The master of rhythmical Latin prose. **Caesar.**—*Commentaries*—Accurate history in clear, concise prose.			146. Greece becomes a Roman province.
100 B.C. to A.D.	The *Anthology* compiled. It contains epigrams from most of the Greek classic poets.	**Lucretius.**—*On the Nature of Things*—Original Epicurean philosophy. **Catullus.**—Great Latin love *lyrics*, adapted from the Greek. **Sallust.**—*Histories, Catiline Conspiracy, Letters*—A pedantic stylist. **Varro.**—*On Farming*—The most learned man of his time. **Vergil.**—*Bucolics*, idyls of rural life; *Georgics*, formal didactic poems; *Aeneid*, the great epic of Latin literature. **Horace.**—*Odes, Satires, Letters*—The most polished of all Latin lyric writers. From his time Latin poetry declined in quality. **Nepos.**—*Biographies*—Sympathetic treatment, elegant style.			60–44. Career of Julius Caesar. 27. Augustus, emperor. 4. Birth of Jesus.

TABLE II. FROM JESUS TO MOHAMMED, 1-600 A. D.

Date	Latin		Greek		Historical Events
A.D. to 100	**Livy** (59 B.C.–17 A.D.).—*History of Rome*—Fine style in colloquial Latin. **Ovid** (43 B.C.–18 A.D.).—*Metamorphoses, Heroides*, etc.—A court poet who wrote much that is beautiful and much that is indecent. **Seneca** (3 B.C.–65 A.D.).—*Tragedies, Essays, Satires*—A Stoic philosopher who created a florid rhetorical style. **Pliny the Elder** (23–79).—*Natural History*—A large work drawn from the writings of other men. **Lucan** (39–65).—*Pharsalia*—A pedantic epic of Roman life. **Petronius** (d. 66). —*Satyricon*—A brilliant picture of the vulgar life of his era.		**Josephus, Flavius** (37–95).—*History of the Jewish War, Jewish Antiquities*—Detailed history written in Greek by a Jew. **Plutarch** (46–125).—*Lives of Greeks and Romans*—A master in sketching character. **Epictetus** (?60–100).—*Discourses*—A Stoic philosopher of profound learning, summed up in pungent maxims. **Dion Chrysostomus** (50–117).—*Orations* famous for beauty of style.		70. Destruction of Jerusalem. 79. Destruction of Pompeii and Herculaneum.
		Early Christian		Oriental	
100 to 200	**Martial** (39–104).—*Epigrams*—Original, witty, sometimes vulgar short poems. **Quintilian** (40–118).—*Rhetoric*—Practical education in pleasing style. **Juvenal** (65–140).—*Satires*—Vigorous poems picturing the vices of his era. **Tacitus** (55–117).—*Germania, Histories*, etc.—A terse, vigorous historical writer. **Pliny the Younger** (62–113).—*Epistles*—Best records of his age. **Suetonius** (70–140).—*Lives of the Caesars*—History dry in style but scandalous in content. **Apuleius** (c. 150?).—*Golden Ass*—A satirical romance which was a model for many centuries.	*New Testament* — Mostly written before 100 A.D. and assembled and edited by Greek scholars. **Justin Martyr** (100–165).—*Apologies*—A defender of Christianity. **Tertullian** (160–250).—The father of Christian Latin literature, who influenced all European theology.	**Marcus Aurelius** (121–180).—*Meditations*—Stoic philosopher-emperor. **Lucian** (125–180).—*Dialogues*—A bold satirist, fertile in invention and racy in humor. **Appian** (c. 150).—*Roman History*—Original in method and accurate. **Galen** (130–200). — Prolific writer on medical subjects, long an authority. **Ptolemy, Claudius** (c. 127–150).—*Almagest*—Fixed all astronomical thought for twelve centuries.	*Talmud*, the code of Jewish laws and social customs, was compiled in the Second Century.	117–138. Trajan. 161–180. Marcus Aurelius.
200 to 400	**Ausonius** (310–390).—A nature poet. **Claudian** (c. 365–408).—*Rape of Proserpine*—The last of the classic Latin poets. A master of language and meter.	**Athanasius** (293–373).—Prolific theological writer, fixing Greek creed. **Ulfilas** (311–381). — *Gothic Bible*—The earliest literary work in German. **Ambrose** (333-397).—*Hymns, Sermons.* **Jerome** (331–420).—*Vulgate Bible*—Father of the Western (Roman) Church. **Chrysostom** (347–407).—*Sermons, Letters*—Scholar and keen observer.	**Plotinus** (204–270).—*Enneads*—A Neoplatonic philosopher. **Longinus** (213–273).—A critic and scholar. *Daphnis and Chloe*—This pastoral romance is the best of Greek romances because of graceful style and natural feeling. *Hero and Leander*—A short love epic.	**Kalidasa** (In.). — *Dramas, Lyrics*—Revived the poetic art in Sanskrit.	225. New Persian empire; Zoroastrianism revived. 325. Council at Nicaea. 395. Division of the Roman Empire. 410. Alaric sacks Rome.

TABLE II FROM JESUS TO MOHAMMED, 1-600 A. D.—Concluded

		Prudentius (c. 348–405).—The greatest early Latin *Hymns.* **St. Augustine** (354–430).—*Confessions* — Greatest of the Latin fathers.			449. Saxons invade Britain. 455. Vandals sack Rome.
500 to 600	**Boethius** (470–525). — *Consolations of Philosophy, Translations.*—Almost the last classical Latin prose writer. He ends the Roman period of literature.	**Fortunatus, Venantius** (c. 530–600). — *Hymns; The Royal Banners Forward Go* is still in use. **Gregory the Great** (540–604).—*Letters, Dialogues*—As a pontiff he was the great organizer of the services of the Roman Church.		*Moallakat* (Arab.)—A collection of seven odes by as many authors, the finest pre-Moslem Arabic verse.	571. Birth of Mohammed. 590. Gregory becomes pope.

TABLE III. FROM MOHAMMED TO DANTE, 600-1300

DATE	ENGLISH	GERMAN	SCANDINAVIAN		ARABIAN, PERSIAN		HISTORICAL EVENTS
600 to 700	*Beowulf*—An epic poem of great antiquity, in spoken form long before this era and brought to England by the Saxons. **Caedmon** (675?).—*Paraphrase of Scripture.* **Bede** (673–735).—*Ecclesiastical History, Scientific and theological treatises*—A summary of learning by the greatest scholar of his age.	This is the period of the infiltration of Roman civilization and Roman ideas. *Lay of Hildebrand* in the old Germanic alliterative verse. Authors are unknown. The *Lay of Hildebrand* is an example of the rough, uncouth ballad out of which the German epic was constructed.	400–1000. *Hundreds of Runic Inscriptions*—Very brief. Some in verse. Important for history, language, art. *Skalds* and the *Elder Edda*, composed between 800 and 1200, are alliterative poems recounting the Norse mythology.		*The Koran*, the sacred book of Islam, collected shortly after Mohammed's death. Many odes and lyrics in Arabic. In the latter half of this century Arabia enjoyed a glorious reputation in science and literature under the patronage of **Haroun-al-Raschid.**		622. Flight of Mohammed from Mecca, the Hegira. 711. The Arabs enter Spain. 751. Pepin the Short, king of Franks.
			FRENCH	SCANDINAVIAN			
700 to 800	**Alcuin** (735–804).—Latin *Grammar* — Orthodox theological treatises. **Cynewulf** (c. 750–825).—Serious religious *poems.*		*Song of Roland.* The greatest of the old French epics relating the adventures of Roland, a nephew of the Emperor Charlemagne.		**Abu Hanifah** (702–772).—*Code of Laws*—Still in force in many parts of the Ottoman Empire.		800. Charlemagne crowned emperor of the West.
800 to 900	**Alfred the Great** (c. 849–901).—*Translations* of theological and philosophical classics.	**Otfried** (c. 800–870).—*Gospel Book*—A rhymed version of the life of Christ, theology rather than poetry. The oldest German writer whose name is known. *Heliand* (c. 830)—An alliterative epic of the life of Christ.					866. Schism between Greek and Roman churches.
900 to 1000		**Ekkehard.**—*Lay of Walther of Aquitaine* (c. 930)—A short epic in Latin hexameters. **Hroswitha** (c. 940–1000).—*Dramas*—A nun who wrote six dramas in Latin in the Christian spirit of her time to take the place of the pagan plays of Terence. **Notker III** (950–1022).—*Translations*—A forerunner of the Renaissance. He translated into German Boethius's *Consolations of philosophy*, the *Psalter;* Aristotle's *Categories*, etc.			**Rudagi** (d. 954), (Pers.). — *Divan*—Graceful, fluent lyrics. The first great poet of Mohammedan Persia. **Firdausi** (c. 940–1025), (Pers.).—*Book of Kings*—One of the foremost poets of all literature. A great epic dealing with the Persian monarchs. **Avicenna** (980–1037), (Arab.).—*Medicine, Philosophy*—Philosophical and scientific works. His work was a textbook for European scholars throughout the Middle Ages.		962. Holy Roman Empire set up. 1066. Normans conquer England.
1000 to 1100	**William of Malmesbury** (1095–1142).—*History of Kings of England.*	*Nibelungenlied* (12th or 13th Century)—This long epic, strong on characterization, is the Iliad of German.		**Ari Thorgilsson** (c. 1050).—*Histories.*	**Hariri** (c. 1054–1122), (Arab.).—*Makamat*—Moral and satirical rhymed picaresque prose.		1096. First Crusade.
					SPANISH	ARABIAN, PERSIAN	
1100 to 1200	**Geoffrey of Monmouth** (c. 1100–1154).—A largely legendary *History of English Kings.*	**Wolfram von Eschenbach** (c. 1170–1220). — *Parzifal* — The great epic of chivalry. A story of the search for the Holy Grail. **Walther von der Vogelweide** (*c.* 1170–*c.* 1227).—Greatest lyric poet of medieval Germany. **Gottfried von Strassburg** (c. 1200). —*Tristan and Isolde*—His great court epic is naturalistic, breathing the spirit of passion.	**Villehardouin** (1150–1212). *Conquest of Constantinople*—A valuable, vivid and reliable history.	**Snorri Sturluson** (Ic.), (1178–1241). —*Heimskringla*—History of kings of Norway. *Edda.* Scientific handbook on Norse mythology.	*Poem of the Cid*—Great narrative poem on the national hero.	**Omar Khayyám** (1071–1123) (Pers.).—*Quatrains*—philosophic and meditative stanzas.	1163. Notre Dame of Paris founded. 1206. Franciscan order founded.
1200 to 1300	**Roger Bacon** (1214–1294).—*Natural Science, Philosophy*—A man in advance of his age, the leading scholar of the era and a writer on diverse topics.	**Berthold von Regensburg** (1247–1272).—*Sermons*—The greatest German preacher of the middle ages. **Meister Eckhart** (1260–1327).—*Sermons*—The first of the mystics.	**Jean, Sire de Joinville** (1224–1317). —*Life of St. Louis* — A chronicle of his times. **Marie de France.**—*Lays* and *Fables* of charming theme and elegant style. *Aucassin et Nicolette* — An excellent example of the chantefable of the twelfth century. **Lorris and Meung.** —Joint authors of the *Romance of the Rose*, a long allegorical poem on the "Art of Loving."	**Saxo Grammaticus** (Dan.), (1200). —*History of Denmark* — Father of Danish history.		**Averroes** (1126–1198), (Arab.).—*Science, Philosophy*—Important works which widely influenced western European thought. **Sadi** (Pers.) (c. 1184–1291) *Rose-Garden, Lyrics, Odes.*	1215. Magna Charta signed. 1248. Cathedral at Cologne begun. 1295. Marco Polo returned to Venice.

TABLE IV. FROM DANTE TO THE PREREFORMATION PERIOD, 1300-1600

Date	English	German	French	Persian	Italian, Spanish, Portuguese	Scandinavian	Historical Events
1300 to 1400	*Piers the Plowman*—Unrhymed alliterative verse, satirical, praises the simple life. **John Wycliffe** (1324–1384).—*Translation of Vulgate Bible into English.* **John Gower** (c. 1325–1408).—Love *Poems* and allegories in Latin and English. **Geoffrey Chaucer** (1340–1400).—*Canterbury Tales, Short Poems*—A scholar, a poet of chivalry and a witty narrator of stories in verse. *Miracle Plays*—Religious allegories of great popularity in the 14th and 15th centuries.	**Tauler** (1300–1361)—*Sermons*—A great evangelist and mystic preacher. **Thomas à Kempis** (1380–1471).—*Imitation of Christ*—A simple devotional book in Latin, long popular. **Sebastian Brant** (1457–1521).—*The Ship of Fools*—An effective didactic satirical poem.	**Sir John Mandeville** (c. 1370). —*Travels*—A compilation, partly imaginative, translated into many languages. **Jean Froissart** (1337–1410). —*Chronicles*—A vivid but imaginative account of the age of chivalry. **Charles of Orleans** (1391–1468). — *Poems* — Art takes the place of thought and form nears perfection.	**Hafiz** (c. 1375), (Pers.)—*Poems*—Lyrics of vehement style.	**Dante Alighieri** (It.), (1265–1321).—*Divine Comedy*—Great epic, written in the first person. He fixed the character of Italian poetry and influenced the literature of all medieval Europe. **Juan Ruiz** (Sp.), (c. 1325).—*Book of True Love*, a collection of picaresque medieval poems. **Francesco Petrarch** (It.), (1304–1374).—*Sonnets and Songs*—Lyrics of distinctive finished style and fine odes. The forerunner of the Renaissance. **Giovanni Boccaccio** (It.), (1313–1375). — *Decameron*—A series of tales in prose which give a humorous but vivid picture of his age; a forerunner of the short story. **Iñigo López de Mendoza** (Sp.), (1398–1458).—*Sonnets*—The first in Spain to compose sonnets.	**St. Birgitta** (Swed.), (1303–1373).—*Revelations* — Mystical conversations.	1309. Popes in Avignon. 1386. University of Heidelburg founded. 1414–18. Council of Constance. 1431. Joan of Arc burned. 1455. Gutenberg *Bible*, first European printed book. 1453. Fall of Constantinople.
1400 to 1500	**Sir Thomas Malory** (c. 1469).—*Morte d'Arthur*—Worked over a large part of the Arthurian legends in prose. **Sir Thomas More** (1478–1535).—*Utopia*—In Latin; a studied plan for an ideal state.	**Erasmus of Rotterdam** (1467–1536).—*Colloquies* — Best thoughts of a cultured scholar and accurate translator.	**François Villon** (1431–aft. 1463). — *Ballads* — The most remarkable poet of the fifteenth century. His *lyrics* are among the masterpieces of French poetry.		**Matteo M. Boiardo** (It.), (1430–1494).—*Orlando Inamorato*—A long epic poem. **Lorenzo de' Medici** (1449–1492).—A patron of art and literature; wrote sonnets and love poems.	**Christian Pedersen** (Dan.), (1480–1554) — *Translation of Luther's Bible* (1550)—Father of modern Danish literary language.	1477. First book printed in England. 1492. Discovery of America.
1500 to 1600	**William Tyndale** (1484–1536). — *Translation of Bible*—On his translation of the Scriptures later versions are founded. **Hugh Latimer** (1485–1555).—Vivid *Sermons* picturing the abuses of the Catholics. *Ralph Roister Doister*—The first dramatic comedy in English. **John Haywood** (1497–1578).—His *Interludes* were forerunners of comic drama. **Sir Thomas Wyatt** (1503–1542).—*Sonnets, Lyrics*—Made Italian literature a new force in England. **Henry Howard** (earl of Surrey), (1517–1547).—*Translation of the Aeneid, Songs, Sonnets*—Introduced Italian forms and blank verse. **John Foxe** (1517–1587).—*Book of Martyrs*—His book had great influence in strengthening the reformers. **Thomas Sackville** (1536–1608).—*Mirror for Magistrates.* A poet of force and imagination. Worked in collaboration with others on the first English tragedy, *Gorboduc.* **Edmund Spenser** (1552–1599).—*Faërie Queene, Shepherd's Calendar.* Great in the melodious verse and refined style of the romantic allegory, the ode and the sonnet. **Sir Walter Raleigh** (1552–1618).—*History of the World.* **Richard Hooker** (1553–1600).—*Ecclesiastical Polity*, a plan of church government expounded in dignified prose. **John Lyly** (1554–1606).—*Euphues*, a romance which set the style for the novel; he also wrote the first English prose comedies. **Sir Philip Sidney** (1554–1586).—*Arcadia*, a pastoral romance, and typical Elizabethan love *Sonnets.* **Francis Bacon** (1561–1626).—*Essays, Philosophy*—Beautiful and acute style; the father of modern scientific reasoning. **Christopher Marlowe** (1564–1593).—*Dramas* — Most important of Shakespeare's predecessors. He made blank verse an English dramatic vehicle. **William Shakespeare** (1564–1616).—*Dramas* (37 plays), *Sonnets*—A "timeless genius"; best of English writers, distinguished for wit, characterization, plot, philosophy, rhythm, variety and psychological acuteness.	**Thomas Murner** (1475–1537).—Coarse violent *Satires*, especially attacking Luther. **Martin Luther** (1483–1546).—*Translation of the Bible, Treatises, Hymns*—Inaugurator of the Reformation. **Ulrich von Hutten** (1488–1523).—*Poems, Songs* — Humanist; good Latin verse. **Hans Sachs** (1494–1576).—*Shrove Tuesday Plays, Proverb Poems* — Prolific mastersinger. **Philipp Melanchthon** (1497–1560). — *Treatises, Textbooks* — Colleague of Luther. *Till Eulenspiegel* (15th Century)—A large collection of witty, popular anecdotes, the hero of which was the prince of rogues, Till Eulenspiegel. **Johann Fischart** (1550–1590).—The master of German satire in the later sixteenth century. Achieved fame by *The Fortunate Ship of Zürich.*	**Philippe de Commines** (1445–1509).—*Memoirs*—Give accounts of the reigns of Louis XI and Charles VIII. **Margaret of Navarre** (1492–1542).—*Heptameron*, a collection of tales picturing the life of her times. **François Rabelais** (c. 1494–1553).—*Philosophy, Satire* — Scholar, philosopher, satirist and innovator. Rabelais left to posterity the *Life of Gargantua and Pantagruel*, a criticism of contemporary life in the form of a satirical history of civilization. **Clément Marot** (1495–1544). — *Poems* — Excelled in the lighter forms of poetry, such as the rondeau and the ballad, in the older forms. **John Calvin** (1509–1564).—His *Institutes of the Christian Religion* is a statement of the doctrine of the Reformation and shows his remarkable scholarship. **Jacques Amyot** (1513–1593). — *Translations From the Greek.* These translations stand as a model of the best French of the sixteenth century. **Pierre de Ronsard** (1524–1585). — *Sonnets, Odes,* etc.—As a poet of love and nature he enjoyed in his time great celebrity. **Étienne Jodelle** (1532–1573).—His *Cléopâtre*, a tragedy, and *Eugène*, a comedy, mark the beginning of these forms of the modern French drama. **Michel E. de Montaigne** (1533–1592). — Philosophic *Essays* in an easy style, read to this day.		**Girolamo Savonarola** (It.), (1452–1498). — *Sermons, Poems*—Political and theological writings. **Politian** (It.), (1454–1494).—*Orfeo*, a drama; *lyrics*; translations of the classics. **Jacopo Sannazaro** (It.), (1458–1530).—*Arcadia*, a prose romance; lyrics and sonnets. **Niccolò Machiavelli** (It.), (1469–1527).—*History, The Prince*—Profound, unscrupulous thinker, master of polished prose. **Pietro Bembo** (It.), (1470–1547).—His lyrics, formal in style, became a standard pattern. **Ludovico Ariosto** (It.), (1474–1533).—*Orlando Furioso*—A romantic poem of chivalry. **Francesco Guicciardini** (It.), (1483–1540). — *Recollections; History of Italy.* **Gil Vicente** (Port.), (c. 1470–1536).—*Dramas*—Founder of the Portuguese drama. **Bartolome de Las Casas** (Sp.), (1474–1566). — Missionary in America; wrote *History* of Spanish conquest. **Michelangelo** (It.), (1475–1564)—*Sonnets.* **Vittoria Colonna** (It.), (1490–1547). — *Poems* — Sonnets on the death of her husband. **Juan Boscán** (Sp.), (1493–1543). — *Poems* — Introduced Italian verse forms into Spain. **Benvenuto Cellini** (It.), (1500–1571). — *Autobiography*—A remarkable picture of his times. **Garcilaso de la Vega** (Sp.), (1503–1536). — *Poems* — Refined but lacking in originality. **Hurtado de Mendoza** (Sp.), (1503–1575).—*War of Granada*, a history. A picaresque novel, *El Lazarillo de Tormes*, perhaps by him, set the example for this type of literature. **Giorgio Vasari** (It.), (1512–1574).—*Lives of Celebrated Artists*—A gossipy book about artists. **Luís de Camoëns** (Port.), (1524–1579). — *Lusiad, Poems*—Greatest poet of Portugal. *Lusiad* a celebrated historical epic. **Ponce de León** (Sp.), (1528–1591).—Religious poems; translations. **Ercilla** (Sp.), (1533–1595).—*Araucana*—An epic poem.	*Morality and Mystery Plays* (Dan.), (1500–1600)—Same origin and fate as in other countries. **Tycho Brahe** (Dan.), (1546–1601).—*Rudolphine Tables*—A landmark in early astronomy.	1509–1547. Henry VIII. king of England. 1517. Luther begins Protestant Revolt. 1531. Collège de France. 1555. Religious Peace of Augsburg. 1572. Massacre of St. Bartholomew. 1581. Independence of Netherlands. 1588. Defeat of the Spanish armada.

TABLE IV. DANTE TO THE PREREFORMATION PERIOD—Concluded

DATE	ENGLISH	GERMAN	FRENCH	ITALIAN, SPANISH, PORTUGUESE	SCANDINAVIAN	HISTORICAL EVENTS
1500 to 1600 *Cont.*				**Fernando Herrera** (Sp.), (1534–1597).—*Lyrics* and *Odes*. **Torquato Tasso** (It.), (1544–1595).—*Jerusalem Delivered*—A great epic on the Crusades. **Miguel de Cervantes Saavedra** (Sp.), (1547–1616).—*Don Quixote*—The great masterpiece of Spanish literature, a romance of humor, pathos and philosophy. **Pietro Sarpi** (It.), (1552–1623).—*History of Council of Trent*—Philosophical and historical.		1571. Battle of Lepanto.

TABLE V. SEVENTEENTH CENTURY. 1600-1700

ENGLISH	GERMAN	FRENCH	SCANDINAVIAN	ITALIAN, SPANISH, PORTUGUESE	AMERICAN	HISTORICAL EVENTS
Richard Hakluyt (1552–1616).—Detailed and varied *Travels*, marked by tireless enthusiasm.	**Jacob Ayrer** (1605).—*Dramas*—He popularized the operetta.	*L'Avocat Patelin*—A masterpiece of the comic play and of the Gallic wit.		**Lope de Vega** (Sp.), (1562–1635).—*Dramas*, *Lyrics*—Dramas of unusual number, variety and power.		1598. Edict of Nantes.
George Chapman (1559–1634).—The master translator of *Homer;* mediocre dramas.		**François de Malherbe** (1555–1628).—*Poems*—In his odes, songs and sonnets he developed a new technique and a refined vocabulary.		**Galileo Galilei** (It.), (1564–1642).—*Scientific*—Physical and astronomical discussions.		
Thomas Dekker (c. 1570–1641).—Realistic, coarse, humorous *Dramas*.		**Isaac Casaubon** (1559–1614).—Critic and scholar. **St. François de Sales** (1567–1622).—*Religious Works*—Preacher and writer of religious works whose influence was great.	**Magnus Olafsson** (Ic.), (1573–1636).—*Dictionary*—First Icelandic dictionary.	**Tassoni** (It.), (1565–1638).—*Rape of the Bucket*—A mock heroic poem.		1600. Giordano Bruno burned.
John Donne (1572–1631).—Sensuous, satirical *Lyrics;* complex metaphysical poems. **Ben Jonson** (1574–1637).—*Dramas*, *Lyrics*—A scholar and man of letters.	**Hugo Grotius** (Dutch), (1583–1645).—*Law*, *Philosophy*, *Translations*—Famous scholar and statesman. **Jacob Boehme** (1573–1624).—*Treatises*—The founder of the mystical theosophy of the century.	**Racan** (1589–1670).—*Pastoral Poems*.		**Tommaso Campanella** (It.), (1568–1639).—Philosophical works; he proposed a communistic Utopia. **Claudio Monteverdi** (It.), (1567–1643).—His *Orfeo* was the first opera of the modern type.		
John Fletcher (1579–1625); **Francis Beaumont** (1584–1616).—Collaborated in *Dramas* of advanced technique but coarse language.		**Guez de Balzac** (1594–1654).—*Letters* which greatly influenced French prose style.		**Giovanni Basili** (It.), (1575–1632).—Recorded many charming folk stories.		
Robert Burton (1577–1640).—*Anatomy of Melancholy*—Full of out-of-the-way learning and quotations. **John Webster** (1580–1625).—*Tragedies* of exceptional ferocity.		**René Descartes** (1596–1650).—The founder of the Cartesian school of *Philosophy*, he also wrote on *Science*.		**Gomez de Quevedo** (Sp.), (1580–1645).—*Satires*, *Novel*—Remarkable wit; versatile in technique.	**John Smith** (1580–1631).—*A True Relation of Virginia*—A recital of his adventures.	1602. English East India Company.
Philip Massinger (1583–1640), **John Ford** (1586–1639) and **James Shirley** (1596–1666).—These were the leading writers of the *Drama* in Puritan days; mediocre in quality, it is coarse, sometimes witty. **Robert Herrick** (1591–1674).—*Poems*—Lyrics of charming quality and ingenious construction.	**Georg Weckherlin** (1584–1653).—*Odes* and *Songs*—A minor poet. **Joost van den Vondel** (Dutch), (1587–1679).—Dramatist and poet, greatest figure of Dutch literature. *Gysbrecht van Aemstel*, *Lucifer*. **Friedrich von Spee** (1591–1635).—Catholic religious *lyrics*. **Martin Opitz** (1597–1639).—*Criticism*, *Translations*, *Poems*—Translated from the classics and set up fixed principles of poetic art.				**William Bradford** (1588–1657).—*History of Plymouth Plantation*. **John Winthrop** (1590–1649.)—*History of New England*—A personal narrative.	1603. England and Scotland united under James I. 1607. Jamestown, Va., founded. 1610. Galileo discovered Satellites of Jupiter.
Izaak Walton (1593–1683).—*The Compleat Angler*—A dialogue extolling outdoor life in superb prose. **Sir Thomas Browne** (1605–1682).—*Philosophy*, *Theology*—A scholar, master of beautiful prose.	**J. M. Moscherosch** (1601–1669).—Satirical *Novels*, *Poems*.	**Vincent Voiture** (1598–1648).—Witty *Letters* and ephemeral verse. **Pierre Corneille** (1606–1684).—*Tragedy*, *Comedy*—Called the "Father of French tragedy." Of his works four are ranked among the masterpieces of literature: *Le Cid*, *Horace*, *Cinna* and *Polyeucte*.	**Georg Stiernhielm** (Swed.), (1598–1672).—*Poems*—Introduces new period in literature. Earliest Swedish sonnets.	**Calderón de la Barca** (Sp.), (1600–1681).—*Dramas* in fine flowing verse; his death ended the finest age of Spanish literature. **Pietro Cavalli** (It.), (1602–1676).—Many *Operas*, bettering their form.		1618–1648. Thirty Years' War. 1620. Voyage of *Mayflower*.
Edmund Waller (1606–1687).—Many graceful *Lyrics*; favored the heroic couplet. **Thomas Fuller** (1608–1661).—*Worthies of England*. **John Milton** (1608–1674).—*Areopagitica*, *L'Allegro*, *Il Penseroso*, *Comus*, *Paradise Lost*, *Paradise Regained*, etc.—A poet, grave, learned, of mental dignity and gifted with musical power.	**Friedrich von Logau** (1605–1655).—3000 German *Epigrams*. **Paul Gerhardt** (1607–1676).—*Hymns and Mystical Poems*.	**Mlle. de Scudéry** (1607–1701).—Voluminous *Novels* which contain allusions to the events of her day. **Paul Scarron** (1610–1660).—*Comic Plays*, *Poems*—Author of a number of witty, burlesque poems. His widow became the famous Madame de Maintenon.		**Antonio de Solis** (Sp.), (1610–1686).—*Conquest of Mexico;* dramatic poems.		1628. Gustavus Adolphus killed at battle of Lützen.

TABLE V. SEVENTEENTH CENTURY—Continued

English	German	French	Scandinavian	Italian, Spanish, Portuguese	American	Historical Events
Samuel Butler (1612–1680).—*Hudibras*—A witty anti-Puritan satire in verse.		**François de la Rochefoucauld** (1613–1680).—*Maxims, Memoirs*—His maxims, full of bold paradoxes, give him a lasting reputation.			**Anne Bradstreet** (1613–1672).—*The Tenth Muse*—An affected didactic poem. She was the first woman writer in America.	1635. French Academy founded.
Jeremy Taylor (1613–1667).—*Holy Living*, etc.—Theological prose of rare poetic beauty.						
Richard Baxter (1615–1691).—*Saint's Everlasting Rest*, a Puritan theological treatise.	**Andreas Gryphius** (1616–1664).—*Dramas*, especially comedies, and minor poems.					1642. English civil war.
Richard Lovelace (1618–1658).—Artificial *Lyrics*.						
Abraham Cowley (1618–1687).—Love poems and elegies.	**Philip von Zesen** (1619–1689).—Talented adventure *Novels*.					
John Evelyn (1620–1706).—*Diary* of a country gentleman.		*Port Royal Textbooks*—Produced from 1620 to 1700, these treatises on Grammar and Logic influenced French literature for a century.				1648. Peace of Westphalia.
Andrew Marvell (1621–1678).—*Lyrics* of country life.						
Henry Vaughn (1622–1695).—Sacred and secular poems.	**Christoffel von Grimmelshausen** (1624–1676).—*Satires; Simplicissimus*, the great rogue novel of German literature.	**Jean de la Fontaine** (1621–1695).—His *Contes*, inspired by Boccaccio, are full of wit, while his *Fables*, in lightly satirical and highly melodious verse, are a distinct contribution to literature.				
	Angelus Silesius (1624–1677).—Mystical pastoral *Poems*.	**Molière (Jean B. Poquelin)**, (1622–1673).—*Comedies; Le Misanthrope*, etc.—The greatest writer of comedies of his time. He has not been equaled in France, and seldom in any country.				1653–58. Cromwell, Lord Protector of England.
		Blaise Pascal (1623–1662).—*Philosophy, Mathematics*—A thinker and a philosopher. His *Pensées* (Thoughts), and his *Letters* remain as models of French literature.				
		Mme. de Sévigné (1626–1696).—*Letters*—Her charming familiar letters written to her daughter give interesting information on the court life of her time.				
	Benedict Spinoza (Dutch), (1632–167).—*Ethics*—He developed a pantheistic philosophy.	**Jacques Bossuet** (1627–1704).—*Sermons*, etc.—The greatest orator of his time. In his funeral orations especially he reached magnificent oratorical style.				
John Bunyan (1628–1688).—*Pilgrim's Progress* is the best known allegory in English; it is distinguished for simple passages of natural beauty		**Charles Perrault** (1628–1703).—*Stories for Children*—His stories are known all over the world and have immortalized his name.				
John Dryden (1631–1700).—*Absalom and Achitophel* contains clever heroic couplets; he also wrote *Tragedies*, fine *Odes*, and political *Satires*.					**Michael Wigglesworth** (1631–1705).—*The Day of Doom*—A Calvinistic poem on the day of judgment.	1660. Restoration of the Stuarts.
John Locke (1632–1704).—*Essay on Human Understanding, Thoughts on Education*, etc.—A sound, practical thinker, whose works illustrate common sense.		**Louis Bourdaloue** (1632–1704).—*Sermons*—A severe and austere Jesuit preacher.				1664. New Amsterdam surrenders to English. 1666, Great fire of London.
Samuel Pepys (1633–1703).—*Diary*—His *Diary*, not intended to be public, throws light on the life and habits of a capable businessman of the eighteenth century.		**Mme. de Lafayette** (1634–1693).—Her *Princesse de Clèves* was the first modern novel of character.				
George Etheridge (1635–1691) and **William Wycherley** (1640–1715) excelled in the coarse, witty comedy of the day.	**Caspar von Lohenstein** (1635–1683).—*Dramas, Novels*—Represents the decline of German Renaissance. Reveled in themes of blood, incest and cruelty.	**Nicolas Boileau-Despréaux** (1636–1711).—*Epistles, Art, Poétique, Satires*—An artist and critic who steadied and gave direction to his contemporaries.	**Thormod Torfaeus** (Ic.), (1636–1719).—*History of Norway*—A revolutionizing history.			
		Malebranche (1638–1715).—A Cartesian philosopher and able stylist.				
		Jean Racine (1639–1699).—*Tragedy*—Brought the French classic tragedy to its perfection. He excels in the portrayal of feminine love and the imperfections of human nature.	**Lars Johansson** (Swed.), (1638–1674).—*Lyrics*—Drinking songs, songs of love, casual poems.			
Sir Isaac Newton (1642–1727).—*Principia*, etc.—A great mathematician, he laid the foundation of our understanding of the mechanical structure of the universe.	**Christian Weise** (1642–1708).—Comic, simple *Plays, Novels* of the immediate scene.			**Vincenzo da Filicaja** (It.) (1642–1707).—*Lyrics*—Odes and sonnets in lofty style.		
		Jean de La Bruyère (1645–1696).—A moralist who in his *Charactères* satirized his surroundings.				1685. Edict of Nantes revoked.
	G. W. Leibnitz (1646–1716).—*Philosophic Writings*—The first great scientific German philosopher of the modern type.	**Pierre Bayle** (1647–1706).—*Critical and Historical Dictionary*. A mine of erudition presented with skepticism and humor.				

TABLE V. SEVENTEENTH CENTURY—Concluded

English	German	French	Scandinavian	Italian, Spanish, Portuguese	American	Historical Events
Thomas Otway (1652–1685). — *Venice Preserved* and *The Orphan;* outstanding tragedies of the Restoration Period; deeply emotional.	**Christian Thomasius** (1655–1728). — Delivered the first of university lectures ever given in the German tongue.	**François de la Motte Fénelon** (1651–1715).—*Télémaque*, etc. —Was not equaled in his century for the charm of his style. **Jean François Regnard** (1655–1709).—*Comedies in Verse*—His comedies, especially *Le Joueur*, show a decided talent for the gay intrigue.	**Gunno Dahlstjerna** (Swed.), (1661-1709). — *Elegies* and patriotic *Ballads* in affected style.		**Samuel Sewall** (1652–1730).— *Diaries* of the judge in the Salem witchcraft trials.	1688. English Revolution.

TABLE VI. EIGHTEENTH CENTURY, 1700-1800

English	German	French	American	Italian, Spanish Scandinavian	Historical Events
Daniel Defoe (1661–1731).—*Robinson Crusoe, Moll Flanders* — Superbly told stories; simple English.					
	Heinrich von Ziegler (1663-1696).—Minor *Poems;* a pioneer in the *Historical Novel.*	**Jean Massillon** (1663–1742).—*Orations*—One of the great French preachers.	**Cotton Mather** (1663–1728).—Many wordy *Sermons*, painfully didactic.		
Richard Bentley (1662–1742). —Classical scholar and critic.					1697. Peace of Ryswick.
Jonathan Swift (1667–1745). —*Tale of a Tub, Gulliver's Travels*—Unequaled as a satirist and writer of allegories in simple, idiomatic English.		**Alain René Le Sage** (1668–1747). —Wrote *Comedies*—*Gil Blas*, a satirical novel, was one of the first to depict truly the manners of society.		**G. Battista Vico** (It.), (1668–1744).—*Scienza Nuova*—Metaphysical and scientific.	1701. War of Spanish Succession begins.
William Congreve (1670–1729).—*Dramas*—*The Old Bachelor*, other poetic comedies, much admired in his day.					
Joseph Addison (1672–1719). — *Essays* — Originator of the social essay, marked by kindly, gentlemanlike humor in the urbane style.					1704. Boston *News Letter* established.
Sir Richard Steele (1672–1729). — *Essays* — Established the *Tatler*. A collaborator with Addison.			**William Byrd** (1674–1744).—*The Dividing Line* and *other tracts*—Full of fresh humorous observations on life.		
George Farquhar (1678–1707).—*The Beaux Stratagem* — Master of brilliantly witty comedies of coarse tone.	**Christian von Wolff** (1679–1754). — *Philosophical Writings* — The modern scholastic who popularized philosophy and brought rationalism to bear upon theology.	**Duc de Saint Simon** (1675–1755). — *Court Memoirs*—An original writer.		**Scipione Maffei** (It.), (1675–1755).—*Dramas*—His *Merope* is the first classic Italian tragedy.	1710. St. Paul's Cathedral. London, completed.
Edward Young (1683–1755). —Somber *Poems* of splendid melody.		**Philippe Destouches** (1680–1754). — *Comedies in Verse*—His *Le Glorieux* is an excellent comedy of manners.	**Robert Beverly** (1675–1722).—*History of Virginia* — A straightforward narrative.		1714. War of Spanish Succession ends.
Bishop Berkeley (1684–1753). — Idealist *Philosophy* — A very acute Irish thinker.				**Ludvig Holberg** (Dan.), (1684–1754). — *Comedies, Historical Works, Philosophy, Comic Poetry*—Founder of Danish drama.	1715. Louis XIV dies.
John Gay (1685–1732).—*Dramas, Fables*—His *Beggar's Opera* was the hit of his day.					
Alexander Pope (1688–1744). —*Poems*—The model poet of the English classical era, master of the couplet, but wanting in emotion.				**Emanuel Swedenborg** (Swed.), (1688–1772). — *Philosophy* — Prominent scientist. Founder of a mystic religious sect.	
Samuel Richardson (1689-1761). — *Novels; Clarissa Harlowe, Pamela, Sir Chas. Grandison* — Popularized the long sentimental moral novel, and excelled in drawing feminine character.		**Montesquieu** (1689–1755).—*The Spirit of Laws*—A scholar who satirized his age.			
		Alexis Piron (1689–1773). —Witty short *Poems, Epigrams*, minor poetic *Comedies.*			1720. South Sea and Mississippi speculative bubbles.
Henry Carey (1690–1743).—*Sally in Our Alley*, other light verse.					
Bishop Butler (1692–1752). —*Natural and Revealed Religion*—The orthodox moralist of his day, ponderous in style and commonplace in method.					
Earl of Chesterfield (1694–1773). — *Letters*, admired for finished style and shrewd wit.	**J. C. Guenther** (1695–1723). —*Lyrics*—A lyric poet of personal feeling, modeling his lyrics upon the ballad.	**Voltaire (François Marie Arouet)** (1694–1778).—*History, Letters, Philosophy, Poems, Dramas*, etc.—The greatest literary genius of the eighteenth century. Poet, historian, political and satirical writer, philosopher, writer of tragedies, he greatly influenced the thought of his era.			
George Sale (1697–1736).—A minor writer; his translation of *The Koran* was long classic.	**J. Bodmer** (Swiss), (1698–1783).—*Criticisms, Translations.*			**Pietro Metastasio** (It.), (1698–1782). — *Musical Dramas* — Lyric smoothness of melody frequently weakens his thought.	1727. George II, king of England.
James Thomson (1700–1748):—*The Seasons*, etc. —A delicate feeling for the quieter aspects of nature, harmoniously expressed.	**J. C. Gottsched** (1700–1766). —*Dramas, Criticisms*—He sought to reform the German drama on the model of the French, but was the victim of acid literary quarrels.		**Jonathan Edwards** (1703–1758).—*Sermons, Freedom of the Will*—A metaphysician and Calvinist teacher.		
Henry Fielding (1707–1754). —*Tom Jones, Amelia*, etc. —The first English realistic novelist. Depicts life broadly and faithfully.		**Abbé Prevost** (1697–1763). — *Manon Lescaut*, a classic psychological study of passion.			
	Friedrich von Hagedorn (1708–1754).—*Lyrics, Fables*—Essentially a social poet. He gave the dominant tone to the German lyric for twenty-five years.		**Benjamin Franklin** (1706–1790).—*Poor Richard's Almanack, Autobiography*—Wise and sagacious utterances of an avowed utilitarian.		1734. University of Göttingen founded.

TABLE VI. EIGHTEENTH CENTURY, 1700-1800—Continued

English	German, Swiss	French	Scandinavian	Italian, Russian American	Historical Events
Samuel Johnson (1709-1784). — *Dictionary, Rasselas, Lives of the Poets, Vanity of Human Wishes*—A man great in eighteenth century learning and letters. The critical authority of his day.	**Albrecht von Haller** (1708-1777). — *Science* — Great Swiss anatomist and physiologist.	**Comte de Buffon** (1707-1788).—*Natural History*—A great naturalist and a writer whose style still serves as a model. **Louis Gresset** (1709-1777).—*Poems, Comedies* of manners.	**Karl von Linné** (Swed.), (1707-1778).—*Botany, Travels* — Founder of science of botany. **Olof von Dalin** (Swed.), (1708-1763). — *Journalism, History, Comedy, Tragedy, Poems.*	**Carlo Goldoni** (It.), (1707-1793). — *Comedies* — Animated character comedy, mostly in prose.	1740. Reign of Frederick the Great begins.
David Hume (1711-1776).—*History of England*—The first learned historian of England. An empirical philosopher.		**Jean Jacques Rousseau** (1712-1778). — *Confessions, Philosophy*—A writer of world-wide influence, he led the shift from classicism to romanticism in European literature.		**Mikhail Lomonosov** (Russ.), (1711-1765). — *Lyrics* — Scholar and poet. Put Russian folk songs in durable metrical verse.	
Laurence Sterne (1713-1768). —*Tristram Shandy, Sentimental Journey*—A writer in whom affectation becomes an art.	**C. F. Gellert** (1715-1769).—*Novels, Letters, Fables, Poems*—A great stylist in verse, he produced the pioneer German social novel.	**Denis Diderot** (1713-1784).—*Fiction, Encyclopedie* (Ed.)—One of the most powerful exponents of the ideas and philosophy of the eighteenth century.			
Thomas Gray (1716-1771).—*Elegy in a Country Churchyard*, etc.—A scholar-poet. Production limited but of fine workmanship. **Horace Walpole** (1717-1797). —*Letters*, among the best in English, witty and of unbounded range. He pioneered in the *Novel* of Terror.	**Ewald von Kleist** (1715-1759). — *Nature Poetry, War Odes*—A spirit of melancholy unites with his passionate love for nature.	**Étienne de Condillac** (1715-1780). — *Metaphysics, Treatise on Sensations.*			1745. Jacobite rising in Scotland.
Gilbert White (1720-1793).—*Natural History of Selborn*, a classic of minute observation and graceful style. **Tobias Smollett** (1721-1771). —*Humphrey Clinker, Roderick Random*, etc.—Picaresque tales inclined to vulgarity. **Sir William Blackstone** (1723-1780). — *Commentaries on the Laws of England* —The classic legal textbook for a century.				**Carlo Gozzi** (1722-1806).—Italian *Fable* dramas.	
Adam Smith (1723-1790).—*Wealth of Nations*—The first great modern economist. **Oliver Goldsmith** (1728-1774).—*Vicar of Wakefield, Essays, Deserted Village, She Stoops to Conquer*, etc. —A true and graceful touch both in prose and poetry.	**F. G. Klopstock** (1724-1803). —Epic *Messiah, Lyrics, Odes*—The first great German poet of the eighteenth century.				
Edmund Burke (1729-1797). —*Essays, Orations*—Prose, sometimes musical and poetical, and, at the same time, with a statesman's grasp of principle. **Thomas Percy** (1729-1811). —*Reliques*, an admirable collection of ancient ballads.	**G. E. Lessing** (1729-1781).—*Criticisms, Plays* — The greatest critic of Germany. He developed a new type of national German tragedy.			**Guiseppe Parini** (It.), (1729-1799), *Poems, Odes*—His *Giorno* is one of the masterpieces of dignified style in Italian poetry. **Girolamo Tiraboschi** (It.), (1731-1794). — *Literary History*—A valuable history of Italian literature.	1756-1763. Seven Years' War.
William Cowper (1731-1800). —*The Task, John Gilpin*, etc.—Divests poetry of the affectations of Pope. Writes on simple themes.	**Solomon Gessner** (Swiss), (1730-1788).—*Idyls, Pastorals*—His *Idyls* attained great popularity. **C. M. Wieland** (1733-1813). —*Oberon, Novels*—A master of brilliant witty comedy who greatly advanced German style.	**Augustin de Beaumarchais** (1732-1799). — *Comedies* — Celebrated especially for his two witty, spirited and well constructed plays, *Le Barbier de Séville* and *Le Mariage de Figaro.*		American	
James Macpherson (1736-1796).—A Scottish poet who excelled in rhythmical tales of Gaelic heroes. **Edward Gibbon** (1737-1794). —*Decline and Fall of the Roman Empire*—A painstaking and learned historian. **James Boswell** (1740-1795). —*Life of Samuel Johnson*—Shows the true reporter's instinct for the point of a story. The book is one of the most delightful biographies ever written.	**Immanuel Kant** (1724-1804). —*Critical Philosophy*—The greatest German philosopher. Substituted critical philosophy for the old dogmatic metaphysics, demanded obedience to the moral law, laid the foundations of modern æsthetics. He was the founder of the transcendental philosophy. The next century was the Golden Age of German literature.	**Bernardin de St. Pierre** (1737-1814). — *Paul and Virginia.* This popular prose idyl brings into French literature the taste for Nature as it is.	**Karl Mikael Bellman** (Swed.), (1740-1795). —*Songs, Lyrics*—Bubbling joy of life in ballads, odes and drinking songs.	**George Washington** (1732-1799).—*Farewell Address, State Papers*, etc.—Broadly patriotic and well-considered. **Patrick Henry** (1736-1799). —*Speeches, Letters*, etc.—Eloquent, ardent patriotism. **Thomas Paine** (1737-1809). — *The Crisis, Common Sense, Rights of Man, Age of Reason*, etc.—A talented and widely read political pamphleteer.	1763. *Georgia Gazette* established at Savannah.
William Paley (1743-1805). —*Evidences of Christianity, Natural Theology.* **Hannah More** (1745-1833). —*Coelebs in Search of a Wife*, a novel, *Sacred Dramas.* **Jeremy Bentham** (1748-1832). — *Philosophy, Essays*—Great critic of legislation and government.	**J. G. von Herder** (1744-1803).—*Criticisms, History* —The chief factor in the literary revolution known as "storm and stress." His work in history sets forth the evolution of human institutions.				1772. Partition of Poland. 1776. American independence declared.

TABLE VI. EIGHTEENTH CENTURY—Concluded

ENGLISH	GERMAN	FRENCH	SCANDINAVIAN	ITALIAN	HISTORICAL EVENTS
Richard B. Sheridan (1751–1816).—*The Rivals, School for Scandal, Speeches*, etc.—Writer of witty dialogue and constructor of telling stage situations.	**Johann Wolfgang von Goethe** (1749–1832). — *Dramas, Lyrics, Elegies, Sonnets, Epigrams* — The greatest German poet. A universal genius. Before 1800 he had mastered ballad poetry, sung finished odes, lived his story of *Werther*, and created a new German classicism in *Iphigenie, Tasso*, and *Hermann and Dorothea*. His life poem, *Faust*, typifies the philosophical struggle of the poet's own life.	**Comte Mirabeau** (1749–1791).—*Orations*—The greatest orator of the French Revolution.	**Edv. Storm** (Nor., 1749–1794).—Heroic *Ballads*. **Johan Henrik Kellgren** (Swed.), (1751–1795).—*Journalism, Poems*—Lyric and satiric poetry. A scholar and critic, he led the revival of Swedish literature.	**Vittorio Alfieri** (It.), (1749–1803). —*Classical Tragedies*.	1786. Swedish Academy founded.
George Crabbe (1754–1832).—*Tales in Verse*, other realistic narrative poems.					
William Blake (1757–1827).—*Songs of Innocence, Songs of Experience*—A master of the simple lyric, he illustrated his works by admirable tinted engravings.					1789. Beginning of French Revolution.
Robert Burns (1759–1796).—Scottish poet. *Poems*—Lyrics, songs and satires in Scottish dialect, marked by music, pathos and wit. The national poet of Scotland.	**Friedrich von Schiller** (1759–1805). — *Dramas, Lyrics, History*—Reflects the ideal yearnings of his time. Aimed to lead men to consecrate their gifts to *the good, the beautiful and the true*. He is the best-loved poet among the Germans.	**Claude Rouget de Lisle** (1760–1836).—*Marseillaise* — The immortal national hymn of France.			1792. French Republic declared. 1796. Washington issues his "Farewell Address."
	August von Kotzebue (1761–1819).—*Plays*—A prolific writer, very popular in his day.	**André Chénier** (1762–1794). — *Lyrics* — A model in purity of form and passion in style, following the old classic pattern.			1799. Death of Washington. Napoleon, First Consul in France.

TABLE VII. EARLY NINETEENTH CENTURY, 1800-1875

ENGLISH	AMERICAN	FRENCH	GERMAN, SCANDINAVIAN	OTHER COUNTRIES	HISTORICAL EVENTS
	Thomas Jefferson (1743–1826).—*Notes in Virginia, Declaration of Independence, Letters.* **John Marshall** (1755–1835).—*Life of Washington, Decisions*, etc. **Alexander Hamilton** (1757–1804).—*Contributions to the Federalist*—Keen and ingenious political articles.				1804. Napoleonic code adopted in France.
			J. G. Fichte (1762–1814).—*Philosophic Writings, Orations*—The philosopher of the German Romantic school and the exponent of the philosophy of individualism. **Jean Paul Friedrich Richter** (1763–1825).—*Novels, Esthetics*—Guilty of crude style and bad construction, his books have fine imaginative passages.		1805. Battles of Austerlitz and Trafalgar.
	Alexander Wilson (1766–1813).—*American Ornithology* — Pioneer investigations.	**Mme. de Staël** (1766–1817).—*L'Allemagne, Delphine, Corinne*, etc.—Shrewd political ideas; a leader in the Romantic school in French letters.		**Carlo G. Botta** (It.), (1766–1837).—*Histories.*	1806. Battle of Jena. Napoleon controls Germany. 1806–07. Berlin and Milan Decrees establishing the Continental System.
Maria Edgeworth (1767–1849). — *Popular Tales* — Stories of middle-class domestic life.		**Benjamin Constant** (1767–1830).—A skeptic in *Politics, Religion.* **Jean François Michaud** (1767–1839).—*History of the Crusades*, etc.—Advanced the technique of biographical writing. **François de Chateaubriand** (1768–1848). — *René, Genius of Christianity, Atala*, etc.—A talented and versatile writer, he had great influence on the literature of the first half of the nineteenth century. **Baron de Cuvier** (1769–1832).—His *Animal Kingdom* is the pioneer work in zoological classification.	**Alexander von Humboldt** (1769–1859).—*Science, Travels.* **A. W. von Schlegel** (1767–1845). — Art *Criticism, Translations* — The great critic of the Romantic school. **Zacharias Werner** (1768–1823).—*Plays, Sonnets*—A great dramatist of the Romantic school. **Friedrich Schleiermacher** (1768–1834). — *Addresses, Criticisms* — An eloquent preacher of the Romantic school. **Ernst Moritz Arndt** (1769–1860).—*Warsongs, Lyrics.* **Friedrich Hölderlin** (1770–1843).—*Hyperion*, minor *Lyrics.* **G. W. F. Hegel** (1770–1831).—*Philosophy*—The philosopher of collectivism and of evolution in history.	**Ivan Krylov** (Russ.), (1768–1844).—Popular witty *Fables.*	1807. Battle of Friedland. Peace of Tilsit.
William Wordsworth (1770–1850). — *The Excursion, Poems*—Nature poems, descriptive poems and many fine sonnets. He revived simple verse forms and expressed feeling for nature.					1807. Fulton's steamboat on the Hudson.

TABLE VII. EARLY NINETEENTH CENTURY—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
James Hogg (1770–1835).—*Pastorals, Shepherd's Calendar*—A minor Scottish lyricist.					
Sir Walter Scott (1771–1832).—*Novels, Lady of the Lake, Poems.* — Developed the English historical novel with great success. A master of natural wholesome narrative poetry.	**Charles Brockden Brown** (1771–1810). — His *Wieland*, wierd and uneven, was the first American novel.		**Heinrich Zschokke** (1771–1848). — *Novels* — Prolific historical novelist.		
Sydney Smith (1771-1845).—*Sermons, Essays*—The witty divine. Master of the expository style.					1808. Napoleon interferes in Spain. Beginning of Peninsular War.
James Montgomery (1771–1854).—*Hymns.*					
Samuel T. Coleridge (1772–1834).—*Essays, Rhyme of Ancient Mariner, Translation,* etc.—A man of remarkable gifts, intellectual and poetic; a keen critic; a natural master of verbal melody.	**William Wirt** (1772–1834).—*Life of Patrick Henry, Letters of a British Spy.*	**Charles Fourier** (1772–1839). — *Socialism* — An economist of advanced ideas.	**Novalis (Friedrich von Hardenberg)** (1772–1801). — *Novels, Lyrics, Criticism*—The sentimental poet of the Romantic school. His *Hymns to the Night* are spirituals of enduring quality.		
			Friedrich von Schlegel (1772–1829).—*Criticism; Novels*—A minor poet, he was a leading novelist of the German Romantic school.		1809. Austrians defeated at Wagram. Peace of Schönbrunn.
			Franz Mikael Franzén (Swed.), (1772–1847). — *Poems, Hymns*—Exquisite lyric poems.		
Robert Southey (1774–1843).—*Biographies of Nelson, Wesley,* etc., *Poems*—A minor poet with an even rhythmical prose style.			**Ludwig Tieck** (1773–1853).—Fantastic *Novels, Lyrics*—His *Puss in Boots* is an enduring satirical drama.	**Jean Charles Sismondi** (It.), (1773–1842).—*Histories.*	
Charles Lamb (1775–1834).—*Essays of Elia,* etc.—A quaint and delicate essayist, blending humor and pathos.			**F. N. J. Schelling** (1775–1854).—*Philosophy*—A disciple of Spinoza, taught the identity of spirit and nature.		1810–12. Napoleon at zenith of power.
Walter Savage Landor (1775–1864).—*Imaginary Conversations, Count Julian, Heroic Idyls,* etc.—Classic scholar and remarkable stylist.					
Jane Austen (1775–1817).—*Novels; Pride and Prejudice, Emma,* etc.—Her novels depicting upper middle-class life are delightfully realistic and full of quiet humor.			**Ernst Theodor Hoffmann** (1776–1822). — Fantastic Romantic *Novels* on supernatural themes.		
			Heinrich von Kleist (1777–1811).—Historical *Dramas,* minor *Novels.*		
Thomas Campbell (1777–1844).—*Pleasures of Hope, Lyrics,* etc.—His lyrics have much vigor and verve.			**F. de la Motte Fouqué** (1777–1843).—*Tales, Lyrics*—A Romanticist, popularly known for his charming *Undine.*		
Henry Hallam (1777–1859). — *Europe During the Middle Ages, Constitutional History of England*—Strong, vigorous, historical writing from a standpoint now antiquated.					
William Hazlitt (1778–1830). — *Table Talk, English Poets,* etc.—Critical essays in simple vigorous style.			**Clemens Brentano** (1778–1843).—*Novels,* collector of German *Ballads.*		1812. Napoleon invades Russia. Grande Armée destroyed.
Thomas Moore (1779–1852).—*Biographies, Lalla Rookh, Irish Melodies,* etc.—Sentimental songs of remarkable melody.	**James Kirk Paulding** (1779–1860). — *Novels* — Pioneer in the American historical novel.				
	Francis Scott Key (1780–1843).—*Poems, Star Spangled Banner,* etc.—The chief poem is a national song of patriotic ardor.	**Pierre de Béranger** (1780–1857).—*Lyrics*—His rhythmical patriotic songs were very popular in his day.			1812. War between U. S. and Great Britain.
	William E. Channing (1780–1842).—*Addresses, Sermons*—A popular orator.				
	John James Audubon (1780–1851).—*Birds of America*—A pioneer in American scientific writing.		**Achim von Arnim** (1781–1831).—Romanticist *Novels, Poems.*		1813. Battle of Leipzig.
			Adelbert von Chamisso (1781–1838). — *Peter Schlemihl, Poems*—A later Romantic lyricist.		
	Daniel Webster (1782–1852).—*Orations.*		**Esaias Tegnér** (Swed.), (1782–1846).—Popular lyrical *Poems, Frithiofs Saga.*		
	Thomas Hart Benton (1782–1858). — *Thirty Years' View*—Memoirs of a politician.				
Leigh Hunt (1784–1859).—*Essays, Sketches, Memoirs, Poems*—A minor poet. A *littérateur* of appreciation rather than of creative power.		**Henri Beyle** (Stendhal), (1783–1842). — *Novels* — His novels *Le Rouge et le Noir* and *La Chartreuse de Parme* mark the beginning of the analytical psychological novel.	**Erik Gustaf Geijer** (Swed.), (1783–1847). — *History, Philosophy, Poems.*		1814. Napoleon abdicates.

TABLE VII. EARLY NINETEENTH CENTURY—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
Thomas De Quincey (1785–1859).—*Confessions of an Opium Eater*, etc.—A scholar and prolific but uneven writer, he produced some passages of superb color.	**Washington Irving** (1783–1859). — *Knickerbocker's History of New York, Sketch Book*, etc.—Humorous tales, characterized by delicate sentiment and grace. He was the first American writer to be recognized in Europe.	**François Guizot** (1787–1874).—Philosophical *Histories.*	**Jacob Grimm** (1785–1863).—*Fairy Tales, Dictionary*—With his brother Wilhelm, founder of modern German philology and compiler of the great German dictionary; known in literature for his large collection of *Fairy Tales.*	**Alessandro Manzoni** (1785–1873).—*Novel, Dramas* — *The Betrothed*, an unsurpassed Italian novel.	1815. Napoleon defeated at Waterloo.
			Ludwig Börne (1786–1837).—*Letters from Paris*—A Jew from the Frankfort ghetto. Famous for his *Letters*, written as a protest against narrowing social limitations.		
			Wilhelm Grimm (1786–1859). — *Critical Writings* — See Jacob Grimm mentioned above.		
			A. Justinus Kerner (1786–1862).—*Lyrics, Soothsayer of Prevorst*—Lyric poet and Romantic mystic.		
			Ludwig Uhland (1787–1862). — *Criticism, Ballads* — Poet of Romantic type. He wrote enduring ballads and patriotic songs.		1819. Steamship *Savannah* crosses Atlantic.
Lord Byron (1788–1824).—*Poems* — Vigorous, eloquent, sardonic, iconoclastic, he was above all a subjective poet, approaching genius when his emotions were aroused.			**J. von Eichendorff** (1788–1857).—*Lyrics, Life of a Good-for-Nothing*—A poet of nature, one of the best lyricists of the German Romantic school.		1821. Greek war of independence against Turkey.
			Arthur Schopenhauer (1788–1860). — *Philosophy* — The philosopher of pessimism.		
			Friedrich Rückert (1788–1866).—*Sonnets in Armor, Poems*—Poet of the war of Liberation.		
	James Fenimore Cooper (1789–1851).—*Leather Stocking Tales, The Spy*, etc.—He put the American Indian in literature. The pioneer in American frontier fiction and sea stories, able in plot and action but stilted in characterization.		**B. S. Ingemann** (Dan.), (1789–1862). — *Novels, Lyrics, Hymns*—Romantic idealization of Middle Ages.	**Silvio Pellico,** (1789–1854).—Italian dramatist, poet, novelist.	
	Jared Sparks (1789–1866).—Pioneer *American Biographies.*				
	Fitz-Greene Halleck (1790–1867). — Spirited, sometimes graceful *Poems, Marco Bozzaris*, etc.	**Alphonse de Lamartine** (1790–1869).—*Poems, History of the Girondists*, etc.—An early but outstanding poet of the Romantic school, showing fine harmony and high ideals.			1823. Monroe Doctrine declared.
	George Ticknor (1791–1871).—*History of Spanish Literature*—Scholarly and authentic.	**Eugène Scribe** (1791–1861).—Gay, light popular *Comedies.*	**Theodor Körner** (1791–1813).—*Lyre and Sword*, a collection of patriotic lyrics.		1810–26. South American Revolution.
Percy B. Shelley (1792–1822).—*Queen Mab, Adonais, The Sky Lark*, etc. all evincing impulsive emotion and a remarkable gift of lyrical melody.	**John Howard Payne** (1792–1852).—*Home Sweet Home* an enduring lyric; *Dramas.*	**Victor Cousin** (1792–1867).—*Philosophy, Metaphysics*—The chief Eclectic philosopher.	**Franz Grillparzer** (1791–1872).—*Dramas, Lyrics* The greatest Austrian dramatist. *Waves of the Sea and of Love* is a great modern love tragedy.		
Frederick Marryat (1792–1848).—*Peter Simple, Jacob Faithful*, etc.—Boys' stories, usually of the sea.					
Felicia Hemans (1793–1835).—*Lyrics*—A minor poet of grace, sweetness and tenderness.	**Samuel G. Goodrich** (1793–1860).—*Peter Parley Books* — Popular introductions with a flavor of fiction.	**Casimir Delavigne** (1793–1843). — Minor *Dramas, Elegies.*	**Karl J. L. Almqvist** (Swed.), (1793–1866).—*Book of the Thorn Rose;* mystical *Novels, Essays, Poems.*		1824. National gallery in London opened.
	William Cullen Bryant (1794–1878).—*Translations, Letters, Poems: Thanatopsis*, etc. — First distinguished American poet, successful in simple rhythms.		**Wilhelm Müller** (1794–1827).—*Lyrics*—Master of the popular lyric. Poet of the German people.		
John Keats (1795–1821).—*Endymion, Hyperion*, etc.—A master of romance and subtle pathos in finished melody.	**Joseph Rodman Drake** (1795–1820).—*The Culprit Fay*—Cleverly executed, but ingeniously fanciful.	**Augustin Thierry** (1795–1856).—*History of France*, etc.—Historian of the Romantic school.			1825. Erie Canal opened.
Thomas Arnold (1795–1842).—*Roman History, Sermons, Essays*—A historian of the old school.	**John Pendleton Kennedy** (1795–1870). — *Swallow Barn, Horse Shoe Robinson*, etc. — Old-fashioned but interesting pictures of Southern life.				
Thomas Carlyle (1795–1881).—*French Revolution, Cromwell, Sartor Resartus, Essays*, etc.—A prose poet, a historian of insight and industry, impatient of shams.					

TABLE VII. EARLY NINETEENTH CENTURY—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
	William H. Prescott (1796–1859).—*Conquest of Peru, Ferdinand and Isabella,* etc.—Histories remarkable for distinctive clear style, based on earnest research. **Thomas C. Haliburton** (Canadian), (1796–1865).—*Sam Slick*—Humorous with the raciness of the soil.		**August von Platen** (1796–1835).—*Venetian Sonnets, Poems, Stories.* **K. L. Immermann** (1796–1840).—*Novels*—A late Romantic writer.		
Samuel Lover (1797–1868).—Irish *Songs* and *Stories.*	**Hugh Swinton Legaré** (1797–1843).—Stilted *Addresses, Articles, Letters.*	**Louis Adolphe Thiers** (1797–1877).—Realistic *History of the French Revolution, the Empire,* etc.	**Heinrich Heine** (1797–1856).—*Lyrics, Short Stories*—The greatest lyric poet after Goethe, strongly imbued with Romanticism. Best known as the author of *The Journey to the Harz Mountains* (1826), and the *Book of Songs* (1827). **Henrik Hertz** (Dan.), (1797–1870).—*Dramas, Epics, Satires*—Most original in his lyric poetry.		
Thomas Hood (1798–1845).—*Poems*—A humorous poet of the first rank: some pathetic verses of high quality.		**Auguste Comte** (1798–1857).—Influential founder of *Positive Philosophy.* **Jules Michelet** (1798–1874).—*History of France*—Gave a new conception of history.	**Wilhelm Häring** (W. Alexis), (1798–1871).—*Patriotic Novels.* **August Hoffmann von Fallersleben** (1798–1874).—Many musical *Lyrics;* his *Deutschland Über Alles* became a national hymn.	**Giacomo Leopardi** (It.), (1798–1837).—An outstanding critic whose pessimistic poems exhibit fine artistic skill.	1828. First passenger railway in U. S.
	Amos Bronson Alcott (1799–1888).—*Concord Days, Table Talks, Sonnets and Canzonets*—A leader of the Transcendentalist philosophy.	**Honoré de Balzac** (1799–1850).—*Novels*—The author of the *Comédie Humaine,* a collection of novels which embraces the whole of society. Balzac is considered as the chief of the "realistic school," although there is idealism in his novels.		**Aleksandr Pushkin** (Russ., 1799–1837).—*Poems, Stories, Novels, Dramas*—A great poet. Romantic at first. Later emphasized national feeling in Russian literature.	1829. Andrew Jackson, President of the U. S. Stephenson's locomotive *Rocket.*
Thomas B. Macaulay (1800–1859).—*Essays, History of England, Lays of Ancient Rome*—Far from impartial, he makes history alive and readable. **Cardinal Newman** (1801–1890).—*Apologia pro Vita sua*—An able orthodox theological propagandist.	**George Bancroft** (1800–1891).—*History of the United States*—Faithfully prepared and honestly presented. The first successful detailed American history.	**Alfred de Vigny** (1799–1863).—*Cinq Mars,* etc.—One of the poets of the Romantic school.		**Manuel Breton de los Herreros** (Sp.), (1800–1873).—*Dramas*—Gives a good picture of Spanish social life.	
			C. D. Grabbe (1801–1836).—Pessimistic but ably characterized *Dramas.* **Fredrika Bremer** (Swed.), (1801–1865).—*Novels*—Describes family life of middle classes realistically.		1830. Revolution in France.
Harriet Martineau (1802–1876).—Didactic *Stories, Tracts*—A woman of sound scholarship and liberal ideas.	**Horace Bushnell** (1802–1876).—Didactic *Tracts.*	**Victor Hugo** (1802–1885).—*Novels, Lyrics*—A leader of the Romantic school. His poetry, epic and lyric, is rarely surpassed. His great novel, *Les Miserables,* ranks equally high in prose.	**Wilhelm Hauff** (1802–1827)—*Lichtenstein, Man in the Moon, Short Stories*—An able writer of historical novels. **Nikolaus Lenau** (Austrian), (1802–1850).—His gloomy *Lyrics* were among the greatest in artistic skill of his age.		1832. Reform Bill in England.
Sir Edward Bulwer Lytton (1803–1873).—*Last Days of Pompeii, Last of the Barons,* etc.—A versatile and successful *littérateur.* **George Borrow** (1803–1881).—*Travels, Romances* of Gypsy life.	**Ralph Waldo Emerson** (1803–1882).—*Conduct of Life, Representative Men, Essays, Poems*—The prophet of American culture. Coalesces oriental ideas and occidental individualism. **Jacob Abbott** (1803–1879).—*Rollo Books*—Popular favorites of unsophisticated youth.	**Alexandre Dumas** (*père*), (1803–1870).—*Novels, Dramas*—The author of a large number of popular novels based upon history and remarkable for their easy style and the tireless action of their romantic characters. Among his important plays *Henry III.* was a milestone in the development of the French Romantic drama.			
		Prosper Mérimée (1803–1870).—*Stories, Novels*—His tender romantic stories are still popular.			1833. Slavery outlawed in British Empire.
Benjamin Disraeli (1804–1881).—*Lothair, Vivian Grey,* etc.—Artificial society novels.	**Nathaniel Hawthorne** (1804–1864).—*Twice Told Tales, Scarlet Letter, Marble Faun,* etc.—Wrote with poetic spirit in charming style of the glories and trials of early New England and fanciful allegorical romances.	**Eugène Sue** (1804–1857).—*Mysteries of Paris, Wandering Jew,* etc.—His popular novels, in which imagination plays the principal part, were enjoyed in his time. **C. A. de Sainte-Beuve** (1804–1869).—*Criticisms,* etc.—Is the master of criticism of his period. **George Sand** (Mme. Dudevant), (1804–1876).—*Novels*—Her literary career was divided between romantic novels and philosophical novels.	**Eduard Mörike** (1804–1875).—*Lyrics, Stories*—The great lyric poet of Swabia. **Johan Ludvig Runeberg** (Finland), (1804–1877).—*Poems, Dramas.*		
		Alexis de Tocqueville (1805–1859).—*Political Science, Histories*—In *Democracy in America* the institutions and customs of the country are keenly observed.	**Hans Christian Andersen** (Dan.), (1805–1875).—*Fairy Tales, Novels, Dramas, Poems*—Used language of the people and of childhood. Next to Bible, his *Fairy Tales* have been translated into the most foreign languages.		1835. Texas proclaimed independent.

TABLE VII. EARLY NINETEENTH CENTURY—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
Elizabeth Barrett Browning (1806–1861).—*Aurora Leigh, Poems*—A pleasing lyrical gift and warm, human sympathy made her a favorite poetess in the Victorian era.	**Nathaniel P. Willis** (1806–1867). — *Poems, Sketches, Editorials*, etc. **William Gilmore Simms** (1806–1870).—*Poems, Novels, Biography*, etc.—Versatile, original and artistic writer whose frontier tales were the outstanding Southern novels of his time.		**Heinrich Laube** (1806–1884). — *Novels, Plays* — Witty, but seldom a delicate poet. His chief works are novels or dramas of radical spirit.		
John Stuart Mill (1806-1873). —*Political Economy*—Of thorough intellectual honesty and diamond-clear intellect, he furthered the cause of political justice and personal freedom. **Edward FitzGerald** (1809–1883).—A minor poet, remembered for his superb *Translation* of Omar Khayyám.	**Henry W. Longfellow** (1807–1882).—*Outre Mer, Hyperion, Poems, Hiawatha*, etc.—Popular in appeal and simple in form, his work is conventional but important because it introduced much European culture to American readers.		**Jonas Hallgrimsson** (Ic.), (1807–1845).—*Island Gunnarsholmi*—Popular patriotic songs.		1837. Victoria crowned queen.
Charles Darwin (1809–1882). —*Origin of Species, Descent of Man*—Lucid and attractive in style and an unflinching lover of truth, he completely changed the direction of biological science. **Alfred Tennyson** (1809–1892). — *In Memoriam, Idylls of the King, Poems*—The national poet of the late nineteenth century; a painstaking artist and master of verbal melody.	**John G. Whittier** (1807–1892).—*Editorials, Household Poems* — Melodious but uneven verse; a poet with a cause, Abolition. **Edgar Allan Poe** (1809–1849). —*Tales, Poems: Raven, Annabel Lee*, etc.—Creator of the modern short story form, inventor of the "detective story," an acute critic and an unsurpassed lyricist, he was one of the foremost literary figures produced in America. **Oliver Wendell Holmes** (1809–1894).—*Autocrat of the Breakfast Table, Novels, Poems*—Clever, witty, versatile and skilful both in verse and prose.			**Aleksyey Koltsov** (Russ.), (1808–1842). — *Lyrics* of deep feeling. **Nikolay Gogol** (Russ.), (1809–1852).—*Plays, Tales, Novels*—The greatest of Russian satirists, and the first widely acclaimed Russian novelist.	1839. Daguerre's perfected photographic process. Belgium independent of Netherlands. Neutrality guaranteed.
Elizabeth Gaskell (1810–1865).—*Cranford, Mary Barton, etc.*—One of the first to make economic problems the basis of a story.	**Margaret Fuller (Ossoli)** (1810–1850).—*Summer on the Lakes, Papers on Literature and Art*—A minor Transcendentalist. **Theodore Parker** (1810–1860). —Liberal theological thinker. Courageous abolitionist.	**Alfred de Musset** (1810–1857). — *Tales, Poems, Dramas*—Some of his tragic love poems—*Les Nuits, le Souvenir*, etc. — are among the most beautiful in French literature. His comedies blend dream and reality. **Henri Martin** (1810–1883).—A standard *History of France*.	**Fritz Reuter** (1810–1874).—Dialect *Poems, Novels*—A born storyteller, with broad realistic humor. **H. Ferdinand Freiligrath** (1810–1876). — *Poems, Translations*.		1840–42. Opium War in China. 1842. Webster-Ashburton Treaty.
William M. Thackeray (1811–1863).—*Vanity Fair, The Newcomes, Henry Esmond*—Sentimentalist, satirist and humorist, but with great powers of characterization, especially of the everyday social elements.	**Harriet Beecher Stowe** (1811–1896). — *Uncle Tom's Cabin*, etc.—The outstanding American propaganda novel, far-reaching in its influence.	**Théophile Gautier** (1811–1872).—*Criticism, Novels, Poems*—Poet and prose writer who regarded beauty of style as more important than emotion or theme. **Victor Duruy** (1811–1894).—*History of Rome*.			
Charles Dickens (1812–1870). —*Novels: David Copperfield, Oliver Twist, Christmas Carol*, etc.—A broad humorist, unsurpassed in power of characterization, whose social novels revolutionized the conditions of life for the underprivileged in England. **Robert Browning** (1812–1889).—*Dramatic Lyrics, Poems, The Ring and the Book* — A psychological poet capable of obscure thought but incapable of barbarous melody.			**Berthold Auerbach** (1812–1882).—*Novels*, naïve *Short Stories*—The poet of the Black Forest. **Friedrich Hebbel** (1813–1863). — *Dramas* — The chief German dramatist of the period. A great innovator. **Otto Ludwig** (1813–1865).—*Dramas, Novels*—Master of detail painting in his novels. **J. Moe** (Nor.), (1813–1882). —*Poems*—Lyrics.	**Alexander Hertzen** (Russ.), (1812–1870). — *Journalism*.	
Charles Reade (1814–1884). —*Peg Woffington, Cloister and Hearth*, etc.—A popular novelist with a vigorous style.	**John Lothrop Motley** (1814–1877). — *Dutch Republic, United Netherlands*—A rapid, easy style in presenting results of research.		**Richard Wagner** (1813–1883). —*Operas*—Creator of the music-drama. Insisted that German drama must be national and so drew for themes on older Germanic myths.	**Mikhail Lermontov** (Russ.), (1814–1841). — *Poems, Novels* — Powerful prose.	
Anthony Trollope (1815–1882).—*Barchester Towers*, etc.—Admirably realistic presentation of English society, political and ecclesiastical.	**Richard Henry Dana** (1815–1882).—*Two Years Before the Mast*—One of the earliest American sea tales.	**Eugène Labiche** (1815–1888). —*Comedies*—A master in the art of writing light comedies.	**Emanuel Geibel** (1815–1884). —*Poems, Voices of the Time*—Successful writer of popular songs.		1844. Electrical telegraph between Baltimore and Washington.
Charlotte Brontë (1816–1855).—*Jane Eyre, The Professor*, etc. — Novels based on narrow experience but remarkable for characterization and ornate style.	**Samuel A. Allibone** (1816–1889).—*Literature and Authors*, etc.—Laborious and valuable bibliography.		**Gustav Freytag** (1816–1895). — *Novels, Dramas* — His *Ancestors* is a cycle of modern German novels.	**José de Espronceda** (Sp.), (1816–1842). —*Lyric Poetry*.	
Emily Brontë (1818–1848).—*Wuthering Heights*, a novel of limited scope but peculiar style. **James Anthony Froude** (1818–1894).—*History of England*—A brilliant prose writer, makes history interesting and suggestive.	**Henry D. Thoreau** (1817–1862). — *Walden, Excursions*—Redolent of nature love, and cultured scholarship.	**Leconte de Lisle** (1818–1894). —Pessimistic *Poems*—One of the great poets of the century. He was the head of the group called the Parnassians, who sought above all technical perfection in poetry.	**Theodor Storm** (1817–1888). —*Lyrics, Novels*—Masterful writer of the novel of reminiscence. The lyric note is prominent in his prose. **Theodor Mommsen** (1817–1903).—Foremost scholar and historian of Roman antiquity.	**Aleksyey Tolstoy** (Russ.), (1817–1875). — Artistic historical *Dramas*. **Ivan Turgenev** (Russ.), (1818–(1883). — *Stories, Novels* — Great prose artist. His social novels are pessimistic in tone.	1845–6. Famine in Ireland. 1846–48. United States at war with Mexico.

TABLE VII. EARLY NINETEENTH CENTURY—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
George Eliot (1819–1880).—*Silas Marner, Spanish Gypsy, Poems*. The first great English woman novelist. A realist with insight, wit and skill in characterization. **Charles Kingsley** (1819–1875).—*Hypatia, Westward Ho! Poems*—His novels, though at times too sentimental, are vigorous and wholesome. **John Ruskin** (1819–1900).—*Stones of Venice, Modern Painters*, etc.—A great stylist.	**Herman Melville** (1819–1891).—*Moby Dick, Typee*, etc.—His adventure novels of the South Seas marked a definite advance toward maturity in American letters. **James Russell Lowell** (1819–1891).—*Among My Books, My Study Windows, Biglow Papers, Poems: Sir Launfal*, etc. — Keen, sparkling, scholarly and artistic. **Walt Whitman** (1819–1892).—*Poems: Leaves of Grass, My Captain*, etc.—Unique for his period both in style and subject matter, he led in the departure from European patterns. **Julia Ward Howe** (1819–1910).—*Social and Philosophical Papers, Battle Hymn of the Republic.*		**Gottfried Keller** (1819–1890).—*Novels, Short Stories*—Master of the short story. Strong independence of spirit reflected in this Swiss poet. **Theodor Fontane** (1819–1898). — An outstanding dramatic *Critic* who wrote minor poems and novels.		1848. Napoleon declared President in France. Revolutionary movement sweeps Europe. 1849. Gold rush to California.
John Tyndall (1820–1893).—*Scientific Papers.* **Herbert Spencer** (1820–1903).—*First Principles*, etc.—A deep thinker but ponderous in style.	**Margaret J. Preston** (1820–1897).—*Beechenbrook, Cartoons, Colonial Ballads.*	**Émile Augier** (1820–1889).—*Dramas*—One of the masters of the modern French drama. **Gustave Flaubert** (1821–1880).—*Novels*—Torn between Realism and Romanticism, he wrote outstanding examples of each form, *Madame Bovary* of one, *Salammbô* of the other. **Octave Feuillet** (1821–1890).—Minor society *Novels, Dramas.* **Charles Baudelaire** (1821–1867).—*Flowers of Evil*—His lyrics show unmatched metrical skill, but his subjects are often vulgar.		**Feodor Dostoevski** (Russ.), (1821–1881). — *Novels* — Great power of psychological analysis is shown in his tragic *Crime and Punishment* and *The Brothers Karamazov.* **Nikolay Nekrasov** (Russ.), (1821–1888). — *Lyrics* — Rare lyric power.	1850. Compromise on slavery issue in United States.
Matthew Arnold (1822–1888). — Distinguished literary *Essays and Criticisms, Sohrab and Rustum, Poems*—As a poet inclined to pessimism; weak in melody.	**Thomas Buchanan Read** (1822–1872).—*Poems: Drifting, Sheridan's Ride*, etc. **Edward Everett Hale** (1822–1909).—*The Man Without a Country* was one of the outstanding early American short stories. **Donald G. Mitchell** (1822–1909). — Graceful meditative essays, *Dream Life, Reveries of a Bachelor.*	**Henri Murger** (1822–1861).—*Novels*—His *Scenes of Bohemian Life* depicts the life of a class of students. **Edmond de Goncourt** (1822–1896). — *Novels* — He and his brother Jules de Goncourt were among the first Impressionists. They are the apostles of "modernism." **Émile Erckmann** (1822–1899).—*Novels* of local color.			1852. Napoleon declared Emperor after *coup d'état.*
Thomas Hughes (1823–1896).—*Tom Brown at Oxford*, etc.—Advanced the character of juvenile literature.	**Francis Parkman** (1823–1893). — *Oregon Trail, Montcalm and Wolfe*, etc.—Romantic, picturesque and lifelike historical works.	**J. Ernest Renan** (1823–1892). — *Life of Jesus*, etc. — Critic and historian but above all an artist.		**Sándor Petöfi** (Hung.), (1823–1849).—*Lyrics, Translations*—One of the great lyric poets of the nineteenth century. Full of the passion, melancholy and humor of the Hungarian.	
Wilkie Collins (1824–1889).—His *Woman in White* and *Moonstone* were pioneers in the modern detective *Novel.* **Thomas Henry Huxley** (1825–1895).—*Man's Place in Nature*, etc.—A master of scientific exposition. **Richard Blackmore** (1825–1900). — *Novels: Lorna Doone*, etc.—Infused an element of romance into the novel.	**George W. Curtis** (1824–1892).—*Potiphar Papers, Prue and I*, etc. **Bayard Taylor** (1825–1878).—*Northern Travel, Greece and Russia, Poems of the Orient, Translation of Faust*—Too good at many things to be best at any.	**Alexandre Dumas** (*fils*) (1824–1895).—*Novels, Dramas*—His *Dame aux Camélias* was an outstanding novel and drama of the era. His wit and concise style developed the modern comedies of manners.	**Conrad Ferdinand Meyer** (Swiss), (1825–1898). — *Short Stories, Novels*—One of the best historical novelists of the century.	**Juan Valera** (Sp.), (1824–1905).—*Pepita Jiménez*, other popular *Novels*, in elegant prose.	1853-56. Crimean War.
Dinah Maria Mulock (1826–1887).—*John Halifax* and other *Novels, Poems.*	**Stephen Collins Foster** (1826–1864).—*Old Folks at Home, My Old Kentucky Home*, etc.—A master in the popular folk lyric.		**J. V. von Scheffel** (1826–1886).—*Epics* and *Historical Novels*—*Ekkehard* was an outstanding success.	**Mikhail Saltykov** (Russ.), (1826–1889). — *Satiric Tales.*	
Walter Bagehot (1826–1877).—Profound *Treatises* on Economics and Finance.	**Lew Wallace** (1827–1905).—*Ben Hur*, one of the most popular novels ever written, and minor books.	**Francisque Sarcey** (1827–1899).—*Criticism*—A recognized authority on the drama.			
Dante Gabriel Rossetti (1828–1882).—*Poems: The Blessed Damozel*, etc.—A highly imaginative poet, a master of color. **George Meredith** (1828–1909).—*Diana of the Crossways*, etc.—Psychological novels of extraordinary power.		**H. A. Taine** (1828–1893).—*History of Literature*, etc.—*Origins of Contemporary France* shows his genius as a critic and as historian. **Jules Verne** (1828–1905).—*Twenty Thousand Leagues Under the Sea, Around the World in Eighty Days*, etc.—His novels pioneer in the field of extravagant fiction based on scientific ideas.	**Victor Rydberg** (Swed.), (1828–1895).—*Philosophy, History, Novels, Poems*—Scholar, poet, and philosopher. **Henrik Ibsen** (Nor.), (1828–1906).—*Dramas, Poems*—A leading dramatic genius of the nineteenth century. In sharp satire and vivid dialogue he attacked social problems.	**Leo Tolstoy** (Russ.), (1828–1910).—*Novels, Essays, Criticisms* — Powerful pessimistic and realistic novels, as *Anna Karenina.*	
	Henry Timrod (1829–1867).—Minor *Poems.* **Chas. Dudley Warner** (1829–1900).—*My Summer in a Garden, Little Journey*, etc.—Charming travel essays.		**Friedrich Spielhagen** (1829–1911). — *Novels* — The novelist of German social conditions.		1857–8. Sepoy mutiny in India.

TABLE VII. EARLY NINETEENTH CENTURY—Continued

ENGLISH	AMERICAN	FRENCH	GERMAN, SCANDINAVIAN	OTHER COUNTRIES	HISTORICAL EVENTS
Christina Rossetti (1830–1894).—A Victorian poet whose careful, sincere work was agreeable to her times.	**John Esten Cooke** (1830–1886).—*Novels: Survey of Eagle's Nest*, etc. **Emily Dickinson** (1830–1886).—*Lyrics* of delicate mystical charm.	**Jules de Goncourt** (1830–1870).—*Novels*—See Edmond de Goncourt (1822–1896).	**Paul Heyse** (1830–1914).—*Novels, Short Stories, Poems*—A Nobel Prize winner.		1861–65. Civil War in the United States.
Edward Lord Lytton (Owen Meredith), (1831–1891).—*Biography of Bulwer Lytton, Lucile*, etc.—Fluent writer of light verse.	**Paul Hamilton Hayne** (1831–1886).—*Sonnets, Legends, Lyrics.*	**Victorien Sardou** (1831–1908). — *Dramas* — Clever comedies and social satires.			
Edwin Arnold (1832–1904).—*Light of Asia, Poems*—Journalist and prolific minor poet. **Lewis Carroll** (Charles L. Dodgson) (1832–1898).—*Alice in Wonderland, Through the Looking Glass*, etc.—World-famous classic fantasies, written for children, loved by adults.	**Horatio Alger** (1832–1899).—A prolific and very popular producer of didactic success stories for boys. **Louisa May Alcott** (1832–1888).—*Little Women, Little Men*—Stories of childhood with lasting popular appeal.	**Henri Meilhac** (1831–1897), **Ludovic Halévy** (1834–1908). — *Comedies* — They collaborated to create the "operetta."	**Björnstjerne Björnson** (Nor.), (1832–1910). — *Novels, Dramas, Poems*—Leading novelist and poet of Norway in his day.		
	Petroleum V. Nasby (David R. Locke) (1833–1888).—Satiric propaganda *Letters.* **Edmund C. Stedman** (1833–1908). — *Victorian Poets, Poets of America*, etc.—Poet and critic.		**Jonas Lie** (Nor.), (1833–1908).—*Stories, Dramas*—Sketches of Nature and popular life in the north of Norway.	**José de Pereda** (Sp.), (1833–1906).—Bucolic *Novels* in simple dialect. **José Echegaray** (Sp.), (1833–1916).—*Dramas* — Most prominent representative of the modern Spanish dramatists.	1866. Prussia defeats Austria in Seven Weeks' War.
William Morris (1834–1896).—*Essays on Art*, etc., *Poems*—Prolific narrative poet whose epics, based on medieval legends, were exceptional. **George du Maurier** (1834–1896). — *Peter Ibbetson, Trilby*—Artist and poet. *Peter Ibbetson* is a fanciful romance of dream life. *Trilby*, a masterful study of character.	**Chas. Farrar Browne** (Artemus Ward) (1834–1867).—*Artemus Ward, His Book*, etc.—Humorous in exaggeration. **Frank R. Stockton** (1834–1902). — *Rudder Grange, The Lady or the Tiger*—Ingenious in plot, straightforward in style. **Moses Coit Tyler** (1835–1900).—*History of American Literature.*	**Édouard Pailleron** (1834–1899).—Graceful light *Comedies.*	**Heinrich von Treitschke** (1834–1896).—His *Histories* are distorted by his extreme patriotism. **Felix Dahn** (1834–1912).—Historian and historical novelist.	**Giosué Carducci** (It.), (1836–1907).—*Poems*—Lyrics of liberty.	
	Samuel L. Clemens (Mark Twain) (1835–1910).—*Innocents Abroad, Huckleberry Finn*, etc.—Thoroughly representative of American humor and a master of folklore.				1867. Second Reform Bill in England.
William Gilbert (1836–1911).—Collaborated with Sullivan to produce ingenious, popular comic operas which have never been surpassed. **John Richard Green** (1837–1883).—*History of the English People*—Clear and simple style.	**Thomas Bailey Aldrich** (1836–1907).—Minor *Novels* and light *Verse.* **William Dean Howells** (1837–1920).—*Venetian Life, Rise of Silas Lapham*, etc.—Realistic and entertainingly descriptive novels.	**Henri Becque** (1837–1899).—*Dramas* —A pioneer in the naturalistic drama.	**Georg Ebers** (1837–1898).—*Egyptology, Novels*—Wrote novels dealing with Egyptian life.		
Algernon Chas. Swinburne (1837–1909).—*Poems* — A poet of remarkable musical power, master of headlong but involved prose. **John Morley** (1838–1923).—*Criticisms, English Men of Letters*, (Ed.)—A critic and a thinker of force and scope.	**John Burroughs** (1837–1921).—*Wake Robin, Winter Sunshine*—A critic and essayist and unsurpassed writer on Nature. **John Muir** (1838–1914).—*Travels* and nature study in melodious prose. **F. Hopkinson Smith** (1838–1915). — Minor *Novels*, good Southern color.				
	Mary Mapes Dodge (1838–1905).—*Hans Brinker*—In high favor with children. **Thomas R. Lounsbury** (1838–1915).—*Life of Cooper, Studies in Chaucer etc.*				1868. President Johnson impeached.
William De Morgan (1839–1917).—Popular *Novels.* **Walter H. Pater** (1839–1894).—*Marius the Epicurean* etc.—A wonderfully finished prose style, which sometimes diverts attention from the thought.	**Francis Bret Harte** (1839–1902).—*Luck of Roaring Camp, Gabriel Conroy, Poems*—Frontier tales of international fame.	**Sully-Prudhomme** (1839–1907).—*Poems*—One of the great poets of the nineteenth century. A leader in the Parnassian school. **Alphonse Daudet** (1840–1897).—*Novels* in superb prose, blending pathos and humor and descriptive power. **Émile Zola** (1840–1902).—*Novels*—Called the head of the naturalistic school.	**Ludwig Anzengruber** (1839–1889). — *Dramas, Prose Tales, Poems*—Highly endowed Austrian dramatist. A pioneer of realism.	**Giovanni Verga** (It.), (1840–1922).—*Novels* — Tales of Sicilian peasantry marked by accurate characterization in simple style.	1869. Transcontinental railroad completed in United States.
John Addington Symonds (1840–1893).—*Translations, Criticism*—A scholar in poetic technique. **Henry Austin Dobson** (1840–1921).—*Vignettes in Rhyme, Proverbs in Porcelain*—Pictured eighteenth century social and literary life in charming light verses. **Thomas Hardy** (1840–1928).—*Novels: Tess of d' Urbervilles*, etc.—Novels of English country life. His books possess at once wit, realism and simplicity of style.					1870–71. Franco-Prussian War.
Robert W. Buchanan (1841–1901).—*Alone in London, Poems*—A minor poet and dramatist.	**Joaquin Miller** (1841–1913).—*Songs of the Sierras*—Verse of unorthodox form but filled with the beauty of his subject.				1871. France a republic.

TABLE VII. EARLY NINETEENTH CENTURY—Concluded

English	American	French	German, Scandinavian	Other Countries	Historical Events
	Ambrose Bierce (1842–1914). —*Verse, Short Stories*—An eccentric writer of unusual wit and sarcasm.	**Stéphane Mallarmé** (1842–1828).—Founder of the Decadent school of French *Poetry*.	**Karl Robert Eduard Hartmann** (1842–1906).—*Philosophy, Criticism.*		1871. Unification of Germany and Italy.
	Sidney Lanier (1842–1881).—*Marshes of Glynn, Tiger-Lilies, Poems*—Artistic and exceptionally musical minor verse.	**Albert Sorel** (1842–1906).—His history of *Europe and the French Revolution* is much esteemed.	**Georg Brandes** (Dan.), (1842–1917).—*Literary Essays*—A piercing literary critic.		
	John Fiske (1842–1901).—*Myths and Myth-Makers,* scholarly *Histories.*	**François Coppée** (1842–1908). —*Poems, Dramas* — Excelled in pictures of real life and the study of interiors.			
	William James (1842–1910). —A leader in Pragmatic *Philosophy* and a pioneer in analytical *Psychology.*	**José de Heredia** (1842–1905). —His *Poems* are on a small scale but perfect in form.			
	Henry James (1843–1916).—*Daisy Miller, Portrait of a Lady,* etc.—Unique and exaggerated style.		**Peter Rosegger** (Austrian), (1843–1918). — *Novels* of peasant life.		1873. Financial panic.
	George W. Cable (1844–1925). —*Old Creole Days,* etc.—Novels admired for fine local color.	**Paul Verlaine** (1844–1896).—*Poems*—A unique poet, leader of the Symbolists; he developed new rhythmic ideas.	**Friedrich Nietzsche** (1844–1900).—*Philosophy, Criticisms*—Prophet of individualism. His greatest work, *Thus Spake Zarathustra,* left an indelible impression on the literature of his time.		
William Henley (1849–1903). —*Invictus* and other short poems of great power.		**Anatole France** (1844–1924). —*Novels* of admirable ironic style and plot, critical of the life of his time.			1876. Centennial Exposition, Philadelphia. Electoral commission awards presidency to Hayes.
Edmund Gosse (1849–1928). — *Criticism* and minor *Poems.*			**Detlev von Liliencron** (1844–1910). — *Epics, Poems* — The chief lyric poet of the epoch.		

TABLE VIII. MODERN LITERATURE

English	American	French	German, Scandinavian	Other Countries	Historical Events
				Antonio Fogazzaro (It.), (1842–1911). —*Poetry, Novels.*	
			Ernst von Wildenbruch (German), (1845–1909).—*Dramas, Short Stories, Poems*—A great historical dramatist.	**Benito Pérez Galdós** (Sp.), (1845–1920). —*Novels, Dramas* —Depicts political and religious life.	1878. Congress of Berlin.
	Arthur S. Hardy (1847–1930). —*Novels.*	**Frédèric Masson** (1847–1923). — *Histories* — His best known work is on Napoleon.			
		Émile Faguet (1847–1916).—A *Critic* of great scholarship.		**Henryk Sienkiewicz** (Polish), (1846–1916). — *Novels* — Historical.	
	Joel Chandler Harris (1848–1908). — Southern Negro and animal tales.			**Edmondo de Amicis** (It.), (1846–1908). —*Travels, Novels* —*Cuore* is best known for brilliant descriptive passages.	
	James Lane Allen (1849–1925).—*Novels.*	**Ferdinand Brunetière** (1849–1906).—*Criticism.*	**August Strindberg** (Swed.), (1849–1912). — Realistic *Novels, Dramas, Lyrics.*		
	Sara Orne Jewett (1849–1909).—*Novels, Short Stories* of New England scenes and characters.	**Jean Richepin** (1849–1926). —*Dramas.*	**Ellen Key** (Swede), (1849–1926).—Sociological writings.		
Robert Louis Stevenson (1850–1894).—*Poems, Essays, Stories*—A great stylist.	**Charles Egbert Craddock** (Mary N. Murfree) (1850–1922). — *Novels* of the Southern Appalachians.	**Guy de Maupassant** (1850–1893).—A master of the *Short Story.*		**Giuseppe Giacosa** (It.), (1847–1906). —*Dramatic Poetry,* including libretti for Puccini's operas.	
		Pierre Loti (pseud. of Louis M. J. Viaud), (1850–1923). —*Novels, Travels.* High descriptive talent; sought perfection of style.			
Henry Arthur Jones (1851–1929). — Able social *Dramas.*	**Eugene Field** (1850–1895).—*Poems* of childhood—*With Trumpet and Drum.*				1881. American Federation of Labor organized.
George Moore (1852–1933). —*Novels,* minor *Poems*—A leader in the revival of Irish letters.	**Edwin Markham** (1852–1940). —*Man with the Hoe,* other realistic poems.	**Paul Bourget** (1852–1935).—*Novels*—A keen analyst.			
	Henry van Dyke (1852–1933).—*Essays, Poems.*				
	Mary E. Wilkins Freeman (1852–1930). — Realistic, severe *Stories* of rural New England.				
	James Whitcomb Riley (1853–1916). — *Poems of Childhood.*	**Jules Lemaitre** (1853–1914). —*Dramas, Criticism.*		**Armando Palacio Valdés** (Sp.), (1853–1938). — Realistic *Novels.*	1883. Triple Alliance, Germany, Austria, Italy.
	Thomas Nelson Page (1853–1922). — *Novels* — *In Ole Virginia.* Adept in Negro dialect and characterization.				
	Francis Marion Crawford (1854–1909). — *Novels* — Best known for his *Saracinesca* series.				
Arthur Wing Pinero (1855–1934). — Many popular *Dramas.*	**William Drummond** (Canadian), (1854–1907).—*Poems* of the French habitant.			**Vsevolod Garshin** (Russ.), (1855–1888).—*The Red Flower,* other *Short Stories* of horror and madness.	
George Bernard Shaw (1856–).—*Essays, Plays*—A critic and writer of high rank.					
Oscar Wilde (1856–1900).—Melodious *Poems* and *Dramas* of great wit and humor.				**Matilde Serao** (Sp.), (1856–1927).—*Novels*—Popular in style.	1886. Haymarket riots in Chicago.
John Davidson (1857–1909). —*Lyrics* and *Ballads* of Scotland.	**Thorstein Veblen** (1857–1929). — *Economics* — A leader of unorthodox viewpoint.	**Paul Hervieu** (1857–1915).—*Dramas, Novels.*	**Hermann Sudermann** (German) (1857–1928). — *Plays, Novels*—His greatest novel was *Dame Care.*		1887. Queen Victoria's Jubilee.
Joseph Conrad (1857–1924). —Of Polish birth. A novelist whose sea stories take first rank.	**Gertrude Atherton** (1857–). — *Novels* — Many of them historical.		**Henrik Pontoppidan** (Dan.), (1857–). — *Novels* — Great writer of ironic prose.		
George Gissing (1857–1903). —*New Grub Street,* other *Novels* of the very poor.	**Margaretta W. Deland** (1857–1919).—*Novels*—New England life.				

TABLE VIII. MODERN LITERATURE—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
William Watson (1858–1935).—Long thoughtful *Poems* in traditional form.	**Agnes Repplier** (1858–).—*Essays* remarkable for light ironic touch.	**Eugène Brieux** (1858–1932).—*Dramas* dealing with social problems.	**Selma Lagerlöf** (Swed.), (1858–1940).—*Novels, Short Stories* of great charm. The first woman writer to win a Nobel Prize.		
A. Conan Doyle (1859–1930).—Popular *Novels*. His *Sherlock Holmes* is the outstanding character of detective fiction. **Francis Thompson** (1859–1907). — Minor *Poems*, mystical in theme. **A. E. Housman** (1859–1936).—His *Shropshire Lad* and other lyrics of the countryside are marked by distinctive direct language.		**Henri Bergson** (1859–).—*Philosophy, Essays*. A leading exponent of the idea of creative evolution.	**Karl von Heidenstam** (Swed.), (1859–)—*Novels, Poems*.		
Sir James M. Barrie (1860–1937). — *Novels, Plays*—*Little Minister* and other tales of Scottish peasantry. He was a master of whimsy.	**Hamlin Garland** (1860–1940).- *Novels* — His realistic *Middle Border* series is most popular. **Charles W. Gordon** (Ralph Connor, pseud.), (1860–1937).—A Canadian writer of life in western Canada.	**René Doumic** (1860–).—*Criticism*—History of French literature.	**Knut Hamsun** (Nor.), (1860–).—*Novels*—Depicts life of the laborer with masterly psychological analysis and keen description. **Gustaf Fröding** (Swed.), (1860–1911).—*Lyrics*.	**Anton Chekhov** (Russ.), (1860–1904). — *Dramas, Short Stories*.	1892. Homestead steel strike.
Sir Rabindranath Tagore (In.), (1861–1941)—*Poems, Essays, Stories*.	**Louise Guiney** (1861–1920).—A minor poet of polished but traditional style. **Bliss Carman** (Canadian), (1861–1921).—*Poetry*. **Emily Pauline Johnson** (Canadian), (1862–1913). — *Poetry*.				
	Sir Horatio Gilbert Parker (Canadian), (1862–1919).—*Historical novels*. **William S. Porter** (O. Henry), (1862–1910). — Master of the short story with surprise ending—*The Four Million*. **Edith Wharton** (1862–1937).—*Novels*—*House of Mirth*.	**Maurice Maeterlinck** (Belgian), (1862–).—*Plays*—Many mystical plays, *The Blue Bird* being one of the most popular. **Marcel Prévost** (1862–).—*Novels* of brilliant style but morbid plot. **Maurice Barrès** (1862–1923).—*Novels*.	**Gerhart Hauptmann** (German), (1862–).—Master of naturalism in social *Dramas*—*The Sunken Bell*. **Arthur Schnitzler** (Austrian), (1862–1931).—Witty light *Plays*.		
	John Fox, Jr. (1863–1919).—*Novels*, largely of the southern mountains. **George Santayana** (1863–).—*Philosophy, Poems, Novel*.		**Arno Holz** (German), (1863–1929).—*Criticism*—A minor poet, he founded the German Naturalist school. **Oskar Levertin** (Swed.), (1862–1906). — *Short Stories, Essays, Poems*—A great literary critic. **Richard Dehmel** (German), (1863–1920).— Minor *Poems*. **Hermann Bahr** (Austrian), (1863–1934). — *Criticism;* Viennese comedies. **Gustav Frenssen** (German), (1863–).—*Jorn Uhl*, other novels of the countryside.	**G. d'Annunzio** (It.), (1863–1938).—*Novels, Plays, Poetry*. Eccentric in purpose, but consistent in rich rhetorical skill and beauty of expression.	1893. World's Columbian Exposition, Chicago. 1894. Pullman strike forcibly put down. Coxey leads army of unemployed to Washington. Captain Dreyfus convicted in France.
Israel Zangwill (1864-1926). *Novels, Dramas, Essays*—Depicts Jewish life. **William Butler Yeats** (Irish), (1865–1939).—*Poetry, Dramas*—Irish settings. **Rudyard Kipling** (1865–1936).—*Stories, Novels, Poems*—Best known for tales of the English in India—*Soldiers Three; Jungle Book*.	**Richard Hovey** (1864–1900).—*Stein Song* and other romantic *Lyrics*. **Clyde Fitch** (1865–1907).—*Society Plays*.		**Frank Wedekind** (German), (1864–1918).— *Novels, Plays*. **Sven Hedin** (Swed.), (1865–).—*Travels*.		
Herbert G. Wells (1866–).—*Novels, History*. **Arnold Bennett** (1867–1931).—*Novels* of the common people of his time. **John Galsworthy** (1867–1933). — *Novels, Drama;* realistic studies of social problems. **George Russell** (Æ, pseud.), (Irish), (1867–1935).—Melodious mystical *Lyrics*. A leader of the Irish revival.	**Meredith Nicholson** (1866–).—*Novels* of the day.	**Romain Rolland** (1866–).—*Novels*—*Jean Christophe*.		**Jacinto Benavente** (Sp.), (1866–).—Psychological *Dramas*. **Vicente Blasco Ibáñez** (Sp.), (1867–1928).—*Novels*—*Four Horsemen of the Apocalypse*.	
Stephen Phillips (1868–1915).— *Poems* — Tragedies in blank verse.		**Edmond Rostand** (1868–1918).—*Dramas*—His *Cyrano de Bergerac* began a revival of romantic drama. **Francis Jammes** (1868–).-A mystic poet of the Decadent school.	**Stefan George** (German), (1868–1933).—A symbolist poet; melodious *Lyrics*.	**Maxim Gorki** (Russ.), (1868–1936). — *Novels* — Depicts labor's struggles.	1898. Spanish-American War.
	Stephen Leacock (Canadian), (1869–). — *Humor, Short Stories*. **William Vaughan Moody** (1869–1910).—*Poems, Dramas*—*Great Divide*. **Edgar Lee Masters** (1869–).—Iconoclastic *Biography;* realistic, epigrammatic verse. **Edwin Arlington Robinson** (1869–1935).—*Poetry*. **Booth Tarkington** (1869–).—*Novels, Plays*—Depicts modern American youth. **Frank Norris** (1870–1902).—Epic *Novels* of great power.	**André Gide** (1869–).—Psychological *Novels*.	**Martin Andersen Nexö** (Dan.), (1869–).—*Novels*.		1899–1901. South African War. 1900. Boxer uprising in China.

TABLE VIII. MODERN LITERATURE—Continued

English	American	French	German, Scandinavian	Other Countries	Historical Events
	Mary Johnston (1870–1936). Romantic *Historical Novels* with Southern settings.				
	Ray Stannard Baker (1870–). —*Biography; charming Essays.*				
John Millington Synge (Irish), (1871–1909). —*Plays* of Irish life.	**Theodore Dreiser** (1871–). Pessimistic, realistic, *Novels.*	**Marcel Proust** (1871–1922). —Psychological *Novels.*			
	Stephen Crane (1871–1900). —*The Red Badge of Courage,* other novels and short stories of action.	**Henri Barbusse** (1871–1935). —Bitter realistic *Short Stories.* **Paul Valéry** (1871–).—*Novels, Poetry.* His appeal is to the mind, not the heart.		**Leonid N. Andreyev** (Russ.), (1871–1919). — *Short Stories, Plays.*	
	Norman Duncan (Canadian), (1871–1916). — Tales of Labrador life.		**Johan Bojer** (Nor.), (1872–). —*Novels*—Depicts man's struggle for life by the sea.		1903. First successful airplane flight.
	Paul Dunbar (1872–1906).—The first accepted Negro poet.		**Jacob Wassermann** (Austrian), (1873–1934).—*Novels.*	**Grazia Deledda** (It.), (1875–1936).—*Novels.*	
Gilbert K. Chesterton (1874–1936).—*Essays, Criticism, Satire.*	**Robert W. Service** (Canadian), (1874–).—*Poems* —Yukon life.				
	Amy Lowell (1874–1925).—*Poems*—The modernist of her day.				1904–05. Russo-Japanese War.
	Josephine Preston Peabody (1874–1922).—*Poems, Plays—The Piper.* More literary than dramatic value.				1906. San Francisco earthquake and fire.
	Ellen Glasgow (1874–). —Realistic social *Novels* of the South.				
	Zona Gale (1874–1938).—*Short Stories;* realistic satirical *Novels.*				
John Masefield (1875–). —*Poems, Plays.*	**Robert Frost** (1875–).—*Poems* — Depicts country life.		**Thomas Mann** (German), (1875–). — *Novels* — Best known is *Buddenbrooks.*		
	Willa Sibert Cather (1876–). —*Novels*—Life in the Middle West in early days.	**Henri Bernstein** (1876–). —*Dramas.*			
	Sherwood Anderson (1876-1941)—Many *Novels.*				
	Jack London (1876–1916).—*Stories*—Adventure on land and sea.				
Lord Dunsany (Irish), (1878–).—*Dramas*—Irish life and legend.	**Carl Sandburg** (1878–). —Prose *Tales, Poems.*		**Georg Kaiser** (German), (1878–).—Impressionistic *Dramas.*		1911. Standard Oil trust ordered dissolved.
	Rachel Crothers (1878–). —Clever social comedy *Dramas.*				
	Nicholas Vachel Lindsay (1879–1931).—*Poems.*				
	James Branch Cabell (1879–).—*Novels—Jurgen.*				
Alfred Noyes (1880–).—*Poems.*			**Emil Ludwig** (German), (1881–).—*Biographies.*		1912–13. Balkan Wars.
Virginia Woolf (1882–). —*Novels* in the "stream of consciousness" technique.			**Sigrid Undset** (Nor.), (1882–).—*Novels.*		
John Drinkwater (1882–1937). — *Plays, Abraham Lincoln.*					
	Sara Teasdale (1884–1933). —Musical *Lyrics.*		**Lion Feuchtwanger** (German), (1884–).—*Dramas, Novels.*		1914. World War began.
D. H. Lawrence (1885–1930). —*Novels, Plays.*	**Ezra Pound** (1885–).—*Poems, Translations.*				
	Sinclair Lewis (1885–). —*Novels*—Depicts American small town life, *Main Street* being his best known story.	**André Maurois** (pseud. of Émile Herzog), (1885–). —*Novels, Biography.* **François Mauriac** (1885–). —Psychological *Novels*—Harsh realism. **Jules Romains** (pseud. of Louis Farigoule), (1885–). —*Novels, Poems, Plays.*	**Fritz von Unruh** (German), (1885–).—Expressionistic *Dramas.*		1915. *Lusitania* torpedoed.
	Joyce Kilmer (1886–1918).—*Poems.*				
	Hilda Doolittle (H.D.), (1886–).—An Imagist poet.				
Rupert Brooke (1887–1915). —A minor poet.					
	T. S. Eliot (1888–). Critic. Experimental poetry.	**Paul Morand** (1888–).—*Novels, Poems* — Impressionistic in style.			1917. United States joins Allies.
	Maxwell Anderson (1888–). —*Drama.*				
	Eugene O'Neill (1888–). — *Dramas* — Depicts the sordid side of life. *Anna Christie.*				1918. World War ended.
	Hervey Allen (1889–).—*Anthony Adverse.*				
Katherine Mansfield (1890–1923).—*The Fly,* other distinguished short stories.			**Frank Thiess** (German), (1890–).—Mystic rural *Novels.* **Franz Werfel** (German), (1890–).—*Novels, Plays,* —*The Goat Song.*	**Karel M. Capek** (Czechoslovak), (1890–1938).—*Plays* — Modernistic, *R. U. R.*	1920. League of Nations.
	Sidney Howard (1891–1939). —*Drama.*				
Richard Aldington (1892–). —*Poems, Novels.*	**Edna St. Vincent Millay** (1892–).—*Poems.*				
			Ernst Toller (German), (1893–1939).—Expressionist *Dramas.*		1922. Irish Free State.
	Laurence Stallings (1894–). —*Drama.*				

TABLE VIII. MODERN LITERATURE—Concluded

ENGLISH	AMERICAN	FRENCH	GERMAN, SCANDINAVIAN	OTHER COUNTRIES	HISTORICAL EVENTS
Aldous Huxley (1894–).—*Novels,* minor *Poems.*					1926. Sesquicentennial Exposition, Philadelphia.
	William Faulkner (1897–).—Bitter *Novels.* Stephen Vincent Benét (1898–).—Minor *Novels* long epic *Poems.* Ernest Hemingway (1898–).—*Novels* of disillusionment.				1929. Financial depression in the United States begins.
Noel Coward (1899–).—Versatile comedy, *Dramas.*			Erich Maria Remarque (German), (1898–).—*Novels — All Quiet on the Western Front.*	Freda Utley (1898–). — (Russ.) Novelist. Madame Chiang Kai-shek (China).—*"This Is Our China."*	1933 - 34. Century of Progress Exposition, Chicago.
P. G. Wodehouse (1881–). — *Novels. short stories.* R. C. Hutchinson (1907–).—*Novels.* Neville Shute (1899–). *Novels.* Richard Llewellyn —*Novels.*	Countée Cullen (1903–). —Negro poet. Pearl S. Buck (1892–). —*Stories* of Chinese life. Carl Van Doren (1885–). —*Editorials* and *Novels.* John Steinbeck (1902–).—*Novel, The Grapes of Wrath.*	Heinz Pol *"Suicide of a Democracy".* D. W. Brogan (1900–). —*"France Under the Republic".*	Lothrop Stoddard (1883–).—*"Into the Darkness: Nazi Germany Today."* F. L. Schuman (1904–). —*"Night over Europe."* Hjalmar Gullberg (1867–).—Poet. Per Lagerkvist (1891–). —Dramatist.	Franklin D. McDowell (Can.). *Historical Novel.* Arthur S. Bourinot (1894–) (Can.) —*Verse.* Laura Goodman Salverson (1890–) (Can.). — *Autobiography.*	1936. Italian conquest of Ethiopia. 1937 - 38. War in Spain and in China. 1939 - 41. Second World War.

GRADED READING LIST

This list is graded by ages; the age group for which a book is suitable appears in brackets after the entry. The letter F following an entry indicates that the book is fiction.

FOR YOUNGER CHILDREN

Nursery Rhymes and A B C Books

L. Leslie Brooke, *Ring o' Roses:* A Nursery Rhyme Picture Book, Warne, $3.00

Charles B. Falls, *A B C Book,* Doubleday, 1923, $1.50

Helen Dean Fish, *Four and Twenty Blackbirds.* Nursery Rhymes of Yesterday Recalled for Children of Today, Stokes, 1937, $1.50

Wanda Gag, *A B C Bunny,* Coward, $2.00

Kate Greenaway, *A Apple Pie,* Warne, $1.50

Mother Goose, Warne, $1.00

Lois Lenski, *Lois Lenski's Mother Goose,* Harper, 1936, $1.50

Andrew Lang, *The Nursery Rhyme Book,* Warne, $2.50

Jessie Wilcox Smith, *Mother Goose,* Dodd, $5.00

Little Mother Goose (miniature edition), Dodd, $1.50

Hendrik Willem van Loon, *Around the World with the Alphabet,* Simon, $1.00

Songs and Singing Games

Walter Crane, *The Baby's Opera,* Warne, 1900, $1.50 (6–8)

The Baby's Bouquet, Warne, 1900, $1.50

Eleanor Farjeon, *Singing Games for Children,* Dutton, $1.50

Helen Dean Fish, *Four and Twenty Blackbirds.* Nursery Rhymes of Yesterday Recalled for Children of Today, Stokes, 1937, $1.50 (7–10)

Dorothy Gordon, *Around the World in Song,* Dutton, 1930, $2.50

Heribert Grüger and Johannes Grüger, *The Sing-Song Picture Book,* Lippincott, $1.50

Florence Hewitt Kirk, *Rhythmic Games and Dances for Children,* Longmans, 1914, $1.25

Edward Lear, *Nonsense Songs,* Warne, $1.50

A. A. Milne, *Fourteen Songs from "When We Were Very Young,"* Dutton, 1925, $2.00 (6–8)

W. H. Neidlinger, *Small Songs for Small Singers,* Schirmer, 1896, $2.00 (6–7)

Edna Potter, Illustrator, *This Way and That,* Oxford, 1930, $2.00

Singing Games With Music

Edna Shaw, *Songs to Sing,* Simcoe, 60¢

Richard Runciman Terry, *Old Rhymes With New Tunes,* Longmans, $1.40

Louis Untermeyer and Clara and David Mannes, *New Songs for New Voices,* Harcourt, $5.00

Hendrik van Loon, *The Songs We Sing,* Simon, 1936, $1.00

Poetry

Dorothy Aldis, *Everything and Anything,* Putnam, 1927, $2.00

Hilda Conkling, *Silverhorn,* Stokes, 1924, $2.50

Walter De La Mare, *A Child's Day,* Holt, 1923, $1.75

Poems for Children, Holt, 1930

Eugene Field, *Poems of Childhood,* Scribner, 1896, $1.50 (8–10)

Rachel Lyman Field, *The Pointed People,* 1930, Macmillan, $1.25 (9–12)

Taxis and Toadstools, Doubleday, 1926, $2.00 (8–12)

Mildred Harrington, *Ring-a-Round,* a collection of verse for boys and girls, Macmillan, 1930, $3.00 (6–10)

Edward Lear, *Nonsense Books,* Little, 1891, $2.00 (8–12)

A. A. Milne, *The Christopher Robin Verses,* Dutton, $3.00 (6–9)

Now We Are Six, Dutton, 1927, $1.00 (6–9)

When We Were Very Young, Dutton, 1924, $2.00 (7–10)

James Whitcomb Riley, *A Host of Children,* Bobbs, $3.00

Book of Joyous Children, Bobbs, 1902, $2.00 (9–12)

Christina Rossetti, *Sing Song: A Nursery Rhyme Book and Other Poems*

From a Library of Congress mural by John W. Alexander

Evolution of the Book: The Printing Press

for Children (The Little Library), Macmillan, 1924, $1.00 (7–9)
Robert Louis Stevenson, *A Child's Garden of Verses,* Scribner, 1905, $1.75 (8–9)
Ann and Jane Taylor, *Original Poems for Infant Minds,* Stokes, 1904, $2.50 (8–10)
Blanche J. Thompson, *Silver Pennies* (The Little Library), Macmillan, 1925, $1.00 (7–12)
James S. Tippett, *I Live in a City,* Harper, 75¢
Louis Untermeyer, Editor, *Rainbow in the Sky,* Harcourt, 1935, $3.00 (7–12)
Kate Douglas Wiggin and N. A. Smith, *Pinafore Palace: A Book of Rhymes for the Nursery,* Doubleday, $2.00, 1907 (6–9)

Picture Story Books

Edward Ardizzone, *Little Tim and the Brave Sea Captain,* Oxford, 1936, $2.00
Boris Artzybasheff, *Seven Simeons: A Russian Tale Retold,* Viking, $2.00
Helen Bannerman, *Sambo and the Twins,* Stokes, 1936, $1.00 (5–8)
The Story of Little Black Sambo, Stokes, 75¢
L. Leslie Brooke, *Johnny Crow's Garden, Johnny Crow's New Garden, Johnny Crow's Party,* Warne, each $1.50
The Golden Goose Book, Warne, $3.00
The Tailor and the Crow: An Old Rhyme with New Drawings, Warne, $1.00
Mary Marsh Buff, *Dancing Cloud; the Navajo Boy,* Viking, $2.00
Randolph Caldecott, *The Farmer's Boy,* Warne, 60¢
John Gilpin, Warne, 60¢
Randolph Caldecott's Picture Book, Warne, $2.25
Randolph Caldecott's Picture Book, No. 2, Warne, $2.25
Valery Carrick, *Picture Tales from the Russian,* Stokes, $1.25
Ruth Carroll, *What Whiskers Did,* Macmillan, $1.25
Ellis Credle, *Down, Down the Mountain,* Nelson, $2.00
A story of the Southern Mountains
Ingri d'Aulaire and Edgar Parin d'Aulaire, *The Magic Rug,* Doubleday, $2.00 (7–9)
Edwin W. Deming, *Indian Child Life,* Stokes, $2.75
William Pene Du Bois, *Elisabeth; the Cow Ghost,* Nelson, 1936, 75¢ (6–8)
Hope Dunlap, *Pied Piper of Hamelin,* by Robert Browning, Rand, $1.50
Elsa Eisgruber, *Spin Top, Spin,* and *Rosmarie and Thyme,* Macmillan, $1.50
Marjorie Flack, *Walter the Lazy Mouse,* Doubleday, 1937, $2.00
Flavia Gag and Frances Carpenter, *Sing a Song of Seasons,* Coward, 1936, $1.50
Wanda Gág, *Millions of Cats,* Coward, $1.50
Wanda Gág's Story Book, Coward, $2.50
Helen Gentry, *The History of Tom Thumb,* Holiday, 75¢
Kate Greenaway, *The Pied Piper of Hamelin,* Warne, $2.50
N. Grishina, *Peter-Pea:* One of Nurse Masha's Russian Tales, Stokes, $1.50
Mabel Betsy Hill, *Down-along Apple Market Street,* Stokes, $1.35
Ruth Langland and Richard A. Holberg, *Mitty and Mr. Syrup,* Doubleday, $1.00
Veronica S. Hutchinson, *Chimney Corner Fairy Tales,* Putnam, 1926, $2.50
Wilfred Jones, *How the Derrick Works,* Macmillan, $2.00
Dorothy Lathrop, *Animals of the Bible,* Stokes, $2.00
Who Goes There? Macmillan, $1.50
Munro Leaf, *The Story of Ferdinand,* Viking, 1936, $1.00 (7 up)
Maja Lindberg, *Karl's Visit to the Moon,* Harper, $1.50
Elizabeth Mackinstry, *Aladdin and the Wonderful Lamp,* Macmillan, $1.75.
Elizabeth Mackinstry, *The Fairy Alphabet as Used by Merlin,* Viking, $1.50
William Nicholson, *Clever Bill,* Doubleday, $1.00
Maud and Miska Petersham, *The Ark of Father and Mother Noah,* Doubleday, $2.00
Auntie, Doubleday, $2.00
The Christ Child, Doubleday, $2.00
Feodore Rojankovsky, *Daniel Boone:* Historic Adventures of an American Hunter among the Indians, Domino, $3.50
Frances Clarke Sayers, *Bluebonnets for Lucinda,* Viking, $1.00, a story of Texas
Dr. Seuss, *And To Think That I Saw It On Mulberry Street,* Vanguard, 1937, $1.00
Helen Sewell, *Blue Barns,* Macmillan, $1.75
Cinderella, Macmillan, $1.25
A First Bible, Oxford, $2.50
Head for Happy, Macmillan, $1.50
Rosalie Slocum, *Breakfast With the Clowns,* Viking, 1937, $1.00
Percival Stutters, *How Percival Caught the Python,* Holiday, 1937, $1.00
Sanford Tousey, *Cowboy Tommy,* Doubleday, $1.50
Clifford Webb, *A Jungle Picnic,* Warne, $2.00
The North Pole Before Lunch, Warne, 1936, $2.00

Picture Books of Other Lands

Edgar Parin and Ingri d'Aulaire, *Children of the North Lights,* Viking, $2.00 A story of Lapland
Ola, Doubleday, $2.00 A small boy's adventures on his skis in Norway
Pura Belpré, *Perez and Martina:* A Puerto Rican folk tale, Warne, 1932, $1.75
Ludwig Bemelmans, *Hansi,* Viking, $2.00 A story of the Austrian Tyrol
Elsa Beskow, *Aunt Green, Aunt Brown and Aunt Lavender,* Harper, $2.25 A story of Sweden
Marjorie Flack, *The Story About Ping,* Viking, $1.00 A Chinese story
René D. Harnoncourt and Elizabeth Morrow, *The Painted Pig,* Knopf, $2.00 A Mexican picture book
Maud and Miska Petersham, *Miki,* Doubleday, $2.00 A story about Hungary
Armstrong Sperry, *One Day With Tuktu,* Winston, $2.00 An Eskimo story
Rhea Wells, *Beppo the Donkey,* Doubleday, $2.00 A story about Sicily
Kurt Wiese, *Liang and Lo,* Doubleday, $1.50 A story about China

Stories of Animals

Cecil Aldin, *Farmyard Puppies,* Oxford, 1935
Esther Averill and Lila Stanley, *Power:* The story of a colt, a duchess and the circus, Random, $2.00
Peggy Bacon, *The Lion-Hearted Kitten and Other Stories,* Macmillan, $1.75
Frances Atchinson Bacon, *Turkey Tale,* Oxford, 75¢
Margaret Baker, *Three for an Acorn,* Dodd, $1.50
Richard Bennett, *Skookum and Sandy,* Doubleday, $1.00
Emma Brock, *To Market, To Market,* Knopf, $1.75
Elizabeth Coatsworth, *The Cat and the Captain,* Macmillan, $1.00
Marie Hall Ets, *Mister Penny,* Viking, $1.00
Zhenya and Jan Gay, *The Shire Colt,* Doubleday, $2.00
Zhenya Gay, *Sakimura,* Viking, 1937, $1.50 Story and pictures of a Siamese cat
Berta and Elmer Hader, *Midget and Bridget,* Macmillan, $2.00
Spunky, Macmillan, 1933, $2.00 The story of a Shetland pony (7–10)
John W. Ivimey, *The Complete Version of Ye Three Blind Mice,* Warne, $1.00
Josef Kozisek, *The Magic Flutes,* Longmans, $2.00
Dorothy Kunhardt, *Little Ones,* Viking, $2.00
Dorothy Lathrop, *The Little White Goat,* Macmillan, $1.75
The Snail Who Ran, Stokes, $1.00
Felicite LeFevre, *The Little Grey Goose,* Macrae, $1.00
Lois Lignell and Betz Pincehorn, *Three Japanese Mice and Their Whiskers,* Farrar, $1.50
Hugh Lofting, *The Story of Mrs. Tubbs,* Stokes, $1.25
Helen Fuller Orton, *The Little Lost Pigs,* Stokes, $1.25
The Twin Lambs, Stokes, $1.25
Beatrix Potter, *Little Pig Robinson,* McKay, $2.00
The Tale of Peter Rabbit, The Tale of Benjamin Bunny and other Rabbit Stories, Warne, each 75¢
Jack Roberts, *The Wonderful Adventures of Ludo, the Little Green Duck,* Duffield, $2.00
Helen Sewell, *Ming and Mehitable,* Macmillan, 1936, 75¢
Phil Stong, *Honk the Moose,* Dodd, $2.00
Clifford Webb, *Butterwick Farm,* Warne, $2.00
Hamilton Williamson, *Baby Bear,* Doubleday, 75¢
Kurt Wiese, *Kurt Wiese's Picture Book of Animals,* Coward, 1937, $2.50 (6–9)

Stories of Dolls and Toys

Elsa Beskow, *Peter's Voyage,* Knopf, $2.00
Margery Williams Bianco, *The Little Wooden Doll,* Macmillan, $1.00 (7–9)
The Velveteen Rabbit, Doubleday, $1.00 (8–10)
Emma L. Brock, *Drusilla,* Macmillan, 1937, $1.50 A corn-cob doll (7–9)

Little Fat Gretchen, Knopf, $1.25

Abbie F. Brown, *Lonesomest Doll,* Houghton, 1901, $1.25

Lois Donaldson, *Karl's Wooden Horse,* Whitman, $1.00

Rachel Field, *Hitty, Her First Hundred Years,* Macmillan, $2.50

May Y. McNeer, *Tinka, Minka and Linka,* Knopf, $1.75

William Nicholson, *The Pirate Twins,* Coward, $1.50

Anne Parrish, *Floating Island,* Harper, $2.00 A family of dolls and a ship wreck

Maud and Miska Petersham, *Get-A-Way and Háry János,* Viking, $2.00

Josephine Siebe, *Kasperle's Adventures,* Macmillan, $3.00

FOR OLDER CHILDREN

THE WONDERS OF NATURE

The Earth

John H. Bradley, *Autobiography of Earth,* Coward, 1935, $3.00 (14 up)

Ethel Cook Eliot, *The Little Black Coal,* Stokes, 1933, $1.00 The story of coal (7–9)

Jean Henri Fabre, *The Story-Book of Science,* Appleton-Century, 1917, $2.50 (12–14)

This Earth of Ours, Appleton-Century, 1923, $2.50 (12–14)

Edith Heal, *How the World Began,* Follett, 1930, $1.00 (10–12)

Frederic Brewster Loomis, *The Field Book of Common Rocks and Minerals,* Putnam, 1923, $3.50 (14 up)

Jannette May Lucas, *The Earth Changes,* Lippincott, 1937, $2.50 (12–16)

J. L. McCreery, *Exploring the Earth and Its Life in a Natural History Museum,* Stokes, 1933, $2.00 (12–14)

Gayle Benjamin Pickwell, *Weather,* Newman, 1937, $3.00 (14 up)

William Maxwell Reed, *And That's Why,* Harcourt, 1932, $1.25 Answers to questions about weather, electricity and the like (8–10)

The Earth for Sam: the Story of Mountains, Rivers, Dinosaurs and Men, Harcourt, 1930, $3.50 (10–14)

Lillian Rifkin, *Our Planet the Earth; Then and Now,* Lothrop, 1934, $1.75 (8–12)

Sidney Aylmer Small, *The Boys' Book of the Earth,* Dutton, 1924, $1.00 The story of the earth from its beginning in the records left by rocks and fossils (12–14)

Carleton W. and H. C. Washburne, *The Story of the Earth and the Sky,* Appleton-Century, 1933, Student edition, $1.32 (12–14)

The Sea

E. G. Boulenger, *A Natural History of the Seas,* Appleton-Century, 1936, $3.00 (12 up)

Wilfred S. Bronson, *Fingerfins; the Tale of a Sargasso Fish,* Macmillan, 1930, $2.00 (8–10)

Eva L. Butler, *Along the Shore,* Reynal, 1930, $1.25 (9–12)

William Crowder, *Dwellers of the Sea and Shore,* Macmillan, 1923, $2.25 A guide for the amateur naturalist (13–15)

Paul William Kearney, *Strange Fishes and Their Strange Neighbors,* Doubleday, 1933, $1.25 (10–14)

Ida Mellen, *The Young Folks' Book of Fishes,* Dodd, 1927, $2.00 (12–14)

Edith M. Patch and Carroll Lane Fenton, *Holiday Shore,* Macmillan, 1935, $2.00 (9–12)

W. Maxwell Reed and Wilfrid S. Bronson, *The Sea for Sam,* Harcourt, 1935, $3.00 (10–14)

The Sky

Robert H. Baker, *Introducing the Constellations,* Viking, 1937, $2.50 (12 up)

When the Stars Come Out, Viking, 1934, $2.50 (12–15)

Eliot Channing Clarke, *Astronomy from a Dipper, with Charts,* Houghton, 1933, $1.25 Simple book on astronomy (10–13)

Edwin Brant Frost, *Let's Look at the Stars,* Houghton, 1935, $2.00 (10–14)

Gaylord Johnson, *The Stars for Children,* Macmillan, 1934, $1.50 (9–12)

Isabel M. Lewis, *Astronomy for Young Folks,* Dodd, 1932, $2.00 (12–14)

Willem J. Luyten, *The Pageant of the Stars,* Doubleday, 1929, $2.50 (14 up)

William T. Olcott, *The Book of the Stars for Young People,* Putnam, 1923, $3.00 (13 up)

A Field Book of the Stars, Putnam, 1914, $3.50 (14 up)

Mary Proctor, *The Young Folks' Book of the Heavens,* Little, 1925, $2.00 (13–15)

W. Maxwell Reed, *The Stars for Sam,* Harcourt, 1931, $3.00 (10–14)

Julia Williamson, *The Stars Through Magic Casements,* Appleton-Century, 1930, $2.00 (educational ed. $1.00) Legends of the constellations (9–14)

Birds

Rudyerd Boulton, *Travelling With the Birds, A Book on Bird Migration,* Donohue, 1933, $1.50 (10–14)

Wilfrid S. Bronson, *Paddlewings, The Penguin of the Galapagos,* Macmillan, 1931, $2.00 (9–12)

John Burroughs, *Bird Stories from Burroughs,* Houghton, 1911, $1.75

Frank M. Chapman, *Bird Life,* Appleton, 1924, $5.00 A guide to the study of our common birds (13–15)

Eric Fitch Daglish, *How to See Birds,* Morrow, 1932, $1.50, (12–14)

The Life Story of Birds, Morrow, 1930, $3.00 (12–14)

Mrs. Nellie Blanchan (De Graff) Doubleday, *Bird Book: Bird Neighbors and Birds That Hunt and Are Hunted,* 1932, Doubleday, $2.95 (12–14)

Gustav Eckstein, *Canary; The History of a Family,* Harper, 1936, $2.50 (14 up)

Marjorie Medary, *Topgallant; A Herring Gull,* Random, 1935, $1.50 (10–14; F)

Olive Thorne Miller, *The Children's Book of Birds,* Houghton, 1927, $3.00 (9–12)

Mrs. Honore Morrow and William J. Swartman, *Ship's Parrot,* Morrow, 1936, $2.00 (9–12; F)

Dhan Gopal Mukerji, *Gay-Neck:* The Story of a Pigeon, Dutton, 1927, $2.00 (10–14; F)

Donald Culross Peattie, *Singing in the Wilderness, a Salute to John James Audubon,* Putnam, 1935, $2.50 (14 up)

Thomas Sadler Roberts, *Bird Portraits in Color,* University of Minnesota Press, 1934, $3.50 (12 up)

Constance Rourke, *Audubon,* Harcourt, 1936, $3.00 (12 up)

A. Hyatt Verrill, *Strange Birds and Their Stories,* Page, 1938, $2.50 (13 up)

Peggy Vondergoltz, *Macaw;* the Story of a Parrot, Farrar, 1937, $2.50 (12–16; F)

Plant Life

Francis Blake Atkinson, *A Year in the Wonderland of Trees,* Scribner, 1922, $1.20 (12–14)

Eric Fitch Daglish, *How to See Plants,* Morrow, 1932, $1.50 (12–14)

Mrs. Nellie Blanchan Doubleday, *Wild Flowers,* 1926, Doubleday, $2.50 (12–14)

Clarence J. Hylander, *The Year Round,* a Book of the Outdoors Arranged According to Season, Putnam, 1932, $2.00 (9–12)

Julie Closson Kenly, *Green Magic,* the Story of the World of Plants, Appleton-Century, 1930, $2.50 (10–14)

Ferdinand Schuyler Mathews, *The Book of Wild Flowers for Young People,* Putnam, 1923, $3.00 (12–14)

Enos A. Mills, *A Thousand Year Pine,* Houghton, 1914, $1.25 (13–15)

Edith M. Patch, *Holiday Hill,* Macmillan 1931, $1.25 (9–12)

Holiday Meadow, Macmillan, 1930, $1.25 (9–12)

Insects

Francis Blake Atkinson, *Clever Little People with Six Legs,* Scribner, 1924, $1.20 (12–14)

Wilfred Bronson, *Wonder World of Ants,* Harcourt, 1937, $1.50 (7–10)

Eleanor Doorly, *The Insect Man,* Appleton-Century, 1937, $1.50 (10–14)

Alfred E. Emerson and Eleanor Fish, *Termite City,* Rand, 1937, $1.50 (10–14)

Jean Henri Fabre, *The Book of Insects,* Dodd, 1921, $2.00 (12–14)

Eleanor King and Wellmer Pessels, *Insect People,* Harper, 1937, $1.25 (10–14)

Maurice Maeterlinck, *The Children's Life of the Bee,* Dodd, 1919, $2.00 (12–14)

Reptiles

Wilfrid S. Bronson, *Pollwiggle's Progress,* Macmillan, 1932, $2.00 (8–10)

Raymond L. Ditmars and William Bridges, *Snake-Hunters' Holiday,* Appleton-Century, 1935, $3.50 (13 up)

Raymond L. Ditmars, *Snakes of the World,* Macmillan, 1932, $5.00 (13 up)

Clifford H. Pope, *Snakes Alive and How They Live,* Viking, 1937, $2.50 (13 up)

W. W. Robinson, *Animals in the Sun,* Harper, 1934, $2.00 About crocodiles, lizards, turtles and snakes (10–14)

E. L. Grant Watson, *Mysteries of Natural History,* Stokes, 1937, $1.75 Insects, sea slugs, jellyfish, reptiles, birds and so on (13–16)

Animals

J. E. Brewton, *Under the Tent of the Sky,* Macmillan, 1937, $2.00 Poems of animals (6–12)

Thornton W. Burgess, *The Burgess Animal Book for Children,* Little, 1920. Animals of America, their habitats and characteristics presented in story form (9–12)

John Burroughs, *Squirrels and Other Fur Bearers,* Houghton, 1914, $1.75

William H. Carr, *The Stir of Nature,* Oxford, 1930, $1.75 Stories about animals and birds (11–14)

Eric Fitch Daglish, *How to See Beasts,* Morrow, 1933, $1.50 (10–14)

Raymond L. Ditmars, *The Book of Zoögraphy,* Lippincott, 1934, $2.00 A description of animals of all kinds, with colorful maps showing their habitats (12–14)

Edward G. Huey, *A Child's Story of the Animal World,* Reynal, 1935, $3.50 (10–14)

Francesca La Monte and Welsh Micaela, *Vanishing Wilderness,* Liveright, 1934, $2.50 (12–14)

Edith M. Patch and Carroll Lane Fenton, *Desert Neighbors,* Macmillan, 1937, $1.75 Animals, birds and insects of the desert (10–14)

W. Maxwell Reed and J. M. Lucas, *Animals on the March,* Harcourt, 1937, $3.00 The origins and evolution of animal life (13 up)

Ivan T. Sanderson, *Animal Treasure,* Viking, 1937, $3.00 Animals of West Africa (13 up)

Wild Animals

Carl E. and M. L. J. Akeley, *Adventures in the African Jungle,* Dodd, 1930, $3.00

Agnes Akin Atkinson, *Blinky, the Biography of a Ringtail,* Viking, 1935, $1.50 (8–10)

Olaf Baker, *Shasta of the Wolves,* Dodd, $2.50 The boyhood of an Indian adopted by a she-wolf (10–14; F)

Charles William Beebe, *Jungle Peace,* Holt, 1918, $2.50 Experiences in a South American jungle (13–16)

Paul Du Chaillu, *In African Forest and Jungle,* Scribner, 1903, $2.25 (13–15)

The Land of the Long Night, Scribner, 1899, $2.50 (12–14)

Stories of the Gorilla Country, Harper, 1928, $2.00 (10–14)

Frances Hubbard Flaherty, *Elephant Dance,* Scribner, 1937, $2.75

Alice Crew Gall and Fleming H. Crew, *Ringtail,* Oxford, 1933, $1.50 Story of a racoon (8–10)

Rudyard Kipling, *All the Mowgli Stories,* Doubleday, 1936, $2.50 (10 up; F)

The Two Jungle Books, Doubleday, $3.50 (10–14; F)

Stephen Meader, *King of the Hills,* Harcourt, $2.00 The story of a stag (12–14; F)

Rutherford G. Montgomery, *Carcajou,* Caxton, 1936, $2.00 The story of a mountain lion (12–14; F)

Dhan Gopal Mukerji, *The Chief of the Herd,* Dutton, 1936, $1 (10–14; F)

Fierce-Face, the Story of a Tiger, Dutton, 1936, $1.50 (8–10; F)

Hari, the Jungle Lad, Dutton, $2.00 (10–14; F)

Jungle Beasts and Men, Dutton, $2.00 A story about India (12–14; F)

William W. Robinson, *Elephants,* Harper, 1935, $1.75 (8–12)

Samuel Scoville, Jr., *Wild Folk,* Little, 1922, $2.50 Stories of forest animals (13–15)

Ernest Thompson Seton, *Wild Animals I Have Known,* Scribner, 1898, $2.50 (10–14)

Henry Williamson, *Tarka the Otter,* Dutton, 1928, $2.50 Biography of an otter (10–14)

Walter J. Wilwerding, *Punda the Tiger-Horse,* Macmillan, 1937, $2.00 Story of a zebra (10–12; F)

Animal Friends

Mrs. Delia J. Akeley, *J. T., Jr.;* the Biography of an African Monkey, Macmillan, 1928, $2.25 (12–14)

Ruth and Latrobe Carroll, *The Luck of the Roll and Go,* Macmillan, $1.50 Story of a cat who stows away on a ship bound for the South Pole (8–10)

Frank Dalby Davison, *The Red Heifer:* A story of men and cattle, Coward, 1934, $2.00 (13 up; F)

Honoré Morrow and William J. Swartman, *Ship's Monkey,* Morrow, 1933, $2.00 (9–12; F)

Carveth Wells, *The Jungle Man and his Animals,* McBride, 1925, $1 (8–10; F)

Animals in the Zoo

Clyde Beatty and Edward Anthony, *The Big Cage,* Century, 1933, $3.50 Animal training for Clyde Beatty's famous lion and tiger acts (12 up)

Paul Eipper, *Animals Looking at You,* Viking, 1929, $3.00 Life histories of animals in the zoo (12–15)

James Lindsay McCreery, *At the Zoo and at Home,* Stokes, 1932, $1.75 (12–15)

Dogs

Eleanor Atkinson, *Greyfriars Bobby,* Blue Ribbon, $1.00 The story of a faithful terrier (12–14)

Esther B. Darling, *Baldy of Nome,* Penn, 1916, $2.50 A story of Alaskan dogs 12–14)

Richard Harding Davis, *Boy Scout, and Other Stories for Boys,* Scribner, $1.50 (12–14)

J. Allan Dunn, *Boru;* the Story of an Irish Wolfhound, Dodd, 1936, $2.00 (10–14)

Charles J. Finger, *A Dog at His Heel,* Winston, 1936, $2.00 (12 up)

Thomas C. Hinkle, *Tawney;* a Dog of the Old West, Morrow, $1.75 (12–14)

MacKinlay Kantor, *The Voice of Bugle Ann,* Coward, $1.25 (14 up)

Rudyard Kipling, *Collected Dog Stories,* Doubleday, $2.50 (14 up)

Jack London, *The Call of the Wild,* Grosset, $1.00 A story of the Klondike and a St. Bernard dog (13 up)

John Muir, *Stickeen,* Houghton, 1909, $1.25 (12–14)

Alfred Ollivant, *Bob, Son of Battle,* Garden City, $1.00 A shepherd dog in Scotland (13–16)

Gustaf Tenggren, *The Good Dog Book,* Houghton, $2.00 Eleven famous dog stories (9–14)

A. P. Terhune, *Lad;* a Dog, Dutton, 1926, $2.00 (12–14)

Jane Brevoort Walden, *Igloo,* Putnam, 1931, $2.50 The story of a fox terrier on Byrd's Arctic and Antarctic expeditions (12–16)

Horses

Enid Bagnold, *National Velvet,* Morrow, 1935, $2.50 The story of a girl who rides in the Grand National race (13 up)

Paul Brown, *Crazy Quilt,* the story of a Piebald Pony, Scribner (7–9)

Baroness Katrina Von Dombrowski, *Just Horses,* Macmillan, 1930, $2.50 Drawings of horses of many countries (9–12)

Alexander Finta and Jeanette Eaton, *Herdboy of Hungary;* the true story of Mocskos, Harper, $2.50 (13–16)

Svend Fleuron, *The Wild Horses of Iceland,* Holt, 1933, $2.50

Gorse Golden, pseud., *Moorland Mousie;* the life story of a child's pony, Scribner, 1930, $3.00 (10–14)

Anne Bosworth Greene, *Greylight,* Century, $1.75 (12–14)

White Pony in the Hills, Appleton-Century, 1927, $1.75 (12–14)

Berta and Elmer Hader, *Spunky,* the story of a Shetland Pony, Macmillan, $2.00 (7–10)

Esther Greenacre Hall, *Back to Buckeye,* Smith and Haas, $2.00 (12–16)

College on Horseback, Smith, $2.00 (12–16)

T. C. Hinkle, *Tornado Boy;* a horse of the West, Morrow, 1930, $2.00 (12–14)

Forrestine C. Hooker, *Star,* the Story of an Indian Pony, Doubleday, 75¢ (10–12)

Stephen Meader, *Red Horse Hill,* Harcourt, $2.50 A roan colt and a boy (12–14)

Siegfried Sassoon, *Memoirs of a Fox-Hunting Man,* Coward, 1931, $2.50 (14 up)

Anna Sewell, *Black Beauty,* Dutton, $1.00 (10–14)

Elizabeth Sprigge, *Pony Tracks,* Scribner, 1936, $2.50 Adventures of children and their ponies in the New Forest (10–12)

Lincoln Steffens, *Boy on Horseback,* Harcourt, 1935, $2.00 Steffens' boyhood in California, taken from his *Autobiography*

PREHISTORIC MAN AND HIS WORLD

Roy Chapman Andrews, *On the Trail of Ancient Man,* Garden City, 1926, $1.00 Explorations in the Gobi Desert (14 up)

Mary E. Boyle, *Man Before History,* Little, 1924, $1.50 (12–14)

Irving Crump, *Moy the Mound Builder,* Dodd, $2.00 (10–14; F)

Og of the Cave People, Dodd, 1935, $2.00 (10–14; F)

Og, Son of Fire, Dodd, $2 (10–14; F)

Raymond Lee Ditmars, *Book of Prehistoric Animals,* Lippincott, 1935, $2.00 Illustrated with pictorial maps (12–14)

Katharine E. Dopp, *The Early Cavemen,* Rand, 1904, 72¢ (8–9)

The Early Farmers, Rand, 1929, 80¢ (9–10)

The Early Herdsmen, Rand, 1923, 80¢ (9–10)

The Later Cave-Men, Rand, 1906, 72¢ (9–10)

The Tree Dwellers, Rand, 1903, 72¢ (9–10)

Carroll Lane Fenton, *Life Long Ago,* the Story of Fossils, Reynal, 1937, $3.50 (11–14)

Charles R. Knight, *Before the Dawn of History,* McGraw, 1935, $2.50 A book about prehistoric man (13–15)

Frederic Arnold Kummer, I. *The First Days of Man* (The Earth's Story), Doubleday, 1922, $2.00 (9–12)
II. *The First Days of Knowledge* (The Earth's Story), Doubleday, 1923, $2.00 (9–12)

Déric Nusbaum, *Deric in Mesa Verde,* Putnam, 1926, $1.75 A twelve-year-old boy's adventures among the cliff dwellings of Mesa Verde National Park (12–14)

Lucy Fitch Perkins, *Cave Twins,* Houghton, 92¢ (8–10; F)

Marjorie and C. H. B. Quennell, *Everyday Life in the Old Stone Age,* Putnam, 1922, $2.50 (13–15)
The New Stone, Bronze, and Early Iron Ages, Putnam, 1923, $2.50 (13 up)

J. Reason, *Bran the Bronze-Smith;* a tale of the Bronze Age in the British Isles, Dutton, 1932, $2 (13–15; F)

William W. Robinson, *Ancient Animals,* Macmillan, 1934, $2.00 (12–15)
Beasts of the Tar Pits; tales of ancient America, Macmillan, 1932, $1.75 (10–14)

S. S. Smith, *The Cave Mystery,* Harcourt, 1935, $2.00 Two boys and an archeologist find Cro-Magnon relics in a mysterious cave in the Spanish-Basque country (12–14; F)

Gregory Trent, *Hunters Long Ago,* a boys' story of the late Paleolithic times, Harcourt, 1937, $2.00 A tale of Cro-Magnon people (12–14; F)
In the Stone Age, Harcourt, $2.00 (12–14; F)

Edith B. Walker and Charles C. Mook, *Tales of the First Animals,* Farrar, 1930, $1.50 (10–13)

Margaret E. Wells, *How the Present Came from the Past* (Vol. I): Seeds in Primitive Life, 1932, Macmillan, 80¢

MAN'S PROGRESS

Marjory Bruce, *The Book of Craftsmen;* the Story of Man's Handiwork through the Ages, Dodd, 1937, $2.75 (12 up)

Mary Duncan Carter, *The Story of Money,* Farrar, 1932, $1.25 History of money from the early days of barter to the present (10–13)

Joseph Cottler and Haym Jaffe, *Heroes of Civilization,* Little, 1931, $2.50, Heroes of exploration, science, invention, biology, medicine (12–14)

F. L. Darrow, *The Boys' Own Book of Great Invention,* Macmillan, 1918, $2.00 (13–15)

R. S. Holland, *Historic Inventions,* Macrae, 1911, $2.00 (12–15)

M. Ilin, *Black on White,* the Story of *Books,* Lippincott, 1932, $1.50 (10–14)
What Time Is It? the Story of *Clocks,* Lippincott, 1932, $1.50 (10–14)

Marion Florence Lansing, *Great Moments in Science,* Doubleday, 1926, $2.50 Invention of iron, porcelain, timekeepers, telescopes, cameras, steam engines, etc. (12–14)

Margaret Norris, *Heroes and Hazards,* Macmillan, 1932, $2.00 (12–15)

Maud and Miska Petersham, *The Story Book of Things We Use,* Winston, 1933, $2.50 Houses, clothes, food, transportation (7–10)

Frances Rogers and Abel Beard, *Heels, Wheels & Wire;* the Story of Messages and Signals, Stokes, 1935, $1.75 Communication through the ages (12–16)

Charles Everett Rush and Amy Winslow, *The Science of Things About Us,* Little, 1926, 90¢ Accounts of the origin of such articles of daily use as paper, ink, chalk, brass, copper, dishes, needles, thimbles (12–14)

Scientific Achievement

Bailey K. Ashford, *A Soldier in Science;* Autobiography, Morrow, 1934, $3.50 Autobiography of a physician who spent his life in the exploration of tropical diseases (14 up)

Eve Curie, *Madame Curie,* a Biography, Doubleday, 1937, $3.50 (14 up)

Floyd Lavern Darrow, *Masters of Science and Invention,* Harcourt, 1923, $2.25 Biographies of leading scientists (14 up)

Paul De Kruif, *Microbe Hunters,* Blue Ribbon, 1930, $1.00

Helen M. Doyle, *A Child Went Forth;* Autobiography, Gotham, 1934, $3.00 The story of the childhood and development of a woman pioneer in surgery and medicine (14 up)

John J. Floherty, *Moviemakers,* Doubleday, $2.00 (12–14)
On the Air; the Story of Radio, Doubleday, 1937, $2.00 (12 up)

William Foster, *The Romance of Chemistry,* Appleton-Century, 1936, $3.00 (14 up)

Otto Willi Gail, *Romping Through Physics,* Knopf, 1934, $1.50 (13–15)

John Winthrop Hammond, *A Magician of Science:* The Boys' Life of Steinmetz, Appleton-Century, 1926, $1.75 (13–15)

Harry N. Holmes, *Out of the Test Tube,* Emerson, 1937, $3.00 (14 up)

Clara Lambert, *Talking Wires,* 1935, Macmillan, $2.00 (12–15)

John Langdon-Davies, *Inside the Atom,* Harper, 1933, $2.00, Introduction to physics and chemistry (13 up)
Radio, Dodd, 1935, $2.00 History and explanation of principles of radio, (13 up)

Hiram Percy Maxim, *Horseless Carriage Days,* Harper, 1937, $2.50 (14 up)

W. H. Meadowcroft, *The Boys' Life of Edison, Harper,* 1921, $2.00 (12–14)

Sydney Moseley and Herbert McKay, *Television, a Guide for the Amateur,* Oxford, 1936, $2.00 (14 up)

Mary R. Parkman, *Conquests of Invention,* Appleton-Century, 1921, $2.00 (12–14)

Michael I. Pupin, *From Immigrant to Inventor,* Scribner, $1.00 (14 up)

Edwin Slosson, *Creative Chemistry,* Appleton-Century, 1930, $3.50 Great achievements in the chemical industries (14 up)

Annabel Williams-Ellis, *Men Who Found Out,* Coward, 1930, $2.00 Stories of scientific discovery (12–15)

Grove Wilson, *Great Men of Science, Their Lives and Discoveries,* Garden City, 1932, $1.00 (14 up)

Raymond Francis Yates, *Exploring with the Microscope,* Appleton-Century, 1934, $2.00 (12–14)
These Amazing Electrons, Macmillan, 1937, $3.75 (14 up)

Hans Zinsser, *Rats, Lice and History,* Little, 1935, $2.75 (14 up)

Engineering

Walter D. Binger, *What Engineers Do;* an Outline of Construction, Norton, 1928, $2.75 The story of civil engineering (12 up)

Archibald Black, *The Story of Bridges,* Whittlesey, 1936, $2.50 (12 up)
The Story of Tunnels, McGraw, 1937, (12–14)

A. Russell Bond, *Pick, Shovel and Pluck,* Scientific American, 1924, $1.00, Keokuk Dam and Panama Canal are described

Lorinda Munson Bryant, *Children's Book of Celebrated Bridges,* Appleton-Century, 1925, $2.50 (12–14)

Ellison Hawks, *Boys Book of Remarkable Machinery,* Dodd, 1928, $2.50

Eric Hodgins and F. A. Magoun, *Behemoth,* the story of Power, Doubleday, 1932, $2.50 Development of modern machinery (14 up)

Transportation

Alice Dalgliesh, *America Travels,* Macmillan, $2.00 Stories of children traveling by every means from stagecoach to the early automobile (8–10; F)

Robert Selph Henry, *Trains,* 1934, Bobbs, $2.50 (12–15)

Henry B. Lent, *Tugboat,* Macmillan, 1936, $1.75 Tugboats in New York Harbor (7–10)

Maud and Miska Petersham, *The Story Book of Wheels, Ships, Trains and Aircraft,* Winston, $2.50 (7–10)

Hildegarde Hoyt Swift, *Little Blacknose,* the Story of a Pioneer, Harcourt, $2.00 The story of DeWitt Clinton's first little locomotive (7–9; F)

Sanford Tousey, *Steamboat Billy,* Doubleday, $1.50 Life on the Ohio River (7–9; F)

T. W. Van Metre, *Trains, Tracks, and Travel,* 1936, Simmons-Boardman, $3.00 (12–15)

Aviation

C. B. Allen and Lauren D. Lyman, *The Wonder Book of the Air,* Winston, 1936, $2.50 (12–14)

Thomson Burtis, *Haunted Airways,* Doubleday, 75¢ Air adventure in 1985 (12–14; F)

Richard Evelyn Byrd, *Skyward,* Blue Ribbon Books, $1.00 (13 up)

Mitchell V. Charnley, *Boys' Life of the Wright Brothers,* Harper, 1928, $2.00 (12–14)

Archie Frederick Collins, *Aviation and All About It,* Appleton-Century, 1929, $2.00 (11–14)

Juan De La Cierva and Don Rose, *Wings of To-morrow,* the Story of the Autogiro, Harcourt, 1931, $2.50 (13 up)

Amelia Earhart, *The Fun of It,* Harcourt, 1932, $2.50 (7–14)
Last Flight, Harcourt, 1937, $2.50 (14 up)

P. F. M. Fellowes, *First over Everest!* the Houston-Mount Everest expedition, 1933, McBride, 1934, $3.50 (14 up)

Marjorie Flack, *Up in the Air,* Macmillan, $1.75 The true story of the three animals who made the first baloon ascent (6–10)

Chelsea C. Fraser, *Heroes of the Air,* Crowell, 1936, $2.50 (13–16)
The Story of Aircraft, Crowell, 1933 $2.50 (12–15)

John Goldstrom, *A Narrative History of Aviation,* Macmillan, 1930, $4.00 (13 up)

Laura B. Harney, *The Skycraft Book,* Macrae, 1932 $2.00 (13–16)

Eric P. Hodgins and Frederick A. Magoun, *Sky High,* a History of Aviation, Little, 1935, $2.75 (12 up)

G. Gibbard Jackson, *The World's Aeroplanes and Airships,* Lippincott, 1930, $2.50 (13 up)

Assen Jordanoff, *Your Wings,* Funk & Wagnalls, 1937, $2.50

Anne Morrow Lindbergh, *North to the Orient,* Harcourt, 1935, $2.50 (12–14)

Charles Augustus Lindbergh, *"We,"* Grosset, $1.00 (12–14)

Grover Loening, *Our Wings Grow Faster,* Doubleday, 1935, $2.50 (14 up)

John Robert McMahon, *The Wright Brothers, Fathers of Flight,* Little, 1930, $1.00 (13 up)

F. Alexander Magoun and Eric Hodgins, *A History of Aircraft,* McGraw, 1931, $4.00 (13 up)

General William Mitchell, *Skyways,* Lippincott, 1931, $3.00 (12–15)

Charles Nordhoff and James Norman Hall, *Falcons of France,* Little, 1929, $2.50 Adventures in the Lafayette Flying Corps during the World War (12–14; F)

Wiley Post and Harold Gatty, *Around the World in Eight Days;* the Flight of the Winnie Mae, Rand, 1931, $2.50 (13 up)

Edward V. Rickenbacher, *Fighting the Flying Circus,* Stokes, 1919, $2.00 Story of America's great ace in the World War (14 up; F)

Agnes Rogers, *Flight;* the story of aviation in pictures and text, Harper, 1935, $2.00 (10–14)

Antoine de Saint Exupéry, *Night Flight,* Appleton-Century, 1932, $1.75 (14 up)

Edwin Way Teale, *The Book of Gliders,* Dutton, 1930, $1.00 (12 up)

Harold Victorin, *The Eaglet,* Macmillan, $1.50 A story of international air racing (F)

Archibald, Williams, *Conquering the Air:* The Romance of the Development and Use of Aircraft, Nelson, 1930, $1.50, (13–15)

WORLD EXPLORATION

Raymond L. Ditmars, *Thrills of a Naturalist's Quest,* Macmillan, 1932, $3.50 (14 up)

Paul Du Chaillu, *The Country of the Dwarfs,* Harper, 1928, $2.00 Experiences among the African pygmies (10–14)
Lost in the Jungle, Harper, 1928, $2.00 Early African exploration (12–14)
Land of the Long Night, Scribner, 1899, $2.50 Life of the Lapps near the Arctic Circle and the fishermen of the northern part of Norway (12–14)

Julian Duguid, *Green Hell,* Travel in the Forests of Eastern Bolivia, Nelson, $1.50 (14 up)

Lincoln Ellsworth, *Exploring Today,* Dodd, 1935, $1.75 (12–14)

Charles J. Finger, *David Livingstone,* Doubleday, 1931, $2.50 (13–16)

Joe Hill, Jr. and Ola Davis Hill, *In Little America with Byrd;* based on experiences of the 56 men of the second Antarctic expedition, Ginn, 1937, $1.00 (10–14)

Geography and Early Exploration

Donn Byrne, *Messer Marco Polo,* Appleton-Century, 1921, $1.25 (14 up; F)

Padraic Colum, *The Voyagers:* Legends and History of Atlantic Discovery, Macmillan, 1925, $2.25 (12–14)

Ingri d'Aulaire and Edgar Parin, *The Conquest of the Atlantic,* Viking, 1933, $1.75 (10–13)

Charles Joseph Finger, *Courageous Companions,* Longmans, 1929, $2.50 The story of an English boy on Magellan's first voyage around the world (13–16)

Arthur Sturges Hildebrand, *Magellan,* Harcourt, 1924, $2.75 (14 up)

V. M. Hillyer, *A Child's Geography of the World,* Appleton-Century, $2.00 (10–12)

Louise Andrews Kent, *He Went with Marco Polo,* Houghton, $2 (12–15; F)

Marion Lansing, *Great Moments in Exploration,* Doubleday, 1928, $2.50 (12–14)

Alida Sims Malkus, *Eastward Sweeps the Current,* Winston, 1937, $2.00 A saga of the Polynesian seafarers 1,000 years before Columbus (14 up; F)

Leonard Outhwaite, *Unrolling the Map,* the Story of Exploration, Reynal, 1935, $3.75 Exploration from 3000 B.C. to the present (13 up)

Vernon Quinn, *Picture Map Geography of the World,* Stokes, 1932, $2.50 (9–13)

M. D. Stevens and Jonas Pendlebury, *Sea Lanes;* Man's Conquest of the Ocean, Minton, 1935, $3.75 (14 up)

Margaret Bertha Synge, *The Book of Discovery,* Putnam, 1912, $5.00 (14 up)

Hendrik Willem van Loon, *The Romance of Discovery,* Carlton, 1936, $1.29 (12 up)
Van Loon's Geography, the Story of the World We Live In, Simon, 1932, $3.75 (13 up)

Recent Exploration

Mary L. Jobe Akeley, *Carl Akeley's Africa,* Blue Ribbon Books, 1929, $1.00 The account of the Akeley-Eastman-Pomeroy African hall exhibition of the American Museum of Natural History (14 up)

Roald Amundsen and Lincoln Ellsworth, *First Crossing of the Polar Sea,* Doubleday, 1927, $5.00 (14 up)

Roy Chapman Andrews, *Ends of the Earth,* Garden City, 1934, $1.00 (14 up)

William Beebe, *The 'Arcturus' Adventure;* an account of the New York Zoological Society's first Oceanographic Expedition, Putnam, 1926, $7.50 (14 up)
Exploring with Beebe, Putnam, 1932, $2.50 (14 up)

George Borup, *A Tenderfoot With Peary,* Stokes, 1911, $2.50 (13–15)

Thomas Charles Bridges and Hubert Hessell Tiltman, *Heroes of Modern Adventure,* Little, 1927, $2 (13–15)

Richard E. Byrd, *Exploring with Byrd;* Episodes from an Adventurous Life, Putnam, 1937, $2.50 (14 up)

Richard E. Byrd, *Litle America,* Aerial Exploration in the Antarctic. The Flight to the South Pole, Putnam, 1930, $5.00 (13 up)

John Lang, *The Story of Captain Cook* (Children's Heroes Series), Dutton, 1906, $1.00

J. Kennedy MacLean, *Heroes of the Farthest North and Farthest South,* Crowell, 1930, $2.00 (12–15)

Jeannette Mirsky, *To the North!* the Story of Arctic Explorations from Earliest Times to the Present, Viking, 1934, $3.75 (14 up)

John S. O'Brien, *Alone Across the Top of the World,* the authentic story of the Arctic journey of David Irwin, Winston, 1935, $2.00 (13 up)

Josephine Diebitsch Peary, *The Snow Baby,* a True Story With True Pictures, Stokes, 1901, $2.50 The story of little American Marie Peary, born in Greenland (7–9)

Marie Ahnighito Peary, *The Snowbaby's Own Story,* Stokes, 1934, $2.00 Admiral Peary's daughter tells the story of her life in the North (12–14)

M. I. Ross, *Back of Time,* Harper, $2.00 Story of a scientific expedition through Australia (11–14; F)
South of Zero, Harper, $2.00 A boy's adventures in the Antarctic (13–15; F)

Vilhjalmur Stefansson and Violet Irwin, *Kak, the Copper Eskimo.* Macmillan, 1933, $1.50 (school ed. $1.20) Life of an Eskimo boy (12–13; F)

Vilhjalmur Stefansson, *The Hunters of the Great North,* Harcourt, 1922, $2.50 The author's account of his first winter and summer in the North (13–16)

Charles Turley, *The Voyages of Captain Scott,* Dodd, 1915, $2.50 (13–16)

THE SEA, SHIPS AND SAILORS

Lis Andersen, *Lis Sails the Atlantic,* Dutton, 1936, $2.00 Adventures of a Danish girl aboard her father's ketch (12–16)

Victor Berge and H. W. Lanier, *Pearl Diver,* Sun Dial, 1931, 75¢ Boyhood in a Swedish village, sea adventure and beginning of life as a pearl diver (13 up)

Frank T. Bullen, *The Cruise of the Cachalot,* Appleton-Century, 1925, $2 A story about whaling (13–16; F)

Harold A. Calahan, *Back to Treasure Island,* Vanguard, $2.00 (12–15; F)

Howard I. Chapelle, *The History of*

American Sailing Ships, Norton, 1935, $7,50 (14 up)

Francis Arnold Collins, *Sentinels Along Our Coast,* Appleton-Century, 1922, $2.00 Account of the development of light houses (12–14)

James B. Connolly, *The Book of the Gloucester Fishermen,* Day, 1930, $2.50 (14 up)

Joseph Conrad, *Sea Tales,* Doubleday, 75¢ (14 up; F)

Richard Henry Dana, Jr., *Two Years Before the Mast,* Macmillan, $1.00 (14 up)

Thomas Eadie, *I Like Diving;* a Professional's Story, Houghton, 1929, $3.50 (13 up)

Edward Ellsberg, *On the Bottom,* Dodd, $3.00 The story of the salvage of the S-51, sunk off Block Island (12–14)

Johan Wigmore Fabricius, *Java Ho!* Coward, 1931, $2.50 Adventure story based on log of a Dutch skipper who voyaged to the East Indies in 1618 (13–16; F)

Helen Follett, *Stars to Steer By,* Macmillan, 1934, $2.50 Travel adventures of a mother and daughter in the South Seas (14 up)

Cecil Scott Forester, *Beat to Quarters,* Little, 1937, $2.50 The story of a captain in the British navy in the early 19th century (14 up; F)

Robert Frothingham, *Songs of the Sea and Sailors' Chanteys,* Houghton, 1924, $1.75 (13 up)

Alice Cushing Gardiner and Nancy Cabot Osborne, *Father's Gone A-Whaling,* Doubleday, 75¢ Nantucket Island in whaling days (10–13; F)

Good Wind and Good Water, Viking, 1934, $2.00 Story of a Nantucket boy who makes a trip to China with a Boston merchant in 1826 (12–14; F)

Peter Gimmage, *The Picture Book of Ships,* Macmillan, $2.00

George H. Grant, *The Half Deck,* Little, 1933, $2.00 Experiences of a boy apprentice on a British cargo steamer (12–14; F)

Gordon Grant, *The Story of the Ship,* McLoughlin Bros., 1919, $2.00 Pictures of ships of all ages (9–12)

Charles Boardman Hawes, *The Dark Frigate,* Little, 1923, $2.00 Adventure on the seas in the days of Charles I (12–14; F)

The Great Quest, Little, $2.00 Adventures of a young New Englander in 1826 (12–14; F)

The Mutineers, Little, 1931, $2.00 A Salem boy's adventures in the early days of the Canton trade (12–14; F)

Ellison Hawks, *The Romance of the Merchant Ship,* Crowell, 1931, $3.00 (12 up)

Agnes Danforth Hewes, *Glory of the Seas,* Knopf, 1933, $2.00 A story of shipping in the days of the clipper ships (13–16; F)

William J. Hopkins, *She Blows! and Sparm at That!* Houghton, $2.00 Four years on a whaler in the South Seas in the early '70s (13–16; F)

Thomas A. Janvier, *In the Sargasso Sea,* Harper, 1898, $2.50 The story of a castaway who finds the treasure of a Spanish galleon (13 up; F)

Charles Kingsley, *Westward Ho!* Scribner, 1920, $1.50 Adventure and sea fights in the time of Queen Elizabeth (14 up; F)

Rudyard Kipling, *Captains Courageous,* Doubleday, $1.00 The son of a millionaire forced to share the life of the crew of a fishing schooner (12–14; F)

Joseph C. Lincoln, *Rugged Water,* Burt, 75¢ (14 up; F)

Captain Marryat, *Masterman Ready,* Harper, 1928, $2.00 A story of shipwreck on a desert island (12–14; F)

Mr. Midshipman Easy, Macmillan, 1924, $2.00 A story of a boy on a cruise about the world at the time of the Peninsular War, early 19th century (14 up; F)

John Masefield, *The Bird of Dawning,* or *The Fortune of the Sea,* Macmillan, 1934, $2.50 The story of a race of tea ships from China to England (14 up; F)

Victorious Troy, or *The Hurrying Angel,* Macmillan, $2.50 (14 up; F)

Jim Davis, Stokes, 1924, $1.25 A story of smugglers in the early 19th century (12–14)

Salt-Water Poems and Ballads, Macmillan, 1922, $2.50 (12–14)

Stephen W. Meader, *The Black Buccaneer,* Harcourt, 1920, $1.75 Pirates in the early days of the 18th century (12–14; F)

Cornelia Meigs, *Clearing Weather,* Little, $2.00 (13–15; F)

The Trade Wind, Little, 1927, $2.00 Sea adventures of a Massachusetts boy before the Revolution (12–14; F)

Herman Melville, *Moby Dick;* or, *The White Whale,* Dodd, $2 (14 up; F)

Charles Nordhoff and James Norman Hall, *Hurricane,* Little, $2.50 (13 up; F)

Men Against the Sea, Little, 1934, $2.00 The story of a 3600-mile voyage in an open boat, based on Captain Bligh's log (14 up; F)

Mutiny on the Bounty, Little, $2.50 Based on historic records of H. M. S. Bounty which set sail from England in 1787, bound for Tahiti (14 up; F)

Charles Nordhoff, *The Pearl Lagoon,* Little, 1924, $2.00 Adventures on a pearl fishing cruise among South Sea Islands (12–14; F)

Alfred Noyes, *Forty Singing Seamen and Other Poems,* Stokes, 1930, $3.00 (13–16)

George Herbert Palmer, *The Odyssey of Homer,* Houghton, 1929, $2.50 (13–15)

Howard Pease, *The Jinx Ship,* Doubleday, 1927, 75¢ The story of a tramp ship dogged by disaster (13–15; F)

The Tattooed Man, Doubleday, 1926, 75¢ Strange adventures on a voyage from San Francisco to Genoa (12–14; F)

Lewis Pendleton, *Down East,* Harcourt, 1937, $2.00 The remarkable adventures on the briny deep and ashore of Captain Isaac Drinkwater and Jedediah Peabody (12 up; F)

Howard Pyle, *Book of Pirates,* Harper, 1921, $2.50 (14 up)

Arthur Ransome, *Peter Duck,* Lippincott, 1933, $2.00 A family of children sail off with Captain Flint and an old seaman, Peter Duck, in search of buried treasure (12–14; F)

Swallows and Amazons, Lippincott, 1931, $2.00 (12–14; F)

Mabel L. Robinson, *Bright Island;* Random, 1937, $2.00 The story of a girl's love for her island home (12 up; F)

William Albert Robinson, *10,000 Leagues Over the Sea,* Harcourt, 1932, $3.00 (14 up; F)

W. Clark Russell, *The Wreck of the Grosvenor,* Dodd, $2.00 (12–16; F)

Michael Scott, *Tom Cringle's Log,* Everyman's Library, 80¢ A tale of the early 19th century (14 up; F)

Armstrong Sperry, *All Sail Set;* A Romance of the "Flying Cloud," Winston, 1935, $2.00 (12–14; F)

E. A. Stackpoole, *Madagascar Jack;* the story of a Nantucket whaler, Morrow, 1935, $2.00 (13–16; F)

Robert Louis Stevenson, *Treasure Island,* Scribner, 1924, $1.50 Pirates and hidden treasure (12–14; F)

Frank R. Stockton, *Buccaneers and Pirates of Our Coasts,* 1898, MacMillan, $2.00 (12–14)

Hendrik Willem van Loon, *Ships and How They Sailed the Seven Seas,* Simon, 1935, $3.00 (14 up)

T. W. Van Metre, *Tramps and Liners,* Doubleday, 1931, $3.00 (12 up)

Jules Verne, *The Mysterious Island,* Scribner, 1918, $1.50 (13 up; F)

Twenty Thousand Leagues Under the Sea, Burt, 1931, $1.00 (13–16; F)

Alan J. Villiers, *By Way of Cape Horn,* Garden City, 1933, $1.00

Stormalong, The Story of a Boy's Voyage Around the World in a Full-rigged Ship, Scribner, 1937, $1.75 (10–14)

Elinor Whitney, *Try All Ports,* Longmans, 1931, $2.00 Boston and England in 1850 (12–14; F)

LIFE AND TRAVEL IN MANY LANDS

Helen Dean Fish, *Invitation to Travel,* Ives Washburn, 1937, $2.50 (14 up)

Africa

Herbert Best, *Garram, the Hunter,* Doubleday, $2.00 The story of an African boy and his wonderful dog (12–14; F)

Elizabeth Enright, *Kintu,* a Congo Adventure, Farrar, $1.00 (8–10; F)

Max Mezger, *Monica Goes to Madagascar,* Coward, 1936, $2.00 (10–14; F)

Caroline Singer and Cyrus LeRoy Baldridge, *Boomba Lives in Africa,* Holiday, $1.75 (9–12; F)

Asia

(China)

Pearl S. Buck, *East Wind: West Wind,* Grosset, 75¢ A book about China (14 up)

Frances Carpenter, *Tales of a Chinese Grandmother,* Doubleday, 1937, $2.50 (10–14)

Johanna M. Hekking, *Pigtails,* Stokes, $2.00 A book about present-day China (7–9)

Mary Brewster Hollister, *Beggars of Dreams,* Dodd, 1937, $2.00 (10–14)

Mulberry Village, Dodd, 1936, $1.75 A story of country life in China (12–14)

Elizabeth F. Lewis, *Ho-Ming,* girl of New China, Winston, $2.00 (13–15)

Young Fu of the Upper Yangtze, Winston, $2.00 (13–15)

Eleanor Frances Lattimore, *Little Pear:* the Story of a Little Chinese Boy, Harcourt, $2.00 (7–9)

Lucy Fitch Perkins, *The Chinese Twins,* Houghton, $1.75 (8–10)

Dorothy Rowe, *Traveling Shops,* Stories of Chinese Children, Macmillan, $2.00 (9–12)

Kurt Wiese, *The Chinese Ink Stick,* Doubleday, $2.00 (9–12)

(India)

Irene Mott Bose, *Totaram:* A Village Boy's Life in India Today, Macmillan, $1.75 (9–12)

Rudyard Kipling, *Kim,* Doubleday, $2.50 (14 up)

Something of Myself; for My Friends Known and Unknown, Doubleday, 1937, $2.50 (14 up)

(Japan)

Shidzué Ishimoto, *East Way, West Way;* a modern Japanese girlhood, Farrar, 1936, $1.75 Reprint of first nine chapters of *Facing Two Ways* (12–16)

Chiyono Sugimoto, *Chiyo's Return,* Doubleday, 1935, $2.00 A Japanese girl who has lived a number of years in America returns to her native land (12–14)

Etsu I. Sugimoto, *A Daughter of the Samurai,* Doubleday, 1925, $2.50 The story of a Japanese girl who marries a Japanese merchant and comes to the United States to live (14 up)

(Persia)

Caroline Singer and Cyrus LeRoy Baldridge, *Ali Lives in Iran,* Holiday, 1937, $1.75 (9–12)

(Turkey)

Selma Ekrem, *Unveiled;* the autobiography of a Turkish girl, Ives Washburn, 1930, $3.00 (14 up)

America

(Greenland)

Vilhjalmur Stefansson, *My Life with the Eskimos,* Macmillan, 1927, $2.50 (14 up)

(Canada)

Marguerite de Angeli, *Petite Suzanne,* Doubleday, 1937, $2.00 A story about the Gaspé country (7–10; F)

Louis Hémon, *Maria Chapdelaine,* Grosset, $1.00; Macmillan, $2.00 (14 up; F)

Ethel Calvert Phillips, *Gay Madelon,* Houghton, $2.00 A story about French Canada (7–10; F)

(United States)

Marguerite de Angeli, *Henner's Lydia,* Doubleday, 1936, $2.00 A story of the Pennsylvania Dutch country (7–10; F)

Arna Bowtemps, *You Can't Pet a Possum,* Morrow, $1.75 An Alabama story (7–9; F)

Gladys Hasty Carroll, *As the Earth Turns,* Grosset, $1.00 A story of Maine farm life (14 up; F)

Alice Dalgliesh, *The Blue Teapot,* Sandy Cove Stories, Macmillan, $2.00 (8–10; F)

Reliefs Rocker, Macmillan, $1.75 More Sandy Cove stories (8–10; F)

Genevieve Fox, *Mountain Girl,* Little, $2.00 A story about the Kentucky mountains (13–16; F)

Christine Noble Govan, *Those Plummer Children,* Houghton, 1934, $2.00 An amusing story of children in a small southern town (10–13; F)

Esther Greenacre Hall, *The Here-to-yonder Girl,* Macmillan, $1.00 A Kentucky mountain story (12–16; F)

Theodore Acland Harper, *Allison's Girl,* Viking, 1936, $2.00 Girl Scouts in Oregon, (12–16; F)

Isis L. Harrington, *Komoki of the Cliffs,* Scribner, $1.20 A story of the Hopi Indians in Arizona (8–9)

Louise Payson Latimer, *Your Washington and Mine,* Scribner, 1924, $1.40 Describes the national capital and its buildings and the famous people who have lived there (13–15)

Marian Hurd McNeely, *The Jumping-Off Place,* Longmans, $2.00 A story of the Dakota prairies (12–14; F)

Florence Crannell Means, *Penny for Luck,* a story of the Rockies, Houghton, 1935, $2.00 Penny runs away from an orphanage and finds a home in one of the "ghost towns" of Colorado (10–15; F)

Luey Fitch Perkins, *The Pickaninny Twins,* Houghton, $1.75 A story of the South (F)

Charlie May Simon, *Lost Corner,* Dutton, $2.00 The Ozark Mountains is the setting of this story (8–10)

Elsie Singmaster, *Keller's Anna Ruth,* Houghton, 1926, $2.00 A story about Pennsylvania people (F)

Annie Vaughan Weaver, *Boochy's Wings,* Stokes, $1.50

Frawg, Stokes, $1.50 These are Southern Negro stories (7–9; F)

(Mexico)

Anne Merriam Peck, *Young Mexico,* McBride, 1934, $2.50 (13–14)

Margaret Loring Thomas, *The Burro's Money Bag,* Abingdon, $1 (9–12; F)

(Central America)

Elizabeth Coatsworth, *Boy With the Parrot,* Macmillan, $1.75 A story of Guatemala (8–10)

(South America)

W. H. Hudson, *Far Away and Long Ago,* Dutton, 1924, $2.00 Boyhood life of the famous naturalist in his home on the pampas of South America (14 up)

Green Mansions, Grosset, $1.00 (14 up)

Elizabeth Steen, *Red Jungle Boy,* Harcourt, $2.00 A story of a Carajas Indian boy of the Brazilian jungle (7–10)

Europe

Anne Merriman Peck, *Roundabout Europe,* Harper, 1931, $2.50 (12–14)

(Balkans)

Elizabeth Cleveland Miller, *Children of the Mountain Eagle,* Doubleday, $2.00 A story of Albania (10–13; F)

Young Trajan, Doubleday, $2.00 The love story of a Rumanian peasant girl (12–14; F)

Kate Seredy, *The Good Master,* Viking, $2.00 Life on a horse farm in the plains of Hungary (9–12)

Monica Shannon, *Dobry,* Viking, $2.00 A story of Bulgarian peasants (13 up)

Nexhmie Zaimi, *Daughter of the Eagle,* The Autobiography of an Albanian Girl, Ives Washburn, 1937, $2.50 (12–16)

(Belgium)

Ludwig Bemelmans, *The Golden Basket,* Viking, 1936, $2.00 (7–9; F)

(Finland)

Bess S. Bryne, *With Mikko Through Finland,* McBride, $2.50 The journey of a brother and sister through Finland and Lapland (12–14)

(France)

Katharine Adams, *The Stork's Nest,* a story of Alsace, Macmillan, 1935, $2.00 (12–14; F)

Carol Ryrie Brink, *Anything Can Happen on the River!* Macmillan, $1.75 A story of mystery and adventure on the Seine River (12–14)

Baroness E. Martineau Des Chesnez, *Lady Green Satin and Her Maid Rosette,* or the Story of Jean Paul and His Little White Mice, Macmillan, $1.75 (F)

Sybil Emerson, *Jacques at the Window,* Crowell, 1936, $1.50 A story about Paris (8–10; F)

Marjorie Fischer, *Street Fair,* Smith and Haas, 1935, $2.00 Two children have an exciting time traveling alone through France (10–14; F)

(Germany)

Anne Merriam Peck, *Young Germany,* McBride, 1931, $2.50 (12–15)

Louise de la (Ouida) Ramée, *The Nürnberg Stove* (The Little Library), Macmillan, $1.00 A story about Bavaria (8–10; F)

Josephine Siebe, *The Hay Village Children,* Houghton, 1932, $2.00 Stories of children in a German peasant village (9–12; F)

(Great Britain)

Kathleen Fitzpatrick, *The Weans of Rowallan,* Coward, 1937, $2.50 A story about five children in Ireland (14 up; F)

Idwal Jones, *Whistlers' Van,* Viking, 1936, $2.00 A story about the Welsh moors (12–16; F)

Eiluned Lewis, *Dew on the Grass,* Macmillan, $2.00 The story of a family of children in Wales (14 up)

Clifton Lisle, *Hobnails and Heather,* Harcourt, 1929, $2.50 Tramping through England and France (13–15)

E. V. Lucas, *The Slowcoach,* Macmillan, $2.00 The adventures of seven children on their travels in a caravan through the Shakespeare country (10–13; F)

(Holland)

Mary Mapes Dodge, *Hans Brinker* or *The Silver Skates,* Scribner, $1.50 (10–14; F)

Lucy Fitch Pekins, *Dutch Twins,* Houghton, $1.75 (7–10; F)

Marie Kiersted Pidgeon, *Afke's Ten,* Told from the Dutch of Ninke van

Hichtum, Lippincott, 1936, $2.00 Family life in Holland (10–12; F)

Hilda Van Stockum, *A Day on Skates;* the Story of a Dutch Picnic, Harper, $2.50 (7–10; F)

(Italy)

Mabel Louise Robinson, *Robin and Tito,* Macmillan, $2.00 A story of Sicily (9–12; F)

(Russia)

Helen E. Haskell, *Peter, Katrinka's Brother,* Dutton, $2.00 A story of Soviet Russia (13–15; F)

Sonia Lustig, *Roses of the Winds,* Doubleday, $2.00 Story of a noble Russian family (12–14; F)

Sergei Rosanov, *The Adventures of Misha,* Stokes, 1938, $1.50 The life of a Soviet boy of today (8–10; F)

(Scandinavia)

Björnstjerne Björnson, *Happy Boy,* Macmillan, $1.00 A pastoral romance with a Norwegian setting (13–16; F)

Sunny Hill, a Norwegian Idyll, Macmillan, $1.00 A story of Norwegian peasant life (13–16; F)

Nora Burglon, *Children of the Soil,* Doubleday, 1932, $2.00 A Swedish story (9–12; F)

The Gate Swings In, Little, 1937, $2.00 A story of Norway (8–10; F)

Laura Mitilda Fitinghoff, *Children of the Moor,* Houghton, $2.50 The story of the wanderings of seven orphan children in Sweden (10–12)

Marie Hamsun, *A Norwegian Farm,* Lippincott, 1933, $2.00 (10–14; F)

Selma Lagerlöf, *Marbacka,* Doubleday, 1926, $3.00

The Diary of Selma Lagerlöf, Doubleday, 1936, $2.50 (12–16)

Eleanor Frances Lattimore, *The Seven Crowns,* Harcourt, $1.75 A story set in Denmark (7–10; F)

Signe Lindegren, *Ingrid's Holidays,* Macmillan, $1.75 A story of Sweden (12–14; F)

Ruth Bryan Owen, *Denmark Caravan,* Dodd, 1936, $2.00 (12 up)

Isabel Proudfit, *The Ugly Duckling; Hans Christian Andersen,* McBride, 1932, $2.25 The life of Denmark's famous author (12–14)

Barbara Ring, *Peik,* Little, $2.00 Story of a Norwegian boy (10–12)

Signe Toksvig, *The Life of Hans Christian Andersen,* Harcourt, 1934, $3.00 (14 up)

Annette Turngren, *Flaxen Braids,* a chapter from a real Swedish Childhood, Nelson, $1.50 (9–12; F)

Dikken Zwilgmeyer, *What Happened to Inger Johanne,* Lothrop, $1.75 Humorous adventures of a little Norwegian girl (10–13; F)

(Spain)

Charlotte Brewster Jordan, *Discovering Christopher Columbus,* Macmillan, 1932, $1.75 Travel in Spain (10–14)

Lucy Fitch Perkins, *The Spanish Twins,* Houghton, $1.75 (8–10)

Ruth Sawyer, *Toño Antonio,* Viking, $1.75 A story of Spain (10–13)

(Switzerland)

Johanna Spyri, *Heidi,* Translated by Helen B. Dole, Ginn, 84¢ A story of child life in the Swiss mountains (9–12)

Islands

Larry Barretto and Bryant Cooper, *Hawaiian Holiday,* Dodd, 1928, $2.00 (F)

Nora Benjamin, *Roving All the Day,* Random, 1937, $2.00 A little girl's vacation in the Bahama Islands (8–10; F)

Arna Bontemps and Langston Hughes, *Popo and Fifina,* Children of Haiti, Macmillan, 1932, $1.50 (9–12; F)

Maribelle Cormack, *Wind of the Vikings,* a Tale of the Orkney Isles, Appleton-Century, $2.00 (11–15)

Adele De Leeuw, *Rika;* A Dutch Girl's Vacation in Java, Macmillan, $2.00 (12–14; F)

Kathleen Morrow Eliot, *Riema,* Little Brown Girl of Java, Knopf, $2.00 (8–10; F)

Helen Follett, *Magic Portholes,* Macmillan, 1932, $2.50 The journey of a mother and her 14-year-old daughter to the West Indies, Panama, Tahiti and the South Sea (13–16)

Elizabeth Goudge, *Island Magic;* a novel of Guernsey, Coward, $2.50 (14 up; F)

Berta and Elmer Hader, *Jamaica Johnny,* Macmillan, $2.00 (7–10; F)

Theodore Acland and Winifred Mary Harper, *Windy Island,* Doubleday, 1931, $2.00 Early days of the New Zealand colony (12–14; F)

Chesley Kahman, *Raquel,* a girl of Puerto Rico, Random, 1936, $2.00 (F)

Margaret Isabel Ross, *Greentree Downs,* Houghton, $2.00 Four American children in Australia (F)

Land of Williwaws, Houghton, 1934, $2.00 Adventures of a 13-year-old girl and her boy cousins in Patagonia and the Folkland Islands (12–14; F)

Eunice Tietjens, *Boy of the South Seas,* Coward, 1931, $2.50 (9–12)

HISTORY

Gertrude Hartman, *The World We Live In,* Macmillan, 1931, $2.50 (12–16)

Virgil Mores Hillyer, *A Child's History of the World,* Appleton-Century, 1924, $2.00 (10–14)

Leo Huberman, *Man's Worldly Goods,* Harper, 1936, $2.50 An economic history of the world (14 up)

H. C. Knapp-Fisher, *An Outline of World History for Boys and Girls,* Dutton, 1932, $3.50 (10–14)

Marion F. Lansing, *Man's Long Climb,* Little, 1933, $1.75 (12–14)

Leon Carroll Marshall, *The Story of Human Progress:* An Introduction to Social Studies, Macmillan, 1928, $3.50 The story of the development of society (13–15)

Dorothy Margaret Stuart, *The Boy Through the Ages,* Doubleday, 1926, $3.00 (13–15)

The Girl Through the Ages, Lippincott, 1933, $2.50 (10–14)

Hendrik van Loon, *The Story of Mankind,* Liveright, 1926, $2.50 (13 up).

The Ancient World

Edgar James Banks, *Seven Wonders of the Ancient World,* Putnam, 1916, $2.50 (12–14)

James H. Breasted, *Ancient Times;* a History of the Early World, Ginn, 1935, $2.00 (14 up)

Josephine H. Greenwood, *Our Heritage from the Old World,* Appleton-Century, 1921, $1.80 (12–14)

Jennie Hall, *Our Ancestors in Europe,* Silver, 1916, $1.12 From Greece and Rome through the Middle Ages (10–13)

Jeannette Rector Hodgdon, *The Enchanted Past,* Ginn, 1922, 88¢ (10–14)

Dorothy Mills, *The Book of the Ancient World for Younger Readers,* Putnam, 1923, $2.00 (13–15)

Michael I. Rostovtzeff, *Out of the Past of Greece and Rome,* Yale, 1932, $2.00 (13–16)

Margaret E. Wells, *How the Present Came from the Past,* Vol. II, Macmillan, $1.00 Roots in Oriental life (8–12)

Asia Minor

Louise Andrews Kent, *Two Children of Tyre,* Houghton, $2.00 (11–14; F)

Dorothy Mills, *The People of Ancient Israel,* Scribner, 1932, $1.75

Egypt

Frances Kent Gere, *Once Upon a Time in Egypt,* Longmans, 1937, $2.00 (6–8; F)

Alice W. Howard, *The Princess Runs Away,* Macmillan, $1.50 A story of Egypt in 1900 B.C. (7–9)

Enid La Monte Meadowcroft, *The Gift of the River,* a History of Ancient Egypt, Crowell, 1937, $2.00 (9–12)

De Wolfe Morgan, *Messenger of the Pharaoh;* a Story of Ancient Egypt, Longmans, 1937, $2.00 (11–14; F)

Lucile Morrison, *The Lost Queen of Egypt,* Stokes, 1937, $2.50 (13 up; F)

Greece

Erick Berry, *Winged Girl of Knossos,* Appleton-Century, $2.00 A story of ancient Crete, (13–15)

Gordon King, *Herodotus, The First European Historian,* Doubleday, 1929, $2.50 (13–15)

Dorothy Mills, *The Book of the Ancient Greeks,* Putnam, 1925, $2.50 (13–15)

Plutarch's Lives for Boys and Girls, Nelson, $1.50 (12–14)

Marjorie and C. H. B. Quennell, *Everyday Life in Archaic Greece,* Putname, 1931, $2.50 (13 up)

Classical Greece, Putnam, 1933, $2.50 (13 up)

Everyday Life in Homeric Greece, Putnam, 1930, $2.50 (13 up)

Caroline Dale Snedeker, *The Perilous Seat,* Doubleday, $2.00 The story of a priestess of Delphi (12–14; F)

The Spartan, Doubleday, $2.00 (14 up; F)

Theras and His Town, Doubleday, $2.00 (10–12; F)

Eva March Tappan, *The Story of the Greek People,* Houghton, 1908, $2.50

Rome

Edward Bulwer-Lytton, *The Last Days of Pompeii,* Scribner, $2.50 A picture of Roman life in the first century (14 up; F)

William Stearns Davis, *A Friend of Caesar,* Macmillan, 1925, $2.50 (14 up; F)

Jennie Hall, *Buried Cities,* Macmillan, 1922, $2.00 Description of early life and excavations of Pompeii, Olympia and Mycenae (10–13)

Dorothy Mills, *The Book of Ancient Romans,* Putnam, 1927, $2.50 (13–15)

Caroline Dale Snedeker, *The Forgotten Daughter,* Doubleday, $2.00 The story of a Roman slave girl (13–15; F)

Eva March Tappan, *The Story of the Roman People,* Houghton, 1910, $2.50 (10–13)

Lew Wallace, *Ben-Hur,* Harper, $2.00 (F)

America

Thomas A. Janvier, *The Aztec Treasure House,* Harper, 1890, $2.50 A search for treasure in the hidden Aztec city (13–15; F)

Alida Sims Malkus, *The Dark Star of Itza;* the story of a pagan princess, Harcourt, 1930, $2.50 The story of life in ancient Yucatan (14 up; F)

Ann Axtell Morris, *Digging in the Southwest,* Doubleday, 1933, $2.50 (13–16)

Digging in Yucatan, Doubleday, 1931, $2.50 Good introduction to archeology (13 up)

Earl H. Morris, *The Temple of the Warriors,* Scribner, 1931, $5.00 Exploring and restoring a masterpiece of native American architecture in the ruined Mayan city of Chichen Itza, Yucatan (14 up)

Hervey White, *Snake Gold,* Macmillan, 1926, $1.75 Adventure on a search for gold in an ancient mine in Mexico (13–16)

The Middle Ages

Julia Davis Adams, *Mountains Are Free,* Dutton, $1.00 The story of William Tell (13–15; F)

Louis Maurice Boutet de Monvel, *Joan of Arc,* Appleton-Century, 1907, $4.00 (9–12)

Noah Brooks, *The Story of Marco Polo,* Appleton-Century, 1896, $1.75 (13–15)

Geoffrey Chaucer, *The Canterbury Tales,* Longmans, 1936, $3.00 In modern English (14 up)

Marguerite Clément, *Once in France,* Doubleday, 1927, $2.00 Ten romantic stories of France (12–14; F)

Hawthorne Daniel, *The Gauntlet of Dunmore,* Macmillan, $1.75 England in 1411 (F)

The Shadow of the Sword, Macmillan, $2.50 (13–15; F)

Alphonse Daudet, *The Pope's Mule* (The Little Library), Macmillan, $1.00 A gay story of old days at Avignon, when the Popes lived there (F)

William Stearns Davis, *Life on a Medieval Barony,* Harper, 1923, $3.50 13th-century life fully described (13–15)

A. Conan Doyle, *The White Company,* Harper, 1928, $2.50 English bowmen in France and Castile, 1366–1367 (14 up; F)

Sidney Lanier, *The Boy's Froissart,* Scribner, 1879, $2.50 (13–15)

Jennie Hall, *Viking Tales,* Rand, 65¢ (10–12; F)

Grace Tabor Hallock, *The Boy Who Was,* Dutton, $2.00 Dramatic events from 553 to 1821 (F)

Gertrude Hartman, *Medieval Days and Ways,* Macmillan, 1937, $2.50 (13–16)

Agnes Danforth Hewes, *A Boy on the Lost Crusade,* Houghton, $2.50 A story of the Children's Crusade in the 13th century (13–15; F)

Spice and the Devil's Cave, Knopf, $2.50 A story of 15th-century Portugal (13–15; F)

Swords On the Sea, Knopf, $3.00 Adventure story of medieval Venice (13–15; F)

Washington Irving, *The Alhambra,* Macmillan, $1.75 (13–16)

Sophie Jewett, *God's Troubadour,* Crowell, 1910, $2.00 Life of St. Francis of Assisi (10–13)

Eric P. Kelly, *The Trumpeter of Krakow,* Macmillan, 1928, $2.50 The setting is in 15th-century Poland (13–15; F)

Harold Lamb, *Durandal:* A Crusader in the Horde, Doubleday, 1931, $2.50 (13–15; F)

Louise Lamprey, *In the Days of the Guild,* Stokes, 1918, $2.50 (12–14)

Masters of the Guild, Stokes, 1920, $2.50 (12–14)

Robert Leighton, *Olaf the Glorious,* Macmillan, $1.00 The story of a king of Norway in the 10th century (12–14; F)

Eloise Lownsbery, *The Boy Knight of Reims,* Houghton, 1927, $2.50 (12–14; F)

Charles Major, *When Knighthood Was in Flower,* Grosset, 75¢ (F)

May McNeer, *Waif Maid,* Macmillan, $2.50 Witchcraft in Germany in the Middle Ages (12–15; F)

Dorothy Mills, *The Middle Ages,* Putnam, 1935, $2.50 (13–15)

Albert Bigelow Paine, *The Girl in White Armor,* Macmillan, 1927, $1.50 About Joan of Arc (13–15)

Jane Porter, *Scottish Chiefs,* Scribner, 1921, $1.50 (13–15)

Howard Pyle, *Men of Iron,* Harper, $2.00 (12–14; F)

Otto of the Silver Hand, Scribner, $2.50 A story of medieval Germany (10–12; F)

Walter Scott, *Ivanhoe,* Grosset, $1.00 (F)

The Talisman, a tale of the Crusades, Dodd, 1929, $2.00 (14 up; F)

Merriam Sherwood and Elmer Mantz, *The Road to Cathay,* Macmillan, 1928, $3.50 (14 up)

Evaleen Stein, *Gabriel and the Hour Book,* Page, $1.65 A story of Medieval Brittany (F)

Emma Gelders Sterne, *Loud Sing Cuckoo,* Dodd, $2.50 England in Chaucer's day (13 up; F)

Robert Louis Stevenson, *The Black Arrow,* Scribner, 1929, $1.50 A story of the Wars of the Roses (13–15; F)

L. A. G. Strong, *King Richard's Land,* a Tale of the Peasants' Revolt, Knopf, 1934, $1.75 (12–14; F)

E. M. Tappan, *When Knights Were Bold,* Houghton, 1911, $3.00 (12–14)

Mark Twain, *Personal Recollections of Joan of Arc,* Harper, $2.50 (14 up)

Elinor Whitney, *Tod of the Fens,* Macmillan, $2.25 15th-century England (F)

Michael Williams, *Little Brother Francis of Assisi,* Macmillan, 1926, $1.75 (13–14)

Charlotte Mary Yonge, *The Dove in the Eagle's Nest,* Macmillan, $1.00 A story of the robber barons of 15th-century Germany (13–15; F)

Little Duke, Richard the Fearless, Macmillan, $1.00 Childhood of the Duke of Normandy, 943–996 (12–13; F)

The Prince and the Page, a Story of the Last Crusade, Macmillan, 1925, $1.00 (12–14; F)

The East

Harold Lamb, *Genghis Khan,* Boy's Edition, McBride, 1930, $2.50 (12–15)

Mary A. Nourse, *The Four Hundred Million,* a Short History of the Chinese, Bobbs, 1935, $3.50 (14 up)

Elizabeth Seeger, *The Pageant of Chinese History,* Longmans, 1934, $3.00 (12–14)

Robert Van Bergen, *The Story of China,* American Book, 1922, 76¢ (13–15)

Europe

Luigi Capuana, *Nimblelegs:* A Story for Boys, Longmans, $1.50 A story of the time of Garibaldi (10–12; F)

Nikolai Gogol, *Taras Bulba:* a tale of the Cossacks, Knopf, 1931, $2.00 (13–16; F)

Augusta H. Seaman, *Jacqueline of the Carrier Pigeons,* Macmillan, $1.75 A story of Holland's war with Spain and the siege of Leyden (1573–1574) (11–14; F)

Lowell Thomas, *Count Luckner, the Sea Devil,* Doubleday, 1927, $2.50 (14 up)

Great Britain

Katharine Adams, *Blackthorn,* Macmillan, $2.00 16th-century Ireland (12–15; F)

John Bennett, *Master Skylark:* a story of Shakespeare's time, Appleton-Century, $2.00 (12–14)

Richard Doddridge Blackmore, *Lorna Doone,* Macrae, $2.00 England in the 17th century (14 up; F)

Dorothy Kathleen Broster, *The Dark Mile,* Coward, 1934, $2.50 Scotland in the days of Bonnie Prince Charlie (14 up; F)

Ships in the Bay, Coward, $2.50 Ireland in the 19th century (14 up; F)

Juliana Horatia Ewing, *Jackanapes, and Other Tales,* McKay, $1.00 The story of a boy who served under Wellington (F)

Charles Kingsley, *Westward Ho!* Macmillan, $1.00 Adventure and sea fights in the days of Queen Elizabeth (13–15; F)

C. Day Lewis, *Dick Willoughby,* Random, 1938, $2.00 An exciting story of the Elizabethan period (F)

Henrietta Elizabeth Marshall, *Island Story:* a child's history of England, 1920, Stokes, $5.00 (12–13)

Scotland's Story: a child's history of Scotland, Stokes, 1907, $5.00 (12–14)

Jeanette Covert Nolan, *Young Douglas,* MacBride, $2.50 A story of the days of Mary Stuart (12–14; F)

Marjorie Quennell and Charles H. Bourne, *A History of Everyday Things in England,* 4 vol. in 3, Scribner, 1922–35, Vol. 1–2 $5.00 Vol. 3 $2.50 Vol. 4 $2.50

Vol. 1–2 covers years 1066–1799

Vol. 3 covers years 1733–1851

Vol. 4 covers years 1851–1934 (13–16)

Walter Scott, Kenilworth, Crowell, $2.00 England in 1575 (13 up; F)

Mark Twain, *The Prince and the Pauper,* Harper, $2.50 The exciting adventures of Edward Tudor, Prince of Wales, and Tom Canty when they changed places with each other (12–14; F)

Annabel Williams-Ellis and F. J. Fisher, *The Story of English Life,* Coward, 1936, $3.75 (12–16)

France

Katharine Adams, *Red Caps and Lilies,* Macmillan, $2.00 A story of the French Revolution (F)

Alfred H. Bill, *The Red Prior's Legacy,* Longmans, $2.00 A story of the French Revolution (12–15; F)

Charles Dickens, *A Tale of Two Cities,* Grosset, $1.00 A story of the French Revolution (F)

Alexandre Dumas, *The Count of Monte Cristo,* Dodd, $2.00 (14 up; F)

The Three Musketeers, Crowell, $2.00 A story of D'Artagnan and his companions in the early 17th century (13 up; F)

Jeanette Eaton, *Betsy's Napoleon,* Morrow, 1936, $2.50 Napoleon at St. Helena (12–16; F)

A Daughter of the Seine; the Life of Madame Roland, Harper, 1929, $2.50 (14 up)

Young Lafayette, Houghton, 1932, $2.50 (13–15)

Felix Gras, *The Reds of the Midi;* an episode of the French Revolution, Appleton-Century, $1.00 (14 up; F)

Hildegarde Hawthorne, *Phantom King,* Appleton-Century, 1937, $2.50 The story of Napoleon's son (13–16)

Booth Tarkington, Monsieur Beaucaire, Grosset, 75¢ (F)

Rachel M. Varble, *Beatrice the Brave,* Little, $2.00 A story of the days of Charles V (13–15; F)

Stanley J. Weyman, *Under the Red Robe,* Longmans, $2.00 (14 up; F)

The New World

Randolph G. Adams, *The Gateway to American History,* Little, 1927, $3.00 A pictorial history of the discovery of the New World and the Spanish, French, English and Dutch colonies (12–14)

Esther Averill, *The Voyages of Jacques Cartier,* Domino, 1937, $3.00 (10 up)

Elbridge S. Brooks, *The True Story of Christopher Columbus,* Lothrop, 1892, $2.00 (9–12)

Edith Janice Craine, *Conquistador,* Dodd, $2.50 A story of the exploration of South America (14 up; F)

The Victors, Dodd, $2.50 A story of the Spanish conquest of Peru (14 up; F)

Edna Kenton, *With Hearts Courageous,* Liveright, 1933, $2.00 An account of the lives of the French Jesuit Missionaries (13 up)

Jacqueline Overton, *Long Island's Story,* Doubleday, 1929, $3.50 (12–15)

William Hickling Prescott, *The Conquest of Mexico,* Doubleday, 1934, $3.00 (14 up)

Agnes Repplier, *Père Marquette; Priest, Pioneer and Adventurer,* Doubleday, 1935, $1.50 (14 up)

Constance L. Skinner, *Beaver, Kings and Cabins,* Macmillan, 1933, $2.50 Adventures of the early French and English fur traders (14 up)

The Growth of a Nation

Randolph G. Adams, *The Gateway to American History,* Little, 1927, $3.00 (12–14)

Ruth A. Barnes, *I Hear America Singing,* an anthology of folk poetry, Winston, 1937, $2.00 (12 up)

Rosemary and Stephen Benét, *A Book of Americans,* Farrar, 1933, $2.00 Verses about famous personalities in American history (10–14)

Gertrude Hartman, *These United States and How They Came to Be,* Macmillan, 1932, $2.50 (12–14)

Washington Irving, *Knickerbocker's History of New York,* edited by A. C. Moore, Doubleday, 1928, $2.00 (13 up)

Marie A. Lawson, *Hail Columbia!* Doubleday, 1931, $2.50 A history of the United States with development and history of each state clearly shown (12–14)

Jacqueline Overton, *Long Island's Story,* Doubleday, 1929, $2.50 (12–15)

Howard Pyle, *Howard Pyle's Book of the American Spirit,* Harper, $5.00

Eleanor M. Sickels, *In Calico and Crinoline, True Stories of American Women,* 1608–1865, Viking, 1935, $2.50 (13–15)

Elsie Singmaster, *The Book of the United States,* Doubleday, 1926, $2.00

Colonial Days

Rachel Field, *Calico Bush,* Macmillan, $2.50 Pioneer life in Colonial Maine (13–15; F)

Elizabeth Gale, *Katrina Van Ost and the Silver Rose,* Putnam, $2.00 A story of New Amsterdam (13–15; F)

Seven Beads of Wampum, Putnam, $2.00 A story of New Amsterdam (13–15; F)

Elizabeth Janet Gray, *Beppy Marlowe of Charles Town,* Viking, 1936, $2.00 The Carolina Colony in the 1700s (12–16; F)

Meggy McIntosh, Doubleday, $2.00 A story of Scotland and of the Carolinas in Colonial days (12–14; F)

Mary Johnston, *To Have and To Hold,* Houghton, 92¢ (14 up; F)

Everett McNeil, *Tonty of the Iron-Hand,* Dutton, $2.00 A boy's adventures with LaSalle and Henry Tonty (12–14; F)

Cornelia Meigs, *Master Simon's Garden,* Macmillan, $2.00 Story of three generations of a Puritan family (13–15; F)

Helen Nicolay, *The Boy's Life of Benjamin Franklin,* Appleton-Century, 1935, $2.50 (12–15)

Feodor Rojankovsky, *Daniel Boone:* Historic Adventures of an American Hunter among the Indians, Domino, 1931, $3.50 A picture book of Daniel Boone's adventures (7–12)

Constance Lindsay Skinner, *Debby Barnes, Trader,* Macmillan, $2.00 Pioneer days in Pennsylvania, about 1750 (13–15; F)

Caroline Dale Snedeker, *Uncharted Ways,* Doubleday, $2.00 A story of the Quakers in Puritan New England in 1650 (14 up; F)

Stewart Edward White, *Daniel Boone, Wilderness Scout,* Doubleday, 75¢ (13–15)

Rachel M. Varble, *A Girl from London,* Little, $2.00 Virginia just before the Revolution (12–14; F)

The Revolution

James Boyd, *Drums,* Scribner, $2.50 (13 up; F)

Mitchell V. Charnley, *Jean Lafitte, Gentleman Smuggler,* Viking, 1934, $2.50 (14 up)

Winston Churchill, *Richard Carvel,* Grosset, 75¢ (14 up; F)

J. Fenimore Cooper, *The Spy,* Macrae, $1.00 Washington's secret service (13–15; F)

Jane Darrow, *Nathan Hale,* a Story of Loyalties, Appleton-Century, 1932, $2.00 (12–15)

Paul Leicester Ford, *Janice Meredith,* Grosset, 75¢ A story of the Revolution (14 up; F)

Hildegarde Hawthorne, *Rising Thunder,* the story of Jack Jouett of Virginia, Longmans, 1937, $2.00 A story of Revolutionary times (10–14)

Frederick Trevor Hill, *On the Trail of Washington,* Appleton-Century, 1910, $2.50 (12–14)

Rupert Sargent Holland, *Mad Anthony,* Appleton-Century, 1931 $2.00 A biography of Anthony Wayne (12–14)

Alden Arthur Knipe, *Everybody's Washington,* Dodd, 1931, $2.00 (12–15)

Emilie Benson Knipe and Alden Arthur Knipe, *The Lucky Sixpence,* Appleton-Century, $1.75 A story of Revolutionary days (12–14; F)

Constance L. Skinner, *Silent Scot,* Macmillan, $1.75 (13–15; F)

The White Leader, Macmillan, $1.75 A story of pioneer days (13–15; F)

Emma Gelders Sterne, *Drums of Monmouth,* Dodd, $2.00 A story of Princeton and the beginning of the Republic (13–16; F)

Nancy Byrd Turner, *In the Days of Young Washington,* Houghton, $2.00 (12–14; F)

Owen Wister, *Seven Ages of Washington,* Garden City, 1932, $1.00 (13 up)

The New Nation

Marjorie Hill Allee, *A House of Her Own,* Houghton, $2.00 Indians during the '40s (12–14; F)

Off to Philadelphia! Houghton, 1936, $2.00 Philadelphia in the '40s (12–16; F)

Elizabeth Janet Gray, *Jane Hope,* Viking, 1933, $2.00 Chapel Hill, South Carolina, just before the Civil War (13–16; F)

Agnes Danforth Hewes, *The Codfish Musket,* Doubleday, 1936, $2.00 Boston, Washington and the frontier during Jefferson's presidency (12–16; F)

Bessie Rowland and Marquis James, *The Courageous Heart,* Life of Andrew Jackson for Young Readers, Bobbs, 1934 $2.00 (12–15)

Six Feet Six; the Heroic Story of Sam Houston, Bobbs, $2.00 (12–14)

Lois Lenski, *Phebe Fairchild;* her Book, Stokes, 1936, $2.00 Connecticut in the 1830s (10–14; F)

Cornelia Meigs, *The Covered Bridge,* Macmillan, 1936, $2.00 Vermont in 1800 (10–14; F)

The New Moon, Macmillan, $2.00 The story of an Irish boy who seeks his fortune in America in pioneer days (12–14; F)

Wind in the Chimney, Macmillan, 1934, $2.00 Lancaster, Pennsylvania just after the Revolutionary War (10–13; F)

Helen Fuller Orton, *The Treasure in the Little Trunk,* Stokes, 1932, $1.75 Pioneer days in 1823 (9–11; F)

Ethel Parton, *Penelope Ellen and her Friends,* Viking, 1936, $2.00 Newburyport in 1840 (10–12; F)

Caroline Dale Snedeker, *Downright Dencey,* Doubleday, 1929, $2.00 A story of Nantucket a hundred years ago (12–16; F)

Myrtle Jamison Trachsel, *Mistress Jennifer and Master Jeremiah,* a story of the building of Old Ironsides, Dodd, 1937, $2.00 (10–12; F)

Civil War

Irving Bacheller, *A Man for the Ages,* Grosset, 75¢ (14 up; F)

Stephen Vincent Benét, *John Brown's Body,* Doubleday, 1929, $1.50 A poem (14 up)

Winston Churchill, *The Crisis,* Grosset, $1.00 (F)

John Drinkwater, *Abraham Lincoln,* a play, Houghton, 1927, $1.50 (14 up)

Robert E. Lee, Houghton, 1923 $1.50 A play

John Fox, Jr., *The Little Shepherd of Kingdom Come,* Scribner, $2.50 (13 up; F)

Honoré Willsie Morrow, *Forever Free,* Burt, 75¢ (14 up; F)

Thomas Nelson Page, *Two Little Confederates,* Scribner, $2.00 (10–13; F)

Carl Sandburg, *Abe Lincoln Grows Up,* Harcourt, 1928, $2.50 Chapters from Carl Sandburg's "Abraham Lincoln: the Prairie Years" (12–14)

Abraham Lincoln, the Prairie Years, Blue Ribbon, 1931, $1.00 (14 up)

Elsie Singmaster, *A Boy of Gettysburg,* Houghton, $1.75 A boy's life in the days preceding Lincoln's inauguration and during the Civil War (10–13; F)

Elsie Singmaster, *Swords of Steel,* a Story of a Gettysburg Boy, Houghton, $2.00 (12–16; F)

Emma Gelders Sterne, *The Calico Ball,* Dodd, $2.00 Alabama after the Civil War (13–16; F)

No Surrender, Dodd, $2.00 The South just after the Civil War (13–16; F)

Hildegarde Swift, *Railroad to Freedom,* Harcourt, 1932, $2.50 A story of the Underground Railway (12 up)

Ida Tarbell, *He Knew Lincoln,* Macmillan, 1926, $1.25 (13 up; F)

Going Westward

Carol Ryrie Brink, *Caddie Woodlawn,* Macmillan, 1935, $2.00 The Wisconsin frontier in 1864 (12–14; F)

Walter Noble Burns, *The Saga of Billy the Kid,* Grosset, 1930 75¢ The story of a famous outlaw (14 up)

Willa Cather, *My Antonia,* Houghton, $2.50 (14 up; F)

O Pioneers! Houghton, 1929, $1.00 (F)

William F. Cody, *The Adventures of Buffalo Bill,* Harper, 75¢ Buffalo Bill's own story (12–14)

Julia Davis, *No Other White Men,* Dutton, 1937, $2.00 Lewis and Clark Expedition (12–14)

Howard R. Driggs, *The Pony Express Goes Through;* an American Saga told by its Heroes, Stokes, 1935, $2.50 (11–14)

Katharine Grey, *Rolling Wheels,* Little, $2.00 Westward to California in the middle '40s (10–14; F)

Bret Harte, *The Luck of Roaring Camp,* Houghton, $1.00 (14 up; F)

Forrestine C. Hooker, *Cricket: A Little Girl of the Old West,* Doubleday, $2.00 A story of the southwest in the days of Indian wars (10–13; F)

Emerson Hough, *Covered Wagon,* Grosset, 75¢ (F)

Helen Hunt Jackson, *Nelly's Silver Mine,* Little, $2.00 Colorado after the middle of the 19th century (10–13; F)

Cornelia Meigs, *The Willow Whistle,* Macmillan, $2.00 Pioneer days in the Middle West (9–12; F)

Rhoda Morris, *Bad Penny,* Little, $1.75 Story of a half-breed Indian girl in the pioneer days of the Northwest (8–13; F)

Honoré Willsie Morrow, *We Must March,* Burt, 75¢ (14 up; F)

On to Oregon! the Story of a Pioneer Boy, Morrow, $1.75 (10–14; F)

Francis Parkman, *The Oregon Trail,* Farrar, $1.00 (14 up)

Ole Edvart Rolvaag, *Giants in the Earth:* A Saga of the Prairie, Harper, $2.50 (14 up; F)

Constance Rourke, *Davy Crockett,* Harcourt, 1934, $2.50 (13–16)

Edwin L. Sabin, *Buffalo Bill and the Overland Trail,* Lippincott, 1914, $1.75 (12–14)

Armstrong Sperry, *Wagons Westward,* The Old Trail to Santa Fé, Winston, $2.00 (12 up; F)

Sanford Tousey, *Jerry and the Pony Express,* Doubleday, 1936, $1.00 (7–9; F)

Indians

Joseph Altsheler, *Young Trailers,* Appleton-Century, $1.75 Early days in Kentucky (12–14; F)

Laura Adams Armer, *Waterless Mountain,* Longmans, $2.50 Navaho Indian life (10–14; F)

Olaf Baker, *Buffalo Barty,* Dodd, $2.00 Story of a boy captive of the Blackfeet Indians (11–14; F)

Buffalo Child Long Lance, *Long Lance,* Farrar, 1928, $1.00 A Blackfoot Indian chief's story of tribal life (13 up)

William H. Bruce, *Son of the Iroquois,* Macrae, 1936, $1.50 Indians of Eastern America (F)

Mary Marsh Buff, *Dancing Cloud;* the Navajo Boy, Viking, 1937, $2.00 (8–10; F)

Elizabeth Coatsworth, *Golden Horseshoe,* Macmillan, $2.00 The story of an Indian girl in Colonial Virginia (10–14; F)

Sword of the Wilderness, Macmillan, 1936, $2.00 Story of a boy captive among the Maine Indians (12–15; F)

James Fenimore Cooper, *The Deerslayer;* or, *The First Warpath,* Scribner, $1.50 (13 up; F)

The Last of the Mohicans, a narrative of 1757, Grosset, $1.00 (13–15; F)

Hubert V. Coryell, *Indian Brother,* Harcourt, 1933, $2.00 Pioneer days in Maine (1713), and a boy captured by Indians (12–15; F)

Tan-Ta-Ka, Little, $2.00 A story of the Sioux Indians (12–15; F)

Therese O. Deming, *Indian Child Life,* Stokes, 1899, $3.00 (8–10)

Indians of the Pueblos, 1935, Whitman, $1.50 (8–10)

Charles Alexander Eastman, *Indian Boyhood,* Little, $2.50 A Sioux Indian's story of his childhood (12–14)

Muriel H. Fellows, *The Land of Little Rain;* a Story of Hopi Indian Children, Winston, 1936, $2.00 (8–10; F)

Elmer Russell Gregor, *Running Fox,* Appleton-Century, $1.75 Story of the son of a Delaware chief (10–14; F)

White Otter, Appleton-Century, $1.75 A story about the Indians of the West (F)

George Bird Grinnell, *Beyond the Old Frontier,* Scribner, 1913, $2.50 (14 up)

Holling C. Holling, *The Book of Indians,* Platt, 1935, $1.00 (8–12)

Ralph Hubbard, *Queer Person,* Doubleday, 1930, $2.00 The story of an outcast Indian boy (12–13; F)

Helen Hunt Jackson, *Ramona,* Little, 1932, $2.50 Spanish and Indian life in Southern California (14 up; F)

Oliver La Farge, *Laughing Boy,* Houghton, $2.50 (14 up; F)

Frank B. Linderman, *American,* the Life Story of a Great Indian, Plenty-coups, Chief of the Crows, Day, 1930, $2.50 (12–16)

Alida Sims Malkus, *Stone Knife Boy,* Harcourt, $2.00 The story of a young Indian of the Taos Pueblo (12–14; F)

Florence Crannell Means, *Tangled Waters;* a Navajo Story, Houghton, 1936, $2.00 (12 up; F)

Grace and Carl Moon, *Book of Mah-Wee,* Doubleday, $2.00 (7–9; F)

Grace Moon, *Chi-Weé;* the adventures of a little Indian girl, Doubleday, $2.00 Pueblo Indian life (8–12; F)

Grace and Carl Moon, *Lost Indian Magic;* a mystery story of the red man as he lived before white men came, Stokes, $2.50 (12–14; F)

Carl Moon, *Painted Moccasin,* Stokes, $2.50 Story of the Pueblo Indian (12–14; F)

Kirk Munroe, *Flamingo Feather,* Harper, 75¢ A French boy's adventures among the Florida Indians in the 16th century (10–14; F)

Lucy Fitch Perkins, *The Indian Twins,* Houghton, $1.75 Indians of the Northwest (7–10; F)

Gertrude Robinson, *Sachim Bird,* Dutton, 1936, $2.00 Maine Indians in 1605 (12–14; F)

White Heron Feather, Harper, $2.00 A story of escape from captivity with the Maine Indians (12–15; F)

James Willard Schultz, *Lone Bull's Mistake,* A Lodge Pole Chief Story, Houghton, 1918, $1.75 A story of the Blackfoot Indians (12–14; F)

Caroline Dale Snedeker, *The Black Arrowhead,* Doubleday, $2.00 Early days on Long Island (12–14; F)

A. Hyatt Verrill, *Our Indians,* the Story of the Indians of the United States, Putnam, 1935, $2.50 (12–14)

Cowboys

James Cloyd Bowman, *Pecos Bill;* the greatest cowboy of all time, Whitman, 1937, $2.50 (F)

Douglas Branch, *The Cowboy and his Interpreters,* Appleton-Century, 1926, $2.50

Irving Crump, *The Boys' Book of Cowboys,* Dodd, 1934, $2.00 (12–16)

Esther G. Hall, *Back to Buckeye,* Random, $2.00 (12–14; F)

Fjeril Hess, *Buckaroo,* a Story of Piñon Ranch, Macmillan, 1931, $1.75 The story of a girl on a Nevada ranch (12–15; F)

Will James, *Young Cowboy,* Scribner, 1935, $1.50 (8–10; F)

Lone Cowboy: My Life Story, Scribner, 1932, $2.50 (14 up)

Margaret Larkin, *Singing Cowboy;* a book of Western Songs, Knopf, 1931, $3.50 (13 up)

Philip Ashton Rollins, *Jinglebob;* a true story of a real cowboy, Scribner, 1927, $2.50 (14 up; F)

Evelyn Scott, *Billy the Maverick,* Holt, 1934, $1.75 The story of a boy brought up on a Western ranch who has an exciting journey to England (12–14; F)

Sanford Tousey, *Cowboy Tommy,* Doubleday, $1.50 (7–9)

Cowboy Tommy's Round-Up, Doubleday, $1.50 (8–10; F)

America Today

Leo Huberman, *We, the People,* Harper, 1932, $2.50 Social and economic history of the United States (13 up)

George Leonard Knapp, *Uncle Sam's Government in Washington,* Dodd, 1933, $2.00 (13–15)

WORLD LITERATURE

Myths and Fables

Boris Artzybasheff, *Aesop's Fables,* Viking, 1933, $2.00 (10–14)

Ellen C. Babbitt, *Jataka Tales,* Appleton-Century, 1912, $1.25

More Jataka Tales, Appleton-Century, 1922, $1.25 (9–11)

M. A. Bigham, *Merry Animal Tales:* A Book of Fables in New Dresses, Little, $1.50 (7–9)

Abbie Farwell Brown, *In the Days of Giants,* Houghton, 1902, $1.50 A book of Norse myths (9–11)

Elsie Finnimore Buckley, *Children of the Dawn:* Old Tales of Greece, Stokes, 1908, $3.00 (13–15)

Elizabeth Coatsworth, *The Cat Who Went to Heaven,* Macmillan, $2.00 Stories of the Buddha (10–14)

Padraic Colum, *The Children of Odin,* Macmillan, $2.00

Orpheus, Myths of the World, Macmillan, 1930, $2.00 (9–12)

M. B. Dutton, *The Tortoise and the Geese,* and Other Fables from Bidpai, Houghton, 1908, 80¢ (7–9)

Joel Chandler Harris, *Uncle Remus, His Songs and His Sayings,* Appleton, 1908, $2.00 (10–14)

Nathaniel Hawthorne, *The Wonder Book and Tanglewood Tales,* Houghton, 1923, $2.00 (10–13)

W. M. L. Hutchinson, *The Golden Porch:* A Book of Greek Fairy Tales, Longmans, $2.00 (10–14)

Orpheus With His Lute: Stories of the World's Springtime, Longmans, $2.25 (10–14)

Joseph Jacobs, *Aesop's Fables,* Macmillan, 1923, $1.00 (10–13)

Charles Kingsley, *The Heroes;* or Greek fairy tales for my children, Macmillan, 1928, $2.00 (10–13)

Amelia Martinez del Rio, *The Sun, the Moon and a Rabbit,* Sheed, 1935, $3.00 Toltec, Aztec and Spanish legends (9–12)

Dhan Gopal Mukerji, *Hindu Fables for Little Children,* Dutton, 1921, $1.75 (9–12)

Horace Scudder, *Book of Fables and Folk Stories,* Houghton, 1919, $2.25 (9–11)

Epics and Hero Stories

James Baldwin, *The Sampo:* A Wonder Tale of the Old North, Scribner, $2.00 Hero tales from the Finnish Kalevala

The Story of Roland, Scribner, 1883, $1.50 (12–14)

Thomas Bulfinch, *Legends of Charlemagne,* McKay, 1924, $2.50 (13–14)

Isabel Butler, *The Song of Roland,* Houghton, 1904, 44¢ (13 up)

Frank Callcott, *When Spain Was Young,* McBride, 1932, $2.50

Hero Stories of Spain Before the Cid (14 up)

Carl Carmer, *The Hurricane's Children,* Tales from Your Neck o' the Woods, Farrar, 1937, Tales of American legendary heroes (12 up)

Padraic Colum, *Legends of Hawaii,* Yale, 1937, $2.50 (10–13)

H. A. Guerber, *Legends of the Middle Ages,* American Book, 1896, $2.00 (14 up)

Gertrude Henderson, *The Ring of the Nibelung,* Knopf, $2.50 (12–14)

George Herbert Palmer, *The Iliad* (Homer), Houghton, $1.12 (12 up)

Dorothy G. Hosford, *Sons of the Volsungs,* Macmillan, $2.00 The story of Sigurd and Brynhild (10–14)

Washington Irving, *The Alhambra,* Macmillan, 1926, $1.00 (13–16)

Sir Thomas Malory, *The Boy's King Arthur,* Scribner, 1924, $1.50 (12–14)

May McNeer and Lynd Ward, *Prince Bantam,* Being the Adventures of Yoshitsune the Brave and his Faithful Henchman Great Benkei of the Western Pagoda, Macmillan, $2.50 A Japanese hero story (11–14)

Kenneth Morris, *The Book of the Three Dragons,* Longmans, $3.50 The gods and men of ancient Wales (10–13)

Dhan Gopal Mukerji, *Rama, the Hero of India,* Dutton, 1930, $2.00 (13–15)

Howard Pyle, *The Merry Adventures of Robin Hood,* Scribner, $3.50 (10–14)

Story of the Champions of the Round Table, Scribner, 1903, $3.00 (12–14)

The Story of the Grail and the Passing of Arthur, Scribner, 1910, $3.00 (12–14)

Story of King Arthur and His Knights, Scribner, 1903, $3.00 (12–14)

Story of Sir Launcelot and His Companions, Scribner, 1903, $3.00 (12–14)

Kate Seredy, *The White Stag,* Viking, 1937, $2.00 Legendary tales of Hungary (12 up)

Frank Shay, *Here's Audacity!* American Legendary Heroes, Macaulay, $3.00

Merriam Sherwood, *The Tale of the Warrior Lord,* El Cantar de mio Cid, Longmans, 1930, $2.50 (13–16)

James Stevens, *Paul Bunyan,* Garden City, $1.00 (13–16)

Vergil, *The Aeneid,* Houghton, $1.08

E. Wilmot-Buxton, *Stories of Norse Heroes,* Crowell, 1909, $2.00 (12–14)

Ella Young, *The Tangle-Coated Horse and Other Tales:* Episodes from Fionn Saga, Longmans, $2.50 (12–14)

The Wonder Smith and His Son, Longmans, 1927, $2.00 Stories of the Irish legendary hero, Gubbaun Saor (10–13)

Folk and Fairy Tales

Felipe Alfau, *Old Tales from Spain,* Doubleday, 1929, $2.00 (8–12)

Hans Christian Andersen, *Fairy Tales,* Coward, 1933, $2.50 (10–14)

Fairy Tales, Illustrated by Rex Whistler, Oxford, 1936, $2.50 (10–14)

Forty Stories, Newly translated from the Danish by M. R. James, Lippincott, 1934, $3.00 (9–12)

Boris Artzybasheff, *Seven Simeons;* a Russian Tale, Viking, 1937, $2.00 (7–10)

Andrew Lang, *Aucassin and Nicolette,* Holiday, $3.00 (10–14)

Ralph Steele Beggs and Mary Gould Davis, *Three Golden Oranges and Other Spanish Folk Tales,* Longmans, 1936, $2.00 (9–12)

Lucia Merecka Borski, *The Gypsy and the Bear and Other Fairy Tales,* Longmans, 1933, $1.75 (9–12)

James Cloyd Bowman and Margery Bianco, *Tales from a Finnish Tupa,* Whitman, 1936, $2.50 (9–11)

Frances Carpenter, *Tales of a Basque Grandmother,* Doubleday, 1930, $2.50 (9–12)

Tales of a Russian Grandmother, Doubleday, 1933, $2.00 (9–12)

Blaise Cendrars, *Little Black Stories,* Harcourt, 1929, $2.00 African folk tales (8–10)

Padraic Colum, *Big Tree of Bunlahy;* stories of my own countryside, Macmillan, 1933, $2.25 (9–12)

Boy Who Knew What the Birds Said, Macmillan, 1918, $1.75 Stories based on Irish folk tales (9–12)

The Forge in the Forest, Macmillan, 1925, $1.75 (10–13)

The King of Ireland's Son, Macmillan, 1921, $1.75 (12–14)

George Ezra and Beatrice J. Dane, *Once There Was and Was Not,* Doubleday, 1931, $2.00 (9–12)

Madame d'Aulnoy, *The White Cat, and Other Old French Fairy Tales,* Macmillan, 1928, $3.50 (10–14)

Mary Gould Davis, *The Truce of the Wolf and Other Tales of Old Italy,* Harcourt, 1931, $2.00 (9–12)

Walter J. de la Mare, *Told Again;* Old Tales Told Again, Knopf, 1927, $3.00 (12 up)

Johan Falkberget, *Broomstick and Snowflake*, Macmillan, 1933, $1.75 Folk tales from Norway (8–11)

Rachel Field, *American Folk and Fairy Tales*, Scribner, 1929, $2.50 (12–14)

Parker Fillmore, *Mighty Mikko*, Harcourt, $2.25 Finnish folk tales

Wanda Gág, *Gone is Gone*, Coward, $1.00 (7–10)

Grimm Brothers, *Household Stories by the Brothers Grimm*, Translated by Lucy Crane, Macmillan, 1926, $1.00 (9–12)

Tales from Grimm, Freely translated and illustrated by Wanda Gág, Coward, 1936, $1.50 (8–12)

Johan Hart, *Picture Tales from Holland*, Stokes, 1935, $1.25 (7–10)

William Hurd Hillyer, *The Box of Daylight*, Knopf, 1931, $2.50 Legends of the tribes of British Columbia (8–12)

Edith Howes, *The Long Bright Land:* Fairy Tales from Southern Seas, Little, 1929, $2.50 (10–13)

Washington Irving, *The Legend of Sleepy Hollow,* McKay, $2.50 (12–14)

Rip Van Winkle, Macmillan, 1925, $1.00 (12–14)

Joseph Jacobs, *Celtic Fairy Tales,* Putnam, $1.75 (9–12)

English Fairy Tales, Putnam, 1892, $1.75 (9–12)

Andrew Lang, *Arabian Nights Entertainments*, Longmans, 1929, $1.50 (12–14)

The Blue Fairy Book, Longmans, $1.50 and the other colors in the series (9–12)

Edmund Leamy, *The Golden Spears, and Other Fairy Tales*, Longmans, $1.50 Based on Irish folk tales (9–10)

Frank Bird Linderman, *Old Man Coyote*, Day, 1931, $3.00 Legends of the Crow Indians (9–12)

Berta Metzger, *Tales Told in Hawaii*, Stokes, 1934, $1.25 (8–12)

Tales Told in Korea, Stokes, 1932, $1.75 (8–12)

Cora Morris, *The Gypsy Story-Teller*, Macmillan, 1931, $2.00 (8–12)

Sybille Noel, *The Magic Bird of Chomo-Lung-Ma*, Tales of Mt. Everest, the Turquoise Peak, Doubleday, 1931, $3.50 (9–12)

Frances Jenkins Olcott, Compiler, *Wonder Tales from Fairy Isles*, Longmans, 1929, $1.75 (8–12)

Wonder Tales from Goblin Hills, Longmans, 1930, $1.75 (8–11)

Charles Perrault, *Fairy Tales*, Dutton, $1.25 (8–11)

Nandor Pogany, *Magyar Fairy Tales*, from Old Hungarian Legends, Dutton, 1930, $2.00 (9–12)

Howard Pyle, *Pepper and Salt*, or *Seasoning for Young Folk,* Harper, $2.00 (10–12)

The Wonder Clock, Harper, $2.50 (9–12)

Ruth Sawyer, *Picture Tales from Spain*, Stokes, 1936, $1.25 (7–10)

Chiyono Sugimoto, *Japanese Holiday Picture Tales*, Stokes, 1928, $1.25 (8–12)

Gudrun Thorne Thomsen, *East o' the Sun and West o' the Moon and Other Norwegian Folk Tales*, 1912, Row, 68¢ (9–10)

Anna Cogswell Tyler, *Twenty-four Unusual Stories,* Harcourt, 1921, $2.00 10–14)

Post Wheeler, *Albanian Wonder Tales,* Doubleday, 1936, $2.00 (9–12)

Russian Wonder Tales, Appleton-Century, 1912, $3.00 (12–14)

Kate Douglas Wiggin and Nora A. Smith, *Tales of Laughter,* Doubleday, $2.00 141 humorous fairy tales (10–13)

Ida Zeitlin, *Skazki,* tales and legends of old Russia, Farrar, $2.50 (11–13)

The Poets and Their Songs

Laura Benét, *The Boy Shelley,* Dodd, 1937, $2.00 (12–16)

William Blake, *Songs of Innocence and Other Poems,* Dutton, 1912, $1.50 (9–12)

Rupert Brooke, *Collected Poems,* Dodd, 1930, $2.00 (12 up)

Robert Browning, *The Pied Piper of Hamelin,* A Child's Story, Rand, 1937, $1.00 (9–12)

Elizabeth Barrett Browning, *Sonnets from the Portuguese,* Harper, 1932, $2.00 (14 up)

Lewis Carroll, *The Hunting of the Snark;* An Agony in Eight Fits, Macmillan, 1927, $1.00 (8–12)

Mrs. H. R. Haweis, *Canterbury Tales* (Chaucer), Scribner, $2.25 (12–14)

Walter de la Mare, *Peacock Pie,* Holt, 1936, $2.50 (7–10)

Emily Dickinson, *Poems for Youth,* Little, 1934, $2.00 (12–16)

Eugene Field, *Poems of Childhood,* Scribner, 1896, $1.50 (8–10)

Frances Frost, *Pool in the Meadow,* Houghton, 1933, $2.00 (10–14)

Robert Frost, *Selected Poems,* Holt, $2.50

Elizabeth Janet Gray, *Young Walter Scott,* Viking, 1933, $2.00 (12–16)

Rudyard Kipling, *Rudyard Kipling's Verse,* Inclusive Edition, 1885–1932, Doubleday, $5.00 (14 up)

Vachel Lindsay, *Johnny Appleseed and Other Poems,* Macmillan, 1928, $1.00 (9–12)

Henry Wadsworth Longfellow, *The Song of Hiawatha,* Houghton, 1901, 50¢ (12–14)

Edna St. Vincent Millay, *Poems Selected for Young People,* Harper, 1929, $2.50 (12–14)

Clement Clarke Moore, *Night Before Christmas,* Dutton, 1928, $1.00

Laura E. Richards, *Merry-go-round,* Appleton-Century, 1935, $1.50 (9–12)

Tirra Lirra; rhymes old and new, Little, 1932, $1.00 (9–12)

Elizabeth Madox Roberts, *Under the Tree,* Viking, 1930, $2.50 (7–10)

Edwin Arlington Robinson, *Tristram,* Macmillan (Modern Readers Series), 1935, 90¢ (14 up)

Christina Rossetti, *Goblin Market,* Lippincott, 1934, $1.50 (8–13)

Carl Sandburg, *Early Moon,* Harcourt, 1930, $2.50 (10–14)

Robert Louis Stevenson, *Child's Garden of Verses,* Scribner, 1905, $1.50 (8–9)

Sara Teasdale, *The Collected Poems of Sara Teasdale,* Macmillan, 1937, $2.50 (12 up)

Alfred Tennyson, *Idylls of the King,* Macmillan (Golden Treasury Series), 1904, $1.40 (13 up)

Anthologies

Boris Artzybasheff, *The Fairy Shoemaker,* Macmillan, 1928, $2.00 Poetry (9–14)

Mary Austin, *The Children Sing in the Far West,* Houghton, 1928, $2.00 (10–14)

Mary Gould Davis (Editor), *The Girl's Book of Verse,* Stokes, 1922, $2.00 (12–14)

Walter de la Mare, *Come Hither,* Knopf, 1923, $2.75 An anthology of poems, chosen by a poet (12–14)

Andrew Lang (Editor), *The Blue Poetry Book,* Longmans, 1902, $1.75 (10–14)

Francis Turner Palgrave, *A Golden Treasury of English Songs and Lyrics,* Dodd, 1861, $2.00 (13 up)

Nellie Barney Sergent, *Younger Poets,* Appleton-Century, 1932, $2.50

Sara Teasdale, *Rainbow Gold,* Macmillan, 1922, $2.00 (10–14)

Lucy W. Thacher, *The Listening Child,* Macmillan, 1924, $1.00 (10–14)

Louis Untermeyer, *Rainbow in the Sky,* Harcourt, 1935, $3.00 (8–12)

This Singing World, Harcourt, 1923, $3.00 321 poems by English and American poets (10–16)

Kate Douglas Wiggin and Nora Archibald Smith, *Golden Numbers,* Doubleday, 1902, $2.00 (9–12)

Posy Ring: A Book of Verse for Children, Doubleday, 1903, $2.00 (7–10)

RELIGION AND BOOKS OF INSPIRATION

Joseph Gaer, *How the Great Religions Began,* McBride, 1935, $3.00 (13 up)

Bible

Little Children's Bible, Macmillan, 1924, $1.00 (8–10)

Older Children's Bible, Macmillan, 1924, $1.00 (10–14)

The Bible for Young People, arranged from the King James version, Appleton-Century, 1902, $3.50 Selected without adaptation and arranged in modern paragraph form (10–13)

Walter de la Mare, *Stories from the Bible,* McKay, 1929, $2.50 (12–14)

Dorothy Lathrop, *Animals of the Bible,* Stokes, 1937, $2.00

Frances Jenkins Olcott, *Bible Stories to Read and Tell,* Houghton, 1916, $2.50 (9–12)

Helen Sewell, *A First Bible,* Oxford, $2.50 (8-10)

Eva March Tappan, *An Old Old Story-Book,* Houghton, 1910, $2.50 (9–12)

Other Books of Inspiration

J. M. Matthew, *Pilgrim's Progress* (Bunyan), Macmillan, 1926, $1.00 Slightly abridged, though the words are unchanged. Includes Part I and Part II (10–13)

Helen Ferris, *Five Girls Who Dared,* Macmillan, 1931, $2.50 The girlhood stories of five courageous girls as told by themselves (13–15)

Ariadne Gilbert, *Over Famous Thresholds,* Appleton-Century, 1931, $2.00 Biographical narratives of famous people

Grace Humphrey, *Heroes of Liberty,* Bobbs, 1921, $1.75

Helen Keller, *The Story of My Life,* Doubleday, 1903, $2.00 (13–15)

Selma Lagerlöf, *Christ Legends,* Holt, 1929, $1.75 (14 up)

Mary R. Parkman, *Heroes of To-Day,* Appleton-Century, 1917, $2.00 (12–14)

Heroines of Service, Appleton-Century, 1917, $2.00 (12–14)

Laura E. Richards, *Elizabeth Fry,* Appleton-Century, 1916, $1.75 (13–15)

Florence Nightingale, Appleton-Century, 1909, $1.75 (12–14)

Ruth Sawyer, *This Way to Christmas,* Harper, 1927, $1.25 (F)

Elva Smith, *Heroines of History and Legend,* Lothrop, 1921, $2.00 (13–15)

Henry Van Dyke, *The First Christmas Tree,* Scribner, 75¢ (12 up)

Booker T. Washington, *Up from Slavery:* An Autobiography, Doubleday, 1901, $2.00 (12–14)

Charlotte M. Yonge, *The Book of Golden Deeds of All Times and All Lands* (Children's Classics), Macmillan, 1921, $1.00 (13–15)

PLAYS FOR READING AND ACTING

James M. Barrie. *The Plays of J. M. Barrie,* Scribner, $5.00, 1928, (13 up)

Dorothy Coit, *Kai Khosru and Other Plays for Children,* Theatre Arts, 1934, $1.50 (12–16)

Clemence Dane, *Will Shakespeare;* an invention in 4 acts, Macmillan, 1922, $1.75 (14 up)

Walter de la Mare, *Crossings,* a fairy play, Knopf, 1923 (12–14)

Lord Dunsany, *Plays of Gods and Men,* Putnam, 1915, $1.75 (14 up)

Rachel Field, *Patchwork Plays,* Doubleday, 1930, $1.25 (10–14)

Beulah Folinsbee, *Guki the Moon Boy,* Harcourt, 1928, $2.50 (10–14)

Rose Fyleman, *Eight Little Plays for Children,* Doubleday, 1925, $1.25 (9–12)

Lady Gregory, *Seven Short Plays,* Putnam, 1915, $2.50 (14 up)

Charles and Mary Lamb, *Tales from Shakespeare,* Macmillan, 1923, $1.00 (10–14)

Gregorio Martinez Sierra, *The Cradle Song and Other Plays,* Dutton, 1929, $2.00 (14 up)

Cornelia Meigs, *Helga and the White Peacock,* Macmillan, 1922, $1.00 A fairy play in 3 acts (10–13)

A. A. Milne, *Mr. Pim Passes By,* Dutton, 1932, $2.50

Nydia E. Minchin, *The Jester's Purse,* Harcourt, 1926, $1.50 (12–14)

Christopher Morley, *One-Act Plays,* Lippincott, 1924, $1.75 (14 up)

Montrose J. Moses, *Ring Up the Curtain!* Little, 1932, $3.00 (12–14)

Treasury of Plays for Children, Little, 1921, $3.00 (10–14)

Alfred Noyes, *Sherwood;* or *Robin Hood and the Three Kings,* Stokes, 1921, $2.00 (14 up)

Eugene O'Neill, *Ah, Wilderness!* Random, 1933 $2.50 (14 up)

The Emperor Jones, Appleton-Century, 1934, 50¢ (14 up)

Edmond Rostand, *Cyrano de Bergerac,* Random, $1.00 (14 up)

William Shakespeare, *Complete Works;* edited by W. J. Craig, Oxford, $2.25

George Bernard Shaw, *Saint Joan,* Dodd, 1936, $2.50 (14 up)

Emma Gelders Sterne, *Far Town Road, Plays to Be Acted and Read,* Dodd, 1935, $2.50 (12–16)

Harriet Sabra Wright, *New Plays from Old Tales,* Macmillan, 1929, $1.75 (12–14)

William Butler Yeats, *The Land of Heart's Desire;* play in one act, Dodd, 50¢ (14 up)

THE ARTS

Anna Curtis Chandler, *Treasure Trails in Art,* Hale, 1937, $2.00 (12 up)

Virgil Mores Hillyer and Edward Greene Huey, *Child's History of Art,* Appleton-Century, 1933, $3.50 (10–14)

Grace Irwin, *Trail-blazers of American Art,* Harper, 1930, $2.50 (12–14)

S. Reinach, *Apollo,* Scribner, 1924, $2.00 An illustrated manual of the history of art throughout the ages

Hendrik Willem van Loon, *The Arts,* Simon, 1937, $3.95 (14 up)

Architecture

C. L. Barstow, *Famous Buildings:* A Primer of Architecture, Appleton-Century, 1932, $2.50 (14 up)

Lorinda Munson Bryant, *The Children's Book of Celebrated Buildings,* Appleton-Century, 1924, $2.50 (12–14)

Emily Helen Butterfield, *The Young People's Story of Architecture,* Dodd, 1933, $3.00 (10–14)

Louise Lamprey, *All the Ways of Building,* Macmillan, 1933, $3.50 History of architecture from the shelters of prehistoric man to modern skyscrapers (12–14)

Wonder Tales of Architecture, Stokes, 1927, $2.50

Ethel Fay and Thomas P. Robinson, *Houses in America,* Viking, 1936, $3.00 (12–14)

Émil Antoine Verpilleux, *Picture Book of Houses,* Macmillan, 1931, $1.00 History and development of houses through the ages (9–12)

Crafts

Katharine Gibson, *The Goldsmith of Florence;* a book of great craftsmen, Macmillan, 1929, $5.00 (12–16)

Susan Smith, *Made in America,* Knopf, 1929, $2.00 Early American silversmiths, cabinetmakers, architects and so on as a background for appreciation of American handicraft (10–14)

Made in England, Nelson, 1932, $2.00 Christopher Wren, Wedgwood, Chippendale and others and the silversmiths and porcelain makers of 18th century England (12–14)

Made in Germany and Austria, Putnam, 1933, $1.50 Porcelain, Nürnberg craftsmen, toys, Tyrolean peasant work, etc. (12–14)

Made in Mexico, Knopf, 1930, $2.00 Decoration and handicraft of Mexico (10–14)

Made in Sweden, Putnam, 1934, $2.00 Museums, decorative arts, traditions of Sweden (12–14)

William C. White, *Made in Russia,* Knopf, 1932, $2.00 Arts and handicrafts, life and customs of Russia (12–14)

Painting and Sculpture

C. L. Barstow, *Famous Sculpture,* Appleton-Century, 1932, $2.50 Master sculptors and their well-known work (13–15)

Anna Curtis Chandler, *Magic Pictures of the Long Ago,* Holt, 1918, $1.75 (11–14)

Story-Lives of Master Artists, Stokes, 1929, $2.50 (12–15)

Harold North and Mary Blackford Fowler, *The Picture Book of Sculpture,* Macmillan, 1929, $2.50 (10–14)

Malvina Hoffman, *Heads and Tales,* Scribner, 1936, $5.00 Autobiography of a sculptress (14 up)

Maude I. G. Oliver, *First Steps in the Enjoyment of Pictures,* Holt, 1920, $1.75 (10–13)

Music

Marion Bauer and Ethel Peyser, *How Music Grew from Prehistoric Times to the Present Day,* Putnam, 1925, $4.50 (14 up)

Allen Milton Bernstein, *The Do-Re-Mi of the Nibelung Ring,* Greenberg, 1928, $2.00 (10–14)

Harriette Moore Brower, *Story-Lives of Master Musicians,* Stokes, 1922, $2.50 (13–15)

Abbie Farwell Brown, *The Boyhood of Edward MacDowell,* Stokes, 1924, $2.50 (12–14)

Grace Castagnetta and Hendrik Willem van Loon, *Christmas Carols,* Simon, 1937, $2.00

Anna Alice Chapin, *The Story of the Rhinegold,* Harper, 1897, $2.00 (13–15)

Wonder Tales from Wagner, Harper, 1898, $2.00 (12–14)

Satis N. Coleman, *The Drum Book,* Reynal, 1931, $2.50 (13 up)

Irving Deakin, *To the Ballet!* Dodge, 1935, $1.50 (14 up)

Angela Diller, *The Story of Siegfried,* Smith, 1931, $2.00 (13 up)

Dorothy Gordon, *Sing It Yourself,* Dutton, 1932, 85¢ A book of folk songs

Madeline Goss, *Beethoven, Master Musician,* Doubleday, 1931, $2.50 (13–15)

Ernest La Prade, *Alice in Orchestralia,* Doubleday, 1925, $1.00 There is hardly anything about a modern symphony orchestra that Alice does not learn in this book (10–13)

J. Walker McSpadden, *Stories from Great Operas,* Crowell, 1923, $2.50 (12–14)

T. Tertius Noble, *A Round of Carols,* Oxford, 1935, $2.00

Percy Alfred Scholes, *The Complete Book of the Great Musicians:* for Young Readers, Oxford, 1931, $3.00 (12–14)

Franciska Schwimmer, *Great Musicians As Children,* Doubleday, 1929, $2.00 (12–16)

Olga Samaroff Stokowski, *A Music Manual,* Containing Certain Things That Everybody Wishes to Know and Remember About Music, Norton, 1937, $1.00 (12 up)

Louis Untermeyer, *The Last Pirate;* Tales from the Gilbert and Sullivan Operas, Harcourt, 1934, $2.50 (12–14)

Hendrik Willem van Loon, *The Songs We Sing,* Simon, 1936, $1.00 (6 up)

Henriette Weber, *The Prize Song,* Stories of Famous Operas, Oxford, 1935, $3.00 (13 up)

Opal Wheeler and Sybil Deucher, *Mozart, the Wonder Boy,* Dutton, 1934, $2.00 (10–14)

SPORTS AND SCHOOL STORIES

Katharine Adams, *Mehitable,* Macmillan, $1.75 About a boarding school in France (12–14; F)

Marjorie Hill Allee, *The Great Tradition,* Houghton, 1937, $2.00 A story of five girl research students in the University of Chicago (13 up; F)

Leroy Atkinson, *Famous American Athletes of Today;* Fifth Series, Page, 1937, $2.50 (14 up)

Ralph Henry Barbour, *The Half-Back,* Grosset, $1.00 (12–14; F)

Frances Hodgson Burnett, *The Little Princess,* Scribner, $1.00 (10–12; F)

Edward Eggleston, *A Hoosier School-Boy,* Scribner, $1.00 (12–15; F)

Alain Fournier, *The Wanderer,* Houghton, $2.00 (F)

Frances Gaither, *Little Miss Cappo,* Macmillan, 1937, $1.75 A story of life in a strict "school for young ladies" in the 1820s (10–13; F)

Donald H. Haines, *Southpaw,* Farrar, $2.00 (F)
  Team Play, Farrar, 1934, $1.75 (13–16; F)

Esther G. Hall, *College on Horseback,* Random, $2.00 (12–14; F)

William Heyliger, *The Spirit of the Leader,* Appleton-Century, 1923, $1.75. A high-school story (12–14; F)

James Hilton, *Good-Bye, Mr. Chips,* Little, $1.25 (14 up; F)

Thomas Hughes, *Tom Brown's School Days,* Macmillan, $2.00 School life at Rugby (12–14; F)

Owen Johnson, *The Varmint,* Little, 1919, $2.00 A story of football and prep-school days (14–16; F)

Charles and Mary Lamb, *Mrs. Leicester's School,* Dutton, $3.00 (10–12; F)

Delos W. Lovelace, *Rockne of Notre Dame,* Putnam, 1931, $2.00 (14 up)

Stephen W. Meader, *The Will to Win, and Other Stories,* Harcourt, $2.00 13–15; F)

Marjorie Medary, *College in Crinoline,* Longmans, 1937, $2.00 A story of girls' school life in 1860 (10–14; F)

Mary White Ovington, *Zeke,* Harcourt, $2.00 A Negro boy's experiences in the strange new world of school 13–15; F)

Charles W. Paddock, *The Fastest Human,* Nelson, 1932, $2.00 (13 up)

Grantland Rice, *Boys' Book of Sports,* Appleton-Century, 1917, $2.50 (13–16)

Tom Robinson, *Trigger John's Son,* Viking, 1934, $2.00 (12–15; F)

Jackson Scholz, *Split Seconds;* Tales of the Cinder Track, Morrow, 1935, $1.25 (14 up; F)

Emma Gelders Sterne, *Amarantha Gay, M.D.,* Dodd, $2.00 A girls' college in early '70s (13–16; F)

John R. Tunis, *Iron Duke,* Harcourt, 1938, $2.00 A story of Harvard life (F)

Jean Webster, *When Patty Went to College,* Appleton-Century, $2.00 (13–15; F)
  Daddy-Long-Legs, Grosset, 75¢ (F)

EVERYDAY LIVES

Louisa M. Alcott, *Little Men,* Little (Orchard House ed.), $1.00 (10–14; F)
  Little Women, Little (Orchard House ed.), $1.00 (10–14; F)

Bess Streeter Aldrich, *A Lantern in Her Hand,* Appleton-Century, $2.00 (14 up; F)

Thomas Bailey Aldrich, *The Story of a Bad Boy,* Houghton, $2.00 Story of a New England village boy and his friends (12–14; F)

Jane Austen, *Pride and Prejudice,* Macrae (Rittenhouse Classics), $2.00 (14 up; F)

Enid Bagnold, *Alice and Thomas and Jane,* Knopf, $2.50 The story of a summer in Sussex (9–12; F)

James M. Barrie, *The Little Minister,* Grosset, $1.00 (14 up; F)
  Margaret Ogilvy, Scribner, 1896, $2.00 The story of Barrie's mother (12 up)

Margery Williams Bianco, *Street of Little Shops,* Doubleday, $1.50 Stories of village life (9–12; F)
  Winterbound, Viking, 1936, $2.00 An American family (12–16; F)

Helen Dore Boylston, *Sue Barton, Senior Nurse,* Little, 1937, $2.00 (13–16; F)
  Sue Barton, Student Nurse, Little, $2.00 (13–16; F)

Charlotte Brontë, *Jane Eyre,* Dodd, $2.00 (14 up; F)

Emma Bugbee, *Peggy Covers the News,* Dodd, $2.00 (13–16; F)

Frances Hodgson Burnett, *The Secret Garden,* Grosset, $1.00 (10–12; F)

Gladys Hasty Carroll, *Land Spell,* Macmillan, $1.75 The story of a Maine farm (12–16; F)

Elizabeth Coatsworth, *Alice-All-By-Herself,* Macmillan, 1937, $2.00 (9–11; F)
  Away Goes Sally, Macmillan, $2.00 A little girl in the early 19th century (8–12; F)

Bob Davis, *Tree Toad,* Stokes, 1935, $2.00 A boyhood in California (13 up)

Adèle De Leeuw, *A Place for Herself,* Macmillan, 1937, $2.00 (12–15; F)
  Year of Promise, Macmillan, $2.00 (13–15; F)

Charles Dickens, *Christmas Carol,* Macmillan, $1.00 (13 up; F)
  David Copperfield, Grosset, $1.00 (F)

Beulah Marie Dix, *The Turned About Girls,* Holt, $1.50 (F)

George Eliot, *Silas Marner,* Heath, 80¢ (14 up; F)

Juliana H. Ewing, *Jan of the Windmill,* Harcourt, $2.00 (10–12; F)

Rachel Field, *Polly Patchwork,* Doubleday, 75¢ (9–10; F)

Dorothy Canfield Fisher, *The Bent Twig,* Grosset, $1.00 (14 up; F)

Helen Forbes, *Araminta,* Macmillan, $1.75 The story of a little girl who finds a baby (9–12; F)

Mrs. Elizabeth Cleghorn Gaskell, *Cranford,* Macmillan, $1.50 Life in an English village (14 up; F)

Madeline Darrough Horn, *Farm on the Hill,* Scribner, 1936, $2.00 (7–9; F)

Mabel Leigh Hunt, *Little Girl With Seven Names,* Stokes, 1936, $1.50 A little Quaker girl of the 1860s (7–9; F)

Sarah Orne Jewett, *Betty Leicester,* Houghton, $2.50 Summer in a New England village (10–13; F)

Marian Hurd McNeely, *Rusty Ruston;* a story for brothers and sisters, Longmans, $2.00 (12–14; F)
  The Way to Glory, Longmans, $2.00 Short stories of American life (12–14; F)
  Winning Out, Longmans, $2.00 The story of a girl who studies nursing (12–14; F)

Cornelia L. Meigs, *Invincible Louisa,* Little, $2.00 The story of the author of "Little Women" (12–16)

Christopher Morley, *Kathleen,* Doubleday, $1.50 (F)

E. Nesbit, *Treasure Seekers,* Coward, $1.00 (10–13; F)
  The Wonderful Garden, Coward, 1935, $1.75 (10–13; F)

Julia Newberry, *Julia Newberry's Diary,* Norton, 1933, $2.50 (13 up)

Albert B. Paine, *The Boys' Life of Mark Twain,* Harper, 1916, $2.00 (14 up)

Ethel Parton, *Vinny Applegay, Her First Year in New York,* a Story of the 1870s, Viking, 1937, $2.00 (10–14; F)

Mary Virginia Provines, *A Home for Keeps,* Longmans, 1937, $2.00 (10–12; F)

Mrs. Carroll W. Rankin, *The Adopting of Rosa Marie,* Holt, $1.75 (9–12; F)
  Dandelion Cottage, Holt, $1.75 (9–12; F)

Margaret T. Raymond, *A Bend in the Road,* Longmans, $2.00 A story of a girl who gets work in a factory in an effort to solve her problems (13–16; F)

Ruth Sawyer, *Roller Skates,* Viking, $2.00 New York in the 1890s (10–14; F)

Kate Seredy, *Listening,* Viking, 1936, $2.00 Stories of an old Dutch farmhouse in New Jersey (8–10; F)

Elsie Singmaster, *The Young Ravenels,* Houghton, $1.75 The story of an American family (12–16; F)

Booth Tarkington, *Alice Adams,* Grosset, 75¢ (F)
  Gentle Julia, Grosset, 75¢ (F)
  Penrod, His Complete Story, Grosset, 75¢ (13–16; F)
  Seventeen, Grosset, 75¢ (F)

William Makepeace Thackeray, *Vanity Fair,* Dodd, $2.00 Grosset, $1.00 (14 up; F)

Eliza Orne White, *The Farm Beyond the Town,* Houghton, 1937, $1.75 (8–10)
  A Little Girl of Long Ago, Houghton, $1.65 Child life two generations ago (9–12; F)
  When Molly Was Six, Houghton, $1.65 (8–9; F)

Kate Douglas Wiggin, *Rebecca of Sunnybrook Farm,* Houghton, $2.00 (12–14; F)

Laura Ingalls Wilder, *Farmer Boy,* Harper, $2.00 (7–10; F)
  Little House in the Big Woods, Harper, $2.00 Life 60 years ago on the edge of the Big Woods of Wisconsin (9–12; F)

Susan Coolidge Woolsey, *What Katy Did,* Little, $2.00 (10–13; F)

ROMANTIC LIVES

George Arliss, *Up the Years from Bloomsbury,* an autobiography, Blue Ribbon, $1.00 (14 up)

Phineas Taylor Barnum, *Here Comes Barnum,* Harcourt, 1932, $2.50 (13–16)

William A. Brady, *Showman,* Dutton, 1937, $3.00 (14 up)

Courtney Ryley Cooper, *Lions 'n' Tigers 'n' Everything,* Little, 1933, $2.50 The training of circus animals (12–14)

Paul Eipper, *Circus,* Viking, 1931, $3.00 (12–16)

Edna Ferber, *Show Boat,* Grosset, 75¢ (14 up; F)

Rachel Field, *Hepatica Hawks,* Macmillan, 1932, $1.75 The story of the giant's daughter in a traveling show of the '90s (13–15; F)

Hermann Hagedorn, *The Boys' Life of Theodore Roosevelt,* Harper, 1922, $2.00 (13–15)

Helen E. Haskell, *Katrinka:* the story of a Russian child, Dutton, $2.00 The story of a little Russian peasant girl before the Revolution and her training as a dancer in the Russian Imperial Ballet (10–13; F)

Katrinka Grows Up, Dutton, $2.00 The story of a dancer in the Russian Imperial Ballet (13–15; F)

Mme. Lily Javal, *Fortune's Caravan,* Morrow, 1933, $1.75 The story of a French family who set up a circus of their own (7–10; F)

Alva Johnston, *The Great Goldwyn,* Random, 1937, $1.50 (14 up)

Harold Keith, *Boys' Life of Will Rogers,* Crowell, 1937, $2.00 (12–16)

Rose B. Knox, *Footlights Afloat,* Doubleday, 1937, $2.00 A showboat on the Mississippi in the 1880s (12 up; F)

Eva Le Gallienne, *At 33,* Longmans, 1934, $3.50 (14 up)

Edwin P. Norwood, *The Other Side of the Circus,* Doubleday, 1926, $1.50 (13–15)

James Otis, *Toby Tyler,* Harper, 75¢ (9–12; F)

Theodore Roosevelt, *Letters to His Children,* Scribner, $1.00 (10–14)

"Lord" George Sanger, *Seventy Years a Showman,* Dutton, 1926, $2.00 (12 up)

Noel Streatfield, *Ballet Shoes,* Random, 1937, $2.00 A story of three foster sisters who attend the Academy of Dancing and Stage Training in London (10–14; F)

Jules Turnour, *The Autobiography of a Clown,* as told to Isaac F. Marcosson, Dodd, 1931, $1.50 The life of the famous French clown, Jules Turnour (13 up)

ADVENTURE

John Buchan, *Prester John,* Houghton, $2.50 An English boy in South Africa caught in a native uprising (12–16; F)

Hawthorne Daniel, *Seal of the White Buddha,* the tale of a New England girl in the year 1847 sailing aboard her uncle's clipper ship to distant China and of the mystery, adventure and great good fortune which befell her, Coward, 1928, $2.00 (12–14; F)

Daniel Defoe, *The Life and Strange Surprising Adventures of Robinson Crusoe,* Harper, 1937, $1.50 (10–15; F)

Hepburn Dinwoodie, *Storms on the Labrador,* Oxford, 1938, $2.00 (13–15; F)

A. Conan Doyle, *Adventures of Sherlock Holmes,* Harper, 75¢ (F)

Charles B. Driscoll, *Doubloons,* Farrar, 1930, $2.50 Story of buried treasure (13 up)

Allan Dwight, *Drums in the Forest,* Macmillan, $1.75 Adventures in the wilderness of New France (13–16; F)

Waldo Fleming, *Talking Drums,* Doubleday, $2.00 Adventure and mystery in western Africa (12–14; F)

John Grove, *The Desert Island Adventure Book,* Macmillan, 1933, $1.90 (12–15)

Theodore Acland and Winifred Harper, *Siberian Gold,* Doubleday, 1927, 75¢ A young American's adventure in Siberia (13–16; F)

Stanton Hope, *Smugglers' Gallows,* Scribner, 1937, $2.50 England in 1805 during the war with France (12–16; F)

Emil Kästner, *Emil and the Detectives,* Doubleday, $2.00 (9–12; F)

Eric P. Kelly, *Treasure Mountain,* Macmillan, 1937, $2.00 A search for treasure in New Mexico in 1894 (12–16; F)

William J. LaVarre, *Up the Mazurini for Diamonds,* Marshall Jones, 1919, $1.50 Experiences in the jungle of South America (12–14)

T. E. Lawrence, *Revolt in the Desert,* Garden City, $1.00

Stephen Meader, *Lumberjack,* Harcourt, $2.00 A boy's adventures in a New Hampshire lumber camp (12–16; F)

Trap-Lines North; a True Story of the Canadian Woods, Dodd, 1936, $2.00 (12–14)

Who Rides in the Dark? Harcourt, 1937, $2.00 Stage coaches and highwaymen in New Hampshire in the early 1800s (12–14; F)

Howard Pyle, *The Story of Jack Ballister's Fortunes,* Appleton-Century, 1894, $2.00 The story of a boy kidnaped and sent to Virginia in 1719 (13–16; F)

Arthur Ransome, *Coot Club,* Lippincott, 1935, $2.00 The Coot Club is formed by six children for the purpose of protecting birds, but there is a great deal of excitement and fun as well (10–14; F)

Edward Robinson, *Lawrence,* the Story of His Life, Oxford, 1935, $1.75 The author served under Lawrence in Arabia (13–15)

Rafael Sabatini, *Captain Blood,* Grosset, 75¢ (14 up; F)

The Sea Hawk, McClelland, $1.00 (14 up; F)

Arnold Savareid, *Canoeing With the Cree,* Macmillan, 1935, $1.50 Two high school boys make a 2250 mile canoe trip through unknown country (12–14)

Samuel Scoville, Jr., *The Blue Pearl,* Appleton-Century, 1920, $1.75 (12–14; F)

Robert Louis Stevenson, *Kidnapped,* Macmillan, $1.00 (13–16; F)

Mark Twain, *The Adventures of Huckleberry Finn,* Harper, $2.25 (12–14; F)

The Adventures of Tom Sawyer, Harper, $2.25 (12–14; F)

Jules Verne, *Michael Strogoff,* Scribner, $2.50 (13 up; F)

Thames Williamson, *The Last of the Gauchos,* Bobbs, $2.00 Mystery and adventure on the Argentine pampas (12–14; F)

Percival Christopher Wren, *Beau Geste,* Grosset, 75¢ (14 up; F)

TALES OF IMAGINATION AND HUMOR

Margery Bianco, *The Good Friends,* Viking, 1934, $1.75 The story of some remarkable farm animals (9–12; F)

The Hurdy-Gurdy Man, Oxford, 75¢ (8–10; F)

Walter R. Brooks, *To and Again,* Knopf, $2.00 A nonsense story of farm animals (9–10; F)

Lewis Carroll, *Alice's Adventures in Wonderland and Through the Looking-Glass,* Macmillan, $1.00 (8–12; F)

Miguel de Cervantes, *Don Quixote,* retold by Judge Parry, Dodd, $2.50 Abridged; not simplified (12–14; F)

Samuel McChord Crothers, *Miss Muffet's Christmas Party,* Houghton, $1.50 (9–12; F)

Mary Gould Davis, *The Handsome Donkey,* Harcourt, $1.75 (8–10; F)

With Cap and Bells, Humorous stories to tell and to read aloud, Harcourt, 1937, $2.00 (10–14; F)

Walter De la Mare, *The Three Mulla Mulgars,* Knopf, $2.50 (10–13; F)

Charles Dickens, *The Magic Fishbone,* Warne, $1.50 (9–12; F)

Eleanor Farjeon, *Martin Pippin in the Apple Orchard,* Stokes, $2.50 (12–13; F)

Martin Pippin in the Daisy-Field, Stokes, $2.50 (10–13; F)

Rachel Field, *Hitty, Her First Hundred Years,* Macmillan, $2.50 A doll writes the story of her eventful life (10–14; F)

Kenneth Grahame, *The Wind in the Willows,* Scribner, $1.00 (12–14; F)

Lucretia P. Hale, *Peterkin Papers,* Houghton, 1924, $2.00 Stories about the irresponsible Peterkin family (10–13; F)

Richard Hughes, *The Spider's Palace and Other Stories,* Harper, $1.50 (9–12; F)

Rudyard Kipling, *Just So Stories,* Doubleday, $2.50 (8–12; F)

Dorothy P. Lathrop, *The Lost Merry-Go-Round,* Macmillan, 1934, $2.00 (F)

Edward Lear, *The Complete Nonsense Book,* Dodd, 1920, $3.50 (7–12)

Hugh Lofting, *Dr. Dolittle's Zoo,* Stokes, 1925, $2.50 (9–12; F)

Story of Dr. Dolittle, Stokes, $1.50 The story of a doctor who understands the language of animals (9–12; F)

Carlo Lorenzini, *Adventures of Pinocchio,* Macmillan, 1927, $1.00 (8–12; F)

A. A. Milne, *Winnie-the-Pooh,* Dutton, $1.00 Christopher Robin and his teddy bear (8–10; F)

Anne Parrish, *Floating Island,* Harper, 1930, $2.00 The story of a family of Dolls, shipwrecked on a tropical island (8–12; F)

Rudolph Raspe, *Tales from the Travels of Baron Münchausen,* Heath, 60¢ (10–14; F)

James Stephens, *Crock of Gold,* Macmillan, 60¢ (12 up; F)

Frank R. Stockton, *The Casting Away of Mrs. Lecks and Mrs. Aleshine,* Appleton-Century, $2.50 (13–16; F)
The Poor Count's Christmas, Stokes, $1.50 (F)

Pamela L. Travers, *Mary Poppins,* Reynal, 1934, $1.50 (8–12; F)

David Wyss, *The Swiss Family Robinson,* Harper, 1937, $1.50 (10–13; F)

Modern Fairy Tales

Margaret Baker, *Patsy and the Leprechauns,* Dodd, $1.75
Pollie Who Did As She Was Told, Dodd, $1.75 (7–10; F)

Sir James M. Barrie, *Peter and Wendy,* Scribner, 1911, $2. 50 (9–12; F)
Peter Pan in Kensington Gardens, Scribner, 1902, $2.50 (9–12; F)

Henry Beston, *The Firelight Fairy Book,* Little, $2.50 (9–12)

William Bowen, *Merrimeg,* Macmillan, $1.50 The story of a little girl who meets imps and elves and all sorts of little fairy creatures (8–10; F)

Charles Carryl, *Davy and the Goblin,* Houghton, $2.00 Davy goes on a voyage with a goblin and meets fairy people of all kinds (9–12; F)

Mrs. D. M. Craik, *The Litle Lame Prince,* Macmillan, $1.00 (8–12; F)

Máirín Cregan, *Old John,* Macmillan, 1936, $2.00 A modern Irish fairy tale (8–11; F)

Eleanor Farjeon, *Italian Peepshow and Other Tales,* Stokes, $2.50 (10–12)

Laurence Housman, *A Doorway in Fairyland,* Harcourt, $2.00 (10–14)
Moonshine and Clover, Harcourt, $2.00 (10–14)

Alice W. Howard, *Ching-li and the Dragons,* Macmillan, $2.00 (10–12)

Charles Kingsley, *Water-Babies;* a Fairy Tale for a Land-Baby, Macmillan, 1922, $2.50 (10–12; F)

Selma Lagerlöf, *The Wonderful Adventures of Nils,* Doubleday, $2.50 (10–13; F)

Dorothy P. Lathrop, *The Fairy Circus,* Macmillan, $2.00 (7–9)

Edmund Leamy, *The Fairy Minstrel of Glenmalure,* and other stories for children, Longmans, $1.00 (7–9)

Norbert Leberman, *New German Fairy Tales,* Knopf, $2.00 (10–12)

Patricia Lynch, *The Turf-Cutter's Donkey,* Dutton, 1935, $2.00 (10–13; F)

George Macdonald, *At the Back of the North Wind,* Macmillan, $1.00 (10–13; F)
The Light Princess, Macmillan, $1.00 (9–12)
The Princess and Curdie, Macmillan, $1.00 (9–12; F)
The Princess and the Goblin, Macmillan, $1.00 (9–12; F)

Mrs. Mary Louisa Molesworth, *The Cuckoo Clock, and The Tapestry Room* (Children's Classics), Macmillan, $1.75 (9–12)

Anne Carroll Moore, *Nicholas;* a Manhattan Christmas story, Putnam, $2.00 New York through the eyes of Nicholas, a strange Dutch boy who appeared on St. Nicholas Eve (9–13; F)

Beatrice Potter, *The Fairy Caravan,* McKay, 1929, $2.00 (9-11)

Howard Pyle, *Twilight Land,* Harper, $1.75 (10–14)

John Ruskin, *King of the Golden River,* Lippincott, $1.50 (9–12)

Carl Sandburg, *Rootabaga Stories,* Harcourt, $2.50 (10–13)

Monica Shannon, *California Fairy Tales,* Doubleday, $2.50 (9–12)

Frank Stockton, *The Reformed Pirate,* Stories from the Floating Prince, Ting-a-ling Tales and The Queen's Museum, Scribner, 1936, $2.50 (10–14; F)

W. W. Tarn, *The Treasure of the Isle of Mist,* Putnam, 1934, $2.00 (12–14; F)

J. R. R. Tolkien, *The Hobbit,* or *There Again and Back,* Houghton, 1938, $2.00 (10–14; F)

Ella Young, *The Unicorn With Silver Shoes,* Longmans, 1936, $2.00 (9–12)

STRANGE AND MYSTERIOUS TALES

Arnold Bennett, *Buried Alive,* Doubleday, 1931, $2.50 (13 up; F)

Emily Brontë, *Wuthering Heights,* Macmillan, $1.50 (14 up; F)

John Buchan, *Greenmantle,* Nelson, 80¢ Mystery (F)
Magic Walking-stick, Houghton, $2.00 (12–14; F)

Lavinia R. Davis, *The Skyscraper Mystery,* Scribner, 1937, $2.00 (F)

Lord Dunsany, *The Curse of the Wise Woman,* Longmans, $2.00 (14 up; F)

Household Geoffrey, *The Spanish Cave,* Little, 1936, $1.75 (11–14; F)

Helen Girvan, *Blue Treasure,* Farrar, 1937, $2.00 Bermuda (13–16; F)

Nathanial Hawthorne, *The House of Seven Gables,* Houghton (Riverside Bookshelf), $2.00 (14 up; F)

James Hilton, *Lost Horizon,* Morrow, $2.50 (14 up; F)

Washington Irving, *The Bold Dragoon and Other Ghostly Tales,* Knopf, 1930, $2.50 (13–16; F)

A. A. Milne, *The Red House Mystery,* Dutton, $1.00 (14 up; F)

Christopher Morley, *The Haunted Bookshop,* Grosset, $1.00 (F)

Edgar Allan Poe, *Gold Bug, and Other Tales and Poems,* Macmillan, 1930, $1.00 (13–16; F)

Evelyn Scott, *Witch Perkins,* Holt, $2.00 (9–12; F)

Elva S. Smith, *Mystery Tales for Boys and Girls,* Lothrop, $2.00 (12–14; F)

Robert Louis Stevenson, *Strange Case of Dr. Jekyll and Mr. Hyde,* Scribner, 90¢ (F)

Jonathan Swift, *Gulliver's Travels,* Macmillan, $2.00 (11–14; F)

H. G. Wells, *The Time Machine,* Everyman's Library, $1.00 (14 up; F)
The War of the Worlds, Harper, $2.50 (14 up; F)

BIBLIOGRAPHY

World Literature

John Macy, *Story of the World's Literature,* Garden City Pub. Co., Garden City, N. Y., 1935, $1.98

Will Durant, *Great Men of Literature,* Garden City Pub. Co., Garden City, N. Y., 1936, $1.00

Burton Rascoe, *Titans of Literature,* Blue Ribbon, N. Y., 1935, $1.00

A. H. Thorndike, *Outlook for Literature,* Macmillan, N. Y., 1931, $1.75

Mary R. Colum, *From These Roots,* Scribners, N. Y., 1937, $2.50

R. G. Moulton, *World Literature and Its Place in General Culture,* Macmillan, N. Y., 1911, $2.25

J. T. Winterich, *The Romance of Great Books and Their Authors,* Halcyon House, N. Y., 1937, $1.69

Literature by Countries

Ida Whitcomb, *Young People's Story of American Literature,* Dodd, Mead, N. Y., 1922, $2.50

Granville Hicks, *Great Traditions,* Macmillan, N. Y., 1933, $2.50

E. M. Tappan, *A Short History of England's and America's Literature,* Houghton Mifflin, Boston, 1921, $1.88

H. A. Taine, *History of English Literature,* Blue Ribbon, N. Y., 1936, $1.00

G. E. B. Saintsbury, *A Short History of English Literature,* Macmillan, N. Y., 1930, $6.00

W. V. Moody and R. M. Lovett, *History of English Literature,* Scribners, N. Y., 1918, $1.60

H. S. Schwarz, *An Outline History of French Literature,* Crofts, N. Y., 1937, $1.65

G. M. Priest, *A Brief History of German Literature,* Scribners, N. Y., 1909, $1.50

Edward Armstrong, *Italian Studies,* Macmillan, N. Y., 1934, $5.00

H. B. Clarke, *Spanish Literature,* Macmillan, N. Y., 1893, $2.50

A. Coester, *Literary History of Spanish America,* Macmillan, N. Y., 1928 (*rev. edit.*) $3.50

W. B. Aston, *History of Japanese Literature,* Appleton, N. Y., 1899, $2.50

Folklore

H. W. Mabie, *Folk Tales,* Grosset & Dunlap, N. Y., 1930, $1.00

H. W. Mabie, *Myths Every Child Should Know,* Garden City Pub. Co., Garden City, N. Y., 1932, $1.00

T. Bulfinch, *Golden Age of Myths and Legends,* Stokes, N. Y., 1915, $4.00

Padraic Colum, *Orpheus: Myths of the World,* Macmillan, N. Y., 1930, $2.00

P. M. Burk, jr., *Golden Thread,* Macmillan, N. Y., 1931, $5.00

Rachel Field, *American Folk and Fairy Tales,* Scribners, N. Y., 1929, $2.50

W. T. Larned, *American Indian Fairy Tales,* Blue Ribbon, N. Y., 1936, $1.00

Frank Shay, *Here's Audacity,* Macaulay, N. Y., 1930, $3.00

James Stevens, *Paul Bunyan,* Garden City Pub. Co., Garden City, N. Y., 1925, $1.00

Bible

Helen Sewell, *First Bible,* Oxford, N. Y., 1934, $2.50

E. J. Goodspeed, *The Junior Bible,* Macmillan, N. Y., 1936, $2.50

W. R. Bowie, *Story of the Bible,* Abingdon Press, N. Y., 1934, $3.00

H. W. van Loon, *Story of the Bible,* Liveright, N. Y., 1923, $5.00

Walter Dè la Mare, *Stories from the Bible,* McKay, N. Y., 1929, $2.50

B. J. Thompson, *Bible Children,* Dodd, Mead, N. Y., 1937, $1.50

Dorothy Lathrop, *Animals of the Bible,* Stokes, N. Y., 1937, $2.00

R. G. Moulton, *Modern Readers' Bible,* Macmillan, N. Y., 1930, $2.50

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GEOGRAPHY

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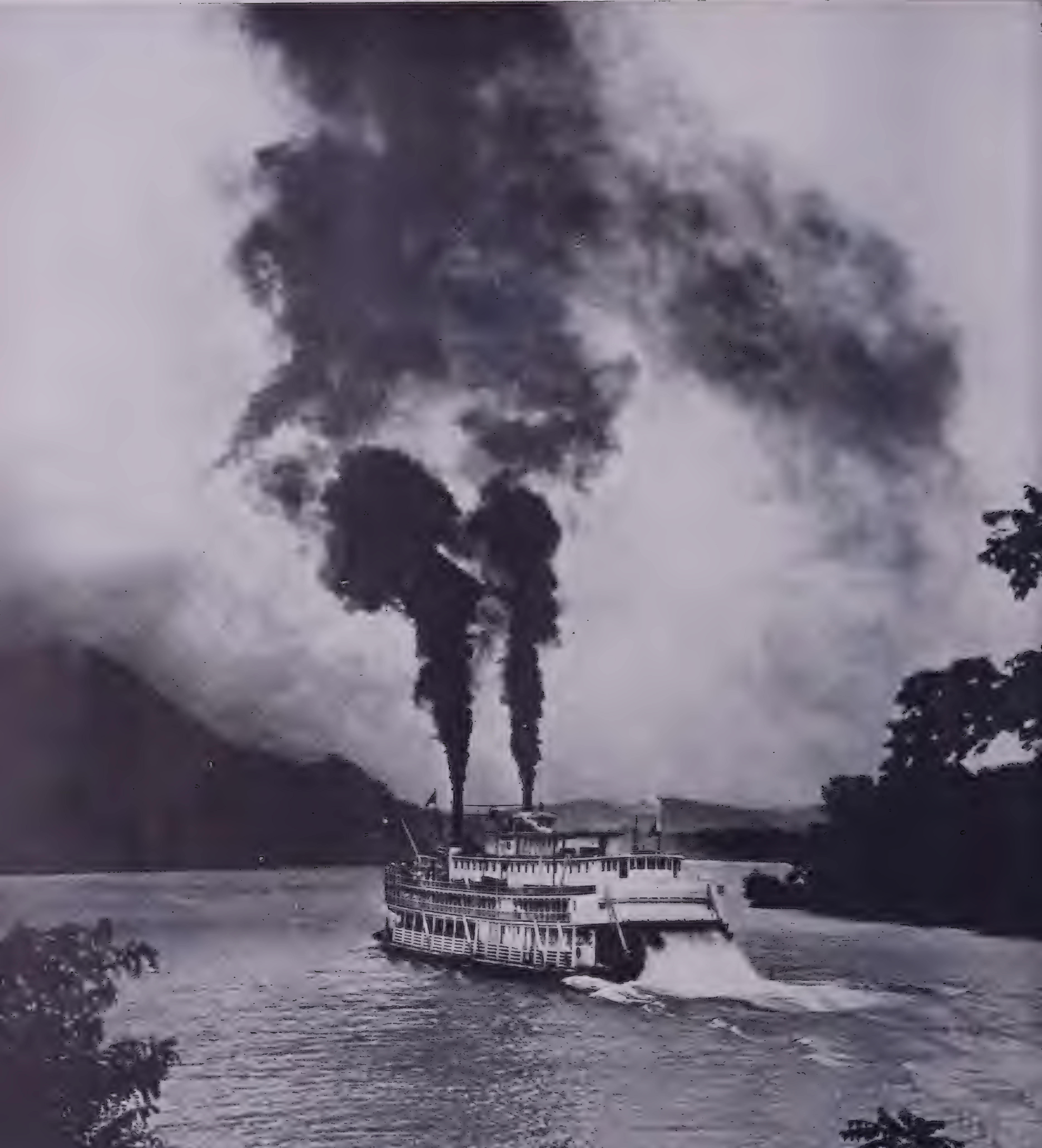


Howard Shipyards *Builders*

Henry F[illegible] *Photog*

Steamer GORDON C. GREENE *of Cincinnati, Ohio.*

[illegible] feet long, [illegible] feet wide, [illegible] feet beam, 7 feet deep, [illegible] tons. Three 28 foot boilers. Steam pressure [illegible] pounds. Engines 8 foot stroke, two [illegible] inch cylinders. TOM GREENE, *Captain.*

Photographed near Newport, Ohio, on the Ohio River.

BOOK V: GEOGRAPHY

FEATURES OF THE WORLD

Man's interest in this earth upon which he lives dates back to the very first man himself. He was interested in his own hunting ground or region, which furnished him with the food and shelter he needed. His curiosity caused him to explore the neighboring regions to see what they offered in the way of additional food or as a zone of safety as the need arose. Primitive man soon learned that a knowledge of surrounding regions and their contents—the land forms, the rivers, the climate, the inhabitants both plant and animal—was distinctly in his favor in times of stress and often the key to his very survival. He was the first geographer, and not greatly different from us, for today, though we have a much wider knowledge of the world than the primitive man had, geography is essentially the same as it was then for it can be defined as a study of the content of regions.

Let us look now at our greatest region of all, the earth itself. At our first glance at a globe or world map we see the earth's surface divided into two distinct regions, the land masses and the water bodies. The land masses sometimes are isolated patches—Australia and Antarctica; or they are lightly tied together by narrow land-bridges—North and South America; or they seem to be clustered together like a patch of drying clay that has broken apart but the pieces are still nearly in place—Eurasia and Africa.

These larger land masses we call *continents* and they are exactly alike only in one respect, they all stand above the seas as land. Aside from that they differ widely and must be studied separately. One continent is so cold the year round that no man can live on its high plateau for any length of time without food and clothing that are produced on some other continent. This is Antarctica, the continent most hostile to mankind. Parts of the other continents also are hostile to man but in other ways: some by their intense heat alone, as in the great deserts where lack of water drives men away, or the steamy hot tropics, where intense heat and moisture create the dense jungles that breed many dangerous diseases and almost defy man—particularly the white man—to enter and accomplish anything significant in the way of work. No great industrial cities have ever been carved out of the tropical jungles and it is doubtful if any ever will be.

Certain portions of other continents have what we call a temperate climate and there we find the great population centers of the world and many industrial and commercial cities. In these temperate regions man does not have to fight a jungle with its fatiguing climate nor does he have to protect himself carefully from intense cold; he can be energetic, industrious and progressive. It is in the temperate-climate regions that the great nations of the earth are located.

Climate has a certain zoning over the earth and creates regions where man can live and others where he cannot. It is the second great factor dividing the world into regions, next to the division into land masses and water bodies.

A third factor that divides the continents themselves and the great climatic belts into smaller regions is the varied relief of the land, the mountain ranges and plateaus and the great river valleys and plains. These smaller regions seem to have a climate all their own and not exactly like that of any other place in the world; they have specific types of trees, plants, animal life and soil. All these set the region apart from the rest of the world as a single unit. Regions that have relief features nearly alike and also fall within the same great climatic belt may be quite similar as to climate, vegetation and soil, but they may be set apart and partially isolated by mountain ranges and must be considered separately.

The Three Elements.—Turning to the major features of the earth itself, our globe consists of: an envelope of gas, the atmosphere; a solid mass, the lithosphere—rock sphere—the solid crust of the earth; and the film of liquid, the hydrosphere—the water of the oceans and on the land. The physical properties of these three elements must be understood before a knowledge of geography, geology, biology or history can be gained, since all life forms, both plant and animal, exist at the zone of contact of these three elements. For example, we live on the earth's crust, or lithosphere, which produces our food, we breathe the air of the atmosphere and drink the water of the hydrosphere—we are dependent upon all three. A very large majority of the world's population lives below an elevation of 1,500 feet, and most of it close to a large body of water and always in a climate where there is sufficient rainfall for adequate drinking water and irrigation, to produce food from the land.

Size and Shape of the Earth.—Because the field of geography is the earth's surface, all geographic factors depend on one essential fact, and that is the shape of the earth and its position in the solar system. We know that the earth is very nearly a sphere in shape. It is sometimes called an oblate spheroid because a slight flattening occurs at the two poles. The polar diameter is 27 miles shorter than the equatorial diameter. The equatorial circumference is about 24,902 miles. These facts are so familiar to us that it is hard to realize their geographical importance.

The philosophers of Greece who first made these discoveries some twenty centuries ago were at once struck with the importance of the earth's shape in explaining many of the geographical facts that they had observed. Though they knew little of the world beyond the eastern portion of the Mediterranean Sea, they realized that there must be a variety of climates over the earth and that the sun's rays must be distributed unevenly over its surface. Since the directness of the sun's rays decreases from the equator to the poles, their heating intensity must be decreased in a corresponding manner. From this arose the theory of the five climatic belts: two polar, which were uninhabitable due to cold; two temperate, which alone could be inhabited; and the torrid belt, which they knew only as a dry hot desert waste. They recognized the fact that all movements that take place in the surface of the earth must occur at opposite times on each side of a great circle—the equator—dividing the sphere into equal halves, or hemispheres. Thus, the harvest occurs in Argentina during the winter of the Northern Hemisphere, and the modern fast transport of today enables Italian laborers to go to Argentina to work at that harvest time and return home for the summer harvest in their own country.

The Earth in the Solar System.—The position of our globe in the solar system is as important as the shape of the earth for explaining the general character of the distribution of climates. Whether the apparent movement of the heavenly bodies, in which the sun itself joins, is real—as was long thought—or the movement results from the rotation of the earth on the polar axis, the effect on climate is the same. The alternation of day and night causes a sort of regular pulsation in life at the surface of the earth. Air, soil and water grow warm and cold alternately. Through these changes winds that are alternately cool or hot rise in the mountains or on the seacoasts and cause cloud masses to accumulate or to scatter.

If day and night were always the same length, a balance would be established between the loss of heat at night and the gain during the day; and the temperature would remain the same from one end of the year to the other at all places in the same latitude, but would decrease regularly from the equator to the poles. If the 24 hours were divided evenly into 12 hours of day and the same of night, seasons would be unknown, and the climatic belts would be only slightly marked. The varying length of day and night is one of those familiar phenomena whose effects are realized only by imagining the monotony of unvarying days and nights. The variation causes the seasons by disturbing the balance between the gain and loss of heat: the loss increases as the days shorten, and air and water both grow warm as the days lengthen. These variations are due to the relative positions of the earth and sun.

The earth revolves around the sun, describing a vast ellipse in a little more than 365 days. The axis of the earth is not perpendicular to the plane of the ellipse but is tilted at an angle of 23° 27′ from the perpendicular. The earth rotates on this axis once every 24 hours, and the axis is perpetually pointed toward the North Star and the Southern Cross; it is held in this position by the gyroscopic action of the whirling body. The effect of this position as it moves about the sun is that first one hemisphere is presented to the direct rays of the sun—the summer of that hemisphere; then six months later the opposite hemisphere receives the burden of the sun's rays, and it is summer there while the first hemisphere is experiencing winter, rapidly losing more heat than it can gain from the weakened sun's rays.

Distribution of Land and Water.—Though the atmosphere envelops the whole earth, the hydrosphere or liquid element, being denser and heavier, accumulates in the depressions of the earth's crust. Hence, the atmosphere is in contact at one place with water and at another with the land. From this fact arise all the differences in climate that do not depend on the position of the earth in the solar system. Land grows cold or warms nearly twice as quickly as water. This explains why the coldest as well as the warmest portions of the earth are the land masses. The water bodies are never extremely cold or extremely hot because there is free circulation within them. They have a distinct tempering effect upon the climate of the regions close to their shores, creating a so-called marine climate.

Glancing at the globe again we are immediately struck by the fact that the oceans are greater in extent than the land masses and also that oceans dominate the Southern Hemisphere, which may be called the water hemisphere; whereas the Northern Hemisphere contains most of the large land masses and may be called the land hemisphere. The percentage of water surface to land surface over the whole earth is very close to a 60-40 ratio. In the Southern Hemisphere the ratio is 80 water to 20 land; in the Northern Hemisphere it is about 40 water to 60 land.

The Build of the Earth.—If we can visualize the earth without the water of the oceans on it for a moment, we shall see what is meant by the build of the earth. The first thing to catch our interest is a series of great broad depressions or hollows. They are separated by high, flat-topped ridges, the continents that stand above the surface of the oceans as land. The depressions show a certain order, or plan: First, a great east-west trench extends clear around the globe at about 60° south latitude. Extending northward from the first trench are three others that are wide at their southern base. Two of them extend far north—about 65° North latitude—before they begin to become narrow. These are the basins of the Atlantic and Pacific oceans. The third trough does not extend so far north, only to 25° North latitude; this is the Indian Ocean. One other nearly circular depression is found about the region of the North Pole with two rather shallow outlets into the northern ends of the Pacific and Atlantic depressions.

The world ridges that stand between these depressions at first appear to be almost flat-topped, but upon closer inspection they show a small amount of relief that represents our mountain systems and the great river valleys. The ridges are very steep-sided with rather square shoulders and the ocean laps over these shoulders and extends inland for a considerable distance. This shallow portion is known as the continental shelf and it is upon this platform that most of our shallow seas are found.

The oceanic depressions, as we have noted, have a girdle about the Southern Hemisphere with tapering tongues extending northward and a north polar depression. The land masses form the opposite pattern. A nearly complete girdle of land is to be found extending from east to west at about 65° North latitude; the continental masses extend roughly southward and become narrow in the Southern Hemisphere; and then there is a circular land mass about the South Pole—Antarctica.

The Relief of the Land and of the Ocean Floor.—The unequal distribution of land and water is due to the unevenness of the surface of the earth's crust. Taking the sea level as a basis for comparison, the highest mountain peaks (in the Himalayas) rise to an altitude of 29,000 feet; and the greatest depression (near the island of Mindanao, in the Philippines) has a depth of 35,400 feet. The difference in the range of the inequalities of the earth's surface is about 12 miles. The inequalities, however, are insignificant as compared with the size of the earth, the ratio of maximum inequality to the diameter being 1 to 665. The actual area covered by these extremes in relief constitutes less than 1 per cent of the earth's surface.

The average height of the land is about 2,400 feet and the average depth of the ocean is about 12,500 feet. From this we can see that most of the land is low-lying, while in the oceans by far the greater part of the floor lies at a depth between 10,000 and 20,000 feet. Submarine relief is comparatively uniform, but the relief of the land is strikingly varied. The average depth of the Pacific Ocean is 12,700 feet; that of the Atlantic, 10,800 feet; and that of the Indian Ocean, 11,800 feet. In Europe the average height of the land above sea level is 1,100 feet, and three-fourths of the surface is below 1,600 feet. The average height of the land in Africa is 2,200 feet, and one-third of the land surface is between 1,600 and 5,000 feet, a great plateau with very few mountain ranges. The vast continent of Asia has an average altitude of 3,300 feet, with the great northern section an elevated plain and 35 per cent of the whole continent below 3,300 feet.

The irregularities that are so noticeable in the relief of the land surfaces are due to erosion, which tends to etch out the softer areas, creating valleys, but to leave the harder zones standing high as mountain ranges. The land surface is a zone of denudation. It perpetually loses material, which eventually is carried by streams and the wind to the oceans, where it accumulates as sediment in the great depressions. What the land loses the ocean gains.

Erosion, which is simply the wearing away of the land, is carried on by the collective action of all the climatic elements. The rain that falls on the land loosens small bits of rock or soil and carries them on down grades to some stream that transports them until they eventually reach the sea

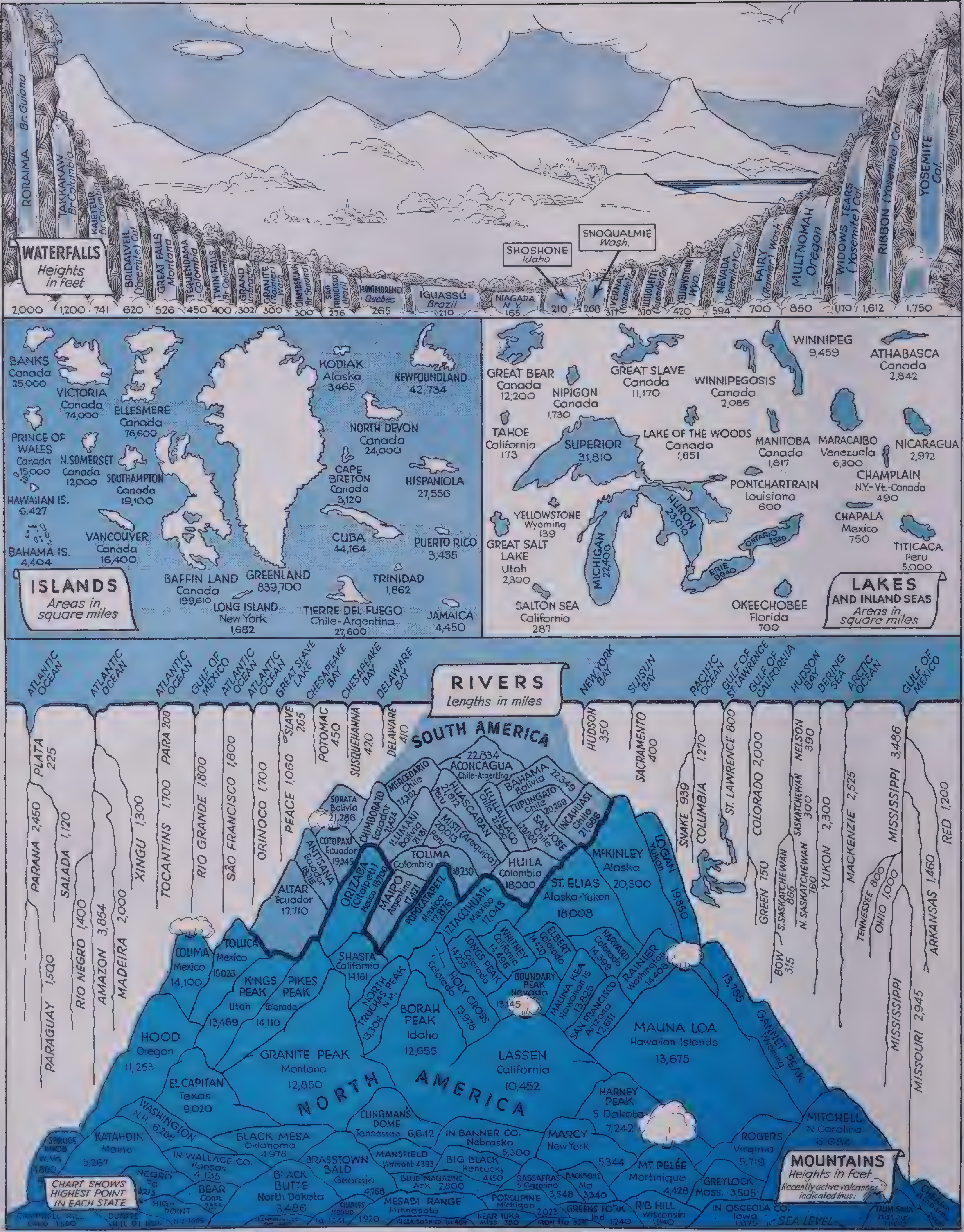
Curvature of the Earth

From its vantage point far up in the stratosphere the camera has registered the horizon 330 miles away, sweeping like a great arch across the photograph. The straight black line has been ruled in to bring out clearly the curvature of this horizon, which is practically concentric with the earth's surface, and thus indicates the actual curvature of the earth. This remarkable picture is the first photograph showing the boundary between the troposphere (the dust-laden region of rising and descending air currents, of clouds and variable temperature) and the stratosphere (the region of nearly constant temperature, above dust and air turbulence). The abrupt change from light to dark on the horizon marks the top of the dust sphere, the meeting surface or boundary between the lower air (troposphere) and the stratosphere. The significance of the photograph is that both the camera and the target (the top of the dust sphere) are in the stratosphere, that is, the line of sight is wholly through the stratosphere. Ninety-six per cent of the earth's atmosphere was wholly below the camera when this picture was made at 72,395 feet. With only 4 per cent of the earth's atmosphere above this height, and that essentially free from dust, there is little to scatter sunlight; consequently the upper sky is very dark. The photograph, which includes an area larger than the State of Indiana, was made from the balloon Explorer II of the National Geographic Society—U.S. Army Air Corps Stratosphere Flight, by Captain Albert W. Stevens, when over a point 35 miles south of Murdo, South Dakota, November 11, 1935. The Big Horn Mountains of Wyoming and Montana, with patches of snow and dark forest, can be seen faintly near the horizon. The long, dark area in the middle ground is the Black Hills of South Dakota, more than 100 miles long and from 120 to 180 miles away. The little squares in the patchwork pattern of the left foreground are cultivated fields, many of them half a mile square. Houses, highways and railways are too small to be seen from this great height and distance. The nearest objects in the foreground are more than 30 miles away

THE STRATOSPHERE
Top of Troposphere and Base of Stratosphere approximately 37,000 feet above sea level
BLACK HILLS OF SOUTH DAKOTA
Nat. Mon.
Hot Springs
Cottonwood Cr.
Mt. Coolidge
French Cr.
Harney Peak
Mt. Rushmore
Stratosphere Bowl
Rapid City
Lead
Deadwood
Fort Meade
Belle Fourche River
Elk Cr.
South Fork of Cheyenne River
Wall
White River
Horizon

ational Geographic Magazine. *Reproduced from the National Geographic Magazine by special permission*

The First Photograph Ever Made Showing the Actual Curvature of the Earth



Western Hemisphere

and settle to the floor of the oceanic depths. The wind transports great amounts of fine material in the form of dust. The freezing and thawing of water in tiny cracks in the rocks break out small and large chunks and start them on their way to the sea. All these forces have the same effect, to wear away the land and deposit the finely ground material on the floors of the oceans.

Age of Mountains.—The mountain masses may be classified in three age groups—youth, maturity and old age. The age depends upon the extent they have been worn down by the forces of erosion. Young mountains are high, steep-sided, with sharp peaks and narrow V-shaped valleys; their streams have rapids and waterfalls. Raw rock is exposed in the form of cliffs and very little deep soil is to be found. Young mountains, such as volcanic cones, usually have been formed recently according to geologic time. Mature mountains have a less rugged appearance than young mountains: very little rock is outcropping on the surface, the soil cover being nearly complete. The streams have deep but wide-bottomed canyons and have a tendency to meander across the valleys, which they are widening because they have already cut downward as far as possible. Old-age mountains or regions present a very subdued topography: very little change occurs in elevation from the lowest to the highest points in the landscape; the deep canyons have now disappeared; the streams, old and overburdened with sediment, wind greatly through their courses and are subject to floods; the soil cover is continuous and for the most part very fine and deep. In time the forces of erosion will wear any youthful region down into a mature land and finally into an old-age region.

These three types of surface relief indicate that mountain areas must have been formed by the internal forces of the earth at very different times in the physical history of the globe.

The youthful regions of the earth are only sparsely settled; they have not enough flat land or soil to accommodate a large population. The mature regions are more densely settled but not nearly so much so as the old-age regions in which the great populations of the world find their homes.

How Mountains Are Formed.—The mountain-making forces come from within the earth itself. Vulcanism produces great mountain chains over the continental masses by pouring out great quantities of lava and building up spectacular cones. Diastrophism is the contraction of the rigid crust of the earth as the heated interior cools and shrinks, causing breaks and ruptures to appear at the surface. These breaks are always associated with earthquakes and upheavals of portions of the earth's crust. The great cracks along which the movement occurs are called faults. When a movement takes place along a fault, an earthquake occurs, the severity of which depends upon the extent of the movement. All the world's earthquake zones are in the youthful mountain chains that are still in the process of formation.

The Mountain Chains of the World.—Two great chains of youthful mountains, or high mountains, on the continents join in the region of Netherland India. The first of these chains forms a complete girdle, or continuous chain of active and inactive volcanoes, about the edges of the Pacific Ocean and is often spoken of as the Fiery Ring of the Pacific. Not a week passes but somewhere along this great range some volcano has at least a light eruption. This chain starts at the southern tip of South America and forms the Andes along the entire western edge of the continent. It continues through Central America into Mexico and just south of Mexico City divides into two ranges: the eastern range extends up through Arizona, Colorado, Wyoming, Idaho and Montana as the Rocky Mountains; the western range follows the coast of Mexico into the United States and forms the coastal mountains of California, Oregon and Washington. The two ranges join in Canada and continue northwestward into Alaska. Between the two ranges from Mexico City to Canada is a great intermountain plateau that for the most part is quite high. Because the ranges act as barriers to the moisture-laden winds, the plateau is dry. The deserts of North America are to be found in this zone. A small loop, like a pulled strand from a rope, forms a chain of islands around the Caribbean Sea between North America and South America.

Westward and southward from Alaska to New Zealand the range is partially submerged beneath the sea, and only the peaks themselves stand above the ocean as volcanic islands. They are arranged in strands like beads that are suspended at rather regular intervals with the loops pointing toward the center of the Pacific. Starting with the Aleutian Islands in western Alaska, the range continues through the peninsula of Kamchatka in Siberia, then along the Kuril Islands to the Japanese group, whence it continues through the Philippine Islands to New Guinea, the Solomon Islands, New Hebrides, Loyalty Islands and New Zealand.

The second part of the youthful mountain chain starts at the western end of the Mediterranean Sea in both Spain and Morocco. It extends eastward with many loops and whorls mostly northward enclosing the Mediterranean Sea and many lowland basins on the southern side of the range. The chain carries through the Pyrenees of northern Spain through the Alps of Switzerland and Italy, then southeastward on the east shore of the Adriatic Sea through Yugoslavia into Greece as the Dinaric Alps, and continues generally eastward through Turkey and Iran (Persia) until it joins the Himalayas north of India. In northern Burma and southwestern China the chain turns sharply southward and continues down through the Malay Peninsula, then on through the islands of Sumatra and Java until it joins the Fiery Ring of the Pacific in the region of New Guinea. These are the great high mountain chains of the world and they are also the young mountains of the world.

Earthquakes.—A close examination of a good relief map reveals another remarkable fact: far from occupying the center of the oceans, the great oceanic deeps are usually near the coasts and form troughs skirting the foot of lofty coast ranges. This, indeed, is one of the most important features of the inequalities of the earth's crust. An earthquake is the resulting jar when there is some movement along a crack in this crust. Some earthquakes are of sufficient intensity to ruin cities near the offending crack, and occasionally the direction of streams has been markedly changed by these crustal movements. The study of earthquakes has shown that they occur particularly in the regions of the weakest rocks where volcanic activity is most pronounced and in those regions where high mountains and great oceanic deeps are very close together. This would indicate that the high-mountain zones and the chain of oceanic deeps are along lines of weakness in the earth's crust and are the result of movements of that crust, caused by forces coming from within the earth itself. It is thought that these forces are caused by the contraction of the crust from the slow cooling of the earth's interior.

The great earthquake zones are in Japan, the Philippine Islands, New Zealand, Alaska, California, Central America, Chile, southern Italy, Palestine, northern India and Netherland India.

Earthquakes often occur at the time of volcanic eruptions. Japan, Alaska, Central America and southern Italy, the regions where volcanoes are most active, have the most earthquakes.

The Old-age Regions.—The old-age regions of the earth are for the most part great plains regions drained by large river systems. It is a significant fact that around the whole Pacific Ocean there is no great plains region that opens directly on that ocean. The great plain of China opens behind a ring of volcanic islands. It is the only significant plain and contains the greatest population anywhere around the whole Pacific. The Atlantic Ocean has very few coastal ranges along its shores, but it does have great broad plains opening on it, and some of these in the temperate climate belts are densely populated. The great interior plain of North America, the Great Basin of the Amazon, the plains of Argentina, the basin of the Congo in central Africa and, the most densely populated of all, the central European plain that opens on the Baltic Sea and extends down into France are the great old-age plains that have deep soil coverings and are therefore fertile and if the climate is favorable to man they are densely populated and very productive. This accounts for the burden of the world's sea commerce being carried back and forth across the Atlantic between the cities of the great lowland regions along its shores. Just under the frowning crests of the Himalayas is another great plain, the Ganges plain of northern India, the most densely populated region in the world except the plains of China. Other smaller river plains also are important, such as the plains of the Tigris and Euphrates rivers in Iraq and the valley of the Nile in Egypt, which were the cradles of some of the earliest and highest civilizations of antiquity.

Shore Lines.—Most remarkable among the shore lines of the continents is that of Europe, which is nothing but a series of peninsulas affording a certain amount of isolation to the nations occupying them and also easy communication and transportation into the heart of the region. Africa presents the opposite picture with its bold solid shore line; and one of the reasons why it has been called the Dark Continent is because it was so hard to enter. Inlets and rivers were the highways over which explorers formerly had to travel into a strange new land, and Africa offered no access—no good harbors or navigable rivers. North America was settled first along her waterways—the St. Lawrence, the Hudson, Chesapeake Bay and the Mississippi—which offered a means of entrance into the interior, and large cities developed in these areas. Many of the large cities of China and India are at the mouths of rivers whose valleys are low, flat and fertile.

Courtesy Swedish Travel Information Bureau

The Midnight Sun at Porjus in Swedish Lapland

During the summer months the sun shines on the area within the Arctic Circle for the entire 24 hours of the day. The first of this series of exposures was at 10:10 P.M., the last at 12:30 A.M.

Soil Fertility and Population.—The regions of the world having the deepest and most fertile soil support the greatest numbers of poor people. In China and India the number of people is almost the maximum that can be fed from the products of the land; consequently when a flood, pest or drought causes a poor crop, famine kills thousands.

The great basins of the Amazon and Congo rivers in South America and Africa are not densely populated because they are within the tropical climatic belt. They are covered with dense, almost impenetrable jungles; but these regions are so rich in rubber, tropical fruits and hard woods that they attract the energetic white man from the temperate regions.

Climates of the World.—Nothing dictates so strongly to man what he can and cannot raise or produce, what he shall wear and what type of house he shall build, as the climate of the region in which he lives. Looking at the earth as a whole we find that a complete belt of tropical climate extends for a distance of about 20° latitude on each side of the equator. Within this zone the typical vegetation is the dense tropical rain forest or jungle. A few highlands are high enough to have a cool temperate climate and even an arctic climate with perpetual snow—as on the crest of the Andes Mountains in Peru and Ecuador. In the main this is a zone of high temperatures and almost daily heavy rainfall throughout the year.

On the west coasts of continents at about 30° latitude north and south, in what is known as the horse latitudes, or extratropical calms, are the great trade-wind deserts of the world. Five in number, these deserts where the winds blow toward the ocean instead of toward the land are very dry. Their strips extend eastward and then turn toward the poles of their respective hemispheres. In these regions the heat is so intense that the rate of evaporation of water far exceeds the amount of rainfall received and causes them to be desert wastes. Far inland these deserts are very cold instead of very hot. They are: the desert of the Southwest in the United States and in Northern Mexico; Atacama in northern Chile; the Sahara in North Africa, which extends (with different names) across Arabia into Iran and into central Siberia, where it becomes distinctly cold—the greatest strip of desert in the world and on the largest land mass; the desert of Kalahari of South-West Africa; and the desert of Central Australia that covers so much of the continent that only the sections along the southern and eastern coasts are populated to any extent. The northern coast of Australia is in the tropical belt and is covered with a dense jungle.

The very delightful so-called Mediterranean climate, characterized by winter rains and summer drought, is found in five regions of the world, closely connected with the five deserts mentioned above and found on the west coasts of continents just poleward from the deserts, the size of the regions being determined by the configuration of the mountain chains. This climate is found in California in the United States; in central Chile; in the Mediterranean region of Southern Europe; at Cape Town, South Africa; and around the city of Perth in southwest Australia. The last two regions mentioned are very small because the land masses taper in their southern extension. These climatic regions are characterized by olive trees and grape vines that have deep roots and small leaves to withstand the dry summers. These five are the only climatic regions that have rains in the winter and an extremely dry summer. All the rest of the world, with the exception of the deserts, receives its rains in summer alone or throughout the year.

The temperate climatic belt is characterized by a long growing season and mild but real winters. The natural vegetation is of mixed forests—evergreens and hardwoods. Most of the region receives rainfall throughout the year and consequently is good farming country. The eastern half of the United States is an example, and so is western Europe. In western Europe, since there is no coastal range of mountains to act as a barrier to the moisture-laden westerly winds, the well-watered region extends far eastward into Russia. In North America a great dry belt just east of these mountain ranges is said to be in the rain shadow of the range. The monsoon climatic region along the south and eastern coasts of Asia is characterized by dry winters, with winds blowing from the dry continental interiors, and very wet summers, with winds blowing from the warm oceans to the land. The principal crop of the monsoon areas is rice. The typical grains of the other temperate zones are barley, rye, oats and wheat.

North of the belt of temperate climates is a zone which has severe winters that are longer than the summers and is characterized by the great evergreen forests of Canada and northern Europe and Asia. No great evergreen forest belts occur in the Southern Hemisphere because the continents do not extend far enough south to fall into this climatic zone.

The next climatic region toward the poles has what is called the tundra or Arctic climate, in which freezing temperatures exist nearly the whole year and where what little vegetation exists is in the form of a lichen.

ECONOMIC GEOGRAPHY

The earth as a whole and the products of nature and of man's activities are too vast to be studied as a unit. A practical and logical approach is, first, by continents and then by natural units and, where they correspond, by political units or countries, since this last division is that with which we are most familiar. What then are the principal regions that contribute to the economic wealth of the world and produce the various raw materials and manufactured articles so necessary to our comfort? We cannot answer this question until we compare different areas and learn the climatic, economic, geographical and political causes for the distribution of the natural wealth of the world. It is difficult to ascertain to what degree economic wealth produced by man's agricultural and industrial activities in a given area is due to location, fertility, climate and other natural influences, and to what extent it has been fostered by social, political and governmental factors—by tariffs, treaties, landownership, caste or peculiarities of race or language.

Australia.—The largest island in the world, nearly as large as the continental United States, Australia is commonly called a continent. Pastoral and agricultural activities prevail, and Australia leads the world in wool production, most of which Great Britain imports, sending in return manufactured goods. Australia's position as a gold producer has declined since 1910. Other mineral products are coal, silver, lead, copper and tin. The climate, though generally hot and dry, is very favorable to human life; but the location of the island is unfavorable for world trade. The racial policy of the Commonwealth may delay progress. Australia has strict immigration laws prohibiting other races entering and aims to be "the last stand of the white man."

South America.—Fourth in size of the continents, South America is handicapped by its location, for more than two-thirds of its area lies within the tropics and suffers the diseases of the tropical rain belt. The present backward nature of South America may be attributed directly or indirectly to these facts: directly, because the progressive whites cannot physically endure the sultry, hot, nonstimulating climate; and indirectly, because it is almost impossible to traverse the great forests resulting from these natural conditions. The great forest of the Amazon basin is the largest equatorial forest in the world and the world's greatest source of wild rubber—an economic advantage now threatened by the plantation rubber production of eastern Asia, though the best rubber in the world still comes from Brazil. The Amazon River, in the northern part of South America, is the great and only water-way system making it possible to penetrate the vast forests of the great plains, which cannot be approached by land. No river equals the Amazon in volume and in number and size of tributaries; only the Mississippi-Missouri system is longer.

Southern South America is separated by the Andes Mountains into two countries and two economic units—Argentina and Chile. Southern Brazil and northern Argentina, the northern part of this southern peninsula area of South America, constitute one of the world's two leading food-exporting regions. Production is far beyond consumption, and this area around the Plata River is the greatest surplus food producer in the world. Argentina is the principal maize (corn) exporting country, supplying more than half that commodity and also nearly half the linseed that enters international trade. Wheat is the principal export of Argentina, about three-fifths of the crop being exported. This great food-producing region is becoming more important as a grazing land for cattle and is potentially one of the world's important sources of meat. Argentina now exports considerable wool and mutton. The wealth of Chile, a narrow country bounded by the Andes on the east and the Pacific on the west, is chiefly minerals. It ranks second as a world producer of copper, though more than half its exports are nitrates.

The western coast of South America, including Peru, Ecuador and Colombia, produces minerals chiefly, but Ecuador until very recently led the world in the production of the cacao bean, which is still her leading export. Colombia has the only important platinum mines outside Russia and at times has supplied half the world's production. Coffee makes up two-thirds the value of Colombia's exports. The Andes in Bolivia yield one-fourth the world's tin. Bolivia ranks second only to China as a producer of antimony. Since 1920 tin ore has constituted more than 90 per cent of Bolivia's exports. In 1928 Venezuela's production of petroleum exceeded Mexico's, and since then Venezuela has been in third place in the world's oil production with more than 140,000,000 barrels a year (compared with 900,000,000 for the United States and 170,000,000 for Russia). Petroleum is now Venezuela's leading export.

Brazil occupies an area greater than that of the continental United States and lies almost completely in the tropics. To the climate and the volcanic soils, rich in iron, may be attributed the fact that nearly 70 per cent of the world's coffee is grown in Brazil, nearly half the world's total coming from the state of São Paulo alone, where more than 3,000,000 acres are under this crop. The Brazilian highlands in the east have vast mineral resources, with reserves of high-grade iron ore probably the richest in the world.

As a continent, South America produces raw materials, and to a limited extent American and European capital aids in developing these resources. Because it lacks the kind of climate to stimulate economic activity, exploration and intellectual curiosity, South America has few industries. The bulk of the population is primitive Indian tribes. Transportation is difficult as the vast interiors are almost impenetrable and the mountains of the west form great barriers to communication between the two coasts. There are no good seaports in the west and few in the east and south. As yet, South America maintains her motto, "Down to the sea and away to the North," meaning that there is little internal trade, but raw materials of mine and agriculture are sent down the rivers, railroads and highways to the sea and are then shipped to northern countries, especially to the United Kingdom, United States and Germany. From these countries South America imports manufactured goods: machinery, cotton textiles, iron and steel. The continent exports more materials to the United States than are imported from this country, thus maintaining a favorable balance of trade with us.

Africa.—The Dark Continent is gradually yielding to the inroads of civilization; the handicaps of unhealthful coasts, a too regular coast line for good natural harbors, treacherous rivers and a desert climate are slowly being overcome. Africa is second to Asia in size and is cut by the equator about halfway in its length from north to south. In the northwest, the European Alpine system extends and constitutes the Atlas Mountains. The rest of the continent is a plateau, separated from the ocean by a narrow coastal plain. This plateau consists of ancient rock, minerals from which supply practically the only commercial wealth of the country. Internal trade and communication are difficult, one-third of the continent having no outlet to the sea. The rivers, though navigable for long distances, are treacherous with rapids and waterfalls. The Congo River in south-central Africa is an unsatisfactory waterway because the seasonal fluctuations in depth are so great. These conditions, however, give rise to vast potential water power—more than in any other continent.

Africa may be divided into three climatic regions, and its natural resources are determined by the differences between these regions. The north is characterized by the Sahara, greatest of the trade-wind deserts, an arid area contributing nothing to the economic importance of the continent. Egypt, a part of the Sahara, differs from the desert only because it has an irrigated valley and the Nile floods. The people live only on the delta and banks of the river. Cotton is the chief crop, its long fiber commanding a high price; it makes up more than three-fourths of Egypt's exports. Trade is chiefly with the United Kingdom, cotton being exported and textiles imported. The port of Alexandria controls 80 per cent or more of Egypt's foreign trade.

The second natural division is the equatorial region characterized by dense rain forests. The vegetation of Africa shades out gradually from this thickly-treed area. In spite of its million or more square miles of forests, Africa as a whole exports but little timber. Nearly half the forest area is in the equatorial zone, and the other half is farther south in the Belgian Congo and Rhodesia; but South Africa is not self-sufficient in timber and imports large quantities. The timber wealth of Africa lies in the mahogany, ebony, rosewood and other cabinet woods of the equatorial zone, though they have been developed very little. Timber is produced under serious disadvantages of high production and transport costs. Rail charges are high on bulky commodities, and valuable timber stands far from the coast. The cost of logging is great, especially because there are so many different species of trees to the acre and it is difficult to get trees out of the jungle. Besides, the tropical hardwoods in which Africa is most wealthy represent a negligible part of the world's trade in timber. To date, the economic importance of Africa's forests has been in the by-products: palm oil, rubber, cork, gums and dyes. The equatorial zone harbors the cacao tree and is one of the important commercial sources of coco, producing nearly half the world's supply. At one time the bulk of the world's rubber came from the Congo and from the equatorial forests of the Amazon basin, but this production was rendered uneconomic by the development of plantation rubber in the Orient.

Of the major world commodities, Africa leads in the production of very few, mainly gold, diamonds and ostrich feathers, all products of South Africa. The presence of cheap coal makes it possible to mine gold at a profit. Here is the source of more than half the world's total annual output of gold and over 95 per cent of its diamonds. Since the World War, the importance of the ostrich industry has declined. African ivory is now of declining importance, though at one time it formed nearly half the value of all exports from the Belgian Congo region. South Africa has recently risen to importance in the copper industry. The Belgian Congo and Rhodesia may become one of the world's chief copper-producing regions. Over three-fourths of South Africa's exports are products of the mine. Depletion of mineral resources could create a serious problem for the country. Large amounts of food are imported. Trade is chiefly with the United Kingdom. Great Britain, France and Belgium dominate the commerce of their colonies. Sheep raising is the chief agricultural industry of South Africa. Sheep number more than 45,000,000, and wool is second to gold as an export. The Union of South Africa comprises a territory wealthy in a few minerals, with areas of fertile soil and of ideal climate, and man has found it an agreeable place to live.

Comparatively undeveloped as yet, South Africa and much of East Africa will eventually support enormously greater agriculture and industry. The continent is largely under the political control of European nations. It is the leading continent in potential water-power development and its mineral resources are largely unknown. Export trade of the west coast of Africa is about equal to that of western South America. The United States is a chief purchaser from South America but has little part in West Africa's trade.

Eurasia.—The large natural continent of Eurasia has been arbitrarily divided in two: Europe, with about one-fourth the world's people; and Asia, the largest continent, with nearly half the people and about one-third the earth's land—about 17,000,000 square miles.

Asia.—Called the continent of diversity, the continent of extremes, Asia has the highest plateaus and the greatest extent of lowlands, the densest and the sparsest populations, the coldest and hottest climates (determined by physical features). Some parts of the continent are 1,500 miles from the sea. The great Himalayas run from east to west and separate the southern and northern areas. Mountain masses occupy the center, far removed from the sea, with a continental climate subject to extremes in temperature. Asia has the greatest population but still is the most sparsely settled continent. Nearly half the world's population is in the monsoon area of southeastern Asia, which includes India, China, Japan and the Philippine Islands and constitutes a potent region in Asia's economic importance. With the investment of capital and the application of managerial ability, these people might join the leading nations in the creation of economic wealth. Asia is the leading food producer of the world, and undoubtedly takes first place also in the creation of the other elemental human needs of shelter and clothing, in spite of a relatively low standard of living. The continent leads in several of the world's leading commodities, including vegetables, rice, tea, jute, silk, tin and rubber.

India forms the southern peninsula of Asia. Its people are more advanced than any other in the tropics. Completely shut off from the rest of Asia by a wall of mountains, there is a common climate throughout. The broad flat fertile plains make agriculture the essential occupation. Despite the dense population, there is still a surplus of food grains for export. Cotton is the most important crop, grown chiefly for export to Great Britain and Burma. Manufactures are largely expert handwork, though India is fast meeting competition in machine-made articles. Exports are raw cotton, rice, oilseed and tea; most of this trade is by sea. Imports are chiefly cotton goods (cotton clothing is sufficient in India's climate), metals, sugar, gold and silver. Cotton manufactures come mainly from England and Japan. The island of Ceylon, south of India, exports tea, rubber and coconut products.

The Malay Peninsula forms a part of the world's great tin-producing region, yielding over one-third the world product. (About 60 per cent of the world's total comes from southeastern Asia.) The Malay Peninsula is also the leading rubber-producing region, supplying over 95 per cent of Asia's total output. This plantation rubber has replaced wild rubber (African and South American) in international markets. Half Malaya's exports consists of rubber. Imports are rice and manufactured goods from Netherland India and the United Kingdom. The Malay Peninsula contains the port of Singapore, one of the key distributing centers of the Orient.

Southeastern Asia, with its monsoon climate and heavy summer rainfall, is the great rice-growing region of the world, and consumes more than nine-tenths of the world's rice. As a sugar producer, Java ranks only below Cuba and India. Java's sugar is too far removed from the leading sugar markets, the United States and Europe, to compete with Cuban sugar. Rubber leads as an export, with sugar second. The trade of southeastern Asia is practically all sea-borne, other countries being more accessible by sea than over the vast regions of plain and mountains. The political units trade with one another, but most of the foreign commerce is with Great Britain and the United States.

China is an important exporter of raw silk, beans and bean products; it imports manufactures of cotton goods and machinery. In silk culture, China is second only to Japan. It is believed that next to the United States, China has more high-grade coal than any other country, though present production is small.

Though the islands are cultivated intensively, Japan is becoming more and more dependent on foreign supplies of foodstuffs. This explains Japan's attraction to Manchuria, a strictly agricultural region, which leads the world in the production of the soy bean. Japan exports much tea to the United States. The Japanese produce 75 per cent of the world's silk (excluding China). Principal manufactures are cotton, silk and woolen goods, though much of the raw materials, especially cotton, for Japanese industries must be imported—cotton from India and the United States, and wool from Australia. Abundant water power is a decided asset to Japan's industries. Exports consist chiefly of raw silk and manufactured cotton and silk goods. Imports are raw cotton and manufactures of iron, chemicals and machinery. Trade is chiefly with the United

Rivers make cities. Water, always a necessity, was doubly important in the days before rail, truck and air transportation; all over our country settlements and then towns and cities grew up along the waterways. St. Paul was once the head of Mississippi River transportation to which it owed much of its growth. Water power made Minneapolis; the Falls of St. Anthony has furnished power for its flour mills since 1822. The manufactures of St. Louis have been carried up and down the river since the invention of the steamboat. Vicksburg, on a bluff where the Yazoo River joins the Mississippi, developed as an outlet for the vast cotton country inland. New Orleans, long a port for ocean commerce, grew rapidly when it also became a port for Mississippi River steamboat commerce. Cincinnati grew up where several streams flowed into the Ohio River. On the Missouri, Omaha was developed by fur trappers and traders who traveled the river, and it was an important trading center after steamboat service started in 1880

River Cities

Minneapolis, Minnesota, on the Mississippi

Courtesy Minneapolis Civic and Commerce Association

Above: Vicksburg, Mississippi, on the Mississippi River

Left: Cincinnati, Ohio, on the Ohio River

Pictures from the Farm Security Administration. The [illegible]

States, India and China. The United States supplies nearly 30 per cent of Japan's imports and purchases nearly 40 per cent of her exports. The Sea of Japan is one of the world's three leading fishing grounds, the total catch being even more valuable than that of British fisheries. The industry employs nearly 1,500,000 Japanese, and fish is an important item in the native diet.

North of the mountainous heart of Asia and south of the bleak Arctic Ocean is Siberia, that vast region now nearly all a part of the Soviet Union. Long, cold winters and a sparse population characterize this area; yet it has black fertile soils that give Asia the title "storehouse of the future." Wheat is the main crop. Though rainfall is limited, the cold climate prevents evaporation. The rivers freeze before they reach the sea in their northward course. Inaccessibility is the difficulty to be overcome and transportation is a critical problem. The long rivers are navigable to some extent, but have no outlet to the sea for boats. Frozen streams offer the main handicap for the development of Siberia's billion or more acres of forest land. This great timber area stretches from northeast Europe to the Pacific Ocean, and its wealth is unexploited. Russia's stand of forests is greater than that of any other country. Mining is second to agriculture. Estimates have indicated that Siberia's coal basins equal half those of all Europe. Russia produces 40 per cent of the world's platinum, 40 per cent of the manganese ore and over 10 per cent of the petroleum. Statistics of Russia's trade are not reliable, but even accurate data would not picture the true possibilities of the great mineral, agricultural and timber resources. For various reasons, foreign trade as yet is small. The country is vast and products are diverse, the people are poor and ignorant, methods of agriculture and mining are primitive and the Soviet Government's policy does not approve liberal trade with other countries. Siberia is composed of many self-sufficient units of economic endeavor, and in the separate localities there is a marked absence of specialization. Asia is indeed an economic frontier and a region of enormous possibilities. Large applications of capital and scientific enterprise with an inflow of the western civilization might develop a progressive continent, intellectual and clever people and a vast amount of natural wealth.

Europe.—The continent of Europe is believed to be more productive than any other as it creates even more wealth than Asia and because in the northwestern portion mining and manufacturing are developed to such a high degree. Of the world's fifty principal commodities, Europe leads the continents in the production of more than half. The importance of northwestern Europe in population and industrial activity is due in large part to the fact that this is one of the few regions in the world with an ideal climate—one in which the average temperature for the coldest month does not go below freezing and for the hottest month is not above 70° Fahrenheit. The climate is cyclonic in nature, bringing the stimulation of rapid but considerable short-range changes in temperature and in humidity. All ideal climates have 20 or more inches of rainfall a year. This type of climate is believed to be stimulating to man; where it exists, man has reached his highest development.

In northwestern Europe civilization is roughly in proportion to the extent to which this climate is present. This region and the northeastern United States are the world's two leading manufacturing regions. It follows as a matter of course that they are the world's two leading food-importing regions. The Plata River lands of South America and the central North American basin are the two great world surplus food-producing areas.

The present political divisions in Europe, with accompanying tariffs and import quotas, make it impossible for natural geographical regions to operate as economic units. Considerable unity exists between mother countries and their colonies on other continents. One of the best European illustrations of political violation of economic geography is found in the Danube countries where all or parts of Austria, Czechoslovakia, Hungary, Yugoslavia, Rumania and Bulgaria ought to be operating as a free-trade region. Uneconomic and painful attempts to balance industry and agriculture within national boundaries exist, however, in each of these countries. Both the Balkan and the Spanish peninsulas suffer from isolation and the Baltic countries are more unified ethnically than economically. The two Scandinavian countries and Denmark produce excellently in relation to their natural resources. The economy of France suffers less than Germany's from political boundaries, since French industry and agriculture are well balanced so that France is better able to live and prosper at home than any other great western European nation. A political United States of Europe would greatly enhance the wealth, production and happiness of European peoples.

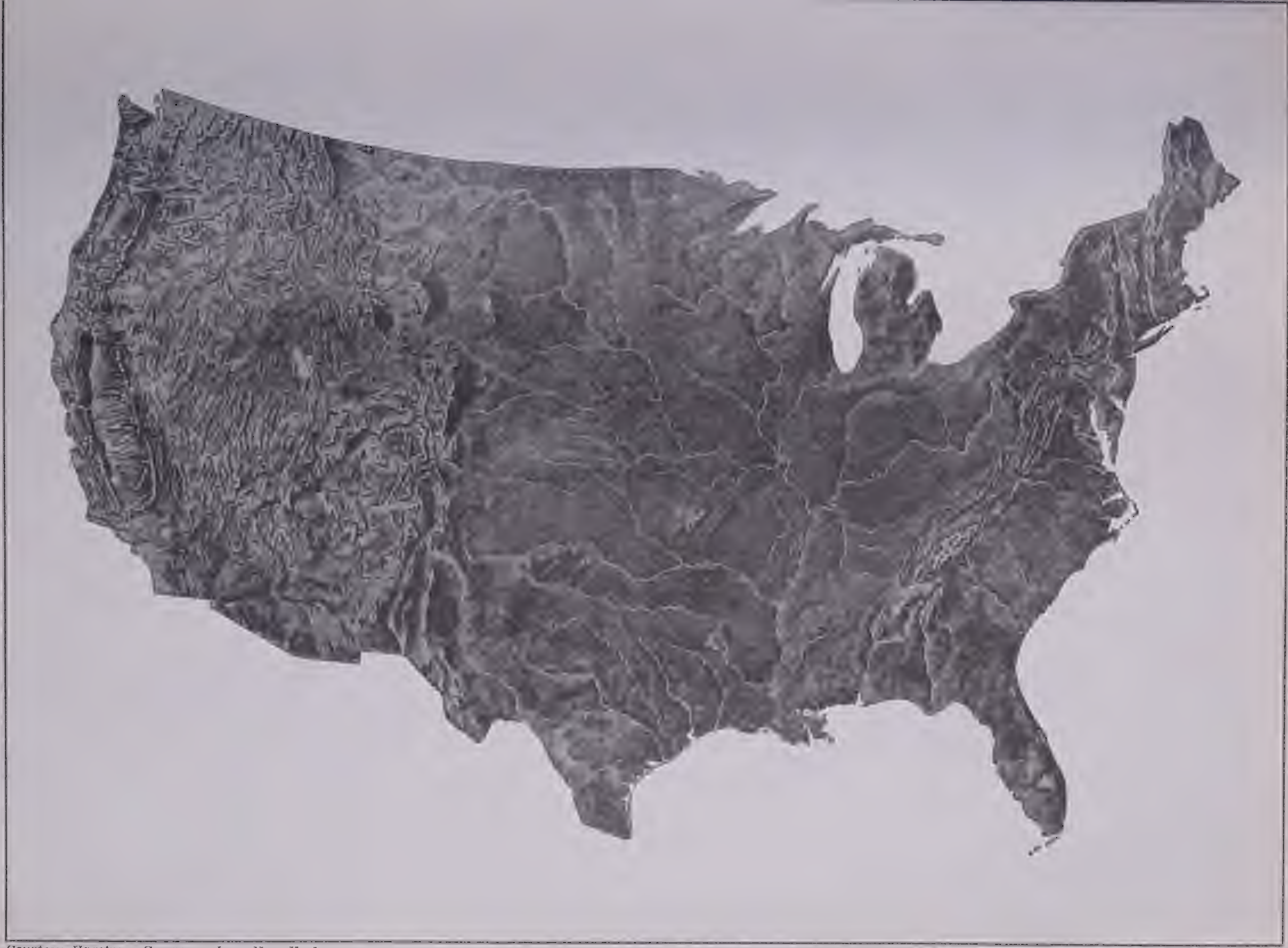
Among the continents, Europe exceeds in size only Australia. European vegetation may be divided roughly into (1) the Mediterranean region, which includes Spain, Italy and the southern coast bordering that sea; (2) the deciduous forests that cover that extensive area from England and northwest Europe north across to Russia; (3) the coniferous forests that extend from Norway and Sweden eastward over northern Eurasia.

About one-third the world's coal is produced by the United Kingdom and Germany. Rumania and Poland are the big oil producers of Europe, and all European countries except Russia, Rumania and Poland are large importers of mineral oil. Fortunately, European water power is located in regions with coal deficits, and water power supplements coal as a fuel for the great industries. The installed horsepower in Europe is equal to an annual saving of nearly 100,000,000 tons of coal.

France, Sweden and England have about two-thirds of the world's iron-ore reserves. Ninety per cent of all the iron and steel in the world is made in six countries, five of which are European. Development of modern transportation has rendered the close natural association of iron and coal necessary for industry. Great Britain produces only 60 per cent of its requirements of ore and imports large quantities, especially from Spain. In France the Lorraine fields annually yield about 40,000,000 metric tons of iron ore. Spain also exports large quantities of the ore, chiefly to Britain and Germany. To Europe may be attributed more than half of the world's total of zinc (from Belgium, Poland, France and Germany) and a considerable amount of lead. There is a marked tendency for aluminum to be produced in countries with hydroelectric power. Hence Norway's importance as an aluminum producer, though it imports the bauxite.

The Mediterranean countries with their cool moist winters and hot dry summers must overcome these climatic handicaps as well as that of poor soil. Wheat, the hardy universal cereal, is the most important crop in the Mediterranean region. The countries of this area are also outstanding producers of raw silk. France is the greatest center of silk manufacture, has about 12 per cent of the world's wool manufacturing capacity, is the world's greatest wine producer and leads all Europe in iron-ore reserves, her Lorraine deposits being world-famous. Limited coal resources explain the slow progress in manufactures. France is the greatest producer of bauxite (the United States is second) and formerly was a large producer of antimony. Competing with Germany for third place for total value of foreign trade, and occupying a unique and critical commercial location, France imports coal and machinery and exports chiefly iron and steel products and silk, cotton and woolen fabrics. The countries in the Danube basin of southeastern Europe are chiefly agricultural, with some manufacturing. Austria leads the other countries of this region in wool production.

West-central Europe includes the Netherlands, Germany, Switzerland and Poland. The Netherlands is famous for scientific dairying and exports of cheese, butter, margarine, eggs and meat. Its foreign trade exceeds that of Russia. Chief occupations are dairying, shipbuilding and ocean fishing. The Dutch are a seafaring and commercial people. Germany is a nation of great scientific industrial activity, with vast productions of potash, phosphates and nitrates. Reserves of potash are estimated to be twenty billion tons. In no other country do potatoes occupy such importance in the diet of the people. Germany leads the world in the manufacture of beet sugar. Its export trade is chiefly with the neighboring countries of Great Britain, the Netherlands, Czechoslovakia and Switzerland, and includes the factory products: steel manufactures, cotton, wool and silk fabrics, beet sugar, chemicals and dyes. The United



Courtesy Hagstrom Company, Inc., New York

RELIEF MAP OF THE UNITED STATES

States ranks first in supplying Germany's imports, and third in buying its goods. Switzerland is world-famous for its scenery and its specialized manufacture of watches, clocks and jewelry; it is among the leading countries in per capita foreign trade. Poland is a valuable mineral region, with great coal reserves and the most productive zinc mines in Europe.

In spite of its great crops, Europe must import food. This is due to the geographical specialization of agricultural production and also to the fact that all Europe lies in the Temperate Zone and cannot produce the variety of foods needed. Europe grows about one-third of all the wheat in the world (excluding Russia); but all the big importers of wheat except Brazil and Japan are European countries, Great Britain leading. Of wheat, dairy products and meat, Europe produces more than all the rest of the world; of barley, more than twice as much as the rest of the world; and of rye, twenty times as much. Europe formerly produced more than 40 per cent of the world's sugar. Despite all this, Europe imports more food than all other continents combined. The North Sea region is one of the world's three great fisheries. In 1930 about a million tons of fish were landed by British, Norwegian, Dutch and German fishermen. Nearly 250,000 people in Britain obtain a livelihood from fishing in the North Sea.

Europe is self-sufficient in timber products, with an annual output of about 17 billion cubic feet. Except for the British-American trade, most of the European timber trade is among the countries of the Continent and not across seas. Europe has about 10 per cent of the world's forest areas, three-fourths of which is coniferous forest. Finland, Sweden, Poland, Russia, Norway, Czechoslovakia, Austria and Rumania are important exporters of timber. Russia has the greatest potential capacity. Scandinavia (Norway, Sweden) and Finland are a part of Eurasia's great northern forest belt. Norway is outstanding for her water power, timber and particularly fisheries. Fish and fish products represent one-fourth the exports, and whaling is carried on extensively. It is said that Norway is the only country in the world whose people could all get in their boats with all their household goods and chattels and sail away.

Coal represents nearly 90 per cent by value of all the mineral products of the British Isles. The mineral next in value is iron ore, representing less than 2 per cent in value. About one-sixth of the coal mined in the world comes from Great Britain. One-third of the production is exported or supplied to ships as bunker coal. Though an iron industry exists, the United Kingdom has to import much iron, principally from Spain and Algeria. In value, Great Britain's agriculture is second to her manufactures. Agricultural products of importance include wheat, barley, oats and hay. Manufactured goods make up 80 per cent of the exports of the United Kingdom, including mainly cotton goods, iron and steel and machinery. Cotton manufactures make up nearly 20 per cent of the exports. Foodstuffs make up nearly half the United Kingdom's imports. Britain's trade balance is unfavorable, but this excess of imports over exports is balanced by invisible exports, such as credits and tourist trade.

North America.—Ranking second to Europe as the most productive continent, North America is third in size, with an area of nearly 8,000,000 square miles, the largest part of which lies in the North Temperate Zone. Physical features of the continent fall into three groups: the Eastern Appalachians, the Great Plains and the Rocky Mountain System. The last is the water divide of the continent, rivers flowing westward into the Pacific and eastward through the plains, the great granary of the world. Main vegetation regions of North America include the hot, wet forests of Mexico and Central America, cool temperate forests in the East, prairies in the center, desert land in the Southwest and coniferous forests in the North.

Though Canada has huge uninhabitable areas, it is believed to be capable of supporting many times its present population. Predictions are that, with its immense reserves of coal and unrivaled deposits of asbestos, cobalt and nickel, Canada will become the leading mineral-producing country of the world. Canada reached its maximum in gold production in 1900. It is now the third producer of gold (South Africa and the United States ranking first and second). Most of the world's asbestos, cobalt and nickel comes from Canada, which also produces important supplies of copper, zinc, silver and lead. In spite of enormous reserves of coal in Canada, at present more than half the coal consumed is imported from the United States. Because Canada's coal lies mainly in the western provinces, the thickly populated sections of the east can obtain this mineral more easily from the United States. Huge water-power resources replace coal requirements, the 7,900,000 installed horsepower representing a saving of 32,000,000 tons of coal a year—twice as much as Canada's total average production of coal. In 1927 over 95 per cent of the world's nickel came from Canada, and reserve ores of this metal in Canada are estimated at 2,000,000 tons. Copper, as a by-product of gold and silver recovery is rising in importance. Canada produces four-fifths of the world's asbestos, Quebec being the chief source. A great cement industry finds its raw material in the St. Lawrence lowlands.

Canada is a great producer and exporter of paper products. Forests still cover 1,000,000 square miles, and the total forestry value is greater than that of mineral products. The lumber industry is second in importance, and British Columbia produces more than one-third of the total output. Necessary conditions for a large-scale paper industry are found only in Canada, the United States, Scandinavia and parts of Germany. The United States is the largest consumer per capita, using the total home production and four-fifths of Canada's output. The Grand Banks of Newfoundland provide the third great fishing grounds of the world, the other two being the North Sea and the Sea of Japan.

Canada is said to be four extensions of economic United States into a frozen desert: (1) The fishing, timbering and mining of the provinces of western Canada are essentially like those industries in Oregon and Washington. (2) The grain-growing provinces of Canada are merely a part of the great prairie area of central United States, the spring wheat region being principally in Canada. (3) The so-called Ontario peninsula is really a peninsula of Canada extending into the United States, with manufactures like those of Cleveland and Detroit and with agriculture similar to that of Ohio and Michigan. (4) The Maritime Provinces continue the industries of the New England States: lumbering, papermaking and fruitgrowing.

Agriculture, including stock raising, is the chief occupation. Canada exports about 10 per cent of the world's wheat. Canada and the United States are the only important rye producers outside Europe, which grows over 90 per cent of the world's rye. The Maritime Provinces are important for their fruit products, Nova Scotia being noted for apples, mostly exported to Great Britain. Canada now ranks second in the British Empire as a manufacturer, thanks to her cheap electric power. Exports are chiefly wheat, wood, paper and dairy products. Imports are foods (sugar and tea), iron and steel, coal and textiles. Trade is chiefly with the United States and the United Kingdom.

Alaska has the capacity for raising reindeer and is the world's future source. Treaties between the United States and Japan, Russia and Canada protect the great supply of seals in the Pribilof Islands, east of the Bering Sea. The United States purchases about 80 per cent of Mexico's exports, most of which are products of the mine, including petroleum, silver, lead and zinc. Central America's significance lies in her fruits and other products commensurate with the tropical climate. Over three-fourths of the exports of the West Indies go to the United States and include bananas from Jamaica, and sugar, tobacco and some iron from Cuba.

Though the United States has an area roughly equal to that of Canada, the States are far more favorably situated and have the capacity for supporting a much larger population. The rapid rise of the United States to her position among industrial nations is due to her possession of high-quality coal in great quantity and to the great ease with which it is mined. There is an immense annual output of minerals, coal and oil competing for first place. The United States produces 40 per cent of the world's coal. Reserves are estimated to be equal to those of the rest of the world put together. The Pennsylvania anthracite field has the largest output of anthracite in the world. With the Appalachian fields, it yields nearly three-fourths of the United States' output of coal. About two-thirds of the world's supply of petroleum is found in the States, but home and export requirements make it necessary to import oil to the extent of .8 per cent of the total American supply. United States' exports of petroleum products have reached an annual value of $500,000,000. This country now produces about one-third of the world's iron ore. At least 80 per cent of this comes from the Lake Superior district.

The United States produces 60 per cent of the world's copper and at least half the sulphur; it ranks second (after South Africa) in gold production; leads in world production of lead and zinc (nearly 50 per cent of total); and produces 40 per cent of the bauxite, Arkansas being the source of more than 75 per cent of this ore mined in the States to date. The value of clay products is more than three times the value of gold produced annually.

Lumbering is the main industry of one-fourth of the states, but the lumber requirements make it necessary to import large quantities, chiefly from Canada. The United States is mainly an agricultural country. Corn is the largest cereal crop, of which about 99 per cent is consumed domestically and only about 1 per cent exported. Of the huge production of wheat, never more than one-fourth is exported. Most of the United States' demand for sugar is supplied by Cuba, Hawaii and Puerto Rico. About one-third of the world's tobacco is grown in Kentucky, North Carolina and Virginia. Cotton leads as a commercial crop and is second in value among all crops. More than half the annual production is exported, normally over 7,000,000 bales. Nearly half the world's cotton crop is grown in the United States. Canada, Cuba and South American countries furnish the main markets for American cotton cloth. India is second to the United States in cotton exportation. The chief demands for cotton come from Japan, Great Britain, Germany, France and Italy. The United States leads the world in the manufacture of leather and imports large quantities of hides and skins in addition to its home supply. The great manufacturing region in the northeastern part of the country has an ideal economic climate of its own and the great natural resources of the whole country to draw from. The States rank first among all countries in value of manufactured goods, which includes textiles, leather, paper, rubber, chemicals, pottery, machinery, automobiles and ships. Three-fourths of the world's automobiles are built here, and more than three-fourths of the American production comes from Michigan.

Vast as the foreign trade of the United States is, it is exceeded by the internal trade. Because the States are still comparatively young in development, raw materials still make up the greater part of the exports, principally raw cotton, oil, tobacco, coal, meat, dairy products and wheat. Other exports are iron and steel manufactures, motor cars, cotton and copper manufactures and wood. Imports include tropical rubber, coffee, tea, silk and cane sugar, European high-grade manufactured goods and those minerals in which the United States is deficient. The first items of import illustrate the fact that the North-South trade routes are more permanent than East-West routes, since the tropics and the temperate zones will always supplement one another. The most lasting trade, therefore, will be between the North Temperate Zone and the South Temperate Zone and between the temperate zones and the tropical regions. Different sections of one temperate zone (like the United States, Europe and Japan) should eventually come to roughly the same state of industrialization, thus lessening the need of each for bringing goods from far away that can be profitably produced at home. This generalization is limited by climate and such natural resources as mineral deposits and soil fertility. The foreign trade of the United States is distributed widely. Exports go chiefly to the United Kingdom and Canada, and then to Germany, France, Japan, Italy and Cuba. Imports are mainly from Canada, the United Kingdom, Japan and Cuba.

In spite of a lack of ideal climate in most of its area, the United States, with its 130,000,000 people, has prospered greatly through the vigorous reduction of its natural fuels and other minerals and through the exploitation of its fertile soil and forest resources. The United States and the other parts of the New World must inevitably settle to their rightful economic positions, based mostly on climate and annual appropriation of the sun's rays. We have greatly depleted our forests; we are depleting our minerals; we are turning regions that should never have been put to the plow into dust bowls; we have tended to exhaust our soil and to allow enormous proportions of it to erode into permanent uselessness. Conservation of national resources has been undertaken—but not yet on a sufficiently large scale or with proper technological equipment.

In economic geography, the relative importance of the continents or of other divisions of land bodies may be based on the relative importance of their economic productivity or wealth creation, or upon the number of people who are supported. On both counts, the Northern Hemisphere is much more important; and from both standpoints Eurasia far transcends in significance all other land areas combined. If one measures civilization by the yardsticks of educational attainment, health, per capita wealth, and so on, he finds that Great Britain, northern France, Belgium, the Ruhr, the Netherlands and Denmark are the center of the world's highest civilization and the heart of the world's best climatic region, and that both desirability of climate and attainment of civilization fade gradually in all land directions in about the same ratio.

GEOGRAPHICAL DICTIONARY

den, a country located at the southwestern tip of the Arabian Peninsula. Formerly attached to the Bombay presidency of British India, it has been since 1937 a Crown colony of Great Britain with executive authority vested in a governor and commander in chief. For many years after its annexation in 1839 the British zone included only the city of Aden and some 80 square miles of surrounding territory. Today Aden (including the island of Perim at the entrance to the Red Sea) covers an area of 42,000 square miles. The population is about 50,000.

The city of Aden (population about 35,000) is situated on the Gulf of Aden, an arm of the Arabian Sea connecting it with the Red Sea through the Strait of Bab el Mandeb. It is an important coaling station and, after Port Said at the Egyptian end of the Suez Canal, the chief fortified seaport on Great Britain's route to India. The principal manufactures are cigarettes and table salt, and Aden handles for transshipment cotton, grains, sugar, tobacco, salt, coffee and hides. Its barren surroundings and lack of adequate rainfall make it probably the hottest city in the world the year round.

Aden was a warehouse even in Roman times, when it was known as Arabia Felix. Attached politically to the colony is the island of Socotra.

Adolf Hitler Roads, a network of automobile highways spreading over the entire German Reich. By 1938 some 1,250 miles had been opened to traffic. The principal roads connect Bremen and Lübeck, Königsberg and Elbing, Giessen and Karlsruhe, Stuttgart and Ulm, Munich and Salzburg, Cologne and Dortmund, Leipzig and Nuremberg, Berlin and Stettin, Dresden and Jena and Göttingen and Kassel. The total width of each road is 78½ feet; it is divided into two traffic lanes, separated by a grassy strip 16½ feet wide. There are no crossroads, and cars can enter and leave the road only at intervals that average 12 to 15 miles. These roads are considered among the safest and most beautiful in all Europe.

Adriatic Sea, an arm of the Mediterranean Sea that penetrates southern Europe for about 500 miles in a northwest-southeast direction. Italy is on the west and north, Yugoslavia and Albania are on the east. The Adriatic averages about 100 miles in width and is connected with the Ionian Sea, another arm of the Mediterranean on the south, by the Strait of Otranto. The only rivers of any size emptying into it are the Adige and the Po. Its chief commercial centers are Venice, Fiume, Trieste and Ancona. The opening of the Suez Canal in 1869 gave back to the Adriatic much of the commercial importance that it had enjoyed when Venice was the mistress of the Adriatic. On Ascension Day the doge used to throw a ring into the sea to show dominion over it. This ceremony was called *Wedding the Adriatic.*

The name Adriatic comes from a small town, Adria, once a seaport now 15 miles inland on the Po River.

Aegean Islands, the islands of volcanic formation in the Aegean Sea, most of which belong to Greece and constitute the Aegean and Cyclades departments of that country. Nearly all the larger northern islands, Lesbos, Lemnos, Samothrace, Thasos and Imbros (now belonging to Turkey), were famous in Greek legend or history, especially as members of the Delian League, but on account of their mountainous character they are now scantily populated. Their principal products are wine, olives, honey, figs and almonds. Mytilene, the principal city of ancient Lesbos (the modern island of Midilu), was celebrated in antiquity as the home of the poets Sappho and Alcaeus. The ancient volcano Mosychlus on Lemnos was regarded as the forge of Hephaestus, Greek god of blacksmithing. From Samothrace the Greek god of the sea Poseidon according to the *Iliad* watched the battles of the Trojan War. Between the Aegean Sea and the Sea of Crete are two groups of islands, called the Cyclades and Sporades.

Aegean Sea, an arm of the Mediterranean, about 400 miles long and 200 miles wide, bounded by Greece on the west and north and by Turkey on the east. The Aegean Sea is the original Greek Archipelago, and many of its hundreds of islands are famed in history and legend. It communicates with the Black Sea to the east through the Dardanelles, the Sea of Marmara and the Bosporus.

affluent, a stream that flows into a larger body of water. Somewhat more general in meaning than tributary, it may describe a stream that flows into a lake or bay, as well as into a larger river. The term *affluent* is derived from the Latin *affluere,* meaning to flow to.

Afghanistan, a kingdom of central Asia. It is a land-locked country, surrounded by the Turkoman Republic of the U.S.S.R. on the north, British India on the east, Baluchistan on the south and Iran on the west. Traversing it are the Hindu Kush and Western Sulaiman mountains whose height ranges from 15,000 to 25,000 feet. The Khyber Mountains are noted for the 33-mile-long Khyber Pass that affords one of the oldest trade routes from Kabul, capital of Afghanistan, to Peshawar, capital of the Northwest Frontier Province of British India; this pass has also been of strategic importance since the days of Alexander the Great and, properly fortified, can block the entrance of an invading army from or into India. The chief rivers are the Helmund, Oxus and Kabul. The area is about 245,000 square miles. The population is estimated at 11,000,000. The dominant tribes are the Duranis, Ghilzais and Tajiks, many of whom are still nomadic. The official language is Persian, although Pushtu and Turki are also spoken. Afghanistan is one of the principal strongholds of Mohammedanism.

The fertile valleys of the country make agriculture possible. The principal crops are wheat, barley, lentils, rice, millet, sorghum, tobacco, cotton, castor beans, melons and orchard fruits. In the grazing areas fat-tailed sheep, humped cows and camels are raised. The meat of these animals constitutes an important article of the natives' diet, the fat of the sheep's tail even being used as a substitute for butter. Afghanistan's mineral wealth includes iron, coal, lead, gold, silver, copper, antimony, gypsum and such precious stones as lapis lazuli, turquoises and rubies. Manufactures are carpets, shawls, felts and cloth made from camels' hair.

Until 1922 Afghanistan was an absolute monarchy, the ruler being called *amir.* Today, in accordance with the constitution adopted in 1932, the king is assisted in the discharge of his executive duties by a cabinet, headed by a prime minister. The legislative body, called the *Grand Council of State,* consists of 106 deputies, elected for a 3-year term. For local administrative purposes the country is divided into five major and four minor provinces, each ruled by a governor responsible to the king.

The capital of Afghanistan is Kabul, an old caravan trade center of about 80,000 inhabitants in the eastern part of the country. With an increased interest in education the city has become the seat of a military college, a college for administrators and a university, founded in 1932. It is also the headquarters of the recently established National Bank of Afghanistan. Telegraphic and radio installations connect it with India and other parts of Asia and with Europe. The government has deliberately excluded the railroad from Afghanistan, because it fears control of this form of communication by its British neighbor to the south or its Soviet neighbor to the north. Herat, an important caravan center in the western part of the country, was founded by Alexander the Great. The chief city of the south is Kandahar.

Africa, the continent that ranks next to Asia in size. It extends through 70° of latitude, from about 35° N. Lat. (nearly the latitude of Richmond, Va.) to the same distance south of the equator (corresponding in latitude to that of Buenos Aires, Argentina). Its length is about 5,000 miles, and its width at the broadest part in the north is 4,500 miles. At the equator it is not more than 2,500 miles wide, and its shape from there southward is roughly triangular; the southern tip of the continent is Cape Agulhas, east of the Cape of Good Hope. Africa's total area is 11,501,000 square miles, including 11,262,000 square miles for the mainland and 239,000 square miles for the adjacent islands, among which are Madagascar in the Indian Ocean and the Canary and Madeira islands in the Atlantic Ocean. This area is about 20 per cent of the land surface of the globe. The population, however, numbers approximately 150,000,000 or only 8 per cent of the total population of the world. It may be divided into four great racial groups—the Negroes of central Africa; the Bushmen of South Africa; the Hamites, divided into two great tribes, the Sudan and Bantu; and the Semites or Arabs of the Mediterranean countries.

Africa may be considered the southwestern extension of the vast land mass of Eurasia, to which it is connected by the Isthmus of Suez, some 80 miles wide. Not long ago, geologically speaking, this connection was much wider, embracing even in Pliocene times the area now covered by the Red Sea and the Gulf of Aden. Europe and Africa were once connected through the Iberian Peninsula, but now these continents merely approach each other within 9 miles at the Strait of Gibraltar, the entrance to the Mediterranean Sea. The 16,000-mile mainland coast line of Africa is almost destitute of bays, harbors and peninsulas; the principal indentations are the Gulf of Guinea on the western coast and the Gulf of Sidra on the northern coast. In this respect Africa is a sharp contrast to Europe that, despite an area one-third that of Africa, has a coast line of 50,000 miles.

Roughly speaking, Africa is a plateau, with an average elevation in its northern half of 2,000 feet and in its southern half of 2,500 feet. These figures may suggest monotony of contour, but this is not wholly correct. It is true that Africa has no mountain systems of such extent as the Rocky Mountains or the Andes, but there are a few short ranges and some high volcanic peaks. The Atlas Mountains, rising to a height of 13,000 feet, skirt the northern part of the Barbary Plateau in the north. The plateau region of South Africa consists of two sections—the Great and Little Karroo. The highest peaks are: Kilimanjaro (19,710 feet) in the Tanganyika Territory; Mt. Kenya (17,040 feet) in Kenya; and Ruwenzori (16,750 feet) between Uganda and Belgian Congo. One-third Africa's area is covered by two great desert regions—the Sahara in the north and the Kalahari in the south. The Sahara proper is found in the central part of French West Africa; its various extensions are: the Nubian Desert in the Anglo-Egyptian Sudan; the Libyan Desert in Libya and Egypt; and the Igidi Desert in the Southern Territories of Algeria. The Kalahari Desert is found in the central part of Bechuanaland.

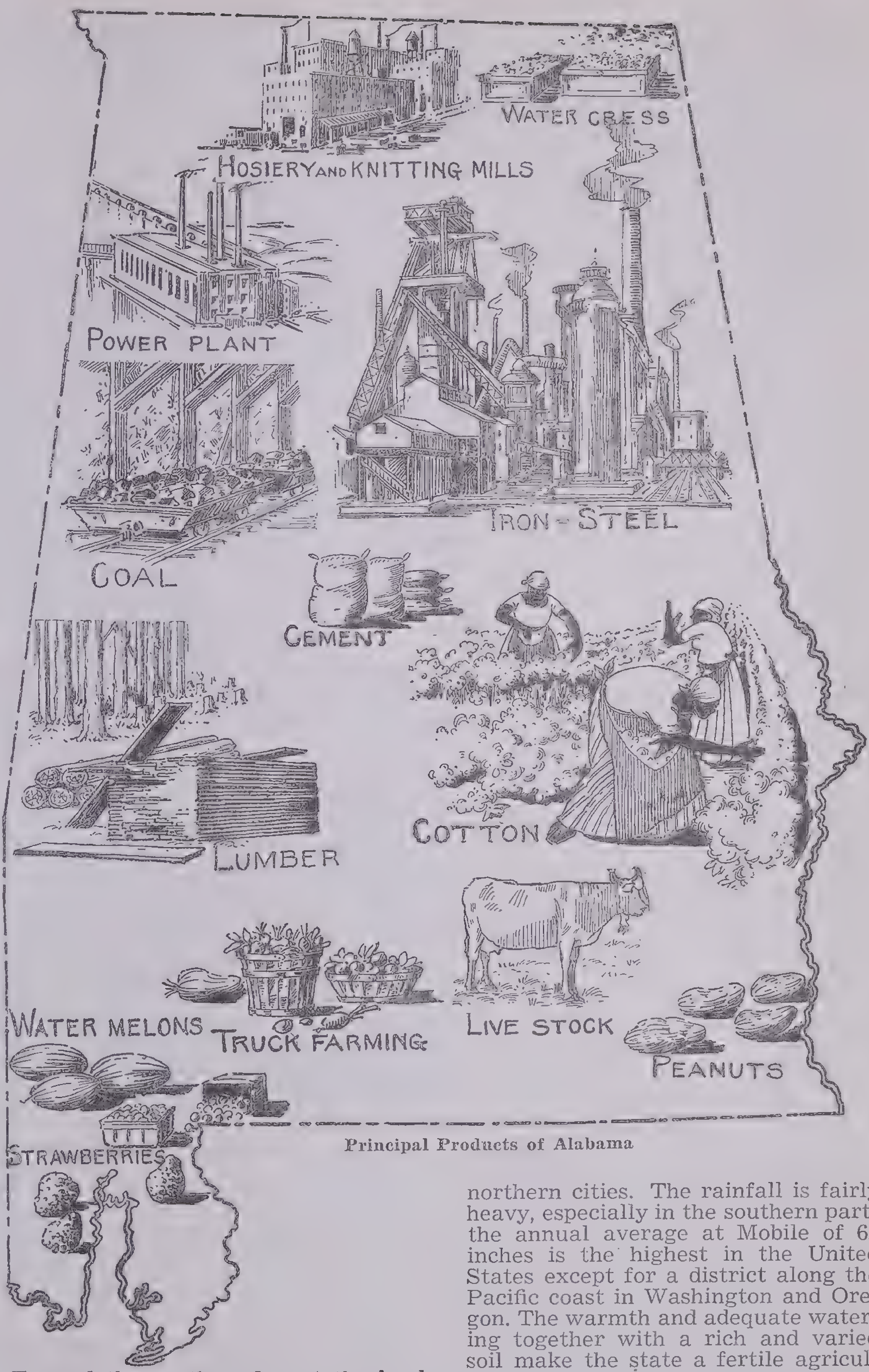
The most notable of Africa's several great river systems is the Congo, which is 2,900 miles long and drains a basin 1,500,000 square miles in extent. The Nile, which saves Egypt from aridity, is 3,600 miles long and drains a basin of 1,100,000 square miles. The Zambezi, which discharges into the Indian Ocean after an eastward course of 1,600 miles, is noted for the magnificent Victoria Falls, 343 feet high. Other noted rivers are: the Niger (2,600 miles), which flows through French West Africa and Nigeria to the Gulf of Guinea; and the Orange River (1,300 miles), which flows westward to the Atlantic near the extreme southern end of the continent. The principal African lakes are Victoria (26,000 square miles), Tanganyika (12,700 square miles) and Nyasa (11,000 square miles).

The only independent countries of Africa are Egypt and Liberia. The Union of South Africa, a member of the British Commonwealth of Nations, holds the mandate over South-West Africa. Other British dependencies are Basutoland, Bechuanaland, British West Africa (Gambia, Sierra Leone, Gold Coast, Ashanti, British Togo, Nigeria and the British Cameroons), British East Africa (Anglo-Egyptian Sudan, Uganda, Kenya, Tanganyika and Nyasaland), British Somaliland, Northern Rhodesia, Southern Rhodesia and Swaziland. France controls Algeria, French Morocco, Tunisia, French West Africa, French Equatorial Africa, French Cameroun, French Togo and French Somaliland. Italy's possessions in Africa are Libya, Eritrea, Italian Somaliland and the recently seized Ethiopia. The Belgian Congo belongs to Belgium. Spain controls Spanish Morocco, Rio de Oro and Spanish Guinea. Portugal's remaining possessions in Africa are Angola, Portuguese Guinea and Mozambique. All these countries are described in separate articles.

Until the imperialistic-minded nations of Europe sought dependencies in central Africa during the latter part of the 19th century, that continent was known as the *Dark Continent.* Interest was largely aroused through the work of such intrepid explorers as David Livingstone (and Henry M. Stanley, the journalist who found him), James Bruce and Paul du Chaillu. With the discovery of diamonds and gold in South Africa near the turn of the century, the attention of the whole world was focussed on the continent. Africa's age-long inaccessibility may be largely attributed to a lack of sheltering harbors and to cataracts and other obstacles that make its rivers unnavigable. Its isolation has been ceasing, though, with the development of modern seaports and the construction of interior railroads such as the British-controlled Cape-to-Cairo line and the French-controlled Uganda line. After science has succeeded in eradicating the tsetse fly, the great cattle scourge and carrier of a blood parasite that produces sleeping sickness in human beings, Africa will be more inviting for settlement by European colonists.

labama, one of the states of the Old South, lying in the heart of the cotton belt between Georgia on the east and Mississippi on the west. It is bounded on the north by Tennessee and on the south by the long western projection of Florida and the Gulf of Mexico. The short coast line includes the fine harbor of Mobile Bay. The area is 51,998 square miles, of which 719 square miles is water. The population is estimated at 2,832,961 (1940).

The northern part of the state is broken by the foothills of the Appalachian system, called here the Racoon and Lookout mountains, with a highest elevation of 2,400 feet. Toward the south and west the land slopes to sea level at Mobile Bay, into which the principal rivers, the Alabama and Tombigbee, drain; and the greater part of the southern and western section is a nearly level alluvial plain. In the hills of the north are the coal and iron mines that have made the city of Birmingham a great steel-manufacturing center.



Principal Products of Alabama

In common with the other states along the Gulf of Mexico Alabama has a climate that approaches the subtropical; except in the extreme north, snow and ice are little known. The mean temperature at Mobile for July is 81° F.; for January, about 52°; but the summer heat is tempered by breezes from the Gulf and less discomfort is experienced than in many northern cities. The rainfall is fairly heavy, especially in the southern part; the annual average at Mobile of 62 inches is the highest in the United States except for a district along the Pacific coast in Washington and Oregon. The warmth and adequate watering together with a rich and varied soil make the state a fertile agricultural area.

The principal wealth-producing crop is cotton, but diversified farming is reducing the cotton predominance. Corn, hay, wheat and sweet potatoes are increasingly important farm products. Alabama is one of the four great peanut-producing states, and a valuable industry is the manufacture of peanut by-products, such as oil and peanut butter. Some sugar and rice and a little tobacco are produced. Madison county in the northwest is a rich nursery center particularly noted for its cultivation and market of water cress.

The main mineral wealth of the state arises from the extensive bituminous coal fields and nearby deposits of iron ore. Small amounts of other metals are found, and there are considerable deposits of limestone and marble. A large fraction of the nation's graphite is mined in Alabama. Forests and forest products are an important part of Alabama's resources; of the states east of the Mississippi, Alabama ranks second to Mississippi in the value of its lumber.

The largest single manufacturing industry is cotton spinning. Next in importance is the iron-and-steel industry, particularly the manufacture of cast-iron pipe, in which Alabama leads the country. Other important industries are making coke and coke-oven by-products; pressing cottonseed for oil, meal cake and meal, the manufacture of cordage and twine, of paper bags and of fertilizers.

In developed hydroelectric power, Alabama is outranked only by the much more populous states of California and New York. In the northeast is the great Wilson Dam, built by the United States Government during the World War to harness the Muscle Shoals rapids of the Tennessee River. Near Montgomery in the central part of the state great dams across the Coosa and Tallapoosa rivers furnish nearly 750,000 horsepower and make Montgomery the largest power-distributing center in the South.

Alabama's largest city is Birmingham in the north-central section. Its large iron-and-steel industry has given it the name, Pittsburgh of the South. The rapidity of its growth has been phenomenal; the population increased nearly sevenfold between 1900 and 1940 and is now estimated at 267,583. The capital is Montgomery, and the most picturesque city is Mobile.

The most important higher educational institutions are the University of Alabama at Tuscaloosa and the Alabama Polytechnic Institute at Auburn. World-famous is the Tuskegee Normal and Industrial Institute for Negroes, founded in 1881 chiefly through the efforts of Booker T. Washington.

The name *Alabama* is of Indian origin, probably a variant of *Alibama* the name of an Indian tribe of the Creek confederacy.

Alamo, The, San Antonio, Tex. This adobe structure, the central building of an old Franciscan mission built by the Spanish about 1722, is now a shrine treasured in memory of Texan patriots who were here besieged and slaughtered by a Mexican army during the Texan war for independence in 1836.

Aland or **Ahvenanmaa Islands,** an archipelago of one large island and about 300 small islands at the entrance to the Gulf of Bothnia, an arm of the Baltic Sea. They were once Swedish, but belonged to Russia from 1809 to 1917. When Finland proclaimed its independence on the downfall of czarism, it claimed the islands. Sweden, however, entered a counterclaim, and the majority of the islanders, as they were Swedish in language and culture, favored annexation to that country, rejecting the plan for autonomous government that Finland had offered them. The dispute was finally settled in 1921, when the Council of the League of Nations assigned the islands to Finland because they were a geological continuation of the Finnish peninsula. At that time the islands were demilitarized, but in 1937 and 1938 anti-Russian and pro-Nazi elements in Finland both urged that they be fortified.

The area of the Åland Islands, which constitute a province of Finland, is 551 square miles; the population of the 80 inhabited islands is about 27,500. The principal town is Maarianhamina (Mariehamn). Exports include fish, meat, seal and cattle hides and dairy products. Barley, oats and other grains are raised. The Swedish name Åland, applied particularly to the largest of the group, means land of streams; Ahvenanmaa is the Finnish equivalent.

Alaska, a territory of the United States that occupies the extreme northwestern corner of the North American continent. With its area of 586,400 square miles it is the largest outlying possession of the United States. It was purchased from Russia in 1867 for $7,200,000. William H. Seward, who as Secretary of State negotiated the treaty, was ridiculed for wasting money on "a land of icebergs and polar bears," and for years the purchase was termed "Seward's Folly." The statesman defended his act by declaring that it would prove to be the most important service to his country of his entire career. Time has vindicated Seward's judgment. The wealth of the territory that lies buried in the mines, the huge timber resources, the riches to be developed from the fisheries, all these have merely been tapped and it is impossible to conjecture what will be their ultimate value.

Alaska is roughly rectangular in shape; but its western coast is deeply indented by Bristol Bay and Norton and Kotzebue sounds; along the southern coast extends the Gulf of Alaska. Bering Strait, connecting the Arctic Ocean and Bering Sea, affords a 36-mile-wide water passage between Seward Peninsula and the East Cape of Siberia. From the southeastern part projects a long, narrow land area popularly known as the *Panhandle.* It cuts off the northern part of British Columbia from the Pacific Ocean and is fringed by the Alexander Archipelago consisting of some 1,100 small islands that represent the tops of a submerged mountain range. Stretching in a great arc from the southwestern part of the mainland are the Alaska Peninsula and the Aleutian Islands. This chain of 150 volcanic islands extends so far into the Pacific that with the Commander Islands belonging to the U.S.S.R. they form a barrier between that ocean and Bering Sea. North of the Aleutians lie the Pribilof Islands. Both these groups are described in separate articles. Other large islands or island groups include: Kodiak, Semidi and Shumagin in the Pacific Ocean; and St. Lawrence and Nunivak in Bering Sea.

More than half Alaska is mountainous. In general the greatest elevations are along the southern coast, especially in the Mt. St. Elias Range. Among these peaks are Mt. St. Elias (18,008 feet high), Mt. Fairweather and Mt. Crillon. Mt. Wrangell, an active volcano, is 14,005 feet high. Further evidence of volcanic activity is found in the Katmai National Monument near the base of the Alaska Peninsula; the eruption of Mt. Katmai in 1912 resulted in the formation of innumerable tiny volcanic vents that have given to the region the name, Valley of Ten Thousand Smokes. The highest point in the territory and indeed on the North American continent is in the Alaska Range where Mt. McKinley rises to a height of 20,300 feet; the area surrounding it has been set aside as Mt. McKinley National Park. The northernmost mountains are the Baird Mountains and Endicott Range. In the far northern part the land slopes gradually to the Arctic Ocean.

The chief river of Alaska is the Yukon, 2,300 miles long. It is formed by the junction (near Fort Selkirk, British Columbia) of the Pelly and Lewes rivers, and it flows in a general northwestward direction across the plateau of central Alaska until it empties into Bering Sea; its chief tributary is the Tanana. Among other important rivers are the Kuskokwim, Susitna and Matanuska. The most famous of Alaska's 1,000 glaciers are the Malaspina, at the seaward base of Mt. St. Elias, and the Muir, formed on the eastward slope of Mt. Fairweather and flowing slowly toward Glacier Bay, a national monument area.

There are wide differences in the climate of the territory. In the northern third, above the Arctic Circle, Arctic conditions prevail, and only for about 6 weeks in midsummer is the Arctic Ocean free of ice. In the interior the thermometer may register in winter 60° below zero, and in the short summer it may reach as high as 90°. The coast region of the Panhandle has a remarkably mild climate and for a considerable part of the year has much rainfall. At Sitka the temperature, moderated by the mild ocean winds that accompany the North Pacific Current, compares favorably both in summer and winter with that of Philadelphia.

Of Alaska's population (about 60,000), about half belongs to the five native groups, of which the Eskimos are the most numerous, numbering possibly 15,000. The other groups, including the Aleuts, Thlinkits, Haidas and Athabaskans, are believed to be racially akin to the North American Indians. Most of the people live along the coasts and on the numerous southern islands. Since the depression, several hundred American farmers who were disastrously effected during the drought years have taken advantage of the Government's offer to provide them with land to settle in the Matanuska Valley.

The hardy cereals, especially winter wheat and rye, are grown in Alaska, and near the towns truck gardens flourish. It seems surprising that strawberries, currants and raspberries are raised in large quantities. Beekeeping and poultry raising also have

Courtesy Alaska Steamship Company

Fishing Fleet, Gold Mine, Mountains—An Alaskan Landscape

Fishing and gold mining, two of Alaska's great industries, are shown side by side along the harbor of Juneau, the capital. The vast crushing mills of the Alaska-Juneau Gold Mine start at the bottom near the water and ascend in immense stairstep fashion halfway up the green mountainside of the Coast Range. They are warehouselike buildings with grey sides and bright red roofs. Running from them, on a level with the upper building, are tracks and strings of little ore cars scooting along the mountain side. The ore is brought in trains through miles of underground tunnels and yields about $1.50 in gold per ton. The Alaska-Juneau Mine is the largest gold mine in Alaska, and one of the largest low-grade quartz mines in the world. It employs about 900 men the year round

been introduced, and there is some grazing. The Eskimos and other natives live largely on fish and the flesh of the reindeer; the reindeer are mostly raised in domesticated herds that were introduced by the Government from Lapland and Siberia about 1900 and that now number about 800,000.

Sealing under government auspices on the Pribilof Islands is the most important fur industry; some 50,000 of these animals are killed annually for their skins. As in certain Canadian provinces, raising blue and white foxes, mink and other fur-bearing animals on fur farms has been introduced. At Alaskan canneries some 250,000 pounds of salmon are packed each year. The other important fish catches are of halibut, cod, herring and sardines. The days of Alaskan whaling have long since been only a memory.

The output of gold is less than in the early days (1896–1900) but averages in value about $18,500,000 a year. Other mineral resources are copper, silver, coal, lead, tin, platinum, antimony, gypsum, tungsten, graphite, mercury, marble and petroleum. Alaska has 21,392,000 acres set aside in timber reservations. The principal trees are the spruce, hemlock, birch and cedar, utilized mostly in the woodpulp, veneer and furniture industries.

The Alaska Railroad, a government undertaking, is about 600 miles long, counting its branches. The main line, completed in 1923, runs from Seward on the southern coast of the Kenai Peninsula to Fairbanks in the interior. Coastwise steamers also provide uninterrupted service between the ports of southern Alaska and Puget Sound, but northern points, such as Nome, are reached only during the summer months. The airplane, however, provides quick transport to any part of the country from Nome, Fairbanks and Anchorage.

The principal settlements are those along the coast. Starting at the southeastern end and going up the coast there are Ketchikan, Petersburg, Sitka, Juneau, Skagway, Valdez, Seward and Anchorage; on the western coast is Nome and to the far north, Point Barrow. Juneau, the capital, has a population of 4,037. Fairbanks, the largest town in the interior, has 2,099 inhabitants.

Alaska was created a territory by Act of Congress in 1912 and has since been governed by a Territorial Legislature consisting of the Senate of 8 members elected for a 4-year term, and the House of Representatives of 16 members elected for a 2-year term from the 4 judicial districts. The executive authority is vested in the governor and territorial secretary, each appointed by the President of the United States for a 4-year term. Like Hawaii, Alaska sends a delegate to the Congress of the United States, but he has no voice, except upon matters pertaining to the Territory, and no vote.

The name *Alaska* is derived from a native Indian word *alayeska,* meaning great country. During the Russian regime, dating from the discovery of the territory by Vitus Bering in 1741 until its sale to the United States in 1867, it was known as *Russian America.*

Albania, a kingdom of southern Europe, located in the western part of the Balkan Peninsula and bounded by Yugoslavia on the north and northeast, Greece on the south and southeast and the Adriatic Sea on the west. It is one of the most mountainous countries of the Continent, lying athwart the Dinaric Alps and possessing only a narrow, marshy littoral. Its principal river is the Drin, whose tributaries, the White and Black Drin, both rise in Yugoslavia. Lake Scutari is the chief lake. The area of the country is 10,629 square miles; the population is about 1,003,000.

The Shkumbi River has been one of the principal arbiters of the country's destiny, those living north of it being called *Ghegs* and those to the south, *Tosks.* The Tosks have attained a higher standard of civilization than the more primitive, nomadic tribes of the north. As a result of Turkish rule almost 70 per cent of the Albanians are Mohammedan in religion. Living in the north is a Roman Catholic element, about 10 per cent of the population; and in the south more than 15 per cent of the population is of the Albanian Orthodox Church. The vendetta or blood-feud has been one of the traditions of this people among whom clan law and custom have existed since time immemorial. For this reason many of the houses, such as those near Berat, are fortified.

The principal products are grain, wool, hides, lumber, tobacco, rice, olives and olive oil. Exploitation of the country's mineral wealth—asphalt, bitumen, petroleum, coal and iron—is largely in the hands of foreign concessionaires. With the aid of Italian financing the Corporation for the Economic Development of Albania has been formed; and the greater part of the country's exports go to Italy. Albania has only a few miles of railroads; most transportation is either by primitive pack-mule and buffalo wagon or by the modern automobile and airplane.

Composed of two former Turkish provinces, Scutari and Yanina, and several vilayets, Albania became a nation with the support of Italy and Austria-Hungary at the close of the Balkan Wars in 1913. Prince William Frederick of Wied was selected by these powers as ruler of the Albanian principality, but he held his throne for only 6 months in 1914. After the outbreak of the World War Italian troops occupied southern Albania, and the Serbs seized the northern part. After the Armistice the Italians extended their sphere and did not evacuate the country until the signing of the Rapallo Treaty in 1920.

In 1922 Ahmed Zogu became prime minister of the provisional government, which had been in existence since 1917, and 3 years later, on the proclamation of Albania as a republic, was elected President. Through the support of Italy, who wished to keep the Adriatic an "Italian lake," the Republic became a kingdom in 1928, with Zogu ruling as Zog I. It was conquered by Italy in 1939, and the scene of war between Italy, Germany and England, Greece in 1940-'41.

The capital of Albania is Tirana (Tiranë), inland a few miles from the seaport, Durazzo (Durrës), which was the seat of government until 1925. Tirana is a medieval town of 30,000 population, noted for its bazaars and mosques. Through the establishment of Technical College and other institutions it is now the center of the country's educational system. Looming above it are the ruins of the fortress of Kruja, where almost 500 years ago the national hero George Castriota or Skanderbeg kept the Turks at bay for nearly 25 years through guerilla warfare. Butrinto in the south has been attracting archaeologists since the discovery of Greek, Roman and Byzantine ruins. Other historic towns are Scutari (Shkodra), Valona and Koritza.

Aleutian Islands, a chain of about 150 volcanic and somewhat barren islands that belong to the United States; they stretch west in a curving line from the southwestern part of Alaska for a distance of 1,100 miles. With the Commander Islands off the Kamchatka peninsula in Siberia they separate Bering Sea from the Pacific Ocean and cover a total area of 6,391 square miles. They are divided into four groups—Fox, Rat, Andreanof and Near islands—and take their name from the Russian word *aleaut,* meaning bald rock.

Unimak, the largest island of the Aleutian chain, is 65 miles long and 25 miles wide and possesses the active volcano, Mt. Shishaldin, 8,000 feet high. Dutch Harbor on the other large island, Unalaska, is important as a naval coaling station and as headquarters for the United States Coast Guard vessels that patrol the Pribilof and other Alaskan sealing islands. The most important industries are fishing for cod and halibut, spearing the fur seal and fox trapping. The natives, called *Aleuts,* number about 1,500 and more closely resemble the typical American Indians than do the Eskimos.

The Aleutian Islands were discovered in 1741 by Vitus Bering, a Danish navigator in the employ of the Russian Government, and were at first called the Catharine Archipelago for Catharine the Great. They have belonged to the United States since the purchase of Alaska in 1867 and are governed as a part of Alaska. Excavations on the islands show a pre-Columbian civilization that may have been the link between Asia and North America in eastward migrations to the latter continent.

Algeria, a country of North Africa that has been under French dominion since 1830. The Mediterranean Sea laps its northern shoreline. On the west is Morocco and on the east, Tunisia and Libya. The southern part of the country gradually merges into the Sahara Desert that also forms the northern part of French West Africa. The total area, including the Northern and Southern territories, is 847,552 square miles. The population (about 6,500,000) is largely an admixture of Berber and Arab strains. About one-sixth of the population is Europeans, principally French, Spanish and Italians.

Courtesy French Chamber of Commerce

Moorish Women of Oran, Algeria

Two ranges of the Atlas Mountains, the Tell Atlas and the Saharan Atlas, run through central Algeria parallel to the sea. The 100-mile wide coastal plain, known as the Tell, is an excellent agricultural region where wheat, barley, oats, tobacco, cotton, almonds, artichokes, tomatoes and legumes are raised. Algeria is also a great fruit-raising country; the chief products are grapes, dates, figs, olives, pomegranates, apricots and citrus fruits. The Shatt Plateau between the Tell and the Tell Atlas Mountains offers good grazing lands for sheep, goats, cattle and camels; it takes its name from the numerous remnants of salt lakes and swamps.

Algeria's mineral wealth is iron, zinc, copper, lead, mercury, tin, antimony, phosphates and petroleum. The chief forest product is cork. Carpet-weaving is the leading industry. Included in the profitable fisheries are sponges, coral, sardines, anchovies and tunny fish.

Algeria has a semiautonomous government. In one sense it may be considered a colony and in another sense an integral part of France. Executive authority is vested in a governor-general, but the three departments of the Northern Territory—Algiers, Oran and Constantine—are each represented in the French National Assembly by 1 Senator and 3 Deputies.

The most important city is Algiers, the capital. Said to have been founded in 944 A.D., it was for centuries the chief city of the Moorish Empire. Although the rather squalid native quarters still exist, the modern part of Algiers today resembles any progressive European city. Its gleaming white buildings, including the Roman Catholic Cathedral, Central Post Office and Museum of Antiquities, are an effective adaptation of Moorish architecture. It is also the seat of the Government University and the headquarters of the 19th Army Corps, a picturesque unit of which is the Foreign Legion, recruited from soldiers of fortune of all nationalities. Through its location on the Bay of Algiers the city is Algeria's most important seaport. The population is about 250,000. Among other important cities are Oran, Bougie, Philippeville and Bone, all attractive winter resorts. The principal inland city is Constantine.

The name *Algeria* is derived from the Arabic *Al-jazirah,* meaning island. In Roman times the country was known as Numidia.

alluvial fan, the sediment of earth or mud, sand, gravel and stone, deposited in fan-shaped flood plains along the banks of a river, at its mouth or at the junction of two rivers. It may also be heaped in semicone-shaped mounds at the base of a mountain down which a river has coursed as in the Great Basin region. The deltas of the Nile and Mississippi rivers are examples. The terms *alluvial* and *alluvium* are derived from the Latin *alluere,* meaning (to wash against.

Alps, the most extensive mountain system in Europe. It covers most of Switzerland, the principal ranges being the Bernese, Urner, St. Gotthard and Emmenthal, and extends into the eastern departments of France where the Maritime and Cottian Alps separate that country from Italy and the Graian Alps form an almost 15,000-foot high barrier between France and Switzerland. On the south the Pennine, Lepontine and Engadine Alps rise between Switzerland and Italy; the Dolomite and Carnic Alps form a barrier between Austria and Italy, and the Julian Alps shut off Italy from Yugoslavia. Surpassing even the Swiss Alps in beauty are the Tirolean and Rhaetian Alps of western Austria, including the Ötztal, Hohe Tauern, Zillerthal and Stubai ranges. The extension of this system toward the west is the Bavarian Alps. Among the Alpine ramifications of the Balkan Peninsula are the Dinaric Alps of Yugoslavia and the Transylvanian Alps of Rumania. The Carpathian Mountains, extending along the boundary between Czechoslovakia and Poland, form the easternmost wing of the Alps.

The main Alpine system has a total length of 650 miles, stretching from the Ligurian Range that encircles the cities along the Gulf of Genoa to the Wienerwald of northern Austria. Its greatest breadth of 160 miles is from the Bavarian Alps to the Apennines of Italy. The total area covered by the system is 90,000 square miles. The highest peaks are Mont Blanc (15,781 feet) in France and Monte Rosa (15,217 feet), the Matterhorn (14,780 feet) and the Jungfrau (13,672 feet) in Switzerland. Only during the last 150 years have mountaineers attempted to climb these peaks, for there clung to them the medieval belief that they were the abode of monsters.

Probably the most famous of the 1,500 Alpine glaciers are the Rhone, source of the Rhone River, and the Mer de Glace on the northern slope of Mont Blanc. During the glacial age most of the beautiful Alpine lakes were formed; among the more spectacular ones are lakes Lucerne, Geneva, Constance, Neuchatel, Zurich, Lugano and Maggiore. In addition to the Rhone River the Rhine and the Po and Danube through their tributaries, the Ticino and Inn, have their sources in the Alps.

The Alps also have many passes of great historic interest. Connecting Switzerland and Italy are the Simplon, Great and Little St. Bernard and Splugen passes. The Brenner Pass affords the easiest route between Austria and Italy. The Simplon and St. Gotthard passes of southern Switzerland are pierced by railroad tunnels, respectively 12.25 and 9.25 miles in length.

The word *Alps* is derived from the Celtic *alb,* meaning high or white.

Amalfi Drive, a highway (completed in 1852) that extends along the Gulf of Salerno, an arm of the Tyrrhenian Sea, from Sorrento to Salerno via Amalfi. It is one of the most scenic roads in all Europe. For nearly the entire length of 30 miles it has been hewn through the cliffs of the coast and in many places is supported by viaducts 100 to 500 feet high. The road skirts several fishing villages, and along it are numerous watch towers, erected in the 16th century as a protection against the Barbary pirates. A northern extension along the Gulf of Naples passes through Pompeii and Herculaneum, which were destroyed by an eruption of Vesuvius in 79 A.D.

Amazon, a river in South America, 3,854 miles long. It is formed by the junction on the Ecuador-Peru boundary of two rivers, the Marañón and Ucayali that rise in a chain of glacier-fed lakes on the eastern slope of the Andes. It flows from west to east across northern Peru and Brazil and enters the Atlantic at the equator. The Amazon with its more than 200 affluents constitutes the largest river system in the world in volume. It is navigable to ocean steamers for a distance of 2,300 miles; smaller vessels may go 500 miles farther. The drainage area is 2,722,000 square miles, one-third of South America and nearly as much as the area of the United States. The population of this basin is about 2,000,000; all but 200,000 of these live in Brazil.

Some of the main tributaries of the Amazon are: the Madeira, a stream 2,000 miles long; the Rio Negro (1,400 miles) and the Tapajoz, 1,200 miles long. Theodore Roosevelt on his expedition in 1913–14 discovered and explored a branch of the Madeira that was first called the River of Doubt but later named Rio Teodoro. The mouth of the Amazon and that of the Tocantins or Para, which empties into the Atlantic just below it, form an estuary more than 200 miles wide in which lies Marajo, an island as large as Denmark. The huge waves at high tide occasionally create in this estuary the distinctive Amazon bore called the *pororoca;* it attains a height of 20 feet or more and its influence is felt for nearly 400 miles up the river.

The heavy tropical rainfall makes the volume of water discharged into the Atlantic by the Amazon so large that a different color and freshness are maintained for more than 100 miles out into the ocean. It has also built up a huge delta, 125 miles in length.

The name *Amazon* was given to the river by Francisco de Orellana, a Spanish explorer who made the descent from the Andes to the sea in 1541. He found that in certain tribes the women assisted the warriors in battle and applied the name of the women of the Greek legend to the river and to the district around it, which is still called *Amazonas* in western Brazil.

Amsterdam, the largest city and the commercial center of the Netherlands, located in the province of North Holland at the junction of the Y, an arm of the Zuider Zee, and the Amstel River. One of the most important ports of Europe, it is connected with the North Sea by the Noordzee Kanaal, in which are some of the largest locks for lifting ocean vessels. At the suburb of Schiphol is one of the largest European airdromes, from which planes operate over a regular route to Netherland India. The city consists of some 100 islands, with 350 bridges spanning the 50 canals. It has been built on piles in a vast marsh, thereby providing the answer to Erasmus's riddle that Amsterdam was that town in which the people lived like crows in the tops of trees. With The Hague it shares honors as the capital of the Netherlands, being styled the constitutional capital. The population is more than 750,000.

Amsterdam is unique in being the greatest diamond-cutting city in the world. The industry started there among the Jews, when the Netherlands had the larger part of Europe's overseas commerce in the 17th century. In addition to shipbuilding the manufactures include sugar, soap, glassware, cigarettes, machinery and cotton, wool and silk materials. The Stock Exchange and Bank of the Netherlands are among the leading European financial institutions. Amsterdam was the home of Rembrandt, and many of his paintings, such as the *Night Watch* and the *Syndics of the Cloth Hall,* are preserved in the Rijks or National Museum that houses more than 3,000 works of Dutch and Flemish masters. There are also the Municipal Museum (noted for its Van Gogh collection) and the Colonial, Fodor and Willet Holthuizen museums. The Royal Palace, built originally in 1648 as the Stadthuis or Town Hall and serving as the nucleus of the city, is a fine example of classicism. The carillon in its tower is one of the most famous "singing towers" in all Europe.

The Gothic Oude Kerk or Church of

Courtesy Netherlands Railways

Intersection of Two of Amsterdam's Canal Streets

St. Nicholas dates from about 1300. The Nieuwe Kerk or Church of St. Catharine, completed in 1478, is the scene of the coronation of the Dutch sovereigns. As a Dutch Westminster Abbey it contains the tombs of Admirals de Ruyter, van Galen and van Speyk and monuments to the poet, Joost van den Vondel, and other great Dutchmen. There are also the modern Roman Catholic Church of St. Nicholas, the Westerkerk and the Zuiderkerk.

The principal thoroughfare of Amsterdam is the Kalverstraat, which runs from the Dam or central square on which is located the Royal Palace to the Munt. The most picturesque canals are the Singel, Prinsen, Keizers and Heeren grachten. The leading park is the Vondel Park, named for the poet. Of considerable importance are the zoological and botanical gardens, to which is attached an ethnological and natural history museum.

Amsterdam is the seat of the State University, founded in 1632 as the *Athenaeum Illustre,* and of the Free University, dating from 1880. It is also the headquarters of the Royal Academy of Sciences, Royal Dutch Geographical Society and Society for the Public Welfare and possesses the National Academy of Arts. In the new southern residential part of the city, called the *Apollo Quarter,* are some striking examples of modern architecture. This section contains the stadium, which was the scene of the 1928 Olympic games.

The name of the city (formerly Amstelredam) means the dam or dyke of the Amstel. It was founded in the 13th century as a fishing village, being held by the lords of Amstel. Behind the dyke, which was built to keep out the sea, there developed during the 15th century a fortified city which later served as a refuge for Flemish Protestants from Antwerp and Brabant and for French Huguenots who fled after the revocation of the Edict of Nantes. Amsterdam owes its great development in the 17th century largely to the concessions to the independent and Protestant Netherlands, confirmed in the Treaty of Westphalia at the close of the Thirty Years' War in 1648, and especially to the closing of the Scheldt, whereby the trade of its rival city, Antwerp, was ruined.

anchor ice, the ice mass that forms on the bottom of a river, lake or shallow sea but rises to the surface. The process is especially noticeable in the Baltic Sea and its arm, the Gulf of Finland, and in the Gulf of St. Lawrence, the shores of which are strewn with boulders that were once part of the bed of the St. Lawrence River. After being brought to the surface with the ice mass these boulders were transported for miles in the spring, when the mass began to thaw and huge blocks of ice were floated downstream. The term was borrowed from that applied to ice that sometimes forms around the anchors of vessels lying in winter in northern estuaries and fiords, kept navigable by icebreakers. Another term for anchor ice is *ground ice.*

Andaman Islands, a group of islands of volcanic origin in the Bay of Bengal, belonging to Great Britain. There are six large islands—North, Middle and South in the Great Andaman group and Interview, Outran and Henry Lawrence in the Little Andaman group—and about 200 islets. Extending a distance of 219 miles they cover an area of 2,508 square miles. From the forests of satinwood and other trees large quantities of timber are taken. The agricultural products include coffee, tea, cacao, coconuts and hemp. The capital is Port Blair on South Island. Excellent anchorage is afforded also by Port Cornwallis on North island.

The native population of Negrito stock mixed with Indian, Arab and Malay blood is about 15,000 and is divided into 12 tribes, each with its own language and customs. Like their neighbors of the Nicobar Islands the Andamans practice flattening a child's head in infancy so as to make it broad-headed. About half the total population of 26,833, however, are convicts, for since 1858 the Andaman Islands have been used by the Indian Government as a reformative colony. As a British possession they are administered by a chief commissioner, who is responsible to the Indian Office for the administration of the Nicobar Islands also.

Andes, the principal mountain system of South America, extending the entire length of that continent parallel to the Pacific Ocean. Starting in northwestern Venezuela, this system covers a distance of 4,500 miles before it ends in the archipelago of Tierra del Fuego. In Colombia three separate ranges are formed—Cordillera de Bogota (eastern), Cordillera del Quindio (central) and Cordillera de Choco (western). The Guaviare River, one of the principal tributaries of the Orinoco, and the Magdalena, Colombia's chief river, rise in the eastern range. In Ecuador the mountains arrange themselves in two chains called Cordillera Guacamayo and Cordillera Galeras. They are famous for their numerous volcanic peaks, the highest of which are Mt. Chimborazo (20,702 feet) and Mt. Cotopaxi (19,550 feet).

On the border between Ecuador and Peru the Andean system broadens again into three ranges called the Cordillera Blanca, Cordillera de Huayhuash and Cordillera de Huarochiri. After merging in the Nudo de Vilcanota in the central part of Peru the system emerges in the southern part as the Western, Central and Eastern Cordilleras and continues under these names in southwestern Bolivia. The plateau of northeastern Bolivia is traversed by several branches of the Andes, including the Azanaques, Frailes and Lipez ranges. The highest peak in Peru is Cerro Huascan (21,812 feet). In Bolivia are Mt. Sahama (22,349 feet), Mt. Illampu (21,286 feet) and Mt. Illimani (21,181 feet). On the border between Peru and Bolivia lies Lake Titicaca, 12,507 feet above sea level. The Ucayali, Maranon and other streams that rise in the Peruvian Andes constitute the headwaters of the Amazon River. In southern Peru and Bolivia the Andes attain their maximum width of 500 miles.

The Andes are reduced to a single range along the northern part of the boundary between Chile and Argentina, but at 30° S. Lat. they widen into two ranges that continue southward as the Patagonian Andes and the South Chilean Andes. The country that lies between them is known as the Puna de Atacama. The highest peaks are Mt. Aconcagua (22,834 feet) in Argentina and Cerro del Mercedario (22,302 feet) in Chile. The most famous Andean pass is the Uspallata Pass between Argentina and Chile; since 1910 it has been the route of the only transandean railroad. The other passes of these mountains have been crossed since time immemorial with the aid of llamas and pack mules.

The climate of South America is largely affected by the Andes. In the northern part of the continent the winds that accompany the South Equatorial Current blow inland, deluging the montana region (as the eastern slopes of the Peruvian Andes are called) with tropical rains and supplying the Amazon with the largest volume of water of any river in the world. Since these winds cannot cross the Andes, western Peru and northern Chile are largely arid. But the central and southern parts of Chile are watered by the winds that accompany the Peruvian Current from the Antarctic. As these winds cannot cross the mountains, a semiarid condition exists in the plains region of Patagonia in southern Argentina. The path traversed by the Andes marks one of the famous earthquake belts of the world, and most of the cities from Caracas to Valparaiso have at some time been devastated.

The name *Andes* has been traced to a word of the Quichua Indians of Peru, meaning copper and referring to the large quantity of that metal found in these mountains.

Andorra, an autonomous and semi-independent state, nestling in the Pyrenees Mountains on the boundary between France and Spain about 80 miles west of the Mediterranean. Its area is 191 square miles, and its population numbers 5,231. Sheep raising is the principal industry; the chief agricultural product raised for export is tobacco. The mineral wealth includes silver, iron and lead. Andorra is one of the oldest republics, having received its independence (according to tradition) from Charlemagne for aid rendered against the Moors. In the 13th century the French count of Foix and the Spanish bishop of Urgel established a joint protectorate over the realm; evidence that this "protectorate" exists today is the payment of an annual tribute to the French state and the Spanish bishopric. The capital is Andorra la Vieille. The governing Council General is composed of 24 members elected for 4 years. Most of the people speak a Spanish dialect called *Catalan.* French influence, though, has predominated since Napoleon granted Andorra its constitution in 1806.

Anglo-Egyptian Sudan, a country of northeastern Africa that until the re-

Courtesy Argentine Information Bureau

Christ of the Andes

The *Christ* statue surmounts La Cumbre Pass in the Andes Mountains on the frontier between Argentina and Chile at Puente del Inca, Province of Mendoza. The statue was erected by the organized workers of the Argentine Republic as a monument to permanent peace between Argentina and Chile. The statue carries the following inscription (translation): *Sooner shall these mountains crumble into dust than the peoples of Argentina and Chile break the peace which at the feet of Christ the Redeemer they have sworn to maintain*

volt led by Mahdi Mohammed Ahmed in 1881–84 was called the Egyptian Sudan and that since its reconquest under Lord Kitchener in 1898 has been jointly administered by Egypt and Great Britain. The country lies within the Torrid Zone, its northern boundary being only 1° south of the Tropic of Cancer and its southern boundary extending to within 4° of the equator. On the north is Egypt; on the east, the Red Sea, Eritrea and Ethiopia; on the south, Uganda and Belgian Congo, and on the west, French Equatorial Africa and Libya. The area (including the western division of Darfur) is 1,008,100 square miles. The population, numbering about 5,606,000, is partly Arab, partly Nubian and partly Negro.

In the northeastern part of the Anglo-Egyptian Sudan is the Nubian Desert, an extension of the Sahara Desert. The central and southern parts of the country are fertile, being well watered by the White Nile and the Blue Nile and their numerous tributaries. The chief agricultural product is cotton with a crop that amounts to some 35,000 tons each year. The most important grains are durra and sesame. In the grazing areas cattle are raised. The Anglo-Egyptian Sudan produces a large portion of the world's supply of gum arabic and exports vast quantities of ivory, dates, palm nuts and ostrich feathers (when they are in fashion). Iron, gold, copper and salt constitute the country's mineral wealth. Its economic importance has been enhanced by the Cape-to-Cario Railroad that parallels the Nile for 1,100 miles.

The governor-general of the Anglo-Egyptian Sudan is appointed by the king of Egypt on the advice of a council and with the consent of the British Government. For local administrative purposes the country is divided into 13 provinces, each under a governor; these provinces, in turn, are divided into numerous districts, each administered by a district commissioner. The Egyptian flag and the British Union Jack are flown side by side. Great Britain maintains a tenacious hold on the Anglo-Egyptian Sudan to protect the Cape-to-Cairo Railroad and its numerous dependencies along the eastern coast of Africa.

The capital of the Anglo-Egyptian Sudan is Khartoum (population about 50,000). It is located at the junction of the White Nile and the Blue Nile and will long be remembered as the scene of the gallant attempt of General Charles G. (Chinese) Gordon to stay the Mahdist insurgents. Under the codominion rule of Egypt and Great Britain it has developed into a fine modern city. The greatest native city of Africa is Omdurman (population more than 100,000), a few miles west of Khartoum on the White Nile. The other leading towns are Meroe, Suakin, El-Obeid and Port Sudan.

The name (Anglo-Egyptian) *Sudan* is derived from the Arabic term *Beled-es-Sudan,* meaning the country of the blacks.

Angola, a Portuguese colony in southwestern Africa, also known as Portuguese West Africa. Its coastline extends southward from the mouth of the Congo River for about 1,000 miles along the Atlantic Ocean. Southwest Africa, over which the Union of South Africa holds a mandate, is on the south; Northern Rhodesia, on the east; and Belgian Congo, on the north. The interior of Angola is part of the vast African tableland. It is watered by numerous rivers, chief of which are the Kunene in the south and the Kwanza and Kwango in the north. The area is 486,079 square miles. The population, predominantly of Bantu-Negro stock, is more than 4,000,000; included in this figure are some 40,000 Europeans, 90 per cent of whom are Portuguese.

The chief agricultural products are coffee, corn, wheat, sugar cane, cotton, tobacco, coconuts, castor beans, cacao, manioc, bananas, pineapples and guavas. The forests yield rubber and various gums. The output of petroleum is becoming an important factor in Portugal's mineral wealth. The country's other minerals include copper, iron, coal, gold, silver, lead, manganese, malachite, salt, asphalt and diamonds. Ivory and whale oil are among the leading exports.

The home government in Lisbon has vested in the high commissioner of Angola wide executive power. For local administrative purposes the country is divided into 14 districts, each administered by a district governor. The capital since 1928 has been Nova Lisbôa (New Lisbon). Previously it was Loando (or São Paulo de Loando), founded in 1576, a year after Portugal occupied the territory. Loando is an important seaport, but Lobito is beginning to rival it. Among other important towns are Ambriz, Benguela, Mossamedes and Novo Rodondo.

Antarctic Circle, an imaginary line around the earth parallel to the equator, all points on which are 23½° distant from the South Pole. It marks the southern boundary of the South Temperate Zone, in the lower part of which, the Cyclonic Zone, the climate is colder than in the northern part or Subtropical Zone. It is also the northern boundary of the South Frigid Zone, where the cold increases and occasionally reaches 70° below zero in regions adjacent to the South Pole.

The sun in its southward journey reaches the Tropic of Capricorn, which is 23½° south of the equator, on December 22, when it is directly over that imaginary line there is little twilight in the region bounded by the Antarctic Circle. At the South Pole itself, there is continuous daylight from late September to the latter part of March because the Southern Hemisphere is tipped toward the sun and oblique rays of the sun reach all parts of the Antarctic Circle.

When the sun reaches its northernmost point over the Tropic of Cancer on June 21, there is no night at the North Pole and no daylight in Antarctica around the South Pole, as the sun's rays fail to reach it by 23½°. Disregarding the effects of refraction of light, darkness prevails at the South Pole for 6 months. During spring and fall, when the sun both rises and sets in the Antarctic Circle, and also during summer there is occasionally observed shortly after sundown in southern Chile and Argentina the luminous phenomenon called the *aurora australis,* which corresponds to the aurora borealis of the Northern Hemisphere.

The word *Antarctic,* meaning opposite the bear, is of Greek origin; it refers to the Great Bear or Ursa Major, the principal constellation above the Arctic Circle.

Antarctic lands and seas, the region occupying the South Frigid Zone, with a land area of approximately 5,000,000 square miles and a water area of 5,700,000 square miles; it is bounded by the Atlantic, Pacific and Indian oceans and is divided into four sections—the Ross, Weddell, Enderby and Victoria quadrants.

The continent of Antarctica is about 800 miles south of South America, 2,000 miles south of Australia and 2,300 miles south of Africa. Its northern border at 60° S. Lat. is about 1,700 miles from the South Pole. The surface is plateaulike and mountainous, the principal feature being the Rockefeller Range that rises to a height of 15,500 feet and at the foot of which both Amundsen and Byrd established their bases; Byrd named his base Little America. Among the important mountains are Mt. Erebus, a dormant volcano, Mt. Gaass and Mt. Sabine. Amundsen discovered the Queen Maud Range; and Ellsworth, Eternity Range.

The South Pole is on a plateau about 10,200 feet above sea level and covered by an icecap more than 2,000 feet thick. On the side of Antarctica nearest New Zealand is a blockade of ice that rises abruptly from the ocean to heights of 200 to 300 feet and extends 400 miles from Ross Island to King Edward VII Land; it is called the Great Barrier or the Ross Barrier (for Sir James Ross who discovered it in 1842).

In winter the Antarctic Ocean (which some geographers consider a southern extension of the Atlantic, Pacific and Indian oceans) is a solid ice pack; during the Antarctic summer, however, the ice pack breaks up into floating blocks called *icebergs.* Its chief seas are the Ross (between Edward VII and South Victoria lands) and the Weddell (between Graham and Coats lands). It has an average depth of 2,000 fathoms (12,000 feet). Two Antarctic currents (Peruvian and Benguelan) sweep the coasts of adjacent continents, and the Antarctic Drift skims the edge of the Antarctic Circle.

ANTARCTIC EXPLORERS

Commander	Nationality	Date	South Latitude	Longitude
James Cook..	British	1773	67° 31′	135° W.
James Cook..	British	1774	71° 10′	107° W.
Bellingshausen	Russian	1820	69° 25′	1° W.
Weddell......	British	1824	74° 15′	34° W.
D'Urville.....	French	1840	66°	140° E.
Wilkes.......	British	1840	70°	105° W.
James Ross...	British	1841	78° 4′	167° E.
James Ross...	British	1843	78° 10′	161° E.
Larsen.......	Nor.	1893	69° 10′	76° W.
Christiansen..	Swedish	1895	74°	170° E.
De Gerlache..	Belgian	1899	71° 30′	87° W.
Borchgrevink.	Br.-Nor.	1900	78° 50′	165° W.
Scott........	British	1902	82° 17′	163° W.
Bruce........	British	1904	74°	24° W.
Shackleton...	British	1909	88° 23′	162° E.
Amundsen....	Nor.	1911	Reached	Pole Dec. 14
Scott........	British	1912	Reached	Pole Jan. 18
Byrd........	American	1929	Reached	Pole Nov. 29

The Antarctic is uninhabited, as the temperature in winter is frequently 70° or more below zero and death from starvation and exposure to sudden gales and blizzards is threatened on every hand. For six months of the year, from late March to the latter part of September, disregarding the effects of refraction of light, there is continuous darkness at the South Pole itself, and in regions as far north as 60° S. Lat. on the shortest day of the year for the Southern Hemisphere (June 21) there are only 5½ hours of daylight. The vegetation is only lichens and mosses. Among the animals are such birds as penguins and petrels and such sea mammals as whales, dolphins, porpoises, seals, sea lions and sea elephants.

Since the early part of the 19th century there have been numerous expeditions to the Antarctic to explore it and to try to reach the South Pole. Finally the successful explorer was Roald Amundsen who on Dec. 16, 1911, raised the Norwegian flag at the pole. A month later Capt. Robert F. Scott, British naval officer, reached this same objective but, with his three companions, perished from starvation and exposure when caught in a blizzard on the return journey.

Among other Antarctic explorers of the 20th century are Sir Ernest Shackleton, who located the South Magnetic Pole and on Jan. 9, 1909, reached 88° 23′, the farthest south latitude yet attained by any explorer; Sir Douglas Mawson, who commanded the British expedition that from 1911 to 1914 explored Antarctic lands south of Australia; and Sir Hubert Wilkins, who with Lieut. Carl Ben Eilson, flew over Graham Land in 1928.

The most prominent American explorers are Richard E. Byrd and Lincoln Ellsworth. Byrd, a former commander of the U. S. Navy, and Bernt Balchen flew over the South Pole in 1929, covering the distance to and from their base in Little America in 19 hours. In 1933–34 Byrd led an expedition of more than 60 men that made greater scientific discoveries than any other in the Antarctic; Byrd wintered alone at a post 123 miles south of Little America to make meteorological observations. The coa deposits found in Antarctica by the Byrd expedition indicate that the climate was once mild enough to make it the home of tropical vegetation.

On an airplane expedition in 1935 Lincoln Ellsworth claimed for the United States an area of approximately 350,000 square miles in the Weddell and Ross quadrants (between 80° and 120° W. Long.) to which he gave the name of James W. Ellsworth Land in honor of his father. It adjoins Marie Byrd Land that Commander Byrd had previously claimed for the United States and named for his wife.

Antigua, an island of the British West Indies that with Barbuda and Redonda forms the most important of the five presidencies of the Leeward Islands. The area is 108 square miles, and the population, mostly Negroes, is more than 30,000. The principal agricultural products are sugar cane, pineapples, sweet potatoes, yams and cotton. The island was discovered by Columbus in 1493 and has belonged to Great Britain since 1632. St. John, the capital, is the residence of the governor of the Leeward Islands Crown Colony.

Antilles, a name given (soon after Columbus's discoveries) to the entire group of the West Indies. They are usually divided into two sections: the Greater Antilles, including Cuba, Hispaniola, Jamaica and Puerto Rico; and the Lesser Antilles, the crescent of islands from Puerto Rico to the South American coast and including, among other islands, Martinique, Virgin Islands of the United States, Trinidad, Tobago and the Barbados. The term *antilles* is derived from Antilia, the name that medieval writers gave to an imaginary archipelago west of the traditional lost continent of Atlantis.

antipodes, two places on the globe that are diametrically opposite each other, the term being derived from the Greek and meaning with feet opposite. They may be in the same meridional circle (that is, at corresponding degrees of longitude on each side of the earth) but in different hemispheres, one place being as many degrees north of the equator as the other is south. Noon in one place corresponds to midnight in the other and vice versa.

If both places are inhabited, the word *antipodes* is used also to describe the geographical relationship of the people to each other. Thus, Argentina, in the neighborhood of Buenos Aires at approximately 60° W. Long and 35° S. Lat., and China, in the region of Nanking at approximately 120° E. Long and 35° N. Lat., are antipodes, and the inhabitants also are described as antipodes.

The Antipodes is the name of a small, rocky, uninhabited island in the Pacific Ocean, 458 miles southeast of Dunedin, New Zealand, claimed by Great Britain. It is so called because it is almost exactly opposite London, its position corresponding to 180° W. Long. and 51° S. Lat.

Appalachian Mountains, a mountain system of the eastern part of North America, extending from Quebec to Georgia and Alabama. The total length is about 1,500 miles, and the width at the broadest part in North Carolina and Tennessee is about 100 miles. In its northern section, extending from Quebec to New York, the system includes the Shickshock Mountains of the Gaspé Peninsula, the Notre Dame Range in Quebec, scattered elevations, such as Mt. Katahdin and Mt. Bigelow in Maine, the White Mountains of New Hampshire and the Green Mountains of Vermont.

The most noted group of the northern section is the White Mountains, covering an area of about 1,300 square miles in the northern part of New Hampshire. The eastern range is known as the Presidential or White Mountains proper and the western range as the Franconia. The highest peak of the Presidential Range is Mt. Washington (6,293 feet) whose summit is reached by a cog railway. Other peaks, named for presidents or great statesmen, include Adams, Jefferson, Madison, Monroe, Franklin, Webster and Clay. In addition to Mt. Lafayette (5,269 feet) the Franconia Range is noted for Profile Mountain which takes its name from three rocks near the top that form a remarkable resemblance to a human profile about 80 feet high. Known locally as the "Old Man of the Mountain," this natural feature has been immortalized by Nathaniel Hawthorne in "The Great Stone Face," one of the *Tanglewood Tales.* To the valleys lying between these mountains the name *notch* has been given; the best-known ones are Crawford Notch and Franconia Notch.

The central section of the Appalachian Mountains comprises the Adirondacks, the Allegheny Mountains and the Blue Ridge Mountains. The Adirondack Mountains cover an area of some 12,500 square miles in the northeastern part of New York. The highest points are Mt. Marcy (5,344 feet) and Mt. McIntyre (5,112 feet). The rugged beauty of these mountains is enhanced by such lakes as Saranac, Placid, Indian and George. The Hudson River rises in Lake Tear-of-the-Clouds. The Adironacks take their name from an Algonquian Indian tribe that inhabited the St. Lawrence Valley. The Allegheny Mountains extend southwest from Pennsylvania through Maryland, Virginia and West Virginia. They are rich in coal and iron ore and have given rise to the concentration of the iron-and-steel industry in Pittsburgh. The Blue Ridge is an eastern parallel of the Alleghenies, extending as far south as South Carolina. The blue haze that sometimes hangs over the crest of these mountains has given the name. In this central section of the Appalachians rise the Potomac, Allegheny and Monongahela rivers.

The southern section of the Appalachian Mountains is composed of the Cumberland Mountains of Kentucky and Tennessee and the Black and Great Smoky Mountains comprising the Unaka group of North Carolina and Tennessee. The Appalachians end in the foothills of northern Georgia and Alabama. The highest peak of the entire system is Mt. Mitchell (6,684 feet) in the Black Mountains near Asheville, N.C. In the Great Smoky Mountains Clingmans Dome is 6,644 feet high; a 643-square-mile area has also been set aside as the Great Smoky Mountains National Park. The Cumberland Mountains are famous for the Cumberland Gap that at the intersection of Kentucky, Virginia and Tennessee provided western immigrants with one of the most frequented routes across the Appalachians.

The name *Appalachian* is derived from the Apalachee Indians who inhabited northwestern Florida in the 16th and 17th centuries. It was bestowed by the Spanish explorer, Hernando De Soto, who on his expedition to Florida in 1539 marched as far north as the Great Smoky Mountains.

Appalachian Way, a 950-mile American highway connecting Chicago, Ill., and Charleston, S.C. It crosses the Ohio River Valley and the Appalachian Mountains, traversing very picturesque country.

Appian Way, the Via Appia of ancient Rome, most famous of the Roman highways. It is 360 miles long and connects Rome and Brindisi. It was begun in 312 B.C. by the censor Appius Claudius so as to strengthen Rome's grip upon the territory she had conquered to the south along the Adriatic. It reached Brundisium (now Brindisi) in 244 B.C. It was the most famous of Roman roads in classical times, and the poet Stotius called it *longarum regina viarum,* queen of long roads. Its most famous monument is the tomb of Caecilia Metella. In the vicinity of the churches of San Callisto and San Sebastian are the catacombs or subterranean burial places in which the early Christians held their services.

aqueduct, an artificial channel of either tunnel or bridge construction, designed with the aid of gravity or pressure to convey water from one place to another. In addition to being part of a municipal system, supplying water for domestic use, it may carry water for irrigation, power and other hydraulic purposes. The materials used are generally iron, steel, brick or concrete.

Among important American aqueducts are the New Croton, 30 miles long, whose average capacity in supplying New York city is 300,000,000 gallons of water a day, and the Catskill, 92 miles in length, which supplies New York with a possible additional 500,000,000 gallons a day. The Wachusett Aqueduct, 12 miles long, supplies Greater Boston with 300,000,000 gallons of water daily; the Hetch Hetchy carries a similar amount to San Francisco from the Tuolumne River, 150 miles distant; and the Los Angeles, 238 miles long, diverts from the Owens River about 310,000,000 gallons of water a day. The European cities of Vienna, Paris, Liverpool and Manchester have remarkable water-supply systems.

Courtesy Italian Tourist Information Office

Appian Way

The campagna or plain surrounding Rome is cut by the ancient road known as the *Via Appia,* which leads from Rome to Brindisi. It is lined with the ruins of historic villas and the tombs of noted Romans. It was named for Appius Claudius, during whose term as censor (312 B.C.) its construction was undertaken

Such famous stone-arcaded aqueducts as those at Nîmes, France, and Segovia, Spain, were developed through the engineering skill of the Romans. Outside Rome stand the ruins of some of the great aqueducts

Courtesy Los Angeles Department of Water and Power

An Aqueduct: Water for Los Angeles

From the Owens River, 238 miles away, comes water for the city through this aqueduct. Other parts of the system consist of tunnels, open and covered canals and reservoirs. The section of 9-foot pipe shown here is 3,841 feet long. Water is carried up the distant hillside by siphon action. The whole system, which carries 310 million gallons of water a day, was built between 1905 and 1913 at a cost of 24½ million dollars that supplied the city with water in the days of the empire. In 1931 the 1,800-year-old Roman aqueduct near Athens was utilized to supply that city with water from the new Marathon Dam. Aqueducts date back at least to 700 B.C. and were constructed by the Babylonians, Egyptians, Phoenicians and Greeks before the famous Roman aqueducts.

Arabia, a peninsula in the southwestern part of Asia, bounded by the Red Sea on the west, the Arabian Sea and the Gulf of Aden on the south and the Persian Gulf and Gulf of Oman on the east. To the north are Trans-Jordan and Iraq. The area covers about 1,200,000 square miles. Of the population, estimated at 10,000,000, more than a seventh are Bedouins or nomadic desert dwellers.

Arabia is a gigantic plateau sloping gradually eastward from the Jebel Shammar. In the extreme north is an extension of the Syrian Desert called *El Hamed* (Stony Plain). Surrounding the kingdom of Saudi Arabia (composed of the Hejaz, Nejd, Asir and Hasa) are the sandy wastes of Nafud on the north and Dahna on the south. The Rub al Khali or Great Sandy Desert of the south covers an area of about 300,000 square miles and until the recent explorations of H. St. John Philby and Bertram Thomas was one of the largest blank spots on the globe. The eastern coast is fringed by the sultanates of Kuwait and Oman. The imamate of Yemen and the British Crown colony of Aden are in the southwestern part. All these countries are treated in separate articles.

The word *Arabia* means desert land. The Romans divided the peninsula into Arabia Deserta (or Desert Arabia), Arabia Felix (or Fortunate Arabia in reference to the less arid region of the southwest) and Arabia Petraea (from Petra, the capital of the Roman province in the north).

Arabian Sea, an arm of the Indian Ocean, bounded by India on the east, India and Iran on the north, Oman, Saudi, Arabia and Italian Somaliland on the west. It receives the waters of the Persian Gulf through the Gulf of Oman on the north and those of the Red Sea through the Gulf of Aden on the west. It connects with the Mediterranean through the Suez Canal. Its chief seaport is Bombay, India. Socotra is the most important island of the Arabian Sea.

Aral Sea, an inland sea in the southwestern part of Siberia, about 200 miles east of the Caspian Sea. It is believed that the Aral was once a dry valley and that the rivers, the Syr-Darya (ancient Jaxartes) on the east and the Amu Darya (ancient Oxus) on the south, that now flow into it once fed the Caspian. With an area of 26,233 square miles, the Aral is, next to the Caspian, the largest inland sea in Asia, but it is slowly decreasing in size.

archipelago, any sea or other broad expanse of water in which there are many scattered islands or groups of islands. The term is derived from the Greek and means chief sea; it applies in particular to the Aegean Sea with its many small islands, famous in legend, history and literature. The most notable of these islands are Delos, Naxos and Syros of the Cyclades group; and Rhodes, Patmos and Samos of the Sporades group.

The word archipelago also means a group of islands themselves. The Malay Archipelago, comprising the islands lying between Asia and Australia and belonging mostly to Netherland India, is the largest of such groups. Another important archipelago is formed by the Lofoten and Vesteraalen islands that fringe the northwestern coast of Norway. The ice-bound islands north of Canada (Victoria, Banks, Melville and Prince of Wales) constitute the Arctic Archipelago. The Antarctic Archipelago, composed of the South Shetland Islands, is south of Tierra del Fuego.

Arctic Circle, an imaginary line around the earth parallel to the equator, all points on which are 23½° south of the North Pole. It marks the southern boundary of the North Frigid Zone, which lies between the Arctic Circle and the North Pole, and the northern boundary of the Cyclonic Zone, which is a subdivision of the North Temperate Zone.

When the sun in its northward journey reaches the Tropic of Cancer, which is 23½° north of the equator, on June 21, there is little twilight in the region bounded by the Arctic Circle; to countries lying within it, such as Norway, has been given the name of Land of the Midnight Sun. At the North Pole itself, because the Northern Hemisphere is tipped toward the sun, oblique or slanting rays of sunlight reach all parts of the Arctic Circle, and there is continuous daylight from late March to the latter part of September. The sun, however, stripped of its brilliant rays, is only a pale disk against a bluish-white sky.

When the sun is farthest south over the Tropic of Capricorn on December 22, there is no night at the South Pole and continuous dark at the North Pole, as the sun's rays fail to reach it by 23½°. This condition may be considered to prevail for 6 months, if one disregards the effects of refraction of light.

This apparent movement of the sun from north to south is in reality the result of inclination of the earth's axis as it revolves about the sun every 365.24 days; and the extent to which the sun's rays fall vertically or obliquely, thereby affecting the length of day and of night, causes the change of seasons. When it is fall or winter in the North Temperate Zone, it is spring or summer in the South Temperate Zone, and vice versa.

During spring and fall, when the sun both rises and sets in the Arctic Circle, and also during winter there is occasionally observed shortly after sundown in the region of the 40th to 60th parallels in North America and the 50th to 70th parallels in Europe the luminous phenomenon called the *aurora borealis.*

The word *Arctic* is derived from *arktos,* the name which the Greeks gave to the Great Bear or Ursa Major, the principal constellation above the Arctic Circle.

Arctic lands and seas, the region occupying the North Frigid Zone, with a land area of approximately 8,200,000 square miles and a water area of approximately 5,300,000 square miles; it is bounded by Alaska, Canada, Labrador, Norway, Sweden, Finland, U.S.S.R. and the Atlantic Ocean. Extending south to 60° N. Lat., the land area possesses greater seasonal contrasts in temperature than any other. The winters are long and bitterly cold; and the summers, with the sun casting oblique rays on the Arctic Circle, are short and quite hot, especially during June and July. The extreme northern part, called the *tundra,* is bleak, largely barren and frozen for all but 2 months of the year. During the 6 months from late September to the latter part of March, disregarding the effects of refraction of light, there is continuous darkness at the North Pole and in regions as far south as 60° N. Lat. on the shortest day of the year (December 22) in the Northern Hemisphere, there are only 5½ hours of daylight.

Contrary to the belief for many centuries, there is no land at or near the North Pole; the great body of water surrounding it is called the Arctic Ocean. The seas bordering this ocean include the Beaufort, Kara, Laptev, Greenland and Barents; the last two are adjacent to the Atlantic Ocean, which is also connected with the Arctic by Baffin Bay and Davis Strait. The only communication between the Arctic and the Pacific oceans, however, is by means of Bering Strait and Bering Sea.

In the Arctic Ocean originates the Labrador Current. On the breaking up in summer of the ice pack and of glaciers at the water's edge, this cold, deep-sea current sweeps southward into the Atlantic via Baffin Bay the huge icebergs that can be so disastrous to shipping. The Arctic Ocean reaches depths of 7,000 to 14,000 feet. Its most important islands are Greenland, Spitsbergen, Baffin, Ellesmere, Novaya Zemlya, Wrangel, Banks, Victoria and New Siberian. After Nansen's death in 1930 Franz-Josef Land was renamed Fridtjof Nansen Land in honor of the explorer. Lenin Land (formerly Severnaya Zemlya) has served for several years as the farthest north base of operation of Russian polar explorers who are intent on opening the Arctic to regular navigation, charting channels, discovering mild currents and collecting data as to ice formations. During the summer of 1937 Russian aviation experts on a drifting ice floe from the North Pole, where a meteorological station had been set up, were making observations that it was hoped would lead to the establishment of a transpolar air route from Europe to North America. Upon the plateaus of Greenland, Spitsbergen and Fridtjof Nansen Land huge icecaps have formed, and along the east and west coasts of Greenland are mountains that rise 8,000 feet to 11,000 feet above sea level.

The climate of the Arctic Region is somewhat ameliorated by the Gulf

Courtesy Hudson's Bay Company

Eskimo Hunter with Indian-Made Harpoon

Stream Drift and North Pacific Current, but during the nine winter months 60° below zero is not unusual, and in Siberia it is sometimes 90° below zero. Cold and darkness, however, seem to have little effect on the vegetation, which is largely an Alpine growth. The prevalence of some 1,700 species of flowering plants, mosses and lichens is largely attributed to dry winds, although the same winds stunt the growth of the coniferous evergreens of the taiga. Even in the extreme north of Greenland during the brief summer season is found the Arctic poppy. Animal life includes mammals, such as the polar bear, fox, hare, beaver, mink, otter, sable, wolf, reindeer, musk ox, caribou, lemming, walrus, whale and seal; fish, such as the cod, halibut, salmon, trout and sturgeon; and birds, such as the little auk, gull, petrel, tern, heron and eider duck.

The Arctic Region is scantily populated. Eskimos, a few thousand in number, live as far north as Point Barrow (the northernmost point of Alaska) and in northern Canada, Labrador and Greenland. Lapps are found in northern Norway, Sweden, Finland and Russia; and Mongoloid tribes, such as the Yakuts, Ostiaks and Samoyeds, in northern Siberia. Most of these peoples depend for food upon hunting and fishing and the berries, roots and wild vegetables that they gather. If pastorally and nomadically minded, like the mountain Lapps, they may tend herds of reindeer that furnish meat for food as well as skins for clothing and shelter. White settlers have to some extent exploited the gold, copper and coal fields of Alaska and since the 17th century have engaged in fur trapping in Siberia and Canada. Lumbering has long been the principle industry of northern Sweden and Finland.

As in the case of the South Pole, explorers had tried to reach the North Pole since the early part of the 19th century. On April 6, 1909, Robert E. Peary, American explorer, was the first to do so, after months of hardship and 30 years of preparation. In 1926 Richard E. Byrd and Floyd Bennett flew over the North Pole in comparative ease and comfort, covering the distance of 1,360 miles from and to their base at Kings Bay, Spitsbergen, in 15½ hours.

Among other noted Arctic explorers are: Fridtjof Nansen, who during 1893–96 drifted in the *Fram* as far north as 85° 57′ and by dog sledge reached 86° 14′ N. Lat., the farthest north that any explorer had yet been; the duke of the Abruzzi, who in 1899 charted the northern coast of Franz-Josef Land and reached 86° 34′ N. Lat.; and Vilhjalmur Stefansson, who during 1914–17 located the continental shelf north of Alaska. In 1926 Roald Amundsen, discoverer of the South Pole, achieved another triumph by crossing the North Pole in a dirigible with Lincoln Ellsworth and Umberto Nobile, the passage from Kings Bay, Spitsbergen, to Teller, Alaska, taking 72 hours.

Argentina, a republic of South America that ranks next to Brazil in size and population. It is bounded on the north by Bolivia and Paraguay; on the east by Brazil, Uruguay and the Atlantic Ocean; on the south by the Atlantic and the southern tip of Chile; and along the 3,000-mile western front by the Andes Mountains, a natural barrier separating it from Chile. The area is 1,079,965 square miles. The population, predominantly Spanish and Italian, is more than 12,000,000.

The surface of Argentina slopes from the high, mountainous section of the west to a low coastal plain along the Atlantic. The northern part of this plain, the Gran Chaco, is a partly forested and partly swampy area that extends from the Rio Pilcomayo to the Rio Salado del Norte. The southern part, Patagonia, stretches from the Rio Negro to the Rio Gallegos and is a steppelike area suitable mostly for grazing. At the foot of the Andes, however, the Patagonian region possesses several beautiful snow-fed lakes, chief of which are Nahuel-Huapi, Buenos Aires and Argentina.

In Argentina are some of the highest peaks in South America—Mt. Aconcagua (22,834 feet), Mt. Mercedario (22,315 feet) and Mt. Tupungato (21,550 feet). The most famous pass is the Uspallata Trail that in 1910 became the route of the first transandean railroad. On the level summit of La Cumbre Pass the fine peace statue, *Christ of the Andes,* was erected to commemorate the settlement in 1902 of the long-standing boundary dispute between Argentina and Chile.

ARCTIC EXPLORATION

Commander	Nationality	Date	North Latitude	Locality
John Davis	British	1587	72° 41′	West Greenland
Willem Barents	Dutch	1596	79° 49′	Spitsbergen and Greenland Sea
Henry Hudson	Dutch	1607	79° 50′	Greenland Sea and Spitsbergen
William Baffin	British	1616	77° 45′	Smith Sound
Vitus Bering	Danish	1728	70° 41′	Bering Strait
J. C. Phipps	British	1773	80° 48′	Spitsbergen and Greenland Sea
William Scoresby	British	1806	81° 30′	East Greenland and Spitsbergen
W. E. Parry	British	1827	82° 45′	Spitsbergen and north
Sir John Franklin	British	1846	—	North Canada
Wm. Morton and E. K. Kane	Amer.	1854	78° 45′	Cape Constitution
O. Nordenskjöld	Swedish	1868	81° 42′	Spitsbergen
Charles Francis Hall	Amer.	1871	81° 38′	West Greenland coast
Julius von Payer	Austrian	1874	81° 50′	Franz Josef Land
G. S. Nares and A. H. Markham	British	1876	83° 20′	Grant Land
O. Nordenskjöld	Swedish	1876–9	77° 43′	First northeast passage
A. W. Greely	Amer.	1882	83° 24′	North Greenland
Frederick G. Jackson	British	1895	81° 19′	Franz Josef Land
Fridtjof Nansen	Norw.	1895	86° 5′	North of Franz Josef Land
Duke of Abruzzi	Italian	1900	86° 34′	North of Franz Josef Land
R. E. Peary	Amer.	1906	87° 6′	North of Greenland
R. E. Peary	Amer.	1909	90°	Reached the pole April 6
Richard E. Byrd	Amer.	1926	90°	Flew over the pole May 9
Roald Amundsen	Norw.	1926	90°	Flew over the pole May 12
Umberto Nobile	Italian	1928	90°	Flew over the pole May 24
Otto Schmidt	Russian	1937	90°	Camped at the pole May 21

The principal river system of Argentina is the Paraná, 2,450 miles long. Its principal tributaries are the Iguassú, Paraguay and Pilcomayo, all of which form part of Argentina's northern boundary. Its estuary is the Rio de la Plata. One of the natural wonders of South America is the falls of the Iguassú River, 210 feet high. Among other important rivers are: the Uruguay, forming the boundary between Argentina and Uruguay; and the Colorado in the south central part. At the southern extremity of the country is the group of islands, Tierra del Fuego, separated from the mainland by the Chilean-controlled Strait of Magellan.

The central part of Argentina is a prairie region called the *pampas*. These almost treeless grasslands afford excellent pasturage for cattle and sheep whose care is entrusted to the picturesque gauchos or cowboys. One of the principal crops of the region is alfalfa, which supplements the native grasses and enables livestock to be sent to market a year sooner. Wheat, corn, linseed, rye, oats, barley and flax are cultivated on a large scale.

With the aid of irrigation agriculture is carried on in the southern and western parts, where the principal crops are sugar cane, cotton, tobacco, rice, potatoes and yerba mate. One-fourth Argentina's area is adapted to fruit farming. In addition to grapes for wine making, apples, peaches, plums, pears, honeydew melons and other fruits are raised. The chief wealth of the country is derived from sheep and cattle raising; the exports of chilled meats, canned and preserved meats, hides, tallow and wool have a profound effect upon the markets of the world.

Petroleum is Argentina's leading mineral product; the yield some years is in excess of 9,000,000 barrels. Tin, lead, silver, gold, copper, zinc, asbestos, mica, wolframite and salt also are mined. Marble and onyx are quarried, and numerous semiprecious stones are found. The principal forest product is an extract from the bark of the quebracho tree that is used in compounding tonics and sedatives and also in tanning. Manufactures include flour, textiles (principally cottons and woolens), shoes, drugs and dairy products (butter and cheese).

On asserting its independence of Spain in 1816 Argentina was known for almost 40 years as the United Provinces of the Silver River. In 1853 it adopted a new constitution establishing the federal form of a republic. Executive authority is vested in the President, elected for 6 years by an electoral college; he is assisted by a cabinet, generally consisting of eight ministers. The legislative body is the bicameral National Congress. Its upper chamber, the Senate, consists of 30 members elected for a 9-year term by the provincial legislatures and a special electoral body in the federal district and is presided over by the Vice President. Its lower body, the Chamber of Deputies, consists of 158 members elected by direct popular vote for a 4-year term. For local administrative purposes the country is divided into 14 provinces, 10 territories and 1 federal district.

The capital is Buenos Aires. Among other important cities are: Rosario, a busy Parana port for the shipment of grain and other produce; the modern seaports of La Plata and Bahia Blanca; Tucuman, the center of the sugar industry; and Cordoba, noted for its university, founded in 1613 and next to the University of Lima the oldest educational institution in South America. The principal seaside resort is Mar del Plata.

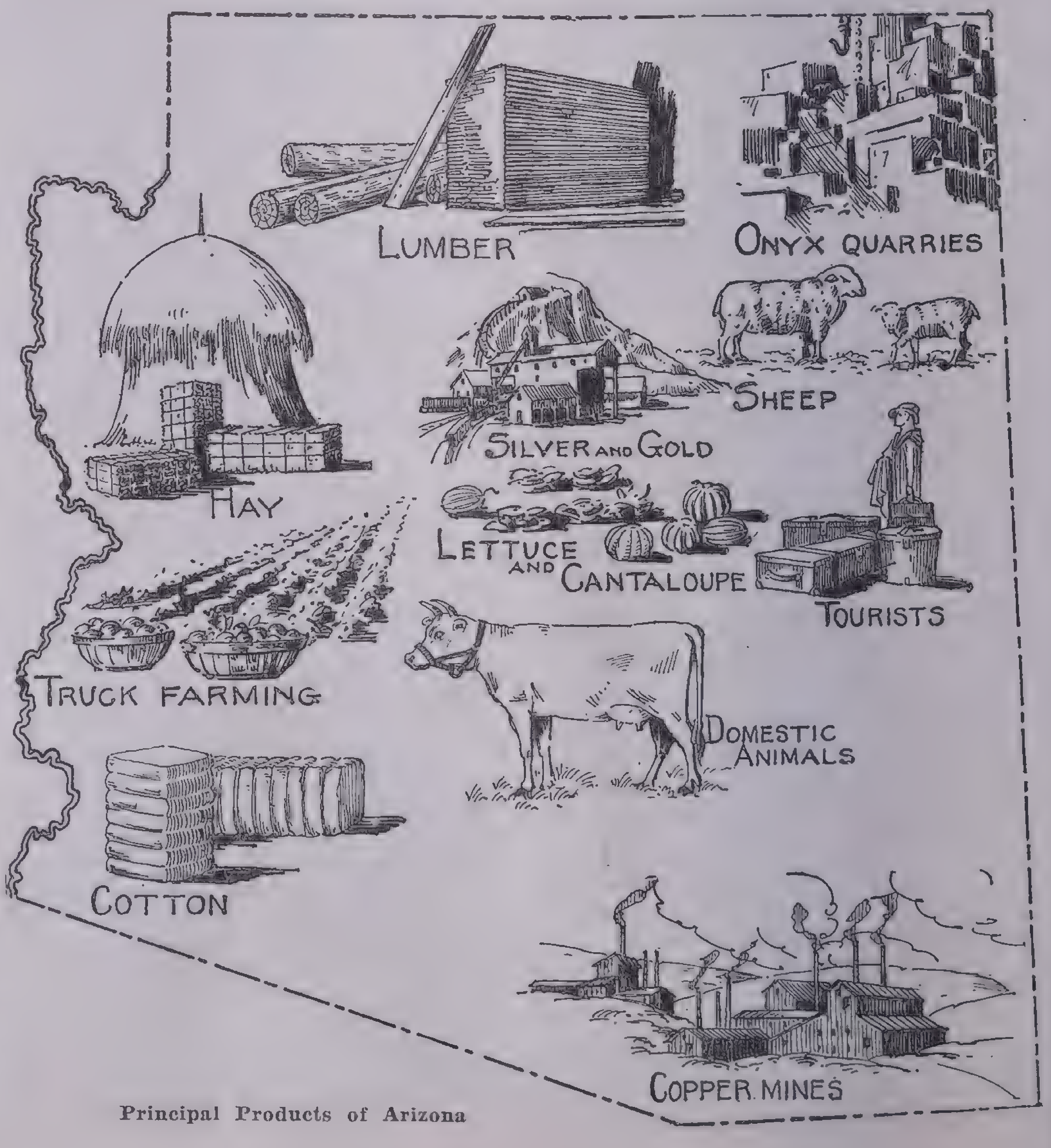
The name *Argentina* is derived from the Latin *argentum,* meaning silver. Officially the name is the Argentine Republic.

Arizona, one of the southwestern plateau states, bounded on the north by Utah, on the east by New Mexico, on the south by Mexico and on the west by California and Nevada. The area is 113,956 square miles, of which 146 square miles is water. The population is estimated at 499,261.

Except in the narrow river valleys, the entire northern part of the state has an elevation ranging from 5,000 to 10,000 feet; and north of the center San Francisco Peak rises 12,611 feet. In the southeast is another great plateau 5,000 to 10,000 feet high. The lowest depressions are along the course of the Colorado River where erosion has worn gorges 1 mile deep. The valley of the Gila River in the southwest is Arizona's lowest land, and the elevation is less than 200 feet at Yuma, where the Gila empties into the Colorado.

The Gila, a shallow stream, and all the other rivers of the state are overshadowed by the mighty Colorado, which with its tributaries drains the entire state. Along much of the Colorado's course it is unsurpassed for scenic beauty. Cutting across the northwest corner of the state is the Grand Canyon of the Colorado, a gorge 217 miles long and more than 1 mile deep carved out of the rock by uncounted centuries of erosion. The zone around the canyon has been set aside by the United States Government as a national park.

Arizona is largely arid, and the cultivated area depends almost entirely upon irrigation. There are more than a thousand small irrigation projects and a few large ones. Of particular note are Boulder Dam, which impounds the waters of the Colorado in the Black Canyon and supplies irrigation water to four states from the largest artificial lake in the world, and Roosevelt Dam, which serves the fertile Salt River valley in the central part of the state. These developments make possible the cultivation of more than 1,000,000 acres of otherwise arid land on which are grown a valuable crop of long-fiber cotton, wheat, corn, alfalfa and great quantities of subtropical fruits and nuts. Truck gardening, especially of let-



Principal Products of Arizona

tuce, cantaloupes and strawberries, is an important enterprise. There is considerable stock raising, although Arizona is well down in the list of cattle and sheep-grazing states.

Arizona's mineral wealth is very great. In most years it leads all the states in copper production, but the amount mined varies enormously with conditions in the world copper market. In 1929 the production was 830,000,000 pounds; in 1933 it fell to 114,000,000 pounds. There are also good yields of gold, silver, lead and zinc. Smaller in quantity but of great industrial importance to the nation are the ore deposits of molybdenum, vanadium and tungsten. Some asbestos also is mined.

As would be expected from its small population, manufacturing interests in the state are not highly developed. The chief industry is copper smelting and refining.

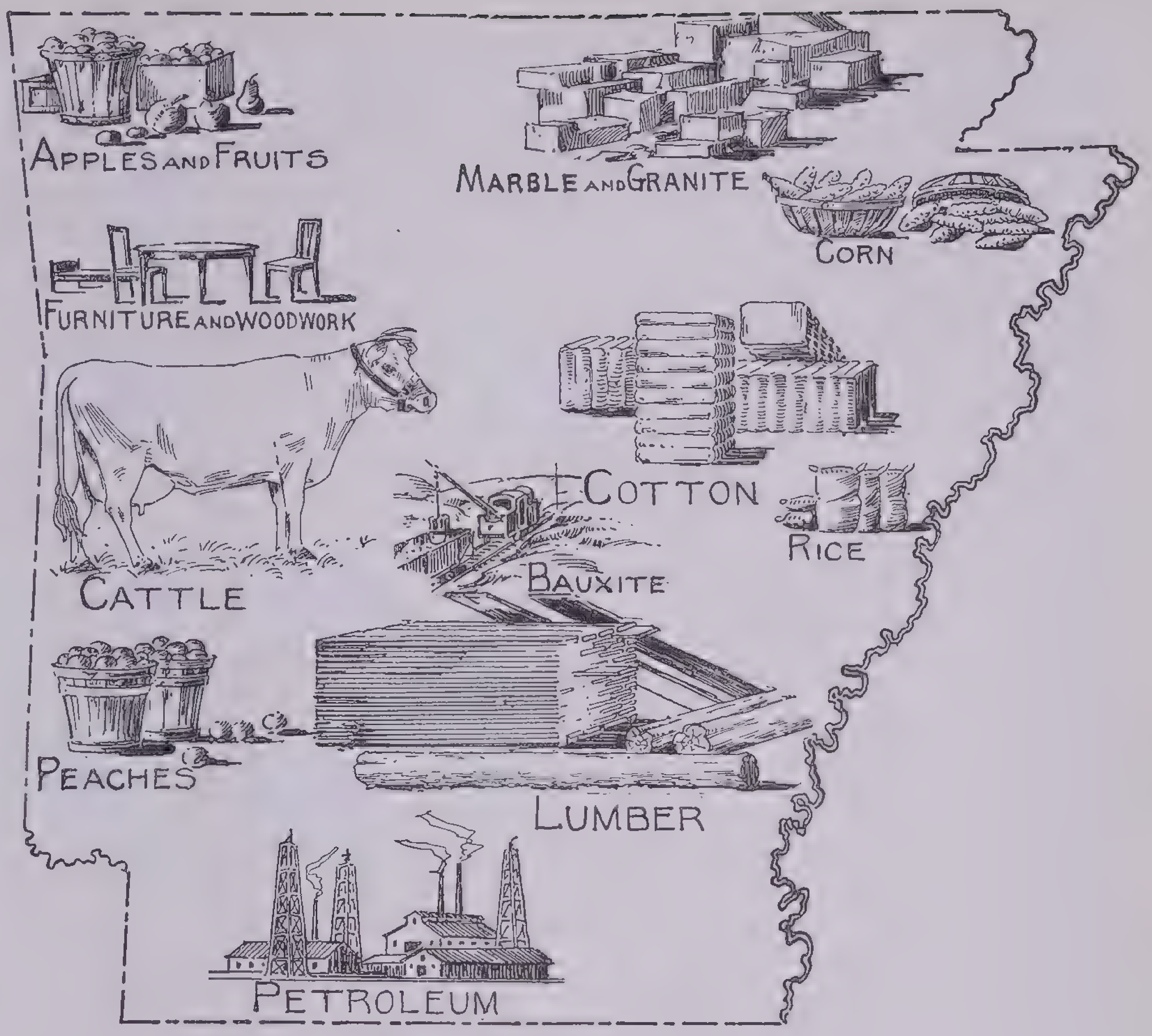
The capital and largest city of Arizona is Phoenix, near the center of the rich Salt River agricultural district. A hundred miles southeast of Phoenix is Tucson, where the State University is located. Other points of interest are: the Lowell Astronomical Observatory at Flagstaff; the Painted Desert, famous for the color variety of its rock formations; the Petrified Forest in the eastern part of the state; and the great copper mines at Bisbee in the southeast corner.

The origin of the name is disputed. The simplest derivation is from the Spanish *arida-zona,* meaning dry country; but it is more probable that the name comes from the Indian word *arizonac,* meaning small spring.

Arkansas, one of the southern states of the Mississippi Valley, bounded on the north by Missouri, on the east by Tennessee and Mississippi, on the south by Louisiana and on the west by Texas and Oklahoma. The area is 53,335 square miles, of which 810 square miles is water. The population is estimated at 1,949,387.

In the northwest are the Ozark Mountains; two of their ranges, the Boston and Ouachita Mountains, have elevations culminating in peaks of about 2,500 feet. To the east, southeast and south the surface gradually lowers until at the Mississippi River it is nowhere more than 200 feet above sea level. The Mississippi forms nearly all the eastern boundary; its principal tributaries here are the Arkansas, which flows entirely through the state, and the Ouachita. Another large stream is Red River (in the extreme southwestern area), which empties into the Mississippi in Louisiana. The White River in the northwest presents scenic loveliness; it flows southeast to the Mississippi. Long stretches of the rivers are navigable.

In the higher regions of the north the chief crops are wheat, oats, clover and fruits. In the south on the low alluvial plains the great crops are cotton (the state usually ranks third in cotton production), rice, sweet potatoes, fruits and garden vegetables. The culture of roses for making perfumes is one of Arkansas's unusual industries. Formerly this state was largely forested, and more than a million acres are still preserved in national forests. Lumber and other forest products are important sources of wealth. Though Arkansas is not one of the leading livestock states, there are more than 2,000,000 animals on its farms, chiefly cattle and swine.



Principal Products of Arkansas

The mineral products are very valuable. Most important is petroleum, found chiefly in the south, and with it are extensive reserves of natural gas. There is also a considerable production of coal. The state is noted for its large bauxite (aluminum ore) deposits, although these are of less money value than the petroleum and coal. The mines in the central part of the state supply 96 per cent of all the bauxite mined in the United States. Arkansas also leads the country in the production of antimony ore.

Manufacturing is not highly developed; the leading industries are the making of lumber and timber products, refining petroleum and canning fruits and vegetables.

The capital and largest city is Little Rock on the Arkansas River in the center of the state. A fine system of motor highways radiate from Little Rock like the spokes of a wheel. About 50 miles southwest of Little Rock are the famous hot springs, which have been set aside, with the land surrounding them, to form Hot Springs National Park.

The state university is located at Fayetteville in the extreme northwest.

The name *Arkansas* is that of an Indian tribe.

Arkansas, a river about 1,460 miles long that drains an area of 185,000 square miles in the south central part of the United States. It has its source in the Rocky Mountains of central Colorado, runs southwest through Kansas, Oklahoma and Arkansas and discharges into the Mississippi River at Napoleon, Ark. Next to the Missouri it is the largest tributary of the Mississippi. Its principal affluents are the Cimarron and Canadian rivers of Oklahoma. The scenery in the western part of the river's course is very beautiful, the 3,000-foot-deep Royal Gorge through which it flows on leaving the Rockies near Canon City, Colo., being particularly noteworthy.

arroyo, a small valley with precipitous side walls, formed generally by stream erosion, as in the Bad Lands. The term, which is Spanish for gutter, may also refer to a rivulet.

Ascension Island, an island of volcanic origin in the South Atlantic Ocean, about 700 miles northwest of St. Helena to which for administrative purposes it was annexed by the British Colonial Office in 1922 after transfer from the Admiralty. It has an area of 34 square miles and a population less than 200. Georgetown, the only community, has been a garrison station since British troops were sent there when Napoleon was exiled to St. Helena in 1815. Guano and phosphate are the chief commercial products. Surmounting the island is Green Mountain, whose craterlike summit is 2,820 feet above sea level. It was discovered on Ascension Day, 1501, by João da Nova, a Portuguese navigator.

Ashanti, a British possession in western Africa; area, 24,379 square miles; population about 580,000. It is sometimes considered an integral part of Great

Britain's Gold Coast Colony, but although its chief commissioner is responsible to the governor of that colony it has a separate entity. Each of the Negro tribes has its native ruler called an *omanhene;* the principal ones are the Kumasi, Adansi, Bekwai, Juabin and Kokofu. To the north of Ashanti is another integral part of the Gold Coast Colony, called Northern Territories, and to the east is Togo. The French Ivory Coast Colony bounds it on the west.

The most important agricultural products are cacao, kola nuts, cereals, tobacco, yams, rubber and coffee. Cattle and sheep are raised for export. The forests yield mahogany, cedar and gum copal, and the mineral wealth consists principally of gold, silver and salt. The chief manufactures are cotton goods, pottery and articles of beaten gold and silver. The capital is Kumasi (population, about 40,000). Before Great Britain abolished negro slavery in 1807 Kumasi was one of the principal centers of that traffic. To facilitate administration the country is divided into two provinces, each under a provincial commissioner. The headquarters of the eastern province are at Kumasi and of the western province, at Sunyani.

Until the establishment of a British protectorate in 1896 and the annexation of the country by Great Britain in 1901 Ashanti was known as the Kingdom of West Africa.

Asia, the largest of the continents. It also constitutes the larger part of the land mass called *Eurasia,* measuring 6,500 miles from Cape Bab-el-Mandeb in Arabia to the Kamchatka Peninsula in the U.S.S.R.; and 5,300 miles from Cape Chelyuskin in the U.S.S.R. to Cape Romania at the tip of the Malay Peninsula. Separating it from Europe and Africa on the west are the Ural and Caucasus mountains and the Caspian, Black, Aegean, Mediterranean and Red seas. Its shores are lapped on the north by the Arctic Ocean, on the east by the Pacific Ocean and on the south by the Indian Ocean. The various arms of the Pacific include the Bering Sea, Sea of Okhotsk, Japan Sea, Yellow Sea, East China Sea and South China Sea. Vast indentations are formed in the southern coast by the Bay of Bengal, the Arabian Sea and its extensions, the Gulf of Oman and the Persian Gulf. Like Europe, Asia possesses an unusually irregular coast line, measuring 35,000 miles. Its various peninsulas include the Anatolian (Turkey) and Arabian on the west; the Hindustan (India) and Malayan (a continuation of the Indo-China Peninsula) on the south; and the peninsula of Chosen (Korea) and the Kamchatka peninsula on the east. The total area of the continent is 16,990,000 square miles, a little less than one-third the land surface of the globe. The population is estimated at 1,155,000,000, more than half the world's inhabitants.

Asia has the greatest extremes of climate, the highest mountains and the greatest expanse of tablelands to be found on any continent. The coldest region on earth, so far as known, is the tundra of northern Siberia; at Verkhoyansk above the Arctic Circle a temperature of 97.6° below zero has been recorded. Aden in the extreme southwestern part of the Arabian Peninsula is said to have the hottest average temperature throughout the year of any spot on earth. The wettest region in the world is the Indian province of Assam that has a recorded rainfall of 800 inches a year.

The principal Asiatic tableland is the Pamir Plateau, connecting the Himalaya Mountains (which separate Tibet from Nepal and British India) and the Tien-Shan Mountains of Sinkiang and the Kirghiz Republic of the U.S.S.R. Even the deepest valleys of this plateau are 6,000 feet above sea level. The 2,000-mile-long sweep of the Himalayas contains the world's highest peaks—Everest (29,141 feet), Kanchenjunga (28,225 feet), Godwin Austen (28,191 feet), Makalu (27,790 feet) and Dhaulagiri (26,795 feet). The other important tablelands are: the Mongolian Plateau, crossed by the Altai and Khingan mountains; the Plateau of Iran, where rise the Elburz Mountains on the boundary of Europe; and the Plateau of Deccan, which with the Eastern and Western Ghats dominates central India. The other parts of Asia's mountain mass are the Hindu Kush of Afghanistan, the Sulaiman Mountains of northern India and the Stanovoi and Yablonoi mountains of the U.S.S.R.

A great deal of Asia is desert land that, geographically speaking, may be considered a continuation of the Sahara Desert. An almost unbroken line of aridity or semiaridity sweeps from southwestern Arabia across the continent to the eastern part of the Mongolian Republic, where it ends in the Desert of Gobi; but in much of alluvial-formed India, loess-deposited China and the volcanic chain of islands comprising the Japanese Empire are vast areas of great fertility.

Asia possesses nine great river systems. Two of these are Chinese—the Yangtze-Kiang (3,100 miles) and the Hwang-Ho (2,700 miles), which rise in Tibet and flow eastward to the East China Sea. The most important rivers of India are: the Indus (1,700 miles) that empties into the Arabian Sea after draining the province of the Punjab; and the Brahmaputra (1,680 miles) and the Ganges (1,540 miles) that have formed a 32,000-square-mile delta at the head of the Bay of Bengal. The Siberian rivers that drain the land toward the Arctic include the Ob-Irtish (3,200 miles), Lena (2,860 miles) and Yenisei (2,800 miles); the Amur River (2,900 miles), forming part of the boundary between the U.S.S.R. and Manchukuo, empties into the Sea of Okhotsk. The Tigris-Euphrates system, totaling 2,850 miles in length, still waters Iraq, as it did in the days when the country was the center of the vast Babylonian and Assyrian empires. The principal lakes of Asia are the Aral Sea (26,233 square miles), Lake Baikal (13,200 square miles) and Lake Balkhash (7,115 square miles), all in the U.S.S.R. Probably the most unusual body of water in the world is the Dead Sea of Palestine, 1,296 feet below sea level.

The countries of major significance are Japan, China, India, the Asiatic republics of the U.S.S.R., Turkey and Palestine. Those of lesser importance are Afghanistan, Arabia, Burma, French Indo-China, Iran, Iraq, Nepal, Siam, Straits Settlements, Syria, Tibet and the island of Ceylon.

Athens, the capital of Greece, located in the southeastern part of the Central Administrative Division on the Ilissus River. It is built on and around several hills, rising from the Plain of Attica. Overlooking it to the northeast is Hagios Georgios (the ancient Lycabettus), whose 1,112-foot summit is crowned by the Greek Church monastery of St. George. The chief heights within the city are the Acropolis, Areopagus or Hill of Ares (the Roman Mars), Hill of the Nymphs, Pnyx and the Hill of the Muses or Museum Hill. Athens is chiefly an administrative and financial center, its commercial activities being centered in Piraeus, 5 miles to the southwest on the Saronic Gulf. Through this port pass exports, such as oil, wine, tobacco and marble, and imports, such as coal and grain. Manufactures include cotton goods, pottery, flour, soap, chemicals, carpets and leather goods. The population is about 450,000.

Among the more important buildings of Athens are the Royal Palace, set in a large and attractive park, and the Boule or House of Parliament. Scarcely less notable are the Greek Cathedral, seat of the Metropolitan of Athens, Palace of Justice, National Library, Academy of Sciences and Zappeion, an industrial exhibition hall. The National Museum is noted especially for its sepulchral reliefs of the 5th and 4th centuries B.C.; its votive reliefs, such as that of Demeter, Persephone and Triptolemus discovered in Eleusis; and the innumerable treasures excavated at Mycenae, Delos and other centers of ancient Greek culture. The Acropolis Museum houses fragments of sculpture from the Parthenon and from the Temple of Athena Nike. The Polytechnic Institute contains an ethnological and historical museum and the National Gallery of Art.

Since its foundation in 1837 the National University has transformed Greek education, reviving the spirit of the Academy at which Plato taught and of the Lyceum founded by Aristotle. Archeological research is fostered by the Greek Archeological Society; the American School of Classical Studies, sponsored by the Archeological Institute of America; and the German Archeological Institute. France, Great Britain, Austria and schools, sponsored in part by their re- Italy also maintain archeological spective governments and in part by their leading universities.

Athens has one of the most colorful histories of any city in the world. It was the capital of Attica, the most enlightened and (from the 6th to the close of the 4th century B.C.) the most powerful of the numerous states that comprised ancient Greece. The port of Piraeus was considered a part of Athens, the two cities being connected by the so-called Long Walls, 60 feet

Courtesy Atlantis Greek Daily, New York

Evzones—Members of a Select Corps of the Royal Greek Army in Dress Uniform

high, 10 feet wide and 550 feet apart. The joint city was known as Polis (meaning the city). An outer wall for the defense of Athens was the Pelasgicum. There still stands the Dipylon or gate marking the point at which issued the Sacred Way, leading to Eleusis, seat of the Eleusinian Mysteries of Demeter, and the Street of Tombs, lined on each side with grave monuments of the 4th century B.C.

Former Grandeur of the Acropolis. The ancient glory of Athens is revealed today in remains of some of the world's finest examples of architecture and sculpture. Dominating the city is the Acropolis, at first a citadel and later the religious center of the city; its ruins 2,500 years ago were gleaming white temples, built of marble from Mt. Pentelicus. The chief of these is the Parthenon or Temple of Athena Parthenos (the Virgin Athena). Designed by Ictinus and Callicrates, it was erected during the Age of Pericles (447–432 B.C.) and is considered a perfect example of Doric architecture. Surrounding it is the noted colonnade, consisting of 8 columns in the front and rear and 17 columns on either flank. In the main hall or Hecatompedos stood the chryselephantine (gold and ivory overlaid on wood) statue of Athena by Phidias, about 40 feet high. It represented the goddess fully armed and holding in her right hand a winged Victory.

The sculptures of the pediment above the eastern portico of the Parthenon depicted the birth of Athena; and those above the western side, the contest of Athena and Poseidon for the dominion of Attica. The sculptured metopes of the southern side represented the battle between the Centaurs and Lapithae; the eastern ones, the struggle between the gods and giants; the northern, the fall of Troy; and the western, the war between the Athenians and the Amazons. Surrounding the entire building was a frieze depicting the Panathenaic procession that every 4 years delivered to the temple a sacred peplos or robe for the goddess. The severity of the white Pentelic marble was relieved by a lavish use of color and gilt.

Most of the sculptured pieces that adorned the pediments, metopes and frieze of the Parthenon and that were executed under the direction of Phidias are now in the British Museum in London, having been procured by Lord Elgin while he served as British ambassador to Turkey (1799–1802). They were mutilated during the war between Turkey and Venice in 1687; the Turks used the Parthenon as a powder magazine, and when a Venetian bomb fell through the roof, the central part of the building was destroyed. During the Byzantine period the Parthenon had been converted into a Christian church, dedicated to the Virgin, and under the first Turkish regime (1456–1699) it was a Mohammedan mosque.

Forming the principal entrance to the Acropolis at its western end was the Propylaea, erected about 432 B.C. Among its Ionic-styled temples were the Erechtheum, containing shrines to Athena Polias or Athena, guardian of the city, Erechtheus and Poseidon and erected during 431–407 B.C., and the Temple of Athena Nike or Athena the Victorious, erected about 450 B.C. after the Persian Wars. The most famous part of the Erechtheum is the Porch of the Caryatides or Maidens, so called from the six female statues that support the roof of this tribune. In this temple were the tomb of Cecrops, legendary founder of Athens and first king of Cecropia or Attica; the sacred olive tree of Athena; and a rock bearing the mark of Poseidon's trident. Parts of the frieze that adorned the Temple of Athena Nike and that depicted a battle between the Greeks and Persians are now in the British Museum.

On the southern slope of the Acropolis were erected: the Sanctuary of Asclepius (or Aesculapius), a resort of the sick; the Theater of Dionysus, with two adjoining temples dedicated to the god; and the Odea of Pericles and Herodes Atticus. All these theaters witnessed in their day performances of the plays of Sophocles, Aeschylus, Euripides, Aristophanes and other Greek dramatists. Dominating the sculpture on the Acropolis was Phidias's 30-foot statue of Athena Promachos or Athena Leader in the Fight that stood in front of the Parthenon; it was cast from bronze spoils taken after the defeat of the Persians at Marathon in 490 B.C.

Ruins of the Lower City and Other Hills. In the lower part of Athens by the Ilissus River stood the Olympeum, a Corinthian building that contained a chryselephantine statue of Zeus. Begun by the Tyrant Pisistratus about 530 B.C., it was finally completed by the Roman Emperor Hadrian in 130 A.D. There was also the Theseum or Temple of Theseus, erected about 425 B.C. when the Athenians decided to claim this legendary king as the founder of their city. As it was converted into a church during the Byzantine period, it is the best preserved of the Doric temples of Greece; its metopes represented the labors of Theseus and Hercules. Many archeologists consider that the Theseum was dedicated to Hephaestus, and it is accordingly styled the Hephaesteum.

The Choragic Monument of Lysicrates was erected in 334 B.C. in commemoration of the award bestowed after one of the Dionysian festivals on a boys' chorus of which Lysicrates was the leader. It served as a pedestal for the prize that the group received—a bronze tripod, the sculptured frieze at its top representing the story of Dionysus and the Tyrrhenian pirates who were turned into dolphins, as told in the Homeric hymn to the god. That it escaped the mutilation that befell several similar Corinthian structures that stood in the Street of the Tripods was because it was in a former Capuchin convent.

The entrance to the agora or market place is still marked by a Doric-columned gate; it was surrounded by stoae or open colonnades erected by Basileios, Attalus and Hadrian. Like the Roman forums the agora was used for political and religious as well as commercial purposes, being the site of the bouleuterion or meeting place of the advisory council of 500 known as the *boule* and of the Metroön or Temple of Rhea, mother of the gods. The ruins of the Areopagus mark the meeting place of the council of nobles and exarchons who, as guardians of the city's laws, constituted its most venerable court. The Pnyx served as the meeting place of the Ecclesia or popular assembly in which all free citizens might vote.

The Roman era in Athens is commemorated by the Arch of Hadrian, Pantheon, Agrippeum Theater, Library of Hadrian and the temples of Hera and Zeus Panhellenios. The

Horologium of Andronicus Cyrrhestes, popularly known as the Tower of the Winds, was the public sundial and weathervane that was erected in the 1st century B.C. near the eastern end of the agora. Each of its octagonal sides faced a point of the compass and was decorated with a bas-relief of the personified wind that blew from that quarter. On top of the tower was a bronze Triton that revolved like a weathercock, and inside was a clepsydra or water clock that told the time on rainy days. The aqueduct built by Hadrian has again been utilized since 1931 in supplying the city with water from the Marathon Dam. The ancient stadium, accommodating about 50,000 persons, was built by Lycurgus about 330 B.C. and rebuilt by Herodes Atticus about 140 A.D. Once the scene of the Panathenaic games, it was restored in connection with the revival of the quadrennial Olympic games in 1896, and an intermediate Olympic meet was held there in 1906.

Atlantic Highway, a 2,240-mile long highway that borders the Atlantic Ocean, extending from Calais, Me., to Miami, Fla. It passes through most of the important cities on the fall line.

Atlantic Ocean, the vast body of water dividing the western coasts of Europe and Africa from the eastern coasts of North and South America. About 13,000 miles in length, it extends from the Arctic basin to the Weddell Sea in the Antarctic basin. The outlets from the Arctic include the Denmark, Davis and Hudson straits. At 5° N. Lat. the ocean may be divided into two sections called the North Atlantic and the South Atlantic. It attains its greatest breadth of about 4,500 miles at 25° N. Lat. In the South Atlantic, between Cape St. Roque, Brazil, and Cape Lopez, French Equatorial Africa, its breadth is only 1,700 miles. The area of the Atlantic Ocean (including coast waters, such as the North, Baltic and Mediterranean seas on the east and the Caribbean Sea, Gulf of Mexico and Hudson Bay on the west) is 41,321,000 square miles. The ocean proper has an area of about 31,500,000 square miles.

The Atlantic possesses several oceanic platforms, including the Grand Bank southeast of Newfoundland and the Great Bahama Bank of the West Indies. The chief depressions are the North American Basin east of the Bahama Islands, the Brazilian and Argentine basins off the coast of South America and the Cape Verde and West African basins off the coast of Africa. The greatest depth of 30,246 feet is found in Nares Deep north of Puerto Rico. The principal oceanic islands (including those of volcanic origin) are Ascension, Azores, Canaries, Cape Verde, Madeira, St. Helena and Tristan da Cunha. Among those classified as continental islands are Great Britain, Ireland, Iceland, Newfoundland, the West Indies and the Falklands.

The Atlantic is noted for its trade winds that accompany the North and South Equatorial currents, blowing almost constantly from northeast to southwest in the Northern Hemisphere and from southeast to northwest in the Southern Hemisphere. This ocean also has numerous well-defined currents, chief of which are the Gulf Stream and its cool, deep-sea branch, the Labrador Current. In the South Atlantic are the Cape Horn, Falkland and Brazilian currents along the coast of South America and the Benguelan and Guinea currents that influence the climate of western Africa. The salinity of the Atlantic far exceeds that of any other ocean, averaging 3.6 per cent.

The name *Atlantic* is derived from Atlantis or Atlantica, the mythological continent that the Greeks believed was the abode of the blessed; it is supposed to have been submerged beneath the tract of the North Atlantic known as the Sargasso Sea.

Atlantic Pacific Highway, a 3,000-mile road extending from New York to Los Angeles through the central section of the United States. Some of the cities along its route are Philadelphia, Baltimore, Washington, Cincinnati, St. Louis, Wichita and Phoenix.

Atlas, a mountain system extending from Cape Nun through Morocco, Algeria and Tunisia to the Gulf of Gabès and covering an area of about 500,000 square miles. The principal ranges are the Great Atlas, Moroccan Atlas and Anti-Atlas. The range nearest the coast is called the Maritime Atlas; that nearest the desert, as the Saharan Atlas. The highest peak is Jeb Ayashin (14,000 feet) in Morocco. On the northern sides of these mountains European flora grow; the southern sides, especially of the Great Atlas and Saharan Atlas, are arid through exposure to the hot, dry winds of the desert. In the coast ranges of Algeria and Tunisia the Romans quarried Numidian marble.

atmosphere, the mixture of gases and vapors that surrounds the earth and that, through gravitational force, forms part of it. The word, derived from the Greek, means vaporous sphere. Atmosphere consists chiefly of oxygen and nitrogen in the proportion of 20.83 parts of oxygen to 79.17 parts of nitrogen. The oxygen enables human beings and other animals to live and breathe and makes the earth the only planet of the solar system that supports higher life.

The atmosphere also contains small amounts of carbon dioxide (the product of the respiration of men and animals that enables plants to live), argon, hydrogen, helium, neon, krypton, xenon, ozone (the product of electrical discharges), water vapor (in the form of clouds) and other substances, particularly organic and inorganic particles (such as dust) and gaseous impurities (such as ammonia and carbonic acid). Most of the lighter gases are found at a distance of 40 or 50 miles above the earth in the highly rarefied realm where the stratosphere stops. Beyond the earth's atmosphere is the vast emptiness of space. But there is no sharp division where the atmosphere ends; although 99.9 per cent is below 100 miles, there are still millions of molecules per cubic inch even at 500 miles.

At the earth's surface the atmosphere has a density that is about 1/800 that of water. Its total mass is about 1/1,000,000 that of the earth or 6,592,000,000,000 tons. The pressure that the atmosphere exerts upon each square inch of the earth's surface at sea level is the equivalent of 14.7 pounds. Recent experiments show that the oxygen of the air is heavier by six parts in a million than the oxygen of the water.

The height of the atmosphere from observation of unusual displays of the aurora polaris is about 600 miles. The lower part is called the *troposphere*. The *stratosphere* or upper part of the atmosphere in which the quantity of oxygen gradually diminishes, begins 6 to 9 miles above the earth, depending on latitude, weather and season. At about 40° N. Lat., for instance, it begins at 7 miles. *Isothermal region* is an early name for the stratosphere.

Scientific studies of the stratosphere in an attempt to determine its usefulness as a medium of flight have been made by Auguste Piccard, Swiss professor of physics at the University of Brussels, on several occasions since his first balloon ascent in 1931. In 1935 two American Army aviators, Capt. Albert W. Stevens and Orville A. Anderson, attained a record height of 72,395 feet (13.71 miles) in *Explorer II*, the largest balloon ever built. Among their observations were that the electrical conductivity of the atmosphere, which causes thunderstorms, increases with altitude, being nearly 100 times as great at 72,395 feet as at sea level; and that the lowest temperature recorded in this rarefied medium was 78° below zero.

atoll, the Polynesian name for a ring-shaped coral island, surrounding a lake or lagoon and often 20 miles or more in diameter. The narrow reef of coral has an uneven surface; soil is washed upon it by the waves and although this forms only a thin coating it is usually sufficient to support tropical vegetation and in some instances suffices for human habitation. If the lagoon is sufficiently deep, a harbor may be formed for the entrance of ships.

Atolls are found principally in warm waters, such as those of the Indian and Pacific oceans. Examples are the Maldive Islands, a British possession in the Indian Ocean. These are more accurately described as compound atolls, because they consist of 17 large atolls, surrounding several smaller ones grouped around central lagoons. They support a population of 70,000.

The Midway Islands, in the Pacific Ocean 1,200 miles northwest of the Hawaiian Islands, are an atoll group with an area of 28 square miles. They have belonged to the United States since 1867 and are important as a coaling and cable station and as a landing place in transpacific flights.

aurora polaris, a luminous atmospheric phenomenon of the Arctic and Antarctic regions, more commonly known as the *aurora borealis* (northern lights) and the *aurora australis* (southern lights), respectively. The aurora borealis is observed in the neighborhood of the 40th to 60th parallels in North America and between the 50th and 70th parallels of Europe and Asia. The aurora australis is observed only in the region between the 40th and 55th parallels of South America.

The aurora polaris occurs especially during spring and fall, when horizontal rays of the sun reach both the Arctic and Antarctic circles. It is also observed during the winter near the Arctic Circle and during the summer near the Antarctic Circle. Across the sky along the meridians of the North and South Magnetic poles shortly after sundown, arches of slender beams of light are formed, whose spectrum colors, when the phenomena are very bright, vary from red near the horizon through yellow to blue and green. The lights also may take the form of curtains in the latitudes nearer the equator and of coronas in those farther away, they become more brilliant as the Arctic or Antarctic circles are approached.

The origin of the aurora polaris is attributed to negative electrons (from the sun) that are trapped in the magnetic field of the earth and ionize the atoms of such gases in the atmosphere as oxygen, nitrogen, helium, neon, ozone, hydrogen and krypton. Auroras generally range in height from 50 to 250 miles but are occasionally 400 and even 600 miles high. Increased sun-spot activity in recent years is responsible for the frequency with which they have been observed in both the Northern and Southern hemispheres. Derived from the Latin, the term *aurora polaris* means polar light or dawn.

Austral or **Tubuai Islands,** a group of islands in the South Pacific Ocean between 21° and 27° S. Lat. and 144° and 154° W. Long., included in Polynesia. There are five volcanic islands or islands of volcanic origin—Tubuai, Rapa, Rimitara, Rurutu and Vavitao—and an atoll called Hull or Maria Island. Surrounding these islands are fringing coral reefs. The area is about 110 square miles, and the population, mostly Polynesians, about 3,000. The Austral Islands were first visited by Capt. James Cook, the English navigator, in 1769. Administered from Tahiti, they have been a French dependency since 1889. *Austral* means southern.

Australia, a member of the British Commonwealth of Nations that occupies the island continent lying southeast of the Asiatic mainland and south of the Malay Archipelago. It is bounded by the Timor and Arafura seas and the Torres Strait on the north, the Coral Sea and Pacific Ocean on the east, the Pacific Ocean on the south and the Indian Ocean on the west. The area is 2,974,581 square miles, and the population is about 6,665,000. More than 95 per cent of the inhabitants are British in origin. Geographers treat Australia as a continent rather than as an island, because in its physical aspects it possesses the typical continental structure. Among its varied conformations are elevated coasts in the southeast with adjacent mountain ranges, a down-faulted region in the northeast and stretches of rocky promontories and sandy bays and spits along the northern, southern and western coasts. The depressed interior represents crustal sagging in the central and eastern parts. In the western part of the interior is a vast, arid tableland that attains an average elevation of 1,500 feet.

Australia lies south of the equator, with more than a third of its area in the Torrid Zone. Only the southeastern projection has a really temperate climate, and here is found the greater part of the population. Even below the Tropic of Capricorn, marking the southern limit of the Torrid Zone, the heat of the interior is intense, for it is cut off by mountains from the cooling influence of the sea. The seasons as they are known in northern lands are reversed in Australia: summer occurs during the winter months of the Northern Hemisphere; but even in the temperate southeast the winters, beginning with autumn in March, are very mild. This may be partly attributed to the warm East Australian Current that flows southward from the Coral Sea. The western coast is much colder, because it is lapped by waves whose temperature has been lowered by a cold current from the Antarctic.

The northern coast of Australia is indented by the Gulf of Carpentaria; and the southern, by the Great Australian Bight. Extending along the coast of Queensland for a distance of 1,200 miles is Great Barrier Reef, built through countless centuries by tiny coral polyps. The Eastern Highlands are known as the Great Dividing Range in Queensland, the New England Range and the Blue Mountains in New South Wales and the Australian Alps in Victoria. The loftiest peak is Mt. Kosciusko, 7,328 feet high, in New South Wales. West of the Eastern Highlands are the South Australian Highlands that rise gradually from the low Flinders Range in South Australia to a height of 5,000 feet in the MacDonnell and Musgrave ranges of the Northern Territory. The western tableland is distinguished by the Great Sandy Desert in the north and the Great Victoria Desert in the south. In the far west, after rising to heights of 3,000 feet in the Darling and Barlee ranges, the land slopes toward the Indian Ocean.

The largest river of Australia is the Murray (2,310 miles). With the Darling River (1,160 miles), it drains the eastern part of the country, emptying into Encounter Bay on the southern coast. Among other important rivers are the Murrumbidgee, the Lachlan and the Macquarie. Cooper Creek is the most important stream discharging into Lake Eyre, the largest body of water on the continent (3,200 square miles). Near Lake Eyre in South Australia are Lakes Gairdner and Torrens, whose salty sediment was left by a prehistoric spread of the sea over this part of the island continent.

Australia presents an array of animals entirely its own. These are mostly prehistoric animals that, owing to the continent's isolated position, have continued their existence long after their kind became extinct in other parts of the world. The most famous are certain marsupials that carry their young in exterior pouches; among these are the kangaroo, wombat and bandicoot. The koala is a small native bear; and a kind of wild dog is called the *dingo.* Lower in the scale of animal life are the distinctively Australian duckbill or platypus and the spiny anteater. Bird life flourishes, and in this division are the great wingless emu, reminding one slightly of the ostrich; the kookaburra, a species of kingfisher that is said to laugh like a jackal; and the menura or lyrebird. The greatest pest, especially in the destruction of pasture land, is the rabbit; the coun-

Courtesy Official Secretary for Australia in U.S.A.

Sheep Raising, Australia's Most Important Industry

Here the herders and sheep dog drive the animals toward the shearing shed

Courtesy Official Secretary for Australia in U.S.A.

Sydney, Capital of New South Wales, under the Steel-Arch Bridge Spanning the Harbor

try is overrun by some 4,000,000,000 of these animals.

The best specimens of the Australian aboriginal tribes are found in the northern part of the country. These nomadic peoples have acquired a certain celebrity for their skill in hunting, having devised the boomerang, and for their message sticks and rock pictures that represent the beginnings of writing. They number some 60,000.

Because tropical rains favor a rapid growth of vegetation, more than half the area is available for pasturage or cultivation. Sheep raising prevails on the Liverpool Plains of New South Wales, southern Queensland and northern Victoria, where the fine-wooled Merino breed of sheep constitute three-fourths of the flocks. Queensland is the great cattle-raising state, and butter and chilled meat are among the leading exports. The other important pastoral occupation is the breeding of horses noted especially for their stamina in enduring a hot, dry climate.

The principal agricultural products are wheat, oats, corn, hops, rice, sugar beets, sugar cane, cotton, tobacco, bananas, pineapples, grapes, apples and citrus fruits. With these are linked the chief manufactures—flour, sugar, wine, beer, shoes and textiles (principally cotton and woolen goods). Most important of all is the metallurgical industry. The presence of coal and iron has led to the establishment of flourishing steel centers at Lithgow and Port Kembla in New South Wales. Among other mineral products are gold, silver, lead, zinc, tin and copper. The forests of eucalyptus, mahogany, rosewood, sandalwood and pine yield large quantities of timber. The pearl and shell fisheries also have considerable commercial value.

Australia has been British territory since Capt. James Cook took formal possession of it in 1770. Its settlement started in 1788 with the establishment of a British convict colony at Botany Bay on the coast of New South Wales. Beginning on Foundation Day (January 26), the nation observed the 150th anniversary of this settlement with a 3-month celebration in 1938.

Australia has enjoyed a dominion status since its proclamation as a commonwealth in 1901. Of the six political divisions or Original States, New South Wales is the oldest. The other divisions are Victoria, Queensland, South Australia, Western Australia and the island of Tasmania, separated from the mainland by Bass Strait and named for the Dutch navigator, Abel Janszoon Tasman, who discovered it in 1642. The north central part is designated Northern Territory, and the 940-square-mile area surrounding Canberra, the capital, constitutes the Federal Capital Territory.

At the head of the Australian Government is the governor-general, who, under the new order of the British Commonwealth of Nations that came into existence in 1931, is the personal representative of the British sovereign and the ostensible, though not the real, head of an advisory Federal Executive Council or Cabinet. He selects the prime minister from the dominant party in Parliament, and the prime minister, in turn, chooses from among his parliamentary confreres the members of his Cabinet. Parliament consists of a Senate and a House of Representatives, elected by the people directly in accordance with the Federal system. The Senate has 36 members (six from each of the Original States) and the House of Representatives more than twice as many members chosen according to proportional representation. Each of the component states of the commonwealth has its local parliament and a governor appointed by the Crown.

Australia has been noted for enlightened labor legislation. It and its states were among the first countries to enact old-age and workmen's compensation acts and laws subsidizing maternity by the payment of bonuses on the birth of each child. The method of secret voting called the *Australian ballot* has been adopted by the United States and other countries.

Sydney, the capital of New South Wales, is the largest and oldest city (population, almost 1¼ millions). Although situated about 8 miles from the coast it is, with the aid of Port Jackson, the most important seaport. Among the city's notable buildings are St. Mary's Cathedral, Sydney Art Gallery and Government House. It is also the seat of the University of Sydney and the Conservatoire of Music and possesses in the Taronga Zoo and Aquarium a fine collection of Australian fauna. The Sydney Harbor Bridge, with a channel span of 1,650 feet, is one of the longest steel-arch bridges in the world. Near Sydney are the famous Jenolan Caves whose limestone formations, through the play of water from underground streams, assume fantastic shapes.

Other Australian cities include Canberra, seat of the Federal Government since 1927 and one of the best examples of city planning in the world; Melbourne, the former capital and leading city of Victoria, famous for its National Museum that specializes in Australian aboriginal life, and for the Sir Colin MacKenzie Animal and Bird Sanctuary; and Adelaide, South Australia's metropolis, dominated by Mt. Lofty. Perth is the capital of Western Australia and Brisbane of Queensland. Hobart, built on a magnificent harbor, is Tasmania's historic capital.

The name *Australia* is derived from *terra australis,* meaning the southern land.

Austria, a province of Germany annexed by the Nazi *coup d'état* of March 12, 1938. Its independence as a nation had been threatened ever since Adolf Hitler's rise to power in 1933, especially as he insisted on returning his "beloved fatherland to the German Reich."

Until the defeat of the Central Powers in 1918 Austria was part of the powerful Dual Monarchy, Austria-Hungary, but its partition in accordance with the Treaty of St. Germain, so as to form parts of Czechoslovakia, Yugoslavia, Rumania and Italy, as well as an independent Hungary, reduced its area from 115,903 square miles to 32,377 square miles. Old Austria of the Hapsburg monarchy had a population of 28,574,155; the province's population numbers only 6,733,000, of which more than one-fourth reside in Vienna, the capital.

More than three-fourths of Austria's area is mountainous. The ranges of the Tirol, Vorarlberg, Salzburg and other western sections are part of the eastern Alps. The highest peak of the Hohe Tauern Alps is Gross-Glockner (12,460 feet); of the Ötztal Alps, Wildspitze (12,379 feet). Above the snow line of Gross-Glockner is the famous glacier Pasterz. The Brenner Pass, one of the most famous trade-route passes in Europe, is located in the southwestern part between the ranges of the Zillerthal and Stubai Alps. Through this mountain section flow the Danube's principal tributaries, the Inn and Drave. It is one of the most beautiful regions on the Continent, attracting tourists both summer and winter. Dotting the landscape are the peasants' balconied homes, whose exteriors are often decorated with frescoes of a religious nature. For this is a land dominated by the Roman Catholic tradition, with numerous wayside shrines and baroque-styled churches and monasteries erected in the days of the powerful archdukes of the Tirol and of such ecclesiastical princes of the Holy Roman Empire as the archbishop of Salzburg.

The lower slopes of these Alpine ranges, especially those covered with morainic deposits, afford excellent grazing land, and one of the principal industries of Austria is livestock raising. The leading agricultural products are grains, such as rye, wheat, oats and barley, potatoes, turnips, sugar beets, hops, flax, tobacco and grapes (from which a new wine called *heurige* is made). Much of Austria's grain, though, has to be imported, as local production supplies only half the country's need. Forests are abundant, covering about 40 per cent of the total area; and timber, particularly the coniferous variety, is one of the most important exports. The mineral wealth includes iron, coal, copper, lead, zinc, salt, graphite, sulphur and manganese. To augment the coal supply there has recently been a great increase in the utilization of hydroelectric power. In addition to iron and steel products the manufactures include furniture, musical instruments, wood pulp, textiles, jewelry and leather goods.

The principal city of Austria is Vienna, which is described in a separate article. Another important city is Salzburg, located in the central part of Austria on the Salzach River. Associated with it in particular are the music festivals, held annually in August, and the performances, staged by Max Reinhardt in front of the cathedral, of the old morality play *Everyman.* Salzburg is famous also as the birthplace of the composer, Wolfgang Amadeus Mozart, for whom its conservatory of music, the Mozarteum, was named. The residence of the prince-archbishops, their old fortress, Hohensalzburg, and their summer palace, Hellbrunn, have been restored. Innsbruck in the western part of Austria on the River Inn contains as its chief attractions the Hofburg, erected by Maria Theresa; the tomb of the Emperor Maximilian I in the Hofkirche (surrounded by Vischer's statues of his ancestors, many of whom, such as the British King Arthur, are legendary); and the Ferdinandeum and Tirolese Folk Art museums.

Graz in the southern part of the province is noted for its university, founded in 1573; the Gothic cathedral; the Imperial Palace; and the Renaissance Landhaus, seat of the government of the Styrian province. Klagenfurt, the capital of Carinthia, possesses a provincial museum, rich in relics of Alpine folklore, and a botanical garden that specializes in Alpine flora. Among other historic cities are Linz in Upper Austria; Hall in the Tirol; and Eisenstadt, the capital of Burgenland, noted for the castle, owned by Prince Paul Anton Esterhazy, where Josef Haydn, as the prince's *kapellmeister,* composed most of his operas, symphonies and other works.

Courtesy Thomas Cook & Son, Inc.

In the Austrian Tirol

Finkenberg in the central Austrian Alps

The most famous of Austria's spas are Badgastein, Bad Ischl, Semmering, Baden and Hofgastein. The great winter-sports centers include St. Anton, Kitzbühel and Igls-Innsbruck. Austrians are also very fond of paddling and other water sports on the different mountain rivers, such as the Inn, Traun, Ager and Enns. The most famous lakes are Lake Constance on the western border of Vorarlberg (principal resort, Bregenz); Traunsee and Attersee in Upper Austria; and those of the Salzkammergut.

The name *Austria* (in German *Österreich*) means the eastern realm, in contradistinction to the Roman Empire of the West founded by Charlemagne.

avalanche, a large mass of loosened earth and rock, oftentimes containing melting snow or ice detached from a glacier, which slides swiftly down a mountainside or falls from a precipice. Its movement is so quick that people seldom have an opportunity to escape; it crushes everything in its path—trees, buildings, animals—and often creates a strong, sharp wind called an *avalanche blast.* Occasionally these masses are so lightly poised that a strong wind, clap of thunder, earthquake vibration or even a loud shout is sufficient to set them in motion.

An avalanche consisting mainly of earth, rock, sand and gravel is generally called a *landslide* or *landslip.* It may be caused by excessive rains, so that the supporting strata of rock are weakened and the weight of the loosened soil increased. Other contributing causes may be alternating freezing and thawing in winter and droughts in summer.

The villages of Switzerland and other mountainous countries are often protected by stone ridges and earthworks, thereby diverting an avalanche in its descent. The word *avalanche* is derived from the French *avaler,* meaning to descend.

Axenstrasse, a 7½-mile highway in Switzerland, leading along the east shore of the Urner See from Brunnen to Fluelen near Altdorf in the heart of the William Tell country. It has been considered one of Europe's most scenic roads since its construction in 1865. It takes its name from the pastures of the Axenberg above it.

Azores, a group of nine islands of volcanic origin in the North Atlantic Ocean 830 miles west of Portugal. Extending 400 miles between 37° and 40° N. Lat., they have an area of 922 square miles and a population of 253,596 and lie farther from a continent than any other group in the Atlantic Ocean. The land is fertile. The principal exports are wine and fruits—pineapples, oranges, grapes, bananas and olives. The island of Terceira with Angra, the capital, is a favorite winter resort. The other islands are São Miguel, Santa Maria, São Jorge, Fayal, Pico, Graciosa, Flores and Corvo. The highest mountain is Mt. Pico (7,612 feet high) on the island of the same name. Other important cities are Ponta Delgada and Horta. The Azores belong to Portugal by virtue of their discovery by Gonzalo Velho Cabral in 1432. Politically they are a part of the mother country. The name is derived from the Portuguese *açores,* meaning hawks and referring to the large number of these birds found there.

Azov, Sea of, a northern arm of the Black Sea that is almost landlocked on the south by the Crimean and Taman peninsulas. The Kerch Strait connects it with the Black Sea. The Don, one of the principal rivers of the U.S.S.R., empties into its northeastern extremity, the Gulf of Taganrog. Its area is about 14,500 square miles.

badlands, an arid area, barren of vegetation, which presents a fantastic appearance through erosion. Wind and rain carve curious mesas, produce sharp pinnacles or dome-shaped hills and form shallow valleys with precipitous side walls called *arroyos.* Such lands are found in plateau regions where the soil consists of horizontal strata of loosely combined sandstone and clay. The best examples are in certain sections of the Black Hills of South Dakota and Wyoming. They also occur in Colorado, New Mexico, Arizona, Nebraska and Utah. The term comes from the French *mauvaises terres à traverser,* meaning bad lands to travel.

Baffin Bay, a large body of water west of Greenland and east of Baffin Land, North Devon Island and other islands of the Arctic Archipelago. Situated entirely within the Arctic Circle, it is connected with the Atlantic Ocean by Davis Strait and with the Arctic Ocean by Smith Sound and Kennedy and Robeson channels. It is about 800 miles long and 280 miles wide, and in some places its depth exceeds 6,850 feet. Although Baffin Bay is hardly ever free from ice, it is open for navigation about two months each summer. It was explored by William Baffin, the English navigator, while he was seeking a northwest passage to the Orient in 1615.

Baffin Land, a barren island in the Arctic Ocean, part of the Arctic Archipelago with an area of 199,610 square miles. In the eastern part it rises to 6,000 feet above sea level, and part of the plateau is covered with an icecap. The other parts are mostly of tundra formation. Baffin Land is included in the Franklin district of the Canadian Northwest Territories. It was named for William Baffin, one of the earliest English seekers for a northwest passage, who discovered it in 1615 while he was exploring the body of water now known as Baffin Bay.

Recent discoveries in Baffin Land have revealed deposits of iron, copper and sulphur. Like Labrador and other parts of Canada, the island has been slowly rising out of the sea, as its icecap, one of the last vestiges of the ice age, has slowly melted. The continental glacier that covered Canada and the northern United States during the last ice age 10,000 years ago seems to have originated in Baffin Land and adjacent islands of the Arctic Archipelago crossed by the 70th parallel. At that time Hudson Strait, separating Labrador and Baffin Land, was formed.

Bahamas, a group of islands, partly of coral formation, lying in the Atlantic Ocean southeast of Florida and north of Cuba and constituting a British Crown colony. There are in all more than 3,000 islands and islets, but only about 20 are inhabited. The total area is 4,404 square miles, and the population, mostly Negroes, is about 60,000. The most populous island is New Providence, with about 20,000 inhabitants. On it is the capital, Nassau, a city of Mediterranean color, with the fine calcareous Paradise Beach, marine caves and salubrious climate; it is a popular winter resort.

One of the Bahamas was the first land seen by Columbus on his discovery of America in 1492. He named it San Salvador, and it is believed to be Watling Island. Among the others are Great Bahama, Eleuthera, Great and Little Abaco, Cat, Long, Andros, Mayaguana, Great Inagua, Great Exuma and Crooked islands. The chief sources of revenue, principally from exports to the United States, are sponges, sisal hemp and such fruits as oranges, lemons, limes, pineapples and bananas.

Great Britain acquired the Bahamas by settlement, the initiative being taken by the Company of Eleutherian Adventurers about 1650, although for a century afterward the islands were the haunts of French and Spanish pirates. Surrounding them is the Great Bahama Bank, which forms part of a tremendous submarine plateau. Administration is entrusted to a British governor, assisted by executive and legislative councils.

Bahrein Islands, a group of eight islands on the south side of the Persian Gulf, the most important of which are Bahrein, Muharrak and Sitra. Their area is 270 square miles, and the population, chiefly Arabs, Negroes, Persians and Hindus, is approximately 120,000. The islands are noted for their pearl fisheries on banks submerged from 50 to 200 feet below sea level, yielding $5,000,000 a year. Shipbuilding and petroleum drilling also are important. Figs, dates, wheat and barley are the leading agricultural products.

As a principality under British protection since 1867 the islands are administered from the capital, Manama, by a resident commissioner. On several occasions in recent years Iran, claiming them as Persian possessions, has protested against British control to the League of Nations. The name *Bahrein,* which is Arabian for two seas, refers to the Persian Gulf and the Gulf of Oman.

Courtesy Nassau, Bahamas Information Bureau

Bay Street in Nassau, Bahama Islands

This market on Bay Street, Nassau's main thoroughfare, faces Market Street. On steamer days, when tourists flock through the West Indian town, it is filled with natives displaying perfumes, woolens, gloves, linens, tropical fruits, carved coconut shells, sea shells, dolls dressed in native costume and the many other souvenirs of tropical waterfronts

Balearic Islands, a group of four large islands and eleven islets in the Mediterranean Sea off the eastern coast of Spain, forming (with Palma as the capital) a province of that country. The total area of the islands, which represent the emergent portions of a submarine plateau, is 1,935 square miles; Majorca (1,352 square miles) is the largest, and Minorca (264 square miles), Iviza (228 square miles) and Formentera (37 square miles) are next in size. The population is about 375,000. The soil produces cereals and legumes, many grape vineyards and orchards of olive, almond, apricot and fig trees.

First a Carthaginian province, the Balearic Islands were conquered by the Romans about 125 B.C. and belonged to the Saracens from the 8th to the 11th century and to the Moors from the 11th to the 13th century. Thereafter they were successively held by Spain, England, France and again England and Spain; the final cession to Spain was made by the peace of Amiens in 1802. Among picturesque sights are several old castles and monasteries. It was on the heights of Miramar on Majorca that Raymond Lully in 1276 founded the first College of the Propaganda to train Christian missionaries to the Saracens and Jews.

Bali, an island of volcanic formation in the Malay Archipelago between the Java Sea and Indian Ocean, separated from Java on the west by the Bali Strait and from Lombok on the east by the Lombok Strait. With the islet of Lombok it forms a province of Netherland India, with an area of 2,243 square miles and a population more than 1,800,000. The highest elevation is the volcano Mt. Agung, 10,560 feet. Mt. Batur, 5,632 feet high, is famous for its many eruptions. In the crater of the extinct volcano Mt. Bratan is Lake Bratan. Only the northern, southern and eastern parts of Bali are inhabited; the western part, in which is the highland of Djembrana, is covered with virgin forest and haunted by tigers, wild boars and other beasts. On the southern peninsula is the limestone plateau Tafelhoek.

The Balinese, who are mostly of East Indian extraction, are noted for their temple rites, in which women dancers, trained from childhood, play a leading part in the worship of Siva and other Brahmanic gods. Their society is based on the Hindu caste system—Brahmans (priests), Kshatriyas (knights), Vaisyas (merchants) and Sudras (commoners)—but fortunately there are no outcasts. The stone and wood carvings in their temples are rich in relief and garland ornamentation. They fashion jewelry and head ornaments of the gold and silver that they mine, fell the teak and other trees for carving masks and various wooden objects, mold fine pottery and weave beautiful silk materials heavily worked with gold and silver threads. Agricultural products include rice, coffee, sugar cane and cacao. Among tourist attractions are: the Goa Gadja or Elephants' Cave; the royal tombs at Mt. Kawi; the Bali Museum at Den Pasar; and the temple at Tirta Empoel with its sacred springs.

Bali, which was visited by Cornelis Houtman in 1597, has belonged to the Netherlands since 1743. The nine principalities at first retained their local autonomy; but since 1906 the only native rule has been that of regents, supervised by the Dutch resident commissioner at Singaradja, the capital. The chief port is Boeleleng. The name of the island is derived from the Sanskrit word *balin,* meaning strong. With its practically unspoiled native population it is regarded as a modern Garden of Eden.

Baltic Sea, a large arm of the Atlantic Ocean with which it is connected by the narrow Sound, Kattegat, Skaw and Skagerrak and the North Sea. It is about 950 miles long and from 50 to 400 miles wide; including the gulfs of Bothnia, Finland and Riga, it has a total area of 157,040 square miles. Surrounding it are Denmark, Germany, Poland, Lithuania, Latvia, Estonia, Finland and Sweden. The Åland or Ahvenanmaa Islands lie at the entrance to the Gulf of Bothnia. Among other islands are the Swedish Gotland and Öland, the Danish Bornholm and the Estonian Saaremaa. The Neva, Oder, Vistula and Nemunas are the most important of the 250 rivers draining into the Baltic; and the Baltic is only a third as salty as the Atlantic and freezes more readily. The chief ports are Leningrad, Helsinki, Tallinn, Riga, Memel, Danzig, Konigsberg, Stettin, Kiel (at the eastern end of the Kiel Ship Canal connecting with the North Sea) and Stockholm. With the aid of icebreakers the more northern ports are kept open to navigation even during the coldest winter months. The Gulf of Bothnia, however, is completely frozen, and the inhabitants of the Åland Islands cross it on sledges.

The name *Baltic* is derived from the Swedish *balt,* meaning strait.

Baltimore, a city of the United States, metropolis of Maryland and a seaport of importance, although it is situated about 200 miles from the Atlantic Ocean on the Patapsco River, whose estuary forms part of Chesapeake Bay. It ranks seventh in size among cities of the United States, the population numbering 859,100. The port has more than 125 miles of water front and affords anchorage for some 200 vessels at its piers. More than 50 steamship companies have terminals here or make the city a port of call. The chief exports are grains (especially corn), coal, cotton and tobacco. Among the imports are sugar, rubber, coffee, pineapples and bananas.

The coastal plain of the Middle Atlantic States forms a vast garden spot, and Baltimore is an important center for the canning of vegetables and fruits. The Chesapeake oyster beds also are close to this city. In manufactures Baltimore leads in copper, tin and sheet-iron production, in cotton goods (particularly sail duck for yachts), men's, women's and children's clothing, meat packing and chemicals and fertilizers.

Baltimore is called the Monumental City because it took an early lead in the erection of monuments to historic persons or events. In Druid Hill Park is the first monument erected in the United States to Christopher Columbus (1792). The first column in honor of George Washington, erected here in 1815, stands in Mount Vernon Place at the intersection of Charles and Monument streets; its 164-foot Doric shaft is surmounted by a statue of the first President. In Monument Square is Battle Monument, a memorial to those who fell in the War of 1812. Other monuments of lesser note are to Chief Justice Roger Brooke Taney, associated with the Dred Scott decision; and Francis Scott Key, author of the *Star-Spangled Banner.* This song expressed its author's jubilation when, after a heavy bombardment by British war vessels, he saw the Stars and Stripes still flying above Fort McHenry on the morning of Sept. 14, 1814. In Carroll Park is the historic mansion once owned by that signer of the Declaration of Independence, Charles Carroll of Carrollton.

The public buildings of Baltimore are notable for their pleasing architecture. Among these are the Federal Building, Enoch Pratt Free Library, Baltimore Sun Building, Baltimore & Ohio Railroad Building, Savings Bank of Baltimore, Masonic Temple, Walters Art Gallery and Baltimore Museum of Art. The courthouse is noted for two murals by Edwin H. Blashfield, *Lord Baltimore's Edict of Toleration* and *Washington Resigning His Commission.* During the early part of the 20th century the Roman Catholic Cathedral was the see of James, Cardinal Gibbons, whose diocese was recognized as the premier one of the United States.

The two campuses of Johns Hopkins University (founded in 1876, world-famous for its medical research work and supporting a great hospital) are adorned with stately buildings. Goucher College, dating from 1885 and originally a Methodist institution, is a well-known school for women. Among other educational institutions are the University of Baltimore, Loyola College, College of Notre Dame, Baltimore College of Dental Surgery and the Maryland Institute for the Promotion of Mechanic Arts. Peabody Institute possesses a fine historical library and is especially noted for its conservatory of music.

Baltimore was named in honor of George Calvert, First Baron Baltimore. King Charles I granted his petition to found in America a Catholic settlement, but before he could carry out this intention he died in 1632. His son, Cecilius Calvert, Second Lord Baltimore, proceeded with these plans and founded Maryland, named in honor of Queen Henrietta Maria. The first settlement bore the family name but did not survive. A second Baltimore, founded in 1662, met with a similar fate. In 1729 Jones Town, was established, to be the nucleus of Baltimore. Among its early residents were a large number of Acadians who had been driven out of Nova Scotia after France had ceded the province to Great Britain in accordance with the Treaty of Utrecht of 1713. Incorporation as a city took place in 1796.

Baltimore first gained fame as a seaport through building a type of fast sailing vessel known as the *Baltimore clipper.* The first bloodshed of the Civil War occurred in this city on April 19, 1861, when a mob tried to prevent the passage of Federal troops en route to Washington; throughout the entire period of the war the city remained under martial law. The city was the first in the United States to have its streets lighted by gas (1821), and the first passenger train of the Baltimore & Ohio Railroad was operated from here to Ellicott City (1829). Between Baltimore and Washington the first telegraph message was sent (1844); and the first practical electric street railway began operation here (1888).

Courtesy Baltimore Association of Commerce

Enoch Pratt Free Library, Baltimore

This central building of Baltimore's free circulating library system was dedicated in 1933. The system was originally established in 1884 through a $1,250,000 gift of Enoch Pratt, a Baltimore merchant. At a subsequent election citizens voted an annual appropriation of $50,000 for its support. The Carnegie Corporation has contributed toward the construction of several branch libraries. Other branches have been donated by the Baltimore and Ohio Railroad Company, the Old Town Merchants and various societies

bank, land forming the margin of a river or stream. The Left Bank in Paris is the left or south margin of the River Seine, the Bohemian section of the city, long frequented by artists and students.

The word *bank* is applied also to the oceanic platform of land, off the shores of continents and islands, that has been formed by sediment carried down from the land or deposited by opposing currents. Fishing banks are areas of this sort in which fish, such as cod, gather in schools. The Grand Bank, southeast of Newfoundland, is important commercially for this reason. Banks may vary in depth under water from 36 to more than 650 feet.

base, the foot of a mountain, where the ascent from the valley or plain commences. The term *base level* is used in reference to a low-lying region generally in the valley of a mature or old river where the process of erosion is slow, and there are no noteworthy changes in the landscape over a long period.

Barbados, an island of the British West Indies in the Atlantic Ocean. It belongs to the Lesser Antilles, is of coral formation and is the most densely populated island in the world —1,065 persons to each of its 166 square miles. The total population, mostly Negroes, is about 175,000. About one-tenth are whites of British extraction. Tropical fruits are grown, and a large production of sugar, rum, molasses and cotton creates exports. The island was claimed in 1605 by the British who began colonization 20 years later. Administered by a governor appointed by the Crown, Barbados has an elected House of Assembly and a nominated legislative council. The capital of the crown colony is Bridgetown. The name *Barbados* is from the Latin *barba,* meaning beard, in allusion to the beardlike streamers of Spanish moss hanging from the branches of many trees.

basin, the entire area that is drained by a river and its tributaries. Thus, the Mississippi River basin is the large portion of the central United States that is drained by the Mississippi and the many rivers (Ohio, Missouri, Arkansas and others) that flow into it.

The word *basin* is used also for any vast depression or abyss in the surface of the earth that is occupied by oceans. These basins attain depths from 3,000 to 5,000 fathoms (18,000 to 30,000 feet), corresponding to the highest elevations on land. The best-known are the North American Basin in the Atlantic Ocean east of the Bahama Islands and the Tuscarora Basin or Trough in the Pacific Ocean off Japan. There are also the Brazilian Basin and the North African Basin near the Azores.

An outstanding example of the land type of basin is the Great Basin in the western United States, which comprises nearly all Nevada and parts of Utah, Oregon, California, Idaho and Wyoming. Since the drainage system of this area has no outlet to the sea, most of the streams empty into the Great Salt Lake. The region is a semidesert, as the surrounding Rocky, Cascade and Sierra Nevada mountains cut it off from moisture-laden winds. It may also be described as a lacustrine (lake) plain, since it occupies the bed of Lake Bonneville, which in Pleistocene times was about 750 miles long and 500 miles wide or 10 times the size of the present Great Salt Lake. Land basins are generally formed by glacial action or by folding of the earth's crust in synclinal fashion.

The term *basin* is used for a small bay or an arm of a larger bay, as Minas Basin, the easternmost arm of the Bay of Fundy, and Foxe Basin, separated from Hudson Bay by Southampton Island. Chambly Basin is a lakelike widening in the St. Lawrence River near Quebec.

Basutoland, a reservation in the heart of the Union of South Africa, set apart as a home for the Basutos and other tribes of Bantu stock that about 1800 occupied the country. It is bounded by the Orange Free State on the west and north and by the Cape Colony on the east and south. Located in that part of the South African plateau known as the Great Karroo, it is well watered by the Tugela River, which rises in Mont aux Sources (11,000 feet high), and by the Orange and Wilge rivers. The most important range is the Drakensberg in the eastern part. Basutoland has an area of 11,716 square miles and a population of about 600,000. Scarcely 2,000 persons are white, and these are mostly government officials, missionaries and traders. Stock raising is the most important industry, hides and wool constituting the leading exports. The principal agricultural products are Kafir corn and wheat.

From 1871 to 1883 Basutoland was attached to the Cape Colony, but the natives revolted and have since been governed by a British resident commissioner and an assistant commissioner for each of the 7 administrative districts into which the country is divided. Hereditary chiefs preside over the various wards into which these districts are subdivided. The resident commissioner is advised by a native council, consisting of 100 members appointed by the chiefs and the Government, which meets annually at Maseru, the capital.

Battery, The, a New York park at the southern tip of Manhattan Island. It is now the site of the Aquarium, formerly Castle Garden, one of the twin forts guarding New York harbor. In Colonial days its 21 acres were surrounded by fashionable houses.

bay, a portion of the sea extending into and partially enclosed by land. Examples are Chesapeake Bay and Delaware Bay along the coast of the Middle Atlantic States. However, the term is rather loosely used. Hudson Bay in northeastern Canada might be considered a sea. The Bay of Biscay is that part of the Atlantic Ocean around which parts of the coasts of France and Spain form a curve. The Bay of Bengal along the eastern coast of India and Baffin Bay to the west of Greenland are large arms of the sea or gulfs. During the period of exploration and discovery bays afforded natural havens and frequently presented favorable sites for settlements that have since developed into important cities.

bayou, a sluggish creek or small river, generally formed on alluvial plains by flood waters seeking new channels; or a lake that has occupied the abandoned part of a stream channel. Such streams or lakes are especially common in Louisiana, the delta region of the Mississippi. The word comes from the French *boyau,* meaning gut.

beach, the sloping, wave-washed shore of any body of water. The term is applied especially to that sandy or pebbly portion of the seashore that lies between the limits of highest and lowest tide and is generally crescent-shaped.

In common usage the term *beach* ordinarily applies to a sandy stretch of coast especially suitable for sea bathing, such as Jones Beach on Long Island; Long Beach, Calif.; Virginia Beach, Palm Beach and Miami Beach (in which the word *beach* is part of the place name) and such other beaches as those at Atlantic City, the Lido, near Venice, Deauville and Biarritz on the French coast and Waikiki in Hawaii.

Boulders, shingle and coarse gravel and sand are characteristic of beaches in glaciated areas, as the shores of Lake Ontario. With the aid of storms waves often build a beach wall, as at Rye, N. H. Shell or calcareous sands are found on the beaches of coral islands and reefs; sands containing iron, along the coast of Alaska; and sands composed of feldspar and other volcanic ashes, along the Bay of Naples.

Ripple marks in a sandy beach are formed by the wind at low tide. When they are found preserved in such rocks as sandstone, they bear witness to the littoral formation of these rocks from a soft, wet sediment that hardened by exposure to the elements. Wave and rill marks, sun cracks and rain prints also are preserved in rocks.

Beacon Street, a street in the north section of Boston, the old, fashionable residential center. It extends along the rim of the hill of the same name, which skirts the Boston Common, and is flanked by stately 19th-century mansions. In Colonial days a beacon to warn the citizens of threatened Indian attacks was set on the summit of this hill, which is now occupied by the Massachusetts State House and the Shaw Memorial by Augustus Saint-Gaudens.

Bechuanaland, a British protectorate lying east of Southwest Africa and bounded by Angola and Northern Rhodesia on the north, Southern Rhodesia on the northeast and the Union of South Africa on the southeast and south. The famous Victoria Falls of the Zambezi River are at the intersection of Bechuanaland, Northern Rhodesia and Southern Rhodesia. The Molopo and Nosob rivers (so called only during the rainy season) form the southern boundary. Most of the southern part of the country is covered with the red sands of the Kalahari Desert. The northern Ngami and Chobe lakes are surrounded by marshes. The area of the protectorate is approximately 275,000 square miles. The population is about 170,000 most of whom belong to that subdivision of the Bantus called *Bechuanas.* Only some 3,000 of the inhabitants, chiefly government officials, missionaries and traders, are white.

The principal products of Bechuanaland are corn and millet. Cotton and indigo grow wild. Cattle, sheep and goats are raised largely for export. Gold and silver are mined in small quantities. Since the establishment of the protectorate in 1885 local chieftains have maintained their rule, subject to the superior authority of the British resident commissioner and his two assistant commissioners. Since these officials are responsible to the high commissioner for the Union of South Africa, administrative headquarters are maintained at Mafeking, just over the southeastern border in the Cape Colony. Important towns of Bechuanaland are Gaberones, Francistown and Serowe (the largest native village).

Belgian Congo, a vast area in equatorial Africa, 920,895 square miles in extent, since 1908 a Belgian colony. It was previously known as the Congo Free State. The opening of the Belgian Congo to foreign influence started in 1876, when King Leopold II of Belgium organized and largely financed the International Association of the Congo that sponsored the work of Henry M. Stanley and other explorers. The International Conference on African Affairs, held in Berlin in 1885, made Leopold ruler of the Congo Free State, but during the next 15 years he so exploited the country for his personal aggrandizement that the inhuman methods of his agents became a world-wide scandal. Largely through action taken by Great Britain administrative reforms were instituted, and when the state assumed the status of a colony its direction was intrusted to the Minister for the Colonies, assisted by an advisory council under the control of the Belgian Parliament. The king of the Belgians on the advice of the minister for the Colonies appoints the governor general of the Belgian Congo. Vice-governors preside over the 15 provinces, and commissioners over the 175 districts. Under mandate from the League of Nations Belgium also administers Ruanda and Urandi, which were formerly in German East Africa.

The Belgian Congo is situated almost entirely inland, with only a 25-mile coastline where the Congo River empties into the Atlantic Ocean. On the north and west lies French Equatorial Africa. Angola and Northern Rhodesia bound the country on the south, and Uganda and the Anglo-Egyptian Sudan on the northeast. Lake Tanganyika forms most of the southeastern boundary between the Belgian Congo and Tanganyika Territory. Most of the colony lies within the basin of the Congo River, a 2,900-mile-long stream that with its numerous tributaries drains an area of 1,500,000 square miles. The Congo proper rises in the highlands of the Katanga Plateau in the southeastern part of the country. On cutting its way to the sea through the Crystal Mountains in the western part this river forms a succession of rapids and waterfalls for about 200 miles. Around this unnavigable stretch, however, has been constructed the Matadi-Leopoldville Railroad. The northeastern limit of the Congo basin is marked by the Mitumba Mountains near Lake Albert on the boundary between Belgian Congo and Uganda. The numerous river valleys are occupied by dense tropical forests and wooded savannahs that are the homes of elephants, lions, pythons, hippopotami, lemurs, jackals, antelopes and other typical jungle animals. Most of these are found in the great African game preserve, the Albert National Park, named in honor of King Albert I.

The Belgian Congo has a population of about 10,000,000; only some 25,000 persons are Europeans. The most typical natives are the Pygmies and Bantus. The country has always been rich in rubber, and the yield amounts to about 4,000 tons annually. The Congo produces in great quantities ivory, coconut oil and nuts, coffee, cacao, sugar cane, rice, tobacco, cotton, bananas and other tropical fruits. The most distinctive mineral is pitchblende from which radium is extracted. Among other minerals are copper, gold, tin, cobalt, coal, iron and diamonds. From the forests are obtained mahogany, ebony, teak, cedar and gum copal.

The capital is Leopoldville (population, about 43,000). Banana on the Atlantic coast and Boma and Matadi on the Congo River near the coast are the chief ports. Other important towns are Albertville, named for the late king of the Belgians; Elizabethville, named for his queen; and Stanleyville, which honors the great English explorer.

Belgium, a kingdom of western Europe, the most densely populated country of the Continent. Belgium has an area of 11,754 square miles and a population of more than 8,000,000.

The country has a short coastline, extending a distance of 42 miles along the North Sea in the northwestern part. Bounding it are the Netherlands on the north; Germany and Luxemburg on the east; and France on the south and southwest. The coastal plain is low, but the land gradually rises to a plateau about 1,500 feet high in the southeast; this Ardennes plateau is the remnant of the ancient Hercynian mountain system that is continued across southern Germany as the Eifel and Westerwald mountains and across northern Austria as the Wienerwald. The division between the lower and higher parts of the plateau is marked by the Meuse and Sambre rivers. The Scheldt, which rises in the French Department of Aisne and flows through the western part, is the main link in Belgium's river-and-canal system; its tributaries include the Lys, Senne, Dendre, Dyle and Gette. For administrative purposes the country is divided into nine provinces—Antwerp, Brabant, East Flanders, Hainaut, Liége, Limbourg, Luxembourg, Namur and West Flanders—and is further subdivided into arrondissements, cantons and communes.

Agriculture is practiced intensively; about 40 per cent of the total area is under cultivation, thanks largely to the reclamation of the sandy heaths in the eastern section called the *Campine* and the construction of dyke-protected polders along the seaboard. The principal crops are wheat, oats, rye, barley, flax, hops, tobacco, potatoes and sugar beets. Belgium's mineral wealth consists of coal, iron, copper, lead and zinc. Marble, granite and slate also are quarried. There are manufactories of steel, sugar, vinegar, matches, silk, lace, linen, jewelry, glassware, porcelain and leather goods.

The people of Belgium are of two different ethnical stocks: Flemings in the north, who speak Flemish, a Teutonic tongue; and Walloons in the south, who speak a French patois. French is the language of commerce, especially in the large cities; but since 1932 the Government has recognized two official languages, Flemish in Flanders and French in Walloonia. German is spoken in the cantons of Malmedy, Eupen and Moresnet in the province of Liége, ceded by Germany in accordance with the Treaty of Versailles.

The government of Belgium is a constitutional and representative monarchy, with hereditary descent in the male line. In behalf of the king, executive authority is exercised by the premier and his cabinet. Parliament consists of the Senate of 153 members, elected in part by the provincial councils, by the electoral colleges of the provinces and by the Senate itself, and the Chamber of Representatives whose 187 members are elected by direct popular vote in accordance with the principle of proportional representation.

Courtesy Consulate General of Belgium, New York

Lacemaker of Bruges

For centuries Belgian pillow or bobbin lace has been famous for its exquisite workmanship. The pillow is a padded round or oval board, held on the worker's knee, on which is affixed parchment pricked with pins marking the desired pattern. A thread is wound into each bobbin. The threads are crossed and twisted to form the ground pattern. Then a thicker thread is interwoven around the pins to form the design. About 80 bobbins are used for a very simple design, and as many as 50 per square inch for complicated ones

Brussels is the capital of Belgium. The next city in importance is Antwerp, the leading seaport, located on the Scheldt River about 55 miles from its mouth. Its architectural masterpiece is the Gothic Cathedral of Notre Dame, containing *The Descent from the Cross* by Rubens. The Royal Museum is enriched with paintings by Rubens, Van Dyck and other Flemish masters. The Plantin-Moretus Museum is a perfect example of the shop of a 16th-century printer. Liége at the confluence of the Meuse and Ourthe rivers owes its importance as a manufacturing city to its location in the mining section and is the seat of one of the leading Belgian universities. Ghent, at the junction of the Scheldt and Lys rivers, is medieval in aspect; its principal structures are: the Gothic Cathedral of St. Bavon, containing the painting *Adoration of the Mystic Lamb* by the brothers, Jan and Hubert van Eyck; the Gothic Town Hall; Grand and Petit Beguinages, where live the pious lay sisters called *Beguines;* and the restored 10th-century château that once belonged to the counts of Flanders. The city is the seat of the University of Ghent.

Bruges, in the province of West Flanders, retains much of the glamour of the Middle Ages, when it was one of the leading trade centers of the Hanseatic League. Among its notable buildings are the Cathedral of St. Sauveur and the 13th-century Halles or market of whose belfry Longfellow sang in *The Bells of Bruges.* To the Chapelle du Saint Sang there is a unique procession each year on the anniversary of the depositing by Theodoric of Alsace in 1149 of drops of the Saviour's blood that he had brought from Palestine. Malines, in the province of Antwerp, owes its fame to the Gothic Cathedral of St. Rombaut, whose finest possession is *The Crucifixion* painted by Van Dyck. The city is the see of the cardinal-archbishop who presides over the six Roman Catholic dioceses of Belgium.

Tournai in the province of Hainaut is justly proud of the Romanesque Cathedral of Notre Dame, the 12th-century belfry with its fine carillon and the Art Gallery whose collection of paintings is one of the finest in Belgium. Ostend on the North Sea coast is one of the leading European beach resorts. Louvain in the province of Brabant has won renown since the 15th century as a center of learning; its principal institution is the Roman Catholic University, restored largely through American generosity after its partial destruction in the World War. Among other towns that played an important part in the war and that since have been restored are Ypres (famous for its Cloth Hall of the medieval clothworker's guild and the British War Memorial, called the *Menin Gate*), Namur (noted for its archeological museum) and Zeebrugge, which was the center of German submarine operations in the World War. Germany conquered Belgium in 1940.

The name *Belgium* means the land of the Belgae. Gallia Belgica was the name that the Romans gave the northern part of Gaul as distinguished from Gallia Celtica, the land of the Celts in the central and southern part. It was adopted when the modern kingdom came into existence in 1830 after rebelling against the rule of the Netherlands.

ben, a mountain, hill or peak in Scotland and Ireland, the word being derived from the Gaelic *beann.* It is familiar in such proper names as Ben Nevis, a mountain in the west of Scotland.

bend, a curve in a river or other stream of water, and in its larger meaning, marking a well-defined change in the river's course. The city of Great Bend, Kans., is situated at the turn of a bend in the Arkansas River. South Bend, Ind., is at a northward bend in the St. Joseph River.

Bengal, Bay of, an arm of the Indian Ocean, roughly triangular in shape, lying east and south of India and west of Burma and Siam. In it are two important island groups, the Andaman and Nicobar islands. The coast of the portion of Burma extending into the Malay Peninsula is fringed by the Mergui Archipelago, islands formed in many instances through the eruption of mud volcanoes. The principal rivers flowing into the Bay of Bengal are the Ganges, Brahmaputra and Irrawaddy. The most important seaports are Madras in India and Rangoon and Moulmein in Burma. This bay is in the path of the northeast monsoon of winter and the southwest monsoon of summer.

Bennington Battle Monument, Bennington, Vt. This square stone shaft, 301 feet high, which rises from a broad green hilltop in the village center, was dedicated in 1891. It commemorates the battle of Aug. 16, 1777, in which the British forces under Burgoyne were defeated.

Bering Sea, an extension of the Pacific Ocean between Alaska in North America and Siberia in Asia. Bering Strait, a 36-mile water passage, separating Alaska and Siberia, connects it with the Arctic Ocean. The name was changed from the Sea of Kamchatka to Bering Sea to honor Vitus Bering, the Danish explorer who claimed Alaska for Russia in 1741. His discovery of Bering Strait proved that the two continents were not united. The area of Bering Sea is 878,340 square miles. The Aleutian Islands belonging to the United States and the Commander Islands claimed by the U. S. S. R. partially separate it from the Pacific. The Yukon is the principal river that flows into it.

Berlin, the capital and largest city of Germany, in the northeastern part of the country in the Kurmark or electorate of Brandenburg on the River Spree. It ranks second in size among European cities and fourth in size among the large cities of the world. As the capital of Germany since the establishment of the Reich in 1871 Berlin is the seat of the *Reichstag* or Parliament, of the various government ministries and of the diplomatic corps accredited to Germany by other nations. Until the suppression by the Third Reich in 1934 of the individual states composing the German Republic Berlin was capital of the Free State of Prussia, which until the establishment of the Republic in 1919 was the kingdom of Prussia, ruled by the Hohenzollern kings who were also emperors of Germany. Greater Berlin with an area of 334 square miles was formed in 1920 by the amalgamation of 59 *gemeinden* or communes; the population is about four and a quarter millions. Berlin has more than 100 stations (including those of the suburban railways) and 12 trans-European express lines passing through it, and the city is the hub of the railway network of the nation. Joining Berlin to Hamburg, Germany's greatest port at the mouth of the Elbe River, and to Stettin at the mouth of the Oder River are canals that connect the Spree with the Elbe and Oder rivers. The Mittelland Canal will afford connection with cities on the Rhine and Ruhr rivers. Nine transshipment harbors, covering an area of 300 acres, enable Berlin to rank next to Duisburg-Ruhrort in Rhenish Prussia as Germany's leading inland port. The municipal airdrome at Tempelhofer Feld is the largest in the world. The first German Museum of Aviation is in Berlin.

Besides being the mainspring of the nation's political life, Berlin is the center of Germany's industrial and economic life. It is the most important grain mart of Europe, occupying a position similar to that of Chicago for North America, and handles a large trade in coal, iron, wool and lumber. The manufactures include woolen cloth, sewing machines, bicycles, chemicals, soap, china, pianos and furniture. Berlin is an important publishing center.

In education Berlin has for many years influenced the world. Its greatest institution is the Friedrich Wilhelm University, more commonly known as the University of Berlin, which was founded in 1810 and has an annual enrolment of about 12,000 students. Of the scientific institutions the foremost is the Kaiser Wilhelm Institute at Dahlem. There are also the Technical College, College of Commerce, State College of Music, Academy of Arts, German College of Political Science and the Reich Academy of Physical Training.

Another evidence of Berlin's cultural influence is its many museums. The most important of these are on Museum Island in the Spree River: the Kaiser Friedrich Museum, National Gallery, German Museum (devoted to German works of art), Old Museum (Greek and Roman Sculpture), New Museum (Egyptian collection) and Museum of Applied Art. In the Pergamon Museum is the magnificent altar to Zeus, erected in the 1st century B.C. in the market place of Pergamon, an ancient city of Mysia in Asia Minor, and discovered in 1878 by German archaeologists. The first German Museum of the National Socialist Revolution is an educational medium of the Nazi Government.

Notable Streets and Buildings. Berlin excels all other European capitals except Paris and Vienna in the number of fine avenues, parks and squares. One of the best-known streets in the world is Unter den Linden, nearly 1 mile in length and 196 feet wide. It is flanked by four rows of linden trees. At one end on Spree Island is the palace of the former German emperors, representing every style of architecture from Late Gothic to modern Classicism. At the other end of Unter den Linden, surmounted by a quadriga representing Victory is the Brandenburger Tor, the only one left of the 16 gates that until the middle of the 19th century pierced the high walls surrounding the city. This arched gate has five passageways for traffic; in the days of the empire the middle one was reserved for the sole use of royalty.

Along Unter den Linden are the buildings of the University of Berlin; the Prussian State Library, housing almost 2,500,000 volumes; the old Royal Library (now the Aula of the university), which contains more than 1,000,000 volumes; the famed State Opera; palaces of the former crown prince and Emperor Wilheim I (the former palace now serves as a modern art annex to the German Museum); the Zeughaus or arsenal (now a military museum) and the Prussian War Memorial (formerly the Royal Guardhouse), where constant guard is maintained at the tomb of Germany's Unknown Soldier. In the Lustgarten or square in front of the Schloss is the National Monument to Emperor Wilhelm I. Unter den Linden is further distinguished by statues of the Great Elector (Frederick I) and Frederick the Great. The Tiergarten, a park of 550 acres, stretches from the Brandenburger Tor to Charlottenburg.

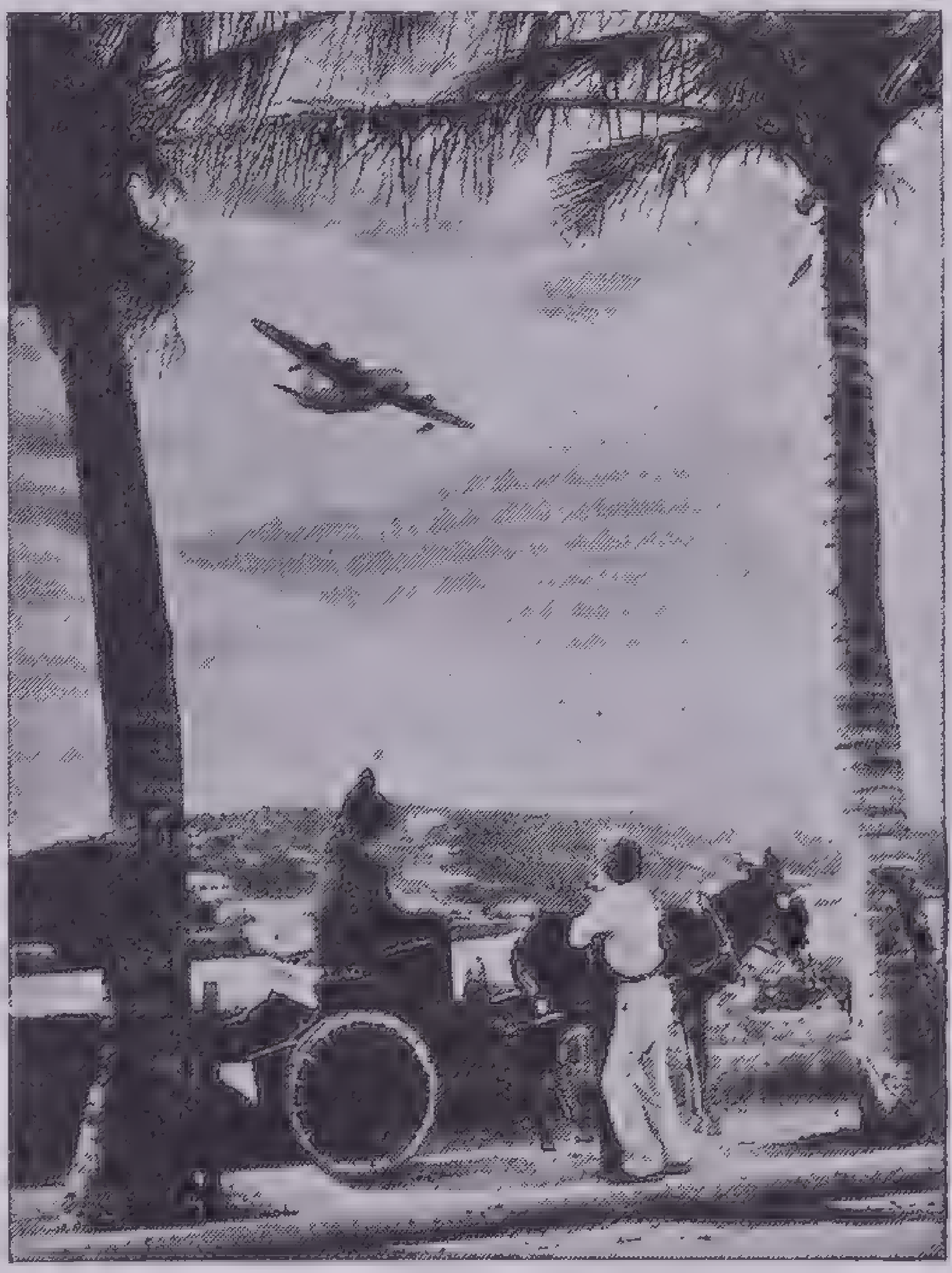
Perhaps the Renaissance-styled Reichstag building is the most conspicuous structure in the city. In front of it in the Königsplatz is the Column of Victory, erected after Germany's success in the Franco-Prussian War. The Bismarck National Memorial faces the entrance on the opposite side. Nearby in the Siegesallee are the statues of 32 former rulers of Brandenburg and Prussia. The center of Berlin's political life is the Wilhelmstrasse, on which are located the residence of the chancellor, the foreign office and the ministries for national enlightenment and propaganda, finance, transport and air.

Among Berlin's notable churches are the Lutheran Cathedral, St. Hedwig's Roman Catholic Cathedral, the 13th-century churches of St. Nicholas and St. Mary (the latter contains the famous fresco *Dance of Death*) and the Baroque Garrison Church or Church of St. Michael. Municipal activities center in the Rathaus or Town Hall and Stadthaus. The most important building project of the Third Reich is the Reich Sports Field in which the 1936 Olympic games were held. It includes the German arena, swimming and hockey stadia, several football fields and tennis courts, artificial ice-skating rink, polo grounds and winter swimming hall.

At Potsdam Frederick the Great developed the summer palaces that in the magnificence of their rococo decorations rival those of Versailles. The one of greatest interest is Sans Souci approached by a broad flight of steps, banked by six terraces on each side; at the foot of the terraces is a statuary-adorned square with a geyserlike fountain in its center. Among other palaces in the park of Sans Souci are the Orangerieschloss and the Charlottenhof, both of which were occupied by Frederick William IV, and the Neues Palais, noted for its art collection and court theater. Scattered about the grounds are a Chinese tea house, Roman bath, several Greek temples and artificial ruins on the wooded height called *Ruinenberg*.

The name *Berlin* is probably from the Wendish word *berle,* meaning uncultivated ground. The city, originally a twin town called Berlin-Kölln, dates from the 13th century. Two centuries later it became the capital of the margraviate of Brandenburg; and it remained the capital when, under its Hohenzollern rulers, Brandenburg expanded into the kingdom of Prussia in 1701 and when Prussia became the strongest state of the German Empire in 1871.

Bermuda Islands, a group of 360 islands and islets of coral formation in the Atlantic Ocean, 580 miles east of North Carolina, constituting a British Crown colony. They have a total area of 19 square miles, and the population of the 20 inhabited islands is less than 30,000. The capital, Hamilton, is on the largest island, Great Bermuda, which occupies more than half the total area and is famed as a winter resort. In 1934 the Bermudas supplanted Halifax, Nova Scotia, as the chief Atlantic naval station of the British Navy. St. George Island has a strongly fortified harbor, and Ireland Island has a large dockyard and floating docks. Among the other islands are Somerset, St. David and Nonsuch. Causeways and bridges connect several of the islands. The 22-mile-long Bermuda Railroad serves to link the various villages of Great Bermuda, St. George and Somerset islands.



Courtesy Bermuda News Bureau

Old and New in Bermuda

A native Bermudian in his donkey cart points to one of the seaplanes that fly on regular schedules to Hamilton, Bermuda, from Baltimore, Maryland, and Port Washington, New York

The climate of the Bermudas is healthful, and the soil is fertile for raising vegetables of all kinds, especially onions, potatoes and tomatoes, which are shipped during the winter months to the United States. The most typical flower, raised for commercial purposes, is the Bermuda (Easter) lily. Most of the revenue is derived from tourist trade, about 75,000 Americans visiting the islands each year. Special attractions are the marine caves, multicolored fish and other ocean life that can be viewed from glass-bottomed boats and the pleasure of carriage driving or bicycling, as no automobiles are allowed on the islands.

First settled in 1609, the Bermudas have a Parliament or House of Assembly that dates from 1620. The British Crown is represented by a governor who is also commander-in-chief of the army; assisting him are executive and legislative councils. The islands are named for the Spanish navigator, Juan Bermudez, who discovered them in 1515. Two years after the beginning of English colonization they supplied the scene for the last of Shakespeare's plays, *The Tempest* (1611).

Betsy Ross House, Philadelphia. The tiny home, patriotically restored to its colonial condition, in which, according to tradition, Mrs. Ross made the first Stars and Stripes flag in 1777.

Bhutan, a semi-independent state between Tibet and India in the southeastern Himalayas. Dividing the country into four sections are the more important ranges—Masong-Chung-dong, Dokyong-la, Black and Tawang. The valleys between these ranges are watered by the Amo-chu, Wang-chu, Ma-chu and Manas rivers. The principal products of the lowland areas are corn, rice, millet, barley, wheat and buckwheat. The Alpine valleys are utilized for cattle and pony grazing. The mountains yield silver, copper and iron that are utilized by the Bhutanese in the manufacture of vessels, swords, bells and other metal objects. Other manufactures are silks and coarse cottons and woolens.

The area of the country is estimated at 17,750 square miles. The population, about 300,000, is mostly of Mongolian origin. The people profess Buddhism and until 1907 possessed a spiritual ruler called the Dharm Raja and a temporal ruler called the Deb Raja. The usurper, Ugyen Wang-chuk, established a hereditary maharajarate. For administrative purposes the country is divided into nine provinces, ruled by feudal barons called *penlops.* Bhutan is an independent state in its internal affairs, but by a treaty signed in 1865 and amended in 1910 the Government is pledged to accept British advice in all foreign relations. Punaka, a strong natural fortress, is the winter capital. Trashi-chod-zong is the summer capital.

The *name Bhutan* is a corruption of the Indian name *Bhotanta* that means the end of Bhot or Tibet.

bight, a bend in a seacoast between comparatively distant headlands forming a shallow opening toward the sea. Typical examples are: the Bight of Benin and the Bight of Biafra, two arms of the Gulf of Guinea indenting Nigeria and the Cameroons on the African coast, and the Great Australian Bight that indents the southern coast of Australia.

Biltmore Estate, Asheville, N.C. This great French château with its complete furnishings, broad terraces, formal gardens and superb scenic setting, originally the vast private estate of

George W. Vanderbilt and now semipublic, is one of the most magnificent private homes ever built in America.

Biscay, Bay of, a portion of the Atlantic Ocean that indents the southwestern coast of France and forms more than half of Spain's northern boundary. Its area is about 160,000 square miles. The 400-mile curve of the bay along the French coast is broken by the estuaries of the Loire, Garonne, Sevre and Charente rivers. At the head of the Loire estuary is the seaport of Nantes, and at the head of the Garonne estuary, Bordeaux. Other important French ports are La Rochelle, Rochefort and St. Nazaire. Santander and Bilbao are the principal Spanish ports. The shipping of all these seaports is large, but it might be greater if the bay were not frequently the scene of dangerous storms; strong winds and the varied Rennel Current are the principal threats to navigation. The westernmost headland is Cape Ortegal. Pointe de St. Mathieu, near which Brest is located, is the northernmost headland.

The name *Biscay* is a corruption of the Spanish form, Golfo de Vizcaya; it refers to the Basques whose settlements are found on both sides of the Pyrenees. The Romans called the bay Sinus Aquitanicus (Aquitanian Gulf) and Sinus Cantabricus (Cantabrian Gulf).

Black Hawk Monument, Oregon, Ill. A titanic concrete statue, designed by Lorado Taft in memory of the Indian leader, Black Hawk, rises on a bluff overlooking the Rock River. The typical pose of the blanketed figure, arms stoically folded, symbolizes the Indian character.

Black Sea, an inland sea bounded on the north and east by the U. S. S. R., on the west by Rumania and Bulgaria and on the south by Turkey. The Danube, Don (through the Sea of Azov), Dnieper, Dniester and many other rivers flow into it. Its waters reach the Mediterranean through the Bosporus, the Sea of Marmara, the Dardanelles and the Aegean Sea. It has an area of 165,640 square miles and is more than a mile deep in some places. The Black Sea is an important southern trade outlet for the U. S. S. R., whose more important ports are Odessa, Sebastopol, Batum and Poti. Turkey's chief ports are Trebizond and Samsun; Constantsa is Rumania's most important seaport; and Bulgaria possesses the port of Varna. The ancients called the Black Sea the *Pontus Euxinus,* meaning hospitable sea and used ironically in reference to the high winds, fogs and frequent storms.

blizzard, a heavy, blinding snow storm, usually accompanied by a freezing wind. Blizzards are common in the Middle West of the United States, although along the Atlantic coast few winters escape without at least one blizzard. One of the most famous storms in the Atlantic section was the blizzard of March, 1888, with drifts 20 feet high. Such storms also occur in Canada, Great Britain and the U. S. S. R. and are characteristic in both summer and winter on the ice-capped plateau near the South Pole, where the wind attains a velocity of more than 100 miles an hour. Their forerunner is a current of cold air that has been forced out from a region of high barometric pressure.

bluff, a steep cliff having a broad flat or rounded face and overlooking a plain, ravine, river or the sea. The city of Pine Bluff, Ark., on the Arkansas River, the town of Oak Bluffs on the island of Martha's Vineyard, overlooking Nantucket Sound, and the city of Council Bluffs, Iowa, take their names from the bluffs on or near which they are situated. The word in this sense originated among the American colonists in the 18th century.

bog, an area of wet, spongy ground, filled with decayed and decaying moss and other vegetation. The word is derived from the Gaelic word meaning tender, moist. Peat bogs, such as are found in Ireland, are formed by the decay of rushes, sphagnum and other aquatic plants and for centuries have been the principal source of fuel for the peasant. The reclaimed bog areas that sometimes have a depth of 50 feet furnish an exceptionally fertile soil for the growth of oats and such vegetables as onions and celery. Peat bogs are found also in the Scandinavian countries, Germany, Canada and the New England section of the United States.

In the United States the word *bog* is applied to an elevated clump of grass, roots and earth covering a peat area in a swamp or marsh. The best example is the Great Dismal Swamp of Virginia and North Carolina, the peat bogs of which are covered with a dense growth of vegetation.

Bois de Boulogne, one of Paris's chief parks, 2,200 acres in area, located in the western, fashionable part of the city. It contains a zoological garden, two lakes called the *Lac Superieur* and *Lac Inferieur* and the tracks where the famous Longchamp and Auteuil horse races are held. The Avenue Foch (formerly the Avenue du Bois de Boulogne) connects the park with the Place de l'Étoile.

Bois de Vincennes, a 2,300-acre park, belonging to the city of Paris. It is the chief recreation center of East End citizens and contains the Pershing Stadium, a race track and a military training ground. Near it is the royal château that was the principal residence of the kings of France until it was superseded by Versailles in 1668.

Bok Singing Tower, Mountain Lake, Fla. Surrounded by semitropical gardens and woodlands that afford shelter to countless birds and colorful flowers, this graceful tapering tower of pink and buff stone rises 205 feet. It contains a carillon of 71 bells, one of the finest in the world. It was built by Edward Bok, editor of the Ladies' Home Journal, who is buried at its base, and was dedicated in 1929.

Bolivia, a republic of South America, landlocked (like its neighbor, Paraguay) since it lost its seacoast to Chile in the war of 1879–83. Brazil bounds it on the north and east, Paraguay and Argentina on the south and Peru and Chile on the west. The area is generally given as 514,155 square miles, but these figures were revised in October 1938 when Bolivia gained some territory in settlement of the century-old dispute between Bolivia and Paraguay over the Gran Chaco. This is an extension of the partly forested and partly swampy plain of northern Argentina that includes the area from the Paraguay River to the foothills of the Andes as far north as 18° S. Lat. According to the latest official estimate Bolivia's population is nearly 3,200,000. There are only about 400,000 white persons, descendants of the early Spanish colonists, but they dominate the country. The principal Indian tribes are the Aymaras and Quichuas who, like their Inca ancestors, live in the Andean highlands. One-fourth of the population is mestizos (mixed bloods).

The Andes, covering two-fifths of the area, cross the southwestern section of the country. Here they attain their greatest breadth and contain some of the highest peaks in South America—Mt. Sahama (22,349 feet), Mt. Illampu (21,286 feet) and Mt. Illimani (21,181 feet). Northeast of the Andes is a vast 12,000-foot-high plateau that covers an area of 40,000 square miles and is traversed by several branches of the Andes, including the Azanaques, Frailes and Lipez ranges. Lake Titicaca on the boundary between Peru and Bolivia is the most highly elevated lake of notable size in the world. Situated at an altitude of 12,507 feet above sea level, it covers an area of about 3,200 square miles and is famed for the admirable examples of Inca architecture found on the Islands of the Sun and Moon. The largest lake within the country is Poopo (Pampa Aullagas), which covers on area of about 1,000 square miles. The principal rivers are the Beni, Mamore and Madre de Dios that as tributaries of the Madeira eventually join the Amazon.

In the more fertile parts of the great plateau, called the *llanos,* grazing is important. Crops of a tropical nature are raised in the warmer regions of the north and include coffee, sugar cane, rice, tobacco and cacao (used in manufacturing cocoa and chocolate). On the higher levels the crops are those of the Temperate Zones—wheat, barley, corn, potatoes and various fruits and vegetables. In the production of rubber Bolivia among South American countries is second to Brazil. The bark of the cinchona tree is used in the manufacture of quinine, and from the dried leaves of the coca shrub cocaine is derived.

Bolivia is rich in minerals. In addition to supplying about one-fourth of all the tin mined in the world it produces in large quantities lead, zinc, antimony and copper. Other minerals are silver, gold, tungsten, wolframite, bismuth and petroleum. The chinchilla is bred for its fur, and the wools of the llama, alpaca and vicuna are used in the manufacture of various woolen fabrics.

On declaring its independence of Spain in 1825 Bolivia became a republic. In accordance with the constitution adopted in 1880 executive authority is vested in the President, chosen by direct popular vote for a 4-year term; he is assisted by the Cabinet, consisting generally of 6 ministers. The National Congress is composed of the Senate of 16 members elected for 6 years and the Chamber of Deputies of 72 members elected for 4 years. For local administrative purposes the country is divided into 8 departments and 3 territories.

The capital is La Paz, called when it was founded in 1548 Pueblo Nuevo de Nuestra Senora de la Paz (the New City of our Lady of Peace) and rechristened after an important victory in 1825 La Paz de Ayacucho. It is located in a gigantic ravine formed by the La Paz River in the western part of the country, and has been the legislative capital since the Revolution of 1898. Guarding it like a sentinel is snow-capped Mt. Illimani. Among its notable buildings are the Legislative Palace, Municipal Theater, Public Library, National Museum (noted for its Inca relics) and the Roman Catholic Cathedral, which was dedicated in 1933. The city is also the seat of the University of San Andres and of a military college and seminary. Its population is 150,165.

An unusual feature is that the National Supreme Court sits at Sucre, the former capital. Among other important cities are Oruro, Cochabamba and Potosi.

Bolivia was named in honor of General Simon Bolivar y Ponte, the liberator of Colombia, Peru and other Latin-American republics.

Bond Street, a street in London famous for its exclusive shops, notably tailors', and the galleries of well-known art dealers. The thoroughfare was built by Sir Thomas Bond in 1686. Its two sections, called New and Old Bond streets, extend between Piccadilly and Oxford Street.

bore, a huge, abrupt flow at high tide. It occurs in a funnel-shaped bay, such as the Bay of Fundy, separating the Canadian provinces of New Brunswick and Nova Scotia, or the estuary of a river, such as the Amazon. In the Bay of Fundy the bore ranges in height from 40 to 50 feet; in the estuary of the Amazon it attains a height of 20 feet or more, going up the river for nearly 400 miles. The natives call the Amazon bore the *pororoca.* Other notable river bores are those in the estuaries of the Seine in France, the Ganges and Indus in India, the Tsientang in China, the St. Lawrence in Canada and the Severn, Dee and Mersey rivers of Great Britain. The phenomenon generally occurs in the spring. *Bore* is Icelandic for wave.

Borneo, an island of the Malay Archipelago of volcanic origin. Its larger and more valuable part belongs to the Netherlands. Three smaller sections, North Borneo, Sarawak and Brunei, are under British rule or protection. Built on a submarine plateau, which indicates that it was once part of the Asiatic mainland, it is surrounded by the South China Sea on the northwest, Karimata Strait on the southwest, Java Sea on the south, Macassar Strait on the southeast and Celebes and Sulu seas on the northeast. It is third in size among islands of the world. Of the total area of about 290,000 square miles, the Dutch section has 206,155 square miles. In the British section North Borneo covers 31,106 square miles; Brunei, 2,230 square miles; and Sarawak, about 50,000 square miles. The island has three important mountain chains, the Tebang in the north, Schwaner in the south and Müller in the east. The highest peak is Mt. Kinabalu, 13,455 feet high. Among the rivers, noted for their meandering courses on the 60-mile-wide alluvial coastal plain, are the Rejang, Kapuas, Mahakam, Kahayan and Barito.

The population of the Dutch section of Borneo is more than 2,000,000. In the British section North Borneo has about 270,000; Brunei, about 30,000; and Sarawak about 475,000. The natives belong principally to the Laut and Dyak sections of the Malay race. The Lauts are Mohammedan in religious belief, and the Dyaks retain their aboriginal belief in anthropomorphic gods and nature spirits. There is a considerable amount of Chinese and Negrito blood. Headhunting tribes formerly gave the island an unsavory reputation.

Most of the Borneans live by agriculture, cultivating rice, sugar cane, coffee, tobacco, cotton and various tropical fruits and vegetables. From the forests they gather principally for export rubber, sago, cinnamon, camphor, rattan and edible birds' nests generally built by the swift and swallow. Such minerals as coal, iron, platinum, gold, silver, mercury, antimony, copper, tin and petroleum are found in abundant quantity. The supply of timber from ironwood, sandalwood, teakwood and ebony trees is almost inexhaustible.

The capital of the Dutch section of Borneo, which is administered by the governor-general of Netherland India, is Banjermasin. In the British dependencies, Sandakan is the capital of North Borneo, which is under the direction of an agent of the British North Borneo Company, and Kuching is the capital of Sarawak, whose rajah is a great-nephew of the Sir James Brooke to whom the sultan of Brunei gave the section in 1842 for his aid in suppressing a rebellion. Brunei is a protected Sultanate with a British resident commissioner in control at the capital, Brunei.

Courtesy Canadian National Railways

Tidal Bore at Moncton, New Brunswick

At high tide in Shepody Bay, an inner arm of the Bay of Fundy, a huge and abrupt flow rolls inland for almost 25 miles

To the naturalist, Borneo is of interest for the many "missing links" between water and land forms, land and air forms and for the many orders of primates that are found there. In addition to many kinds of anthropoids, such as the orangutan and proboscis monkey, it is an "island of nature in reverse" with tree-climbing fish, flying snakes and lemurs and oysters that cling to the roots of trees after being left exposed at low tide.

The name of the island was originally Brunei, a Malay word meaning district; it was changed to Borneo by Portuguese navigators who visited it in the 16th century.

Bornholm, an island in the Baltic Sea, belonging to Denmark and situated about 75 miles east of the mainland. The area is 210 square miles, and the population is about 45,000. Rönne is the capital. Agricultural products include oats, flax and hemp. Weaving, clock-making and the manufacture of earthenware are the most important industries. Kaolin is exported to the mainland to be used in the manufacture of the fine Danish china. An appendage of the Hanseatic League during the 16th century, the island, after being held alternately by Sweden and Denmark for many years, finally came under Danish suzerainty in 1660. Bornholm's granite and chalk cliffs, richly varied scenery, healthful climate and general medieval aspect appeal to many tourists.

In the northern part are found the ruins of the 13th-century Castle of Hammershus, considered the most beautiful in all Denmark.

Boston, a city of the United States, capital of Massachusetts and metropolis of all New England. One of the nation's oldest and greatest seaports, it is located at the mouths of the Charles and Mystic rivers with an excellent harbor penetrating inland from Massachusetts Bay, an arm of the Atlantic Ocean. It ranks next to New York in passenger traffic and is fourth among United States ports in amount of water-borne commerce. Since it is the center of the allied shoe and leather trades and of the cotton and woolen manufacturing interests of the United States, its exports are largely boots and shoes and cotton and woolen goods, made in tremendous quantities in Massachusetts factories.

The population of Boston proper is nearly 800,000 and of the metropolitan area, including 80 additional cities and towns, more than 2,300,000. The most famous of these independent municipalities is Cambridge, the home of Harvard University, Radcliffe College (the women's Harvard annex) and the Massachusetts Institute of Technology. Next to Boston in historical importance are Quincy and Salem, which were settled (before Boston) in 1625 and 1626, respectively. Other cities of note within the metropolitan area are Wellesley, the seat of the well-known women's college of that name; Medford, the seat of Tufts College; Waltham, a watch-making town; Brookline, one of the wealthiest suburbs in the United States; Lynn, a city of shoe factories; Lexington and Concord, where the American Revolution started in April, 1775; and Chelsea, Malden, Somerville, Newton, Everett, Milton and Dedham. The area of the city proper is 43.78 square miles. It ranks ninth in size among cities of the United States.

When Boston was settled in 1630 by a small body of Puritans led by John Winthrop, there was no attempt to lay out the streets on geometrical lines, and many of the business streets in the old part of the city are still crooked and several of them, such as Washington Street, are very narrow. As city planning developed, the streets in the newer sections were made broad and laid out symmetrically. The Fenway is noted for its beautiful boulevards.

Since ordinances limit the height of buildings, the Boston skyline is unlike that of New York and Chicago, where giant skyscrapers have risen without rigid restrictions. The highest building is the United States Custom House, with a tower 498 feet high. Some of the noblest architecture in America is in Boston. The Boston Public Library is one of the finest examples of Italian Renaissance architecture; guarding its entrance are Bela Pratt's statues *Science* and *Art*. *The Prophets* by John Sargent; *The Growth of Art and Literature* by Puvis de Chavannes; and *The Legend of the Holy Grail* by Edwin Abbey. It is especially noted for its murals: On the opposite side of Copley Square is Trinity Protestant Episcopal Church in French Romanesque architecture; it is famed for its murals by John La Farge as well as for the long rectorship of Phillips Brooks. The First Church of Christ, Scientist, which adjoins the Mother Church of Christian Science, is a beautiful structure.

Of the many museums the most noteworthy is the Boston Museum of Fine Arts, originally a part of the Athenaeum. Impressive in structure are the buildings of the Harvard Medical School and Simmons College, a women's institution. Boston University, the city's largest educational institution, has an enrolment of more than 10,000. Boston is the seat of the New England Conservatoire of Music.

Courtesy Boston Chamber of Commerce

Boston—North Church

Old North Church—Christ Church—was built in 1723. From its belfry on the night of April 18, 1775, lanterns were hung to signal to Paul Revere that the British troops were marching to Lexington and Concord

No other American city is so rich in historical associations as Boston. Old North Church, officially Christ Protestant Episcopal Church, built in 1723, is the structure from whose belfry Paul Revere saw the lanterns that started him on his famous ride to alarm the countryside April 18, 1775. The home of Revere still stands in North Square and is considered the oldest building in the city, dating back to 1676. The Old South Meeting House, scene of many a patriotic meeting since its erection in 1729, is filled with relics pertaining to the early days of the Massachusetts Bay Colony. The Old State House, dating from 1713, is a museum of pre-Revolutionary days. Faneuil Hall, the "cradle of American liberty," once echoed to the voices of John and Samuel Adams and other Revolutionary patriots.

The Massachusetts State House, erected in 1795, meeting place of the General Court or state legislature, faces Boston Common, which was laid out in 1634 as a training ground for the colony's militia. Adjoining the Common are the Boston Public Gardens, on whose artificial lake children enjoy rides in swan boats in summer and skating in winter. Surmounting Breed's Hill is the monument commemorating the Battle of Bunker Hill, fought June 17, 1775.

By some authorities the name *Boston* is said to have been given in honor of John Cotton, vicar of St. Bodolph's Church in Boston, Lincolnshire, England, and one of the first clergymen in the American Boston. Others say that it was named before the arrival of John Cotton in honor of three prominent colonists from Boston, England.

Boston Common, a 48-acre park in Boston, Mass., set aside for public use in 1634. Originally a militia training field, it now contains the Army and Navy Monument, erected in memory of the Boston soldiers who died in the Civil War, and the monument commemorating the Boston Massacre of 1770.

Boston Post Road, a modern, paved highway, 235 miles long, connecting New York and Boston. It mostly follows the route along the Connecticut shore used in colonial days by mail coaches.

Boston Public Gardens, a 24-acre park in Boston, Mass., separated from Boston Common by Charles Street. It was originally a part of the Charles River marshes but was drained at the same time as the Back Bay section. The gardens are famous for their flower beds and shrubbery, memorial to George Washington and an artificial lake whose swan boats have been the delight of children of several generations.

bottom land, a level tract of land along the banks of a river or other stream of water, formed or enriched by soil deposited on it by the stream's overflowing. It is formed when a rapidly flowing stream carrying silt and other materials flows into a stream whose velocity is not so great and is therefore unable to hold these materials in suspension. Such land, if not too wet, is prized by farmers for its fertility.

A bottom land, in a strictly geological sense, is a *flood plain.* The Mississippi in the United States, the Nile in Egypt, the Hwang-Ho in China and the Ganges in India are rivers noted for their alluvial formations both in the form of bottom lands and deltas. Along the bottom lands of the Ganges River is the densest agricultural population in the world—900 persons to the square mile.

Bowery, a New York street that traverses lower east Manhattan from Chatham Square to 8th Street at the junction of Third and Fourth avenues. It takes its name from the estate of New Amsterdam's governor, Peter Stuyvesant, called the *Bouwerie* (from the Dutch word for farm or plantation).

Bowling Green, a small New York park at the intersection of Broadway and

Whitehall Street, near the Battery. It was used as a public square where bowls were played during the Dutch Colonial period and was surrounded by fashionable houses.

Brahmaputra, a river of southern Asia, 1,680 miles in length. It rises in the Kubigangri Glacier of the Himalaya Mountains at an elevation of nearly 16,000 feet. Throughout its 700-mile easterly course in southern Tibet it is known as the Tsangpo River. After flowing through the deep gorges of the Gyala Peri and Namcha Barwa mountains, where it forms some of the most picturesque cascades and rapids in all Asia, it emerges in the foothills of the Himalayas as the Dihang River. While flowing westward through the Assam Valley it is joined by the Dihang River and from that point on is known as the Brahmaputra. It assumes a southward course on reaching the Bengalese border, and at Goalanda, about 90 miles from the Bay of Bengal, it joins the Ganges, the united stream being known as the Padma. At the mouth of the Padma has been formed the largest delta in the world; it covers an area of 32,000 square miles and is an intricate network of islands and water arms. The basin drained by the Brahmaputra in India and Tibet has an area of 361,200 square miles.

The name *Brahmaputra* is of Sanskrit origin and means offspring of Brahma; this god, the First Person in the Hindu Triad, was the creator of the world.

Brazil, a republic occupying three-sevenths of the continent of South America and officially called the United States of Brazil. Its greatest length from north to south is 2,695 miles, and it measures 2,691 miles in greatest width. Colombia, Venezuela, British Guiana, Surinam (Dutch Guiana) and French Guiana bound Brazil on the north. The Atlantic Ocean extends along the entire eastern side of the country, giving it a coast line of 4,106 miles. Uruguay and Argentina are on the south, and on the west are Paraguay, Bolivia and Peru. Most of the country lies within the Torrid Zone and is crossed by the equator in the northern part and by the Tropic of Capricorn in the southern part. The area, according to official estimate, is 3,285,319 square miles; the population numbers 45,332,700.

Brazil has the distinction of being the only independent country of South America in which Spanish is not the official language. In accordance with the line of demarcation drawn by Pope Alexander VI in 1493 and confirmed by the Treaty of Tordesillas between Spain and Portugal the following year this part of the continent became Portuguese America. Portuguese has continued to be the language of Brazil, for nearly half the people are descendants of the early Portuguese settlers or of later Portuguese immigrants. The other whites are mostly Italians, Spaniards and Germans. About a third of the population are of mixed blood (mestizos), and the others are descendants of Negro slaves and Indians. The chief Indian tribes are the Arawaks and Tupis, to whom the world owes the domestication of the manioc and peanut.

In other respects than size Brazil is notable. It possesses the world's longest river, the Amazon, which rises in the Peruvian Andes and flows eastward through Brazil for a distance of more than 3,850 miles. With its 200 affluents, chief of which are the Madeira and Negro, it drains a total area of 2,722,000 square miles. Another important South American river system, the Paraná, has its origin in Brazil and flows through the southern part of that country for about 1,000 miles. The principal rivers lying entirely within the country are the São Francisco, Parnahyba and Tocantins.

Brazil contains more unexplored land than any other country in the world. Junglelike forests called *silvas* extend thousands of miles into the northern interior. The parts that have been penetrated near the riverbanks yield valuable timber—mahogany, rosewood, dyewood, pine and cedar. Other products are rubber, Brazil nuts, castor beans, cacao, chicle, quinine and *herva matte* (Portuguese for yerba mate). Such deadly forms of animal life as the boa, cougar and jaguar have given to this jungle region the name Green Hell.

The plateau of central Brazil is a great stock-raising region; cattle, sheep and hogs predominate. It is separated from the coastal plain by the Serra do Mar Range. The principal cultivated area is in the states of Minas Geraes, São Paulo and Rio Grande do Sul. Coffee is the great agricultural staple. Brazil has more than 2,660,000,000 coffee trees that produce about three-fourths the world's supply of coffee every year. The crop in normal years is worth more than $250,000,000. To keep up the price of the product during the depression era the National Coffee Council destroyed some 6,500,000 bags annually; one method of disposal was making the surplus coffee into briquettes that were used as fuel. Other important crops are cotton, sugar cane, rice, tobacco and manioc. Brazil's mineral wealth consists of monazite, manganese, iron, gold and diamonds. The principal manufactures are textiles (cottons, woolens and silks), shoes, cigarettes, matches, furniture and agricultural implements.

The Brazilian Republic came into existence on the overthrow of the monarchy under Dom Pedro II in 1889. It consists of 20 states, largely autonomous, the Federal District (similar to the District of Columbia) and one territory (Acre), purchased from Bolivia in 1902. The executive authority is vested in the President, who is elected for a 4-year term; he is assisted by the Ministry, consisting generally of 9 portfolios. The National Congress consists of the Senate of 63 members elected for 9 years, and the Chamber of Deputies of 213 members elected for 3 years; one-fifth of the deputies represent the professions and trade associations.

Rio de Janeiro, the capital of Brazil, is described in a separate article. Among other important cities are the seaports of São Paulo and São Salvador; Manaos, the Amazon river port, which is 1,000 miles from its mouth; Belem, another port at the mouth of the Tocantins River; and Bello Horizonte, the progressive capital of Minas Geraes.

The name *Brazil* is derived from the color of its dyewoods, which the early explorers likened to *braza,* the color of live coals.

Brenner Pass, the lowest pass (4,470 feet) of the Tirol between the ranges of the Zillerthal and Stubai Alps; it connects Innsbruck, Austria, and Bolzano, Italy. The Brenner Pass was used 2,000 years ago and was traversed by a railroad for the first time in 1867.

British Guiana, a Crown colony of Great Britain on the northern coast of South America. Its shores are lapped by the Atlantic Ocean. Surinam bounds it on the east, Brazil on the south, and Venezuela on the west. The area is 89,480 square miles. Of the population (more than 300,000), only about 20,000 are Europeans, mostly Portuguese in origin. The majority of the population are descendants of African slaves and East Indians who were imported originally as plantation laborers. There are also some 7,000 aborigines of the Arawak, Carib and Wapisiana tribes.

Courtesy Pan American Airways

Kaieteur Falls, British Guiana

These Potaro River falls are 741 feet high

The coastal plain of British Guiana is a swampy region. Inland is a fertile alluvial plain, toward which the tableland of the interior slopes. The chief river is the Essequibo; it is joined near its mouth by the Mazaruni and Cuyuni rivers. Among the natural wonders of British Guiana are its innumerable waterfalls. In the Roraima and Kukenaam falls, each averaging 2,000 feet in height, it possesses two of the highest waterfalls in the world.

The Pacaraima Mountains in the central part of British Guiana and the

Acarai Mountains in the southern part are covered with forests noted for their dyewoods. In the western part are savannas suitable for grazing. The principal agricultural products are sugar cane, coffee, cotton, rice, coconuts, cacao and rubber. Some 30,000 fine ounces of gold and diamonds totaling 47,000 carats in weight are mined each year. Bauxite, manganese and mica also are found. The chief manufactures are molasses and rum.

The capital is Georgetown (population, 57,921). Executive authority is vested in a governor, appointed by the British Crown; he is assisted by an executive council. The legislative council or Court of Policy consists of seven appointed and eight elected members. Great Britain obtained formal possession of British Guiana after the Napoleonic Wars (1815). For more than a century previously it had been held by the Netherlands.

British Honduras, a Crown colony of Great Britain is in northeastern Central America. Guatemala lies to the west and south, and the Mexican peninsula of Yucatan to the north. The Caribbean Sea extends along the northeastern coast that is fringed by several cays, including Turneffe Island. The Gulf of Amatique, a small arm of the Gulf of Honduras, indents the southeastern coast. Most of the coastal plain is a swampy, junglelike region; but farther inland there is rich alluvial soil deposited by the 16 rivers that descend from the Cockscomb Mountains. The chief of these is the Belize; at its mouth is Belize, the capital. The area of the country is 8,598 square miles. Of the total population (a little more than 50,000) scarcely 2,000 are white. The rest of the inhabitants are descendants of African slaves or Indians of the Mayan and Caribbean stocks or mestizos (half-breeds). British Honduras is rich in mahogany, logwood, rosewood, ironwood and cedar. From the bully tree is obtained chicle, used in making chewing gum. The sarsaparilla and vanilla plants yield valuable extracts. Cultivated products include sugar cane, coffee, coconuts, bananas, citrus fruits and cacao.

British occupation of the colony dates from 1638; but for almost 200 years Spain attempted to wrest it from Great Britain. Not until the waning of Spanish dominion in Latin America in the early part of the 19th century did Great Britain feel secure in its possession. British Honduras was declared a colony in 1862, but its lieutenant governor was subject to the governor of Jamaica. On its detachment from Jamaica in 1884 British Honduras was elevated to the rank of Crown colony and its lieutenant governor took the titles of governor and commander in chief. The governor is assisted by an executive council of 6 members and a legislative council of 12 members.

The name *Honduras* is Spanish for deep water. In early days the colony was called *Belize.*

Broad Street, one of the principal thoroughfares of Philadelphia, traversing the city from north to south. Its intersection with Market Street marks the center of the city's municipal life. Here the City Hall, surmounted by a colossal statue of William Penn, was built in 1871.

Broadway, the principal business and entertainment street of New York. It is the longest street in the world and extends the full length of Manhattan Island and the Bronx, from Bowling Green to the city line at 242d Street. It continues under various names through Yonkers and north to Albany, N.Y. Broadway crosses Union Square at 14th Street, Times Square at 43d Street and Columbus Circle at 59th Street. From 38th to 59th Street it is the theatrical, motion-picture and entertainment center of New York, called *The Great White Way.* North of 59th it is devoted to retail business establishments, hotels and apartment houses. Below Times Square it is a business street on which are located the Woolworth Building and other great skyscrapers. Among the noted churches that have survived from Colonial days are Trinity Church and St. Paul's, both Protestant Episcopal. Columbia University extends from 116th to 121st streets, and at 155th Street is located another cultural center whose nuclei are the buildings of the Hispanic Society of America, the American Academy of Arts and Letters and the American Geographical Society.

brook, a stream of water that is too small to be called a creek. Many brooks are shallow streams that run from a source on a hillside and continue until they join a river. A brook of this sort is rapid because of the steep grade down which it flows, usually a rocky course. The refreshing sound of the water rushing over the stones creates the familiar sounds of the babbling brook.

The word *brook* is used to refer also to a small quiet stream flowing through a meadow or woodland. A *rill* is a very small brook. The word *brook* occurs in many place names, as Brookline, Brook Farm, Brookhaven, Brookings, Bound Brook and Brookfield.

Brussels, the capital of Belgium, located near the center of the country in the province of Brabant. The city is world-famous for the manufacture of lace, curtains and carpets. Its other exports include glass, marble, sugar, coal and candles. Railways and canals afford connections with all parts of the country, the Willibroek Canal connecting it with the sea near Antwerp by means of the Rupel and Scheldt rivers. Air transportation headquarters are centered in the suburb of Haeren. The population, with such suburbs or communes as Laeken (in which is located the summer Royal Palace), Haeren, Molenbeek, Schaerbeek, Anderlecht and Koekelberg, is 887,623.

The Grande Place of Brussels is surrounded with some of the most beautiful Gothic structures in all Europe. The Hôtel de Ville or Town Hall was built in the 15th century, when, through the marriage of Mary of Burgundy to Maximilian I, the Lowlands became the possession of the house of Hapsburg; surmounting the 370-foot central spire is a statue of St. Michael, patron saint of the city. In the Maison du Roi, or Broodhuis as it is sometimes called, the Emperor of the Holy Roman Empire. Charles V, weary of constant struggles in the various parts of his realm, exchanged the throne for the cloister in 1557. The Belgian Parliament sits in the Palais de la Nation. The state maintains in their original condition the several medieval guild houses on the north side of the square.

The Palais de Justice, whose dome is higher than that of the Vatican, is one of the most imposing buildings on the Continent. The foremost ecclesiastical structure is the Gothic Church of St. Michael and St. Gudula, erected in the 13th century. Among other notable buildings are the Royal Palace, reminiscent in style of the architecture of Buckingham Palace in London; the Bourse or Stock Exchange; Royal Library; Palais des Academies, scene of international conferences; Palais d'Egmont, which contains paintings by Rubens, Rembrandt, Vandyke and Frans Hals; and the Palais des Beaux Arts, devoted to works of Flemish masters. Brussels' famous opera house is the Théâtre de la Monnaie.

The University of Brussels, founded in 1834, was enlarged in 1924 with funds donated by the American Relief Commission. The Brussels Conservatoire of Music ranks high among such institutions. In the Place Royale is a monument to Godfrey of Bouillon, the crusader. Belgium's Unknown Soldier is buried in the Place du Congrès at the foot of a column erected to the assembly that declared Belgium's independence in 1830 and surmounted by a statue of her first king, Leopold I. The Arcade du Cinquantenaire was erected on the fiftieth anniversary of Belgian freedom. The Palais du Centenaire marks 100 years of independent existence.

A high mound on the battlefield of Waterloo near Brussels, where Wellington defeated Napoleon June 18, 1815, is surmounted with a statue of the Belgian Lion. The name of the city, meaning the site on the marsh, is derived from the Flemish *broek* (marsh) and *seli* (house).

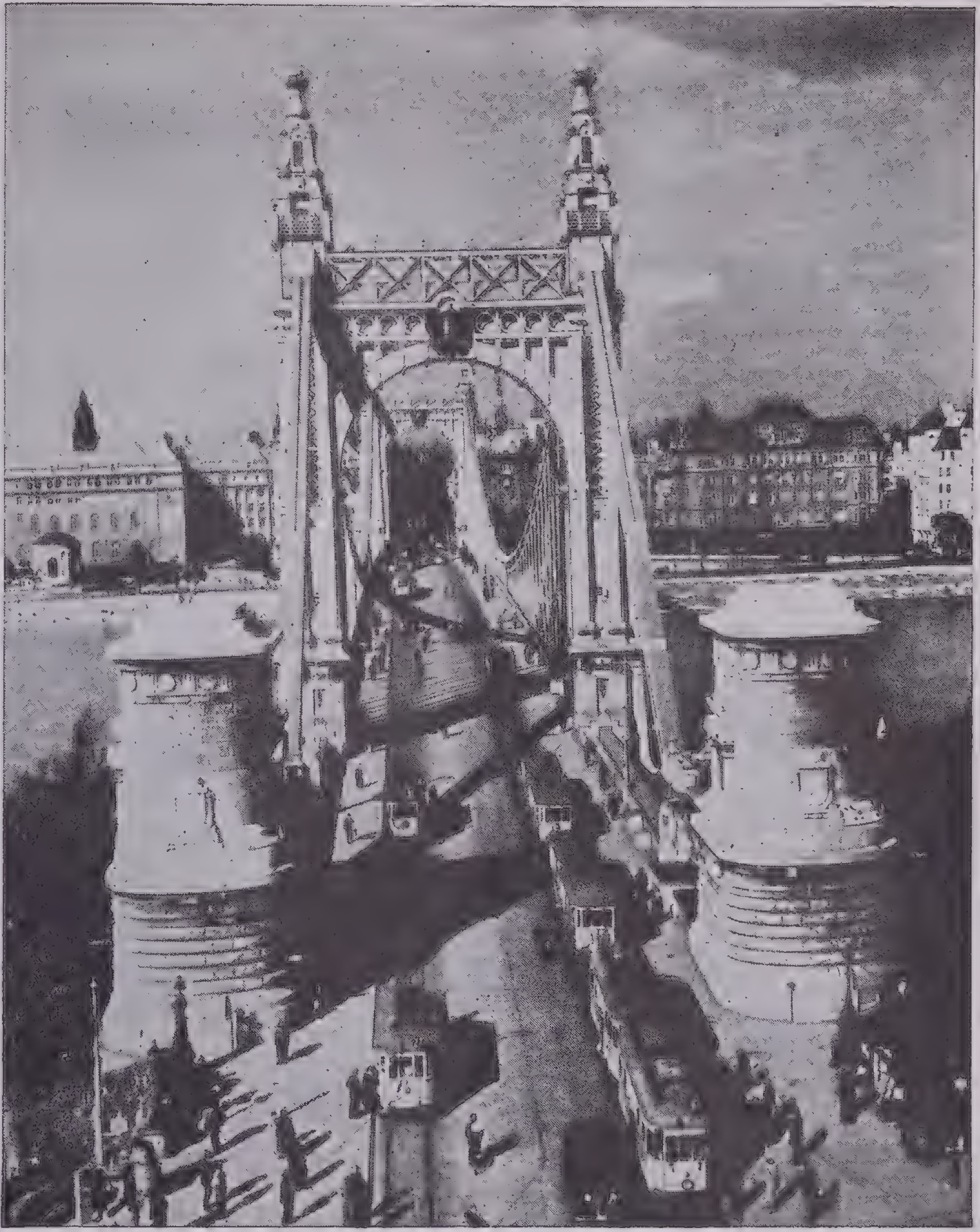
Budapest, the capital of Hungary and from 1867 to 1918 one of the capitals of the Dual Monarchy, Austria-Hungary. It is situated in the northern part of the country on the Danube River, the twin city of Buda being on the right bank and of Pest on the Left bank (these two cities have been combined as one municipality only since 1872). The modern Buda was founded by Bela IV in 1247 on the site of the Roman Aquincum, established by troops of Marcus Aurelius in the 2d century. The city of Pest, which had been powerful since the Huns settled on the plains of Hungary in the 5th century and had prospered under the succeeding Slavs and Magyars, was repeopled by Bela, after its partial destruction by the Tartars in 1241, with German and other colonists.

After the selection of Buda as the capital of Hungary in 1361 Italian artists and French architects strove to make it worthy of this honor. During this Renaissance period Pest remained the commercial center of the kingdom, carrying on a thriving trade with Venice and the cities of the Hanseatic League. To this day the Danube is more important as an avenue of commerce than are the numerous railroads of Hungary, all of which have connections with Budapest. Great quantities of grain, hides, wool, tobacco and Tokay wine are exported. The most important local manufactures are flour, textiles, chemicals, cigarettes and leather goods. The population numbers 1,060,720.

The most imposing building of Budapest is the House of Parliament, a beautiful late Gothic marble palace covering nearly 4 acres and opened in 1896. The sumptuous Royal Palace, with its more than 800 rooms, was erected during 1748–71 and enlarged in 1894. The most noted church is the 13th-century, Gothic-styled Matthias Church, also called the Coronation Church because here took place the coronation of Franz Josef as king of Hungary in 1867. Near it, overlooking the bastions and ramparts of the Fisher citadel, is a bronze equestrian statue of King Stephen the Saint, in whose reign in the early part of the 11th century Christianity was established in Hungary and who is honored from August 15 to 20 each year with a great church festival.

Among the other notable buildings of Budapest are the Renaissance-styled Opera House, Palace of Justice, National Theater, National Museum, Museum of Fine Arts and National Archives. The educational institutions include the University of Budapest, founded as a national university in 1635; the Academy of Sciences, whose special task has been the preservation of the Magyar language and culture; the Polytechnic Institute; and the Academy of Music, whose director from 1875 until his death in 1886 was Franz Liszt. The principal thoroughfare of Budapest is the Andrássy Avenue; at its entrance to the City Park (Városliget) is the Millenium Monument with statues of the Hungarian kings. The most beautiful of the bridges connecting the twin cities is the Queen Elisabeth Bridge, named for the consort of Franz Josef.

The origin of the name *Budapest* is rather uncertain, but Buda is believed to be the name of a brother of Attila the Hun and Pest is derived from a Slavonic word meaning oven, doubtless in reference to the kilns built by the Romans so as to burn lime for making mortar. The city's sobriquet is Queen of the Danube.



Courtesy Hungarian State Tourist Department

Elisabeth Bridge Over the Danube, Budapest

Looking from the Buda head of the bridge toward the Pest side. On the left, on the far side of the river is a college building, in front of which is the Elisabeth Monument, erected in memory of Elisabeth, Queen of Franz Josef. The bridge opens into the Square of the Oath, in Pest, where the kings of Hungary took the oath after their coronations

Buenos Aires, the capital and chief seaport of Argentina, located in the Federal District on the estuary of the Rio de la Plata about 170 miles from the Atlantic Ocean. It is the largest city in the world south of the equator and is also the world's largest Spanish-speaking city. From Buenos Aires and its sister port La Plata, about 125 miles from the ocean, the principal exported products of Argentina are wool, grain, fruits, dressed meats and livestock. Local manufactures include shoes and different kinds of leather goods, woolen materials, cigarettes, machinery and furniture. The population numbers about 2,231,000.

The growth of Buenos Aires resembles that of nearly all great cities. It was founded in 1580 by Juan de Garay who called it Santa Maria de Buenos Aires. Today the old part of the city has narrow, crooked streets that can hardly accommodate the crush of the crowds, and traffic is expedited along one-way streets. The newer sections have wide, straight, tree-lined avenues, the principal one being the Avenida de Mayo, which, a mile in length, extends from the Palacio del Congreso or Capitol to the Plaza de Mayo. On the latter have been erected the imposing Casa Rosada or presidential palace, Banco de la Nación and the 18th-century, classical-styled Cathedral in which is the tomb of San Martin, the Argentine national hero. In the center of the square stands a statue of Liberty.

Among the other notable buildings of Buenos Aires are the Palace of Justice, Opera House, Colon Theater, Bank of Boston, La Prenza Building, Jockey Club, Custom House, Central Argentine Railroad Station and such skyscrapers as the Kavanagh Building. The prevailing styles of architecture are classical and Italian and Spanish Renaissance. The most important of the city's 100 parks are the Retiro Park and the Parque Tres de Febrero in the suburb of Palermo. Near the latter park are the zoological gardens, noted especially for their collection of llamas, guanacos, anteaters and other South American animals. Buenos Aires has not only an adequate street-car system, operating over 500 miles of track, but an excellent subway system that was first opened in 1913 with extensions built in 1930 and 1937.

Buenos Aires is important as an

educational center, being the seat of the University of Buenos Aires, founded in 1821, of a technical college and of several art schools. On being dissociated from the province of Buenos Aires in 1880 it became the capital of Argentina. The name *Buenos Aires* is Spanish for good breezes.

Bulgaria, a kingdom constituting one of the Balkan states of southern Europe. It is bounded by Rumania on the north, by Yugoslavia on the west and by Greece and Turkey on the south; the coast line on the east is lapped by the Black Sea. The area of the country is 39,825 square miles; a considerable amount of territory along the Aegean coast was ceded to Greece, along the Black Sea coast to Rumania and in the western part to Yugoslavia by the Treaty of Neuilly, because Bulgaria was allied with the defeated Central Powers in the World War. The population is about 6,090,000.

Bulgaria possesses two mountain ranges—the Balkans in the northern part and the Rhodopes in the southern. Between them lies the Valley of the Maritsa River. The Danube forms most of the northern boundary between Bulgaria and Rumania. A loess-covered plateau, called the *Danubian Tableland,* is situated between this river and the Balkans; it is drained by the Isker River, noted especially for its gorges. The most important river of the southwestern part of the country is the Struma.

Both the Danubian Tableland and the Valley of the Maritsa are remarkably productive, 36 per cent of the total area being under cultivation. The leading crops are wheat, rye, barley, tobacco, sugar beets, grapes, rice, cotton and potatoes; also fruits such as plums and peaches; and walnuts. Roses, from which is distilled the volatile oil used in the perfume industry that is centered in the Vale of Kazanlik, are Bulgaria's most distinctive garden product.

Forests, chiefly of oak, beech and pine, cover 28 per cent of the country's area and furnish in the form of timber and charcoal some of the country's most important exports. The mulberry tree is cultivated in connection with raising silkworms. Coal, iron, copper, gold, silver, lead and zinc are the chief mineral deposits. Manufactures include flour, cigarettes, woolen materials, leather goods, gold and silver filigree jewelry, pottery, copperware and cutlery. In Danubian fishing towns that prized Russian delicacy—caviar—made from roe of the sturgeon and other large fish is canned.

Bulgaria is a constitutional and hereditary monarchy. The executive power is vested in a premier and council of ministers nominated by the king. The legislative body is the unicameral National Assembly (Narodno Sobranye), whose 274 members are elected by popular vote for 4 years. For local administrative purposes the country is divided into 12 departments and subdivided into districts and communes.

The seat of government is Sofia (population, 287,976), located on a plateau in the west-central part of the country, with Mt. Vitos forming its background. Formerly of medieval aspect, it has been largely rebuilt since 1880. Modern in style of architecture are the royal palace, the Parliament and other government buildings, the Cathedral of the Bulgarian Orthodox Church and the buildings of the University of Sofia (which was founded in 1888). Among ancient structures are the Chapel of St. George, supposed to have been a Roman temple, and the medieval Chapel of St. Sofia, noted for its frescoes. The Buyuk Djamia mosque has been converted into a National Museum.

Bulgaria's principal port is Varna, located in the northeastern part on the Black Sea. In addition to being famous for the beauty of its setting, it is noted for its archaeological museum; and from it the royal castle of Euxinograd and the monastery of Aladja may be reached. Another city containing many Roman ruins is Plovdiv (Philippopolis), the chief commercial center located on the Maritsa River. Medieval palaces, churches and monasteries are the principal attractions in Tirnova, the capital of the country in the 13th and 14th centuries.

Bulgaria means the land of the Bulgars, a Slavic people who are assumed to be of ancient Mongolian origin; after migration to the region between the Volga River and Ural Mountains they became allied with the Caucasian race. The Bulgars settled along the lower Danube in the 7th century A.D.

Bund, The, a wide, handsome street along the waterfront of Shanghai that houses the foreign banks and business firms established in that city.

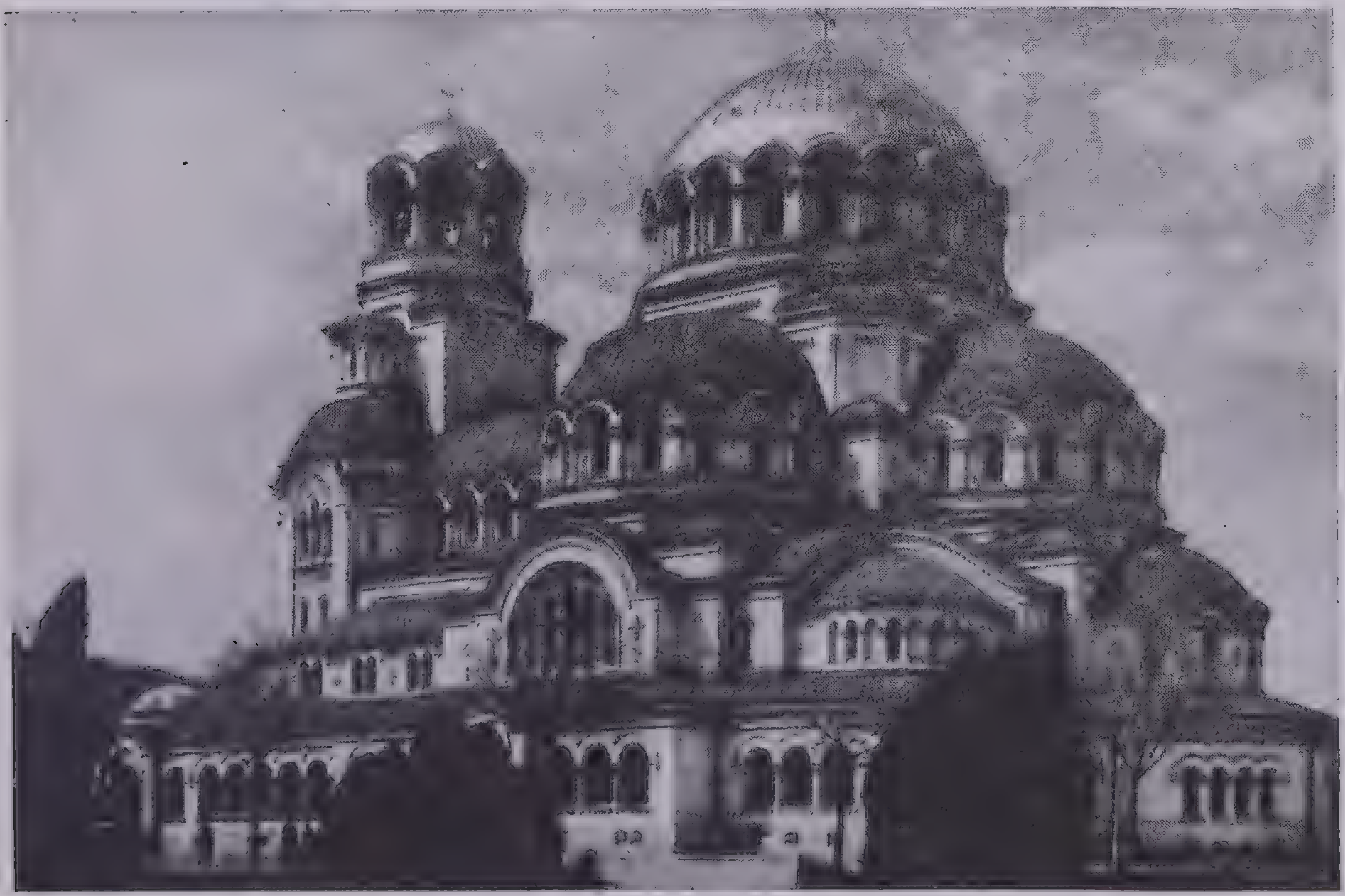
Courtesy Boston Chamber of Commerce

Bunker Hill Monument

On Breed's Hill in the Charlestown section of Boston is this granite obelisk 231 feet high. It is within the lines of the American redoubt that was the center of the Battle of Bunker Hill, June 17, 1775

Bunker Hill Monument, Boston, Mass. This square granite shaft rises 231 feet on the site of the epochal Revolutionary battle that it commemorates. The shaft was begun on the fiftieth anniversary of the battle with elaborate ceremonies in which Lafayette took part.

Burma, a British possession in southern Asia that since 1935 has had the status of a Crown colony. It is bounded by Tibet and China on the north, by China, French Indo-China and Siam on the east, by Siam on the south and by the Bay of Bengal and India on the west. The country may be divided into three sections, with the Arakan Yoma Mountains in the western part, the Shan Plateau in the



Courtesy Bulgarian Consulate General, New York

Cathedral of Saints Cyril and Methodius, Sofia, Bulgaria

eastern part and the valleys of the Irrawaddy, Chindwin and Sittang rivers constituting the central part. Among other important streams are the Salween River, which drains the Shan Plateau, and the Packchan River, which forms part of the southern boundary between Burma and Siam. The area is 261,610 square miles. The majority of the population, numbering more than 14,500,000, are Burmese, an offshoot of the Mongolian race. The country's minority groups include the Karens, Shans and Chins in the east, the Kachins in the north and the Arakanese in the west. East Indian immigrants number almost 1,000,000.

Burma's agriculture is concentrated in the central basin that owes its great fertility to the alluvial deposits of the Irrawaddy and other rivers. The principal products are rice, sesame, millet, cotton, tobacco, rubber, groundnuts and various tropical fruits. The country's mineral wealth is based on petroleum, of which more than 250,000,000 gallons are produced annually. Tin, tungsten, silver, gold, lead, iron, salt and amber also are mined. Among the various stones found in Burma are rubies and jade. The forests yield annually some 350,000 tons of teak (used largely in wood carving); cutch, a yellow dye product obtained from the sha tree; and lacquer, a natural varnish obtained by tapping the *Rhus verniciflua* and other varnish trees. The Burmese use elephants in hauling teakwood logs. Their other beasts of burden are humped oxen and water buffaloes, used in ploughing and for traveling by oxcart.

Burma became a British possession in 1826; additional territory was annexed after the wars of 1853 and 1886. Until 1935 it was politically a province of British India. Executive authority continues to be vested in the governor, but under the constitution granted the new colony the legislative body consists of a Senate of 36 members and a House of Representatives of 132 members.

Rangoon, the capital of Burma, has a population of 400,000. It is located on the Rangoon River, close to the great delta of the Irrawaddy River, and is the world's greatest teakwood market. The city's great architectural marvel is the bell-shaped, goldleaf-encrusted Shwe Dagon Pagoda, the foundation of which was laid about 500 B.C. It has a circumference of 1,355 feet and rises to a height of 370 feet. It was erected as a shrine for eight of Gautama Buddha's hairs and for relics of three Buddhas who preceded him, and it is one of the most sacred pagodas and is visited annually by thousands of Buddhist pilgrims.

Burma's other important city is Mandalay (population about 150,000), located in the central part of the country on the Irrawaddy River. Especially attractive are the former Royal Palace, the Queen's Golden Monastery, the Arakan Pagoda, the Buddhist shrine called Dat Daw and some 730 pagodas erected over the stones on which the holy books of Buddhism were originally recorded. The city is known to the Western World through Kipling's poem, "On the Road to Mandalay."

butte, an isolated, steep-sided, round-topped hill or mound, common in the Rocky Mountain section of the United States. Butte, Mont., takes its name from the formations in that locality. Buttes are common also in the Bad Lands of South Dakota and Wyoming. The word *butte* is French for mound.

Cairo, the capital of Egypt, located about 130 miles southeast of Alexandria at the mouth of the Nile's Rosetta branch. Built partly on the Nile delta and partly on the slopes of the Mokattam Hills, it is one of the most picturesque cities in the world and is the largest city in Africa with a population more than a million.

Since the Middle Ages Cairo has been one of the most important trade centers of the Mediterranean region, handling products from Turkey, Iran and India and shipments from the interior of Africa of ivory, ostrich feathers, hides, cotton, sugar cane and grain. Local manufactures include cotton and silk materials, jewelry, paper, sugar and leather goods; but with the exception of textiles, paper and sugar, Cairo does not engage in mass production. Nearly all its industries are small enterprises, producing a considerable variety of curios that find a ready market among tourists in the bazaars of the Mohammedan quarter. The city is the northern terminus of that gigantic railroad project conceived by Cecil Rhodes—the Cape-to-Cairo Railroad.

In the older and eastern section of Cairo are several racial quarters whose gates during the Middle Ages were closed at night fall. They include the Mohammedan, Coptic or Christian, Jewish and Frankish or European, in which are most of the European shops. In the Coptic quarter are nearly all the Christian churches of the city—Armenian, Greek and Roman Catholic, a modern Coptic cathedral, built in the basilica style and dedicated to St. Mark, a Coptic Church of the Virgin dating from the 9th century—and a Coptic museum. The population of the Frankish and Coptic quarters consists mostly of Greeks, Italians and Armenians.

The Mohammedan quarter, where in addition to the native Cairenes of Arabic origin gather Turks, Negroes, Syrian Arabs and Bedouins from the desert, is distinguished by the citadel erected by Saladin in the 12th century. Within its walls are the famous mosques of Ibn Touloun, Mohammed Ali and Sultans Hassan and Nasir Ibn Kalaun—with graceful domes, tall minarets and geometrical tracery. The chief Mohammedan theological seminary is the 1,000-year-old Mosque El-Azhar. Perfect examples of 15th-century Arabian architecture are the Tombs of the Mamelukes beyond the eastern wall of the city. In the Mosque of Rifai are buried the members of the present Egyptian dynasty, which under Fuad was the first since the days of Cleopatra to rule as kings rather than khedives or sultans. During the British protectorate that lasted from 1882 to 1922 attempts were made to improve sanitary conditions in this older quarter and to remedy the housing situation.

The newer and western half of the city, whose residents are largely the wealthier Cairenes and the British, has the Opera House, Stock Exchange and various foreign missions and residencies; also in this section are: the Houses of Parliament; ministries of justice, finance, war and public works; the two royal palaces called Ismailia and Abdin; and the famous Ezbekian Gardens. In the Museum of Egyptian Antiquities some of the greatest treasures of the Pharaohs, including those of Tutankhamen, have been assembled. The Museum of Arab Art is a revelation of the art of the Arab peoples that flourished during Europe's Dark Ages. This museum also houses the Royal Library, containing more than 100,000 volumes. Cairo is the seat of the University of El-Azhar and of the Institute of Oriental Music.

Ten miles from Cairo at Giza are found the great triangular tombs of the pharaohs, erected more than 5,000 years ago and rising from 200 to 450 feet in perpendicular height. The more famous ones are the Pyramids of Cheops (which covers an area of 13 acres), Cephron and Mycerinos. Nearby is the inscrutable Sphinx, a human-headed lion, 188 feet long and 65 feet high, which represented a special form of the solar deity Ra and was erected to guard the tombs from evil spirits.

Cairo was founded in 968 A.D. by Jauhar El-Kaid, the Arabian general who conquered Egypt for the Fatimid caliphs. The name that he bestowed on the city was El-Kahira, meaning the victorious and referring to the planet of victory, Kahir (Mars). In time the name was corrupted to Cairo.

California, the largest of the Pacific coast states and next to Texas the largest state in the United States. It is one of the most rapidly growing sections of the country. From 1900 to 1940 it rose from twenty-second to fifth place in population and has today a population of 6,907,387 (1940). The Pacific Ocean forms its western boundary for more than 950 miles. Oregon bounds it on the north, Nevada and Arizona on the east. To the south is the Mexican peninsula of Lower California. The area is 158,297 square miles, of which 2,645 square miles is water.

A narrow coastal plain extends along the Pacific coast. Inland between the Coast Range on the west and the Cascade and Sierra Nevada mountains on the east is the Great Valley, which extends through two-thirds of the state. California has both the highest and the lowest points in the United States. The loftiest elevation is Mt. Whitney (14,496 feet) in the Sierra Nevada Range; Death Valley to the southeast of this range contains one point 276 feet below sea level. About 200 miles south of Death Valley in the region of the Salton Sea is the Imperial Valley, an area of 4,356 square miles reclaimed through irrigation.

Three main ranges of mountains give to California its rugged surface. Parallel to the Pacific Ocean and near it is the Coast Range; its highest peak is Mt. San Bernardino (10,630 feet). In the northern and central sections is the Cascade Range, where Mt. Shasta rears its snow-capped peak 14,161 feet. The largest range is the Sierra Nevada, extending from northwest to southeast about 450 miles in the eastern part of the state. Among its elevations, all more than 13,000 feet, are Mt. Whitney, Fisherman Peak, Mt. Corcoran, Mt. Kaweah, Mt. Brewer and Mt. Lyell.

California has only two important rivers—the Sacramento, which rises in Goose Lake of the Cascade Range, and the San Joaquin, which rises near Yosemite National Park in the Sierra Nevada Mountains. After flowing a distance of 400 miles, the Sacramento south and the San Joaquin north, their waters unite and reach the Pacific at San Francisco Bay. The state has a large number of lakes, but the best-known is Lake Tahoe on the California-Nevada boundary, 6,225 feet above sea level and surrounded by towering peaks. It is 22 miles long, 10 miles wide and 1,600 feet deep.

The climate of California ranges from the subtropical to the temperate. The all-year delightful temperatures that attract hundreds of thousands of visitors prevail only along the coastal plain of southern California. In summer the Great Valley, stretching almost 400 miles between mountain ranges is intensely hot; in winter it is cool but almost never freezing. Everywhere except in the high altitudes livestock may find grazing all the year, and in many parts of the state flowers bloom every month. Rainfall varies in extent, ranging from 30 inches in the north to 15 and 10 inches around San Diego. Irrigation is practiced in both central and southern California.

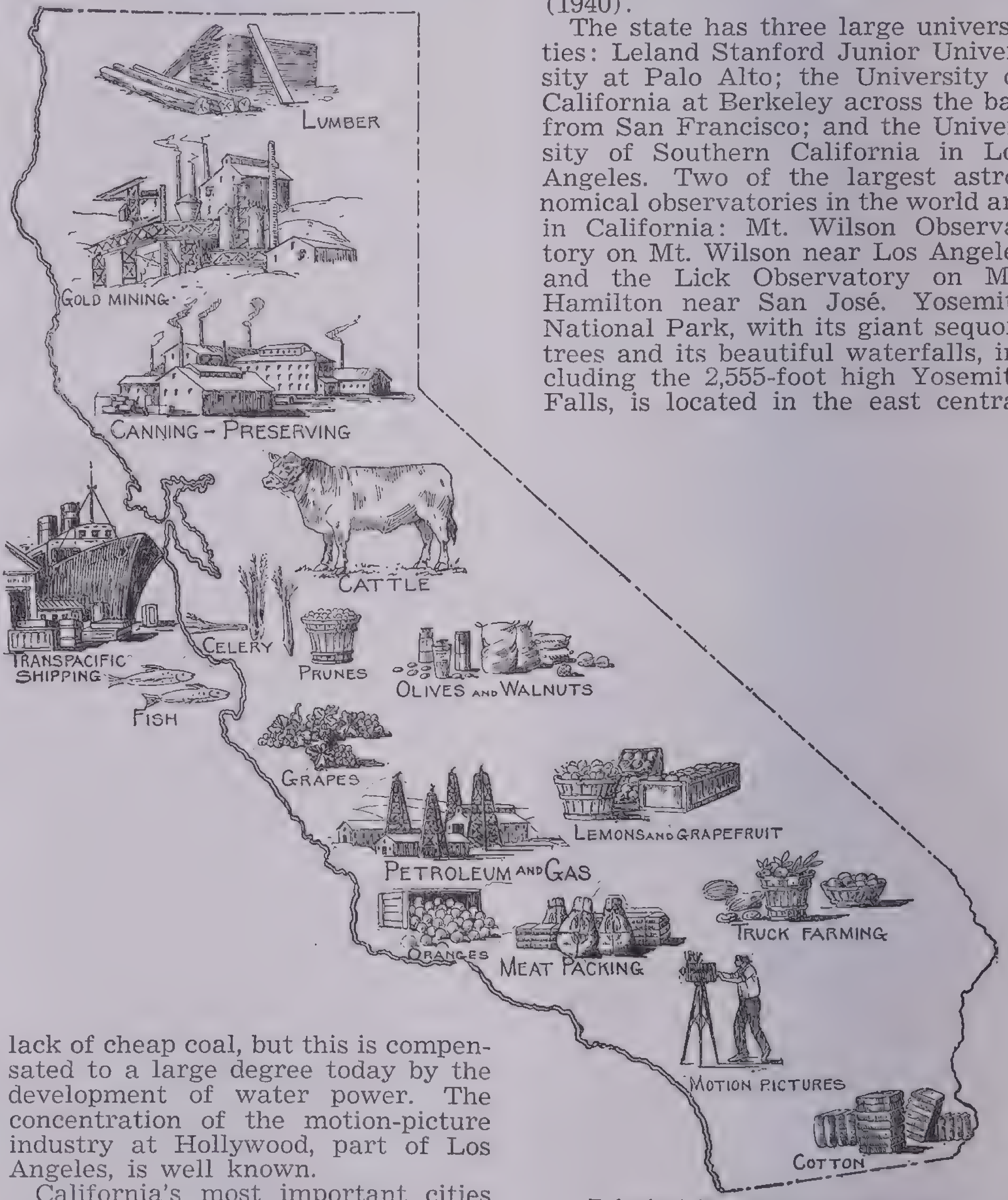
In the great length of California nearly every product of agriculture and horticulture flourishes remarkably well. All the cereals are grown in the north; barley is the largest crop, followed by wheat, hay and corn. Cotton and sugar beets also thrive. California boasts that it supplies 70 per cent of America's oranges and nine-tenths of its grapes, principally for wine making. Among other fruits are dates, figs, plums, peaches, apricots, pears, cantaloupes and olives. Lettuce, beans, walnuts and almonds also are raised.

California derived its name of the Golden State from its mineral wealth. It was here that gold was discovered in 1848. For many years the output of this precious metal exceeded $50,000,000 a year, but the supply declined slowly, and now the gold mines yield about $37,000,000 every year. Other metals taken in paying quantities are silver, copper, lead, mercury and borax. The petroleum output is tremendous, enabling California to rank with Oklahoma and Texas as one of the three greatest petroleum-producing states; the wells of the state produce nearly 300,000,000 barrels a year. Natural gas also exists in large quantities.

Although known most widely for its agricultural riches, California is rapidly increasing in importance as a manufacturing state. Since it is one of the richest fruit- and vegetable-raising districts in the country and also possesses extensive fisheries, its canning industry is enormous. There is also a large meat-packing industry. Manufactures include machinery, planing-mill products, tin cans, stoves, soap, aircraft and aircraft parts and automobiles. Heavy industry in California has been handicapped by the lack of cheap coal, but this is compensated to a large degree today by the development of water power. The concentration of the motion-picture industry at Hollywood, part of Los Angeles, is well known.

California's most important cities are Los Angeles, San Francisco and San Diego. The capital of the state is Sacramento, located 75 miles northeast of San Francisco in the heart of the Great Valley. Among other colorful cities are the Spanish mission centers, Santa Barbara and Monterey.

Oakland, which is located on the east shore of San Francisco Bay, is an important railroad terminus and a port of call for many foreign and domestic steamship lines. The airport is a main terminal on transcontinental air routes. Connection with San Francisco is by means of ferries and the San Francisco-Oakland Bridge. Along the rim of the hills that flank Oakland on the east is the Skyline Boulevard, which extends to the adjoining residential city of Berkeley. Oakland's notable buildings include the City Hall, Public Museum, Public Library, Tribune Building and Municipal Auditorium in which is also housed the Art Gallery. Lakeside Park, surrounding Lake Merritt in the heart of the city, is noted for the wild duck pageant that is presented each fall by school children to welcome the thousands of wild ducks that winter under government protection on the shores of the lake. Oakland is the seat of Mills College for women. The population is 302,163 (1940).



Principal Products of California

The state has three large universities: Leland Stanford Junior University at Palo Alto; the University of California at Berkeley across the bay from San Francisco; and the University of Southern California in Los Angeles. Two of the largest astronomical observatories in the world are in California: Mt. Wilson Observatory on Mt. Wilson near Los Angeles and the Lick Observatory on Mt. Hamilton near San José. Yosemite National Park, with its giant sequoia trees and its beautiful waterfalls, including the 2,555-foot high Yosemite Falls, is located in the east central section high in the Sierra Nevadas. Other points of interest are the Lassen National Park around Mt. Lassen, the only active volcano in the United States, in the northeastern part of the state and Sequoia National Park near Owens Lake in the southern part. The most famous of the Santa Barbara Islands off the southwestern coast is Santa Catalina.

The name *California* is taken from a Spanish romance, popular in the early 16th century. In the book it was the name of a paradise island.

Cameroons, a region of West Africa that from 1884 until the World War was a German protectorate. It lies north of the equator between Nigeria on the northwest and French Equatorial Africa on the northeast, east and south. To the southwest is Spanish Guinea. The 220-mile coastline is formed by the Bight of Biafra, an arm of the Gulf of Guinea. The total area is 204,057 square miles; the population, numbering about 3,150,000, is mostly of Bantu stock and is divided into the Bakoko, Bakundu and Fang groups. Under mandate granted by the League of Nations Great Britain administers an area of 34,559 square miles, called British Cameroon; and France, an area of 169,498 square miles, called *French Cameroun.*

Most of the interior of the Cameroons is a plateau region that descends in terraces to the narrow coastal plain on the west and to the Congo basin on the east and south. On the north and northwest this plateau rises to an elevation of 4,000 feet in the Mandara Mountains. The highest peak is the active volcano, Mt. Cameroon (13,370 feet). In the extreme north are lacustrine plains that once formed part of the bed of Lake Chad whose present area is 6,500 square miles. The principal rivers of the Cameroons are the Mungo, Wuri, Sanaga and Nyong.

Of great economic value are the forest products of the Cameroons—mahogany, teakwood, ebony, rubber, bamboo, coconuts, coffee, kola nuts, almonds and cloves. Cultivated agricultural products include bananas, corn, rice, yams, cassava, plantains, cacao, vanilla, ginger and pepper. The mines yield copper, lead and zinc. Ivory is one of the most important exports.

The capital of British Cameroon is Buea, the resident commissioner being responsible to the governor of the British Crown colony of Nigeria. Since 1921 French Cameroun has been an autonomous territory, governed by a commissioner who is responsible to the governor general of French Equatorial Africa. The capital is Yaounde and the chief port, Duala.

The Cameroons take their name from the coastal indentation called by Portuguese navigators Rio das Camarões; it means river of prawns and refers to the shrimplike crustaceans found in this estuary.

Camino Real, El, an old road in California along which Father Junípero Serra established a chain of 21 Franciscan missions during the latter part of the 18th century. The road extends from San Diego to Sonoma with each mission a day's ride apart. The name is Spanish for the King's Road.

Canada, a member of the British Commonwealth of Nations, officially called the Dominion of Canada. With the exception of Alaska (which belongs to the United States), Greenland (which belongs to Denmark) and the British Crown colony, Newfoundland and its mainland dependency, Labrador, Canada comprises the whole of North America north of the United States. To the east are Baffin Bay, Davis Strait and the Atlantic Ocean, and to the west, the Pacific Ocean and Alaska. If superimposed on Europe, Canada would extend from about the North Cape to Rome. Canada has an area 30 times greater than that of Great Britain and Ireland and is considerably larger than the United States. Its total land surface is 3,466,556 square miles; its water surface is 228,307 square miles. The population is nearly 10,400,000.

Since the consolidation of Yukon Territory with British Columbia in 1937, the Dominion of Canada consists of 9 provinces and 1 territorial section, whose areas and populations (1931 census) are as follows:

Province	*Area (sq. m.)*	*Population*
Alberta	255,285	731,605
British Columbia	573,331	698,493
Manitoba	246,512	700,139
New Brunswick	27,985	408,219
Nova Scotia	21,068	512,846
Ontario	412,582	3,431,683
Prince Edward Island	2,184	88,038
Quebec	594,534	2,874,255
Saskatchewan	251,700	921,785
Northwest Territories	1,309,682	9,723

At the last census (1931) the percentage of Canada's population of British origin was more than half. In Quebec and in certain parts of Ontario and Nova Scotia are about 3,000,000 descendants of the early French settlers, and French is the only language heard even today in many of the villages of these provinces. The 1931 census also revealed that 64.49 per cent of the population was Canadian born; 17.82 per cent, British born; and 17.69 per cent, foreign born. The foreign-born population is found largely in the Prairie Provinces and to a considerable extent is composed of immigrants from the United States who have been attracted to these provinces on account of their cheap and highly productive lands. In certain years previous to the World War as many as 100,000 American farmers joined this migration. The population statistics also include some 100,000 Indians, mostly descendants of the once brave Iroquois and Ojibwas, whose care is entrusted to the Indian Department of the Dominion Government.

Physical Features. Canada has as varied a topography as the United States. In the far southeast is the northern end of the Appalachian Mountain system, known as the Shickshock Mountains of the Gaspé Peninsula and as the Notre Dame Range of Quebec. In the west are the ranges of the Rocky, Selkirk, Gold and Coast mountains. The Rockies extend from Alaska into the United States, form the southern part of the boundary between British Columbia and Alberta and possess in Mt. Logan (19,850 feet) the second highest peak in North America. The other three ranges are in British Columbia. The great plains region is in the Prairie Provinces—Manitoba, Saskatchewan and Alberta. The eastern seaboard provinces—New Brunswick, Nova Scotia and Prince Edward Island—are called the *Maritime Provinces.*

Canada has marked climatic variations. The far north is a region of severe extremes, where the thermometer may record in winter a temperature 70° below zero, and during the short summer the heat may be so intense that it reaches even 100°. The eastern coast is cooled by the winds accompanying the Labrador Current; this current makes Labrador inhospitable and retards the arrival of spring in Newfoundland and the Maritime Provinces. Summers along the Atlantic coast are mild, and it is a favorite vacation spot.

On the western coast the climate is quite the reverse of that on the Atlantic seaboard. The influence of the North Pacific (or Japan) Current is especially beneficent, and there is scarcely a spot in North America where the temperature is more equable. In British Columbia, near the coast, the average winter temperature is seldom lower than 35°, and in summer it averages about 60°. The Pacific Ocean is about 20° warmer than the Atlantic, and the warm winds that accompany the North Pacific Current are diffused all along the western coast.

The Great Lakes—Superior, Huron, Erie and Ontario—modify the climate of the south-central part of the Dominion and render it warmer in winter and cooler in summer. The interior plains have a midcontinental climate with temperatures that range from 40° to 50° below zero in winter and as high as 90° and 100° in summer.

Canada has eight rivers each more than 1,000 miles in length. The most important is the St. Lawrence, which provides through its many canal links with the Great Lakes one of the world's greatest water-transportation routes. Ocean-going vessels enter the Gulf of St. Lawrence through Cabot Strait at the south of Newfoundland and sail as far inland as Montreal. At that entrepôt cargoes destined for lake ports are transferred to vessels of lighter draft that can utilize the canals built around the Lachine and other rapids between Montreal and Kingston. The 27-mile-long Welland Canal that connects lakes Ontario and Erie ranks in engineering importance with the Panama Canal and enables ships to continue westward despite the barrier presented by Niagara Falls. The Sault Ste. Marie Canals, popularly called the *Soo Canals* and constructed on both the Canadian and American sides, lift vessels past the rapids in the St. Marys River, which connects lakes Huron and Superior. The most important Canadian western terminus of the St. Lawrence-Great Lakes waterway is Port Arthur, Ontario.

The principal river system draining into Hudson Bay (the great inland sea that covers an area of about 400,000 square miles and is connected with the Atlantic Ocean by means of Hudson Strait) is the Nelson-Saskatchewan. With the aid of Lake Winnipeg (9,459 square miles) and the north and south branches of the Saskatchewan River this system provides an almost 3,000-mile-long transportation route far into Alberta. Near the headwaters of the North Saskatchewan the Athabaska River starts on a northward course to Athabaska Lake, where, with the navigable Peace River that joins it from the west, it forms the Slave River and discharges into the Great Slave Lake. The Mackenzie River emerges from the western part of the Great Slave Lake (which covers an area of 11,170 square miles) and winds its way northward for 2,525 miles to the Arctic Ocean.

The Arctic Circle crosses Great Bear Lake, whose area of 12,200 square miles makes it the largest body of fresh water lying wholly in Canada. The most important of the famed lakes of Ontario are Nipigon (1,730 square miles) and the chain east of Georgian Bay—the Muskoka lakes.

The most famous of Canada's 15 national parks are Banff and Jasper, both located in Alberta on the eastern fringe of the Rockies. Banff possesses such breath-taking beauty spots as Lake Louise, Paradise Valley and the Valley of the Ten Peaks. Jasper, covering an area of 4,200 square miles, has many varied attractions, ranging from snow-capped Mt. Edith Cavell and the Angel Glacier to the Miette Hot Springs and Athabaska Falls. Glacier National Park in the Selkirk range contains the celebrated Illecillewaet Glacier and is dominated by Mt. Sir Donald (10,808 feet high). The Waterton Glacier International Peace Park, a continuation of the United States Glacier National Park in Montana, is a region where snowy glaciers are contrasted with multicolored peaks and forested canyons. Prince Albert, Riding Mountain, Yoho, Kootenay and Revelstock national parks all are noted for the primeval grandeur of their mountain scenery and for their unbelievably beautiful lakes, waterfalls and canyons. Several of the Canadian national parks also provide sanctuary for numerous forms of wild life, such as the bison and pronghorn that might otherwise disappear from the North American continent.

Economic Resources. Canada is a great agricultural country. The long hours of sunshine (averaging 16 to 18 hours daily in summer) and a beneficent rainfall extend the northern limits of grain growing. The most important crop is wheat, which averages about 280,000,000 bushels annually; and about 97 per cent of this crop is raised in the Prairie Provinces. Although it is surpassed in production by the United States and the Soviet Union, Canada supplies more wheat to the outside world than any other country. The other grains, in the order of their importance, are oats, barley, corn, rye and buckwheat.

From British Columbia, Nova Scotia and Ontario come most of the orchard fruits; apples are the leading crop. Ontario also produces most of the dairy products, and it may seem somewhat surprising that Canada leads all other countries in cheese production, with more than 80,000,000 pounds annually. Much of its cheese, butter and condensed milk, as well as chilled meats and hides, are exported to Great Britain. Its agricultural wealth also includes eggs, honey and maple sugar.

Like the United States, Canada has a large variety as well as a large extent of minerals. The coal fields, extending over an area of more than 111,000 square miles, may be conveniently divided into the bituminous coal fields of Nova Scotia and New Brunswick, the lignite fields in Alberta and Saskatchewan and the anthracite and bituminous fields in British Columbia and the islands off its coast—Vancouver Island and the Queen Charlotte Islands. The largest supply of gold comes from Ontario and British Columbia. Canada has a total annual gold production of 3,735,000 fine ounces. Ontario (around Cobalt), British Columbia and the Northwest Territories furnish most of the silver.

Courtesy Canadian National Railways

A Canadian Mountie

A member of the Royal Canadian Mounted Police detailed to ranger service in Jasper National Park, Alberta. In the distance looms Mt. Edith Cavell (11,033 feet). The constabulary's force grew from 300 men in 1873 to more than 2,500 in 1938. It was originally organized to maintain law and order in the various Canadian territories. Under agreements with the Department of the Interior of the Dominion Government most of the provinces request the services of the constabulary for one purpose or another

Canada has virtually a monopoly in the world supply of nickel; the mines around Sudbury, Ontario, are the most productive in the world. Canada produces between 80 and 85 per cent of the world's supply of asbestos; the principal mines are located in the Province of Quebec. Canada has also large deposits of mica and furnishes practically the entire amount consumed in the United States. Among other Canadian minerals are iron ore, cobalt, aluminum, copper, lead, zinc and petroleum.

Canada's greatest asset, perhaps, is its forests. The total area covered by forests, including merchantable timber and young growth, is estimated at 900,000 square miles. The principal trees are the conifers, such as spruce, Douglas fir, white pine and cedar; there are also hardwoods, such as oak, ash, hickory and several varieties of the maple. (The maple leaf is the national symbol of the Dominion.) The bark of the hemlock is used in the tanning industry, centered in Quebec. The yearly output of lumber and wood pulp is valued at about $90,000,000.

Along its Atlantic and Pacific coasts Canada possesses some of the most extensive fishing waters in the world. The principal deep-sea fish are cod, haddock and halibut; the salmon is found in rivers on both the Atlantic and the Pacific coasts. Inshore are caught also herring, mackerel, flounder, shad, smelt, sardines and lobsters. The estuarine deposits of the St. Lawrence make excellent oyster beds. Trout, pike, whitefish, pickerel and sturgeon are the principal fresh-water fish. The total value of all fish products averages about $40,000,000 annually.

Fur-bearing animals abound in the vast subarctic forests of Canada, and fur trading has been an important activity since the earliest days of the Hudson Bay Company. The principal animals are the beaver, sable, marten and black and silver foxes. An important fact to note in connection with the fur trade is that Canada no longer depends for its supply of pelts on the trapping of wild animals but is now breeding various fur-bearing animals on some 7,500 farms. The leading fur-farming section is Prince Edward Island. The value of fur production averages about $14,000,000 a year.

In wealth of raw materials and power Canada is equaled only by the United States and the Soviet Union. Since the World War, Canada has made great strides in manufacturing development. Many American firms have established branches in Canada to take advantage of the market preferences that Canada enjoys as a member of the British Commonwealth of Nations. The gross value of all the manufactures produced by some 25,000 establishments averages more than $2,800,000,000 annually. The pulp and paper mills of the Maritime Provinces have the advantage of location near the supply of spruce and other trees. Steel and pig-iron works are located along the shores of the Great Lakes, especially at Toronto, Hamilton and Sault Ste. Marie. Other manufactures are flour, textiles (principally woolens), cigarettes, maple-sugar products, automobiles, agricultural implements and canned fruits and vegetables.

Government. The Dominion of Canada came into existence under the British North America Act of 1867. In accordance with the Statute of Westminster it has enjoyed since 1931 an equality status with Great Britain and with the other members of the British Commonwealth of Nations—Australia, New Zealand, Union of South Africa and Ireland. There has been transferred to its Parliament full control in the enactment of legislation pertaining to Dominion matters.

The provincial capitals are: Charlottetown, Prince Edward Island; Halifax, Nova Scotia; Fredericton, New Brunswick; Quebec, Quebec; Toronto, Ontario; Winnipeg, Manitoba; Regina, Saskatchewan; Edmonton, Alberta; and Victoria, British Columbia. The administration of the Northwest Territories is directed from Ottawa by a commissioner and nominated council of five members. The Royal Canadian Mounted Police are responsible to the Department of the Interior for the maintenance of law and order in the Northwest Territories.

Cities. Montreal and Quebec are the oldest and best-known Canadian cities. Ottawa, the capital city of the Dominion, is located in southeastern Ontario on the navigable Ottawa River, 120 miles from its junction with the St. Lawrence near Montreal. The imposing Parliament Building is to a certain degree a reproduction of the Gothic building that was destroyed by fire in 1916; its dominant feature is the Peace Tower, famous for its carillon and for the beautiful memorial chamber that contains the Book of Remembrance in which are inscribed the names of Canadians who died in the World War. Among other noted buildings are Rideau Hall (the residence of the governor general), the City Hall, National Museum, Carnegie Library, Christ Church Cathedral (Anglican), Cathedral of Notre Dame (Roman Catholic) and the Château Laurier, a distinctive hotel operated by the Canadian National Railways. The Royal Canadian Mint and the Dominion Archives are located in Ottawa, and the Supreme Court of Canada holds its sessions there. The population is about 125,000.

Toronto, the capital of Ontario, ranks next to Montreal in size, with a population more than 600,000. It is located on the northwestern shore of Lake Ontario and presents a truly metropolitan appearance. The city rises from a few feet above lake level to an elevation in the northern section of about 300 feet. There are many beautiful parks and drives. Queen's Park contains the provincial House of Parliament. Close at hand are the buildings of the University of Toronto, one of the oldest and most important institutions of higher education in the Dominion; it was founded in 1827 as King's College and has an annual enrolment of about 5,000. The great exposition building is the scene late every summer of a trade fair that attracts nearly 1,000,000 visitors from eastern Canada and the northeastern United States. Among other noted buildings are the City Hall, St. James Cathedral (Anglican), St. Michael's Cathedral (Roman Catholic), Public Library and Royal York Hotel. Next to Montreal, Toronto is the banking center of the Dominion, and in the number of manufacturing establishments and wholesale houses it ranks first in all Canada.

Vancouver, the largest city of British Columbia, ranks next to Montreal and Toronto among the large cities of the Dominion; its population is about 250,000. It is in the extreme southwest on Burrard Inlet, an arm of the Strait of Georgia that connects with the Pacific Ocean through the Strait of Juan de Fuca. Vancouver is noted for its large foreign commerce, a great deal of wheat being exported even to Europe via the Panama Canal. Lumber products are among the most valuable exports, and fish are shipped in great quantities. The privately owned Canadian Pacific and the government-operated Canadian National railways have their western terminals in this city.

The principal seaports of the Maritime Provinces are Halifax and St. John. Halifax, the capital of Nova Scotia, is located in the eastern part on one of the world's finest deepwater harbors. Strongly fortified, it has been for many years the chief Atlantic base of the British Navy, but it is now losing its importance in this respect to St. George Island and Ireland Island, two of the Bermudas. Nearly 700 miles nearer Europe than New York, Halifax should assume a greater importance as a seaport, as the province that it serves increases in population. It is the seat of Dalhousie University.

St. John, the most important city of New Brunswick, is situated at the mouth of the St. John River on the western shore of the Bay of Fundy. It carries on a large trade in lumber and agricultural produce. The St. John River enters St. John harbor through a narrow gorge. The high tides of the Bay of Fundy (which sometimes reach 50 feet) so change the relative water levels at the two ends of the gorge that the water pours through to the sea when the tide is low and pours back up the river when the tide is high. This produces the famous reversing falls.

Origin of Name. The name *Canada* is probably derived from a word of the Iroquois Indians, meaning a collection of huts or wigwams. The early French settlers called the country *La Nouvelle France*, New France.

canal, an artificial waterway for navigation, generally connecting bodies of water; the Erie Canal (now part of the New York State Barge Canal) connects the Hudson River and Lake Erie, and the Cape Cod Canal connects Buzzards Bay and Cape Cod Bay. The Panama Canal across the Isthmus of Panama connects the Caribbean Sea and the Gulf of Panama; the Kiel Canal in Germany provides water connection between the Baltic and North seas and the Baltic-White Sea Canal has been the pride of the Soviet Union. Vessels are generally transferred from one level to another in a canal by means of locks.

Most canals of European countries, especially France and Germany, provide a cheap means of transportation, supplementing the river systems. In other countries, such as Egypt, canals provide a means of irrigation and drainage, carrying water from the Nile to the land where it is needed. Other canals have been designed for drainage purposes. The Chicago Drainage Canal, until its conversion into a ship canal in 1933 as part of the Illinois Waterway from Lake Michigan to the Mississippi River, was used (through reversing the current of the Chicago River) to carry sewage from Chicago into the Des Plaines River, a branch of the Illinois River that empties into the Mississippi. This course avoided polluting Lake Michigan, the source of the city's water supply. The Welland Canal was built around Niagara Falls to facilitate ship transfer on the Canadian side from Lake Erie to Lake Ontario. This Great Lakes water transport chain is continued by the Sault Ste. Marie Canals around the north and south sides of the falls of St. Marys River, thereby connecting Lake Superior and Lake Huron.

Canary Islands, a group of islands of volcanic origin in the North Atlantic Ocean, 60 miles off the northwestern coast of Africa and forming a province of Spain. Of the 13 islands, only seven are inhabited. The capital Santa Cruz de Tenerife is on the island of Tenerife. Gran Canaria possesses the leading port Las Palmas. Among the other islands are La Palma, Gomera, Hierro, Lanzarote and Fuerteventura. The total area is 2,808 square miles, and the population, representing an intermixture of Spanish blood with that of the ancient Guanchos, is more than 550,000. All the islands are rugged; one volcanic mountain, Pico de Teyde on the island of Tenerife, rises 12,200 feet above sea level.

The Canary Islands were called by the ancient Romans *Fortunatae Insulae* (Fortunate Isles), because they have a delightful climate and a fertile soil. Grains, fruits and vegetables flourish; the most important products are bananas, oranges, dates, sugar cane and coffee. Fishing ranks next to agriculture in importance. Early in the 14th century the islands were rediscovered by French navigators; the Spanish sovereigns, Ferdinand and Isabella, acquired them in 1476. The group name is derived from *Canaria*, the Latin name of one of the islands, which in Roman times was noted for a breed of large dogs (*canis* means dog). The islands are the original home of canary birds.

canyon or **cañon,** a narrow gorge or river valley having steep sides. The word is Spanish for funnel. Canyons are the result of erosion extending over thousands of years; they generally are found in plateau regions that have been elevated, geologically speaking, in comparatively recent times.

The Grand Canyon of the Colorado River in Arizona is the most famous and awe-inspiring canyon in the world. Next to it in beauty and size is the Grand Canyon of the Yellowstone River in Yellowstone National Park. One of the highest and narrowest canyons is the Royal Gorge of the Arkansas River in Colorado. Several smaller canyons are found in the Canadian Rocky Mountains.

cape, an extension of land, usually longer than it is broad, jutting out from the shore line into the sea. It differs from a peninsula in that a peninsula usually is connected with the mainland by a neck that is narrower than the peninsula itself, but a cape is approximately the same width throughout. The word *cape* is applied also to the land that constitutes the tip of such an extension.

Capes have been and are of tremendous importance and interest in history, in exploration and in travel. Among those that have special associations are the Cape of Good Hope, Cape Horn, Cape Cod, Cape Flattery, Cape Hatteras and the North Cape. The word *cape* is derived from the Latin *caput*, meaning head.

Cape Cod, a hook-shaped peninsula that forms the most easterly part of the mainland of Massachusetts. It is 65 miles long and varies in width from 20 miles in the southern part to one mile near the tip at Provincetown. The name Cape Cod is also given to this tip. The peninsula curves around Cape Cod Bay, which lies to the west. Vineyard Sound and Nantucket Sound separate it from the islands of Martha's Vineyard and Nantucket to the south. Buzzards Bay, an inlet of Long Island Sound, extends inland along the southwest shore of the cape. The Cape Cod Canal (8 miles long), opened in 1914, connects it with Cape Cod Bay; it not only provides a short inland water route between New York and Boston but lessens the danger of shipwreck as the waters around the cape are often rough. Cape Cod is important commercially for its fishing and is a popular summer resort. On its tip the Pilgrims first landed in 1620 before they crossed to Plymouth where they made their permanent settlement.

Cape Verde Islands, a group of 14 islands and islets of volcanic formation, located in the Atlantic Ocean about 320 miles west of French West Africa. The total area is 1,511 square miles, and the population, mostly Negroes, is more than 150,000. The principal islands are São Thiago, Santo Antão, São Vicente, Santa Luzia, São Nicolao, Boa Vista, Maio, Brava, Sal and Fogo. On Fogo (Fire) island is the volcano, Pico de Cano, 9,744 feet high, which is occasionally active. Cape Verde products include coffee, sugar, fruits, millet, tobacco, indigo, salt and hides.

The Cape Verde Islands were discovered and colonized by the Portuguese in the middle part of the 15th century. Slavery was not stamped out until 1876, when the Government completed the process of emancipation that it had started 20 years previously. Administration is entrusted to a governor-general whose seat is at Porto Praya on São Thiago. Mindello on São Vicente is the chief port. The island group was named (in Portuguese, *Ilhas do Cabo Verde*) after Cape Verde (green cape) at the westernmost tip of Senegal.

capital, the city from which a country or state is governed—the city in which the legislature holds its sessions and where the various government officials have offices. If the capital is one of the smaller cities, it probably was selected for its central position or its general accessibility from various parts. A city may have been chosen as the capital because it was important at the time it was selected for that purpose; but economic or other reasons may have given some other city a greater opportunity for growth, yet the city originally chosen may remain the capital for traditional reasons.

Albany, surpassed in size by several other cities of New York State, of which it is the capital, maintains its prestige through its location. Boston, the capital of Massachusetts, has become both the largest city in the state and a seaport of great importance. Canberra, Australia, and Washington, D. C., are examples of modern capitals that have been especially established. The word *capital* is derived from the Latin *caput,* meaning head.

Capitol, The National, Washington. Begun in 1793 and completed in 1865, this building (designed by William Thornton), 751 feet long and 350 feet broad, rises to a dome capped by a bronze statue of Freedom, the crown of which is 287½ feet above the ground. Within are the halls of Congress and other smaller rooms for officials and ceremonial uses.

Capri, an island belonging to Italy that has been famed as a beauty spot since the days of the Roman emperors. It lies in the Bay of Naples, about 20 miles southwest of the city of Naples, and has an area of 6 square miles and a population about 5,000. The principal industry is fishing; products include citrus fruits and wine. The quaint town of Capri is the capital. On the rocky plateau above it Anacapri is situated. Among the numerous historic ruins are the Palace of Tiberius and the 12 villas that this emperor built in honor of the chief gods and goddesses. According to tradition he had his enemies hurled into the sea from one of the cliffs of Anacapri. The most famous of the island's marine caves is the Blue Grotto, 40 feet high, 175 feet long and 100 feet wide, which is entered by rowboats through a 3-foot aperture. Taking its name from the intense color of fiery blue that is cast upon its walls, this grotto was the favorite swimming place for the Emperor Tiberius and his court.

The name *Capri,* signifying the island of goats, is derived from the Latin *caper,* meaning goat. In ancient times it was known as *Caprae.*

Caribbean Sea, an arm of the Atlantic Ocean, bordered on the south by Panama, Colombia and Venezuela and on the west by Costa Rica, Nicaragua, Honduras, British Honduras and the Yucatan Peninsula of Mexico. It is partially enclosed on the north and east by Cuba, Jamaica, Hispaniola (Haiti and the Dominican Republic) and the Lesser Antilles. It is connected with the Gulf of Mexico by the 120-mile-wide Yucatan Channel. The length of the sea is about 1,700 miles, and its width varies from 400 to 700 miles; the area is approximately 750,000 square miles. As the Caribbean is the waterway by which the Panama Canal is approached from the east, it is of tremendous commercial importance. The principal Caribbean ports are Kingston, Santiago de Cuba, Port au Prince, Ciudad Trujillo, Belize and Colon.

The Caribbean Sea was discovered by Columbus on his first voyage to America in 1492 and was thoroughly explored on his three subsequent voyages in an attempt to find a strait connecting with the China Sea. Its name is derived from that of the Carib Indians who previous to the Spanish, British and French invasion of their territory dwelt on the islands of the Lesser Antilles and in what is now Venezuela and British Guiana.

Caroline Islands, a group of some 550 islands in the North Pacific Ocean, included in Micronesia and situated at about 1° to 10° N. Lat. and 135° to 160° E. Long. The area is 560 square miles, and the population, mostly of Micronesian stock, numbers 31,609. The chief islands, Yap, Hogolu and Ponape, are of volcanic formation. The others are mostly coral reefs and atolls. The capital is Korror. The usual tropical fruits and vegetables are raised, but the chief article of export is copra. These islands were discovered by the Portuguese Diego da Rocha in 1527 and were named the Sequeira Islands. After Spain acquired them in the following century, they were renamed the Carolines in honor of Charles II of Spain. Sold to Germany in 1899, they were transferred to Japan under mandate of the League of Nations at the close of the World War. By a treaty with Japan, ratified in 1922, the United States secured for itself and other nations equal cable rights on the island of Yap.

cascade, a series of small waterfalls resulting from a sharp slope in a stream bed. Typical are the Seven Falls in South Cheyenne Canyon near Colorado Springs, Colo., and the Wahkeena Falls on the Columbia River Highway near Portland, Oreg. When they occur in old rivers, as in the Delaware and the Potomac, cascades may be attributed to a re-elevation of the land. The word *cascade* is French for waterfall.

Cascade Range, a range of mountains of volcanic origin that begins in northern California and extends 500 miles northward through Oregon and Washington into British Columbia, Canada. It is about 100 to 150 miles from the Pacific Ocean. Mt. Shasta in California (14,161 ft.) and Mt. Rainier (14,408 ft.) in Washington are the loftiest peaks. Others are Mounts Hood, Adams, Jefferson, Washingon and St. Helens. The slopes of the Cascade Range are forested with cedar, fir and pine. An area of more than 13,000,000 acres has been set aside in 13 National Forest Reserves, the best-known of which is Mt. Rainier National Park. Three rivers, the Fraser in British Columbia and the Columbia and Klamath in the United States, cross the range. It takes its name from the numerous picturesque cascades, notably the Wahkeena Falls on the Columbia River Highway.

Caspian Sea, the largest inland sea in the world, bounded on the north, east and west by the U.S.S.R. and on the south by Iran. It is 760 miles long and 130 to 270 miles wide and covers an area of 169,330 square miles. It is 85 feet below sea level. The Volga, Ural and other rivers flow into it, but it has no outlet. The most important Russian ports are Astrakhan, Baku (a great center of oil production in the Soviet Union) and Krasnovodsk (the western terminal of the Transcaspian Railway). Salt and fish are exported. The Caspian Sea was named from the Caspii, a tribe dwelling on its western shore in ancient times.

cataract, a waterfall caused by the descent of water over a high precipice, generally formed of fault scarps or prehistoric lava flows. Typical are the Trummelbach Falls in the Lauterbrünnen Valley, Switzerland, the Great Falls of the Yellowstone River in Yellowstone National Park and Multnomah Falls on the Columbia River Highway near Portland, Oreg. The word *cataract,* derived from the Greek, originally meant down-rushing.

Cathedral, National, Washington. This Gothic edifice is in size, dignity and setting the peer of the greatest old cathedrals. It rises on one of the highest hills of the District of Columbia and is destined when complete to become a memorial church and a final resting place for distinguished national leaders. It now contains the tombs of President Woodrow Wilson and Admiral George Dewey. It is the Protestant Episcopal Cathedral of St. Peter and St. Paul.

Cathedral of St. John the Divine, New York city. Begun in 1892 and not yet completed, this Gothic temple will be the largest cathedral in the Western Hemisphere and one of the greatest in the world. Its main spire will rise impressively 402 feet above Morningside Heights in upper Manhattan. The nave is exceptionally spacious, and the great rose window is most effective. The old portions were designed by Heins and La Farge, the new by Ralph Adams Cram.

Caucasus Mountains, a range of mountains of majestic beauty, higher than the Alps, north of the Caucasian Isthmus in the U.S.S.R. It extends about 700 miles in a northwest and southeast direction between the Black and Caspian seas. The loftiest peak is Mt. Elbrus (18,465 ft.). The Dykh Tau (17,054 ft.), Mt. Kasbek (16,346 ft.) and Mt. Koshtantau (16,875 ft.) are all higher than Mont Blanc. The most important of the high passes crossing these mountains are Daryal and Mamisson. Mineral resources include coal, petroleum and manganese. The Caucasus Mountains were the scene of many early migrations, and this explains the variety of nationalities. The region played a prominent part in Greek legend: Prometheus was chained on a Caucasus mountain; Jason and the Argonauts looked there for the Golden Fleece.

cave, a naturally formed cavity below the surface of the earth, resulting from the underground action of water on limestone or gypsum or from the displacement of earth or rock material in some past period of upheaval. If it is found in the side of a mountain or cliff, it may be formed by erosion, especially of sandstone and volcanic rocks. The erosive action of waves of the ocean may form a marine cave, such as Fingal's Cave on the Island of Staffa of the Inner Hebrides. The Cave of the Winds at the base of Niagara Falls has been worn away by spray dashing against the cliffs.

The United States has a number of caves that are notable for size and beauty. The most famous, Mammoth Cave, covering an area of 54 square miles in southwestern Kentucky, and Wind Cave in the Black Hills of South Dakota have been converted into national parks. Their beautiful crystalline formations, called *stalactites* if suspended from the ceiling and *stalagmites* if rising from the floor, have been formed after most of the water in the cave has been drained off, by the solution and redeposition of the rock's calcium carbonate content. In other caves, such as the Big Bone Cave, Tenn., and Rampart Cave in the Grand Canyon of Arizona, mastodon and giant sloth relics have been found.

Courtesy American Brazilian Association, Inc.

Cataracts of Iguassú Falls in the Iguassú River between Brazil and Argentina

The falls are 210 feet high; in the wet season their crest is 2½ miles long

Cave excavations in France and Spain have disclosed that primitive peoples of the Paleolithic and Neolithic ages dwelt in such natural, hollowed-out chambers, and that these cave people had a considerable culture and art. The word *cave* comes from the Latin *cavus,* meaning hollow.

cavern, a large underground cavity of natural formation, resulting generally from the action of water on limestone or gypsum or from the displacement of earth or rock material. It is usually much greater in size and horizontal extent than a cave, but as its formation has depended on slow-moving subterranean streams its depth is limited by the extent to which the region is drained. The most noted caverns in the United States are the Carlsbad Caverns in the southeastern part of New Mexico. The part explored has an area of almost 16 square miles; a special feature is the "big room," more than 1½ miles long, 400 feet wide and 348 feet high. Set aside as a national monument in 1923, this area was converted into a national park in 1930.

Celebes, a volcanic island of Netherland India, east of Borneo and crossed by the equator in its northern part. It is irregularly shaped and is surrounded by the Strait of Macassar on the west, Celebes Sea on the north, Banda Sea on the east and Flores Sea on the south and is deeply indented in the eastern part by the Gulfs of Tomini, Bolo and Boni. Of the many lakes and mountains Lake Matana and Mt. Bonthain, more than 10,000 feet high, are the most celebrated. The area is 73,160 square miles, and the population, largely of Malayo-Polynesian stock, numbers 4,226,586. The capital is Macassar, although for administrative purposes the residencies of Menado and Ternate on the northeastern and eastern peninsulas have been established.

The agricultural products of Celebes are chiefly rice, sugar cane, cotton, tobacco, coffee and spices. From the mines are taken gold, iron, copper, lead and nickel and from the forests, teak, ebony and sandalwood. The island was discovered by the Portuguese in 1512 but since 1667 has been a dependency of the Netherlands. The early trade monopoly was held by the Dutch East India Company. In accordance with Dutch colonial policy the island is ruled in the main by the native chiefs who are subject to the governor general of Netherland India.

Central Park, the largest park in Manhattan, containing 840 acres and extending from 59th Street to 110th Street and from Fifth Avenue to Eighth Avenue or Central Park West. It is the site of the Metropolitan Museum of Art, the American Museum of Natural History, the municipal zoo and botanical garden, bird sanctuaries and various public playgrounds for children. On its celebrated Mall band concerts are held on summer evenings. Among its curiosities are Cleopatra's

Needle, an Egyptian obelisk that until 1880 stood beside the Caesareum in Alexandria, and the Shakespeare Garden that contains all the flowers mentioned in Shakespeare's plays. The great men who are honored with statues or busts in Central Park include Shakespeare, Burns, Scott, Alexander Hamilton, Daniel Webster, Beethoven, Cervantes, Schiller and Thomas Moore. At the southwestern entrance stands the Maine Memorial.

Ceylon, an island in the Indian Ocean, situated about 55 miles southeast of the southern part of India from which it is separated by the Gulf of Manar and Palk Strait. Its area is 25,332 square miles; the population is almost 5,500,000 of whom only some 10,000 are Europeans. The loftiest peak among the southern mountains is Mt. Pedrutalagala, 8,296 feet high. The principal river is the Mahavili Ganga. Ceylon is one of the choicest spots in the Orient for the cultivation of tea and produces one-sixth of the world's supply. Rice, copra, rubber, coffee, cinnamon, vanilla, cacao, tobacco and areca nuts also are raised. Graphite and such precious stones as garnets, amethysts and sapphires are found in the mountains, and the forests yield ebony and satinwood. The principal beasts of burden are the tame elephant and ox.

The original inhabitants of Ceylon were the ancestors of the present-day aborigines called *Veddahs.* They were conquered in 543 B.C. by the Indian prince, Vijaya, who established a dynasty of 165 kings who reigned almost 2,350 years. Vijaya named the island Sinhaladvipa, whence the name Sinhalese for those inhabitants of Ceylon who are descendants of the colonists from the Ganges valley who settled here in the 5th century B.C. and afterwards. After the visit of Francisco de Almeida in 1505 the Portuguese ruled Ceylon for almost 150 years. In 1658 the Dutch conquered it; and the British took it in 1796. In 1802 it was formally ceded to Great Britain by the Treaty of Amiens. Ruled as a Crown colony, it is divided for administrative purposes into nine provinces, each under a government agent. Assisting the British governor are executive and legislative councils. The capital and chief seaport is Colombo (population, more than 280,000).

Buddhism was proclaimed the state religion of Ceylon in the 3d century B.C. Today more than half the native population are Buddhists. The others are Hindus (principally Tamils), Mohammedans (Moors), who were originally imported to work on the great plantations, and Christian converts, mostly Roman Catholics. Adam's Peak, 7,420 feet high, is said to be the mountain on which Gautama Buddha descended, and the shrine at its summit is visited annually by thousands of Buddhist pilgrims. In the Temple of the Sacred Tooth at Kandy is one of the most holy relics of this religion. At Anuradhapura, the ancient capital of Ceylon from 437 B.C. to 1109 A.D., is a tree planted about 240 B.C., its cutting having been from the famous bo tree (a species of fig) at Buddha Gaya, India, under which Buddha, while meditating, received the inspiration to found his religion. Peradeniya is noted for its botanical gardens.

The English name *Ceylon* is derived from the Portuguese *Selen,* which, in turn, was derived from the Indian name of the island *Sinhaladvipa.* The beauty of its scenery has earned for it the sobriquet, Pearl of the Orient. According to a legend that grew up among the Mohammedan population it was given to mankind as consolation for the loss of Paradise.

Champ de Mars, a Parisian park, planned about 1770 as a training field. It has been the site of many expositions. On the north side stands the Eiffel Tower, 984 feet high, a relic of the exposition of 1889. The École Supérieure de Guerre, which Napoleon and other great French generals attended, is on the south side.

Champs Élysées, the main avenue of Paris that connects the Place de la Concorde and the Place de l'Étoile, a distance of 1½ miles. In its surrounding park, known as the Carré, the Théatre Marigny and the Théatre Guignol (the sole surviving Punch and Judy theater in Paris) are situated. On the southeastern side of the avenue are two survivors of the exposition of 1900—the Grand Palais, in which motor shows and other industrial exhibitions are held, and the Petit Palais, which houses the municipal collection of modern painting and sculpture. On the northeastern side is the Palais d'Élysée, once the home of Mme. de Pompadour and now the official residence of the President of the French Republic. The continuation of the Avenue des Champs Élysées, known as the Avenue de la Grande Armée, forms one of the main approaches to the Bois de Boulogne.

channel, a narrow sea between two land areas. It differs from a strait or narrow passage of water between two larger bodies of water. The English Channel, between England and France, is probably the most famous. It is ordinarily thought of as lying between the two countries rather than as connecting the North Sea and the Atlantic Ocean. Ambrose Channel, in New York Harbor, off the southwestern coast of Long Island, is very important to shipping; it is more than 7 miles long and 2,000 feet wide.

In a more restricted sense the word *channel* defines that part of a river or harbor where the main current flows and which is deeper than the other parts. It may apply also to an area artificially deepened and greatly extended by dredging to provide a safe passage for ships. An example is dredging a 30-foot channel in Lake Pontchartrain so that ocean-going vessels might have a more direct access to New Orleans from the Gulf of Mexico.

Channel Islands, a group of islands in the English Channel, comprising Jersey, Guernsey, Alderney, Sark and a number of smaller islands. Jersey and Guernsey are discussed in their alphabetical order. Alderney has an area of about 3 square miles and Sark of 2 square miles, and both are included in the Bailiwick of Guernsey. All the islands, except the Îles Chausey, belong to Great Britain. They came under Norman rule in the 10th century, and England derived her claim to them when William the Conqueror became king in 1066. The total area is 75 square miles, and the population is more than 90,000. In recent years the islands have been a tourist attraction both summer and winter on account of the balmy climate, picturesque scenery and the many medieval laws and feudal customs that still survive. The language of most of the inhabitants is Norman French.

Chartres Street, the most famous thoroughfare in New Orleans, principal street of the Vieux Carré (old French quarter), which dates back to the earliest settlement in 1718. Its famous spots include a house built for Napoleon, the blacksmith shop of the pirate, Jean Lafitte, and the site of the old New Orleans slave market.

chasm, a deep cleft in the earth or in rock, generally made by an earthquake. A superb example of this phenomenon is Ausable Chasm, the rocky gorge through which the Ausable River flows before emptying into Lake Champlain. The word is derived from a Greek word meaning gap or gape.

Cheapside, the central east-and-west thoroughfare of the city of London, extending from Paternoster Row opposite St. Paul's Cathedral to its intersection with Princes and Threadneedle streets on which the Bank of England is located. Though less than a quarter mile long, it is one of the most important shopping streets, being especially favored by tailors and jewelers. The name is derived from the Anglo-Saxon *ceapian,* meaning to sell or bargain.

Chesapeake Bay, the largest inlet of the Atlantic Ocean, between Virginia and Maryland. Its entrance, 12 miles wide, is between Cape Charles and Cape Henry. The bay is 200 miles long and 4 to 40 miles wide, with an area of 6,000 square miles. Rivers that flow into it are the Susquehanna, Potomac, James, Rappahannock and York. It is economically important for its famous oyster beds and as a great shipping highway for the city of Baltimore. The United States Naval Academy is at Annapolis on the western shore. Hampton Roads, the channel between Old Point Comfort and Sewall's Point, Va., pours its waters into Chesapeake Bay. The Port of Hampton Roads was formed in 1926 and includes Norfolk, Va., where an important United States Naval Base is situated; Newport News, famous for its shipbuilding; Hampton and Portsmouth. The Civil War battle between the *Monitor* and *Merrimac* was fought at Hampton Roads. Chesapeake is an Indian name that apparently meant very salt water.

Chicago, a city of the United States, on Lake Michigan in northeastern Illinois. It ranks second in size among cities of the nation and sixth among those of the world. At first existing as a fur-trading post, it became the site in 1803 of Fort Dearborn, which served as the nucleus of a growing frontier settlement. In 1833 it was incorporated as a town and 4 years later was chartered as a city. In less than 75 years thereafter it had become the terminus of 40 railways, one of the greatest railroad centers in the world, the world's largest grain market and chief city in the preparation of dressed meats and a distribution center that handled one-eighth the nation's wholesale and retail business.

Besides slaughtering and meatpacking, Chicago's principal industries are the manufacture of agricultural implements, Pullman sleeping cars, telephone equipment, furniture, musical instruments, men's and women's clothing and iron, steel and metal products. Chicago is an important publishing center. To meet the demands of air transportation 18 airports have been constructed in the Chicago metropolitan area. The volume of water transportation is great; more than 6,000 vessels enter and leave the port every year.

The population of Chicago proper is 3,396,808 (1940). The population of the metropolitan area, which covers 1,120 square miles and includes in addition to the central city the counties of Cook, Du Page, Kane, Lake and Will in Illinois and Lake County in Indiana, is about 4,825,000. Outstanding among Chicago's suburbs are: Evanston (to the north), the seat of Northwestern University; Gary (in Indiana), the headquarters of the United States Steel Corporation and the American Bridge Works; and Berwyn, Cicero, Oak Park, Aurora and Waukegan.

For many years the main business section of Chicago was confined to an area of 1½ square miles in the heart of the downtown district, called the *Loop* from the fact that here the various elevated and surface trolley-car lines made a loop for their return trips. Only within very recent years have business houses spread beyond this area, principally to the north. In the business section are found the Chicago Board of Trade (in which center all grain market activities), Mercantile Exchange (which operates as a butter-and-egg clearing house), Furniture Mart and the Stock Exchange; also the City Hall, County Courthouse, Federal Building, Civic Opera House, Chicago Temple Building (owned by the First Methodist Episcopal Church) and the Daily News Building with plaza stretching to the river's edge. Of the many department stores the most notable is that of Marshall Field & Co.

Chicago Tribune Tower

A 20th-century expression of Gothic architecture on Michigan Boulevard. Architects of this 36-story newspaper and office building were John Mead Howells and Raymond M. Hood

The Chicago River and its two affluents, called the North and South forks, divide the city into sections known as the North, South and West sides. The North and South sides are primarily residential; the West Side is industrial. In the former are the city's great parks, covering 7,520 acres and connected by more than 100 miles of boulevards. The North Side has Lincoln Park, whose principal features, in addition to the statue of Abraham Lincoln by Augustus Saint-Gaudens, are the museum of the Chicago Historical Society, a conservatory and a zoological garden. Grant Park along the lake front was the site of the Century of Progress Exposition in 1933 and is noted for the Municipal Stadium in Soldiers' Field, the Shedd Aquarium, Adler Planetarium and the Field Museum of Natural History, founded in 1893 through the lavish benefactions of Marshall Field and others and noted in particular for its ethnological, botanical and meteorite collections. The most important of the South Side parks is Jackson Park, which was the site of the World's Columbian Exposition in 1893 and on whose Midway Plaisance are now located several of the buildings of the University of Chicago and Lorado Taft's famous sculpture, *The Fountain of Time;* the only remaining edifice, the Fine Arts Building, has been converted into the Rosenwald Museum of Science and Industry. There are also Washington, Douglas, Garfield, Humboldt, McKinley, Sherman, Marquette and Columbian parks.

Along Michigan Boulevard and its northern extensions—the Gold Coast, Lake Shore Drive and Sheridan Road—are some of the most imposing skyscrapers, hotels, apartment houses and private residences in the United States. The Gothic Tribune Tower is generally considered the most artistic business building in the country. The Art Institute of Chicago has nobly carried out the purposes of its founders to promote an art culture in the United States; it also embraces an art school and a school of industrial art that are among the foremost in the country. Among other notable buildings are the twin-towered Wrigley Building, Straus Building and the Palmolive Building, from whose topmost pinnacle shines the 2,000,000 candlepower Lindbergh Beacon, whose rays are visible to aviators at night for more than 100 miles. In 1937 there was completed a 30-mile automobile express highway along Lake Michigan from the far north to the far south shores of the city; an important center link in this project is the Outerlink Bascule Bridge over the mouth of the Chicago River.

In addition to the University of Chicago, which has an annual enrolment of about 13,000, the city is the seat of two Roman Catholic institutions, De Paul and Loyola universities, and of the higher technical schools, Lewis Institute and the Armour Institute of Technology.

The origin of the name *Chicago* has been traced to the Miamis, an Algonquian tribe that inhabited this region in the early part of the 19th century and in whose language the word for skunk is *se-kaw-kwaw.*

Chile, a republic of southwestern South America, called the *shoestring republic* because its length from Peru on the north to Tierra del Fuego on the south is 2,620 miles; and its width varies from 100 to 221 miles. For about 300 miles in the northern part it lies in the Torrid Zone. Its southern extremity is Cape Horn, a cold, dreary region at the tip of Horn Island where the waters of the Atlantic and Pacific oceans merge.

The South Chilean Andes that separate Chile from Argentina contain some of the highest peaks in South America; the more famous are Cerro del Mercedario (22,302 feet) and the volcano Llullaillaco (21,500 feet). Between this range and the coast range, (Cordillera de la Costa) is the fertile agricultural region of the Vale of Chile. The principal river is the Loa. In the southern part of the country is the Chilean Lake District, the most celebrated lake being Llanquihue. From an average height of 6,000 feet in the Cordillera de la Costa the land slopes toward the Pacific; there is a very narrow coastal plain. The area of the country is 286,396 square miles. The population is about 4,300,000, and about one-fourth are of Spanish descent. Others are British, Irish, German, Italian and French. The 30,000 Indians, found mostly in the Andes and in Tierra del Fuego, are descendants of the ancient Araucos and Changos.

The Atacama Desert, a 450-mile strip along the northwestern coast, is rich in nitrate of soda, sulphur and borax. Before the World War Chile furnished 95 per cent of the world's supply of nitrate. This proportion has decreased, however, with the perfection of processes for obtaining nitrogen from the air. Nitric acid (of which nitrate of soda is the salt) is widely used in the manufacture of artificial fertilizers and of such nitro-explosives as guncotton. The most important by-product of the nitrate industry is iodine, valuable as an antiseptic and as an element of nutrition. Even during the depression years the Chilean nitrate beds yielded an average of 1,300,000 tons a year. The country also has valuable deposits of gold, silver, coal, iron, manganese, nickel, cobalt, salt and oil shale. It ranks next to the United States in copper production, with an annual yield of about 250,000 tons.

Chile's agricultural activity is centered in the subtropical section of the central part. The principal crops are wheat, barley, oats, corn, rye, flax, sugar beets, potatoes, tobacco, beans and peas. Some 275,000 acres are devoted to vineyards and to fruit orchards whose chief crops are apples, apricots, figs and olives. Most of Chile's 6,250,000 sheep and 2,400,000 cattle find rich grazing lands in the southern part of the country; chilled mutton and beef and hides and wool are among the leading exports. This area is also heavily forested. Of the predominating evergreens the Chilean pine is especially prized for its nuts.

Chile has been a republic since it threw off the Spanish yoke in 1818. Its chief executive is a President, elected for 6 years by popular vote. He is assisted by a Cabinet of 8 members. The National Congress consists of two houses: a Senate of 45 members, elected for 8 years, and a Chamber of Deputies of 143 members, elected for 4 years according to a system of proportional representation. For local administrative purposes the country is divided into 25 provinces, administered by *intendentes* appointed by the President.

Santiago, the capital and largest city, lies in the fertile valley of central Chile. It is noted for its verdant parks and gardens; the principal thoroughfare is the Avenida de las Delicias. The city owes its modern aspect to the rebuilding program after the severe earthquake of 1906. Among important buildings are the Cathedral, National Votive Church, National Congress, Palace of La Moneda (official residence of the President), Municipal Palace and Palace of Justice. Cultural institutions include the National Museum, Gallery of Fine Arts, National Library, Opera House and University of Chile (founded in 1743). The city was founded by the Spanish invader, Pedro de Valdivia, in 1541 and today has a population of nearly 750,000.

Valparaiso, the only port of importance in Chile, is 115 miles northwest of Santiago. The business section is in the coastal area, and the residential sections have been developed on the 19 hills that overlook the bay and that vary from 300 to 1,100 feet in height. The most important of the city's public buildings is the Naval Academy. Its population is almost 200,000. Chile's other important cities include Concepcion, Iquique, Talca and Antofagasta. In 1935, Easter Island, a dependency, was made a national park.

The name *Chile* is derived from the Quichuan Indian word *Tchili* or *Tchiri,* cold, referring to the perpetual snow that crowns Mercedario and other peaks of the Andes.

Courtesy Grace Line

Primitive Weaving in Chile

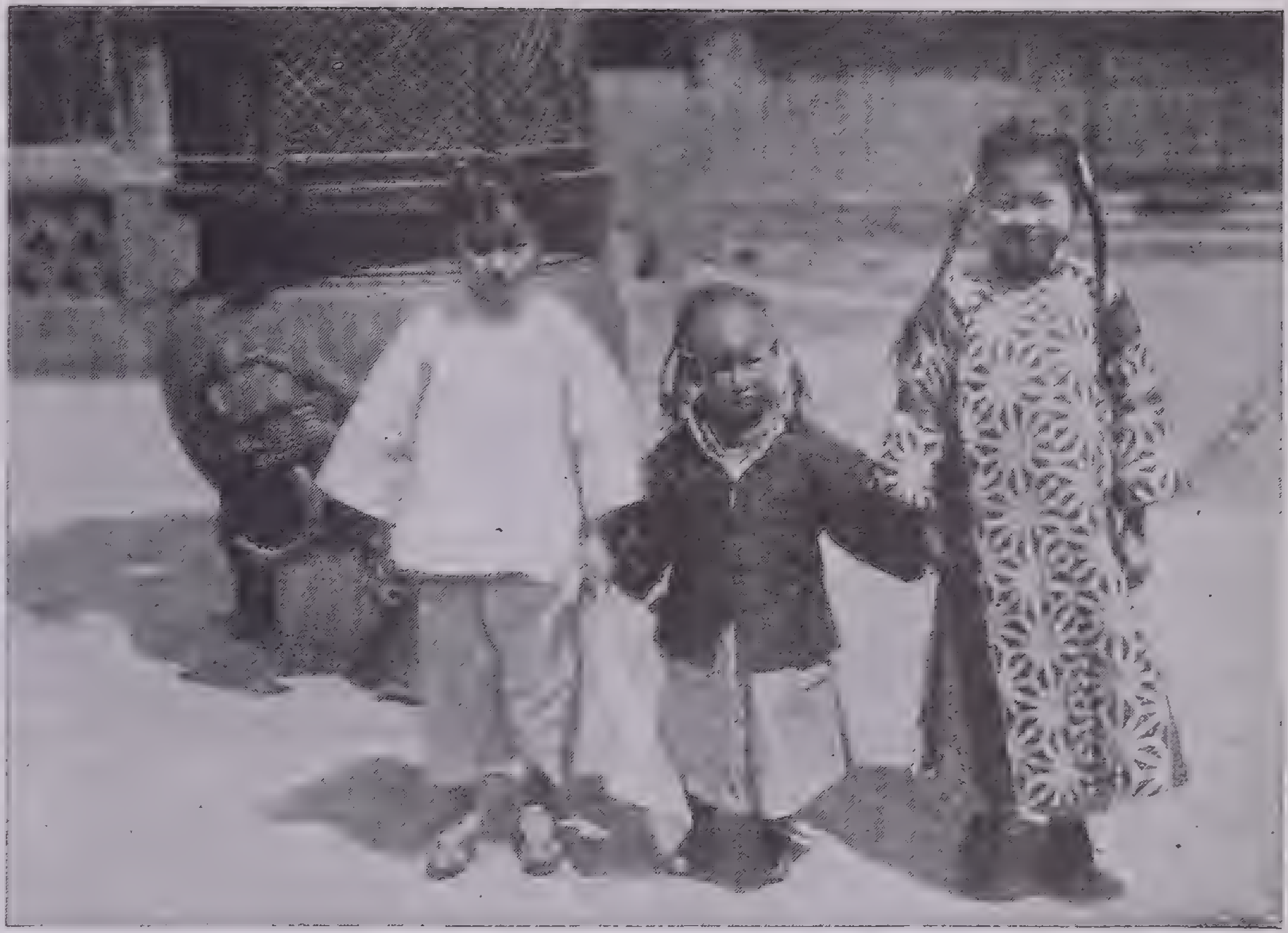
An Araucanian Indian woman of Temuco, in the Chilean lake district, demonstrates an art handed down from generation to generation

China, a republic of eastern Asia that occupies more than a tenth of the area of the largest continent. At the beginning of the 20th century the area of its 24 provinces amounted to some 4,278,000 square miles. Tibet, however, has been virtually independent since the expulsion of Mandarin agents on the outbreak of the Chinese Revolution in 1911, and during the past decade the Soviet Union has been acquiring more and more influence in the buffer states of Outer Mongolia and Sinkiang. The northern provinces of Manchuria, Heilungkiang, Kirin and Jehol have constituted since 1932 the puppet state of Manchukuo, set up by Japan. During 1934 and 1935 the Japanese army continued to occupy the eastern provinces of Inner Mongolia, and Peiping, the ancient capital in the province of Hopeh, was voluntarily evacuated by the Chinese so as to save from destruction in case of bombardment its age-old treasures. After resuming its undeclared war with China in July, 1937, Japan occupied about 150,000 square miles in the east central part of the country; this territory includes Shanghai, the great commercial center, and Nanking, which became the capital in 1928. The population numbers about 360,000,000. The Chinese belong to the Mongolian race.

For centuries China was closed to western contact, and not until the Opium War with England in 1840, caused by China's attempt to prevent the importation of opium from India, were trade barriers broken down. China owed its isolation to both natural and artificial barriers. Across what is now the central part of the country there was erected in 214 B.C. a Great Wall of stone faced with brick; it was 1,500 miles long, 20 feet wide and from 20 to 30 feet high and ran from the Gulf of Liaotung to Kiayu Kwan not far from the Gobi Desert. Until the Manchu invasion in 1644 this wall was successful in keeping out the northern barbarians. The country was protected on the west by the Gobi Desert and by the almost impassable Himalaya, Kunlun and Altai mountains. On the south were the equally impenetrable jungles of Burma and French Indo-China. China's eastern and southern coasts are lapped by such arms of the Pacific Ocean as the Yellow Sea and the East and South China seas. Scattered along these coasts are the numerous Treaty Ports of Shanghai, Canton, Amoy, Ningpo and Swatow that were opened to foreign trade after the Opium War. The principal islands are Hong Kong and Formosa (ceded to Japan in 1895).

The great central and eastern plains of China are watered by three great rivers, Yangtze Kiang (3,100 miles), Hwang Ho (2,700 miles) and Si Kiang (1,650 miles). The valley of the Hwang Ho is a great loess-deposited region whose yellowish-brown sediment was wafted thither by winds from the Gobi Desert. It is resistant to erosion, and when it is cut, it assumes blocklike shapes that permit building hillside terraces for crop rotation and other methods of intensive agriculture. From the color of the loess deposits comes the name of Yellow for the Hwang Ho and for the sea into which it empties. The Hwang Ho is also called from its numerous floods *China's Sorrow.* The valley of the Yangtze Kiang is often called the *Red Basin* from the large amount of iron ore that stains the soil red. This valley and that of the Si Kiang to the south are largely alluvial. Between them are the low coastal ranges of the Chekiang, Fukien and Kwangtung mountains.

Economic Resources. With some 80 per cent of its population engaged in the cultivation of its fertile plains China is one of the greatest agricultural countries. However, the holdings are very small. More than half the Chinese farms constitute only 1½ acres, and a third of the agricultural population must be content with less than an acre of ground. Farming methods are also very primitive; irrigation is accomplished with the aid of man-propelled water wheels and labor-saving devices are practically unknown. If the rain-bringing southwest monsoon comes in summer, then China will evade famine another



Courtesy Thomas Cook & Son, Inc.

Children of a Chinese Village

While most of the children in the cities dress in occidental clothes as do their elders, those in smaller communities and in the rural sections still wear the traditional Chinese costumes. The boy (in the center) is wearing a long loose coat called a *sham;* over it is a vest of dark figured sateen. The girl on the left is wearing a pajama costume, consisting of a short jacket with straight sleeves and trousers. The girl on the right is wearing the kind of sham that her mother would wear; it is close fitting to the waist and is buttoned on the sides. Both boys and girls may wear trousers under their shams, the broad band on the boys' trousers being wrapped several times around each ankle so as to form a cuff. The shoes are of coarse dark cloth; those which the girls are wearing are embroidered. Often younger boys and girls can be told apart only by the shaving of the front part of the boy's head. The red hair ribbon that the boy is wearing is to keep away evil spirits; the girls always wear gold earrings

year. It is essential for watering the rice fields of the south, where some 3,750,000 tons of this crop are raised each year. Rice is supplanted in the north by millet. Wheat, barley, corn, sorghum, soy beans and peas also are cultivated. Other crops include tea, cotton, tobacco, sugar cane, peanuts, sweet potatoes and orchard fruits. The principal grazing lands for sheep and cattle are in the northwest.

One reason why Japan has greatly coveted China is her great wealth in natural resources. Abundant supplies of coal and iron make possible the development of a vast steel industry. China produces more than three-fifths of the world's supply of antimony and tungsten. Other minerals include tin, copper, lead, zinc, salt and petroleum.

With the vast mulberry plantations is linked one of the oldest Chinese industries, silk. From the filament of silkworms fed on oak leaves (instead of mulberry) is made the *wild silk* that is used in manufacturing pongee and tussah. China is estimated to furnish 27 per cent of the world's supply of raw silk and a large proportion of the manufactured product. Other textiles include cottons and woolens, centered until recently in Shanghai. An artistic nation, the Chinese have been noted for centuries for their cloisonné ware, fine porcelain, jewelry of jade, cinnabar and other precious and semiprecious stones, embroideries, articles of carved ivory, of teak and lacquered wood, paintings on paper or silk, rugs and fans.

China still relies on its numerous rivers and interconnecting canals for transportation, although with the construction of some 40,000 miles of macademized roads the use of the automobile is increasing. As recently as 1935, though, China proper had only 8,131 miles of railway. This may be attributed to the fact that the Chinese feared that the thundering roar of the trains would disturb the slumbers of their ancestors; particular care has been taken in constructing the lines that they do not pass anywhere near a cemetery. Today the country has an air-mail service linking the largest cities.

Until the outbreak of the Chinese Revolution in 1911 China's system of government was based on the patriarchal form of society decreed by Confucius; the supreme patriarch was the emperor to whom every subject owed obedience. Since the overthrow of the Manchu dynasty China has been a republic, but the Government was unable to compel the provincial military governors to obey it, and there have been only brief periods of internal peace. Not until the threat of Japanese invasion in 1930 did the war lords forget their selfish ambitions and join forces in an attempt to save China from perishing as a nation. The Kuomintang or Nationalist party transferred the capital from Peiping (formerly Peking) to Nanking in 1928, and after the fall of that city to the Japanese invaders late in 1937 the Government established a temporary capital at Hankow. The republic has a nominal President, but since the Kuomintang party assumed control all of the functions of government have been exercised by the five councils of its National Committee; these councils embody executive, legislative, judicial, examinatory and supervisory powers and are presided over by a council president.

Important Cities. China's cities are among the largest in the world. Peiping is described in a separate article.

Shanghai (population about 3,450,000) is situated on the Whangpoo River, an affluent of the Yangtze Kiang, 12 miles from the estuary of the larger river. It is China's chief seaport in that it handles more than half of the total import trade and about a third of the export trade. Its most attractive feature is the Bund (water-front avenue), lined with modern office buildings and hotels. Until Shanghai's capitulation to the Japanese in 1937 its population included more than 1,000,000 foreigners who lived and conducted their business in what was known as the International Settlement; of the 12 nationalities represented the principal ones were British, American and Japanese. About 500,000 other foreigners made their headquarters in the French Concession.

Nanking (population about 1,000,000) is located on the Yangtze Kiang River nearly 200 miles from the sea. As early as the 3d century it was the capital of various emperors and in the 14th century became the southern capital of the Ming dynasty. It has long been famous for the manufacture of paper and silk (including Nanking brocade). Its most distinctive structure is the mausoleum erected to the republic's greatest statesman Dr. Sun Yat-sen. It is the seat of Nanking University for men and of Ginling College for women.

Canton (population about 860,000) is located on the Pearl River, 80 miles from the sea. It is a typical river port, with some 50,000 of the inhabitants living in *tanmins* or houseboats. It is also the most progressive of the purely Chinese cities. Canton was the birthplace of the Chinese Revolution; among the memorials to its great leader are the Sun Yat-sen Obelisk on a high hill overlooking the city and the ocatagonal auditorium suggestive in shape of the Temple of Heaven at Peiping.

Among other important Chinese cities are Hankow, Changsha, Lanchow, Tientsin, Hangchow, Chungking, Wenchow, Foochow and Tsingtao.

China Sea, an arm of the Pacific Ocean that reaches from Japan on the northeast to British Malaya on the southwest. China, French Indo-China and the Malay Peninsula form its western shore; Borneo and the Philippine Islands separate it from the Pacific Ocean. The Island of Formosa divides it into the East and South China seas. The Yellow Sea to the northwest is usually considered a part of it also. The area of the East China Sea alone is 479,740 square miles; the South China Sea has an area three times as great. Among the rivers emptying into the China Sea are the Hwang Ho, Yangtze Kiang, Si Kiang, Pearl and Mekong. The cities of Shanghai, Canton, Hong Kong, Saigon, Singapore and Manila are on or near it. Navigation is often hazardous in the China Sea because of the typhoons and other violent storms.

chinook, a warm, dry wind that sweeps over the plains from the Rocky Mountains, melting snows and often causing floods in winter and droughts in summer. It occurs when warm, expanding air, forced up the westward slopes of the mountains, loses some of its moisture and descends as a dry wind. Frequently the temperature of the invaded region is raised 50° within an hour. The wind may blow for several hours or even for several days. Farmers mitigate its effect by planting several rows of trees, called windbreaks. The name *chinook* comes from a tribe and linguistic group of North American Indians who dwelt along the Columbia River.

chop, the mouth or entrance to a body of water, as the Atlantic entrance to the English Channel, guarded by Ushant Isle and the Scilly Isles. West Chop is a peninsula at the entrance to Vineyard Haven, Martha's Vineyard, Mass.

cirque, a large, semicircular, steep-sided basin, formed by the erosive action of converging glaciers; this action, which includes the alternate melting and freezing of the ice whereby the underlying rock structure is shattered, is called *nivation.* Cirques are usually at the head of mountain valleys. They are numerous in the Sierra Nevada and other ranges of the western United States. The term was originally applied to formations of this sort in the Pyrenees; it is derived from the Latin *circus,* meaning circle.

A corresponding circular hollow, generally formed by glacial action on mountain slopes, is called a *corrie.* Derived from the Gaelic and meaning caldron, this word is used more commonly than cirque in Great Britain.

city, a place inhabited by a large organized assemblage of people; it is larger than a town and of greater commercial or political importance. The choice of the site of a city may be determined by its accessibility, especially if it is on a river or lake, and in medieval days by its ease of defense through the protection of nearby hills. Cities that are trade centers have grown up through the convergence at one point of several trade routes. The abundance of some particular raw product and the availability of water power have made many cities important manufacturing centers.

The largest cities in the world are London, New York, Tokyo, Berlin, Moscow, Shanghai, Chicago, Osaka, Paris and Leningrad. The largest cities in the United States are New York, Chicago, Philadelphia, Detroit, level. The population is 878,336 (1940), making Cleveland sixth in size

The government of American cities is entrusted to a mayor and an aldermanic council, to a commission of several members, one of whom acts as mayor, or to a city manager. The required population for legal incorporation as a municipality varies from 1,000 in several western states to 10,000 or more in many eastern states. The instrument of incorporation is a charter.

Courtesy Cleveland Convention & Visitors' Bureau

Cleveland Museum of Art

The Cleveland Museum of Art, housed in a classic white marble structure opened in 1916, contains notable collections of medieval pieces, arms and armor and a series of 17th-century Roman tapestries. Among its paintings are a number of Early American portrait studies by Copley, Stuart, Sully and West, an El Greco and a Madonna by Il Tintoretto. The Museum also owns the contemporary American *Stag at Sharkey's* by George Wesley Bellows

The Free City of Danzig, virtually an independent state, is a modern revival of the meaning attached to the word city during the period of such Italian city-states as Venice and Genoa. Vatican City within the city of Rome, Italy, is the territory under the jurisdiction of the Bishop of Rome—the Pope.

The word *city* comes from the Latin *civitas,* meaning city, state or citizenship. A city like New York, which is the principal center of trade of a state or country, is called a *metropolis,* a Latin word derived from the Greek, meaning mother city.

Cleveland, a city of the United States, located in the northeastern part of Ohio at the mouth of the Cuyahoga River on the south shore of Lake Erie. It is a lake port of great commercial importance; adequate harbor and docking space is provided by two great breakwaters that extend almost 3,000 feet into the lake. The city itself stretches for more than 14 miles along the lake, gently rising from the flats to about 250 feet above lake Los Angeles, Cleveland, Baltimore, St. Louis, Boston and Pittsburgh. among the cities of the United States. In Greater Cleveland, which has a population of 1,111,449, are included 12 suburbs, of which the principal are Lakewood, Cleveland Heights, East Cleveland and Shaker Heights.

The chief items of Cleveland's shipping trade are iron ore, coal, coke, lumber, grain and livestock. Through its port passes 60 per cent of the iron ore shipped from the Lake Superior region, and although its blast furnaces consume many million tons of this ore each year, much of it is reloaded on freight cars and sent to Youngstown, Pittsburgh and other cities in the steel zone of Pennsylvania and Ohio. As an iron and steel center Cleveland leads in the production of automobiles, bridges, boilers, Diesel engines, stoves, furnaces, astronomical instruments, sewing machines, printing presses and agricultural implements. The city has petroleum refineries, slaughtering and meat-packing houses, shipbuilding yards and factories for the manufacture of clothing, airplanes, paints and varnishes, electric batteries and incandescent lamps.

Cleveland has more than 1,100 miles of streets, many of which are attractive, tree-lined avenues and boulevards. In the heart of the city is the Public Square (formerly Monumental Park), from which extend the principal streets—Euclid, Carnegie, Woodland, Detroit and Franklin avenues. In its center is the Civil War Soldiers and Sailors' Monument. On the southwest side of this square is the Terminal Group composed of the Union Station and several other buildings; dominating the center of this group is the Terminal Tower that rises to a height of 708 feet. The two parts of the city on either side of the Cuyahoga River are connected by elevated viaducts; the principal one is the High Level Bridge whose central span measures 591 feet in length.

The pride of Cleveland is its civic center, called the Municipal Group. Arranged around the Mall are the City Hall, Cuyahoga County Courthouse, Federal Building, Post Office, Custom House, Public Library and Public Auditorium. The auditorium seats 12,500 persons, has one of the largest pipe organs in the world and houses a Music Hall and Little Theater. Among other notable buildings are the Federal Reserve Bank (Cleveland is the center of the 4th Federal Reserve District), Society for Savings, Ohio Bell Telephone, Hanna and Plain Dealer buildings. The principal churches are Trinity Protestant

Episcopal Cathedral, Church of the Covenant (Presbyterian) and St. Agnes's Roman Catholic Church. In Lake View Cemetery is the monumental tomb of James A. Garfield, erected in 1890, 9 years after his assassination.

The Cleveland Museum of Art is one of the foremost institutions of its kind in the United States. There are also the Museum of Natural History in Wade Park and the Western Reserve Historical Society's Museum. Among the more important of Cleveland's other 25 parks are Gordon and Rockefeller parks. The Western Reserve University, founded in 1826, has an annual enrolment of almost 5,000. One of its principal departments is the School of Medicine, which, with the Western Reserve University nursing school and the Maternity, Babies' and Rainbow hospitals, is part of the Cleveland Medical Center. Equally important are the Case School of Applied Science and the John Carroll University, a Roman Catholic institution.

Founded by Moses Cleaveland in 1796, the town was incorporated in 1814 when its population was somewhat in excess of 100. The present form of the city's name was adopted by a newspaper in 1831 to meet the exigencies of headline space and was quickly accepted by the citizens. On the completion at this point of a canal extending northward from the Ohio River to Lake Erie in 1832 the town began to grow, and 4 years later when it had a population of 6,000, it was incorporated as a city. When the city-manager plan went into effect in 1924, Cleveland was the largest city in the United States so governed; but the old mayor-alderman form of government was restored about 10 years later.

cliff, a high, steep face of rock or a hill with precipitous sides. Cliffs are formed by water erosion, especially when a stream cuts its way through rock in an almost perpendicular line; by rain and frost and other atmospheric conditions; by the action of waves against rock at the edge of the sea; and by folding of the earth's crust.

Dover, England, is famous for the chalk cliffs that border the Strait of Dover. They occasioned England's ancient name of *Albion,* which was derived from the Celtic word *alb,* meaning white.

In the Southwest remains of an early race of American Indians, the cliff dwellers, are found. About 1,000 years ago they constructed their houses of stone and adobe on the ledges of high cliffs. Some of these are in the Mesa Verde National Park in southwestern Colorado. Other cliff dwellers utilized as dwelling places the natural chambers, entered through small, erosion-formed holes, near the base of soft volcanic cliffs. Examples of their mode of life, so vividly described by Adolph Bandelier in *The Delight Makers,* are found in the Canyon of the Rito de los Frijoles near Santa Fe, N. M. This canyon is now known as the Bandelier National Monument.

coast, land that immediately touches the sea. Its margin or seashore is continually changing on account of erosion, slight raising or lowering of the floor of the ocean and accumulation of silt and other materials brought to their mouths by rivers. A coast is characterized by bays, coves, estuaries and fiords that represent submerged valleys and by capes, peninsulas and promontories that generally represent the hills enclosing these valleys.

Lagoons, reefs and sandbars form an *emergent coastline,* as is the case with the southern coast of Long Island. *Neutral coastline* is the term applied to a delta formation or the regular coast of a volcanic island. The term *coast* may refer also to coastal regions, such as the Pacific coast or the Gold Coast, belonging to Great Britain, and the Ivory Coast, belonging to France, along the Gulf of Guinea, West Africa. On this same gulf along the coast of Liberia is the Grain Coast.

The word *littoral* is frequently used for coast, as the southeastern littoral or coastal plain of Australia.

Coast Range, a mountain range that extends nearly parallel to the Pacific coast from Alaska, through Canada and the United States into the Mexican peninsula of Lower California. Mt. San Bernardino in California is the loftiest peak (10,630 ft.); on Mt. Hamilton in the same state is the famous Lick Observatory. Valuable mineral products, including petroleum, gold, silver, copper, zinc, quicksilver and borax, are found in these mountains. The valleys between them are irrigated. The range has a marked effect on the climate of the countries through which it extends, making the western slope much milder.

coastal plain, a narrow land section beginning with the coast and extending to rising inland areas. In the United States, a coastal plain borders the Atlantic Ocean from Maine to Georgia and extends from the shore line to the inland plateau. In many places this plain has been formed by a slight raising of the continental shelf. The cotton industry of certain southern states owes its origin largely to the presence of oceanic salt in the soil. In other parts the plain has been built of silt and other materials brought down by numerous rivers. Erosion of the coast line of the region has afforded the formation of several excellent harbors.

Coastal plains are also a feature of southeastern Australia, eastern China and western Ecuador. In China especially this region is an alluvial formation.

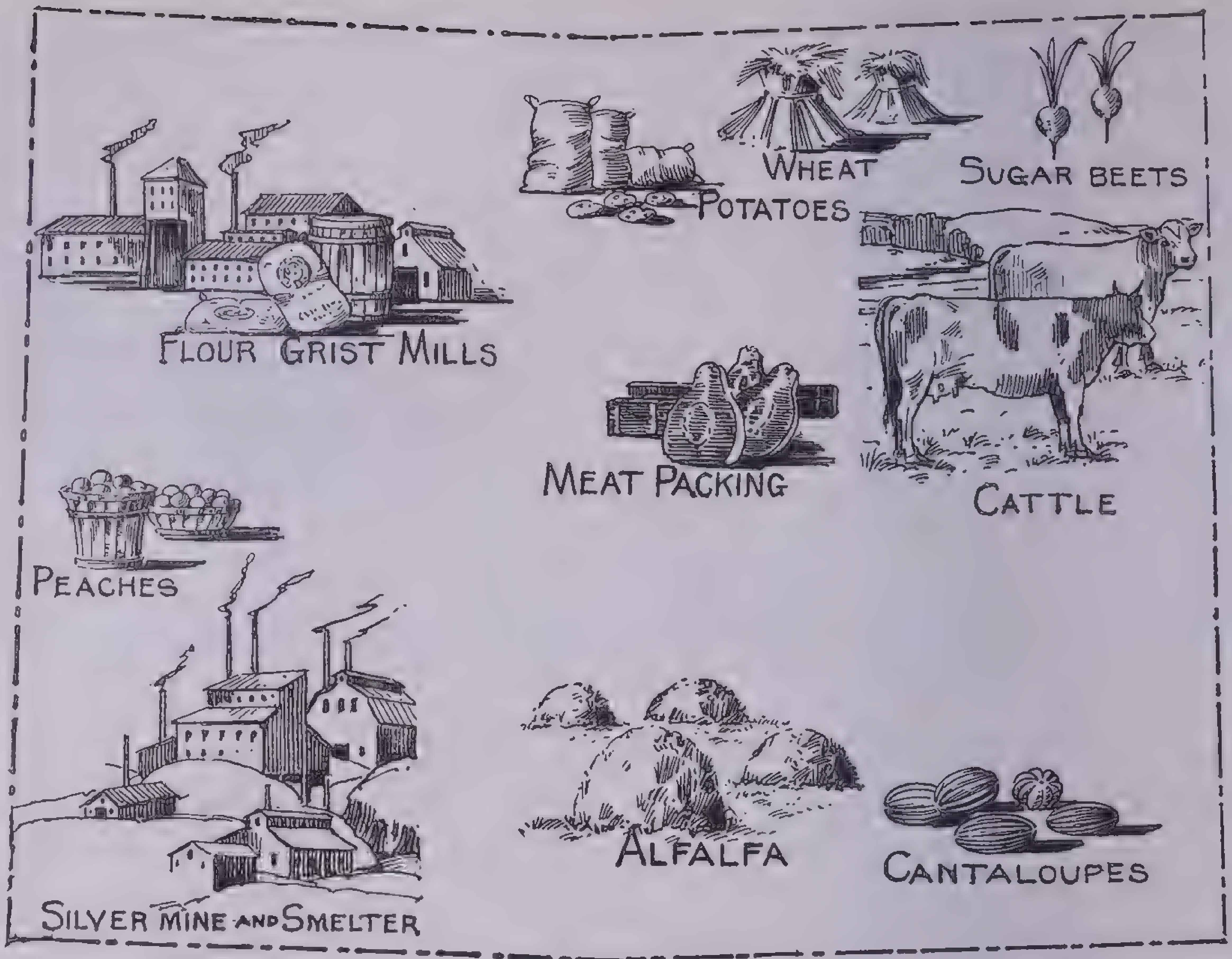
Colombia, a republic that occupies the northwestern corner of South America. The Caribbean Sea and its arm, the Gulf of Darien, lap its northern coast. Venezuela and Brazil are on the east; Peru and Ecuador, on the south; and the Pacific Ocean and Panama on the west. The area of the country is 476,916 square miles; included in this area since the settlement of the boundary dispute with Peru in 1928 are the Caribbean islands of Old Providence and San Andres. The population numbers about 8,350,000, of whom 70,000 are Indians. The majority of the people are of Spanish descent.

Three ranges of the Andes cover the western and central parts of the country: the Cordillera de Bogota (eastern), Cordillera del Quindio (central) and Cordillera de Choco (western). The highest peaks are found in the central range, notably Mt. Tolima (18,320 feet). Colombia's most important river is the Magdalena, which rises in the eastern range of the Andes, flows northward into the Caribbean Sea and is navigable by smaller craft for 930 miles. The

Courtesy Grace Line

Jungle along the Cauca River, Colombia

The native and his dugout and hut are framed by an almost impenetrable growth of tropical trees, shrubs and low, densely growing plants



Principal Products of Colorado

valley between the central and western ranges is drained by the Cauca River, which becomes a tributary of the Magdalena near its mouth. Other affluents of the Magdalena include the Cesar, Nechi and Lebrija.

To the east of the Andes lies a vast tableland. Its southern part consists of forests (*silvas*), from which mahogany, dyewoods, other cabinet woods and rubber are obtained. Its northern part consists of *llanos* or natural pastures that are used principally for cattle grazing during the rainy season from June to October. In the southwestern part of this tableland are the wind-swept deserts called *paramos*.

The climatic range of Colombia—intense heat in the low valleys and severe cold on the mountains—makes possible a wide variety of agricultural products. The valleys and coastal plains yield tropical crops, such as coffee, tobacco, sugar cane, cacao, rice, cotton, cultivated rubber and bananas and other tropical fruits. Wheat and other cereals are grown in the northern tableland section. An important export is the fruit of the tagua palm called the *ivory nut;* from it the higher grades of buttons are made.

The country's mineral wealth consists of coal, iron, gold, silver, lead, mercury, manganese and salt. For 400 years the emerald mines of Colombia have been the source of the world's chief supply of these gems. The emerald mines and pearl fisheries along the Caribbean coast are controlled by the Government. Colombia also furnishes the major part of the world's supply of platinum. Petroleum was found recently in the Magdalena basin; the industry has already attained the proportion of about 19,000,000 barrels annually.

Colombia is a republic, having gained its independence from Spain in 1819. Venezuela and Ecuador withdrew from the union to establish independent republics in 1830. In 1903 the northern department of Panama seceded. The chief executive is a President, elected for 4 years by popular vote; he is assisted by a Cabinet of 9 members. The Federal Congress consists of a Senate of 56 members, elected for 4 years, and a House of representatives of 118 members, elected for 2 years. For administrative purposes the country is divided into 14 Departments, 4 Intendencias or territories and 6 Comisarias or special districts.

Bogota, the capital of Colombia, is located in the central part at an elevation of 8,564 feet. The business and official life center largely around the Plaza Bolivar, named for Simon Bolivar, Colombia's liberator, a statue of whom stands in this square. Grouped around the Plaza Bolivar are the Capitol, the Roman Catholic cathedral and the palace that was the residence of the Spanish viceroy in the days when Colombia was known as the Vice-Royalty of New Granada. Other notable buildings are the Presidential Palace, National Library and buildings of the National University. Bogota was founded by the Spanish invader Gonzalo Jimenez de Quesada in 1538 and today has a population about 220,000. Other important cities of Colombia are Barranquilla (the leading Caribbean port), Medellin, Cartagena and Cali.

Colombia was named in honor of Christopher Columbus.

Colorado, one of the Rocky Mountain states of the United States. It is bounded on the north by Wyoming and a corner of Nebraska, on the east by Nebraska and Kansas, on the south by Oklahoma and New Mexico and on the west by Utah. The area is 103,948 square miles, of which 290 square miles is water. The population is approximately 1,123,296.

The crest of the Rocky Mountains runs north and south through the center of the state, and it is therefore famed for its rugged surface and high peaks. There are more than 40 peaks which reach heights exceeding 14,000 feet; of these, Mt. Elbert (14,420 feet) is the highest. The principal ranges are the San Juan, Culebra and Sangre de Cristo.

Eastern Colorado is the western extension of the plateau which rises gradually from the Mississippi Valley and at the foothills of the mountains has an elevation of 3,500 to 4,000 feet. The central topographical division is the majestic sweep of the Rocky Mountains rising sharply from the plain to the great elevations of the peaks. West of the range the high plateau belt extends into Utah.

From the watershed of the mountains many rivers flow in all directions; more streams have their beginnings here than in any other state of the Union. The South Platte and the Arkansas flow eastward. Southward and westward the most important rivers are the Colorado, Gunnison and Rio Grande, which emerges from southwestern Colorado and later forms the boundary between the United States and Mexico for a distance of 1,100 miles.

With so much of the surface mountainous, agriculture was slow in developing, and lack of rainfall sufficient to mature crops was another deterrent. However, in semiarid sections, crops that do not need an excess of moisture have developed a large farming industry, and in other parts of the state great irrigation projects have added 3,500,000 acres to the cultivable area. There is more acreage under irrigation in Colorado than in any other state except California.

Colorado produces nearly 3,000,000 tons of sugar beets each year; in this crop it leads all the states, and the industry has led to the development of many sugar refineries in which hundreds of thousands of tons of beet sugar are made every year. In the protected valleys all kinds of fruits grow well, and the growing of cantaloupes is particularly developed; other crops of importance are wheat, corn, hay and potatoes. The livestock interest is the most valuable in dollars of any phase of agriculture, sheep being raised in especially large numbers.

In mineral wealth, coal, gold, silver and copper are in the lead, in the order named. Most of the coal of the state is bituminous. Colorado is usually fifth among the states in silver production and third in gold production. There is considerable petroleum, though the state is well down in the list of producing states. Among the minor products are lead, zinc and manganese.

As in most of the mountain states, manufacturing in Colorado ranks behind agriculture and mining but is increasing in importance. Flour and grain mill products, meat-packing, fruit and vegetable canning, and sugar refining are the leading industries.

The capital and largest city is Denver, high in the mountains in the north central part of the state. More than half of the people in Colorado live in a narrow strip cutting the center of the state from north to south, passing through Greeley, Boulder, Denver, Colorado Springs, Pueblo and Trinidad. Denver is an important railroad center and is the principal distribution point for the Rocky Mountain region. The city has one of the most distinctive civic centers in the United States. In this 40-acre area are found the City and County Building, Public Library and a Greek theater. Dominating it is the Capitol, flanked by the State Office Building and the State Historical Museum. The population of Denver is about 322,412.

Colorado has several important colleges and universities; the largest is the University of Colorado at Boulder. There is also a university at Denver and a famous School of Mines at Golden. Other points of interest are the United States mint at Denver; the magnificent scenery along the Royal Gorge of the Arkansas River; Pike's Peak, near Colorado Springs, 14,108 feet high with the famous Garden of the Gods near its base; Rocky Mountain National Park in northern Colorado; the mining operations at such centers as Leadville, Telluride and Cripple Creek.

Colorado, a river of the western United States that originates in Rocky Mountain National Park, near Denver, Colo., and flows in a general southwest direction for about 2,000 miles through Utah and Arizona into the Gulf of California. It also forms part of the boundary between Arizona and Nevada and Arizona and California. The Gunnison River of Colorado, the Green River of Wyoming, the San Juan River of Utah and the Gila and Little Colorado of Arizona flow into it. Grand Canyon, the most famous of the Colorado's colorful canyons, has been set aside as a national park. The waters are used to irrigate lower Arizona and California (Imperial Valley). Boulder Dam has been constructed in the Black Canyon of the Colorado about 30 miles southeast of Las Vegas, Nev. The name *Colorado* is Spanish for colored, red or ruddy, probably referring to the red sandstone of the river's canyons.

Colorado to Gulf Highway, a 1,450-mile long road that extends from Denver, Colo., to Brownsville, Tex., with a branch from Waco to Galveston, Tex. It skirts the Rocky Mountains a considerable part of the distance, crossing Raton Pass between Colorado and New Mexico.

Columbia, a river in the northwestern part of the United States, about 1,270 miles long and draining an area of 260,000 square miles. It rises in the Rocky Mountains of British Columbia, Canada, about 80 miles from the border, almost circles the Selkirk Mountains and crosses northeastern and central Washington. For 350 miles it forms the boundary between Washington and Oregon. Its tributaries in Canada are Clarks Fork and the Kootenay River; in the United States, the Spokane, Okanagan, Yakima, Snake, Wenatchee and Willamette. The Columbia is famed for the beauty of its scenery, especially in the Dalles region. In connection with its salmon fisheries the United States Government has established hatcheries in its branches. The government has also built canals around its several cascades so that the river is navigable for more than 300 miles. At the mouth of the Columbia is one of the few deep-water harbors on the Pacific coast. The Columbia River Highway, a scenic road of rare beauty, was opened in 1915. It extends for 60 miles along the river from Columbia Bay through Portland to the Hood River County line.

Although it was known by hearsay as the Oregon or River of the West, the mouth of the Columbia was discovered by Capt. Robert Gray of Boston in 1792 and named after his boat. The Lewis and Clark Expedition (1805) reached it overland; David Thompson, a Northwest Company geographer, explored its whole course in 1807–11; and for many years the furtraders made it their chief western trade route.

Columbia River Highway, a scenic highway that extends along the left bank of the Columbia River from its mouth at Astoria to The Dalles, Ore. Above Portland extend some 60 miles of cliffs over which drop such world-famous waterfalls as Multnomah (850 feet), Wahkeena, Bridal Veil and Latourelle. Snow-capped Mt. Hood looms in the distance.

Columbus Circle, a large intersection in New York at 59th Street and Broadway. It marks the southwestern end of Central Park, where the Maine Memorial has been erected, and is notable for the political rallies that usually take place close to the statue of Columbus in the center of the circle. Since the unveiling of this statue in 1892 it has been decorated with wreaths by the Italian residents of New York on each Columbus Day (October 12).

Congo, an African river that flows into the Atlantic just south of the equator. It is 2,900 miles long, rises in the highlands of the Katanga Plateau and drains an area of about 1,500,000 square miles in central Africa. It is commercially important to French Equatorial Africa and the Belgian Congo, carrying rubber and other commodities in great quantities to the sea. Tributaries include the Lomani, Aruwimi, Itimbiri, Mongala, Ubangi, Sanga, Lulonga and Kasai. The Congo is navigable for almost 100 miles to Matadi in Belgian Congo. There, because rapids and waterfalls spoil its course for 200 miles as it cuts its way through the Crystal Mountains, the Matadi-Leopoldville railroad connects it with the upper river near Stanley Pool.

Diogo Cam, a Portuguese navigator, discovered the mouth of the Congo in 1482 and erected a marble pillar to claim it for Portugal; it was first called Rio de Padrão (Pillar River), then Zaire (native word meaning river) and later Congo from the Bantu nation of that name living on the banks of the lower river. Livingstone discovered the Luapula and Lualaba, its main head streams in the Belgian Congo, but Stanley made the first trip the entire length of the river in 1876–77.

Connecticut, one of the thirteen original states of the United States and the southernmost state of the New England group. It is bounded on the north by Massachusetts, on the east by Rhode Island, on the south by Long Island Sound and on the west by New York. The area is 4,965 square miles, of which 145 square miles is water. Only Rhode Island and Delaware are smaller. The population is approximately 1,709,242.

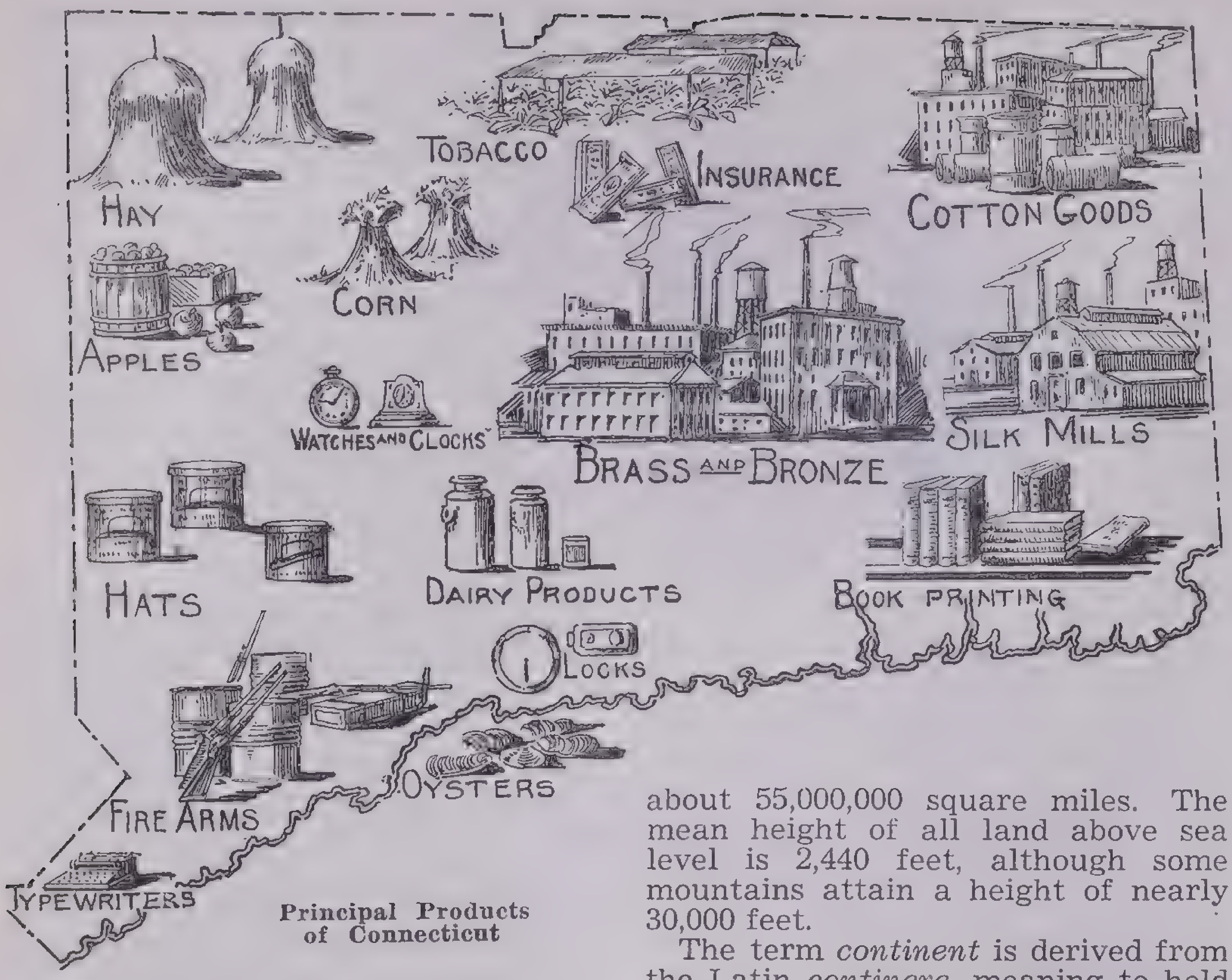
The southern part of the state and the valley of the Connecticut River, which runs north and south through the middle, is a low fertile plain but broken by picturesque hills and ridges. In the northwest the foothills of the Berkshires rise to an altitude of 2,000 feet, and in the extreme northwest corner Bear Mountain, the highest point in the state, reaches 2,355 feet. There are three important rivers, all flowing in a general southward direction towards Long Island Sound. The largest is the Connecticut River, which rises in the White Mountains of New Hampshire and is more than 400 miles long. The Housatonic River and its confluent the Naugatuck are in the west, and the Thames in the east.

Connecticut is primarily a manufacturing state, but its agricultural products are by no means negligible. The most important money crop is tobacco, which is raised in large quantity in the Connecticut River valley. Connecticut tobacco is used especially for cigar wrappers as a substitute for Havana tobacco. Dairy products are next to tobacco in importance, as might be inferred from the state's central position in an industrial urban community. Orchard fruits, strawberries, potatoes and corn are raised in considerable quantity on Connecticut farms.

The mineral products of Connecticut are small. Some clay, limestone and asbestos are quarried and a quantity of basalt rock and granite. Iron has been mined since early times, but the workings are no longer of much commercial importance.

Manufacturing is highly developed, and there is a remarkable concentration of certain industries. The brass industry centered around Waterbury makes more than one-third of all the brass and bronze in the United States. The second most valuable product is electrical machinery. The output of cotton, silk and wool textiles is of great value. Connecticut is also famous for its manufacture of clocks, silverware, fur-felt hats and typewriters.

Connecticut has five cities with populations exceeding 50,000—Hartford, New Haven, Bridgeport, Waterbury and New Britain. All are important industrial centers. Hartford, the state capital, is the insurance center of the United States. New Haven is famous as the seat of Yale University,



Principal Products of Connecticut

one of the world's leading institutions of higher learning. Trinity College at Hartford and Wesleyan University at Middletown are also well-known colleges.

The name *Connecticut* is derived from the Indian word *Quonecktacut,* meaning the land on the long river.

continental shelf, a submarine plain bordering each continent. It varies in width from a few miles to a few hundred miles and slopes to a depth of about 600 feet; then there is a sudden drop to 6,000 feet. It appears to have been part of the continent originally, because in many places there are characteristic land forms, such as river beds, gorges, canyons, hills and valleys. The lower course of the Hudson River and New York Harbor bear witness to such a land submersion and so do the North, Irish and Baltic seas that cover part of the European continental shelf.

Continental islands are formed when the hills enclosing a submerged valley project above sea level, as the islands on which Greater New York is built—Manhattan, Staten Island and western Long Island. Martha's Vineyard and Nantucket off the Massachusetts coast are of the same formation.

continents, the great land areas of the world, in contrast to the oceans that are the great water areas. The continents were probably formed by the wrinkling and shrinking of the earth's crust when it cooled; and the oceans settled in the depressions that were thus formed.

The six continents are: Eurasia, (Europe and Asia), Africa, North America, South America, Australia and Antarctica. Their major surface is composed of plains, plateaus, mountains, valleys, canyons, hills, promontories and such smaller features as buttes, mesas, cliffs, bluffs and peninsulas. Their combined area is about 55,000,000 square miles. The mean height of all land above sea level is 2,440 feet, although some mountains attain a height of nearly 30,000 feet.

The term *continent* is derived from the Latin *continere,* meaning to hold together. As a proper noun it is used to designate Europe in distinction from the British Isles.

Cook Islands, a group of small islands of volcanic and coral formation in the South Pacific Ocean, belonging to New Zealand, located at about 20° S. Lat. and 160° W. Long., comprising part of Polynesia. The area is 110 square miles, and the population (of Polynesian stock), less than 12,000. The chief islands are Rarotonga, on which is located the capital Avarua-Avatin, Mangaia, Aitutaki, Atiu and Mauki. Bananas, oranges, copra, coffee and pearl shells are the chief products. The islands were discovered by Capt. James Cook, the English navigator, in 1777. They have their local administrative body, an executive council composed of native chiefs and a general legislature. The veto power over legislation is held by the New Zealand resident commissioner. The interests of the islands are looked after by the Minister of the Cook Islands, a member of the New Zealand executive council.

Copenhagen, the capital of Denmark, situated on the eastern coasts of the islands of Zealand and Amager on the Sound. It is the largest city in Denmark with an area of 31 square miles and a population, including the suburbs of Frederikberg, Amagerbro and Gentofte, of 840,000. It is noted for its silver, jewelry, porcelain and textile manufactures. Through the port of Copenhagen, part of which is free, passes more than half the commerce of Denmark.

The German Renaissance architecture of the inner city, called *Gammelsholm,* gives Copenhagen the reputation of one of the most beautiful cities of Europe. This style has been admirably adapted for the City Hall, Holmens Church and the Stock Exchange, with a spire representing the entwined tails of four dragons whose heads show the four points of the compass. Parliament and the Supreme Court meet in the Christiansborg Palace—on the small island of Slottsholm; in front of this palace is a statue of Absalon, Bishop of Roskilde and founder of Copenhagen in 1167. Nearby is the Holmens Canal with its picturesque fish-market women.

The heart of the city is Kongens Nytorv (New King's Market Place), a circular area in the center of which is a leaden equestrian statue of Christian V; on one side of this area is the Royal Theater, home of Danish grand opera. The royal family resides in the four baroque palaces of the Amalienborg, grouped about an octagon-shaped court with an equestrian statue of Frederick V, one of the most benevolent of the absolute monarchs of the 18th century, in the center. Among examples of Copenhagen's ecclesiastical architecture are: Vor Fru Kirke (Church of Our Lady), the Lutheran cathedral; Frederikskirke or the Marble Church, which has a dome rivaling that of St. Peter's in Rome; Trinity Church, whose round tower was once used as an observatory; the English Church, a charming bit of transplanted England; and Grundtvigskirke, whose modern façade from a distance resembles a gigantic pipe organ.

As the cultural center of Denmark, Copenhagen possesses the ethnological National Museum housed in the Prinsens Palace; among its unrivaled exhibits are such vestiges of viking days as weapons, luren, runic stones and barrows (huge rocks inclosing sepulchral chambers). Charlottenborg Palace is the headquarters of the Royal Academy of Fine Arts; and Rosenborg Castle, of the State Museum of Art. In the Thorwaldsen Museum are more than 300 of the works of the great Danish sculptor; and his Etruscanlike tomb is in the open court. The Ny-Carlsberg Glyptothek is another noted sculpture gallery. The University of Copenhagen, founded in 1478, has nearly 5,000 students. Affiliated with it are the Polytechnic Institute and the Surgical Academy.

Hans Christian Andersen, weaver of fairy tales, was one of Copenhagen's most distinguished residents, and the statue of a mermaid, reminiscent of his story *The Little Mermaid,* surmounts a rocky breakwater in the harbor near the yacht pavilion. Among Copenhagen's other charming pieces of sculpture are the *Viking Horn Blowers* and the *Dolphin Fountain* near the City Hall; the *Stork Fountain* near the Holmens Church; and on the Langelinie Drive the *Gefion Fountain* to the goddess (identical in Teutonic mythology with Frigg) who, by turning her four sons into bulls, was able to plow in one day the land allotted to her favorite Danes.

The city's unique amusement center is the Tivoli, noted especially for: its music hall, copied from the Great Mosque of Delhi; its Japanese garden; and its Peacock Theater, possibly the last remaining pantomime theater in Europe. At Elsinore, a short distance from Copenhagen, is Kronborg Castle

Courtesy Scandinavian-Baltic Travel Bureau

Stock Exchange, Copenhagen

One of the many Renaissance buildings of Copenhagen erected by Christian IV in the early 17th century. Its spire represents the entwined tails of four dragons whose heads indicate the four directions of the compass

with which is associated the legend that Shakespeare utilized in his *Hamlet.*

The name *Copenhagen* (Danish, *Köbenhavn*) means merchants' haven or trade harbor.

coral island, an island of coral built of the skeletons of *Anthozoa* and found principally in the South Pacific and Indian oceans. The foundation may be either a submarine limestone bank or a truncated volcanic cone. Wave action sweeps into one spot a mass of coral pebbles that hardens when it is exposed to the air, the upward growth of the island ceasing when the low-tide mark is reached. Calcareous algae and lime-secreting foraminifera also contribute to the formation of coral islands. Along their shores the wind and waves spread a beach of fine calcareous sand. Most of the 255 islands of the Fiji group are of coral formation.

coral reef, a ridge made up chiefly of the skeletons of the *anthozoan* species of coral polyps. There are two types: fringing reefs that cling closely to the shore and barrier reefs that have been built at some distance but are parallel to the land. The width of a fringing reef is determined by the slope of the continental shelf; it is narrower on a steep grade than on a gentle one. The barrier reef may be from 20 to 80 miles distant from the land. Notable examples are the fringing reefs off the tip of Florida, called the *Florida Keys,* and the Great Barrier Reef of Australia, which extends along the coast of Queensland for 1,200 miles. The *Coral Sea,* named from its many coral reefs, is that part of the South Pacific Ocean between the Great Barrier Reef on the west and New Caledonia on the east and between New Guinea and the Solomon Islands on the north and the 25th parallel on the south.

cordillera, a band of mountain systems, chains and ranges that run in the same general direction and form the principal elevation of a continent. In North America the cordillera includes the Rocky, Alaska, Cascade, Coast, Sierra Nevada, Sierra Madre Oriental and Sierra Madre Occidental ranges.

The word *cordillera* is Spanish for a little string or rope and is most frequently used of the Andes in the Spanish-speaking continent of South America, especially of any one of the three ranges of the Andes, known as the Western, Central and Eastern cordilleras in Colombia and Peru.

Corfu, an island of limestone formation in the Ionian Sea, separated from the Greek mainland by the Corfu Channel. The area is 227 square miles, and the population is more than 105,000. The landscape, dotted with vineyards and olive trees, is hilly and picturesque. The principal range is the San Salvador. Among the exports are wine, olive oil and such fruits as oranges and figs. The capital is Corfu. The island was settled by colonists from Corinth in the 7th century B.C.; its ancient name was *Kerkyra* or *Corcyra.* Down the ages it has successively belonged to Rome, Sicily, Genoa, Venice, Greece, Anjou, again Venice, France and Great Britain. In 1864 in accordance with the wishes of the Corfiotes it was ceded to Greece and has since been the administrative center of the Ionian Islands. The Greek name *Kerkyra* is frequently used.

Corniche, Route de la, a celebrated road along the French and Italian Riviera, extending from Nice to Genoa. In France the road consists of the Grand Corniche, which follows an inland route from Nice to Mentone, and the Little Corniche, which follows the coast from Beaulieu to Roquebrunne.

Corsica, a large island in the Mediterranean Sea, about 100 miles southeast of France and separated from Sardinia to the south by the Strait of Bonifacio. The area is 3,367 square miles; the population about 300,000. Ajaccio is the capital, and Bastia is the chief port. Some of the mountains, such as Mont Cinto and Mont Rotondo, rise to more than 8,500 feet above sea level. The most important river is the Golo. The climate is mild, and the soil is fertile. Olives, citrus fruits, wine and brandy are exported. The coral fisheries and quarries of marble and porphyry are valuable.

Napoleon Bonaparte was born at Ajaccio and was nicknamed "the little Corsican." The island has an ancient history. In the 6th century B.C. it was the *Kyrnos* of the Phocaeans of Ionia. After being held by the Carthaginians it was taken by the Romans at the time of the Punic Wars and received its present name. On the downfall of the Roman Empire it was successively claimed by the Goths, the Lombards, the Saracens, the Genoese and finally by the French who, with the exception of a 2-year British interlude in 1794–96, have held it since 1770. Since the French Revolution it has been one of the departments of France; it is subdivided into four arrondissements, 62 cantons and 364 communes. Corsica has long been a stronghold of the vendetta or blood feud to avenge an injured relative.

Corso, the main avenue of Rome, Italy, famous for its carnival festivities. The full name of the street is Corso Umberto Primo in honor of King Humbert I who reigned from 1878 to 1900. It starts at the Monument to Victor Emmanuel II in the Piazza di Venezia and extends to the Piazza del Popolo. Its continuation beyond the latter square is the Flaminian Way, *Via Flaminia.*

The word comes from the Latin *cursus,* a running, a course.

Costa Rica, a republic of Central America, located between Nicaragua on the north and Panama on the southeast. The Caribbean Sea laps the eastern coast for 180 miles, and the Pacific Ocean extends along the western coast for about 360 miles. These two bodies of water are only 174 miles apart in the widest part of the country and 74 miles apart in its narrowest part. The area of Costa Rica is about 23,000 square miles. The population numbers about 575,000; included in this figure are some 20,000 Negroes originally imported from the West Indies to work on the banana plantations. There are only a few hundred descendants of the Talamanca Indians left.

Costa Rica's most elevated part is the majestic Sierra of Talamanca, which extends through the central part of the country parallel to the coast. Some peaks rise almost 12,500 feet in height; the loftiest are Chirripo (12,477 feet), Buenavista (11,375 feet) and the volcanoes Irazu (11,200 feet) and Turrialba (10,913 feet). The most important rivers are the San Juan, whose headwaters are Lake Nicaragua, and the Reventazon. The Caracho and Poas rivers are noted for the beauty of their cataracts. Costa Rica lies in the earthquake belt; the most disastrous quake in recent years destroyed part of San José in 1924.

Coffee is Costa Rica's leading export, some 350,000 bags being shipped annually. Next in importance is the vast banana culture that has been developed on the coastal plains; more than 4,000,000 bunches of bananas are exported each year. Other products of the soil include cacao, sugar cane, rice and tobacco. Cattle are raised in the Santa Clara Valley and on the prairies of Guanacaste.

Costa Rica possesses hundreds of square miles of virgin forests. In addition to mahogany, rosewood, cedar and other valuable cabinet woods there are trees whose bark is used in tanning or for marquetry (inlaid) work and feather-light trees like the balsa that are utilized in the construction of airplanes. The country's mineral wealth consists of gold, silver, copper, iron, manganese and petroleum. Rubies are mined in large quantities, and pearls are fished from the Gulf of Nicoya on the Pacific coast.

Costa Rica has been a republic since throwing off the Spanish yoke in 1821. Its chief executive is a President, elected for 4 years; he is assisted by a Cabinet of 7 members. The unicameral legislative body is called the Constitutional Congress; it consists of 43 members, elected for 4 years.

San José, the capital, is located on the inland plateau. It has fine paved and tree-lined streets, notably the Paseo de Colon on which stands an obelisk monument to Columbus. Among the distinctive monuments in the National Park is one to the Sister Republics of Central America. San José's notable buildings include the National Museum, containing a priceless archeological collection of ceramics, gold jewelry and idols and sculptured stones; the National Theater; Ministry of Foreign Relations, which was originally erected by Andrew Carnegie in 1907 to house the Central American Court of Justice; and the stately Roman Catholic cathedral. The population is about 57,000. Other important cities are Cartago (the capital until 1823), Heredia and Alajuela and the ports of Limon and Puntarenas.

The name *Costa Rica,* Spanish for rich coast, was given by Christopher Columbus when he discovered it in 1502.

country, an extensive area of land that is known by a particular name, has definite political boundaries and is inhabited by a people who are governed as a whole, who speak a common language and whose history and institutions are distinct from those of the people of any other country. This area may be compact in form, like France and Rumania; prorupted, like Spain and Poland; fragmented, like Greece and Japan; or attenuated, like Chile.

Countries range in size from the principality of Monaco (8 sq. m.) and the Republic of San Marino (38 sq. m.) to the United States (3,026,000 sq. m.) and the U.S.S.R. (8,240,000 sq. m.) A diminutive country is one whose area is less than 1,000 square miles. The area of a small country ranges from 1,000 to 40,000 square miles; of a medium country, from 40,000 to 100,000 square miles; and of a large country, from 100,000 to 1,000,000 square miles. Gigantic countries, such as Argentina, India, the United States, Australia, Brazil and Canada, have more than 1,000,000 square miles. Density of population ranges from 3,000 per square mile of arable land for Japan to 60 per square mile for Argentina.

According to location countries are classified as *continental,* such as the U.S.S.R.; *littoral,* such as Norway; *insular,* such as Great Britain; *peninsular,* such as Italy; and *pelagic,* such as Hawaii. Location also involves the situation of a country on a continent and its relative position with reference to other countries, as central, adjacent, peripheral or strategic.

In another sense, the word *country* is used to describe those areas of land that have been left more or less in their natural state and that are distinct from cities and towns in that they are sparsely inhabited or uninhabited.

The term *country* is also applied to a region that is noted for some natural feature peculiar to it and that differentiates it from other areas, as the Lake Country of England.

cove, a small opening or recess in a coast line. As a water form it is a small inlet in the shore of any body of water, sheltered either by high banks or by overhanging trees. As a land form a cove is a strip of grassland extending into a woodland or a small valley in the side of a hill or between hills. Glen Cove, Long Island, is an illustration of a name given to a locality because of its natural formation.

Covent Garden, the site, in London, of what was once a garden of the monks of St. Peter's, Westminster. (*Covent* is another form of *convent.*) It is located between the Strand and Longacre and is now occupied by a vegetable, fruit and flower market. It was a center of the 18th-century coffee houses, including the famous Piazza, designed by Inigo Jones.

crag, a rugged, broken cliff, as The Crags on the northwestern side of Twin Sisters Mountains, in Colorado.

crater, an opening at the top or on the side of a volcano, through which it discharges or has previously discharged lava, ashes and steam. The term is derived from a Greek word meaning bowl or mixing vessel. Craters vary in size; that of Mt. Etna, the highest volcano in Europe, is more than 3 miles in diameter.

The word *crater* is used also to designate the mouth of a hot spring or geyser when it is so formed that it resembles a bowl. This applies to the geysers and paintpots in Yellowstone National Park, which represent a dying volcanic activity.

When a volcano becomes inactive, either permanently or over a long period, its crater sometimes fills with water and becomes a lake. Crater Lake National Park in Oregon takes its name from a formation of this kind and is known for its remarkable beauty. There are lakes of this kind in Italy.

creek, a minor stream of water, flowing into a river or lake. It is smaller than a river, yet larger than a brook, and ordinarily flows through comparatively level country. The term applies also to a small inlet that is narrower and extends farther inland than a cove.

Crete, a long, narrow island in the eastern part of the Mediterranean Sea, about 60 miles from the mainland of Greece from which it is separated by the Strait of Kythera and the Sea of Crete. It is about 160 miles long, and its greatest width of 35 miles is in the central part. At the eastern extremity is Cape Sideron and at the western, Cape Krios. It is indented by the Gulfs of Canea, Messara and Merabelu. The principal mountain ranges are the Messara and Lassithi. The highest elevation is Mt. Psiloriti (8,000 feet), the Mt. Ida of Greek myth, being associated with the early childhood of Zeus. The Metropoli is the chief river. The area is 3,195 square miles, and the population is about 385,000. Lemons, oranges, olives and raisins are the leading agricultural products. Among minerals are iron, lead, lignite, manganese, zinc and copper. Soap and cheese are the principal manufactures.

Crete has an ancient history, dating back to 2800 B.C. During the Middle and Late Minoan periods (2100–1100 B.C.) it possessed a high degree of civilization, represented especially in architecture, fresco painting, metal work, pottery and its law system. In the valley of the Kairatos River are the ruins of the palace of Knossus and the labyrinth built by Daedalus, where actual events gave rise to such stories of Greek mythology as those of the Minotaur and Icarus. The island has been owned by Rome, Byzantium, Venice, Turkey, Egypt and again Turkey. After a period of autonomy from 1898 to 1912 it was annexed by Greece, forming an administrative department. The capital is Khania (Canea). Erakleion (formerly Candia and in ancient times called *Heracleum*) was the capital until 1840.

crevasse, a long, deep crack or fissure in a compressed snowy mass such as a glacier, caused by the glacier's moving over uneven, sloping grand. There are three kinds of crevasses—marginal, found on the sides of glaciers; transverse, resulting from an increase in the slope of the bed; and longitudinal, formed near the tip of the glacier. Crevasses may be 3,000 feet long, 50 to 100 feet wide and 200 feet deep. The word is French for crevice. The term applies also to cracks that appear in the levees or embankments built along a river and that are caused by an unusual pressure of water at flood times.

Crimea, a peninsula in the southern part of the U.S.S.R., almost surrounded by the Black Sea and Sea of Azov. A canal across the Isthmus of Perekop, which joins it to the mainland, makes it practically an island. Its total area is 15,060 square miles, and it has a population of 760,000. The cities Balaklava and Sevastopol (population, 76,000) were the scene of important events in the Crimean War (1854–56). Sevastopol's fine harbor is now an important naval station. The capital is Simferopol with 90,000 inhabitants. The mountains Yaila-dagh run parallel to the southeastern coast and have one or two peaks more that 5,000 feet high. There are picturesque valleys and flat mountain-top pasture lands —*yaila* in Turkish, giving the name Yaila-dagh, pasture plateau chain. Cape Fiolente at the southwestern end of the peninsula was the ancient Parthenium where Iphigenia is supposed to have served as a priestess in the Temple of Artemis. The present Crimea was called *Tauris* by the Greeks. The Crimea is called *the Russian Riviera,* and many of the summer palaces of the former nobility now serve as workers' rest homes.

Cuba, a republic occupying the largest island of the West Indies and the westernmost of the Greater Antilles, 90 miles southeast of Florida. It is separated from the mainland by Florida Strait on the north and by Yucatan Channel on the west. Between it and Haiti on the east is the Windward Passage, and surrounding it are the Atlantic Ocean on the northeast, the Caribbean Sea on the south and the Gulf of Mexico on the northwest. The island is 760 miles long from its western extremity, Cape San Antonio, to the point farthest east, Cape Maisi; its width varies from 25 to 120 miles, with an average of 50 miles. The area is 44,164 square miles.

The chief features of the island's topography are three mountain ranges that extend nearly the entire length. They are for the most part low, but one elevation, Mt. Turquino, in the eastern province of Oriente rises to a height of 8,320 feet. The principal river is the Río Cauto that flows into the Gulf of Guacanayabo. Several other rivers, such as the Jojo, disappear underground for a portion of their course. The population is almost 4,000,000, making Cuba one of the most densely populated countries of the Western Hemisphere—90 persons to each square mile. About 60 per cent are descendants of the Spanish colonists; the remainder are principally Negroes (whose ancestors until the abolition of slavery in 1883 were imported from Africa to work on the sugar plantations), foreign-born whites and some Chinese.

Cuba's fertile, alluvial soil yields a variety of agricultural products. The leading crops are sugar cane and tobacco. Coffee, cacao, coconuts, bananas, pineapples, oranges, lemons, figs, guavas and dates are harvested in large quantities. The forests cover about 8,500,000 acres; mahogany, cedar, ebony and rosewood are the most valuable trees. Iron, copper manganese and gold are the principal minerals; and there are rich beds of asphalt. The sponge industry is the most important of Cuba's fisheries. In manfacturing, sugar occupies first place; the island has about 180 sugar mills that grind more than 4,000,000 tons of cane a year. Cigar making ranks next in importance, about 90,000,000 cigars and a billion cigarettes being manufactured each year. Most of Cuba's commerce is with the United States and Great Britain.

Courtesy Cuban Commissioner of Agriculture, New York

Cuba's New Capitol, Havana

The Capitol, in the classic style with a 308-foot-high dome, was completed in 1929

The island was discovered by Columbus on October 28, 1492, and after its conquest by Diego Velazquez in 1511 was held by Spain until the Spanish-American War of 1898. After a 3-year period of American military occupation it became a republic. By ratification of a treaty in 1936, superseding the one signed in 1903, the United States abandoned the right that it had held under the Platt Amendment to intervene in Cuba's internal affairs when Cuban security or the interests of the United States were threatened.

The Constitution of Cuba, adopted in 1901, is patterned after that of the United States. There are the President and Vice-President; the Congress, consisting of the Senate, elected for 8 years, and the House of Representatives, elected for 4 years. The Senate consists of 37 members—6 from each province and the retiring President of the Republic; the House of Representatives has 162 members. Assisting the President is the Cabinet of six members. Each of the six provinces —Pinar del Rio, Havana, Matanzas, Santa Clara, Camagüey and Oriente— has an elected governor and council. On account of the revolt against President Machado constitutional government was suspended from 1933 to 1936. Cuba is a member of the League of Nations.

The capital is Havana, which is described in a separate article. Among other important cities are Camagüey (population about 130,000), Santiago de Cuba (103,000), Santa Clara (97,000) and Matanzas (69,000). The name *Cuba* is shortened from Cubanacan, a name used by the native Indians when Columbus arrived. He thought it must be the same as Kubla Khan, the great ruler of China! Cuba is often called the *Pearl of the Antilles.*

Cumberland Road, the first Federal highway in the United States, originally called the National Pike. It was begun in 1806 and extends from Cumberland, Md., to Indianapolis, Ind., a distance of 800 miles.

Curaçao, a colony consisting of two groups of islands, mostly of coral formation, in the Caribbean Sea, constituting the Dutch West Indies. Three of the islands—Curaçao, Aruba and Buen Ayre—are about 40 miles off the coast of Venezuela. The other three—St. Eustatius, Saba and part of St. Martin—belong to the Leeward group of the Lesser Antilles. The total area is 403 square miles, and the population mostly Negroes, is about 80,000. The agricultural products are chiefly sugar cane, citrus fruits and tobacco. Salt and phosphates are mined and exported. Of the industries, petroleum refining and the manufacture of panama hats are most important; but the island and colony are best known from the curaçao cordial made there and flavored with bitter orange peel.

Discovered by Alonso de Ojeda, a Spanish explorer, in 1499, Curaçao has belonged successively to Spain, the Netherlands and Great Britain, and again the Netherlands in 1814. Administration is entrusted to a governor assisted by an executive and a colonial council and by commissioners for the more distant islands. The capital of the colony is Willemstad, (population, 16,000) a Dutch-styled city on the largest island, Curaçao.

current, a stream flowing through the ocean. Owing to the intense heat of the sun at the equator and the pressure exerted by air currents such as the trade and westerly winds, there is in both hemispheres a general drift of their waters from the equatorial area either to the North Pole or the South Pole. After reaching the polar circles the current becomes so cooled that it dips downward beneath the surface, then flows back to the equator where it becomes heated and rises again to the surface. The movement toward either pole is thus a surface current and that toward the equator, a deep-sea current.

Currents may be caused by some particularly irregular contour of coast line that acts with the winds upon the general tidal movement of the sea. A current beneath the surface that is directed toward the sea when waves break on the shore is called *undertow;* one that propels the surface water with turbulent force is called an *over-*

fall; and a short rippling that results from eddies or an opposing tide is called a *tide rip.*

Currents have an important influence upon the climate of the countries whose shores they approach. Cold currents from the frozen regions flow toward the equator, and coldness and fogs follow in their wake. Warm currents from the Torrid Zone flow north or south and carry warmth to the cooler latitudes. Special interest attaches to the Gulf Stream and its deep-sea branch, the Labrador Current, in the Atlantic Ocean and the Japan or Kuro Shio Current in the Pacific Ocean.

Other important currents, whose names generally specify the coasts that they touch, are the Brazilian, Falkland, Guinea and Benguelan (off the western coast of Africa) of the Atlantic Ocean. The Pacific Ocean has the Peruvian, North Pacific, Californian and East Australian currents and the Mexican Monsoon Drift. In the Indian Ocean are the currents called the West Australian, Mozambique and Agulhas (off the southeastern coast of Africa), and the Southwest Monsoon Drift of summer and the Northeast Monsoon Drift of winter. The North Equatorial Current is found in the Atlantic and Pacific oceans, with a countercurrent in the Pacific, and the South Equatorial Current in the Atlantic, Pacific and Indian oceans. The Antarctic Drift is found in the southern extension of all three oceans, skimming Antarctica.

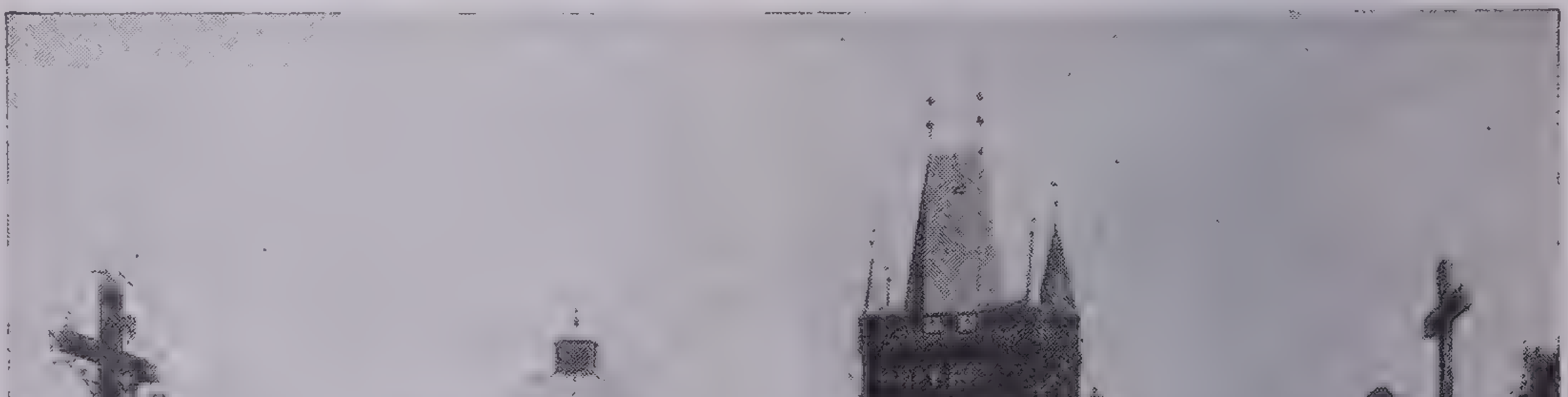
The term *current* is applied also to the movement of air in a vertical or inclined position to the surface of the earth, thereby causing winds.

Cyclades, a group of about 220 islands of volcanic formation in the Aegean Sea, forming a department of Greece. The name, derived from the Greek word for circle, was given to the islands because they partly encircled the sacred isle of Delos, the birthplace of Apollo and site of his temple and oracle. Delos, Naxos, Melos and Thera were celebrated in Greek myth and history. They have been thoroughly excavated. Among other important islands of the group are Andros, Keos, Ios, Paros, Tenos, Seriphos, Kythnos, Siphnos, Syros and Mykonos. The total area is 1,041 square miles, and the population is about 200,000. The principal occupation is fishing; the soil is too poor to be extensively cultivated. Vineyards flourish, however, and wine and brandy are exported. Among minerals are emery, a state monopoly in Naxos, iron, sulphur, pumice and fuller's earth. The capital is Hermoupolis (population, 21,000) on the island of Syros. The Cyclades were united with Greece in 1832, soon after the establishment of an independent Greek kingdom.

Cyprus, a British island possession in the Mediterranean 60 miles west of Syria. It has an area of 3,584 square miles. Of the population (about 350,000) four-fifths are Greek Christians and the remainder are Turkish Mohammedans. The principal agricultural crops are grains, cotton, tobacco, olives and citrus fruits. Wine, sponges, cigarettes, copper (named from the island), salt, asbestos and gypsum are produced and exported. The island is the site of Mt. Olympus and Mt. Adelphi. The capital is Nicosia (population, 19,000) and the chief ports are Limasol (13,000) and Larnaca (10,000).

Cyprus was owned by almost every nation of antiquity, and archeological excavations have been rich and various. Its Aegean and Phoenician colonists were conquered in turn by Egypt, Assyria, Persia and Macedonia under Alexander the Great. After his death Cyprus passed in succession to the Egyptian Ptolemies, Rome, Byzantium and England (through Richard the Lionhearted). For nearly 3 centuries after the early crusades Cyprus was a kingdom; the founder of the line was Guy de Lusignan, King of Cyprus in 1192–94 and also King of Jerusalem. For about another century Cyprus belonged to Venice but in 1571 was conquered by Turkey, to which nation it belonged until 1914.

Great Britain, which had been responsible for Cyprus's administration since 1878, in return for an annual tribute so as to protect the Suez Canal, annexed it when Turkey joined the Central Powers in the World War. It became a Crown colony. Formal recognition of this status took place in 1925. In the legislative council Christians and Moslems are represented in the proportion of nine to three. The governor is assisted by an executive council.



Charles Bridge, Prague

View of the oldest stone bridge still standing in Europe, looking toward the bridge tower on the east bank of the Moldau River. In the left background is the monastery of the Red Cross Knights

Czechoslovakia, a republic of central Europe brought into existence after the World War and reapportioned and dismembered in the autumn of 1938. It was composed of several races formerly in Austria Hungary. Almost 70 per cent of the inhabitants were Czechs (living mostly in Bohemia, Moravia and part of Silesia), Slovaks of Slovakia and Ruthenes of Ruthenia. Most of the others were Germans, Magyars, Jews and Poles. Germany and Poland bound Czechoslovakia on the north; Rumania, Hungary and Austria on the south; and Germany on the west. The eastern boundary is only 45 miles long, coming almost to a point between Poland and Rumania. Along the northeastern border extend the Carpathian Mountains. The chief group of these mountains in northern Slovakia is known as the Tatras; in the Gerlsdorfer Spitze they attain a height of 8,737 feet. The White Carpathians and Little Carpathians extend along the western boundary of Slovakia and join the Wienerwald in Austria. The principal rivers are the internationalized Moldau (Vltava) and Elbe; the Danube forms part of the southern border. The area (before October 1938) was 54,196 square miles; the population, about 14,850,000.

About 50 per cent of Czechoslovakia's area, especially in the western part, is fine agricultural land. On it are raised sugar beets, wheat, barley, oats, rye, hops, flax, potatoes, grapes and tobacco. By the partition since 1924 of almost 2,000 vast estates formerly owned by the Austrian landed gentry, the country has developed into a land of peasant holdings. Some of these large estates were taken for national forests, and the forested region is almost 35 per cent of the total area. Mineral wealth includes coal, iron, graphite, gold, silver and copper. The finest precious stone is the garnet. Kaolin is used in manufacturing the gaily decorated Czech porcelain. Equally famous are Bohemian glassware and colored glass beads. Other manufactures are sugar, beer, steel, alcohol, furniture, paper, cheese, smoked meats, confectionery, shoes and textiles (cottons, woolens, silks and linens). In 1938 she lost to Germany many of her industries and natural resources.

The Czechoslovakian constitution was adopted in 1920. It provides for a republican form of government, with a President as the chief executive, assisted by a premier and other Cabinet Ministers. The legislative body is the National Assembly, composed of the Senate of some 150 members with an 8-year tenure and the Chamber of Deputies of some 300 members with a 6-year tenure. The two bodies in joint session elect the President for a 7-year term. In 1938 Slovakia set up an independent legislature.

The capital, Prague or Praha, is described in a separate article. Brunn or Brno (population, 264,000) is noted for its old citadel and other medieval remains and is the seat of the Masaryk University (founded in 1919; named in honor of the Republic's first President, Thomas G. Masaryk). Pressburg or Bratislava (population, 123,000), now an important industrial center, was the city in which the Hungarian kings were crowned from the 11th to the 14th century. Pilsen or Plzen (population, 114,000) is the original home of the famous Pilsener beer; in its Renaissance Town Hall Wallenstein received the oath of fidelity from his generals in the Thirty Years' War.

Czechoslovakia owes her national existence largely to President Woodrow Wilson's Fourteen Points. Its boundaries were delineated by the treaties of Versailles (with Germany), St. Germain (with Austria) and Trianon (with Hungary). Czechoslovakia was one of the most stable and democratic of the new European states until 1938, when she was forced to relinquish many border districts to Germany, Poland and Hungary. The presence of 3,000,000 Germans, mostly in the northwestern districts, coupled with Nazi aggression, created a situation that in September 1938 almost led to a European war. A last-minute agreement by Great Britain, France, Germany and Italy gave to Germany many of Czechoslovakia's finest industries and natural resources and defenses.

dalles, the high and nearly vertical walls of a gorge or canyon through which a river flows swiftly. It may refer also to the rapids produced when the stream runs over a rocky bed. The word is French, meaning in one sense *tube* and in another sense *slab.*

Most dalles are noted for beautiful scenery; outstanding examples are those of the Wisconsin River near Kilbourn, Wis., generally called *The Dells,* and the St. Louis Dalles in the St. Louis River near Duluth, Minn. The city of Dalles, Oreg., takes its name from the dalles of the Columbia River.

dam, a barrier of earth or of masonry, concrete, and steel built to restrain the flow of water from a stream or lake and to conserve it for domestic and industrial uses. Most modern dams are of the rock-fill, hydraulic-fill, single horizontal-arch, multiple-arch, arch-gravity, multiple-buttress and barrage types of construction.

Dams have been a great boon since the days of the Pharaohs in storing water for irrigation and domestic purposes. The Coolidge Dam (multiple-arch structure) on the Gila River in Arizona, provides irrigation for 100,000 acres. The New Croton Dam, one of the largest masonry dams, impounds about 34,000,000,000 gallons of water a day for New York city's water supply. Wilson Dam, part of the Muscle Shoals, Ala., project, and Norris Dam on the Clinch River in Tennessee are hydroelectric units. In the Black Canyon of the Colorado River, Boulder Dam (arch-gravity type, 1,180 feet long and 727 feet high) impounds 10,000,000,000,000 gallons of water daily for irrigation and power; it is also of service in flood-control and improves navigation. Gatun Dam on the Chagres River was constructed in connection with the Panama Canal.

Among notable dams in foreign countries are: the Aswan across the Nile River in Egypt; Lloyd on the Indus River, India; and Dnepropetrovsk on the Dnieper River, U.S.S.R. Of new American dams Fort Peck in Montana was designed to curb Mississippi floods; and the Bonneville in Oregon and Grand Coulee in Washington to harness the Columbia River for hydroelectric power.

Danube, a river of central and southern Europe, 1,725 miles long, that rises in the Black Forest of Germany and flows in a general southeast direction into the Black Sea at Sulina, Rumania. Although it is shorter than the Volga, it is greater in volume and since earliest times has been the most important water trade route in Europe. Draining an area of about 320,000 square miles, the Danube has more than 300 tributaries, most of which rise in the Tirolean Alps, the Carpathians and the Transylvanian Alps. The most important of its affluents are the German Isar, the Austrian Inn, the Hungarian Drava, the Yugoslavian Sava, the Bulgarian Iskar and the Rumanian Sereth. Leading cities along the shores of the Danube are Ulm, Linz, Vienna, Budapest, Belgrade, Braila and Galati. The stretch of the river between Linz and Vienna is famous for its beauty and historical interest. At Melk and Gottweig are two Benedictine abbeys. In the castle at Greifenstein Richard the Lionhearted was imprisoned by the Holy Roman Emperor Henry VI when returning from the Third Crusade in 1192; there he was found by his faithful minstrel Blondel and was released 2 years later after a heavy ransom had been paid.

A Danube commission, formed in 1856 at Paris, controls the navigation of ocean-going vessels from the Black Sea to Braila, Rumania; an International Commission, formed in 1919 in accordance with the Treaty of Versailles, controls river craft from Braila to Ulm, Germany. The Danube is an internationalized river; that is, it is free to all nations.

Danzig, Free City of, was a sovereign and nominally independent state under the protection of the League of Nations, located between the Polish Corridor and East Prussia on the delta of the Vistula River, which empties into that arm of the Baltic Sea known as the Gulf of Danzig. It was created by the Treaty of Versailles so as to provide Poland with a seaport. The chief exports are grain, lumber, coal, steel, zinc and sugar. Imports include cotton, iron ore, chemicals, fertilizers, foodstuffs and textiles. The League appointed its governing head, the High Commissioner of Danzig, and the Constitution, authorized in 1922, provided for a legislature called the *Volkstag,* consisting of 72 members. From it was chosen the Senate of 22 members, 7 of whom, called the Chief Senators, form the Ministry. Since the collapse of the German mark in 1923 the city had its own currency. It also had its own flag and its own postal, telegraph and telephone systems.

The total area of the territory included in the administration of the Free City of Danzig is 754 square miles. The population of the 325 localities comprising it was more than 400,000, of whom 96 per cent were German. The municipality of Danzig alone has a population of 235,000. Other towns are Zoppot, Ohra, Praust, Tiegenhof and Neuteich. Since the advent of the National Socialist party in Germany the city virtually reverted to German control. In 1939 Germany conquered the Free City of Danzig and made it a part of the German Reich. Poland was also conquered and divided by Russia and Germany. From 1793 until the close of the World War Danzig was the capital of the German province of West Prussia.

Danzig was an important center of the Hanseatic League and retains much of its picturesque medieval aspect. Its most important structure is the 14th-century, red-brick Marienkirche (Mary's Church), erected by the Teutonic Knights and frequently their fortress in clashes with the Prussians. On the narrow, winding streets there still stand the old stone guildhalls and countinghouses of the Danzig merchants, revealing through their styles of architecture—Gothic, Renaissance and baroque—the periods in which they were erected. The most famous of these is probably the Artushof or Junkerhof, now the grain exchange. Among other important buildings are the Gothic Town Hall, Zeughaus (armory) and a Franciscan monastery that is now an art gallery. At one end of the Lang Gasse, Danzig's 16th-century main street, is the Hohe Tor, built in imitation of a Roman triumphal arch. Steffens Park was created on the site of the old fortifications in the northwestern part of the city. Danzig is the seat of a technical university.

Its strategic position since the latter part of the 10th century has made Danzig the gateway to the granary of eastern Europe. It was also for many centuries the most important terminus on the Amber Road that led to the amber mines of the Baltic region. From 1308 to 1455 it was held by the Teutonic Knights; but when that order became corrupt, it sought the protection of Poland and was formally ceded by the Treaty of

Thorn. This nominal connection lasted for more than three centuries; and the free hand that Poland then allowed Danzig is listed today as one of the arguments for special Polish privileges in the city. The name *Danzig,* a corruption of *Dansk-vik,* means Danes' Town, and refers to the time previous to the regime of the Teutonic Knights when the city was held by Denmark.

Dardanelles, a narrow strait between European and Asiatic Turkey that connects the Black Sea by way of the Bosporus and the Sea of Marmara with the Aegean Sea and the Mediterranean. It is about 45 miles long, and its average width is 3 to 4 miles. The strait has been important throughout history as a gateway between east and west. Xerxes, the Persian king, led an army of 1,000,000 men across the Dardanelles in 480 B.C. in his invasion of Greece; Alexander the Great crossed it in 334 B.C. to conquer Persia and India. The most important event in modern history was the closing of the strait to the warships of all nations except Turkey, by treaty concluded with the Great Powers in 1841. The strait was internationalized, however, on Turkey's downfall after the World War. When Turkey was restored to an influential position through the efforts of Kemal Ataturk, the nation was permitted by the Montreux Conference in 1936 to refortify the Dardanelles.

In ancient times the Dardanelles was called the Hellespont.

Dead Sea, an inland sea in southern Palestine, 16 miles southeast of Jerusalem. It is the deepest natural depression in the world, its surface being 1,292 feet below the level of the Mediterranean. The Dead Sea is 47 miles long and 4 to 9 miles wide and has an area of about 360 square miles. It is bounded on the north by the Jordan Valley, on the east by the Plain of Moab, on the west by the Judean Plateau and on the south by the Desert of the Arabah. The waters of the Dead Sea contain about 25 per cent of mineral salts, making it the saltiest body of water in the world. Other minerals include magnesium, potassium and calcium; from sodium and magnesium salts bromine is derived. The Dead Sea is fed by several streams, including the historic Jordan River, but it has no outlet. Although as much as 6,000,000 tons of water enter it every day, its level remains constant through excessive evaporation. No animal or vegetable life is found on its shores mainly on account of the poisonous gases that rise from its waters.

The Arabs call the Dead Sea *Bahr-Lut* (Sea of Lot); this doubtless refers to the story in Genesis of Lot's wife who was turned into a pillar of salt. Since it is supposed to occupy the site of the destroyed cities of Sodom and Gomorrah, it is often called the *Sea of Sodom.*

Delaware, one of the middle Atlantic states of the United States. It is bounded on the north by Pennsylvania, on the east by the Delaware River, Delaware Bay and the Atlantic Ocean and on the south and west by Maryland. The area is 2,370 square miles of which 405 square miles is water. It is the second smallest state; only Rhode Island is smaller. The population is approximately 266,505.

The entire state lies in the great coastal plain, and the average elevation is only 60 feet. In the north are a few low hills; the highest point is Centerville, northwest of Wilmington, with an elevation of 440 feet. In the south the height of land falls nearly to sea level, and there are considerable areas of swamp.

EXPLOSIVES
LEATHER TANNING
PEACHES
TRUCK FARMING
TOMATOES

Principal Products of Delaware

There are no large rivers in the state. Indian River, in the southern section, is one of the largest and is only 20 miles long.

Nearly half the people of Delaware live in Wilmington and its suburbs in the northern corner. This largest city of the state is a great manufacturing and shipping port. Particularly important industries are leather tanning and finishing, machinery and machine-shop products, paper, textiles and explosives, often called *Du Pont Powder* from the name of the leading manufacturer, E. I. du Pont de Nemours and Co. The only sizable manufacturing industry outside Wilmington is the canning of fruits and vegetables, which is largely centered at Milford in the southern part of the state.

Mineral products are of little importance. Some granite and porcelain clay are quarried and there are large sand and gravel pits.

Nearly the whole area of the state is fertile soil fit for cultivation, and considering its small size, the total value of farm products is large. The orchard fruits are widely raised, and the proximity to large urban centers (Baltimore across Chesapeake Bay, and Philadelphia a few miles up the Delaware River) makes dairying and truck farming highly profitable. Particularly famous are Delaware tomatoes and strawberries. The staple cereals, corn and wheat, also are raised.

Wilmington is the only city with a population exceeding 10,000. The capital is Dover, located in the center of the state. At Newark, near the Maryland border 14 miles west of Wilmington, is the University of Delaware. Another point of interest is the canal cut across the state in the north connecting the Delaware River with Chesapeake Bay. The state was named in honor of Virginia's first colonial governor, Thomas West, Baron De la Warr.

Delaware, a river in the eastern part of the United States. It rises in the Catskill Mountains and for about 70 miles forms the boundary between New York and Pennsylvania. At Port Jervis, N.Y., it assumes a southward direction, forming the boundary between New Jersey and Pennsylvania and between New Jersey and Delaware. The Delaware is 410 miles long, including its wide estuary, Delaware Bay, and drains an area of 12,012 square miles. Tidewater below Trenton, it is navigable to ocean liners as far as Philadelphia and to smaller vessels as far as Trenton. Its chief tributaries are the Schuylkill and Lehigh rivers in Pennsylvania; the Mongaup River in New York; and the Musconetcong and Maurice rivers and Rancocas Creek in New Jersey. Cities along its banks include Philadelphia and Easton, Pa., and Trenton and Camden, N.J. Wilmington, Del., is located on Delaware Bay. The most important of the several canals linked with the Delaware are the Delaware-Raritan Canal that connects it with the Raritan River near the eastern coast of New Jersey and the Delaware-Chesapeake Canal that connects it with Chesapeake Bay.

Delaware Water Gap is the name given to the 3-mile long pass in the Kittatinny Range of the Appalachian Mountains near Stroudsburg, Pa. It provided a water-level-route for early emigrants to the West. The gap's picturesque scenery makes it a popular summer vacation spot.

Delhi, the capital of India, located in the Administrative District of Delhi in the southeastern part of the Punjab (a province of northern India) on the Jumna River. It is to the land of Hindustan what Athens was to Greece and Rome to Italy. The capital of seven empires of the past (Hindu, Greco-Bactrian, Kushan, Scythian, Turkish, Pathan and Mogul), it is today the seat of government of British India. It was chosen as the seat of the durbar (court) when Queen Victoria was proclaimed empress of India in 1877; and in 1911 on the accession of George V as emperor it superseded Calcutta as the capital. Among its manufactures are cotton and woolen materials, sugar, flour, jewelry, gold and silver filigree articles, ivory ornaments, brass and copper wares, pottery and wood carvings. The population numbers almost 450,000.

The Delhi that survives today is the Shahjahanabad, established by the Mogul invader, Shah Jahan, in the 17th century. Its most distinguishing feature is the Imperial Palace (also known as the *Fort* as it now houses the British barracks), erected during 1630–48 by Shah Jahan, and one of the most perfect examples of Indian Saracenic architecture. Its most famous pavilions are the red-sandstone Diwan-i-Am, from whose throne the emperor dispensed justice, and the white-marble Diwan-i-Khas or hall where special audiences were held.

A reminder of the ancient purpose of the Diwan-i-Am is the marble screen of the Scale of Justice with very delicate carving. The Diwan-i-Khas once contained the celebrated Peacock Throne, so called from the tails of two peacocks that formed a screen behind the jewel-incrusted throne and so greatly coveted that in 1739 it was carried to Persia by the Persian invader, Nadir Shah. Partial restoration has revealed the pristine beauty of these halls, whose brightly hued walls and ceilings were richly overlaid with flowers and foliage in gold and silver or, if incrusted with gold and silverleaf, inlaid with precious stones in floral design. In the cornices of the audience chamber was the Persian inscription in letters of gold: "If there is a paradise on earth, it is this, it is this, it is this."

Surrounding this palace, whose proportions rival those of the Vatican in Rome, is a wall with two imposing entrances, the Delhi and the Lahore gates. Adjoining the Diwan-i-Khas and overlooking the huge inner quadrangle are the imperial private apartments, consisting of the Tasbihkhana (or private chapel for telling beads), the Khwabagh (palace of dreams), the Baithak (palace of social intercourse) and the Hammam (Turkish baths).

The Jumma Masjid or Great Mosque of Delhi, one of the most superb places of worship in the world, dominates the city. Built by Shah Jahan of red sandstone and white marble, it shows great architectural magnificence, and its geometrical symmetry is unique in mosque construction. A three-domed structure, whose central dome rises to a height of 201 feet, it is flanked at either end of the front by two tall minarets. The main entrance opens on a huge court, where devout Moslems leave their shoes before entering the mosque. In the Imperial Palace area stands the beautiful white-and-gray-marble Pearl Mosque (Moti Masjid), from whose three pearllike domes rise slender gilded spires.

The most famous thoroughfare of Delhi is the Chandni Chowk (Street of Silver), with its endless variety of shops stocked with foods and goods of the Orient. The British soldiers who fell during the siege of the Sepoy Mutiny in 1857 are honored by the Mutiny Memorial, a Gothic monument. The Imperial Durbar Memorial commemorates the visit of King George V and Queen Mary in 1911, when the king proclaimed the restoration of Delhi to its former position as the capital of India.

Contrasting sharply with the native quarter of Delhi is the British section or New Delhi, built on bottom lands of the Jumna and noted for its European-styled hotels, modern shops on Connaught Place and compounds enclosing stucco bungalows and chummeries. Its principal feature is the government buildings, opened in 1931. The Council Chamber, where meet the Council of State, the Legislative Assembly and the durbar of ruling princes, is a circular colonnaded building, reminiscent of the Colosseum in Rome. A corresponding circular structure will house the Supreme Courts of Justice. The Imperial Secretariat, built in Palladian classical style of red-and-white sandstone and crowned with three domes, houses the Indian Government's three departments of commerce: industries and labor, education and health and lands. The dignity of this group of buildings is enhanced by the magnificent façade of the Viceroy's House, which faces the Imperial Secretariat at the end of a mile-long processional way. The World War dead of Delhi are commemorated by the Memorial Arch, from whose top on November 11 each year ascends the Smoke of Commemoration. Several palaces of Indian princes have been erected along the circular streets surrounding this arch.

A mile south of New Delhi is the site of the first city named Delhi, founded about the end of the 12th century on the site of the Hindu Indraprastha, sung of in the *Mahabharata,* India's 2,500-year-old epic by Kutb-ud-Din of the Slave Dynasty of Mohammedan kings. This ruler erected, probably as a victory commemoration column, the Kutb Minar, a graceful, five-storied tower reaching a height of 238 feet. Built of sandstone that ranges in color from a purplish red to a dark orange, it is decorated with carved scrolls that extol the greatness of Kutb-ud-Din. It also served as the minaret of the adjoining mosque, built by this ruler soon after his capture of the city in 1193, and is considered one of the world's most perfect towers. On the outskirts of Delhi are several tombs—Humayun's, Safdar Jang's and Qudsia's—whose Indian Saracenic style of architecture has made them famous.

The name *Delhi* is derived from the Hindustani word *dil,* meaning an eminence. The various cities founded on its site or in its suburbs since the days of Kutb-ud-Din are Siri (1303), Tughlaqabad (1321), Jahanpannah (1327), Firozabad (1354), Purana Kila (1540), Shahjahanabad (1638) and New Delhi (1911).

dell, a small, isolated vale or ravine, so situated that it is not easily seen from a distance.

delta, alluvial land, usually roughly triangular in shape, at the mouth of a river; the name originated because the triangular mouth of the Nile resembled the Greek letter delta (Δ). The soil deposited by the river forms the delta so rapidly that the river is divided into several smaller streams or distributaries, like the Rosetta and Damietta branches of the Nile. The best example of this formation in the United States is the delta of the Mississippi River; its area is 12,500 square miles and an additional square mile is added along the Gulf of Mexico every 16 years. Other notable deltas are those of the Rhone in France; of the Po in Italy; and of the Ganges in India. In all these cases, with the exception of the Ganges, the deltas have been built in seas, bays and gulfs where the effects of currents in sweeping away the silt are comparatively negligible.

Denmark, a kingdom in northwestern Europe, located on the Jutland peninsula and a number of small islands in the Baltic and North seas; the connecting bodies of water between these seas are known as the Skagerrak, Skaw, Kattegat and Sound. The chief islands are Zealand, Funen, Laaland, Langeland, Falster and Moen. Bornholm, about 75 miles to the east in the Baltic, is described in a separate article. The islands of Zealand and Falster were connected in 1937 by Europe's longest bridge (10,432 feet), crossing the Storstrom. Two years previously Funen and the Jutland mainland were connected by the Little Belt Bridge. Of the total area of 16,576 square miles, the peninsula covers 11,408 square miles and the various islands, 5,168 square miles. Some 3,000 square miles of territory in North Slesvig were added in accordance with a plebiscite of 1920; this province was part of the territory that Germany had annexed after Denmark's defeat in the second Schleswig-Holstein War in 1864. The population is more than 3,500,000.

Throughout its extent Denmark is in no place more than 560 feet above sea level, the highest elevation being Himmelbjerget near Silkeborg. In the Raebild Hills south of Aalborg a Danish-American National Park has been established. The western part of the country is largely a sandy, heather-covered plain; but elsewhere there is fine, rolling agricultural land, comprising some 80 per cent of the area. Along the coasts are many picturesque inlets, lagoons and harbors. The principal river is the Guden, 85 miles in length. The largest lakes are the Arre and Esrom in the northeastern part of the country.

Agriculture is the leading industry, affording a livelihood for 35 per cent of the population. Nowhere else in the world, considering the area occupied, has co-operative farming and dairying reached such large proportions. In fact it has been said that since their establishment in 1864 the agricultural co-operative societies have been the salvation of Denmark.

Courtesy Scandinavian-Baltic Travel Bureau

Storstrom Bridge in Denmark

Denmark is a country of islands connected by bridges and ferries, and as a result Danish engineers have been faced with unusual construction problems. One of their achievements is the steel-arch Storstrom Bridge, 10,432 feet long, connecting the islands of Zealand and Falster across the Storstrom. The picture shows several of the 49 piers that support the bridge. It carries a permanent way for railroad trains, an automobile and carriage driveway and a footway. Construction of the Storstrom Bridge has expedited the express service between Copenhagen and Berlin and Hamburg

Livestock, especially cows, pigs and poultry, are the greatest sources of wealth, Great Britain and other European countries largely relying on Denmark for bacon, eggs and dairy products such as butter, margarine, cheese and condensed milk. The crops include oats, barley, rye, wheat, sugar beets, potatoes and hay. Hardly any coal occurs in Denmark, so that the peat bogs furnish most of the fuel. The forests consist principally of beech, oak and pine trees. Denmark is noted throughout the world for its porcelain, glassware, jewelry and silverware. Other manufactures include furniture, textiles, sugar, cement, brandy and beer. Fishing is another important industry; the principal catches are of cod, plaice (European flounder), haddock, herring, salmon, mackerel and oysters. Skagen, the principal fishing town, is also a noted artists' colony.

Denmark is a constitutional monarchy, the crown being hereditary in the male line of descent; but the Constitution stipulates that the monarch must be of the Evangelical Lutheran faith. In his executive work the king is assisted by a premier and cabinet, called the *Statsraadet,* and by a privy council. The legislative power is held jointly by the king and the Rigsdad, composed of the Landsting (Senate) and the Folketing (House of Commons). For local administrative purposes the country is divided into 22 amters or districts and subdivided into hundreds and parishes.

Copenhagen, the capital, is described in a separate article. Next in size are Aarhus, noted for its 13th-century Gothic cathedral and one of the finest museums in Denmark, and Odense, the home of Hans Christian Andersen, Denmark's great author.

The name *Denmark* (Danish, *Danmark*) is derived from the old Norse *Danmark,* meaning the boundary or march of the Danes. With Norway and Sweden and the Danish possession, Iceland, Denmark forms part of Scandinavia. Denmark was conquered by Germany in 1940.

desert, a region whose aridity restricts animal and vegetable life and, if below sea level, is largely covered by sand dunes or masses of shifting sand. Deserts are arid because they are generally remote from any large body of water and because the trade and other winds that reach them, after passing mountain barriers or a region near the equator even warmer than the desert, are not moisture-laden. They may be hot like the sandy Sahara, cold like the tundras of Siberia and Greenland or rocky like the plateau region of the southwestern United States. Deserts also may be gravelly or of hard sun-baked clay or contain salt or alkali. They cover one-sixth of the entire land surface of the earth.

In the *ergs* or sandy deserts are found the *oases* (spots with vegetation and water) that from time immemorial have been a boon to those who travel on camel back over the desert. Among other animals that, like the camel, have adjusted themselves to the desert by their ability to get along on a minimum supply of water are the donkey and wild ass; the Arabian horse and gazelle have compensated by developing fleetness of foot in traveling from oasis to oasis. The most common desert plants are the cactus and sagebrush.

The world's great desert areas include: the Sahara in Africa and its Asiatic extensions, the Arabian Desert, the Desert of Gobi (chiefly in Mongolia) and the Thar Desert in northwestern India; the Kalahari Desert of South Africa; the Victoria Desert of central Australia; the Atacama-Peruvian Desert in western South America; and the Colorado-Sonora Desert of North America (southwestern United States and northwestern Mexico). What once was called the Great American Desert is now confined to Nevada and parts of Utah, Arizona and southern California; soon even these parts will be reclaimed through irrigation by means of Boulder and other dams. The Atacama Desert formerly was the world's principal source of nitrate.

Detroit, a city of the United States, the largest in Michigan and fourth in size in the country. Its rapid growth may be attributed in part to its admirable location on the strait called the Detroit River between Lake St. Clair and Lake Erie. But this growth is largely the result of the establishment here of more automobile factories than exist in any other city in the world. When the automobile industry began its amazing development about the year 1910, Detroit had a population of 465,766 and was ninth in size in the United States. Thirty years later it had outdistanced all but three cities for honors with respect to size and had a population of 1,623,452.

The city extends for more than 16 miles along the west bank of the Detroit River, sometimes called the Dardanelles of the New World. Its area is 138.65 square miles. The most noted street is Woodward Avenue, on which are located the Public Library (with its murals depicting Shakespeare's Seven Ages of Men) and the Institute of Arts, one of the more important art museums of the United States. West of Woodward Avenue on Grand Boulevard are two of the largest office buildings in the country, General Motors and Fisher (named for Fisher Body, a subsidiary of the General Motors Company). Around the main plaza, Grand Circus Park, are many of Detroit's skyscrapers.

On the outskirts of Detroit or in its suburbs are the plants of about 20 automobile companies that produce 83 per cent of all the automobiles manufactured in the United States. The most important is the plant of the Ford Motor Car Company at River Rouge, one of the greatest examples of mass production; the 100,000 employees of this company in prosperous times turn out about 8,000 cars daily. Detroit also leads in the manufacture of automotive products and of airplanes and airplane engines and accessories. The Ford Airport at Dearborn, Mich., is one of the largest flying fields in the United States. Other products are stoves, drugs, refrigerators, vacuum cleaners, paints and varnishes and aluminum and brass wares.

Courtesy Detroit Convention and Tourist Bureau

Detroit Public Library Institute of Arts

In the background to the left are the General Motors and Fisher buildings and to the right the Hotel Wardell

Detroit has more than 30 parks, chief of which is Belle Isle Park, on Belle Isle in the Detroit River, 850 acres beautifully landscaped. Connecting the city with Windsor, Ont., Canada, is the Ambassador Bridge, 7,400 feet long; with its center span of 1,850 feet, it is one of the longest suspension bridges in the world, and cost about $20,000,000. These two cities are also connected by a vehicular tunnel under the Detroit River. Detroit shares with the other Great Lakes' cities the water transportation facilities of the region; 60,000,000 net registered tonnage of shipping passes through the Detroit River each year. The principal educational institutions are the University of Detroit and the Detroit Institute of Technology.

Detroit was originally established as a military post in 1701 by the French Commandant, Antoine de la Mothe Cadillac, and was named Fort Pontchartrain. Captured by the English in 1761, it was the northwest headquarters of the British Army throughout the Revolution and was not surrendered to the United States until after the signing of the Jay-Grenville Treaty in 1796. Later the name of the settlement was changed to that of the river on which it was built; this name, in turn, was derived from the French *d'étroit,* of the strait or narrows.

Detroit, the county seat of Wayne County, was incorporated as a town in 1815 and chartered as a city in 1824. After Michigan Territory became a state in 1837 it continued as the capital until 1847, when Lansing was selected on account of its more central location.

divide, a ridge or crest line between two basins or areas of drainage. The Continental Divide in the Rocky Mountains is an outstanding example, all rivers on the east side eventually flowing into the Mississippi River and thence to the Gulf of Mexico and all rivers on the west side eventually reaching the Pacific Ocean. The term *watershed* is more frequently used in referring to the divide created by the Appalachian Mountains.

Dixie Highway, a United States highway, extending 3,989 miles from Mackinaw City, Mich., to Miami, Fla. An eastern branch running along the Lake Huron shore of Michigan and a western branch along the Lake Michigan shore (which is joined at Indianapolis, Ind., by a branch from Chicago) meet at Chattanooga, Tenn., and continue south. The highway passes through eight states and was completed in 1916.

Dixie Overland Highway, a United States highway that extends 2,660 miles from Savannah, Ga., to San Diego, Calif.

doldrums, the shifting zones of calm within 5° to 15° north and south of the equator. With the sun's rays almost vertical at all times in the Northern Hemisphere from March 21 to September 22 and in the Southern Hemisphere from September 22 to March 21, these zones are characterized by the highest possible temperatures and humidities. The surface of the sea, except for occasional feeble winds called *cats-paws,* is smooth and glassy. The heavy rainfall of the region is caused by convection circulation resulting from the ascension and expansion of abnormally heated air that is condensed on reaching a high altitude and produces local showers. These two areas of the doldrums were avoided as much as possible by sailing ships. Coleridge gives an excellent description of them in *The Rime of the Ancient Mariner.*

Dominica, an island of the British West Indies between Guadeloupe and Martinique, constituting a presidency of the Leeward Islands group. The area is 305 square miles, and the population, mostly Negroes, is about 43,000. Limes, oranges, bananas, coffee, sugar cane, rubber and spices are the chief products. The island is mountainous; the loftiest peak is Morne Diablotin, 5,314 feet high. Hot springs and a so-called Boiling Lake indicate that it is a region of dying volcanic activity. It was named by Columbus, who discovered it on Sunday (*Dies Dominica,* the Lord's day), Nov. 3, 1493. Alternately controlled by France and Great Britain, it has belonged to the latter since 1783. The capital, Roseau, is the seat of local government, conducted by a resident commissioner and executive and legislative councils.

Dominican Republic, a republic occupying the eastern and larger part of Hispaniola, next to Cuba the largest island of the Greater Antilles. The Atlantic Ocean laps its northern coast and the Caribbean Sea, its southern. Separating it from Puerto Rico to the east is the Mona Passage. The length of the country is 260 miles, and where it joins Haiti the common boundary line is about 160 miles long. The total area is 19,325 square miles. The island is mountainous, the principal ranges being the Cibao and Monte Cristi; between them lies the Vega Real or Royal Plain. Loma Tina, 10,300 feet high, is the highest peak in the West Indies. The principal rivers are the Yague del Norte, Yague del Sur, Yuna, Neiba and Ozama. The population is a little more than 1,000,000. The people are predominantly mestizos, a mixed race of European, Indian and African blood. There are many Creoles of Spanish descent, however, and political control is mainly in their hands. Spanish is the official language.

Most of the Dominicans gain a livelihood by agriculture. The wealth of the country is based largely on sugar. Most of the plantations are owned by Americans, Cubans and Italians who conduct their business with the aid of native and imported peon labor. Other products of the soil are tobacco, coffee and cacao. Corn and tropical fruits are raised mostly for local consumption. In the mountains is considerable unexploited mineral wealth—gold, silver, iron, coal, copper, nickel, chrome, tin, cobalt, asbestos, phosphate, platinum, mercury and rock salt. The petroleum industry is of increasing importance. Of forest products the most important are mahogany, logwood, some gums and resins and the pods of the divi-divi tree that are used for tanning. Manufactures include cigars, cigarettes, rum, soap and straw hats.

The country has been a republic since the middle of the 19th century. Its first revolt was against Haitian rule in 1844 and its second in 1865 against the dominion of Spain, under which it had placed itself for protection. The present Constitution dates from 1924, when the last of the American forces were withdrawn after the military occupation that had lasted since the revolution of 1916. The chief executives are the President, elected for 4 years and assisted by his Cabinet of seven members, and Vice-President. The legislative body is the National Congress, composed of the Senate and Chamber of Deputies; members of each house are chosen by popular vote for 4 years. Each of the 12 provinces is administered by a governor.

Ciudad Trujillo (formerly Santo

Domingo), the capital, was founded in 1496 by Spaniards led by Bartholomew Columbus, 4 years after the discovery of the island by Christopher Columbus, his brother. It has recently been renamed in honor of President Trujillo. It is located on the southern coast at the mouth of the Ozama River; its fine harbor has made it the principal seaport of the Republic. With the remnants of its old wall and bastions and its old buildings such as the palace of the governors general (now occupied by the President), it has retained many of the characteristics of a Spanish colonial town. Its principal edifice is the 16th-century Cathedral de Colon, built at the order of the Spanish sovereigns, Ferdinand and Isabella, in Spanish Renaissance style. The city maintains that it still possesses the relics of Christopher Columbus that were brought from Spain and interred here about 1540. Through error the remains that were taken to Havana in 1795 and later to Seville in 1898 were those of a member of Columbus's family, probably his son Diego. A statue of the great explorer has been erected in the Plaza de Colon. The population of Ciudad Trujillo is about 70,000.

Among other important cities are San Pedro de Macoris and Santiago de los Cabelleros, each with a population of about 20,000. The principal tobacco and coffee port is Puerto Plata.

On sighting the island on December 6, 1492, Columbus named it La Isla Española (the Spanish Island); from this originated its name of Hispaniola. After the Treaty of Ryswick in 1697, when the western part or Haiti was ceded to France, the eastern part, which remained in Spanish possession, took the name of the capital, Santo Domingo. It is still known by that name, although officially it is called the Dominican Republic.

down, an undulating tract of land grass-covered and with few trees. Along the south and southeast coasts of England there are two extensive areas of this sort—South Downs in Sussex and North Downs in Kent, which form highly prized pastures for sheep grazing. The sheep-grazing sections of southern and western Australia, which furnish some of the finest merino wool, also are called *downs.* The word *down* comes from the Celtic word for hill, *dun,* which explains the use of the term downlands for low uplands. It is sometimes used in the same sense as dune, to describe a hillock of sand formed by the wind along the seashore. It may refer also to a comparatively low flat-topped round hill.

Downing Street, a short London street whose name is synonymous with the executive branch of the British Government because the official residence of the prime minister is located on this street, at number 10. Whitehall is at one end of this street and St. James's Park at the other end. It was named after Sir George Downing (d. 1684), an English diplomat of no great ability.

Dresden, a city of Germany, located in the eastern part on the Elbe River. Until the suppression in 1934 of the political individualities of the states composing the Reich it was the capital of the Free State of Saxony, which had been known until the establishment of the German Republic in 1919 as the kingdom of Saxony. The population is 640,000. The city's manufactures include china (mostly manufactured at the State Porcelain Manufactory in the suburb of Meissen), jewelry, cigarettes, chocolate, cameras, chemicals, artificial flowers, leather, lace and perfumery.

One of the outstanding cultural centers of Europe, Dresden is famous for its art treasures housed in the Zwinger, Albertinum and other galleries. Two pictures that tourists always seek in the Zwinger are Raphael's *Sistine Madonna* and Correggio's *Holy Night.* The Museum of Hygiene with its graphic depiction of various phases of human anatomy, the Japanese Palace containing the formal royal library and the Johanneum with its rich collection of china are famous institutions.

Facing the main square or Adolf Hitler Platz, in addition to the rococo-styled Zwinger Palace, are the Roman Catholic Court Church, an excellent example of baroque architecture, and the Royal Palace and Opera House in German Renaissance style. The leading Protestant church is the Frauenkirche (Our Lady's Church) in the Neumarkt. Among educational institutions are the Technical Academy, Academy of Graphic and Plastic Art, Academy of Applied Art and the Conservatoire of Music. The principal park is the Grosser Garten. Along the south bank of the Elbe is the Brühl Terrace. The Fürstenzug or Procession of Princes, representing all the rulers of Saxony from 1127 to 1918 and painted on 25,000 porcelain tiles, adorns a wall in the Augustus Strasse near the Adolf Hitler Platz.

Most of Dresden's famous palaces were erected by Augustus the Strong, who reigned from 1694 to 1733 as both elector of Saxony and king of Poland. It was his ambition to make the city the handsomest royal residence in Germany. In the vicinity Napoleon won on August 27, 1813, the last of his great victories over the allied forces of Austria, Prussia and Russia.

drought, a dry condition resulting from lack of rain, when the earth becomes so dry that plants do not grow. The plain and prairie sections of the United States are subject to periodic droughts, often on account of the chinook.

drumlin, an elongated hill of glacial drift whose longer axis is parallel to the direction of the transported ice movement. Usually unstratified, it ranges in height from 100 to 200 feet and in width from ½ to 1 mile. Thousands of drumlins were formed in Massachusetts, New York and Wisconsin after the last ice age. The term is derived from the Gaelic *druim,* meaning the ridge of a hill.

Drury Lane, a street in London, near the Strand. It is one of the great arteries of the parish of St. Clement Danes, an aristocratic part of London in the time of the Stuarts. The original Drury Lane Theater was opened in 1663. The two successive theaters were managed by David Garrick (1746–76) and Richard Brinsley Sheridan (1794–1809). The present theater is the fourth to be erected on this site.

Dry Tortugas, a group of 10 coral islets in the Gulf of Mexico about 120 miles southwest of Florida and, with the Florida Keys, a part of Monroe County. During the Civil War the Confederate Government established on the largest of these islands a penal station, Fort Jefferson. Since 1904 the islands have been noted for the marine biological work carried on there by the Carnegie Institution of Washington. In 1908 they were made a national bird sanctuary. The name is derived from the Spanish *tortuga,* turtle; a large number of turtles was found there by the Spaniards in the 16th century.

Dublin, the capital of Ireland, located in the province of Leinster at the mouth of the Liffey River, which flows into Dublin Bay, an arm of the Irish Sea. Noted in the past for the manufacture of woolens, cottons, silks and linens, its chief manufactures for export today are poplins, whisky, porter and stout. Cigarettes, glassware, hosiery, biscuits and bottled mineral water also are produced. Shipbuilding has long been an important industry. The population of the city is 316,500. Greater Dublin, which since 1930 has included the suburbs of Rathmines, Rathgar, Pembroke and other parts of Dublin County, has a population of almost 470,000.

The most imposing building is Dublin Castle, an ancient structure dating from the 13th century, formerly the winter residence of the Lord Lieutenant or representative of the British Crown. It now houses the various government departments. Within the walls surrounding the castle are the City Hall and the Norman-styled Christ Church or Holy Trinity Cathedral, founded in 1038 by the Danish King, Sigtryg, and containing the tomb of Strongbow (Richard Fitz Gislebert, Earl of Pembroke) who rebuilt it in the 12th century. In the Commons' Hall attached to this cathedral the Irish Parliament met until the destruction of the building in 1566. Another Protestant cathedral is the Gothic-styled St. Patrick's, which dates from 1225 and has had as varied a history as Christ Church. St. Patrick's once housed the University and served as a court of justice; William III gave thanks here after he won the Battle of the Boyne in 1690; and from its pulpit during the early 18th century thundered that mighty dean, Jonathan Swift, author of *Gulliver's Travels.* The principal Roman Catholic edifice is the Pro-Cathedral of St. Mary.

The center of the city is the Nelson Pillar, erected to the hero of Trafalgar in O'Connell Street (formerly Sackville Street). Along this principal thoroughfare there are commemorated such distinguished Irishmen as: the national leaders, Daniel O'Connell, Charles Stewart Parnell and Henry Grattan; and the writers, Thomas Moore, Edmund Burke and Oliver

Goldsmith. College Green at the end of O'Connell Street is flanked on one side by the Bank of Ireland, formerly the House of Parliament, and on the other, by the University of Dublin, known also as Trinity College since its incorporation in 1591 as the College of the Holy and Undivided Trinity. The University Library contains the famous *Book of Kells,* an 8th-century illuminated copy of the Gospels. The city is the seat of the National University, with constituent colleges in Cork and Galway. Of the 12 bridges across the Liffey connecting the two parts of the city, the most important is the spacious O'Connell Bridge.

Leinster House serves as the assembly place of the Irish Parliament, and in Leinster Lawn rises a cenotaph commemorating Arthur Griffith, Michael Collins and Kevin O'Higgins, three leaders of the Sinn Fein party who figured prominently during the days of the Trouble or Civil War of 1922. Among other important buildings of Dublin are the Four Courts, Custom House, National Library, National Museum (noted for its Irish antiquities), National Art Gallery and Municipal Gallery of Modern Art. To the Irish Academy and such institutions as the Abbey and Peacock theaters, Ireland largely owes the preservation of its cultural traditions. The most beautiful of Dublin's several parks is Phoenix Park, noted especially for its zoological gardens. St. Stephen's Green is the principal square.

The name *Dublin* (in Gaelic, *Dubhlinn*) means black pool. The city's post-office name is Baile Atha Cliath, meaning the Town of the Ford of the Hurdles.

Duke University, Durham, N.C. This modern scholastic group, on a forest-bordered slope, is executed in gray stone in the traditional collegiate Gothic architecture and is unique because it was designed and built at one time in harmonious style, complete with chapel, library, hospitals, professional schools, classrooms, laboratories and residential halls. An outgrowth of Trinity College, founded in 1838, it was endowed by James B. Duke in 1924.

dune, a ridge or hill of loose sand found in deserts, along ocean, sea or lake shores, in some river valleys and, in general, in places where there is dry surface sand during some part of the year. Dunes are formed by the action of strong winds which, when they blow fairly constantly from one direction, sweep the sand along. When an obstruction is encountered, the sand is piled against it into a hill of characteristic shape.

Dunes have an easy slope on the windward side but a much sharper slope on the side away from the wind (leeward). The wind carries the sand up the windward slope, from the top of which it falls down the sharper opposite slope. The result of this action is a gradual forward movement of the dune at the rate of about 50 feet a year. Dunes often are blown over fields, orchards and even buildings and slowly cover them.

Courtesy Associated British & Irish Railways, Inc.

O'Connell Street in Dublin

In the center is shown the monument to Daniel O'Connell, the great Irish liberator, and in the rear the 135-foot pillar in memory of Admiral Nelson

Dunes sometimes attain a height of several hundred feet in the Sahara Desert and elsewhere; but usually they range in height from about 10 to 30 feet. Very little vegetation is found upon dunes because plants cannot establish their roots in the shifting sand. But if for any reason the dune in temperate climates ceases to move on, it eventually is covered with grass or heath and becomes a dune hill.

Dune Park, Ind., at the southern end of Lake Michigan, has been made a state park, and the dunes of San Luis Valley in Colorado were created a national monument. Dunes are found also at Cape Cod, Mass., and in Bermuda.

dust, minute particles in the atmosphere, organic and inorganic, that are carried by air currents. Organic dust is composed of pollen and spores from plants, eggs of insects and bacteria. Inorganic dust swept from the earth by the wind consists of sand, soil and mineral matter (such as iron of meteoric origin, salt thrown into the air by ocean spray, soot, planetary dust and ashes from volcanoes).

The most injurious dust is found in the large cities, where it consists of 100,000 or more particles to the cubic centimeter. It not only spreads disease germs among the inhabitants but with oxidation and hydration causes extensive damage to metals and other materials on which it settles.

The blue color of the sky results from the fact that minute dust particles reflect light and the blue of the spectrum is the most widely reflected color. Larger particles visible in a beam of light are called *motes.*

earth, the globe or planet on which we live. The surface of the earth is divided unequally between land and water areas, above which is a vaporous envelope called the *atmosphere.* The land area or *lithosphere* constitutes 57,510,000 square miles of the earth's surface, and the water area or *hydrosphere* covers about 145,000,000 square miles. The mean height of land is 2,440 feet; the mean depth of the seas, 12,500 feet. The mean density of the earth, which has a volume of 260,000,000,000 cubic miles, is 5.53. Its mass or weight is 6,592 billions of billion tons.

The earth's equatorial circumference is 24,902 miles; its polar circumference, 24,860 miles. Its equatorial diameter is 7,926 miles and its polar diameter, 7,899 miles. These facts prove that, instead of being a true sphere, the earth is slightly flattened at the North and South poles, making it an oblate spheroid.

The earth rotates on its axis every 23 hours and 56 minutes at a speed of 1,000 miles an hour, thereby causing day for the hemisphere that is turned toward the sun and night for that turned away from the sun. It also revolves with the other planets in an elliptical path about the sun every 365.24 days or 1 year. The mean distance from the sun is 92,898,000 miles. When the earth is nearest the sun, in January in the Northern Hemisphere, it is in perihelion; when it is farthest away from the sun, in July, it is in aphelion. The opposite condition exists in the Southern Hemisphere, the earth being nearest the sun in July and farthest away in January. The earth is the third planet in the order of distances from the sun; the fifth in size among the eight planets and the only one known to support life.

The Greek philosopher Anaximander first taught (in the 5th century

B.C.) that the earth is a round, solid body, suspended in a hollow, celestial sphere. Two centuries later Aristotle used as proof of the earth's roundness many of the arguments that are used today: that as a ship approaches shore, the first part of it to come into view is the top of the masts or funnels, then the lower parts and finally the hull; that during an eclipse of the moon the shadow that the earth casts upon its satellite is always round; and that the stars shift their positions as one travels northward or southward, eastward or westward, some disappearing and others, formerly invisible, appearing above the horizon.

In the 2d century A.D. Ptolemy insisted that, though the earth is round, it is fixed in space. To him we owe Dante's and Milton's descriptions of the celestial sphere or empyrean with the earth enclosed in a series of hollow, revolving spheres in each of which is fixed one of the planets or constellations. It was Ptolemy's miscalculation as to the size of the earth that led Columbus to believe that he could find a short passage to India by sailing westward.

From the theory of Copernicus in the 16th century that the earth is a revolving rather than fixed sphere and from Newton's discovery of the laws of gravitation in the 17th century the theory of the earth's daily rotation and yearly revolution about the sun was deduced. To Huygens's investigation (also in the 17th century) of the law of centrifugal force, we owe the deduction that the earth is an oblate spheroid, bulging at the equator and flattened at the poles.

Modern scientists have arrived at the conclusion that the age of the world is less than 3,000,000,000 years. The land portions of the earth's crust had emerged from the prehistoric ocean and had solidified sufficiently to make life possible about 1,500,000,000 years ago.

earthquake, a vibratory movement of the earth's crust caused by subterranean disturbances, such as the faulting of rocks from prolonged strain in a certain stratum, or by volcanic explosions when lava and various mephitic vapors seek a vent. Earthquakes range in intensity from tremors so slight that they are known only by the records that automatically appear on seismographs to terrific shocks spreading over a wide area and resulting in great loss of life and destruction of property.

Earthquakes occur principally in regions adjacent to youthful mountain ranges that developed a certain structural weakness with the cooling of the earth's crust. Their belts follow world ridges, such as the western coasts of North and South America, the east coast of Asia and the north shore of the Mediterranean Sea, with an extension into central Asia.

In addition to California and Alaska in the United States, the earthquake countries that lie within the Pacific belt are Japan, China, New Zealand, Ecuador, Peru, Chile and the Hawaiian, Philippine and other volcanic islands of the Pacific Ocean. Most of the earthquakes of the Mediterranean belt occur in Italy, Portugal, Spain and various islands of this sea. Guatemala, Nicaragua, the West Indies, India, Iran, Iraq, Turkey, Syria and Palestine occasionally experience earthquakes.

Among recent notable earthquakes are those of: San Francisco, Calif., and Valparaiso, Chile (1906); Kingston, Jamaica (1907); Messina, Sicily (1908); Central American cities of San Salvador and Guatemala City (1917); Kansu Province, China (1920); Tokyo and Yokohama, Japan (1923); Corinth, Greece (1928); Managua, Nicaragua (1931); and Tuguerres, Colombia (1936).

To earthquakes in the ocean, sometimes erroneously called *tidal waves,* is attributed the preservation of the continents from general submersion. Such earthquakes cause the formation of many oceanic islands and deepen the ocean's basins so that a general flooding of the continents is impossible.

NOTABLE EARTHQUAKES

Location	*B. C.*
One at Rome	358
	A. D.
One accompanied by the eruption of Vesuvius; the cities of Pompeii and Herculaneum buried	79
Antioch destroyed	115
Nicomedia demolished, and its inhabitants buried in its ruins	358
Catania, in Sicily, overturned; 15,000 persons buried in the ruins	1137
At Naples; 40,000 persons perished	1456
At Lisbon; 1,500 houses and 30,000 persons buried in the ruins	1531
London; part of St. Paul's and the Temple churches fell	1580
In China; when 300,000 persons were buried in Pekin alone	1662
One at Jamaica, which totally destroyed Port Royal, whose houses were engulfed	1692
One in Sicily; more than 60,000 lives were lost	1693
Again in China; 100,000 people swallowed up	1731
At Lisbon; 50,000 inhabitants were buried. Fez, in Morocco, was destroyed, and half of the Island of Madeira became waste	1755
Messina and other towns in Italy and Sicily overthrown; 60,000 persons perished	1783
Archindschan wholly destroyed, and 12,000 persons buried in its ruins	1784
Cuzco and Quito, Peru; 40,000 people buried	1797
At New Madrid, Mo. The course of the Mississippi River was changed, forming Reelfoot Lake	1811
Caracas, Venezuela; 12,000 killed	1812
Several throughout India; district of Kutch sunk; 2,000 persons buried	1819
Genoa, Palermo, Rome and many other towns damaged; thousands perished	1819
Aleppo, Syria; 22,000 lives lost	1822
In Spain; Mercia and numerous villages devastated; 6,000 persons perished	1829
Martinique; nearly half of Port Royal destroyed; about 700 persons killed and the whole island damaged	1839
Ternate; the island made a waste, and thousands of lives lost	1840
Awful and destructive earthquake at Mount Ararat, Armenia	1840
At Cape Haitien, Santo Domingo nearly two-thirds of the town destroyed; between 4,000 and 5,000 lives lost	1842
Point à Pitre, Guadaloupe destroyed	1843
In South Italy; Melfi in ruins; 14,000 killed	1851
In Philippine Islands; Manila nearly destroyed	1852
Thebes, in Greece, nearly destroyed	1853
St. Salvador, South America, destroyed	1854
Amasca, and Simoda, Japan, destroyed; Jeddo much injured	1854
Brusa, in Turkey, nearly destroyed	1855
Moluccas; about 3,000 lives lost	1856
In the Mediterranean; at Candia, 500 lives lost; Rhodes, 100; and other islands, 150	1856
Calabria; about 22,000 lives lost	1857
Corinth nearly destroyed	1858
Quito, Ecuador; 5,000 killed; great property loss	1859
Erzerum, Asia Minor; about 1,000 persons said to have perished	1859
Mendoza, Argentina; about two-thirds of the city and 7,000 lives lost	1861
Peru and Ecuador; 25,000 lives lost	1861
Guatemala; 150 buildings destroyed	1862
Manila, P. I., great destruction of property	1863
Cities of Arequipa, Iquique, Tacna and Chincha, and many small towns in Peru and Ecuador destroyed; about 25,000 perished	1868
Manila, Philippine Islands; 3,000 lives lost	1880
Ischia, Bay of Naples; 2,000 lives lost	1883
Java and neighboring isles desolated	1883
Province of Granada, Spain; 690 perished	1885
Charleston, S. C.; 60 lives and $8,000,000 worth of property lost	1886
Severe shock in southern Europe, especially in the Riviera; about 2,000 perished	1887
Japan; 4,000 perished, 50,000 houses destroyed	1891
Islands of Zante and Stromboli; great loss of lives and property at Zante	1893
Japan; 26,000 lives lost, 60,000 homeless	1896
Assam, India; 1,542 killed, loss of property over area of; 750,000 sq. m.	1897
Monte Pelée, Martinique, W. I.; 30,000 lives lost	1902
Northern India; over 1,600,000 square miles affected, 20,000 lives lost	1905
Severe shocks in California; San Francisco wrecked by terrible fire that lasted two days; $400,000,000 property destroyed; 300,000 homeless; 500 dead	1906
Chile, especially Valparaiso and Santiago; 5,000 lives and $100,000,000 property lost	1906
Large part of Kingston, Jamaica, destroyed	1907
Turkestan; 14,000 lives lost	1907
Sicily and Calabria; Messina and Reggio destroyed; 77,283 dead; 1,000,000 homeless	1908
Cartago, Costa Rica; 1,500 lives lost	1910
Guadalajara, Mexico; great part of city destroyed	1912
Turkey; 3,000 lives lost, 6,000 persons injured, 40,000 homeless	1912
Sakura, Japan; 43 killed, 855 houses destroyed	1914
Sicily; 200 killed, 1,000 injured	1914
Central Italy; 29,978 killed. Avezzana destroyed	1915
Guatemala, Guatemala; 2,500 killed	1917
Puerto Rico; 100 killed	1919
Java, Dutch East Indies, Mt. Kalut; 5,000 killed	1919
San Salvador, El Salvador; nearly all the city's houses destroyed	1919
Mugello Valley, Italy; 100 killed	1919
Kansu province, China; 100,000–200,000 killed; 10 cities destroyed	1920
Mendoza province, Argentina; 100 killed in city of La Valle	1920
Orizaba district, Mexico; 3,000 killed	1920
Chile; 900 killed; Copiapo partly destroyed	1922
Chile; 1,800 killed	1923
Japan, Tokyo and Yokohama destroyed. Dead 150,000; injured 125,000; missing 235,000; homeless 2,000,000. 634,000 houses destroyed, including the Library of the Imperial University, with 700,000 volumes; money loss of $4,500,000	1923
San José, Costa Rica, partly destroyed	1924
Santa Barbara, California, partly destroyed	1925
Island of Rhodes, in the Aegean Sea; 200 houses destroyed	1926
Managua and Leon, Nicaragua; partly destroyed	1926
Central Japan; 2,500 killed	1927
Palestine and Transjordania; hundreds killed	1927
Namangan, Turkestan; 106 casualties; 4,850 houses destroyed	1927
Lanchau, District of Kansu, China; 500,000 killed	1927
In Bulgaria; 153 killed; enormous property loss	1928
Southern Italy, centering in the village of Melfi; approximately 3,000 killed; over 4,000 injured	1930
Managua in Nicaragua; 2,000 killed; $20,000,000 property loss	1931
Kansu Province of China; 70,000 killed	1932
Southern California; 130 killed; much property damage	1933
In India; 6,000 killed	1934
In Baluchistan; Quetta destroyed; 40,000 killed	1935

Easter or **Rapanui Island,** an island of volcanic formation in the South Pacific Ocean, about 2,000 miles west of Chile of which it has been a dependency since 1888. The area is 42 square miles, and the population (of Polynesian stock) is about 6,000. It is important archaeologically for the large number of megalithic statues, prehistoric stone houses, burial platforms and curiously inscribed wooden tablets found there, possibly of an earlier Polynesian culture. The Dutch navigator, Jacob Roggevin, discovered the island on Easter Sunday, 1722. In 1935 the Chilean Government declared Easter Island a national park.

Ecuador, a republic of the northwestern part of South America. It is triangular in shape, with its base along the Pacific coast; on the east it tapers to a point, being bounded by Colombia on the north and Peru on the south. The

Courtesy Carnegie Institution of Washington

Easter Island Monoliths: The Unsolved Mystery of the Pacific

Easter Island is in the South Pacific about 2,000 miles from Chile to which it was annexed in 1888. In its small area 555 statues, some of colossal size, cut out of lava, are found. In addition the island contains platforms of masonry from 200 to 300 feet long; stone houses over 100 feet long with walls 6 feet thick built like forts; and tablets curiously inscribed with hieroglyphics. The statues, ranging from 3 to 70 feet in length, are in various stages of construction, some finished, others nearly completed and others just commenced. Appearances indicate that work was suddenly arrested. The conjecture has been made that they were designed to represent distinguished persons and intended as monuments to preserve their memory. However, as no one knows who carved them or can be sure of the purpose, the island has been called *the unsolved mystery of the Pacific*

area, according to official estimate, is 337,392 square miles; no definite figure can be given on account of a long-standing boundary dispute between Ecuador and Peru, which it is hoped will soon be settled. The population is about 2,560,000. More than half are Indians, descendants of the ancient Incas.

The equator crosses the northern part of the country and gives it its name (*ecuador* is Spanish for equator). Parallel to the coast are the Andes Mountains in two chains, the Cordillera Guacamayo (western) and the Cordillera Galeras (eastern). The loftiest peaks are Mt. Chimborazo (20,702 feet), Mt. Cotopaxi (19,550 feet), Mt. Cayambe, (19,186 feet) and Mt. Antisana (18,715 feet). Among other high peaks, many of a volcanic nature, are Iliniza, Sangay, Altar, Cotocachi, Quilindana, Carihuairazo and Tungurahua. The eastern part of the country is a vast tableland that gradually descends toward the Amazon basin and is watered by several tributaries of the Amazon, including the Napo and Tigre and the Maranon that forms the southeastern boundary of the country.

The 125-mile-wide coastal plain is Ecuador's great agricultural region. It is watered by the Guayas and Esmeraldas rivers. The temperatures, though high, are modified by ocean breezes that accompany the Peruvian Current from the Antarctic. The chief crops are cacao, coffee, sugar cane, cotton, tobacco and rubber. The higher inland areas produce in their valleys, which are known as hoyas, most of the fruits and vegetables and cereals of the Temperate Zone.

The country is rich in minerals. Gold is plentiful; the output of petroleum is increasing; and there are good deposits of copper, mercury, lead, iron, silver and quayaquillite, used in the manufacture of explosives. Sulphur is found on the mainland and also on the Galápagos Islands, a territorial division lying 600 miles west in the Pacific Ocean. The forest area is very extensive. On the Pacific side it covers some 10,000 square miles and on the Montana or eastern side, some 80,000 square miles. Some of the timber, such as mahogany and dyewoods, is very valuable. Balsa or corkwood is used for airplanes and lifeboats. The bark of the Cinchona tree yields quinine, and the fruit of the tagua palm is used in the manufacture of vegetable-ivory buttons. The principal manufactured article is the panama hat, woven from the fiber of the fan-shaped plant, *Carludovica palmata.* Other manufactures include flour, sugar, beer, chocolate, shoes, pottery and cotton and woolen goods.

Courtesy Pan American Union

Ecuadorian Indians at a Fair at Otavalo

Ecuador threw off the Spanish yoke in 1822 and after an 8-year union with Colombia withdrew to establish its own republic. The President serves for 4 years; he is assisted by a Cabinet of 6 members. The National Congress consists of a Senate of 32 members, elected for 4 years, and a Chamber of Deputies of 56 members, elected for 2 years. When Congress is not in session, it is represented by the consultative Council of State. For local administrative purposes the country is divided into 15 provinces.

Quito, the capital, is one of the oldest cities in Latin America. Before it was captured by the Incas of Peru in 1470 it had been the center for more than 1,000 years of the civilization of the Quitus. The city lies within 15 miles of the equator, but as it is 9,371 feet above sea level the climate is always delightful. Dominating it is the snow-crowned Mt. Pichincha (15,925 feet high). It is reached by railroad from the seaport of Guayaquil, 297 miles to the southwest. The most distinctive buildings, Spanish in architecture, are the National Palace, Palace of Justice, Municipal Building, National Library and the colonial churches of San Francisco, San Agustin and La Compania de Jesus. The city is also the seat of the Central University. The population numbers about 106,000.

Edinburgh, the capital of Scotland, in Midlothian on the south shore of the Firth of Forth, an arm of the North Sea. Before the annexation of Leith (and surrounding villages) in 1920 that city was the port of Edinburgh, the larger city being about 2 miles from tidewater. The principal industries are those associated with printing, such as papermaking, bookbinding and map making. Furniture, ale, rubber goods, rope, soap, hosiery, iron and brassware are manufactured. The population numbers 438,998.

The location of Edinburgh occasioned its sobriquet, the *Modern Athens,* from the hills on which it is built and by which it is surrounded. Reminiscent of the grim Acropolis, Edinburgh's principal height is Castle Rock, on which was erected in the 14th century that impenetrable fortress, Edinburgh Castle. Once the seat of the Scottish kings, the castle is noted for: St. Margaret's Chapel; the banqueting hall; apartments occupied by Mary, Queen of Scots; the armory; and the crown room with its coronation regalia. In the courtyard is an impressive World War Memorial.

At the foot of Calton Hill, on the site of the ravine that once contained the Nor' Loch, is Princess Street, dividing the Old Town from the New and considered one of the most beautiful thoroughfares in all Europe. The Princess Street Gardens on the eastern and western sides of this street are noted for their floral displays and numerous statues of prominent Scotsmen. The most splendid of these is the 200-foot-high red-sandstone Gothic-styled monument to Sir Walter Scott, containing beneath its canopy a large marble statue of the author and in its numerous niches small statues of different characters that he created. Robert Burns is commemorated by a Greek temple on the southern slope of Calton Hill. On the summit of this hill are the Nelson Monument, the unfinished National Monument commemorating the Battle of Waterloo (built in imitation of the Parthenon) and the monument to the Scottish philosopher Dugald Stewart (copied from the Choragic Monument of Lysicrates in Athens).

Connecting Edinburgh Castle and Holyrood House is the Royal Mile (High Street), over whose ridgelike road has passed an age-long pageant. The Palace of Holyrood House was originally erected as an abbey for the canons of the Order of St. Augustine, founded by David I in the 12th century. Later it became the home of the House of Stuart, its most poignant incidents being those associated with Mary, Queen of Scots.

Since the signing of the Act of Union of Scotland and England during the reign of Queen Anne (1707) the Scottish House of Parliament has accommodated the supreme courts of law and the famous advocate's library. The most important churches of Edinburgh are the 15th-century St. Giles's Cathedral, erected in Gothic style, and the two adjoining Greyfriars' churches. The stone house in which John Knox once lived has been restored.

Modern architecture in Edinburgh is represented by the buildings housing the National Gallery and the Royal Scottish Academy (of painting, sculpture and architecture). Among other important musums is the National Portrait Gallery and the Antiquarian Museum. The city's supremacy as an intellectual center is largely the result of the influence of the University of Edinburgh, founded in 1582, and of publishing enterprises, such as the *Edinburgh Review* that flourished there throughout the 19th century.

Edinburgh takes its name from the fact that it was fortified by its Saxon conqueror, Eadwine (or Edwin), King of Northumbria, in 617 and was accordingly known as Eadwine's Burgh, meaning Eadwine's fortified town. It was made the capital of Scotland by James II in 1450.

Courtesy Associated British & Irish Railways, Inc.

In Honor of Sir Walter Scott

In East Princes Street Gardens in Edinburgh is the Scott Memorial, a Gothic spire 200 feet high, below which is the seated figure of the novelist. In the niches are figures of characters in Scott's novels. The monument was designed by George Meikle Kemp

Edison Memorial Tower, Menlo Park, N.J. A memorial to Thomas Edison, this tower rises 130 feet into the air and is topped by a 14-foot replica of the first electric light, which was invented there. Within, in tribute to the inventor, is an eternal light, supplied from four independent power sources. The tower was dedicated in 1938.

Egypt, a kingdom of northern Africa, bounded by the Mediterranean Sea on the north, Palestine and the Red Sea on the east, the Anglo-Egyptian Sudan on the south and Libya on the west. The northeastern section of Egypt comprises the triangular-shaped Sinai Peninsula; this desert area is connected with Egypt proper by the Isthmus of Suez through which the Suez Canal has been cut. With the exception of the extreme southern part the country lies in the North Temperate Zone. The area is estimated at 383,000 square miles, but only 12,226 square miles are cultivable. Into this area is crowded most of the population of 14,950,000. Four-fifths of the people are of ancient Egyptian stock; the peasants who constitute about 60 per cent of the whole are called *fellahs.* The rest are Bedouins and Nubians of the desert sections. Jews, Greeks and Turks constitute the mercantile class. The predominant European influence is British.

Gift of the Nile. Egypt is the cradle of a civilization more than 5,000 years old. Yet during all the centuries it would have been an irreclaimable desert except for a river. It is literally the gift of the Nile. The great river, about 3,600 miles long, is swollen by summer rains in its upper course and, until the beginning of the 20th century, poured its excess water upon the parched earth. The overflow reached 8 to 12 miles on either side of the river and was 5 to 20 feet deep. Receding, the river left a thick alluvial deposit that enriched the soil. The floods have been adequately controlled since the completion in 1902 of the Aswan Dam, erected at the first cataract of the Nile. This dam, 144 feet high and 6,400 feet long, is capable of storing some 1,323,000,000,000 gallons of excess water for irrigation use throughout the year. Since the completion of the Gabel Awlia Dam in 1937 about 7,000,000 acres of land can be irrigated with water from the Nile.

Near the city of Cairo begins the triangular-shaped delta, built of soil that the Nile has deposited through 60 centuries. It measures 155 miles along the coast and 100 miles from north to south and is intersected by the Nile's distributaries, the Rosetta and Damietta, and by numerous canals.

In the western part of the country is an extension of the Libyan Desert; in the southeastern part, an extension of the Nubian Desert; and in the northeastern part, an extension of the Arabian Desert. The Libyan Desert possesses five large oases—Farafra, Bahariya, Dakhla, Kharga and Siwa (ancient site of the temple to Jupiter Ammon); they owe their fertility to a porous sandstone bed 300 feet below the surface, from which the water rises through natural fissures. Here agriculture is practiced on an intensive scale. A tier of olive or coffee trees may be planted beneath tall date palms, and in the space around these trees cotton plants and an assortment of vegetables may be raised. The scanty grass of the oases affords pasturage for sheep and goats.

The holdings of the Egyptian fellahs, like those of the Chinese peasant, are tiny; about 60 per cent of them are less than an acre each, and the rest from 1 to 5 acres. But the richness of the soil renders these small holdings highly productive. An annual crop of some 900,000,000 pounds of cotton makes Egypt one of the keenest competitors with other cotton-growing countries. Other products include wheat, corn, barley, millet, lentils, beans, rice, sugar cane, dates, grapes, figs, bananas and citrus fruits.

Egypt's most important mineral product is petroleum; about 1,300,000 barrels are produced annually. The mines yielding manganese, salt, alum, nitrate, phosphate, hematite and carbonate of soda are also valuable. Egypt has long been noted for its precious stones, especially turquoises and emeralds, and for its quarries of porphyry, syenite and breccia verde. Manufactures include coarse cotton goods, pottery (especially water jars), copper and brassware, jewelry, leather goods, carved woodwork inlaid with ivory or pearl, cigarettes and perfumes.

Egypt attained the status of a sovereign state on the termination of the British protectorate in 1922. Ahmed Fuad Pasha, who was installed as a constitutional sovereign under the title of Fuad I, was the first Egyptian ruler since the downfall of Cleopatra almost 2,000 years before. At the beginning of his reign Fuad exercised legislative authority with the Senate and Chamber of Deputies, nominated almost two-thirds of the 100 members of the Senate and could dissolve the Chamber of Deputies although his ministers were responsible to it. With the consent of the Egyptian Government Great Britain reserved the right in case of emergency to safeguard the Suez Canal and the Cape-to-Cairo Railroad.

Courtesy Hamilton M. Wright

Along the Mahmudia Canal near Alexandria, Egypt

Cities and Ancient Monuments. Cairo, the capital of Egypt, is described in a separate article. Its seaport, Alexandria, founded in 332 B.C. by Alexander the Great, is about 130 miles northwest of Cairo on a sandy spit between the Mediterranean Sea and Lake Mariut. During the reign of the Ptolemies it was a great center of Greek culture. Its library, which was destroyed by fire on the advent of Julius Caesar in 47 B.C., contained more than 700,000 papyrus rolls and was considered the finest of the ancient world. Among Alexandria's other noted buildings was the Caesareum. The two obelisks, known as Cleopatra's Needles, that stood beside it, have since the early '80s adorned, one the Victoria Embankment in London, and the other Central Park in New York city. At the height of its ancient glory the city had a population of more than 1,000,000, but today it is estimated at only 573,000. In addition to being an important commercial center Alexandria is Egypt's summer capital. The country's other important seaport is Port Said (population, 105,000) at the Mediterranean entrance to the Suez Canal. Guarding this entrance is a statue of Ferdinand de Lesseps, the French engineer who conceived the idea of the Suez Canal and in 1854 presented his plan to the Khedive.

Egypt's ancient glory is suggested by the ruins at Luxor and Karnak on the east bank of the Nile about 460 miles from Cairo and at Thebes opposite these cities on the river's west bank. Luxor is noted for its great temple, built about 1400 B.C. by Amenhotep III and dedicated to Ammon, Mut and Khonsu; one of the obelisks that guarded its main entrance now stands in the Place de la Concorde in Paris. At Karnak are the remains of the Temple of Ammon. Thebes, the ancient capital of the pharaohs, contains the Rameseum (a temple in honor of Ramses II), statues called the Memnon Colossi and numerous pyramid tombs, sphinxes and obelisks. North of Thebes is Abydos (the modern Araba et Madfuna); it is the reputed burial place of the god Osiris, to whom several magnificent temples were erected by Ramses II and Seti I. All that remains to mark the location of Memphis, Egypt's ancient commercial center, located about 12 miles south of Cairo, are two colossal statues of Ramses II, an alabaster sphinx and the Step Pyramid of Sakkara.

Elba, an island in the Tyrrhenian Sea, lying 6 miles off the coast of Italy, to which it belongs. With Corsica and Sardinia, it constitutes the Tyrrhenian Archipelago. About 18 miles long and 6 miles wide, the entire island is the top of a sunken mountain range, and the highest peak is Mount Capanne, 3,350 feet high. The area is 140 square miles, and the population is about 30,000. Agriculture flourishes in the fertile parts of the island, and a considerable amount of wine is exported. The inhabitants also engage in sardine and tunny fishing, iron, copper and tin mining and marble quarrying. The capital is Portoferraio, although for administrative purposes the island is considered part of the Tuscan province of Leghorn.

Elba is famous as the scene of Napoleon's exile after his first abdication in April 1814. He escaped in February 1815, and the Hundred Days, from his entry into Paris on March 20, ended with his defeat at Waterloo on June 18.

Ellice or **Lagoon Islands,** a group of coral islands and atolls in the South Pacific Ocean between the Gilbert and Fiji Islands and included in Micronesia. Annexed by Great Britain as a protectorate in 1892, the group has been since 1915 part of the Crown colony known as Gilbert and Ellice Islands Colony. The total area of the islands, which extend about 400 miles from 5° to 11° S. Lat., is 14 square miles. The chief islands are Ellice, Mitchell, Sophia, Egg, Hudson and Lynx. The population (of Polynesian extraction) is about 5,000. Copra, yams and guano are the principal exports. The islands were discovered in 1781 by a French navigator named Maurelle.

Ellis Island, a small island in upper New York Bay about 1 mile southwest of the Battery or tip of Manhattan Island. It belongs to the United States Government and since 1892 has been an immigrant station. When immigration was at its peak shortly after the World War fully three-fourths of the immigrants to the United States were cleared through the port of New York, and during the period of detention more than 3,000 aliens could be accommodated at Ellis Island. The purpose of this detention was to give a medical examination and pass on physical and mental fitness to enter the United States and to become citizens. The original islet has been enlarged from 3 to 27 acres. Before the Civil War it became the site of Ft. Gibson.

Empire State Building, New York city. Rising 1,248 feet into the air from the pavement of Fifth Avenue, this office building is the tallest structure ever erected by man. It was completed in 1931. The observation gallery on the 102d floor, which commands on clear days a view extending over a radius of 25 miles, is topped by a tall mast used for experimental television broadcasting.

England, the largest constituent of the United Kingdom of Great Britain and Northern Ireland that for more than a century has been the center of an empire on which the sun never sets. It is bounded on the north by Scotland; on the east by the North Sea; on the south by the Strait of Dover and the English Channel; and on the west by the Irish Sea and Wales. The area totals 50,874 square miles, and the population is nearly 38,000,000. With 742 persons to each square mile England is the most densely populated country of Europe.

The principal highland region is in the northern part. The Cheviot Hills separate England from Scotland, and the Pennine Chain extends along the Cumberland-Northumberland border to the Peak District of Derbyshire. In the southwest rise the Severn, Cotswold and Quantock hills. The low mountains of Lincolnshire and the East Riding of Yorkshire are called *the Wolds*. In Worcestershire and the other Midland counties are the famous Malvern Hills. The rest of England is a fertile plain whose placid, friendly landscape, to quote Thackeray, seems to "shake hands on every side." The most famous of the English rivers are: the Thames, Humber and Tyne, which discharge into the North Sea; the Mersey, which empties into the Irish Sea; and the Severn, whose broad estuary forms part of Bristol Channel. The Avon will forever carry a Shakespearean association. England is distinguished by such physical conformations as the fenlands of Cambridgeshire and Lincolnshire; the chalk cliffs and downs near Dover in Kent; and the heather-covered moors of Sussex and of Dartmoor and Exmoor in Devonshire (known as the *Lorna Doone* country).

More than three-fourths of the land is in pasture or under crop cultivation. The products include wheat, oats, barley, hops, potatoes, sugar beets, apples and other orchard fruits. Sheep raising is the most important industry of the moorland section of the North Riding of Yorkshire. The cattle-raising region of Somersetshire is noted especially for the manufacture of Cheddar cheese and other dairy products. Since the agricultural areas are mostly in large estates, England adheres to the tenant system of farming; but with the increased taxation since the World War many estates that had been held by the same families for nearly 1,000 years are being gradually broken up. The more famous estates in northwestern Nottingham (east central England) are known as the *Dukeries*. The surviving forests of England are the royal New Forest, Sherwood Forest of Robin Hood fame, Epping Forest and the Forest of Dean; their principal trees are the oak, beech and pine.

Harris & Ewing

Windsor Castle in Berkshire

Windsor Castle, 21¼ miles west of London, has been the home of the royal family since the time of William the Conqueror. This is a view of the southern side of the castle, with King Henry VIII's Gateway in the left foreground. The Gateway leads to St. George's Chapel, in the choir of which are the stalls of the Knights of the Garter. In the left background is the massive Round Tower

Industrial England. It is natural that England, as the birthplace of the Industrial Revolution, should be an industrial country with a preponderant urban population. Although it has to import some 60 per cent of the needed foodstuffs, its mines furnish plenty of coal, iron, tin, copper and other ores. From the chalk beds underlying the southern part of the country limestone is obtained in large quantities. Hanley and the other pottery towns of Staffordshire (the Five Towns of Arnold Bennett's novels) have exploited for centuries the fine clay beds of the region. The deposits of slate, gypsum, granite, sandstone and salt afford other large sources of revenue.

The great manufacturing centers are near the mineral deposits or the source of supply of wool and other needed raw materials. Sheffield specializes in cutlery; Wolverhampton in hardware; and Nottingham in lace. Manchester, Oldham and Preston are among the world's greatest cotton manufacturing centers; Bradford, Leicester and Leeds have played an important part in the development of the modern woolen industry; and Halifax has long been noted for the production of carpets. Until the depression Newcastle-on-Tyne was the greatest English shipbuilding center.

London, the capital and chief seaport, and Liverpool, another important seaport, are described in separate articles. More than 40 years ago Manchester was transformed into a seaport by the Manchester Ship Canal across the southern part of Lancashire, which enables 15,000-ton ships to sail 35 miles inland from Liverpool. Portsmouth on the southern coast of Hampshire is the great British naval center. Near it is located Southampton that in recent years has taken the lead in transatlantic traffic. From Yarmouth on the Norfolk coast the numerous fishing trawls set out and from the Dogger Bank to Iceland scout the North Sea for herring, haddock and other fish. Hull, Boston, Bristol, Falmouth and Plymouth are the other important English ports. The only survivor of the Cinque (Five) Ports, to which Edward III granted special privileges in exchange for their providing a certain number of ships in wartime, is Dover. Romney, Hythe and Sandwich have been deserted by the sea, and Hastings, near which William the Conqueror established his prerogative in 1066, is now a seaside resort.

Cultural England. Oxford and Cambridge, the two leading English universities, are in the shires of those names. Oxford University, founded in the 12th century, is noted in particular as the seat of the Bodleian Library; the more famous of its 22 colleges are Magdalen, Christ Church, All Souls and Corpus Christi. The equally ancient Cambridge University consists of 17 colleges, whose finest specimens of Tudor architecture are the chapel of King's College and the Erasmus Court of Queen's College. Among England's other noted educational institutions are the universities of London, Liverpool, Manchester, Durham, Birmingham, Leeds, Sheffield and Bristol.

In the vicinity of Oxford is picturesque Warwickshire, more commonly known as the Shakespeare country. Its heart is Stratford-on-Avon. Each summer thousands of pilgrims visit Shakespeare's birthplace, the Anne Hathaway cottage where he courted his wife and Holy Trinity Church where he is buried and attend performances of his plays in the modernistic Shakespeare Memorial Theater. The commercial center of the country is Birmingham, ranking next to London in size (population more than 1,000,000) and noted for the manufacture of automobiles, jewelry and other metal products; the city library boasts a large collection of Shakespeareana and the Council House is one of the finest Renaissance buildings in England. Warwickshire's principal town of legendary fame is Coventry, through whose streets 900 years ago rode Lady Godiva. All that the age of chivalry meant to England is summed up in Warwick Castle and the ruins of Kenilworth Castle, immortalized by Sir Walter Scott in *Kenilworth,* his novel of Elizabethan days. The start of most excursions to the Shakespeare country is the noted spa of Leamington.

England's principal dramatic festival is held each summer at Great Malvern, nestling among the Malvern Hills of Worcestershire. Near Banbury in Oxfordshire is Sulgrave Manor, the ancestral home of George Washington. Other quaint villages of this Midland region are Broadway, Amersham, Chipping Camden and Henley-in-Arden. With their thatch-roofed cottages, surrounded by typically English gardens, they have changed but little since feudal days and enhance England's reputation as having the most attractive rural landscape in the world.

Picturesque and Historical England. The south of England is noted for its watering places, the best-known being Brighton, Eastbourne, Margate and Bournemouth. On the southern coast of Devonshire are Torquay and Teignmouth and on the northern coast, Ilfracombe and the twin towns of Lynton and Lynmouth. Somersetshire possesses the famous spa of Bath (dating from Roman times) and Kent has that known as Tunbridge Wells. Avice's Cottage on Portland Island has been converted into a museum in memory of Thomas Hardy who immortalized the surrounding region of Dorsetshire in *Tess of the D'Urbervilles* and other novels.

The southwestern extremity of Cornwall is a rocky promontory, Land's End. The rocky fortress of Tintagel on the northern coast of Cornwall is one of the famed locales of the Arthurian legend. Among the quaint villages of England's southland are St. Ives, Selbourne, Newlyn, Dunster and Clovelly. The principal town of legendary fame is Glastonbury, whose ruined abbey is said to be the first Christian church in England and to have been founded by Joseph of Arimathea.

The eastern and northwestern parts of England are famous for their lakes. In Essex, Suffolk and Norfolk are the Broads, a series of small lakes linked by narrow waterways for a distance of more than 150 miles. The lake region of Cumberland, Westmorland and Lancashire, consisting of rocky crags, smooth moorland and sky-blue water, covers a total area of 35 square miles. With it are associated the names of some of the greatest English men of letters: Wordsworth, Coleridge and Southey lived at Grasmere; Shelley, at Keswick on Derwentwater; and De Quincey, at Rydal Water. Among the other lakes are Windermere, Thirlmere, Ullswater and Wastwater. This northern lake country is also noted for the Roman Wall, built by the Emperor Hadrian as a defense against the Picts; it extends for 73 miles from Wallsend-on-Tyne to Carlisle.

Especially Elizabethan in atmosphere is the Cheshire town of Chester, with its half-timbered houses and inns; the famous *rows* of covered galleries that have been cut from the first floors of the buildings; and the 14th-century town wall. A medieval tradition clings also to most of the English cathedral towns, the more notable of which are Lincoln, St. Albans, Lichfield, Salisbury, Winchester, Exeter, Wells, Norwich, Ripon, Ely, Durham and York. One of the most famous music festivals is that given each September by the choirs of Gloucester, Hereford and Worcester cathedrals; it is called the *Three Choirs Festival* and is held alternately in one of the three cathedrals. The Abbeys of Tewkesbury, Selby and Hexham are three of the finest examples of Norman architecture in England. Equally famous are the ruins of Fountains, Whitby and Tintern abbeys. The mother city of the Church of England is Canterbury. It is the see of the Archbishop of Canterbury, Primate of All England, and during the Middle Ages, as recounted in Chaucer's *Canterbury Tales,* hundreds of pilgrims annually visited the shrine erected in the cathedral to the murdered archbishop, Thomas à Becket.

Courtesy Associated British & Irish Railways, Inc.

Tom Tower, Christ Church College, Oxford

Tom Tower, designed by Christopher Wren in 1682 over Cardinal Wolsey's gateway, the college's main entrance, contains Great Tom, the huge bell that once belonged to Osney Abbey. Every evening at 9 o'clock 101 strokes, each in honor of a member of the original foundation, are sounded on Great Tom as a signal for closing the gates of all the colleges

The name *England* is derived from Englaland, meaning the land of the Engles or Angles who in the 5th century were the first invaders of Britain after the Romans. It was bestowed by Egbert, King of the West Saxons, who on subduing all the other kings of the country, proclaimed himself high king at a council held in Winchester in 829.

English Channel, a reach of the Atlantic Ocean that lies between England and France and that is one of the most important waterways in the world. The Strait of Dover connects it with the North Sea. From the strait the channel extends in a generally southwestern direction for 350 miles and varies in width from 20 to 140 miles. The average depth is about 200 feet; the area is about 30,000 square miles. The entrance to the Atlantic is at the chops, guarded by Ushant Isle and the Scilly Isles. Beyond them lie the Channel Islands and the Isle of Wight. The English coast line is 390 miles long, with the ports of Southhampton, Plymouth, Portsmouth, Brighton, Falmouth, Folkestone and Dover; the French coast line that extends 570 miles has the ports of Havre, Cherbourg, Dieppe, Boulogne and Calais. Shallow water, cross currents and high tides make the channel crossing rough and disagreeable. Tunnels have been planned at various times, but they never materialized because Great Britain feared a possible invasion in time of war.

The French call the English Channel *La Manche* (meaning sleeve). Many important historical events have occurred here, including the defeat of the Spanish Armada in 1588, the battle of La Hogue in which the English and Dutch defeated the French in 1692 and the sinking of the Confederate commerce destroyer *Alabama* by the *Kearsage* in 1864.

Ephrata Cloisters, Ephrata, Pa. A group of severely plain four-story houses, built before the Revolution, in which lived a strict religious sect, founded by Conrad Beissel, under conditions approaching the extreme simplicity of medieval monastic houses. The cheerless narrow cells and communal workrooms are preserved in their original state.

equator, an imaginary line marking the center of the Torrid Zone and encircling the earth 90° equidistant from the North and South poles. It divides the earth into the Northern and Southern hemispheres, and from it (as zero) the various degrees of latitude are measured. The length of the equator is 24,902 miles, 42 miles greater than the earth's meridianal circumference via the poles. The earth's equatorial diameter is 7,926 miles. The word *equator*, of Latin derivation, means something that equalizes.

The equinoxes—periods when day and night are equal in length at the equator—occur when the sun passes either of the equinoctial points on the celestial equator and is directly over the terrestrial equator. At the time of the vernal equinox (March 21), the sun is crossing from the Southern to the Northern Hemisphere of the celestial sphere; at the time of the autumnal equinox (September 22), it passes from the Northern to the Southern Hemisphere.

In the earth's Northern Hemisphere the days lengthen until the sun enters the summer solstice on June 21, the longest day of the year. Thereafter they become shorter, and when the sun enters the winter solstice on December 22, the shortest day of the year is reached. In the Southern Hemisphere these conditions, which cause the seasons, are reversed.

Summer and winter, spring and autumn in both hemispheres depend, of course, largely on the amount of heat that the earth receives from the sun. On the sun's so-called northward journey to the Tropic of Cancer the Northern Hemisphere is tipped toward it; on its southward journey to the Tropic of Capricorn, the Southern Hemisphere falls more in the circle of illumination.

During the equinoxes the sun's rays fall vertically on the equator, obliquely on the Temperate Zones and horizontally on the polar areas. In its yearly revolution with the other planets in an elliptical path about the sun, the earth is nearest that body in January, when it is 91,342,000 miles away, and farthest from it in July, when the distance is 94,452,000 miles. At the equinoxes the earth is 92,898,000 miles distant from the sun.

Erie, the fourth in size of the five Great Lakes of North America and the shallowest (210 feet). It lies between the province of Ontario, Canada, on the north and the states of Ohio, Pennsylvania and New York on the south. Lake Huron flows into it through the straitlike St. Clair and Detroit rivers and Lake St. Clair. Its waters reach Lake Ontario through the Niagara River, famous for its 167-foot-high waterfalls. The principal ports on Lake Erie are Toledo and Cleveland, Ohio; Erie, Pa.; and Buffalo, N. Y. Rivers flowing into it are the Maumee, Sandusky and Cuyahoga rivers of Ohio. The 27-mile-long Welland Canal, connecting lakes Ontario and Erie in Canada, enables traffic to continue westward despite the barrier presented by Niagara Falls. The New York State Barge Canal connects Lake Erie with the Hudson River and hence with New York city and the Atlantic Ocean. In the Battle of Lake Erie in the War of 1812 Commander Oliver H. Perry defeated the British fleet at Put in Bay (west end of the lake) and gained control of the lake. Soon thereafter an international boundary through the center of the lake was established.

erosion, a process whereby surface features of the earth, such as mountains, hills, plains, plateaus, valleys and coasts, are worn down or changed in form. The eroding agents may be the air and rainfall (containing carbonic acid, nitric acid and ammonia, which slowly decompose rocks) or sunshine, wind, frost and melting snow. Rivers, glaciers and the tides and waves of the sea also contribute to this action.

The fantastic red-sandstone shapes, resembling animals and human forms in the Garden of the Gods near Colorado Springs, Colo., are excellent examples of erosion. Similar natural sculptures are found in the Bad Lands of South Dakota. From the volcanic, sepulcherlike rocks covered with travertine that was deposited thousands of years ago by the Mammoth Hot Springs in Yellowstone National Park, erosion carved the Hoodoos. The word *erosion* is derived from the Latin *erodere,* meaning to gnaw.

escarpment, a high, steep slope or cliff, generally caused by erosion and marking the boundary of different strata. Often an escarpment separates one level from another, as, for example, the Niagara, which divides the lower lands about Lake Ontario from the higher ones of Lake Erie. Typical escarpments formed by erosion or weathering are those in Bryce Canyon, Utah, which, through exposure of the harder strata after the softer strata of the plateau have been washed away, attain a height of 1,500 to 2,000 feet.

estuary, the lower, widened portion of a river, resembling a fiord in its strong tidal action and formed by the sinking of the river valley or coast at the river's mouth. Among outstanding estuaries are those of the St. Lawrence in Canada, the Delaware in the United States, the Thames in England and the Elbe in Germany. Oysters thrive in the estuarine deposits or mud flats that line another famous estuary, Chesapeake Bay. The word is derived from the Latin *aestus,* meaning tide.

Estonia, a Baltic State, since 1940 a part of the Russian Soviet. Like its sister republics, Latvia and Lithuania, it was a Russian province previous to the Russian Revolution of 1917, having fallen to that country in Sweden's surrender to Peter the Great in 1721. In February 1918 it became an independent republic. Estonia is composed of Estonia proper and the Estonian-speaking sections of the former Russian districts of Livonia, Pskov and Petrograd. It is bounded by the Gulf of Finland on the north, the U.S.S.R. on the east, Latvia on the south; and the Gulf of Riga and the Baltic Sea on the west. The area is 18,353 square miles, and the population about 1,125,000. These statistics include the large islands of Saaremaa, Hiiumaa, Mukumaa and Vormsi in the Baltic.

The country is a plain with the highest elevation (in the southeastern part) only 450 feet. The coastal region is low and in parts is covered with peat bogs. Inland there are numerous lakes that have formed in glacial moraines. The largest is Lake Peipus on the border between Estonia and the U.S.S.R.; its area is 1,357 square miles. The principal river is the Narova. Estonia is primarily a nation of peasants. The size of each holding is fixed at 186 acres in accordance with the Land Reform Act of 1919 by which the great estates of the Baltic nobility and of the Russian Orthodox Church were divided.

Of the cultivable two-thirds area of the country half is devoted to pasturage for cattle and sheep. The principal crops are rye, oats, barley, wheat, buckwheat, flax, sugar beets, potatoes and legumes. Butter is the chief dairy product. Lumber, however, is the leading export, for forests of spruce, pine, fir, birch, poplar and aspen cover a fifth of the area. The principal manufactures are cotton, woolen and linen goods, paper, matches and chemicals. The most important mineral product is petroleum.

Courtesy Consulate General of Estonia

Olai Church in Tallinn, the Estonian Capital

The principal cities of Estonia are: Tallinn (formerly Reval), the capital; Tartu (formerly Dorpat), seat of a university that was founded by Gustavus Adolphus in 1632 and renamed in 1919 the Estonian National University; Narva, a manufacturing center; and Parnu, next to Tallinn the most important port. Tallinn (population, 136,000) possesses many reminders of the days when it was one of the leading cities of the Hanseatic League —the grim, thick-walled Toompea Castle, dating from the early 13th century; the 14th-century Town Hall; the Byzantine-domed cathedral of the Russian Church; and the ancient Schwartzhaupter Club House, where merchant members of the league met on business and social occasions.

Until adoption of a revised constitution in 1937 executive power was vested in the prime minister, called the *Riigiwanem* or State Head, who was assisted by a ministry. The President was elected for a 6-year term, being chosen from three candidates nominated by the two chambers of the National Assembly (*Riigikogu*); the electoral college consisted of 80 special representatives from the town and rural districts. The upper chamber had 40 members, chosen partly by the parish administrative departments and partly by the professional corporations; and the lower chamber's 80 members were elected by direct popular vote to serve 4 years.

The constitution guaranteed cultural autonomy to the minorities, Russians, Germans, Finns, Letts and Swedes, who comprised about 5 per cent of the population. This autonomy included use of its own language by each minority group and instruction in that language in especially established schools. The Estonians themselves are related to the Finnish-Ugrian family. They have a strong racial feeling, keeping alive their folklore and folk songs and dances. Every 5 years they hold a national folk festival, called the *Laulu Pidu.*

Euboea, the largest island of the Grecian Archipelago in the Aegean Sea, separated from the mainland by the Atalante Channel. The area is 1,430 square miles, and the population is about 155,000. It is mountainous, the highest peaks being Mts. Delphi and St. Elias. The slopes of the mountains afford good pasturage for sheep, cattle and goats. The principal agricultural products are wool, cotton and wine. Iron, copper and magnesite are mined. Marble (cipolin) from Euboean quarries has always been in demand. The principal city and seaport is Chalcis. Now the island is a part of the central department of Greece. It has been successively held or dominated by Athens, Persia, Macedonia, Rome, Venice (with which its other name, Negroponte, originated) and Turkey. In 1830 along with Greece, it achieved independence. The name *Euboea* is the Latin form of a Greek word, meaning rich in cattle. The Italian name is *Negroponte.*

Euphrates, the largest river of western Asia. It is formed by the joining of two streams, the Kara Su or Western Euphrates and the Murad Su or Eastern Euphrates, which both rise near Mt. Ararat. It flows in a general southwestward direction across Turkey, Syria and Iraq. After joining the Tigris, which rises in northern Turkey and whose course is more or less parallel to that of the Euphrates in the eastern part of Iraq, the stream is known as the Shatt al Arab and empties into the Persian Gulf. The Euphrates is 1,716 miles long. Above its confluence with the Tigris it is navigable only by small, flat-bottomed boats on account of numerous rapids and a channel depth of only 5 feet. Part of the river's waters are diverted for irrigation purposes.

No longer of commercial importance, the Euphrates was once the main water highway of Asia Minor. The Garden of Eden was supposedly located at the point of land where the Tigris and Euphrates join. To the Euphrates the Assyrian, Babylonian and Chaldean civilizations largely owed their development. Among the many great cities that grew up along its course were Babylon, Ur, Erech and Sippar. Archeologists have made many interesting discoveries on the sites of these cities; at Ur they found historical evidence of the great flood described in the book of Genesis.

Europe, the smaller part of the continental mass called *Eurasia.* It may be considered a great peninsula extending westward from Asia, the division between the two occurring roughly on the line of the Ural Mountains and the Caspian Sea. Although after Australia Europe is the smallest of the continents, for more than 1,000 years it has been the most important geographical area in wealth and economic achievement. No other continent has had so great an influence either politically or culturally. Europe ranks next to Asia in population, for closely crowded into its 34 countries, covering an area of 3,750,000 square miles, are about 550,000,000 persons. No other continent is so densely populated as Europe; Asia has twice as many people, but its area is nearly five times as great.

The Continent experiences a wide range of climate. It reaches so far beyond the Arctic Circle that for 3 months of the year the sun shines continuously at its northernmost point, the North Cape on the Norwegian island of Magerö; and for a similar period in winter the Cape experiences total darkness. Winter in the southern part is a delightful contrast, especially along the Riviera sections of France, Italy and Yugoslavia. In view of its location between 36° and 72° N. Lat., Europe would be a cold continent but for the Gulf Stream that tempers the climate of all the western countries and modifies the otherwise rigorous climate of the northern countries.

No other continent has a more deeply indented coast or a longer coastal mileage than Europe. Along the Atlantic and Arctic oceans and along the Mediterranean Sea with its various arms (the Adriatic and Aegean seas) and the Black, Caspian, Baltic and North seas this coast line measures about 50,000 miles. No country of Europe is more than 400 miles from the sea; and now only Czechoslovakia, Hungary and Switzerland are entirely landlocked. For many centuries the argosies of European powers have sailed the seas and have enriched their peoples. It was largely through its maritime exploits that Great Britain erected a mighty empire that today covers about a fourth of the globe and controls the political destinies of nearly half a billion persons. In addition to Great Britain the other important islands of Europe are Ireland, Iceland, Sicily, Sardinia, Corsica, Crete and Cyprus.

Only the central part of Europe is very mountainous. It has two great systems rising above the generally plainlike surface. The Alps, whose highest peak is Mt. Blanc (15,781 feet), are centered in Switzerland, eastern France, western Austria and northern Italy, with extensions into the Balkan Peninsula; the Carpathians form the boundary between Poland and Czechoslovakia. Between France and Spain the Pyrenees form a natural barrier. In the southern part of the U.S.S.R. is the Caucasus range with the highest peak in Europe, Mt. Elbrus (18,465 feet). The chief rivers of Europe are: the Rhine and Elbe, which flow into the North Sea; the Oder and Vistula, into the Baltic Sea; the Rhone, into the Mediterranean; the Po, into the Adriatic; the Volga, into the Caspian; and the Danube, Don and Dnieper, into the Black Sea.

Each of the 34 European countries is described in a separate article. The name *Europe* is derived through the Latin from two Greek words that seem to mean broad face (of the earth).

Everest, the highest mountain peak in the world (29,141 feet, more than 5½ miles) on the Tibet and Nepal frontier, called *Chomo-lungma* by the Tibetans. Its English name is in honor of Sir George Everest, British surveyor-general in India, who first determined its position and altitude in 1841. In recent years four attempts have been made to climb to the summit of Mt. Everest, and in 1924 two Englishmen apparently came within 600 feet of the top and then disappeared. Early in 1938 it was announced that a British expedition would attempt once more to conquer the peak.

everglade, a tract of low, swampy land, many parts of which are covered with water, surrounding small hummocks of earth or islands of varied vegetation. *The Everglades* of southern Florida extend from Lake Okeechobee southward for more than 100 miles. The water is supplied in part by the lake, which has no natural outlet; and in part by the heavy summer rainfall of the region; its depth varies from 1 foot to 6 feet, although in dry seasons the water is much shallower. Throughout the Everglades there are islands bearing pine, cypress and palm trees and other tropical vegetation. Some areas are covered with an extremely dense growth of saw grass. Some parts of the Everglades have been reclaimed by digging drainage canals, and more canals are planned. The reclaimed land is of value in raising sugar cane and truck garden produce. The Everglades are the home of the Seminole Indians, who opposed cession of their land to the United States Government and fled there in 1842 after the defeat of their chief Osceola.

Faeroes, a group of 21 islands in the North Atlantic Ocean, about 300 miles northwest of the Shetland Islands; they belong to Denmark. Of the 17 that are inhabited the principal islands Strömö, Osterö, Suderö, Sandö, Vaagö (2 islands) and Bordö. The total area is 540 square miles. The population (of Norse descent) numbers 24,200; most of the people live by fishing, whaling and sheep raising (Faeroes means sheep islands). At the capital, Thorshavn, on the island of Strömö sits the *lagthing* or local parliament. As an *amt* or county of Denmark the Faeroe Islands are represented in the Danish *Landsthing* or national Parliament.

Falkland Islands, a group of more than 100 islands and islets in the South Atlantic Ocean, about 250 miles east of southern Argentina and constituting a British Crown colony. The area is 5,618 square miles, and the population, mostly Scottish colonists, numbers 3,101. The capital, Port Stanley, is on East Falkland Island. Separating East and West Falkland islands is Falkland Sound. The principal industries are whaling and sheep, cattle and horse raising. The Falkland Islands were sighted by the British navigator, John Davis, in 1592; and after being controlled by France and Spain were claimed by Great Britain in 1832. Since 1908 the governor and executive and legislative councils at Port Stanley have supervised such dependencies as South Georgia, a whaling station located 900 miles to the southeast, covering an area of 1,600 square miles and having a population of 562, the South Sandwich, South Orkney and South Shetland islands and Graham's Land, part of Antarctica. Argentina never relinquished her claim to the Falkland Islands and in 1937 issued a postage stamp with a map that showed the islands as a part of Argentina.

fall line, the edge of a plateau over which streams descend suddenly, forming waterfalls. Along nearly the entire Atlantic coast of the United States a narrow coastal plain extends from the shore line to higher elevations inland. For nearly this entire distance the low ranges of the Green, White, Adirondack, Allegheny, Blue Ridge, Cumberland, Great Smoky and other mountains of the Appalachian system run nearly parallel to the plain. These mountains form a watershed that forces rivers to flow eastward or westward.

The eastward rivers flow swiftly to the Atlantic Ocean, a line of falls marking their passage over the piedmont plain (foothill plain) from the high plateau to the softer soil of the coastal plain. Since these falls have immense potential water power, they have attracted the establishment of important cities from Portland, Me., to Columbus, Ga. The fall line marks the limit to which ocean-going vessels can ascend a river; therefore these cities, being at the head of navigation, have become important shipping centers.

With the aid of a map the fall line of the eastern United States may be traced from Maine to Georgia by locating the various key cities, such as Philadelphia and Baltimore, situated on or at the mouths of important rivers.

fault, any displacement resulting from the dislocation of rock strata along a plane of fracture through prolonged strain in a certain stratum. Where there are faults there are likely to be earthquakes. There are three kinds of faults: *Strike faults,* which are horizontal to the strike of the bed of stratified rocks; *dip faults,* whose scarps are parallel to the vertical dip of the strata; and *oblique faults,* which being intermediate between the strike and dip faults assume a so-called normal strike-fault angle.

Many evidences of faults may be found in the Rocky and Sierra Nevada mountains, as well as in sections, such as San Francisco and Santa Barbara, Calif., that have been previously visited by earthquakes. Death Valley in California, the Dead Sea in Palestine and the Great Rift of North Africa are results of faulting.

fen, low land partially covered with water and largely overgrown with sedges and other aquatic vegetation. In England the word is used most often to describe marshy areas not unlike the bogs of Ireland. The term Fen Country or the Fens is applied to a part of eastern England, particularly Lincolnshire, which is reclaimed fen land. The Fenway, a beautiful residential section of Boston, Mass., was so named from the fact that it was once a fenlike area. Finland is the country of fens.

Fernando Po, an island of volcanic origin in the Bight of Biafra, about 20 miles off the coast of the Cameroons. It belongs to Spain. The area is 810 square miles, and the population is about 21,000. The inhabitants in the interior are called *Bubis;* and on the coast, *Portos.* The capital is Santa Isabel or Port Clarence. The highest peak of the rugged surface is Pico de Santa Isabel or Clarence Peak (14,683 feet). On the mountain slopes are forests of mahogany, ebony and the African oak. The agricultural products are cotton, sugar cane, coffee, tobacco, rice, millet, yams and bananas. Discovered in 1471 by Fernando Po, a Portuguese navigator, and ceded to Spain in 1778, the island, with the permission of Spain, was used by the British as a station for vessels engaged in suppressing the slave traffic prior to England's abolition of slavery in 1833 and for 10 years after.

field, an expanse of naturally open, grassy land, usually more or less flat and without trees. The term may also refer to a plot of land, often enclosed, that is used for some special purpose such as raising crops or pasturage for cattle.

In a somewhat more restricted sense, the word *field* is applied to an area that yields a particular product, as a cotton field or potato field. When referring to larger areas, the plural *fields* is ordinarily used. Thus, regions that are devoted to the raising of wheat are known as wheat fields; those in which gold is found are known as gold fields.

Many common place names, such as Pittsfield, Bloomfield, Plainfield, Deerfield and Springfield, incorporate the word *field.*

Fifth Avenue, one of New York's most beautiful streets, extending for 6½ miles from the Washington Arch, designed by Stanford White, on the north side of Washington Square, to the Harlem River at 140th Street. It was once famous as an exclusive residential center and now is known for the shops and department stores that line it from 34th to 59th streets. It borders Central Park from 59th Street to 110th Street, through which section it is still a noted residential street. The most notable structures on Fifth Avenue are the Empire State Building, the New York Public Library, several buildings of Rockefeller Center, the Metropolitan Museum of Art, the Museum of the City of New York and such churches as St. Patrick's Cathedral and St. Thomas's (Protestant Episcopal) Church.

Fiji or **Viti Islands,** a group of islands, mostly of coral formation, in the South Pacific Ocean, constituting a British Crown colony. They lie between 15° and 20° S. Lat. and 177° and 180° E. Long. and belong to the Polynesian section of Oceania. There are some 250 islands that cover a total area of 7,083 square miles and of which about 80 are inhabited. The principal islands are Viti Levu with the capital Suva, Vanua Levu, Taveuni and Kandavu. These larger islands are of volcanic formation, and their mountains rise 4,000 feet or more above sea level. The Rewa on Viti Levu is the principal river.

The position of the islands in the track of the trade winds and northwest monsoon makes bountiful crops of sugar cane, copra, bananas and pineapples; and coffee, tea, tobacco, yams, sweet potatoes, taro and kava are raised. The sandalwood tree furnishes the most valued timber. Pearl shells, tortoise shells and rubber are among the most important exports. The population (about 190,000) is a mixture of the Melanesian and Polynesian races, with several thousand Indian and Chinese coolies who were imported to work on the great plantations.

The Fiji Islands were discovered in part by Abel Tasman, the Dutch navigator, in 1643 and in part by Capt. James Cook, the British explorer, in 1773. The islanders' reputation for cannibalism limited western intercourse until Great Britain annexed the Fijis in 1874. The 17 provinces of the islands are ruled by native chiefs or European commissioners. Assisting the British governor are executive and legislative councils composed in part of Fijians. As high commissioner for the western Pacific the governor of the Fiji Islands has control also of most of the British possessions in Oceania.

Finland, a republic of northern Europe, bounded by Norwegian Lapland and the Arctic Ocean on the north; by the U.S.S.R. on the east; by the Gulf of Finland on the south; and by the Gulf of Bothnia and Sweden on the west. In the Gulf of Bothnia are the Ahvenanmaa or Åland Islands, which were assigned to Finland by the Council of the League of Nations in 1921 because they were a geological continuation of the Finnish peninsula. The country's southern boundary is on the 60th parallel of latitude, and it extends beyond the Arctic Circle to the 70th parallel and the region known as Lapland. The cession of Petjeng or Petsamo by the Soviet Government in 1920 gave Finland an outlet on the Arctic.

Finland covers an area of 116,416 square miles or, if the water area of its 35,000 lakes is included, 149,903 square miles. It is in the heart of the glaciated region of the last Ice Age, and thousands of lakes were formed in its southern part in the moraines left by the great glaciers. Many of these lakes are joined by canals, which afford an additional means of communication. The larg-

Courtesy Finnish Travel Information Bureau

A Medieval Castle in Eastern Finland

Olavinlinna Castle, built in 1475, is on an island in the heart of the town of Savonlinna, which itself is built on numerous islands connected by bridges. This fortress-castle played an important part in the frequent wars between Russia and Sweden during the 18th century when Finland was a part of Sweden

est is Lake Ladoga, whose area of 7,004 square miles makes it the largest in Europe; it is in the southeast on the boundary between Finland and the U.S.S.R. Among other important lakes are Saima, Päijänne and Kalla. From the low coastal plain the land rises to a tableland 600 feet above sea level. In the extreme northern part are the Halditjokko or Maanselka Mountains, more than 4,000 feet high.

Of the total population (3,670,000) almost 90 per cent are Finns. Ethnologically they are related to the Turks, the Magyars of Hungary and the Estonians. The rest of the inhabitants are of Swedish, Russian and German extraction, and in the northern part are some 2,000 Lapps. The Constitution guarantees to these minorities (especially the Swedish who constitute 10 per cent of the population) linguistic, educational and social privileges.

Though the climate is cold, the winters are long and only 7 per cent of the land is cultivable, agriculture is the chief occupation. Such hardy crops as rye, barley, oats and potatoes lead in production. The most important dairy products are butter and cheese. Along the extensive seacoasts and in the inland lakes fishing has been developed on a large scale. The principal minerals are iron, copper and granite. Since forests cover almost 75 per cent of the total land area, timber, paper and wood-pulp industries are of great importance. The principal trees are fir, pine, spruce, birch, oak and larch. Half of the forest area is state-owned. Other manufactures, which largely owe their existence to the highly developed water power in such cities as Tampere (Tammerfors), are iron products, textiles, cigarettes, leather goods and chemicals. All Finland's manufactures and commercial activities are dominated by the co-operative system.

After being a grand duchy of the Russian Empire for more than 100 years Finland proclaimed its independence on the downfall of the Czar in 1917, and 2 years later, after the defeat of the Communist element with German aid, the Republic was firmly established. The executive is a president, chosen by popular vote (through an electoral college) for a 6-year term. He is assisted by the Council of State of 10 ministers, headed by a premier. The unicameral Parliament or Diet is known as the *Eduskunta;* it consists of some 200 members, elected according to proportional representation from the nine provinces for a term of 3 years. This legislative chamber has enacted much progressive social legislation. Education is compulsory, more than 90 per cent of the population is literate and the school enrolment includes about 97 per cent of the children of school age. Finland led in the adoption of woman suffrage in 1906 and of prohibition in 1919, but after 13 years' trial prohibition was repealed.

The capital, Helsinki (Helsingfors), is described in a separate article. Turku (Åbo) has been an important commercial center of the Baltic region since its founding in the 13th century. It was the capital of Finland until 1819. The most notable of its medieval structures is the romanesque Cathedral of St. Henry, named for the canonized bishop of Uppsala who at the command of the Swedish conqueror Eric IX, converted the Finns to Christianity in the 12th century and later became the patron saint of Finland. The New Castle, erected in the 16th century, is now a historical museum. Viipuri (Viborg) is located in southeastern Finland near the mighty Imatra Rapids of the Vuokski River, which discharges into Lake Ladoga. The 13th-century fortress and the wall that surrounds the older part of the city afford an excellent idea of how the Finnish people lived and were protected 500 years ago.

The name *Finland* (properly Fenland) means the land of marshes, and so does the Finnish name *Suomi* or *Suomen Tasavalta.*

fiord or fjord, a narrow inlet of the sea or ocean that penetrates deeply in-

Courtesy Norwegian Travel Information Office

Along a Norwegian Fiord

Seven Sisters' Waterfalls in Sünmore County, Norway, flow into the Geiranger fiord. The falls are on the northern side of the narrow fiord, surrounded by mountains ranging from 3,000 to 5,000 feet high land between mountains or high, steep cliffs. The formation is probably the result of glacial action and erosion of the seacoast in bygone ages. It may be attributed also to the depression of a mountainous region that about 25,000 years ago turned valleys into undersea canyons. The word *fiord* is derived from the Norwegian.

The coast of Norway has the most notable fiords in the world. One of them, Sogne Fiord, extends inland through steep, rocky walls for 133 miles and in some places is 4,000 feet deep. Fiords are found also on the coasts of Alaska, Greenland, Chile, British Columbia and New Zealand. The bays indenting the coast of Maine may be considered fiords; and so may the lower parts of the Hudson River, where it is bordered on its west bank by steep cliffs known as the Palisades.

firth, an arm of the sea, as the Firth of Forth and Firth of Clyde in Scotland. It has many of the characteristics of a fiord and is also akin to an estuary. The word is derived from the Icelandic word meaning fiord.

fissure, a narrow opening, cleft or fracture in a rock not accompanied by dislocation of strata; or a crevasse in a glacier. The Latin *fissura* comes from the verb *findere,* cleave.

Flaminian Way, one of the oldest and most famous of the northern highways of Italy. It extends 210 miles from Rome to Rimini and was built by the censor Gaius Flaminius in 220 B.C. As the Aemilian Way it was continued by Marcus Aemilius Lepidus to Mediolanum (Milan) in 187 B.C.

Fleet Street, a London street running from Ludgate Circus to Aldwych where it continues as the Strand. On it from the 12th to the middle part of the 19th century stood the infamous Fleet Prison, used during its latter days as a debtors' prison. Today the street is England's great journalistic center. It is named for the Fleet River, a one-time tributary of the Thames.

flood, a spreading of the area of a river, generally caused by a mature or old river overflowing its banks after excessive rains or melting ice and snow. Some rivers, notably the Nile, have beneficial annual floods that deposit fertile soil in the form of bottom lands along their banks. The floods of other rivers have proved particularly destructive. Overflows of the Hwang Ho or Yellow River of China and of the Ganges River of India, largely caused by loess formations in the river valleys, periodically destroy hundreds of thousands of lives and leave millions homeless. The annual floods of the Amazon force rubber-gatherers to discontinue their work during the rainiest months—November to May.

In the United States during spring freshets the Mississippi, Ohio, Missouri, Susquehanna, Connecticut and other rivers often overflow their banks. According to geologists these floods have been further occasioned by a continual slight raising during past centuries of the Canadian prairies, so that they are resuming the position they had before the last ice age, when they sank beneath a gigantic blanket of glacial ice. In the northern part of Canada, poleward-flowing rivers, like the Mackenzie, are subject to spring floods caused by ice packs in the still frozen lower parts.

The Netherlands, partly below sea level, suffered in the past from sea floods, when the dikes burst. Tropical hurricanes and so-called tidal waves or earthquakes also have caused floods in Galveston, Tex., Lisbon, Portugal, and Messina, Italy.

Among methods of river-flood control are: building artificial levees and dams for the storage of surplus water; and correcting meanders in a river so as to enable it to increase its velocity and thereby deepen its channel. Other methods employed to prevent excessive soil erosion and accompanying floods are reforestation, contour-plowing to hold water on hillsides, and strip-cropping or planting alternate strips of crops that do and do not require cultivation.

Florence, a city of Italy and capital of a province of the same name in the Tuscany section; it is situated on the Arno River near the foothills of the Apennines. As a great city-state of the 13th and 14th centuries, when power was generally concentrated in the hands of an aristocracy of the wealthier merchant guilds, and as

GREAT FLOODS

LOCATION	EFFECT	YEAR
Zealand, Denmark	1,300 drowned	1717
Yorkshire, England	Great property loss	1771
Navarre, France	2,000 persons drowned	1787
Dublin, Ireland	River Liffey overflowed, causing great property damage	1802
Lorca, Commune of Murcia, Spain	Floods caused great property damage	1802
Hungary	Overflow of Danube River destroyed 24 villages	1811
Austria, Hungary, Poland	Great loss of life and property; 4,000 persons said to have been lost	1813
Prussian Silesia	6,000 drowned; ruin of French army accelerated by the flood	1813
Germany	Great loss of life and property	1816
England	5,000 acres flooded in the Fen country	1819
St. Petersburg and Kronstadt, Russia	Neva River flood took 10,000 lives	1824
Danzig	Vistula River broke its dikes, many lives lost, much property destroyed	1829
Vienna, Austria	50,000 houses under water	1830
France	Over 600 houses swept away at Avignon, Marseille, Nîmes	1840
France	Floods in central and western France destroyed property valued at over 100,000,000 francs	1846
New Orleans, La.	1,600 houses flooded	1849
Sheffield, England	Bradfield reservoir burst, drowning about 250 people	1864
England	Yorkshire, Lancashire and Derbyshire farms were destroyed, mines inundated, mills demolished	1866
Italy	Thousands of people made homeless	1872
Mill River valley, near Northampton, Mass.	Several villages destroyed, 144 people perished	1874
Pennsylvania	220 persons drowned in western part of state	1874
Toulouse, France	1,000 lives lost	1875
Szegedin, Hungary	77 persons drowned, town nearly destroyed	1879
Commune of Murcia, Spain	1,000 lives lost; 2,000 houses wrecked	1879
Iowa, Kans., Minn., Mo.	Much property damage	1881
Ohio and Mississippi valleys	138 lives lost; $15,000,000 property loss	1882
Ohio, Pa., Ky.	Heavy floods, especially destructive at Cincinnati	1883
Java and Sumatra	Tidal wave as result of earthquake, 30,000 killed	1883
Ohio River	15 drowned; 5,000 homeless	1884
Floods in New England, Pa., N. Y.	Great loss of property	1886 1886
Texas	38 lives lost; Galveston suffered great damage from storm and flood	1887
Honan, China	Hwang River overflowed, millions perished	1889
Shantung, China	Yellow River overflowed; great loss of life	1889
Johnstown, Pa.	2,235 persons perished; Johnstown swept away as dam burst	1891
Consuegra, Spain	1,781 lives lost; town nearly destroyed	
Japan	Earthquake caused tidal wave; 27,000 killed and 60,000 homeless	1896
Galveston, Tex.	4,500 lives lost; 3,000 buildings wrecked; $30,000,000 property loss	1900
Kansas City, Mo., Mississippi River towns	Many lives lost; great destruction of property	1903
Hepner, Oreg.	300 drowned in cloudburst and flood	1903
Hong Kong, China	10,000 drowned	1906
Paris, France	Seine River flood; several drowned; $200,000,000 property damage	1910
Mississippi Valley	200 drowned; 200,000 homeless; $45,000,000 property damage	1912
Dayton, Ohio	84 drowned; city partly destroyed; $128,000,000 property damage	1913
Japan	Typhoon kills 1,100	1913
Ohio, Ind.	River floods drowned 730 people; destroyed 60,000 buildings; $180,873,000 property damage	1913
China	2,000 drowned, $90,000,000 damage in Kwangtung, Kwangsi, Kiangsi	1915
States along Gulf of Mexico	300 drowned; $20,000,000 property damage	1915
Shanghai, China	500 drowned; $5,000,000 damage	1915
Cabin Creek valley, W. Va.	100 lives lost; 5,000 homeless; $5,000,000 property loss	1916
South Atlantic coast	50 drowned; $15,000,000 damage	1916
Tientsin, China	15,000 square miles flooded; millions homeless; $50,000,000 damage	1917
Puerto Rico	116 lives lost; $3,500,000 property loss	1919
Pueblo, Colo.	120 dead, 140 missing; $20,000,000 property loss	1921
Mississippi Valley	20,000 square miles flooded; about 100 dead; 700,000 homeless; property damage over $270,000,000	1927
New England	112 lives lost; property loss over $40,000,000	1927
California	St. Francis dam broke in hills near Los Angeles; over 250 dead; 15,000 homeless	1928
Southern Florida	Lake Okeechobee, disturbed by hurricane, caused great damage and killed about 2,000	1929
Vera Cruz (state), Mexico	Many towns damaged; several hundred drowned; crop losses over $2,000,000	1930
River Tarn, France	400 killed; 4,000 homes destroyed	1930
Central China	200,000 killed; $440,000,000 property loss	1931
New England and Quebec	29 killed; immense property damage	1936
Ohio, Susquehanna and Potomac valleys	171 killed; 420,000 homeless; over $500,000,000 property damage in Penn., Ohio, Md., W. Va., Mass. and other states	1936
Ohio Valley	900 killed; 500,000 homes flooded; Cincinnati and Louisville hard hit; property damage in hundreds of millions	1937
North China	Dikes of Yellow River destroyed in military operations. Enormous land and property damage. Many thousands drowned.	1938
Japan	Floods following torrential rains sweep Kobe. 70,000 homes under water. 500 drowned	1938

Courtesy Italian Tourist Information Office

Ponte Vecchio (Old Bridge), Florence

For almost six centuries this covered bridge over the Arno has been lined with goldsmiths' shops, and in the houses that project over the water live the goldsmiths and their families. The bridge connects the Pitti and Uffizi palaces

the principality ruled by the Medici family in the 15th century, Florence was the center of Italian culture. Much of this prestige remains, although the city and its former dominions, known as the Grand Duchy of Tuscany from the 16th to the 19th century, have become part of the Italian kingdom. Today, as an agricultural market center, the city deals in grain, olive oil and wine. Its manufactures include jewelry, tooled leather, glassware, pottery, silk, lace, embroidered linens, mosaics and *pietra dura* (stone inlays). The population is about 315,000.

The most notable building of Florence is the polychrome marble-incrusted cathedral or *duomo* (Santa Maria del Fiore). Its construction, begun in 1298, took nearly 600 years, for only in 1883 was the façade finished. Brunelleschi was architect of the dome; Giotto, of the Gothic bell tower or campanile; and Di Cambio, of the octagonal baptistery of San Giovanni. Ghiberti designed the bronze doors of the baptistery, depicting scenes from the Old and New Testaments; Michelangelo pronounced the doors worthy to be the gates to Paradise.

In the Franciscan Church of Santa Croce are the tombs of Michelangelo, Galileo, Machiavelli, Alfieri and many other Italians of high renown, including the Florentine heroes of the Fascist Revolution. Adorning the walls of the chapels of this church are murals by Giotto; and in front of it in the Piazza Santa Croce is a statue of Dante. Equally famous for its murals by Ghirlandaio and terra cotta altarpieces by Della Robbia is the Church of Santa Maria Novella. The niches in the exterior of the Church of San Michele contain statues of the great Florentine sculptors.

The Church of San Lorenzo is famous for its Medici chapel, containing the tombs of Giuliano and Lorenzo de' Medici, surmounted by Michelangelo's sculpture groups, *Day and Night, Dawn and Twilight.* In the Chapel of the Princes are buried some of the later members of the Medici family who ruled as grand dukes of Tuscany. The Laurentian Library, attached to San Lorenzo, contains thousands of priceless books. Another reminder of the Medicis is the Dominican monastery of San Marco, of which Cosimo de' Medici was a patron. It is noted for its frescoes and murals, especially *The Annunciation* and *The Virgin Enthroned* by Beato Angelico, and contains relics of Savonarola, the martyred reformer.

Of equal historic interest with these ecclesiastical structures is the fortresslike Uffizi Palace. Among its art treasures are: Greek sculptures such as *The Wrestlers, The Knife Grinder* and *Venus de' Medici;* and paintings by old masters, such as *Adoration of the Madonna* by Correggio, *Spring* by Botticelli and the *Madonna of the Harpies* by Del Sarto. The palace also houses the National Library and the State Archives. The Pitti Palace contains an equally important collection of old masters (the most famous of which is possibly *The Concert,* attributed to Giorgione), a modern art gallery and a museum of silverwork. In this palace are a throne room and apartments for the king of Italy when he visits Florence. The famous Boboli Gardens are in the rear of the Pitti Palace. The Ponte Vecchio, a covered bridge over the Arno connecting the Pitti and Uffizi palaces, is lined with the goldsmiths' shops that made it famous centuries ago.

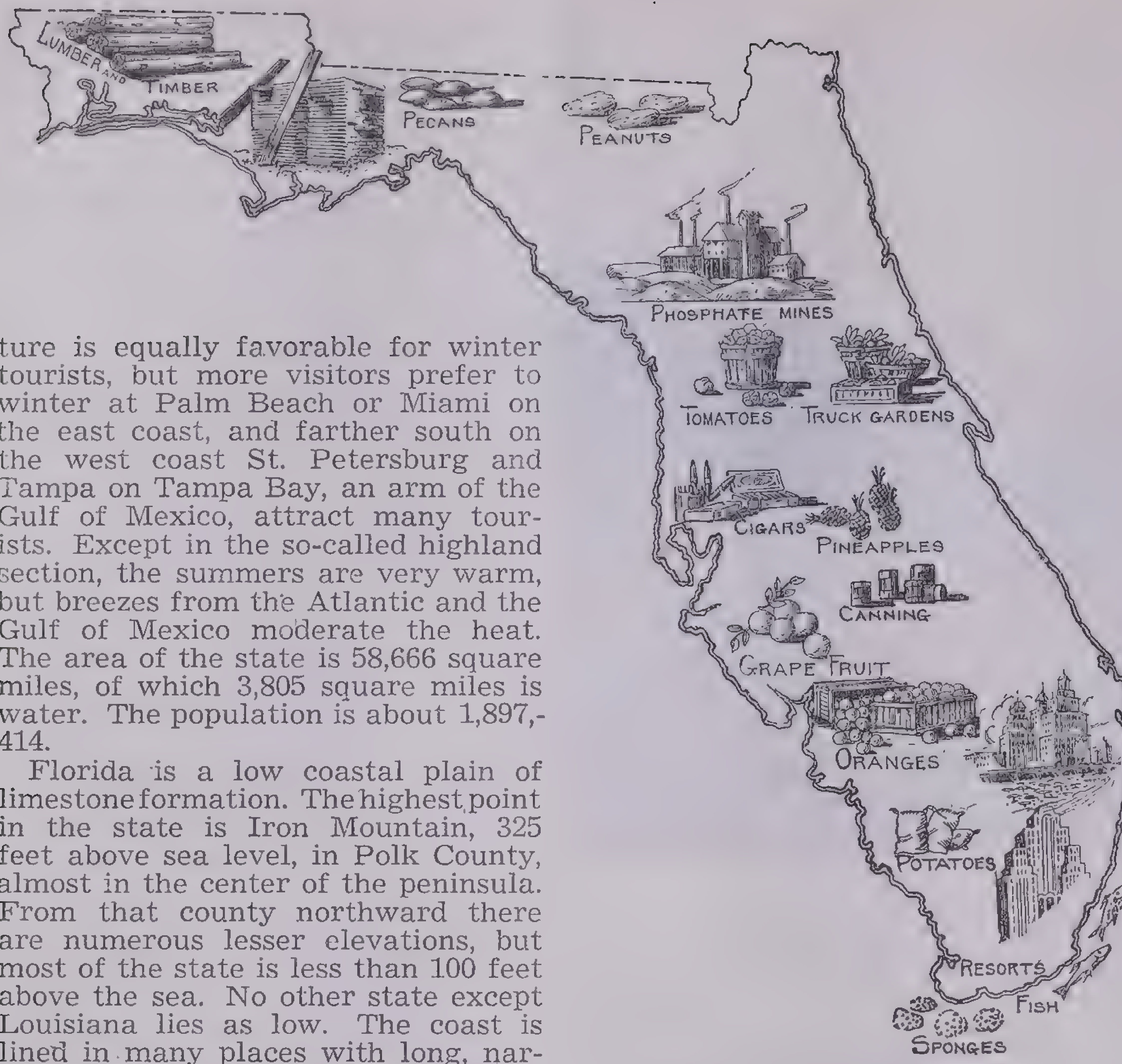
The Palazzo Vecchio (Old Palace), now the Town Hall, was built by Arnolfo at the end of the 13th century. In the courtyard of this palace is Verrocchio's fountain piece, *Boy with a Dolphin.* Opposite the Palazzo Vecchio in the Piazza della Signoria is the Loggia dei Lanzi, at one time the headquarters of the mercenary guard and named for the lances that the soldiers carried. Today it is an open-air gallery, containing famous pieces of sculpture—Cellini's *Perseus with the Head of Medusa,* John of Bologna's *Rape of the Sabine Women* and Donatello's *Judith and Holofernes.*

The University of Florence (established in 1349), Institute of Economics, Conservatoire of Music and Academy of Fine Arts (whose museum contains Michelangelo's sculpture of the boy *David*) continue to maintain Florence's reputation as mother city of the Renaissance. A bronze reproduction of *David* is found in the Piazzale Michelangelo on the summit of San Miniato, a hill overlooking Florence, and a marble reproduction of the same piece guards the entrance to the Palazzo Vecchio, as did its original. In the National Museum of the Bargello Palace is a notable collection of Renaissance sculpture, whose most important pieces are probably Donatello's *St. George,* Verrochio's *David* and John of Bologna's *Mercury.* The pediment of the Hospital of the Innocents (for foundlings) is adorned with Della Robbia's famous terracotta medallions of infants in swaddling clothes.

True to the tradition of intellectual leadership that Petrarch, Raphael, Leonardo da Vinci and other great Florentines established during the Renaissance, Florence has an International Culture Week every year. Special art exhibits are arranged, and under the auspices of the Friends of Music symphonic concerts are held in the Sala Bianca of the Palazzo Vecchio. There are also imposing open-air theatrical performances in the Boboli Gardens and historical pagents, such as the trial and execution of Savonarola, in the Piazza della Signoria.

Florence is the French form of the city's name. In Italian it is Firenze (originally Fiorenza) and is derived from the Latin *florentia,* meaning bloom. Hence Florence is often called *The City of Flowers.*

Florida, one of the southern states and the peninsula that is the most southeasterly projection of the United States. It has a coast line 3,751 miles in length, with the Atlantic Ocean on the east, Florida Strait on the south and the Gulf of Mexico on the west. Alabama and Georgia bound Florida on the north. The mainland extends to within 2½° of the Torrid Zone; the city of Key West, built on one of the Florida Keys, is slightly nearer the Tropic of Cancer and is farther south than any other town in the United States. The tropical climate of the southern part of the state has made Florida one of the chief winter resorts of the nation. In the central and north-central portions, at Lakeland, Orlando and Ocala, the tempera-



Principal Products of Florida

ture is equally favorable for winter tourists, but more visitors prefer to winter at Palm Beach or Miami on the east coast, and farther south on the west coast St. Petersburg and Tampa on Tampa Bay, an arm of the Gulf of Mexico, attract many tourists. Except in the so-called highland section, the summers are very warm, but breezes from the Atlantic and the Gulf of Mexico moderate the heat. The area of the state is 58,666 square miles, of which 3,805 square miles is water. The population is about 1,897,414.

Florida is a low coastal plain of limestone formation. The highest point in the state is Iron Mountain, 325 feet above sea level, in Polk County, almost in the center of the peninsula. From that county northward there are numerous lesser elevations, but most of the state is less than 100 feet above the sea. No other state except Louisiana lies as low. The coast is lined in many places with long, narrow islands and coral reefs that enclose lagoons. South of Lake Okeechobee, which is shallow but has an area of 733 square miles, most of the land is a great swamp known as the Everglades, 4,475 square miles in extent. This area, heavily saturated by water from the lake (which has no natural outlet) and by the heavy summer rainfall of the region, is gradually being drained and made fit for cultivation. On the reclaimed land sugar cane and truck-garden produce are raised. Since the defeat of their chief Osceola in 1842 the Everglades have been the home of the Seminole Indians, who lead quite an independent existence there. Among Florida's other 30,000 lakes, found mostly in the central part, the most important are Lakes George, Kissimmee and Apopka.

Some of the rivers of Florida bear strange or romantic names. The Suwanee River, celebrated in the song, "Old Folks at Home," is in the north-central section; 240 miles in length, it rises in the Okefinokee swamp of southern Georgia and flows into the Gulf of Mexico near Cedar Keys. The most important river is the St. Johns, which flows northward from the lake region of Osceola County and, after a course of 300 miles, empties into the Atlantic Ocean at Jacksonville. The Kissimmee River flows south into Lake Okeechobee; the Peace flows southwest, emptying into the Gulf of Mexico at Punta Gorda; and the Apalachicola enters the northwestern part of the state from Georgia and flows into the Gulf at Apalachicola. The Indian River, along the eastern coast, is a lagoon.

Tropical fruits predominate in the agriculture of the state. Nearly all of the pineapples, tangerines, limes and guavas grown in the United States are Florida products, and the state is famous for its oranges and grapefruit. Strawberries for northern markets are raised in immense quantities. Peanuts, sweet potatoes, tobacco, cotton and sugar cane are added sources of wealth. Other crops of importance are peppers, eggplants, tomatoes (in vast quantities), celery, pecans and cucumbers.

The forest areas are nearly 5,450,000 acres in extent; about 989,000 have been set apart in national forests, chief of which are the Choctawachee and the Ocala. The pines produce one-fourth of the nation's supply of tar, resin and turpentine. More phosphate rock (used for fertilizer) is found in Florida than in any other state. Here also is produced more fuller's earth than elsewhere in the United States, and there is some kaolin. Florida is not a great manufacturing state, but it is world-famous for the making of cigars. The cigar industry centers in Tampa and Key West, and these cities successfully compete with the Cuban tobacco industry.

Tallahassee, the capital, is a small city in the northwestern part of Florida. The state university is at Gainesville. Other institutions of higher learning include the University of Miami, the University of Tampa and Rollins College at Winter Park. Jacksonville is an important Atlantic port in the northeastern part of the state. About 40 miles south of it is historic St. Augustine, founded by the Spanish in 1565 and noted for Fort Marion (the ancient Fort of San Marco), the Roman Catholic cathedral dating from 1793 and the palace of the Spanish governor. A unique attraction is furnished by Silver Springs, near Ocala. Near Lake Wales is the Bok Singing Tower and Bird Sanctuary given by Edward W. Bok.

Florida was named by Ponce de León, who discovered it on Easter Sunday, March 27, 1513; *Pascua Florida,* holy day of flowers, is Spanish for Easter.

Florida Keys, a group of small coral islands and fringing coral reefs, extending in a crescent about 200 miles from the mainland of Florida, southwest of Miami, into the Gulf of Mexico. At the eastern end is Key Biscayne and at the western, the Marquesas Keys. The most important is Key West, near the southwestern end of the group. It was connected with the mainland by a branch of the Florida East Coast Railway, the "railroad that goes to sea," running on viaducts that connect 41 islands for a distance of 130 miles. The railway was wrecked by a hurricane, and the viaduct was rebuilt as a motor highway, which was opened in 1938. The city of Key West (population, 13,000), a favorite winter resort, is the county seat of Monroe Co., Fla. It is also noted for its sponge fisheries and cigar manufactories.

flume, a ravine or gorge through which a stream flows, such as the flume of Ausable River, part of Ausable Chasm in New York. The word originally meant a river and is derived from the Latin *fluere,* flow.

foothills, the hills that lie at the foot of a mountain range. They are considered a part of the mountains, because they consist of a series of elevations that gradually increase in size until the mountains themselves are reached and they generally have the same name; for example, the foothills of the White Mountains.

Forbidden City, a spacious area that forms the core of Peiping, China. It contains the Imperial Palace, which served as the residence of the president of the Chinese Republic from 1912 until the transfer of the seat of government to Nanking in 1928. Among the component palaces of this building are the Palace of Heavenly Purity, Palace of Earth's Repose, Hall of Distinguished Sovereigns, Hall of Intense Thought and Hall of the Literary Abyss. The Forbidden City owes its name to the fact that during the days of the Manchu emperors no persons, other than members of the imperial household, might ever cross the marble bridges over its moat except on court business.

ford, the shallow part of a stream over which a conveyance or a man on horseback may cross by wading. Fords are plentiful in the more undeveloped sections of the western United States where bridges have not yet been built. The word occurs in many place names—Oxford, Hartford, Bradford, Stafford, Stamford.

forest, a large tract of land, whether level or mountainous, covered with a dense growth of trees and underbrush and a thin carpet of grass. Such tracts are found especially in the tropics and in the temperate zones. In the tropics the precipitation ranges from 45 to 90 inches for a deciduous forest and from 90 to 150 inches for a silva; in the temperate zones a precipitation of 30 inches or more, falling mostly in the summer months, is essential.

Characteristic level forest areas are those in the southern United States where the forests of cypress, ash, black and red gum and loblolly, longleaf and shortleaf pines supply more than 30 per cent of all timber cut in the United States. In the Rocky Mountains such coniferous trees as the Douglas fir, cedar, hemlock and spruce are typical and at the southwestern margin of the Cascade Range the giant sequoias are found.

Among typical European trees are the oak, beech, cypress, hickory, ash, elm, linden, poplar and birch. The silva of Brazil, with its rubber, mahogany, rosewood, cacao and bully (chicle) trees, is the most characteristic South American forest. New Zealand has the kauri pine, rimu, totara and tawa. The eucalyptus is typical of Australia.

The Black Forest in southwestern Germany is a wooded mountain region, so called from the dark foliage of its pine and fir trees; it has been chosen as the scene of many German folk and fairy tales. Of Sherwood Forest, famous in the legend of Robin Hood, only a small part near Rotterham, England, remains. Soignes Forest, part of the Forest of Ardennes, survives on the outskirts of Brussels.

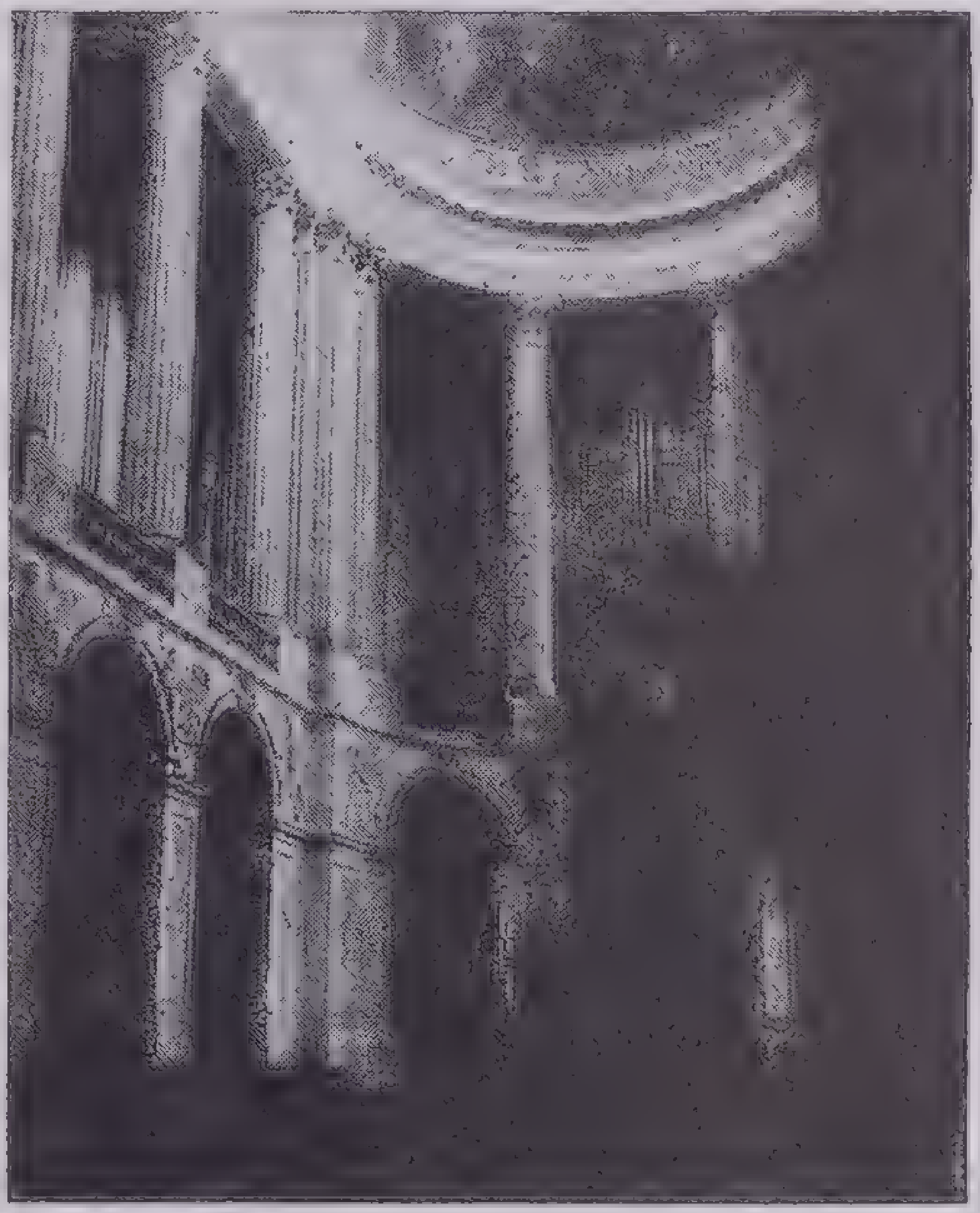
The word *forest* is occasionally used in the proper names of places, because they were once forest areas or were near forests, as Lake Forest, Ill.

Fort Marion, St. Augustine, Fla. Begun by the Spanish in 1656, this is the oldest fort standing in the United States and is now a National Monument. Built of durable coquina rock, its walls and parapets, casemates and dungeons are well preserved. The inner court is 100 feet square. Built to protect the early Spanish settlement from devastation, it has flown the flags of three nations.

Fort McHenry National Monument, Baltimore, Md. Commanding the entrance to the inner harbor of Baltimore, this star-shaped fort, its walls 35 feet thick, resisted the attack of the British fleet during the War of 1812. Francis Scott Key was inspired during the bombardment to compose the "Star-Spangled Banner." The structure is well preserved.

France, a republic of western Europe; since the days of Charlemagne, was conquered and partially occupied by the Germans in 1940. So paramount has been its position on the Continent that for hundreds of years French has been the universal language of diplomacy and in recent years has been adopted for the transactions of the League of Nations, sitting at Geneva, and by the Permanent Court of International Justice, whose sessions are held at The Hague. To the north of France are the English Channel, Strait of Dover, Belgium and Luxemburg; to the east, Germany, Switzerland and Italy; to the south, the Mediterranean Sea and Spain; and to the west, the Bay of Biscay and the Atlantic Ocean. The area (including Corsica) is 212,736 square miles. It has been augmented since the World War by Germany's return of Alsace-Lorraine, constituting some 5,600 square miles. The population is about 41,835,000.

Along the northern, western and southern coasts is a low plain 1,950 miles in length. The interior of the country is a triangular plateau whose greatest heights of 3,000 to 4,000 feet are attained in the Cévennes, Auvergne and Vosges mountains. The elevations increase in height toward the eastern and southern boundaries: in the Graian Alps Mont Blanc is 15,781 feet high; and in the Pyrenees, Mt. Pic des Possets, 11,045 feet. The Maritime and Cottian Alps separate France and Italy; the Jura Mountains, France and Switzerland; and the Ardennes, France and Belgium. The lower mountains of the tableland section act as watersheds, dividing the rivers of the Rhone-Saône, Garonne-Dordogne and Somme-Seine-Loire (or Paris) basins.


Courtesy Railways of France
Chapel of the Palace of Versailles

The Rhone Valley is noted for its Roman ruins, such as the temple, amphitheater and aqueduct called the *Pont du Gard* at Nîmes; and the Loire Valley, for its historic châteaux. The Rhine River forms part of the boundary between France and Germany. Indenting the northern coast is the Gulf of St. Malo and indenting the southern, the Gulf of the Lion. Numerous long estuaries, lagoons and fringing islands are found along the western coast. Cape Griz-Nez on the Strait of Dover is the point of land marking the nearest approach of the Continent to the British Isles; between it and Dover, England, is a distance of some 20 miles. Pointe de St. Mathieu near Brest is the westernmost point of land in France.

Economic Resources. France is a nation of agriculturists; the farms are small as a rule and are cultivated largely by their owners and not on the oppressive tenant system common to some countries of Europe. The decline in the French birthrate may be said to have begun among the peasants and was necessitated by the division of property among the heirs. For a peasant with a small holding the family is usually limited to two children—a boy and a girl. Any additional children must make their way in the towns or industrial centers. The peasant's love of property is an expression of his love of independence. Out of this the individualistic traits of the French have developed.

One-fifth of the land area of France remains in forests; one-fifth, in meadows and pastures; and a little more than two-fifths is cultivated. The crops include wheat, oats, rye, barley, hops, flax, potatoes, sugar beets, tobacco, olives and various fruits and nuts. In the south, where the influence of the warm Mediterranean winds is felt, the vine is extensively cultivated, and the making of wines, especially champagne and burgundy, is an immense source of wealth. France manufactures also several special kinds of cheese, such as Camembert and Roquefort, that are in demand throughout the world. Sheep raising is the most important industry of the sandy marshland of the southwest, called *the Landes.*

The French Government encourages all processes of the silk industry from raising the mulberry trees on which the silkworms feed before spinning their cocoons, to the manufacture in Lyons of the silks that have made that city famous since the 6th century. Since the World War the manufacture of rayon and other artificial silk has grown to great proportions. Cotton is another large textile industry, which is concentrated in Rouen; and the manufacture of woolen and linen goods has been augmented by the return of Strasbourg and other Alsace-Lorraine centers and by the restoration of Lille, Roubaix and other cities of the north that were occupied by Germany during the World War. The French show skill and a strong instinct for art in the manufacture of Sèvres porcelain, Gobelin and Beauvais tapestries, Alençon lace, and the cut glass of Baccarat. Chemicals, perfumes, soap, cigarettes, matches and leather goods are other important manufactures.

The Breton fishermen sail as far west for cod as the French islands of St. Pierre and Miquelon off the coast of Newfoundland, and they invade the North Sea for herring, sardines, tunny and mackerel. Oyster breeding is conducted in the estuaries along the western coast. The country's mineral wealth, which is found principally in the northeastern part, includes coal, iron ore, petroleum, potash, lead, lignite, salt and bauxite. The leading mining centers are Lille and Nancy in the north and St. Etienne in the south.

Within 150 years France has been twice a kingdom, twice an empire and three times a republic. The Third Republic dates from 1870.

divided into 90 departments, 279 arrondissements, 3,024 cantons and 38,004 communes. The affairs of each commune were intrusted to a municipal council, elected by the people; at its head was the mayor. The chief administrative officer of a department was called a *prefect;* and of an arrondissement, a *subprefect.*

French Cities. Paris, the capital of France, is described in a separate article. Marseille, next city in size (population about 915,000), is on the eastern part of the Gulf of the Lion, an arm of the Mediterranean. It is a great center of maritime commerce, especially with northern Africa and, via the Suez Canal, with the Far East. Since the completion in 1926 of the Marseille-Rhone Canal, Marseille has led all other French cities in commercial supremacy. Among its important buildings are the modern Byzantine-styled cathedral and the museum known as the Palais de Longchamp. The Château d'If, a former state prison that Alexandre Dumas, the Elder, immortalized in the *Count of Monte Cristo,* stands on an island in the gulf. The history of Marseille goes back 2,500 years; it was a Greek colony established about 600 B.C.

Courtesy Railways of France

Entrance to Mont-Saint-Michel

One of France's picture towns, Mont-Saint-Michel has presented the same aspect for the last 600 years. It is located on an island in the Bay of Saint-Michel, off the western coast of Normandy

The most important western port is Bordeaux, located in the southwestern part at the mouth of the Garonne River. From it Bordeaux wines, as well as fruits, dyes and drugs, are exported. Among the notable structures are the Hôtel de Ville, Palais de Justice, Cathedral of Saint André and Church of Saint Croix. Among other important ports are Le Havre and Cherbourg on the English Channel, Calais on the Strait of Dover, Nantes and St. Nazaire at the mouth of the Loire, and Toulouse, a river port on the Garonne. The great French naval bases are Brest on the Atlantic and Toulon on the Mediterranean. Along the Bay of Biscay are the well-known coast resorts of Deauville and Biarritz. The Riviera or Côte d'Azur along the Mediterranean is distinguished by Cannes, Nice, Monte Carlo and the Corniche Drive. Le Tourquet is the most famous Channel resort.

Historic interest is summed up in Carcassonne with its old castle, dating from the 11th century; Avignon with its palace that was occupied by the popes during their exile from Rome in the 14th century; and Mont Saint Michel, a 200-foot-high rocky island in the Bay of St. Michel on the northern coast that is crowned with a 10th-century Benedictine abbey. About Domremy, Reims and Rouen centers the heroic legend of Jeanne d'Arc. Lourdes, noted for the healing miracles attributed to the Virgin, and Lisieux, where a shrine to St. Theresa of the Infant Jesus has been erected, are two of the greatest Roman Catholic pilgrimage centers in the world. Chartres, Amiens, Reims and Strasbourg possess the most famous French cathedrals, with unsurpassed stained glass and other art treasures.

The name *France* means the country of the Franks. They represented a confederation of Teutonic tribes who, after defeating the Alemanni, Burgundians and Visigoths in the 5th century, founded the Frankish kingdom.

French Equatorial Africa, a vast territory in the west-central part of Africa, called until 1910 the French Congo. It extends from the Sahara Desert in a general southwesterly direction to the Atlantic Ocean and is bounded by Libya on the north, by the Anglo-Egyptian Sudan and the Belgian Congo on the east and by Spanish Guinea, Nigeria and French West Africa on the west. Its constituent colonies from north to south are Chad (area, 398,955 square miles), Ubangi-Shari (236,363 square miles), Middle Congo (172,411 square miles) and Gabun (104,320 square miles). Under a mandate from the League of Nations the Government of French Equatorial Africa administers French Cameroun in the southwestern part; an area of 169,498 square miles with a population of 2,340,000, of which about one-tenth of 1 per cent is European. The total population of the four colonies is about 3,193,000. The great majority are Negroes of Bantu stock in the south and of Sudanese stock in the north. Europeans, mostly French officials and traders, number about 4,000.

The Congo River and its affluent, the Ubangi, form most of the boundary between French Equatorial Africa and the Belgian Congo. On the boundary between the Chad Colony of French Equatorial Africa and Nigeria is Lake Chad. Ordinarily this lake has an area of 6,500 square miles, but since it has no outlet, the Shari River that empties into it sometimes increases its area to 20,000 square miles during the rainy season from May to October. Towns that are on the shores of the lake during the rainy season are 20 miles inland during the dry season. Among rivers flowing directly to the Atlantic are the Ogowe, Nyanga and Kwila. The Crystal Mountains rise to a height of 4,000 feet beyond the 250-mile-wide coastal plain. The inland plateau has an average elevation of 2,000 feet.

Some 30,000 square miles of the inland plateau are covered with tropical forests that yield mahogany, ebony and walnut woods, wild rubber, gum copal and kola nuts. Coffee and cotton also grow wild, and dates, oranges, lemons and bananas are gathered. Cultivated products include corn, millet, manioc, sweet potatoes, cacao and rubber. Among the exports are hides, ostrich feathers and ivory.

French interest in the African Congo section dates from 1841. Serious efforts at colonization started during the late '70s after Stanley made the first trip the entire length of the Congo. The administration of French Equatorial Africa is entrusted to a governor-general whose headquarters are at Brazzaville on the Stanley Pool of the Congo. To him are responsible the lieutenant governors of the Chad, Ubangi-Shari and Gabun colonies; their respective capitals are Fort Lamy, Bangui and Libreville. Since 1932 Brazzaville has been connected with the newly constructed port of Pointe Noire by a 340-mile-long railroad.

French Guiana, a colony of France in the northeastern part of South America, bounded by the Atlantic Ocean on the north, by Brazil on the east and south and by Surinam on the west. It is smaller than either Dutch or British Guiana. The area, including the Safety, Enfant Perdu and Remire islands, is 34,740 square miles. The population is about 25,000, including some 1,500 Indians of the Arawak and Carib tribes.

The boundaries between French Guiana and Brazil are marked by the Oyapock River on the east and by the Tumuc-Humac Mountains on the south. The Maroni River is the country's western boundary. The coast section is a low plain, largely covered with mangrove swamps and dense jungles. Inland there is a fertile alluvial plain toward which the tableland of the southern part slopes. From the forests that cover the Tumac-Humac Mountains mahogany, rosewood, dyewoods and other woods for cabinetmaking are obtained. The agricultural products include sugar cane, coffee, rice, cacao, tobacco, pepper, cloves, cinnamon, nutmeg and vanilla. There is some cattle raising in the savanna regions. Placer gold mining is the greatest source of wealth and in some years has provided 90 per cent of the exports. Small quantities of silver, iron and phosphate also are mined.

Held intermittently by France since 1626, the colony has been recognized as a French dependency since 1814. It is administered by a governor, appointed by the President of the Republic and responsible to the Minister for Colonies. He is assisted by a privy council of five members and by a council general of 16 elected members. A deputy chosen by the Council General represents the colony in the French Parliament. The seat of government is Cayenne (population, about 11,000).

French Guiana is noted for its penal settlements, especially the one maintained on Devil's Island of the Safety Islands group since 1885. To it France has sent its most notorious criminals. Among those sentenced for life was Captain Alfred Dreyfus who was later exonerated through the efforts of Émile Zola. A similar settlement called the Penal Settlement of Maroni has been maintained on the mainland since 1852. The total prison-colony population is about 6,500.

French Indo-China, a French dependency in the southeastern part of Asia, bounded by China on the north, by Burma, Siam and the Gulf of Siam on the west and by the Gulf of Tonkin and the South China Sea on the east and south. It is composed of the colony of Cochin China (26,476 square miles) and of the protectorates of Annam (39,758 square miles), Cambodia (67,550 square miles), Tonkin (40,530 square miles) and Laos (103,000 square miles); the 190 square-mile territory of Kwangchowan was leased from China in 1898 for 99 years. The total area of the country is 277,504 square miles. The population, mostly of Mongolian sotck, numbers about 22,000,000. Included in this figure are some 42,000 Europeans, mostly French officials, planters and traders.

Physically French Indo-China consists of two great delta areas, built by the Mekong River in the southern part and by the Songka or Red River in the northern part. The Cordillera of Annam stretches between these areas, following the curve of the coast. To the west is the Laos Plateau. In Tonkin, Cambodia and Cochin China, developed in the delta areas, agriculture and fishing are the chief industries. The principal crops are rice, sugar cane, coffee, cacao, tobacco, cotton, pepper and other spices. From the forests of Annam and Laos teak, rosewood, ebony and other hardwoods, rubber and bamboo are obtained. The cultivation of tea and rubber is also practiced in these highland areas. The mineral wealth includes coal, zinc, gold, tin, lead, copper and phosphate. The chief manufactures are silks, cottons, lace, bricks, tiles, cement, jewelry and carved teakwood furniture.

Cochin China was recognized as a French colony in 1881. The protectorates of Annam, Cambodia and Tonkin were established in 1884. Annam and Cambodia have retained their monarchies and are nominally governed by their own kings. Administration of the dependency is entrusted to a governor general, appointed by the President of the French Republic and responsible to the Minister for Colonies. He is assisted by a secretary-general and a superior council. To him are responsible the lieutenant governor of Cochin China and the residents general of Annam, Cambodia and Tonkin. The seat of government is Hanoi, the capital of Tonkin.

The most picturesque city of French Indo-China is doubtless Hué, capital of Annam (population, 124,000). It is famed for its Royal Palace, containing the official throne room called the Palace of the Laws of Heaven; the Temple of Heaven, where on special occasions the sovereign offers sacrifices to the All Highest Emperor of August Heaven and to the Spirit of the August Earth; Khai-Dink Museum; and Pagoda of Confucius. The most important seaport is Saigon (population, 143,000), the capital of Cochin China. Among other important cities are Pnom-Penh (population, 83,000), capital of Cambodia, and Vientiane (population, 12,000), capital of Laos. In Cambodia are found the ruins of Angkor Wat, Angkor Thom and other temples, evidences of a Buddhistic civilization that flourished under the Khmers in the 9th and 10th centuries.

French West Africa, a French dependency occupying a large part of northwestern Africa. It extends from Rio de Oro and the Atlantic Ocean to French Equatorial Africa and from the southern desert boundaries of Morocco, Algeria, Tunisia and Libya to Liberia, Nigeria and other countries along the Gulf of Guinea. It is composed of the following colonies: Senegal, Dahomey, Ivory Coast, French Guinea, French Sudan, Niger and Mauritania. Most of the region is a vast plateau, broken by the Futa Jallon Mountains of the Ivory Coast, the Atacora Mountains of Dahomey and the Adrar and Tagant mountains of Mauritania. It is watered by the Niger River (2,600 miles), often called the French Nile. Among short rivers of the coastal colonies are the Senegal, Gambia, Sassandra, Comoe, Weme and Volta.

The total area of French West Africa is 1,799,159 square miles. The population, about 14,575,000, is mostly Negro, but in the more desertlike areas a mixture of Arab and Berber strains is found. Included in this figure are some 20,000 Europeans, 70 per cent of whom are French. Since 1895 the dependency has been administered by a governor general whose seat is at Dakar (population, 40,000) in Senegal. To him are responsible the lieutenant governors of each of the component colonies. While the common interests of the colonies are looked after by the Government of French West Africa, the colonies have retained a large measure of autonomy, and their local chieftains have much authority.

Senegal is located in the western part of French West Africa, with the Senegal River on the north and the Gambia River on the south. The area is 77,818 square miles, and the population is about 1,639,000. The principal products are wild rubber, corn, millet, rice, peanuts and groundnuts. Gold is found in the alluvial deposits of the Senegal River. The natives are good brickmakers and also manufacture jewelry, pottery and leather goods. St. Louis (population, 22,000) is the capital.

Dahomey is located in the southern part of French West Africa, west of Nigeria. It has a 75-mile-wide coast line along the Gulf of Guinea and extends inland for about 300 miles. The area is 47,144 square miles, and the population is about 1,112,000. The principal crops are corn, coconuts, pineapples, bananas and other tropical fruits. The capital is Porto-Novo (population, 23,000).

Ivory Coast takes its name from the 35-mile-wide coastal region, lined with lagoons, along the Gulf of Guinea, which was a great center for the buying and selling of ivory in the 18th century.

It is bounded by the Gold Coast colony of Great Britain on the east and by the republic of Liberia and French Guinea on the west. The Futa Jallon Mountains are covered with forests, from which mahogany and other precious woods are obtained. Mt. Nimba (5,393 feet) is the highest peak. Gold is the principal mineral. The chief crops are coffee, cacao, bananas, coconuts and manioc. The area is 189,029 square miles, and the population is about 3,879,000. The capital is Bingerville.

French Guinea, with an area of 96,865 square miles and a population about 2,237,000 is in the western part of French West Africa. Portuguese Guinea, Senegal and the French Sudan are on the north; Sierra Leone (British) and Liberia are on the south. The Ivory Coast colony forms the eastern boundary and the Atlantic Ocean, the western. The colony produces rubber, coconuts, gum, millet, rice, pineapples and bananas. There is considerable grazing in the plateau region. The capital is Conakry (population, 9,000).

French Sudan lies east of Senegal and Mauritania and north of French Guinea and the Ivory Coast. It has an area of 582,437 square miles and a population about 3,565,000. The principal products are corn, millet, rice and cotton. The capital is Bamako (population, 25,000).

Niger is a military territory east of French Sudan. It has an area of 483,526 square miles and a population of about 1,822,000. The capital is Zinder (population, 7,000).

Mauritania comprises a large part of the western Sahara Desert and embraces the mountainous regions of Tagant and Adrar. The area is 322,344 square miles, and the population about 325,000. The nomads of the interior engage principally in cattle and sheep raising.

Fridtjof Nansen Land, an Arctic archipelago east of Spitsbergen and north of Novaya Zemlya. It consists of about 100 islands, all mountainous with their plateaus covered by icecaps. The largest are Alexandra, Zichy, Wilczek and Graham Bell lands. The region was discovered and partly explored during 1872–73 by the Austrian explorers, Julius von Payer and Karl Weyprecht, who gave it the name of Franz Josef Land. During 1881–82 explorations were carried on in the southeastern part by a British party led by Leigh Smith. After Nansen's death in 1930 the name of the region was changed to Fridtjof Nansen Land.

For several years in connection with its Arctic navigation and aeronautical research the Soviet Government has maintained a meteorological station in Fridtjof Nansen Land. As in the case of Antarctica, the fossil remains of plants and animals found in this barren region lead geologists to believe that it once had a warm climate.

Frisian Islands, a group of islands of the North Sea, extending along the coasts of the Netherlands, Germany and Denmark from the Zuider Zee to Jutland. The western group with an area of 173 square miles belongs to the Netherlands; the eastern (34 square miles) and most of the northern group (about 100 square miles) belong to Germany. Of the North Frisian group Denmark claims Fanö and Röm. Among the other islands are Texel, Vlieland, Terschelling, Ameland, Schiermonnikoog, Norderney, Borkum, Wangerroog, Amrum, Sylt and Föhr. There is no individual census for the islands; their population is included in the population of the Netherlands, Germany or Denmark. Fishing and grazing are the most important industries.

The home of the ancient Frisians, the islands were known to the Romans in the 1st century A.D. For several centuries they have been gradually disappearing through marine erosion. A notable engineering enterprise has been the construction of the 7-mile-long Hindenburg Causeway, connecting the island of Sylt with the German mainland at Klanxbüll and enabling express trains from Berlin and Hamburg to run as far as the fashionable bathing resort of Westerland.

Fundy, Bay of, an arm of the Atlantic Ocean that extends in a northeasterly direction between New Brunswick and Nova Scotia, Canada. It has an area of about 6,250 square miles, is 48 miles wide at its mouth, has an average width of 35 miles, and, with its arms Chignecto Bay and Minas Basin, extends about 150 miles. Tributary rivers are the St. John in New Brunswick; the St. Croix, which forms part of the international boundary between Maine and New Brunswick, and the Annapolis in Nova Scotia. St. John is the chief New Brunswick port, Yarmouth the chief Nova Scotia port. Annapolis Royal, N. S., is the oldest settlement in Canada, having been founded by the French in 1605. Fogs and bores, which reach from 40 to 50 feet at high tide, make navigation dangerous.

Galápagos Islands, a group of 16 volcanic islands, crossed by the equator, in the Pacific Ocean. They are located about 600 miles west of Ecuador and have been claimed by that country since 1832. Recently they were constituted a territorial division called the Territory of the Colon Archipelago.

The Galápagos Islands are of great interest and importance to naturalists. As they lie outside the regular ocean routes and hence have been seldom visited, their animal life has not been disturbed. The cormorant, a flightless bird, is indigenous, and the finch and mockingbird exhibit unusual variations. More than 50 new species of moths also have been discovered on the islands. The iguana grows to a length of 4 to 6 feet and exhibits many primitive reptilian characteristics. The penguin, found only in Antarctica and other very cold regions, doubtless arrived on the islands by swimming with the aid of the Peruvian Current. Strangest of all is the monster tortoise, which weighs 400 to 500 pounds, lives 300 to 400 years and is similar in structure to fossilized turtle forms found in Cuba.

Discovered by the Spaniards in the early part of the 16th century, the islands were named from the Spanish word *galápago,* meaning tortoise. The English names of the principal ones are Albemarle, Indefatigable, James, Charles, Narborough, Hood and Chatham. The total area is 2,868 square miles, and the population is about 2,000. A number of Europeans who desired to live a primitive life have been attracted in recent years. Charles Island is an Ecuadorean penal settlement. The capital, San Cristobal on Chatham Island, is the residence of the governor. Charles Darwin, the English naturalist, visited Galápagos on the voyage of the *Beagle* in 1858; his observations were of importance in his subsequent work on evolution and were published in *The Origin of Species.*

Gambia, a British Crown colony on the western coast of Africa; the smallest of Great Britain's possessions in Africa. The area of the colony proper is 69 square miles, but dependent upon it is a 12-mile-wide protectorate that extends inland for some 200 miles and is bisected by the Gambia River. Gambia is surrounded on all but the Atlantic side by Senegal, a colony of French West Africa. The population, about 200,000, is mostly Negroes. The chief export product is groundnuts, whose oil is used as a substitute for olive oil and in the manufacture of margarine. The natives also raise corn, cotton, rice, manioc and indigo. Bathurst on the Island of St. Mary at the mouth of the Gambia River is the seat of the governor. He is assisted by a nominated legislative council and by a traveling commissioner for each of the five provinces.

Ganges, a river of northern India. It is formed by the junction of two streams, the Bhagirathi and Alaknanda, that rise in the Himalaya Mountains. After flowing about 1,500 miles in a generally southeastern direction across the United Provinces of Agra and Oudh, it joins in Bengal the Brahmaputra. The united stream, known as the Padma, crosses the 32,000-square-mile delta, which it has built over many centuries, and discharges through several mouths into the Bay of Bengal. The Ganges flows through the most thickly populated agricultural region in the world estimated at 900 persons to the square mile. Tributaries include the Ramganga, Jumna, Son, Gumti, Gogra, Gandak and Kusi. Important cities along the banks of the Ganges are Allahabad, Benares, Ghazipur, Patna, Monghyr and Bhagalpur. Moderate-sized craft navigate the river as far as Hardwar, about 1,300

Underwood & Underwood

Burning Ghat Beside the Ganges in the Holy City of Benares

A burning ghat or landing place where bodies are burned after having been immersed in the sacred waters of the Ganges. In Hindu belief, bathing in these waters cleanses the soul of sin

Courtesy Swiss Federal Railroads

Harbor of Geneva

Geneva lies along the Lake of Geneva at the outlet of the Rhone River. To the right is Rousseau's Island and in the background is the faint glitter of Mont Blanc (15,781 feet), the highest peak in the Alps

miles from the mouth. Canals, the Upper (opened in 1854) and the Lower (opened in 1878), have been built to simplify navigation above Allahabad and to irrigate the country lying between the Ganges and the Jumna.

The Ganges is the sacred river of the Hindus, who believe that it rises from the feet of Brahma and that the waters have miraculous power to cleanse from sin; moreover, they believe that the souls of those who die and are cremated on its banks will be transported immediately to paradise. The chief bathing resort is Allahabad. To Benares every devout Hindu attempts to make his last pilgrimage. The name Ganges is the Greek form of the Sanskrit word *ganga,* which means *stream.*

gap, a mountain pass, found generally in old, folded mountains, such as the Appalachians. If the rock that it intersects is soft, the gap assumes the form of a broad valley with gently sloping sides; if the rock is hard, the gap becomes a deep, narrow gorge. A typical formation of this sort is the Delaware Water Gap in the Kittatinny Range near Stroudsburg, Pa. Named from the Delaware River that flows through it, the gap provided a water-level route for early emigrants crossing the Appalachians. Cumberland Gap in the Cumberland Mountains served as a pass for those who entered Kentucky or Tennessee from Virginia.

Geneva, a city in the southwestern part of Switzerland, capital of the canton of the same name. It is located at the tip of Lake Geneva, from which flows the river Rhone, and is flanked by Mont Salève and other mountains of the Jura Alps. In 1920 it became the headquarters of the League of Nations, now housed in a monumental edifice in Ariana Park. Among the buildings composing the Palace of the Nations are the Secretariat with 400 offices, Council headquarters, Assembly Hall and Library, the last three facing the Court of Honor overlooking the lake. Spain donated the mural paintings by José-Maria Sert on the walls of the Council Chamber, depicting mankind's long struggle toward peace.

Since the neutrality of Switzerland is guaranteed by international law, Geneva was selected in 1864 as the home of the International Red Cross and League of Red Cross Societies and in 1919 as the headquarters of the International Labor Office. It also serves as international headquarters for many learned and philanthropic societies and is one of the Continent's most important railroad and financial centers. Local manufactures include watches, clocks, jewelry, music boxes, scientific instruments, enamels and miniature paintings. The city's population is more than 140,000.

Geneva's most famous church is the 800-year-old Romanesque Cathedral of St. Peter, in which John Calvin preached the Reformation (1536–64). The work of Calvin and his collaborators, Guillaume Farel and Théodore Beza, and his Scottish follower, John Knox, is commemorated by the Monument of the Reformation, bearing the inscription *Post Tenebras Lux* (After Darkness Light), on the Promenade des Bastions. The Geneva Town Hall is a Renaissance-styled building erected in the 16th century. In its Salle de l'Alabama the arbitral award that closed the Civil War controversy over the *Alabama* claims was pronounced in 1872; it was based on the agreement of Great Britain to pay the United States $15,500,000 damages.

Geneva is noted for its many museums; the best-known are: the History and Art Museum, an archeological storehouse; the Rath Museum, noted for its modern art collection; and Ariana, Reformation and Jean Jacques Rousseau museums. There also stands the house in which Rousseau, the great French philosopher, was born, and on Rousseau's Island at the headwaters of the Rhone a bronze statue of him has been erected. Among the city's educational institutions are: the University of Geneva, the Collège de Genève that Calvin founded in 1559 as a theological seminary; Institute of Higher International Studies; Conservatoire of Music; and Industrial Arts School. The Grand Opera House is one of the finest in Europe.

The name *Geneva* comes from the Celtic *genava,* meaning mouth or jaw. The city existed in the time of Julius Caesar and belonged to the Allobroges; but after the Roman conquest of the Helvetians it was included in the Provincia Maxima Sequanorum. During the Middle Ages it was part of the kingdom of Transjurane Burgundy. In 1531, having adopted the doctrine of the Reformation, Geneva joined the Swiss Confederation, and with the exception of the years 1798–1815, when it was annexed to France, it has been the leader of the 22 cantons composing this confederation. It has long been noted as an asylum for political refugees or revolutionists.

Genoa, a city of Italy, located in the northwestern part on the Gulf of Genoa and Bisagno River. It is the capital of the province of the same name in the Ligurian section. From the water front it rises on terraces extending far back into the hills that form the Ligurian spur of the Apennines. Surmounting these hills for a distance of 11 miles is the boulevard Via di Circonvallazione a Monte, which has supplanted the old chain of fortifications. The 600-acre harbor still serves as one of the most important bases of the Italian Navy.

Genoa is famed as the birthplace of Christopher Columbus (whose mud-walled house still stands and who is commemorated by a monument in the Piazza Acquaverde) and for centuries has been a city of culture and wealth derived from commerce with far-distant parts of the world. Its present-day exports include wine, olive oil, hemp, flax, coral, marble and macaroni. The manufactures are textiles, such as silks, velvets and cotton and woolen goods, gloves, artificial flowers, felt hats, leather goods and furniture. Since the founding of the Bank of St. George in the 13th century it has been an important financial center. The population is about 610,000.

The Cathedral of San Lorenzo, built in Gothic style with a Renaissance dome, was founded in the 10th century; its most important relic is the Sacro Catino, an octagonal bowl of ancient glass, brought from Caesarea in 1101 and closely resembling descriptions of the Holy Grail in which Joseph of Arimathea caught drops of the blood of the crucified Christ. Among other noted churches are Santissima Annunziata and Santa Maria di Castello. The Rosso, Bianco and Balbi-Senarega palaces, once the homes of merchant princes, now serve as art museums. The Palazzo Ducale, in which Genoa's doges held sway in the 14th century and again in the 16th, is now a courthouse. The Palazzo Reale dates from 1815, when Sardinia-Piedmont, ruled by the House of Savoy, acquired the city.

In the Piazza Ferrari is an equestrian statue of Garibaldi, who with Mazzini in 1834 unsuccessfully attempted to launch in Genoa the movement for a united Italy. The Campo Santo is probably the most ostentatious cemetery in all Europe. Among educational institutions are the University of Genoa, which was founded in 1623, Academy of Fine Arts, Verdi Institute of Music and Naval Engineering School.

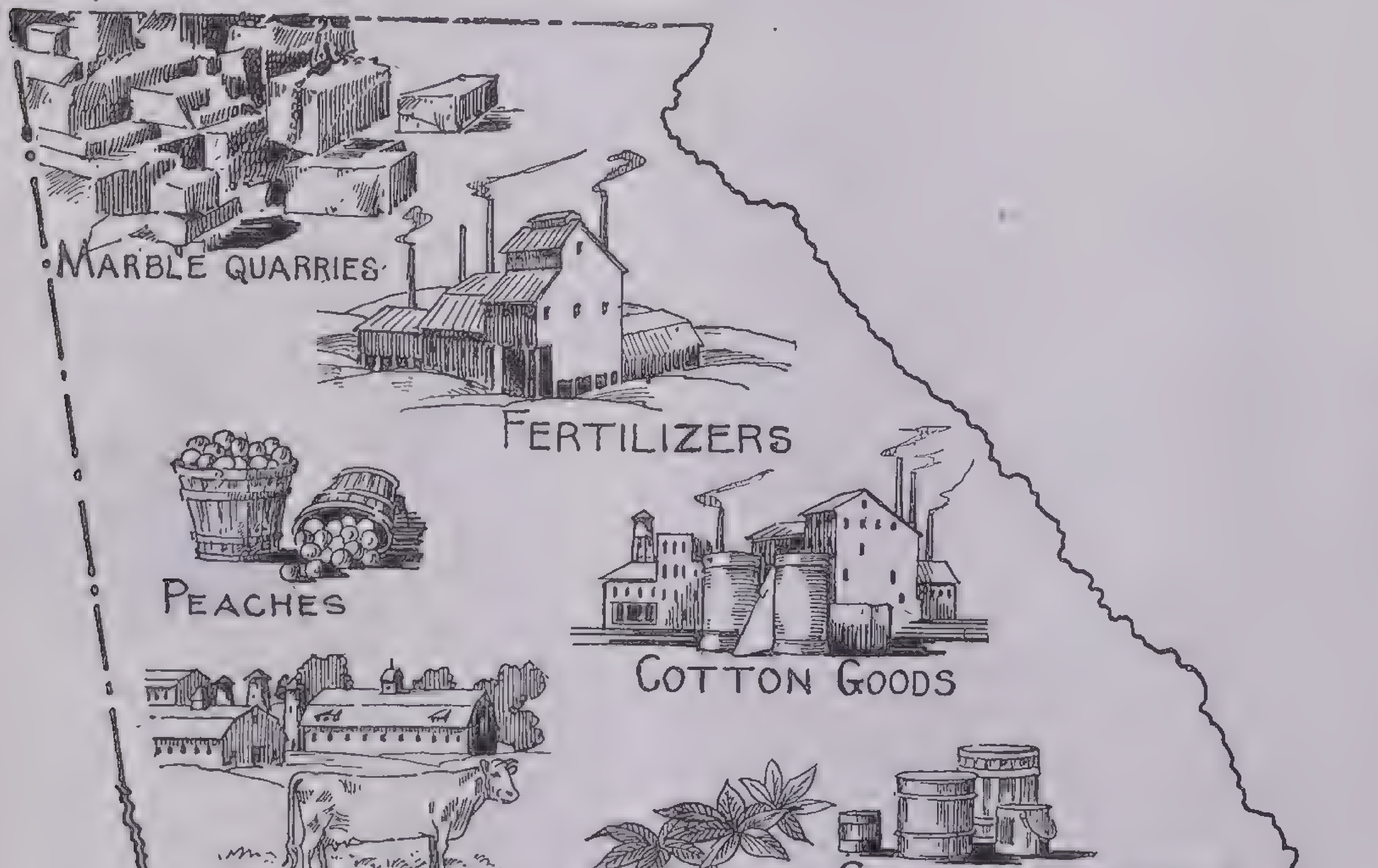
The name *Genoa* may have the same origin as Geneva, from the Celtic *genava,* meaning mouth or jaw. The Latin form of the name was *Genua.*

George Rogers Clark Memorial, Vincennes, Ind. This circular stone temple, surrounded by columns, is connected by a broad plaza with a monumental bridge across the Wabash River, all commemorating the exploits of the conqueror of the Northwest Territory during the American Revolution. The memorial was dedicated in 1936.

George Washington Birthplace National Monument, Wakefield, Va. Reconstructed in 1932, the simple brick house and old-fashioned garden reproduce the birthplace of the first President as far as the details are known. The setting, on a slight rise overlooking the broad Potomac, completes an inspiring scene.

Georgia, one of the south Atlantic states and one of the original thirteen. It is bounded on the north by Tennessee and North Carolina, on the northeast by South Carolina, on the east by the Atlantic Ocean, on the south by Florida and on the west by Alabama. The area is 59,265 square miles of which 540 square miles is water. The population is approximately 3,123,723.

The most elevated section is in the far north, where the Blue Ridge and Cumberland ranges enter the state. The highest point in the state is a peak of the Blue Ridge Mountains called Brasstown Bald (4,768 feet). For about 30 miles inland from the ocean the surface is not more than 100 feet above the sea, and almost the entire southern half of the state averages only 250 feet in altitude. Running through the middle of the state in a general northeast-southwest direction is the fall line, where the elevation of the land changes abruptly from the low coastal plain to the higher country of the Piedmont. At the fall line the rivers all become unnavigable, and the rapids and falls provide suitable sites for power plants.



Principal Products of Georgia

Georgia possesses several navigable rivers that were important waterways before the railroads became numerous. The Chattahoochee flows from the northeastern part of the state almost directly southwest and from the center of the western boundary forms the boundary between Georgia and Alabama. The Flint River joins the Chattahoochee at the southwestern corner of the state, where the two rivers unite to form the Appalachicola of Florida. In the east the Savannah River separates the state from South Carolina. Flowing southeast from central Georgia, the Altamaha pours its waters into the Atlantic.

Georgia long ranked next to Texas in cotton production, but experience taught its people that diversified crops are more profitable. Four or five other states now produce more cotton than Georgia, although its crop usually exceeds 1,000,000 bales. The peanut crop is 500,000,000 pounds annually. Other crops include tobacco, corn, hay, sweet potatoes, peaches and watermelons.

Though the mineral wealth of Georgia is exceeded by that of about 35 states, some phases are important. Some 40 per cent of the nation's supply of fuller's earth is found here. The state also ranks high in the production of barite, manganese and bauxite. The china industry of the United States largely depends on Georgia, which provides more than two-thirds of the domestic production of kaolin. Other minerals include coal, iron, talc, gold, silver and mica. Of the great forest area, 245,000 acres are in national forest reserves. Georgia supplies more than half of the United States production of turpentine and resin. Georgia's lumber production also is important.

Stimulated by the development of waterpower, manufacturing has made great strides in recent years. The manufacture of cotton goods is the most important single industry, and in the number of active cotton spindles Georgia ranks second in the United States with more than 5,200,000 active spindles (North Carolina is first, Massachusetts third). Cottonseed oil and artificial fertilizer also are produced in quantity.

The capital and largest city of Georgia and the banking and industrial capital of the southeast is Atlanta in the north-central section (population about 302,288). It is in the heart of a rich agricultural district and is an important railway center. It is also the seat of the Georgia School of Technology and of Oglethorpe University. Savannah, at the mouth of the Savannah River on the Atlantic coast, is the most important seaport. At Athens, northeast of Atlanta, is located the University of Georgia, founded in 1785 and the oldest state university in the United States. Other important towns are Columbus, Macon and Augusta, located on the fall line, where cheap water power has led to industrial growth.

Established by a group of English colonists under James Oglethorpe in

1733, Georgia was named in honor of the English King, George II.

German Alpine Road, a 310-mile highway extending through the Bavarian Alps from the Königssee to the Lake of Constance. It passes through Oberammergau, Garmisch-Partenkirchen and other tourist centers.

Germany, a totalitarian state of central Europe that until the defeat of the Central Powers in the World War was known as the German Empire or Second Reich. From November 1918 until the ascendency of the National Socialist German Workers Party in March 1933 it was called the Republic of Germany. It then became a politically unified and centralized state, officially known as the Third Reich. Adolf Hitler, founder and leader of the Nazi party and Chancellor of the Reich, on the death of President Paul von Hindenburg in 1934 was confirmed in the office of president for life under the title of Reichsführer or realm leader.

Germany's area was then 213,362 square miles. The annexation of 738 square miles of the Saar Basin by plebiscite in 1935; Austria, Czechoslovakia, Bohemia, and Moravia in 1938; Memel, Danzig, and western Poland in 1939; and Denmark, Norway, Belgium, the Netherlands, Luxemburg and northern France in 1940, added many thousand square miles to Germany's area.

Physical Features. Germany is bounded by the Baltic Sea on the north; by Russia and Hungary on the east; by Italy, Switzerland, and France on the south; by the North Sea on the west. The North German Plain bears all the marks of a glaciated region, including the Baltic Hill Range and the dunes that caused the mark of Brandenburg to be called the "sandbox of the Holy Roman Empire." The Nazi Government has undertaken the ambitious program of reclaiming by 1945 from the North Sea some 25,000 acres of new land and has already provided homes for about 100 peasant families on the reclaimed Adolf Hitler Koog and Hermann Göring Koog, named for the Reichsführer and his Minister of National Economy. (*Koog* is low German for polder or reclaimed land.)

On the southern fringe of the North German Plain rise the picturesque Harz Mountains. The highest peak in this range is the Brocken (3,806 feet). It is famous in German legend as the scene of the Walpurgis Night ride of witches and kobolds immortalized by Goethe in *Faust.* It is noted also for the mirage known as the *spectre of the Brocken,* caused at sundown when the shadows of men and animals appear projected on the wall of clouds. The most celebrated cave of the region is the alabasterlike recess in the side of Kyffhäuser Mountain; here the Emperor Frederick Barbarossa is said to await the day when he will awake from his long sleep to survey what has been accomplished by a unified Germany. On top of the mountain is the Kyffhäuser National Monument, dedicated to Barbarossa as founder of the First Reich and to Emperor William I as creator, with Bismarck, of the Second Reich.

The Thuringian Forest extends from the Harz Mountains to the Fichtelgebirge, where begins the Erz Gebirge, formerly part of the barrier between Germany and Czechoslovakia. All these mountains supply considerable coal and iron, as well as lead, zinc, copper and silver. The cock canaries called the *Harzer Roller* have long been bred for commercial purposes at St. Andreasberg in the Harz Mountains.

The Bavarian Alps in the southern part of the country attain in the Zugspitze, the principal peak, a height of 9,738 feet. The principal beauty spots are: Garmisch-Partenkirchen, scene of the 1936 Olympic winter sports; Oberammergau, where about every 10 years since 1634, when it was first presented as a thank-offering for the stilling of the plague, the famous Passion Play has been given; and the beautiful mountain lakes, Starnberger (Würmer) See, Chiem See, Ammer See and Walchen See. Scattered throughout the Bavarian Alps are the fairy-tale-like castles erected by King Ludwig II of Bavaria; the more famous of these are Hohenschwangau, Neuschwanstein and Linderhof.

Baden is noted for the Black Forest, a wooded mountain region extending about 100 miles; it was named from the dark fir and pine trees with which it is largely covered. The noted health resorts, Baden-Baden, Wildbad and Freudenstadt, owe their existence to the many medicinal springs of the region. The principal products (manufactured for the most part in the homes of the peasants) are toys, clocks and musical instruments. Among other noted mountain ranges of Germany are the Swabian Alb, bordering the upper Danube Valley in Württemberg; Bavarian Forest; Franconian Forest, a continuation of the Thuringian Forest; the Taunus; and Eifel, Siebengebirge and Westerwald that are a continuation of the Forest of Ardennes.

Germany's principal river, the Rhine, described in a separate article, has numerous tributaries—the Aar, Lahn, Moselle, Main, Ruhr, Neckar, Nahe and Saar. Among the tributaries of Elbe are the Saale and Elster. The Isar is an affluent of the Danube. The Oder River empties into the Baltic Sea; and the Weser, into the North Sea. In the Kiel Canal, joining Brunsbuttekoog at the mouth of the Elbe and Holtenau a few miles north of Kiel on the Baltic Sea, Germany has possessed since 1895 one of the world's great artificial waterways. It is 61 miles long and 45 feet deep.

Agricultural and Industrial Germany. The better agricultural lands of Germany are in the central and southern sections. Of the cereals, rye is all important, for rye or black bread is the great food staple of the peasant and laboring classes. Next in importance are oats, wheat and barley. Considerable acreage is devoted to hay, turnips, sugar beets, hops, flax and tobacco. The vineyards are found mostly in the western part, the wines of the Rhine, Moselle, Neckar and Main valleys being world-famous. The leading dairy product is butter. Germany is one of the most heavily forested of European countries; the total forest acreage is more than 31,250,000.

Courtesy German Railroads Information Office

The German Rhine

A typical scene on the Rhine near Caub in the picturesque 80-mile stretch between Bonn and Bingen. Here the river winds between vineyard-covered hills crowned with medieval castles. On the left is the Castle Gutenfels, which has looked down on the river for more than seven centuries. The famous Pfalz Castle in the center of the stream was once the stronghold of a robber baron who collected tolls from all ships that passed

The principal industrial district is the Ruhr Valley in the northwestern part of the country. Its development has been steady since France and Belgium, which seized the district under sanctions of the Versailles Treaty in 1923, evacuated it in 1926. It possesses one of the richest coal and iron-ore fields in all Europe; additional fuel is obtained from the coal mines of the Saar Basin that was returned to Germany in 1935. For 15 years France had operated the Saar mines in compensation for the destruction of mines in the north of France during the World War. In addition to iron, lead, copper, zinc and silver from the Harz and other mountains Germany's mineral wealth includes lignite, potash, arsenic and petroleum.

Essen on the Ruhr is the great German steel center; the most important works are those founded by Friedrich Krupp in 1800 and noted during the World War for the manufacture of the monster cannon called *Big Berthas* in honor of the daughter of the firm's head. In peacetime the Krupp steel works devote their attention to the manufacture of locomotives, ship engines and armor plate. Solingen in Rhenish Prussia is famous for the manufacture of knives and cutlery, another peacetime industry that grew out of the production of swords and blades in the Middle Ages. Iserlohn was known for the manufacture of armor during the Middle Ages but is now renowned for its needles. Dortmund produces much of the iron and steel used in the manufacture of bridges and railroad equipment in all parts of the world.

The principal German center for the manufacture of silks is Krefeld-Verdingen on the Rhine. Wuppertal (formerly the twin cities of Elberfeld and Barmen) is noted for its cotton manufactures. From Chemnitz and Zwickau in Saxony come stockings, fabric gloves and knit underwear. Meissen, near Dresden, is the great German porcelain center. Germany's unrivaled optical industry has its headquarters in Jena; in addition to microscopes and telescopes, the famous Zeiss works make the instruments that graphically reveal the secrets of the heavens in planetaria in New York, Chicago and other large cities.

Important Cities. Berlin, the capital of Germany, and Munich and Dresden are described in separate articles. Hamburg (population, 1,130,000) ranks next to Berlin in size; it is one of the world's great seaports through its location at the head of the wide and deep estuary of the Elbe River that discharges into the Helgoland Bight, an arm of the North Sea. Its development has been aided by its possessing a free harbor area where the transshipment cargoes of foreign vessels are not subject to customs formalities. It is one of the principal shipbuilding centers of Europe. Before the formation of the German Empire in 1871 Hamburg, like the other North Sea port, Bremen, and the Baltic Sea port, Lübeck, was a free imperial city, a survival from the days when these cities were members of the Hanseatic League. The fourth important German seaport is Stettin, located at the mouth of the Oder River, which discharges into the Pomeranian Bay, an arm of the Baltic Sea.

Leipzig (population, 715,000) has long occupied a notable position as one of the world's great publishing and bookselling centers, and is also the seat of a great university that was founded in 1409 and of a library in which since 1913 a copy of every book printed in Germany has been deposited. Its most important structures are: the 17 gigantic Fairs Palaces, where are held the various sample trade fairs for which Leipzig has been famous for centuries; the Reichsgericht, where the German Supreme Court of Judicature sits; and St. Thomas's Church, whose choir has been one of Germany's leading musical organizations since the days of its early 18th-century cantor, Johann Sebastian Bach. The Monument of the Battle of the Nations that commemorates the release of Europe from Napoleon's domination (through his defeat by the combined forces of Prussia, Austria, Russia and Sweden on October 18, 1813) stands near the city.

Cologne, located on the Rhine at the start of the most scenic part of the journey to Mainz, is world-famous for its great cathedral, whose twin towers rise 525 feet in height. In the golden chamber of this cathedral is a reliquary containing the bones of the Three Magi; the relics were brought from Milan by Emperor Frederick Barbarossa after a successful Italian campaign in 1162. During Roman times the city was known as *Colonia Agrippinensis.* Later in the 13th century it became one of the most powerful cities of the Hanseatic League. With Frankfort on the Main, another former "free imperial and Hanseatic town," it continues to maintain the commercial supremacy of western Germany.

There have survived from the Middle Ages such picturesque cities as Nürnberg, Augsburg, Rothenburg, Aachen and Hamelin. Nürnberg is famous for the Five-Cornered Tower erected in the 11th century; it contains one of the most formidable collections of torture instruments, including the ghastly Iron maiden, whose embrace meant death. The Germanic Museum here contains one of the most notable ethnological and historical exhibits in all Europe. The city is the scene of the annual congress of the National Socialist German Workers Party.

Augsburg won fame during the period from the 14th to the 16th century through its family of merchant princes, the Fuggers. To them the city owes such reminders of its ancient glory as the golden hall in the Town Hall and the handsome Fuggerhaus, whose frescoed exterior illustrates the early history of Augsburg. Rothenburg recalls, through the performance each summer of the play *Der Meistertrunk,* the heroic feat of its burgomaster in saving the town from destruction during the Thirty Years' War; at the command of the victorious general, the Count of Tilly, he quaffed, without once stopping for breath, an enormous flagon of wine.

The student of antiquity will find much of interest in Aachen (Aix-la-Chapelle); its many Charlemagne memorials recall the days when it was the capital of the Frankish Empire. With Hamelin is associated the legend of the pied piper, described by Robert Browning in his poem, *The Pied Piper of Hamelin.* In 1934 on the 650th anniversary of the disappearance of the town's children a memorial clock and carillon, with bas-relief depicting the principal incidents of the legend, was erected there.

As one of the great cultural centers of the world Germany was long famous for its universities. In addition to the universities of Berlin, Munich and Leipzig are Heidelberg, Jena, Bonn, Göttingen, Giessen, Halle, Marburg, Königsberg, Tübingen and Breslau. Eisenach and Erfurt are associated with Martin Luther and the Protestant Reformation in Germany; Weimar was immortalized by Goethe's 60-year residence; and Bayreuth has become Germany's musical capital and is noted especially for the Wagnerian Festivals held there since 1876.

geyser, a spring that throws forth from the interior of the earth, usually at irregular intervals, a fountainlike jet of hot water and steam. It results when water 75 or more feet below the surface of the earth comes into contact with hot rocks and is heated to a temperature above that of the boiling point—198° F. in the Yellowstone National Park. The hot water and steam escape when they overcome the pressure exerted in the upper part of the geyser's tube by the continually flowing, cool underground streams that fill it. With each eruption there is deposited about the crater of the geyser a minute quantity of an opaline silica called *geyserite.*

Geysers are found in regions of dying volcanic activity, such as Yellowstone National Park, Wyo., North Island, New Zealand, and Iceland (where they are utilized in heating baths, farm-, school- and greenhouses).

The active Yellowstone geysers number more than 70 and are grouped in five basins in the southwestern part of the park. The most famous, Old Faithful, throws a jet of hot water and steam about 150 feet into the air every 65 minutes. Among the other notable geysers, some of whose jets exceed 200 feet in height, are Giant, Giantess, Excelsior, Grand, Beehive, Grotto, Castle, Monarch and Constant. They play at irregular intervals of days, weeks, months and even years.

The most famous New Zealand geysers are Tarawera and Polutu; Iceland's century-old rivals are the Strokhr and the Great and Little geysers. The word *geyser* is derived from an Icelandic word, meaning to rush furiously.

Gibraltar, a rocky promontory at the southern tip of the Iberian Peninsula. Located on the Strait of Gibraltar, it guards the Atlantic entrance to the Mediterranean Sea and serves as one of the most important bases of the British Mediterranean Fleet in protecting the route to India. The promontory is 2¾ miles long, ¾ mile wide and 1,396 feet high. In ancient times the Rock of Gibraltar was known as Calpe, one of the Pillars of Hercules. On the first Moslem invasion of Spain in 711 the Berber leader, Tarik, captured it and gave it the name, Jebel-al-Tarik (Mount of Tarik) from which Gibraltar is derived. The Spaniards seized it from the Moors in 1462; the English and Dutch took it in 1704; and the English have held it since its cession by the Treaty of Utrecht in 1713. Today it is a British Crown colony, and the commander-in-chief of the fortress acts as governor. A large harbor, constructed at the base of the rock, serves as a naval base. The civil population of the town that has grown up on the landward side of the rock numbers 18,000; the military and naval population is about 4,000. Between British and Spanish territories is a low sandy isthmus that serves as neutral ground.

Gilbert Islands, an archipelago of 18 coral islands and atolls in the Pacific Ocean, crossed by the equator near 175° E. Long., belonging to the Micronesian part of Oceania. The principal islands are Butaritary, Makin, Tarawa, Marakei, Abaiang and Maiana. The total area is 166 square miles, and the population (of mixed Micronesian and Polynesian blood) is about 27,000. The chief agricultural products are copra and coconuts. Phosphate is mined. The Gilbert Islands were named for an English sea captain who visited them in 1788, although they were first discovered by the Spanish navigator Saavedra in 1529. In 1892 a British protectorate was established, and in 1915 Ocean Island became the administrative center of the British Crown colony of Gilbert and Ellice Islands. The dependencies of this colony are Washington, Fanning and Christmas islands. Its resident commissioner is responsible to the High Commissioner to the Western Pacific in Fiji.

glacier, a large mass of compressed snow and ice moving slowly in regions of perpetual snow over a sloping surface. Glaciers are generally formed in high mountainous regions where, on account of moist winds, the quantity of snow that falls exceeds that which melts. They also occur in the Arctic and Antarctic circles. Among the different kinds are: *continental glaciers* or ice sheets; *plateau glaciers* or ice-caps; *piedmont glaciers,* those that spread out at the foot of a mountain; *hanging glaciers,* those on a mountainside; and *reconstructed glaciers,* those formed from recongealed remnants of other glaciers.

Glaciers vary in size, the largest being in Alaska. Malaspina Glacier on the southern slope of Mt. St. Elias has an area of 1,500 square miles. The rate of movement varies from an almost unnoticeable 10 inches or 20 inches to several feet a day. The Mer de Glace on Mont Blanc in the Alps moves about 3 feet a day, and the Muir Glacier at the head of Glacier Bay in Alaska sometimes moves 7 feet a day. Like a river a glacier moves faster on the surface than below and faster in the middle than at the sides; its motion is believed to be the result of regelation, that is, melting and freezing anew of parts of it.

Glaciers are erosive agents that wear down rock and soil and leave on their sides or at their bases deposits called *moraines.* Those that move down mountain valleys end abruptly in a tonguelike tip a short distance below the snow line, although some, like the Rhone Glacier, may continue as rivers or, like the glaciers of Glacier National Park, may feed mountain lakes. On reaching their terminal, the sea, many Arctic glaciers form treacherous icebergs that are swept south by the Labrador Current and impede navigation.

Much of the continental formation of North America may be traced to the action of glaciers. This is especially noticeable in the Great Lakes region, the Hudson valley and the lake region of Minnesota. Glacier National Park in Montana has 60 small glaciers, the largest and most beautiful of which is Blackfeet Glacier. The word *glacier* is derived from the French *glace,* meaning ice.

glade, an open, grassy section of a forest or a cleared passage through a wood.

glen, a narrow, secluded valley or ravine between hills or mountains.

At Watkins Glen, N. Y., is one of the most interesting examples in the eastern United States. Its small inner gorge and series of potholes that form the pools of the present cascade were formed by the retreat of a great cataract. It has been set aside as a state park.

The word *glen,* derived from the Gaelic *gleann,* meaning valley, is used in many place names, such as Glen Rock, N. J., and Glen Cove, Long Island, N. Y. Glen Nevis, Scotland, is noted for its hanging valley.

globe, the round object on which the various land divisions and bodies of water that characterize the earth's surface are represented. It is generally made of cardboard, pasted over a hollow sphere made of papier maché or wood, with a metal base or standard. Such an object is an admirable means of demonstrating how the earth rotates on its axis, the axis of the globe, in accordance with the inclination of the earth's axis to the celestial equator, being adjusted to an angle of 23½°.

Anaximander, the Greek philosopher, is believed to have designed the first globe (or section of a globe) and to have made the first map of the world in the 5th century B.C. During the late Renaissance period when the idea of the earth as a sphere had been generally accepted, despite the century-old ban imposed by the Church, the manufacture of ornate metal globes became an important part of the coppersmith's craft. Derived from the Latin *globus,* meaning a ball, the word *globe* applies also to the earth and its surface.

Gobi, a desert in southern Outer Mongolia, northern Inner Mongolia and eastern Sinkiang; it covers an area of about 500,000 square miles and is located at the northeastern end of the great arc of deserts that is practically unbroken from the Sahara in Africa. With an average elevation of 3,000 feet, it has a severe but variable climate and is inhabited by a few nomadic Mongolian tribes. Regular caravan routes cross the Gobi, and recently motor trucks have been employed in transportation. Expeditions led by Roy Chapman Andrews of the American Museum of Natural History in New York have discovered in this region dinosaur eggs, fossils of prehistoric animals and artifacts of prehistoric men. Marco Polo refers to the Desert of Gobi in his *Travels.* The Chinese names for the region are *Shamo* (sand desert) and *Han-hai* (dry sea).

Gold Coast, a British Crown colony of West Africa that derives its name from grains of gold mixed with river sands. It extends 334 miles along the Gulf of Guinea and is bounded on the east by British Togo and on the west by the Ivory Coast colony of French West Africa. Joined to it for administrative purposes are Ashanti and the Northern Territories on the north. The area of the Gold Coast colony proper is 23,490 square miles; with its administrative dependencies this area amounts to 78,802 square miles. Most of the population of 3,165,000 is negro, As the climate is extremely hot and not very healthful for white people, only some 2,000 Europeans, mostly British Government officials and traders, live here.

The inland part of the Gold Coast colony is part of the great African plateau, with some of the hills rising to a height of 2,000 feet. The chief rivers are the Volta, Ankobra (or Snake) and Prah. The colony is one the greatest cacao-growing regions of the earth; the annual exports amount to almost 270,000 tons. Other products include kola nuts, coffee, tobacco, cotton, spices, rubber, bananas and other tropical fruits. The colony has been exploited since the early '70s by European concessionaires for its gold and for diamonds that are obtained mostly from alluvial deposits. Other important minerals are manganese and bauxite.

The administration of the colony is entrusted to a governor appointed by the Crown. He is assisted by an executive council and a legislative council. There are responsible to him the commissioners of the three provinces into which the colony is divided, as well as the commissioners for Ashanti and the Northern Territories. He also has charge of the administration under mandate from the League of Nations of British Togo (area, 13,019 square miles), formerly part of the German protectorate, Togoland.

The capital of the Gold Coast is Accra (population, 64,000), located on the southeastern coast. The governor's residence is Christiansborg Castle, erected in 1661 when the territory belonged to Denmark. The chief seaport is Takoradi, where at a cost of $15,000,000, one of the finest harbors in all Africa has been developed. Among other important towns are Tarkwa (center of the gold-mining industry), Winneba and Akropong.

British influence in the Gold Coast dates from the formation of the Royal

African Company in 1672. It became a Crown colony in 1874.

Golden Gate Park, a 1,013-acre park in San Francisco, Calif. It is noted for its Japanese tea garden, Steinhart Aquarium, zoo, aviary, botanical garden (with conservatories and Arizona garden of cactus and yucca), arboretum, temple of music and stadium. In this park is also located the city's most important museum, the De Young Memorial Museum and Art Gallery. The principal statues are those of Father Junípero Serra, founder of the California missions, and Gen. John J. Pershing. Reflected in Lloyd Lake are the Portals of the Past, the only reminder that one will find anywhere in San Francisco of the earthquake of 1906.

gorge, a steep, rocky ravine, particularly one through which a creek or river flows. The term applies also to a narrow passage or defile between mountains. The Finger Lakes region of central New York is noted for the beauty of its gorges. The most famous gorge of the western United States is the Royal Gorge of the Arkansas River in Colorado.

Gotland, the largest of the Baltic Sea islands, situated about 50 miles east of southern Sweden and constituting with the Islands of Fårö and Göttska Sandö one of the 25 administrative districts or governments of that country. The area is 1,220 square miles, and the population is about 57,000. The agricultural products include sugar beets, wheat, rye and oats. Sheep, cattle and other livestock are raised. The capital, Visby, was an important commercial center during the Middle Ages and belonged to the Hanseatic League; it is noted for its ecclesiastical ruins. Alternately claimed by Denmark and Sweden, Gotland has belonged to the latter country since 1679. It is one of the most important Swedish military and naval outposts, and in recent years its defenses have been strengthened.

Grand Canyon of the Colorado, a deep gorge carved in the Kaibab and Coconino plateaus of northern Arizona by the Colorado River. It is considered the greatest example of running water erosion, aided by such erosive agents as heat, cold and frost in expanding and contracting the rocks. Over many thousands of centuries the broken surfaces of these rocks have been carried away by rain water and wind. The canyon now measures 217 miles in length, from 8 to 20 miles in width and has a depth from 4,000 to 7,000 feet. Along its floor the Colorado River winds its tortuous course over a boulder-strewn bed; it is 300 feet wide and 30 feet deep but from the cliffs above resembles a narrow silver stream. The steep downgrade of the river has been aided, according to geologists, by the gradual uplift of the Kaibab Plateau that is now 300 feet higher than the Coconino Plateau on the south rim of the canyon.

In addition to the Colorado's main canyon the chasm is cut in every direction by myriads of smaller canyons, carved by rivulets in seeking the parent stream. The result is a miniature submerged mountain system that assumes many bizarre forms. In addition to the easily recognized buttes and mesas there are turrets and towers, domes and minarets, colonnades and pinnacles. To them have been given names from Greek, Teutonic, Egyptian and Hindu mythology, of Indian tribes and chieftains, of Spanish explorers and famous scientists. Among the more distinctive forms are Wotan's Throne, Shiva Temple, Osiris Temple, Krishna Shrine, Isis Temple and Brahma Temple.

The walls of the Grand Canyon are composed of different multicolored rock beds, formed by the region's being submerged at least five times beneath the prehistoric ocean. Starting at the top, these layers include gray Kaibab limestone and Coconino sandstone, red Supai sandstone, Redwall limestone, green Tonto shale and sandstone and dark Unkar granite. They also present marked differences in character, the hard beds rising to great cliffs and the softer ones breaking into slopes.

Two trails, the Bright Angel and Hermit, lead from the canyon's rim to its floor. The most important lookouts are El Tovar, Hopi Point and Grand View Point. From these the Grand Canyon presents an ever-fascinating panorama. The beauty of this scenic spectacle, bathed in colors of pastel softness, varies from hour to hour with changing atmospheric conditions—mist gives the colors opalescent tints, bright sunshine endows them with a vivid brilliancy and a passing cloud casts over the whole a bluish shadow.

So great a favorite has the Grand Canyon been with both American and foreign tourists that in 1919 the Federal Government set aside as a national park some 100 miles of its most interesting part. The total area of the park is 1,009 square miles. The Grand Canyon was discovered in 1540 by Garcia Lopez de Cardenas, a captain in Coronado's army of Spanish adventurers. John W. Powell, who later became director of the United States Geological Survey, was the first to explore this part of the Colorado by boat in 1869.

Grande Place, the main square of Brussels, Belgium, which is surrounded by some of the most beautiful Gothic structures in all Europe. These include the Hôtel de Ville, Maison du Roi, Palais de la Nation and several medieval guild houses.

Grands Boulevards, the 23 miles of avenues encircling Paris, which were constructed during the reign of Napoleon III on the site of the old fortifications. The system may be said to commence at the Church of the Madeleine with the Boulevard de la Madeleine and includes among others the Boulevards Haussmann, Italiens, St. Germain and Pont Royal.

Grant's Tomb, New York city. This monumental granite structure on Riverside Drive, overlooking the Hudson, was dedicated in 1897. The base, 90 feet square, is surmounted by a circular tower with a pyramidal roof. The Civil War leader General Ulysses S. Grant and his wife lie in dignified state within.

Great Britain, the largest island of Europe and the most important of the British Isles. Its three geographical divisions are England, Scotland and Wales. Linked to it for political purposes is Northern Ireland in the United Kingdom of Great Britain and Northern Ireland. The southern part of Ireland has had a separate government since 1922. Several adjacent groups of islands belong to Great Britain; principally the Shetland, Orkney, Hebrides, Manx, Scilly and Channel. The total area of Great Britain is 94,278 square miles; the population is about 44,800,000.

Great Britain is separated from the Continent by the North Sea on the east and the Strait of Dover and the English Channel on the south; to the northwest and southwest is the Atlantic Ocean, and the island is separated from Ireland by the Irish Sea and the North and St. George's channels. The Gulf Stream flows near the northwestern and southwestern coasts and so moderates the climate that it is much milder than the average temperature in like latitudes elsewhere. Great Britain's latitudes correspond with those of bleak Labrador.

Great Britain is a constitutional, hereditary monarchy, with no written constitution such as is possessed by the United States. Its basic law consists largely of precedents that have been established during the centuries and are accepted as fundamental law.

great circle, the circle cut on the terrestrial sphere by an imaginary plane passing through the center. As shown in solid geometry, the shortest distance between two points on the surface of a sphere is the arc of the great circle passing through the points.

In long-distance navigation or aviation a considerable distance may be saved by following the great-circle routes, and such methods are known as great-circle sailing or flying. New York and Coimbra, Portugal, for example, are nearly on the same parallel of latitude; yet the shortest route from New York to Coimbra is not the route due east. By following the arc of the great circle that passes through these ports a vessel would sail more than 200 miles north of the straight east-west line and still would be following the shortest route.

With the development of aviation it will doubtless be possible to take even greater advantage of the geometrical principles of great-circle navigation. The shortest route from San Francisco to Moscow, for instance, is a great circle passing nearly through the North Pole. On their transpolar flight from Moscow to San Jacinto, Calif., July 12, 1937, the three Russian aviators—Gromov, Yumashev and Danilin—established a world-record flight of 62 hours and 17 minutes by following this great-circle route. The North-to-the-Orient flight of Col. Charles A. Lindbergh and his wife, Anne Morrow Lindbergh, in 1931 was by the shorter aviation route, utilizing the great-circle principle.

Great Lakes, a series of five large, freshwater lakes in the east-central part of North America. Lake Michigan, between Michigan and Wisconsin, lies wholly within the United States; the other four, Superior, Huron, Erie and Ontario, form part of the international boundary between the United States and Canada. With the aid of the St. Lawrence River and the Welland, New York State Barge and Sault Ste. Marie canals they also form a continuous waterway from Duluth, Minn., at the western end of Lake Superior to the Atlantic Ocean. The Great Lakes waterways have a total area of 288,245 square miles, including their drainage basin; the length of the system from the head of Lake Superior to the St. Lawrence River is about 1,300 miles. The chief cities on the Great Lakes are Duluth, Minn., Milwaukee, Wis., Chicago, Ill., Detroit, Mich., Toledo and Cleveland, Ohio, Buffalo, N. Y., and Toronto and Port Arthur, Ont.

Great Salt Lake, a lake lying in the Great Basin between the Wasatch Range of the Rocky Mountains and the Great Salt Lake Desert in northwestern Utah. Next to the Dead Sea it is the saltiest body of water in the world, containing some 14 per cent of mineral salts. Irregular in form, it is about 75 miles long and from 30 to 50 miles wide and has an area of about 2,300 square miles, although during the dry season in many years this area is reduced to 1,750 square miles. The chief tributaries are the Jordan River, which carries waters from Utah Lake, and the Weber, Ogden and Bear rivers. The lake has no outlet. On evaporating the waters leave sodium chloride and other salts that are regularly gathered, the amount secured each year averaging about 40,000 tons. The shores of Antelope Island, the largest island in the lake, are whitened with salt. At Saltair, a well-known resort built on a peninsula extending 4,000 feet out into the lake, bathers like to test its reputed buoyancy. Salt Lake City is 11 miles from the southeastern shore.

Great Salt Lake was first explored by John C. Frémont in a rubber boat in 1843. Geologists have found that after the Glacial Era the Great Basin was the site of a lake that covered probably as much as 25,000 square miles. This prehistoric lake is called *Lake Bonneville* in honor of Benjamin L. E. Bonneville (1793–1878), a French-born soldier in the U.S. Army who explored the Rockies in 1831–38. When part of this prehistoric lake evaporated, several small lakes were formed. The largest of these is today the Great Salt Lake.

Greece, a kingdom of Europe, occupying the southernmost part of the Balkan Peninsula. It is bounded by Yugoslavia and Bulgaria on the north; by Turkey and the Aegean Sea on the east; by the Mediterranean Sea on the south; and by the Ionian Sea and Albania on the west. Included in its area of 50,257 square miles are most of the Aegean Islands, the more famous of which are Euboea and the two groups, the Cyclades and Sporades; Corfu and other islands of the Ionian Sea; and Crete. This area is more than twice as great as Greece was in 1912, having been augmented by Greece's success in the wars with Turkey (1912) and Bulgaria (1913); her occupation of Thrace and other territory during the World War was confirmed by the Treaties of Neuilly with Bulgaria and Sèvres with Turkey. The population is 6,746,000.

Greece is so deeply indented by gulfs and bays that there are about 2,500 miles of coast line or 1 mile of strand for every 20 square miles of area. Among the gulfs are Thermaikos, Cassandra, Kavalla, Argolis, Laconia, Messenia, Saronic, Patras and Corinth. In fact, the Gulf of Corinth, which is connected with the Gulf of Patras by the Strait of Lepanto, penetrates so far inland that the southern part of the peninsula, the famed Peloponnesus of ancient times, is almost an island. This insular position may be considered complete, for the 4-mile-long Corinth Canal, connecting the gulf of Saronic and Corinth across the Isthmus of Corinth, makes Peloponnesus a body of land entirely surrounded by water.

A considerable part of Greece is mountainous. The Pindus Mountains, extending nearly north and south along the Thessaly-Epirus border, are the principal range of the Dinaric Alps. The highest peaks in Greece are found in the eastern Othrys and Parnassus ranges. Mt. Olympus (in mythology the home of the gods) is 9,793 feet high; Mt. Khiona, 8,240 feet high; and Mt. Lykeri (the ancient Parnassus at whose foot was Delphi, site of the oracle of Apollo), 8,065 feet high. The principal range of Peloponnesus is Malevo. Between the ranges are fertile valleys watered for the most part by short rivers that flow swiftly to the sea. The Alpheus and Eurotas are the principal rivers of Peloponnesus; and the Achelous, Arakthos and Spercheios drain the mainland. The most noted plains of Greece are Attica, on which developed Athenian civilization, and Laconia, whose fertility was the foundation of Sparta's greatness.

Agriculture is the chief occupation, although the country's mountainous conformation leaves only a fourth of the area fit to be cultivated. Reclaiming the marshes of the Vardar River and draining lakes Copais, Ardzan and Amatovo have brought some 600,000 acres under cultivation. The draining of Lake Copais has rid this territory of the malaria and other diseases that had made the slow-witted Boeotians an object of ridicule since the days of Aristophanes. Half of the arable area is devoted to stock raising, principally of sheep and goats. Bee culture has been important since the days when the ancient Greek poets sang of the honey from Mt. Hymettus.

The principal crops are olives, currants (a variety of seedless grapes), figs, dates, citrus fruits, nuts, tobacco, wheat, corn, barley, oats, cotton and rice. Through increased production of mulberry trees the number of silk cocoons raised annually on mulberry plantations has been increased. Linked with these products are the chief manufactures—olive oil, wine, flour, textiles (principally cotton and silk goods), cigarettes, chemicals, pottery, carpets and leather goods. The country's mineral wealth is to a large extent unexploited. Iron ore, iron pyrites and lignite lead in production. There are also deposits of lead, chromite, zinc, emery and salt. Mt. Pentelicus and the island of Paros of the Cycladean group have been famous for their marble since the days of Praxiteles. Fishing is naturally one of the leading occupations of a maritime people who specialize in sponge diving and in catching sardines, tunny, anchovies and other Mediterranean fish.

After a 10-year interval as a republic Greece returned to the monarchical form of government in 1935, recalling to the throne King George II. Parliament is a unicameral body, consisting since the Senate was abolished in 1935 of only the Chamber of Deputies called the *Vouli;* it consists of some 300 members, elected by popular vote for 4 years. Executive power is held by the premier and the ministry assisting him.

Athens, the capital of Greece, and its port Piraeus are described in a separate article. Other important cities are: Salonika, a busy modern seaport and university center, noted also as the ancient Thessalonica for its Greek and Roman ruins; Patras, a manufacturing center whose castle bespeaks Venetian and Turkish domination; and Corinth, a modern town that has grown up 3 miles from the site of the ancient city. The past lives again at Argos with its acropolis and Olympia where the original Olympic games were held. On the summit of the 6,346-foot Mt. Athos, located on the easternmost prong of the Khalkidike Peninsula, the Greek Orthodox Church has maintained for centuries a religious community. Its 20 monasteries are now inhabited by some 4,800 monks, to whom autonomous power as a monastic republic has been granted by the Greek Government.

The English name *Greece* is derived from the country's Latin name *Graecia.* The Greek name is Hellas.

Greenfield Village, Dearborn, Mich. Here Henry Ford has assembled a group of typical and individually historic village buildings that preserve the atmosphere and setting of American life of a century ago. Tavern, store, church, smithy and other local village industries are in active operation, and the artisans employ the tools and methods appropriate to the era they commemorate.

Greenland, the world's largest island, excepting Australia, which geographers include among the continents. Greenland has a total area of 839,700 square miles; it stretches as far south as 59° 45′ N. Lat. and northward to 83° 39′ or within 450 miles of the North Pole. Surrounding it are the Arctic Ocean on the north, Greenland Sea on the east, Atlantic Ocean on the south and Davis Strait, Baffin Bay and Smith Sound on the west. More than three-fourths of the island is a lofty plateau, 10,000 feet above sea level, covered in some places with an icecap 1,500 feet thick. In the eastern part rise a few snow-covered peaks, the highest being Mt.

Forel, 11,500 feet high. The western coast is cut by deep fiords, at which terminate numerous glaciers, and the huge icebergs thus formed are carried southward by the Labrador Current.

Greenland is a Danish colonial possession, the habitable part in the south and southwest including 46,740 square miles. The population numbers 16,630; all but about 300 are Eskimos. The capital is Godthaab. At Godhavn on Disko Island in Disko Bay (which is also the administrative center of the northern inspectorate) the Danish Government maintains a station for scientific research pertaining to Arctic life. The Eskimo community of Umanak on the west central coast at 70° 40′ N. Lat. is one of the most northerly settlements of the Arctic Region. It is too far north to be swept by that branch of the Gulf Stream known as the North Atlantic Stream, which makes parts of the island more habitable.

During the long summer days of June and July vegetation springs into life, and flowers such as the Arctic poppy bloom for a brief time even in the northern part. (The days average 20 hours in length in the southern part of Greenland, and above the Arctic Circle daylight is continuous.) Most of the vegetation is alpine in character. The natives subsist by fishing, sealing, hunting and gathering edible berries and the eggs of sea birds.

Greenland was named in 985 by its Norse discoverer, Eric the Red, who may have been surprised to see the coastal fringe of the southwestern part green in summer. The descendants of the Norse colonists that he induced to settle there disappeared sometime in the 15th century, maybe as the result of a severe famine or of the plague.

In 1774 Denmark succeeded in establishing a trading settlement on Greenland, and now more than 60 such settlements dot the southern and southwestern coasts for about 1,000 miles. The Danes, who have held a state monopoly since 1776, have exploited the mines of cryolite and graphite and export fox and bear skins, eiderdown, whale and seal oils and various kinds of fish. Recently coal, iron and copper have been discovered. The United States relinquished its claim to Peary Land in northern Greenland, discovered by Robert E. Peary during 1892–95, on purchasing the Virgin Islands from Denmark in 1917. In 1933 the World Court recognized Denmark's sovereignty over eastern Greenland.

Grenada, an island of volcanic formation in the Caribbean Sea, belonging to the Windward group of the Lesser Antilles and forming part of the British West Indies. It has an area of 133 square miles (including the chain of small islands to the north called the Grenadines) and a population of 79,000, mostly Negroes. The mountains are noted for their crater lakes, such as Grand Etang and Lake Antoine, and Mt. Catharine rises to 2,750 feet above sea level. The chief agricultural products are cacao, nutmeg, sugar cane, coffee, cotton and tropical fruits. Sulphur and fuller's earth are mined. The capital, St. George, is the residence of the governor of the Windward Islands Crown Colony. Its unique harbor is really an ancient crater. Discovered by Columbus in 1498 and earlier named Conception, the island has been a British possession since 1783, when it was ceded by France in accordance with the Peace of Versailles.

grotto, a cave or natural or artificial well-protected recess in the earth or rock. The term is derived from the Italian *grotta,* meaning cave. Among world-famous grottoes are the marine Blue Grotto on the Isle of Capri and the Grotto of the Sibyl at Marsala, Sicily, the abode of the prophetess of Lilybaeum whose oracles were inspired by the bubbling spring of the cave.

The term *grotto* applies also to a cavelike opening in a glacier, noted for the aquamarine light that filters through the roof of snow. The most famous is the grotto of the Rhone glacier, visited annually by thousands of tourists in Switzerland.

grove, a tree group smaller than a forest and without underbrush; either especially planted or growing naturally but appearing to have been cultivated. The term also describes any small wood. In mythology groves had a religious significance and were often sacred to some god or goddess. For instance, at the temple in a grove near Aricia on the shores of what is now Lake Nemi, the ancient Romans worshiped Diana.

Guadeloupe, a group of islands of volcanic origin in the Caribbean Sea, belonging to the Leeward section of the Lesser Antilles. The principal islands are Basse-Terre and Grande-Terre, separated by the Rivière Salée (Salt River), and there are five smaller islands. They comprise a French colony and have an area of 688 square miles and a population of 267,000, mostly Negroes. The highest mountain is La Soufrière, a dormant volcano on Basse-Terre, 4,900 feet high. The agricultural products include sugar cane, cacao, coffee, cotton, yams, tobacco, vanilla and bananas. The capital is Basse-Terre on the island of that name, and the chief seaport is Pointe-à-Pitre on Grande-Terre. The islands were discovered by Columbus in 1493; they have been a French possession since 1816 and are now administered by a governor and privy and legislative councils. As a department of France they are represented in the French Parliament by one senator and two deputies.

Guam, one of the Marianas Islands in the Pacific Ocean, three-fourths of the distance westward between Hawaii and the Philippines. Belonging to Micronesia, it is the smallest and most isolated possession of the United States and came into American ownership through Spanish cession after the Spanish-American War. The area is 206 square miles, and the population numbers 18,500, including a naval contingent of more than 1,000. The principal products are copra, coconut oil, rice, coffee, tobacco, hemp, bananas, mangoes and breadfruit. The natives, who call themselves *Chamorros,* are of Indonesian stock with a mixture of Malayan and Spanish blood. Under American occupation great progress has been made in their education, and 40 per cent of the island's revenue has been expended for that purpose. At the capital, Agana, resides the governor, a captain of the United States Navy who is also commandant of the naval station at Apra, a port of call for vessels between Honolulu and Manila. Assisting the governor is a native advisory congress. The island was discovered by Magellan in 1521.

Guatemala, a republic of Central America bounded by Mexico on the north and west, by British Honduras, the Gulf of Honduras and Honduras on the east and by El Salvador and the Pacific Ocean on the south. In accordance with the award of an arbitration commission, settling in 1936 the 90-year boundary dispute between Guatemala and Honduras, the area is 48,290 square miles. The population is estimated at 2,005,000. Only 5 per cent of the people are white, mostly of Spanish descent. Of the 13,000 white foreigners the predominating element is German. About 70 per cent of the inhabitants are Indians, descendants of the Quiches, Caribs and other tribes; they are found mostly in the semimountainous foothills.

Along the country's Pacific coast is a 50-mile-wide coastal plain that constitutes the most important agricultural section. Rising above this plain is the Sierra Madre that forms the principal watershed and is noted for such volcanic peaks as Acatenango (13,615 feet), Tajamulco (13,517 feet) and Fuego (12,795 feet). From the foothills of these mountains, called the *Altos,* and from the Sierra de Chama that extends into British Honduras the land slopes to the Peten Plain that comprises a third of Guatemala's total area. The southern part of the country is well watered by the Motagua River (250 miles long) and the Polochic River (180 miles long); both flow into the Gulf of Honduras. Among Guatemala's picturesque mountain lakes, many of them formed in the craters of extinct volcanoes, are Atitlan and Amatitlan.

Guatemala's principal products are coffee, bananas, sugar cane, cacao, Indian corn, cotton, rubber, tobacco and citrus fruits. More than 100,000,000 pounds of coffee and 5,000,000 bunches of bananas are exported each year. From the latex of the *sapodilla* tree is obtained chicle, the chief ingredient of chewing gum. The mountain valleys are utilized as grazing lands for sheep and cattle. In Guatemala's vast forests are found 150 different varieties of cabinet and dyewoods. The exploited mineral wealth includes gold, silver, lead, salt and petroleum. Deposits of tin, copper, mercury, antimony, coal and sulphur also have been found. Manufactures include textiles (cottons and woolens), straw hats, pottery, Indian blankets and furniture.

Courtesy Pan American Union *Courtesy Pan American Airways*

Colorful Costumes in Guatemala

Each Indian village in Guatemala has its volunteer troops, each troop dressed in different and distinctive costumes, as with the group at the left. The soldier in front is an officer and carries a machete, while the privates in the background carry rifles. At the right is a Guatemalan flower girl in native costume

Guatemala has been an independent republic since 1839. On throwing off the Spanish yoke in 1821 it was attached first to Mexico and then from 1823 to 1839 was a member of the Central American Federation, composed of the present republics of Guatemala, Honduras, El Salvador, Nicaragua and Costa Rica. The President or chief executive is elected by direct vote for a 6-year term; he is assisted by a cabinet of 7 secretaries and by a council of state of 7 members. The legislative body is the unicameral National Assembly, composed of one member for every 30,000 inhabitants and elected by direct vote for a 4-year term. For local administrative purposes the country is divided into 23 departments.

Guatemala City, the capital, is situated in the Valley of Las Vacas in the southern part of the country. It is connected by rail with its seaport, San José, 85 miles to the southwest on the Pacific coast. A beautiful example of Spanish colonial architecture is the Roman Catholic cathedral, facing the Plaza de Armas. Among other notable buildings are the National Legislative Palace, the old Spanish churches of Cerro del Carmen, La Merced, San Francisco and Santo Domingo, National Library and University (founded in 1918). The principal thoroughfare is the Paseo de la Reforma. In the Aurora Park is the Archeological Pavilion, containing specimens of archaic Indian art. In 1917 Guatemala City experienced one of the most disastrous earthquakes since its founding in 1776. The population is about 116,000. Among other important cities are Quezaltenango, Antigua, Huehuetenango, Coban and Zacapa.

Guernsey, the westernmost of the more important Channel Islands, about 70 miles south of England, to which it belongs. The area is 24.5 square miles; and with the inhabitants of adjacent islands, such as Alderney, Sark and Herm, constituting the bailiwick of Guernsey, the population is about 42,000. The most important industries are truck gardening, dairying (a certain breed of cattle take their name from this island) and fishing. At the capital, St. Peter Port, resides the lieutenant-governor, appointed by the Crown.

gulch, a deep or very steep ravine or gully. In the western United States the formation may be the sharply hollowed-out bed of a rapid mountain torrent.

gulf, a large arm of an ocean or a sea extending into the land. In the strictest use of the term, which is derived through the French *golfe* from a Greek word meaning bosom, it is larger than a bay but smaller than a sea. There are notable exceptions to this general rule, for the word *gulf,* like the word *bay,* is often loosely used. Thus, on the east coast of India is the Bay of Bengal which is almost as large as the Arabian Sea on the west. The Gulf of Genoa, an arm of the Ligurian Sea in the Mediterranean, is decidedly smaller than the Bay of Biscay that indents the western coast of France.

The largest gulf in the Western Hemisphere is the Gulf of Mexico. The Gulf of St. Lawrence, the Gulf of California and the Gulf of Alaska are other important North American Gulfs. In Central America special interest attaches to the gulfs along the coasts of Panama: the Gulf of Darien and Mosquito Gulf on the Atlantic side and the Gulf of Panama on the Pacific side.

In Europe the Gulf of Bothnia, the Gulf of Finland and the Gulf of Riga are arms of the Baltic Sea. The Gulf of Taranto forms the arch of the foot of the Italian peninsula. The Gulf of Trieste and the Gulf of Venice are at the northern end of the Adriatic Sea.

In Asia along the coast of Iran are the Persian Gulf and the Gulf of Oman. The Gulf of Aden borders southern Arabia; the Gulf of Siam, the southern coast of Siam; and the Gulf of Tonkin, the eastern coast of French Indo-China.

The western coast of Africa is marked by the Gulf of Guinea. Along the northern coast of Australia is the Gulf of Carpentaria. In South America, Argentina is indented by the Gulf of St. George and San Matias Gulf; and Chile by Corcovado Gulf.

Gulf Stream, the broad, shallow, warm stream that constitutes the most important current of the North Atlantic Ocean. It takes its name from the Gulf of Mexico. It issues from the Gulf near the coast of Cuba and at the narrowest portion near the Florida Keys is about 50 miles wide and 350 fathoms (2,100 feet) deep, with a velocity of about 65 miles a day. When it reaches Cape Hatteras, it turns northeastward until it reaches the Grand Bank off the coast of Newfoundland, where part of it mingles with the Labrador Current and with warm southwest winds causes the fogs for which this region is particularly noted.

A second branch of the main Gulf Stream, called the North Atlantic Stream, then assumes the character of a drift, its velocity decreasing from about 28 miles a day off the coast of Newfoundland to 10 or 15 miles a day 300 miles eastward. Its depth also decreases to about 100 fathoms, but its width increases to about 150 miles. On reaching the British Isles this part of the Gulf Stream is further subdivided into flows that reach the Arctic Ocean via the west coast of Norway, west coast of Iceland and the southwestern coast of Greenland. In the Arctic Circle these three branches mingle with the cold, deep-sea currents that flow southwest to the equator as the Labrador Current. The greater warmth of western Europe in winter compared with eastern North America in the same latitude is largely the result of the Gulf Stream, although the difference in temperature may be partly due to moisture-laden southwesterly trade winds.

The third branch of the main Gulf Stream also assumes the character of a drift, being known as the West Wind Drift. After mingling with the current off the Canary Islands it becomes part of the North Equatorial Current and flows back to the Gulf of Mexico where it originated.

gully, a small gorge through which water runs only after a rainfall or when snow is melting. It thus forms the bed of a temporary (rather than a permanent) stream. The term applies also to a woodland hollow with steep sides.

Hague, The, the capital of the Netherlands, located in the western part of the province of South Holland about 3 miles from the North Sea. It is primarily the seat of government; but it has manufacturing establishments that produce iron castings, furniture, copper ware, jewelry, porcelains, chemicals and optical instruments. The population is about 477,000.

Ever since the latter part of the 17th century The Hague has played an important role in European diplomacy as one of the most important treaty-signing centers for nations that wished to discuss the terms of these conventions on neutral ground. Since 1899, when at the instigation of the czar of Russia there was convened here the conference that resulted in the formation of the Permanent International Court of Arbitration or Hague Tribunal, the name of the city has been a synonym for peace. The beautiful Peace Palace, built by Andrew Carnegie and dedicated in 1913 as the home of the Permanent International Court of Arbitration, became in 1922, on the initiative of the League of Nations, the headquarters of the Permanent Court of International Justice (or World Court); it is also the seat of the Academy of International Law.

Like other cities of the Netherlands, The Hague has many picturesque, shaded canals crossed by ornamental bridges. Handsome buildings, mostly in the Dutch Renaissance style, dominate the principal streets. Next to the Peace Palace the most imposing structure is the 16th-century royal palace, in front of which is a statue of the father of united Netherlands, William I. The center of the city is the Binnenhof (inner court), formerly the palace of the counts of Holland and now housing the States-General or Parliament and various government departments. The Ridderzaal (Knights' Hall), where in 1581 the seven northern provinces renounced their allegiance to the Spanish King Philip II, is now the archive chamber. In the Buitenhof (outer court) is the Gevangenpoort or prison, which possesses many a grim record of the Spanish occupation. The principal churches of The Hague are the Gothic-styled Groote Kerk (Church of St. James) and the Nieuwe Kerk, which contains the tombs of the philosopher Baruch Spinoza and of the statesmen Jan and Cornelis de Witt. In the Haagsche Bosch or Hague Wood (alders, oaks and beeches) is the summer royal palace, Huis Ten Bosch (House in the Wood).

The most celebrated art gallery of The Hague is the Mauritschuis (Palace of Maurice), which takes its name from its 17th-century builder, Count Maurice of Nassau; its most important canvases are those of Rembrandt, Van Dyck, Rubens, Ver Meer and Ruysdael. There are also the Gemeente or Municipal Museum, Museum Mesdag (a modern art collection started by the painter Hendrik Willem Mesdag), Museum Meermanno-Westreenianum (noted for its antiquities), Royal Library, Ethnographical Institute of Netherland India and a historical art collection in the 16th-century Town Hall. The National Monument commemorating the restoration of freedom to the Netherlands at the end of the Napoleonic Wars stands in Willems-Park. The Hague is noted also for its model beach at the suburb of Scheveningen.

The name *The Hague* (Dutch, *den Haag*) is a contraction of 's Gravenhage, the count's hedge, referring to the period when the city was a hunting seat of the counts of Holland. In the 13th century under Count Flores V it became a princely residence and in the 16th century under King William I was the seat of the States-General.

Hainan, an island of the South China Sea, 15 miles south of the Luichow Peninsula, the southernmost tip of the mainland of China, from which it is separated by the Hainan Strait. It forms part of the Chinese province of Kwangtung. The area is 13,166 square miles. Of the total population of about 3,000,000, 2,000,000 are Chinese and 1,00,000 are aborigines, known as *Sheng-li,* and half-breeds, called *Shu-li.* Gold, copper, tin and other minerals are found in the mountains, the principal range of which is the Wu-Chi-Shan, rising to a height of 6,000 feet above sea level. The northern part of the island is mainly agricultural; rice, cotton, tobacco, coconuts and sugar cane are the principal crops. Rubber also is cultivated, and in the forests mahogany, cedar and rosewood trees are felled. The capital and seaport, Kiungchow, has been opened to foreign trade since 1858. Japan seized it in 1939.

Haiti, a republic occupying the western third of Hispaniola, next to Cuba the largest island of the Greater Antilles. The Atlantic Ocean laps its northern coast; the Caribbean Sea, its southern. Separating it from Cuba to the west is the Windward Passage. Almost two-thirds of the island is mountainous; the principal range is the Sierra del Cibao. From the Gulf of Gonaives eastward to the boundary of the Dominican Republic extends the narrow plain called Cul de Sac, once an arm of the sea and now an excellent pasture land. The principal river is the Artibonite. The area is 10,204 square miles. Of the population of about 2,550,000, Negroes constitute 90 per cent; their ancestors were imported by the Spaniards early in the 16th century to repopulate the island after hundreds of thousands of the native Arawak Indians had been killed. One of the most densely populated countries of the Western Hemisphere, Haiti has 250 inhabitants to the square mile. French is the official language.

Agriculture is the chief occupation of the people. The principal export is coffee, but sugar, cotton, cacao, bananas, tobacco and cashew nuts are produced in considerable quantities. From the forests come principally sisal, logwood and other dyewoods. Industrial products include cigars, cigarettes, rum, cotton-seed oil, furniture, pottery and shoes. France and the United States are the principal consumers of Haitian products.

Haiti has been a republic since 1804; after the United States, it was the second republic to be established in North America. Its development was largely an outgrowth of the French Revolution whose Constituent Assembly bestowed on all free persons of color the rights of French citizenship. In the struggle against enforcement of Napoleon's decree re-establishing slavery in the island, the Haitian leader, Toussaint L'Ouverture, was betrayed and died in a French prison. From 1806 to 1820 the northern part of the country was ruled by the former slave, Henri Christophe, who proclaimed himself emperor under the name of Henry I and on top of a 2,500-foot-high mountain built one of the most remarkable fortresses of all time, the Citadelle La Ferrière. When the inhabitants of Santo Domingo in the eastern part of Hispaniola rebelled against Spanish rule in 1821, the Haitian President, Gen. Jean Pierre Boyer, succeeded in extending his sway over them as well, and not until 23 years later were the Dominicans able to overthrow his rule.

At the capital, Port-au-Prince, located in the southwestern part on the Gulf of Gonaives, sits the National Assembly, composed of the Senate and Chamber of Deputies. This body elects the President who is assisted by a Cabinet of five secretaries. He resides in the white-marble National Palace, one of several ornate government buildings that give to the city a metropolitan appearance in contrast to the hill villages with their crude, grass huts and rather primitive mode of life. The population of Port-au-Prince is about 125,000.

The French scheme of administration has been adopted for the country. There are 5 departments, 14 prefectures, 27 arrondissements, 91 communes and 504 rural sections. Among other cities are Cap-Haitien, Gonaïves and Les Cayes, all important seaports. The hill villages of Haiti are the greatest strongholds in the Western Hemisphere of voodooism, a survival of African paganism; with its observance are mingled certain mystical and sacrificial rites.

The island of Hispaniola on which Haiti is located was discovered by Columbus on his first voyage in 1492. When the western part was given to France in accordance with the Treaty of Ryswick of 1697, it was known as Saint Dominique; the colony in the eastern part bore the saint's Spanish name, Santo Domingo. On throwing off the French yoke and becoming a republic in 1804 the country took anew its aboriginal Indian name of Haiti, meaning mountainous land.

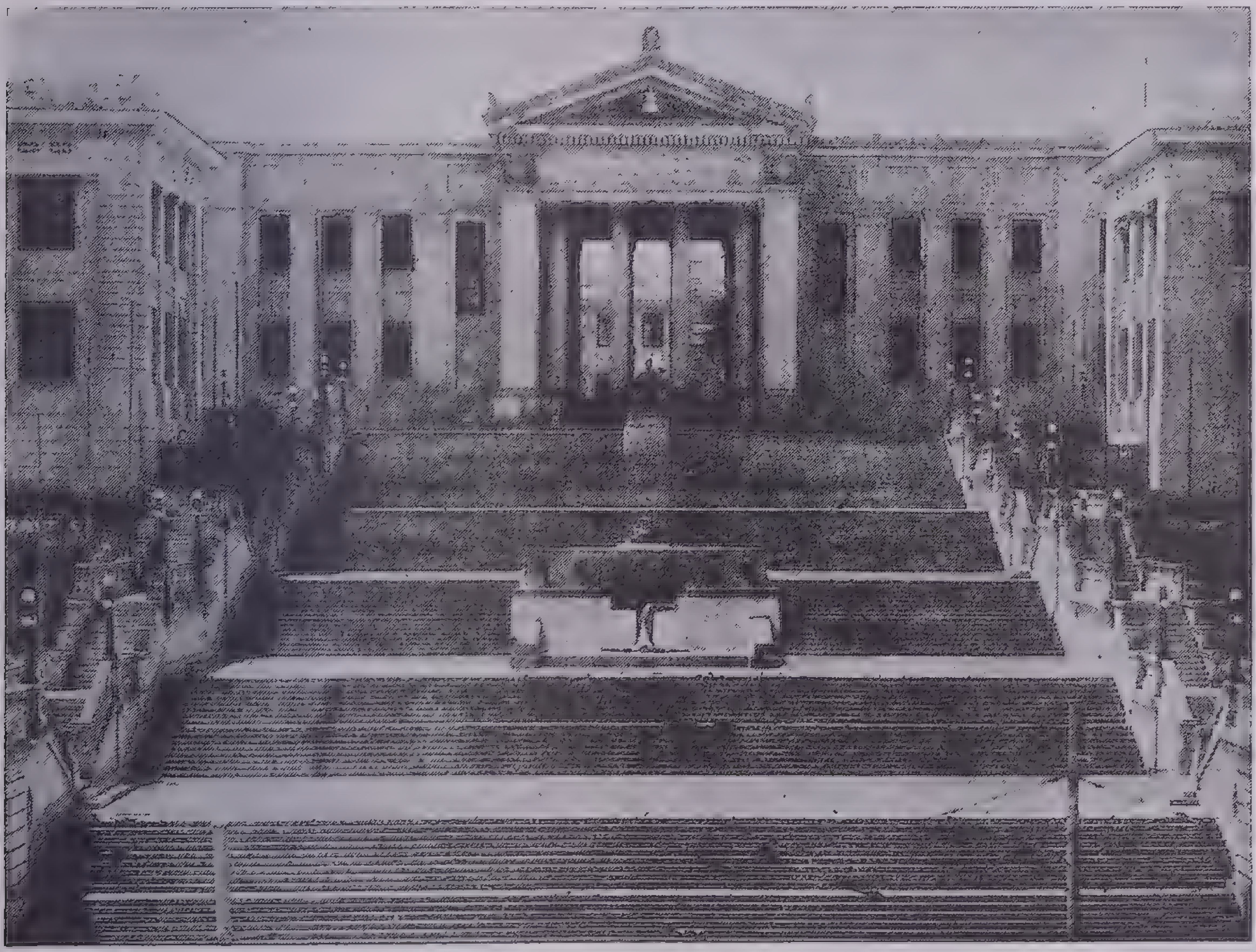
harbor, a port or haven for ships, somewhat like a bay, made by a naturally or an artificially sheltered section of an ocean, sea or lake. Since it is designed primarily for commercial purposes, especially the loading and unloading of passengers and cargoes, its physical features should include: a depth of water sufficient for navigation and anchorage; the absence of currents, strong winds, fogs, silting and ice in winter; a spacious, easily negotiable entrance channel; and, if necessary, such artificial protective barriers as breakwaters and jetties. Ideal harbors are the ports of New York, Rio de Janeiro and Halifax.

True to the old Germanic meaning of the term *harbor* as a shelter for soldiers and in view of the military importance of such a recess, the development and improvement of harbors in the United States is intrusted to the War Department.

Havana or **Habana,** the capital and chief seaport of Cuba, located in the province of Havana on a peninsula between the Gulf of Mexico and the Bay of Havana. It is also the metropolis of the Caribbean, having held this position since the early part of the 17th century, when by royal decree it was proclaimed the "key to the New World and bulwark of the West Indies." The picturesque Bay of Havana has three arms, called Regla or Marimalena, Atarés and Guanabacoa. Guarding its entrance is Morro Castle, a 16th-century fortress that played an important part during the Cuban War for Freedom and is now the Cuban training school for army officers; its full name is Castillo de los Tres Reyes del Morro, meaning the hill or headland castle of the Three Kings. Adjoining it is the equally obsolete Cabaña Fortress, and on a hill at the inner end of the harbor is Atarés Castle, once a prison and now a garrison.

Havana is one of the most popular tourist centers in the Western Hemisphere and is a port of call for vessels bound for both eastern and western seaports of the United States via the Panama Canal. Certain southern seaports, such as New Orleans, are connected with it by train ferry. Havana has also regular airplane connections with New York and Miami and is the most important railroad and highway center of the island. Through the port of Havana pass most of Cuba's exports, notably sugar, tobacco and tropical fruits, such as bananas, pineapples, oranges and grapefruit. Besides catering to the tourist trade the Havanese engage principally in the manufacture of cigars and of boxes in which to pack them. The population is about 585,000.

Among reminders of the Spanish regime the most venerable is the Castillo de la Fuerza (Castle of the Armed Forces), built originally in 1538 by that intrepid conqueror of Florida and discoverer of the Mississippi River, Hernando de Soto. In the Plaza de Armas is the old palace of the Spanish captain generals, now housing the Supreme Court of Cuba; of the many historical events of which this palace was the scene the most notable was the transfer of the sovereignty of the island from Spain to the United States at the close of the Spanish-American War; and here for 3 years until Cuba was granted self-government lived the American military governor, General Leonard Wood. The City Hall in the Plaza de Armas dates from 1792; its patio contains a statue of Columbus. Facing this square is the Templet Shrine, commemorating the landing of Cuba's conqueror Diego Velázquez in 1511.



Courtesy Cuban Commissioner of Agriculture, New York

Administration Building of the University of Havana

The 17th-century Cathedral of the Virgin Mary of the Immaculate Conception, built in Spanish baroque style of coral limestone and standing in Cathedral Square, is popularly known as the Columbus Cathedral, because from 1795 to 1898, when they were transferred to Seville, Spain, here reposed the reputed bones of Christopher Columbus. (The word *reputed* is used because the Dominicans claim that their ancient cathedral in Ciudad Trujillo still possesses these relics). The Cuban Ministry of Public Works is housed in the 17th-century Convent of Santa Clara; the Havana Post Office was once the Convent of San Francisco, erected in the 16th century and rebuilt in the 18th.

The modern part of Havana is a strong contrast to the old part, with its narrow, balconied streets. Throwing into bold relief the entire harbor section is the Malecon Drive. At its entrance to the residential section (called the *Vedado*) is the Maine Monument erected by the Cuban Government in 1925 as a tribute to the 266 Americans who lost their lives in the explosion of the U.S.S. *Maine* in Havana Harbor February 15,1898. Extending from the Plaza de la Fraternidad to the bay is the tree-shaded and building-arcaded Prado Promenade or Paseo de Martí as it is called in honor of the Cuban patriot José Martí. A monument to this apostle of Cuban freedom has been erected also in the Parque Central that forms the hub of the city. The residences of Havana are mostly in the Spanish and Moorish styles of architecture and are noted for their iron grilled gateways, balconies and fountain-adorned patios or central courtyards. They are generally built of white limestone or of stucco, tinted different colors.

Havana has some of the most magnificent public buildings of any city in the Western Hemisphere. Dominating the upper Prado is the classical-styled Capitol, built of granite and marble and completed in 1929 at a cost of $18,000,000. The chambers of the Senate and House of Representatives, vestibule, reception hall and committee rooms are decorated with murals portraying important events in Cuban history. Beneath the 308-foot-high dome is a bronze statue of the Goddess of the Republic by the Italian sculptor, Angelo Zanelli. A 24-carat diamond, set in an onyx base in the center of this vestibule, marks the starting or zero point of the Central Highway, running from Havana to Santiago de Cuba at the eastern end of the island and from Havana to Pinar del Rio at its western end.

Next to the Capitol in importance is the Presidential Palace, a regally imposing modern structure that was completed in 1922 at a cost of $2,000,000; like the Capitol its reception hall and other rooms are sumptuously decorated in gold leaf and have murals glorifying the republic. Among other notable buildings of Havana are the Central Railroad Station, Royal Bank of Canada Building, Manzana de Gomez Office Building, Municipal Hospital, National Museum and the building housing the National Theater and the Centro Gallego, Havana's largest club. The city is the seat of the University of Havana, founded in 1728.

Havana was originally established by Diego Velázquez, after he had subjugated the native Indian tribe called the *Siboneys,* in 1515 near the present town of Batabanó. Four years later it was transferred to its present peninsula site, but it did not become capital of the island until 1552; Baracoa and Santiago de Cuba were the earlier capitals.

haven, a safely navigable recess in the shore of an ocean, sea or lake, affording protection to ships from storms. It differs from both harbor and port in that these are important centers of commerce with adequate facilities for handling passengers and cargoes and not mere places for temporary refuge.

The word *haven* is part of various place names, as New Haven, Conn., named after the Sussex seaport, Newhaven, by English settlers.

Hawaii, a territory of the United States, comprising some 20 islands (eight of which are inhabited) at the "crossroads" of the Pacific Oceans, 2,091 miles southwest of San Francisco and 3,394 miles southeast of Yokohama. The principal islands are of volcanic origin and include Hawaii, Maui, Oahu, Kauai, Molokai, Lanai, Niihau and Kahoolawe. Most of the smaller islands in the westerly end of the chain are of coral formation; they have been set aside by the United States Government as the Hawaiian Islands Bird Reservation. The area of the entire group is 6,435 square miles. Of the total population (about 370,000) only about a fifth are white. The islands are one of the greatest "melting pots" in the world, with a preponderance of Japanese, Filipino and Chinese elements. The native Hawaiians, who belong to the Polynesian race, constitute only one-fifteenth of the total population.

On the island of Hawaii are five active volcanoes: Mauna Kea (13,825 feet high); Mauna Loa (13,675 feet); Hualalai (8,269 feet); Kohala (5,505 feet); and Kilauea (4,400 feet). The crater of Kilauea, covering an area of 4.14 square miles and filled with eternal fire, is one of the most amazing sights in the Hawaii National Park. This park also includes the areas around the volcanic peaks Mauna Loa on Hawaii and Haleakala on Maui; Haleakala's crater has a circumference of 20 miles and is 2,720 feet deep. Because it has such canyonlike depressions as Iao Valley, Maui is called the valley island; its town of Lahaina was once a whaling port.

Oahu, on which is located the capital of the territory, Honolulu, is distinguished by two parallel mountain ranges, Koolau and Waianae; through the adoption of irrigation it is the most important of the islands agriculturally. Kauai is called the garden island, as it is the most verdant of the chain and abounds in rivers and waterfalls; its finest scenic attraction is the Waimea Valley, a canyon 3,000 feet deep that in form and coloring resembles the Grand Canyon of the Colorado River, only on a miniature scale. The Hawaiian leper colony on Molokai is widely known for the martyrdom of Father Damien, a Belgian priest who cared for the lepers from 1873 until his death from the disease in 1889.

Lying in the Torrid Zone, 18° to 22° north of the equator, the Hawaiian Islands are a veritable riot of tropical vegetation. In addition to more than 2,800 kinds of hibiscus other indigenous flora are the night-blooming cereus; shower, flame and hau trees; and bird of paradise, torch ginger, silversword and ti plants. Rainfall is abundant, and the cool northeast trade winds assure fairly equable temperatures. The many high mountains act as barriers to tropical storms.

Courtesy Pan Pacific Press

Waikiki Beach, Honolulu Harbor
In the background is Diamond Head (761 feet)

The leading industry is the production of sugar cane, sugar refining and the manufacture of molasses. When production has reached as high as 800,000 tons a year the industry has given employment to some 45,000 natives. The next industry in importance is growing pineapples, although during the depression there has been a greater demand for pineapple juice than for the fresh or canned product. Rice, taro (from which the favorite Hawaiian dish, poi, is made), coffee and bananas are other important products of the soil. A considerable amount of the wealth of the islands comes from raising livestock. Sandalwood is the mainstay of the lumbering industry.

The islands have a regular territorial form of government. The governor and the territorial secretary are appointed by the President of the United States for terms of 4 years; they must be residents of the islands. The biennial Territorial Legislature consists of the Senate of 15 members and the House of Representatives of 30 members, elected by popular vote. Hawaii sends a delegate to the Congress of the United States, but he has no voice, except upon matters pertaining to the islands, and no vote. The territory has clamored for statehood.

Honolulu, the capital and chief seaport, with a population of 137,500 is one of the most beautiful and romantic cities for setting. It is guarded on the east by Diamond Head; and forming its backdrop is the Punchbowl, from whose 500-foot-high crater may be obtained a superb view of the city and harbor. The hub of the city is the Civic Center, about which are grouped the Territorial Capitol, Federal Building, City Hall, the law court, public library, archives and post office. The principal thoroughfares are Mission and Bishop streets. The city is noted for its numerous places of worship, Buddhist and Shinto temples and Japanese and Chinese Christian churches; striking in architecture are the Christian Science Church and the nonsectarian Church of the Crossroads. The World War memorial is a natatorium. The Bishop Museum contains a notable collection of Polynesian material. The "Aloha" Tower rises at the docks; it was named for the Hawaiian song that is played when ships, thronged with lei-bedecked passengers, arrive or leave the port.

Honolulu is the seat of the University of Hawaii and of several organizations to promote the welfare of the Pacific islands, such as the Institute of Pacific Relations. Its famous beach is Waikiki. About 6 miles west of the city is Pearl Harbor, the largest United States naval base in the Pacific. On the national holiday, June 11, the statue of King Kamahameha I, who in 1791 brought the islands under one rule, is decorated with the flower garlands called *leis* and a purple feather cloak, symbolic of royalty.

The Hawaiian Islands were discovered in 1778 by the English explorer, Capt. James Cook, who called them the Sandwich Islands in honor of the Earl of Sandwich. American influence in the islands dates from the arrival of New England missionaries in 1820. The successors to these missionaries urged the people to insist on a more constitutional form of government so as to curb the power of the king. When Queen Liliuokalani tried to abolish the constitution, which had been wrung from King Kamahameha III, she was deposed in 1893. After a few years as a republic Hawaii was annexed by the United States in 1898. Two years later it became an organized territory.

headland, a clifflike promontory projecting into the sea. It is thus distinguished from a tongue or point, which is low in elevation. The word *head,* with the same meaning as headland, is used in some place names, as Marblehead, Mass., and St. David's Head on the island of St. David, one of the Bermudas.

headwaters, the water areas at or near the source of a stream. Thus, Lake Geneva, which is near the source of the Rhone River in the Rhone Glacier, forms the headwaters of that river.

heath, a tract of open, usually level, waste sandy land covered with heather or other low shrubs. Such tracts are commonly found in Great Britain, where they are known also as moors.

Hebrides or **Western Islands,** a group of islands located in the Atlantic Ocean off the western coast of Scotland and separated from that country by the Minch, Little Minch and Gulf of the

Hebrides. Not more than a quarter of the 500 islands and islets are inhabited. They are divided into northern and southern groups called the *Outer* and *Inner Hebrides.* The Isle of Skye of the Inner group is the largest and is famous as the original home of the Skye terrier. Next in size is Lewis of the Outer Hebrides, which with Harris is sometimes called *Long Island.* Among the other important islands are North Uist, Benbecula, South Uist, Barra, Coll, Tiree, Iona, Mull, Jura, Islay and Arran. The total area is 2,812 square miles; much of it is mountains, lakes, moors and peat bogs.

The population is about 62,000. Most of the inhabitants speak Gaelic and cling to quite primitive habits. They engage in sheep and cattle raising, fishing and in slate quarrying. Barley, oats, turnips and potatoes are the principal agricultural products.

The islands are still ruled in almost feudal fashion by the Lord of the Isles, the descendant of a line founded in the 12th century. Land tenure is the system called *crofts*—holdings at the pleasure of the Lords of the Isles. The limited opportunities that arise from this system of land tenure drove many islanders to emigrate as long ago as the middle of the 18th century.

The climate, mild because of the Gulf Stream, and the picturesque scenery attract many tourists. The islands are attached for administrative purposes to the mainland counties of Ross, Inverness, Argyll and Bute.

The name *Hebrides* seems to have been a misprint for *Hebudes,* the name used by Greek and Roman geographers. Iona is a shrine of Christianity, for from it St. Columba and his missionaries carried the gospel to Scotland and northern England in the 6th century. The famous basaltic Fingal's Cave, 230 feet long and 65 feet high, is located on the Island of Staffa.

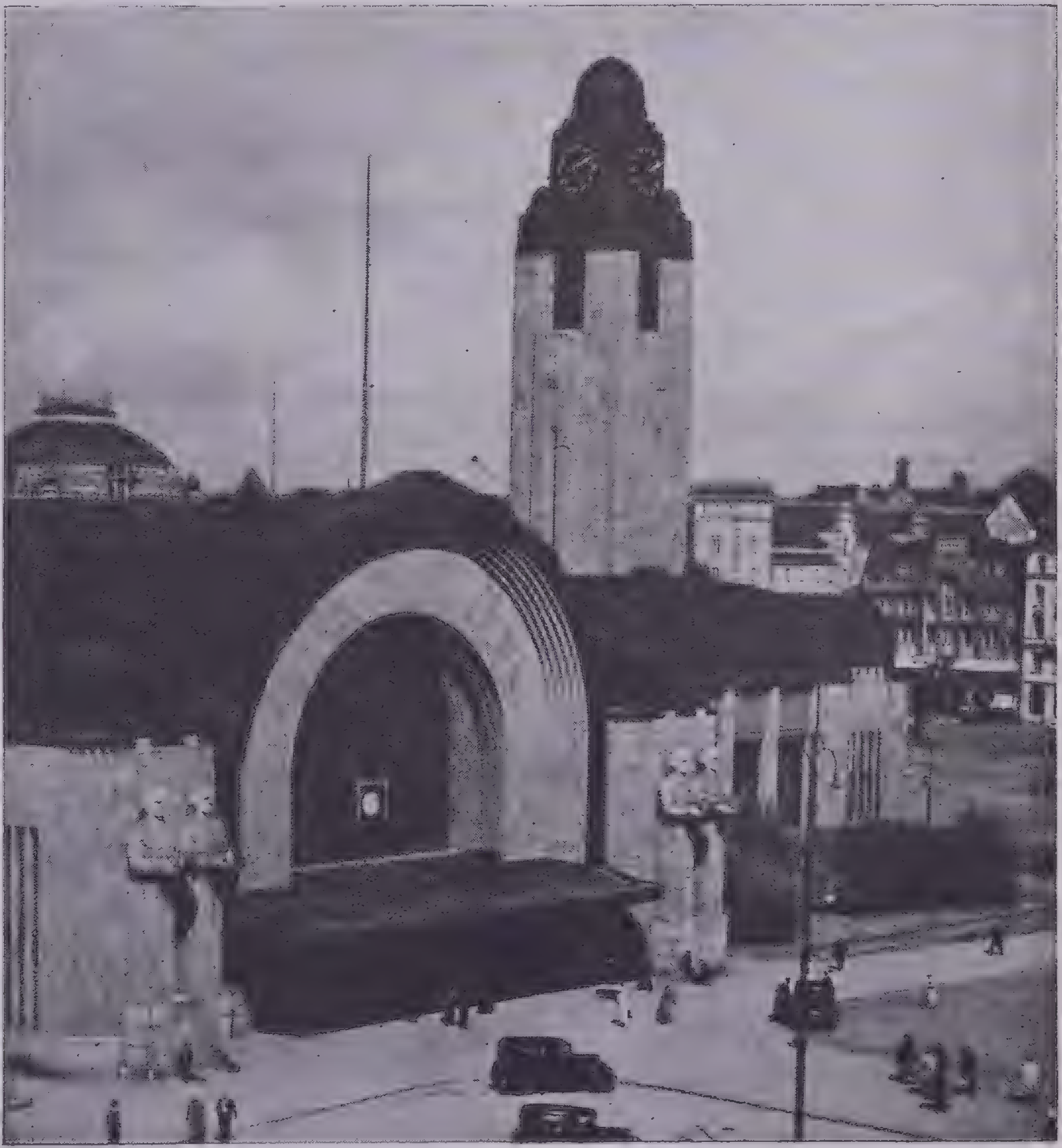
Helgoland, a small island in the North Sea, about 40 miles from the mouth of the Elbe River and separated from Germany by Helgoland Bight; less than one-third of a square mile in area. It belonged to Denmark until 1807 and to Great Britain until 1890, when the latter country traded it to Germany for Mafia Island off the eastern coast of Africa, formerly included in the Zanzibar Protectorate but now part of Tanganyika Territory. This exchange was sorely regretted by Great Britain when the World War began, for Germany had turned Helgoland into a northern Gibraltar. In Helgoland Bight the first important naval engagement of the World War occurred August 28, 1914. After the war the fortifications were dismantled in accordance with the Treaty of Versailles. By the 1935 naval agreement between Germany and Great Britain, Germany was allowed to refortify Helgoland and to build up her navy to 35 per cent of the total British tonnage.

Until the construction of a sea wall in 1910 the island was a conspicuous example of marine erosion, for it had been reduced to a fifth of its size in the days of the vikings. The population (of Frisian origin) is about 2,000. The name *Helgoland,* meaning holy land, is a reminder of the time when the island was sacred to Hertha or Nerthus, a Teutonic goddess symbolic of Mother Earth and probably of peace.

Helsinki or **Helsingfors,** the capital of Finland (Finnish Suomi), situated on a peninsula on the Gulf of Finland in the province of Nyland. Although one of the farthest north of European ports, it is important for the export of lumber, wood pulp, newsprint paper, eggs, butter and other dairy products. Its manufactures include sugar, carpets, linens, cigarettes and beer. The population is about 270,000.

Helsinki is noted for its high standard of architecture. Among the buildings that have been erected since the World War are: the Parliament Building of Finnish rose-gray granite, classical in style; and the granite railroad station, one of the finest examples of modern architecture in all Europe designed by the famous Finnish architect, Eliel Saarinen. Beyond the Parliament Building is the National Museum that reflects in its architectural details, as well as in its exhibits, the history of the national culture. The modern note is carried out also in the impressive new post office and in various department stores, schools, hospitals and apartment houses. Many of the latter are co-operative enterprises.

The hub of the city is the marketplace, facing the harbor; in its center is a fountain sculpture by Ville Vallgren, symbolizing Helsinki rising from the sea. Around the square are the Town Hall, Supreme Courts of Justice, residence of the President and several foreign legations. Towering above it is the magnificent Suurkirkko or Lutheran cathedral of St. Nicholas. With its large central dome and four small domes surrounding it, symbolizing the Saviour and the four Evangelists, this church reveals, despite the classic severity of its portico, the Byzantine note that was characteristic of Russian ecclesiastical architecture and that naturally influenced construction in a grand duchy of the Russian Empire. Flanking the church on either side of Suurtori Square are the State Council Building and the State University (founded at Åbo in 1640 and removed to Helsinki in 1827). Among other churches are the Uspenski (Greek Orthodox) Cathedral on the heights



Courtesy Finnish Travel Information Bureau

Modern Architecture in Finland

The railroad station of Helsinki, completed in 1919, is an outstanding example of modern European architecture. It was designed by Eliel Saarinen, and exterior construction was carried out in native rose-gray granite. The four figures on the façade represent genii of light of Katajanokka, St. John's Church in the West End and the Kallio Church in the modern East End.

Helsinki is noted also as the seat of the Technical University and possesses the Finnish National Theater, Swedish Theater and Opera House. In addition to the National Museum there are the Athenaeum or national art gallery, Municipal Museum, Sinebrychoff Art Collections, Art Industry Museum and Social Museum.

The city's principal park is the Kaisaniemi, noted for its numerous animal sculptures that strike a particularly modern note. On the group of small islands that protect the entrance to Helsinki's harbor are the Korkeasaari Zoological Gardens and the Seurasaari Open-Air Museum, illustrating folk culture of the days of the *Kalevala,* Finland's great 1,000-year-old epic. The fortified group of seven islands called *Suomenlinna* (Sveaborg) has served as a naval base since the early part of the 19th century.

The city, which was founded by King Gustavus Vasa of Sweden in 1550, derives its Swedish name *Helsingfors* from the tribal name of the Helsings and fors, meaning a waterfall; Helsinki is the Finnish equivalent. In 1812 after Sweden had ceded the territory to Russia, the city became the capital of the grand duchy of Finland. Since the establishment of the Republic of Finland in 1919 it has been one of the most progressive capitals of Europe.

hemisphere, one-half the earth or globe, whether it is considered as divided by the equator or by a meridian of longitude. The term is derived through the Latin *hemisphaerium* from the Greek, meaning half a sphere. The equator divides the earth into Northern and Southern hemispheres. All places between the equator and the North Pole are in the Northern Hemisphere; and those between the equator and the South Pole are in the Southern Hemisphere.

The earth is divided also into Eastern and Western hemispheres at a point represented approximately by 30° W. Long. The exact line of division, however, is not important, as in general usage the continents of North and South America are in the Western Hemisphere and the Continents of Europe, Asia, Africa and Australia are chiefly in the Eastern Hemisphere.

hill, an elevation of land, more or less rounded in outline, that rises less than 2,000 feet above the surrounding country and in relief and configuration characteristics is intermediate between mountain and plain. It may have been formed by glacial or volcanic action and is continually subject to erosion. The climate of a hill country is similar to that of a plain, and it is often rich in timber and minerals, such as coal.

Among varieties of hills are *dunes,* as found in Nebraska; *foothills,* as found in New Hampshire; and *plateaus* deeply dissected by streams and their tributaries, as found in the Cumberland Plateau of Kentucky and Tennessee. The term *hill* applies also to any conspicuous elevation in an area that is comparatively flat, as the Berkshire Hills in Massachusetts. The inferior elevations of a mountainous country are often called hills, as the Black Hills of South Dakota, because though they are really mountains, they are hills in comparison with the Rockies. The Scottish word for hill is *brae.* Its use is frequent in the poems of Robert Burns.

Himalaya, a mountain system of central Asia that is the highest and the youngest in the world. The Himalayas proper extend about 1,600 miles in length, from 100 to 500 miles in width and separate India from Tibet. Extensions include the Khyber and Hindu Kush mountains of Afghanistan, the Sulaiman, Pamir and Karakoram mountains of western India, the Altai Mountains of Mongolia, Kunlun Mountains of northern Tibet and the Yablonoi and Tien Shan mountains of the U.S.S.R. Of the 40 gigantic peaks crowned with ice and snow, Mt. Everest (29,141 feet) is the highest in the world. Mt. Kanchen (28,225 feet), Mt. Godwin Austen (28,191 feet) and Mt. Makalu (27,790 feet) rank next in height. Tirach-Mir (25,400 feet) is the highest peak of the Hindu Kush range. Few of the numerous passes, over which traders travel with yaks as beasts of burden, are less than 16,000 feet in height; they are impassable for half the year because of snow and cold. The most famous is the 33-mile-long Khyber Pass in the Khyber Mountains. The most noted glacier is the Kubigangri in which the Brahmaputra River rises. Among other rivers that have their sources in the Himalayas are the Yantze Kiang and Hwang Ho of China, Salween of Burma, Mekong of French Indo-China and Indus and Ganges of India. The word *Himalaya* is from the Sanskrit and means abode of snow.

Honduras, a republic of Central America between Guatemala on the northwest and Nicaragua on the southeast. El Salvador extends along nearly three-fourths of its western boundary, but Honduras has a Pacific coastline of about 40 miles where the Gulf of Fonseca penetrates the country. The Caribbean Sea and its arm, the Gulf of Honduras, form the northern boundary as far east as Cape Gracias a Dios. The area, according to official estimates since settlement of the boundary dispute with Nicaragua in 1931 and with Guatemala in 1933, is 46,332 square miles. The population is about 963,000, including some 35,000 Indians of Carib stock and about 20,000 Negroes. The majority of the people are of mixed Spanish and Indian blood and are called *mestizos.*

The northern coastal plain of Honduras is ideal for banana growing, and about 20,000,000 bunches are exported each year. Inland the country is mountainous, and in the southern part the Colon Mountains, part of the Nicaraguan Cordillera, attain a height of 10,000 feet. The mountain valleys are watered by the Ulua, Aguan, Patuca and other rivers. The best-known is the Plain of Comayagua, 40 miles long and from 5 to 15 miles wide. The principal crops are corn, sugar cane, coconuts, coffee, tobacco, cacao, rubber, indigo, sarsaparilla and citrus fruits; and cattle raising is important in the rich plains. The country's mineral wealth includes gold, silver, lead, copper, nickel, zinc, iron, mercury, antimony, salt and petroleum, but lack of rail transportation and capital has prevented the full development of these resources. The forests yield mahogany, dyewoods and pitch pine, largely exported to the United States. The principal manufactures are cigars and panama hats.

Honduras has been an independent republic since the dissolution of the Central American Federation in 1838. It had thrown off the Spanish yoke in 1821. The chief executive is the President, elected for a 4-year term; he is assisted by a Cabinet composed of 3 to 6 secretaries. The unicameral legislative body, called the Congress of Deputies, consists of 43 members elected for a 4-year term. For local administrative purposes the country is divided into 17 departments and 1 territory (Mosquitia).

Tegucigalpa, the capital, is located in the southern part of Honduras on the Choluteca River. Although the city has no railroad, it is connected with San Lorenzo on the Gulf of Fonseca by an excellent automobile highway and with Puerto Cortes on the Gulf of Honduras by highway and railroad. Its notable buildings include the National Palace, President's Residence, Roman Catholic Cathedral and University. The population is about 47,000.

The name *Honduras* is Spanish for wavelike or deep water.

Hong Kong, a small but important island at the entrance to the estuary of the Chu-kiang (Pearl or Canton) River in southeastern China, ceded to Great Britain by the Chinese Government in accordance with the Treaty of Nanking at the close of the Opium War in 1842. The flourishing city of Victoria or Kwantailo occupies a considerable part of the island, although island and city are commonly called Hong Kong. The island has an area of 32 square miles, but the cession of the Kowloon Peninsula in 1861 and the 99-year lease of the mainland section called the *New Territories* in 1898 increased the British area to 391 square miles. The population of Greater Hong Kong is 1,075,690, and about half of this number live in Victoria. To solve the housing problem about 75,000 Chinese live in houseboats in the harbor. Non-Chinese, found mostly in the European quarter in the center of Victoria, number about 20,000.

The island is mountainous, and Victoria is built largely upon a succession of terraces to the peak of Victoria Mountain, 1,825 feet high. As one of the world's great trade centers the city is a free port, and flags of every nation are seen in its cosmopolitan harbor, considered the most beautiful in the Orient. The chief commodities that it handles for export are rice, tea, sugar, sandalwood, silk and cotton yarn. It manufactures paper, cement, rope, soap and preserved ginger. The University of Hong Kong, founded in 1912, is one of the most famous educational institutions in China. The city is noted for its scenic drives, notably the Bund or embankment, its shops with rich Oriental wares and beautiful homes and gardens in the peak district. The most important British military and naval station in the Orient, Hong Kong is administered as a Crown colony by a governor, assisted by executive and legislative councils. The name is Chinese for port of fragrance.

hook, a spit or narrow, sandy peninsula that assumes the form of a hook by being turned landward at the outer end, as Sandy Hook on the New Jersey coast and the Hook of Holland, formed at the mouth of the Maas (Meuse) River.

horizon, the line that appears to mark the boundary between earth and sky, and is curved because the earth is a sphere. If one is on a low, level surface, the horizon will appear but a few miles distant. If one views the surrounding landscape from a height of 5,000 feet, the horizon is some 80 miles away. From the observatory of the Empire State Building in New York city (1,248 feet high), visibility on a clear day covers a radius of 25 miles. The term *horizon* is derived from a Greek word meaning boundary.

Hudson, the principal river of New York State, about 350 miles in length. It rises in 14 small lakes of the Adirondack Mountains, chief of which is Lake Tear-of-the-Clouds, and flows south fairly close to New York's eastern boundary. For a short distance near the southern end it forms the boundary between New Jersey and New York and discharges into the Atlantic Ocean through New York Bay. The lower part of the Hudson is a tidal fiord and is navigable to river steamers as far north as Troy (about 150 miles). Its chief tributary is the Mohawk River. The principal cities or places of interest along its shores are New York, Jersey City, Yonkers, Tarrytown (heart of the Washington Irving country), Ossining (associated with Sing Sing State Prison), West Point (seat of the United States Military Academy), Poughkeepsie, Albany, Troy and Glens Falls.

As an important part of the Port of New York, the Hudson is one of the chief commercial streams of the world. Piers for vessels plying to ports all over the world line the western shore of lower Manhattan Island and the opposite Jersey City shore. This great harbor was created, according to geologists, some 20,000 years ago when a great marine transgression submerged the gigantic canyon (125 miles long and 4,000 feet deep) that the Hudson River had carved in cutting its way to the sea. At New York the Hudson is spanned by the George Washington Memorial Bridge, completed in 1931; it is a suspension structure with a channel span of 3,000 feet and with towers at each end that rise to a height of 600 feet. The only other important bridge below Poughkeepsie is the Bear Mountain Bridge, a suspension structure built in 1924. The New York State Barge Canal connects the Hudson at Waterford (above Troy) with Buffalo and thus forms part of the Great Lakes highway linking the East and West.

The Hudson is famed for its scenic beauty and is often called the American Rhine. The famous Palisades on its lower western bank extend from Haverstraw, N. Y., to Weehawken, N. J.; the states of New York and New Jersey have established in the area adjoining them the Palisades Interstate Park, with an area of about 47,000 acres. The scenic Storm King Highway, named for a mountain in the Palisades Interstate Park, extends along the western bank of the river. Its picturesqueness is enhanced by the Highlands of the Hudson near West Point. The Hudson River was first explored by Henry Hudson in the *Half Moon* in 1609 and is named for him.

Hudson Bay, a large, almost landlocked inland sea in northeastern Canada, connected with the Atlantic Ocean through Hudson Strait and with the Arctic Ocean through Foxe Channel, Foxe Basin, the Gulf of Boothia and other channels. With its southern projection, James Bay, Hudson Bay is about 850 miles long and 650 miles wide and has an area of 472,070 square miles. Southampton, Coats, Mansell, Baffin and other islands partially landlock the bay to the north. Off the eastern shore are the Ottawa, Belcher and other small island groups. Hudson Bay itself is never frozen, but ice in the 450-mile-long Hudson Strait blocks navigation for some 7 months of the year. During the summer months the Bay affords an important water highway for shipments of grain and cattle from the Canadian Prairie Provinces to Europe. Inland transportation is afforded by the Hudson Bay Railway, an extension of the Canadian National Railway, and the navigable Nelson-Saskatchewan river system and the Churchill, Severn and Hayes rivers. The chief ports are Churchill, Moosonee and Port Nelson. Hudson Bay was first explored by Henry Hudson in 1610, while he was searching in the *Discovery* for the Northwest Passage. Since 1670 it has been the center of operations of the great British fur-trading organization, the Hudson's Bay Company.

Hungary, a nominal kingdom of central Europe that is bounded by Germany on the north; by Rumania on the east; by Yugoslavia on the south; by Germany on the west. Prior to the World War a larger Hungary and a strong Austria were joined in the powerful Dual Monarchy, Austria-Hungary. The defeat of the Central Powers in 1918 brought about the separation of these countries and their reduction to negligible positions among the countries of Europe.

The area of Hungary is 55,175 square miles, a reduction of some 70,700 square miles from its prewar area. In accordance with the Treaty of Trianon, Hungary was compelled to transfer Croatia and Slavonia to Yugoslavia, Slovakia to Czechoslovakia, and Galicia to Poland. Of the total population (about 8,690,000), 92 per cent are Magyars, descendants of the supposedly Mongolian tribes that invaded the country in the 9th century. Ethnologically the Magyars are related to the Turks, the Finns and the Basques. The principal minority group is German; it constitutes about 6 per cent of the population. The ancestors of these people were scattered in small villages along the Danube in accordance with the century-old Hapsburg policy of using German-speaking communities as a lever for the control of the non-Teutonic elements in the Dual Monarchy.

The country, as a whole, is a plain (the Alfold), with the Mittelgebirg Mountains forming its structural backbone or watershed. The principal river is the Danube, which forms the western half of the northern boundary and flows southward through the central part. Other important streams are the Drava, part of the southwestern boundary, and the Tisza, which flows through the eastern part. The largest lake in central Europe is Lake Balaton, a long, narrow body of water in western Hungary; it covers an area of 266 square miles and is surrounded by some 30 fashionable summer resorts.

The soil of the Hungarian plain owes its exceptional fertility to deposits of alluvial loam and loess. More than two-thirds of the area is cultivated; the principal crops are wheat, corn, rye, potatoes, sugar beets, barley, tobacco, grapes, various orchard fruits and vegetables. On the meadows that constitute a fifth of the area cattle, sheep and horses are pastured. The cattle for the most part are the white, long-horned variety that the Magyar nomads brought with them 1,000 years ago. The horses are an exceptionally fine breed; the love for horse flesh has developed among the Hungarians those daring riders called the *Csikos*.

Hungary lost most of its rich mineral deposits to the new European states surrounding it; but lignite, coal, bauxite and iron ore are still mined. The leading manufactures are flour, sugar, wine (especially the famous Tokay), beer, leather goods, agricultural implements and textiles (principally cotton and linen goods, many of which are decorated with distinctive Hungarian embroideries).

Since the overthrow of the Communists led by Bela Kun in 1919, Hungary has been a kingdom; but with the political pressure exerted by the Great Powers it has not been expedient to allow a king to reign. The aspirant for the throne is the Archduke Otto, eldest son of King Charles IV (Emperor Charles VII of Austria), who after his abdication in 1918 died in exile 4 years later. The executive power is held by a regent, styled the Protector of the Magyar State, who is assisted by a ministry. The legislative body is the bicameral Parliament: its upper house is composed of some 200 representatives of the former hereditary members or magnates and of persons occupying a distinguished position in the national life; and the lower house, of some 250 members elected by popular vote.

Budapest, the capital of Hungary, is described in a separate article. Other important cities are Szeged, the leading manufacturing center, noted for its folklore museum; Esztergom, whose most impressive structures are the Bakocz Chapel, the Renaissance-styled cathedral and the palace of the Prince-Primate with its noted art gallery; and Sopron, richest of all Hungarian towns in buildings of historic interest since the days when it was the Roman Scarabantia.

The English name *Hungary* means the land of the Huns, a people of Asiatic origin who established their dominion along the Danube in the 5th century. The Hungarian name of the country is *Magyarorszag,* meaning the land of the Magyars.

Huron, the second in size among the five Great Lakes of North America. It lies between Michigan on the west and the Canadian province of Ontario on the north, east and south. Georgian Bay, projecting into Ontario on the northeast, is its largest arm; Saginaw Bay, cutting into the central eastern shore of Michigan, is less than one-fourth as large. The area of Lake Huron is 23,010 square miles (including Georgian Bay); it is about 250 miles long and 155 miles wide. The Strait of Mackinac connects Lake Huron with Lake Michigan to the west. The waters of Lake Superior pour into it through the St. Marys River; they are discharged through the St. Clair River and Lake and Detroit River into Lake Erie. Mackinac and Manitoulin are the principal large islands, although Georgian Bay is dotted with thousands of small ones. All are popular summer resorts. The principal ports are Bay City, Alpena and Cheboygan, Mich., and Collingwood, Midland and Depot Harbor, Ont.

hurricane, a violent windstorm or cyclone, usually accompanied by heavy rain, thunder and lightning. Storms of this type are especially prevalent in the West Indies, and the majority of them occur between August and October. They often sweep across Florida and into the lower Mississippi Valley via the Gulf of Mexico. The winds, which attain a velocity as high as 85 or 100 miles an hour, cause vast destruction before being deflected into the Atlantic Ocean. The extent of the storm area may be from 100 to 300 miles in diameter. Hurricanes occurring in the China Sea are called *typhoons.* The term is derived from the Spanish *huracán* and ultimately from a West Indian word that meant evil spirit.

Hwang Ho, a river of China, about 2,700 miles in length. It rises in the Kunlun Mountains of northeastern Tibet and follows a very irregular but generally eastward course, reaching the Yellow Sea through the Gulf of Chihli. Its chief tributaries are the Tao-ho from the south, Wei-ho from the west and Tatung-ho from the north. The only cities of any size on its shores are Lanchowfu in Kansu Province and Tsinan in Shantung Province. The course of the river for many hundreds of miles is through an area of dense population, but the hazardous shoals and rushing current make it unnavigable. It is often called "China's Sorrow" because its frequent floods have brought enormous loss of life and property throughout Chinese history. The floods are caused by the deposits of loess silt that raise the bed of the stream and cause it to overflow in spite of the dikes built along the shores. There was a severe flood in 1931. Another name for the Hwang Ho is *Yellow River* from the yellowish-brown silt of loess origin.

Hyde Park, a 361-acre park in London. It was originally the manor of Hyde, belonging to the abbey of Westminster, and became Crown property at the dissolution of the monasteries in 1539. It contains the Serpentine, an artificial lake that continues into Kensington Gardens, and Rotten Row (a corruption of *route du roi* or way of the king), which is reserved for riders. At the entrance is the Marble Arch (originally intended as the portal of Buckingham Palace) where London's self-styled orators exercise their prerogative of free speech. Hyde Park's most famous monument is the fountain piece *Rima* by Jacob Epstein, which forms part of the bird sanctuary memorial to W. H. Hudson.

hydrosphere, the aqueous envelope or water surface of the earth, including the oceans, seas, lakes, rivers, creeks, brooks, canals and subterranean streams and springs. It may also include the water vapor in the atmosphere in the form of clouds, drawn from the large water areas of the earth by the sun's rays or process of evaporation. This water vapor is given back to the earth in the form of rain that waters the soil and swells the volume of various streams; in winter it assumes a solidified form called *snow.* The hydrosphere has a total area of about 145,000,000 square miles. The percentage of water surface to land surface is as 40 to 60 in the Northern Hemisphere and as 80 to 20 in the Southern Hemisphere. The word, derived from the Greek, means water sphere.

iceberg, a large mass of floating ice and snow, detached from a glacier. It may be set free by its own weight, on account of the discontinuance of the glacier's movement at the edge of the sea, or by the undermining action of the sea itself which, since ice is lighter than water, causes the edge of the glacial mass to bend and cracks to form.

Icebergs found floating in the Arctic Ocean are generally peak-shaped; those of the Antarctic regions are more often flat-topped and block-shaped. They are of tremendous size. Only about one-ninth of the floating mass projects above sea level, and that part is sometimes 250 feet high.

The Labrador Current is responsible for sweeping into the North Atlantic Ocean from Baffin Bay the icebergs that are so dangerous to navigation. One of the worst marine disasters of modern times occurred April 15, 1912, when the White Star steamship *Titanic,* then the largest passenger vessel afloat, rammed an iceberg off the Newfoundland coast and more than 1,500 lives were lost.

Today the U. S. Coast Guard patrols the North Atlantic region, notifying ships of the location of icebergs that it has discovered with the aid of the radiomicrometer, and dynamiting the smaller icebergs wherever possible. On account of this danger from icebergs ships follow a more southerly course during the summer than during the winter months. An international patrol of the Atlantic lanes of shipping is also maintained by fourteen nations.

Iceland, an island of volcanic origin in the North Atlantic Ocean, whose northern coast touches in parts the Arctic Circle and which is separated from Greenland, 200 miles to the west, by the Strait of Denmark. The area is 39,709 square miles, and the population, mostly Scandinavians, is about 109,000. The principal occupations are fishing, grazing and agriculture (particularly raising potatoes and turnips) on the coastal lowlands of the south and southwest that constitute one-fourteenth of the total area. Wool, hides, tallow, salted meat, dried fish, seal and fox skins, eiderdown and Iceland spar, which is used in making optical instruments, are the chief exports.

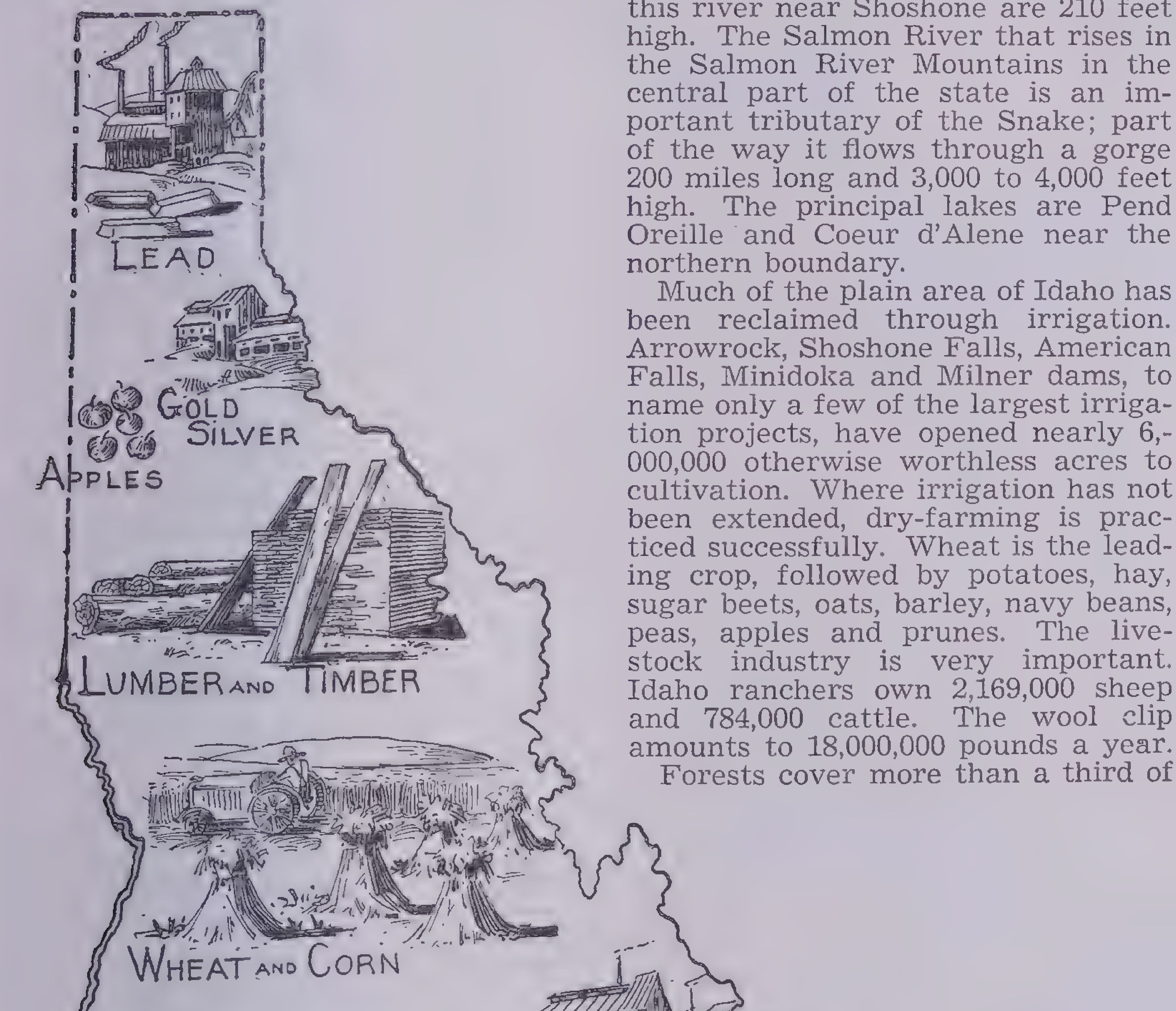
In spite of the snow fields and more than 120 glaciers that cover its two plateaus the island is a region of dying volcanic activity. It has long been noted for its geysers, hot springs and lakes of boiling mud. Earthquakes occur occasionally, and several of the 100 volcanoes, such as Askja, Hekla, Katla and Laki, are active. In the Dettfoss and Gullfoss falls Iceland possesses two of the finest waterfalls in Europe. The northwestern coast is indented by fiords. The nearness of the Gulf Stream makes the island habitable.

Iceland was discovered and settled by Norsemen under the viking Naddodd in 868. It was an independent commonwealth until union with Norway in 1263. Through the Union of Calmar, which in 1397 united Norway, Sweden and Denmark under Danish rule, Iceland passed to Denmark, but since 1918 it has been a sovereign state or kingdom, united to Denmark only by allegiance to the same king. It has its own ministers, but since it has no army and navy it relies upon Denmark for protection against foreign encroachments. The *Althing* or bicameral assembly of 42 members is the oldest parliament in the world, having observed its 1,000th anniversary in 1930. The capital is Reykjavik. Its National Museum is a repository of many interesting antiquities. Near it is Thingvallir, a natural amphitheater where the early Althings met.

Iceland was one of the first countries to adopt woman suffrage (1911) and prohibition (1912), although the latter was repealed by referendum in 1933. Like other Scandinavian peoples the Icelanders are highly literate. They take considerable pride in their 1,000-year-old sagas, and their language has retained much of its early purity. Lutheranism is the principal religion. The name *Iceland* (*Island* in Norse) refers to the ice floes that beset the northern coast.

Idaho, one of the northwest plateau states of the United States. It extends from the international boundary at British Columbia, where it is about 45 miles wide, southward to Nevada and Utah, where its boundary is 320 miles long. On the east are Montana and Wyoming and on the west, Washington and Oregon. From north to south its length is 485 miles. The area of the state is 83,888 square miles, of which 534 square miles are water. The population is about 524,873.

The crest of the Rocky Mountains—a part of the Continental Divide—separates Idaho from Montana. Mt. Borah (12,655 feet) and Hyndman Peak (12,078 feet) in the Sawtooth Range in the central part of the state are the most elevated points. Other ranges of the Rockies include the Bitter Root along the Montana boundary and the Coeur d'Alene and Cabinet mountains in the northern part. The rivers of the state offer unbounded possibilities as water supply for irrigation, and most of them are scenic. The Snake River that rises in Yellowstone National Park flows through the plainlike region of the southern part and for some 200 miles forms the boundary between Idaho and Oregon. Guarding the Grand Canyon of the Snake River on the boundary are the Seven Devils Mountains. The falls of this river near Shoshone are 210 feet high. The Salmon River that rises in the Salmon River Mountains in the central part of the state is an important tributary of the Snake; part of the way it flows through a gorge 200 miles long and 3,000 to 4,000 feet high. The principal lakes are Pend Oreille and Coeur d'Alene near the northern boundary.



Principal Products of Idaho

Much of the plain area of Idaho has been reclaimed through irrigation. Arrowrock, Shoshone Falls, American Falls, Minidoka and Milner dams, to name only a few of the largest irrigation projects, have opened nearly 6,000,000 otherwise worthless acres to cultivation. Where irrigation has not been extended, dry-farming is practiced successfully. Wheat is the leading crop, followed by potatoes, hay, sugar beets, oats, barley, navy beans, peas, apples and prunes. The livestock industry is very important. Idaho ranchers own 2,169,000 sheep and 784,000 cattle. The wool clip amounts to 18,000,000 pounds a year.

Forests cover more than a third of the state; the stands of white and ponderosa pine are particularly noteworthy. Other valuable timbers include Douglas fir, larch, yellow pine, red cedar, blue and white spruce, mountain hemlock and birch. More than 19,800,000 acres have been set aside in national forest reserves. Idaho is rich in minerals. Production of silver is valued at $10,000,000 a year. Gold, copper, lead, zinc and rock phosphate are among the other important minerals. Manufacturing has developed as the needs of the state have demanded industrial life. The lumbering interests are foremost. Smelters and flour and sugar mills are numerous. The state has enormous reserves of undeveloped water power, and as the population increases this should stimulate manufacturing.

The capital and largest city is Boise (population 26,130), located high in the mountains in the southwest. The principal attraction is the Capitol Building. Only one other city has a population exceeding 17,500, Pocatello in the southeast, the seat of the Idaho Technical Institute and a center of the mining and lumbering industries. The University of Idaho is located at Moscow near the Idaho-Washington state line. In the southeastern part of the state is the Craters of the Moon National Monument, in which are found curious lava formations that resemble the surface of the moon as seen through a telescope.

The name *Idaho* is derived from the Indian words *Ee-dah-how,* meaning light on the mountains.

Iguassú Falls, the waterfalls of the Iguassú River, located about 11 miles from the intersection of Brazil, Paraguay and Argentina where the Iguassú joins the Paraná River. Greater than Niagara in both height and width, these falls are one of the world's most magnificent spectacles. Like Niagara, they form two crescents, the Argentine Falls and the Brazilian Falls, each about 800 yards wide. In the wet season, however, the increased volume of water joins the two crescents in one vast fall with a width of nearly 4,000 yards. The falls have also two separate drops, each of more than 100 feet. Beautiful tropical forests surround them, and auto roads and a hotel now make them accessible to the tourist. Iguassú Falls are sometimes called *Victoria Falls.*

Illinois, one of the north central states of the United States. It is bounded on the north by Wisconsin, on the east by Lake Michigan and Indiana, on the south by Kentucky and on the west by Missouri and Iowa. The area is 56,665 square miles of which 622 square miles is water. The population is about 7,897,241.

Illinois' popular name, Prairie State, is well deserved. Almost all of it is a level plain sloping imperceptibly toward the Mississippi River in the west and the Ohio River in the south. In the extreme northwest (Jo Daviess and Stephenson counties) there are low hills and in the extreme southeast are foothills of the Ozarks but most of the state is nearly as level as the surface of a lake. Railroads run for many miles without a curve or even a dirt cut; in some of the farming regions one can look across the fields with half-closed eyes and actually imagine that one is on a ship floating in a calm sea, so straight is the horizon line and so uniform the landscape.

Illinois has an excellent drainage system. Along the entire western border runs the great Mississippi into which empty the Illinois, Kaskaskia, Rock and other tributaries. The chief tributary of the Ohio River is the Wabash that forms part of the eastern boundary. The Illinois River, through its affluent, the Des Plaines River, and the former Chicago Drainage Canal, is an important link in the Lakes-to-Gulf waterway by which it is proposed to make Chicago a seaport by way of the Gulf of Mexico. The largest lakes are Fox and Grass, within 40 miles of Chicago.

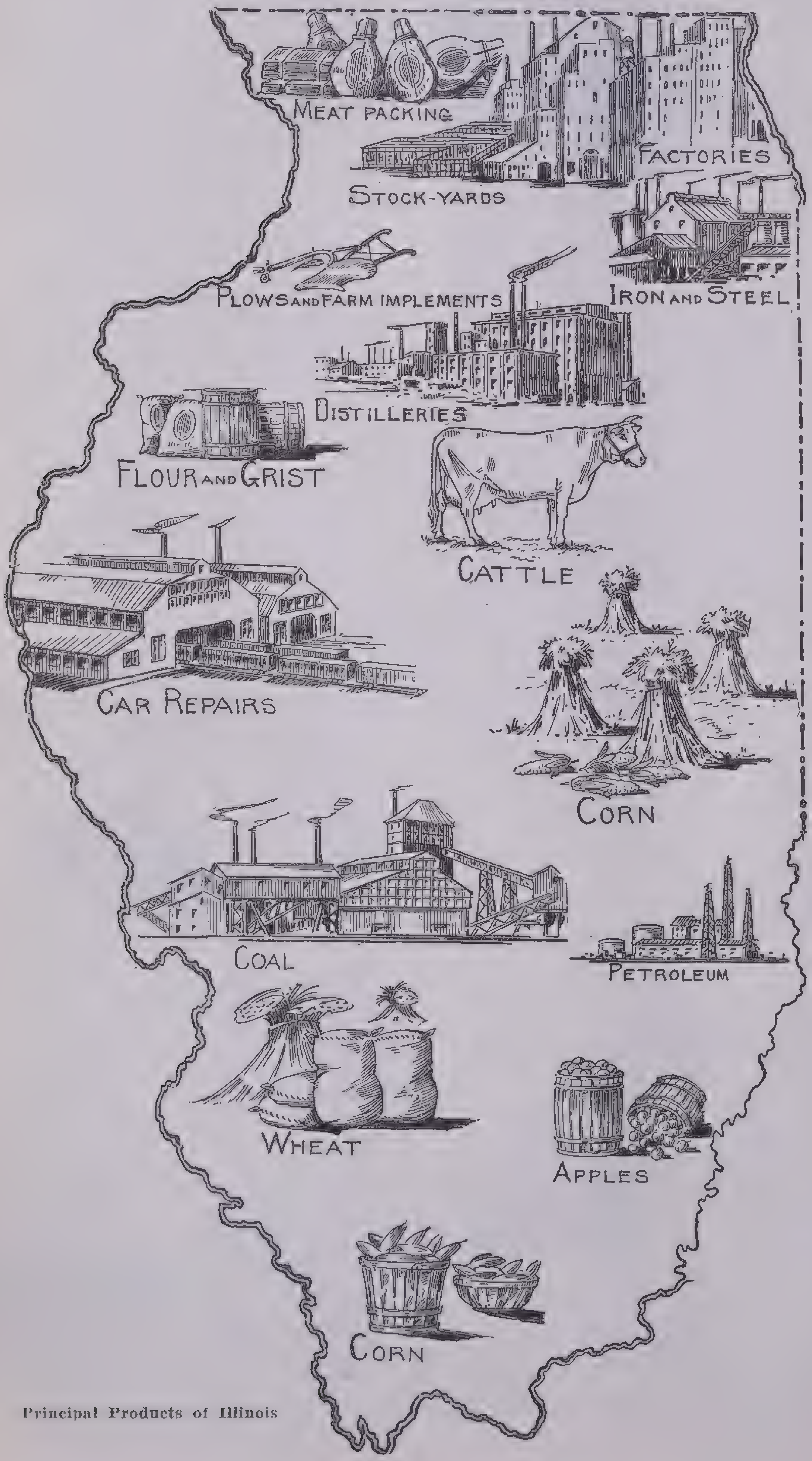
Illinois with its alluvial soil is one of the leading agricultural states of the Union. Nearly 85 per cent of the land is in farms. Iowa alone produces more corn; the Illinois yield averages about 300,000,000 bushels a year. The second crop in volume is oats, in production of which the state ranks next to Iowa and Minnesota. Many years ago the state led in wheat production, but the great western states now produce much more. Every other Temperate Zone crop grows abundantly. In the vicinity of Chicago are thousands of acres of truck gardens; near the great centers of population the dairying interests are large.

Illinois ranks third among the states in the production of bituminous coal, the annual yield averaging more than 55,000,000 tons. Only Pennsylvania and West Virginia exceed it in output. The state is well down in the list of petroleum-producing states, yet its output is usually in excess of 5,000,000 barrels a year. Other minerals include lead, zinc, fluorspar, limestone and sandstone.

Illinois is a leading manufacturing state. In slaughtering and meat packing and in the manufacture of electrical supplies it ranks first. It is near the top in the making of iron and steel, clothing, railroad cars, furniture, corn products, cement, clay products and agricultural implements.

Chicago is described in a separate article. The next largest city, Peoria (population 105,000) on the Illinois River, is one of the greatest distilling centers in the United States. Other important industrial centers are East St. Louis, Elgin, Aurora, Joliet, Berwyn, Decatur, Rock Island and Quincy.

The state university, one of the largest and most advanced in the country, is located at Urbana. There are two other great universities; the University of Chicago and Northwestern University, located in Evanston, just north of Chicago. The capital is Springfield (population 75,503), located nearly in the geographical center of the state in the midst of the richest agricultural section. The city was for many years the home of Abraham Lincoln, and the Lincoln Tomb, as well as the Lincoln Homestead and Lincoln Memorial Hall, attract thousands of tourists. Other points of interest are the Capitol, Governor's Mansion, Supreme Court and Centennial Buildings.



Principal Products of Illinois

Independence Hall, Philadelphia. In this simple white-trimmed red-brick building, which has since been faithfully maintained, representatives of the American colonies adopted the Declaration of Independence, and here the Liberty Bell sounded to proclaim their action, July 4, 1776. That bell and other Revolutionary relics are preserved here. The building was completed in 1734, and the steeple was added in 1751.

Independence Square, a square in Philadelphia, Pa., that is known as the cradle of American liberty. Its principal buildings are Independence Hall (where the Declaration of Independence was signed July 4, 1776), Congress Hall (where Congress met from 1790 to 1800), the Public Ledger Building and the building of the Curtis Publishing Company (noted especially for its murals by Maxfield Parrish done in Tiffany glass).

India, a country of Asia, occupying the Hindustan peninsula that juts out into the Indian Ocean between the Arabian Sea on the west and the Bay of Bengal on the east. To the northwest lies Iran and to the northeast, Burma. Afghanistan, the Tadzhik Republic of the U.S.S.R., Sinkiang, Tibet, Nepal and Bhutan bound the country directly on the north. The total area is about 1,819,000 square miles; included in it are several island groups, the Andamans and Nicobars in the Bay of Bengal, the Laccadives and Socotra in the Arabian Sea and the Bahrein Islands in the Persian Gulf. The total population is approximately 353,000,000. Next to China, India is the most thickly populated country in the world.

British India. Great Britain's interest in India dates from the early 17th century, when the East India Company acquired the British trade monoply with the Far East. British India (of which Queen Victoria became Empress in 1877) has an area of 1,094,220 square miles and a population of about 270,000,000. The provinces include Assam, Baluchistan, Bengal, Bihar and Orissa, Bombay, Central Provinces and Berar, Coorg, Delhi, Madras, Northwest Frontier Province, Punjab and the United Provinces of Agra and Oudh. Each province is administered by a governor and executive council who is responsible to the viceroy and governor general; the latter official whose headquarters are at Delhi is appointed by the Crown for a 5-year term. In London the affairs of British India are handled by a Cabinet member called the *Secretary of State for India.*

The Government of India Act of 1935 provided for the first time in India's history a federal union of the provinces and the semi-independent sovereign states. Two native legislative chambers are set up; a Council of State consisting of 156 representatives, partly elected and partly appointed by the native rulers; and a House of Assembly consisting of 250 representatives, chosen partly by the provincial legislatures and partly by the native rulers. The provinces themselves are governed by ministries responsible to the provincial parliaments. This federal form of government paves the way for the recognition of India's status as a self-governing dominion and member of the British Commonwealth of Nations.

The principal native states are Baroda, Gwalior, Hyderabad, Kashmir and Mysore. Many of the smaller states, which number more than 600, are banded into agencies, such as the Central India, Madras States, Rajputana and Western India States agencies. The native states have an area of 711,032 square miles and a population of about 80,839,000. They are governed by princes whose authority is determined by treaties with the British Government. To each semi-independent sovereign state a British consultative officer is assigned.

French and Portuguese India. France and Portugal retain an interest in India dating from the days of their 17th-century trading organizations. French India consists of an area of 196 square miles along the Coromandel Coast in the southeastern part. It consists of 5 dependencies: Pondicherry, Karikal, Chandernagor, Mahe and Yanaon and is ruled from Pondicherry, the capital, by a governor and an elective council. The colony is represented in the French Parliament by a senator and deputy. The population is about 287,000.

Portuguese India consists of an area of 1,469 square miles along the Malabar Coast in the southwestern part. It includes Damao, Goa, Mormugao and the island of Diu. The population is about 571,000.

Physical Characteristics. The Himalayas extend along India's northeastern boundary for a distance of 1,600 miles. The greatest of the many lofty peaks are Mt. Everest (29,141 feet), Mt. Kanchenjunga (28,225 feet) and Mt. Godwin Austen (28,191 feet). In the midst of these mountains are the independent states of Nepal and Bhutan. Along India's northwestern boundary are extensions of this system that include the Karakoram, Padmir, Hindu Kush, Khyber (noted since the days of the early Aryan invaders for the Khyber Pass) and Sulaiman mountains.

The strictly peninsular portion of India is crossed from east to west by the Vindhya Mountains, from 1,500 to 4,000 feet in height. Their most distinctive peaks are Mts. Abu and Parnasath, sacred to the Jain religion that prevails especially in Rajputana. The triangular form of this low mountain system is completed by the Eastern and Western Ghats that meet near Cape Cormorin at the southern tip of the Hindustan peninsula. The tableland area which they bound is called the *Deccan Plateau.*

In the northwestern part of India is the Thar Desert, an extension of the Sahara. The fertile valley of the Indus River, however, lies to the west of this desert. To the east of it is the great plain whose rich bottom lands have been deposited over thousands of years by the Ganges and Brahmaputra rivers. This is the most thickly populated agricultural region in the world, with 900 persons to each square mile. The southwestern coast of India is called the *Malabar Coast,* and the southeastern coast, the *Coromandel Coast.*

Economic Resources. Agriculture is the chief means of livelihood of 70 per cent of India's population. Rice, wheat and cotton are the most important products; the rice crop alone amounts to some 65,000,000 bushels annually. Corn, millet, sesame, sugar cane, jute, tea, coffee, opium, cinchona, rubber, linseed, dates, coconuts, tobacco, indigo and oilseeds also are raised. Livestock, bred for their meat, milk and hides or as beasts of burden, include cattle, sheep, horses, water buffaloes, camels, asses, goats and yaks. Under British rule much has been done to prevent the droughts

Courtesy American Museum of Natural History

Jaina Temple at Calcutta

Located in the garden of Badri Das, this temple illustrates the value that the Jains set on a proper esthetic setting for their architecture. The square, cell-like shrine, called the *vimana,* is crowned with a sikhara or pyramidal tower. Sculptured ornament of symbolic design covers the entire structure. The Jaina temples generally contain a large cross-legged seated statue of one of the 24 jinas (including Mahavira Jnatiputra, who founded the religion in the 6th century B.C.) and 100 or more image cells containing smaller replicas of this statue. The Jaina style of architecture flourished between 1000 and 1300 A.D.

and famines that occur if the monsoons should be dry instead of rain-bringing winds. Insurance against crop failure is the irrigation of some 45,000,000 acres by water from such government works as the Sukkur Barrage on the Indus River.

India excels in the manufacture of textiles of all kinds, but the most important are hand-loomed and block-printed cottons and tussah silk, made from the coarse fiber of undomesticated silkworms. Other manufactures include rugs, paper, blankets, leather goods, pottery, brass and copper ware, tiles and articles of carved wood and ivory. From time immemorial India has been noted for its mineral wealth. The diamond mines are practically exhausted, but there are large deposits of gold, silver, coal, iron, tin, lead, copper, tungsten, manganese, salt and petroleum. The most valuable forest products are teak, sandalwood, ironwood, sisal hemp, satinwood and deodar.

Racial Origins. The Indian peoples are of diverse stocks. The principal ethnological groupings include the Dravidians, Indo-Aryans, Turko-Iranians and Mongoloids. About 220 distinct languages are spoken in India. Religion also plays a vital part in the life of these peoples. The most powerful sects are the Hindus who number about 239,169,000 and the Mohammedans who constitute about 77,678,000 of the population. Smaller sects include the Animists (8,281,000), Christians (6,297,000), Sikhs (4,336,000), Jains (1,253,000), Parsees (110,000) and Buddhists (100,000).

A caste system has prevailed among the Hindus since the Aryan hordes swept down upon India about 2000 B.C. Three hereditary classes enjoy prestige and special privileges: the *Brahmans* or priests; the *Kshatriyas* or warriors; and the *Vaisyas* or merchants and agriculturists. Of lower birth are the *Sudras* or artisans and servants. Below the Sudras are a number of castes of which the *Pariahs* are best-known although they are not the lowest in rank. These lower castes constitute collectively the *untouchables*. To the higher groups, especially to the Brahmans, the slightest contact with an untouchable means pollution.

The Sudras and the untouchables probably represent descendants of various conquered groups, and the system may have grown out of the attempt of the Aryan conquerors to preserve their racial purity by preventing intermarriage. The efforts of Mohandas K. Gandhi (better known as Mahatma Gandhi) to improve the lot of these outcasts have made the western world conscious of the plight of some 60,000,000 of India's inhabitants.

Important Cities. Delhi, India's capital, is treated in a separate article. The three great commercial centers are Calcutta, Bombay and Madras. Calcutta (population, 1,486,000) is the largest city of India. Although it is located on the Hooghly River 86 miles from the Bay of Bengal, it is the country's greatest seaport. From 1877 when Queen Victoria was proclaimed Empress of India until 1911 when George V ascended the throne, it was the capital of India. Among its distinctive buildings are the *Belvedere,* residence of the viceroy when he visits the city; Government House, residence of the governor of Bengal; Victoria Memorial; Indian Museum; Anglican Cathedral; the Badri Dos (Jaina) Temple; and the Kalighat (Hindu) Temple from which the city takes its name.

Bombay (population, 1,162,000) is the gateway to India from the West. It is located on an island in the Arabian Sea that is connected with the mainland by causeways. The harbor, 11 miles long and 3½ miles wide, is one of the finest in the world. Bombay is also the financial center of India. Near it are the Cave Temples of Ellora, visited by Hindu, Jain and Buddhist pilgrims. Madras (population, 648,000) on the Coromandel Coast was founded under the auspices of the East India Company in 1639 as Fort St. George. Among its important buildings are the Victoria Memorial Hall, St. George's Cathedral and Madras University.

Benares, the holy city of the Hindus, is located on the Ganges River 400 miles west of Calcutta. In the sacred waters of this stream devout pilgrims from all parts of India bathe to purify themselves from sin. Moreover, the Hindus believe that the souls of those who die and are cremated on the banks of the Ganges at Benares will be transported immediately to paradise. Along the river's 3-mile stretch are found numerous temples, notably the Viswanath Temple, often called the *Golden Temple* from its gilded dome, the Temple of Annapurna and the Durga Bari or Monkey Temple where sacred monkeys are kept. The population of the city is about 206,000.

In the north-central part of India are Lucknow, scene of the Sepoy Mutiny of 1857, and Agra, ancient capital of the Mogul emperors. Agra is also famous for the palace erected by Shah Jahan and for the tomb in which his favorite wife is buried, the Taj Mahal. Other important cities include Hyderabad, Lahore, Rangoon, Ahmedabad, Bagalore, Amritsar, Poona and Cawnpore.

The name *India* is related to the name of the great river, the Indus.

Indiana, one of the north-central states of the United States in the Mississippi Valley. It also borders on the Great Lakes, for Lake Michigan extends about 45 miles along its northwestern boundary. Michigan completes the northern boundary. Ohio is on the east, Kentucky on the south and Illinois on the west. The Wabash River is the natural line for half the western boundary. The Ohio River forms the southern boundary. The area is 36,354 square miles, of which 309 square miles are water. The population is about 3,429,000.

The highest lands in the state are in the northeastern county (Steuben) and in the east-central section, extending into Ohio. The general surface is slightly rolling in the north and fairly flat in the west and south. Indiana is called one of the prairie states, but the prairie section begins only in the western half of the state. The Wabash, with its branches, drains more than half of the state; its chief affluents are the White and Tippecanoe rivers. The Maumee carries drainage into Lake Erie, and the St. Joseph into Lake Michigan.

Indiana is essentially an agricultural state; almost 90 per cent of the land is farm land—under cultivation, in pasturage or in wood lots. The chief crop is corn, followed by oats, wheat and rye. The hay crop is large, and in the south considerable tobacco is raised. Cheese and butter are the leading dairy products.

Indiana has large deposits of bituminous coal. Although the petroleum industry is not large, more than 1,000,000 barrels are marketed yearly, and there is the usual accompaniment of natural gas in fair quantity. One source of wealth is Indiana limestone, quarried in the southwest.

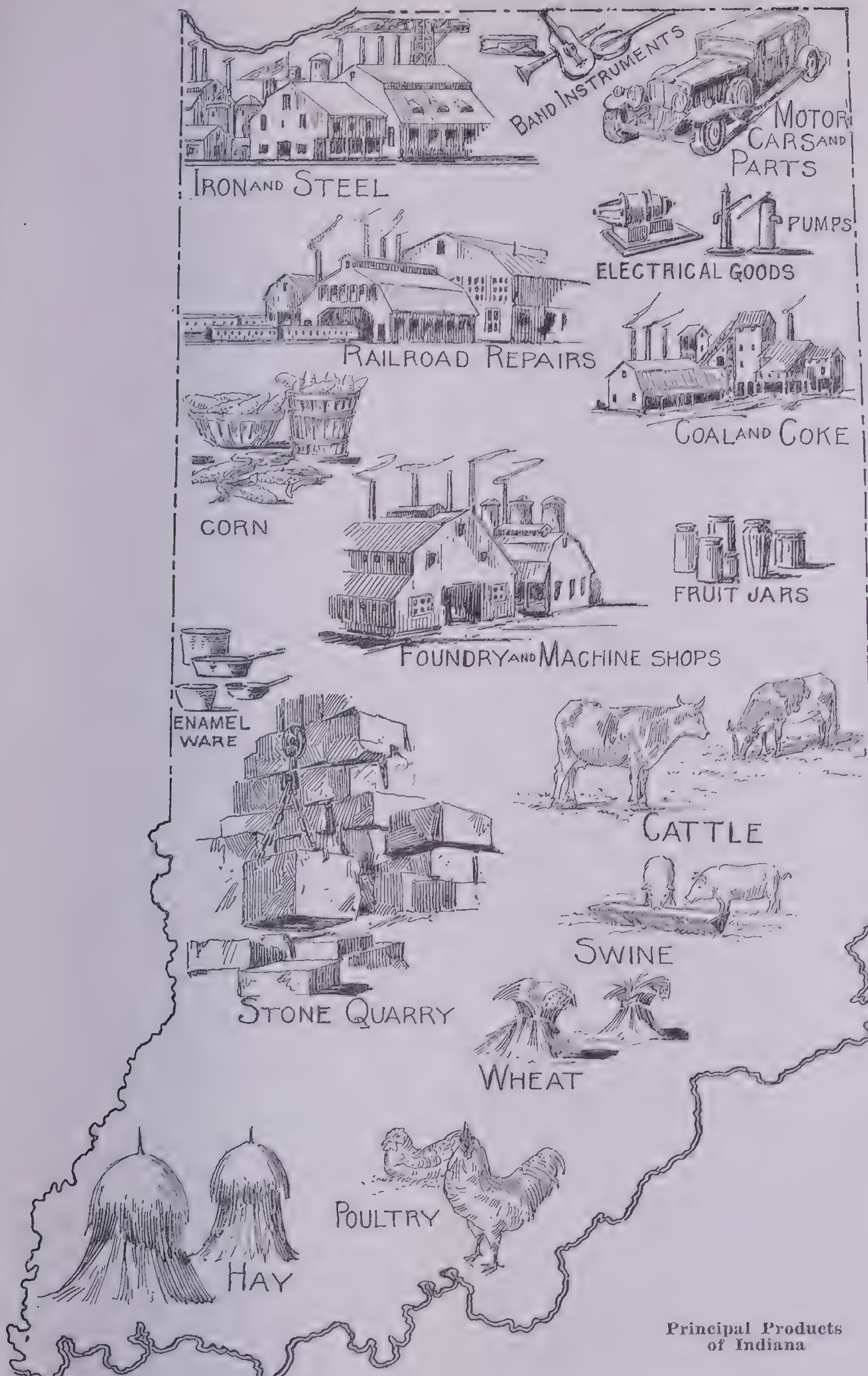
Indiana is one of the great manufacturing states of the Union. In the northwest corner on the southern shore of Lake Michigan are grouped several manufacturing centers that are really a part of metropolitan Chicago. Here are the great steel mills of Gary and the railroad yards, car repair shops and foundries of Hammond. Farther east is the city of South Bend with its large automobile plants and machine shops. Enamelware from Terre Haute, fruit jars from Muncie, band instruments from Elkhart, steam engines, valves and pumps from Fort Wayne are typical products of Indiana's cities.

The capital and largest city of the state, Indianapolis, is one of the most important railroad centers in the country and is the home of a vast variety of industries. It is also the national headquarters of the American Legion and possesses in its War Memorial Plaza one of the most beautiful tributes to America's war dead.

Indiana has three large universities; Notre Dame at South Bend, Purdue at Lafayette and Indiana University at Bloomington. These, with several smaller colleges and technical schools, give the state a high rank in the educational world. Among smaller places of interest is Greenfield, birthplace of James Whitcomb Riley, who has immortalized the Hoosier State (as Indiana is called) in his poetry.

Indian Ocean, a body of water that, although the smallest of the three oceanic basins, contains about a fifth of the ocean area of the globe. It is bounded on the north by Asia (Iran, India, Burma and Malaya), on the south by Antarctica, on the west by Arabia and the various countries extending from Italian East Africa to the Union of South Africa and on the east by Netherland India and Australia.

The area of the Indian Ocean is about 29,340,000 square miles. In length it measures approximately 6,500 miles and in breadth from 4,000 to 6,000 miles, being widest between the south points of Africa and Australia. The Hindustan peninsula divides the narrow northern part into two arms,



Principal Products of Indiana

the Arabian Sea on the west and the Bay of Bengal on the east. Its greatest depth of 22,968 feet has been sounded off the southeastern coast of Java. Among the rivers emptying into the Indian Ocean are the Zambesi and Limpopo in Mozambique; the Shatt-el-Arab (Euphrates-Tigris) in Iraq; the Indus, Ganges and Brahmaputra in India; and the Irrawaddy and Salween in Burma. The monsoons bring heavy rains that add much surface water to the Indian Ocean; the volume is thereby increased but the salinity is lessened.

The continental islands in the Indian Ocean are Madagascar, Socotra and Ceylon. The most important of the many oceanic islands of volcanic origin is Mauritius. The Maldive and Seychelle groups are mostly of coral formation. In the south central part is the uninhabited Kerguelen island, which is claimed by France and used as a base station for Antarctic exploration.

Indus, a river of northwestern India. It rises in the Himalayas of Tibet, on the north side of Mt. Kailas, at an altitude of 15,000 feet. After flowing between the Himalayas proper and the Hindu Kush range, and between the Mustagh and Karakoram ranges, it follows a generally southwestern course across the plains of the Punjab. Before entering the Bombay delta it combines with the Panjnad and discharges through several mouths (the three chief ones of which are the Kori, Mal and Yatho) into the Arabian Sea south of the city of Karachi. The Indus is about 1,700 miles long and drains an area of about 372,000 square miles. It is navigable only by small flat-bottomed craft, but it is an important source of water for irrigation projects. Tributaries of the Indus are the Gilgit, Kabul, Chenab, Jhelum, Ravi, Beas and Sutlej. Towns along its shores are Leh, Attock, Dera Ismail Khan, Dera Ghazi Khan, Sukkur, Hyderabad and Miani. Alexander the Great crossed the Indus at Attock (the ancient Taxila) in 325 B.C.

inlet, a water recess that indents the shore of a lake or sea or the bank of a river.

international date line, an imaginary line, drawn irregularly in the Pacific Ocean but approximately following the meridian of 180°. It thus forms the continuation on the opposite side of the globe of the meridian of Greenwich, the reference meridian of 0° from which all civilized nations have agreed to measure longitude and reckon standard time.

Travelers crossing the international date line change their calendar reckoning. If the crossing is made from east to west, one day is subtracted, as this is what would happen if one followed in the path of the sun all the way around the globe, and the earth, in its relation to one person, made no 24-hour rotation. If the crossing is from west to east, one day must be added. Thus, at the same moment it may be called *Sunday* on one side of the line and *Monday* on the other, and western newspapers apparently report events in the Far East the day before they occur.

To understand why this change of date is necessary, let us consider the time and date in different parts of the world at the moment when it is midnight between January 1 and January 2 on the meridian of Greenwich. At all points west of the meridian of Greenwich the date will be January 1; at all points east of that meridian the date will be January 2. Halfway round the globe, on the meridian of 180°, the time of day will be noon, but obviously the date will be either January 1 or January 2, depending upon which direction from Greenwich we measure. Thus, in Honolulu, T. H., which is a little east of the meridian of 180°, the time will be 1:30 o'clock in the afternoon of January 1; but at the same moment at Wellington, New Zealand, just west of the meridian of 180°, the time will be 10:30 o'clock in the morning of January 2.

The international date line coincides with the 180th meridian only in midocean. Northeastern Siberia has adopted Asiatic time so as to have the same day as the rest of the country; but farther south in the Bering Sea the line swerves to the west to enable the Aleutian Islands to follow American time the same as the Alaskan mainland. Likewise in the Southern

Hemisphere the international date line swerves to the east so that the Fiji and Chatham islands may have the same time as New Zealand.

Ionian Islands, a group of six large islands and numerous smaller ones in the Ionian Sea off the western coast of Greece. They have formed an administrative division of that country since the abolition in 1864 of the British protectorate authorized by the Congress of Vienna. Corfu, the most important island, is discussed separately. Ithaca, the most famous of the group in ancient times, was the home of Ulysses, hero of Homer's *Odyssey*. Among the other islands are Cephalonia, Zante, Santa Maura, Cythera and Paxos. The total area is 1,117 square miles. The population is about 285,000.

Iowa, one of the north-central states of the United States. Along its eastern boundary, separating it from Wisconsin and Illinois, is the Mississippi River. Minnesota is on the north and Missouri is on the south. The Missouri River and the Big Sioux separate it from Nebraska and South Dakota on the west. The area of the state is 56,147 square miles, of which 561 square miles are water. The population is about 2,534,000.

Iowa is a typical prairie state, for its surface is either level or slightly rolling. Its lowest spot is at a point on the Mississippi River near Keokuk (477 feet elevation); the average elevation is about 1,000 feet. Iowa is well watered, the largest river being the Des Moines, which enters the northwestern part of the state from Minnesota and flows southeast into the Mississippi at Keokuk. The Iowa River, which flows parallel to the Des Moines and east of it, also empties into the Mississippi, and so do the Turkey and Maquoketa, still farther east.

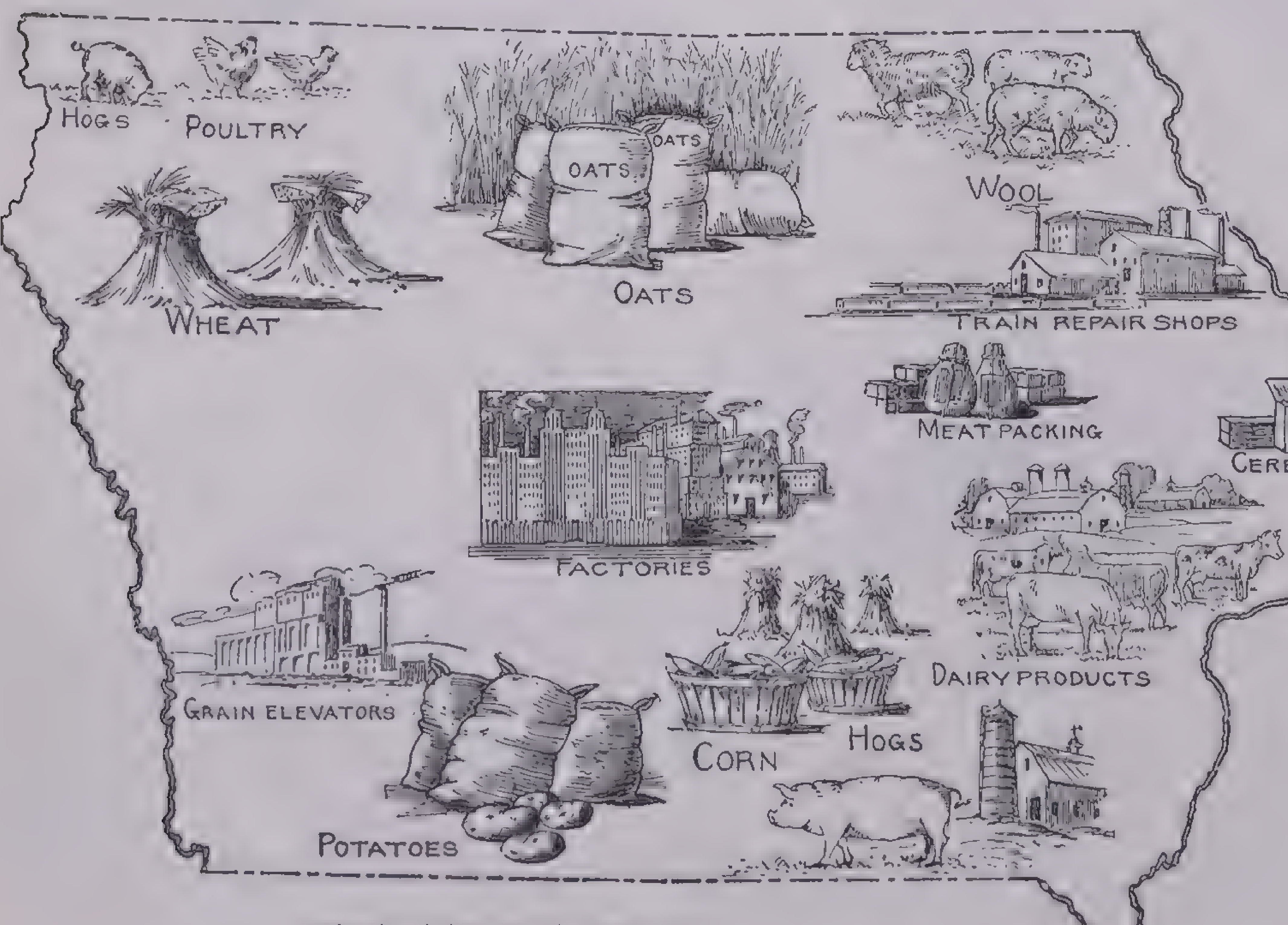
There is not a state in the Union with richer soil; Iowa, in the value of its farm products year by year, is second only to Texas, and Texas has five times as much cultivable land. Iowa is the greatest producer of corn of all states in the Union; in some years more than 425,000,000 bushels are harvested. Oats is the second crop in size and value, followed by wheat, barley, rye and buckwheat. Potatoes, hay and flaxseed are produced in abundance. There are more than 12,000,000 cattle, hogs and sheep on the farms.

The state possesses soft-coal areas totalling 19,000 square miles and underlying about one-third of the state. The mines and quarries also produce lead, gypsum, sandstone, limestone and ochre. The chief manufacturing industries are meat packing and the making of butter and cheese. Corn products, flour and canned goods also command a large labor supply.

The capital is Des Moines (population, 159,819), located in the central part of the state. Other large cities, mostly manufacturing centers, are Cedar Rapids, Council Bluffs, Dubuque and Sioux City. The University of Iowa is located at Iowa City; the Iowa State College, a leading school for instruction in agriculture, is located at Ames.

Iran, a kingdom occupying the eastern half of the great Iranian Plateau of western Asia. It extends from the Caspian Sea to the Perisan Gulf and the Gulf of Oman. Turkey and Iraq are on the west; the Soviet republics of Armenia, Azerbaijan and Turkoman are on the north; and Afghanistan and India (Baluchistan) border it on the east. The area of the country is about 628,000 square miles. The population is estimated at 15,000,000 of whom at least 3,000,000 are nomadic wanderers. Turks, Arabs, Kurds, Armenians and gypsies constitute about 2,000,000 of the population.

Iran lies within the warm Temperate Zone at an altitude of 2,500 to 4,000 feet above sea level. To the northeast are the Elburz Mountains and to the southwest the Zagros system. The highest peak is Mt. Demavend (18,605 feet) in the Elburz Range. The important rivers are the Safid Rud, Herhaz, Gurgan and Atrek, most of which empty into the Caspian Sea. The largest lake is Lake Urmia in the northwestern part; during the wet season it has an area of about 2,300 square miles. The great desert known as the *Lut* stretches across the plateau from northwest to southeast; its length is 800 miles and it varies in width from 100 to 200 miles.



Principal Products of Iowa

The best agricultural region of Iran is around the Caspian Sea, but by irrigation cereals and other crops are raised in the central part. The products include wheat, barley, rice, corn, beans, lentils, millet, peas, opium, cotton, apricots, citrus fruits, almonds and the variety of tobacco known as Tambaku used largely for hookah smoking. Silk has been an important article of commerce since the 16th century. Both silk and wool (from the fat-tailed sheep) are utilized in the carpet industry, centered in the cities of Sultanabad, Hamadan, Tabriz and Kerman. Other industries include wood carving, repousse silverwork, mosaic and tilework, brasswork (especially lamps) and the manufacture of porcelains and lacquered papier-mâché articles.

Iran's mineral wealth includes coal, iron, lead, copper, nickel, manganese and marble that await development. Since 1901 the Anglo-Iranian Oil Company has held a 60-year monopoly in the development of the rich petroleum area at the head of the Persian Gulf; production averages 60,000,000 barrels annually. The turquoise mines have been worked since ancient times.

Formerly an unlimited monarchy, Iran has had a constitutional form of government since 1906. The power of the shah is curbed by the Majlis or National Consultative Assembly, consisting of 136 members representative of various clases. The prime minister and his cabinet comprise the real executive power; they are appointed by the shah but are responsible to the Majlis. For local administrative purposes the country is divided into 26 provinces, administered by governors appointed by the shah.

The capital and largest city is Teheran (population, 350,000). It is about 70 miles south of the Caspian Sea, with which it is connected by the Chalous Road that crosses the Elburz Mountains at a height of 10,600 feet. All commerce is by caravan and by newly established air routes. The city is one of the greatest rug and fur markets in the world; the principal furs are Persian lamb, sable, ermine, fox and stone marten. From the gallery of the Nagara-Khaneh gate trumpets have blared forth each morning since the days of the Zoroastrian rulers the resounding fanfare called the *Salute to the Sun*. The Imperial Palace is composed of the Palace of the Ark (in which is the Peacock Throne that Nadir Shah carried off from Delhi in 1739), Palace of Roses and Sun of the Palaces (the harem quarter). One of the most important educational institutions in

Iran is Teheran University, conducted under American auspices. The Museum of Art and Antiquities contains an excellent collection of early Persian art.

Among other important cities are Tabriz, Isfahan, Meshed and Resht. The Rock of Behistun near Kermanshah in western Iran proved to be as important in deciphering cuneiform inscriptions as the Rosetta Stone was in deciphering Egyptian hieroglyphics. Another haunt of the archeologist is the ruined city of Persepolis, capital of the Achaemenian Empire of the 3d century B.C.

Since 1935 the western world has known the country under its native name of *Iran*. Persia, by which it was previously known, was the name which the Greeks gave to one of the western provinces.

Iraq, an Arab kingdom occupying the western half of the great Iranian Plateau of western Asia. It is bounded on the west by Syria and Trans-Jordan, on the south by Saudi Arabia, Kuwait and the Persian Gulf, on the east by Iran and on the north by Turkey. It is nearly coextensive with the ancient country of Mesopotamia, a Greek name that meant the land between the rivers. Composed of the former Turkish vilayets of Basra, Bagdad and Mosul, it was made a mandated territory after the World War, being assigned by the League of Nations to Great Britain. In 1930 a treaty of friendship and alliance was signed between Iraq and Great Britain, and 2 years later, on its joining the League of Nations, the independence of Iraq was recognized. In form of government it is a limited monarchy. Its first ruler, chosen by popular referendum, was Feisal Ibn Husein, son of the Grand Sherif of Mecca, who reigned as Feisal I from 1921 until his death in 1933. The legislative body is composed of a Senate of 20 nominated elder statesmen and a lower house of 107 elected deputies. The area of Iraq is 177,148 square miles. The population is about 3,300,000. Included in this figure are several minority groups, such as the Armenians, Chaldees and Assyrians, that number about 50,000.

The southern part of Iraq is a vast alluvial plain, 35,000 square miles in extent, built by the two principal rivers, the Tigris and Euphrates. The western part is an extension of the Arabian Desert called *El Hamed* (Stony Plain). In the northeast are the Jawur Mountains. Great extremes of temperature (as high as 125° F. in summer and as low as zero in winter) and scant rainfall make the climate of Iraq in many respects unattractive.

About 90 per cent of the population of Iraq is in the river valleys, where they gain a livelihood from agriculture. The chief crops are dates, wheat, barley, millet, rice, tobacco, cotton, figs, pears, apricots, melons and citrus fruits. Sheep raising is important in the north; some 15,000,000 pounds of wool and skins are exported annually. Iraq ranks eighth among the countries of the world in petroleum production with about 30,000,000 barrels annually. Since 1931 the Iraq Petroleum Company, representing British, American, French and Dutch interests, has been developing the rich Mosul field in the northern part. One branch of the 1,200-mile-long pipe line goes to Tripoli in Syria (under French control) and the other to Haifa in Palestine (under British control).

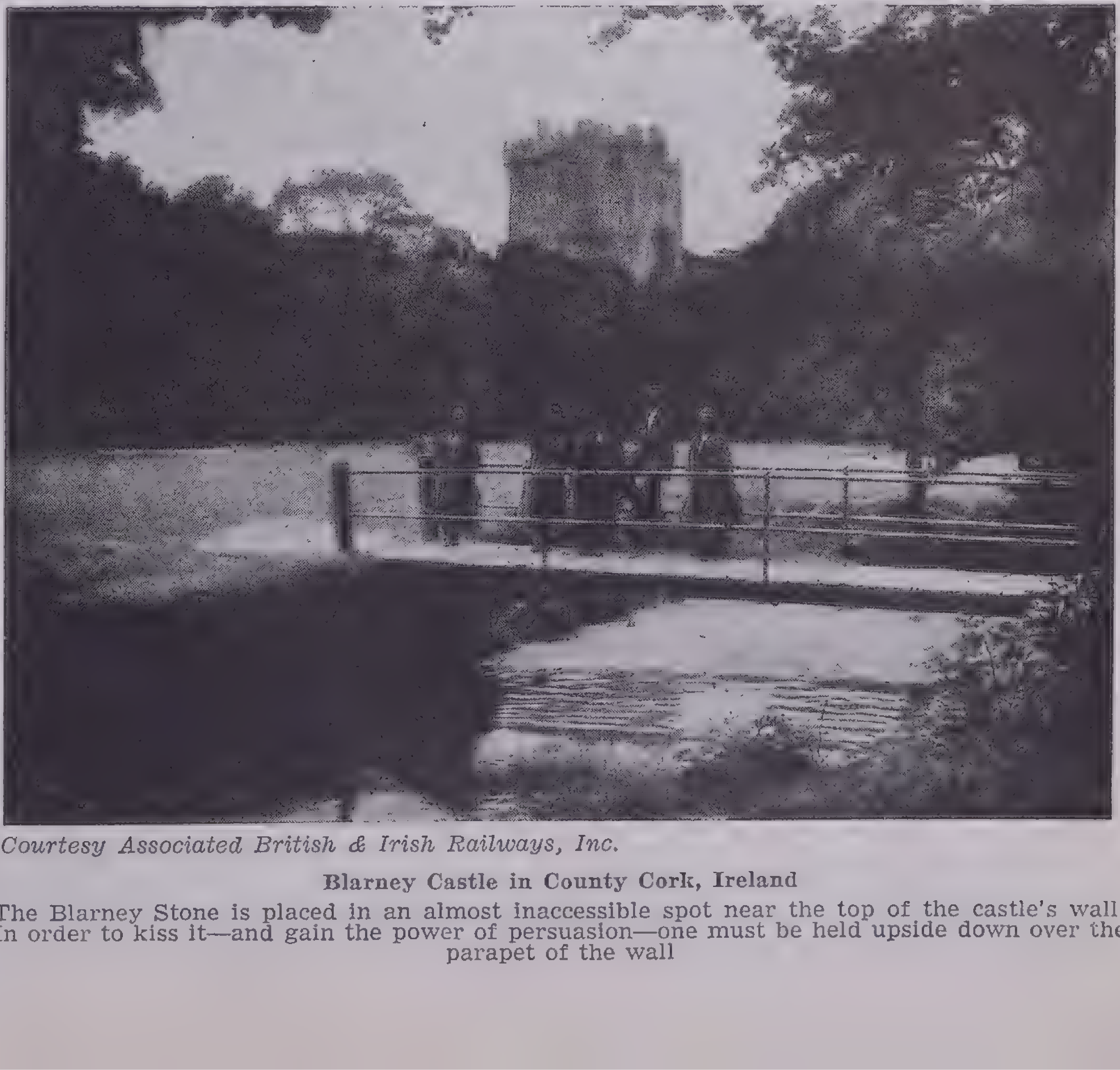
The capital of Iraq is Bagdad (population, 300,000), located in the east central part on the Tigris River. It was founded by Caliph Almansur in 762 and under Harun-al-Rashid of *Arabian Nights* fame became a century later one of the chief Moslem cities. The city is the terminus of the Berlin-to-Bagdad Railway, begun by Germany before the World War and completed by Great Britain. It has changed little during the centuries. The buildings are constructed principally of brick and tile; their dull monotony and uniformity are relieved by the peacock-colored tile or gold-encrusted domes and minarets of the Kazemain, Haider Khane and other mosques.

Iraq's other important cities are Mosul, center of the petroleum industry, and Basra, an important port at the head of navigation on the Shatt al Arab River (the combined Tigris and Euphrates). The draining of the malarious swamp around Basra has not only made the land more healthful but has reclaimed a large acreage for gardening. The cradle of one of the oldest civilizations, Iraq is famous for the ruins of two ancient cities, Babylon on the Euphrates River in the central part and Nineveh on the Tigris River in the northern part. At Babylon the Palace of Nebuchadnezzar, noted for its hanging gardens, has been excavated. Imposing remains of the palace of Khosru II, a Sassanid king who reigned about 560, have been found at Ctesiphon near Bagdad.

Ireland or **Eire,** a member of the British Commonwealth of Nations that comprises the central and southern provinces of Connacht, Leinster and Munster and nine counties of the province of Ulster. The country is bounded by Northern Ireland and the Atlantic Ocean on the north; by the Irish Sea and North and St. George's channels on the east; and by the Atlantic Ocean on the south and west. It has an area of 26,601 square miles and a population of about 2,966,000.

In January 1938 the new Irish constitution went into effect. In accordance with it the country, which 16 years previously had received the status of a British dominion after a campaign of many years' duration for home rule, changed its name from the Irish Free State to Ireland. During the intervening years most of the remaining ties to Great Britain had been severed; the culmination was abolition of the oath of allegiance to the British sovereign and omission of even the name of Great Britain in the constitution. As a sovereign, independent and democratic state (internally) Ireland is governed by a president and council of state. The Parliament (Oireachtas) consists of the Senate (Seanad Eireann), composed of 60 members representing various occupational groups, and the House of Representatives (Dail Eireann) whose members represent some 115 constituencies.

Ireland has no high peaks, but there are rugged sections such as the Glendowan and the Derryreag mountains in the northwest and the Wicklow Mountains in the east. The Caha and the Commeragh mountains in the



Courtesy Associated British & Irish Railways, Inc.

Blarney Castle in County Cork, Ireland

The Blarney Stone is placed in an almost inaccessible spot near the top of the castle's wall. In order to kiss it—and gain the power of persuasion—one must be held upside down over the parapet of the wall south represent a continuation of the continental Hercynian system. The eastern coast has a comparatively straight strand line; but on the sides lapped by the Atlantic, drowned valleys resembling the fiords of Scandinavia are numerous. The most picturesque is Bantry Bay. The glacial-formed lakes of Ireland are called *loughs,* the most beautiful being the chain in the southwest known as the Lakes of Killarney. The interior of the country is an emerald-green plain, drained by various rivers, such as the Shannon, Barrow, Liffey, Blackwater and Lee. On the banks of the Boyne on July 11, 1690, was fought the battle that shattered the hopes of restoring James II to the throne of England.

Agriculture is the chief occupation; the principal crops are potatoes, oats, barley, wheat, sugar beets, turnips and flax. With raising more cattle, sheep and other livestock than in the past, the production of dairy products and wool has increased. The coal found in Ireland is of poor quality, so that most of the peasants rely upon the peat bogs for fuel. Iron is the only mineral of any importance; the principal stone is marble, and that from Connemara is especially beautiful. The most important manufactures are linens, woolens, worsteds, sugar, beer, porter, ale, cigarettes, furniture and lace. The surrounding seas yield fish, such as herring and mackerel, and seaweed, kelp. The principal fresh-water fish are salmon and trout. The climate of Ireland is greatly influenced by the Gulf Stream.

Dublin, the capital, is described in a separate article. Among other important cities are: Cobh (formerly Queenstown), a port of call for transatlantic steamers; Limerick, located at the head of the broad estuary of the River Shannon and the most important port on the western coast; and Cork, an important manufacturing city, also the gateway to famed Killarney, with a stop-off at Blarney Castle to kiss the stone that is said to endow one with elegance in the art of flattery. Sligo is famous for its 13th-century Dominican abbey; and Waterford, for an equally ancient Holy Ghost Priory. Galway is a center for expeditions to the rather primitive Aran islands, to Lough Corrib and the other lakes of Connemara and to East Galway, noted for its ecclesiastical ruins and ancient Celtic crosses, for Ireland was one of the earliest strongholds of Christianity. The origin of the numerous round towers found throughout Ireland, however, is a mystery to archaeologists.

island, a relatively small tract of land that is entirely surrounded by water. Two classes of islands—continental and oceanic—constitute more than 3,500,000 square miles of the land surface of the earth.

A continental island is near the coast of a continent or in the large inland seas, lakes or rivers of a continent. Since it is of geological similarity, it partakes of the general physical characteristics of the mainland and has the same plant and animal life. Continental islands along a gulf, bay or open coast may be land that was at some time part of the continent but that became separated by marine submersion or by the sinking of a portion of the coast below sea level. In both cases the hills or mountains enclosing submerged valleys project above sea level. Thus Martha's Vineyard and Nantucket, which are separated from the Massachusetts coast only by shallow water, and Sicily, whose previous union with the Italian mainland is indicated by a submarine bank, were formed.

Continental islands are formed sometimes at the mouths of rivers, when sediment is deposited by the current in sufficient quantity to build up a land area, as the section of the Nile delta between the Rosetta and Damietta branches. The triangular plain of about 370,000 acres, formed by the Grand and Petit distributaries of the Rhone River at its Mediterranean mouth, is an island called *La Camargue.* Other continental islands are sandbars formed by ocean currents and tidal action, as Fire Island off the southern coast of Long Island.

An oceanic island is usually distant from large land masses. Its formation is generally the result of volcanic action or coral growth. When volcanoes under the sea become active, they erupt large masses of lava and other material that accumulate around their cones and finally rise above sea level as oceanic islands. For instance, in 4 years after its first appearance in 1796 the volcanic island of Bogoslof, Alaska, rose to a height of 3,000 feet, with frequent eruptions during the succeeding 23 years.

On the other hand, oceanic islands of the volcanic type sometimes completely disappear beneath the ocean. This happens when the eruption of the volcano is violent enough to blow out the upper portion of its cone. A case in point was Ferdinandea, a Mediterranean island that disappeared soon after being thrown up in 1831. If the volcanoes that form oceanic islands become inactive, these rapid changes do not take place, and the islands may be considered permanent, as in the case of St. Helena and of Tristan da Cunha.

Volcanic islands may be formed on continental shelves, but their characteristics are quite different from those of true continental islands. Coral islands are built of the skeletons of *Anthozoa* and are found principally in the warm waters of the Indian and Pacific oceans. The Fiji Islands are typical examples.

The 15 largest islands of the world are Greenland, New Guinea, Borneo, Madagascar, Baffin, Sumatra, New Zealand, Great Britain, Honshu (chief island of the Japanese Empire), Victoria (part of the Arctic Archipelago), Celebes, Java, Cuba, Newfoundland and Luzon (largest of the Philippines).

The term *isle* is frequently applied to a small island, as the Isle of Pines. A small island may also be called an *islet* or, to use the Spanish piratical expression, a *cay* (derived from *cayo* and pronounced *key*).

isobars or **isobarometric lines,** the lines on a weather chart joining places at which the barometric pressure is the same either at a given time or for a certain period. The term is derived from the Greek, meaning equal weight (or pressure) measure. Maps showing isobarometric lines are called *isobaric maps.* They depict atmospheric areas of high, normal and low pressure, and from them the direction and velocity of winds and storms can be forecast with considerable accuracy.

isotherms or **isothermal lines,** the lines on a weather chart joining places that have the same average temperature for a certain given period (a month or a year) and indicating prevailing temperature conditions. Since temperature is given as of sea level, the temperatures of various altitudes must be calculated according to a scale that allows a reduction of 1° F. from the normal boiling point of 212° F. for every 370 feet of ascent in summer and 400 feet in winter. The term *isotherm* is derived from the Greek, meaning equal heat.

isthmus, a narrow strip of land that joins two larger areas of land, the term being derived from the Greek word meaning neck. An isthmus may serve to connect two continents, as the Isthmus of Panama, which joins North America to South America, and the Isthmus of Suez, which enables Africa to be considered a southwestern extension of Eurasia. It may also connect a peninsula with the mainland, as the Isthmus of Corinth, which joins the peninsula of Peloponnesus to northern Greece, and the Isthmus of Krau, which connects the Malay Peninsula with Burma and Siam. The barrier that isthmuses once presented to shipping has been removed by constructing such waterways as the Panama and Suez canals.

Italian East Africa, an Italian dependency occupying a large part of northeastern Africa. Established by decree of King Victor Emmanuel III in 1936, this colony is composed of the formerly separate colonies of Eritrea and Italian Somaliland and the recently conquered native kingdom of Ethiopia. The total area is estimated at 590,000 square miles. The total population is about 9,244,000. The viceroy maintains his headquarters at Addis Ababa, the capital of Ethiopia. Appointed by the king (who now bears the title of emperor of Ethiopia), he is responsible to the minister for colonies in Rome for the administration of the dependency.

Eritrea, which extends 650 miles along the Red Sea coast from Ras Kasar to Ras Dumeira on the Strait of Bab el Mandeb, is bounded on the west by the Anglo-Egyptian Sudan, on the south by Ethiopia and on the southeast by French Somaliland. The area, including the Dahlak Islands in the Red Sea, is 45,754 square miles. The native population, numbering about 622,000, is of Arabic, Hamitic and Ethiopian stock. There are some 70,000 Europeans, mostly Italians. The chief source of wealth along the Samhar or low coastal plain are the pearl and mother-of-pearl fisheries.

On the inland plateau, whose hills rise to a height of 10,000 feet, wandering tribes pasture their herds or flocks of cattle, camels and sheep. The principal agricultural products, raised in many instances with the aid of irrigation, are coffee, tobacco, corn, flax, dates, figs and olives. Gold is the chief mineral. The capital is Asmara (population, 22,000); it is the seat of a resident governor who is responsible to the viceroy of Italian East Africa. The most important seaport is Massaua. Eritrea has belonged to Italy since the consolidation in 1890 of the Red Sea dependencies, ceded by the Sultan of Aussa. It takes its name from the Greek name for the Red Sea, *Erythre Thalassa.*

Italian Somaliland is a long, narrow strip of land extending 1,100 miles along the Indian Ocean from Cape Guardafui on the Gulf of Aden to Kenya. To the west are the British Somaliland Protectorate and Ethiopia. The area is estimated at 194,000 square miles; the population is about 1,022,000, some 2,000 of whom are Italians. The most fertile part of the country is along the Benadir Coast in the southern part. The region is watered by the Juba and Webi-Shebeli rivers. The northern part presents an arid aspect. The crops include cotton, sugar cane, rice, durra and kapok oil and fiber (used for soap making and mattress stuffing). More than half of the world's supply of Frankincense and myrrh comes from Italian Somaliland. Other exports include cattle hides and ivory. The capital, Mogadiscio (population, 30,000), is the seat of a resident governor who is responsible to the viceroy of Italian East Africa. The colony is divided into 7 districts whose commissioners are responsible to the governor. The region has been under Italian influence since 1889.

Ethiopia lies wholly inland, being separated from the sea by Eritrea and the three Somalilands (British, French and Italian). It is bounded on the west by the Anglo-Egyptian Sudan and on the south by Kenya. Its area is estimated at 350,000 square miles and its population at 7,600,000. The country lies wholly in the Torrid Zone, but the temperature in most sections is not usually hot, for most of the country is a plateau from 5,000 to 8,000 feet above sea level. The highest peak is Ras Dashan (15,150 feet) in the Simen Range in the northern part. The chief river is the Blue Nile, which rises in the Gojjam Highlands; its Ethiopian tributaries include the Bashilo, Jamma and Muger rivers. The principal lake is Lake Tana (1,100 square miles).

Ethiopia is rich in minerals, especially gold, silver, platinum, copper, iron, coal and potash. The rubber industry flourishes. Coffee, sugar cane, cotton, wheat, barley, rye, teff (a kind of millet), bananas, citrus fruits and tobacco are raised. Among the exports are ivory and the hides of zebu cattle and fat-tailed sheep, as well as leopard and monkey skins. The forests produce mahogany, ebony and other hardwoods.

In addition to the capital Addis Ababa (population, 65,000), the principal towns of Ethiopia are Harrar, Makale, Aduwa, Gondar, Gambela and Ankober. Since its annexation in 1936 Ethiopia has proved an excellent means of carrying out several purposes of colonization. It has helped to relieve the unemployment situation in the mother country by providing work for some 600,000 labor volunteers. Italy is exploiting Ethiopia's great natural resources and is supplementing its home agricultural products by those raised in the new colony.

In 1923 the country, which for several centuries had been known as Abyssinia, resumed its ancient name of *Ethiopia,* meaning the land of the blacks, a name apparently derived from the Greek words, *aithein,* to burn, and *ops,* face. The people have always called themselves Ethiopians and are intensely proud of their claim to a history reaching back to King Solomon, whose reputed son Menelik, by the Queen of Sheba, was the first ruler.

Italy, a kingdom of southern Europe, located on the boot-shaped Apennine Peninsula extending southeastward into the Mediterranean Sea. Some 25,000,000 years ago this peninsula resembled the block-shaped Iberian Peninsula, its western section including the three islands of the Tyrrhenian Archipelago—Elba, Sardinia and the French-owned Corsica—and its southern section, the island of Sicily. Today Italy is bounded by Switzerland and Germany on the north; by Yugoslavia and the Adriatic Sea on the east; by the Ionian and Mediterranean seas on the south; and the Tyrrhenian and Ligurian seas and France on the west. Between Italy and Sicily is the Strait of Messina; and between Italy and Albania, the Strait of Otranto. In the northeastern part of the peninsula, extending from the Brenner Pass to the Istrian Peninsula is the southern Tirol, a part of some 9,000 square miles of territory that Italy obtained from Austria under the Treaty of St. Germain at the close of the World War. Italy's possession of the seaport of Fiume was assured by agreement between that country and Yugoslavia in 1924, the initial step in its occupation having been taken by the poet Gabriele D'Annunzio, 5 years previously. The total area is 119,768 square miles. The population is about 42,500,000.

Courtesy Italian Tourist Information Office

Casa dei Vettii, Pompeii

The peristyle or large inner court of a Roman dwelling shows the Greek influence on Roman domestic architecture. This court, which afforded the only light for the surrounding rooms, was decorated with mural paintings and adorned with statues and fountains. Since the latter part of the 18th century archeologists have been engaged in excavating Pompeii and Herculaneum, which were destroyed by an eruption of Vesuvius in 79 A.D.

The Alps are the northern border; the Maritime and Cottian Alps separate France and Italy, and the Swiss Alps, Switzerland and Italy. The Dolomite Alps form the barrier between Germany and Italy; and the Julian Alps shut off Italy from Yugoslavia. Most of the Dolomite region is included in the division of Venezia-Tridentina. The chief mountain chain of the peninsula is the Apennines. The Ligurian Range encircles the cities along the Gulf of Genoa. The mountains around Florence and on which the famous Italian hill towns (Perugia, Orvieto, Assisi, Urbino and Volterra) were built are known as the Etruscan Apennines. Between Florence and Rome are the Roman Apennines. The Lepini Mountains and the Neapolitan Range of the Apennines extend between Rome and Naples, and near the "toe of the boot" are the Calabrian Mountains. The highest peak of the Swiss Alps is the Grand Paradis (13,300 feet); and of the Apennines, Monte Corno (9,560 feet), known also as the Gran Sasso d'Italia. Other celebrated peaks are Monte Cimone, Monte Bue and Monte Nerone. Italy has the only active volcanoes on the European continent; these are Mt. Vesuvius (4,300 feet high), near Naples; Mt. Etna (10,740 feet), in Sicily; and Mt. Stromboli (3,040 feet), on one of the Lipari Islands in the Tyrrhenian Sea. Earthquakes occur occasionally in the extreme south and in Sicily.

The lakes of northern Italy are noted for their beauty. Most of them nestle in valleys between high mountains and have occasionally formed in the craters of extinct volcanoes. Lakes Como, Garda, Iseo and Idro are wholly in Italy; but the northern parts of lakes Maggiore and Lugano are in Switzerland. Lake Garda is the largest, covering an area of 143 square miles. On all these lakes picturesque resorts are located. Probably the best-known are Bellagio on Lake Maggiore and Gardone and Riva on Lake Garda.

The greatest river of Italy is the Po, which rises in Mt. Viso, a mountain of the Maritime Alps, and flows some 420 miles across the northern part of Italy, emptying into the Adriatic Sea. Noted especially for the delta that it is building, it may in the course of the next 10,000 years turn the Gulf of Venice into a lake. Both the Tiber and the Arno have historical importance, for on one is Rome and on the other, Florence. Among Italy's other important rivers are the Adige, Volturno, Isonzo and Liris.

Economic Resources. Agriculture is the principal occupation of the Italian people; the chief crops are olives, grapes (for making wine), citrus fruits, figs, wheat, corn, oats, barley, rye, potatoes, sugar beets, rice, cotton, hemp, legumes, tobacco and flax. The dairy industry also is of great importance; cheese and butter are the leading products. In recent years much of Italy's swampy lowland area has been reclaimed, providing additional agricultural land and sites for modern cities, such as Vittorio. An improvement in the health of the people has resulted from the drainage of mosquito-ridden areas, such as the Pontine Marshes near Rome.

Italy has not developed manufacturing on the large scale that has characterized other countries, because coal of a good quality is lacking. Since the World War, however, Italy has availed itself more and more of the potential hydroelectric power of its mountain torrents and now has more power from this source than any other country in Europe. Mineral resources include iron, copper, lead, zinc, bauxite, quicksilver, lignite, sulphur and leucite. The most famous marble quarries are those of Carrara in northern Tuscany, which supply the marble best suited for sculpture. Among other stones are granite, porphyry and pumice. Manufactures include textiles, lace, tooled-leather goods, jewelry, glassware, pottery, chemicals, fertilizers, automobiles and food products, such as spaghetti and macaroni. The sponge, coral, tunny and sardine fisheries are important.

Italy is a constitutional monarchy. The reigning king is Victor Emmanuel III, who succeeded to the throne in 1900 on the death of his father, King Humbert I. Since 1922 the Government has taken on the character of a totalitarian or corporative state, created by the Fascist leader Benito Mussolini. The executive power is still vested in the king but is exercised by Premier Mussolini, who throughout this period has held the majority of the portfolios in his Cabinet. In 1934 the bicameral Parliament was supplanted by a National Council of Corporations, headed by the premier. Each of the 22 component corporations represents a business or professional group that dictates the course of the national life in fields such as industry, education, science, finance, the press and propaganda.

For administrative purposes the country is divided into 94 provinces, grouped into some 18 larger divisions. Each province is governed by a prefect representing the Fascist party. The Minister of the Interior appoints the *podesta* (governing head) of each of the 7,300 communes. In this way the Fascist party watches and guides all the nation's activities, its leader (called *Il Duce*) being referred to as the "father" of the Italian people. Of particular interest are the Fascist youth organizations. Boys from 4 to 6 years of age, for instance, join the Figli della Lupa (Sons of the Wolf); and those from 6 to 14 and from 14 to 18 are enrolled in the more militia-like Balilla and Avanguardisti.

The capital, Rome, and noted cities, such as Florence, Venice, Genoa, Milan and Naples, are treated in separate articles. Turin, center of a great automobile industry and also of Italy's silk manufacture, is located on the Po River in the heart of the Piedmont plateau; its population is about 625,000. The most important building is the 17th-century Royal Palace that was occupied by Victor Emmanuel II when Turin served as the first capital of a united Italy from 1861 to 1865. The Basilica on the Superga Hill contains the tombs of the princes of the House of Savoy, the reigning dynasty. Other interesting features are the Renaissance-styled Cathedral of San Giovanni, the beautiful public gardens, Parco del Valentino, and the University of Turin, which was founded in 1405 by Lodovico di Acaja.

The Amalfi Drive, a 30-mile scenic highway bordering the Tyrrhenian Sea between Sorrento and Salerno, is one of Italy's principal tourist attractions. Assisi's great attraction is the Church of St. Francis, noted for its frescoes by Giotto and Cimabue. Pisa is famous for its cathedral and attendant baptistery and campanile (better known as the Leaning Tower of Pisa, because it deviates 14 feet from the perpendicular). In the 6th-century churches of San Vitale and Sant' Apollinare Ravenna possesses two of the finest examples of early Christian architecture. Buildings of the Gothic period survive in Verona, and those of the Renaissance, in Siena, Padua and Bologna.

In addition to the ports of Naples and Genoa Italy possesses Trieste on the Gulf of Trieste, an arm of the Adriatic Sea, and Brindisi on the Strait of Otranto. The Italian Riviera along the Ligurian Sea, with resorts such as San Remo, Rapallo and Santa Margherita, rivals that in France. Among the notable university centers are Bologna, Rome, Florence, Genoa, Naples, Padua, Perugia, Pisa, Siena and Ferrara.

Jackson Park, a 543-acre recreation area on the south side of Chicago, Ill., which was the site of the World's Columbian Exposition of 1893. The Fine Arts Building of that exposition has been converted into a Museum of Science and Industry through gifts of Julius Rosenwald, a Chicago merchant. On the exposition's Midway Plaisance are now located the Gothic-styled chapel and other buildings of the University of Chicago. There have also survived from the exposition the Japanese buildings on Wooded Island and a lagoon in which is anchored a reproduction of the *Santa Maria,* Columbus's flagship. The park's most distinctive piece of sculpture is Lorado Taft's *Fountain of Time.* It was inspired by Austin Dobson's lines:

> "Time goes, you say. Ah no,
> Alas! Time stays; we go."

Jackson Square, a square in New Orleans, La., that is named for Andrew Jackson, hero of the Battle of New Orleans in the War of 1812. In the center of the square (the old Place d'Armes) is a heroic statue of the general. St. Louis Cathedral and the Presbytery and Cabildo face the south side of the square.

Jamaica, an island of the Greater Antilles, lying 90 miles south of Cuba in the Caribbean Sea. Of the area of 4,450 square miles about two-thirds is occupied by a limestone plateau, composed largely of foraminifera. The highest mountains are the Blue Mountains, which rise in the central part of the island to a height of 7,000 feet. The population is 1,050,667, of whom 77 per cent are Negroes, 18 per cent are of mixed blood and only 2 per cent are white. There is also a large number of Chinese, descendants of the coolies who were imported to work on the great plantations after the abolition of Negro slavery in 1833. The agricultural products include bananas, oranges, grapefruit, pineapples, mangoes, sugar cane, coffee, copra, cacao, spices (including Jamaica ginger and pimento), tobacco and other tropical crops. The forests are rich in valuable timber, such as mahogany, rosewood, yucca and ebony; and from logwood is derived an extract of importance in dyeing. Among the manufactured products are cigars and rum.

Jamaica was discovered by Columbus on his second voyage in 1494 and was colonized by Spain, which held it until 1655. Seized by the British, who were confirmed in its possession by treaty in 1670, it served for almost 150 years as one of the great Negro slave marts of the Royal African Company. One of the early governors, Sir Henry Morgan, before his appointment in 1674 was leader of the buccaneers that ravaged the Spanish main and in 1671 captured Panama. As a British Crown colony since 1866 it is administered by a governor, who uses the old Spanish title of captain general, and privy and legislative councils; also under its administration are the dependencies of the Turks and Caicos islands, whose chief industry is the manufacture of salt, and the Cayman islets. Kingston, the capital, was rebuilt after the earthquake that partially destroyed it in 1907. Its population is about 88,000.

The name *Jamaica,* originally Xaymaco, is an Arawak word signifying the country abounding in springs. Its tropical flowers, such as the orchid, iris and passionflower, its moss-draped trees, brilliant birds and butterflies and surrounding turquoise sea make the island an almost perfect winter resort. It is called *Queen of the Antilles.*

Japan, an island empire in the Pacific Ocean. It extends for 2,900 miles from the Kamchatka Peninsula nearly to the Philippine Islands and is separated from the Asiatic mainland by the Sea of Okhotsk and the Japan and East China seas. It includes five main groups: Kuril Islands, southern part of Sakhalin or Karafuto Island (the northern part belongs to the U.S.S.R.), Japan proper, Ryukyu Islands and Formosa. Of the 4,000 islands and islets that constitute these groups only 500 are inhabited. The largest and most important islands are Hokkaido, Honshu, Shikoku and Kyushu, which belong to Japan proper, and Formosa, which China ceded to Japan after the war of 1894-95.

After acting for several years as

Korea's ostensible guardian in protecting it against Russian encroachment Japan annexed the ancient kingdom in 1910. The puppet state of Manchukuo has been under Japanese control since 1932. Japan also has held since 1905 a 99-year lease of the Liaotung Peninsula (Dairen and Ryojun), formerly Port Arthur. Under mandate from the League of Nations Japan has governed since 1919 the Caroline, Marianas, Marshall and Palau islands, all former German possessions. Japan proper has an area of 147,441 square miles; its population is about 68,866,000. The Japanese Empire has an area of 260,493 square miles and a population of about 93,630,000. The people represent three types—Manchu-Korean, Mongolian and Malayan. On the Kuril Islands dwell some 5,000 Ainus, whose ancestors once occupied Japan proper but were driven northward by the invading Manchu-Koreans.

Japan Proper. Honshu, the largest island of Japan proper, is called *the mainland* and has an area of 87,426 square miles. The other important islands are Hokkaido (30,502 square miles), Kyushu (15,703 square miles) and Shikoku (7,083 square miles). Attached to them are 524 small islands. The Japan Current makes the districts of these islands that border on the Pacific Ocean warmer than those that border on the Japan Sea. Among the islands' south shores are the principal harbors, formed by Tokyo, Osaka, Suruga, Atsuta, Kagoshima and other bays. The Inland Sea, 255 miles long and 56 miles wide, which separates the islands of Shikoku and Kyushu from each other and from the main island of Honshu, is noted for its picturesqueness; with its 950 islets it constitutes one of the most important Japanese national beauty spots.

The mountains of the larger islands of Japan proper are a continuation of the Kwangtung Range of China and culminate in the Japanese Alps. The most noted peak is the dormant volcano Mt. Fuji or Fujiyama (12,395 feet), located in the south central part of Honshu and dominating the city of Tokyo. As the sacred mountain of Japan it is ascended each year by thousands of Pilgrims. At the foot of this mountain are the picturesque Fuji lakes, chief of which is Yamanaka. Other noted peaks include Ontake (10,450 feet), Asamayama (8,184 feet), Nantai-san (8,169 feet) and Nyoho-san (8,100 feet). (*Note.* The ending *-san* or *-yama* in a Japanese name means mountain.)

Japan possesses about 200 volcanic mountains, 50 of which are more or less active. The best-known are Bandai-san, Adzumayama and Sakurajima, whose eruptions in the last 50 years have caused considerable loss of life and property. Since the country lies in the earthquake zone of the Pacific, it undergoes some 1,500 seismic shocks a year. The most disastrous earthquake in recent history was that of September 1, 1923, when parts of Tokyo, Yokohama and their suburbs were destroyed by a tidal wave and fire; in this catastrophe almost 150,000 persons lost their lives. Most of Japan's severe earthquakes have originated in the form of tidal waves in the Tuscarora Basin of the Pacific Ocean.

Courtesy Japan Tourist Bureau

In a Japanese Tea Garden

As tea can be successfully grown anywhere south of 40° N. Lat., its cultivation is extensive in Japan. The area under tea cultivation in Japan proper is roughly 120,000 acres

The plains of Japan are watered by the Ishikari River of Hokkaido, the Shinano, Tone, Kitakami and Kiso rivers of Honshu and the Yoshino River of Shikoku. Many lakes and waterfalls contribute to the beauty of the country. In addition to the Fuji lakes are Biwa, Towada, Suwa and Yumoto. The principal waterfall, Kegon-no-taki or Splendor of the Sun, in Nikko National Park, is 330 feet high. Japan has more than 1,000 mineral springs and hot springs, around many of which spas have been developed. One such hot-spring region on the Unzen Plateau has been set aside as the Unzen National Park.

Formosa. About 100 miles directly east of the city of Canton, China, is the island of Formosa. It is separated from the mainland by Formosa Strait and forms a barrier between the East and South China seas. Japan acquired this island after its successful war with China in 1894–95 and renamed it Taiwan. Including the 12 Pescadore Islands, the area is 13,908 square miles. The population is about 5,061,000. The Tropic of Cancer bisects Formosa, and it is traversed by the Niitaka Range, whose chief peak, Mt. Niitaka (13,075 feet), is the highest mountain of the Japanese Empire. Among the products are rice, tea, sugar cane, bananas, sweet potatoes and opium (a government monopoly). Nearly all the world's supply of natural camphor comes from Formosa. The seat of government is Taihoku. Tainan is the commercial center of the southern part of the island.

Chosen. After an existence of 2,000 years as the kingdom of Korea this country became a Japanese province on its annexation in 1910 and its name was officially changed to Chosen. It is an elongated peninsula separating the Yellow Sea from the Sea of Japan; the Chosen Strait on the south separates it from Japan. The northwestern boundary is formed principally by the Yalu and Tumen rivers, which separate Chosen from Manchukuo. On the northeast the Paik-tu-san (White-head-peak) Range forms a barrier between Chosen and Siberia. The eastern part of the country is traversed by the Kongo-san or Diamond Mountains, which were long regarded as sacred by the Koreans and at one time harbored 180 Buddhist monasteries. The area, including more than 1,000 islets off the southern coast, is 85,206 square miles. The population is 20,600,000. The most important products are rice and ginseng. The capital, Seoul (population, 438,700), the Japanese renamed Keijo. Among its impressive sights are the Chosen Shrine, Keifukukyu Palace and Museum. Other important cities are Kaijo (capital of Korea until the 14th century), Heijo, Shingishu and the port of Fusan.

Economic Resources. Of Japan's total population (almost 100,000,000) about 70 per cent live in Japan proper. Since only 15 per cent of the area of this section is suitable for agriculture, Japan's density of population in relation to arable land is greater than that of any other country. About 30,000,000 persons are engaged in agriculture. The principal crops are rice, wheat, corn, rye, millet, buckwheat, barley, soya beans, tea, tobacco and fruits, such as cherries, peaches, strawberries and melons. Although the rice crop amounts to approximately 319,762,000 bushels annually, it is not sufficient for home consumption. Next in importance to rice cultivation, which occupies every available patch suited to irrigation or more than half the land, is sericulture. Huge mulberry plantations for feeding silkworms are found in the mountainous districts. For many years raw silk has constituted a fifth of Japan's total exports.

Japan leads in the production of textiles (silks, cottons and woolens), and its rayon or artificial silk industry ranks next to that of the United States. Other manufactures include paper (made from fibers of the paper-mulberry tree), rubber, celluloid and leather goods, fertilizers, cigarettes, matches, toys, glassware and art products, such as carvings (jade, ivory, wood), embroideries, embossed paper, Japanese prints, porcelains, cloisonné and lacquer ware. Japan's leadership as an industrial nation may be largely attributed to its hydroelectric development; some 3,105,000 kilowatts are generated annually.

More than 1,500,000 Japanese live by fishing. The principal fish are salmon, sardines, cuttlefish, mackerel, tunny, sole, carp, eels and crab. Whaling is an important industry in the northern waters. Large amounts of salmon, sardines and crabs are canned. Other occupations of Japanese fishermen are diving for pearls and collecting tortoise shell.

Coal, copper, gold, silver, petroleum, sulphur and kaolin constitute Japan's mineral wealth. For its expanding steel industry the country has to import most of its iron ore and seems to covet the iron deposits of central China. Bamboo and the sap of the lacquer tree, a sumac known as *Rhus verniciflua*, are the chief forest products.

Government. Japan has been a constitutional monarchy since 1889, when the Meiji emperor allowed his subjects to share in the administration of the country. It boasts of the oldest reigning dynasty on earth, founded by Jimmu Tenno, who ascended the throne in 660 B.C. The present Emperor Hirohito is the 124th of his line. The person of the emperor or mikado is sacred to every loyal Japanese subject. In the adoration of this august personage there is merged a worship of the state and a pious belief in Japan's manifest destiny.

The emperor exercises the supreme executive power with the advice of the Premier and his Cabinet. The legislative body or Imperial Diet is composed of the House of Peers of 409 members, most of whom sit by virtue of heredity, and the House of Representatives of 466 members, elected by popular vote.

Important Cities. Tokyo, the capital of the Japanese Empire, is described in a separate article. Next in size is Osaka (population, 2,654,000), a great seaport on Osaka Bay in the southern part of Honshu. It is also a leading textile center, with more than 6,000 factories, and is the financial center of Japan, containing the Imperial Mint and the Bank of Japan. Among its notable buildings are the castle built in 1585 by Toyotomi Hideyoshi, the Japanese Napoleon, the Shitennoji (Buddhist) Temple and the Sumiyoshi (Shinto) Shrine.

Kyoto (population, 1,026,000) served as the capital of Japan from its founding in 794 until the removal of the Imperial Court to Tokyo in 1868. In the 14th-century Imperial Palace the coronation of each emperor is held. The most noteworthy of its 1,000 temples are the Kiyomizu and Tofukuji. The Heian Shrine is a replica on a reduced scale of the first Imperial Palace built in 794. The city is the seat of the Kyoto Imperial University (founded in 1897) and is an important silk and lacquer-ware manufacturing center.

Yokohama (population, 682,600) is the chief seaport of Japan; it is located on Tokyo Bay and was the first port opened to foreign trade in 1859 as the result of the treaty negotiated 5 years previously by Commodore Perry between the United States and Japan. The earthquake of 1923 destroyed 80 per cent of the buildings and changed the harbor bed, but the people rebuilt the city on an improved scale. Especially attractive are its numerous parks and gardens. Japan's other important port is Kobe (population, 836,900), located on Osaka Bay. It is also a great shipbuilding center.

Among other important cities are Nara, Kamakura and Nagoya. Nara, the capital of Japan from 710 to 794, is noted for the Kasuga Shrine, the Todaiji Temple containing a 53-foot-high statue of Buddha and the 6th-century Horyuji Temple, which is the oldest existing temple in the country. Kamakura possesses another superb Great Buddha, 42 feet high, and the 11th-century Hachiman Shrine erected to the god of war. Outside Nagoya are located the Great Ise Shrines to the sun goddess (the chief deity of the Shinto religion, from whom it is believed that the Japanese Imperial line is descended) and to the goddesses of agriculture and sericulture. Nikko National Park contains the Sacred Bridge over which only the emperor may cross and the Toshogu Shrine, noted for the wood carving of three monkeys that embody the precept, "See no evil, hear no evil, speak no evil."

The Japanese name for the country is *Nippon*, meaning the land of the rising sun.

Japan or **Kuro Shio Current,** the principal warm current of the Pacific Ocean, though smaller and cooler than the Gulf Stream in the Atlantic Ocean. It originates in the North Equatorial Current. After being deflected by the Philippine Islands, it passes, under the influence of the southwest monsoon, Formosa and the southeastern coast of Japan. At about 40° N. Lat. it mingles with the North Pacific Current, into which there is also merged the drift of cool waters brought along the Siberian coast by the Dya Shio Current. The North Pacific Current then crosses the Pacific and on reaching the western coast of the United States mingles with the Californian Current and the Mexican Monsoon Drift and flows back to the equator. Part of the North Pacific Current, though, flows northward to the southern coast of Alaska, where it so ameliorates the climate that the winter temperature of Sitka compares favorably with that of Philadelphia. The name *Kuro Shio* is Japanese for black tide because the current carries dark sediment of volcanic origin.

Japan Sea, an arm of the Pacific Ocean that lies between the Japanese Islands and Chosen and Manchukuo on the Asiatic mainland. It is connected directly with the Pacific on the southeast by the Inland Sea, through Bungo Strait and Naruto Pass, and on the northeast by the Tsugaru Strait. Chosen Strait connects it with the East China Sea to the southwest, and Soya and Tatar straits connect it with the Sea of Okhotsk to the northeast. Owing to a lack of erosive force of the waves of the Japan Sea the northern shore of Honshu Island does not have the diversity of outline of the southern shore that is lapped by the Pacific. Its monotony, however, is relieved by Wakasa and Miku bays and minor indentations; the only large projection is Noto Peninsula. The Inland Sea, which separates the islands of Shikoku and Kyushu from each other and from the main island of Honshu, is noted for its picturesqueness; it has 950 islets. The area of Japan Sea is 403,040 square miles.

Java, an island of Netherland India in the group of the Malay Archipelago known as the Sunda Islands. On the north is the Java Sea, separating it from Borneo; on the east, Bali Strait; on the south, the Indian Ocean; and on the west, Sunda Strait, separating Java and Sumatra. With Java are included for administrative purposes the small island of Madura and several islets, the total area being 51,480 square miles.

The island is mountainous, the volcanic Tengger and Iyang ranges rising to a height of more than 12,000 feet above sea level; the most famous peak is Mt. Semeru, 12,044 feet high. The eruptions of some 45 active volcanoes have taken a heavy toll in lives in the past. It is also a region of geysers and hot springs. The principal rivers are the Solo and Surabaya. Notable cliffs, such as Java Head, are found along the southern coast. In the northwestern part is a fertile alluvial plain. The heaviest rain is brought in winter by the northwest monsoon, enabling almost 50 per cent of the area of the island to be cultivated. The western part also is in the path of the rain-bringing summer monsoon that originates south of the island as a southeast trade wind.

With a population of 41,719,524, Java is one of the most thickly populated islands in the world—821 persons to each square mile. Javanese of Indian extraction comprise all but about 635,000 of the population, who are of Malayan, Chinese, Arab or other origin. The Malayan element, called the *Sundanese,* dwell in the western part of the island. There are about 192,500 Europeans, mostly Dutch. The Javanese are largely Mohammedans, although their culture shows Hindu influences, especially in such forms as dancing and puppet-shadow plays.

The chief agricultural products are rice, coffee, tea, sugar cane, cotton, copra, spices, cacao, cassava, peanuts, tobacco, bananas, pineapples and indigo. The forests are rich in teakwood and sandalwood, and rubber, cinchona (quinine), rattan, sisal and kapok are gathered. Tin and coal mines and petroleum wells are now being exploited. The Javanese are supposed to have originated the method of fabric decoration called *batik.* They are also noted for metalwork.

Java is the most important island of Netherland India not only commercially but politically. To the governor general, whose seat is at Batavia, the governor of West Java and the commissioners of the province's 17 residencies are responsible. In Batavia there still stand the Amsterdam Gate, erected in 1671; the Old Portuguese Church, dating from 1693; and the Dutch-styled Government Record Office. There is a statue of Jan Pieterszoon Coen, who founded the city in 1619. In the botanical gardens at Buitenzorg is the summer palace of the governor general. Native rule is represented by regents, generally descendants from the ancient princes, who are called upon for political advice, and by a people's council or volksraad. The sultans of Solo and Jokjakarta govern with the advice of the resident commissioners. The population of Batavia is 437,433. Among other important cities are Bandoeng, Soerabaya and Soerakarta.

Java was a dependency of India until the 16th century. As early as the 4th century it had developed a certain degree of civilization and became a stronghold of both Buddhism and Hinduism. One of the finest Buddhist monuments is the 8th-century Borobudur, whose bas-reliefs depict the story of Buddha's previous incarnations. The Government has restored several of the old Hindu temples, such as those at Prambanan, Mendut and Panataran. In the 15th century Buddhism and Hinduism were supplanted by Mohammedanism.

The first Europeans to visit Java were the Portuguese in 1511. When Spain, after conquering Portugal, cut off the spice trade that the Dutch carried on with the Portuguese, the Netherlands, through an expedition led by Cornelis Houtman in 1596, occupied the island. The early trade monopoly was held by the United (Dutch) East India Company. With the exception of a brief British interlude (1811–16) the island has belonged to the Netherlands, its rule being one of the most enlightened of all dependencies. The name *Java* is derived from the Sanskrit *yava,* meaning millet.

Jefferson Highway, a north-south road traversing the central part of the United States. It extends from Winnipeg in Canada to New Orleans.

Jersey, the largest of the Channel Islands in the English Channel; it belongs to Great Britain although situated only 15 miles from the French coast. The area is 45 square miles, and the population numbers 50,455. The island is noted for its breed of cattle. In the loamy soil, potatoes, parsnips, turnips and tomatoes are among other vegetables raised for export. The Jersey fishermen played an important part in the development of deep-sea fishing off the Grand Bank of Newfoundland. The principal city, St. Helier, is the seat of a military lieutenant governor, appointed by the Crown. The name Jersey is derived from the Latin name, Caesarea, in honor of Julius Caesar.

Jerusalem, the capital of Palestine, located in the west central part about 30 miles from its port of Jaffa on the Mediterranean Sea. It is situated on a limestone plateau, 2,500 feet above sea level and is surrounded by the purplish and harshly contoured hills of Moab. Its importance since the early days of its history more than 3,000 years ago has been as an entrepôt, owing principally to its cross-roads location on trade routes to Hebron, Bethel (the modern Beitin) and Jericho. Despite the meaning of its name (foundation of peace), Jerusalem became one of the most important fortified cities of the Near East and served as a military outpost for the Egyptian pharaohs and, after the kingdom of Judaea fell, as a political pawn for the Chaldeans under Nebuchadnezzar, the Greeks under Alexander the Great, the Syrians under Antiochus Epiphanes and the Romans under Pompey. The Crusades were organized to recover Jerusalem from the Moslems, and from 1099 to 1187, when it was recaptured by Saladin, it was the capital of the so-called Latin Kingdom.

After the Turks surrendered Palestine to Lord Allenby in 1917, Jerusalem came under British protection. In 1922 under the mandate granted Great Britain by the League of Nations it became the seat of government of the long-hoped-for national homeland for the Jews. The principal industries are the manufacture of mother-of-pearl and olive-wood articles for sale to tourists. In recent years Jerusalem has became an important salt and potash center. These products are brought from the Dead Sea region 15 miles east of the city. The population is about 90,500; 51,000 are Jews; 20,000, Moslems; and 20,000, Christians.

Down through the ages Jerusalem has been the holy city of the three great monotheistic religions—Jewish,

Courtesy Jewish National Fund

Wailing Wall, Jerusalem

Before this wall hundreds of Jews gather each Friday night and Saturday morning to lament the downfall of the kingdoms of Judah and Israel and to pray for the restoration of Palestine as a national home. The custom originated soon after the destruction of Jerusalem by Titus in 70 A.D. and in the 16th century became especially strong among the Sephardic Jews or descendants of those who were driven from Spain and Portugal. Every orthodox Jew is supposed to make a pilgrimage to the Holy Land at least once during his lifetime to pray at the Wailing Wall. The 59-foot-high wall is located near the Mosque of Omar, supposed to be on the site of Solomon's Temple

Christian and Mohammedan. One of the most sacred spots of the Moslem world is the Mosque of Omar or the Dome of the Rock, erected in the 7th century by the Persian invader, Abdul Malik, on what is supposed to be the site of Solomon's Temple on Mount Moriah. Over Solomon's reputed stables on this same hill Abdul Malik erected the Aqsa Mosque. In addition to the Church of the Holy Sepulcher, originally built by Constantine on the supposed site of Christ's crucifixion and resurrection on Golgotha and guarded by representatives of the principal sects, the Christians possess numerous churches and monasteries. Among Roman Catholic edifices are the Church of Our Lady of France, Church of the Ascension, Church of Pater Noster, a Benedictine convent and a Franciscan monastery in the Garden of Gethsemane at the foot of the Mount of Olives. The Russian church is the dominating element of the Greek Orthodox denomination; also represented are the Armenian, Syrian, Nestorian, Coptic and Abyssinian churches; and the leading Protestant denominations are the Anglican and Lutheran.

In addition to their ancient synagogues and houses of learning where the Torah and other books were studied, the Jews have preserved the famous Wailing Wall on the western side of the Old City. Throughout the period of dispersion or exile (called the *Diaspora,* a Greek word for dispersion) hundreds of Jews gathered here each Friday to lament the downfall of Israel and to pray for its reestablishment. The wall that surrounds the city is pierced by seven gates, the more famous of which are the Damascus and Jaffa gates; an eighth gate, called the *Gate of Mercy,* was left walled up in anticipation of the coming of the Jewish Messiah. One of the most picturesque streets of the Old City is the narrow Via Dolorosa, beneath whose stone archways Christ is believed to have carried His cross on the way to Calvary. Excavations in the southeastern part have unearthed the tombs of the kings of Judaea and also the tomb of Absalom, David's son, Tower of Fazael, Wall of Agrippa, Arch of Hadrian and churches of the Crusaders. In the western part is the restored Fortress of Zion with its famous and fomidable David Tower.

The building of suburbs outside the Old City was begun by the Jews about 1860. The most important of the more than 100 residential quarters are the garden cities, Beth Hakerem, Talpioth and Rehavia. The city is now well drained, and the water problem has been solved by the construction of reservoirs and utilization of old aqueducts. On Mount Scopus the buildings of the Hebrew University have been erected; it opened in 1925 as a world-center for Jewish study. The most noted building of this group is the Jewish National Library. The city is also the seat of the Hebrew Teachers' Training College. Of the Jewish hospitals the more important are the Hadassah and Shaare Zedek; the Straus Health Center was given by the American merchant and philanthropist Nathan Straus.

Among Jerusalem's other modern buildings are the King David Hotel, Y.M.C.A., Rockefeller Museum of Palestinian Antiquities, law courts and central offices of the Zionist institutions. All incorporate features of Semitic architecture. In the Valley of Kidron, which separates the plateau on which the city is built from the Mount of Olives, the old Jewish burial ground, is the ancient reservoir called the *Pool of Siloam.* On the outskirts of Jerusalem are Job's Well, the Apostles' Cave and the tomb of Mary Magdalen.

The name *Jerusalem* (originally Urusalim) is derived from the Hebrew *Yerah,* meaning foundation, and *shalaim,* meaning peace. After its destruction by Titus to put down a Jewish rebellion in 70 A.D. (the Arch of Titus in the Roman Forum commemorates this event), the city was rebuilt 66 years later by the Emperor Hadrian, who called it *Aelia Capitolina,* meaning the capital of Aelius—his name was Publius Aelius Hadrianus. Jews however were excluded by both Romans and Byzantine Christians, and not until Saladin captured the city from the Crusaders in 1187 were they allowed to return. This Moslem tolerance proved a boon during the ostracism of these people in France, England, Spain and other countries during the Middle Ages. The present Jewish community dates from the middle of the 13th century.

Jordan, a river of Palestine that is about 200 miles in length. It rises in mountain springs of the Anti-Lebanon Mountains in the northern part and, after flowing through Lake Huleh, drops sharply in a descent of 689 feet to the Sea of Galilee. Below Galilee it flows below sea level through a small, deep valley called *El Zor* (½ to 2 miles wide), which is within another larger valley called *El Ghor* (1 to 16 miles wide). Tributaries are the Yarmuk and Jabbok rivers from the east and the Jabud and Fara rivers from the west. Salt springs are found in the lower valley. At the point of discharge into the Dead Sea the Jordan is 1,290 feet below the level of the Mediterranean. It is a shallow, meandering stream except during the spring flood period and, on account of its total fall of about 2,300 feet, is not navigable upstream. Its shores are almost deserted except for a scant, migratory population. The construction of a hydroelectric dam not far from the Sea of Galilee has harnessed the Jordan for the good of all Palestine and Trans-Jordan.

The River Jordan is connected with some of the most memorable episodes in early Hebrew history and in the early history of the Christian religion. Joshua led the children of Israel to the Promised Land over it; John the Baptist baptized Christ in its waters. The name *Jordan* comes from the Hebrew *yarden,* meaning the flowing.

jungle, a dense and almost impenetrable area of tropical trees, shrubs and low-growing plants. Jungles are found especially in the low or swampy sections of India, Brazil, Australia, Belgian Congo, French Indo-China and other tropical countries. The term is derived from the Hindustan word for forest.

Noted especially for their animal life, jungles are the abode of apes, monkeys, sloths, elephants, water buffaloes, anteaters, tapirs, hippopotamuses, alligators, crocodiles and innumerable other mammals, birds and reptiles. Among the jungle products are rubber, mahogany, rosewood, cacao, palm nuts and oil and ivory.

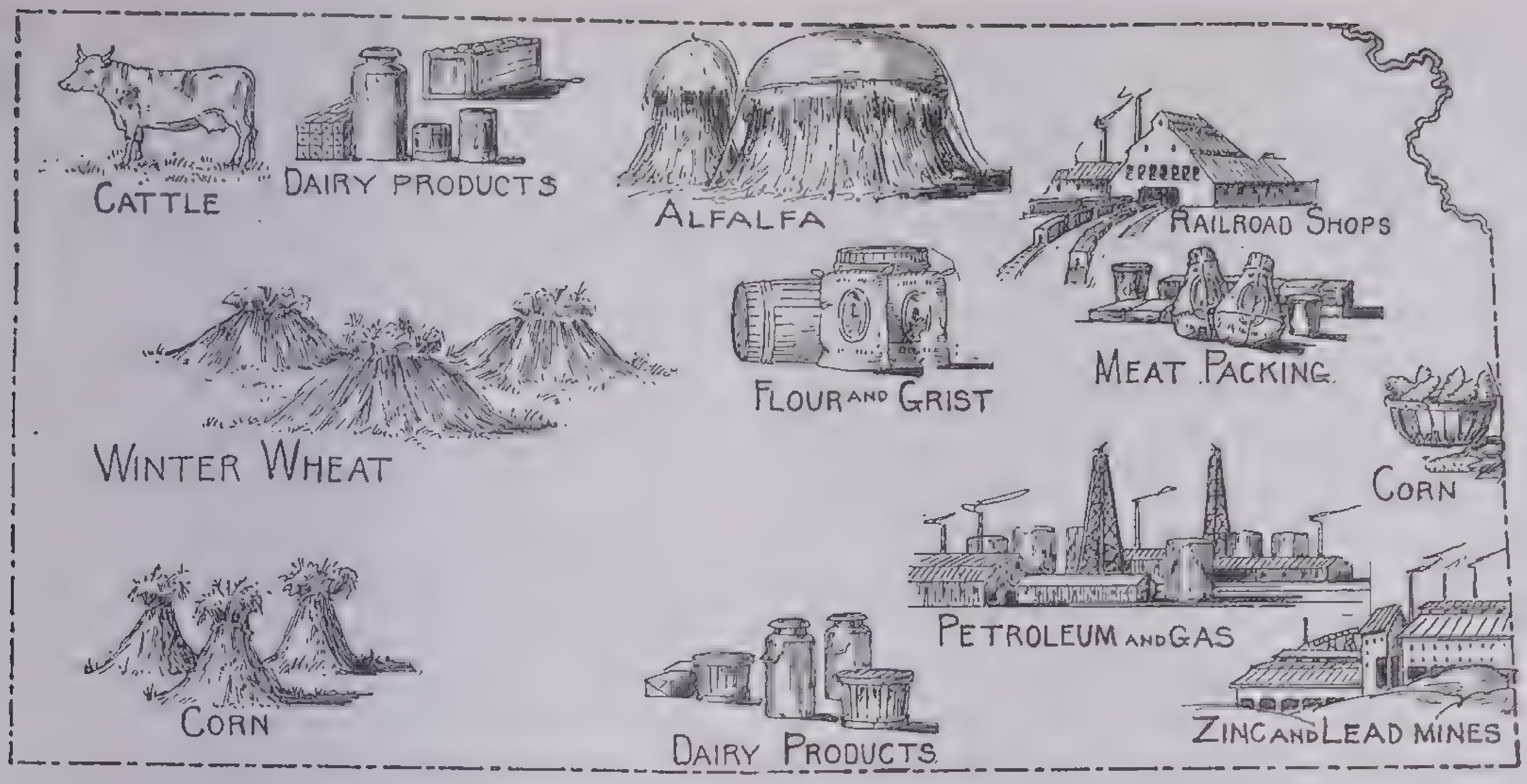
Kalahari Desert, a semiarid tableland region of southern Africa that covers an area of 120,000 square miles in the western part of Bechuanaland and the eastern part of Southwest Africa. It extends to the Molopo River on the south, to the Nama and Damara hills on the west and to the Okavango swamp and bed of Lake Ngami on the north. On its eastern border huge sand dunes, covered with tufts of dry grass, mark the boundary between the desert and the fertile region of Bechuanaland. Its western part is covered with scrubby trees and patches of stunted forest growth. In this desert dwell nomadic tribes of Bushmen and Bakalaharis. Salt is obtained and fossils of prehistoric animals have been found. David Livingstone was the first white explorer to cross the Kalahari in 1849.

Kansas, the thirteenth state in area, occupying the geographical center of the United States. In terrain and development it is typical of the Great Plains. Roughly rectangular in shape, 400 miles long and half as wide, its boundaries are survey lines except where the Missouri River cuts across the northeastern corner. Adjacent states are Nebraska on the north, Missouri on the east, Oklahoma on the south and Colorado on the west. The population, now about 1,801,028, has grown slowly since its phenomenal expansion in the 1870s and 1880s. Of the 82,158 square miles of surface, only 384 are water.

In general Kansas slopes gently toward the east. The surface is level, except for occasional ravines cut by the larger streams. There are no mountains or lakes of any size, and the chief rivers, the Arkansas and the Kansas, flow in small volume except when swollen by sudden floods. The climate is variable, with bitter cold in winter and burning heat in summer, and strong winds, continuing sometimes for days, are characteristic. In the eastern section the rainfall is adequate to support rich crops and a heavy forest growth, but in the west is sparse enough to require extensive irrigation developments.

Agriculture is the leading industry, and almost 90 per cent of the area is in farms. Kansas usually produces more wheat than any other state, and the corn crop is very large. Most of the corn is fed to cattle and hogs, which are shipped to the packing centers in immense numbers. Sugar beets, hay and potatoes are other leading products.

Kansas has large deposits of coal and salt, and its oil fields are among the most productive in the nation. Zinc ores are mined in the southeast-



Principal Products of Kansas

ern corner. Manufactures are generally of local importance, though Wichita is a principal aircraft center and Kansas City has great meatpacking plants grouped about its stockyards, the second in size in the country. These two cities and Topeka, the capital and a busy railroad center, are the only ones of much size.

The University of Kansas at Lawrence and Kansas State College at Manhattan are the ranking educational institutions. Haskell Institute at Lawrence is the principal U. S. Government school for Indians, offering practical training in arts and trades. Kansas has no exceptional scenic attractions, but its miles of rich, level farmlands vividly impress the stranger.

Kattegat and Skagerrak, two straits that lie on either side of the northern part of Denmark and that form, with the Skaw, the Little and Great Belts and the Sound, a chain that links the North and Baltic Seas. The Skagerrak, about 130 miles long and 90 miles wide, lies northwest of the Jutland Peninsula and separates Denmark from Norway. The Kattegat, about 150 miles long and 80 miles wide, separates Denmark from Sweden. Navigation is difficult in both these straits on account of their irregular depths and occasional severe storms. The principal islands are Läsö and Anholt in the Kattegat. The chief port is the Swedish city of Göteborg. The battle of Jutland, the most important engagement between the British and German fleets in the World War, was fought in the Skagerrak Strait, May 31–June 1, 1916.

Kensington Gardens, a series of gardens, covering an area of 275 acres, which were detached from Hyde Park during the reign of George II, largely through the efforts of his consort, Queen Caroline. It contains the statue of Peter Pan by Sir George Frampton; the Round Pond, a favorite resort of juvenile yachtsmen; and a large lake, a continuation of Hyde Park's Serpentine. In Kensington Palace Queen Victoria spent her childhood.

Kentucky, a south central state of the United States shaped roughly like a wedge, extending from the crest of the Cumberland plateau west 350 miles to the Mississippi River, which separates it from Missouri. The Ohio River forms the entire northern border, with Illinois, Indiana and Ohio beyond. West Virginia and Virginia lie on the east and Tennessee on the south. With 40,598 square miles, 417 of which is water surface, it ranks 36th in area. The population, approximately 2,845,627, has shown a slow but steady increase since pioneer days, when Daniel Boone led the first settlers through Cumberland Gap.

The eastern half of the state is rugged, marked by the parallel sharp ridges and narrow valleys of the Cumberland plateau, further broken by the meandering branches of the Kentucky and Cumberland rivers, the chief streams. The central section is a rich, rolling limestone plain, the famous Bluegrass region. The western end slopes gently toward the Mississippi, level except where crossed by stream gorges. There are no conspicuous mountain peaks, but the altitudes vary from over 4,000 feet on the eastern border to 257 feet on the bank of the Mississippi.

Kentucky has a temperate climate, with rare extremes of heat or cold and ample rainfall. Winter temperatures in the higher mountains are occasionally severe, but the western section rarely experiences zero weather.

The highly productive soil of Kentucky supports a thriving agriculture. Tobacco is the best-known crop, but corn outranks it in importance. The other grains and livestock are raised throughout the state, and some cotton is grown in the warmer sections. Hemp is a product of growing value. The breeding and training of fine horses has long been a major interest of Kentuckians. The state was originally heavily forested except in some limestone sections, and though timber cutting has continued for generations, considerable stands of both hard and soft woods still remain.

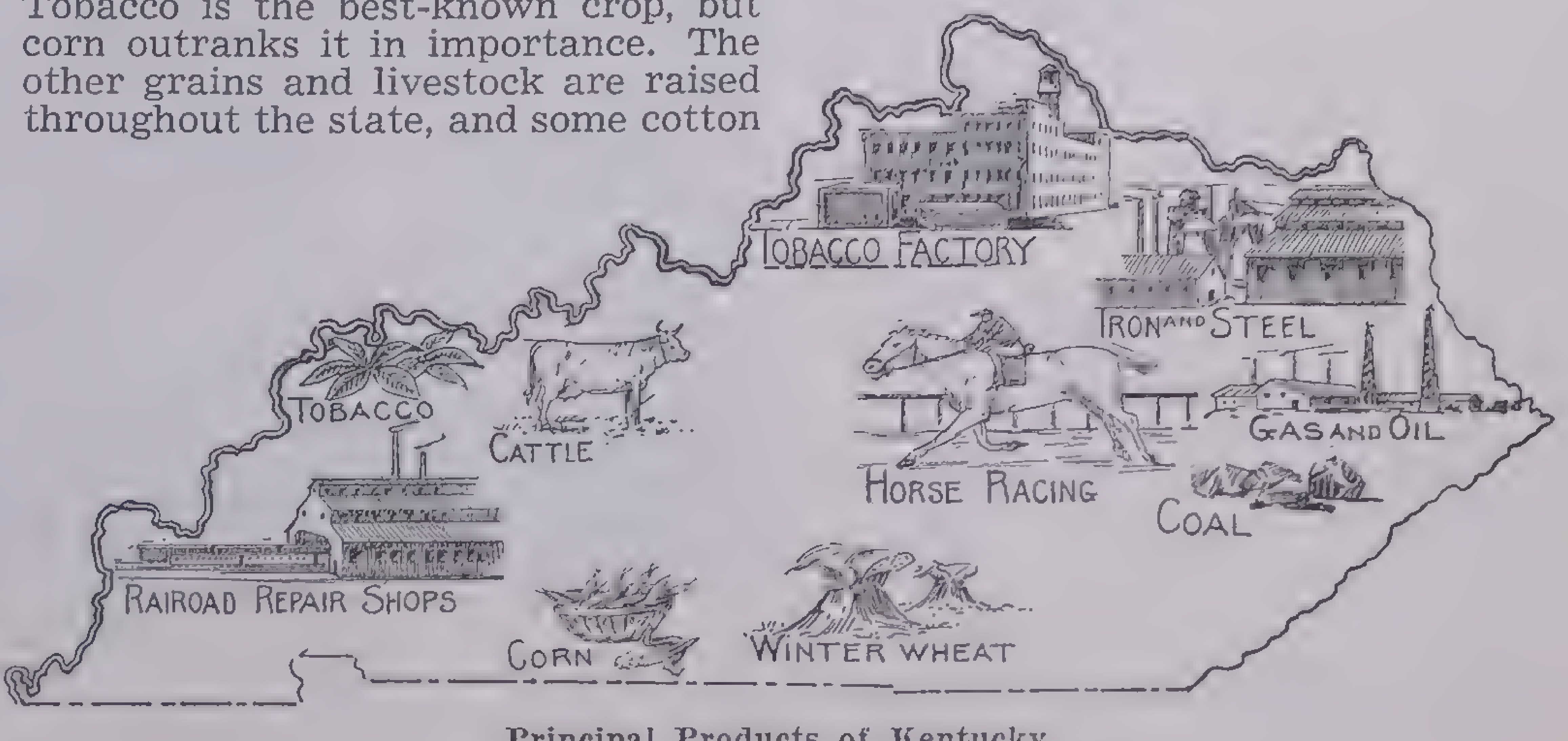
Immense coal fields are the basis of Kentucky's mineral wealth. Oil, building stones and clay also are produced in considerable quantities. Varied manufacturing industries have developed, based especially on the lumber, tobacco and farm crops of the state.

Louisville, the metropolis of Kentucky and its chief trade and industrial center, is one of the 25 largest cities in the country. It has varied manufactures, including large distilleries. Here the annual Kentucky Derby is run, the most noted horse race in America. Lexington is the business center of the Bluegrass region and an important tobacco market; Frankfort is the capital. Covington, second city of the state in population, is a residential and industrial suburb of Cincinnati, Ohio.

The University of Kentucky at Lexington and the University of Louisville at Louisville are the ranking schools. Transylvania College at Lexington is the oldest west of the Alleghenies, and Berea College has won great acclaim for its work with the mountain people.

Mammoth Cave National Park includes the outstanding natural wonder of the state, the most extensive group of limestone caverns east of the Mississippi, visited yearly by thousands. The birthplace of Abraham Lincoln near Hodgenville is preserved by the Federal Government. Other places of interest in Kentucky include the falls of the Cumberland River near Corbin and the principal gold-storage vault of the United States Treasury at Fort Knox.

Kenya, a Crown colony and protectorate of Great Britain, formerly known as the British East Africa Protectorate. Divided almost in half by the equator, it is bounded by Italian East Africa on the north, Uganda on the west, Tanganyika Territory on the south and the Azanian Sea, an arm of



Principal Products of Kentucky

the Indian Ocean, on the east. The southeastern coastal fringe, extending about 10 miles inland between the Tana River and the Tanganyika boundary, and the islands of Mombasa, Lamu, Manda and Patta, leased from the sultan of Zanzibar, constitute the Kenya Protectorate. In 1925 Great Britain transferred most of Jubaland (the northeastern part of Kenya bordered by the Juba River) to Italian Somaliland, now a part of Italian East Africa.

The total area of the colony is about 225,100 square miles. Of the population of about 3,077,000, some 18,000 are Europeans (mostly British) and some 50,000 are Asiatics (mostly Indians and Arabs). The natives are principally of Bantu stock in the south and of Hamitic stock in the north. The chief rivers of Kenya are the Sabaki and Tana that discharge into the Azanian Sea and the Guaso Nyiro that empties into Lake Rudolf on the northwestern boundary. Kenya's other important lake is Lake Victoria (26,000 square miles) on the southwestern boundary. Mt. Kenya (17,040 feet), after which the colony is named, is the tallest peak in the Sattima Mountains in the central part. Other peaks are Mt. Elgon (14,140 feet), Mt. Sattima (13,214 feet) and Mt. Nandarua (12,900 feet).

The coastal zone of Kenya is fertile and more healthful than many tropical regions; cotton, sugar cane, tobacco, rubber, rice, coconuts and other tropical products are raised there. In the highlands coffee, maize, sisal, wheat, barley, potatoes, beans and fruits are cultivated mostly by white planters. Considerable livestock, including cattle, sheep and ostriches, are also raised. Timber resources, covering some 4,500 square miles, include principally sandalwood, teak and camphor. Gold, graphite, iron, carbonate of soda, mica and diatomite are the principal minerals.

The administration of Kenya Colony and Protectorate is entrusted to a governor appointed by the Crown. He is assisted by an executive council. The Legislative Council consists of elected and nominated members, the last-named being in the majority so that the British Colonial Office controls the policy of the colony. Europeans, Indians and Arabs have adult suffrage. In fact the leadership in India of Mohandas K. Gandhi dates from his espousal, about 1922, of the cause of suffrage for his disfranchised countrymen. The Arabs from choice have only male suffrage. Nairobi (population 85,700) is the capital of Kenya. Mombasa (population 57,000) on the eastern coast is the chief port. Kisumu, the third important city, is located on Lake Victoria.

Kenya has been famous as a big-game-hunting area since the expedition of Theodore Roosevelt in 1909. Many of the specimens that he caught are on exhibition in the National Museum, Washington, and in the museum attached to the Roosevelt birthplace in New York.

Khyber Pass, a 33-mile-long pass in the Khyber Mountains that affords one of the oldest trade routes from Kabul, capital of Afghanistan, to Peshawar, capital of the Northwest Frontier Province of British India. The highest point is Lundi Kotal (3,373 feet). This was the pass by which Alexander the Great invaded India in 327 B.C.

kill, a creek or narrow channel. Dutch in origin, the term was applied by the early Dutch settlers to such tributaries of the Hudson River as the Jansen Kill. The Kill van Kull is a narrow channel between Staten Island and Bergen Neck on the New Jersey coast. The names *Catskill* and *Kaaterskill* have a similar derivation.

Kill Devil Hill Monument, Kitty Hawk, N.C. A modern symbolic stone monument crowns the sand dune on the remote North Carolina shore where in 1903 the Wright Brothers accomplished the first successful airplane flight. The surrounding area of 547 acres has been set aside as a national monument.

Kings Highway, a 90-mile road connecting Plymouth and Provincetown, Mass., used by the early inhabitants of Cape Cod. The name was revived in connection with the Pilgrim Tercentenary of 1920.

knoll, a small round hillock.

Kuwait, a sultanate in the northeastern part of the Arabian Peninsula. It is bounded by Iraq on the north and west, the Persian Gulf on the east and Saudi Arabia on the south. The area is 1,950 square miles; the population is estimated at 50,000, half of whom reside in the sultan's capital, Kuwait. This city is also one of the chief seaports of Arabia; the principal exports are dates, horses and wool from the interior and pearls from the Persian Gulf. Before the World War it had been proposed that Kuwait be the terminus of the Berlin-to-Bagdad Railroad. The boundaries of the sultanate were fixed by the Treaty of Mohammerah in 1921, and the country is under British protection to prevent its absorption in the kingdom of Saudi Arabia. The name *Kuwait* is derived from the Arabic *Kut,* meaning fort.

Labrador, a peninsula that forms the most easterly part of the mainland of North America between the Hudson Strait on the north and the Gulf of St. Lawrence on the south. Of its total area of 511,000 square miles, 120,000 square miles constitute an administrative dependency of Newfoundland, which lies to the southeast; the remainder of the peninsula on the south and west belongs to Quebec. This allocation of territory by the British Privy Council in 1927 settled the long-standing boundary dispute between Newfoundland and Quebec; the area of Newfoundland's part was enlarged by 110,000 square miles. The population of all Labrador is about 14,000: Eskimos number about 1,000 and Algonquin Indians about 6,000. In the part belonging to Newfoundland live some 4,500 persons, mostly fishermen of British descent.

The Labrador Current makes the coast extending along the Atlantic Ocean for about 850 miles cold and forbidding. This coast has many bays and inlets, chief of which is Hamilton Inlet into which the river of that name, which is tidal for 135 miles, discharges. On the Hudson Bay shore are a number of posts of the Hudson's Bay Company. The Hamilton River is noted for the marvelous Grand Falls (302 feet high). Among other important rivers are the Koksoak and Leaf that discharge into Ungava Bay and the Great Whale, Fort George,

Courtesy Newfoundland Information Bureau

Aerial View of the Grand Falls, Labrador

In the Grand Falls of the Hamilton River Labrador possesses one of the most noted waterfalls of North America. It is 302 feet high, 135 feet higher than Niagara

Eastmain and Rupert that empty into Hudson Bay or its arm, James Bay. Along the eastern seaboard are several mountain ranges including the Kiglapaits, Tongaks and Kaumajets, that are rich in minerals, such as mica, hornblende, iron and labradorite (a crystalline feldspar formation); the peninsula is believed to possess deposits of gold, silver, nickel, lead, copper, zinc and cobalt. The chief industry of Labrador has long been cod and salmon fishing. The only ways to reach the peninsula are by boat or airplane. The chief ports are Cartwright, Rigolet, Hopedale and Nain on the Atlantic coast.

Labrador is becoming a vacation land for sportsmen to whom fishing and duck and moose hunting appeal. The Norsemen visited Labrador in 986, John Cabot in 1498, Cortereal in 1501 and Jacques Cartier in 1543. All supposed it to be a part of Greenland. It was not until Henry Hudson rounded its coast, through Hudson Strait into Hudson Bay, in 1610 that it was revealed as a peninsula of North America.

The International Grenfell Association, established by Sir Wilfred Grenfell, the British missionary-physician, supports four hospitals, three nursing stations, several co-operative stores, schools and other institutions for the benefit of the Labrador fisherfolk.

In 1501 Cortereal named the country Terra de Lavradores, land of laborers or slaves; and the peninsula still bears a name originally Portuguese.

Labrador Current, a cold current of the North Atlantic Ocean that flows southward from polar waters through Baffin Bay; it passes Labrador and in the region of the Grand Bank meets the warm waters of the Gulf Stream. In reality it is that branch of the Gulf Stream that, after sweeping past Norway, Iceland and Greenland into the Arctic Ocean, becomes a cold, deep-sea current that seeks warmer waters. Off the coast of Newfoundland its cold waters chill the vapor-laden winds from the south, condense the moisture and produce one of the foggiest regions in the world.

Since the Labrador Current is the chief conveyor of icebergs in the North Atlantic, the region off the coast of Newfoundland has been especially dangerous for shipping. This under surface current carries the icebergs because eight-ninths of the floating mass of ice and snow is submerged below sea level. The United States Coast Guard, as part of an international patrol maintained by 14 nations, patrols the region, notifying ships of danger whenever possible.

Ladoga, the largest lake of Europe (7,004 square miles), between southeastern Finland and western U.S.S.R. Once entirely Russian, it has constituted part of the boundary between these countries since the World War, half of it being owned by each. Into this lake flow about 70 streams, many of which originate in the Saima Lake system of Finland; the most important rivers are the Finnish Vuoxen and Taipale and the Russian Volkov and Svir. The lake is drained by the Neva River, which discharges into the Gulf of Finland and hence into the Baltic Sea. On Valamo and Konnevitz, two of the several islands of Lake Ladoga, are medieval Russian monasteries where many monks took refuge after the suppression of religion by the Bolsheviks. The most important Finnish towns on this lake are Kakisalmi and Sortavala; the chief Russian ports are Novaya Ladoga and Schlüsselburg, which is on the Neva.

lagoon, a shallow body of water resembling a lake but ordinarily near and communicating with the sea. Venice, for instance, is built on about 120 islands in the lagoon communicating with the Gulf of Venice. Lagoons are also characteristic of southwestern France; and in the South Seas and other regions where atolls form, the word *lagoon* is applied to the rather deeper water enclosed by coral reefs. The word is derived from the Latin *lacuna,* meaning pool.

lake, an inland standing body of water, larger than a pond. Lakes differ from bays and lagoons in being completely shut off from tidal connection and are situated usually in depressions above sea level. Fresh-water lakes have both feeders and outlets; salt-water lakes, such as the Great Salt Lake in Utah and the Dead Sea in Palestine, may have feeders but no outlet.

The formation of most lakes in northern Europe, the United States and Canada has been by erosion, especially glacial action. Others, such as the Great Lakes, in North America, owe their origin to both glacial action and the warping of the earth's crust when the earth cooled some 2,000,000,000 years ago. Still other lakes have been formed by the barrierlike accumulation in a valley of loose material, deposited by avalanches, glacial moraines or lava flows, as in the case of many of the lakes of Switzerland and northern Italy. Occasionally a lake may be formed in the crater of an extinct volcano, as Crater Lake, Oreg., which has a depth of 2,000 feet. Lakes of accidental origin, are generally formed by alluvial fans or deposits of silt across a river channel.

Since lakes have a beneficial effect on climate, many cities have been located on their shores. Among those that have become important trade centers are Chicago, Cleveland, Buffalo and Toronto. The term *lake* is derived from the Latin *lacus,* meaning pond.

Lancaster Turnpike, the 62-mile road built, 1790–92, to connect Philadelphia and Lancaster, Pa.

latitude, the distance of any point on the earth's surface, north or south of the equator, stated in degrees, minutes and seconds. The distance from the equator to either pole is 90°, so that a point one-third the distance from the equator to the North Pole is at 30° N. Lat. Ideal climatic conditions prevail in the North and South Temperate zones between 25° and 60°. The most important North American cities are found around 40° N. Lat., and the leading European cities are located near 50° N. Lat.

Sometimes political boundary lines are fixed at definite latitudes. The northern boundaries of British Columbia, Alberta, Saskatchewan and Manitoba, for example, are on the line of 60° N. Lat.

At the equator the length of a degree is 68.7 miles; midway to the poles, on account of the earth's being slightly flattened, it is about 69 miles; and at the poles, 69.4 miles. A minute, the equivalent of a geographical mile, is one-sixtieth of a degree at the equator or 6,080.27 feet. A second, in turn, is one-sixtieth of a minute. The term *latitude* is derived from the Latin *latitudo,* meaning breadth.

Latvia or **Letvia,** one of the Baltic States, since 1940 a part of the Russian Soviet. Like its sister republics, Estonia on the north and Lithuania on the south, it was part of the Russian Empire before the Russian Revolution of 1917; the section known as Livonia had fallen to Russia on Sweden's surrender to Peter the Great in 1721 and the Kurland section had been acquired on the partition of Poland in 1795. On November 18, 1918, Latvia was proclaimed a republic. Its boundaries were fixed by the Supreme Council of the Allies on the basis of self-determination of peoples. Of the population of 1,950,000, three-fourths are native Letts; the minority groups are Russian and German. The area is 25,402 square miles.

The country is a low plain covered with many lakes that formed in glacial moraines and that cover a total area of 560 square miles; along the 340-mile Baltic and Gulf of Riga coasts are numerous marshy tracts, peat bogs and sand dunes. Agriculture is the chief occupation. The small landholders specialize in livestock raising, dairy farming and beekeeping. Flax, wheat, barley, oats, rye and potatoes are the principal crops. There are extensive fisheries, and one of the principal exports is lumber from forests of oak, birch and elder trees that cover one-fourth the area. Manufactures include paper, matches, cellulose, textiles (principally woolen goods) and various chemicals.

The Latvian Parliament (called the *Saeima)* was composed of one house of 100 members, elected for 3 years; this body elects the president for the same length of time. The capital was Riga, located on the Daugava (Dvina) River 8 miles from the Gulf of Riga. Its population is about 378,000. The city was founded by Knights of the Teutonic Order in the 13th century; it possesses many relics of the Middle Ages, including the Gothic-styled cathedral, Hall of the Black Heads (once a meeting place of merchant members of the Hanseatic League) and the 16th-century castle, now housing the city's Historical Ethnographical Museum. The Polytechnic Institute of Riga was reorganized as the Latvian University in 1919. Among other important cities are Liepaja (formerly Libau), a busy Baltic seaport, and Jelgava (formerly Mitau), at one time the capital of Kurland.

The Letts represent a branch of the Letto-Lithuanian family of the Baltic region.

lava, the hot, melted rock and dissolved mineral material that issues from the crater or side fissure of an erupting volcano. If it is acid and sticky, it may accumulate in the form of a cone near the vent. If it is basic and fluid, it may cover the surrounding countryside for miles and, as in the case of Pompeii, which was ruined by an eruption of Vesuvius in the year 79, destroy all vegetation and leave lava-encrusted specimens of human beings that later turned to stone. The temperature of a lava flow often rises as high as 1830° F.

In past geological ages a cooling lava surface has often cracked, forming a rugged terrain, as in the case of Lava Divide on the southeastern slope of Mt. Baker, Wash. A rapid process of cooling may produce the volcanic glass known as *obsidian*, used by the Nez Percé and other tribes of North American Indians to make arrow heads. *Pumice* is a volcanic glass whose cellular texture is the result of mephitic vapors and gases in the lava. Among rocks of volcanic origin are basalt, tufa and trachyte.

The lava beds found on Mount Hebron in California have been made a national monument. The Giant's Causeway, a promontory on the northern coast of Northern Ireland, is an unusual basaltic phenomenon. The word *lava* is derived from the Latin *lavare*, meaning to wash.

ledge, a narrow, flat shelf of rock, projecting from or overhanging an upright rock or cliff.

Lee Birthplace Memorial, Stratford, Va. built two centuries ago and carefully restored, this finely situated red-brick mansion of one of the most distinguished American families is now preserved as a shrine to the beloved Confederate General Lee, whose birthplace it was. Mansion, grounds and furnishings show the circumstances of life that were enjoyed on the great plantations of the early colonies.

Leeward Islands, a general name given to the northern half of the fringe of islands known as the Lesser Antilles, which separate the Caribbean Sea from the Atlantic Ocean. The name originated from the fact that they are less exposed to the constant trade winds that blow from northeast to southwest than are the Windward Islands to the south. Guadeloupe and part of St. Martin are French. Of the Virgin Islands, St. Thomas, St. Croix, St. John, Culebra, Culebrita and Vieques belong to the United States, the latter three being grouped with Puerto Rico for administrative purposes. The Netherlands claims Saba, St. Eustatius (or Statia) and part of St. Martin. The other islands of the Leeward group belong to Great Britain and are divided into five presidencies—Antigua with Barbuda and Redonda; Dominica; St. Christopher (or St. Kitts) and Nevis with Anguilla; Montserrat; and the Virgin Islands of Tortola, Gorda and Anegada with 29 islets.

Leningrad, a city of the U.S.S.R. (Union of Soviet Socialist Republics), located on the Gulf of Finland at the mouth of the Neva River in the Leningrad Area of the Russian Socialist Federated Soviet Republic. It was founded in 1703 by Peter the Great as St. Petersburg and retained that name until the outbreak of the World War in 1914, when the German form was changed to Russian—Petrograd (City of Peter). From 1714 until after the success of the revolution of the Bolshevik faction of the Social-Democratic party in 1917 it served as the Russian capital; but, for fear of occupation by the White Army or Allied interventionist armies, the seat of government was removed early in 1918 to Moscow. In 1924 on the death of Lenin, the revolutionary leader, the Congress of Soviets renamed the city Leningrad.

Courtesy Intourist, Inc.

St. Isaac's Cathedral, Leningrad

A majestic classic structure, which until its conversion into an antireligious museum could accommodate 12,000 persons at its services and ranked next in size to St. Peter's in Rome. Opposite it is an equestrian statue of Nicholas I by the Baron Clodt-Jürgensburg

Leningrad is an important seaport (being the Soviet Union's only Baltic port) and railroad terminus. It manufactures 14 per cent of the industrial output of the country; the principal products are textiles, shoes, cigarettes, incandescent lamps, turbines, agricultural implements, tractors, chemicals and paper. Leningrad has also sugar refineries, ironworks and shipbuilding yards and holds a commanding position as the center of Russian book publishing. The population is about 2,840,000.

The most notable building of Leningrad is the baroque-styled Winter Palace (the town house of the czars) built in 1762. With its 1,000 rooms it is one of the largest and most celebrated royal places in the world; a museum of the Revolution is now housed in some of the halls. Adjoining the Winter Palace is The Hermitage, built by Catherine the Great and containing a rich and varied art collection. Surmounting a column in the Uritsky Square in front of the palace is a statue of an angel of peace; the monument commemorates the Russian victory over Napoleon. All the Russian czars after Peter I, except Nicholas II, the last of the Romanovs, are buried in the cathedral of the fortress of Sts. Peter and Paul (Petropavlovsky), located on an island in the Neva River opposite the Winter Palace.

Other magnificent buildings of Leningrad are St. Isaac's Cathedral and the Kazan Cathedral (now antireligious museums); the classic edifices in which the General Staff of the Russian Army and the Admiralty were formerly housed; the Stock Exchange (now occupied by a power museum), built in the style of an old Greek temple and flanked by two huge rostral columns; and the Smolny, formerly a monastery and then a girls' finishing school, which served as the headquarters of the military revolutionary committee during the "ten days which shook the world" in October, 1917, and which is now occupied by the Leningrad Soviet of Workers and Red Army Deputies. Reminders of the old regime are the buildings housing the Senate or supreme administrative court, whose members were appointed by the czar, and the Synod, which was charged with the supervision of affairs of the Russian Orthodox Church; these adjoining buildings are typical of the old union of Church and State. A favorite meeting place for conventions is the Uritsky Palace, formerly occupied by the elected Duma that came into existence in 1905. Leningrad's chief thoroughfare is the October 25th Avenue (formerly the Nevsky Prospect), which extends from the Admiralty to Insurrection Square, facing the Moscow Railroad Station.

As a cultural center Leningrad is the headquarters of some 75 scientific societies, headed by the Academy of

Sciences (established in 1726), and more than 200 scientific research institutes. The State Dramatic Theatre continues its reputation for the quality of its histrionic art; the Lunacharsky State Grand Opera and Ballet Theatre (named for the Soviet Commissar of education) brings opera and the dance to the workers; and the Theatre of Young Spectators presents plays that are of educational as well as entertainment value for school children.

In the Russian Museum are housed the best works of the greatest Russian painters. The ethnographic department of this institution gives an excellent idea of the mode of life, both past and present, of the 189 nationalities that compose the Soviet Union. Among other educational institutions are the Leningrad State University, Communist University, Conservatoire of Music, Academy of Fine Arts, Polytechnic Institute and Academy of the History of Material Culture. The Soviet Government has let stand the statues of those rulers to whom Russia owed her past strength, such as Peter I and Catherine II, and those that the suppressed proletariat especially hated, such as Nicholas I and Alexander III.

More than 600 bridges, some of them beautiful in design, span the Neva River and the numerous canals that were built to increase transportation facilities in the early days. Located on an island in the Gulf of Finland is the fortress of Kronstadt, the old naval base of the Russian Empire.

levee, an artificial embankment constructed near the banks of a river to prevent the water during flood periods from overflowing the adjoining land. It has a narrow top (about 8 feet wide), a broad bottom (more than 150 feet wide) and sloping sides (15 to 30 feet high).

The levees of the Mississippi River, extending from Cairo, Ill., to the Gulf of Mexico below New Orleans, La., aggregate more than 1,500 miles in length. Their maintenance is the work of commissions of the seven states whose boundaries the lower river forms and of the U. S. Mississippi River Commission. Levees are found along such European rivers as the Danube, Po and Vistula.

A natural levee is a low ridge of coarse sediment that is sometimes built up by streams at the edge of their banks. The word *levee* is French for raising or lifting.

Liberia, a republic of West Africa that is bounded on the northwest by Sierra Leone, on the northeast and east by French West Africa (Ivory Coast), on the south by the Gulf of Guinea and on the southwest by the Atlantic Ocean. The 350-mile coast line that extends from the Mano River on the north to the Cavally River and Cape Palmas on the southeast is known as the Grain Coast. The country reaches inland as much as 170 miles, but only the coast strip is developed. The area of Liberia is about 43,000 square miles. The population, almost entirely Negro (except a few whites in charge of foreign rubber concessions), is estimated at 1,570,000; about 25,000 are descendants of American freed slaves and as the more intelligent group constitute the governing class. To them some 55,000 coast natives submit and are gradually becoming civilized. The natives of the interior, however, govern themselves after tribal forms.

Liberia has more than 30 rivers, chief of which are the Mano, Cavally, St. Paul's, St. John's and Castos. None is suitable for navigation for any great distance. In fact, the country has no harbors, surf boats being used to load and unload passengers and cargoes. The coast strip is low, fertile and very hot; the interior plateau is covered with forests that yield rubber, gums and piassava fiber. Agricultural products include coffee, oil nuts, ivory, cotton, cacao and ginger. Among concessionaires that are developing the rubber industry is the Firestone Rubber Company of the United States, which has leased 1,000,000 acres. Ivory is one of the chief exports.

Monrovia (population 10,000), located at the mouth of the St. Paul's River, is the capital. It was named in honor of James Monroe, President of the United States in 1822 when the republic was founded. Liberia's early settlers were ex-slaves who were assisted in returning to Africa by the American Colonization Society for the Repatriation of Freed Slaves. The Constitution, adopted in 1847, is modeled after that of the United States. The chief executive is a president, elected for 8 years. The legislative body consists of a Senate of 8 members, elected for 6 years, and a House of Representatives of 15 members, elected for 4 years. Only the descendants of the repatriated freedmen can vote. The republic has always been under the unofficial protection of the United States; since 1912, for instance, the general receiver and financial adviser in charge of customs has been designated by the United States. Supervision by the League of Nations is now being considered so as to abolish forced labor, practiced by many foreign concessionaires.

The name *Liberia* is coined from the Latin and means the country of the free or freedmen. Liberia and Haiti are the only two Negro republics in the world.

Liberty Island, a small island in New York Bay, 1½ miles southwest of the Battery at the tip of Manhattan Island and covering an area of 13½ acres. It is famous for the statue by Frédéric Bartholdi called *Liberty Enlightening the World,* which was presented to the United States by the people of France in 1886. During the World War the name of the island was changed from Bedloe's to Liberty.

Liberty Memorial, Kansas City, Mo. The tall central shaft of this imposing stone monument to the World War service men rises 280 feet. Its height is emphasized by low, broad, supporting wings. It is capped by a column of fire at night and of cloud (or smoke) by day.

Libya, an Italian dependency of northern Africa (formerly known as Tripoli). Extending along the Mediterranean Sea, it is bounded on the east by Egypt, on the west by Algeria and Tunisia and on the south by the Anglo-Egyptian Sudan, French Equatorial Africa and French West Africa. In the northern part are the provinces of Tripolitania (area, 347,500 square miles; population, about 553,000) and Cyrenaica (area, 73,000 square miles; population, about 165,000). Much of the southern part is occupied by the Sahara and the Libyan deserts, and this desert area of Libya was increased in 1935 by France's cession of 44,500 square miles that previously belonged to French West Africa. The previous year Great Britain and Egypt ceded to Italy the Tibesti District of the Anglo-Egyptian Sudan, which added 34,740 square miles to Libyan territory. Fezzan, a dry plateau surrounded by hills and spotted with oases, occupies the central part. The total area is about 715,000 square miles; the population, about 717,000.

The Tropic of Cancer crosses Libya near its southern boundary, thereby placing most of it in the North Temperate Zone; the sirocco and other winds from the desert, however, increase the temperature. Sponge fishing is the chief industry along the coast. Agriculture and stock raising are carried on in the fertile parts of the interior, the chief products being wheat, barley, olives, grapes, lemons, dates, figs and almonds. Among the exports are ivory and ostrich feathers.

The chief cities of Libya are Tripoli on the northwestern coast, capital of Tripolitania, and Bengasi on the Gulf of Sidra in the northeastern part, the capital of Cyrenaica. Tripoli (population 71,700) is an ancient, walled city whose picturesqueness is enhanced by numerous mosques and minarets. As the terminus of several caravan routes since ancient times it is the commercial center of the country. A luxurious palace has been erected as the residence of the governor general of the colony. Under the Fascist regime sanitary conditions in the bazaars and other parts of the native quarters have been vastly improved. Good motor roads now connect Tripoli with interesting spots in the interior, such as Gadames in the country of the mysterious veiled Tuareg tribes and Sabratha and Leptis Magna, noted for their Roman ruins. The city is also a favorite stop for Mediterranean cruisers. A 6-hour service affords airplane connection with Rome.

Libya is the ancient Greek name for Africa. Italy gained control of the region after the defeat of the Turkish army in the Turko-Italian War of 1911. To the governor general are responsible the commissioners of the four administrative provinces into which the country was divided in 1934—Tripoli, Bengasi, Mesurata and Berna. Since the suspension of local autonomy in 1927 all legislative matters have been decided by the Fascist officials in Rome.

Liechtenstein, a principality whose area of 65 square miles makes it one of the smallest independent, sovereign states in Europe. It is located on the upper

Rhine between the Swiss canton of St. Gallen and the Austrian province of Vorarlberg. As is typical of such mountainous country, the principal industry is stock raising. The chief crops are corn, grapes and orchard fruits. The home industries of the peasants include weaving, wood carving, embroidering and pottery making. The marble quarries of the Rhaetian Alps yield a good quality of limestone. The population numbers 10,213.

The succession to the throne of Liechtenstein is hereditary in the male line. The principality has been ruled by the same family since its foundation from the lordships of Vaduz and Schellenburg in 1719. At the capital, Vaduz (population, about 1,700), sits the Diet of 15 members, elected by universal suffrage for a 4-year term. Switzerland represents the principality's foreign interests and administers its postal service and telegraph communications, and Liechtenstein is a member of the Swiss customs union.

Lincoln Birthplace National Park, Hodgenville, Ky. The Federal Government has rebuilt near here from the original timbers the log-cabin birthplace of Abraham Lincoln and sheltered it in a handsome granite memorial building on a terraced hillside.

Lincoln Highway, a national American highway, begun in 1913 as a memorial to Abraham Lincoln. It extends for 3,384 miles across the United States, connecting New York and San Francisco and traversing 13 states.

Lincoln Memorial, Washington. This stately rectangular temple in severely classic style, built of pure-white marble, rises on grassy terraces at the head of a long reflecting pool. Within is a gigantic statue of Lincoln, seated facing the National Capitol. The statue was executed by Daniel Chester French, and the building by Henry Bacon. The memorial was completed in 1922.

lithosphere, the solid part or land surface of the earth, the continents and the continental and oceanic islands that have a total area of 57,510,000 square miles. The term is derived from the Greek and means stone sphere. It came into use after geologists had discarded the idea that the earth was a liquid sphere enclosed in a crust and had accepted the inference that, as the earth was a huge magnet, it had a metallic core of iron to which they gave the name *centrosphere.* This core contains small amounts of nickel, gold, platinum and other metals. Its diameter is believed to be about one-half that of the earth.

The earth's outer crust, which is from 40 to 60 miles thick, consists chiefly of such sedimentary rocks as sandstone and limestone, over which soil is spread a few hundred feet deep. Beneath this outer crust to a depth of about 1,000 miles are: first a layer of plutonic rock, such as granite; and then a layer of basaltic rock, both obsidian and crystalline in formation. Surrounding the centrosphere there is probably a transitional layer of rocks of silica compounds, with iron interspersed and increasing in quantity until the iron core is reached.

The molten composition of the earth's interior is attested by the eruption of such material from volcanoes and the occurrence of earthquakes caused by volcanic explosions when molten lava and various mephitic vapors seek a vent. The interior of the earth is very hot, the temperature from a depth of 50 feet increasing at a mean rate of 1° F. for every 57 feet of descent. In the parts where rock is melted it is conjectured to be about 2000° F.

Lithuania or **Lietuva,** a Baltic State, since 1940 a member of the Russian Soviet. Like its sister republics, Estonia and Latvia, previous to the Russian Revolution of 1917 Lithuania was part of the Russian Empire, having fallen to that country on the partition of Poland in 1795. It proclaimed its independence February 16, 1918. Lithuania is bounded by Latvia on the north; Poland on the east and south; and Germany (East Prussia) and the Baltic Sea on the west. The area claimed by the Lithuanian Government is 21,489 square miles; the population is almost 2,400,000. Boundary disputes between Lithuania and Poland have been bitter, for Lithuania has keenly resented the occupation of its historic capital, Vilna, and surrounding territory by Poland in 1920 and the subsequent confirmation of this occupation by the League of Nations. Early in 1939 several Nazi demonstrations brought about the return to Germany of the free port of Memel (called by the Lithuanians *Klaipeda*) and its surrounding territory of 943 square miles, awarded to Lithuania by the Conference of Ambassadors in 1923, but only nominally Lithuanian territory.

Lithuania is a flat, low-lying country with numerous marshy tracts and moraine-formed lakes, the most beautiful of which are Dusetai and Zarasai. The principal river is the Nemunas (or Niemen). The soil is fertile, enabling almost 50 per cent of the area to be cultivated. The principal crops are wheat, rye, barley, flax, linseed and potatoes. Livestock and poultry raising are gaining in importance. As 16 per cent of the area is forested, lumbering is a leading industry. Manufactures include wood pulp, furniture, railway sleepers, chemicals, pottery and linen goods. The leading mineral product of the Baltic region since the days of the Romans has been amber.

The Lithuanian Parliament was a unicameral body, called the *Seimas,* whose 112 members were elected by universal suffrage every 5 years. The president was elected by an electoral college for a term of 7 years; he was assisted by a ministry responsible to the Diet. The capital was Kaunas (Kovno) with a population of 101,000. Its most important buildings are the Vytautas Castle and the Miesto Museum, noted for its archaeological collection. It is also the seat of the state university.

Liverpool, a city of England, located in the southwestern part of Lancashire on the estuary of the Mersey River, which empties into the Irish Sea. The banks of the Mersey are lined with wharfs and docks for a distance of 7 miles from the sea. The bores sometimes attain a height of 30 feet, and vessels enter the harbor at high tide and are locked to their wharfs in enclosures called *wet docks* where the water level does not change. Shipping is principally with the Atlantic ports of North America and the West Indies and with western Africa and Australia. Liverpool is the world's greatest cotton-distributing center and one of the most important European wheat centers and distributors of dressed meats. It handles more than a third of English-made commodities for export. Liverpool's own manufactures include sugar, flour, dyes, chemicals, glass, matches, rope, cable and telephone equipment and beer. The population is about 855,000.

Liverpool's most distinctive buildings are the Corinthian-styled Town Hall and St. George's Hall, one of the finest examples of Greco-Roman adaptation, housing the assize courts and various municipal bureaus. The Anglican Cathedral, a great modern Gothic structure, has been under construction since 1904; in the completed part is the Lady Chapel, commemorating noble women of history. St. Peter's Church serves as procathedral of the Liverpool diocese. The city is the seat of the University of Liverpool, founded in 1881 and famed for its school of tropical medicine. The Walker Art Gallery is probably the most important English museum outside of London.

llano, an extensive plain that may or may not have trees, grass and other vegetation. In its plural form, *llanos,* the term is applied specifically to a sandy area of about 300,000 square miles in Venezuela and Colombia, stretching between the Orinoco River on the east and the Eastern Cordillera on the west. During the southwest monsoon or rainy months from June to October this area is covered with grass and provides excellent pasturage. At other times the hot winds from the Caribbean Sea make it a partially barren wasteland.

In the United States there has survived from Spanish days the name *Llano Estacado* (Staked Plain) of a plateau extending from northwestern Texas to southwestern New Mexico, distinguished by the stakelike boles of the yuccas that grow there. The word *llano* is Spanish for level.

loess, a loam formation resulting in part from deposits of wind-borne desert sand and in part from the fine sediment left at the close of the last ice age about 10,000 years ago. Intermediate in texture between silt and clay, it assumes blocklike shapes when cut that permit building terraces on hillsides for intensive agriculture; it is also erosion resistant.

Most of the world's finest agricultural lands, such as those along the Rhine, Danube, Dnieper and Mississippi rivers are mainly loess. This formation was largely responsible for leveling the prairie region of the United States during the Pleistocene period, and it cut off the Gulf of California from Salton Sea and formed the Imperial Valley.

Loess formations in the river valleys of China have caused the frequent overflow of the Hwang Ho and other rivers; from their yellowish-brown color the name of Yellow for the Hwang Ho is derived. Moreover the discharge of this sediment into an arm of the China Sea has so discolored it that it is called the *Yellow Sea.* In loess are found such minerals as quartz, mica, feldspar and calcite. The word is of German origin from a word that means to pour.

Lofoten and **Vesteraalen Islands,** an archipelago extending about 150 miles in the Atlantic Ocean off the northwestern coast of Norway. The islands have precipitous coasts, indented with fiords, and mountainous interiors. The principal islands are Andö, Langö, Hindö, Öst-Vaagö, Röst, Moskenaesö and Vaerö. Between the last two is the celebrated whirlpool called the *Maelstrom.* The total area is 1,565 square miles, and the population numbers about 47,000. The principal industry is fishing, the region being noted for the immense shoals of cod and herring. The chief ports are Skolvaer on Öst-Vaagö and Lödingen on Hindö.

Lombard Street, a street in the heart of London, which is a continuation of Cheapside and extends as far as Gracechurch Street. Lined with banking houses, it takes its name from the city's early bankers, some Lombardy merchants who settled in England in the 12th century but were expelled during Queen Elizabeth's reign.

London, the capital and chief seaport of England, located in the southeastern part on the River Thames. With a population of 8,200,000 in the Greater London area of 693 square miles, covering the counties of London and Middlesex and parts of the counties of Kent, Surrey, Essex and Herts, it is the largest city in the world. Its magnitude is largely the outgrowth of its position as center of a vast world-encircling empire, but ever since Alfred the Great made it the capital of his kingdom of Wessex in the 9th century its pre-eminent influence has been acknowledged.

The city is located about 40 miles from the North Sea on the estuary of the Thames River, which at London Bridge is about 900 feet wide. Tides reach inland to this historic bridge, and docks line both sides of the stream for 20 miles eastward along the busy pool. Here centers the vast commerce of the British Empire; the cargo handled in foreign and coastwise shipping is about 25,000,000 tons annually. Much of it represents cargoes that come from distant parts of the empire and are transshipped from here to other parts of the world. London itself is the largest manufacturing city of Great Britain, ranking high in the value of output of men's and women's clothing, furniture, leather goods, silk and beer.

The London Underground Railway, consisting of the District and Metropolitan systems that run only a short distance below ground and the five tubes that run at considerably greater depths, is the most celebrated and extensive subway in the world. Traffic crosses the Thames by such famous bridges as the London, Tower, Westminster, Lambeth, Waterloo and Blackfriars bridges. Under the river are five vehicular tunnels, the most important of which is the Rotherhithe Tunnel. London is the terminus of the five great English railway lines and has 16 stations to accommodate their various sections. The airdrome at Croydon is the commercial flying headquarters of Great Britain.

Historic Buildings.—London possesses more buildings of great historic interest than any other city. The largest of these is popularly known as the Houses of Parliament (officially, Westminster Palace). It is a Gothic structure, covering 8 acres on the north bank of the Thames and containing magnificent chambers for the sessions of the House of Lords and House of Commons as well as 1,000 smaller rooms. In one of its imposing towers is the famous clock, "Big Ben," named in compliment to Sir Benjamin Hall, commissioner of works when the bell was cast. Adjoining the palace is Westminster Hall, dating from 1097, which has been the scene of stirring events in English history, among them the trials of William Wallace, Sir Thomas More, Guy Fawkes and Charles I.

Harris & Ewing

The Clock Tower, a London Landmark

The hours are struck on the famous *Big Ben* in the Parliament clock tower in Westminster; through radio broadcasting its resonant notes are known throughout the world and in good weather can be heard throughout the greater part of London. The clock has four dials, each 22½ feet in diameter; the minute hands are 14 feet long, the hour hands 9 feet

Probably the city's most famous edifice is the Tower of London. Part of it, called the great central keep or *White Tower,* was erected by William the Conqueror, and in his day it was a feudal fortress. Later it became a royal palace and then a prison. Among the famous prisoners executed here were Anne Boleyn and Catharine Howard (wives of Henry VIII), Lady Jane Grey, Sir Thomas More and the earl of Essex. In the Bell Tower, Queen Elizabeth was imprisoned when she was a girl by her sister Mary, and in the Bloody Tower (scene of the murder of the boy-king Edward V and his brother Richard by their uncle, the duke of Gloucester, who thereby became Richard III) Sir Walter Raleigh spent a 12-year imprisonment, during which time he wrote his monumental *History of the World.* The White Tower, where Richard II signed away his throne to Henry IV in 1399, is now an armory, and in the Wakefield Tower the crown jewels are kept. The Wardens of the Tower are called *Beefeaters;* the style of their picturesque uniforms has remained unchanged since the days of the Tudors.

Westminster Abbey, the great national Church of England, stands opposite the Houses of Parliament. It is indeed a British sanctuary. From the coronation of William the Conqueror in 1066 to that of George VI in 1937 every English sovereign except Edward V (who was murdered) and Edward VIII (who abdicated) has been crowned in Westminster. Beneath the coronation chair is the Stone of Scone, brought from Scotland by Edward I in 1296. The accession of James I in 1603 fulfilled the ancient prophecy:

If fates go right, where'er this stone is
found
The Scots shall monarchs of that realm be
crowned.

Great men and women of England are buried here: of royalty, Queen Elizabeth and her sister, "Bloody" Mary; Mary, Queen of Scots; Edward I and his Queen Eleanor; Henry III; Edward III; Henry V; Henry VII and his Queen Elizabeth; James I; Charles II; William and Mary; and Queen Anne. Among illustrious commoners, William Pitt the Younger, Charles Darwin, Ben Jonson, David Livingstone, Robert Browning, Alfred Lord Tennyson and Sir Henry Irving are likewise interred in the Abbey. Scores of memorial tablets have been inserted in the walls and floor, and many statues of notable persons adorn open spaces. Among those thus commemorated are William Pitt the Elder, John Milton, Edmund Spenser, William Shakespeare, Robert Burns, William Makepeace Thackeray, Charles Dickens and the American poet Henry Wadsworth Longfellow. The British Unknown Soldier is buried in the nave.

Westminster Abbey is on the site of the abbey church erected about 610 by Sebert, king of the East Saxons. The ground plan of what is the present building was determined by Edward the Confessor, who reigned from 1042 to 1066. In the main the building is the work of Henry III and Edward III; its crowning feature is the Chapel of Henry VII, now used for the installation ceremonies of the Knights of the Bath. The Abbey was named Westminster because it was built on the west side of what was then the City of London. The adjoining St. Margaret's Church is called the Abbey's lady-in-waiting. Across the Thames is Lambeth Palace, for nearly 700 years the London residence of the archbishop of Canterbury, primate of All England.

Harris & Ewing

The Tower of London from the Thames

The great fortress, palace and prison is shown floodlighted for the coronation of George VI. To the right center are the four towers of the central keep, or White Tower, built in 1078 by William the Conqueror to protect and overawe the city. Here were imprisoned Lady Jane Grey, Sir Walter Raleigh and Guy Fawkes, and here Queen Mary—Bloody Mary—was married to Philip II of Spain. In 1483 the young King Edward V and his brother the duke of York, were murdered in the Tower at the instigation of Gloucester, afterwards Richard III. In the lower left is the Traitors' Gate, through which Sir Thomas More and Anne Boleyn were led to captivity and death. The massive Lanthorn Tower is in the right center

St. Paul's Cathedral stands on Ludgate Hill, the site of the first Roman settlement in London in 41 B.C. A Renaissance structure, it was designed by Sir Christopher Wren and erected between 1675 and 1710 after the Great Fire of London had destroyed the previous structure in 1666. The dome, noted for its whispering gallery, is 215 feet high. The length of the structure is about 510 feet. In the crypt are buried Lord Nelson, the hero of Trafalgar, and the duke of Wellington, the victor at Waterloo. Florence Nightingale, the founder of scientific nursing, is honored with a memorial tablet. Over the tomb of Sir Christopher Wren is the Latin epitaph, *Si monumentum requiris circumspice* (If you seek his monument, look about you).

Well-known Streets, Parks and Squares.—Near the center of London is Trafalgar Square, with the Nelson Monument, a Corinthian column surmounted by a statue of the hero of Trafalgar and at its base the four colossal lions sculptured by Sir Edwin Landseer. On the north side of the square are the National Gallery, National Portrait Gallery and Church of St. Martin's-in-the-Fields. There is a fine vista down Whitehall, lined with the more important government buildings and in whose center stands the cenotaph to the World War dead. In front of the only remaining part of Whitehall Palace, the banqueting hall where Charles I met his death on the scaffold, the Horse Guards maintain their statuesque watch.

From the Admiralty Arch on the south side of Trafalgar Square a fine avenue, called *the Mall,* extends through St. James's Park to the Victoria Monument and Buckingham Palace, the London residence of the king. In St. James's Park stands St. James's Palace, to whose use as a royal residence from the reign of Henry VIII to that of Queen Victoria we owe the expression that a foreign ambassador or minister is "accredited to the Court of St. James." Just east of Trafalgar Square is Charing Cross, the last of the nine Gothic crosses erected by Edward I to mark the places where the coffin of Queen Eleanor was set down on its way to Westminster.

Among London's notable thoroughfares are: Fleet Street, the publishing center; the Strand, lined with hotels and office buildings and famous for the churches, St. Clement Danes and St. Mary-le-Strand; Piccadilly, whose start at Piccadilly Circus, as London's circular street intersection areas are called, is distinguished by Sir Alfred Gilbert's fountain piece, *Eros.* Regent, Oxford and Bond streets are the most distinctive shopping streets; and Pall Mall is the heart of club land. The Haymarket and Leicester Square constitute the theatrical center, and in Bow Street is the Royal Opera House, popularly known as *Covent Garden* from its location near that market. In Downing Street is the London house of the prime minister.

Along the north side of the Thames from Westminster to Blackfriars Bridge is the Victoria Embankment, distinguished by the Egyptian obelisk (called *Cleopatra's Needle*), Scotland Yard and the Royal Courts of Justice. Above Westminster Bridge on the south side of the river extends the Albert Embankment. Modern architecture in this section of London is represented by the Australia, India, South Africa, Bush and Grosvenor houses; Lloyds Bank, which has developed from the marine-insurance undertaking of an 18th-century coffee house; and the buildings of the British Broadcasting Corporation, London County Council and London Passenger Transport Board, with ultramodern sculptures by Jacob Epstein that have provoked considerable comment.

In the mile-square area properly known as the City of London is Threadneedle Street, the home of the Bank of England; skirting its north and south sides are the Royal Exchange and Mansion House, residence of the lord mayor of London. The city's administrative center is the 15th-century Guildhall, where the election of the lord mayor is held and on Lord Mayor's Day (November 9) he gives a great banquet.

On Great Russell Street in Bloomsbury is the British Museum, noted as the repository of the Elgin marbles brought from the Parthenon in Athens, and the Rosetta Stone, the key to the translation of Egyptian hieroglyphics; its reading room is one of the foremost libraries in the world. The Tate Gallery, in which are housed the finest examples of British art, is located along the Millbank. The superb Wallace Collection of art works is in Hertford House on Manchester Square. The annual exhibition of the Royal Academy of Arts is one of the most important events of the art world.

London's most famous park is Hyde Park (361 acres), at whose entrance near the Marble Arch Englishmen exercise their prerogative of free speech. In the adjoining Kensington Gardens (275 acres) are Kensington Palace and that delight of childhood, the statue, *Peter Pan,* by Sir George Frampton. In South Kensington are the Albert Memorial, the nation's tribute to Queen Victoria's consort, and the Royal Albert Hall, a concert hall named for him. Among museums in this section are the Victoria and Albert (formerly, the South Kensington), Science, Geological, Imperial War and Natural History museums, as well as the Imperial Institute, whose object is to promote utilization of the British Empire's industrial resources. The largest of all London parks is Regent's Park (473 acres), noted for its open-air theater and zoological gardens.

The city's most important educational institutions are the University of London, Imperial College of Science and Technology, Royal College of Music, Royal Colleges of Physicians and Surgeons and the Inns of Court (Middle Temple, Inner Temple, Lincoln's Inn and Gray's Inn). Associated with English literary figures are the former residences of Thomas Carlyle, Charles Dickens, Samuel Johnson and John Keats; also the Old Curiosity Shop, which Dickens immortalized, and the inn called

The Cheshire Cheese, where the pompous Dr. Johnson held forth to his admirers.

Near the village of Windsor on the outskirts of London is Windsor Castle, famous the world over since the days of William the Conqueror as the residence of the British sovereigns. Hampton Court is another palace of storied interest; it was built by Cardinal Wolsey and "presented" to his master, Henry VIII, but it has not been occupied as a royal residence since the reign of George II. The Royal Botanic Gardens, probably the most famous in the world, are located in the grounds of Kew Palace (a favorite residence of George III), hence the more popular name, Kew Gardens. At Greenwich is the equally world-famous Royal Observatory. London's most important sports centers are Lord's Cricket Ground, Wembley Stadium and Wimbledon, scene of many an international tennis match.

The name *London* is probably derived from the Celtic *lyn* (pronounced *lun* and meaning pool, in reference to the lakelike widening of the Thames) and *dun* (meaning hill, in reference to Ludgate Hill).

Lone Star Route, a 1,190-mile-long highway that runs from Chicago, Ill., through St. Louis, Mo., down the western side of the Mississippi River to the Gulf of Mexico at Lake Charles, La.

Long Island, a continental island, the southeastern part of New York state, extending northeastward from the tip of Manhattan Island, from which it is separated by the East River. Long Island Sound separates it from Connecticut on the north, and the Atlantic Ocean laps its southern and eastern shores. It is 118 miles long and from 12 to 23 miles wide. With a population of more than 4,100,000 for its area of 1,682 square miles, it is one of the world's most populous small islands. Long Island comprises four counties of New York State—Kings, Queens, Nassau and Suffolk; the first two form boroughs of the City of New York. Brooklyn occupies all Kings County. The numerous beaches, such as Coney Island, Jacob Riis Park and Rockaway, Jones and Southampton, afford playgrounds for both rich and poor. Fishing, truck gardening and duck farming are the most important of Long Island's industries.

Discovered by Henry Hudson in 1609, Long Island was first settled by the Dutch. The early name of Brooklyn was Breuckelen, from a village in the province of Utrecht, the Netherlands. The earliest English settlement was in 1640 at Hempstead. By the Treaty of Westminster in 1674 when Great Britain acquired New Netherland, Long Island was annexed to the new British colony of New York. During the American Revolution it played an important strategic part. The battle of Long Island took place in the area now known as Prospect Park, Brooklyn, August 27, 1776. That the island was once part of the mainland is indicated by evidences of glacial action in the soil and topography.

longitude, the distance of any point on the earth's surface, indicated in degrees, minutes and seconds east or west of a given meridian.

In determining latitude the equator is the fixed parallel from which measurement is made. Since there is no such starting point from which to measure longitude, the scientific world decided in 1884 to adopt for all land maps and sea charts the meridian that passes through Greenwich, England, as the zero or given meridian. Longitude, therefore, is reckoned by a series of 360 meridians that pass through both the poles and are numbered to 180° (international date line) as east or west of the meridian of Greenwich. Thus, Paris is 2° 20′ 14″ E. Long.; New York is 73° 57′ 30″ W. Long.

The distance between any two meridians for longitude in arc varies in width. Widest at the equator (69.17 miles), it narrows as the poles are approached, until all meridional lines pass through the poles. At New Orleans, for instance, the distance between 89° and 90° W. Long. is about 60 miles; at Peoria, Ill., this distance has narrowed to 52 miles; and at Port Arthur, Ont., it is only 45 miles. The 60th part of a degree is a minute, and the 60th part of a minute is a second.

The earth makes one complete rotation on its axis every 24 hours, and in that time the 360° of longitude pass under the sun at the speed of 15° for 1 hour of time. Therefore when the sun is directly over any point on the earth's surface, it is noon at that point; 1 hour before noon the sun would be 15° east and 1 hour after noon, 15° west. From this relationship to the sun longitude in time is determined. The 24 zones so established are called *standard time belts;* each possesses a different standard time. Canada and the United States have five such time belts, called *Provincial* (60° to 75° W. Long.), *Eastern* (75° to 90°), *Central* (90° to 105°), *Mountain* (105° to 120°) and *Pacific* (120° to 135°).

Greenwich mean solar time determines standard time for Great Britain. Throughout the half of the globe west of the meridian of Greenwich standard time is slower than Greenwich time, but in the half of the globe east of the meridian of Greenwich standard time is faster than Greenwich time. For this reason American travelers set their watches ahead an hour each day when they are crossing the Atlantic to Europe and set them back a like hour each day on the return voyage.

The choice of Greenwich, a London suburb, as zero point for the meridians was largely because the Greenwich Observatory (established by Charles II in 1675) was for centuries the best-equipped observatory in the world. Until the middle of the 19th century Ptolemy's selection of the line passing through the Canary Islands (Fortunate Isles) as the given meridian in measuring longitude had persisted. Even after the Washington Conference of 1884, which decided on the Greenwich meridian, Austria retained the Ptolemaic meridian on many maps, and France continued to use Paris as the point of departure. The word *longitude* is from the Latin word for length, *longitudo.*

loop, a bend in the course of a river that constitutes a nearly complete circle. An excellent example is the loop in the Yellowstone River in Yellowstone National Park, from which the Northern Pacific Railroad derived its symbol.

Los Angeles, a city of the United States, located in the southwestern part of California on the San Pedro and Santa Monica bays; it is the largest city in the state and ranks fifth in size among cities of the United States. In 1850 it was a village of 1,610 persons; in 1920 its population was 576,673; and two decades later it had almost tripled its size with 1,504,277 permanent residents. The growth of the city dates from about 1900, when various outlying villages began to be annexed to its original 28 square miles. In 1915 so as to facilitate the distribution of water brought by the Los Angeles Aqueduct from the Owens River about 170 square miles of the San Fernando Valley were added.

Realizing also the need of an ocean port, the city by annexation of territory southward to San Pedro and Santa Monica bays increased its total area to about 450 square miles. At San Pedro the Federal Government constructed about 1910 at a cost of $41,000,000 a harbor covering 10 square miles and a breakwater about 2 miles long. In this harbor Los Angeles handles a large coastwise and foreign shipping trade; 188 steamship companies serve the port. Not only does the Panama Canal give its shipping easy access to the Atlantic Ocean but its location favors its selection as an entrepôt for shipments to the Orient. More than 19,000,000 tons of shipping are handled annually.

Foremost among the causes of the phenomenal growth of Los Angeles since its expansion began is the mild and equable climate that makes it one of the most important winter resorts in the United States; more than 1,000,000 tourists visit it annually. It is the marketing center of a fertile agricultural section, noted especially for citrus fruits, vegetables, olives and walnuts, and the refining center for the petroleum fields of southern California. The motion-picture industry, centered in Hollywood, is the most important industry in Los Angeles. Among other products are canned fish, fruits and vegetables, dressed meats, rubber tires, women's clothing, furniture, chemicals, electrical machinery, soap, paints, varnishes and confectionery. Since Los Angeles is one of the country's leading aviation centers (with more than 25 airdromes and public landing fields in the vicinity), there are several companies engaged in the manufacture of airplanes and airplane accessories.

The most conspicuous structure in Los Angeles is the City Hall, with its commanding tower rising to a height of 438 feet. Other imposing structures are the Public Library, Hall of

Courtesy Los Angeles Chamber of Commerce

Los Angeles City Hall

The City Hall is built of white California granite. It was completed in 1928; 32 stories high, it covers 20 acres. Architects were Albert Martin, John C. Austin and John Parkinson

Records, Century Hospital, Ambassador Hotel, Grauman's Chinese Theater, Southern California Edison Company Building and the buildings of the Title Guaranty Company and several other banks. The stadium in which the 1932 Olympic games were held seats 150,000 persons; after the spectacle it was renamed the Los Angeles Memorial Colosseum in honor of the World War dead.

The Museum of History, Science and Art is located in Exposition Park, adjoining the colosseum; it is noted for the Rancho la Brea exhibit of more than 100 fossilized animals that inhabited this region during the Pleistocene period. Among other Los Angeles museums are the Southwest Museum and the Otis Art Institute. The San Gabriel Mission, founded in 1771, is one of the best-preserved of the 21 Spanish Franciscan missions established by Father Junípero Serra along the Californian coastal highway, El Camino Real (King's Highway). Concerts of the Los Angeles Symphony Orchestra are held during the summer in the famous Hollywood Bowl, an outdoor natural amphitheater whose stage is set in the hillside. The city is the seat of the University of Southern California, a Methodist Episcopal institution, Occidental College (Presbyterian), Los Angeles State Normal School and a branch of the University of California.

Many towns near Los Angeles have grown to prosperous proportions partly through its fame. Along the coast are Santa Monica, Venice, Hermosa Beach, Redondo Beach, Long Beach and Laguna Beach. Twenty-five miles out to sea is the small, picturesque Santa Catalina Island, famed for its aviary and submarine gardens in Avalon Bay. Inland are such beautiful residential cities as Pasadena (the seat of the California Institute of Technology and noted also for the Busch fairy-tale gardens and the Huntington Library and Art Gallery), Beverly Hills, Glendale, Riverside and Pomona. San Pedro at the southern end of the city's extension to the sea is a part of Los Angeles through annexation, as is also Hollywood, home of the majority of the motion-picture producing companies. The Universal Pictures Corp. maintains its studios at Universal City, and the Metro-Goldwyn-Mayer Co. is located at Culver City.

Los Angeles was settled in 1781 by 44 Spaniards from Mexico who gave it the name of Puebla de Nuestra Senora la Reina de los Angeles (City of Our Lady, the Queen of the Angels). In time the name was shortened to its present form. As long as it remained Spanish (until 1847), Los Angeles alternated with Monterey as the capital of the Mexican province of California.

Louisiana, originally the entire Mississippi Valley region, now a state of the United States. The Gulf of Mexico forms the southern border of 280 miles, deeply indented by bays and bayous. On the west is Texas, on the north Arkansas, and on the east Mississippi. The area is 48,506 square miles, of which 3,097 are water surface. Large sections are swampy and subject to irregular floods, as most of the state lies in the low delta of the Mississippi River. The population, about 2,363,880, doubled between 1880 and 1940.

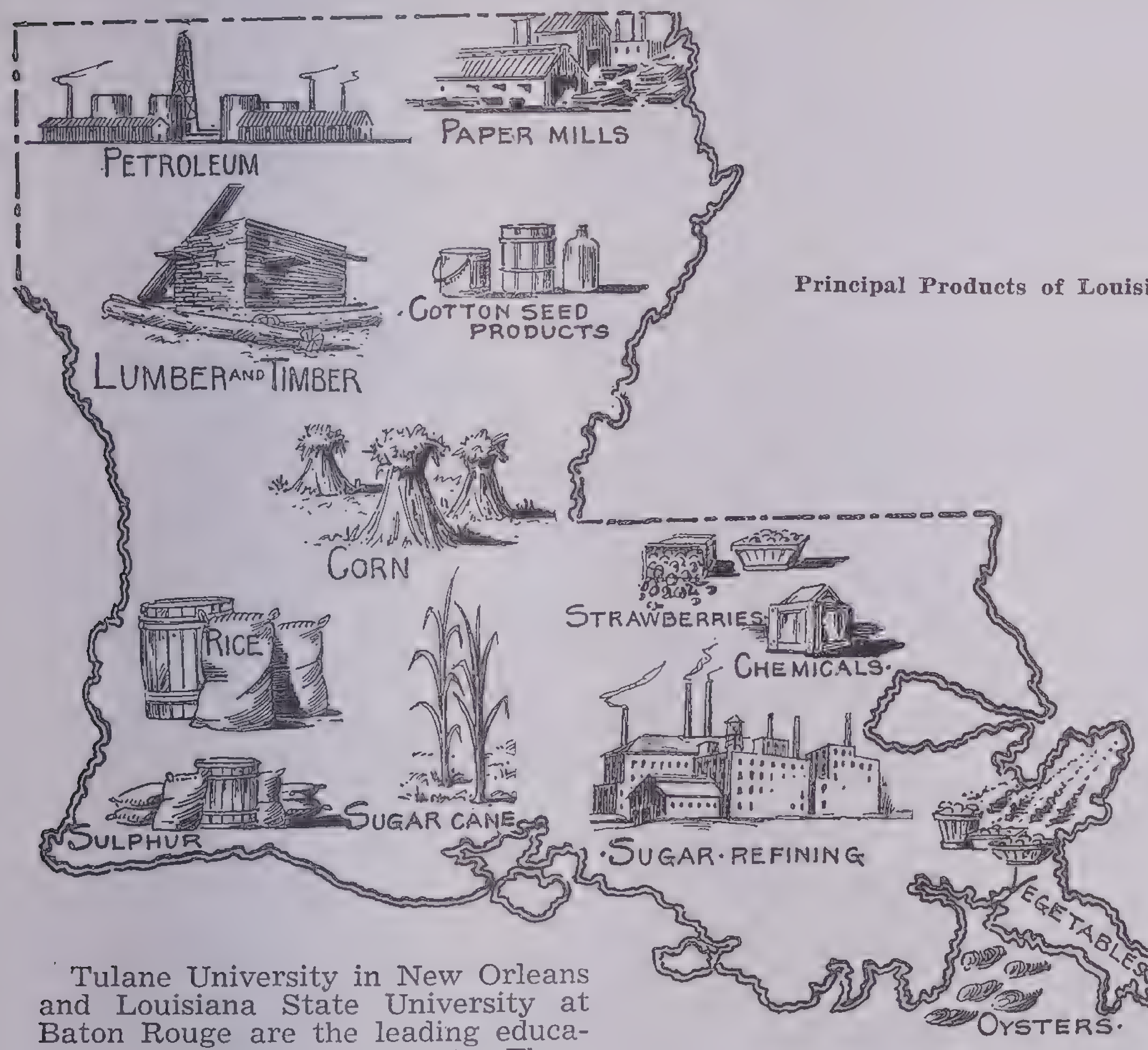
The Mississippi River forms two-thirds of the eastern boundary, then enters the state to wind sluggishly to the Gulf. On the southeast is marsh-bordered Lake Pontchartrain, an arm of the Gulf almost cut off by the spreading delta. The Red River traverses the state diagonally from northwest to southeast, entering the Mississippi where that river passes within Louisiana. Many smaller rivers and bayous are navigable, but only the Mississippi is of major importance in commerce.

Louisiana has no mountains. Only along the western and northern borders do elevations rise high enough to vary the monotonous dampness of the moisture-burdened lowlands. The climate approaches the subtropical, with brief cold spells in the winter and long, hot, humid summers. Rainfall is abundant and the soil is generally fertile, much of it enriched in the past by periodic Mississippi floods. Forests still cover considerable areas, and lumbering is an important industry. Live oaks, draped with Spanish moss, border many of the streams, but pines and varied hardwoods are more abundant.

The state ranks first in the country in the production of rice and sugar cane. Cotton is the chief farm crop. Corn is largely grown, but the climate is unsuited to wheat and other Temperate Zone cereals. The oil fields in the northwestern section are of great importance, while salt and sulphur are produced in abundance along the Gulf coast. Fisheries are an important revenue source, and the trapping of muskrats and other fur-bearing animals is profitable.

Manufacturing industries are developing rapidly in Louisiana to take advantage of favorable transportation facilities and abundant fuel oil. The refining of sugar and oil lead in importance, and the output of lumber and related wood products continues large.

New Orleans, the principal city, is separately described. Shreveport, next in size, is a trade center for the oil fields and has grown rapidly with them. Baton Rouge, the capital, is a developing industrial center on the Mississippi, and Lake Charles is a Gulf port of growing importance.



Principal Products of Louisiana

Tulane University in New Orleans and Louisiana State University at Baton Rouge are the leading educational institutions in the state. There are no outstanding natural wonders, but the romantic atmosphere of New Orleans and other centers of Creole culture entice many visitors, as do the distinctive white-columned mansions of the old cotton plantations. The dark bayous where Lafitte's pirates found shelter are yet inaccessible except by small boats, but most of the state is crisscrossed by fine highways.

The navigable Bayou Teche winds through what is called *the Evangeline country,* where the Acadian French settled after their long journey from Nova Scotia in 1755, the basis of Longfellow's poem *Evangeline.* This region is visited by many tourists.

Louisiana was originally named in honor of Louis XIV, King of France, by La Salle, who made the first descent of the Mississippi River by a white man in 1681–82.

Lundy's Lane, a Canadian road, in the vicinity of Niagara Falls, where the Americans were defeated by the British in the battle of Niagara, July 25, 1814.

Luxemburg, a European grand duchy, surrounded by France, Belgium and Germany; it has an area of 999 square miles and a population of 297,000, and is situated on the outskirts of the Forest of Ardennes. Its principal river is the Sauer. More than one-third the Luxemburgers are farmers; wheat, oats, rye, potatoes and grapes lead in production. Dairying is gaining in importance. The country derives most of its wealth from the large deposits of iron ore in the southern part; and the production of steel has long been the principal industry, centered in Esch. Other manufactures are textiles (principally woolens), cigarettes, beer and leather goods (especially shoes and gloves).

The throne of Luxemburg is hereditary in the House of Nassau; and the present ruler is the Grand Duchess Charlotte. The executive authority, however, is entrusted to the minister of state and president of government; assisting him are the director-generals of finance, justice and the interior. The legislative power is held by the unicameral Parliament, called the Chamber of Deputies, of 48 members elected by universal suffrage for 6 years. The capital is Luxemburg (population, about 54,000). The upper city is built on top of a 200-foot-high crag, like an inland Gibraltar, and during the Middle Ages was one of the really impregnable fortresses of the Holy Roman Empire. The most noted buildings are the 16th-century royal palace and the 17th-century Gothic cathedral. With the 11th-century Abbey of St. Willibrod at Echternach there is associated the famous Dancing Procession on Whitsuntide Tuesdays.

Luxemburg, which was made a duchy of the Holy Roman Empire in 1354, was raised to the rank of a grand duchy by the Congress of Vienna in 1815. After demolition of its fortifications the European nations guaranteed its independence and neutrality through the Treaty of London of 1867, but this treaty proved to be only another "scrap of paper" when Germany decided to invade France by way of the Lorraine plateau and occupied it on the outbreak of the World War. In 1921 Luxemburg entered into a customs union with Belgium, which has been beneficial to both countries. Luxemburg also uses the Belgian franc as its currency unit.

Luxemburg is also the name of a province in Belgium bordering the grand duchy. Its population is about 220,000.

Madagascar, an island dependency of France in the Indian Ocean. Located 250 miles off the coast of southeastern Africa, from which it is separated by the Mozambique Channel, it is fourth in size among the islands of the world, excluding Australia as a continent. The total area is 241,094 square miles, including the Comoro and Mayotte islands that are attached for administrative purposes. The population is about 3,700,000, of whom only 25,000 are Europeans, mostly French officials and traders. The natives belong to 18 tribes, which represent both the Malayo-Polynesian and Melanesian stocks, with a mixture of Negroid blood.

In the eastern part of Madagascar are the Amber Mountains and the extinct volcanic chain of the Ankaratra Mountains that attains an elevation of 7,000 to 9,000 feet. The central part consists of the great Antankara Plateau, 5,000 feet above sea level, from which the land, although broken by hills, gradually slopes toward the Mozambique Channel. Among the rivers are the Mangoro, Mananara and Betsiboka. The largest lake is the Alaotra.

With its 3,000 plant species Madagascar is a botanist's paradise. The forests yield valuable woods from different varieties of the palm, bamboo, fir and pine trees. There are also flowering trees, such as the *Poinciana regia* and *Cryptostegia.* From the Tangèna tree was obtained the sap used in poison ordeals (corresponding to the medieval ordeals by fire and water to determine a person's innocence) that prevailed until 1865, when English missionaries secured their prohibition through an article in the Anglo-Malagasy Treaty of that year.

Iron and gold are the principal metals, and graphite, radium, mica and phosphates, found in small quantities, are among the chief exports. Agricultural products are of the tropical variety; rice, cotton, spices, tobacco, cacao, coffee, manioc (tapioca) and sugar cane predominate. The rainy season, dependent on trade winds and the northwest monsoon, is from November to April.

Madagascar was made a protectorate of France in 1885. When it became a colony 11 years later, royalty was abolished. The French governor general is assisted by a council of administration, and each of the 18 districts has its native governor and other local officials. The capital is Antananarivo. Tamatave is the principal port.

In prehistoric times the island is believed to have been part of a continent that extended as far east as India. Geologists call this continent *Lemuria,* from the large number of lemurs that inhabited it and that are still represented in Madagascar by some 39 species. The first European to sight the island was Diogo Diaz, a Portuguese navigator, who called it the *Isle of St. Lawrence,* since he discovered it on the saint's day, August 10, 1500. The native name was *Malagasy,* of which Madagascar is a corruption, because most of the natives belong to the Malay race.

Madeira Islands, a group of islands of volcanic origin in the Atlantic Ocean off Africa's northwest coast and named for the largest island. The area is 314 square miles, and the population is 210,000. The islands of Madeira and Porto Santo are inhabited; there are also the rocky islets of Dezerta Grande, Ilheo Chão and Bugio. Madeira is mountainous, and the highest peak is Pico Ruivo, which reaches an elevation of 6,056 feet. The islands are in the path of the leste, a hot, dry wind that sweeps from the Sahara. The principal products are sugar, wine (named for the islands), sweet potatoes, citrus fruits, figs, pineapples and bananas. Portugal owns the islands, which were first sighted by João Goncalvez Zarco in 1418 and were first colonized in 1431. Politically and administratively they are a part of the mother country and are termed the District of Funchal. The people are of Portuguese and Moorish descent with some intermixture of Negro blood. The capital is Funchal on the island of Madeira. The name is Portuguese for timber and refers to the great variety of trees, many of indigenous growth.

Maelstrom, a swift current of the Arctic Ocean that passes between the islands of Moskenaesö and Vaerö of the Lofoten group off the northwestern coast of Norway. Renowned in fable, it is even today a whirlpool that destroys small vessels that venture to pass through the channel when strong winds lash the waters. The word is Danish and means grind stream or whirlpool.

Magellan, Strait of, the winding, almost semicircular passage between the Atlantic and the Pacific oceans near the southern end of Chile. It is about 350 miles long and from 2½ to 15 miles wide and separates the mainland of South America from the archipelago of Tierra del Fuego, controlled by both Chile and Argentina. The city of Magallanes (the old Punta Arenas) with a population of 24,000 is located midway on the strait. The shores of the Strait of Magellan are low and barren on the eastern end, but in the central and western parts they become high and forested, resembling the fiords of Norway. In fact this western end is often called *Renihue Fiord.* Thundering waterfalls and gigantic glaciers on the slopes of the South Chilean Andes add to the beauty of the region. At the eastern end of the strait is Cape Virgins and at the western end Cape Pillar on Desolation Island.

The strait was named after Ferdinand Magellan, the Portuguese navigator who discovered it in 1520 on the first voyage around the world. It opened up a shorter and on the whole safer route for sailing vessels, for Cape Horn at the tip of Horn Island was especially dangerous to round. The Chilean Government provides navigation aids. Since the opening of the Panama Canal in 1914 the use of the Strait of Magellan has lessened.

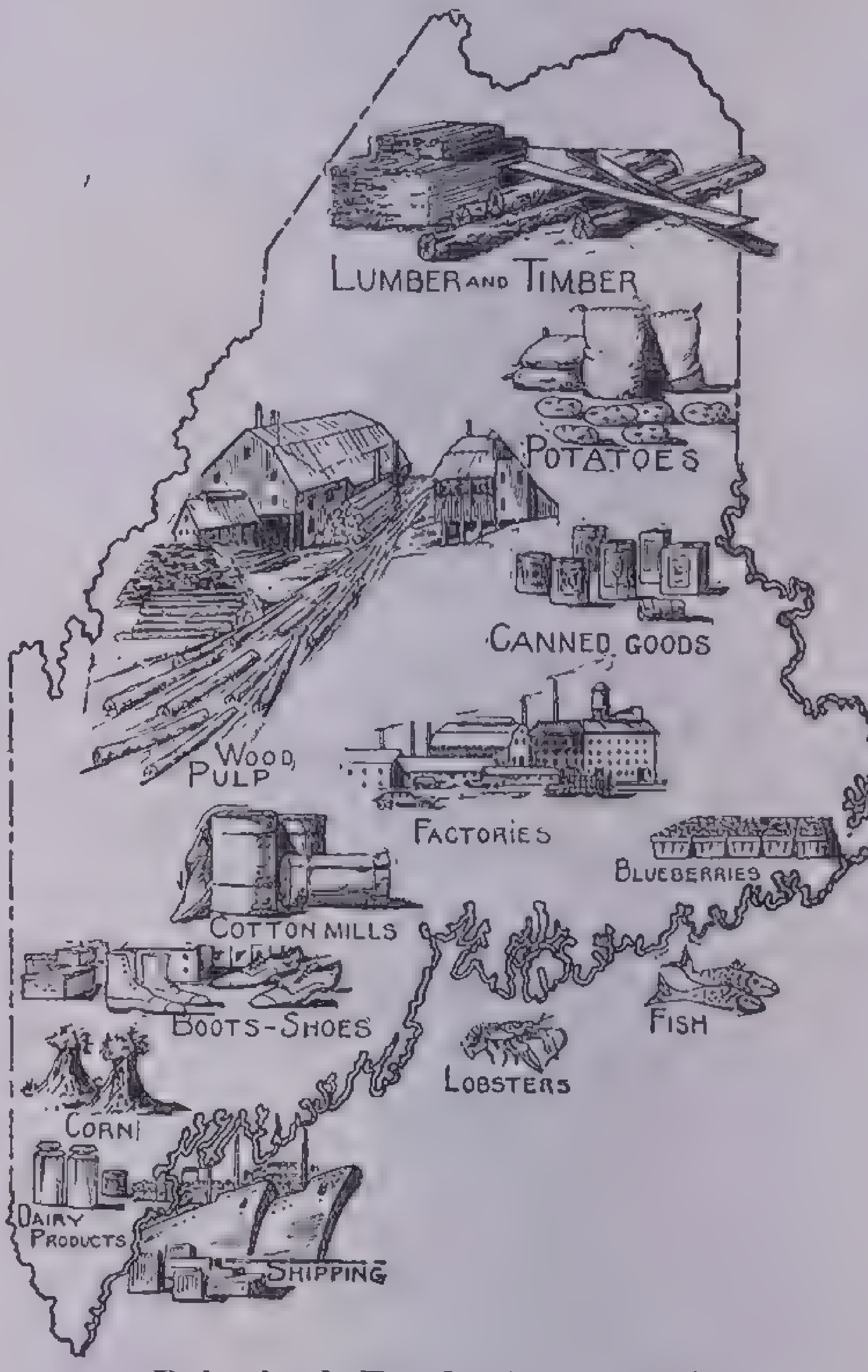
magnetic poles, the two poles, north and south, that make the earth an immense magnet. As the centers at which there converge all magnetic lines of force the north magnetic pole is positive and the south magnetic pole, negative. These poles do not coincide with the geographic poles, the north magnetic pole being in the southwestern part of the Boothia Peninsula in Baffin Land (70° 5′ N. Lat. and 96° W. Long.) and the south magnetic pole being in Antarctica (72° 4′ S. Lat. and 154° E. Long.). The magnetic axis connecting these two points passes some 750 miles distant from the earth's center. The magnetic influence of the sun makes the positions of the poles shift from time to time, and new magnetic charts are issued about every 5 years to aid sea and air navigators.

Maine, the northeasternmost state in the United States and the largest of the New England states. It has an area of 33,040 square miles, of which 3,145, nearly one-tenth, are water. The Atlantic Ocean forms the southern boundary, a rocky coast broken by an extraordinary number of indentations. Following these irregularities, the coastline of the state is nearly 2,500 miles long. New Hampshire lies on the west, Quebec on the north, and New Brunswick on the east. Quoddy Head, easternmost point in Maine, is the extreme eastern limit of United States territory. The population of the state, about 850,000, has grown slowly in the last century, as many of its sons and daughters have sought opportunities beyond its borders.

The surface of Maine is very irregular, a result of glacial action. In the northwest a mass of mountains rises to around 4,000 feet, and Mt. Katahdin, near the center of the state, reaches an altitude of practically one mile above sea level. These rolling mountains and their narrow valleys join with more than 2,400 small lakes to form a region of unusual scenic charm. The Androscoggin, the Penobscot and the Kennebec are the principal rivers of the state. Their rapid descent to the Atlantic provided dependable water power for the early industrial development of Maine.

Though the oldest settlement dates from 1624, only one-fourth of the area is devoted to farming. Rainfall is abundant, but the long severe winters and shallow, rocky soil discourage agriculture except in the most favorable localities, such as Aroostook County in the northeast, where as many as 55,000,000 bushels of potatoes have been raised in a year. Hay is also an important crop, and eggs and poultry are shipped to many markets.

The forests of Maine have yielded valuable timber since Colonial days, when their tall trunks were sought for masts for British ships. Maine timber is still cut in quantities for lumber, but most of it now goes into wood pulp for paper production. Fur-bearing animals are trapped in great numbers in these woods. Fishing remains a popular sport and a profitable occupation in Maine, and many natives earn good livings as guides to strangers who come to the wilderness to fish and hunt.



Principal Products of Maine

The mineral industry is unimportant, though granite is produced in large quantities and shipped by water to ports along the Atlantic coast. Maine shared in the early industrial development of New England, and many factories line the river in the southern section, producing chiefly textiles and shoes. Their relative importance has declined in recent years, however, while paper mills have sprung up farther north in the state. The swift streams have been utilized for many small hydroelectric power developments.

Portland is the leading city and trade center, with a good harbor which handles some Canadian commerce during the winter months. The twin cities, Auburn and Lewiston, form the next ranking center, devoted to miscellaneous manufacturing. Augusta, the capital, is the business center of the Kennebec region, and Bangor serves the Penobscot in the same way. There are many fine harbors on the coast, but they are little used because markets and producing areas are too distant. Bath and other seaport towns had thriving shipyards in the days of sailing ships, and Maine seamen won a rich share of the whaling trade, but hardly a trace of this activity remains.

The University of Maine is at Orono. Typical old New England classical colleges are Bowdoin at Brunswick, Colby at Waterville and Bates at Lewiston.

Maine's chief income today is from the tourist trade. Its cool summers, numerous lakes and varied scenery draw thousands of visitors to hotels, cottages and camps; other thousands make briefer visits to points of interest. On Mount Desert Island the wealthy summer colony at Bar Harbor has flourished for many years, while the adjacent Acadia National Park affords varied recreations and a combination of mountain and marine scenery not found elsewhere on the Atlantic coast. The innumerable coves and islands along the shore provide safe channels for small boats and secluded situations for summer homes, while rushing streams and remote lakes afford water sports, fishing and canoeing, attracting children's camps and mature sportsmen.

mainland, a continent or other principal land area, as opposed to an island or peninsula. The name *mainland* is sometimes given to the largest island of a group, as Mainland, the largest of the Shetland Islands. Pomona, the largest of the Orkney Islands, is also called Mainland.

Malaya, the British-controlled lands in the southern part of the Malay Peninsula in southeastern Asia. They include the Straits Settlements, Federated Malay States and Unfederated Malay States and cover an area of about 52,000 square miles.

The Malay Peninsula is long and narrow, 850 miles long and 45 to 200 miles wide, extending between the South China Sea to the east and the Bay of Bengal to the west. The Strait of Malacca separates it from Sumatra, and the Isthmus of Kra is the connecting link between it and the Asiatic mainland. The area of the entire peninsula is about 90,000 square miles, and the northern part belongs to Siam and Burma. The population is about 2,000,000, mostly Malays and Siamese with some Chinese, Europeans and Negritos.

The peninsula consists of a central range of heavily forested hills with occasional peaks as high as 7,000 feet and plains cut by small river valleys lying east and west of these hills. The plains are the agricultural region, in which sugar cane, rice, cotton, tobacco, coffee, pineapples, tapioca, tea and pepper are raised. The area is rich in minerals. Most of the tin of the world comes from here. Other exports include gold, silver, gutta-percha, copra and great quantities of rubber.

The *Straits Settlements* are a British Crown colony that includes the islands of Singapore, Penang, Christmas, Cocos and Labuan in the Strait of Malacca and South China Sea and the territories of Province Wellesley, Dindings and Malacca at the tip of the Malay Peninsula. Its area is about 1,536 square miles; population, about 1,115,000 of whom 12,000 are whites (mostly British planters). The capital is Singapore (population, 445,700) on the island of the same name. In addition to being one of Great Britain's finest fortified naval and aircraft bases, it ranks 7th among the great ports of the world, handling each year the cargoes of some 5,700 vessels, valued at more than $1,000,000,000. Other cities are Georgetown (Penang), Malacca and Victoria (Labuan). The Straits Settlements were originally settlements of the East India Company. They were transfererd from the Government of India to the Colonial Office in 1867 and as a Crown colony are administered by a governor, aided by executive and legislative councils.

The *Federated Malay States* consist of the small states of Perak, Selangor, Negri Sembilan and Pahang. They occupy the central part of British Malaya and constitute a protectorate that is administered by a high commissioner (the governor of the Straits Settlements) and a federal council. Each state has a native ruler who is assisted by a British resident. The total area of the Federated States is 27,585 square miles; population, about 1,713,000. The chief cities are the capital, Kuala Lumpur, and Ipoh, Taiping and the port of Swattenham. The Federated Malay States have been under British protection since 1874.

The *Unfederated Malay States* consist of the small states of Johore, whose capital is Johore Bharu, Kedah (capital, Alor Star), Kelantan (capital, Kota Bharu), Perlis (capital, Kangar) and Trengganu (capital, Kuala Trengganu). Their combined area is 23,355 square miles, and their population is about 1,630,300. A sultan rules each state with the aid of a British adviser. Johore has been under British protection since 1885 and the other states since 1909.

Maldive Islands, a group of 17 atolls and some 300 coral islets in the Indian Ocean about 500 miles southwest of Ceylon. The most important are Addu, Fua-Mulaku, Malé and Minikoi. In their 115 square miles there are about 78,000 persons; they live by tropical agriculture. The chief exports are copra and tortoise shell. The natives of the northern and central clusters of islands are of mixed Indian and Arabian descent and are mostly Mohammedans. Those in the southern part represent a more primitive strain, although their language is a Singhalese dialect. Since the 17th century, the Maldive Islands have generally been attached to Ceylon, having sought protection from the Mopla pirates and from the encroachments of Portuguese and Dutch explorers. They are ruled by a sultan who is responsible to the Government of Ceylon, which is a British Crown colony. The capital is Malé.

Mall, a section of Washington extending between the Capitol and Potomac Park. At the westernmost extremity is the majestic Lincoln Memorial. A lagoon, located between the memorial and the Washington Monument, reflects the forms of both. East of the monument are the buildings of the Department of Agriculture and of the Smithsonian Institution (United States National Museum and Freer Gallery of Art). The Grant Memorial, modeled by Henry M. Shrady, stands in the botanical gardens that adjoin the Capitol grounds.

Maltese Islands, a group of islands in the Mediterranean Sea, lying 60 miles south of Sicily, of which the most important are Malta, Gozo and Comino. Their area is 122 square miles, and the population is 248,000. They constitute a British colony, which, since it has its own constitution and elected legislature consisting of the Senate and House of Assembly, is considered a responsible government with quasi dominion status. They are also one of the important bases of the British Mediterranean fleet, and Valetta, the capital, is a port of call for vessels of all nations passing through the Mediterranean. Agriculture is the support of the native population. The crops are potatoes, onions, corn, wheat, barley, oranges, figs, apricots and peaches. The manufactures include lace, pottery and hand-woven cotton materials. English and Italian are the languages of the upper classes, which represent a mixture of Italian, Norman and Spanish blood. Among their cultural enjoyments is a season of Italian opera for 5 months of each year in the opera house in Valetta.

The Maltese Islands are a rich historical field. The Phoenicians were first here in the 8th century B.C., and to them the language used today by the lower classes is traced. Two hundred years later, after a Greek interval, the Phoenician colony of Carthage assumed control; but during the Second Punic War in 218 B.C., the islands fell to Rome. On Rome's downfall they were conquered by various nations, including the Saracens, who held them for 200 years. From 1530 until Napoleon seized them in 1798, they were held by the Knights Hospitallers of St. John of Jerusalem, better known as the Knights of Malta, who represented the flower of European Catholic nobility; the tombs of many of these knights are found in the magnificent Cathedral of St. John in Valetta, which itself is named for one of the early grand masters, Jean de la Valette. The inhabitants with the aid of a British fleet revolted against French control in 1800: and after Napoleon's downfall in 1815 British possession was confirmed by the Congress of Vienna. It was on Malta that the Apostle Paul was shipwrecked about 60 A.D. The name is derived from the Greek *Melita.*

Mammoth Cave, a huge cave in the Green River section of Edmondson County, Ky., set aside as a national park in 1936. With a known area of 54 square miles it is the largest cave in the world. It was discovered in 1799 and acquired fame as early as the War of 1812 when its saltpeter deposits were used in making gunpowder.

Mammoth Cave consists of a complex series of more than 200 chambers, domes, abysses, pits, grottoes, avenues and galleries extending 175 miles underground. The longest avenue is Broadway, 3 miles long, 60 to 175 feet wide and 40 to 125 feet

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Echo River in Mammoth Cave

high. Its principal enlargement is the so-called Temple, 541 feet long, 287 feet wide and 125 feet high. Other features are: the Bottomless Pit (105 feet deep), Mammoth Dome, Star Chamber, Ruins of Karnak, Hindu Temple, Echo Dome, Martha Washington's Statue, King Solomon's Tomb and the Onyx Arm Chair, where Jenny Lind, "the Swedish Nightingale," sang in 1851.

In some of the lower chambers at a depth of 300 feet there are rivers, waterfalls and lakes, varying in volume with the local rain supply. The largest are the Dead Sea, Lake Lethe, the Styx, Crystal Lake and Echo River. The outer galleries of the cave are inhabited by multitudes of bats, and there are two species of blind fish, crayfish, crickets and other insects. Many parts of Mammoth Cave, such as the Frozen Niagara, are beautifully incrusted with gypsum and onyxlike formations. Stalactites and stalagmites are abundant.

Mammoth Cave is one of the Seven Wonders of the New World.

Man, Isle of, an island in the Irish Sea between the northern part of England and Northern Ireland, belonging to the British Crown. The area is 220 square miles, and the population is about 50,000, of whom about 20,000 live in Douglas, the capital. The people engage in fishing and agriculture; they raise principally oats, potatoes, turnips, strawberries, raspberries and currants. There are also mines of lead, zinc and other metals. The Manx language is still used, but English is taught in the schools. The island was the home of an ancient Celtic race and from the 9th to the 13th century was ruled by a viking king called the *King of Man and the Isles.* It then fell to Scotland, and, after Scotland's subjugation, by England in the 14th century, it was granted by Edward III to the First Earl of Salisbury.

The most important of the hereditary lords have been the descendants of Sir John Stanley who ruled as earls of Man from the 15th to the 18th century. The British Crown acquired the island by purchase of the sovereign and manorial rights through the Revesting Act in 1765, and since then the government has been entrusted to a lieutenant governor appointed by the Crown, and a legislature whose upper house is called the *Council,* and lower house, the *House of Keys.*

The word *Man* is derived from the Manx name *Mannin* or *Vannin,* which means middle and refers to the island's central position in the Irish Sea. Hall Caine popularized it in fiction. It is noted for its breed of tailless Manx cats.

Manchukuo, a territory of eastern Asia that since 1932 has been a puppet empire under the suzerainty of Japan. Its nominal ruler is Kang Te, who was formerly known as Husan Tung, boy emperor of China, and after the establishment of the Chinese Republic in 1912 as Henry Pu-yi. He was crowned emperor in 1934. It was from this region that his Manchu forebears came; the Manchu dynasty ruled China from 1644 to 1911. At the time of the Mukden incident in the Japanese-controlled South Manchuria Railway zone in 1931 the territory was a semi-independent Chinese administration, known as Manchuria. This incident gave the signal for Japan's advance on China on the pretext of defending its resident nationals.

Manchukuo, which includes the provinces of Fengtien, Heilungkiang, Kirin, Jehol and Hsingan, has an area of 460,383 square miles and a population of about 29,600,000. It is bounded on the north and east by the U.S.S.R., on the south by Chosen and by the arms of the Yellow Sea called Korea Bay and the Gulf of Liaotung and on the west by China and Outer Mongolia. The Amur, Argun and Ussuri rivers separate Manchukuo from the U.S.S.R. The Yalu and Tumen rivers form part of the boundary between the povinces of Chosen and Manchukuo.

The central plains of Manchukuo are exceedingly fertile and are watered by the Nonni, Liao, Sungari and other rivers. Most of the crops of the Temperate Zone are raised, including soya beans, wheat, corn, rice, millet, flax, sugar beets, cotton and tobacco. The country is rich in minerals, such as coal, lignite, iron, gold, silver, lead, asbestos and shale oil. Most of the minerals are obtained from the Great and Little Khingan mountains in the western part and the East Manchukuoan Highland. The most important industries are the manufacture of tussah silk and of flour.

The capital of Manchukuo is Hsingking (formerly Changchun) with a population of 134,000. Other important cities are Shenyang (formerly Mukden), Harbin and the ports of Antung and Newchang. Most of the peasants have been forced to abandon their farm houses and live in *protected villages,* where they are continually under the watchful eye of the Japanese police and the large garrison force.

map, a graphic representation of any plane projection of the earth's surface, drawn to scale and printed or engraved on paper, cardboard or heavy cloth. It usually shows such physical features as continents, countries, states, provinces, cities, oceans, rivers, lakes, mountains, railroad lines and degrees of latitude and longitude; or it may illustrate political, topographical, geological, historical, nautical, aeronautical, meteorological, mineralogical and various statistical or economic facts.

The earliest recorded maps are those of the Egyptians, drawn *c.* 1300 B.C. on wooden tablets. Clay was the medium used for maps by the Babylonians. The Greeks, starting with Anaximander in the 5th century B.C., were excellent cartographers, and until the Renaissance geographical knowledge was derived largely from the 26 maps in Claudius Ptolemy's *Geographia Universalis,* prepared in the 2d century A.D.

After Columbus's discovery of America an interest in map making was revived. Gerardus Mercator (Gerhard Kremer), a Flemish geographer, devised the map known as *Mercator's projection,* which from the 16th to the 18th century was an accepted standard. In the 19th century it was partially supplanted by Mollweide's Homolographic projection, which better depicted the true size and shape of relative land areas. One of the greatest cartographic undertakings of the 20th century has been the International Map of the World, prepared on a uniform one-millionth scale for each country.

Margarita, an island in the Caribbean Sea off the northern coast of Venezuela. With the islands of Tortuga, Coche and Cubagua it constitutes an administrative division of Venezuela known as the state of *Nueva Esparta.* The area is 400 square miles, and the population is about 70,000. The island is mountainous, and its highest elevation is Mt. Macanao, 4,484 feet high. The principal industries are fishing, grazing and mining salt and magnesium. The pearl and pearl-shell fisheries, which were at their height of production during the 16th and 17th centuries, still amount in value to nearly $1,000,000 a year—*Margareta* is Spanish for pearl. The capital is Asunción, and Pompatar is the principal port. Columbus discovered the island in 1498.

Marianas or **Ladrone Islands,** a group of 16 islands in the Pacific Ocean; they lie north of the Caroline Islands between 12° and 21° N. Lat. and at 145° E. Long. and are included in Micronesia. The total area is 250 square miles, and the population is nearly 70,000. The northern group, which includes among others the islands of Agrigan, Pagan and Alamagan, is mainly of volcanic formation; in the southern coral and limestone group are Guam, Rota, Tinian and Saypan. Rice, sugar, sweet potatoes, manioc, cotton, coffee and tobacco are the chief products. The capital is Saipan. Discovered in 1521 by Magellan, the islands were originally called Islas de los Ladrones (Thieves' Islands) because of a pirates' cache that he found there. In the 17th century they were renamed Las Marianas in honor of Maria Anna, consort of Philip IV of Spain. They were sold to Germany in 1899; all but Guam, which belongs to the United States, have been held since the World War under Japanese mandate.

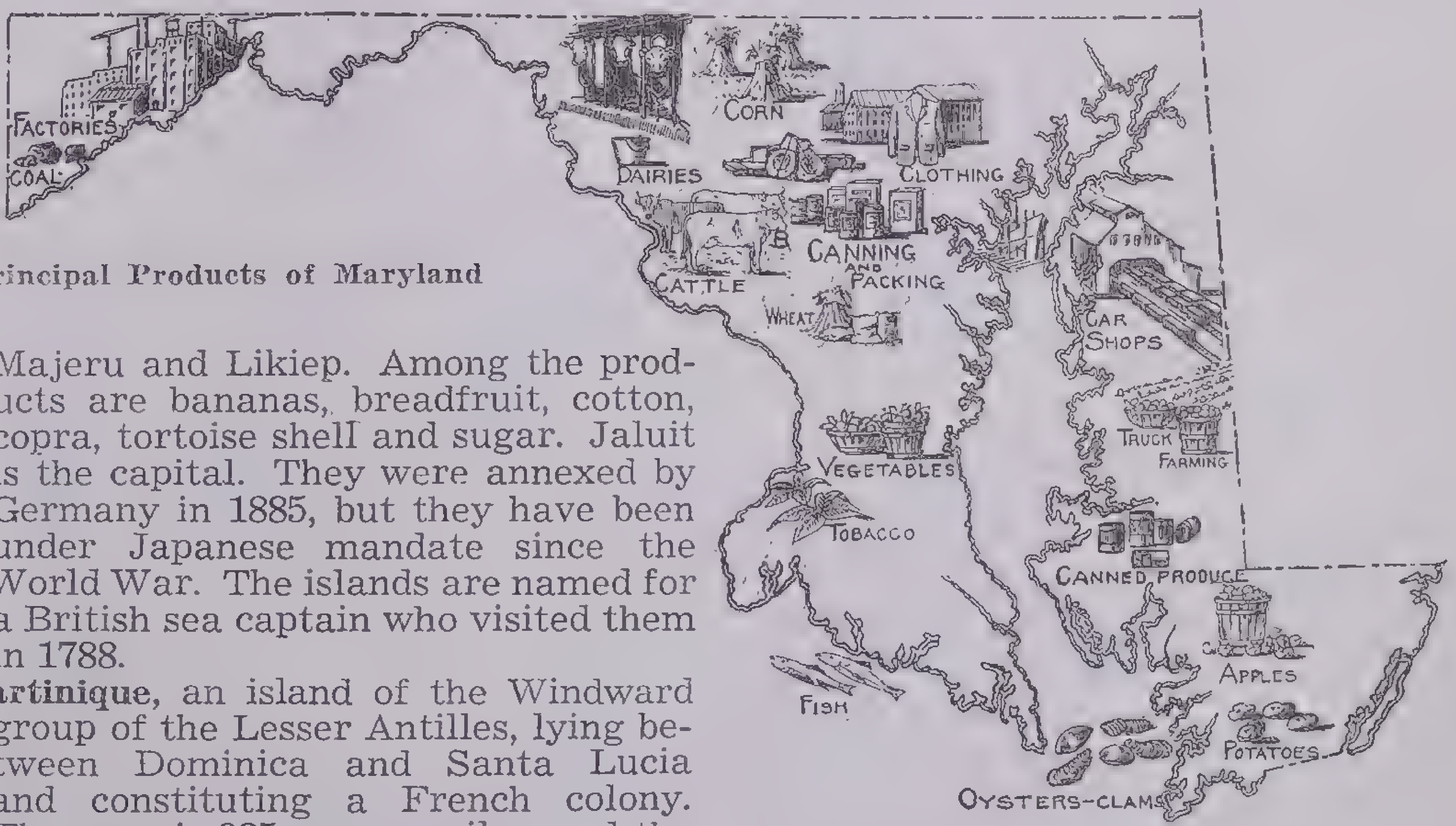
Marquesas or **Mendaña Islands,** a group of islands of volcanic origin in the Pacific Ocean, situated between 7° and 10° S. Lat. and 133° and 140° W. Long. They belong to France. There are 12 islands and islets, divided into two groups—Washington and Mendaña—which extend more than 250 miles and have a total area of 480 square miles. Nukuhiva or Marchant is the largest island of the Washington or northern group, and Hivaoa or Dominica of the Mendaña or southern group. Some of the mountains attain an elevation of more than 4,000 feet. Nukuhiva is the only island that possesses good harbors. The principal products are breadfruit, bananas, yams, copra, sugar cane, bamboo and cotton. The inhabitants of Polynesian stock have steadily decreased from some 20,000 in the early part of the 19th century to only 2,300. This was the only island group of Polynesia in which cannibalism prevailed.

The southern group of the Marquesas Islands was discovered in 1595 by the Spanish navigator Alvaro de Mendaña de Neyra, and was rediscovered in 1774 by that intrepid English explorer Capt. James Cook. The name *Washington* for the northern group was bestowed by an American sea captain named Ingraham, who sighted it in 1791. After the coming of French missionaries the islands were claimed by France in 1842. The capital, Papeete, on Hivaoa, is the seat of the French resident commissioner, to whom the native chiefs are subject. The name *Marquesas* (Spanish for marchionesses) was bestowed by Mendaña in honor of the wife of the Marqués de Mendoza, Viceroy of Peru.

marsh, a tract of low, partially water-covered land ordinarily near a stream or lake. As marshes derive most of the water that they contain from the overflow of the neighboring body of water, they vary in degree of saturation and are comparatively dry in seasons when there is no overflow. Those near the ocean and covered by high tides are called salt or tide marshes.

A marsh may be without vegetation or it may produce certain types of plants peculiar to marshy land and, in some instances, small trees. The commonest marsh plants are the cattail and bulrush. From the oxidation of exposed dead vegetable matter, such gases as carbon dioxide, ammonia and marsh gas (CH_4) are formed. Marshy tracts are characteristic of the state of Louisiana and of Latvia and Lithuania.

Marshall Islands, two groups of atolls in the Pacific Ocean between 4° and 15° N. Lat. and 161° and 174° E. Long.; they are included in Micronesia. The northern group is the Ratack Chain, composed of 15 islands, and the southern is the Ralick Chain, which has 18 islands. Their total area is 150 square miles, and the population is about 9,700. The most important islands are Majeru and Likiep. Among the products are bananas, breadfruit, cotton, copra, tortoise shell and sugar. Jaluit is the capital. They were annexed by Germany in 1885, but they have been under Japanese mandate since the World War. The islands are named for a British sea captain who visited them in 1788.



Principal Products of Maryland

Martinique, an island of the Windward group of the Lesser Antilles, lying between Dominica and Santa Lucia and constituting a French colony. The area is 385 square miles, and the population is about 235,000, mostly Negroes. About one-third of the island is under cultivation; sugar, cotton, coffee, cacao, vanilla and tobacco are the chief products. Fort-de-France is the capital and leading port. St. Pierre, the principal market town, was destroyed by an eruption of Mt. Pelée (4,430 feet high) in 1902; more than 40,000 persons lost their lives.

Martinique was first seen by Columbus in 1493 or 1502. The French began colonization as early as 1635. The island's administration is entrusted to a governor, general council and elected municipal councils. It is also represented in the French Parliament by a senator and two deputies. The Empress Josephine (first wife of Napoleon I) was born at the settlement called *Trois-Ilets.*

Maryland, a middle Atlantic state that was one of the 13 original states of the United States. It has an area of 12,300 square miles, of which 2,386 are water surface, and a population about 1,821,244, of whom about 60 per cent live in cities and towns. The northern or Pennsylvania boundary is formed by the Mason and Dixon Line. The Potomac River forms the curving southern boundary with West Virginia and Virginia. West Virginia lies on the west, and Delaware and the Atlantic Ocean bound the eastern side. Maryland is almost bisected by Chesapeake Bay, and that part of the state between the Bay and the Atlantic is known as the Eastern Shore.

The surface varies from the level sandy plain of the Eastern Shore to the rugged ridges and valleys of the Alleghenies in the west. Running north and south across the middle of the state is South Mountain, an extension of the Blue Ridge, to the west of which lies the Cumberland Valley, a part of the great Appalachian Valley which extends from New York to Alabama. Maryland shares the Potomac and Susquehanna Rivers with its neighbor states and has no other commercial waterways except Chesapeake Bay, an arm of the Atlantic which forms a sheltered channel of immense importance for shipping and oyster fishing.

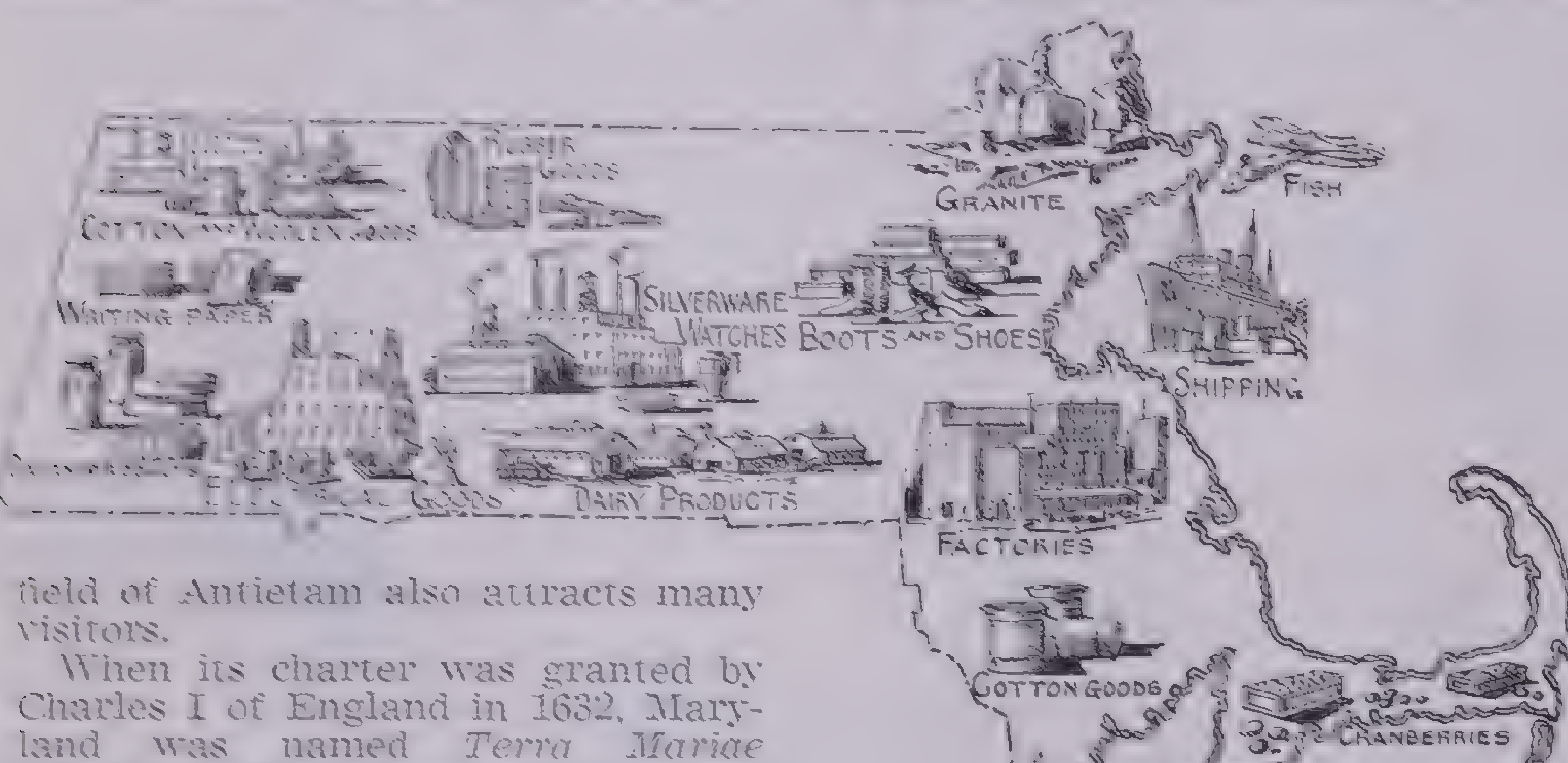
All the common American farm crops are grown in the state. Tobacco is a valuable product, and truck farming is highly developed on the Eastern Shore, which has ready access to the Philadelphia and New York markets. A large acreage in the fertile central section is devoted to vegetable growing for the canning industry. In the mountains fruit growing is an important business. The fishing industry of Maryland is especially valuable, and Chesapeake Bay oysters and crabs are shipped far and wide. The state was originally richly forested, but the remaining timber is of little commercial importance. A minor industry of interest is goldfish production, in which Maryland leads the nation.

Coal of high quality is produced in the western mountains in large quantities. Manufacturing is concentrated around Baltimore, where shipbuilding and steel plants, clothing factories and a great variety of smaller industries have gathered. Rayon and automobile tires are made in the Cumberland district.

Baltimore, the chief city and port, is separately described. Cumberland is the trade center of the western mining region, and Hagerstown is of similar importance to the Cumberland Valley. Annapolis, the capital, has many homes and public buildings built in Colonial days, representing the best early American architecture.

The United States Naval Academy is at Annapolis. The University of Maryland is located at College Park, a suburb of Washington, D. C., though its professional schools are in Baltimore. Also at Baltimore are Johns Hopkins University, with its internationally famous medical school, hospitals and graduate schools; and Goucher College for women. St. John's at Annapolis is one of the oldest small colleges in America.

Maryland's mountains and rivers form charming scenery. The shores of Chesapeake Bay and its broad tributaries are dotted with summer cottages and great estates. Ft. McHenry in Baltimore is the foremost historic shrine. The Civil War battlefield of Antietam also attracts many visitors.



Principal Products of Massachusetts

When its charter was granted by Charles I of England in 1632, Maryland was named *Terra Mariae* (Mary's land) in honor of his queen, Henrietta Maria.

Massachusetts, a New England state and one of the most important of the 13 original states of the United States. Although it is 44th in size, it is among the first in industry, wealth and beauty. Bounded on the north by Vermont and New Hampshire, on the east by the Atlantic Ocean, on the south by Rhode Island and Connecticut, and on the west by New York, it has an area of 8,266 square miles, 227 of which are water surface. The greatest length of the state is 190 miles; the width is 110 miles at the eastern end, but about 45 miles through most of its length. The population (now about 4,316,721) has shown a consistent growth during the last century, and more than 90 per cent live in cities and towns. Only one state is more densely populated.

The surface of Massachusetts is rolling. In the west it becomes mountainous, and several elevations in the Berkshires exceed 3,000 feet, with Mt. Greylock at 3,505 feet the highest point. Lesser ridges are scattered through the central and eastern sections, and only in the southeast, where Cape Cod forms a long elbow-shaped projection into the sea, is the typical Atlantic coastal plain found. The shore north of Boston is generally rocky and irregular, forming charming marine scenery. Off Cape Cod is a group of sandy islands; Martha's Vineyard and Nantucket are the most important of these. Somewhat west of the center Massachusetts is bisected by the valley of the Connecticut River; and the Merrimack crosses the northeast corner. Much of the state's early industrial importance may be attributed to the water power of these two streams and their swift tributaries.

Massachusetts has cold winters and generally mild summers, though occasional heat waves are experienced. On Cape Cod and the adjacent islands, almost invariably cooled by sea breezes, are many populous summer colonies. Though climatic conditions are favorable, agriculture is of minor importance in this state of rocky soil and rough terrain. In some sections, however, especially parts of the Connecticut Valley, there are many productive truck and tobacco farms. Hay and small fruits are the principal general crops. Maple sugar is produced in the hills, and the marshes of Cape Cod yield large cranberry harvests. The forests are of little commercial importance.

Immense quantities of sea food are brought into the ports of Massachusetts (especially Boston and Gloucester) by fleets of fishing vessels, whose men continue the seafaring traditions of the state. Cod from the Newfoundland banks are the most valuable catch. The mineral industry is limited to the production of granite, marble and other building stones.

Massachusetts has always ranked among the leading manufacturing states. Textiles, especially cottons, woolens and worsteds, have been produced in great quantities since the late 18th century, and boot and shoe factories have been of almost equal importance in the development of the state. In recent years these industries have declined somewhat in position, but the manufacture of electrical apparatus, firearms, tools, hardware and machinery of all sorts, paper, books and innumerable small products has maintained industrial activity at a high level.

Boston, the capital and chief city, is separately described. Cambridge, Somerville, Chelsea, Quincy, Malden, Everett, Medford, Newton and numerous smaller places, though they are politically distinct, are part of the Boston metropolitan area. Worcester, the second city in population, has diversified industries. Its art museum is outstanding among cities of its size. Springfield, on the Connecticut, is the chief trade and manufacturing center in the western section; among its varied manufacturing plants is the principal arsenal of the United States Army.

Fall River and New Bedford in the southeast are centers for the making of cotton yarns and fabrics, but varied smaller industries are of growing importance. Lowell and Lawrence, sharing the water power of the Merrimack, are cotton and worsted mill towns, and shoe factories predominate in Haverhill, Brockton and Lynn. Lynn is also a center for the production of electrical machinery, as is Pittsfield in the Berkshires. Holyoke has large paper mills; and all the paper for United States currency is made at Dalton. Most of the smaller cities of the state have one or more nationally known manufacturing plants.

Massachusetts has many educational institutions of first rank. Harvard University, founded in 1636 at Cambridge, is the oldest in the country. The Massachusetts Institute of Technology at Cambridge is a leading engineering school. Also in the Boston district are Tufts, Simmons and Boston colleges and Boston University. Among leading women's colleges are Smith at Northampton; Mt. Holyoke at South Hadley; and Wellesley at Wellesley. Williams at Williamstown and Amherst at Amherst, are outstanding among the classical colleges for men; and Clark University at Worcester is famous for its graduate school, especially in psychology and geography. Holy Cross College and Worcester Polytechnic Institute also are situated at Worcester, and Massachusetts State College is at Amherst.

There are historic and literary shrines throughout the state, from Plymouth Rock on the eastern coast to the homes of Bryant and Herman Melville high in the Berkshires. Nantucket and New Bedford retain many relics of their great prominence as whaling ports. The water fronts of Salem and Newburyport are full of reminders of the era of the Yankee clippers that brought these cities great wealth. Gloucester and Marblehead are still busy fishing ports, but pleasure boats now crowd their wharves. Summer visitors are drawn in great numbers by the mild climate of Cape Cod and the adjacent islands, and the shores of Buzzards Bay and Cape Ann are almost equally popular.

In Lexington and Concord the American Revolution had its beginning. Fine colonial homes and churches are to be found throughout the state, particularly in Salem, Topsfield, Quincy and Plymouth. The Wayside Inn, made famous by Longfellow, is preserved in South Sudbury. Many artists have pictured the seascapes of Provincetown, the rocky ledges of Cape Ann, the rolling hills of the Berkshires and the sweeping curves of the Connecticut. The Mohawk Trail west from Greenfield across the Berkshires is one of the leading scenic highways of the East.

Mauritius, an island of volcanic origin in the Indian Ocean, more than 500 miles east of Madagascar, constituting, with nine small islands, such as Rodriguez, Diego Garcia and Cargados, a British Crown colony. The total area is 720 square miles, and the population is almost 400,000, which makes these islands one of the most densely populated regions in the world. Only about 4,000 persons are Europeans, principally French and British. The remainder is made up of Indians (constituting two-thirds of the population), Chinese, Negroes and half-breeds with French blood, called *creoles*. The Indians and Chinese are mostly coolies who were imported to work on the great plantations. Sugar, aloe fiber, rice, coffee, tea, cotton, tobacco and copra are the principal products. The capital and chief port is Port Louis.

Originally Mauritius belonged to Portugal by right of Mascarenhas's discovery in 1505 but was successively claimed by the Netherlands in 1598 and France in 1715; it has been a British possession since the Treaty of Paris of 1814. Assisting the governor are an executive council and a council of government or representatives of the legislative body. Here, at the time when the island was known as the *Île de France,* were laid the scenes of St. Pierre's famous romance, *Paul and Virginia* (1787).

The name *Mauritius* originated during the Dutch period, when the colonists wished to honor Count Maurice of Nassau. An administrative dependency of Mauritius is the Chagos Archipelago, which has a total area of 76 square miles and is situated in the Indian Ocean between 4° and 7° S. Lat. and 71° and 73° E. Long.

meadow, a level area of grassland that is both fertile and well drained and is ordinarily used either for raising hay or as pasture lands for sheep and cattle. Meadowlands are often on the banks of rivers or lakes, but they are high enough above the surface to be dry land, dependent on rainfall for moisture, and are exceptionally suitable for cultivation. Timothy and alfalfa are among the most popular of meadow grasses; others include redtop, orchard grass, rye grass, oat grass and meadow fescue, with which clover is frequently mixed.

meander, the winding part of a stream, occurring if a valley's slope is so gentle that the river no longer flows over stones or other obstacles in its path but shifts its channel so as to swing round them. The term is derived from the name of a river in Phrygia, Asia Minor, which was noted for its serpentine course.

In a re-elevated region, however, where the velocity of the stream has not been greatly increased, a meander may be retained in the form of a winding gorge and hence is called an *intrenched meander*. An example is the Salt River of Arizona.

Mediterranean, a large inland sea that is almost completely surrounded by the continents of Europe (to the north and west), Asia (to the east) and Africa (to the south). It is connected with the Atlantic Ocean to the west by the Strait of Gibraltar; with the Black Sea to the east by the Dardanelles, the Sea of Marmara and the Bosporus; and with the Red Sea and Indian Ocean to the south by the Suez Canal. The Mediterranean is about 2,300 miles in length and 1,200 miles at its greatest width. It has an area of 1,145,830 square miles, and its greatest depth is 12,276 feet.

The African coast owes its regularity of outline to the fact that the Mediterranean, because of the narrow entrance from the Atlantic, is almost tideless. The European coast, however, has many peninsulas, formed doubtless by the submersion of part of their area some 25,000,000 years ago. The Apennine Peninsula (Italy) almost divides the Mediterranean into two sections. At the western end is the Iberian Peninsula and at the eastern end the Balkan and Anatolian peninsulas. The various arms of the Mediterranean are: the Adriatic Sea to the east of the Apennine Peninsula; the Ionian Sea that extends eastward from the toe of Italy to the Ionian Islands and the mainland of Greece; the Tyrrhenian Sea that lies between Corsica and Sardinia and the western shore of Italy; the Aegean Sea to the east of Greece; and the Balearic Sea between the eastern coast of Spain and the Balearic Islands.

Rivers that discharge into the Mediterranean are the Ebro (Spain), Rhone (France), Po (Italy) and Nile (Egypt). The islands of Sicily, Sardinia, Corsica and the Balearic group are in the western portion; Cyprus, Rhodes, Crete and the Maltese and Ionian islands are in the eastern. Important cities on the shores of the Mediterranean and its arms are: Algiers in Algeria, Tunis in Tunisia, Tripoli and Bengasi in Libya, Alexandria and Port Said in Egypt, Jaffa and Haifa in Palestine, Beyrouth in Syria, Naples, Genoa and Venice in Italy, Marseille in France and Barcelona in Spain.

The Mediterranean was a very important water highway of the ancient Phoenicians, Greeks and Romans; throughout history it has been the stage of conflicts among the nations along its shores. Today, as the principal water route between East and West, it is one of the most important foci in the struggle for world domination. England must control it to protect her trade route to India. For this reason she has fortified the Maltese Islands in the middle of the sea and Cyprus and Gibraltar that guard its eastern and western ends. Italy calls it *mare nostrum* (our sea) and hopes to dominate it. France needs it as a connecting link with her North African colonies.

The name *Mediterranean* is from the Latin *medius,* meaning middle, and *terra,* meaning earth. It refers to the location of this body of water.

Melanesia, the islands of that portion of Oceania that lies between 5° and 30° S. Lat. and 50° and 170° E. Long. and extends from the Bismarck Archipelago (whose chief islands are New Britain and New Ireland) to New Caledonia and the Loyalty Islands. Since the World War, the Bismarck Archipelago, a former German possession, has been administered by Australia as the New Britain Archipelago under mandate from the League of Nations. Part of the Solomon Islands also is an Australian mandate, and the other part forms a British protectorate. New Caledonia and its dependency, the Loyalty Islands, belong to France; and the New Hebrides are administered jointly by France and Great Britain. *Melanesia,* derived from the Greek, means dark islands in reference to the natives' complexions.

Memorial Lighthouse, Astoria, Oreg. Commanding the mouth of the Columbia River, this column rises 125 feet from a sheer bluff high above the water. Dedicated in 1926 to the memory of the pioneer discoverers and explorers of the region, it is encircled by 15 elaborate decorative historical panoramas.

meridian, any one of the imaginary lines, running north and south on the earth's surface and passing through both the poles, which serve to indicate longitude. With the aid of a parallel of latitude, the exact location of a place, north or south of the equator and east or west of a given meridian of longitude, can be determined in degrees, minutes and seconds. The word is derived from the Latin adjective *meridianus,* noonday, and is so called because it is midday at any place when the sun is directly over it.

Meridian Highway, a 1,769-mile-long road connecting Winnipeg, Man., Canada, and Mexico City, Mexico. Among the cities of the United States that it passes through are Fargo, N.D., Watertown, S.D., Wichita, Kan., Austin and Laredo, Texas. The highway owes its name to the fact that its route is about midway between the Atlantic and Pacific oceans.

mesa, a high, broad and flat tableland, towering above a plain and caused by the erosion of a sandstone plateau. The top is usually a layer of hard rock that has worn away less rapidly than the softer strata beneath it and by which it was once surrounded. The sides are steep escarpments.

Mesas are found in several western states, such as Colorado, New Mexico and Arizona. The most noted are the Enchanted Mesa in western New Mexico and Mesa Verde in southwestern Colorado, famous for its cliff-dwelling ruins and created a national park. The word *mesa* is Spanish for table.

Messina, Strait of, a narrow strip of water, 24 miles long and from 2 to 12 miles wide, that connects the Ionian and Tyrrhenian seas and separates the island of Sicily from the southwestern point of the Apennine Peninsula. At the narrow point navigation is difficult because the cross currents are strong. In ancient times mariners dreaded the passage of the strait because they were in danger of being thrown upon the rocks of Scylla on one side or into the whirlpool of Charybdis on the other. In this strait the mirage, Fata Morgana, is observed.

Mexico, a republic of North America, lying partly in the Temperate and partly in the Tropical Zone. With an area of 760,372 square miles it is exceeded in size by only four countries of the New World—Canada, the United States, Brazil and Argentina. It extends more than 1,800 miles northwest to southeast along the southern boundary of the United States, the border states being California, Arizona, New Mexico and Texas. The Rio Grande River, called by the Mexicans the Rio Grande del Norte, forms the natural boundary between Texas and Mexico for 1,100 miles. The population is about 16,552,000. Of this total some 4,600,000 are Indians, 9,000,000 are mestizos and 2,500,000 are whites of Spanish descent.

It is quite usual to refer to the country as having the form of a cornucopia (horn of plenty), for as it extends southward it narrows until at the Isthmus of Tehuantepec between the Gulf of Tehuantepec and the Bay of Campeche its width is only 135 miles. Two peninsulas, however, somewhat dispel this conception. The Peninsula of Yucatan continues northeastward from Tehuantepec, and from the boundary of southern California extends the long, narrow peninsula of Lower California that is separated from the Mexican mainland by the Gulf of California. Bounding the country on the southeast are Guatemala and British Honduras.

Two ranges of the Sierra Madre traverse the country in a northwest-southeasterly direction. Nearly parallel to the 4,574-mile-long Pacific coast is the western range or Sierra Madre Occidental. The eastern seaboard, washed by the Gulf of Mexico and the Caribbean Sea, is paralleled by the Sierra Madre Oriental. These two ranges meet near the Isthmus of Tehuantepec in the Sierra Madre de Sur. Between them is a plateau whose average height is 6,000 feet. The Mexican cordillera contains some of the loftiest peaks on the North American continent. The highest is Mt. Orizaba (18,700 feet). Dominating the valley of Anahuac in which Mexico City is located are the volcanic peak Popocatepetl (17,880 feet) and the glacier-crowned Ixtacihuatl (17,343 feet). Among other peaks are Xinantecatl (over 15,000 feet), Malinche (13,460 feet) and Cofre de Perote (13,412 feet).

The coastal areas in the east, especially in the Peninsula of Yucatan, constitute a humid, junglelike region whose highest part is only 100 feet above sea level. In the north are found extensive semiarid highland plains. The rivers of Mexico include the Conchos (a tributary of the Rio Grande), Panuco, Papaloapam, Coatzacoalcos and Usumacinta. The largest lake is the Chapala.

Economic Resources. Mexico is rich in minerals and metals. Silver mines are found in every state, enabling Mexico to produce at least one-third of the world's supply of this mineral. In recent years the silver production has averaged 75,000,000 fine ounces annually. Next in importance are gold, lead, zinc and copper. Minor minerals and metals include antimony, mercury, arsenium, graphite, iron, tin, cadmium, molybdenum, tungsten, manganese and platinum. Mexico possesses incredibly rich oil fields, nearly all formerly foreign-owned by American and other companies but taken over by the nation in 1938. Production varies from 40,000,000 to more than 175,000,000 barrels a year. The richest petroleum fields are situated in the eastern states of Tamaulipas and Veracruz and in the northeastern part of the Isthmus of Tehuantepec.

Agriculture is the means by which 66 per cent of Mexico's population gains a livelihood. Since the issuance of President Obregon's land decree in 1923 federal lands have been distributed to 1,700,000 Mexican families for development agriculturally. In all there are some 30,000,000 acres under cultivation, a sixth of which are irrigated. In the fertile plateau section corn, wheat, alfalfa, beans, peas, cotton, tomatoes and other vegetables are the staple products. In the warmer coastal sections coffee, sugar cane, tobacco, bananas and citrus fruits are produced in large quantities. Yucatan is famous for its sisal hemp, called *henequen* or *green gold* by the Mexicans; most of it is shipped to the United States to be manufactured into binder twine and rope. Cattle raising is an important occupation in most parts of Mexico. Allied with it is the raising of donkeys, mules, sheep and goats.

The forests cover 44,000,000 acres and are rich in mahogany, rosewood, logwood, pine, cedar and spruce. Chicle, used in the manufacture of chewing gum, is derived from the zapote tree. From the fermented juice of the agave plant the Mexican national beverage pulque is made.

Although Mexico cannot be classed as a great manufacturing country, it has about 50,000 factories. These are engaged in the manufacture of textiles (cottons, woolens, silks and rayons), iron and steel, cigars and cigarettes, flour, paper, chemicals, leather goods, pottery, jewelry, glassware and lacquer.

Mexico has been a republic since it threw off the Spanish yoke in 1822. In accordance with the revised Constitution of 1917 the Federal Republic consists of 28 states, 2 territories and a Federal District comprising Mexico City and a small surrounding area. As a free and sovereign entity each state has its own government. The chief executive is the President, chosen for a 6-year term by popular vote. He is assisted in the discharge of his duties by a Cabinet of 8 to 10 members. The Congress consists of a Senate of 58 members, elected for 6 years, and a Chamber of Deputies of 170 members, elected for 3 years with 1 member representing 100,000 of the population.

Cities. Besides the capital, Mexico City, which is described separately, Mexico has three cities each with a population more than 100,000. They are Guadalajara (180,000), Monterrey (132,000) and Puebla (115,-

Courtesy Mexican Tourist Information Bureau

Carrying Home Rolls of Woven Straw from the Market

Every Mexican Indian has his pallet of woven straw. Sometimes the straw sheets are used to line the walls of a house, and often they are gayly painted for decoration

000). Guadalajara, about 150 miles from the Pacific coast in the state of Jalisco, of which it is the capital, is an important commercial center in the midst of a fertile farming area. It is well known for the artistic pottery and blankets made by the Indians. The city has a good university, a public library, an academy of fine arts and one of the largest and most ornate Roman Catholic cathedrals, dating from 1571. The government palace, built in 1634, is a fine example of Spanish colonial architecture.

Monterrey, located in the northeastern state of Nuevo Leon, is an important railroad center and the main gateway by land into Mexico from the United States. Through it passes the new highway from Laredo, Texas, to Mexico City. Puebla, 60 miles southeast of Mexico City, is the capital of the state of the same name. It is located in a beautiful mountainous district close to the great volcano Popocatepetl. The cathedral, library, Academy of Fine Arts and Government Palace are among its best-known buildings. The city is an active manufacturing center.

Although smaller in population, the two Gulf cities, Tampico and Veracruz, are important as shipping centers, handling the large sea-borne trade with the West Indies and the United States. Mazatlan is the most important Pacific port. Merida at the tip of the Yucatan Peninsula is the center for sight-seeing expeditions to the ancient Mayan capital, Chichen Itza. Here may be seen ruins of a civilization that meant to the New World what the Egyptian and Babylonian civilizations meant to the Old World. Its splendors include the Temple of the Warriors, Astronomical Observatory, Temple of Kukulcan, Temple of the Tigers and the Nunnery in which hundreds of virgins were confined before they were thrown into the Sacred Well as sacrifice to an avenging god. The Archeological and Historical Museum of Yucatan in Merida contains a fine collection of Mayan relics.

Among other popular Mexican resorts are Xochimilco, famous for its *floating gardens*; Oaxaca, noted for the ruins of Mitla and Monte Alban; and the towns of Taxco, Cuernavaca and Cuantla, whose fiestas attract numerous tourists.

Photo by Hugo Brehme, Mexico City

Flower Boat on Lake Xochimilco near Mexico City

Mexico City, the capital of Mexico, located on a plateau in the south central part of the country not far north of the Isthmus of Tehauntepec. Surrounding the Valley of Anahuac, as this section of the plateau is called, are towering and often snow-capped mountains, the most famous of which are the volcanic Popocatepetl (meaning smoking mountain) and Ixtacihuatl (meaning white woman). Mexico City has a large number of thriving manufacturing establishments, in which are made textiles (principally cottons, woolens and hand-drawn linens), boots, shoes and other leather goods, flour, cigars, cigarettes, paper, jewelry, pottery, baskets and furniture. The city proper has an area of 15 square miles and a population of about 1,030,000; the Federal District, in which it is located as the country's administrative center, covers an area of 579 square miles and has a population of 1,230,000.

The most imposing of the city's more than 1,000 squares is the Plaza Mayor or Plaza de la Constitucion, which is laid out as a formal garden and is adorned with statuary. It is famous for the buildings that surround it: On one side is the 675-foot-long National Palace, containing the government executive offices, Senate Chamber and general archives. This palace is also the official residence of the President of the Republic of Mexico. Over its main entrance is the liberty bell, first rung in 1810 by the priest Hidalgo y Costilla when he attempted to foment an insurrection against the Spanish Government; and now rung each Independence Day (September 16) by the President. In one wing of the palace is the National Museum, one of the world's greatest treasure houses in its appeal to the archeologist and ethnologist; its most important exhibits are the huge monoliths—the Sacrificial, Calendar and Great Turtle stones—that are decorated with religious symbols of the Aztecs and the statue of the God of Fire.

On another side of the Plaza Mayor is the twin-towered cathedral, one of the largest churches in the western world; its foundations were laid in 1573 on the ruins of an old Aztec temple (dedicated to Huitzilopochtli, the Aztec titular god) and its construction took almost 300 years. The architecture is Spanish Renaissance, blended with the three Greek orders—Doric, Ionic and Corinthian. Adjoining the cathedral is the 18th-century Sagrario Metropolitano, whose highly ornamented façade is considered one of the finest examples in Latin America of the fantastic, overdecorated Spanish Renaissance style called *Churriguerresque* after José Churriguerra (1650–1723), Spanish architect who introduced the style. The Municipal Palace or City Hall faces a third side of this square; and on the fourth are some of the city's smartest shops.

Among Mexico City's other notable buildings are: the National Library, housed in the old Church of St. Augustine; Palace of Justice; Palace of the Chamber of Deputies; Central Post Office; and the Pantheon of San Fernando, in which the greatest Mexicans are buried or commemorated. The Palace of the Ministry of Education is decorated with murals by Diego Rivera, depicting the lot of the Mexican workers from earliest times. There are also the national art gallery, known as the San Carlos Academy; Lindbergh Outdoor Theater; and the imposing building housing the Palace of Fine Arts and the National Theater, noted for its magnificent curtain of glass mosaic showing Mts. Popocatepetl and Ixtacihuatl. The National University of Mexico, founded in 1553 and reopened in 1910 after having been closed 45 years previously during the troubled reign of Maximilian, is one of the oldest and most famous of Latin-American institutions. The city is noted for its many imposing monuments, commemorating the achievement of independence from Spanish rule in 1824 or extolling celebrated patriots and statesmen, such as Benito Juárez, Gen. Alvaro Obregón and the Indians' friend, Fray Bartolome de las Casas. Most of these are erected in circular parked expansions of the principal avenues called *glorietas*.

At one end of the city's finest boulevard, the Paseo de la Reforma, is the Alameda or public garden, and at the other end on the 200-foot-high crest of Chapultepec (meaning grasshopper hill) is Chapultepec Castle, the summer home of the President of Mexico, in an attractive park bearing the same name. One wing of the castle is occupied by the National Military School. This castle figured in the last battle before the capitulation of the city during the war between Mexico and the United States (1846–48). At the base of another suburban hill, Guadalupe, is the famous shrine to the Virgin of Guadalupe. The suburb of San Juan Teotihuacan contains such ruins of the Aztec civilization as the Pyramids of the Sun and Moon, the Highway of the Dead and the Temple of Quetzalcoatl. The national tree of Mexico is the *ahuehuete,* a gigantic species of cypress; under one in the suburb of Popolta, called "the tree of the sad night," Hernando Cortes is said to have bewailed his defeat by the Aztecs July 1, 1520.

Mexico City, which was founded in 1325, was named for the Aztec war god, Mexitli. The splendors of this ancient city aroused in Cortés and his Spanish adventurers, on their reception by Montezuma, the desire to dispossess the Aztec emperor. This they finally succeeded in doing in 1521. During the 300-year Spanish regime Mexico City was the capital of the viceroyalty of New Spain.

Mexico, Gulf of, a great arm of the Atlantic Ocean, extending 1,000 miles in width and 750 miles in length and having an area of about 700,000 square miles. It is bordered on the east by Cuba and Florida; on the north by Florida, Alabama, Mississippi, Louisiana and Texas, and on the west by Texas and Mexico. The Straits of Florida to the north of Cuba connect it with the Atlantic Ocean; the Yucatan Channel between the Yucatan peninsula of Mexico and Cuba connects it with the Carribean Sea. The Bay of Campeche at the eastern end of the Isthmus of Tehuantepec is the largest indentation on its coast. The Mississippi and the Rio Grande are the most important rivers emptying into the Gulf of Mexico. Other smaller streams flowing into it are the Sabine, Brazos and Colorado in Texas, the Pearl in Mississippi, the Alabama and Tombigbee in Alabama and the Appalachicola and Suwannee in Florida. The principal cities on the gulf are Havana, Cuba; Tampa and Pensacola, Fla.; Mobile, Ala.; New Orleans, La.; Galveston, Tex.; and Tampico and Veracruz, Mexico. In the Gulf of Mexico originates the Gulf Stream.

Michigan, a state of the Great Lakes district that is one of the most irregularly shaped in the United States. The outlet of Lake Michigan divides it into two parts. The lower, larger portion, shaped like a mitten, lies between Lake Michigan on the west and Lake Huron on the east, with Lake St. Clair and the connecting straits (Detroit and St. Clair rivers) extending the latter boundary to the western end of Lake Erie. Ohio and Indiana lie to the south. The smaller northern portion of the state, known as Upper Michigan, lies on the southern shore of Lake Superior, with Wisconsin forming the southern, and Lake Michigan the eastern, side of its triangular boundary. The entire state has an area of 57,980 square miles, of which its 6,000 tiny lakes form 500 square miles. The population, approximately 5,256,106, is found mostly in the lower section, and about two-thirds of its people live in cities and towns.

Lower Michigan is generally flat, with no conspicuous topographic features. The upper peninsula has a rougher surface, and the highest elevation is more than 2,000 feet above sea level. The rivers are short and of little economic importance, but the bordering Great Lakes are of tremendous value to the state as arteries of trade. The canals at Sault Ste. Marie, at the outlet of Lake Superior, carry more commerce than the Panama or Suez Canal; their traffic is estimated at 42,000,000 tons annually. Through the Detroit River about 73,000,000 cargo tons pass annually.

Rainfall is ample for agriculture, but severe winter weather limits extensive farming activity to the lower third of the state. Here sugar beets, corn, oats, potatoes, apples, cherries and other hardy crops are grown. The northern sections are mostly covered with scrub timber, which has succeeded the magnificent evergreen forests ruthlessly cut in the 1870s and 1880s. Reforestation projects are slowly reviving this once leading industry of Michigan. Fishing and trapping continue to employ many people.

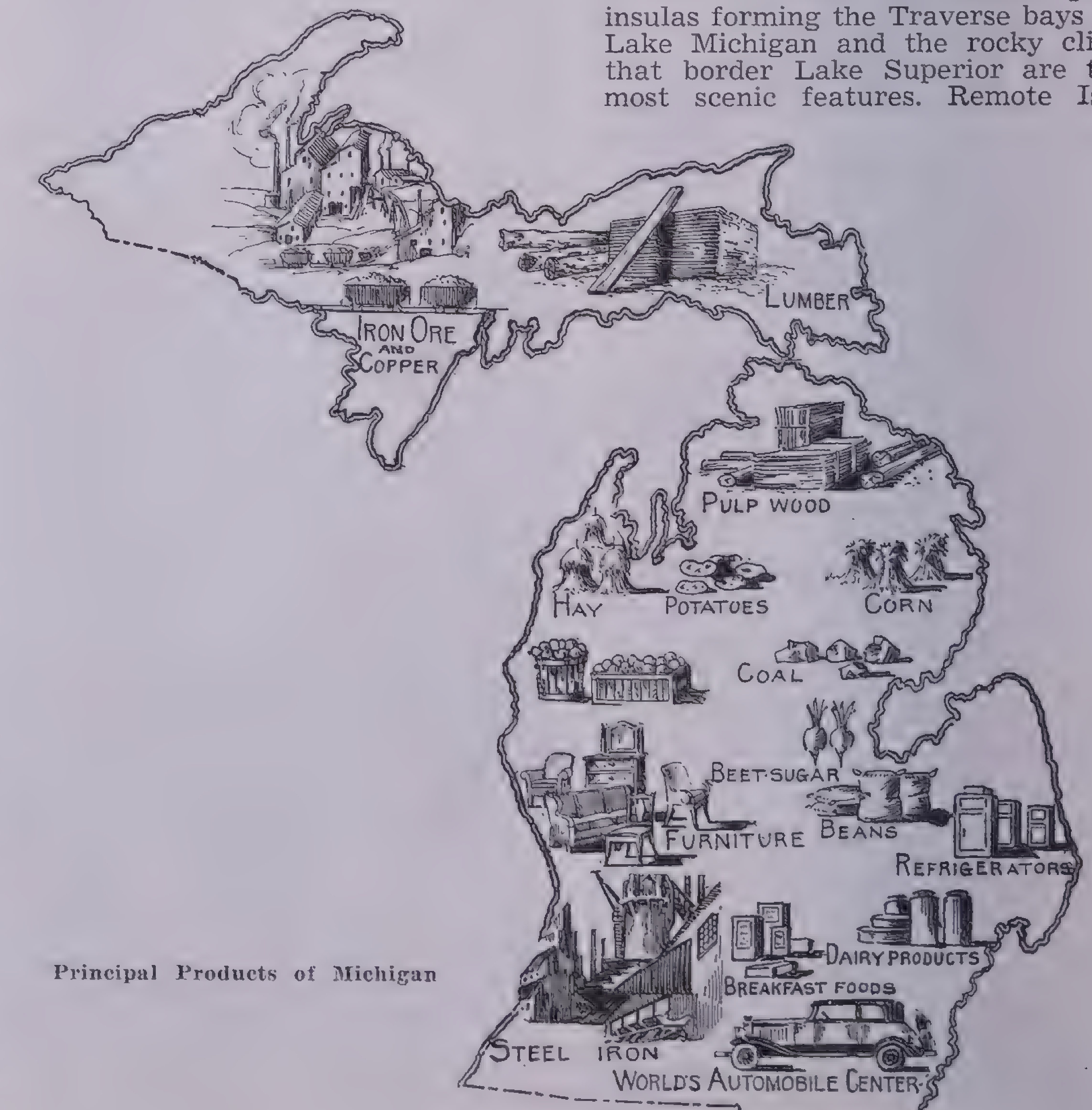
In the northern peninsula the soil is thin and poor, but the mineral wealth is great, and copper and iron ores are produced in immense quantities to be shipped down the Lakes for processing. Salt is also an important mineral product, while limestone is quarried along the lake shores for use in iron furnaces.

In the 20th century southern Michigan has developed with remarkable swiftness into a manufacturing district of first importance. Detroit has become the principal world center for automobile manufacture, and hundreds of smaller dependent factories have sprung up there and in nearby cities.

Detroit, the principal city, is described elsewhere. Dearborn, a suburb, has the great Ford factories. Other important centers of the automobile industry are Flint, Pontiac and Lansing, the capital. Grand Rapids, the second city in size, has varied manufacturing interests in addition to its great furniture trade. Jackson, Bay City, Kalamazoo, Muskegon, Saginaw and a score of smaller cities have diversified manufactures. Battle Creek is known for its breakfast cereals and sanitoria.

The University of Michigan at Ann Arbor and Michigan State College at East Lansing are large state institutions. Wayne University and the University of Detroit, both at Detroit, also have large enrolments. The Michigan College of Mines at Houghton is an outstanding school in that field.

Michigan's long shorelines, swept by lake breezes, are dotted with summer-resort colonies and camps. Mackinac Island, at the entrance to Lake Michigan, is particularly favored in situation. The narrow peninsulas forming the Traverse bays on Lake Michigan and the rocky cliffs that border Lake Superior are the most scenic features. Remote Isle



Principal Products of Michigan

Royale, 45 miles in length and far out in Lake Superior, is being developed as a national wilderness reserve and park.

Michigan, a lake that ranks third in size among the five Great Lakes of North America and is the only one of these lakes that does not form a part of the boundary between the United States and Canada. It has an area of 22,400 square miles and a depth of about 870 feet and is bounded by Michigan on the north and east, Indiana on the southeast, Illinois on the southwest and Wisconsin on the west. Its largest arms are Green Bay (100 miles long) in Wisconsin and Grand Traverse Bay (30 miles long) in Michigan. The waters of Lake Michigan drain into Lake Huron through the Strait of Mackinac. The lake is connected with the Mississippi by the Chicago River, the former Chicago Drainage Canal, and the Des Plaines and Illinois rivers. The Kalamazoo, Manistee and Muskegon rivers flow into it from Michigan and the Menominee and Fox from Wisconsin. Cities on its shores are Chicago, Ill., Milwaukee, Racine and Manitowac, Wis., and Muskegon, Mich. Dangerous storms are prevalent on Lake Michigan, and its upper part is often frozen over in winter months.

Michigan Avenue, a wide boulevard in Chicago, in some parts of the city only one block west of Lake Michigan. Along it and its northern extensions—the Gold Coast, Lake Shore Drive and Sheridan Road—are some of the most imposing skyscrapers, hotels, apartment houses and private residences in the United States. The most famous of these are the Tribune Tower, Wrigley, Straus and Palmolive buildings and the Art Institute of Chicago.

Micronesia, the islands of the Pacific Ocean that are situated between the Melanesian group on the west and the Polynesian on the east and extend from 30° N. Lat. to 5° S. Lat. They include the Marianas, Palau, Caroline, Marshall, Gilbert and Ellice groups. Most of them came under Spanish sovereignty in the 16th century. The Marianas, Palau, Caroline and Marshall islands, former German possessions, have been held by Japan under mandate from the League of Nations since 1920. Gilbert and Ellice islands together constitute a British Crown colony. Most of the Micronesian peoples are divided into clans in which descent is on the mother's side. There are four castes, including the chiefs, nobles, freemen and serfs. *Micronesia,* derived from the Greek, means small islands.

Milan, a city of Italy, capital of the province of Milan in the Lombardy section and located on the Olona River. With a population of 992,036 it is next to Rome the largest Italian city. It is the greatest railroad center of the country and has one of the largest terminals in Europe, completed in 1935, where 800 trains arrive and leave daily. It is also the leading financial city. The principal industries are the construction of railway equipment, including locomotives and cars, turbines, bridges, telephone and telegraph equipment, automobiles, chemicals, musical instruments and textiles, such as silk, rayon, cotton, linen and woolen goods. Milan leads other Italian cities as a publishing center.

The most famous building in Milan is the great Gothic cathedral, third in size among churches on the Continent, being exceeded only by St. Peter's in Rome and the Cathedral of Seville. Its length is 486 feet and its width, 189 feet. The exterior is adorned with upward of 2,000 statues, and the upper structure, 356 feet high, is a maze of spires and pinnacles, even the highest of which are crowned with statues. The interior is equally splendid; its great marble spaces are rich with the glowing color of stained glass. The relics of St. Charles repose in a crystal shrine in the subterranean chapel. The cathedral, begun in 1386, was completed by Napoleon during 1805–13. It was the scene on May 26, 1805, of Napoleon's coronation as king of Italy.

The Royal Palace and Archiepiscopal Palace face the cathedral across the mosaic-paved Piazza del Duomo. In the center of this square is a bronze equestrian statue of Victor Emmanuel II. The Piazza del Duomo is connected with the Piazza della Scala by the glass-covered, shopping arcade, the Galleria Vittorio Emanuele. The Piazza della Scala takes its name from the Scala Theater, noted throughout the musical world for more than two centuries as the home of Italian grand opera.

Among famous churches of Milan are the medieval San Ambrogio and San Lorenzo and the modern San Carlo Borromeo. San Ambrogio was built on the site where St. Ambrose baptized St. Augustine in 387; it was the scene until the 8th century of the coronation of the kings of Lombardy. Santa Maria delle Grazie, the abbey church of a suppressed Dominican monastery, is noted for Leonardo da Vinci's tempera work, *The Last Supper,* painted at the request of one of the Sforza dukes on a wall of the refectory. It is said that during Napoleon's occupation of the city in 1796 the head of Judas was used as a target by his troops. The best examples of Milan's modern architecture are the Palace of Justice, Stock Exchange and magnificent marble Railroad Station.

Milan's art treasures are housed in the Brera Palace that serves as the home of the Academy of Fine Arts and Sciences. The Sforza Castle, in front of which Napoleon's Arch of Peace was begun, is noted for its archaeological exhibits. A musical museum commemorates Giuseppe Verdi, the Italian opera composer whose success at La Scala during the latter part of the 19th century was repeated at leading opera houses throughout the world. Among educational institutions are the University of Milan, the School of Engineering and the Conservatoire of Music.

The name *Milan* (Italian *Milano*) is a corruption of the Latin *Mediolanum,* which is probably Celtic in origin and of unknown meaning. The city became the capital of the Gallic peoples, called *Insubres,* who settled in the Lombardy plain in the 4th century B.C. In 194 B.C. it was captured by the Romans.

Minnesota, a state of the United States, the northernmost in the Mississippi Valley. A projection from the middle of its northern border is the most northerly part of continental United States. The state is 400 miles long

Courtesy Italian Tourist Information Office

La Galleria, Milan

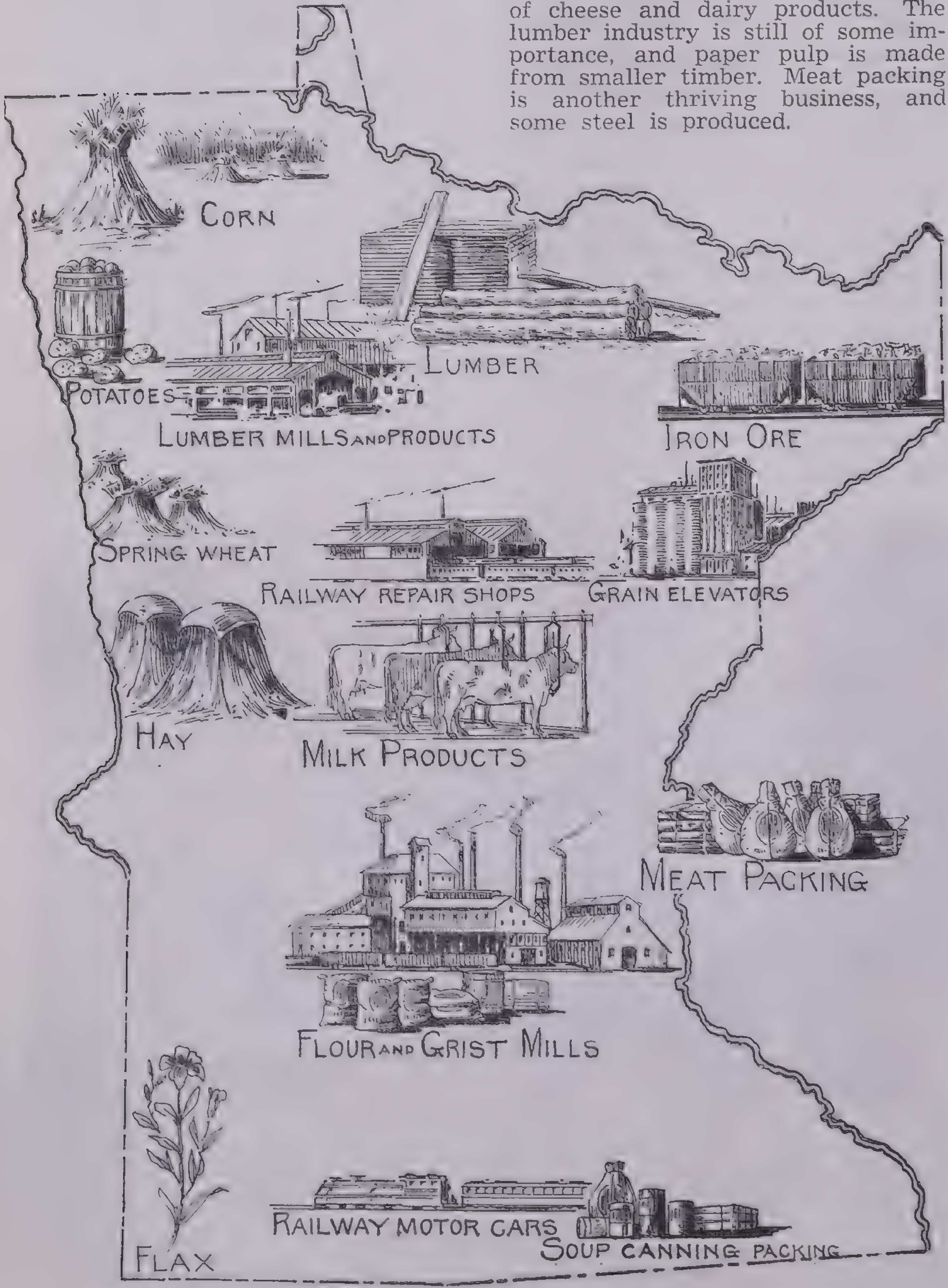
The glass-covered arcade called the *Galleria Vittorio Emanuele* connects the Piazza del Duomo and Piazza della Scala. It is built in the form of a Latin cross, 960 feet long and 48 feet wide; the central cupola is 160 feet high. Some of Milan's finest shops and restaurants are located in this area and 350 miles wide. Its irregular boundaries include an area of 84,682 square miles, of which 3,824 make up the surface of its thousands of small lakes. Manitoba and Ontario bound the state on the north, Lake Superior and Wisconsin on the east, Iowa on the south, and South Dakota and North Dakota on the west. Within these borders is the geographical center of North America. The population, about 2,792,300, has doubled in the last 50 years.

Most of its surface is a rolling prairie through which the larger streams have cut winding valleys. Around the head of Lake Superior are scattered low mountains, while the northwest corner is the flat and fertile bed of an ancient lake. Streams rising in Minnesota drain into Hudson Bay, the Atlantic Ocean and the Gulf of Mexico. The source of the Mississippi River is in the north central section. Other important rivers are the Minnesota and the Red, the latter on the western boundary. Lake Superior is a commercial waterway of immense economic importance.

Minnesota experiences long and bitterly cold winters, but the summers are warm enough to produce bountiful crops, especially of wheat, corn, barley and oats. Most of the forests that originally covered the state were cleared before the end of the last century, but timber is still an important resource.

The richest iron-ore beds in America lie in Minnesota near the head of Lake Superior, and the state ranks first in the nation in the production of this basic mineral, which is hauled by the shipload to furnaces on the lower Great Lakes.

Miscellaneous manufactures now employ many of Minnesota's citizens. Its flour mills are the world's greatest, and it produces large quantities of cheese and dairy products. The lumber industry is still of some importance, and paper pulp is made from smaller timber. Meat packing is another thriving business, and some steel is produced.



Principal Products of Minnesota

Minneapolis, the most important city and the principal manufacturing center, produces more flour than any other city in the world. Intense rivalry exists between Minneapolis and its neighbor, St. Paul, the state capital. Both cities are important banking and trade centers, not only for Minnesota but for the entire northern plains region west to the Rockies. The stockyards of St. Paul are among the greatest in America. It is also noted for its Capitol, Public Library and Roman Catholic Cathedral. Minneapolis and St. Paul are often called the *Twin Cities*. Their populations are respectively 492,370 and 287,736.

Duluth, the third city in size, is the leading port on Lake Superior and handles tremendous quantities of iron ore, wheat, lumber and coal. Rochester is the seat of the world-famous Mayo Clinic.

The University of Minnesota at Minneapolis is the leading educational institution. The state has several important smaller colleges, such as Hamline at St. Paul and St. Olaf and Carleton at Northfield.

Water sports draw summer visitors to all parts of Minnesota, and the remnants of the great North Woods afford good fishing and hunting in season. The picturesque lakes and winding streams are the chief sources of natural beauty. In the wild country along the northeastern border a huge international game preserve and sportsmen's retreat is under development.

mirage, an optical illusion often seen at sea, on arid plains or deserts and on the icy wastes of the Polar Regions. It is a phenomenon in which distant objects, such as ships, houses, clusters of trees, small lakes and, in the Polar Regions, great crevassed areas of ice, may be seen near at hand and in places where one knows they are not supposed to exist; especially suspended in the sky. These objects often appear in an inverted position and may be greatly magnified.

A land mirage is generally caused by the reflection produced when light, in reaching an observer from a distant object, has passed through layers of air unequally heated and accordingly of unequal density. If the difference in density between two layers of air is great enough, the common surface will act as a mirror, much as the surface of water acts, and accordingly objects may be seen by reflection. Because the surface is not smooth and well defined, there will be continuous shimmering and change in the image; this frequently gives the effect of a sheet of water ruffled by the wind.

The appearance of the mirage is governed chiefly by the height above the earth's surface of the reflecting layer of air. If the reflecting surface is below the eye level of the observer, as is usually the case in desert regions on account of the low position of the abnormally heated stratum of air, the mirage will appear near the horizon, and the object reflected will be a vague, distorted image of sky and cloud. In Polar Regions and at sea, on the other hand, the reflecting surface is usually high above the observer because the cooler and denser layer of air is near the surface of the water, and the mirage is a reflection of distant terrestrial objects apparently suspended in the sky. The observer's imagination undoubtedly contributes something to the subjective effect of a mirage, filling in details and giving a familiar interpretation to fantastic images.

Some famous mirages are the Fata Morgana, seen in the Strait of Messina, and the Specter of the Brocken, a looming or magnification seen in the Harz Mountains of central Germany. The word is derived from the French *mirer,* meaning to look at carefully. Gaspard Monge, the French mathematician who accompanied Napoleon on his Egyptian campaign of 1798, gave the first scientific explanation of the phenomenon.

mire, an area of wet, boggy earth, similar to a swamp, which is often of considerable depth and yields easily to pressure.

Mississippi, a state of the United States in the Gulf-coast section. Of the area of 46,865 square miles 503 are water surface. The Mississippi River forms the western boundary, with Arkansas and Louisiana beyond. A projection of Louisiana and the Gulf of Mexico bound the state on the south; Alabama is on the east, and Tennessee on the north. Of the population of about 2,183,796 more than 50 per cent are Negroes, and only 20 per cent of the people live in towns and cities.

The surface of the state is rolling, sloping gently to the south and west from a more hilly region in the northeast. The highest elevation is only 806 feet above sea level. The Mississippi River is the principal waterway, and the western section owes much of it fertility to the periodic floods of that stream and of the Yazoo, its principal tributary within the state. The Pearl River drains the central and southern sections. Along the Mississippi there are many bayous and oxbow lakes of local importance. The Gulf coast is penetrated by several bays. A string of low sandy islands parallels the shore, protecting it from storms.

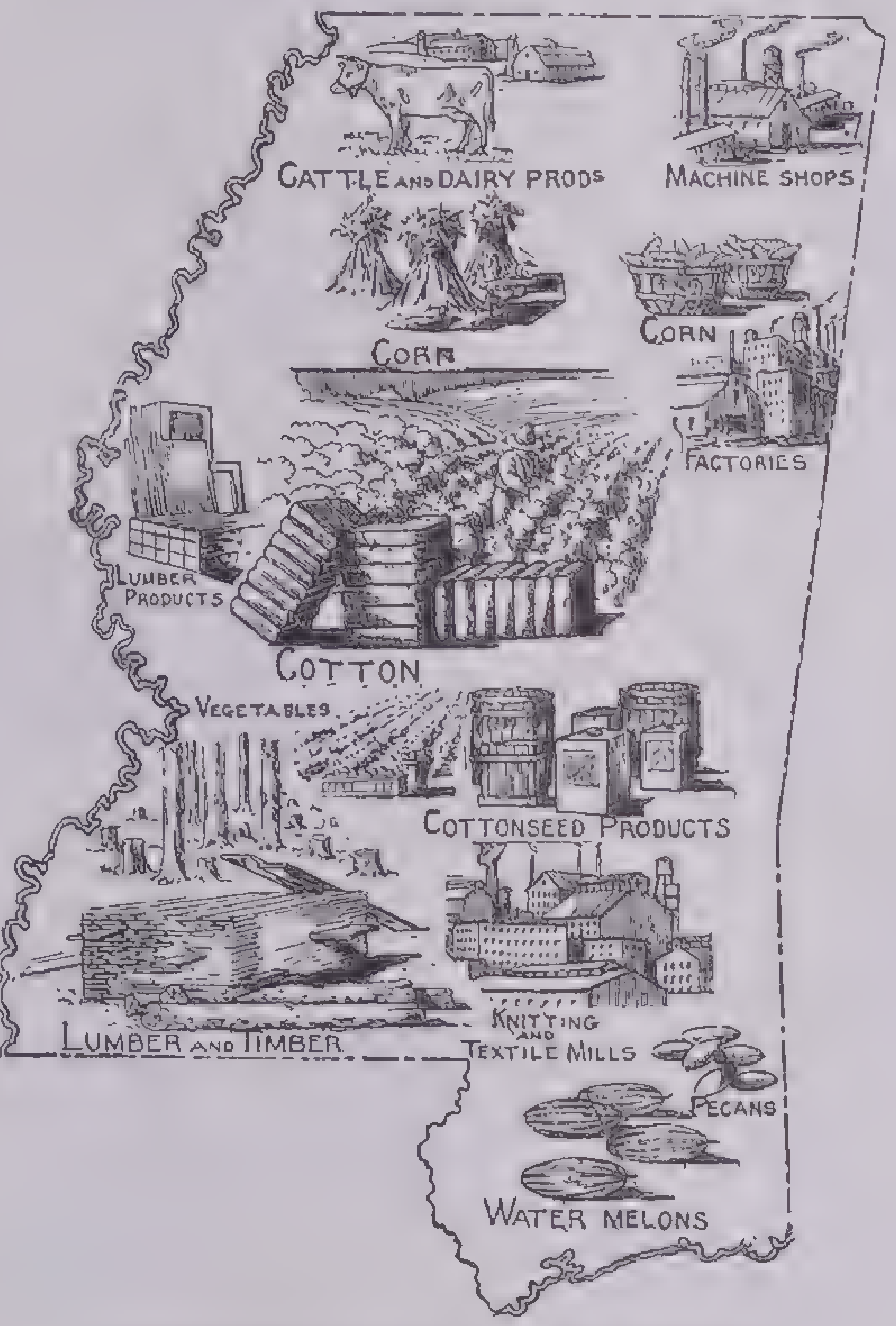
Mississippi has a subtropical climate, with short, mild winters, long, hot summers and generous rainfall. In the Delta region lying between the Yazoo and Mississippi Rivers is some of the most productive farmland in America, ideally adapted to cotton growing, in which the state takes high rank. Corn and peanuts are also valuable crops. The production of melons, fruits and vegetables for northern markets is of increasing importance.

There is great wealth in the pine forests of southern Mississippi. Huge lumber mills have been operating here for years, but timber cutting is so controlled that a continuous supply is assured. Hardwoods are cut in the western section in quantity.

Manufacturing is conducted on a small scale in the state. By-products of the timber and cotton industries form the chief output. The fishing fleets of the Gulf-coast towns bring in great hauls of oysters, shrimp and other sea food to be canned there. Mineral production is only of local importance.

Mississippi has no large cities. Jackson, the capital, has shown rapid growth since the World War. Meridian and Vicksburg are other important trade centers, and Gulfport is the principal port. Much of the commerce of the state crosses its borders to the greater centers in its neighbor states.

The University of Mississippi at Oxford and Mississippi State College at Starkville are the leading educational institutions.



Principal Products of Mississippi

Along the sheltered Gulf coast are several winter resorts of growing popularity. Biloxi, Pass Christian, Gulfport and Bay Saint Louis share this advantageous situation with several smaller towns. The annual spring pilgrimage to the old houses and gardens of Natchez has become an established custom, and the National Military Park at Vicksburg is much visited for its historic memorials and attractive landscapes.

Mississippi, the main stream of the great river system that drains the entire central section of the United States between the Rockies on the west and the Appalachians on the east and extends from the Great Lakes and Minnesota lake region on the north to the Gulf of Mexico. The Mississippi is 3,486 miles long and, with its tributaries, drains an area of 1,257,000 square miles. It is navigable by steamships to Minneapolis, Minn. Locks and dams have been built around such obstructions as the rapids near Keokuk, Iowa, and the channel has been deepened by dredging in several places.

The Mississippi forms the boundary between the states of Wisconsin, Illinois, Kentucky, Tennessee and Mississippi on the east and those of Minnesota, Iowa, Missouri, Arkansas and Louisiana on the west. Its largest affluent is the Missouri. Other tributaries are the Chippewa, Wisconsin, Illinois, Kaskaskia, Ohio and Yazoo from the eastern watershed; the Minnesota, Des Moines, Arkansas and Red from the western. Cities along its course are St. Cloud, Minneapolis, St. Paul and Winona, Minn.; La Crosse and Prairie du Chien, Wis.; Dubuque, Davenport and Burlington, Iowa; Moline, Rock Island, Quincy, East St. Louis and Cairo, Ill.; Hannibal and St. Louis, Mo.; Wickliffe and Hickman, Ky.; Memphis, Tenn.; Helena and Arkansas City, Ark.; Greenville, Vicksburg and Natchez, Miss.; Baton Rouge and New Orleans, La. Minneapolis and St. Paul are great grain and mill centers; St. Louis with East St. Louis is a great railroad center; New Orleans is a great port near the Gulf of Mexico.

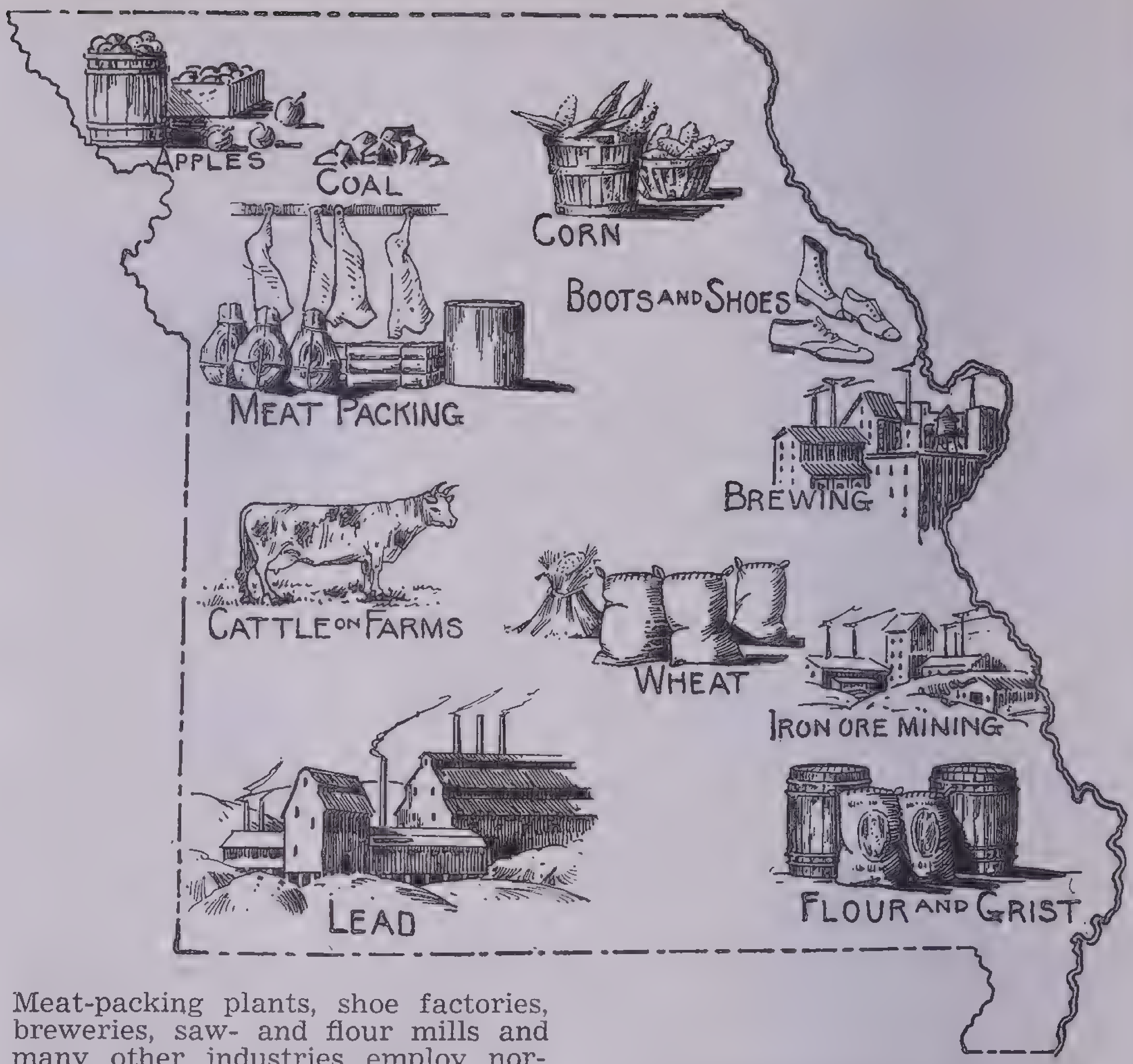
In its upper reaches the Mississippi is clear and swiftly flowing, but after the muddy waters of the Missouri enter it near St. Louis, it becomes broad and muddy and spreads out in oxbow lakes and bayous. It carries much sediment that over many centuries has formed a delta, 12,500 square miles in area, across which the several mouths discharge into the Gulf of Mexico. Although its natural levees have been reinforced for flood protection, the river has many times overflowed its banks and caused incalculable damage. The worst disaster of this kind occurred in 1927 when nearly 28,000 square miles were inundated. As a result of the terrific loss of life and property, Congress approved a flood-control plan that includes reforestation of the watersheds and the construction of reservoirs on the tributaries and of larger and better levees.

The Mississippi was discovered by De Soto in 1541, and its upper part was explored by Jolliet and Marquette in 1673. La Salle found its mouth in 1682 when he claimed Louisiana for France. There were French trading posts at various points along the river from 1700 until the sale of Louisiana to the United States in 1803. Henry R. Schoolcraft found the source of the Mississippi in Lake Itasca, Minnesota, in 1832; the first steamboat traveled on the Mississippi in 1811.

The name *Mississippi* is an Indian word, meaning great water or the father of waters.

Mississippi Highway, a road extending through the Mississippi Valley from Ely, Minn., to Gulfport, Miss.

Missouri, a state of the United States in the heart of the Mississippi Valley. Of its area of 69,420 square miles only 1 per cent is water surface. Iowa bounds the state on the north; Illinois, Kentucky and Tennessee, on the east; Arkansas, on the south; and Oklahoma, Kansas and Nebraska, on the west. The Mississippi River forms all of the eastern boundary, and the Missouri River, half of the western. At Kansas City the Missouri swings east to bisect the state, merging with the Mississippi above St. Louis. In population Missouri ranks 10th among the states, with about 3,784,664 inhabitants.



Principal Products of Missouri

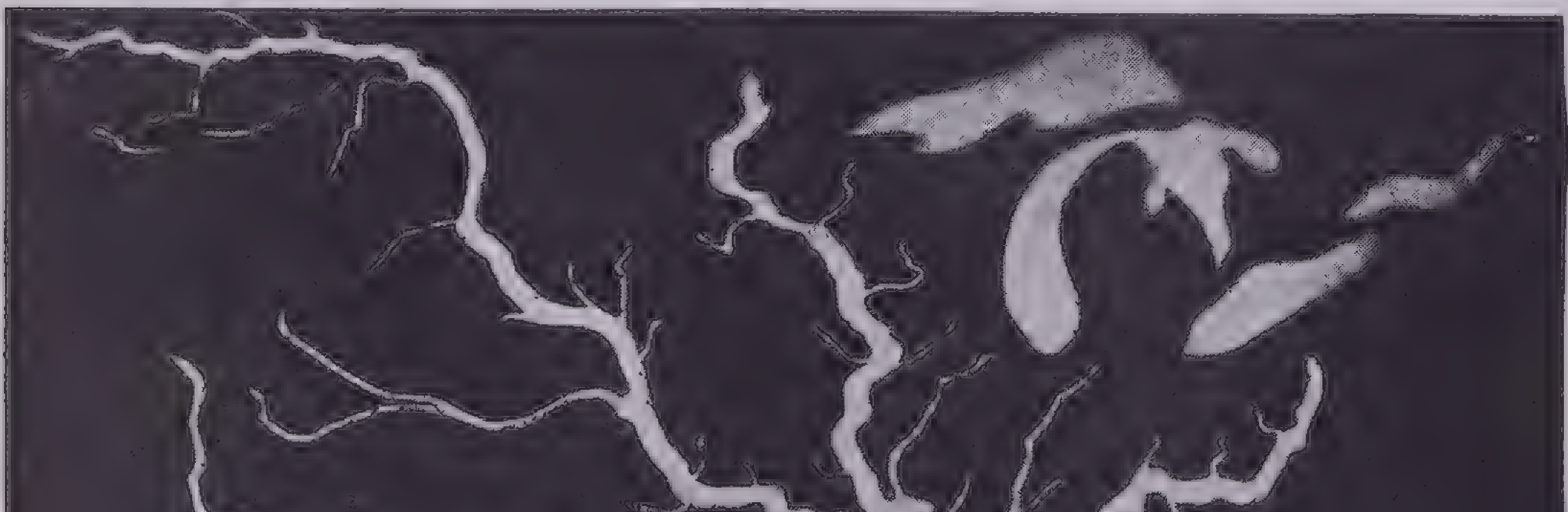
Most of the surface is a rolling prairie well adapted to farming. In the south and southwest the Ozark mountain section is more rugged, with many narrow ravines and abrupt hillsides. In the southeast a small section exhibits the characteristic flat, swampy terrain of the lower Mississippi Valley. Many tributaries of the two great rivers provide excellent drainage; the Osage and the St. Francis are the most important of these. The Osage is dammed near the edge of the Ozark uplift to form a narrow lake (the Lake of the Ozarks) that winds for 125 miles back into the hills.

Missouri has a typical continental climate, with hot summers and cold winters though the temperature variations are smaller than in the more northerly states. Rainfall is usually ample for agriculture. Of the forests that once covered much of its area only remnants are left, principally in the Ozarks, and about three-fourths of the land is used for farming.

Its geographic position permits an unusually wide range of crops to be grown successfully in Missouri. Cotton thrives in the southeast, and hay, wheat and oats in the extensive prairie sections. Corn is the leading field crop. Most of it is consumed in the state by hogs and cattle grown for the stockyards and packing plants of Kansas City, St. Joseph and other centers. Missouri mules are the best-known livestock, and many thousands are exported yearly. A large acreage is devoted to commercial orchards.

The lead mines of the state are the most productive in the Union. Coal, clay, sand and zinc ores are other valuable mineral products. Manufacturing is diversified and important. Meat-packing plants, shoe factories, breweries, saw- and flour mills and many other industries employ normally about 200,000 persons.

St. Louis, the principal city, is separately described. Kansas City, second in importance, has shown consistent growth, and with a population of 400,000 is now among the 20 largest cities of the United States. It is a distributing and marketing point for a tremendous area to the west and south. Kansas City's exceptional railroad connections have contributed greatly to its prosperity. The terraces that rise from the Missouri River have been developed with parks and scenic drives that rank high among such civic improvements; the Nelson Art Museum is outstanding.



From the Farm Security Administration film, The River

Two-Thirds of the Continent Is Drained by the Mississippi

Mark Twain called the basin of the Mississippi the Body of the Nation. "All the other parts are but members, important in themselves, yet more important in their relation to this. Exclusive of the Lake basin and of 300,000 square miles in Texas and New Mexico, which in many aspects form a part of it, this basin contains about 1,257,000 square miles. In extent it is the second great valley of the world, being exceeded only by that of the Amazon . . ." (*Life on the Mississippi*)

St. Joseph is the third city in importance. It has meat-packing plants and varied manufactures and considerable wholesale trade. Springfield is the principal business center of the Ozark region. Jefferson City is the capital.

In addition to the University of Missouri at Columbia, the Missouri School of Mines at Rolla and St. Louis and Washington Universities at St. Louis there are several important smaller colleges.

Missouri has many lakes and caves, bluffs and hills to diversify its scenery. In the vicinity of Hannibal are interesting reminders of its famous son, Mark Twain.

Missouri, the largest tributary of the Mississippi River that in itself is one of the longest rivers of the world (2,945 miles). It is formed by the junction at Three Forks in southwestern Montana of the Jefferson River that rises in the Red Rock Range of the Rocky Mountains and of the Madison and Gallatin rivers that rise in Yellowstone Park. It flows in a generally southeastern direction across Montana, through North and South Dakota and forms much of the boundary between Iowa and Nebraska and a part of that between

Missouri and Kansas; then it flows eastward across Missouri to a point 18 miles above St. Louis, where it pours its muddy waters into the Mississippi. Its tributaries are the Milk, Yellowstone, White, Niobrara, Dakota, Platte, Kansas and Grand. Cities along its course are Grand Falls, Mont.; Bismarck, N. D.; Pierre, S. D.; Sioux City and Council Bluff, Iowa; Omaha and Nebraska City Nebr.; Atchison, Leavenworth and Kansas City, Kan.; St. Joseph, Kansas City, Jefferson City, Washington and St. Charles, Mo. The Missouri is navigable from its junction with the Mississippi for 2,285 miles upstream to the city of Fort Benton, Mont.

The mouth of the Missouri was discovered by Jolliet and Marquette in 1673. Its use as a westward route for fur traders began in 1700. Steamboats began to navigate on it in 1830 and together with the Mississippi it was the most important traffic route of the west until the advent of the railways.

The name *Missouri* comes from two Indian words meaning great and muddy.

Mohawk Trail, a highway retracing the original path of the Iroquois Federation and connecting the Hudson and Connecticut valleys. Among the important towns on this route are East Northfield (site of the preparatory schools established by Dwight L. Moody), Greenfield (of French and Indian War fame), North Adams (an industrial city) and Williamstown (seat of Williams College). For part of the way the highway follows the Deerfield and Cold rivers.

Molucca Islands, the many small islands of Netherland India that lie in the Banda and Arafura seas between Celebes and New Guinea and extend south to the Timor Archipelago. They are largely of volcanic formation and may be divided into six groups, whose principal islands are Ternate, Obi, Amboyna, Banda, Larat and Kei. The Dutch part of New Guinea also is included in their administrative district whose center is Ternate. The total area is 192,453 square miles, and the population, which has a mixture of Malayan, Papuan and Polynesian blood, numbers 893,000. Since the temperature and soil are well adapted to the production of spices, such as nutmegs, cloves and peppers, the islands are sometimes called the *Spice Islands.* Copra, coffee, indigo, rice, cacao, sago and tobacco also are exported. The Moluccas were discovered by the Portuguese in 1512; they have been owned by the Netherlands since the early part of the 17th century. The name means king in Arabic.

Monaco, a principality whose area of only 8 square miles and population of 22,153 make it one of the smallest independent, sovereign states of Europe. Situated on the Mediterranean coast, it is surrounded on all three land sides by the French Department of the Alpes Maritimes. Its governing head is the prince of Monaco, who ruled absolutely until 1911; since then legislative control has been shared by the National Council of 21 members, elected by popular vote for 4 years.

The chief agricultural products are olives and citrus fruits. Manufactures include perfumes and liqueurs. For almost 100 years the principality has encouraged the development of resorts whose principal attraction are world-famous gambling casinos; from these casinos the state has derived most of its revenue. The principal center for these games of chance is Monte Carlo, although gambling facilities exist in Monaco, the capital, and in its newer section, called *La Condamine.* The capital is noted for its Byzantine Cathedral of St. Nicholas, a Renaissance palace and oceanographic and historical museums, portraying the principality's history since the days of the Phoenicians in the 5th century B.C. Monaco was called *Monoecus* by the Greeks, an epithet of Hercules to whom there was a temple on the headland. So the Italian name comes from the Greek.

monadnock, an isolated mountain or hill of hard rock that projects above a more or less level plain. It is found in an area that was once mountainous but the softer parts of which have been worn down to a general level. The word *monadnock* is taken from the name, Mt. Monadnock (in southwestern New Hampshire), which is an outstanding example of this formation. The name is Indian and means supernatural hill country; the first syllable is the same as in the Indian word *manito,* spirit or god.

Mongolia, a territory occupying the central Asiatic plateau between the U.S.S.R. and China. Sinkiang is on the west and Manchukuo on the east. Its center is the Gobi Desert that covers an area of 500,000 square miles. The rest of the country is mostly mountainous; the ranges are the Altai, Tien Shan, Khingan, Tarbagata and In Shan. All are rich in silver, gold, iron and copper. On the plains between these ranges the seminomadic Mongols raise sheep, horses and camels. The chief exports are wool, hides and furs. With the aid of water from the Salenga, Irtish and Shiramuren rivers they irrigate patches of land on which to raise crops of the North Temperate Zone. The area of all Mongolia exceeds 1,367,000 square miles, and the population is about 2,500,000.

Mongolia is divided into two distinct parts—Outer Mongolia and Inner Mongolia. Outer Mongolia, also called the *Mongolian Republic,* has a Soviet form of government. The Chinese suzerainty is recognized by the U.S.S.R., so that nominally the territory belongs to China. But since 1921 there has been a military alliance, between Outer Mongolia and the U.S.S.R., which is pledged to assist Outer Mongolia in case of attack by the Japanese. Outer Mongolia has an area of 850,000 square miles and a population of 550,000. The capital is Ulan Bator Khoto (formerly Urga). It used to be the seat of a theocratic ruler called the *Living Buddha,* who was supposed to be the incarnation of one of Buddha's disciples; since the death of the last such ruler no successor has been chosen. Inner Mongolia, the section south of Outer Mongolia adjoining China proper, consists of the provinces of Ningsi, Chahar, Suiyuan and Jehol, but all except Ningsi have been occupied by Japan.

The name *Mongolia* means the land of the Mongols.

monsoon, any wind that blows regularly in one direction at one fixed season and in the opposite direction at another fixed season; and in particular the wind that accompanies the southwest or the northeast monsoon drifts in the Indian Ocean and the Japan Current in the Pacific Ocean. It arises from the unequal heating of the atmosphere over land and that over water; and it is in reality part of local trade winds that cause cool ocean winds to replace warm currents of land air in summer. In winter the cool land air rushes in to replace the warm air that accompanies some of the ocean currents.

The monsoon also affects the seasons, in that it ushers in the rainy season in various countries. The southwest monsoon (which originates in the Pacific and Indian oceans at about 25° S. Lat. as a southeast trade wind, and on reaching 10° N. Lat. is deflected into a southwest wind) causes from April to October the heavy rainfall of India, Siam, French Indo-China, China, Japan, the Philippines, Malay Peninsula, northern Borneo, Sumatra and Ethiopia. This abundant rain insures the production of rice, the principal crop of the peoples of these regions.

In the Western Hemisphere the southwest monsoon, originating around 25° S. Lat. in the Atlantic Ocean as a southeast trade wind, waters the llanos of Venezuela and Colombia and is responsible for the luxuriant vegetation of Central America, the West Indies and southern Mexico. Occasionally the southwest monsoon touches Florida. In winter, the direction of the monsoon is changed. Originating in the China Sea, it blows from the northeast over the Bay of Bengal and the Arabian Sea and, on reaching 10° S. Lat., is deflected into a northwest wind that touches northern Australia and the various islands of the South Seas. In the Western Hemisphere this monsoon (originating around 25° N. Lat. in the Atlantic) waters the campos of Brazil. In contrast to the rain-bringing monsoon of summer, the northwest wind is more often dry; but occasionally the southwest wind also is dry, and then drought and often famine are the portion of the thickly populated countries of eastern Asia. The term *monsoon* is derived through the French from the Malay word *musim,* meaning season.

Montana, the northernmost of the Rocky Mountain states, of the United States. Third in size in the Union, it has an area of 146,997 square miles, only 866 of which are water surface. It is 580 miles long and 315 broad. On the north it is bordered by British Columbia, Alberta and Saskatchewan, on the east by North Dakota and South Dakota, on the south by Wyoming and on the southwest and west by Idaho. The population is approximately 559,456. Only two states have fewer inhabitants per square mile.

The eastern half of the state is a part of the Great Plains, with level surfaces sloping gradually upward to the west. The main ranges of the Rocky Mountain system cross the western half, giving it a highly broken topography. The highest elevations are found in the Bitter Root range on the western and southwestern border, where sharp peaks rise above the snow line to a maximum elevation of 12,850 feet.

Most of Montana is drained by branches of the Missouri River or its great tributary, the Yellowstone, but the streams of the western end of the state flow into the Columbia River. The rivers are of little commercial importance, but they furnish most of the water used in irrigation. In the western section Flathead Lake, some 27 miles long, is surrounded by highly productive land in a setting of fine mountain scenery. The great dam on the Missouri River at Fort Peck is designed to equalize the flow of that stream and so improve navigation. The reservoir it forms covers about 245,000 acres.

Approximately half of Montana is classified as farm land, but much of that is devoted to grazing, as the rainfall is generally inadequate for good crop production. Dry farming is practiced to some extent, and the state ranks fourth in acreage of irrigated lands. The winter climate is severe, though the mountains shelter the western valleys from the blizzards that sweep from Canada across the eastern plains. The summers are short but often hot except in the mountains.

Where water is available the soil is very productive, yielding good crops of wheat sugar beets, oats, hay and other hardy products. There are valuable commercial orchards in some of the sheltered western valleys. Great areas of timberland are now included in National Forests, and lumber production is important though it is somewhat restricted by the distance to the important markets. Immense areas of grasslands, too dry for farming, support great numbers of cattle and sheep. The wool clip sometimes exceeds 35,000,000 pounds yearly.

Montana has great mineral wealth and ranks among the leading states in the production of copper, silver, arsenic, zinc and manganese. The oil fields are valuable, and the available coal supply, mostly unexploited, is enormous.

Industries in the state are generally of local importance except those devoted to the processing of the ores of copper and other metals. Anaconda is one of the world's chief smelting centers. The available water power is very great, but its development has been retarded by lack of demand.

There are no large cities in the state. Helena, the capital, is a leading trading point. Butte, the principal city of the mining section, is the most populous, and Great Falls, another smelting center, ranks second.

The principal schools are Montana State College at Bozeman and the State University at Missoula.

Glacier National Park in the northwestern section includes the finest alpine scenery in the United States. It lies on the Continental Divide, which is traversed within the park by a superb scenic highway. Sharp colorful peaks and 250 beautiful small glacier-fed lakes are its outstanding features. The park forms a wild life refuge and attracts thousands of visitors to Montana every year.

Monticello, Charlottesville, Va. This mountaintop home of Thomas Jefferson, designed by him and completed in 1805 after 30 years of work, is treasured for its associations and its architecture, its many reminders of the genius of its builder and its superb broad views of mountains and plains.

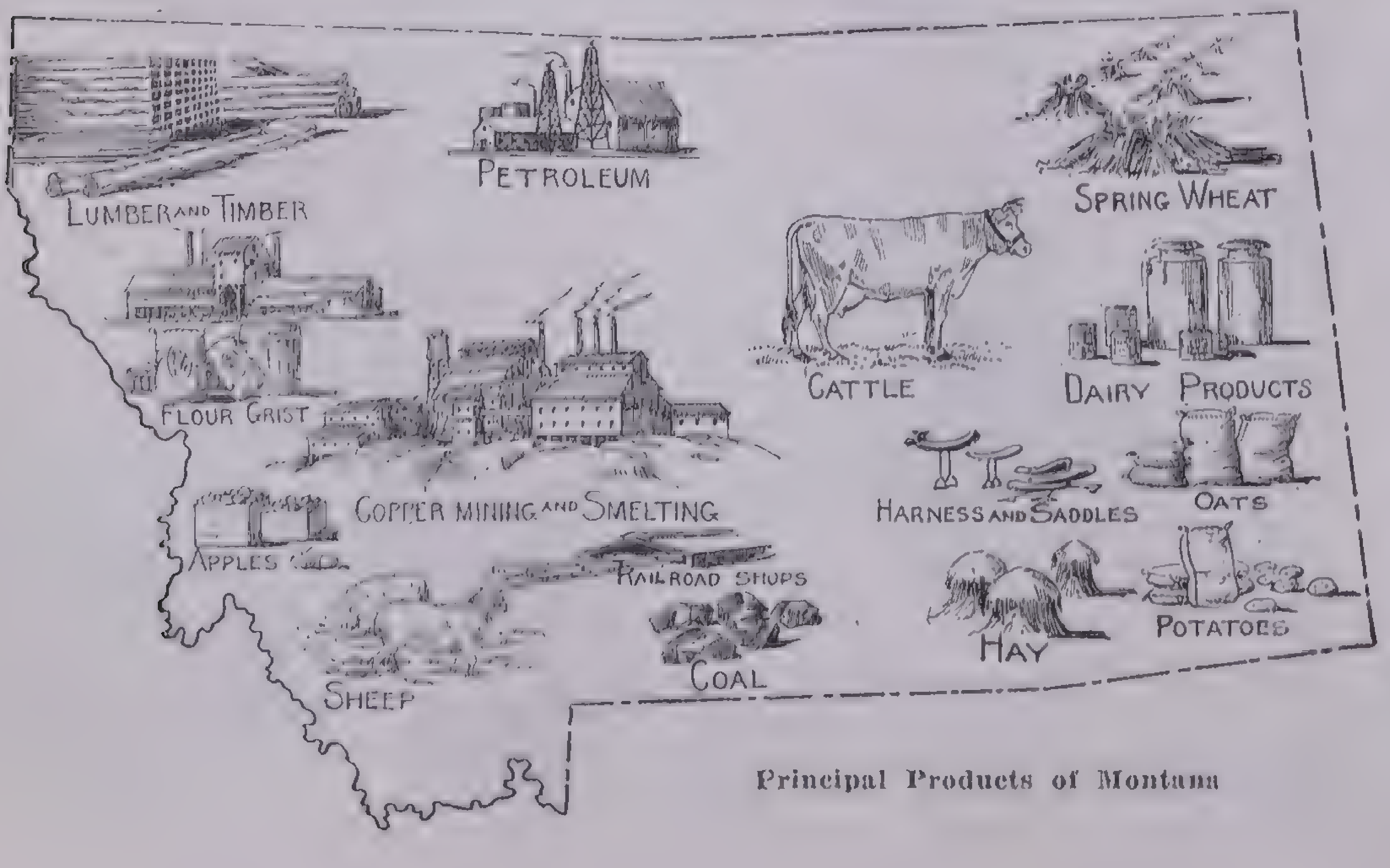
Montreal, the largest city of Canada, located in the province of Quebec on the island of Montreal at the junction of the Ottawa and St. Lawrence rivers. It takes its name from the elevation, Mt. Royal (in French, *Mont Réal*), which reaches a height of 753 feet. It is the leading port, although 600 miles from the Gulf of St. Lawrence, for both foreign and Great Lakes shipping; it is also the headquarters of the two great railroad systems—Canadian Pacific and Canadian National; and with its 300 banks or branches is the financial center of eastern Canada. The population is 818,577; about half the residents are French, found principally on the city's east side and to the north of Mt. Royal. Greater Montreal has a population a little more than one million. The city is bilingual, and the mayors are usually alternately English and French.

Montreal and suburbs extend along the St. Lawrence River for nearly 9 miles, and the river front is devoted almost entirely to shipping interests. Grain, dairy products and lumber are the principal exports. The chief industries are shipbuilding and the manufacture of flour, railroad rolling stock, electrical apparatus, automobiles, agricultural implements, cement, furniture, shoes and textiles. The St. Lawrence is spanned by several bridges, among which are the Victoria Jubilee, Montreal-Longueuil and Galipault.

As Montreal is essentially a Roman Catholic city, the largest churches belong to that faith. The Church of Notre Dame, facing the Place d'Armes, is especially noteworthy, for its two Gothic towers rise 228 feet, and its interior is adorned with mural replicas of some of the greatest religious paintings. Beside it is the Seminary of the Gentlemen of St. Sulpice, the residence of the first Montreal clergy that dates back to 1685. St. James's Cathedral on Dominion Square is patterned after St. Peter's in Rome, though only half the size. St. Joseph's Oratory is a miracle-working shrine. The leading Protestant church is the Anglican Christ Church Cathedral. Among other notable buildings are the City Hall, Courthouse, Royal Bank of Canada and Bank of Montreal. The Château de Ramezay, former residence of the governor when Montreal was capital of Quebec (1844–49), is now a historical museum.

Montreal's great educational institution is McGill University (founded in 1821) with an annual enrolment of about 3,000. It is also the seat of the University of Montreal (formerly the Montreal branch of Laval University in Quebec), where instruction is entirely in French; St. Mary's College, a Jesuit institution; and Jacques Cartier Normal School.

The city was founded in 1642 by Paul de Chomedy, Sieur de Maisonneuve, as the Ville Marie-de-Montréal and was an early French fur-trading and military post; since the downfall of Quebec in 1760 it has been an English city. A bronze statue of the founder by Louis Philippe Hébert, Canadian sculptor, adorns the Place d'Armes. A fiery cross on the summit of Mt. Royal is kept alight in memory of the cross that Maisonneuve first planted there in 1643 as a thank offering for the sparing of the infant colony.



Principal Products of Montana

moor, two types of wasteland—high and low—open and uncultivated, having only coarse vegetation, if any, and found principally in parts of Great Britain, Scandinavia, France, Ger-

Courtesy Canadian Pacific Railway

Place D'Armes, Montreal

In the center of Montreal's principal square stands a bronze statue (by Louis Philippe Hébert) of the Sieur de Maisonneuve who founded the city in 1642. The buildings in the background are the Bank of Montreal and the Royal Trust Company

many and other countries of central and southern Europe. A *high moor* is essentially the same as a heath. It is ordinarily sandy, largely infertile and barren or with heather and other small shrubs of the heath or similar families as its principal vegetation. A *low moor* is similar to a fen—marshy, with moss, grass and sedges as the principal vegetation and with soil reasonably rich in peat and humus. Drainage may make low moorlands available for cultivation. In England the word *moor* frequently is part of the name given to a stretch of moorland, as Dartmoor in Devonshire and Exmoor in Devonshire and Somersetshire.

moraine, the accumulation of coarse stones, sand and gravel carried down by glaciers. A *lateral moraine* refers to the ridge of loose stones that have accumulated on each side of a glacier after slipping down from adjoining slopes. A *medial moraine* is formed when two glaciers meet and their lateral moraines unite. A *terminal moraine* is the huge ridge built at the extreme termination of a glacier. A *ground moraine* is the debris at the bottom of a glacier, revealed as the ice melts.

morass, a large tract of flat, soft, permanently water-soaked ground. It is a marsh of the worst kind, from which the water cannot be drained either naturally or artificially, because it generally lies below the level of the surrounding territory.

Mormon Temple, Salt Lake City, Utah. This gray-granite structure, the central church of the Mormon religion, is elaborately ornamented without and within and rises to three pointed towers at each end; the highest spire at the eastern end is crowned by a gilded statue of the angel Moroni, standing 210 feet above the surrounding park. The building was completed in 1893 after 40 years of labor.

Morocco, a territory of northwestern Africa, bounded on the east by Algeria and on the south by Algeria and Rio de Oro. The Mediterranean Sea washes its northern coast and the Atlantic Ocean its western. The Riff Hills, the native habitat of Islamized Berbers, run along the Mediterranean shore and from the 15th to the 19th century afforded shelter for the Barbary pirates. Through the central part of the region extends the western spur of the Atlas Mountains, whose highest peak is Jeb Ayashim (14,000 feet). From these mountains lead, silver, iron and coal are obtained. The soil of the plains is fertile and is watered by the Tensift and other rivers, but the Igidi Desert encroaches in the southern part. Stock raising and agriculture are carried on, the products including barley, wheat, citrus fruits, linseed, olives, dates and almonds. Morocco leather goods and rugs are world-famous. Phosphates and petroleum also exist in great quantities. From the forests cork is obtained. The total area of Morocco is about 175,500 square miles; the population, consisting of Arabs, Berbers, Jews, Spaniards and Frenchmen, is about 7,500,000.

Morocco is divided into three zones—Tangier, Spanish Morocco and French Morocco. In the extreme north on the Strait of Gibraltar is the internationalized district of Tangier. It occupies 144 square miles and has an estimated population of 80,000. It is governed by a mixed commission, representing France, Spain and Great Britain and headed by the French Administrator. The International Legislative Assembly is subject to a committee of control, consisting of the consuls general of these Powers.

The Spanish Moroccan Protectorate, established in 1912, occupies an area of 13,125 square miles in the northeastern section and has a population of about 1,000,000. Its seat of government is Tetuan (population, 48,000). Here reside the Spanish High Commissioner and the Khalifa of the Spanish zone. Other cities in the Spanish zone are Ceuta (which is opposite Gibraltar and which has belonged to Spain since the 16th century as a part of the province of Cadiz), Medilla, Alcazar and Larache. In the southwestern part of the country is another Spanish zone around the city of Ifni. Spanish Morocco was the base from which in July 1936 Gen. Francisco Franco launched the Insurgents' attempt to overthrow the Popular Front government of Spain; his recruits included Moorish troops and the Tercio or Spanish Foreign Legion, recruited like the French Foreign Legion from among soldiers of fortune of all nationalities.

The French Moroccan Protectorate, also established in 1912, is the largest section, with an area of 162,162 square miles and a population of about 6,250,000. Rabat (population, 53,000) is the seat of government where the French resident general resides. The residence of the sultan of Morocco, whose position since the establishment of the French and Spanish protectorates is only that of a figurehead, is usually Fez. This city was once the greatest seat of learning of the Moslem world and is still noted for the Karueein University, attended by some 1,500 students. The Mosque of Mulai Idris, built in 810, is one of the most important Mohammedan shrines. Marrakesh (the old city of Morocco) contains the tombs of the Sa'adian sultans, superb examples of Moorish art. The minaret of Katoubia was built to commemorate the victory of the Moors, commanded by El Mansour, over the Spanish at the battle of Alarcos in 1195. Other cities in the French zone are Casablanca, Meknes, Oudja and Taza.

The name *Morocco* is a corruption of the country's Arabic name, *Maghrib el Aksa,* meaning the farthest west.

Moscow, the capital of the Union of Soviet Socialist Republics, located on the Moscow River in the central part of the Moscow Area of the Russian Socialist Federated Soviet Republic. It is now the seat of government for the second time. The city, which was founded in 1147, became the capital of the Russian Empire under Ivan III, who reigned from 1462 to 1505. In 1714 Peter the Great transferred the seat of government to St. Petersburg (now Leningrad), but after the revolution of October 1917 and the establishment of the Soviet Government St. Petersburg was abandoned as the capital because there was danger of its being surrounded and cut off from the rest of the country by the White and

Courtesy Intourist, Inc.

Moscow Kremlin

View from the Moscow River Bridge of the southern side of the triangular-shaped Kremlin (citadel). Each of the 18 machicolated towers that surmount the brick walls differs in style of architecture. The Great Palace is at the far left. East of it, in order, are the Cathedral of the Annunciation or Blagoveschenski Cathedral, noted for its 15th- and 16th-century frescoes, the Archangel Cathedral (in which are buried those czars who reigned before Peter I) and the Cathedral of the Assumption or Uspenski Cathedral (in which the coronation ceremonies were held). Each cathedral is surmounted by a bulbous-shaped central dome, surrounded by four smaller domes; they are symbolic of Christ and the four evangelists and illustrate a style of ecclesiastical Byzantine architecture that prevailed after the 16th century

Allied interventionist armies. Moscow, 400 miles to the southeast, again became the capital in March 1918. The city covers an area of 99 square miles. The population is 3,662,000, so that the city is third in size among European cities.

Moscow is the great railroad center of the Soviet Union; 11 lines enter it, and one, the Trans-Siberian Railway, extends 5,000 miles eastward through Siberia to the Pacific Ocean at Vladivostok. It is also the industrial center of the country and manufactures automobiles, machine tools, electrical apparatus, bicycles, watches, aviation equipment, scientific instruments, steel castings and textiles. During the first Five-Year Plan (1929–33), which emphasized heavy-industry production, 55 new factories were erected in Moscow. Through the establishment of factory nurseries thousands of women were enabled to aid achievement of the plan by leaving their children in the care of trained nurses.

The city's transportation facilities have been improved by construction of the Moscow subway, the first section of which was opened in 1935. With its 16 marble-walled modernistic stations it is the most beautiful underground railroad in the world. Moscow's importance as an inland port has been enhanced by the construction of a 77-mile canal, connecting the Moscow and Volga rivers near the town of Dmitrov, and by deepening the channel of the Moscow River and raising the level of its embankments within the city's limits. The city is administered by the Moscow Soviet, which works through a system of 10 district soviets.

The dominating architectural feature of Moscow is the famous triangle-shaped Kremlin, built originally as a fort and surrounded by walls 1½ miles in extent. The walls are surmounted by 18 towers and have five entrance gates. Within them are two great palaces, once the home of the czars, and several of the great churches of the city—among them the Cathedral of the Assumption, in which the czars were crowned, and the Archangel Cathedral, where those who reigned before Peter I are buried. The headquarters of the Soviet Government, including the Central Executive Committee, Council of People's Commissars and Council of Labor and Defense, are now concentrated inside the Kremlin, and the bells in the tower of Ivan the Great play the "International" and the "Revolutionary Funeral March" each morning and afternoon.

Of Moscow's famous churches the Cathedral of St. Basil the Blessed still stands; it is a remarkable architectural pile in the Red Square, noted for its motley-colored Byzantine domes suggestive of the barbaric splendor of the court of Ivan the Terrible in whose reign during 1554–60 it was erected; it is now an antireligious museum. The immense Palace of the Soviets, surmounted by a statue of Lenin, rises on the site of the demolished Cathedral of Christ the Redeemer. Lenin's red-marble mausoleum, severe and modern beneath the northern wall of the Kremlin in the Red Square, has become to many since the repudiation of religion a symbol of the new nation, and every day long lines of Russians may be seen waiting to gaze with veneration upon the embalmed remains of the revolutionary leader.

As the cultural center of the Soviet Union, Moscow is the seat of the Second Moscow University (the Soviet continuation of the Imperial University that was founded in 1755), Institute of Red Professors, Institute of Eastern Languages, Conservatoire of Music and Academy of Fine Arts. Enrolment in the secondary and technical schools is 10 times as great as it was during the last days of the czarist regime. Research is carried on by institutions such as the Arctic Institute (which since 1930 has directed the work of 40,000 investigators of the Arctic), Lenin Institute, Meteorological Society and Society of the Lovers of Natural History, Anthropology and Ethnography. The Lenin Public Library is another notable institution; and the most celebrated museums are the Tretyakov Art Gallery, Museum of the Revolution, Historical Museum, Museum of Modern Western Art, Museum of Woman's Emancipation and Museum of Mother and Child.

The theatrical tradition of czarist Russia is upheld by the Moscow Art Theater, Meyerhold Theater and Theater of the Revolution, which during the Moscow Theater Festival in September of each year attract lovers of the drama from all parts of the world. Centers of recreation are the workers' clubs, now housed in many of the beautiful homes of the prewar aristocratic and merchant classes, and the Central Park of Culture and Rest, noted for its children's village, educational exhibits, huge stadium for all kinds of sport demonstrations, circuses, motion-picture houses and theaters whose programs are frequently the folk songs and dances of the various peoples composing the Soviet Union.

The city is named from the river.

mound, a small, isolated hill or knoll. The term may also refer to an artificial hill or embankment, especially one thrown up for defense. The custom of building mounds for burial, sacrificial and other purposes was prevalent among the early Indian tribes of the Mississippi and Ohio River valleys. The mounds near Chillicothe, Ohio, have been made a national monument.

mountain, a lofty and more or less isolated elevation of land, ranging in height from 2,000 to 30,000 feet, with generally a crest or peaklike summit and steep sides. It may be formed by volcanic action, igneous material that has been erupted forming such a group of cone-shaped mountains as the Cascade Range in the western United States or assuming a laccolithic form in which igneous rock is intruded between sedimentary beds, as the Henry Mountains of Utah. In the case of mountains formed by warping of the earth's crust in cooling there may be folded mountains, like the Alps; overthrust mountains, like the front range of the Canadian Rockies; and block mountains, like the Wasatch Range in Utah. Other mountains, such as Lookout Mountain in Tennessee, are fragments of dissected plateaus.

Erosion determines the age of mountains. Young mountains are like those of the Alps or Rockies, high, steep-sided and sharp-peaked; mature mountains are like those of Ethiopia, less rugged in appearance and with little rock out-cropping at the top or

Courtesy Denver Convention and Tourist Bureau

In the Denver Mountain Country

Estes Park, northwest of Denver and part of Rocky Mountain National Park, lies in a valley 7,500 feet above the sea. Stanley Hotel, a pioneer mountain hostelry, is shown in the center

on the sides; and old mountains are like those of the Appalachians, which with their sugar-loaf and saddleback tops have little change in elevation from the lowest to the highest points.

Mountains affect climate on both their windward and leeward sides, since warm expanding air, forced up their slopes, partly loses its moisture and descends as a warm dry wind, such as the chinook. As the elevation of a mountain increases, the temperature is lowered, the boiling point (normally, 212° F.) is 1° cooler for every 370 feet of ascent in summer and for every 400 feet in winter. Above the snow line there is some evidence of snow the year round, often accompanied by high winds. For scenic beauty and invigorating air mountains are unsurpassed.

The principal industries of a mountainous country are grazing in the summer pastures, lumbering and mining. A mountain frontier is the finest kind of military defense for a country. India, for instance, has never been invaded from the north, where innumerable peaks of the Himalayas, 20,000 or more feet high, form an insurmountable barrier. Among mountain animals are the llama of the Andes, antelope and chamois of the Alps and bear and bighorn of the Rockies.

A group of linearlike mountains is called a *range;* several ranges running in parallel are called a *system;* and any two or more systems are called a *chain.* The entire collection, if forming the principal elevation of a continent, is called a *cordillera.* The highest mountain is Mt. Everest (29,141 feet) in the Himalayas. Among other well-known mountains are Mont Blanc in France, Jungfrau and the Matterhorn in Switzerland, McKinley in Alaska, Fujiyama in Japan, Popocatepetl in Mexico, Etna in Sicily, Ararat in Armenia and Whitney, Rainier, Pike's Peak and Holy Cross in the United States. The word *mountain* is derived from the Latin *mons.*

Mount Rushmore National Memorial, in the Black Hills, S.D. Sculptured by Gutzon Borglum from the vertical granite slopes of this massive mountain are the titanic heads of four great Americans—Washington, Jefferson, Lincoln and Theodore Roosevelt—which with a sculptured epitome of national history are designed as a perpetual patriotic shrine.

Mount Vernon, Mt. Vernon, Va. Washington's home on the Potomac, 15 miles below Washington, stands as he lived in it, complete with the customary accessory plantation buildings, the gardens and shrubbery, walls and terraces that he designed. His modest brick tomb on the hillside below is a shrine that draws thousands.

mouth, the part of a river that meets the ocean or is discharged into any other large body of water, such as a lake or gulf. The term *mouth* is also applied to the entrance into a harbor.

Mozambique, a Portuguese colony on the southeastern coast of Africa, known also as Portuguese East Africa. It is bounded on the north by Tanganyika Territory, Nyasaland and Northern Rhodesia and on the west by Southern Rhodesia and the Union of South Africa. The Mozambique Channel, which separates Madagascar from the African mainland, extends along the eastern coast from Cape Delgado to Delagoa Bay, an arm of the Indian Ocean. The coastal plain is a swampy region, but farther inland is a plateau with heavily forested hills. The plateau is watered by the Zambezi and other rivers; here sugar cane, copra, sisal, maize, cotton, coconuts, peanuts and rubber are cultivated. Mineral resources have not been extensively exploited, although gold, silver, copper, tin and coal are found in the hills. Ivory is one of the principal exports. The area of Mozambique is 297,657 square miles. With the exception of about 35,000 Europeans and Indians the population (almost 4,000,000) is of Bantu stock.

Mozambique is divided into two parts: the province of Mozambique, which is controlled by the Portuguese Government; and the territory of Manica and Sofala, which is governed by the Mozambique Company. The town of Lourenço Marques (population, 42,000), situated on Delagoa Bay, is the capital of the colony and its principal port. It is important commercially because of the railroad connecting it with Johannesburg and other South African cities. The town of Mozambique, located on a small coral island in Mosuril Bay at the mouth of the Monapo River, was once a Portuguese fort; it is the capital of Mozambique Province. Beira, the capital of Manica and Sofala Territory, has an excellent harbor and is an important port for inland Rhodesia, with which it is connected by rail. At the mouth of the Zambezi, the largest river that crosses the colony, are the towns of Guelimane and Chinde.

Munich, a city of Germany and formerly (until the suppression in 1934 of the political individualities of the states composing the Reich), capital of the Free State of Bavaria. It is located in the southern part on the River Isar and is noted as a cultural center. The art world cherishes the Old Pinakothek, which houses 4,000 paintings of old masters and rare specimens of antique vases, engravings and the like. Opposite this building is the New Pinakothek, noted for its works by artists of the 19th century. The Ionic-styled Glyptothek contains ancient and modern sculpture. The Bavarian National Museum is an ethnographical institution, presenting in many forms the history of art and civilization. The German Museum of Science and Industry, opened in 1925, was the first in the world to depict through the visual-education method the extent of this field. In 1933 the House of German Art was established in Munich. The former Royal Library contains 1,200,000 volumes and 50,000 rare manuscripts. Among educational institutions are: the University of Munich, founded in 1472; a conservatoire of music; and an art academy.

Munich's most famous street is the Ludwigstrasse, named for the art-loving Ludwig I, to whom the city has owed its regal appearance since the early part of the 19th century. At one end of this street is the Siegestor (gate of victory), erected in 1843 in imitation of the Arch of Constantine in Rome and commemorating the achievements of the Bavarian army. Flanking this gate are the University, the Library and Ludwigskirche. At the other end of the Ludwigstrasse is the Feldherrenhalle (hall of marshals), containing statues of illustrious military leaders; in front of the hall is a statue of Bavaria, 65 feet high, which was cast from the bronze of the cannon of defeated foreign armies. On the Max-Joseph Platz is the former Royal Palace or Residenz Museum, which is decorated with mural scenes from the *Odyssey* and *Niebelungenlied* and events in the lives of Charlemagne, Frederick Barbarossa and Rudolf von Hapsburg. Nearby are the Allerheiligen-Hofkirche or Court Church and the National Theater; the latter is one of the most famous opera houses in all Europe and is noted especially for its Wagnerian and Mozart festivals. The Roman Catholic Cathedral is the Frauenkirche (Church of Our Lady). The Old Town Hall, erected in the 14th century, was restored in 1865. The New Town Hall is a Gothic structure erected in 1906. Among other buildings of interest is the Brown House, original home of the National Socialist party. The 16 heroes who were killed in the Nazi *putsch* (attempted revolution) of November 9, 1923, are buried in the two open Temples of Honor on the Königsplatz.

Munich is a world center for the production of fine printing and engraving, the art of lithography having been invented there in the 18th century. Munich factories make astronomical and optical instruments of highest quality and admirable stained glass, porcelains and silverware. Bavarian beer is known throughout Europe. Wallpaper, gloves, chemicals, pianos and artificial flowers are manufactured. The population of the city is about 735,000.

The name *Munich* (German, *München*) is derived from the Old High German word meaning monk; the town is built on lands that belonged to the Schaftlarn monastery.

Courtesy German Railroads Information Office

Deutsches Museum, Munich

Opened in 1925 the German Museum of Natural and Technical Sciences was the first to depict technical progress through the visual educational method. Electrically driven miniature models give visitors an opportunity to observe through a push of the button how a locomotive is operated, how coal is mined and how various raw materials are refined. It was in this museum also that the first Zeiss planetarium was demonstrated

Naples, a city of Italy, located on the Bay of Naples in that part of the Mediterranean known as the Tyrrhenian Sea. It is the capital of the province of Naples in the Campania section. The Bay of Naples, in which are located the famed islands of Capri and Ischia, is one of the most beautiful sapphire-colored bodies of water in the world. Mt. Vesuvius, 10 miles to the southeast with its continually smoking crater, furnishes an imposing background for the city. The port of Naples enjoys a large foreign trade, rivaling even Genoa. Manufactures include wine, gloves, macaroni, coral jewelry, tortoise-shell articles, glassware, textiles, ships and locomotives. The population of the city is 839,390.

Built on the slope of a volcanic hill, Naples resembles a huge amphitheater. In the western part is the fashionable quarter of Santa Lucia, noted for its beautiful villas and gardens; certain sections in the eastern part are still scenes of squalor and poverty, for Naples is one of the most densely populated of Italian cities. The boulevard Via Caracciolo runs along the bay shore for several miles. The other principal thoroughfares are the Corso Vittorio Emanuele, Via Tribunal, Riviera di Chiaja, Via Roma and Corso Umberto I. The Corso Vittorio Emanuele is a winding driveway that ascends the city's slopes to the summit occupied by the Castel Sant Elmo, a fortress of the Angevin kings of the 13th century, and the cloister of San Martino. The Via Tribunal terminates at the 12th-century Castel Capuano, now the Court of Justice.

Abutting on the Bay of Naples are the 17th-century Royal Palace, whose façade is adorned with eight statues representing the founders of the dynasties that have ruled over Naples; the Castel Nuovo, which is distinguished for the triumphal arch of Alfonso V of Aragon (15th century), and which, like the Tower of London, after being a royal palace became a prison; and the Castel dell' Ovo, which was named from its egg-shaped construction.

The most noted church of Naples is the 14th-century Gothic cathedral (named for St. Januarius, patron saint of the city), whose art treasures include a silver altar by Solimena and several murals by Domenichino. Other churches are: San Domenico Maggiore, which contains the monumental tombs of the Aragonese kings; Santa Chiara, whose choir is decorated with frescoes by Giotto; the Romanlike temple of San Francesco di Paola with its Pantheon-styled dome; and Santa Maria di Piedigrotta, famous for its picturesque festival on September 7–9 in honor of the Madonna, whose church adjoins the grotto.

Naples is famous for its National Museum, an archeological storehouse of Greek and Roman antiquities, including frescoes and other relics excavated in Pompeii and Herculaneum, which were destroyed by an eruption of Vesuvius in 79 A.D. The Institute of Fine Arts houses the gallery of modern art.

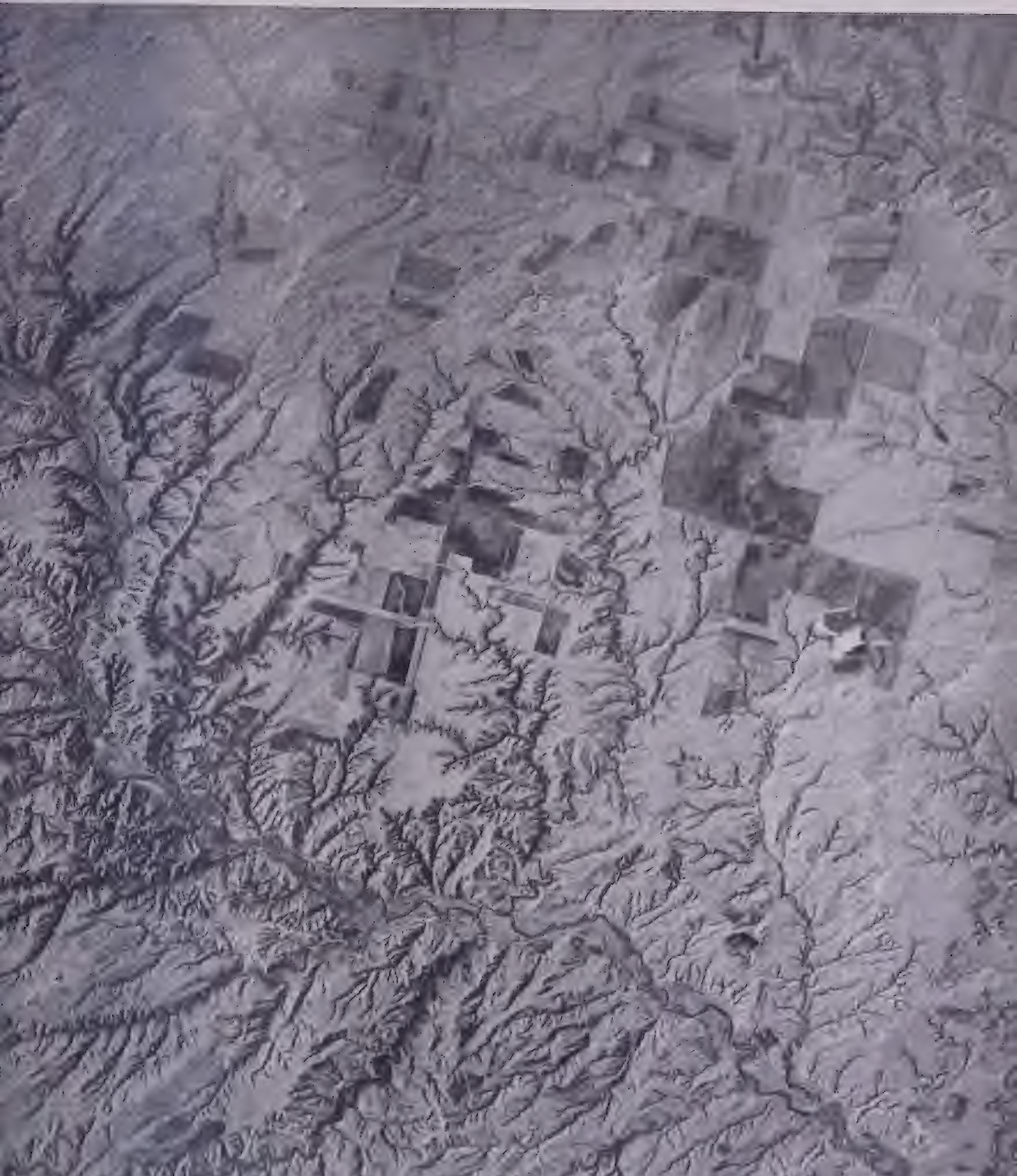
Among the city's educational institutions are the University of Naples, founded by Frederick III of the Swabian dynasty in 1224; Royal School for Oriental Languages; and Royal Conservatoire of Music. The San Carlo Opera House has been one of the most famous institutions of the kind since its erection in 1737. In the Villa Nazionale park is an aquarium noted for its specimens of Mediterranean fauna.

Naples was founded in the 5th century B.C. by Greek colonists from Cumae; its name (Italian, *Napoli*) is derived from the Greek *Neapolis*, meaning the new city. Until 1860, when Garibaldi defeated the Neapolitans in the battle of Milazzo, it was the capital of the kingdom of the Two Sicilies. The following year after annexation to Sardinia it became part of united Italy.

National Old Trails Road, a 3,096-mile highway, extending from Washington, D.C., to Los Angeles, Calif., and including the Cumberland Road, Santa Fé Trail and El Camino Real.

National Parks Highway, a national highway, 2,352 miles long, extending across the northern United States from Chicago, Ill., to Seattle, Wash. It owes its name to the fact that it passes south of Glacier National Park and north of Yellowstone National Park.

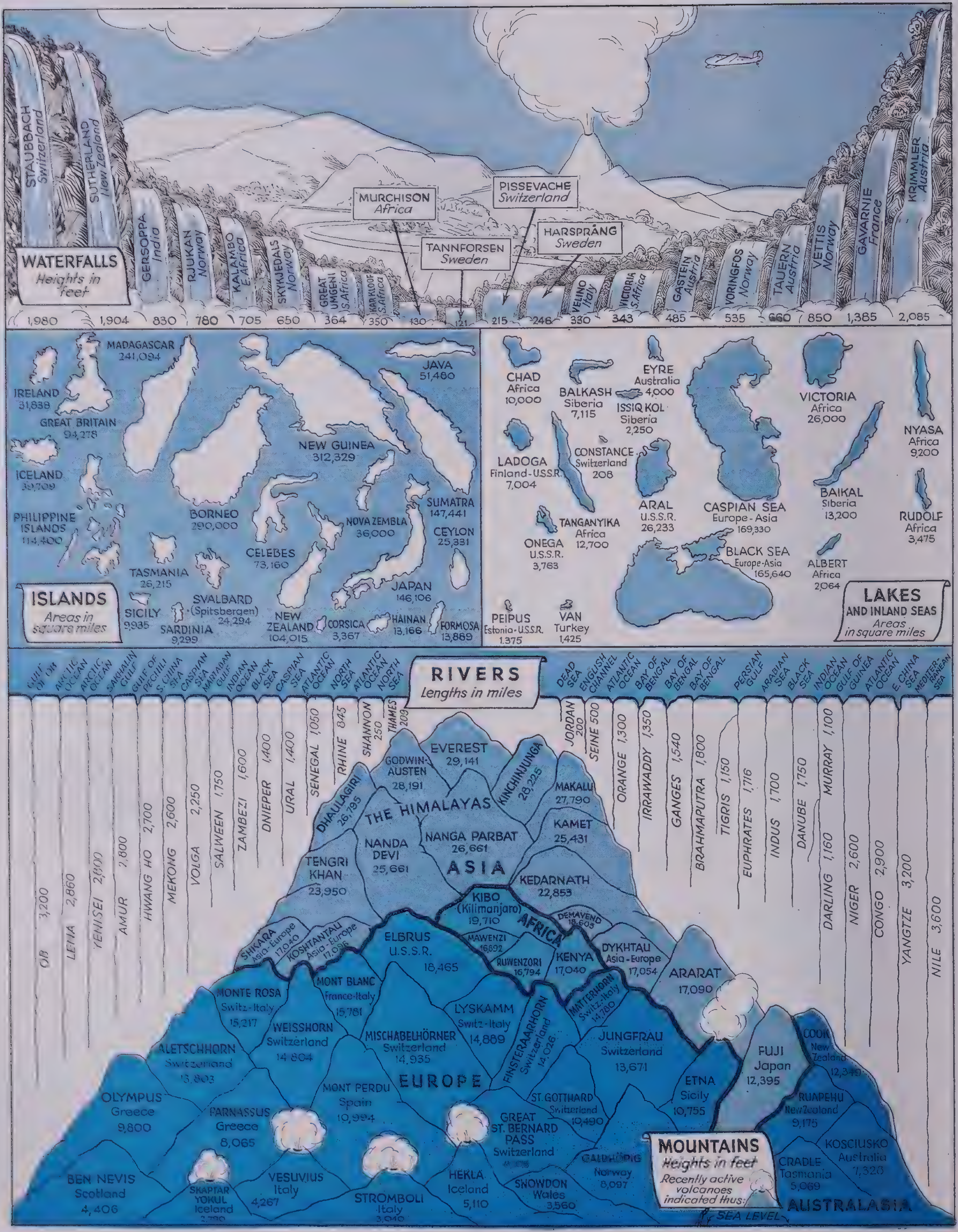
National Park to Park Highway, a scenic road, 4,500 miles long, that circles the Rocky, Sierra Nevada and Pacific coast ranges, connecting the national parks. Among the cities it reaches are Seattle, Wash., Portland, Oreg., Sacramento, San Francisco and Los Angeles, Calif., Denver, Colo., Cheyenne, Wyo., and Spokane, Wash.



National Geographic Magazine. Reproduced from the National Geographic Magazine by special permission

Thirteen Miles Above the Earth—The Highest Vertical Photograph Yet Made by Man

This photograph, covering approximately 105 square miles, was made November 11, 1935, from the balloon *Explorer II* of the National Geographic Society-U. S. Army Corps Stratosphere Flight, by Captain Albert W. Stevens. At a world-record height of 72,395 feet above sea level (69,780 feet or more than 13 miles above the ground), over south-central South Dakota, the aerial camera mounted in the bottom of the balloon's gondola recorded the earth beneath. The geometrical cultivated fields and the straight section lines at the north (right side of picture) stand out in sharp contrast to grasslands and erosion channels carved by rain water draining into the South Fork of the White River, which extends diagonally across the lower part of the picture. Near the upper right-hand edge of the picture is shown the village of Parmelee with its small grid of streets. U. S. Highway No. 18, showing as a fine white line, enters Parmelee from the top of the photograph. The white irregular object a little over an inch in from the right margin is the official meteorograph suspended 33 feet below the gondola. The two shadowy lines extending inward from the top margin are ropes dangling from the side of the sphere


WATERFALLS
Heights in feet
STAUBBACH Switzerland 1,980
SUTHERLAND New Zealand 1,904
GERSOPPA India 830
RJUKAN Norway 780
KALAMBO E. Africa 705
SKYKJEDALS Norway 650
GREAT UMGENI S. Africa 364
KARKLOOF S. Africa 350
MURCHISON Africa 130
TANNFORSEN Sweden 121
PISSEVACHE Switzerland 215
HARSPRÅNG Sweden 246
VELINO Italy 330
VICTORIA S. Africa 343
GASTEIN Austria 485
VORINGFOS Norway 535
TAUERN Austria 660
VETTIS Norway 850
GAVARNIE France 1,385
KRIMMLER Austria 2,085
ISLANDS
Areas in square miles
MADAGASCAR 241,094
IRELAND 31,838
GREAT BRITAIN 94,278
ICELAND 39,709
PHILIPPINE ISLANDS 114,400
BORNEO 290,000
NEW GUINEA 312,329
JAVA 51,480
SUMATRA 147,441
CEYLON 25,331
NOVA ZEMBLA 36,000
CELEBES 73,160
TASMANIA 26,215
SVALBARD (Spitsbergen) 24,294
SICILY 9935
SARDINIA 9,299
NEW ZEALAND 104,015
CORSICA 3,367
HAINAN 13,166
FORMOSA 13,889
JAPAN 146,106
LAKES AND INLAND SEAS
Areas in square miles
CHAD Africa 10,000
BALKASH Siberia 7,115
EYRE Australia 4,000
ISSIQ KOL Siberia 2,250
LADOGA Finland-U.S.S.R. 7,004
CONSTANCE Switzerland 208
ARAL U.S.S.R. 26,233
CASPIAN SEA Europe-Asia 169,330
VICTORIA Africa 26,000
NYASA Africa 9,200
BAIKAL Siberia 13,200
RUDOLF Africa 3,475
TANGANYIKA Africa 12,700
ONEGA U.S.S.R. 3,763
BLACK SEA Europe-Asia 165,640
ALBERT Africa 2,064
PEIPUS Estonia-U.S.S.R. 1.375
VAN Turkey 1,425
RIVERS
Lengths in miles
GULF OF OB
ARCTIC OCEAN
ARCTIC OCEAN
SAKHALIN GULF
GULF OF PECHILI
S. CHINA SEA
CASPIAN SEA
MARTABAN GULF
INDIAN OCEAN
BLACK SEA
CASPIAN SEA
ATLANTIC OCEAN
NORTH SEA
ATLANTIC OCEAN
NORTH SEA
DEAD SEA
ENGLISH CHANNEL
ATLANTIC OCEAN
BAY OF BENGAL
BAY OF BENGAL
BAY OF BENGAL
PERSIAN GULF
ARABIAN SEA
BLACK SEA
INDIAN OCEAN
GULF OF GUINEA
ATLANTIC OCEAN
E. CHINA SEA
MEDITERRANEAN SEA
OB 3,200
LENA 2,860
YENISEI 2,800
AMUR 2,800
HWANG HO 2,700
MEKONG 2,600
VOLGA 2,250
SALWEEN 1,750
ZAMBEZI 1,600
DNIEPER 1,400
URAL 1,400
SENEGAL 1,050
RHINE 845
SHANNON 250
THAMES 209
JORDAN 200
SEINE 500
ORANGE 1,300
IRRAWADDY 1,350
GANGES 1,540
BRAHMAPUTRA 1,800
TIGRIS 1,150
EUPHRATES 1,716
INDUS 1,700
DANUBE 1,750
MURRAY 1,100
DARLING 1,160
NIGER 2,600
CONGO 2,900
YANGTZE 3,200
NILE 3,600
MOUNTAINS
Heights in feet
Recently active volcanoes indicated thus:
SEA LEVEL
THE HIMALAYAS
ASIA
EVEREST 29,141
GODWIN-AUSTEN 28,191
KINCHINJUNGA 28,225
MAKALU 27,790
DHAULAGIRI 26,795
NANDA DEVI 25,661
NANGA PARBAT 26,661
KAMET 25,431
TENGRI KHAN 23,950
KEDARNATH 22,853
AFRICA
KIBO (Kilimanjaro) 19,710
DEMAVEND 18,605
SHKARA Asia-Europe 17,040
KOSHTANTAU Asia-Europe 17,096
ELBRUS U.S.S.R. 18,465
MAWENZI 16,892
RUWENZORI 16,794
KENYA 17,040
DYKHTAU Asia-Europe 17,054
ARARAT 17,090
EUROPE
MONTE ROSA Switz-Italy 15,217
MONT BLANC France-Italy 15,781
LYSKAMM Switz-Italy 14,889
MATTERHORN Switz-Italy 14,780
WEISSHORN Switzerland 14 804
MISCHABELHÖRNER Switzerland 14,935
FINSTERAARHORN Switzerland 14,026
JUNGFRAU Switzerland 13,671
ALETSCHHORN Switzerland 13,803
OLYMPUS Greece 9,800
PARNASSUS Greece 8,065
MONT PERDU Spain 10,994
ST. GOTTHARD Switzerland 10,490
GREAT ST. BERNARD PASS Switzerland
ETNA Sicily 10,755
FUJI Japan 12,395
BEN NEVIS Scotland 4,406
SKAPTAR YOKUL Iceland 2,790
VESUVIUS Italy 4,267
STROMBOLI Italy 3,040
HEKLA Iceland 5,110
SNOWDON Wales 3,560
GALDHÖPIG Norway 8,097
AUSTRALASIA
COOK New Zealand 12,349
RUAPEHU New Zealand 9,175
KOSCIUSKO Australia 7,328
CRADLE Tasmania 5,069

Eastern Hemisphere

National Roosevelt Midland Trail, a 3,550-mile-long highway that extends from Newport News, Va., to Los Angeles, Calif. Among the cities along its route are Richmond, Va., Charleston, W. Va., Lexington, Ky., St. Louis, Mo., Topeka, Kan., Denver, Colo., and Salt Lake City, Utah.

natural bridge, an arch of rock or earth that spans a gorge or other depression; it is formed by wind or water erosion or wave action. The most famous of the 50 natural bridges in the United States is that in Rockbridge County, Va., which has a span of 90 feet above a stream 215 feet below. In southern Utah a group, including the Augusta, Caroline and Edwin natural bridges, has been set aside as a national monument.

Nebraska, a state of the Great Plains region of the United States with an area of 77,520 square miles, including 712 of water surface. The state is 415 miles long and 205 broad. It is bounded by South Dakota on the north, Iowa and Missouri on the east, Kansas on the south, and Colorado and Wyoming on the west. The Missouri River forms the eastern boundary. About one third of the 1,315,834 people live in cities and towns.

The eastern half of the state is a level plain, sloping gently upward to the west. A belt of sand hills separates this area from the more hilly and broken section near the western boundary. In the northwest is the weirdly eroded Bad Lands region.

The Platte River flows across Nebraska from its Rocky Mountain sources, watering the most fertile farming district. The Niobrara and Republican rivers are also important. These streams lie in wide valleys bordered by steep bluffs. Too shallow for navigation, they are of immense value for the water they supply to irrigation projects.

The state has a continental climate, experiencing a great range of temperatures. Blizzards bring bitter cold in winter, and summer heat waves are intensified by strong, parching winds.

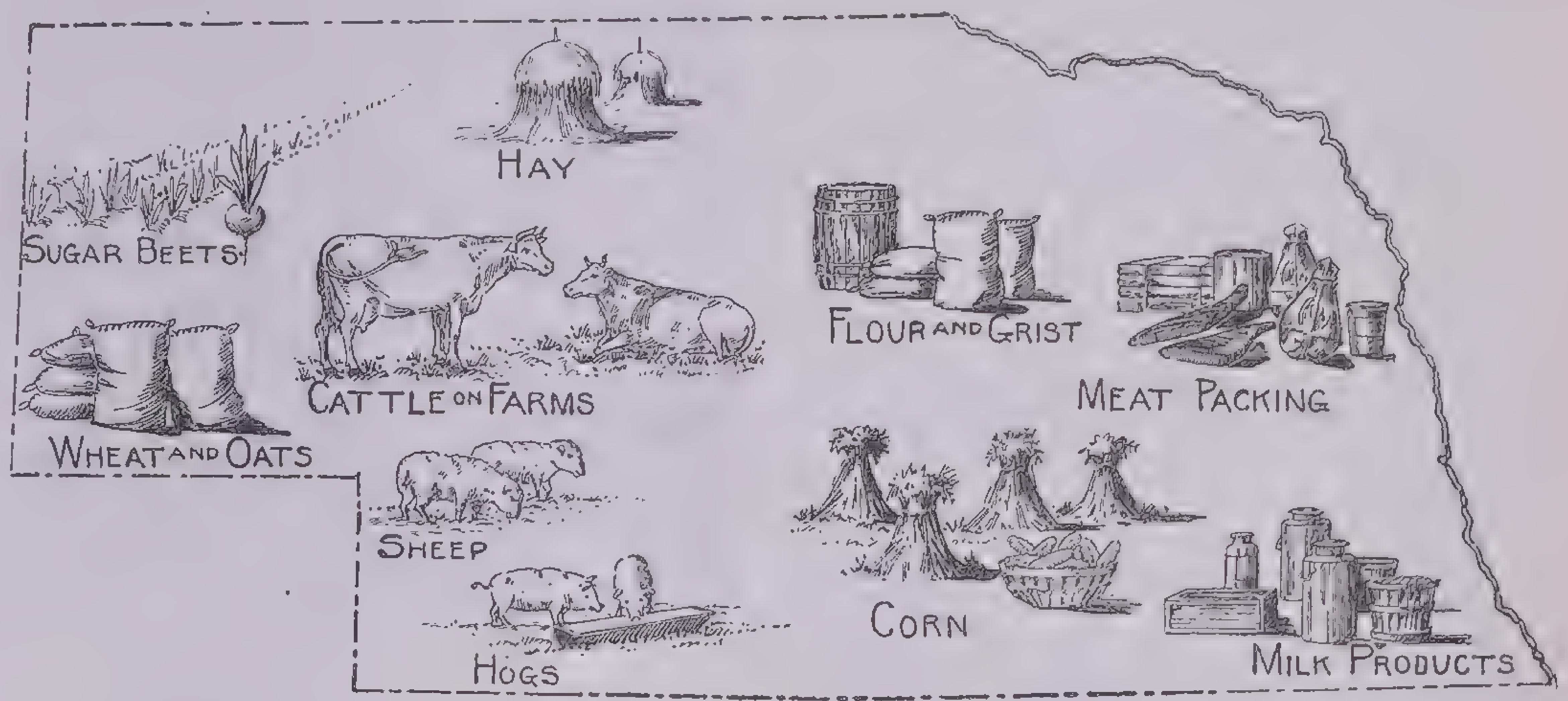
Western Nebraska has little rainfall. There farming is profitable only where irrigation is possible, but live stock range over the grassy slopes in great numbers. In the east there is more rainfall, and various temperate zone crops are produced in huge quantities. Over 90 per cent of the area is in farms. Corn, wheat, oats and sugar beets are the leading crops. Much of the corn is fed to cattle and hogs to be shipped to the meat packing plants of Omaha and other centers. There are no large forests in the state. Some trees are found along the streams and thousands have been planted for wind breaks and local timber supply.

Nebraska produces no minerals of more than local importance. The chief manufacturing industries, meat packing, sugar refining and flour milling, are based on its agricultural resources.

Omaha, the chief city, is a leading railroad, distributing and market center for the Missouri Valley and the northern Great Plains. The stockyards are among the largest in the country and the smelting plants refine a great tonnage of concentrated ores from the western mines. Lincoln, the capital, is the only other important city.

The University of Nebraska at Lincoln is one of the largest in the country. Creighton University is at Omaha, and there are several smaller colleges.

Nebraska has the scenic features of the Great Plains, wide landscapes broken into a checkerboard pattern of golden wheat and green corn, and horizons marked by the tall elevators of the railroad towns. It also has reminders of pioneer days when Indians harassed wagon trains and herds of buffalo halted puffing locomotives.



Principal Products of Nebraska

neck, a narrow stretch of land, similar to an isthmus, that connects two larger areas of land. The term also refers to a narrow strip of land that projects from the main tract, like a cape, or forms a defile, like a mountain pass. Among places named from land necks are Great Neck, Long Island, N.Y., and Bergen Neck, N.J.

A *neck of water* is a narrow channel, similar to a strait, between two larger bodies of water.

A *volcanic neck* is the upper part of an extinct volcano whose cone has been worn away by erosion. Mount Royal, after which Montreal was named, is one of the Monteregian Hills of Quebec noted for their volcanic necks.

Nepal, a small kingdom in the Himalayas between British India and Tibet. It is bounded by Tibet on the north, Sikkim on the east, Bengal and Bihar on the south and the United Provinces on the south and west. It is about 500 miles long, from 90 to 140 miles wide and has an area of about 54,000 square miles. The population (about 5,640,000) is of mixed Mongol and Indian origin, the predominating element being the Gorkhalis or Gurkhas.

The Kali River forms the western boundary of Nepal. The only other important stream is the Gandak River. In this country are found the highest peaks in the world—Everest (29,141 feet), Kanchenjunga (28,225 feet), Makalu (27,790 feet), Dhaulagiri (26,795 feet) and others. In the Katmandu Valley and in other fertile valleys of the Nepal plateau grains (wheat, barley, oats and buckwheat), rice, potatoes, sugar cane, cotton, opium, tea, tobacco and hemp are raised. Cattle are the chief animal product, and their hides constitute one of the country's most important exports. The mineral wealth includes iron, copper, zinc, lead and sulphur, and from the rich forests bamboo and rattan are obtained.

The capital of Nepal is Katmandu (population, 80,000), which has been connected by rail with Raxaul on the Indian frontier since 1926. Other cities are Paton and Pashpoti (noted for its Buddhist shrines). For about a century the king of Nepal has been relegated to his palace in Katmandu and the real authority has been exercised by a military oligarchy headed by the hereditary prime minister who bears the courtesy title of maharaja. The first incumbent of the office was Jung Bahadur who came to power about 1840. His descendants, according to seniority, have since held the posts of prime minister and commander in chief of the army and all other important military and civil positions. Essentially independent since 1923, Nepal is influenced by Great Britain only in its foreign policy.

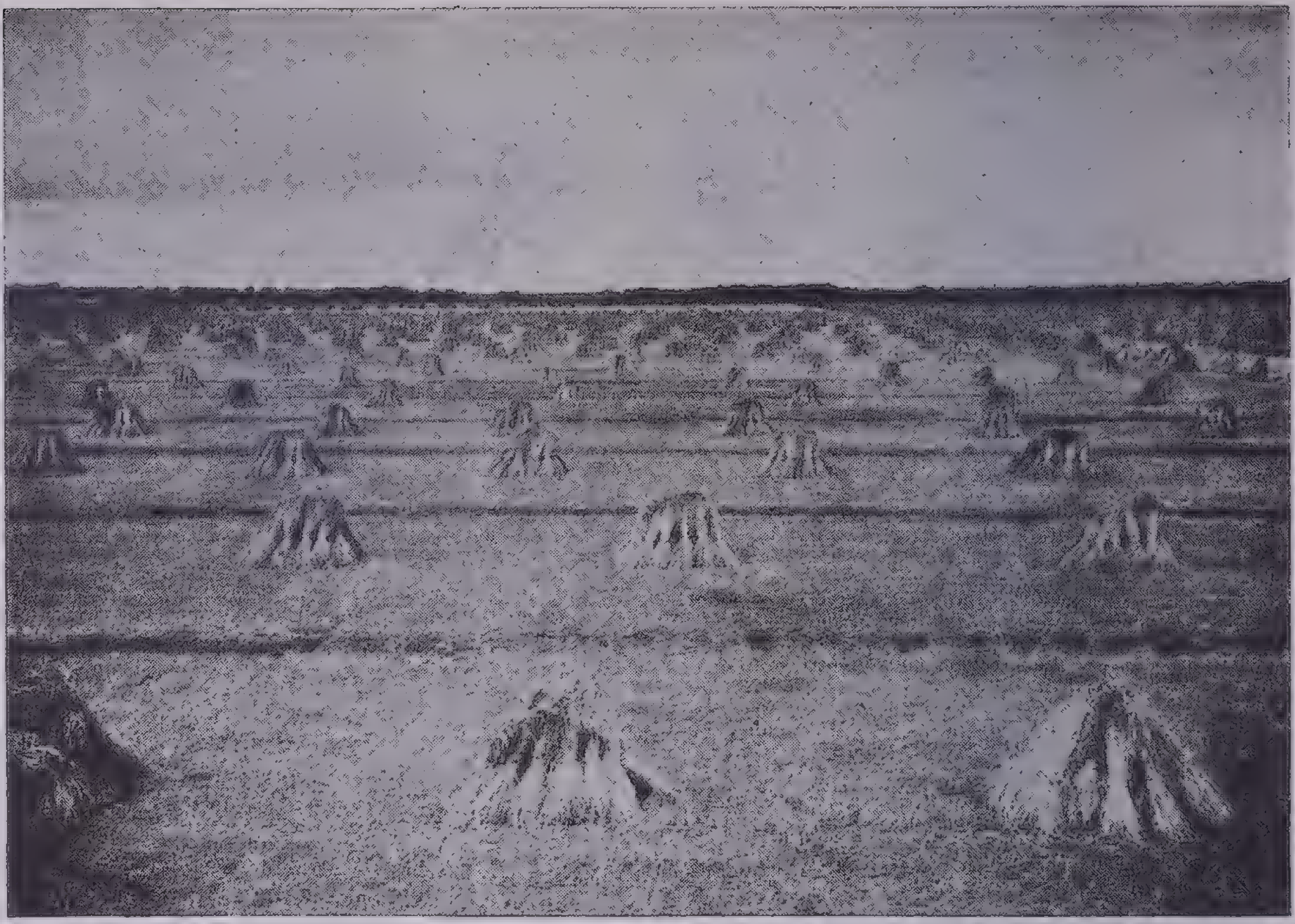
Netherland India, the group of islands situated between Australia and the Asiatic mainland. Uncounted ages ago they were a southeastward continuation of the continental mass. They number several thousands and vary in size from New Guinea and Borneo, which rank second and third in size among the islands of the world, to tiny unnamed coral islets. They lie from Sumatra in the west to New Guinea in the east and are crossed in the northern third of the archipelago by the equator. Important islands besides those already named are Java, Celebes, Bali and Timor. The islands of the western section are frequently grouped as the *Sunda Islands;* and those of the eastern section, as the *Moluccas.* Most of the islands have been controlled by the Netherlands since the early part of the 17th century. They are known also as the Dutch East Indies and as the Malay Archipelago or Malaysia.

Netherlands, The, conquered by Germany in 1940, constitutional monarchy of western Europe, bordering on the North Sea for 465 miles and surrounded on its land sides by Belgium on the south and Germany on the east.

The country is composed of 11 provinces: Drenthe, Friesland, Gelderland, Groningen, Limburg, North Brabant, North Holland, Overyssel, South Holland, Utrecht and Zeeland. Though it has a land area of only 12,692 square miles, it has a population of 8,556,849, making it one of the most densely populated countries of Europe with an average of 670 persons to each square mile. Like England and France the Netherlands is the center of a vast colonial empire; it totals 800,000 square miles in area and controls the political destinies of 50,000,000 persons. The more important of these colonies, known collectively as Netherland India and the Dutch West Indies, are described in separate articles. Since 1922 Netherland India has been recognized as an integral part of the Kingdom of the Netherlands.

The most notable fact about this country is that fully one-fourth of its area is below the level of the sea, the depression in some places being as great as 25 feet; only the famous dikes, 1,500 miles long, prevent inundation of a large area. The opening of some of these dikes at times has played an important part in the past in halting the advance of an enemy: in 1672 the combined armies of France, England and Germany would have taken the Dutch capital if an artificially created flood had not stopped the invasion. The average elevation of the whole country is only 37 feet above sea level, although in the eastern part hills, formed originally as glacial ridges, rise about 1,000 feet. The low elevation does not affect the health of the population unfavorably because cleanly habits prevail.

The Netherlands has long needed more land to accommodate its dense population, and in 1918 the Parliament voted reclamation of the Zuider Zee. This was a great tidal basin that has been turned into a body of fresh water, called the *Yssel Lake,* by construction of a sea dike nearly 20 miles long, 23 feet high and 300 feet broad at the bottom and 100 feet broad at the top. By 1930 the Northwest Polder, covering an area of 78 square miles, had been reclaimed, and in 1938 work was started on the Southwest Polder which will add 214 square miles to the country's area. Eventually some 850 square miles will become cultivable, and the area of the Yssel Lake will be reduced to 500 square miles. In contrast to the picturesque windmills that were used in the past for pumping water out of lakes and marshes, most of the reclamation of the Zuider Zee has been done with electricity. The total cost of the project will be some $270,000,000 but it will prevent a repetition of the disastrous flood of 1916, caused by the invasion of huge tides from the North Sea; and by providing holdings for 300,000 more farmers it will be a protection against the food shortage that the Netherlands experienced during the World War. Regulation of the height of the Yssel Lake above the Friesland canals will ensure an adequate amount of water for irrigation purposes.


Courtesy Netherlands Railways

Land of the Zuider Zee, Until 1925 an Ocean-Filled Lake

The water has been drained from the Zuider Zee, a massive system of dikes constructed and the reclaimed land turned into valuable soil by extracting the salt. When the reclamations are finished, the total area of the country will be enlarged by 7 per cent, the cultivated area by 10 per cent. Above is shown a crop of rye, the first produced on the new land

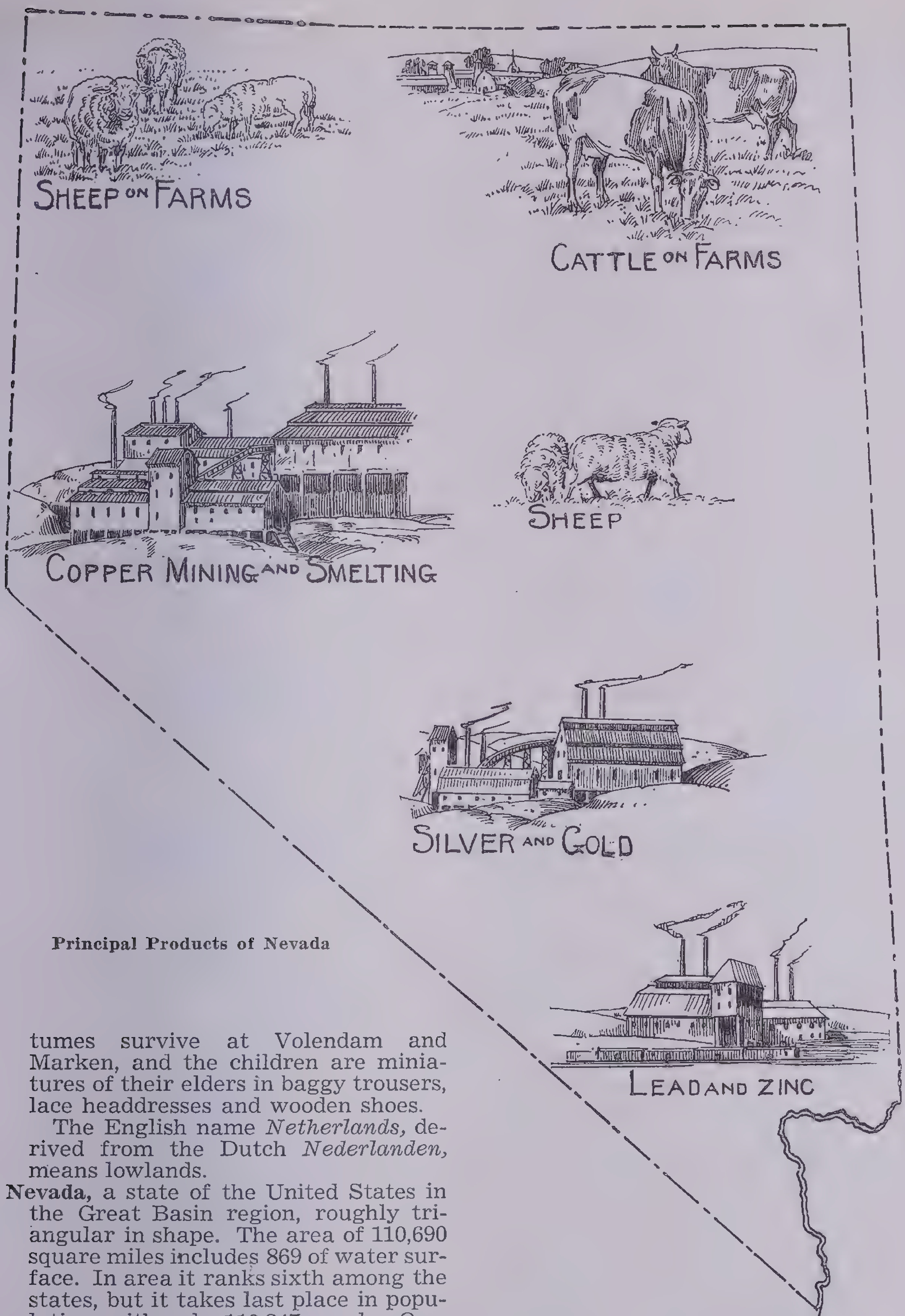
The internationalized Rhine, Maas (Meuse) and Schelde (Scheldt) rivers reach the sea through the Netherlands, and the waters of the Yssel and other short rivers serve to irrigate the country. In addition to these natural waterways the Dutch have built more than 4,500 miles of canals that connect all parts of the kingdom.

The Netherlands owes the great fertility of its soil to the fact that a large part of it is located in the delta regions of the Rhine and the Maas. The principal agricultural products are wheat, rye, oats, barley, flax, tobacco, sugar beets, potatoes and legumes. Dairying is of vast importance, and dairy products—butter, condensed milk and cheese—increase the export trade, especially to Great Britain and Germany. Horticulture also assumes the proportions of an industry; picturesque color is given to the land by the raising of millions of tulip and hyacinth bulbs that find markets in all parts of the world and whose brilliant blossoms spread their hue over acres upon acres. About 25,000 Hollanders fish for oysters along the coast and for herring in the North Sea. The large cities have been famous for their diamond-cutting industry since the Middle Ages. Shipbuilding also has been of vast importance since the latter part of the 17th century, when Peter the Great worked as a shipwright at Amsterdam and Saardam so as to gain firsthand information in improving the Russian Navy. Other manufactures include textiles (principally cottons, linens and artificial silks), cigars, cigarettes, incandescent lamps and radio apparatus.

When France lost its hold upon the country after the defeat of Napoleon in 1814, the Netherlands restored the monarchy and adopted a national constitution that is still in force. The sovereign exercises the executive authority through the Council of Ministers headed by a premier. The Parliament or States-General consists of two houses: the First Chamber of 50 members elected by the legislatures of the provinces for a term of 9 years; and the Second Chamber of 100 members elected directly by the people for a term of 4 years. The State Council of 14 members serves in a consultative capacity to both the sovereign and the Parliament. The 11 provinces are subdivided into 1,121 communes, each administered by a local elective council and a burgomaster appointed by the sovereign.

The twin capitals of the Netherlands, Amsterdam and The Hague, are described in separate articles. Rotterdam (population, 587,000) is an important port, though located 15 miles from the North Sea on the Maas River. Among its notable structures are the 15th-century St. Lawrence Church, the Town Hall, the Ethnographical Museum and Boymans' Art Gallery. A monument has been erected in the market place to the great Renaissance scholar Erasmus, who was born here.

Other important cities are: Utrecht, noted for the medieval exhibits in its Museum van Oudheden and the carillon of its 13th-century cathedral; Leyden, seat of the world-famous university, founded in 1575; Delft, which gave its name to pottery that originated here in the 17th century; Alkmaar, since time immemorial the center of the Dutch cheese trade; Haarlem, located in the heart of "tulip land"; and Scheveningen, one of the most fashionable European seaside resorts. To the delight of tourists, gaily painted houses and picturesque cos-



Principal Products of Nevada

tumes survive at Volendam and Marken, and the children are miniatures of their elders in baggy trousers, lace headdresses and wooden shoes.

The English name *Netherlands,* derived from the Dutch *Nederlanden,* means lowlands.

Nevada, a state of the United States in the Great Basin region, roughly triangular in shape. The area of 110,690 square miles includes 869 of water surface. In area it ranks sixth among the states, but it takes last place in population, with only 110,247 people. Oregon and Idaho lie on the north, Utah and Arizona on the east and California on the south and west. Its greatest length is 485 miles; and width, 315 miles.

The state has a highly irregular topography, having the form of a shallow bowl crisscrossed by mountain ranges. Only the southeastern edge has drainage into the ocean, and throughout its area streams are widely separated and irregular in volume, often disappearing in alkali flats or salt lakes a few miles from their mountain sources. The western boundary closely follows the Sierra Nevada range, a barrier that stops moisture-laden clouds and makes much of Nevada a desert. The waters of the Humboldt, the chief river, are extensively used for irrigation.

Its generally high altitudes, sparse vegetation and scant rainfall result in a climate of great temperature variations, even within a few hours, as burning heat may be followed by chilly breezes from snowclad mountains. Where water is available farming is successfully carried on, but little more than 5 per cent of the area is devoted to agriculture. But much of the land produces good forage, and sheep and cattle are raised in large numbers. The area in forests is considerable, but trees of marketable size are found only at the higher elevations.

Manufacturing is of little importance. Mining has always been the major industry, and more than a billion dollars worth of ores have been produced in the state. The Comstock gold and silver mines alone have yielded over six hundred million dollars. Copper and lead are now the most valuable minerals, though large amounts of silver and gold are recovered as by-products.

Reno, with some 20,000 people, is the chief city. It has gained worldwide notoriety for the ease and speed with which divorces may be obtained. Las Vegas, in the southeast, has grown with the nearby Boulder Dam development. Carson City, the capital, is a small town. The University of Nevada at Reno is the only important institution of learning.

With its great areas of desert Nevada has limited scenic attractions. Boulder Dam, which it shares with Arizona, is the principal engineering achievement. The vicinity of Lake Tahoe, in the Sierras on the California boundary, has great natural beauty. Along the southwestern border are several abandoned mining camps, unique "ghost cities" of the desert.

New Britain Archipelago, a group of about 100 islands of volcanic formation in the Pacific Ocean, lying between 2° and 7° S. Lat. and 146° and 153° E. Long, and included in Melanesia. Formerly a German protectorate known as the *Bismarck Archipelago,* these islands were captured by Australian forces on the outbreak of the World War and since 1921 have been governed by Australia under mandate from the League of Nations. They have a total area of 19,660 square miles and a population (of Papuan and Melanesian stock) of about 192,000.

The principal islands are: New Britain (formerly New Pomerania), whose area is 13,000 square miles and whose population is 88,000; and New Ireland (formerly New Mecklenburg), with an area of 3,500 square miles and a population of 38,000. Volcanic eruptions and earthquakes are frequent. The most important active volcano is the Father (7,500 feet high) on New Britain. Copra, cotton, rubber, coffee and pearl and tortoise shell are the chief products. Rabaul is the capital of New Britain; and Kavieng, of New Ireland.

The New Britain Archipelago also includes Lavongai (formerly New Hanover), Duke of York Islands (formerly New Laurenburg) and Admiralty Islands. These islands were discovered by the Dutch in 1616 and were annexed by Germany as a protectorate in 1885.

New Caledonia, an island of volcanic formation in the Pacific Ocean, which with its coral-formed dependencies, the Loyalty Islands, Isle of Pines, Wallis Archipelago and Huon Islands, constitutes a French colony. The group is situated between 20° and 22° S. Lat. and 164° and 167° E. Long. and is included in Melansia. The total area is 8,548 square miles; and the population, about 57,000. New Caledonia itself has an area of 6,296 square miles. It is mountainous, and its most noted peak is Mt. Humboldt, 5,360 feet high. The chief river is the Diahat. The native population is of Melanesian stock; but, as Nou and some of the other islands were used as French penal stations from 1864 to 1896, the white population is considerable (about 17,000) for a group of South Sea islands.

New Caledonia is one of the world's chief sources of nickel. Among the other minerals and metals are gold, silver, copper, lead, coal, iron, manganese and cobalt. The principal agricultural products are coffee, cotton, sugar, copra, manioc, tobacco, rubber, bananas and pineapples. The island was discovered and named by Capt. James Cook in 1774; despite Great Britain's counterclaim it was annexed by France in 1853. The capital, Nouméa, is the seat of the French governor, who is assisted by a privy council. There is also an elected legislature called the Council General.

Newfoundland, a Crown colony of Great Britain that comprises the large island of Newfoundland, lying east of the Gulf of St. Lawrence, and its political dependency Labrador on the Canadian mainland. It is the oldest British colony, having been formally occupied by Sir Humphrey Gilbert in 1583; the first governor was appointed in 1728. After the World War Newfoundland assumed a dominion status, but the world-wide depression affected it so severely that in 1933 it petitioned the British Government to be permitted to return to its former colonial position. The country tried to maintain its independent existence and discharge the large national debt by offering to sell Labrador to Canada for $110,000,000, but in the face of the depression the Canadian Government did not accept the offer.

Newfoundland is separated from the Labrador Peninsula on the north by the Strait of Belle Isle and from Prince Edward and Cape Breton islands on the south by Cabot Strait. It assumes the general form of an equilateral triangle, each side of which is about 317 miles in length, but so irregular are its shores that it has a coast line of nearly 4,000 miles. Cape Norman is at the tip of the northern peninsula (Le Petit Nord), and at the tip of the Avalon Peninsula on the southeast is Cape Race. Nine-tenths of the population live in the southern part of the island. The northern part is rather barren. The area is 42,734 square miles, and the population is about 285,000.

Newfoundland's interior is a plateau broken by low hills in the western part called the Long Range. The rivers are short, and, though they are not navigable, they furnish abundant water power for manufacturing; the principal ones are the Exploits, Gander and Humber. The chief lakes are the Grand and Red Indian. The important bays include the White, Green, Conception, Trinity, St. Marys, Bonavista, Placentia and Islands. The climate is colder than on the Canadian mainland because the Labrador Current sweeps down huge icebergs from the Arctic Regions and causes fogs at all times of the year.

The majority of Newfoundlanders gain a livelihood from fishing. The Newfoundland fishing grounds in the region of the Grand Bank, a submarine platform built of iceberg deposits and extending more than 200 miles off the southeastern coast, have been famous since the 16th century. These grounds have been the subject of quarrels on many occasions between England and France, but since the settlement of the last quarrel in 1814 France has held the islands of St. Pierre and Miquelon 10 miles south of the Burin Peninsula. The principal fish are cod and salmon. The cod catch amounts to approximately 140,000,000 pounds annually and in recent years has been augmented by the discovery of biological chemists of the great vitamin content of cod-liver oil. Other fish taken are herring, hake, lobsters and halibut. Sealing and whaling are also important.

The wood pulp and paper industry ranks next to the fisheries in importance. The abundant forests yield the necessary timber, and the rivers furnish the water power. Some 205,000 tons of newsprint paper are exported annually to Great Britain and some 105,000 tons to the United States. The mineral wealth includes iron, copper, zinc, lead, coal, gypsum and magnetite. The agricultural products are mostly cereals, vegetables and orchard fruits.

The administration of the colony during the financial emergency is entrusted to a governor and a royal commission of 6 members, half of whom are appointed by Great Britain and the other half by Newfoundland. This commission also has full legislative power, as the Newfoundland Parliament was suspended. The capital is St. Johns (population, 40,000), a seaport on the Atlantic side of the Avalon Peninsula. It has the advantage of being nearer Great Britain than any other city in North America. The city builds ships for the fishing industry and manufactures everything required for their equipment. There are large fish-drying and -packing establishments. The only other important city is Harbor Grace.

Newfoundland was named by John and Sebastian Cabot who discovered the region for England in 1497.

New Guinea, an island of the Malay Archipelago, and next in size to Greenland, the largest in the world. It lies directly north of Australia, and the two are separated by the Arafura Sea and Torres Strait. New Guinea is 1,490 miles long and 430 miles wide at its broadest point. The area is 312,329 square miles. In the northern and western parts are found the principal mountain chains, the Charles Louis, Orange, Nassau and Otto mountains. Mt. Carstenz (16,400 feet high), Mt. Wilhelmina (15,580 feet) and Mt. Idenburg (15,150 feet) have glaciers above their snow lines, which begin at 14,600 feet above sea level as the island is near the equator. The chief rivers are the Mamberamo and Sepik. The plants and animals of New Guinea resemble those of Australia. Kangaroos and other marsupials are found, and the island is the home of the rare and beautiful bird of paradise. The agricultural products are tropical: rice, sugar, cacao, copra, rubber and sago the chief exports. Gold and copper mines and petroleum wells are being developed.

New Guinea is divided into two sections—the eastern part, British New Guinea; and the western part, Dutch New Guinea. The older section of British New Guinea is the Territory of Papua, which covers an area of 90,540 square miles in the southeastern part and has a population of about 275,000. Since 1906 it has been administered by a lieutenant governor, who is responsible to the governor general of Australia, an executive council and a legislative council. The principal towns are Port Moresby and Samarai.

Essentially British also is the mandated section in the northeastern part. It was called *Kaiser-Wilhelmsland* on its annexation by the German New Guinea Company in 1885 and as such was placed under mandate to Australia in 1921 by the League of Nations. This section or Territory of New Guinea as it is now called, covers an area of 93,000 square miles and has a population of 396,958. The capital is Rabaul. The natives of British New Guinea are mostly of Melanesian stock.

Dutch New Guinea has an area of 151,790 square miles and a population of 195,460. Administratively it is part of the Molucca Islands. The principal settlement is Merauke. Among the natives, who are of Papuan and Negrito stock, head-hunting and cannibalism have not been entirely eradicated, and there is continual enmity among the mountaineers, coast dwellers and peoples of the scrub land or section of the interior between the coast and mountains.

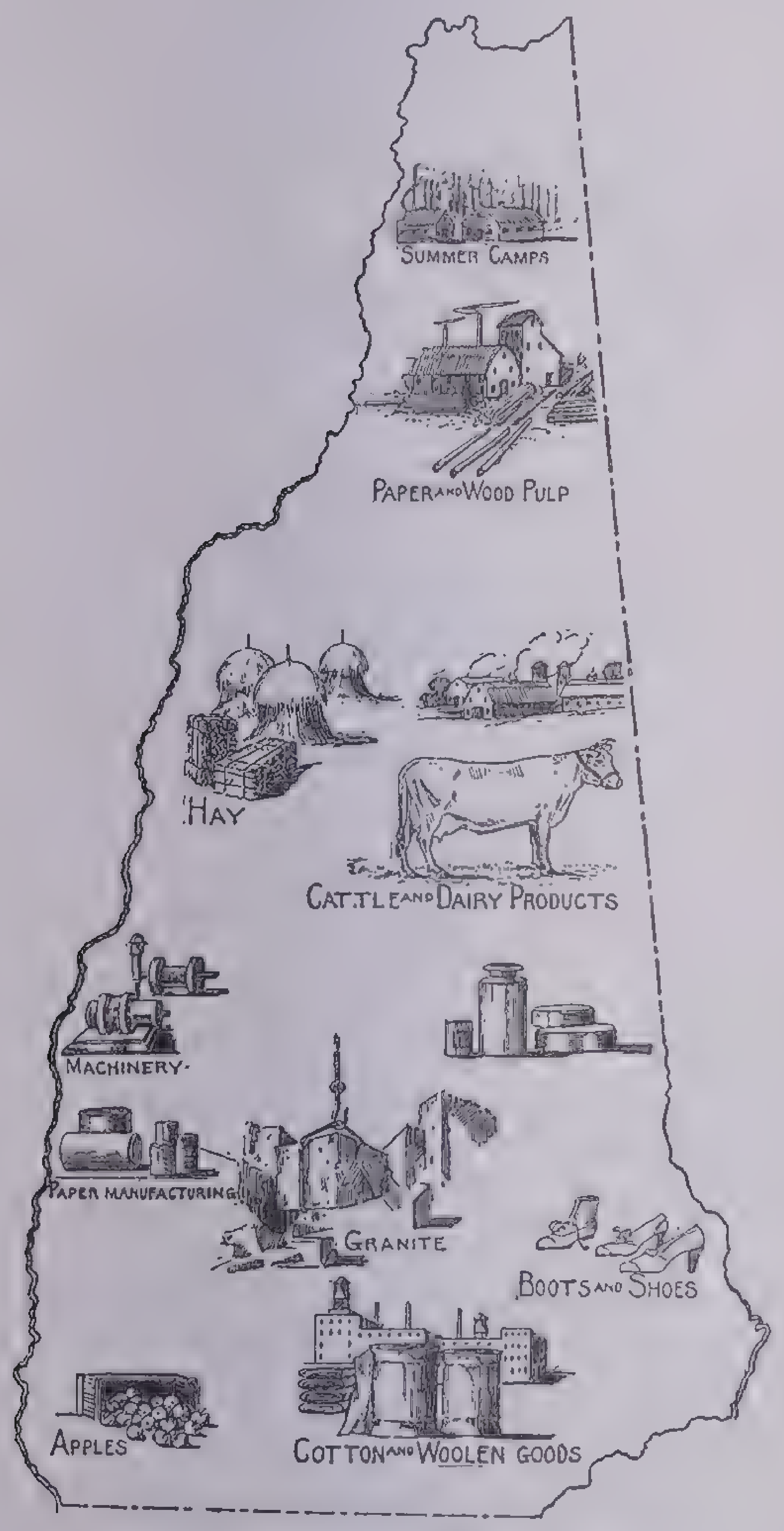
New Guinea was discovered by Dom Jorge de Meneses, a Portuguese navigator, in 1526; a later explorer, Ortiz de Retez, called it *Nova Guinea* because he saw a resemblance between the island natives and the people of western Africa. The Netherlands claimed the western section following the conquest of the Moluccas early in the 17th century but did not annex it until 1793. British control in the eastern part of the island dates from Capt. James Cook's rediscovery of Torres Strait in 1770 and the annexation by the East India Company in 1793.

New Hampshire, a New England state, bounded on the north by Quebec, on the east by Maine and the Atlantic Ocean, on the south by Massachusetts and on the west by Vermont, from which it is separated by the Connecticut River. It is the 43d state in size with an area of 9,341 square miles, of which 310 are water surface. It is 185 miles long and 90 broad. The population is slightly over 491,524.

The White Mountains cover the northern half of New Hampshire, giving the state the highest elevations in New England. From the summit of Mt. Washington, 6,288 feet above sea level, a tumbling mass of rounded peaks spreads in all directions, divided at intervals by deep narrow valleys, locally called *notches*. The broader southern section is rolling and dotted with small lakes where ancient glaciers have left depressions. Here occasional granite domes, of which Mt. Monadnock is most conspicuous, rise above the general level. In the southeast is a narrow strip of the Atlantic coastal plain.

Many rivers rise in the New Hampshire hills, including the Connecticut, Androscoggin, Saco and Merrimack. The last has been of great importance to the state by supplying abundant water power to its factories. Of the several hundred lakes two, Winnepesaukee and Sunapee, cover considerable areas and afford splendid summer recreation.

Cold winters bring deep snows to the White Mountain section and make it a popular winter sports region. The summers are generally mild, attracting thousands of visitors to resorts, cottages and camps in the valleys and on the lakes. Though climate and rainfall are favorable for agriculture, the soil is thin and rocky in many sections, and little more than a third of the land is devoted to farming. A large acreage, particularly in the mountains, is included in public forest reservations. The lumber industry, once of great importance, is slowly reviving, and much wood pulp is produced. Dairying is the most profitable rural activity. Hay and maple sugar are other valuable products.



Principal Products of New Hampshire

Mineral resources are limited. New Hampshire has shared in New England's manufacturing development, and the cities (especially on the Merrimack River) have large textile, shoe and paper mills. The total value of manufactures has declined greatly, however, since the World War.

Manchester, the chief city, is an old textile mill town on the Merrimack. Concord, the capital, is also on this river. These cities, as well as Nashua, Berlin and smaller places, have suffered somewhat from the decline of the New England textile trade but are reviving with the establishment of more diversified industries. Portsmouth, a prosperous port in the days of sailing ships, is an important naval station.

Dartmouth College at Hanover is one of the leading educational institutions in New England. The University of New Hampshire at Durham has made great progress in recent years.

The lakes, mountains and coast of New Hampshire have been popular vacation regions for more than a century, and the entertainment of travelers is one of the chief sources of income. The cog railroad to the summit of Mt. Washington was one of the first of its kind. On Profile Mountain in the Franconia Range is the Great Stone Face. Fine scenery abounds throughout the state, and notable colonial homes and churches are preserved in the older towns near the coast.

New Hebrides, a group of islands of volcanic formation in the Pacific Ocean. They are located about 1,000 miles east of Australia and included in the Melanesian section of Oceania. There are some 40 islands and islets, but only eight are of a size that renders them important. The largest is Espiritu Santo. The total area is 5,700 square miles; the population, mostly of Melanesian stock, is about 64,500. Breadfruit, coconuts, copra, coffee, cotton, pineapples and bananas are the chief agricultural products. Sandalwood is the most important timber, and copper, iron and nickel are the most important metals. The capital, Vila, is on the island of Efaté. Since the islands became a codominion in 1906, the government is administered jointly by high commissioners representing both Great Britain and France. The islands were discovered by the Portuguese Pedro Fernandez de Quiros in 1606. Capt. James Cook on his voyage of 1774 gave the islands the name that they now bear.

New Jersey, a middle Atlantic state, bounded on the north by New York, on the east by the Atlantic Ocean, on the south by Delaware Bay and on the west by Pennsylvania. The Delaware River forms the western boundary. It ranks 45th in size of the 48 states: area, 8,224 square miles, including 710 of water surface. It is 160 miles long and 70 broad. The population, 4,160,165 (1940), is largely concentrated in cities and towns, particularly in the areas adjacent to New York and Philadelphia.

The northwest corner is crossed by several minor mountain ridges, and here the highest elevation, 1,805 feet, is found. Most of the state is low and flat. Along the Atlantic coast is a long line of sandy islands, separated from the mainland by shallow salty bays. The rivers within New Jersey are short, and only the Raritan and the Passaic are of much economic importance. The Delaware on the west and the Hudson on the northeast border are busy commercial waterways of incalculable value to the state, and a large part of the foreign and coastal shipping of New York harbor is accommodated at wharves on the New Jersey side.

The climate is temperate, with occasional short periods of cold in winter and heat in summer. Along the Atlantic the temperature changes are less extreme, especially on the long islands where the influence of the surrounding water surfaces is most pronounced. Rainfall is adequate for agriculture, but irrigation is employed to some extent by growers of fruits and vegetables for the nearby city markets and the numerous canneries. Close to 40 per cent of the area is in farms. Most Temperate Zone crops are raised, but dairy farming and commercial orchards are of greatest importance after truck gardening. Cranberries and blueberries are harvested in large quantities. Nearly half the state is covered with scrub timber of little economic value.

New Jersey has large iron-ore deposits which were extensively worked in the early 19th century, but their output has declined with the exploitation of richer fields in other states. Some magnetite is still mined. In zinc production the state ranks second. The clay deposits are important, and Trenton is a center for pottery manufacture.

With its many cities, excellent transportation and nearby markets New Jersey takes high rank in manufacturing, and in only five states is the value of such products greater. Petroleum refineries and copper smelters, located on tidewater where the raw materials may be brought in by the shipload, are leading industries. The chief center in the country for silk manufacture is Paterson. Textiles, electrical machinery, radios, paint, tools and machines in great variety, soap, canned foods, surgical and hospital supplies, jewelry and platinum, chemicals, plumbing fixtures, these and many other products are turned out in abundance by factories in all sections.

Newark, the principal city, has large insurance interests. Manufactures are diversified, and much trade is handled through the port, a branch of New York Harbor. The city is served by large trunk railroads. The library and museums rank high. In the adjacent residential suburbs there are many homes and estates of New York business people.

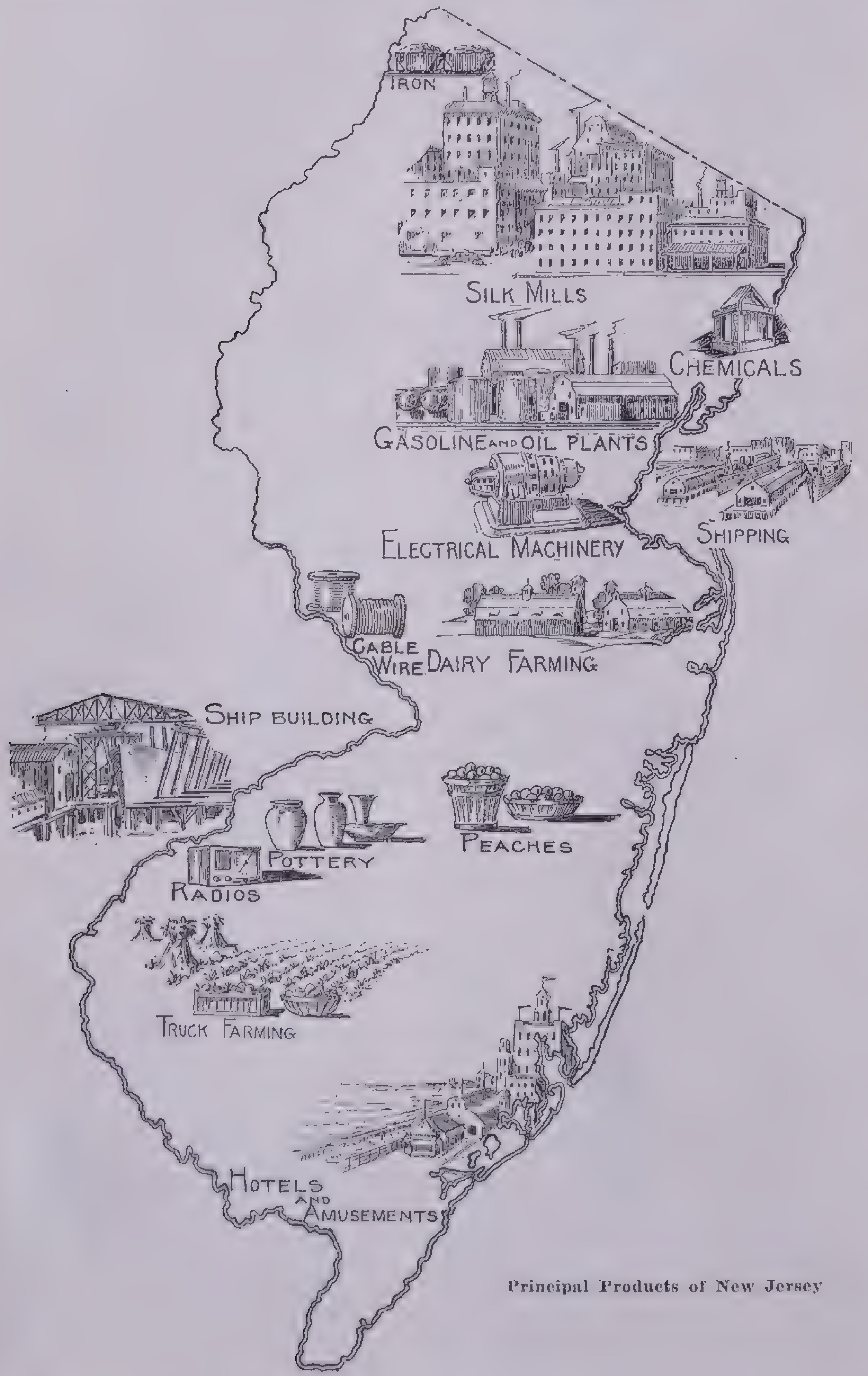
Jersey City lies along the Hudson opposite New York city, and has many characteristics of an industrial suburb of the metropolis. Its waterfront is occupied by the terminals of trunk line railroads and transatlantic shipping lines. Hoboken, Bayonne, Union City and smaller adjoining places have similar situations and varied manufacturing interests.

Paterson's textile mills grew around the falls of the Passaic River. The city is surrounded by a ring of residential towns, suburban to New York. Trenton, the capital, at the head of navigation on the Delaware River, has varied industries besides its great pottery trade. Camden, opposite Philadelphia, is a port of considerable importance, with shipyards and heavy industries in addition to diversified manufactures. Elizabeth, on the edge of the New York district, is a center for production of sewing machines, chemicals and hardware.

Princeton University at Princeton is an outstanding institution. Rutgers University at New Brunswick and Stevens Institute of Technology at Hoboken also take high rank, and the University of Newark at Newark is growing rapidly.

Atlantic City is the outstanding seaside resort of America, with hotel and amusement facilities of every kind. It has the most spacious Convention Hall in the country. The boardwalk, which parallels the beach for miles is a popular promenade. Among other resorts that enjoy excellent water sports and a pleasant summer climate are Cape May, Wildwood, Ocean City, Asbury Park and Long Branch. These resorts and the smaller towns on the bays have busy fishing fleets for both sporting and commercial purposes, and the sea-food industry yields substantial profits.

In the northern hilly section there are a number of attractive small lakes in wooded surroundings. Morristown, Trenton and other places have many reminders of New Jersey's place in the strategy of the American Revolution. Princeton, Salem, Perth Amboy, New Brunswick and Mount Holly are among the old towns where specimens of colonial architecture are found.



Principal Products of New Jersey

New Mexico, southernmost Rocky Mountain state, the fourth of the United States in area, with 122,634 square miles, including only 131 of water surface. On the north is Colorado, on the east Oklahoma and Texas, on the south Texas and Mexico and on the west Arizona. The greatest length is 390 miles, and breadth 350 miles. The outline is almost rectangular; only the southern boundary is not a straight line. The population is about 531,818 (4.3 people per square mile), many of whom are of Mexican or Indian ancestry.

The highest elevation in New Mexico is North Truchas Peak, 13,306 feet. There are great stretches of level plateau, particularly near the eastern and western borders, and of lower arid plains which in places become deserts. The Pecos and Rio Grande rivers are the only large streams. Their valleys, watered by irrigation, are the most productive sections.

With scant waterfall, seldom over 15 inches per year, the climate is semi-arid. Winter temperatures are low in the mountains, and summer days in the valleys grow very hot, but the dry atmosphere is stimulating.

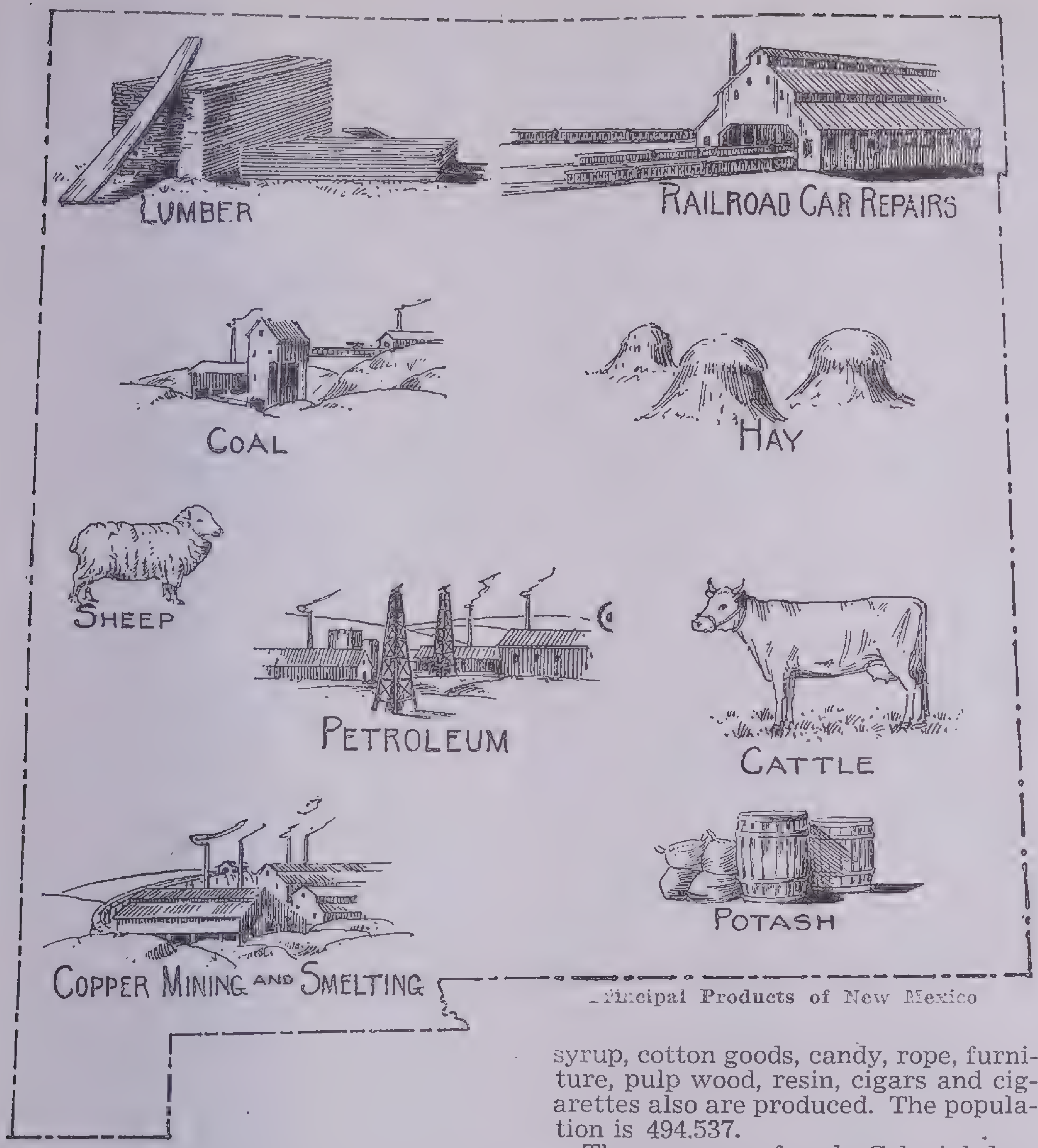
At the higher elevations considerable growths of timber are found, especially evergreens, but most of the surface is better adapted to grass than any other vegetation, except where irrigation is feasible. Cotton, sugar beets and various grains and fruits are raised, but sheep and cattle range over most of the useful land. The Elephant Butte reservoir on the Rio Grande is the outstanding irrigation project of the region.

Manufacturing is of little importance in New Mexico, but the mineral resources are great. Gold and silver, oil and coal, copper, lead and potash are among the valuable products of the mines.

There are no large cities in the state. Albuquerque is a health resort and the principal trading center, though much of the business of the Rio Grande Valley goes south to El Paso. Santa Fe, the capital, is the second oldest city in the United States, having been founded in 1609. It has a distinctive pueblo architecture and an exhilarating climate both of which attract a profitable tourist activity.

Among many distinctive natural wonders in New Mexico the Carlsbad Caverns in the southeast are best known. They are not yet entirely explored, but these great underground chambers and passages are included in a National Park. Another government reservation protects the White Sands, where great dunes of white gypsum crystals are fantastically patterned by the winds.

The ancient Indian pueblos of the upper Rio Grande Valley attract



Principal Products of New Mexico

many visitors to the state. The survivors of this race are skilled makers of pottery, rugs and hammered metal. Their settlement at Taos is flourishing, but some of the more primitive pueblos near Santa Fe have been abandoned for centuries.

New Orleans, a city of the United States and the most important in Louisiana; it is located in the southeastern part of the state on the Mississippi River and Lake Pontchartrain, an arm of the Gulf of Mexico. Though the city is 110 miles from the mouth of the Mississippi, it is one of the most important ports of the South and leads in export shipments of cotton, rice, sugar timber and petroleum. Bananas from Central America are the principal import; about 30,000,000 bunches are received annually. Completion of the Inner Harbor Navigation Canal in 1923 added 11 miles to the water frontage; this canal extends 5 miles from the Mississippi River to Lake Pontchartrain. Through Lake Pontchartrain, previously 16 feet deep, a channel has been dug to make a depth of 30 feet so that ocean-going steamers have direct access to the city.

The city lies below the level of high tide but is protected by levees 20 to 30 feet high. It is served by 9 railroad lines and 90 steamship lines. Among industries are sugar and cotton-seed-oil refining, rice milling, seafood packing and mahogany milling. Cane syrup, cotton goods, candy, rope, furniture, pulp wood, resin, cigars and cigarettes also are produced. The population is 494,537.

The romance of early Colonial days still clings to New Orleans. Evidences of the French and Spanish occupations abound in the older part of the city called the *Vieux Carré.* Here are grey-stoned and stucco buildings with wrought-iron balconies overhanging narrow streets. The heart of this section is Jackson Square (formerly the Place d'Armes), with its heroic statue of Andrew Jackson, victor at the Battle of New Orleans on January 8, 1815. On the south side of the square are the Cabildo, in which the governing body of the Spanish colony sat from 1795 to 1800, and which is now a state museum; St. Louis Cathedral, a Capuchin church that dates from 1794; and the Presbytery (corresponding in appearance to the Cabildo and named from the fact that it was erected on the site of the residence of the Capuchin priests), now a museum, which was for almost a century after its construction in 1813 used for the sessions of the civil district courts. The square is flanked on the east and west sides by the Pontalba Apartments, now occupied as artists' studios.

Courtesy New Orleans Association of Commerce

Iron Lacework Balcony in New Orleans

Striking characteristics of the architecture of the *Vieux Carré* (French Quarter) are the balconies and grillwork of wrought and cast iron, in vogue during the period 1795–1830. Balconies are found on all *Vieux Carré* buildings more than one story high. Through the decorative ironwork can be seen Orleans Street with St. Louis Cathedral in the background

On Chartres Street, the principal thoroughfare of the Vieux Carré, are: the Napoleon House, which was furnished for the St. Helena exile but, on the eve of sailing of Dominique You and his pirates to rescue Napoleon, word was received of his death; Ursuline Convent, built in 1727; the old slave mart; and the blacksmith shop of Jean Lafitte, a French pirate, whom the citizens forgave for plundering ships in the Gulf of Mexico because of his aid to Jackson in the Battle of New Orleans. Beauregard Square (formerly Congo Square) was the headquarters of the voodoo cult of the negro population during the 18th century.

In the modern section of New Orleans, St. Charles Avenue is the most imposing boulevard; lined with beautiful homes, it extends to Lafayette Square, where towering skyscrapers prove the modern development of the city. Along this avenue are Tulane University and its women's division, Sophie Newcomb College. Loyola University, a Roman Catholic institution, is on Audubon Parkway. In City Park are the moss-draped duelling oaks, beneath which French or Spanish honor was vindicated, and the Delgado Art Museum.

The early settlement, founded by Le Moyne, Sieur de Bienville, in 1718, was named *Nouvelle Orleans* (or New Orleans) for the French regent, the duke of Orleans. It served as the capital of Louisiana from 1723 until after the American purchase of the colony from France in 1803. In 1849 the seat of government was transferred to Baton Rouge. During the Civil War the city was held by Federal troops after its capitulation to Admiral David Farragut in April 1862.

At the close of the century a new era of prosperity began, and the city's growth was hardly interrupted except for a period when yellow fever proved a terrible scourge. By 1906, however, such stringent sanitary measures had been enforced that there has been little recurrence of the disease. Since 1914 the United States Health Service has wiped out the bubonic plague also.

A feature of New Orleans life since the early part of the 19th century is the 3-day pre-Lenten festival called *Mardi Gras,* French for fat Tuesday, in reference to the last day of the carnival before Ash Wednesday.

New York, a Middle Atlantic state, ranking first in the United States in population and commerce but 29th in area. Of its 49,204 square miles 1,550 are water surface. Its shape is most irregular. The greatest length is 320 miles, breadth 310 miles. It is bounded on the north by Lake Ontario and the provinces of Ontario and Quebec; on the east by Vermont, Massachusetts and Connecticut; on the south by the Atlantic Ocean, New Jersey and Pennsylvania; and on the west by Pennsylvania, Lake Erie and Ontario. The St. Lawrence River forms a part of the northern border. Fish-shaped Long Island, 118 miles in length, forms the Atlantic coastal frontage; it is separated from the mainland by Long Island Sound.

The population of the state is about 13,479,142. Over 80 per cent of the people live in cities and towns, and about 50 per cent are of foreign birth or parentage.

Most of the surface is hilly, and there are several branches of the Appalachian mountain system within its boundaries, including the Catskills in the southeast, where the highest elevation is 4,202 feet, and the Adirondacks in the northeast, rising to an altitude of 5,344 feet in Mt. Marcy, the highest point in the state.

There are many deep narrow parallel valleys in the central and western sections, and lakes have formed in several of them. Among them are Seneca and Cayuga, each 35 miles long, and the broader Oneida, which with smaller ones form the noteworthy Finger Lakes group of central New York. Chautauqua Lake in the west is similar in shape. In the Adirondacks region are hundreds of small lakes of irregular shape. Lake Placid is outstanding in this group. Lake Champlain on the eastern border is about 120 miles long. Southwest of it and entirely within the state is island-dotted Lake George, 33 miles long, one of the most beautiful of all. On the northern and western borders are Erie and Ontario of the Great Lakes group; of all the New York lakes only these are now of great commercial importance.

The Delaware, Susquehanna and other smaller rivers rise in its hills, but the principal river of the state is the Hudson, navigable for 150 miles above its mouth, which forms New York Bay, the world's busiest harbor. The valley of the Mohawk, a tributary of the Hudson, forms the lowest westward passage through the Appalachian Mountains, a topographic detail which has been of incalculable importance in the development of New York city.

The state has a temperate climate, though the higher elevations in the Adirondacks experience bitter cold in winter. The rainfall is ample for crops, but general agriculture is less important than it was a century ago. Dairy farms, commercial orchards and vineyards take up a large portion of that three-fifths of the total area devoted to agricultural purposes. Hay, corn and oats are the leading field crops. Market gardening is a highly developed business, particularly on Long Island.

Once the state ranked first in lumber production, but only traces of the virgin forest remain. Reforestation projects, particularly in the Adirondacks, are restoring large woodland areas to productivity, and the output of lumber and wood pulp is a substantial factor in its industrial wealth.

Metallic minerals are scarce. The fairly abundant low grade iron-ore deposits have little commercial value. On the other hand the state takes high rank in the production of salt, cement, sand and gravel and common building stone.

New York's manufacturing industries rank in size and value of output above those of any other state. In boom years the value of manufactures has approached ten billion dollars, though it is normally much lower. Products are highly diversified, and factories are to be found in all sections. The clothing industry in its various branches, including every sort of apparel for men and women, is most important. Chemicals, tools and machinery, typewriters, electrical apparatus, flour, rugs and carpets, shoes, packed meats, canned fruits and vegetables, beer and wines, sugar, steel, books, periodicals, paper and paints are among other products produced in exceptional quantities.

New York city, including Brooklyn, is separately described.

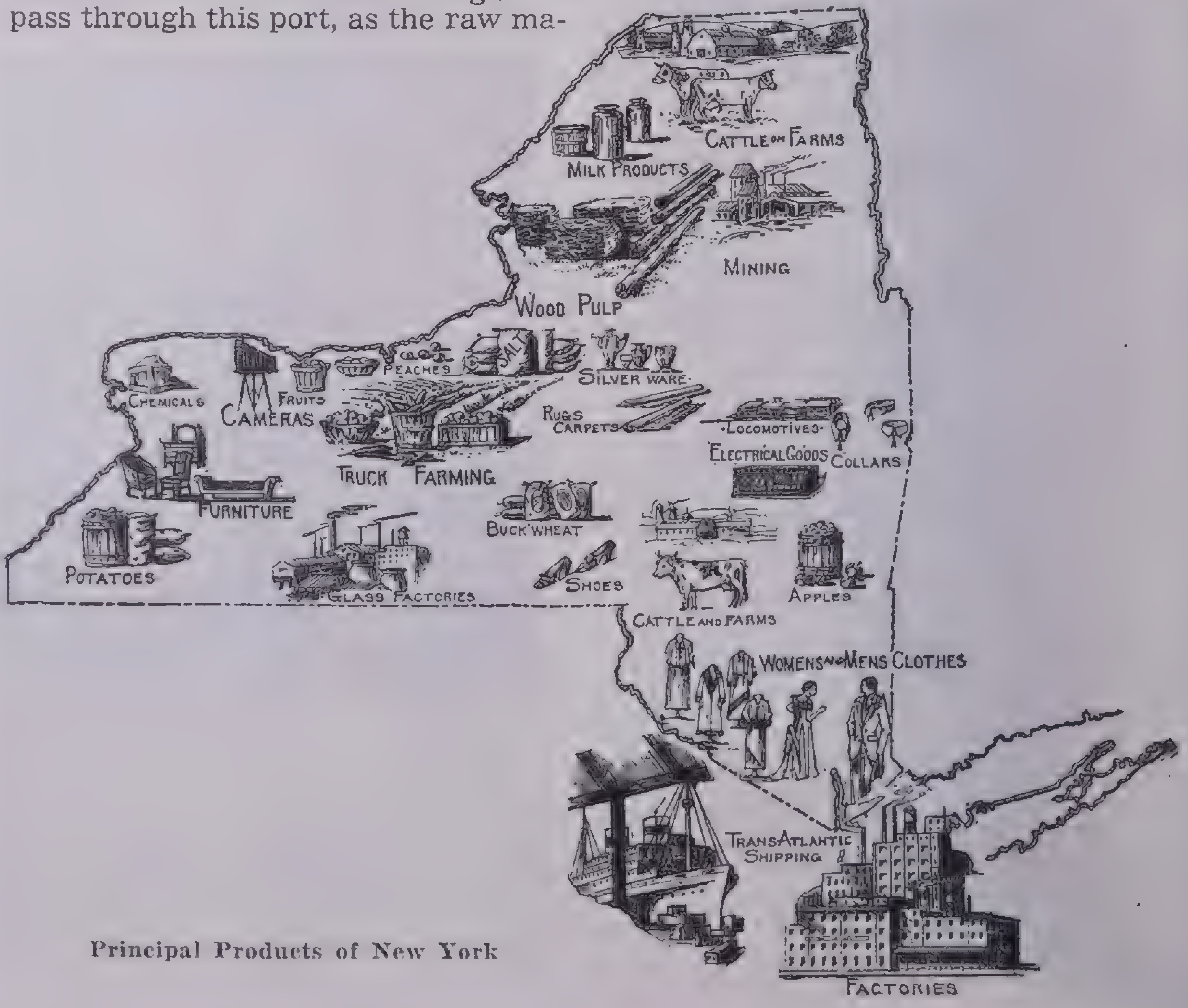
Buffalo is the second city of the state in size and the 14th in the country. Its growth has resulted from its situation at the eastern end of Lake Erie. With the construction of the Erie Canal over a century ago a tremendous flow of commerce began to pass through this port, as the raw materials of the West were exchanged for the coal and manufactures of the East. Railways and highways have maintained this traffic. Today Buffalo has huge grain elevators and ore docks and exceptionally varied manufacturing industries as a result of these transportation facilities and cheap electric power. Its parks and museums are among the finest in America, and its skyscraper city hall is outstanding among public buildings.

Rochester, the third city, was long a flour-milling center. Clothing manufacture and the Eastman plants, large producers of cameras and photographic film, now lead its industries. It has fine parks, a beach on Lake Ontario and flower gardens of wide renown. The Eastman Theater and School of Music are among the foremost in the country.

Syracuse has varied industries, including typewriters, agricultural implements, railroad equipment, chinaware and very extensive chemical works. The system of parks and boulevards is highly developed.

Albany, the capital, is at the head of deep-water navigation on the Hudson. Settlement was begun here by the Dutch, traces of whose influence can still be seen. The Capitol, with its elaborate interior decoration, and the skyscraper State Office Building are prominent. The State Education Building houses a fine museum.

Schenectady with manufactures of electrical apparatus and locomotives and Troy, a center for the production of men's collars and shirts, are other important cities of the capital district. Utica, the most centrally located of the state's leading cities, has a large wholesale trade and busy mills. Binghamton and its suburbs have great shoe factories. Many of the smaller



Principal Products of New York

cities have industries of national importance, and those in the Hudson Valley preserve historic colonial homes and public buildings.

Outside of New York city, described elsewhere, there are other important universities and colleges in the state. Cornell at Ithaca, Syracuse at Syracuse, Rochester at Rochester, Union at Schenectady and Buffalo at Buffalo are among the large institutions. Of high rank in their fields are Rensselaer Polytechnic Institute at Troy; Vassar, for women, at Poughkeepsie; and the State Teachers College at Albany. Colgate, Hamilton, Canisius, Hobart, Skidmore, Niagara and Clarkson are among the leading smaller colleges. The U. S. Military Academy is at West Point.

New York is rich in scenic and historic attractions. The Adirondack State Park is one of the largest public reservations in the world. There are other state parks in all sections. These include Jones Beach on the Long Island seashore; Bear Mountain stretching back from the Hudson; Taughannock Falls, the highest vertical drop in the East; Watkins Glen, a narrow ravine with waterfalls and remarkable rock formations; parts of the Thousand Islands at the head of the St. Lawrence River; and the American bank of Niagara Falls, most famous natural wonder of the state. The medicinal baths and curative equipment at Saratoga Springs are models, and the race track there is among the country's finest. The neighborhoods of Tarrytown, Cooperstown and Glens Falls are full of literary landmarks.

New York, a city of the United States and metropolis of New York State, located in the southeastern part at the mouth of the Hudson River. It is the largest city in the Western Hemisphere and next to London, the most populous in the world. This population is also greater than that of any one of 45 states in the Union, the exceptions being New York, Pennsylvania and Illinois. The area is 314 square miles; moreover, if there are included in the Metropolitan District adjacent parts of Connecticut, New York and New Jersey, the city has a population of almost 11 millions and a land area of 2,514 square miles.

New York is the leading shipping port of the United States; nearly 8,500 vessels enter its landlocked harbor every year, and an equal number clear for foreign or domestic ports. The value of imports, which totals more than $1,000,000,000 annually, amounts to about half that for the entire country; the value of exports, which amounts to about $800,000,000 annually, represents one-third the country's total. The greater city's waterfront has an aggregate of 578 miles and accommodates more than 100 steamship lines. Along the Hudson River there are eight terminals of the New York State Barge Canal.

Whatever the total value of manufactured goods in New York State in any year, that of New York city represents 50 per cent of the total. New York is the country's center for the manufacture of women's clothing and accessories; is second only to Chicago in the manufacture of men's clothing; and leads all other cities in printing and publishing. Among other products are metal and machine-shop products, chemicals, textiles, beverages, cigars, cigarettes, jewelry, paper and paper products and stone, clay and glass products. Nearly one-tenth of all goods manufactured in the United States is produced in New York.

The Boroughs. Originally New York occupied only the island of Manhattan. Growth was largely northward, and in 1874 and again in 1895 small parts of Westchester County became parts of the city. Finally in 1898 plans were consummated whereby the city limits were greatly expanded, and the city became a vast municipality comprising five boroughs: Manhattan, the Bronx, Brooklyn, Queens and Richmond.

Manhattan is coextensive with New York County. On the west is the Hudson River; on the east, the so-called East River, a strait connecting Long Island Sound and New York Bay; and extending in a northwesterly direction is the Harlem River, connecting the Hudson and East rivers. The greatest length of the island is 12½ miles; the greatest width is 2½ miles. The East River islands—Welfare (formerly Blackwells), Wards and Randalls—form part of Manhattan. On Liberty Island (formerly Bedloe) in New York Bay is the famous statue, *Liberty Enlightening the World.* Governors Island (once the home of the British colonial governors) is controlled by the United States Government as headquarters of the 2d Corps area of the United States Army, and on Ellis Island is its immigrant station.

The Bronx is the borough lying north and east of Manhattan and separated from it by the Harlem River, Spuyten Duyvil Creek and Bronx Kills. Brooklyn, which lies across the East River from lower Manhattan, occupies the southwestern part of Long Island and is coextensive with Kings County. Queens, the largest borough in extent, is situated on the northwestern end of Long Island, north of Brooklyn, with the East River separating it from Manhattan and the Bronx; it is coextensive with Queens County. These three are New York's great residence boroughs.

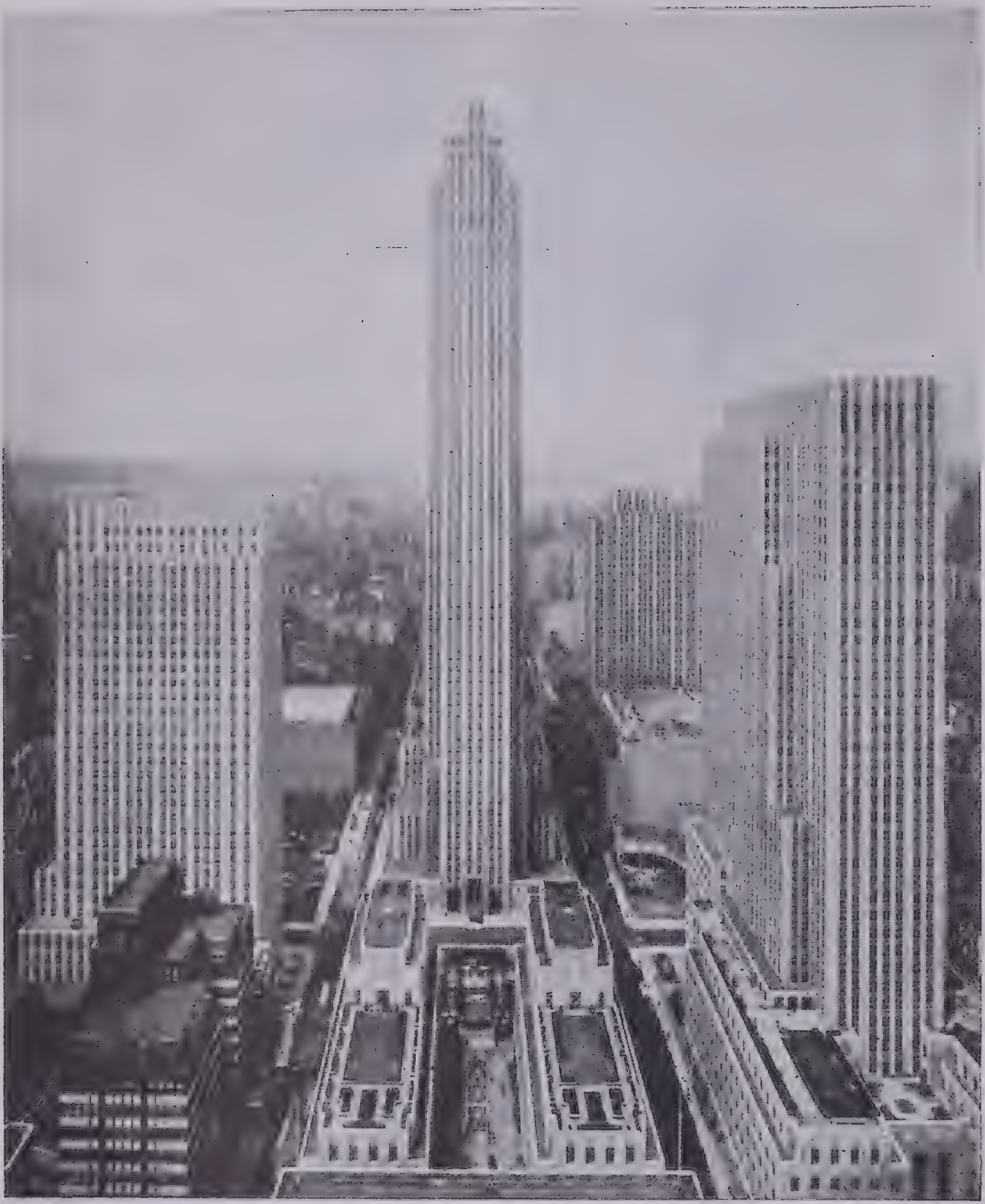
Richmond, the fifth borough of the city and more rural in character, embraces all Staten Island, which lies southwest of Manhattan and helps to form the western boundary of New York Bay. The waterway between Staten and Long Islands at the point where they are nearest each other is called *The Narrows.* This strait, 1¼ miles wide, connects the upper and lower sections of New York Bay; it is commanded by Fort Wadsworth on the Staten Island side and by Fort Hamilton on the Long Island side. Ambrose Channel, the entrance to New York Bay, is off the southwestern coast of Long Island. Staten Island is separated from New Jersey, which lies to the north, west and south, by the Kill van Kull, Newark Bay, Arthur Kills and Raritan Bay.

Important Streets. Six streets in New York are famous throughout the United States. Broadway, which extends from the Battery at the extreme southern end of Manhattan Island through the Bronx to the city of Yonkers in Westchester County, is possibly the best-known, because one small section of it (from 38th to 59th streets) is America's greatest theatrical center. At the southern extremity of this section is the Metropolitan Opera House, the foremost American home of grand opera. At 43rd Street, Broadway crosses Times Square (named for the *Times* and dominated by the Times Building), and at 59th Street it is one of three streets that cross Columbus Circle at whose center is a column surmounted by a statue of the famous explorer Christopher Columbus.

Extending from 116th to 120th streets along Broadway are the buildings of Columbia University, which includes Columbia College (for men), Barnard College (for women), Teachers College and various professional schools. It was founded in 1754 as King's College and today has an annual enrolment of about 30,000 students. At Broadway and 155th Street a notable cultural center includes buildings of the American Academy of Arts and Letters, Hispanic Society of America and Museum of the American Indian (Heye Foundation).

Fifth Avenue, once world-famous for its millionaire's mansions, is now the best-known shopping street in the United States. For about 40 blocks above 59th Street where it forms the eastern boundary of Central Park (a great green area of 840 acres) it is still almost exclusively residential, and homes of the wealthy class and vast apartment houses face the park. At Washington Square where the avenue starts in the heart of Greenwich Village, New York's Bohemian quarter, is the Washington Arch. Among the famous churches on Fifth Avenue are St. Patrick's Cathedral, Roman Catholic, St. Thomas's Church and the Church of the Heavenly Rest, both Protestant Episcopal, and Temple Emmanu-El.

Skyscrapers on Fifth Avenue include the Empire State Building (the tallest in the world with 102 stories and a height of 1,248 feet), and the buildings of Rockefeller Center, which occupy three blocks from West 48th to 51st streets. Of the 14 contemplated units of Rockefeller Center, 11 have been erected. Between the low British Empire and French (*La Maison Française*) buildings is a fountain vista extending to Rockefeller Plaza. On the west side of this plaza is the 70-story RCA (Radio Corporation of America) Building; on the south side, Time and Life Building (36 stories); and on the north side, the 41-story International Building, which has two adjuncts fronting on Fifth Avenue, the Palazzo d'Italia and International Building, East. Along Rockefeller Center's Sixth Avenue side rise the RKO (Radio Keith Orpheum) Office Building of 31 stories, which also serves as entrance to the Radio City Music Hall; the 16-story RCA Building, West (on whose ground floor is



New York: City of Tall Buildings

Rockefeller Center from the east, with the Hudson River in the background. In the center is the 70-story Radio Corporation of America Building, with La Maison Française (left) and the British Empire Building (right) at its base. At the right may be seen the 41-story International Building, with the Palazzo d'Italia occupying the lower building at its left, and the International Building East at the lower right corner. Behind the International Building is the Radio City Music Hall and the 31-story Radio-Keith-Orpheum Building. To the left is the 36-story Time and Life Building and the Center Theater in the background. Rockefeller Center is a development lying between Fifth Avenue (in the foreground) and Sixth Avenue, occupying the square blocks between 49th Street (left) and 51st Street (right) and a large part of the blocks between 48th and 49th streets.

the Museum of Science and Industry); and the Center Theater.

Fifth Avenue's cultural institutions include: the New York Public Library, a repository for about 2,000,000 volumes and numerous art treasures; the Metropolitan Museum of Art, whose collections rival those of the Louvre in Paris; and the Museum of the City of New York, one of the first museums to adopt the visual-education method in depicting a city's history. At the upper end of Fifth Avenue is New York's great Negro section, Harlem, with a population of 180,000.

Extending northward along the Hudson River from 72d Street is Riverside Drive, flanked by towering apartment houses and various mansions on one side and by a parkway of great beauty on the other. It is also the site of Grant's Tomb, the Soldiers and Sailors' Monument (to the Civil War dead) and Riverside Church (Baptist), a magnificent Gothic structure that in many features resembles the Cathedral of Chartres in France. The Henry Hudson Parkway is an extension of Riverside Drive above Dyckman Street. At the extreme northern end of Manhattan, overlooking the river, are the attractive Inwood Hill and Fort Tryon parks; in the latter area is the building, called *The Cloisters,* erected to house the notable collection of medieval ecclesiastical sculpture collected by George Grey Barnard and acquired by the Metropolitan Museum of Art.

Park Avenue, which runs parallel to Fifth Avenue two blocks east of it, is the most exclusive residence street in New York. In addition to palatial apartment houses and private residences there are located on it such world-famous hotels as the Waldorf-Astoria and Ritz Tower, and St. Bartholomew's Protestant Episcopal Church, a beautiful Byzantine structure.

Forty-second Street is a cross-town artery on which or in whose locality have risen many outstanding skyscrapers, such as the Chrysler, Chanin, Lincoln, Daily News, McGraw-Hill and American Radiator. It is the site of one of New York's two great railroad terminals, the Grand Central, owned and occupied by the New York Central Railroad with rights leased to the New York, New Haven & Hartford Railroad. The other railway terminal, Pennsylvania Station, occupies the area between Seventh and Eighth avenues and 31st and 33d streets and serves the Pennsylvania, Lehigh Valley and Long Island railroads. Other lines, such as the Baltimore & Ohio, Central Railroad of New Jersey, Erie and Delaware, Lackawanna & Western, transfer their passengers from Hoboken by ferry and from Jersey City by ferry, by tube or through the Holland Vehicular Tunnel.

Other Famous Streets and Buildings. The sixth famous street of New York is Wall Street, located a short distance north of the Battery and extending eastward from Trinity Protestant Episcopal Church on Broadway to the East River. It is the financial center of the nation, and its name is a synonym for money power throughout the world. In early days the Dutch settlers built a stockade wall along the north side of the street to protect themselves from the Indians, and this rude fortification gave to the street its name. On it are the New York Stock Exchange, United States Subtreasury and the banking house of J. P. Morgan & Co.

In the Wall Street district are such famous skyscrapers as the Bank of Manhattan, 60 Wall Tower, City Bank Farmers Trust, Irving Trust, Chase National Bank, Equitable Trust and Woolworth buildings. Of architectural interest also are the Colonial City Hall, Federal Office Building, United States Courthouse, Municipal Building and the United States Custom House, the entrance of which is adorned by four sculpture groups of the continents by Daniel Chester French. Clearings of the city's 116 banks average about $200,000,000,000 annually.

Among churches other than those mentioned the most notable is the Protestant Episcopal Cathedral of St. John the Divine on Amsterdam Avenue at 112th Street. The cornerstone was laid in 1892, and though work has progressed steadily (except for the World War and early depression periods), it probably will not be completed for many years to come, as more than a third of the structure has still to be built. When it is completed, it will rank third in size among the churches of the world, being exceeded only by St. Peter's in Rome and the Cathedral of Seville. The length will be 601 feet and the width, 320 feet; the central tower will attain a height of 402 feet and the two western towers, of 266 feet. The seven apsidal chapels, ambulatory, sanctuary, choir, baptistery, central transept and nave have been built. In the 14 bays of the latter and corresponding parts of the clerestory, are stained glass windows in the best style of the medieval craftsman. The west front is distinguished by a beautiful rose window and bronze doors that depict scenes from the Old and New Testaments. Among the Gothic-styled buildings in the cathedral close, which extends south to 110th Street and east to Morningside Drive, are the Synod Hall, Bishop's House, Deanery, Choir School and Deaconess Home. The Protestant Episcopal Church of the Transfiguration (popularly called the *Little Church around the Corner*) is famous for actors' weddings and funerals.

Of educational institutions New York University rivals Columbia in enrolment. It is noted also for its Hall of Fame (in the west Bronx) with busts of about 100 great Americans arranged in a semicircular portico. The College of the City of New York has an enrolment of about 22,000; Hunter College, for women, of about 15,000; Brooklyn College, about 11,000; Fordham University, a Roman Catholic institution, about 7,000; and Pratt Institute, Brooklyn, about 5,000. The Union Theological Seminary is a well-known liberal Protestant institution. The Jewish Theological Seminary of America has distinctive buildings near Columbia and Union Seminary.

The American Museum of Natural History at 77th Street and Central Park West is noted for its zoological, geological, ethnographic and archeological collections. The latest additions to it are the Theodore Roosevelt Memorial Building, with its Asiatic and African halls, and the Hayden Planetarium. In Bronx Park are the zoological and botanical gardens; and at the Battery, the aquarium is housed in the old theater called *Castle Garden,* which was once a fort. Brooklyn has the central museum, children's museum and botanic garden of the Brooklyn Institute of Arts and Sciences. Its great breathing space is Prospect Park; at the main entrance to this park is the triumphal arch designed by Frederick MacMonnies as a tribute to heroes of the Civil War.

The most important of New York's medical institutions are the Columbia-Presbyterian Medical Center at West 165th to 168th streets, overlooking the Hudson River, and the New York-Cornell Medical Center at East 67th to 70th streets, overlooking the East River. The Rockefeller Institute for Medical Research also fronts the East River at 66th Street. Twenty-five of more than 200 hospitals are operated by the city; of these Bellevue Hospital is one of the best-known in the United States.

New York's great sports centers are Madison Square Garden, Yankee Stadium, the Coliseum, Ebbets Field, Randalls Island Stadium and the Polo Grounds. On the Flushing meadows in Queens rise the buildings of the 1939 New York World's Fair.

Solving the City's Transportation Problem. Intercity transportation centers in an elaborate system of subways, which reaches under the Hudson River to Jersey City and Hoboken via the tubes of the Hudson-Manhattan System. It runs under the East River to Brooklyn and Queens and under the Harlem River to both sides of the Bronx, via the various lines of the Interborough Rapid Transit System, the Brooklyn-Manhattan Traction System and the Independent Subway System (operated by the city under the auspices of the board of transportation).

Elevated railways run along Second and Third avenues, and a new Sixth Avenue subway has replaced the old Sixth Avenue elevated railway. The Fifth Avenue bus line, which has routes on Riverside Drive and other streets as well as on Fifth Avenue, provides a popular form of transportation. About 30 other surface lines, both trolley and bus, serve both north-and-south and crosstown traffic. In all there are more than 1,500 miles of subway, elevated and surface lines in New York.

Ferries furnish the cheapest transportation, both for passengers and motor cars, from St. George, Staten Island, or Jersey City, Hoboken and Weehawken, N. J. The Holland Vehicular Tunnel from Jersey City to Canal Street, Manhattan, can accommodate 45,000 automobiles daily. The Lincoln Vehicular Tunnel, crossing under the Hudson from Weehawken to 38th Street, Manhattan, accommodates a similar number.

The most famous of New York's bridges is the George Washington Bridge, extending from 178th Street, Manhattan, to Fort Lee, N. J.; a suspension structure with a channel span of 3,500 feet and towers at each end that rise to a height of 600 feet, it serves both vehicular and pedestrian traffic. Between Manhattan and the boroughs of Brooklyn and Queens are the Brooklyn, Manhattan, Williamsburg, Queensborough and Triborough bridges. The Brooklyn Bridge was the world's first great suspension bridge, an engineering marvel when it was opened in 1883. The Triborough takes its name from the fact that it connects both Manhattan and the Bronx with Queens via Randalls Island. The arched Hell Gate Bridge across the former whirlpool of that name in the East River is used by railroads from New England. The most important of the 13 bridges across the Harlem River between Manhattan and the Bronx are the High Bridge and Henry Hudson Bridge. Staten Island is connected with New Jersey points by the Kill van Kull, Outer and Goethals bridges.

The construction of an automobile express highway by covering over the tracks of the New York Central Railroad along Riverside Drive has expedited traffic in the city's more congested areas and created a more seemly parkway. The municipal airports are located at Floyd Bennett Field on Barren Island in southeastern Brooklyn and at North Beach in Queens.

Something of New York's History. The site of New York was discovered in 1609 by Henry Hudson, an English navigator in the employ of the Dutch East India Company. Six years later a Dutch trading post was established, but not until 1624 was a permanent colony undertaken by Walloons from the Netherlands. In 1626 the director, Peter Minuit, bought all of Manhattan Island from the Manhattan Indians (whose name means people of the whirling waters in reference to the former whirlpool called *Hell Gate* between the East River and Long Island Sound) for the equivalent of $24—less than the value today of one square foot in some parts of lower Manhattan. At the same time the settlement received the name of New Amsterdam.

The city (so designated through incorporation in 1653) flourished under the able administration of Peter Stuyvesant, who became governor of the colony of New Netherland in 1647. In 1664 the English captured it and renamed it New York in honor of the duke of York (later James II). During the Revolution the British Army occupied the town for almost its whole duration. In 1785 New York was designated capital of the United States. Here the Congress met during the next 5 years, and here Washington was inaugurated April 30, 1789, on the balcony of Federal Hall, which stood in Wall Street.

The city received a great forward impetus when the Erie Canal was completed in 1825; it opened the commerce of the growing West to New York, and soon there was a population of about 200,000. After the Civil War both the New York Central and Pennsylvania railroads effected connections with Chicago, and from that time forward with the aid of foreign immigration the city's growth was very rapid.

New Zealand, a member of the British Commonwealth of Nations, 1,200 miles southeast of Australia, with the Tasman Sea on the western side and the Pacific Ocean on the northern, eastern and southern sides. It consists chiefly of two large areas—North Island and South Island, separated by Cook Strait—and a smaller area—Stewart Island, separated from South Island (to the north) by Foveaux Strait. The more important of the outlying island groups are Auckland, Campbell and Chatham. The main group is about 1,000 miles long, but the broadest part on North Island is only 250 miles in width. The area totals 104,015 square miles. The population (about 1,575,000) includes some 80,000 Maoris; 96 per cent of the white inhabitants are British in origin.

North Island, which has an area of 44,281 square miles, lies below the equator in a latitude comparable to that (above the equator) of the Middle Atlantic States of the United States. Its northern part is almost cleft in twain by the Hauraki Gulf on the east side and Manukau Harbor on the west side. The eastern coast is indented by Hawke Bay and the Bay of Plenty. The principal mountain ranges are the Kaimanawa and Raukumara. Southwest of these mountains are the isolated volcanoes—Ruapehu, Egmont and Ngauruhoe, ranging from 7,000 to 9,000 feet in height. Lake Taupo is located in the central part of the island, and surrounding it is New Zealand's famous geyser and hot-spring region. The principal rivers are the Waikato and Mokau.

South Island, with an area of 58,092 square miles, contains more arable land than North Island. The southern coast is indented by numerous fiords. Tasman Bay is the principal indentation of the northern coast; on the eastern coast is the Canterbury Bight and on the western, the Westland Bight. The principal mountain range, called the *Southern Alps,* is noted for its glaciers. Both these mountains and the Kaikoura Range in the northeast exhibit some thrilling scenery. The highest peak is Mt. Cook (12,349 feet). The most important lakes are Te Anau, Manipouri and Wakatipu in the southern part. The principal rivers are the Clutha and Grey.

About two-thirds of New Zealand's area is fitted for agricultural pursuits, either the usual cultivation or grazing. Wool, frozen meats, hides, tallow, wheat, butter and cheese are great sources of wealth and figure largely in the country's exports. Oats, barley, corn, flax, grapes and legumes also are raised. From gold, silver, coal, iron, copper, tin, platinum, sulphur, manganese and cinnabar New Zealand derives its mineral wealth. The principal forest product is kauri gum—the resin from partially fossilized kauri trees, which is used in the manufacture of linoleum and varnish and as a substitute for amber. Manufactures include textiles (principally woolen goods), metal products, chemicals, glassware, shoes and furniture. Whaling has long been an important industry.

Administration of the dominion's government is entrusted to a governor general, the Crown's representative, and to the bicameral General Assembly, consisting of the Legislative Council of some 40 members and the House of Representatives of 80 members, four of whom are Maoris. Assisting the governor general is an executive council of 11 members, corresponding to a constitutional cabinet. New Zealand has been a pioneer in the enactment of protective labor legislation; extension of the franchise to women (1893); establishment of loan banks for aid to immigrant settlers and ownership of public utilities, such as railroads, coal mines, telephone and telegraph lines and hydroelectric plants. It achieved the status of a dominion in 1907.

Wellington, the capital of the dominion, is on Cook Strait at the southern end of North Island. Among its noted buildings are the Houses of Parliament, Town Hall and National Museum. It is also an important educational center, as it is the seat of Victoria University College and of St. Patrick's College. The population is about 150,000. Auckland, on Hauraki Gulf in the northern part of the island, is the most important seaport. It has a large trade with the islands throughout the South Pacific Ocean and specializes in shipbuilding. It is the seat of Auckland University College and a museum containing some excellent exhibits of Maori art. It was also the seat of government until the removal of the capital to Wellington in 1865. The population is about 220,000. The other important cities are Christchurch and Dunedin, both located on the eastern coast of South Island.

New Zealand was named by the Dutch navigator Abel Janszoon Tasman, who sighted it in 1642; *Zeeland,* meaning sea land, is the name of a province of the Netherlands. Capt. James Cook claimed the islands for Great Britain in 1769, but they were not annexed until 1840.

Niagara Falls, the cataract of the Niagara River, a 28-mile stream that carries the waters of four of the Great Lakes into Lake Ontario and forms part of the boundary between Canada and the United States. It is the largest cataract of North America and is considered one of the seven wonders of the New World. The falls begin about 20 miles below the source of the Niagara at Lake Erie. For half a mile, in which the descent of the river over the Niagara escarpment amounts to 50 feet, the waters are a boiling torrent. In this portion several islands appear. The largest, Goat Island, on the brink of the falls, divides them into two unequal parts that plunge over the precipice to a narrow, deep gorge. This gorge turns away almost at a right angle, and with a succession of foaming rapids and whirlpools the river finally reaches the open valley 7 miles below. One sharper turn than the others is known as the Great Whirlpool.

The smaller falls lies to the American side and is known as the American Falls. It has a crest of 1,400 feet and a fall of 165 feet. Under the ledges which form the chief support the spray has worn away cavernous recesses, one of which is accessible and is known as the Cave of the Winds. The larger falls between Goat Island and the Canadian shore forms a great curve with a crest 2,600 feet long and is known as the Canadian or Horseshoe Falls. The amount and depth of water pouring over this crest are much greater than at the American Falls, but its drop is somewhat less, 155 feet. A further descent of 104 feet is reached by the 7 miles of rapids through the gorge.

The average flow of water over both falls is estimated by the United States Army engineers, from the mean flow of water over a period of 40 years, to be 222,400 cubic feet per second. This volume of water has a potential value of more than 3,800,000 horsepower, but the water that may be diverted for power purposes is limited by international treaty to about one-fourth of the total flow. In 1910, 12 municipalities began to draw electric power from Niagara Falls, and the number had increased to more than 200 in Canada alone within the next 20 years. The American side shows a recession (produced by erosion) of half a foot per year; the Horseshoe Falls recedes 2 to 4 feet.

Niagara Falls was discovered in 1678 by Father Louis Hennepin, whose description and estimates of proportions are somewhat extravagant. The first accurate surveys were conducted by James Hall in 1842. New York and Ontario have both created reservations to protect the falls, and a special international board is in control. Several great bridges cross the gorge and the river. In February 1938 the most famous of these (but the least important commercially), the "honeymoon" arch, was destroyed by a heavy ice jam that tore away its supports. The falls are visited by more than 2,000,000 persons annually.

Nicaragua, a republic of Central America between Honduras on the north and Costa Rica on the south. The Caribbean Sea extends along its eastern coast for 280 miles and the Pacific Ocean along its western coast for 200 miles. The area of the country is 49,200 square miles; the population is about 750,000. The few thousand descendants of the early Spanish colonists constitute the ruling class.

The eastern coastal plain is low and humid but, owing to the porous tufa underlying the top soil, is relatively healthful. It is called the *Tierra caliente* or, from the proximity of the Mosquito Bank in the Caribbean Sea, the *Mosquito Coast.* In this region most of the inhabitants of Nicaragua live. The uplands of the interior are called the *Tierra templada,* and in the western part is the *Tierra fria* that contains Mts. Guisisil and several other 7,000-foot-high volcanic peaks. The plateau country is watered by the San Juan, Coco, Grande and Escondido rivers that empty into the Caribbean. Near the western coast are Nicaragua's most important lakes—Nicaragua (6,100 square miles) and Managua, which is connected with the larger lake by the Tipitapa River. The route of the proposed Nicaraguan Canal from the Pacific to the Atlantic would utilize Lake Nicaragua and its outlet, the San Juan River, which forms part of the boundary between Nicaragua and Costa Rica. The United States acquired the right to construct such a canal by treaty ratified in 1916.

Nicaragua's crops are of two kinds —those that are cultivated for export, such as coffee, cacao, sugar cane and bananas, and those that are raised for home consumption, such as corn, wheat, beans, rice and cotton. Other products are pineapples, coconuts, citrus fruits, rubber, indigo, tobacco and yucca. Cattle raising is one of the most important phases of agricultural life. The mineral wealth consists of gold, silver and copper. In the mountains many precious stones are found, and there is also some petroleum. Cabinet woods, such as mahogany and cedar, are the most valuable forest products. Gums and medicinal plants are also obtained from the forested regions. The Indians of the Mosquito Coast are noted for the manufacture of pottery, straw hats and gold chains.

On throwing off the Spanish yoke in 1821 Nicaragua first belonged to the Central American Federation and then in 1838 established an independent republic. At its head is a president, who is elected for a 4-year term and who is assisted in the performance of his duties by several secretaries of state. The National Congress consists of a Senate of 24 members, elected for 6 years, and a Chamber of Deputies of 43 members, elected for 4 years by universal suffrage. For local administrative purposes the country is divided into 13 departments and 2 comarcas or territories.

The capital is Managua (population, 60,000), located on the southwestern shore of Lake Managua. About the only railroad lines in the country are those connecting Managua with Granada on Lake Nicaragua and with the Pacific port of Corinto. Transportation elsewhere is mostly by ox teams on rough trails. But the government is engaged in road building on an extensive scale, and airplane transportation is also in use. Among Managua's noted buildings are the Cathedral, Presidential Palace, City Hall and University. The city lies in the earthquake belt; as a result of the severe shock that it experienced in 1931 parts of the city were destroyed by a fire that broke out after the earthquake. Nicaragua's other important cities are León, Matagalpa, Rivas and the Caribbean port of Bluefields.

Nicobar Islands, a group of 19 islands in the Bay of Bengal of both volcanic and coral formation; belonging to Great Britain. They are nearly 75 miles south of the Andamans, to which they are attached for administration by the British chief commissioner. The total area is 635 square miles; the population, mostly of mixed Indian and Malay origin, is about 9,500. The most important of the 12 inhabited islands are Great Nicobar and Car Nicobar. The capital and chief port is Nankauri. The products are mainly coconuts, copra, betel nuts, edible birds' nests and tobacco. Since the islands are in the path of both the southwest and northeast monsoons, there are only about 4 months of the year when there is no heavy rainfall. The Nicobarese practice couvade or the custom of the father's taking to his bed when a child is born, as though he himself suffered the birth pangs. These people also flatten the child's head in infancy and later blacken its teeth and distend its ears. After Denmark's attempts to colonize them during the early part of the 19th century, the Nicobar Islands were annexed by Great Britain in 1869.

Nigeria, a territory of British West Africa that takes its name from the fact that it lies in the basin of the lower Niger River. It consists of the Crown colony of Nigeria and the Nigeria Protectorate (Northern and Southern provinces) and is bounded on the west by French West Africa (Dahomey), on the north by the French Niger territory and on the east by the French sphere of the Cameroons. The Gulf of Guinea washes the southern coast. The total area is 372,364 square miles; of the total population of about 19,900,000, some 6,000 are Europeans. The natives, principally Yorubas and Hausas, belong to branches of the Negro race.

Nigeria consists of a coastal delta, built by the Niger, a forested strip and open plateau, covered in its central part by low mountains. Tributaries of the Niger include the Benue, Sokoto and Kaduna. Other streams are the Imo (or Opobo), Benin, Bonny and Cross. In the northeastern part are the plains of Bornu that extend to Lake Chad. The agricultural products of Nigeria are cacao, cotton, palm oil and nuts. Mineral wealth includes tin, iron, lead, coal, silver, manganese, antimony and galena. From the forests mahogany, walnut, rosewood, cedar, satinwood and ebony are obtained.

Courtesy Barber Steamship Lines, Inc.

Village in Nigeria

The mud huts are thatched with straw

The seat of government is Lagos (population, 126,000), located on the Gulf of Guinea in the southwestern part of the country. The chief official is the governor and commander in chief, who is assisted by executive and legislative councils. There is a lieutenant governor in charge of each province. The Northern Province has an area of 281,778 square miles, the Southern Province an area of 89,515 square miles. Other towns in Nigeria are Ibadan, Kano, Port Harcourt, Ilorin and Abeokuta.

Nile, a river of Africa that ranks next to the Amazon as the longest river system in the world. It rises near the equator, flows north through the Anglo-Egyptian Sudan and Egypt for 3,600 miles and empties into the Mediterranean Sea at Alexandria. It drains an area of 1,107,227 square miles and affords irrigation for a vast country that would otherwise be useless desert. Until the control of its periodic floods at the beginning of the 20th century the river poured its excess waters upon the parched earth. When it receded it left a thick alluvial deposit that enriched the soil. At its mouth near the city of Cairo it has built in 60 centuries a triangle-shaped delta measuring 155 miles along the coast and 100 miles from north to south.

The Nile proper is formed by two streams and their affluents—the Bahr el Abiad, or White Nile, which flows from Lake Victoria on the boundary of Tanganyika Territory, Kenya and Uganda Protectorate, and the Bahr el Azrek, or Blue Nile, which rises in the Gojam Highlands of Ethiopia. The only tributary of the Nile after the junction of the streams at Khartoum is the Atbara River. As it flows through the Nubian Desert the Nile becomes very narrow, and its waters evaporate considerably. Below Khartoum begins a series of 6 cataracts, the most important of which is the first at Aswan, where in 1902 the huge Aswan Dam, 144 feet high and 6,400 feet long, was built. The flow of water is also regulated by barrages at Asyut and at the apex of the delta (noted for its Barrage Gardens). The delta of the Nile is intersected by the distributaries the Rosetta and the Damietta, each about 126 miles long.

The Nile is navigable during the rainy season from October to April. Most tourists take the trip only as far as the frontier town of Wadi Halfa at the second cataract, about 900 miles from the mouth of the river. The river is closed to navigation when its waters are diverted for irrigation purposes. Along its banks are the picturesque ruined cities of Luxor, Karnak, Thebes, Abydos and Memphis. Near Cairo are the great pyramids of Giza and at Sakkara the step pyramids. The name *Nile* is from the Greek *Nilus,* probably a corruption of the Phoenician *Nahal,* meaning stream; the old Egyptian name was *Hapi.* Emil Ludwig has written a fascinating biography of this river.

North America, the third continent in size, surpassed only by Asia and Africa. It is triangular-shaped and extends from Alaska and the northernmost islands in the Arctic Ocean to within 7° of the equator. Its most southerly country is Panama, in which the United States controls the Canal Zone. On the east is the Atlantic Ocean and on the west, the Pacific Ocean. The area of North America is about 8,500,000 square miles; its population numbers about 180,000,000, of whom about 130,000,000 live in the United States. With South America it constitutes the New World, unknown to people of the Eastern Hemisphere until the courage of Columbus led to its discovery in 1492. If Northmen visited the shores of North America 400 years earlier, their discoveries did not become current knowledge in Europe and no permanent results were achieved.

The length of North America is approximately 6,000 miles, and its greatest breadth from British Columbia to Labrador is about 3,300 miles. The Arctic Archipelago stretches 1,000 miles beyond the Arctic Circle; the narrow southern extension, which tapers at the Isthmus of Panama to a width of only 40 miles, extends through one-third the Torrid Zone. Greenland, next largest island to Australia, is separated from the mainland by Baffin Bay and Davis Strait. Newfoundland is located at the entrance to the Gulf of St. Lawrence. At its northwestern projection in Alaska, North America approaches Asia within 36 miles; Seward Peninsula is separated from the East Cape of Siberia by Bering Strait.

The so-called backbone of the continent is the Rocky Mountains, whose name indicates the character of their formation. The Rockies extend from Alaska almost to Vera Cruz, Mexico. Parallel to this range are the Sierra Nevada Mountains in California, the Cascade Mountains in Washington and Oregon and the Coast Mountains in these three states. The highest peak in North America is Mt. McKinley

(20,300 feet) in Alaska; the lowest point is in Death Valley (276 feet below sea level) in southeastern California.

In the eastern part of the continent the Appalachian system extends from Quebec to northern Georgia and Alabama. Various names are given to the ranges in this system—the White, Adirondack, Allegheny, Blue Ridge, Cumberland and Great Smoky mountains. Between the foothills of the Appalachians and the beginning of the western plateau approaching the Rocky Mountains is a vast central plain; it averages 1,000 miles in width and extends from the tundras of the Arctic Region through the Canadian Prairie Provinces and the great Mississippi Valley to the coastal plain of the Gulf of Mexico. This immense area, especially in southern Canada and the northern United States, is one of the most fertile regions of the world.

The principal drainage system of North America is the Mississippi, called by the Indians the *Father of Waters;* with the Missouri River, it forms a waterway 6,431 miles long. These rivers receive the flow from about 250 smaller streams, some of which, such as the Ohio, Platte and Arkansas rivers, are of major importance. Another river of first rank is the St. Lawrence, the 2,200-mile outlet of the Great Lakes, which attains a width of 35 miles before it reaches the Gulf of St. Lawrence. For the greater part of its course it is a Canadian stream. In northwestern Canada the Mackenzie system forms one of the greatest waterways in North America, but it is so far north and settlements are so few that it is of little economic importance. Near central Canada the Saskatchewan-Nelson system drains into Hudson Bay. Among other important rivers are the Yukon in Alaska and the Columbia and Colorado in the western United States.

Forming part of the boundary between the United States and Canada are four of the Great Lakes—Superior, Huron, Erie and Ontario; the fifth, Lake Michigan, lies within the United States. On these lakes are located various great commercial centers such as Chicago, Cleveland and Buffalo. In northeastern Canada is the vast Hudson Bay, an inland sea tributary to the Atlantic Ocean. The southeastern part of the continent is indented by the arm of the Atlantic called the *Gulf of Mexico,* which is partially enclosed by the West Indies.

Each of the countries of North America—Alaska, Canada, the United States, Mexico, British Honduras and the six Central American states—is described in a separate article. The name of the two Americas is derived from that of Amerigo Vespucci (or Americus Vespucius), an Italian navigator who is supposed to have been the first to land on the southern continent in 1497. His name was suggested by the German geographer Martin Waldseemüller, who translated and published Vespucci's account of his four voyages in 1507. The first explorer to reach the northern continent was John Cabot, who landed in 1497 near Cape Breton, Nova Scotia.

North Carolina, a South Atlantic state, roughly wedge shaped, 520 miles long and 200 broad. Its area of 52,426 square miles includes 3,686 of water surface, accounted for principally by two great landlocked bays, Albemarle and Pamlico Sounds, which deeply indent the coast line. Virginia bounds the state on the north, the Atlantic Ocean on the east, South Carolina and Georgia on the south, and Tennessee on the west. The population is about 3,500,000, and about 29 per cent is Negro.

Nearly one-half of the area is included in the low, level coastal plain. The bays on the eastern edge are separated from the ocean by a string of narrow sandy islands some 200 miles long. Cape Hatteras, a storm center feared by seamen, forms an angle near the middle of this island chain. The coastal plain is fertile but poorly drained. The middle of the state has a rolling surface, a part of the Piedmont plateau. The western end is mountainous, including Mt. Mitchell, altitude 6,684 feet, the highest elevation in the eastern states.

Several small rivers run from the Piedmont to the southeast, entering the Atlantic through broad estuaries that form sheltered harbors. These streams afford good water power, and large reservoirs have been installed to equalize their flow.

Rainfall is ample for agriculture. The climate is temperate, and low temperatures are rarely experienced except in the high mountains. The southeastern coastal plain is almost subtropical, and hardy palms grow freely there. The entire state was originally forested, and large areas still remain, especially in the coastal plain, though the lumber cut is normally about a billion feet per year. Conservation projects are restoring the hardwood forests in the mountains, and the lowland pines grow so rapidly that a steady supply of timber is available. The yield of turpentine, rosin and other forest by-products is larger than in any other state.

North Carolina grows most Temperate Zone crops and ranks first in tobacco production. Cotton, peanuts and corn are raised in large quantities. Fishing and trapping are profitable occupations in many sections.

The mineral output is of small importance. Mica, feldspar and granite are the most valuable mineral products.

North Carolina ranks first in the Union in the manufacture of tobacco products, especially cigarettes, and in cotton mills in operation. Cotton clothing and hosiery, towels and plain fabrics are made in great quantities. The furniture industry is also important. The factories are concentrated in the Piedmont section, where cheap electric power is available.

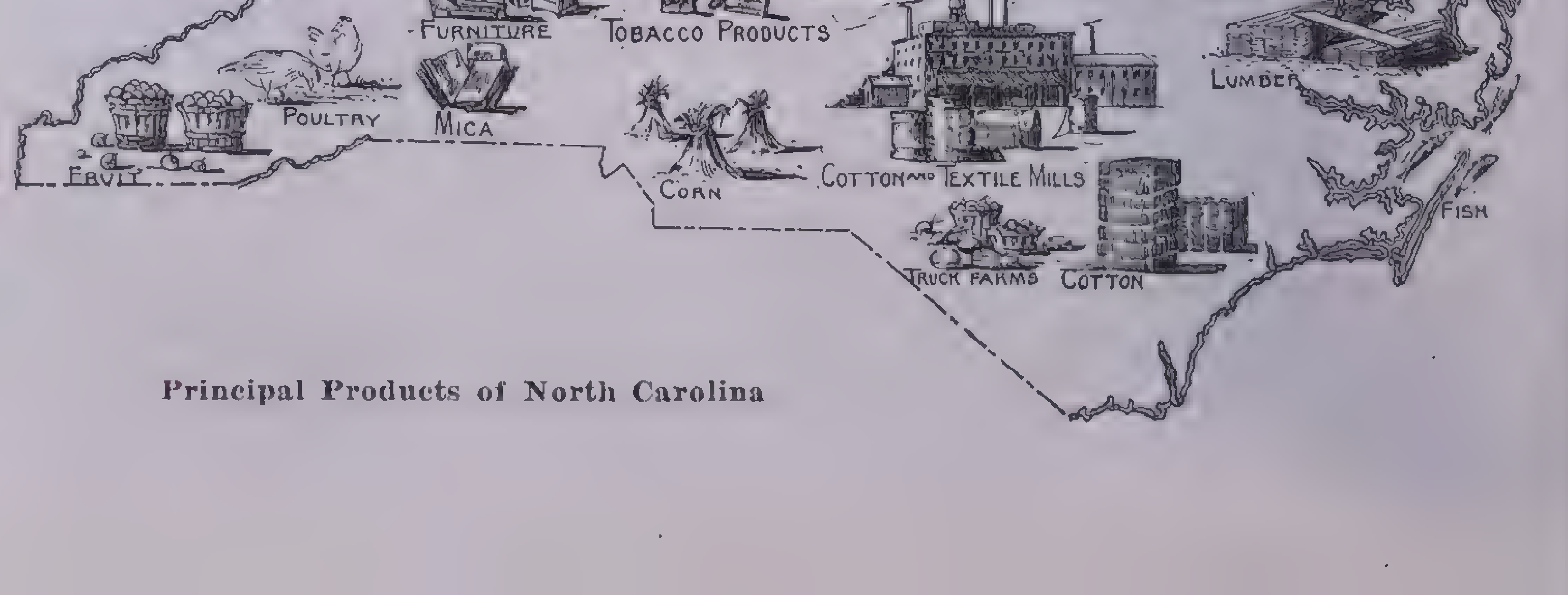
Charlotte, the principal city, is the center of the cotton mill region, and Winston-Salem and Durham lead in tobacco production. Raleigh, the capital, and Greensboro are important distributing points, and Wilmington is the chief port.

The University of North Carolina has three units, the woman's college at Greensboro, the agricultural and technical division at Raleigh, and the arts and professional schools at Chapel Hill. Duke University at Durham is the most richly endowed educational institution in the South.

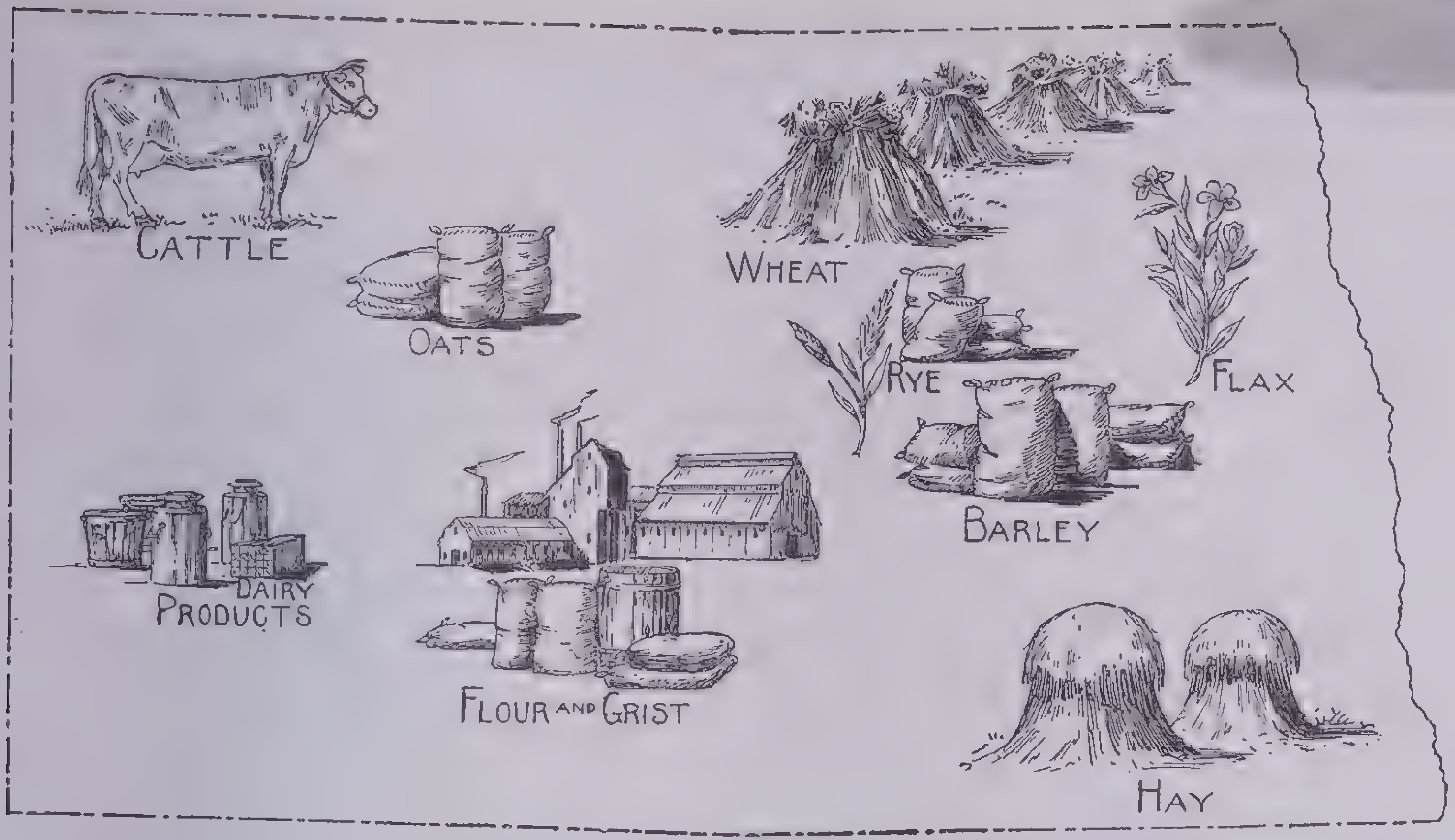
Western North Carolina includes a part of the Great Smoky Mountains National Park, and the scenery and climate of the entire mountain section (and especially of Asheville) are unsurpassed in the eastern states. Pinehurst, a resort in the Piedmont district, is equally well known. The coastal plain offers fine hunting, fishing, and other water sports. The scene of the first airplane flight (Kitty Hawk) and the site of the first English colony in America (Roanoke Island) attract many visitors. Colonial homes are preserved in Halifax, Edenton and other towns.

North Dakota, northernmost state of the Great Plains with an area of 70,837 square miles, including 654 of water surface. On the north it is bounded by Saskatchewan and Manitoba, on the east by Minnesota, on the south by South Dakota and on the west by Montana. It is an irregular rectangle, 360 miles long and 210 broad. The population is 641,935 (1940), one fifth of which is found in cities and towns.

The Red River forms the eastern boundary. Its valley, the level bed of an ancient lake, is one of the nation's richest farming areas. The surface slopes evenly upward to the west from this valley, except where the Missouri River (west of the center of the state) and its tributaries have cut their broad channels. Southwest of the Missouri is a region of rougher topography, including the fantastically eroded Bad Lands area. Drainage is poor in the northern section, which has many small alkaline lakes. Here is Devils Lake, 35 miles long, the



Principal Products of North Carolina



Principal Products of North Dakota

second largest salt lake in the United States.

North Dakota has cold winters, but the summers are often hot. In the east rainfall is usually adequate for agriculture. Dry farming and irrigation are practiced in the west, though much of that section is devoted to grazing. Forest growth is scant, and of little commercial value.

Spring wheat is the chief crop. The fields of the Red River valley are so productive that the state usually ranks second in the nation in yield. Oats, corn, barley and hay also are grown in huge quantities, and the rye crop is the largest in the country. Sheep and cattle are raised in great numbers, and the output of dairy products is increasing.

Mining and manufacturing have been developed only to take care of local needs. There are immense areas of lignite coal in North Dakota, but it is not extensively marketed. Bricks, dairy products and flour are the leading manufactures.

There are no large cities. Fargo and Grand Forks are the trade centers of the Red River valley, and Minot and Bismarck, the capital, are the principal towns of the central section.

The only large educational institutions are the University of North Dakota at Grand Forks and the North Dakota Agricultural College at Fargo.

In the low Turtle Mountains on the Canadian boundary an International Peace Garden is under development. Devils Lake is the principal resort region. The Bad Lands of the southwestern district form the most remarkable natural scenery of the state.

Northern Ireland, a constituent of the United Kingdom of Great Britain and Northern Ireland, consisting of six counties in the eastern part of the province of Ulster—Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone. On the establishment of the Irish Free State in 1922 Northern Ireland refused to join, and again when the question came up in 1938 on the adoption of a new constitution, this section of the island preferred to retain its political connection with Great Britain. The differences between the two sections are largely religious. The Irish Free State (or Ireland as it is now called) is predominantly Roman Catholic; in Northern Ireland the great majority is Protestant, and the people were not content to be represented in the Parliament where Catholics could outvote them; moreover, the tie to Great Britain is strengthened by the fact that they are mostly descendants of the English conquerors.

Northern Ireland has an area of 5,237 square miles and a population of 1,279,177. Lough Neagh, covering an area of 153 square miles, is the largest lake in the British Isles. Other scenic features include the glens of Antrim, the most beautiful of which is Glenariff with its numerous cascades; the Mountains of Mourne; and loughs Erne and Strangford and the smaller lakes of Fermanagh. On the northern coast of Antrim is the unusual promontory, the Giant's Causeway, which consists of about 40,000 columns of basaltic rock, some 500 feet high, formed from cooling lava during the Tertiary Period.

Like its southern neighbor, Northern Ireland is an agricultural country. The principal crops are potatoes and turnips; wheat, hay, oats, flax, tobacco and orchard fruits also are raised. Butter and other dairy products are exported to Great Britain. The chief industries are shipbuilding and linen weaving. Woolen goods, cigarettes, rope, twine and soap also are manufactured.

The executive authority is exercised by a governor, appointed by the Crown for a term of 6 years. Assisting him is the Ministry, headed by a prime minister and responsible to the Parliament. The 52 members of the House of Commons are elected by popular vote, but the 26 members of the Senate are chosen from the Lower House. Northern Ireland is represented in the British House of Commons by 13 members.

The capital and largest city of Northern Ireland is Belfast (population, 438,000). It is located at the mouth of the River Lagan on the broad estuary, Belfast Lough. The city is famous throughout the world as the center of Ireland's linen manufacturing and shipbuilding. Among its notable structures are the Parliament Building, Royal Courts of Justice, City Hall and Art Gallery and Museum. It is the seat of Queen's University. Northern Ireland's other important cities are Londonderry, noted for its ancient walls and historic cathedral, and Armagh, called Erin's Eternal City from its many traditional associations with St. Patrick.

North Sea, an arm of the Atlantic Ocean, bounded by Great Britain on the west, Belgium and the Netherlands on the south and Germany, Denmark and Norway on the east. Its area is 220,820 square miles. Most of the North Sea is fairly shallow, with a mean depth of only 186 feet. It is deepest off the Norwegian coast where, at the entrance to the Skagerrak, a depth of 1,140 feet has been sounded. The Dogger Bank in the south central part is the most famous fishing area; the principal fish caught are herring. The coasts of the North Sea consist mostly of sandy beaches, low cliffs and flat marshes such as the Fens of eastern England. Its tides are very complex. Rivers flowing into the Sea are the Thames and Humber in Great Britain, the Elbe and Weser in Germany and the Rhine, Meuse and the Scheldt in the Netherlands. Among the islands are the Frisian, Orkney and Shetland groups as well as Helgoland. Ports are Rotterdam in the Netherlands, Hull, Yarmouth and Ipswich in England and Leith in Scotland. The Strait of Dover and English Channel connect the North Sea with the Atlantic Ocean on the west; the Skagerrak, Skaw, Kattegat, Sound and Little and Great Belts connect it with the Baltic Sea on the east.

Norway, a kingdom of northern Europe, occupying the western and northern portions of the Scandinavian Peninsula. It is bounded by Sweden and Finland on the east; the Skagerrak on the south; the Atlantic Ocean on the west; and the Arctic Ocean on the north. Extending farther north than any other part of the continent of Europe, it possesses as its northernmost extremity the 968-foot-high headland, North Cape, on the island of Magerö. About a third of Norway lies in the North Frigid Zone, for the Arctic Circle crosses it a short distance above the center of the country. The climate along the coast is moderated by the Gulf Stream, and here and in the southern part dwell most of the inhabitants. The total area of Norway is 124,588 square miles; the population is more than 2,800,000.

Norway is a land of the midnight sun, for above the Arctic Circle in summer the sun shines continuously for almost 3 months; then in winter there is a like period of almost total darkness. The western coast is broken by innumerable fiords, the more famous of which are the Sogne (133 miles long and in some places 4,000 feet deep), Naerö, Hardanger, Nord, Stor, Geiranger and Romsdal. Although the length of Norway along the Atlantic is only 1,160 miles, the coast line, because of the fiords, measures more than 2,100 miles. Along the coast are myriads of islands, the best-known of which are the Lofoten and Vesteraalen groups.

The interior of the country is a 1,500-foot-high plateau, covered with mountains and valleys. The principal range is the Kjolen, separating Norway from Sweden, and the highest peak is Galdhopiggen (8,097 feet). Of the many crystal-clear lakes the largest is Mjosen, covering an area of 140 square miles. The most important of the numerous rushing rivers is the Glommen. Norway is noted for its waterfalls, notably the Feigumfos and Skykjedalsfos, each about 650 feet high (four times higher than Niagara). The Jostedalsbrae Glacier (area, 580 square miles) is one of the largest in Europe. All these scenic features contribute to Norway's reputation as an ideal tourist land.

Courtesy Norwegian Travel Information Office

Norway's National Parliament Building

The building where the two houses of the Storting meet was designed by the Swedish architect E. V. Langlet and was completed in 1866

Only about 4 per cent of Norway's total area can be devoted to agricultural pursuits. The principal crops are wheat, rye, barley, oats, potatoes, tobacco and orchard fruits. Sheep and cattle are raised in large numbers: and the chief exports are butter and condensed milk. The country is especially fortunate in its mineral deposits; iron ore leads in production, followed by iron pyrites, copper, nickel, silver, feldspar, bauxite, zinc, lead and tin. Forests of pine and fir cover one-fifth the area.

Manufacturing owes its development to hydroelectric power, supplemented by coal from Spitsbergen; the principal products are paper, wood pulp, matches, machinery, metal products, textiles (principally cotton, woolen and linen goods) and chemicals, such as saltpeter. About 100,000 Norwegians are engaged as fishermen, catching herring, mackerel, cod and salmon and spearing the seal and walrus. Since 1906 they have also extended their activities to the whaling regions of the Antarctic.

As a constitutional monarchy Norway is governed under a constitution adopted in 1814, when Denmark ceded the country to Sweden. The union, however, was a very loose one and in 1905 was dissolved as the result of a plebiscite. After recognition of this act by the Swedish Parliament, Prince Charles of Denmark was called to the Danish throne as King Haakon VII. The executive authority is vested in the king, but it is primarily exercised through the Council of State (*Statsraad*), headed by a premier. The legislative body, called the *Storthing*, consists of the Lagthing of 38 members and the Odelsthing of 112 members elected for 3 years. Like other Scandinavian countries Norway has been a leader in the enactment of labor legislation, the formation of cooperative societies and the extension of suffrage to women (1909).

Oslo, the capital, retained until 1925 its Danish name, Christiania. With a population more than 250,000 it is the largest city of the country and its commercial center. It is located 50 miles from the Skagerrak at the head of a broad and deep fiord and is dominated by Holmenkollen Mountain. Among Oslo's notable buildings are the Parliament Building (*Storthings-Bygning*), the Royal Palace and National Theater, flanked by statues of the great Norwegian dramatists Henrik Ibsen and Björnstjerne Björnson. It is also the seat of the Fredericiana University, which was founded in 1811 and possesses the unique Ski Museum, the Museum of Applied Art, National Art Gallery and Historical Museum, world-famous for its viking exhibits. Norway's other important cities include: Bergen, which possesses several 13th-century churches and national memorials, such as Haakon's Hal and the towers of Rosenkrans Taarn as reminders of the days when it was a member of the Hanseatic League; Nidaros (formerly Trondhjem), in whose Cathedral of St. Olaf the old Norwegian kings were crowned; and Hammerfest, the most northern incorporated town of Europe. Germany captured Norway in 1940.

notch, a narrow passage between two hills or mountains. The word *notch* is often used in proper names, as Crawford Notch in the White Mountains of New Hampshire.

Nyasaland, a British protectorate in southeastern Africa, bounded by Northern Rhodesia on the west, Tanganyika Territory on the north, Lake Nyasa (area, about 11,000 square miles) on the east and Mozambique, from which it is separated by the Zambesi River, on the south. Its area is 47,949 square miles (including 10,353 square miles of water), and it has a population of about 1,611,000, including about 1,800 Europeans and 1,500 Asiatics. Nyasaland consists of several elevated plateaus, notably the Nyika and Angoniland. The fertile valleys are watered by the Shire (which drains Lake Nyasa) and other rivers. In the northwest are the Nkondi Mountains and in the northeast the Mlanje Massif. Products include tobacco, tea, hemp, cotton, coffee and ivory. The capital is Zomba; Blantyre (population, 6,000) is the largest town. Other settlements are Limbe, Fort Johnston, Karonga and Livingstone, which was named in honor of David Livingstone who was the first white man to penetrate this territory when he discovered Lake Nyasa in 1859.

The country is divided into three provinces, each under a provincial commissioner. In authority over them is the governor, who is assisted by executive and legislative councils. Native chiefs and headsmen act as intermediaries between the natives and the commissioners or their district assistants. From 1891 to 1907 Nyasaland was known as British Central Africa Protectorate. Nyasaland's name is derived from the Bantu word *nyanza*, the land of great water, in reference to Lake Nyasa.

oasis, a fertile spot in a sandy desert, generally made possible by the presence of a natural spring, well or subterranean river. Irrigation has made possible the creation of artificial oases. In some parts of the Sahara and other deserts there are areas of considerable size that, because they are near the mountains, have sufficient local rainfall to support more extensive vegetation and to make possible communities of considerable size. Examples are the Oasis of Farafra and the Siwa Oasis, the ancient site of the temple to Jupiter Ammon in the Libyan Desert.

Because the area is limited, agriculture is often practiced on an intensive scale in these oases. Beneath date palms may be planted a second tier of smaller trees, such as the olive, pomegranate, orange or coffee, and in a third tier, cotton plants or an assortment of vegetables. For a pastoral people such as the Bedouin Arabs the scanty grass of the oases affords pasturage for their sheep, goats and asses.

Egypt, Iraq and northwestern India, watered by the Nile, Tigris, Euphrates and Indus rivers, are often referred to as huge oases. Among artificial oases is the Imperial Valley in California. The word *oasis* is derived through Latin and Greek from an Egyptian word meaning a place for dwelling.

ocean, the entire body of salt water that occupies the great depressions in the earth's crust and covers about 142,000,000 square miles or 72 per cent of the earth's surface. There are five large divisions: the Atlantic Ocean, consisting of 34,800,000 square miles; Pacific, 67,700,000 square miles; Indian, 28,600,000 square miles; Arctic, 5,300,000 square miles; and Antarctic, 5,700,00 square miles.

The average depth of the ocean is 12,500 feet. In 76 per cent of the total area there are depths between 6,000 and 18,000 feet; only 7 per cent has a depth of more than 18,000 feet; and 17 per cent, in the regions of the continental shelves, of less than 6,000 feet. The deepest depression is in the Swire Deep near Mindanao, one of the Philippine Islands, where a sounding of 35,400 feet has been taken.

The aquamarine color of the ocean on a sunshiny day results from the selective absorption of light, the blue rays of the spectrum being absorbed 10 times slower than the red rays. Tropical seas are also rich in phosphorescent animalcules, such as the Noctilucidae and Pyrosoma, and vari-colored algae that tint the water.

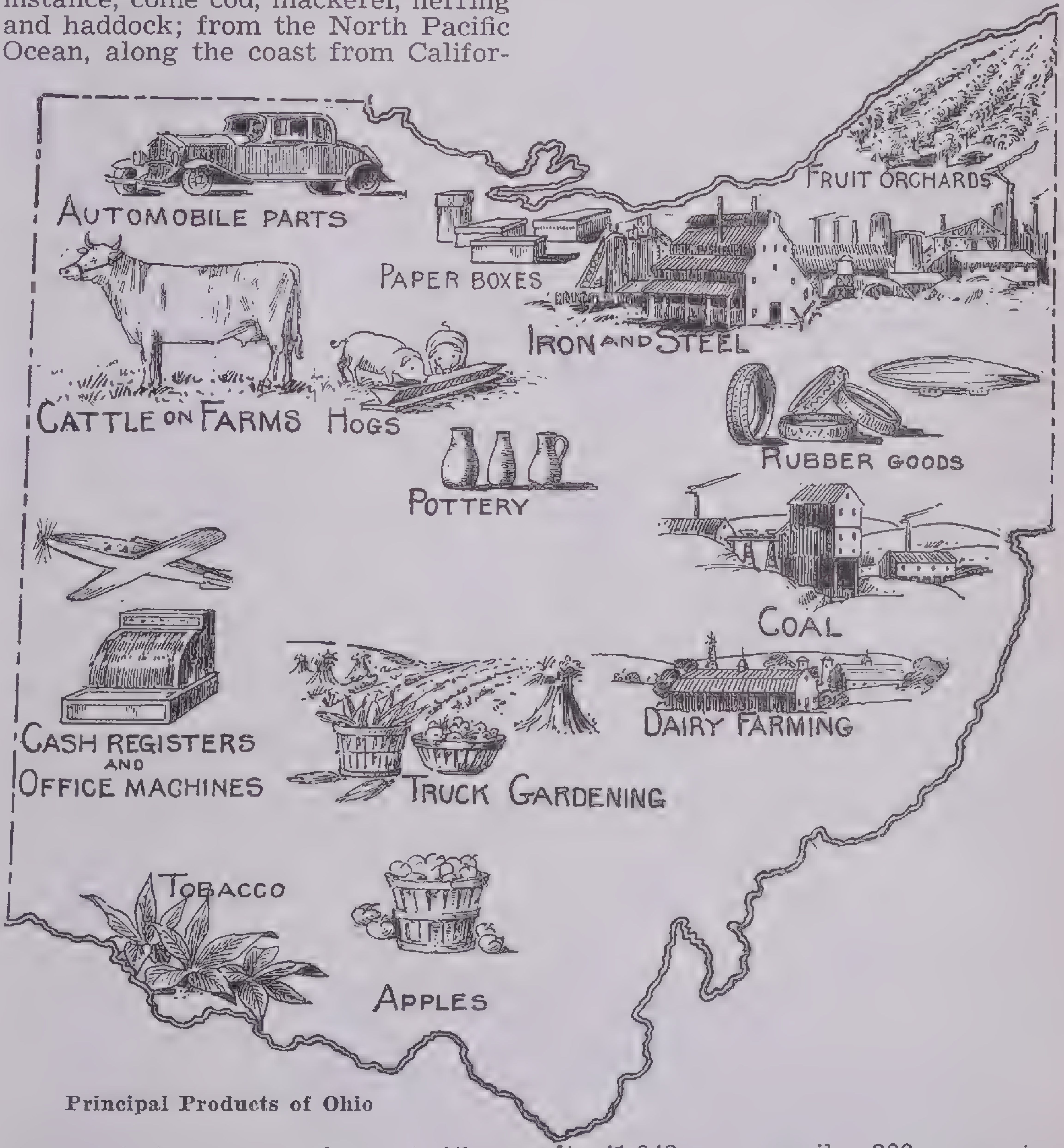
The deposits on the ocean bed, a great undulating submarine plain, are classified as *terrigenous* and *pelagic*. The former, consisting of sand, gravel, clay and volcanic matter spewed forth by oceanic volcanoes, are land derived; the latter, consisting of shells and the skeletons of marine organisms, have originated in the ocean and often form pelagic islands, like the coral island, which eventually rise above the sea level or the chalk cliffs of England, believed to be of prehistoric foraminiferan origin.

Ocean water derives its high density (1.026) and consequent great buoyancy from dissolved mineral matter, such as sodium chloride, which constitutes three-fourths of this matter, and the salts and sulphates of magnesium and calcium. From calcium carbonate corals and Foraminifera derive lime. Altogether these minerals average in weight 3.7 per cent of the total oceanic volume of about 315,000,000 cubic miles. The ocean also holds in solution such gases as oxygen, nitrogen and carbon dioxide.

Near the surface the temperature of ocean water ranges from 30° F. in the North and South Frigid zones to 80° F. in the Tropics. In the depths, however, there is less difference, the temperature in the Tropics being only 40° F. as compared with 30° F. in the North and South Frigid zones, which proves that the movement of water from the poles to the equator is a deep-sea current.

Ocean currents, such as the Gulf Stream and the Japan and Labrador currents, greatly affect the climate of adjacent land masses by their distribution over wide areas of warm and cold waters. Currents are also affected by variations in temperature, unequal salinity, prevailing winds and atmospheric pressure. Besides currents, the noticeable movements of oceanic water are waves, overfalls, undertows, tides and tide rips.

Oceans teem with animal and plant life, and one of the most important industries is ocean fishing. From the Grand Bank and the North Sea, for instance, come cod, mackerel, herring and haddock; from the North Pacific Ocean, along the coast from California to Alaska, come salmon, halibut and tuna; and from cultivated areas in Chesapeake Bay, the oyster. People settle along ocean coasts for the mild climate, especially in the cyclonic parts of western Europe and North America.



Principal Products of Ohio

William Beebe, director of the department of scientific research of the New York Zoological Society, has conducted important oceanic researches since 1928 by descending in a bathysphere to the bottom of the ocean off Nonsuch Island, Bermuda. After reaching a depth of 1,700 feet he found that daylight did not penetrate the water.

Of Greek origin, the word *ocean* was the name of the river supposed, according to Greek mythology, to encircle the earth.

Oceania, the collective name of the islands of the South Seas or central Pacific Ocean. Its divisions include Malaya, Melanesia, Micronesia and Polynesia. The total area, extending from 30° N. Lat, to 30° S. Lat. and from 110° W. Long. to 50° E. Long., is some 70,000 square miles.

Ohio, a Great Lakes state, 35th in the United States in area but 4th both in population and in the value of manufactures. It is bounded on the north by Michigan and Lake Erie, on the east by Pennsylvania and West Virginia, on the south by Kentucky and on the west by Indiana. All of the southern and half of the eastern boundary is formed by the Ohio River. Of its 41,040 square miles 300 are water surface. The population is approximately 6,907,612. Two-thirds of the people live in cities and towns.

Most of the surface is rolling prairie, though the southeast includes a hilly section of the Allegheny plateau, and the northwest is a flat, fertile plain. The maximum difference in elevation is only 1125 feet.

The state has many rivers. The Ohio is navigable for its full length, but the others are of little commercial importance. The Muskingum, Scioto and Miami are the largest tributaries of the Ohio, and the Cuyahoga and the Maumee drain into Lake Erie, where their mouths form busy harbors. Natural lakes are unimportant, but several large reservoirs built in the era of canal transportation now serve the same recreational purposes.

With abundant rainfall, cold winters and hot summers, the state has a typical continental climate, well suited to agriculture. Five-sixths of its surface is devoted to farming. Corn, wheat, oats and hay are the largest crops. Tobacco and grapes are also valuable products, and the live stock industry ranks high. The forests are of little commercial importance. Lake Erie fisheries are highly profitable.

Ohio ranks among the half dozen leading states in mineral wealth. Clay for pottery and bricks, coal, gas, oil, lime and salt are the most valuable products.

Manufacturing is highly developed in every section of the state. In production of pig iron, made from ore brought into the Lake Erie ports, it ranks first, with the Cleveland and Youngstown districts leading in output. Akron and its suburbs make more tires and minor rubber products than any other locality in the world. Pottery, bricks and tile, made chiefly in the East and Southwest, are produced in greater quantity than in any other state. It is among the leaders in the manufacture of coke, special steels, machinery, automobiles and parts, plate glass and glassware, paints, meat products, gasoline, soap and many other essential commodities.

Ohio has many thriving cities. Cleveland, the most important, is separately described.

Cincinnati, second city in the state and one of the twenty largest in the country, has been a leading industrial and commercial center for a century. Its early growth depended on Ohio River traffic, and it became a natural focus of interior trade routes north and south. After the Civil War the city built a railroad south to Chattanooga, which it still owns, to preserve its southern business connections. Its manufactures are highly diversified; soap, radios and playing cards are among the best known products. It has long ranked high in its support of musical and artistic endeavors. Its hills are dotted with fine residential sections, and its business district includes one of the nation's finest railway stations and two office buildings over 500 feet high.

Toledo and Columbus vie for third place among Ohio cities. The former is a busy lake port, handling great quantities of coal and iron ore. Its manufactures include glass, automobiles and parts, sheet steel and machinery of many types. It has attractive parks and a progressive art museum with a notable collection of glass, both antique and modern.

Columbus, the capital, is an important trade and distributing point. It has large insurance interests. The public buildings are imposing, and its 555-foot skyscraper is visible for miles. It is the seat of many state institutions and is one of the principal U.S. Army supply bases.

Akron is essentially a manufacturing city. In addition to its great rubber mills it has important pottery works and the principal dirigible building facilities in America. Dayton also is a factory center of recent development; its best known products are cash registers, airplanes, scales, electric refrigerators and small apparatus. It has one of the principal U.S. Army flying fields.

Youngstown is an iron and steel center second in importance only to Pittsburgh. Canton also turns out steel products of many kinds. The elaborate memorial to President McKinley is situated there. Springfield and Hamilton are busy industrial cities, and Sandusky and Lorain are major Lake Erie ports.

Ohio has many educational institutions. Ohio State at Columbus, Ohio University at Athens, Western Reserve at Cleveland, Miami at Oxford, Cincinnati at Cincinnati, Akron at Akron, Ohio Wesleyan at Delaware and Toledo at Toledo are among the larger universities. Smaller colleges are numerous; among the best known are Oberlin at Oberlin, Hiram at Hiram, Kenyon at Gambier, John Carroll and Case at Cleveland, Denison at Granville and Antioch at Yellow Springs. There are a dozen more of established reputation.

Though Ohio lacks spectacular natural scenery, it has many attractive localities. No state has more remarkable Indian mounds; these are particularly numerous in the vicinity of Newark and Chillicothe, and the Great Serpent Mound near Portsmouth is possibly the most notable of all. Among many historic shrines are Grant's birthplace on the Ohio River and the reconstructed Moravian log village of Schoenbrunn, where pioneer living conditions of the Revolutionary era are accurately reproduced.

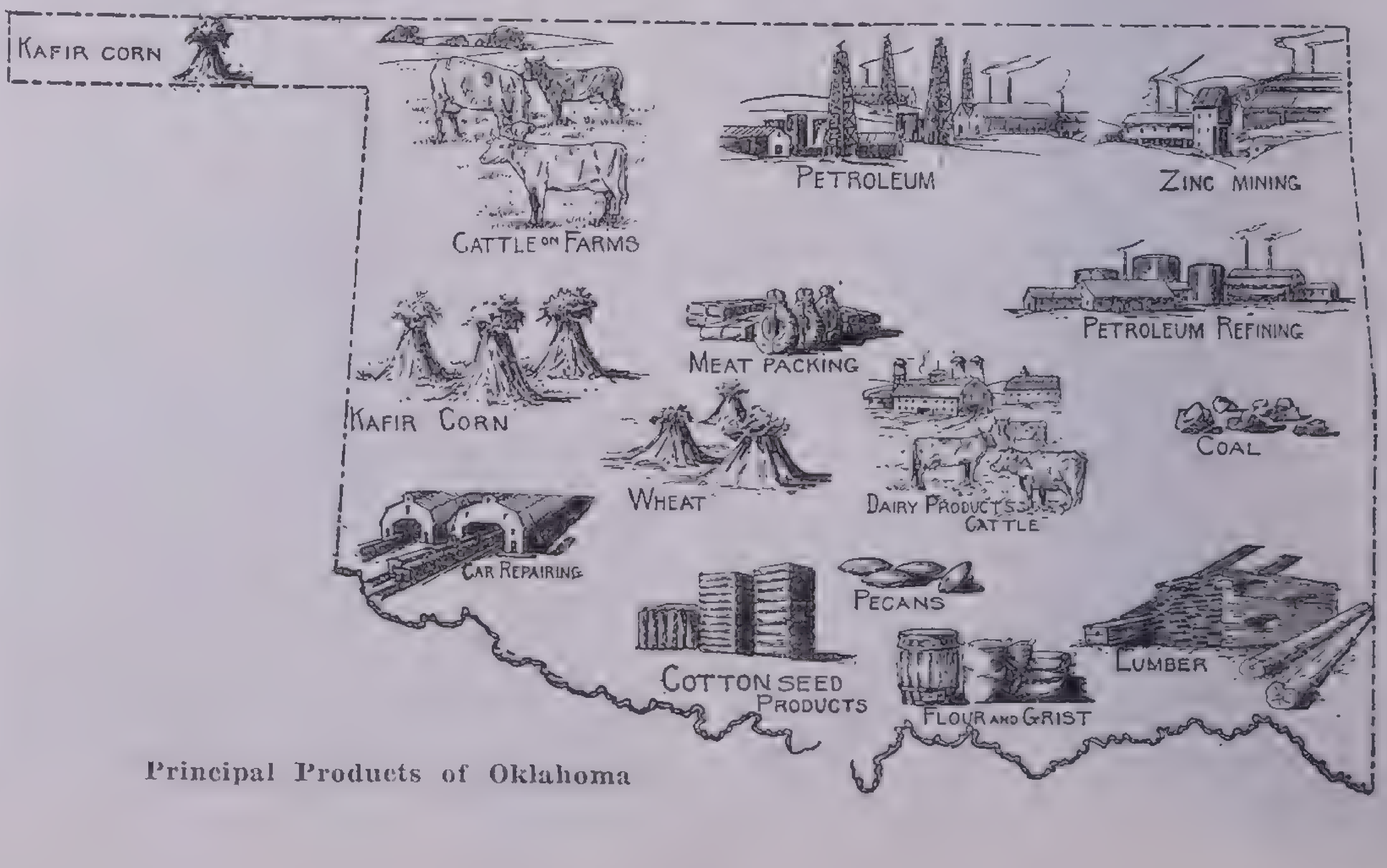
Ohio, the largest eastern tributary of the Mississippi River. It is formed by the junction of the Allegheny and Monongahela rivers at the city of Pittsburgh in western Pennsylvania and flows in a generally southwestern direction to the Mississippi at Cairo, Ill. It is about 1,000 miles long, drains an area of about 210,000 square miles and is navigable for its entire course. The Ohio River forms the boundary between the states of Ohio, Indiana and Illinois on the north and West Virginia and Kentucky on the south. Tributaries from the south are the Kanawha, Big Sandy, Kentucky, Green, Cumberland and Tennessee rivers; from the north are the Wabash, Great Miami, Scioto and Muskingum rivers. Among the cities along the shores of the Ohio are Louisville, Paducah and Covington, Ky.; Huntington and Wheeling, W. Va.; Evansville, New Albany and Madison, Ind.; and Cincinnati, Portsmouth and Marietta, Ohio. The United States Army engineers have constructed many power dams and several canals to carry traffic around obstructions at Louisville and other places. There are also reservoirs to take care of the surplus waters in time of flood.

La Salle discovered the Ohio in 1670. It played an important part in the settlement of the West and was the bone of contention of the French and Indian War (1754–60), the English and French both wishing to control it. The Treaty of 1763, which ended the Seven Years' War (the European counterpart of the French and Indian War), gave control to England. The treaty at the close of the American Revolution in 1783 gave the entire Ohio region to the United States.

Ohio is an Indian word meaning beautiful river.

Oklahoma, a state of the Southwest with an area of 70,057 square miles, which includes 643 of water surface. Its greatest length is 585 miles; greatest breadth, 210 miles. Colorado and Kansas bound it on the north, Missouri and Arkansas on the east, Texas on the south, and Texas and New Mexico on the west. The Red River forms the southern border. The population, now 2,336,434 (1940), has increased tenfold in fifty years.

The surface is generally level, sloping upward to the west. There are, however, several hilly sections. In the northeast the Ozark foothills rise above the general level; and the Wichita Mountains in the southwest vary the even topography of that section. The larger rivers, particularly the Arkansas and its branches, the Canadian and the Cimarron, have cut



Principal Products of Oklahoma

considerable valleys in their sweeping progress through the state on their way to the Mississippi.

The state has a fairly mild climate, though it is subject to occasional cold waves and long hot spells. Most of Oklahoma is good farming land. In the western section the rainfall is seldom sufficient to produce good crops, however, and dry farming and grazing are practiced. In the dry seasons the prevalent high winds often produce disastrous dust storms in this area. Wheat, corn and oats are the leading grain crops. Cotton production is fairly important. Hogs, fattened for the stockyards, consume much of the grain raised in the state, and great herds of cattle still range the dry western plains. The hilly districts are forested, but lumber production is of minor importance.

Oklahoma has great mineral wealth. It ranks among the three leading states in natural gas and petroleum output, and coal, lead and zinc are valuable products. The refining of these minerals, especially oil, is the principal manufacturing interest. Flour and cottonseed products are the other leading manufactures.

The two larger cities of the state have grown very rapidly with the development of the rich oil fields. Oklahoma City, the capital and chief center of population, and Tulsa share the business of this region. Oil derricks rise almost in the dooryard of the handsome Capitol building. Both cities have modern tall hotels and office buildings, wide streets, delightful parks and museums rich in Indian and pioneer material. Muskogee is a center for the trade of the prosperous Indian tribes that still retain ownership of much Oklahoma land, especially oil fields.

The University of Oklahoma at Norman is one of the larger state institutions of higher learning. Other important schools are the Oklahoma Agricultural and Mechanical College at Stillwater, Oklahoma College for Women at Chickasha and the University of Tulsa at Tulsa.

Platt National Park has valuable medicinal springs and scenic waterfalls. The 101 Ranch near Ponca City is widely known. Lawton and Muskogee have notable Indian schools, supported by the Federal government. Fort Sill, in the Wichita foothills, is a large U. S. Army reservation, and adjacent is a great wild life refuge for the protection of bison, elk and Texas longhorn cattle.

Old Church Tower, Jamestown, Va. The sole remaining structure of the oldest English settlement in America, this partially ruined brick tower and the adjacent foundations and paved floor of the parish church have survived nearly three centuries and are now maintained as a monument to the first settlers.

Old Lighthouse, Cape Henry, Va. This simple white tower marks the site of the first landing of the first permanent English settlers in America and is preserved as the first lighthouse built by the United States Government. It rises from a sand dune overlooking the entrance to Chesapeake Bay.

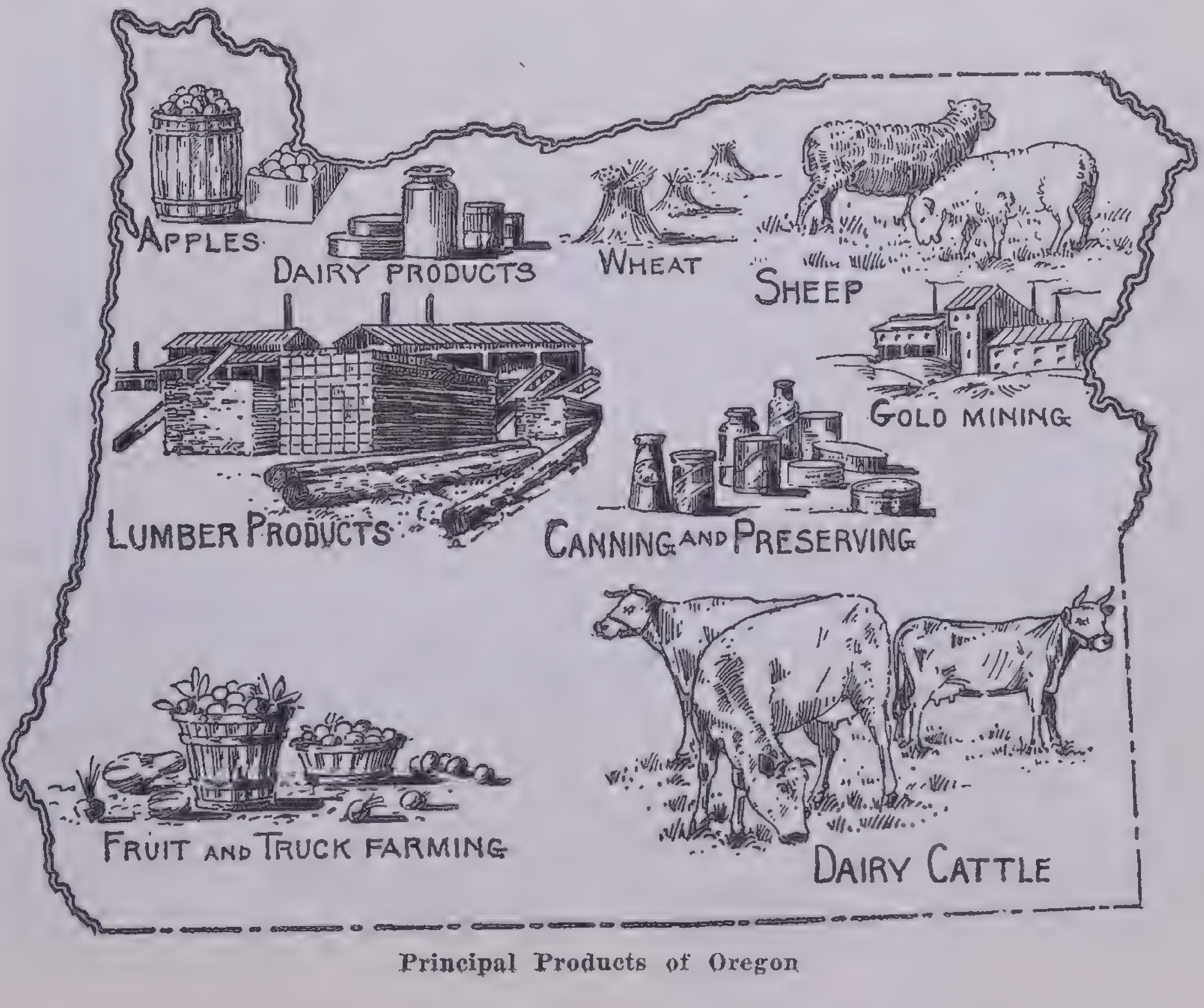
Old Spanish Trail, a 2,743-mile highway in the southern United States. It connects St. Augustine, Fla., and San Diego, Calif., passing through New Orleans, La., San Antonio, Texas, and other cities that are among the oldest in the United States.

Oman, a sultanate in the southeastern part of the Arabian Peninsula. It is bounded by the Persian Gulf, Strait of Ormuz and the Gulf of Oman on the east, the Arabian Sea on the south and Saudi Arabia on the west and north. The area is estimated at 82,000 square miles, and the population, chiefly Arabs, is about 500,000. Much of the country is mountainous, the principal height being Jeb Akhdar (9,900 feet). The principal oases are Wadi Tyin, Wadi Munsab and Wadi Kahza. The chief agricultural products of Oman are dates and cereals; other fruits are melons, oranges, peaches and apricots. Camel breeding is carried on in the interior. Among manufactures are gold and silver filigree jewelry. Muscat, a town of 4,500 inhabitants, is the capital; Matrah, on the coast near Muscat, is the chief port. The sultan of Oman belongs to a dynasty that has been in control since Ahmed bin Said recovered the region from the Portuguese in 1741. The British Government through the government of India subsidizes the sultanate so as to prevent its absorption in the kingdom of Saudi Arabia. Oman formerly extended along the coast of Iran (Persia) and still owns Gwadar, a port on the coast of Baluchistan, India, with a population about 4,000.

Ontario, the smallest and easternmost of the five Great Lakes of North America, lying between the province of Ontario on the north and the state of New York on the south. It is more than 300 feet below the level of Lake Erie, whose waters flow into it through the Niagara River. Ontario is 193 miles long, 53 miles wide and has an area of 7,540 square miles. Near Kingston, Ont., its waters pass into the St. Lawrence River and are carried through the Gulf of St. Lawrence to the Atlantic Ocean. The Welland Canal in Canada carries steamship traffic from Lake Erie to Lake Ontario. The Rideau Canal connects Lake Ontario with the Ottawa River, and the Oswego Canal connects it with the New York State Barge Canal and the Hudson River. Cities on Lake Ontario are Toronto, Hamilton, Coburg, Port Hope and Kingston, Ont., and Oswego and Watertown, N. Y. The name *Ontario* is an Indian word meaning beautiful lake.

Oregon, a state of the Pacific Northwest, ranking 9th in area in the United States, with 96,699 square miles, including 1,092 of water surface. On the north it is bounded by Washington, on the east by Idaho, on the south by Nevada and California and on the west by the Pacific Ocean. Most of the northern boundary is formed by the Columbia River, and the Snake River forms half the eastern border. The state is about 375 miles long and 290 broad. The population of about 1,000,000 is evenly divided between the urban and rural classifications.

The topography is highly diversified. Closely following the Pacific shoreline, sometimes rising in vertical cliffs out of the very breakers, the deeply eroded Coast Range forms a barrier along the western boundary. Parallel to it and about 100 miles inland is the Cascade Range, a massive mountain wall with irregular snow capped peaks. At the northern end is Mt. Hood, altitude 11,253 feet, the highest point in the state. Between these ranges is the broad, fertile Willamette Valley, the *garden of Oregon.* East of the Cascades is the parallel Deschutes Valley. Southeastern Ore-



Principal Products of Oregon

gon is a high semiarid plain; and the northeast is a section of rougher terrain, rising in places into broken mountain groups with some elevations about 10,000 feet above the sea. At the eastern boundary this high land is abruptly severed by the Snake River canyon, over a mile deep.

Ocean vessels navigate the Columbia to Portland on the Willamette near the confluence of the two streams. The other rivers are of economic importance only as power sources, in which the state ranks third, though much is not yet developed. The Bonneville Dam on the Columbia is a major project of this character in which Oregon and Washington share the benefits.

Western Oregon has abundant rainfall and an equable climate. Its forests are among the finest in America, and it ranks second in lumber production. Much of the timber is protected against ruthless exploitation by National Forest reservations. Wheat, oats, hay, hops, fruits and berries are grown in great quantities, especially in the Willamette Valley. Irrigation is practiced in the Deschutes Valley and in parts of eastern Oregon, but most of that semiarid and thinly settled region is range land where herds of sheep and cattle graze.

An Oregon industry of great importance is the catching and canning of salmon, for which Astoria, at the mouth of the Columbia, is the center. Manufactures otherwise are primarily to care for local needs. Woolens, flour and meats are among the more valuable products.

Minerals are available in considerable variety but have been little exploited. Gold is found in moderate quantities.

Aside from Portland, which is described elsewhere, the cities are small, serving chiefly as local trading and distributing points. Salem, the capital, is second in population.

Oregon State College at Corvallis and the University of Oregon at Eugene are the principal institutions of learning.

Crater Lake National Park includes the chief scenic feature of the state, a deep, cold and very blue lake, walled in by high vertical cliffs and filling the crater of an ancient volcano. The Columbia River Highway is a notable scenic drive which passes within view of several of the nation's highest waterfalls. Oregon's beaches offer summer recreation, and Mt. Hood is a popular winter-sports region. The annual *roundup* at Pendleton is a colorful frontier festival.

Oregon or **Overland Trail,** an American highway close to the route followed by the early settlers in the 2,000-mile trip from Independence, Mo., to The Dalles, Oreg.

Orkney Islands, a group of 67 islands in the Atlantic Ocean, the nearest (South Ronaldshay) being 7 miles from the northern coast of Scotland, of which they form a county. Only about 30 of the islands are inhabited, the most important being Pomona or Mainland, Westray, Sanday, Stronsay and Hoy. The total area is 376 square miles; the population numbers 21,700. The chief crops are oats, barley, turnips and potatoes. Grazing and fishing are important industries. Though the islands are far north, the climate is made moderate by the Gulf Stream. In midsummer the days are about 19 hours long; in midwinter the nights are about the same length. The county center is Kirkwall on Pomona Island.

The name is derived from the Norse *Orkn,* meaning seal, and *ey,* meaning island. Both the Orkney and Shetland islands were pledged by Christian I of Denmark as dowry for his daughter Margaret on her marriage to James III of Scotland in 1469. As Denmark defaulted in payment, they were formally transferred to Scotland in 1590.

Pacific Highway, a paved road, 1,675 miles long, that runs along the Pacific coast of North America from Vancouver, B.C., Canada, to the United States-Mexico border just south of San Diego, Calif. Within view of it are Mt. Rainier in Washington, Crater Lake in Oregon and the Mt. Lassen volcano in California.

Pacific Ocean, the largest and deepest body of water in the world, dividing the western coasts of North and South America from the eastern coasts of Asia and Australia. The Bering Strait connects it with the Arctic Ocean on the north; Drake Strait affords connection with the South Atlantic on the east; and the Panama Canal and Caribbean Sea connect it with the North Atlantic. Like its sister oceans, it merges into the Antarctic on the south so that the Antarctic may be called an extension of the Atlantic, Pacific and Indian oceans. The connection of the Pacific with the Indian Ocean on the west is through the Celebes, Coral, Sulu, Java, Flores, Banda, Timor and Arafura seas.

The area of the Pacific with its arms, Bering, Okhotsk, Japan, Yellow, China and the eight seas of the Malay Archipelago region, is about 68,634,000 square miles. Its length is about 7,350 miles or 9,300 miles to the Antarctic Circle; its greatest width (between Panama and Mindanao Island of the Philippines) is 10,300 miles. The greatest depth, sounded off Mindanao, is 35,400 feet. The chief basin is the Tuscarora off Japan. Among the currents in the Pacific are the Peruvian, North Pacific, Californian, Alaskan, Japan, East Australian and North and South Equatorial.

The great cordillera formed by the Rockies and the Andes is near the Pacific coasts of North and South America. The chief indentation is the Gulf of California on the western coast of Mexico. In the extreme north and south of the two Americas are many bays, fiords and islands. The five seas along the Asiatic coast—the Okhotsk, Japan, Yellow, East China and South China—give it a very irregular outline, but the eastern Australian coast is fairly regular. The principal islands are the Aleutian, Caroline, Cook, Easter, Ellice, Fiji, Galápagos, Gilbert, Hawaiian, Japanese, Mariana, Marshall, Marquesa, New Britain, New Caledonia, New Hebrides, New Zealand, Palau, Philippine, Samoa, Society and Solomon.

The Pacific Ocean was named by Magellan who on Nov. 28, 1520, sailed into it from the South Atlantic through the Strait that bears his name. Balboa, who first sighted it from one of the Darien peaks of Panama in 1513, called it the *Southern Sea.* Derived from the Latin *pacificus,* the name means peaceful.

Palau or **Pelew Islands,** a group of 26 small islands in the Pacific Ocean; belonging to the Micronesian section of Oceania and crossed by 7° N. Lat. and 134° E. Long. The total area is 173 square miles, and the population is a little more than 8,000. Some of the islands are of volcanic formation, and some, of coral. The largest of the six inhabited islands are Babeltop, Uruktapi and Korror. Rice, sugar, tobacco, breadfruit, coconuts and other tropical fruits are the principal agricultural products. Phosphate is mined in some of the southern islands. Spain held the group by virtue of Ruy Lopez de Villalobos's discovery in 1543 but sold them to Germany in 1899. Since the World War they have been administered by Japan under mandate from the League of Nations.

Palestine, a territory that since 1923 has been administered by Great Britain under mandate from the League of Nations. To Jews, Christians and Moslems it is the Holy Land. For the Jews it is the home of the ancient Hebrews whose kings reigned from about 1000 to 600 B.C.; for the Christians its entire area is associated with events in the life of Jesus Christ; and for the Moslems it possesses numerous pilgrimage shrines that range from the Dome of the Rock in Jerusalem to Samson's tomb on the hill of Saraa. The area is about 10,000 square miles; and the population, about 1,500,000.

Palestine is as much a buffer state today as it was in the days of ancient Egypt, Assyria or Rome, for it is essential that Great Britain control it so as to protect the Suez Canal and the air route to India. Great Britain, however, has shown herself sympathetic to the nationalistic aspirations of the Jews, which have developed from the efforts of the Zionist Movement during the past 50 years to provide a home for the victims of anti-Semitism in other countries. In the declaration issued by Lord Balfour on the occupation of Jerusalem by Allenby's troops in 1917 it was asserted that the British government viewed "with favor the establishment in Palestine of a national home for the Jewish people" and would use its "best endeavors to facilitate the achievement of this object." Later this declaration was incorporated in the terms of the mandate over Palestine that was given to Great Britain by the League of Nations.

The effort to establish in Palestine a Jewish homeland has met with serious opposition on the part of the Arab population that numbers more than 900,000. But the Jews are gaining in political control, despite the understanding that nothing should be done to prejudice the rights of other elements, whether Moslem, Christian, Samaritan, Bahai or Hindu. The number of Jews increased from some 66,000 in 1920 to more than 400,000 in 1938 largely through the expulsion of Jews from Germany and other European countries. The Moslems, however, are still in the ascendancy, constituting about two-thirds of the population.

Palestine, which lies along the eastern Mediterranean, is bounded by Syria on the north, Trans-Jordan on the east and Egypt (Sinai Peninsula) on the west. To the south is the Gulf of Aqaba, an arm of the Red Sea. Most of the country is a plateau region that rises gradually from the coastal plain. The most picturesque parts of this region are the Plain of Sharon (famous in Biblical lore for the roses of Sharon) and the Great Plain of Esdraelon, separated by the Mt. Carmel Range. The plateau culminates in the Judean Hills whose average height is 2,500 feet above sea level. On the eastern side of this watershed the elevation recedes until the Plain of Moab is reached. East of this plain is the deep valley, El Zor, within a larger valley called El Ghor, through which the River Jordan flows. This 200-mile long river, which rises in the Anti-Lebanon Mountains and flows through Lake Huleh and the Sea of Galilee, forms the boundary between Palestine and Trans-Jordan. It empties into the Dead Sea, which lies 1,292 feet below sea level. Since this inland sea has no outlet, it is the saltiest body of water in the world; its content of mineral salts amounts to 25 per cent. In the northern part of Palestine rise the Galilean Mountains, the southernmost spur of the Lebanon Mountains.

Palestine is essentially an agricultural country. Its climate is much like that of southern California, but the land is more arid, and irrigation is necessary. The principal crops are wheat, barley, olives, figs, grapes, melons, oranges, lemons, almonds, cotton and tobacco. From the grapes raisins and wine are derived. The mineral wealth includes rock salt, gypsum, sulphur, cement, sandstone and limestone. The Palestine Potash Co., Ltd., has been formed to exploit the Dead Sea for its potassium, calcium and sodium and magnesium salts. The historic Jordan has been harnessed for hydroelectric purposes; the works, although owned by a private organization, called the Palestine Electric Corp., are under government supervision so as to serve all Palestine.

The mandated government of Palestine is headed by a British High Commissioner. The constitution provides for a Legislative Council of 28 members, with proportionate representation of the various religious elements; but the Moslems and Jews refuse to cooperate. Separate Moslem and Jewish committees represent their constituencies in the administration of affairs.

Jerusalem, the capital of Palestine, is described in a separate article. Equally revered are the smaller cities of Bethlehem and Nazareth, associated with the birth and youth of Jesus. Other towns of Biblical and historic fame are Jericho, Hebron, Bethany, Bethel, Tiberias, Beersheba, Gaza, Samaria and Acre. The most important seaports are Jaffa and Haifa. Adjoining Jaffa is the all-Jewish settlement of Tel Aviv (population, 102,000). With its modern facilities of all sorts, its agricultural school and experimental station and its various philanthropic institutions it is an excellent example of what the Jewish immigrants have accomplished in an incredibly short time in transforming an impoverished vilayet of the former Arabian province of Syria (under Turkish rule) into a fairly prosperous country. Haifa is the terminus of the British branch of the 1,200-mile long oil pipe-line from Mosul, Iraq, that was completed in 1934 so as to supply the British fleet in the eastern Mediterranean with fuel.

The name *Palestine* is derived through the Greek *Palaestina* from the Arabic *Falastin* and means the land of the Philistines, the people who originally inhabited the southern coastal region.

Pall Mall, a street in London leading from Trafalgar Square to the Haymarket. Its name is a modern spelling of *paille maille,* the title of a French game of ball somewhat similar to croquet, first played in the adjoining St. James's Park by Charles II and his merry associates when the king was at St. James's Palace. Pall Mall is now the heart of London's clubland.

palisades, a series of steep, prominent cliffs or escarpments, generally of basaltic traprock. The Palisades on the west bank of the lower Hudson River from Haverstraw, N. Y., to Weehawken, N. J., contribute to its scenic beauty. They rise in some parts to a height of 550 feet and extend about 30 miles. The name *Palisades* may have been suggested by the measure of defense that these cliffs afforded early settlers. Geologically they are considered a *sill* or mass of horizontal or moderately inclined igneous rocks.

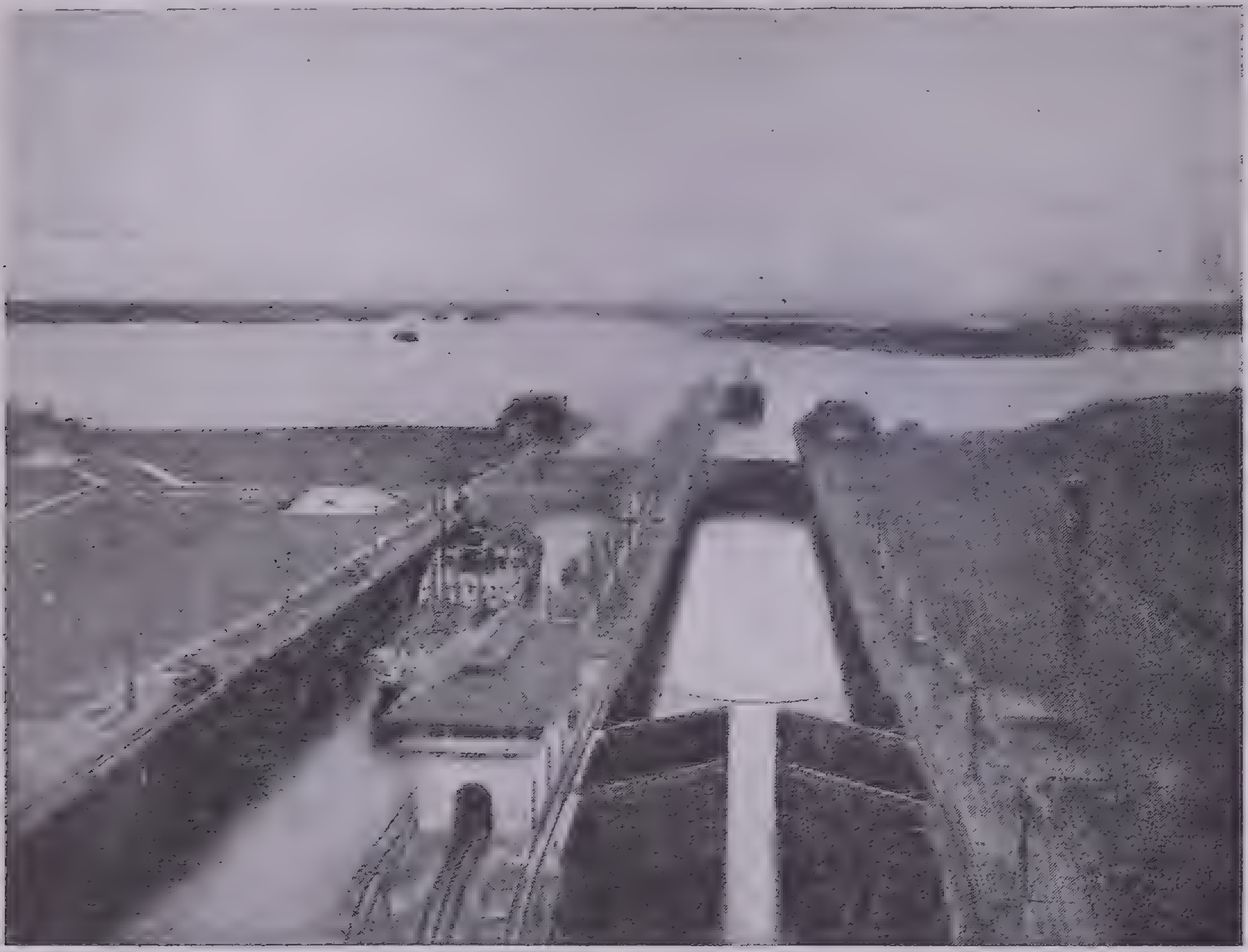
pampas, the vast, grassy, treeless plains in the central part of Argentina between the Río Salado on the north and the Río Negro on the south. They afford excellent pasturage for cattle and sheep. The crops of the region are alfalfa (which supplements the native grasses, enabling growers to send livestock to market a year sooner), wheat, corn and flax. Heavy rains occur during the winter, when there blows from the north a hot moist wind, similar to the sirocco and called the *zonda.* It may alternate with a cool, dry and often crop-destructive wind from the south, called the *pampero.* The term *pampa* is derived through the Spanish from a Peruvian Indian word, meaning field. It applies also to forest regions in Peru along the Ucayali River and to dry lake basins on the Andean plateau.

Panama, a republic of Central America that occupies the isthmus of the same name, the connecting link between North and South America. The Caribbean Sea and its arms, the Mosquito Gulf and the Gulf of Darien, lap the concave northern coast; on the south are the Gulf of Panama, a convex arm of the Pacific, and numerous inner arms such as the Bay of Panama, the Gulf of San Miguel and the Gulf of Parita. On the western side of the Gulf of Panama is the peninsula of Azuero. Costa Rica bounds the country on the west and Colombia on the east. Panama has an area of 32,380 square miles and a population of 475,000, the greater part of which is of mestizo or mixed white and Indian blood. Whites of Spanish descent, Negroes, Chinese and Japanese make up the balance. On the San Blas Islands in the Gulf of San Blas on the Caribbean side live the San Blas Indians, a simple, primitive race, small in stature, who are probably

Courtesy Panama Tourist Commission

San Blas Indians of Panama

These small-statured aborigines enforce racial purity and political independence by barring whites or Negroes from their villages. The women usually wear short-cropped hair, gold nose-rings and bangles and skirts of native workmanship. White Indians, produced by mutations from the dark-skinned natives who regard them as outcasts, are limited in number by laws forbidding their marriage to other semialbinos



Courtesy Executive Department, Canal Zone, Balboa Heights. C.Z.

Gatun Locks Looking South Toward Gatun Lake, Panama Canal

At the left a ship going from the Atlantic to the Pacific is in the last lock chamber being raised to the level of Gatun Lake. In the background another ship is about to enter the locks on its way to the Atlantic. Four tracks for the locomotives that tow the ships through the Canal are shown in the picture; on the tracks at the left and left center these small towing engines are working at their task. A beacon or range light is at the right

the purest in blood of all the American Indians.

Panama is traversed by several mountain ranges of the Antillean system—the Talamanca in the north, the San Blas in the east, the Darien in the south. All are covered with forests, from which mahogany, dyewoods, coconuts, rubber and tagua nuts are obtained. The most important of Panama's 500 streams are the Tuyra, Bayano, Calobebora, Tarire, Los Indios and Chagres. The Chagres has been almost absorbed by the Panama Canal; the other rivers are navigable for small craft.

In the valleys between the mountain ranges stock raising and agriculture are carried on. The chief products are bananas, coconuts, cacao, coffee, sugar cane, rubber, tobacco and cattle hides. Mineral wealth includes manganese, gold, silver, aluminum, coal, lead, iron and asbestos. In the waters off the Pacific coast coral and sponges are found. Along the Caribbean coast tortoise-shells are collected. Around the Pearl Islands in the Gulf of Panama are extensive pearl fisheries.

The Isthmus of Panama was discovered and explored by Columbus on his fourth voyage in 1502. In 1513 Vasco Nuñez Balboa crossed its jungles and mountains and discovered the Pacific Ocean; in 1519, Pedro Arias de Avila, Spanish governor of the colony that had been established, founded the old city of Panama, which was destroyed by the English buccaneer Sir Henry Morgan in 1671. In 1821 Panama declared its independence from Spain and became a part of the Colombian republic, which Bolivar had established. It remained a part of Colombia until 1903 when, backed by the United States, it declared its independence.

The chief executive is a president, who is elected for a 4-year term and who is assisted by a cabinet of five members. The National Assembly is a unicameral body whose 32 members are elected by direct vote for a term of 4 years. The country is divided into 9 provinces, administered by governors appointed by the President for a term of 1 year.

Panama, the capital and largest city (population, 83,000), is on the Pacific below the hills of Ancon, about 6 miles from the site of the old Panama. It is the western terminus of the Panama Canal. The church of San José, whose Golden Altar is one of the most important relics of old Panama; Las Bovidas Promenade, a part of the great wall originally built around new Panama for protection; the Roman Catholic cathedral; Government Palace; Municipal Building; National Institute of Panamá and the monument to Balboa are points of interest. The shops with their many curios for the attraction of tourists resemble Oriental bazaars. Colon (population, 33,500), the chief Caribbean port, is the eastern terminus of the canal; it was originally called *Aspinwall* in honor of one of the promoters of the Panama Railroad, built in 1849-55 during the Gold Rush to connect the city with the capital, but was later renamed in honor of Christopher Columbus to whom a monument was erected. Part of the city, known as Cristobal, has since the completion of the Panama Canal in 1914 been under the jurisdiction of the Canal Zone. Other cities are David, Chitre, Penonome and Bocas del Toro.

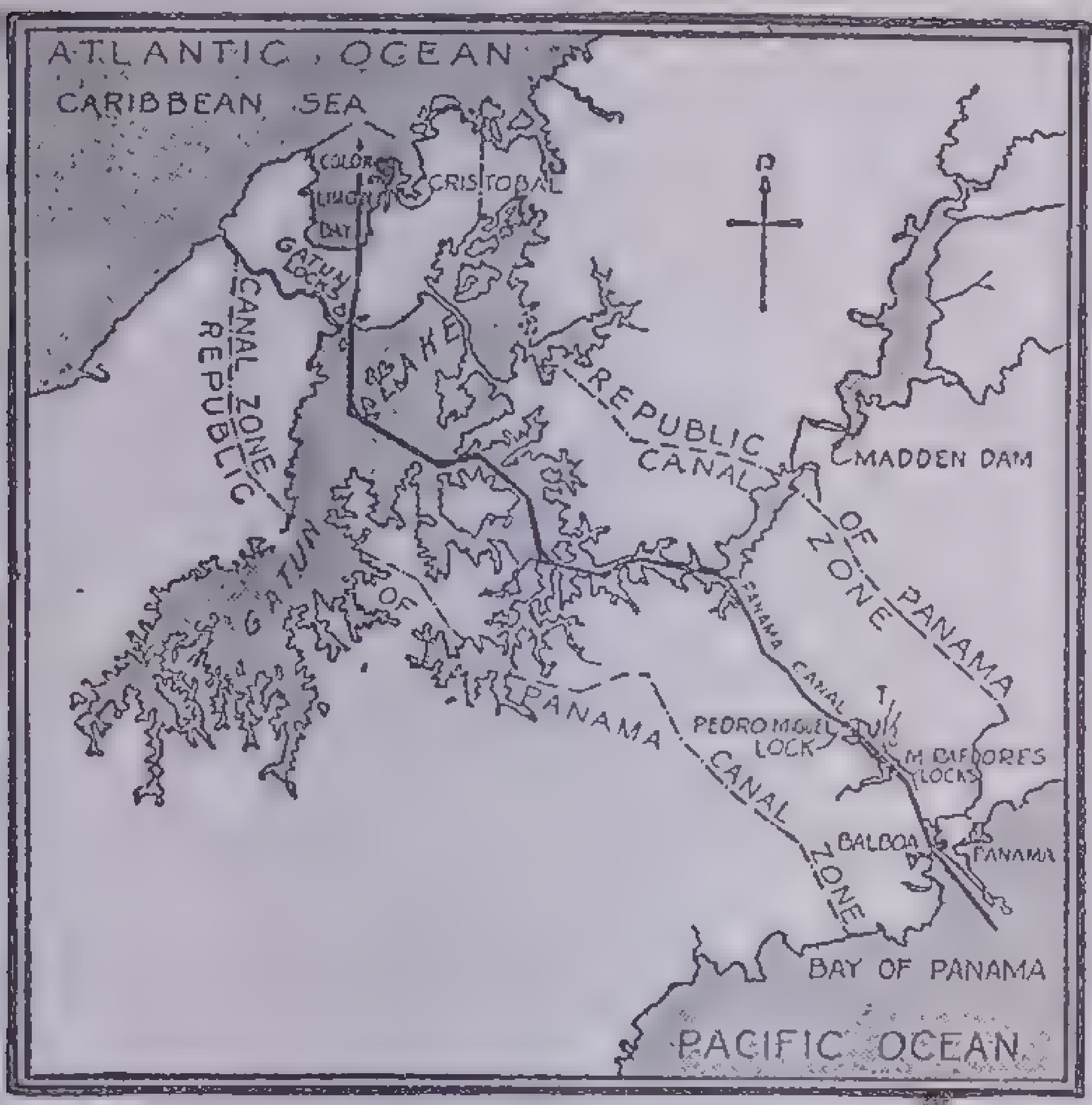
Panama Canal, the artificial waterway, cut through the Isthmus of Panama, that connects the Caribbean Sea and the Gulf of Panama and through them the Atlantic and Pacific oceans. From deep water to deep water it measures 50.72 miles. The width varies from 300 feet in the Gaillard Cut to 1,000 feet in Gatun Lake. The minimum depth of the channel is 41 feet; the maximum depth, in Gatun Lake, is 85 feet. The Isthmus of Panama lies in a general northwest to southeast direction, but with an S-shaped curve, so that near the middle the sun rises in the Pacific Ocean and sets in the Atlantic. The city of Panama at the Pacific entrance to the canal is 33 miles south and 27 miles east of Colon at the Atlantic entrance.

From Limon Bay on the Caribbean side the Panama Canal extends through the 6-mile long valley of the Chagres River to Gatun where traffic is lifted to Gatun Lake by three locks, with a total length of 1¼ miles and a height of 87 feet. Gatun Lake has an approximate area of 165 square miles; it was formed by damming the Chagres River and next to Boulder Dam is the largest artificial lake in the world. The lake's normal level is

Panama Canal Commercial Traffic

(The figures are for Fiscal Years, ending June 30. The Canal was opened August 15, 1914, and was closed about seven months in 1916 by slides.)

YEAR	SHIPS	NET TONS	CARGO TONS	TOLLS
1915	1,058	3,791,770	4,888,400	$ 4,366,747.13
1916	724	2,391,433	3,093,335	2,403,089.40
1917	1,738	5,791,236	7,054,720	5,620,799.83
1918	1,989	6,563,864	7,525,768	6,428,780.26
1919	1,948	6,116,877	6,910,097	6,164,290.79
1920	2,393	8,538,804	9,372,374	8,507,938.68
1921	2,791	11,405,550	11,595,971	11,268,681.46
1922	2,665	11,411,482	10,882,607	11,191,828.56
1923	3,908	18,601,298	19,566,429	17,504,027.19
1924	5,158	26,142,021	26,993,167	24,284,659.92
1925	4,592	22,847,527	23,956,549	21,393,718.01
1926	5,087	24,763,075	26,030,016	22,919,931.89
1927	5,293	26,210,623	27,733,555	24,212,250.61
1928	6.253	29,436,697	29,615,651	26,922,200.75
1929	6,289	29,822,122	30,647,768	27,111,125.47
1930	6,027	29,963,670	30,018,429	27,059,998.94
1931	5,370	27,773,037	25,065,283	24,624,599.76
1932	4,362	23,613,370	19,798,986	20,694,704.61
1933	4,162	22,803,798	18,161,165	19,601,077.17
1934	5,234	28,550,953	24,704,009	24,047,183.44
1935	5,180	27,805,588	25,309,527	23,307,062.93
1936	5,382	28,024,417	26,505,943	23,479,114.21
1937	5,387	27,491,622	28,108,375	23,102,137.12



The Panama Canal and Canal Zone

controlled by a spillway that allows excess water to flow into the Caribbean through the old channel of the Chagres. If necessary, the lake's water supply is replenished by water from Madden Dam, built across the Chagres River at Alhajuela.

After crossing the 24-mile-long Gatun Lake vessels proceed from Gamboa through the Gaillard (or Culebra) Cut that pierces the Antillean system's continental divide at one of its lowest points for a distance of 8 miles. At Pedro Miguel vessels begin their descent to the Gulf of Panama through the valley of the Rio Grande River. The Pedro Miguel lock lowers them 30 feet to the Miraflores Lake, and at the southern end of this mile-long lake the two flights of the Miraflores locks lower them 45 feet more to the 8-mile-long Pacific sea-level division. The Miraflores locks are 1,000 feet long and 110 feet wide and are double-barreled so that ships may be passed in opposite directions simultaneously. They are large enough to float any ship except the *Queen Mary* and the *Normandie*. Passage through the canal now takes 8 hours.

The Panama Canal runs through the American-controlled Canal Zone; this is 10 miles wide, 50 miles long and has a total area (both land and water) of 553 square miles. It was leased to the United States by the Republic of Panama in 1904 in return for $10,000,000 and an annual payment since the opening of the canal of $250,000. The United States in return for this concession guaranteed the independence of Panama. (This guarantee was finally renounced in 1936.) The cities of Panama and Colon in the Zone have remained politically attached to Panama. Before Panama broke away Colombia had spurned the overtures of the United States to purchase the Canal Zone rights; but in 1922 the United States recompensed Colombia by the payment of $25,000,000. In the Canal Zone live more than 40,000 Americans. Some 10,000 of these are in the service of the Government as Panama Canal employees or as members of the Army and Navy; and three islands at the Pacific entrance to the canal are fortified, and the entire area is administered as a military reservation. The Zone's headquarters are at Balboa.

The long voyage of the battleship *Oregon* around South America from the Pacific to join the American squadron at Santiago, Cuba, in the Spanish-American War stimulated American interest in the Panama Canal idea. It was realized that in a serious naval war quick passage between the Atlantic and Pacific oceans might be essential to success.

In 1902 the United States government purchased for $40,000,000 the rights and property (including the Panama Railroad) of a defunct French company that under Ferdinand de Lesseps, builder of the Suez Canal, had started construction of the Panama Canal in 1879 but had abandoned the project 10 years later. Beginning work in 1905, the Isthmian Canal Commission encountered many obstacles, notably earth slides, but these great engineering difficulties were overshadowed in the early days by the problem of sanitation. Under the leadership of Col. William Crawford Gorgas a sanitary administration was set up that successfully battled the scourge of yellow fever and malaria (distributed by mosquito carriers) that threatened for a time to make the whole undertaking impossible. In 1907 work was whole-heartedly resumed under the able direction of Gen. George W. Goethals, the chief engineer. The total cost of construction was $525,812,000.

On August 15, 1914, four centuries after Balboa had stood on a peak in Darien and beheld the Pacific Ocean for the first time, the passage of the S.S. *Ancon* opened the great canal to traffic. Nothing shows better the use of this great piece of engineering than the accompanying tabulation of traffic increase since the memorable trip of the *Ancon*. Overnight the Isthmus of Panama became the "crossroads of the world."

Paraguay, a republic of South America that is landlocked like its neighbor, Bolivia. Its area was formerly 61,647 square miles, but it claimed also the Gran Chaco, a partly forested and partly swampy plain that extends from the Paraguay River westward to the foothills of the Andes and from the Pilcomayo River as far north as 18° South Lat. The armistice declared in June, 1935, of the century-old dispute between Paraguay and Bolivia over the Gran Chaco, which has an area of 100,000 square miles, resulted in 1938 in an arbitral award to Paraguay of the greater part of this area.

In addition to Bolivia on the northwest Paraguay is bounded by Brazil on the north and east and by Argentina on the south and southwest. The eastern part of the country is a continuation of the Brazilian Plateau; the principal heights are the Amambahy, Maracaju and Caaguazu mountains. The rivers of Paraguay are many. The Paraguay, which forms the eastern boundary of the Chaco, is the most important and is navigable for small vessels almost its entire length. Paraguayan affluents of this river are the Apa (which forms the northern boundary), the Aquidaban and the Tibicuary. The most important lakes are Ypoa (100 square miles) and Ypacaray.

Animal husbandry and agriculture are the chief occupations of Paraguay. The rich soil and subtropical climate of the plateau region are suited to the raising of tobacco, coffee, cotton, sugar cane, citrus fruits, corn, rice, beans, mandioca and sweet potatoes. Yerba mate, from which the popular South American tea is made, is finding a ready market in the United States. The forests yield quebracho (whose extract is used in tanning), lapacho, curupay and other valuable woods. Since Paraguay has some 3,850,000 heads of cattle, hides and beef products are among the other important exports. Among the minerals are iron, manganese, copper, mercury, quartz, agate, marble, opals and kaolin. The manufacture of fine lace in elaborate patterns is an important industry.

Paraguay has been a republic since it threw off the Spanish yoke in 1811; it previously had been governed as part of the Vice-royalty of La Blata River. The chief executive is a president who is elected for a term of 4 years and who is assisted by a vice-president and a Cabinet of 6 members. The National Congress consists of a Senate of some 70 members, elected for 6 years and a Chamber of Deputies of some 140 members, elected for 4 years. For local administrative purposes the republic is divided into 12 departments, each governed by a chief appointed for a 4-year term by the President.

Asunción is the capital and chief city of Paraguay. It is situated on the left bank of the Paraguay River and has a population of about 90,000. Founded in 1537, it has several notable buildings such as the Roman Catholic cathedral, the Government Palace and Municipal Palace. The name *Asunción* comes from the fact that it was founded on the feast day of the Assumption of the Virgin (August 15). Among the other cities are Villa Rica, Villa Concepción and Caraguatay.

The country is named for the Paraguay River. This name, meaning the river of waters, refers to the numerous tributaries. Within recent years about 6,000 Mennonites have emigrated to Paraguay from Canada, the U.S.S.R. and Poland and have established several prosperous colonies. Other colonies have been established by Russian and German refugees.

parallel, one of the imaginary circles, marking the latitudes and drawn around the earth parallel to the equator. On maps they may be drawn for every 1°, 5° or 10°, depending on the size of the projection. Because the earth is flattened at the poles, a degree of latitude at the pole is considerably longer than at the equator—69.4 miles at the pole; only 68.7 miles at the equator. The four great parallels are: the Arctic and Antarctic circles, 23½° from the North and South Pole, respectively; and the Tropic of Cancer, 23½° north of the equator and the Tropic of Capricorn, 23½° south of the equator.

Paraná, a river system of South America that ranks next to the Amazon in size. The Paraná itself, with a length of

2,450 miles, is formed by the junction at a point on the boundary of the southern Brazilian states of São Paulo and Matto Grosso of two streams—the Parahiba, which rises in the Serra dos Vertientes of the Coast range, and the Rio Grande, which rises in the Serra da Mantiqueira. Below this junction are the Falls of Urupupunga. Another cataract, called the Falls of Guayra, is formed as the Paraná descends over the boundary escarpment between Brazil and Paraguay. On reaching the Argentine boundary the Paraná receives from the east the Iguassū River (noted for the Victoria Falls) and from the north the Paraguay River. The Paraguay, 1,500 miles long, is to the Paraná what the Missouri is to the Mississippi. It rises in the Matto Grosso Plateau of Brazil and flows generally southward to join the Paraná at Corrientes, Argentina. Its principal tributary is the Pilcomayo, which forms part of Argentina's northern boundary and joins the larger river at Asunción, the capital of Paraguay.

The Paraná flows for about 700 miles southwest across the Argentine pampas, until at Rosario it takes an eastward turn. At Buenos Aires it unites with the Uruguay, which forms the boundary between Argentina and Uruguay, to form the Plata estuary. This estuary, known also as the Rio de la Plata, is about 230 miles long; it is about 140 miles wide at its mouth and narrows to about 25 miles at its head. The 100-mile-long delta, built by the Paraná and Uruguay, consists of a vast network of channels, and the waters of these two rivers are discharged into the Plata estuary through 14 mouths. Important cities on this estuary are Montevideo, the capital of Uruguay, and Buenos Aires, the capital of Argentina. There are many smaller ports. The total area drained by the Parana system amounts to 1,198,000 square miles and includes the most fertile part of southern Brazil, eastern Argentina, southeastern Bolivia and western Paraguay and Uruguay.

The Plata estuary was discovered by Juan Diaz de Solis, a Spanish explorer in 1516, when he was looking for a strait connecting the Atlantic Ocean and the newly found Southern Sea (Pacific Ocean). It was explored by Ferdinand Magellan in 1520. In 1526 Sebastian Cabot discovered the Paraná River and ascended the Paraguay as far as Asunción.

Paris, the capital of France and chief city of the Department of the Seine, located on both banks of the Seine River, 110 miles from its point of discharge into the English Channel at Havre. It is not only the center of French commerce and industry but the esthetic center of the nation and one might say of the world. The city's designers dictate the changes in fashions of women's dress for every civilized country; its manufacturers lead in the production of accessories and luxuries such as hats, bags, shoes, gloves, jewelry, artificial flowers and perfumery. Among other products are glass, pottery, metalwares, chemicals, cigarettes, tapestries and automobiles. Paris is also an important railroad center, the North, East and St. Lazare stations serving all the great railroads of the Continent. Equally important is its airport, located in the suburb of Le Bourget. The population is more than 2,830,000, making Paris fourth in size among European cities. Greater Paris (Department of the Seine) has a population about 4,963,000.

Paris is one of the most beautiful cities in the world, with innumerable historical associations. Time and circumstance have stamped each section of the city with its own peculiar physiognomy. On the Île de la Cité, the oldest part of Paris, is the 13th-century Gothic Cathedral of Notre Dame, which, with its flying buttresses, hideous gargoyles and beautiful rose windows, Victor Hugo has immortalized in the *Hunchback of Notre Dame.* Opposite the cathedral is the jewel-like Sainte Chapelle, the only part left of the royal palace that was burned in 1618 to hide evidence of the assassination of Henry IV; on the site of the palace now stands the Palais de Justice. These buildings, together with the Sorbonne (now part of the University of Paris) on the Left Bank, recall the enlightened reign in the 13th century of Louis IX, better known as St. Louis.

Courtesy French Government Tourist Bureau

Tomb of Napoleon

This structure was erected in 1706 as the chapel of the Hôtel des Invalides, a military hospital built by Louis XIV; in 1840 it was converted into a tomb for Napoleon I. It is adorned with Doric and Corinthian columns, and the gilded dome, 340 feet high, is one of Paris's most distinctive landmarks

The Louvre and Environs. Francis I, the French leader of the Renaissance, embellished the city by erecting the early part of the Louvre Palace and founding the Collège de France. Set aside by the Revolutionary government as a public museum, the Louvre now houses thousands of priceless works of art, including Leonardo da Vinci's *Mona Lisa* (the nucleus of the collection), 21 murals by Rubens called the *Apotheosis of Marie de Médicis,* wife of Henry IV, and the statues of the *Venus de Milo* and *Nike of Samothrace* (or *Winged Victory*).

The 12-century Church of St. Germain l'Auxerrois opposite the Louvre witnessed the Massacre of St. Bartholomew, instigated by Charles IX and his mother, Catherine de Médicis, for from its tower the signal was given for the wholesale destruction of the Huguenots or French Protestants on August 24, 1572. Louis XIV erected two gates—Porte St. Martin and Porte St. Denis—to commemorate his military successes against the Spanish and Dutch in the Netherlands and in seizing Alsace and Lorraine from the Germans, respectively.

The Place de la Bastille recalls the beginning of the French Revolution; the site of the famous prison is now marked by the Column of July, surmounted by the statue, *Genius of Liberty.* On the spot in the Place de la Concorde where now stands the Luxor Column the guillotine was erected and used to behead Louis XVI, Marie Antoinette and more than 2,000 aristocrats during the Revolution. Surrounding this square are eight colossal statues symbolizing the capitals of the former French provinces; and from 1870 until Armistice Day, 1918, the one representing Strasbourg, heart of Alsace-Lorraine that France lost to Germany in the Franco-Prussian War, was draped in mourning. The Chapelle Expiatoire in the rear of the Church of the Madeleine is the last resting place of many of the martyrs of the French Revolution, including Mme. Roland, Charlotte Corday and the 1,000 soldiers of the Swiss Guard who fell defending the Tuileries Palace.

Memories of Two Napoleons. Triumphal Arches. Napoleon I and his exploits are recalled by the triumphal arches that he erected in the Place du Carrousel (so named for a court revel held there by Louis XIV) and the Place de l'Étoile, from whose center radiate like the spokes of a wheel nine of the famous streets of Paris. The Arc de Triomphe du Carrousel, surmounted by a triumphal car in imitation of the Arch of Septimius Severus in Rome, originally had for its steeds the four bronze horses that Napoleon brought from the portico of St. Mark's Cathedral in Venice but that after his downfall were restored to Venice. Buried beneath the Arc de Triomphe de l'Étoile is the Unknown Soldier of France, his grave marked by a flame to be kept burning perpetually. In the center of the Place Vendôme is a column (in imitation of Trajan's Column in Rome) surmounted by a statue of Napoleon wearing a toga; its bas-reliefs commemorate his victories of 1805.

Notable Buildings. The Church of the Madeleine and the Panthéon (formerly the Church of St. Geneviève), built in the form of Greek temples, were converted by Napoleon into temples of glory. The former, over whose Corinthian-columned entrance is a façade depicting the penitent Madeleine at the feet of the Saviour, returned to its earlier designation as a church about 1850. In the latter, whose façade bears the inscription

Aux grands hommes la Patrie reconnaissante are buried some of the greatest men of France, including Voltaire, Rousseau, Victor Hugo and Zola. The Panthéon is also noted for its murals by Puvis de Chavannes depicting scenes from the life of St. Geneviève; by Cabanel, of St. Louis's administering justice and founding the Sorbonne; and by Lenepveu, of incidents in the life of St. Jeanne d'Arc.

Napoleon sleeps his last sleep in a porphyry sarcophagus beneath the gilded dome of the chapel of the Hôtel des Invalides, a military hospital built by Louis XIV. The marble well containing his tomb is surrounded by 12 colossal figures symbolizing his chief victories. There was thus fulfilled in 1840, 19 years after his death, Napoleon's desire that his "ashes repose on the banks of the Seine in the midst of the French people whom I have loved so well." Buried in the smaller chapels surrounding the dome are Vauban and Turenne, two of Louis XIV's marshals; Napoleon's brothers, Jerome, king of Westphalia, and Joseph, king of Spain; and Marshal Ferdinand Foch, commander of the Allied Armies in the World War.

The broad, tree-lined boulevards, Haussmann, Italiens, St. Germain and Port Royal, constructed on the site of the encircling fortifications of Paris, as well as the Rue de Rivoli, Rue St. Antoine and Avenue de l'Opéra, are evidences of Napoleon III's ambition to beautify Paris. The prospect extending from the Louvre across the Place du Carrousel, gardens of the Tuileries, Place de la Concorde, Avenue des Champs Élysées to the Place de l'Étoile is considered one of the most beautiful vistas in the world. But in spite of the attempts of Napoleon III to leave on Paris as great an impress as had his uncle, Napoleon I, the white, Byzantine-domed basilica of the Sacré Coeur on the heights of Montmartre was built by a humiliated people as expiation for his many follies that after the Mexican fiasco culminated in the Franco-Prussian War.

Other Famous Structures. The remaining vestiges of Paris's many expositions are the Tour Eiffel (1889), 984 feet high (and until the recent erection in New York of the Empire State and Chrysler buildings the world's tallest structure), and the Grand and Petit palaces (1900), now noted municipal art galleries. In connection with the Paris 1937 International Exposition a new Trocadéro Palace was erected on the site of the Oriental structure built for the Exposition of 1878 that long served as a concert hall and art gallery.

The Luxembourg Palace, once the home of Marie de Médicis and noted also for its art gallery and gardens, is the seat of the Senate of the French Republic. The Chamber of Deputies meets in the Bourbon Palace on the Quai d'Orsay opposite the Place de la Concorde. The Palais Royal, erected by Cardinal Richelieu early in the 17th century, became a royal residence during the reign of Louis XIV and now houses the Ministry of the Colonies. The Tuileries was another famous royal palace, built by Catherine de Médicis in the 16th century but destroyed in 1871 during the commune that held Paris in its grip on the collapse of the Second Empire. Its garden, however, is a beauty spot, adorned with innumerable statues.

There are also the Hôtel de Ville or City Hall, headquarters of the Prefect of the Seine, who supervises the administration of both the city of Paris and the Department of the Seine, assisted by a subprefect for each of the 22 arrondissements; the Bourse or Stock Exchange; and the Palais Élysée, residence of the President of the French Republic. The Bibliothèque Nationale or National Library is housed in the palace of Cardinal Mazarin, and the French Academy, whose 40 members, mostly men of letters, are called *the immortals,* meets in the palace of the Institut de France. The Carnavalet Museum is a historical museum of the city of Paris, and the Hôtel de Cluny, named for the abbots of Cluny who once resided there, is a treasure house of art objects.

The most beautiful of the 30 stone bridges that cross the Seine is the Pont Alexandre III, named for the Russian czar at the time of an alliance between France and Russia. The book stalls along the quays afford another glimpse of unique Parisian life. On the outskirts of the city in the Bois de Boulogne, the famous Longchamp and Auteuil horse races are held. The Paris subway system is called the *Métropolitain* (*Métro* for short).

Places of Amusement. Paris is noted as an amusement center with numerous music halls and cabarets. Among theaters devoted to the drama are the Théâtre (or Comédie) Française and the Odéon, both subsidized by the Government. In the Grand Opéra, probably the most ornate building of its kind in the world, classical operas are produced; the Opéra Comique is devoted to the lighter form of opera.

In addition to the University of Paris and the Collège de France, Paris has such famous educational institutions as the Polytechnic School, Higher Normal School for the training of lycée (high school and junior college) teachers and the National Conservatoire of Music and Acting. It is world-famous as an art center, its principal schools being the École des Beaux Arts and the Académie Julian. The Left Bank or Latin Quarter has been renowned as a student center since the days of Abelard; it also acquired a reputation for Bohemian life during the 19th century, but now Montmartre is the section frequented by tourists for Bohemian atmosphere.

Versailles Palace. On the site of a royal hunting lodge at Versailles, Louis XIV erected one of the most magnificent palaces of all time. Its principal apartments are: the Gallery of Mirrors, where William I of Prussia was proclaimed German Emperor in 1871 and where the Peace Treaty between the Allies and Germany was signed in 1919; the Gallery of Battles, which contains pictures of famous French battles down to Napoleon's time; and the King's State Apartments, in which the ceiling decoration of each room represents some aspect of the Roman deity for whom it was named, such as the *Labors of Hercules.* In the beautifully landscaped grounds of the palace are two villas: the Grand Trianon, which was built by Louis XIV for Madame de Maintenon; and the Petit Trianon, which Louis XV presented to Madame du Barry. Near the Petit Trianon is the Swiss Village, where Marie Antoinette and her court ladies amused themselves by pretending that they were peasants.

Paris is named for the Celtic tribe Parisii whom Titus Labienus defeated in 52 B.C. The town was of little importance until a later period. It was called by the Romans *Lutetia Parisiorum,* meaning the bright city of the Parisii, in reference to the white freestone used in building.

Park Avenue, the fashionable residential street of New York, extending from 32d Street to 134th Street. For about the first mile or as far as the Grand Central Building, it is a business section; then, until it reaches 110th Street, it is the site of some of New York's finest apartment houses and residences and such world-famous hotels as the Waldorf-Astoria and Ritz Tower. The most distinguished church on Park Avenue is St. Bartholomew's, a Protestant Episcopal structure in Byzantine style. The street is a continuation of Fourth Avenue, which starts at Eighth Street. Above 110th Street the character of the street gradually changes, until it becomes squalid, with the exposed tracks of the New York Central Railroad's main line running just below its surface.

pass, a narrow defile in a mountain range that may be used as a passageway from one side to the other. It may also be a trail, skirting a mountain on the one hand and a body of water on the other. Passes are often of great importance in the military defense of a country, as was the pass at Thermopylae between Mt. Oeta and the Maliac Gulf in Greece, which was the scene in 480 B.C. of a famous battle between 300 Spartans led by Leonidas and an invading Persian horde. On Rumania's entry into the World War in 1916 she availed herself of the natural defense afforded by her northern mountains by immediately occupying the Predeal and other passes in the Transylvanian Alps.

History has been made at Khyber Pass in the Khyber Mountains between Afghanistan and India, the St. Bernard, Simplon and St. Gotthard passes of the Swiss Alps, Brenner Pass of the Tirolean Alps and Uspallata Pass of the Chilean Andes on the most frequented transcontinental route of South America. During the Middle Ages the robber barons derived their wealth by levying tolls on travelers crossing mountains through gaps or passes that the outlaws controlled.

Paternoster Row, a narrow street in London, north of St. Paul's, which was long famous as a center of book publishing. It was named from the prayer books and rosaries sold in it. Near at hand are Amen Corner, Ave Maria Lane, Sermon Lane and Creed Lane, all suggestive of the locality's former ecclesiastical aspect.

peak, the pointed top of a mountain or hill. The term may be applied to the entire mountain or hill if it is isolated, as Pike's Peak near Colorado Springs, Colo., which, rising high above the plain, served as a beacon for western immigrants.

The word *peak* is rarely used of a headland or promontory.

Peiping, a city of northeastern China, which since 1935 has been occupied by military forces of Japan. It is located on an alluvial plain built by the Hunho River about 100 miles west of its point of discharge in the Gulf of Chihli. It is also the administrative center of a Metropolitan District that covers an area of 75 square miles in the province of Hopeh. In recent years the economic importance of Peiping has waned, especially as it was never made a treaty city for foreign-trade domination like Shanghai, Canton and Foochow. The population is about 1,490,000.

Peiping is in some respects the strangest city in the world. It really consists of two cities, one circular in shape and the other quadrilateral or oblong; furthermore, the circular city is a triple one, its core being the Forbidden City; and each of these three cities has its encircling wall. During the many centuries of the existence of the Manchu Empire every means of protection was afforded to the emperors who lived within the enclosure of purple plastered walls known as the Inner or Purple Forbidden City. This spacious area took its name from the fact that no persons, other than members of the imperial household, ever crossed the marble bridges over its moat except on court business. Imperial troops guarded it.

Today the pagoda-roofed palaces and temples of carved stone and yellow tile that stand amidst the splendor of a floral and pool-adorned park, bespeak the power once held by the Chinese ruler. He was known as the Son of Heaven, and his realm was called the *Celestial Empire*. In the Hall of Highest Peace the emperor held his court levees on the Chinese New Year and other state occasions. His apartments were in the Palace of Heavenly Purity, and the Palace of Earth's Repose was assigned to his harem. There were also the Hall of Distinguished Sovereigns, Hall of Intense Thought and Hall of the Literary Abyss, where in accordance with the Chinese scholarly tradition learning was enshrined. The most important of the temples of the Forbidden City was the Guardian Temple of the City. The imperial palace was the residence of the President of the Chinese Republic from 1912 until the transfer of the seat of government to Nanking in 1928.

Surrounding the Forbidden City is the Imperial City, within whose walled enclosure of red plaster lived the mandarins and other lesser dignitaries. The palaces along the Imperial Highway, leading from the Forbidden City to the Ch'ien Men or Front Gate, housed the various governmental departments. Several of these are Occidental and modern in style of architecture, having been erected since the Republic came into existence. Just outside the Forbidden City are the temples in which the emperor worshiped his ancestors. The Imperial City is noted also for its three lotus-strewn lakes, whose creeklike connections are spanned by moon-shaped marble bridges; Prospect Hill, which is crowned by five Buddhist temples; and the Temple of Great Happiness, dedicated by a grateful people to Yuan-Fei, discoverer of the use of the silkworm's filament in silk manufacture.

Outside the Imperial City is the Tartar City, enclosed by a wall 16 miles long, 42 feet high and 40 feet wide at the top. Here until the last century lived only the "superior" Manchus. It is called the Tartar City, because it was planned in the 13th century by that great Mongolian ruler, Kublai Khan. The lofty watchtowers, guarding the nine gates that pierce the wall of this city, were the barracks of the imperial troops. There were also located in the Tartar City until the transfer of the seat of government the legations of different foreign nations, guarded by their own soldiers; the walled enclosure of the Legation Quarter was the scene of a two-month siege during the Boxer Rebellion of 1900. Among other important buildings of the Tartar City are: the Temple of Confucius; Lama Temple, next to Lhasa in Tibet the most important residence of the Living Buddha; and the Hall of Classics, where under the old Chinese system of education the triennial classical examinations were held.

Since they were conquered by the Manchus in the 17th century, most of the Chinese residents of Peiping have been obliged to live in the so-called Chinese City that adjoins the Tartar City to the south. It is oblong in shape and is surrounded by a wall 14 miles long and 30 feet high, pierced by seven gates. In the southern part of this city are the famous circular Temple of Heaven, where the emperor offered sacrifices to the Supreme Being of Taoism, known as Shang-Ti, and the Temple of Earth (or Altar of Agriculture), where each spring he inaugurated seedtime by offerings to Shen-nung, the legendary emperor who was a patron of husbandry. The Chinese City is also the terminus of the South Manchuria Railway, and whatever commercial importance the city has is centered here.

Practically nonexistent now are Peiping's great educational institutions, for all the Chinese intellectuals who could leave the city prior to the Japanese occupation did so. The leading schools were the National University and the National Teachers College, and it was largely propaganda among their students that produced the Chinese Renaissance or New Thought Movement. The leaders of this movement attempted to save China from perishing as a nation by urging the war lords to forget their selfish, personal ambitions and unite against the common enemy. Among the other institutions, in which Peiping's 50,000 students were enrolled, were the College of Languages, Customs College, Higher Technical School, Law School and Union Medical College (supported by the Rockefeller Foundation). The American Indemnity College is located at Tsing-Hua, about 20 miles from Peiping; it was built with funds that the Chinese Government paid to the United States as indemnity after the Boxer Rebellion and that the United States chose to return in that form.

Peiping is as old as historical China, having come into prominence

Courtesy Thomas Cook & Son, Inc.

Street in Peiping

A thoroughfare thronged with jinrikisha passengers and their coolie runners. The arch is called a *pailou* and was erected to the memory of some important personage whose name and record appear in the inscription over the central gateway on the founding of the Chou dynasty in 1122 B.C. From that time until the 2d century B.C. it was one of the most important cities, being the capital (under the name of Ch'i) of the feudal buffer state of Yen. It was then eclipsed for several hundred years, and not until the Liao dynasty came into power in the 10th century A.D. was it again the capital city and known as Nan-Ching. Captured by the Tartars under Genghis Khan two centuries later, the city was renamed Chung-Tu, meaning the middle capital. Kublai Khan (the magnificence of whose court has been described by Marco Polo in his *Travels*) elevated the city to capital of the vast Mongol Empire that stretched from the Pacific Ocean to the Black Sea; it held that status from 1267 to 1368 and was generally known as Khanbalig or city of the great khan.

During the succeeding native Ming dynasty the city became the northern capital, its name in significance of this position being changed to Peking. It continued under this name after the conquest of China in 1644 by the Manchus and for the next 268 years served as the capital of the great Ch'ing dynasty. Even after the downfall of this dynasty and the establishment of the Republic in 1912 it continued as the capital of China. Sensing the threat of Japanese invasion by way of Manchuria (now Manchukuo), the Nationalists (Kuomintang party) decided in 1928 to transfer the seat of government to Nanking, the old southern capital, and to rename the city Peiping, which means the peaceful city of the North. In 1935 the territory around Peiping became a demilitarized zone under Japanese control. The Chinese had long been reconciled to evacuating the city so as to save its age-old treasures from destruction when hostilities should be renewed.

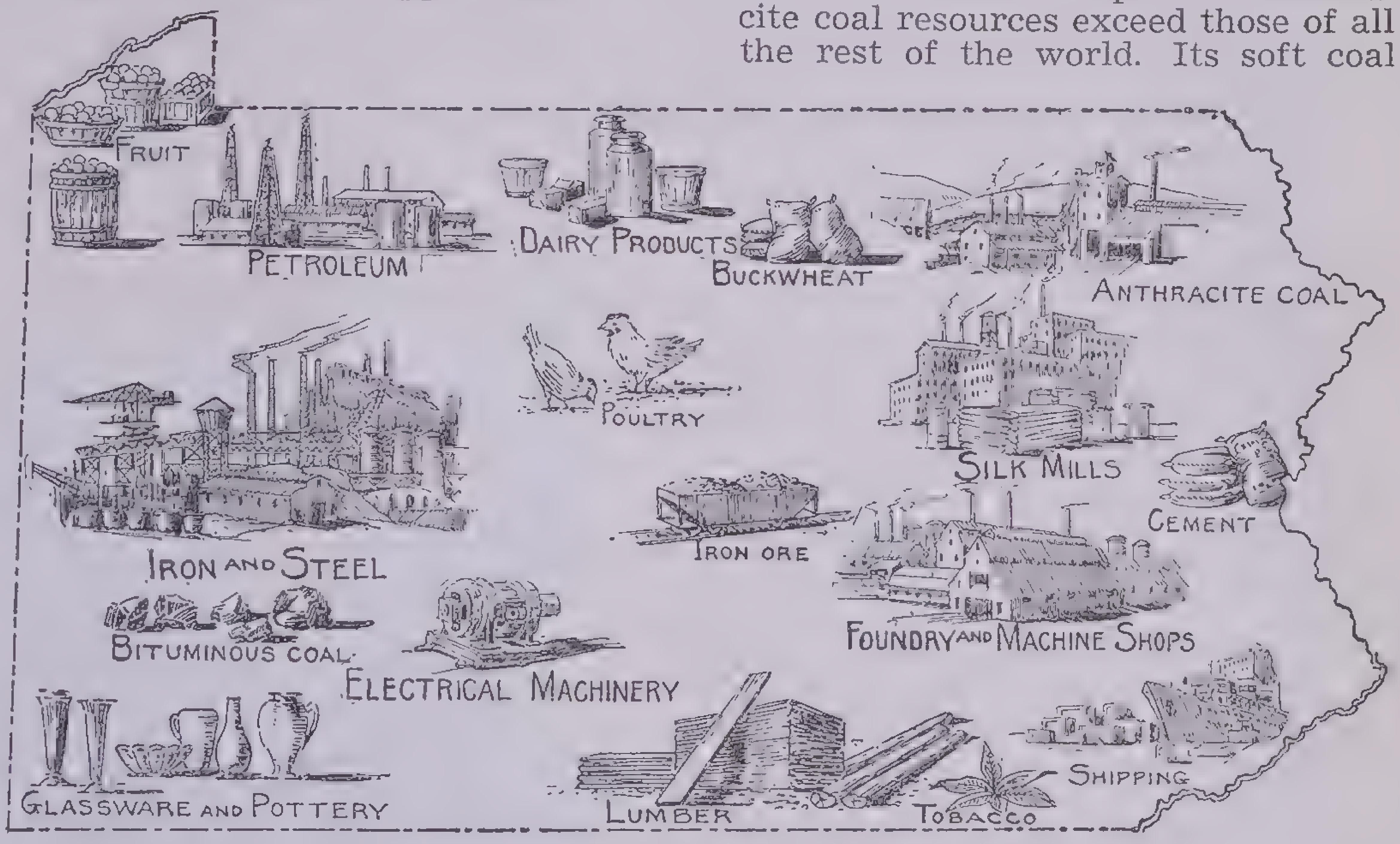
peninsula, a land area that is nearly surrounded by water and is connected with a larger body of land by means of an isthmus. The term also applies to any portion of land, longer than it is wide, which juts out into the sea or ocean.

The Malay Peninsula, which is joined to Burma and Siam by the Isthmus of Krau, is of the first type. The Apennine (Italy), Iberian (Spain and Portugal), Anatolian (Turkey) and Scandinavian (Norway and Sweden) peninsulas, approximately the same width throughout, are of the second type.

Derived from the Latin, the word *peninsula* means almost island. The European peninsulas especially have afforded a certain amount of protection and isolation to the nations occupying them.

Pennsylvania, a Middle Atlantic state of the United States, roughly rectangular in shape, 300 miles long and 180 broad. Its area of 45,126 square miles includes 294 of water surface. It is bounded on the north by Lake Erie and New York, on the east by New York and New Jersey, on the south by Delaware, Maryland and West Virginia and on the west by West Virginia and Ohio. The Delaware River forms the eastern boundary and gives ocean commerce access to the Philadelphia section. Pennsylvania ranks 32d in size among the states, but is second in population and second in value of manufactured products. About two-thirds of its 9,900,180 people live in cities and towns.

The surface is generally hilly or mountainous. The entire width of the Appalachian system passes through the state, running from the northeast to southwest. In the southeast corner is a bit of the Atlantic coastal plain. This rises into the hillier Piedmont, which in turn is bounded by the outlying Appalachian ridges. The great Appalachian valley, in part called the Cumberland Valley in this state, curves southwest along the base of the rugged Allegheny chain, which includes a large part of Pennsylvania's surface. Sloping off toward the northwest, the Allegheny plateau finally meets the narrow Lake Erie rim.



Principal Products of Pennsylvania

Most of the mountains are separated by fertile, well drained valleys, and the ridges themselves are pierced occasionally by the stronger rivers. The Delaware Water Gap on the eastern boundary is a scenic feature formed in such a process. Some of the tributaries of the Delaware, particularly the Lehigh and the Schuylkill, have been of great importance in the economic development of the state, serving as routes for trade, first by canal, later by railway and highway. Most of the state's surface is drained by the branches and tributaries of the Susquehanna, a stream important for power production but too shallow for navigation. In the west the Monongahela and the Allegheny, swollen by the waters of numerous tributaries, merge to form the Ohio. Navigation is still maintained on these rivers. There are several small lakes and two large reservoirs, one with 70 miles of shore line.

Pennsylvania has a variable climate, sometimes experiencing severe cold in the mountains and heat waves in the lower valleys, but temperature and rainfall favor agriculture. The rich forests that once covered the state have long since fallen, though second-growth timber is now reviving the lumber industry on a more stable basis. Much of the mountain section is better suited to timber than any other crop, but the valleys are very productive. Lancaster County (east of the Susquehanna and within 50 miles of Philadelphia) ranks among the richest farming sections in America. The state produces wheat, corn, oats, hay, dairy products, tobacco and buckwheat in large quantities, and most temperate zone crops are successfully raised.

Pennsylvania ranks first of the states in mineral output. Its anthracite coal resources exceed those of all the rest of the world. Its soft coal production is surpassed only by one state, and it leads the nation in clay products and cement. Natural gas and petroleum were first obtained in Pennsylvania, and it still yields large quantities. Many other minerals are found in marketable form, including iron ore, lime and slate.

Its manufacturing industries are highly diversified. The Pittsburgh district produces more steel and steel products than any other place in the world. Coke and coal tar products are produced more abundantly than in any other state. Scranton is an important silk mill center. The Delaware River has large shipyards. Textiles, candies, glass, chemicals, paint, leather, locomotives, railway equipment, electrical apparatus, pottery, paper, machinery of many types—all are manufactured on an immense scale.

The principal cities, Philadelphia and Pittsburgh, are separately described. Scranton is the chief center of the anthracite district and shares with Wilkes-Barre the trade of the whole northeastern section. Wilkes-Barre's museum has fine historical and geological collections. Reading is another of Pennsylvania's steel producing centers. It has diversified manufactures as well, and its hilly environs have notable scenery.

Erie is a thriving Lake Erie port known for its attractive peninsular park and fine beaches. Allentown and

Bethlehem are centers for steel, silk and cement manufacture. Bethlehem is one of the oldest musical centers in America, and its Bach choir is unexcelled. Harrisburg, the capital, has fine public buildings and a riverside park of notable beauty. The sculptural and mural decorations of the Capitol are exceptional.

Chester has large shipbuilding plants and some ocean commerce. Lancaster and York are markets and distributing points for a rich agricultural section. New Castle and Johnstown are steel mill cities. Altoona, in the Alleghenies, has the greatest railroad shops in the world.

Pennsylvania has many colleges and universities. Those situated in Philadelphia and Pittsburgh are mentioned under those headings. Pennsylvania State College at State College is the leading state-supported institution. Lehigh at Bethlehem, Lafayette at Easton, Bucknell at Lewisburg, Swarthmore at Swarthmore, Bryn Mawr at Bryn Mawr, Washington and Jefferson at Washington, Franklin and Marshall at Lancaster, Haverford at Haverford and Dickinson at Carlisle are examples of others scattered through the state.

There are many scenic and historical attractions. The Pocono Mountain section in the northeast is a favorite playground in summer and winter. The Philadelphia area has many reminders of the Colonial and Revolutionary periods, including the cherished state reservation at Valley Forge, where the superb dogwood in bloom attracts thousands each spring. Gettysburg is the best marked battlefield in the world; its National Cemetery was the scene of Lincoln's famed address. In the mountains there are many state reservations affording varied recreation. The Allegheny ridges in the center and northwest offer excellent hunting and fishing. The Philadelphia suburban district has some of America's finest estates, and the southeastern counties, first settled by Quakers and Germans, have many old homes and churches of admirable design.

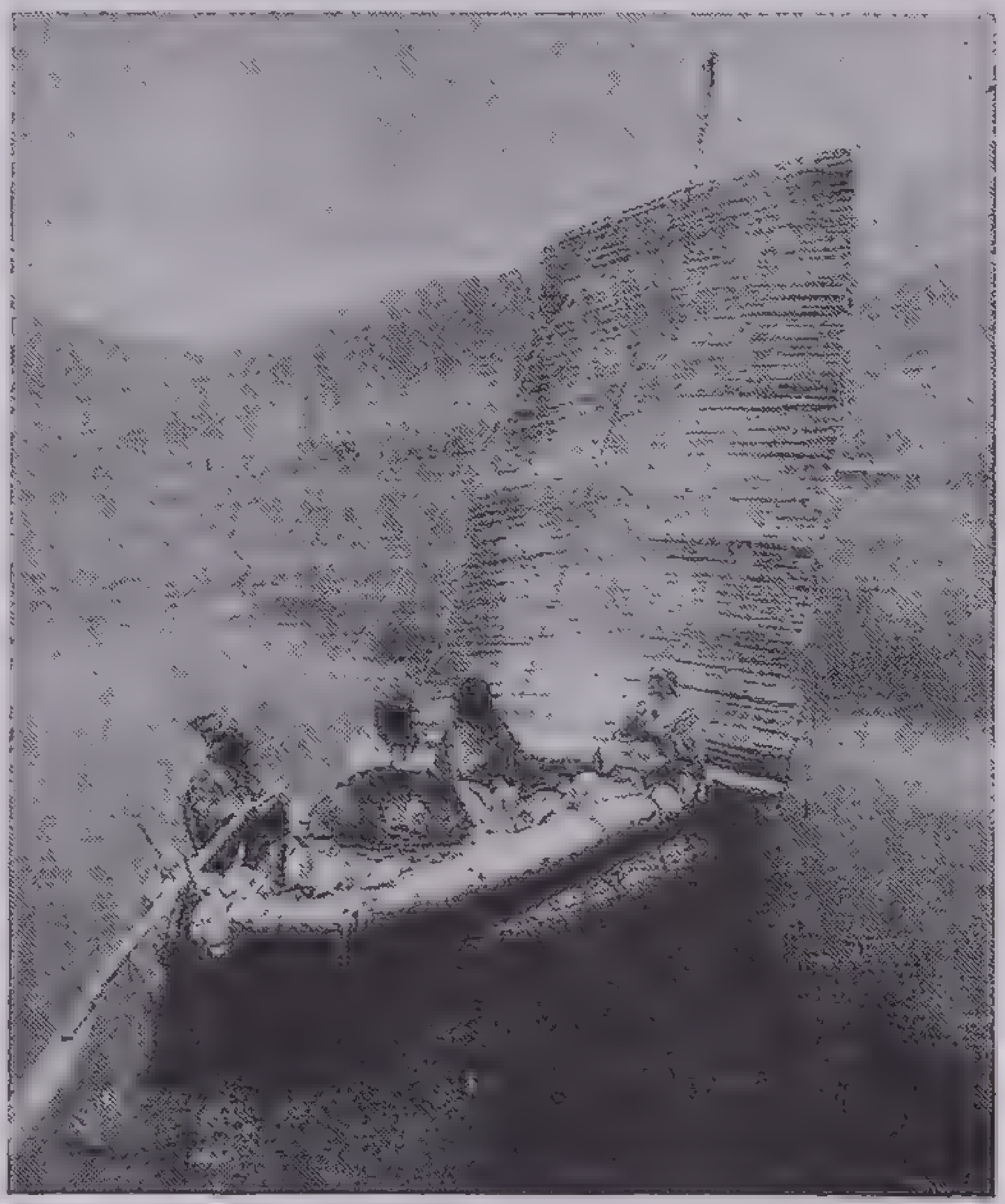
Pennsylvania Avenue, the principal street of Washington, D.C., 4½ miles long and 160 feet wide. It extends diagonally northwest to Georgetown from the Anacostia River and passes through the Capitol and Library of Congress grounds and the Treasury and White House grounds. Located on it are buildings housing the departments of Commerce, Labor, Justice, State, Navy and War and the Bureau of Internal Revenue. It is also flanked by several foreign embassies. At the intersection of Pennsylvania Avenue and First Street is the Naval or Peace Memorial.

Pennsylvania State Road, a road connecting Philadelphia and Pittsburgh, Pa., that was used by early immigrants to the country west of the Alleghenies. The eastern section includes the Lancaster Pike and the western section, built in 1783 by Gen. John Forbes, is sometimes referred to as Forbes Road.

Perry Memorial, Put-in-Bay, Ohio. Commemorating the naval victory of Lake Erie during the War of 1812, as well as the century and more of peace between Canada and the United States that has followed, this stately fluted column forms a lighthouse that rises 352 feet above the waters of Lake Erie.

Persian Gulf, an arm of the Arabian Sea, with which it is connected through the Strait of Ormuz and the Gulf of Oman. It is bounded by Iraq on the north, Iran on the east and Kuwait, Saudi Arabia and Oman on the west. It is 520 miles long and from 150 to 200 miles wide and has an area of 97,000 square miles. The Tigris and Euphrates rivers, united to form the Shatt-el-Arab, flow into it at the northwestern end. The Bahrein Islands, claimed by both Iran and Great Britain, are important for their pearl fisheries.

Peru, a republic of South America that is bounded on the north by Ecuador and Colombia, on the east by Brazil and Bolivia and on the south by Chile. The Pacific Ocean laps its 1,100-mile long western coast. Pending settlement of the long-standing northeastern boundary dispute with Ecuador, the area of Peru is estimated at 532,185 square miles. Of the population, estimated at 6,600,000, more than half are pure Indians, 25 per cent are mestizos, 14 per cent are whites and the rest are Asiatics and Negroes.



Courtesy Pan American Airways

Native Balsa Boat on Lake Titicaca, Peru

Balsa is the name of the boat and also of the light strong wood from which it is made

In configuration Peru consists of three zones: the dry, barren, coastal land, the mountainous plateau section and the luxuriant forested region of the eastern mountain slopes. The Andes of Peru consist of three ranges called the Cordillera Blanca, Cordillera de Huayhuash and Cordillera de Huarochiri. In the central part of the country, however, these ranges merge into the Nudo de Vilcanota and emerge in the southern part as the Western, Central and Eastern cordilleras. Among the high peaks of the Andes of Peru are Huascaran (21,812 feet), Coropuna (21,700 feet) and El Misti (19,262 feet).

The important rivers of Peru rise on the eastern slopes of the mountains and eventually join the Amazon. Chief of these are the Marañon and the Ucayali that form the headwaters of the Amazon, joining forces at the intersection of Ecuador and Brazil. Most of the southern streams, such as the Inambari and Blanco, reach the Amazon through the Dios and Madeira rivers. Lake Titicaca, on the boundary between Peru and Bolivia, is situated at an altitude of 12,507 feet above sea-level and is the highest lake in the world navigable by steamers. It has an area of 3,200 square miles and is famed for the admirable examples of Inca architecture found on the islands of the Sun and Moon. Near it are round and square towers called *chullpas,* in which are buried the chiefs of a people whose civilization flourished before that of the Incas. Among other Peruvian lakes are Chinchay-Cocha and Lauricocha.

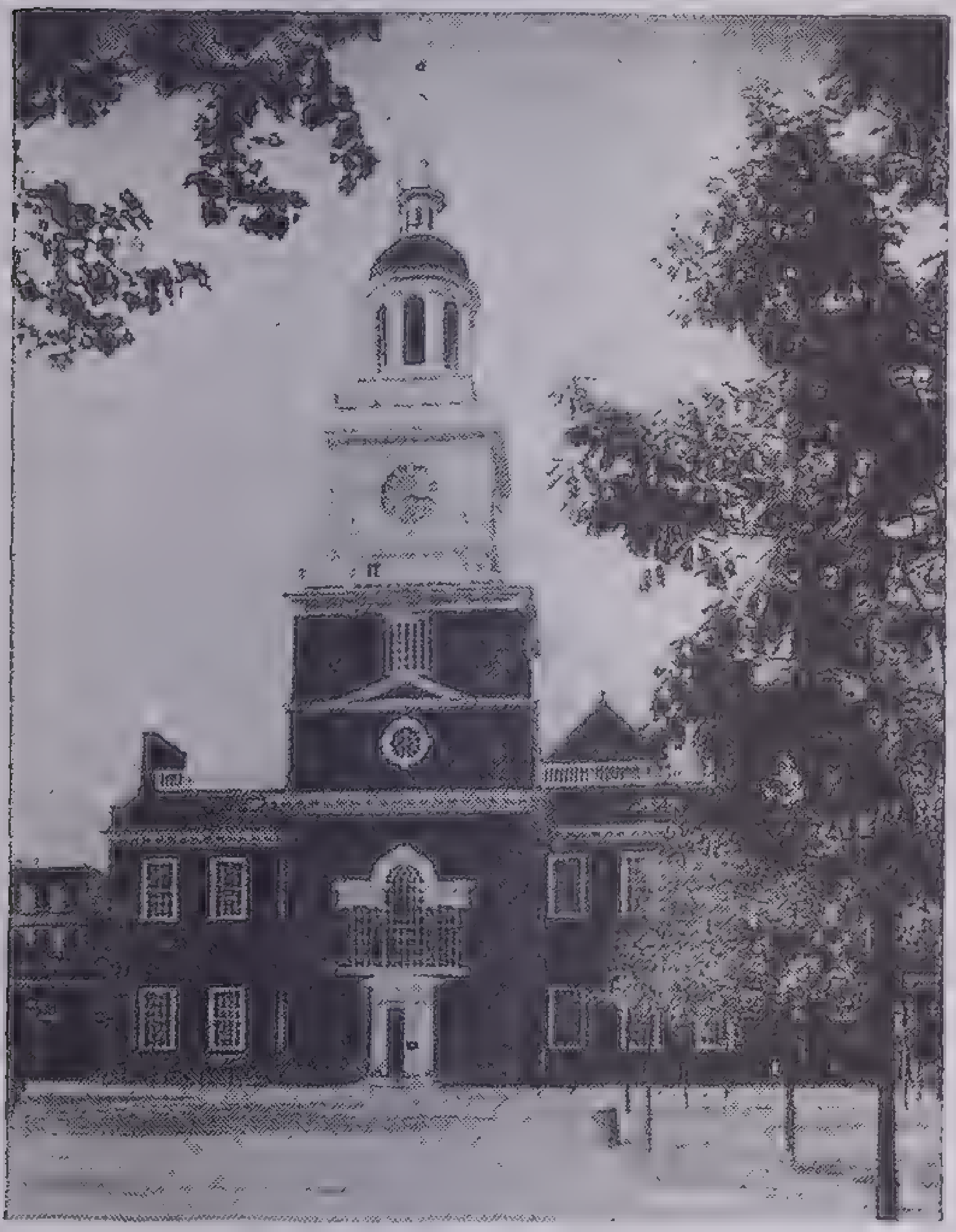
Mountain valleys of the plateau region constitute Peru's most fertile agricultural region, although some crops can be raised on the coastal plain with the aid of irrigation. The principal products are sugar cane, cotton, rice, tobacco, tea, wheat, ramie, maize, potatoes, coffee, cacao, coca (from which cocaine is obtained) and rubber. Silk growing and vineyards are important. Alpaca, sheep and llamas are raised for their wool, and goat and kid skins are in demand among foreign glove makers.

Peru has been noted for its mineral wealth since the days of Francisco Pizarro and the other Spanish conquistadors. Products include copper, silver, gold, coal, tungsten, nickel, borax, antimony, molybdenum, salt, bismuth and petroleum. Peru produces more than half the world's supply of vanadium. Subbranches of the mining industry include the exploitation of guano and asphalt deposits. From the forested region come cinchona for quinine and balata, the juice of which is used in making chewing gum.

Peru has been a republic since it threw off the Spanish yoke in 1821 under the leadership of San Martin. A new constitution was proclaimed in 1933. The chief executive is the President, who holds office for 5 years; assisting him is a Council of Ministers, generally nine in number. Congress consists of a Senate of 40 members who serve for 6 years and a Chamber of Deputies of 110 members who serve for 5 years. For local administrative purposes the country is divided into 23 departments.

Lima (population, 456,000) is the capital and chief city of Peru. It is situated on the River Rimac, 8 miles from the Pacific port Callao. Its notable buildings include the historic palace, built by Pizarro in 1535, which served as the residence of the Spanish viceroys; the Roman Catholic Cathedral, in which the mummified remains of Pizarro are preserved; the Senate, once the tribunal of the Inquisition in New Spain; San Marcos University (founded in 1551); the Bolivarian Museum and the National Museum (noted for its Inca relics). Among other cities are Cuzco (once capital of the Inca Empire), Arequipa, Ayacucho, Iquitos, Trujillo and Mollendo. At Machu Pichu archeologists have recently discovered a secret city of refuge of the Virgins of the Sun God. Here dwelt the last survivors of the court of the Inca Emperor Atahualpa, whom Pizarro dispossessed and put to death in 1533.

Philadelphia, a city of the United States and the metropolis of Pennsylvania, located in the southeastern part at the confluence of the Delaware and Schuylkill rivers. With a population about 1,950,000 (metropolitan area, about 2,850,000) it ranks third in size among cities of the country. In Colonial times and the early days of the republic it was the nation's largest city; when the first United States census was taken in 1790, it had a population of 28,500. The city's area, which since 1854 has included all of Philadelphia County with various attractive suburbs, such as Germantown and Chestnut Hill, is 130 square miles.



Underwood & Underwood

Independence Hall, Philadelphia

Because Philadelphia was the largest and most centrally located city in the colonies, Independence Hall was the scene of a series of important events in American history. The building was erected in 1735 and served as the Pennsylvania State House until 1799

The tidewater estuary of the Delaware River and Delaware Bay bring the Atlantic 88 miles, so to speak, to the city. The port of Philadelphia ranks next to New York in amount of water-borne commerce; it handles 32,500,000 tons of shipping annually and is able to accommodate more than 250 vessels at one time at its wharves. The United States Government also maintains one of its chief naval stations, the League Island Navy Yard, off the southern end of Broad Street.

As a railroad center the city is served by the Pennsylvania, the Baltimore & Ohio and the Reading railroads. The metropolitan area has also 15 airports. Connecting Philadelphia and Camden, N.J., is the Delaware River Bridge, one of the world's great suspension bridges with a channel span of 1,750 feet.

Industrially Philadelphia leads in the manufacture of locomotives, saws and streetcars and also has a large output of petroleum products, knit, worsted and cotton goods, sugar, paper, canned fruits and vegetables, men's and women's clothing, cigars, leather goods and chemicals. In printing and publishing the city is excelled only by New York and Chicago. The industrial area of Philadelphia, which includes five counties in Pennsylvania and three in New Jersey, is third among the manufacturing districts of the United States in the annual value of manufactured products.

Philadelphia was the first American town to lay out its streets on a general plan of east-west and north-south directions; this so-called gridiron plan, by which the streets cross each other at right angles, was devised by the city's founder, William Penn. The principal thoroughfares are Market, Broad, Chestnut, Walnut and Arch streets and the Parkway. The intersection of Market and Broad streets became the center of the city's municipal life. Here in 1871 the City Hall was built, and the colossal statue of William Penn atop the tower, which is 548 feet high, became a familiar landmark.

The monumental building of the Curtis Publishing Company, noted for its murals by Maxfield Parrish, faces Independence Square. Other structures, noted for their beauty or great utility, are the Philadelphia Savings Fund Society, Girard Trust, Bell Telephone, Medical Towers, Lewis Towers, Stock Exchange, Public Ledger, Inquirer, Packard, Widener, Drexel, Bankers Trust, Insurance Company of North America and Fidelity Mutual Life Insurance buildings, Convention Hall, the John Wanamaker department store and the New Pennsylvania Railroad Terminal. Distinctive in architecture among government buildings are the United States Mint, Federal Building, the main post office and United States Custom House.

Historic Shrines. Philadelphia has the most notable patriotic shrine in America, Independence Hall. Here on May 10, 1775, the Second Continental Congress met, and here on June 16 of the same year Washington was chosen commander in chief of the Continental Army. In its east room the Declaration of Independence was adopted on July 4, 1776, and from the tower the Liberty Bell rang out tidings of the momentous event. On July 9, 1778, the Articles of Confederation were signed here by representatives of eight states, and here, too, the delegates to the Constitutional Convention held from May to September, 1787, framed the Constitution of the United States. The original building was erected in 1735 to house the General Assembly of Pennsylvania, and the additions constructed in 1785 at each end were used as a city hall and courthouse.

Congress Hall in Independence Square served for 10 years from 1790 as the home of Congress. In this hall Washington was inaugurated for his second term in 1793, and John Adams took the oath of office as President 4 years later. The seat of government was removed to Washington in 1800, and for many years after 1800 the hall was devoted to criminal courts.

Carpenters' Hall, not far from Independence Hall in a narrow court off Chestnut Street, was the seat of the First Continental Congress in 1774. The Betsy Ross or American Flag House on Arch Street still stands as a memorial to the maker of the first United States flag. Examples of ecclesiastical architecture of the Colonial period survive in the Old Swedes' or Lutheran Church of Gloria Dei, occupied in 1700; the Protestant Episcopal Christ Church, completed in 1744; and St. Peter's Church, completed in 1761.

The home of William Penn, the first brick house erected in Philadelphia (from bricks imported from England in 1682), stood on Letitia Court near the Delaware River not far from the later location of Independence Hall. To preserve it from destruction through the encroachment of business houses it was taken down brick by brick and reconstructed in Fairmount, the city's principal park, which occupies more than 3,600 acres on both sides the Schuylkill River. In it are located Horticultural Hall, the aquarium, zoological garden and Memorial Hall, a municipal art gallery that serves as a reminder of America's first great fair, the Philadelphia Centennial Exposition of 1876.

Cultural Features. The most distinguishing feature of modern Philadelphia is the Parkway, extending from City Hall to Fairmount Park. On it are located the Public Library, Academy of Natural Sciences, Rodin Museum (given by Jules Mastbaum), Franklin Institute Museum containing also the Fels Planetarium and the Philadelphia Museum of Art, whose exhibits include some 40 period rooms, depicting mostly Colonial and Pennsylvania Dutch furnishings, and an important medieval collection. In front of the art museum is the Washington Monument. Philadelphia possesses also the Museum of the American-Swedish Historical Union and the Hall of the American Philosophical Society.

The city's most important educational institution is the University of Pennsylvania, which grew out of a plan published by Benjamin Franklin in 1749 and from a charitable school opened in 1751. It is now one of the great universities of the country with an enrolment of 7,500. Temple University, founded in 1884, has 5,000 students; Girard College, founded under the will of Stephen Girard and opened in 1848, is a boys' preparatory school, and among the decrees of its founder were two stating that no clergyman was ever to enter its grounds and that only orphaned or widows' children could attend. Drexel Institute of Technology, founded by Anthony J. Drexel in 1891, offers courses in industrial training, the sciences and art. The Pennsylvania Academy of Fine Arts, established in 1805, is one of the oldest art institutions in the United States. The Curtis Institute of Music is one of the country's great music schools. Among other institutions are the Jefferson Medical College, Hahnemann Medical College, Philadelphia College of Pharmacy and Science and the Woman's Medical College of Pennsylvania.

The name *Philadelphia* is derived from two Greek words, meaning loved or friendly and brother; they were applied by the English Quaker, William Penn, who founded the city in 1682, as the city of brotherly love.

Philippine Islands, an archipelago in the far western Pacific Ocean, separated from French Indo-China on the Asiatic mainland by the China Sea and from the islands of the Malay Archipelago by the Sulu and Celebes seas. Becoming a dependency of the United States after the Spanish-American War of 1898, they have since 1935 held the status of a commonwealth. There are 7,083 islands and islets in the group, and they cover a land and ocean area of 1,152 miles from north to south and 682 miles from east to west. Names have been given to only 2,441 of the islands. The two largest are Luzon (40,814 square miles) in the north and Mindanao (36,906 square miles) in the south. Between them lie Mindoro, Samar, Panay, Palawan, Negros, Cebu, Bohol and Leyte. Of volcanic formation these islands represent the tops of mountains whose bases in some cases are more than 3 miles below the surface of the ocean. The principal chain is the Cordillera Central, composed of the Ilocos, Sierra Madre and Caraballo ranges. Among the active volcanoes are: Mt. Apo (9,610 feet high) on Mindanao; Mt. Mayon, on Luzon; and Mt. Canlaon, on Negros. The principal rivers are the Rio Grande on Mindanao and the Cagayan on Luzon. The total area of the islands is 114,400 square miles. Fringing their shores are typical coral reefs.

The population of the Philippine Islands is about 16,000,000. The native Filipinos, who constitute three-fourths of the population, are members of the Malay race; they represent 43 ethnographic groups, each with its distinct language or dialect. Only recently has English supplanted Spanish as the official language of the islands. The Spanish conquistadores found among the Filipinos a group of dwarflike, dark people whom they called *Negritos*, which means little blacks; this name is still applied to some 30,000 of the population, found principally on the island of Negros. In the mountain fastnesses of Luzon live the Igorrotes and other pagan Malays. Until the Americans changed their mode of life they were savage head-hunters. The majority of the Filipinos have been Christianized or, like the Moros (who constitute half the population of Mindanao and the Sulu Islands), have become Mohammedans.

Tropical products grow profusely in the fertile soil of the islands. Immense crops of rice, sugar cane, corn, cotton, tobacco, peanuts and sweet potatoes are harvested. In many places hillsides are terraced, as in Japan and China, to increase the cultivable area. Coconuts, from which are derived copra and coconut oil, are one of the great sources of wealth in all the islands. Among other products are bananas, mangoes, oranges, grapefruit, limes, watermelons and guavas.

The mineral wealth and the forests are as yet little exploited. The principal metals are iron, gold, platinum, copper, lead, zinc, manganese, chromite and silver. The mountains contain an abundance of coal, and there are also deposits of lime, alum, sulphur, salt, gypsum and pottery clays. The most important precious stones found in the Philippines are the opal, agate and amethyst. The culture of rubber trees is assuring an industry of great proportions. Among forest products are bamboo, rattan, Manila hemp from the abaca tree, dyewoods, areca nuts and various gums and spices. The principal fisheries are coral, sponge and pearl.

Designated a commonwealth in 1935, the Philippines may achieve after a 10-year transitional period the independence that the United States promised on their purchase from Spain in 1898 at the end of the Spanish-American War. They have their own president, vice-president and other elected officials; a single legislative body called the National Assembly, composed of 120 members who represent the island's 40 provinces; and a supreme court. The only remaining ties to the United States are a high commissioner, who supplants the governor general, and a military adviser. What political control the Filipinos have exercised has long been in the hands of the mestizos or half-breeds, an admixture of Filipino and Spanish blood.

Manila, the capital, is located on landlocked Manila Bay on the southwestern coast of the island of Luzon. With a population of about 390,000 it is the largest city of the islands. The Pasig River divides the city into two parts. On one bank of this stream is the old, picturesque part of the town, still surrounded by a wall; on the other is the modern commercial and residential quarter. The city's architecture blends the Spanish and American styles. Among notable structures are the Legislature Building; President's Executive Hall; Public Library and Philippine Museum, housed in an old Spanish government building; Augustinian Convent, dating from the early 17th century; and Roman Catholic cathedral. A waterside park and promenade, called the *Luneta*, is the city's chief pleasure ground. Dewey Boulevard (named for Admiral George Dewey who as commander of the Asiatic squadron of the United States Navy destroyed the Spanish squadron in the Battle of Manila Bay on May 1, 1898) connects this park and the Naval Station at Cavite, 15 miles southwest of the city. Manila is the seat of the University of the Philippines, founded in 1908, and of the University of Santo Tomas, a Roman Catholic institution, established in 1619. Among other important cities are Cebu, Albay, Iloilo, Batangas and Zamboanga.

The Philippine Islands, which were discovered by Ferdinand Magellan on the feast day of St. Lazarus, March 16, 1521, were named by him the Archipelago de San Lazaro. In 1542 this name was changed by Ruy Lopez de Villalobos, who attempted the conquest of the islands, to Islas Filipinas in honor of Philip, the heir apparent to the Spanish throne. During the reign of Philip II (1556–98) the colonization of the islands was begun.

In spite of some 20 Filipino revolts and various attempts of the Portuguese, English and Dutch to oust the Spaniards the Philippine Islands belonged to Spain until they were ceded to the United States after the Spanish-American War for a consideration of $20,000,000. One excellent result of American rule was the practical eradication of such diseases as bubonic plague, beriberi, smallpox and cholera and the segregation of the numerous lepers in colonies; this work was supervised by Dr. Victor G. Heiser, who served as chief quarantine officer and director of health from 1903 to 1915. The freebooting and system of slavery of the Moros were suppressed. Under the direction of the American Secretary of Public Instruction the educational system was reorganized and better adapted to the needs of the Filipinos, with special emphasis on agriculture, manual training and other subjects that had a direct bearing on their daily lives.

Piazza della Signoria, the principal square of Florence, Italy. Facing it are the Palazzo Vecchio or town hall and the Loggia dei Lanzi, which contains such famous pieces of sculpture as Cellini's *Perseus with the Head of Medusa* and John of Bologna's *Rape of the Sabine Women.* It was the scene of the execution of Savonarola, which is reproduced annually in a historical pageant.

Piazzetta, a square in Venice, Italy, that is surrounded by St. Mark's Cathedral, the Campanile or bell tower, Doge's Palace, Library of St. Mark and the Old and New Procuratie. At its eastern end are two columns, surmounted by statues of the winged lion of St. Mark and of St. Theodore and his crocodile.

Piccadilly, an attractive London thoroughfare extending a mile between Hyde Park Corner and Piccadilly Circus and continuing westward to the outskirts of the city as Knightsbridge, Kensington Road and Hammersmith Road. The street is known for its clubs, mansions and fine shops. The circular area, Piccadilly Circus, is distinguished by Sir Alfred Gilbert's fountainpiece *Eros.* The name comes from the pickadils or ruffs once worn by English gallants.

piedmont, lying or formed at the foot of a mountain, as a piedmont glacier. The term *piedmont* is from the Italian, meaning foot of the mountain. It became the name of the fertile region formed by the alluvial fans of the Po and other rivers of northwestern Italy that discharge at the base of the Pennine Alps.

The section of the Atlantic coast between the Appalachian Mountains and the low soft coastal plain, distinguished by its more rugged appearance and harder rock strata and marking the fall line of this section, is often called the *piedmont plain*.

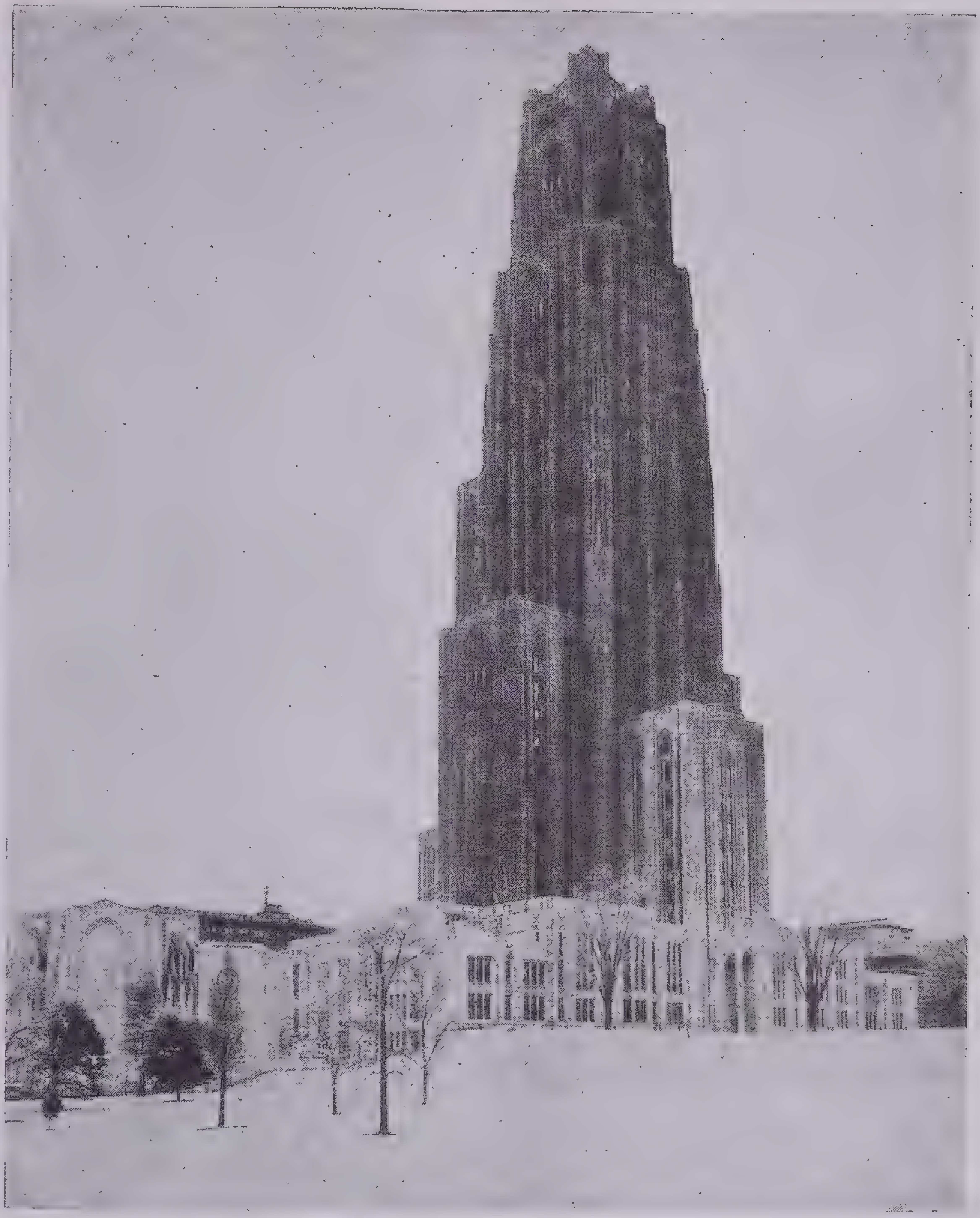
Pikes Peak Ocean-to-Ocean Highway, a cross-continent American highway, 3,564 miles long, connecting New York and San Francisco and passing Pikes Peak through the Ute Pass near Colorado Springs, Colo. The Pikes Peak Auto Highway leads from it to the top of the 14,109-foot mountain. Possibly the world's highest highway, it is 18 miles long and from 20 to 50 feet wide. Between miles 13 and 14 are the famous switchbacks, which play an important part in the Pikes Peak Hill Climb Contest held each Labor Day.

Pilgrim Memorial Monument, Provincetown, Mass. This square granite tower, 254 feet high, rises from a hill on the tip of Cape Cod and commemorates the first landing in America of the Pilgrims in the Mayflower. It was dedicated in 1910.

Pines, Isle of, an island that is located in the Caribbean Sea about 40 miles south of Cuba and belongs to that country. The area is 1,180 square miles. The population, numbering about 4,000, lives chiefly in the two towns of Nueva Gerona, the capital, and Santa Fé. Citrus fruits, pineapples and potatoes are raised in great abundance. There are also extensive cattle raising and marble quarrying, and in the forests of the northern part pine, cedar and mahogany trees are felled. the island's scenery, climate and mineral springs make it attractive as a winter resort, and many Cubans and Americans have homes there.

Before the Spanish-American War the Isle of Pines belonged to Spain. In 1904 the United States and Cuba, in exchange for permission to establish a United States Naval Base on the Cuban mainland, agreed by treaty that the island should be Cuban territory; but the protests of Americans who had large investments there and who wished to bring the island under American jurisdiction postponed ratification of the treaty by the United States Senate for 21 years. Since 1925 the island has been one of the districts of Havana Province, Cuba.

Pitcairn Island, a small island of volcanic origin in the South Pacific Ocean at 25° S. Lat. and 130° W. Long. The area is 2 square miles, and the population about 200. The principal products are coffee, sugar, yams, sweet potatoes, pineapples, bananas, oranges and melons. Discovered by Philip Carteret, an English navigator, in 1767, the island was colonized in 1790 by Fletcher Christian, eight other mutineers from the British ship *Bounty* and 18 Tahitian natives. After several years John Adams succeeded in establishing a semblance of brotherly feeling among the survivors of many murderous fights. The present-day islanders are Seventh-Day Adventists. Great Britain took formal possession of Pitcairn Island in 1839; and, since 1898, it has been administered by a chief magistrate and council of seven members, subject to the supervision of the High Commissioner for the Western Pacific. It was named for the midshipman who first sighted it.



The University of Pittsburgh's Cathedral of Learning

A 42-story structure embracing all the groups of the University. On the first floor is the commons room covering an area of more than half an acre. The building allows for nearly 100 classrooms; 67 laboratories; 52 graduate research laboratories; 13 lecture rooms; 15 departmental studies, libraries and assembly rooms; 78 offices; a main library; fine arts library; faculty club and student recreation and activities rooms. Surrounding the structure is a quadrangle of three- and four-story buildings including science halls, dormitories, Heinz Memorial Chapel and the Stephen Collins Foster Memorial Auditorium. The name—Cathedral of Learning—was suggested by its Gothic architecture. Charles Z. Klauder was the architect

Pittsburgh, a city of the United States, located in the southwestern part of Pennsylvania at the confluence of the Allegheny and Monongahela rivers to form the Ohio River. The three rivers flow through valleys from which hills rise to heights as great as 1,200 feet. Pittsburgh is largely built upon these hills and the lowlands between, and many of the streets, particularly in the older northern section, are narrow and steep. The city was originally built in the point or triangle formed by the junction of the Allegheny and Monongahela; but it expanded in all directions, and ultimately Allegheny and other attractive suburbs were annexed. The population of the city proper is about 670,000; but the metropolitan area, including all Allegheny County, has about 1,375,000.

From the industry that has contributed in largest measure to its upbuilding and to making it rank tenth in size among cities of the United States, Pittsburgh has been aptly termed the Steel City. That it was destined to be a vast industrial center was largely because it rose in the midst of one of the greatest bituminous coal-mining districts in the world. This section of Pennsylvania is also rich in natural gas and petroleum. Most of the iron ore used in steel manufacture is shipped from the Lake Superior region. Within the Pittsburgh area are produced about half the coke needed for consumption in the United States, one-fifth the plate and window glass and nearly one-fifth the country's output of glass bottles and jars. The leading steel works are the Carnegie-Illinois, the Jones & Laughlin and the United States Steel Corporation. Electrical products of world-wide fame are those of the Westinghouse Company, particularly air brakes and railroad-signal devices. Pittsburgh is also an important publishing, meat-packing and food-preserving center and leads in the manufacture of aluminum and of chemicals derived from coal tar.

Because Pittsburgh is hilly many viaducts and bridges are needed to facilitate transportation. More than 100 have been built, including 16 bridges that span the three rivers. Possibly the most notable is Liberty Bridge, connecting the main part of the city with the southern residential section around Mt. Washington. The Bloomfield Bridge connects the Bloomfield district and the section at the foot of Pittsburgh's highest ascent, Herron Hill. The Larimer Avenue Viaduct has a span of 312 feet. Access to the southern section has been expedited by the construction of twin vehicular tunnels under Mt. Washington.

Pittsburgh's importance as an inland port has been increased by added harbor frontage, which now amounts to 54 miles. Canalization of the Ohio River has been completed, and its entire length is now navigable with the aid of locks and dams.

About 1,700 acres of the city's area are in parks. The most notable of these is Schenley Park, which contains the Carnegie Institute of Technology, founded by Andrew Carnegie in 1900. Carnegie Library, also in the park, houses the Institute's museum of science and gallery of fine arts (where the international exhibition of modern paintings is held annually) and the Phipps Conservatory and Hall of Botany, given by the steel manufacturer, Henry Phipps. On a bluff above the Allegheny River is Highland Park, noted for its zoological gardens and several statues, including one of the song writer, Stephen C. Foster, who was born at Lawrenceville, now a part of Pittsburgh.

Pittsburgh possesses several notable buildings, many of the skyscraper type: the Allegheny County Courthouse; the Frick, Plaza, Clark and Carnegie office buildings; St. Paul's Roman Catholic Cathedral; the Federal Building, containing the customs and post offices; the City-County Building; and several bank buildings, such as the First National and Union Trust. The University of Pittsburgh, incorporated in 1819 as the Western University of Pennsylvania, is housed in the 41-story Cathedral of Learning. Connected with the University's medical department is the Pittsburgh Medical Center, composed of the Magee, Presbyterian, Eye and Ear and the Children's hospitals. Pittsburgh is also the seat of the Pennsylvania College for Women (Presbyterian), Duquesne University (Roman Catholic) and three theological seminaries of the Presbyterian, United Presbyterian and Reformed Presbyterian denominations. The Mellon Institute for Industrial Research, founded by Andrew W. Mellon, is at the disposal of industry as a research laboratory.

Originally named Fort Duquesne by the French in 1754 and renamed Fort Pitt in honor of William Pitt, Earl of Chatham, when the British captured it 4 years later, the community took the name Pittsburg when a town was laid out in 1764 near the fort. (The final *h* in its spelling was officially added in 1911.) It was incorporated as a borough in 1794 and as a city in 1816. Pittsburgh was exceedingly prosperous during the World War, for it furnished not only armor plate for battleships but a large proportion of the munitions and barbed wire that were sent to the Allied Armies.

Place de la Concorde, a public area in Paris, planned under the direction of Louis XV. During the French Revolution it was the scene of the guillotining of Louis XVI, Marie Antoinette and more than 2,000 aristocrats. In its center is the 76-foot-high Obelisk of Luxor, which was presented to the government of Louis Philippe by the khedive of Egypt in 1834. The circular area is surrounded by eight colossal statues, symbolizing the capitals of the former French provinces. From 1870 until Armistice Day 1918 the one representing Strasbourg, heart of Alsace-Lorraine (that France lost to Germany in the Franco-Prussian War), was draped in mourning. To the east of the Place de la Concorde are the gardens of the Tuileries and to the west the Avenue des Champs Élysées. The buildings on the north side of the square are the Hotel Crillon, the American Embassy and the Ministry of Marine. Opposite them on the other side of the Pont de la Concorde (a bridge across the Seine built of stones from the demolished Bastille) is the Bourbon Palace, occupied by the Chamber of Deputies.

Place de l'Étoile, a Parisian area, the center of nine radiating avenues, including the Champs Élysées, Foch, Victor Hugo, Friedland, Marceau, MacMahon, Wagram, Kleber and Grande Armée. In the center of this circular area Napoleon erected the world's largest triumphal arch, celebrating his victory in the Austerlitz campaign of 1805. It is 160 feet high, 146 feet wide and 72 feet deep. Among the sculptures adorning it are Rude's *Departure of the Troops* and Cortot's *Triumph of Napoleon.* A perpetually burning Flame of Remembrance marks the grave of France's Unknown Soldier who is buried beneath the Arc de Triomphe de l'Étoile.

Place du Carrousel, a square in Paris that occupies the area between the Louvre and the gardens of the Tuileries. In its center is the Arc de Triomphe du Carrousel, erected by Napoleon to celebrate his victories of 1805–06. Modeled after the arch of Septimius Severus in Rome, it is surmounted by a triumphal car whose steeds originally were the four bronze horses of St. Mark's portico in Venice. The name originated in a court revel held there by Louis XIV in 1662.

plain, an extensive stretch of level or undulating land, usually 1,000 feet or less above sea level. It differs from a plateau in that its valleys, formed by the erosional action of streams, are shallower; and from a prairie in that it is less uniformly fertile and less well watered. About half the earth's surface may be considered as plain formation, the term including such comparatively barren stretches as the steppes of Russia and the tundras of Alaska.

If a plain is of silt formation, as in India and China, it is called an *alluvial plain. Coastal plains* (likewise composed of the softer materials of the earth's crust), as in the case of the states along the Atlantic coast, are an uplifted part of the continental shelf. *Lacustrine plains* are generally formed in the beds of prehistoric lakes, as the Great Basin, which was once the site of Lake Bonneville, the precursor of Great Salt Lake and 10 times its size. *Piedmont plains,* as in northwestern Italy, are formed by the alluvial fans of rivers at the base of a mountain range.

In Venezuela and Colombia the word *llano* is used for plain; in Brazil, *campo;* in Argentina, *pampas;* in other parts of South America, *savanna.* In England and Australia some plains are called *downs,* and the South African equivalent is *veld.* The plains or Great Plains of the United States are the smoothly glaciated, treeless lands sloping gradually from the Rocky Mountains to the Missouri River's junction with the Mississippi. Extending southward from Kansas, they also include the Llano Estacado (Staked Plain) of northwestern Texas and southeastern New Mexico. They were once the roaming ground of the bison.

From Montana to Texas the great industry of the plains is grazing. Most of the crops raised are those that require little moisture, such as wheat, barley, flint corn and kaffir corn, sorghum, alfalfa and millet. In irrigated districts, such as the Milk River Valley of Montana and the Valley of the North Platte of Nebraska, sugar beets, fruits and vegetables are raised. Drought, caused often by the chinook, is one of the greatest menaces to farming in this region. Among others are rust, hail and insects, such as the locust and cattle tick.

The word *plain,* derived from the Latin *planum,* meaning level ground, is used in a number of place names, as West Plains, Kans., White Plains, N. Y., and Plainfield, N. J. Among plains of historical interest are the Plains of Abraham, southwest of the city of Quebec and named for the farmer, Abraham Martin, who owned the land; they were the site in 1759 of the battle of Quebec, where the English gained control of Canada from the French.

plateau, an elevated and rather flat tract of land from 1,000 to 10,000 feet above sea level. Though a plateau is usually adjacent to mountains, its underlying strata of sedimentary rocks or lava sheets are more or less horizontally uniform. The streams cut deeper valleys than those on a plain, and in arid regions canyons, such as the Grand Canyon of the Colorado, have been formed. Its flatness is relieved by solitary buttes and mesas and occasional groups of low mountains.

Plateaus are found near the centers of several continents. North America has the Colorado, Sierra Nevada, Columbia, Allegheny and Cumberland plateaus in the United States; the Laurentian Plateau in Canada; and the Anahuac Plateau in Mexico. Asia is noted for the Anatolian, Tibetan, Mongolian, Deccan, Iranian and Arabian plateaus. In Europe are the Bohemian Plateau of Czechoslovakia, the Bavarian Plateau of Germany and the Meseta Plateau of Spain and Portugal; in South America, the Brazilian, Peruvian and Bolivian plateaus; and in Africa, the Ethiopian Plateau and High Veld country of South Africa. Buried beneath the icecap of Greenland is an extensive plateau.

Plateaus are often arid and have to be irrigated for crop cultivation because the adjacent mountains absorb the moisture of rain-bearing winds that cross them. A few regions, such as Ethiopia and the Deccan Plateau of India, are watered by the monsoon rains of summer. Grazing and wheat raising are the most widespread industries. Coffee raising is next in importance, especially in South America. Some mountainous plateaus are highly mineralized: from those of South Africa come gold and diamonds; from Iraq, petroleum; and from the western part of the United States, gold, silver, coal, copper, lead and zinc.

The word *plateau* is French for a platter, plate, something flat. The term *tableland* is often used for a plateau that rises suddenly and steeply from lowlands, as in northern Norway and Sweden. An *intermontane basin* is a plateau located between mountain ranges and crossed by a river, as the Tarim Basin in Sinkiang between the Karakoram and Altyn-Tagh ranges.

Plaza Mayor, the principal square of Mexico City, Mexico, known also as the Plaza de la Constitucion. Surrounding it are the National Palace, Roman Catholic Cathedral and the Municipal Palace. The National Museum, famous for its Aztec relics, is housed in one wing of the National Palace.

Plymouth Rock, Plymouth, Mass. This rock on the shore of Massachusetts Bay is protected by a small granite canopy and preserved as the traditional landing place of the Pilgrims in 1620.

Po, the largest river in Italy (418 miles long). It rises in Mt. Visno, one of the Cottian Alps, and after being joined by the Baltca River flows in a generally eastern direction across the broad, fertile plain between the Alps and Apennines and discharges through several mouths into the Adriatic Sea. It drains an area of 26,798 square miles. The sediment it carries down from the mountains has formed a delta that grows continuously larger because there is no current in the Adriatic. The most important tributaries of the Po are the Ticino (which rises in the St. Gotthard Alps and flows south through Lake Maggiore to join the Po), the Adda, Parma and Trebbia. Cities on its banks include Turin, Cremona and Piacenza. It is navigable as far as Casale Monferrato. The river regulation works on the Po originated in Roman times. The ancient name of the river was *Padus*.

point, the tapering end of a tract of land, such as a promontory or cape. The word *point* is part of some place names as West Point on the Hudson and Point Pleasant, W. Va. Point Barrow, Alaska, is the northernmost cape and inhabited part of North America.

Poland, a republic of central Europe, bounded by the U.S.S.R. on the east, Rumania and Czechoslovakia on the south, Germany on the west and the Baltic Sea, Germany (East Prussia) and Lithuania on the north. It was independent from 1918 to 1940 when at the beginning of the 2nd World War it was captured, and divided between Germany and Russia. In accordance with the treaties of Versailles, Trianon and Riga its area of 149,958 square miles was constituted out of territories that had belonged to Germany (Prussia), Austria-Hungary and Russia since 1815. In 1938 Poland got Teschen, 405 square miles with a population of 240,000, from Czechoslovakia. Without this addition the population is about 32,150,000, of which about 70 per cent is Polish. The large Jewish element, which totals 8 per cent of the population, is generally found segregated in the ghettos of the large cities. Germans, Lithuanians, Ukrainians and Ruthenians constitute the remaining 22 per cent.

Poland is essentially an agricultural country, since its main part is a fertile, undulating plain. The land is well watered by the Vistula, Oder, Dvina and Dniester rivers and their numerous tributaries, and more than half the total area is under cultivation. By the Agrarian Act of 1920 the large landed estates of the nobility and church were divided, and now the farms for the most part are small and are operated by peasant owners. The principal crops are potatoes, rye and sugar beets; oats, barley, wheat and flax also are raised. Cattle, sheep and horses lead in production among livestock.

In the Carpathian Mountain region of the south (noted also for such scenic features as Lake Morskie Oko) Poland possesses a great deal of mineral wealth. Coal mining yields some 40,000,000 tons a year; iron ore, zinc, salt, potash, petroleum (found principally in Galicia) and natural gas add to the country's riches. The manufacture of steel is yearly growing in importance; and so is the production of agricultural implements, locomotives, automobiles, hardware and armaments. Other manufactures include textiles (principally cottons, woolens, silks and linens), sugar, beer, cement, glassware and leather goods. Peasant crafts, such as wood carving, lace and pottery making and embroidering are still practiced in Poland. Since one-fourth the area is forested, the manufacture of furniture, paper and other lumber products is important.

Poland's position as a republic was redefined in the new constitution, adopted in 1935. The chief executive is the President, elected by the Parliament for a term of 7 years. This bicameral body consists of the Senate of 96 members, appointed for 6 years in recognition of some distinguished service to the state, and the Lower House, called the *Sejm,* whose 208 members are elected by the people for 5 years. The Cabinet, headed by a premier, assists the President in administering the government. For local administrative purposes the country is divided into 16 provinces.

The capital is Warsaw (population, about 1,180,000), on the Vistula River

Courtesy Gdynia America Line

Three Generations of Lowicz Women on their Way to Church

Peasant women of this Polish village weave their own fabrics from wool grown on their own sheep. They make dyes from roots, leaves and berries of their native fields. Stripes of every color in the rainbow are combined in the dresses of the women and girls in the north central part of the country, is one of the most important metropolitan centers of the Continent. Among Warsaw's notable buildings are the castle of the Polish kings; 14th-century Roman Catholic cathedral of St. John; the Grand Theater, seat of the national drama; and the University of Warsaw, founded in 1816. The Lazienki Gardens are adorned with monuments to John III (Sobieski), the Polish king who as leader of a combined Austrian-Polish force saved Vienna from the Turks in 1683; Frederic Chopin, the pianist and composer; and Nikolaus Copernicus, the Polish astronomer who advanced in the 16th century the revolutionary hypothesis of the solar system. Another unusual feature of the city is a radium institute, established in honor of Mme. Marie Curie, discoverer of radium, who was born in Warsaw. Outside the city stands the Pilsudski Mound, an artificial hill, erected as a memorial to the great statesman, Joseph Pilsudski, who died in 1935; each pilgrim contributes a wheelbarrowful of dirt, which he himself wheels.

More interesting historically is Cracow, which served as the capital of Poland from 1320 to 1609. The old royal castle, called the *Wawel,* is occupied by the President when he visits this city. The 14th-century Cathedral of Stanislaus contains the tombs of some of the greatest monarchs, bishops and national heroes. Important features of medieval architecture are the Church of St. Mary, Sukiennice (Drapers' Hall), Jagiellonska Library and the University of Cracow, founded in 1364.

In connection with the formation of the Polish Corridor, by which Poland sought access to the Baltic Sea through former German territory, Poland requested the League of Nations to grant it major maritime rights at the Free City of Danzig. Because its demand was not granted in terms to meet its future needs, the Polish Government began in 1923 at the village of Gdynia east of Danzig the construction of a new seaport, which within 15 years became one of the most important Baltic shipping centers with a population of more than 50,000. Among other important cities are: Lodz, a textile industrial center; Lemberg, now Lwow, noted for its 15th-century Gothic cathedral and the Ossolinski National Institute; and Posen (called Poznan by the Poles) with a Town Hall that besides being noted for its valuable archives is the best example of Renaissance architecture in the country.

pole, either of the tip ends of the axis on which the earth turns in its daily rotation. The northern end of this axis, 90° from the equator, is called the *North Pole;* the southern end, a like distance from the equator, is the *South Pole.* The earth's polar circumference is 24,860 miles; polar diameter, 7,899 miles. The Polar circumference is 42 miles less than the equatorial circumference, because the earth is an oblate spheroid, bulging at the equator and flattened at the poles.

Polynesia, the eastern group of islands of the central Pacific Ocean; it extends from 110° W. Long. to 170° E. Long. Among them are: Hawaii and Samoa, which belong to the United States; Tonga and Cook islands, which are British (Cook is under New Zealand's supervision); and Society, Austral and Marquesas islands, which France claims. The total area is about 100,000 square miles. India may have been the original home of the Polynesians, and probably they settled for a time in Java. As Malayan immigrants made fresh inroads in that island, the older settlers moved on to the less populated islands farther east. Among the notable social institutions that developed throughout this whole area is the *taboo* (forbidden act or object). The term name *Polynesia* is from the Greek and means many islands.

pond, a body of water similar to but usually smaller and shallower than a lake. Some ponds are so shallow that aquatic plants, such as water lilies, will grow in them. Many ponds are artificial. New Englanders refer to their smaller lakes as ponds.

pool, a small and rather deep body of water fed by springs, either hot or cold, like Morning Glory Pool in Yellowstone National Park.

The term applies also to the part of a stream where it suddenly widens and deepens. The Pool of London, for instance, is the portion of the River Thames which forms the upper part of London harbor and the head of navigation for ocean-going vessels.

Courtesy Portland Chamber of Commerce

Sacagawea, The Bird Woman

Statue by Alice Cooper in Washington Park, Portland, Oregon. Sacagawea, the Shoshone Indian woman, guided the Lewis and Clark Expedition over the Great Divide in 1803-06. Her familiarity with the wilderness and her friendship with the Shoshone and Blackfeet, from whom she procured food and horses, contributed greatly to the success of the expedition

A *tide pool* is a basinlike crevice below the arch of a partly eroded cliff along the sea coast where water is left by ebb tide.

port, a harbor established in a bay or at the mouth of a tidal river, for the entrance and exit of ships, with adequate facilities—wharves, docks, machinery and so forth—for loading and unloading passengers and cargo. It differs from a haven, which merely offers shelter to vessels from storm, because it has a governmental status and control over vessels docking for any length of time.

The great ports of the world are cities at one end or the other of the main oceanic trade routes or at a convenient crossroads, as New York city, Liverpool, Marseille, Hamburg, Naples, San Francisco and Honolulu.

A *port of entry* is a customs district where goods imported from a foreign country and specified for that destination may be discharged. A *port of call* is generally a coaling and repair station for vessels en route. A *port of discharge* or *entrepôt* is one where all or part of the cargo is unloaded, often for shipment by some other means of transportation or warehousing.

The word *port* is derived from the Latin *portus,* meaning harbor. The word is used in the names of places, such as Port Arthur, Ont., Port-au-Prince, Haiti, Port Elizabeth, South Africa, and Port Chester, N. Y.

Portland, the chief city of Oregon, at the confluence of the Columbia and Willamette rivers 110 miles from the Pacific Ocean. Its port, the only freshwater harbor on the Pacific coast, has 30 miles of water frontage and is served by 57 steamship lines. The leading exports are wheat and lumber. As the southern gateway to the Pacific Northwest and as the end of the old Oregon Trail, Portland is also an important railroad center for the Great Northern, the Northern Pacific and the Union Pacific lines and is a leading terminal on the Pacific coast airway. The chief manufactures are lumber, furniture, paper, flour, cereals, copper, sheet iron, canned fruits and vegetables and paints and varnishes. The area is 67 square miles. The city population is more than 300,000; that of the metropolitan district is nearly 380,000.

The guardian sentinel of the city is snow-capped Mt. Hood. From Portland Heights and other terraced residential districts on a clear day there is a panorama of several other mountains: above the lesser peaks of the Cascade Range rise Mt. St. Helens, Mt. Rainier, Mt. Adams, Mt. Jefferson and Mt. Washington. The city's leading park is Washington, whose rose gardens serve as an international rose-test laboratory. It also contains two famous Indian statues—a group, *The Coming of the White Man,* and a memorial to Sacagawea or the Bird Woman, who served as guide to Meriwether Lewis and William Clark on their trail-blazing feat of 1805-06; also the huge log cabin erected for the Lewis and Clark Centennial Exposition of 1905 to house the forest products of the state. Other important parks are Mt. Tabor (site of an extinct volcano), Peninsula, Laurelhurst and Columbia.

Portland's notable buildings include the City Hall, Art Museum, Municipal Auditorium (housing also the museum of the Oregon Historical Society), the Public Market and the Multnomah Civic Stadium, where, in addition to various sports events, the summer concerts of the Portland Symphony Orchestra are held. On the outskirts of the city is one of the leading Roman Catholic shrines in the United States, the Sanctuary of Our Sorrowful Mother. Portland is the seat of Reed College, University of Portland, Northwestern School of Law and the North Pacific colleges of dentistry, pharmacy and optometry. The University of Oregon maintains in Portland its school of social work and a medical school that forms an important unit of the Medical Center, composed of the Veterans' Hospital, Multnomah County Hospital and Doernbecher Memorial Hospital for Crippled Children.

Portland was founded in 1843 by New England pioneers and retains a New England atmosphere. It was incorporated as a city in 1851 and in 1913 adopted the commission form of government, which is administered by a mayor and four commissioners. A rose festival is held annually in June —for Portland is called the *City of Roses.*

Portugal, a republic of southwestern Europe, occupying most of the western part of the Iberian Peninsula. It is bounded by Spain on the north and east and by the Atlantic Ocean on the west and south. The eastern boundary is partly defined by the Guadiana and Tagus rivers. The northern part of the country is watered by the Douro River. The mountain ranges that traverse the Meseta Plateau belong to the Transmontane and Beira systems; the loftiest is the Serra da Estrella, about 6,500 feet high. The most famous of the numerous rocky promontories along the Portuguese coasts is Cape St. Vincent at the southwesternmost extremity. The area of Portugal proper is 34,254 square miles; including the Azores and Madeira Islands, which are attached politically to the country, it is 35,490 square miles. The total population is nearly 6,700,000.

Portugal is an agricultural country and about one-third the area is under cultivation. The principal products are wheat, rye, oats, barley, olives, potatoes, rice, citrus fruits, figs, almonds and chestnuts; from a vast vineyard acreage 100 million gallons of wine are made every year. Sheep are raised for their wool and cattle for their hides. Sardine and tunny fishing is a thriving industry. The forest area that covers one-fifth of the country has more than usual value through cork trees whose annual yield amounts to some 70,000 tons.

The country possesses extensive mines of bituminous coal and lignite, but the supply is insufficient for the nation's needs and great quantities are imported. Deposits of wolframite, tin, copper, lead, antimony, tungsten, zinc and manganese occur, but transportation is so poor that these mines have not been fully exploited. The leading manufactures are cotton, woolen, linen and silk fabrics, lace, porcelain, tiles, jewelry, glassware, pottery, corks, soap and leather goods.

In 1910 a revolution destroyed the Portuguese monarchy that had existed for more than 800 years. In the republic that was proclaimed the executive power was vested in the President, elected by the Parliament for 4 years. In accordance with the new constitution adopted in 1934 the President's term was extended to 7 years; he is elected by direct suffrage, the voters being the heads of families. Assisting the President is the Council of State, headed by the premier. The Parliament now consists of two assemblies of 90 members each, elected for 4 years. The first or National Assembly has legislative and financial powers; the second or Corporative Chamber controls economic and social affairs. For local administrative purposes the country is subdivided into districts, communes and parishes.

Portugal has two large cities, Lisbon (*Lisboa*), the capital, and Oporto (*Porto*). Lisbon (population, about 595,000) is provided with one of the finest harbors in Europe, through its location on the broad and deep estuary of the Tagus River. It is an old city, for according to tradition it was founded by the Phoenicians. It was long called *Olisipo,* and there is a story that it was settled by Ulysses. After the Roman conquest about 175 B.C. it took the name of Felicitas Julia. An interesting chapter in Lisbon's history relates to its long occupation by the Moors from the 8th to the 12th centuries. One of the greatest disasters of modern times was the earthquake of 1755 that destroyed almost the entire community and killed more than 30,000 persons. When the capital was rebuilt, care was taken to provide wide, straight streets and to build it according to a plan that has made Lisbon one of the finest cities of Europe.

The national architecture of Portugal, like that of Spain, shows much Moorish influence; it is called *Manueline* for Manuel I, in whose reign in

Courtesy Consulate General of Portugal, New York

Grape Harvest in Portugal

Vintagers of the River Douro district carry to the wine presses the product that constitutes Portugal's fundamental wealth. These red and white grapes are made into port wine, which takes its name from the principal export center, Oporto. The presence of 0.9 per cent potash in the soil is said to contribute to the rich taste and bouquet of this wine. The vintage is gathered about the end of September the early 16th century Portugal achieved its greatest commercial supremacy. Among Lisbon's notable structures are the Cathedral Sé Patriarchal, Chapel of St. John the Baptist, Archeological Museum, National Theater, Royal Palace and the Moorish citadel renamed the Castle of St. George. The Jardin Botanico, with its superb tropical plants, is one of the finest botanical gardens in Europe. In the Square of Dom Pedro IV, celebrated for the exotic patterns of its mosaic pavement, an equestrian statue of Pedro IV, Portugal's last great imperial ruler, has been erected. The city is the country's educational center; during the republican regime the high standard of illiteracy has been reduced from 80 per cent to 55 per cent.

Oporto (population, about 232,000) is located near the mouth of the Douro River and is an important commercial center. Its leading export is port wine, which takes its name from the city. In its buildings there is a blending of the ancient and the modern; many old churches and monasteries of the Middle Ages still stand, the most famous of which is the Church of the Clergy from whose tower a superb view of the city is obtained. One of the greatest iron-arch bridges in Europe spans the Douro; it was completed in 1877 and has a length of 1,150 feet. Among Portugal's other picturesque cities are: Braga, with its shrine of Dom Jesus de Monte, whose long flight of marble steps thousands of pilgrims ascend on their knees each Whitsuntide; and Thomar, noted for the great castle-church of the Order of the Templars, one of the finest examples of Manueline architecture.

The name *Portugal* is derived from Portus Galliae, harbor of Gaul, the name that the Romans gave one of the principal seaports, now Portus Cale, a suburb of Oporto.

Portuguese Guinea, a Portuguese colony on the northwestern or Senegambian coast of Africa between Senegal and French Guinea of the territory of French West Africa. With the Bissagos Islands it has an area of 13,944 square miles. Its population is estimated at 365,000. Most of the country lies in the coastal plain and is watered by the Cacheu, Geba and Rio Grande rivers. The products of Portuguese Guinea are ivory, rubber, beeswax, rice, peanuts, hides, palm oil and nuts. The capital is Bolama on the coast; the chief port is Bissau. Trading centers are Farim, Bafata and Xitoli. Portuguese Guinea was discovered in 1450 and for almost two centuries was important in the slave trade. It became a colony in 1879 and is administered by a governor.

Prado, a famous boulevard in Madrid. The Royal Picture Gallery (Real Museo de Pinturas) on this boulevard is often called the *Prado gallery*. The word *prado* is Spanish for meadow or park.

Prague or **Praha,** the capital of Czechoslovakia, located in the central part of the province of Bohemia on the River Moldau (or Vltava). An industrial center of first importance, it is noted for the manufacture of sugar, flour, beer, leather, cotton and linen goods, pottery, fertilizers, chemicals, furniture, railroad cars and agricultural implements. Prague is also a junction for seven railroad lines and is an important river shipping and commercial aviation center. The population numbers 848,823.

In the old part of the city and on the hill Hradcany are many imposing buildings, reminders of the period from 1085 to 1620 when Prague was the capital of the independent kingdom of Bohemia. What is now the residence of the President of the Czechoslovak Republic was once the palace of the Bohemian kings. Still standing and restored to their pristine glory are: the Vladislav Hall, where the king received the oath of allegiance from the Estates after he had been crowned in the cathedral; the former Diet Hall; and the Chancellery of the Imperial Court. From the lower window of the Chancellery Protestant Bohemians, indignant at the intolerant attitude of their Hapsburg king, Ferdinand II, over the building of new Protestant churches, on May 23, 1618, threw two members of the Council of Regency; although only the dignity of the imperial vice-regents was injured, this rash act precipitated the Thirty Years' War, one of the most unhappy eras in Prague's history. This was called the *Defenestration* or out-of-the-window.

Dominating the third courtyard of the palace is the Gothic Cathedral of St. Vitus. Its foundation stone was laid by Charles IV in 1344, but it was not completed until 1929. The year 1929 also marked the 1,000th anniversary of the founding of the cathedral by St. Václav (Good King Wenceslaus of legend). His tomb in a jewel-encrusted memorial chapel is the cathedral's proudest possession. In other courtyards are the Romanesque Church of St. George, an equestrian statue of St. George and against the castle wall a row of tiny houses where the king's alchemists lived in the Middle Ages.

The Old Town Square is the most memorable square in Prague. In the center is the John Huss Monument, the scene of religious and political gatherings on July 6, the day when Huss was burned at the stake in Constance in 1415 for his heretical views. His last pronouncement, "The truth conquers," is the motto of the Republic. On the south side of the square is the 14th-century Gothic Town Hall, noted for its astronomic clock, with figures of the 12 Apostles and Saviour that pass in procession each hour, and a chapel in which reposes the Unknown Soldier of Czechoslovakia. The hall's council room contains two large paintings by Václav Brožík—*The Verdict on John Huss by the Council of Constance on July 6, 1415,* and *The Election of George of Poděbrady as King of Bohemia on March 2, 1458.* Towering above the Kinsky Palace on the north side of the square are the Gothic twin spires of the Týn Church or Cathedral of the Mother of God below the Tyn, where John Huss preached his sermons.

The oldest stone bridge in Europe is the 14th-century Charles Bridge of Prague, named for its builder, Charles IV. Embellishing the buttresses of this bridge are statues of the saints, including Prague's own martyr, St. John of Nepomuk, and in the center a gilded Crucifixion scene. It is famous as the scene of the closing battle of the Thirty Years' War when, despite their strength, the Protestant Swedish troops were unable to wrest it from the Jesuit-trained students of Prague. Typical of the fortifications of the medieval city are the tower that guards the west end of the Charles Bridge and the old powder tower, adorned with statues of the kings of Bohemia. Another picturesque part of the old town is the Ghetto with its old Jewish cemetery and 12th-century synagogue.

The building of the National Assembly (noted also for its art gallery with works of old Czech masters) and the famous Prague opera house or National Theater are on the banks of the Moldau. The oldest building of the University of Prague, which was founded by Charles IV in 1348, is the Karolinum; modern buildings have been erected near the Charles Bridge to house the law and philosophical faculties. Among other famous churches of Prague are the chapel of the Loreta Monastery, Church of the Holy Cross Fathers with Monastery of the Red Cross Knights and Church of St. Nicholas, in front of which is the Plague Column of the Holy Trinity, erected after an 18th-century epidemic.

The Industrial Art Museum is noted for its collection of Bohemian glass. In front of the National Museum, of historic as well as ethnological significance, is an equestrian statue of St. Václav by J. V. Myslbek, Czech sculptor. The various government ministries and embassies of foreign nations are housed in the former palaces of members of the Austrian nobility.

The most important feature of the new town are the Masaryk Homes (named for the first President, Thomas G. Masaryk), one of the most modern institutions in Europe for the care of the aged, feebleminded and undernourished children of the poor. On the Exhibition Grounds is the gigantic building, modern in architecture, of the Prague Samples Fair held each spring and autumn.

Prague is the English equivalent of the German *Prag*. The Czech word, *Praha* means threshold.

prairie, a level or slightly undulating area of land, which is grass-covered but largely treeless. It differs from a plain only in that it is fairly well watered and any monotony of landscape is relieved by low hills and tributary streams.

The word *prairie,* which originated with the early French explorers, is applied especially to the extensive area of the Mississippi Valley lying between the Ohio and Missouri rivers. It includes such states or sections, as western Ohio, southern Michigan, Indiana, Illinois, Missouri, Iowa, Minnesota and Wisconsin. It has exceptionally rich soil. With the advent of the white settler it became the great granary of the United States; wheat, corn and other grains are the principal crops. These prairies also reach into adjacent portions of Canada. The grain-growing regions of the south-central part of that country, such as Manitoba, Saskatchewan and Alberta, are known as the Prairie Provinces.

Prater, a park that has been a favorite resort of the citizens of Vienna since it was opened to the public by order of Emperor Joseph II in 1766. It is in the eastern part of the city along the Danube and covers an area of 6½ square miles. The former imperial hunting lodge has been turned into a café. From the Riesenrad (Great Wheel) an extensive view of the city may be obtained. There are motion-picture houses and a variety of other amusement centers. The park was the scene of a world's fair in 1873. The word *prater* comes from the Latin *pratum,* meaning meadow.

precipice, a very steep cliff, particularly one that is almost perpendicular or overhanging. The Marche des Dames is a high precipice near Namur, Belgium, in attempting to scale which King Albert I lost his life in February, 1934. The term is derived from the Latin *praeceps,* meaning headlong.

Pribilof Islands, a group of four islands in the Bering Sea, north of the Aleutian Islands and about 200 miles southwest of Alaska. There are two islands of fair size—St. Paul, with an area of 35 square miles and a population of about 300; and St. George, with an area of 27 square miles and a population of about 100. The Pribilofs are the natural home of the fur seal, the blue and the white fox, cormorant and auk. At one time the destruction of the fur seals was threatened by hunters, but protective laws, administered by the United States Bureau of Fisheries since 1910, have resulted in increasing the herd until now there are close to 1,500,000. More than 50,000, however, are killed each year for their skins. The islands were discovered by the Russian navigator Gerasim Pribilof in 1786 and were acquired by the United States when Alaska was purchased from Russia in 1867.

Princes Street, a street of Edinburgh, Scotland, that divides the Old Town from the New. It was constructed on the site of a ravine at the foot of Calton Hill. The most splendid of its numerous memorials to noted Scotsmen is the 200-foot-high Gothic-styled monument to Sir Walter Scott.

principality, the territory over which a sovereign prince rules, as the European principalities of Monaco and Liechtenstein.

In their relation to the British Crown, Wales and Scotland are in one sense regarded as principalities. The title Prince of Wales has been held since 1343, when the Black Prince, son of Edward III, was so designated, by the eldest son of the reigning sovereign, but for each holder it has been created anew through special investiture. The heir apparent to the British throne is also known as Prince and High Steward of Scotland.

promontory, a high point of land or rock, such as a headland, jutting into the sea. Land's End, Cornwall, England, is a famous promontory. The term is derived from the Latin *promontorium,* that which projects.

protectorate, a dependent territory over which another nation assumes authority. In exchange for protecting the weaker nation from foreign invasion or dictation, the stronger one has exclusive control of its foreign relations and shares in the management of its domestic affairs. This relationship is created by treaty between the nations concerned.

A protectorate differs from a mandated territory in that control over a mandate is authorized by the League of Nations; for example, the Solomon Islands are a British protectorate; but Iraq was governed by Great Britain under a mandate until 1930 when a treaty signed at Bagdad made Iraq independent.

Among important protectorates are Bechuanaland, Gambia, Gold Coast, Kenya, Nigeria, Nyasaland, Sierra Leone, Somaliland, Uganda and Zanzibar under British protection; Morocco, under French and Spanish; and Tunis, under French.

The government of protectorates, as in the case of those controlled by Great Britain, is generally intrusted to a governor or commissioner responsible to the Colonial Office, who may be assisted by an executive or advisory council nominated by the Crown.

Providence, a city of the United States and the capital of Rhode Island, located on the north arm of Narragansett Bay called the Providence River, 27 miles from the Atlantic Ocean. Once a great shipping port in trade with the West Indies and Orient, Providence is now noted chiefly for the manufacture of textiles (woolen, worsted, cotton and silk goods), jewelry, silverware, rubber goods, drugs and textile machinery. The population is about 253,000. The area is 18 square miles.

Providence is rich in landmarks that commemorate its history as both a colony and a state. Among these is the Old Colony House, dating from 1762, where Rhode Island proclaimed herself the first independent republic in America on May 4, 1776. On the site of the Old Market Building (erected in 1774 and once the City Hall) in 1773, a few months before the Boston "Tea Party," Rhode Island patriots burned tea that the East India Company delivered in Providence on orders of the British Government. The First Baptist Meeting House, a colonial structure patterned after St. Martin's-in-the-Fields in London, was erected in 1775 on the site of Roger Williams's original church. Colonial homes, such as the John Brown, Edward Carrington and Thomas Poynton Ives houses, recall the dignity and graciousness of an earlier way of living. The Athenaeum, a Doric structure, erected in 1838, houses one of the oldest libraries in the United States. The library and museum of the Rhode Island Historical Society contain many relics of Providence's past.

Among the public buildings of modern Providence are the Rhode Island State Capitol, a white marble structure whose dome is surmounted by a colossal bronze statue known as the *Independent Man;* Providence County Courthouse, whose Georgian style of architecture in red brick and white marble trim is in keeping with the city's Colonial atmosphere; and the Industrial Trust Building, 391 feet high, Providence's tallest skyscraper. In Roger Williams Park (452 acres) are the Museum of Natural History, zoological and Japanese gardens and a concert amphitheater, the Benedict Memorial.

The city is the seat of Brown University (formerly Rhode Island College), located here since 1770 and renamed in 1804 in honor of Nicholas Brown, a generous benefactor. Its present annual enrolment is about 1,500 with 500 students registered in the women's division, Pembroke College. The Rhode Island School of Design has an enrolment of about 1,700 and is noted for instruction in jewelry, textile and other forms of decorative design; its museum is Providence's foremost art gallery. Providence College (Roman Catholic) institution, and the Rhode Island state colleges of education and pharmacy also are located here.

The city was founded in 1636 by Roger Williams, a believer in religious tolerance. He was expelled from the Massachusetts Bay Colony largely on account of the doctrines that led him to found in Providence the first Baptist church in America. Williams called the settlement *Providence* from gratitude to the Divine Providence that had guided him. Rhode Island and Providence Plantations was the name of the united colony.

province, an administrative division of a country, usually having a local legislature to which the governor or lieutenant governor (in whom executive power has been vested) is responsible. Examples are the nine provinces of the Dominion of Canada. The Prairie Provinces of Canada are Manitoba, Saskatchewan and Alberta, and the Maritime Provinces are Nova Scotia, New Brunswick and Prince Edward Island.

The word *province* is derived from the Latin *provincia,* meaning duty. In Roman times it referred to a conquered territory, like Gaul, that was governed by a proconsul. After throwing off the Spanish yoke in 1579 the seven provinces of the Netherlands proclaimed their sovereignty in 1761 under the name of the United Provinces.

Puerto Rico, the smallest and most easterly of the islands of the Greater Antilles, separated from Hispaniola on the west by the Mona Passage and from St. Thomas, one of the Virgin Islands on the east, by the Virgin Passage. To the north is the Atlantic

Ocean; and to the south, the Caribbean Sea. The island has been a possession of the United States since 1898, when it was ceded by Spain at the conclusion of the Spanish-American War. Under the amended Organic Act of 1917 it is a territory appurtenant of the United States, that is, organized but unincorporated. The area is 3,435 square miles, and the population about 1,545,000, of whom about 1,000,000 are white and largely Spanish in descent. The others are mostly mulattoes and blacks, descendants of the slaves who were brought from Africa to work on the great sugar plantations.

The mountains of Puerto Rico range from 1,200 to 3,700 feet in altitude; El Yunque is the highest peak. Most of them are cultivated to their summits. The land is lowest and most fertile along the northern coast. On account of a lack of moisture along the southern coastal plain irrigation is necessary. The agricultural products are all tropical, including sugar cane, tobacco, pineapples, oranges, bananas, grapefruit, coconuts, coffee and cotton. The mineral deposits are not large, but there are valuable limestone and gypsum quarries and some marble, iron, gold, silver, lead, copper and kaolin, which is used in the manufacture of porcelain. The forests yield logwood, ebony, cedar, bamboo and boxwood. The most important manufacture is sugar and molasses. Next in importance is the production of cigars, cigarettes and straw hats.

San Juan, the capital, is located on a small coral island off the northeastern coast. Like several other cities of the West Indies it is noted for its many modern buildings in an Old World setting. Near the medieval like Morro Castle is the ornate Customs House. The 16th-century Governor's Palace is still used as the headquarters of the governor of the island. Another reminder of colonial Spanish days is the 17th-century cathedral where the first governor, Juan Ponce de León, is entombed. A statue of Columbus, who discovered the island November 19, 1493, adorns the main plaza. In the newer section of the city rise the well-designed Capitol, Federal Building, Casa de Espana and Carnegie Library. The University of Puerto Rico, founded in 1903, is in the suburb of Rio Piedras. Under its auspices is the School of Tropical Medicine, which has led in the fight to eradicate the hookworm disease, the island's most dreaded malady. The population of San Juan is about 115,000. Among other important communities are Ponce, Mayaguez, Caguas and Arecibo.

Courtesy Puerto Rican News Bureau

Looking Down on the High Parapets of El Morro, San Juan

The ancient battlements and sentry boxes of El Morro Castle dominate the harbor of Puerto Rico's capital. El Morro was begun in 1539 to protect the town from pounding seas and from the British, French and Dutch. Here in 1595 the Spaniards fought off Sir John Hawkins, the British mariner, who died in the attack and was buried at sea off Puerto Rico. On November 22 of the same year Sir Francis Drake was repulsed when he tried to storm the ancient fort

When the United States acquired Puerto Rico in 1898, there was a military occupation, but 2 years later under the Organic Act a modified civil government was put into effect. In 1917 this Act was amended so as to extend local rule, and all Puerto Ricans received the privilege of becoming citizens of the United States if they so desired.. The governor, attorney general, commissioner of education and justices of the Supreme Court are appointed by the President of the United States. The remaining four members of the Executive Council, representing the departments of finance, interior, agriculture and labor, and all other government officials are appointed by the governor. The Legislative Assembly has a Senate of 19 members and a House of Representatives of 39 members, elected by popular vote. Puerto Rico is represented in Washington by a resident commissioner, who is elected for a 4-year term; he sits in the House of Representatives but has no voice, except upon matters pertaining to the island, and no vote. Since 1934 Puerto Rico has been clamoring for statehood and a larger autonomy in its internal sovereignty.

The name *Puerto Rico* means rich port. The name that Columbus gave the island, San Juan Bautista (Spanish for St. John the Baptist), became the name of the capital, and the name that its conqueror, Ponce de León, gave the site of this city in 1510 became the name of the island.

Pyrenees, a chain of mountains, 270 miles long and from 25 to 90 miles wide, that forms an almost impassable boundary between France and Spain. It consists of three systems, the Eastern, Central and Western. The highest peak is the Pic d'Aneto (11,169 feet) in the Central Pyrenees. Other noted peaks are Mt. Orion, Pic du Midi, Mt. Perdu, Mt. Maladetta and Pic du Siguier. The most famous passes of these mountains are the Col de Portus, crossed by Hannibal, the great Carthaginian general, when he invaded Italy during the Second Punic War, and the Roncesvalles, where Charlemagne's rearguard fought the famous battle with the Saracens in 778. The Ariège River, a tributary of the French Garonne, and the Segre, a tributary of the Spanish Ebro, have their sources in the Pyrenees. Railways between France and Spain cross the eastern and western ends of the Pyrenees where they are fairly low. In 1928 a railway was opened from Pau, France, to Saragossa, Spain, across Somfort Pass. In the French Department of Hautes-Pyrenees is found one of the most beautiful waterfalls in the world—the Gavarnie (1,385 feet high).

quagmire, an area of soft, miry land similar to a morass, which trembles and yields if stepped on. It is apparently a variant of the earlier name, quakemire.

Quai d'Orsay, a short street in Paris that extends along the left or south bank of the Seine. It is connected with the Place de la Concorde by means of the Pont de la Concorde. On it the Bourbon Palace, housing the Chamber of Deputies, and the Foreign Office are located. In American newspapers the term *Quai d'Orsay* is often used synonymously for the French government.

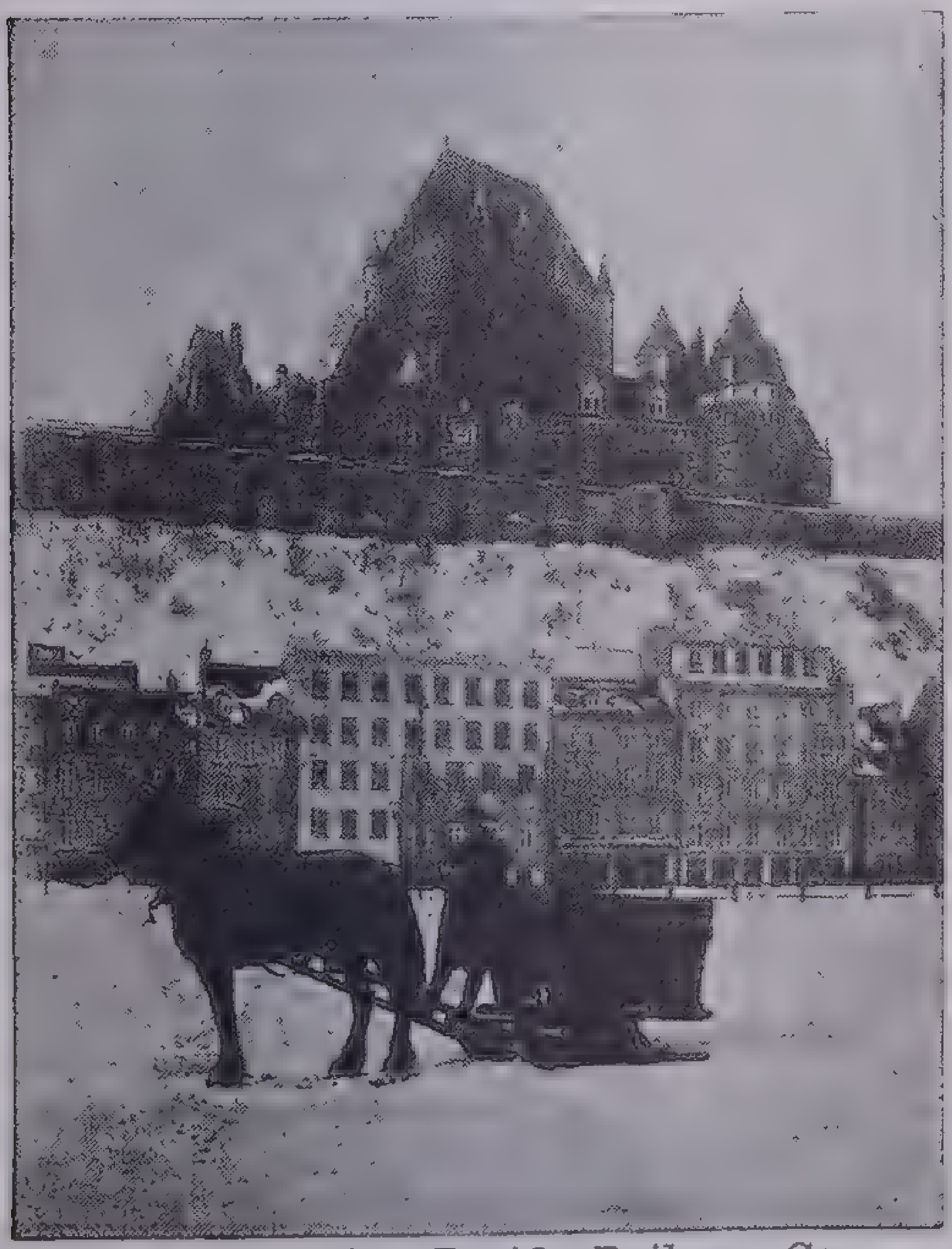
Quebec, a city of Canada and the capital of the province of the same name, on the north bank of the St. Lawrence River about 400 miles from the Gulf of St. Lawrence. The city has an enormous ocean and Great Lakes commerce during all but the three most severe winter months when the river is frozen. Lumber and lumber products comprise the leading exports, followed next by wheat and dressed meats. The importance of Quebec as a railroad center has increased since the construction in 1917 of the great Quebec Bridge (a cantilever structure with a channel span of 1,800 feet), and the city is now served by nine railroad lines. Among manufactures are paper, shoes, doors, candies, biscuits, foundry products, drugs, cigars and cigarettes. The population is about 131,000, nine-tenths of which is of French descent.

The older section of the city, the lower town, is almost medieval in aspect. The streets are narrow and crooked, and there still stand the 300-year-old Church of Notre Dames des Victoires, the Hôtel Dieu (a hospital) and the General Hospital and Nunnery. The highest part of the headland on which the upper town is built is Cape Diamond, 350 feet above the river. Surmounting it is the Citadel, which was begun by Count de Frontenac in 1693 and whose fortifications were designed by Wellington; it has 40 acres of parade ground. Until the days of modern artillery this Citadel was practically impregnable and was considered by the British their American Gibraltar.

Joining the Citadel and the Château Frontenac, a distinctive hotel operated by the Canadian Pacific Railroad, is the promenade called *Dufferin Terrace*. The upper town possesses also the historic Ursuline Convent in whose chapel is buried the Marquis de Montcalm, leader of the French forces in the battle whereby Quebec fell to the English in 1759. The Quebec Seminary, whose modern extension is Laval University, was founded in 1663 by Mgr. François Xavier de Laval-Montmorency, first Roman Catholic bishop of Quebec. The Basilica of Notre Dame, destroyed by fire in 1922, was rebuilt on the model of the original cathedral, erected in 1647.

Beyond the encircling city walls and gates are the Parliament buildings whose façade is adorned with a host of bronze statues symbolizing those who contributed to the early development of Quebec, such as priest, explorer, warrior, statesman and Red Man. On the Plains of Abraham where the battle of Quebec was fought September 13, 1759, a monument to the British commander Gen. James Wolfe stands. It rises above the boulder on which Wolfe died. One of the most celebrated miracle-healing shrines in the world is Ste. Anne de Beaupré, in the village of that name 21 miles northeast of Quebec.

The city was founded by Samuel de Champlain in 1608. The name is believed to be the Algonquin word for strait and to refer to the narrowing of the St. Lawrence on the west side of the Isle of Orleans. From 1841 until the formation of the Dominion in 1867, the city was the capital of Canada.



Courtesy Canadian Pacific Railway Co.

Château Frontenac, Quebec

The Château Frontenac, a distinctive hotel operated by the Canadian Pacific Railway Company and built in the style of the 16th-century royal châteaux of France, looms above Quebec's lower town. In front of it is a boardwalk called Dufferin Terrace. It is famous for its band concerts in summer and for tobogganing in winter

quicksand, a deep mass of loose sand in which solid bodies sink rapidly. It is made up of small round smooth particles that, since they do not form a compact mass, are dangerous to step upon when wet. Quicksand is usually found at the mouths of rivers or on sea coasts; it is also deposited by glaciers. One of the largest quicksand areas is Quicksand Cove on Aialik Bay, Alaska.

rapids, the part of a river where the current moves swiftly and its passage is obstructed by stones and rocks in the bed of the stream. It resembles a series of cascades of slight declivity.

The Lachine Rapids in the St. Lawrence River, a few miles below Montreal, are noted for their beauty. The most famous rapids in the United States are those in the St. Marys River at Sault Sainte Marie, Mich., between Lake Superior and Lake Huron. Canals have been constructed on both Canadian and American sides so as to circumnavigate the St. Marys Rapids. To promote commerce between Montreal and cities of the Great Lakes it was also necessary to construct the Lachine Ship Canal around the Lachine Rapids. The city of Grand Rapids, Mich., takes its name from the rapids of the Grand River. on which it is situated.

ravine, a defile, ordinarily larger than a gully, excavated by running water. In low land a ravine is generally shallow, but it may be deeper in a mountainous or plateau region. The word is French in origin.

Red Sea, a long, narrow arm of the Indian Ocean that extends in a general northwestern-southeastern direction and separates the Arabian Peninsula on the east from Egypt, the Anglo-Egyptian Sudan and Italian East Africa on the west. It is about 1,450 miles long, from 130 to 250 miles wide and has an area of about 177,030 square miles. The Suez Canal connects it with the Mediterranean Sea on the north; the Strait of Bab el Mandeb and the Gulf of Aden join it to the Indian Ocean on the south. The Sinai Peninsula separates its northern end into the gulfs of Suez and Aqaba. The shores of the Red Sea have few indentations. Chief ports are Suez, Suakin, Massaua and Mocha. The principal islands are the Dahlak Islands, included in Italian East Africa.

In ancient times the Red Sea played an important part in the commerce of Egypt, India and Arabia. Then it went through a period of comparative disuse until the opening of the Suez Canal in 1869 made it again one of the important water highways of the world. The miraculous passage of the children of Israel through the Red Sea is told in the 14th chapter of Exodus, and Moses' song of triumph is in the 15th chapter. The sea was called *red* in very early times—the modern *Italian* name *Eritrea* is just the Greek word for red. The water actually has a red tinge from red algae on the surface.

Red Square, the central square of Moscow, so designated since the founding of the city in 1147. The Kremlin dominates this rectangular area. Its most distinctive features are the Cathedral of St. Basil the Blessed and Lenin's Mausoleum. The predominant color in most Russian artcraft, the word *red* is synonymous with beautiful.

Redwood Highway, a 479-mile road that extends from San Francisco, Calif., to Grants Pass, Oreg., passing through the redwood forests and along the Pacific coast.

reef, a barrier of sand or rock extending along the seashore and generally enclosing a lagoon. Rock reefs are commonly of coral.

Regent's Park, one of the largest parks of London, situated in the northwestern part of the city. It is 472 acres in extent and contains the zoological gardens, Royal botanic gardens and an open-air theater. It was designed by John Nash in 1812 for the Prince Regent (later George IV) after whom it was named.

region, a territory indefinite in area but of considerable extent, marked by some feature peculiar to it, as the Arctic Region.

Réunion, an island of volcanic origin in the Indian Ocean 400 miles east of Madagascar, belonging to France. The area is 970 square miles, and the population, mostly a mixture of Negro, Indonesian and European blood, is about 198,000. The creole element, which constitutes the majority of the population, is descended from the early French settlers. The highest elevation is Piton des Neiges, 10,069 feet above sea level. On the flanks of this mountain, as evidence of its dormant volcanic activity, are found mineral hot springs. The only active volcano on the island is Piton de la Fournaise (8,713 feet high). Hurricanes cause great damage frequently. The principal products are sugar, manioc, cacao, coffee, tapioca, vanilla, spices, bananas, coconuts, breadfruit and cinchona. Rum is one of the chief exports.

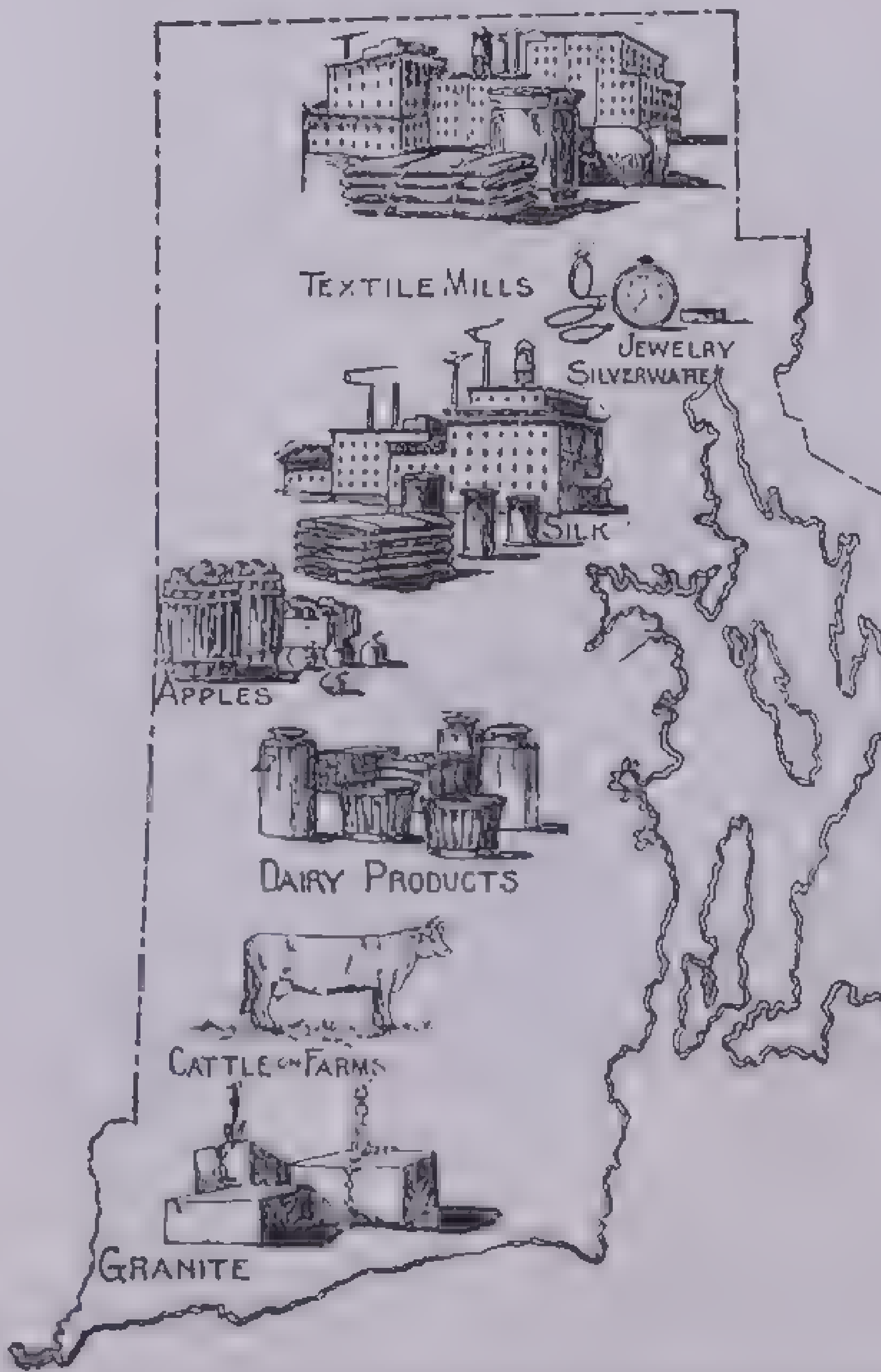
The capital of Réunion is St. Denis. Among the other important towns are St. Paul, St. Pierre and St. Louis. The island is represented in the French Parliament by one senator and two deputies. Assisting the French governor are a privy council and an elective council general. The island was discovered by the Portuguese navigator Pedro Mascarenhas in 1513 but was claimed by France in 1638 and again in 1649. Originally called the *Île de Bourbon,* the name was changed to Réunion by decree of the convention during the French Revolution. For a time during the Napoleonic regime it was known as *Île Bonaparte.*

Rhine, one of the great rivers of western Europe, rising in the St. Gotthard group of the Swiss Alps and flowing northeastward from the Grisons Canton. After forming the boundary between Switzerland on the west and Liechtenstein and Austria on the east, it joins the Lake of Constance. From the 100-foot-high falls at Schaffhausen the Rhine in its westward flow divides Switzerland from Germany. On turning northward it skirts the Black Forest between France and Germany and then winds northward through Germany. When it reaches the Netherlands border it flows westward and finally reaches the North Sea through its distributaries—the Waal, Lek and Old Rhine. It is about 825 miles long, drains an area of 86,000 square miles and is navigable from its mouth to Basel, Switzerland, a distance of 550 miles. Affluents of the Rhine are the Linth, Reuss, Ruhr, Aar, Neckar, Main, Nahe, Lippe, Saar, Lahn and Moselle rivers. Important cities on its banks are Mainz, Mannheim, Ludwigshafen, Duisburg, Cologne, Coblenz and Bonn. The Rhine is a great commercial artery and is joined to the Danube, Rhone, Meuse, Seine and other European rivers by various canals.

The river's course in Germany from Cologne to Mannheim is famous for its scenery, its legends and its historical associations. There are Xanten, the reputed birthplace of Siegfried of the *Nibelungenlied;* the Lorelei Rock near St. Goar where a river sprite sang and lured sailors to destruction; the twin-towered cathedral at Cologne whose proud possession is the reliquary containing the bones of the Three Magi; the birthplace of Beethoven at Bonn; and the Mouse Tower in the middle of the stream near Bingen where the cruel and greedy Hatto, Archbishop of Mainz, was said to have been eaten alive by mice about 970. The Rhine was a fortified boundary of the Roman Empire (remains of old Roman forts and walls are still found). Its control was battled for through long periods of history, until it was finally declared internationalized in 1868. The Treaty of Versailles after the World War confirmed this freedom.

Rhode Island, in the southeastern part of the New England region of the United States, the smallest American state. It is 50 miles long and 35 broad. The area of 1,248 square miles includes 181 of water surface. Massachusetts is on the north and east, the Atlantic Ocean on the south, and Connecticut on the west. The most densely settled state, it has about 700,000 inhabitants, more than 90 per cent of whom live in cities and towns.

The terrain is rolling, and hills and cliffs come to the water's edge. The state gets its name from its principal island, situated in Narragansett Bay, an arm of the Atlantic which gives excellent harbors for small boats and ocean shipping. The total shore line of mainland and islands, following the irregularities of the bay, is 156 miles.



Principal Products of Rhode Island

Its rivers are short and swift, affording fine water power, which was the basis of the state's early industrial progress. The Blackstone, rising in Massachusetts, is the principal stream.

Rhode Island's climate is more equable than in sections further from the sea, but winter storms are sometimes severe. The summer temperatures are mild. Though the climate is favorable to agriculture, the soil is unfavorable, and the crop production is limited. Truck gardening and poultry raising are the leading rural occupations.

Forest resources and mineral production are of negligible importance. The fisheries are of some value, and many citizens continue the seafaring traditions of the state.

In manufactures Rhode Island ranks high. It had the first American cotton spinning plant, and the textile industry—cotton, wool, rayon and silk—continues to employ thousands. Machinery, tools, jewelry and silverware are other products.

Providence, the capital and principal city, is described elsewhere. Pawtucket and Cranston, though politically separate, are a part of the capital district, with similar industrial interests. Woonsocket, a few miles to the north, is a textile mill city and has other large factories. Newport is a resort center noted for its colony of shore cottages and estates of wealthy owners. Narragansett Pier was one of the first American seaside resorts; it is still a popular summer playground.

Brown University in Providence and Rhode Island State College at Kingston are the principal institutions of higher education.

Every town in the state has some treasured specimen of colonial architecture. The varied beach and water recreations attract many summer visitors. Newport is one of the leading yachting centers of America.

Rhodes, an island in the Mediterranean Sea and 10 miles from Cape Alypo on the southwestern coast of Turkey. The area is 564 square miles, and the population about 56,000. The island is mountainous and the highest peak, Atairo, has an elevation of 4,560 feet. The agricultural products are those of a tropical climate, and citrus fruits, figs, pomegranates and olives predominate. Sponges are the chief export. In Rhodes, the chief town, are an old fortress and tower that were built by the Knights Hospitalers of St. John of Jerusalem, who occupied the island from 1310 to 1522; after being dispossessed by the Turks they established their seat on the island of Malta. The stone houses on the principal thoroughfare, called the Street of the Knights, still retain the armorial bearings of the Knights of Italy, France, Provence and Spain, and the hospital of the order has been converted into a museum.

Rhodes was of strategic importance in the days of the Greek city-states, and was alternately held by Sparta and Athens. After being conquered by the Persians and restored to the Greek fold by Alexander the Great, it began to assume *c.* 300 B.C. considerable power. It was especially noted for its schools of oratory and art, and in 280 B.C. at the entrance to its chief harbor the city erected in the *Colossus of Rhodes,* a brass statue of Apollo, 109 feet high. Until its destruction in the earthquake of 224 B.C. it was one of the Seven Wonders of the World. Italy took the island in the Turko-Italian War (1911–12), and the results of the World War left it in Italy's possession. The city of Rhodes is the capital of the Italian section of the Dodecanese, composed of the 12 islands of the Sporades group, which Italy owns in the Aegean Sea. The name *Rhodes* is derived from the Greek word meaning rose, one of the emblems of the sun-god Apollo.

Rhodesia, a British dependency of southern Africa, colonized during the latter part of the 19th century by the British South Africa Company and in 1923 formally annexed by Great Britain. It is named for Cecil Rhodes, founder of the British South Africa Company and the great empire-builder of the Union of South Africa. Rhodesia extends from the Transvaal and Bechuanaland to the Belgian Congo and Tanganyika Territory. On the west is Angola and on the east, Mozambique. The total area is about 441,000 square miles. For convenience of administration it is divided by the Zambezi River into Northern Rhodesia and Southern Rhodesia.

Northern Rhodesia is a British Crown colony with an area of 290,320 square miles. The population is about 1,371,000 of whom some 11,000 are Europeans. Since it occupies a high plateau region, the chief occupations are cattle raising and the growing of cotton, corn, wheat and tobacco. The Muchinga Mountains yield lead, zinc and copper. The new capital of Northern Rhodesia is Lusaka, where the duke of Kent laid the cornerstone of the new government buildings in 1934. Livingstone, located near the Victoria Falls of the Zambezi, was the former capital. The government is entrusted to a governor, assisted by an executive council of 5 members and a legislative council of 16 members. Among the country's natural features are Lakes Bangweulu and Mweru.

Southern Rhodesia also is a British Crown colony, with an area of 150,344 square miles and a population of about 1,212,000, of whom some 50,000 are Europeans. Most of the country is a fertile agricultural region whose crops resemble those of Northern Rhodesia. From the Inyangeni Mountains gold, copper, coal, chrome, asbestos, cobalt, vanadium and manganese are obtained. The capital is Salisbury. The colony is administered by a governor and a bicameral legislature, composed of an executive council, headed by a premier, and an Assembly of 30 members elected by popular vote.

Rhone, a river of western Europe that rises in the Rhone Glacier on the southern slope of the Dammastock of the Swiss Alps. It flows southwestward through the Canton of Valais, joins Lake Geneva, emerges at the city of Geneva and then flows southwestward to Lyon where it is joined by the Saone River. It then continues its course through southern France to the Gulf of the Lion, an arm of the Mediterranean. Extending from Arles the Rhone has built a delta of 370,000 acres; the land between its distributaries, the Grand and Petit Rhone, is called Camarque Island. The total length of the river is 505 miles, of which 360 miles are navigable waters. A system of canals that connects the Rhone with the Rhine, Loire, Meuse, Seine and other rivers adds much to its commercial value. Tributaries of the Rhone, besides the Saone, are the Avançon and Guier in Switzerland and the Valserine, Usses, Fier, Ain, Isère, Drome, Aygues and Durance in France. Among the towns on its banks are Geneva, Lyon, Vienne, Valence, Avignon, Arles and Tarascon.

Richmond, a city of the United States and the capital of Virginia, located in the eastern part of the state at the head of tidewater on the James River 127 miles from the Atlantic Ocean. The city's chief industry is the preparation of leaf tobacco; about 500,000,000 cigars and 40,000,000,000 cigarettes are manufactured here annually. Paper and paper products, iron, steel, flour, textiles and stone, clay, glass and wood products also are manufactured. Richmond is the leading printing and publishing center of the South, and as the seat of the 5th Federal Reserve Bank District it is also an important financial center. The population is about 193,000; including the suburban area, which covers 26 square miles, it is about 220,500.

Courtesy Virginia Conservation Commission

White House of the Confederacy at Richmond

This was the home of Jefferson Davis, President (1861–65) of the Confederate States of America. The building now serves as a museum for relics and mementoes of the Civil War

Richmond was the capital of the Confederacy and has many mementoes of the Civil War. The Executive Mansion, in which President Jefferson Davis and his family lived, is now a museum under the auspices of the Confederate Memorial Society. The home of Gen. Robert E. Lee, commander in chief of the Confederate Army, is now a museum of the Virginia Historical Society. This period is also commemorated by the Confederate Memorial Institute or Battle Abbey, noted for its mural paintings by Hoffbauer and portraits of Confederate statesmen and heroes. Along Monument Avenue are statues of Generals Robert E. Lee, J. E. B. Stuart and T. J. ("Stonewall") Jackson and a monument to Jefferson Davis.

The center of the city is Capitol Square. Surrounding it are the Capitol, State Library, State Office Building and Governor's Mansion. In the rotunda of the Capitol, which was designed by Thomas Jefferson and erected during 1785–92, is the statue of Washington by the famous French sculptor, Jean Antoine Houdon; even in her darkest hour of need during the Civil War, the city refused to part with this priceless treasure. West of Capitol Square is St. Paul's Protestant Episcopal Church, noted for its stained-glass windows, two of which are memorials to General Lee. In St. John's Protestant Episcopal Church Patrick Henry electrified the delegates to the Virginia Convention, assembled here on March 20, 1775, to hear the report of the First Continental Congress, with his words: "Give me liberty or give me death." The Sacred Heart (Roman Catholic) Cathedral is a beautiful edifice.

Famous as an educational center, the city is the seat of the University of Richmond, which was founded in 1832; the Medical College of Virginia; and extensions of both the University of Virginia (located in Charlottesville) and the College of William and Mary (located in Williamsburg). The parks aggregate 800 acres and include: Maymont Park and Museum; Chimborazo Park; Libby Hill, where stands the Soldiers and Sailors' Monument to the Civil War dead; and Gamble's Hill, whose cross is a replica of the one said to have been planted there in 1607 by Captain John Smith of the Jamestown colony. The Old Stone House, built in 1737 and considered to be the oldest house in Richmond, has been converted into a shrine to Edgar Allan Poe, who lived in Richmond during the late 1830s and edited the *Southern Literary Messenger.* A library honors the poet Father Tabb.

Richmond was founded in 1733 by William Evelyn Byrd and was so named because its situation is like that of Richmond on the Thames in England. In 1742 it was incorporated as a town and 40 years later was chartered as a city.

ridge, the top of a hill or mountain, called (according to process of folding) *anticlinal*—an upward fold of strata in which the beds dip on both sides from the ridge; and *synclinal*—a downward fold of strata in which the beds from opposite ridges meet in a troughlike valley. The term may similarly refer to the upper part of a mountain chain, as the ridges of the Himalayas.

rill, a small stream, such as a brook or rivulet. *Rill marks,* preserved in rocks, were made by rills of water trickling over a sandy or muddy beach at ebb tide.

Photo by W. E. Barr, Rochester, N. Y.

Harbor of Rio de Janeiro

The pointed rock rising 1,270 feet above the sea is Sugarloaf

Ringstrasse, a Viennese boulevard, 3¾ miles long, which encircles the city, occupying the site of the 13th-century inner fortifications that were razed in 1858. Its principal sections are the Stuben Ring (on which is located the Austrian Museum for Art and Industry), Park Ring (named for the adjoining City Park), Schubert Ring (adorned with a monument to the composer Franz Schubert), Kartner Ring, Opern Ring (on which the State Opera House stands) and Burg Ring (noted for the colossal statue of Marie Theresa and the buildings housing the museums of art and of natural history). The Parliament Building faces the Dr. Karl Lueger Ring, and the Rathaus (City Hall), Burgtheater and University front the former Dr. Ignaz Seipel Ring.

Rio de Janeiro, the capital of Brazil, located in the southeastern part on the Bay of Guanabara. It has one of the most beautiful landlocked harbors in the world, the entrance to which is through a natural channel less than 1 mile wide, guarded by the famous rocky cone, Pão de Açúcar (Sugarloaf). Rising in the background is the Corcovado (Hunchback) Mountain, on whose 2,800-foot-high summit stands a heroic statue of Christ the Redeemer. The city is the leading commercial center of the country, receiving more imports than any other Brazilian port and second in exports only to Santos, the great coffee port. Rio de Janeiro's exports include sugar, meat, hides, coffee, rubber, cotton, cabinet woods, tapioca, tobacco, cigars and cigarettes. Its manufactures are principally textiles, flour, glassware, boots and shoes, chemicals, cigars, cigarettes and caustic-soda products. The population of the city proper is 1,585,000; its area is 158 square miles. The Federal District, in which the city is located as the country's administrative center, has an area of 451 square miles and a population of 1,700,000.

The city is built on a plain only a few feet above sea level and surrounds the harbor on three sides. A great boulevard, the Avenida Rio Branco, extends for almost 2 miles through the business section and as the Avenida Beira Mar curves around the shore of the bay for 15 miles, ending at Rio de Janeiro's superb beach, Praia de Copacabana. Along this drive the promenade sidewalks are paved with colored tiles arranged in striking patterns. Lining the Avenida Rio Branco are some of the city's finest buildings, such as the Monroe Palace (named for the father of the Monroe Doctrine and housing the National Senate), Municipal Building, National Library, Academy of Fine Arts and the Municipal Theater, the city's famous opera house. In the Cattete Palace on the Avenida Beira Mar are the President's executive offices, and the Guanabara Palace serves as his residence. The former imperial palace, Quinta da Boa Vista, facing the park called Praça 15 de Novembro, is now occupied by the National Museum. The city is also the seat of the University of Rio de Janeiro, founded in 1920 by the consolidation of the Polytechnic school, medical school and law school.

In addition to specializing in Brazilian flora the botanical gardens of Rio de Janeiro contain more than 5,000 plant species from all parts of the world. Among other attractive parks are the Jardim da Praça da Republica and the zoological gardens. In 1920 the Morro do Castello, the hill on which the city was originally built, was leveled the soil being used to form a peninsula for Rio de Janeiro's international airbase, named for the dirigible designer, Alberto Santos-Dumont, a Brazilian by birth.

Rio de Janeiro was founded in 1565 by Estacio de Sá. It owes its name, however, to an earlier Portuguese explorer, Martim Affonso de Souza, who believed that when he sailed into the Bay of Guanabara, on January 1, 1541, he had entered a river; he named it Rio de Janeiro, which means River of January. The later settlers christened it São Sebastião do Rio de Janeiro, in honor of St. Sebastian on whose feast day (Jan. 20, 1567) they destroyed the encroaching settlements of French Huguenots.

Rio de Oro, a Spanish colony in northwestern Africa that borders on the Atlantic from Wad Draa on the north to Cape Blanco on the south. Morocco bounds it on the north, Algeria on the east, and French West Africa (Mauritania) on the south. The total area is 109,200 square miles; it includes the colony proper (65,000 square miles), the protectorate of Cape Juby territory (34,700 square miles) and an occupied territory (9,000 square miles) stretching from Cape Juby to Wad Draa. Since most of the region is desert, it is often called the Spanish Sahara. The population, about 100,000, consists mostly of Bedouins. The capital, Villa Cisneros on the Rio de Oro Peninsula in the southwestern part, is the residence of a sub-governor. The entire Spanish Sahara is administered by the captain general of the Canary Islands, which lie off the northwestern coast and form a Spanish province. The name *Rio de Oro* (meaning river of gold) is the Spanish form of the name which Portuguese explorers bestowed in the 15th century. They mistook the estuary between the Rio de Oro Peninsula and the mainland for a river and believed that the region was an El Dorado, since they obtained from the natives a quantity of gold dust.

river, a large stream of water flowing from a specific source, such as a spring or glacier, in the hills or mountains to a definite mouth on the sea coast or shore of a lake. The bottom of the channel is called the *bed,* and the sides are called *banks.* The speed of flow varies with the type of region: the Volga, flowing through lowlands, is slow; the Missouri, flowing through more sloping country, is comparatively fast. Generally, however, near their sources rivers flow swiftly, and their currents are slower when they enter more level plateau or plain regions. They empty into the ocean either directly or indirectly by uniting with a larger river or flowing into lakes whose waters eventually reach the sea.

Rivers often aid soil conditions by depositing as bottom lands and alluvial fans the fertile silt that they have held in suspension. As erosive agents they destroy soil by carrying away with the aid of gullies and creeks that empty into them the top soil. Rivers also provide water for hydroelectric power and irrigation, aid transportation and the disposal of waste and are of further importance since cities, planted on their banks, develop industrially and serve as trade centers.

Like mountains, river systems are classified as young, mature and old. Young rivers generally have numerous falls and rapids that furnish abundant water power; they flow through narrow V-shaped valleys and are perfect drainage or erosive agents. Mature rivers follow a more meandering course through broad U-shaped valleys and act as both erosive and depositing agents. Old rivers generally flow slowly through level regions, depositing their load of silt as bottom lands and deltas, but they are negligible as erosive agents. Some rivers, such as the Mississippi, are a combination of all three types.

The world's largest river system is that of the Amazon (3,854 miles long). Among other notable rivers are the Nile, Yangtze, Congo, Hwang Ho, Niger, Mackenzie, Paraná, Yukon, Colorado, St. Lawrence, Rhine, Danube and Hudson.

Riverside Drive, a beautifully landscaped boulevard of New York city, which extends along the eastern bank of the Hudson River from 72d to Dyckman Street, Manhattan. Facing the drive are towering apartment houses. It is also the site of Grant's Tomb, the Soldiers and Sailors' Monument to the Civil War dead and the Gothic-styled Riverside Church. Through the Fort Tryon park and Inwood Hill sections the drive continues northward over the Henry Hudson Bridge as the Henry Hudson Parkway.

roadstead, a protected recess, generally a bay or an estuary, where ships may safely ride at anchor, as Hampton Roads, the estuary of the James River.

Rockefeller Center, New York city. This great building project occupies most of 3 blocks facing Fifth Avenue in the heart of Manhattan. It includes the world's largest theater, the world's largest office building and many other distinctive structures. In them some 20,000 people find employment. Other features are a great sunken court and a group of outdoor gardens 140 feet above the street in which are some 2,000 growing trees, all connected by galleries and concourses. The firms of Reinhard and Hofmeister, Hood and Fouilhoux and Corbett, Harrison and MacMurray designed these buildings.

Rocky Mountains, the great mountain chain of western North America that extends more than 4,000 miles from Alaska southward through Canada and the United States into Mexico and that forms the backbone of the continent. Between the Rockies and the various ranges along the Pacific coast—Cascade, Sierra Nevada and Coast—lie the plateaus and the Great Basin, which vary from 3,000 to 8,000 feet in elevation. To the east of the Rockies are the Great Plains that slope gradually to the Mississippi Valley.

The Rocky Mountains begin in Alaska with the Endicott, Alaska and Mt. St. Elias ranges. In Canada they form the boundary between the provinces of British Columbia and Alberta and include the Mackenzie, Pelly, Stikine, Cariboo and Selkirk ranges. In the United States they cross the states of Montana and Idaho (Bitter Root Range), Wyoming (Big Horn Mountains), Utah (Wasatch Range), Colorado and New Mexico (Sangre de Cristo Mountains) and Texas (Sacramento Mountains). In Mexico are the Sierra Madre Mountains.

Among the high peaks of the Rockies are Mt. McKinley (20,300 feet) and St. Elias (18,008 feet) in Alaska; Mt. Logan (19,850 feet) in Canada; Mt. Whitney (14,496 feet), Mt. Elbert (14,420 feet) and Mt. Rainier (14,408 feet) in the United States; and Popocatepetl (17,880 feet) and Ixtacihuatl (17,343 feet) in Mexico.

The crest of the Rocky Mountains forms the Continental Divide from which such rivers as the Fraser, Columbia, Snake and Colorado flow west to the Pacific, and others such as the Nelson-Saskatchewan, Missouri, Platte, Arkansas, Red and Rio Grande flow east to Hudson Bay, the Great Lakes, the Mississippi River or the Gulf of Mexico. The governments of the United States and Canada have set aside a number of national parks so that the rugged grandeur of these mountains may be preserved for the enjoyment of their peoples. There are Yellowstone National Park in Wyoming, Rocky Mountain National Park in Colorado, Glacier National Park in Montana and Jasper and Banff National parks in Alberta.

Rome, the capital and largest city of Italy, situated in the west-central part on the Tiber River 16 miles from its mouth, and surrounded by the Campagna, a plain stretching from the Mediterranean Sea to the Sabine Hills. Rome is also the capital of the province of Rome in the Lazio section. The ancient city was built on seven of the Sabine Hills—the Palatine, Aventine, Caelian, Esquiline, Viminal, Quirinal and Capitoline. Early in the Christian era, it was extended onto the Campagna and was built up especially on the Campus Martius (Field of Mars) to the north and on the right bank of the Tiber beneath the Vatican Hill, which is crowned by S. Peter's Cathedral and the residence of the popes. This region was in many respects unhealthful, but the malaria-ridden marshes of the Pontine plain have been eradicated through modern drainage. The manufactures of Rome are principally silk goods, jewelry (especially cameos and artificial pearls), mosaics, terra cottas, artificial flowers, cigarettes and macaroni. The population is a little more than 1,000,000.

Historically Rome is the world's most famous city. One may gaze upon the ruins of the Colosseum and Forum and Pantheon and survey the emblems of 20 centuries of Roman achievement. He may view within a stone's throw of one another the largest church and palace and tomb in the world—St. Peter's, the Vatican and Hadrian's Mausoleum (the Castel of Sant' Angelo). As to the present, all that the unification of modern Italy has come to mean is summed up in the colossal monument to Victor Emmanuel II in the Piazza di Venezia; buried beneath the Altar of the Country at the base of the king's equestrian statue is Italy's Unknown Soldier of the World War.

Ancient Landmarks of the Eternal City. The Colosseum or Flavian Amphitheater is now the imposing ruin of a superb structure that was built to make a Roman holiday. Begun by Vespasian a few years after Nero's death it rose on the site of that emperor's artificial lake (where galleys fought sham battles for his amusement) and was completed about 80 A.D., by Titus, conqueror of Jerusalem, whose 300,000 Jewish prisoners labored on its construction. It had four stories, each formed by a series of brick and concrete arches faced with marble; it measures 615 feet in length and 510 feet in width. Fifty thousand persons could be accommodated at the Colosseum's chariot races and gladiatorial combats.

Courtesy Italian Tourist Information Office

University City, Rome

A huge statue of Minerva, the goddess of wisdom, is reflected in a lagoon in front of the Rectorate of the *Studium Urbis* (University City). This building is a fine example of modern architecture in Rome. With the Library, Aula Magna (Great Hall) and buildings of the various faculties or departments it covers an area of 215,000 square meters. The University of Rome was founded in 1265. Its newest buildings were dedicated in 1936

The Forum or marketplace was the civic center of ancient Rome, and the one now exposed belongs to the time of Julius Caesar or the period between the Republic and the Empire. Buried beneath it are Rome's remains of two or three other periods. The Forum is reached by the Via Sacra (Sacred Way), over which has passed from the Capitoline Hill the triumphal procession of many a conqueror. Other important ruins are: the Regia or office of the Pontifex Maximus; temple of Vesta and palace of the Vestal Virgins; Rostra or altar on which sacrifices were offered; Basilica Aemilia or law court; temple of Julius Caesar, erected after his deification by Augustus; temples of Saturn and of Castor and Pollux; and the Curia or Senate chamber, known today as San Adriano's Church.

Another remarkable monument of ancient Rome is the Pantheon, erected in 27 B.C. by Agrippa and remodeled by Hadrian. It was built in honor of all the gods—Pantheon means of all the gods. In the 7th century it was converted into a Christian church and named St. Mary of the Martyrs; it became the repository of numerous relics of the martyrs brought from the catacombs or underground labyrinth cemeteries of the early Christians. The brick and concrete rotunda of the Pantheon, which is faced with marble, is 142 feet in diameter and is lighted by an opening 25 feet in diameter at the apex of the dome. Bronze from the roof of the portico was used to make the baldacchino in St. Peter's Cathedral. It has been said that the Christians, in building their churches and the palaces of their prelates, wrought more havoc to the temples and palaces of the Caesars than all the barbaric hordes that invaded Rome. The Pantheon is now the mausoleum of some of Rome's departed rulers and great men and contains the tombs of Victor Emmanuel II, Humbert I and the artist Raphael.

Among other ruins of ancient Rome are the Tullianum or Mamertine Prison, in which were imprisoned Vercingetorix, Jugurtha, Sts. Peter and Paul; the tomb of Caecilia Metella on the old southern military road called the *Appian Way;* the arches of Constantine, Titus and Septimius Severus; the column and forum of Trajan; and the Forum of Augusti, of Vespasiani and of Julian. The palaces of the Caesars on the Palatine Hill, the baths of Caracalla and Diocletian, the sewer called the *Cloaca Maxima,* the Claudian Aqueduct, the city wall built by the Emperor Aurelian and the Tomb of Hadrian are other features of interest. Since the days of Gregory the Great the Tomb of Hadrian has been popularly called the Castle of Sant' Angelo; for, according to tradition, as the pontiff was on his way to pray for a cessation of the plague that was devastating the city, an angel appeared with sheathed sword and he knew that his prayer was answered. Today this tomb is a military museum, sheltering the flags of victorious Italian regiments.

A Religious and Cultural Center. The mother church of Roman Christendom is St. Peter's Cathedral, a description of which, together with the famed churches of St. John Lateran, St. Paul's-without-the-Walls and Santa Maria Maggiore, will be found in the article on Vatican City. Among the city's other 300 churches is San Pietro in Vincoli, containing the tomb that Michelangelo designed for Pope Julius II; the most important feature of this tomb is the statue of Moses, flanked by smaller statues of Rachel and Leah typifying the active and contemplative life. The Church of Trinità dei Monti is approached by the famous Spanish steps, designed by Specchi in the 18th century.

The residence of the king of Italy is the Quirinal Palace, originally a summer palace of the popes. Another former papal residence is the Palazzo Venezia, now occupied by the Premier, Benito Mussolini. The Farnese, Colonna, Barberini, Torlonia, Doria and Orsini palaces are representative of some of the oldest Roman families but now house art collections or libraries. Of special interest are the Corsini Palace, assigned to the National Gallery of Ancient Art, and the Farnesina Palace, headquarters of the Royal Academy of Italy. The Villa Umberto I (formerly the Villa Borghese) is the National Modern Art Gallery and contains the work of leading Italian artists of the 19th and 20th centuries; in its Galleria Borghese are various masterpieces, such as *Sacred and Profane Love* by Titian and *David* by Bernini.

Under the Fascist regime a new forum and stadium, named for Mussolini, have been erected and several of the ancient forums have been excavated and their buildings restored. A subway system has been built under the Seven Hills, and districts have been cleared so as to afford more impressive vistas of the Victor Emmanuel Monument and several of the old ruins. Surrounding the Colosseum, for instance, are the Oppian Park and Park of Trajan. Among the new streets are Via dei Trionfi, Via dell' Impero, Via del Mare, Via di Valle Murcia and Via Nazionale.

Aside from that of the Vatican Rome's most famous art collection is in the Capitoline Museum. Among its statues are the *Dying Gaul, Marble Faun, Thorn Extractor, She-Wolf Suckling Romulus and Remus* and *Father Tiber.* In front of the Capitol is an equestrian statue of Marcus Aurelius. The most notable fountain in Rome is the 18th-century Fountain of Trevi showing Neptune driving his steeds. Surmounting the Janiculum Hill in the Piazzale del Gianicolo is the Garibaldi Monument, and leading to it is an avenue flanked by busts of the heroes of the wars for the unification of Italy.

As an educational center the city is the seat of the University of Rome, founded in 1265 and now housed in the new Studium Urbis or University City whose most important buildings are the Rectorate, Library, Aula Magna and centers of the various faculties. It also has the Higher Institute of Economic and Commercial Education, School of Architecture and the Plastic Arts, Engineering College and Conservatoire of Music. Under the auspices of the Vatican are the College for the Propaganda of the Faith and the Pontifical Academy of Ecclesiastical Nobility, which affords training for administrative and diplomatic careers in the service of the State of Vatican City. In the American Academy are the schools of classic studies and of architecture.

The government of the city since 1925 has been entrusted to a governor appointed by the king. Assisting him is an advisory council of 12 members.

According to legend Rome was founded in 753 B.C. by Romulus, son of Sylvia by the god Mars who, with his twin brother Remus, was reared by a she-wolf and who later slew that brother because he sneered at the furrow Romulus had plowed on the Palatine Hill as boundary of the city. From the destruction of Carthage and overthrow of the Greeks at Corinth in 146 B.C. until the fall of the Roman Empire in 476 A.D., this city, called by the Romans the Eternal City, was mistress of the world. The Italian and the Latin form of the name is Roma.

Rue de la Paix, a short but handsome street of Paris, connecting the Place Vendome and the Place de l'Opéra. It is noted for its exclusive shops, including those of the world-renowned Parisian coutouriers that set women's styles. On this street are also located the best jewelers in Europe.

Rumania, a Balkan kingdom of southern Europe, bounded on the north by Czechoslovakia and Poland, on the east by the U.S.S.R. and the Black Sea, on the south by Bulgaria and on the west by Yugoslavia and Hungary. The Carpathian Mountains extend through the north-central part of the country, and Rumania's prewar northern frontier is marked by the Transylvanian Alps. For a distance of 300 miles the mighty Danube forms the country's southern boundary, extending from the town of Bazias through the pass of the Transylvanian Alps known as the Iron Gates to the town of Turtacaia, whence it flows northward and discharges into the Black Sea. Another internationalized river, the Dniester (called by the Rumanians the Nistru), forms part of the northern boundary. The interior is drained by several tributaries of the Danube, including the Muresh, Olt and Sereth. Rumania's topography is mountainous in the north, plateaulike in the central part, plainlike in the south and marshy along the coast, especially in the region of the Danube delta.

Since the World War, Rumania's area has been increased from 53,489 to 113,887 square miles. By the Treaties of St. Germain and Trianon she acquired from Austria-Hungary Transylvania, Crisana and Maramures, the Banat and Bukovina. Bulgaria surrendered Dobrudja (Dobrogea) in accordance with the Treaty of Neuilly. Not until 1933, though, did the U.S.S.R. acknowledge Rumania's sovereignty over the steppelike territory of Besafter a plebiscite late in 1918. Seriously threatened in 1940 Rumania ceded about half of Transylvania to Hungary; Bessarabia and two districts of Bukowina to Russia, and 2983 square miles of Southern Dobruja to Bulgaria.

Rumania owes the great fertility of the southern plains largely to the alluvial deposits of the Danube. About four-fifths of the population gain a livelihood from agricultural pursuits, and nearly half of the area is under cultivation or utilized as pasturage. All the cereals are raised in large quantities; corn (maize) and wheat are the chief crops. Other products include potatoes, sugar beets, legumes, olives, grapes, figs, citrus fruits, flax, tobacco, sunflower seeds and honey. The forests that cover one-fourth of the total area yield all the lumber re-

Courtesy Rumanian Legation, Washington, D. C.

Rumanian Peasants

A woman of Transylvania

Men of the Carpathian Mountains

quired for domestic use; and their principal trees are the pine, fir, oak and beech.

Rumania is noted for its large mineral deposits, which include coal, iron, copper, gold, silver, lead, magnesite, chrome and bauxite. Onyx is the most important stone. The salt mines, among the state's chief monopolies, are said to be capable of supplying the requirements of the whole world. The petroleum deposits are the largest in Europe and yield an average of 60,000,000 barrels each year. Linked with these raw materials are the principal manufactures—metal products, textiles, flour, leather goods, chemicals, glassware, paper and refined petroleum products. The Danube fisheries yield about 50,000 tons annually; carp and sturgeon (from whose roe caviar is made) are the most numerous fish.

After the formation in 1866 of the Kingdom of Rumania out of the united Turkish principalities of Walachia and Moldavia, followed by the achievement of complete independence at the close of the Russo-Turkish War in 1878, Rumania became a constitutional, hereditary monarchy. Executive power was entrusted to the king, and he was assisted by the Council of Ministers, headed by a premier. The Parliament consists of the Senate of some 170 members and a Chamber of Deputies of some 350 members. A new constitution, carrying a bill of rights, was adopted in 1927. King Carol II made himself dictator in 1938.

The seat of government is Bucharest (population, about 640,000), a gay, cosmopolitan city often called a miniature Paris. It is inland, near the southern border and is the most important commercial center of the kingdom. Its notable buildings include the Royal Palace, Parliament Building, Metropolitan Church (Byzantine in style), Roman Catholic cathedral, Town Hall, National Theater and University (founded in 1864). Kisilev Park is patterned after the Champs Élysées in Paris. Among other commercial centers are Chishineu (Kishinev), Cluj (Klausenburg), Iassy (Jassy), Cernautsi (Cernowitz), Galatz (Galati) and Brashov (Kronstadt). Constantsa (Constanza) is the principal seaport. The most famous of the Rumanian spas are Carmen Sylva (named for the queen of King Carol I) and Tekirghiol. The principal seaside resorts are Mamia, Elforia and Balcic (Baltchik). At the mountain resort of Sinaia is the royal summer palace, Castle Pelesh.

The name *Rumania* is derived from *Rumeni* or *Romani* (Romans). The native Rumanians speak a neo-Latin dialect and are descendants of the colonists who settled in the Roman province of Dacia during Trajan's reign about 100 A.D.

run, a small stream, usually one flowing through a comparatively level country. Two important battles of the Civil War were fought on the banks of the Bull Run in northeastern Virginia, on July 21, 1861, and Aug. 29–30, 1862. The word is part of another historic place named Runnymede (streamy meadow), where the Magna Charta was signed.

Sahara, the world's most extensive desert with an area of 3,500,000 square miles in northern Africa. It extends from the Nile Valley on the east to the Atlantic Ocean on the west. Bounding it on the north are the Atlas Mountains and the Mediterannean coastal plain. On the south it merges into French Sudan and Niger (parts of French West Africa) and into the southern part of the Anglo-Egyptian Sudan. The north-to-south length of the desert varies from 800 to 1,500 miles. The Libyan Desert of Libya and the Nubian Desert of the Anglo-Egyptian Sudan are the easternmost extensions of the Sahara in Africa. Three-fifths of the Sahara belongs to France; Great Britain, Egypt, Spain and Italy claim the rest.

The surface of the Sahara varies from the shifting sands of the Libyan desert in the northeast (some of which is below sea level) to the stony Tibesti mountain region of Niger in northern French West Africa (where the elevation is as much as 10,000 feet). The few inches of rainfall in numerous sections sink into the ground, forming natural springs and subterranean rivers to which oases owe their creation. The best known of these are the Oases of Farafra and Cufra in the Libyan Desert; the Siwa Oasis in this desert is the ancient site of the temple to Jupiter Ammon. Small towns and caravan centers are located at these oases. The scanty grass affords pasturage for sheep, goats and asses and agriculture is practiced on an intensive scale. The chief products are dates, olives, citrus fruits, coffee and cotton. Nomad tribes of Berbers, Tuaregs, Bédouins and Sudanese are the chief inhabitants of the desert.

The principal means of travel across the Sahara is camel caravan, although railway routes have been planned at various times and there is some airplane travel. Some of the principal caravan routes are: from Tripoli, Syria, through Chadames and Chat in Libya, to Zinder in Niger and Kano in Nigeria; from Senegal through Nioro to the Upper Niger; across the western part of the desert to Timbuktu, French Sudan; and between Wadai in Chad Territory and Bengasi in Libya. In olden days a great deal of ivory was carried across the desert from the Ivory Coast and other sections noted for their ivory production.

The Egyptians explored some parts of the Libyan and Nubian deserts; the Phoenicians and Carthaginians knew the northwestern part; Jewish and Genoese traders traveled over the desert, and some of their knowledge was put on maps in Majorca in the 15th century. During the 19th century a number of explorers penetrated the desert at various parts; Gerhard Rohlfs (1831–96), a German, was the most successful of these. In the present day airplanes are adding much to the world's knowledge of the Sahara.

The name *Sahara* is the Arabic for desert.

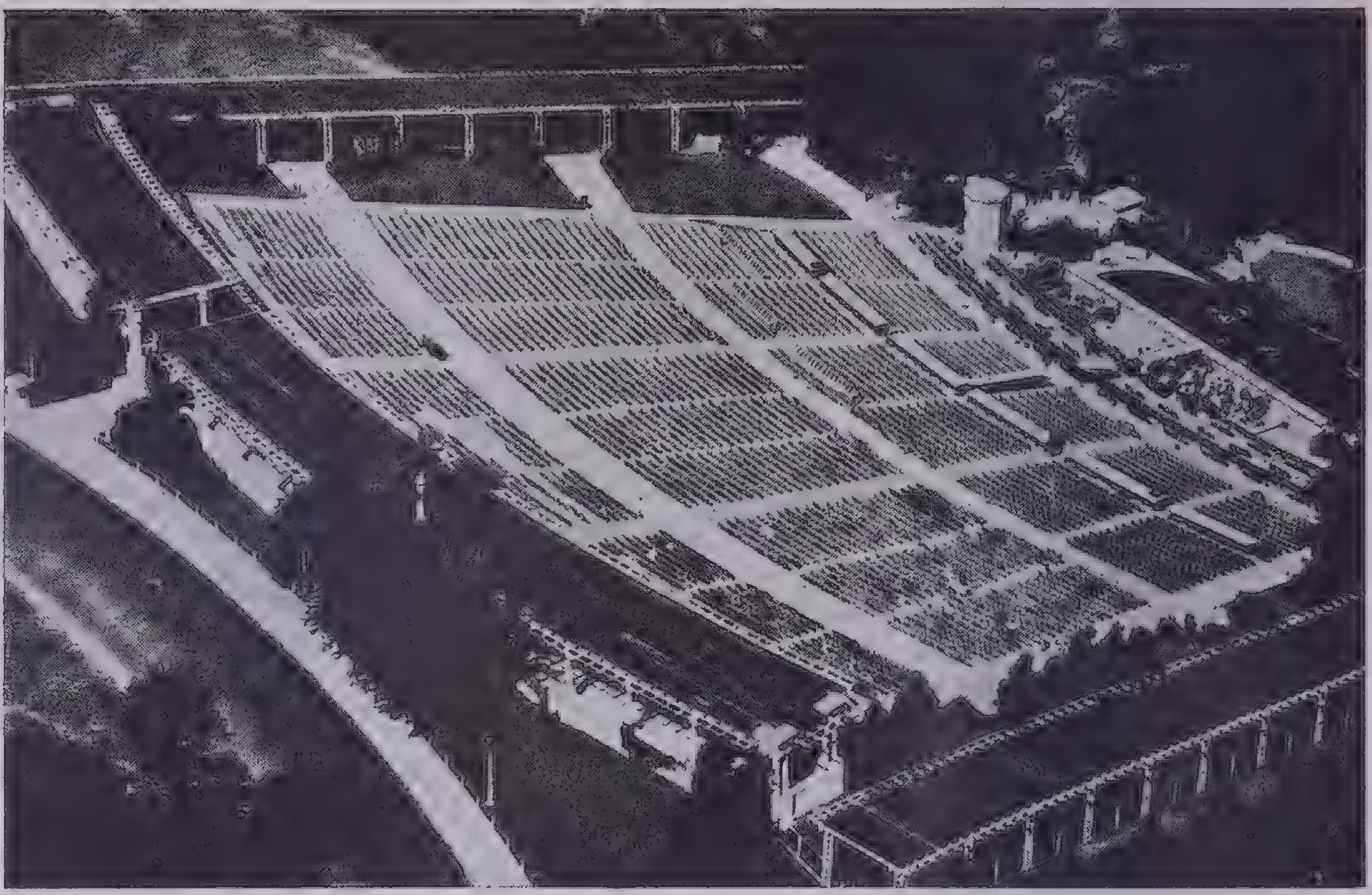
St. Bernard, Great, a pass of the Pennine Alps, leading from Martigny, Switzerland, to Aosta, Italy, a distance of 53 miles. It connects the valleys of the Rhone and the Dora Baltea. On its 8,111-foot high summit St. Bernard founded in 962 a hospice, which for centuries has been famous for its St. Bernard dogs, a strong, intelligent breed that is especially trained by the monks in the rescue of storm-belated travelers. Napoleon invaded Italy over the Great St. Bernard Pass in 1800. Hannibal is supposed to have used the 39-mile-long Little St. Bernard Pass, connecting the French town of Bourg St. Maurice and Aosta, when he invaded Italy at the start of the Second Punic War in 218 B.C.

St. Helena, an island of volcanic formation in the South Atlantic Ocean, located about 1,200 miles west of Angola, Africa, and famed as the place of final exile of Napoleon (1815–21). A British Crown colony, it has an area of 47 square miles (only about one-third of which is cultivable), and a population of 4,000 of mixed European, Negro and Indonesian blood. Potatoes and flax are the chief crops. Jamestown (named for James II) is the residence of the British governor and headquarters of a detachment of the Royal Marine Artillery. St. Helena was discovered in 1502 by the Portuguese navigator João de Nova, who named it for the saint on whose day it was sighted. It has belonged to Great Britain since 1651, the original proprietors being the British East India Company. Longwood, Napoleon's home, is preserved as a museum.

St. James's Park, a 93-acre area in London established as a deer park by Henry VIII; it was redesigned by the French landscape gardener Le Notre, during the reign of Charles II and further improved by John Nash during the reign of George IV. A fine avenue, called the *Mall,* extends diagonally from the Admiralty Arch on the northeastern side of the park to the Victoria Monument and Buckingham Palace, the London residence of the king. Along the eastern side are the various government offices of Whitehall. On the northwestern side is St. James's Palace, built by Henry VIII. It is still to the "Court of St. James's" that foreign ambassadors and ministers are accredited.

St. Lawrence, a river of northeastern North America that carries the waters of the Great Lakes from the eastern end of Lake Ontario to the Gulf of St. Lawrence and the Atlantic Ocean. The St. Lawrence itself is about 800 miles long and 90 miles wide where it enters the gulf. From its real source in the St. Louis River of Minnesota, which empties into Lake Superior, through the four other Great Lakes and their connecting links, however, it is more than 2,200 miles long. Beginning with the Thousand Island region near Lake Ontario, the St. Lawrence forms as far as Cornwall, Ont., the political boundary between the Canadian province of Ontario and the state of New York. It then flows northeasterly across the province of Quebec to the Gulf of St. Lawrence.

Including the Great Lakes Basin, the St. Lawrence drains an area of 530,000 square miles. The chief tributaries are the Ottawa, St. Maurice, Saguenay, Richelieu and St. Francis rivers in Canada and the Raquette and Oswegatchie rivers in the United States. Canadian cities along its banks are Kingston, Brockville and Cornwall, Ont., and Montreal, Trois Rivières, Quebec, and Levis, Quebec. Ogdensburg, N.Y., is the only important United States city. Much of the country through which the St. Lawrence flows is heavily forested, and lumbering and papermaking are important industries of Trois Rivières and other cities. The St. Lawrence is navigable to ocean liners as far as Montreal.



Courtesy St. Louis Chamber of Commerce

Outdoor Municipal Theater, Forest Park, St. Louis

During the summer season lasting for 12 weeks, beginning on the first of June and ending the last of August, light operas are presented nightly in the great amphitheater. Its capacity is 10,000 persons

The Gulf of St. Lawrence is the huge estuary of the St. Lawrence River, about 250 miles long and varying in width from 35 miles below the Island of Orleans to 90 miles at the entrance on the western side of Newfoundland through Cabot and Belle Isle straits. Prince Edward Island, itself a province of the Dominion of Canada, lies in the gulf off the northern coast of New Brunswick and Nova Scotia; the large barren island of Anticosti lies at the mouth of the St. Lawrence River. Among the other islands are Magdalen and Shippegan. Ports on the Gulf of St. Lawrence are Port aux Basques, Newfoundland; Tracadie, New Brunswick; and Elmira and Tignish, Prince Edward Island.

The St. Lawrence River is spanned by numerous bridges, the most notable being the Quebec Bridge, a cantilever structure with channel span of 1,800 feet, and the Victoria Jubilee, Montreal-Longueuil and Galipault bridges at Montreal. In 1932 there was signed a treaty between the United States and Canada that provided for the eventual construction of the St. Lawrence Waterway. This calls for deepening the river's channel and improving the canals so that ocean vessels may proceed from Montreal around the Lachine and other rapids to any port on the Great Lakes.

Jacques Cartier discovered the St. Lawrence in 1534–36. Samuel de Champlain explored the whole river system to Lake Huron from 1603 to 1616 and took possession in the name of France. The Treaty of Paris at the end of the Seven Years' War in 1763 made it British. The international boundary was finally determined after a survey in 1817 and was confirmed in the Porter-Barclay Treaty of 1822.

St. Louis, a city of the United States, located in the eastern part of Missouri on the Mississippi River. Its central position in the Mississippi Valley and its situation 18 miles south of the junction of the Missouri and Mississippi rivers and about 200 miles north of the confluence of the Ohio River and the Mississippi make St. Louis one of the greatest commercial, industrial and transportation centers of the United States. The city extends for about 20 miles along the river front, is nearly 10 miles wide and covers in all an area of 62 square miles. The population within the corporate limits is 816,048 (1940). It ranks eighth in size among the large cities of the United States. Greater St. Louis has a population of 1,294,000.

In pioneer days St. Louis was the commercial gateway to the great and almost unknown West. Most of the advantages that it held then it still retains. Although railroads have largely supplanted the steamboats, the city's river traffic, with the aid of the Illinois Waterway and the Ohio and Missouri rivers, is still very considerable. Nineteen railroad trunk lines enter St. Louis, and nearly a dozen shorter roads serve it. The railroad center of the city is the large Union Station. The St. Louis Municipal Airport and the Curtiss Field in East St. Louis are important stops for transcontinental air liners.

St. Louis, which was originally established as a fur-trading post, remained until a very recent date the chief market in the United States for raw furs; New York now contends with St. Louis for primacy in this important industry. The city is the center of a vast livestock trade, especially in horses and mules, and is a large grain, lumber and coffee market. Its manufactures include an ever-widening range, chief of which are automobiles, boots and shoes, chemicals and drugs, brick and terra cotta, stoves and furnaces, Diesel engines, airplanes, reapers, hardware, furniture, clothing and beer.

In the newer parts of St. Louis the streets are regularly laid out and cross one another at right angles, but in the older section near the river they run with less definite order. Broadway, a few blocks west of the river, follows the general curve of the stream from the northern to the southern limits. Projecting westward are Washington and Lindell avenues and Locust, Market, Morgan, Chestnut and Olive Streets. Though many of the streets downtown are narrow, permitting only one-way traffic, Olive Street has been widened and is today one of the most important business thoroughfares in the United States.

The City Plan Commission worked for years to establish a Civic Center: the Civic Courthouse, City Hall and Public Library are its principal architectural improvements. The most conspicuous building in the city is the lofty Southwestern Bell Telephone Building with typical setback architecture. Among other unusual structures are the Federal Building, Federal Reserve Bank (which serves the Eighth Federal Reserve District), Municipal Auditorium, Arena, Railway Exchange and the Missouri Pacific, Mercantile Trust and Boatmen's Bank buildings. Outstanding examples of ecclesiastical architecture are the St. Louis Cathedral (Roman Catholic), Westminster Presbyterian Church and Christ Church Cathedral (Protestant Episcopal). The old Broadway Courthouse was the scene of the trial of Dred Scott, which led to the Supreme Court's decision that Congress had no right to prohibit slavery in any Territory. It is also a relic of slave-auction days.

St. Louis has more than 60 parks. The largest, Forest Park, contains 1,381 acres and is notable as the site of the Louisiana Purchase Exposition of 1904. Of the permanent buildings erected for that exposition the Jefferson Memorial is utilized as the home of the Missouri Historical Society, and to this society were presented the *Spirit of St. Louis* (the airplane in which, sponsored by St. Louis businessmen, Col. Charles A. Lindbergh made his historic nonstop flight from New York to Paris in 1927) and hundreds of Lindbergh trophies. The St. Louis Art Museum, housed in the exposition's central art hall, contains one of the most important collections of paintings and sculpture in the United States. The most noted of the many park sculptures is an equestrian statue of St. Louis by Charles H. Niehaus. Forest Park also maintains an open-air municipal theater and zoological gardens.

Adjoining Tower Grove Park, with its heroic statues of Shakespeare and Columbus by Eduard Mueller, German sculptor, is the Missouri Botanical Garden, one of the finest in the United States. The most famous of the city's bridges is the Eads Bridge, the first to span the Mississippi on its completion in 1874 and named for its builder, James Buchanan Eads. The most important educational institutions are Washington University, founded in 1853, and St. Louis University, a Roman Catholic institution to which the first charter for the establishment of a university west of the Mississippi was granted in 1832.

Where St. Louis now stands a French fur-trading post was established in 1764. The name first given to the settlement was Laclède's Village, for Pierre Laclède Ligueste, one of the founders. Within a few years it was renamed St. Louis in honor of the canonized French sovereign, Louis IX. It became American in 1803 when Napoleon sold all Louisiana to the United States. St. Louis was chartered as a city in 1822.

St. Lucia, an island of the Windward group of the Lesser Antilles; it lies south of Martinique and constitutes a British Crown colony. The area is 233 square miles, and the population, mostly Negroes, is about 61,000. Sugar cane, cacao, rubber, bananas, limes, coconuts, nutmegs and other spices are raised. From the forests covering the rugged mountain sides logwood and other valuable timber are taken. The highest elevation is the volcano Soufriere, about 4,000 feet high, not to be confused with the volcano on St. Vincent which has the same name. The island was discovered by Columbus in 1502, was colonized by the French in 1650 and, after being ceded back and forth between France and Great Britain several times, has belonged to Great Britain since 1814. Its administrator is responsible to the governor in chief of the Windward Islands, whose headquarters are at St. George, Grenada. Assisting him are executive and legislative councils. The capital is Castries (population about 6,000).

St. Pierre and **Miquelon,** a group of small islands about 10 miles south of the Burin Peninsula of Newfoundland. The area is 93 square miles, and the population about 3,600. These islands are the only possessions left to France of its vast Canadian territory. They are barren and for the most part rocky and are important only as the headquarters from May to October of the valuable French cod fisheries. They were first occupied by the French in 1660, and were held alternately by France and Great Britain but have been an undisputed French possession since 1814. St. Pierre on the island of that name is the seat of the French governor, who is assisted by a consultative council.

St. Vincent, an island of the Windward group of the Lesser Antilles, lying between St. Lucia and the Grenadines and constituting a British Crown colony. The area is 150 square miles, and the population is about 48,000, mostly Negroes although there are a few Caribs of mixed blood. Traversing the island from north to south is a chain of volcanic mountains whose highest peak is Soufrière (3,500 feet). The most memorable eruption of Soufrière occurred in 1902 at the same time as the disastrous eruption of Mt. Pelée on Martinique; it cost the lives of 1,500 persons and laid waste about one-third the island.

About one-sixth the total area of St. Vincent is cultivated, the principal products being cotton (an unusually fine grade), cacao, copra, cassava, arrowroot, spices and various tropical fruits.

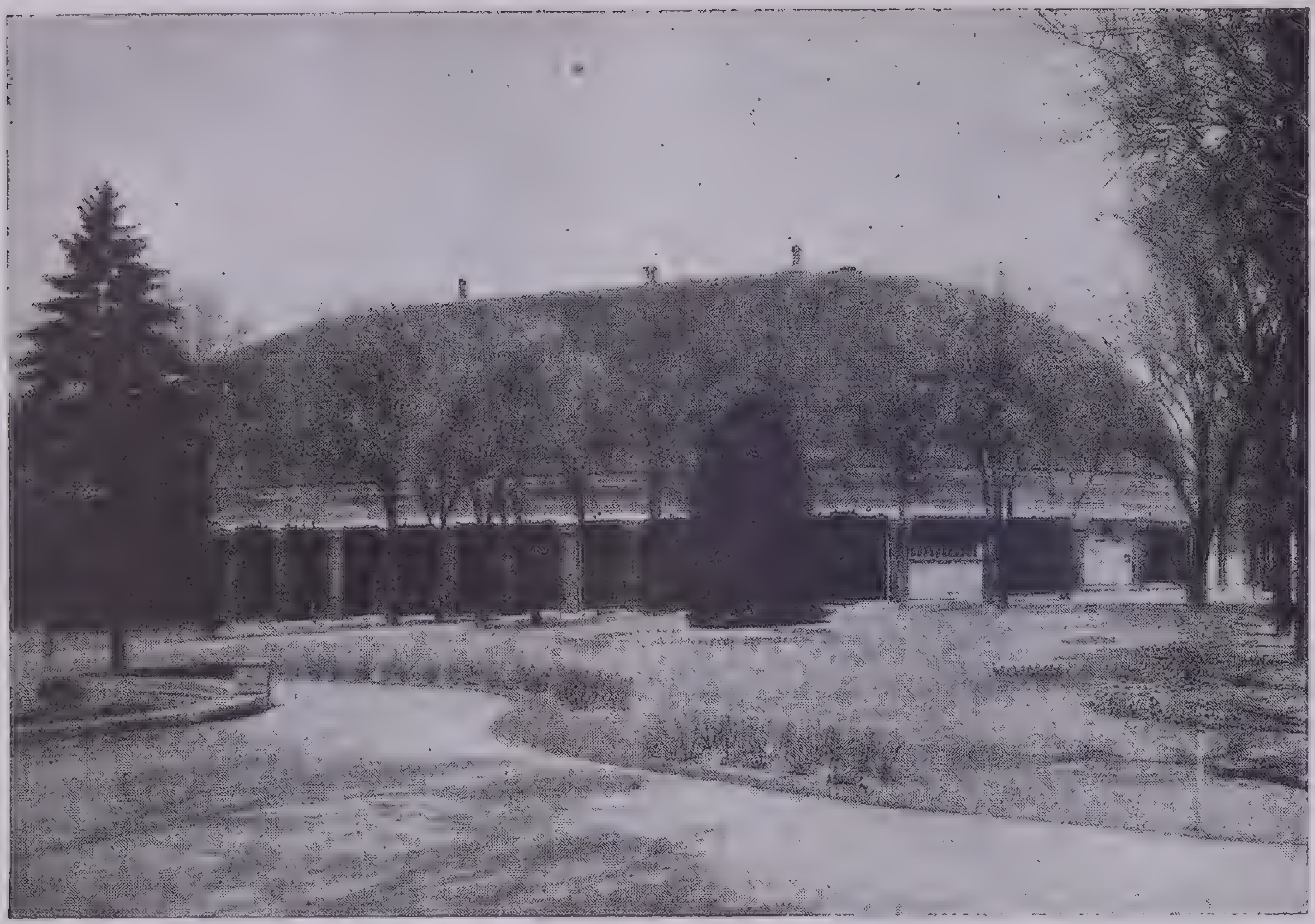
The island, which was discovered and named by Columbus in 1498, has been a British possession since the Treaty of Versailles in 1783. On account of the opposition of the Caribs to British administration the majority of them, after being subdued, were deported to the island of Roatan in the Gulf of Honduras. Kingstown, the capital, is the seat of the British administrator who is responsible to the governor in chief of the Windward Islands; assisting him is a legislative council.

Salt Lake City, a city of the United States and the capital of Utah, located in the northern part at the base of the Wasatch Range of the Rocky Mountains, 11 miles east of Great Salt Lake. Among the industries are: smelting silver, copper, gold, lead and zinc; mining coal and iron; quarrying marble, onyx and granite; refining oil; and canning fruits and vegetables. Manufactures include sugar (from the sugar beet), woolen materials, clothing, butter and dairy products. The city is an important market also for cattlemen, and there is some slaughtering and meat packing. As a transportation center Salt Lake City is served by 10 railroad lines, and its airport, from which three major airlines operate, is one of the models of the West. The population is 150,000. The area is 53 square miles.

Salt Lake City is the seat of the Church of the Latter Day Saints of Jesus Christ (Mormon Church), and its hub is the Mormon Temple, a Gothic edifice of native gray granite that was 40 years under construction (1853–93). Near by is the earlier wooden elliptical dome-roofed Tabernacle, whose famous acoustics make an organ recital heard there a memorable experience. Temple Square also contains smaller structures housing material relating to the early history of the Mormons, including facsimiles of the golden plates that the angel Moroni revealed to Joseph Smith, founder of the religion.

The city was founded in 1847 as a refuge for the Mormons from the persecution of their sect in the East; it has many reminders of its pioneer days and of the leadership of Brigham Young. Among the monuments are the Eagle Gate and the Pioneer, the Brigham Young and the Sea Gull monuments; the last was a mark of appreciation of help from a flock of sea gulls that saved one of the crops of the early pioneers from destruction by grasshoppers. Places of interest include: Bee Hive House in which Brigham Young lived and which is now occupied by the president of the Latter Day Saints; Amelia House, the home of Young's favorite wife; and the Lion House, in which lived the rest of his 19 wives, for the early Mormons practiced polygamy. The early government might be termed a theocracy.

Liberty Park, a 100-acre tract, was once part of Brigham Young's estate.



Courtesy Salt Lake City Chamber of Commerce

Mormon Tabernacle in Temple Square, Salt Lake City

This vast auditorium, seating 8,000 people, was built during 1865–67 as a meetinghouse by the Mormons or members of the Church of Latter-day Saints. Its roof is ellipsoidal in shape, its architecture simple and unpretentious. Utah sandstone and timber were used in its construction, and the wooden beams and joists of its arched roof were originally put together with wooden pegs and cowhide thongs. It spans 250 feet in length and 150 feet in breadth and is without any interior columns. The Tabernacle is noted for its almost perfect acoustics and for its organ, which has more than 7,000 pipes

The *Deseret News* and Zion's Cooperative Mercantile Institution are other evidences of the predominant influence of the Mormons. In City Creek Canyon, which was the scene of early Mormon irrigation activities, Memory Grove, a World War memorial, has been established.

The Utah State Capitol, completed in 1915, is the pride of Salt Lake City. Of special interest are its murals of covered-wagon days and its museum depicting the industries of the state. The Union Station also contains two famous murals: the scene at the completion of the Union Pacific Railroad in 1869; and the Mormon Pioneers entering the Great Salt Lake Valley July 24, 1847. Among other notable buildings are the Roman Catholic Cathedral of the Madeleine, Latter Day Saints Church Office Building and Hotel Utah. The city is the seat of the University of Utah.

Salvador, El, a republic of Central America, bounded on the west by Guatemala and on the north and east by Honduras. On the south are the Pacific Ocean and its arm, the Gulf of Fonseca. The area is 13,176 square miles; there is a dense population of 1,460,000. Two volcanic mountain chains, which are independent of the Antillean system, extend almost across the country; they include the Izalco, San Salvador, Cojutepeque, San Vicente and San Miguel groups. Among the crater lakes of these mountains is Ilopango, which is sometimes used for seaplane landings. Lake Guija is on the boundary between Salvador and Guatemala. The principal river is the 200-mile-long Lempa, which rises in Lake Guija and flows east and south across Salvador. The San Miguel River, flowing into the Gulf of Fonseca, drains the eastern part of the country.

The valleys of the mountainous plateau are fertile and have an almost temperate climate; the coastal plain, however, is hot and humid. Coffee is the principal crop; from some 118,800,000 trees about 141,000,000 pounds of coffee berries are gathered annually. Other important products are cacao, tobacco, sugar cane, indigo, rubber, henequen and balsam. The balsam is the so-called Balsam of Peru (really native in El Salvador), which is a much-used pharmacological product. Gold, silver, copper, lead, iron and mercury are mined. Native industries include weaving, leathercraft and metalwork.

Pedro Alvarado, a lieutenant under Cortes in the conquest of Mexico, invaded the country now El Salvador in 1524–25 and captured the Mayan capital, Cuscatlan. El Salvador was then governed by Spanish authority, forming part of the captaincy general of Guatemala. In 1821 it threw off the Spanish yoke and became a member of the Central American Federation. After 1841 El Salvador withdrew from this federation to form its own republic. The government of El Salvador is headed by a president and a vice-president, both elected by popular vote for terms of 4 years. The president appoints 4 ministers of state to assist him. The unicameral legislative assembly has 42 deputies, 3 being elected from each of the 14 departments into which the country is divided for a term of 1 year. The present constitution of El Salvador was adopted in 1886.

The capital and principal city of El Salvador is San Salvador. Although destroyed by earthquake several times, the last in 1919, it has been rebuilt each time. It is an inland city in the department of the same name with a population of about 100,000. Among its interesting buildings are the National Palace, the Presidential Palace, the astronomical observatory and the cathedral. Other inland cities are Santa Ana, San Miguel, Sonsonate and Ahuachapan. Seaports include Acajutla, La Libertad and La Union.

The name *El Salvador* means The Saviour in Spanish.

Samoa or **Navigator Islands,** a group of 14 islands of volcanic formation in the South Pacific Ocean; they are crossed by the 14th parallel and extend from 169° to 172° W. Long. The total area of the group is 1,209 square miles, and the population is about 58,500, of whom about 3,000 are whites. In 1900, in accordance with an agreement with Great Britain by which that country received the Tongas and part of the Solomon Islands, ownership of Samoa was divided between the United States and Germany. In 1920 New Zealand, which had occupied the German territory on the outbreak of the World War, received from the League of Nations a mandate to administer the former German section, now known as West Samoa, as an integral part of its territory. The largest islands of West Samoa are Savaii and Upolu. Apia on Upolu is the capital and the seat of the administrator, who is assisted by consultative and legislative councils. Lake Lanuto'o and Falefa Falls have beautiful scenery.

American Samoa comprises Tutuila and all small islands of the Samoan group that lie east of the 171st meridian. The area is 76 square miles, and the population is about 10,000. At the capital and chief port, Pago Pago on Tutuila, is a United States Naval Station; it was originally established in 1878 as a coaling station. The administration of the islands is under the control of the naval commandant.

The natives of Samoa are Polynesians of the highest type. They are straightforward in their relations with their white governors, are extremely hospitable and are rapidly acquiring an education and the various arts of civilization. The chief trade is in copra, cacao and rubber. Breadfruit and bananas are abundant.

The Samoa Islands were first explored in 1768 by the French navigator Louis de Bougainville, who named them *Îles des Navigateurs* (Navigator Islands). Later in the 19th century interests were acquired by Great Britain, Germany and the United States who until the signing of the agreement in 1900 fostered continual dissension among the native chiefs by supporting rival candidates for the throne. At Apia on Upolu Robert Louis Stevenson, the author of *Treasure Island* and other tales of romance and adventure, lived from 1890 until his death in 1894; he is buried on Mt. Vala. Vailima, Stevenson's home, is now the residence of the New Zealand administrator.

sandbar, a bar or reef of sand, gravel or other materials, formed by deposits at the mouths of rivers or stretching along coasts on account of shifts caused by currents and tidal action.

Courtesy San Diego-California Club

A Franciscan Mission near San Diego

The Mission San Diego de Alcala, now located 5 miles northeast of the city, was constructed under the supervision of Friar Junípero Serra in 1769 on the present site of San Diego. This was the first of the many missions built along the California coast by early Franciscan fathers

Such bars often obstruct the entrances to harbors and are dangerous to navigation.

San Diego, a city of the United States and the county seat of San Diego County, Calif., on San Diego Bay, one of the finest harbors in the United States. San Diego is the first port of call on the Pacific coast north of the Panama Canal. Canning sardines, tuna and other fish and the manufacture of airplanes, bricks, tiles, soap, olive oil, macaroni and boats are the chief industries. Feldspar, marble, onyx and various semiprecious stones are mined in the vicinity. The population numbers 203,341. The area is 78 square miles.

The site was discovered in 1542 by Juan Rodriguez Cabrillo, a Spanish navigator, but San Diego was not settled until 1769, when Father Junípero Serra established there the first of the 21 Franciscan missions that dot El Camino Real (the King's Highway) from San Diego to Sonoma. The full name is San Diego d'Alcala. Near the Serra Cross marking the site of this mission is Ramona's marriage place, a Spanish colonial farmhouse once owned by the Estudillo family and made famous by Helen Hunt Jackson's story of the California Indians entitled *Ramona*. The first American flag in California was raised in the Old Town square in 1846 by Gen. John C. Frémont, commandant and civil governor during the American military occupation of California, which, with the secession of Texas, led to war with Mexico 2 years later. Incorporation as an American city took place in 1850, but development was not noticeable until after the completion of the Santa Fe Railroad in the '80s.

Of San Diego's 24 parks the most beautiful is Balboa Park, a 1,400-acre area in which the Panama-Pacific Exposition was held in 1915–16. Several of the permanent buildings of this exposition, in the Spanish Mission style of architecture, now house such collections as the Works of Art of Ancient America, Science of Man, Indian Arts, Fine Arts and Oriental Arts. The Pueblo Village has become the headquarters of the San Diego Boy Scouts. The Park has botanical and zoological gardens, an organ amphitheater, stadium and various playgrounds.

The aviation fields of the United States Army and Navy are on North Island in San Diego Bay. San Diego is also a Marine Corps and destroyer base, a training center for the 11th Naval District and seat of the San Diego Army and Navy Academy. Guarding it is Fort Rosecrans on scenic Point Loma. The municipal airdrome is named for Col. Charles A. Lindbergh, who in 1927 started from San Diego on the first lap of his famous flight to Paris in his monoplane *The Spirit of St. Louis,* which was built in San Diego.

The Scripps Institution for Biological Research, a branch of the University of California noted for its work in marine biology, is near La Jolla, a residential town in San Diego's suburban area.

San Francisco, a city of the United States and next in size to Los Angeles the largest city of California. It is located in the western part at the tip of a peninsula between the Pacific Ocean on the west and San Francisco Bay on the east. North of the city connecting the bay and the ocean is the 1-mile-wide strait, the Golden Gate, named by Gen. John C. Frémont, to whom it suggested the Golden Horn in the harbor of Istanbul. The bay itself, including its northern arm, San Pablo Bay, is about 55 miles long and from 5 to 12 miles wide. On its eastern shore are the important cities of Oakland, Berkeley (seat of the University of California) and Alameda. Across the bay has recently been constructed the San Francisco-Oakland Bay Bridge, whose East Bay crossing from Oakland to Yerba Buena Island is a 1,400-foot-long cantilever span and whose West Bay crossing from the island to San Francisco consists of five suspension spans totaling 8,100 feet in channel length. The new Golden Gate Bridge, with a channel span of 4,200 feet, which makes it the longest suspension bridge in the world, connects San Francisco and Sausalito.

San Francisco Bay affords the city the finest landlocked harbor on the Pacific coast; it can accommodate 187 vessels along its 15 miles of berthing space and handles more than 25,000,000 tons of water-borne commerce annually. Its coastwise and South American trade is extensive, and many of the 118 steamship lines that serve it operate to ports of Asia as well as the Philippine and Hawaiian islands. Four transcontinental railroads serve the city, and it is an important terminal for the Transcontinental & Western Air and the United Air lines. The manufactures include automobiles, chemicals, men's and women's clothing, electrical machinery, paper and clay, glass and stone products. San Francisco is also the financial center of the Pacific coast and headquarters of the 12th Federal Reserve District. The population is about 635,000. The area is 46 square miles.

Hills, Streets and Squares. Since the land surface rises from sea level along the ocean and bay to hills ranging in height from 300 to 950 feet, many of the streets of the city present very sharp inclines. The greatest elevations are Telegraph Hill, comprising the Italian quarter; Russian Hill, the artists' district; Nob Hill, the aristocratic residential section; Twin Peaks, famous for its figure-eight drive; and Lone Mountain, surmounted by a cross erected in memory of Father Junípero Serra and the other early Spanish missionaries.

Telegraph Hill was named from the semaphore that in early days informed the townspeople of the approach of ships through the Golden Gate. The name Russian Hill was from the old Russian cemetery, and that of Nob (a slang designation for capitalists in the bonanza days) was applied to the hill on which in the era following the California gold rush of '49 many mining magnates erected their homes. Cable cars are used to ascend the steepest hills.

The city's principal thoroughfare is Market Street, which runs diagonally through the city, terminating at the east end at the Ferry Building and at the west at Twin Peaks. Among other busy streets are Sutter, Kearny, Geary and Stockton.

Architectural Features. San Francisco's focal point is the Civic Center that rose after the great fire of 1906.

About it are grouped: the classic City Hall, whose dome is higher than that of the Capitol at Washington; the Public Library, noted for the murals *Leaving the East* and *Arrival in the West* by Frank Du Mond; the Civic Auditorium; Opera House; Hall of Justice; and California State Building. In the center is the Volunteer Memorial, commemorating the hardihood of the Forty-Niners and others.

Among other notable buildings of San Francisco are the United States Custom House, United States Post Office and Federal Courts, Mark Hopkins Hotel and Pacific Telephone and Telegraph, Matson Navigation Company, California Commercial Union, Standard Oil, Pacific Gas and Electric, Hunter-Dulin and Russ Buildings. Chinatown on Grant Avenue in the heart of the business section holds a special allure. An exotic bit of the Orient, it covers 20 blocks that are gay with pagoda roofs, lantern-hung balconies and shops that are veritable Oriental art galleries. Its local color is enhanced by the native dress of many of the inhabitants who retain the Chinese mode of living.

The mission San Francisco de Assisi, established in 1776 by Father Junipero Serra as one of a chain of 21 missions along the California coast, gave the city its name. It is more commonly known as the Dolores Mission from its location on Dolores Street. In spite of its decayed condition it is a beautiful example of Spanish architecture. Its bells have been stilled since the secularization of the missions by the Mexican Government in 1833. The walls and ceiling of adobe were decorated by the Indians with such colors as they could make from vegetables. Other interesting features are the hand-hewn rafters lashed together with rawhide, the floor of red-clay tile and the rococo-styled altar that was brought from Mexico more than a century and a half ago. The mission stands today as a witness to the cross borne by the Franciscan fathers that followed the sword of the conquistadores throughout the period of the Spanish settlement of America.

Parks and Museums.—The largest of San Francisco's parks is the Golden Gate Park, which covers 1,000 acres mostly of reclaimed land. It is noted for its Japanese tea garden, Steinhart Aquarium, zoo, aviary, botanical garden, temple of music, stadium and numerous monuments and statues. Reflected in Lloyd Lake are the Portals of the Past, the only reminder that one will find anywhere in San Francisco of the earthquake and fire of 1906; they are part of the doorway of the A. N. Towne residence that stood on Nob Hill.

The city's most important museums are the De Young Memorial Museum and Art Gallery (in Golden Gate Park) and the California Palace of the Legion of Honor (in Lincoln Park the terminus of the Lincoln Highway overlooking the Golden Gate). The De Young Museum is noted for its collection of Russian and modern French paintings, Napoleonana collection and galleries of Oriental art and mission and pioneer life. The Legion of Honor Palace, which is a replica of the Palace of the Legion of Honor in Paris, is especially known for its collection of sculpture by Auguste Rodin and its Gobelin tapestries.

Courtesy Californians, Inc.

San Francisco Civic Center

The San Francisco Civic Center clusters around a green plaza. In the distance is the domed City Hall, and to its left is the Health Center; next, also to the left, is the Civic Auditorium, with a pyramid-shaped skylight and roof. In the foreground is the main Public Library building. To the right, directly across the plaza from the Civic Auditorium, is the State Building where California governmental offices are maintained

Extending along the entrance to San Francisco Bay from Seal Rocks (on which seals and sea lions disport themselves) is the Presidio, which has retained the name of the Spanish military post established here in 1776; with its 1,550 acres it is the largest military reservation within city limits in the United States. Adjoining it are the grounds that were used for the Panama-Pacific Exposition of 1915; of the buildings still standing the most important is the one housing the Museum of Fine Arts, noted especially for its works by California artists.

In San Francisco Bay is Yerba Buena (meaning good herb in reference to a medicinal plant that once grew there) or Goat Island, now a United States Naval Station and training school. Angel Island serves as immigration headquarters, and on Alcatraz Island is the Federal Government prison.

San Francisco was incorporated as an American city in 1850, 2 years after the cession of California by Mexico and 1 year after the discovery of gold. Within 18 months it grew from a hamlet of a few hundred inhabitants to a city with a population of 10,000. Territorial law and order had not reached this far western outpost, and for a time justice was administered by vigilance committees. Its growth was steady after the completion of the first transcontinental railroad, the Union Pacific, in 1869.

San Jacinto Battle Monument, not far from Houston, Tex. A 570-foot-high shaft, commemorating Texas independence, was erected in 1938 on the battlefield of San Jacinto about 20 miles from Houston. It is topped by a huge star. The building at the base contains an entrance hall with statues of pioneer men and women, a museum of historical relics, an art gallery and an auditorium.

San Marino, a republic in the Etruscan Apennines not far from the Adriatic seaport Rimini. It has an area of 38 square miles and a population of 14,000. Agriculture is the principal occupation; wine and cattle are the leading exports. The little republic possesses its own currency and derives considerable revenue, especially from foreign philatelists, by frequently changing its postage stamps. It is governed by the Great Council of 60 members, elected by universal suffrage for a term of 3 years. Every 6 months two councilors are chosen to act as executive officers or regents. The capital, San Marino, is on Mt. Titano. The 2,650-foot-high mountain is surmounted by a castle. In front of the fortresslike Government Palace in the Town Square stands a statue of Liberty. The Pieve Church contains relics of St. Marinus, for whom the republic is named. San Marino is said to have been founded in the latter part of the 4th century and, after several centuries of protection by the papacy, was formally acknowledged in 1631 an independent state.

Santa Fé Trail, an 850-mile road from Independence, Mo., to Santa Fé, N.M., longest of the old pioneer trails in the United States. An expedition in 1821 was the first to cover the entire trail. As Indian attacks were usual along this trail, the trip was usually made by large, armed expeditions. In 1858 the Trail was extended to Los Angeles, and it is now part of the National Old Trails Road extending from Washington, D.C., to Los Angeles, Calif.

Sardinia, an island that is located in the Tyrrhenian Sea (an arm of the Mediterranean), off the western coast of Italy of which it forms a department. It is separated from Corsica to the north by the Strait of Bonifacio. Next to Sicily it is the largest island in the Mediterranean; its area is 9,299 square miles and its population about 975,000. Sardinia is volcanic in formation, and has two important chains of mountains in the northeast and northwest; the highest summit is Punta Bianca Spina (6,016 feet). The principal river is the Tirso, which flows into the Gulf of Oristano on the western coast. The mines in the southwestern part of the island, which have been worked since the days of the Carthaginians in the 5th century B.C., yield lead, zinc and lignite. Sardinia was one of the principal granaries of ancient Rome, but today its agricultural products include olives, tobacco, grapes (for making wine) and various citrus fruits. Lumbering, granite quarrying and salt mining also are important. The tunny, lobster and sardine fisheries are exploited mostly by the Genoese and Neapolitans. Cagliari is the capital. The other important city is Sassari.

After the downfall of Carthage, Sardinia was held for about 1,200 years by Rome and Byzantium. During the period of the crusades it was controlled by the Pisans, whose fleet in 1022 succeeded in ousting the Saracen invaders. In more modern times it has belonged successively to Spain, Austria and Savoy. In 1848 it was united with Piedmont, and in 1861 its ruler, Victor Emmanuel II, became king of a united Italy.

Of great interest to archeologists are some 3,000 truncated conical stone monuments or towers, called *nuraghi,* built without mortar. They are 35 to 100 feet in diameter at the base and vary in height from 30 to 60 feet.

Sargasso Sea, a tract in the North Atlantic Ocean, stretching north and east of the Bahama Islands as far as the Azores. Carrying floating seaweed called *Sargassum bacciferum,* it forms a comparatively still area in the midst of ocean currents. The name *Sargasso,* meaning sea of little grapes and derived from the bladderlike appearance of the thallus that keeps the seaweed afloat, was given to the area by the Portuguese. It was long supposed that the lost continent of Atlantis lay beneath it, and that since the days of the Phoenicians its bottom had been a nest of rotting derelicts.

Saudi Arabia, a kingdom that occupies the greater part of the Arabian Peninsula. Its nucleus is the Emirate of Nejd and Hasa. To it in 1926 were added the western kingdom of the Hejaz and Asir, a principality in the southwestern part. Other dependencies are Katif, Jebel Shammar and El Jauf. Trans-Jordan and Iraq lie to the north; Kuwait, the Persian Gulf and Oman to the east; Aden and the Arabian Sea to the south; and Yemen and the Red Sea to the west. The population is estimated at 5,500,000; it consists mainly of Bedouins and a small urban population in the towns near the coasts. The deserts of Nafud, Dahna and Hamed lie in the Nejd territory and in the southeastern part of the peninsula is the Great Sandy Desert (Rub al Khali) that covers an area of about 300,000 square miles. Animal husbandry and agriculture are the chief occupations. The products include wheat, barley, dates, clarified butter, honey and citrus fruits. Camels, sheep, asses, goats and horses are raised. Arab cloaks are manufactured.

The kingdom of Saudi Arabia was formed in 1926 when Abdul Aziz ibn Abdul-Rahman al Faisal al Saud (now known as Ibn Saud), leader of the fanatical Mohammedan sect called Wahabis, succeeded in deposing Husein ibn Ali, the ruler of the Hejaz, because the latter two years previously had proclaimed himself caliph of Islam. His eldest son, Emir Saud, is now viceroy of Nejd, and his second son, Emir Faisal, is Viceroy of Hejaz. Since 1917 King Ibn Saud has received a subsidy from Great Britain; its payment, however, is conditioned by his being guided in his foreign policy by the wishes of the British government.

Saudi Arabia has twin capitals—Riyadh (population, 30,000) in the Nejd and Mecca (population 80,000) in the Hejaz. Mecca, the birthplace of Mohammed, is the holiest city of Islam. It lies in a valley 70 miles inland from the Red Sea. To its Great Mosque, called Beitu'llah (House of God), journey each year more than 100,000 of the faithful. In the courtyard of this mosque is the Kaaba, a cube-shaped stone building that holds the sacred Black Stone given by the angel Gabriel to Abraham, for, like the Jews, the Arabs claim descent from Abraham, only through his son Ishmael by the bondswoman Hagar. Near the Kaaba is the holy well of Zemzem that plays a part in the story of Hagar and Ishmael. Another Mohammedan pilgrimage city is Medina, about 250 miles north of Mecca; it contains the tombs of Mohammed, his daughter Fatima and Omar, the first caliph. Other cities are the seaport Jidda (or Jedda) and Sabiya', the capital of Asir.

Saudi, in honor of King Ibn Saud, was prefixed in 1932 to the name Arabia.

savanna, a large, grass-covered plain of tropical and subtropical regions. Its vegetation chiefly consists of tall grasses, growing in tufts; its umbrella-like shaped trees are low and well scattered. This is the sort of vegetation that grows in regions of alternate rainfall and drought, such as the southwest monsoon brings to central Africa, eastern Asia and northern South America. Grains grown in savanna regions include wheat, rice, sorghum, guinea corn and various kinds of millet, such as durra. Yams, peanuts, cotton, jute, sugar cane, coffee and tea also are raised. Among the animals are the monkey, baboon, elephant, giraffe, rhinoceros, tiger, lion, crocodile, alligator and hippopotamus.

There are great savanna areas in Brazil, to which the name *campos* is applied; in Venezuela and Colombia they are called *llanos.* Southern Florida, the only section of the United States that the southwest monsoon occasionally touches, has some of the characteristics of savannas.

The word *savanna* came into English from the Spanish, but originally it was a Carib Indian word. The older English spelling, *savannah,* is the name of a river and city in Georgia.

Scilly Isles, a group of about 40 small islands 25 miles west of Land's End, England, forming with Ushant Isle the chop or entrance to the English Channel. These islands are the first land seen in the eastward crossing of the Atlantic Ocean. Their total area, including about 100 rocky islets, is 4,041 acres. On five of the islands about 1,750 persons live and engage in truck gardening, flower raising and fishing. The Scilly Isles are a part of the county of Cornwall; their capital is Hugh Town on St. Mary's Island. On some of the larger islands have been found huge monoliths set up in circles for druidical rites. Noted for their rugged yet picturesque scenery, the islands attract many tourists.

Scotland, a constituent of the United Kingdom of Great Britain and Northern Ireland that lies north of England; the Cheviot Hills mark the natural land boundary between the two countries. Included in its land area of 30,405 square miles are some 185 small islands, attached politically. The principal island groups are the Hebrides, Orkneys and Shetlands. The total population, mainland and islands, is about 4,843,000.

The coasts of Scotland are washed by the North Sea on the east and the Atlantic Ocean on the north and west; the Atlantic is connected with the Irish Sea by the North Channel. The coasts, especially the western, are deeply indented. The principal firths or fiords on the eastern coast are Moray, Tay and Forth (crossed by a cantilever bridge 2,818 feet in length); and Lorne, Clyde and Solway on the western coast. The country, except small coastal areas and a central lowland, is mountainous. The Northern Highlands, which occupy nearly one-third the country, represent the eroded portion of an ancient plateau. They are separated from the Central Lowlands by the Grampian Hills, whose highest elevation is Ben Nevis, rising in Invernesshire to a height of 4,406 feet. The so-called Southern Uplands constitute a moorland region, famous for grouse hunting. For 35 miles the Cheviot Hills form part of the boundary between Scotland and England; during the Middle Ages they were the scene of continual border warfare.

The great commercial river of Scotland is the Clyde, on whose banks is a vast shipbuilding industry. Its outlet is a broad estuary, the Firth of Clyde, leading to the Atlantic by way of the North Channel. The Forth flows into the wide Firth of Forth and thus to the North Sea. Other rivers, whose names have been made famous in song and legend, are the Dee, Spey, Tay, Esk and Don. The most famous of the Scottish glens or valleys are Glengarry, through which flows the Garry River, and Glencoe, extending southward from Loch Leven. The largest lake (Scottish, *loch*) is Lomond, 25 miles in length and dominated by Ben Lomond and Ben Vorlich. Sir Walter Scott wrote of Loch Katrine in *The Lady of the Lake;* it is located in the Trossachs of western Perthshire and is considered the jewel of all the Scottish lakes. Lochs Lochy and Ness form part of the Caledonian Canal, which extends across northern Scotland for a distance of 62 miles from the Firth of Lorne to Moray Firth.

The central lowlands comprise the agricultural belt; the tenant system of farming prevails, for most of the land is held by the landed gentry in large estates. The area devoted to farming is more than 4,650,000 acres. One-fourth the arable land is used for raising wheat, barley, oats and rye. The other products are potatoes, turnips, sugar beets, legumes, cabbage and orchard fruits. Cattle raising has long been important, and the most famous breeds are the Ayrshire for milk, the Galloway for beef and the West Highland, famous for their small size, shaggy coats and long horns. Sheep, however, outnumber cattle six to one, and Scottish wool is used in the manufacture of tartans and tweeds (named for the River Tweed).

The fisheries of Scotland are very important; the annual catch of herring, haddock, salmon and other fish is said to average $25,000,000 in value. Coal, iron, oil shale, slate, limestone, granite, lead, zinc and fire clay constitute the country's mineral wealth. In manufacturing, Scotland is famed for its textiles (woolens, linens, silks and cottons); whisky, beer, paper, sugar, furniture and machinery.

Scotland retains Edinburgh as its nominal capital; it is described in a separate article. The largest city is Glasgow (population, about 1,088,000), on the River Clyde 14 miles from the Firth of Clyde. It is a great commercial port and manufacturing city and the center of the greatest shipbuilding industry in the world. Its most notable building is St. Mungo's Cathedral, dating from the 12th century. The University of Glasgow, one of Scotland's four great universities, was founded in 1450. The Art Museum in Kelvingrove Park is the repository of much of the work of the British painters who at the turn of the century started the modern-art movement known as the Glasgow school. The city was founded in 560, and is of great interest to antiquarians.

On the Firth of Tay on the eastern coast is Dundee, which excels all other cities in Scotland in the making of fine linens. The North Sea port of Aberdeen is the center of the fishing industry and the seat of the University of Aberdeen, founded as the College of St. Mary in 1494. Among lesser cities of importance are Perth, where the Scottish kings were crowned seated on a throne containing the Stone of Scone, and Ayr and Alloway, noted for their associations with the poet Robert Burns. Since the death of Sir James Barrie in 1937 his birthplace in Kirriemuir has been visited by many tourists. The finest ruin in Scotland is Melrose Abbey; near it is Sir Walter Scott's home, Abbotsford. The most famous Scottish castles are the royal residence Balmoral; Glamis, which Shakespeare immortalized in *Macbeth;* and Stirling, with its memorials of Sir William Wallace, who drove the English armies of Edward I out of Scotland in the battle of Stirling Bridge in 1297. Oban in Argyllshire is Scotland's most fashionable seaside resort.

Underwood & Underwood

New Scotland Yard from the Thames

Here, in a turreted granite structure designed by Richard Norman Shaw, are the headquarters of the efficient police and detective force known as the Criminal Investigation Department

Scotland Yard, a short street in London, between Whitehall and the Victoria Embankment and near Westminster Bridge, which has been the headquarters since 1891 of the metropolitan police. The turreted building in Scottish Baronial style was erected on the site of a palace belonging to the kings of Scotland. The surrounding land was once included in the Scottish realm. It is often called *New Scotland Yard* to distinguish it from Great Scotland, a street near Charing Cross.

sea, a great body of water, partly land-enclosed, as the Baltic, Red and Black seas. More or less distinct from the ocean, a sea has features of its own such as special currents, irregular tides, independent of the ocean tides, and peculiar fauna. The waters of a sea are usually less saline and of less density than ocean water, and generally they are warmer.

Border or marginal seas, such as the Japan and North seas, are those that communicate with the ocean but are separated by a ridge on the ocean's floor. *Continental seas,* such as the Mediterranean, are land-surrounded bodies that communicate with the ocean only by means of a narrow strait; the almost total absence of tides has obliterated estuaries and other coastal irregularities, made gulfs and bays shallower and enabled such rivers as the Nile and Po to build their deltas.

The term *sea* is applied to some lakes, as the salt-water Dead and Caspian seas and the fresh-water Sea of Galilee. Hudson Bay and the Bay of Bengal might well be considered seas.

seaport, a city or town that is on the coast of a sea or ocean, preferably on a sheltered bay or other small body of water. Through its ideal location on Massachusetts Bay, Boston ranks next to New York as the chief Atlantic port for water-borne commerce. The term *seaport* is also applied to any place that is accessible to ocean-going vessels by being at the head of navigation on a river. Philadelphia on the Delaware River and Portland at the junction of the Columbia and Willamette rivers are seaports because they are at the head of navigation.

seashore, the land that lies adjacent to the sea or ocean, is covered with water at high tide and is bare when the waves recede at low tide. The term *littoral,* derived from the Latin *littus,* means seashore or coastal region, as the southeastern littoral or coastal plain of Australia.

sea stack, a rocky tower at or near the coast line, representing the outer buttress of a headland that through wave erosion became first a sea cave, then an arch and finally an isolated stack. Examples of this phenomenon are found along the coasts of Quebec, Nova Scotia and in Ireland and Scotland, where they are associated with submersion of the strand line.

section, a distinct part of a country, as the South, referring to the southern United States. The term may also refer to the part of a territory separated by geographical formations, as the Tirol, the Alpine section of Austria.

A *section* as a precise unit is one of 1-square-mile units into which the public lands of the United States are divided. The townships of counties, carved from the public lands in some of the southern and western states, consist of 36 sections.

Seine, a river of France that rises near Dijon in the Department of Côte d'Or in the eastern part of the country. Having its origin in the Plateau de Langres at the base of the Jura Mountains, it flows in a generally northwestern direction across France and enters the English Channel at Havre. It is navigable for nearly three-fourths of its length of 500 miles (to Rouen) and drains an area of about 30,000 square miles. Tributaries are the Marne (famous for the three battles that were fought in its vicinity during the World War), Aube, Yonne, Oise and Eure. Paris, Rouen, Chatillon and Troyes are the important cities along its banks. A system of canals that connects it with other European rivers, including the Rhone and Rhine, enables it to play an important part in the water commerce of the country.

selva or **silva,** the extensive, junglelike rain forest of the Amazon Valley, extending from northern Brazil to southern Venezuela and Colombia. It is the source of Brazil's chief exports, such as rubber, mahogany, rosewood, cacao (whose beans yield cocoa and chocolate), chicle, cinchona (quinine) and Brazil nuts. The heavy rainfall, high temperature, high humidity and retarded evaporation cause its luxuriant growth. It contains almost 2,500 plant species. The most representative animal is the sloth. The region is also the abode of various reptiles, both arboreal and semiaquatic. The word is Portuguese from the Latin *silva,* forest.

settlement, a recently established colony or any place or region that is newly peopled. The term is also applied to a small village in a region that has few inhabitants. The word *settlement* is sometimes incorporated in a place name as the Straits Settlements, part of the British controlled lands of Malaya; they consist of such mainland territories as Malacca and of several islands, Singapore and Penang, for example, in the Strait of Malacca off the Malay Peninsula. Originally these territories and islands were settlements belonging to the East India Company. The name has remained, although the settlements are now more than 100 years old and have attained the status of a British Crown colony.

Seychelle Islands, a group of some 90 islands and islets of volcanic and coral formation in the Indian Ocean about 650 miles north of Madagascar, constituting with the Amirante, Aldabra, Cosmoledo and other groups, a British Crown colony. The total area is 156 square miles, and the population is about 28,000, consisting principally of creoles from Mauritius and Réunion, Negroes, Chinese and Indians, with only about 1,000 Europeans.

On Mahé, the largest island, is Victoria, the capital. Next in size are Praslin and La Digue. Praslin is noted as the home of the twin coconut or *coco de mer,* a double nut resembling two huge coconuts cemented together; the palm that bears it is known as *Lodoicea seychellarum.* Other products are vanilla, rubber, sugar, cacao, coffee, tobacco, cotton, rice, bananas, cinnamon and various spices. The British governor is assisted by executive and legislative councils.

The Seychelle Islands were originally claimed for France by Capt. Lazare Picault, who visited them in 1742 and named them *Îles de la Bourdonnais.* They were renamed in 1756 in honor of Moreau de Séchelles, Louis XV's controller of finances. By the Treaty of Paris of 1814 they were ceded to Great Britain, which had already occupied them for 4 years.

shallows, a body of water that has little depth or less depth than adjoining bodies. An example is Shallow Creek, a tributary of Deep Creek that, in turn, is a tributary of the Yellowstone River in Yellowstone National Park.

Shetland Islands, a group of more than 100 islands and islets about 50 miles northeast of the Orkney Islands and constituting a county of Scotland and the northernmost European possession of Great Britain. They are surrounded by the Atlantic Ocean on the north, west and south and by the North Sea on the east. Of the 24 inhabited islands the most important are Mainland, Yell, Fetlar, Unst, Whalsay, Bressay, Papa Stour, Trondra, Foula and Fair Isle. The total area is 550 square miles, and the population is about 21,000. In addition to sheep and cattle raising, fishing, whaling and sealing are the chief occupations. The famous Shetland ponies originated here; and so did the Shetland sheep dog, a collie only 12 to 15 inches high. The climate is warm for the latitude because the Gulf Stream passes near the islands. Agricultural products, such as oats, barley, potatoes and turnips, are raised under somewhat primitive conditions on the 5- to 8-acre crofts. The principal manufactures are wool hosiery, sweaters (Fair Isle), shawls and tweed cloth. Lerwick on Mainland is the county seat. From the rocky promontory of Eshaness on this same island the waves have carved the staircase called the *Grind of the Navir* or *Gate of the Giants.*

The Shetland Islands were occupied about 1,000 years ago by the Picts, a Celtic race who left stone circles and other relics of the Long Barrow period of the Stone Age. During the 8th century they were seized by the vikings. After being annexed by Norway and passing to Denmark on the union of those two countries the Shetlands, like the Orkneys, were pledged by Christian I as dowry for his daughter Margaret on her marriage to James III of Scotland in 1469. As Denmark defaulted in payment, they were formally transferred to Scotland in 1590.

shoal, a place where a sea, lake or other body of water has little depth or less depth than surrounding areas. The term is also applied to a submarine sand bank or other elevation that, less than 6 fathoms (36 feet) deep, makes the water shallow. Generally built of sediment heaped up by waves and currents, it assumes the form of a spit on reaching the high-water mark.

shore, the land bordering any wide expanse of water, as a sea, bay, sound or lake. The word *bank* is more accurately used to designate land bordering a river.

shore line, the line of contact between land and water areas, especially the land bordering a sea, bay, sound or lake. Its contours are being continually changed by the action of waves, currents and tides. Cliffs are undermined and sea caves carved, and with the materials thus worn away beaches, sandbars and reefs are built.

Siam, a monarchy of southeastern Asia between French Indo-China on the northeast, east and southeast and

Courtesy Siamese Consulate General, New York

Temple of Rajanadda, Bangkok, Siam

The Buddhist *wat* or temple with its slender pointed gables is a typical expression of Siamese and Cambodian architecture

Burma on the northwest, with a narrow southern arm stretching down into the Malay Peninsula as far as the Isthmus of Kra. The Gulf of Siam, an arm of the South China Sea, 400 miles long and 250 miles wide, is on the south; to the west of the Malay Peninsula portion is the Bay of Bengal. In configuration the country consists of a junglelike coastal plain, a central plateau and the Dwana Hills in the west. The principal river is the Menam, which overflows and fertilizes the great central valley where more than half the people live. In Siam rise the Nam and Mun rivers, which become the Mekong River at their conjunction near the eastern border. The area of Siam is 200,234 square miles; the population of about 12,355,000 includes Chinese, Indians and Malays with a few Europeans, Americans and Japanese.

The country lies wholly in the Torrid Zone, and tropical agriculture and stock raising are the chief occupations. Rice is the principal crop; other products are rubber, sugar cane, pepper, coconuts, spices, coffee, cotton, tobacco, hemp and fruits such as mangoes and pomegranates. Cattle raising is carried on in the higher sections, and teakwood lumbering is a source of wealth. Tin production is high; other minerals include coal, iron, tungsten, manganese, antimony, quicksilver, gold and silver. Rubies and sapphires also are mined. There are a great many elephants in Siam, many of which are used for heavy work; the white elephant is sacred and is owned only by royalty.

In 1932 King Prajadipok met the demands of the People's party in substituting a limited constitutional monarchy for the absolute monarchy that had existed since the founding in 1782 of the present dynasty by Chakri, a commanding general of the army. The king was to exercise executive power through a State Council of 14 to 24 members, which, although appointed by him, was responsible to the National Assembly; members of the National Assembly were to serve 4 years, half being appointed by the king and half being elected by the people. King Prajadipok abdicated in 1935 in favor of his 11-year-old nephew, Prince Ananda Mahidol, because he refused to entrust to his ministers the royal prerogative of the power of life and death.

The capital of Siam is Bangkok (population, 550,000), a seaport on the Gulf of Siam near the mouth of the Menam River. It has two parts—the modern with its sumptuous royal palace and gardens on an island in the Menam and up-to-date buildings that contrast strangely with the old part, which is called the *floating city* with houses built on piles in the river or on bamboo rafts moored to its banks. Bangkok has a number of beautifully decorated Buddhist temples, the most famous of which is the Temple of the Emerald Buddha; its eight towers symbolize the Eightfold Path that Gautama Buddha devised for his followers. Ayuthia to the north of Bangkok was the capital until it was destroyed by fire in the late 18th century.

Courtesy Italian Tourist Information Office

Cathedral of Palermo, Sicily

This example of Saracenic-Byzantine architecture was consecrated in 1185 and is noted for the decoration of its exterior in stone of two colors. This style owes its development to the occupation of Sicily by the Saracens from the 9th to the 11th century. The Renaissance-styled dome was added late in the 18th century

Sicily, an island in the Mediterranean Sea, belonging to Italy and lying about 5 miles southwest of the toe of the mainland boot, from which it is separated by the Strait of Messina. It is the largest island of the Mediterranean and has an area (including the small adjacent Lipari and Aegadian islands) of 9,935 square miles. In some remote age, as indicated by a connecting submarine bank, it was a part of the continental structure. It is rugged and in part mountainous, being traversed by the Peloritan, Nebrodian and Madonian mountains. The highest peak is the famous volcano, Mt. Etna (10,740 feet). In the central part is the plain of Catania, watered by the Simeto River. The island has a crowded population of almost 3,950,000.

The surrounding sea moderates the climate, which is also influenced by the hot, dry wind, called the *sirocco;* it blows from African deserts to the southeast. Oranges, lemons, peaches, grapes, dates, figs, almonds, olives, pistachio nuts, lentils and wheat are the principal agricultural products. Sicily also handles more than half of Italy's wine exports. Minerals include sulphur, rock salt, asphalt and pumice stone. The sponge, coral, tunny and sardine fisheries are important. Manufactures are chiefly furniture and lace.

Palermo is the capital and chief seaport; the sixth largest city of Italy, with a population of 390,000. Among its architectural treasures, which bear the marks of the island's different conquerors, are the Cathedral, Benedictine Monastery of Monreale, Royal Palace, Royal Chapel of Cappella Palatina and the National Museum, housing many of the island's antiquities. It is also the seat of the University of Palermo, founded in 1779. Messina, another important port, has been reconstructed since the earthquake that killed more than 77,000 persons in 1908.

Sicily was successively owned by almost every important nation of antiquity. The Greeks colonized it in the 8th century B.C.; their most important city was Syracuse. Among ruins of the Greek period, which lasted almost 400 years, are the temples of Segesta, Selinunte and Agrigentum, the Greek theatre of Taormina and the altar erected by the tyrant Hiero II at Syracuse. Later Sicily was ruled by the Carthaginians, Romans, Vandals, Goths and Byzantine emperors of Constantinople. The Saracens acquired supremacy in the 9th century but were expelled by the Normans two centuries later. In 1282 on the outbreak of the horrifying Sicilian Vespers (which gave the signal for the nations' massacre of the French), Sicily freed herself from France and chose as her king Pedro III of Aragon. Savoy acquired the island by the Treaty of Utrecht in 1713, but 7 years later ceded it to Austria in exchange for Sardinia. While it was under the rule of the Spanish Bourbon kings of the so-called Two Sicilies (Sicily and Naples), the island was liberated by Garibaldi in 1860 and in the following year became part of the Kingdom of Italy. Its seven provinces now form one of the 18 departments or sections of Italy.

Until the Fascist regime the island was terrorized, especially at trials and elections, by the powerful secret organization called the *Mafia*. The name *Sicily* (in Italian, *Sicilia*) is derived from *Siculi,* the name of the people who possessed a great part of the island when the first Greek colonists arrived in 735 B.C.

Sierra Leone, a British dependency, consisting of a Crown colony and a more extensive protectorate, on the western coast of Africa. It is bounded by French Guinea on the north and east and Liberia on the south. The Atlantic Ocean laps the 180-mile western coast. It has a total area of 27,928 square miles, and the population is about 1,769,000, of whom some 1,200 are Europeans and 600 are Asiatics. The colony consists of the coastal plain, the Sierra Leone Peninsula and the Tasso, Banana, Turtle and York islands; it has an area of 259 square miles, and the population is about 96,000. The hinterland protectorate occupies 27,669 square miles; the population is about 1,700. Agriculture and mining are the chief occupations. Crops include palm kernels, kola nuts, piassava fiber, ginger, rice, yams, plantains, sugar cane, coffee and fruits. The minerals are gold, iron, platinum and diamonds.

The chief executive is the governor who is assisted by an executive council of 5 and a legislative council of 22 members. The capital is Freetown (population about 55,000) on the Sierra Leone Peninsula, the largest seaport on the west African coast. There is an attractive European quarter in the town. It is connected by rail with the interior cities of Pendembu and Kamabai. Other towns are Waterloo, Bonthe, Falaba and Port Lokko. The colony was originally founded in 1787 as a settlement for emancipated slaves. It was formally annexed by the Crown in 1807.

Silver Springs, a crystal clear body of water near Ocala, Fla., an excellent example of a spring in a limestone region that has been comparatively recently uplifted. It is a 200-foot wide and 80-foot deep basin across an underground stream from which 550,000,000 gallons of water flow daily. The excess water fills the basin and is drained by the Silver River, a tributary of the Oklawaha River. In electric-driven, glass-bottomed boats tourists may see an underwater fairyland of precipices and gorges, various multicolored fish, shells and crystalline formations, coral ferns and other subaquatic plants and changing prismatic effects. The springs were held in reverence by the Indians and may be regarded as the "fountain of youth" that Ponce de Leon sought.

Sinkiang or **Chinese Turkestan,** a nominally independent territory of central Asia, bounded by Mongolia on the northeast, China on the east, Tibet on the southeast, India on the south and the U. S. S. R. on the west and northwest. The area is 550,340 square miles; the population, mostly Mohammedans of Turko-Mongol origin, is approximately 2,688,000.

Sinkiang is surrounded by mountains, including the Altyn Tagh on the east, the Kunlun Mountains on the south and the Karakoram and Pamirs on the west. The Tien Shan Mountains extend almost across the central part of the country from west to east. In the district to the north of them are the Dzungaria and Ili basins; in the south is the Tarim Basin. Extensions of the Gobi Desert, dotted with oases, are found in these basins. The chief rivers are the Tarim, Boratala, Kashgar and Yarkand. In the southwest is the lake-marsh region of Lop Nor. Rice, cereals, cotton and fruits are cultivated around the oases and in the river valleys. Sericulture is also practiced. Minerals include sulphur, saltpeter, alum, iron, lead, coal, copper and Chinese jade. Leather goods and carpets are among the manufactures.

The capital of Sinkiang is Tiwa or Urumchi (population, 60,000). Since the revolt staged by the Moslems at Kashgar in 1934 Sinkiang has been more or less independent, as China proper has been absorbed in its own troubles and wars with Japan. In fact the hold of the Chinese government on this outlying dependency gradually weakened after the revolution of 1912. In view of the recent completion of the Trans-Siberian Railroad the territory has fallen more and more under Soviet domination and may be regarded as a potential if not actual outpost of the U. S. S. R. Among other towns are Kuldja, Aksu, Kashgar, Yorkland and Kholan.

The name *Sinkiang* means the new dominion.

slough, a deep hole or pit filled with mire. Derived originally from the Gaelic word for pit, it is pronounced as though spelled *slou* (the *ou* as in loud). The market town of this name in Buckinghamshire, England, is pronounced in this way.

Pronounced *sloo̅,* the word means a marshy inlet, largely filled with reedy vegetation. This second usage is limited to the western United States.

snow field, an area of snow on a level plain or in the hollows of mountains. It remains at a more or less constant temperature, especially if the amount of snow that falls exceeds the amount that melts. If the area is above the snow line, it may be converted through continued pressure into the slow-moving mass of ice and snow known as a *glacier.*

snow line, the lowest level on the slope of a mountain or mountain range above which snow exists nearly all the year. Largely determined by latitude and the prevailing temperatures, moisture and velocity of winds, it varies from year to year. The highest snow line—19,000 feet—is in the Himalayas. In the Alps the snow line averages 9,000 feet above sea level, in the Rockies about 12,000 feet and in the Andes, 16,000 feet. In Iceland it averages only 3,000 feet, and in regions of perpetual snow such as the Arctic and Antarctic circles it is at sea level.

Society Islands or **Tahiti Archipelago,** a group of 11 islands of volcanic and coral formation, in the Pacific Ocean between 16° and 18° S. Lat. and 148° and 155° W. Long. They constitute a French colony. The most important island is Tahiti, on which is Papeete, the administrative center of all the French dependencies of Oceania. Other islands of the group are Huaheine, Raiatea and Moorea. The total area is 635 square miles, and the population is about 28,000. Copra, bananas, sugar, mother-of-pearl, vanilla and phosphates are the principal products. The natives, once a splendid type of the Polynesian stock, have declined through contact with the white man and his vices. The French government, however, is trying to rehabilitate them through education.

The Society Islands owe their name to that which Capt. James Cook bestowed on the leeward or northwestern group in 1769 in honor of the Royal Society of Great Britain. They were originally discovered by the Spanish navigator Pedro Fernandez de Quiros in 1607 and were officially annexed by France in 1880. Assisting the French governor is an administrative council. In art circles Tahiti has been popularized through the paintings of the post-Impressionist, Paul Gaugin, who became disillusioned with European civilization and went to Tahiti to live in 1891.

Socotra, an island in the Arabian Sea at the entrance to the Gulf of Aden; a British protectorate. The area is 1,382 square miles, and the population, a mixture of Arabian and Indian blood, is about 12,000. In the center of the island are the Haghier Mountains. The principal products are incense and aloes. Grazing and fishing are important. The island has been under British protection since 1886, although it is still nominally ruled by the Sultan of Qishn or Keshin. Tamridah is the capital.

soil, the loose portion of the earth's crust in which plants grow. It is generally composed of disintegrated rock, such as granite, sandstone, limestone or basaltic lava, whose additional chemical characteristics are derived from decayed animal and vegetable matter.

Soils are classified as *residual* (formed by the weathering of stationary rocks and organic matter *in situ*) and *transported* (composed of materials brought by wind, rain, streams or glaciers from other localities). Among the latter are: *alluvial* soil (deposited by rivers as bottom lands and deltas); *morainic* soil (transported by glaciers) and *aeolian* soil (deposited by the wind, such as loess in river valleys and sand dunes which may later become dune hills).

Soils are also described as sandy, gravelly, loamy, peaty, humus, clayey, calcareous or loess, according to the proportions of these constituent elements. Their age depends on how long they are undisturbed by the elements or other erosive agents.

The most careful and scientific studies of soils and their characteristics were made in Russia by K. D. Glinka of the Dokuchaiev Institute of Soils, Leningrad; and it was published in an English translation by the U.S. Department of Agriculture. Soil types follow climatic types, and the different classes have different amounts and degrees of leaching and moisture content.

Soil erosion is a vital problem in the United States, because 75 per cent of the land consists of sloping areas. When it is used for only one kind of crop, such as corn, cotton and tobacco, or is overgrazed, erosion increases. It can be reduced by planting more trees, especially orchards, by crop rotation and by strip-cropping or alternating such crops as corn and tobacco that require frequent cultivation with sorghum and similar close-growing crops that require only one plowing.

Soldiers and Sailors' Monument, Indianapolis, Ind. Marking the center of the city, this elaborate stone and bronze memorial to the Indiana dead in the forces of the United States in various wars culminates in a statue-capped shaft 285 feet high, which is surrounded by fountain-fed pools.

Solomon Islands, a group of islands of volcanic and coral formation in the Pacific Ocean, extending from 5° to 11° S. Lat. and from 154° to 162° E. Long. They are included in the Melanesian section of Oceania. The total area is 16,950 square miles, and the population is about 130,000. Of the more important islands Bougainville and Buka were transferred to Germany on the division of the islands between Great Britain and Germany in 1885 but were occupied by an Australian force on the outbreak of the World War. Choiseul and Ysabel also were German until 1900, when they were transferred to Great Britain in exchange for Savaii, one of the Samoan Islands. Malaita, Marovo or New Georgia, Guadalcanal and San Cristoval had been annexed by Great Britain in 1893. The chief products are copra, pearl and tortoise shell, ebony and sandalwood. Head-hunting and cannibalism formerly prevailed; the islands were one of the principal sources of slave labor for the Queensland plantations.

The Solomon Islands were discovered by the Spanish navigator Alvaro de Mendaña de Neyra in 1567 and were named by him, in anticipation of their natural wealth, Islas de Salomon. Two hundred years later they were rediscovered by the French explorer Louis de Bougainville (1729–1811). In 1920 the former German possessions, which covered an area of 4,100 square miles and had a population about 40,000, were assigned to Australia under mandate from the League of Nations. The other islands, which have an area of about 11,000 square miles and a population about 91,500, form the British protectorate of the Solomon Islands, of which Tulagi is the capital.

Somaliland, a long, narrow, almost triangular coastal area in East Africa, which projects sharply into the Indian Ocean at Cape Guardafui. It is divided into British, French and Italian dependencies. The Gulf of Aden and the Strait of Bab el Mandeb bound the territory on the north, the Indian Ocean on the east, and Ethiopia and Kenya on the west. It consists of elevated plateaus bordered by the Harrar Hills on the north and the Galla Highlands on the west. The Nogal, Webi, Shebeli and Juba rivers drain it. Its trees and shrubs yield fragrant resins and balsams—myrrh, frankincense and the balm of Gilead of biblical fame. Its forests abound with jungle animals of all kinds—lions, leopards, panthers, jackals, giraffes and rhinoceros.

The Protectorate of British Somaliland is bounded by the Gulf of Aden on the north, Italian Somaliland on the east and south and Ethiopia on the west. The area is 68,000 square miles; the population, about 345,000, is mostly nomadic. The Somali, who claim to be of Arab origin, are generally Mohammedans. Stock raising (cattle, sheep and goats) is the chief occupation. Hides, gums, resins and ostrich feathers are exported. The government is entrusted to a commissioner, appointed by the colonial office. Berbera is the capital; other towns are Bulhar and Zaila. All are located on the coast. The British protectorate was created in 1884.

The Protectorate of French Somaliland to the west of the Strait of Bab el Mandeb is bounded by Eritrea on the north, British Somaliland on the south and Ethiopia on the west. Its area is 8,880 square miles; it has a population of about 70,000 of whom about 1,000 are Europeans. Mother-of-pearl fishing is an important industry. Hides, coffee and ivory are exported; salt mines are found there. Djibouti is the capital and the only French port on the Suez Canal route. A governor, sent from France, is in charge. He is assisted by a general council of six members, three of whom are French officials and three, leading residents. Most of the territory has been under French control since France purchased the port of Obock on the Gulf of Tadjoura in 1862. The protectorate was proclaimed in 1883.

Italian Somaliland, between the Gulf of Aden and Kenya, is now a part of Italian East Africa and is described in the article on that country.

sound, a long passage of water, connecting two larger bodies of water, but generally wider and more extensive than a strait. A sound may connect a gulf or sea with the ocean or another sea, as The Sound joining the Kattegat and the Baltic Sea and separating the Danish island of Zealand from Sweden. It may also be a channel passing between a mainland and an island, as Long Island Sound, which separates Long Island from Connecticut.

source, the point at which a stream is formed by springs and other underground water and from which it commences to flow. The Mohawk River rises in Oneida Co., N.Y. A source may be the point that forms an outlet for a lake or a series of lakes; for example, the Hudson River rises in 14 small lakes of the Adirondack region, the principal one being Lake Tear-of-the-Clouds.

In the case of a river such as the Rhone, which rises in a glacier, the source is the point at which the ice of the glacier starts to melt and flow onward as a stream.

South America, the fourth continent in size, joined to North America by the Isthmus of Panama and extending southward about 4,800 miles to Cape Horn. The Atlantic Ocean is on the east, the Pacific on the west. At the southern tip the continent terminates in the archipelago of Tierra del Fuego. The breadth of the continent at its widest part is about 3,300 miles. The two Americas are called the *New World,* for until the voyage of Columbus in 1492 nothing was known of either continent.

The area of South America is about 6,814,000 square miles, and its population is estimated at 80,500,000. This continent is frequently called *Latin America,* for nearly all its white inhabitants are of Spanish and Portuguese descent.

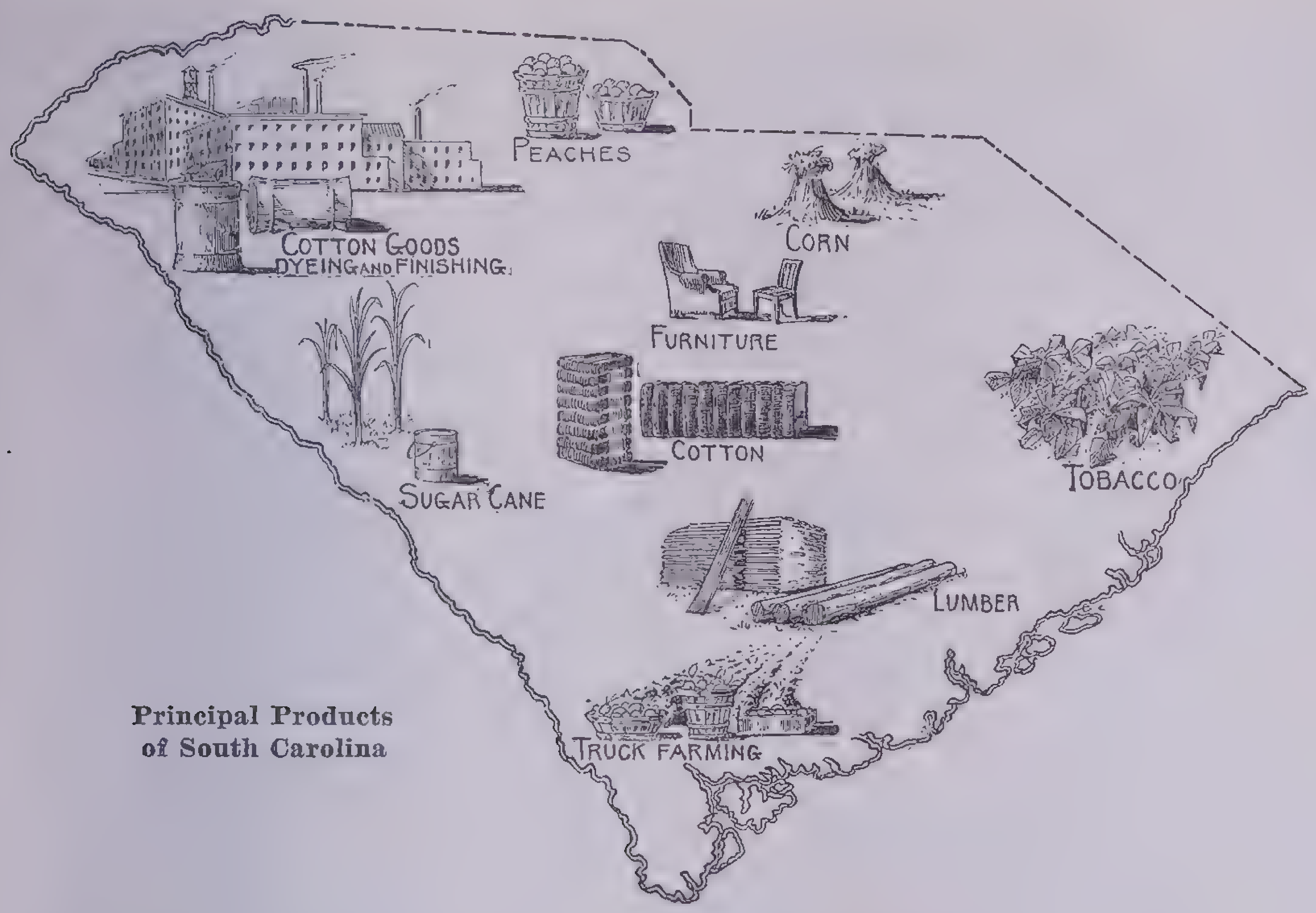
The physical aspects of the American continents are strikingly similar. The great system of the Andes, which skirts the Pacific shore of South America for its entire length, corresponds to the Rockies of North America; the two comprise what geographers term the *American cordilleras.* The great central plains and prairies of North America have their counterpart in the South American pampas, llanos and savannas, but the two are far different in other physical aspects. The silvas of Brazil are so overgrown with jungle vegetation as to be almost inaccessible; indeed, many parts of it have never been explored. South America possesses two of the most important river systems in the world. The Amazon is comparable to the Mississippi-Missouri system, although it runs from west to east rather than from north to south. It is 3,854 miles long and drains an area of 2,722,000 square miles. The Paraná River is 2,450 miles long and with the Paraguay and Uruguay rivers drains an area of 1,198,000 square miles.

The physical characteristics of the continent have determined the distribution of the population. Whites are found in greatest numbers not more than 300 to 500 miles from the coasts, but they are not more than 20 per cent of the total population. About half the inhabitants are descendants of the Incas and other Indian races that dominated the continent before the coming of the Spaniards and Portuguese in the 15th and 16th centuries. In all the countries of South America except Brazil, Spanish is the language of the people; Brazil is Portuguese in language and tradition.

The thousands upon thousands of square miles of tropical jungle teem with animal life. Especially noteworthy are the scores of species of birds of brilliant plumage—flamingoes, humming birds, toucans and many kinds of parrots, to name a few. The condor, the largest bird of prey, is found in the Andean region. The fiercest animal of South America is the jaguar, and the most typical tree-living animal is the sloth. Tapirs, anteaters, alligators and crocodiles are also found. Peculiar to jungle land are the dreaded boa constrictor and water boa and the deadly anaconda of the same family. Some of the world's largest turtles live in the warm waters of hundreds of rivers.

Gold and silver have been mined since the days of Spanish occupation, and both metals are still plentiful. But South America's greatest sources of wealth are in the vast coffee plantations of Brazil, in the rubber industry and in cattle; Argentina is one of the world's largest producers of meats and hides.

The republics include Paraguay, Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay and Venezuela. The only remaining European dependencies on the continent are the three Guianas, controlled by Great Britain, France and the Netherlands;



Principal Products of South Carolina

Dutch Guiana is officially known as Surinam. The Falkland Islands off the southeastern coast constitute a British Crown colony.

The name of the two Americas is derived from that of Amerigo Vespucci (or Americus Vespucius), an Italian navigator who is supposed to have been the first to land on South American shores in 1497.

South Carolina, a wedge-shaped South Atlantic coastal state of the United States with an area of 30,989 square miles, including 494 of water surface. It is 285 miles long and 215 broad. North Carolina is on the north, the Atlantic Ocean on the southeast, and Georgia on the southwest. The Savannah River forms the entire southwestern boundary. The population of about 1,900,000 is approximately 45 per cent Negro.

Most of the surface is a part of the coastal plain, level and of slight elevation, with numerous swamps and marshes. Running across the middle of the state parallel to the coast, the Fall Line marks the edge of the Piedmont plateau, a rolling section that extends northwest to the base of the Blue Ridge. The mountain crest forms the northwestern boundary line, where the highest elevation is 3,548 feet.

Several rivers flow across the state. Their mouths form wide harbors, but they are of more importance as sources of hydroelectric power for the factories of the Piedmont area. The Pee Dee, Edisto and Santee are the largest streams.

Along the coast the climate is almost subtropical, but in the Piedmont it is cooler and more variable. Rainfall is abundant, and the soil is generally fertile. The chief crops are tobacco, cotton and rice. Corn is grown for local needs. About four-fifths of the population live in rural sections, but much of the coastal plain remains in swamp or forest. The production of yellow pine and cypress lumber is important. The state makes large quantities of turpentine and rosin.

The mineral deposits are of little value. Some phosphate rock is mined, but sand and gravel, clay and stone for local use form the bulk of the output. Commercial fisheries are profitable.

South Carolina's manufactures are of growing importance. The Piedmont section is dotted with cotton mills of recent construction, and it now takes high rank in that industry. Lumber and forest by-products and fertilizer are other large factors in its industrial progress.

Charleston, the principal city, has a good harbor, formed by the estuaries of the Ashley and Cooper rivers. In addition to a U.S. Navy Yard it has other shipping interests but is best known for its splendidly preserved early American architecture. Well-proportioned homes in the Georgian style and elaborate hand-wrought iron balconies, gates and grilles are reminders of the pre-Civil War era when Charleston was one of America's wealthiest cities. Fort Sumter, in the harbor, is the scene of the actual beginning of that war.

Columbia, the capital, is the trade center of the thriving Piedmont section. It has varied manufacturing plants and several state institutions.

The University of South Carolina is at Columbia. Clemson Agricultural College at Clemson is a state school, and the College of Charleston is the oldest municipal college in the country. The Citadel at Charleston is a leading military school.

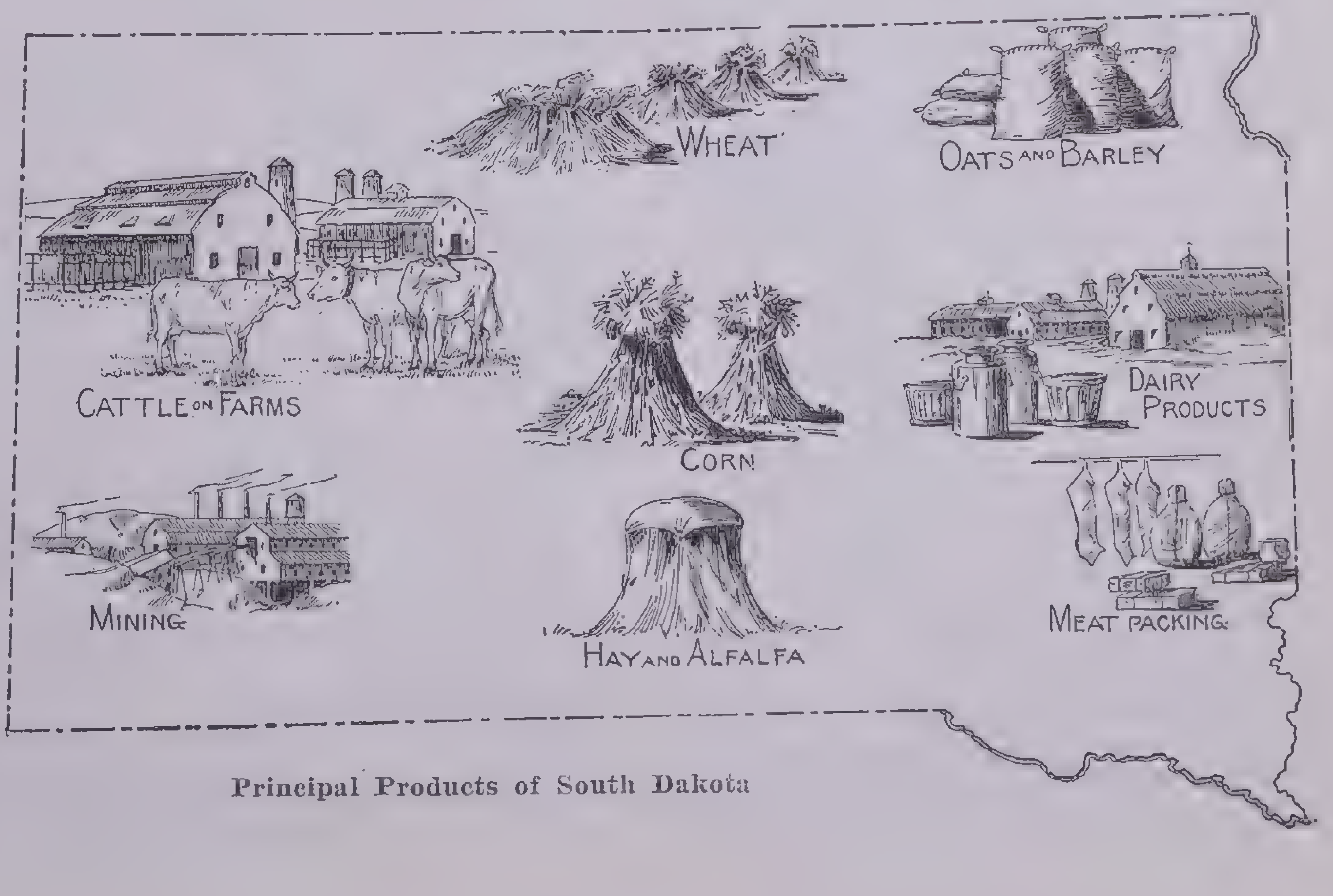
South Carolina has fine beaches on the Atlantic. The Aiken section is a winter resort of sportsmen. The most admired features of the state, however, are the remarkable magnolia and azalea gardens in the lowlands near Charleston. The Middleton Place Gardens, laid out 2 centuries ago, are the oldest formal gardens in America, and others in the district rank with it in the profusion and variety of their seasonal floral display.

South Dakota, a state of the Great Plains of the United States, bordered on the north by North Dakota, on the east by Minnesota and Iowa, on the south by Nebraska and on the west by Wyoming and Montana. Its area is 77,615 square miles, including 747 of water surface. Approximately rectangular, it is 380 miles long and 245 broad. The population is 642,961 (1940), of whom less than one-fourth live in cities and towns.

Most of the surface is gently rolling, well drained and treeless, except along the streams. It slopes regularly upward to the west. In the southwest is a mountainous section where the elevation reaches 7,242 feet. This district is called the *Black Hills* from its thick dark forest cover. Bordering it on the east is a weirdly eroded semiarid stretch of Bad Lands.

The Missouri River bisects the state from north to south, dividing the grazing area in the west from the cereal farming region in the east. The James, Big Sioux, Cheyenne and other Missouri tributaries provide excellent drainage. These streams are not navigable, but they supply some water for irrigation.

South Dakota has cold winters and hot summers. Rainfall is usually adequate for farming except in the far west, but an occasional disastrous drought is experienced. Corn, hay,



Principal Products of South Dakota

wheat, oats, barley, flax and rye are all raised in quantity, and sugar beets are also a profitable crop. Most of the corn and forage are fed to cattle and hogs for the stockyards, and the western ranches graze large herds of cattle and sheep. The timber output of the Black Hill section is of considerable value.

Gold has been mined in the Black Hills since the Civil War period, and other minerals are abundant in that locality. In the northwest is a great lignite deposit, not yet of much commercial importance. The manufactures are only adequate to take care of local produce. Sugar, flour and packed meats are shipped in large quantities.

Sioux Falls is the principal city and industrial center. It is surrounded by the most productive agricultural district, in which it conducts a large wholesale trade. Pierre, the capital, is a small town on the Missouri.

The leading educational institutions are the South Dakota State College at Brookings, the University of South Dakota at Vermillion and the South Dakota School of Mines at Rapid City.

Though the Bad Lands section is the most distinctive natural feature of the state, the Black Hills with their cool forests and clear streams attract more visitors. Mt. Rushmore, in this region, is the site of a huge sculptural memorial, featuring the heads of four presidents. Wind Cave National Park in the Black Hills is noted for remarkable fossil remains and for the strange suction of air in and out of its mouth. Deadwood treasures are relics of the old Wild West.

Southwest Africa, a large territory in the southwestern part of Africa that since 1920 has been administered by the Union of South Africa under mandate from the League of Nations. Before the World War it was known as German Southwest Africa, having been annexed by Germany in 1884. British troops seized it in 1915. It is bounded on the north by Angola, on the east by Bechuanaland and the Cape Province of the Union of South Africa, on the south by the Cape Province and on the west by the Atlantic. Since the World War the 40-mile-wide Caprivi strip between Northern Rhodesia and Bechuanaland has been included in Bechuanaland. The area of Southwest Africa is 322,393 square miles; the population is about 273,400, of whom about 31,000 are Europeans. The native tribes include Hottentots, Damara, Herero, Ovambo and Bushmen.

Southwest Africa consists of the high plateau region of the Khomas Hochland. In the western part are the Onyati and Awas Mountains whose highest points reach more than 7,000 feet. On Mt. Brukkaros near Keetmanshoop the Smithsonian Institute of Washington has a solar radiation station. The Namib Desert lies between the mountains and the Atlantic. Rivers are the Kunene and Okavango, in the north, and the Orange, which forms part of the southern boundary. The Benguelan Current, flowing northward from the Antarctic, causes fogs, some rainfall and rather low temperatures along the coast. In the plateaus potatoes, corn, pumpkins and beans are raised; in the drier regions large numbers of sheep, goats and cattle find pasturage. Minerals exported are copper, diamonds and cassiterite (tin dioxide); vanadium, lead, iron, marble, gold and nitrate of soda are found but are not yet exploited.

The administrator of this mandated territory is assisted by an executive council of 4 members. The unicameral legislative assembly has 18 members, 12 elected and 6 appointed by the administrator subject to the approval of the governor general of the Union of South Africa. One member of the legislative assembly is in charge of the interests of the natives, who are well organized into tribal communities. For local administrative purposes the country is further divided into 17 parts, each under a magistrate with administrative and judicial powers. The capital is Windhoek (population, 18,000). The only other important town is Luderitz.

spa, a locality having a number of mineral springs and generally organized as a health resort. The word was originally the name of a fashionable watering place near Liége, Belgium. Among other noted spas are Carlsbad, Czechoslovakia; Baden-Baden, Nauheim and Wiesbaden, Germany; Aix-les-Bains, France; and Bath, England. Hot Springs, Ark., White Sulphur Springs, W. Va., and Saratoga Springs, N.Y., are the most famous spas in the United States.

Spain, a country that occupies the greater part of the Iberian Peninsula in the extreme southwestern part of Europe. The natural boundary of the Pyrenees separates it from France. The Bay of Biscay extends along about three-fifths of the northern boundary; the Mediterranean Sea is on the east and southeast; and the Gulf of Cadiz, an arm of the Atlantic Ocean, bounds it on the southwest. At the extreme southern tip of the country is the British Crown colony of Gibraltar; between this small British area and the mainland is a narrow neutral zone. On the west are Portugal and the Atlantic Ocean. The Balearic Islands in the Mediterranean Sea and the Canary Islands off the northwestern coast of Africa are Spanish provinces and are included in the country's total area of 194,793 square miles. Among Spain's population of about 28,000,000 are some 700,000 Basques who inhabit the triangular area west of the Pyrenees that is bounded by the Bay of Biscay on the north and the province of Navarre on the east.

The interior of Spain is a tableland that varies in elevation from 1,000 to 3,000 feet and is called the Meseta Plateau. The Cantabrian mountains and the Pyrenees extend along the northern boundary, and smaller and lower ranges are found throughout the country. In the south is the Sierra Nevada, where one peak, Mulhacén, reaches an elevation of 11,421 feet. The outstanding crest of the Catalan coast range is Montserrat (4,064 feet), which is associated with the legend of Parsifal. There are also the Central Cordillera (which separated the ancient kingdoms of Aragon and Castile), Iberian ranges, the Baetic System (whose most important range is the Sierra Morenas) and the Penibaetic System (to which the Sierra Nevadas belong).

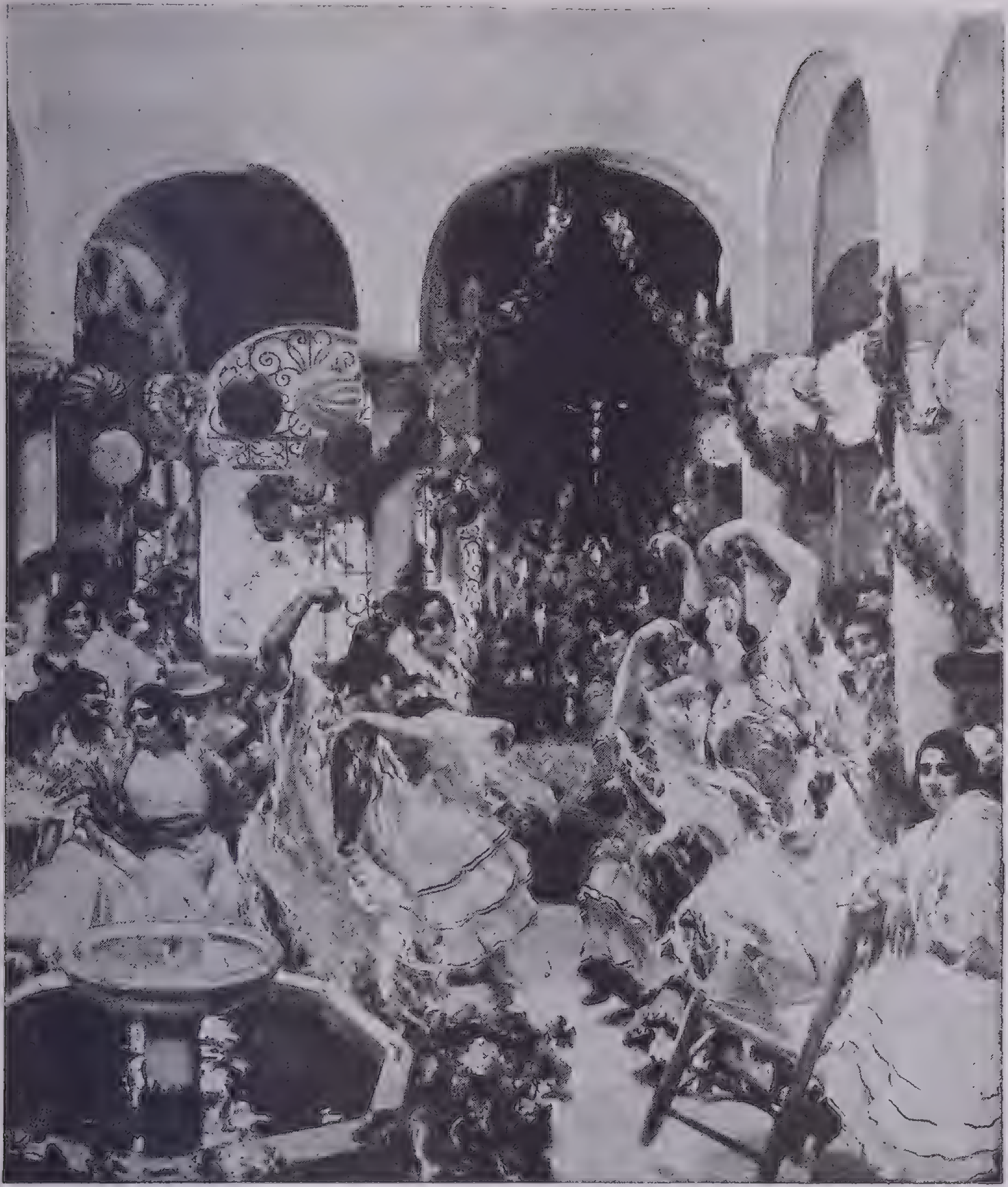
The largest rivers of the country, the Tagus and the Douro, flow westward into Portugal and thus into the Atlantic Ocean; the Guadalquivir and Guadiana flow southwest into the Atlantic; and the Ebro and Guadalquivir discharge into the Mediterranean Sea. These rivers furnish water for irrigation, but only the Guadalquivir is navigable.

Although more than three-fourths of the total area of Spain is said to be suitable for agriculture, only a little more than a third of the land (some 56,000,000 acres) is under regular cultivation. It is true that irrigation is necessary in some sections, and this feature is now receiving constantly increasing attention. In southern Spain vineyards predominate, and some of the world's famous wines, such as Spanish sherry, originate in the territory adjacent to Seville and Cordoba. Groves of olive trees cover many hundreds of square miles throughout the south. In the north wheat, rye, barley, oats, rice, corn, potatoes, sugar cane, sugar beets, tobacco, almonds, cotton and citrus fruits, principally oranges and lemons, are produced. Silk culture is centered in the southern provinces of Murcia and Valencia. There are 25,000,000 sheep and goats, and more than 1,000,000 mules in the country.

Spain is rich in minerals. Coal produces the greatest wealth, the yield of anthracite and lignite amounting to about 8,000,000 metric tons annually. There are large deposits of iron, copper, lead, zinc, mercury, sulphur, tin and phosphates. The most outstanding product of the forest area is cork; Spain and Portugal together provide about three-fourths of the world's supply. Manufactures include wine, sugar, glassware, paper, leather goods and textiles (cottons and woolens). The most important products of the Spanish fisheries are sardines, tunny fish and cod.

Spain was a kingdom from the unification under Ferdinand and Isabella, in the latter part of the 15th century, until 1931, when King Alfonso XIII abdicated, following elections that indicated an overwhelming Republican sentiment. In accordance with the constitution the head of the "democratic republic of workers" was a President who was elected for 6 years. Parliament, however, was reorganized as a unicameral chamber of deputies, called the *Cortes,* with some 475 members. To this body were responsible the premier, appointed by the president, and his ministry. This form of government soon came into the hands of a Socialist and Communist group, and in the middle of 1936 Civil War began.

The bombing raids of the Insurgents reduced to ruins many of the notable buildings of Spain's cities. Gone is Toledo's great stronghold, the Alcazar; and the Alhambra, Granada's citadel-palace, can no longer be acclaimed the most superb example of Moorish architecture. Another Moorish stronghold was Cordoba, which in its ancient splendor might be likened to Damascus or Athens; the greatest



Courtesy Hispanic Society of America

The Dance, by Joaquin Sorolla y Bastida

The *fiesta* of the *Cruz de Mayo* is being celebrated in a patio of a Sevillian province on May third. In this festival in honor of the elevation of the Holy Cross, a provisional altar is raised in a patio or near the door of a house, and flowers are placed everywhere. Here the altar appears beneath white arches in the background, where a tall cross is illuminated by candles. Near the flower-encircled fountain four girls in ruffled skirts and fringed shawls dance to the music of a guitar. This gay, light-hearted aspect of Spanish life all but vanished in the struggle of civil war

survival of this era was the great mosque, which was converted into a Roman Catholic cathedral. Seville was noted for its Alcazar; the great Gothic cathedral that ranked next in size to St. Peter's in Rome; the Giralda or Bell Tower; the Biblioteca Columbina; and the House of Murillo. Madrid's attractions were the former Royal Palace, the Art Museum and the famous boulevard known as the Prado; about 30 miles from the city was the Escorial or Royal Palace, to which the Church of San Lorenzo was attached. Segovia and Ronda were noted for the remains of aqueducts, amphitheaters and other Roman ruins.

Barcelona in its cathedral and the Church of the Holy Family displayed a distinctive style of Catalan architecture and was the country's most important commercial center. Among manufacturing centers were Valencia, Saragossa, Bilbao and Murcia. Cadiz was the most important seaport on the Atlantic side, and San Sebastian was the leading port on the Bay of Biscay. Mediterranean ports included Malaga, Cartagena and Valencia.

The English name *Spain* and the Spanish *España* are derived from the Latin *Hispania,* which may come from a Punic word, *span,* meaning rabbit, in reference to the large number of wild rabbits found there.

Spanish Guinea, a dependency of Spain on the coast of West Africa just north of the equator. It is bounded by the Cameroons on the north, French Equatorial Africa (Gabun) on the east and south and the Gulf of Guinea on the west. It includes Rio Muni or the Muni River Settlement on the mainland and the islands of Fernando Po, Annobon, Great and Little Elobey and Corisco in its total area of 10,290 square miles; the population is about 140,000. The mainland portion is a wooded, coastal plain, rising to a plateau region and the Crystal Mountains in the eastern part. The chief products are sugar cane, coffee, cotton, cacao, tobacco, rice, millet, yams and bananas. From the forested mountain slopes mahogany, ebony and the African oak are obtained. Bata is the chief city. The capital is Santa Isabel on the island of Fernando Po, which is described separately.

spit, a long, narrow stretch of land, generally of sand, extending from the shore of any body of water. An example is the Spit off the coast of Portsmouth, England, about 3 miles long. The word is used sometimes of a narrow shoal offshore. Originally the word meant something sharp or pointed like a thorn or *spine.*

Spitsbergen or **Svalbard,** an archipelago in the Arctic Ocean about 370 miles north of Norway from which it is separated by the Barents Sea. There are four large islands—West Spitsbergen, North-East Land and Edge and Barents islands—and a number of small islands; together they have an area of 24,294 square miles. A subbranch of that part of the Gulf Stream known as the North Atlantic Stream has made Spitsbergen livable though it is crossed by the 80th parallel. It is the most northerly inhabited land in the world. The population in summer numbers about 1,500; and in winter, about 1,200. The plateaus of the larger islands are covered by huge icecaps; the fiords are frozen from November to April; and during four winter months darkness is relieved only by a faint twilight during the middle of the day. In summer, on the other hand, Spitsbergen is a true land of the midnight sun, for since it is located above the Arctic Circle the sun does not set. During the last two decades Kings Bay, West Spitsbergen, has become known to the public as the starting point of several outstanding Arctic expeditions.

The archipelago was discovered in 1596 by the Dutch navigators Willem Barents and Jacob Heemskerk, who gave it the name *Spitsbergen,* which means sharp-pointed mountains and refers to its many granite peaks. The most noted of these are Mt. Newton (5,445 feet), Horn Sund Tin (4,960 feet) and Mt. Eidsvoll (4,770 feet). In the 17th century Spitsbergen was an important whaling center for the Dutch, Danes (who then owned Norway) and English. After whaling declined, the Russians began to engage in walrus, seal, bear and fox hunting, and by the latter part of the 19th century the discovery of coal and iron ore made ownership of the group a vital issue to Sweden and Russia.

For many years Spitsbergen remained a *terra nullius* or no man's land. After the World War the matter was brought before the Paris Peace Conference, and on final ratification in 1925 of a general treaty signed by the leading nations the islands became Norwegian territory. They are administered by a governor whose seat is Green Harbor. The Norwegian name *Svalbard,* bestowed by viking explorers in 1194, means cold coast.

Splugen Road, a 42-mile highway leading from Thusis, Switzerland, to Chiavenna, Italy, via the Splugen Pass on the international boundary. Its most famous feature is the 4-mile-long Via

Mala, a wooded gorge at the northern end; it is hemmed in by limestone cliffs that rise to a height of 1,600 feet and that in some places are only 30 feet apart. Part of the way the Via Mala follows the Hinterrhein (one of the headstreams of the Rhine River) that is a sheer drop of 300 feet or more below. The first road through the Via Mala was built in 1473. The present one dates from 1823.

Sporades, a group of islands of volcanic formation in the Aegean Sea, belonging partly to Greece and partly to Italy. The northern group, which lies northeast of Euboea, includes Skiathos, Skopelos and Khios (Chios), constituting the Grecian department of Magnesia or the Aegean Islands, and Skyros, which like Euboea is part of the central department of Greece. The more important islands of the southern group, which is southwest of Turkey, are Rhodes, Patmos, Samos, Cos, Nikaria, Leros and Calymnos. Patmos is famous as the place of banishment in 95 A.D. of St. John, who beheld while there the visions of the *Apocalypse.* Since the 11th century it has been the site of the fortresslike monastery of St. John. In ancient times Samos was the seat of the temple of Hera, and during the crusades Cos was one of the strongholds of the Knights Hospitallers of St. John of Jerusalem. The total area of the Sporades group is some 1,600 square miles. The word *Sporades* is Greek, meaning scattered.

Most of the islands are cultivated and produce grains, citrus fruits, vegetables, olives and grapes (for wine and raisins). Among the minerals are zinc, lead, silver, antimony, manganese and copper. Marble is quarried, and the sponge fisheries are important. Previous to the Turko-Italian War (1911–12), the southern group of the Sporades belonged to Turkey, being known as the vilayet of the Islands of the White Sea. During that war they were seized by Italy and, with the exception of Samos, which is claimed by Greece, have belonged to Italy ever since; the World War, as a result of Turkey's defeat, left Italy in possession. The 12 Italian-owned islands of the Sporades group constitute today the section of the Dodecanese, whose capital is Rhodes. The name Sporades is Greek and seems to mean scattered.

spring, an issue of water through a natural outlet from underground. It is generally the result of the sinking of rain water or melting snow through porous rock until a nonporous stratum is met; the porous layers then become saturated and the surplus water has to seek an outlet. Water that is released not in a single issue but in a spreading formation is called *seepage.* Springs are the source of most streams, including some of the greatest rivers.

Hot springs (attaining a temperature of 98° F. or more) and *thermal springs* (attaining a temperature of 70° F.) are found in regions of major faulting or of dying volcanic activity, where the water flows over hot rocks deep in the earth. The most famous hot springs in the United States are found in Yellowstone National Park. At Yellowstone a unique formation is the Dragon's Mouth Spring, a small fissure in some rocks from which jets of steam and hot water spurt at regular intervals. Emerald and Grand Prismatic springs, which also have a more or less eruptive force, owe their coloring to the reflection and refraction of light rays, influenced by the nature and color of the springs' surroundings.

The Fountain Paint Pots, another form of Yellowstone hot springs, contain a varicolored, boiling clay that, rising in crater-shaped masses, produces sounds like a whispered "plop-plop." The most famous formation, however, is the noneruptive Mammoth Hot Springs, composed of about 4,000 springs in all. Laden with minerals of limestone origin, these springs have built up very delicately sculptured terraces whose semicircular basins, thanks to algae growth, shimmer in a remarkable harmony of reds and yellows.

Many springs, both hot and cold, are noted for their mineral deposits that have a medicinal value. Health resorts built around such springs, as Hot Springs, Ark., and Saratoga Springs, N.Y., are called *spas.* The former is built along a major fault line of the Ouachita Mountains.

Among noted mineral springs are Manitou Springs near Colorado Springs, Colo. These were held in veneration by the Indians who believed that through the bubbling of the waters (which contain soda, sulphur and iron) the god was speaking to his people, but only a medicine man, attuned to these mysteries, could interpret the message.

State Capitol, Lincoln, Neb. This distinctive public building of original design combines a low, broad base, each side of which is 437 feet long, with a square central tower 400 feet high. It was completed in 1933. In this building the Nebraska legislature, reorganized in 1937 as a unicameral body of 30 to 50 members, meets.

Statue of Liberty, New York city. This landmark, a present to America from the people of France, rises 301 feet above the waters of the harbor. The female figure, bearing aloft the flaming torch of Liberty, extends a welcome to all who enter the port from foreign lands. It was dedicated in 1886 and is the work of Frédéric Bartholdi.

steppes, the vast tracts of slightly undulating, treeless land extending from the Caspian shore of southeastern Russia to the Altai Mountains of central Siberia. Some of the lowland steppes are comparatively fertile, those in southeastern Russia being covered with grasses during the summer rainy season and constituting excellent pasture land. Other steppes, especially those in plateau regions, are desert or wasteland. For centuries the steppes were the abode of nomadic Tartar tribes who today have their own autonomous republic within the Russian Socialist Federated Soviet Republic of the U.S.S.R.

Of steppe formation are portions of Mexico, Yucatan, East Africa, Madagascar and Australia. They are semiarid areas, characterized by a wet season when the sun is overhead at either the Tropic of Cancer or Tropic of Capricorn and possessing relatively high temperatures throughout the year. The winds that reach them are generally of monsoon origin.

stock, a dome-shaped mass of plutonic rock, usually rounded in shape. A famous example is Stone Mountain near Atlanta, Ga., on whose northern cliff, 300 feet high, Gutzon Borglum and other sculptors have carved several gigantic figures of heroes of the Confederacy.

Stockholm, the capital of Sweden, in the eastern part of the kingdom, about 40 miles from the Baltic Sea. It is reached by means of the Saltsjö (the main channel of the Skerries Archipelago), which drains Lake Mälar and at whose junction with the lake the city has been built. It has an excellent harbor, leading in Sweden's import trade and being excelled in export trade only by Gothenburg. Shipbuilding is one of the most important industries. There are also extensive sugar, beer, textile, chemical, tobacco, porcelain and furniture manufactories. The population numbers about 526,000.

Stockholm was established in the 13th century for defensive reasons in combating the Baltic Sea rovers and originally grew around the fortified castle erected on Stadholm (the city island). It developed into a trade center and in the 14th century was chosen the capital of the country. The Renaissance-styled Royal Palace, which now stands on the castle's site, dates from the middle part of the 18th century. Near it are the palaces that house the different ministries. The older part is known as the "city between the bridges."

About the only reminders of a medieval Stockholm are: the coronation church, Storkyrka, which was dedicated to St. Nicholas in the 13th century and which contains a store of ancient paintings, wood carvings and other treasures; the Riddarholmskyrka, a former Franciscan church that since the early 17th century has been the burial place of the royal family; and the pantheon, in which are commemorated Sweden's great men. Until the middle part of the 19th century the Riddarhus served as an assembly hall for the Council of Nobles; the square in front of it was the scene of the *blood bath* or execution of some 80 nobles, ordered by Christian II of Denmark when he invaded the country in 1520 to enforce his claim to the throne.

Modern Stockholm dates only from the 18th century, for not until then did the city begin to expand on nearby islands, such as Helgeandsholm (the island of the Holy Ghost), Kungsholm, Skeppsholm and Kastellholm, and the mainland. Its most famous building is the Town Hall, in which there are blended the Renaissance style and certain national features. From afar gleam its copper roof and fortresslike tower, bearing three golden crowns, the symbol of the Swedish state. Its most elaborate room is the golden chamber, whose walls are enriched by rainbowlike mosaics and gold leaf. In the sculptured stone work of the Town Hall many of the old Swedish myths have been embodied; its stained-glass windows keep vividly alive many incidents of the city's past.

Of particular interest as the scene of the annual presentation of the Nobel prizes is the Stockholm Concert Hall, whose classic façade illustrates another blending of the old and new forms of architecture. Other striking examples of the city's modern architecture are the Engelbrektskyrka, named for a 15th-century patriot and combining all the pleasing though austere features of the modern ecclesiastical style; the Law Courts; and the Library. Along the Kungsgatan, the main business thoroughfare, are several department stores whose towers reach a height of 15 stories, probably the highest on the Continent.

A more conservative style of architecture is represented by the Houses of Parliament, Bank of Sweden, Royal Dramatic Theater, Royal Opera House and Royal Library. Among Stockholm's educational institutions are the Högskola, since 1904 a state university, the Caroline Medical Institute, Royal Academy of Music and Royal Academy of Art. Its principal museums are the National, Natural History, Biological and Nordic; with the last is affiliated the Skansen Open-air Folk Museum, where old folk dances and various arts are kept alive. The Stockholm Stadium was built for the Olympic Games of 1912. Of the city's many charming pieces of sculpture probably the most noted are *Hail to the Sun* by Carl Milles in the Town Hall Square and the monument to John Ericsson, designer of the *Monitor,* which fought the *Merrimac* in the American Civil War.

The name *Stockholm* (originally Stadholm) may mean log island (from an early wooden wall) or sound island (from its position in the Saltsjö).

Courtesy Swedish Travel Information Bureau

Modern Architecture in Sweden

The City Hall of Stockholm, on the shore of Lake Mälar, is a widely known example of modern Renaissance architecture. The building, designed by Ragnar Ostberg, was completed in 1923

Stone Mountain Memorial, near Atlanta, Ga. Here on the face of a vertical granite cliff are being carved figures of Lee, Jackson, Davis and many other heroes of the Confederacy, to whom this titanic sculptural tribute is a timeless memorial. It was begun by Gutzon Borglum and taken over in 1926 by Augustus Lukeman.

strait, a narrow channel connecting two larger bodies of water, such as the Strait of Messina, which joins the Tyrrhenian and Ionian seas in the Mediterranean. Other notable straits are the Strait of Gibraltar, connecting the North Atlantic Ocean and the Mediterranean Sea; the Strait of Magellan, connecting the South Atlantic and South Pacific oceans near the tip of Chile; and the Strait of Malacca, connecting the Bay of Bengal and the South China Sea. Davis Strait joins Baffin Bay and the North Atlantic Ocean; Hudson Strait, Hudson Bay and the North Atlantic.

strand, the coast or beach of an ocean or border sea. In all parts of the world this coast is continually subject to erosion and to elevation or subsidence. The raising of the strand line of the northern Scandinavian Peninsula as far as an altitude of 1,000 feet has been going on since it was first observed in the 18th century. The movement corresponds to the raising of the Canadian prairies so as to resume their position before the last ice age when they sank beneath a gigantic blanket of glacial ice. Above the 40th parallel the strand line of North America has been raised from 200 feet near Boston to 700 feet in Labrador and on the eastern shore of Hudson Bay. The raised strand lines of Alaska, Chile, the West Indies, India and Netherland India, however, are associated with earthquakes.

Certain other countries, such as Ireland, Scotland and England along the Yorkshire coast, have been experiencing a submersion of their strand lines at a rate of 7 to 15 feet annually, and the sea stacks off their shores bear witness to this form of erosion. In the United States the coast of New Jersey has been subjected to submersion for the past two centuries, and all France from the English Channel to the southern interior has been sinking at a rate of 10 feet per century.

The original Anglo-Saxon word *strand* referred to the bank of a river. It is from its location parallel to the Thames that London's important thoroughfare, The Strand, takes its name. The word *strand* sometimes means the arm of a body of water, as Kalvebod Strand, the inlet of the Sound that separates the islands of Zealand and Amager and on which is located the city of Copenhagen.

Strand, a London street that goes from Trafalgar Square to Temple Bar and continues eastward as far as Ludgate Circus at Fleet Street. The most noted buildings are Australia House and the 17th-century St. Clement Danes

Church (famous for the bells of St. Clement's). The street follows the curve of the Thames River and owes its name to the fact that it was formerly located on the left bank of this stream.

stream, a body of running water that flows in a definite course. There are five classes of streams: *Antecedent,* which have maintained their courses in spite of diastrophic movements of the earth; *superimposed,* which have been established in regions that were covered by either floods of basaltic lava or by the great glacier of the last ice age; *consequent,* which follow the slope of the land in a newly elevated or newly folded region; *subsequent,* which have been established after the consequent streams; and *obsequent,* which flow in an opposite direction to the consequent streams. Streams may be lengthened by the recession of their spring sources, a practice that often results in stream capture or piracy by means of which other streams or their branches may be diverted into the stream with the more favorable flow.

Although ordinarily applied to land streams, such as rivers, brooks and rills, the word *stream* also describes a current or drift of water that flows through the ocean in a definite course, as the Gulf Stream. The term is of Anglo-Saxon origin, meaning a flowing.

Suez, Isthmus of, the narrow neck of land, 105 miles long and 72 miles wide, which joins the continents of Asia and Africa. It consists only of salt lakes, marshes and desert and extends from Port Said on the Mediterranean to Port Tewfik on the Gulf of Suez, an arm of the Red Sea between the Sinai peninsula and Egypt proper.

The Suez Canal, which crosses the Isthmus of Suez, is about 100 miles long, 200 feet wide and 43 feet deep and extends from Port Said to Suez. It was planned by the French engineer, Ferdinand de Lesseps, and was completed in 1869 after 10 years' construction at a cost of about $148,500,000. The canal is at sea level, and ships pass through it in about 15 hours. Great Britain with France has held the controlling interest in the canal since 1875 when the British Government at Disraeli's instigation bought for £4,000,000 the shares in this enterprise owned by the Khedive of Egypt. Today the canal is administered by 32 directors, 21 French, 10 British and 1 Dutch. Since its conquest of Ethiopia and the formation of Italian East Africa, the Italian Government is anxious to secure a dominant hand in the administration of the canal. The Suez Canal, however, has been open to all nations since the signing of the Convention of Constantinople in 1888; through it about 5,880 merchant ships of 32,400,000 net registered tonnage pass annually.

Sumatra, an island of the Sunda group of Netherland India, ranking sixth in size among the islands of the world and third among the islands of the Malay Archipelago (next after New Guinea and Borneo). Sumatra lies farthest west in the archipelago and is southwest of the Malay Peninsula. Surrounding it are the South China Sea, Java Sea and Indian Ocean, and it is separated from Java by the Sunda Strait and from the Malay Peninsula by the Strait of Malacca. The equator crosses it near its center. The area is 163,093 square miles, and the population about 7,660,000, of whom about 20,000 are Europeans and 350,000 Asiatics, mostly Chinese, Indians and Arabs. The native Malayans are divided into four principal groups, known as the Achinese, Gayos, Bataks and Menangkabaus.

Minerals and metals, such as silver, copper, coal, iron, tin and antimony, are abundant in the Barisan Mountains, which extend more than 1,000 miles or almost the entire length of the island; this chain also contains about 70 volcanic peaks, which culminate in the middle of the island in Mt. Korinchi (12,484 feet high). Of the other products, petroleum is increasing in production, and the forests of ebony, sandalwood, bamboo, teakwood, ironwood and camphorwood yield valuable timber and gums. Tobacco, pepper, rice, tea, coffee, sago, nutmegs, cloves, copra, rubber and quinine are exported in large quantities. The natives are noted for the manufacture of filigree gold and silver jewelry.

The largest of the mountain lakes of Sumatra is Lake Toba, and the most important rivers are the Musi and Jambi. The island is in the path of both the southwest and northeast monsoons, and it is adjacent to the China Sea, where waterspouts occur. Occasionally there are earthquakes. In the savannalike interior are found the orangutan, pigtail ape, two-horned rhinoceros, wild hog, Malayan bear, elephant, tiger, tapir and flying lemur and fox.

The island is divided into seven provinces. The head of the administration is the governor general of Netherland India, whose seat is at Batavia, Java. To him are responsible the resident commissioners of each province, the governor of the West Coast of Sumatra and the civil and military governor of Achin in the northern part of the island, the home of the troublesome Achinese. Of the provincial capitals the most important is Padang of the West Coast residency. The Volksraad or legislative body has restricted powers.

Dutch tenure of Sumatra has been practically secure since 1850, although Dutch attempts to establish supremacy, after driving out the Portuguese, go back to the early part of the 17th century. The first European to visit the island was Marco Polo in 1292. The name *Sumatra,* derived from the Arabic, means the happy land.

summit, the highest point of any land elevation, such as a hill or a mountain. It differs from a peak in that it may be of any shape, whereas a peak is always pointed. The highest point on the Apache Trail near Roosevelt Dam in Gila Co., Ariz., is called The Summit.

Sunda Islands, the islands of the Malay Archipelago west of the Moluccas. They include the large Dutch possessions—Java, Sumatra and Celebes—the Dutch- and British-owned Borneo and all the smaller islands of the Java, Flores and Timor seas. Among the Lesser Sundas are Banka, Billiton, Bali, Lombok, Sumbawa, Flores, Sumba and Timor.

Banka and its dependencies, such as Lepau, constitute a residency attached to Sumatra and have a total area of 4,460 square miles and a population about 205,000. Billiton, another Sumatra residency, has an area of 1,860 square miles and a population about 73,500. Both Banka and Billiton are noted for their extensive tin deposits, which are a government monopoly. Bali and Lombok form an important outpost province of Netherland India, whose area is 2,095 square miles and whose population is about 1,800,000. Sumbawa, Flores, Sumba and the southern part of Timor constitute another Dutch province, known as the Timor Archipelago, which has a total area of 24,537 square miles and a population about 1,657,000. The northern part of the island of Timor, however, is a Portuguese colony with an area of 7,350 square miles and a population about 452,000.

Like the Moluccas, the population of the Lesser Sunda Islands represents a mixture of Malayan, Papuan and Polynesian blood. The islands take their name from the Sunda Strait, which separates Java and Sumatra. The Sundanese are a Malayan people who inhabit the western part of Java.

At the top of Mt. Gelimutu on Flores Island are the famous Red, Yellow and Blue lakes which owe their peculiar coloring to the sulphur and iron contained in the water. Red Lake is called by the natives the lake of the bewitched or after-death abode of the wicked; Yellow Lake is called the dwelling place of the souls of young men and virgins, and Blue Lake, the home of the souls of the ancients.

Superior, the largest fresh-water lake in the world. It extends the farthest north and west of the Great Lakes system and lies between the province of Ontario, Canada, on the north and east and the states of Minnesota, Wisconsin and Michigan (northern peninsula) on the west and south. It is the deepest of the lakes, with a maximum of 1,290 feet. Its mean surface is 602 feet above sea level. Its greatest length is 350 miles; greatest width, 160 miles; and it has an area of 31,810 square miles. The St. Marys River, 40 miles long, carries its waters into Lake Huron; a canal system, popularly called the *Soo* canals and constructed on both the Canadian and the United States sides, carries the shipping around the Sault Ste. Marie rapids in the river. About 200 small rivers flow into Lake Superior. Among its many islands are Isle Royale, St. Ignace, Michipicoten, Caribou, Grand and the Apostle Islands. Its harbors are Marquette, Mich., Superior, Wis., Duluth, Minn., and Port Arthur, Ont.

Surinam or **Dutch Guiana,** a Crown colony of the Netherlands in South America. The Corentyne River separates it from British Guiana on the west; the Maroni River and its headstream, the Awa, separate it from

French Guiana on the east. Between it and Brazil on the south are the Tumac Humac Mountains. Other rivers are the Surinam and Saramacca. The occupied, fertile territory is the strip near the coast where sugar cane, coffee, bananas, rice, rubber and cacao are raised; in the savannalike interior corn is the most important crop. Balata gum (used in the manufacturing of chewing gum) is procured from the forests. Some bauxite and gold are mined. Surinam has an area of 54,291 square miles; its very heterogeneous population, about 163,000, includes Jewish refugees, French fugitives, Javanese, East Indians, Negroes and Indians.

Paramaribo (population, about 49,000) is the capital. It is located on the Surinam River, not far from the Atlantic coast. Two forts, now obsolete, guard the harbor. Control of the government is entrusted to a governor and Council of Three, all appointed by the ruler of the Netherlands. Surinam was first settled by the British in the 16th century and traded by them to the Dutch for New Netherland (New York) by the Treaty of Breda in 1667.

swamp, a tract of lowland, saturated with water and sometimes partially covered with water in pools and winding channels. This water may be derived from floods and from overflows from neighboring bodies of water, but ordinarily the tract depends for its continuous saturation upon local springs and abundant rainfall. A shallow lake or pond may become completely filled with vegetation and thus develop into a swamp.

Such swamps as have no natural drainage often develop a dense, coarse type of grass. In some instances there are trees of considerable size, as in the cypress and mangrove swamps of the southern United States. Finland, Estonia and Honduras have characteristic swamps.

Swaziland, a British protectorate in southeastern Africa. Mozambique bounds it on the east, and the Union of South Africa on the other three sides. It lies between the Drakensberg range on the west and the Lobombo Mountains on the east. The rest of the country is divided into the high veld (1,500 to 4,000 feet in elevation) and low veld (400 to 1,500 feet in elevation). Among the rivers draining the velds are the Usutu (a tributary of the Maputo), the Komati and Umbeluzi. The area of the state is 6,704 square miles; the population, including some 3,000 Europeans, is about 156,000.

Agricultural products of the low veld are mostly fruits (apples, apricots, citrus fruits, peaches and pears) and vegetables, including sweet potatoes; in the high veld corn, cotton, tobacco, millet and ground nuts are raised. Livestock includes cattle, sheep and goats. The only minerals found are tin and gold. Mbabane is the capital, where a resident commissioner, assisted by an Advisory Council of nine members, has ruled since 1906 under the British high commissioner for South Africa. Other towns are Bremersdorp, Goedgegen and Hlatikulu.

Sweden, a kingdom of northern Europe in the eastern portion of the Scandinavian Peninsula. Norway bounds it on the west and north; to the east lie Finland, the Gulf of Bothnia and the Baltic Sea; to the south, the Baltic; and to the west, the various bodies of water known as the Sound, Kattegat, Skaw and Skagerrak, which connect the Baltic and North seas. The area of Sweden is 173,143 square miles; the population is about 6,190,000. With the exception of about 30,000 Finns and 8,000 Lapps in the far north all of the people belong to the Scandinavian group.

The coast line of Sweden is serrated but does not possess the drowned valleys known as fiords that make the Norwegian coast so picturesque. The eastern coast is protected by a fringe of islands known as the Skargard or Skerries Archipelago. The northern and western parts of the country are mountainous. The principal range is the Kjolen, which forms a natural barrier between Sweden and Norway. The highest peaks are Mt. Sarjektjakko (6,971 feet) and Mt. Kebnekaise (6,965 feet). The central part is a lowland region, which is dominated by the Smaland Highlands in the southeastern part. In the southern section are the plains of Skane, constituting the best agricultural lands.

Courtesy Swedish Travel Information Bureau

In Sweden Skis Speed the Way To and From School

Sweden abounds in picturesque scenery. Hundreds of lakes, formed like those of Finland in glacial moraines and covering a total area of 14,500 square miles, add a pleasing aspect to the landscape. Of these lakes Vanern (2,149 square miles) and Vatern (733 square miles), both in southern Sweden, are the largest. The principal rivers are the Tornea (part of the boundary between Sweden and Finland), Kalix, Lule, Skellefte, Ume, Angerman, Klar and Dal, each more than 200 miles long. In the cataracts called *Harsprang* (246 feet) and *Handol* (148 feet) Sweden possesses two striking waterfalls.

Since it is not favored by the Gulf Stream, Sweden has a colder climate than Norway. In the far north the winters are 8 to 9 months long, with almost total darkness for more than 2 months. In the extreme south, almost 1,000 miles from the northern boundary, winter lasts only 5 months. Although cultivated soil constitutes only 10 per cent of the total area and grazing lands only 2 per cent, Sweden is an agricultural land. All the hardy cereals are raised, and hay, potatoes and sugar and fodder beets. Butter, the principal dairy product, is exported in large quantities.

With the development of hydroelectric power in recent years Sweden is becoming more and more an industrial country. The Government has erected a hydroelectric plant at Porjus in the heart of the mining region of Lapland. Iron ore, coal, copper, zinc, silver, manganese, lead and sulphur pyrites constitute the country's mineral wealth. Sweden has developed to a high degree the manufacture of machinery, hardware and electrical supplies of all kinds. Its porcelains and glassware also find large world markets. Shipbuilding, cotton spinning and flour milling are of considerable importance. Since about 60 per cent of the area is forested, the lumber industry is widespread. Timber, wood pulp, paper, pasteboard and matches are among the leading exports.

Sweden is a limited, hereditary monarchy with a liberal constitution adopted in 1809 and frequently amended. The executive power is vested in the king, who is assisted by a Council of State (*Statsradet*), headed by a premier. The king has some legislative authority, since all new laws must have his assent. The bicameral Parliament is called the *Riksdag;* its First Chamber has 150 members, elected by the landsthings and municipal councils of the 25 provinces or administrative governments for a term of 8 years, and its Second Chamber, 230 members, elected by universal suffrage for 4 years. The enactment of wise social legislation has earned for Sweden the reputation of being a country that follows the middle way.

The capital, Stockholm, is described in a separate article. Gothenburg or Göteborg (population, 255,000), through its location on the Kattegat, ranks first among Swedish cities in the extent of its foreign trade. The picturesque Göta Canal affords through connecting lakes and rivers a 240-mile water communication between Gothenburg and Stockholm. Among Gothenburg's notable buildings are the Town Hall, Cathedral and Art Museum housed in the old East India Company's Building and containing a large collection of the works of Scandinavian artists.

Sweden's other important cities are the seaport Malmö, located at the junction of the Sound and the Baltic Sea, and Uppsala, noted for its 13th-century cathedral and the university, founded in 1477. The Dalecarlia region (government of Kopparberg) attracts tourists because each village has distinctive peasant costumes. There also have survived in Dalecarlia old customs, such as raising the Maypole in observance of Mother Earth's renewed fertility and lighting bonfires in celebration of Midsummer Eve on June 23.

Switzerland, a republic of central Europe that is landlocked like Hungary and Czechoslovakia; bounded by Germany on the north, Germany and Liechtenstein on the east, Italy on the south and France on the west. The republic is a confederation of 22 cantons, each of which has preserved its political and cultural individuality and may be regarded as a miniature republic. However, the Swiss are not a people united in language. German is the dominant tongue in 16 cantons; French, in 5; and Italian, in 1. In certain districts of the Grisons the Romansch language, a survival of a form of Latin called *lingua rustica,* is used, and it was made one of the official languages of the country in 1938. The area of the country is 15,940 square miles; the population is about 4,143,500.

Switzerland is the most mountainous country in Europe. Along the western boundary extend the Jura Mountains, which attain an altitude of 5,653 feet in the Crête de la Neige near Lake Geneva. The most level land in the country is in the northern part and in the midlands, lying between the Jura range and the Alps. The principal Alpine ranges of the central part are the Urner, Bernese, St. Gotthard and Emmenthal. In the southern part are the Pennine, Lepontine and Engadine ranges. The loftiest peaks are the Jungfrau (13,672 feet) in the central part and Monte Rosa (15,217 feet) and the Matterhorn (14,780 feet) in the southern part. All are crowned with perpetual snow.

The glaciers of Switzerland are estimated to cover an area of more than 700 square miles; the largest is the Aletsch, 15 miles long. Several of the great rivers of the continent have their origin in these glaciers. The source of the Rhone is the Rhone Glacier on the southern slope of the Dammastock; this river flows southwestward through the Canton of Valais, joins Lake Geneva and emerges again at the city of Geneva as a stream that flows southward through France to the Mediterranean. The Rhine, whose source is near that of the Rhone on the northern slope of the St. Gotthard group, flows northeastward until it joins the Lake of Constance; it forms part of the northern boundary of Switzerland and part of the boundary between France and Germany, and then it flows northward through Germany and westward through the Netherlands into the North Sea. In the Engadine rises the Inn, one of the most important tributaries of the Danube. The Ticino (Tessin) rises in the St. Gotthard group and flows southward through Lake Maggiore to join the Po.

Switzerland's mountain scenery attracts many thousands of visitors yearly, and the Swiss lakes, taken as a group, are acclaimed the most beautiful in the world. Lake Geneva is on the boundary between Switzerland and France; the Lake of Constance forms part of the boundaries of Switzerland and Germany; and the resort lakes Maggiore and Lugano are partly in Switzerland and partly in Italy. The lakes of note that are entirely in Switzerland are Neuchatel (85 square miles), Lucerne and Zurich. These lakes, as well as the Bienne, Thun and Brienz, are drained by the Aar River, a tributary of the Rhine.

The Swiss mountain passes have been important trade routes since the early days of the Roman Empire. On its completion in 1906 the Simplon Tunnel, 12¼ miles in length, was the longest railroad tunnel in the world; it leads into Italy beneath the famous pass in the eastern part of the Canton of Valais. Through the Splugen Pass, with its narrow, dark 4-mile defile known as the *Via Mala,* threads the most noted highway in all Switzerland. The Rhone Glacier is reached by means of the Furka Pass. The St. Gotthard Pass is noted for its 14th-century hospice, and near Martigny the 10th-century hospice of the Great Mount St. Bernard still survives, famous for the St. Bernard dogs especially trained by the monks in the rescue of storm-belated travelers. Other passes are the Muretto, Bernina, Grimsel, Klausen, Brunig and Oberalp.

In mountain valleys as well as the fertile plateau region of the north are thousands of small farms, for a fourth of the population of Switzerland are engaged in agriculture. The chief crops are wheat, rye, oats, potatoes, tobacco, flax, hemp, grapes and orchard fruits. In most of the cantons wine making is a leading industry. The lower mountain sides are used for pasturage for cattle, sheep and goats, and the exportation of cheese (especially Gruyère and Emmenthaler) and condensed milk has reached vast proportions. On these mountain sides are most of Switzerland's forests, which cover one-fourth the total area.

The mountain torrents furnish water power for factories producing cotton, linen, silk and rayon fabrics. The country is especially famous for the manufacture of watches and clocks; in some years more than 20,000,000 watches are exported. The milk-chocolate industry has made Switzerland well known abroad. Among home industries are lace making, wood carving and embroidering (especially Appenzell). Other manufactures include engines, turbines, paper, beer, aluminum products, jewelry, music boxes and pottery whose designs frequently incorporate the beautiful edelweiss and other Alpine flowers.

Politically Switzerland is a confederation of 22 cantons or provinces, but three of the larger ones—Valais, Grisons and Bern—are subdivided, which makes 25 administrative districts. The executive authority is vested in the Federal Council of 7 members, who are chosen by the Federal Assembly for a term of 3 years. The legislature also chooses the president of the Swiss Confederation for a term of 1 year. The Federal Assembly is a bicameral body that consists of a States Council (*Standerat*) of 44 members and a National Council (*Nationalrat*) of 187 members. The States Council is composed of 2 members from each canton; the members of the National Council are elected according to proportional representation. For local administrative purposes the cantons are subdivided into 192 districts and some 3,000 communes.

It has been significant that, as an internationally recognized neutral territory, Switzerland should play a leading part in the preservation of world peace. On the establishment in Geneva of the headquarters of the League of Nations, it was hoped that the city would assume the role of a world capital. (Geneva is described in a separate article.) Bern, the capital of the republic since 1848, is located in the western part of the country on the River Aar. The most imposing edifice is the Parliament Building, which is called the Federal Palace. The Gothic Minster is about 500 years old, and in the Historical Museum many mementoes of Switzerland's colorful past are treasured. Other interesting features are the Town Hall, Clock Tower and bear pit in which families of bears are maintained at the city's expense in recognition of the traditional founding of the city in the 6th century on a site where many bears were killed—Bern is supposed to be named from the bears. Its population is about 112,000.

Switzerland's largest city, Zurich (population, about 250,000), is located on the lake of the same name in the northeastern part of the country. Among its notable buildings are the 13th-century minsters (called the *Grossmünster* and *Fraumünster*), St. Peter's Church and the Town Hall. Zurich also possesses several museums, such as the Art Gallery, Arts and Crafts Museum and the National Museum, noted especially for its exhibit of the life of Switzerland's prehistoric inhabitants, the lake pile dwellers. It is the seat of the Federal Institute of Technology and of the University of Zurich.

Lausanne, on the north shore of Lake Geneva and dominated by Mont Jorat, is a favored meeting place for international conferences; its 13th-century Cathedral of Notre Dame is the best preserved of the many ancient Swiss ecclesiastical structures. Basel, now the permanent home of the Bank for International Settlements, is noted for its Gothic Minster, Historical Museum and the University, opened in 1460. Montreux at the eastern end of Lake Geneva possesses the 13th-century Castle of Chillon, immortalized by Byron in "The Prisoner of Chillon"; this castle is framed by the snow-crowned Dent du Midi, and forms one of the most harmonious pictures in all Europe.

Lucerne, at the northern end of the lake of the same name, is dominated on one side by the jagged Mt. Pilatus and on the other by the majestic Mt. Rigi. It presents an unusual combination of the medieval and the modern. Among quaint survivals are the picturesque Guild Houses, parts of the city wall and towers and two 16th-century covered wooden bridges —the Muklenbrücke and Kapellbrücke—across the Reuss River. The Muklenbrücke is decorated with allegorical pictures of the Dance of Death, and the Kapellbrücke is noted for its historical paintings. The Hofkirche dates from the early 16th century and the Town Hall from the 17th century. The most modern building is a cultural center—the Art, Concert and Congress Hall. *The Lion of Lucerne* by Thorwaldsen, a world-famous piece of sculpture, is hewn from the solid rock; it commemorates the Swiss guards who fell in defense of Louis XVI and the Tuileries in the French Revolution, 1792.

Interlaken, which takes its name from its location between Lakes Brienz and Thun, is the gateway to the Lauterbrunnen Valley, dominated by the Jungfrau, Monch, Eiger and other peaks and famous for waterfalls, such as the Staubbach, Trummelbach and Schmadribach. It is noted for its open-air presentations of Schiller's *Wilhelm Tell.* The William Tell legend is likewise perpetuated through a summer festival and a fine monument in the principal square of Altdorf at the southern end of Lake Lucerne.

St. Moritz, the most popular winter resort in Switzerland, is located in the heart of the Engadine Alps. Among noted Swiss spas are Baden, Bex, Gurnigel, Passugg and Yverdon. Favorite lake resorts are Locarno on Lake Maggiore, Lugano on the lake of the same name and Vevey on Lake Geneva.

The name *Switzerland* (in German, *Schweiz*) is that taken by the three Forest Cantons—Schwyz, Uri and Unterwalden—when through the issuance of special charters of liberty they asserted their independence of Hapsburg rule in the latter part of the 13th century. On the formation of the Confederation of Switzerland in the following century the name was applied to the whole country.

Syria, a territory that since 1922 has been administered by France under mandate from the League of Nations. Before the World War it constituted a province of Arabia that was ruled by Turkey. It was made an independent state by the Treaty of Sèvres, but France insisted on a mandate so as to control the branch of the petroleum pipe line from Mosul, Iraq, to Tripoli, Lebanon. In 1936 there was signed a treaty of friendship and alliance between Syria and France that paves the way for the establishment of an independent Syria under French military supervision.

Syria is bounded by Turkey on the north, Iraq on the east and Trans-Jordan and Palestine on the south. The Mediterranean Sea laps the western coast from Alexandretta Gulf on the north almost to Acre on the south. Its area of 77,220 square miles (including the Syrian Desert in the southeastern part) consists of Syria proper, Lebanon, Latakia and Jebel Druse. The population is about 2,832,000. The Lebanon and Anti-Lebanon mountains run parallel to the Mediterranean coast. They acquired fame almost 3,000 years ago when the cedars and other evergreens that cover them were used in the construction of Solomon's temple in Jerusalem. The Euphrates River and its tributary the Khabur cross the eastern section; the Orontes River traverses the western section, and the Jordan River rises in the Anti-Lebanon Mountains.

Agriculture and stock raising are the chief occupations of Syria. The crops include wheat, barley, oats, corn, rice, potatoes, tobacco, cotton, hemp, sesamun, olives, grapes, apricots and citrus fruits. Sheep, goats, camels, oxen and asses constitute the livestock. The principal minerals are iron and lignite. Wine, silks, silk thread, cotton goods, glassware, soap, flour and cigarettes are among the manufactured products.

The *Republic of Lebanon* consists of a long, narrow strip, about 100 miles long and 30 miles wide, along the Mediterranean. Covering an area of 49,200 square miles, it extends from Palestine on the south to Latakia on the north. The Anti-Lebanon Mountains separate it from Syria on the east. Of its total population (about 863,000) more than a third are Moslems and less than half are Christians called Maronites. Lebanon was proclaimed the State of Great Lebanon in 1920 and was reorganized as a republic in 1926. The administration is entrusted to a president and an appointed Advisory Council. The capital is Beyrouth (population, 135,000). This city is noted for its American University (formerly called the Syrian Protestant College) and a museum containing a vast number of Syrian antiquities. Beyrouth is the western terminus of an important motor road to Bagdad. Near it is the superb Crusaders' stronghold called the *Krak des Chevaliers,* which French archeologists have recently restored. Tripoli, Tyre (Sour) and Sidon (Saida), important cities of old Phoenicia, are all in Lebanon.

The government of *Latakia* occupies the coastal strip to the north of

Courtesy Syrian World, New York

Citadel of Aleppo, Syria

This massive fortification dates back to the 12th century. Erected by the Saracens, it served during the Third Crusade as Saladin's northern base. The main gateway is typical of the Saracenic arch construction. Leading from the gateway is a bridge over what was once a moat and the entrance portal

Lebanon. The sanjak of Alexandretta, freed and now a part of Turkey, bounds it on the north; Syria proper is on the east. It has an area of 2,800 square miles, and the population is about 287,000. Latakia is its capital. The government of *Jebel Druse* occupies a small section in the southernmost part of Syria. It has an area of 2,400 square miles and a population about 52,000. Its capital is Es Suweideh. Both these governments are administered by French governors who are assisted by partly elected and partly nominated councils.

The *State of Syria,* formed in 1925 by uniting Damascus, Alexandretta, Aleppo, Hauran, Hama, Homs and Deir Ezzor, occupies 49,200 square miles and has a population about 1,697,000. Damascus is its capital and chief city (population, about 194,000). Located in a fertile plain 2,000 feet above sea level and surrounded by hillsides covered with orchards and vineyards, it is thought to be the oldest city in the world that has continuously existed. It was a city in the days of Abraham more than 4,000 years ago. Tiglath Pileser I attacked it unsuccessfully about 1100 B.C.; Tiglath Pileser III captured it about 700 B.C.; and Alexander the Great took it in 333 B.C. The Arabs held it in the 7th century; the Crusaders tried to seize it in the 12th century; and Tamerlane sacked it in the last part of the 14th century. In the 16th century the Turks gained possession and held it until the World War. The arcaded Street Called Straight, mentioned in the New Testament, connects the eastern and western gates of the city; on it are the traditional houses of Judas and Ananias. The oldest surviving building of interest is the Great Mosque, whose reliquary contains the reputed head of John the Baptist. The city is divided into Moslem, Christian and Jewish quarters. Damascus is the seat of the Syrian University. It is also the headquarters of the French high commissioner. Except for France's control of the foreign policy and certain other functions, the state is administered by a president, elected for 5 years, and a unicameral legislature whose 69 members are elected for 4 years.

There are famous ruins at Baalbek (north of Damascus) and Palmyra (in central Syria). Each city had a great Temple of the Sun in a high-walled enclosure. Huge stones in the Baalbek Acropolis measure as much as 62 feet by 14 feet by 11 feet. These temples and others were built in the 2d and 3d centuries by the Romans in a florid Corinthian style. Aleppo almost rivals Damascus in age; it was founded about 2,000 B.C.

taïga, the vast, swamplike forest of the Arctic region, south of the tundra, in which grow chiefly the coniferous evergreens—pines, firs, larches and spruces—with occasional birch, poplar, alder, aspen and willow trees. This forest has an undergrowth of tough bushes and is carpeted with mosses and lichens. In the more swampy areas are found rushes, reeds and sedges. Cold, dry winds stunt the growth of the trees. The word *taïga,* which is used particularly in northern Siberia, is of Russian origin.

talus, an accumulation of earth, sand, gravel and rock debris at the base of a cliff or mountain slope, caused by erosion. Rain, frost, intense heat and other weathering conditions, as well as gravitational slide, enter into its formation. When the debris accumulates in a cone-shaped mound, it is called a *talus cone.* Taluses are a feature of the Kenai Peninsula of Alaska. They are also found above timber line on many high mountains and in cold, stony deserts such as the tundra. The word is French, meaning slope.

Tanganyika, a British mandated territory, formerly known as German East Africa. The Urundi and Ruanda districts of this territory, which Germany had annexed in 1884, were transferred to the Belgian Congo after the World War, and the Kionga Triangle was incorporated in Mozambique. Tanganyika is bounded by the Azanian Sea, an arm of the Indian Ocean, on the east, Mozambique on the southeast, Northern Rhodesia and Nyasaland on the southwest, Belgian Congo on the west and Uganda and Kenya on the north. It has an area of 366,632 square miles and a population of about 5,000,000, including some 8,000 Europeans and 32,000 Asiatics. The Negroes represent 75 distinct tribes.

The British-controlled islands of Zanzibar, Mafia and Pemba lie off the coast of Tanganyika. Lake Tanganyika, on the boundary between Tanganyika and Belgian Congo, is the longest fresh-water lake in the world (450 miles long) with an area of 12,700 square miles. The greater part of Lake Victoria (26,000 square miles), on the boundary of Uganda, Kenya and Tanganyika, lies in Tanganyika Territory; it is the chief source of the White Nile. The northern part of Lake Nyasa forms part of the boundary between Nyasaland and Tanganyika. The Rovuma River bounds Tanganyika on the south; the Rufiji and Pangani are the largest of the numerous interior streams. In the north rises the highest peak in Africa —the extinct volcano, Mt. Kilimanjaro (19,710 feet high) whose crater is filled with snow masses. Southeast of it are the Para and Usambara highlands.

The plateau that comprises most of the territory is crossed in its eastern part by the Nguru, Useguha and Usagara mountains. The middle of the plateau is traversed by the Great Rift valley, caused by faulting and noted for its relics of a prehistoric culture of the Aurignacian period. In the northwest are the Mfumbiro Mountains. The southern part of the country is desertlike, but the plains of the northern part swarm with elephants, lions, rhinoceroses, zebras, antelopes and wildebeests.

Agriculture is practiced on the coastal plain and in the fertile area around Lake Victoria. The chief products are mangroves, bananas, cacao, rubber, sisal hemp, rice, cotton, coffee and ground nuts. From the forested slopes, cedar, ebony, silk, cotton, tamarisk, resins and copal are obtained. Gold, tin, mica and diamonds are the principal minerals.

The chief administrator of the Tanganyika mandate is the governor, who is assisted by executive and legislative councils. The natives retain their tribal organizations as much as possible, their chiefs being responsible to the British administrators. Slavery was abolished in 1923. Dar es Salaam (population, 33,000), a seaport on the central coast, is the capital; Tanga, farther north, is another port. Among other towns are Bagamayo, Kilwa, Tabora (the seat of a government school that is called the Eton of Tanganyika) and Bukoba.

tarn, a small mountain lake. Derived originally from the Icelandic, the word is applied in particular to the lakes of Norway, Sweden and Scotland.

Temple Square, a square in Salt Lake City, Utah. It contains the Mormon Temple, Tabernacle (world-famous for its organ recitals) and numerous smaller structures housing material relating to the Mormon trek of 1847.

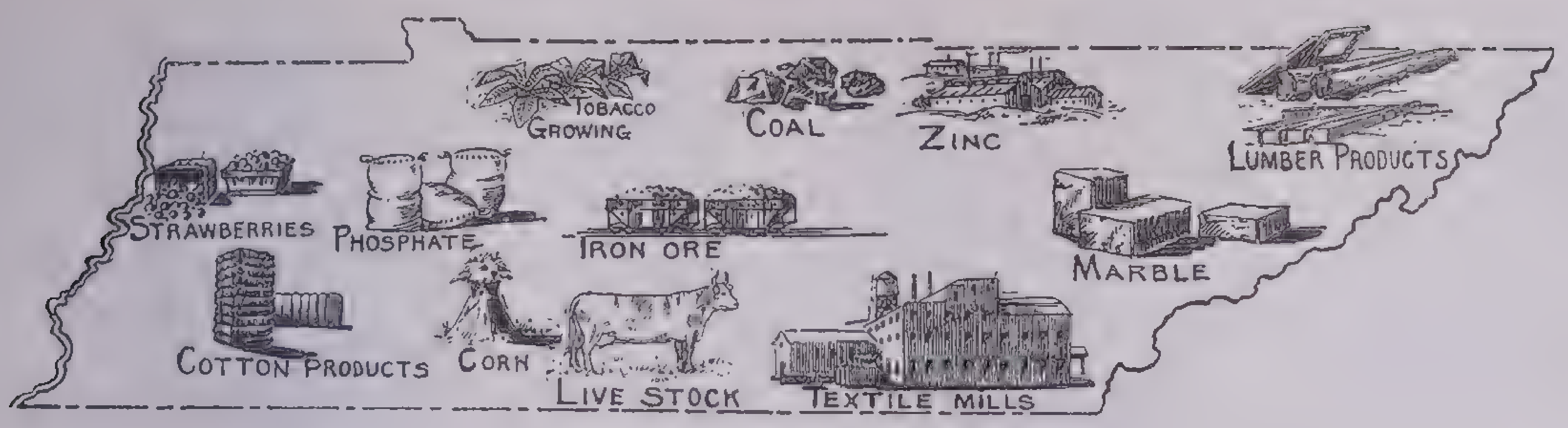
Tennessee, a South Central state, 430 miles long and 120 wide, bounded on the north by Kentucky and Virginia, on the east by North Carolina, on the south by Georgia, Alabama and Mississippi and on the west by Arkansas and Missouri. The Mississippi River forms the western boundary. The area of 42,022 square miles includes 335 of water surface. Of the population (approximately 2,900,000) only about a third live in cities and towns.

Eastern Tennessee is mountainous. The eastern boundary follows the crests of the main Appalachian ranges, and here in the Great Smoky Mountains is the highest elevation, 6,643 feet at Clingman's Dome. A part of the great Appalachian Valley, drained by the Tennessee River, separates the Great Smokies from the Cumberland plateau, a broad belt of wooded ridges gradually diminishing in altitude toward the west. The western half of the state is a part of the Mississippi Valley, relatively low and level.

The Tennessee and the Cumberland are the principal rivers, aside from the Mississippi. All three are navigable and of some commercial importance. The Tennessee Valley is the field of the great Federal experiment in public utility development, associated with flood control and improvement of navigation. Of the many dams, built or projected, on the stream, one of the greatest, Norris Dam, is in Tennessee, near Knoxville. Close to the Mississippi is the odd Reelfoot Lake, formed early in the 19th century by an earthquake.

In the eastern mountains the rainfall is great, and throughout the state it is adequate for agriculture. The climate is temperate. In the Great Smokies an unusual variety of trees and shrubs grow profusely, and all through the state there are remnants of its once dense forest cover. The hardwoods are especially valuable.

Farming is the principal source of income. Corn, tobacco and cotton are



Principal Products of Tennessee

the leading crops. Cattle and hogs are raised in great numbers.

Coal is the most important mineral. Copper and iron ores and phosphate rock are also produced, and Tennessee marble is highly regarded for building purposes.

Manufactures are devoted to local needs. The processing of the output of farms and forests forms the backbone of industrial activity.

Memphis, the largest city, is the leading trade center of a great stretch of the Mississippi Valley. It ranks as the largest inland cotton market, the largest hardwood lumber center and the chief producer of cottonseed products in the country. Its parks, boulevards and public buildings are models.

Nashville, the capital, is the trade center of the Cumberland Valley. Its educational institutions and parks, including a replica of the Parthenon, are well known. Chattanooga is a thriving manufacturing city in a particularly scenic part of the Tennessee Valley. It shares with Knoxville the prospect of rapid development with the expansion of industry in that area.

The University of Tennessee at Knoxville and Vanderbilt University, Fisk University for Negroes, and Peabody College for Teachers, all at Nashville, are prominent institutions of learning.

Tennessee includes a large part of Great Smoky Mountains National Park, a section of high elevations, varied wild flowers and superb forests which is one of the most popular national reservations. The scenery and the carefully marked battlefields of the Chattanooga sections are also noteworthy. Near Nashville is The Hermitage, home of Andrew Jackson.

territory, the land and waters, or any part of them, belonging to or under the jurisdiction of a ruler, a state or a government of any form. The word is also used to designate any area that is governed or ruled as a dependency.

In the United States the term *territory* is used to designate a section of the country or a dependency that is organized with an elected legislature and is administered by a territorial governor and other officers appointed by the President with the approval of the Senate. In Canada, Australia and Argentina the term *territory* is also applied to a section of the country that is not yet formed into a province or state. Its organization is similar to that of a territory in the United States. The word is derived originally from the Latin *terra,* meaning earth.

Texas, a Southwestern state, the largest in the Union, with an area greater than that of any European country except Russia. Its 265,896 square miles include 3,498 of water surface. The state is very irregular in outline. It is bounded on the north by New Mexico and Oklahoma, on the east by Arkansas and Louisiana, on the southeast by the Gulf of Mexico, on the southwest by the Republic of Mexico, from which it is separated by the Rio Grande River, and on the west by New Mexico. Its greatest length is 825 miles; and greatest breadth, 740 miles. In population it ranks fifth among the states, with some 6,414,824 people, almost half of whom live in cities and towns.

The state's great area includes nearly every variety of topography. The surface in general rises toward the northwest from the low, level plain along the Gulf Coast. Most of the eastern and central sections belong to the Great Plains, with broad stretches of level land broken occasionally by winding river valleys. The western and northwestern appendages reach into the edge of the Rocky Mountain region, and here is the highest elevation, 8,751 feet.

Texas has many rivers, but none are of commercial importance except for irrigation and limited hydroelectric power production. The Sabine forms most of the eastern boundary, and the Neches, Trinity, Brazos and Colorado are the chief streams entirely within the state. The Gulf coast is indented by several wide bays which form sheltered harbors and have superb facilities for recreation.

Climatic conditions are generally favorable to agriculture, though rainfall is deficient in the west. In the lower Rio Grande Valley the climate is subtropical, and an extensive citrus fruit and winter vegetable industry has developed. Throughout the state the summers are long and hot, but the dry atmosphere of the western plateaus is exhilarating in all seasons.

The eastern section once had fine forests, and lumbering is still an important business in that region. The west is almost treeless.

Due to its size and varied climate, Texas is the greatest agricultural state. Cotton is the leading crop, but the production of corn, wheat, hay, and sorghum is tremendous. Rice, onions and pecans are profitable in some localities. Cattle, sheep, mules and hogs are raised in huge numbers, ranging the western grazing lands and fattening on the grain and forage of the east.

Its several great oil fields give the state such immense mineral wealth that it ranks first among the states in value of petroleum output. It leads the nation in the production of petroleum, natural gas and sulphur. There are other extensive mineral resources, especially low grade coal, which have had little commercial exploitation.

Manufactures are of growing importance. Oil refining is the leading industry, and other processes depending on local products, such as meat packing, milling flour and cottonseed, and fruit and vegetable canning, employ thousands of citizens. The fisheries are a steady source of income.

Houston, the largest city and chief port, has almost tripled in population since 1920. Of American ports it ranks fourth in tonnage handled. Oil and cotton are the chief factors in its prosperity. Its business buildings and residential sections are impressive, and its parks, rich in semitropical flora, museums and public institutions are well supported.

Dallas is the trade center of north and northwest Texas and the principal manufacturing city of the state. Cotton gins, harness and leather goods, textiles and furniture are leading products. It is an important wholesale distributing point, and its trade has expanded greatly with the development of the Texas oil fields. It is the home of the Texas State Fair, the largest of its type. There are fine museums and parks. The Little Theater movement has won exceptional prominence. Natural gas and electricity are so generally used that the air is exceptionally free from smoke.

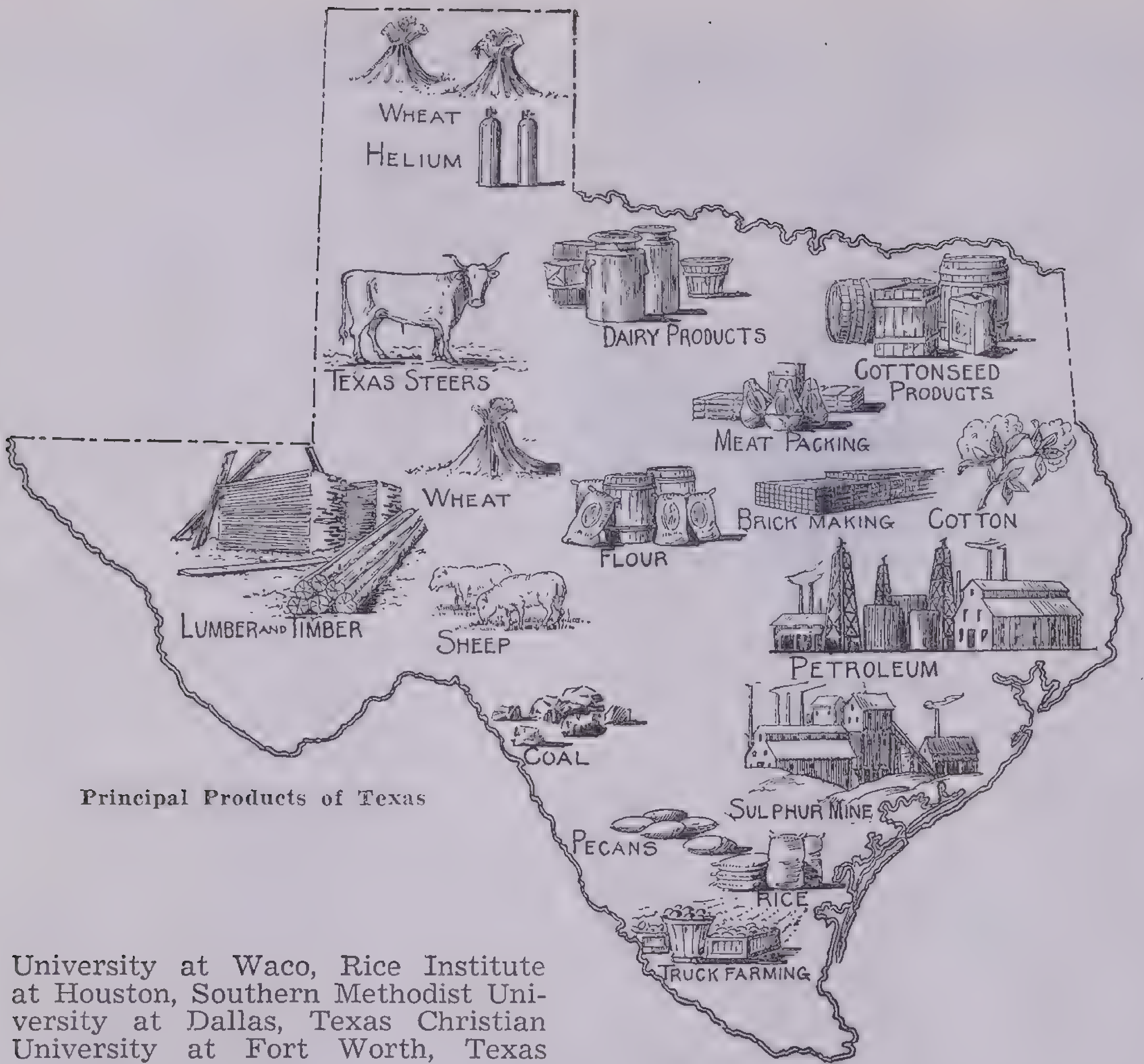
San Antonio has many reminders of its near neighbor, old Mexico, in its architecture and atmosphere. It is a distributing and market point for the ranches and farms of southern Texas. As a winter resort it attracts many visitors, who enjoy its subtropical vegetation, old Spanish missions and great U. S. Army posts.

Fort Worth is a busy trade center for the cattle and oil operations of western Texas. It has extensive stockyards and packing plants, flour and cottonseed mills. There are many parks.

El Paso is the principal center of far western Texas, and of southern New Mexico and northern Mexico as well. Its dry, sunny climate gives it some fame as a resort, and its nearness to Mexico is an added charm.

Among the smaller Texas cities are several which have shown remarkable growth in recent years: Austin, the capital, with the tall domed capitol building and the state university; Waco, trade point and university town; Beaumont and Port Arthur, neighbor ports for the oil fields and pine forests; Amarillo, business center of the Panhandle and principal source of the American helium supply; Galveston, historic port and popular Gulf resort; and Wichita Falls, busy outpost of the ranch and dry-farming area.

Texas has several important educational institutions. The University of Texas at Austin, the largest, is richly endowed. Among others are Texas Agricultural and Mechanical College at College Station, Baylor



Principal Products of Texas

University at Waco, Rice Institute at Houston, Southern Methodist University at Dallas, Texas Christian University at Fort Worth, Texas Technological College at Lubbock and Texas State College at Denton.

Among the state's historic shrines are The Alamo at San Antonio and the San Jacinto Battleground, near Houston, marked by a star-capped memorial shaft. Scenic features include the wild, semi-arid, mountainous Big Bend region on the Rio Grande and the spectacular Palo Duro Canyon in the Panhandle.

thalweg, the lowest part of a valley where the two sides join, thereby serving as a course for any stream of water. The term is German for valley way.

Thames, the principal river of England. It rises in Gloucestershire in the Cotswold Hills and flows in a generally eastern direction to the North Sea, into which it discharges through the Nore estuary. From Thames Head to Nore it is 209 miles long. Its width at Oxford is about 150 feet; at Nore it is 5½ miles wide. The river is navigable for 180 miles and is tidal as far as Teddington. Its upper course is connected by canals with the Severn and other rivers. Tributaries of the Thames are the Windrush, Evanlode, Cherwell, Ock, Thame, Kennet, Loddon, Colne, Wey, Mole, Brent, Ravensbourne and Lea. Among the towns on its banks are Oxford, Abingdon, Dorchester, Wallingford, Reading, Henley, Bourne End, Taplow, Maidenhead, Eton, Windsor, Hampton Court, Kingston, Richmond, Kew, Woolwich and Gravesend. The river is London's great commercial waterway. The upper part of the harbor is formed by the 870-foot lakelike widening called the *Pool of London,* and this is as far as ocean-going vessels may go. The Port of London is the part of the river between Blackwell and London Bridge.

Although it is commercially important, the Thames is outstanding as a playground for those who like to row, sail and fish. The Royal Regatta and the Oxford and Cambridge boat races are held each year at Henley. In 1215, either at Runnymede, a meadow on the south bank of the Thames west of London, or on Charter Island nearby, King John accepted the Magna Charta.

Thousand Islands, a group of 7 large islands and about 1,700 small islands in a 40-mile-long and 7-mile-wide expansion of the St. Lawrence River near its junction with Lake Ontario. They were discovered in 1534 by the French explorer Jacques Cartier. The English, after they acquired New France or Canada in 1763, retained the French name, *Les Mille Isles* or the Thousand Islands. Following the boundary survey of 1817 and the signing of the Porter-Barclay Treaty in 1822 half of the islands were conveyed to the United States by Great Britain. The American title had previously been confirmed by a treaty with the Oneida Indians in 1788.

The Thousand Island region was the original home of Hiawatha, legendary founder of the federation of the Five Nations of the Iroquois Indians, about whom Longfellow wrote his famous poem. For almost a century the picturesque beauty of the islands has made them a favorite summer resort. Many of them are privately owned.

Threadneedle Street, a street in the city of London famous as the site of the Bank of England, popularly known as the Old Lady of Threadneedle Street. It also skirts the northern side of the Royal Exchange and is adjacent to the Bank of Scotland. It takes its name from the three threaded needles on the escutcheon of the Needleworkers' Guild.

Tibet, a mountainous country of central Asia, probably the most secluded in the world. It is bounded by China on the east, Bhutan and Nepal on the south, India on the west and Sinkiang and Inner Mongolia on the north. The gigantic Kunlun Mountains on the north and the Himalayas on the west and south have contributed to make Tibet a forbidden land. Until the collapse of the Chinese Empire in 1912, though, Tibet acknowledged China's suzerainty. But since it expelled the Mandarin agents and the last of the Chinese garrisons were withdrawn on the outbreak of hostilities between China and Japan in 1931, Tibet has been virtually independent.

Tibet occupies a vast plateau that varies in elevation from 12,000 to 17,000 feet. The only approach to the country is through lofty mountain passes traversed by yak caravans. Since the 13th century it has been practically shut to foreigners. In the mountains of Tibet rise four of the great rivers of Asia—the Indus and Brahmaputra of India and the Yangtze and Hwang Ho of China. The sacred lakes of Manasarawar and Rakastal are located near the source of the Sutlej River. The area of Tibet is about 463,000 square miles. The population is estimated at 3,000,000, divided into two main classes—the priesthood and landed gentry and some 2,000,000 peasants, who are obliged to devote most of their time to supporting the privileged lamas or serving the landed gentry. A few thousand traders may be said to constitute the middle class.

The principal crops that can be produced on Tibet's bleak plateau are barley, peas, wheat, buckwheat, although in the protected valleys fruits and vegetables are raised. The nomadic herdsmen wander from place to place with their herds of yak, wild asses, sheep and goats. The climate is very dry and hot in summer and extremely cold in winter.

The most important of Tibet's minerals is gold, which is washed down with the river sands; only the gold dust can be gathered as the nuggets are the property of the priests and can be removed only at their pleasure. Iron (in pyrite form), salt, soda, potash and borax are found. The exports, which reach the outside world mostly through India, include gold dust, wool, furs and a musk, used in the manufacture of perfumery, that is obtained from a fast-disappearing muskdeer in the mountains of southeastern Tibet.

Religion may be called the chief occupation of Tibet, for more than 700,000 of the population dwell in some 3,000 monasteries and nunneries where they carry out the innumerable rites of Lamaism, a form of Buddhism that has existed since the 7th century, when Buddhism came into Tibet. Lama means superior. The government is definitely by the priesthood. Its heads—the spiritual ruler, called the *Grand* (or *Dalai*, literally, ocean) *Lama*, and the temporal ruler, the *Teshu Lama*—are reincarnations of Buddhist divinities. On the death of either ruler his successor is selected with the aid of oracles from among Tibetan children born immediately after the lama's death. His spirit is supposed to have passed to the newborn child. In 1936 a successor was chosen to the Grand Lama who died in 1933. The new Grand Lama, who represents the 14th reincarnation, will assume his spiritual leadership in 1951 at the age of 18. In November, 1937, occurred the death of the Teshu Lama who had been living since 1924 in voluntary exile at the Temple of a Hundred Miracles in Outer Mongolia, because he refused to sanction the militaristic program of the young Tibetans. The Regency Council, headed by the Foreign Minister, has carried on the government since the deaths of the Grand and Teshu lamas.

The national assembly is a bicameral body. It consists of: a Greater House (in reality, the lower house) in which any priest and any nobleman (the eldest son of families in which Grand Lama or Teshu Lama reincarnations have occurred in past generations) may sit; and a Lesser House (in reality the upper house) whose 12 members constitute an Advisory Council.

Lhasa (population, about 20,000) is the capital of Tibet. With the exception of the residence of the Grand Lama, which is an elaborate fortress-palace, the town retains the medieval aspect that it had when Marco Polo visited it the latter part of the 13th century. The residence of the Teshu Lama is at Shigatse (population, 12,000), 145 miles west of Lhasa. Yatung is a trading center.

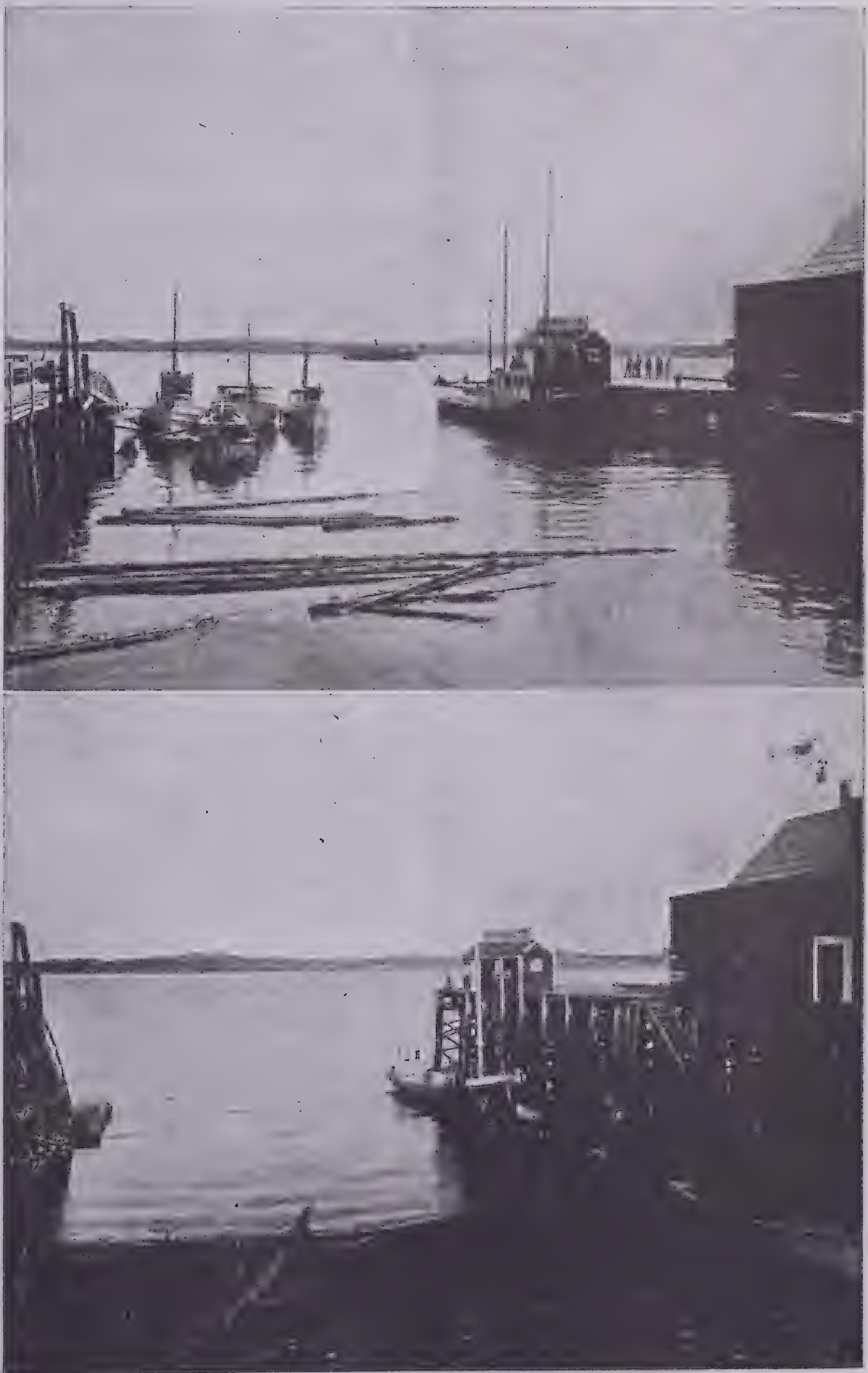
Tibet is probably the only country where polyandry prevails. A woman generally marries all the men in a family, but the children belong only to the eldest brother. This is to keep intact from generation to generation the agricultural holdings.

The name *Tibet* is a corruption of *Thupo* meaning high country.

tide, the alternate rising and falling of the water of the ocean, occurring four times (two high tides and two low tides) in a lunar day, consisting of 24 hours and 50 minutes. It is caused by the difference in gravitational attraction or pull of the sun and moon on the earth, thereby affecting (particularly at high tide) the movement of ocean water on both the near and far sides of the earth. The rising of the water, when the moon is high in the heavens above a given point, is called high or flood tide. The falling of the water, when the moon is near the horizon, whether east or west, is called low or ebb tide.

As the earth rotates on its axis, two vast double tidal waves are produced. Formed by the attraction of the moon and the earth and of the sun and the earth, these waves (called the *lunar* and the *solar tidal waves*) travel steadily from east to west in accordance with the earth's rotation across the seas and oceans. (The expression *tidal wave* is often erroneously used in reference to a submarine earthquake.)

At the time of the new moon the tide is called *spring*. The moon in its 29½ day revolution about the earth is then in conjunction with the sun (that is, on the same side of the earth as the sun), and their combined action in pulling in the same direction produces the highest and lowest tides and causes the solar and lunar tidal waves to coincide. The effect is the same when the moon is full. The moon is then in opposition to the sun (that is, on the opposite side of the earth, with that body between it and the sun), but the combined pull of the sun and moon is



Courtesy Maine Development Commission

High and Low Tides in Passamaquoddy Bay

The picture above shows high tide in Eastport Harbor, Maine; the one below, low tide. Eastport is on an island in Passamaquoddy Bay where tides rise higher than anywhere else along the Atlantic seaboard. Variation between high and low tide is sometimes as much as 25 feet still in a straight-line direction, with a corresponding coincidence of the solar and lunar tidal waves. The time when the moon, earth and sun assume a horizontal position through the moon's being in conjunction with or in opposition to the sun is called *syzygies,* a term derived from the Greek *syzygia,* meaning a joining together.

During the first and last (or third) quarters of the moon, when the sun is pulling at right angles to the moon, the effect is to weaken both tides, so that the flood tide is lower and the ebb tide higher than the average, and to cause the crest of the lunar tidal wave to fall in the trough of the solar tidal wave. The resulting tide is called the *neap;* however, this diminution in force is explained by the fact that, even when the moon is in conjunction with or opposition to the sun, the latter's tide-producing power on account of its extreme remoteness from the earth is but one-third as great as that of the moon. The time when the sun is pulling at right angles to the moon, thereby causing only part of the lunar disk to be illuminated, is called *quadrature,* the term being derived from the Latin, *quadrans,* meaning a fourth part.

Tides that enter bays or the estuaries of rivers to any great distance often cause bores, as in the Bay of Fundy and the Amazon River. The word *tide* in Anglo-Saxon meant the same as *time.*

Tierra del Fuego, an archipelago in the Atlantic Ocean, off the southern extremity of South America, from which it is separated by the Strait of Magellan. It includes one large island, generally known as East Tierra del Fuego, and various small islands, such as Staten, Hoste, Navarin and Clarence. The total area is 27,600 square miles. By arbitration agreement in 1881 the archipelago was divided between Chile and Argentina. The Chilean part, which covers 19,256 square miles, is known as the Territory of Magallanes; and the Argentinian part, whose area is 8,344 square miles, is called the Gobarnacion of Tierra del Fuego. Through the Chilean section extend the Andes, whose loftiest peak is Mt. Sarmiento (7,200 feet high). The principal industries are stock raising, mining coal, gold, copper and lignite and lumbering. The tribes of native Indians, numbering about 1,000, include the Onas, Yagans and Alakalups. The white population is about 35,000.

On the Strait of Magellan in the Chilean section is the city of Magallanes (until recently called Punta Arenas). The capital of the Argentinian section is Ushuaia. The southernmost bit of land is Horn Island, whose projection, Cape Horn, was especially dangerous to round in the days of the clipper ships. The islands were discovered by the Portuguese navigator Ferdinand Magellan on his circumnavigation of the globe in 1520; but they were not explored by the Dutch and British until the 17th and 18th centuries. The name *Tierra del Fuego* means land of fire in reference to its once active volcanoes.

timber line, the level, especially on mountains, at which the growth of trees stops. It varies with latitude and climate. Near the timber line and just below it the few trees are scrubby and distorted in shape through battling with high winds.

Times Square, the most famous intersection in New York, where Broadway and Seventh Avenue cross at 43d Street. To the south is the old building of the New York *Times.* It is the center of the theatrical section of New York.

Timor, an island of volcanic formation, the largest and easternmost of the Lesser Sunda Islands of the Malay Archipelago. A Portuguese colony, administered by a governor with Dili as the capital, occupies 7,350 square miles in the northern part of the island. In the southern part, 5,120 square miles constitute the Dutch colony, whose capital, Kupang, is the seat of the resident commissioner of the Timor Archipelago of Netherland India. The population of the Portuguese colony of Timor is 452,000 and of the Dutch colony, about 360,000. Included in the Timor Archipelago are Sumbawa, Flores, Sumba and the Alor Isles, which with Timor have a total area of 24,537 square miles and the population is about 1,656,700.

The highest of the numerous peaks of Timor is Mt. Rameau (9,600 feet high) in the Portuguese colony. Among the mineral resources are copper, gold and gypsum. Petroleum wells have been sunk. Copra, coffee and cacao are the principal agricultural products. In addition to agriculture the chief occupations of the natives, who represent a mixture of Malayan, Papuan and Polynesian blood, are fishing, weaving and plaiting. The Portuguese colony was established in the early part of the 16th century. Dutch exploitation of Timor dates from 1613.

Togoland, a mandated area of West Africa that lies between the British Gold Coast colony and Dahomey of French West Africa; formerly known as German Togoland. It has been administered since 1922 by Great Britain and France under mandates granted by the League of Nations.

The British sphere in the west has an area of 13,041 square miles and a population of about 294,000; it is landlocked, its principal towns being Ho and Kpandi.

The French sphere in the east has an area of 21,893 square miles and a population of about 762,000; it occupies all of the coast along the Gulf of Guinea with Lome as its chief port.

The Agome Mountains traverse the region from the northeast to the southwest. The chief rivers are the Sio and Haho, which flow into the Togo lagoon, the Mono, Oti and Volta. Coffee, cacao, rubber, copra, cotton, palm oil, indigo and dyewoods are the principal products. British Togo is administered by the governor of the Gold Coast; French Togo, which is attached to Dahomey, comes under the administration of the governor-general of French West Africa.

Tokyo, the capital of the Japanese Empire, located at the mouth of the Sumida River, which empties into Tokyo Bay, on the eastern coast of the principal island, Honshu. In the distance is snow-capped Mt. Fuji. In recent years Tokyo has become important industrially as well as administratively. It is a printing and publishing center, and its manufactures include silk, rayon, cotton and other textiles, paper, rubber and celluloid goods, matches, cigarettes and various art-craft productions, such as porcelains, lacquer ware and embroideries. The port of Tokyo is Yokohama, 18 miles to the south at the entrance to the practically landlocked Tokyo Bay. By continual annexation of suburbs Tokyo now ranks third in size among the large cities of the world; its area is 214 square miles and its population, about 5,633,000. Numerous canals provide local waterway transportation facilities. There are also a network of trolley cars and a 5-mile-long subway that operates between the Shinbashi and Asakusa sections.

The architecture of Tokyo presents a striking combination of features typical of the East with those of the West. Seventy-five years ago there was not an Occidental-styled building in the city. Today its business section, largely rebuilt since the disastrous earthquake and fire of 1923, contains many of the most modern buildings in the Orient. They include the spacious railroad station and Central Post Office, Greek-columned banks such as the Bank of Japan and Yokohama Specie Bank, 8-story department stores and office buildings, newspaper offices and imposing hotels, such as the Imperial Hotel. Among Tokyo's theaters are the Imperial, a palatial motion-picture house; the Kabukiza Theater, in which productions of the Kabuki drama are staged; and the Hosho Theater, noted for its No drama. A rather extreme example of modern architecture is the Imperial Diet Building, where the House of Peers and the House of Representatives meet.

A reminder of the feudal Japan that existed until the middle part of the 19th century is the Imperial Palace, surrounded by the age-old moat and cyclopean wall. Until the revolution that resulted in the overthrow of the Shogunate and the transfer of the Imperial seat of government from Kyoto to Tokyo in 1868, the castle that stood on this site had been the residence of the military governors. Since the early 17th century this office had been hereditary in the Tokugawa family, and though nominally subject to the emperor the shogun had become the virtual ruler of Japan. He was the acme of the Japanese feudal system, for to him 300 feudal lords (called *daimyos*) and their 18,000 retainers owed allegiance. In the surrounding Fukiage Park these nobles had their residences. The fall of the Shogunate was followed by the abolition of

Courtesy Japan Tourist Bureau

Hotel Imperial, Tokyo, Designed by Frank Lloyd Wright

Frank Lloyd Wright, American architect, studied earthquakes carefully before drawing the hotel's plans, which were so curious that they created a furor in the architectural world. Built on a mud foundation topped by 8 feet of surface soil, the hotel is literally floating in mud. All the weight of the walls is at the bottom; at the top of the building, the outer walls are narrower and lighter, avoiding the usual top-heaviness of Japanese buildings. The floors are supported from the center by the cantilever method, giving lightness and flexibility. The Imperial withstood the earthquakes of 1920 and 1923; it was the only building of any consequence left standing after the 1923 tremor

the special rights and privileges of the Samurai or warrior class composed of these feudal lords. Even their palaces were replaced by buildings housing the various ministries and governmental departments, by the law courts and the Imperial Diet Building. The Imperial Palace itself is comparatively modern; it was erected in a style half Oriental and half Occidental after the Shogun Castle burned in 1873. From Tokyo's most notable bridge, Nihon-bashi, all distances in the Empire are measured.

Besides being the administrative capital of the Japanese Empire Tokyo is the cultural center. The Tokyo Imperial University, which was founded in 1886 by the merger of two older institutions and where the American writer, Lafcadio Hearn, served as professor of English during the '90s, is the most important of all Japanese universities. In this city are also the private Waseda University; the Japanese Military and Naval academies; the Tokyo Academy of Music, which offers instruction in both Japanese and western music; and the Kodokan, where *jujitsu,* the art of self-defense, is still taught. The Tokyo Academy of Fine Arts, the Tokyo Prefecture Fine Art Gallery and the building of the Japanese Fine Arts Society stand in Ueno Park. This park contains also the Imperial Library, Tokyo Science Museum and the Imperial Museum, whose comprehensive exhibits represent all periods in Japanese history.

Every important Tokyo park has its shrine or temple, either Shinto or Buddhist. In Ueno Park is the Toshogu Shrine; in Shiba Park, the Zojoji and Sengakuji (temples) and several shogun tombs; and in Asakusa Park, the Kwannon Temple, dedicated to the Buddhist goddess of mercy. The Yasukuni Shrine (with a nearby military museum) on Kudan Hill commemorates those who have lost their lives in battle since the Imperial Restoration of 1868. On the outskirts of the city is the Meiji Shrine (*Meiji* means enlightened peace), dedicated to the Emperor Mutsuhito in whose reign (1868–1912) Japan let down the barriers to Western influence; it is built in the Shinto style in token of the Shinto religion of the Imperial family. In the outer gardens of the Meiji Shrine stands the Meiji Memorial Art Gallery; there are also a stadium, baseball grounds, swimming pools and wrestling, fencing and archery arenas, where Japanese youth indulge in many activities that appeal to Western youth as well as in various native sports.

The name *Tokyo* means eastern capital and was bestowed in contradistinction to Saiko or Kyoto, which means western capital. For 600 years previous to the Imperial Restoration the city was known as Yeddo, which means gate of the inlet. During Japan's modern phase Tokyo has been the only capital, although Kyoto retains its old name.

Tomb of the Unknown Soldier, Arlington Cemetery, Va. Placed on the crest of a hill across the Potomac from the National Capital, this simple block of white marble, always guarded by soldiers at attention, marks the last resting place of an Unknown American soldier of the World War. Dedicated to all the unidentified dead on the battlefields of France, it has become a national shrine.

Tonga or **Friendly Islands,** a Polynesian archipelago of more than 100 islands and islets in the Pacific Ocean. The islands are partly volcanic and partly coral in formation and lie between 15° and 23° S. Lat. and 173° and 177° W. Long. There are three groups, named for their principal islands—Tongatabu, Vavau and Haapai. Copra and green fruits, such as bananas, are the chief exports. The islands were discovered by Abel Tasman, the Dutch explorer, in 1643. In 1845 they were united under one king who is advised by a cabinet of seven ministers and by a privy council. The elective legislative assembly is convened annually. Since 1900 the islands have been a British protectorate. Nukualofa is the capital.

The name *Tonga* is a contraction of the name of the largest island, Tongatabu. The name *Friendly* was bestowed by the English navigator, Capt. James Cook, who visited the islands in 1773 and again in 1777 and was agreeably impressed with the hospitality and friendly disposition of the natives.

topography, a detailed delineation of the physical features of any land area, including its mountains and other elevations, rivers, lakes, railroads, highways, counties, cities, towns and so forth, with special emphasis on relief and contour peculiarities. In even greater detail it may give this information for some particular section, as a state or province, county, city or township. Each of the five climatic zones has its peculiar topography. The only forms that are practically alike everywhere are the savannas.

Among types of topography dealing with the configuration of a land surface are: *tectonic,* in which the mountains and hills are of anticlinal formation (with the rock strata raised upward to form an arch) and the valleys are of synclinal formation (with the rock strata dipping downward to meet at a common level); *diastrophic,* in which all parts of the land are subject to elevation and subsidence, producing plateaus, basins and faults; and *erosional,* in which such factors as air, wind, rain, frost, streams and wave and glacial action change the relief contours of the land by denudation.

A *topographical map* is one intermediate between a general map and a plan, which presents with minute accuracy and according to a scientific scale the physical features of a region. The term is derived through the French *topographie* from two Greek words, meaning place description.

tor, a lofty cliff or rocky pinnacle. This formation is characteristic of Devonshire, England, where it is used in such place names as Torquay, the fashionable sea resort, and Tor Bay. Some of the rocky hills of the Highlands of the Hudson are called tors, and from them Sherwood Anderson took the name for his play, *High Tor*. The word is Anglo-Saxon in origin and is related to the word *tower*.

tornado, a violent, rotating storm whose destructive eddies of wind, like those of a cyclone, circulate about a central area of low atmospheric pressure in spiral formation, counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. Its storm center, a black, funnel-shaped cloud, progresses in a narrow path at a rate of 75 miles or more an hour.

Tornados occur in many parts of the Mississippi Valley, usually during the early summer months, and cause vast destruction. Cyclone cellars have been built throughout the section for protection from these storms that come up very suddenly.

torrent, a stream of water flowing swiftly and with a roaring noise over a shallow, rocky bed in a mountainous region, as the Ache, a tributary of the River Inn in the Tirolean Alps. The term is applied specifically to young rivers. The word is derived from the Latin *torrens,* meaning boiling.

trade center, a city or town that draws retail or wholesale business from a large surrounding area. Usually a trade center has a larger population than any unit in its contributing territory. A requisite for a successful trade center is the ease with which it can be reached by consumers from the surrounding country—and by the goods shipped to the center for sale. The early trade center was at a port or on a cross-country trail. The growing use of the automobile has increased the trading radius of many centers.

In addition to an exchange of commodities through productive and distributing centers the activities of a trade center may involve the exchange of services or ideas. It may be accordingly classified as *administrative,* like Washington, D.C.; *defensive,* like Verdun, France; *recreational,* like Atlantic City, N.J.; or *cultural,* like Ithaca, N.Y., the seat of Cornell University, and *Florence,* the Italian art center.

In the United States 29.6 per cent of the inhabitants live in trade centers that have a population of 100,000 or more. Throughout the world there are about 550 trade centers with a population in excess of 100,000.

The term *agricultural center* is more properly applied than trade center to a market town that receives farm and dairy products and sells general merchandise to a large rural and farming community.

trade route, the route along which commercial products move. It has existed since the earliest dawn of civilization, being created on account of the unequal distribution of the earth's resources and the necessity of moving raw materials that are abundant in one region to regions where they are scarce and are desired for manufacturing. A trade route likewise sprang up between the manufacturing center or place of production and the market center or place of consumption or processing for further distribution.

The three types of trade routes are: land, water and air. The direction of land routes is affected by favorable climate; by the distribution of trade centers; by military exigencies, particularly in Europe; and by topography—mountain passes and water gaps, for instance always have played an important part since time immemorial in overcoming the obstacles that mountains presented. Rivers and lakes also have been utilized since earliest times as inland arteries of transportation. Those rivers that have the highest rating for navigability have generally been improved by: dredging so as to correct insufficient depth or length; straightening the channel and meandering courses; removal of shifting sandbars at the mouth; and building canals and locks so as to circumnavigate rapids and falls.

Oceanic routes have been largely determined from surveys that revealed the wind systems of the earth, particularly in stormy areas, and the topography of the ocean floor, so as to avoid navigational hazards and the advantage of a shortened route in following great circle paths. The Atlantic Ocean carries nearly one-fourth of the tonnage of all merchant vessels, and the Pacific is yearly growing in importance.

The direction and altitude of aerial routes are likewise greatly affected by topographical and weather circumstances and from experiments already made via transpolar routes show a preference for great circle paths. As a means of connecting trade centers much quicker than can be done by rail or steamship this method of transportation has been especially adopted by the smaller European countries, such as Denmark and the Netherlands. The U.S.S.R. has found aerial navigation a means of unifying its vast country. Between North and South America air transport has proved to be one of the most successful methods of intercourse.

trade winds, the constant winds that occur in the open seas on both sides of the equator within the areas 15° to 28° north and south of the equator. They are caused by cold currents of air from the Polar Regions replacing the hot layers that are continually ascending in the Tropics. On account of the rotation of the earth these currents near the equator are deflected into winds blowing northeast to southwest in the Northern Hemisphere and southeast to northwest in the Southern Hemisphere. A shifting belt of calm, called the *doldrums,* 5° to 15° north and south of the equator, separates these winds.

The trade winds reach their greatest strength in the Indian Ocean. They do not blow with equal force the year around, however, because the sun's rays fall unequally in the tropics as the sun journeys back and forth between the points marking the summer and winter solstices, and the low-pressure belts on either side of the equator about which these winds originate vary accordingly.

The name *trade* was given because such winds, blowing more or less uniformly and regularly, gave aid to sailing vessels carrying cargoes in following a definite course. In the tropics trade winds carry to coastal areas exposed to them abundant rainfall; but farther inland, especially as they approach the equator or cross high mountains that absorb their moisture, they become dry and are generally responsible for the aridity of the deserts.

Trafalgar Square, one of the principal squares in London, so named in commemoration of Nelson's great sea victory of 1805. In its center is the Nelson Monument, a 184-foot-high Corinthian column surmounted by a statue of the admiral. The bas-reliefs on the base of the monument represent scenes from the battles of the Nile, St. Vincent, Copenhagen and Trafalgar. It is guarded by four colossal lions, designed by Sir Edwin Landseer. On the north side of the square are the National Gallery, National Portrait Gallery and the Church of St. Martin's-in-the-Fields. South Africa House is on the east side, and the London headquarters of the Canadian Government on the west side. On the south side is the Admiralty Arch.

Trans-Jordan, an Arab state in Asia Minor; administered since 1922 under the British Mandate of Palestine; bounded by Syria on the north, Iraq on the northeast, Saudi Arabia on the southeast and south and Palestine on the west. The River Jordan and the Dead Sea form part of its western boundary, hence the name Trans-Jordan or Beyond the Jordan. The area is about 30,000 square miles, and the population, about 300,000. The eastern part of the country is a continuation of the Syrian Desert, but in the fertile valleys of the Gilead, Edom and Moab mountain sections wheat and grapes for raisins are grown. There is also considerable raising of cattle, sheep and goats by Bedouin tribes. The mineral wealth consists of potash, phosphates and petroleum.

The country is administered by an emir with the advice of a British representative who resides at Amman, the capital, and who is responsible to the high commissioner for Palestine. The Legislative Council consists of 16 elected and 6 official members. Amman was known in Greco-Roman times as Philadelphia, having been rebuilt by Ptolemy Philadelphus. Other cities are Kerak, Jerash, Gadar and Es Salt.

tributary, a stream of water that flows into a larger stream or lake. The Missouri, Ohio and Arkansas rivers are tributaries of the Mississippi; these rivers, in turn, have tributaries, such as the Yellowstone and Platte rivers that flow into the Missouri; the Wabash, Tennessee and Cumberland rivers that feed the Ohio; and the Cimarron that flows into the Arkansas. The Grand and Muskegon rivers are tributaries of Lake Michigan.

A distributary is a river that flows away from a main stream and does not rejoin it. The Nile at its delta breaks into two streams that are called its *distributaries.*

Trinidad and **Tobago,** the most southerly group of the islands of the Lesser Antilles, constituting a British Crown colony. Trinidad is situated in the Gulf of Paria about 10 miles from the delta of the Orinoco River on the northern coast of Venezuela; and Tobago lies 20 miles northeast of Trinidad. The total area, including such adjacent islets as Little Tobago, Chacachacare, Huevos Monos and Monos Gaspar Grande, is 1,980 square miles; and the combined population of the two islands is about 413,000. Tobago alone has an area of 114 square miles and a population of 25,358, mostly Negroes. Trinidad's area is 1,754 square miles, and its population about 387,500. About one-third of the population are East Indians; this accounts for the large number of Hindu temples found throughout the island. Since a certain element of the Trinidad population is of people with a mixture of Negro and French, Spanish or British blood, both a French patois and Spanish, as well as English, are spoken.

Among the natural phenomena of Trinidad are Maracas Falls, 312 feet high; the famous 104-acre Pitch Lake of bubbling asphalt in the crater of an extinct volcano in La Brea ward; and the road leading from the lake to the port of La Brea, which is built over a bed of asphalt and moves glacierlike toward the sea. Trinidad is noted for its educational institutions, including the Imperial College of Tropical Agriculture and Queen's Royal College, with which are affiliated St. Mary's College (Roman Catholic) and Naparima College (Presbyterian). The products of the two islands include sugar, cacao, coffee, rubber, tobacco, cotton, copra, nutmegs, rum, molasses, Angostura bitters and crude petroleum. Trinidad is one of the world's principal sources of asphalt; it furnishes three-fourths the amount used in the United States.

Port of Spain (population, 71,000) is Trinidad's thriving capital and seat of the governor of the colony. Assisting him are executive and legislative councils. Scarborough is Tobago's chief city. Trinidad, which was discovered by Columbus on his third voyage to America in 1498, was held by Spain until 1797, when it was seized by a British force and was formally ceded to Great Britain by the Treaty of Amiens in 1802. It received its name from its three ranges of high hills, emblematic of the Trinity.

Tobago, which Columbus discovered in the same year he found Trinidad (1498), was named by him Assumption. Later its name was changed from the fancied resemblance of the shape of the island to the bowl of the pipe or inhaling tube of the natives called *tobaco.* After being held by the Netherlands and France, Tobago was ceded to Great Britain on the signing of the Treaty of Paris in 1814. At first a part of the British Crown colony of the Windward Islands, it was joined to Trinidad in 1889, the arrangement of a united colony becoming permanent 10 years later.

Tristan da Cunha, a group of four small islands of volcanic formation in the South Atlantic Ocean, located about 1,500 miles southwest of St. Helena. The largest and only inhabited island of this group is Tristan, which covers an area of 15 square miles and has a population of 165, chiefly descendants of settlers from American whaling vessels and of the British garrison stationed there during Napoleon's confinement on St. Helena. Surmounting the island is a now extinct volcano, 7,640 feet high. The chief settlement is Edinburgh. Fishing and agriculture are the principal industries. The other three islands are Inaccessible, Nightingale and Gough. The total area of the group is 44 square miles. They were named for the Portuguese navigator Tristão (or Tristan) da Cunha who discovered them in 1506. Great Britain annexed them in 1816. Politically they are attached to Cape Province of the Union of South Africa.

tropics, either of the two parallels of latitude that are equidistant north and south of the equator. They correspond to similar circles in the celestial sphere that mark the summer and winter solstices or points at which (on June 21 and December 22) the sun is farthest from the equator. When the sun is directly over the parallel that is 23½° north of the equator, it is about to enter the ecliptic of the zodiacal constellation of Cancer or the summer solstice, hence the name *Tropic of Cancer* for the northern parallel. Similarly, when the sun is directly over the parallel that is 23½° south of the equator, it is about to enter the ecliptic of the zodiacal constellation of Capricorn or the winter solstice, hence the name *Tropic of Capricorn* for the southern parallel.

In general, the Torrid Zone, or area 23½° north and 23½° south of the equator, is called the tropics. The term is derived from the Greek *tropikos,* meaning of a change.

The heavy rainfall for which the tropics are noted is frequently caused by convection circulation, resulting from the ascension and expansion of abnormally heated air that, on reaching a high and rare altitude, is condensed and produces local showers. A rainy climate also occurs on coasts exposed to the trade winds; but farther inland these same winds, which become dry either as they approach the equator or as their moisture is absorbed by high mountains that they cross, are responsible for the arid condition of the great deserts.

Tuileries, a 56-acre formal Parisian park that perpetuates the name of the magnificent royal palace that was erected by Catherine de' Medici in the late 16th century and was destroyed during the Commune of 1871. At its southern end is the Place du Carrousel and at its northern end the Place de la Concorde. The park was once the site of tile (or *tuile*) works.

tundra, a level or slightly rolling plain in the northern part of the U.S.S.R., Alaska and Greenland. Generally boulder-strewn, the area is a labyrinth of lakes, streams, swamps and peat bogs. It is impassable in summer but, on freezing in winter, can be safely crossed. The tundra supports vegetation of a stunted, shrubby sort and is densely covered during the two summer months with mosses and lichens; moreover, since this vegetation does not die during the winter and since strong winds carry away much of the snowfall, the caribou and muskox are enabled to graze the year around. Cold, dry winds, however, exclude the growth of many trees in this region. The word *tundra* is of Russian origin.

Tunisia, a territory in the northern part of Africa that has been under French protection since the signing in 1881 of the Treaty of Bardo so as to curb the raids into Algeria of the Kroumirs who occupy the northwestern part of Tunisia. The Mediterranean and its arm, the Gulf of Gabes, laps its northern and eastern coasts. Libya lies to the southeast; Algeria is on the west. Cape Bon, the northernmost point, forms with Sicily and the Apennine Peninsula a barrier that almost divides the Mediterranean into two parts—eastern and western. The area of Tunisia is about 48,300 square miles, of which some 22,000 square miles are part of the Sahara Desert. The population of 2,500,000 consists mostly of Arabs and Bedouins; the 200,000 Europeans are principally French and Italian.

Tunisia consists of a coastal lowland, with a plateau and mountain region in the center and a desert area in the south. The Atlas Mountains traverse most of the northern and eastern parts, the highest point being Djebel-Chambi (5,217 feet). The Medjerda River (228 miles long) with its affluents waters the northern part of Tunisia and discharges into the Mediterranean near Porto Farina. Animal husbandry and agriculture are largely practiced. The principal crops are corn, wheat, barley, oats, beans, grapes, olives, oranges, dates and figs. Cattle, horses, camels, pigs, sheep, goats, mules and asses constitute the livestock. Tunisia produces a large percentage of the phosphates of the world; iron, zinc and lead are other minerals. Sponges are collected in the Gulf of Gabes, and the forests yield cork and alfa, used for making paper pulp. Manufactured products are rugs, pottery, tiles, copperware, leather goods and flour.

The protectorate is called the Regency of Tunisia from the monarchial form of government with the bey as ruler. The French Resident General, however, is Minister of Foreign Affairs and has authority over other departments; he also presides over the Council of Ministers and Head Officials. The Kaids still have charge of the native local government under the supervision of French Commissioners who are responsible to the Resident-General. Previous to the establishment of the French protectorate, Tunisia was one of the Barbary States under Turkey's suzerainty.

Tunis, the capital and chief city, is about 3 miles from the Gulf of Tunis. More than half the total population (approximately 200,000) are Moslems. Their section of the city, with its mosques and bazaars or souks, is distinct from the European quarters. Remnants of the old city-wall still stand; here also are the Dar-el-Bey, the old palace of the beys, the Dar-Hussein or military palace, the Grand Mosque, the Mosque of Sidi-ben-Ziad. In the European quarters are the General Residency, Palace of Justice, Roman Catholic cathedral and the Municipal Theater. The Sadiki College is the chief educational institution. About 10 miles to the northeast of the city are the ruins of ancient Carthage, destroyed by the Romans in 146 B.C. Modern Carthage, Susa, Bizerta, Qairwan and Beja are other towns.

Turkey, a republic of southern Eurasia, the remnant of the once powerful Ottoman Empire. It occupies an area in Europe (eastern Thrace) of 9,257 square miles; in Asia Minor it embraces mostly the historic province of Anatolia and covers an area of 285,159 square miles. Before the World War the Ottoman Empire also included Arabia, Armenia, Kurdistan, Mesopotamia, Palestine, Syria and numerous islands in the Aegean Sea. Today the Aegean Sea bounds it on the west; the Black Sea, Bulgaria and Greece are on the north; Iran is on the east; and to the south are Iraq (formerly Mesopotamia), Syria and the Mediterranean Sea. Turkey has retained Kurdistan, but part of Armenia is now included in the U.S.S.R.; the only Aegean Islands that still belong to Turkey are Tenedos and Imbros. The population is estimated at 16,200,000. The chief non-Turkish elements are Greeks, Italians, Russians and Jews (mostly descendants of Jews driven out of Spain in the 16th century).

Nearly all of Turkey occupies the Anatolian Plateau, which is crossed by the Taurus Mountains in the southern part and by the Ala and Bulgar ranges in the northern part. On the eastern border is Mt. Ararat (16,916 feet), the loftiest peak in the country and the traditional landing place of Noah's Ark. The plateau is watered by the Menderes (the ancient Meander), Gedis, Kizil Irmak and Sakarya rivers, and in the eastern part is one of the largest salt lakes in Asia, Lake Van (1,400 square miles). Turkey in Europe is separated from Turkey in Asia by the Sea of Marmara; the strait known as the Bosporus connects this sea with the Black Sea, and that of the Dardanelles joins it to the Aegean Sea. The narrow Gallipoli Peninsula at the entrance to the Dardanelles recalls the unfortunate British siege at the beginning of the World War.

Courtesy Turkish Embassy, Washington, D. C.

Mosque of Suleiman, Istanbul

The 16th-century Mosque of Suleiman the Magnificent, designed by Sinan, rises above the city of Istanbul—a mass of spherical domes and semicircular apses that are crowned with semidomes. The pointed towers are minarets, from each of whose balconies, four times each day, the muezzin calls faithful Mohammedans to prayer

Turkey is essentially an agricultural country. Tobacco, cotton, wheat, barley, corn, sugar beets, olives, figs, grapes (for raisins), hazelnuts, opium and licorice are the chief products. Wool from some 6,000,000 sheep and mohair from some 3,000,000 goats add to the national wealth. On the plateau cattle, horses, asses, mules, camels and buffaloes are pastured. The abundant mineral wealth awaiting exploitation includes zinc, chrome, manganese, antimony, emery, borax, asphalt, salt, gold and silver; only the deposits of coal, copper and petroleum have as yet been touched.

Since the adoption of a 5-year industrial plan in 1934 Turkish industry has made rapid strides. Numerous state factories have been built, especially for the development of the cotton, silk, woolen and other textile industries. Turkey has long been famous for its rug industry; other manufactures include glassware, copperware and paper. Hydraulic electrification has aided considerably in carrying out the 5-year plan. The purpose of this plan has been to make the country independent, so far as is possible, of foreign imports. Foreign influence in Turkey has been curtailed by the purchase of nearly all the foreign-owned railroads and port facility concessions.

After Turkey's defeat in the World War the sultanate was abolished and a republic proclaimed. In accordance with the Treaty of Sevres Turkey lost more than 400,000 square miles of territory, but within three years after this humiliation, when the Greeks had been driven from Smyrna (now Izmir), she was the one former enemy that was strong enough to defy the Powers, practically dictating the terms of the Lausanne Treaty that replaced the Treaty of Sèvres. All this she owed to Mustafa Kemal Pasha who after serving as commander in chief of the army in the war with Greece was chosen president of the Turkish Republic by the Grand National Assembly in 1923.

Mustafa Kemal Pasha, who is now known as Mustafa Kemal Ataturk Ghazi (the three surnames mean Perfect, Chief Turk and Liberator), may be regarded as a second Peter the Great in his attempt to modernize a backward Oriental country. One of his first steps was to remove the capital from Istanbul to Angora (or Ankara) so that Turkey might have a more impregnable seat of government. Here meets the unicameral National Assembly, whose 399 members are elected for 4 years by universal suffrage (women received the franchise in 1934). The president is assisted by a council of ministers, headed by a premier. Angora's formidable old fortresses, dating back to Roman days, afford a curious background for the new government buildings in a modern architectural style. The city is also the seat of several important educational institutions, such as an agricultural institute, commercial school and training school for skilled workers. The population of Angora is about 75,000.

Throughout the more than 15 years that he was in power (he was reelected in 1927, 1931 and 1935) Ataturk carried out a program of social and cultural reform. With the approval of the National Assembly he abolished the fez of the men and the veil of the women, ended polygamy, slavery and the purdah system and ordered all Turkish families to adopt surnames. Among other reforms the new Turkey has adopted the Gregorian calendar; a 24-hour clock, instead of two 12-hour periods, with the day starting at midnight rather than at daybreak; the metric system and a Latinized alphabet of 27 letters that replaces more than 125 Arabic symbols. In 1927 at Ataturk's order the first population census in Turkish history was taken. The National Assembly has controlled the country's religion since the caliphate was abolished in 1924, and Sunday has been substituted for the traditional Mohammedan Sabbath, which was Friday.

The establishment of about 6,000 primary schools and more than 100 secondary schools was also part of Ataturk's program to raise the cultural level of Turkey. Before the war about 95 per cent of the population was illiterate; now more than 70 per cent can read and write. The general health level has also been improved by the adoption of higher sanitary standards.

The chief city of Turkey is Istanbul. The Byzantium of the ancient world, it was named Constantinople by Constantine the Great, when he made it the capital of the Roman Empire in 330 A.D. It is at the eastern end of the Sea of Marmara and is famed for its commodious harbor, an inlet of the Bosporus called the Golden Horn. For many centuries it was the key city to two continents and was called the Queen of the Bosporus. Contrasting with the historic landmarks and quaint bazaars are many striking modern developments, but the glory of the city is summed up in that great evidence of the Mohammedan faith, the Mosque of St. Sophia, which was originally erected by the Emperor Justinian in the 6th century as the Church of Divine Wisdom. Among relics of the days of the sultanate are the Imperial Palace (consisting of the Chalce, Daphne and sacred palaces), the ornate Dolma Batche Palace, Castle of Seven Towers (once a state prison), the Sublime Porte (seat of the sultanate's government) and several imperial mosques, including the Suleimanieh or Mosque of Suleiman I, the Ahmedieh or Mosque of Ahmed I and the Mosque of the Standard Bearer, which was the first imperial mosque and was built in 1463–69. The ruins of the Hippodrome recall the days when the Empress Theodora, wife of Justinian, was one of Constantinople's most popular actresses. Among Istanbul's educational institutions are Robert College, originally founded in 1863 as an American philantropic institution, and the National University, founded in 1900. With the suburbs of Pera (the European quarter) and Galata (noted for the 150-foot-high Galata Tower) the city has a population of more than 691,000.

Other important cities of Turkey include Izmir, Bursa, Adana, Adrianople, Sivas and Konya (once the headquarters of the Mohammedan order of whirling dervishes). Near Urgub are found numerous cone-shaped rocks that served as prehistoric apartment houses; in each scraped-out limestone interior once dwelt several troglodyte families.

Tuva or **Tannu Tuwa,** a republic in central Asia, bounded on the north, east and west by the U.S.S.R. and on the south by Outer Mongolia. It has an area of about 150,000 square miles and an estimated population of 72,000, of which some 12,000 are of Russian extraction. The Yenisei River flows in a general northwestern direction across the country. The Tannu-Ola Mountains traverse the southern part. Gold mining and stock raising are the principal occupations. Originally a Chinese dependency, Tuva became a Russian protectorate in 1914 through the efforts of Russian immigrants who had established settlements throughout the country in the early part of the 20th century. In 1921 the Soviet Union granted the country its independence by abrogating the former protectorate and signing with Tuva a treaty of friendship and alliance.

typhoon, a cyclonic storm, originating in the North Pacific Ocean in an area extending from 5° to 12° N. lat. and 129° to 147° E. long. Passing along the coasts of Japan, China and other countries bordered by the China Sea, these storms, accompanied by a downpour of rain and moving at a rate of 75 miles an hour or more, are very destructive within their radius of approximately 100 miles. The word *typhoon,* derived from the Chinese, means great wind. Similar storms in the West Indies are called hurricanes.

Uganda, a British protectorate of East Africa, bounded by the Anglo-Egyptian Sudan on the north, Kenya on the east, Tanganyika Territory on the south and the Belgian Congo on the west. Like Kenya and Tanganyika it is traversed by the Great Rift Valley. Its area is 94,204 square miles, of which 15,000 square miles are water. Almost half of Lake Victoria, the largest African lake with an area of 26,000 square miles, lies in Uganda between that country and Tanganyika. Lake Albert and Lake Edward, on the western boundary between Uganda and the Belgian Congo, are partly within Uganda; and Lake Kioga in the central part is really a broadening of the White Nile, which has its source in Lake Victoria. At the exit of the Nile from Lake Victoria are the Ripon Falls. The Murchison Falls are a 118-foot drop of this river near Lake Albert. The population of Uganda is about 3,600,000, mostly of Bantu and Hamitic stocks. There are some 14,000 Asiatics and 2,000 Europeans.

The equator crosses the southern part of Uganda, but the tropical heat is tempered in the plateau and mountain regions. Mt. Elgon (14,000 feet) dominates the Debasien Mountains in the east; Mt. Ruwenzori (16,750 feet) is the loftiest peak of the Ruwenzori Range in the west. With the Ruwenzori Mountains geographers now identify the Mountains of the Moon mentioned by Ptolemy. The chief agricultural product is cotton. Sugar cane, coffee, groundnuts, sesame (or simsim) seeds, sweet potatoes, plantains, millet, cassava, peas, beans, corn, tobacco, tea, chilies (a source of cayene pepper) and rubber are also produced. The hides of cattle, sheep and goats and ivory are among the principal exports. Mineral wealth consists of tin, copper, gold and salt.

The protectorate is under the direct control of a governor, who is assisted by executive and legislative councils. There are commissioners in charge of the province of Buganda (of which the name Uganda is a corruption) and of the eastern, western and northern provinces. Native rule is encouraged, and the *kabaka* or king, assisted by a ministry and a *Lukiko* or native parliament, receives British support. The British administrative headquarters are at Entebbe (population, 6,000) on the northern shore of Lake Victoria. Kampala, the native capital, is situated on seven hills about 20 miles northeast of this city. The European quarters and government offices are on one hill and the residence of the *kabaka* and the *lukiko* building are on another; the Anglican cathedral, the Roman Catholic cathedral, the museum and the tomb of Mtesa (19-century native ruler) each has its own hill. The principal educational institution of the protectorate is Makerere College, which occupies the seventh hill.

A British sphere of influence was established in Uganda in accordance with the Anglo-German agreement of 1890, and the protectorate was declared four years later. Uganda and Kenya have been united for customs purposes since 1917.

Union of South Africa, a member of the British Commonwealth of Nations that occupies the extreme southern part of Africa. It consists of four provinces: the Cape of Good Hope (popularly called the *Cape Colony*) and Natal (including Zululand), which were former British colonies, and the Transvaal and Orange Free State, which were former Boer republics. Since 1910 these provinces have been united as a self-governing dominion with administrative headquarters at Pretoria and legislative headquarters at Cape Town. The Union of South Africa is bounded by Bechuanaland and Southern Rhodesia on the north, Mozambique and the Indian Ocean on the east and the Atlantic Ocean and Southwest Africa on the west. The southernmost point of the country is Cape Agulhas, although the Cape of Good Hope, about 100 miles to the northwest, is better known for its historical associations, having first been founded by the Portuguese navigator Bartolomeu Dias in 1486. The Union has a total area of 471,917 square miles. Of the population of about 9,530,000, some 1,920,000 are Europeans (about half of Dutch descent and half of British) and 806,000 are Asiatics. The natives are of Bantu stock and include Kaffirs, Hottentots and Bushmen.

Except for the narrow coastal plain the Union of South Africa may be considered a great table-land, 3,000 to 4,000 feet in elevation. Some peaks of the 600-mile long eastern Drakensberg Range, such as Cathkin Peak, Mont aux Sources and Giants' Castle, reach 10,000 feet. In most parts rainfall is sufficient for agriculture. The well-watered grasslands of the Transvaal, Orange Free State and Natal are called the grass velds. The so-called bush velds of the western part of Cape Province have sufficient growth for pasturage. The principal river is the Orange that rises in the southern Drakensberg Mountains and flows 1,300 miles westward to the Atlantic. Rivers mark most of the Union's northern boundary. The Limpopo separates the Transvaal from Southern Rhodesia; the Molopo and the Orange separate Bechuanaland and Southwest Africa from the Cape Province. The Vaal is the principal tributary of the Orange.

The Union lies almost wholly in the South Temperate Zone. The Tropic of Capricorn, marking the southern limit of the Torrid Zone, crosses the northern section of the Transvaal, giving the Union approximately the same position in the Southern Hemisphere that northern Mexico and the southern United States occupy in the Northern Hemisphere. The Union extends to about 35° S. lat., comparable to the southern part of North Carolina at 35° N. lat. The seasons, of course, are reversed; when it is winter in North Carolina it is summer at the southern tip of Africa.

The agricultural products of the grass velds include corn, wheat, oats, barley, potatoes, sugar cane, ground nuts, tea, tobacco, cotton and fruits, including grapes, peaches, pears, apricots, pineapples, bananas, mangoes and citrus fruits. Sheep and Angora goat raising is the principal pastoral occupation; the wool is largely exported, and the Union provides more mohair than any other part of the world. On the ranges are found more than 10,000,000 cattle, 36,000,000 sheep, 6,000,000 goats and 30,000 ostriches.

South Africa is the world's great center for the mining of diamonds. The industry since 1870 has centered in Kimberley in the northeastern part of the Cape Colony. During the last decade new alluvial diamond fields have been discovered in the western part of the Transvaal and near the mouth of the Orange River in the Union's mandated territory of Southwest Africa. More than half the world's supply of gold comes from South Africa; the yearly output is valued at $397,000,000. Silver, copper, tin, coal, iron, asbestos, corundum, chromite, manganese and platinum contribute to the mineral wealth.

As a member of the British Commonwealth of Nations, the Union of South Africa is in every sense self-governing. The position of the governor-general is analogous to that of the British king whose representative he is. With each change of ministry he chooses from the dominant party in Parliament a premier in whom, as head of the Cabinet, the real executive authority is vested. Parliament consists of a Senate of 40 members, 8 of whom are nominated by the governor general and 32 of whom are elected for 10 years, and a House of Assembly of 150 members elected for 5 years. Each of the four provinces has an administrator, appointed by the governor general, a nominated Executive Committee and an elected Provincial Council.

Courtesy South African Railways and Harbours

In Kruger National Park, Union of South Africa

Zebra and wildebeests come to a drinking pool in the cool of the morning. This game reserve, near Portuguese East Africa between the Crocodile and Sabi rivers, is one of the most popular in the commonwealth

Constituent Provinces of the Union of South Africa. The Cape of Good Hope is the largest of the provinces of the Union of South Africa. It extends from the southernmost point of South Africa to Southwest Africa and Bechuanaland; the Orange Free State and Natal lie to the northeast of it. Its area, excluding Walvis Bay (430 square miles), which is administered as part of Southwest Africa, is 276,536 square miles. Its population of 3,522,000 includes 2,732,000 natives and 790,000 Europeans. Cape Town (population, 271,000), located on Table Bay about 30 miles from the Cape of Good Hope, is its chief city and the seat of the Union Parliament. It is also the most important seaport of South Africa. The city was founded by the Dutch in 1651 and was taken by the British in 1806. The Koopmans-de Wet Museum contains exhibits showing the life of the early Boer or Dutch settlers; the South African Museum contains interesting native relics. Groote Schuur, the home of Cecil Rhodes, is preserved as a memorial to the empire builder of South Africa. Among other buildings are the University and the Anglican and Roman Catholic cathedrals. The 4,000-foot-high Table Mountain, which dominates the town, rises square and flat like a hewn stone. Among the important cities of the Cape Province are Port Elizabeth, East London and Kimberley. Near Oudtshoorn in the south-central part of the province are the world-famous Cango Caves in a limestone formation.

The Transvaal in the northeastern part of the Union of South Africa is the second province in size, having an area of 110,450 square miles and a population of 3,301,000, of whom 2,485,000 are natives and 815,000 are Europeans. It is bounded on the north by Southern Rhodesia, on the east by Mozambique and Swaziland, on the south by the Orange Free State and Natal and on the west by the Cape Colony and Bechuanaland. The Limpopo River separates it from Southern Rhodesia on the north, the Vaal River from the Orange Free State and Natal. Other rivers are the Olifants, a tributary of the Limpopo, the Komati and the Pongola. Most of the Transvaal is high veld bordered by mountains, chief of which are the Lebombo Range, the Drakensberg, Witwatersrand, Witwatersberg and Zoutpansberg. On the forested slopes of these mountains many non-native trees have been introduced—such as the Australian wattle and the eucalyptus. Pretoria (population, 88,000), named for M. W. Pretorius, the first president of the Boer state called the *South African Republic,* is the administrative seat of the Union of South Africa. It is also the seat of a University and is famed for its remarkable Zoological Gardens, Voortrekker's Museum and the Paul Kruger House. Johannesburg (population, 170,000), the largest city of the Union, is situated in the heart of the Rand gold mining district; it is the seat of the University of the Witwatersrand.

The Orange Free State, third in size among the provinces of the Union of South Africa, has an area of 49,647 square miles and a population of about 767,000 of whom 567,000 are natives and 199,000 Europeans. The Drakensberg Mountains separate it from Natal on the northeast, the Caledon River from Basutoland on the southeast, the Vaal River from the Transvaal on the north and the

Cape Colony on the west, and the Orange River from the Cape Colony on the south. Most of the country consists of high grass velds, 4,000 to 5,000 feet in elevation, which slope from the mountain section in the east gradually westward and are especially suited to stock raising. The principal cities are Bloemfontein (capital), Kroonstad and Ladybrand.

Natal, the smallest province of the Union of South Africa, has an area of 35,284 square miles, which includes Zululand, a Negro kingdom of 10,500 square miles, annexed in 1897. The population is about 1,940,000, of whom 1,750,000 are natives (250,000 dwelling in Zululand, and 189,000 are Europeans. The Indian Ocean laps its eastern coast. The Umtamvuna and Umzimkulu rivers separate it from the Cape Colony on the south, and the Drakensberg Mountains from the Orange Free State and Basutoland on the west. The Lebombo Range and the Pongola River form most of the boundary between Natal and Mozambique, Swaziland and the Transvaal. Citrus fruits, pineapples, bananas and sugar cane are produced in the coastal lowlands; dairy farming, tea growing, and the raising of grains, tobacco and cotton are carried on on the grass veld. Pietermaritzburg is the capital of Natal. Durban (population, 160,000) is the largest town and only seaport; it is noted for its stately town hall, with the Municipal Library and Municipal Museum occupying wings of this building. Among other important towns are Ladysmith, Glencoe and Newcastle.

The Union of South Africa possesses two notable national parks—the Drakensberg National Park, whose mountain scenery in such peaks as the Sentinel and Mont aux Sources rivals that of Switzerland, and Kruger National Park. The latter, named for the last president of the South African Republic, is a great game reserve, 220 miles long and 40 miles wide, in eastern Transvaal. Here the big game hunter, armed with a camera, can "shoot" any kind of African animal—from a lion or giraffe to a zebra or black rhinoceros. The most distinctive animals are the wildebeest, impala, sable antelope, tsessebe and eland. The park is also a sanctuary for African birds of all kinds.

Union of Soviet Socialist Republics, a group of 16 states of eastern Europe and northern Asia.

These states occupy an area of 8,819,791 square miles and are coextensive with 94 per cent of the territory of the former Russian Empire. This territory ranks next to that of the British Empire in size and comprises nearly one-sixth of the total land surface of the globe. The component states of the U.S.S.R. are the Russian Socialist Federated Soviet Republic (R.S.F.S.R.), Ukraine, White Russia, Georgia, Armenia, Azerbaijan, Turkomen, Uzbekistan, Tajikistan, Kirghizia, Kazakhstan, Karelo, Moldavia, Lithuania, Latvia and Estonia. The capital is Moscow.

About 22 per cent of the area of the Soviet Union is in eastern Europe, where it extends from the Barents and White seas on the north to the Black and Caspian seas on the south. On the west it is bounded by Finland, the Gulf of Finland (an arm of the Baltic Sea), Estonia, Latvia, Poland and Rumania; all these countries but Rumania were formerly included in the Russian Empire. The Ural Mountains separate the U.S.S.R. in Europe from the U.S.S.R. in Asia. The Caucasus Mountains extend between the Black and Caspian seas; to the south of them are Turkey and Iran. The U.S.S.R. in Asia, which comprises 78 per cent of the area of the Soviet Union, is bounded on the north by the Arctic Ocean and its arms, the Kara, Laptev and East Siberian seas, and on the east by Bering Strait and the arms of the Pacific Ocean, known as Bering Sea, Sea of Kamchatka, Sea of Okhotsk and Sea of Japan. Along the southern boundary extend Iran, Afghanistan, Sinkiang, Tuva, Outer Mongolia and Manchukuo. The total population of the U.S.S.R. is estimated at 183,267,000 and includes 189 nationalities.

Great Russia and Siberia. The Russian Socialist Federated Soviet Republic is the largest state of the U.S.S.R.; it contains 92 per cent of the territory and 70 per cent of the population. Embracing most of what was once known as Great Russia and Siberia, it is the largest continuous political unit in the world. Within it are 17 autonomous republics and about 25 autonomous territories and regions. The best known of these are the Tatar, Bashkir, Chuvash, Daghestan, Mordva, Karelian, Mariisk, Volga-German, Komi, Udmurt, Yakut and Buryat-Mongolian Autonomous Soviet Socialist republics; there are also the Krasnoyarsk, West Siberian and Far Eastern autonomous territories.

Nearly all of the R.S.F.S.R. is a vast plain that averages less than 800 feet above the sea. In northern Siberia this plain merges into the taiga or forest region and then above the Arctic Circle into the desolate tundra that is swampy in summer but becomes passable on freezing in winter. On the southern boundary between the Black and Caspian seas, however, in the Caucasus Mountains are the highest peaks in Europe; Mt. Elbrus attains a height of 18,468 feet and the Dykhtau rises 17,050 feet. The loftiest peaks of the Ural Mountains are only 5,000 feet high, and those of the Yablonoi and Stanovoi ranges of eastern Siberia are only 3,000 feet higher. In the southern part of Siberia are the Sayan Mountains whose highest peak is Munku Sardik (11,447 feet). Other Siberian ranges include the Baikal, Sikhotaalin, Verkhoyansk, Anadyr and Pamir and the westernmost spurs of the Great Altai and Tien Shan mountains.

The Valdai Hills of the north-central part of Great Russia form a watershed from which great rivers flow to the north and south. The most important northerly stream is the Dvina, which discharges into the White Sea. The mighty Volga (2,300 miles long) flows southward to the Caspian Sea, and the Don (1,100 miles long) discharges into the Black Sea through the Sea of Azov. In the Ural Mountains rise the 1,400-mile-long Ural River, which flows southward to the Caspian Sea; the Kama River, a 1,172-mile-long tributary of the Volga; and the Pechora River, 980 miles long, which discharges into Pechora Bay, an arm of the Barents Sea. Siberia's great rivers include the Ob-Irtish system (3,200 miles), Yenisei (2,800 miles) and Lena (2,860 miles), which discharge into the Arctic Ocean, and the Amur (2,900 miles), which after forming most of the boundary between Siberia (East Siberian Province and Far Eastern Territory) and Manchukuo empties into the Sea of Okhotsk. The Amu Darya and Syr Darya, each about 1,500 miles long, flow into the Aral Sea.

Many of the rivers of the R.S.F.S.R. are connected by canals that greatly facilitate water transportation. The most famous of these are the canals connecting the Moscow and Volga rivers and the Volga and Don rivers, whereby Moscow has direct water connection with either the Caspian or Black Sea. The Mariinski and Baltic-White Sea canals also connect the

Courtesy Intourist, Inc.

Oil Wells of Baku

In the Bay of Ilyich, an arm of the Caspian Sea, are reflected some of the huge derricks of one of the world's richest petroleum-producing regions capital with Archangel and Murmansk, the farthest north ports.

The most important lakes of the U.S.S.R. are Baikal (13,200 square miles) and Balkash (7,115 square miles) in southern Siberia and Onega (3,800 square miles) in western Great Russia. On the border between the U.S.S.R. and Finland is the largest lake in Europe—Ladoga (7,004 square miles); its outlet is the Neva, which discharges into the Gulf of Finland. The Aral Sea (26,233 square miles) in central Asia (Kazak and Kara-Kalpak republics) is the second largest inland sea in the world.

Under the sovereignty of the Russian Socialist Federated Soviet Republic are various islands in the Arctic and Pacific oceans. The most notable of these are Novaya Zemlya, Fridtjof Nansen Land (formerly Franz Josef Land), Leninland or Northland, New Siberian Islands and Wrangel Island. These islands have served for several years as a base of operation for Soviet polar explorers who have been charting channels, discovering mild currents and collecting data on ice formations so that the Arctic may be opened to regular navigation. The northern part of the Island of Sakhalin between the Sea of Okhotsk and the Sea of Japan belongs to the U.S.S.R. (the southern part is included in the Japanese Empire) and has proved valuable for its oil deposits. Off the Kamchatka Peninsula are the Commander Islands, which with the Aleutian Islands, extending westward from Alaska, separate Bering Sea from the Pacific Ocean.

The most important cities of Great Russia are Moscow, the capital, and Leningrad, both described in separate articles. On the banks of the Volga are located several important cities, including Gorky (named for the distinguished writer), Kazan, capital of the Tatar Autonomous Republic, and Stalingrad (formerly Tsaritsyn) in the lower Volga region. Gorky (population, 399,000) is famous today as the Soviet automobile manufacturing center; about the only reminder of the days when it was known as Nizhnii Novgorod is the 16th-century Kremlin. Kazan (population, 224,000) is famous throughout the Soviet Union for possessing one of the largest and oldest universities (founded in 1804). Stalingrad (population, 400,000) is noted especially for the construction annually of more than 100,000 tractors since the adoption of the first 5-year plan in 1928.

Around Rostov-on-Don (population, 478,000) in the North Caucasus region have dwelt for centuries the picturesque Don Cossacks. Astrakhan (population, 222,000) on the Caspian Sea is the chief source of the caviar of which the Soviet peoples are so fond. Ivanovo is the principal textile center, and at Magnitogorsk, Cheliabinsk and Sverdlovsk (formerly Ekaterinburg) in the Ural Mountains great metallurgical plants have been developed.

The leading cities of Siberia are Omsk (population, 228,000), Novosibirsk (population, 121,000) and Irkutsk (population, 142,000), all on the Trans-Siberian Railroad. Vladivostock (population, 190,000) at the eastern terminus of this line on the Sea of Japan is an important port.

Other Component States. The *Ukrainian Soviet Socialist Republic* is located in the southwestern part of the U.S.S.R. With a population of about 31,902,000 to an area of 171,000 square miles it is the most densely populated of any of the constituent republics. It is situated in the black soil belt, watered by the Dnieper River (1,400 miles long) and noted especially for its grain production. The Donetz Basin is one of the richest coal sections, and the Krivoi Rog furnishes considerable iron.

The capital of the Ukraine is Kharkov (population, 742,000); it is noted for its Museum of Ancient Ukrainia, Palace of State Industry and Palace of the Pioneers (the Communist party's youngest members). Kiev (population, 608,000) possesses in the ancient Pechersky Monastery an important historical museum; its St. Sophia Cathedral, dating from the 11th century, is patterned after the famous mosque in Istanbul. This city is also the seat of the All-Ukrainian Academy of Sciences and possesses a fine opera house and library. Near the industrial center of Dniepropetrovsk, a gigantic dam has been constructed at the rapids of the Dnieper River; its huge hydro-electric station, which was completed in 1932, supplies power to places within a 200-mile radius.

The great Ukrainian port is Odessa, located in the southwestern part on the Black Sea. It is the home of the All-Ukrainian Opera, seat of an agricultural university and famous for its medicinal baths. The villas of the former aristocracy in its vicinity now provide rest homes for the proletariat. Sevastopol at the tip of the Crimean Peninsula is the starting point for excursions to scenes of the Crimean War (with the famous siege of 1854 reproduced on the walls of a cyclorama) and for picturesque drives along the highway that winds past Yalta, Alupka, Massandra and other health and vacation resorts. At Kherson, near the mouth of the Dnieper, Soviet archeologists are engaged in excavating the ancient city of Chersonese, founded 3,000 years ago by Greek colonists.

The White Russian or Byelorussian Soviet Socialist Republic is located in the western part of the U.S.S.R. north of the Ukraine. The capital is Minsk (population, 164,000). That more than 10 per cent of the population of 5,440,000 is Jewish is owing to the fact that in the days of Czarist Russia this small state was in the Jewish pale of settlement.

Georgia, one of the republics of the Caucasian mountain region, stretches along the southeastern coast of the Black Sea. It is famous for such seaside resorts as Batum, Sochi and Sukhumi and the noted spa, Kislovodsk. Between Ordzhonikidze and Tiflis, the capital, is the 135-mile-long Georgian Military Highway, one of the most magnificent roads in Europe. Dominating Tiflis is the old citadel atop Mt. David, and in the distance rises Mt. Kazbek (16,546 feet high). The city is noted for the Georgian Museum in which may be traced the record that Persians, Huns, Turks, Arabs and Crusaders have left on the country and that resulted in such an astounding mixture of peoples, languages and customs.

South of Georgia is the flourishing republic of *Armenia.* It provides a homeland for the ancient Christian peoples who down the centuries had been subjected to periodic persecution by the Turks. The capital is Erivan (population, 102,000), noted for its university and archeological museum. On the border between Turkey and Armenia is Mt. Ararat (16,916 feet high), the traditional resting place of Noah's ark.

Azerbaijan is another republic of the Causasian mountain region, whose formerly oppressed and backward peoples have transformed it. They have built roads, dammed the streams for the development of hydroelectric power and are exploiting the mineral wealth of the region. The capital is Baku (population, 635,000) on the western shore of the Caspian Sea. Baku and Grozny lie in the heart of one of the greatest petroleum producing sections in the world.

Turkomen or *Turkmenia* (formerly known as Russian Turkestan) is located on the southeastern coast of the Caspian Sea. The capital is Ashkhabad, but the most important city is Samarkand (population, 155,000). The land was conquered by Genghis Khan in the early 13th century and attained its greatest glory under Tamerlane in the 14th century. Following the Golden Road to Samarkand has been a supreme travel experience since the days of Marco Polo.

Uzbek or *Uzbekistan,* which lies north of Turkomen, includes parts of Russian Turkestan and Bokhara. An intensive kind of agriculture is carried on with the aid of irrigation, for a large part of the republic lies in the Semirechensk Desert. Cotton is the chief crop. The capital is Tashkent (population, 491,000).

Tajik or *Tajikistan,* southeast of Uzbek, was until 1929 an autonomous republic under Uzbekistan's suzerainty. On the south is Afghanistan and on the east Sinkiang. Gold and coal are mined in the Pamir Mountains of the southern part. The capital is Stalinabad (formerly Dyushambe) with a population of 60,000.

The youngest of the Soviet republics are *Kirghiz* and *Kazak,* which were set aside from the R.S.F.S.R. in 1936. Kirghiz is located northeast of Tajik, with Frunze (formerly Pishpek) as its capital. Kazak, which occupies one-sixth of the total area of the Soviet Union, extends from the Caspian Sea to Outer Mongolia. Its southern part is crossed by the Semirechensk Desert and its central and northern parts by the Kirghiz Steppe. This steppe is comparatively fertile in the loess-covered lowland parts; the plateau sections, though, become arid as the Great Altai Mountains are ap-

Courtesy Intourist, Inc.

Threshing on a Collective Farm

Scenes such as this are typical of more than 200,000 co-operative agricultural enterprises in the U.S.S.R. Stretching far beyond the horizon are vast fields devoted to one crop, which have supplanted the striplike holdings, averaging 7 acres in size, on which each peasant family raised the grains and vegetables and other crops that it needed. Now the state has charge of the marketing of all crops, and the production of each collective farm is supervised by a trained agronomist. Vast hydroelectric enterprises have aided the development of irrigation, and the tractor, threshing machine and other agricultural machinery have supplanted the primitive implements that were used previous to collectivization

proached. The capital of Kazak is Alma-Ata in the southeastern part with a population of 65,000.

Economic Resources. The foundation of the U.S.S.R. is the socialist system of economy, by which the land and natural resources are held in trust by the Government for the benefit of the people. Agriculture has been brought under state control, and state trusts exploit the natural resources, such as mineral deposits, forests and water power.

The petroleum production of the U.S.S.R. ranks next to that of the United States, with about 190,000,000 barrels annually. From the Ural Mountains 40 per cent of the world's supply of platinum is obtained. Asbestos, gold, silver, mercury, coal, iron, zinc, copper and potash are also mined there. The Caucasus Mountains are rich in manganese, yielding 40 per cent of the world's supply, and are world-famous for their deposits of coal and petroleum. In northwestern Siberia valuable deposits of graphite have been found, and the mining of coal and iron is carried on in the Baikal and other mountains around Lake Baikal.

The forests of the taiga region of Siberia cover a billion or more acres; the principal trees are the pine, fir, larch and spruce, with a few birch and poplar. In addition to timber the chief products are turpentine, resins and wood pulp. In the taiga are various fur-bearing animals, such as the fox, beaver, mink, otter, sable and wolf.

The U.S.S.R. has always been an agricultural country, but under the Soviet Government its agriculture is state-controlled. This plan took effect with the inauguration of the first 5-year plan in 1928. Previously the land was divided into some 25,000,000 peasant holdings that averaged 7 acres each in size. By 1932 three-fourths of these holdings had been amalgamated into collective farms, which were called *kolhozes* if they were managed as co-operative enterprises by the peasants themselves and *sovhozes* if they were managed by the state. The U.S.S.R. now has more than 200,000 kolhozes and nearly 5,000 sovhozes that average 600 acres each in size. The scapegoat of the period of adjustment was the *kulak* or well-to-do peasant, but the term was applied indiscriminately to all who opposed forcible collectivization.

The principal crops of the U.S.S.R. are wheat, rye, oats, barley, buckwheat, millet and corn; the annual wheat exports alone represent 2,125,000 bushels. Cotton, flax, sugar beets, potatoes, cabbages, cucumbers, tobacco, rice, hemp, tea, grapes, apricots, cherries and other orchard fruits are also raised. Cultivation has been expedited by the substitution of the tractor for horse ploughing and of other agricultural machinery for the rather primitive implements that were used before collectivization. The country's vast hydroelectric enterprises have aided the development of irrigation, so that almost 50,000,000 more acres are now under cultivation than in 1928. The production of each collective farm is supervised by a trained agronomist. Livestock consists of sheep, goats, cattle, hogs and horses. The breeds of these animals are continually being improved through the experiments of the Institute of Hybridization.

The object of the three 5-year plans, inaugurated in 1928, 1933 and 1938, has been to balance agriculture and industry so that the U.S.S.R. need not depend on foreign imports in supplying the population's needs. With the adoption of collectivization it was also possible to draw on the land for industrial workers, a ruling being made that only three of a peasant's adult children might remain on the farm. Most of the people were glad to cooperate in this industrial program, because they were assured that the government was working against time to make the country self-sufficient under constant threat of attack by foreign and capitalistic enemies.

The first 5-year plan concentrated on the development of the so-called heavy industries or those that produce the means of production. Factories sprang up so rapidly that by 1933 mechanical construction in the Soviet Union was eight times greater than in 1928. The second 5-year plan emphasized the development of capital goods industry with an emphasis on consumption; in consequence the standard of living has been raised. The principal characteristic of the third 5-year plan has been the speed-up system called stakhanovism from the coal miner, Alexei Stakhanov, who developed it in an attempt to set new production records.

All industry in the U.S.S.R. is grouped under four heads—heavy, light, food and timber—and is supervised by four commissariats. The country now possesses about 575,000 manufacturing establishments. The principal products are textiles (cotton, woolen, linen and silk), automobiles, tractors and other agricultural implements, airplanes, chemicals, electrical supplies, carpets, flour, pottery, glassware, leather goods, hardware, furniture, lacquerware, woodenware, toys and copperware (such as samovars).

Government. The highest authority in the Union of Soviet Socialist Republics is the Supreme Soviet, which in accordance with the new constitution of 1936 replaces the All-Union Congress of Soviets. It consists of two chambers of about 570 members each, called the Soviet of the Union and the Soviet of Nationalities. The members of the Soviet of the Union are elected by all citizens above 18 years of age according to a system of proportional representation with 1 deputy to each 300,000 of the population. The members of the Soviet of Nationalities consist of 25 deputies from each Union Republic, 11 deputies from each autonomous republic and 5 deputies from each autonomous region. The term of office of all deputies is 4 years.

The Supreme Soviet meets twice a year. When it is not in session, the affairs of the U.S.S.R. are conducted by the Presidium, elected by the Supreme Soviet. The Presidium consists of a chairman, 11 vice-chairmen, a secretary and 24 members, most of whom serve as commissariats in the administration of foreign affairs, home affairs, defense, foreign trade, justice, communications, finance and the various industries. Each Union Republic is administered by a Council of People's Commissars, which is responsible to the Supreme Soviet.

Only members of the Communist party may participate in the affairs of government. This membership is estimated at 2,400,000, but with the Young Communists and Pioneers the ultimate strength of the party is approximately 10,000,000. The directive body is the Central Executive Committee, whose 71 members are elected at the annual party congresses. Within this committee is a small executive group of 9 members, called the *Political Bureau,* which determines governmental policy. The general secretary of the Communist party is Joseph Stalin.

In spite of the criticism of its despotic methods the Soviet government has some splendid accomplishments to its credit. For instance, the race prejudice that once existed in Russia is practically dormant, and to each of the 189 nationalities composing the Union political and social equality has been extended. This emancipation has also included women. Under the Soviet Government they have full participation in political, economic and cultural life. Before the World War 72 per cent of the rural population and 41 per cent of the urban population was illiterate, but since the campaign conducted by Lunacharsky, chairman of the Committee for Education, about 90 per cent of the population can now read and write. Among children of school age the compulsory period of attendance has been raised to 7 years. About 25,000,000 pupils are now enrolled in the 169,000 primary and secondary schools of the U.S.S.R. The country also has 591 colleges and universities, with an enrollment of about 519,000.

The marked increase in the health of the nation may be attributed to a better knowledge of sanitation, to proper care in childhood especially through the state crèches and kindergartens, to state-promoted interest in dietetics and nutrition and to participation in all kinds of sports programs. The keen interest of the peoples of the Soviet Union in literature, the theater, music and the ballet is evidence of the awakening cultural desire of the proletariat.

Union Square, a New York square between 14th and 17th streets and Broadway and Fourth Avenue. It contains Bartholdi's statue of Lafayette, which was presented by French residents of the city in 1876, and statues of Washington and Lincoln by Henry Kirke Brown. The square today is noted for its radical meetings and demonstrations.

United States of America, a federal republic of 48 states and the District of Columbia, occupying the central part of the North American continent, with Canada on the north and Mexico and the Gulf of Mexico on the south. Its greatest width, from the Atlantic Ocean to the Pacific Ocean, is 2,807 miles. Its greatest length from north to south is 1,598 miles. The 49th parallel and the Great Lakes constitute the international boundary between Canada and the United States. Between the United States and Mexico the Rio Grande River forms a large part of the boundary. The coast line of the United States measures 21,354 miles.

The area of continental United States is 3,026,789 square miles. With territories and dependencies, such as Alaska, Hawaii, Philippines, Puerto Rico, Virgin Islands, Canal Zone, Guam and American Samoa, the total area is 3,738,395 square miles. Continental United States has an estimated population of about 137,500,000. Including the dependencies, this figure is increased to about 142,000,000. According to the official census taken in 1930, 88.4 per cent of the population were native born. There were 13,366,000 foreign-born whites, most of whom came from Italy, Germany, Great Britain, Canada, Poland, Russia and Scandinavia. Negroes numbered about 12,000,000. Mexicans, Indians, Japanese, Chinese and Filipinos were the dominant elements among the other nonwhites.

In the eastern part of the United States is a narrow coastal plain that borders the Atlantic Ocean from Maine to Georgia. It extends to the inland plateau marked by the fall-line. Parallel to the coastal plain are the mountains of the Appalachian system, including the Green, White, Adirondack, Allegheny, Blue Ridge, Cumberland, Great Smoky and other mountains. West of the Appalachians the land slopes to the great central plain that owes its fertility to the alluvial deposits of the Mississippi-Missouri system. It merges into the prairies and then into a gradually ascending plateau that reaches to the Rocky Mountains, the backbone of the continent. The mountains extend through the states of Montana, Idaho, Wyoming, Colorado, Utah, Arizona and New Mexico. Between the Rocky Mountains and the Sierra Nevada Mountains is the Great Basin, a vast, arid waste that has to some extent been reclaimed through irrigation. Farther north is the Columbia Plateau, another desertlike area between the Rockies and the Cascade Range. The Colorado Plateau is famed for the huge canyon in northwestern Arizona cut by the Colorado River. The westernmost mountains are the Coast Range. The Pacific Ocean is bordered by the coastal plain of California, Oregon and Washington. In California is the highest peak in the United States, Mt. Whitney (14,496 feet), and in Death Valley California also has the lowest point on the continent—276 feet below sea level. The climate of the Pacific states is modified by the North Pacific Current that originates in the Japan Current.

The United States has one of the greatest drainage systems of any country in the world. The Mississippi alone drains an area of 1,257,000 square miles; its principal tributaries are the Missouri, Ohio and Arkansas. In the West, the Columbia and the Colorado are the most important rivers; in the east, the Hudson and the Delaware. Among the scenic marvels of the country are Niagara Falls, the Grand Canyon of the Colorado River, Mammoth Cave and Yellowstone and Yosemite National Parks. Meteorological phenomena include Florida hurricanes (originating in the West Indies) and tornadoes in the Great Plains region. California lies at the tip of the earthquake belt that extends along the western coast of Latin America. The Mississippi, Ohio and other rivers often overflow their banks during spring freshets.

The most important agricultural region of the United States is in the northern and central parts of the Mississippi Valley. Here 50 per cent of the world's supply of corn and 36 per cent of its wheat are raised. Farther south cotton is the leading crop; the United States produces nearly half of the world's supply. Kentucky, North Carolina, Virginia and other states furnish one-third of the world's tobacco. Among other agricultural products are alfalfa, oats, barley, rye, potatoes, peanuts, rice and various fruits and vegetables that range from the oranges and artichokes of California to the apples and broccoli of New York. Some 379,000,000 acres have been set aside as pasture and range land to feed 68,000,000 cattle, 25,000,000 milk cows, 51,000,000 sheep and 11,000,000 horses.

The United States is one of the richest countries in the world in metals and minerals; to enumerate them would be to list almost every form of mineral wealth. Coal, iron and petroleum, the basic necessities of industry, exist in practically inexhaustible quantities and have made the United States the greatest manufacturing nation in the world. The United States produces two-thirds of the world's supply of petroleum, 60 per cent of its copper, 50 per cent of its lead, zinc and sulphur, 44 per cent of its coal, 40 per cent of its bauxite, 33 per cent of its iron. Extensive also are the deposits of gold, silver and quicksilver. About 457,000,000 acres of forests produce more than half of the world's lumber. In the western states the Douglas fir, Engelman spruce, birch, cedar, hemlock, juniper, western white and yellow pines predominate; in the southern, the cedar, cypress, red gum and pine; and in the eastern and central, the oak, maple, elm, hickory, poplar, birch, beech and other deciduous trees. The giant sequoia is found in California.

The United States leads in the manufacture of leather goods, such as boots and shoes, and produces about three-fourths of all the automobiles in the world. Among other industries are meat packing, fruit and vegetable canning, petroleum refining, steel and iron production, the manufacture of textiles, flour, chemicals, clay products, glassware, paper, electrical apparatus, machinery, locomotives, airplanes and other transportation equipment, motion pictures and radios. Manufacturing in the United States has been aided by about 41 billion kilowatt hours of hydroelectric energy produced every year.

The capital of the United States is Washington, D. C. The largest 10 cities are New York, Chicago, Phila-

Courtesy Portland Chamber of Commerce, Washington Department of Highways

Deception Pass, a narrow water passage where the tide runs with great velocity between Fidalgo Island and Whidbey Island in Puget Sound, Washington. A bridge connects Fidalgo (left), Pass Island (center) and Whidbey (right) to the mainland. *Top:* Looking toward the snow fields of Oregon's towering Mount Hood (11,253 feet)

Courtesy Californians, Inc.

The General Sherman Tree in Sequoia National Park, California, 280 feet high, 36½ feet around its trunk, is the world's tallest and oldest living thing. Note its size in relation to the two people at the lower right

American Scenes—Washington, Oregon, California

Courtesy Maine Development Commission

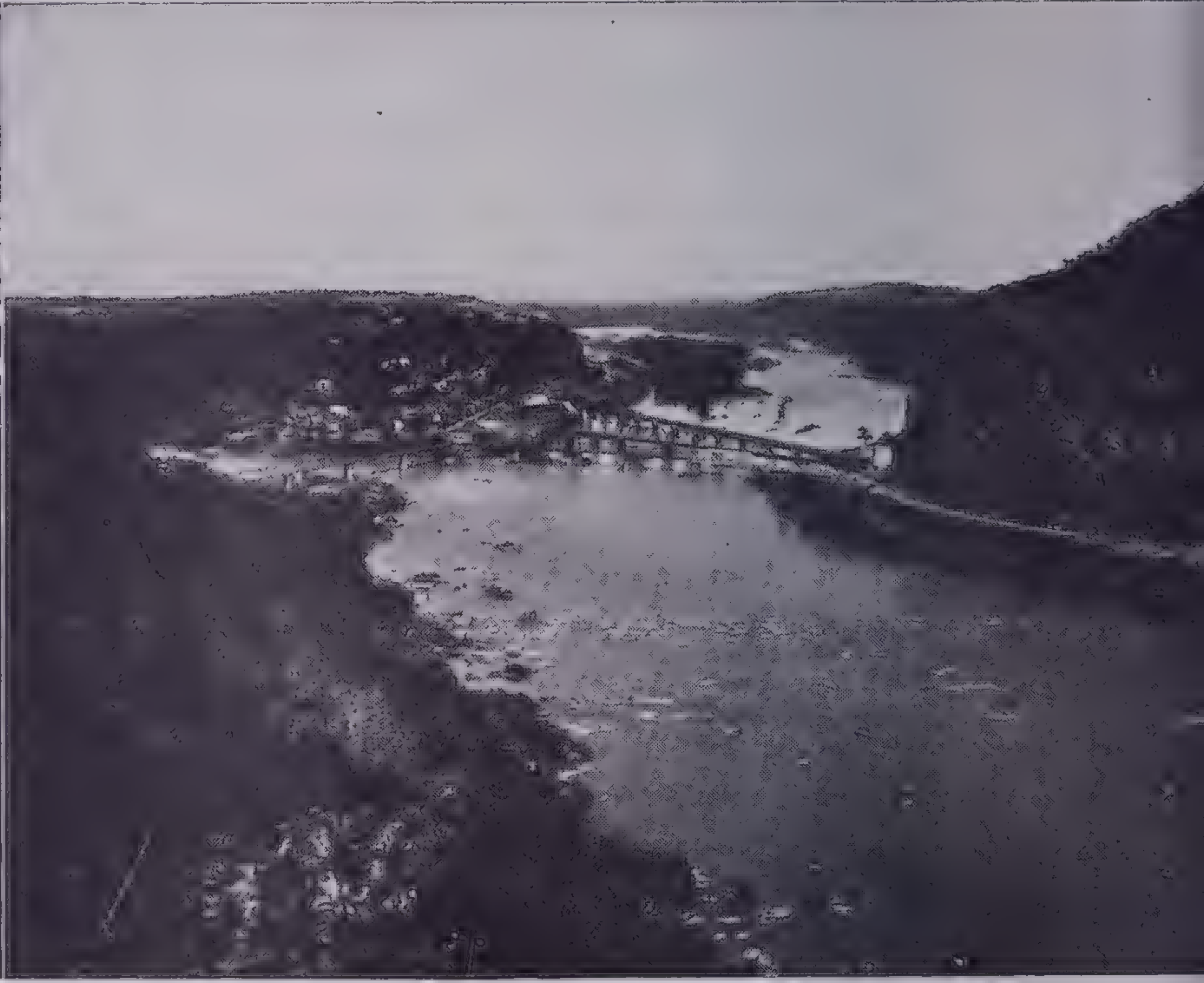
Crooked River, Maine, Winds a Devious Course From the Town of Norway Down to Sebago Lake

Courtesy New Hampshire Planning and Development Commission

A Survival of 19th-Century New England: Covered Timber Bridge at North Conway, New Hampshire

Courtesy South Carolina State Forestry Commission

Sea, Sand and Palmettos—A View on Edisto Island in South Carolina. This Semitropical Landscape is Characteristic of the Gulf States, the Carolinas and Virginia

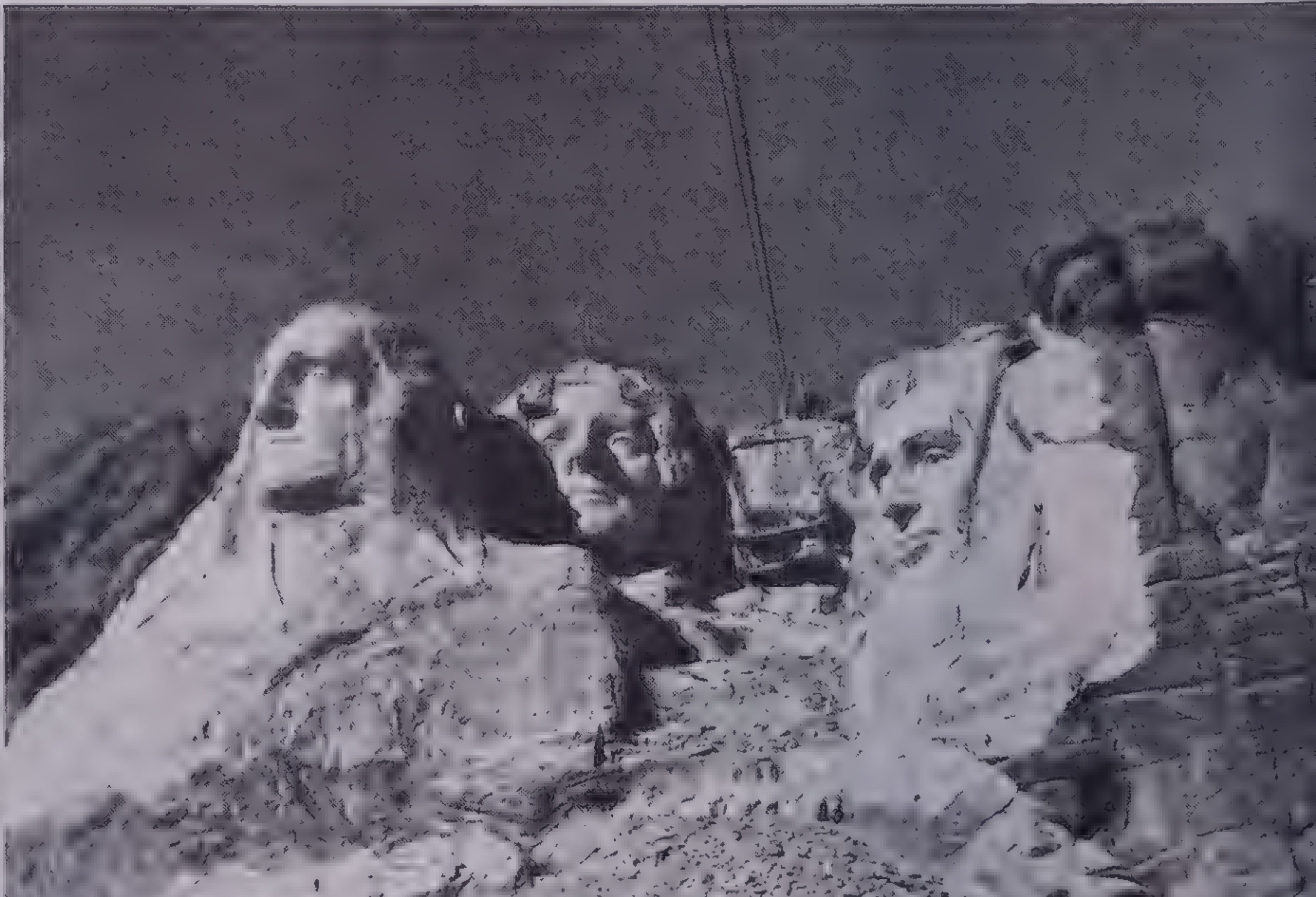


Courtesy Baltimore and Ohio Railroad Company

Three States Meet: Harpers Ferry, West Virginia (Left), and Maryland (Right) Joined by the Baltimore and Ohio Railroad Bridge Over the Potomac. In the Lower Left, Virginia Extends Along the Shenandoah

Courtesy Colorado Springs Chamber of Commerce

Pikes Peak (14,108 feet), Discovered in 1806 by Zebulon M. Pike, Rises in the Front Range of the Rockies in Colorado. (View from the Rampart Range Road.)



Courtesy National Park Service

Mount Rushmore National Memorial, South Dakota: Heads of Washingto Jefferson and Lincoln, Each 465 Feet High, Sculptured by Gutzo Borglum. A Head of Theodore Roosevelt Will Complete the Grou

American Scenes, East and West

delphia, Detroit, Los Angeles, Cleveland, Baltimore, St. Louis, Boston and Pittsburgh.

The 48 states may be grouped into the following natural divisions:

New England States: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut.
Middle Atlantic States: New York, New Jersey, Pennsylvania, Delaware and Maryland.
South Atlantic States: Virginia, West Virginia, North Carolina, South Carolina, Georgia and Florida.
East North Central States: Ohio, Indiana, Illinois, Wisconsin and Michigan.
West North Central States: Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas.
East South Central States: Kentucky, Tennessee, Alabama and Mississippi.
West South Central States: Arkansas, Louisiana, Oklahoma and Texas.
Mountain States: Montana, Idaho, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico.
Pacific States: Washington, Oregon and California.

Unter den Linden, a famous avenue in Berlin that is nearly a mile in length and 196 feet wide. It extends from the Brandenburger Tor eastward to Spree Island on which is located the former imperial palace. Bordering the avenue are the buildings of the University of Berlin, Prussian State Library, State Opera, palaces of the former crown prince and Emperor Wilhelm I, Zeughaus or arsenal and Prussia's War Memorial (formerly the Royal Guardhouse), where constant guard is maintained at the tomb of the Unknown Soldier. In the center is a statue of Frederick the Great. From the four rows of linden trees that flank it the name *Unter den Linden,* meaning under the lindens, is derived.

Ural, a chain of mountains that extends 1,335 miles southward from the Arctic Ocean, forming a great part of the boundary between the European and Asiatic parts of the U.S.S.R. The Urals, with their average elevation of 2,000 feet, are considered low mountains. Mt. Telpos (5,535 feet) is the highest peak in the north; Mt. Yaman-Tau (5,400 feet) is the loftiest in the south. Dense forests of fir, pine and larch cover the slopes of the northern Urals. Mineral wealth includes platinum, asbestos, gold, silver, copper, mercury, iron and coal.

The principal river that has its source in these mountains is the Ural. It rises in the Bashkirian Republic and flows in a general southerly direction for 1,120 miles to the Caspian Sea. Tributaries of the Ural are the Samara, Oro and Ilek rivers.

Uritsky Square, a square in Leningrad that was formerly the parade ground of the imperial guards. It is surrounded by the Winter Palace, Hermitage and the building housing the General Staff of the Army and Admiralty. In the center is a column, crowned with an angel of peace, that commemorates the Russian victory over Napoleon in 1812.

Uruguay, the smallest independent country of South America. Located on the southeastern coast of the continent, it is bounded by Brazil on the north, Brazil and the Atlantic Ocean on the east and the Atlantic and the wide estuary, Rio de la Plata, on the south. The area of the country is 72,153 square miles; the population is about 1,942,000. The Uruguay River, which empties into the Plata (the estuary of the Paraná system), separates Uruguay from Argentina on the west. The Cuareim and Yaguaron rivers and Lake Mirim form part of the northern boundary. Among rivers of the well-watered interior are the Rio Negro, Queguay, Cebollati, Santa Lucia and their numerous tributaries. The greater part of Uruguay consists of rolling plains. In the northern and northwestern sections, however, the wooded slopes of the Santa Ana, Cuchilla Grande, Cuchilla de Belen and Cuchilla de Haedo ranges rise in some places as high as 2,000 feet.

Animal husbandry is the chief industry. Uruguay has 7,000,000 cattle and 20,000,000 sheep, as well as swine, mules and asses. Wool, hides, skins, meats, meat extracts, grease, tallow and livestock constitute 96 per cent of Uruguay's exports. Wheat, corn, flax, oats, barley, alfalfa, linseed, birdseed, tobacco, olives and grapes (for wine making) are the principal agricultural products. Lumber is cut from the ombu, alder, aloe, poplar, acacia, willow, eucalyptus, algarroba, guava, quebracho and urunday trees. Mineral wealth includes gold, silver, lead, copper, talc, manganese, iron ore, lignite coal and petroleum. Among the semiprecious stones found in Uruguay are amethysts and various chalcedonies. In addition to meat-packing and winemaking establishments, Uruguay's factories include flour mills, furniture shops and shoe and textile (cotton and woolen) factories. Sealing is the most important of the fisheries.

After throwing off the Spanish yoke in 1811, Uruguay was known as the United Provinces of the Rio de la Plata. It resisted the attempt of Brazil to incorporate it in 1825 and three years later a treaty was signed by which Brazil did recognize the independence of Uruguay. The chief executive is the President, who is elected by direct vote for 4 years. He is assisted by a Cabinet, generally consisting of 9 secretaries. The General Assembly consists of a Senate of 30 members and a Chamber of Representatives of 99 members who hold office for 4 years. The social legislation enacted by this body is among the most advanced of any Latin American country. For local administrative purposes the republic is divided into 19 departments. Under the new constitution, adopted in 1934, all native Uruguayans who are 18 years old and can read and write and all naturalized foreigners may vote. The national elections of March, 1938, were the first in which women voted.

The capital and chief city of Uruguay is Montevideo (population, 662,000), located on the north shore of the Plata estuary. Among its points of interest are the Legislative Palace, the cathedral, the Solis Theater (named for Juan Diaz de Solis, who discovered the Rio de la Plata in 1515), the Municipal Palace, the Atheneum, the University and the monument to Gen. José Artigas, Uruguay's earliest dictator, which stands in the Plaza Independencia. Montevideo's chief industry is meat packing. Paysandu, Fray Bentos and Salto, all located on the Uruguay River, are important commercial centers.

Uspallata Pass, the most famous pass of the Andes Mountains, which form the boundary between Argentina and Chile. Since 1910 it has been the route of the only Trans-Andean railroad. The beautiful peace statue, called the *Christ of the Andes,* stands on the level summit of nearby La Cumbre pass.

Utah, a Great Basin state, is the tenth largest state in the Union, with 84,990 square miles, including 2,806 square miles of water. Idaho and Wyoming bound it on the north, Wyoming and Colorado on the east, Arizona on the south, and Nevada on the west. It is 345 miles long and 275 broad. About half of Utah's 550,310 people live in cities and towns.

The surface is irregular; high mountain ranges, the Uinta, the Wasatch and their branches, occupy a large area. The Colorado River winds in a deep canyon across the southeastern quarter, which is otherwise an arid plateau. The western half of the state is without drainage to the sea; its streams flow into alkali flats or saline lakes, of which Great Salt Lake is the largest. West of the lake is an extensive sandy desert of extraordinary flatness.

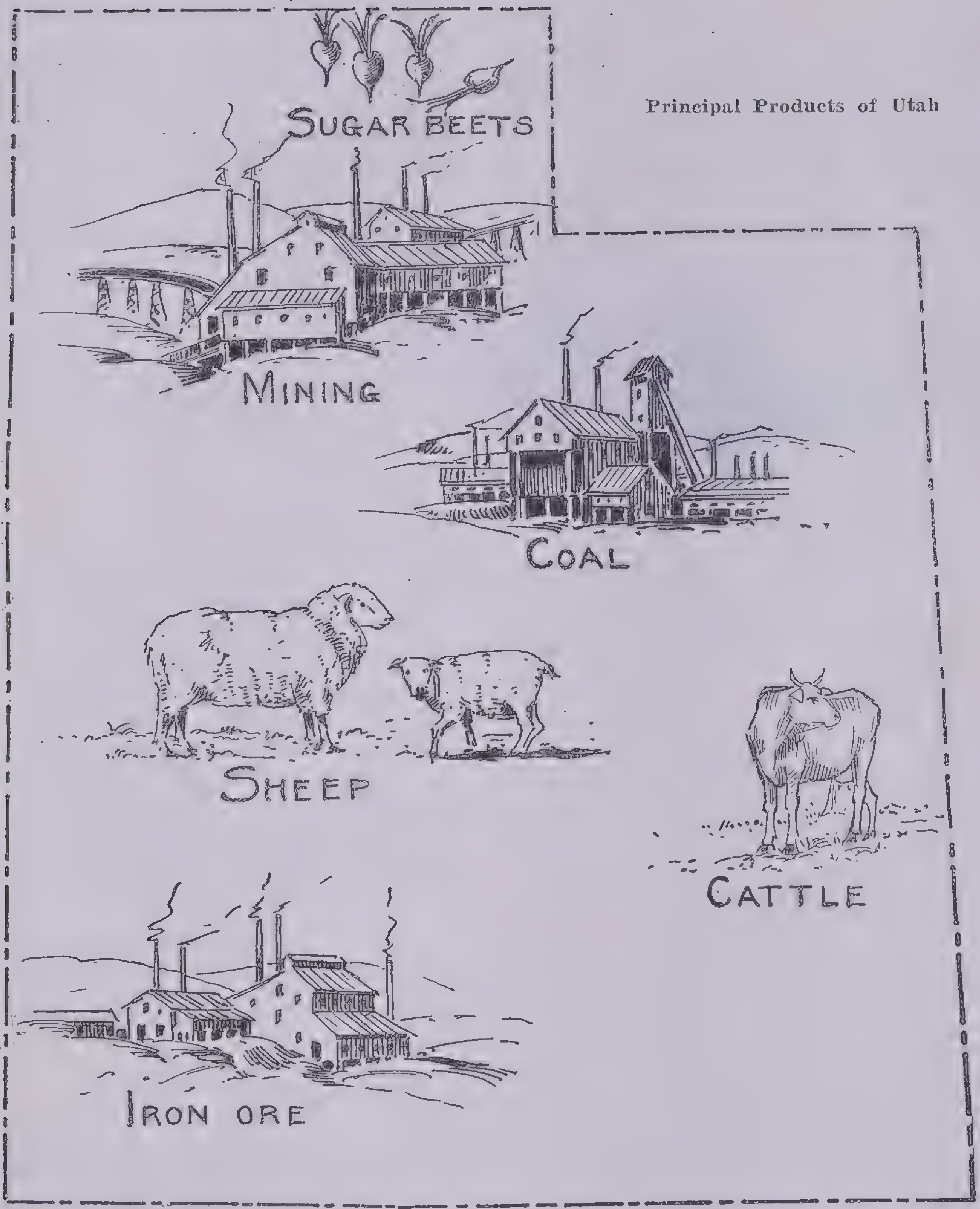
Only in the higher mountains does Utah have enough rainfall to support a good forest growth. Farming is profitable under irrigation, though dry farming is practiced with fair success in some localities. Sugar beets, wheat and hay are the principal crops. Immense grazing areas support great herds of cattle and flocks of sheep. There are extensive fruit growing districts. The state has much mineral wealth, mostly copper, but lead, silver and gold are also important. There are huge coal deposits, mostly undeveloped.

Utah's manufacturing interests are essentially a part of its mineral and agricultural industries; the processing of ores and farm products are the important occupations.

Salt Lake City, capital and principal center of population, is separately described. Ogden, second place in importance, is a railroad point with growing industries.

The largest schools are the University of Utah at Salt Lake City, the State Agricultural College at Logan and Brigham Young University at Provo.

Utah has strikingly varied and spectacular scenery. America has no more colorful or fantastic geological curiosities than the regions included in Bryce Canyon National Park and Cedar Breaks National Monument. Zion National Park has a remarkable canyon walled in by steep, vividly colored



Principal Products of Utah

cliffs. The remote Rainbow Natural Bridge, near the Arizona boundary, is exceptional in its immense span and symmetrical form. The natural scenery of the state is not confined to the arid plateaus, however. The forested mountains have many beautiful small lakes and tumbling streams, and the varied formations in Timpanogos Cave interest many visitors.

vale, a valley or hollow between two hills or mountains. The Vale of Kashmir, a valley in the Himalaya Mountains in the northern part of India, through which the Jhelum River flows, is widely celebrated for its beauty. The term *intervale* is used in the United States and Canada for a valley between hills or mountains or low alluvial lands (bottoms) through which a river flows.

valley, a depression, longer than it is wide, between ranges of hills or mountains. It has generally been formed by the folding of the earth's crust, so that the ridges are either anticlinal or synclinal. An example is the Sierra Nevada Valley in the western United States, between the Cascade and Sierra Nevada mountains on the east and the Coast Range on the west.

U-shaped valleys, steep-sided and flat-bottomed, are generally found in regions of hard rock that have been glaciated, as the Lauterbrunnen Valley near Interlaken, Switzerland. Valleys in dry and desert regions also assume a U-shape, as Death Valley in California.

V-shaped valleys, with sloping sides and gently rounded floor, are found in soft-rock regions where erosion can work more quickly. Typical of such valleys are the Canyon de Chelly in Apache Co., Ariz., and the Canyon of the Rito de los Frijoles (Bandelier National Monument) near Santa Fe, N. M., in regions of soft volcanic rock.

In mountainous regions there may also be found *longitudinal valleys,* running parallel to the ranges that form their two sides, and *transverse valleys* that cut a chain of mountains crosswise. In glacial regions, if a small valley joins the main one, but at a considerable height above it, it is called a *hanging valley.* Many hanging valleys are noted for their waterfalls, as the Trummelbach Falls of the Lauterbrunnen Valley in Switzerland. The word *valley* is applied also to the plain or lowland region through which a river flows, as the Mississippi Valley.

Vatican City, the smallest independent sovereign state, formed within the city of Rome by the Lateran Treaty (1929) between the Roman Catholic Church and the Italian Government. It includes the Vatican Palace, St. Peter's Cathedral and the adjoining Vatican Gardens with certain extra-territorial churches and palaces, covering in all an area of 109 acres. The Pope has full temporal as well as ecclesiastical power over the city-state. Its population is 1,025. The treaty ended the half-century of self-imposed confinement of the popes within the walls of the Vatican. It also restored an outward semblance of the authority in mundane affairs that the popes held during the Middle Ages, when the so-called Papal States comprised an area of some 16,000 square miles. This territory was incorporated into the newly formed kingdom of Italy in 1871.

Vatican City is represented at the capitals of the more important nations by papal diplomatic agents; the nuncios correspond to the ambassadors, and the internuncios have a status comparable to that of the ministers of national governments. Their reports reach the Pope through the Cardinal secretary of state and occasionally through the Consistorial Congregation and the Congregation for the Propagation of the Faith. For centuries the Vatican has had its own legal system, based on the code of canon law, and its own tribunals, called the *Rota* and *Signatura.* It also possesses its own flag, postage stamps and currency. The Vatican radio station permits the pope to communicate with the Roman Catholic world; his encyclicals are read in Latin and then translated into the language of the country receiving the broadcast. Vatican City is surrounded by a wall and guarded by soldiers who have been recruited from the Catholic families of Switzerland; the medieval blue, yellow and red uniform of the Swiss Guard was designed by Michelangelo. The opening of the Via della Conciliazone between Vatican City and the Tiber has afforded a more dignified approach to St. Peter's Cathedral, its most imposing structure.

St. Peter's Cathedral stands on what is thought to be the site where the Apostle suffered martyrdom in 67 A.D. The original basilica was founded by Constantine in the early part of the 4th century, and the cornerstone of the present structure was laid by Pope Julius II in 1506. Michelangelo, who superintended the construction for 18 years, designed the dome, which was inspired by that of the Pantheon; Maderno lengthened the nave from the original plan of a Greek cross and designed the façade. Bernini added the great entrance court, enclosed by a quadruple colonnade with an Egyptian obelisk in the center. It was brought from Heliopolis by the Emperor Caligula. The bronze doors are the work of Ghiberti, the principal one being the Porta Santa that is opened only for the Holy Year observed every quarter century. The cathedral was

Courtesy Italian Tourist Information Office

St. Peter's Cathedral in Vatican City, Rome

The world's largest ecclesiastical structure, covering an area of 225,000 square feet and erected 1506–1626, stands on what is claimed to be the site where St. Peter suffered martyrdom in 67 A.D. It is surmounted by a 139-foot-high dome, designed by Michelangelo after that of the Pantheon. Bernini's great entrance court is enclosed by a fourfold colonnade consisting of 284 columns. In the center is an Egyptian obelisk that the Emperor Caligula brought from Heliopolis. The Vatican Palace, residence of the Pope, is on the right. Besides Michelangelo and Bernini, Bramante, Raphael, Peruzzi, Vignola, Della Porta, Fontana and Maderno aided in designing St. Peter's

consecrated by Pope Urban VIII in 1626.

In the vestibule of St. Peter's is a statue of Charlemagne, whom Pope Leo III crowned emperor of the West in the old basilica on Christmas Day 800. The *Pietà,* by Michelangelo, which shows the Madonna with the crucified Christ, is found in the first chapel; farther on is a great bronze statue of St. Peter whose foot has been kissed as smooth as glass by the faithful. There are also mosaic reproductions of Raphael's *Transfiguration* and Domenichino's *Last Communion of St. Jerome.* The lofty bronze baldachin (or altar canopy) was designed by Bernini; the subterranean chapel beneath it marks the site of St. Peter's tomb and heroic statues of St. Helena, St. Veronica, St. Longinus and St. Andrew surround it. Among the tombs lining the walls of the nave are those of Sixtus IV, builder of the Sistine Chapel and founder of the Sistine choir; of Countess Matilda of Tuscany at whose castle, Canossa, in 1077 the Holy Roman Emperor Henry IV humbled himself before Pope Gregory VII; and of the three Stuart claimants to the English throne, the Old Pretender (James III), the Young Pretender (Charles III) and Charles's brother (Henry IX).

The Vatican Palace, built to the north of St. Peter's, is the outgrowth of a simple dwelling erected on this site about 500 by one of the early popes; it consists of a series of buildings erected at different times and skilfully joined together. Its embellishment began about 1450 under Pope Nicholas V. On the walls of the papal state apartments are Raphael's *Disputa,* representing the spiritual union of the church on earth and the church in heaven; and the *School of Athens* by the same artist, in which are depicted the leaders of Greek philosophy and science. Raphael is honored also by the collection in the Raphael Salon of various works, such as the *Coronation of the Virgin, Theological Virtues and Mysteries* and *Madonna di Foligno.*

The Pinacotheca and Borgia Apartments contain masterpieces by Fra Angelico, Titian, Leonardo da Vinci and others. In the Court of the Belvedere and the Museo Pio Clementino are such world-famous statues as the *Laocoön,* discovered in 1506 on the site of the baths of Titus; *Apollo Belvedere,* found about the same time at Antium, a suburb of Rome; and the *Discobolos* (Discus Thrower) by Myron.

The frescoes on the ceiling of the Sistine Chapel are the *Prophets and Sibyls,* the *Creation of the World* and the *Fall of Mankind* by Michelangelo; the altar wall is adorned with one of the largest frescoes in the world depicting the Last Judgment. In this chapel are held the sessions of the Sacred College of Cardinals, the funeral service of each deceased Pope and the election of his successor from among the members of the Sacred College. The services in the Pauline Chapel, conducted by Augustine friars, are attended only by residents of Vatican City. The Vatican Library, containing more than 400,000 volumes, and the Etruscan and Egyptian museums are world-famous.

The *Vatican Library,* one of the richest and oldest collections of books and manuscripts, is housed in a building erected in 1588 by Sixtus V and remodeled in the last few years.

Several churches and palaces outside Vatican City come under its jurisdiction. The most important of these is the Church of St. John Lateran (called also the Cathedral of Rome), whose palace was for nearly 1,000 years the residence of the Pope. It is famous for the Scala Santa (Sacred Stairway) that St. Helena, the mother of Constantine, is said to have brought to Rome from the house of Pontius Pilate in Jerusalem; at the foot of this stairway, which the faithful ascend on their knees, are two beautiful statues —*Christ and Judas* and *Christ before Pilate.* Next to St. Peter's the most ornate church in Rome is St. Paul's-without-the-Walls, erected over the martyr's burial place; above the interior colonnade, which consists of 40 gigantic marble pillars on each side of the church, are medallions of the popes from St. Peter to Benedict XV. Santa Maria Maggiore is one of the most notable Roman churches; its construction took from the 5th to the 18th century. Each of these three churches has a special or Holy Door that is opened only during the observance of the Holy Year. The papal summer residence is the suburban villa, Castel Gandolfo. The Quirinal Palace, another papal summer palace, has for many years been the residence of the king of Italy.

The name *Vatican City* originated from the fact that its citadellike group of buildings were erected on top of the slight eminence, Vatican Hill.

veld, the savannalike plain of South Africa, chiefly characterized by grass in Transvaal and Natal and by bush in Cape Colony. Trees such as the acacia may be sparsely scattered over it. The term was first used by the Boers, or Dutch settlers.

Venezuela, a federal republic of South America, known officially as the United States of Venezuela. It is situated in the extreme northern part of the continent, with the Caribbean Sea lapping its northwestern coast and the Atlantic Ocean its northeastern for a distance of 1,876 miles. British Guiana bounds it on the east, Brazil on the south and Colombia on the west. Its area is 393,976 square miles, and the population is about 3,295,000.

Venezuela may be divided into four zones: the low coastal plain; the mountain section traversed by the Maritime Andes in the northwest and the Parimas in the southeast; the llanos or grassy plains of the central part, which are watered by the Orinoco River; and the Guayana Highlands, the elevated section south of the Orinoco. The Orinoco itself is a 1,700-mile-long stream that rises in the Parima Mountains. After flowing westward it turns north to form part of the boundary between Colombia and Venezuela and then assumes an eastward course and discharges into the Atlantic through the several distributaries at its delta. The principal tributaries of the Orinoco are the Caura and the Caroni. Among Venezuela's other 70 rivers are the Meta, Apure, Portuguesa, Yaracuy, Escalante and Zulia-Catatumbo.

The seacoast of Venezuela has many indentations, the largest being the Gulf of Maracaibo between the Goajira and Paraguana peninsulas on the extreme west; it is connected with Lake Maracaibo by a narrow channel. There are also the Gulf of Paria, between Trinidad Island and the Paria Peninsula, and the Gulfs of Coro, Cariaco, Triste and Santa Fe. Margarita (400 square miles), lying off the Araya Peninsula, is the largest of the many islands; with Tortuga, Coche and Cubagua it constitutes the State of Nueva Esparta. Of the 32 ports along the coast, La Guaira (Caracas's port), Puerto Cabello and Carupano are the most important.

The agricultural district extends over the northeastern part of Venezuela and is the country's most important source of wealth. Coffee, cacao, sugar cane, tobacco, cotton, corn, wheat and vegetables are the principal products. Stock raising is carried on extensively both on the llanos and on the tablelands; cattle, sheep, hogs and horses are bred. In the forested areas of Venezuela—one in the northern mountain section and the other in the region south of the Orinoco—are found two valuable trees: the dividivi, whose pods furnish an excellent tanning extract; and the tonka, whose beans are used in making perfumes and flavoring extracts. Other forest products include rubber, indigo, fustic (dyewood) and various cabinet woods. Venezuela is rich in minerals—gold, silver, coal, iron, copper, lead, salt and petroleum—and it is an important world source of asphalt, obtained from the State of Bermudez and from the region around Lake Maracaibo. This mineral pitch is used in the manufacture of roofing and road building materials and varnishes. Petroleum fields near Lake Maracaibo yield abundantly. Pearl and pearl-shell fishing has for centuries been carried on off the coast and around Margarita Island.

Christopher Columbus first sighted the coast of what is now Venezuela on his third voyage (1498). Amerigo Vespucci and others explored it and described more than 100 different Indian tribes. No permanent Spanish settlement was made until Juan de Carvajal was sent by the crown in 1545. For three centuries Spanish authority held control in spite of the raids of British, French and Dutch buccaneers and many revolts of the people. Finally, at the Battle of Boyaca on August 7, 1819, Simon Bolivar defeated the Spanish royalists, and Venezuela became a part of Bolivar's Greater Colombia. In 1830 Venezuela seceded and set up its own republic.

The president is the chief executive. He is elected by the National Congress for a 7-year term and is assisted by a Cabinet of Ministers. The Congress consists of a Senate of 40 members and a Chamber of Deputies of 77 members, elected for three years. A new Federal Constitution, adopted in 1936, called for advanced social legislation, including trades-union recognition and the 8-hour day. The United States of Venezuela consists of 20 autonomous states, 2 territories and a federal district.

Caracas (population, 142,000) is the capital and largest city. It is situated on the Guaira River near the Caribbean coast and is noted as the birthplace of Simon Bolivar, Francisco de Miranda and other revolutionists. Notable buildings are the Capitol, Miraflores Palace (the president's residence), the Pantheon, Bolivar Museum and the Academy of Fine Arts. Other important cities are Valencia, La Guaira, Puerto Cabello, Maracaibo and Ciudad Bolivar.

The name *Venezuela* is Spanish for little Venice; it was suggested by the resemblance to the Italian city of the coastal villages built on stilts by the Indians.

Venice, the eighth largest city of Italy, located at the head of the Adriatic Sea in the section of Veneto, and the capital of the province of Venice. It has been built on 117 small islands in the lagoon of the Gulf of Venice. Some 175 canals take the place of streets; the main artery is the Grand Canal, which was probably at one time a river. Gondolas are the only means of local transportation, although, since the construction of an automobile bridge between the mainland and nearest island in 1933, the city is served by busses as well as by railroad trains. The principal manufactures are filigree jewelry, mosaics, lace, tapestry, brocade, glass, mirrors, electric lamps and furniture. Through the port, which has been developed at Marghera on the mainland, Venice is regaining some of the power that she held as Queen of the Adriatic and arbiter of Europe's trade with the Far East during the Middle Ages. The population is about 260,000.

The heart of Venice is the Piazzetta, surrounded by St. Mark's Cathedral, the Campanile (bell tower), Doge's Palace, Library of St. Mark and the Old and the New Procuratie, once the residences of administrative officers called *procurators*. The New Procuratie is now an art museum. At the eastern end of the square are two columns surmounted by statues—the winged lion of St. Mark and St. Theodore and his crocodile (St. Theodore was the patron saint of Venice before St. Mark). The pigeons that from time immemorial have been associated with St. Mark's are a familiar sight. They were proclaimed sacred by Enrico Dandolo, Venice's illustrious doge of the 12th century, who owed one of his greatest victories to a carrier pigeon.

The sanctuary of all Venice's greatness is the Byzantine St. Mark's Cathedral. It was begun in 838 and was consecrated in 1073 as the repository of the relics of St. Mark. Above the entrance, against a background of prismatic colors, are the four bronze horses that once adorned Napoleon's Arc de Triomphe du Carrousel in Paris. These horses were originally cast for a triumphal arch of Nero's in Rome but were carried by Constantine to his new capital and after the Fourth Crusade were brought from Istanbul by Doge Enrico Dandolo.

The church, built in the shape of a Greek cross, has three naves and is surmounted by three large domes over the center and arms. On the porphyry slabs of the vestibule the Holy Roman Emperor, Frederick I, surnamed Barbarossa, knelt in 1177 to receive the pardon of Pope Alexander III, whom he had exiled after creating an antipope. The ceiling, true to Ruskin's

Courtesy Italian Tourist Information Office

Feeding the Pigeons before St. Mark's, Venice

The pigeons of Venice were proclaimed sacred by the Doge Enrico Dandolo, who owed one of his victories during the Fourth Crusade to a carrier pigeon. In the background is the façade of St. Mark's Cathedral, its beauty enriched by mosaic panels and varicolored marble columns simile of the cathedral as "an illuminated missale in mosaics and precious stones," is decorated with primitive mosaics; the walls are incrusted with marble, alabaster and precious stones, brought back by Venetian merchants from their travels. The richest and most ornate possession of all is the Pala d'Oro (golden retable) of the high altar, made of gold and hundreds of jewels.

The imposing marble Doge's Palace, Gothic in architecture, has stood since the 15th century. The interior court is surrounded by a two-story arcade. To reach the loggia where the oligarchy of the Venetian Republic held sway, one ascends the Giants' Staircase, guarded at the top by Sansovino's colossal statues of Neptune and Mars. Among the halls are those in which the Senate, Council of Ten, Three Chiefs of the Council of Ten, Quarantia Civil Vecchia and the Great Council met. In the latter hall is the immense canvas *The Glory of Paradise* by Tintoretto, which he painted in commemoration of Venice's part in the Fourth Crusade. There is also the Bocca di Leone (marble lion's head) into which, during the Inquisition, were dropped those secret denunciations that caused so many lives to be taken.

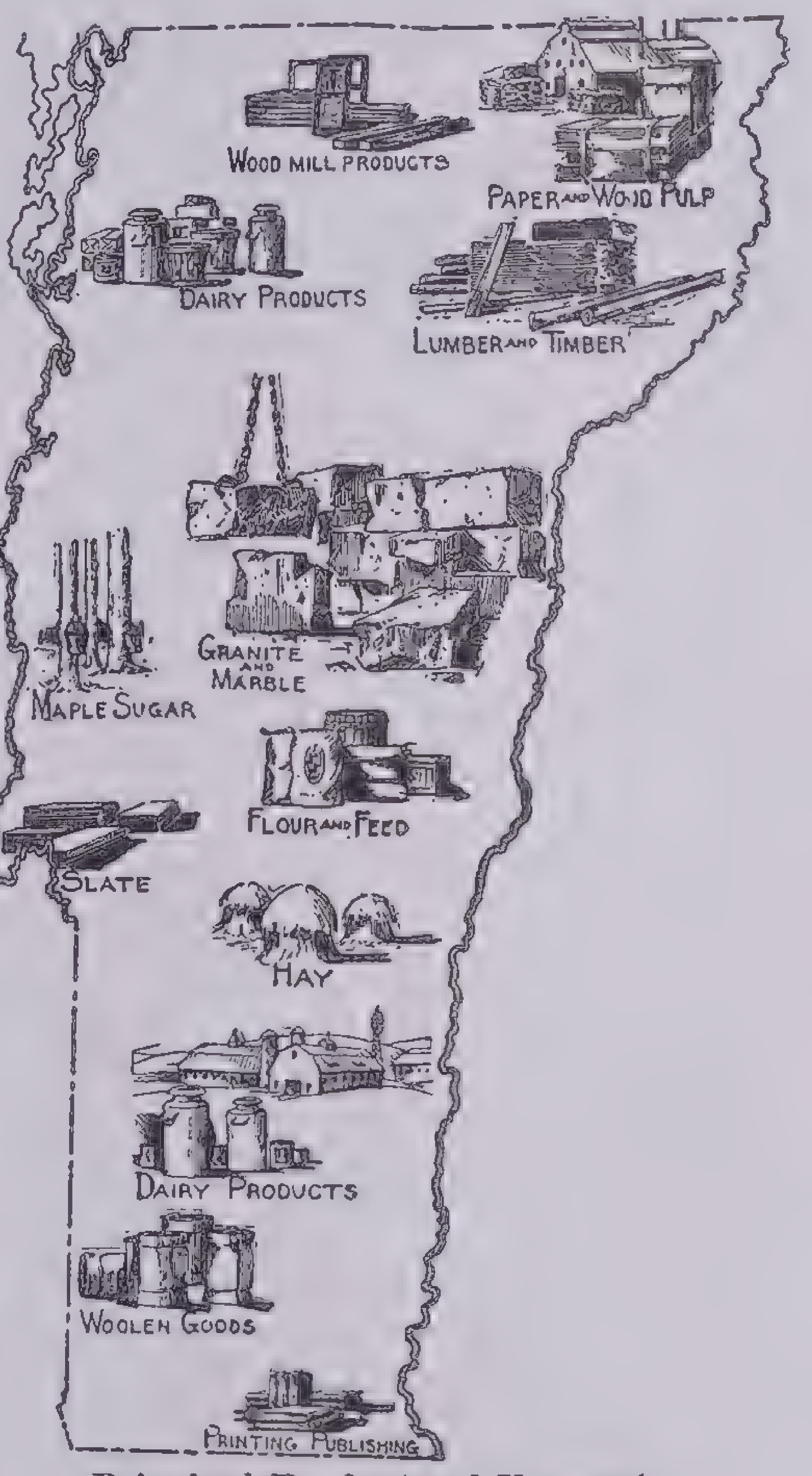
Among the other important churches of Venice are the Franciscan Santa Maria Gloriosa dei Frari and the Dominican Church of SS. Giovanni e Paolo. Many of Venice's distinguished dead are buried in them. In the Frari are the tombs of Titian, the painter, and Canova, the sculptor. It also contains Titian's famous *Assumption of the Virgin* and *Madonna of the Pesaro Family* and Bellini's altarpiece, *The Madonna Enthroned.* In SS. Giovanni e Paolo are buried Venice's doges and great statesmen and admirals. Verrocchio's statue of Bartolommeo Colleoni, one of the most famous equestrian statues in the world, is in the square adjoining this church.

The Church of Santa Maria della Salute is a Renaissance structure, decreed in 1630 as a thank offering to the Virgin for staying the plague of that year. Ever since a previous plague in 1562 the Venetian gondolas have been painted black, and the women of Venice have worn a traditional black shawl.

Along the Grand Canal are several palaces whose façades exemplify the best in Venetian Byzantine and Gothic architecture. The most famous is the Ca' d'Oro, so called from the profusion of gold ornamentation on the tracery. The English poet Robert Browning died in the Palazzo Rezzonico; the Palazzo Mocenigo was probably the residence of Lord Byron during his stay in Venice. A collection of the works of Venetian masters is housed in the Accademia. Venice also has one of the most important collections of modern art, purchased in part from the biennial international exhibitions held there since 1895. The Library of St. Mark contains more than 450,000 volumes. The Franciscan monastery, adjoining the Church of the Frari, serves as the State Archives. Of the 400 bridges spanning the canals of Venice the most important are the Rialto, a graceful, bazaar-lined structure across the Grand Canal, and the Bridge of Sighs, connecting the Doge's Palace and the prison.

Venice was founded during the 5th century by refugees fleeing from the ravages of the northern barbaric hordes that invaded Italy.

Vermont, a New England state with an area of 9,564 square miles, including 440 of water surface. It is 155 miles long and 90 broad at the north, diminishing in width at the southern end. Quebec bounds it on the north, New Hampshire on the east, Massachusetts on the south and New York on the west. The eastern boundary is formed by the Connecticut River, and half of the western by Lake Champlain. The population, 359,231 (1940), has shown very little change during the past forty years.



Principal Products of Vermont

The state is mountainous, with the Green Mountains and their foothills taking up most of its surface. Mt. Mansfield, the highest point, is 4,393 feet above sea level. The narrow intervales between the ridges and the more level lands near the Connecticut and Lake Champlain are the most productive sections. There are several small lakes and many rushing streams, sources of water power that gave Vermont an early start in the development of manufactures.

With severe winters and pleasantly cool summers, except in the lower valleys, the state has attracted thousands of people to its hills and shores, where camps, cottages and resorts make them comfortable while the cities suffer heat waves. The cool climate and thin soil do not encourage extensive agriculture, so most of the cleared land is kept in grass for the herds of dairy cows whose produce is the main source of rural income. Maple sugar and syrup are important farm products also. The forest area is considerable, and the timber output is reviving under a conservation program.

The Green Mountains yield valuable minerals; Vermont ranks first among the states in the production of marble, granite and asbestos. The slate quarries also are extensive.

Small manufacturing industries have long been characteristic of the state. Window screens, brushes and bristles, organs and platform scales are examples of its varied products. The processing of the quarry output gives employment to more people than any other single industry, however. The manufacture of paper and small wood products is important.

There are no large cities in Vermont. Burlington, on Lake Champlain, is the most important center, with a considerable wholesale trade. The residental sections, on bluffs overlooking the lake and the distant Adirondacks, command a remarkable landscape. Barre is the principal city in the granite district, and Rutland in the marble region. Montpelier is the capital.

The University of Vermont is at Burlington. Middlebury College at Middlebury is one of the older New England colleges, while Bennington College at Bennington is new and is devoted to the most advanced educational methods.

Vermont's climate and its satisfying, restful scenery are its greatest attractions. Bennington, with its tall battle monument, is the center of historic interest.

Victoria Embankment, the finest of the Thames embankments in London, connecting Blackfriars and Westminster bridges. It is lined with attractive gardens, including Temple Gardens in which the adherents of the Lancaster and York factions plucked red and white roses at the start of the Wars of the Roses in 1455. The most notable building is Somerset House, which occupies the site of the palace built by the Protector Somerset in 1547 and which now houses King's College, an affiliate of the University of London. On the embankment are Cleopatra's Needle, brought from Alexandria in 1878, and the Belgian Monument, commemorating the gratitude of the Belgian government for the hospitality that Londoners extended to Belgian refugees during the World War.

Victoria Falls, the 343-foot-high cataract of the Zambezi River that is located at the intersection of Bechuanaland and Northern and Southern Rhodesia in Africa and is one of the most magnificent phenomena of its kind in the world. Islands at the brink of the escarpment break the mile-wide waterfall into four parts, called Leaping Water, Main Falls, Rainbow Falls and Eastern Cataract. The principal islands are Boaruka and Livingstone (named in honor of David Livingstone, who discovered the falls in 1855 and named them for Queen Victoria). It is estimated that 60–100 million gallons of water a minute flow over the falls. After a further turbulent descent of 57 feet through a narrow gorge 100 feet wide and 200 feet long, this immense volume of water reaches a wider and deeper section called the Boiling Pot.

There is a dense forest along the brink of the chasm. When the sun is not too high gorgeous rainbow arches are cast over this forest, which is perpetually bathed in dew by the spray from the falls. The mist that rises from the falls and that in the process of condensation often resembles smoke is responsible for the native name *Mosi-wa-Tunya,* meaning thundering smoke. The Rhodesian government has preserved the country around Victoria Falls as a public park.

Victoria Falls, Rhodesia

The 343-foot-high cataract of the Zambezi River was discovered by David Livingstone in 1855 and named in honor of Queen Victoria.

Vienna, the capital of Austria before the German *coup d'état* of March 1938, by which Austria ceased to exist as an independent nation. Until the defeat of the Central Powers in the World War it had been the capital of Austria-Hungary.

Vienna is located in the eastern part of the Austrian province on the west bank of the Danube River. There flows through the city, however, only an arm of the Danube, called the Danube Canal; into it empties the River Wien, which rises in the Wienerwald 16 miles west of the city. A flood-control project, completed in 1881, regulated the course of the Danube and put an end to the floods that frequently devastated the city. This improvement in the river, which now has a quay length of 9 miles along the northern and eastern outlying districts, has made Vienna one of the most important inland ports in all Europe.

The city is divided into 21 districts. Its nucleus is the Inner City, once girdled by fortifications, which on being demolished in 1858 were replaced by a magnificent boulevard, the Ringstrasse, almost 4 miles long. Likewise in 1893 the outer ramparts, known as the *Lines,* were supplanted by a semicircular boulevard called the *Gürtelstrasse.* Among Vienna's manufactures are optical and musical instruments, jewelry, silk and other textiles, clothing, chemicals, furniture, paper, leather goods and metalwares. As a railroad center it is a junction for most of the transcontinental lines of Europe. The population numbers 1,874,581. The area is 107 square miles.

The Inner City. The center of the Inner City is the square known as Stephansplatz, on which rises the Gothic St. Stephen's Cathedral. It was begun in the early part of the 13th century but was not completed until 1556; its principal feature is the graceful, lacelike southern tower, which rises to a height of 446 feet. The interior of the cathedral is richly ornamented with stained-glass windows, marble pillars and 35 baroque altars in different sections of the nave. The reredos of the high altar represents the stoning of St. Stephen.

Near the cathedral is the Hofburg or Imperial Palace, which, like the Vatican in Rome, is an irregular series of buildings joined together. The oldest part, the chapel, dates from the 13th century, when Rudolf I, Holy Roman Emperor and founder of the Hapsburg dynasty, established his residence in Vienna. The Renaissance-styled Amalienhof contains the apartments of the Empress Elisabeth, wife of Franz Josef I; the baroque Leopoldinischer Trakt and Reichskanzlei Trakt (or Knights' Hall) abound in mementos of the reigns of Maria Theresa and Franz Josef. The modern Renaissance wing, which overlooks the Heldenplatz and was constructed during the latter part of the 19th century, is known as the Neue Hofburg; it houses the ethnological and various art museums. The National Library, containing more than 1,500,000 volumes, and the famous Spanish riding school are housed in buildings facing the Josefsplatz, which was named from the equestrian statue of the Emperor Josef II in the center. The Heldenplatz has equestrian statues of Prince Eugene and the Archduke Karl, and its entrance, the Äusseres Burgtor, has been converted into a war memorial with the tomb of the Austrian Unknown Soldier.

Separating the Hofburg from the Ringstrasse are two parks—Hofgarten and Volksgarten. Opposite the latter is the Maria-Theresien Platz, in the center of which is a colossal statue of Maria Theresa surrounded by contemporary celebrities. On either side of the square are domed buildings that were erected in the 19th century in Renaissance style; one houses the museum of art and the other the museum of natural history. To the north along the Ring is the House of Parliament, whose classic style of architecture is emphasized by the Pallas Athene Fountain in front of the building. Then come the Renaissance building of the University of Vienna, the Burgtheater (which is noted for its productions of classical and modern plays) and the Rathaus or city hall. The Rathaus was erected in 1883 and is one of the best examples of a modern style combining the elements of Gothic and Renaissance architecture; it houses a municipal library and the Historical Museum of the city of Vienna. Along the Ring are also the State Opera House, Urania (a concert hall), Academy of Fine Arts, Stock Exchange and Austrian Museum of Art and Industry.

In the oldest part of the Inner City is the Alte Aula, the original home of the University of Vienna, on the Universitatsplatz. It now houses the Academy of Science and Art. The famous Vienna Sängerknaben, or boys' choir, sings at the University Church, a baroque edifice that was erected for the Jesuits by the Emperor Ferdinand II in 1631. Franz Schubert and other great musicians sang in this choir. The principal thoroughfare of the Inner City is the Graben, which is lined with smart shops; in its center is the Pestsäule or so-called Plague Column; it was designed by Fischer von Erlach, Vienna's great exponent of the baroque, and was erected to the Trinity in commemoration of the cessation of the plague of 1679.

Cultural Vienna. The city is the seat of: the University of Vienna, which was founded in 1365 and is noted especially for its medical faculty, the Conservatoire of Music, Polytechnic Institute, Academy of Oriental Languages and Military Academy. Its miscellaneous museums include the Austrian Gallery housed in the Belvedere Palace, the Count Czernin, Count Harrach and Prince Liechtenstein picture galleries, the Roman Museum of the City of Vienna, Schubert and Haydn museums, Technical Museum for Industry and Trade and the Austrian Military Museum.

Among other Viennese churches are the Gothic Maria am Gestade, the Renaissance Schottenkirche and the baroque Peterskirche, Michaelerkirche (formerly the court church) and the Karlskirche. The last-named church was erected by Emperor Charles VI as a thank offering for the cessation of the plague of 1713; it is flanked by two columns in imitation of Trajan's Column in Rome, with bas-reliefs of scenes from the life of St. Borromaus, to whom the emperor made his vow. The Votivkirche was likewise erected between 1856 and 1879 at the behest of the Archduke Maximilian, the unfortunate emperor of Mexico, as a thank offering for the escape of his brother, Franz Josef, from an assassin's blow.

The former imperial country seat is the baroque Schönbrunn Palace in the Hietzing, most westerly of the Viennese districts. Its chief beauty is its park, which culminates in the Neptune grotto and the colonnade, Gloriette. It was named from the fountain, Schöner Brunnen (beautiful fountain).

The 64 municipal apartment houses that were erected during the Socialist regime (1919–31) form a distinctive feature of postwar Vienna and mark the city as a leader in slum eradication. Vienna's principal park is the Prater, an amusement and sports center. The popular Viennese waltz king, Johann Strauss, is commemorated by a monument in City Park and a theater.

The name *Vienna* (in German, *Wien*) is from the Latin *Vindobona,* which was its name as a Roman gar-

Courtesy Thomas Cook & Son, Inc.

Along the Ringstrasse, Vienna

Facing Maria Theresa Place is the Museum of Natural History (1872–81) in Italian Renaissance style. In the center of the square is the monument to the Austrian queen. Directly opposite the museum, but not pictured, is the History of Art Museum, similar in construction and detail

rison town during the early part of the Christian era.

Virginia, a South Atlantic state that is roughly triangular in shape, 425 miles long and 205 broad. Its 42,627 square miles of area include 2,365 of water surface. On the northeast it is bounded by Maryland, on the east by the Atlantic Ocean, on the south by North Carolina and Tennessee and on the northwest by Kentucky and West Virginia. Most of the northeastern boundary is formed by the Potomac River, while Chesapeake Bay intrudes between the main part of the state and the peninsular section, called the Eastern shore, along the Atlantic. The population is approximately 2,700,000; about one-third of the people live in cities and towns.

The topography is diverse. The Eastern Shore and the southeastern corner are flat and sandy, with broad estuaries indenting the coasts. Chesapeake Bay is a sheltered waterway of immense commercial importance, and Hampton Roads, the outlet of the James River, is one of the most spacious and convenient harbors in the world. From the low coastal plain the surface rises into the rolling piedmont plateau, which stretches from north to south across the middle of the state, ending against the base of the Blue Ridge. The great Appalachian Valley, in this region known as the Valley of Virginia, lies west of the Blue Ridge, extending far into the southwestern angle. Forming its northern end is the historic Shenandoah Valley. To the west are the higher parallel ridges of the Allegheny Mountains, through which the western boundary winds. Mt. Rogers, in the Blue Ridge near the North Carolina border, is the highest point, with an elevation of 5,719 feet.

The Potomac, James, York and Rappahannock are broad navigable rivers. In the south and southwest the New and the Dan, which find outlets in other states, are valuable sources of hydroelectric power.

Virginia has a variable coastal climate, with mild temperatures near the sea and more severe changes in the interior valleys. Rainfall is everywhere adequate for agriculture, and about three-fourths of the land area is in farms.

Crop production is varied. In the southern section tobacco, peanuts, cotton and early vegetables are important. In the northern piedmont and valley wheat, cattle, dairy products and apples lead in yield. Corn is grown in all parts of the state. The Eastern Shore produces great quantities of potatoes and other vegetables for the markets of the nearby great cities. Fine horses are bred in the piedmont and valley.

Virginia still has extensive forests, mostly of second growth timber. Soft pines predominate near Chesapeake Bay and hardwoods in the mountains. Lumbering and the making of wood products are important industries. The commercial fisheries employ many people, especially on Chesapeake Bay and the tidal streams flowing into it.

Many minerals are found in the state. Coal is the most valuable commodity, and the deposits of pyrites, soapstone, titanium ores, clay and lime are worked profitably. Iron ore is abundant, but of relatively low grade.

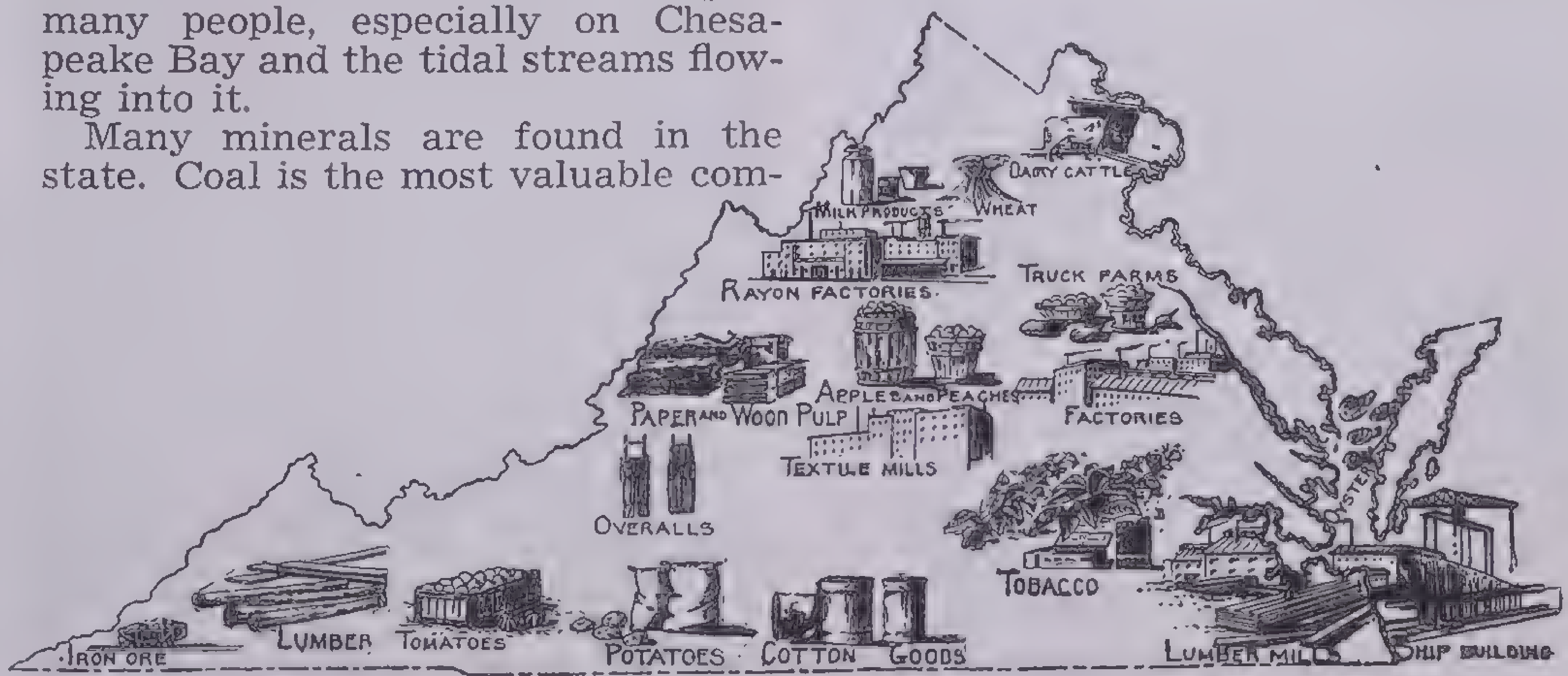
The value of the output of Virginia's factories is growing rapidly. Tobacco products, rayon, cotton textiles, paper, fertilizers, cellophane, leather goods and wooden ware are among the leading industries. Newport News is one of the largest shipbuilding centers in the world.

Richmond, the capital and largest city, is separately described. Norfolk, next in size, is the largest of a group of cities on the shores of Hampton Roads. Portsmouth faces Norfolk across the tidal Elizabeth River, a waterway of great commercial importance and the entrance to one of the principal U. S. Navy Yards. Norfolk has varied manufacturing industries, and ships enormous quantities of coal.

Roanoke is the trade and manufacturing center of the southwestern region and has grown in size rapidly. Lynchburg and Danville are older cities with important factories, particularly in the tobacco and textile industries. Newport News is another Hampton Roads port which handles an enormous tonnage of coal and builds many ships. It has a large and unique Mariner's Museum.

The state has many institutions of higher learning. Among them are the University of Virginia at Charlottesville, William and Mary College at Williamsburg, Washington and Lee University and Virginia Military Institute at Lexington, the University of Richmond at Richmond, Virginia Polytechnic Institute at Blacksburg, Hampden-Sidney College near Farmville and Hampton Institute at Hampton. Foxcroft near Middleburg is one of the most exclusive girls' finishing schools in the United States.

Virginia has scenic and historic attractions of high rank. In the coastal plain and piedmont there are many great mansions, restored or preserved from colonial days, noteworthy for their architecture and historical associations, often for their magnificent grounds. Mount Vernon, Washington's home, Arlington and Stratford, both estates of the Lee family, and Monticello, designed and lived in by Jefferson, are open to visitors. Many others, equally impressive in style and setting, may be visited dur-



Principal Products of Virginia

ing the spring Garden Week celebration.

There are several Federal reservations in the state. The Shenandoah National Park includes a 90-mile Skyline Drive, following the crest of the Blue Ridge, which has made it one of the more popular parks. The Colonial National Historical Park includes Jamestown, where the first permanent English settlement in America was made; Williamsburg, colonial capital and social center, and Yorktown, scene of the closing of the American Revolution. The town of Williamsburg is a unique museum of colonial life and architecture, where dozens of pre-Revolutionary houses have been restored and reconstructed, especially the old Capitol, Governor's Palace, Gaol, Tavern and Parish Church.

Among the many Civil War battlefields in Virginia those in the vicinity of Fredericksburg, Petersburg and Richmond have been carefully restored. In the scenic Shenandoah Valley the Virginia Natural Bridge and the numerous limestone caverns are outstanding attractions. Virginia Hot Springs in the Alleghenies and Virginia Beach on the Atlantic coast are among the most fashionable American resorts. Alexandria, Fredericksburg and Winchester have many appealing historical associations, and Hampton is the oldest surviving English town in America, having been established about 1610.

Virgin Islands of the United States, a group of three principal islands—St. Thomas, St. Croix and St. John—and about 50 islets, located 40 miles east of Puerto Rico. They belong to the Leeward group of the Lesser Antilles. They were discovered by Columbus on his second voyage in 1493, and since they were so numerous he called them the Virgin Islands in honor of St. Ursula and her 1,000 or more companions who, while on a pilgrimage sometime in the early Christian era, suffered martyrdom when they were captured by the Huns near Cologne.

In 1733 the islands became a possession of Denmark and, except for brief periods during 1801–02 and 1807–15 when they were held by Great Britain, remained a colony of that country. They were known as the Danish West Indies. In 1917 the group was bought by the United States for 25 million dollars. In the treaty the United States also relinquished its claim to Peary Land in the northern part of Denmark's possession, Greenland. The islands had been desired by the United States since the close of the Civil War because of their strategic value as a naval base.

The total area of the Virgin Islands of the United States is 133 square miles. St. Croix (82 square miles) is the largest but St. Thomas (32 square miles) is the most important. St. Thomas, the capital, is on the island of the same name. Under Danish rule it was known as Charlotte Amalie. St. Croix has a population of 11,413; St. Thomas, 9,834; St. John, 765. The products are chiefly sugar, molasses, bay rum, cotton and tropical fruits. Since the repeal of prohibition in the United States the economic status of the islands has improved because of the increase in the manufacture of rum and other liquors.

Most of the natives are descendants of Negro slaves. Through co-operation with an American agency called the Virgin Islands Company, the more intelligent among them are improving the conditions of the islanders, especially in the way of education, sanitary measures and better agricultural methods. Assisting the American governor are two legislative councils, one for St. Thomas and St. John jointly, and the other for St. Croix. Naval supervision of the islands ceased in 1931, when control was transferred from the Navy Department to the Department of the Interior. Since 1927 the islanders have been considered United States citizens.

In recent years the Virgin Islands have become an important tourist center. At St. Thomas the Government operates the Bluebeard Castle Hotel, named for a nearby pirate stronghold of the 17th century.

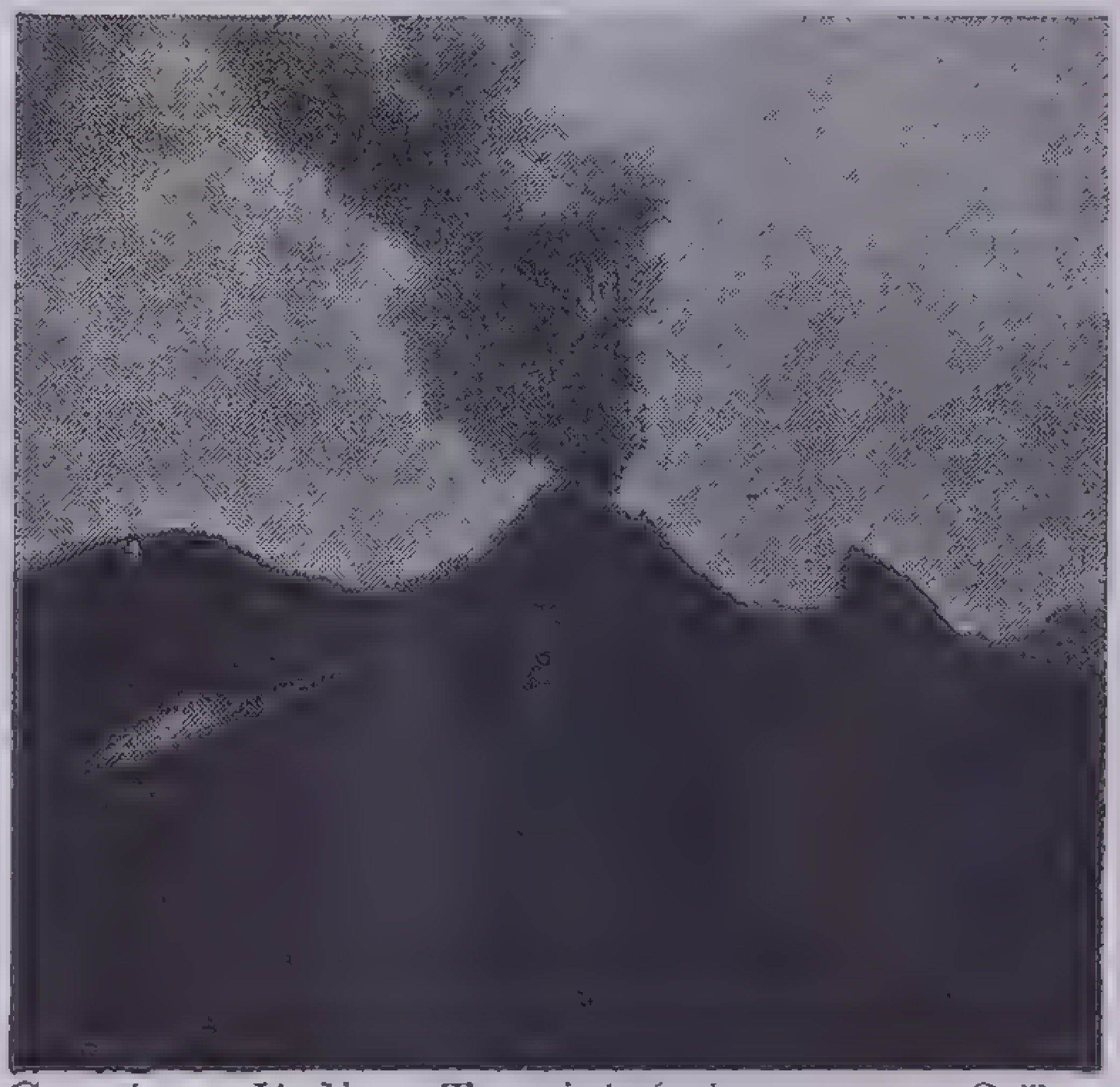
volcano, a mountain or hill from which lava, steam, ashes, mephitic gases and other igneous material are erupted through craters or fissures. The erupted materials originate deep in the earth's interior and are forced to seek an outlet through the pressure exerted by the gases and steam. The conelike shape of such a mountain or hill is usually the result of its having been built up, entirely or partly, by the ejected material.

The three classes of volcanoes are: active, dormant and extinct. An *active volcano* is one that is in eruption or has recently erupted; among the latest (in 1937) were the eruptions of three large volcanoes near Rabaul (the capital of New Britain, a mandated territory held by Australia) that forced the 5,000 inhabitants to flee. A *dormant volcano* is one that has not been in eruption for a long period, as Popocatepetl in Mexico that, although continually emitting smoke and ashes, has not erupted violently since 1548. An *extinct volcano* is one that has entirely ceased erupting, as Mt. Shasta in Calfornia or Mt. Mazama in Oregon, whose crater is now the basin of Crater Lake.

The eruption of a volcano may be extremely violent and explosive, causing great loss of life and damage to property, as was the case in Pompeii and Herculaneum during the eruption of Vesuvius in 79 A.D. At the other extreme it may be no more than the quiet outpouring of lava. Most volcanoes are near the ocean or on islands in it. They are generally arranged in groups in *earthquake belts*, or regions of greatest structural weakness in the earth's crust. Some volcanoes, located on continental shelves, are suboceanic and after a severe eruption may appear as islands.

Among the great volcanoes are Vesuvius in Italy, Etna in Sicily, Cotopaxi in Ecuador, Fujiyama in Japan, Mauna Loa and Kilauea in Hawaii and Stromboli on one of the Lipari islands in the Mediterranean. Mt. Lassen in California, which last erupted in 1917, is the only active volcano in the United States. The word *volcano* is Italian and is derived from the name of the Roman god of fire, Vulcan.

Wales, a part of the United Kingdom of Great Britain and Northern Ireland that occupies a roughly rectangular peninsula to the west of England. It is bounded on the north by the Irish Sea, on the west by St. George's Channel and on the south by the Bristol Channel. Including Monmouthshire and the island of Anglesey, the area of Wales is 8,012 square miles; the population is about 2,593,000.



Courtesy Italian Tourist Information Office

Vesuvius in Quiet Eruption

Since the last great eruption of this 4,300-foot-high Italian volcano in 1931, lava, steam and mephitic gases have been emitted continually from its crater. Pompeii and Herculaneum were destroyed in the eruption of 79 A.D.

The low Cambrian Mountains extend from north to south through the central part of Wales. The loftiest elevation is Mt. Snowdon (3,560 feet high) in the county of Caernarvon. Southern Wales possesses the Brecon Beacons and Plynlimmon. The country is drained by the Dee, Conway, Rheidol, Ystwyth, Usk, Towy, Neath, Taff and Wye rivers. Beaumaris Bay on the North, Cardigan and Caernarvon bays on the west and Carmarthen and Swansea bays on the south contribute to the irregular coast line of this part of Britain.

The southeastern part of Wales, especially the Vale of Glamorgan, is rich in minerals; here is mined one-fifth of all the coal produced in Great Britain. Iron, copper, tin, lead, zinc and slate also are mined in large quantities. Closely linked with these metals is the manufacture of steel, brass and bronze. Other manufactures include textiles (principally woolens and artificial silks), paper, machinery and chemicals. The most important agricultural occupation is sheep and cattle raising. The crops include wheat, barley, oats and fodder roots.

The chief city of Wales is Cardiff (population, 224,000); through its location at the mouth of the Taff River on Bristol Channel it is the most important seaport. About 170 acres of docks have been built there to handle the coal that is its leading export. Swansea, located on the bay of that name, is another important seaport. The manufacturing center of Merthyr

Tydfil is in the heart of the coal-and-iron-mining section.

Wales has many picturesque towns. Carnarvon is famous for its Roman walls and for its castle, where the investiture of each newly created Prince of Wales has taken place since the days when this honor was conferred on the Black Prince, son of Edward III, for in its relationship to the British Crown Wales is still regarded as a principality. Among other famous castles are Conway Castle, built by Edward I, who conquered the Welsh during the latter part of the 13th century. Harlech Castle was the inspiration of the famous song, "March of the Men of Harlech." The legend of King Arthur and his Knights of the Round Table lives on in Caerlon. In Llandrindod Wells many Druidic stones are preserved. The principal Welsh seaside resorts are Llandudno, Rhyl and Colwyn Bay.

The name *Wales* is derived from the Anglo-Saxon *Wealas,* which means foreigners; it was applied to the early Britons, whom the invading Angles drove into the mountain fastnesses of Wales in the 5th and 6th centuries. In recent years the Welsh have become conscious of their Celtic heritage, and at local and national Eisteddfods their bards preserve much of the Welsh culture through song and story.

Wall Street, a short, narrow street in the lower part of New York that extends from Broadway, opposite Trinity Church, to the East River. It is famous as a financial and speculative center and has become a figurative term for the money power of the country. Among the buildings located on it are the New York Stock Exchange, United States Subtreasury and the banking house of J.P. Morgan & Co. In early days the Dutch settlers built a stockade wall along the north side of the street to protect themselves from the Indians, and this rude fortification gave the street its name.

Washington, the capital of the United States, eleventh in size among American cities. Formerly coextensive in area with the District of Columbia, it now extends north into Montgomery and Prince Georges counties, Md., and south into Arlington County, Va. The district itself occupies 62 square miles, excluding 8 square miles of water area, and is located on the northeastern bank of the Potomac River about 100 miles from its mouth. The population of the city is 663,091. Its site was chosen by George Washington in 1791, and for him the city was named.

In many respects there is no other city in the United States that compares with Washington. It was established solely as the seat of the national Government and is not controlled by its citizens. Except for a brief period during the early '70s, when the experiment of a territorial governor and legislature was tried, its laws have been made only by Congress. As a municipal corporation it has been administered since 1874 by a board of three district commissioners, appointed by the President and confirmed by the Senate. The administration of justice also is entrusted to special district courts, including a court of appeals and supreme, probate, municipal and juvenile courts. The Federal Government owns 40 per cent of the land in the city of Washington, and at one time the Federal Treasury contributed 50 per cent of the cost of the District rule. This proportion was later reduced to 40 per cent and still later to 22 per cent, so that private property is now as heavily taxed as in most other cities.

The Plan of Washington. In accordance with the plan of Major Pierre Charles L'Enfant, a French engineer who served in the Continental Army, the great Capitol is the center of the city. From it to the north, east, south and west extend North Capitol, East Capitol and South Capitol streets and the Mall. These divide the city into four sections that determine the official designations of the city; namely, Northeast, Northwest, Southeast and Southwest, usually expressed by their abbreviations. Streets that run directly north and south are numbered, and the intersecting streets, at right angles east and west, are indicated by letters. One is assisted in locating a street by the designation following its name, as F Street, N. W. A number of avenues that were named for the states extend diagonally in all directions. The newest one is Constitution Avenue (formerly B Street).

The Mall extends westward from the Capitol. At its western end, near the Potomac, is the Lincoln Memorial. The 36 Ionic columns of this majestic building are symbolic of the number of states in the Union at the time of Lincoln's death. In the central hall is a colossal bronze statue of Abraham Lincoln by Daniel Chester French. East of the Lincoln Memorial rises the 555-foot pyramid-topped shaft of the Washington Monument, which is reflected in the pool about which grow the flowering cherry trees presented by Japan. Directly north of this are the White House and executive grounds, some 80 acres that become the scene of the egg-rolling contests of Washington children on Easter Monday. At the head of the Mall, near the Capitol, is the botanical garden, and between it and the Washington Monument are the Department of Agriculture Building, Bureau of Engraving and Printing (where paper money, postage stamps and government bonds are printed) and the Smithsonian Institution, which has under its charge the adjoining United States National Museum and the Freer Gallery of Art.

The glory of Washington is its magnificent array of government buildings and national monuments, built mostly of white sandstone, limestone, granite and marble, along broad, tree-lined thoroughfares. The Capitol, which was under construction from 1793 to 1865, is 751 feet long and 350 feet wide. Surmounting the dome, which rises to a height of 287 feet, is the bronze statue, *Freedom,* by Thomas Crawford. The House of Representatives meets in the south wing, and the Senate Chamber is in the north wing. In the pediment of the central portico is the *Genius of America,* and on either side of the entrance are the colossal statuary groups, *The Discovery of America* and *The Rescue.* The first and second are by Luigi Persico; the third is by Horatio Greenough. In the center of the portico are the bronze doors designed by Randolph Rogers; they depict events in the life of Christopher Columbus. Since the time of Andrew Jackson, the inauguration of the President of the United States has taken place upon this portico.

Beneath the dome of the Capitol is the vast rotunda, which contains familiar paintings, such as the *Landing of Columbus at San Salvador* by John Vanderlyn, *Discovery of the Mississippi by De Soto* by William H. Powell and *Signing the Declaration of Independence* by John Trumbull. *Apotheosis of Washington* by Constantino Brumidi adorns the canopy of the dome. In the National Statuary Hall are marble and bronze statues of the most illustrious sons of 36 states.

For many years the United States Supreme Court held its sessions in cramped quarters in the Capitol, but it now occupies its own imposing marble building, designed by Cass Gilbert. Near the Senate and House wings, to the northeast and southeast, are the Senate Office and old and new House Office buildings. The Union Station, one of the most beautiful railroad terminals in the world, and in which enter seven of the most important eastern railroad lines, is north of the Capitol; near it are the buildings of the Government Printing Office and the City Post Office.

The Keystone Street. Running diagonally southeast and northwest from the Capitol is Pennsylvania Avenue, Washington's most important street. Located on or near it are the General Post Office and buildings housing the departments of Commerce, Interior, Justice and Treasury and the Bureau of Internal Revenue. The departments of State, War and Navy, housed in a stately French Renaissance structure, have outgrown their quarters, and the clerical forces are widely scattered over the city in the Munitions, Navy and other buildings.

Between the Treasury and State, War and Navy buildings is the great area containing the White House and the surrounding grounds that extend southward to meet the western end of the Mall. The White House is a small Italian Renaissance building enlarged by a wing at either end so as to house the executive offices. It was partially burned by British troops in the War of 1812; and it was first called the White House when it was painted white to hide the smoke stains. It was first occupied by President John Adams during the closing year of his term in 1800. In the White House are the famous East Room (used for official receptions), the Blue, Red and Green rooms, the State Dining Room and the Cabinet Room where the President confers with members of his Cabinet.

One of the most magnificent inte-

Harris & Ewing

Buildings of the Federal Government Along Constitution Avenue, Washington

In this picture, looking west from Seventh Street, can be seen the Archives Building and the Department of Justice Building. The Archives Building, first occupied in 1935, has a classic entrance before which two sculptured figures by James Earle Fraser mount guard; they are *Heritage* (left) and *Guardianship* (right). The National Archives preserves all archives or records belonging to the Government of the United States including voice recordings of the speeches of the presidents and current newsreel and motion-picture films with authentic historical backgrounds

riors in the United States is that of the Italian Renaissance-styled Library of Congress, which faces the eastern side of Capitol Square. It was opened to the public in 1897. Among the murals are: *Evolution of the Book,* by John W. Alexander; *The Sciences* and *The Arts,* by Kenyon Cox; *War* and *Peace,* by Gari Melchers; *Lyric Poetry* by H. O. Walker; and *Religion* and *Labor* by Charles S. Pearce. The library contains reading rooms exclusively for the use of members of the Senate and the House of Representatives. Its huge collection of almost 5 million books and pamphlets may be partly attributed to the fact that under United States law two copies of every book copyrighted in the country must be deposited in the Library of Congress. Recently an addition to the Library of Congress has been constructed.

There are many other public and semipublic buildings in the capital city that are of particular note. Among these are: the Corcoran Gallery of Art, whose collection is representative of the work of the best American painters and sculptors; the Pan-American Union Building, noted for its imposing Hall of the Americas and the patio containing an Aztec fountain; Continental Memorial Hall, the home of the Daughters of the American Revolution; American Red Cross Building; Folger Shakespeare Library; and structures housing the National Academy of Sciences, Carnegie Institution of Washington and Chamber of Commerce of the United States. Among the city's educational institutions are George Washington University, Georgetown University, Catholic University of America and Howard University, a negro institution.

The most noted of Washington's many churches is the Protestant Episcopal Cathedral of St. Peter and St. Paul, sometimes called the National Cathedral. It contains the tombs of President Woodrow Wilson and Admiral George Dewey.

The American Unknown Soldier is buried to the east of the amphitheater erected in Arlington National Cemetery for holding appropriate ceremonies on Memorial Day and similar occasions. Connecting the Mt. Vernon Parkway and the western end of the Mall is the Arlington Memorial Bridge. Of special interest also are the National Zoological Park, United States Navy Yard and Mount Vernon, the home of George Washington (where he is entombed), 16 miles below the city on the right bank of the Potomac.

Development of a City Beautiful. L'Enfant envisioned a great city, but for years its development was slow. During the War of 1812 a British force advanced by land and river and on August 24, 1814, burned the Capitol and White House. They were restored within a few years after the close of the war, but construction of other government structures was so slow, and they were so widely scattered, that Washington was derisively called by many foreign visitors the "city of magnificent distances" and the "wilderness city."

Serious attempts to beautify and modernize the city were not made until some years after the Civil War. Then a sewerage system was installed, miles of pavements were laid, trees were planted in abundance and the beautiful city that exists today began to take form. Georgetown (named for George II), lying west across Rock Creek, was annexed to the city in 1878, and in the same year the city limits were extended to include the entire District of Columbia. Since 1926 the regional plans of the National Capital Park and Planning Commission have been carried out to make the entire metropolitan area of Washington unsurpassed in the United States.

Washington, a state of the Pacific Northwest that is bounded on the north by British Columbia, on the east by Idaho, on the south by Oregon and on the west by the Pacific Ocean. Its area is 69,127 square miles, including 2,291 of water surface. It is 340 miles long and 230 broad. The Columbia River forms most of the southern boundary, while Puget Sound and its connecting waterways deeply indent the northwestern corner. The population is about 1,700,000.

The terrain is varied. The Coast Range of mountains lies close to the Pacific. A broad valley extends the breadth of the state back of that elevation, forming the most productive and populous region. Puget Sound occupies a part of this valley. About 100 miles east of the Coast Range is the parallel Cascade Range, a high barrier mountain which gives the eastern two-thirds of the state a semiarid climate. Isolated volcanic peaks rise above the general level of the Cascades; one of these, Mt. Rainier (elevation 14,408 feet), is the highest point in the state.

The Columbia and its tributary, the Snake, are the principal rivers. Both are navigable in sections, and ocean commerce ascends the Columbia for 150 miles. On the Columbia Bonneville Dam, shared with Oregon, and Grand Coulee Dam, entirely within the state, are among the greatest power and reclamation projects ever undertaken. The other rivers are short but swift, so that altogether Washington has more available water power than any other state. There are many lakes. The largest, Lake Chelan, narrow but about 50 miles in length, winds into the heart of the Cascades.

Rainfall is abundant in the west. The climate is mild, tempered by the Japan current. Freezing temperatures are rare near the shore, though glaciers and eternal snow clothe the higher peaks.

Washington has tremendous evergreen forests and produces more timber than any other state. Large areas are included for conservation in National Forests. Lumber is shipped from the Pacific ports to all parts of the world, but particularly to the Atlantic coast. The city of Longview has the greatest lumber mills in the state.

Wheat, oats and hay are valuable crops. The commercial orchards are noteworthy; the apple crop is especially important. In the drier eastern section many cattle and sheep are grazed.

Coal is the only important mineral product. The fisheries are of great value, and the packing of salmon is a thriving industry. Manufactures of considerable variety have developed, chiefly based on local raw materials, with lumber and wood products especially important.

Seattle, the principal city, is the leading port on Puget Sound and the gateway to Alaska. It has a large Oriental trade, handling much of the silk imported from Japan and exporting manufactures in great variety. It has large airplane factories and flour mills. The lakes and hills around it form a scenic background for its imposing buildings and verdant parks.

Spokane is the market point and distributing center for the ranches and mines of eastern Washington and northern Idaho. Tacoma is another busy, progressive Puget Sound port; it leads in handling lumber and refining Alaska ores. Olympia is the capital.

The University of Washington at Seattle and Washington State College at Pullman are the largest educational institutions.

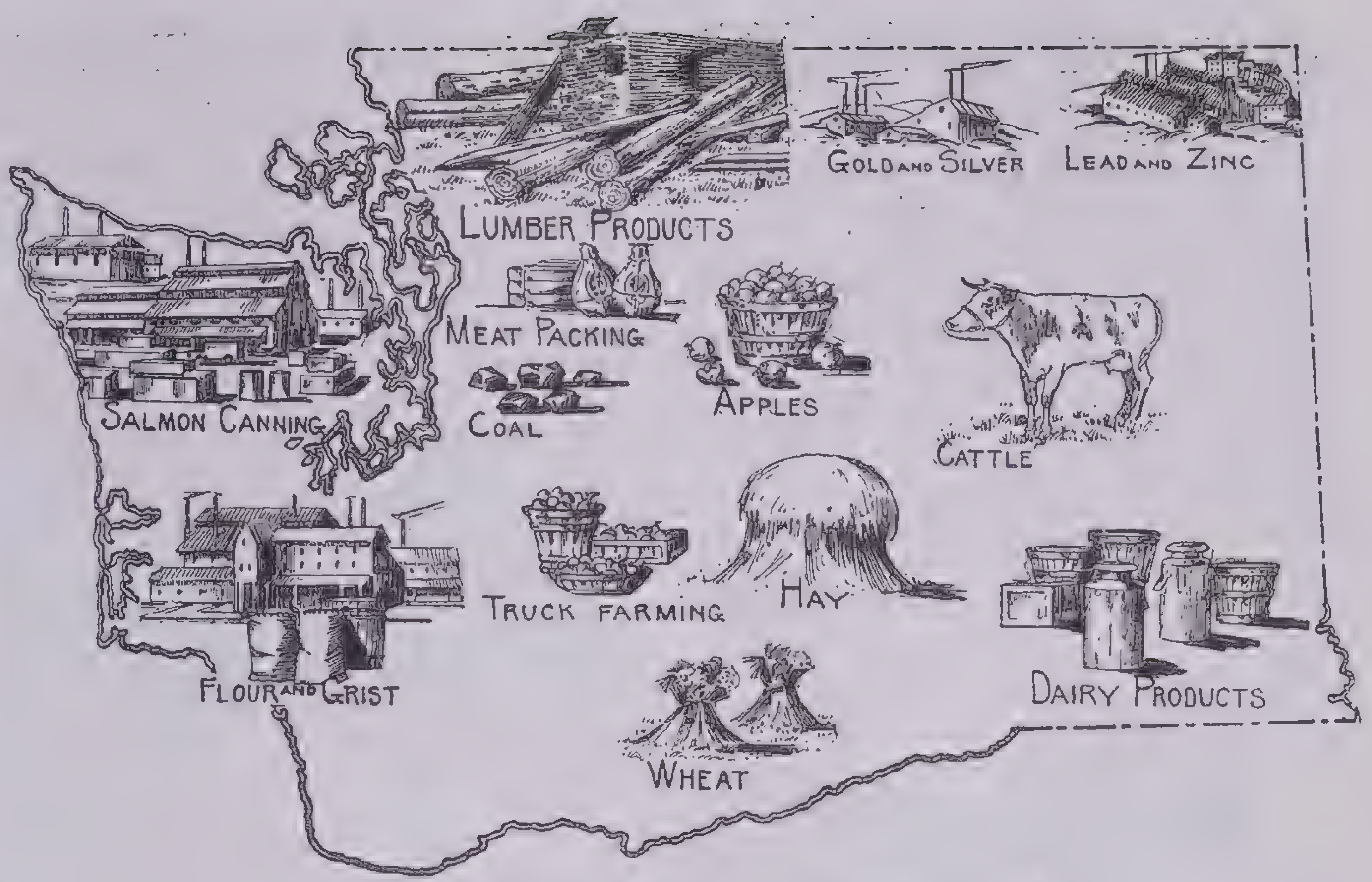
The state has many scenic areas, particularly in the Cascades and Olympic peninsula. Mt. Rainier National Park, with its winter sports and summer wild flowers, is an outstanding recreational area. The islands and bays of Puget Sound afford every variety of maritime attraction.

Washington Monument, Washington, D. C. This simple, white-marble shaft in the shape of an obelisk, 555 feet 5½ inches high, rises from the crest of a low hill green with grass. It was designed by Robert Mills and completed in 1884, nearly 40 years after it was begun. It is the tallest masonry structure, unsupported by steel, ever erected.

Washington National Masonic Memorial, Alexandria, Va. Dedicated in 1932 by the Masons of the nation as a tribute to George Washington and as a depository for relics associated with him, this stone tower rises from a hilltop overlooking the Potomac. Its receding cubes, faced by great columns, suggest the architecture of the ancient classic pharos or lighthouse.

wasteland, a tract of uncultivated land, such as a marsh, swamp, fen, moor, bog, desert or steppe. Such land can often be reclaimed through drainage or irrigation.

waterfall, the sudden descent of a stream of water, flowing from uplands over an upright or nearly upright face of rock, representing generally a fault scarp or hardened lava flow. The brink of a fall continually recedes through erosion. Waterfalls vary greatly in size and shape; the highest are generally found in mountain regions. Usually narrow, they are often noted for their beauty; examples are Bridalveil Falls in Yosemite National Park and Multnomah Falls on the Columbia River Highway near Portland, Oreg. Other falls, such as those of the Niagara River, have gained fame for their breadth and the enormous volume of water that pours over them. With a potential energy of 6 million horsepower, Niagara Falls has been harnessed to produce hydroelectric power and to furnish electricity to places within a 300-mile radius.



Principal Products of Washington

A series of falls over a gently sloping bed are called a *cascade,* such as Seven Falls in South Cheyenne Canyon near Colorado Springs, Colo. When the waterfall is of great depth or drops over an abrupt precipice, it is called a *cataract,* as the Great Falls of the Yellowstone River in Yellowstone National Park.

The Finger Lakes region of central New York is noted for the beauty of its waterfalls and gorges, the most distinctive being Taughannock Falls on the west shore of Cayuga Lake. Among other famous waterfalls are Yosemite in Yosemite National Park; Roraima in British Guiana; Gavarnie in the French Pyrenees; Montmorency near Quebec; Victoria on the Zambezi River in Northern Rhodesia; and Iguassú Falls on the Iguassú River in Brazil.

waves, the alternate rising and falling of successive ridges of water, caused by the friction of wind and of gravitational pull on the surface of oceans, seas and lakes. Each particle of water describes a small curve and comes back to its starting point, although the whole wave has the appearance of moving forward. The top of a wave is called the *crest;* the bottom, the *trough.*

Under pressure of both the wind and of the sloping shore the waves break or curl over on approaching land, as the upper part advances more quickly than the impeded lower part. Such an effect in ocean waves is called a *breaker.* Waves raised by heavy storms are called a *swell* or *ground swell.* When sea waves break on the shore, they form *surf.*

West Indies, an archipelago that extends in a 1,800-mile arc from the eastern coast of Florida to the Gulf of Paria on the northern coast of Venezuela. It separates the Atlantic Ocean from the Caribbean Sea and the Gulf of Mexico. Many of the larger islands represent the tops of a range of submerged mountains; the rest are of coral formation. The total area is 91,300 square miles, and the population numbers about 11,500,000.

The larger islands of the West Indies are called the Greater Antilles; Cuba (44,164 square miles) is the largest and Hispaniola (28,954 square miles) is next in size. The smaller islands extend from Puerto Rico to Venezuela and are called the Lesser Antilles.

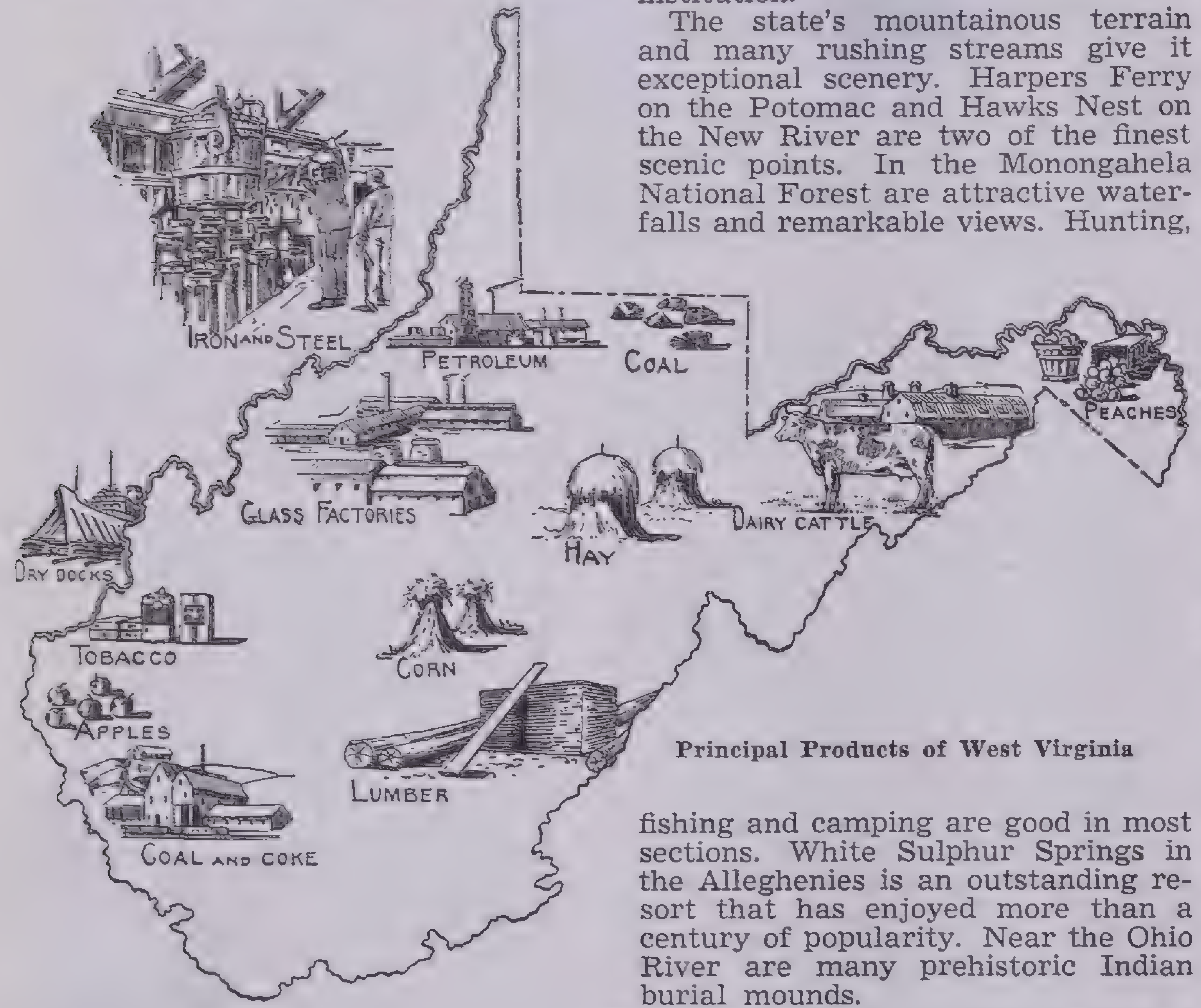
Ownership of the islands is shared by several nations. Great Britain has Jamaica, Trinidad and Tobago, Bahamas, Barbados; the Leeward group, including Antigua, Barbuda, Redonda, Dominica, St. Christopher and Nevis with Anguilla, Montserrat and the Virgin Islands of Tortola, Gorda and Anegada; the Windward group, including Grenada and the Grenadines, St. Lucia and St. Vincent. The Netherlands owns Curaçao, in which colony are included St. Eustatius, Saba and part of St. Martin of the Leeward group. France has Martinique, Guadeloupe and part of St. Martin. The United States owns Puerto Rico and the Virgin Islands of St. Thomas, St. Croix and St. John. The first two groups collectively are called the British West Indies and Dutch West Indies, respectively. Cuba is independent, and there are two republics on Hispaniola—Haiti and the Dominican Republic.

Columbus discovered most of the islands of the West Indies on his four voyages from 1492 to 1503. On one of them, which he called San Salvador, now supposed to be Watling Island in the Bahamas, he made his first landing on American soil, October 12, 1492. He believed that he had reached an archipelago adjacent to India, hence the name of West Indies.

West Virginia, an Appalachian state, fortieth in size of the United States, with an area of 24,170 square miles, including 148 square miles of water surface. Its shape is very irregular. The greatest length is 225 miles; and the greatest breadth, 200 miles. On the north it is bounded by Pennsylvania and Maryland, on the east by Virginia, on the south by Virginia and Kentucky and on the west by Ohio. The Ohio River forms the entire western boundary, and the Potomac that part of the northern boundary which meets Maryland. The population is approximately 1,900,000.

Most of the state is mountainous. The main ridge of the Alleghenies forms part of the eastern boundary, and from this elevation the general level declines gradually to the northwest. Most of the fertile land occurs in the river valleys and in intervales between ridges. The eastern panhandle includes a section of the long Appalachian Valley.

West Virginia has many rivers important as potential sites for waterpower development. The Kanawha, New Tygart, Cheat and Guyandot, all draining into the Ohio, are the chief streams.



Principal Products of West Virginia

Rainfall is ample for farming, and the climate is favorable, but the steep slopes and rocky soil restrict agriculture to a fraction of the total surface. There is much pasture land, where cattle and sheep thrive. The forests are extensive, and timber cutting continues to be an important occupation. Much of the forested area is under the protection of a conservation program designed to maintain its productivity. Corn is the most important grain crop. Tobacco, hay, apples and potatoes are profitable also.

In value of mineral output West Virginia ranks fourth among the states. In production of coal it ranks first. Railway lines have built deep into the Alleghenies to carry coal to ports on the Atlantic and the Great Lakes and to the manufacturing centers of the Middle West. Natural gas and oil are also valuable products. Salt, sand and clay of high quality furnish raw materials for busy factories.

Iron and steel, glass, pottery, chemicals and wood products are the chief manufactures. The industrial plants are concentrated mainly in the Ohio and Kanawha valleys.

The largest city is Huntington, a railroad and manufacturing center on the Ohio. Charleston, the capital, has chemical and glassware factories and is the chief trading point for the Kanawha Valley. Wheeling, occupying a hilly site in the northern panhandle, is the principal commercial center in that region. Most of the state's steel and pottery industry is concentrated there.

West Virginia University at Morgantown is the principal educational institution.

The state's mountainous terrain and many rushing streams give it exceptional scenery. Harpers Ferry on the Potomac and Hawks Nest on the New River are two of the finest scenic points. In the Monongahela National Forest are attractive waterfalls and remarkable views. Hunting, fishing and camping are good in most sections. White Sulphur Springs in the Alleghenies is an outstanding resort that has enjoyed more than a century of popularity. Near the Ohio River are many prehistoric Indian burial mounds.

whirlpool, a body of water having a more or less circular motion or eddy caused by an irregularity in a river's channel, by the meeting of opposing currents in the sea or by the oblique blowing of strong winds. One of the most notable whirlpools is the Maelstrom in the Atlantic Ocean off the coast of Norway, between the islands Moskenaesö and Vaerö. The violent waters at the base of Niagara Falls form a whirlpool. Until recently there was in the Strait of Messina a celebrated whirlpool, the Galofaro, known to the ancients as Charybdis. This and a large rock, Scylla, were menaces to navigation for centuries, giving rise to the expression "between Scylla and Charybdis," meaning between two dangers. Both have recently been removed.

Whitehall, a London thoroughfare between Trafalgar square and the Houses of Parliament. Along it are found the War Office, Admiralty, Foreign Office, Home Office, India Office, Colonial and Dominion offices, Treasury, Ministry of Labor and Ministry of Transport. The Horse Guards maintain their statuesque watch in front of the banqueting hall, the only remaining portion of Whitehall Palace. The Cenotaph to the World War dead, which stands in the center of Whitehall, is the scene of Great Britain's Armistice Day services.

White House, The, Washington. Surrounded by parks and gardens, the official residence of the President is a simple, impressive stone structure. It was designed by James Hoban and first occupied in 1800. It has several time since been modernized and modified. Since its walls were blackened by fire during the British occupation of Washington in 1814, it has been painted white, hence its popular and now official name.

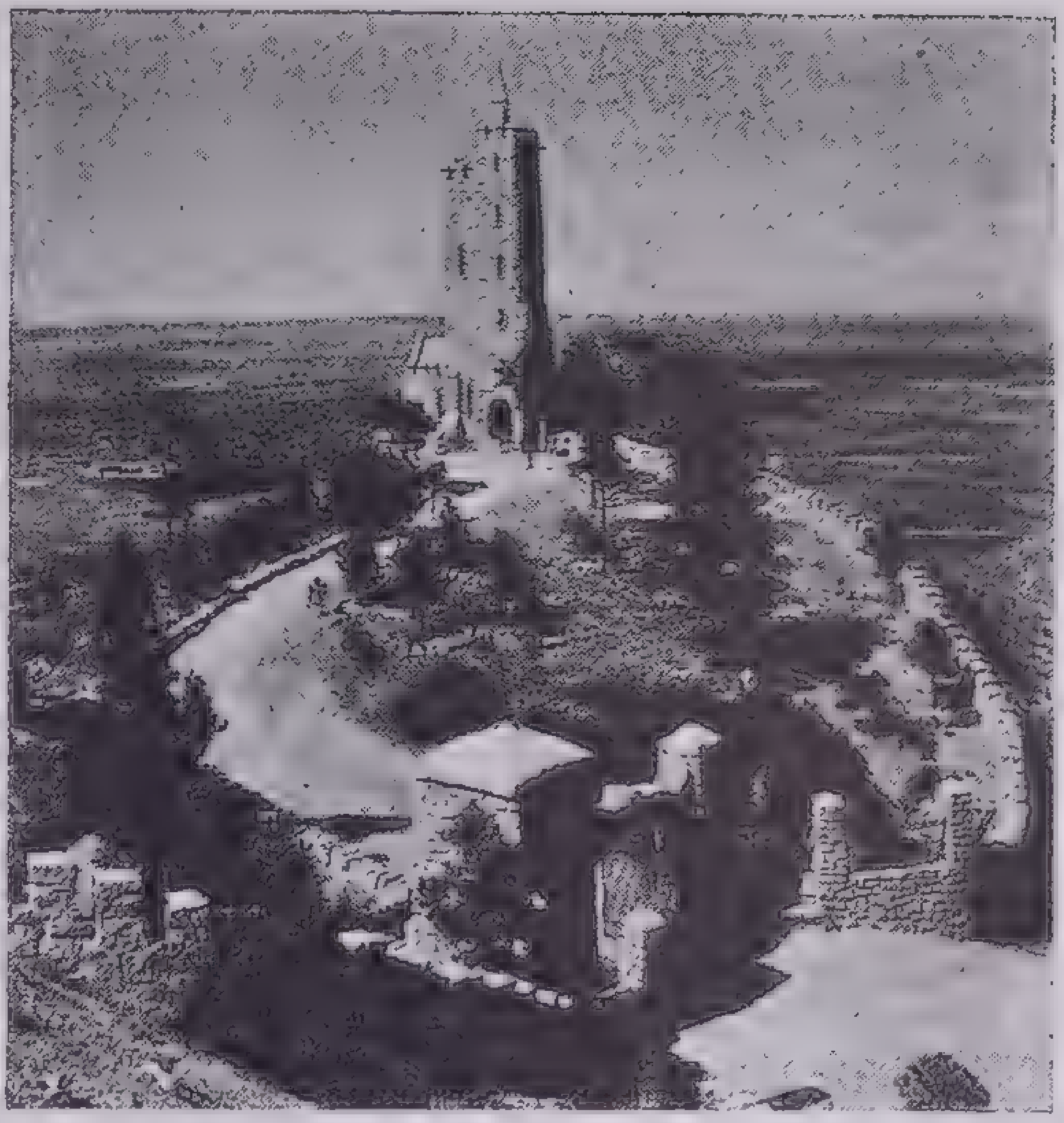
Wight, Isle of, an island off the southern coast of England, which constitutes part of Hampshire. Separating it from the mainland are the channels of Spithead on the east and Solent on the west. The area is 147 square miles, and the population numbers 88,400. On the promontory at the western extremity of the island are three chalk cliffs known as the Needles. The island is also noted for its chalk downs 400 to 700 feet high. The principal export is cement. Newport is the leading town, but other places, such as Ryde, Cowes, Sandown, Shanklin, Ventnor and Yarmouth, are popular seaside resorts. On the Isle of Wight is located Osborne House, one of Queen Victoria's favorite residences, which was presented to the nation after her death.

wilderness, an uninhabited tract of land, generally forested and having a thick growth of underbrush. One of the most decisive battles of the Civil War, the Battle of the Wilderness (May 5–6, 1864), was fought in the forested region south of the Rapidan River in Virginia.

Wilderness Road, one of the early American roads connecting Virginia with Kentucky. It was used by the settlers migrating to Kentucky and Tennessee via the Cumberland Gap and was sometimes called *Boone's Road* for its surveyor, Daniel Boone.

Williamsburg Restoration, Williamsburg, Va. With the aid of John D. Rockefeller, an entire colonial town has been re-created under the direction of the Rev. W. A. R. Goodwin. The Capitol, the Governor's Palace and its elaborate gardens, the Gaol, Tavern and many private dwellings are in the spirit of those in the colonial capital of two centuries ago and are in many respects exact reproductions. The parish church and the original main building of William and Mary College survive from that period. The entire project is a monument to our colonial ancestors and a museum of colonial customs and architecture.

Will Rogers Shrine of the Sun, Colorado Springs, Colo. In 1937 a 100-foot-high tower, resembling a medieval turret, was erected on the top of Cheyenne Mountain near Colorado Springs, Colo., to Will Rogers, star of stage and screen who died in 1935. The shrine is considered everlasting, for the pinkish granite of which it is constructed will wear away at the rate of only 1 inch every 1,000 years. It contains a carillon, is decorated with frescoes depicting the history of the Pikes Peak region and is floodlighted at night. In front of the shrine is a bronze bust of Will Rogers by the American sculptor, Jo Davidson. The plan was conceived and financed by Spencer Penrose, Colorado pioneer.



Courtesy Colorado Springs Chamber of Commerce

Will Rogers Shrine of the Sun

Windward Islands, the southern half of the fringe of islands known as the Lesser Antilles, which separate the Caribbean Sea from the Atlantic Ocean. The name originated from the fact that they are more exposed to the constant trade winds that blow from northeast to southwest than are the Leeward Islands to the north. Grenada, St. Lucia and St. Vincent belong to Great Britain; they constitute the Windward Islands Crown Colony whose capital is St. George, on Grenada. Martinique, whose capital is Fort-de-France, is a French possession. The total area of the islands is 516 square miles; the population numbers 190,096.

Wisconsin, a Great Lakes state with an area of 56,066 square miles, including 810 of water surface. It is 300 miles long and 290 broad. Lakes Superior and Michigan bound it on the north, Lake Michigan on the east, Illinois on the south, and Iowa and Minnesota on the west. The Mississippi River forms part of the western boundary. The population is about 3,000,000, evenly divided between rural and urban classifications.

The surface is a level prairie, in part so poorly drained that hundreds of small lakes have formed. Lake Winnebago in the east, the largest in the state, is an oval 30 miles in length. The small lakes and rivers have little economic importance, but the Great Lakes bring a heavy cargo traffic through Wisconsin's ports.

It has a typical continental climate with severe winters and occasional heat waves in summer. The northern section is usually cool, and its lakes and woods have many camps and resort colonies. Agriculture flourishes in most of the state. Originally heavily forested, Wisconsin in the 1880s led the nation in lumber output. The woods were ruthlessly felled, and now only remnants are left. The acreage of available second growth timber is slowly increasing in the north, where conditions are less favorable to agriculture.

Dairy products, especially cheese, butter and condensed milk, are the richest source of farm income. Corn, barley and oats are the principal grain crops. Hay is grown in great quantities. Peas and other hardy vegetables for canning, hemp, sugar beets, fruits and berries, grapes and tobacco are also valuable farm products, as are hogs, poultry and eggs.

Iron and zinc ores are the leading minerals of Wisconsin. The commercial fisheries give profitable employment to many citizens.

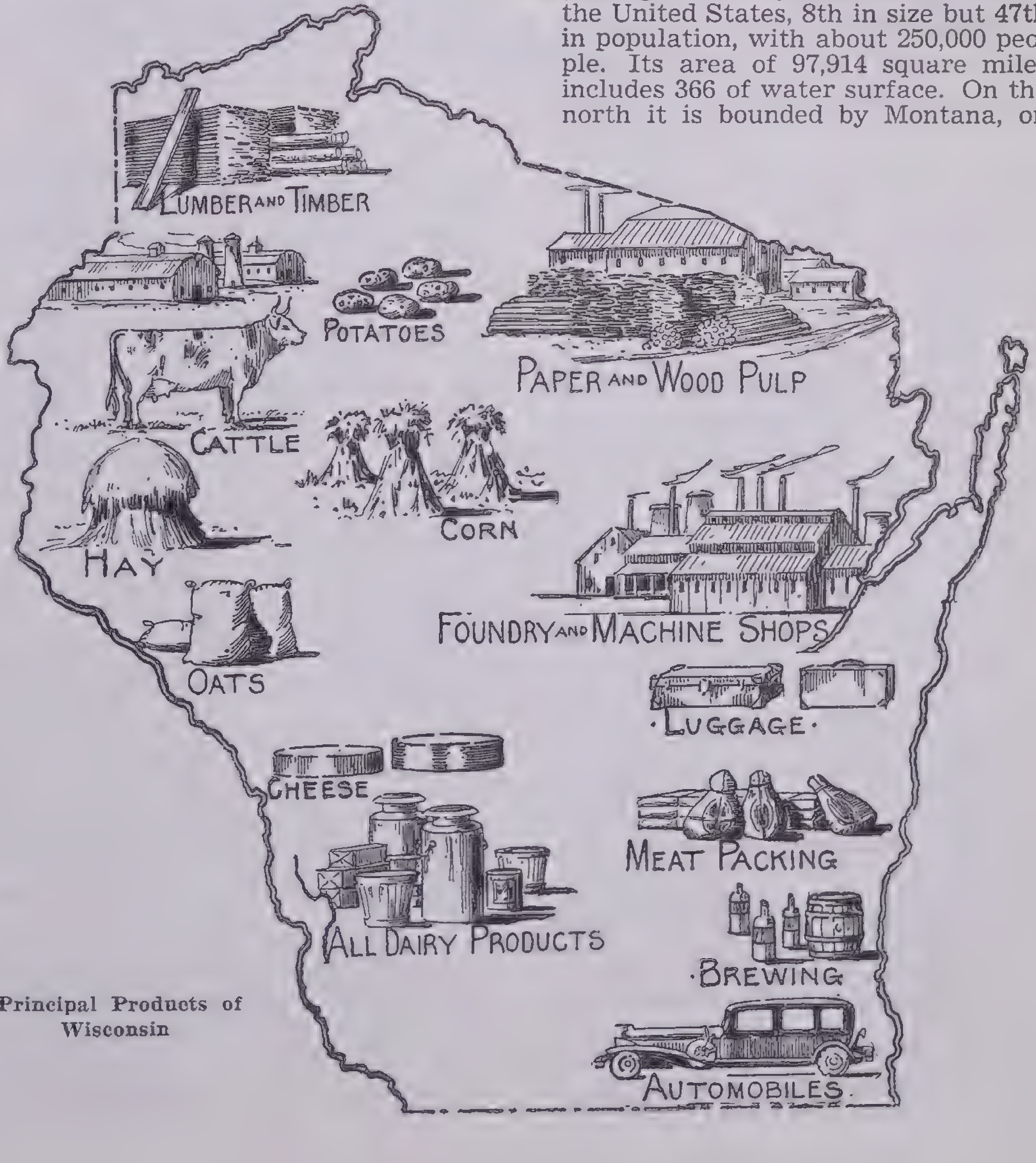
The state ranks among the first ten in the value of manufactured products. Most important are the output of the lumber, furniture and paper mills, the dairies and creameries, the canneries and meat packing plants. Automobiles, metal wares, shoes, beer, sugar, farm implements and power machinery are other large industries.

Milwaukee, the principal city, is thirteenth in rank, and Kenosha, with busy harbor on Lake Michigan, which handles an immense volume of wheat, flour and coal, as well as manufactured products of all sorts. As an important trade and industrial center it has an impressive business district and substantial public buildings. Parks on the lake and the winding Milwaukee River afford recreation, supplemented by good museums and libraries. Steel, machinery and wooden and metal articles of infinite variety are important manufactures.

There are no other large cities, but many thriving small ones. Racine, a manufacturing center and lake port, is a nationally important city. It has similar advantages, is only a few miles distant. Madison, the capital, is pleasantly situated between two lakes. Its public institutions include the research laboratories of the U. S. Forest Service. Superior, on Lake Superior, is a neighbor of Duluth, Minnesota, and shares its commercial importance.

The University of Wisconsin at Madison is one of the largest state universities. Marquette University at Milwaukee is also important, and there are several smaller colleges of high standing.

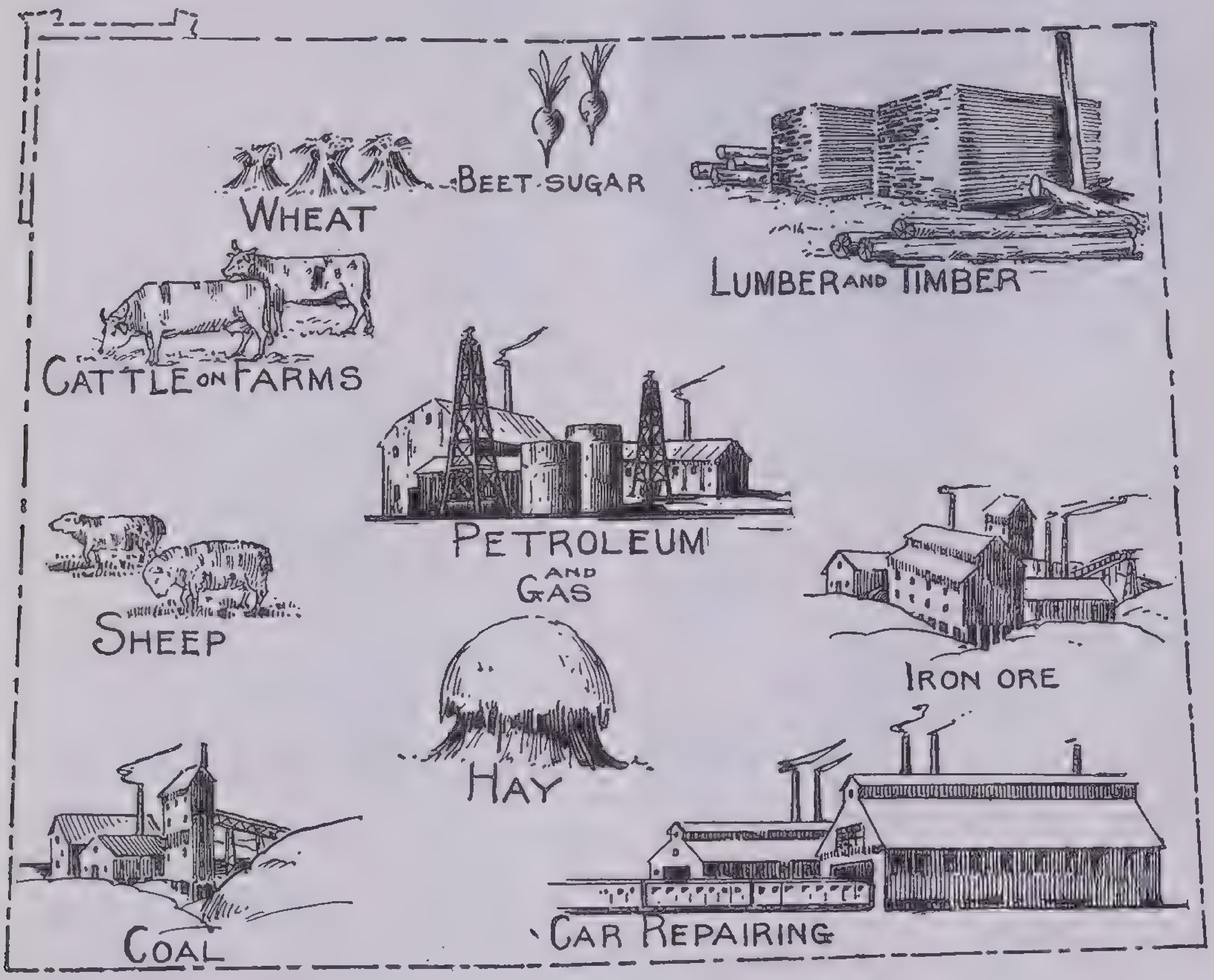
Its northern lakes and woods are Wisconsin's greatest resort area, but the shores of the Great Lakes are also popular with visitors. Remarkable rock formations and historic sites in various sections are preserved in State Parks.



Principal Products of Wisconsin

woods, a more or less dense growth of trees, larger than a grove and smaller than a forest. Muir Woods (named for John Muir, the naturalist) is a section of Sequoia National Park, where the giant California redwoods are preserved.

Wyoming, a Rocky Mountain state of the United States, 8th in size but 47th in population, with about 250,000 people. Its area of 97,914 square miles includes 366 of water surface. On the north it is bounded by Montana, on the east by South Dakota and Nebraska, on the south by Colorado and Utah and on the west by Utah, Idaho and Montana. It is rectangular in outline, 365 miles long and 275 broad. Much of the surface is a high, semiarid plateau. The Rocky Mountains swing across the state from south to northwest, while the outlying Big Horn group takes up much of the northern section. Gannett Peak, the highest point, is 13,785 feet above sea level.



Principal Products of Wyoming

The rivers are valuable as sources of water for irrigation, as rainfall is generally inadequate for farming. The North Platte, Bighorn, Snake and Green Rivers drain most of the state. In the mountains there are several scenic lakes. The climate is variable, with severe winters and a burning summer sun, but the air is dry and exhilarating.

The higher mountains have a valuable forest cover, but commercial timber production is relatively small, as the more accessible regions are practically treeless.

Farm crops are of limited value, though sugar beets and most grain crops are raised in the irrigated sections. Hay is grown in large quantities. The livestock industry is of great importance, and herds of cattle and flocks of sheep graze over a large part of the state's surface. Wool is an important source of income.

Oil and coal are found in vast deposits, giving Wyoming high rank as a producer of minerals. Manufacturing industries are limited to the processing of agricultural and mineral products.

Cheyenne, the capital and leading trade center, is the largest city. The University of Wyoming at Laramie is the principal institution of higher learning.

The state has excellent hunting and fishing. Its "dude ranches" attract many summer visitors, to whom the annual Frontier Days celebration at Cheyenne is an additional thrill.

Yellowstone National Park, most of which is in northwest Wyoming, is treated in a separate article.

Grand Teton National Park is also in the Rockies of Wyoming. It includes a section of spectacular alpine scenery of rare beauty.

Yangtze Kiang, the longest and most important river of China. It rises between the Kunlun and Tangla mountains in Tibet, about 16,000 feet above sea level, and flows in a generally northeastern direction across China to the Yellow Sea. It is about 3,100 miles long and drains an area of about 700,000 square miles. Among the tributaries of the Yangtze are the Yalung, Min, Kialing, Wu and Han. The 850-mile Grand Canal, the first part of which was built in 486 B.C. and which was completed under Kublai Khan in 1289 A.D., connects the Yangtze with the Hwang Ho and Peiho rivers. The famous gorges of the Yangtze are between the towns of Ichang and Suifu. It is navigable as far as Suifu (about 1,600 miles) and is one of China's most important commercial waterways. Among the towns along its banks are Chinkiang, Nanking, Hankow, Anking, Wuchang, Ichang, Kinchowfu, Chungking and Suifu.

The name *Yangtze Kiang* means the son of the great water. The Chinese give this name only to the lower part of the river. Its upper part is known as *Kinsha Kiang* or river of golden sand. The Yangtze is popularly called the *Girdle of China* because it encircles and unites most of the central provinces.

Yellowstone, a national park that lies mainly in Wyoming but extends into Idaho and Montana. It is the oldest (founded in 1872), largest (3,426 square miles) and probably the most famous of the 26 national parks of the United States. It is also the wildest and the most universal in appeal, for it contains many natural wonders—hissing geysers, steaming hot springs, churning mud volcanoes and the stupendous cataract and canyon of the Yellowstone River.

In the western part of Yellowstone is geyser land; more than 100 geysers are found in the five geyser basins—Lower, Midway, Upper, Shoshone and Norris. Many of them erupt at more or less regular intervals. The most remarkable and best-known of the geysers is Old Faithful, which flings a 120- to 150-foot column of boiling water and live steam into the air every 65 minutes. During a day it emits some 33,225,000 gallons of superheated water. Some of the other large geysers in Yellowstone play at irregular intervals of days, weeks or months. Of these the most important is the Giant Geyser, which hurls its waters as high as 250 feet. Others are the New (first active in 1928), Great Fountain, Riverside, Grand, Giantess and Excelsior (which has not played since 1888). Some of the small geysers play every few hours or days. Among them are the Castle, Grotto and Beehive, all fantastic in shape. The geysers hold silica in solution, and at each eruption a minute quantity is deposited on the walls of their craters.

In the vicinity of the Firehole River are hot springs, different from the geysers. Many of these, such as the Emerald and Grand Prismatic Springs, Turquoise and Morning Glory Pools, are boiling springs with more or less eruptive force; their coloring results from the reflection and refraction of light rays, influenced by the nature and color of the pool's linings and surroundings. The Fountain Paint Pots, another variety of hot spring, contain varicolored, boiling clay. In the northern part of Yellowstone are the Mammoth Hot Springs, consisting of about 4,000 terraced hot springs. The water is laden with minerals of a limestone origin; the deposits have built up delicately sculptured cornices and basins that shimmer in a remarkable harmony of color. Their names are most appropriate—Pulpit, Jupiter, Cleopatra, Minerva, Hymen and Angel. Not only are these terraces constantly changing their forms, but they are also altering their pastel hues as the growth of algae flourishes or fades with the various temperatures of the water. Other features at Mammoth are the Devil's Kitchen, the interior of an extinct hot spring; Liberty Cap, a monumentlike shaft that may be an extinct hot spring cone; and the Stygian Caves, which emit a suffocating carbonic acid gas that has killed many birds and small animals.

South of Mammoth are the Golden Gate, a narrow, picturesque passage between Bunsen Peak and Terrace Mountain; the Hoo Doos, a jumble of sepulcherlike rocks that were doubtless formed from the travertine deposited thousands of years ago by the hot waters of the terraced springs; Obsidian Cliff, a mountain of volcanic glass from which the Indians fashioned their arrowheads; and Roaring Mountain, from which jets of steam issue with such force that they can be heard a mile distant. The Norris Geyser Basin is famous for the Minute Man, Constant and Monarch geysers. It is also noted for its steam vents, whose continually changing character and volume indicate a comparatively recent volcanic development.

Photo by Frank C. Rogers

Old Faithful Geyser

In the southeastern part of the park is Yellowstone Lake, one of the largest mountain lakes in the United States, covering an area of 139 square miles. Its shores are indented by bays and inlets and are fringed by dense forests. The snow-capped Absaroka Mountains afford a perfect frame for this lake. Smaller lakes in Yellowstone are the Shoshone, Lewis and Heart. In the northwestern part of the park are the Gallatin Mountains, and in the southern part, the Red Mountains. The Continental Divide of the Rocky Mountains also passes through the lower part of the park from northwest to southeast. The Madison, Mirror, Pitchstone and other surrounding plateaus have been formed mostly of volcanic lava. The most noted peak is Mt. Washburn (10,346 feet), and the loftiest is Electric Peak (11,155 feet).

The most spectacular features of Yellowstone National Park are the Falls and Grand Canyon of the Yellowstone River, which rises in the Shoshone Mountains and flows through Yellowstone Lake. The Falls are divided into the Upper Falls (112 feet high) and the Great Falls (310 feet high). The Canyon itself is 1,400 feet deep, 2,000 feet wide and nearly 20 miles long. For grandeur, majesty and color no single spectacle compares with it. Its walls of eroded volcanic rock are so marvelously colored that, as a Japanese visitor has so expressively phrased it, all the sunsets of all the yesterdays seem to be emblazoned upon them! These colors Thomas Moran has recaptured in his painting, *Grand Canyon of the Yellowstone.* The Yellowstone River is an important tributary of the Missouri. There also rise in this park two other tributaries of the Missouri, the Gallatin and the Madison (formed by the junction of the Gibbon and Firehole rivers). The Snake River is a tributary of the Columbia.

Yellowstone Park is one of the most important game preserves in the United States, with many elk, deer, moose, antelopes, mountain sheep, buffaloes, beavers, badgers, grizzly bears and black bears. The bears of Yellowstone are notorious beggars, gathering about the hotels and lodges for food and stopping automobiles on the roads. In the lake region are pelicans, eagles, ospreys and waterfowl. The streams abound with trout and other fish. The park is likewise a paradise for the botanist and forester, for it has flowers peculiar to the region, as well as the Douglas fir, Engelman spruce and other trees found only in the northwest. In the northern part of the park, along the Lamar River, is a remarkable petrified forest.

Yellowstone Trail, a 3,400-mile-long highway that extends from Boston, Mass., to Seattle, Wash.

Yemen, an imamate in the southwestern part of the Arabian Peninsula. It is triangular in shape, with the Red Sea along its base, Asir on the northern side and Aden, a British protectorate, on the southern. It has an area of 75,000 square miles and an estimated population of 2,500,000. The country consists of a low coastal strip 20 to 30 miles wide, from which rises the plateau of El Jebel that extends to the great desert of Rub al Khali. Stock raising is carried on. The chief agricultural product is coffee, but wheat, barley and millet are also raised.

The capital is Sana (population, 20,000), an ancient walled town with eight gates. It was the capital of the Himyarites or Sabeans who occupied this part of Arabia in ancient times when it was known as Arabia Felix. Sheba or Saba is the Biblical name given to the territory. The queen of Sheba carried much wealth—spices, gold and precious stones—to Solomon when she visited him in Jerusalem. A French archeologist, Jules Barthoux, announced in 1937 the discovery of remains of ancient Sheba. Hodeida is the principal seaport on the Red Sea. Mocha was once an important coffee export center, but Manakha has taken its place.

Yosemite, a national park in east central California, on the western side of the Sierra Nevada Mountains, about 150 miles east of San Francisco. It extends from the Mt. Lyell crest of the Sierra Nevadas west for 30 miles and covers an area of 1,162 square miles. River erosion and glaciers in ancient times produced this country of beautiful lakes, precipitous cliffs, lofty waterfalls, valleys and gorges. The greatest scenic marvels are the Yosemite Valley, 7 miles long, averaging 1½ miles in width and with walls from 2,000 to 6,000 feet high; the Tuolumne Canyon through which the torrential Tuolumne River rushes westward from the Sierras; and the Hetch Hetchy Valley, the site of a reservoir that furnishes most of San Francisco's water. Yosemite also contains the Mariposa Grove of 600 sequoia trees, of which the Grizzly Giant (204 feet high, 29½ feet in diameter and 99 feet in girth) and the Wawona tree, through which a 26-foot-wide automobile road runs, are the most famous.

The Merced River, a tributary of the San Joaquin River, flows through the Yosemite Valley. Ages ago a glacier carved out the river's bed. After the glacier receded it left the mouths of the tributary streams in hanging valleys high above the river. Consequently they discharge their water in waterfalls. These include Ribbon Falls, with a drop of 1,612 feet; Bridalveil Falls (620 feet); Nevada Falls (594 feet); Illilouette Falls (370 feet); and Vernal Falls, also called the Cataract of Diamonds (320 feet). The most marvelous spectacle of all, however, is the Yosemite Falls; the water drops vertically for 1,430 feet in the Upper Falls and makes another plunge of 320 feet in the Lower Falls. Counting a series of cascades, the total height of Yosemite Falls is 2,555 feet.

On either side of the Yosemite Valley rise such granite masses as the Cathedral Rocks (2,600 feet high), Sentinel Dome (3,040 feet), Glacier Point (3,254 feet), El Capitan (3,604 feet), Three Brothers (3,830 feet), Half Dome (4,892 feet) and Clouds Rest (6,000 feet). Between Half Dome and Basket Dome in the eastern part of the valley lies Mirror Lake, which reflects these huge granite bulks.

The Tioga Road, which crosses the park from east to west on the northern rim of the valley, was reconditioned by the Department of the Interior in 1915 so that the northern section of the park might be accessible. Here may be seen more than 250 mountain lakes, remnants of glaciers and the source of the Tuolumne River. The most noted lakes are Tenaya, Mono, Rogers, Benson, Swedburg, Young and Gaylor. They are fed by the snows from Excelsior, Regulation, Conness, Dana, Kuna and other peaks.

The word *Yosemite* is the Indian word for grizzly bear. In 1865 Congress granted the Yosemite Valley to the state of California, along with the Mariposa grove (discovered by Galen Clark in 1857), with the understanding that it would be improved and cared for as a reservation. In 1890 the northern section of the present park was set aside by Congress as a national park, and in 1905 California gave back the valley and grove to the national Government.

Yugoslavia, one of the Balkan States of southern Europe. Until 1929 it was officially known as the Kingdom of the Serbs, Croats and Slovenes. Yugoslavia is one of the new states formed at the close of the World War, to group together the Slavic peoples of southern Europe. Its nuclei were Serbia and Montenegro; with these were combined the former Austro-Hungarian provinces or districts of Dalmatia, Croatia, Slovonia, Bosnia, Herzegovina, Slovenia and Voyvodina. Bulgaria lost to Yugoslavia part of Macedonia, including the Strumnica Salient. Bounding the country are Germany and Hungary on the north, Rumania and Bulgaria on the east, Greece and Albania on the south and the Adriatic Sea and Italy on the west. The area is 96,010 square miles; the population numbers nearly 14,000,000.

The western part of Yugoslavia is mountainous; its Julian and Dinaric Alps form a continuation of the great Alpine system of central Europe; the mountains of Montenegro are called the Durmitor Heights. The plains of the north-central and northeastern parts constitute the Pannonian Basin; they are drained by the Drava and Sava rivers, both tributaries of the Danube, which forms most of the northeastern boundary. The plains of the south-central and southeastern parts are called the Morava-Vardar Depression from the principal rivers that drain them. Yugoslavia's coastal belt is noted for its cliffs, beaches and many indentations. It is fringed by the Dalmatian Archipelago. One of the islands is Lokrum (Lacronia), where Richard the Lionhearted was shipwrecked when returning from the Third Crusade. Another is Hvar, called the *Madeira of the Adriatic.*

Four-fifths the population of Yugoslavia are farmers. The principal crops are corn, wheat, oats, barley, rye, flax, hemp, hops, tobacco, opium, potatoes, sugar beets and legumes. Yugoslavia is also a great fruit-raising country and is noted for its cherries, from which is made the liqueur *maraschino*. Plums are dried and exported as prunes; grapes, olives, figs and citrus fruits are also important. Sheep, cattle, goats, horses and pigs (raised principally on the acorns of the oak and beech trees) constitute the livestock.

Yugoslavia's mineral wealth consists of iron, lignite, copper, chrome, lead, bauxite and salt. Steel making is an important industry; carpets, filigree jewelry and textiles (especially silks and cottons) are the principal manufactures. There are many sugar factories, and breweries and distilleries for the manufacture of brandy and other liqueurs.

Yugoslavia is a constitutional and hereditary monarchy. During the minority of Peter II, who succeeded to the throne on the assassination of his father, Alexander I, in 1934, the executive power is vested in three regents. The regency is assisted by the Ministry, headed by a premier. The bicameral Parliament consists of the Senate of some 80 members, some elected and some appointed, and the Chamber of Deputies of 280 members, who are elected by direct popular vote. For local administrative purposes the country is divided into nine *banovinas;* there is also a Federal District or District of Beograd.

The seat of government is Belgrade (Beograd), the old capital of Serbia. It has a sightly location at the confluence of the Danube and Sava rivers in the eastern part of the country. Serbia did not win its independence from Turkey until 1878 and there is much that is Saracenic in its architecture. The Asiatic aspect of Belgrade, however, has been considerably changed since the World War, for the city was obliged to rebuild sections that were bombarded in 1915. Modern office buildings, hotels, banks and apartment houses now line the streets. The most noted survival of Belgrade's historic past is the Kalemegdan Fortress. The population numbers 238,775.

Among Yugoslavia's other noted cities is Zagreb (Agram), whose university, founded in 1874 and formerly called the Franz Josef University, is the oldest in the kingdom. The twin cities of Skoplje and Sarajevo are noted for their Turkish atmosphere. In Sarajevo (June 28, 1914) the heir to the Austrian throne, the Archduke Franz Ferdinand, was assassinated; this precipitated the World War.

The principal seaports of Yugoslavia are Spalato (Split), which possesses the ruined palace where the Roman Emperor Diocletian ended his days, and Ragusa (Dubrovnik), noted for its glamorous bazaars and such examples of Venetian architecture as the Renaissance Cathedral. Bled, where the royal summer residence is located, is the best-known of Yugoslavia's picturesque lake resorts. The most noted of the many mountain lakes is Bohinj, dominated by the highest peak in the country, Triglav.

The name *Yugoslavia* means the land of the southern Slavs. Through this ethnical grouping the Yugoslavs are distinguished from the northern Slavs of the U.S.S.R., Poland and Czechoslovakia.

Yukon, a river in Alaska, the fifth largest in North America. With its tributaries the largest of which are outside of Alaska, its length is 2,300 miles. It rises in the Yukon district of British Columbia and empties into Bering Strait. The Yukon and its tributaries are navigable over much of their length, and there is a considerable amount of passenger and freight traffic. The river system has a navigable length of 3,500 miles.

Zanzibar, an island of coral formation that lies in the Indian Ocean about 20 miles east of Tanganyika Territory. With Pemba and several islets to the north it forms the Zanzibar Protectorate of Great Britain. The area of Zanzibar is 640 square miles; of Pemba, 380 square miles. The population of Zanzibar, including the capital and chief port of the same name, is 137,741; Pemba's population numbers 97,687. The aborigines are known as the Wahadimus, although the predominating element in the Negro population are the Swahili. There is a large number of Asiatics, including Arabs, Indians and Persians, but only 300 Europeans, mostly British.

These islands lie about 6° south of the equator, so the temperature is always high. Humidity and rainfall are excessive because the islands are in the path of both the southwest and northwest monsoons. The chief exports are cloves, copra, vanilla, sugar, tobacco and ivory. Fishing and grazing are important.

Zanzibar was conquered by the Portuguese in the early part of the 16th century, but 200 years later it fell to the Arabs and was ruled by the Sultan of Muscat. It attained its independence under its own sultan in 1856. However, eastern Africa was divided among the European powers in the latter part of the 19th century, and a 10-mile-wide mainland section of Zanzibar, from Warsheikh to Tunghi Bay, was appropriated by Italy, Great Britain and Germany. In 1890 Germany gave up Mafia Island, and Great Britain proclaimed the Zanzibar Protectorate over what remained of the sultan's territory. (Mafia Island is now politically a part of Tanganyika Territory.) By 1907 slavery, which had been declared illegal 10 years previously, was wiped out.

The name *Zanzibar* is Portuguese but is derived from an Arabian word that means the region of the black peoples.

zone, one of the five great belts into which the earth's surface is divided with respect to latitude and temperature. The Torrid Zone is that area where, owing to the inclination of the earth's axis, the sun is directly over the equator at the *equinox,* or time of year (around March 21 and September 22) when the days and nights are of equal length. The North Frigid and the South Frigid zones are those areas 23½° north and south of the poles where for almost 6 months the sun does not shine, except by refraction, and where for another 6 months it apparently does not set.

The North Temperate Zone is divided from the Torrid Zone by the Tropic of Cancer, 23½° north of the equator, which marks the summer solstice, or point at which around June 21 the sun is farthest north of the equator. The South Temperate Zone is divided from the Torrid Zone by the Tropic of Capricorn, 23½° south of the equator, which marks the winter solstice, or point at which around December 22 the sun is farthest south of the equator. Changes in temperature in the South Temperate Zone, in contrast to the land-massed North Temperate Zone, are slight on account of the great oceanic areas. Either Temperate Zone may be subdivided at the 40th parallel into the subtropical or warm Temperate Zone and the cool Temperate Zone. During all human history civilization has progressed fastest in the cool temperate zones.

The term *zone* is derived through the Latin *zona* from the Greek, and means girdle. Such Greek philosophers as Thales and Anaximander in the 5th century B.C. are supposed to have divided the earth's surface into these five climatic belts.

TRAVEL DISTANCES BETWEEN IMPORTANT CENTERS IN THE UNITED STATES

The figures in this table are taken in most instances from the *Official Table of Distances* used by the U. S. War Department; in other cases the distances are computed along the best routes of travel. All distances are in statute miles.

	Atlanta.	Baltimore.	Boston.	Buffalo.	Chicago.	Cincinnati.	Cleveland.	Denver.	Detroit.	Galveston.	Havana. Via Tampa.	Honolulu Via San Francisco.	Indianapolis.	Jacksonville, Fla.	Kansas City.	Little Rock.	Los Angeles.	Manila, Ph. Is. Via San Francisco and Honolulu.	Milwaukee.	Minneapolis.	Nashville.	New Orleans.	New York.	Omaha.	Philadelphia.	Pittsburgh.	Portland, Me.	Portland, Oreg.	Saint Louis.	Salt Lake City.	San Francisco.	San Juan, P. R. Via New York or Tampa.	Seattle, Wash.	Sitka, Alaska. Via Seattle.	Washington.
Atlanta		686	1104	888	731	461	705	1523	722	907	940	5165	548	336	884	553	2267	10800	816	1151	289	496	874	1020	783	774	1212	2839	607	2086	2750	1944	2992	4010	646
Baltimore	686		418	402	802	593	474	1827	653	1561	1393	5571	704	885	1211	1279	3014	11206	887	1222	810	1150	188	1292	97	334	526	3111	934	2358	3156	1747	3039	4057	40
Boston	1104	418		478	999	905	661	2024	724	1979	1811	5768	944	1303	1432	1529	3235	11403	1084	1419	1200	1568	232	1489	321	674	108	3326	1184	2555	3353	1776	3236	4254	458
Buffalo	888	402	478		527	427	183	1552	251	1575	1795	5296	466	1239	954	1051	2757	10931	612	947	722	1253	411	1017	413	235	561	2836	706	2083	2881	1970	2764	3782	442
Chicago	731	802	999	527		294	344	1025	272	1152	1671	4769	183	1096	457	628	2260	10404	85	420	442	915	912	490	821	468	1082	2309	283	1556	2354	2471	2237	3255	813
Cincinnati	461	593	905	427	294		244	1257	261	1210	1413	4996	111	812	618	686	2421	10631	379	714	295	826	757	717	666	313	988	2536	341	1783	2581	2316	2531	3549	553
Cleveland	705	474	661	183	344	244		1369	169	1392	1657	5113	283	1056	771	868	2574	10748	429	764	539	1070	584	834	493	140	744	2653	523	1900	2698	2143	2581	3599	442
Denver	1523	1827	2024	1552	1025	1257	1369		1297	1151	2462	3869	1120	1824	639	1082	1361	9504	1048	902	1234	1348	1937	538	1846	1493	2107	1409	916	657	1454	3496	1595	2613	1810
Detroit	722	653	724	251	272	261	169	1297		1351	1674	5041	272	1073	708	827	2511	10676	357	692	556	1087	662	762	664	321	807	2581	482	1828	2626	2221	2509	3527	623
Galveston	907	1561	1979	1575	1152	1210	1392	1151	1351		1613	4579	1109	1027	840	524	1681	10214	1237	1346	891	411	1749	1040	1658	1490	2087	2560	869	1713	2164	2617	2746	3764	1521
Havana via Tampa	940	1393	1811	1795	1671	1413	1657	2462	1674	1613		6104	1497	586	1823	1474	3144	11739	1756	2091	1229	1202	1581	1960	1490	1655	1919	3779	1547	2954	3689	1120	3951	4969	1353
Honolulu Via San Francisco	5165	5571	5768	5296	4769	4996	5113	3869	5041	4579	6104		4885	5360	4479	4714	2897	5635	4789	4643	5010	4859	5681	4279	5590	5237	5851	3161	4692	3285	2415	7240	3373	4391	5582
Indianapolis	548	704	944	466	183	111	283	1120	272	1109	1497	4885		899	492	585	2295	10520	268	603	295	852	825	606	734	381	1027	2425	240	1672	2470	2384	2420	3438	664
Jacksonville, Fla.	336	885	1303	1239	1096	812	1056	1824	1073	1027	586	5360	899		1185	833	2462	10995	1181	1516	654	616	1073	1385	982	1125	1411	3204	972	2387	2945	1590	3333	4351	845
Kansas City	884	1211	1432	954	457	618	771	639	708	840	1823	4479	492	1185		470	1803	10114	542	556	595	881	1342	200	1251	898	1515	2019	277	1250	2064	2901	2234	3252	1171
Little Rock	553	1279	1529	1051	628	686	868	1082	827	524	1474	4714	585	833	470		1816	10349	713	919	367	451	1410	670	1319	966	1612	2489	345	1577	2299	2478	2677	3695	1239
Los Angeles	2267	3014	3235	2757	2260	2421	2574	1361	2511	1681	3144	2897	2295	2462	1803	1816		8532	2345	2263	2183	1961	3145	1899	3054	2701	3318	1127	2080	1225	482	4107	1313	2331	2974
Manila, P. I., via San Francisco and Honolulu	10800	11206	11403	10931	10404	10631	10748	9504	10676	10214	11739	5635	10520	10995	10114	10349	8532		10424	10278	10645	10494	11319	9914	11225	10872	11486	8796	10327	8920	8050	12878	9008	10026	11197
Milwaukee	816	887	1084	612	85	379	429	1048	357	1237	1756	4789	268	1181	542	713	2345	10424		335	527	1000	997	510	906	553	1167	2237	368	1576	2374	2556	2152	3170	898
Minneapolis	1151	1222	1419	947	420	714	764	902	692	1346	2091	4643	603	1516	556	919	2263	10278	335		862	1261	1332	364	1241	888	1502	1901	574	1430	2228	2891	1817	2835	1233
Nashville	289	810	1200	722	442	295	539	1234	556	891	1229	5010	295	654	595	367	2183	10645	527	862		557	998	731	907	608	1283	2550	318	1797	2595	2233	2679	3697	770
New Orleans	496	1150	1568	1253	915	826	1070	1348	1087	411	1202	4859	852	616	881	451	1961	10494	1000	1261	557		1338	1081	1247	1139	1676	2757	700	1838	2444	2206	2943	3961	1110
New York	874	188	232	411	912	757	584	1937	662	1749	1581	5681	825	1073	1342	1410	3145	11319	997	1332	998	1338		1402	91	444	325	3221	1065	2469	3266	1559	3149	4167	228
Omaha	1020	1292	1489	1017	490	717	834	538	762	1040	1960	4279	606	1385	200	670	1899	9914	510	364	731	1081	1402		1311	958	1572	1819	413	1066	1864	2961	2005	3023	1303
Philadelphia	783	97	321	413	821	666	493	1846	664	1658	1490	5590	734	982	1251	1319	3054	11225	906	1241	907	1247	91	1311		353	429	3130	974	2377	3175	1650	3058	4076	137
Pittsburgh	774	334	674	235	468	313	140	1493	321	1490	1655	5237	381	1125	898	966	2701	10872	553	888	608	1139	444	958	353		782	2777	621	2024	2822	2003	2705	3723	302
Portland, Me.	1212	526	108	561	1082	988	744	2107	807	2087	1919	5851	1027	1411	1515	1612	3318	11486	1167	1502	1283	1676	325	1572	429	782		3391	1267	2638	3436	1884	3319	4337	566
Portland, Ore.	2839	3111	3326	2836	2309	2536	2653	1409	2581	2560	3779	3161	2425	3204	2019	2489	1127	8796	2237	1901	2550	2757	3221	1819	3130	2777	3391		2232	922	746	4780	186	1204	3122
Saint Louis	607	934	1184	706	283	341	523	916	482	869	1547	4692	240	972	277	345	2080	10327	868	574	318	700	1065	413	974	621	1267	2232		1479	2277	2624	2391	3409	894
Salt Lake City	2086	2358	2555	2083	1556	1783	1900	657	1828	1713	2954	3285	1672	2387	1250	1577	784	8920	1576	1430	1797	1838	2469	1066	2377	2024	2638	922	1479		870	4028	1068	2086	2369
San Francisco	2750	3156	3353	2881	2354	2581	2698	1454	2626	2164	3689	2415	2470	2945	2064	2299	482	8050	2374	2228	2595	2444	3266	1864	3175	2822	3436	746	2277	870		4825	958	1976	3167
San Juan, P. R., via New York or Tampa	1944	1747	1776	1970	2471	2316	2143	3496	2221	2617	1120	7240	2384	1590	2901	2478	4107	12878	2556	2891	2233	2206	1559	2961	1650	2003	1884	4780	2624	4028	4825		4708	5726	1787
Seattle, Wash.	2992	3039	3236	2764	2237	2531	2581	1595	2509	2746	3951	3373	2420	3333	2234	2677	1313	9008	2152	1817	2679	2943	3149	2005	3058	2705	3319	186	2391	1068	958	4708		1018	3027
Sitka, Alaska, Via Seattle	4010	4057	4254	3782	3255	3549	3599	2613	3527	3764	4969	4391	3438	4351	3252	3695	2331	10026	3170	2835	3697	3961	4167	3023	4076	3723	4337	1204	3409	2086	1976	5726	1018		4045
Washington	646	40	458	442	813	553	442	1810	623	1521	1353	5582	664	845	1171	1239	2974	11197	898	1233	770	1110	228	1303	137	302	566	3122	894	2369	3167	1787	3027	4045	

WORLD-TRAVEL DISTANCES

The chief ports of the world are in alphabetical order down the sides of the tables, and most of them also across the top. The distance between any two ports is at the intersection of the two with the names of the selected ports. Thus the distance from Baltimore to Bombay is given as 8431, and the small "s" shows that the route is via the Suez Canal. Distances are for full-powered steam vessels reckoned in nautical miles.

	Amsterdam	Antwerp	Barbados	Belfast	Bombay	Boston	Bremen	Buenos Aires	Cape Town	Cherbourg	Genoa	Glasgow	Hamburg	Havana	Havre	Hongkong	Liverpool	London	Melbourne	New Orleans	New York	Plymouth	Rio de Janeiro	San Francisco	Shanghai	Singapore	Southampton	Valparaiso	Yokohama
Amsterdam	—	135	3877	733	S 6336	3164	272	6370	6193	303	2237	818	290	4335	267	9764	711	201	11131	4837	3346	385	5280	P 8135	10507	S 8324	277	P 7475	11226
Antwerp	135	—	3841	697	S 6300	3128	357	6334	6157	267	2201	782	385	4299	231	9728	675	180	11095	4801	3310	349	5244	P 8099	10471	8288	238	P 7435	11190
Baltimore	3638	3602	1823	3204	S 8431	674	3851	5898	6913	3357	4332	3250	3869	1112	3423	P 11618	3328	3562	P 10319	1614	410	3265	4808	P 8159	P 10576	S 10419	3383	P 4560	P 9725
Barbados	3877	3841	—	3637	S 8199	1880	4090	4169	5284	3596	4100	3719	4108	1472	3662	P 10589	3624	3801	P 9214	2115	1825	3549	3079	P 4542	P 9937	S 10187	3622	P 3880	P 8970
Belfast	733	697	3637	—	6245	2730	880	6271	6089	459	2146	113	891	3899	528	9673	137	663	S 11040	4401	2912	360	5168	P 7860	10535	8233	488	P 7200	S 11135
Bermuda	3248	3112	1222	2958	7876	707	3459	5175	6181	2967	3771	2885	3477	1141	3033	P 11052	2945	3172	P 9677	1643	699	2875	4085	P 5005	P 10400	S 9864	2956	P 5350	P 9430
Bombay	S 6336	S 6300	S 8199	6245	—	S 7962	6549	C 8349	4604	6040	4473	6327	6567	S 9000	6115	4090	6223	6260	6535	9502	8153	5997	C 7824	9780	4633	2450	6090	M 9875	5352
Boston	3164	3128	1880	2730	S 7962	—	3377	5804	6776	2883	3863	2777	3395	1422	2949	11390	2854	3088	P 10162	1924	379	2791	4714	P 5490	P 10885	S 9950	2909	P 4825	12852
Bremen	272	357	4090	880	6549	3377	—	6583	6406	513	2450	922	171	4548	480	9977	924	409	S 11344	5050	3559	598	5501	P 8348	S 10720	8537	479	P 7685	S 11439
Buenos Aires	6370	6334	4169	6271	C 8349	5804	6583	—	3778	6074	6130	6350	6601	5669	6151	C 10643	6258	6294	9099	6255	5838	6029	1135	M 7536	C 11386	9376	6124	M 2766	C 12105
Cape Town	6193	6157	5284	6089	4604	6776	6406	3778	—	5897	5972	6168	6424	6716	5966	6898	6076	6117	5814	7347	6795	5852	3267	P 9727	7641	5631	5947	5447	8360
Charleston	3846	3810	1630	3561	S 8388	845	4059	5790	6828	3565	4459	3498	4077	605	3631	P 10930	3548	3770	P 9555	1107	614	3473	4700	P 4883	P 10278	S 10546	3591	P 4220	P 9310
Cherbourg	303	267	3596	459	6040	2883	513	6074	5897	—	1941	544	531	4029	71	S 9468	437	227	S 10835	4531	3065	108	4984	P 7854	10211	8028	83	P 7190	S 10930
Colon	4818	4782	1225	4543	9283	2173	5031	5318	6410	4537	5184	4625	5049	1380	4603	P 9370	4530	4742	P 7990	1380	1972	4445	4228	P 3320	P 8710	S 11271	4563	P 2655	P 7742
Galveston	5031	4995	2240	4595	9696	2118	5244	6378	7470	4725	5591	4641	5262	765	4816	P 10865	4719	4955	P 9490	380	1893	4658	5288	P 4820	P 10210	S 11678	4776	P 4155	P 9245
Genoa	2237	2201	4100	2146	4473	3863	2450	6130	5972	1941	—	2228	2468	4895	2018	7901	2124	2161	9268	5397	4054	1898	5040	P 8500	8644	6461	1991	P 7840	S 9363
Gibraltar	1389	1353	3252	1298	4953	3015	1602	5282	5124	1093	854	1380	1620	4047	1162	S 8381	1276	1313	9748	4549	3206	1050	4192	P 7655	9121	6941	1143	P 6990	S 9843
Glasgow	818	782	3719	113	6327	2777	922	6350	6168	544	2228	—	1049	3945	610	9755	210	745	11122	4447	2959	442	5158	P 7945	10498	8315	570	P 7280	S 11217
Hamburg	290	385	4108	891	6567	3395	171	6601	6424	531	2468	1049	—	4566	498	9995	942	427	11362	5068	3577	616	5519	P 8365	10738	8555	497	P 7705	S 11457
Havana	4335	4299	1472	3899	S 9000	1422	4548	5669	6716	4029	4895	3945	4566	—	4120	P 10350	4023	4259	P 8975	597	1197	3962	4579	P 4305	P 9700	S 10982	4080	P 3640	P 5025
Havre	267	231	3662	528	6115	2949	480	6151	5966	71	2018	610	498	4120	—	9537	503	194	10904	4622	3131	175	5061	P 7920	S 10280	8097	105	P 7260	11999
Hongkong	9764	9728	P 10590	9673	4090	11390	9977	C 10643	6898	S 9468	7901	9755	9995	P 10350	9537	—	9651	9688	5031	P 10745	P 11335	9425	C 10118	6041	853	1440	S 9518	10536	1580
Honolulu	P 9570	P 9535	P 5975	P 9295	8375	P 6925	P 9780	M 7709	M 10390	P 9290	P 9935	P 9375	P 9800	P 5740	P 9355	4855	P 9280	P 9595	4916	P 6130	P 6725	P 9195	M 8587	2089	4333	5925	P 9315	5916	3445
Istanbul	2898	3158	5057	3103	3837	4820	3407	7381	S 6137	2898	1312	3185	3425	5852	2975	7266	3081	3118	8633	6354	5011	2855	5997	P 9465	8009	5826	2948	9583	8728
Jamaica	4314	4278	1040	4039	S 8844	1658	4527	5166	6260	4033	4739	4121	4545	716	4099	P 9915	4026	4238	P 8540	1115	1457	3941	4076	P 3870	P 9265	S 10826	4059	P 3205	P 8290
Leningrad	1070	K 1165	4888	1606	7353	4052	951	K 7381	7204	1311	3248	1648	860	5346	K 1275	K S 10755	1716	K 1207	12142	5848	4234	1396	6299	P 9210	11518	9335	1277	P 8545	12237
Lisbon	1111	1087	3085	1020	5249	2797	1324	5304	5148	815	1150	1102	1342	4174	884	8677	998	1035	S 10044	4676	3025	770	4214	P 7600	P 9420	7237	865	P 6935	10139

K, via Kiel Canal. S, via Suez Canal. C, via Cape of Good Hope. M, via Strait of Magellan. H, via Cape Horn. T, via Torres Strait. P, via Panama Canal.

WORLD-TRAVEL DISTANCES—Concluded

The chief ports of the world are in alphabetical order down the sides of the tables, and most of them also across the top. The distance between any two ports is at intersection of the two with the names of the selected ports. Thus the distance from New York to Melbourne is given as 9,960 and the small "P" shows that the route is via the Panama Canal. Distances are for full-powered steam vessels reckoned in nautical miles.

	Amsterdam	Antwerp	Barbados	Belfast	Bombay	Boston	Bremen	Buenos Aires	Cape Town	Cherbourg	Genoa	Glasgow	Hamburg	Havana	Havre	Hongkong	Liverpool	London	Melbourne	New Orleans	New York	Plymouth	Rio de Janeiro	San Francisco	Shanghai	Singapore	Southampton	Valparaiso	Yokohama
Liverpool	711	675	3624	137	6223	2854	924	6258	6076	437	2124	210	942	4023	503	9651	—	638	S 11018	4525	3053	345	5158	P 7845	S 10394	8211	463	P 7185	S 11113
London	201	180	3801	663	6260	3088	409	6294	6117	227	2161	745	427	4259	194	9688	638	—	S 11055	4761	3270	309	5204	P 8060	S 10437	8248	201	P 7400	S 11150
Manila	9667	9631	P 10660	9576	3793	S 11293	S 9880	C 10546	6801	9371	7804	9658	9898	P 10420	9440	640	S 9554	S 9591	4511	P 10815	P 11405	9328	C 10021	6238	1130	1435	S 9421	10406	1768
Melbourne	11131	11095	C 11047	S 11040	6535	12534	S 11344	9099	5814	S 10835	9268	11122	11362	C 12512	10904	5031	S 11018	11055	—	C 13140	C 11586	S 10792	8827	6966	5234	3823	S 10885	6280	4875
Montreal	3317	3281	2715	2645	8141	1222	3530	6421	7108	3036	4042	2693	3548	2475	3102	S 11569	2760	3241	P 11130	2977	1451	2944	5331	P 6460	P 11855	S 10129	3062	P 5800	P 10885
New Orleans	4837	4801	2115	4401	9502	1924	5050	6255	7347	4531	5397	4447	5068	597	4622	P 10745	4525	4761	P 9370	—	1699	4464	5160	P 4695	P 10090	S 11484	4582	P 4035	P 9120
Newport News	3514	3478	1699	3080	8307	550	3727	5774	6789	3233	4208	3126	3745	988	3299	P 11135	3204	3438	P 9760	1490	286	3141	4590	P 4090	P 10485	S 10295	3259	P 4425	P 9515
New York	3346	3310	1825	2912	8153	379	3559	5838	6995	3065	4054	2959	3577	1227	3131	P 11335	3053	3270	P 9960	1699	—	2973	4748	P 5290	P 10685	S 10141	3091	P 4625	P 9715
Panama	P 4860	P 4820	P 1265	P 4585	P 9323	P 2215	P 5070	M 5280	P 6450	P 4575	P 5225	P 4665	P 5090	P 1025	P 4645	9324	P 4570	P 4780	7949	P 1420	P 2010	P 4485	P 8270	3277	8672	13405	P 4605	2615	7702
Philadelphia	3482	3446	1828	3048	8284	517	3694	5870	6861	3201	4185	3094	3712	1158	3267	P 11300	3172	3406	P 9925	1660	234	3109	4782	P 5255	S 12455	S 10272	3227	P 4595	P 9680
Plymouth	385	349	3594	360	5997	2791	598	6029	5852	108	1898	442	616	3962	175	9425	345	309	10792	4464	2973	—	4939	P 7760	10168	7985	129	P 7100	10887
Portland (Me.)	3086	3050	1927	2652	7912	98	3299	5849	6787	2805	3807	2698	3317	1470	2871	S 11334	2776	3010	P 10210	1972	427	2713	4759	P 5540	S 12077	S 9894	2831	P 4875	P 9965
Rio de Janeiro	5280	5244	3079	5168	7824	4714	5501	1135	3265	4984	5040	5250	5519	4579	5061	C 11118	5158	5204	8827	5160	4748	4939	—	P 7545	C 10861	C 8851	5034	M 3644	C 11580
St. Thomas	3846	3810	440	3586	8265	1516	4059	4629	5708	3570	4160	3668	4077	1040	3639	P 10385	3573	3770	P 9010	1590	1435	3473	3539	P 4335	P 9720	10247	3591	P 3675	P 8220
San Francisco	M 13639	M 13603	M 11438	M 13527	9780	M 13073	M 13852	7536	M 10217	13343	M 13399	M 13609	M 13870	M 12974	M 13412	6041	M 13517	M 13563	6966	13524	M 13107	13300	M 8414	—	5491	7330	M 13393	5140	4521
San Juan	3867	3831	502	3600	8307	1480	4080	4694	5773	3583	4202	3681	4098	975	3652	P 10365	3588	3791	P 8990	1525	1428	3494	3604	P 4315	P 9710	10289	3612	P 3655	P 8700
Savannah	3916	3880	1648	3443	8640	928	4129	5820	6860	3684	4535	3489	4147	634	3701	P 10925	3618	3840	12650	1136	695	3543	4730	P 4880	P 10275	10622	3661	P 4220	P 9265
Seattle	P 8915	P 8880	P 5320	P 8640	9515	P 6270	P 9125	M 8315	P 10505	P 8635	P 9280	P 8720	P 9145	P 5085	P 8700	5779	P 8625	P 8835	7326	P 5475	P 6070	P 8540	M 9193	799	5209	7068	P 8660	5917	4259
Shanghai	10507	10471	12370	10535	4633	S 12133	10720	C 11380	7641	S 10211	8644	10498	S 10738	S 13165	10280	853	S 10394	10437	5234	S 13667	S 12324	10168	C 10861	5491	—	2183	10267	10266	1030
Singapore	8324	8288	10187	8233	2450	S 9950	8537	9376	5631	8028	6461	8315	8555	10982	8097	1440	8211	8248	3823	S 11484	S 10141	7985	C 8851	7330	2183	—	8078	M 10899	2902
Southampton	277	238	3622	488	6090	2909	479	6124	5947	83	1991	570	497	4080	105	S 9518	463	201	S 10885	4582	3091	129	5034	P 7880	S 10261	8078	—	P 7220	10980
Suez	3376	3340	5239	3285	2960	5002	3589	8154	5259	3080	1513	3367	3607	6034	3157	6388	3263	3300	7755	6536	5193	3037	6179	12278	7131	4948	3130	9768	7850
Valparaiso	M 8869	M 8833	M 6668	M 8757	M 9875	M 8303	M 9082	M 2766	M 5447	M 8573	M 8626	M 8839	M 9100	M 8168	M 8642	10536	M 8747	M 8793	6280	M 8754	M 8337	M 8530	M 3644	5138	10266	M 10899	M 8623	—	9339
Yokohama	11226	11190	S 13089	11135	5352	S 12852	11439	C 12105	8360	10930	9363	11217	11457	S 13890	10999	1580	11113	11150	4875	S 14386	S 13042	10887	C 11580	4521	1030	2902	10980	9339	—

K, via Kiel Canal. S, via Suez Canal. C, via Cape of Good Hope. M, via Strait of Magellan. H, via Cape Horn. T, via Torres Strait. P, via Panama Canal.

PRODUCTION OF THE PRINCIPAL MINERALS AND METALS, AND THE TOTAL VALUE OF ALL MINERAL PRODUCTS IN THE UNITED STATES

(By States)

STATES	RANK	COAL (Thousands of short tons)	RANK	IRON ORE (Thousands of long tons)	RANK	GOLD (Thousands of fine ounces)	RANK	SILVER (Thousands of fine ounces)	RANK	COPPER (Thousands of pounds)	RANK	LEAD (Short tons)	RANK	ZINC (Short tons)
Alabama	7	11,730	3	5,961										
Alaska					3	677	11	398	6	30,422	11	941		
Arizona					6	318	5	7,824	1	**414,144**	8	10,138		
Arkansas														
California			10	31	1	**1,435**	7	2,037	8	10,328				
Colorado	9	6,768			5	373	4	8,496	7	19,181	9	7,267	13	1,172
Connecticut														
Delaware														
Florida														
Georgia														
Idaho					10	85	1	**17,222**	10	2,925	2	91,339	5	49,100
Illinois	3	41,912												
Indiana	6	17,410												
Iowa	13	3,550												
Kansas											7	11,409	3	79,017
Kentucky	4	38,545												
Louisiana														
Maine														
Maryland	19	1,695												
Massachusetts														
Michigan	22	580	2	9,178					5	91,105				
Minnesota			1	**31,634**										
Mississippi														
Missouri	10	6,650[1]							12	464	1	**110,428**	10	18,709
Montana	14	3,195			9	185	3	9,088	3	215,433	5	19,119	4	49,623
Nebraska														
Nevada					7	287	6	5,173	4	146,154	6	12,305	11	15,785
New Hampshire														
New Jersey			8	160									2	89,883
New Mexico	20	1,600			12	36	9	1,244	9	6,975	10	6,626	9	20,668
New York			6	778									8	26,941
North Carolina														
North Dakota	17	2,258[1]												
Ohio	5	23,030												
Oklahoma	16	3,125[1]									4	25,427	1	**129,175**
Oregon					11	62	13	103	11	566				
Pennsylvania	**1**	**168,086**	4	2.714										
Philippine Islands					2	999	10	461						
Rhode Island														
South Carolina														
South Dakota					4	619	12	145						
Tennessee	12	5,070											6	44,916
Texas	21	780			14	1	8	1,348						
Utah	15	3,170	9	154	8	233	2	10,759	2	261,202	3	69,886	7	36,192
Vermont														
Virginia	8	11,630												
Washington	18	1,750			13	12	14	60	13	202				
West Virginia	**2**	**126,437**												
Wisconsin			5	970									12	8,126
Wyoming	11	5,785	7	507										

STATES	RANK	PETROLEUM (Thousands of 42-gallon barrels)	RANK	PORTLAND CEMENT (Thousands of 376-pound barrels)	RANK	NATURAL GAS (Millions of cubic feet)	RANK	MINES AND QUARRIES (Number)	RANK	SALT (Short tons)	RANK	CLAY PRODUCTS	RANK	TOTAL VALUE (In thousands of dollars)
Alabama			10	3,912			12	242			15	1,717,681	21	31,772
Alaska													30	18,812
Arizona							20	134			39	94,880	18	38,848
Arkansas	10	10,419			15	6,167	24	121			42	44,748	31	17,609
California	2	214,773	2	13,399	2	284,109	8	340	6	368,290	4	6,063,213	2	489,949
Colorado	17	1,674					9	333			18	1,118,299	15	44,413
Connecticut							40	42			25	663,614	43	2,656
Delaware							45	6			38	100,138	49	230
Florida							36	65			41	48,483	34	11,447
Georgia							32	81			12	2,263,557	36	7,440
Idaho							37	65			37	110,148	28	21,364
Illinois	14	4,445	8	4,807	16	1,448	5	486			5	5,835,861	10	96,484
Indiana	18	798					7	375			8	3,725,601	16	42,513
Iowa			9	4,099			13	207			14	2,015,986	27	21,710
Kansas	5	58,329	11	3,560	7	57,125	10	257	5	704,164	19	965,183	9	96,906
Kentucky	11	5,628			9	39,738	4	617			7	3,865,301	8	98,486
Louisiana	4	79,822			4	249,450	46	1	4	918,414	36	160,204	7	107,545
Maine							38	56			32	294,828	44	2,560
Maryland							25	119			10	3,274,251	35	10,036
Massachusetts							33	77			20	869,335	38	5,650
Michigan	9	11,828	3	7,673			26	117	1	**2,354,282**	23	760,270	11	77,149
Minnesota							19	143			26	615,600	13	57,313
Mississippi					13	9,643	47	1			28	391,605	42	3,093
Missouri			7	4,955			6	401			3	8,149,200	19	35,800
Montana	12	5,588			12	19,870	16	169			31	300,486	14	52,097
Nebraska							44	8			30	312,882	41	3,229
Nevada							27	104					29	20,988
New Hampshire							41	39			35	202,051	47	694
New Jersey							35	71			6	5,393,784	24	28,515
New Mexico	6	27,185			10	27,931	31	89			40	77,480	20	33,502
New York	13	4,663	5	5,729	14	8,288	14	206	2	2,021,983	9	3,470,379	12	58,409
North Carolina							23	123			13	2,107,914	37	6,775
North Dakota							18	150[2]					45	2,544
Ohio	15	3,847	6	5,370	8	49,592	3	744	3	1,633,056	2	18,450,236	6	126,134
Oklahoma	3	206,809			3	274,313	11	245			33	248,134	4	251,701
Oregon							39	44			34	240,065	39	5,596
Pennsylvania	7	17,070	1	**22,871**	6	94,464	1	**2,129**			1	**27,601,907**	3	472,773
Rhode Island							43	14					48	571
South Carolina							42	35			22	773,140	46	1,843
South Dakota							18	150[2]					26	22,210
Tennessee			12	3,014			17	167			21	785,324	25	25,743
Texas	1	**427,280**	4	5,840	1	**642,366**	28	104	7	316,006	16	1,665,755	1	**740.147**
Utah							21	131	9	56,480	27	438,825	17	41,881
Vermont							22	129					40	5,097
Virginia							15	196			17	1,332,066	22	30,923
Washington							30	90			24	752,735	32	13,688
West Virginia	16	3,847			5	115,772	2	870	8	117,401	11	2,431,084	5	245,402
Wisconsin							29	104			29	315,066	33	11,816
Wyoming	8	14,455			11	26,643	34	73					23	30,670

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[1] The figure for Missouri includes Kansas; that for North Dakota includes South Dakota; that for Oklahoma includes Arkansas.

[2] This figure includes North Dakota and South Dakota.

NATIONAL MONUMENTS AND MEMORIALS

Name	Location	Characteristics	Area (Acres)	Date
Abraham Lincoln	Kentucky	Memorial containing the log cabin and part of the farm where Lincoln was born, near Hodgenville.	110	1916
Antietam	Western Maryland	Memorial commemorating the Battle of Antietam or Sharpsburg, in Civil War.	40	1890
Appamatox	Virginia	Memorial commemorating the end of the Civil War, near Lynchburg.	2	1930
Arches	Eastern Utah	Hot, desert wind erosion has formed window openings, arches, bridges, caves and castlelike piles.	4,520	1929
Aztec Ruins	Northwestern New Mexico	Remains of pueblos of prehistoric times that are remarkable examples of Stone Age construction. Chief building is E-shaped with 500 rooms.	25.88	1923
Bandelier	North central New Mexico	Partly restored cliff dwellings containing tools; named after the archeologist, Adolphe Francis Alphonse Bandelier; 18 miles west of Sante Fe.	26,026	1932
Big Hole Battlefield	Southwestern Montana	Memorial commemorating battle in which the Nez Percé Indians were defeated in 1877.	5	1910
Black Canyon	Western Colorado	A 10-mile gorge, 1,750 feet deep, on the Gunnison River.	17,636	1933
Brice's Crossroads	Northeastern Mississippi	Memorial commemorating a battle of the Civil War, June 10, 1864.	1	1929
Cabrillo	California	Memorial marking the spot where Juan Rodriguez Cabrillo, Spanish explorer, first saw California in 1542.	.5	1913
Camp Blount	Southern Tennessee	Memorial on the site of the Old Stone Bridge where Andrew Jackson mobilized his troops.		1930
Canyon de Chelly	Northeastern Arizona	Box canyon about 25 miles long with red sandstone walls 700–1,000 feet high. The cliff dwellings in its caves and crevasses are considered the most important ruins in the Southwest as records of cultural progress.	83,840	1931
Capulin Mountain	Northeastern New Mexico	Large cinder cone, geologically young; it has an altitude of 8,000 feet.	680	1916
Casa Grande	Southern Arizona	Prehistoric ruins, first seen by the Jesuit Missionary, Father Kino, in 1694.	472.5	1889
Castle Pinckney	South Carolina	National monument on site of fort built in 1810, which replaced one built in the Revolution.	3.5	1924
Cedar Breaks	Southwestern Utah	Cliffs 2,000 feet high, curiously shaped and colored.	5,790	1933
Chaco Canyon	Northwestern New Mexico	Cliff-dwelling ruins, including communal houses. Pueblo Bonito, originally containing 1,200 rooms, is the largest prehistoric ruin in the Southwest.	21,512	1907
Chalmette	Southeastern Louisiana	Monument commemorating the Battle of New Orleans, Jan. 8, 1815.	15	1907
Chickamauga and Chattanooga	Northwestern Georgia and southeastern Tennessee	Military park and cemetery including the battlefields of Chickamauga, Missionary Ridge and other battles of Civil War.	5,733	1890
Chiricahua	Southeastern Arizona	Curiously shaped and balanced rocks and pillars.	4,480	1924
Colonial Monument	Eastern Virginia	Colonial historic land, including Jamestown Island, where the first permanent English settlement was made in 1607, Williamsburg, the seat of the Colonial Government and Yorktown, scene of the last battle of the Revolution; all connected by parkways.	2,707	1930
Colorado	West central Colorado	Unusual examples of irregular erosion, especially of large, lofty monoliths.	13,749	1911
Cowpens	Northwestern South Carolina	Memorial commemorating the Revolutionary Battle of Cowpens, Jan. 17, 1781.	1	1929
Craters of the Moon	Southern Idaho	Craters, volcanic cones, lava flows, fissure eruptions, caves and tunnels. Blue-and-red stalactites and stalagmites are found in the caves and tunnels. Named from its resemblance to the surface of the moon as seen through a telescope.	49,602	1924
Death Valley	Southeastern California	Lowest spot in North America (276 feet below sea level); desert vegetation; lies east of Panamint Mountains.	1,601,800	1933
Devil's Postpile	Eastern California	Hexagonal columns or posts of basalt.	800	1911
Devil's Tower	Northeastern Wyoming	In Black Hills region, 1,200-foot tower of rock of volcanic formation.	1,153	1906
Dinosaur	Northeastern Utah	Fossils of prehistoric animal life, particularly of reptiles; most important animal remains found, the brontosaurus skeleton, 85 feet long and 16 feet high; contains Jura-Trias rock.	80	1915
El Morro	West central New Mexico	Rocks of sandstone eroded to look like a castle and inscribed by Spanish explorers; cliff dwellings; also called *Inscription Rock*.	240	1906
Father Millet Cross	Western New York	Cross placed by Father Millet in 1688 on Fort Niagara Military Reservation.		1925
Fort Donelson	Northwestern Tennessee	Memorial park and cemetery on the site of a fort and battle of the Civil War.	108	1928
Fort Jefferson	Southern Florida	Memorial on Florida Keys on the site of a fort built in 1846.		1935
Fort Marion	Northeastern Florida	Spanish fort near St. Augustine, built in 1656.	18.09	1924
Fort Matanzas	Northeastern Florida	Relic of a fort of the time of the Spanish invasion.	1	1924
Fort McHenry	Maryland	Inspiration of "The Star Spangled Banner."	47	1925
Fort Necessity	Southwestern Pennsylvania	Memorial marking scene of battle between Washington and the French and Indians, July 3, 1757; located near Uniontown.	2	1931

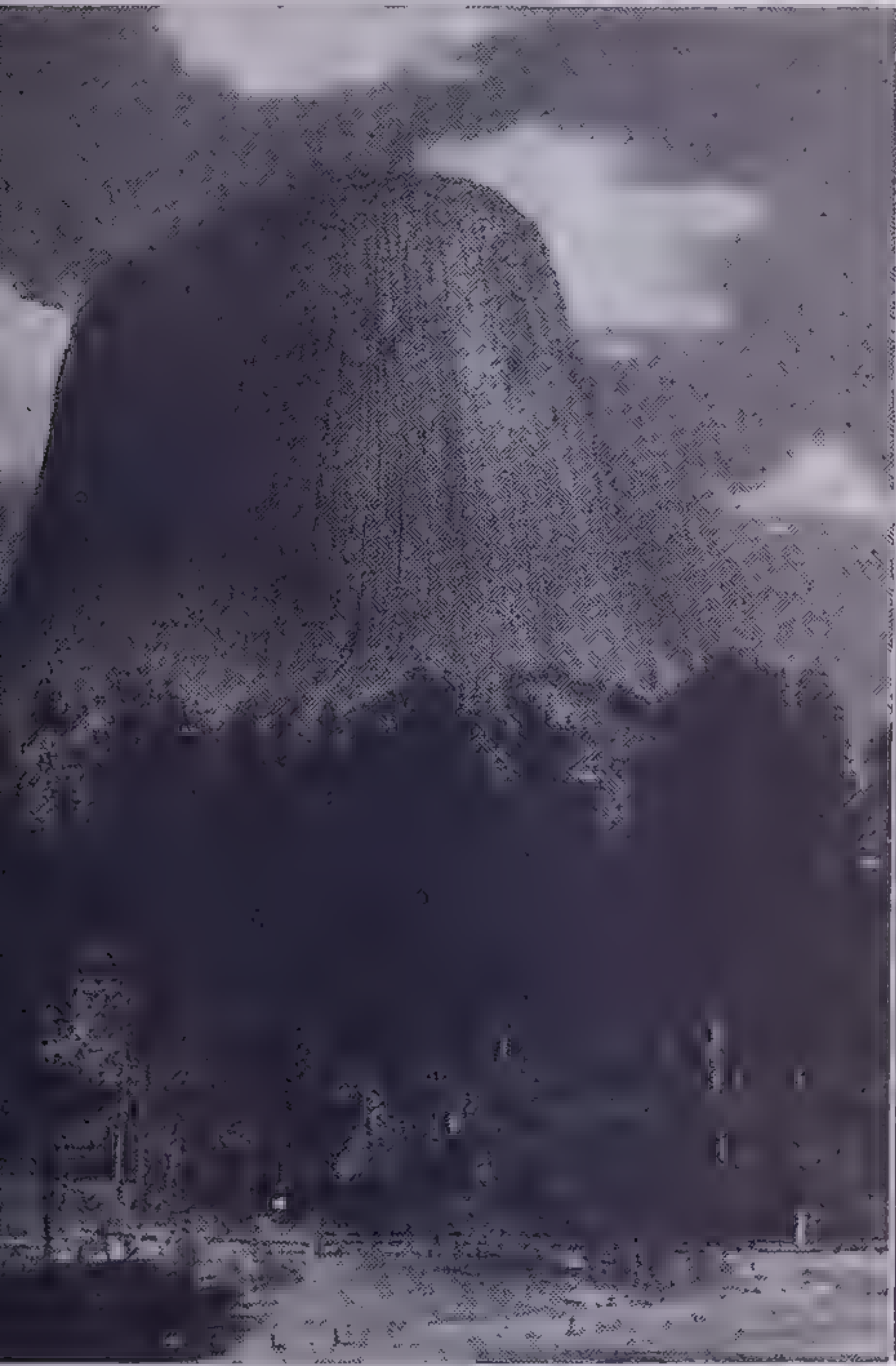
Name	Location	Characteristics	Area (Acres)	Date
Fort Pulaski	Southeastern Georgia	Memorial marking the site of Fort Greene of Revolutionary times, replaced by Fort Pulaski in 1810; located on island at mouth of Savannah River.	20	1924
Fort Wood	New York	(See Statue of Liberty.)	2.5	1924
Fossil Cycad	Southwestern South Dakota	Created for the preservation of the fernlike fossilized plants of the Mesozoic Period; scientific investigations show that these plants bore flowers in the age of egg-laying monsters.	320	1922
Fredericksburg and Spotsylvania	Eastern Virginia	Memorial park and cemetery on the site of the Battle of Fredericksburg and Spotsylvania in the Civil War.		1927
Gettysburg	Southern Pennsylvania	Memorial park on the site of the Battle of Gettysburg, July 1, 2 and 3, 1863; Lincoln's undying address was made here, Nov. 19, 1863, when the National Cemetery was dedicated.	2,530	1895
Gila Cliff Dwellings	Southwestern New Mexico	150-foot cliff, containing a cavern divided into rooms by adobe walls.	160	1907
Glacier Bay	Southern Alaska	Tidewater glaciers; area also contains mature forests, youthful trees and bare stretches for future forests.	1,164,800	1925
Grand Quivera	Central New Mexico	Pueblo ruins and an old Spanish Mission, the Gran Quivera, shaped like a short-armed cross, 48 by 140 feet.	611	1909
Guilford Courthouse	North Carolina	Scene of the Revolutionary War battle between generals Cornwallis and Greene; now a national military park.	110	1917
Holy Cross	Central Colorado	Mountain of the Holy Cross in the Sawatch Range (13,978 feet high); so named because of the snow-filled crevasses that form a Greek Cross.	1,892	1929
Hovenweep	Utah and Colorado	Four groups of prehistoric pueblos, cliff dwellings and towers. Hovenweep Castle is the largest, with walls 66 feet long and 20 feet high.	285.8	1923
Jewel Cave	Southwestern South Dakota	Limestone caverns in which narrow galleries connect the chambers.	1,280	1908
Katmai	Southwestern Alaska	Includes Katmai Volcano and the Valley of Ten Thousand Smokes in the Katmai Pass, where steam and gas come from thousands of vents in the earth.	1,087,990	1918
Kennesaw Mountain	Northwestern Georgia	Memorial of the Civil War battle, June 27, 1864, at Marietta, near Atlanta; now a park.	60	1917
Kill Devil Hill	Northeastern North Carolina	Memorial on the spot where the Wright brothers tried out their first airplane at Kitty Hawk.	547	1927
Kings Mountain	Northern South Carolina	Scene of the Revolutionary War battle of Kings Mountain, Oct. 7, 1780, in which American backwoodsmen defeated the British forces.		1931
Lava Beds	Northern California	Ice caves, tunnels, Indian pictographs; site of a battle in Modoc Indian War in 1873.	45,967	1925
Lehman Caves	Eastern Nevada	Caverns of gray-and-white limestone, with stalactites.	593	1922
Lewis and Clark Cavern	Southwestern Montana	Large, vaulted caverns of limestone with unusual stalactite and stalagmite formations; named after Lewis and Clark because their trail is visible from them.	160	1908
Meriwether Lewis Monument	Tennessee	Burial place of Meriwether Lewis of the Lewis and Clark Expeditions; near Hohenwald.	300	1925
Monocacy	Maryland	Memorial of the Battle of Monocacy, July 8, 1864, near Frederick, west of Baltimore.	1	1929
Montezuma Castle	Central Arizona	Vertical cliffs with dwellings in the niches; Montezuma Castle, chief of these, is 50 feet high and 60 feet wide.	160	1906
Moore's Creek	Southeastern North Carolina	Park on scene of a Revolutionary War battle.	30	1926
Morristown	Northern New Jersey	Main camp of the American Army in the Revolution, also a base hospital; now a park.	1,000	1933
Mound City Group	South central Ohio	Prehistoric Indian mounds in Camp Sherman Military Reservation.	57	1923
Mount Olympus	Northwestern Washington	Breeding ground of great herds of elk: includes wild and beautiful country around Mt. Olympus.	298,730	1909
Muir Woods	West central California	Grove named after the naturalist, John Muir; contains redwood, Douglas fir, madrona, bay and mountain oak.	426	1908
Natural Bridges	Southeastern Utah	Three of the largest natural bridges in existence (one is 222 feet high with a span of 261 feet) caused by stream erosion; the area also contains springs, caverns and cliff-dwelling ruins.	2,740	1908
Navaho	Northeastern Arizona	Navaho Indian cliff-dwelling ruins. Chief of them are: Betatakin, Keet Seel and Inscription House (on whose walls Spanish inscriptions dated 1661 are found).	360	1909
New Echota	Northwestern Georgia	Marker on the site of the capital of the Cherokee Indian Nation.	1	1931
Old Kasaan	Southern Alaska	Abandoned Haida Indian village with totem poles and graveyard.	38	1916
Oregon Caves	Southwestern Oregon	Limestone caverns of unusual formations in a section of beautiful scenery.	480	1909
Petersburg	Southeastern Virginia	Memorial park on the site of a strategic point in both Revolutionary and Civil wars. Memorial Hill, Sewell Mansion, where Grant and Lee met, and a Confederate cemetery are here; situated on Appamatox River 20 miles south of Richmond.		1926

rtesy National Park Service

house Row, Hot Springs National Park, Arkansas. Waters n the Hot Springs Are Considered to Have Therapeutic Effects

Courtesy Department of the Interior

The Breaking Waves Dash High on Mount Desert Island Off the Coast of Maine, Site of Acadia National Park



rtesy Wyoming Dept. of Commerce

evil's Tower National Monument in ook County, Northeastern Wyoming

Courtesy Kentucky Department of Conservation

The Log Cabin in Which Lincoln Was Born in Abraham Lincoln National Memorial near Hodgenville, Kentucky

HERE ON
FRANCE THIS
TABLET FOUND
RECORD OF THE
VISIT OF WHITE
MEN TO
SOUTH DAKOTA
ERECTED BY

Courtesy South Dakota Department of Agriculture

Where the Missouri River Region Was Claimed for France—Verendrye National Monument, South Dakota

Varied Scenes from America's National Parks, Memorials and Monuments

A Great Stone Canyon Dwarfs Man-Made Army Bombers in Yosemite National Park, California. Yosemite Falls Drops 2,526 Feet

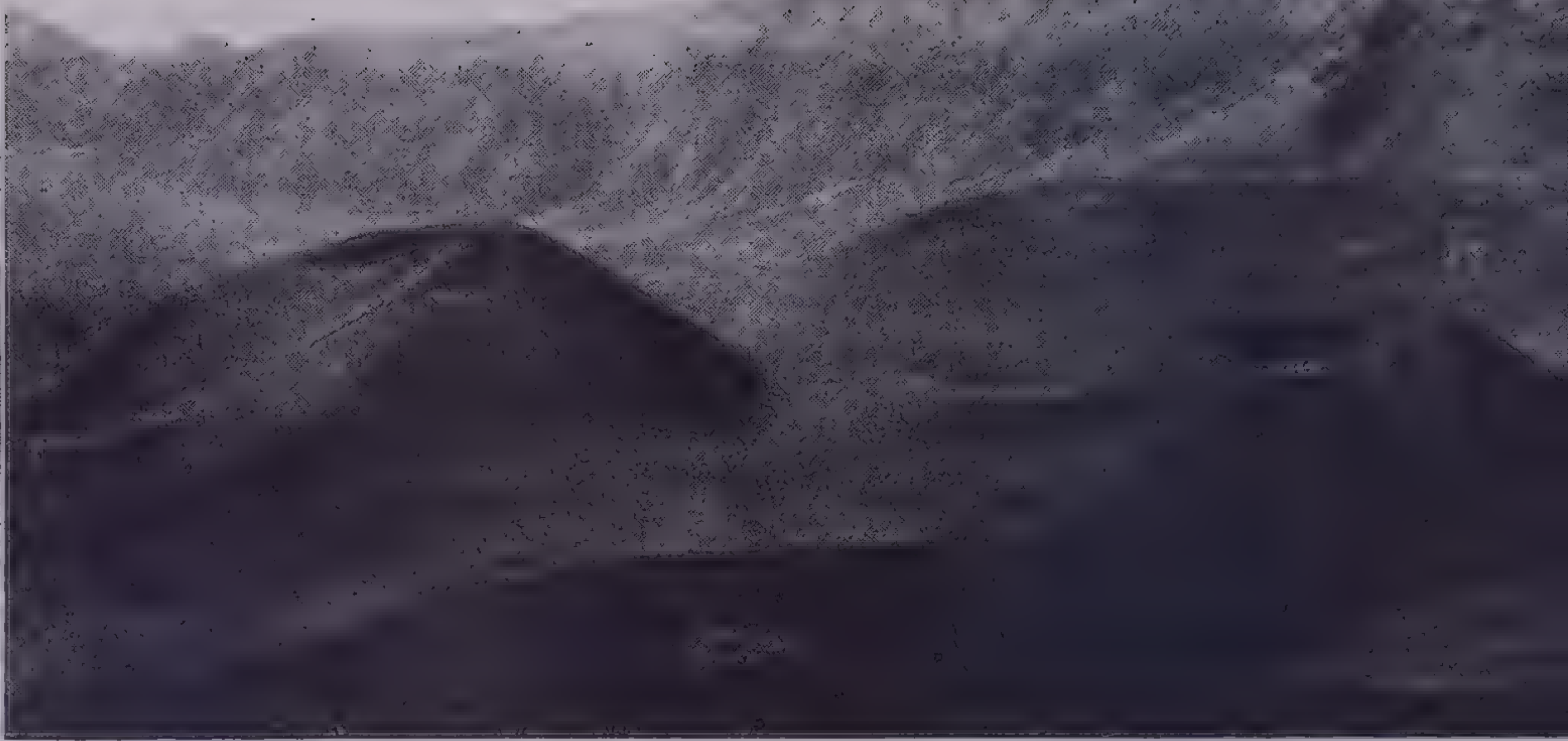
m an official photograph, U. S. Army Air Corps

Mount Rainier (14,408 Feet) and Reflection Lake in Mount Rainier National Park, Washington

Courtesy Seattle Chamber of Commerce

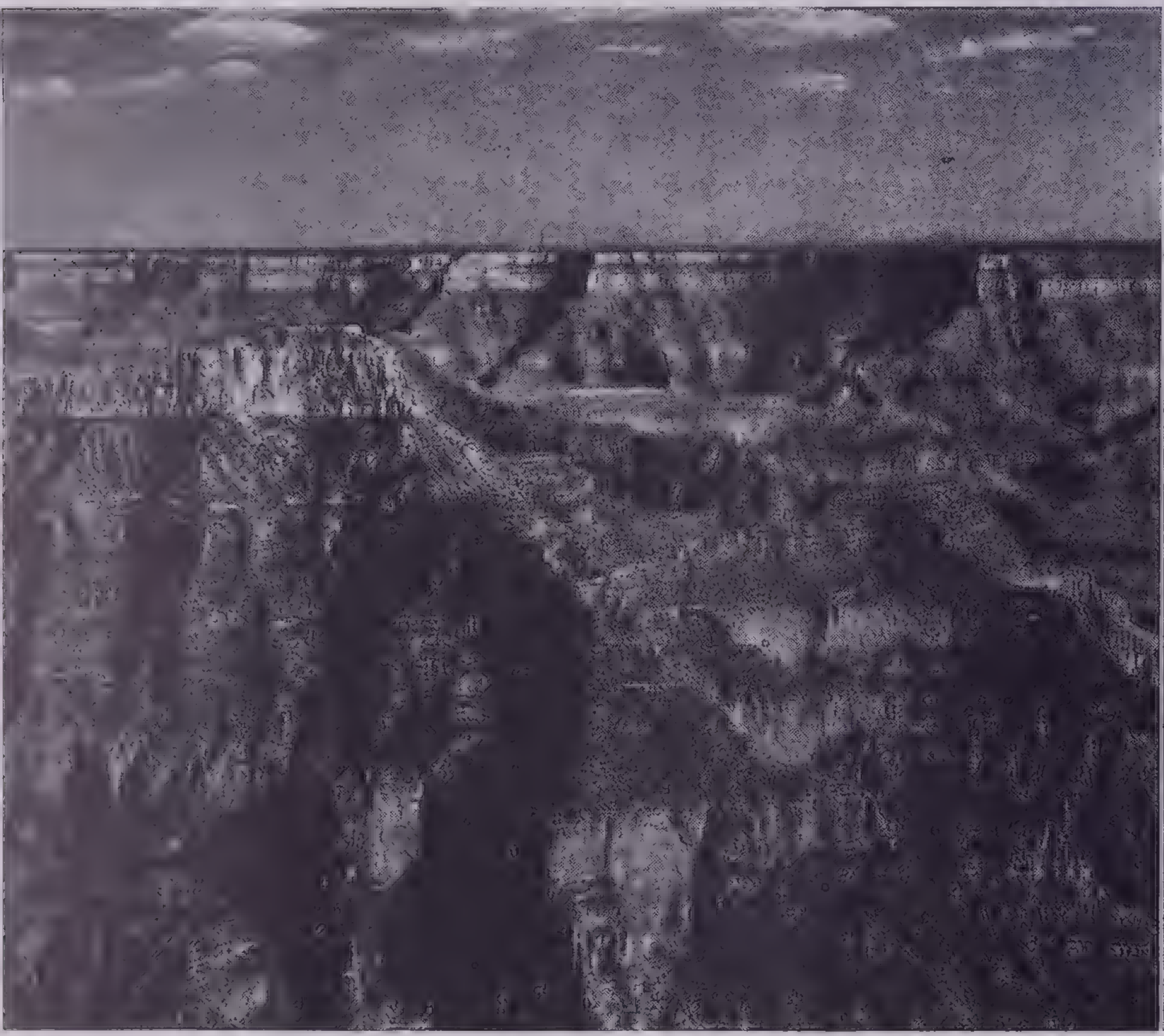
Courtesy The Colorado Association

Balcony House, Mesa Verde National Park, Colorado



From a U. S. Geological Survey photo

Cinder Cones Formed by Volcanic Eruption on Mount Haleakala, Hawaii National P



From a photo by Frank C. Rogers, Rochester, N. Y.

Grand Canyon of the Colorado River, Grand Canyon National Park, Arizona

Courtesy Wyoming Dept. of Commerce and Industry

Canyon and Lower Falls of the Yellowstone River, Yellowstone National Park, Wyoming

In the Great National Parks

Mount Moran in Grand Teton National Park, Wyoming

From a photo by Frank C. Rogers, Rochester, N. Y.

Bryce Point in Bryce Canyon National Park, Utah

From a photo by Frank C. Rogers, Rochester, N. Y.

NATIONAL MONUMENTS AND MEMORIALS—Concluded

NAME	LOCATION	CHARACTERISTICS	AREA (Acres)	DATE
Petrified Forest	Eastern Arizona	Painted desert and petrified conifers, between the Little Colorado and Rio Puerco; park also contains much beautiful scenery.	36,993	1906
Pinnacles	West central California	Caves, domes, passages and spires (600 to 1,000 feet high); named from the spires. One of the caves, Banquet Hall, is 100 feet square and 30 feet high.	4,906	1908
Pipe Spring	Northwestern Arizona	Desert spring and old stone fort (Windsor Castle), erected by the Mormons and used by pioneers; on main road between Zion National Park and North Rim of Grand Canyon.	40	1923
Rainbow Bridge	South central Utah	Natural bridge shaped like a rainbow with a 309-foot height and a 278-foot span; interesting example of eccentric stream erosion; over a canyon in the Navajo Indian Reservation.	160	1910
Saguaro	Southeastern Arizona	Interesting desert plant and rock formations and pictographs; also called Papago Saguaro.	1,940	1914
Scott's Bluff	Western Nebraska	A monument on bluffs of Platte River, where pioneer trails met.	3,240	1919
Shiloh	Southwestern Tennessee	Park and cemetery on the site of the Battle of Shiloh (or Pittsburg Landing), April 6 and 7, 1862.	3,546	1894
Shoshone Cavern	Northwestern Wyoming	Contains large caves with rooms 150 feet long and 40 to 50 feet high, connected by passages and lined with limestone crystals; located a few miles east of Shoshone Dam.	210	1909
Sitka	Southern Alaska	Scene of the Indian massacre of Russians in 1802; contains 16 totem poles and much beautiful scenery.	57	1910
Statue of Liberty	New York Harbor	On Liberty (Bedloe) Island, owned by the Federal Government; a bronze statue (150 feet tall) by Bartholdi, presented by France to the United States in 1886 to commemorate 100 years of American Independence.	2.5	1924
Stone River	Tennessee	Park and cemetery commemorating the Battle of Murfreesboro (or Stone River) in the Civil War.	345	1927
Sunset Crater	North central Arizona	Lava flows and ice caves in the crater of an extinct volcano, near the San Francisco peaks.	3,040	1930
Timpanogos Cave	North central Utah	Caverns of limestone with a 600-foot passage.	250	1922
Tonto	Southeastern Arizona	Ruins of adobe cliff dwellings, some several stories high; south of the Tonto River mouth, near the Roosevelt Dam on the Salt River.	640	1907
Tumacacori	Southeastern Arizona	Monument created to preserve a Franciscan Mission of the 17th century that was built by Jesuit priests.	10	1908
Tupelo	Northeastern Mississippi	On the site of a battlefield of Civil War.	1	1929
Verendrye	Central South Dakota kota	Crowhigh Butte, where Verendrye, famous French explorer, first saw and claimed the country beyond the Missouri 1743.	250	1917
Vicksburg	Western Mississippi	Scene of Battle of Vicksburg in 1863; now a park and cemetery.	1,322	1899
Walnut Canyon	North central Arizona	Ruins of cliff dwellings in canyon walls; located near Flagstaff.	960	1915
Washington's Birthplace	Eastern Virginia	At Wakefield; foundations of house bought by John Washington in 1664; family burial grounds; house in which Washington was born, which was burned, has been rebuilt.		1930
Wheeler	Southeastern Colorado	Volcanic area in which wind and water erosion have carved interesting and fantastic shapes.	300	1908
Battlefield of White Plains	New York	Tablet marks the site of the Battle of White Plains between Washington and Howe.		1926
White Sands	South central New Mexico	Gypsum or white sand near Alamogordo, drifted by wind.	142,987	1933
Wupatki	North central Arizona	Hopi Indian ancestral pueblo dwellings of red sandstone.	2,234	1924
Yucca House	Southwestern Colorado	Ruins of prehistoric village on the slope of Sleeping Ute Mountain.	10	1919

NATIONAL PARKS

NAME	LOCATION	CHARACTERISTICS	AREA (Sq. Mi.)	DATE
Acadia	Southeastern Maine	Old Acadian country; part of Mt. Desert Island, Schoodic Point, Me.; woods and rocky seashore.	16.72	1919
Bryce Canyon	Utah	Several huge box canyons, filled with vividly colored, eroded pinnacles; a huge horseshoe-shaped bowl.	22.6	1928
Carlsbad Caverns	Southeastern New Mexico	Enormous caverns with decoration formations limestone; explored for 30 miles.	1.12	1930
Crater Lake	Southern Oregon	Unusually blue lake in extinct volcano crater of Mt. Mazama, with sides 1,000 feet high; of interesting lava formation; excellent fishing.	249	1902
General Grant	Middle eastern California	Created to preserve the General Grant tree, a redwood 40.3 feet in diameter. Christmas festivities are held at foot of tree each year.	4	1890
Glacier	Northwestern Montana	Rugged mountainous district resembling the Swiss Alps; 250 glacier-fed lakes, 60 small glaciers, queer-shaped peaks, high precipices.	1,538	1910

NATIONAL PARKS—Concluded

Name	Location	Characteristics	Area (Sq. Mi.)	Date
Grand Canyon	North central Arizona	Wonderful example of erosion caused by water-force of Colorado River. (See special article.)	1,008	1919
Grand Teton	Northwestern Wyoming	Unusually grand uplift in Teton Mountains; also Jackson Hole and lakes.	150	1929
Great Smoky Mountains	North Carolina and Tennessee	Area not to be developed until 427,000 acres have been donated to the United States.	643	1926
Hawaii	Hawaiian Islands Territory	Kilauea and Mauna Loa are active volcanoes on Hawaii; Haleakala is an extinct volcano (it erupted 200 years ago) on Maui; tropical jungles and forests are included in park.	248	1916
Hot Springs	Middle Arkansas	Reserved by Congress in 1832 as Hot Springs Reservation to prevent exploitation of waters supposed to have healing properties.	1.54	1921
Isle Royale	Northern Michigan (Upper peninsula)	Authorized for National Park status; lies in Lake Superior.		
Lassen Volcano	Northern California	Lassen Peak (10,453 feet high) only active volcano on north Pacific coast; it erupted in 1914–16; Cinder Cone (6,913 feet) has odd-shaped lava beds of unusual beauty; there are also mud geysers, hot springs, primeval forests and alpine lakes.	163	1916
Mammoth Cave	Southwestern Kentucky	Series of magnificent caverns, underground rivers, onyx formations, stalactites and stalagmites. (See special article.)	54	1936
Mesa Verde	Southwestern Colorado	Elaborate and well-preserved prehistoric cliff dwellings; area 15 miles long and 8 miles wide; most important ruins are in the Rock, Long, Wickiup, Navajo, Spruce, Soda and Moccasin canyons. Sun Temple was unearthed in 1915.	80	1906
Mount McKinley	South central Alaska	Includes Mt. McKinley (20,300 feet), highest mountain in America, and surrounding country; game preserve (caribou and mountain sheep).	3,030	1917
Mount Rainier	West central Washington	Contains 28 glaciers (48 sq. mi. in area), some from 50 to 500 feet thick; Nizqually and Ingraham are best known; also subalpine flower fields. Mt. Rainier, the single peak, originally volcanic, gives off enough heat still to produce ice caverns.	378	1899
Platt	Southern Oklahoma	Curative mineral springs—sulphur, sodium and chloride; one of the Mid-Continent Parks.	1.32	1902
Rocky Mountain	North central Colorado	Range of snowy, peaks (11,000 to 14,255 feet high) in Rocky Mountains; park straddles Continental Divide. Estes Park is its eastern gateway; Grand Lake, its western.	405	1915
Sequoia	East central California	Park of giant sequoias and other redwoods from 10 to 30 feet in diameter; General Sherman Tree is 37.3 feet in base diameter and 273.9 feet tall. Mount Whitney, Kern River Canyon, precipices and other mountain ranges are included in the park. Part of area was made a park in 1890.	604	1926
Shenandoah	Northwestern Virginia	Beautiful scenic section of the Blue Ridge Mountains.	262	1935
Sully's Hill	Northeastern North Dakota	Wild animal preserve.	1.5	
Wind Cave	South Dakota	One of the Mid-Continent Parks; in the Black Hills; cavern of limestone contains 90-mile-long passages and many rooms with profuse ornamental formations, mostly in white; part of the park area is a game preserve for bison, elk and antelope.	20	1903
Yellowstone	Northwestern Wyoming, southwestern Montana, northeastern Idaho.	(See special article.)	3,438	1872
Yosemite	Central Eastern California	(See special article.)	1,176	1890
Zion	Southwestern Utah	A wonderful gorge, 1,500 to 2,500 feet deep, with rainbow-colored sandstone precipices; made a National Monument in 1909.	135	1919

NATIONAL FORESTS

Apache, in New Mexico and Arizona; area, 1,717,542 acres.

Ashley, in Utah and Wyoming; area, 1,115,537 acres.

Big Horn, in Wyoming; pine, spruce, fir; grazing for cattle, horses and sheep; area, 1,121,534 acres.

Bitterroot, in Idaho and Montana; named for Bitterroot, a mountain plant of the purslane family; area, 1,996,833 acres.

Black Hills, in South Dakota and Wyoming; mostly yellow pine, which looked black from a distance; area, 785,922 acres.

Cache, in Idaho and Utah; area, 1,050,826 acres.

Cascade, in Oregon; fir, pine and cedar; in Cascade Mountain region.

Caribou, in Idaho and Wyoming; area, 741,988 acres.

Chelan, in Washington; on Chelan Mountains, an eastern branch of the Cascades.

Cherokee, in North Carolina and Tennessee; yellow pine, oak, hemlock, chestnut, spruce, cypress and red gum; area, 1,204,327 acres.

Chugach, in Alaska; area, 4,821,400 acres.

Coronado, Arizona and New Mexico; area, 1,505,122 acres.

Custer, in Montana and South Dakota; area, 1,306,065 acres.

Dixie, in Nevada and Utah; area, 943,439 acres.

Eldorado, in California and Nevada; area, 851,920 acres.

Flathead, in Montana.

George Washington, in Virginia and West Virginia; area, 1,740,391 acres.

Harney, in South Dakota and Wyoming; area, 585,797 acres.

Inyo, in California and Nevada; area, 1,631,292 acres.

Kaniksu, in Idaho, Montana and Washington; area, 1,419,022 acres.

Klamath, in California and Oregon; area, 1,708,124 acres.

Kootenai, in Montana and Idaho; area, 2,094,735 acres.

La Sal, in Colorado and Utah; area, 543,441 acres.

Lolo, in Idaho and Montana; area, 2,281,860 acres.

Mt. Hood, in Oregon.

Minidoka, in Idaho and Utah; area, 636,998 acres.

Mono, in California and Nevada; area, 1,359,856 acres.

Olympic, in Washington; elk and other game preserve; Olympia National Forest Service headquarters at Olympia.

Ouachita, in Arkansas and Oklahoma; area, 2,423,839 acres.

Rainier, in Washington.

Rogue River, in California and Oregon; area, 1,209,798 acres.

Sequoia, in California; big tree and redwood.

Shenandoah, in Virginia and West Virginia.

Siskiyou, in California and Oregon; area, 1,725,343 acres.

Shoshone, in Wyoming.

Tahoe, in California and Nevada; conifers, pinon, juniper, mountain ash and mountain mahogany; area, 1,242,255 acres.

Targhee, in Idaho and Wyoming; area, 1,419,699 acres.

Teton, in Wyoming.

Tongass, in Alaska; area, 16,546,242 acres.

Tonto, in Arizona; area, 2,262,044 acres.

Umatilla, in Oregon and Washington; area, 1,404,858 acres.

Wasatch, in Utah and Wyoming; area, 1,007,723 acres.

White Mountains, in Maine and New Hampshire; pine, sugar maple, oak, spruce and cedar; area, 855,229 acres.

Changing Centers of United States Population

DATE	CENTER OF POPULATION APPROXIMATE LOCATION OF IMPORTANT TOWNS	WESTWARD MOVEMENT DURING PRECEDING DECADE IN MILES
1790	23 miles east of Baltimore, Md.	...
1800	18 miles west of Baltimore, Md.	41
1810	40 miles northwest by west of Washington, D. C.	36
1820	16 miles north of Woodstock, Va.	50
1830	19 miles W. S. W. of Moorfield, in the present State of W. Va.	39
1840	16 miles south of Clarksburg, in the present State of W. Va.	55
1850	23 miles S. E. of Parkersburg, in the present State of W. Va.	55
1860	20 miles south of Chillicothe, Ohio	81
1870	48 miles east by north of Cincinnati, Ohio	42
1880	8 miles west by south of Cincinnati, Ohio	57
1890	20 miles east of Columbus, Ind.	48
1900	6 miles southeast of Columbus, Ind.	14
1910	Bloomington, Ind.	39
1920	1.9 miles west of Whitehall, Ind.	10
1930	3 miles south of Linton, Ind.	22

COUNTRIES OF THE WORLD—AREAS AND PRODUCTS (1939)

COUNTRIES	AREA SQUARE MILES	CHIEF INDUSTRIES	LEADING PRODUCTS AND EXPORTS
Afghanistan	245,000	Agriculture, grazing	Wool, skins, fruit, nuts
Albania	10,629	Agriculture, cattle and sheep raising	Wool, corn, wheat, rice, tobacco, olives, oranges, fish
Argentina	1,079,965	Grazing, agriculture	Beef, mutton, wheat, hides
Australia	2,974,581	Grazing, agriculture, manufacturing	Wool, meat, butter, wheat
Belgium	11,754	Agriculture, forestry, manufacturing	Textiles, leather, glass, iron, steel, zinc wares, sugar
Bolivia	534,000	Mining, agriculture	Minerals, rubber, hides, coco
Brazil	3,285,319	Agriculture, mining	Coffee, cacao, cattle, cotton, sugar
Bulgaria	39,825	Agriculture, grazing	Tobacco, grain, hides, petroleum, attar of roses
Canada	3,694,863	Agriculture, mining	Copper, lumber, nickel, grain, coal, cattle
Chile	286,396	Agriculture, mining	Copper, silver, nitrate, grain
China	4,277,170	Agriculture	Silk, rice, tea, indigo, cotton, eggs, cereals, beans, copper
Colombia	476,916	Agriculture, mining	Coffee, fine woods, emeralds, gold, bananas, cotton
Costa Rica	23,000	Agriculture, stock raising	Coffee, cacao, bananas, gold, silver
Cuba	44,164	Agriculture, lumbering	Sugar, tobacco, cattle, hardwoods
Czechoslovakia	39,000	Agriculture, mining, lumbering	Foodstuffs, minerals, wood, livestock
Denmark	16,576	Agriculture, dairying	Dairy products, eggs, fuels, metal and wood manufactures, textiles
Dominican Republic	19,325	Agriculture	Sugar, cacao, tobacco
Ecuador	337,392	Agriculture	Cacao, ivory, nuts, coffee, hats, hides, rubber
Egypt	383,000	Agriculture, mining	Cotton, petroleum, cereals, sugar cane
Estonia	18,353	Agriculture, dairying	Dairy products, paper, flax, potatoes, timber
Finland	149,903	Lumbering, agriculture	Lumber, butter, cheese, paper, grain
France	212,736	Agriculture, manufacturing	Textiles, coal, raw silk, wine, wool
Germany	224,248	Agriculture, manufacturing	Grain, sugar, beer, iron-and-steel products
Great Britain	94,278	Agriculture, manufacturing	Grain, machinery, coal, iron
Greece	50,257	Agriculture, mining	Tobacco, fruits, wine, olive oil
Guatemala	48,290	Agriculture, lumbering	Coffee, sugar, bananas, chicle
Haiti	10,204	Agriculture	Cacao, cotton, logwood, sugar, coffee
Honduras	46,332	Agriculture, stock raising	Bananas, coffee, sugar, hides
Hungary	40,662	Agriculture, mining	Grain, coal, iron
Iceland	39,709	Agriculture, stock raising	Hay, potatoes, mutton, fish
India	1,819,000	Agriculture	Cotton, jute, oil, minerals
Iran (Persia)	628,000	Agriculture	Oil, rugs, grain, fruits, wines
Iraq (Mesopotamia)	177,148	Agriculture, stock raising	Wheat, barley, rice, millet
Irish Free State	26,601	Agriculture, manufacturing	Grain, potatoes, hay, meat
Italy	119,768	Agriculture, manufacturing	Silk, oil, fruits, cotton
Japan	147,441	Agriculture, manufacturing	Cotton cloth, silk, porcelain, toys, tea
Latvia	25,402	Agriculture, stock raising	Flax, linseed, grain, meat
Liberia	43,000	Agriculture	Coffee, rubber, oil, ivory
Liechtenstein	65	Agriculture, stock raising	Grain, meat products
Lithuania	21,489	Agriculture, lumbering	Flax, grain, wood products
Luxemburg	999	Agriculture	Grain, hay, iron and iron products
Manchukuo	460,383	Agriculture, mining	Coal, wheat, soy beans, iron ore
Mexico	760,372	Agriculture, stock raising	Grain, cotton, fiber, meats, coffee, sugar
Morocco	175,500	Agriculture, grazing	Eggs, poultry, grain, wool, hides
Nepal	54,000	Agriculture, grazing	Rice, grain, cattle, hides
Netherlands	12,692	Agriculture. fishing, manufacturing	Food products, fish, sugar, cereals
Newfoundland	42,734	Mining, fishing, lumbering	Paper, fish, iron ore
New Zealand	104,015	Agriculture, stock raising	Grain, wool, dairy products
Nicaragua	49,200	Agriculture, lumbering	Sugar, coffee, bananas, timber
Norway	124,588	Fishing, lumbering	Fish, paper, matches, ships
Palestine	10,100	Agriculture	Grain, fruit, nuts, wines
Panama	32,380	Agriculture, stock raising	Bananas, coconuts, hides, gum
Paraguay	130,000	Agriculture, grazing	Hides, quebracho, yerba maté, tobacco
Peru	532,185	Mining, stock raising	Copper, silver, oil, cotton, wool
Philippine Islands	114,400	Agriculture, mining	Sugar, tobacco, copra, rice, gold
Poland	150,363	Agriculture, lumbering, mining	Grain, beets, timber, zinc
Portugal	34,254	Agriculture, fishing	Wines, cork, fish, wool
Rumania	113,887	Agriculture, lumbering	Cereals, oil, timber
Salvador	13,176	Agriculture	Coffee, tobacco, rice
Siam	200,234	Agriculture, lumbering	Rice, teakwood, fish, coal, iron
Spain	190,050	Agriculture, mining	Olives, cork, wine, silk, coal, iron
Sweden	173,157	Agriculture, mining	Grain, beets, coal, steel, butter
Switzerland	15,940	Agriculture, manufacturing	Grain, dairy products, watches, textiles
Syria	77,220	Agriculture	Cotton, silk, wines, fruits
Turkey	294,416	Agriculture, mining	Tobacco, cereals, cotton, minerals
Union of So. Africa	471,917	Mining, stock raising, agriculture	Gold, diamonds, hides, wool, grain
U. S. S. R.	8,241,644	Agriculture, manufacturing	Grain, beets, flax, machinery
United States	3,026,789 (continental)	Agriculture, mining, manufacturing	Cotton, oil, coal, textiles, meat, grain, automobiles, tobacco, chemicals
Uruguay	72,153	Agriculture, grazing	Grain, wool, hides, meat
Venezuela	393,976	Agriculture, stock raising	Coffee, cacao, balata, hides, rubber, oil
Yugoslavia	96,010	Agriculture, stock raising	Corn, sugar, meat, hides

COUNTRIES OF THE WORLD—GOVERNMENTS AND RULERS

Country	Capital	Form of Government	Title of Ruler	Present Ruler	Began Rule
Afghanistan	Kabul	Kingdom	King	Mohammed Zahir Shah	1933
Argentina	Buenos Aires	Republic	President	Roberto Ortiz	1938
Australia	Canberra	Commonwealth	Governor-General	Lord Gowrie of Ruthven	1936
Belgium*	Brussels	Kingdom	King	Leopold III	1934
Bolivia	LaPaz	Republic	President	Col. German Busch	1937
Brazil	Rio de Janeiro	Republic	President	Getulio Vargas	1930
Bulgaria	Sofia	Kingdom	King	Boris III	1918
Canada	Ottawa	Dominion	Governor-General	Lord Tweedsmuir	1935
Chile	Santiago	Republic	President	P. Aguirre Cerda	1938
China	Chungking	Republic	President	Lin Sen	1932
Colombia	Bogotá	Republic	President	Eduardo Santos	1938
Costa Rica	San José	Republic	President	Don Leon Cortez	1936
Cuba	Havana	Republic	President	Dr. F. L. Bru	1936
Denmark*	Copenhagen	Kingdom	King	Christian X	1912
Dominican Republic	Trujillo City	Republic	President	Dr. Jacinto B. Peynado	1938
Ecuador	Quito	Republic	President	M. M. Borrero	1938
Egypt	Cairo	Kingdom	King	Faruk I	1936
Eire (see **Ireland**)					
Finland	Helsinki	Republic	President	Kyosti Kallio	1937
France*	Paris	Republic	President	Henri Petain	1940
Germany	Berlin	Republic	Reichsfuehrer	Adolf Hitler	1933
Great Britain	London	Monarchy	King	George VI	1936
Greece	Athens	Monarchy	King	George II	1935
Guatemala	Guatemala	Republic	President	Jorge Ubico	1931
Haiti	Port-au-Prince	Republic	President	Stenio Vincent	1930
Honduras	Tegucigalpa	Republic	President	Tiburco Carias Andino	1933
Hungary	Budapest	Kingdom	Regent	Nicholas von Horthy	1920
Iceland	Reykjavik	Kingdom	King	Christian X	1912
India, British	Delhi	Federal Union	Viceroy	Marquess of Linlithgow	1936
Iran (Persia)	Teheran	Kingdom	Shah	Mirza Riza Pahlevi	1925
Iraq (Mesopotamia)	Bagdad	Kingdom	King	Ghazi I	1933
Ireland	Dublin	Commonwealth	President	Douglas Hyde	1938
Italy	Rome	Kingdom	King	Victor Emmanuel III	1900
Japan	Tokyo	Empire	Emperor	Hirohito	1926
Liberia	Monrovia	Republic	President	Edwin J. Barclay	1931
Liechtenstein	Vaduz	Principality	Prince	Franz Joseph	1938
Luxembourg*	Luxembourg	Grand Duchy	Grand Duchess	Charlotte	1919
Manchukuo	Hsinking	Japanese Empire	Sub-Emperor	Kang Te	1934
Mexico	Mexico	Republic	President	Gen. Lazaro Cardenas	1934
Monaco	Monaco	Principality	Prince	Louis II	1922
Morocco	Rabat	Protectorate	Sultan	Sidi Mohammed	1927
Nepal	Kathmandu	Kingdom	Maharajah	Tribhubana Bir Bikram	1911
Netherlands*	Amsterdam The Hague	Kingdom	Queen	Wilhelmina	1890
Newfoundland	St. John's	Colony	Governor	Vice-Admiral H. T. Walwyn	1934
New Zealand	Wellington	Dominion	Governor-General	Viscount Galway	1935
Nicaragua	Managua	Republic	President	Anastasio Somoza	1937
Norway*	Oslo	Kingdom	King	Haakon VII	1905
Palestine	Jerusalem	British Mandate	British High Commissioner	Sir Harold MacMichael	1938
Panama	Panama	Republic	President	Juan Arosemena	1936
Paraguay	Asunción	Republic	President	Felix Paiva	1937
Peru	Lima	Republic	President	Oscar Benavides	1933
Philippine Islands	Manila	Commonwealth	President	Manuel Quezon	1935
Poland*	Warsaw	Republic	President	Ignace Moscicki	1926
Portugal	Lisbon	Republic	President	Antonio O. de F. Carmona	1928
Rumania	Bucharest	Kingdom	King	Michael	1940
Salvador, El	San Salvador	Republic	President	Maximiliano H. Martinez	1935
Siam	Bangkok	Kingdom	King	Ananda	1935
Spain	Madrid	Republic	President	Manuel Azana	1936
Sweden	Stockholm	Kingdom	King	Gustaf V	1907
Switzerland	Berne	Republic	President	Johannes Baumann	1938
Syria	Damascus	French Mandate	High Commissioner	Damien, Count de Martel	1933
Turkey	Ankara	Republic	President	Gen. Ismet Inonu	1938
Union of So. Africa	Pretoria	Commonwealth	Governor-General	Sir Patrick Duncan	1936
Union of Soviet Socialist Republics	Moscow	Soviet	General Secretary, Communist Party	Joseph Stalin	1923
United States	Washington	Republic	President	Franklin D. Roosevelt	1933
Uruguay	Montevideo	Republic	President	Gen. Alfredo Baldomir	1938
Venezuela	Caracas	Republic	President	Eleazar Lopez Contreras	1935
Yugoslavia	Belgrade	Kingdom	King	Peter II	1934

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*Conquered by Germany.

ELEVATIONS OF LARGE CITIES OF THE UNITED STATES

The highest and lowest elevations in each of the largest fifty cities of the United States, arranged according to population in 1940.

	Elevation in Feet	
City	Highest	Lowest
New York, N. Y.	430	Sea level
Chicago, Ill.	665	581
Philadelphia, Pa.	440	Sea level
Detroit, Mich.	635	575
Los Angeles, Calif.	2785	Sea level
Cleveland, Ohio	865	573
Baltimore, Md.	445	Sea level
St. Louis, Mo.	585	394
Boston, Mass.	300	Sea level
Pittsburgh, Pa.	1240	715
Washington, D. C.	420	Sea level
San Francisco, Calif.	900	Sea level
Milwaukee, Wis.	740	581
Buffalo, N. Y.	680	571
New Orleans, La.	5	—1
Minneapolis, Minn.	945	695
Cincinnati, Ohio	820	435
Newark, N. J.	225	Sea level
Kansas City, Mo.	1005	745
Indianapolis, Ind.	816	667
Houston, Texas	74	Sea level
Seattle, Wash.	450	Sea level
Rochester, N. Y.	660	260
Denver, Colo.	5550	5100
Louisville, Ky.	540	380
Columbus, Ohio	860	685
Portland, Ore.	1050	Sea level
Atlanta, Ga.	1050	940
Oakland, Calif.	1550	Sea level
Jersey City, N. J.	180	Sea level
Dallas, Texas	500	390
Memphis, Tenn.	320	195
St. Paul, Minn.	1060	685
Toledo, Ohio	625	572
Birmingham, Ala.	900	565
San Antonio, Texas	800	560
Providence, R. I.	199	Sea level
Akron, Ohio	1140	760
Omaha, Nebr.	1245	970
Dayton, Ohio	960	720
Syracuse, N. Y.	681	364
Oklahoma City, Okla.	1100	1070
San Diego, Calif.	300	Sea level
Worcester, Mass.	720	415
Richmond, Va.	225	15
Fort Worth, Texas	700	545
Jacksonville, Fla.	43	Sea level
Miami, Fla.	20	Sea level
Youngstown, Ohio	1080	818
Nashville, Tenn.	746	400

ELEVATIONS OF HEALTH OR PLEASURE RESORTS IN THE UNITED STATES

The elevations above sea level of 100 resorts, the figures being those of the highest points in the places named.

Place	Feet
Abilene, Tex.	1726
Albuquerque, N. M.	4950
Asheville, N. C.	1985
Ashland, Ore.	1868
Atlanta, Ga.	1032
Atlantic City, N. J.	21
Ausable Forks, N. Y.	551
Bar Harbor, Me.	240
Boulder, Colo.	5350
Bozeman, Mont.	4755
Bristol, Tenn.	1680
Burlington, Vt.	112
Carlsbad, N. M.	3102
Carson, Nev.	4660
Cayuga Lake, N. Y.	381
Chautauqua Lake, N. Y.	1308
Cheshire, Mass.	945

Cheyenne, Wyo.	6060
Coeur d'Alene Lake, Ida.	2131
Colorado Springs, Colo.	5980
Concord, N. H.	244
Crawford Notch, N. H.	1891
Custer, S. D.	5301
Delaware Water Gap, Pa.	350
Denver, Colo.	5280
Durango, Colo.	6517
El Paso, Tex.	3710
Flagstaff, Ariz.	6894
Flathead Lake, Mont.	2884
Fort Bayard, N. M.	6166
Fulton Chain Lakes, N. Y.	1706
Glenwood Springs, Colo.	5748
Grand Canyon Hotel, Ariz.	6866
Hot Springs, Ark.	607
Hot Springs, S. D.	3443
Hot Springs, Va.	2195
Jackson Lake, Wyo.	6733
Kaaterskill, N. Y.	2440
Keene, N. H.	487
Lake Champlain, N. Y.	95
Lake Chelan, Wash.	1080
Lake Erie	572
Lake George, N. Y.	322
Lake Hopatcong, N. J.	926
Lake Huron	581
Lake Michigan	581
Lake Ontario	246
Lake Placid, N. Y.	1864
Lake St. Clair	575
Lake Superior	602
Lake Tahoe, Cal.-Nev.	6225
Lake Winnepesaukee, N. H.	504
Las Vegas, N. M.	6714
Little Rock, Ark.	300
Los Angeles, Cal.	300
Luray, Va.	819
Manitou, Colo.	6336
Marfa, Tex.	4695
Miami, Fla.	20
Monterey, Cal.	360
Moosehead Lake, Me.	1023
Natural Bridge, Va.	736
Niagara Falls, N. Y.	603
Ogden, Utah	4300
Oneida Lake, N. Y.	370
Ouray, Colo.	7710
Palm Beach, Fla.	20
Pasadena, Cal.	828
Pensacola, Fla.	39
Phoenix, Ariz.	1083
Plattsburg, N. Y.	109
Portage, N. Y.	1310
Portsmouth, N. H.	80
Prescott, Ariz.	5346
Raquette Lake, N. Y.	1762
Reno, Nev.	4490
St. Petersburg, Fla.	20
Salt Lake City, Utah	4390
San Angelo, Tex.	1847
San Antonio, Tex.	660
San Bernardino, Cal.	1049
Santa Barbara, Cal.	500
Santa Fe, N. M.	6950
Saranac Lake, N. Y.	1535
Saratoga Springs, N. Y.	314
Schroon Lake, N.Y.	807
Sebago Lake, Me.	276
Seneca Lake, N. Y.	444
Skyland, Va.	3606
Tampa, Fla.	72
The Dalles, Ore.	96
Ticonderoga, N. Y.	277
Trinidad, Colo.	5985
Tucson, Ariz.	2375
Tupper Lake, N. Y.	1556
Umbagog Lake, Me.-N. H.	1256
Watkins Glen, N. Y.	1009
White Sulphur Springs, W. Va.	1917
Winchester, Va.	717
Woodstock, N. H.	649

Historical and Geographical Facts about the States and Territories of the Union

STATE OR TERRITORY ORIGIN OF NAME POPULAR NAME	ORIGINAL TERRITORY, FROM WHICH DERIVED, YEAR ADMITTED	SETTLEMENT WHERE, WHEN, BY WHOM	POPULATION WHEN ADMITTED OR ACQUIRED	AREA (In square miles)	PERSONS TO SQUARE MILE (1940)	HIGHEST AND LOWEST ALTITUDES (In feet)	MOTTO AND STATE FLOWER
Alabama, an Indian tribe; "Cotton"	Louisiana, Georgia and Mississippi and Alabama territories. 1819	Mobile Bay, 1702, by the French	127,901	51,998	55.5	Cheaha Mt. 2,407 Gulf of Mexico 0	Here we rest Goldenrod
Alaska, Eskimo for a great country	Purchased from Russia in 1867 for $7,200,000	Three Saints, 1784, by the Russians	Not known	586,400	.1	Mt. McKinley 20,300 Pacific Ocean 0	None
Arizona, Indian for small spring; "Sunset"	New Mexico Territory. 1912	Tucson, 1580, by the Spanish	205,000	113,956	4.4	San Francisco Pk. 12,611 Colorado River 100	*Ditat deus* (God enriches) Sahuaro cactus
Arkansas, an Indian tribe; "Bear"	Louisiana and Louisiana, Missouri and Arkansas territories. 1836	Arkansas Post, 1685, by the French	97,574	53,335	37.	Blue and Magazine Mts. 2,800 Ouachita River 55	*Regnat populi* (The people rule) Apple blossom
California, a Spanish romance; "Golden"	New Albion, Upper California. 1850	San Diego, 1768, by the Spanish	92,597	158,297	44.1	Mt. Whitney 14,496 Death Valley −276	*Eureka* (I have found it) California poppy
Colorado, Spanish for red; "Centennial"	Louisiana and Mexican cession. Colorado Territory. 1876	Auroria, 1859, by the Americans	175,000	103,948	10.8	Mt. Elbert 14,420 Arkansas River 3,350	*Nil sine numine* (Nothing without providence) Columbine
Connecticut, Indian for long river; "Nutmeg"	One of the original 13 states. 1788	Windsor, 1636, by the English	237,964	4,965	348.9	Bear Mt. 2,355 Long Island Sound 0	*Qui transtulit sustinet* (He who transplanted still sustains) Mountain laurel
Delaware, from Lord De la Warr; "Diamond"	New Sweden, New Netherlands, three counties of Pennsylvania. 1787	Near Wilmington, 1631, by the Swedes	59,096	2,370	134.7	Centerville 440 Atlantic Ocean 0	Liberty and independence Peach blossom
District of Columbia, for Columbus	Ceded to United States by Maryland and Virginia	Francis Pope's plantation in 1663 (?)	Not known	70	10,870.3	Tenleytown 420 Potomac River 0	*Justitia omnibus* (Justice to all) American beauty rose
Florida, Spanish for flowering; "Everglades"	Florida territory. 1845	St. Augustine, 1565, by the Spanish	87,445	58,666	35.	Iron Mt. 325 Atlantic Ocean 0	In God we trust Orange blossom
Georgia, for King George II; "Empire of the South"	One of the original 13 states. 1788	Savannah, 1733, by the English	82,548	59,265	53.4	Brasstown Bald 4,768 Atlantic Ocean 0	Wisdom, justice, moderation Cherokee rose
Hawaii, native name	Polynesian islands	Americans founded Honolulu in 1820	154,000	6,435		Mauna Kea 13,825 Pacific Ocean 0	None
Idaho, Indian for light on the mountains; "Gem"	Oregon, Washington and Idaho territories. 1890	Cœur d'Alene, 1842, by the Americans	84,385	83,888	6.3	Borah Peak 12,655 Snake River 720	*Esto perpetua* (Mayest thou last forever) Syringa
Illinois, an Indian nation; "Prairie"	Northwest, Indiana and Illinois territories. 1818	Kaskaskia, 1682, by the French	55,211	56,665	141.2	Charles Mound 1,241 Mississippi River 279	State sovereignty, national union Violet
Indiana, for the Indians; "Hoosier"	Northwest and Indiana territories. 1816	Vincennes, 1702, by the French	147,178	36,354	94.7	Greensfork Tp. 1,240 Ohio River 316	No motto Zinnia
Iowa, an Indian tribe; "Hawkeye"	Louisiana, Missouri, Michigan, Wisconsin and Iowa territories. 1846	Dubuque, 1833, by the Americans	182,000	56,147	45.3	In Osceola Co. 1,675 Mississippi River 477	Our liberties we prize and our rights we will maintain Wild rose
Kansas, an Indian tribe; "Sunflower"	Louisiana, Kansas Territory. 1861	Leavenworth, 1854, by the Americans	107,206	82,158	21.9	In Wallace Co. 4,135 Verdigris River 700	*Ad astra per aspera* (To the stars through difficulties) Sunflower
Kentucky, Indian for land of tomorrow; "Blue Grass"	Virginia. 1792	Boonesboro, 1769, by the English	73,677	40,598	70.9	Big Black Mt. 4,150 Mississippi River 257	United we stand, divided we fall Goldenrod
Louisiana, for Louis XIV of France; "Pelican"	Louisiana, Territory of Orleans. 1812	New Orleans, 1718, by the French	76,556	48,506	52.3	In Claiborn Co. 469 Gulf of Mexico 0	Union, justice and confidence Magnolia
Maine, for French province; "Pine Tree"	New England, Laconia and Massachusetts. 1820	Saco, 1623, by the English	298,335	33,040	27.3	Mt. Katahdin 5,267 Atlantic Ocean 0	*Dirigo* (I direct) Pine cone and tassel

Historical and Geographical Facts about the States and Territories of the Union—Concluded

State or Territory Origin of Name Popular Name	Original Territory, From Which Derived, Year Admitted	Settlement Where, When, by Whom	Population when Admitted or Acquired	Area (In square miles)	Persons to Square Mile (1940)	Highest and Lowest Altitudes (In feet)	Motto and State Flower
Maryland, for the English Queen; "Old Line"	One of the original 13 states. 1788	St. Mary's, 1634, by the English	319,728	12,300	184.2	Backbone Mt. 3,340 Atlantic Ocean 0	*Fatti maschii, parole femine* (Manly deeds, womanly words) Blackeyed Susan
Massachusetts, Indian for great small hills; "Bay"	One of the original 13 states. 1788	Plymouth, 1620, by the English	378,787	8,266	545.9	Mt. Greylock 3,505 Atlantic Ocean 0	*Ense petit placidam sub libertate quietem* (With the sword she seeks calm peace under liberty) Mayflower (trailing arbutus)
Michigan, Indian for big lake; "Wolverine"	Northwest, Indiana and Michigan territories. 1837	Sault Ste. Marie, 1668, by the French	212,267	57,980	92.2	Porcupine Mts. 2,023 Lake Erie 572	*Si quaeris peninsulam amoenam, circumspice* (If you seek a beautiful peninsula, behold it here). Apple blossom
Minnesota, Indian for sky-blue water; "North Star"	Louisiana and Northwest and Minnesota territories. 1858	St. Paul, 1838, by the Americans	172,793	84,682	34.9	Misquah Hills 2,230 Lake Superior 602	*L'etoile du nord* (The star of the north) Moccasin flower
Mississippi, Indian for fish river; "Bayou"	Louisiana and Georgia, Mississippi Territory. 1817	Biloxi, 1699, by the French	75,448	46,865	46.1	Near Iuka 780 Gulf of Mexico 0	*Virtute et armis* (By valor and arms) Magnolia
Missouri, an Indian tribe; "Ozark"	Louisiana and Louisiana and Missouri territories. 1821	St. Genevieve, 1755(?), by the French	66,586	69,420	54.6	Taum Sauk Mt. 1,800 St. Francis River 230	*Salus populi suprema lex esto* (The welfare of the people is the supreme law). Hawthorn
Montana, Spanish for mountain; "Mountain"	Louisiana and Nebraska, Dakota and Montana territories. 1889	Yellowstone River, 1809, by the Americans	175,000	146,997	3.8	Granite Peak 12,850 Kootenai River 1,800	*Oro y plata* (Gold and silver) Bitterroot
Nebraska, Indian for wide river; "Antelope"	Louisiana, Nebraska territory. 1867	Bellevue, 1847, by the Americans	122,993	77,520	17.2	In Banner Co. 5,300 In Richardson Co. 825	Equality before the law Goldenrod
Nevada, Spanish for snow covered; "Silver"	Upper California and Utah and Nevada territories. 1864	Genoa, 1850, by the Americans	35,000	110,690	1.	Boundary Peak 13,145 Colorado River 470	All for our country Sagebrush
New Hampshire, for Hampshire, England; "Granite"	One of the original 13 states. 1788	Portsmouth, 1623, by the English	141,885	9,341	54.5	Mt. Washington 6,288 Atlantic Ocean 0	No motto Purple lilac
New Jersey, for Isle of Jersey; "Garden"	One of the original 13 states. 1787	Elizabethtown, 1617(?), by the Dutch	184,139	8,224	553.1	High Point 1,805 Atlantic Ocean 0	Liberty and prosperity Violet
New Mexico, for Mexico, an Indian name; "Sunshine"	New Mexico Territory. 1912	Santa Fe, 1605, by the Spanish	330,000	122,634	4.4	N. Truchas Peak 13,306 Red Bluff 2,876	*Crescit eundo* (It increases as it goes) Yucca
New York, for Duke of York; "Empire"	One of the original 13 states. 1788	New York, 1614, by the Dutch	340,120	49,204	281.2	Mt. Marcy 5,344 Atlantic Ocean 0	*Excelsior* (Higher) Rose
North Carolina, for Charles II of England; "Old North"	One of the original 13 states. 1789	Albemarle Sound, 1653, by the English	393,751	52,426	72.7	Mt. Mitchell 6,684 Atlantic Ocean 0	*Esse quam videri* (To be, rather than to seem) Goldenrod
North Dakota, Indian for allies; "Sioux"	Louisiana, Minnesota and Nebraska and Dakota territories. 1889	Red River Valley, 1793, by the French	182,000	70,837	9.2	Black Butte 3,468 Pembina 790	Liberty and union, now and forever, one and inseparable Wild prairie rose
Ohio, Indian for great; "Buckeye"	Northwest Territory. 1803	Marietta, 1788, by the Americans	45,365	41,040	168.	Campbell Hill 1,550 Ohio River 425	*Imperium in imperio* (An empire within an empire). Carnation
Oklahoma, Indian for red people; "Sooner"	Indian and Oklahoma territories. 1907	Guthrie, 1889, by the Americans	1,414,042	70,057	33.7	Black Mesa 4,978 Red River 300	*Labor omnia vincit* (Labor conquers everything) Mistletoe
Oregon, Spanish for wild Sage(?); "Beaver"	Oregon Territory. 1859	Astoria, 1811, by the Americans	52,566	96,699	11.3	Mt. Hood 11,253 Pacific Ocean 0	*Alis volat propriis* (She flies with her own wings) Oregon grape
Pennsylvania, Latin for Penn's woods; "Keystone"	One of the original 13 states. 1787	Chester, 1638, by the Swedes	434,373	45,126	219.8	Negro Mt. 3,213 Delaware River 0	Virtue, liberty and independence Mountain Laurel
Puerto Rico, Spanish for rich port	Spanish colony	San Juan, 1510, by the Spanish	953,243	3,435		Ponce Peak 4,399 Atlantic Ocean 0	None
Rhode Island, for the Aegean island	One of the original 13 states. 1790	Providence, 1636, by the English	68,825	1,248	674.2	Durfee Hill 805 Atlantic Ocean 0	Hope The violet
South Carolina, for Charles II of England; "Palmetto"	One of the original 13 states. 1788	Ashley River, 1670, by the English	249,073	30,989	62.1	Sassafras Mt. 3,548 Atlantic Ocean 0	*Dum spiro, spero* (While I breathe, I hope) Yellow jessamine
South Dakota, Indian for allies; "Coyote"	Louisiana, Minnesota and Nebraska and Dakota territories. 1889	Southeast part, 1794, by the French	328,808	77,615	8.4	Harney Peak 7,242 Big Stone Lake 962	Under God the people rule Pasque flower
Tennessee, Indian for winding river; "Volunteer"	North Carolina and the state of Franklin. 1796	Fort Loudon, 1757, by the English	35,791	42,022	69.5	Clingmans Dome 6,642 Mississippi River 182	Agriculture, commerce Iris
Texas, Indian for friends; "Lone Star"	Mexico and Republic of Texas. 1845	San Antonio, 1692, by the Spanish	212,592	265,896	24.1	Guadelupe Peak 8,751 Gulf of Mexico 0	Friendship Bluebonnet
Utah, for the Ute Indians; "Deseret"	Mexican cession, Utah Territory. 1896	Salt Lake City, 1847, by the Americans (Mormons)	207,905	84,990	6.7	King's Peak 13,498 Beaverdam Creek 2,000	Industry Sego lily
Vermont, French for green mountain; "Green Mountain"	New Netherland, New Hampshire grants. 1791	Fort Dummer, 1724, by the English	85,425	9,564	38.7	Mt. Mansfield 4,393 Lake Champlain 95	Freedom and unity Red clover
Virginia, for Queen Elizabeth of England; "Old Dominion"	One of the original 13 states. 1788	Jamestown, 1607, by the English	748,308	42,627	67.1	Mt. Rogers 5,719 Atlantic Ocean 0	*Sic semper tyrannis* (Ever so to tyrants) American dogwood
Washington, for George Washington; "Evergreen"	Oregon and Washington territories. 1889	Columbia River, 1811, by the English	349,390	69,127	25.9	Mt. Rainier 14,408 Pacific Ocean 0	*Al-ki* (By and by) Rhododendron
West Virginia, from Virginia; "Panhandle"	Virginia. 1863	Berkeley Co., 1726 (?), by the English	376,688	24,170	79.	Spruce Knob 4,860 Potomac River 240	*Montani semper liberi* (Mountaineers are always free men) Rhododendron
Wisconsin, Indian for wild swift channel; "Badger"	Northwest, Illinois, Michigan and Wisconsin territories. 1848	Green Bay, 1665, by the French	305,391	56,066	57.3	Rib Hill 1,940 Lake Michigan 581	Forward Violet
Wyoming, Indian for mountain and valley	Louisiana, Dakota and Wyoming territories. 1890	Bessemer Bend, 1834, by the Americans	60,705	97,914	2.6	Gannett Peak 13,785 Belle Fourche River 3,100	*Cedant arma togae* (Let arms yield to the gown) Indian paint brush

BIBLIOGRAPHY

General

H. W. van Loon, *Geography, the Story of the World We Live In,* Simon and Schuster, N.Y., 1932, $3.75

V. M. Hillyer, *A Child's Geography of the World,* Appleton-Century, N.Y., 1929, $2.00

Vernon Quinn, *Picture Map Geography of the World,* Stokes, N.Y., 1932, $2.50

Luther C. Snider, *Earth History,* Appleton-Century, N.Y., 1932, $4.50

Eugene van Cleef, *Trade Centers and Trade Routes,* Appleton-Century, N.Y., 1937, $3.50

G. D. Hubbard, *The Geography of Europe,* Appleton-Century, N.Y., 1937, $5.00

L. E. Klimm, *Introductory Economic Geography,* Harcourt Brace, N.Y., 1937, $3.75

Delos O. Kinsman, *Our Economic World,* T. Y. Crowell, N.Y., 1937, $3.50

Charles R. Walker, *The American City* (Minneapolis), Farrar Rinehart, N.Y. 1937, $2.50

Robert S. Lynd and Helen Merrell Lynd, *Middletown* (Muncie, Ind.), Harcourt, Brace, N.Y., 1929, $5.00

Robert S. Lynd and Helen Merrell Lynd, *Middletown in Transition,* Harcourt, Brace, N.Y., 1937, $5.00

L. Outhwaite, *Unrolling the Map,* Reynal and Hitchcock, N.Y., 1935, $3.75

H. W. van Loon, *The Romance of Discovery,* Carlton House, N.Y., 1917, $1.49

John T. Faris, *Real Stories of the Geography Makers,* Ginn, N.Y., 1925, 92¢

Hader and Hader, *Picture Book of Travel,* Macmillan, N.Y., 1928, $2.00

J. Cottler and H. Jaffe, *Map Makers,* Little Brown, Boston, 1936, $1.75

Padraic Colum, *The Voyagers,* Macmillan, N.Y., 1925, $2.25

Marion Lansing, *Great Moments in Exploration,* Doubleday Doran, N.Y., 1928, $2.50

Karl Sundheim, *The Romance of Exploration,* Hillman Curl, N.Y., 1937, $1.50

R. C. Andrews, *This Business of Exploring,* Putnam, N.Y., 1935, $3.50

R. C. Andrews, *Ends of the Earth,* Garden City Pub. Co., Garden City, N.Y., 1932, $1.00

Carveth Wells, *Adventure,* Garden City Pub. Co., Garden City, N.Y., 1931, $1.00

Margaret B. Synge, *The Book of Discovery,* Putnam, N.Y., 1912, $5.00

Margaret B. Synge, *The Romance of Discovery,* Carlton House, N.Y., 1936, $1.29

Mary H. Wade, *The Boy Who Loved the Sea* (Captain Cook) Appleton-Century, N.Y., 1931, $1.75

H. A. Franck, *Vagabond Journey Around the World,* Garden City Pub. Co., Garden City, N.Y., 1910, $1.00

A. Limpus, *Sea Lord: Francis Drake,* Macmillan, N.Y., 1932, $2.50

Richard Hakluyt, *Voyages,* E. P. Dutton, N.Y., 1927, $3.00

Charles J. Finger, *Heroes from Hakluyt,* Holt, N.Y., 1928, $3.00

A. S. Hildebrand, *Magellan,* Harcourt Brace, N.Y., 1924, $2.75

Charles Ford, *Death Sails with Magellan,* Random House, N.Y., 1937, $2.50

Stefan Zweig, *Conqueror of the Seas* (Magellan), Viking, N.Y., 1938, $3.50

John Lang, *The Story of Captain Cook,* E. P. Dutton, N.Y., 1906, $1.00

Sven Hedin, *My Life as an Explorer,* Liveright, N.Y., 1925, $5.00

Lincoln Ellsworth, *Exploring Today,* Dodd Mead, N.Y., 1935, $1.75

Hoffman Birney, *Roads to Roam,* Burt, N.Y., 1930, $1.00

R. E. Fulton, Jr., *One Man Caravan,* Harcourt Brace, N.Y., 1937, $2.75

T. C. Bridges and H. H. Tiltman, *Heroes of Modern Adventure,* Little Brown, Boston, 1927, $2.00

John Craig, *Danger Is My Business,* Simon and Schuster, N.Y., 1938, $3.00

Vincent Sheean, *Personal History,* Doubleday Doran, Garden City, N.Y., 1936, $3.00

James P. Barker, *The Log of a Limejuicer,* Macmillan, N.Y., 1936, $3.00

North Pole and South Pole

H. E. Davis, *The Year is a Round Thing,* Harpers, N.Y., 1937, $2.00

Thora Thorsmark, *Children of Lapland,* Rand McNally, Chicago, 1936, 10¢

Jeannette Mirsky, *To the North!* Viking, N.Y., 1934, $3.75

Robert A. Bartlett, *The Log of Bob Bartlett,* Putnam, N.Y., 1923, $2.75

D. Wallace, *Story of Grenfell of the Labrador,* Revel, Inc., N.Y., 1922, $1.50

Vilhjalmur Stefansson, *The Friendly Arctic,* Macmillan, N.Y., 1921, $6.50

J. K. MacLean, *Heroes of the Farthest North and South,* T. Y. Crowell, N.Y., 1930, $2.00

Vilhjalmur Stefansson, *My Life With the Eskimos,* Macmillan, N.Y., 1927, $2.50

Vilhjalmur Stefansson, *The Hunters of the Great North,* Harcourt Brace, N.Y., 1922, $2.50

Daniel Streeter, *An Arctic Rodeo,* Putnam, N.Y., 1929, $2.50

Anne Lindbergh, *North to the Orient,* Harcourt Brace, N.Y., 1935, $2.50

John S. O'Brien, *Alone Across the Top of the World,* Winston, Phil., 1935, $2.00

Peter Freuchen, *Arctic Adventure,* Farrar and Rinehart, N.Y., 1935, $3.50

Paul Siple, *Boy Scout With Byrd,* Putnam, N.Y., 1931, $1.75

Martin Lindsay, *The Epic of Captain Scott,* Putnam, N.Y., 1934, $1.50

C. Turley, *The Voyages of Captain Scott,* Dodd Mead, N.Y., 1915, $2.50

Richard E. Byrd, *Little America,* Putnam, N.Y., 1930, $5.00

George Seaver, *Edward Wilson of the Antarctic,* E. P. Dutton, N.Y., 1938, $2.00

Roald Amundsen, *The South Pole,* Lee Kendrick, N.Y., 1929, $10.00

E. H. Shackleton, *South,* Macmillan, N.Y., 1926, $2.50

Old World

M. and L. MacVeagh, *Greek Journey,* Dodd Mead, N.Y., 1937, $2.00

H. A. Perdue, *Child Life in Other Lands,* Rand McNally, Chicago, 1918, 85¢

Frances Eliot, *The Traveling Coat,* E. P. Dutton, N.Y., 1937, $1.50

Mary Wade, *Our Little German Cousin,* Page, N.Y., 1930, $1.30

E. Johnson and A. M. Peck, *Roundabout Europe,* Harpers, N.Y., 1931, $2.00

A. M. Peck, *Young Germany,* McBride, N.Y., 1931, $2.00

Little Schoolmate Series, Edited by Florence Converse, E. P. Dutton, N.Y., $2.00 each:

- Charles H. Schnapps, *Archag, the Little Armenian,* 1920
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Mary Wade, *Our Little Russian Cousin,* Page, N.Y., 1930, $1.00

Mary Wade, *Our Little Turkish Cousin,* Page, N.Y., 1929, $1.00

Caroline Singer and C. L. Balridge, *Ali Lives in Iran,* Holiday House, N.Y., 1937, $1.75

Freya Stark, *Baghdad Sketches,* E. P. Dutton, N.Y., 1938, $3.50

Dhan Gopal Mukerji, *My Brother's Face,* E. P. Dutton, N.Y., 1924, $3.00

Mary Wade, *Twin Travelers in India,* Page, N.Y., 1920, $2.00

Rudyard Kipling, *Kim,* Doubleday Doran, Garden City, N.Y., 1917, $2.00

Stella M. Rudy, *Children of China,* Rand McNally, Chicago, 1937, 10¢

Frances Carpenter, *Tales of a Chinese Grandmother,* Doubleday Doran, Garden City, N.Y., 1937, $2.00

Mary Wade, *Twin Travelers in China and Japan,* Stokes, N.Y., 1922, $2.00

Japan for the Young, Board of Tourist Industry, Japanese Government Railway, Tokyo, 1937

S. L. Jean and Grace Hallock, *Spending the Day in Japan, China and the Philippines,* Harpers, N.Y., 1937, $1.50

Mark Twain, *A Tramp Abroad,* Harpers, N.Y., 1924, $2.75

J. Siviré, *King Zog's Albania,* Liveright, N.Y., 1937, $3.00

Ruth B. Owen, *Denmark Caravan,* Dodd Mead, N.Y., 1936, $2.00

Ichikaiwa Haruko, *A Japanese Lady in Europe,* E. P. Dutton, N.Y., 1937, $2.50

Edmund Vale, *How to See England,* E. P. Dutton, N.Y., 1938, $2.50

W. H. Hudson, *Afoot in England,* Knopf, N.Y., 1922, $2.00

Will Duranty, *I Write as I Please,* Simon and Schuster, N.Y., 1935 $3.00

Jay N. Darling, *Ding Goes to Russia,* McGraw Hill, 1936, $1.00

F. L. Codinay, *Was It a Holiday* (France), Little Brown, Boston, 1935, $1.75

A. Greene, *Sunshine and Dust* (Italy), Appleton-Century, N.Y., 1936, $4.00

H. M. Tomlinson, *London River,* Knopf, N.Y., 1921, $1.25

Vincent Sheean, *The New Persia,* Appleton-Century, N.Y., 1927, $2.50

Robert H. Davies, *Oriental Odyssey,* Stokes, N.Y., 1937, $3.00

E. K. Maillart, *Turkestan Solo,* Putnam, N.Y., 1935, $3.00

Lowell Thomas, *India: Land of the Black Pagoda,* Garden City Pub. Co., Garden City, N.Y., 1930, $1.00

Frank Buck, *On Jungle Trails,* Stokes, N.Y., 1937, $1.75

Marco Polo, *Travels,* E. P. Dutton, N.Y., 1907, $1.00

Edsu Sugimoto, *A Daughter of the Samurai,* Doubleday Doran, Garden City, N.Y., 1925, $2.50

Carl Crow, *Four Hundred Million Customers,* Harpers, N.Y., 1937, $3.00

Sven Hedin, *A Conquest of Tibet,* E. P. Dutton, N.Y., 1934, $5.00

Lafcadio Hearn, *Glimpses of Unfamiliar Japan,* Houghton Mifflin, Boston, 1899, $6.00

Emil Ludwig, *The Nile,* Viking, N.Y., 1937, $5.00

South

Elizabeth K. Steen, *Red Jungle Boy,* Harcourt Brace, N.Y., 1937, $2.00

R. C. Gill, *Manga: Amazon Jungle Indian,* Stokes, N.Y., 1937, $2.00

M. H. Lee, *Volcanoes in the Sun,* T. Y. Crowell, N.Y., 1937, $1.50

Anne M. Peck, *Young Mexico,* McBride, N.Y., 1934, $2.50

R. Gaines and G. W. Read, *The Village Shield* (Little Schoolmate Series Mexico), E. P. Dutton, N.Y., 1928, $2.00

Stella B. May, *Children of Mexico,* Rand McNally, Chicago, 1936, 10¢

Blanche C. Wagner, *Tales of Mayaland,* San Pasqual Press, Pasadena, 1938, $1.50

William Beebe, *Exploring with Beebe,* Putnam, N.Y., 1932, $2.50

Carlton Beals, *America South,* Lippincott, Phila., 1937, $2.50

Carveth Wells, *Panamexico,* McBride, N.Y., 1937, $2.75

Tom Marvel, *Circling the Caribbean,* Harcourt Brace, N.Y., 1937, $2.50

Carlton Beals, *Banana Gold,* Lippincott, Phila., 1932, $3.00

William Beebe, *Jungle Days,* Putnam, N.Y., 1925, $3.00

Hendrik de Leeuw, *Crossroads of the Caribbean Sea,* Messner, N.Y., 1935, $3.00

Hendrik de Leeuw, *Crossroads of the Buccaneers,* Lippincott, Phila., 1937, $3.00

William Beebe, *Arcturus Adventure,* Putnam, N.Y., 1926, $7.50

William Beebe, *Half Mile Down,* Harcourt Brace, N.Y., 1934, $5.00

John Vandercook, *Tom Tom,* Harpers, N.Y., 1926, $3.50

Victor W. von Hagen, *Off With Their Heads,* Macmillan, N.Y., 1937, $3.00

C. W. D. Fife, *Modern South America,* Lippincott, Phila., 1931, $3.50

Hudson Strode, *South by Thunderbird,* Random House, N.Y., 1938, $3.00

H. M. Tomlinson, *The Sea and the Jungle,* E. P. Dutton, N.Y., 1928, $1.00

W. B. Guitteau and N. O. Winter, *Seeing South America,* Row, N.Y., 1929, $1.00

A. Desmond, *South American Adventure,* Macmillan, N.Y., 1934, $2.50

J. S. Childers, *Sailing South American Skies,* Farrar and Rinehart, N.Y., 1936, $2.50

Julian Duguid, *Green Hell,* Appleton-Century, N.Y., 1931, $4.00

W. H. Hudson, *Green Mansions,* Grossett and Dunlap, N.Y., 1931, $1.00

Peter Fleming, *Brazilian Adventure,* Scribners, N.Y., 1934, $2.75

E. Erskine Loch, *Fever, Famine and Gold,* Putnam, N.Y., 1938, $3.00

Erna Fergusson, *Venezuela,* Knopf, N.Y., 1938, $3.00

W. H. Hudson, *Far Away and Long Ago,* E. P. Dutton, N.Y., 1924, $2.00

Negley Farson, *Transgressor in the Tropics,* Harcourt Brace, N.Y., 1938, $2.50

A. H. Verrill, *Panama, Past and Present,* Dodd Mead, N.Y., 1921, $2.00

J. B. Bishop, *The Panama Gateway,* Scribners, N.Y., 1913, $3.00

Aldous Huxley, *Beyond the Mexique Bay,* Harpers, N.Y., 1934, $2.75

John Vandercook, *Black Majesty,* Harpers, N.Y., 1928, $2.50

René Belbenoit, *Dry Guillotine,* E. P. Dutton, N.Y., 1938, $3.00

Hamilton Cochran, *These are the Virgin Islands,* Prentice-Hall, N.Y., 1937, $3.00

Lee S. Crandall, *Paradise Quest,* Scribners, N.Y., 1931, $3.50

Larry Barretto, *Hawaiian Holiday,* Dodd Mead, N.Y., 1938, $2.00

K. M. Elliott, *Riema, Little Brown Girl of Java,* Knopf, N.Y., 1937, $2.00

J. Brooks Atkinson, *The Cingalese Prince,* Doubleday Doran, Garden City, N.Y., 1934, $2.50

Hendrik de Leeuw, *Crossroads of the Java Seas,* Garden City Pub. Co., Garden City, N.Y., 1931, $1.00

F. O'Brien, *Atolls of the Sun,* Appleton-Century, N.Y., 1922, $5.00

C. Gessler, *Hawaii—Isles of Enchantment,* Appleton-Century, N.Y., 1937, $5.00

Nordhoff and Hall, *Faery Lands of the South Seas,* Harpers, N.Y., 1921, $1.00

H. M. Tomlinson, *Tide Marks,* Harpers, N.Y., 1924, $4.00

John Vandercook, *The Dark Islands,* Harpers, N.Y., 1937, $3.50

Miguel Covarrubias, *Island of Bali,* Knopf, N.Y., 1937, $5.00

F. O'Brien, *White Shadows in the South Seas,* Appleton-Century, N.Y., 1921, $5.00

Lewis Freeman, *In the Tracks of the Trades,* Dodd Mead, N.Y., 1920, $5.00

Isak Dinesin, *Out of Africa,* Random House, N.Y., 1938, $2.75

Attilio Gatti, *Great Mother Forest* (Africa), Scribners, N.Y., 1937, $2.50

W. Cameron Forbes, *The Philippine Islands,* Houghton Mifflin, Boston, 1929, $12.50

Paul Du Chaillu, *Country of the Dwarfs,* Harpers, N.Y., 1928, $2.00

Charles J. Finger, *David Livingstone,* Doubleday Doran, Garden City, N.Y., 1931, $2.50

Paul Du Chaillu, *In African Forest and Jungle,* Scribners, N.Y., 1903, $2.25

Daniel Streeter, *Denatured Africa,* Garden City Pub. Co., Garden City, N.Y., 1929, $1.00

Martin E. Johnson, *Over African Jungles,* Harcourt Brace, N.Y., 1937, $1.89

Mary L. J. Akeley, *Carl Akeley's Africa,* Blue Ribbon, N.Y., 1929, $1.00

Mary L. J. Akeley, *Restless Jungle,* McBride, N.Y., 1936, $3.00

Stewart E. White, *Land of Footprints* (Africa), Doubleday Doran, Garden City, N.Y., 1912, $2.00

G. M. Haardt and L. Audouin-Dubreuil, *The Black Journey,* Cosmopolitan, N.Y., 1927, $4.00

André Gide, *Travels in the Congo,* Modern Age, N.Y., 1929, 25¢

Clifton Johnson, *Sailing For Gold,* Putnam, N.Y., 1938, $2.00

F. Fox and P. A. Vaile, *Australia and New Zealand,* Macmillan, N.Y., 1921, $1.25

H. H. Richardson, *The Fortunes of Richard Mahoney* (*Australia Felix*), Norton, N.Y., 1931, $3.50

William Hatfield, *I Find Australia,* Oxford, N.Y., 1937, $3.50

Jack McLaren, *My Crowded Solitude,* McBride, N.Y., 1926, $3.50

C. Kearton, *I Visit the Antipodes,* Ryerson, N.Y., 1937, $2.50

D. M. Dow, *Australia Advances,* Funk and Wagnalls, N.Y., 1938, $2.00

West

Alice Dalgliesh, *America Travels,* Macmillan, N.Y., 1933, $2.00

Vernon Quinn, *Picture Map Geography of the United States,* Stokes, N.Y., 1931, $2.50

Abbie F. Brown, *Round Robin* (Little Schoolmate Series), E. P. Dutton, N.Y., 1931, $2.00

John T. Faris, *Little Journeys in the Eastern States,* Art Educ. League, N.Y., 1926, $1.50

John T. Faris, *Romance of the Rivers,* Harpers, N.Y., 1927, $6.00

E. Johnson and A. M. Peck, *Roundabout America,* Harpers, N.Y., 1933, $3.50

J. T. Bealby and F. Fairfield, *Canada and Newfoundland,* Macmillan, N.Y., 1921, $1.25

Mark Twain, *Life on the Mississippi,* Harpers, N.Y., 1923, $2.25

L. P. Latimer, *Your Washington and Mine,* Scribners, N.Y., 1924, $1.25

Federal Writers, *American Guide Series,* Houghton Mifflin, Boston, 1937, $2.50 each:
  Maine
  Connecticut
  New Orleans

Of Ships and the Sea

H. W. van Loon, *Ships and How They Sailed the Seven Seas,* Simon and Schuster, N.Y., 1935, $3.00

Howard I. Chapelle, *The History of American Sailing Ships,* Norton, N.Y., 1935, $7.50

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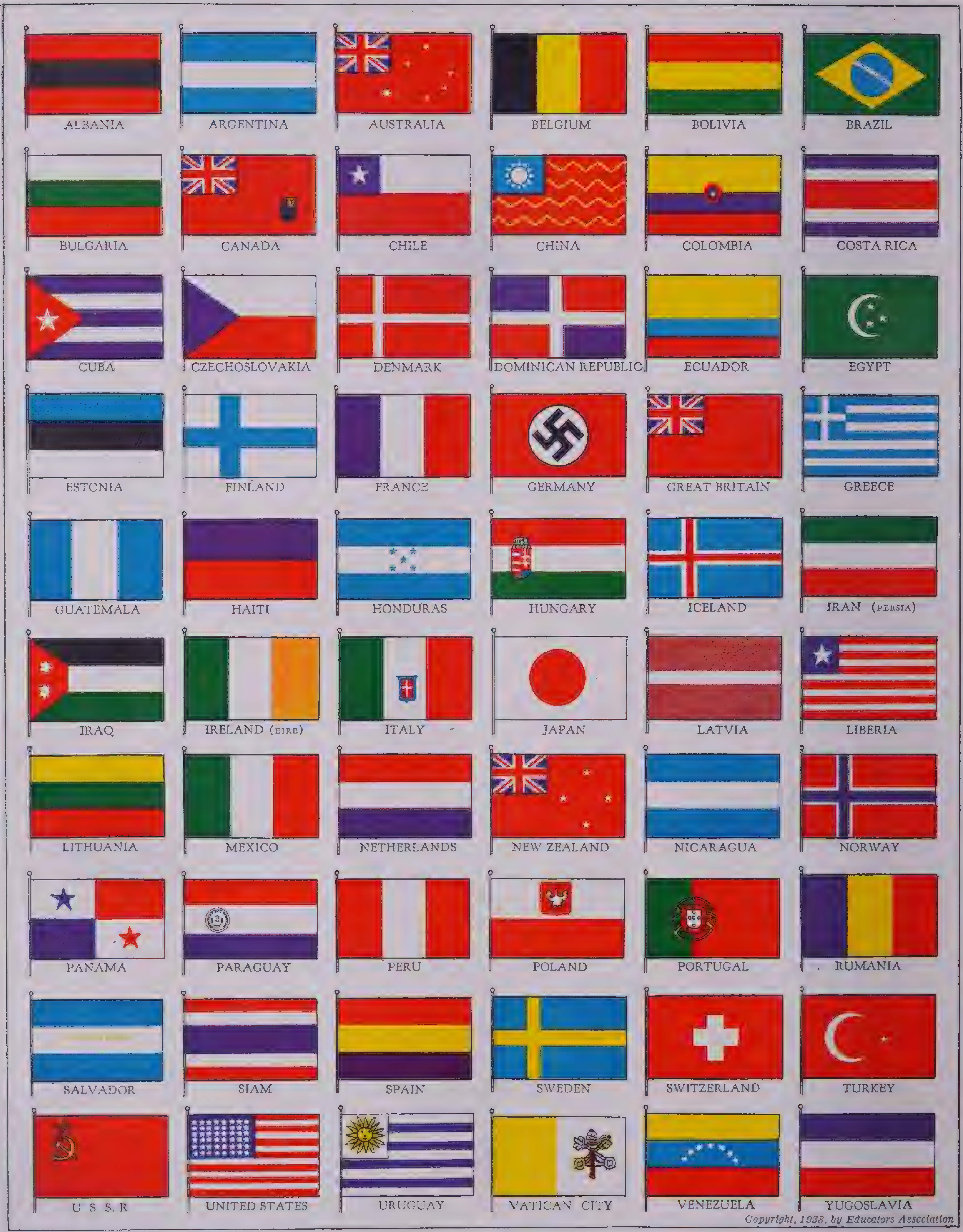

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CUBA
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DENMARK
DOMINICAN REPUBLIC
ECUADOR
EGYPT
ESTONIA
FINLAND
FRANCE
GERMANY
GREAT BRITAIN
GREECE
GUATEMALA
HAITI
HONDURAS
HUNGARY
ICELAND
IRAN (PERSIA)
IRAQ
IRELAND (EIRE)
ITALY
JAPAN
LATVIA
LIBERIA
LITHUANIA
MEXICO
NETHERLANDS
NEW ZEALAND
NICARAGUA
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FLAGS OF THE NATIONS

BOOK VI: HISTORY

ARCHEOLOGY

Archeology (from Greek *archaia,* "ancient things," and *logos,* a "study" or "science") may be defined as the scientific study of the material objects left behind by ancient man. As the term is at present used, it comprises the study of nothing beyond the "works of men's hands," and it thus rejects such elements as ancient literature and the skeletal remains of early man. At the same time, the archeologist is obliged, from the very nature of the case, to make the greatest possible use of literary accounts, where they do exist, for the purpose of bringing light to bear on obscure archeological problems; and the evidence that is supplied by paleontology and many others of the sciences must not be neglected in archeological pursuits.

The field of archeological research is essentially the world, at least all parts of it where the foot of earlier man has trodden. In time, it covers the period that begins with the "eoliths," or the dawn stones, the first attempts of man at fashioning stones into hand implements, and ends with the Middle Ages. Indeed, it has been extended by some authorities to include the medieval period and even the modern world to the end of the 18th century.

The scope of archeological investigation is vastly more extensive in time if not in area than that of history. Hence, it is infinitely too vast to be comprehended by any single mind. Accordingly, archeologists are found divided into groups by periods or by geography: Classical (Greece and Rome), Egyptian, Mesopotamian, American, etc. Besides, archeologists devote themselves each to a special field of study: architectural, ceramic, numismatic or epigraphic, as they are interested in buildings, pottery, coins or inscriptions, respectively.

The purpose of archeology is to paint a clear picture of ancient cultures. For the prehistoric period (earlier than about 3500 B.C.), we are dependent entirely on the material things that the hands of man have fashioned. The historic age is illuminated by literary accounts, almost all so aristocratic in tone that they give a one-sided picture of the early civilizations. Archeology helps to correct this distorted view, for it investigates, quite impartially, the remains of temples and palaces and the ruins of the poor man's hut. In the archeological museum, we find, not only splendid sculptures and paintings, but humble earthen vessels, axe-heads, household utensils and many other objects that are useful rather than decorative.

Because it studies all available material that has been shaped by the hand of man throughout the ages, archeology is the most comprehensive and the most variegated of the sciences. It is the most useful aid that historical research can employ. On the material side, its discoveries furnish our museums with works of art that are often priceless in themselves and indispensable to a proper understanding of mankind's development in culture and civilization.

The course of man's existence upon earth may be divided into many periods. Of these the most important may be thus distinguished: (1) The Paleolithic, when the chief tools used by man were fashioned from stone by the process of chipping and flaking. The home of Paleolithic man was in the forest, in caves, or more commonly, in rock-shelters where the dampness of the cave was avoided. (2) the Neolithic, when the stone implements were ground and polished, as in the case of the American Indian cultures. In this era the arts of the potter originated, and agriculture came to be practiced in a small way. The dwelling of man was now the daub-and-wattle hut or the log cabin. (3) The Bronze Age shows distinct advance in the crafts and arts. The potter's wheel is invented and the Neolithic village is replaced, in some regions, by the town or city. (4) The Iron Age, when men came to appreciate the value of this metal which had, indeed, long been known but used mainly for ornament. This age merges with the Modern.

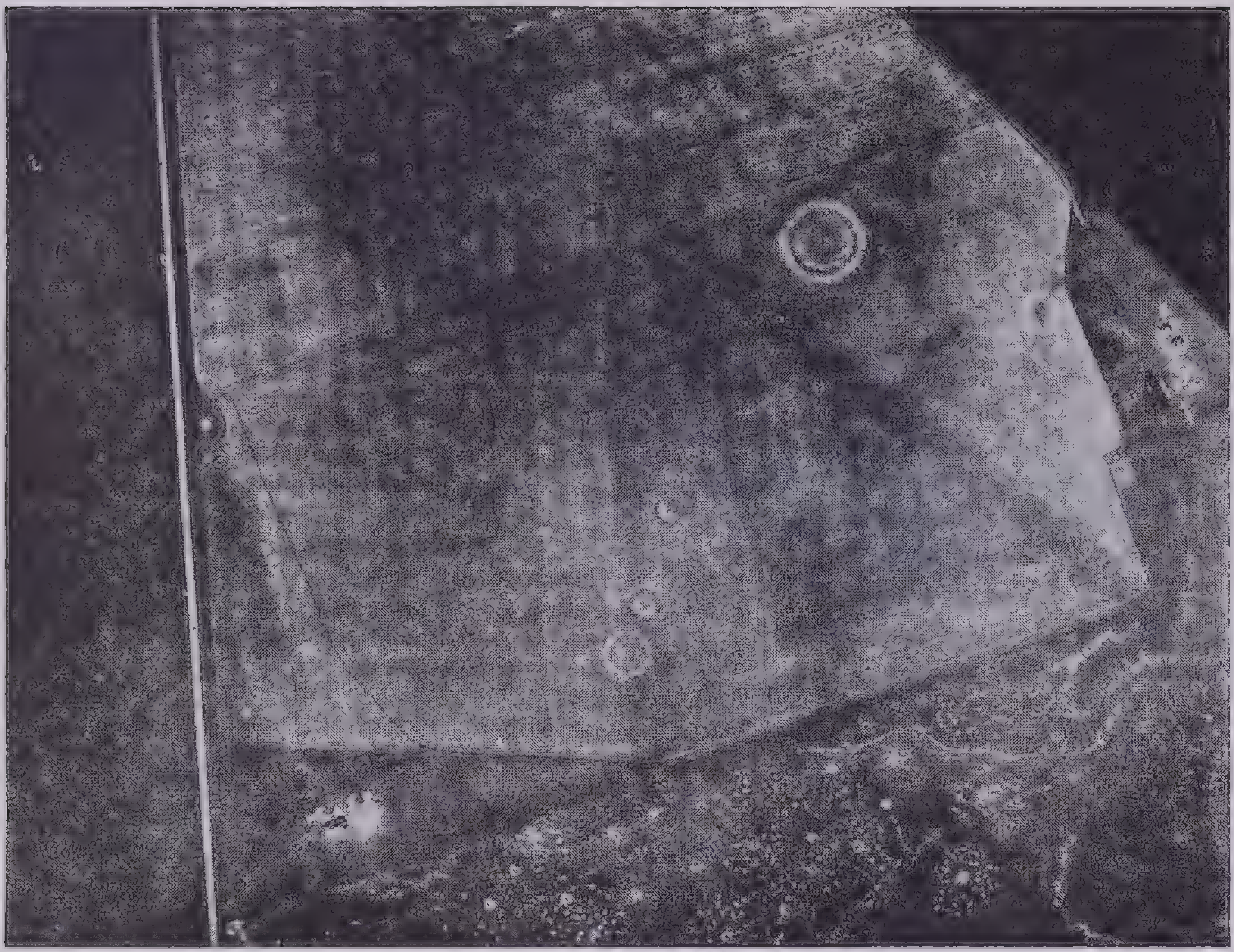
It is impossible to assign to these periods of time dates that are of much more than local significance. As an illustration, it may be noted that the Neolithic Age, which came to an end in Crete about 3000 B.C., persisted in America till the coming of the white men more than 4,500 years later. The cultures of the Americas never had either a Bronze or an Iron Age but skipped from Neolithic to Modern.

Chief among the materials that one may expect to find in an archeological excavation are pottery and architectural fragments. Archeological research on any period later than the Paleolithic is based on pottery. It is everywhere found, it is indestructible and it presents so many varieties of textures and decoration that it provides in itself a history of the cultural development of a given people. Architectural materials are to a considerable extent perishable. Nothing survives the action of time but stone, stucco, cement, mortar, terracotta and baked brick. The crude, or sun-dried, brick that was so much used in antiquity for building purposes comes to light almost invariably as a disintegrated mass of earth. Coins are of great importance, where they do occur, in establishing chronologies, but they are found little before 700 B.C. The nature of ancient religious beliefs created a demand for sculpture, and in this art we find the chief artistic expression of ancient civilizations. Paintings seldom survive, though the Bronze Age in Crete and Greece and the historical period of the Roman world provide us with sufficient examples of frescoes and mosaics to enable us to appreciate to some extent the details of this art. Weapons, offensive and defensive, household utensils and implements of agriculture are universally found. Inscriptions are of the greatest value to the historian and the student of social sciences, but they are found only among the remains of more advanced civilizations.

The method of discovering ancient sites is interesting. In the case of almost all the important cities of antiquity, the identity of their sites has never been lost; often, as with Rome and Athens, the original name has never been altered. But there are many lesser towns of the historical period, which were long ago covered up and the names forgotten. These we may identify through inscriptions found on the site. Light may be thrown likewise on the same point by the discovery of large numbers of coins the majority of which attest the ancient name.

But there are also many settlements, largely prehistoric, of whose name and fame we have no knowledge, although the exploitation of their ruins may prove of the highest archeological importance. Some of these, unsought by the explorer or excavator, we come to know of through the casual diggings of peasants who unearth objects of value that they offer to dealers in antiquities, and thus the secret is revealed. Sometimes the accumulated debris of the town forms a mound whose contours are unmistakable to expert eye.

Since the World War, air photography has proved useful in revealing the existence of ancient graves, earthworks, roads, systems of cultivation and even settlements. Where these are completely covered with earth, faint elevations and depressions may be left on the surface that will, in the early morning and late evening, throw shadows deep enough to be picked up by the camera of the airman. Ancient



Courtesy Ordnance Survey Office, Southampton

The Airplane Aids the Archeologist

This air photograph taken over Salisbury Plain, England, reveals in a series of concentric circles the presence of Bronze Age disk barrows or circular burial mounds. The white outer circle is the bank, within which the ditch shows black. Next is a platform with a small mound in the center. Several dark circles toward the top of the picture indicate the ditches of ordinary barrows. The grass which grows in them is more luxuriant and consequently of a deeper green than in the surrounding area. The main patterns show the effect of cross-plowing; the white dots and streaks in the lower right are hay scattered for cattle

disturbances of the soil, for whatever purpose, seem to leave their inevitable traces in the plain, chiefly in the variegated colors of the vegetation, which the modern film and lens have no difficulty in differentiating. In a heavily forested country it is of course useless to attempt to photograph from the air. The process has been used with much success in Palestine and elsewhere in the Near East where so many objects of interest lie beneath a coating of sand. A recent report declares that a part of the original Mason and Dixon Line has been discovered in this way.

In excavating a site, the actual work of digging is performed, not by the so-called excavators, but by native workmen under the control of a native foreman. At the head of the party is the Director who must possess a working knowledge of the various types of material that are likely to be unearthed and some experience in the scientific principles of excavation. He is supported by a staff of experts, each of whom pursues some special task: surveying the site at all depths of progress, photographing the site and the finds, making drawings and plans.

It is the desire of every archeologist that the site he is investigating may present an undisturbed system of stratigraphy. That is to say, that the spade may unearth a regular series of layers each of which houses the remains of its peculiar culture; and that it may not happen that the inhabitants have on occasion resorted to levelling the ground or to any procedure that results in confusing the various layers. When a layer or stratum containing a certain style of beads, pottery, figurines is replaced by one that shows materials of a wholly different type, the inference is that we have to do with an invasion and a resettlement of the site by outsiders. Frequently the hostile nature of their coming is heralded by traces of fire. Peaceful penetration reveals itself in other ways. It is clear that the record of the site must be read from beneath upward, or in an order that is the reverse of that in which excavation proceeds.

The immediate concern of the party is that records be kept of the progress of the excavation through (1) photography and (2) the surveyor's transit and endless measurements, with the results transferred to the chart. The exact distance between find and find must be recorded, their distance below the surface of the ground, and their distance above or below an ideal plane or *datum* level. Moreover, all recovered objects must be carefully preserved and catalogued immediately. The ideal excavation is so conducted that the excavators could, if called upon at a later date, restore every object found to its original position in the earth.

The second phase of archeological research is the work of a specialist in some particular field—architecture, pottery or sculpture—who devotes long and careful study to the accumulated material that belongs to his own department. Vase is compared with vase, coin with coin, sculpture with sculpture, and from the investigation there emerges a definite knowledge of each particular find, its chronology, importance, style and relation to other examples of the same type or to closely related types. This study is called *typology.*

The preliminary study of the excavated material is carried out partly—as with architectural remains and large and heavy sculptures—in the excavation itself, partly in an adjoining *excavation house,* which serves as a temporary shelter for the party of excavators. Publication of the new discoveries soon appears in the learned journals, generally in the form of brief summaries. Preliminary reports of a more detailed sort may be prepared entirely at the site of the dig, but these are seldom definitive. It is a matter of years—sometimes unfortunately many years—before the final publication of the material in large and sumptuous volumes. The knowledge thus acquired from the excavation of the site is gradually absorbed into the vast stream of historical and cultural research.

With regard to the final disposal of the various excavated objects this much may be observed: remains of buildings are, as a rule, left where they are found, though a particularly fine capital or moulding may be removed to a place of greater safety. Local museums absorb material of minor or local interest. The prize pieces are usually claimed by the national museums of the countries to which they belong. But as foreign scholars play such an important part in excavation, there is frequently an agreement by which a certain part of the spoils is assigned to the particular foreign institution that has assisted with money and expert advice.

When did the science of archeology originate? The answer to this question can be no more definite than one about the origin of the natural sciences. Each science moves from loose and vague beginnings in the direction of an ever increasing severity of accuracy. The *Society of Antiquaries* in England was formally constituted as early as 1717 and the *Society of Dilettanti* was founded in 1733. These learned bodies interested themselves in inquiries and theorizings that may be called archeological pursuits, though the methods employed seem to us today almost absurd. And it was not until the '70s of last century that such truly scientific organizations as the *Archaeogical Institute of America,* the *German Archaeological Institute,* and the English *Society for the Promotion of Hellenic Studies* came into being. As regards scientific excavation, it began not much, if at all, before the '90s.

We may now undertake a brief archeological survey of the most important regions of the earth. In Egypt, one of the two cradles of civilization, archeological activity began in the days of Napoleon. His great military expedition of 1798 was accompanied by a party of scientific men whose labors resulted in the first adequate description of Egypt and its monuments. The key to the ancient languages of Egypt was found through the discovery, in 1799, of what has come to be called the "Rosetta Stone."

Such was its importance that it was demanded of Napoleon and ceded by him to Britain in 1801 and is now in the British Museum. It bore three inscriptions: in Greek, demotic (the language of the common people) and hieroglyphics (the tongue of the priests and aristocracy), each written in its own characters. The Greek inscription contained a decree of the priests in honor of Ptolemy V (204–181 B.C.) and his queen. The others proved to be replicas of this decree, in the two current languages of the country. But in spite of what we might superficially regard as the obvious simplicity of the undertaking, it was not till 1821—and largely through the genius of the French scholar Champollion who compared this inscription with many others that he had copied—that the demotic and hieroglyphic versions were read by scholars.

A century of patient investigation in Egypt has thrown an extraordinary light on the ancient conditions of the country. In the popular mind, this culminated in the opening of the tomb of Tutankhamen in 1922. But in spite of the extraordinary wealth of its contents and the fact that its inner chamber had been veiled for over 3000 years from the eye of man, the discovery was hardly of first-class archeological importance. At the present moment, the attention of the Egyptologist is focussed mainly on the Badarians—a Neolithic people who occupied the Nile Valley for perhaps 1500 years before the Egyptians.

One of the first great archeological undertakings was carried out in Mesopotamia, the second land to foster incipient civilization. Current archeological interest is centered, in the main, in this region and the territory lying to the east of it. The great Assyrian city of Nineveh, which was captured in 606 B.C., seems to have fallen so rapidly into oblivion that its very site was unknown two centuries later. This city was sought and found by the English archeologist, Sir Henry Layard, in the middle of the 19th century, and the excavations of Henry Creswicke Rawlinson and others, carried on sporadically over half a century, revealed to the world a new and distinctive civilization. An extended series of discoveries made known the course of the cultural and political history of the Mesopotamian valley during the 2,000-year-period that preceded the time of Christ.

The reading of the riddle of the cuneiform or wedge-shaped characters of the languages of Mesopotamia and Persia proceeded in a way somewhat different from that of the Egyptian. The inscriptions at the great Persian city Persepolis were copied and thus made accessible for study in 1765. The work of interpretation was carried onward by many scholars, notably those of Denmark, France and Germany. In course of time, it was recognized that the official inscriptions of Persia were trilingual—expressed in Persian, Susian and Babylonian.

The Persian was the first to be deciphered. Fortunately, the investigators were familiar, from literary sources, with the high-sounding titles arrogated to themselves by the Persian kings. It was observed that the inscriptions contained many instances of a certain word, in a short and a longer form. It was proposed that these might well stand for "king" and "kings" respectively, and when they occurred together, they signified "king of kings." After this beginning it was easy to infer—on historical grounds—that the king was Darius. Soon the name of his father Hystaspes and his son Xerxes was read, and much progress was made before Major (afterward Sir) Henry Rawlinson, who has been mentioned above, copied and interpreted the inscriptions of Hamadan and Behistun. By virtue of this man's extraordinary linguistic ability—he was not a professional scholar—the remaining difficulties were cleared away, and ancient Persian became an open book. The key to the cuneiform script having been thus found, it was not long before Susian and Babylonian yielded their respective secrets.

Shortly after the World War an expedition commenced operations on a site on the lower Euphrates, 100 miles south of Babylon. This was soon definitely identified as the "Ur of the Chaldees" which is so often cited in the Old Testament as the home of Abraham. The results obtained at Ur and in the surrounding terrain are the most remarkable in the present century. This was the cradle of the great Sumerian culture which preceded the rise of the Babylonian Empire and which outshone, in many ways, the culture of Egypt.

The Sumerians' origin is as yet unknown; all that can be said is that this people appears to have migrated from the northern highlands and to have settled a large portion of Mesopotamia before 3500 B.C. They seem to have been the first people to become expert in the smelting of metals. Their mythical ancestor was perhaps the Biblical Tubal-Cain, "an instructor of every artificer in brass and iron." They invented a military organization of great efficiency. Their objects of art, particularly those that are found in the royal tombs, are sumptuous beyond measure. Gold and silver cups, weapons of copper, silver and electrum (an alloy of gold and silver), mosaic standards and alabaster vases are found in these sepulchres. The sculpture is remarkably realistic, especially where it depicts animal forms.

Further to the east, the land of the Medes and Persians is gradually yielding up its secrets. Particularly is this true of the city of Persepolis where the great palace of the Kings has recently been unearthed by an American expedition. Far beyond the Persian plateau, in western India, the widespread influence of Sumerian culture has been clearly demonstrated, particularly by the excavations at Mohendyo Daro and Harappa. It is plain that there was intercommunication between western India and Mesopotamia in the third millennium before Christ. These early people of India had a well developed system of writing.

Turning westward, we find that archeological discoveries of the highest importance are being made in Syria. Two sites in particular claim our attention. At Ras Shamra, on the northern coast, there has been unearthed a curiously mixed culture that flourished more than a thousand years before Christ and that contains elements derived from Crete, Cyprus, Mesopotamia, Rhodes and places even more remote. The literary interests of the city are extraordinary; various alphabetical systems have been discovered and even dictionaries with Babylonian words and their equivalents in an unknown tongue in parallel columns. Eastward, on the banks of the Euphrates, at Dura-Europos, Yale University and the French Academy of Inscriptions and Letters started in 1928 to conduct a series of joint excavations.

Till its capture in the year 256 A.D. Dura was an important frontier post of the Roman Empire. It was much influenced by the neighboring Parthians and their successors, the Persians. Both these peoples attained preëminence in military science, particularly in the invention of improved defensive armor. Armor has been found and excavations reveal a military mine and a countermine in which are the bodies of several Roman soldiers. Many fine frescoes and painted

Courtesy Oriental Institute, University of Chicago

Relief from the Palace at Persepolis, Persia, Showing Tribute Bearers

tiles have been removed to the museum of Yale University.

To the south, in Palestine, there has been an almost feverish activity since the World War and the consequent improvement of political conditions. Site after site that is mentioned in Scripture has been explored and excavated, and a flood of light has been thrown on the history and cultural conditions of the Hebrews and their predecessors in the Holy Land.

In northern Syria we encounter the southernmost fringe of the great civilization of the Hatti, the Hittites of Scripture, whose empire at its widest limits included most of the territory between Armenia and the Aegean Sea. The most important centers of the culture were at Eyuk, Jerablus (the ancient Carchemish), Marash, Singjerli and Boghaz-Keui (the ancient Hattosas). The last is the capital, where some 10,000 inscribed tablets have been discovered. The language, which has recently been interpreted, is found to be a cousin, as it were, of the Indo-European group which includes Sanskrit, Greek, Latin, and nearly all the tongues of modern Europe. Hittite power lasted from about 2000 to 1200 B.C. and rivaled that of Egypt and the Mesopotamian kingdoms. Like the Romans, the Hittites adopted and absorbed ideas and institutions from the many peoples with whom they came in contact. Notable among their artistic achievements are their relief sculptures, sometimes remarkable alike in their enterprise and their grotesquerie.

Courtesy Atlantis Greek Daily, New York

Porch of the Caryatids, the Erechtheum, Athens

Six sculptured maidens—called *caryatids*—support the entablature of the southern portico of the great temple on the Acropolis. The Erechtheum contained sanctuaries to Athena Polias, Poseidon and Erechtheus and was constructed during 431–407 B.C.

At Hissarlik, in northwestern Asia Minor, Heinrich Schliemann, the German Homeric scholar, began his excavations in 1870. This, he was led to believe, was the site of ancient Troy, immortalized in the *Iliad* of Homer. His view has been confirmed by recent excavations conducted by the University of Cincinnati. The Homeric city, as it now appears, was the seventh in order, counting the strata from the bottom of the hill upwards—not the sixth, as was long believed.

The excavations of Sir Arthur Evans in the Island of Crete, which have continued roughly over the past thirty years, have brought to light a Bronze Age civilization contemporary with the cultures of the Egyptians and Sumerians and hardly inferior to them. The palaces with their maze of rooms, the frescoes, the ivory statuettes, the delicate and highly ornamented pottery, the objects of gold, bronze, and silver, bear evidence to the former existence of a people light-hearted and artistic, revelling in the joy of life.

In Greece itself almost all the ancient cities of importance have been excavated, at least in part, and we we are now well informed, through the spade and the manuscript, of the progress of the country from Neolithic times down to the Middle Ages. Almost every town now possesses its museum of local antiquities, while the most important of the artistic and portable finds are transported to the National Museum in Athens.

The Athenians have given much thought, of recent years, to the scientific restoration of the ancient temples. The Parthenon, the gem of the Athenian Acropolis, has had its fallen columns and parts of its entablature restored to their original place, and the experiment has been made of erecting in the eastern gable copies of statues that used to adorn that area but are now in the British Museum.

The greatest archeological project at present on foot in Greece is the excavation of the Athenian Agora by the American School of Classical Studies in 1931. Already the city hall, the council chamber, the public fountain, the place of assembly and several temples and stoas (porticoes) have been uncovered. The excavations have also brought to light sculpture in various degrees of preservation, hundreds of inscriptions and more than 40,000 coins. So abundant indeed is the material that its proper digestion will occupy the labor of a generation of scholars.

The present government of Italy has given every possible encouragement to archeological research within the country and has raised the ban that long prevented foreigners from excavating Italian soil. Accordingly, at Minturnae the American School of Classical Studies has dug with interesting results. The northern and central parts of Italy are now veritable hives of archeological activity.

The area of Rome that is richest in ancient monuments has been completely transformed. Two great thoroughfares have taken the place of the former maze of streets. Excavations proper have revealed much that is new, and the process of clearing ancient buildings of their modern additions has gone far toward making their details understandable. The temple of Vesta, Forum Romanum and the Theater of Marcellus have been partially restored so as to make clear to the observer the precise nature of the construction of the whole. The great Imperial Fora have for the first time been thoroughly excavated, cleared, and exposed to the public view.

The chief archeological interest of central Europe is the culture of the Paleolithic period, where its development may be studied to the greatest advantage. Public interest in this culture is twofold: in the curious and apelike skulls of the Stone Age men (whose study belongs to the domain of paleontology and anthropology rather than archeology), and in the extraordinary drawings and paintings, chiefly of animals, that have been found in caves that long ago served as human habitations. The first find was made in 1879 in the now-famous cave of Altamira in northern Spain. Experts doubted that the paintings were prehistoric until the discovery in 1895 of similar art in the cave of La Mouthe, in France. Since then more cave paintings have been found in various parts of France and Spain and in the "heel" of Italy.

There is little of the spectacular in the ancient remains found in the British Isles, but they present a unique record of the activities of man from the Piltdown type of perhaps half a million years ago, down through the Neolithic, Bronze and Iron Ages, and finally the 400 years of Roman occupation. In all this vast expanse of time, there is no one age or period of outstanding pre-eminence such as we find in the cultures of southern Europe and the Near East; but seldom has fortune provided us with an archeological laboratory so complete in its equipment as the British Isles.

The relatively primitive conditions of life in aboriginal America render the greater part of North America comparatively uninteresting from the archeological point of view. The culture of both American continents is uniformly Neolithic, varied in the more progressive areas by an elementary knowledge of metals on the part of the natives. In New Mexico, particularly in the vicinity of Santa Fe, where the School of American Archaeology has its headquarters, the Indians achieved considerable distinction in the arts of pottery and building; but the advent of the white man interfered with whatever progress they might otherwise have made in these and kindred crafts. The descendants of these tribes have imitated the arts of their forefathers instead of improving on them.

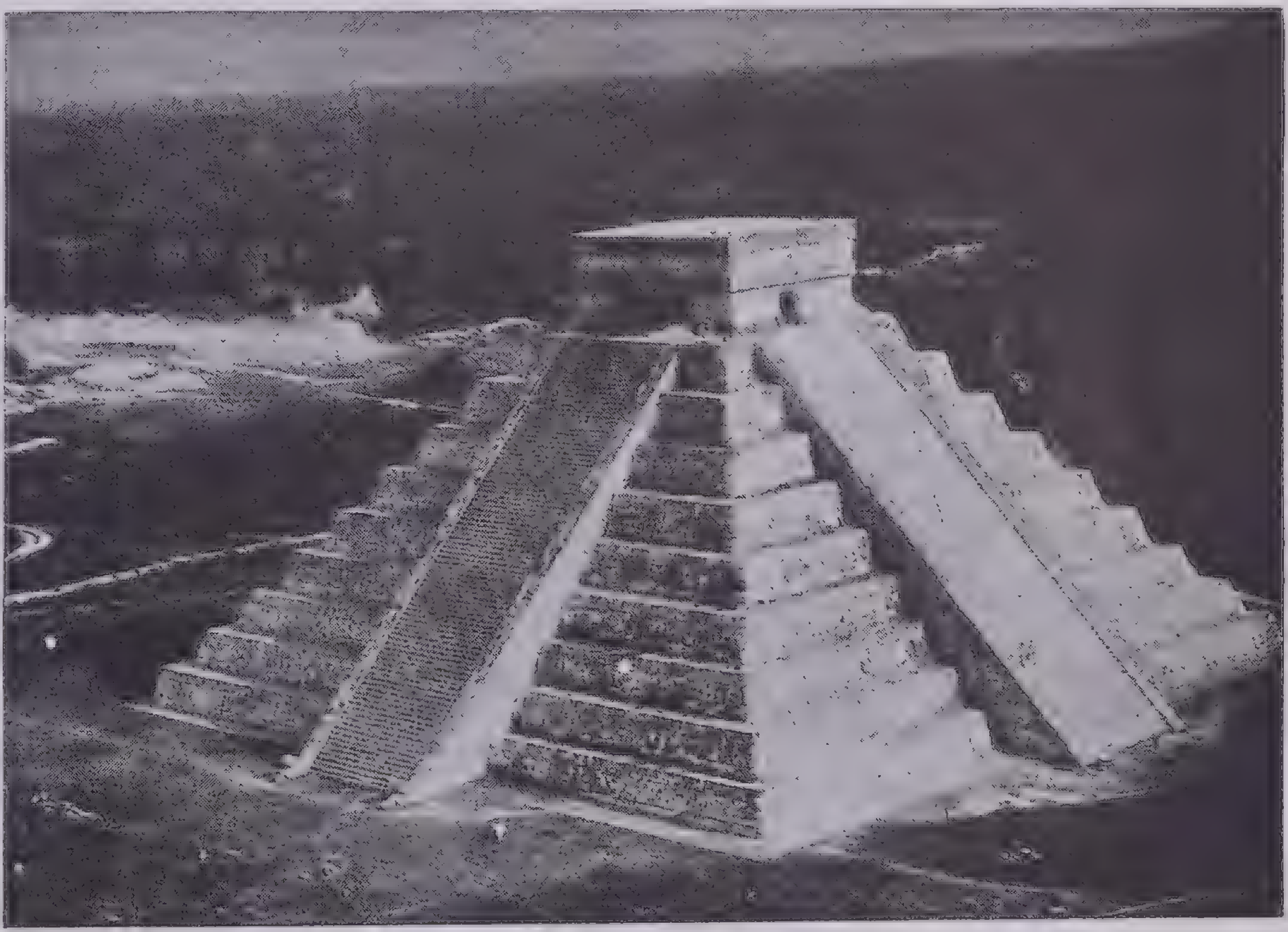
A feature of American antiquarian lore is the repeated revival of interest in the story that makes the Norsemen the original discoverers of America. This is brought about through the discovery, from time to time, of inscriptions in runic characters and other materials alleged to be genuine memorials of the Norsemen's exploration of the country. Inscriptions of this sort have been found all the way from No Man's Land, an island near Martha's Vineyard, to Spokane, Wash. Although perhaps no more than one of these is an actual forgery, the only example in which credence may reasonably be placed is the inscription found at Kensington, Minnesota. Several genuine weapons of ancient Scandinavian manufacture have been found to the south of Lake Superior. Most important of all is a recent announcement of the discovery of a viking's grave, containing axe, shield, and sword, at Lake Nipigon in Ontario. But the material is not yet published, and final judgment about its genuineness must be reserved.

South of the Rio Grande, the most important culture as yet unearthed is that of the Mayas of Central America, who were displaced by the Toltecs in the 8th century A.D. The Toltecs gave way about 400 years later to the Aztecs, who have long been known from their contacts with the Spanish conquerors of America.

Despite their Neolithic limitations, the Mayas may well be regarded as one of the miracles of prehistoric times. Truly amazing are their achievements in pottery, painting, carving in stone and architecture. They possessed a fairly effective system of writing and a calendar that is inferior only to the Julian system of 46–45 B.C. Whence did they come? The guess that makes them the descendants of the mound-building Indians of the Mississippi Valley is perhaps the most likely of the several conjectures that have been advanced.

Relatively little is as yet known of the archeology of South America, as only the northern fringe has been investigated in any detail. The artists of early Peru are known for their extraordinary skill in linear design, but to what extent they were originators and to what extent they may have drawn upon the Mayas for their inspiration cannot be determined without much patient investigation in the years to come.

And thus the great quest for the recovery of things of the past goes on, a quest that, from the nature of the case, can never end. We have accomplished as yet but a trifle of spadework, for the science has hardly progressed beyond its infancy. It will be the task of future generations to carry on the search, ever expanding and deepening the scope of their activities.



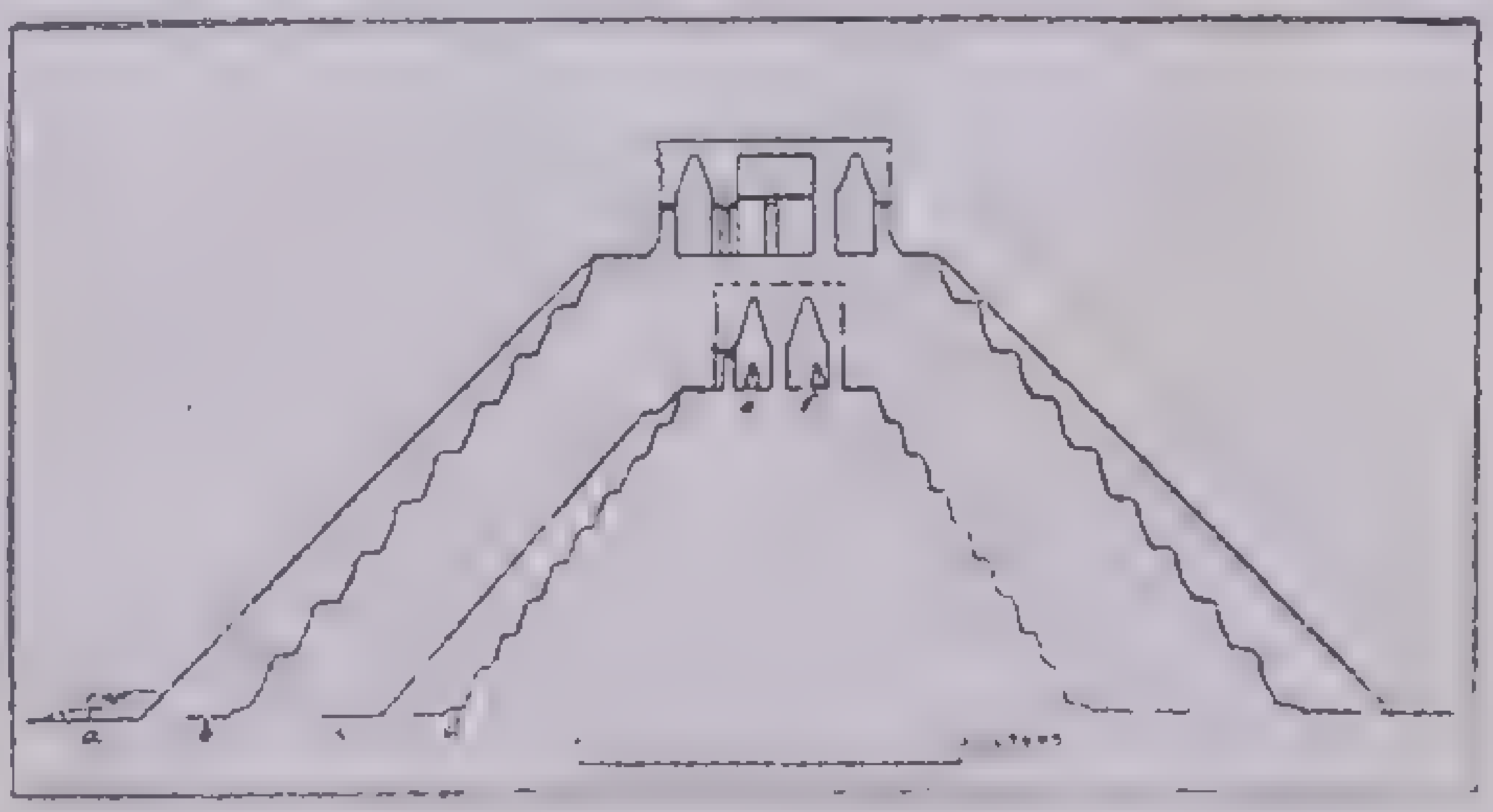
Courtesy Pan American Airways

The Great Pyramid Temple of the Mayas at Chichen Itza, Yucatán

El Castillo is a pyramid 197 feet square at its base. It rises in 9 receding terraces to a height 79 feet above the terrace on which it was built. Unlike Egyptian pyramids, which terminate in a point, the pyramids of the Mayas are flat on top to serve as bases for altars or temples. It was built between the 11th and 15th centuries to honor the feathered-serpent god Kukulcan

Cross Section of El Castillo's Interior: *a*, outer stairway; *b*, outer terraced face; *c*, inner stairway; *d*, inner terraced face; *e*, vestibule; *f*, sanctuary of concealed temple where the jaguar throne reposes. The jaguar throne, carved from a single block of stone and painted a vivid red, is studded with inlays of apple-green jade. Here presumably the ancient Mayas of the region sacrificed to Kukulcan

Courtesy Carnegie Institution of Washington



ANCIENT CIVILIZATIONS

Ancient history tells the story of man from his appearance on earth to the time of Christianity and the coming of the Germans in the Roman Empire. For convenience, it is usually divided into four parts—Prehistoric, Near Eastern, Greek and Roman. These civilizations overlapped in time and had a great deal of influence on one another. The center of activity in ancient times was the Mediterranean Sea. After the prehistoric Stone Ages, with the discovery of metals and the invention of writing, civilization began to develop rapidly in the the valley of the Nile and the fertile crescent formed by the coast of Syria and the great basin of the Tigris and Euphrates rivers. The lessons that the people in those areas learned were transmitted to the Greeks, who developed their brilliant culture in the lands surrounding the Aegean Sea.

Last among the great ancient peoples, the Romans entered the scene of history in the central Mediterranean peninsula of Italy and, after a brief period of growth and conquest, maintained control over the whole region around the Mediterranean, absorbing the culture of the East, remaking it to fit themselves and teaching it to the West. All ancient history treats a period when men were gradually mastering the methods of agriculture, industry and trade, political and social life and intellectual and artistic expression and were laying the broad foundations on which our own civilization rests. Most ancient peoples worshiped many gods; when Christianity won a victory over the pagan religions, the character of civilization was changed and the Middle Ages began.

Our information about antiquity comes first from the remains that have survived and are dug up by archeologists. Among these remains are tools, pottery, jewelry and clothing; the ruins or remnants of buildings, tombs, walls, roads and bridges; statues, reliefs, paintings and coins; and the skeletons and mummies of men themselves. These give us information about the appearance and the dress of the men and women of ancient times and about their abilities as workmen and enable us to picture the way in which they lived. In addition, we have, commencing with the time when writing began, all sorts of records written or incised on papyrus, stone, clay and the walls of buildings and tombs; and the works of literature that have come down to us. From them we are able to reconstruct the events and tell the story of the activities of the peoples of antiquity.

Prehistoric Times.—For many thousands of years before the dawn of written history men were living on the earth and taking the first steps in civilization. The first period about which we know is called the Paleolithic, or Old Stone Age. By that time, primitive men had acquired the use of fire and had learned to chip flint to make tools and weapons. During the Old Stone Age they added tools of bone and horn. They lived in caves, under overhanging rocks or in rude shelters; they gathered wild grains and fruits and secured their other food by hunting and fishing. Entirely dependent, therefore, on nature to supply their food, they worshiped gods who, they believed, helped them in their efforts to live. Skilled artists carved pictures on tools and painted likenesses of animals on the walls of their limestone caves. The examples found in the caves of southern France and northern Spain are often very beautiful.

In the Neolithic period or New Stone Age civilization took a great stride forward when men learned to farm and in some places learned at the same time to drain swamps and to irrigate dry lands. Animals were domesticated to serve men or to supply them with meat and milk. Storage receptacles were made of baskets and skins; then men learned to bake clay and make pottery. Weaving flax and wool led to the substitution of fabrics for animal skins as clothing. Chipped flint was still used for tools, but at this time hard stones were polished to make axes with fine edges and a variety of tools that had been impossible earlier. Houses were built; villages were founded and fortified, and complex social organizations were developed. Religions that sought to secure good crops and herds came into existence, and from the success of these agricultural experiences a strong belief in immortality developed.

When men learned to use metals—copper, bronze and later iron—the final stage in primitive culture was reached. At about the same time, priests worked out calendars to serve the farmers and devised systems of writing in response to the needs for records. Writing began with the drawing of pictures to represent objects and to tell stories. Then a picture came to be used to represent a sound (corresponding to a group of our letters), the sound of the name of the picture. Using several of these as parts of words, new picture groups made new words. Among the Egyptians, whose writing the Greeks called *hieroglyphics,* some characters were eventually used to stand for single consonants. Hieroglyphic writing contained all three—pictures of objects, of sounds and of single letters. The Egyptians wrote on strips pulled from the papyrus reed and pasted together. Later, they simplified their pictures, but they never developed an alphabet. Pictures were used also in Babylonia, and these in time came to represent syllables. The Babylonian writers drew with blunt-ended reeds on clay tablets that they afterwards baked. As a result, the picture element was lost. The lines thus drawn were wedge-shaped, and for this reason, Babylonian writing is called *cuneiform.* Shortly before 1000 B.C. the Phoenicians devised signs to represent single letters by using pictures to represent the first sound of the name of the object.

The Near Eastern Civilizations.—Written history begins with the great cultures of Egypt and Babylonia in the river valleys of the Nile and the Tigris-Euphrates. In these two regions of the Near East, the annual floods, when the river waters overflowed their banks and left a deposit of silt on the land, provided fertile soil. The needs of drainage (to draw off surplus water) and of irrigation (to wet the lands during the dry summer) required co-operation under strong and unified control. The rewards of labor, however, were very great, and men were able to accumulate wealth and to develop culture. Materials such as clay, stone, metal, wool and flax were at hand for the development of industry, and the rivers provided highways for trade.

Agriculture was the chief occupation, and men acquired skill in working the ground and producing wheat and barley and many vegetables. They tended goats, sheep and cows, ducks, geese and cranes, and used the donkey as their chief beast of burden. In addition, they snared wild birds, hunted animals and caught fish in the streams. They wove wool and linen for clothing and tapestries and made pottery, dishes and metal jewelry. In Egypt they made jars of the stone, which was plentiful, and used the papyrus reed not only for paper but for ropes, mats and even boats. Babylonia had little building stone or pottery but became famous for its fine carving of gems and seals and for its woolen goods. Trade passed not only on the rivers but on the roads developed through Syria and on the Mediterranean. The governments were all-powerful. In Egypt the king was regarded as a god; in Babylonia he was a priest-king, the earthly representative of the gods. Laws that regulated land ownership and tenantry, the practices of industry, and the methods of trade were developed and recorded. The code of Hammurabi, King of Babylon in the 20th century B.C., is the oldest surviving code of laws in the world. The people of both Egypt and Babylonia produced works of literature including much of great interest, as shown in the fragments that have remained—myths of gods and heroes, stories of adventure, collections of wise sayings, poems, prayers and hymns—the Egyptian works written in hieroglyphs on papyrus and the Babylonian, in cuneiform on clay tablets. In mathematics, these early people of the Near East could solve many problems. Geometry, earth measurement, was an Egyptian science. From the Babylonians, who used sixty, instead of ten, as a unit of measure, has come our sixty-minute hour. The Babylonians knew some astronomy—without a telescope they predicted eclipses and worked out a rather accurate calendar. Though these ancient people depended greatly on charms and prayers to heal the sick, they knew much about drugs and could perform many surgical operations. They worshiped many gods, for whom they built temples. The Babylonians made their temples of brick, building great towers (with setbacks like those of our skyscrapers) called *ziggurats;* to architecture they contributed the arch and the vault. The Egyptians used stone to erect great pyramids and temples with pillars and columns.

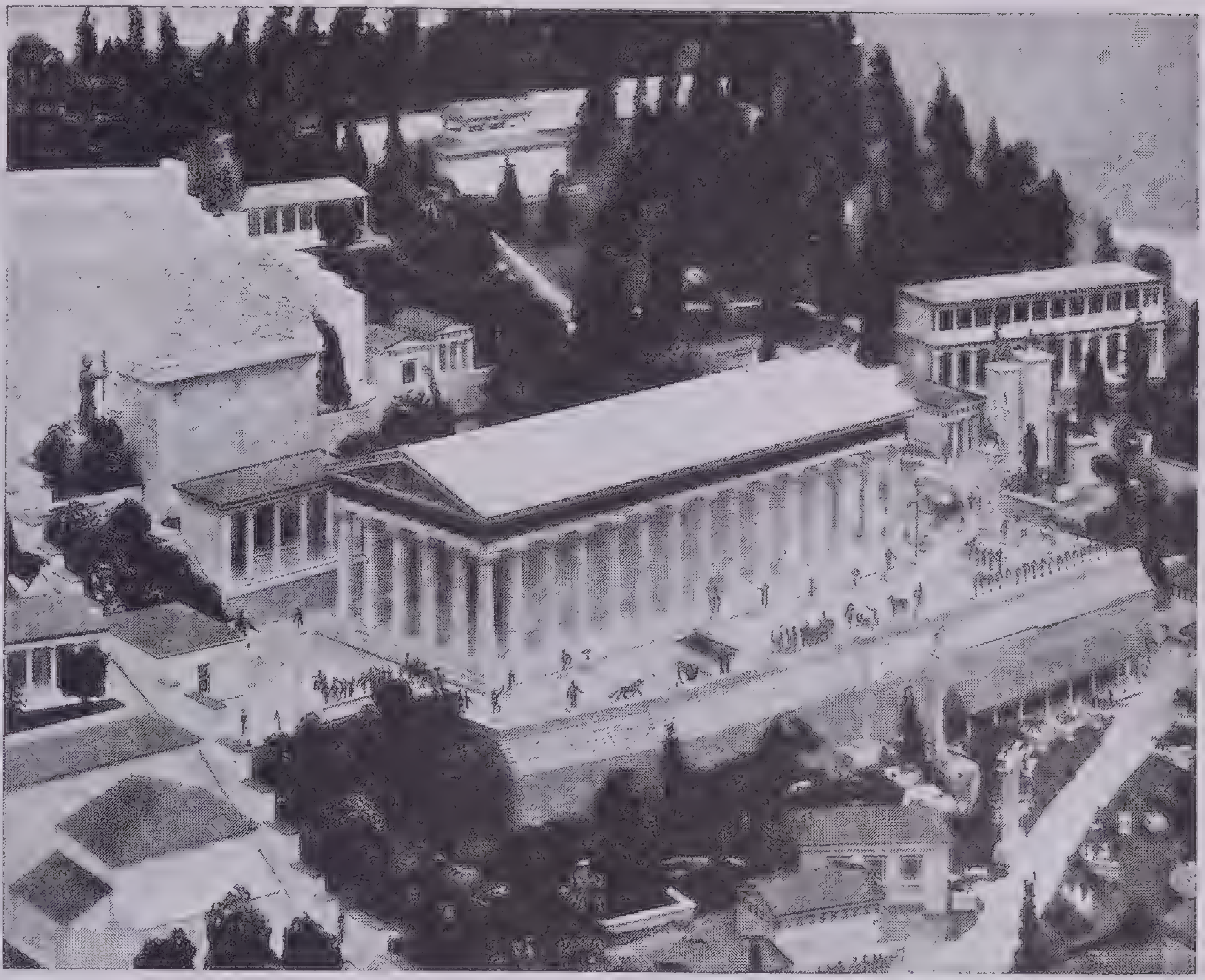
In Babylonia religion was devoted to the needs of life in this world, since the Babylonians had only vague ideas concerning a future life. They sought to learn the will of the gods and developed divination, the art of foretelling the future through various means, such as the examination of the livers of sheep, dreams, accidental occurrences and astrology, the study of the stars. As the Egyptians believed in immortality, they built great pyramids as tombs for their kings; later, they dug tombs with many rooms in the cliffs above the Nile. Around or near the royal tombs were the graves of their people. They mummified the body to preserve it; and they placed objects in the tombs and painted pictures on the sides to supply the soul with food and pleasure. To decorate the temples they made fine statues of stone or copper and carved many pictures on the walls.

The Semitic tribes of Syria, the Hittites of Asia Minor (first users of iron) and the people who lived in the Aegean region came under the strong influence of Babylonia and Egypt, and much of the culture of these later peoples shows a clear relationship to these two mighty, early civilizations.

Between the years 1100 and 800 B.C., the great powers of the East were weak, and the small states of Syria made good use of their chance for independence. The Phoenicians of Tyre and Sidon, inventors of the alphabet, possessed fine glass and woolen industries and carried their products and the goods of Babylon and Egypt throughout the Mediterranean and into the Atlantic. In southern Syria, the Hebrews, coming out of the desert and conquering both Canaanites and Philistines, established their little kingdoms. They possessed a religion of great spiritual and moral power that they had received from their leader, Moses. Their prophets developed this faith into a belief in one God, Maker and Ruler of all, who demanded good behavior, economic and social justice and true humility from all His worshipers. The collection of their historical books, laws, proverbs, psalms and prophetic writings that forms our Old Testament is our most precious heritage from antiquity.

The peoples of Syria were soon overwhelmed by the great empire of Assyria. The Assyrians, a martial, peasant folk of the Tigris valley, contributed much to military science, imperial organization and road building, and spread Babylonian culture over their domains. The Chaldaeans, who succeeded to their power in Babylonia, were celebrated in antiquity for their use of the older methods of divination and additions thereto particularly in astrology. Then, between 600 and 500 B.C., the whole East fell under the power of the kings of Persia, mountaineers from the plateau of Iran. Their imperial organization, with its satrapies (provinces), governors, inspectors, postal service and roads, completed the development begun by the Assyrians. Their religion, a dualism, that is, a belief in two gods, one a god of light and truth, the other an evil god of darkness and sin, greatly influenced later thought.

Near Eastern civilizations thus contributed to mankind the ways of doing and making things; the beginnings of literature, the methods of trade; the principles of law, thought and science; the first lessons in architecture, sculpture and painting; and both superstitious and glorious ideas of religion. In their life and thought, however, there was little emphasis upon man as an individual. Especially in the great empires of Egypt and Babylonia, men as individuals had little consideration; they were subject to all-powerful kings and without political rights, and at the same time they were looked upon as playthings of the gods, clay in the hands of the divine potter, not worthy in themselves.


From a model in the Metropolitan Museum of Art

The Town of Delphi in Greece in 160 A.D.

In the center is the great Temple to Apollo, constructed sometime in the 2d century B.C. In the background to the left is an open-air theater with the back of the stage toward the camera. In the right background is a long two-story colonnade. The rock of the Delphian sibyl is in the foreground to the left of the sacred street

The Greeks.—The keynote of Greek history is the dignity of the free man and citizen. The Aegean Sea, dotted with islands and bordered by the mountainous lands of the Greek peninsula and Asia Minor, was the center of the activities of the Greeks. Greece itself is a land of mountains that divide it into little valleys with thin but fertile soil. Yet in some of these little valleys and along the narrow coast of Asia Minor between the mountains and the sea, a culture so varied and brilliant developed that it was not equaled until the modern era. The mild climate of the Aegean area, the clear air and the magnificent scenery made it a pleasant place to live. Though the soil never supplied quite enough food for the people, it did provide fields and climate suitable for grapes and olives. The good deposits of clay, the mines of iron, copper and silver, the mountains of marble and the herds of sheep and goats on the hillsides furnished abundant materials for industry. The Mediterranean Sea was an easy highway of trade with other lands, so that the surplus of goods might be exchanged for needed food. By this same sea route, the lessons that the Near East had to teach were carried to the Greeks.

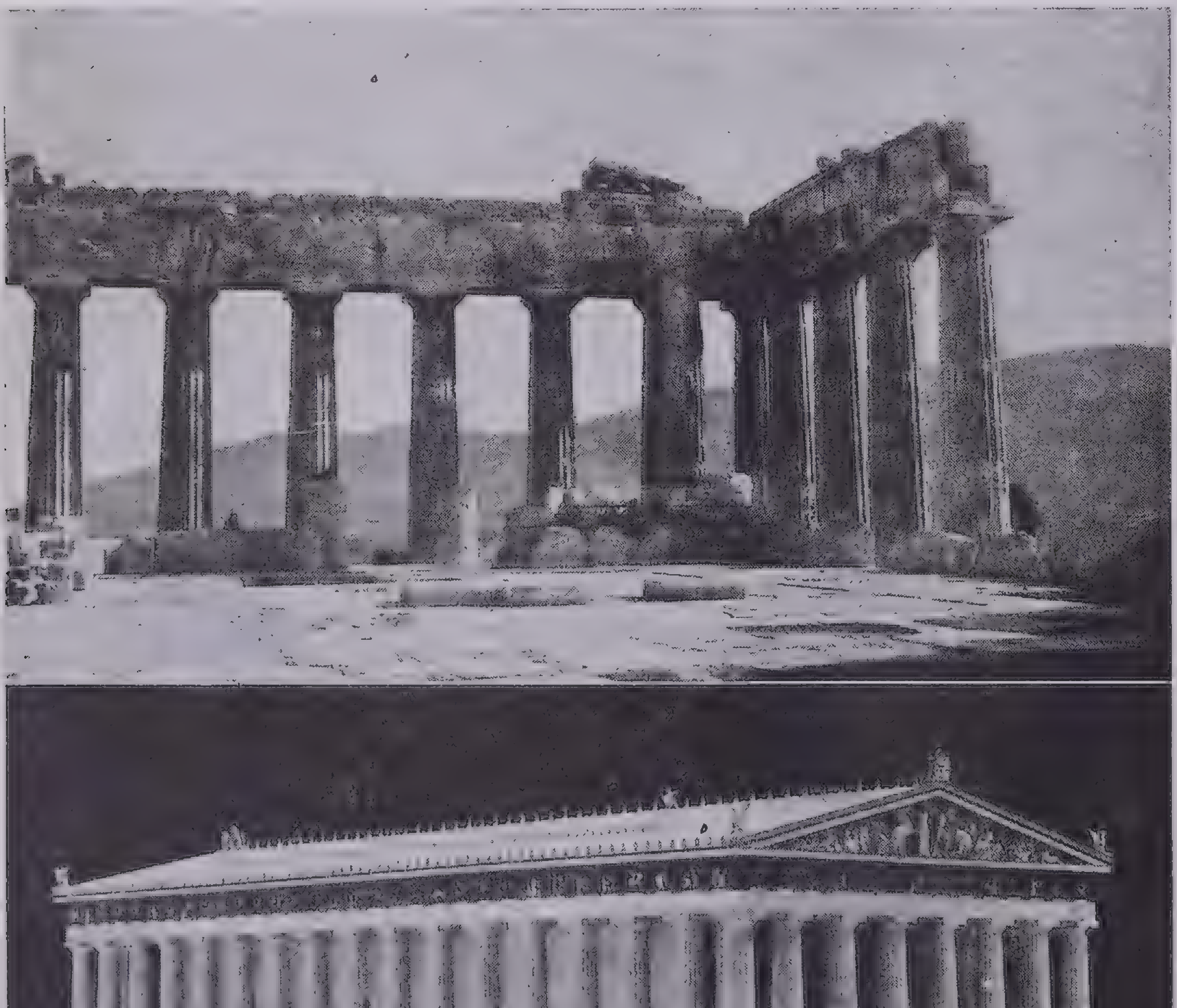
In the first period or Aegean age, of which records have been only recently discovered by archaeologists, the people on the island of Crete learned under Egyptian influence how to make pottery and work in metals, how to paint pictures and how to build. They transformed what they learned into a brilliant life, centering around a great palace adorned with paintings. They made beautiful clay figures, exquisite gold cups and inlaid daggers. They enjoyed parties with music, dancing, boxing and bull leaping. The system of picture writing devised by these early inhabitants of Crete cannot be read today. Their culture was taught to the ancestors of the Greeks on the mainland, whose fortresses, palaces and tombs have survived in ruins. The Greek legends of heroes like Hercules and Theseus and the story of the Trojan War were later recollections of the deeds of men of those early times. They overthrew the Cretans, and in turn their civilization was destroyed about 1100 B.C. by the Dorians, a tribe of Greeks from the Northwest; but the lessons that they had learned from the Cretans and through them from the Egyptians were transmitted to the new conquerors and were never entirely forgotten.

In the centuries that followed the Greeks spread first across the Aegean to the islands and the coast of Asia Minor and then, after 800 B.C., into the western Mediterranean, particularly Sicily and southern Italy, and into the Black Sea region. During this time, they developed that characteristic Greek political institution, the city-state. This was a group of people claiming common descent, living in a limited area with a common political, economic and religious center—usually an easily defended hilltop. In these city-states the Greeks advanced steadily toward democracy. First they were ruled by kings; then by aristocratic landowners; then by wealthy merchants; sometimes temporary monarchies called *tyrannies* were established; but when they organized an army, the men who fought soon gained political power; and finally in many states all free citizens were admitted to a share in the government. This political development and the economic and cultural growth that went with it began in Miletus and the other cities on the coast of Asia Minor that came to be called *Ionia.* It spread rapidly to all parts of the world where Greeks lived. Chief among the cities of the mainland were Sparta, which was famous for the military training it gave its boys and for the strength of its army; and Athens, whose leaders, particularly Solon (*c.* 639–559 B.C.), Cleisthenes (*c.* 507 B.C.) and Pericles (*c.* 495–429 B.C.), established Athenian democracy and laid the foundations of Athenian greatness. In the 5th and 4th centuries B.C., after the Greeks had defeated the Persians, Athens became the great city of the Greeks. Greek olive oil, wine, woolens, metal goods and pottery were everywhere in demand, and to aid in trade the Greeks developed the use of coinage.

This was also a period of great works of literature and art. In literature, the Greeks created and established the forms that we still use. In the early period, Homer (9th century B.C.) wrote epic poetry, telling heroic stories in poetic form; in the 7th and 6th centuries B.C. poets like Alcaeus and Sappho wrote lyrics, short songs of love or nature or war to be sung to the lyre; others wrote songs for choruses or for soldiers to sing. In the 5th century, the drama came into full maturity, as the great writers of Athens, particularly Aeschylus, Sophocles and Euripides, produced tragedies, and Aristophanes, comedies. In prose, the father of history, Herodotus, wrote a prose epic of the Persian Wars; and Thucydides, the first scientific historian, described the great war between Athens and Sparta. The service of the democracy led to the establishment of schools of oratory, and great orators made this a recognized branch of literature.

Architecture and art were closely linked with religion. The Greeks believed that nature around them was filled with gods and goddesses of human form. In honor of these deities, men held feasts and offered sacrifices, took part in athletic contests like the Olympic games and held dramatic competitions in which many of the great plays were produced. Temples in which the gods might live were built of marble. Learning much from the Egyptians, the Greeks used columns and pillars and created the Doric, Ionic and Corinthian orders of architecture. To adorn these temples they carved figures in relief and made statues of gods and goddesses, great men and victors in the athletic games. The marble that they used gave them greater freedom than was possible to their Egyptian teachers who, besides being conservative, had to work in harder stone. The Greeks, using living models and seeking lifelike beauty, soon overcame deficiencies in their skill and produced superb buildings like the Parthenon and many marvelous statues. When the experience of distant lands and the ideas that they adopted from Egypt and Babylon made some men doubt the stories of the gods, Thales (*c.* 640–546 B.C.), Pythagoras (582–500 B.C.) and other daring men like them tried to explain the nature of the universe and thus started the study of philosophy. Hippocrates (*c.* 460–377 B.C.), discarding magic and charms in healing the sick, began scientific medicine. Teachers called sophists laid emphasis upon the importance of individuals, and Socrates (469–399 B.C.) turned the attention of philosophers to the study of ethics. Plato (*c.* 427–347 B.C.), his pupil, who taught school and wrote masterly philosophic essays in dialogue form, composed a description of an ideal state; and Aristotle (384–322 B.C.) prepared the way for many of the sciences in his systematic treatises, which aimed to describe the universe and the nature of man, society and government.

In the succeeding centuries continual wars among the Greek city-states weakened many of them. The smaller communities fell under the power of Athens, Sparta or Thebes and finally all were conquered by the Macedonian leaders, Philip (382–336 B.C.) and Alexander (356–323 B.C.). The last important period of Greek history followed the Macedonian ascendancy. Differing from the earlier *Hellenic* period, it is called *Hellenistic* for now Hellenic culture was blended with Near Eastern culture. It was marked by the great expansion of the power of the Greeks into the Near Eastern lands, as Alexander conquered Persia and he and his successors settled colonies of Greeks wherever they went with a resulting interaction of Greek and Near Eastern civilizations.



Courtesy Atlantis Greek Daily, New York; Metropolitan Museum of Art

Perfection in Greek Architecture and Sculpture—The Parthenon

At the top is shown the surviving columns and entablature of the great Doric temple to Athena on the Acropolis. At the bottom is a model of the Parthenon as it appeared when first constructed, 447–438 B.C. For scale, note the human figure on the left side

Courtesy Italian Tourist Information Office

Restoration of Ancient Roman Fora: The Forum of Trajan

In recent years Italian archeologists have cleared the imperial fora—great open spaces used as meeting places and markets—of medieval and modern building material. Shown in the center is Trajan's Column, 114 A.D., rising to a total height of 147 feet. This great column of the Roman Doric order has a spiral band of sculptures carved on it beginning at the base and winding for 800 feet to the top. The sculptures, numbering more than 2,500 human figures and animals, illustrate incidents of Trajan's war with the Dacians

The chief characteristics of Hellenistic culture were cosmopolitanism and individualism, motivated by the conviction that "the educated man is a citizen of the world." The city-states declined, and in their places came federal leagues or great kingdoms that were ruled by kings who claimed to be gods, and in which life was as carefully regulated as in the days of the Egyptian pharaohs. Scientific agriculture, specialized industry and widespread trade brought wealth to many; but high costs and small rewards made life very hard for the lower classes, so that reformers talked of redividing the land or forming communistic states.

Poets composed poems in many elaborate meters on a variety of subjects displaying their skill and knowledge rather than any creative genius. Much emphasis was placed upon useful knowledge. The historian, Polybius (*c.* 205–123 B.C.), composed a history of Rome for the education of future generals and statesmen. Scientists advanced such studies as: geography, wherein they arrived at a fairly accurate measure of the size of the earth; mechanics—Archimedes (*c.* 287–212 B.C.) was a scientific inventor in the 3rd century B.C.; mathematics—Euclid (*c.* 330–275 B.C.) compiled the basic geometry textbook; and medicine—the doctors discovered basic facts about the nervous system. Architects built porticoes in the marketplaces, theaters and stadia. Sculptors carved portraits and statues to adorn the houses of great men or to celebrate the victories of kings. In philosophy, great ethical systems were developed: the Epicureans taught the avoidance of pain and a mechanistic, evolutionary philosophy; the Cynics emphasized the simple life, independence and self-control; and the Stoics taught endurance and obedience to the law of nature. The old religion broke down with the decline of the city-state, and men turned to Near Eastern religions, such as the worship of Isis, which gave promise of immortality as a reward for sufferings on this earth. This last great period of Greek history, the Hellenistic age, came to an end with the establishment of the Roman empire; but Greek culture, absorbed by Rome, continued to be a vital force in the world.

The Greek spirit was based upon the principle of freedom and upon confidence in the power of man. "Of all the wonders on earth, none is more wonderful than man," said Sophocles. Men, unafraid and free to explore and discuss, endeavored to solve the mysteries of the universe in their search after truth. "The object of our discussion," wrote Plato, "is not that either of us may gain a victory but that between us we may discover the most perfect truth." The Greeks sought for proportion also. The search of the artists for perfect balance in statues and in buildings is best exemplified by the Parthenon and its marbles. In ethics, the motto of the teachers was, "Nothing to excess," and they called moderation "the golden mean." Finally, in all things, the Greeks looked for beauty—in art, literature, religion and the life of man.

Rome.—The mission of Rome was to absorb Greek culture, to add to it law, order, organization and practical arts and to teach this new civilization to the West. In striking contrast to Greece, Italy has few good harbors. The valleys and coastal plain west of the Apennine Mountains are fertile, and their inhabitants were devoted to agriculture from early times. Rome occupied the strategic position in this region at the crossing of the Tiber. The Romans learned the first steps in civilization from their neighbors, the Etruscans, a people, possibly from Asia Minor, who lived north of the Tiber—lessons in organization, architecture and divination. About 500 B.C., the Romans freed themselves from Etruscan rule and with great speed advanced to the conquest of Italy, then of the entire Mediterranean world. Even the great monarchies of the East fell before the Roman legions.

Great factors in this triumph were the elements of the Roman government: the Senate, composed of experienced former magistrates serving as a body to advise and administer; the two consuls, generals of the army and chief magistrates with full power of command as executives; and the people who had the right to give or refuse assent in their assemblies and were trained to render effective obedience in the army. Behind these institutions was Roman character, based on tradition and discipline and noted for simplicity, courage and fidelity. The chief contributions of the early Roman Republic were the marvelous methods of road building and a system of law which tried to secure justice for all men, even for non-Romans.

The great conquests brought new problems. The government, well adapted to the rule of a city-state, was not suited to the management of an empire. The other Italian peoples had been admitted to Roman alliance; but the overseas dominions were organized into tribute-paying provinces like those of Assyria and Persia. Great wealth from booty and graft suddenly came to Roman governors and businessmen, who shamelessly exploited and robbed the provincials. The great military power entrusted to the governors, who commanded armies that were now composed of professional soldiers, was a menace to the state unless some method of control could be developed.

Great estates belonging to wealthy Romans and worked by slaves began to appear in Italy, and the small farming class, backbone of early Rome, was turned into a poverty-stricken city population. The new class of businessmen challenged the power of the Senate over the empire. Finally the new wealth and the absorption of Hellenistic culture by the educated classes broke down the simplicity and vigor of the old tradition. Self-seeking took the place of loyalty to the public service.

The failure of the Senate to solve these problems resulted in the Roman revolution, a series of events that began with an attempt to remedy agricultural conditions in Italy, reached its climax with the dictatorship of Julius Caesar in 46 to 44 B.C. and ended with the victory of Augustus in 31

B.C. and his establishment of one-man rule over the Roman Empire. The first great period of Roman literature came during the period of conquest and revolution. In the main it followed Hellenistic models, poems, plays, history, oratory and philosophic essays, though it was inspired by the Roman spirit. The chief writer of this period was Cicero (106–43 B.C.). His orations are read in our schools, his letters form our best source of information about the politics of his time and his essays provide us with much of our knowledge of Hellenistic philosophy.

The Roman Empire.—In the Roman Empire, the three streams of culture—Near Eastern, Greek and Roman—met and mingled. The widely diverse peoples of East and West were welded together in a common loyalty to an emperor who, like the Eastern kings, was worshiped as a god. Their world was well administered by the emperors, who kept the governors in hand, preserved order in the provinces and guarded the frontiers against barbarian invasions. Roman law was developed into a body of rules and practices so suitable to meet the needs of varied peoples that it remains today the foundation of many modern legal systems. Roads, built for military purposes, bound the empire together, and Roman officials, merchants and soldiers carried civilization to all corners of the empire. The West was well Romanized; but the East remained Greek in language and culture. Industry was highly developed, and trade spread over the empire and reached beyond its borders even to India and China. In agriculture, great estates, many of which belonged to the emperors, continued to appear; but on them tenant-farming took the place of slave labor. Though the poor still received starvation wages, the government provided them with free bread and shows (*panem et circenses*) and in some towns furnished free schools, libraries, hospitals and medical attendance. Slavery declined except in domestic service.

There was great building activity throughout the Roman Empire. *Fora* (buildings with porticoes in which work was carried on) and temples were erected; elegant houses for public baths and arenas like the Colosseum were constructed; aqueducts brought water that was distributed to fountains and sometimes piped into houses; bridges on arches crossed the streams along the roads; and ornamental arches celebrated the triumphs of the emperors. The Romans employed concrete as building material and perfected the use of the arch, the vault and the dome.

Latin literature attained its highest peak in the Age of Augustus when Vergil composed the *Aeneid,* Horace, his Odes, and Livy, his history. Though there were great writers like Seneca, Tacitus and Juvenal in the period that followed, most authors, terrified by the power of despotic emperors and afraid to express themselves freely, paid more attention to form than to content. The best writing and thinking was in the fields of morals and religion. Stoic philosophy was taught by Seneca and Epictetus, and by the philosopher-emperor, Marcus Aurelius (who wrote his *Meditations* not in Latin but in Greek). In the field of religion the Near East was all-powerful. Isis-worship from Egypt, Mithraism (a Persian religion developed out of the early dualism) and the worship of the Great Mother of Asia Minor took the place of the old gods of Greece and Rome in the hearts of the masses. Judaism, expounded by the rabbis who interpreted the collections of Hebrew sacred writings, spread throughout the empire; but victory rested with Christianity, inspired by the memory of its Founder, with its high code of morals, its intolerance of wickedness and the willingness of its adherents to suffer martyrdom for the faith they had espoused.

The Decline of Ancient Civilization.—The great spread of Near Eastern religions and the eventual triumph of Christianity came in that dark period of human history in which ancient civilization declined. In the 3rd century of the Christian era, the generals of the armies began civil wars to contend for the imperial throne, and the political structure crumbled. Diocletian and Constantine revived it for a time, but in 395 the empire was divided in two. The Eastern half, with its capital at Constantinople, lasted until 1453; but the Western, suffering under Germanic invasions, came to an end in 476. With the fall of the political framework and the destruction of peace and unity, economic life also collapsed. Coinage was debased, commerce almost stopped, industry languished, and the great estates tried to become self-supporting. In the effort to keep necessary services going, the government reduced the tenants to serfdom and made commercial and industrial activities hereditary, thus establishing castes, forcing men to carry on the crafts or trades in which they happened to be engaged, and compelling boys to succeed their fathers in the same occupations and in the same places. These burdens, in addition to the crushing load of taxation, proved too great for the middle-class people to bear, and they declined in wealth and numbers. In the end, the Roman world was composed chiefly of powerful landowners and a great mass of tenant farmers, who were almost slaves. The army, made up of peasants, declined in intelligence and discipline until it could no longer hold back the barbarians, and the Germans flooded the Western empire.

Amid general discouragement, art, architecture and literature went into almost total eclipse. Superstition took the place of intelligence; and men, convinced that the world was base, sought only escape from it. To this weary world Christianity brought its high fidelity and its promise of Heaven. Its triumph marked the end of classical civilization. The new age, called medieval, was Germanic and Christian; but the lessons that Rome had garnered from the East, from the Greeks and from its own experiences were never lost. The institutions, the law, the literature, the architecture and the art, in short, the whole product of ancient culture continued as the inspiration of later ages and it lives today as the foundations of our modern life.

ASPECTS OF ORIENTAL HISTORY

The human race has produced three great civilizations and all of them originated in Asia. They are the Chinese, the Indic and the civilization of the Near East. These three civilizations developed independently of each other and, until modern times, had very little to do with each other. As a result, the Orient may be said to be divided into three distinct cultural areas: the Far East, dominated by Chinese civilization; the Middle East or the sphere of the culture of India; and, finally, the Near East, where our own civilization originated thousands of years ago.

THE FAR EAST

China.—Chinese civilization is unique in that it began and developed almost without any influence from other countries. China is isolated from the rest of the world by huge deserts, mountain ranges and vast oceans and consequently had time in which to create its own type of civilization without being affected by neighboring cultures. The only outside influence on Chinese civilization has been Buddhism, which was introduced into China from India nearly 2,000 years ago. But even in this case the Chinese so changed and adapted the practice of Buddhism that it hardly can be distinguished from the other two religions of China, Taoism and Confucianism. This approximation of one religion to another in China may be explained by the fact that the Chinese always try to harmonize and blend conflicting ideas in an effort to reach a workable compromise. This is true of other aspects of Chinese life as well as of religion.

Though Chinese civilization is not as old as that of Egypt, it is the oldest in eastern Asia. It began probably 4,000 years ago in the valley of the Wei river, near the great bend in the Hwang Ho (Yellow River), hundreds of miles from the sea. The first two dynasties, according to Chinese historians, were the Hsia (2205–1765 B.C.) and the Shang (1766–1122 B.C.), but the real history of China did not begin till the Chou (pronounced Joe) dynasty, which began in 1122 and lasted to 249 B.C. This dynasty produced the great philosophers for whom China is famous, Confucius

(Kung-fu-tse), Lao-tse, Mencius (Meng-tse) and others.

Courtesy China Institute in America

Great Wall of China

The Great Wall is the longest fortification ever constructed. It runs for some 1,400 miles along China's northern and northwestern boundaries adjoining Mongolia. It varies from 20 to 30 feet in height and in thickness from 25 feet at its base to 15 feet at its apex. Although it was constructed during the Ming Dynasty (1368–1644) hundreds of miles of the Wall stand intact today. The picture shows several of the watchtowers, each 40 feet high

Confucianism; Taoism.—Confucius, who lived from 551 to 478 B.C., is one of the greatest thinkers produced by the Orient. He was not a religious thinker like Buddha, Christ or Mohammed, but a social reformer. As he himself said, "I am not an originator but a transmitter." He edited or compiled the Chinese "Classics"—the nearest Chinese equivalent of the Bible of the Christians and the Mohammedan Koran. They are made up of the "Five Canons" and the "Four Books", which contain the morals and philosophy that the Chinese people have followed consistently for the past 2,500 years. Lao-tse is supposed to be the author of the *Tao Te Ching,* a small book containing the main tenets of Taoism. Taoism, unlike the practical Confucianism, is largely negative in its teachings and emphasizes pacificism, mysticism and the importance of nonactivity. Mencius is chiefly noted as the philosopher who adapted Confucianism to the political needs of the Chinese people.

The Chinese people are unlike most Orientals and similar to us in many ways. For instance nearly all Oriental nations have a fondness for mysticism and religious speculation, and have never succeeded in developing a democratic form of government but have been content to be ruled by despots. This is not true of the Chinese, who have succeeded in developing democratic ideas in government and social organization, and who have been more interested in material prosperity and comfort than other Oriental peoples. Throughout history we find the Chinese making valuable contributions to science and often anticipating the great mechanical inventions of our own times.

To the Chinese, the family is the all-important unit rather than the state. The interests of a Chinese are centered first of all in his family and family-clan, secondly in his own community. A Chinese believes that his first duty is to his parents. Home and ties of blood are the center of life. The individual is unimportant. Ancestors are worshiped as a part of religion. The idea of Chinese nationalism has been comparatively unknown until this century, but it is an idea that has grown like wildfire, especially among the young people and since Japan has menaced China's survival as a separate nation.

One of the greatest rulers produced by the Chinese was a man named Shih Huang Ti or the First Emperor, who overthrew the Chou dynasty in the 3d century B.C. He abolished the nobility and founded a form of government that lasted until 1912. Since his time Chinese society has been democratic, and the only two classes that have existed have been the educated and the uneducated. Since any poor boy with talent was allowed to compete in the government examinations and, upon passing them, could occupy the highest posts in the state, there was no distinction between rich and poor as far as the state was concerned. The "First Emperor" also built the Great Wall of China, designed to keep the northern barbarians in check. It is said to be the only man-made object on earth that can be seen from the moon. Chinese writing was revolutionized by the use of small brushes made of hair. The Chinese use the pictographic method of writing and express their ideas in the form of pictures greatly abbreviated. Their characters or ideograms are not letters of the alphabet but actually represent an individual drawing of an object. There are about forty thousand of these ideograms in the standard Chinese dictionary.

The Han Dynasty.—During the next dynasty, the Han (206 B.C.–220 A.D.), the Chinese again showed their genius as inventors. Paper as well as porcelain was invented. It was a period of military conquests that extended to the boundaries of ancient Persia. Trade followed Chinese arms, and for the first time in their history the Chinese came into contact with the cultures of India and the Near East. Before long an extensive trade was carried on by Chinese and Persian merchants, the Chinese exchanging their silk goods for iron and precious stones of the Near East. So proud are the Chinese of the Han period that they often call themselves the sons of Han rather than Chinese. This was one of the great periods in Chinese art.

In this period Confucianism became the basis of the Chinese State, and the Confucianist scholars became the only state officials. To China belongs the unique distinction of having raised the scholar to the highest rank in society and put all power in his hands. In no other country was learning so honored and respected as in China.

Korea.—It was during this dynasty that the little-known peninsula called *Korea* or *Chosen,* "the land of morning freshness," was conquered and Chinese civilization penetrated into it. The culture of the Koreans is older than that of any other Far Eastern people except that of China, from whom they borrowed their earliest civilization about 1000 B.C. The founder of Korea was a certain Ki-tze, uncle of the last Shang emperor of China. When the Shang dynasty fell in 1122 B.C., this prince with his followers fled to what is now northwestern Korea and there set up a new state. Gradually, this state extended its rule over the rest of the peninsula until by the 4th century A.D. the whole of Korea accepted Chinese culture. Though the Koreans belong to a different racial stock, they became thoroughly Chinese in their culture, becoming more Chinese in some respects than the Chinese themselves. Thus when most Chinese adopted the foreign Buddhism, the Koreans disestablished Buddhism and adopted the Chinese Confucianism. The upper classes in particular use only Chinese in writing, while the lower classes use an alphabet of 25 letters (11 vowels and 14 consonants) derived from India by way of China. Korean writers use Chinese rather than the native language. When the Japanese annexed Korea in 1910, their language was forced on the Koreans. Korean is not taught in the schools, the press is chiefly in Japanese and the language of postage stamps, place names and public buildings is Japanese. The Koreans are skilful artisans, especially in porcelain and metalwork. Korean copperware, in particular, is much prized in the Far East and in the West.

Probably the most important part played by the Koreans in Oriental history was to transmit Chinese civilization to Japan. They were the first scholars and artisans in Japan and the only ones until the Japanese learned the secrets of Chinese culture themselves.

Buddhism.—Early in the Christian era, during the Han dynasty, Chinese merchants traveling to India by the old caravan route through Turkestan brought back with them the teachings of Gautama Buddha. Buddhism affected Chinese civilization in many details. It had an especially strong influence on the religious ideas of the Chinese. It brought the Chinese the concept of mercy and compassion and the promise of an afterlife. Its influence upon Chinese art and architecture was tremendous. Monasteries and convents were built everywhere, especially on hilltops. Bell towers or pagodas dotted the countryside. The Buddhists also advanced landscape gardening to a higher degree. But it was in the field of decorative art that Buddhism was most felt. The figure of the seated Buddha is familiar to all students of Chinese art as are the other Buddhist symbols of the net, the rosary, the swastika and the lotus.

Tea drinking, so characteristic of the Chinese today, originally was practiced only by the Buddhist monks who used tea as a stimulant to keep awake during the night while at prayer. The practice soon spread among the masses partly because unboiled water in China is not suitable for drinking.

Tang Dynasty.—The most brilliant period in Chinese history is the Tang dynasty (618-907). During these three centuries China was not only the largest and most powerful state in the world but the most civilized. The capital, Ch'ang-an, on the site of which stands the present city of Kaifeng, was more populous and richer than its only two rivals, Bagdad and Constantinople. To promote commercial relations with India and the Near East the Tang emperors set out on a series of successful military campaigns to the north, west and south. Central Asia and southeastern Asia were conquered and Chinese civilization planted there.

Cultural progress kept apace with the material prosperity of the Tang period. Learning was very widespread and in the reign of Wu Hou, an empress who left a convent for the throne, women were allowed to compete with men in civil service examinations and, on passing, were given high government posts. The Chinese showed their ability as engineers and inventors by building the Grand Canal, by erecting those beautiful half-moon bridges that adorn the Chinese landscape and especially by the invention of printing. This last-named invention came about from ink rubbings made on stone and wood carvings. The invention of printing facilitated a wider diffusion of learning and made possible a greater production of books, which formerly were copied painstakingly by hand. The *Peking Gazette*, sometimes called the oldest newspaper in the world, dates from this period.

Chinese Poetry and Calligraphy.—As might be expected from a period of so much literary activity, poetry, prose and painting rose to unexcelled heights. The greatest poet of China, Li Po, whose poems are familiar to every Chinese schoolboy, lived at this time. Two great schools of Chinese painting were founded. Chinese painting is different from that of the West in that the Chinese artist paints from memory and uses ink as a medium, painting with a brush on silk or some other highly absorbent material. Among the Chinese, painting is closely related to literature, especially to poetry. As a famous Chinese poet-emperor once said, "A poem in every painting, a painting in every poem." In China, calligraphy or the art of writing beautiful characters is more esteemed than the painting of pictures.

During the next great dynasty, the Sung (960–1280), China became weak politically but continued to make advances in philosophy and art. Sung pottery is famous throughout the world and much sought after by art collectors. This period witnessed the attempt of a statesman and scholar, Wang An-Shih (1021–86), to introduce into China many of the reforms that have only recently been begun in the western world—daily regulation of wages, old age pensions, state relief for the sick and unemployed, regulation of prices, and a form of income tax and other benefits of state socialism.

In 1280 the Mongols conquered China. Their rule ended in 1368 when a Chinese general expelled them from Peking and established a pure Chinese dynasty, named the Ming (Bright), a famous period of Chinese art. In 1644 this dynasty was overthrown by the Manchus who reigned until 1912, when China became a republic.

It was during the Tang dynasty (618–907) that China transmitted her culture to Japan. At first Chinese civilization entered into Japan indirectly by way of Korea, but by the 6th century A.D. Chinese emigrants began to arrive and to teach the Japanese the elements of their civilization.

Japan.—The origin of the Japanese is unknown, but they are composed of three main stocks—invaders from Manchuria and the Malay islands, and the original inhabitants of Japan, known to us today as the hairy Ainus. Japanese historians traditionally begin their history on February 11, 660 B.C. when Jimmu Tennō, the first emperor of Japan, ascended the throne; but in reality Japanese history begins only in the 6th century A.D. with the introduction of Buddhism into Japan by the great Soga family.

The Japanese owe the Chinese the same debt that we owe ancient Greece and Rome for our cultural heritage. From China came whatever knowledge the Japanese ever had of writing, law, government, medicine, mathematics, the calendar, social organization and agriculture. Although the actual origin of the Japanese language is not known, its ideographs were borrowed from Chinese. Japanese has differing spoken and written languages, and in the latter are still further distinctions—the archaic, classical, epistolary and other forms. All the Chinese culture came through the medium of Buddhism, which was made the official religion of Japan by the Prince Regent, Shotoku Taishi, who ruled from 593 to 621, one of the greatest Japanese who ever lived.

Even before the introduction of Chinese civilization, the Japanese displayed certain traits that marked them as different from the Chinese. They had developed the idea of loyalty to the country to an advanced degree whereas the Chinese emphasized only loyalty to the group or family. Then too the Japanese have always been a martial people ready to fight on the least provocation while the Chinese, thanks to Confucianism, are pacifists and resort to war only when all other means of settling a dispute are exhausted. Finally the position of the emperor in Japan is different from that which was occupied by the Chinese emperor. The Japanese emperor is a divinely descended ruler whereas the Chinese emperor merely represented Heaven and did not claim a divine origin. In other words, the basis of the Japanese state was aristocratic and rested on the clan, which was descended from a god, but the basis of the Chinese state was democratic and rested upon the family structure.

For a few centuries the Japanese were content to imitate their Chinese teachers in the arts of civilization but before long they began to create things in the Japanese spirit. The two outstanding characteristics of the Japanese artistic genius are simplicity and a delight in exquisite details. We see this on every hand in Japanese creations in art, literature, decoration and architecture. In literature the Japanese developed the short poem called the *hokku,* which depends for its meaning not on what it says but on what it suggests. The Japanese house, too, is a constant reminder of Japanese simplicity and delicacy. It is always constructed of wood—necessary in a land of earthquakes—and is simplicity itself. The rooms are almost bare of furniture; whenever an article is needed it is brought out from the spacious closets with which every Japanese house is provided and removed as soon as it is no longer required. The floor is covered with a thick matting called the *tatami,* which is kept scrupulously clean. In a corner of the main room is a raised alcove named the *tokonoma,* where a few ornaments are displayed and replaced with others in conformity with the occasion and time of the year.

There are few countries in the world as beautiful as Japan. Abundant rainfall, plenty of sunshine and a luxurious vegetation tend to make the Japanese landscape one that is not easily forgotten. Mountain and forest and roaring torrent or waterfall are nearly always in sight; as a Japanese proverb says, "One is always within earshot of water in Japan." The loveliness of Japan is reflected in the universal love of beauty that every Japanese has. No matter how poor or humble a Japanese may be there is always a garden around his home, even if it is no larger than a few square feet. The Japanese are "born" artisans; their skill and phenomenal patience are proverbial. They excel in landscape gardening, lacquer work and woodcarving. In decorative art, their influence throughout the world is second only to that of the French. The art of flower arrangement or *ikebana* has reached a degree of perfection unknown in any other country.

Shintoism.—Here, as in China, there is toleration of all forms of religious belief. The Japanese are nominally Buddhists but many of them are also Shintoists. Shinto was the primitive religion of Japan before the coming of Buddhism and Chinese culture. It is typically Japanese in being a very simple religion. It gives only one command, the necessity of being loyal to one's ancestors. This precept of loyalty to the departed binds all Japanese in a bond of unity, almost unknown in any other country today. Shintoism has about 800,000 gods in its pantheon, mostly the deified heroes of the Japanese. The chief deity of Shinto, which means the "Way of the Gods," is Amaterasu, the Sun Goddess, from whom the Imperial Family of Japan traces its origin. The lesser clans, in turn, claim descent from the lesser Shinto divinities.

The emperor of Japan, until the last century, ruled the country but did not govern it. This was done in the beginning by the regents but since the 13th century by the military commander called the *shogun*. Thus Japan early evolved a dual form of government; the religious power was held by the emperor or Tennō, sometimes referred to as the *Mikado* ("August Gate"), and the temporal power was wielded by the military overlord or shogun, who maintained his own court and state officials. This form of government lasted until 1868 when the Emperor Mutsuhito overthrew the shogun and added the temporal power to his religious duties. This strong central government brought about the adoption of Western techniques much more quickly and easily than was possible in China. Since her victory over Russia in 1905 Japan has been the only Oriental nation important as a war power.

The population of Japan increases at a terrific rate. Within the past 60 years it has doubled itself but so did the production of food in Japan due to more intensive cultivation. But today the limit of food production has been reached, and the Japanese have had to turn to industry to provide for the surplus population of their country.

Tibet.—China likewise taught other nations of eastern Asia her wonderful and ancient civilization. In addition to Korea and Japan, the Manchus, Mongolians and Tibetans accepted the main principles of Chinese culture. The entire northern frontier region of China is often referred to as Tatary. The word *tatar* comes from a Chinese word meaning barbarian or one who does not know how to speak Chinese.

Some Tibetans are settled dwellers of the valleys and some are wanderers in the arid mountains.

Lamaism.—Buddhism was introduced from India in the 7th century A.D. but Chinese civilization remained the basis of Tibetan cultural life. So thorough was the conquest of Buddhism, however, that a large part of the population entered the monastic life. The Tibetan monastery is known as a *lamasery* and often harbors 10,000 monks or lamas. The most famous of these lamaseries is at Lhasa, the capital of Tibet, and is called the *Jokhang*. Far above Lhasa towers the Potala, the palace of the head or Dalai Lama. It is located on a high hill, like most Buddhist temples, and in construction resembles a modern skyscraper. A series of staircases leads up to the Potala from the city.

Courtesy South Manchuria Railway Company

Lamaist Religious Services in Tibet

The drums and long portable trumpets provide musical accompaniment

Lamaism is the religion of some 3,000,000 Tibetans and of 7,000,000 Mongols and other races. At the head of this vast horde are two Lama popes, the Dalai Lama and the Panchen or Teshu Lama. Theoretically both the leaders have the same spiritual and temporal powers, but as the Panchen Lama rules over less territory than the Dalai, his authority is smaller. Then, too, modern political influences have been at work, and the Panchen Lama was protected by China's nationalist government after he was compelled to flee from his monastery at Tashilhunpo in 1924. The Grand Lamas are regarded as "Living Buddhas," being the incarnations of Buddha passing from one existence to another. When one dies, his successor is sought from among the baby boys born at the time the leader passed away because it is believed that the soul of the Buddha has only passed into another existence. These infant claimants to the throne are weeded out, and the one selected by the priests and nobles begins a rigorous education to fit him to assume his duties.

What the Tibetans know of art and literature is the monopoly of the lamas. The most characteristic products of the lamaseries are the prayer wheel and the Tibetan prayer rug, much prized by art collectors.

Mongolia.—The Mongols like the Tibetans are followers of Lamaism, or the Yellow Religion, a corrupt form of Buddhism, which in Mongolia as in Tibet has lost much of its Indian character and has degenerated into a form of spirit worship. Until the 13th century the Mongols were content to live as nomads, being quite backward in civilization. But early in that century one of their chiefs, named Temuchin, formed them into a nation. In 1206 Temuchin raised his standard of nine yak-tails and took the high-sounding title of *Genghis Khan*, the Mighty One. He at once ordered the conquest of the world. The conquests of the Mongols have no parallel in all history. Genghis Khan and his successors succeeded in conquering all of eastern Asia (except Japan), all of central Asia, India (where they are known as the Moguls), Persia and the Near East and nearly all of Russia. Never before nor since has so much of the earth's surface been ruled over by one nation. The Mongols succeeded in breaking down all barriers between the Far East, the Middle East and the Near East, so that trade between the East and the West again was resumed after many centuries of inactivity. Travel between the West and the Orient began and the wonders of Oriental civilization were made known to the Europeans of the 13th century.

The most famous of the Western travelers to China were the Polos, Nicolo, Maffeo and Marco (son of Nicolo), merchants of Venice. Marco (1254–1323) later dictated an account of his travels and residence in the court of Kublai Khan in Khanbaliq, just north of Peking, and the capital of the Mongols, deserted after their expulsion. Marco Polo's book became one of the most widely read in the Middle Ages.

Kublai Khan, who conquered China in 1280, was the greatest Mongol emperor. He brought Chinese civilization to the Mongols and created the Mongolian system of writing, which is based on a script borrowed from Syria. He introduced many influences from Persia into China, notably the novel and the drama. Like all Chinese emperors Kublai Khan practiced religious toleration, extending official patronage to all religions, including Christianity.

The Mongol hurricane soon spent its force and gradually the Mongols retired to their homeland, north of the Gobi Desert, where they live now as simple nomads hunting and grazing their herds.

Manchuria.—Another Asiatic people who owe China whatever knowledge they have of civilization are the Manchus, who in ancient times occupied the valley of the Amur River, but during the Middle Ages moved into what is today southern Manchuria. They are more like Europeans than Chinese and Koreans in their physical appearance. Their eyes have not the slant produced by an eyelid fold that is characteristic of other Mongolian peoples. It is believed by many that the Manchus have a Persian strain in them, which probably accounts for their somewhat Caucasian appearance. Until the 16th century they were an unimportant tribe, but late in that century a chief named Nurhachu welded them into a nation and started them on a career of conquest. In 1644 they succeeded in conquering China, and they continued to rule the Chinese until 1912. The Manchus introduced into China the queue or pigtail, which they obliged all Chinese to wear as a badge of servitude. They contributed very little to Chinese civilization and were ultimately absorbed within the Chinese masses. Today, only a few nomadic tribes in Manchuria are able to understand the Manchu language.

Because Chinese civilization is so old and self-sufficient and because China is so large, westernization has not made the progress that it has made, for instance, in Japan. Moreover, the Chinese are unwilling to accept western ideas unless they can be modified to suit conditions in China. What they desire to do is to graft western civilization on the trunk of Chinese culture so that the basis will remain, as before, purely Chinese. That is the chief reason why China is so slow today in setting her house in order. In the meantime, while China hesitates, Russian communism has gained many followers, and Japanese imperialism is slowly devouring the northeastern provinces. Yet as Chinese history abundantly proves, Chinese civilization is China's main weapon of defense and is capable of overcoming all enemies —time is on the side of the Chinese.

THE MIDDLE EAST

India.—The second great cultural area of the Orient is India. In many respects India is the most Oriental of Asiatic lands. The principal religion, Brahmanism (or more commonly, Hinduism), has played a greater part in determining the civilization of the people than in other parts of Asia. Very little is known regarding the history of India until the coming of the Aryans, a white people related to the ancient Persians, sometime in the second millenium before Christ. Their sacred songs to the gods of nature, now known as the *Vedas,* form the earliest records we have of their civilization. In order to maintain their white supremacy over the aboriginal inhabitants called the Dravidians and to keep their blood unmixed, the Aryans organized the so-called caste system. This system was devised to prevent any admixture of the white race with the natives and is to be found in no other country. In the beginning the Aryans recognized only four castes: the Brahmans, priests and scholars; the Kshatriyas, nobles and warriors; the Vaisyas, farmers and merchants, and finally, the Sudras, serfs and slaves. Later, these four castes multiplied until today there are thousands of castes in India, which form the greatest obstacle to any feeling of unity or nationalism. The word *caste* is not Indian in origin but is a Portuguese word (meaning race or unmixed race) describing this peculiarly Indian institution. The Hindus themselves use two words denoting the same thing: one, *varna,* means color; the other, *jati,* refers to one's birth or family origin. Only the Hindus practice the caste system; it is abandoned when a Hindu becomes a Mohammedan or a Christian.

Buddhism; Brahmanism. — Throughout their history the Hindus have been distinguished for their religious thought. One of the most understanding religious leaders of the world was a Hindu born in northern India in the 6th century B.C. named Gautama, the Buddha, the Enlightened or Awakened One. He founded a school of religious thought that was primarily designed to reform Brahmanism and especially to overthrow the caste system. Although in essence both religions emphasize the necessity of escaping from material life and extinguishing desire, the Buddhists protested against the ritualism and extreme self-denial and self-punishment practiced by the Hindus. Buddhism is based upon the equality of all in the religious life, women as well as men. The aim of the Buddhists, to obtain eternal life, Nirvana, by extinguishing all desire for material existence, is attained by following the "Eightfold Path": Right Belief, Right Feeling, Right Speech, Right Actions, Right Means of Livelihood, Right Endeavor, Right Memory and Right Meditation. For a time Buddhism triumphed in India, and missionaries were sent to preach it in all parts of Asia. But in the 3d century B.C. its followers split into two halves; the northern school (Mahayāna, the "Great Wheel") professed to regard Gautama as a god; but the southern school (Hinayāna, the "Little Wheel") preferred to consider Gautama merely as a teacher. It was from the northern school that China received her most important religion. The schism in the Buddhist church gave the Brahmans an opportunity to rouse the people against the Buddhists; a reaction set in and before long Buddhism disappeared in India. The triumph of Brahmanism and of the caste system was complete. The only stronghold left to Buddhism among the Indians is the island of Ceylon, where thousands of pilgrims annually go to Kandy, the capital, to venerate the reputed "tooth of Buddha" in one of the local temples.

India is a land of strange customs and stranger religions. It is likewise a land of contrasts: mud villages huddle against marble palaces dazzling white in the sun. One of the noblest architectural monuments in the world is in India—the Taj Mahal at Agra, tomb of the favorite wife of a Mohammedan ruler of northern India. Owing to the power that tradition has over the mind of the Hindu, life in India goes on today much as it did thousands of years ago. The only changes brought in were those introduced by the Mohammedans and, in modern times, by the British.

India has at least half a dozen distinct cultural areas. The farther south in India one goes the more ancient are the ruins which one meets until at the tip of the peninsula the origins of extinct civilizations are lost in time. Southern India around modern Madras was never politically or culturally a part of India proper and was itself the source of the civilization of southeastern Asia, the Malay islands and the East Indies.

The region north of Madras is a plateau called the Deccan and is the home of the warlike Mahrattas. It is likewise a stronghold of the Mohammedans. The Nizam of Hyderabad, the Moslem ruler of this region, is one of the richest men in the world.

Proceeding northwards we come to the modern city of Bombay, one of the great commercial ports of the Orient. In it are to be found descendants of the Parsis or Zoroastrian Persians who fled before the Moslems. They still practice the ancient religion of Persia and many of them constitute the wealthy merchants of Bombay. Northern India is especially famous for the sacred river, the Ganges, where millions of pilgrims come annually to wash away their sins, especially at the holy city of Benares. At one of the mouths of the river is Calcutta, the second great modern city of India. Delhi, the capital of British India, where the Durbars or meetings of the Indian princes are held, is also a great center of Hinduism. Yet, in the main, India is agricultural. There are over half a million villages in India and most of the people, as in China and Russia, make their living by tilling the soil. In India the smallest group is the self-contained more or less communistic village community that formerly was governed by meetings of the village owners and was collectively responsible for its taxes.

The Mohammedans conquered India during the Middle Ages and today form the warlike elements in Indian life. The English are responsible for the development of such modern cities as Bombay and Calcutta with their teeming populations. It was British rule that was responsible for the abolition of such practices as suttee, the sacrifice of a widow on her husband's funeral pyre.

The Indians learned many Western ideas, especially nationalism, from Great Britain. Hindus, educated in England, returned to India and began to agitate for an "India for the Indians." There is now an Indian National Congress (an annual assembly of nationalistic Hindus) and a corresponding All India Moslem League. The leader of the nationalists is Mahatma Gandhi, who has organized a movement of passive resistance against British rule. He hopes to accomplish this by a boycott of British goods, commerce and industry. As a result, of late years, Japanese goods have been flooding the Indian markets.

As bewildering as the religions of India are her many races and languages. Generally speaking there are three racial types in India. In the north and east are the Mongoloid peoples of Nepal and Burma. In the central part and all through the south are the Dravidians, descended probably from the same stock as the Australian aborigines. Only in the northwest, in the Punjab and in Kashmir does the white race predominate. There are seven principal languages in India and hundreds of dialects of these languages.

The Punjab (literally, five waters or five rivers), the fertile Valley of the Ind, has been much exposed to invasions from Persia and Afghanistan, hence its white population. But it is Kashmir that is the most colorful portion of northern India. It is often called the California of the Orient, because of its mild healthful climate and beautiful scenery. The roses of Kashmir are a favorite theme of poets, Occidental as well as Oriental. The Hindus themselves have a proverb that says "Anything can grow in Kashmir."

Burma.—In Southeastern Asia are the small countries of Burma, Siam and French Indo-China (including Cambodia, Annam, Tonking and Laos), which have been influenced by cultural streams from both India and China. All three regions are strongholds of Buddhism, which was introduced from India early in the Christian era. Burma, inhabited by a people of the yellow race, contains two cities familiar to all travelers in the Orient, Rangoon and Mandalay. The Burmese received Buddhism of the Hinayana type from Ceylon but their culture was obtained from China. Their contributions to civilization are negligible, but their happy and gay temperament has led many who know them well to call the Burmese the Irishmen of the Orient.

Burma is cut off from India by high mountain chains, with the result that the Burmese have been allowed to develop comparatively uninfluenced by their neighbors. Burmese women, for example, have equal rights with their men. Hindu women are still completely subservient, but in Burma women come and go as freely as men and often work for their living; sisters inherit equally with brothers and wives are copartners with their husbands in all enterprises. With King Thebaw, Queen Supyalat (Middle Princess) came to the throne in 1878 through the machinations of her mother. She promptly began a series of massacres of ministers and rival princes. In the meantime her husband bankrupted the royal treasury and involved the country with French and British trading concerns. In 1885 Upper Burma became a province of British India, and the pair were deported to Rangoon.

Siam.—East of Burma are the Siamese who, like the Burmese, also belong to the Mongoloid type but are more warlike and progressive. The Siamese have never been conquered by the Chinese; nevertheless, they too possess the elements of Chinese civilization, modified by certain influences from India. The Siamese are very artistic, as their capital Bangkok with its bizarre palaces, dazzling pagodas and temples testifies. Siam is one of the few Oriental countries which is still independent of any western Power, and, until quite recently when it became a limited monarchy, it was ruled by a typical Oriental despot. Situated as it is, between British Burma and French Indo-China, Siam acts as a buffer state.

French Indo-China.—Perhaps the most picturesque part of southeastern Asia is Cambodia, now a part of French Indo-China. Like the neighboring regions it is within the sphere of Chinese cultural influence but as a result of invasions from South India, Hindu influence has been predominant at times and is responsible for many of the brief periods of glory enjoyed by the people of Cambodia. During the early centuries of the Christian era, a wave of Indian invaders introduced Buddhism and built up a powerful kingdom in Cambodia. The capital of this Indian kingdom was located at Angkor and was embellished by many beautiful palaces and temples, chief of them the temple known as Angkor Wat. In time the kingdom disappeared, the jungle covered the deserted capital and all knowledge of the ruins was lost until French scientists rediscovered Angkor Wat and its architectural glories.

THE NEAR EAST

We shall now consider the most western of all Oriental civilizations, that of the Near East. The contributions of the Babylonians, the Assyrians and the Hebrews are really a part of the history of the western world, as is the role played by the Arabs in conserving and improving the science of Greece and Alexandria and introducing it into Europe through Spain. But the religion of the Arabs, Mohammedanism, had a tremendous influence upon near eastern civilization and it spread over much of eastern Asia. After the first wave of Arab enterprise had spent itself in the 7th century A.D. it was Persia that contributed most to Near Eastern civilization.

Persia (Iran).—The history of ancient Persia is closely bound up with that of Greece and is principally noteworthy for the governmental methods of Darius I and the amazing conquests of Cyrus the Great. After centuries of strife a Persian prince named Ardashir founded about 226 A.D. a purely Persian line of rulers called the *Sassanid* dynasty (from Sassan, Ardashir's grandfather). The Sassanids reigned until 641, and in these four centuries Persia became powerful and wealthy, and art and literature flourished. Zoroastrianism, the early Persian religion, which explained life as a conflict between the gods of good and evil, was revived and flourished until the Arabs conquered Persia in 641 and made it Mohammedan. Persia then did much to bring about the Golden Age of Islam or Mohammedanism (749–847).

Photo by Arthur Upham Pope, American Institute of Iranian Art and Archaeology

Dome and Sanctuary Portal at Isfahan, Iran

Madrassa Mader-i-Shah (College of the Mother of the Shah), dating from about 1709, shows typical Persian decoration in colorful facing bricks and enameled tiles.

Mohammedanism.—Mohammedanism or Islam is the third great religion of the Near East and was founded by Mohammed (*c.* 570–632), a wealthy merchant of Mecca, Arabia. In the religion of Islam, he is known as a prophet, along with Adam, Noah, Abraham, Moses and Jesus. At 40 Mohammed announced to the world that he had received visions from God and was convinced that he was God's messenger. His revelations have been collected in the Koran, the sacred book of Islam, which is written in classical Arabic. Every good Moslem centers his life about the performance of five duties: the acceptance of the confession of faith, "There is no god but the true God (Allah) and Mohammed is his prophet"; prayer, five times in every 24 hours, with the face turned towards Mecca; almsgiving; observance of the sacred month of Ramadan by fasting from dawn to sunset, and the pilgrimage to Mecca, which he must make at least once in his lifetime. The Koran describes the coming of a judgment day and the heaven and the hell awaiting in the hereafter; eternal punishment is the fate of those guilty of hypocrisy (professing, without having, a religion), murder, theft, adultery, luxury, dishonesty and other derelictions. Drinking, gambling and usury are rigorously prohibited as a part of Mohammedanism.

Though in the main the Persians were converted to Islam, they did not lose their national consciousness. To protect themselves against the predominant Arab element in Islam, the Persians took advantage of the schism that split Islam into two parts. Those Mohammedans who occupy the eastern half of the Mohammedan world or Persia became known as the Shiites; those of the western or Arab division were known as the Sunnites. The former are regarded as schismatics by the orthodox Sunnites. During the period of the Eastern Caliphate (or Moslem government) when the capital was at Bagdad, the Persian family of the Barmecides (descendants of Barmek) was largely responsible for the period of learning and culture that we associate with the name of Harun-al-Rashid, the hero of *The Arabian Nights.*

Even after the Arab Caliphate fell and the Seljuk Turks in the 11th century took up the task of defending Islam against the Christians, the Persians continued to contribute to Near Eastern civilization. Two of Persia's great men were the poet-astronomer Omar Khayyám, whose verses are familiar through the translations of Edward FitzGerald to most readers of English literature, and a schoolmate of Omar's, the famous Hasan ibn-al-Sabbah, the founder of the dreaded secret society of the Assassins, really a sect of Islam. Hasan was better known to the Crusaders as the "old man of the mountain."

The Persians are famous through the Orient for their skill in the manufacture of rugs and in bookbinding. From China they learned the art of landscape gardening, so that the principal cities of Persia, Teheran, Isfahan and Tabriz, are as famous for their rose gardens as for their mosques.

Today Persia is slowly undergoing a transformation due mostly to a strong ruler, Riza Khan Pahlavi. The influence of the Moslem religion and its conventions is checked and women are allowed more freedom. Even the name of the country, Persia (Arabic in origin), has been changed to Iran or land of the Aryans to emphasize that the Persians are not Semitic, as are the Arabs, but belong to the same linguistic stock as the Europeans.

Turkey in Asia.—Central Asia is the homeland of the Turkish people. Thousands of years ago the area was quite fertile and the center of great civilizations; but as the plains dried up, civilization drifted into China, India and the Near East and only the hardy Turks remained.

It is difficult to classify them in any cultural group. They have been exposed to both Chinese and Persian influences through the centuries. In spite of that no great civilization has been produced by the Turks, who are important mainly as warriors. When they became converted to Islam, or Mohammed's religion, their prowess as fighters helped protect and even spread that faith. Wave after wave of conquering hordes have emerged from Turkestan: the Seljuk Turks, who conquered Persia; the Ottoman Turks, who once threatened even Europe; and the armies of Tamerlane, who established a brilliant but short-lived empire with its capital at Samarkand at the end of the 14th century. Samarkand had played an important part in the trade between China and Persia and rose to its height of glory under Tamerlane. He was buried in one of its numerous mosques.

When they are not at war, the Turks make skilful blacksmiths and their women are noted for their rugs. Often one rug is the work of an entire family over a period of several months.

It was the Ottoman Turks who, in modern times, of all Oriental people, penetrated farthest into Europe. Though they kept much of southeastern Europe under their political influences for centuries, their cultural influence in Europe was negligible for they made no attempt to force their Christian subjects to adopt Islam and Oriental culture. Gradually they were expelled from their European possessions. Today Constantinople, which the Turks now call *Istanbul,* is the only foothold of Oriental civilization in Europe. Thus, this city, once the bulwark of western civilization during the Byzantine period, now acts as a bridgehead from the Occident to the Orient, located as it is at the crossroads of the world.

HISTORY OF THE MIDDLE AGES

The long period that separated antiquity from modern times is called the Middle Ages or the medieval period. It is, of course, impossible to limit such a period by precise dates, but for convenience we may assume that it began about the year 400 and ended about 1500. In these eleven hundred years there emerged, flourished and declined a civilization fundamentally different from that of the Greeks or Romans on the one hand and from that of our day on the other.

The first stage in the evolution of this new civilization was the fusion of Roman and German peoples and institutions that took place between the 5th and 8th centuries. At the beginning of this period Roman emperors still governed Europe; but they were unable to check the progress of internal decay or to prevent tribes of German barbarians from crossing the frontiers and settling in their choicest provinces.

After the year 476 there was no Roman Empire in the West; yet its institutions and traditions lived on. From Rome, the Middle Ages inherited many of their most characteristic features, notably the ideal of a single great state under an autocratic emperor. Roman law and the Latin tongue likewise survived the Roman state, as did the Christian religion and the Christian Church.

Roman civilization, however, was profoundly modified by the German invaders. The Nordic physical type was transplanted to Gaul, Spain, North Africa, Britain and Italy itself. In some areas, as in Britain, German dialects displaced the native tongues. Many military and legal institutions of the Middle Ages seem clearly to have been of German origin; but historians do not agree how great the influence of the Germans was upon the economic and social life of the regions where they settled.

Politically, this period of fusion was one of great disorder. A number of petty German kingdoms occupied the territory of the former Roman Empire. The history of these kingdoms is a dreary tale of perpetual war, murder and rapine.

The Early Church.—The one force making for stability was the Roman Catholic Church, which already possessed an effective organization. The smallest administrative unit was the parish, supervised by the priest. Parishes were grouped into dioceses, each diocese governed by a bishop. Dioceses in turn were grouped into provinces, each province being under an archbishop or metropolitan. Supreme jurisdiction over the entire system was claimed by the bishop of Rome, the Pope. The popes held that they were the successors of St. Peter, whom Jesus had designated chief of the Apostles and to whom he had given miraculous powers. Accepted in western Europe, papal supremacy was disputed in the East.

An important development within the Church was the rise and spread of monasticism. Christian monasticism originated in Egypt. The first monks were hermits who sought to save their souls by exiling themselves from society. As time went on, many of these hermits formed communities where they lived together in a monastery under the rule of an elected abbot.

Monasticism spread to the West in the 4th century. There St. Benedict of Nursia (480-543) gave it definite form by drawing up a famous set of rules for the government of a monastery. This Benedictine Rule defines the duties and obligations of the monk, divides his day between manual labor and divine service, and even prescribes what he shall eat, drink and wear. Practical and moderate, it proved immensely popular and became the generally accepted rule of western monasteries.

To overemphasize the services of the Church in this period is impossible. Its splendid organization, directed by such able popes as Leo the Great (pope, 440–61) and Gregory the Great (pope, 590–604), did much to preserve civilization. In the absence of efficient civil government, the Church assumed responsibility for education, charity and the care of the sick. The Benedictine monks were tireless missionaries and pioneers, working among pagan Anglo-Saxons, Frisians and Thuringians. Their monasteries were islands of order and peace in a sea of chaos and war. They sheltered libraries and scholars and frequently had model farms where the agricultural science of the ancients was still known and applied.

The Byzantine Empire.—Meanwhile in the Balkan Peninsula, Asia Minor, Syria, Palestine and Egypt, the Roman Empire, with its capital at Constantinople (formerly Byzantium), still held sway. In the 6th century, this Byzantine Empire experienced a revival of its former glory. Under Justinian (emperor, 527–65), northern Africa, Italy and even part of Spain were reconquered. Roman law was codified in the *Corpus Juris Civilis*. The great domed Church of St. Sophia was built. Justinian's successors, however, lost his western gains and had difficulty in holding the capital itself. In the 7th century the empire was beset by a new enemy, the Mohammedans.

Mohammedanism.—Mohammedanism takes its name from its founder, Mohammed (or Mahomet) (*c.* 570–632), a native of Mecca in Arabia. Despite many obstacles, Mohammed succeeded in converting many of the Bedouin tribes to his religious views, the essence of which is, "There is but one God, Allah, and Mohammed is his Prophet." His followers are often called Moslems, and the whole civilization of Mohammedanism is styled Moslem.

Under the successors of Mohammed, the caliphs, the Arabs became a great conquering power. They overran Persia, Syria, Palestine, Egypt and northern Africa. In 711 they began the conquest of Spain. Their advance into Europe was not checked until 732 when the Franks defeated them in the Battle of Tours. In 717 they failed in an attempt to take Constantinople. They had occupied most of the important islands of the Mediterranean, whence they proceeded to subject Europe to an enforced isolation by severing the trade routes with the East.

The civilization of Mohammedan lands between the 8th and 12th centuries presented a sharp contrast to the semibarbarism of Europe. The luxurious courts of the caliphs were centers of art and letters. The cities enjoyed material comforts and conveniences undreamed of in the West. Learned men translated the works of Greek philosophers and scientists into Arabic. Mohammedan scholars did much to advance mathematics, astronomy, chemistry and medicine. The time was to come when Europe would profit greatly from their labors.

Great Hall of a Feudal Castle

The Great Hall of Penshurst Place in Kent, England, home of the Sidney family, survives today. A model in the Metropolitan Museum of Art shows the room as it may have been at the time it was built, about 1335. The lord and lady eat on a raised platform beneath the open timber roof. The fool plays on the floor with the dog while a soldier and retainers cluster around the open fireplace

The Rise of the Frankish State.—In western Europe the major political development between 500 and 800 was the expansion of the Frankish state. The Franks were a Germanic tribe. Under their king, Clovis (*c.* 465–511), they conquered all of northern and southwestern Gaul. It was under Clovis, too, that they were converted from paganism to Roman Catholicism, an event of great importance, for it gained the Frankish king the support of the people and the co-operation of the bishops and native population of Gaul.

The successors of Clovis extended his conquests to the southeast and across the Rhine into Germany. As time went on, however, the kings became utterly incapable. By the 8th century they were mere figureheads. The actual government was in the hands of one of their officials, the Mayor of the Palace. In 752 a mayor named Pepin deposed the reigning descendant of Clovis and assumed the royal title. The dynasty established by Pepin is called Carolingian, descendants of Charles, from Pepin's son Charles (Latin, *Carolus*).

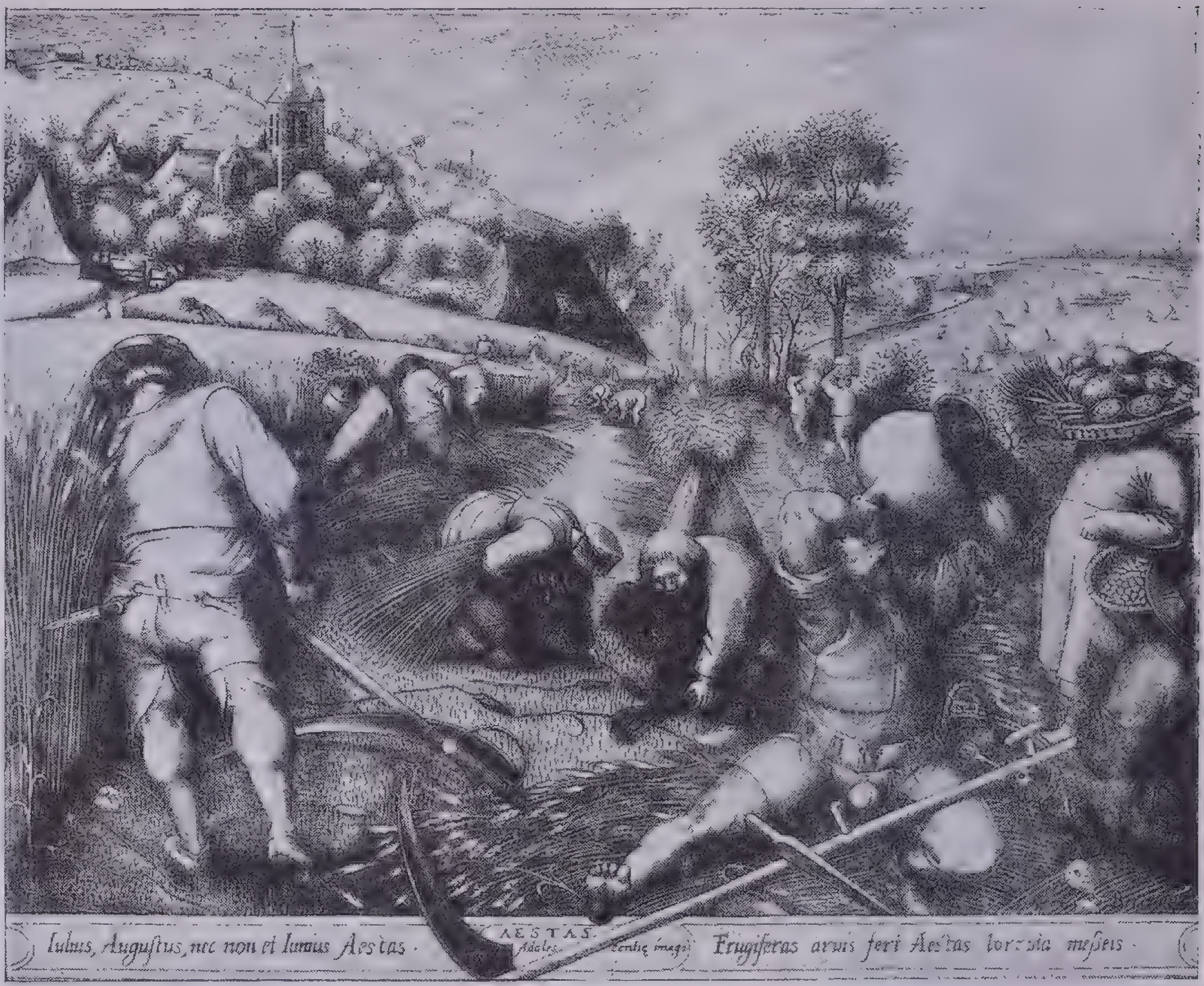
The Age of Charlemagne.—Charles the Great or Charlemagne (742-814) is one of the most imposing figures in history. A mighty conqueror, he annexed most of Italy, much of Germany and part of northern Spain to the already extensive Frankish territories. Certainly his dominions were imperial in extent, and on Christmas Day, 800, the Pope crowned him Roman Emperor. Thus the imperial tradition was revived and the Medieval Empire was born.

Charles the Great was more than a conqueror; he was a great ruler. His vast dominions were efficiently administered by local counts, who were held strictly responsible for their actions by agents sent out directly by the king. Education and learning were encouraged with such gratifying results that historians sometimes speak of a Carolingian Renaissance.

Unfortunately this promising reign was followed by two centuries of chaos. The successors of Charlemagne divided his realm and fought among themselves and with their nobles. To make matters worse, Europe was scourged by new invasions. Fierce, pagan vikings swept down from Scandinavia and harried the coasts and river valleys of Britain and Gaul. The Asiatic Magyars (ancestors of the Hungarians) plundered and burned their way across Germany. Mohammedan pirates laid waste the coasts of Gaul and Italy.

Feudalism.—The Carolingians were quite unable to defend their subjects. In its dire necessity, society turned to feudalism. People no longer looked to the central government for protection, but to local nobles who had castles and bands of armed retainers. The term feudalism comes from the custom of the fee or fief, called *feudum* in medieval Latin. A fief was land granted by one man, called the lord, to another man, called the vassal, which means servant or subject. The vassal swore allegiance to the lord and promised to render him military assistance and other honorable services. It is important to note that both lord and vassal were nobles. Very often a man was lord and vassal at the same time. He might be lord of A and vassal of B. In the 9th and following centuries most of Europe was divided into fiefs. This meant the virtual disappearance of the state and central government. The king became simply a great feudal lord. His own vassals owed him certain services, but the vassals of his vassals owed him nothing at all. Nor did the king have a monopoly of the functions that we associate with central government. Most feudal lords had political powers, such as the rights to try people in their courts and to coin money.

Physically a fief was one or more great estates or manors. The center of the manor was the lord's castle or manor house. Close by was a village in which the most conspicuous building was the church. Around the village stretched the fields and forests. The villagers received protection from the lord of the manor. In return for this and for the use of the lands they occupied, they had to devote part of their time to the cultivation of the lord's crops. They also owed him certain payments. Most of the peasants were serfs who could not leave the estate and were subject to a perplexing variety of obligations.


Iulius, Auguſtus, nec non et Iunius Aestas ·
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Courtesy Metropolitan Museum of Art

Life in the Middle Ages—Summer

From an engraving after a painting by the Flemish artist Pieter Breughel (*c.* 1525–69). The Latin inscription is translated: *July August, part of June—Summer symbolizes youth—Hot summer brings fruit to the harvest fields*

The Holy Roman Empire.—The 10th century was a dark one. In England, the successors of Alfred the Great (king, 871–901) were powerless to resist a new Danish invasion. In France the Carolingians were displaced in 987 by the Capetians, who were no more able to maintain order than their predecessors. In Spain the Mohammedans crowded the Christians into the extreme North. In Italy, while rival lords fought each other, the papacy became the pawn of Roman politicians. Only in Germany were conditions better. There the vigorous Otto the Great (912–73) put an end to the Magyar invasions and checked disintegration. He was even able to conquer northern Italy and to assume the title of Roman Emperor; but this Holy Roman Empire included only Germany and Otto's Italian conquests.

The Crusades.—The 11th century saw the beginning of a general recovery that was to reach its height in the two succeeding centuries. This recovery was greatly stimulated by the Crusades (1096–1270). A succession of vigorous popes, notably Gregory VII (pope, 1073–85), had reformed the Church and freed the papacy from lay control. A follower of Gregory, Urban II (pope, 1088–99), sought further prestige for the papacy by uniting Europe for the recovery of Jerusalem from the Mohammedan Turks so that it would again be in Christian hands.

With the blessing of Pope Urban the First Crusade departed for the East in 1096. The crusaders captured Jerusalem in 1099, but the four petty states they established in Palestine and Syria were constantly threatened with extermination. This was staved off for a long time by the dispatch of new crusades from the West; but in 1291, Acre, the last Christian stronghold, was captured by the Egyptians.

Judged by their direct accomplishments, the Crusades were a failure; yet their by-products were of vast importance. Trade between East and West was stimulated. Europe escaped from its isolation. With trade, money again came into general use; old towns increased in population and many entirely new towns appeared; a new social class, the townsmen, began to play an important role in history. Europe's intellectual horizon was greatly extended, for the new intercourse with the East was quite as much a matter of ideas as it was of spices and silks. It may be added that the Crusades led to the collapse of the Byzantine Empire, for in 1204 a crusading army captured Constantinople. Though the Byzantines recovered it in 1261, the empire had been so enfeebled that it fell an easy prey to the Ottoman Turks, who finally took the capital in 1453.

The Rise of Powerful Governments.—Economic revival was accompanied by revival of the state. Many feudal lords never came back from the Crusades and feudalism declined. Kings were now able to pay soldiers in money, instead of land, and in the townsmen they found valuable allies.

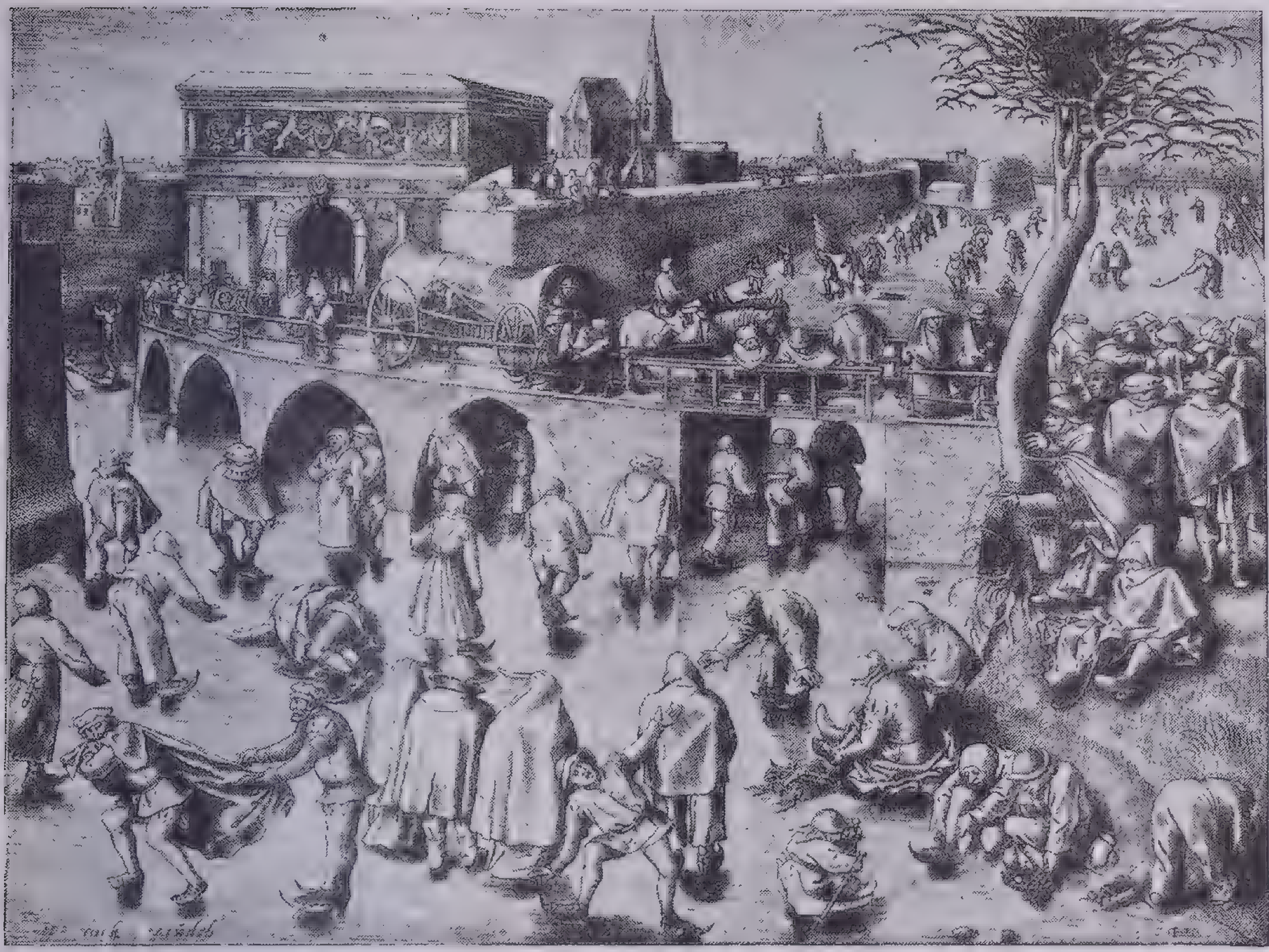
Thus the successors of William the Conqueror (king, 1066–87) in England created a strong government that curbed the power of the nobility at every turn. It is true that *Magna Charta* (1215) and the rise of Parliament in the 13th century limited the royal power; nevertheless an able and energetic king could still rule England in fact as well as in name.

A similar development took place in France. Such ambitious rulers as Philip Augustus (1180–1223) and Philip the Fair (1285–1314) extended the royal domain by annexing the lands of their vassals and created a corps of administrative officials to whom the king's will was law. When Philip the Fair died in 1314, France was well advanced on the road to absolutism.

The Hohenstaufen rulers (1138–1254) of the Holy Roman Empire also tried to increase the power of the central government. Unfortunately, they tried to do too much—to control Italy as well as Germany—and they were defeated by the Pope and his allies, the powerful Italian cities. As a result, neither Italy nor Germany had a strong central government until modern times.

The Culture of the Middle Ages.—In this period medieval civilization reached its full development. Translations from Greek and Arabic into Latin made the vast knowledge of the ancient and Mohammedan philosophers and scientists accessible to Europeans. Justinian's codification of the Roman civil law was rediscovered, and the autocratic principles of the Roman law helped the state to triumph over feudalism. Schools flourished and the universities were born. The earliest of these were in Bologna, Paris and Oxford. Crowds of students thronged the lecture halls of these institutions where they studied the seven liberal arts—grammar, rhetoric, logic, arithmetic, geometry, astronomy and music—or took advanced courses in medicine, law or theology.

Theology was considered the queen of sciences. To it the best intellects



Courtesy Metropolitan Museum of Art

Life in the Middle Ages—Winter

Skating scene before the Gate of St. George, Antwerp. From an engraving by Frans Huys after a painting by the Flemish artist Pieter Breughel (*c.* 1525–69)

of the day devoted themselves. The intensely formal and logical methods of the theologians and their philosophy were called Scholasticism. The greatest of the Scholastics or Schoolmen was St. Thomas Aquinas (*c.* 1225–74), who harmonized the teachings of Aristotle (384–322 B.C.) with the doctrines of the Church and reduced Catholic theology to a clear and logical system.

At this time the Middle Ages made their greatest contributions to literature and to art. Latin was still used in all formal literature but now there began to be a less formal literature in the vernacular or everyday language of the people. Epics recounting the exploits of Roland, King Arthur and Alexander the Great were composed in Romance and the Germanic dialects; but the supreme achievement of medieval literary genius was the *Divine Comedy* of Dante Alighieri (1265–1321), the first great work in Italian.

In architecture, the 12th century deviated from the heavy, stolid Romanesque building and created a new style, later called Gothic. By a liberal use of spires, gabled roofs and perpendicular lines, Gothic architecture creates the illusion of height. Its conspicuous features are pointed arches, ribbed vaulting and flying buttresses. The large windows are filled with the most exquisite stained glass that has ever been produced. Gothic architecture was primarily a style for churches, and its finest examples are such cathedrals as Chartres, Reims, Notre Dame in Paris and Amiens.

The Church in the Later Middle Ages.—The Church was the dominant factor not only in this brilliant intellectual and cultural development but also in all the life of medieval man. The primary purpose of the Church was saving souls, but in many ways the Church had become like a great state: it was an involuntary association; a person was born into it and could not leave it. It taxed him, tried him in its courts and looked out for him in sickness or poverty. It was efficiently governed through the hierarchy of priests, bishops and archbishops, and at its head was the Pope, an absolute monarch. Innocent III (Pope, 1198–1216) was not content with supremacy within the Church. He vigorously asserted that the Pope was superior to all kings and emperors, and a number of important rulers were obliged to admit his claims. In short, the Church, originally a spiritual institution, in the 13th century was becoming a great superstate.

The intellectual ferment of the 12th and 13th centuries produced only critics of the clergy and rebels against the doctrines of the Church. Such rebels, called heretics, became very numerous. To defend itself against them the Church organized regular crusades, for example, against the Albigensians around Toulouse and Albi in southern France in the years 1209 to 1229. Another weapon was the Inquisition, a special court for the trial of heretics. More effective against heresy was a spiritual revival within the Church itself. The two great leaders in this revival were St. Francis of Assisi (1182?-1226) and St. Dominic (1170–1221, born and educated in Spain), who founded the Franciscan and the Dominican orders of friars. In many ways the friars resembled the earlier orders of monks, but their main aim was preaching to the masses and caring for them, rather than saving their own souls. Their unselfish devotion to society did much to check the spread of heresy and to give people fresh confidence in the Church.

Despite the success of the Church in suppressing rebellion in the 13th century, the next two centuries witnessed an alarming decline in its prestige. Between 1309 and 1377 the popes made their residence at Avignon in France instead of at Rome. Rightly or wrongly they were suspected of being mere pawns in the political game of the French kings. This Babylonian captivity was followed by the Great Schism (1378–1417). The rivalry of two, and then three, claimants to the papal tiara perplexed and scandalized all Europe. Heresy grew rapidly under such notable leaders as John Wycliffe (*c.*1324–84) in England and John Huss (1369–1415) in Bohemia. In 1417 the Council of Constance ended the Great Schism, but untold damage had been done that the popes of the late 15th century were unable to repair. Interested in establishing their control over the Papal States and enamored of the literary and artistic splendors of the Renaissance, they were famous for military prowess, diplomatic skill and esthetic taste, but rarely for piety or moral leadership.

The Rise of National Consciousness.—Still more threatening to the Church was the growth of national consciousness throughout Europe. This was evident even in such politically disunited areas as Germany and Italy. It was most apparent in England and in France during the Hundred Years' War (1337–1453). In England the new dislike of the foreigner was shown in the substitution of English for French as the language of law and of literature. It is noteworthy, too, that Wycliffe's opposition to the papacy was quite as much patriotic as religious. In France patriotism developed somewhat more slowly, only revealing itself when Joan of Arc in the years 1429 to 1431 rallied it for the expulsion of the English.

Equally dangerous to the Church was the parallel rise of political absolutism. By 1500 what we of today should call dictatorship was established in many parts of Europe. The petty states of Italy had long been ruled by families of despots, the Sforzas of Milan and the Medici of Florence. In France the king had become absolute, thanks to the work of Charles VII (king, 1422–61) and Louis XI (king, 1461–83). In England, Henry VII (king, 1485–1509) was founding the strong monarchy of the Tudors. In Spain, Ferdinand and Isabella, having united Castile and Aragon by their marriage in 1469, were expanding the royal power at the expense of the Church, the nobles and the cities. There were even attempts to strengthen the central government of the Holy Roman Empire; but in Germany it was the princes and not the emperor who were to become absolute.

The Renaissance.—Not only was the Church's political position being challenged but a new secular culture threatened the older culture of the Church. The rise of this new culture—and the new culture itself—is called the Renaissance, which means rebirth. The essential characteristic of the Renaissance was boundless admiration for classical antiquity. The movement began in Italy, where it found its first great exponent in Petrarch (1304–74). Scorning Scholasticism, this Florentine devoted himself body and soul to the classics. He read them avidly, imitated them in his own writing and sought high and low for lost manuscripts of classical authors. His enthusiasm was contagious. He left numerous disciples and imitators. They came to be called Humanists because Greek and Latin literature were called the humanities or the more human literatures in contradistinction to the sacred literature of the Bible, theology and the Church. Princes, wealthy burghers and even popes came under their spell and proved to be generous patrons.

Enthusiasm for the glories of Greece and Rome spread from literature to art. In the 15th century the architects abandoned Gothic for the classical style. The sculptors studied and imitated the surviving examples of ancient statuary. The painters had no paintings from Greece and Rome to imitate, so they strove to make their pictures realistic and lifelike, which was quite in keeping with the classical ideal. A new epoch in the progress of art had begun.

In all this the Italian cities, especially Florence, took the lead; yet the Renaissance was not to remain an exclusively Italian movement. In the 15th century it spread beyond the Alps, to produce in the northern countries the great humanist Erasmus (*c.*1466–1536) and the great artist Dürer (1471–1528).

It would be a mistake to attribute all of the great achievements of the 14th and 15th centuries to the classical revival. Many other factors were at work. Thus it is difficult to find any direct connection between Humanism and the revolutionary invention of printing in the 1450's or the even more revolutionary voyages of exploration that resulted in the discovery of the New World.

Nevertheless the classical revival was a very significant event in history. In 1300 European life and culture had centered in the Church. By 1500 Europe was becoming secularized. The national autocratic state was claiming man's allegiance even at the expense of his allegiance to the Church. A culture emphasizing man and his works was displacing one that stressed the spirit and the world to come. The Middle Ages were in dissolution. Our own age was assuming its familiar form.

MODERN EUROPEAN HISTORY

Prior to the modern age European society consisted of the privileged aristocracy and the dependent serfs or farmers. All these people lived in small self-sufficient economic units, the agricultural manor villages, which had little need for businessmen to serve as economic go-betweens. By the 12th century the merchants and traders began to attain power. The building of towns, the expansion of trade and the formation of kingdoms were some of the causes that explain their rise.

At the beginning of the modern period two great movements—the Commercial Revolution and the Renaissance—led the business and professional men (the middle classes) on to fortune. The Commercial Revolution (1400–1700) gave them an opportunity to weaken the opposition of the privileged nobles and clergy and to advance in wealth and social position. The discovery of America, the remarkable development of trade and industry and the influx of gold and silver led to the establishment of the modern capitalistic or profit system. Gold and silver became the common mediums of exchange; barter virtually disappeared; and the increase of trade that followed brought the rise of rich and influential businessmen, capable of directing governments as well as commercial enterprises.

Age of Discovery.—Great colonial empires arose as a result of the Age of Discovery. As overseas possessions were established, the center of economic activity passed from the ports around the Mediterranean to the Atlantic. Portugal, Spain, Holland, France and England engaged in trading activities and created huge empires. Kings, often backed by the wealthy middle classes, destroyed the political power of their aristocratic subjects.

In a way the Italian Renaissance between the 14th and 16th centuries promoted the rise of businessmen. Individualism and emphasis upon worldly things, the bases of a middle-class regime, were the fundamental reasons why Renaissance men attempted to imitate the ancients in art and living. Wealthy individuals of that time, the Medici in Florence, for example, took keen delight in becoming patrons of learning that would sanction earthly rather than spiritual ways of living.

This Renaissance was not limited to the Italian city-states. Wherever the Commercial Revolution made possible the rise of the middle classes, an intellectual revolution took place. Sixteenth-century England enjoyed a golden age (the Elizabethan period) that culminated in the plays of Shakespeare. Seventeenth-century Holland experienced a scientific, educational and artistic birth that made possible the beautiful paintings of Rembrandt. Germany inaugurated the Christian Renaissance that resulted in the Protestant Revolt.

Commercial Policies.—This religious revolution contributed to the rise of our capitalistic age. Stanch defender of the established order, the medieval Christian Church favored the hierarchy of classes and feared the anarchy of individualism. The subordination of the material to the spiritual side of life was its constant aim. Despite its emphasis upon otherworldliness, the Church possessed great wealth and so laid itself open to criticism. Something had to yield. Advocating a return to the doctrinal and administrative simplicity of the early Christian Church, Martin Luther in Germany, John Calvin in Switzerland and John Knox in Scotland in the first half of the 16th century led the Protestant Revolt and founded Protestant sects whose followers live today in all parts of the world.

These religious leaders contributed to the economic and political as well as to the religious movements of their day. Through their emphasis upon the right of the individual to work out his own salvation by hard work and clean living, they indirectly sanctioned the activities of businessmen. To many of their followers the test of salvation was economic success as well as moral perfectibility; but the outstanding result of the Protestant Revolt was the subordination of religion to politics as the dominant factor in life. Henceforth the individual owed allegiance to the monarch as well as to the Church.

By the 17th century some European kings were virtually dictators. Desirous of increasing their power by creating prosperous states they adopted a new doctrine of political economy—mercantilism. The essense of this belief was a money theory of wealth. Gold and silver were the sources from which the prosperity of the state was derived. Therefore, the acquisition of this money by selling the maximum amount of goods to foreign countries and by buying the minimum amount from them was the objective of these mercantilist rulers.

During the 17th and 18th centuries this mercantilist policy was adopted by the monarchs of nearly all countries engaged in commerce and industry. Spain used it to exploit her great empire; the Italian city-states and the German countries applied it with success; in Holland, England and France it experienced its greatest triumphs. During the reign (1643–1715) of Louis XIV, famous for his autocratic saying, *"L'état c'est moi"* ("I am the State"), France became the classical example of an absolute mercantilist state. As a result of her commercial expansion she created one of the largest colonial empires, became the dominant nation in Europe and was recognized as the cultural center of the world.

The Intellectual Leaders.—The old order however, was not adapted to the growing capitalist regime. Three defects and abuses present in absolute monarchy—feudal society, paternalism and mercantilism—aroused much criticism. By the 18th century an intellectual revolt took place. First the scientists, Francis Bacon, René Descartes and Isaac Newton, and then the publicists, Voltaire, Jean Jacques Rousseau and Adam Smith, led the opposition. Through their researches they evolved a scientific method and a philosophical point of view that tended to weaken the bases of the privileged classes and the absolute government itself. Affirming a belief in social progress, some of these intellectual leaders asserted that the decadent absolute monarchies and the degenerate feudalism would have to give way to a new order. They advanced the concept of natural law, denounced the theory of the divine right of kings and attacked social inequalities and religious intolerance.

As bitter opponents of the old regime the traders welcomed suggestions that would enable them to advance their interests. They accepted, therefore, the views of the 18th-century English economist, Adam Smith. Maintaining in his famous book, *Wealth of Nations,* that the true strength of a nation lies in the prosperity of its citizens, Smith claimed that unrestricted enterprise promotes the accumulation of riches by the individual. In direct opposition to mercantilism he asserted that government interference in business is useless and even harmful; that each man knows best how to acquire wealth, and if he were permitted to adopt a policy of self-interest the nation would become rich. This doctrine of *laissez faire* (leave things alone, do not interfere) constituted the expression of economic liberty.

The Revolutions.—Influenced by these views, men strove first for intellectual and religious liberty, later for political rights and eventually for economic freedom. A series of upheavals resulted from attempts to realize these aims. In England a civil war (1642–49) and the so-called Glorious Revolution of 1688 resulted in the supremacy of Parliament. In America the Revolution of 1776 brought independence to the Thirteen Colonies and led to the abolition of mercantilism in England. The French Revolution of 1789 overthrew the monarchy, abolished the nobility and established political control by the business classes.

Two important 18th-century developments insured the supremacy of the capitalistic system—the Agricultural and Industrial revolutions, both resulting from a technological revolution that put mechanical power to work on the farm and in the factory. Scientific methods applied to all phases of rural and town life practically revolutionized agriculture and industry in England. Wealthy farmers abolished the strip system and introduced new notions of farming and stock raising. The soil was drained and fertilized, crops were rotated and sheep and cattle were carefully bred. New labor-saving devices, the reaper, the loom and the power machine, the steamboat and the locomotive, were introduced into agriculture, industry and transportation. Utilization of steam power resulted in the construction of factories and the increased output of manufactured articles, and made goods cheaper, promoted demand and revolutionized transportation and communication.

Accompanying this transformation came a complete change in the economic system. The feudal regime disappeared. In place of a social structure in which the status of each individual was determined by birth, tradition and law and under which production was carried on to meet immediate needs, there was an attempt to set up complete equality in social and political life; manufacturing was for future needs and in great quantity; and the profit motive became dominant.

Rise of Middle and Lower Classes.—This capitalist regime benefited the businessmen first and then contributed to the rise of the wage earner by making him class conscious. The workers soon refused to submit to the evils brought about by the mechanization of industry. They formed unions to better their own conditions and fought against the political and social restrictions of the old feudal regime only less vigorously than did the businessmen themselves.

Led by the middle classes, many wage earners and peasants helped to destroy the old order in the French Revolution of 1789. The destructive excesses of the Revolution soon alarmed the moderate liberals. Opposed to the wars, corruption, inefficiency and radicalism of the republican government, they submitted in 1799 to the dictatorship of Napoleon Bonaparte as First Consul. In 1804 he became emperor.

Napoleon as Dictator.—As head of the French state Napoleon I sought to create a great empire in which men, though denied political liberty, might enjoy legal equality and careers would be determined by talent; but Napoleon failed to realize his ideas. In his attempt to bring glory and prosperity to France by dominating the Continent and by creating a world empire, he encountered the opposition of the greater part of Europe. His disastrous invasion of Russia (1812) and his defeat at Waterloo (1815) finally doomed the Napoleonic scheme.

The representatives of England, Russia, Prussia and Austria tried at the Congress of Vienna (1815) to reestablish the balance of power whereby no single nation could dominate Europe. The continental states also attempted to check the spread of such liberal ideas as nationalism, constitutionalism and individual liberty.

Unrest of the 40s.—Despite the opposition of the conservatives, nearly every European country was touched by the revolutionary tendencies of 1815–48. In England the passage of the Reform Bills of 1832 and 1867 resulted in the establishment of a democratic government. In France the revolutions of 1830 and 1848 led to the creation of the Second French Republic. In various European states constitutions were granted and serfdom abolished. In Denmark a moderate constitution was created in 1849. In the Netherlands the people first obtained national independence and then gained political rights. In Switzerland the problem was one of nationalism rather than democracy. In the Balkans nationalist movements resulted in the gradual decline of the Ottoman Empire.

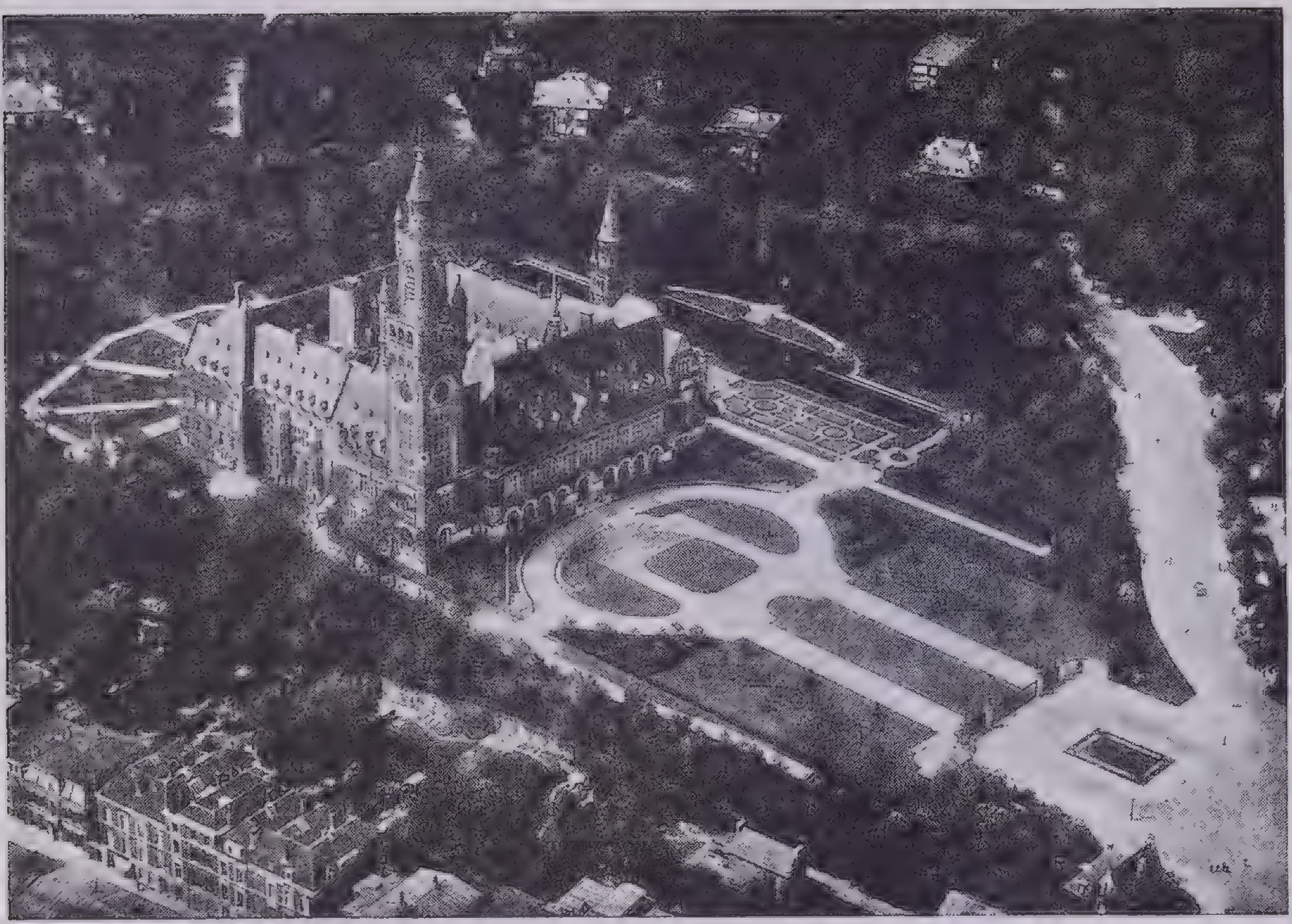
These revolutions were important because they were preliminary manifestations by Western peoples of their desire for national unity, control of government and social equality—all necessary in order that the capitalistic system might find an environment in which it could flourish. Complete success, the establishment of the middle-class order, was not feasible at that time. Before this transformation was possible, the Industrial Revolution had to create, in the revolutionary centers, more numerous businessmen and workingmen.

Radical Movements.—A division between the middle classes and the wage earners often delayed the progress of liberalism. This division was accentuated by the rise of radical movements—especially Socialism. Attacking capitalism, Socialist leaders, the Frenchman, Louis Blanc (1811–82), and the German, Karl Marx (1818–83), urged the workers to obtain economic and so political supremacy also by seizing the agencies of production and distribution and consequently the government. Opposed to these ideas, after 1848, the middle classes often favored certain features of the old regime—the monarchy and the dictatorship for instance—rather than a socialistic order.

Between 1848 and 1870 the revolutionary movement resulted in bourgeois, rather than socialistic, reforms. Led by Count Cavour (1810–61) and other patriots and aided by France, the Italian people expelled the Austrians, created a United Italy and established a constitutional monarchy. At the same time the Germans, ably directed by Otto von Bismarck, gained unity in the form of an autocratic empire by means of three successful wars. Liberalism even penetrated reactionary Russia. In 1861 Czar Alexander II emancipated twenty-three million serfs and introduced other reforms that made Russia a little more like western Europe.

Cultural Progress.—Europe prospered as a result of these advances. The period 1848–78, the mid-Victorian age, marked a high point in English economic and cultural progress comparable to the Elizabethan period. By 1848 the middle classes ruled England. They had grown in numbers and in power, thanks to the Technological and Industrial revolutions that rapidly made Great Britain an industrial beehive. As in the period of the Italian Renaissance, this economic prosperity was accompanied by marked cultural and scientific progress. Brilliant books were written by such earnest writers as William Makepeace Thackeray, Robert and Elizabeth Barrett Browning and Charles Dickens; and astounding discoveries were made in the fields of physics, geology and biology by Michael Faraday, Sir Charles Lyell and Charles Darwin.

Literary, scientific and industrial achievements were not limited to England. Honoré de Balzac, the French novelist; Georg Wilhelm Hegel, the German philosopher; Leo Tolstoy, the Russian literary giant, and Henrik Ibsen, the Scandinavian playwright, are a few of the great European intellectuals of the 19th century. The Frenchman Louis Pasteur, who laid the foundations of bacteriology, was but one of a great number of investigators many of them German, who in the late 19th century made Europe the scientific center of the world and the



Courtesy K. L. M. Royal Dutch Air Lines

Aerial View of the Peace Palace, The Hague

Here is housed the Permanent Court of International Justice. Governments fall and economic crises arise, but no matter how dark the outlook for the immediate future may be, man never loses his hope that peace and stability may be achieved through co-operation and peaceful settlement of international disputes

starting point of an entirely new phase of science.

Industrial progress was especially marked in Germany. By 1914 she ranked only after the United States and England as a coal producer and ahead of England in the manufacture of iron. In shipping Germany was second only to England and in the electrical and chemical industries Germany took the lead. Despite a declining rural population, German scientists and technicians were able to increase Germany's crops by promoting careful soil preparation and by producing and using fertilizers and agricultural machinery. Their development of the sugar beet was a noteworthy achievement.

All this cultural and economic development, however, had its dark side. The rise of the capitalistic system and large-scale business led to a vast accumulation of capital that caused further growth and expansion of business enterprises. By 1870 diminishing profits at home and economic opportunities abroad caused businessmen to seek raw materials, markets and places for investments in the so-called backward lands.

Improved means of communication and transportation, especially the telegraph, steamship and railway, accentuated the spread of capitalism. By making the world relatively smaller these conveniences contributed to the development of profitable trade with distant lands. Vast sums were expended in the creation of these transportation facilities. To safeguard these and other business enterprises, capitalists soon urged their governments to assume direct or indirect control over remote parts of the earth.

Empire Building.—Between 1870 and 1914 European nations took possession of large parts of Africa and Asia. In Africa, Great Britain obtained control of the Suez Canal, Egypt, the Sudan and a large part of the South; France built a great Mediterranean empire in North Africa; and Germany, Belgium, Portugal, Spain and Italy gained smaller areas of African territory. In Asia, Russia greatly extended her Siberian Empire; England exploited her Indian Empire; and France, Germany and Holland had minor possessions. By 1914 the European states were ready to devour China, the last tender territorial morsel in Asia.

Unfortunately this new imperialism was accompanied by the brand of diplomacy that frequently results in wars. By 1914 Europe was divided into two hostile camps, maintaining a precarious balance of power. On the one side were the have-not nations—Germany, Austria-Hungary and Italy (the Triple Alliance)—all of which wanted additional lands and increased opportunities. On the other side the have nations—Great Britain, France and Russia (the Triple Entente)—already possessed generous shares of the world. Statesmen on both sides wanted peace and attempted to settle all imperialist rivalries; but the economic antagonisms and hatreds that constantly endangered the maintenance of peace could not be controlled.

The World War.—Upon the assassination of the heir to the Austro-Hungarian throne, the same patriotism and nationalism that had contributed so much to the rise of the new order caused men of all classes to rally to their governments, and Europe plunged into one of the very greatest of historic tragedies—the World War.

After four years of conflict (1914–18), superior human and material resources enabled the Allies to defeat the Central Powers and to attempt another balance of power. Germany, Austria, Hungary, Bulgaria and Turkey were deprived of valuable territories and saddled with heavy debts; new states—Poland, Czechoslovakia and Finland—were created, and the League of Nations, designed to maintain peace, was established.

Since the war a number of events have threatened the peace of Europe. With industries hopelessly dislocated and disorganized by war demands, tremendous losses of man power and property and enormous inflation of financial systems, the entire post-war world was indeed in a lamentable state. Economic conditions in the defeated countries were especially bad. Burdened with heavy debts, these countries, especially Germany, Austria and Hungary, faced virtual bankruptcy.

The Communist State.—In addition to these difficulties, capitalistic Europe faced for the first time a communist state in Russia after her overthrow of the aristocratic government in 1917. Determined to end capitalism as well as absolutism, this communist government under the guidance of Lenin confiscated property, nationalized industry and abolished the profit system. An earnest effort was made to carry out the radical ideas of Karl Marx.

After the war communism threatened to overthrow capitalism in other European states. In Germany, in Austria, in Hungary—wherever the aftermath of the war created intense social unrest—radicalism secured a foothold. Capitalism was not destroyed, however. Under the leadership of dictators who aroused patriotism, abolished democracy and regimented society, communism was eradicated.

The Dictators.—Intense antagonism to the new *status quo* created by the peace treaties also appeared. In Turkey, Kemal Atatürk, a nationalist dictator, forced the Allies to modify greatly the terms of the peace settlement. Italy under Mussolini, dissatisfied with the territorial grants obtained at the peace conference, took possession of Ethiopia in 1936 despite the opposition of France, England and the League of Nations. Hitler, Germany's dictator, ignoring the Treaty of Versailles, occupied the Rhineland, adopted a policy of German rearmament, withdrew from the League of Nations and in 1938 took over Austria.

Twenty years after the close of the World War Europe was divided into two armed groups—the have-nots and the haves. Again Germany and Italy, lacking raw materials and markets, demanded a place in the sun. Again the haves—Great Britain, France and Russia—stood in the way. Spain was the bone of contention between the two groups. In a civil war between the Fascists and the radical Spanish government, Germany and Italy favored the Fascists, and Russia backed the so-called reds. To prevent the possible outbreak of another European war, Great Britain and France urged all states to adopt a policy of nonintervention in Spain.

World Economic Crisis.—The world economic crisis of the 1930's did much to encourage the spread of communism and the development of imperialistic rivalries. In practically all countries credit was restricted and business activity slowed down almost to a standstill. Bread lines were longer than ever before as men from all walks of life lost their jobs and faced starvation. Numerous explanations were given for this depression: lack of economic planning, high tariff walls, huge armaments, war debts, the breakdown of capitalism.

Practically every capitalistic nation in Europe was affected by this crisis. In England, France and Germany, the middle classes as well as the wage earners suffered. To prevent a complete economic collapse these groups appealed to their governments for help. In Germany most of them welcomed the dictatorship of Hitler, believing that he would conquer their two great enemies—big business and communism. In Great Britain they approved the attempts on the part of the Labour-Conservative government to restore prosperity by reducing taxes and encouraging the revival of trade. In France they accepted the liberal government of the Socialist party, believing that it would curb the concentration of power in the hands of the wealthy and help the lower classes.

Small as well as large nations tried to obliterate communism and curb big business. In Sweden, for example, voluntary co-operation and limited state capitalism resulted in a distinct improvement in economic conditions: extremes of poverty and wealth were diminished and the general level of prosperity was raised. In short all over Europe the middle classes, joining the wage earners, deserted traditional policies and showed themselves ready to experiment with new and often radical ideas.

When economic conditions gradually improved, the willingness to experiment began to die down. Many felt that the capitalistic world was not doomed, that despite wars, revolutions and depression, Western civilization in the 20th century had marched on; that improvements in nearly all phases of human activity had taken place; that a rising tide of inventions and a supreme ingenuity in applied sciences had revolutionized the life of the average man; that knowledge had been more widely distributed than in any other period in history; that books, newspapers, periodicals, radios, motion pictures, public schools, churches and clubs had helped to dispel ignorance. If these conclusions are correct, some critics insist that this material and intellectual progress is bound to produce a better and a finer world without recourse to revolutionary tactics.

HISTORY OF ENGLAND

PREHISTORIC AND ROMAN BRITAIN

Great Britain is one of the oldest and greatest of European nations and the center of the world-encircling British Empire. It comprises three main political divisions, England, Scotland and Wales. The name Great Britain was adopted in 1707 when the parliaments of England and Scotland were united in a single body. In 1801 Ireland was joined in the United Kingdom of Great Britain and Ireland; in 1921 this union came to an end with the formation of the Irish Free State though Northern Ireland did not join the Free State.

England's development from a small island off the west of Europe into the greatest empire the world has ever known is a glorious page in the history of western civilization. It is a story of special interest to Americans, for whom the history of England is not the history of a foreign country but the history of their own civilization. Politically independent for more than 150 years, the United States is none the less joined to England by the ties of a common language and literature, a common legal system and a common past. The pride that men legitimately feel in the great traditions of their national life is for Americans rooted in the history of England as deeply as it is rooted in the history of their own country.

Of all the nations of the modern world, the English have shown the greatest genius for political organization. The English system of self-government, developed through many centuries, yet ever capable of adjusting itself to changing conditions, is, perhaps, England's greatest contribution to world civilization. But her cultural achievement, especially in literature, has also been enormous. Shakespeare, Bacon, Newton: in the world of intellect there are no higher names. Of such a nation we can never learn too much.

Celts and Romans.—The earliest inhabitants of the British Isles of whom we know anything at all were a race of savages of the stone age who lived in caves, used unpolished weapons and made clothing from skins with bone needles. Sometime in the first millennium B.C. waves of invaders from the continent—the Celts—began to push across the North Sea and the English Channel into the islands. They brought with them a higher level of culture, for they knew how to fashion implements of bronze and they had developed a tribal form of government. By the middle of the 1st century B.C. these Celts had apparently spread all over the islands, and their rudimentary civilization had replaced the cruder culture of the primitive inhabitants.

The written history of Britain begins with Julius Caesar's account of his expedition to the island in 55 B.C. This first so-called invasion was really no more than a landing. In 54 B.C. Caesar returned and this time penetrated some distance inland, fought several skirmishes with the islanders and received a nominal submission from the tribes living in what is today the county of Kent.

These expeditions of Caesar were of little immediate importance as the Romans made no further attempt to subjugate Britain for nearly 100 years, and Caesar left no Roman garrison. But the two books of his *Commentaries* in which Caesar describes his invasions are of immense interest to modern scolars, as they give the only firsthand account of the early Britons that has come down to us.

In the first century A.D. most of the island south of Scotland became part of the Roman Empire. The Romans introduced the first advanced civilization, built many roads, walls and public buildings, established a stable government administered by an official responsible to Rome and settled many fortified centers which later grew into important cities. But the *Pax Romana* was purchased, as everywhere else in the empire, by submission to the domination of military force and the rapacious exactions of the Roman tax collector. These conditions were not conducive to the development of a strong national spirit, and when the Roman legions were withdrawn early in the 5th century, the Britons were unable to make much resistance to the bands of fierce sea rovers who now began to pour over from the German coast.

ANGLES, SAXONS AND DANES

The Anglo-Saxon Conquest.—These new invaders from the continent were the Angles, Saxons and Jutes, who lived around the southern shores of the Baltic Sea in the regions now called Denmark, Schleswig and Holstein. They were far less civilized than the Celtic Britons had become under Roman tutelage, but they were also much more warlike. In a period of 60 years or so in the last half of the 5th century, these new Germanic tribes had forced the Celts out of much of southern and eastern Britain, and had set up their own tribal kingdoms.

The Angles, Saxons and Jutes were closely related in language and cultural institutions. As they spread over Britain they mingled among themselves, and gradually the original distinctions based upon tribal and family loyalty died out. They became known by the common name of English, and they gave the name of England (Angle-land) to the country.

We know little of the details of this great Anglo-Saxon or English conquest, but we can be sure that it was a very different thing from the Roman occupation that had preceded. The Anglo-Saxons took over the country for permanent homes, and they undoubtedly destroyed a large part of the Celtic population who were there before. How much intermarriage and cultural mingling occurred we cannot say, but it is certain that the English language and English customs prevailed with little modification wherever the English settled. By 800 A.D. there was left little trace, except in the extreme west of the island and in Scotland, of the Celtic nation that had lived there for a thousand years. England had become English.

Early in the 7th century Christianity was introduced. The story goes that Pope Gregory the Great became interested in some fair-haired Angles whom he saw in the Roman slave market, and saying after he heard their nationality that they should be not Angles but Angels, he sent St. Augustine in 597 to convert the island to Christianity. The first Christian king was Ethelbert (d. 616), who ruled over a group of tribes settled in Kent, just south of the mouth of the river Thames. Ethelbert married a Christian princess Bertha, from among the Gauls on the continent.

Anglo-Saxon and Dane.—The Angles and the Saxons ultimately divided nearly all of England between them. In the year 827 Egbert, king of Wessex, joined seven kingdoms into one, and from this date the kingdom of England may be said to have a history. It was in the Court of Charlemagne that this first king of all England was educated. By the time that Alfred the Great came to the throne (871), the Danes threatened to overrun the island, but Alfred was able to limit their influence to the eastern part (the Danelagh), and forced them to acknowledge his supremacy.

Alfred was one of the greatest of the kings of England. Under him the first English navy was built. It defeated the Danish fleet at Swanwic (Swanage). The Danes pushed on, however, in great numbers. At Chippenham Alfred finally defeated the Danish leader, Guthrum, who became a Christian and Alfred's godchild. But Alfred's peaceful accomplishments were even greater. He established uniform laws in the realm and in many cases was judge himself. He was a wise and farsighted administrator and was greatly beloved by his people. After Alfred's death the Danes made other attempts to subjugate the land, and the common danger led to the organization of the Witenagemot, a council of all the leading men in the kingdom; previously each of the separate kingdoms had had its own independent Witenagemot. (*Witan* means wit or wise.) The kings took council with this body continually; some headstrong ones practically ignored it, yet it served an excellent purpose until the conquest by the Normans.

In the 10th century the kings had as adviser a bishop named Dunstan, whose wisdom made him the chief power in England. For a time the threat of the Danes subsided. But after Ethelred was declared king in 979, he ordered a massacre of all the Danes in England (1002), because their depredations had been renewed. Revenge was speedy, for Sweyn, king of Denmark, began at once to ravage the country and after two campaigns he declared himself king of England. Ethelred's rule had been so weak that the leaders accepted Sweyn. Ethelred fled across the channel. After Sweyn's death in 1014 he returned to the throne, but the following year he was overthrown by Sweyn's son Canute. Beginning his reign with cruel tyranny, he later exercised his authority with moderation and treated Danes and Englishmen as equals.

Canute died in 1035. A period of disorder followed until 1042, when on the death of Hardicanute, Canute's son, the Danish line of kings ended. By general consent of all the English leaders, the throne passed to Edward, son of Ethelred, known as Edward the Confessor. His reign lasted 25 years.

On the death of Edward the Confessor (1066), the throne was seized by the energetic Harold, who had long governed the kingdom in fact though not in name. Harold had no hereditary right, as he was the son of Earl Godwine, and was not in the direct line of royal descent. But he was accepted by the majority of the nobles in the south and east of England, and it seems probable that he could have consolidated his power and founded a royal line if he had been left alone. His right was immediately challenged, however. The powerful Duke William of Normandy laid claim to the English throne on the basis of his relationship to Edward the Confessor (he was the grandson of the brother of Edward's mother), and in the autumn of 1006 he landed an army to make good his claim. The decisive battle of Hastings followed in which Harold's army, after a brave struggle, was utterly routed and Harold himself was killed. William marched to London and was crowned king on Christmas Day 1066. This event ended the Anglo-Saxon period.

Courtesy Associated British & Irish Railways, Inc.

Municipal Roman Bath at Bath, Somersetshire

The Romans used the hot mineral springs in Britain and left behind them evidences of their occupation, such as the bath pictured here, discovered in 1755. In the background is part of the Abbey Church of St. Peter and St. Paul. In the 18th century, Bath was at its height as the meeting place for fashionable society

THE NORMAN CONQUEST

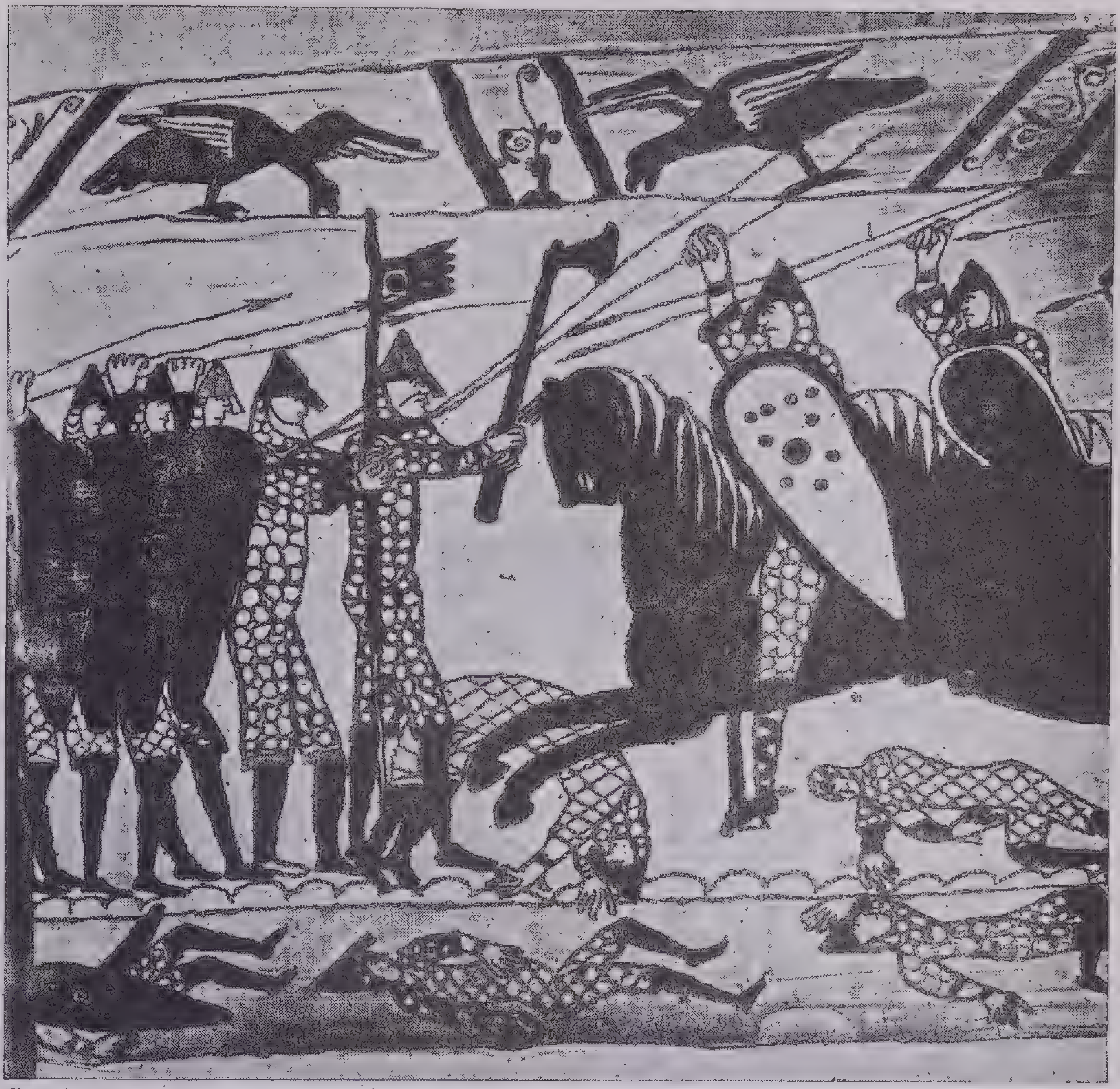
The defeat of Harold at Hastings and the seizure of the English crown by William was far more than a mere change of royal line. The knights and barons who had followed the Duke were not a paid army that could be disbanded as soon as the main battle had been fought, but were themselves powerful noblemen, each the head of a band of armed retainers. They had not joined William's expedition without expecting plenty of lands and plunder for themselves, and William was in no position to refuse their demands even if he had wished to do so. The first result of the Norman victory, therefore, was a redistribution of lands on a great scale. All over England large estates passed into the hands of Norman lords personally loyal to the new king. The system of feudal land tenure, by which lands were held on condition of allegiance and military service to the superior lord, thus became centralized. In the distribution of land, William shrewdly avoided giving any great compact section to a single baron, minimizing the chance that any nobleman might grow powerful enough to be a rival to the king.

The Norman nobility thus became the governing class of England. They brought with them a new language (French) and a new culture. In the next two centuries a complete fusion of many elements of the English and Norman civilizations took place. By the time of Edward I (king 1272–1307) the process was nearly complete; England was a united nation of Englishmen, rather than a conquered state parcelled out among foreign overlords.

Perhaps the greatest result of the Norman Conquest was the change it produced in the English language. Most English words of Latin derivation were brought into the language through the French spoken by the Norman invaders. The rich vocabulary of modern English, the flexibility of the language for the expression of fine distinctions and its sonorous power in the hands of such poets as Milton and such orators as Burke are mainly owing to the combination of Anglo-Saxon and Latin (French) elements that grew together into a single language in three centuries following the Norman Conquest.

The chief accomplishment of William's 20-year reign (1066–1087) was the establishment of a strong central monarchy. He crushed rebellion with an iron hand. He built strong castles in different parts of the country. He took a complete census known as the Domesday Survey which he made the basis of a uniform system of taxation. He set up courts of law which, while they diminished local self-government, enabled the poor and weak to get "the king's justice" against the strong.

William Rufus or William II was the second son of William the Conqueror. He ascended the English throne on his father's death in 1087 and ruled until 1100. He was a man of violent passions and had little interest in the welfare of his kingdom. Early in his reign he was faced with a serious revolt of the Norman nobles which he put down with the help of the English. The fact that the English would rally round the king for the sake of maintaining order shows how rapidly the policies of William I had brought about a community of interest between the new monarchy and the people.



Courtesy Metropolitan Museum of Art

English Soldiers Attempt to Repel the Normans at the Battle of Hastings, October 14, 1066

One of the 72 remaining panels of the Bayeux Tapestry, a band of embroidered linen 20 inches wide in the museum of Bayeux, Normandy. The tapestry was originally done in 76 panels that described in detail the conquest of England by the Normans, beginning with the visit of the English King Harold to Normandy, continuing with his reception, the arrival of the duke of Normandy in England, the preparations for battle, the battle of Hastings, the death of Harold and the final victory of the Normans. It is believed to have been made shortly after the Conquest at the request of William's half brother, the Bishop Odo, for the Bayeux cathedral

Henry I (1100–1135) was the younger brother of William Rufus. During his reign a further concentration of authority in the king's hands made the crown more than ever the symbol of law and order. Henry did what he could to increase his popularity with the English and obliterate the distinction between Norman and Englishman. He married Eagdyth, the direct descendant of the old Saxon king Ethelred, and thus united the English royal line with his own.

On Henry's death in 1135 a period of civil war followed. Henry's only living child was a daughter Matilda, and the turbulent barons found it impossible to reconcile themselves to a woman's rule. A nephew of Henry, Stephen, claimed the throne. For some years the country was distracted by a horrible anarchy. At last in 1154 following the death of Stephen the young Henry of Anjou, son of Matilda, ascended the throne and brought with him once more an era of peace and order.

THE HOUSE OF PLANTAGENET

The First Plantagenets.—Henry II (1154–1189) was the first king of the Angevin or Plantagenet line that reigned for 245 years, until 1399. One of the ablest of all the English kings, he established many reforms in the government and brought to England a national unity such as it had not known since the days of Alfred. In his efforts to advance the royal authority he came into conflict with the powerful churchman Thomas à Becket, Archbishop of Canterbury. The point at issue was the right of the church to conduct trials of the clergy independent of the state. The quarrel continued for many years and in 1170 some overzealous followers of the king, taking literally an expression of anger that Henry had given vent to in a moment of rashness, set upon Becket and murdered him before the altar in the church at Canterbury. The deed shocked public opinion and caused Henry to lose much of the prestige that his able government had won for him.

Henry II made the earliest attempt

to bring Ireland under the sway of the English crown.

In 1189 Henry II died, disappointed and embittered by the conduct of his sons Richard and John who were engaged in treasonable intrigues against their father's throne. Richard succeeded to the crown. His reckless knightly valor in the Crusades won this king the title of the Lion Heart, but he did little indeed for England. Most of his 10-year reign was spent abroad, fighting with the crusaders in the Holy Land and languishing in the dungeon of the Emperor Henry VI. During his absence the management of affairs was in the hands of his worthless brother John, who succeeded to the throne on Richard's death in 1199. A vivid account of this period is given in Scott's novel *Ivanhoe*.

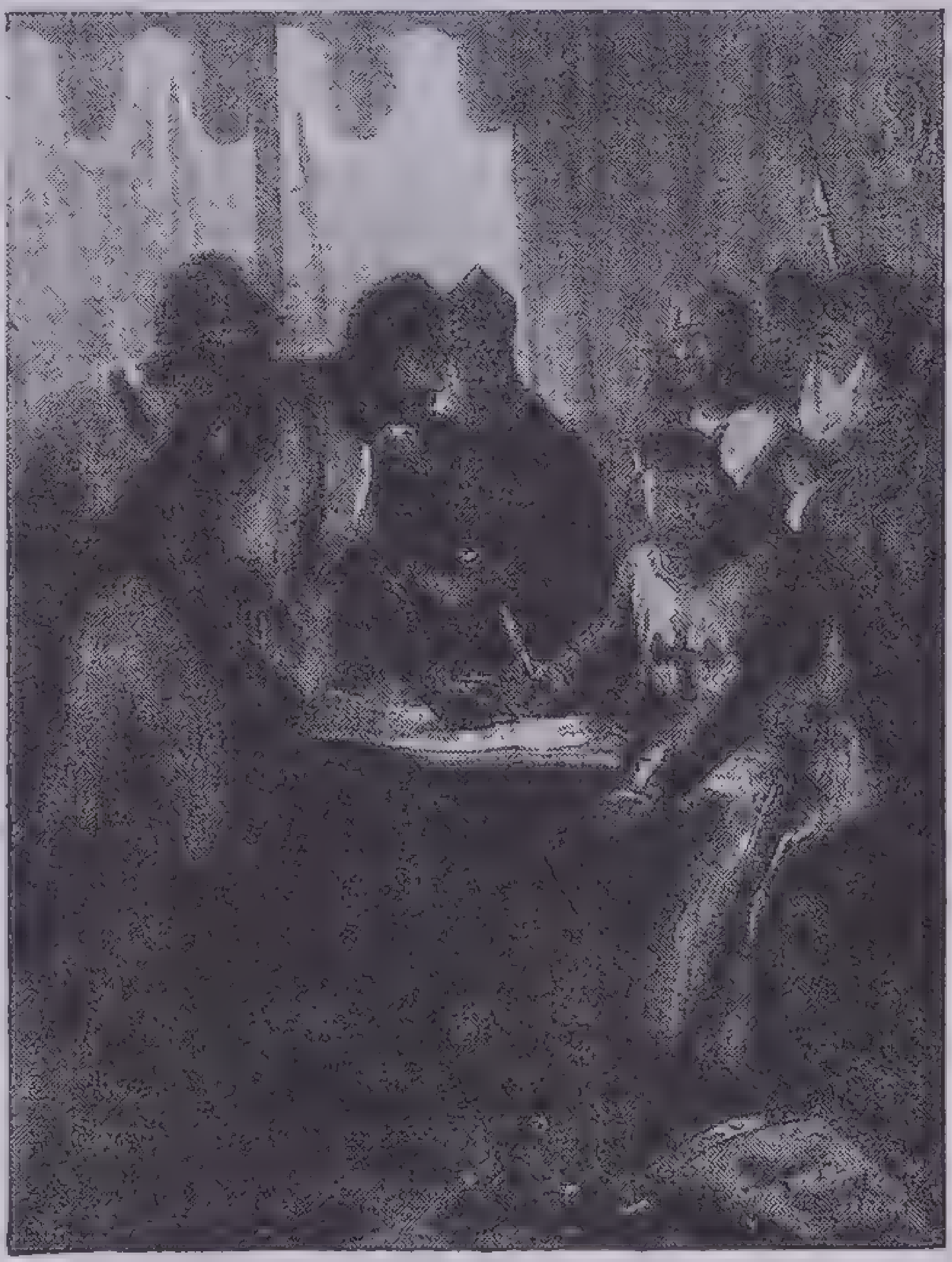
John (1199–1216) was probably the worst king that England ever had. Yet from the very badness of his character arose the greatest single reform of English history. This was the granting of the Magna Charta or Great Charter, the first important step in the establishment of the English constitutional system of government.

Enraged by a long period of arbitrary misrule, the barons and clergy in 1214 rebelled against John and occupied the city of London. In 1215 at Runnymede the king, finding himself almost alone against a united and well-armed combination of barons, clergy and tradesmen, saw that he must accede to whatever demands were made. He signed the Great Charter on June 15.

The actual provisions of the Great Charter are less important than the principle it established, the principle that the law is above the king, and that the subject has rights that no king can deprive him of. Some of the phrases of the charter have been rallying cries of civil liberty ever since. "No freeman may be taken, or imprisoned, or disseised, or outlawed, or banished or in any way destroyed, nor will we [the king] go against him nor send against him except by the lawful judgment of his peers and by the law of the land. To none will we sell, or deny or delay right or justice."

The Later Plantagenets.—The death of John in 1216 was followed by the long reign of Henry III (1216–1272). For the first 16 years of this period affairs were in the hands of a regency under the leadership of the able Hubert de Burgh. Beginning in 1232, Henry took over the government himself. His character was weak and extravagant although not tyrannical nor cruel. He soon managed to alienate most of his subjects. After a long period of mismanagement, the general discontent found a leader in Simon de Montfort, Earl of Leicester. At a meeting of the barons at Oxford in 1258 (the so-called Mad Parliament) a list of grievances and proposed remedies called the Provisions of Oxford were drawn up and forced upon the king in much the same way that the Great Charter had been forced upon King John. The Provisions of Oxford arranged for a government by a committee of 15 barons and bishops, and practically reduced the king to a figurehead. The scheme thus proposed was found to be impracticable, but again as in 1215 the principle of resistance to the king had been established.

For some years the struggle continued between Simon de Montfort and the king. Finally, in 1265, Simon lost his life in the Battle of Evesham, and Henry once more was supreme. The whole rebellion had apparently been futile. But one very important innovation continued after Simon's overthrow. In 1265 Simon had summoned a council consisting not only of the clergy and the barons, but including two knights from each shire and two citizens from each chartered town in the realm, thus greatly broadening the basis of representation. This council of 1265 thus became the first true Parliament in which all classes, in theory at least, had some representation. The name Parliament apparently dates from about this time also.


From a painting by Alonzo Chappel
King John Signing the Magna Charta at Runnymede, June 15, 1215

Henry's feeble reign ended in 1272, and his able son Edward ascended the throne. The new king, who reigned until 1307, saw clearly that he could not rule without keeping the good will of his subjects. While he loved the exercise of personal power, he knew better than to provoke the sort of opposition that had risen against his father and grandfather. His 35-year reign is marked by extraordinary constitutional and legal progress. Probably the most important single piece of legislation was the statute *De Tallagio non concedendo* of 1297 by which the king specifically agreed that no taxes should be levied except those voted by Parliament. This paved the way to the general control by Parliament of the whole government, because no king could get along indefinitely without money, and in order to get it he had to keep the good will of Parliament.

Edward II (1307–1327), in strong contrast to his father, was a frivolous, idle, weak-headed wastrel, totally unsuited to the office of king of England. In his reign occurred the famous rebellion of Scotland under the leadership of Robert Bruce. Edward attempted to put down this rebellion but was badly beaten at the Battle of Bannockburn, 1314. In 1326 a rebellion headed by Lord Mortimer and Isabella, Edward's estranged queen, resulted in the King's deposition (January, 1327). His 14-year-old son was proclaimed king as Edward III. Edward II was kept in prison and cruelly treated; when he did not die from his privations he was murdered by orders of Isabella and Mortimer.

These two continued in power for some three years; finally in 1330, Edward III, now a bold young man of 18, seized the reins of government after arresting and executing Mortimer.

Edward III's reign lasted until 1377. Its most stirring event was the Hundred Years' War with France which Edward entered to make good a shaky claim to the French throne. By the great victories of Crécy (1346) and Poitiers (1356), England's prestige was much advanced and national unity promoted.

In the midst of the war the terrible Black Death broke out all over Europe reaching a climax in the years 1348–49. Perhaps one-third of the whole population was carried off by this pestilence. While no class was exempt, the poorer classes suffered most heavily.

The Black Death produced a serious shortage of labor in England, and in 1351 the famous Statute of Laborers was passed in an effort to deal with the emergency. The Statute of Laborers fixed the wages that workmen might be permitted to receive, and provided severe penalties for any one who refused to work for the wages that were current in 1348. In the following 30 years this effort to keep the peasant class in a virtual slavery produced great discontent, finally culminating in a violent uprising under the leadership of Wat Tyler and John Ball in 1381.

Edward III died in 1377. He had long outlived the days of glory of his early victories over France. His son, the famous Black Prince, very popular with the nation, had died in 1376. The throne therefore passed to the 10-year-old Richard, son of the Black Prince, and the last of the Plantagenet line. Richard's reign lasted until 1399. His rapacious and incompetent government ended with his deposition after a rebellion headed by his cousin, Henry of Lancaster. Richard was shut up in the Tower of London where he died in 1400, probably done to death by Henry's orders.

THE HOUSE OF LANCASTER

Although Henry of Lancaster's hereditary claim to the throne was weak, he succeeded in getting the support of Parliament and was crowned as Henry IV. Most of his reign of 14 years was spent in trying to consolidate his position against numerous rebellious factions. Worn out with his exertions he died in 1413, and his young son, the brilliant and warlike Henry V, succeeded him.

Henry V (1413–1422) renewed the war with France. In 1415, leading his troops in person, he invaded France and won the great battle of Agincourt. By the Treaty of Troyes (1420) Henry was acknowledged the heir to the French throne, and he married Catherine, the daughter of the French king. Hardly was this treaty concluded, however, than series of uprisings in France occurred. Henry died of disease while trying to complete his conquest (1422).

Henry V's son was an infant of 9 months when his father died. His reign lasted nominally from 1422 to 1461. The period was one of almost continual foreign war and civil disturbance. In the first half of the reign the war with France continued savagely with varying success. In 1428 the English laid siege to the town of Orléans, and for a time it appeared that the French would be entirely defeated and France reduced to an English province. The whole situation was changed, however, by the astonishing revival of French spirit under the leadership of Joan of Arc. In 1429 the English were decisively beaten at Orléans, the siege was raised, and from this time forth the English met defeat after defeat. Although in 1430 Joan of Arc was captured and in 1431 burned at the stake in Rouen, the spirit of resistance that she had aroused against the foreign invader continued. By 1450 the English had been driven out of all the land conquered by Edward III and Henry V; of the possessions that the English kings had once held on the continent, only Calais was retained. Thus the Hundred Years' War resulted in the emergence of the French nation. Although technically the loser of the war, since it was ostensibly fought over the claims to the French throne of the kings of England, English arms had been victorious almost throughout the struggle, and the war made England a proud, united and vigorously ambitious nation.

The Wars of the Roses.—The French war was no sooner ended than the long and bloody struggle of the Houses of Lancaster and York called the Wars of the Roses broke out in England. Henry VI's claim to the throne was based upon his descent, through his father Henry V and his grandfather Henry IV, from John of Gaunt, the third son of Edward III. A better hereditary claim was now put forward on behalf of Edward of York, who was descended from Edward III through Lionel, Edward III's second son. The bitter rivalry of the great noble families over this issue resulted in a devastating irregular warfare that lasted until 1485. In 1461 Henry VI was deposed, and the Yorkist claimant, Edward IV, ascended the throne. Nine years later Henry was replaced on the throne for a brief period, under the control of the Earl of Warwick (known as the king-maker), but in 1471 Warwick was defeated and killed at the Battle of Barnet, and the final Lancastrian effort was beaten at Tewksbury. Henry VI died in the Tower immediately afterwards, and it is almost certain that he met the same fate as Edward II and Richard II.

Edward IV's reign ended with his death in 1483. His younger brother Richard, Duke of Gloucester, now seized the throne. The rightful heir was the 12-year-old son of Edward, who is recognized in the list of English kings as Edward V. He and his younger brother Richard were murdered in the Tower by order of their uncle, who now assumed the title of Richard III. Richard III's reign lasted only two years. His excesses alienated all parties. The suspicion that he had obtained the crown by the cold-blooded murder of his nephews grew stronger and stronger. In 1485 a rebellion led by the Earl of Richmond, Henry Tudor, gathered support from all the disaffected elements. Richard was defeated and slain at Bosworth Field, and Henry Tudor was acknowledged as King with the title of Henry VII. By his marriage with Elizabeth, daughter of Edward IV, and his descent from Edward III through John of Gaunt, he united the conflicting claims to the crown, and brought the 30-year civil war to an end.

THE TUDOR MONARCHY

The reign of Henry VII (1485–1509) marks the beginning of a new period in English history. The Wars of the Roses had left the nobility impoverished and exhausted. Henry VII seized affairs with a strong hand and soon elevated the crown to the preponderant position in the government that spelled the death of the old feudalism and favored the formation of a strong centralized national state. Great things were in the air throughout western Europe. In 1492 Columbus pushed the frontiers of the known world westward to the Americas; in 1497 John Cabot sailed from Bristol and established the first recognized claim to the mainland of North America. William Caxton brought the first printing press from the Continent in 1474. Europe was awaking from the thousand years' sleep of the Middle Ages.

Throughout the 14th and 15th centuries the influence of Parliament in the affairs of government had increased. The hold of the purse strings was the real source of Parliament's power. By the simple expedient of withholding funds, Parliament could quickly bring a recalcitrant king to terms. Henry VII found a way to avoid the financial domination of Parliament. By a system of fines and confiscations he raised money without regular taxes; and by strict economy in the management of the government he made his income exceed his expenses. At the close of his reign he had accumulated an immense surplus, some £1,800,000, and it was owing largely to this financial freedom that his successor Henry VIII was able to establish a despotic regime. The power of Parliament to levy taxes proved the deciding weapon in the long struggle of the 17th century between king and Commons.

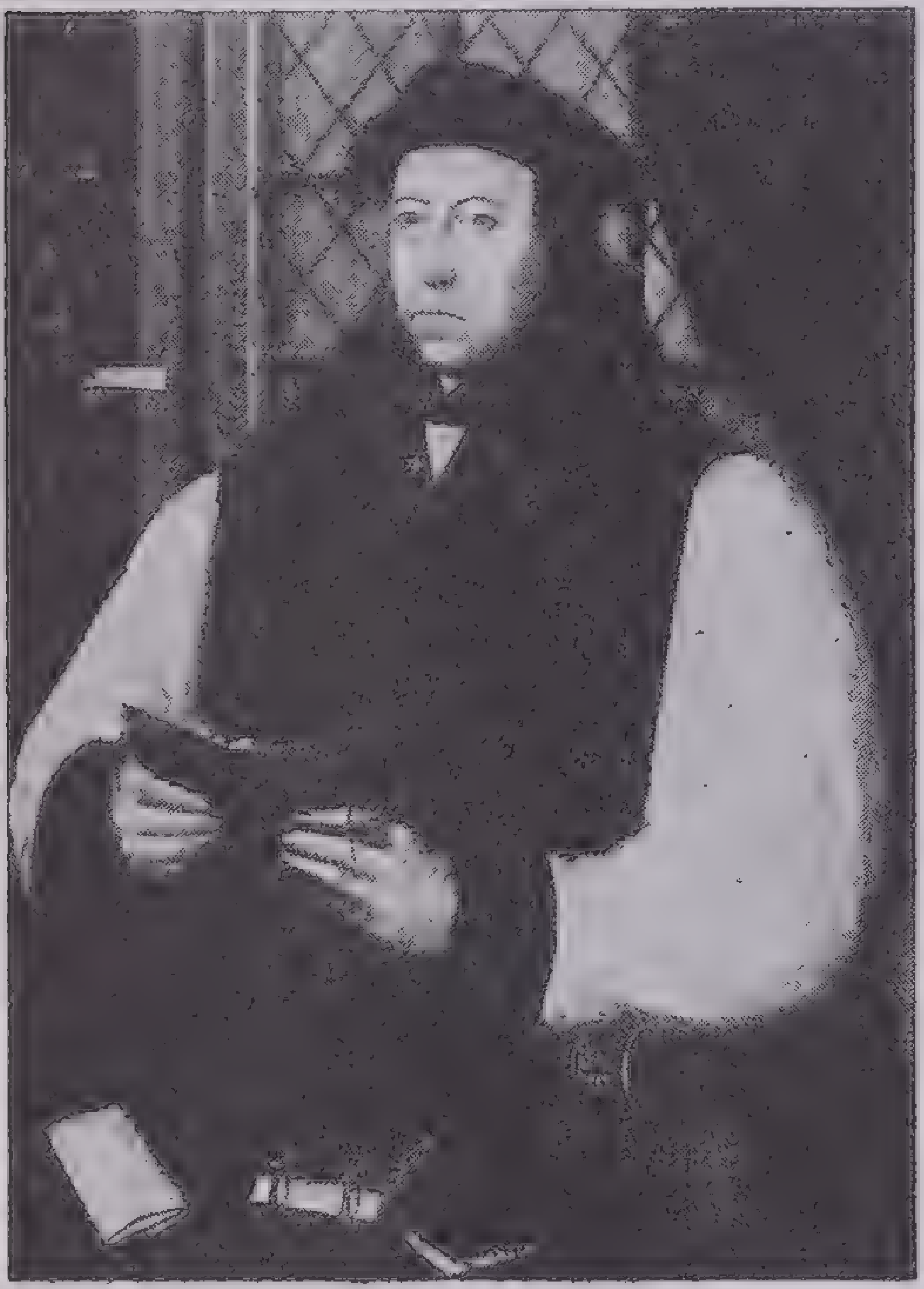
The next king, Henry VIII, was only 18 years old when he ascended the throne in 1509. Self-willed, unscrupulous and sensual, he was nevertheless gifted with a keen mind and considerable administrative ability. Thanks to the shrewd and careful management of his father, Henry found himself in control of a full treasury, a smooth-working governmental organization, a pliant Parliament and a united and prosperous people. His bluff and hearty manners, his handsome person and his undoubted mental ability made him a favorite with all classes. His reign of 38 years was marked by fundamental changes in the religious and political institutions of the country.

The first half of this period is associated with the dominance of the powerful Cardinal Wolsey, whom Henry made Archbishop of York in 1514. For 16 years Wolsey was the king's executive officer, and held in his hands almost absolute power over Church and State. This power depended, however, on the whim of the king. In spite of his outward appearance of greatness, Wolsey's position was thus highly precarious; only so long as he was indispensable to Henry could he hope to enjoy his honors and revenues. When in 1529 he failed to secure from the Pope an annulment of Henry's marriage, he was immediately cashiered, and he spent his last days in poverty and bitterness.

The Religious Revolution.—The King's divorce case, or speaking more correctly the marriage annulment case, ultimately resulted in far-reaching changes in the state religion. At the beginning of Henry's reign, the Roman Catholic Church was the sole recognized religious institution of Western Europe; but 40 years later three great branches of Protestantism had arisen: Lutheranism in Germany, Calvinism in Switzerland and Scotland and Anglicanism in England. The special character of Anglicanism was to a great extent determined by the policies and personal character of Henry.

It is a tempting oversimplification to say that Henry took England out of the Roman Catholic fold because he was tired of the middle-aged Catherine of Aragon and desired to marry the vivacious young Anne Boleyn. But the religion of a whole nation cannot be changed quite as easily as this. Actually there were many profound influences at work that would surely have brought about a great change even if Henry's divorce case had never arisen or if it had been settled to Henry's satisfaction. The whole complex of causes that made possible the Protestant revolt led by Luther and Calvin on the continent was also operative in England. Henry VIII's part was to shape details and influence the direction of the change; he had little to do with the underlying conditions that made the change possible.

When Henry found himself unable to get his marriage annulled by the Pope, he took matters into his own hands. He married Anne Boleyn early in 1533 while, according to church law, he was still married to his first wife Catherine. In March of the same year, his new Archbishop of Canterbury, Thomas Cranmer, bullied the clerical Convocation to pronounce the first marriage null and void. Henry had to all intents and purposes substituted his own authority in the English Church for that of the Pope. There was in the beginning on Henry's part no thought of change of doctrine or ritual. In his personal theological views Henry had no sympathy with Luther, Zwingli, Calvin and the other continental religious rebels. As first instituted the change was purely one of organization. Indeed, in the latter part of Henry's reign it was about as dangerous to be a genuine Protestant as it was to be a genuine Catholic. Catholics who could not stomach the supremacy of the king in spiritual matters were liable to execution for high treason. Protestants who denied the characteristic Catholic doctrines such as transubstantiation were liable to be burned for heresy. The great scholar Sir Thomas More was beheaded on the first charge; such men as John Lambert were burnt on the second charge.



Thomas Cranmer, Archbishop of Canterbury
In 1533 Henry VIII, in order to have his marriage to Anne Boleyn validated under Church-of-England law, made Thomas Cranmer Archbishop of Canterbury. Gerlich Flicke's painting of the archbishop, done sometime in the 16th century, is now in the National Portrait Gallery, London

Edward VI, son of Henry VIII by Jane Seymour, was a sickly child of 10 when his father died early in 1547. He lived only six years, and during this period the government was naturally dominated by older statesmen. Cranmer, Archbishop of Canterbury, was the leading churchman. The duke of Somerset and the earl of Warwick carried on a series of political intrigues.

The historical importance of the reign lies in the changes that continued in the state religion. Under the leadership of Cranmer, the First and Second Books of Common Prayer were prepared and their use in all church services was prescribed by law. The Second Book of Common Prayer with its Forty-two Articles of Faith became the essential body of doctrine known as Anglican. Except for slight revisions made a few years later under Elizabeth, the formal doctrine and ritual of the Church of England was thus established. The Forty-two Articles (later consolidated in the Thirty-nine Articles) represented a compromise between the extreme Protestantism of Calvin and Roman Catholicism. It rejected the doctrine of transubstantiation and the supremacy of the pope, but retained much of the more characteristic ritual of the old religion.

Reaction under Mary.—When Edward died in 1553, the question of the succession was critical. Mary, the daughter of Henry VIII by Catherine of Aragon, was the logical successor by right of birth, and she had been specifically designated by the will of Henry confirmed by act of Parliament. But she was a firm Catholic, and it was possible to cast a shadow on her legitimacy by raising the old issue of the validity of Henry's marriage with Catherine. A scheme was hatched by the intriguing earl of Warwick to exclude Mary from the throne and to set up in her place the great-granddaughter of Henry VII, Lady Jane Grey, daughter of Henry Grey and Frances Brandon (niece of Henry VIII). Lady Jane was actually proclaimed Queen on July 10, 1553, but she had no effective following and a few days later she was deposed and Mary assumed the crown. About 8 months later Lady Jane was executed. Her story is one of the romantic tragedies of English history.

Mary reigned from 1553 to 1558. Her consuming passion was to undo the work of the religious revolution of the preceding 20 years and to restore England to the Roman Catholic fold.

Under Mary's leadership, Parliament repealed all the religious laws of the reign of Edward. The Roman Catholic religion once more became the official faith of the nation. Those who had taken an active part in establishing the Protestant Church were tried for heresy, and many were burned at the stake. Because Protestantism ultimately triumphed in England, the persecutions under Mary were magnified in the minds of subsequent generations, and the opprobrious epithet "Bloody" became applied to the queen. Actually, the persecutions of Protestants under Mary's regime were no different from the persecutions of Catholics that had occurred under Henry VIII and Edward and were again to occur in the time of Elizabeth. We must not blame Mary for living in an age when the accepted way of dealing with those who disagreed with the dominant religious opinion was to burn or otherwise destroy them.

Protestantism had taken too firm a root in England to be extirpated by persecution. When Mary died in 1558, it was clear that she had accomplished nothing of what she had hoped; all that she left was an increased bitterness in religious disputes.

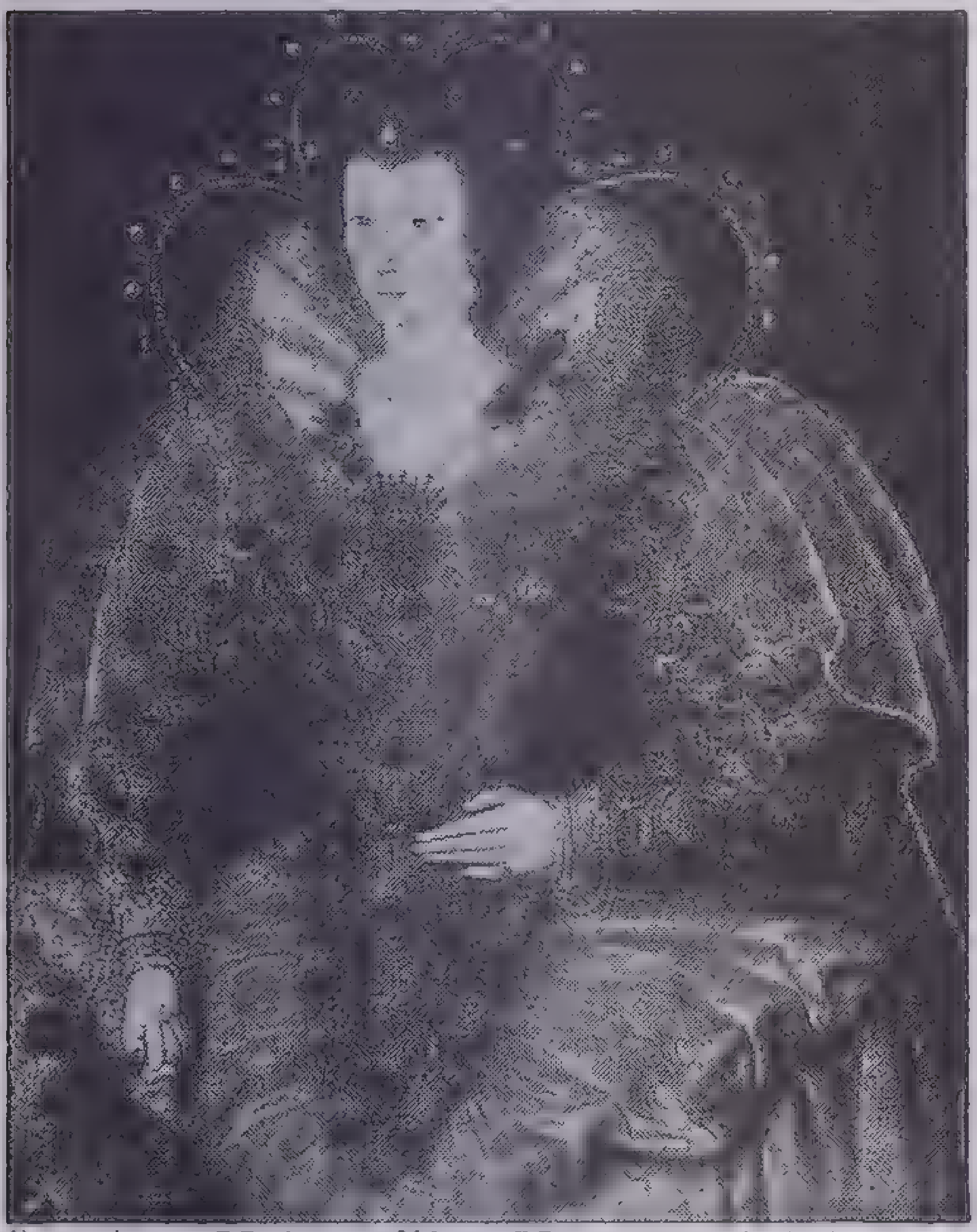
The Age of Elizabeth.—The woman who now came to the throne, whose greatness had been acknowledged by the world, was Elizabeth, the daughter of Henry VIII and Anne Boleyn. Her reign lasted nearly 50 years, and was marked by the greatest national progress that had yet attended an English monarch's reign. Englishmen still talk of the "spacious days of Elizabeth."

Her character was an enigma to her contemporaries, and it is an enigma still. The King of Spain said she had ten thousand devils in her. She was a finished mistress of all the arts of diplomatic intrigue, lying and chicane. She was vain, dictatorial and slippery. Yet the best summing up of her character and work is provided by her last public words addressed to the House of Commons in 1601: "I have ever used to set the last judgment day before mine eyes and so to rule as I shall be judged to answer before a higher Judge—to whose judgement-seat I do appeal, that never thought was cherished in my heart that tended not to my people's good. Though you have had and may have, many princes more mighty and wise sitting in this seat, yet you never had or ever shall have any that will be more careful and loving."

The first problem that had to be settled by Elizabeth was the state religion. Within a year after she ascended the throne Parliament passed the second Act of Supremacy (1559) making the English sovereign the supreme head of the Church of England. In general the religious settlement reverted to the Second Book of Common Prayer drawn up by Cranmer and his advisers in the reign of Edward VI. Undoubtedly the majority of the English people were satisfied if not pleased with this compromise; but there were substantial minorities that were unable to conform. The Roman Catholics regarded the Church of England as a schismatic and heretical body; and the extreme Calvinists on the other hand considered the ritual that the new church observed no better than the Roman liturgy they so much disliked. These Calvinist nonconformers gradually grew into the numerous sect of Puritans who wished to "purify" the Church of England of the characteristic rituals and doctrines of Catholicism.

The second half of the 16th century was a period of troublous times in Europe. Philip II of Spain, the dominant figure on the Continent, was determined to crush out the rising tide of Protestantism. In 1588 he raised a flimsy claim to the English throne, and sent a huge fleet called the "Invincible Armada" to conquer England. The Armada was decisively defeated in battle by an English fleet and was later practically destroyed by a series of severe storms. The historian Creasy places the defeat of the Spanish Armada among the decisive battles of the world; it was the beginning of England's dominance of the seas.

A weakness in Elizabeth's position was her questionable title to the throne. In the eyes of good Catholics the union of Henry VIII and Anne Boleyn had not been a marriage at all; Elizabeth, the child of this union, was a usurper; and the true heir to the English crown was the young Mary Stuart, queen of Scots by hereditary right and queen of France by marriage with the French King Francis II. From the very beginning of Elizabeth's reign Mary was a thorn in Elizabeth's side and a menace to her security. She provided a focus for political intrigues and plots against the English throne. In 1568 Mary was driven out of Scotland by the indignation that arose after the scandalous murder of her second husband, and she came to England. Elizabeth had her arrested and kept in prison for some 19 years. In 1586, she was charged with complicity in a conspiracy against Elizabeth's life, and in 1587 she was executed. Her romantic figure and tragic fate have excited sympathy in modern times, but there can be little doubt that her execution was a stern political necessity, and in the 16th century no one dreamed of reproaching it as bloodthirsty.



Courtesy Metropolitan Museum of Art

Queen Elizabeth

This portrait of the great English queen is by an unknown 16th-century painter

The defeat of the Armada was only one of a series of exploits by the great sea rovers Francis Drake, Walter Raleigh, John Hawkins, Richard Grenville and others of less note who made the English flag a terror on the ocean from the Pillars of Hercules to the South American coast. These men combined patriotism, exploration and piracy in about equal proportions. But they laid the foundations of England's maritime greatness. They also laid the foundations of the African slave trade that was to curse western civilization for more than 200 years.

The reign of Queen Elizabeth was marked by a great advance in the general level of material culture. Trade and manufacturing increased. A flow of gold from the New World stimulated all kinds of business enterprise. Improvements in building, sanitation and furniture transformed standards of comfort.

An important consequence of this economic development was the increasing strength and influence of Parliament.

THE HOUSE OF STUART

With Elizabeth's death the Tudor line came to an end and the throne went to James VI of Scotland, son of Mary, Queen of Scots, founder of the Stuart line. So England and Scotland were united, and James VI of Scotland became James I of England.

Parliament versus King.—The reign of James I (1603–1625) was marked by increasing friction between King and Parliament. James was personally vain, autocratic and tactless. He had little of the administrative ability of the Tudors. His views on the nature of monarchy are summed up in his assertion of the divine right of kings: "As for the absolute prerogative of the crown, that is no subject for the tongue of a lawyer, nor is it lawful to be disputed. It is atheism and blasphemy to dispute what God can do; good Christians content themselves with his will as revealed in his word; in like manner it is presumption and high contempt in a subject to dispute what a king can do, or to say that a king cannot do this or that; but rest in that which is the king's will revealed in his law."

King James is best known to most of the world from the authorized version of the English Bible made in his reign and called the King James version.

The question of religious toleration, agitated on the one side by the Puritans and on the other by the Catholics, caused much trouble. In 1605 occurred the famous Gunpowder Plot, an attempt by a group of Catholic conspirators, headed by Robert Catesby, to blow up the Houses of Parliament. The plot was betrayed, and its discovery greatly increased popular resentment against the Catholics.

The first permanent English colonies in America were established in Virginia and in Massachusetts during the reign of James.

Charles I came to the throne in 1625. He had been brought up on his father's theories of the divine rights of kings and was, if possible, even more tactless than James had been in attempting to apply his ideas to the government of the country. During the years 1625 to 1629 Parliament was convened three times, and on each occasion a dispute developed between the king and the Commons over the question of money. Finding Parliament unwilling to supply him with funds, Charles began a course of illegal exactions and forced loans that aroused great resentment. But he could not by these means raise enough money to do without Parliament, and in 1628 matters were brought to a head by Parliament's refusal to grant any revenue until the king should agree to the "Petition of Right," a document drawn up by the great lawyers Coke and Selden intended to bring an end to the king's highhanded methods. The Petition of Right reasserted many of the traditional privileges and immunities that had been secured from previous kings, and in particular demanded that "no man be compelled to make or yield any gift, loan, benevolence, tax or suchlike charge without common consent by act of Parliament; that freemen be imprisoned or detained only by the law of the land and by due process of law and not by the king's special command without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked."

In order to obtain the money he needed, Charles signed this concession, but subsequent events showed that he had little intention of abiding by its provisions. From 1629 to 1640 he governed without convening Parliament, and he continued the illegal exactions of money and the arbitrary arrests and detentions that were supposedly ended by the Petition of Right. Particularly irritating were the tyrannical sentences of the Court of the Star Chamber which under the color of legality acted as a tool of the king. In religious matters the autocratic methods of William Laud, whom Charles made Archbishop of Canterbury, aroused widespread opposition.

In 1640 Charles found it necessary again to convene Parliament. As usual, it was financial pressure that forced his hand. This famous Long Parliament continued in session until 1653. When it first met there was a general determination on the part of its leaders to curb the illegal government of the king, but few men thought of actual abolition of the monarchy. If Charles had realized that he was beaten and agreed to the various constitutional reforms proposed by Parliament, he could probably have retained his crown and even a considerable amount of his royal authority. But he badly misjudged the determination and the power of the Parliamentary leaders. Unwilling to concede anything, he lost all. He attempted to retain control by force of arms; but in the civil war that followed he was beaten and made a prisoner (1648).

THE COMMONWEALTH

Cromwell and the Commonwealth.—The appeal to military force raised new men to power. Chief among these was Oliver Cromwell (1599–1658). At the head of a loyal army, he was in a position to make himself dictator. It is probable that the majority of Englishmen were by this time anxious for peace and quite willing to accept a reasonable compromise which would preserve the monarchy. But the extremists, headed by Cromwell and supported by the army, could not be stopped. The moderates and supporters of compromise were forced out of the meetings of Parliament by a military coup called "Pride's Purge," and the remainder, known as the Rump or sitting part of Parliament, composed exclusively of antiroyalists, carried through a form of trial of the king on a charge of high treason. The result was never in any doubt. On January 30, 1649, Charles was beheaded on a scaffold in front of his own palace.

For the next nine years the government was in the hands of Cromwell. He was an able administrator, a skillful soldier and a shrewd politician. He raised England to a position of respect among the powers of Europe that she had not enjoyed since the great days of the Tudors. At home he was not successful in establishing a self-perpetuating constitutional government but maintained his position through the power of his army. When he died in 1658 it was evident that there was no permanence in the political system that he had controlled.

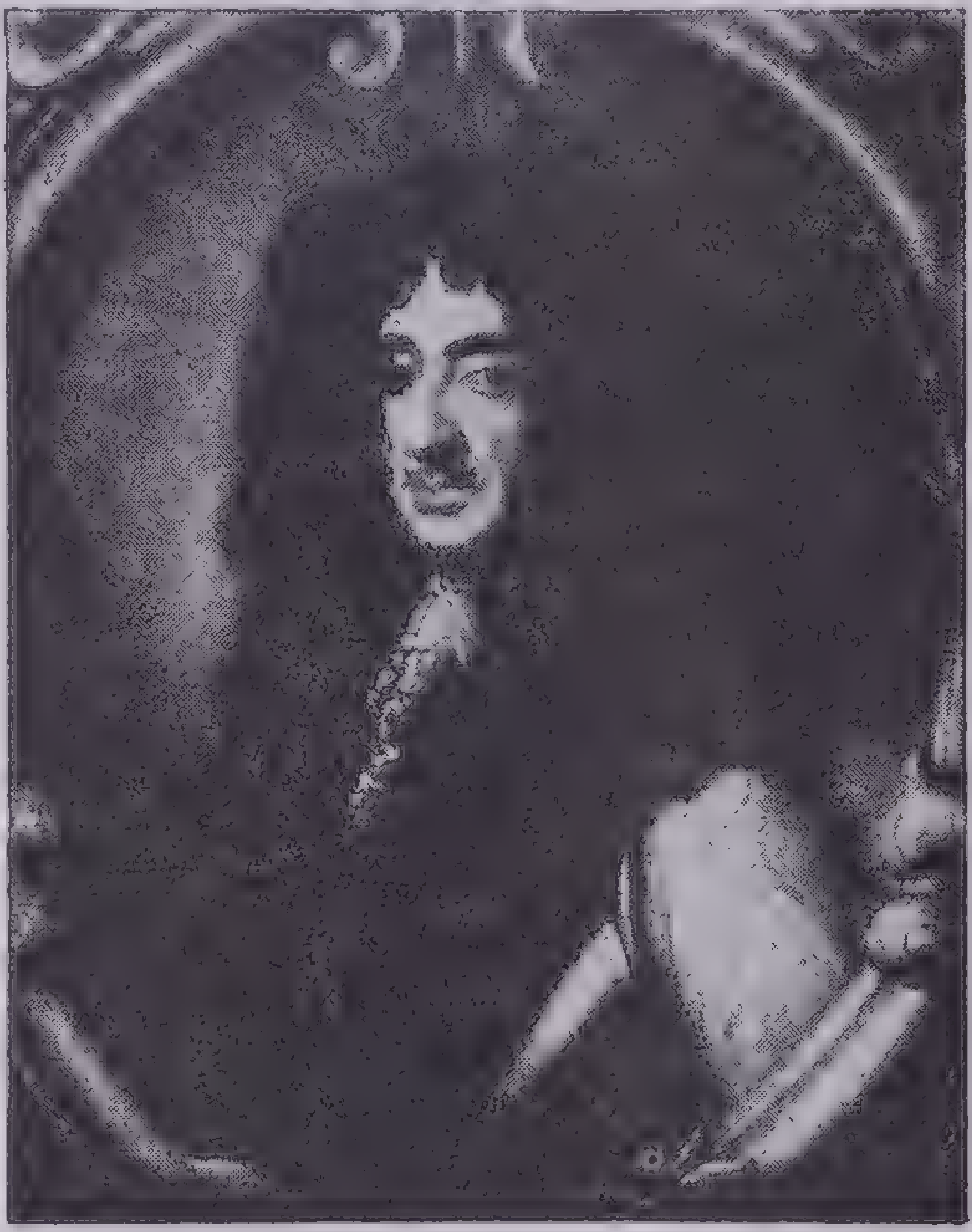
For a brief time an effort was made to continue the Commonwealth and Protectorate, as this period of government under Cromwell is called. Oliver's son Richard was chosen as Oliver's successor, but he was weak and indolent, quite unfit for the responsibilities and duties of the office. His nominal protectorate lasted but a few months. A period of disorder followed until 1660, when the exiled son of Charles I was invited to resume the crown. The resolution of Parliament that "according to the ancient and fundamental laws of this kingdom, the government is and ought to be by King, Lords and Commons" formally brought the Puritan Revolution to an end.

THE RESTORATION

Charles II found the country unwilling to grant him the powers that had been denied to his father, and he was not the man to persist in a stubborn opposition at the expense of his own safety. One of his characteristic remarks was that he had no desire to go on his travels again. He was far more skillful than either his father or grandfather in judging the temper of the nation, in knowing what he might do and what was impossible. He had accepted his throne on conditions laid down by Parliament, and among these conditions were the confirmation of the Great Charter, the Petition of Right and the other statutes that in earlier times had limited the power of the king. There could be no doubt that in the last analysis Parliament was the master, and although Charles was willing to circumvent the will of Parliament whenever it seemed safe to do so, he never openly defied it as his father had done.

The chief domestic issue of Charles's reign was religious. It is difficult for Americans of the 20th century, accustomed to complete religious freedom, to realize the bitterness and savagery that religious controversy produced in the 17th century. In England fear and hatred of Roman Catholicism was widespread. Although more than 100 years has passed since the time of Mary Tudor, men still harked back to the persecutions of Protestants that had occurred in her reign as evidence of what might again happen in England if a Catholic king should ascend the throne. There was continual talk of various "Popish Plots" that were supposed to be brewing; the Gunpowder Plot of 1605 was never forgotten. Severe laws were in force to compel conformity with the established church.

Charles II was by outward profession a Protestant of the Church of England. Because his younger brother James, the Duke of York, who was in line for succession to the throne, was a convinced Catholic, many efforts were made to force Charles to agree to a different succession. "Exclusion Bills" intended to prevent the succession of James were at various times presented in Parliament. These bills failed of passage, but they were a source of friction between Parliament and the king, and they indicate how powerful were the feelings on the subject of religion.



King Charles II

From a painting in the National Portrait Gallery, London, by an unknown 17th-century artist

The question of the power of the king to suspend the operation of acts of Parliament came to the fore when Charles attempted by the Declaration of Indulgence in 1672 to allow full religious liberty. In the light of our modern ideas on the value of religious toleration, this Declaration of Indulgence seems a wise and salutary measure, but it must not be supposed that Charles was prompted by any love of liberty. Influenced by his brother James, he had secretly become a Catholic, and he was anxious to secure toleration for Catholics. There can be little doubt that he would have favored suppression and persecution if his side had been in the majority.

Parliament looked upon the Declaration of Indulgence as an illegal usurpation of power. In the struggle that followed Parliament forced the withdrawal of the declaration by the old expedient of withholding funds until its demands were met.

With the restoration of the Stuart monarchy came a general reaction against the ideals of Puritanism that had been dominant during the Commonwealth. This is especially evident in the literature of the period, which has long been noted for the looseness and cynicism of its moral tone. A sensualist and libertine himself, Charles set the standard for his court, while the court set the standard, if not for the nation, at least for that articulate and prominent part of the nation that has left the record of its social life. The diarist John Evelyn, who had sided with the king's party, writing of 1685 speaks thus of Charles's court:

> "I can never forget the inexpressible luxury and profaneness, gaming and all dissoluteness, and as it were total forgetfulness of God (it being Sunday evening), which this day Se'night I was witness of, the King sitting and toying with his concubines, Portsmouth, Cleveland, and Mazarine, &c., a French boy singing love songs in that glorious gallery, whilst about twenty of the great courtiers and other dissolute persons were at Bassett round a large table, a bank of at least £2,000 in gold before them; upon which two gentlemen who were with me made reflections with astonishment."

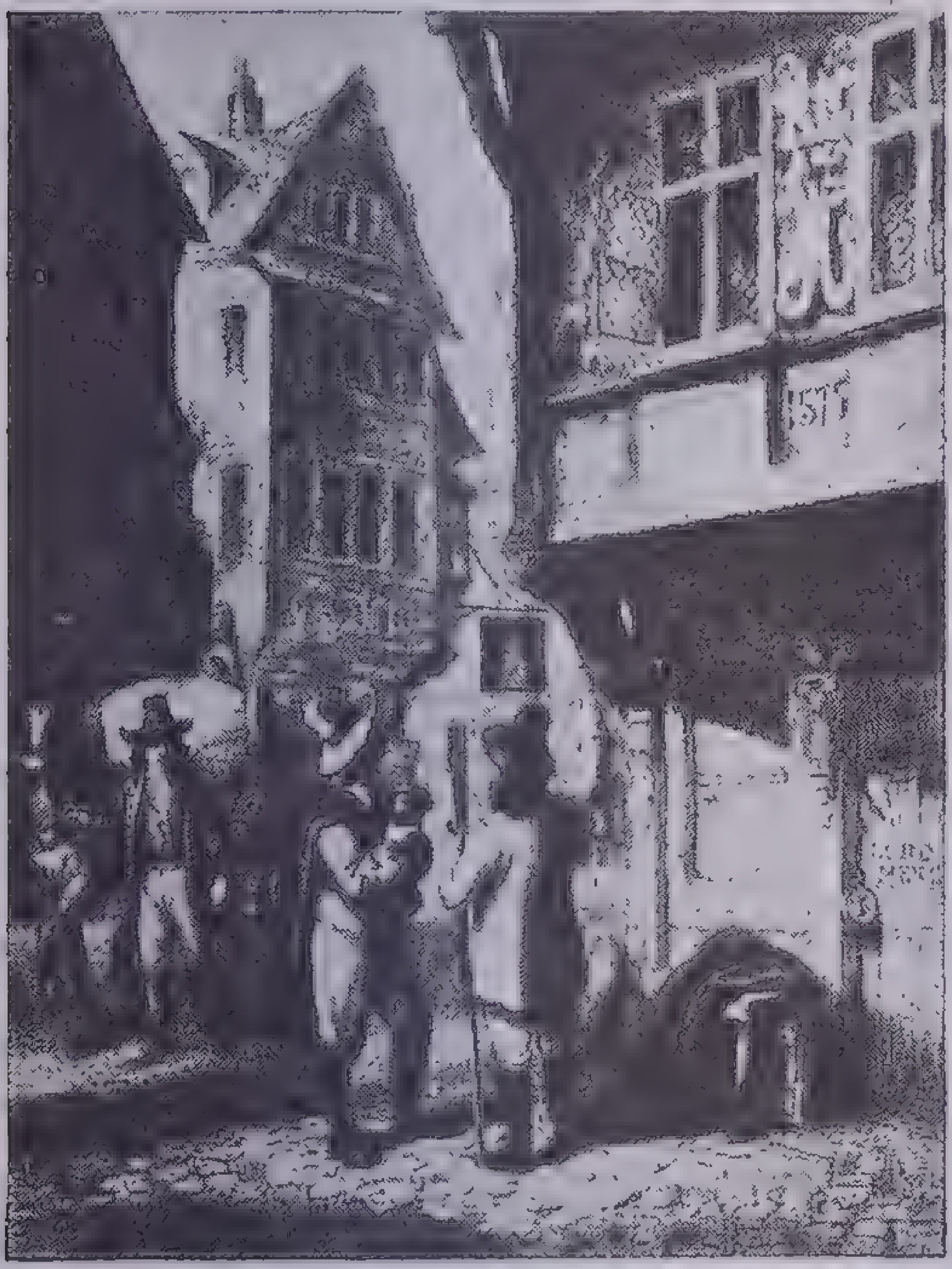
While the court and many of the wealthy nobility thus led lives of worthless self-indulgence, the mass of the common people were sunk in a squalor and misery such as cannot be imagined in our day. The most horrible conditions of insanitation prevailed in the great centers of population. In 1665–66 a terrible plague, centering in London, swept off from 75,000 to 150,000 lives. The plague was followed in the same year by a devastating fire that razed a large part of the city. In the long run this fire was productive of much good, as it burned up a vast number of antiquated and insanitary buildings, and the new city that was built up from the ruins was intelligently planned under the supervision of the great architect Sir Christopher Wren. But the wretched population who were burned out of their homes suffered intensely.

The coarse brutality of the times has been described by Macaulay:

> "The implacability of hostile factions was such as we can scarcely conceive. Whigs were disposed to murmur because Stafford had been suffered to die without seeing his bowels burned before his face. Tories reviled and insulted Russell as his coach passed from the Tower to the scaffold in Lincoln's Inn Fields. As little mercy was shown by the populace to sufferers of a humbler rank. If an offender was put into the pillory, it was well if he escaped with life from the shower of brickbats and paving-stones."

Yet we must not forget that some of the greatest intellectual work of all time was done in this period. In 1687 the Royal Society published Isaac Newton's *Philosophiae Naturalis Principia Mathematica* which founded modern astronomy and physics. The greatest English poetry except Shakespeare's was written by John Milton between 1660 and 1672. In 1689 the philosopher John Locke published his *Letters on Toleration*, and in 1690 his masterpiece, the *Essay on Human Understanding*.

In an effort to free himself from financial domination by Parliament, Charles entered into a secret agreement with the powerful French King Louis XIV. Louis agreed to pay Charles a pension of £200,000 a year. In return, Charles was to become a Catholic and support Louis in his various intrigues and wars on the continent. The great mass of the English people hated the French, and it was fortunate for Charles that his dealings with Louis were not discovered during his lifetime.



The Plague: Collecting the Bodies of the Dead

The dead cart was a common sight in London when the terrible bubonic plague swept the city in 1665–66, and bell ringers canvassed every neighborhood with the cry, *Bring out your dead!* This picture is from a drawing by George Cruikshank for Daniel Defoe's *A Journal of the Plague Year*

James II and the "Glorious Revolution."—In 1685 Charles died, and his brother James succeeded. James II had all the tactlessness and exaggerated notions of the divine authority of the kingship that had characterized his father and grandfather. Worse still, from the standpoint of the majority of Englishmen, he was a Catholic, and was suspected of intentions to overthrow the established church. Nevertheless, the more influential men in the country were opposed to any attempt to resist his accession by force. He was 54 years old and his only children were his daughters Mary and Anne, both Protestants, so that the prospects for a Protestant succession in the comparatively near future disposed moderate men to a policy of watchful waiting rather than the risks of civil war. A faction of Protestant and Whig hotheads, indeed, led by the duke of Monmouth, an illegitimate son of Charles II, raised the standard of rebellion, but they were quickly crushed. Monmouth was executed (July 1685) along with as many of his partisans as could be found. The judicial punishment of those implicated in the rebellion was carried out with frightful severity, and the "Bloody Assizes" conducted by the infamous Judge Jeffreys became a byword for the cruel and arbitrary exercise of power.

During the next two years (1686–1688) James's various acts of oppression, and in particular his efforts to secure toleration for Roman Catholics against the desire of Parliament and the majority of the people wore threadbare the loyalty that had supported him at his accession. On June 10, 1688 the hopes of the Protestants were dashed by the birth of James's son. As long as it appeared that the Catholic ascendancy of James was temporary, his opponents bided their time, but when an heir was born, preventing the succession of the Protestant daughters of James, affairs were brought to a crisis. A group of Parliamentary leaders issued an invitation to William of Orange, a grandson of Charles I and the husband of James's daughter Mary, to ascend the throne of England. On November 5, 1688, William landed an army of 14,000 men. James fled for his life to France. The following year, supported by an army furnished by Louis XIV, he made an attempt to recover the crown, but he was beaten by William at the battle of Boyne (July 1690) and gave up the hopeless struggle. He returned to France where he died in 1701. It was not until 1746 that agitation for a restoration finally ceased. The supporters of James and the two pretenders after the Revolution of 1688 are known as Jacobites (from the Latin *Jacobus*, James).

The Revolution of 1688 completed the triumph of Parliament in the long struggle for dominance that had begun in the reign of John. James II was the last king of England who exercised any substantial authority over the government. For the next two centuries the history of England becomes less and less concerned with the personality and actions of the king and more and more concerned with the actions of cabinet ministers responsible to Parliament.

PEOPLE AND PARLIAMENT TRIUMPH

Constitutional Monarchy of William III.—The doctrine of divine right was killed by the Revolution of 1688. William and Mary ascended the throne not by the grace of God but by the grace of Parliament. No one could mistake the confident and authoritative tone with which Parliament laid down the famous Bill of Rights (1689):

"Whereas the late King James II, by the assistance of divers evil counsellors, judges and ministers employed by him, did endeavor to subvert and extirpate the Protestant religion, and the laws and liberties of this kingdom. . . ."

The Bill of Rights summed up the leading concessions that had grown, since the Great Charter was wrung from King John, into the traditional privileges and immunities of Englishmen. It affirmed the rights of petition, of freedom of elections and Parliamentary debate, of trial by jury and thus indirectly of habeas corpus. It denied to the king the power to suspend the laws, a power that Charles and James had tried to exercise with their Declarations of Indulgence. It prohibited the king from levying soldiers or from maintaining a standing army without Parliamentary consent.

Many of the fundamentals of the Bill of Rights were later incorporated in the Constitution of the United States.

The Bill of Rights specified that future kings of England must be Protestants, and thus in effect asserted the right of Parliament to order the succession as it pleased.

A revealing comment on the character of the times and the nature of the fears and passions that were at work in men's minds is to be found in the oath of allegiance that was prescribed for public officials:

"I, A. B., do swear that I do from my heart abhore, detest and abjure as impious and heretical, that damnable doctrine and position, that Princes excommunicated or deprived by the Pope, or any authority of the See of Rome, may be deposed or murdered by their subjects or any other whatsoever. And I do declare that no foreign prince, person, prelate, state, or potentate hath, or ought to have, any jurisdiction, power, superiority, preeminence or authority ecclesiastical or spiritual within this realm: So help me God."

Accepting their thrones at the hands of Parliament on the conditions laid down by the Bill of Rights, William and Mary did not try to exceed the authority of their strictly limited constitutional position. The statesmanship of the new king, however, made itself felt in many branches of the government. William III was one of the ablest men that ever occupied the English throne. Cold, self-contained and brusque, his personality was not one to arouse the adulation of the masses, but he had that tenacity of purpose, that will to get business done, that clear grasp of end and means which characterize all strong men. And he had too a sense of honor and duty that commanded respect if it did not, except in his intimates, inspire love.

The mainspring of William's life and the focus of his entire policy was his ceaseless effort to build a European counterbalance to the ascendancy of Louis XIV of France, who was at the height of his power. William's strongest motive for accepting the English crown was his hope of throwing England into the continental coalition against Louis.

In 1700, upon the death of the king of Spain, Louis, in violation of a previous agreement, laid claim to the vast Spanish dominions in the name of his grandson. Anti-French feeling in England was bitterly aroused, and the nation wholeheartedly approved the Grand Alliance against France that was formed by William. Thus began the long War of the Spanish Succession (1701–14) that resulted in the humbling of France and the rise of England to the position of the foremost power of Europe. William, whose political skill had made it possible, did not live to see the success of his lifelong plans. He died in 1702, just as the war began.

The policy of preserving the balance of power, which became a leading idea with all subsequent British statesmen, may be said to have originated with William III.

In the domestic affairs of England, William felt much less interest than in the absorbing game of political chess that he played on the European board. Nevertheless, his reign is notable for two highly constructive measures that did much to advance the evolution of modern England. The first of these was the Toleration Act of 1689 that permitted liberty of worship to Protestant dissenters. England was still a long way from the freedom of conscience that our own age regards as indispensable to civilization: Catholics, Jews and Unitarians continued to be regarded as dangerous to the state. But a great step had been taken, and from this time forward, the idea of persecution which had been universal for a thousand years began to give way to the more enlightened policy of live and let live. Similar in its effects to the Toleration Act was the refusal of Parliament in 1695 to renew the act licensing publications; without any idea of the importance of what it was doing, Parliament had established a free press.

Queen Anne and the War with France.—Upon the death of William III in 1702 Anne, sister of William's Queen Mary and the second daughter of James II, ascended the throne. She was not a strong-willed executive type of woman like the Tudor Queens Mary and Elizabeth. In her reign the actual management of state affairs passed into the hands of a group of ministers. The queen's political incapacity favored the growth of the idea of cabinet government that became definitely established in the reign of her successor. Prominent in the rather sordid political intrigues of the time were the Duke and Duchess of Marlborough.

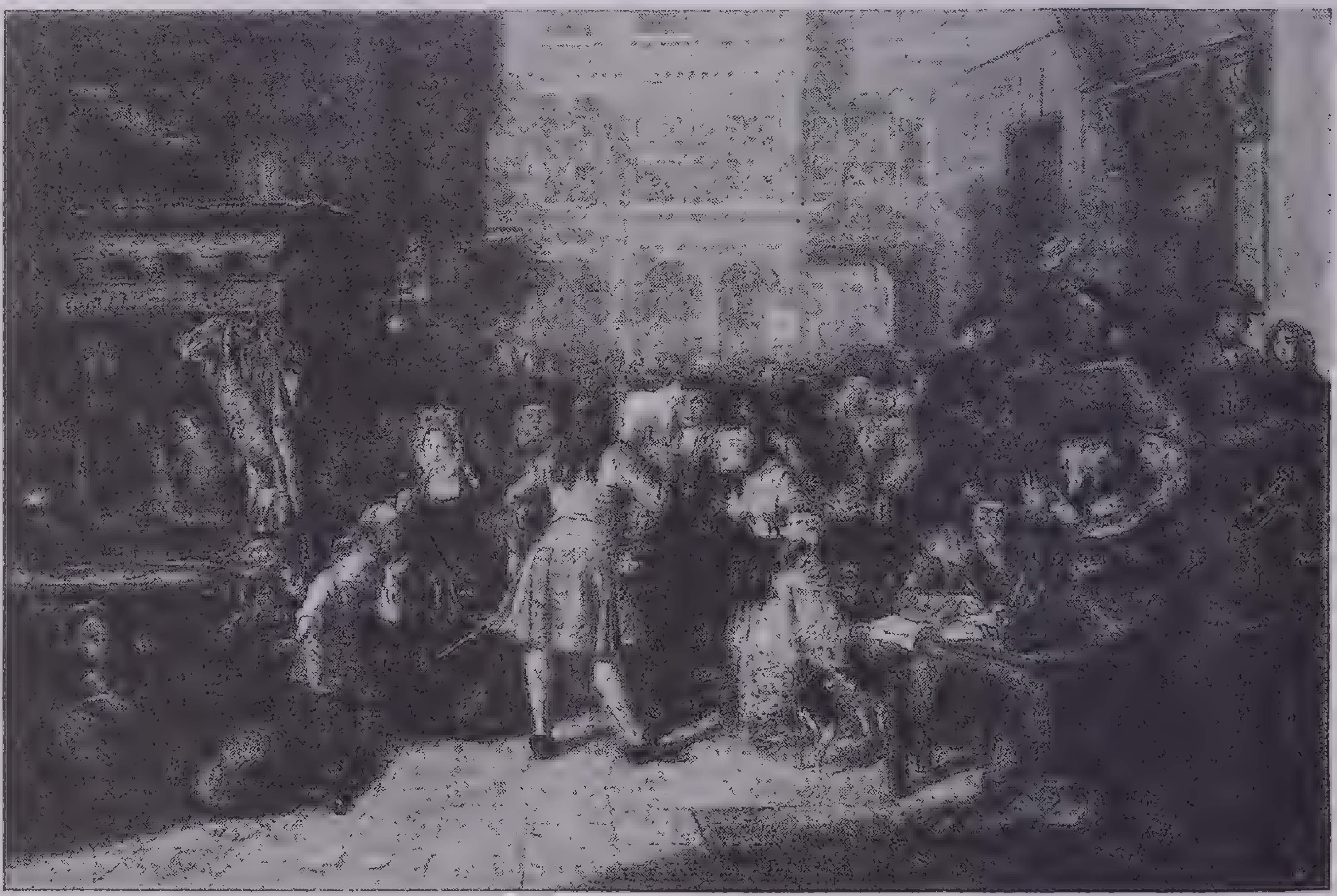
The War of the Spanish Succession, which had really been entered into by William, continued almost throughout the reign of Anne. From a military point of view, the war was highly successful; the victories of Blenheim (1704), Ramillies (1706) and Malplaquet (1709) definitely established England's power on the Continent. Marlborough and Prince Eugene were the leading generals on the English, Dutch and German side. The war was ended by the Treaty of Utrecht in 1713. England obtained Gibraltar, Minorca, the Hudson Bay territory and Nova Scotia, and gained trade concessions (chiefly slaves) in the West Indies. The peace settled the "quarrel between two princes to decide which of them should dispossess a third of his dominions to which neither of them pretend any right"—as the great English satirist Jonathan Swift called it.

Anne was the last of the direct descendants of Charles I who occupied the throne. By the Act of Settlement (1701) Parliament had provided that the crown should pass to the heirs of the Electress Sophia of Hanover, granddaughter of James I.

THE HOUSE OF HANOVER

Party Strife; Ministry of Walpole.—The end of the War of the Spanish Succession in 1713, followed almost immediately by the deaths of Queen Anne and Louis XIV of France, marks the beginning of a new era in the history of England and of Europe. The 75 years from the death of Louis to the outbreak of the French Revolution (1789) were characterized by a steady advance in cultural and intellectual achievement; an increasing interdependence, if not co-operation, among the nations of Europe; the building of far-flung colonial empires by England, France and Holland; the rise of Prussia and Russia to positions of importance in European affairs; the development of a skeptical, urbane and tolerant intellectual atmosphere, strongly contrasting with the harsh bigotry of the 16th and 17th centuries; and, perhaps most significant of all, an immense growth of commercial activity and wealth.

In England the new king, George I, took little interest in public affairs. He never troubled himself to learn English. The trend which had begun under Anne of government by a cabinet of ministers continued. The two political parties Whig and Tory, that had taken shape in the reign of Charles II, had now developed a fairly consistent set of opposing theories of government. The Whigs favored a further limitation of the powers of the king, the extension of religious toleration to dissenters and the vigorous participation by England in the European scramble for colonial empire and trading concessions. The Tories hated and feared the rise of Parliamentary dominance and the growing power of the commercial classes; and they wished to preserve the prerogatives of the Crown, uniformity of worship and the traditional hereditary succession. Many of them were Jacobites. They had opposed the Revolution of 1688, and they were opposed to the accession of George I as representing the parliamentary arrogation of the right to order the succession. Their Jacobitism was in conflict with their support of the established church, however, and this fundamental inconsistency weakened them as a political faction. If the old Pretender, the son of James II, had grown up to be a stanch Anglican Protestant, it is conceivable that he might have obtained the throne in 1714. As it was, the opposition to the Hanoverian succession was ineffective.


From the painting by Edward Matthew Ward
The South Sea Bubble: Wildcat Speculation in 'Change Alley, London, 1720

In thinking of English political life of this time there is danger of falling into error through a false application of modern analogies. We must not, for example, think of the Whigs as a party of democracy in the modern sense. Democracy, as we understand it today, "government of the people, by the people and for the people," was utterly unknown in European civilization down to the time of the French Revolution; and in its practical application it is a development of the 19th and 20th centuries. In England of the 18th century not one person in fifty had any direct share in the government. Voting was confined to property holders, and bitterly as we sometimes complain today of the maldistribution of wealth, property holders then were far less numerous than they are now. At least three-quarters of the population were completely illiterate.

In the early years of the reign of George I a fever of financial speculation associated with the South Sea Company broke out. This was a complicated enterprise for making money out of trading monopolies with South America and the West Indies. Enormous amounts of stock were sold, and extravagant hopes of growing rich were entertained by the investors. In

1720 the South Sea Bubble burst, ruining thousands of investors and producing a grave financial crisis. Many government officials including some cabinet members were involved in the crash. In the governmental reorganization that followed, Robert Walpole, a rich and prudent business man, rose to a dominant position. He became the leader of the new cabinet, the first prime minister of Great Britain; and for over 20 years the affairs of state revolved about his person and policies.

The ruling ideas of Walpole's ministry were to keep the peace, to extend the power of the Whig party and to let sleeping dogs lie. The period from 1720 to 1740 is singularly free from violent troubles or conspicuous change. It was a kind of breathing spell in which business activity expanded, ferocious religious disputes died out, intolerant idealism gave place to a calm if uninspired and materialistic common sense.

Walpole's cynical remark that all men have their price explains both his methods of government and the essential characteristics of the age. He dealt with the world as he found it, rather than as high-minded people think it ought to be. He was one of the earliest masters of the art of manipulating a political machine through the judicious distribution of patronage and money. He remained in power by the means used by a modern political boss; by building a clique of supporters whose continued prosperity depends upon the continued prosperity of the boss and the organization

The expanding commercial activities of England led to foreign friction. The Spanish dominions in the West Indies and South America were a field of commercial exploitation that greedy English traders insisted on entering in spite of the objections of the Spanish government. A rich smuggling trade grew up, and the Spanish efforts to suppress it soon led to "incidents" as they are called in the euphemistic language of diplomacy. In 1738 a certain Captain Jenkins appeared in the House of Commons and asserted that some years before, his English ship had been boarded by a Spanish patrol crew who had cut off one of his ears and suggested that he take it to his king for satisfaction. Jenkins thereupon took from a box what he declared to be his severed ear.

Indignation in the House of Commons and among the general public brought on a war with Spain called the War of Jenkins's Ear, which quickly became merged in the more general European conflict called the War of the Austrian Succession.

The outbreak of this war in 1740 brought about the fall of Walpole after a leadership of 20 years.

Foreign Intrigue; Rise of Cabinet Government.—The War of the Austrian Succession continued sporadically until 1748. Not much was settled. In many respects the war was a mere dress rehearsal for the far more deadly conflict that broke out 8 years later—the Seven Years' War (1756–63).

A famous incident was the invasion of England by Charles Edward, the Stuart Pretender, who landed in Scotland in 1745 and managed to rally an army of several thousand men. He defeated two English forces sent to put down his uprising; but he was finally crushed in an unlucky engagement at Culloden Moor (1746). He succeeded in making his way back to France, where he died in 1788. This was the last serious effort to restore the exiled Stuarts.

George I had died in 1727. George II's reign lasted from 1727 to 1760. Neither of these kings exerted much influence over public affairs, although the formal union of England and Hanover under the common king had some effect on the diplomatic lineup of the European Powers. George II's remark in a moment of disgust, "The ministers are the king in this country," shows clearly the change of spirit that had taken place since the days of the Tudors.

Many of the characteristic features of the modern British cabinet system took shape in the 60-year period between the accession of Queen Anne and the death of George II. The office of prime minister was created by Walpole. The doctrine that a cabinet, under the leadership of a prime minister, may retain office irrespective of the wishes of the king as long as it has the support of Parliament, became fully established. Thus the executive as well as the legislative powers of the government became centered in the House of Commons.

England and France in World Conflict.—The Seven Years' War, which began in 1756, was a desperate struggle involving all the important powers of Europe. On the continent Russia, Sweden, Austria and France were allied to crush the rising power of Frederick the Great, King of Prussia. On the world stage, England and France battled for colonial empire. Although the line-up of Powers was slightly different, the war really continued to a decision the issues that had been fought over in the war of the Austrian Succession—whether France or England should be the dominant maritime and colonial power of Western Europe and whether Prussia or Austria should be the military leader of Central Europe. By the cynical seizure of Silesia from Austria Frederick the Great had procured the enmity of Maria Theresa. "In order that he might rob a neighbor whom he had sworn to defend, black men fought on the coast of Coromandel and red men scalped each other by the Great Lakes of North America," said Macaulay.

In the Seven Years' War, the English broke the power of the French in Canada and India. After a brilliant campaign (1759–60), General James Wolfe defeated Montcalm at Quebec, and the whole of North America east of the Mississippi became a dominion of the king. In India, a complex struggle went on for years between the French leader Joseph Dupleix and the British East India Company. This was not, properly speaking, a national war, as the East India Company was not a branch of the government. But after the outbreak of war in Europe, it becomes impossible to distinguish between the company and the national government. The leader in this Indian struggle was the reckless and rapacious Robert Clive. A famous event was the horrible death of more than 100 Englishmen suffocated in the "Black Hole of Calcutta."

The success of Great Britain in the Seven Years' War owed much to the energy and administrative ability of William Pitt, who had come to the fore after the fall of Walpole in 1742. Pitt was the ablest of the group who in the closing years of Walpole's regime had denounced the venality and ignoble ease that characterized the administration. In the political scheming and manoeuvering that went on from 1745 to 1756 Pitt took a prominent part. He made the Cabinet responsible to the voters of the country, and in some instances kept his power in spite of strong opposition in the House of Commons.

Pitt's successful conduct of the Seven Years' War made him the most popular man in England. But his enduring greatness is not that he broke the power of France and made Great Britain the supreme naval and imperial power in the world. Far more significant than mere material achievement was the tradition of patriotism, rectitude and self-sacrificing devotion to the common good that Pitt made the dominant force in British statesmanship for more than 100 years to come.

George III; Loss of the American Colonies.—In 1760 George II died, and his grandson George III succeeded. The new king was born a century too late. He had all the instincts of a Charles I or a Louis XIV; to "be a king" in fact as well as in name was his life study. It was his tragedy that he tried so hard to be a king in a country that had broken two kings and had learned to do without them, and in an age when ideas of the divine origin of kingship were dissolving all over Europe. His long reign (1760–1820) saw the end of the *ancien régime;* the breakup of the old Europe under the impact of the French Revolution and the sword of Napoleon Bonaparte.

For a decade and a half after the close of the Seven Years' War, the policy of the government toward the fast-growing American colonies was, as the orator and statesman Burke declared, "the most important and most delicate object of Parliamentary attention." Unfortunately the majority of leaders lacked Burke's vision; for them and for most educated Englishmen the local party disputes involving the seating of the dissolute radical John Wilkes in the House of Commons, and the brilliantly written letters of "Junius" attacking the king and his ministers were far more absorbing than the affairs of a continent 3,000 miles away that "serves only to amuse you with stories of savage men and uncouth manners."

Without much statesmanlike vision and certainly without the slightest idea of the fateful consequences for world history, a series of ministers following Pitt sponsored the levy of taxes that greatly irritated the American colonists. Most important of these were the Stamp Act (1765) and the Import Duties (1767). These acts were strongly opposed by Pitt and Burke. The question at issue was really whether the American colonists were to be considered as Englishmen or as dependent provincials. In 1775 the opposition to the colonists flamed out in armed rebellion, and after a War of Independence lasting for seven years in which the Americans received substantial aid from France, Great Britain formally recognized American independence. "A new nation, conceived in liberty, and dedicated to the proposition that all men are created equal," had been born.

Pitt, who had been created Earl of Chatham, died while the American War was in progress (1778). His last years were clouded by his inability to prevent what he believed were the blunders of the Government in the conduct of American affairs. "Sir, I rejoice that America has resisted!" he had exclaimed when the news of the colonists' nullification of the Stamp Act reached England. Nevertheless he could not reconcile his mind to the idea of independence—the "dismemberment of this ancient and most noble monarchy." His death spared him the humiliation of seeing his worst fears come to pass.

The French Revolution.—The American War was finally dropped in 1783. The years 1783 to 1790 were marked by a political struggle for financial and parliamentary reform led by William Pitt the younger, second son of the first Earl of Chatham. In 1784 Pitt became the leader of the government. "He is not a chip of the old block," said Burke, "he is the old block itself." For 17 fateful years the younger Pitt remained at the head of affairs. In 1789 the French Revolution broke out, and all plans for internal reforms were shelved by the pressing demands of foreign affairs. In 1793 England became involved in the conflagration that was spreading over Europe, and from this date until the final collapse of the Napoleonic empire in 1815, the nation was constantly at war.

The French Revolution involved the violent overturning of the whole political and social order. Hailed at first by liberal Englishmen, the revolution soon developed an excess of violence that terrified all who had a stake in the established order. Not content with turning upside down their own social system the revolutionists of France stirred up discontent all over Europe, promised military support to any people who should rise against its ruler and spread the firebrands of disaffection far and wide.

The governing aristocracy of England was soon in a state of panic. They saw sedition everywhere. Severe laws were passed to check the spread of revolutionary ideas. As is usual in mass reactions moved by fear, little distinction was drawn between those who wished violently to subvert the government and those who were mildly dissatisfied with existing evils. Every agitation for reform, every friendly word for the ideas of democracy, came to be regarded as treason. A man named Hudson was fined £200 and was sentenced to 2 years imprisonment for proposing a toast "to the French Republic." Another man was sentenced to 14 years for joining an association favoring universal suffrage and annual Parliaments.

In 1793 the French revolutionists executed Louis XVI. The event excited horror throughout Europe, and nowhere, perhaps, more than in England. It was the signal for the beginning of a holy war against France and the ideas she represented.

Duel with Napoleon.—This war arising from the French Revolution soon took on an entirely different aspect. The government of France fell into the hands of the great adventurer, Napoleon Bonaparte, and there immediately began a duel of giants that was to last for 15 years and was to cover Europe with blood from Lisbon to Moscow.

The war with Napoleon was not essentially a war against the French Revolution. The conflict of political theory and the fear of the spread of French ideas in England that had pushed Pitt into the anti-French coalition of 1793 no longer had any force. From 1800 to 1815 England was fighting the old battle to preserve the balance of power and to prevent France from obtaining a military preponderance on the Continent.

In 1810-1811 Napoleon reached the zenith of his power. Through puppet kings from his immediate family, through his tools and subservient allies, he controlled practically the whole of continental Europe. In a series of brilliant military campaigns he had crushed every attempt to dispute his authority. He had crowned himself Emperor of the French and had obtained recognition of his son as his successor in a dynasty to replace the ancient Bourbon line. The only Power of Europe that he had not yet humbled was England.

Strong as Napoleon appeared in 1810, there were several fatal flaws in his position. England still controlled the seas, and there was no way by which the emperor could attack her and bring her to terms. In the second place, his rule over the countries of Central Europe could be maintained only by armed force, and there was a rising national spirit of resentment against the French despotism. Finally, his power depended to a large extent on a legend of invincibility that had grown up after the successful battles of Austerlitz, Jena and Friedland, and this legend was sure to collapse at the first military reverse. In Kipling's story *The Man Who Would be King,* the hero was able to terrorize and dominate a tribe of superstitious savages until one day he was accidentally wounded, and the savages saw blood flowing from his wounds. Immediately the cry "Not gods, not gods, men! men!" arose. Napoleon's situation in 1810 was very like this.

In his efforts to bring England to her knees, Napoleon attempted to prevent all the countries of Europe from trading with her. It was in an effort to enforce this famous "continental system" that he made his fatal invasion of Russia in 1812. Instead of crushing Russia, his own magnificent army was practically destroyed. This check on his career of military success was the signal for a general uprising in Europe. In 1813 he was beaten decisively at Leipzig; and the following year he was forced to abdicate as Emporer of the French and retire to the island of Elba in the Mediterranean. In 1815 he made one further bid for power, but was crushed by the combined armies of England and Prussia at the battle of Waterloo, June 18.

Throughout the career of Napoleon, England had been the soul of the opposition. In the long run the decisive battle of the whole war was not at Leipzig or Waterloo but Trafalgar, the sea fight in which the English under Nelson ended French power on the sea. Had Nelson been beaten, there can be little doubt that Napoleon would have carried the war into England, and he had once declared that he could crush England if he could be master of the Channel for only 48 hours.

American War of 1812.—At the very time that the struggle with Napoleon was at its height, England became involved in a war with the United States (1812). The United States complained that American seamen had been unlawfully impressed into British service and that the British had seized ships engaged in trade with the West Indies. British efforts to prevent American trade with the European countries allied with Napoleon was a further source of friction. In addition, there were plenty of influential Americans who thought the time was ripe for an American seizure of Canada.

The war was indecisive and consisted mainly of sporadic raids and sea fights. The Peace of Ghent (December 1814) did not mention the issues over which the war had ostensibly been fought. Nevertheless, its general effect was to increase the prestige and national pride of the United States. To England the war was a mere side issue to the desperate struggle with France.

Reaction and Reform.—The period from 1790 to 1815 had turned Europe upside down. A new world had grown up. The diplomats at the Congress of Vienna, which met to liquidate the Napoleonic wars, tried hard to turn back the clock to the 18th century, to the days of divine right and benevolent despotism; but no political reorganization could ever reconstruct the psychology of those good old days. The watch words of the French Revolution "Liberty, Equality, Fraternity," had taken deep root in men's minds. Although the revolution had apparently been crushed, its ideas went marching on and became, in a modified form, the leading political issue of 19th century Europe.

England passed through the Napoleonic wars with less internal political change than any other important country. The whole effort of the nation was bent on winning the war, and proposals for parliamentary reform, increased religious toleration and humane modification of the criminal law had little chance for a hearing. But as soon as the war had been brought to a successful end a strong agitation for social improvement began.

The reform movement, which culminated in the great Reform Bill of 1832, aimed specifically at extending the suffrage and apportioning parliamentary representation more justly. In a broader sense, the reform movement embraced all the liberal, humanitarian and progressive forces that were at work, not restricting the term to specific reform in the voting and representation system.

The new order did not make its way without bitter opposition. The attitude of many conservatives has been summed up by Walter Bagehot in his description of Lord Eldon, Lord High Chancellor of England from 1801 to 1827: "He believed in everything that it is impossible to believe in: in the danger of parliamentary reform, in the danger of Catholic emancipation, in the danger of abolishing the death penalty for petty thefts, in the danger of making anything more, in the danger of making anything less. It was as if he had decided, 'Now I know the present state of things to be consistent with the existence of John Lord Eldon; if once we change that state, I am sure I do not know that any other state will be consistent.'"

George III died in 1820. Blind and insane in his last years, he was a pitiful figure. Chiefly because he happened to be king of England during the American War of Independence, his reputation in the United States has been unduly blackened. His chief fault was that he clung to ideals that were out of date. The English poet Byron said of him: "A better farmer ne'er brushed dew from lawn; a worse king never left a realm undone," but this is an extreme judgment. Fairer and nearer the truth is the statement of the historian McFarlane: "Nearly every circumstance concerning him that has been brought to light of late years . . . has tended to clear away prejudices of former times and to raise our estimate not merely of the goodness of his heart and intentions, but also of the powers of his intellect and of his capacity for public business."

George IV, the son of George III, had virtually become king in 1810 when his father's mind gave away. He has been generally described as a worthless voluptuary of the type of Charles II. Nevertheless he was known as "the first gentleman of Europe," and the duke of Wellington called him "the most extraordinary compound of talent, wit, buffoonery, obstinacy and good feeling . . . that I ever saw in my life." George IV's reign lasted until 1830. He was succeeded by his younger brother, William IV. While a man of little ability, William was at least a decent and respectable human being, and in his reign the throne recovered some of the dignity it had lost through the scandalous conduct of George IV.

During the period 1815 to 1832 the movement for reform, in spite of the stubborn opposition of conservatives, kept gaining weight. Some of the leading figures in the movement were: Samuel Romilly, who ceaselessly worked for improvements in the criminal law and the abolition of the death penalty for petty offenses; William Cobbett, whose weekly paper the *Register,* became the mouthpiece of agitation for universal male suffrage; William Huskisson, whose Combination Law (1825) gave the first legal sanction to labor organization; Lord John Russell and Daniel O'Connell who led the battle for removal of the civil disabilities of Catholics, and Henry Brougham, who supported vigorously the reform of the law and the effort to abolish Negro slavery in the West Indies.

In 1829 an important step was taken in the Catholic Relief Bill, by which the old oath of supremacy was abolished, and Catholics were permitted to occupy positions in the government.

The Reform Bill of 1832 was a long step in the direction of democracy. It greatly increased the number of persons entitled to vote for members of Parliament. It abolished, to a great extent, the so-called "rotten boroughs"—districts of negligible population that since early times had sent representatives to Parliament, though large cities were unrepresented. Most important of all, perhaps, it demonstrated the flexibility and capacity for growth of the English constitutional system and showed that the will of the people could make itself felt without a bloody revolution.

The parliamentary struggles accompanying the agitation for the Reform Bill once more emphasized the power of the House of Commons. Both the king (William IV) and a majority of the House of Lords were fiercely opposed to the bill. Nevertheless, the cabinet under Earl Grey had its way. The House of Lords weakened in its opposition when it became known that the cabinet by threatening to resign had forced the king to agree to create new peers who would pack the House of Lords and overcome the opposition there.

Industrial Revolution.—While the French Revolution and the many conquests of Napoleon were transforming the political life of Europe, an even greater change was steadily going forward in the economic sphere. This was the Industrial Revolution. Beginning with the textile industry in England in the late 18th century, a series of inventions made by Kay, Hargreaves, Arkwright, Crompton and Cartwright ushered in the modern industrial era of machine production. In 1769 James Watt made fundamental improvements in the steam engine.

Slowly at first, but gathering momentum like a rolling snowball, the movement for technological improvement went forward. By 1820 it had penetrated nearly every branch of industry. For good or evil the old economic life was gone. New industrial towns sprang up. Farmers began to leave agriculture for the coal fields and cotton mills. A new and enormous working class came into existence, bringing complex social problems in its wake.

Victorian Age.—William IV died in 1837, and to the throne of England (now more correctly called the United Kingdom of Great Britain and Ireland) came his niece the princess Victoria, who was destined to rule her country through two generations (until 1901). This period is generally called the Victorian Era. The name is justified, for although direct management of affairs had passed from the crown, Victoria by the force of her character and by her indirect influence set the tone of public life and summed up in her own personality many of the outstanding characteristics of the age. She brought to the English court a moral purity and sobriety such as it had never before known. In the 20th century Victorianism has come to mean an exaggerated prudery and smugness, but at the time moral earnestness was exactly what England needed.

The Victorian period was, in the main, a time of peace and steady intellectual and economic progress. The most important foreign conflicts were: the Crimean War (1854–56), in which Great Britain and France joined to prevent the aggrandizement of Russia on the Black Sea; the dangerous Sepoy Rebellion in India which was put down after a bloody struggle in 1858, and the South African War at the very end of Victoria's reign (1899–1902).

The expansion of the Empire went on at a rapid rate. Practically all Africa was divided up among the scrambling European powers, and Great Britain managed to secure the richest slices. The settlement of Australia and New Zealand, which began in the late 18th century, received a great impetus by the discovery of gold in Australia in 1851.

The great characteristic of the 19th century was its consciousness of being civilized, its faith in human progress, its pride in being, as Tennyson wrote, "the heir to all the ages, in the foremost files of time." And men had good reason to feel thus confident of the great destiny of the human race. Science and technology were advancing as never before. Wealth was increasing at an enormous rate. Tolerance and free interchange of opinion had taken the place of the ferocious bigotry and suppression of earlier times. For the first time in history there was a generally diffused confidence that mankind had won the battle—that the evils that had reigned for thousands of years, the evils of poverty, war, pestilence, ignorance and intolerance belonged to a dying past.

In domestic affairs the period is marked by the advance of democracy and by efforts to solve the social problems arising out of the new industrial order. The second Reform Bill (1867) extended the suffrage to a large class, practically including the whole adult male population except agricultural laborers. In 1872 the secret ballot was adopted, ensuring greater freedom of elections. A long list of Factory Acts did much to better the horrible conditions of child labor and exploitation that had followed the Industrial Revolution. How inhuman these conditions were is indicated by the terms of the Acts of 1844 and 1847, which prohibited the employment of children under nine years of age in cotton and silk mills, and the employment of women and children for more than 10 hours a day. "If I were to tell you," says the American economist Stuart Chase, "the whole story of how machinery came to England and what it did to the three generations following Watt, you would not be able to stand it. Caligula himself could not have stood it." Adherents of Negro slavery in the United States used to argue and with substantial truth that the cruelties of the slave system were less shocking to decent human feelings than the merciless exploitation under the lash of starvation that kept women and children in England at the cotton spindles, at the looms and in the mines.

Victoria's Ministers.—Of the great prime ministers who served Great Britain during the reign of Victoria, four are especially conspicuous. They were Robert Peel (1841–46); Lord Palmerston (1855–58, also 1859–65); William E. Gladstone (1868–74, also 1880–85, 1886, 1892–94), and Benjamin Disraeli (1868, 1874–80).

The ministry of Peel is noteworthy for the adoption of the policy of free trade. Since early times England, like other European countries, had attempted to regulate trade and raise revenue by taxing imports. Particularly important were the corn laws, which imposed a heavy duty on the importation of wheat. The corn laws were advantageous to the landowning class, and as long as that class remained dominant in the government, the laws were kept in force. The Industrial Revolution, however, brought into existence a new group clamoring for power whose interests were directly opposed to the interests of the agriculturalists. These were the factory owners and the merchants whose prosperity depended on manufactured goods. The Reform Bill of 1832 greatly strengthened this group, and it began agitation for repeal of the corn laws. Led by Richard Cobden, John Bright and Charles Villiers, the free trade movement kept gaining adherents during the years 1840 to 1845. In the latter year the potato crop failed in Ireland, producing a frightful famine. In this emergency Peel, who had gradually become converted to the ideas of the free-trade advocates, saw that it was imperative to repeal the Corn Laws to relieve the widespread starvation. The laws were abolished in 1846. It was another step in the transformation of England from an agricultural to a predominately manufacturing nation.

Lord Palmerston rose to the prime ministership in 1855 on the wave of popular dissatisfaction that followed the early defeats and losses of the Crimean War. Under his leadership the war was soon brought to a successful conclusion, and Palmerston's reputation as the strong man of the hour was much advanced. Before attaining the office of prime minister he had long served in the Foreign Office, where his skill at the difficult and dangerous game of international manoeuver had made Great Britain an important factor in European affairs. His dictatorial and self-sufficient attitude made him disliked and feared by many of his colleagues and by the queen, but he retained the good will of the public throughout his career, and his genius for foreign diplomacy was recognized even by his opponents.

Underwood & Underwood
Queen Victoria
The queen in the year of the Diamond Jubilee, 1897, the 60th year of her reign

Lord Palmerston was again at the head of the government when the American Civil War broke out in 1861. Much distress was caused in England when the Union blockade of Southern ports cut off the supply of cotton for English mills. While the mass of the English people sympathized with the North even against their own material interests, there was considerable pro-Southern feeling among the governing aristocracy. At one time, late in 1861, Great Britain was perilously close to a declaration of war against the United States over the Trent Affair. The British mail ship *Trent* had been stopped and searched at sea by a United States warship, and two Confederate representatives, going abroad to seek aid for the South, had been forcibly removed. Only the prompt apology of the American Government prevented serious trouble.

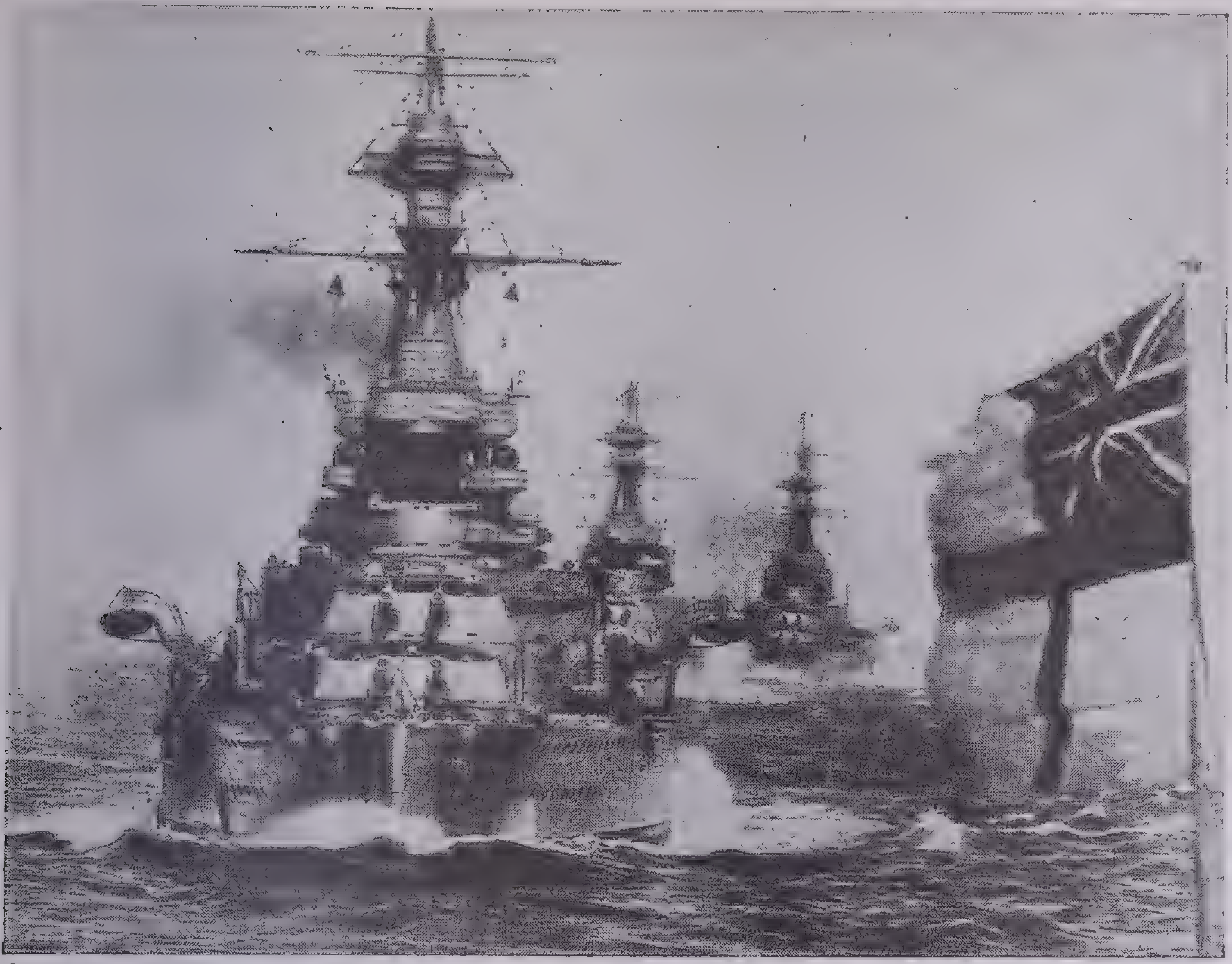
The period following the death of Palmerston in 1865 is famous for the political rivalry of the ministers Gladstone and Disraeli. Gladstone was chiefly interested in home affairs, public education, civil service reform, Irish Home Rule. Disraeli was an imperialist. In many ways the abilities of the two men supplemented each other, and each did what the other overlooked. Disraeli's most famous exploit was the purchase of a controlling interest in the Suez Canal.

Edward VII.—Victoria died in 1901 after a reign of 63 years, the longest in English history. She was succeeded by her son Edward VII, whose reign lasted until 1910. The period was marked by progress in social legislation and further democratic reform. The budget bill of 1909 was opposed by the House of Lords, because it proposed a schedule of taxation bearing heavily on the rich. After a crisis in which the old threat to pack the House by the creation of new peers was used to bring the Lords to terms, the bill was passed, and further legislation was adopted that gave the House of Commons exclusive control over money bills and abolished the veto that the House of Lords had previously exercised.

In foreign affairs, Great Britain, still pursuing her 200-year-old policy of opposing any power on the continent that threatened to gain a European ascendancy, drew closer to France and Russia in opposition to the rising power of the German Empire.

The World War.—George V ascended the throne in 1910. Never had European civilization seemed so prosperous, so stable and so democratic. Those on the inside of diplomatic affairs knew, indeed, that Europe was an armed camp, a powder barrel that required only a spark to produce a terrible explosion. But the ordinary citizen understood little of this. He looked forward with the new king to an era of peace and progress.

The spark necessary was provided by the assassination at Serajevo in Bosnia of the Archduke Franz Ferdinand, heir to the throne of Austria-Hungary. Such was the complicated system of alliances in Europe that it was practically impossible for a war to occur between any two Powers without involving all the others. In the diplomatic crisis that followed the delivery of the Austrian ultimatum to Serbia (July 23, 1914), the Government of Great Britain, whose foreign policy was directed by Sir Edward Grey, made strong efforts to preserve the peace, as did also the German Government led by Bethmann-Hollweg. But a train of events had been set in motion that could not be resisted without the co-operation of the leaders of the governments of France, Russia and Austria-Hungary, and these leaders, though they did not deliberately hope for a world war, were unwilling to make any concessions to prevent one. The last hope



Underwood & Underwood

British Warships: The Power and Strength of the Nation Are Embodied in its Navy

of preserving the peace was destroyed by the precipitate action of the czar of Russia. On July 30 he ordered a general mobilization of the Russian army. The Russian mobilization forced mobilization by Germany, and German mobilization, everyone knew, would be followed immediately by a German attack upon France. Thus, on August 2, the German army was already massing on the western frontier, while Germany and Austria-Hungary faced Russia on the east.

Great Britain was the only one of the major Powers not obligated by definite treaty to take part in the general war that thus broke out. The German statesmen, indeed, fatuously hoped for Britain neutrality up to the last moment, and the French were in considerable terror that they might have to fight Germany without British help. But there were several powerful reasons why the British leaders felt it necessary to go to war. The strongest of these was the fear of German military dominance on the Continent. Ever since the time of William III it had been a major aim of British policy to preserve a balance of power by steadfastly opposing any continental Power that seemed about to gain an ascendancy. For over 200 years the threatening Power had been France, and against France England had traditionally ranged herself. But the Franco-Prussian War of 1870 to 1871 and the creation of a unified German Empire by Bismarck had shifted the danger point. Germany and not France was the growing, ambitious Power. Anglo-German trade rivalry strengthened this conviction. Worst of all, for some years the Germans had been vigorously building a navy, which by 1914 had grown to formidable size and struck terror into the hearts of many Englishmen. "We attacked Germany," declared the English scholar Conybeare, "for three reasons:

1. To down her navy before it got any larger.
2. To capture her trade.
3. To take her colonies." [1]

It would have been quite impossible for the realistic leaders of the British Cabinet to have confronted the House of Commons and the peace-loving British people with any such arguments as these. But German military necessity and the ineptitude of German diplomacy quickly provided an issue on which all Englishmen could unite. This was the ruthless invasion of Belgium. On August 4, Great Britain demanded the immediate withdrawal of troops from Belgium. The demand was refused, and Britain declared war on August 5.

Thus in a space of two weeks Europe was transformed from the center of world civilization into a slaughterhouse. Nothing remotely like it had been known in previous history. The immense progress in material culture that had been the leading feature of the 19th century now reacted to destroy the civilization it had created. "They turned their boasted science to the discovery of new methods of butchery. They used their marvelous economic system to maintain hosts for slaughter. They prostituted their noblest ideas as war propaganda. They made their sons cannon fodder. In the eyes of those of their children who escaped from this holocaust they must ever remain a generation that spoke eloquently and much of liberty and justice and science and progress and drove millions of men to their deaths in the most gigantic folly of all history." [2]

Once war was declared, the whole British Empire threw itself into the struggle with determination and loyalty. The enormous importance of British sea power was evident from the start. By her control of the seas, Britain was able to establish an immediate blockade of Germany which not only stopped shipments of munitions and food but also cut off free communication between Germany and the United States. This became an important factor in the war of propaganda for American sympathies that started as soon as the armies began marching in Europe. Under the protection of her navy, Britain was able to transport millions of men from England to France and to bring men also from Canada, India, Australia and New Zealand.

At the beginning of the war Brittain maintained, as the kaiser declared, only "a contemptible little army," but she soon created a powerful military machine. Six months after the opening of hostilities she had nearly a million men on the battle line in northern France.

The great British financial and industrial organization became the economic backbone of the Allied cause. In 1914 it was supposed that wars were fought by armies; by 1916 it had become clear that they are fought rather by heavy industry. Coal, steel, electric power, oil and food are the sinews of war; an army of 10,000,000 men, such as Russia commanded, was able to accomplish little because it did not have a constant supply of heavy armament. In the last analysis, the Allies won the war because shells, ships, airplanes and guns poured out of England without stint, and a steady stream of British ships carried millions of tons of similar supplies bought by British credit in the United States.

The most dangerous situation faced by the nation was the shortage of food. Of the great countries of Europe, England is the most dependent upon an outside food supply. A tight blockade lasting for only a few months would unquestionably reduce the population to starvation. Beginning in 1915, Germany, in a desperate effort to break the stranglehold of the British blockade on her own ports, instituted her submarine campaign by which she hoped to drive British shipping from the seas and force Britain out of the war. The submarine did great damage in 1915 and 1916, but the situation did not become really critical until 1917. In February, March and April of that year, the submarines sank 1,800,000 tons of shipping, and it became clear that if destruction should long continue at such a rate the war was lost. In this emergency the British Admiralty put into effect new methods of dealing with the submarine menace, and ultimately the danger was brought under control. During the whole war the submarine campaign sank a grand total of 11,189,000 tons of shipping.

SINCE 1918

Peace and Reconstruction.—The war ended November 11, 1918 with the collapse of the German Empire before the overwhelming combined force of Britain, France and the United States. At the Conference of Paris, which drew up the Treaty of Versailles, the British Commission was headed by David Lloyd George. By the terms of the treaty Great Britain received governing mandates over the former German colonies in Africa. The German navy was surrendered in its entirety. German military and naval armaments for the future were severely restricted.

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[1] Private letter quoted by H. E. Barnes, *Genesis of the World War.*

[2] Swain, J. W., *Beginning the Twentieth Century.* W. W. Norton.

The peace settlement of Versailles was the outcome of a compromise between the idealistic Fourteen Points of President Wilson and the "Carthaginian" terms desired by the patriotic but implacable Frenchman Georges Clemenceau. In this conflict of ideals Lloyd George placed himself on the side of moderation. Unfortunately the ferocious hatred engendered by the war produced the worst possible atmosphere for the framing of a permanent settlement. In all but a few points the revenge party led by Clemenceau had its way, and the treaty that was finally drawn up has been ever since the chief factor making for a new European struggle. By 1935 the German Government had successfully repudiated the treaty in so far as it related to rearmament and reparations, and the effort to upset the territorial settlement is constantly threatening world peace.

Once the war was over, the British people took up the task of reconstruction with characteristic energy. The material and human losses of the war had been enormous. More than 900,000 of the best men in the nation had been killed on the battlefield. Hundreds of thousands more were blinded, maimed and mentally wrecked by shell shock. The nation was saddled with a debt that would have seemed incredible in the days before the war. Complex industrial problems were created by the sudden stoppage of war industry and the return to civilian life of millions of soldiers. Unemployment was widespread.

The Government met these grave emergencies with courage and skill, and by 1929 Britain had fought her way back to a position of internal calm and economic prosperity. The world economic depression which began about this time seriously affected the British Empire, but again demonstrated the resilience of the British people and the stability of British institutions. Frankly accepting the view that it is the business of government to promote the general prosperity of the people by direct action, Britain has adopted a program of social legislation involving government control of industry, unemployment insurance and state-subsidized housing that marks the most successful effort yet made by a great democratic nation to maintain the essential liberties of a capitalistic laissez-faire economic system and at the same time to provide rigorous state checks on the excesses and economic anarchy that such a system tends to produce. This middle course between socialism and rugged individualism is apparently another successful instance of the British love of compromise and gradual change.

Probably the most important political trend was the rise of the Labor Party. For the first time in the history of cabinet government there were three major parties in the field, Liberal, Conservative and Labor, and it often happened that no one party could control a majority in the House of Commons, so that government had to be carried on by a coalition of leaders. In 1924 the first Labor Prime Minister, James Ramsay MacDonald, took office after a combination of Liberal and Labor votes in the House of Commons had forced the fall of the Conservative government of Stanley Baldwin. This first Labor government lasted only eight months depending as it did on the support of the Liberals. In 1929, after a general election, the Labor Party seated 287 members, just short of a majority. Ramsay MacDonald returned to the Prime Ministry.

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King Edward VIII

On December 10, 1936, Edward VIII, afterwards Duke of Windsor, abdicated, the first English king in history who voluntarily renounced his rights to the throne

The world business depression created a serious financial crisis in 1931, forcing the resignation of the Labor Cabinet. To the astonishment of many of his old supporters, MacDonald undertook to form a new government. His action split the Labor Party. In the general election that followed in October 1931, a tremendous majority was returned in favor of MacDonald's coalition. In the meantime the financial crisis had been relieved by the abandonment of the gold standard (September 21, 1931). The MacDonald coalition remained in office until 1935, when MacDonald resigned, his last years darkened by ill-health and the bitterness of the old Laborites who considered him a traitor to Labor. Stanley Baldwin succeeded MacDonald. He resigned in 1937, and the prime ministership passed to Neville Chamberlain.

Renewed International Tension.—From the close of the World War until the military resurgence of Germany under the leadership of Adolf Hitler and the Nazi Party, the main British effort was concentrated on domestic economic problems. Beginning about 1935, however, the increasing dangers and complexities of foreign affairs have required greater attention. At about this time we may see a turning point in European history. Europe stopped reconstruction from the last war and began preparing for the next.

In 1935 Italy, under the bold leadership of Mussolini, carried out the military conquest of Ethiopia. As a member of the League of Nations, Ethiopia appealed for protection. It was quickly apparent, however, that against the aggressiveness of a great Power such as Italy the League was not prepared to use force, and in spite of the efforts of Great Britain to hold the League to a united front, nothing effective was done. Britain sent a large detachment of her fleet into the Mediterranean but failed to overawe the Italians.

In the meantime, as Winston Churchill declared in the House of Commons, the hammers were ceaselessly ringing in Germany as the most efficient people in Europe went grimly forward in preparations for war. It was clear that the great structure of so-called "collective security" raised at Versailles at the end of the war to end war had broken down after less than 20 years, and that the old law of empire to the strongest and woe to the vanquished was again the dominant force of the world scheme.

The British answer to the new war psychology of Europe was an armament program on a vast scale.

In 1936 a civil war broke out in Spain creating a dangerous tension among the Powers. The war was widely described as a struggle between the ideals of Fascism and Communism. Throughout the Spanish crisis the efforts of the British Government were always directed to keep the war from spreading over Europe and to end it by mediation.

In the Czechoslovakian crisis in September, 1938, Prime Minister Chamberlain agreed to the dismemberment of Czechoslovakia in order to preserve European peace. Great Britain then undertook to guarantee Czechoslovakia's new borders and at the same time signed a pact with Germany to arbitrate all future disputes — both events being notable changes in foreign policy. Hitler soon broke this treaty. In 1939 Germany attacked Poland, whereupon England and France declared war on Germany. See World War number 2, page 805c.

Edward Abdicates.—George V's 25-year reign ended with his death on January 20, 1936. The popular prince of Wales succeeded as Edward VIII. Before the new king's coronation, however, a constitutional crisis developed over the king's announced intention of marrying the twice-divorced American woman, Mrs. Wallis Simpson. Opposition to the proposed marriage on the part of Prime Minister Stanley Baldwin and his Cabinet, supported by the House of Commons, forced the king's abdication on December 10, 1936. The duke of York, second son of George V, succeeded to the throne as George VI. The power of Parliament to order not only the policies of government but even the private life of the king was thus demonstrated once more. See World War II, p. 805c.

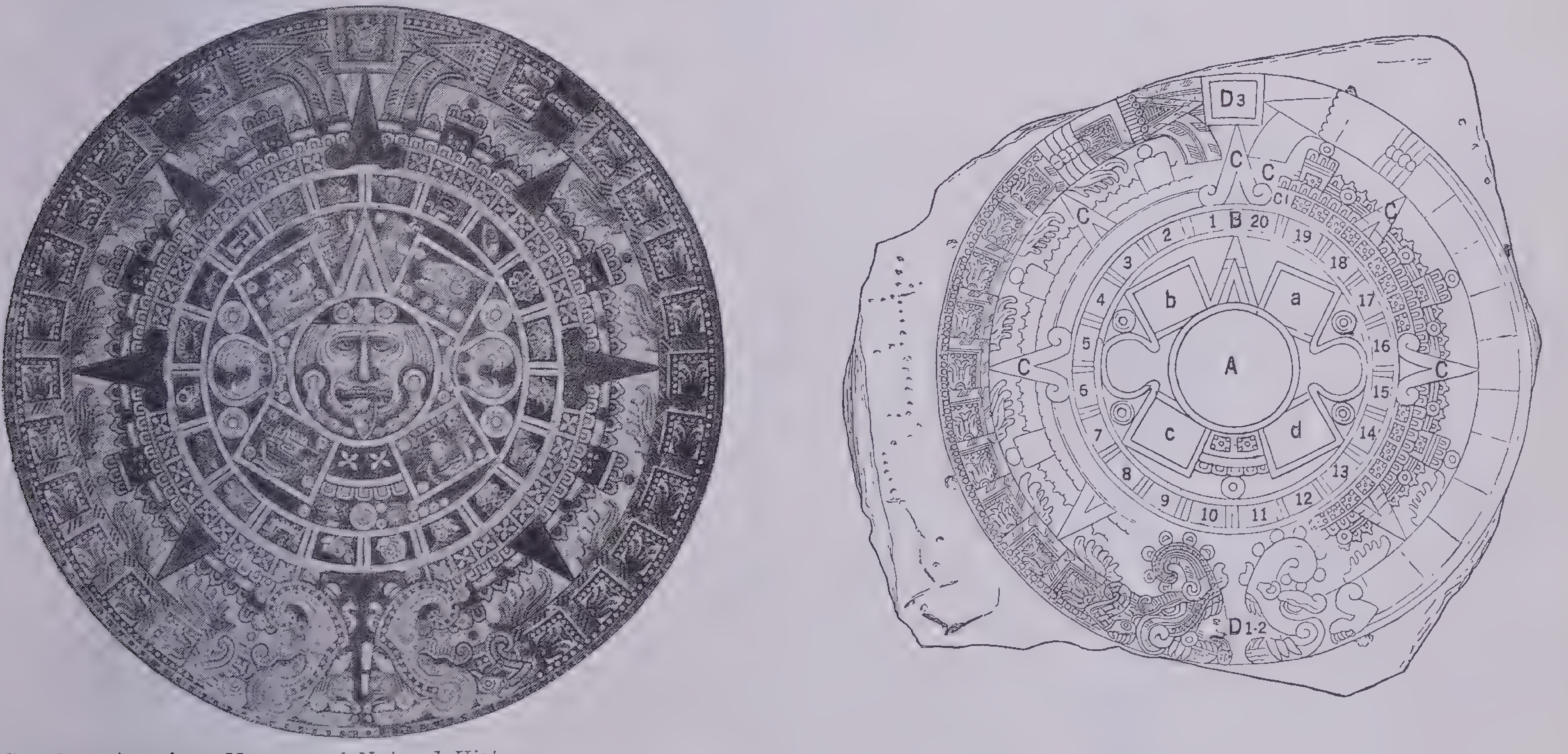
HISTORY OF THE AMERICAS

A wise man once wrote, "He little knows of England who only England knows." Everyone agrees that it is necessary to know European history in order to understand properly the history of France, Germany or England. But there are very few who appreciate that the history of the United States or Canada or Argentina takes on new and deeper meaning if it is viewed as part of the history of the Americas. This failure to think in terms of America as a whole is curious, because so many experiences, so many of the problems encountered and so many of the controlling forces were essentially the same in all parts of the Western Hemisphere.

The Red Man's America.—Even before the first Europeans reached the New World the Indians gave the Americas a certain amount of unity. Just where the Indians came from is not definitely known, but the most generally accepted theory is that they came from Asia by way of Alaska. It must have been centuries and centuries before the discovery by Columbus, because they had spread all over the two continents and had erected different civilizations. Some of the Indians—and this is especially true of those that occupied most of what became the United States and Canada—were still very primitive. Like other peoples in the hunting stage they wandered from place to place after the wild animals that furnished their food and clothing. With no permanent homes, they were poor, dirty, ignorant and few in number; to support only a small number of people who live by hunting, a vast area of land is necessary. Other Indians had reached higher cultural levels. Some were partially agricultural, some entirely so and some had rich civilizations with large cities and complex societies.

The Indians in the temperate and cold sections of both North America and South America were more primitive than those in the tropical sections. Probably the most advanced of all were the Mayas who lived in what is now Yucatan, the extreme south of Mexico and Guatemala. From their cities and other remains that are now being dug up it seems that the Mayas reached that region about 1000 B.C. Their complex civilization was marked by elaborate farming, good roads, large cities with beautiful buildings, skilful weaving of textiles, expert work with metals and artistic achievements of a high order. They developed the most advanced system of recording thought in aboriginal America and one that has not yet been deciphered. The Spaniards destroyed most of the Maya writings as unchristian and devilish. The Mayas were particularly good in mathematics: they invented a calendar that some scholars say was more accurate than the one then used in Europe. The Mayan civilization had passed its peak before the Europeans arrived, and the Mayas had been conquered by the Toltecs, who built up a flourishing empire until it was conquered in its turn. The victorious Aztecs, with their capital at Mexico City, were the first rich, densely populated Indian civilization to dazzle the eyes of the Spanish newcomers. Their only rivals were the Incas who had an equally elaborate and rich civilization in what is now Peru.

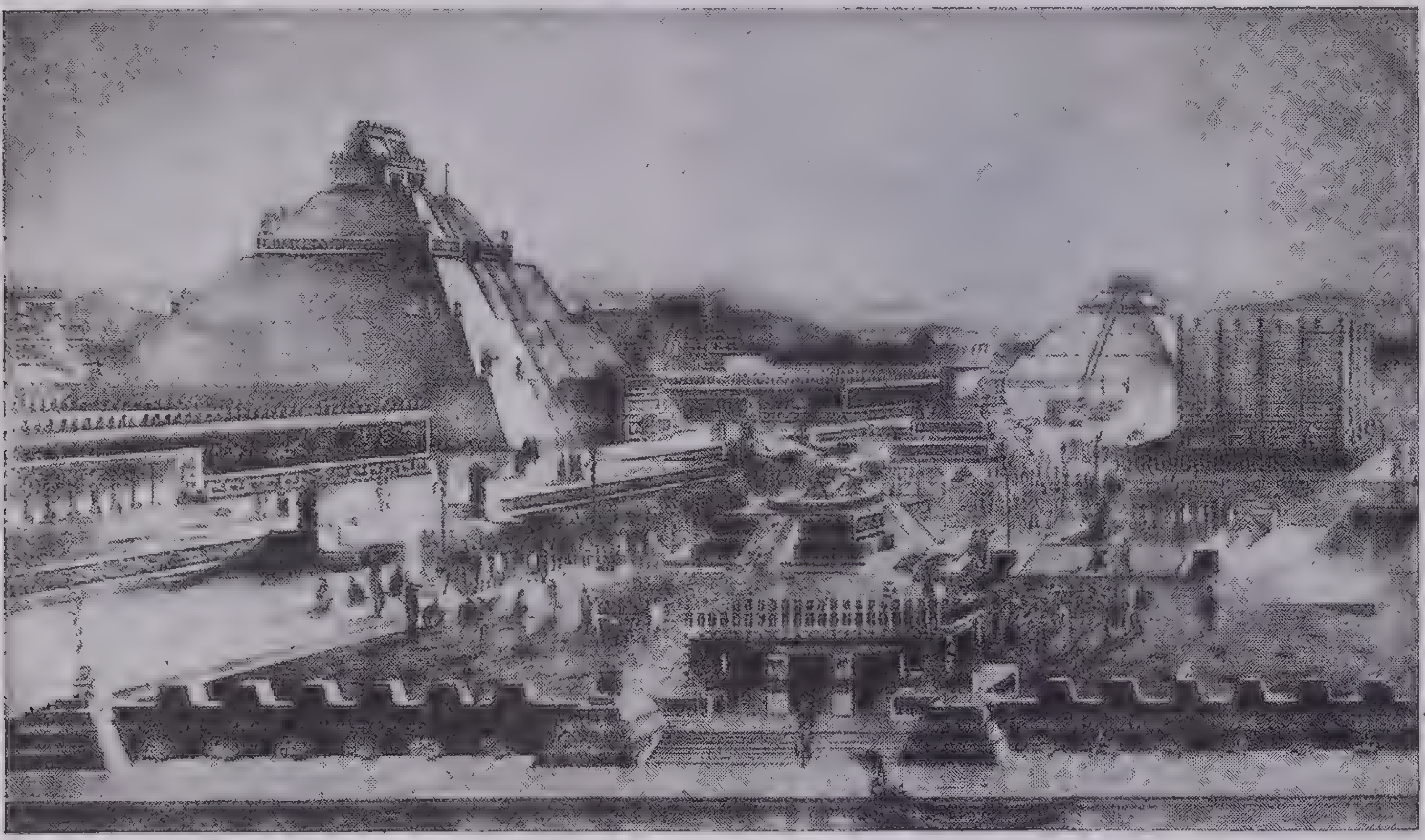
It was the white man, not the Indian, who gave real unity to the history of the Americas. The desires, forces and preparation that resulted in the voyage of Columbus in 1492 were not confined to Spain but were common to many of the peoples of Europe. The consequences of his voyage were equally international. The Europeans thought in terms of the New World as a unit, at first regarding it as an obstacle barring them from a direct and cheap water route to the wealth of India and Asia. Spanish, Portuguese, French, Dutch and British navigators tried again and again, often enduring extreme hard-



Courtesy American Museum of Natural History

The Calendar Stone of the Aztecs

Pictured above at the left is a mosaic reproduction of the stone in the floor of the Solar Room of the Hayden Planetarium, New York, and at the right an explanatory diagram. The Calendar Stone or Stone of the Sun is the most valuable object that survives from the time of the Aztecs. The original, a slab of porphyry with a sculptured face 12 feet in diameter and weighing over 20 tons, is now in the National Museum, Mexico City. The soldiers of Cortez probably removed the Calendar Stone from its original position in Tenochtitlan (Mexico City) in 1519; about 1560 it was again exposed to view. "The Calendar Stone is not only a symbol of the sun's face marked with the divisions of the year but it is a record of the cosmogonic myth of the Aztecs and the creations and destructions of the world. In the center is the face of the sun-god, Tonatiuh, enclosed in the middle of the symbol called *Olin.* Olin is one of the day signs and means movement or perhaps earthquake. The history of the world according to the Aztecan myth is divided into five suns or ages, four of which refer to the past and one to the present. The present sun is called *Olin Tonatiuh* because it is destined to be destroyed by an earthquake."—Herbert J. Spinden, Curator of Primitive and Prehistoric Art, Brooklyn Museum. *Explanation of diagram: A,* Olin symbol with face of the sun god Tonatiuh; a, Ocelotl (jaguar); b. Ehecatl (wind); c. Quauhtli (rain); d, Atl (water)—these refer to destruction, first, by jaguars, second by a hurricane; third, by a volcanic rain of fire, fourth, by a flood; *B,* Twenty day signs of the Aztecan month: 1, crocodile; 2, wind; 3, house; 4, lizard; 5, serpent; 6, death; 7, deer; 8, rabbit; 9, water; 10, dog; 11, monkey; 12, herb; 13, reed; 14, jaguar; 15, eagle; 16, vulture; 17, movement; 18, stone; 19, rain; 20, flower. *C,* Band of conventional rays of the sun and other details; *D* 1, 2, Two plumed monsters meeting face to face; in each reptile face is seen a human face in profile, probably the Xiuhcoatl or Fire Serpents ships in the search, for a passage through or around the barrier. Soon, however, the new lands were prized for themselves—especially after Cortez had proved in Mexico that great wealth could be won by an audacious plunderer. In spite of their efforts no European country except Spain and Portugal succeeded in establishing permanent settlements in the New World for more than a century after the discovery by Columbus. The great power of Spain kept the others out. Once Spanish sea power was broken by the defeat of the Armada in 1588, the other nations rushed into the New World. England, France and Holland quickly began their American empires. Although much smaller than the Spanish possessions, which extended from California and the southwestern part of the United States through Mexico, Central America and all of South America except Brazil (Portuguese), these other empires were not confined to one portion of the New World. The thirty or more colonies that the English ultimately established included portions of frigid Canada, the temperate United States and tropical areas in the Caribbean. So, too, did the French and Dutch settlements.



Courtesy American Museum of Natural History

Mexico City in the Days of the Aztecs

Great Plaza of Tenochtitlan, the ancient Mexico City, as reconstructed by Ignacio Marquina. In the foreground is the termination of the northern canal, a wall studded with serpents' heads which surrounded the sacred precinct. In the left background is the Great Pyramid topped by two temples, one dedicated to Huitzilopochtli, the war god, and the other to Tlaloc, the rain god. At the left of the Great Temple is the rambling structure occupied by Montezuma. In the center of the plaza is the circular stone used for sacrificial combats. In the far background can be glimpsed the volcanoes Popocatepetl and Ixtacihuatl

A World Migration.—The migration of Europeans to the Americas that Columbus started became the largest and most important movement of people in the history of the world. At first only a thin stream flowed across the Atlantic, for the hardships were great, and many died on the way. Gradually the stream increased in volume and after the development of the steamship and railroad with all the accompanying economic changes, wave after wave of humanity reached the shores of America from Europe. We in the United States are apt to think that ours is the only country whose history has been vitally and continuously affected by a steady influx of immigrants from Europe. Every large country in the New World has had much the same experiences and problems. Although only guesses can be made for the early period, there are fairly accurate figures showing that from 1846 to 1935 over 50,000,000 persons moved from Europe to the Americas and that from 1821 to 1935 about 36,000,000 came to the United States. In the 70 years after 1857, when Argentina began collecting immigration statistics, nearly 6,000,000 persons entered that country, and 47 per cent of them were Italian. According to the census of 1914 about 30 per cent of the Argentine population were foreign-born, a proportion twice as large as that in the United States in 1910 when it reached its maximum here. In truth, the movement of European peoples to the New World was intercontinental and can be better understood if it is so viewed. At present the United States and Canada restrict immigration drastically, but the other American countries do not; so that it is easily possible that within a short time the population of Latin America will again outnumber that of English America as it did during the Colonial period. If this occurs, the racial stock of Latin America will be more and more largely European and less and less Indian.

Similar Colonial Experiences.—Not only was the movement of Europeans common to all the Americas but the experiences of the newcomers in each part of the Western Hemisphere were strikingly similar. For about 300 years after Columbus the New World consisted entirely of European colonies. The Europeans who came to America as well as those who stayed in Europe busied themselves with plans for getting wealth out of this fabulous New World. Their first thought was for gold and silver, but only the Spanish were lucky enough to find such precious metals. Then attention was given to other products and because labor was the lagging factor in production every European country established some kind of system of forced labor, Negro slavery being the commonest.

The ruling European countries all shared the same fundamental ideas regarding the relation between colonies and mother country. Each believed in mercantilism, the national policy of promoting economic self-sufficiency so that the country would not have to buy from other countries. Each mother country wanted its colonies to produce the kind of articles that otherwise would have to be imported. Accordingly the English passed laws to compel or encourage her colonies to produce wine and silk. The same desire for national self-sufficiency and national strength led all the colonizing nations to pass laws making all the trade of the colonies flow through the mother country. Naturally the mother country was most important in their eyes and in adopting policies for their empires they tried to arrange things so that the mother country would get the greatest benefit.

These commercial regulations differed in details, but English, Spanish, French and Dutch empires had essentially the same policies, and everywhere in America the effect was the same. The colonists, believing their interests were being sacrificed for the benefit of the home countries, protested and finally sought through independence the economic freedom and opportunity for growth that they felt were being denied them. Other factors played a part in the various colonial revolutions occurring in America between 1776 and 1826, but opposition to imperial commercial policies was fundamental to all.

Revolt and Democracy.—The American revolutions that resulted in the independence of most of America from Europe had other important elements in common. All were based on the same political philosophy. The English colonists who announced the independence of the United States in 1776 gave those ideas their classic form in the Declaration of Independence. The ideas did not originate in the New World. Indeed, they had already been used by John Locke (1632–1704) and others to justify another revolution, that of 1688 in England. The colonists had taken them to America along with their other intellectual baggage. The Spanish colonists also justified their acts by the same principles, which they received not so much from the United States as from Europe and the French Revolution. In both English and Spanish colonies under the influence of the new environment the settlers had grown apart from the peoples in the European mother countries. They began to think of themselves as different and to resent being treated as political inferiors and provincials.

The character of the successful revolutions committed all the newly independent countries, in principle at least, to democracy. Spanish America is still democratic in theory, but in practice there has been a marked contrast with English America. Throughout the history of the various Spanish-American countries there have been series of dictators so that, although the forms of democracy have been and still are preserved, democracy has been partial and intermittent. Consequently the similarities between the governments of the United States and so many Spanish-American countries —the written constitutions, the federal and state governments, the separation of powers—are more superficial than real. The form is much the same, but the spirit and essentials are different. Although as a dominion of the British Empire, Canada has a king, its government and political practices are closer to those of the United States than are those of Spanish America. The form of Canadian government is different, the spirit and the essentials are the same as ours. Democracy was established in Canada within the Empire, and Canadian independence, real independence with full control over their own destiny, was achieved not by revolution and war but by a gradual and peaceful process.

Another contrast between the United States and most other American countries is their attitudes toward Europe. In the years immediately after independence was won, all of them feared that European Powers might attempt to reconquer empires in America. These fears produced the Monroe Doctrine. The object of this policy was to protect the peace and safety of the United States; but the Latin-American republics regarded it with high favor because it offered them, incidentally at least, protection from Europe. An attempt was made to bind all American republics in a league, the main object of which was to defend its members from European attacks. However, in the course of time conditions changed and the Spanish-American nations no longer saw any threat to their independence coming from Europe. With that fear removed they altered their policies and today most of the countries of Latin America, like Canada, are members of the League of Nations. If the League of Nations fails as an agency for peace, there will probably be greater unanimity in the Americas on the subject and probably also an attempt to provide some inter-American machinery to preserve peace.

American Frontiers.—Contrasts of this nature are trivial compared with the striking similarities that are obvious when some of the most important phases of American history are considered. The key to the history of the United States during the 19th century is the westward expansion of its population across the almost empty and fabulously rich continent to the Pacific. Nearly every major problem presented to the people of the United States from 1815 to 1914 arose from that westward expansion or was connected with it. The strong and often decisive influence exerted by the presence of the frontier has long been recognized, as any American history text will show; but what is forgotten is that other American peoples also were on the march. In the larger countries —Canada, Brazil and Argentina— migration was westward, as in the United States; but elsewhere the movement was eastward from the Pacific or it was southward; in Mexico it was northward. Always the settlers pressed on to the interior, to the unoccupied lands. Everywhere they were extending their institutions, adjusting themselves to the frontier and sharing the same experiences. The part played by the frontier in the United States can be much better understood if something is known of the other American frontiers.

Courtesy Pan American Union

Statue and Cathedral of Colon (Columbus) in Ciudad Trujillo
In the cathedral is a tomb reputed to contain the remains of Christopher Columbus

So many types of historical events were repeated in each country that the mere enumeration of them is startling. In nearly every country there was an Indian problem. The results were much the same in the United States and Canada, but quite different in most of Latin America. The explorations of Lewis and Clark and Pike for the United States were duplicated by Alexander Mackenzie and Duncan McGillivray in Canada and by earlier Spanish and Spanish-American explorers throughout the rest of the two continents. The dramatic story of the building of the Union Pacific Railroad was exactly paralleled by the construction of the Canadian Pacific. There were the same heroic vision, the same rugged endurance by the men who did the job, the same Indian troubles, the same engineering difficulties, the same financial problems—and the same success. Only the names of the individuals and the superficial details were different; the essentials were identical. By making only a few more changes the history of the Union Pacific could be taken for that of the Mexican National Railways or of the Transandine Railroad. The United States had a period of flush mining when mushroom towns sprang up overnight, when law and order were conspicuously lacking and when things occurred that can now be found only in the stories of Bret Harte. But so, too, did Canada; so, also, Mexico; and long before them, so did Peru. What could be more typical of the United States than the rancher and the Western cowboy? Yet the ranches of Canada, of Mexico and of Argentina could scarcely be distinguished from their counterparts in the United States. The picturesque gaucho of Argentina lived, worked and played like the Texan cowboy—indeed could only be told from the latter by the shape of his hat, the way he roped cows and by the language he spoke.

English and Latin Cultures.—As many and great as are these features that appear in the histories of all the countries in the Americas, there is one field in which there are two distinct and separate groups. Notwithstanding the large number of immigrants to North America from southern and eastern Europe, it is clear that the culture, the literature, the family life and most of the social customs in the United States and Canada are definitely English or Anglo-Saxon. It is equally clear that the literature, the family life, and most of the social customs of the rest of the Western Hemisphere are Latin in origin. This is true even of Brazil where there is a large German minority and of Chile where an English group has had great influence. We of the United States are hardly aware of the books written in Latin America. They, on the other hand, find their books and literary models in Spain, France, Portugal and Italy. Their art shows the same influences. Their young men, as a general rule, have gone to France or Spain to study, not to the United States or England or Germany. Their young women, again as a general rule, have not received a higher or academic education—another difference in social custom from the United States and Canada.

Such, then, are some of the things to be borne in mind when one reads the history of any of the American countries. Whatever the individual peculiarities, each is not isolated but is part of the greater epic, the expansion of European peoples in the New World.

HISTORY OF THE UNITED STATES

America.—Four hundred years before the birth of Christ, Plato wrote an account of a great island in the Atlantic Ocean called Atlantis which was said to be larger than Asia Minor. Beyond it there was supposed to be a country larger than Europe. Other ancient writers mentioned Atlantis as a mysterious land where strong and powerful people lived and which, because they were so wicked, was sunk into the sea. Navigators dared not journey far to the west for fear that they would encounter perilous shoals marking the place where it disappeared. These accounts are only fables. It is not even a fable that the Phoenicians, on their sea voyages reached the continent of America, as some fantastic historians have attempted to prove from the Writing Rock, at Dighton, Massachusetts, containing hieroglyphic inscriptions similar to those found in Asia, and the famous Skeleton in Armor, discovered at Fall River and made famous by Longfellow's poem. This evidence is not good enough to prove anything. Even if it seemed to show pre-Columbian visits to North America, those visits could not be dated and there is no proof who made them. Most important—nothing came of these early voyages, if there ever were any.

There is evidence in old Norse sagas that Vikings reached and settled the shores of North America early in the 11th century, but those settlements were abandoned, they were unknown to the rest of the civilized world and they had no effect on the history of America.

The ruins of the Mound Builders in the West, especially in the Mississippi Valley, covering acres of territory, are other sources of speculation. Careful study of these mounds leads scientists to the belief that the mound builders were not a separate and distinct race but only a slight variant from the other North American Indians—or possibly the ancestors of the tribes found by the first white explorers of this Continent.

The name America to designate the entire known western world was first employed by Mercator in 1541. Originally the name "America" was used only for central Brazil, in honor of Americus Vespucius or Amerigo Vespucci, an Italian, who wrote an account of a voyage he made in 1497–98 along the coast of South America (Brazil, apparently). Columbus's earlier discovery of the mainland was a secret when Vespucci made his claim.

Early European Background.—During the latter half of the 15th century, Europe was emerging from the Middle Ages into the modern period. The transition is called the Renaissance, which means *rebirth.* Some scholars say the Renaissance began with the fall of Constantinople in 1453 and the spread of classical culture through western Europe; others say it began with the invention of typography in 1440. Certainly both these things played a large part in awakening western Europe to art and learning, to astronomy, geography and invention; and they quickened the curiosity of the nations concerning the wide world as a human habitation. In western Europe Spain especially was fired with the dream to find a new route to that rich land visited by Marco Polo in 1269–1295 and described in the book he wrote while he was a prisoner in Genoa in the year 1298.

The marriage of Ferdinand and Isabella in 1469 led to the union of Castile and Aragon in 1479—Spain was becoming one nation. When the conquest of Granada in January 1492 pushed the Moors from their last stronghold on the continent back into North Africa, a strong, united Spain was ready to reach still farther afield for gold and riches and dominions. Thus Isabella at last, after eight years of indifference, lent a willing ear to the disheartened Christopher Columbus of Genoa, who had also failed at the court of Portugal to find patronage for a voyage into the West, which he (and other geographers) believed would lead to the Indies.

Isabella foresaw in this venture glory and wealth for Spain, as well as the chance to establish her church in a heathen land. But no one, not Columbus himself, dreamed what an empire Spain was soon to hold, as the three small vessels provided by Isabella, the *Niña, Pinta* and *Santa Maria* started out of Palos, Spain, on August 3, 1492, making into the trackless sea toward an unknown west.

The Discovery.—The voyage of Columbus with its hardships and discouragement, the terror and mutiny of the sailors as the ten long weeks went by and no land appeared, the courage and unswerving faith of the commander who kept his eyes on the west, is a thrilling story too well known to repeat.

On October 12, 1492, land was sighted and American history began. But Columbus did not know that he had discovered a new continent. Even the learned geographers, who believed with him that Marco Polo's Indies could be reached by sailing west, had no idea that between that rich land and Spain lay yet another huger, richer, unknown world, unnamed. And it was many, many years before Europe could believe that the new domains were New indeed.

Columbus believed that he had found the Indies, the very islands Polo described off the east coast of Asia. But he really landed on a small island now identified with Watling Island in the Bahamas. He named it San Salvador, raised the flag of Spain and formally claimed it in the names of their majesties, Ferdinand and Isabella. Then he turned home, eager to make known his success. He was received with honor and ceremony and rewarded with the title, Admiral of the Ocean.

The Explorers.—If southern Europe ever heard of the legendary voyages to a new country made by the Viking, Leif Ericson, about 1000 A.D., it had forgotten them long before 1492. Columbus made four voyages between 1492 and 1504, but at no time did he set foot on the continent of North America. It remained for another Genoese, John Cabot, under the patronage of Henry VII of England, to land on our own northern shores.

In 1497, though burdened with debt, Henry VII outfitted an expedition under the command of John Cabot to search for the western passage to India. Exactly where Cabot landed is not known, but most historians agree that it was on Cape Breton Island, Nova Scotia. He took possession in the name of the king of England, and the following year continued his explorations southward, possibly as far as South Carolina.

In 1501 and 1502 two Portuguese brothers, Gaspar and Miguel Cortereal, made voyages which touched the shores of Newfoundland and Labrador. But Spain was foremost in expressing the Old World's zeal for New World exploration. Alonso de Ojeda in 1509 established the first Spanish settlement in Darien in eastern Panama. Ponce de Leon, who had been with Colombus on his second voyage in 1493 and became governor of Puerto Rico in 1509, learned from the Indians of a wonderful island named Bimini, where flowed the Fountain of Youth. He set sail in 1512 to discover and claim this island, and on Easter Sunday (*Pascua Florida* in Spanish) he found a new land that he named Florida.

Balboa crossed the Isthmus of Darien in 1513 and was the first white man to behold the Pacific Ocean. In 1518 Hernandez de Cordova discovered Yucatan, and Juan de Grijalva pushed on northward to Vera Cruz. Hernando Cortez conquered Mexico in 1519–21 and gave the coveted gold of that new territory into the possession of Spain.

In 1520 Magellan, the great Portuguese navigator, sailed into the Pacific Ocean through the straits which now bear his name and removed the last doubt that a new continent lay between Europe and the east coast of Asia, at the same time giving the first physical demonstration that the world is round.

Other Spaniards, among them, Coronado and De Soto, pushed through the wilderness into the interior of North America. During 1540–42, Coronado, seeking the seven cities of Cibola, planted the flag of Spain in what is now Arizona and New Mexico. De Soto pushed westward and northward from Florida and came upon the Mississippi River in 1542.

In the meantime France was realizing that a new world was to be had for the taking, and in 1524 with a French commission the Italian navigator, Verrazano, explored the new coasts and entered New York bay. Between 1534 and 1542 Jacques Cartier explored the new lands. He found the Strait of Belle Isle; he discovered and named the St. Lawrence River and followed it inland to a little Indian village, which he named Mont Real (Mount Royal), now Montreal. He took possession of all that northern territory in the name of France, and was on his way home when he passed the shipload of French colonists under the Sieur de Roberval coming to attempt the first ill-fated settlement. Later, Champlain, Joliet, LaSalle and others were to move westward and establish New France in Canada.

England was no laggard in her interest in the New World. Her ships roved the seas, trading in the West Indies and defying Spain's right to forbid her. With Queen Elizabeth's accession to the throne, definite expeditions were resumed. Sir Martin Frobisher made three voyages between 1576 and 1578 looking for that northwest passage to India which all Europe still believed must exist. He found Frobisher Bay in South Baffin Island and entered Hudson Strait. In 1577 with the secret consent of Elizabeth, Sir Francis Drake sailed out to raid the rich Spanish towns along the Pacific coast. He went through the straits of Magellan, plundered the South American Pacific settlements, sailed north and took possession of the California coast in the name of Queen Elizabeth.

In 1609 Henry Hudson, an Englishman employed by the Dutch East India Company, was one more to take up the search for the Northwest Passage. He entered Chesapeake Bay, Delaware Bay and finally the great river which now bears his name, claiming the land as far as Albany for the Dutch. His voyage in 1610 in an English ship resulted in the exploration of Hudson Bay, and on its shores he perished being marooned by mutineers.

Colonization.—Out of the great sweep of adventure and exploration in the new continent, ideas of empire gradually took shape. Here was wealth to be had undisputed; here were inexhaustible resources for trade and commerce; here was vast and unguessed territory to be peopled and possessed. The three great rival powers of Europe, Spain, England, France, extended their rivalry to the new world. Spain took Florida; St. Augustine, the oldest city in America, was founded in 1565. Spain occupied Texas and the whole southwest of the present United States and upper California. The Spanish missions became rooted and Spanish dominion prevailed until Mexico took over in 1822. France took the northeast, modern Canada; Port Royal, Nova Scotia, was founded in 1605, Quebec in 1608. From there France flung her trails along the Great Lakes, to Hudson Bay, to Illinois, to the Mississippi, to the Gulf of Mexico. Louisiana was settled in 1699. England took the Atlantic coast and was content to prosper east of the Alleghenies. The story of the struggle of these three, resulting in the supremacy of the English colonies and their final separation from the parent country, is the story of all the big and little wars fought on American soil up to and including the American Revolution.

"The Lost Colony."—England was the last of the three great nations to send permanent settlers to America. In 1584 Sir Walter Raleigh sent out the expedition which claimed and named Virginia for the Virgin Queen. In 1585 he outfitted a band of 108 colonists to go to Virginia under Ralph Lane. They landed in August of that year on Roanoke Island on the coast of what is now North Carolina. The ships returned at once to England for supplies. But the little group left on the island were threatened with starvation. Sir Francis Drake came along and picked them up in 1586.

Bitterly disappointed, but undaunted, Raleigh sent out another group. One hundred and twenty-one persons under John White landed once more on Roanoke Island in July 1587. Here the first English child was born in America: Virginia Dare, on August 18, 1587. In the fall John White set sail for England, expecting to return at once with the supplies and equipment essential to existence in a wild land. For some reason he did not get back until 1591, and then not one human being could be found. A search of the island revealed only the word "Croatan" carved on a tree. It was the name of a tribe of Indians of that region. People like to think the little group sought shelter with a friendly tribe and followed them somewhere into the interior; but no one knows.

THE THIRTEEN COLONIES

Virginia.—Failure never meant "give up" in English; and the work of planting English colonies in America went on. In 1606 King James I divided the tract called Virginia into North Virginia and South Virginia. South Virginia took in the land from Cape Fear (now in North Carolina) to the Potomac River. North Virginia included everything between the Hudson River and Newfoundland.

A charter to settle South Virginia was given to the London Company, which sent out the expedition destined to be the first permanent English colony in America. They landed at Jamestown on May 13, 1607. Two years of suffering and want went by which old records call "the starving time"; and had it not been for Captain John Smith, whose good sense and high courage pulled them through, the little group at Jamestown might have followed the fate of that first Lost Colony.

In 1609 the London Company received a new charter which enlarged the South Virginia territory. Sir Thomas Gates was commissioned the first governor; and 150 new colonists were sent out. But when they arrived, May 23, 1610, they were met with tales of hunger and sights of want and hardship that quickly disheartened them. The whole colony set sail for home in less than a month after the newcomers landed. But the little fleet had barely reached the mouth of the James River when they saw English ships heading in. It was Lord De La Warr arriving with more colonists and enough supplies to give them hope. They turned back and once more took up the hard task of making a home in a wilderness. This time they settled at Hampton; and thus Virginia was saved.

The next year 650 more colonists joined them. Settlements spread out, up and down the James River, up and down the Appomattox, farther and farther inland, until Virginia prospered and became the great tobacco-growing colony.

Massachusetts.—The second permanent English colony in America and the first in New England was Plymouth Colony, founded in 1620. The famous little *Mayflower* sailed out of Plymouth, England, in September of that year, with 41 families on board. These were the Pilgrims, 102 men, women and children, who left the Old World, seeking only the freedom to think and worship as they pleased. They landed on the Massachusetts coast on Dec. 21, and founded the settlement which they named New Plymouth.

The story of this colony is the stirring story every school child knows: how the axes started at once felling trees to build shelter from the winter which was already advanced; how that first, long, terrible winter dragged by and the people died, one by one, from disease or exposure, until only 50 were left alive; and how the survivors buried their dead and stoically flattened the tops of the graves and in the spring sowed grain across Burial Hill to keep the Indians from knowing how many had died.

In 1621 more settlers came to cast in their lot with those courageous few, and to eat the small harvest for which the first Thanksgiving Day was set aside. But there was no thought of turning back; not once did the Plymouth settlers consider abandoning the colony which they had undertaken to plant "for the glory of God, advancement of the Christian faith, and the honor of king and country."

John Carver, the first governor, died the first year. William Bradford was chosen in his place and the colony grew strong under his integrity and firm idealism until 1657. Plymouth Colony was governed "for the general good of the colony," according to the Mayflower compact, a strangely brief covenant signed on board that vessel a month before the Pilgrims landed.

The Massachusetts Bay Colony was founded at Salem in 1628 under John Endecott. Boston was founded by Governor John Winthrop in 1630 and became the capital in 1632. New England towns are governed today by the town meeting system that grew up from the first meetings of these early settlers. In 1691 the government at Plymouth joined the government at Boston and Massachusetts colony throve on the union.

New York.—Already there were Dutch fur-trading posts on the Hudson before the Massachusetts people took root. After Henry Hudson's enthusiastic account of the rich traffic in furs that might be established with the Indians, the Netherlands lost no time in sending out a vessel (1610) loaded with merchandise to exchange for the prized skins. In 1614 Fort Nassau was built on Castle Island near Albany, and another smaller post was left on lower Manhattan Island.

The first permanent colonists, about thirty families, came out to New

Netherland in 1624 and founded Fort Orange, which is now Albany, with Cornelis Mey for governor. The first director-general of the colony was Peter Minuit, who arrived in 1626 with still more colonists. He it was who bought Manhattan Island from the Indians for a fantastic $24 worth of bright red cloth and trinkets and built Fort Amsterdam at the lower end of it.

There are many colorful stories about Peter Stuyvesant, his wooden leg and his hot temper. The last Dutch governor of New Netherland, though his rule was despotic, he strengthened, enriched and expanded the colony to the point of 10,000 population in 1664. Brooklyn, New Harlem, Bronx and Staten Island were other thriving Dutch settlements.

There had been long dispute with the English for the possession of New Netherland. King Charles II bestowed it by grant upon his brother James, the Duke of York. English ships appeared one day in August 1664 in the harbor of New Amsterdam, demanding the colony. In a rage Peter Stuyvesant tore up the English letter; he was willing to resist to the last inch. But the citizens were tired of his iron rule and refused to fight. The colony was transferred to the English on Sept. 9, 1664 and renamed New York, with Richard Nicolls for first English governor. From these three English colonies, Virginia, Massachusetts and New York, grew the United States. Gradually the settlements spread out and formed their governments. One hundred and twenty-five years from the founding of Jamestown there were thirteen colonies, destined to become one nation.

New Hampshire.—Permanent settlements were made at Rye and Dover, New Hampshire, as early as 1623; but that colony was not named until 1629, when the vast "province of Maine" was divided between the two original grantees. John Mason received the land between the Merrimac and Piscataqua rivers and named it New Hampshire. It became a royal colony in 1679.

Delaware.—The first settlement in Delaware was made by the Dutch in 1631. In 1638 Fort Christina (near Wilmington) was founded for the Swedish Royal Trading Company by the same Peter Minuit who purchased Manhattan Island for the Dutch. All the land between the mouth of the Delaware and the Schuylkill he bought from the Minqua Indians and named New Sweden. Johan Printz became the first Swedish governor in 1643 and proceeded to remove the Dutch traders from their posts up and down the river.

The Dutch of course protested the seizure of what they considered their own by first claim and possession; and when fiery old Peter Stuyvesant became governor of New Netherland, he speedily took Delaware back into Dutch possession (1655), only to lose it to the British in 1664 with the rest of New Netherland. It was granted to William Penn in 1682 and remained under a Pennsylvania governor until 1776 when the Lower Countries became Delaware State.

Maryland.—Maryland was intended as a refuge for persecuted Roman Catholics in England. Leonard Calvert, the 2d Lord Baltimore, in 1664 brought out the first colonists. They made a settlement between the Potomac River and the Chesapeake which they called St. Mary's. Having tasted of persecution himself, Lord Baltimore encouraged non-Catholics in the colony and in 1649 proposed the amazing Toleration Act, the first attempt at religious toleration in America.

The granting of Delaware to William Penn in 1682 resulted in almost a century of squabbling over the northern boundary of Maryland. In 1763 two English mathematicians, Charles Mason and Jeremiah Dixon, were hired to settle the dispute. It took them four years to survey the territory and run the famous line which not only separates Maryland from Pennsylvania, but the North from the South.

New Jersey.—The history of New Jersey overlaps the history of New York and Pennsylvania. The first settlers were a few Dutch families from New Amsterdam who established themselves in 1623 on the Delaware and Hudson rivers, where Gloucester and Hoboken now stand. And Dutch control prevailed over these and certain Swedish settlements (taken in 1655) until 1664 when the British took New Netherland and these river towns undisputed.

It was named New Jersey after the Channel Island of Jersey to honor Sir George Carteret, former governor of the English island and one of the original grantees of the land between the Delaware and the Atlantic shore running north from Cape May. It was part of the English consolidation of New York and New England under one governor, Sir Edmund Andros, 1685–89, and a royal colony from 1702 to 1776.

Connecticut.—A growing discontent with the high-handed and intolerant government in Massachusetts Bay Colony resulted in the movement of some 100 people from the Massachusetts towns into Connecticut. Withersfield was settled, 1634, Windsor, 1635, and Hartford the same year. Strangely enough the new government which the people formed in 1639, the famous Fundamental Orders of Connecticut, differed from the Massachusetts government in only one important respect: a man's right to citizenship was not based on religious creed. It is interesting to note that this document mentioned neither the English king nor country.

In 1638 New Haven was settled by still another group from Massachusetts, this time from Boston. The government of New Haven was even more theocratic than the one the settlers had left in Massachusetts. The New Haven Plantation Covenant provided for a government according to "the laws of God as given by Moses." No one could be a citizen who was not a church member; and there were other severe and strange laws—though most of the Blue Laws that are attributed to the New Haven colony were made up by a Connecticut historian, Samuel A. Peters, and were never heard of in old New Haven.

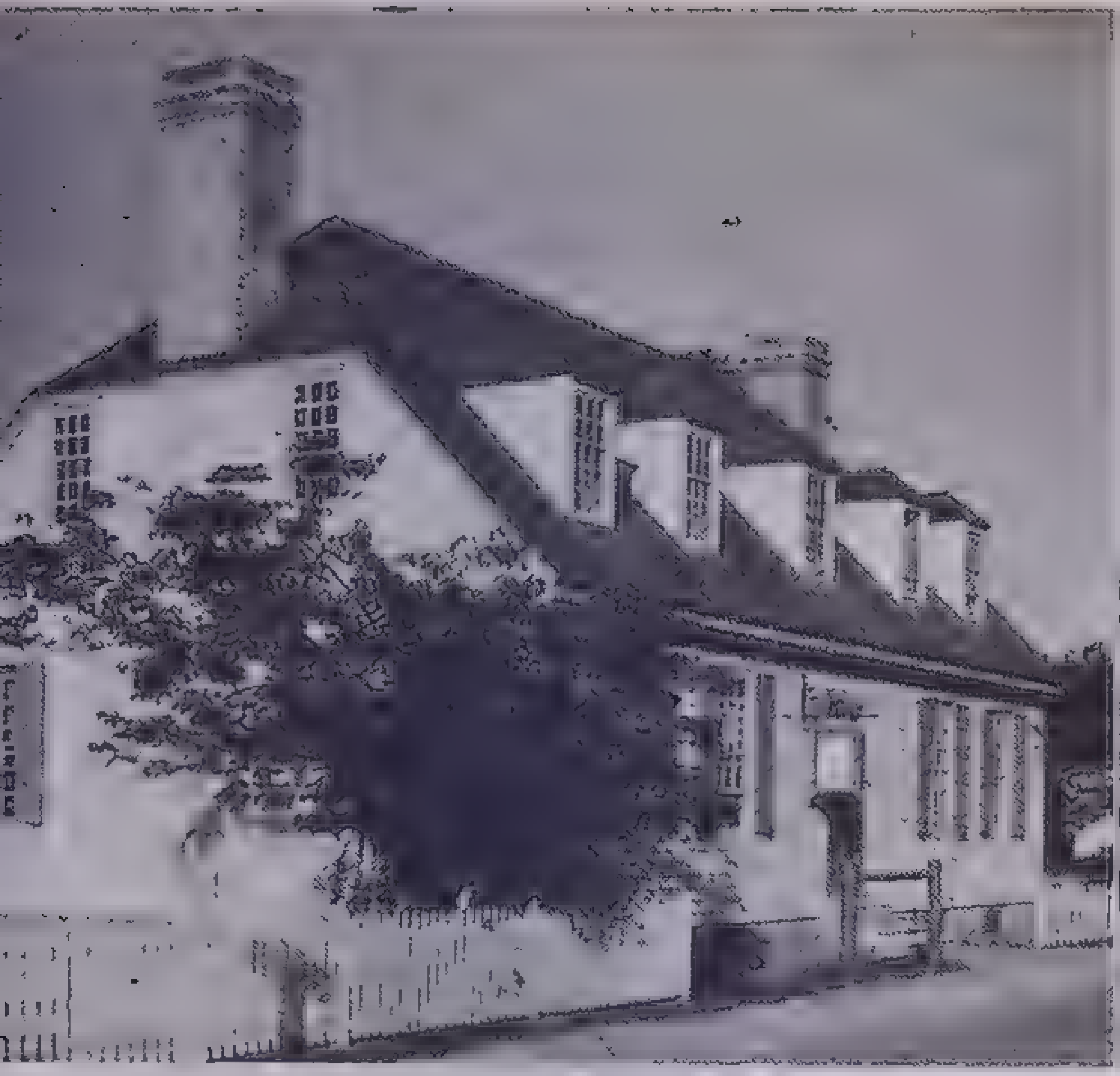
The Connecticut and New Haven colonies, and Massachusetts and Plymouth, joined the New England Confederation in 1643. This union was for making war and for mutual defense; it left the autonomy of each member colony intact. Connecticut and New Haven became one colony in 1664, under the royal charter of 1662 which was preserved until Connecticut became a state.

Rhode Island.—The first settlement in Rhode Island was made by Roger Williams in 1636 and called Providence Plantations. He was a refugee from Massachusetts Bay Colony, where he had so passionately and publicly opposed the right of civil government to dictate to the human conscience that the Puritans had decreed to banish him and even tried to deport him to prevent his founding a new colony on such dangerous principles. But he got away into the forests and the dangerous colony was founded "especially for such as are troubled elsewhere about the worship of God." Other liberals followed in 1638, settling Portsmouth on the island of Aquidneck (Rhode Island), Newport was settled in 1639 and Warwick in 1643. Roger Williams worked for the union of the scattered towns, and in 1644 brought back from England the charter which made Providence Plantations and Rhode Island one colony. In 1663 Rhode Island received the famous charter from Charles II by which it was governed long after it became a state.

North Carolina.—A huge piece of territory south of Virginia was granted in 1629 to Sir Robert Heath by Charles I and named Carolina for the king. The first permanent colony was made at Albemarle in 1660. But little was done toward colonizing until 1663, when Charles II gave it to the Duke of Albemarle and seven other nobles, thereafter designated as the lords proprietors. The story which follows is one of incessant disturbance and cross-purposes between the people and proprietors. Out of sixteen governors appointed by the proprietors, six were jailed, forced to abdicate or openly driven out of office by the people for unjust and severe taxation or their unworthiness as men.

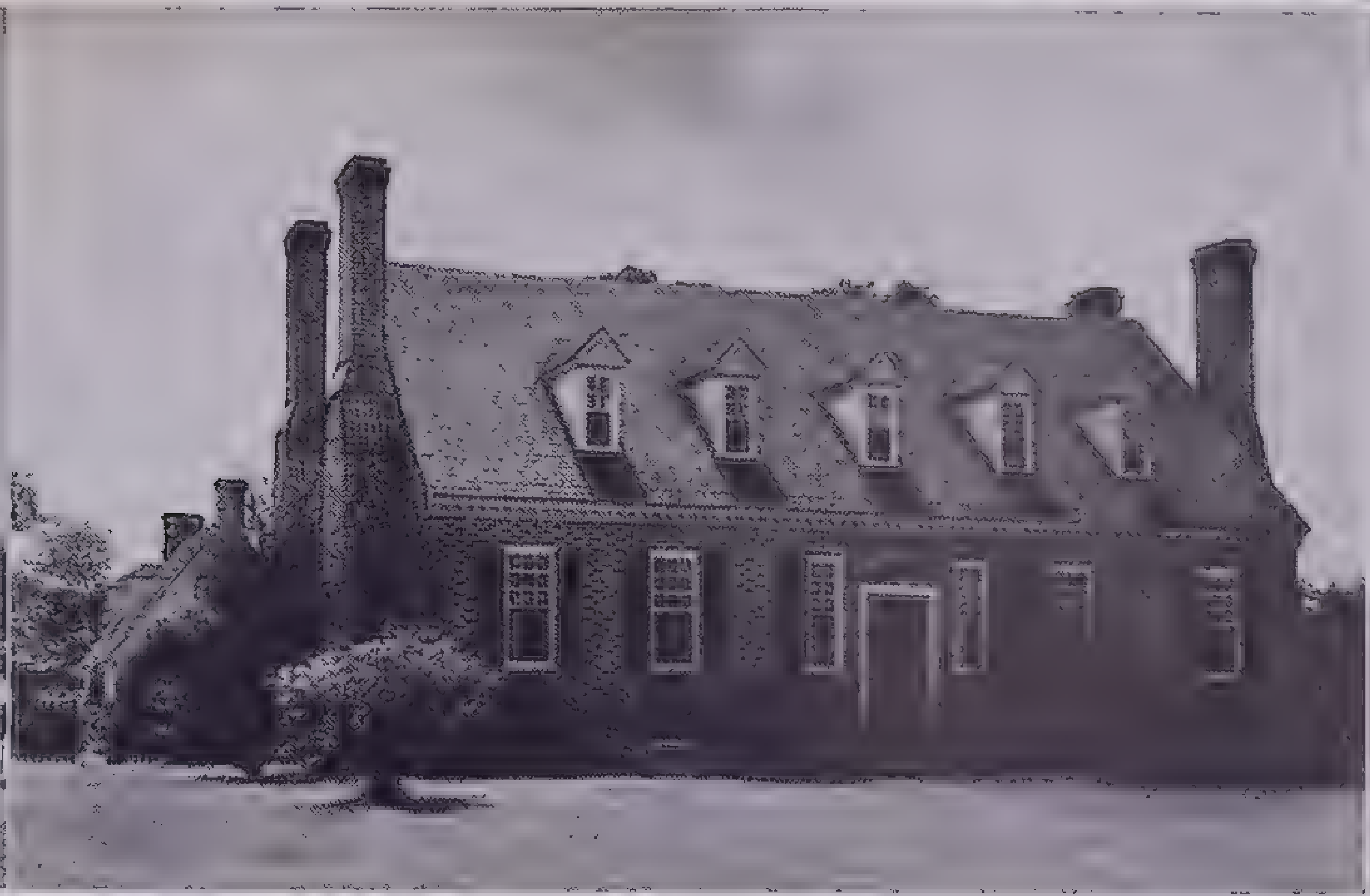
By 1729 the proprietors were glad enough to be rid of a troublesome bargain. They sold their grants back to the Crown; the land was officially divided into North and South Carolina; and North Carolina became a royal colony. With this change the land began to fill up with settlers from Virginia and Pennsylvania. By 1776 there were 300,000 inhabitants. The passion for democracy and the independence of spirit which would tolerate neither imposition nor interference persisted throughout the history of the colony. In 1768 and 1770 this independence flared up in the Regulator risings in the western counties against the governor. In 1775 Governor Martin had to flee and on May 10th of that year a committee representing the militia of Mecklenburg county is supposed to have adopted the Mecklenburg Declaration which asserted the independence of America from England, almost four-

When Virginia Was An English Colony: Some Famous Buildings Restored



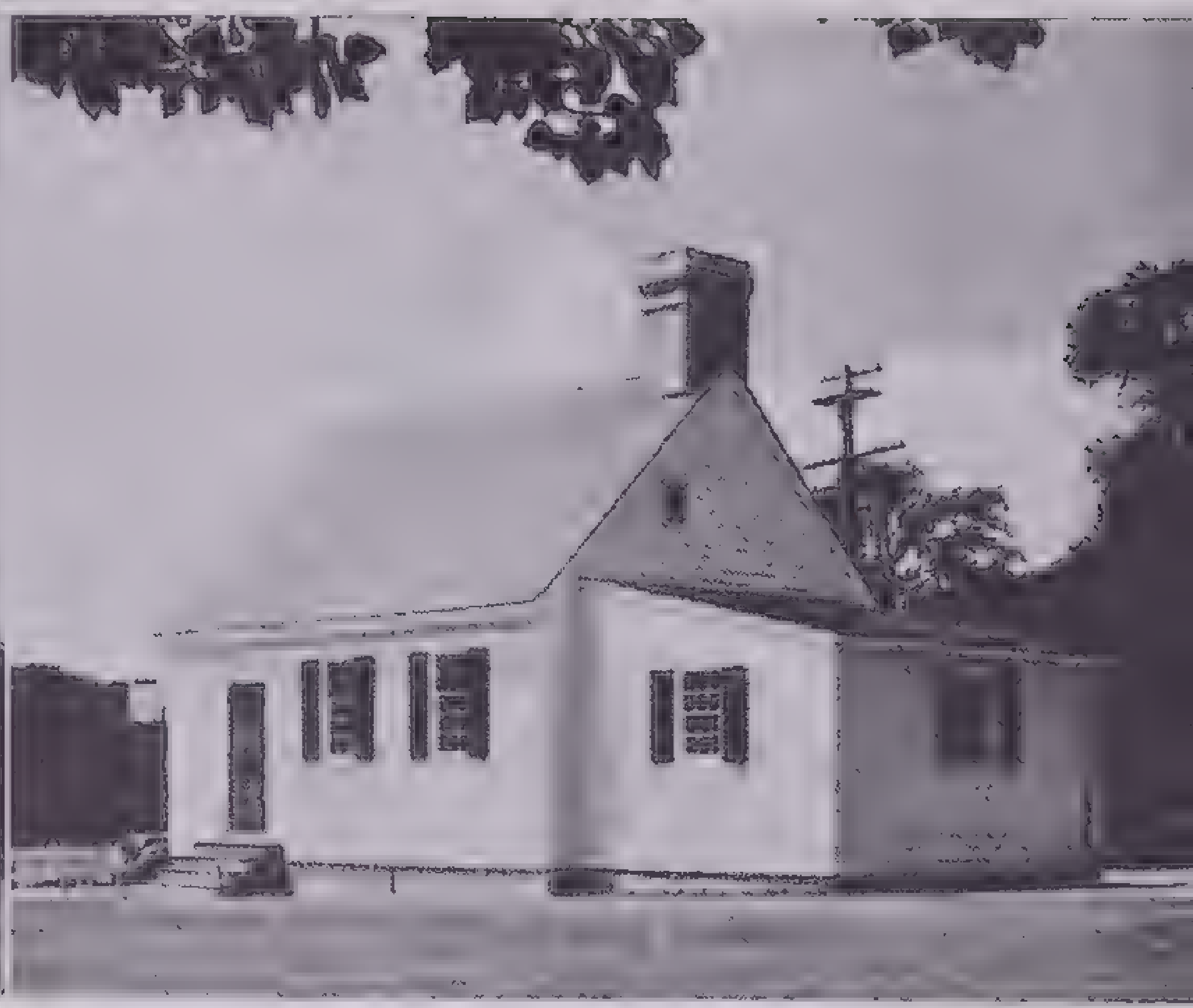
tesy Colonial National Historical Park

town: The Swan Tavern 1719–22 Re-
structed on Original Foundation



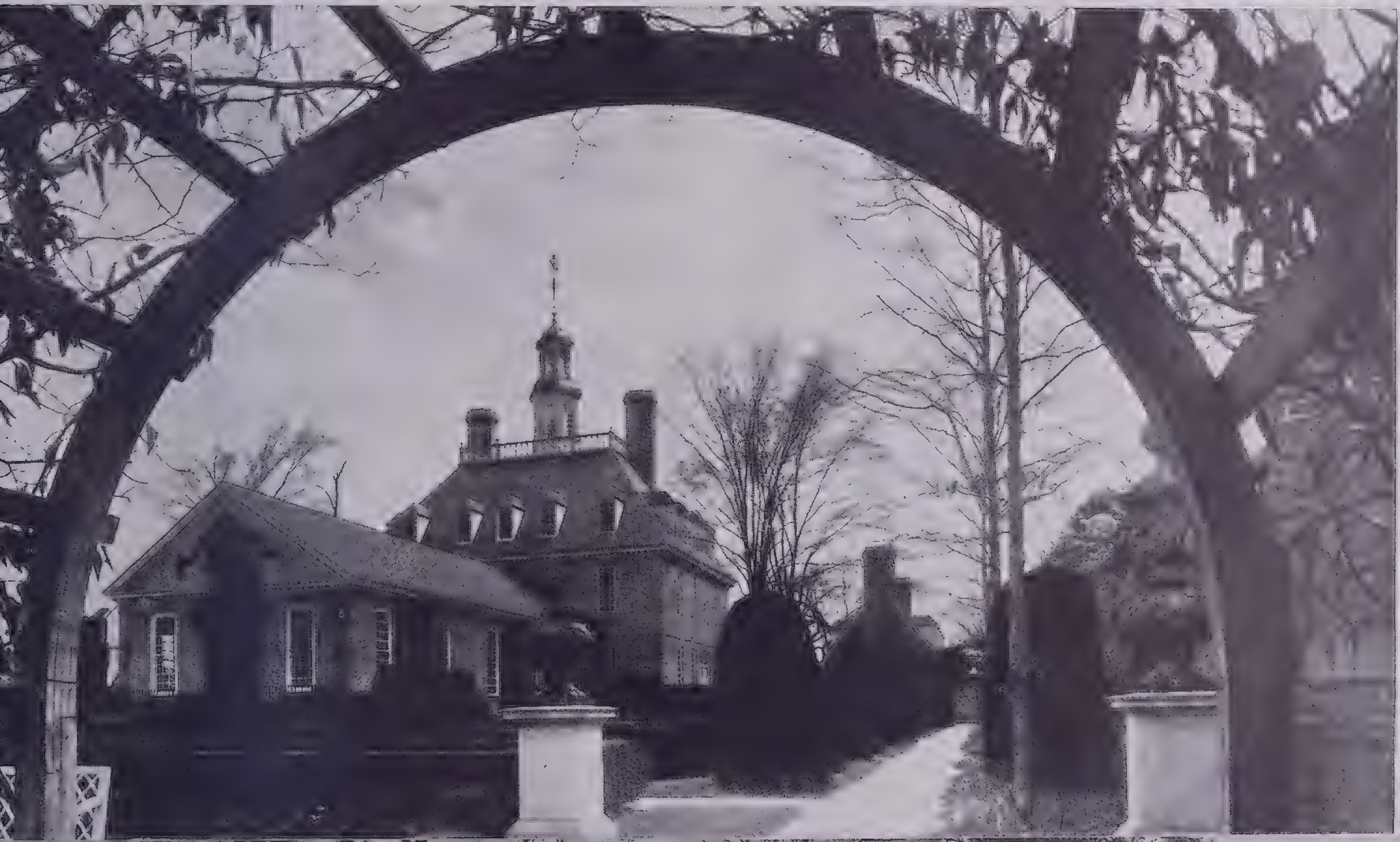
Courtesy Virginia Conservation Commission

Westmoreland County: Wakefield, Birthplace of George Washington, February 22, 1732



Courtesy Colonial National Historical Park

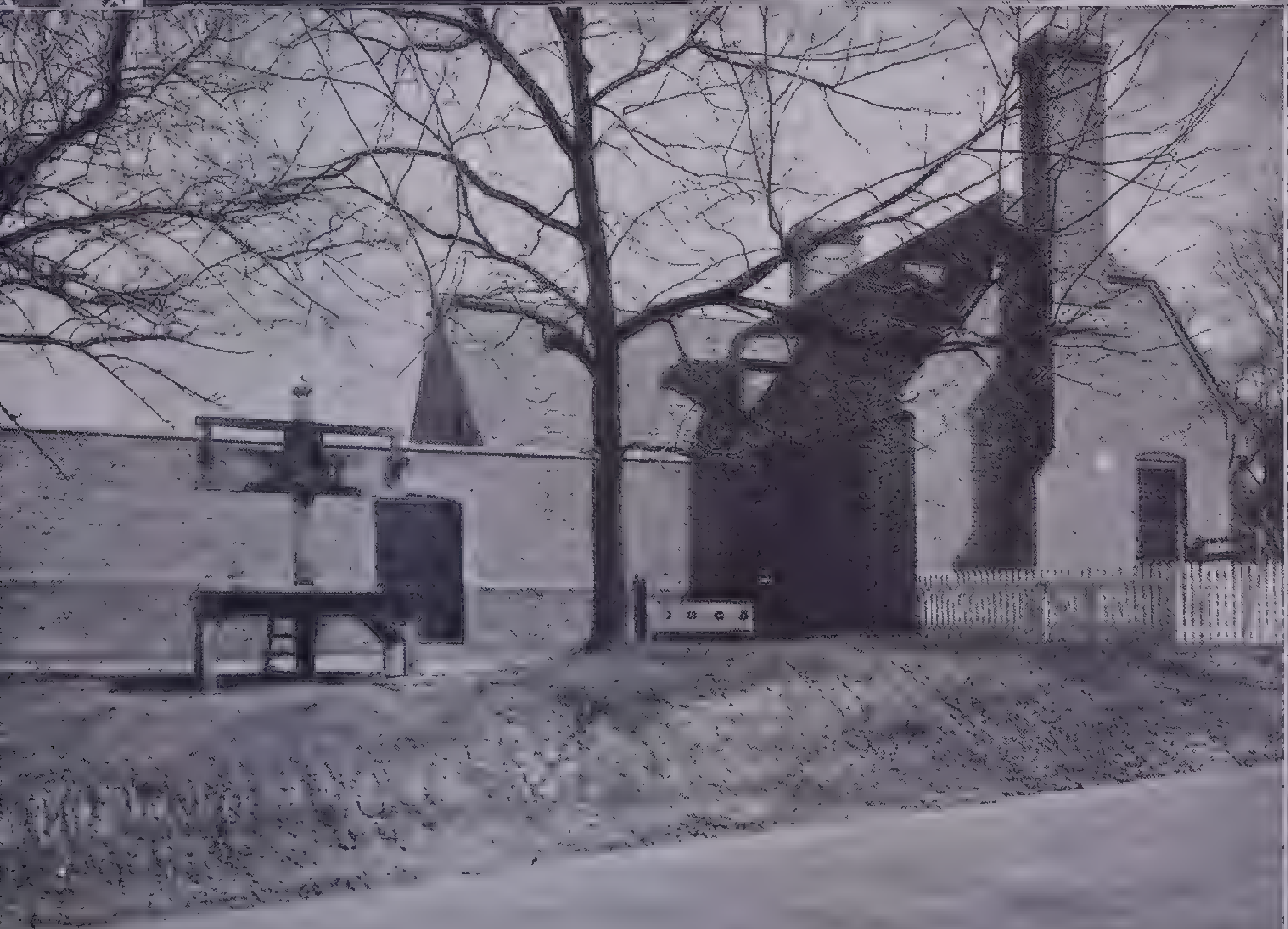
Yorktown: Apothecary Shop of Dr. Corbin Griffin, Prominent Physician of the Colony



Williamsburg:
The restoration of one of the most historic cities in America was undertaken by Mr. John D. Rockefeller, Jr., and today the town looks as it did in pre-Revolutionary times. Williamsburg was founded as Middle Plantation in 1633,—an outpost palisaded against the Indians. From 1699 until the seat of government was removed to Richmond in 1779, it was the capital of the Virginia colony

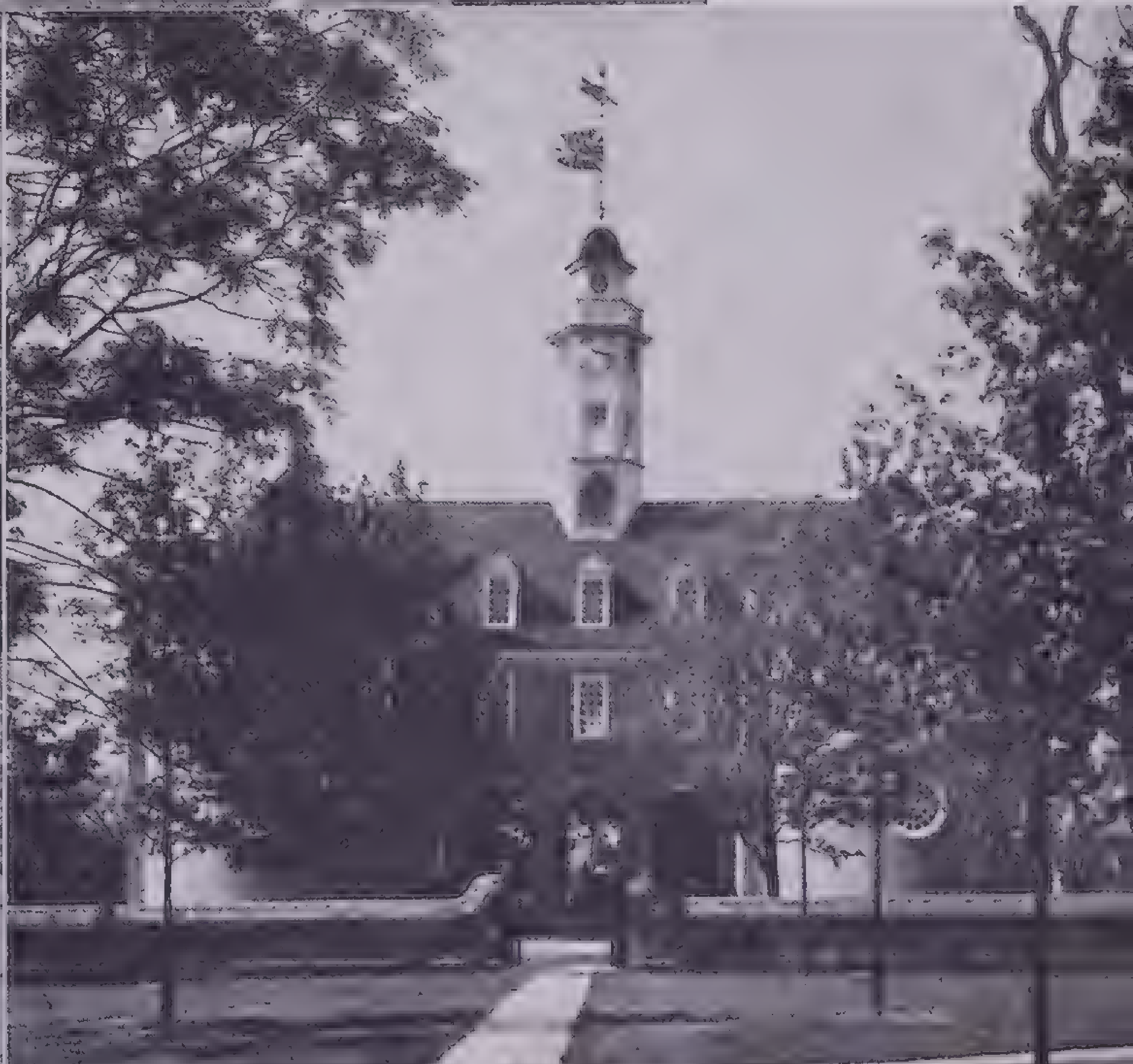
Pictured at the left is the Governor's Palace surrounded by formal 18th-century English gardens

Courtesy Virginia State Chamber of Commerce



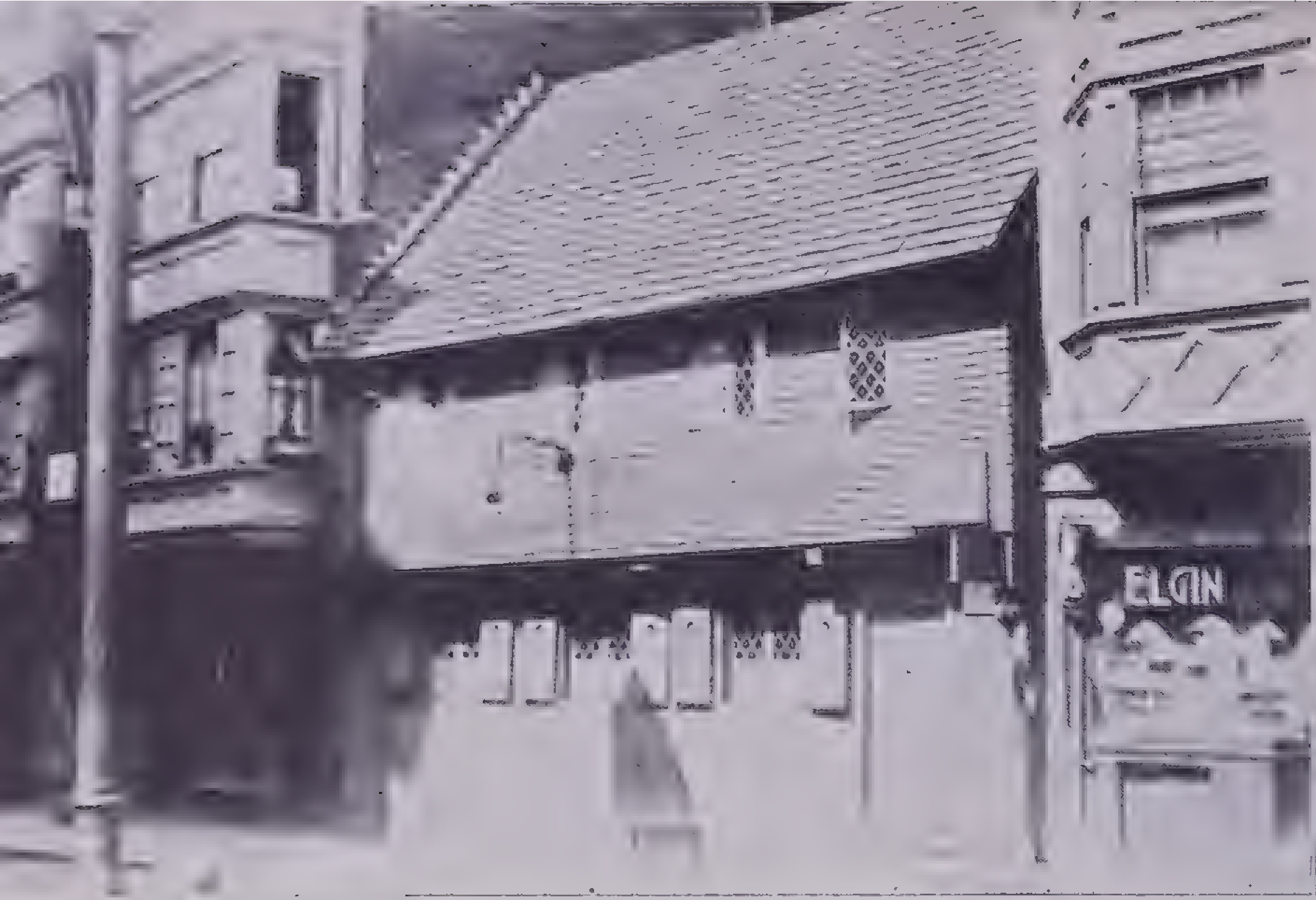
ourtesy Colonial Williamsburg, Inc.

Villiamsburg: The Public Gaol. Here were Imprisoned Persons Awaiting Trial
y the General Court. In the Yard Are the Whipping Post, Pillory and Stocks

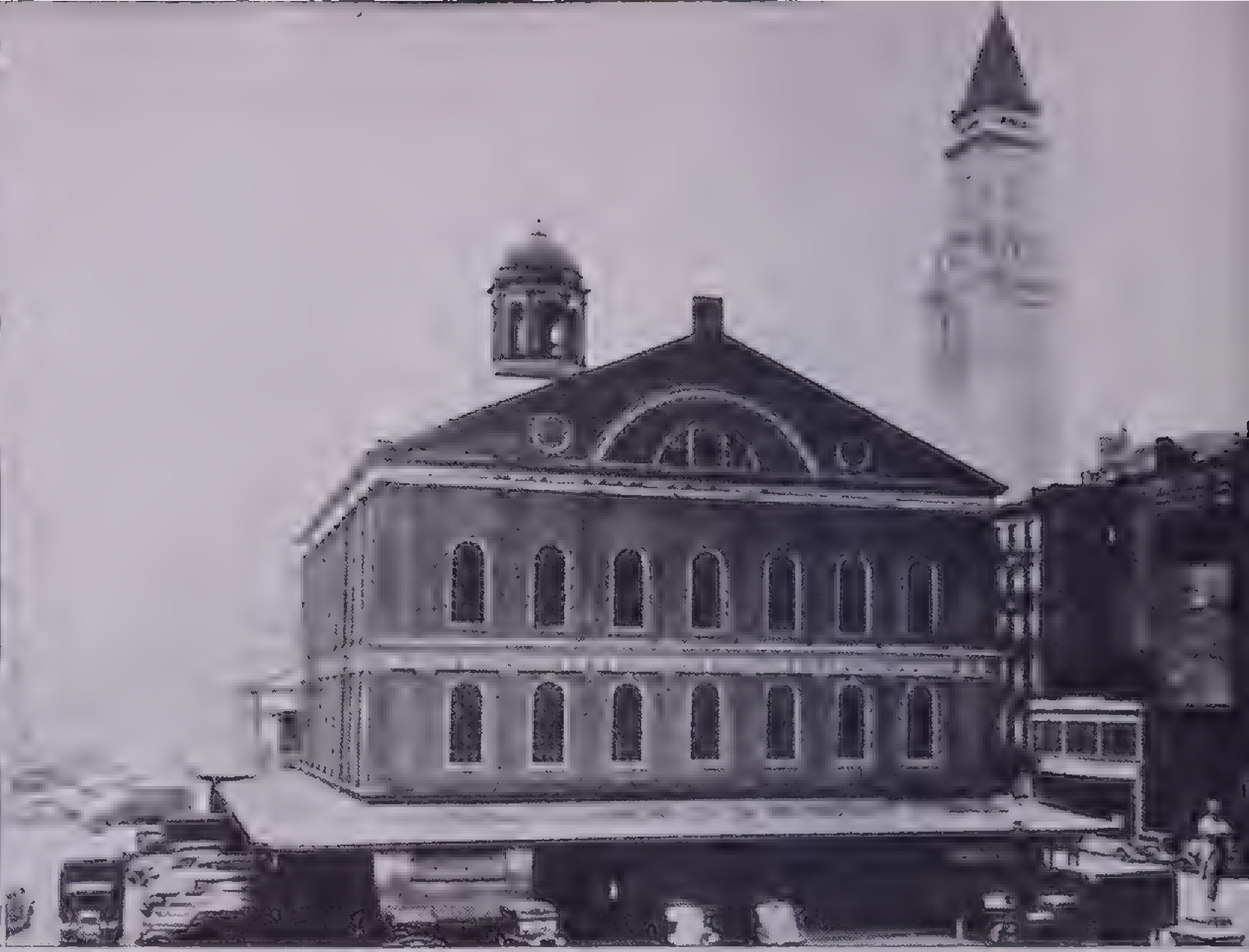


Courtesy Colonial Williamsburg, Inc.

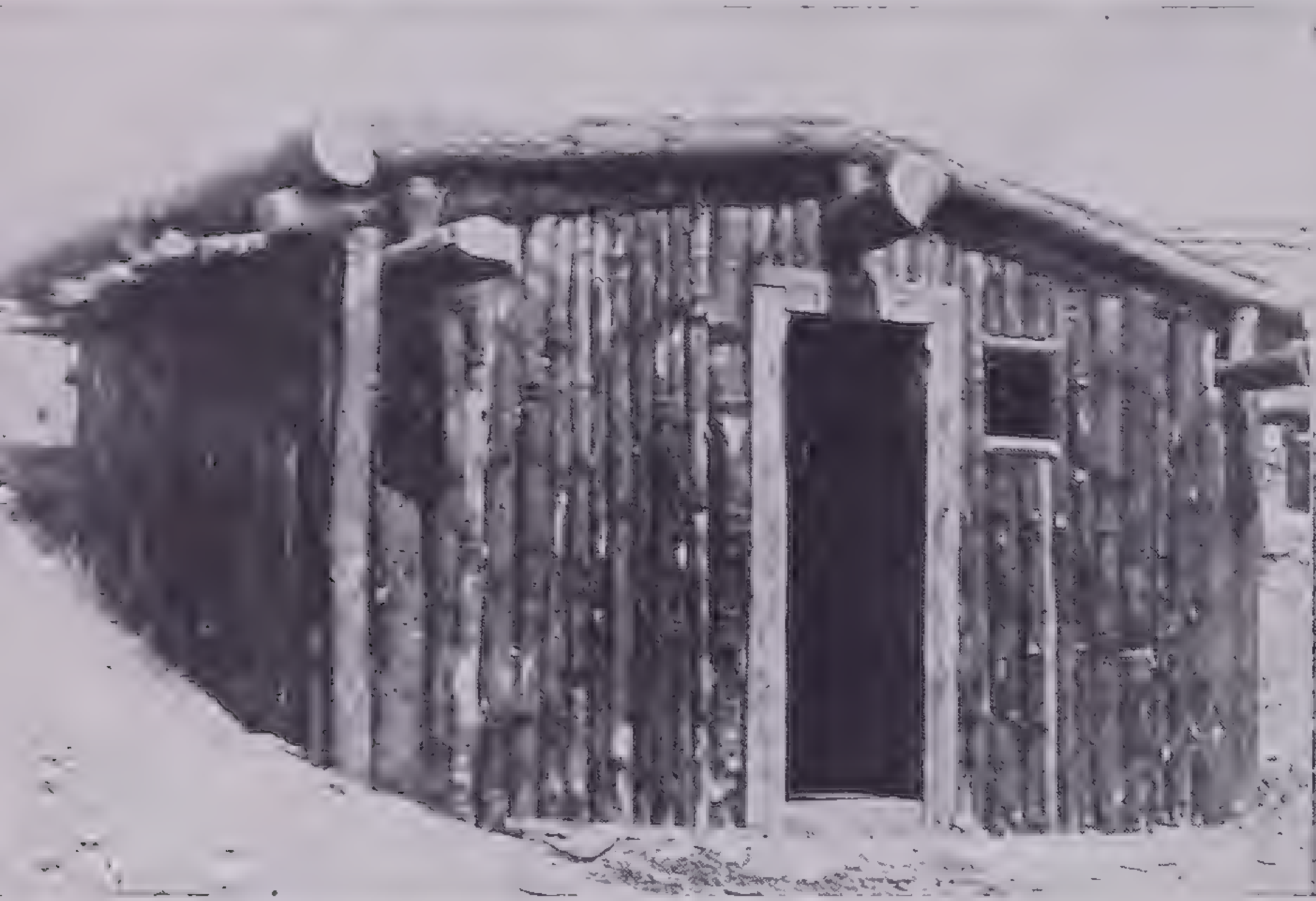
Williamsburg: The Capitol, a Building Closely Identified with the Political Life of the Colony



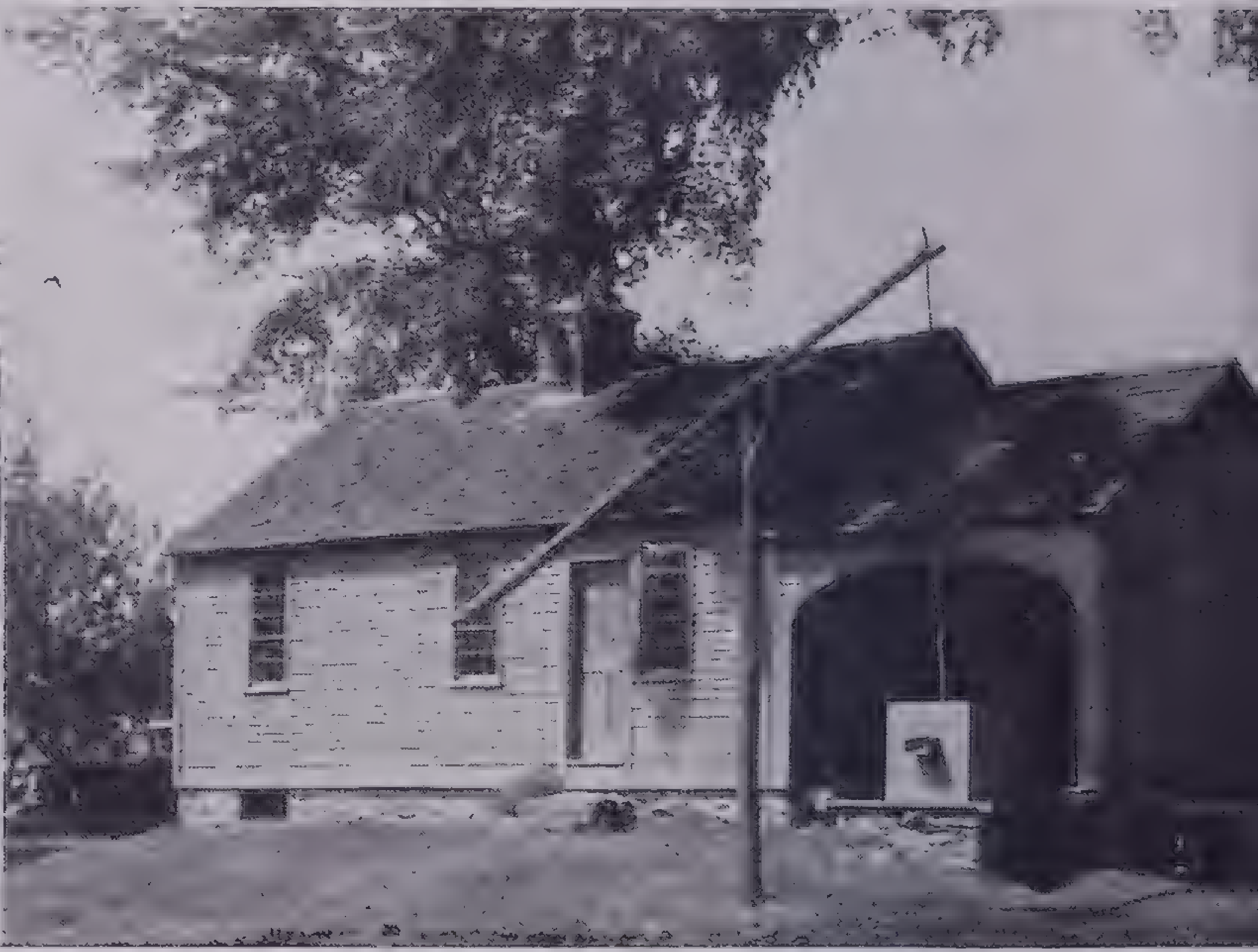
Boston—One of the Oldest Houses in the United States, Built in 1676. Paul Revere Made this His Home from 1770-1800



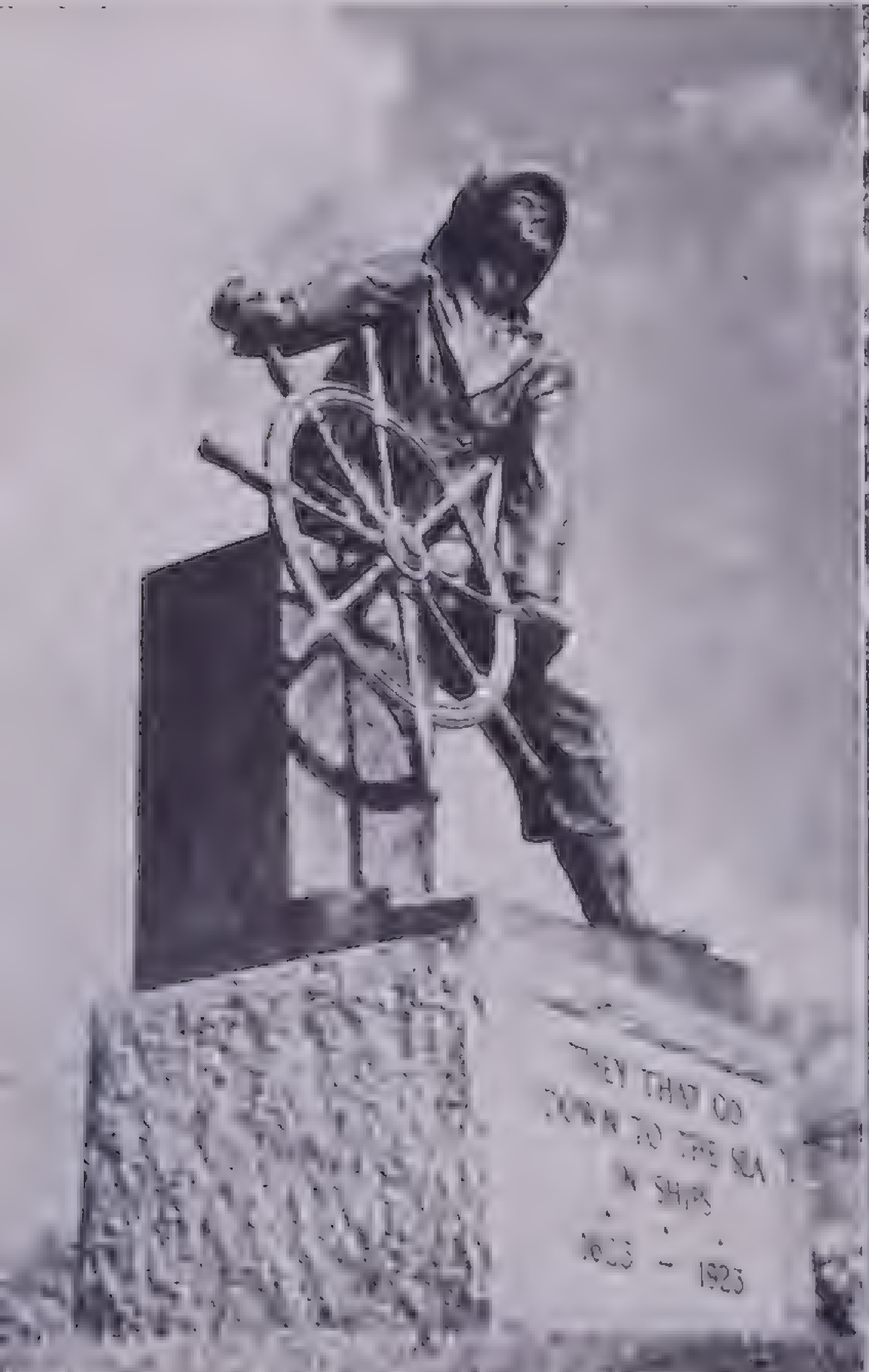
Here in Faneuil Hall, Boston, Colonial Patriots Met to Discuss Separation from England

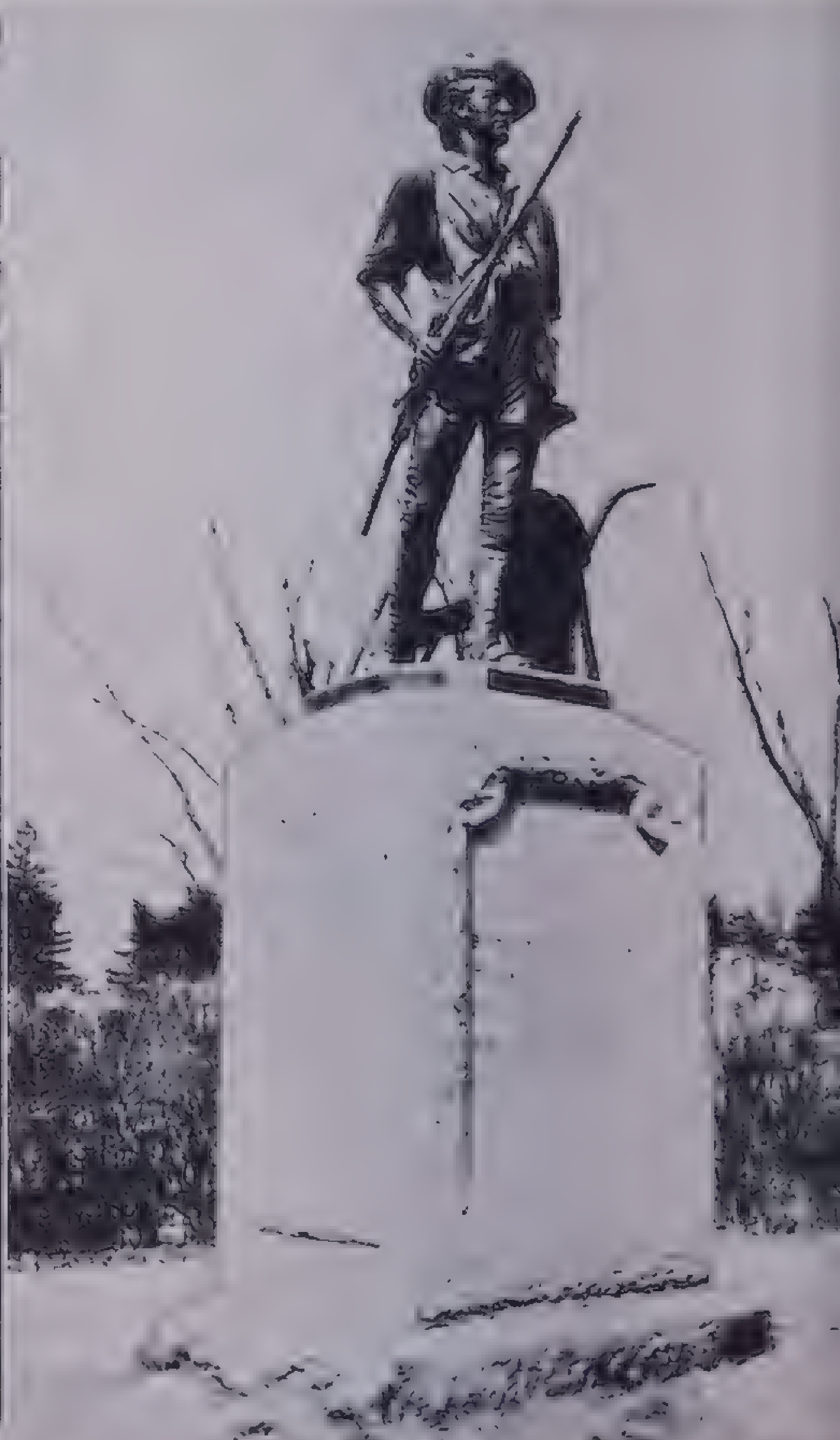


Salem, Massachusetts—Cabin in the Reconstructed Pioneers' Village, a Puritan Community of 1630



Daniel Webster was Born in this Simple Clapboard House at Franklin, New Hampshire, January 18, 1782





Courtesy New England Council; New Hampshire Development Commission

Memorial, at Gloucester, Massachusetts, to the Deep-Sea Fishermen

Monument 300 Feet High, Commemorating the Battle of Bennington (Vermont), August 16, 1777

Concord, Massachusetts—Statue to the
men Who Left Their Plows to Take up

teen months before the Declaration of July 4, 1776.

South Carolina.—South Carolina was named Carolina a whole century before the 1663 grant of Charles II which included it in the Carolina given to Sir Robert Heath. Jean Ribaut in 1562 brought to Port Royal 150 Huguenots, who named the region Carolina for their king, Charles IX of France. But this settlement was short-lived for lack of supplies and support.

The first English colonists settled at Albemarle Point in 1670; they moved up to the head of the harbor and founded Charleston in 1680. As in North Carolina, the people bitterly resented the deliberate attempt of the proprietors to curb popular government. They insisted on the letter of the charter, that the colony be governed "by and with the advice and assent of the Freedmen." Half a century of discord went by, with the people demanding or petitioning and the proprietors ignoring or denying. At last in 1719 the proprietors vetoed so many of the laws that the people had battled to establish, among them freedom of franchise, that the colonists overturned the proprietary government and put up their own man, James Moore, as governor "for the king." England immediately recognized the appeal and South Carolina became henceforth a royal colony, although the proprietors were not officially bought up until 1729. From then on the colony prospered. Trade, culture and social ease increased. Schooled in the struggle for personal and civil liberty as the Carolinians were, their sympathies were quickly enlisted on the side of their New England neighbors. The issue of "no taxation without representation" led to the Revolution.

Pennsylvania.—William Penn, an English Quaker of wealth and family, many times imprisoned for his principles, in 1680 asked the king for "a tract of land in America, north of Maryland, west of the Delaware and northward as far as plantable," which he intended as a refuge for persecuted English Quakers. Charles II, who then owed the Penn family £16,000, saw an easy way to pay an old debt and gave the grant. Penn sailed in 1682 with 100 colonists, wrote the constitution for the new colony, laid out Philadelphia in that year, and in 1683 made the famous "Great Treaty" with the Indians, "not sworn to and never broken," which insured peace for the colony and safety from the Indians as long as Penn lived. His frame of government established entire religious freedom and "just and friendly conduct toward the natives" and gave the people full power to make and repeal their own laws.

Thus the Quaker commonwealth goes down in history for the *fact* of religious tolerance, not theory or effort only, and because it harbored more races and creeds than any other English colony. English, Germans, Dutch, Swedes, Welsh, Irish, Scotch and Swiss lived side by side and worshiped as their hearts desired. Here lived a people unarmed and unmolested in a wilderness surrounded by savage tribes; here no oaths were asked or given in the people's courts; and there was no capital punishment except for treason and murder. To English statesmen any *one* of these things was enough to spell folly or failure. But there was no bloodshed in Pennsylvania and the colony flourished. By 1685 there were 8,000 inhabitants; by 1702 there were 12,000 white people alone; in 1709, 3,000 Germans came from the Rhenish Palatinate; and in 1749 12,000 more poured in to take up farms in the rich country north of Philadelphia. By 1776 Pennsylvania had a population of 300,000.

But when rumblings of war with the French were heard in England, and the defenses of the American colonies were investigated, the king was told that the "insane colony" had no defenses whatever and that its assembly refused to contribute either men or money to any military project. This cost Penn his charter in 1692, and Governor Benjamin Fletcher of New York became governor of Pennsylvania. It was returned to Penn in 1694, however, on his promise to *police* the frontiers. Quaker conscience could sanction police defenses but not full preparation for war. Hence when the French and Indian Wars actually broke out, the king proposed that Pennsylvania become a Crown colony.

When Penn hurried back to England to attend to the situation, he was destined never to return. Before he left (1701) he had made Philadelphia a city and revised the constitution which served the colony unaltered until 1776. He died in 1718 and his sons became proprietors of Pennsylvania.

Pennsylvania had delegates at the first Continental Congress held in Philadelphia, 1774; subscribed money to aid Massachusetts; and adopted the Declaration of Independence. In September, 1776, a new state constitution was adopted and Penn's proprietorship came to an end.

Georgia.—Georgia, the last of the thirteen colonies, was founded: to serve as an intervening defense between South Carolina and Spanish invasion from the south; to receive and repulse the harrying attacks from the west of Indians and the French in Louisiana; to serve as a haven for the small Protestant sects of Europe; and to provide homes for inmates of the English debtors' prisons, whose only crime was poverty. Furthermore, England could use more silk than she could buy, and the philanthropists planned to have the settlers raise silkworms.

In 1732 James Oglethorpe and his friends obtained a charter from George II to a tract of land (originally part of South Carolina) which they named Georgia in honor of the king. Their first settlement at Yamacraw Bluff in 1733 was the founding of Savannah. The settlers were told to plant mulberry trees for silkworms and grapes for wine, but were forbidden to own slaves, to use or sell rum, or to sell their lands. Dismal failure followed; without labor the people could not raise enough of anything to export to England; without rum they had nothing to sell to their neighbors. But in 1749 these two bans were lifted. Georgia became a royal colony in 1753 and from then on grew rich. Naturally enough, her loyalties were divided between king and selfhood at the beginning of the separation issues; but she signed the Declaration of Independence and fought against the British to maintain her own rule within her own borders.

In a new land where survival depended on each man's endurance, his single ingenuity and independence of help or direction, the survivors would not be likely to accept dictation. What homes they had they had hewn and made; their laws, good or bad, were their own; their labors and their dead bestowed on them the right to live their lives.

The stage was set for liberty; all the cues were given. The desire for individual and civil freedom actuated nearly every early settlement in America; and the long pull towards self-government colors the story of each of the thirteen colonies. The growth of this feeling can be traced through this long series of assemblies and documents and rebellions:

1. The Virgina House of Burgesses (1619), grown from the harsh rule of deputy-governors, the first representative legislative body in America.
2. The Mayflower Compact (1620), which took for granted that the people were to "combine together into a civil body politic—to enact, constitute and frame just and equal laws—for the general good of the colony."
3. The town meetings of New England, whereby the town governed the town and each town was represented in the general Court.
4. The bitter struggle in Maryland between the people's assembly and the proprietors for the right to make laws.
5. The Fundamental Orders of Connecticut (1639), "the first written constitution of a self-governing people," which placed all the authority in the people and forgot to mention the king.
6. The New England Confederation (1643–84), the first step towards union for mutual strength taken by separate autonomous colonies.
7. Bacon's Rebellion (Va., 1676), the first violent people's uprising against unjust, indifferent and aristocratic government.
8. The way in which North and South Carolina settlers continuously disposed of obnoxious proprietary governors for the sake of popular representation; and the constant contest between settlers and Crown or settlers and proprietors which raged even in the comparatively peaceful colonies of Pennsylvania and Maryland.
9. The Albany Congress (1754) representing seven colonies, which favored Benjamin Franklin's famous Plan for Union of the colonies;
10. The famous Virginia Parsons' Case (1759), the protest of underpaid country clergy which brought forth Patrick Henry's daring assertion that class-favoring laws brand a

king as tyrant who "forfeits all right to obedience."

11. The Sons of Liberty (1764), intercolonial secret societies which fanned the flame of rebellion against taxation tyranny;

12. The Regulator Movement (1765–76), an organization of thousands of farmers in North Carolina who took up arms against taxation and extortion;

13. The Stamp Act Congress (1765), representing nine colonies, the first intercolonial indignation meeting against English policy, which adopted its own *Declaration of Rights*;

14. The First Continental Congress, 1774 (representing every colony but Georgia) which agreed to boycott English imports;

15. The Second Continental Congress (1775) which put off loyalty to England, donned defiance and adopted in 1776 the unanimous Declaration of Independence of the thirteen united states.

Wars.—For about 75 years in the 17th and 18th centuries England and France were involved in a series of four European wars. Each one precipitated in America a flare-up of the long ill-hidden spark of colonial jealousy between these two rival powers. The intercolonial or French and Indian wars settled once and for all the supremacy of England over France in America. But they did more than that: they revealed to the colonists their own strength and their own importance. They can be marked up as one more item in the foregoing list of steps in the growth of colonial self-consciousness. And thus the war *for* England helped to pave the way for the war *against* England.

King William's War was the first one, the American echo of the War of the Grand Alliance (1688–97) in which William of Orange involved England almost immediately upon becoming William III of England. Actual conflict in America began in 1690 with the French and Indian attack an Schenectady, N.Y., followed by a series of massacres throughout New England. Sir William Phipps with 855 men took Port Royal, Acadia, from the French in 1690. The peace treaty of Ryswick in Europe (1697) brought the colonies a five-year lull in their conflict; but there was no real peace.

Close on the heels of the War of the Spanish Succession in Europe (1710–14) came Queen Anne's War in America (1702–13). Once again the French and Indians came down on New England. The terrible massacre and burning of Deerfield, Mass., in 1704 is one of the horrors of this period; and there were battles in the south with the Spanish. Peace came with the treaty of Utrecht (1713), which gave all of the Hudson Bay region to the British and reconfirmed British possession of Acadia (Nova Scotia). Port Royal was renamed Annapolis in honor of Queen Anne.

The next French and English clash in America came with King George's War (1745–48), the American phase of the War of the Austrian Succession (1740–48). About 4300 New England men went out in this war of futile bloodshed. Louisburg on Cape Breton Island, N.S., was taken from the French but was returned to them by the treaty of Aix-la-Chapelle.

Still there was no peace. Already the French had taken the Ohio Valley and forced a young officer named George Washington to depart from his stronghold at Great Meadows in western Pennsylvania, where he had endeavored to stem the French advance. His surrender (1754) was the beginning of the last and fourth French and Indian War, usually known as *The* French and Indian War.

The European counterpart of the fourth war, The French and Indian, was the Seven Years' War (1756-63), with France, Spain and Austria lined up against England and Prussia. The English colonists took Louisburg (1758) and all the St. Lawrence region. They took Fort Duquesne, now Pittsburgh, Pa. Ticonderoga fell into their hands in 1759, and that year saw the memorable battle on the Plains of Abraham between Wolfe and Montcalm, in which both great generals fell and the English won Quebec. The Peace Treaty of Paris in 1763 established English colonial supremacy in America. Canada came into the possession of England; Spain gave up Florida; and though French Louisiana was given to Spain, the English now held all of North America east of the Mississippi.

Rumors of Wars.—Even by the middle of the 17th century England had begun to realize that the colonies were worth something. She determined not to share their trade or lands with any other power. And in three-quarters of a century she took care to establish and make good her territorial hold in the French and Indian Wars (1690–1763). The colonies, on the other hand, being rid of the French and without England's military aid for the first time, felt an increasing independence, a sense of isolation and a growing solidarity, which became more and not less as the Crown, now fully conscious of their existence and value, began to tighten its control of the colonies.

Navigation Acts.—With the Restoration of Charles II to the throne in 1660, England launched a definite colonial program. Already in 1651 Parliament had passed the first Navigation Act, requiring that colonial trade be carried in English or colonial vessels, and colonial products (sugar, tobacco, cotton, ginger, indigo) be shipped only to England. A new Navigation Act was passed in 1660, almost identical with the old, and it was strengthened with new acts year by year. The Act of 1663 required all colonial products intended for foreign sale to be first shipped to England, where a duty could be collected before reshipment. The same requirement was put on foreign goods going into the colonies. Of course smuggling flourished and there was not too much discomfort from the Acts, until 1673 and 1696 when measures were passed to check smuggling and prevent frauds and abuses.

The Dominion of New England.—In 1686 the New England colonies were united under one charter with Sir Edmund Andros as royal governor. By 1688 all the colonies north of the Delaware River were joined under his direction into one Dominion of New England. This move was primarily for defense against the French and as such was a good move. But to the people it seemed a violation of all they had labored to create. They resented handing over their individual colony charters; they resented being taxed by a royal council instead of by their own assemblies; and the disassembling of these representative bodies was intolerable. Bred as they were to wrest what they needed from a hard environment, they could not sit patient long. In 1689 they put Andros and his officers on an English boat and sent them home. And that was the end of the Dominion of New England.

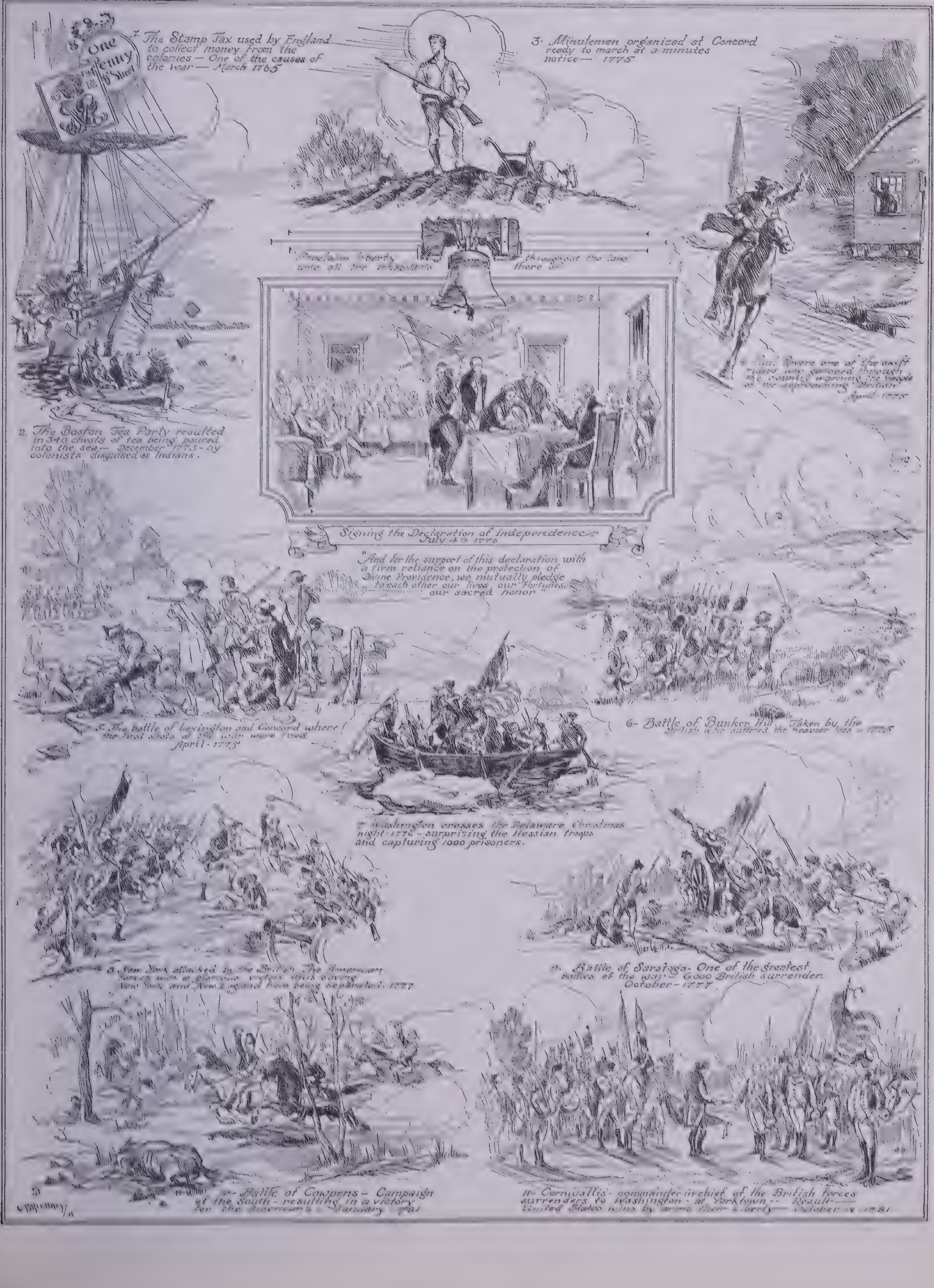
The single royal charters were gradually restored to the colonies, but revenue acts and irking trade restrictions continued as England's consciousness of empire grew.

The Last Straw.—The Molasses Act (1773) put so high a duty on molasses and sugar imported from the West Indies into the colonies that the people could not manufacture rum. Smuggling was still the cure for that until the Sugar Act (1764) indicated that England meant to collect this duty with the aid of the Navy, if need be. The indignation on all sides might have subsided finally into a grumbling acceptance if there had not been the added burden of the Stamp Act (1765). This was an attempt to collect £100,000 a year in the colonies for their defense and administration by the simple method of requiring a revenue stamp on all legal documents.

Resistance flared up in every colony. The assemblies passed measures of protest. The New England town meetings were unanimously against the Act. The Sons of Liberty spread the gospel of defiance and staged mob scenes in Boston. The officers appointed to distribute the stamps were violently handled. There was a wave of boycotting English goods. The newspapers spoke the mind of the people with extravagance. The Stamp Act Congress, representing nine colonies, met in New York to consider methods of opposition. They came to one decision: the Stamp Act violated the just principle of "no taxation without representation." They would be taxed by their own assemblies, not Parliament. Thus supported, the people carried on business as usual—without stamps. The Act was repealed in 1766, but too late to arrest the leaven of alienation already at work.

Boston's Defiance.—The Townshend Acts followed in 1767, revenue acts giving England the right to collect a duty on all glass, lead, paper, pepper and tea brought into the colonies. The answer was rioting in the streets of Boston. English soldiers were sent to keep the peace and enforce the tax. Four people were shot down in one of the outbreaks which their presence provoked: the Boston Massacre, 1770.

The REVOLUTIONARY WAR


One Penny
Proclaim liberty throughout the land unto all the inhabitants thereof
Cappon/11

1. The Stamp Tax used by England to collect money from the colonies — One of the causes of the war — March 1765

2. The Boston Tea Party resulted in 340 chests of tea being poured into the sea — December 1773 - by colonists disguised as Indians.

3. Minutemen organized at Concord ready to march at a minutes notice — 1775

4. Paul Revere one of the swift riders who galloped through the country warning the people of the approaching British April - 1775

Signing the Declaration of Independence July 4th 1776

"And for the support of this declaration with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our lives, our Fortunes, our sacred honor"

5. The battle of Lexington and Concord where the first shots of the war were fired April - 1775

6- Battle of Bunker Hill. Taken by the British who suffered the heavier loss - 1775

7. Washington crosses the Delaware Christmas night - 1776 - surprising the Hessian troops and capturing 1000 prisoners.

8. New York attacked by the British. The American forces won a glorious victory thus saving New York and New England from being separated. 1777

9. Battle of Saratoga - One of the greatest battles of the war — 6000 British surrender. October - 1777

-- Battle of Cowpens — Campaign of the South - resulting in a victory for the Americans — January 1781

11- Cornwallis - commander in chief of the British forces surrenders to Washington - at Yorktown -- Result — United States wins by arms their Liberty — October 19 1781

England withdrew the troops from the town and repealed all the duties except the one on tea. This was left as an assertion of right. But the people were goaded now beyond the point of compromise. A group of citizens made up as Indians stealthily boarded three vessels in Boston harbor one night in 1773 and dumped chest after chest of good tea into the water. Thus the Boston Tea Party settled that no tax could be collected on *that* tea. But England retaliated with the Boston Port Bill (1774) which closed the harbor till the tea should be paid for; and martial law was established under General Thomas Gage in Massachusetts.

First Continental Congress.—What was intended to punish and isolate Massachusetts served only to rally the other colonies to her support and defense. At the first news of Boston's fate, the intercolonial congress (already proposed) was summoned.

This was the First Continental Congress which met in Philadelphia in 1774. From every colony but Georgia came delegates ready to pat Massachusetts on the back and promise her the support of men and arms if things came to that issue. The Congress accomplished one significant thing: the formation of the Continental Association, whereby the colonies agreed not to import English goods or export their own to England. It adjourned to meet again in 1775.

Declaration of Independence.—When the Second Continental Congress came together in May, 1775, all thirteen colonies were represented, destined to sit for six years at a game of war. The Revolution was at hand. Already blood had been shed at Lexington and Concord in April. George Washington was made commander in chief of the colonial armies in June. The Battle of Bunker Hill, June 17, though a British victory, was no American defeat. Outnumbered and unbeaten, the colonists learned that courage was greater than technique, and their confidence grew sure. The royal governments throughout the colonies were at an end and the only government was through the local committees of correspondence.

Even up to this point the sympathies of the colonists were divided. The radicals preached independence; the loyalists stood stanchly for the mother country; another group, intensely pro-colonial, still hoped for some other solution than complete independence. But Congress went about the work that was to bring the break with England. Defenses were built. Recruits were drilled on the village greens. Nine thousand men were sent to New York, where it was plain that the British intended to concentrate. Privateers were financed to harass British merchant vessels. All trade restrictions were cast to the winds and traffic was resumed with foreign countries. Loyalists were watched and disarmed. Overtures for help were made to France.

By May of 1776 the colonies had learned that they had been abandoned by the king, that no answer came to their petitions, no redress for their wrongs. The time had come to adopt some form of representative government for their individual and mutual good. In June it was resolved "that these united colonies are and of right ought to be free and independent states." Ten colonies voted for full independence of England and the Crown. New York, South Carolina and Georgia still wavered. Then Charleston, South Carolina, was attacked by the British fleet; General William Howe was known to be approaching Staten Island. Indecision suddenly came to an end, and the Declaration of Independence was adopted, July 4, 1776.

The American Revolution.—The story of the American War of Independence is one of constant trial and error from the first gun fired at Lexington in 1775 to the British surrender at Yorktown in 1781. England little realized the initiative or calibre of the colonists. Had she known the Minute Men were to rise up 16,000 strong for the siege of Boston, General Gage might have had the 20,000 men he originally demanded for the chastisement of the colonists.

1775.—"Lexington and Concord": These words flew through the colonies and started the war. Bunker Hill proved the mettle of the troops. The siege of Boston ended with General Howe's retreat to Halifax, Nova Scotia, in March 1776. He had replaced Gage as commander in chief of the British forces. In the meantime the British had failed to take Charleston, S.C.; the Vermont patriot, Ethan Allen, had taken Ticonderoga; though Benedict Arnold was defeated at Quebec he nevertheless served to stop the British movement south out of Canada.

1776.—This year opened with an attack on North Carolina. In January Sir Henry Clinton sailed from Boston with a considerable fleet, aided by 1,600 Tories who marched toward the coast. The Tories were beaten at Moore's Creek by a force of volunteers. The state was now aroused, and so many armed men had assembled that when Clinton arrived he decided not to attack. Instead, he proceeded against South Carolina, his fleet appearing before Charleston late in June. It was decided to reduce Fort Moultrie, attacking it by sea and land. The land attack was repulsed, and the accurate return fire of the fort so badly damaged the British ships that they were compelled to withdraw. The expedition sailed away to aid Howe, who reappeared off the Long Island coast with 34,000 men. He landed on Staten Island, July 5, 1776. Washington was waiting for him with a line of defenses stretched from Brooklyn across lower Manhattan. But Howe's advance was too strong, and Washington was pushed from Brooklyn Heights to Manhattan, to White Plains. Howe took Forts Washington and Lee and 3,000 prisoners, and sent three regiments after Washington as he retreated across New Jersey into Pennsylvania.

It was during this retreat that Washington suddenly turned in his tracks and on Christmas night, 1776, moved 6,000 men across the ice-packed Delaware in little boats. The place, eight miles above Trenton, is still called Washington's Crossing. He surprised the Hessian mercenaries under Col. Rall at Trenton and took 1,000 prisoners, followed up this coup by defeating Cornwallis at Princeton and then proceeded to Morristown to camp for the winter. Thus he controlled northern New Jersey and the British were held back to eastern Jersey and New York. Colonial spirits soared with these sudden successes after Washington's long discouraging retreat, and by March 1777 new enlistments had raised Washington's strength from 1500 to 4000 men.

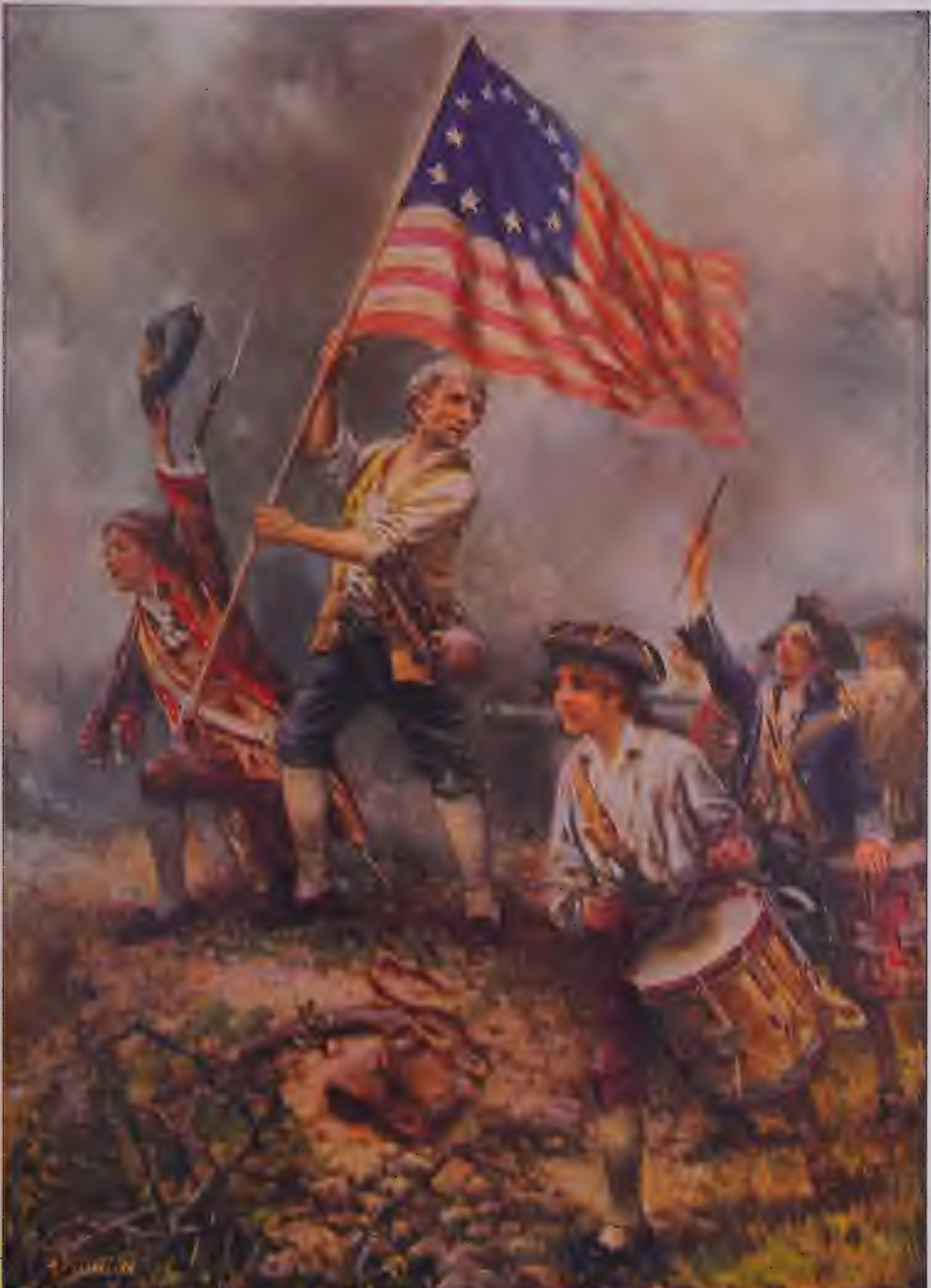
1777.—In 1777 the British made their fatal mistake. They had planned to split the colonies by seizing the whole waterway from the St. Lawrence to Lake Champlain and the length of the Hudson to New York. Howe moved toward Philadelphia by sea. He landed at the head of the Chesapeake, advanced over land into Pennsylvania, defeated Washington in the battles of Brandywine and Germantown, and moved into the American capital. This partial success netted the British little gain. The forces

THE FIRST AMERICAN FLAG IN BATTLE

The painting reproduced on the opposite page depicts one of the most stirring episodes in American history. A small body of Americans under Colonel Peter Gansevoort held Fort Schuyler in the Mohawk Valley of New York in August 1777. A much larger force of British under Colonel Barry St. Leger laid siege.

The garrison was without a flag when the enemy appeared, but their pride and ingenuity soon supplied one in conformity to the pattern adopted by the Continental Congress. Shirts were cut up for the white stripes, bits of scarlet cloth were joined for the red, and the blue ground for the stars was composed of an old cloth coat belonging to Captain Abraham Swartwout who was then in the fort. Before sunrise this curious mosaic-work standard, as precious as the most beautifully wrought flag of silk and needlework, was floating over one of the bastions.

During the siege occurred one of the bloodiest battles of the war. During this battle the garrison made a sally under Colonel Marinus Willett and attacked that portion of the camp occupied by Sir John Johnson and his Royal Greens. The enemy was driven back and a large quantity of clothing, blankets, stores and camp equipage, together with important papers and five British standards, was taken. It was probably during this sally that the first American flag received its baptism of fire in an actual battle. After their return to the fort the five British standards were raised in full view of the enemy upon the flagstaff beneath the crudely made American standard, and the whole garrison, mounting the parapets, made the forest ring with three loud cheers. Of this sally the artist, Edward Percy Moran, painted a typically heroic battle picture, one that should appeal to the patriotism of every American.



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The First American Flag in Battle

left in New York under Sir Henry Clinton were inadequate for the northward push up the Hudson to meet General John Burgoyne. So Burgoyne's army was forced to surrender before the English troops from New York got half-way to Albany.

The Turning Point in the Revolution.—Burgoyne, coming down from Canada with 7,600 men, expected to meet Colonel Barry St. Leger advancing southeast from Ontario, and join forces with him at Albany. They never met. St. Leger, stopped at Oriskany, N.Y., by Herkimer, turned back to Canada. Burgoyne took Ticonderoga, was beaten at Bennington, yet continued the hard push through the thick, unbroken forests. He was delayed and obstructed at every step by General Schuyler, but got as far as Stillwater, above Albany. Cut off from reinforcements from Canada, his supplies captured, waiting in vain for Clinton to come up the Hudson from the south, his 5,000 men surrounded by 16,000, he finally surrendered to General Horatio Gates in the hard battle at Saratoga, Oct. 17, 1777. The Battle of Saratoga was the turning point in the Revolution because it frustrated the one campaign that would have given the British sweeping control from the St. Lawrence to New York and so put an end to the war.

1778-79.—The winter of 1778-79 was the terrible winter of starvation, disease and suffering, courage and endurance that Washington spent with the remnants of his army at Valley Forge. The British held the Delaware. The capital had been moved from Philadelphia, first to Lancaster, then to York, Pa. The men at Valley Forge starved and drilled and died under Washington and the German military genius Baron von Steuben.

In the spring Clinton, who had replaced Howe as British commander in chief, decided to leave Philadelphia and march across New Jersey to New York. His haste was caused by the signing of the American-French alliance. He wished to get back within the protecting range of the British navy before the French fleet could arrive in American waters. Washington fought a drawn battle with him at Monmouth, N.J., but did not prevent him from reaching New York.

With Clinton once well settled in New York, Washington now flung his defenses to the north and west of him and made his own headquarters at West Point. Here he could keep an eye on the British and forestall any move they might make north into New England or west again towards Philadelphia. There was almost no fighting. Clinton in New York, Washington at West Point: this was the set-up in this region for the next three years.

From 1778 on the difficulties of the British increased. They had had the advantage of approach by sea until France came into the picture. But the Americans knew the interior. There they could play a watching and waiting game; and they did. They could give battle or disappear as they saw fit. Often they saved the day by some clever ruse instead of fighting at the wrong moment. Moreover, in 1778 Franklin signed the American pact with France. England could not scare up a single ally. In 1779 she was at war with Spain as well as France and by 1780 with Holland.

Her next move was to the South. The British took Savannah late in 1778 and extended their influence through most of Georgia. They held Savannah against the combined attack of the French by sea and the Americans by land.

1780.—The British took Charleston, S.C. in 1780 and went about the business of subjugating the Carolinas. There was little real resistance. Gates was defeated by Cornwallis at Camden, S.C.; and only small raw patriot bands were left to protect the overrunning of the South. The British might have held Georgia, North Carolina and South Carolina forever separate from the union, if they had not set about *forcing* military service in the conquered area. This coercion stirred up a storm of partisan welfare which changed the whole story. Marion, Sumter, Pickens: these names stand for the heroic utmost that unequipped but desperate Carolinians could do. Marion in particular inspired and wrought telling resistance to the British and saved himself and his wild bands time and again only by his knowledge of the deep swamps into which he vanished when certain defeat faced him. Thus the British hold was broken in the South and Cornwallis's intended conquering northward march was most fatally postponed. The sharp battle of King's Mountain in October 1780 between the British and Carolina backwoods riflemen left Cornwallis no troops to spare. By 1781 the British were confined to the coast, Charleston and Savannah.

1781.—Gen. Nathanael Greene, who took the place of Gates, now proceeded to tempt Cornwallis away from the coast. Gradually he drew the British across North Carolina. General Daniel Morgan defeated the British at Cowpens, N.C. in January 1781. At Guilford Court House in March of that year, Greene, though he was defeated, inflicted such heavy losses on the English that Cornwallis retreated to Virginia. He fortified himself at Yorktown, where he thought aid from Clinton in New York could easily reach him by sea.

Washington in the meantime was faking activity for Clinton's attention. Clinton fully expected some new campaign and dared not weaken his strength to reinforce Cornwallis. But Washington and the French under Marshal Rochambeau were planning to advance into Virginia. They so informed De Grasse, the French admiral then in the West Indies. He wrote back, "Look for me in the Chesapeake."And that was enough. Washington, Rochambeau and Lafayette went into Virginia and stood in full force before Yorktown. De Grasse true to his promise, appeared in the Chespeake and cut off Yorktown from the British fleet. The move was checkmate for Cornwallis. He surrendered, October 19, 1781. The American War of Independence was over. The United States of America had become a new nation.

The war would have ended sooner but for certain facts that it is easy for us to overlook. There had been a powerful and influential group in every colony that had not joined the move for independence—the Loyalists or Tories who hated the idea of rebellion and remained firm in their allegiance to established government even though they had to sacrifice their homes and their property.

Articles of Confederation.—The passion for personal liberty which had become almost a fetish with the people was reflected in each state's jealousy of any Congressional encroachment upon state government. Congress, however, from the first foresaw the need of some centralized control in a new nation and knew the necessity for some definite understanding between Congress and the states about their relations.

A committee was first appointed in June 1776 to draft plans of confederation for the consideration of the separate colonies. John Dickinson of Delaware and Pennsylvania, the Penman of the Revolution, wrote the first draft and submitted it to Congress in July. A "firm league of friendship" between the states was the proposition. The Articles went out to the state legislatures in 1777, were adopted by Congress in 1778; in 1779 every state had signed them but Maryland. She held out to the bitter end, insisting that the states (Massachusetts, Connecticut, Rhode Island, New York, Virginia, the Carolinas and Georgia) must give up their claim to western territory. When these "large" states agreed to cede those claims to Congress and Congress had decided that new states should be created from this western territory, Maryland ratified (March 1, 1781) and the Articles were in effect.

The Articles continued the Congress with state delegates appointed and paid by each state. They gave Congress the right to declare and carry on war, build a navy, manage all foreign and all Indian affairs, settle inter-state disputes, coin money and create post offices.

They were a big step forward towards a unified government; but they were not equal to the need. They could not work without more centralization of power. Congress was still child, not father, to the nation. Congress could neither levy nor collect taxes; all she could do was name the amount needed and wait for the states to supply it. She could not make good her own decrees. She had no way of enforcing treaty obligations, and consequently could not command respect abroad. No change or improvement could be made in the Articles without the unanimous vote of all the states. Thus 12 states could be held to the rule of one.

Delegates from Maryland and Virginia met in 1785 at Alexandria and at Washington's home, Mt. Vernon, to regulate trade on Chesapeake Bay. These delegates invited the other states to join in a later meeting on trade and commerce at Annapolis. But only five states (New York, New

Jersey, Pennsylvania, Delaware and Virginia) attended the Annapolis Convention in September 1786. Nothing could be done immediately, but the group that met at Annapolis called a convention of delegates from all the states to meet in Philadelphia in May 1787 "to take into consideration the situation of the United States." Congress in February 1787 repeated this call, explaining that the purpose was to revise the Articles of Confederation.

Ordinance of 1787.—Before the Federal convention met, the Congress of the Federation adopted its one and only important and far-reaching measure—the Ordinance of 1787, which shaped the government of the vast Northwest Territory and provided for its division into self-governing states.

Virginia, New York, Massachusetts, Connecticut, North and South Carolina, Georgia all claimed huge tracts of land stretching west and north to the Mississippi and the Great Lakes. These claims had delayed ratification of the Articles of Confederation for five years (1776–1781). One by one, however, the states ceded their western lands to Congress, New York in 1781, Virginia in 1784; the others followed.

The Ordinance declared that the region become self-governing as fast as the population warranted. It divided the land into territories under one territorial governor. Slavery was forbidden, but this provision did not affect slaves already in the region. Congress held the reins until the free male inhabitants of full age in any territory numbered 5,000. Then each was to elect its own legislature and be represented in Congress. Each territory could apply for statehood when the population reached sixty thousand.

Five states grew out of this old Northwest: Ohio (1802), Indiana (1816), Illinois (1818), Michigan (1837), Wisconsin (1848). But the whole import of the Ordinance lies in its provisions for the creation of new states on a par with the old, the framing of the method by which the whole west came into the Union and the exclusion of Negro slavery from this territory.

Constitutional Convention. — The Convention that met in Philadelphia in May 1787 represented every state except Rhode Island. The leaders of the nation were there: George Washington, who was chosen president of the Convention, James Madison, Alexander Hamilton, Benjamin Franklin, Gouverneur Morris—in all 55 of America's ablest statesmen sent to inquire into the state of the union and frame a new national government. It was at once found impossible to revise the old Articles of Confederation; they failed on too many points. The Convention set to work on a new constitution.

They struck a snag at once. Large state and small state ambitions clashed. Representation in proportion to population was favored by Virginia and other large states, for this would assure their own control of Congress and the nation. The little states held out for a Congress with an equal representation of states. For a time it seemed as if the Convention must divide and fail. Connecticut's proposal saved the day: two houses in Congress—one, the House of Representatives, representing the people according to the population of each state; the other, the Senate, giving each state equal voting power. The big states finally fell in line with this plan, and the first stumbling block was surmounted.

An Electoral College, representing each state, was provided to cast the votes for President. The population of slave states was counted as including three-fifths of the slaves. Other compromises were successfully maneuvered, until the 13 states had an outline for a Federal Government strong enough to conduct itself in a world of other nations and equipped with a system of Federal courts empowered to deal with individuals and with the states.

The convention adopted the Constitution and adjourned in September 1787, having resolved that ratification by nine states should make it effective. The new form of government was first reported to the old Congress of the Confederation which submitted it to the 13 states for their approval.

Ratification.—There was plenty of opposition. Prominent patriots who had been eager for independence opposed the new instrument of government. Patrick Henry, for instance, fought against its ratification and then, when the new government was set up, refused to hold any Federal office. The *Federalist* papers, a series of essays written by Hamilton, Madison and John Jay, defended the Constitution and helped secure its ratification. Eight states had ratified it by May, 1788. On June 21, 1788—about nine months after the Convention had adopted it—the vote of the ninth ratifying state (New Hampshire) made the Constitution "the supreme law of the land"; and "we, the people" became sovereign in the United States.

The first Wednesday in January 1789 was set apart for the selection of electors by the states, the first Wednesday in February for the meeting of the Electoral College to choose the president and vice-president, and the first Wednesday in March as inauguration day.

ADMINISTRATIONS OF THE PRESIDENTS

George Washington—1789-1797

Whatever the differences of the states during the framing of the Constitution, they were of one mind when it came to a president. The votes of the Electoral College were cast unanimously for George Washington for first President of the United States.

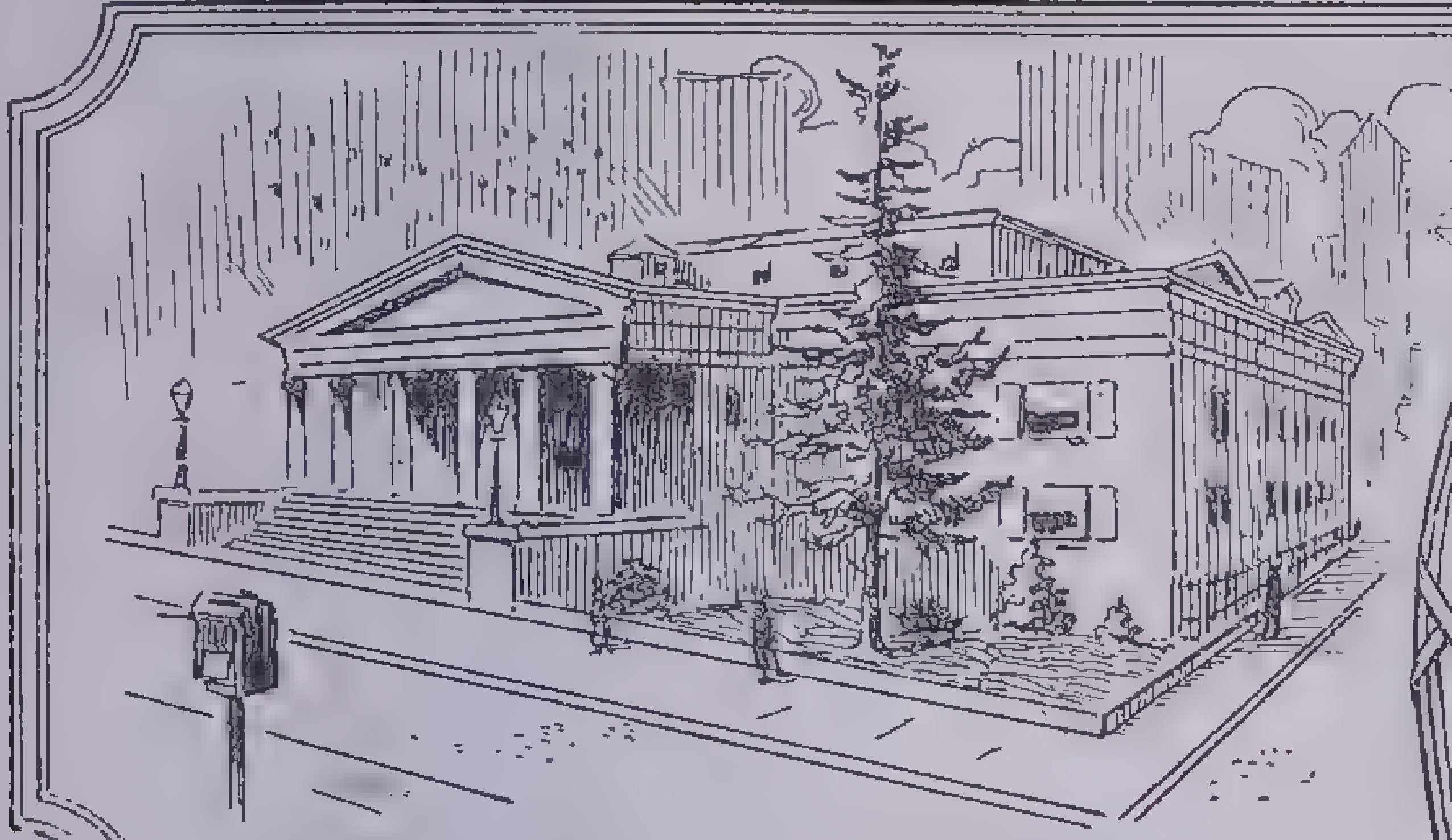
Organization.—Congress created three Executive Departments: State or Foreign Affairs, Treasury and War; it also provided for an Attorney General and a Postmaster General. Washington named Thomas Jefferson Secretary of State, Alexander Hamilton Secretary of the Treasury, General Henry Knox Secretary of War and Edmund Randolph Attorney General. These men formed the first Cabinet. The head of the postal service was not then considered an executive officer; not until 1829 did the Postmaster General become a member of the Cabinet.

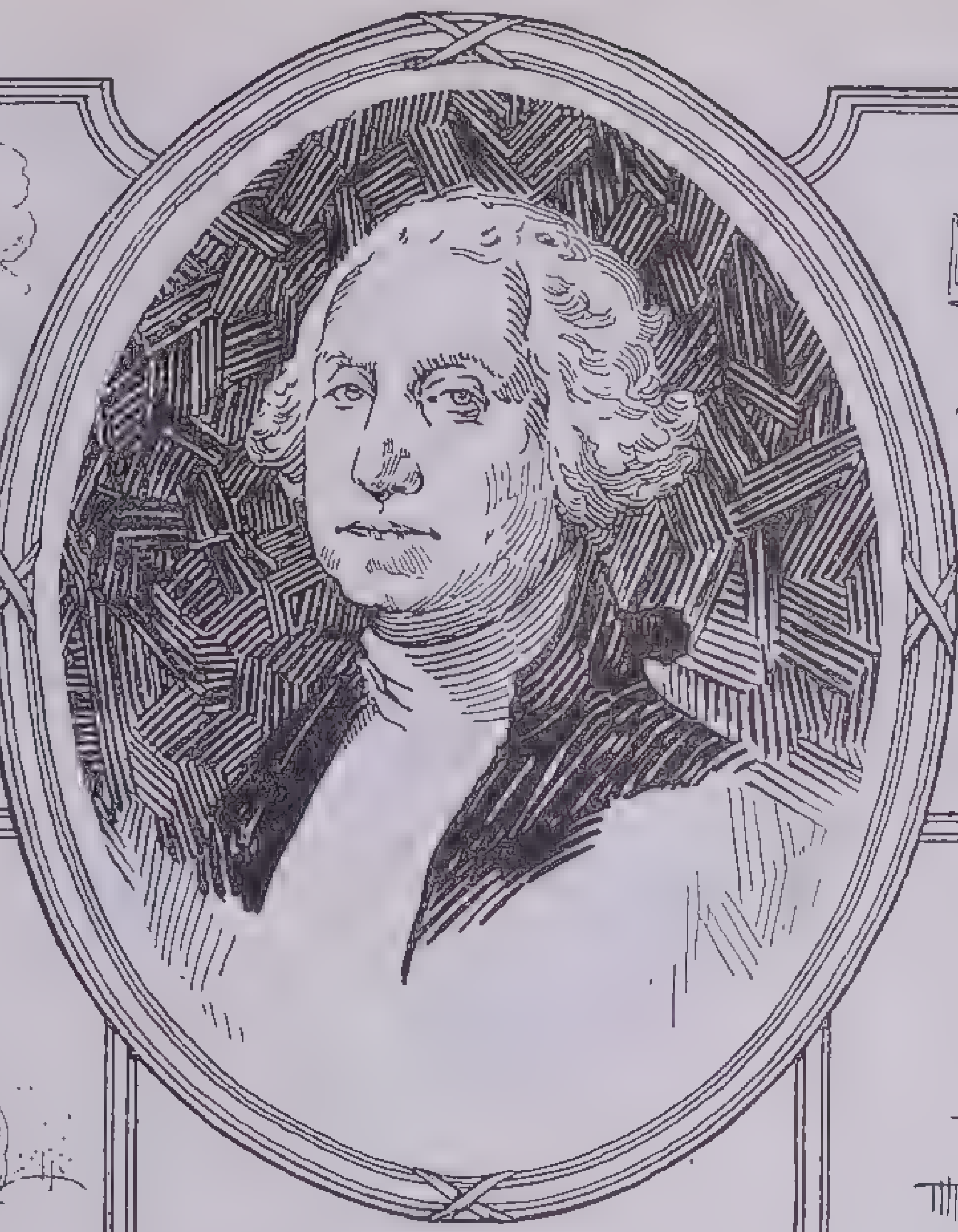
The new Congress was a potent body and settled down to governing the nation. It created a national bank and a United States mint; laid high import duties to protect American industries and raise government funds; and took over state debts. By economic pressure, Congress compelled the two still resistant states to ratify the Constitution: North Carolina in 1789, Rhode Island in 1790. And it adopted and submitted to the states the famous Bill of Rights, the first ten Amendments to the Constitution which secure to the people their personal freedoms and to the states their rights. The ten Amendments pledge to the people freedom of worship, speech and press, freedom of appeal to the government for redress of wrong, freedom from search without warrant, the right to their assemblies, to trial by jury, and protection against too heavy fines and "cruel punishment."

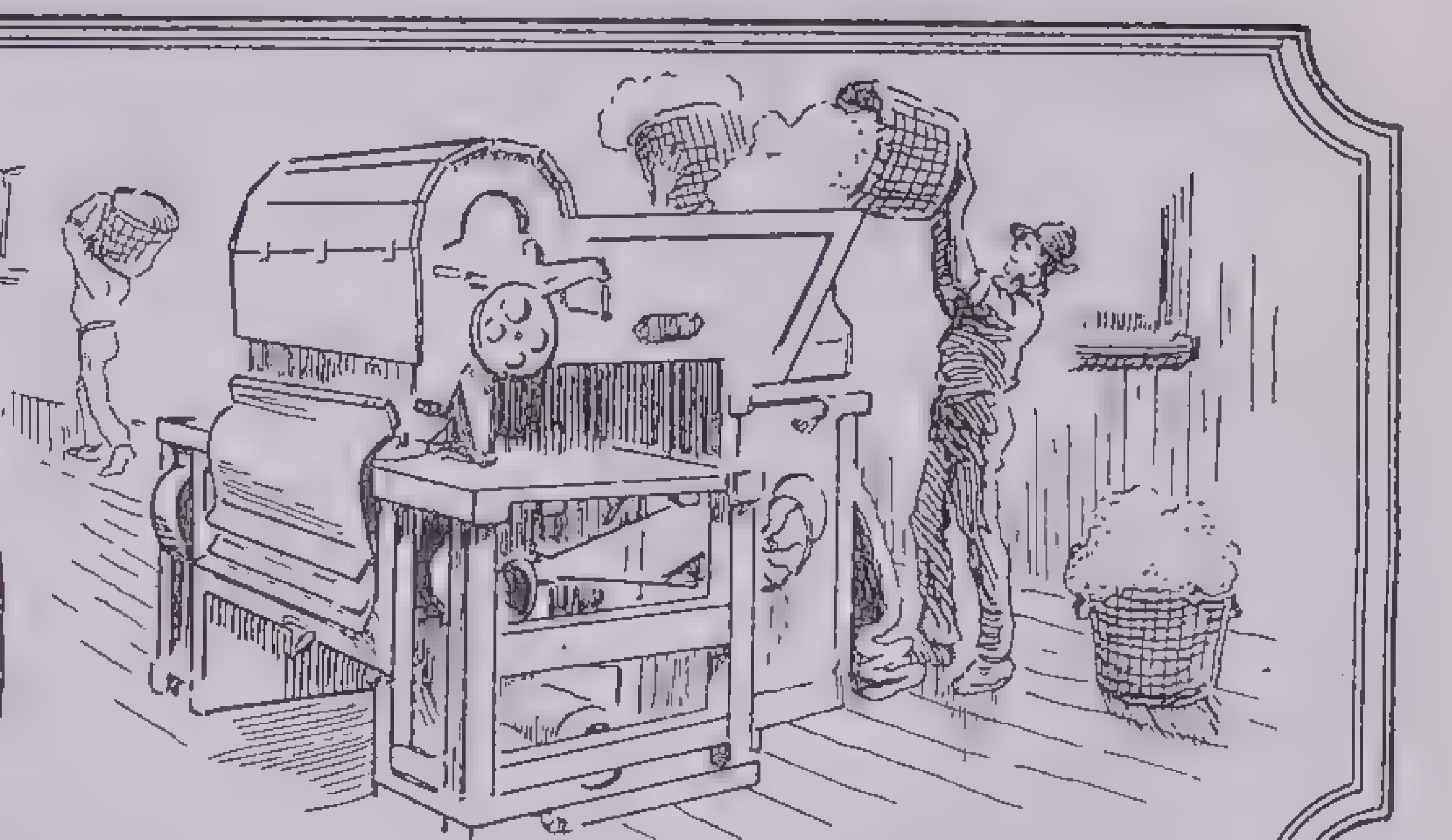
Federalist and Republican.—Very soon two bitterly opposed political factions began to develop. One, headed by Alexander Hamilton, represented the wealthy, landed class and favored a strong central government: national power rather than individual or too great state rights. These were the Federalists. The other, headed by Thomas Jefferson, represented the small people and held for strong state powers as the surest medium for gaining individual rights. Jefferson detested the flavor of monarchy and was strong for the "rights of man," the ideals of the French Revolution which he had encountered in France and the principles of the English Whigs that he admired. The group that rallied to his views called themselves Republicans and later developed into the Democratic party.

The Second Term.—George Washington was unanimously re-elected for his second term; but the peaceful business of organization was over. Troublous foreign problems brought differing political views to violent expression; and Washington came in for a full dose of criticism as a rank aristocrat and even usurper.

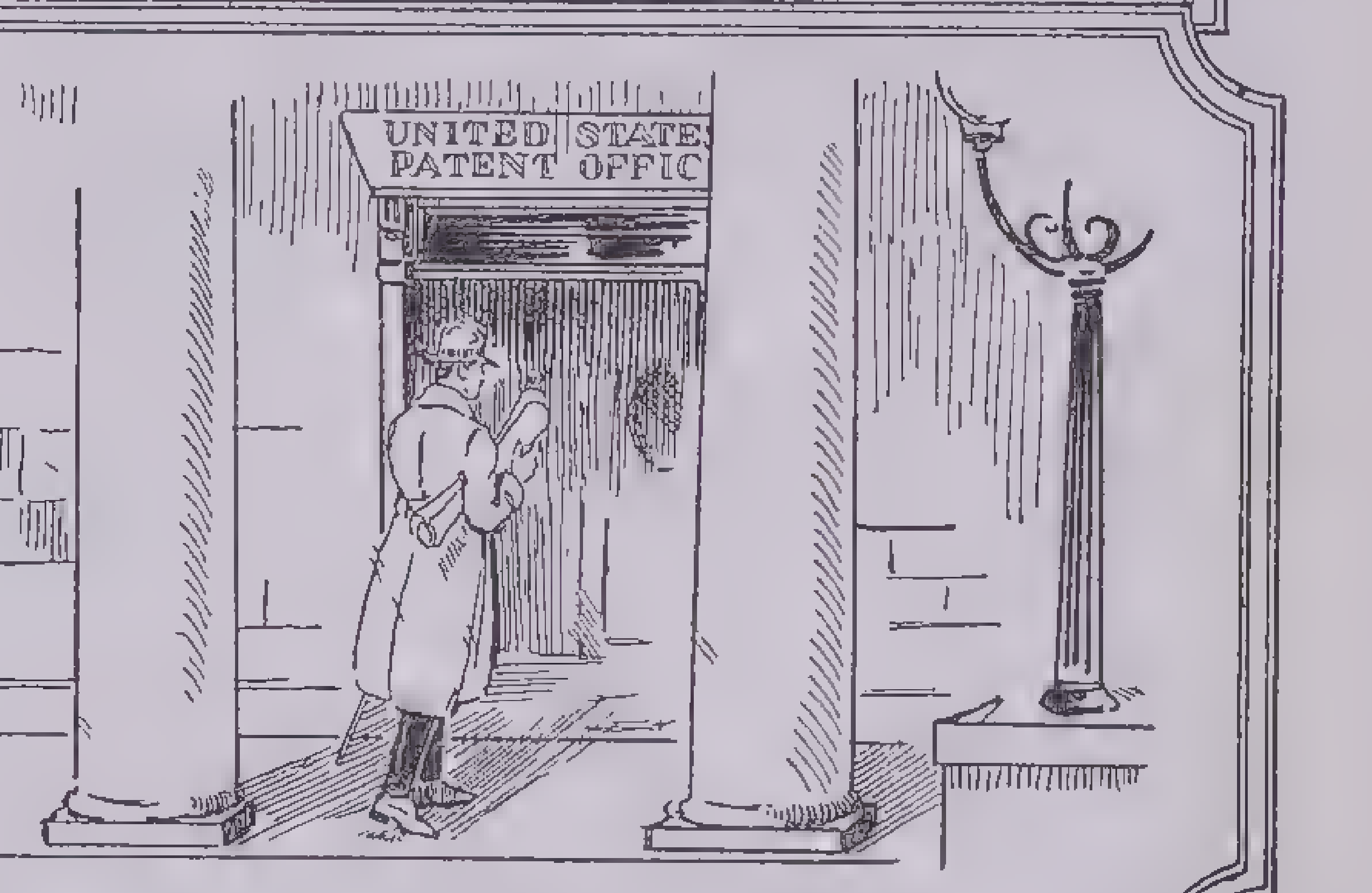
Neutrality.—During the war between England and France in 1793 Jefferson was all for throwing in his hat on the side of France; he withdrew from the Cabinet in protest against Washington's proclamation of neutrality. He had a large following who felt neutrality was sheer ingratitude to a former ally. "Citizen" Edmund Charles Genêt, French minister to the United States, defied Washington's strict neutrality stand and proceeded to outfit privateers to harass British ships and to enlist troops. Washington and his Cabinet, realizing that any meddling in European wars would be suicidal to the new nation, insisted on neutrality. And when Genêt demanded an appeal to Congress, Washington insisted on his recall to France. Jay's Treaty with England (1794) displeased the people


UNITED STATES MINT ESTABLISHED 1793

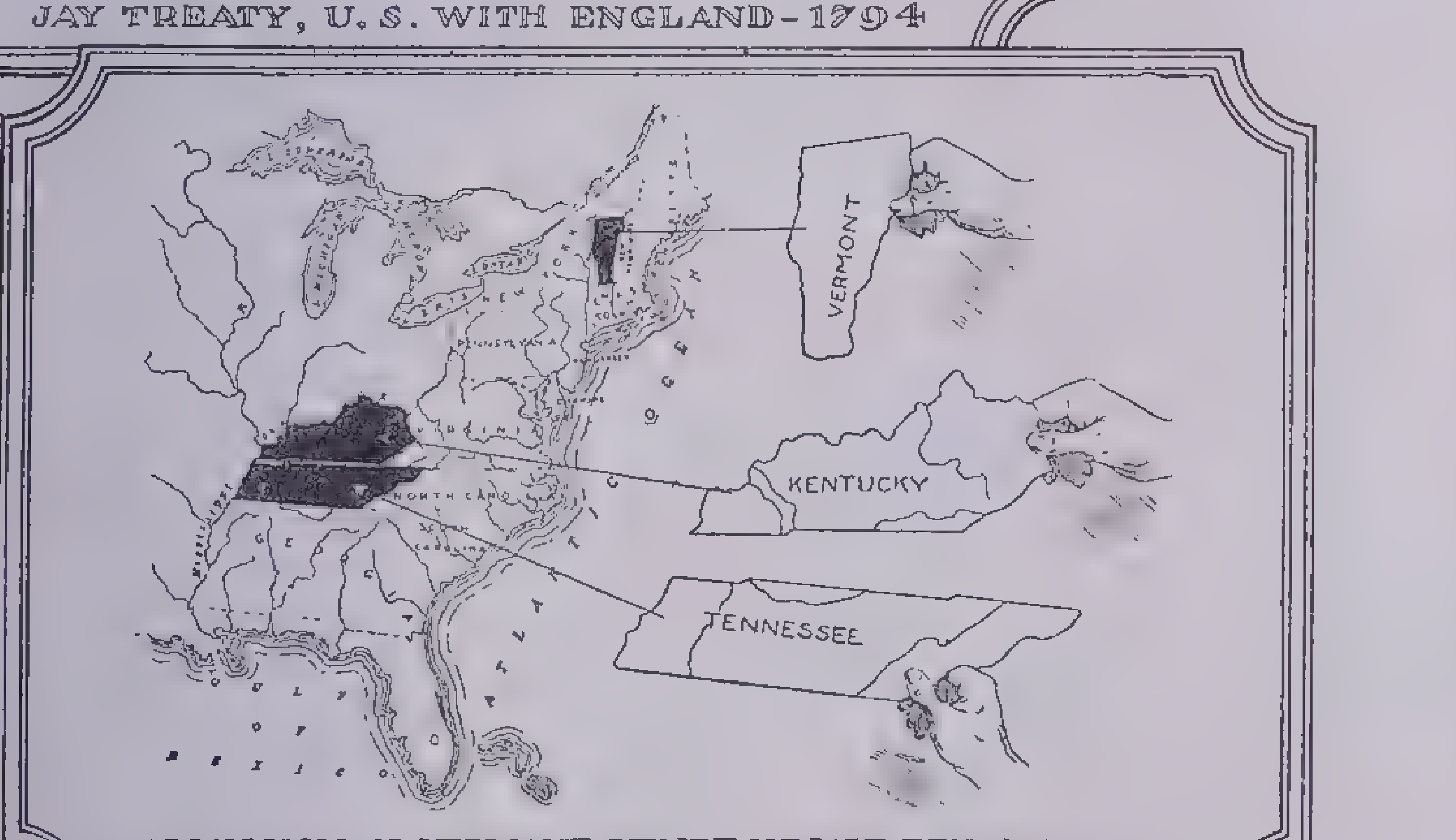

GEORGE WASHINGTON
1789 TO 1797


COTTON GIN INVENTED BY ELI WHITNEY-1793

JAY TREATY, U.S. WITH ENGLAND-1794



PATENT LAW PASSED-1793



ADMISSION OF VERMONT KENTUCKY AND TENNESSEE TO THE UNION 1790 (MAP OF UNITED STATES IN 1790)

CONSTITUTION OF THE U.S. BECOMES EFFECTIVE 1789

by binding the United States to non-intervention and by its failure to lift the restrictions on American shipping.

Whisky Rebellion.—Internal troubles also confronted the second term. When Congress laid a tax on the manufacture of whisky, the western Pennsylvania farmers refused to pay it. They could not market their grain, but they could and did make whisky on their farms at a profit. The tax seemed to them a personal as well as an economic insult. They resisted the tax for three years, and to the point of bloodshed in 1794. This was the Whisky Rebellion. Washington called out 15,000 militia to enforce the tax and put down the uprising. The defiant farmers took the required oath of allegiance peaceably enough. And the strong hand of Federal law was shown and proved.

Other Events.—There was trouble in the west with the Indians. General Harmar in 1790 and General St. Clair in 1791 both failed against them. But General Anthony Wayne gave them a defeat at Fallen Timbers in 1794 which resulted in the Greenville Treaty and the cession of 25,000 square miles to the United States.

A treaty with Spain in 1795 gave the United States free navigation of the lower Mississippi. Eli Whitney's invention of the cotton gin in 1793 planted the germ of the industrial revolution in America. Three new states joined the Union under Washington: Vermont (1791), Kentucky (1792), Tennessee (1796).

Washington refused to accept a third term and in September 1796 delivered the moving *Farewell Address* with its famous warning against "entangling alliances" that echoes down to the present day.

John Adams—1797-1801

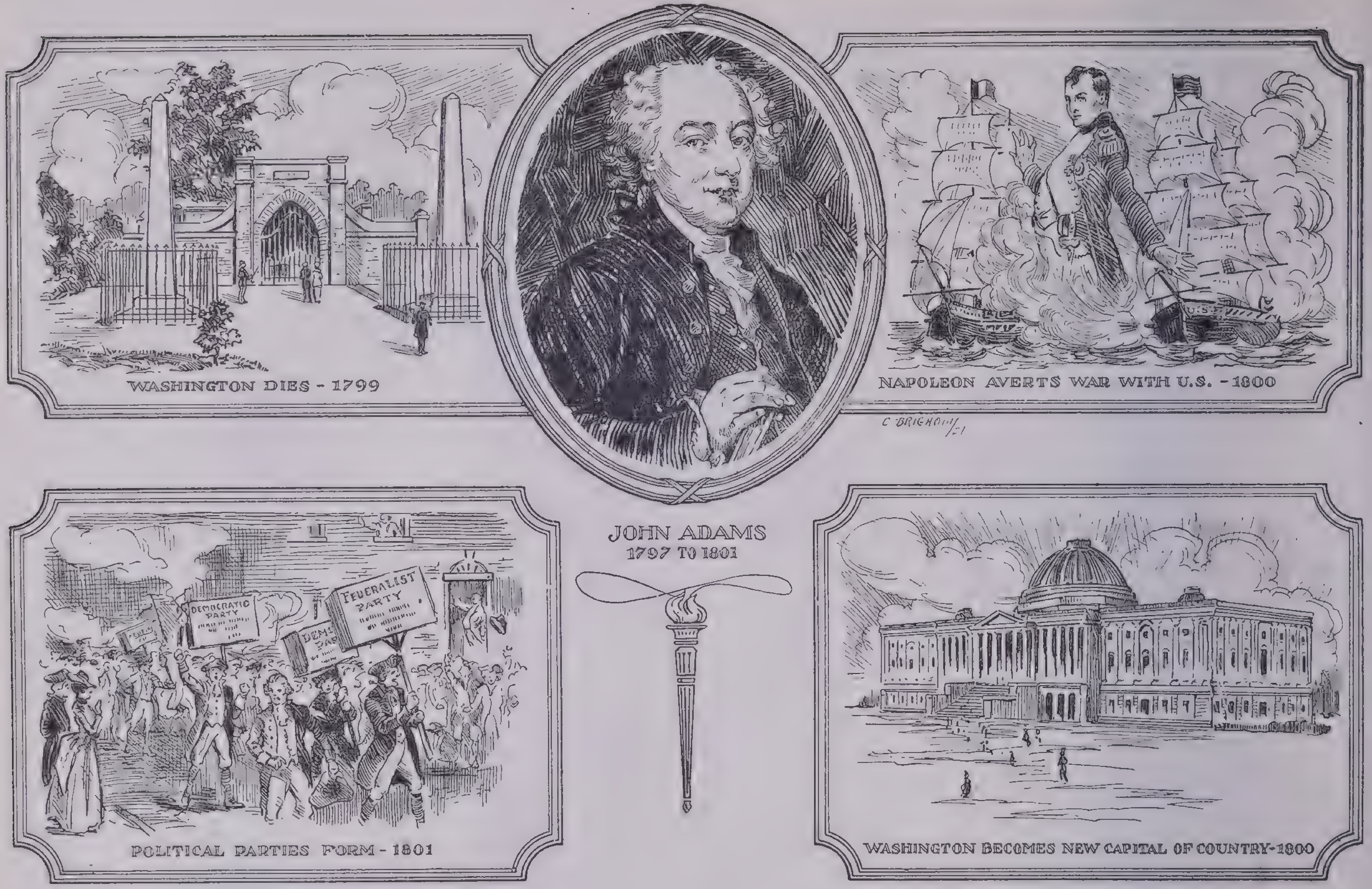
John Adams of Massachusetts was one of the most fervent patriots of the colonial and Revolutionary periods and one of the ablest statesmen that America had produced. When Washington laid down the cares of office after two terms, Adams having served as Vice-President for eight years, was his logical successor. He received 71 votes in the Electoral College, and Thomas Jefferson received 68. Under the Constitutional provision (not changed until 1804), giving the Vice-Presidency to the candidate receiving the second highest number of electoral votes, Jefferson became Vice-President, though he and Adams belonged to opposing political parties.

The Jay Treaty with England provoked France to break off diplomatic relations with the United States. Charles C. Pinckney, the American minister, was refused a hearing. French privateers attacked and took American ships; Adams sent a special commission to France, Pinckney, Elbridge Gerry and John Marshall, to re-establish peace.

XYZ Affair.—Talleyrand, French minister of foreign affairs, would not see them but sent three men demanding huge sums of money for a peaceful settlement. The Americans scorned the offer; Pinckney is said to have made the spirited answer: "Millions for defense, but not one cent for tribute." This incident was reported in detail through America, but the identity of the three Frenchmen was concealed under the signatures X, Y and Z. Immediately the cry for war was heard in the nation; there were battles at sea, and Washington was called from Mount Vernon to take command of the army.

But Adams was determined to avert war and in spite of Hamilton and the Cabinet, managed to do so. Napoleon supplanted the Directory in 1799 as first Consul of France, and a treaty of peace was made in 1800.

Alien and Sedition Acts.—The violence of popular feeling and popular writings at the height of the French crisis led Congress to pass the Alien and Sedition Acts in 1798. The first gave the President power to deport any for-


WASHINGTON DIES - 1799
NAPOLEON AVERTS WAR WITH U.S. - 1800
JOHN ADAMS
1797 TO 1801
FEDERALIST PARTY
DEMOCRATIC PARTY
POLITICAL PARTIES FORM - 1801
WASHINGTON BECOMES NEW CAPITAL OF COUNTRY-1800

eigner who seemed a menace to the nation; the second imposed fines and imprisonment upon anyone who should oppose government measures or publish "false and malicious" attacks upon Congress, the President or the government. These Acts, grown from Federalist fear that the Constitution would be overthrown, resulted in the arrest of ten Republican newspaper editors. There was a wave of popular fury when freedom of press and speech as pledged by the Constitution was thus suddenly swept away. The Kentucky and Virginia Resolutions adopted in 1798 denied to the Federal government any powers not given it by the Constitution; and declared the right of the states to nullify unconstitutional acts of Congress.

In November, 1800, Congress moved from Philadelphia, where it had met since 1790, and met for the first time in the new, rough city of Washington, in a Capitol building erected in the woods. John Marshall, Adams's Secretary of State, was appointed Chief Justice of the Supreme Court a few weeks before the close of Adams's administration.

Thomas Jefferson—1801-1809

The next election is sometimes called the Revolution of 1800. It was a striking about-face in national politics. John Adams, the Federalist, was not re-elected; Thomas Jefferson, the Republican, succeeded him. Of the electoral votes Adams received 65, Jefferson and Aaron Burr each 73. This was no majority and the election was thus thrown into the House of Representatives, where six whole days of balloting gave Jefferson the vote of ten states and Burr the vote of four. Two states did not record their votes. Jefferson thus became President, Burr Vice-President. This was the deadlock that gave rise to the 12th Amendment to the Constitution in 1804, providing for the election of president and vice-president on separate ballots in the Electoral College.

The first act of the new President was to cancel many of the last-minute appointments to office made by Adams. Jefferson then began to apply the extreme theories of his party to limit the powers of the Federal government and to give more power to the states. The term *strict construction* came to the fore in politics, meaning that the Federal government had no power not expressly given to it by the Constitution.

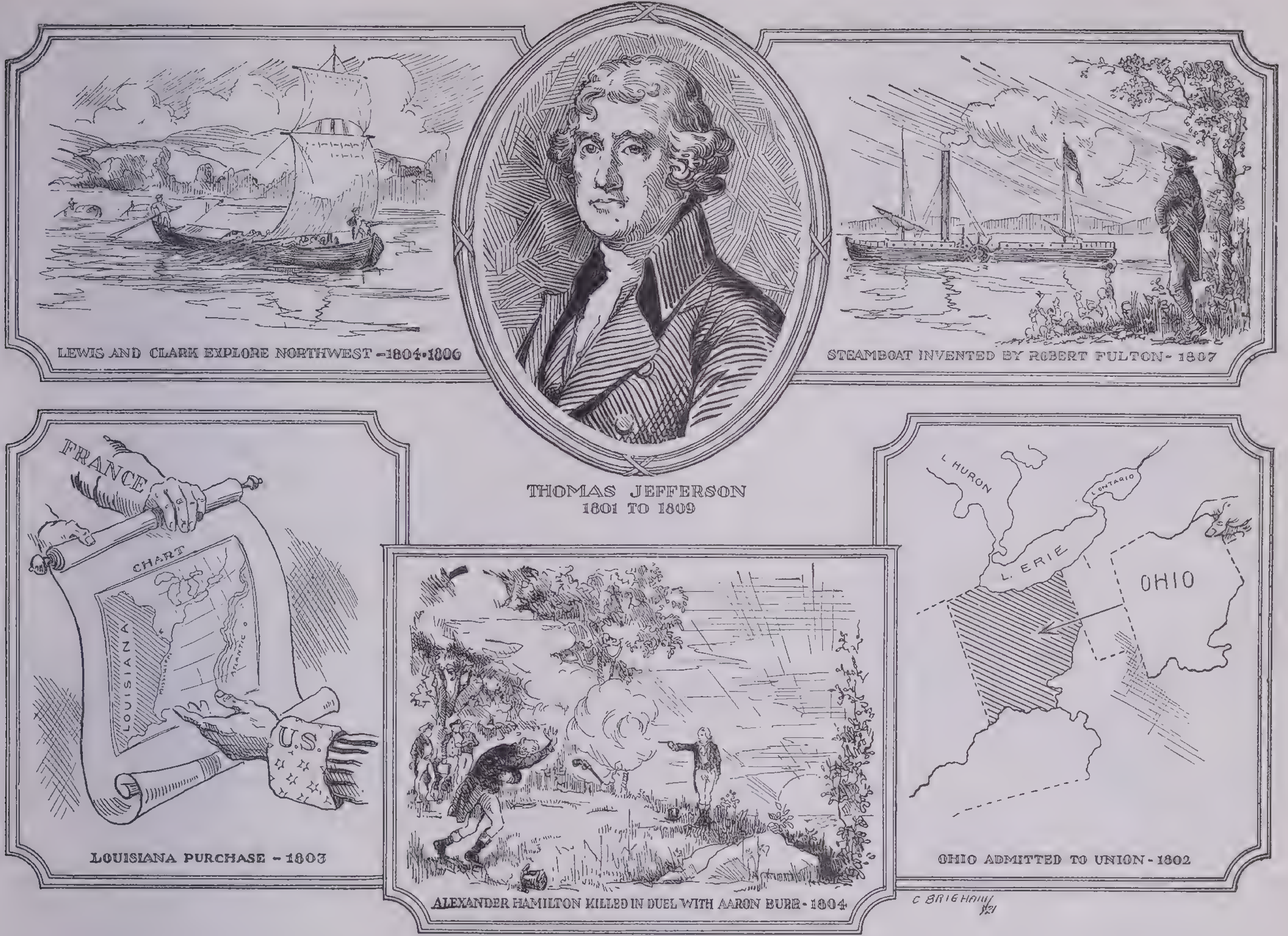
Louisiana Purchase.—Though Jefferson was a strict constructionist, he had the sense and greatness of mind to enlarge his views when Napoleon offered Louisiana territory to the United States for $15,000,000. Jefferson doubted the constitutionality of the purchase but quickly pushed through a treaty securing to the United States this territory—New Orleans, West Florida and all the French lands west of the Mississippi. Then he asked for a Constitutional amendment to ratify what he had done. This was unnecessary; he was already clothed with power to make treaties ("by and with the advice and consent of the Senate").

New England objected to the purchase because it so greatly expanded the power of the South, but since it guaranteed forever the Mississippi undisputed to the United States, the rest of the country approved, and Louisiana was purchased in 1803. The value of this vast region was little realized at the time, although it more than doubled the area of the United States. To ascertain something of the character of the purchase, Jefferson commissioned Lewis and Clark to explore the territory.

The Barbary Pirates.—It was a Jeffersonian theory that Federal control should not overbalance the rights of the states. One way not to emphasize Federal supremacy was to keep the army and navy down to skeleton form. The error of this policy was shown in 1802–05, when a small American fleet had to be built and sent into the Mediterranean to attack the pirates of the Barbary States of North Africa who had been preying on American shipping. In 1815 the pirates were subdued—a triumph for the American navy.

The Right of Search.—The United States had been suffering directly from the Napoleonic wars between England and France. England declared a blockade on European ports; Napoleon blockaded the British coasts. England did not recognize the right of any Englishman to change his citizenship, and captains of English war vessels claimed the right to search American ships for escaped English sailors, and impress them into her own service.

In 1807 the English frigate *Leopard* demanded the right to search the



LEWIS AND CLARK EXPLORE NORTHWEST – 1804-1806

THOMAS JEFFERSON
1801 TO 1809

STEAMBOAT INVENTED BY ROBERT FULTON - 1807

LOUISIANA PURCHASE - 1803

ALEXANDER HAMILTON KILLED IN DUEL WITH AARON BURR - 1804

OHIO ADMITTED TO UNION - 1802

American frigate *Chesapeake.* The request was refused; the *Leopard* fired on the *Chesapeake* and forced the American ship to submit.

Embargo Act.—The Chesapeake affair was the last straw. Congress passed the ill-fated Embargo Act, Dec. 1807, to show England and France that they could not interfere with neutral vessels. It was a sweeping ban on all foreign trade: foreign ships were not to bring goods to American ports; American ships were not to trade in foreign ports. But the Act failed in its purpose and only crippled America's own shipping. So great was the opposition to it in New England and New York, the American shipping centers, that it was repealed in 1809 and replaced by the Nonintercourse Act which forbade trade with England and France only.

Burr's Dream of Empire.—When Aaron Burr was defeated for the Presidency, he charged that Alexander Hamilton had thrown his influence to Jefferson, which was true. In 1804, while he was still vice-president, Burr lost the election for governorship of New York; again he blamed Hamilton for his defeat. Embittered by the long-standing feud, Burr challenged Hamilton to a duel on the New Jersey side of the Hudson River, opposite New York, and killed him (July 11, 1804).

Burr fled to Georgia, but returned to his post at Washington. After his term was over he was politically ostracized in the North and went South. His opponents charged that he was planning to raise a force to conquer the great Southwest and there establish a new republic, with himself as its president. He did muster a party of men, but was arrested and tried for treason. Chief Justice Marshall directed his acquittal—greatly to the disappointment of Jefferson and his friends.

Other outstanding events of Jefferson's administration were: the act preventing the importation of slaves after 1807; the construction of the National Road from Cumberland, Md. to Ohio; the admission to the Union in 1803 of Ohio, the 17th state. And in 1807 Fulton's steamboat made its first successful trips—the forerunner of modern steam navigation.

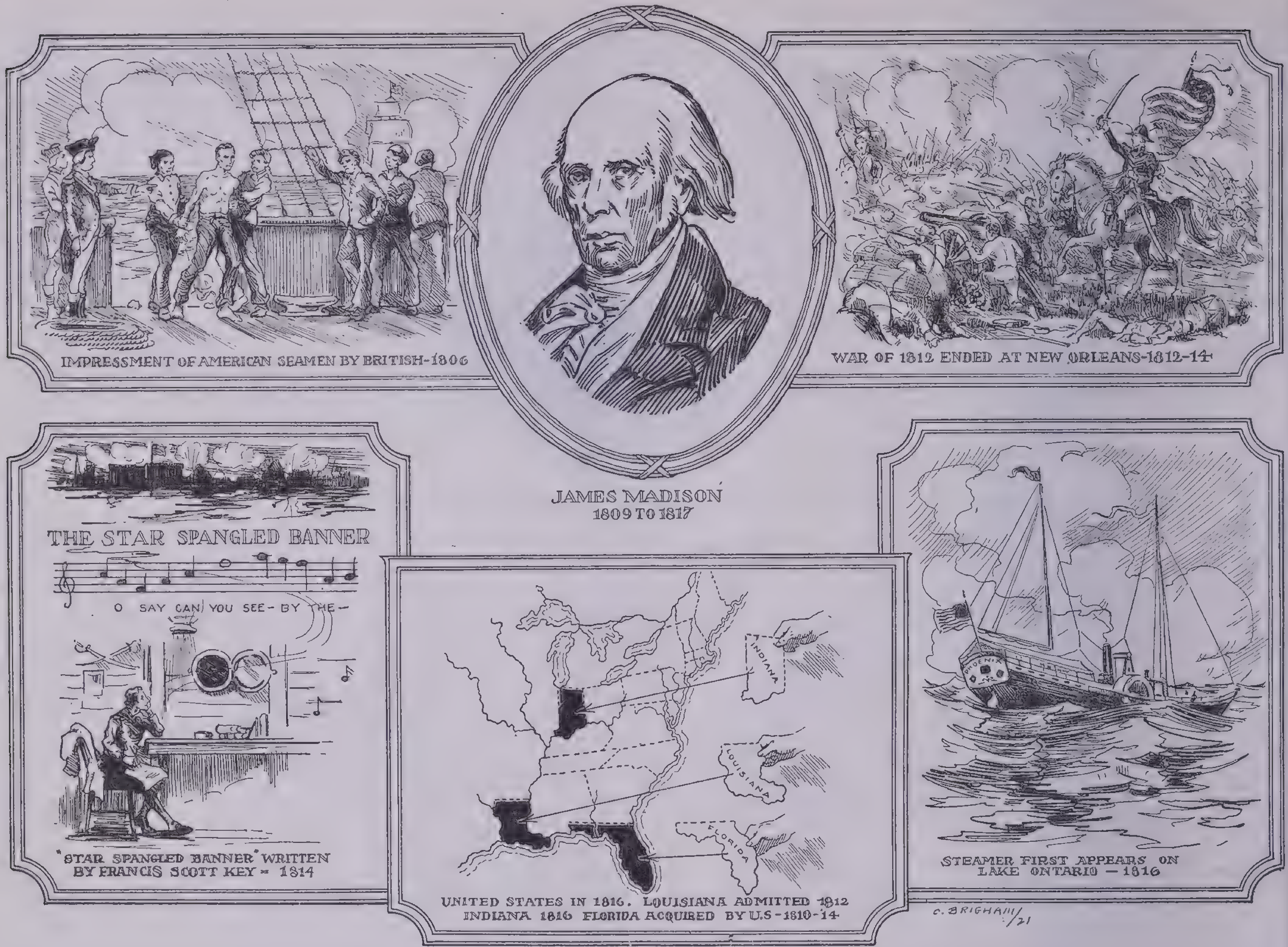
Having served two terms, Jefferson followed the example of Washington and refused to accept a third. The election of 1808 resulted in the choice of James Madison of Virginia as President and George Clinton of New York as Vice-President.

James Madison—1809-1817

James Madison, the fourth President, stepped into a hornet's nest of trouble. American grievances against England increased. English impressment of American seamen continued. The western frontier accused the British of stirring up Indian warfare against them. The French and English blockades were still in effect. The Nonintercourse Act of 1809 was repealed and replaced by Macon's Bill No. 2 (1810) which gave the President power to renew nonintercourse against one belligerent the minute the other lifted its restrictions against American shipping. Napoleon was quick to take advantage of this and led Madison to believe France had withdrawn her decrees against neutral vessels. Hence nonintercourse was maintained the more strictly against England and against England only.

Relations grew more and more tense. The Republican party was all for war with England, insensible of the fact that America was not prepared for war against a nation which was prepared. The President was for keeping the peace. But the war party grew and war psychology prevailed under the eloquence of the popular young "war hawks," Henry Clay of Kentucky and John C. Calhoun of South Carolina. On June 1, 1812, Madison was persuaded to ask Congress to declare war, on the grounds of impressment, the blockade and British incitement of Indian wars. War was declared June 18, 1812.

War of 1812.—The War of 1812 was a sorry story from the start. Like the boastful little tailor who claimed to kill twenty at a blow, the Americans expected to take Canada with one run and a dash. Instead, the first move



IMPRESSMENT OF AMERICAN SEAMEN BY BRITISH-1806

JAMES MADISON
1809 TO 1817

WAR OF 1812 ENDED AT NEW ORLEANS-1812-14

THE STAR SPANGLED BANNER

"STAR SPANGLED BANNER" WRITTEN BY FRANCIS SCOTT KEY - 1814

UNITED STATES IN 1816. LOUISIANA ADMITTED 1812 INDIANA 1816 FLORIDA ACQUIRED BY U.S-1810-14

STEAMER FIRST APPEARS ON LAKE ONTARIO - 1816

was inglorious defeat. Gen. William Hull undertook the advance into Canada with 2,000 men, August 1812. Forced back by Gen. Isaac Brock and a handful of British and Indians, he gave up Detroit and with it all Michigan Territory. In October Van Rensselaer and Smyth made another spectacular failure to invade Canada at Queenstown on the Niagara River.

1813.—January 1813 saw Winchester's defeat at Raisin River by the British General Proctor and the terrible massacre of abandoned wounded by the Indians. The Americans took York (now Toronto) in May, but failed at Montreal. The bright spots of 1813 were Harrison's victory over Proctor at Thames River and the retaking of Detroit, which definitely broke the British hold in Michigan Territory. Already in September Lieutenant Oliver Hazard Perry had beaten the British fleet on Lake Erie and cleared the British out of that region.

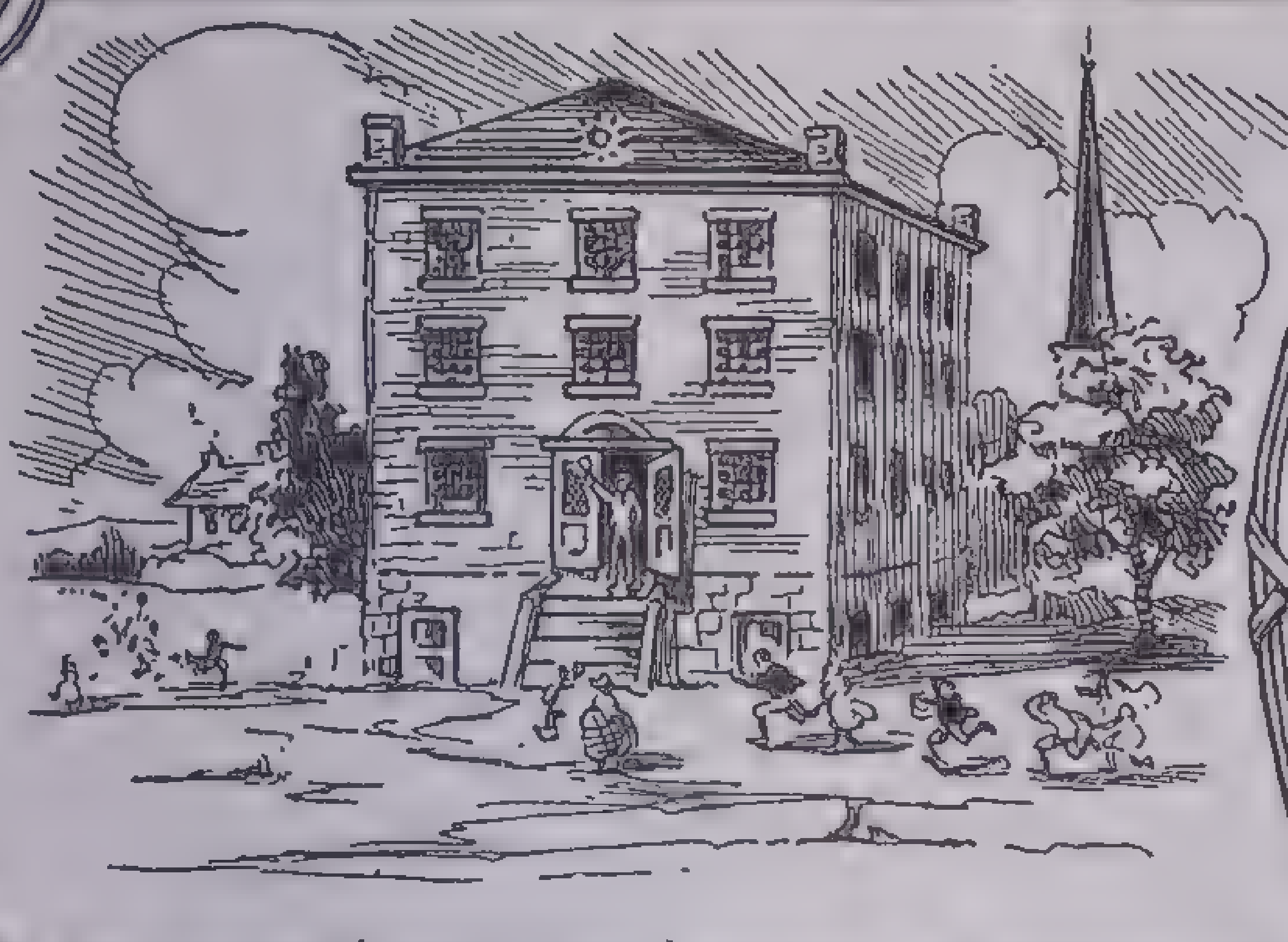
At Sea.—America's naval prowess during the war surprised the enemy and herself. Her privateers captured some 300 British vessels; and her navy at every turn in seamanship and battle-tactics outmaneuvered the British fleet. In 1812 the frigate *Constitution* took the British *Guerriere* and added the legend of "Old Ironsides" to American lore. The *Wasp* took the *Frolic;* the *United States* took the *Macedonian;* the *Constitution* took the *Java.* In 1812 the *Hornet* took the *Peacock,* and the *Enterprise* captured the *Boxer.* But the *Chesapeake* fell to the British *Shannon.* In March 1814 the *Essex* was captured by two British ships, the *Phoebe* and *Cherib;* and the *Wasp* sank the British *Avon* in April.

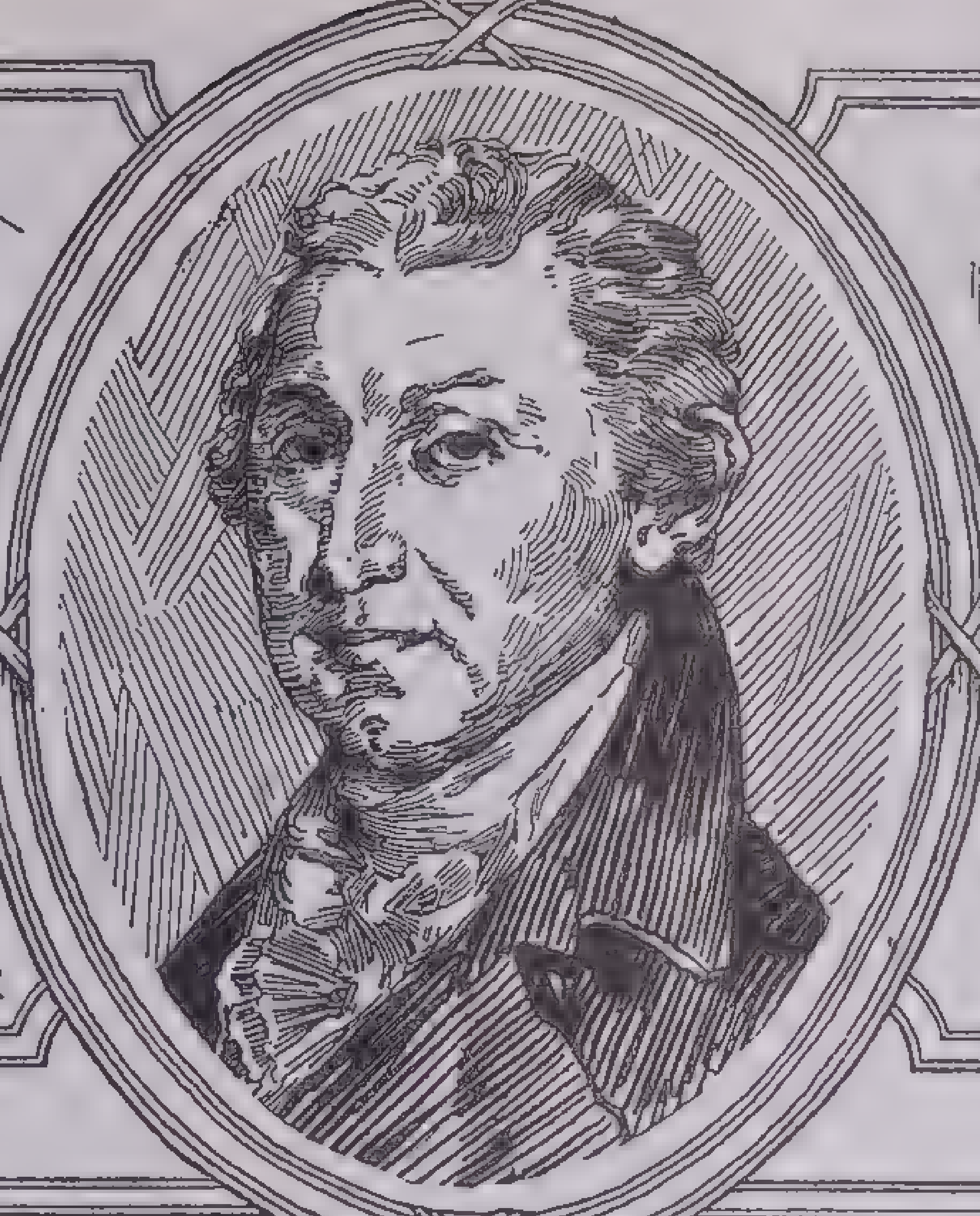
1814.—The new year found Jacob Brown and Winfield Scott in command of the inland armies and American fortunes began to look up. Brown defeated the British at Chippewa, Ontario, on July 5. Brown and Scott together met the enemy at Lundy's Lane, Ontario, in a hard battle that was neither victory nor defeat. In August the British fleet sailed up the Chesapeake and landed General Ross and 4,000 soldiers to march against the capital. They easily took Washington and burned the Federal buildings. But they could not take Baltimore in September either by land or sea; and this American victory (September 12), the occasion for writing our national song, "The Star-spangled Banner," gave England the idea that the war would be forever see-sawing between indeterminate gain and futile loss. In the same month, on the 11th, Macdonough on Lake Champlain saved Plattsburg from a British land and naval attack and added to the growing impression in England that nothing was to be gained by continued warfare.

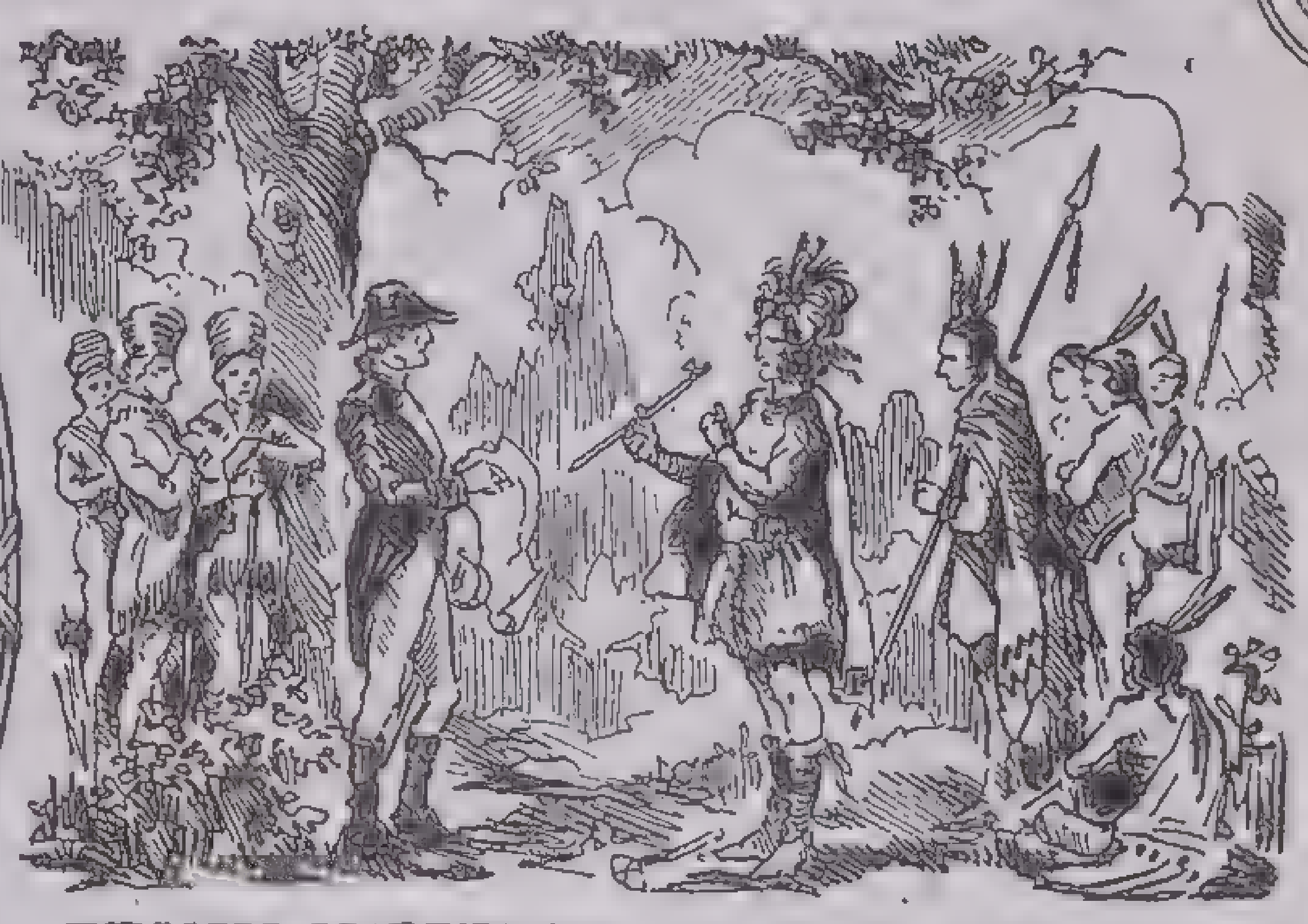
America was only too ready to end the war. Things were looking very bad: the government had no money; the English had more men (released by the end of the Napoleonic war); and New England was threatening to withdraw from the Union to save her own shipping. Already Connecticut had withdrawn her troops; Vermont kept hers in Vermont; the Federal loan got no support in New England. The Hartford Convention (all New England delegates) met on December 15, 1814, to repudiate "Mr. Madison's War" and to consider a separate peace with England.

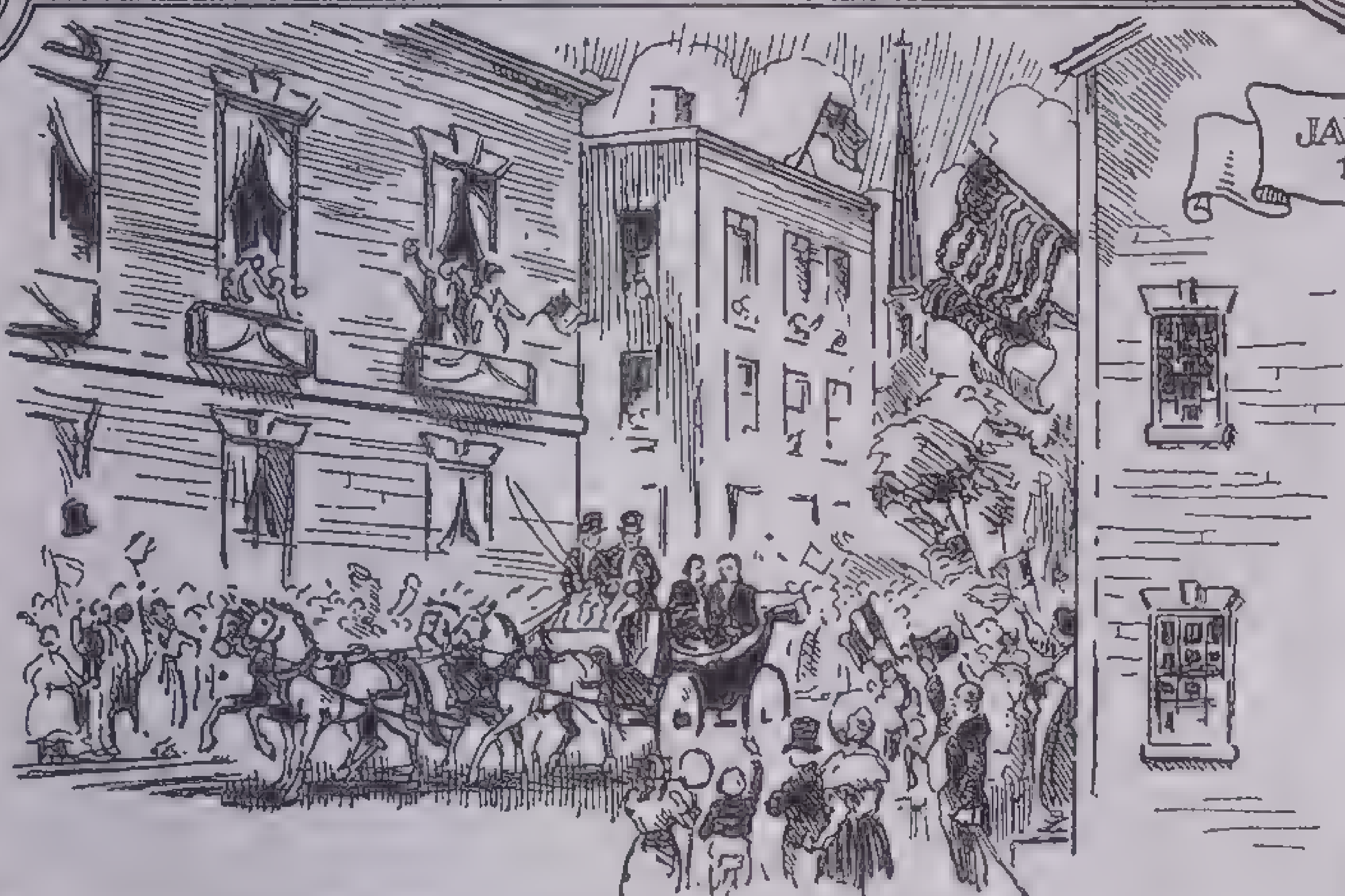
The Treaty of Ghent was signed December 24, 1814; but the news of peace did not reach either side before the British had landed at New Orleans with 10,000 men, to be decisively driven back by Andrew Jackson with 5,000. Peace and victory came together.

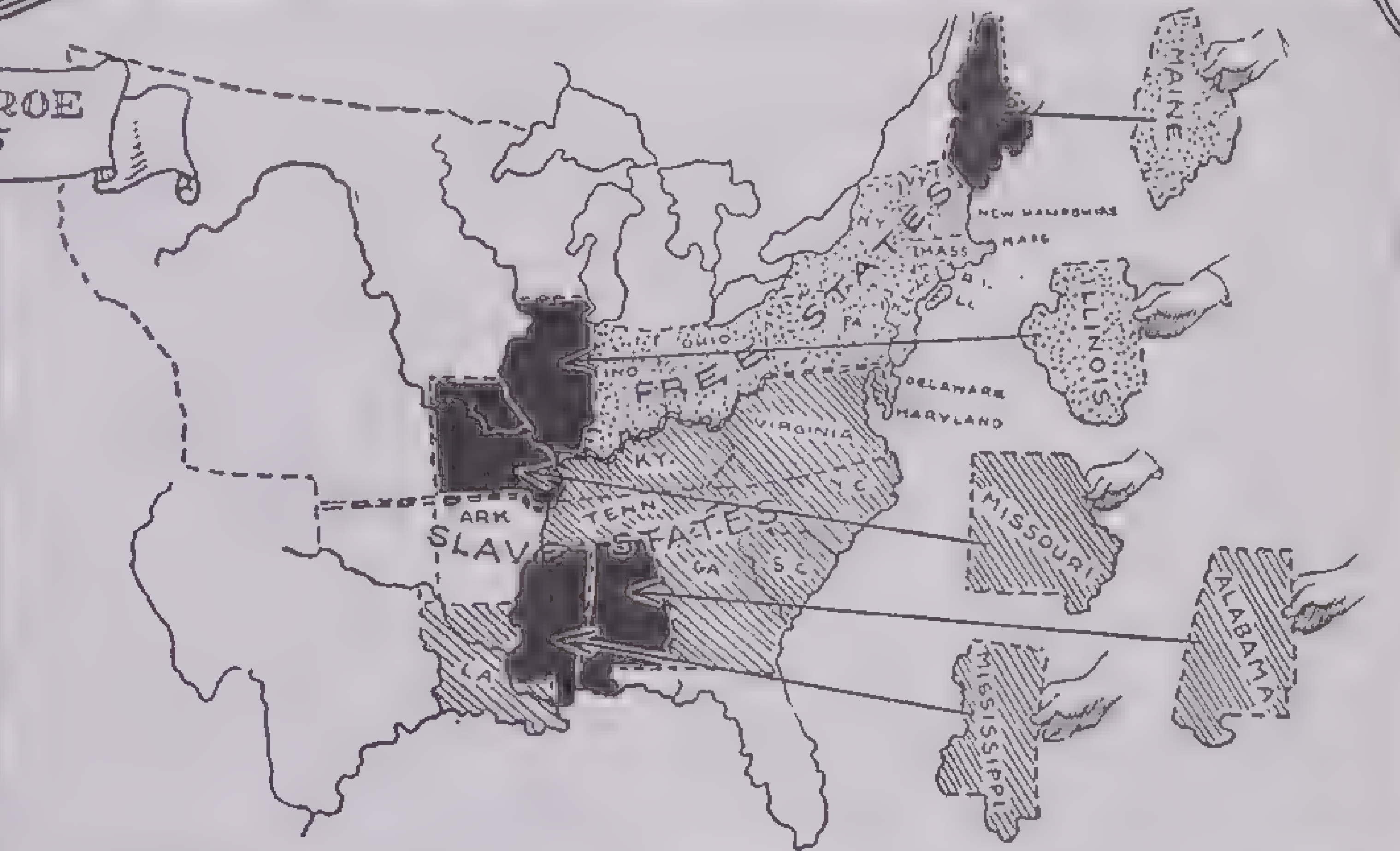
Post-War Events.—The war was over. The Union was saved, the West was free for unlimited expansion. America took her place at last as a full-fledged nation among nations. The new sense of unity and national selfhood bore fruit in the chartering of a second national bank (1816), the building of new national fortifications, roads and canals, and the laying of a stiff new tariff to protect American manufactories. Louisiana was admitted as a state in 1812, Indiana in 1816.


HIGH SCHOOL (FIRST PUBLIC) OPENED IN BOSTON—1821

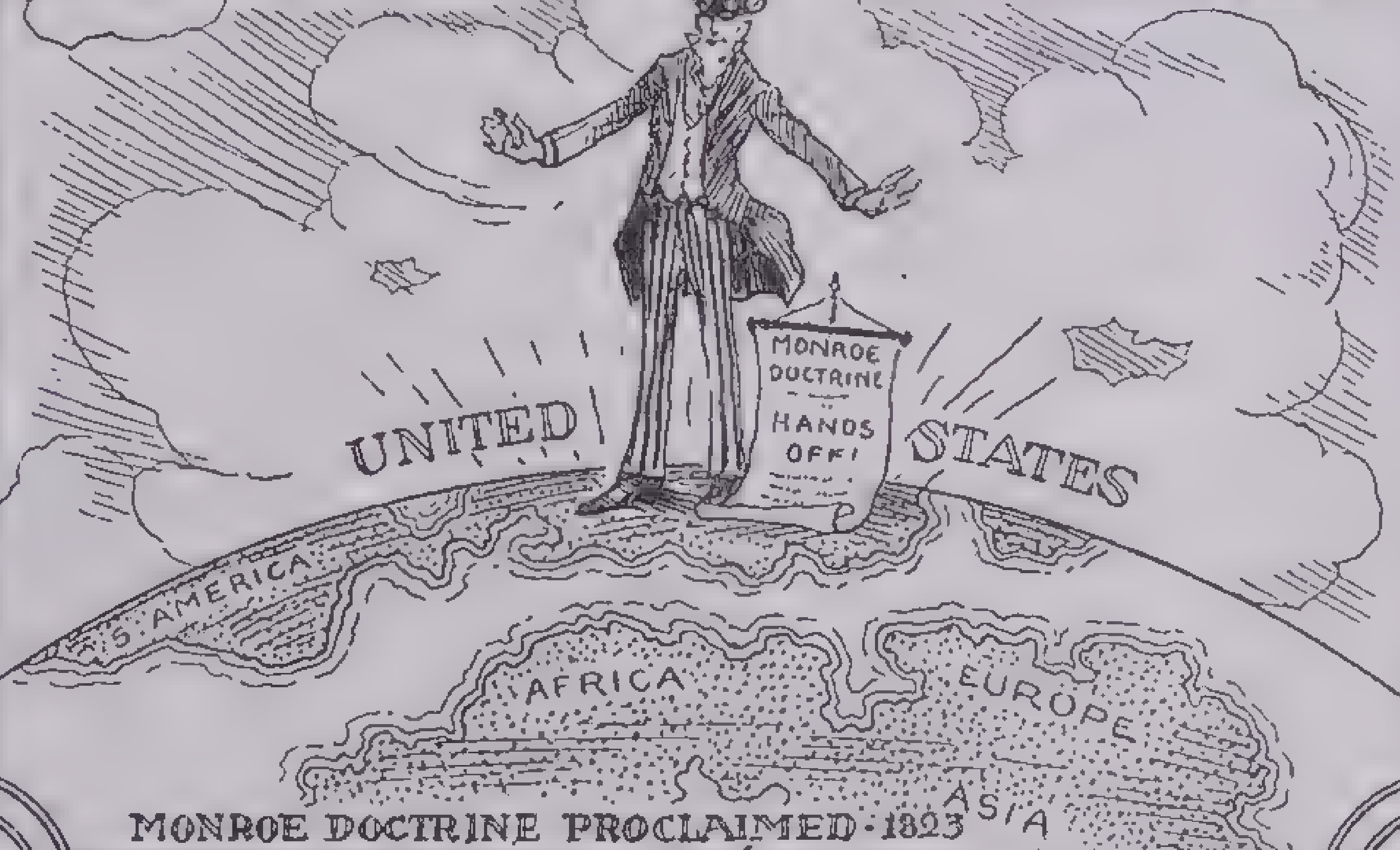

JAMES MONROE
1817 TO 1825


INDIANS NORTHWEST OF OHIO AGREE TO TREATY WITH U. S.—1818


LAFAYETTE VISITS UNITED STATES—1824



UNITED STATES IN 1820 ∴ MISSOURI COMPROMISE FIXES BOUNDARY BETWEEN SLAVE AND FREE STATES ∴ NEW STATES ADMITTED—MISSISSIPPI 1817; ILLINOIS—1818; ALABAMA—1819; MAINE—1820, MISSOURI—1821



MONROE DOCTRINE PROCLAIMED—1823

The Federalists had faded into oblivion. There were no sharp party differences. The country was of one mind and elected James Monroe fifth President of the United States with almost the unanimity that had marked the choice of Washington.

James Monroe—1817-1825

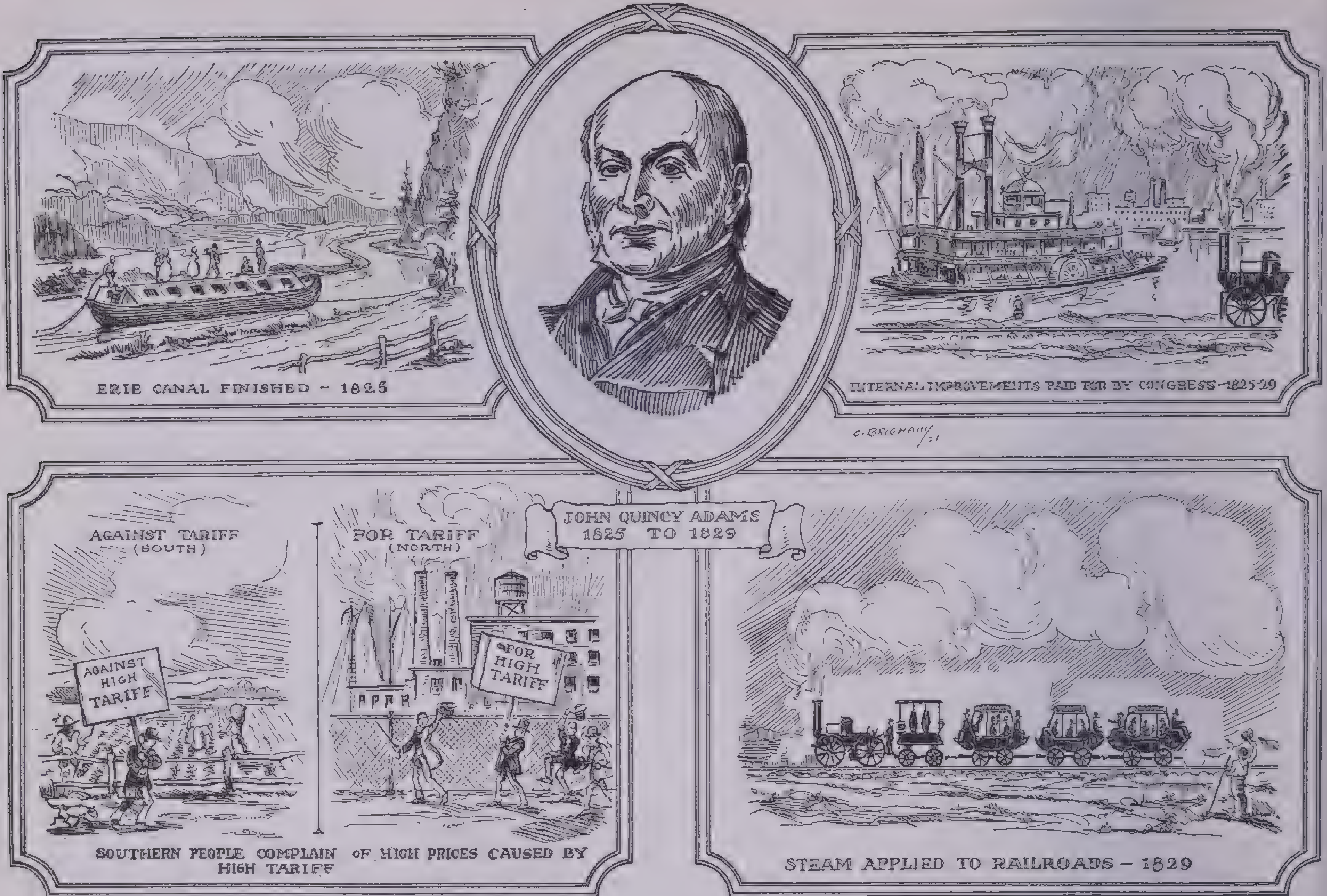
The manifest oneness of the people in their purpose to uphold and build a nation has caused Monroe's administration to be called the Era of Good Feeling. An unbroken line of settlers marched west to fill up and organize the rich lands of the Louisiana Purchase. Five states came into the Union, four of them the result of this westward movement: Mississippi (1817), Illinois (1818), Alabama (1819), Maine (1820), Missouri (1821). Steamboats plying up and down the rivers were the only highly developed means of communication and transport. But roads were built and the Erie Canal (1825) from Lake Erie to New York helped knit together inland producers and seaboard markets. Andrew Jackson put a stop to the plundering raids of the Seminole Indians into Georgia. He went into Florida and took their towns and let his vengeance fall also on both Spanish and British troublemakers. Florida was bought from Spain for $5,000,000 in 1819.

Missouri Compromise.—In 1818 Missouri applied for admission to the Union as a state, and brought up for the first time slavery as a national problem. Missouri had been settled by people from the south who expected it to become a slave state. The House of Representatives put an amendment to her bill of application prohibiting the importation of more slaves and providing for the freeing of those born in the state. But the Senate would have none of this amendment. The country suddenly was divided between slave-holder and abolitionist; and the chasm of bitterness between their thinking was deep and sharp.

So far slave state and free state had been evenly represented in the Senate. When Maine was admitted in 1820 as a free state, it was seen that Missouri could come in as a slave state without endangering the balance of the Senate vote. So Missouri was admitted to the Union (1821) under the Missouri Compromise, which allowed it to come into the Union as a slave state but prohibited slavery elsewhere north of the 36°30′ line (boundary of Missouri).

The Monroe Doctrine.—The Holy Alliance, a union of European nations ostensibly formed to preserve the peace of the Continent after the downfall of Napoleon, but actually aiming to preserve the old monarchical orders against the rising tide of republicanism, began to fear for the Spanish and Portuguese colonies in South America. One by one these little states were declaring their independence, and Europe was ready to use force to hold them in subjection. England proposed to the United States that the two join to prevent Spain, Portugal or France from annexing territory on this side of the Atlantic. In 1823 President Monroe, in his annual message to Congress, enunciated the famous doctrine which has since borne his name, warning European nations against any attempt at territorial expansion in the New World. "Hands off" was the gist of it. Colonization or intervention in either of the Americas on the part of Europe would be looked upon by the United States as "an unfriendly disposition toward the United States." Though this document has never in history been embodied in the actual law of the land, it is absolutely part and parcel of the national mind and national practice to this day.

Election of 1824.—There were no party issues in the election of 1824. Four


ERIE CANAL FINISHED – 1825
INTERNAL IMPROVEMENTS PAID FOR BY CONGRESS–1825-29
C. BRIGHAM '31
JOHN QUINCY ADAMS 1825 TO 1829
AGAINST TARIFF (SOUTH)
FOR TARIFF (NORTH)
AGAINST HIGH TARIFF
FOR HIGH TARIFF
SOUTHERN PEOPLE COMPLAIN OF HIGH PRICES CAUSED BY HIGH TARIFF
STEAM APPLIED TO RAILROADS – 1829

men ran for President: John Quincy Adams, Henry Clay, William H. Crawford, Andrew Jackson—all Republicans. The differences were personal differences, and the country lined up behind its "men" with no party consciousness. Adams was supported by the commercial interests of the East, Clay by the commercial interests of the West, and the leanings of both were to nationalism. Crawford represented the South and all it stood for—pure democrat without the label. Jackson, of the people and for the people, was eventually to be elected by the people, but not yet. No one of the four received a majority vote and the election was thrown into the House of Representatives, where John Quincy Adams was chosen President. Calhoun was almost unanimously elected Vice-President.

John Quincy Adams—1825-1829

The election of John Quincy Adams brought to the Presidency a man whose father had also occupied the chair. He was the son of John Adams, and like him, was destined to a single term. Soon after his inauguration party differences became marked. Andrew Jackson's following charged that Adams had been elected in the House of Representatives through a corrupt bargain between Adams and Clay. The party which had been called Republican or Republican-Democrat now became the Democratic party with Jackson as its leader. In opposition the National Republican party was formed, with Clay at its head. It became the Whig party in 1832.

The hands of John Quincy Adams were pretty well tied, for the Jackson faction thwarted the administration at every turn.

New England was rapidly becoming a manufacturing center, and a high tariff was needed to protect American industry against the cheaper products of Europe. Such a law was passed in 1828 by Adams' efforts. At once opposition developed in the South, where there was little manufacturing and no demand for protective tariffs. South Carolina opposed it as a "sectional benefit" and asserted her right to nullify the tariff law within her own domain. The rest of the South took up the cry, and nullification was very soon again to become a vital issue.

In 1828 Adams received 73 electoral votes. Jackson was brought in with 178. John C. Calhoun was again elected Vice-President.

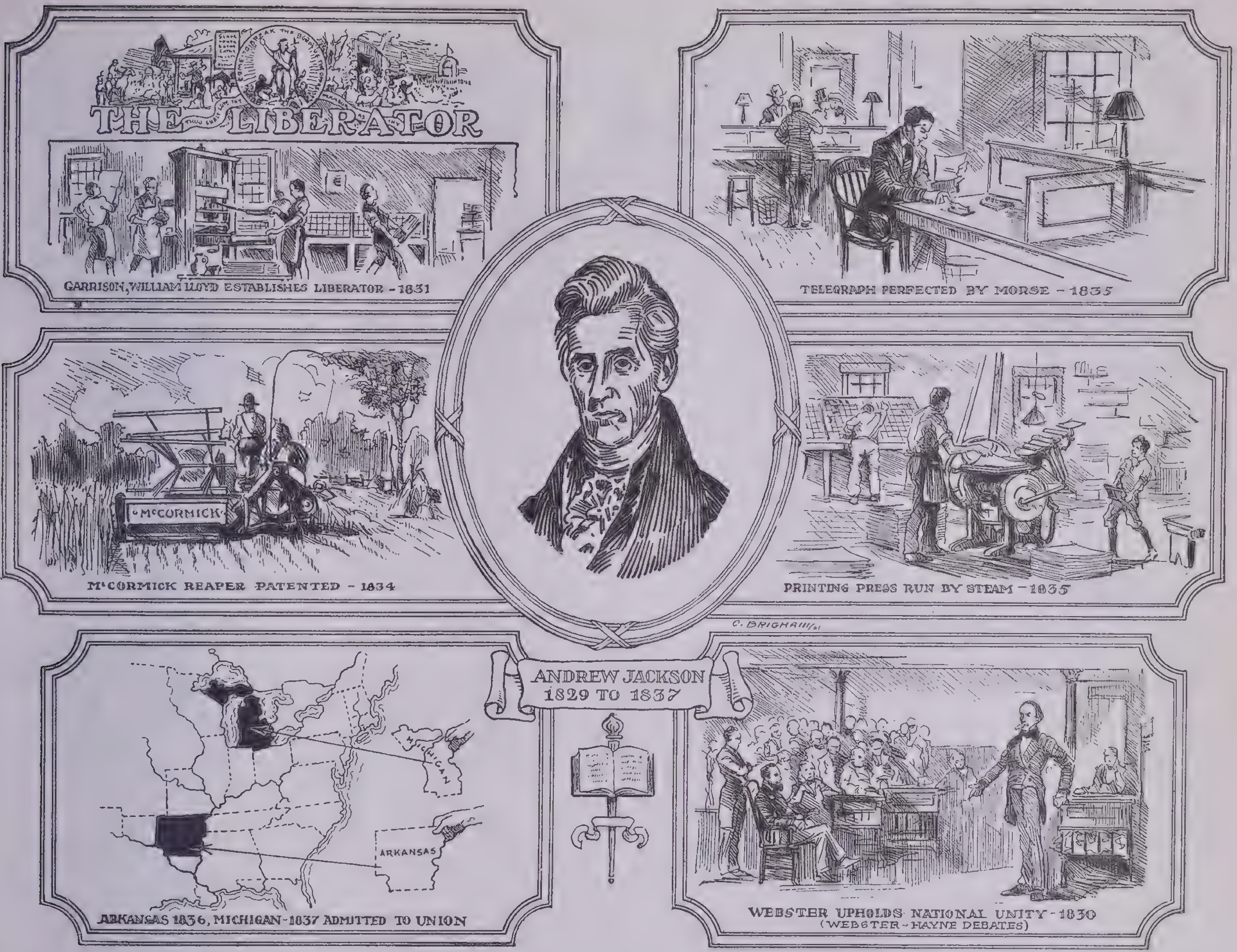
Andrew Jackson—1829-1837

With Andrew Jackson began a new era in American history. He was the idol of the frontier West with its intense individualism and red-blooded democracy; and his figure was the center of the most sweeping change toward a *people's* government that America had yet seen. All corners of the land were heard from and listened to; sectional interests, prejudices, antagonisms took form in definite political parties.

The Spoils System.—It was Jefferson who complained of government officials that "few die and none resign" and forthwith replaced John Adams' last-minute appointees with men to his own liking.

President John Quincy Adams had made no removals for partisan purposes, not even of his avowed enemies. But the conflict between Adams and Jackson had been so bitter that Jackson came into office feeling that friends were essential. "To the victor belong the spoils" had already been the practice in New York and Pennsylvania state politics; and Jackson proceeded to act upon the same principle. He removed 121 officeholders for partisan reasons the first year; and ignoring the severe censure of his enemies, in three years removed 919 out of over 10,000 Federal officials, even down to village postmasters. When the Whigs came into office they continued and enlarged the system, which was not checked until the Civil Service Act of 1883.

The Kitchen Cabinet.—Jackson's abilities were those of war not peace. He had a smattering of law, had taken a prominent part in frontier disputes and development, had been a country storekeeper, lawyer, district attorney, judge, congressman and senator before he was thirty-two years old. Jefferson says of him that he never could speak in the Senate "on account of the rashness of his feelings . . . he would choke with rage." As President, Jackson rarely held a Cabinet meeting, but advised with his personal friends, who came to be known as The Kitchen Cabinet.



GARRISON, WILLIAM LLOYD ESTABLISHES LIBERATOR - 1831

TELEGRAPH PERFECTED BY MORSE - 1835

M'CORMICK REAPER PATENTED - 1834

ANDREW JACKSON 1829 TO 1837

PRINTING PRESS RUN BY STEAM - 1835

ARKANSAS 1836, MICHIGAN - 1837 ADMITTED TO UNION

WEBSTER UPHOLDS NATIONAL UNITY - 1830 (WEBSTER - HAYNE DEBATES)

United States Bank.—The United States Bank had been chartered in 1816 for 20 years, chiefly as a depository for government funds. In 1832 Congress voted to renew the charter. Jackson challenged the constitutionality of the bank and vetoed the act when it was passed. Thus the Bank became the great issue in the next election. And when Jackson was returned to office with 219 electoral votes to Clay's 49, he felt that he had indeed executed the will of the people. He ordered all government money removed from the U.S. Bank in 1835 and distributed in state banks throughout the country. The Bank was crippled and failed.

Nullification.—Adams' high tariff act of 1828 had antagonized the South, and still another act in 1832 re-enforcing it added to the load of southern grievance. South Carolina passed a law in November 1832 declaring the tariff null within that state and got ready to keep it null by force of arms if necessary. Jackson was personally opposed to the tariff but would not brook any disruption of the Union. He sent South Carolina a sharp warning that the law would be enforced and backed up the warning with two warships in Charleston Harbor. Conflict seemed imminent until Henry Clay pushed through Congress a compromise tariff that provided for a ten-year stepping down of the duties until none should exceed 20 per cent. This satisfied South Carolina and there was no more talk of nullification.

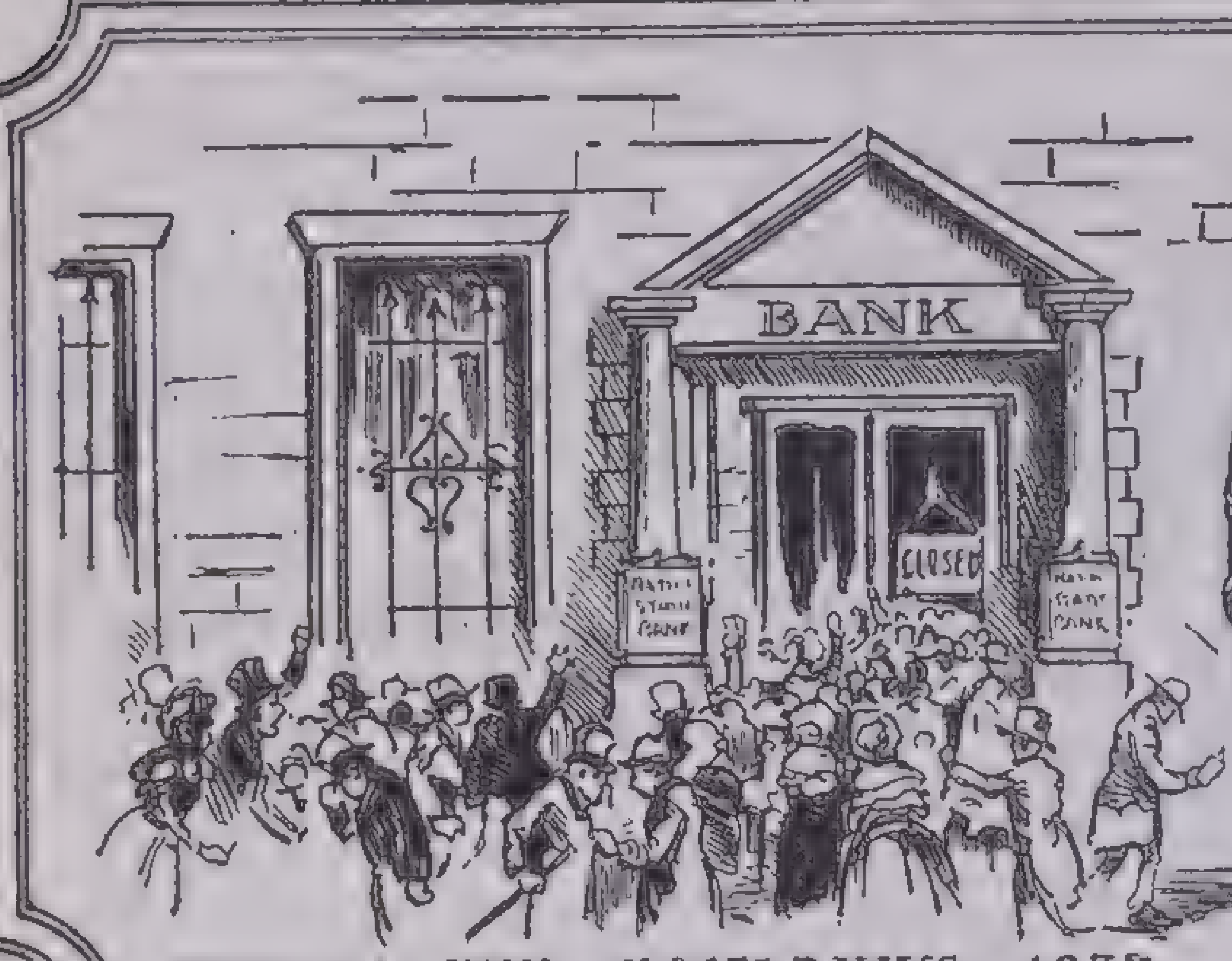
The nullification issue gave rise to that series of great debates in the Senate on state rights, the Constitution and the preservation of the Union, in which Daniel Webster made his stirring *Reply to Hayne,* repudiating "Liberty first and Union afterwards" and exalting "that other sentiment, dear to every true American heart—Liberty *and* Union, now and forever, one and inseparable."

Other Events.—The Cherokee Indians in Georgia protested that the state had unjustly taken their lands, but the Federal government upheld the state on this issue, and the Cherokees were obliged to move west of the Mississippi River. In Illinois Chief Black Hawk was in insurrection against the whites for encroaching on tribal lands (1832). In 1835 the Seminoles in Florida warred against the government and were not put down for several years. In 1831 William Lloyd Garrison gave impetus to the anti-slavery movement by beginning publication of *The Liberator*. In 1834 Cyrus McCormick invented the reaping machine, destined to revolutionize the agricultural world. Samuel F. B. Morse announced the principle of the telegraph and demonstrated its practicability in 1835. The steam locomotive had become a success in England; two locomotives were imported into Pennsylvania in 1829; and when America began to build her own engines in 1830, railroad mileage jumped from three to 23 miles! By 1835 there were 1,098 miles of track in the East, and 2,800 by 1840. In 1833 the steamship *Royal William* crossed the Atlantic in 17 days. Arkansas joined the Union in 1836, Michigan in 1837.

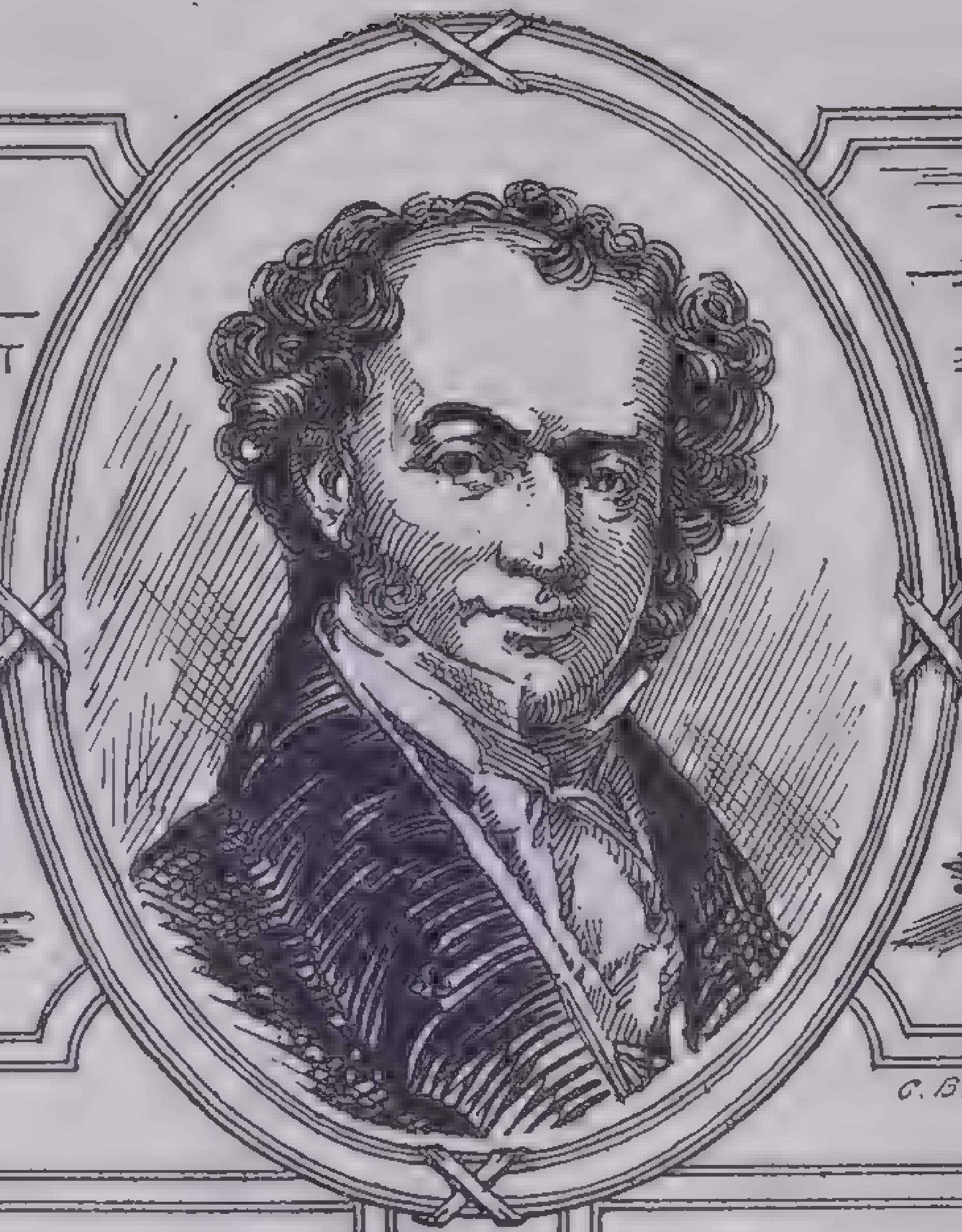
The dynamic and beloved Jackson had established the Democratic party so firmly in power that Martin Van Buren, Jackson's trusted lieutenant and the party's presidential candidate, was chosen by an electoral vote of 170 to 73 for William Henry Harrison in 1836.

Martin Van Buren—1837-1841

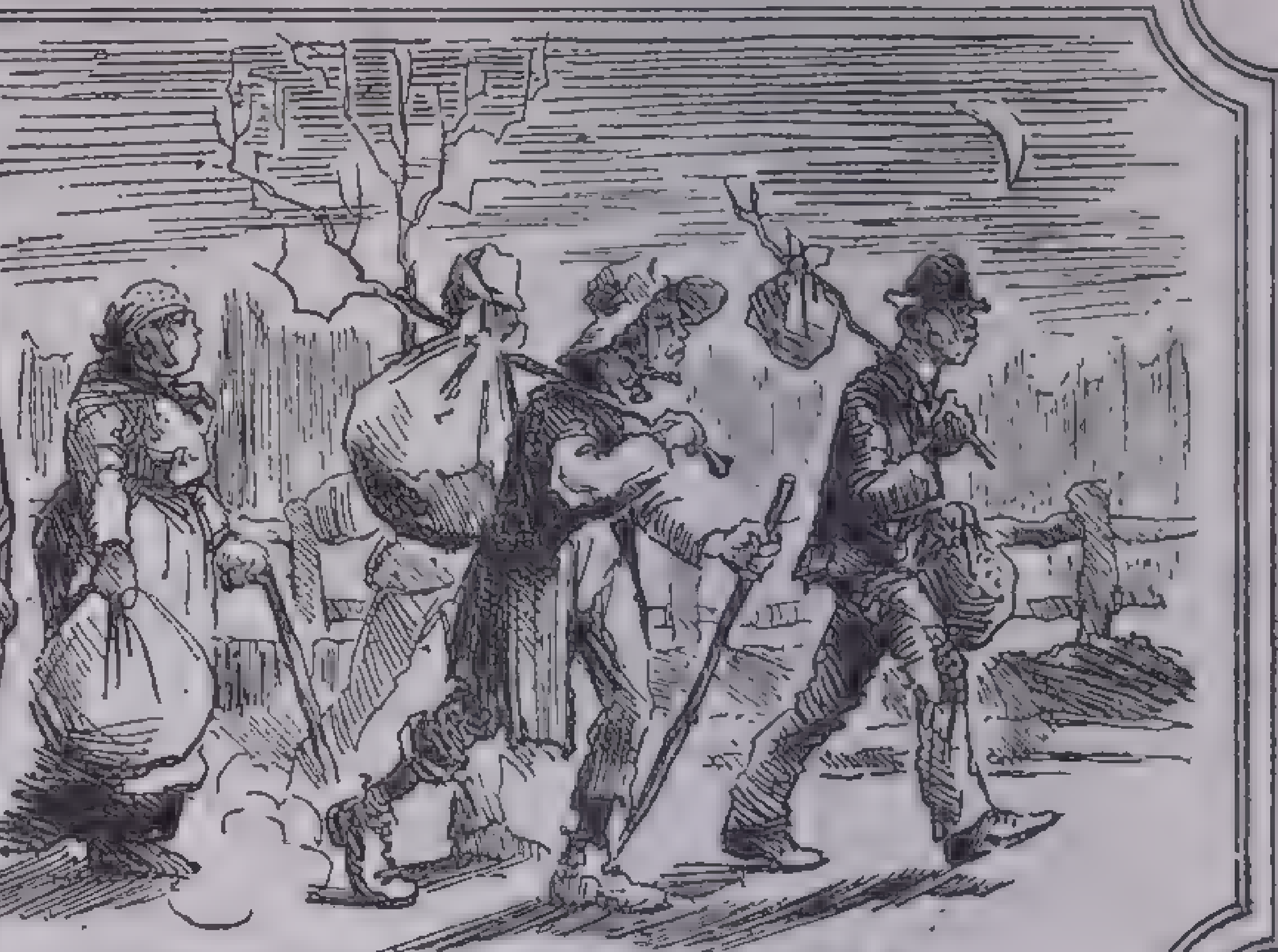
Panic of 1837.—When Jackson had ordered the cessation of deposits of the national funds in the United States Bank, certain other banks were chosen which were called "pet banks." Large amounts of bank notes were put into circulation, fostering speculation, to the extent that soon there was no money for anything. These banks began to issue bills payable in gold and silver without the specie



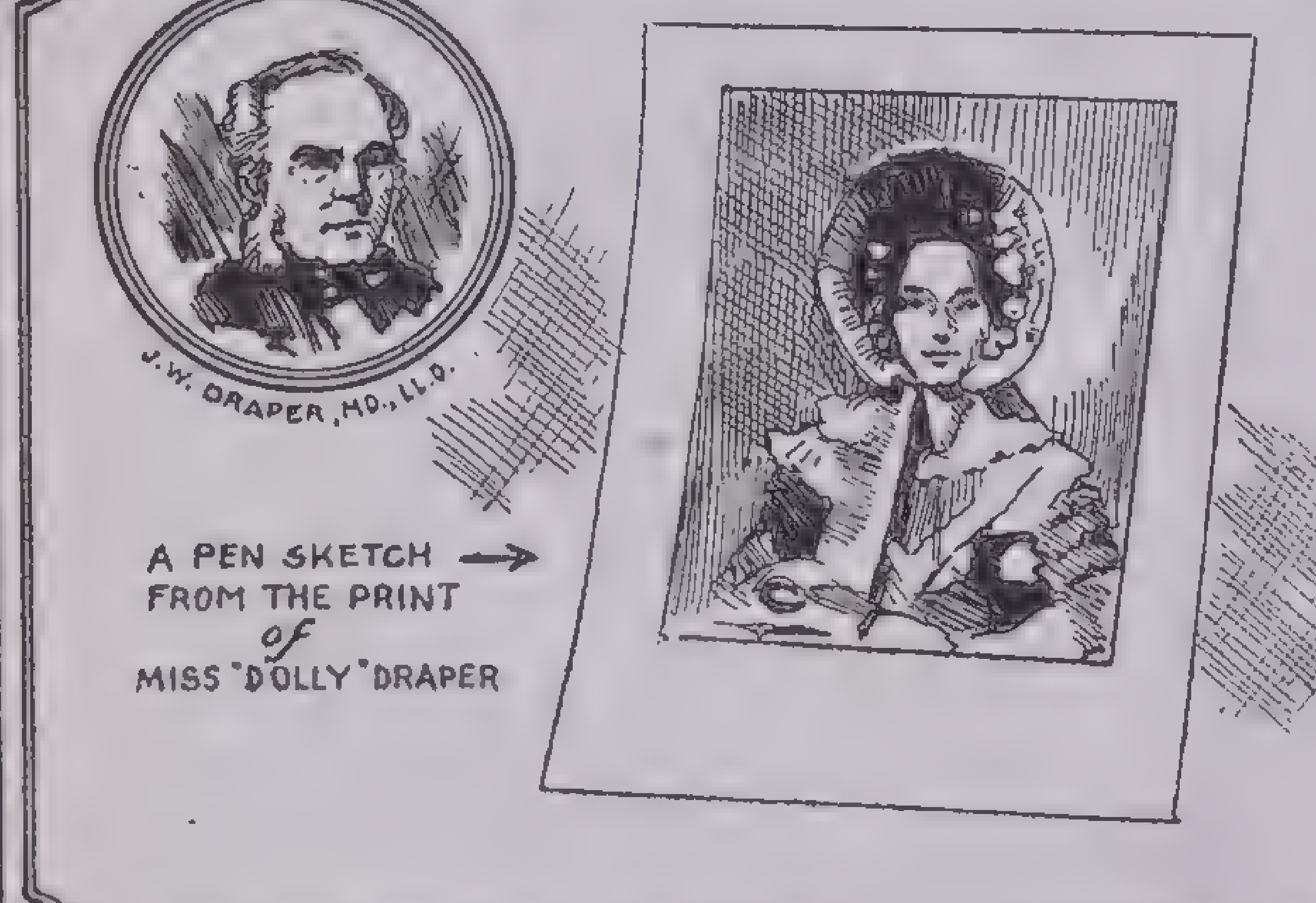
FINANCIAL PANIC CLOSES BANKS - 1837



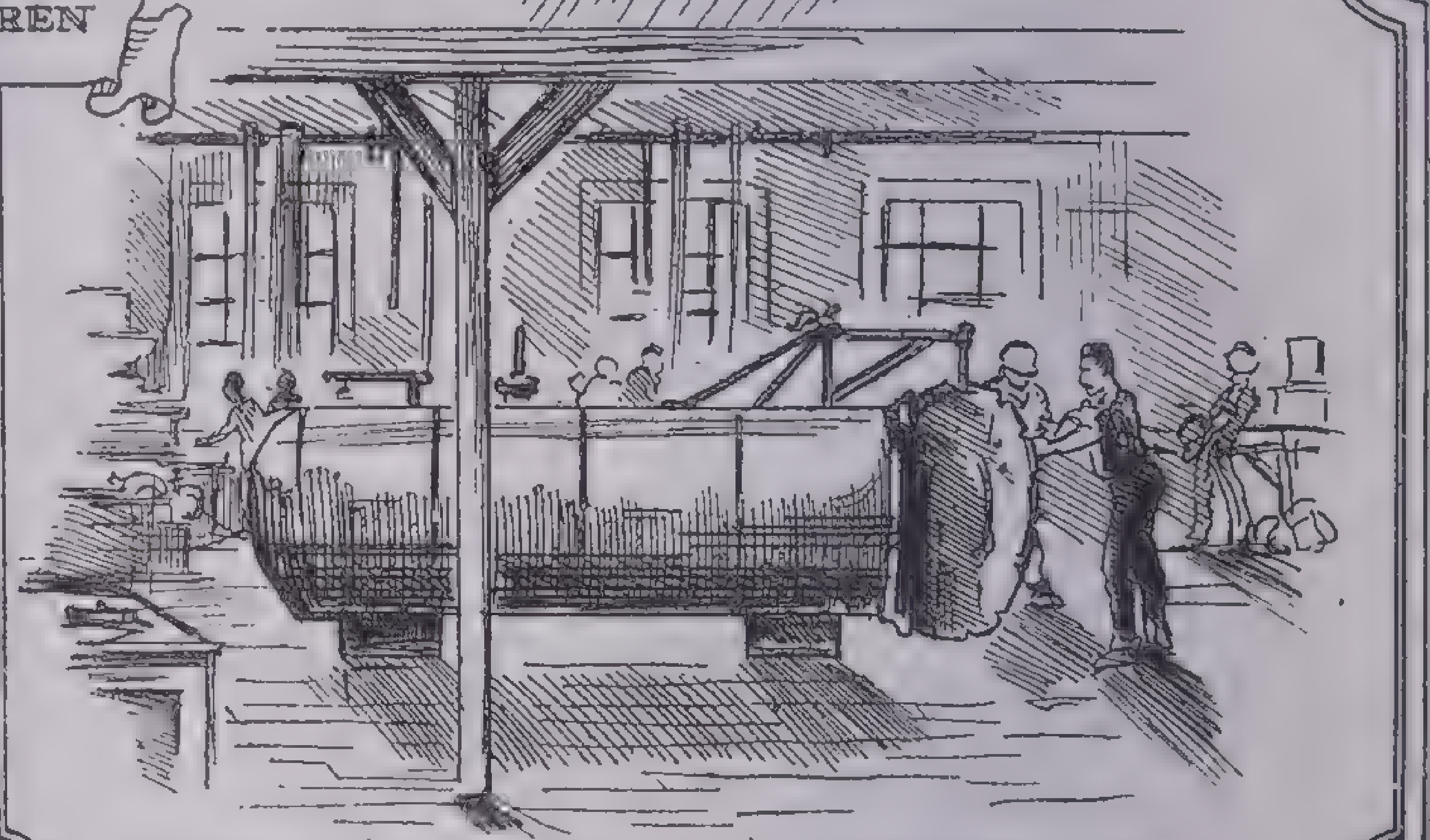
MARTIN VAN BUREN
1837 - 1841



UNDERGROUND RAILWAY - 1838



PHOTOGRAPH FIRST TAKEN FROM LIFE BY DRAPER - 1839



VULCANIZED RUBBER PATENTED BY GOODYEAR - 1839

with which to meet the obligations. Wild-cat banks were formed with little or no capital, and this was the legacy left over from Jackson's reign to the Van Buren administration. Since the greater part of the speculation was in public lands, Jackson's order that agents should receive nothing but gold for land had precipitated the panic which extended to all branches of trade. Everywhere banks failed, and the Treasury was compelled to issue notes to the amount of $10,000,000.

Repudiation (1837).—During the period of speculation states had undertaken the construction of railroads, canals and other public works, issuing bonds on which they could not now even pay the interest. In some cases the money had been squandered, in others plundered. Some states refused to pay their debts, taking refuge behind the clause of the Constitution which forbids a state to be sued by an individual. Later some states paid up, as for example Pennsylvania, but others never did. Since much of this money had been borrowed in Europe, American honor received a deadly blow and American credit fell so low that even the United States government was unable for years afterwards to place a loan in Europe.

Subtreasury Established (1840).—Van Buren, who had run for office on the platform of walking in the footsteps of his illustrious predecessor, hurried to find a way to remedy his mistakes and proposed the Subtreasury System which severed all connection between the government and the banks of issue and allowed the government to do its own banking. Vaults were built and government moneys deposited, to be paid out by government agents under heavy bonds; but this scheme had the disadvantage of holding such money out of circulation, except through payment of salaries and interest and the purchase of its own bonds.

The Abolition Movement (1834-1840).—For some years the Abolition movement to put an end to Negro slavery had been in progress, resulting in riots and sometimes in bloodshed. In 1835 a mob broke up a meeting in Boston and dragged William Lloyd Garrison through the streets with a rope around his body; and in 1837, Elijah P. Lovejoy, another ardent abolitionist, was murdered in front of the office of his own newspaper at Alton, Illinois. Whittier, the poet, lost his books and papers through a mob in Philadelphia, and large rewards were offered in the South for the miscreants who opposed slavery. The feeling grew in depth and power both North and South and was hastening the day of reckoning, which even then seemed to be inevitable. J. Q. Adams had said long before that the Union would ultimately split on the slavery issue.

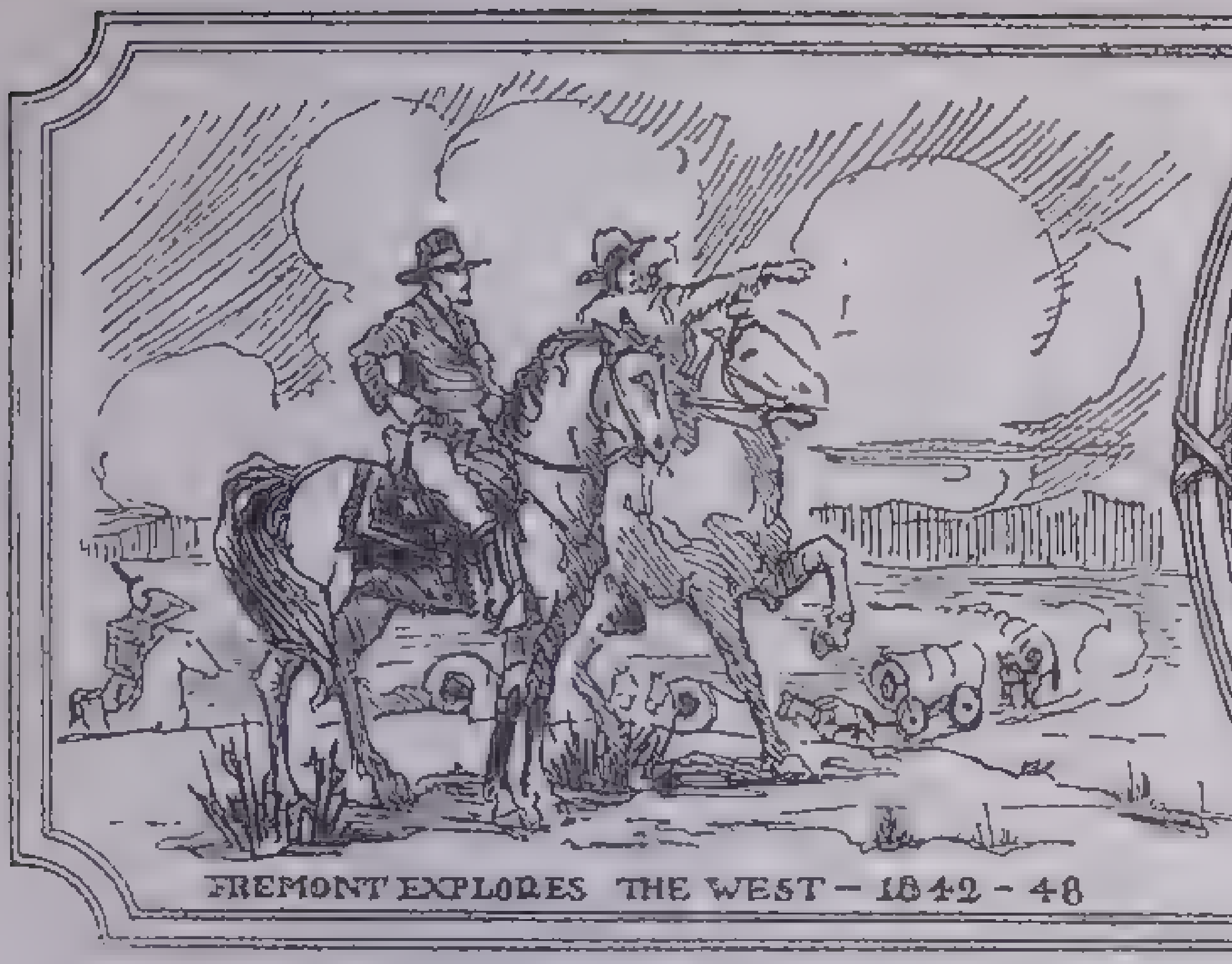
Other Events.—Before the end of Van Buren's term regular steamship routes were established between the United States and Europe—less than 20 years after the first steamboat had made the Atlantic crossing (1819). A new outbreak on the part of the Seminoles occurred in Florida.

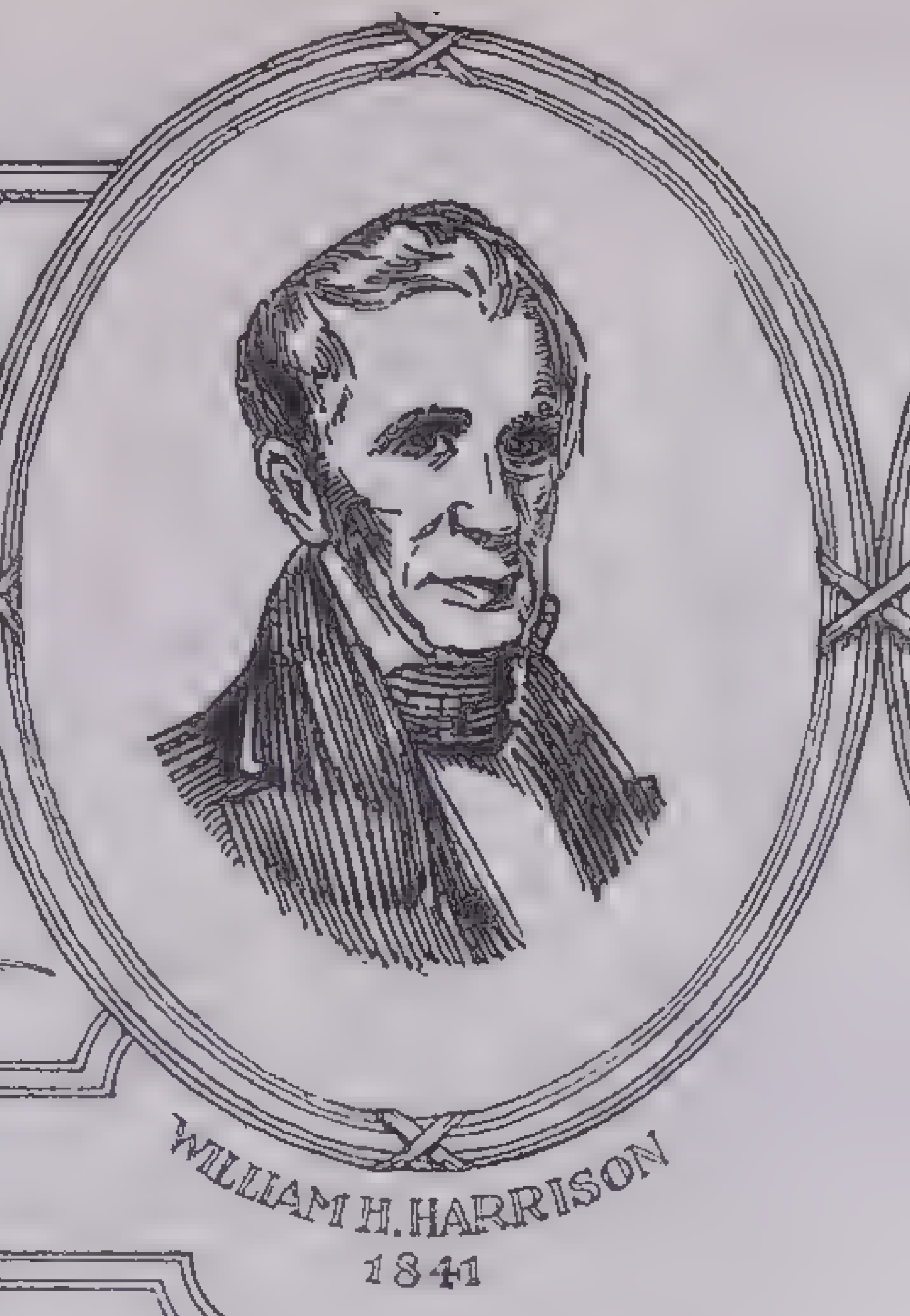
Election of 1840.—Misfortune had marked the greater part of Van Buren's four years as president, and though the Democrats nominated him for a second term, he was easily defeated. The Whigs took advantage of the financial distress of the common people to wreck their already weakening faith in Van Buren's party. Gen. William Henry Harrison, the Whig candidate, loomed up as the man of rude and simple virtue that the masses wanted; and he was elected on the wave of hysteria known as the Log Cabin and Hard Cider Campaign. He received 234 electoral votes to 60 for Van Buren. John Tyler, another Whig, was elected Vice-President.

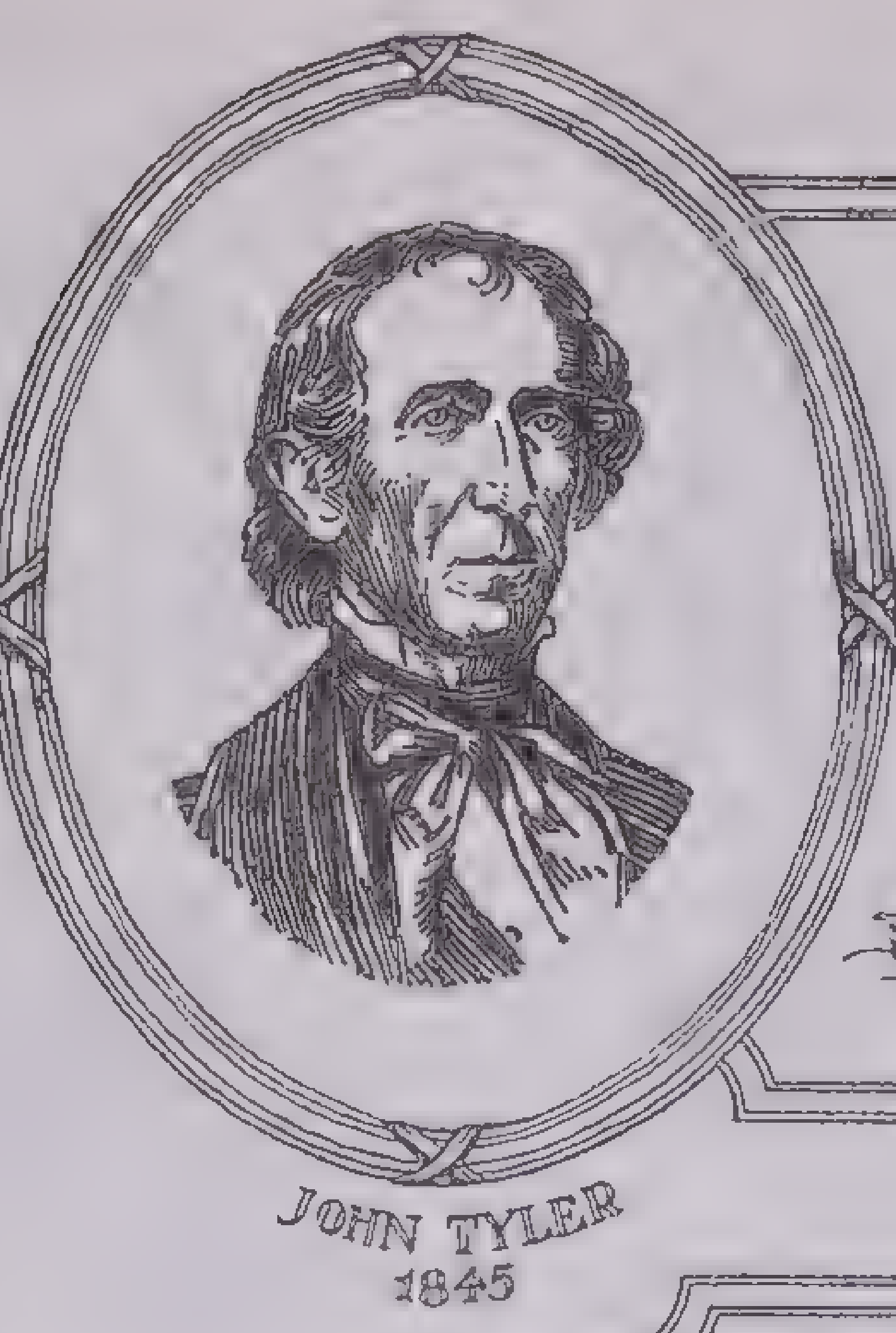
William Henry Harrison—1841

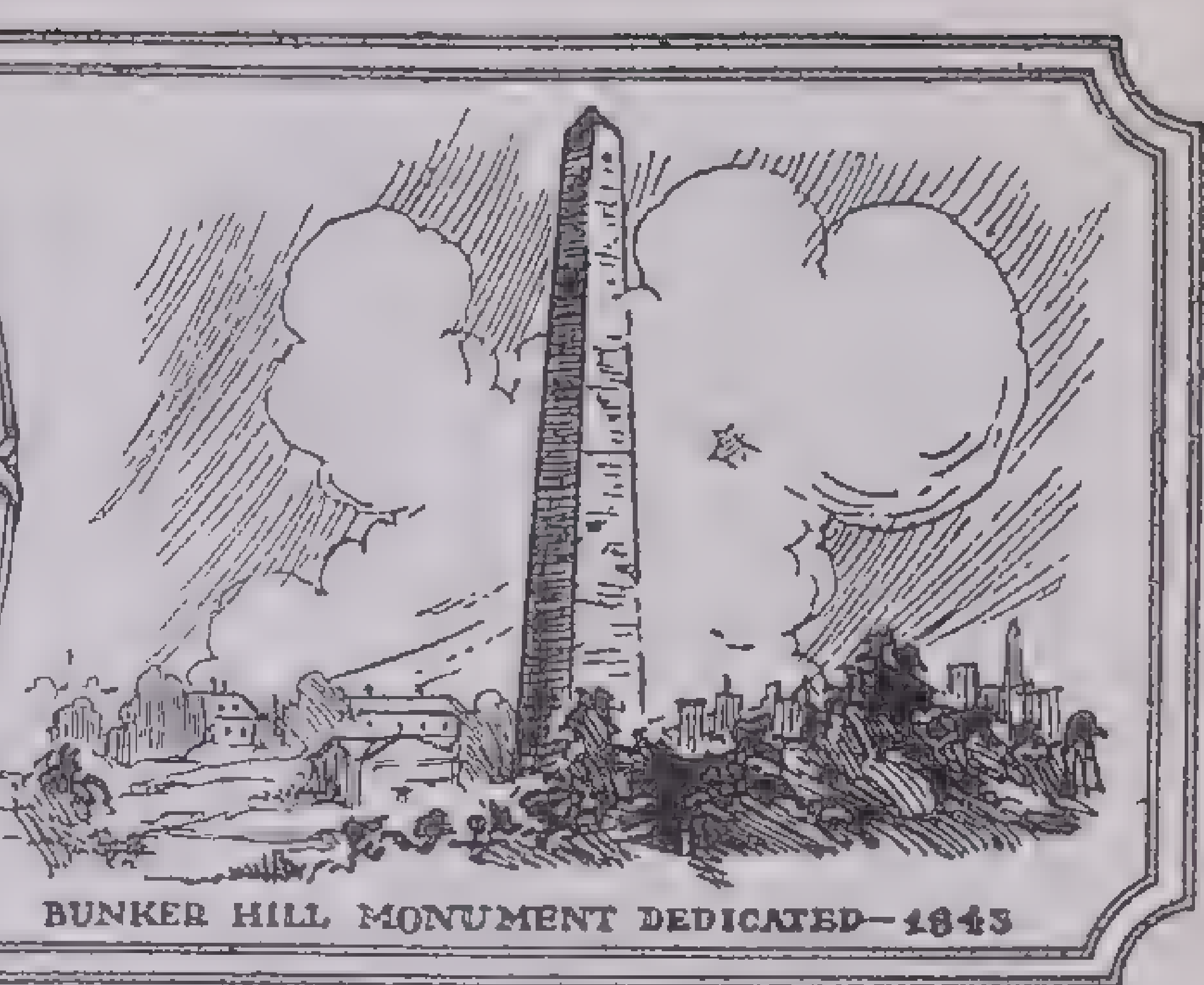
Harrison died one month after his inauguration, having had time to accomplish little except appoint Daniel Webster Secretary of State and call a special session of Congress to plan a way out of the financial distress of the nation.

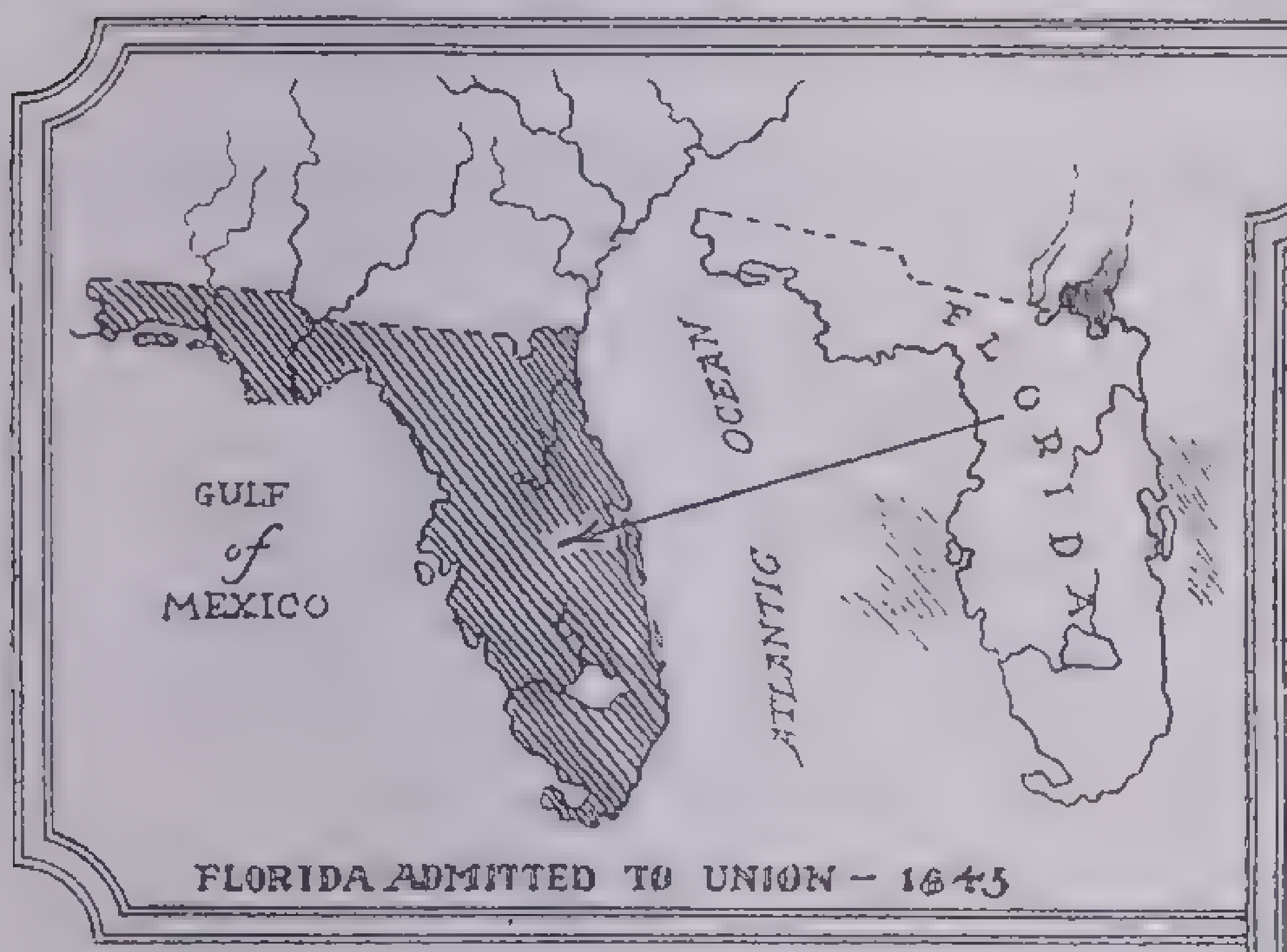
John Tyler—1841-1845.—John Tyler, Vice-President, followed him. He was a Virginian, bred in a democracy that had idolized Jefferson, and at heart a states-rights man, not a nationalist. Harrison's victory at the polls had naturally filled Congress with a Whig majority. But when the two Houses began to legislate for party


FREMONT EXPLORES THE WEST – 1842 – 48

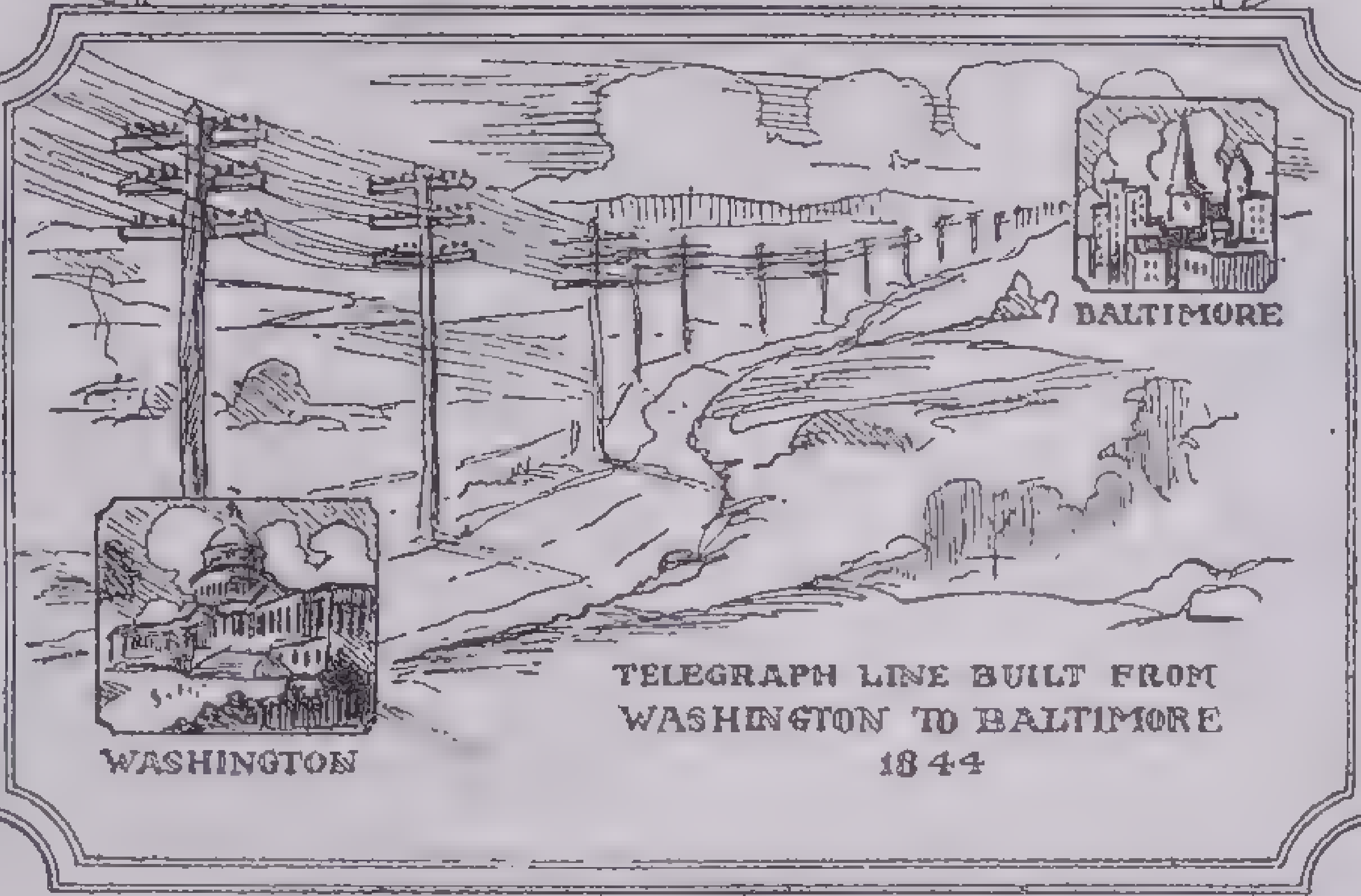

WILLIAM H. HARRISON
1841


JOHN TYLER
1845

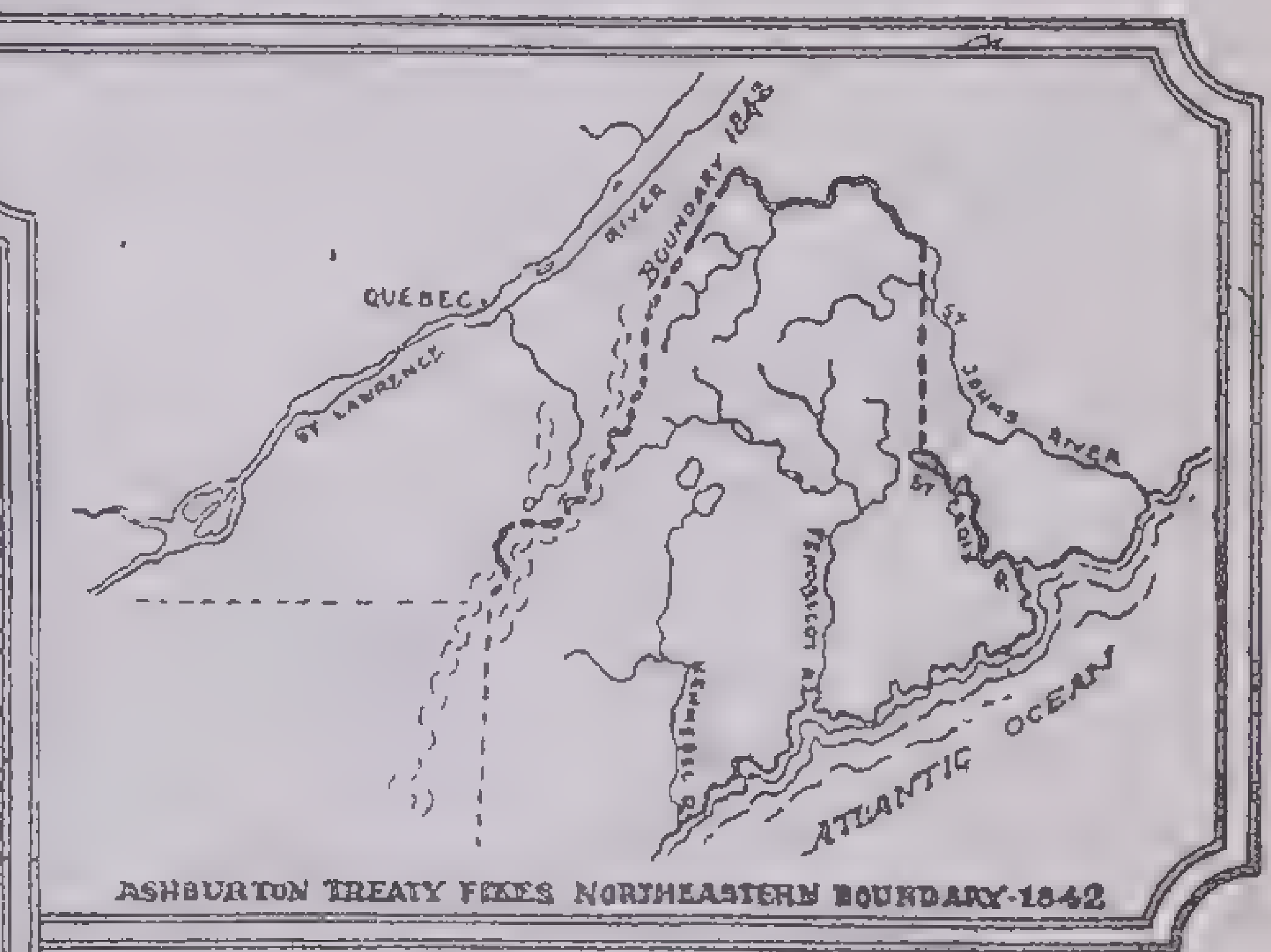

BUNKER HILL MONUMENT DEDICATED—1843



FLORIDA ADMITTED TO UNION – 1845



TELEGRAPH LINE BUILT FROM WASHINGTON TO BALTIMORE 1844



ASHBURTON TREATY FIXES NORTHEASTERN BOUNDARY-1842

policies, they found Tyler not only unsympathetic but against them. How immovably against them was seen when he at once (in August 1841) vetoed the bill providing for a new United States Bank with various state branches. It was unconstitutional, he said, an infringement upon state rights. The bill was rehashed and reworded to meet the President's objections; but he vetoed it again in September. Frustrated and indignant, the whole Whig Cabinet resigned, except Daniel Webster who remained to negotiate the pending treaty with Great Britain. When it had been signed he too walked out of office, and Tyler stood alone—disowned by the Whigs, unclaimed by the Democrats.

Webster-Ashburton Treaty.—The treaty with Great Britain, known as the Webster-Ashburton Treaty was signed in 1842. It fixed the Maine-Canada boundary line and provided for joint suppression of the African slave trade and the handing over of each other's refugee criminals.

Annexation of Texas.—In 1844 the Republic of Texas applied for admission to the Union. As it was largely settled by slave-holding Southerners, the annexation issue brought the slavery question into the full light of day. The South was solid for annexation; the North feared it; Tyler approved it. But the annexation treaty was defeated in the Senate (1844). It became the main issue of the next election, and the Democrats nominated James K. Polk of Tennessee for President on an annexation platform.

But before the new President came in Congress passed another resolution to annex Texas as a state. Tyler approved it just before he went out of office. The provisions of the Missouri Compromise left Texas open to slavery because it was south of the 36°30′ line. Texas became a state in December 1845.

Long-Distance Telegraph.—In 1844 Congress gave S. F. B. Morse an appropriation to set up an electric telegraph line between Baltimore and Washington—the first successful long-distance line in the world.

James Knox Polk—1845-1849

James Knox Polk, the 11th President, came into office with 170 electoral votes to 105 for Henry Clay. Clay might have been elected had not the Liberty Party in New York swung its full strength from Clay to James G. Birney, the anti-slavery candidate. George M. Dallas was elected Vice-President.

Mexican War—1846-1848.—Close on the heels of the annexation of Texas came the Mexican War. Texas claimed the Rio Grande as its southwestern boundary; Mexico claimed the region as far north and east as the Nueces River. In May 1845 General Zachary Taylor was sent with troops to the border, and in July he advanced to the Rio Grande. The Mexicans under General Arista attacked him (April 1846) but Taylor drove them back across the river, and though outnumbered 3 to 1 scored two decisive victories: Palo Alto, May 8, and Resaca de la Palma, May 9. Congress declared war on Mexico, May 13, 1846; Mexico's formal declaration followed, May 23.

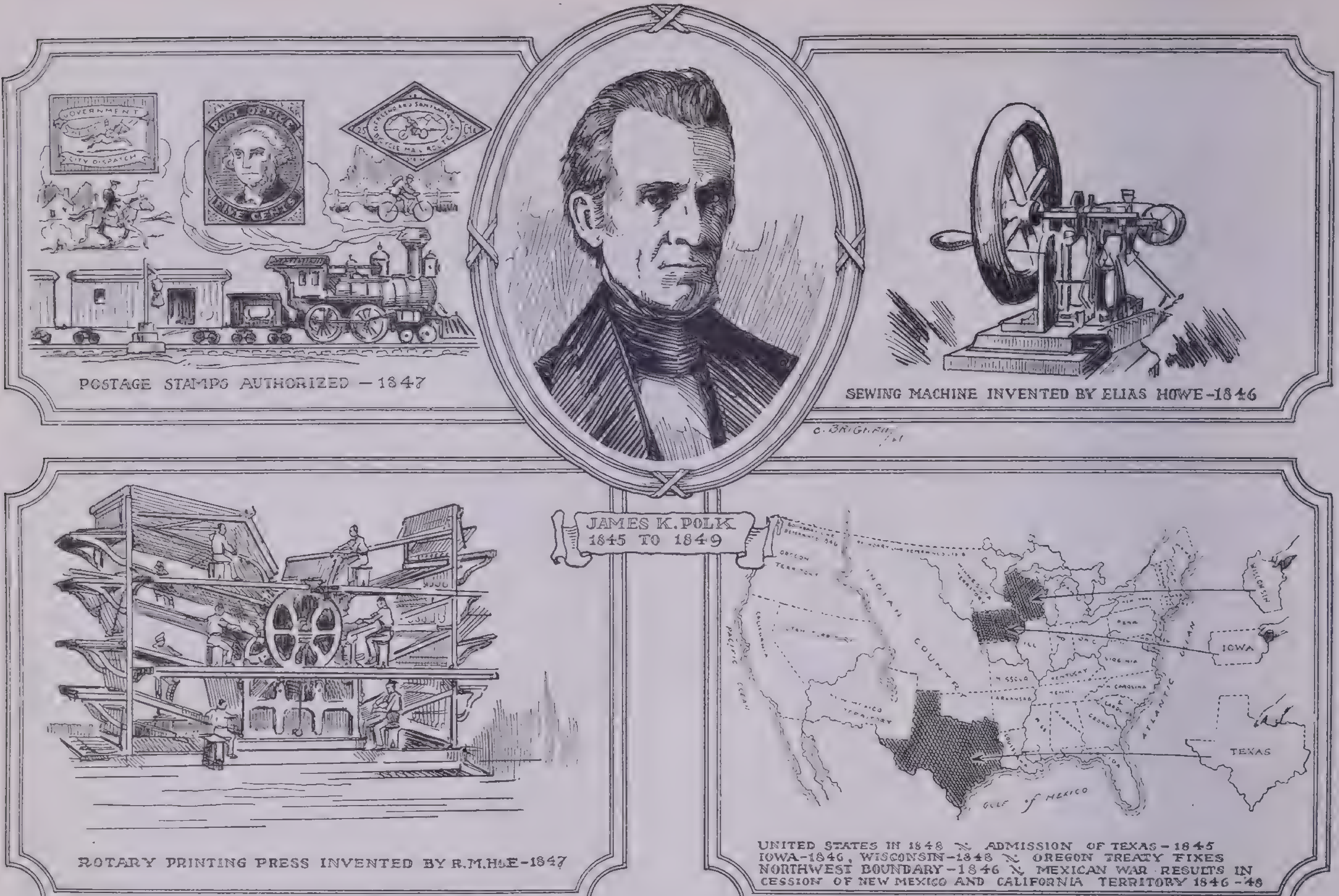
Four moves were planned: Taylor was to hold the Rio Grande; General Scott was to advance on Mexico City from Vera Cruz; Colonel Stephen Kearny was to take and hold New Mexico, and push on to California to join the army there under Captain John C. Frémont, whose safety there would be assured by a fleet in the Pacific commanded by Commodore Stockton. All four campaigns were marked with success.

Taylor followed up his two first victories by taking Matamoras and in September 1846 attacked and captured Monterey. He then sent some 10,000 men south to reinforce Scott's march from the coast to Mexico City. Gen. Santa Anna with an army of 20,000 then attacked Taylor's weakened forces at Buena Vista—only about 4,000 men. But the 4,000 did not give an inch, and a desperate two-day battle (February 1847) sent the Mexicans flying. This battle made Taylor the hero of the war and put him in the White House in 1849.

In March 1847 Scott landed at Vera Cruz, took the city and began his march on the Mexican capital. He drove Santa Anna from the pass at Cerro Gordo and continued his advance, taking city after city en route, in August Churubusco, in September Molino del Rey and the citadel of Chapultepec which the Mexicans had believed invincible. On September 14 Santa Anna retreated from Mexico City, Scott's army walked in and kept possession until the peace treaty was signed, February 1848.

In the meantime New Mexico had been occupied by Colonel Kearny (1846) who then proceeded into Upper California where Commodore Stockton's Pacific fleet had taken Los Angeles and San Diego and established the occupation of Frémont's land forces.

The peace treaty was signed February 1848 at Guadalupe-Hidalgo. Mexico conceded the border question: the Rio Grande henceforth would be Texas' southwestern boundary. She also ceded to the United States for $15,000,000 territory now occupied by California, Utah, Arizona and New Mexico.



POSTAGE STAMPS AUTHORIZED — 1847

SEWING MACHINE INVENTED BY ELIAS HOWE - 1846

JAMES K. POLK
1845 TO 1849

ROTARY PRINTING PRESS INVENTED BY R.M.HOE - 1847

UNITED STATES IN 1848 — ADMISSION OF TEXAS - 1845
IOWA - 1846, WISCONSIN - 1848 — OREGON TREATY FIXES
NORTHWEST BOUNDARY - 1846 — MEXICAN WAR RESULTS IN
CESSION OF NEW MEXICO AND CALIFORNIA TERRITORY 1846 - 48

Oregon Question.—A convention with Britain in 1818 fixed the northeast boundary between America and Canada, but had not done a whole job and settled the northwest boundary dispute. Oregon was filling up. 1842 saw the first Oregon-bound wagon train make its way over the Oregon trail. In 1843 came the "great emigration" of 900 people and 120 wagons. By 1845, 3,000 emigrants had settled in Oregon. British-American interest in the territory increased and British-American jealousy for its possession grew more and more intense. The people wanted 54°40′ for the northern boundary. "Fifty-four forty or fight" was the cry. And Polk, who had been elected partly on a platform "to reoccupy Oregon," wanted to make good that pledge without involving America in two wars at once. Great Britain had refused the 49° line as a boundary compromise. The settlers had made their own stand against the presence of the British by setting up their own government (1843). But Polk would not let them fly to arms. He persisted in negotiating for the 49° compromise treaty until England finally agreed (1846), and the northwest boundary was fixed.

Walker Tariff.—In 1846 Polk's Secretary of the Treasury Robert G. Walker framed the lowest tariff measure the country had yet known. It was a bill to raise revenue for government expenses, omitting all protective features. Every important tariff bill so far had been framed to protect American industries. But Congress and the President passed Walker's bill with the instantaneous result of increasing British-American trade. "Tariff for revenue only" was the Democratic party's policy for the next 80 years.

The Independent Treasury.—After the panic of 1837, government money had been removed from state banks and put in a government treasury. This system was discarded by the Whigs in 1841. In 1846 Congress recreated the independent Treasury Department.

Other Events.—During this administration, Iowa was admitted as a state in 1846 and Wisconsin in 1848. In 1847 postage stamps were first authorized by the government. Elias Howe invented the sewing machine in 1846. The Wilmot Proviso (abolishing slavery in the territory newly acquired from Mexico) was debated back and forth (1846–47) keeping that question in ferment. The Free-Soil Party was formed (1848) to keep the territories closed to slavery. Gold was discovered in California and 1849 saw the great gold rush.

Election of 1848.—The Mexican War hero General Zachary Taylor was nominated for President on the Whig ticket; Millard Fillmore was named for Vice-President. They won the election over Lewis Cass, the Democratic nominee. The new Free-Soil Party was headed by Martin Van Buren, but received no electoral votes.

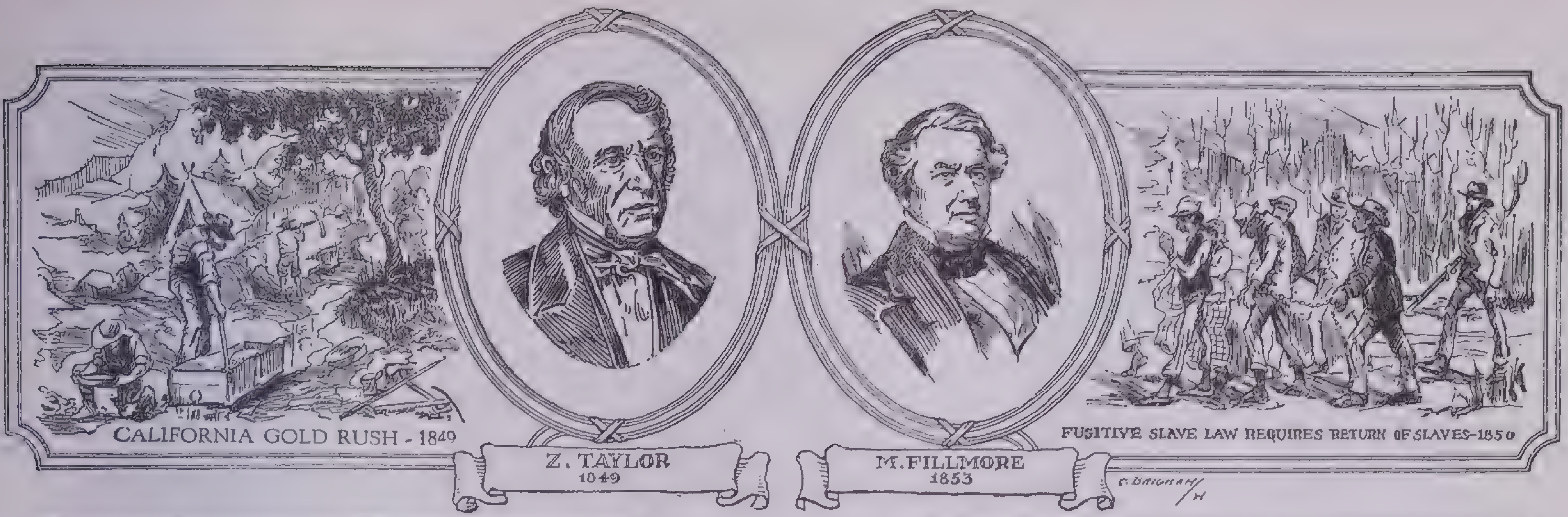
Zachary Taylor—1849-1850

Taylor came to the Presidency without political experience at a time when sentiment regarding slavery was rapidly causing a breach between the North and the South. He was scarcely more than an onlooker at the course of events, and his career as Chief Executive was cut short by his death 16 months after his inauguration.

Compromise of 1850.—California was applying for admission to the Union with a state constitution prohibiting slavery. In the Union the slave and free states were still equal in number—15 each. If California were admitted as a free state, this balance would be broken: the 16 free states would have 32 Senators to 30 from the 15 slave states. Henry Clay, "the great pacificator," came forward with a compromise bill, loaded down with so many distinct measures that it was called by its enemies the "Omnibus Bill." History records it, however, as the "Compromise of 1850."

Clay's bill, intended to satisfy both North and South, provided that California should be admitted as a free state; New Mexico and Utah should be organized as territories and decide themselves about slavery; and Texas should receive $10,000,000 as indemnity for the territory it claimed from New Mexico. A second bill in the compromise group excluded the slave trade from the District of Columbia and provided for the enforcement of fugitive-slave laws by Federal officers, whose duty it became to return to their masters runaway slaves who escaped to free states.

Before Congress could act upon

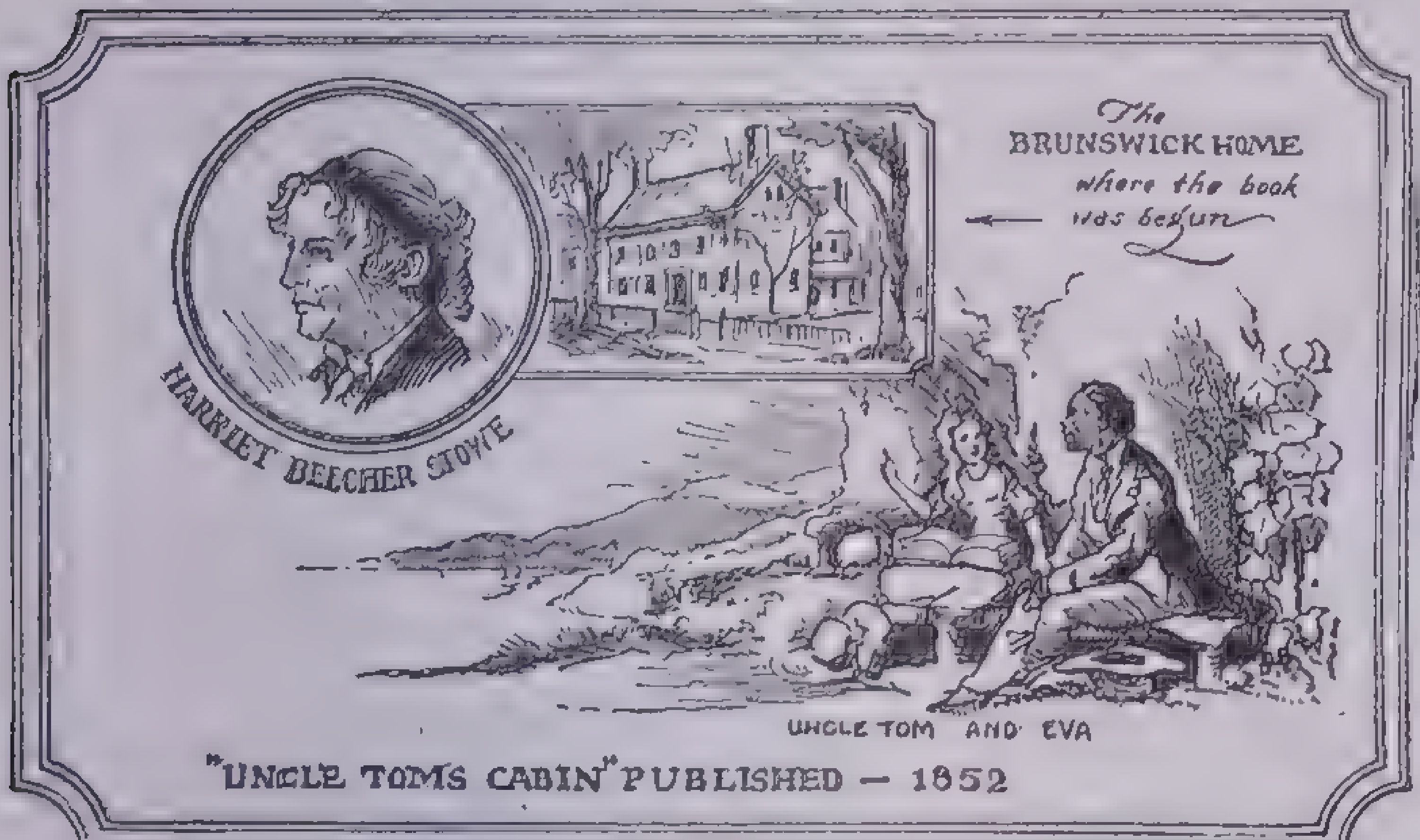


CALIFORNIA GOLD RUSH - 1849

Z. TAYLOR 1849

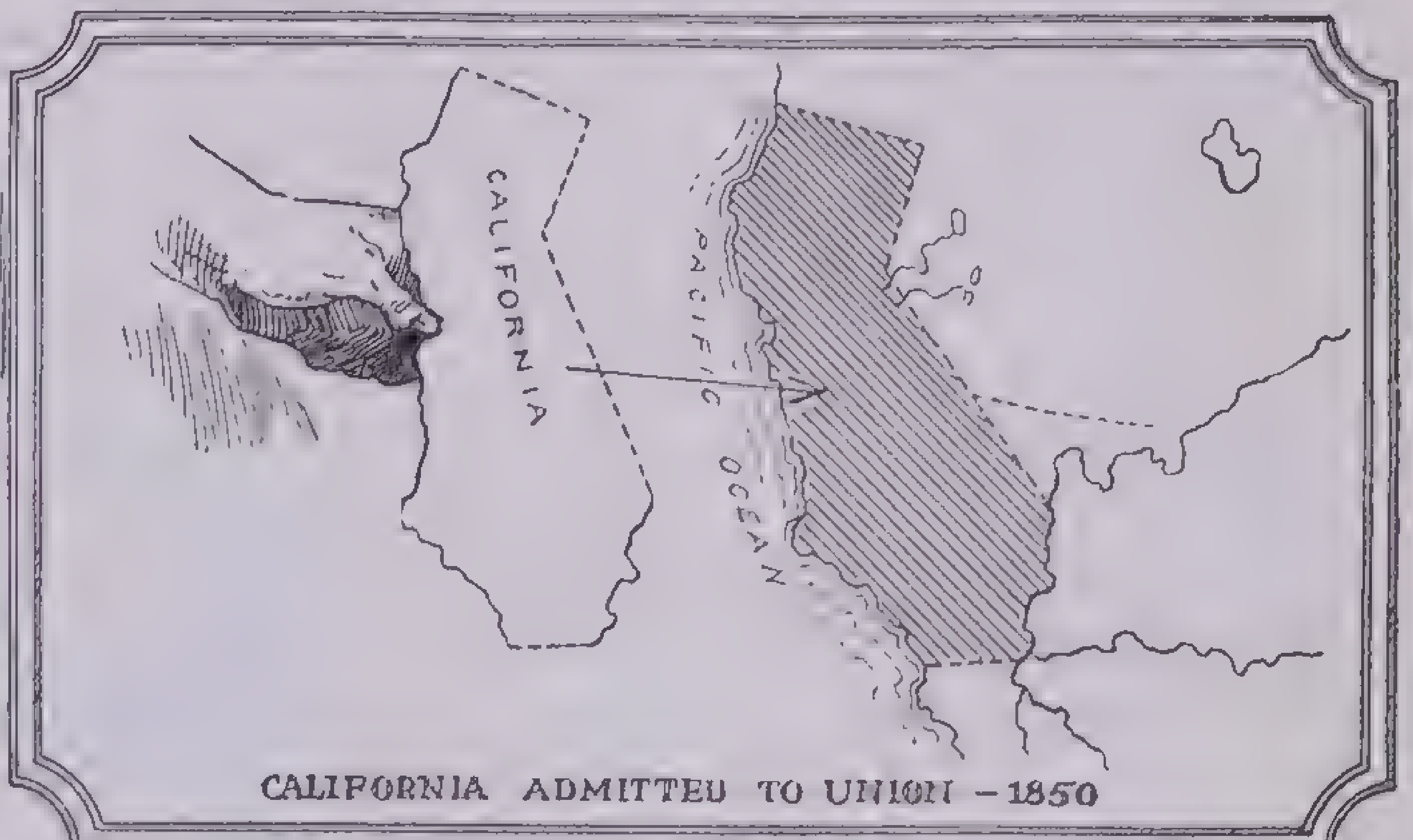
M. FILLMORE 1853

FUGITIVE SLAVE LAW REQUIRES RETURN OF SLAVES-1850



HARRIET BEECHER STOWE
The BRUNSWICK HOME where the book was begun
UNCLE TOM AND EVA

"UNCLE TOM'S CABIN" PUBLISHED — 1852



CALIFORNIA ADMITTED TO UNION - 1850

these measures, President Taylor died on July 9, 1850, and Vice-President Millard Fillmore became President.

Millard Fillmore—1850-1853

Fillmore had presided over the Senate as Vice-President in a manner highly satisfactory to both sides on the heated question of slavery; he had been impartial, as his position required him to be. As President, he became the leader of the Whigs, who were opposed to the extension of slavery.

During the entire summer of 1850 the Compromise bills were hotly discussed. They passed early in September. California was admitted to the Union on September 9. When Fillmore signed the Fugitive Slave Law, which had been demanded by the South, he weakened his leadership of the Whigs, and never fully regained it. He believed, however, that he was taking the only possible course to preserve the Union.

Other Events.—One of the circumstances leading to the crystallization of Northern sentiment against slavery was the publication of *Uncle Tom's Cabin* in 1852. The first state to legislate against liquor was Maine, which in 1851 passed a prohibitory law.

Election of 1852.—Fillmore desired the Whig nomination for the Presidency, and General Scott and Daniel Webster also were candidates. Scott was nominated, but was defeated at the November election by Franklin Pierce, the Democratic nominee, who received 254 electoral votes to 42 for Scott.

Franklin Pierce—1853-1857

The lull that followed the assertion that the Compromise of 1850 was "final" was only the stillness that precedes a storm. Pierce's whole administration was filled with bitter feeling, violent debate and actual bloodshed over the slavery issue. The lands west of Missouri were ready to be organized into territories and according to the Missouri Compromise (prohibiting slavery north of 36°30′) would automatically become free states when they entered the Union. The initiation of surveys (1853) for the first transcontinental railroad alarmed the slave-holding South, which feared any increase in free-state representation in Congress and felt that easier intercourse with antislave sections would be a contamination and a danger. In the North the enforcement of the Fugitive Slave Laws had driven home the inhumanity of the commercial slave system. The question of slavery became more and more one of intense feeling.

Kansas-Nebraska Bill.—In 1854 Senator Stephen A. Douglas proposed a bill organizing the territories of Kansas and Nebraska and leaving slavery to the yes or no vote of the settlers themselves. The bill was passed, May 1854. Squatter sovereignty was the term given the proposal. It repealed the Missouri Compromise of 1820 and released again all the old contention, reopened all the questions that law had laid.

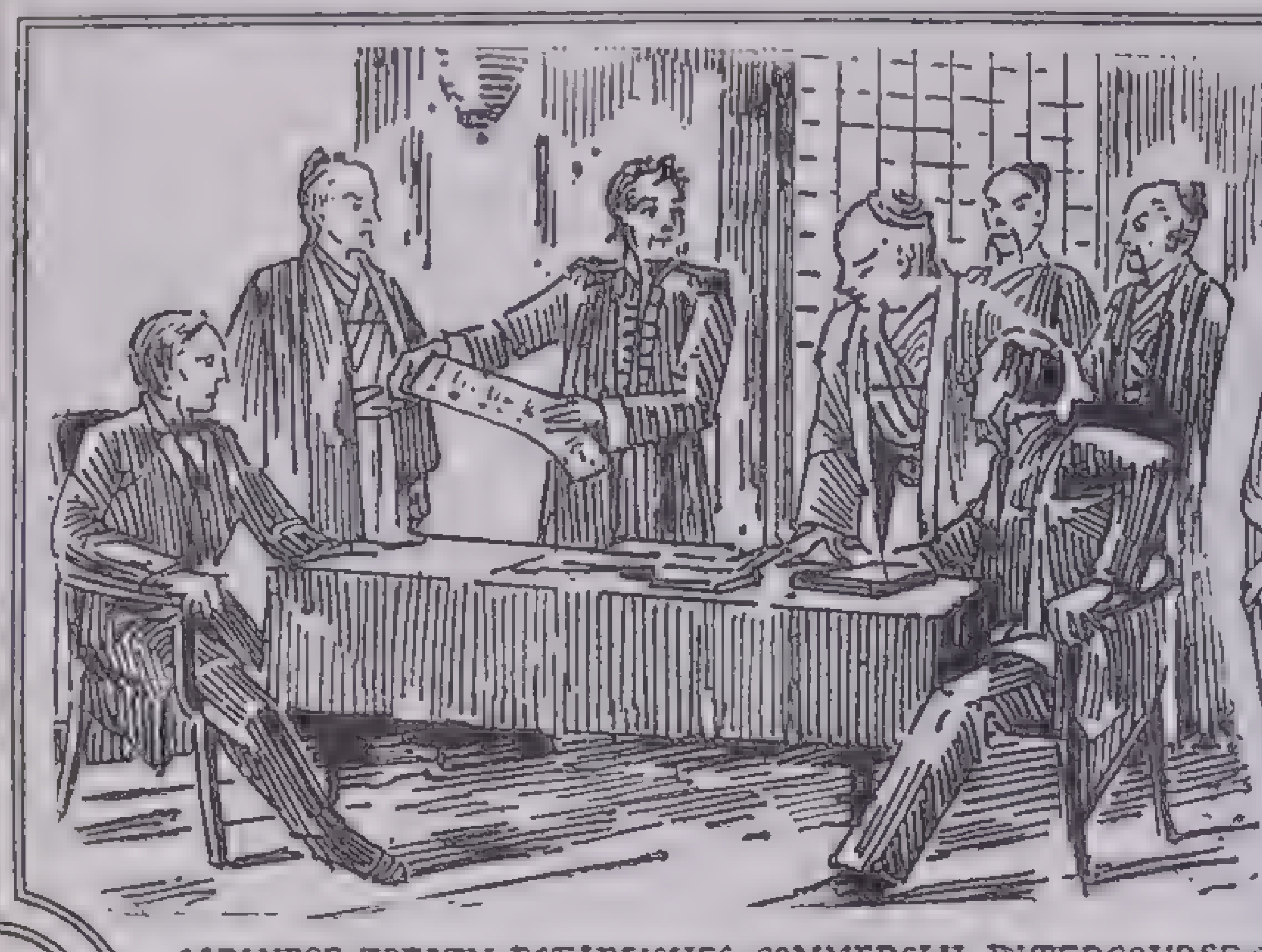
At once proslave and antislave interests rushed armed settlers to the new territories, especially Kansas, which became the stage for a violent drama. Westbound free-soil settlers found their way obstructed time and again by armed proslave Missouri men, who also dashed over the border and carried the first Kansas territorial elections. Each side set up a government and sent delegates to Congress. Murders, pillagings, burnings prevailed. Kansas was in a state of civil war, which continued into 1858.

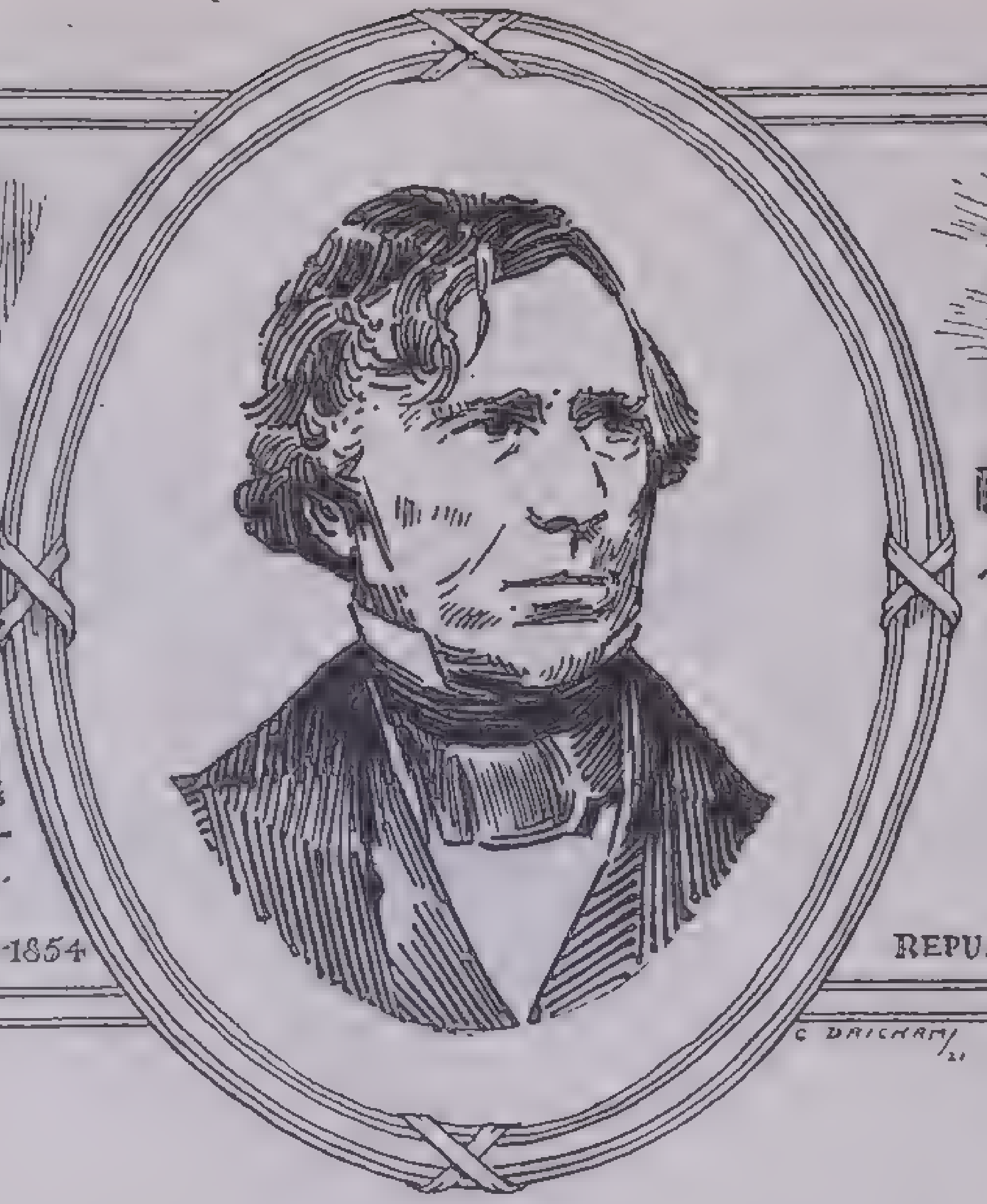
Gadsden Purchase.—To settle a boundary dispute with Mexico, the United States purchased the territory in question for $10,000,000, about 45,535 square miles, now forming the southern parts of New Mexico and Arizona. This purchase was put through by James Gadsden, United States minister to Mexico.

Proposed Annexation of Cuba.—The South greatly desired the annexation of Cuba to the United States in the interests of slavery extension. The administration was not opposed to the movement but proceeded slowly. The American ministers to Spain, France and England were instructed to confer on the subject in Europe and they issued the Ostend Manifesto, a proclamation that the United States would be justified if it took Cuba from Spain by force.

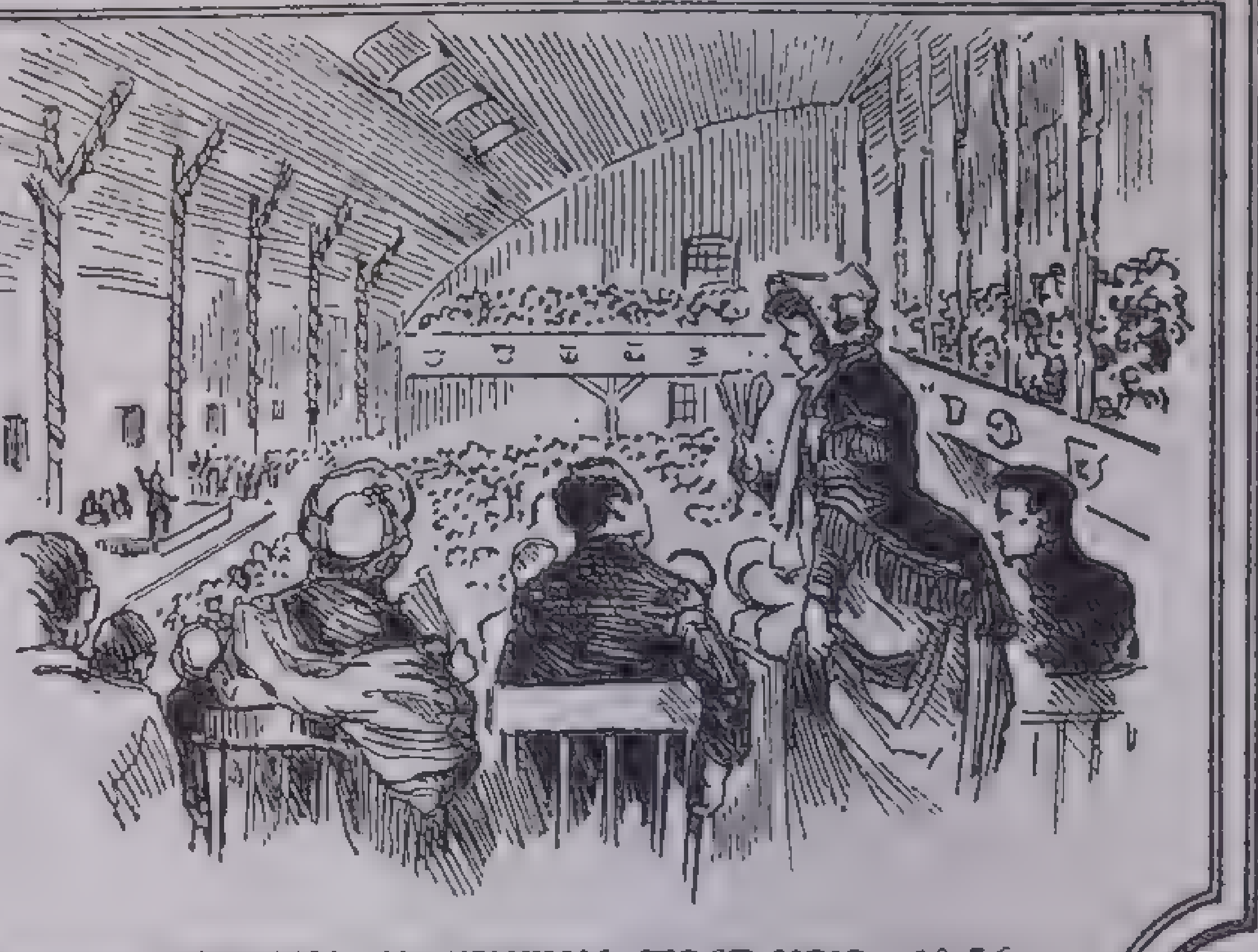
Other Events.—A Tennessee adventurer, William Walker, in 1855 took possession of the Central American state of Nicaragua, over which Great Britain desired to establish a protectorate, and the United States recognized Walker's government, which restored slavery in Nicaragua, but the government was overthrown in 1857. Commodore Perry's treaty with Japan (1854) opened two Japanese ports to American ships and put a U.S. consul in Japan.

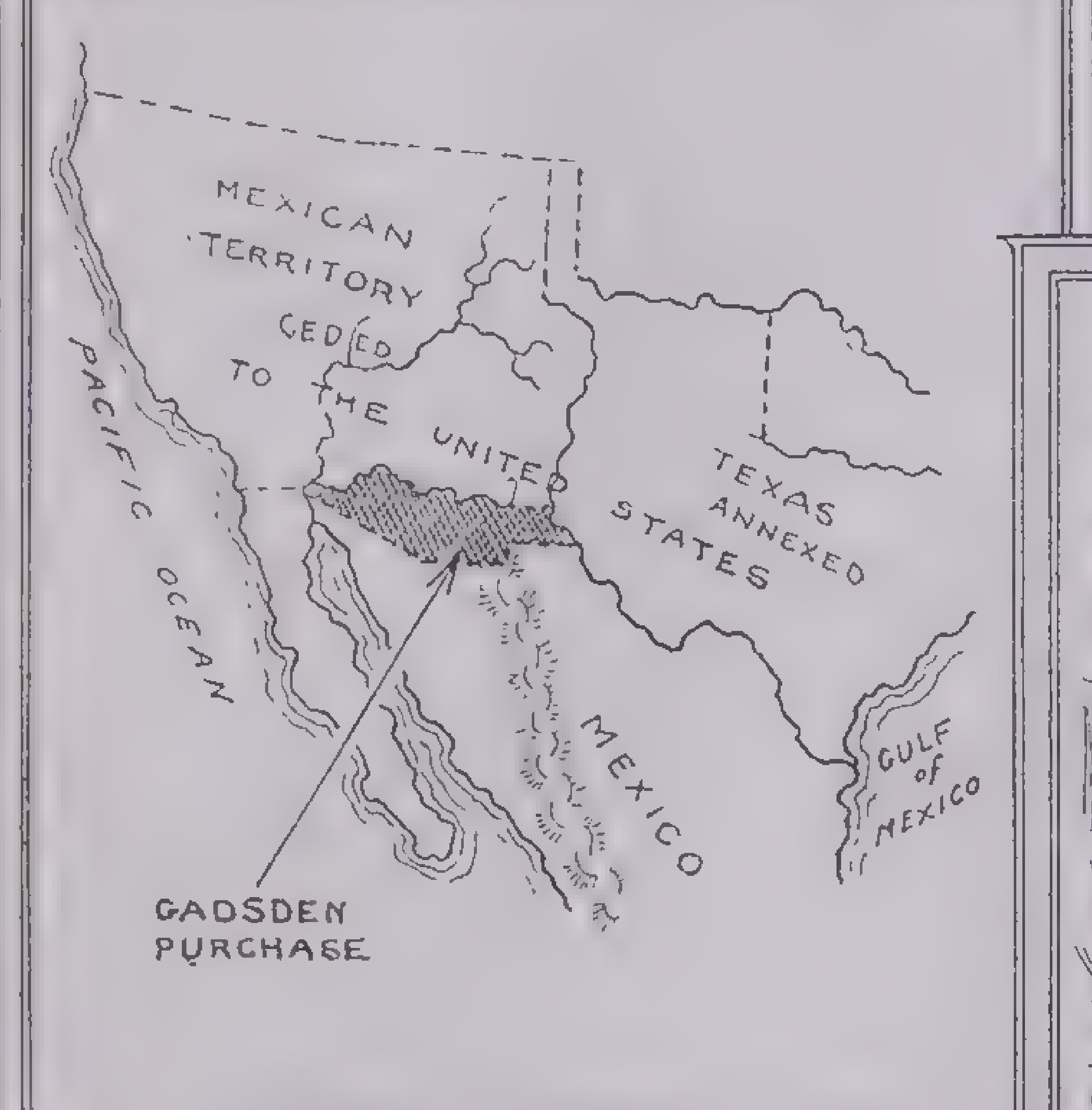
Election of 1856.—The passage of the Kansas-Nebraska Bill was directly responsible for the rise of a new party, the Republican, formed in the north in 1856 to oppose the further spread of slavery. John C. Frémont was named as its candidate for president; the Democrats nominated James Buchanan of Pennsylvania, who received 174 electoral votes to Fré-


JAPANESE TREATY ESTABLISHES COMMERCIAL INTERCOURSE-1854

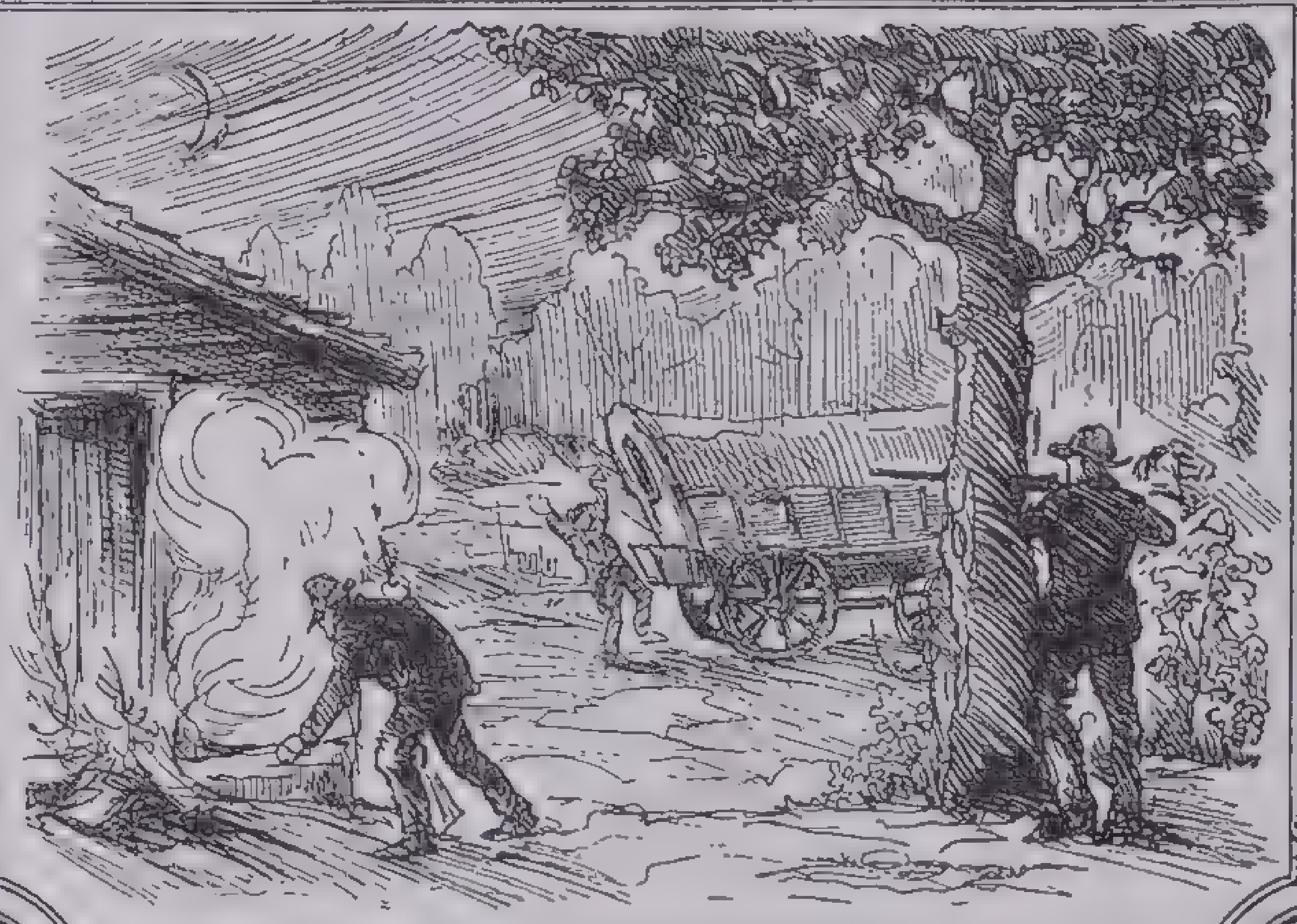


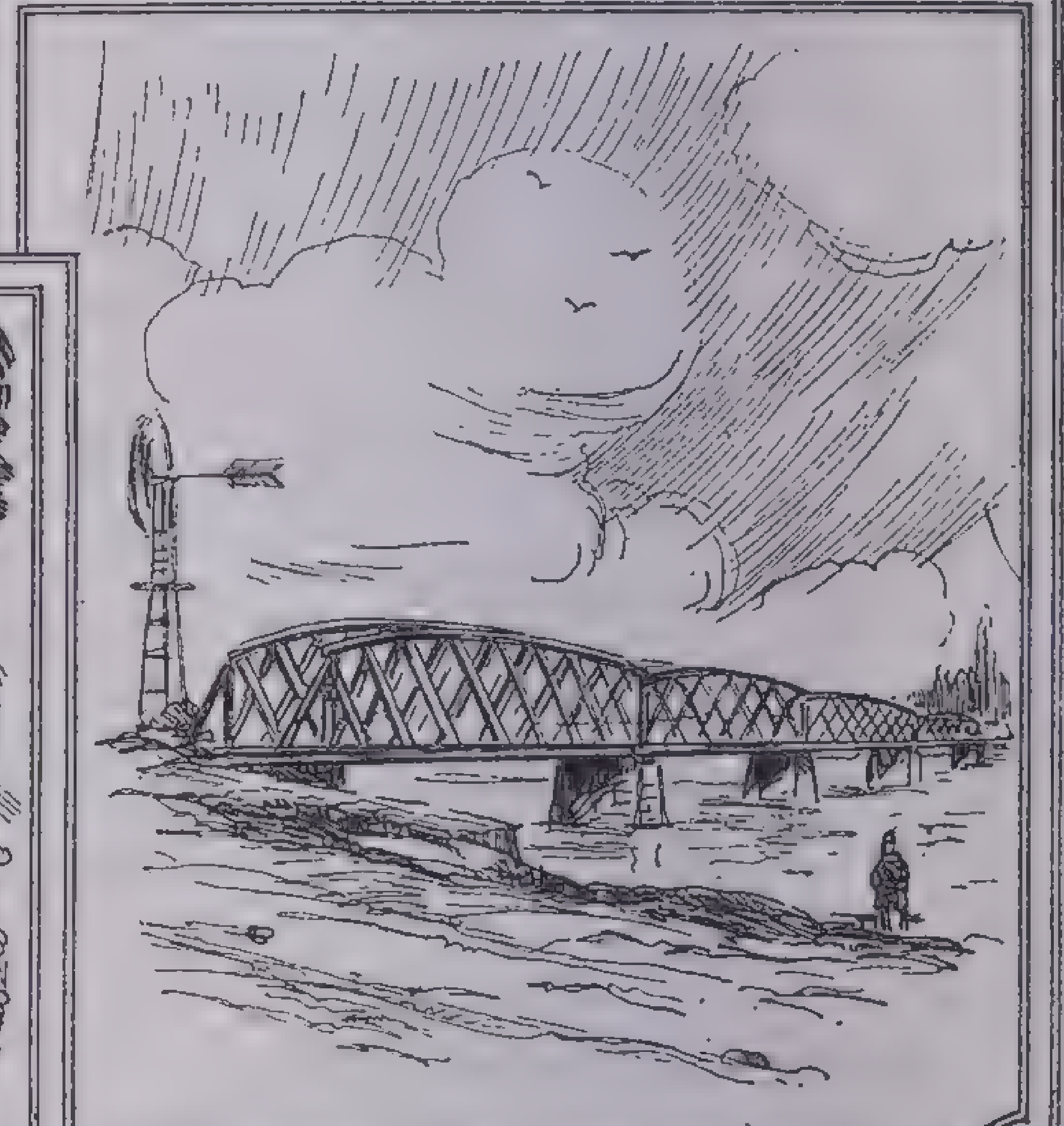
FRANKLIN PIERCE
1853 TO 1857


REPUBLICAN NATIONAL CONVENTION FIRST HELD-1856



GADSDEN PURCHASE – 1853
(ADDS 45000 SQUARE MILES TO U.S.)


GUERRILLA WARFARE WAGED IN BLEEDING KANSAS -1854


MISSISSIPPI RIVER FIRST BRIDGED AT ROCK ISLAND ILL. - 1856

mont's 114; and 8 votes were cast for Fillmore who ran as candidate of the American party and of the few Whigs who had not become Republicans.

James Buchanan—1857-1861

Buchanan's administration began with the Supreme Court decision in the Dred Scott case and ended with the secession of the South from the Union. In the case of Dred Scott the Supreme Court declared (March 6, 1857) that no slave and no individual of slave ancestry could be a citizen of the United States or appeal to a Federal Court, that slaves were "property" to be transported from state to state like any property and that Congress could not prohibit slavery in the territories and was bound by the Constitution to protect it.

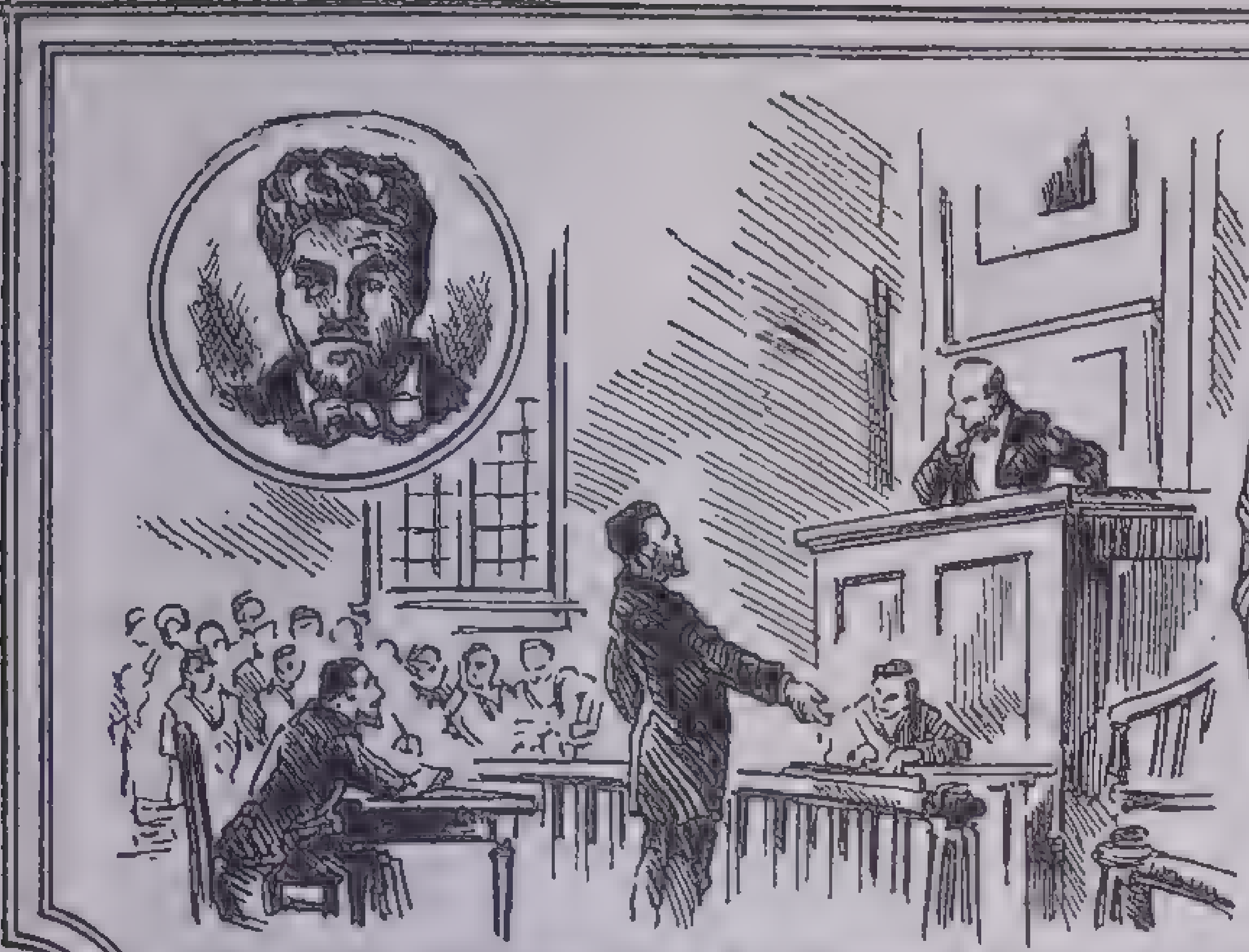
The break between North and South was hastened by the four-year agitation over the two territorial constitutions of Kansas, one pro-slavery, the other anti-slavery. Congress was split wide open on the question: the gentlemen from the South were as determined to prevent the admission of Kansas as a free state as the Northern representatives were unwilling to see a pro-slave constitution railroaded through. The result was the break-up of the Democratic party itself into Northern and Southern Democrats. Minnesota came into the Union as a free state in 1858, Oregon as a free state in 1859. By this time there were 19 free and 12 slave states represented in the national Congress. Kansas further upset the balance by signifying her will to become a free state (1859) with the adoption of the Wyandotte Constitution prohibiting slavery; but she did not get in until January 1861.

John Brown.—In the midst of all this ferment came John Brown's attack on the U.S. arsenal at Harper's Ferry, Virginia (1859). This was the first step in his fanatic design to arm the slaves to attack their masters. With a band of only 21 he attacked and took the armory at Harper's Ferry, was captured by Colonel Robert E. Lee with a small force of Marines, tried for treason and hanged, December 1859. The episode electrified the nation. The possibility of slave uprisings horrified and terrified the South. In the North, the hanging of John Brown put his name first on the list of Abolition martyrs. The time had come when the South knew that her existence as a slave-holding territory depended on separation from an anti-slavery union.

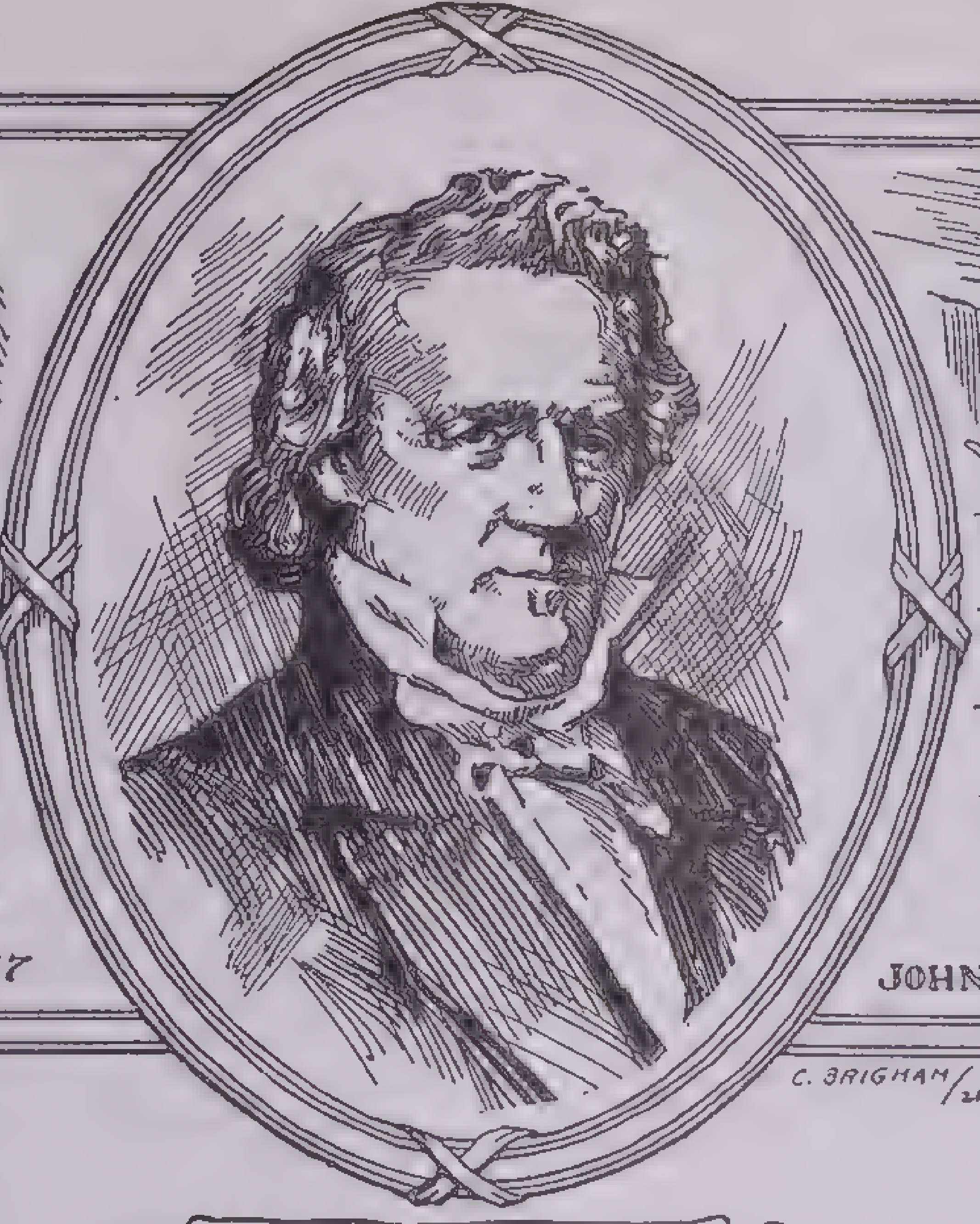
Election of 1860.—All she was waiting for was the next election. There were four candidates for the Presidency: Stephen A. Douglas, Northern Democrat; John C. Breckinridge, Southern Democrat; John Bell, for the new Constitutional Union party; Abraham Lincoln, Republican. The Republicans ("black Republicans" to the South!) wanted no slavery in the territories and eventual abolition everywhere in the Union, high protective tariffs so disadvantageous to the plantation areas and internal improvements to which the South begrudged a penny. Lincoln received 180 electoral votes; Breckinridge, 72; Bell 39; Douglas, 12.

Secession.—News of Lincoln's election was all the Southern states needed to make them feel that the cards were stacked against them. A president pledged to anti-slavery and industrial interests was not their idea of a square deal. South Carolina had long been of the temper to secede; but one state could not secede from the Union without the support of others. The governor of South Carolina had already sent a letter through the South asking how many states would support South Carolina should she secede. He was promised 100% co-operation. South Carolina seceded from the United States, Dec. 20, 1860. Ten states followed her: Mississippi, Jan. 9, 1861; Florida, Jan. 10; Alabama, Jan. 11; Georgia, Jan. 19; Louisiana, Jan. 26; Texas, Feb. 1; Virginia, Arkansas, North Carolina, Tennessee followed later.

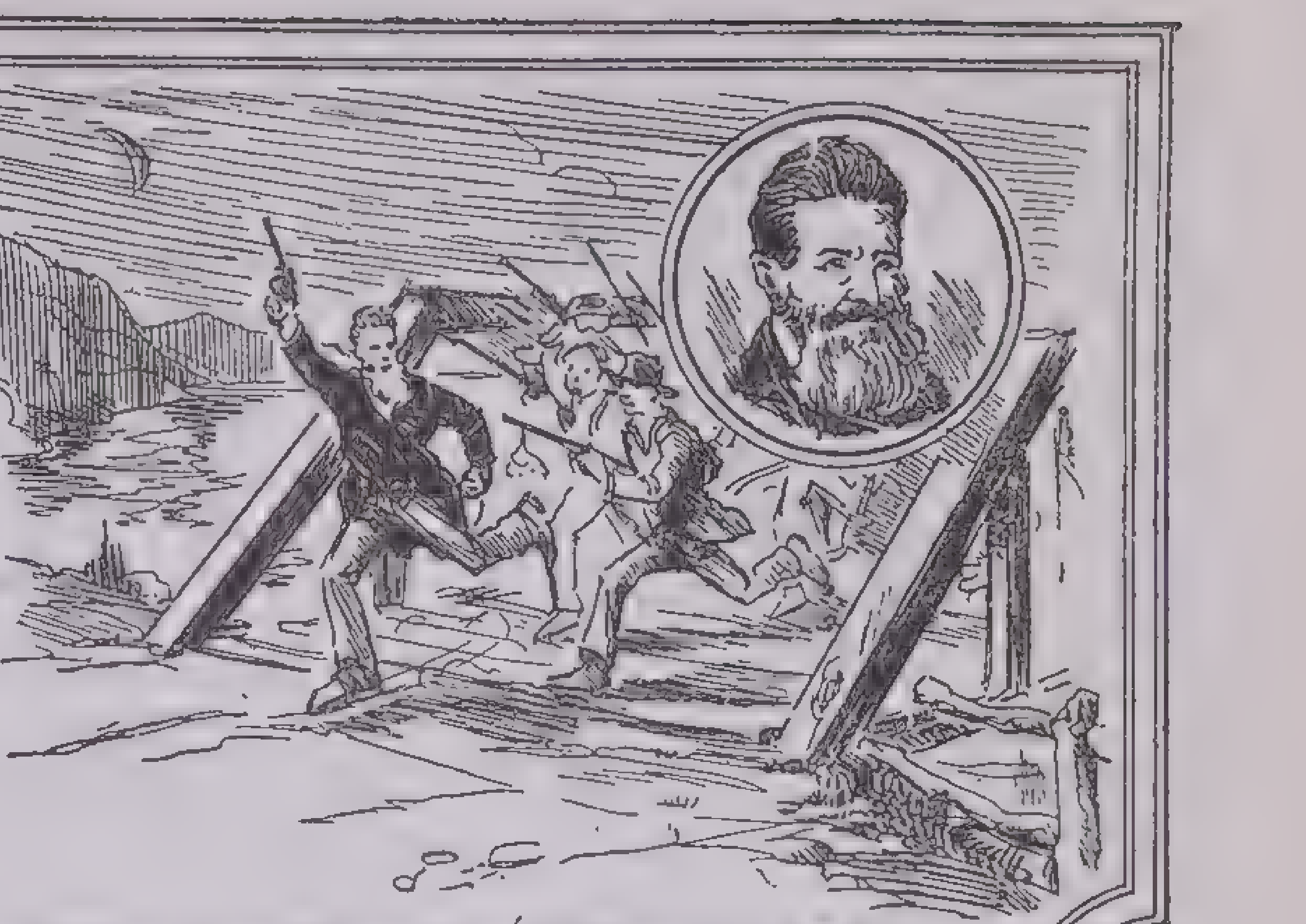
The Confederacy.—Delegates of the first seven seceding states met at Montgomery, Ala., Feb. 8, 1861, to frame a constitutional government. Jefferson Davis was inaugurated president of the Confederate States of America with A. H. Stephens vice-president on



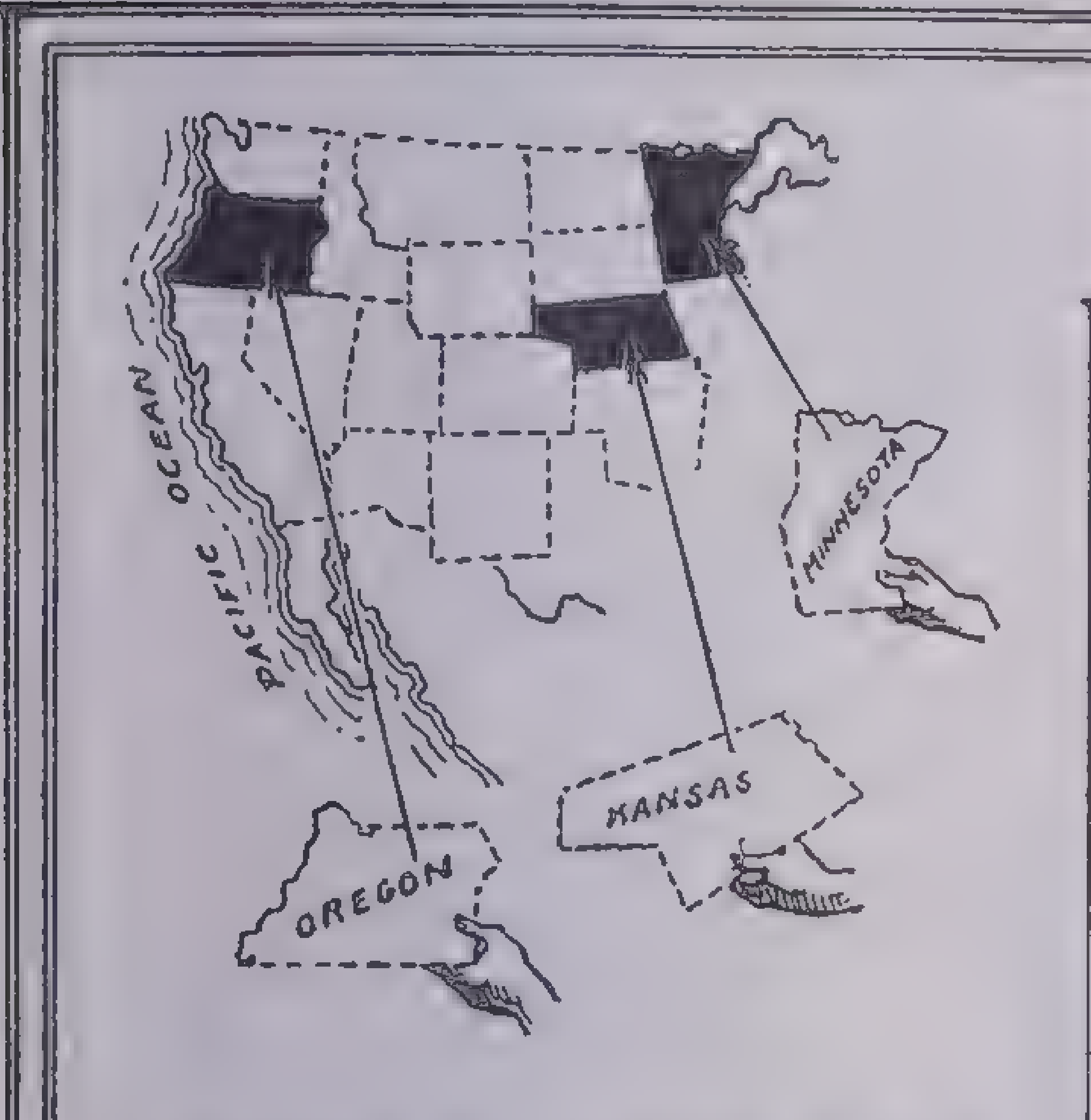
DRED SCOTT DECISION MADE BY SUPREME COURT - 1857



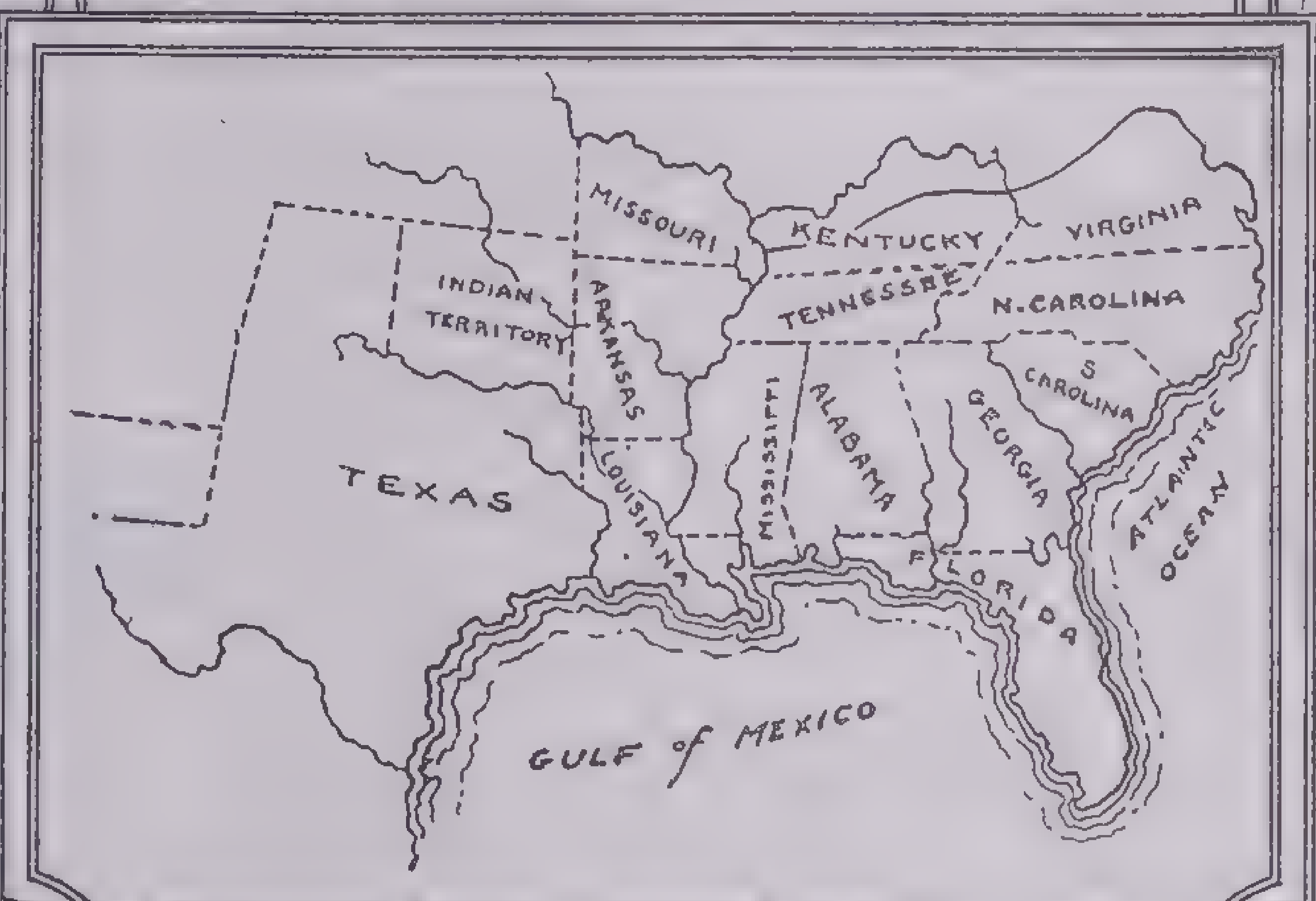
JAMES BUCHANAN 1857 TO 1861



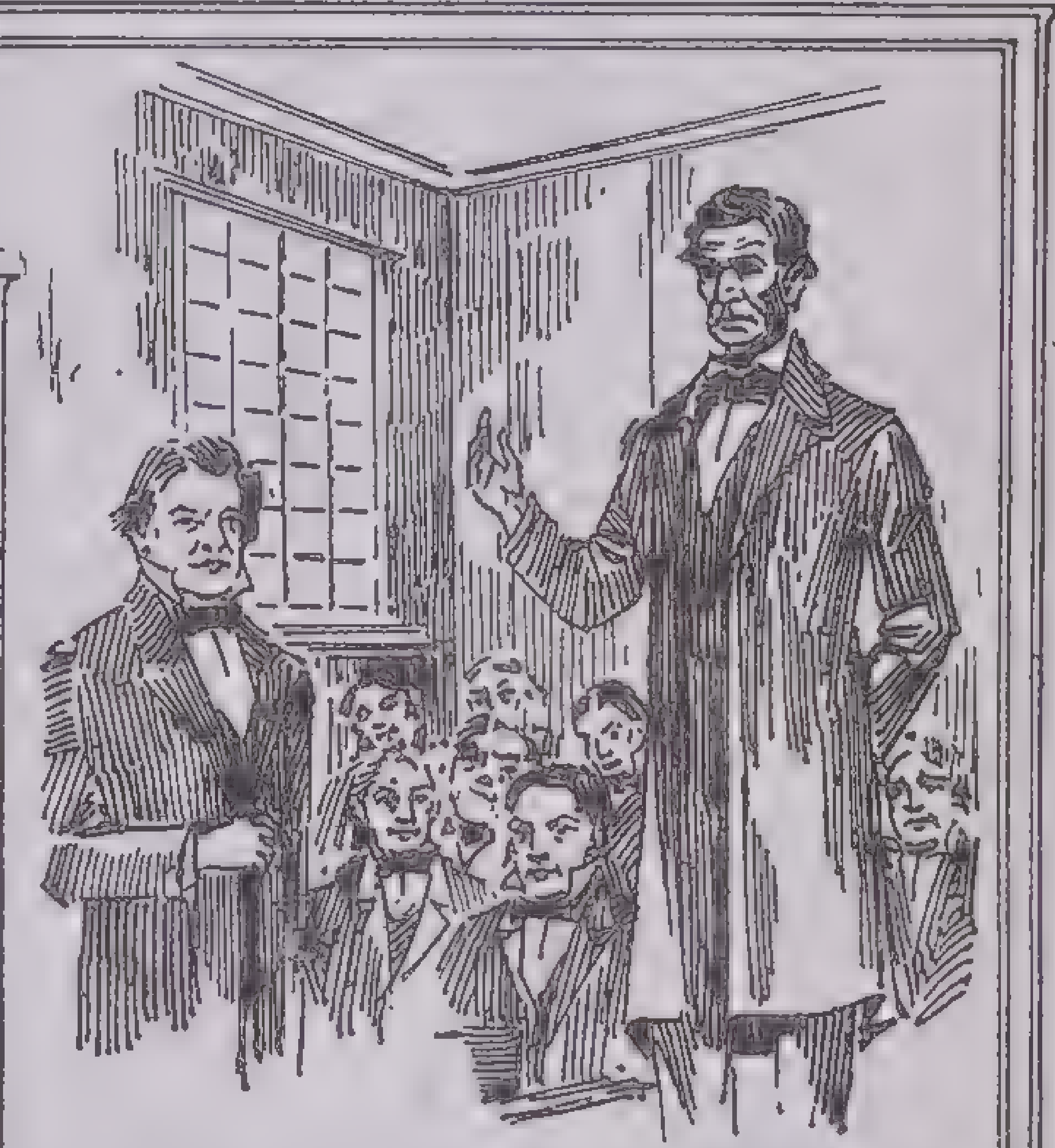
JOHN BROWN RAIDS HARPER'S FERRY - 1859



ADMISSION OF MINNESOTA - 1858 OREGON - 1859 -- KANSAS - 1861 TO THE UNION



CONFEDERATE STATES OF AMERICA ORGANIZED - 1860-61



LINCOLN-DOUGLAS DEBATES - 1858

Feb. 18. The constitution differed from the constitution of the United States in stressing state sovereignty, prohibiting high protective tariffs, recognizing and protecting "the institution of Negro slavery as it now exists in the Confederate States."

War Postponed.—Buchanan could do little but look on. He spoke his mind, declaring that no state had the right to secede, but he had no way of compelling the rebellious states to return to the Union. When South Carolina delegates came to him demanding the transfer of U.S. property within the state *to* the state, he refused to confer with them as officials of a recognized government, but said he would "receive them as private gentlemen of the highest character." He was intent on avoiding war and warned the men in command of the threatened Fort Pickens at Pensacola and the three forts in Charleston Harbor to do nothing that could be interpreted as an act of war. Major Robert Anderson was thus forced to sit by while South Carolina guns drove away a vessel of supplies for Fort Sumter in Charleston Harbor. Not until Anderson moved from Fort Moultrie to Fort Sumter (which was less certain to be crushed by the South Carolina batteries) did Buchanan send tardy reinforcements. Buchanan postponed the war in his own administration, but he knew that Lincoln "had no alternative but to accept the war."

Abraham Lincoln—1861-1865

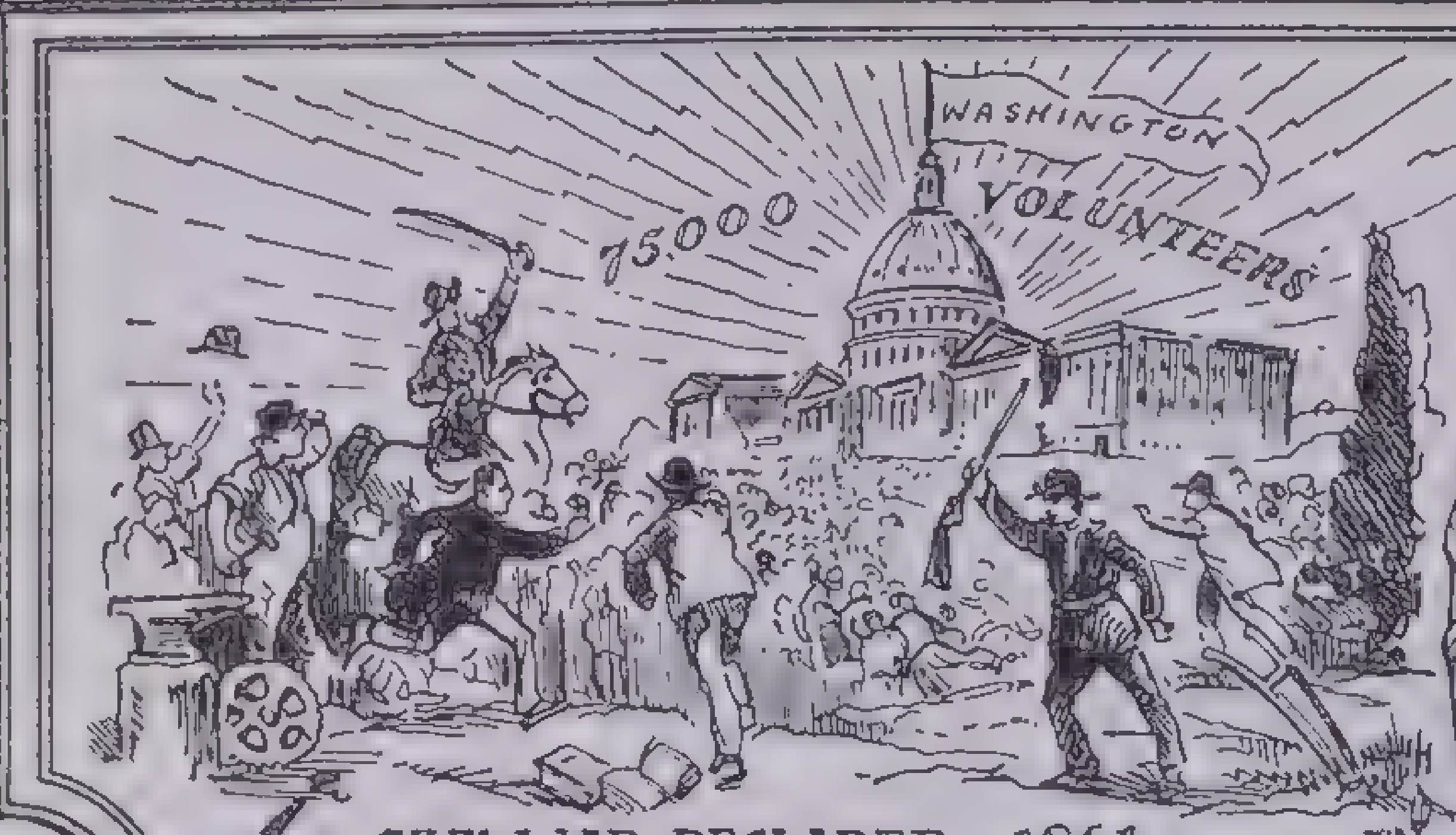
The South saw in Lincoln's election the handwriting on the wall prophesying doom. They had no belief that the Republicans would stop at limiting slavery in the territories only; they did believe that John Brown's raid symbolized what the Republican party stood for. Secession was already in effect when Lincoln came into office; already U.S. forts, arsenals and navy yards in the South were being seized by the seceding states.

"A house divided against itself cannot stand," Lincoln had said two years before. "I believe this government cannot endure permanently half slave and half free. I do not expect the Union to be dissolved—I do not expect the house to fall—but I do expect it will cease to be divided." With this expectation he took up the reins of government. His inaugural address denied the right of any state or group of states to secede from the Union. "No state upon its own mere motion," he said, "can get out of the Union." And "the Union must be preserved, with or without slavery."

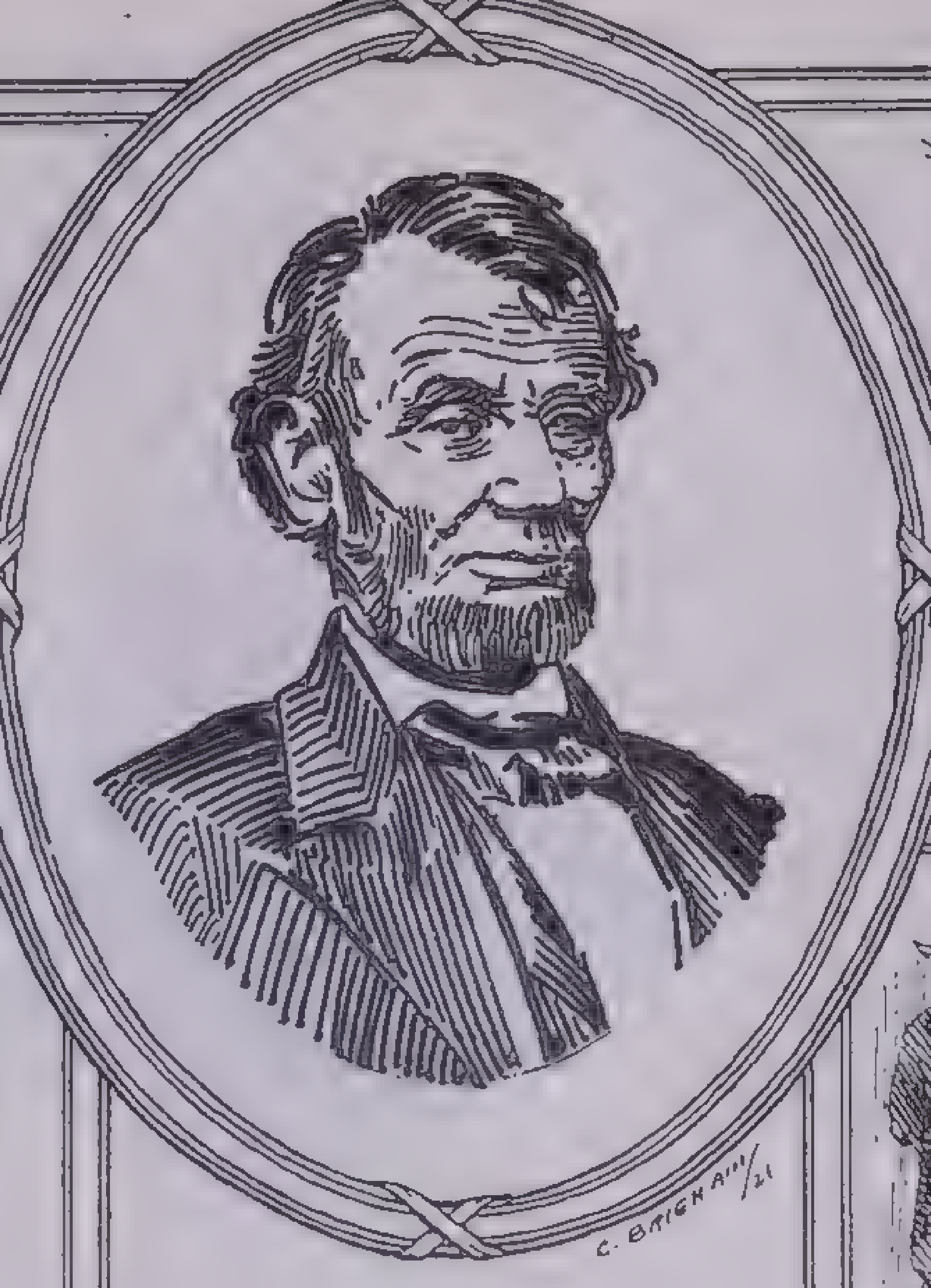
Lincoln believed that slavery was unjust, cruel and morally wrong, even to the point of saying "If slavery is not wrong, nothing is wrong." But he also believed that the violence of Abolition propaganda had made a bad thing worse.

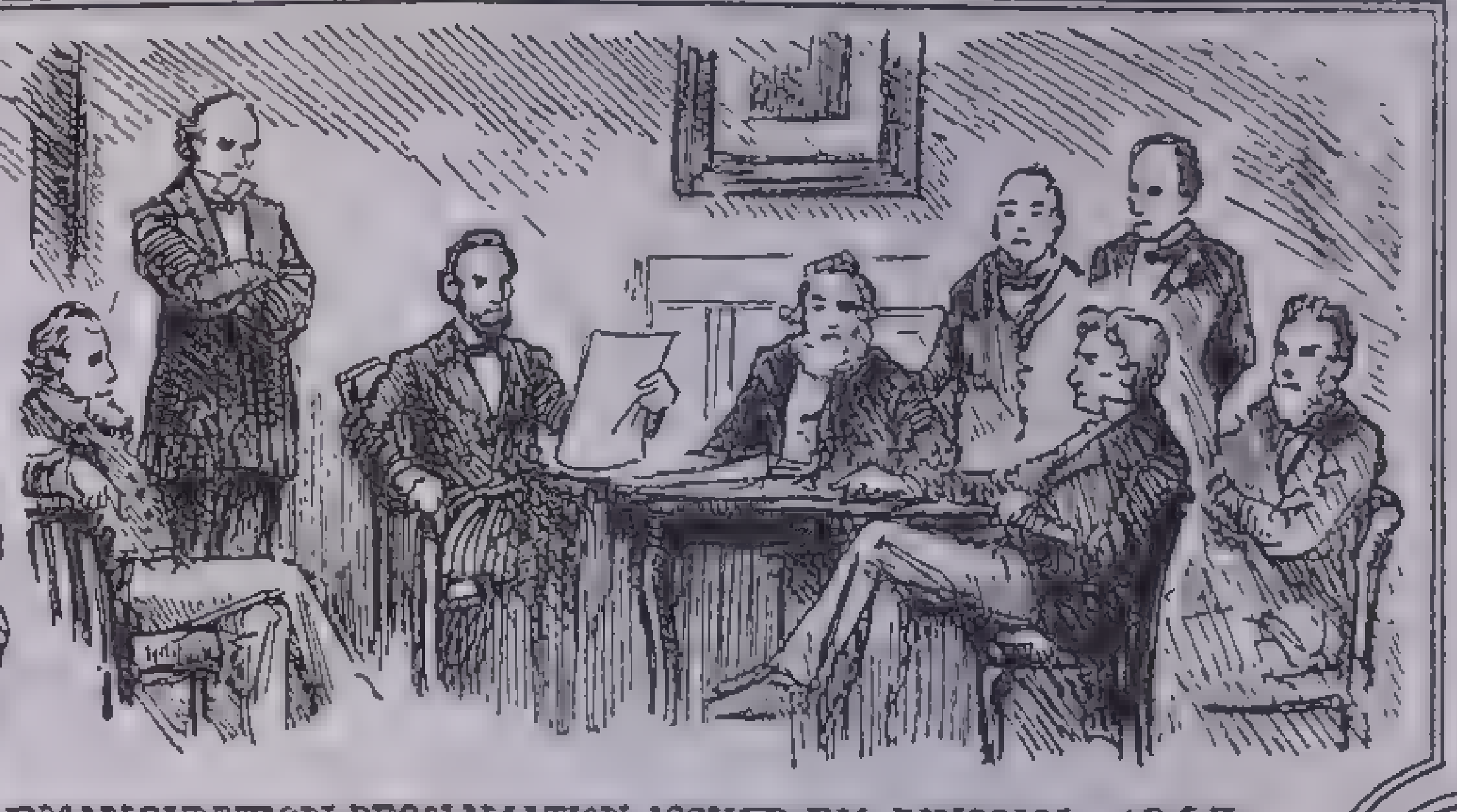
Almost a century of looking back reveals him as a man who walked alone. He was not supported by the extreme Abolitionists who could not brook his tolerance; he was not supported by the conservatives who blamed him for killing all compromise measures and for bringing on the war. He was not upheld by his Cabinet who did not uphold each other. And even the people's minds began to close against him for his delay in sending into action a volunteer army that he realized was unprepared; for the army's failure and first inglorious return when he did send it; for his suppression of newspapers; for conscription and war taxes and for his sharp dealings with the Copperheads (Northerners of strong Southern sympathy) who so insidiously and secretly worked to undermine the government.

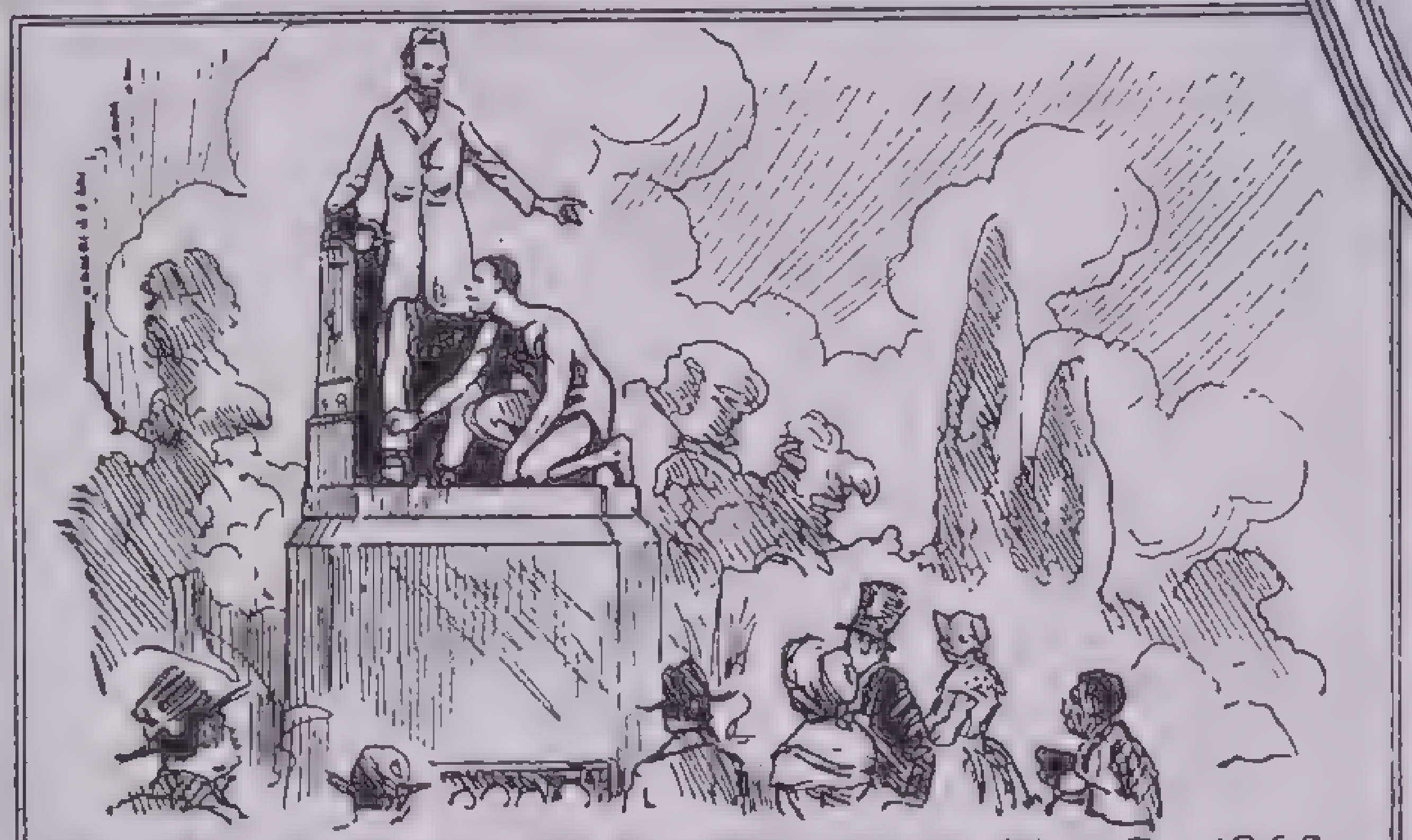
Fort Sumter, April 1861.—In the first three months of secession the seceding states had taken over fort after fort belonging to the national government almost without protest from those in command. Waiting and hoping for compromise measures that would undo Secession had kept those in command of forts from warlike action. When Lincoln came into office, Fort Sumter alone of the three forts in Charleston harbor still flew the United States flag. South Carolina had taken the other forts; her agents were in Washington expecting official delivery of the third (Fort Sumter) when Lincoln decided (April 8) to

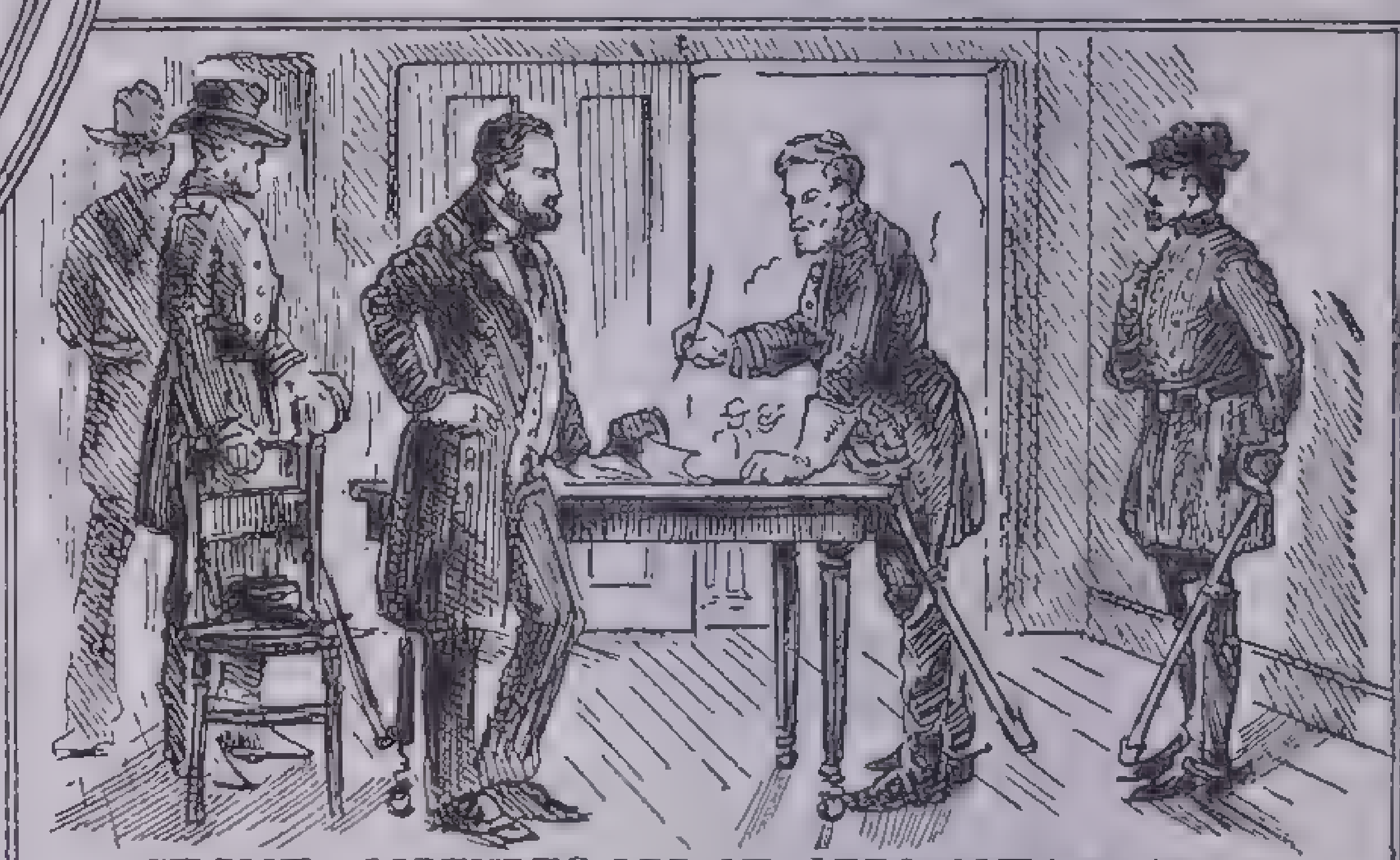


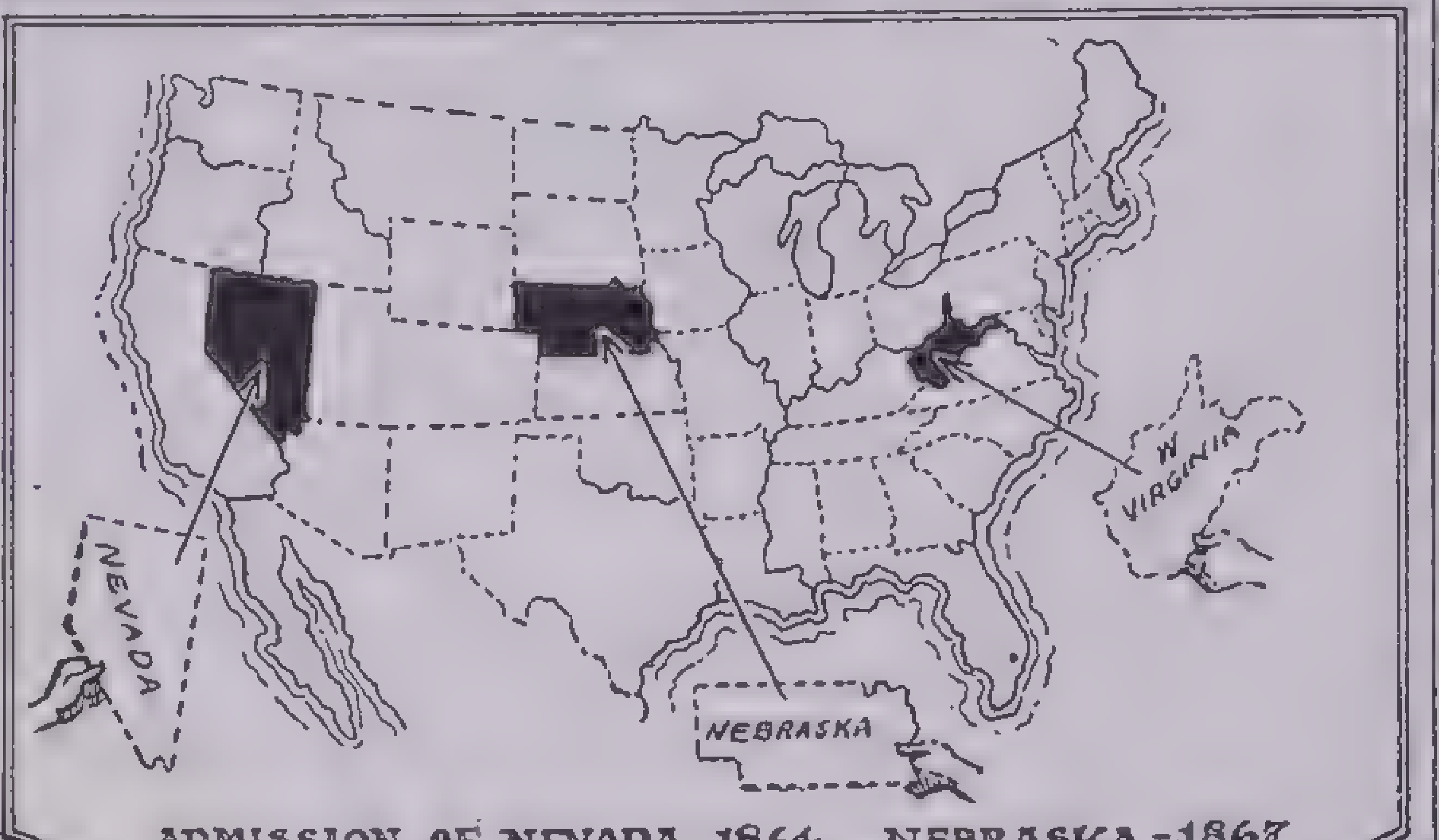
CIVIL WAR DECLARED - 1861


ABRAHAM LINCOLN
1861 TO 1865

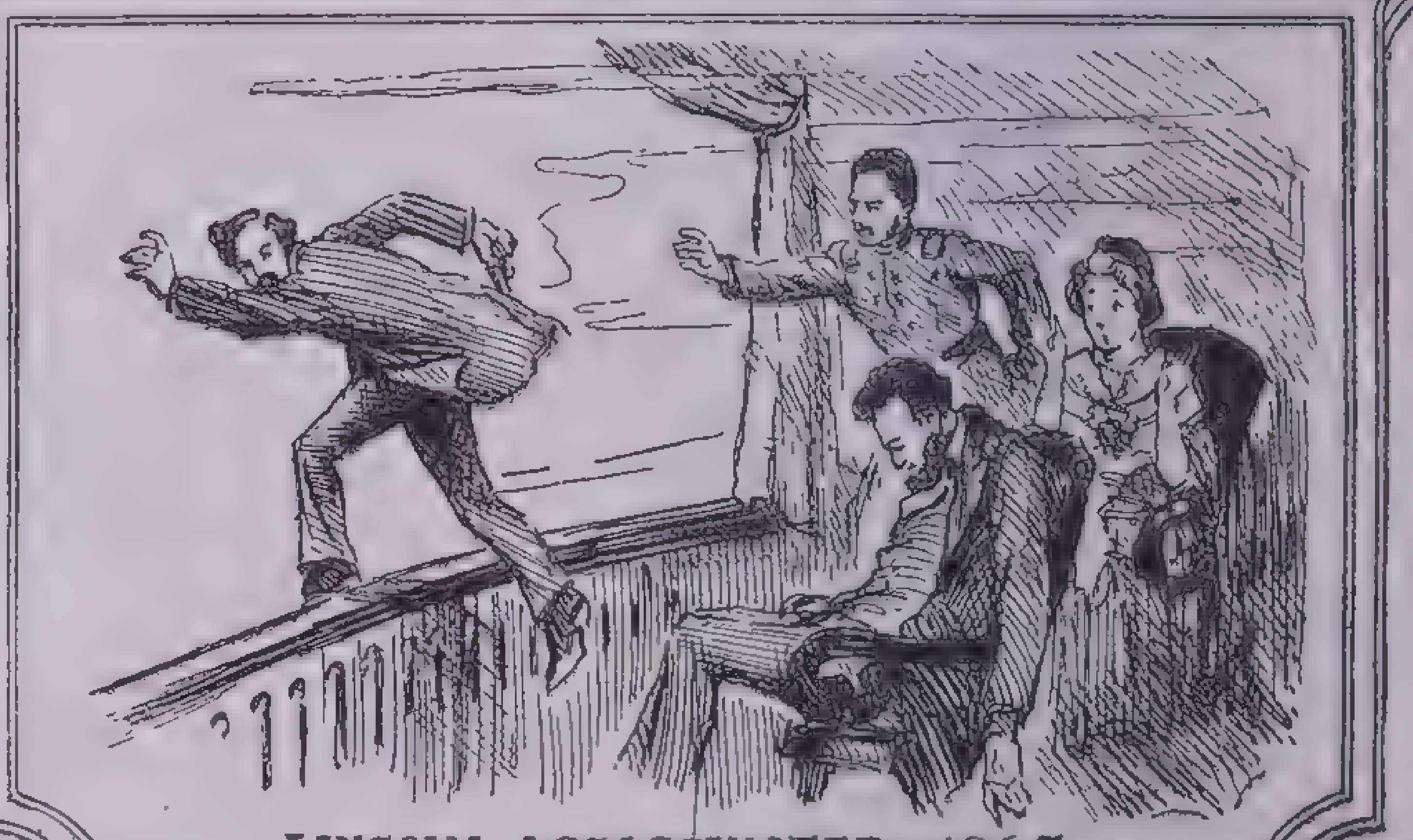

EMANCIPATION PROCLAMATION ISSUED BY LINCOLN -1863


THIRTEENTH AMENDMENT PROHIBITS SLAVERY IN U.S.- 1865


GRANT CAPTURES LEE AT APPOMATOX-1865



ADMISSION OF NEVADA-1864 NEBRASKA-1867
WEST VIRGINIA-1863 TO THE UNION.


LINCOLN ASSASSINATED-1865

send provisions to Major Robert Anderson, the Federal officer commanding this fort which had been in a state of siege since December. South Carolina at once made a formal demand to Anderson for the surrender of the fort. Anderson refused. South Carolina guns began to bombard the fort April 12. The unrationed garrison could not hold out and Anderson surrendered on April 14, 1861.

Preparations.—This was war. North and South both knew it now. The next day Lincoln made formal proclamation of war and called for 75,000 volunteers. The answer was instantaneous. From city, farm and little town, native American and naturalized alien came running. Regiments sprang up overnight. In the first call 90,000 men were enlisted, and still they volunteered. By December 1861 there were 600,000 men in the Union army.

In the South the call for volunteers brought an equally ardent response, and many brilliant officers resigned from the U.S. army to go home and serve their states, among them Albert S. Johnston and the unparalleled Robert E. Lee, who refused the command of the Union army to do so. Four more states went over to the Confederacy. Virginia passed her ordinance of secession April 17, two days after the Union call to arms. Arkansas seceded May 6; North Carolina, May 20; Tennessee, June 18. But the western section of Virginia held to the Union and was admitted as the state of West Virginia (June 20, 1863). The capital of the Confederacy was moved from Montgomery, Ala., to Richmond, Va. President Davis issued a proclamation (April 17) licensing southern privateers to seize U.S. vessels. Lincoln proclaimed the blockade of southern ports, April 19.

On July 4, 1861 Lincoln called a special session of Congress to plan for war. All other business was dropped. Congress issued another call for volunteers, 500,000 men this time; it voted a $500,000,000 loan, made new and higher tariff duties to pay for the war, provided for the punishment of any who worked against the government and proclaimed the property of states in rebellion subject to confiscation. In May Lincoln put Federal troops on the south bank of the Potomac to protect the capital. The Army of the Potomac this was called, under General Irvin McDowell. Davis protected his capital in a similar manner: two Confederate armies stood between Washington and Richmond under Generals Beauregard and Joseph E. Johnston.

The Civil War, Manassas (Bull Run).—Once committed to war the people wanted war. "On to Richmond" was heard everywhere. The people and the Congress still believed one sharp battle would end the Confederacy. The army and the administration were under a cloud of disfavor for the delay. Lincoln knew the troops were still too green to fight, but he believed the Confederate troops were equally unprepared. So on July 21, 1861 he allowed McDowell to advance against Beauregard's forces at Manassas Junction about 30 miles south of Washington, while spectators drove out to watch "their boys" win, like parents at a Boy Scout field day.

The battle was fought along the little creek called Bull Run; North and South seemed evenly matched. The men on both sides were equally raw, equally brave; but the Union generals were conspicuously outgeneraled. The plan had been for Patterson and 18,000 men to prevent General J. E. Johnston's Shenandoah army from joining Beauregard. The Union troops were about to gain an easy victory when five new regiments appeared before them, standing "like a stone wall" and giving their commander, General Thomas J. Jackson his name of Stonewall. Still another brigade from Johnston's forces arrived to confound the Federal troops, whose retreat turned into a panic and a run for Washington.

Gloom succeeded assurance in the public mind. This war was a real war and not to be decided by the turn of a battle. The next day (July 22) Lincoln sent west for McClellan to reorganize the army. This young major-general during June and July had successfully helped West Virginia establish her Unionist stand, and seemed so far the one man into whose hands the Union cause might be delivered.

The Trent Affair.—Late in 1861 (November 8) an incident occurred which nearly cost the Union the neutrality of England. Two Confederate agents, Mason and Slidell, were on board the English mail steamer, *Trent,* one bound for England, the other for France, to solicit aid for their cause. The ship was stopped and boarded by officers from the U.S. frigate *San Jacinto.* Mason and Slidell were taken off and sent as prisoners to Boston. Before the United States had time to disavow the act as unauthorized, Great Britain demanded the release of the two men and the apology of the United States Government. England lined up on the side of the Confederacy was the last thing the Union wanted. The cotton manufacturing interests of England had predisposed her to side with the South. The freedom of neutral vessels and nonmilitary persons from search or capture was "an old, honored and cherished American cause," as Secretary of State Seward admitted. "We are asked to do to the British nation," he said, "just what we have always insisted all nations ought to do to us." So the prisoners were released and allowed to go to England, where they secured, not the official aid they sought, but more sympathy than the Union cause could spare.

1862. The Western Campaign.—All winter McClellan drilled his men in the East. In the West General Halleck was in command, and the successes of a hitherto unknown subordinate officer named Grant were compelling attention.

Albert S. Johnston was in command of the Confederate army in the West. He had fortified the Tennessee and Cumberland Rivers and flung the Confederate line up into Kentucky. An advance north through Kentucky to the Ohio River was his scheme; but this advance was not to be. Grant was in command at Cairo on the Mississippi; he had taken the mouth of the Tennessee River and the mouth of the Cumberland, where they flowed into the Mississippi. To strike quickly at Fort Henry on the Tennessee, then take Fort Donelson on the Cumberland was his idea. This would leave Nashville undefended and give Tennessee over to Union operations.

But Halleck did not give the command until February 1. Grant started the next day through the mud and rain. His advance by land was backed up by gunboats in the Tennessee under Commodore Andrew H. Foote, and on February 6 Fort Henry surrendered. Grant then pushed overland to Fort Donelson on the Cumberland. Foote's gunboats hurried down the Tennessee and up the Cumberland again to help him. On February 15 he surrounded Fort Donelson and discovered that the garrison was leaving. He attacked at once. The fort surrendered February 16, and Grant took 15,000 prisoners. On February 25 the Union troops were in Nashville and west Tennessee was won.

Washington rejoiced and made Grant a major-general. But Halleck, instead of rejoicing in the discovery of an able man, looked jealously to his own laurels and forbade Grant's further advance southward, designed to cut the Memphis–Charleston railroad. Delay gave Johnston time to strengthen and make sure his defenses on that line all the way from Memphis to Chattanooga.

The next obvious thing to do was break the Confederate blockade on the Mississippi and in March this job was given to General John Pope with 20,000 men. Supported by Commodore Foote from the river, he took New Madrid, and after long siege, Island No. 10, April 7. Missouri was thus isolated from further Confederate activity.

Shiloh.—Halleck now decided to finish up the task so spectacularly begun by Grant in February. Whichever side held Corinth (a Mississippi town between Memphis and Chattanooga), could control the Mississippi down to Vicksburg. This was plain. Halleck had already given Johnston plenty of time to move west and take his stand with Beauregard at Corinth. Against these odds stacked up by his own superior officer, Grant undertook the movement. He marched up the Tennessee and stood at Pittsburgh Landing. General Don Carlos Buell was on his way to join him from Nashville. But an unexpected attack by Johnston on April 6 nearly ended in defeat for Grant's recruits. After one of the most terrible battles of the war, night saw Grant in retreat and Johnson killed on the field of battle. But Buell came before daybreak with 20,000 men to meet a new assault led by Beauregard. And that day (April 7) the Confederates were forced back toward Corinth. Halleck now took command of the armies of Grant and Buell, reinforced them with Pope's troops, and slowly advanced toward Corinth, which was evacuated on May 30. Memphis fell in June. The North now held the Mississippi from Cairo to Vicksburg. New Orleans had already fallen to Farragut's fleet on April 24, and General Butler had taken possession of the city on May 1.

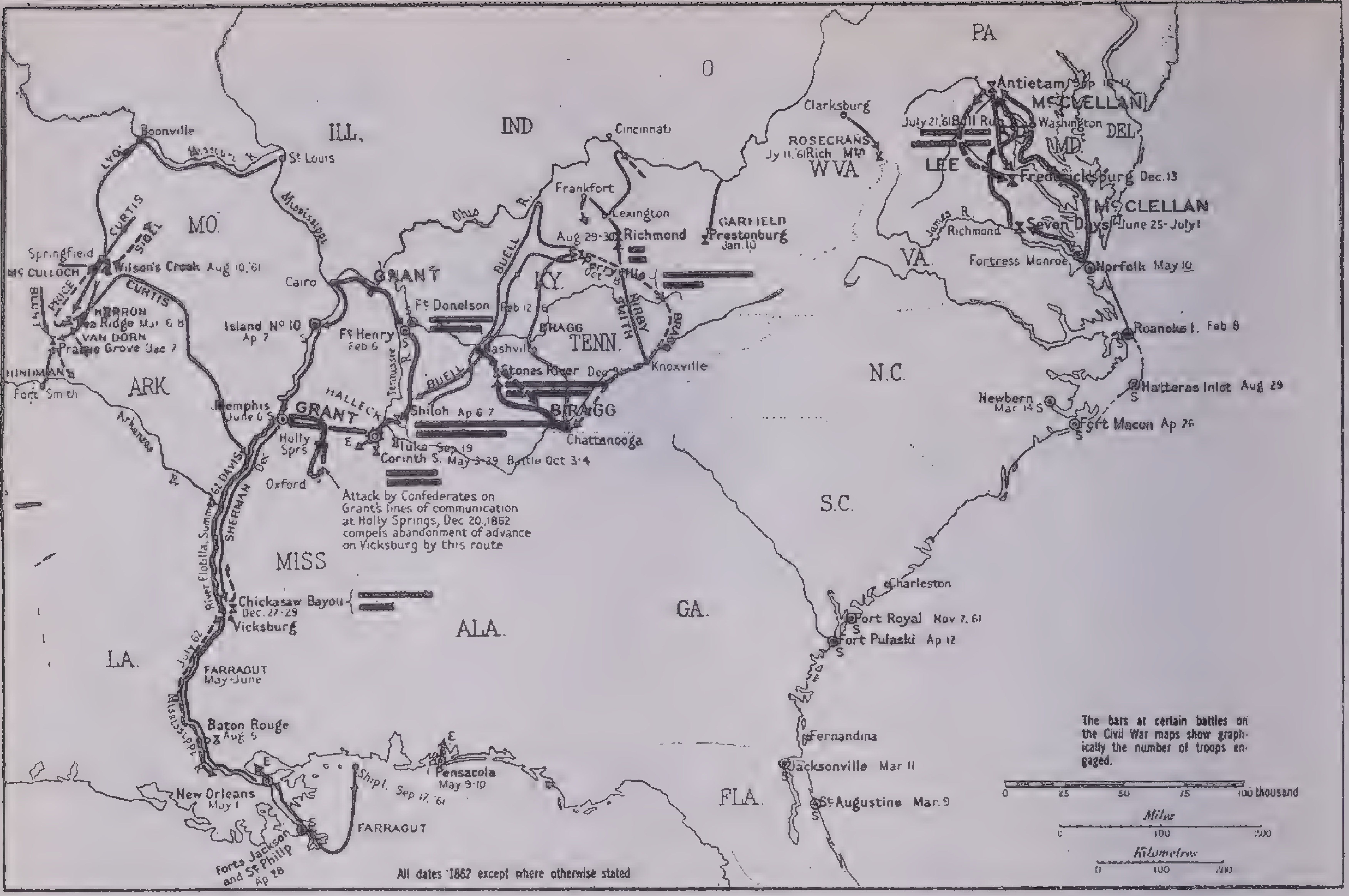
1862. The Seven Days' Battles, June 26–July 2.—But there were no amazing victories in the East. McClellan was partly to blame. Instead of marching from Washington direct toward Richmond, probably fighting a great battle near Fredericksburg, he decided to approach the Confederate capital by water. Early in April his army of 100,000 men was crowded on the little peninsula between the York and James rivers, ready for a march on Richmond. McDowell's corps of 50,000 men were left to guard Washington and still the fears of the politicians. In the Shenandoah Valley General N. P. Banks had about 10,000 men, guarding against a raid from that quarter. It was understood that when he required it, McClellan was to have McDowell's corps.

McClellan advanced with caution, besieging Yorktown for a month and giving the Confederates ample time to evacuate it, which they did on the night of May 3, retreating to Williamsburg. Here took place the first battle, an unimportant affair, the outnumbered Confederates retreating across the Chickahominy. McClellan followed, establishing his camps on both sides of the river. Two corps were placed on the south bank, ready to march on Richmond, but seven miles away. Three corps were entrenched on the north bank, to await the arrival of McDowell. Joe Johnson, in command of the Confederate troops, now decided to attack the two corps south of the Chickahominy, hoping to defeat them before assistance could arrive. A fierce two-day battle resulted (Seven Pines, May 31–June 1). The Confederates were defeated, and Johnson was badly wounded. His place was taken by Robert E. Lee.

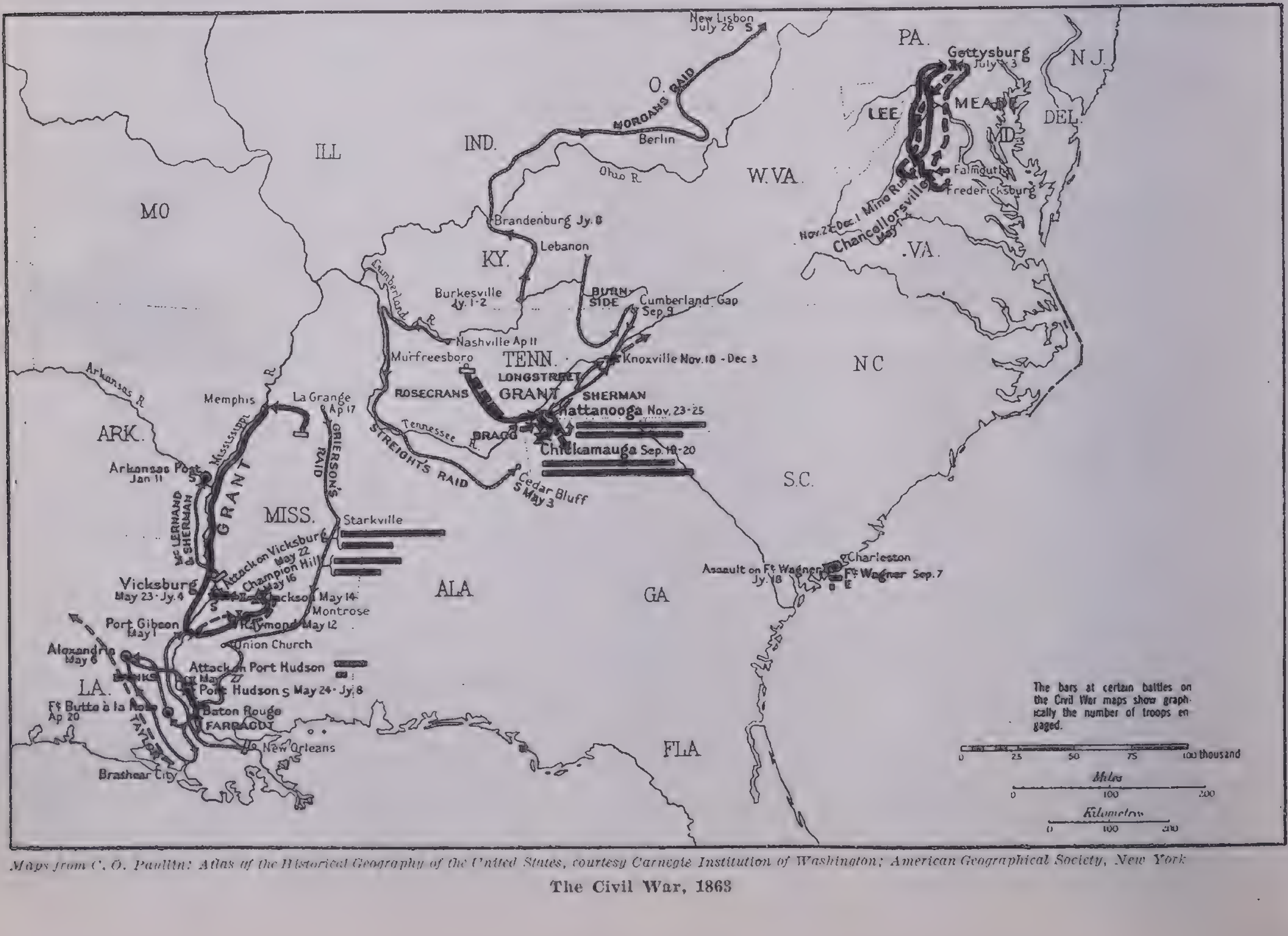
Meanwhile, amazing things were taking place in the Shenandoah Valley. By a series of swift and bewildering marches, Stonewall Jackson had defeated the Union forces under Banks at Front Royal, beat them again at Winchester and drove them in disorder back to the Potomac and out of the Valley. Lincoln ordered McDowell to detach 20,000 men to the Valley to catch Jackson, but Jackson eluded these troops, as well as others led by Frémont and Shields.

Lee now planned a swift and secret concentration north of the Chickahominy of nearly all his army. His intention was to crush the single corps stationed there, the other two corps having been withdrawn to south of the stream. The plan failed, Jackson's troops not arriving when promised. General A. P. Hill waited until three in the afternoon of June 26. Not daring to delay longer, he launched a fierce attack on the corps of General Fitz-John Porter. Though he was not defeated, Porter retreated that night and was attacked the next morning by nearly all of Lee's army, Jackson having at last arrived. Greatly outnumbered, the Union troops crossed the Chickahominy on the night of the 27th and burned their bridges behind them. The next day Lee's troops were busy repairing the bridges, while the Union army was marching south through White Oak Swamp. Emerging from this morass on the 29th, they were attacked at Frayser's Farm, but held off the Confederates until dark, thereby making good their retreat to Malvern Hill. Here, on July 1, Lee made a serious blunder: his attack on an impregnable position resulted in a bloody defeat, and more than 5,000 dead and wounded were left on the slopes of the hill. But McClellan that night resumed his retreat and did not halt until his army was under the protection of the Federal gunboats at Harrison's Landing on the James River.

1862. Second Bull Run.—While McClellan remained on the James and de-

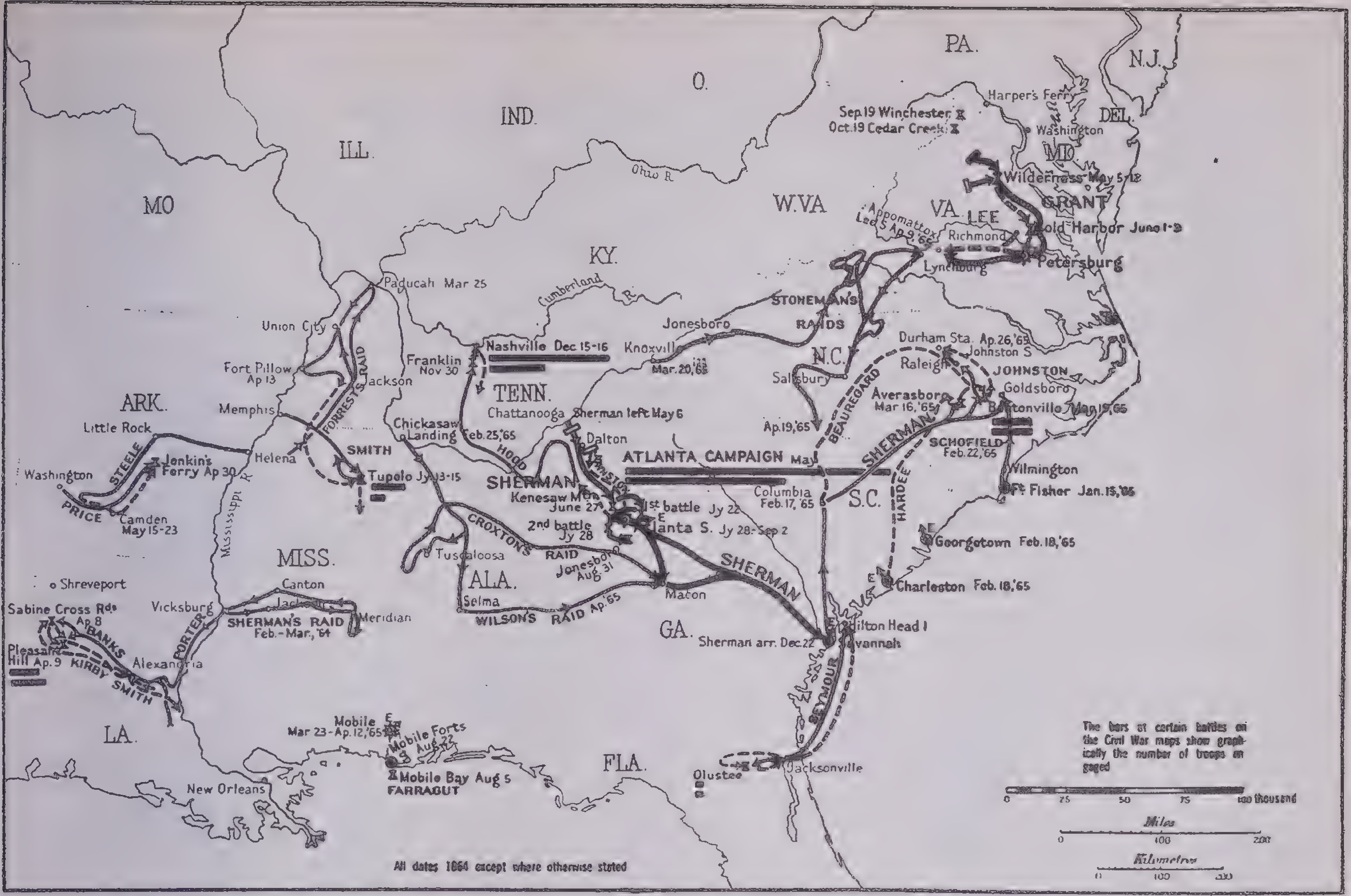

PA
O
Clarksburg
ROSECRANS Jy 11,'61 Rich Mtn
W.VA
Antietam Sep 16-17
McCLELLAN
July 21,'61 Bull Run
Washington
DEL
MD
LEE
Fredericksburg Dec.13
McCLELLAN
Seven Days June 25-July 1
James R.
Richmond
Fortress Monroe
Norfolk May 10
VA.
Roanoke I. Feb 8
N.C.
Hatteras Inlet Aug 29
Newbern Mar 14
Fort Macon Ap 26
S.C.
Charleston
Port Royal Nov 7,'61
Fort Pulaski Ap 12
GA.
Fernandina
Jacksonville Mar 11
St Augustine Mar 9
FLA.
ILL.
IND
Cincinnati
Frankfort
Lexington
Richmond Aug 29-30
GARFIELD
Prestonburg Jan.10
Perryville Oct 8
KY.
KIRBY SMITH
BRAGG
BUELL
Ohio R.
Knoxville
TENN.
Stones River Dec 31
BRAGG
Chattanooga
Nashville
Ft Donelson Feb 12-16
Ft Henry Feb 6
Tennessee R.
GRANT
Cairo
Island No 10 Ap 7
HALLECK
Shiloh Ap 6 7
Iuka Sep 19
Corinth S. May 3-29 Battle Oct 3-4
Memphis June 6
GRANT
Holly Sprs
Oxford
Attack by Confederates on Grant's lines of communication at Holly Springs, Dec 20, 1862 compels abandonment of advance on Vicksburg by this route
MO.
Boonville
LYON
Missouri R.
St Louis
Mississippi
CURTIS
SIGEL
Springfield
McCULLOCH
Wilson's Creek Aug 10,'61
CURTIS
PRICE
BLUNT
HERRON
Pea Ridge Mar 6 8
VAN DORN
Prairie Grove Dec 7
HINDMAN
Fort Smith
ARK
Arkansas R.
DAVIS
SHERMAN Dec.
River Flotilla, Summer '62
MISS
Chickasaw Bayou Dec. 27-29
Vicksburg
ALA.
LA.
July '62
FARRAGUT May-June
Mississippi R.
Baton Rouge Aug 5
New Orleans May 1
Ship I. Sep 17,'61
Pensacola May 9-10
Forts Jackson and St Philip Ap 28
FARRAGUT
All dates 1862 except where otherwise stated
The bars at certain battles on the Civil War maps show graphically the number of troops engaged.
0 25 50 75 100 thousand
Miles
0 100 200
Kilometres
0 100 200

The Civil War, 1861–62

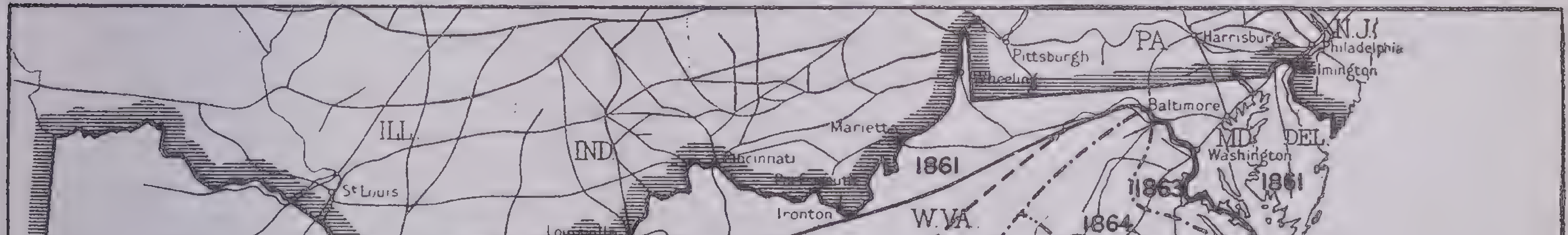

New Lisbon July 26
PA.
Gettysburg July 1-3
N.J.
LEE
MEADE
DEL.
MD.
Falmouth
Fredericksburg
Nov.26-Dec.1 Mine Run
Chancellorsville May
VA.
W.VA.
O.
MORGAN'S RAID
Berlin
IND.
ILL
Ohio R.
MO
Brandenburg Jy.8
Lebanon
KY.
Cumberland R.
Burkesville Jy.1-2
BURNSIDE
Cumberland Gap Sep 9
Nashville Ap 11
Murfreesboro
TENN.
Knoxville Nov.18 - Dec 3
LONGSTREET
ROSECRANS
GRANT
SHERMAN
Chattanooga Nov.23-25
BRAGG
Chickamauga Sep.19-20
Tennessee R.
STREIGHT'S RAID
Cedar Bluff May 3
NC
S.C.
Memphis
La Grange Ap 17
GRIERSON'S RAID
Arkansas R.
ARK.
Arkansas Post Jan 11
Mississippi
McCLERNAND & SHERMAN
GRANT
MISS.
Starkville
Attack on Vicksburg May 22
Champion Hill May 16
Vicksburg May 23-Jy.4
Jackson May 14
Raymond May 12
Montrose
Port Gibson May 1
Union Church
Alexandria May 6
BANKS
LA.
Attack on Port Hudson May 27
Port Hudson May 24-Jy.8
Ft Butte à la Rose Ap 20
Baton Rouge
FARRAGUT
TAYLOR
New Orleans
Brashear City
ALA
GA
Charleston
Assault on Ft Wagner Jy.18
Ft Wagner Sep.7
FLA
The bars at certain battles on the Civil War maps show graphically the number of troops engaged.
0 25 50 75 100 thousand
Miles
0 100 200
Kilometres
0 100 200

Maps from C. O. Paullin: Atlas of the Historical Geography of the United States, courtesy Carnegie Institution of Washington; American Geographical Society, New York

The Civil War, 1863


PA.
N.J.
O.
IND.
ILL.
DEL.
MD.
MO
W.VA
VA.
KY.
N.C.
TENN.
ARK.
S.C.
MISS.
ALA.
GA.
LA.
FLA.
Ohio R.
Cumberland
Mississippi R.
Harper's Ferry
Sep.19 Winchester
Oct.19 Cedar Creek
Washington
Wilderness May 5-12
GRANT
LEE
Cold Harbor June 1-3
Appomattox Lee 5 Ap.9,'65
Richmond
Lynchburg
Petersburg
Paducah Mar 25
STONEMAN'S RAIDS
Jonesboro
Knoxville Mar.20,'65
Durham Sta. Ap.26,'65 Johnston S
Raleigh
JOHNSTON
Goldsboro
Union City
Fort Pillow Ap 13
FORREST'S RAID
Jackson
Franklin Nov 30
Nashville Dec 15-16
Salisbury
Averasboro Mar 16,'65
Bentonville Mar 19,'65
BEAUREGARD
Memphis
Chattanooga
Sherman left May 6
Ap.19,'65
Little Rock
Chickasaw Landing Feb.25,'65
Dalton
SCHOFIELD Feb.22,'65
STEELE
Jenkin's Ferry Ap 30
Helena
SMITH
HOOD
JOHNSTON
ATLANTA CAMPAIGN May
SHERMAN
Wilmington
Washington
Tupelo Jy 13-15
SHERMAN
Kenesaw Mtn. June 27
Columbia Feb.17,'65
Ft Fisher Jan.15,'65
PRICE
Camden May 15-23
1st battle Jy 22
Atlanta S. Jy 28-Sep 2
2nd battle Jy 28
HARDEE
CROXTON'S RAID
Tuscaloosa
Jonesboro Aug 31
Georgetown Feb.18,'65
o Shreveport
Canton
Macon
SHERMAN
Charleston Feb.18,'65
Sabine Cross Rds Ap 8
Vicksburg
Jackson
Meridian
Selma
WILSON'S RAID Ap.'65
SHERMAN'S RAID Feb.-Mar.,'64
PORTER
BANKS
Pleasant Hill Ap.9
KIRBY SMITH
Alexandria
Hilton Head I
Sherman arr. Dec.22
Savannah
SEYMOUR
Mobile Mar 23-Ap.12,'65
Mobile Forts Aug 22
Mobile Bay Aug 5 FARRAGUT
New Orleans
Olustee
Jacksonville
The bars of certain battles on the Civil War maps show graphically the number of troops engaged
0 25 50 75 100 thousand
Miles
0 100 200
Kilometres
0 100 300
All dates 1864 except where otherwise stated

The Civil War, 1864–65


Pittsburgh
PA.
Harrisburg
N.J.
Philadelphia
Wilmington
Wheeling
Baltimore
ILL.
IND.
Marietta
MD.
DEL.
Washington
1861
Cincinnati
Portsmouth
1863
1861
St Louis
Ironton
W.VA.
1864
MO.
1861
Evansville
Louisville
1861
Ohio R.
Lexington
Richmond
VA.
KY. 1862
1863
Lynchburg
Petersburg
Norfolk
Paducah
Bowling Green
Wytheville
Macon
Weldon
Nashville
Plymouth
Murfreesboro
Knoxville
Raleigh
Washington
1864
1862
TENN.
N.C.
1861
ARK.
Memphis
1865
Goldsboro
Corinth
Chattanooga
Newbern
Mississippi R.
Hartsville
Wilmington
1863
Columbia
Florence
Atlanta
ALA.
Augusta
SC
1864
1864
Charleston
1862
Vicksburg
Jackson
Selma
Macon
1861
MISS.
Meridian
Montgomery
Columbus
GA.
Savannah
LA.
1865
1862
Port Hudson
Baton Rouge
Mobile
Fernandina
Sabine City
1863
Pensacola
New Orleans
1862
1861
1862
Tallahassee
Jacksonville
St Augustine
1862
FLA.
Cedar Keys
Southern limit of free states at beginning of war
Approximate limit of Union gains in 1861
" " " " " 1862
" " " " " 1863
" " " " " 1864
Railroads in operation, 1861

Maps from C. O. Paullin: Atlas of the Historical Geography of the United States, courtesy Carnegie Institution of Washington; American Geographical Society, New York

The Northern Armies in the South in the Civil War manded vast reinforcements before again attacking Lee, Lincoln made Halleck commander in chief of all the Union armies. He called General Pope to the East to take command of a new army, composed of the troops guarding Washington and those in the Shenandoah Valley. Despite the reinforcements sent him from McClellan, Pope was outgeneraled by Lee and Jackson and was badly defeated near Manassas Junction on August 20–30. His troops retreated to Washington and began to disintegrate. Much as he disliked to do so, Lincoln was now compelled to restore McClellan to the command of not only the Army of the Potomac but the short-lived Pope army, known as the Army of Virginia.

1862. Antietam.—Believing that the Union troops were too badly shaken to offer resistance, after resting only a day, Lee started to invade Maryland. Jackson's corps crossed the Potomac Sept. 5. Confident that he would not be attacked by McClellan, Lee now divided his army, sending about half of his troops to capture the garrisons at Harper's Ferry and Martinsburg. McClellan learned of this through a captured dispatch from Lee to one of his corps commanders. He marched in pursuit, and attacked Lee at Sharpsburg Sept. 17. The bloodiest one-day battle of the war followed, and the result was a draw. Lee, however, was compelled to retreat across the Potomac. There was great disappointment over McClellan's failure to pursue Lee. Lincoln removed him and gave the command to Gen. Burnside.

1862. Fredericksburg.—Burnside decided to march the Army of the Potomac direct to Richmond, attacking Lee wherever found. The attack, on December 13, was made at Fredericksburg, and against a well-fortified position. A bloody defeat followed, the Union loss being over 12,000 dead and wounded. Obviously, a more able general than Burnside was needed to cope with Lee and his great subordinate, Stonewall Jackson.

Emancipation Proclamation.—Lincoln's one aim that the Union must "cease to be divided" had remained his aim from the first. "The Union must be preserved, with or without slavery," he had said. But now he had long been realizing that the war was going to be too long and too discouraging to be won without the impetus of some greater emotional lift. Many a man would fight to right a wrong who would grow weary fighting for a Union which seemed already broken. *Now* was the time to raise the banner for the Slave. And all that was needed was a victory in which to sound the trumpet for a moral cause.

Antietam was good enough. On Sept. 22 Lincoln made a proclamation (ready since July) that all slaves within the states still in rebellion by Jan. 1, 1863, would be made freemen from that day forever. The South (as was to be expected) paid no heed. Not a state returned to the Union. And the Proclamation was accordingly issued, Jan. 1, 1863.

Few people realize that this proclamation freed no slaves. It did not apply to the loyal slave states, only to those in rebellion. It did not apply to slave territory recaptured in the war. And certainly it went as unheeded as the wind within the Confederacy. What it did do, however, was to change the war from one of political patriotism to a crusade for the oppressed, and enlist the wavering sympathy of Europe. A war to end slavery had England's full approval; in a political squabble her leanings were to the South. Not until the passing of the 13th Amendment at the end of the war in 1865 was slavery actually abolished in the United States.

1863. Chancellorsville.—After its December disaster at Fredericksburg, the Army of the Potomac remained long in its winter camps along the Rappahannock. Everybody except Burnside himself realized that he was not a fit commander. That winter he was replaced by Joseph Hooker, "Fighting Joe," a corps commander who had distinguished himself at Antietam. Hooker planned an ambitious campaign against Lee—nothing more or less than the capture of all of Lee's army. The plan should have succeeded, since Hooker had 130,000 men and Lee not more than 60,000. But Lee was a military genius and he had as one of his corps commanders a man of almost equal ability—Stonewall Jackson. The outcome was an utter defeat for Hooker, who had about 11,000 killed and wounded and 6,000 prisoners. Lee lost more than 10,000 killed and wounded and about 2,000 taken prisoners. But Lee's greatest loss was Stonewall Jackson. Mistaken for a Union officer, he was shot by his own troops. Competent military critics have said that if Jackson had been second in command at Gettysburg Lee would have won that battle.

1863. Gettysburg.—Despite such a brilliant victory, the South was in a desperate situation after the Battle of Chancellorsville. The strangling effect of the sea blockade made it difficult to ship cotton abroad or to obtain munitions and other supplies from Europe. A great offensive victory was necessary to win an alliance with France.

The final decision was to invade Pennsylvania, the army to march down the Shenandoah Valley and then proceed up the valley of the Cumberland to Harrisburg. After the capture of that city, if the North did not sue for peace, Philadelphia and New York were to be captured.

Unknown to Hooker, Lee began to detach his troops, Longstreet's corps starting for the Shenandoah June 3. Three weeks later the entire Confederate army was across the Potomac, and two days later the extreme advance was approaching Harrisburg. When he learned that Lee was on his way north, Hooker wanted to march direct for Richmond, but Lincoln would not permit it. Instead, he was ordered to go after Lee's army, but to not uncover Washington. On June 28 shortly after the Army of the Potomac had entered Maryland, Hooker was relieved from command and General Meade, a corps commander, took his place.

Learning that Meade would soon be on his line of communications, and that he must be defeated before a farther advance was made, Lee began to concentrate his army on June 29. Neither Lee nor Meade planned a battle at Gettysburg; it was only by chance that it took place there. It was a bloody struggle and continued for three days (July 1–3). The Confederates were the victors the first day, driving the Union troops out of the town of Gettysburg, but could not dislodge them from the entrenchments on Cemetery Hill. The struggle on the second day was also a victory for Lee, and encouraged him to charge the Union center on the third day. Here the Confederates met defeat, Pickett's division, which led the charge, being almost annihilated. While the exact total of the losses of both armies at Gettysburg is not known, it was not far from 40,000.

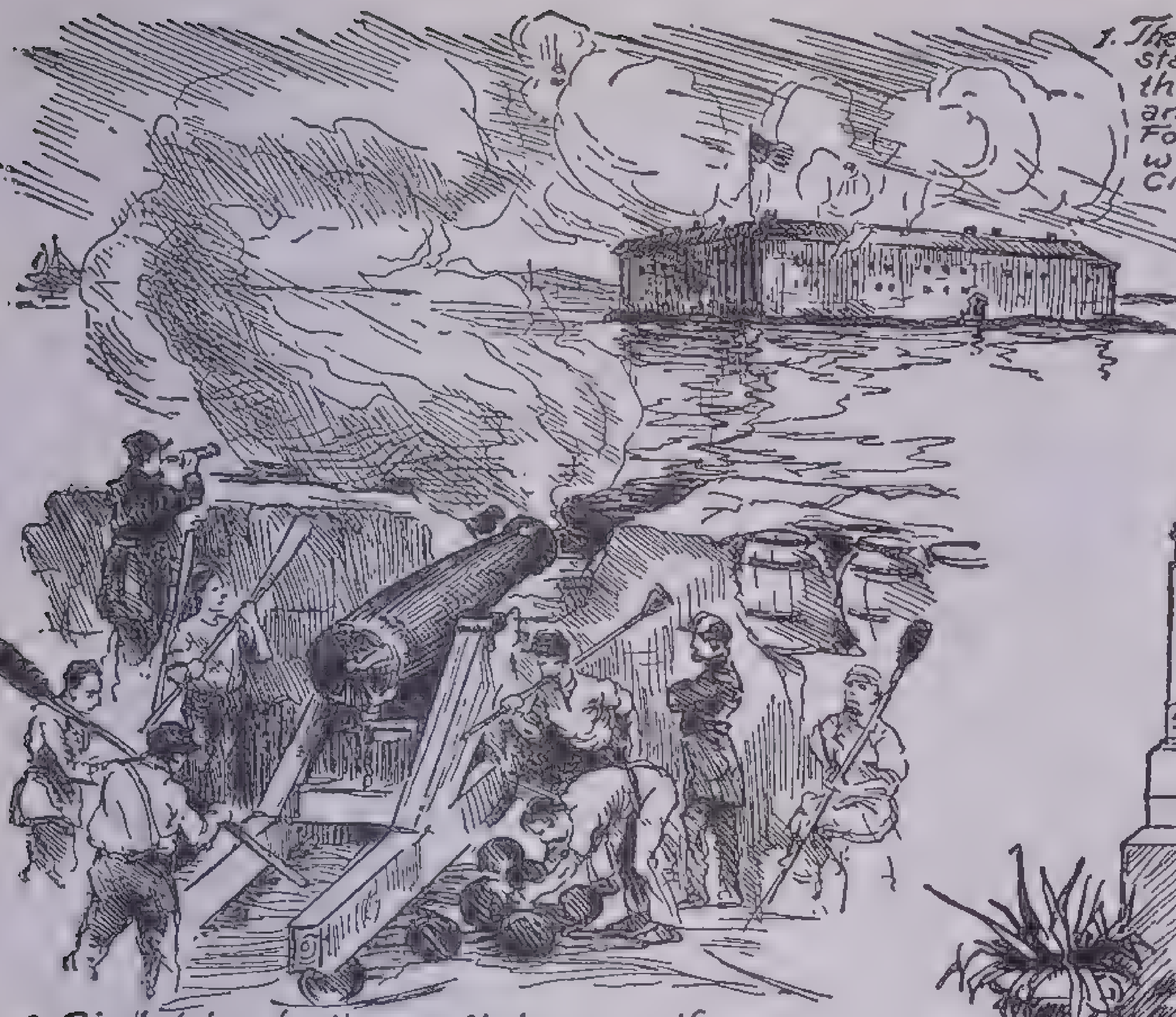
1863. Vicksburg.—This fortress was a hard nut to crack, so many swamps and rivers surrounded it. Since October, 1862, Grant had been in command of the Union armies in this central area. His most important task was the opening of the Mississippi River—impossible without the capture of Vicksburg. His first plan was to take a large army down the railroad from Holly Springs, Miss., and at Jackson to turn right toward Vicksburg. Meanwhile, General Sherman with a considerable force was to proceed down the Mississippi in transports conveyed by a gunboat flotilla. These troops were to attempt a lodgment north of Vicksburg at Chickasaw Bluff. The plan failed. The redoubtable Confederate cavalry leader Forrest wrecked beyond repair the railroad Grant depended on for his supplies. Sherman's attack at Chickasaw late in December 1862, was repulsed with heavy loss.

After several other failures Grant decided to attack Vicksburg from the south. Late at night on April 16 Admiral Porter ran 11 vessels past the batteries at Pittsburg, losing only one. Six nights later several more boats passed safely down the stream. Grant now landed about 20,000 men on the west bank of the Mississippi and above Vicksburg. They were marched south, and at a landing below Vicksburg Porter's fleet ferried them to the east bank of the Mississippi.

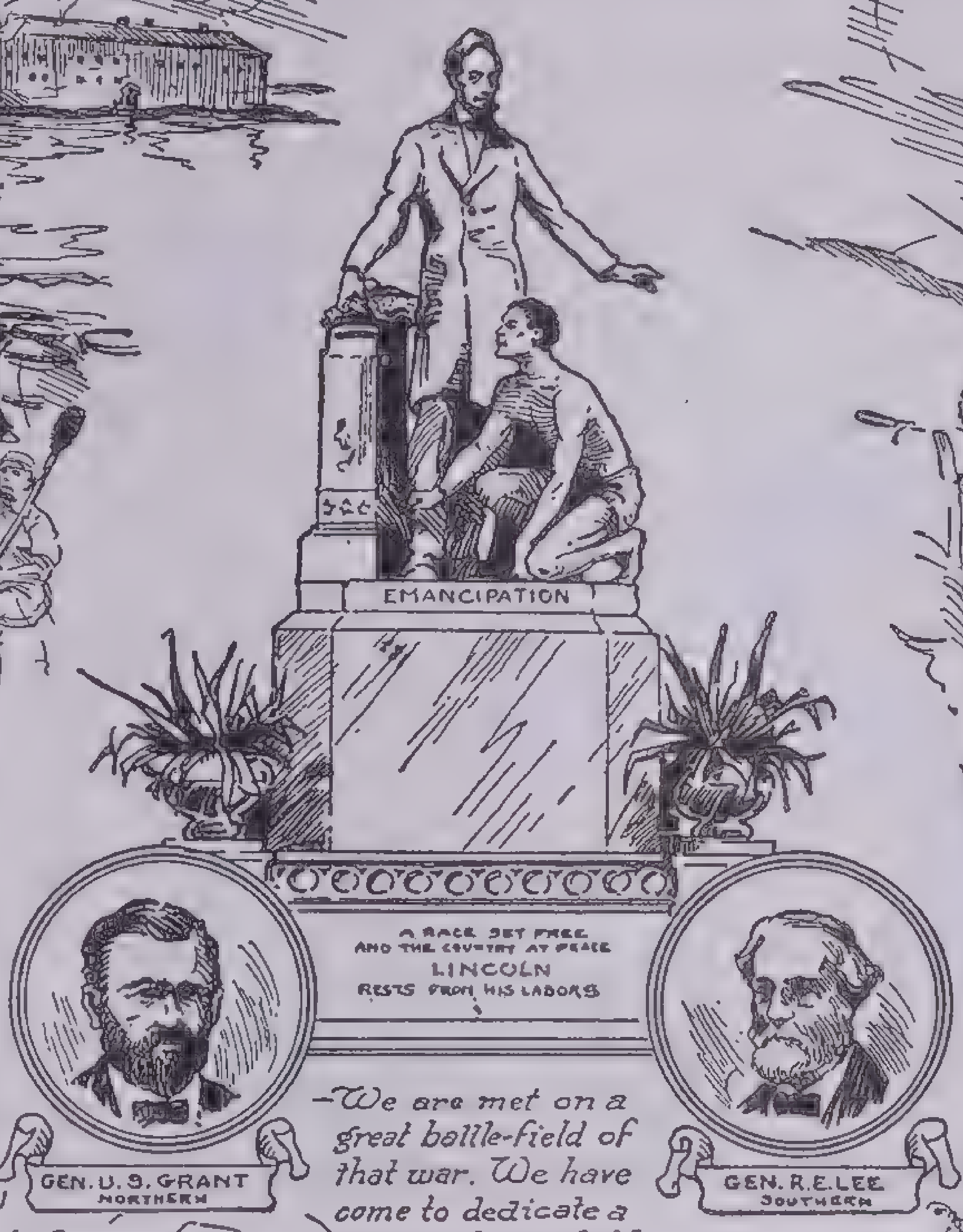
Grant now cut loose from his line of supplies, improvised an ammunition and supply train, using every sort of vehicle and draft animal to be found on plantations and farms. Marching north toward Vicksburg, his left flank protected by the Big Black River, he suddenly turned his columns to the right—away from Vicksburg. Driving before him the few Confederate troops General Johnson had collected, on May 14 Grant captured and destroyed Jackson, an important railroad and munition center.

The next day Grant turned his columns to the west and on May 16, at Champion Hill, defeated a considerable part of the Vicksburg garrison. Two days later Grant had completely invested Vicksburg, and 47 days later the fortress surrendered. As Lincoln so well expressed it, the Father of

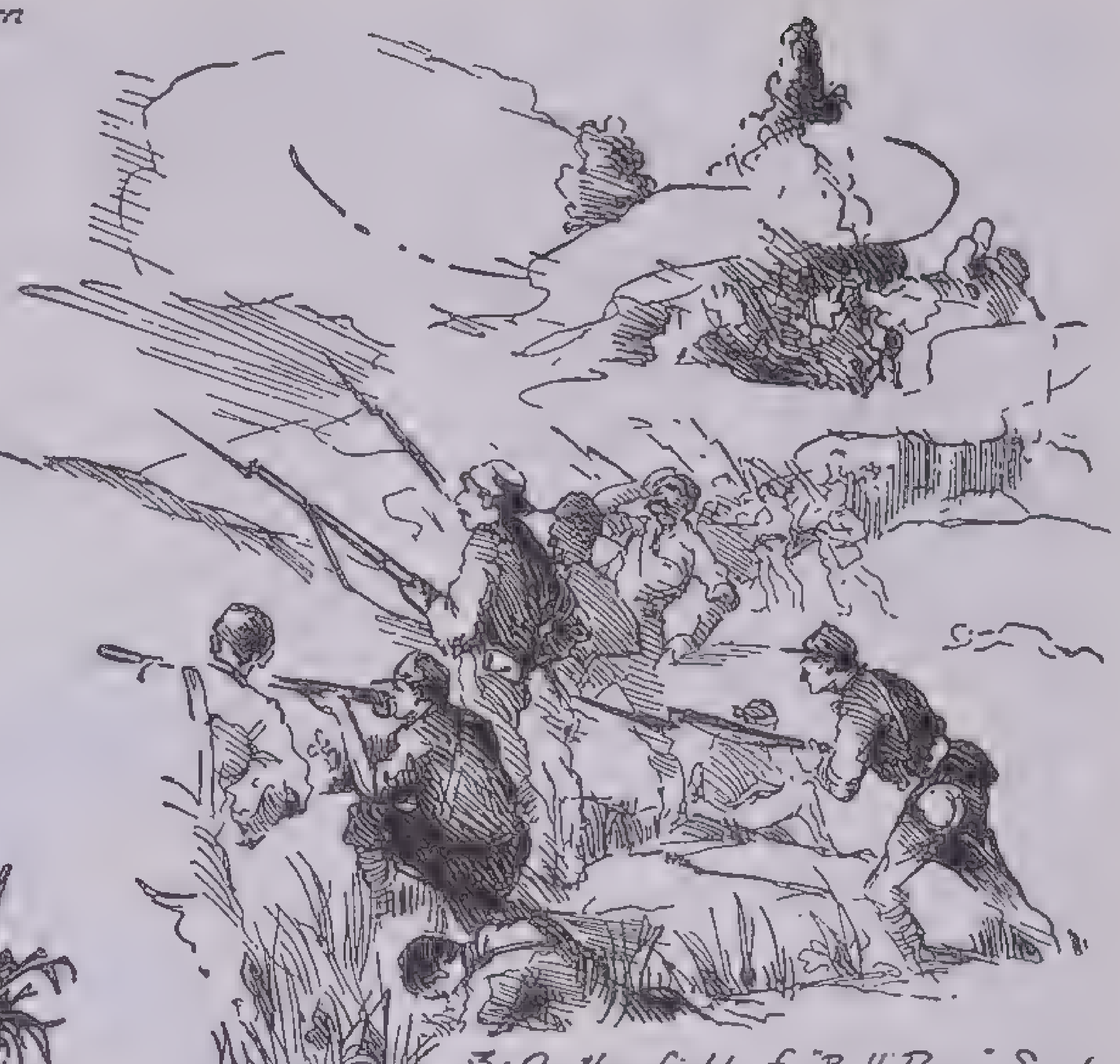
1. The secession of the Southern states from the north over the question of slavery and the attempt to take Fort Sumter by force were the causes of the Civil War.



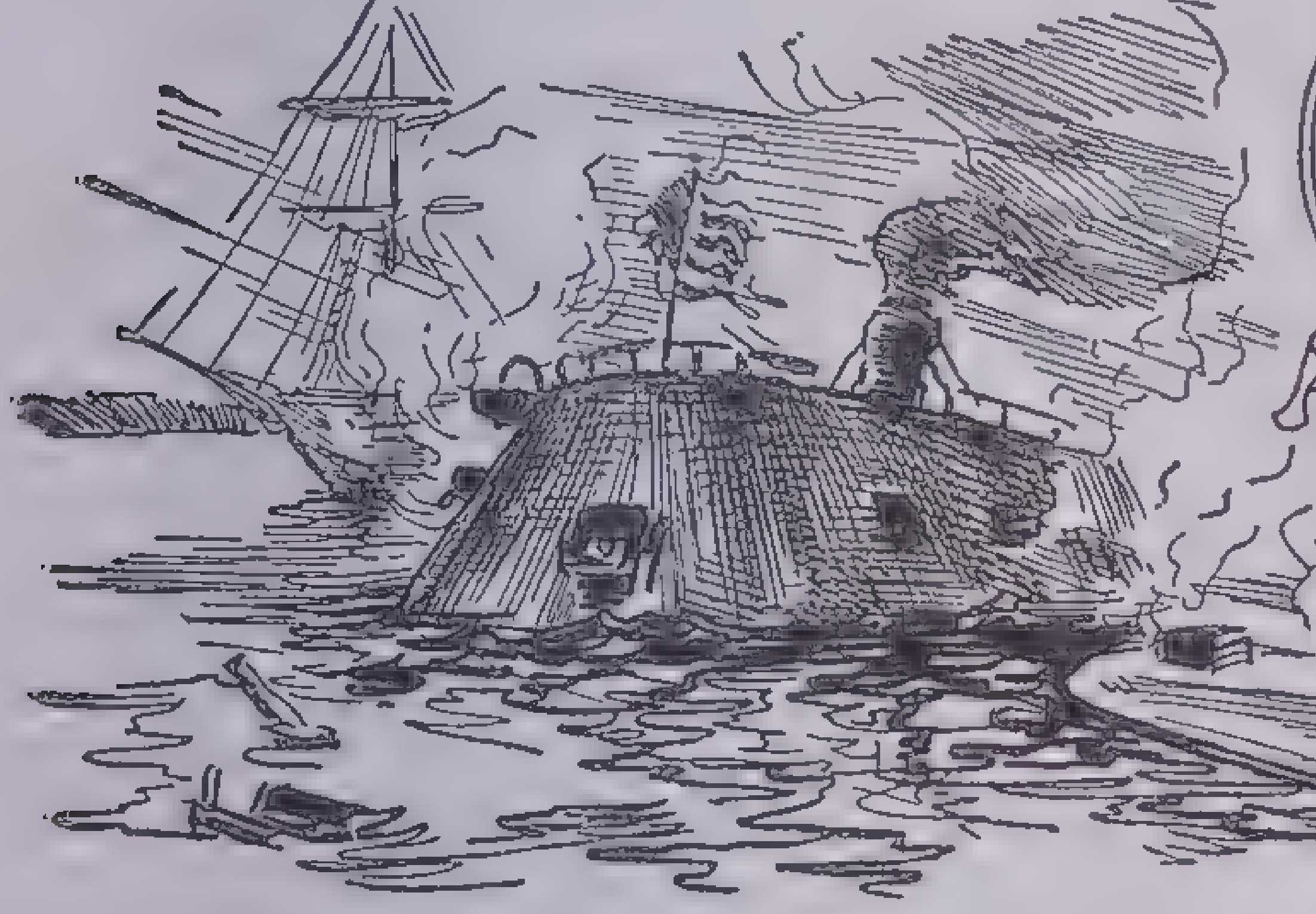
2. Civil War begins — At dawn on the morning of April 13-1861. the confederates fired the first gun at Sumter.


EMANCIPATION
A RACE SET FREE AND THE COUNTRY AT PEACE LINCOLN RESTS FROM HIS LABORS
GEN. U. S. GRANT NORTHERN
GEN. R. E. LEE SOUTHERN

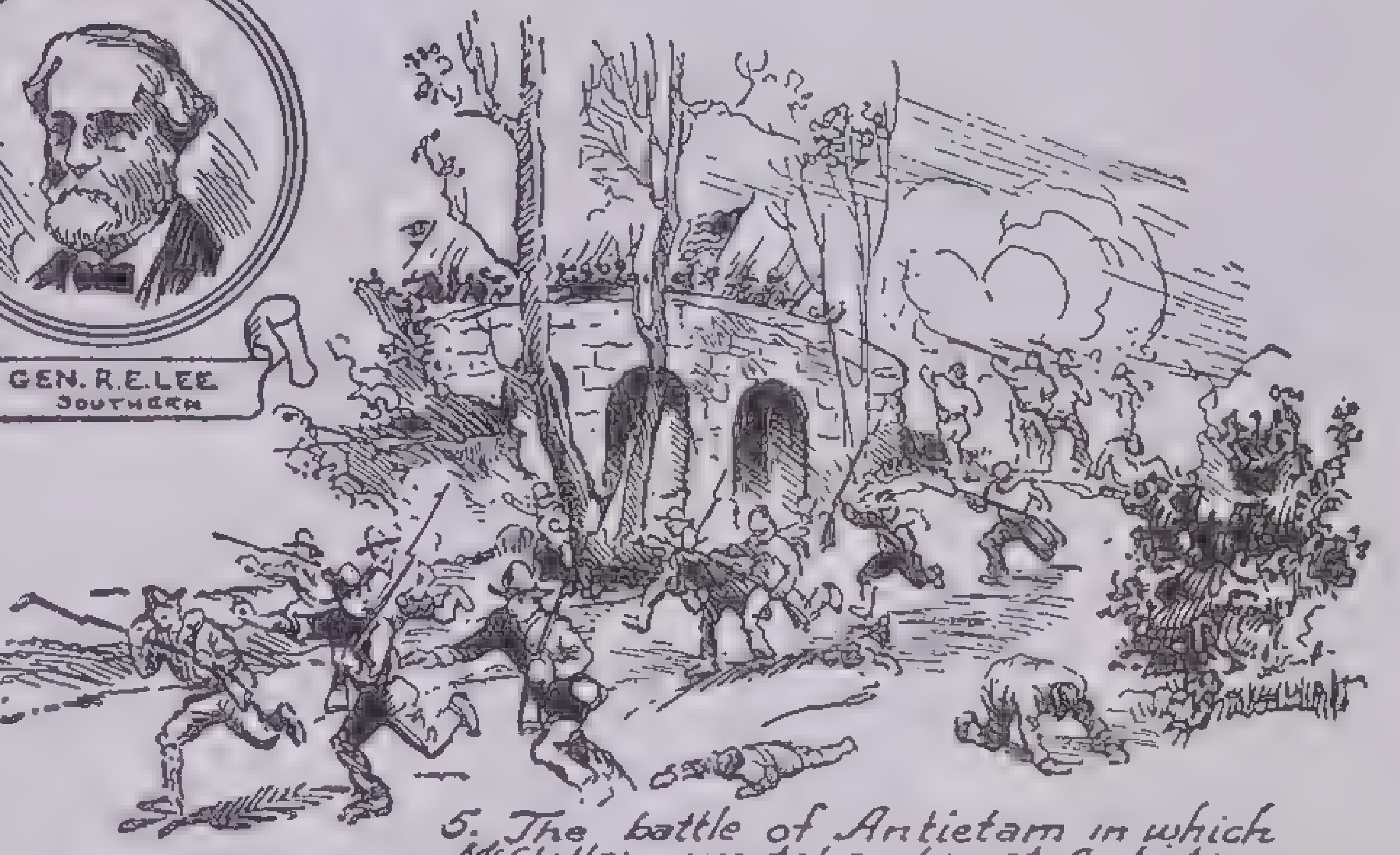
—We are met on a great battle-field of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live.
Lincoln.



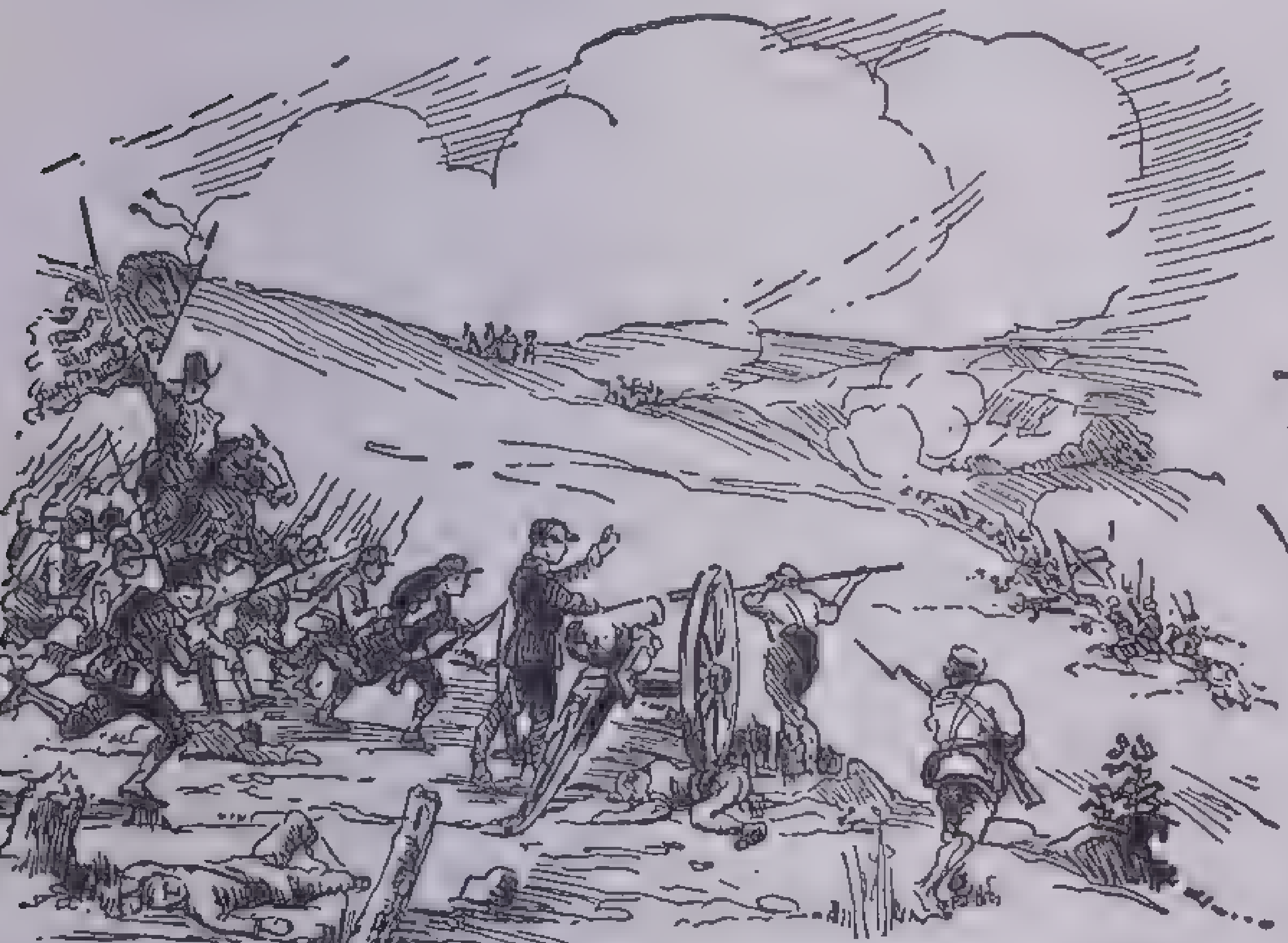
3. On the field of "Bull Run" Sunday July 21-1861 - was fought the famous battle which ended with defeat and flight of the Union forces



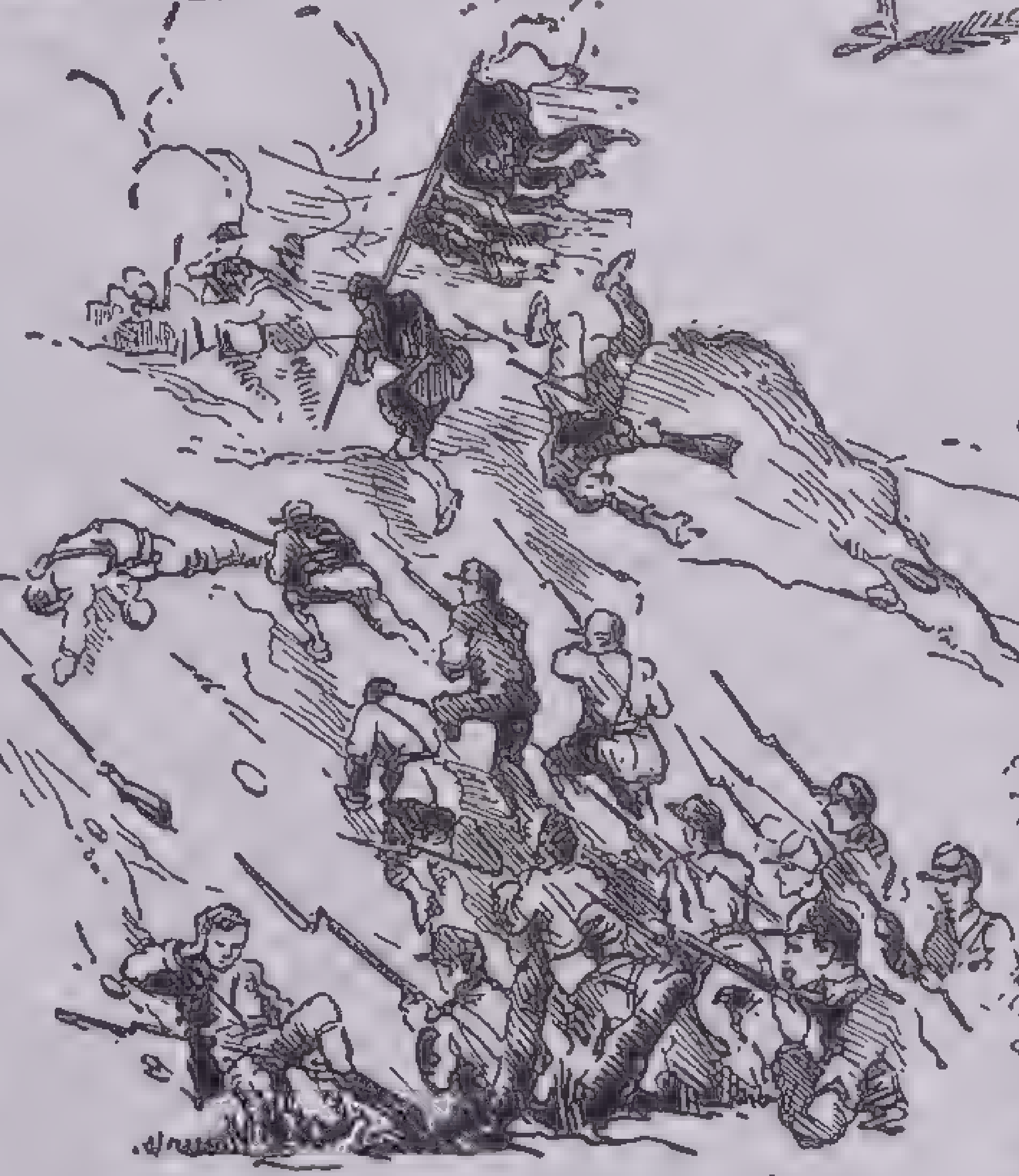
4. The encounter at close range between the Merrimac and the Monitor - in the greatest naval battle of Modern Times — Neither ship was disabled - They proved to be masters of the seas. March 9-1862.



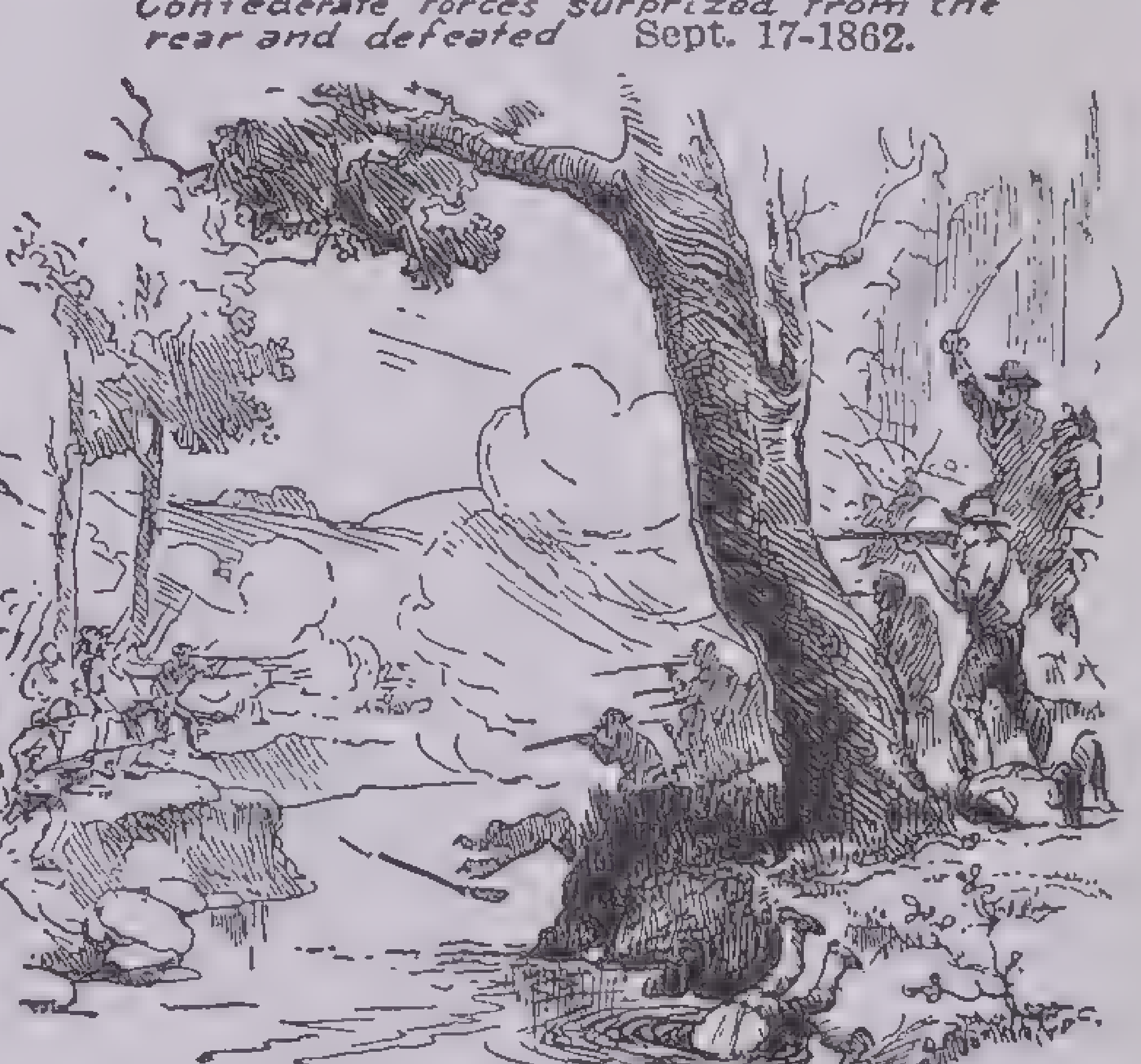
5. The battle of Antietam in which McClellan overtakes Lee at Antietam Creek near Sharpsburg where is fought one of the bloodiest battles of the war Confederate forces surprized from the rear and defeated Sept. 17-1862.



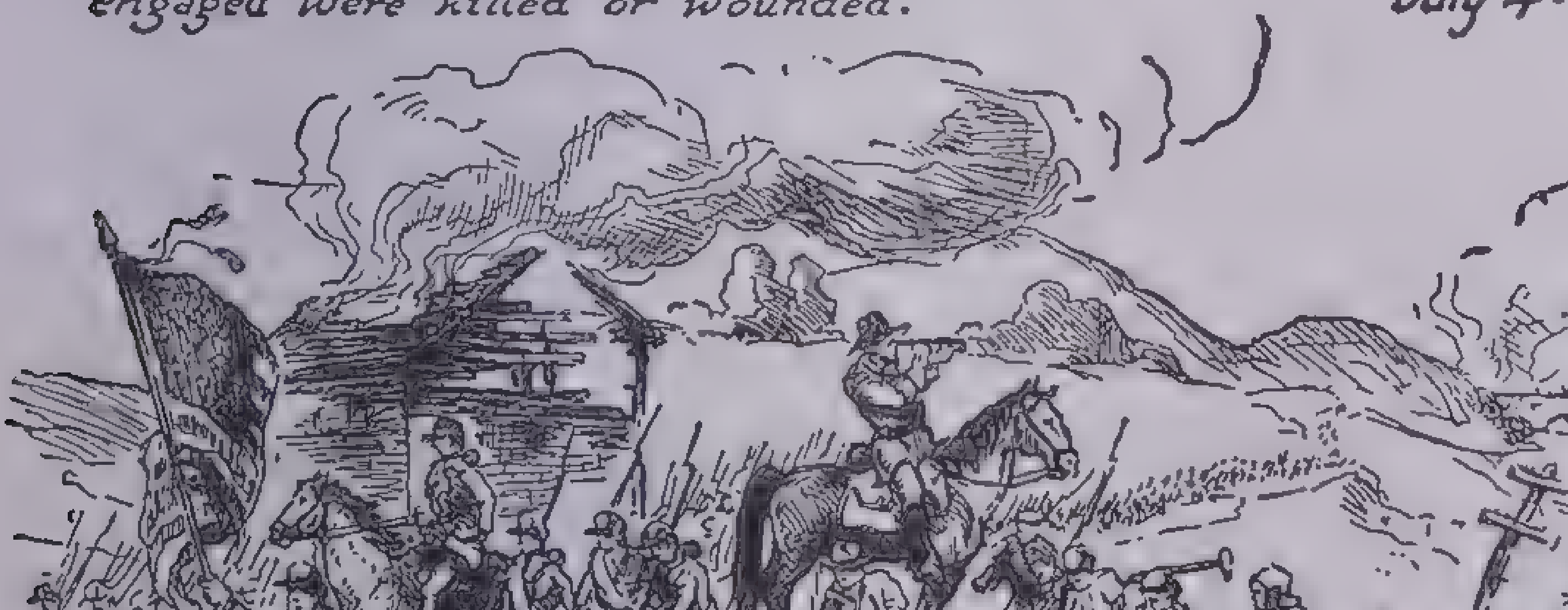
6- Battle of Gettysburg - July 1-3-1863. Lee was beaten in one of the most stubbornly fought battles. About one fourth of the men engaged were killed or wounded.



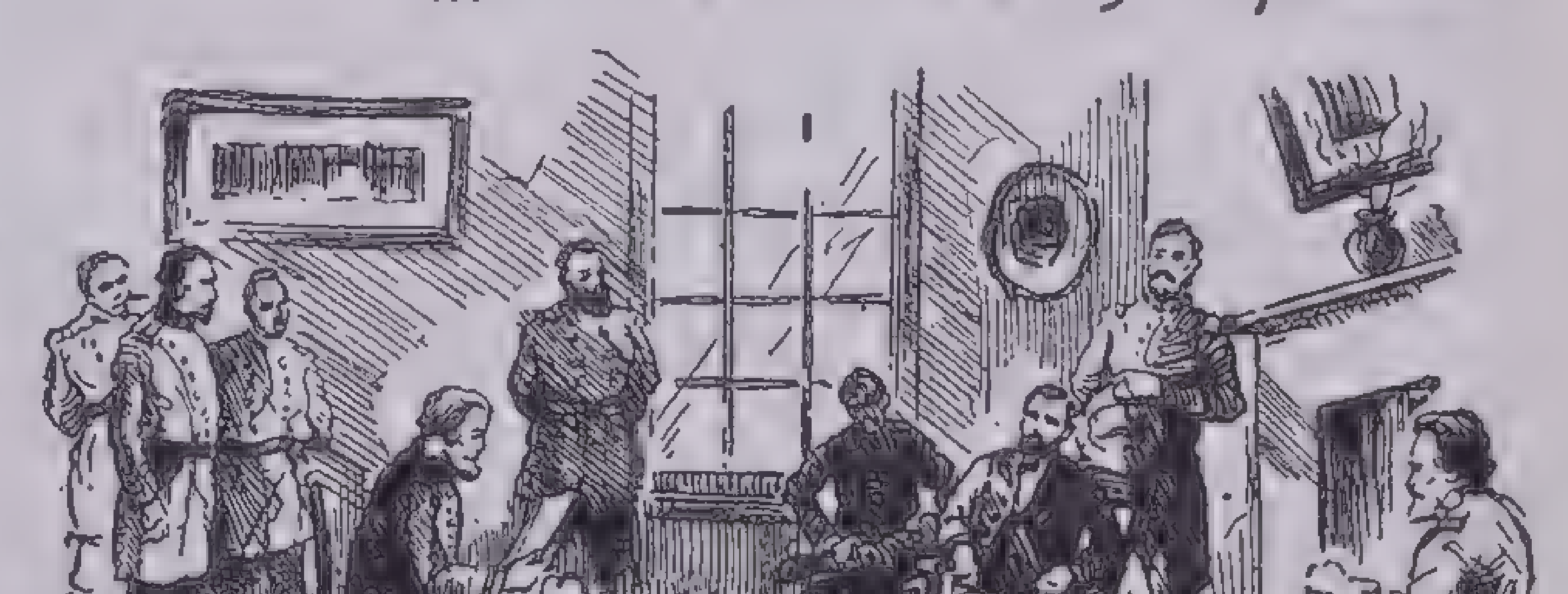
7. The siege of Vicksburg - which lasted seven weeks and ended in the surrender to Grant. July 4 - 1863.



8. Battle in the Chickamauga Valley. one of the most desperate battles of the war - which ended in victory for the Confederate army - Sept-19-20 1863.

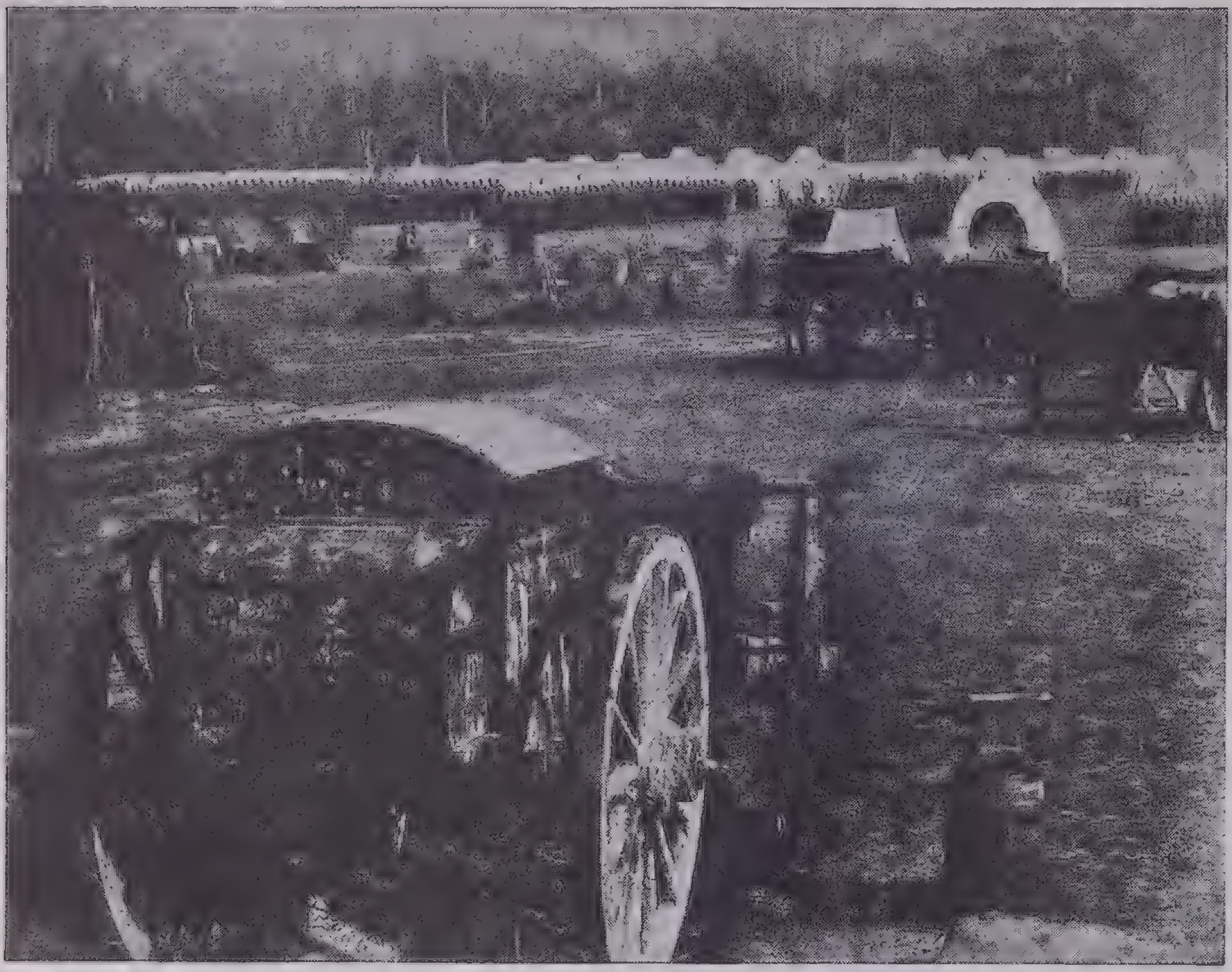


9- Shermans famous march from Atlanta to the sea with 60 000 of his best veterans. They burned bridges, tore up railroads, living on the country as they marched — Nov - 1863.



10. Lee surrenders to Grant at Appomattox Courthouse - April 9 - 1865. Thus ended the war and the Confederacy.

THE CIVIL WAR



Courtesy Museum of Modern Art

Inspection of Northern Troops in Virginia in 1862

From a photograph by Alexander Gardner who with Matthew Brady photographed the Civil War behind the northern lines under protection of the War Department and Secret Service

Waters again flowed unvexed to the sea.

The Turn of the War.—The two victories of Vicksburg and Gettysburg, a day apart, marked the turn of the war. The Union forces now controlled the Mississippi. Lee for once was beaten. West Virginia was admitted to the Union, June 20, 1863. By December the recaptured sections of Louisiana, Tennessee and Arkansas were ready for reconstruction, and Lincoln was already dedicating himself to that "great task remaining." His proclamation of December, 1863, offered the oath of allegiance to every one in the retaken sections except Confederate military and government officers and those who had mistreated prisoners of war. When the percentage of loyal citizens should be enough, state governments were to be set up and recognized.

1864. The Battle of the Wilderness.—Two armies remained to the Confederacy: Lee's in Virginia and Johnston's in Georgia. Grant was made commander in chief of all the Union armies, March 1864. He put Sherman in command in the West and himself took over the Army of the Potomac, retaining Meade, however, in the field. Here at last was a man who knew his soldiering, whom neither the politicians nor public pressure could dissuade from his own plans.

The eighth commander of the Army of the Potomac headed straight for Richmond. Grant and Meade crossed the Rappahannock, May 4, and were attacked by Lee in the difficult, unbroken forest land which gave the region its name, the Wilderness. For 16 days Lee kept them busy; they could not push him back. The battle of the Wilderness, May 5–6, was no gain. The battle at Spottsylvania Court House got them nothing, and the long struggle at Cold Harbor nothing but the loss of 12,000 men and Lee still standing strong.

But Grant would not sit and wait here. He kept after the enemy. Unlike his predecessors he knew the value of unremitting pressure. For him nondefeat was *not* as good as a victory. He moved at once to the left and crossed the James River, planning to approach Richmond by way of Petersburg, 20 miles south of it. By June 15 he was there and began the long siege which would open the way to the Confederate capital.

1864. Western Campaign.—In the meantime Gen. Sherman was pressing Joseph E. Johnston back into Georgia. On May 5 he started from Chattanooga, beginning the famous move which was to unite his army and Grant's, tie up the Confederacy in a loop knot and end the war. There was hard fighting every inch of the way, at Dalton, Rome, Resaca, but no pitched battle. An engagement at Kenesaw Mountain was Johnston's victory. But by July Johnston had been forced back to Atlanta. His long maneuver of impeding but not fighting the invader and the inevitable retreat did not seem enough to President Davis, who sent Gen. Hood to replace him. Hood wearied and used up his army (already small and exhausted) by constant and fruitless fighting in July. Sherman defeated him in three battles, cut the railroad lines which kept him and Atlanta in touch with the Confederacy, and moved into that city on Sept. 2. Hood tried to lure him north again into Tennessee, Sherman would not be tricked from his objective, but stayed in Atlanta. Gen. Thomas then defeated Hood at Nashville (Dec. 15–16) so effectively that Hood's army was never unified again.

Election of 1864.—Lincoln's re-election hung on the success of Grant. Even he himself thought so. While the army fought and died in the Wilderness, tongues wagged and bitterness prevailed. Hardly a good word was said for Lincoln, who was at once "too tyrannical" and "too lenient" for his critics. Everybody felt wiser than the one man on whose wisdom the fate of the nation hung. Secret societies sprang into being, conspired against the government, encouraged deserters from the army. Lincoln would often pardon a frightened boy-deserter because he could not lay hands on the traitor, the Copperhead, who had seduced him from duty. For this he was called weak and vacillating, and for his drastic suppression of treason when unearthed, he was thought harsh and tyrannical. He was blamed for the failure of the war, for the length of it, for unconstitutional proclamations and usurping the power. There was even a myth that Davis was willing for a peace *and* Union which Lincoln had refused.

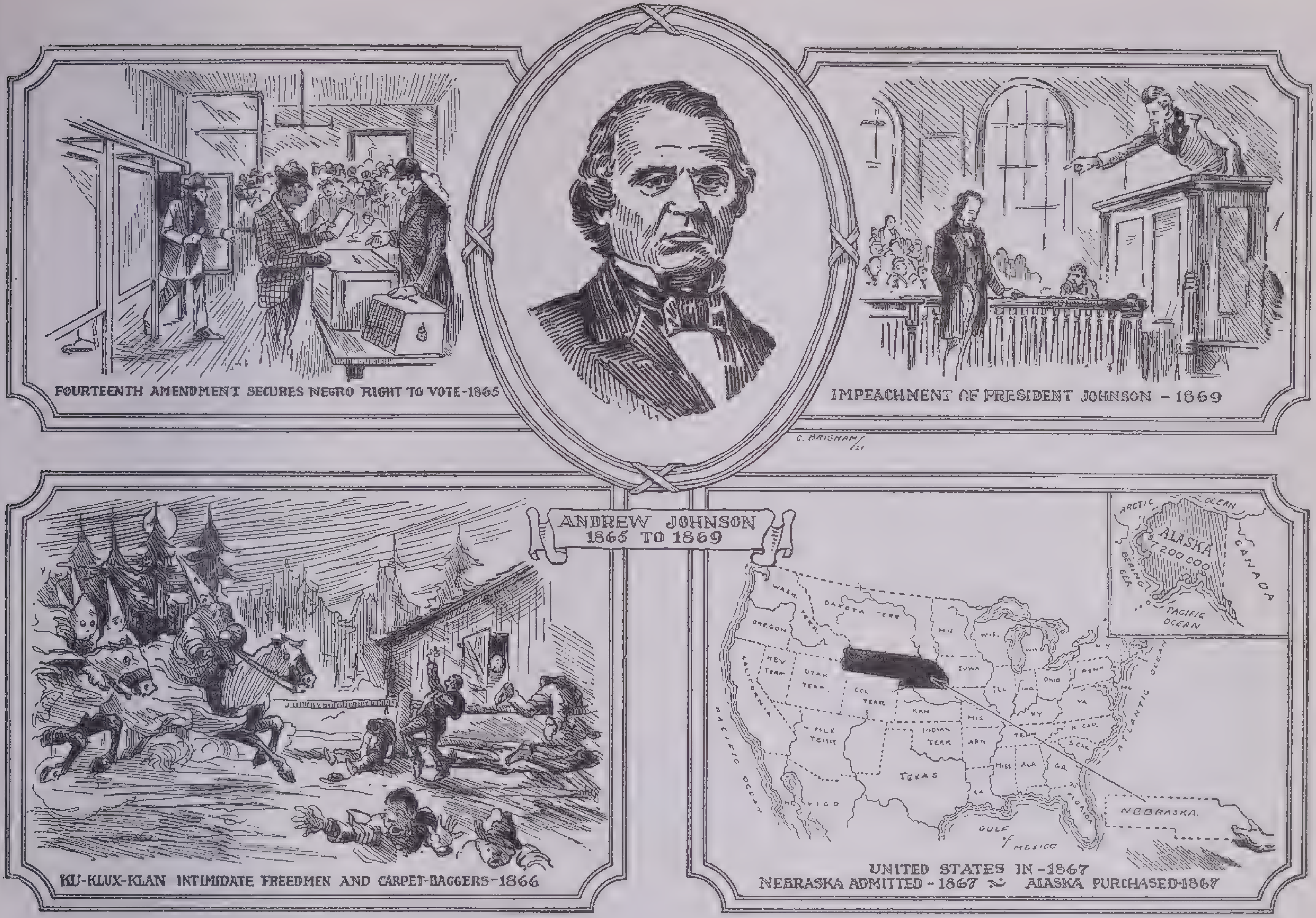
Both the Republicans and Democrats popularized other candidates. The Democrats nominated McClellan. The radical Republicans tried to run Frémont. The conservative Republicans tried to run Chase, Lincoln's own Secretary of the Treasury, against his chief. But the Republican convention which met in Baltimore, June 17, renamed its party the Union Party, nominated Abraham Lincoln, Republican, and Andrew Johnson, Democrat, on the same ticket, and pledged itself to Union interests.

By September Lincoln's chances had increased. Farragut had taken the harbor of Mobile in August. Sherman entered Atlanta, Sept. 2. And Lincoln issued a proclamation of Thanksgiving, Sept. 3, which lifted dissatisfaction and showed the end in sight. He was elected in November with 2,200,000 votes to McClellan's 1,802,000.

Sherman's March to the Sea.—Once inside Atlanta, from which the civilians had fled, Sherman destroyed the famous mills and factories, burned tons of cotton in the storehouses and marched out, leaving the great Confederate industrial city useless. He was eager to strike out for Savannah. "I can make this march," he told Grant; but even Grant, who ignored most hazards, was loath to let him cut loose from his base and advance foodless 300 miles into enemy territory. He did consent, however, and Sherman picked his men. No sick, no laggards, no doubtful spirits, no baggage could impede this march.

On Nov. 15 they started; 60,000 of the toughest men in the world, marching, foraging, singing through Georgia. They cut a swath 60 miles wide, destroyed 160 miles of railroad and isolated Georgia's grain from Lee's army. They ate what they found, burned what they left, arrived before Savannah on Dec. 10 and entered the city Dec. 20.

1865. The End of the War.—Sherman turned north in Feb. 1865 and headed for Columbia, S. C., which he took Feb. 17. South Carolina suffered horrors of destruction from the hands of



ANDREW JOHNSON 1865 TO 1869

FOURTEENTH AMENDMENT SECURES NEGRO RIGHT TO VOTE-1865

IMPEACHMENT OF PRESIDENT JOHNSON - 1869

KU-KLUX-KLAN INTIMIDATE FREEDMEN AND CARPET-BAGGERS-1866

UNITED STATES IN-1867
NEBRASKA ADMITTED-1867 ~ ALASKA PURCHASED-1867

this army who had plundered their way through Georgia on a wave of enthusiasm. Now they were experts in the business of a pitiless annihilation and left nothing undone. The news of homes gone up in smoke and flame, families scattered and lost, broke the morale of the Confederate armies more than any defeat. Men deserted by the hundreds, to find and help their families at home. Charleston had already fallen to the U. S. fleet in February. Sherman entered Fayetteville, N. C., March 11, and continued northeast towards Goldsboro. Johnston attacked him, March 19, but was forced to retire to Raleigh. Here Sherman moved up on him, April 10, and took the city, April 13. This was the end, but Johnston did not make formal surrender until April 26 at Greensboro, N. C.

All this time Grant was besieging Petersburg. He had put Sheridan in command of the cavalry in the East, April 1864. And Sheridan had distinguished himself in the Shenandoah Valley by a series of victories and an utter laying waste of the region, which gave the Union permanent control of the valley.

Sheridan turned south again in the Spring to help Grant close in on Richmond. Both armies began this move, March 22, 1865. On April 1 Sheridan in his victory over Lee's forces at Five Forks took 6,000 prisoners and the South Side Railroad. This cut the last supply line of the Confederacy. On April 2 Petersburg was abandoned to Grant's advance. Richmond surrendered, April 3. Lee withdrew toward Lynchburg, the one avenue of refuge where possibly the dwindling Confederate army might still hold the mountain passes. Lee was now in definite retreat. His supplies had miscarried. Between April 1 and 7 he had lost 14,000 men. Sheridan intercepted him, April 8, at Appomattox Court House. And here Lee surrendered to Grant on the 9th.

Two Great Men.—There was no rancor in this meeting. Lee felt no humiliation in surrendering to so great a man. Grant felt no triumph over a general as great or greater than himself, whose army was beaten only because it was starved and outnumbered. He talked on and on, unable to mention surrender to a foe "who had fought so long and valiantly." Lee had to bring him to the subject. And Grant's terms were generous. Surrender, unconditional, of course, came first; but officers and men were to go home unmolested; no personal property was to be given up, no swords laid down; each man could take his own horse or mule home for the spring plowing. And the starved Southern army was to be fed at once, before disbanding. The war was over.

Lincoln's Death.—North and South were one again. The 13th Amendment (Feb. 1865) was passed; all slaves were free and no human being could ever again be enslaved under the law of the United States. Washington was still on the top of the wave of rejoicing, when Lincoln stepped into a box at Ford's Theater about 10 o'clock the night of April 14, to watch the performance of *Our American Cousin.* A shot rang out. *"Sic semper tyrannis!"* [1] some one cried. "The South is avenged!" A man leaped to the stage, ran off behind the scenes and disappeared. It was John Wilkes Booth, once an actor, now the crazed, fanatic assassin of the one man who might have put through the impossible policy of "malice toward none—charity toward all." The war was over, but Lincoln was dead.

Andrew Johnson—1865–1869

It needed a greater mind and a greater personality than Andrew Johnson's to hold a Congress composed of human beings to Lincoln's magnanimity. To forget everything and *build* was to have been Lincoln's policy. "Treason must be made odious," said Johnson, "and traitors must be punished and impoverished." The radicals who had deplored Lincoln's leniency cheered this attitude, only to be dashed by Johnson's about-face when he took up the identical plans Lincoln had already put in operation in Virginia, Arkansas, Louisiana and Tennessee, and when he fought the drastic reconstruction measures that Congress put through over his head.

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[1] "Thus ever to tyrants"—the state motto of Virginia.

The Presidential Plan.—Johnson was too good a Unionist to feel that the southern states (even while in rebellion) had ever been out of the Union. This was Lincoln's view: no state *could* secede, hence no state *had*. His plan, like Lincoln's, was to restore civil government throughout the broken South as rapidly as possible. In May 1865 he proclaimed a general amnesty, that is, a wholesale pardon to all who would take the oath of allegiance to the United States, but with certain exceptions. Beginning with North Carolina, he started provisional governments in the seven southern states not already recognized by Lincoln. The provisional governments were to organize state conventions representing that percentage of the people eligible to vote; they were to embody in their constitutions the abolition of slavery, ratify the 13th Amendment and repudiate all debts incurred in the furtherance of rebellion. The only difference between this set-up and Lincoln's was the enlargement of the list of exceptions. Lincoln's amnesty was withheld from civil and military Confederate officers. To these leaders Johnson added "all persons whose taxable property is over twenty thousand dollars." In other words, Johnson was a poor white and small farmer man, bred to jealousy and distrust of the plantation aristocracy. By fall, 1865, all the southern states except Texas were organized and ready to send representatives to Congress.

Congress Steps In.—Congress met in December 1865 in no frame of mind to accept the new southern representatives. Things were moving too fast. In the first place, by ratifying the 13th Amendment, the southern states were entitled to added representation for the added freed population. This northern Congress was not ready to be outnumbered by southern representatives or overruled by the South in Federal legislation. In the second place, these men were deeply suspicious of the *black codes* adopted by the new southern legislatures. These laws forbade Negroes carrying arms, providing for their apprenticeship while under age, for their useful employment and for their restraint by strict labor contracts. To Congress the vagrancy laws and labor statutes seemed not in good faith; they seemed a violation of true emancipation.

Congress was justified in this by the frequent evidence of intolerance and violence in the execution of the new codes and statutes, and the later imposition on the Negroes of unfair fines, penalties and restrictions, such as limiting them to agricultural or menial labor (as in South Carolina) or denying them the right to own or rent land (as in Mississippi). On these two points, the black codes and too great representation, Congress refused to admit the new southern representatives.

Reconstruction Legislation.—Congress immediately appointed a Joint Committee on Reconstruction to inquire into the loyalty of the South and its fitness to be represented. It passed a bill prolonging and enlarging the powers of the Freedmen's Bureau, a government organ, created March 1865 to uplift and educate the freedmen, assign them to abandoned lands and protect them in their labor contracts and local troubles. Unfortunately, its lofty purpose was lost sight of; in the hands of tactless northern officers it exaggerated the rift between white and black, and fostered the simple black man's dream of "40 acres and a mule," without producing the mule. Its existence had originally been limited to one year, and Johnson vetoed the measure to extend its time or powers.

Congress answered the veto with the Civil Rights bill and passed it over Johnson's next veto, April 1865. This act raised the Negroes to full and equal citizenship with the whites, and entitled them to Federal protection against discriminating laws, thus nullifying the black codes, which had imposed certain restrictions on the Negroes. The 14th Amendment, designed to make permanent the propositions of the Civil Rights Bill, was put up to the states in June, and the passing of a new Freedmen's Bureau Bill in July, also over Johnson's veto, continued that institution for two more years and extended Federal protection to the blacks. With the development of negro politics, the Bureau became one of the most corrupt political machines in all American history.

Fourteenth Amendment.—The 14th Amendment, passed by Congress, June 1866, gave full citizenship to the freedmen, reduced the representation in Congress of any state denying the franchise to any male citizen 21 years old and disqualified for office (until Congress should pardon them) the leaders of the South in the war. Ratification of the 14th Amendment became the price of readmission to representation in Congress. But it was too stiff a dose for the proud old order; the South chose to remain unrepresented. Every southern state defeated the amendment except Tennessee. Tennessee ratified the 14th Amendment and was restored to statehood; her senators and representatives walked into Congress, July 24, 1866.

Johnson's Failure.—In the meantime, the Joint Committee on Reconstruction had been investigating the fitness of the southern states for readmission to Congress, and had reported various outrages, instability of state conventions, defiance of the 13th Amendment; in fact, unfitness.

Johnson had alienated Congress by opposing and vetoing every extreme reconstruction measure Congress put through. In the 1866 Congressional campaign he hoped to win enough Democrats and conservative Republicans so that the new Congress would support his policies. But he lost his own cause by intemperate and abusive attacks on Congress and his personal enemies. Perhaps only a Lincoln whose devotion to a cause ignored personal hostilities could have won the North to faith and generosity. As it was, Johnson estranged both the politicians and the public, and brought discredit and distrust upon himself. The new Congress came in more rapidly anti-Johnson and anti-Southern than the old.

Reconstruction Act, 1867.—It scrapped all Johnson's ideas and launched the extreme and pitiless reconstruction campaign that was to postpone and block the rehabilitation of the South for 16 years.

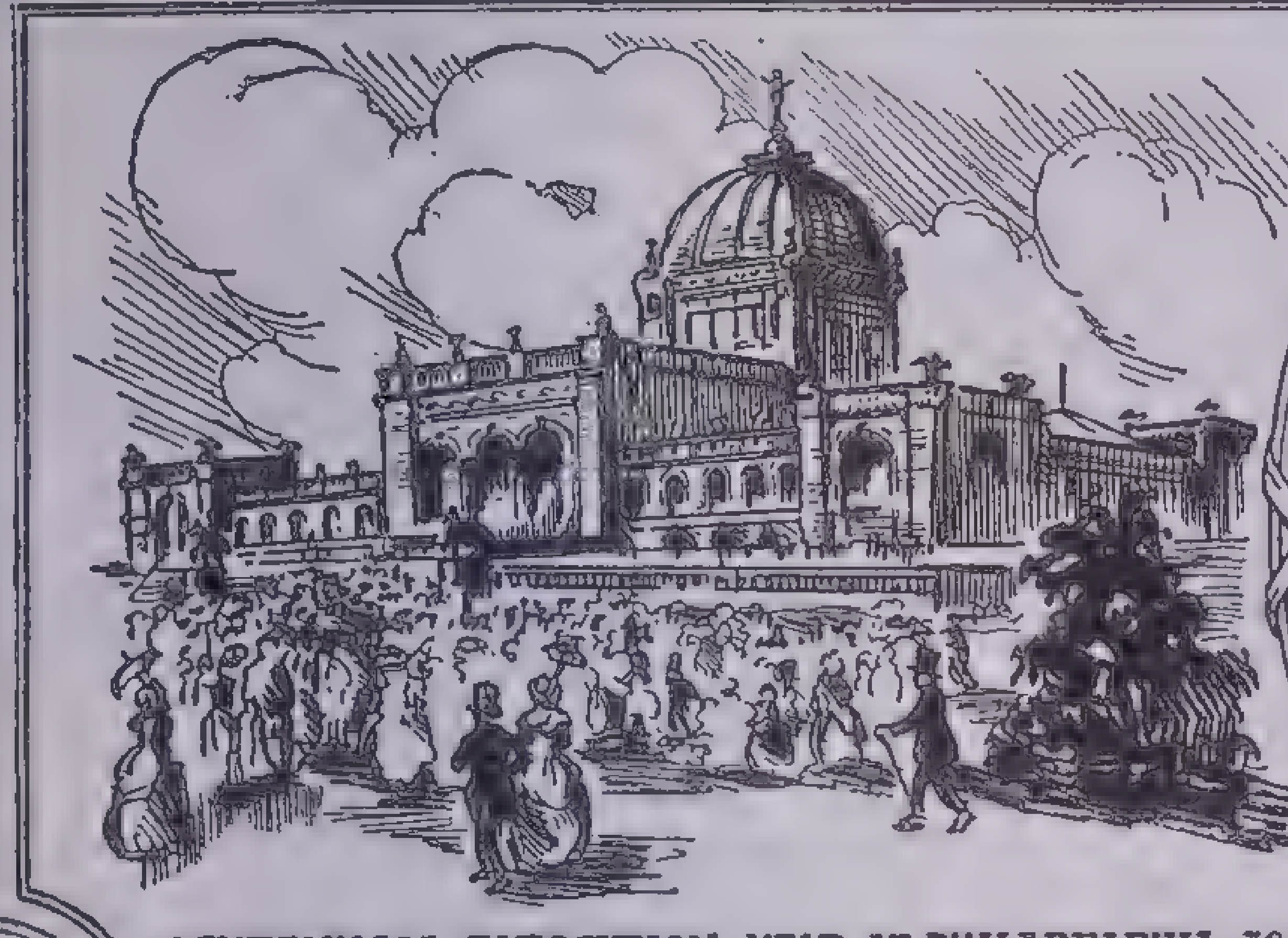
The Reconstruction Act, March 2, 1867, put the South under military rule (with the exception of Tennessee), enfranchised the Negroes and disfranchised enough whites to keep the southern vote Republican. The ten ex-Confederate states were divided into five military districts. The military commander of each district was put in direct control of reconstruction. He was to register the voters, excluding prominent Southern leaders and including all other male citizens "of whatever race, color or previous condition of servitude." To these voters was entrusted the election of a state convention to frame a state constitution. If this constitution satisfied Congress and if its legislature ratified the 14th Amendment, then that state was to be readmitted to the Union.

Johnson vetoed this act, as he had the others, and Congress passed it over his veto. Congress further stripped him of power by the Tenure of Office Act, which prohibited his making removals from office without the consent of the Senate. Over the appointment of military commanders to the southern military districts Johnson came into direct conflict with Secretary of War Stanton, removed him from his post and appointed Gen. Grant in his place. As the President's act was a violation of the Tenure of Office Act the Senate would not approve the appointment of Grant, and Stanton was returned to his post. Within five months Stanton was again discharged.

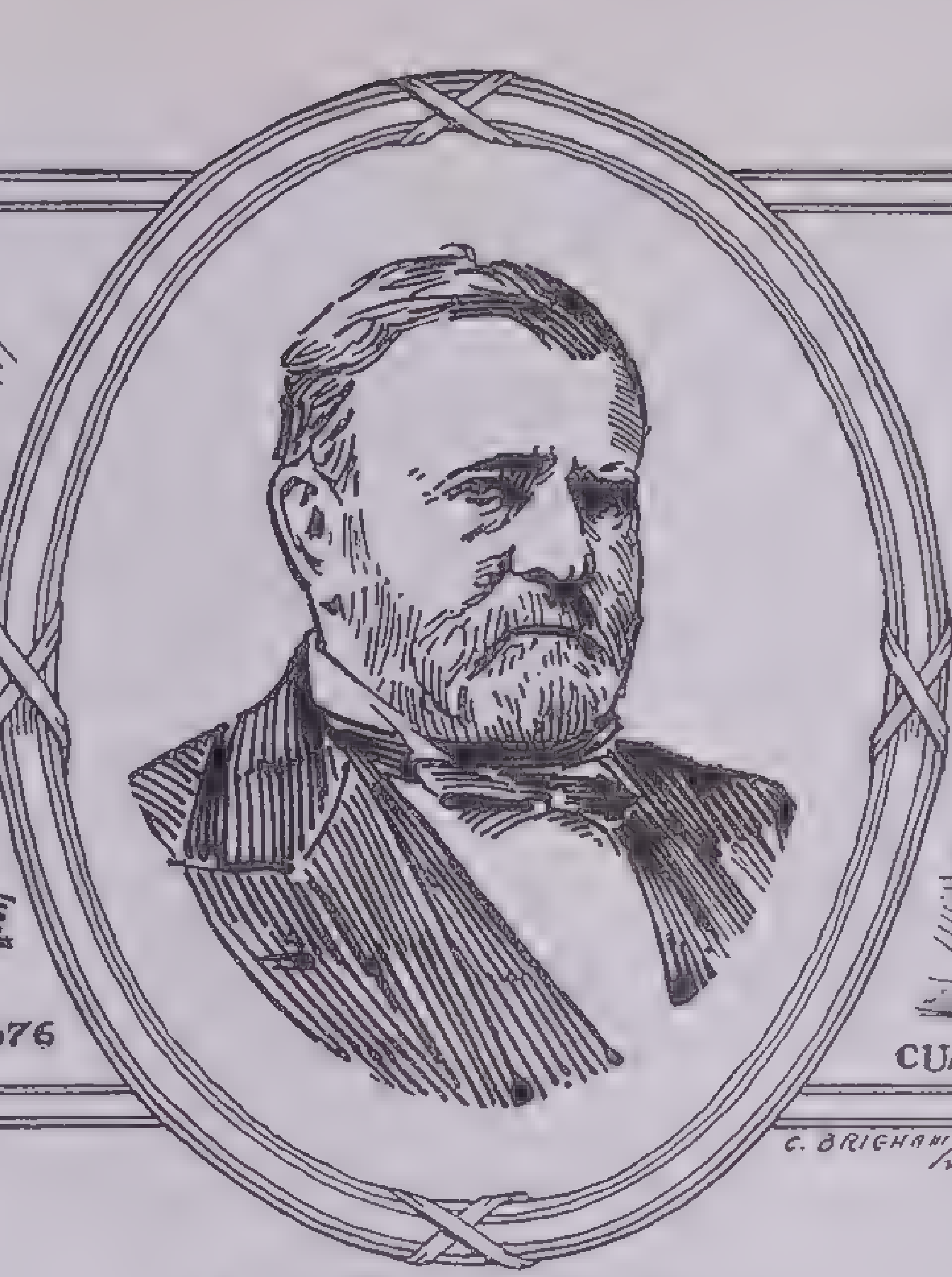
Impeachment and Trial of Johnson.—Congress again declared Stanton's removal illegal, and the House of Representatives passed articles of impeachment against Johnson, Feb. 2, 1868 in which all of the President's "misdemeanors and crimes" were recited. In the spring of 1868 the Senate sat as a jury to try the impeachment, with the Chief Justice presiding. Thirty-five Senators voted him guilty, 19 voted for his acquittal. Had the vote been 36 to 18, the President would have been removed. In effect, his milder policy had been defeated and Congress continued its own severe course of reconstruction.

Reign of Terror.—This period of reconstruction, called "thorough" by Congress, is often known as the Reign of Terror in the South. Crime and outrage passed for law. The Carpetbaggers were, for the most part, penniless, unscrupulous northerners who had gone South to seek their fortunes. The Scalawags were equally unprincipled Southerners gone Republican in self-interest. Such men as these controlled the South. They swung the vote of the negro-majority legislatures. Heavy taxes, mountainous debts bore witness to the fraudulent extravagance of their legislation; gold spittoons for negro assemblies symbolized the ridiculous in the upheaval. Military rule and, worst of all, state negro troops, enforced the disorder.

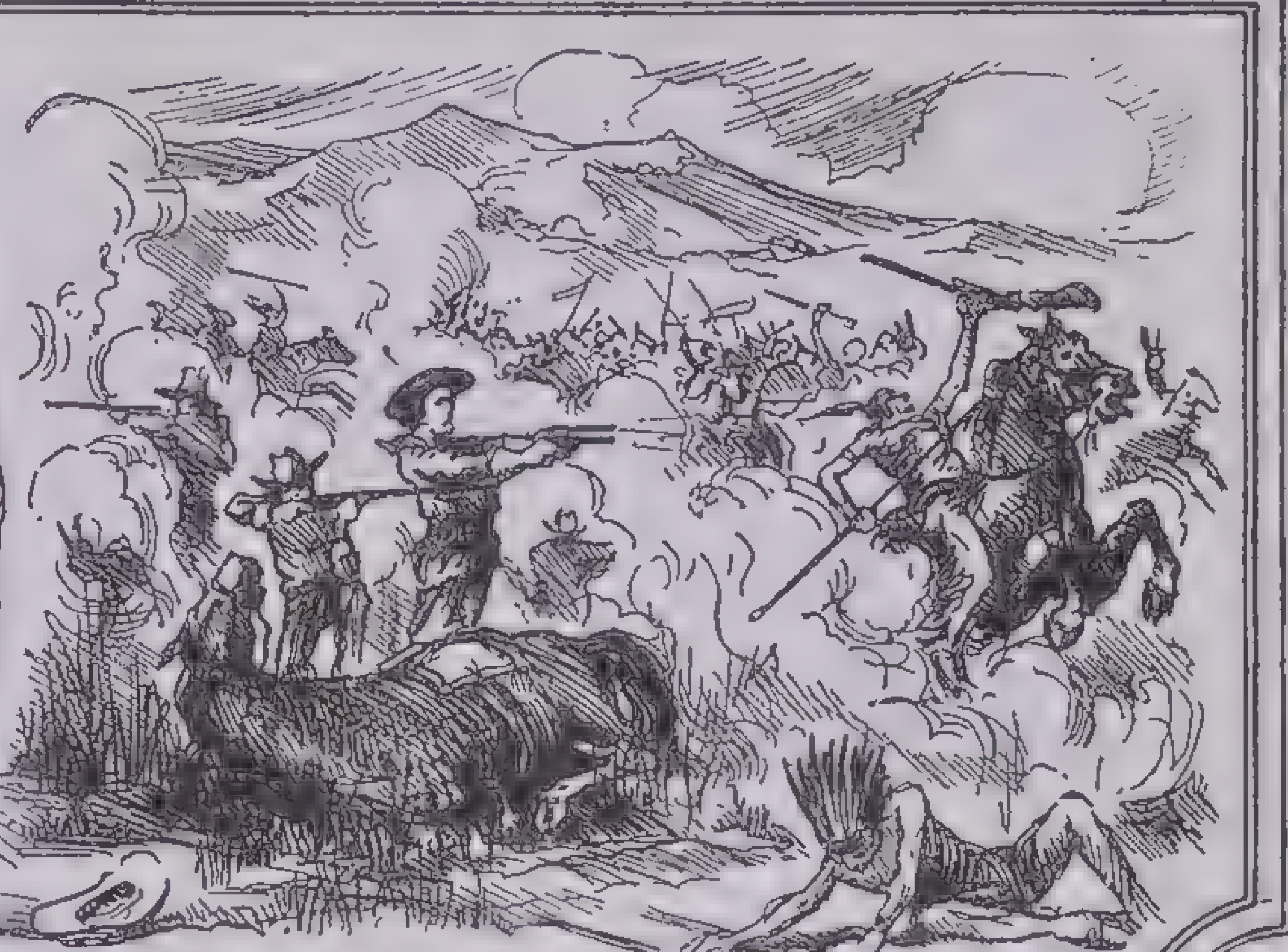
Under this regime the new state constitutions were framed. By July 1868 the 14th Amendment was ratified and six more states were back in the



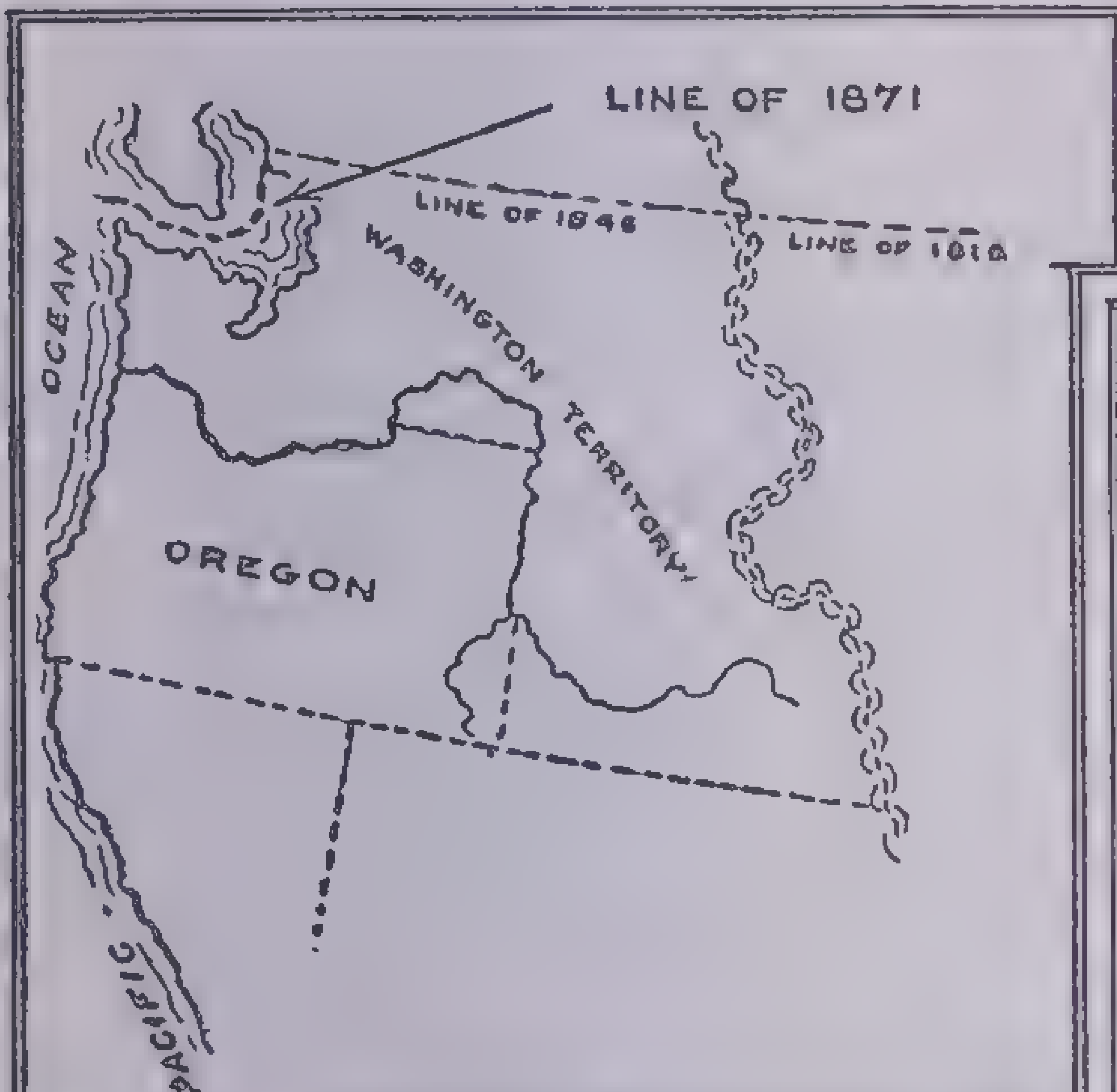
CENTENNIAL EXPOSITION HELD AT PHILADELPHIA-1876



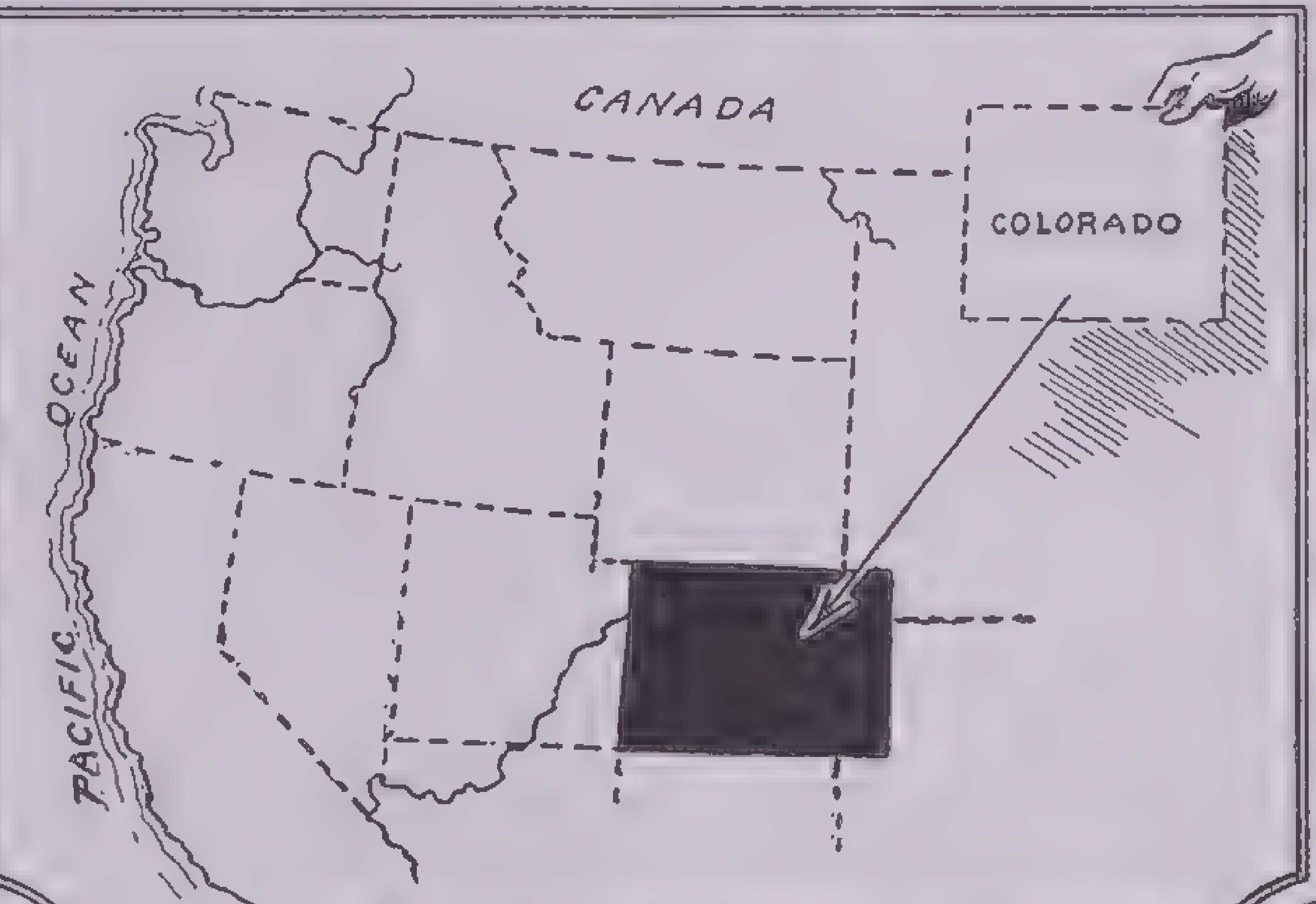
ULYSSES GRANT 1869 TO 1877



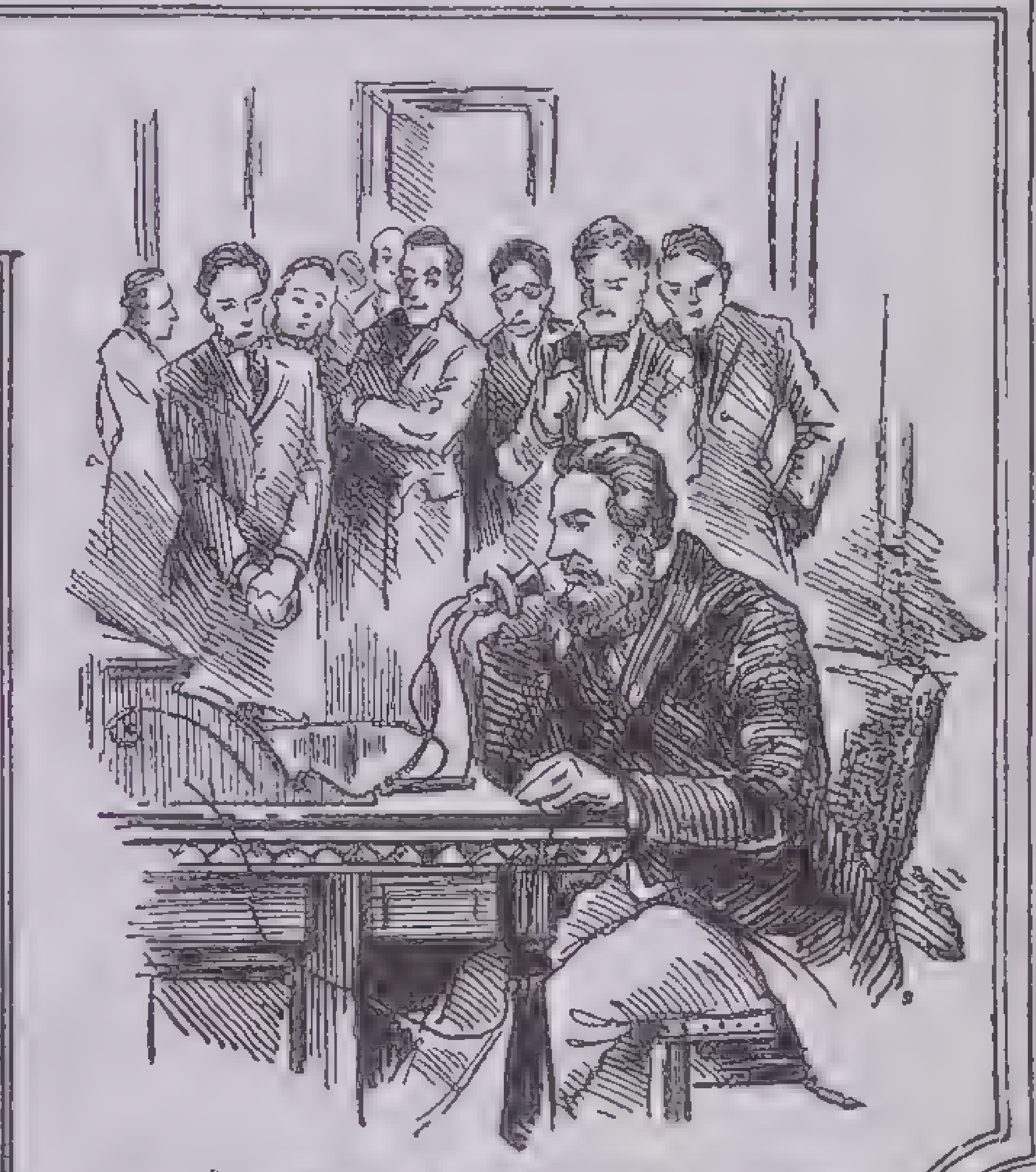
CUSTER'S TROOPS MASSACRED IN SIOUX WAR-1876



OREGON BOUNDARY FIXED BY TREATY WITH GREAT BRITAIN 1871



COLORADO ADMITTED TO UNION-1876



BELL'S TELEPHONE PATENTED-1876

Union: Arkansas, North Carolina, South Carolina, Florida, Alabama and Louisiana. But Mississippi, Virginia, Georgia and Texas were still out.

Other Events.—Alaska was purchased from Russia (1867) for $7,200,000. Secretary of State Seward was severely censured in many quarters for this extravagant outlay for "500,000 square miles of ice and polar bears," but today we know that no other government investment has yielded greater returns.

Nebraska was admitted to the Union, March 1, 1867.

Seward proved the strength of the Monroe Doctrine in the case of the French occupation of Mexico in 1862. Napoleon III wished to set up a throne for the Archduke Maximilian of Austria. But when Sheridan appeared with troops on the Mexican border, the French Army withdrew. Maximilian was murdered by Mexicans, and Mexico resumed charge of her own destiny.

Election of 1868.—Again a war hero was nominated for President. The Republicans unanimously nominated Ulysses S. Grant; the Democrats nominated Horatio Seymour. Grant received 214 electoral votes, Seymour, 80. For the first time a large number of former negro slaves voted in a presidential election.

Ulysses S. Grant (1869–77)

Grant came into office beloved and acclaimed, hero of the war, a military genius of no political subtlety and absolutely without guile. "Let us have peace," he said, and won the nation. But he did not know how to keep it. His administration witnessed the height of the Reconstruction atrocities, unwittingly and inevitably fostered race and sectional hatreds and created the "solid South." His very honor brought himself and his administration into disrepute because he was too honest and too trusting to suspect the financial and political corruption discovered in high places.

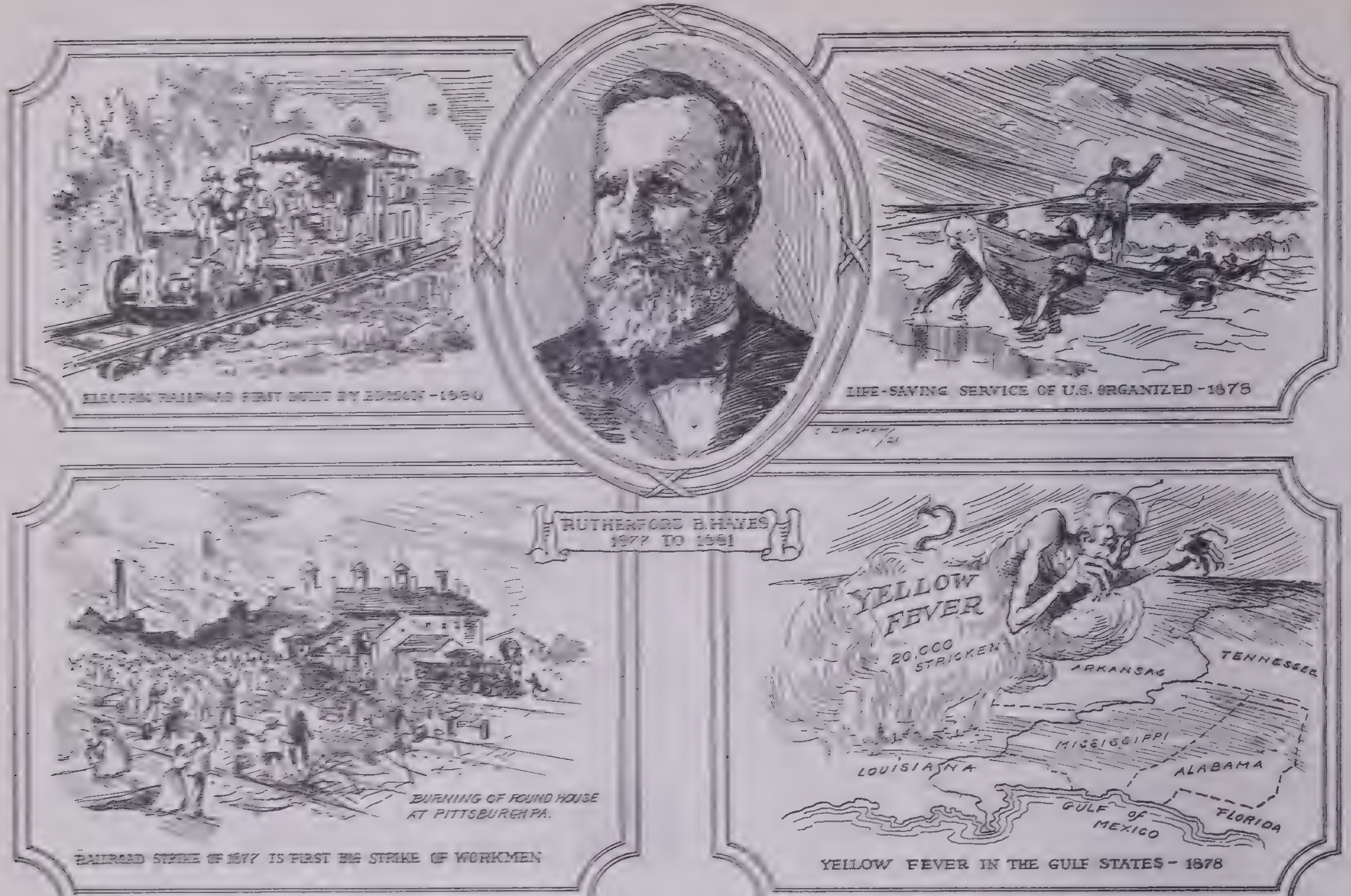
Fifteenth Amendment.—The 15th Amendment became law, March 1870. This was the Amendment that guaranteed the vote to the Negro. "The right of the citizens of the United States to vote shall not be denied or abridged," it said, "by the United States or by any state on account of race, color or previous condition of servitude." The four states still out of the Union (Virginia, Mississippi, Texas and Georgia) were compelled to ratify it to get in.

Reconstruction Continued.—The 15th Amendment and the negro vote it guaranteed made possible the organization of new Republican state governments in those southern states which had ratified it. These embarked on a campaign of greater violence and corruption than any yet known, and the Force Acts (1870 and 1871) sustained them with the power of the Federal Government. The legislatures were filled with Negroes and Carpetbaggers and renegade southern whites. Debilitating taxes and actual theft completed the impoverishment of the whites.

Ku Klux Klan.—The South would have risen in arms and overthrown the whole impossible business had not the Federal arm prevented. The Ku Klux Klan was organized to cope with the disorder. This was a secret organization armed to prevent negro outrages and to combat the secret political societies of Negroes and Carpetbaggers. The movement swept through the South and everywhere secret vigilante local bands sprang up (the White Brotherhood, Knights of the White Camelia, Men of Justice, etc.) unified by the one aim of defending the defenseless and by their like methods of terrorizing the very superstitious blacks.

They met at night, white-hooded, white-robed men on white-robed horses, impersonating the ghosts of the southern dead. However justifiable or unjustifiable its tactics may have been, the Ku Klux Klan seemed to the South the only weapon it had to restore orderly government.

The Ku Klux Acts (1871 and 1872) were passed for its suppression. Grant suspended the writ of *habeas corpus* in some sections and Federal troops arrested hundreds of the Klansmen. But nothing could really down the movement.


ELECTRIC RAILROAD FIRST BUILT BY EDISON - 1880
LIFE-SAVING SERVICE OF U.S. ORGANIZED - 1878
RUTHERFORD B. HAYES
1877 TO 1881
BURNING OF ROUND HOUSE AT PITTSBURGH PA.
RAILROAD STRIKE OF 1877 IS FIRST BIG STRIKE OF WORKMEN
YELLOW FEVER
20,000 STRICKEN
ARKANSAS
TENNESSEE
MISSISSIPPI
LOUISIANA
ALABAMA
GULF of MEXICO
FLORIDA
YELLOW FEVER IN THE GULF STATES - 1878

End of Reconstruction.—The radicals were already beginning to lose their hold on the South when the Amnesty Act of 1872 hastened the turnover. The gradual return of government to white Southerners was reached by bribery and reward in the elections, by force and bloodshed at times and certainly by intimidation of the negro vote. But southern disturbances were becoming an old story; and the discovery of corruption in Washington helped to restore responsible government in the South. All attention was suddenly turned to the Federal scandals, and with the lessening of Federal coercion in the carpetbag states, the carpetbag governments fell of their own rottenness. Reconstruction had failed to produce anything but sectional ruin, create a hatred between white and black that had not existed before, demoralize the Negro, and pile up a "solid South" which cast few Republican votes for two generations.

The Amnesty Act of 1872 left only about 500 persons banned from civil rights. Gradually the natural order was restored in Virginia, North Carolina and Georgia. By 1876 only Florida, Louisiana and South Carolina were still under radical control and the election of Hayes in the same year was really the end of the severe regime.

Foreign Policy.—The outstanding international event of Grant's administration was the conclusion of the Treaty of Washington, May 1871, which settled the Alabama claims, that is, the losses suffered by the United States at the hands of the Confederate cruiser *Alabama,* built in England during the Civil War. The United States demanded that England pay for the losses thus caused our government. The question was submitted to a tribunal of five nations, which decreed that England pay the United States $15,500,000.

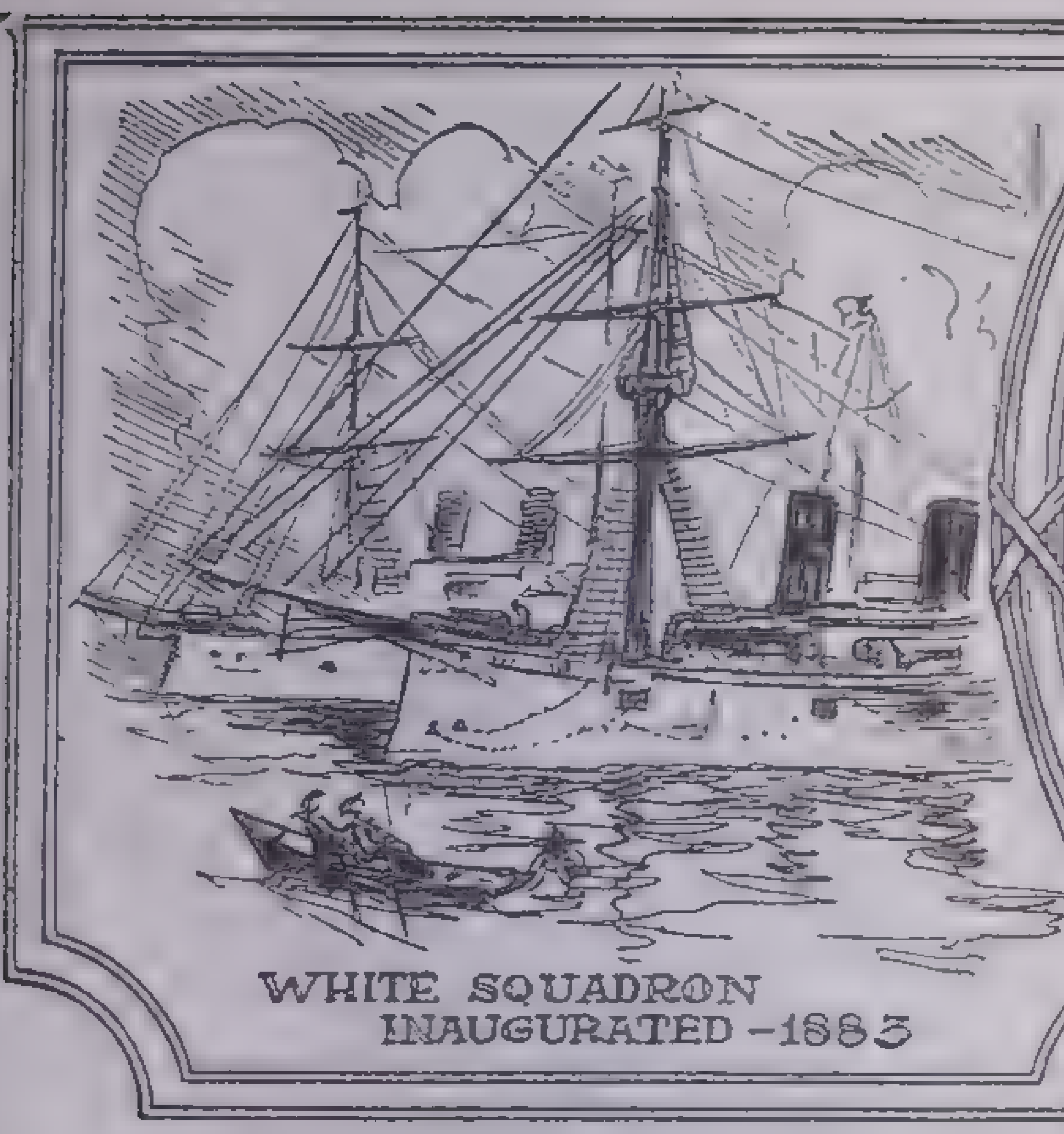
Grant favored the annexation of Santo Domingo when that small state asked to be taken in, but the Senate defeated the proposition.

Civil Service Reform.—The custom whereby the President of the United States, on coming to office, put new men in all government positions had, by the time of Grant's accession 1869, resulted in a vast amount of political corruption as well as inefficiency in the civil service. In 1871 the pressure of public opinion caused Congress to pass the first law of Civil Service Reform, authorizing the President to organize a system for regulating appointments to minor civil service positions. The President appointed a commission which arranged competitive examinations for applicants to the civil service. This method of appointment was in practice for three years, at the end of which time the influence of the politicians in Congress prevailed in withdrawing the financial support from the Commission.

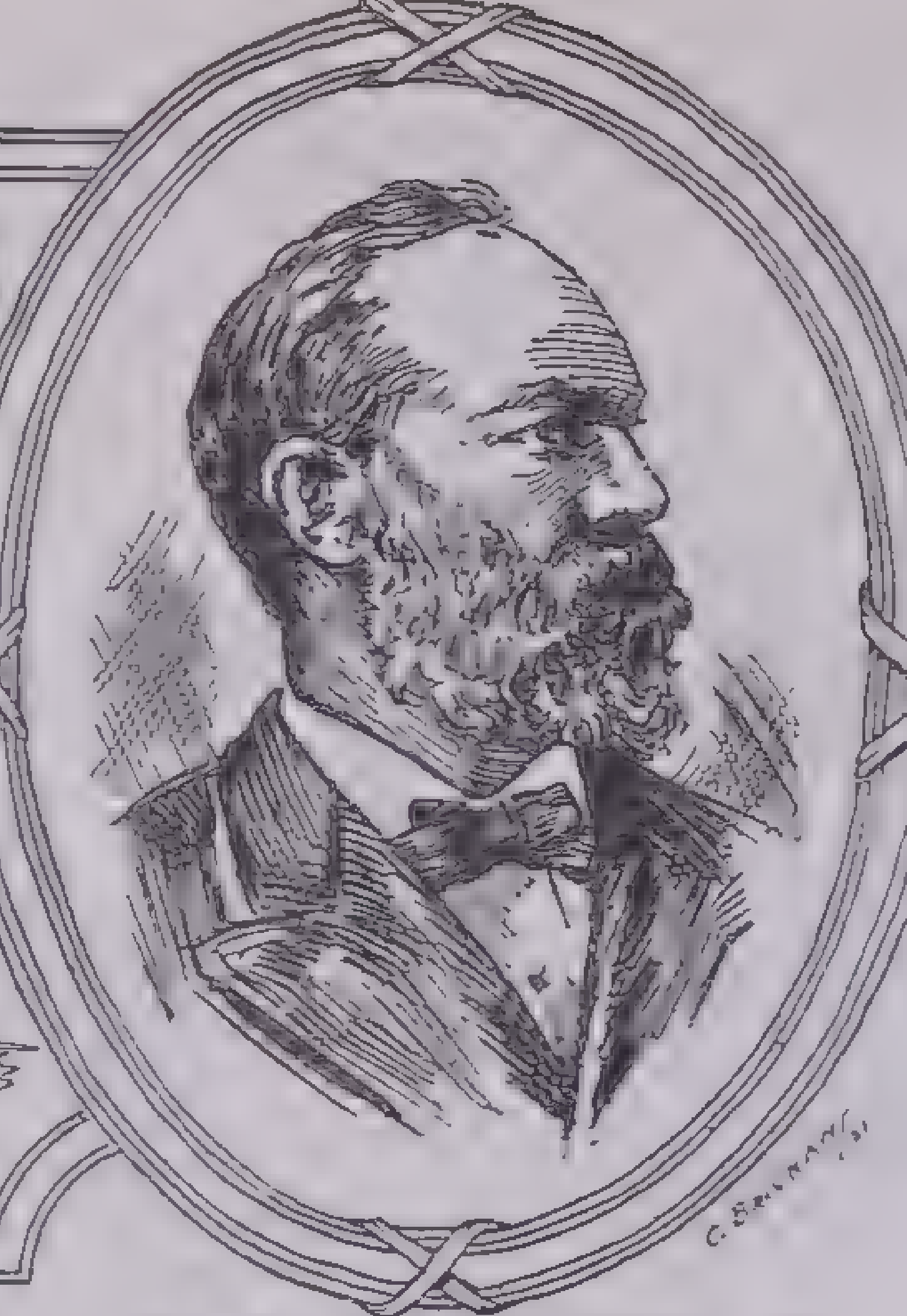
Re-election.—As Grant's first term drew to a close, many Republicans believed he could not be re-elected because he was unpopular in the South for his harsh reconstruction methods and because the dominant element of his party was corrupt. The regular Union-Republican convention gave him the nomination; but a convention of Liberal Republicans nominated Horace Greeley, whom the Democrats also named. Greeley died after the election and before the meeting of the Electoral College; the Democrats then gave his successor, Thomas A. Hendricks 42 electoral votes, but Grant was elected with 286.

Panic of 1873.—A period of overexpansion in industry, overinvestment in railroads and new lands, unstable currency and overexpansion of credit could end only in a sweep of failures in banking, railroads and private businesses. A serious panic resulted. Congress tried to stay the tide toward national insolvency with the Inflation bill, 1874, ordering the printing of $400,000,00 in unsecured paper money, but Grant vetoed the bill. To bring financial order out of the existing chaos, the Resumption Act was passed, 1875, providing for resumption of specie payments in 1879.

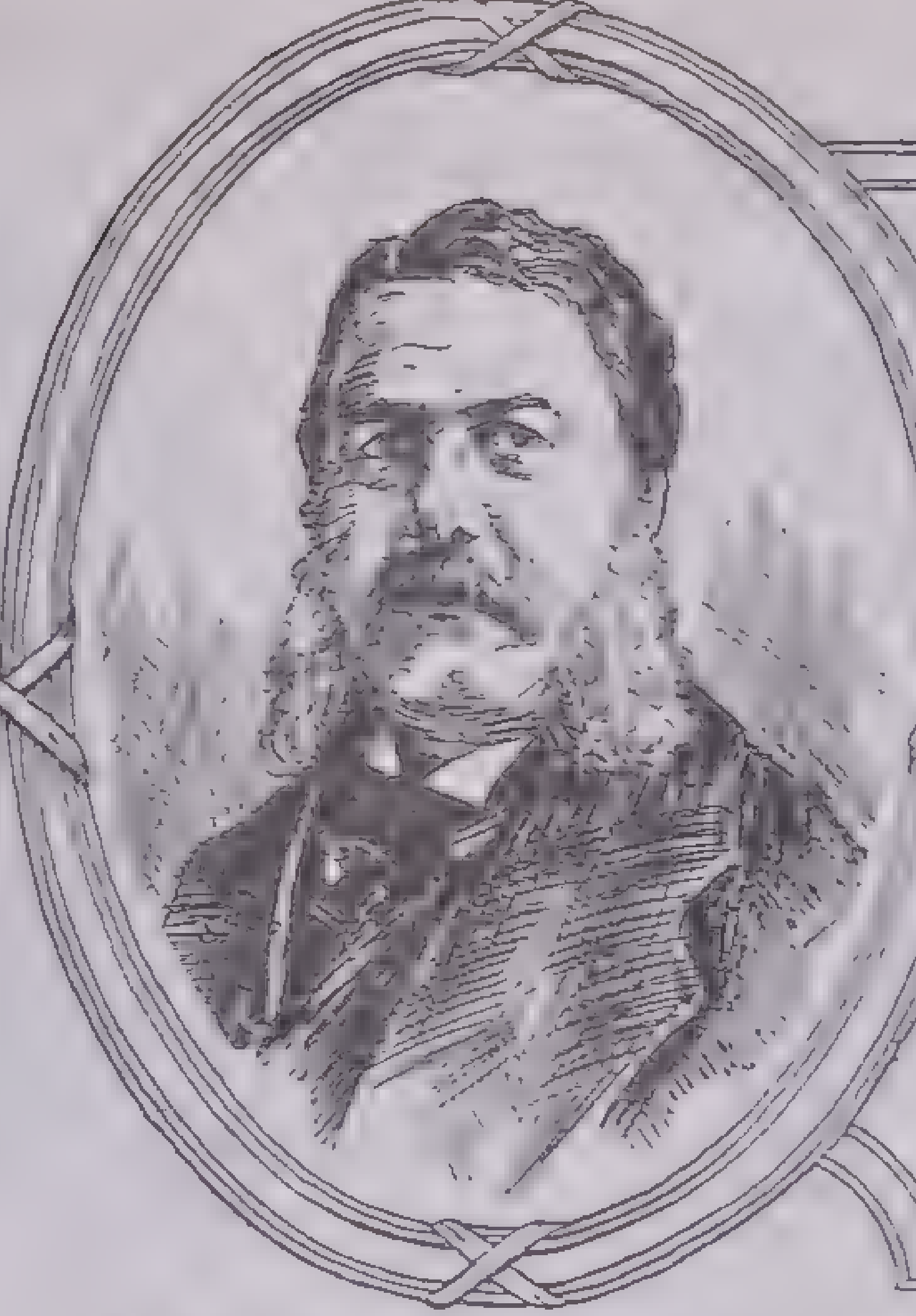
The Scandals of 1873–75.—Grant's administration was colored by the first and worst political and financial graft brought to public knowledge. Time and again Grant was implicated, though innocent, because his own forthrightness made it impossible for him to suspect dishonor in others and his loyalty made it impossible for him to believe evil of his friends. His second term was darkened by charges that Congressmen had been bribed with stock of the Credit Mobilier, a railroad construction company.. In-



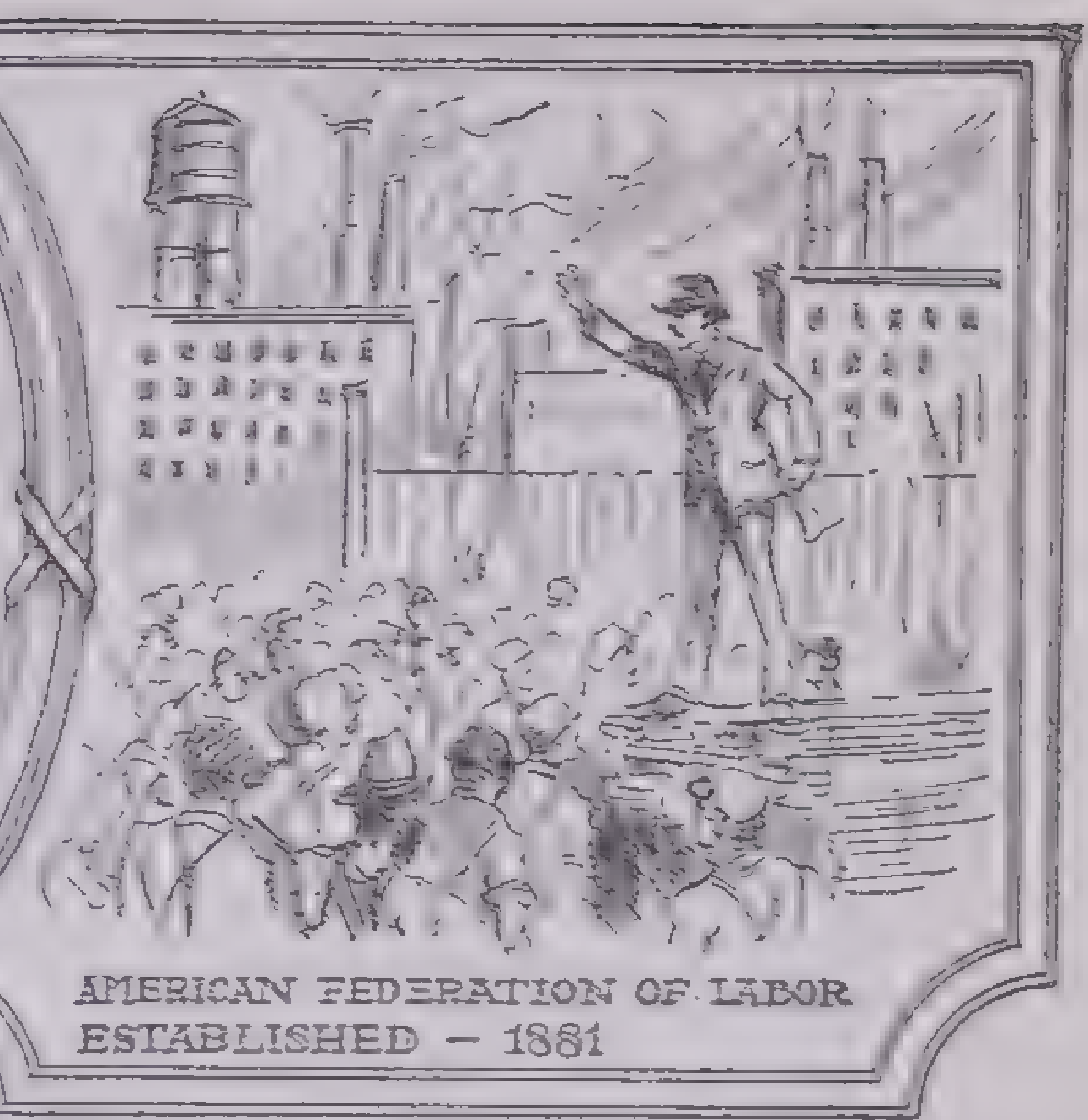
WHITE SQUADRON INAUGURATED—1883



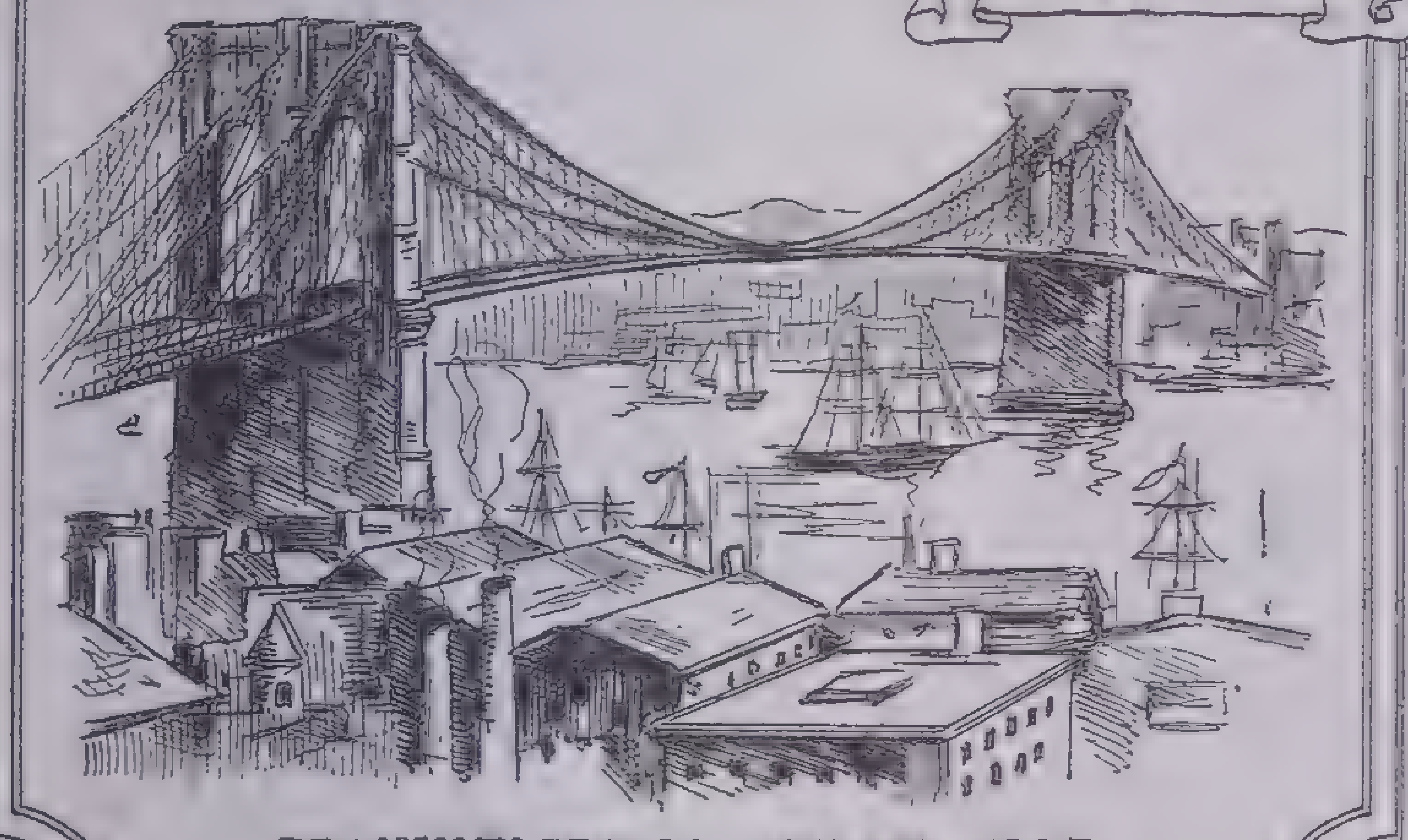
J.A.GARFIELD 1881



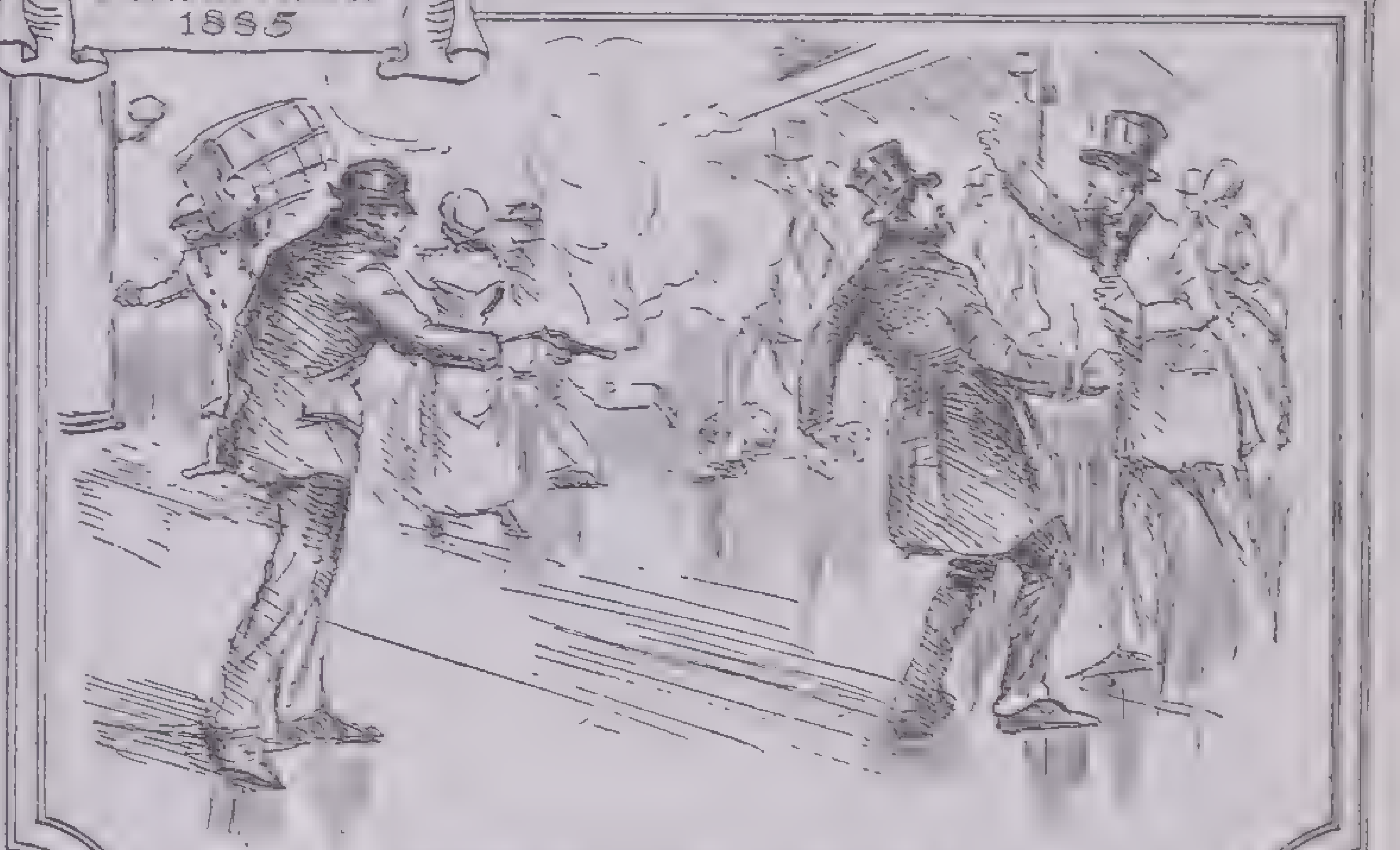
C.A.ARTHUR 1885



AMERICAN FEDERATION OF LABOR ESTABLISHED — 1881



BROOKLYN BRIDGE OPENED—1883



GARFIELD ASSASSINATED—1881

vestigation left two prominent Republican Congressmen and Vice-President Colfax uncleared of suspicion.

Then came the "Salary Grab" Act (1873) which increased the salaries of the President, the Cabinet, Federal judges, senators and representatives. It provided increases in pay for the terms Congressmen were then serving. Hence, they raised their own pay! So great was the outcry against this "back-pay grab" that there was an undignified scramble in Congress to return the back-pay increases and to reduce the raised Congressional salaries!

Tweed Ring. A hotbed of political corruption in New York city was brought to light, known as the Tweed Ring. This society of political crooks under the leadership of Boss Tweed had been ruling the elections of New York State and influencing those of the nation since before 1860. Their headquarters was Tammany Hall. Their strength lay in their control over the ignorant foreign vote and in the band of thugs they employed to cast many times their given number of votes. They influenced the lawmaking of the state by bribing legislators and amassed great fortunes by appropriating public funds.

The Whisky Ring. Coincident with the disclosure of the Tweed Ring's activities came the disclosure of the Whisky Ring, 1875. This was an agreement between distillers of whisky and internal revenue officers to rob the government of the tax on whisky. Suspicion centered about Grant's private secretary Babcock as one of the ringleaders, but guilt was not proved.

By the end of the second term so many frauds had been brought to light and so many of the suspects were intimates of Grant that extreme reaction and opposition ensued. Grant's Secretary of War Belknap was impeached on the charge of selling army-supply contracts and appointments to frontier trading posts. Belknap resigned to escape trial, a move that did Grant no good in the public eye.

Other Events.—Alexander Graham Bell completed the invention of the telephone and secured patents on his invention in 1876. His invention attracted much attention at the Centennial Exposition, held in Philadelphia that year in commemoration of the 100th anniversary of the signing of the Declaration of Independence. Colorado was admitted to the Union, 1876.

Election of 1876.—The election was one of intense feeling and violent action. Grant's friends tried to secure his nomination for a third term, but without success. Rutherford B. Hayes of Ohio was nominated by the Republicans, Samuel J. Tilden of New York by the Democrats.

On the face of the election returns, a majority of the Electoral College was Democratic, but charges of fraud were raised in three states. An Electoral Commission (containing eight Republicans and seven Democrats) was named by Congress to decide the contest, and Hayes was declared elected with 185 electoral votes to 184 for Tilden.

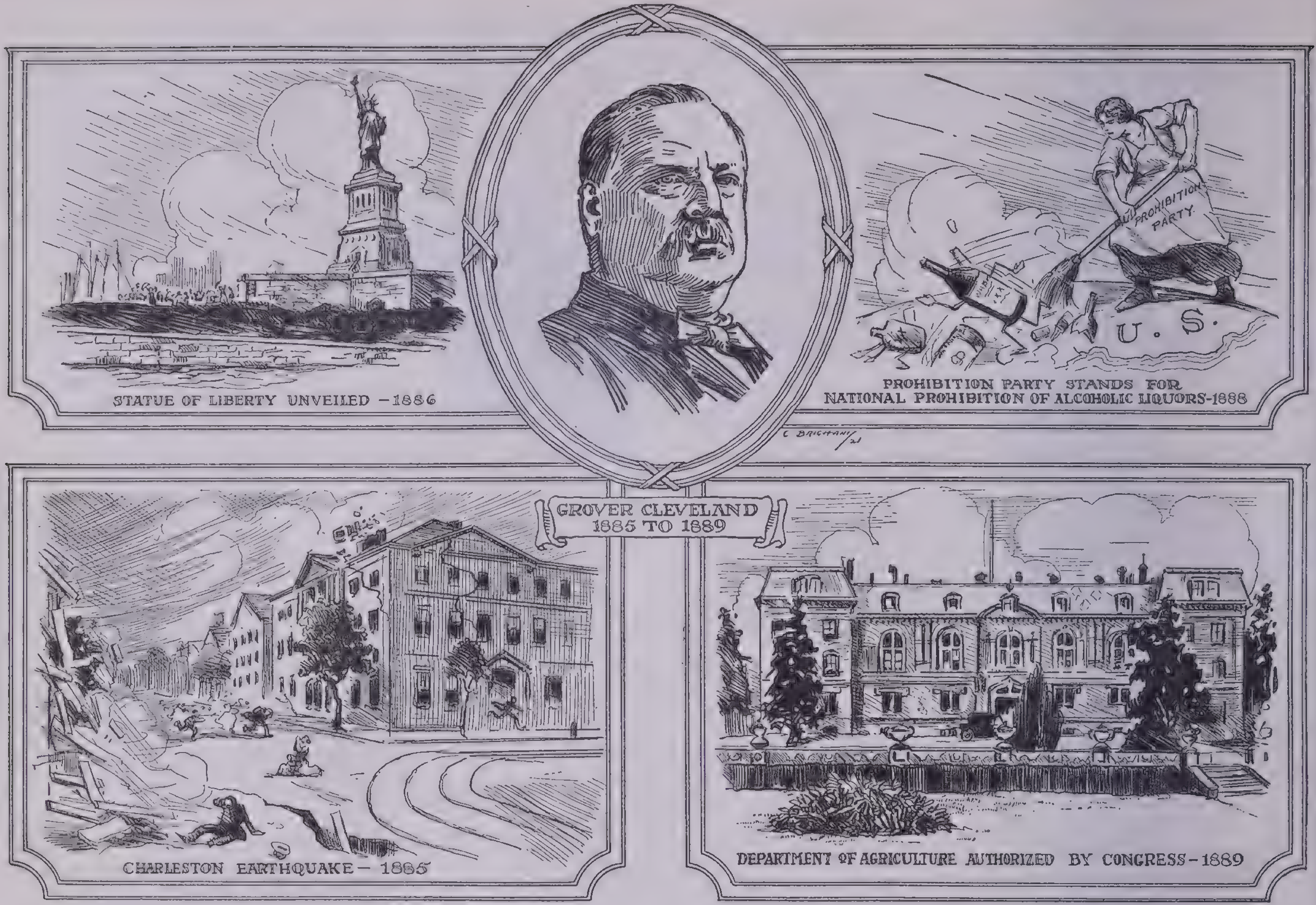
Rutherford B. Hayes—1877–1881.

Hayes fell heir to the Republican campaign promise that Federal troops would be withdrawn from South Carolina and Louisiana on his election; and not two months went by before the promise was kept. This was the end of the Reconstruction specter in the South, and the last of the ex-Confederate states were restored to competent white administration. And Hayes appointed David M. Key, an ex-Confederate officer, as a member of his Cabinet (Postmaster General).

Hayes was ardently interested in civil service reform but he accomplished as little as Grant in this field, except to alienate party leaders on both sides by his independence in removing certain ineffectual officers and his refusal to take care of others who felt they had done him campaign service.

Labor Troubles.—Hayes inherited the aftermath of the panic of 1873. Business was in a condition of stagnation, and thousands of laborers were unemployed or at work only part of the time. The unrest induced railroad strikes on the Pennsylvania and the Baltimore & Ohio railroads, and they affected other lines. Fully 100,000 men were involved. Strikes and riots occurred all over the United States. Federal troops were required to maintain order.

Bland-Allison Act.—In 1878 a new Congress passed the Bland-Allison Act authorizing the Government to purchase silver bullion at the rate of $2,000,000 worth a month, to be coined


STATUE OF LIBERTY UNVEILED –1886
U. S.
PROHIBITION PARTY
PROHIBITION PARTY STANDS FOR NATIONAL PROHIBITION OF ALCOHOLIC LIQUORS-1888
C BRIGHAM /21
GROVER CLEVELAND 1885 TO 1889
CHARLESTON EARTHQUAKE – 1886
DEPARTMENT OF AGRICULTURE AUTHORIZED BY CONGRESS – 1889

into silver dollars. This was passed over Hayes's veto. But the revival of trade plus the sound sense of the Secretary of the Treasury brought hard money from abroad to the United States; and by Jan. 1, 1879, when specie payments were resumed, the United States had an excess reserve, and greenbacks were equal in value to gold.

Election of 1880.—Hayes refused to be a candidate for re-election, for he was aware that strong elements of his party did not want four more years of a reformer. The Republicans nominated James A. Garfield of Ohio for President and Chester A. Arthur of New York for Vice-President. The Democrats named Gen. Winfield S. Hancock, of Civil War fame. In the Electoral College the Republican ticket received 214 votes; the Democratic, 155.

James A. Garfield—1881

The Republican faction called stalwarts, the pro-Grant wing, had supported Garfield for president only because they expected a major share of patronage. Garfield's choice for Collector of the Port of New York so angered Senators Conkling and Platt of New York, both prominent stalwarts, that they resigned, May 1881. They did not receive the justifying re-election they demanded, and there were bitter feuds in the party for many months.

Assassination of Garfield.—Just how vicious a thing the spoils system could become was proved on July 2, 1881, when the President was shot by Charles J. Guiteau, a disappointed office seeker. Garfield died Sept. 19.

Chester A. Arthur—1881–1885

Chester A. Arthur, Vice-President, stepped into office the same day and took up the banner against the spoils system. A National Civil Service Reform League was organized, 1881, and a law was passed, 1883, providing for government employees to be placed in classified lists, appointments to be made by competitive examination, and forbidding recommendations to be made by Congressmen.

Other Legislation.—In 1882 two important acts were passed by Congress. The Chinese Exclusion Act prohibited the entry of Chinese into the United States for a period of ten years, and denied the right of naturalization to Chinese immigrants already in the country. The Edmunds Anti-Polygamy Act, particularly directed against the Mormons in Utah, prohibited the practice of polygamy in the United States.

Other Events.—A great engineering triumph was the completion of the Brooklyn Bridge in 1883. In 1884 Alaska was organized as a territory.

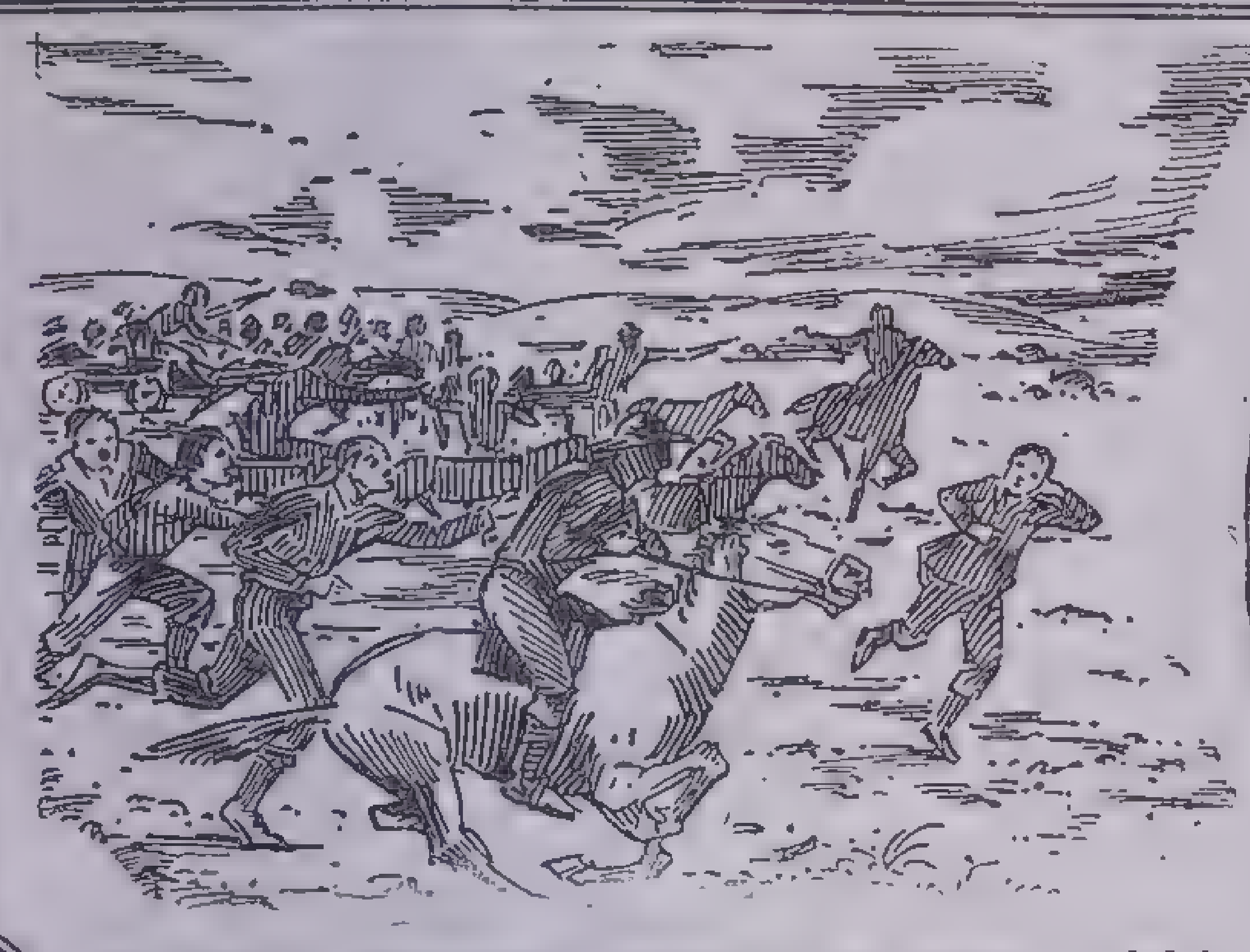
Election of 1884.—Arthur sought the nomination for a full term as President in his own right, but was defeated in the Republican convention by James G. Blaine of Maine, Secretary of State under Garfield and an active candidate in two preceding Republican conventions. The Democrats nominated Grover Cleveland, whose career as governor of New York recommended him as the man of the hour, strong, sincere and committed to the "new issues born of time and progress." Personalities more than political issues marked the campaign. Cleveland was the victor with 219 electoral votes to 182 for Blaine.

Grover Cleveland—1885–89

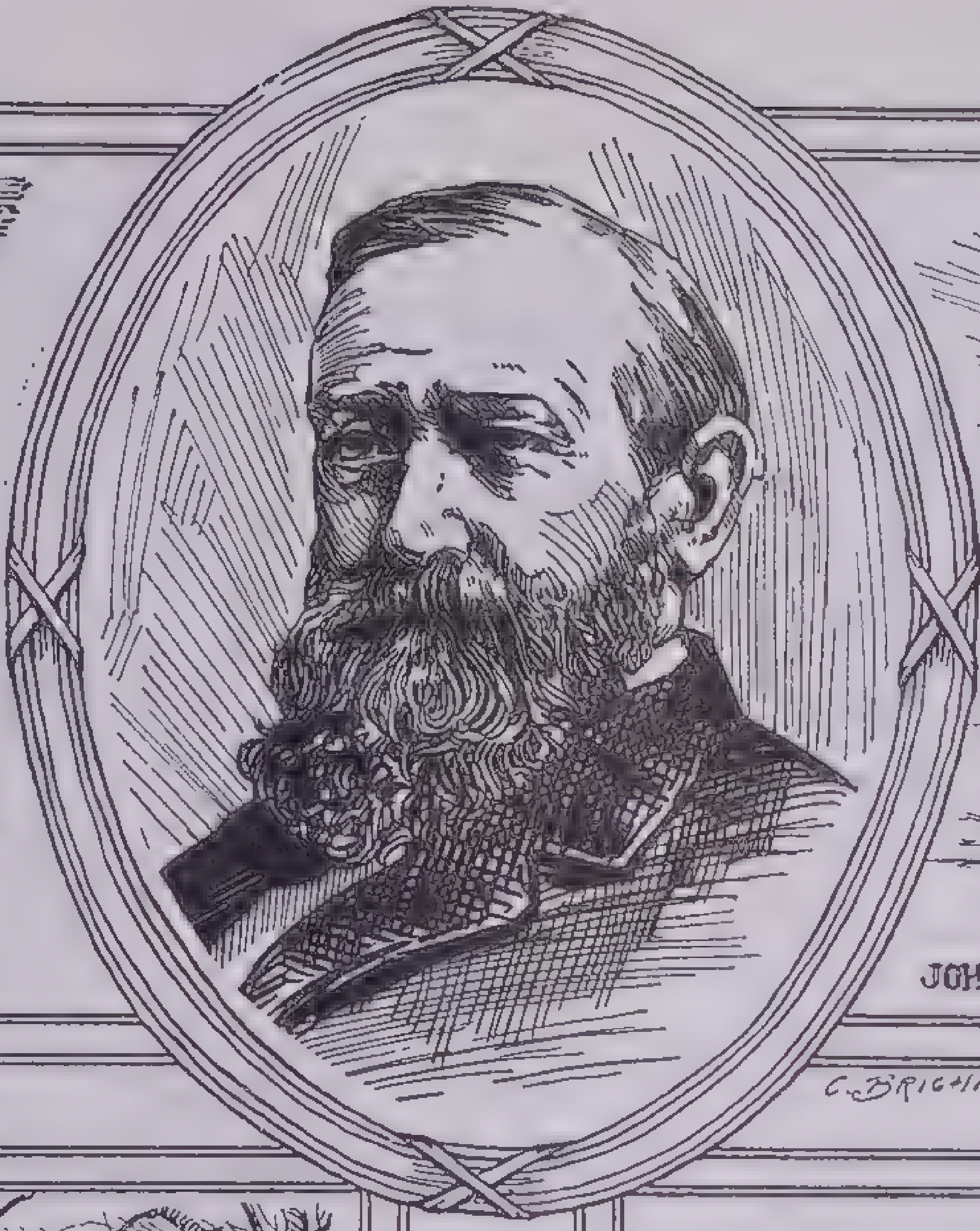
Cleveland came into office as a champion of civil service reform; but on this issue he satisfied nobody. He did not dismiss *every* Republican officeholder in the civil service system as his Democratic supporters wished, nor did he make all his appointments strictly nonpartisan. But his policy had the good effect of compelling the Republicans to decry the spoils system and of curbing the political activity of many holding civil service positions. The Tenure of Office Act was repealed in his administration.

Legislation.—The death of Vice-President Hendricks gave rise to the Presidential Succession Act, 1886, which declared the line of succession to the presidency to be first, the vice-president, then in order, the secretaries of state, treasury and war, next, the attorney general, and then the secretaries of navy and interior.

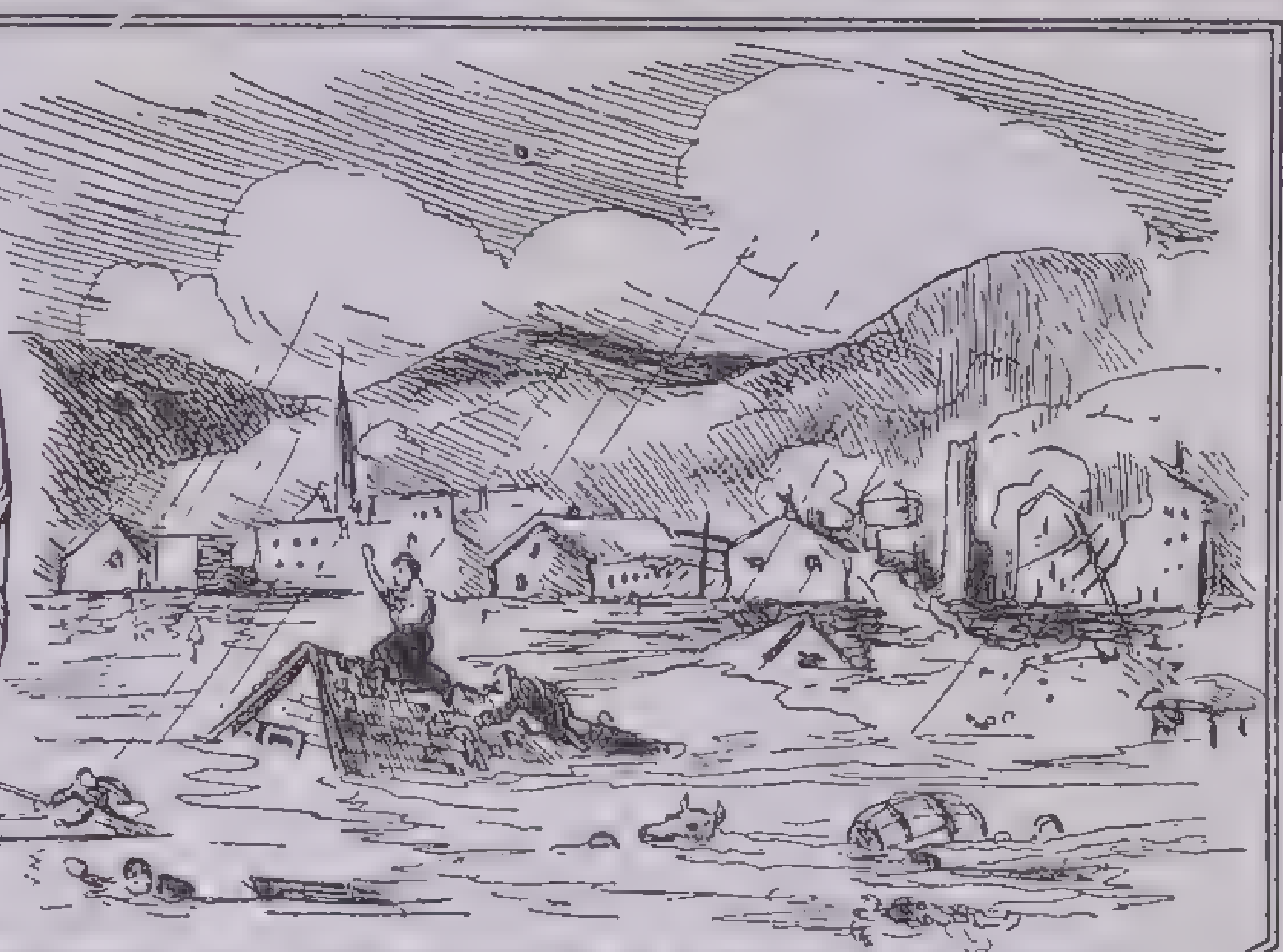
The Interstate Commerce Act, Feb. 1887, was an attempt to correct the abuses by which the railroad companies were enriching themselves. This act forbade the railroads to give rebates to favored shippers, to pool their freight revenues or to charge relatively more for a short haul than for a long haul, and declared that all



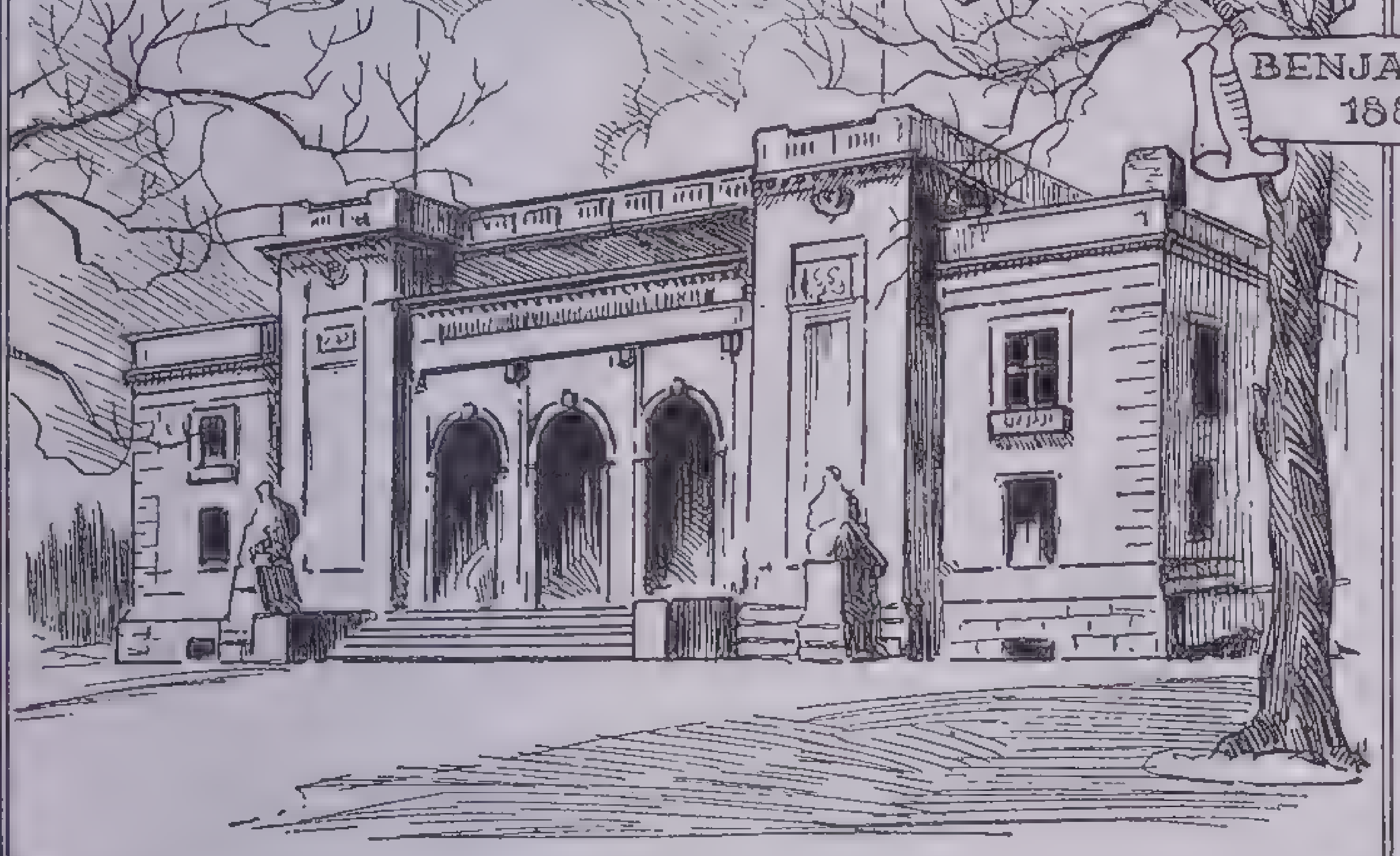
OKLAHOMA TERRITORY OPENED TO SETTLERS — 1889



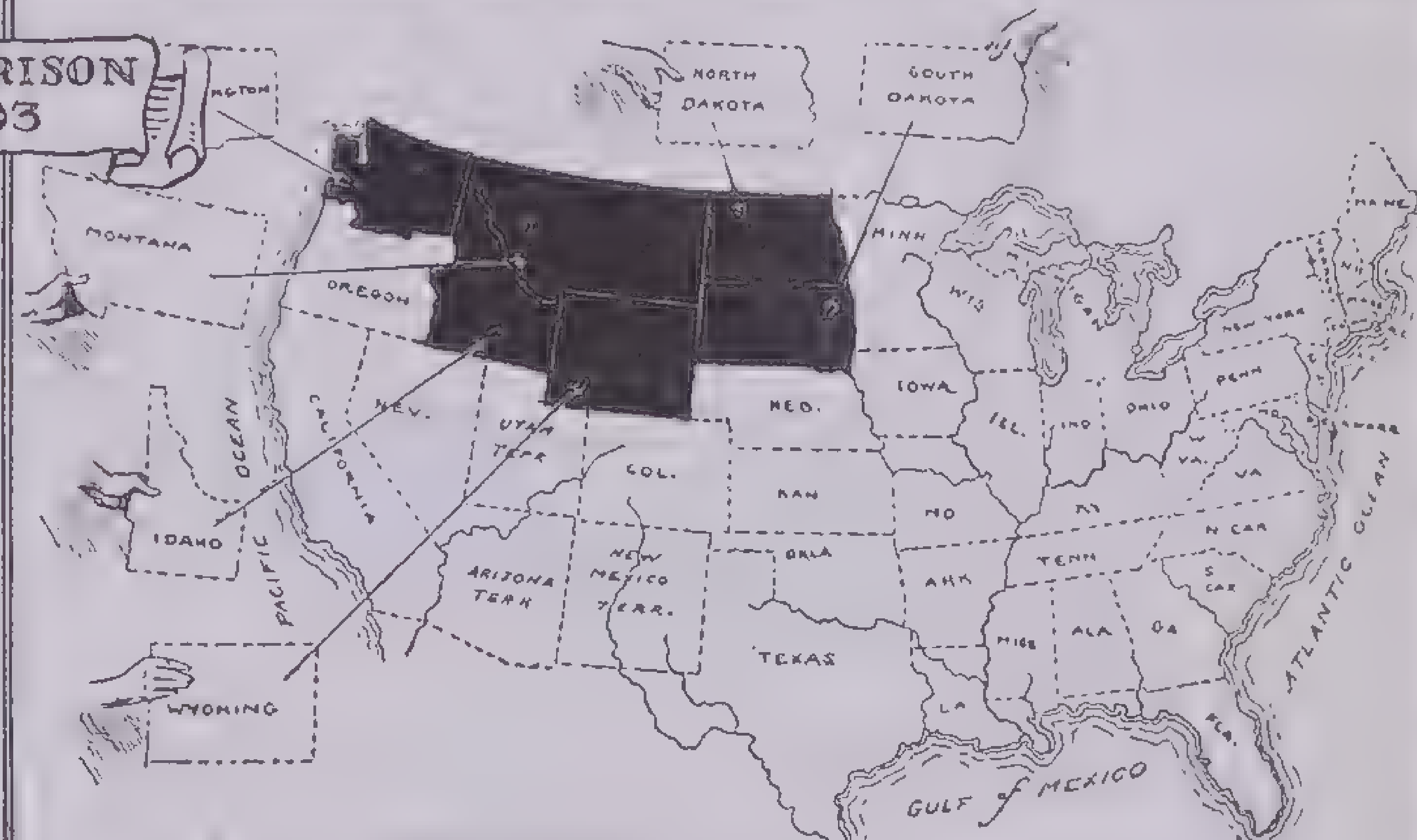
BENJAMIN HARRISON
1889 TO 1893



JOHNSTOWN-PA., DESTROYED BY BURSTING DAM - 1889



BUREAU OF AMERICAN REPUBLICS ORGANIZED - 1890



UNITED STATES IN 1890
ADMISSION OF NORTH DAKOTA-1889, SOUTH DAKOTA-1889
MONTANA-1889. WASHINGTON-1889-IDAHO & WYOMING-1890

rates and tariffs must be kept public. A permanent Commission was appointed to investigate railroad management, fine offenders and work out a system of railroad accounting. The bill might have worked an excellent reform if the Commission had received greater powers. It failed because only by a long process of trial and retrial in the Federal courts could the provisions be enforced.

Labor Troubles.—Strikes and lockouts, which had marked the two preceding administrations, continued in greater number. At one time 6,000 miles of the Gould railway lines were inactive. There were anarchist outbreaks and bombings all over the country. In the Spring of 1886 in a riot in Haymarket Square, Chicago, involving thousands of strikers, seven policemen were killed. Four anarchists were afterwards hanged for provoking this disturbance. By this time the Knights of Labor, a general organization of all types of workers whose membership had increased to nearly a million in 1886, began to lose strength to the American Federation of Labor, first formed in 1881, which gathered skilled workmen into craft unions.

Pension Vetoes.—By 1885 there were 345,125 war veterans receiving pensions from the United States. Among those legally entitled to government aid were many who had never seen action, some who had been dishonorably discharged from the army, and even some deserters. Cleveland vetoed 233 private pension bills and won the name of the Veto President and a reputation for being antiveteran.

Tariff Issue.—Cleveland devoted his 1887 annual message to the tariff question. There was a surplus of $140,000,000 in the U. S. Treasury, and high protective tariffs were no longer necessary, he said, and not now expedient. He advised tariff revisions in order to reduce the revenue; he did not propose "free trade," as is often thought. The resultant Mills Bill passed the House, 1888, providing for a reduction in protective duties. But the Republican Senate made a counter-proposition to keep down the revenue by eliminating taxes on tobacco and limiting the importation of all articles produced in the United States. The tariff question finally resulted in the McKinley Tariff Act.

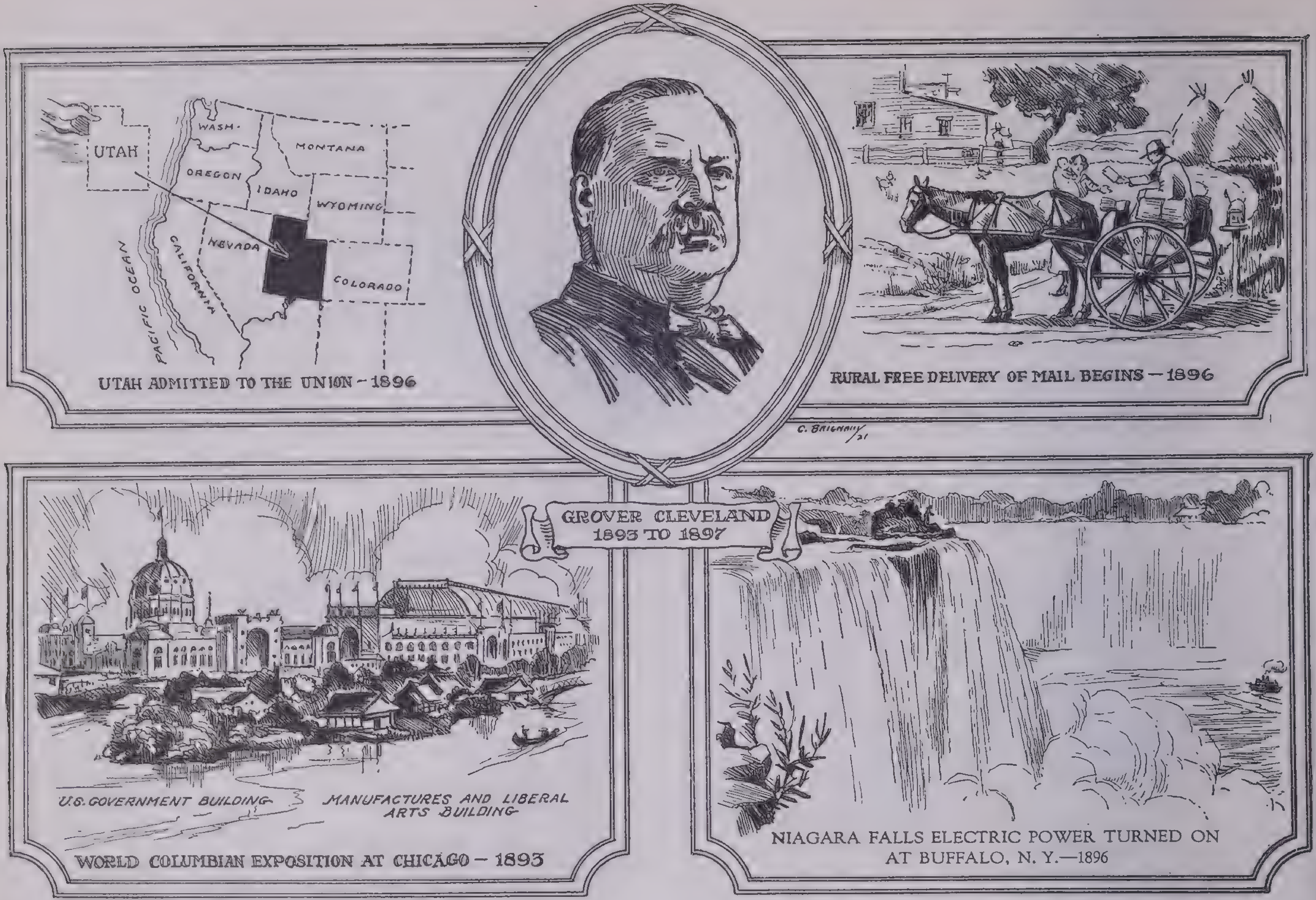
Election of 1888.—The next election campaign was fought out on the tariff question. Cleveland was renominated by the Democrats; Benjamin Harrison was nominated by the Republicans. Cleveland had alienated too many influential members of his own party; the Mills Bill was too unpopular. Harrison was elected with 233 electoral votes, to 168 for Cleveland.

Benjamin Harrison—1889–1893

Benjamin Harrison was elected in a campaign tariff fight and political turn-over, which convinced him and the Republicans who picked him that the people wanted a protective tariff. They got it in the McKinley Tariff Act, which put higher duties on imports for the protection of American industries than any yet known in the history of the country. It put staggering duties on almost everything that could be produced in the United States, including agricultural products. This raised the price of so many necessities of everyday life that "the high cost of living" became for the first time a bugaboo of American life and helped defeat the Republicans in the next election.

Legislation.—To keep another of its campaign promises to the people—that it would restrain the growing power of the great trusts which were stifling small business—the Republican Congress passed the *Sherman Anti-Trust Act,* July 1890. This outlawed and penalized the big monopolies insofar as they interfered with interstate or international commerce. It was aimed at the Sugar Trust, the Standard Oil Trust and Armour's meatpacking company. The Act passed with a huge vote, for once absolutely nonpartisan, revealing how widespread was the oppression felt from monopoly prices. Unfortunately it was not rigidly enforced and the trusts soon devised loopholes for reducing competition.

Another important law of 1890 was the Sherman Silver Purchase Act, which bound the Treasury to purchase 4,500,000 ounces of silver each month and to issue in payment Treasury certificates redeemable in gold or silver. This double standard of currency became an important political issue under the name of bimetallism.



UTAH ADMITTED TO THE UNION – 1896

GROVER CLEVELAND 1893 TO 1897

RURAL FREE DELIVERY OF MAIL BEGINS — 1896

WORLD COLUMBIAN EXPOSITION AT CHICAGO – 1893

NIAGARA FALLS ELECTRIC POWER TURNED ON AT BUFFALO, N. Y.—1896

Foreign Affairs.—Germany, England and the United States in 1889 established a joint control over the Samoan Islands to continue for ten years. The monarchy in Hawaii was overthrown and a republic set up largely by the efforts of business men of American descent who wanted Hawaii annexed to the United States. Harrison prepared an annexation treaty, which was later withheld by Cleveland on the grounds that the United States had taken too serious a part in the revolution.

Other Events.—The first Pan-American Conference met in Washington, D. C., 1889, important for the encouragement of good will and reciprocity between the United States and the South American governments. In November 1889 North and South Dakota, Montana and Washington were admitted to the Union; in July 1890 Idaho and Wyoming also became states.

Billion Dollar Congress.—The Republican Congress lost no time spending the surplus in the United States Treasury. They reduced the excess from $10,000,000 in 1892 to $2,000,000 in 1893 and were therefore dubbed by the Democats the "billion dollar Congress." By the Dependent Pension Act they granted enough more pensions to double the number of Civil War veterans and dependents on the lists. They put out large sums for river and harbor improvement. And they authorized the building of a new navy as speedily as possible, an act that jumped the United States from twelfth to fifth place among world navies.

More Unrest.—More and more discontent pervaded the labor element throughout the country. The terrible strike in the steel works at Homestead, Pa., June 1892, which was handled with ruthless bloodshed, helped turn public sentiment against the administration. The western farmers, too, were pinched for money and saddled with mortgages. They wanted lower freight rates and more silver in circulation. And so great was their influence that the People's Party (or Populists, first known as the Farmers' Alliance) assumed important proportions.

Election of 1892.—During the next presidential campaign the Democrats attacked the McKinley Tariff in no mild language; it was "fraud and robbery" and the root of all evil. The Populists agitated for a return of the government into the hands of the "plain people." Grover Cleveland was routed out of private life and nominated on the Democratic ticket, with A. E. Stevenson for Vice-President. Harrison was again the Republican nominee. The Populists named James B. Weaver of Iowa and he polled more than 1,000,000 votes. Cleveland was elected with 277 electoral votes to 145 for Harrison and 22 for Weaver.

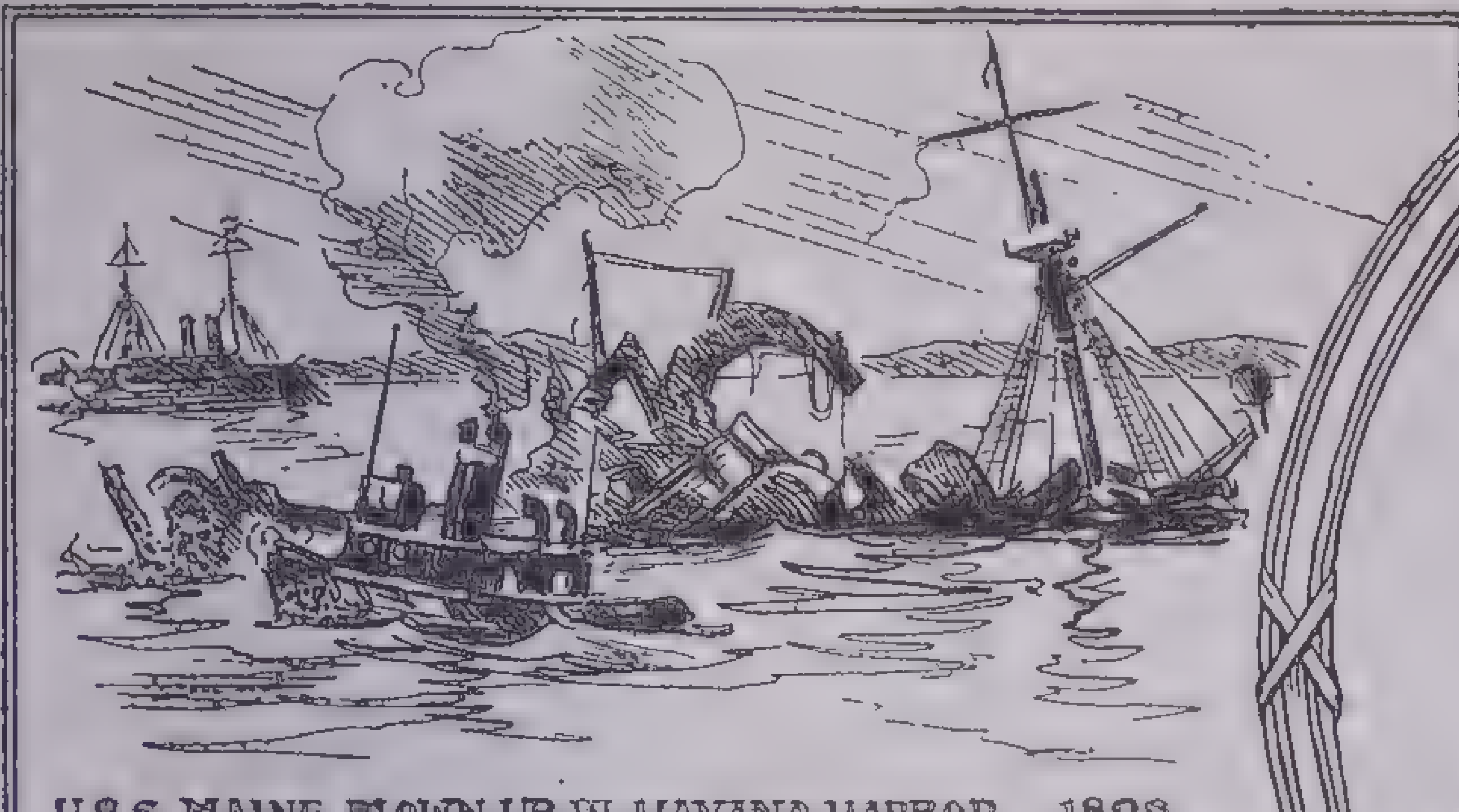
Grover Cleveland—1893–1897

Cleveland walked into the midst of the financial havoc wrought in Harrison's administration and received all the blame for it. He had promised to revise the McKinley Tariff, but by the time he got the Wilson Bill, which increased the number of free entries and reduced several high duties, through the House (Dec. 1893) it was no longer wise to reduce the tariffs. The Treasury now had a deficit, not a surplus, and drastic things had to be done to pull the country out of panic and depression.

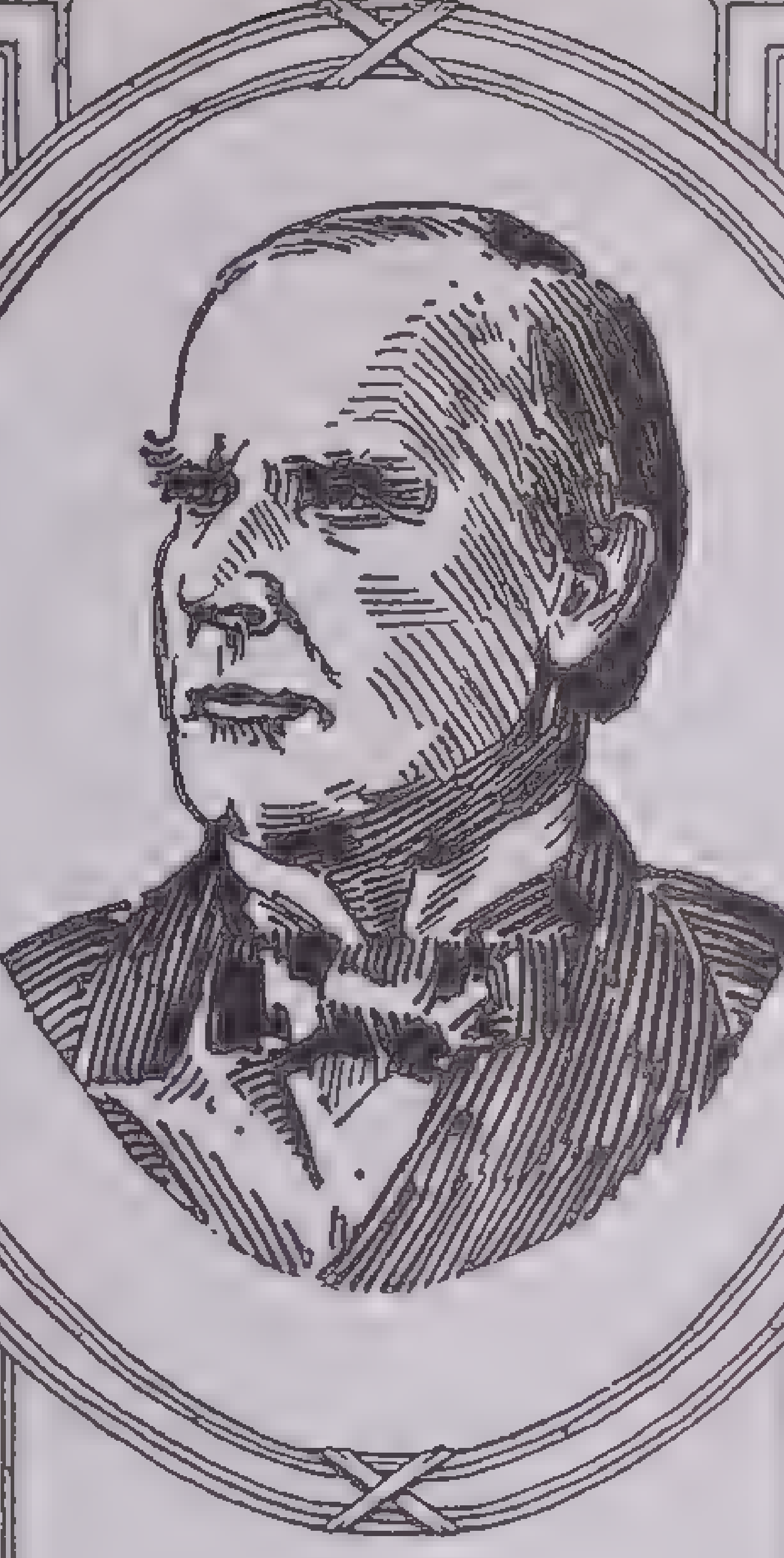
Panic of 1893.—For panic was at hand. The gold reserve in the U. S. Treasury was only $80,000,000, far too low for the United States to go on redeeming currency in gold. Cleveland called a special session of Congress, Aug. 1893, to repeal the Silver Purchase Act that was depleting the reserve. He was hotly opposed by the silver contingent of his own party. The Act was repealed, but no legislation was made to protect the reserve in any other way.

People began to hoard gold. Business failed and banks crashed everywhere. National bank deposits fell $378,000,000. The silver dollar dropped from 67 to 60 cents in value; the western silver mines shut down. By winter (1893–94) everything was worse. Thousands were jobless; hundreds starved. Coxey's Army, a spectacular horde of the unemployed, marched to Washington to plead redress. They arrived in front of the White House, May 1, 1894, but all the government could do was arrest them for walking on the grass!

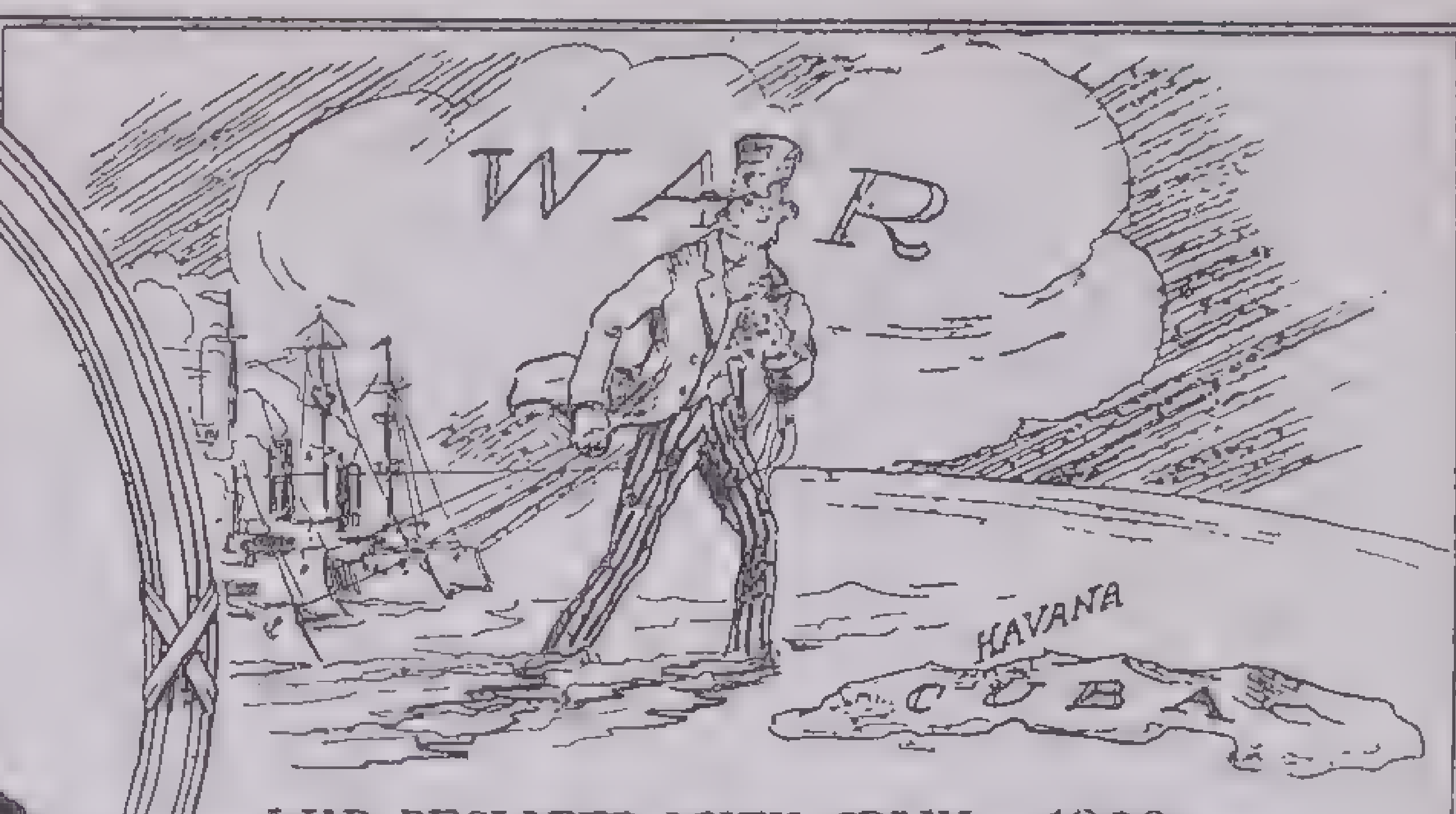
Workers in the Pullman Co., Chicago, struck in protest against cut wages. The strike spread to 27 states and involved 23 railroads. Railroad property, cars and buildings, were



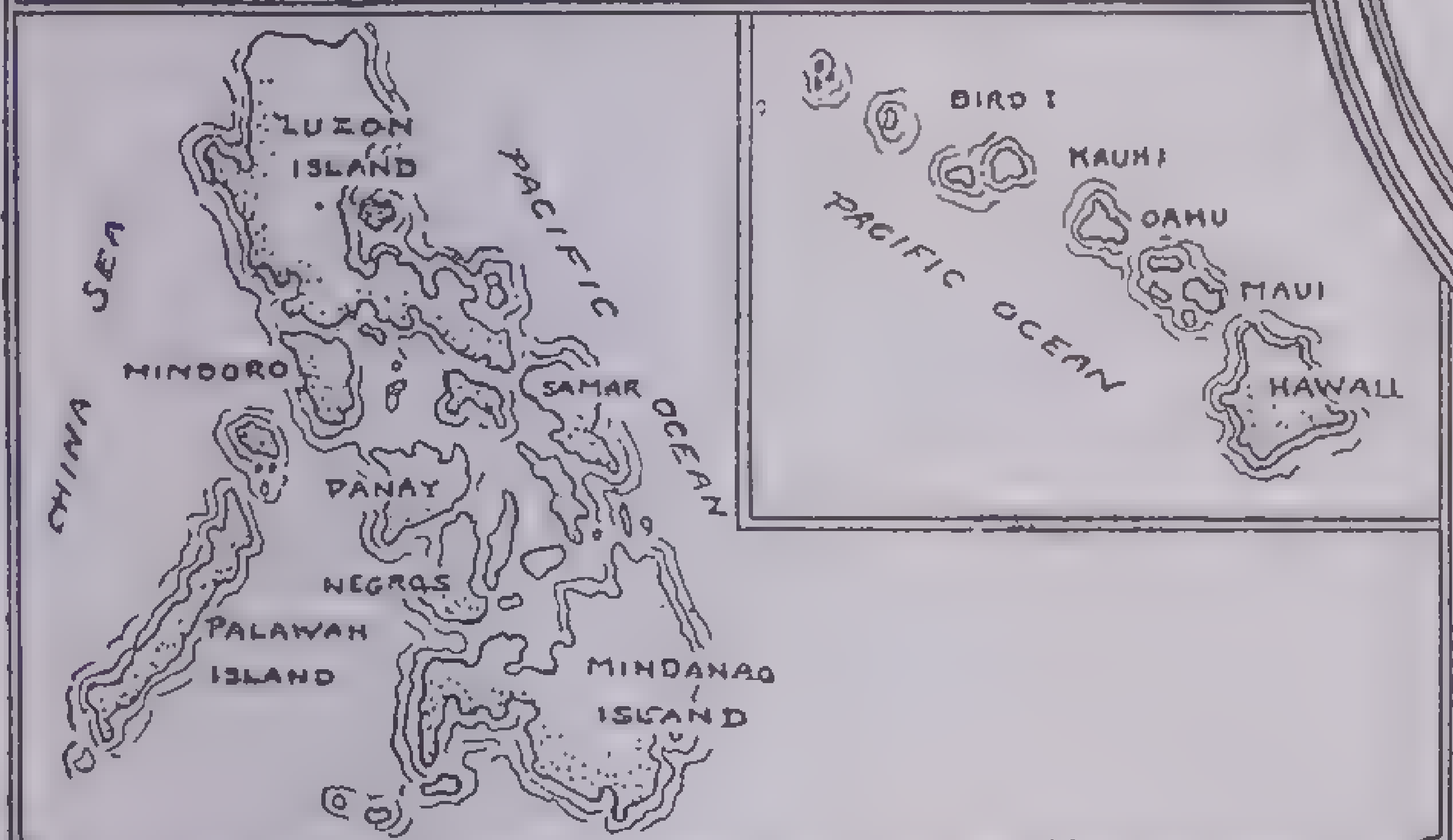
U.S.S MAINE BLOWN UP IN HAVANA HARBOR — 1898



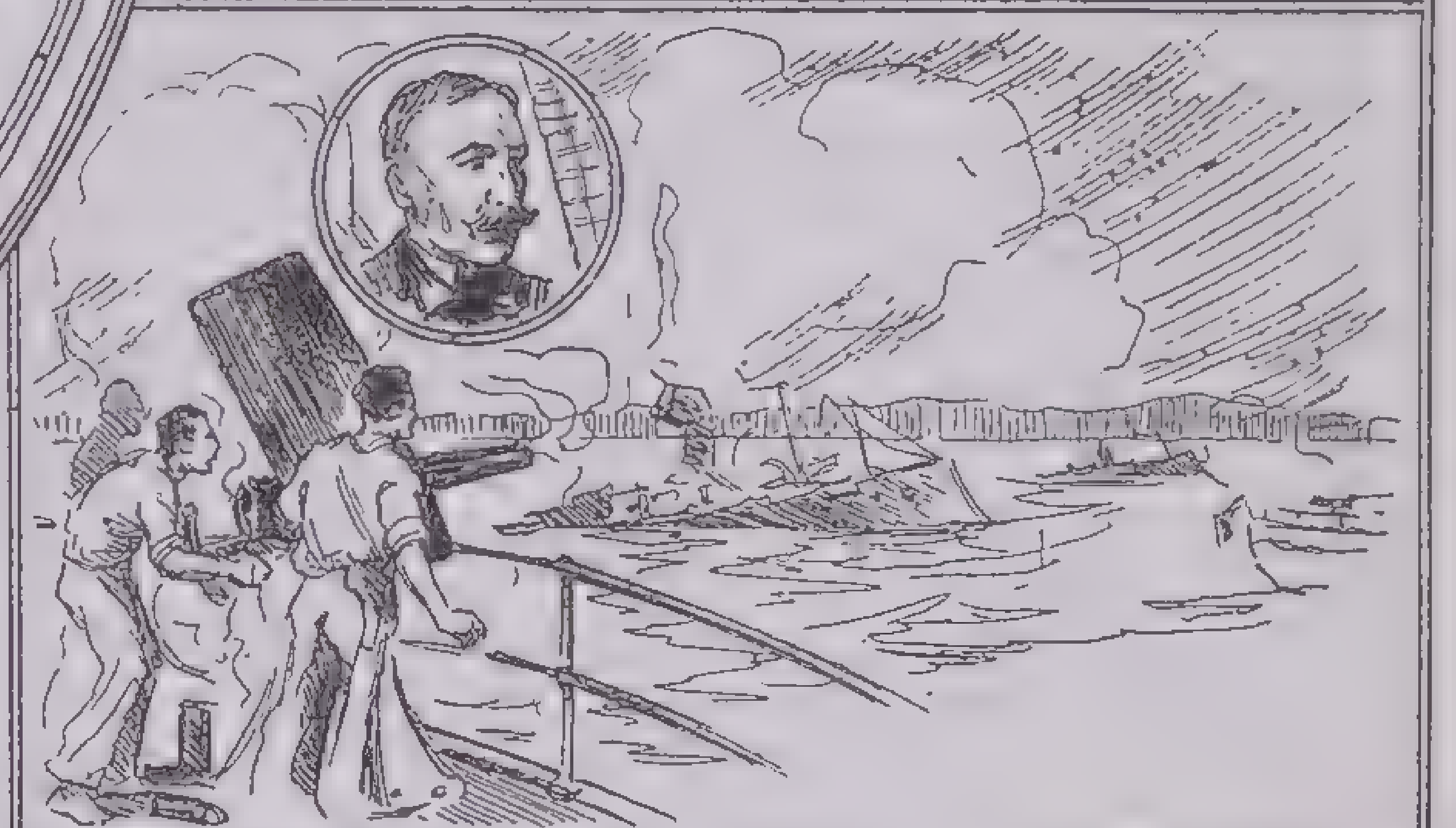
WILLIAM McKINLEY
1897 TO 1901



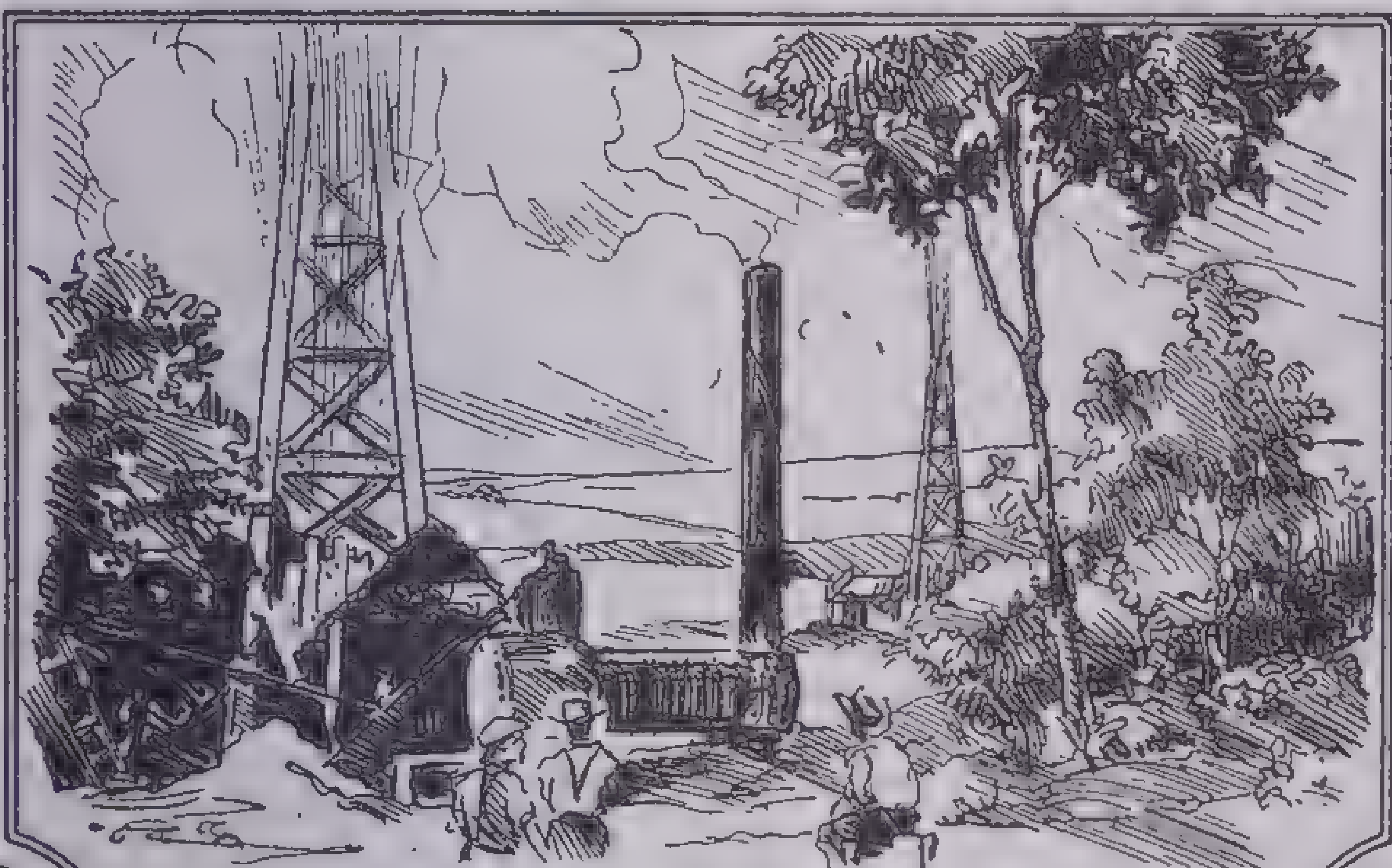
WAR DECLARED WITH SPAIN — 1898



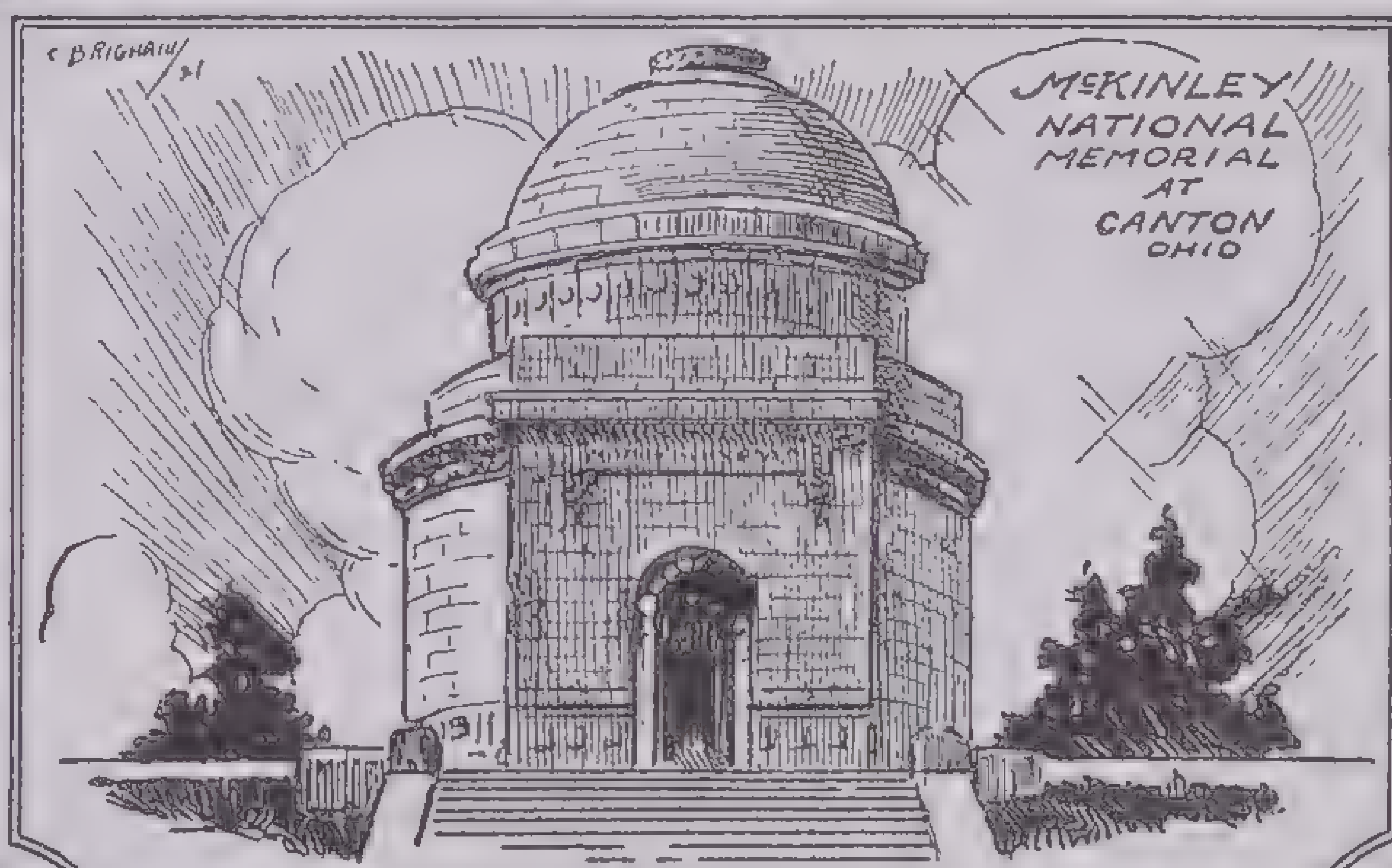
PHILIPPINE ISLANDS CEDED TO U.S. FOR $20,000,000 — 1898 ~ HAWAII ANNEXED — 1898.



COMMODORE GEORGE DEWEY WINS BATTLE of MANILA BAY — 1898



OIL DISCOVERED IN TEXAS — 1901


C. BRIGHAM /31
McKINLEY NATIONAL MEMORIAL AT CANTON OHIO

McKINLEY ASSASSINATED — 1901

burned; trains were stopped; the mails obstructed. Gov. Altgeld of Illinois, who sympathized with the strikers, would do nothing. But President Cleveland sent Federal troops to quell the agitation and keep the mails moving. The U. S. Supreme Court by injunction forbade interference with the movements of trains. There was bloodshed and war between the troops and the strikers. Quiet was restored by the end of July 1894. But Cleveland's interference cost him the support of organized labor and its sympathizers.

Wilson Bill.—True to their promise to reduce the high tariffs of the McKinley Tariff Act, the Democrats framed the Wilson Bill, which allowed wool, coal, lumber, iron ore and raw sugar to come into the country free. It reduced the duties on silks, cottons, etc., and provided for a 2 per cent income tax on all incomes over $4,000. The bill passed the House, Feb. 1894, but struck a snag in the Republican Senate. It was changed and amended beyond recognition: duties were put on sugar, coal and iron ore. All the changes were suspiciously favorable to "big interests." When it finally came through, the Wilson Bill differed little from the McKinley Tariff Act. Cleveland would not sign it, but he let it become law. By that time the deficit in the Treasury prohibited any lower tariff.

Foreign Affairs.—Great Britain declared that the United States had no right to invoke the Monroe Doctrine in a boundary-line dispute between Venezuela and British Guiana. But Cleveland demanded that the quarrel be settled by arbitration. For a time there was danger of war, but the British Government finally agreed to arbitrate.

Election of 1896.—With the repeal of the Silver Purchase Act, Cleveland had alienated the pro-silver element of his own party and the western and southern Populists who still thought free silver the cure-all for bad times. Labor was hostile to him because of his interference in the Pullman strike. Republicans and Democrats alike turned against him for the four bond issues with which he strove to keep the U. S. gold reserve up to its $100,000,000 mark. His great virtues, notably his sincerity and independence, were not appreciated then as they are now.

The election campaign of 1896 was entirely a money fight. The Democratic convention, captivated by a young ex-Congressman from Nebraska, William Jennings Bryan, and his impassioned free-silver declamations, nominated him for the presidency. The Republicans nominated William McKinley of Ohio and came out in direct opposition to the free-silver platform and for the gold standard. "Back to prosperity" was the cry. Business and jobs hung on the election. "Vote for McKinley and go back to work." McKinley was elected with 271 electoral votes; Bryan had only 176.

William McKinley—1897–1901

Dingley Tariff. 1897.—After the Senate got through with the Wilson Bill in Cleveland's administration, no tariff revision was really needed to bring in revenue. But the business interests that had put the Republicans in power were demanding that the government go through the motions of victory. And the Dingley Tariff Bill was framed and became law, July 1897. It differed little from the old McKinley Tariff of 1890. The duties were so high that foreign trade was almost prohibited. The clauses giving the President power to make limited reciprocity treaties were intended to temper the burden of the high rates. Seven such reciprocity treaties were prepared but the Senate refused to ratify them.

Cuban Insurrection.—There was an outburst of interest and sympathy with the Cuban uprising against Spain, and of indignation over Spain's inhuman herding of Cuban noncombatants into garrisoned towns where they died by the thousands.

Spain had long been enriching herself at the expense of Cuban agriculture. And her rigid rule in the island resulted in the inevitable people's uprising for self-government. The Ten Years' War (1868–78) had won certain grants and concessions from Spain that were less and less religiously enforced as time went by. In 1895 came another insurrection. The natives could not cope with professional Spanish troops and guerilla warfare raged, 1896–97. Spain put General Weyler in charge of the island in 1896, and it was his pitiless system of concentrating the people inside the towns to starve and sicken that earned him the title of Butcher.

American sympathy with the native uprising was not at all lessened by the fact that $50,000,000 of American capital was tied up in Cuba. There was much talk of intervention, but the strictest neutrality was actually maintained. But a letter from the Spanish minister to a Cuban friend, mentioning McKinley in insulting terms, was published Feb. 9, 1898. The U.S. battleship *Maine* was blown up in Havana harbor, Feb. 15, and 266 American sailors were killed.

The American public was ready for war. European powers intervened to prevent it. On April 10 the United States was informed that Spain had suspended hostilities in Cuba, but on April 11 McKinley asked Congress for the right "to intervene" and received enthusiastic consent. On April 19 Congress passed resolutions declaring Cuba free and independent, asserting the right of the United States to demand that Spain relinquish the island, disclaiming any intentions beyond the restoration of peace and declaring "determination, when that is accomplished, to leave the government and control of the island to its people." On April 24 Spain declared war. On April 25 the United States resolved that a state of war had existed since the 21st.

Spanish-American War. 1898.—Activities began at once. Capt. William Thomas Sampson in charge of the North Atlantic squadron was ordered to blockade Cuba and head off the Spanish fleet then known to be en route from the Cape Verde Islands since April 29, destination unknown. Commodore George Dewey in command of the Pacific squadron had been ordered to the Philippine Islands to destroy the Spanish fleet stationed there. Dewey was in Manila Bay by midnight, April 30. He began his bombardment about 5 A.M., took time out for breakfast at 7:30, began fire again at 11 and had won the engagement by 12:30 with no losses. But the Spanish fleet was destroyed.

The mysterious and elusive Spanish fleet for which Sampson had been searching finally sailed into Santiago harbor in Cuba under the command of Admiral Cervera. Commodore W. S. Schley had the harbor blockaded by May 28 and then stood by to wait for Sampson.

Gen. W. R. Shafter with 17,000 troops (including the famous Rough Riders led by Theodore Roosevelt) landed at Daiquiri near Santiago in June. El Caney was taken by Gen. Lawton, July 1. The same day the Rough Riders stormed and captured San Juan Hill. Fearing the destruction of Cervera's fleet thus caught between land and sea, Gen. Blanco in Santiago ordered it to make a run for the open sea. On July 3 Cervera sailed out of the harbor to dare the blockade, and the battle that followed left not one Spanish vessel afloat. Sampson then bombarded Santiago unhindered and the city surrendered, July 17.

An armistice was signed, Aug. 12. On Dec. 10, 1898, a peace treaty was signed in Paris. Spain gave up all claims to Cuba, Puerto Rico and Guam and sold the Philippine Islands to the United States for $20,000,000.

The Open Door.—The United States was no sooner rid of the Spanish-American war than she was at once involved in a ticklish international trade problem requiring the utmost diplomacy. The European nations were engaged in the partition of China—dividing it into portions convenient and favorable to their respective interests. American-Chinese trade was thus threatened as well as America's position in the newly acquired Philippines.

On Sept. 6, 1899, John Hay, Secretary of State, sent his famous message to the nations protesting that the ports of China be kept open to the trade of the world. He asked each nation for a statement that it would not interfere with any treaty, port or vested interests in its so-called "sphere of influence"; that the Chinese customs should not be interfered with, but should be collected by Chinese officials; and that it would not discriminate against other powers in matters of port dues or railroad rates. The European powers were thus compelled to disavow before all the world their acquisitive intentions in China.

The New Possessions. Hawaii.—Hawaii's request for annexation to the United States had been refused in Cleveland's administration. But the Spanish war had revived America's old spirit of expansion, and the Hawaiian Islands were annexed by a joint resolution of Congress signed by the President, July 7, 1898. Formal transfer of sovereignty took place on August 12, the islands remaining for a time under the existing form of government with a few changes, till June 1900, when they were organized as a territory with Sanford B. Dole as governor.

Cuba.—Cuba received a provisional government under Gen. Leonard Wood, whose military rule worked wonders for the education and sanitation of the island. Yellow fever was wiped out, thanks to the sacrifices of Major Walter Reed, a U. S. army surgeon. The provisional government was developed always with self-government as its goal. In Feb. 1901 Cuba framed a constitution patterned after the U. S. Constitution. The Platt Amendment, March 1901, was superimposed on this constitution, guaranteeing that Cuba would permit no foreign interference or control by treaty of any kind, and obligating the United States to intervene in behalf of Cuba's peace or independence.

Puerto Rico.—Puerto Rico remained under U. S. military rule until the Foraker Act, April 1900, set up a provisional government with an American governor and executive council appointed by the President, and a house of representatives elected by the natives. This was far from satisfactory to the Puerto Ricans, however, because control of their government really lay with the American executive council and because U.S. citizenship was withheld from them. For 17 years they continued in this state of dissatisfaction until an Act in 1917 bestowed on them their own legislature and U.S. citizenship.

Philippines.—The Philippines were the real problem. Here, 8,000,000 half-Christianized pagans of 80 tribes, speaking as many dialects and occupying some 7,000 islands, rose in revolt against the new regime. Emilio Aguinaldo fostered Filipino resentment against American occupation and led the foolhardy attack on Manila, Feb. 1899. The United States put 50,000 troops in the islands and the disgraceful, unequal war that followed resolved itself into a series of massacres. Three years of guerilla warfare killed hundreds of thousands of Filipinos. Aguinaldo was captured, March 1901, and the revolt died down.

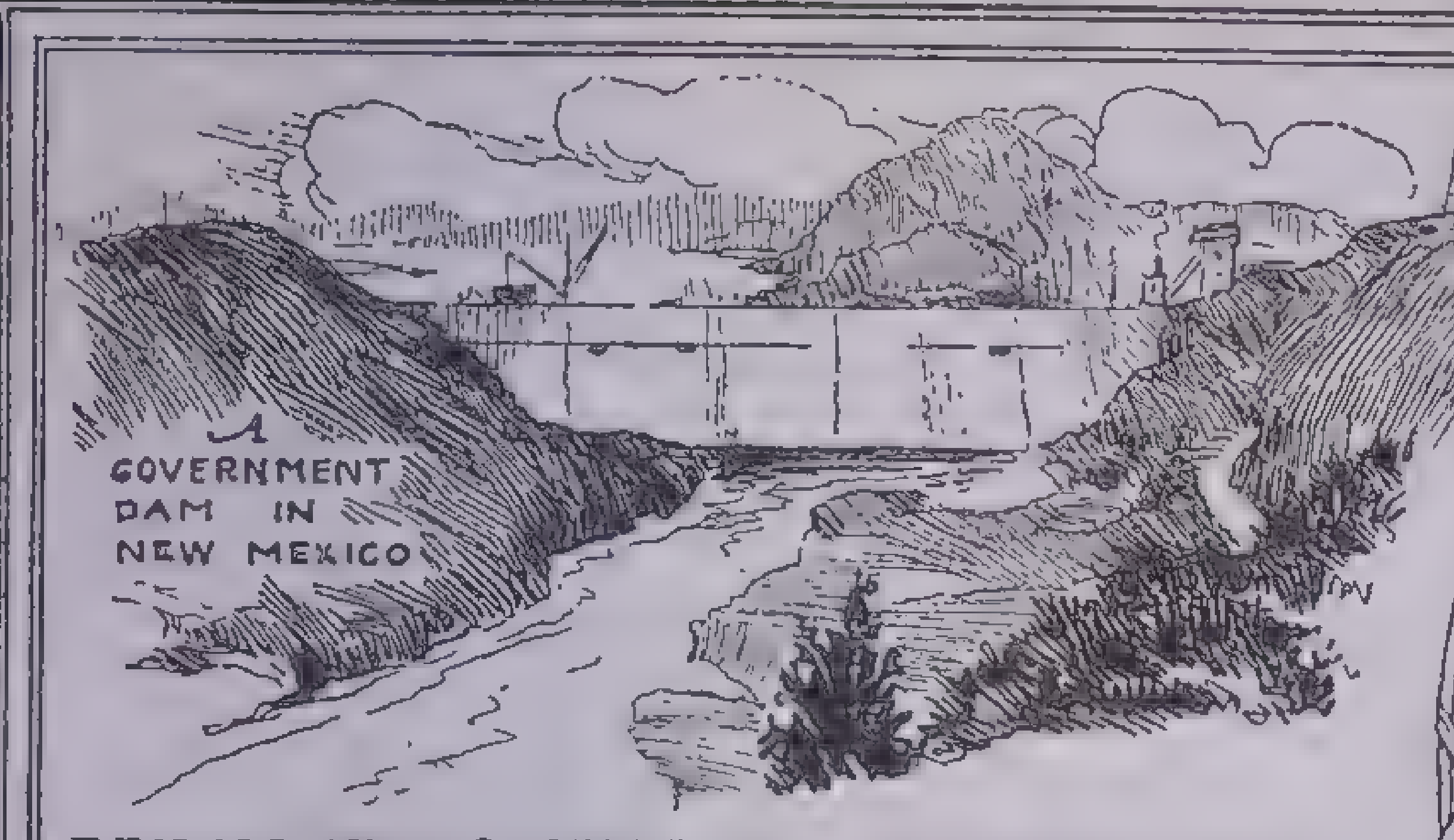
In April 1900 William H. Taft headed a commission to organize a civil government. He became the first civil governor, July 1901, administering a government very like the one in Puerto Rico. "The Philippines for the Filipinos" was his policy from the first, and step by step the government was guided to autonomy.

Other Events.—Congress passed the Gold Standard Act, March 1900, which put the country's currency back on the gold standard. It reserved $150,000,000 in gold and provided for the sale of bonds whenever necessary to keep it there.

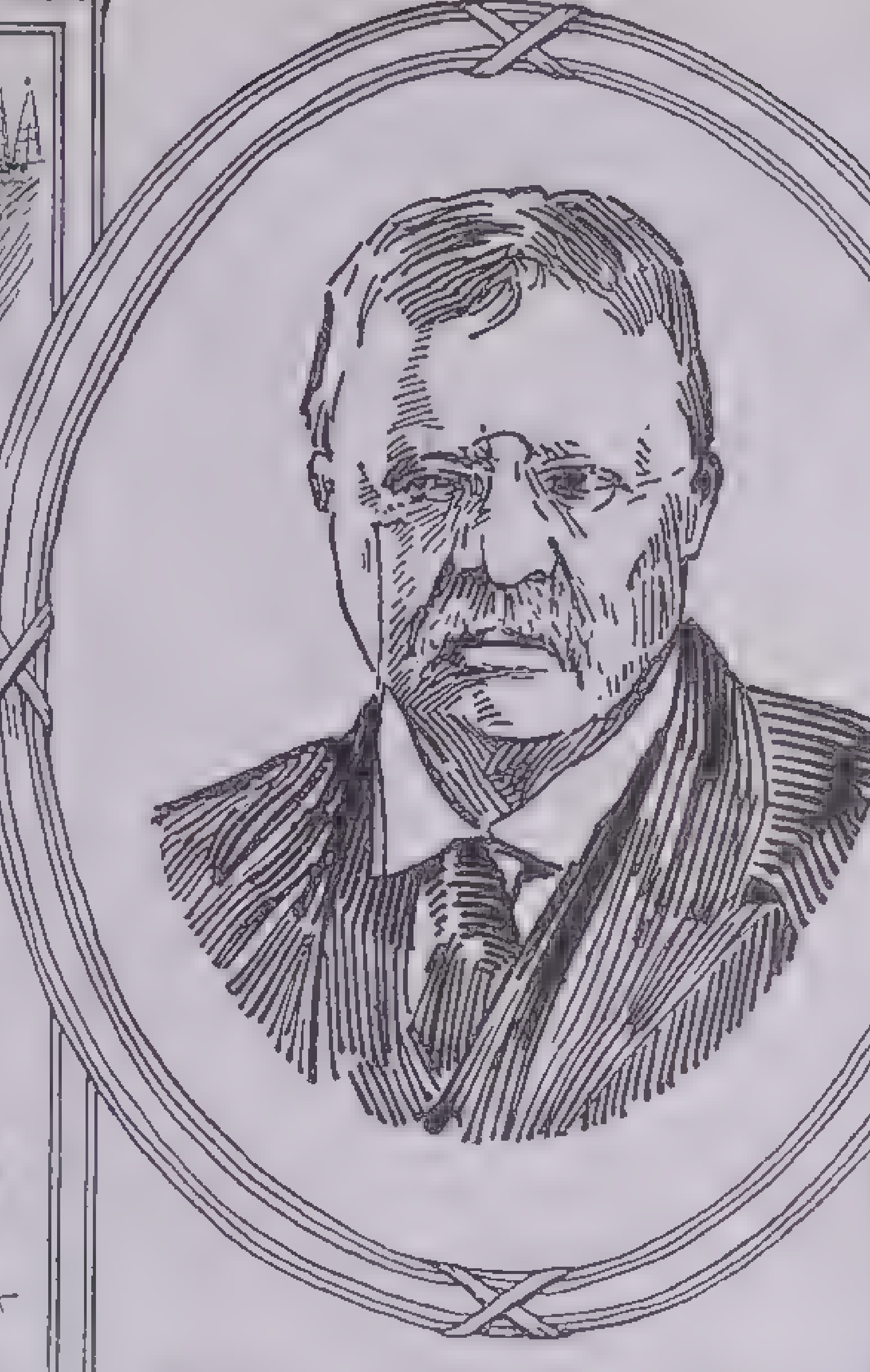
In 1899 Samoa, which had been occupied jointly by Great Britain, Germany and the United States, was divided, and the United States acquired in perpetuity the island of Tutuila with a splendid harbor at Pago Pago and four smaller islands.

Election of 1900.—As the end of McKinley's first term approached, the Democrats put their demand for free silver second only to their criticism of the administration's imperialism and the expansion of the nation beyond its continental borders. McKinley was renominated by the Republican party with Theodore Roosevelt on the ticket for Vice-President. Bryan was again the choice of the Democrats. McKinley won a more pronounced victory than in 1896, receiving 292 electoral votes to 155 for Bryan.

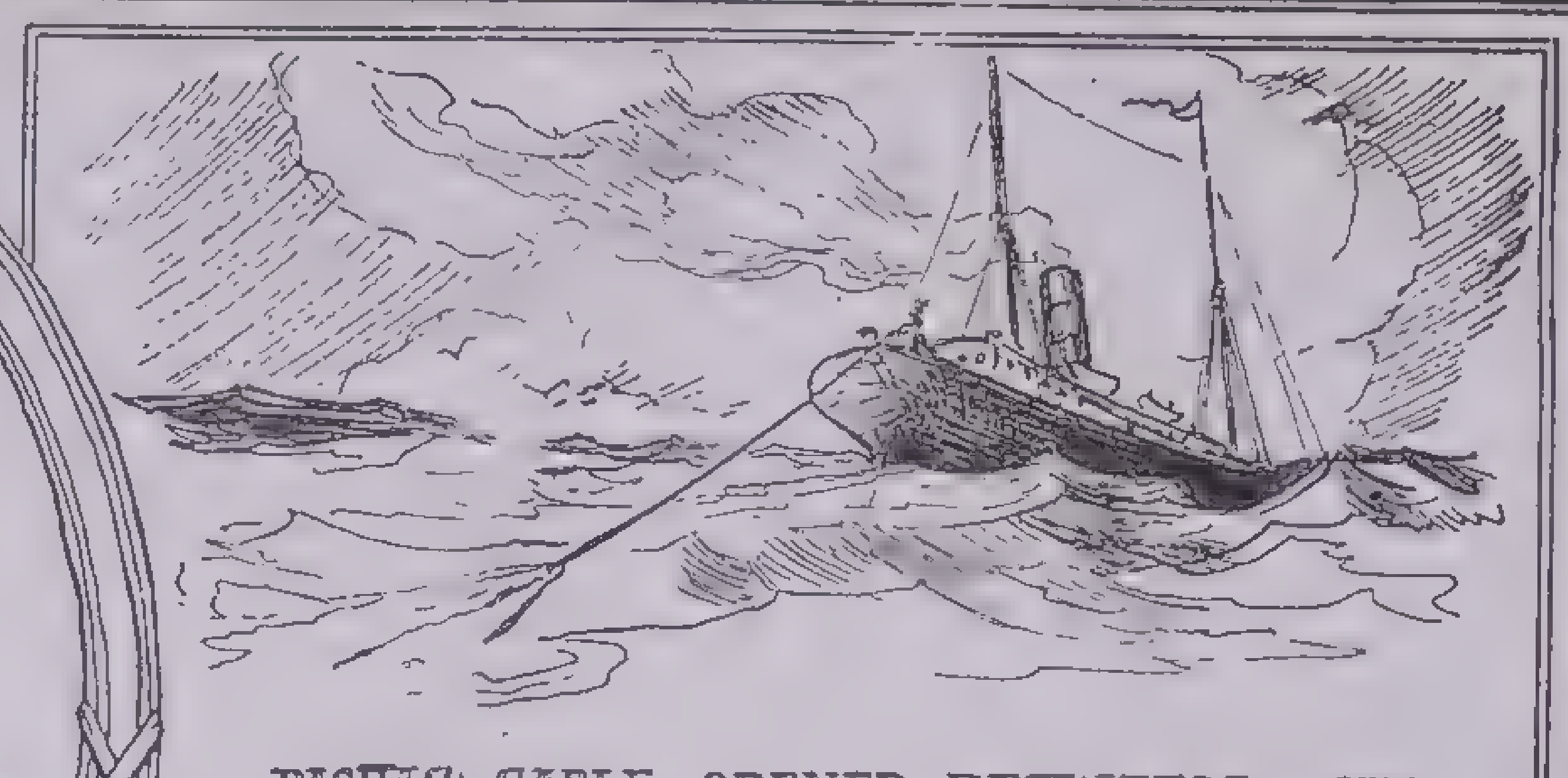
Assassination of the President.—Six months after his second inauguration President McKinley was shot by a German Pole named Leon Czolgosz at the Pan-American Exposition at Buffalo, N.Y. He died Sept. 14, eight days after he was shot. Theodore Roose-


A GOVERNMENT DAM IN NEW MEXICO

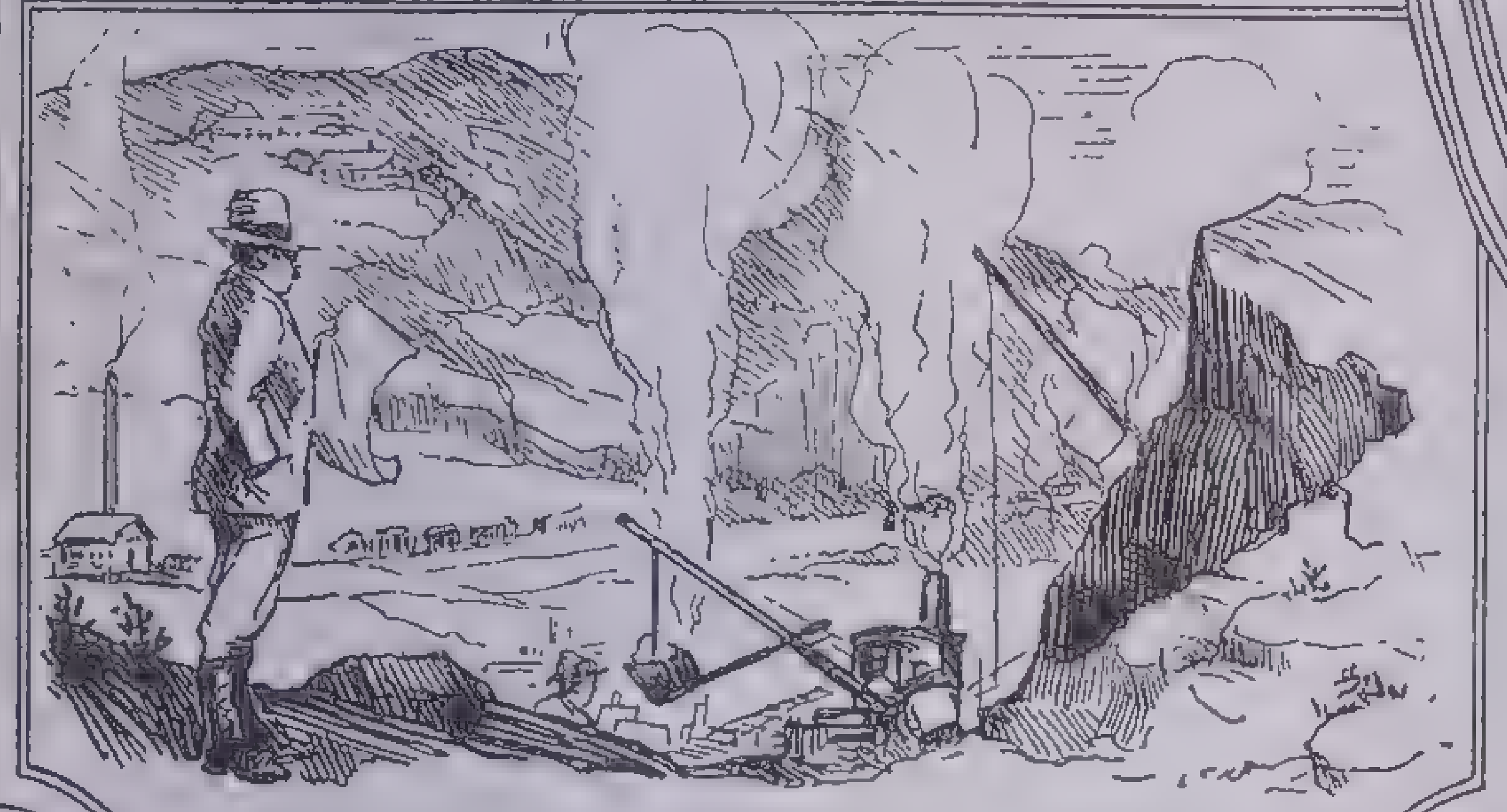
RECLAMATION OF ARID LANDS AUTHORIZED—1902



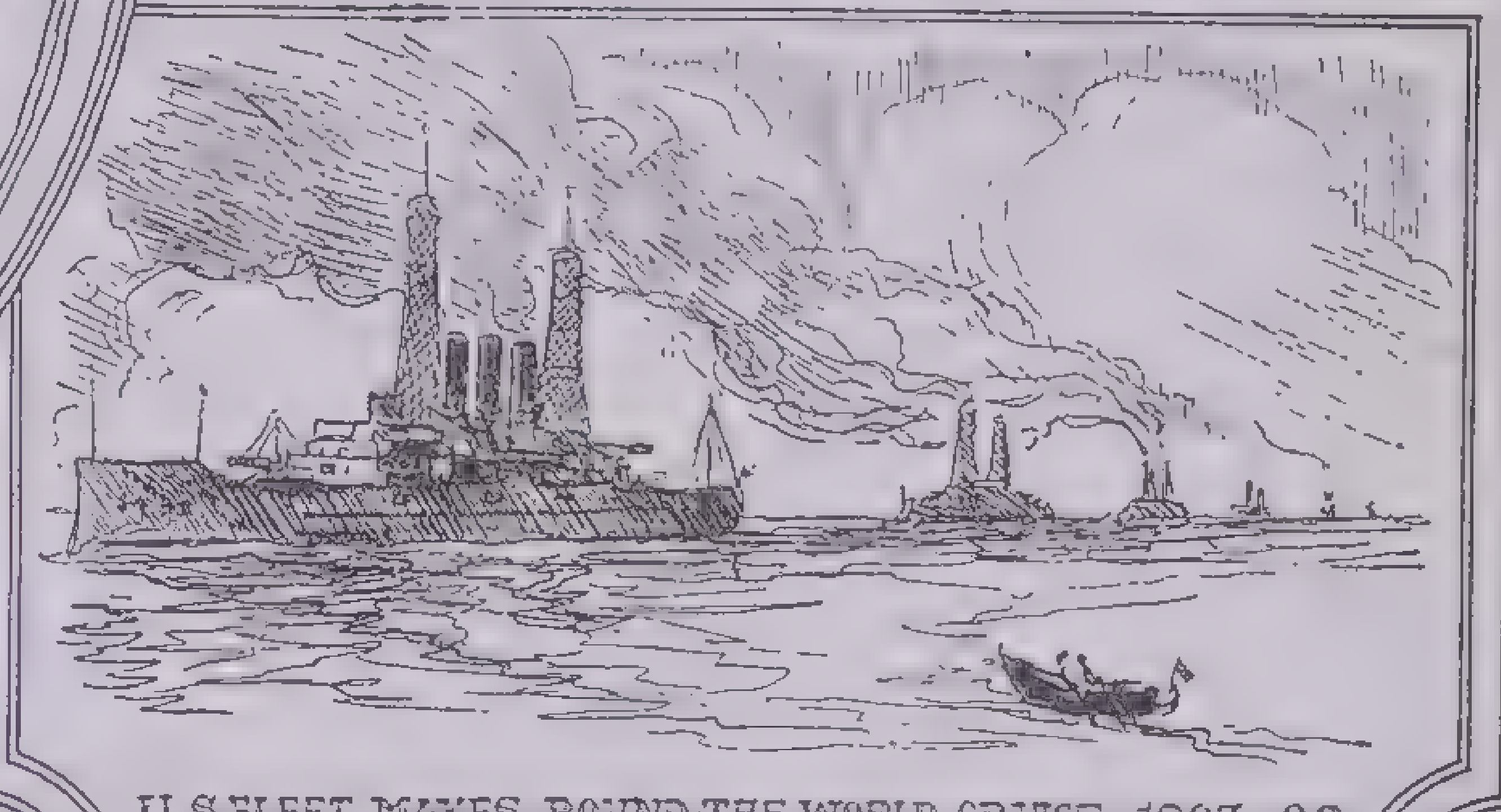
THEODORE ROOSEVELT 1901 TO 1909



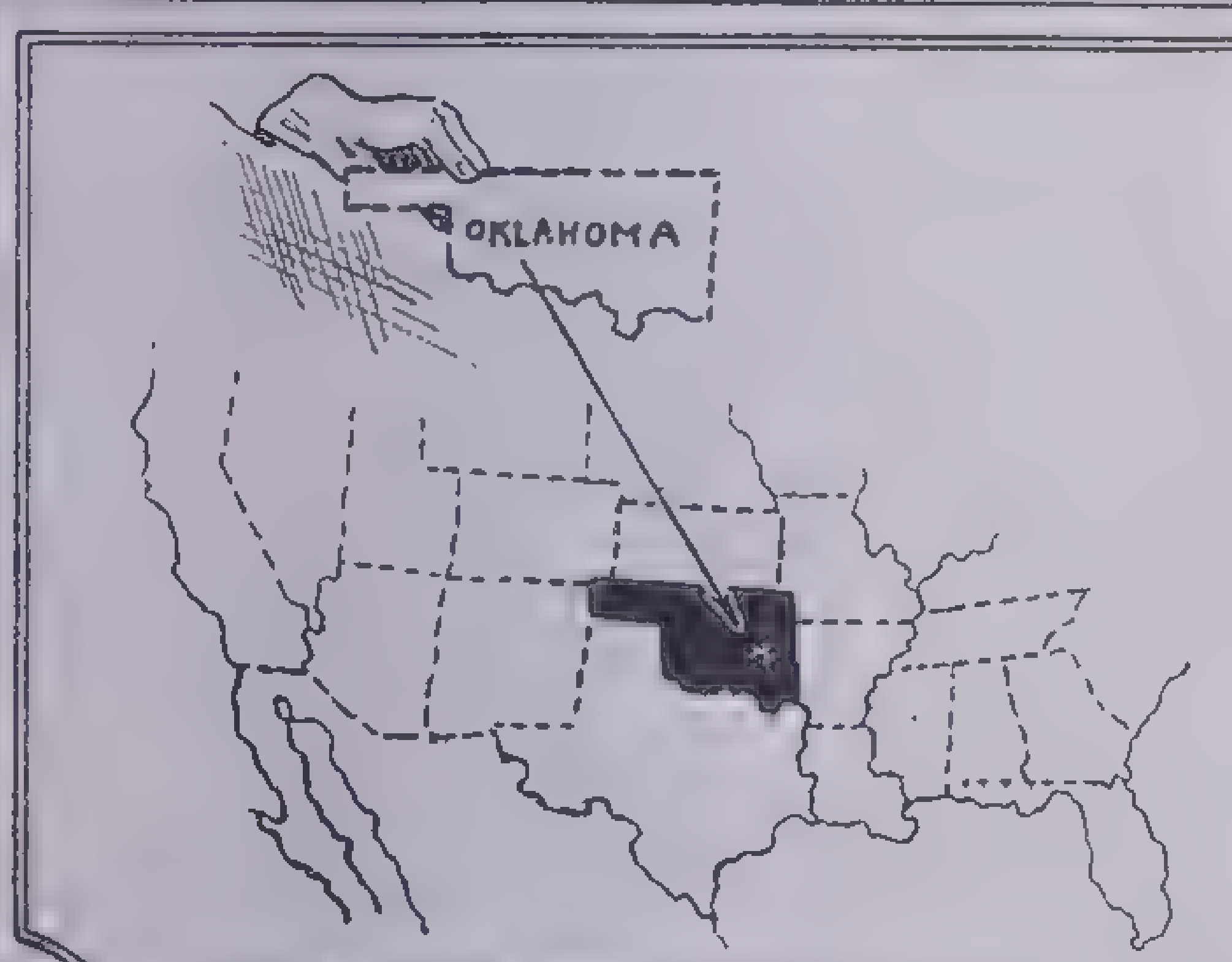
PACIFIC CABLE OPENED BETWEEN SAN FRANCISCO AND MANILA—1903



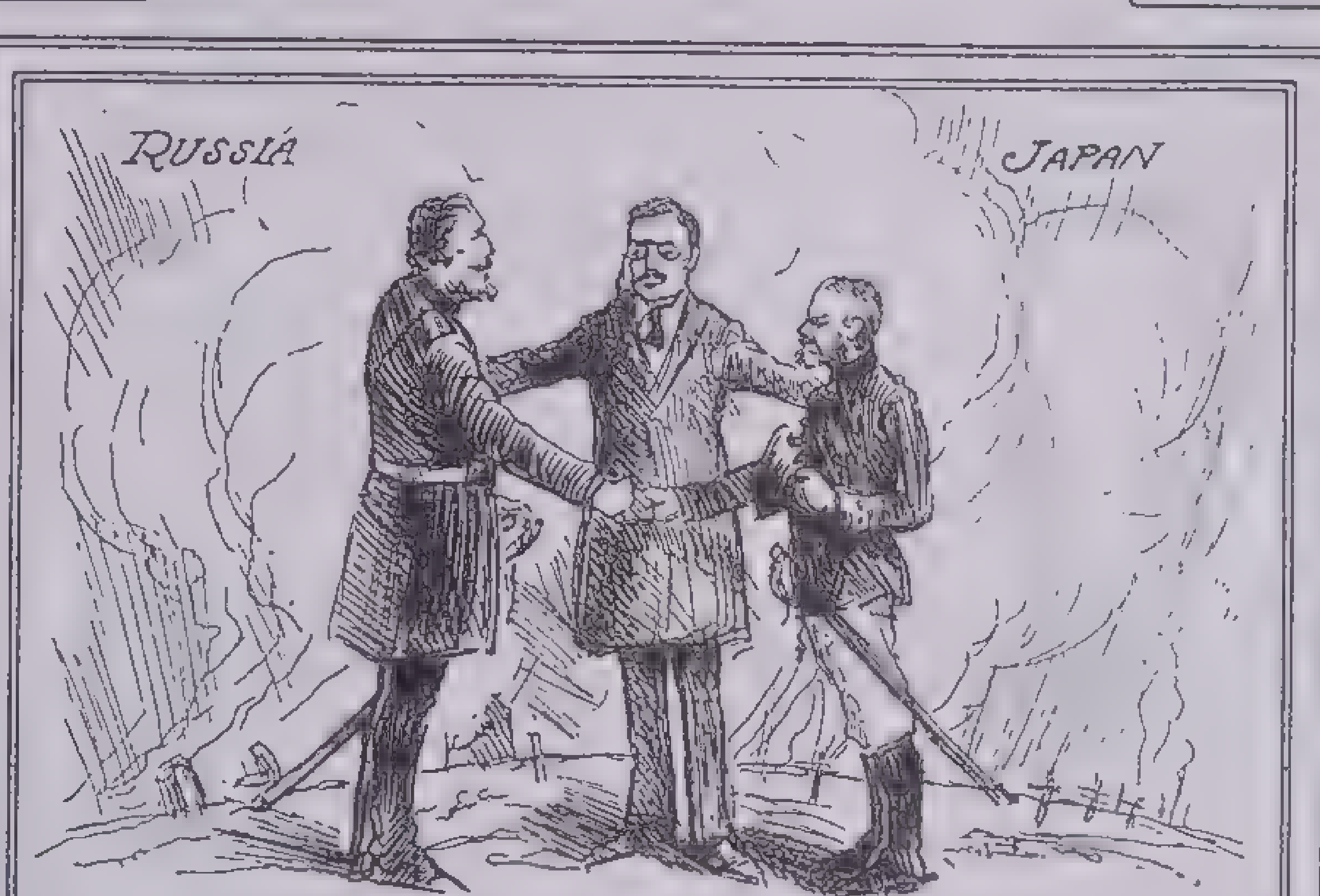
PANAMA CANAL STARTED — 1906



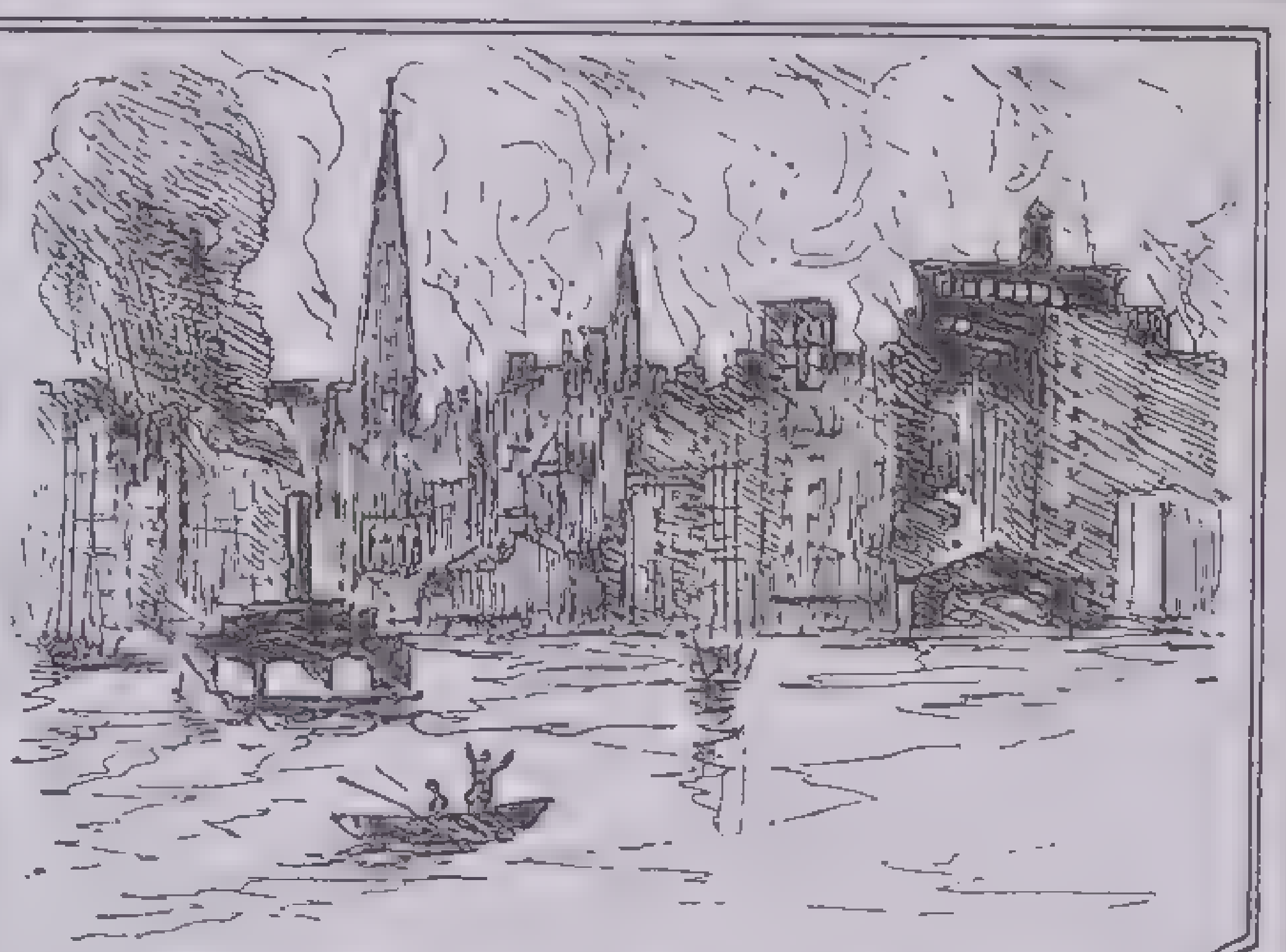
U.S. FLEET MAKES ROUND-THE-WORLD CRUISE—1907—09



OKLAHOMA ADMITTED TO UNION—1907



ROOSEVELT ACTS AS MEDIATOR BETWEEN JAPAN AND RUSSIA—1905



SAN FRANCISCO FIRE—1906

velt then became the new head of the administration.

Theodore Roosevelt—1901–1909

When Theodore Roosevelt so unexpectedly became President he announced that he was ready to take up and continue the policies of McKinley. But the difference between the two men was great. Young Roosevelt seemed "unsafe" to the conservative leaders of big business, but the vigor and picturesqueness of his personality at once captured the mass of the people.

Coal Strike.—Opportunity quickly came to test his leadership. The Pennsylvania anthracite coal mines had come into the hands of a combination of coal-carrying railroads that was concealing profits, cutting wages and raising the price of coal. They would not arbitrate the wage cut, and the inevitable strike followed, May, 1902, throwing 150,000 miners out of work. With the coming of cold weather in the autumn, discomfort spread. Cities, schools, hospitals, orphan asylums, rich and poor suffered alike. No one could buy a ton—nor a bagful. When the mine owners tried to make the strike unpopular by withholding coal already mined, the people appealed to the President, who called owners and workers to Washington to settle the dispute in the name of humanity. The owners again refused to arbitrate. When Roosevelt threatened to take over the mines in the form of "government receivership" to keep them working, the owners were forced to come to terms that put the miners back to work in the spring of 1903.

Panama Canal.—By the Hay-Pauncefote Treaty with Great Britain, 1901, the United States secured the exclusive right to build and operate a canal across the Isthmus of Panama. In January 1903 the Hay-Herran Treaty between Colombia and the United States provided that the United States would buy a strip of land six miles wide across the isthmus. The U.S. Senate readily ratified this treaty but Colombia rejected it. The inhabitants of Panama, who had looked towards the canal project as a kind of millennium, rebelled against Colombia and established an independent republic of their own—apparently with the tacit assistance of President Roosevelt.

The U. S. naval forces arriving close on the heels of Colombian troops prevented them from opening fire in Panama to quell the rebellion. The little new government was recognized within three days by the United States and almost immediately the United States guaranteed its independence. Another treaty was quickly put through between the new Republic of Panama and the United States, in which Panama leased to the United States forever a zone 10 miles wide across the isthmus for $10,000,000 down and a perpetual annuity of $250,000. The coasts and certain islands were also ceded for the building of defenses.

Digging began at once but there was no great progress until 1907, when Roosevelt gave the job over to the U. S. army engineers under Col. George W. Goethals. The work took ten years (1904–1914).

The Big Stick in the Caribbean. 1902–1905.—Germany, Italy and France had announced their intention to collect by force from Venezuela and Santo Domingo certain debts long owing to their citizens. Roosevelt secured arbitration at The Hague Tribunal (1904), which declared the claims valid. Venezuela agreed to pay the debts in part and to set aside a percentage of her customs receipts for the payment. Roosevelt declared the right of the United States to *police* all international difficulties in the Western Hemisphere. In 1905 the United States took control of the Santo Domingo debts by appointing a U. S. official in the Santo Domingo customhouse to collect for that purpose. This firm foreign policy of "hands off in the Caribbean" was dubbed the Big Stick policy by Roosevelt's anti-imperialistic enemies.

Reforms.—In 1903 the President caused the government to bring suit against the Northern Securities Co. This was a holding company for three great railroads controlled by two or three financial interests. In 1904 the U. S. Supreme Court by a 5 to 4 decision declared the combination illegal and it was dissolved.

The Elkins Act, 1903, empowered the Interstate Commerce Commission to prosecute those who violated laws against rebating.

The Square Deal Campaign. 1904.—No wonder Big Business squirmed. Roosevelt was no dreaming reformer but a hard-headed politician who knew how to handle his enemies and made no bones of his enmity to the bad trusts. There was a movement within the Republican party to nominate for the presidency Mark Hanna, the capitalist who had engineered McKinley's whole career. But Roosevelt was nominated on the Republican ticket. The Democrats forgot their free-silver issue and also came out for trust reform. Their nominee was Judge Alton B. Parker of New York. Roosevelt was elected by the largest popular plurality yet counted, 2,500,000, with 336 electoral votes to Parker's 140.

Trust-Busting.—During Roosevelt's second term his reform activities came to be more and more feared and detested by the law-breaking combinations known as Big Business. In his whole administration (1901–09) 44 prosecutions against trusts were decided in favor of the government. In June 1906 the Hepburn Rate Bill was passed, giving the Interstate Commerce Commission still greater powers to investigate and fix railroad rates; and many railroads and shippers were exposed and convicted for rebating.

Among the most famous trust exposures of this period was the suit against the Standard Oil Co., 1906, which was convicted of receiving and granting rebates and ordered to dissolve, 1907. The suit against the American Tobacco Co., 1906, ended in an order for its dissolution in 1911. Another famous suit was brought (1906) against the New York Central & Hudson River Railroad, which was convicted of granting illegal rebates.

Cuban Insurrection.—In August 1906 a Cuban uprising turned out the administration then in office. The United States was asked and obliged to intervene under the terms of the Platt Amendment. Roosevelt sent Secretary of War William H. Taft to investigate the situation. He found it bad enough to warrant U. S. military occupation until a new government could be organized. The U. S. troops were recalled in 1909 when the new government was able to stand alone.

Other Events.—A new Department of Commerce and Labor was created in 1903, and a new member was thus added to the President's Cabinet. Laws were passed providing for meat inspection and attempting to assure the purity of foods, 1906. A Bureau of Immigration was instituted, 1906, and naturalization laws were revised and strengthened. The Alaskan boundary line was fixed by arbitration, 1903.

At the close of the Russo-Japanese War, the President induced the peace negotiators to meet at Portsmouth, N.H., 1905, to arrange their treaty. For his masterly mediation, Roosevelt received the Nobel Peace Prize, 1906. San Francisco suffered great loss by earthquake and fire in 1906; 200,000 were left homeless and the property damage was close to half a billion dollars. The first Pacific cable was laid, touching at Guam, Hawaii and the Philippine Islands, and from there was extended to the Asiatic mainland by way of Japan to Shanghai.

The panic of 1907, which started with the Knickerbocker Trust Co. smash in October was over before the end of December. The amount of money in circulation was increased as a result of government activity and intervention on the part of high financial circles. The Root-Takahira note, 1908, calmed all fears of American-Japanese hostility and seemed to assure the open door in China.

Conservation.—Before he went out of office Roosevelt called the Conservation Congress, May 1908, to take up the question of saving America's dwindling natural resources. The Reclamation Act, 1902, had already provided for the irrigation of western arid areas. The renewal of forests was now provided for, the protection of wild life and the development of water power.

Election of 1908.—In spite of the now bitter opposition to his extreme reforms, Roosevelt was able to secure the nomination of his friend, William H. Taft, on the Republican ticket. The Democrats nominated William Jennings Bryan for the third time. It was an uneventful campaign except for the Republican promise to revise the tariff, which Taft said would be downward. Taft received 321 electoral votes, Bryan, 162.

William Howard Taft—1909–1913

The new President began his duties under most favorable conditions. He was Roosevelt's friend and Roosevelt's choice, had a background of wide governmental experience and possessed the good will of the people to an extraordinary degree. He pushed the antitrust activities started by Roosevelt and furthered much civil service reform. But his popularity waned with the enactment of the Payne-Aldrich Tariff and the disappointing stand he took in the Ballinger-Pinchot conservation controversy.

Tariff Act of 1909.—The people had been led to expect a downward revision of the tariff. Taft called a special session of Congress and the Payne-Aldrich Tariff Act was passed, August 1909. Out of some 2,000 duty rates it reduced only 650, raised 220, and left rest as they were. The people felt that their wishes had been ignored, and thus the public mind at once pigeonholed the new President with the old conservative factions.

Ballinger vs. Pinchot.—The Ballinger-Pinchot controversy the same month added to this impression. Chief Forester Pinchot accused Secretary of Interior Ballinger of re-entering for private ownership large tracts of coal land in Alaska. Ballinger was known to have had no sympathy with Roosevelt's conservation program; yet Taft backed Ballinger and dismissed Pinchot. As a matter of fact, Taft was whole-heartedly pro-conservation, but this seeming repudiation of Roosevelt's ideals labelled him all the more flagrantly conservative in the popular mind.

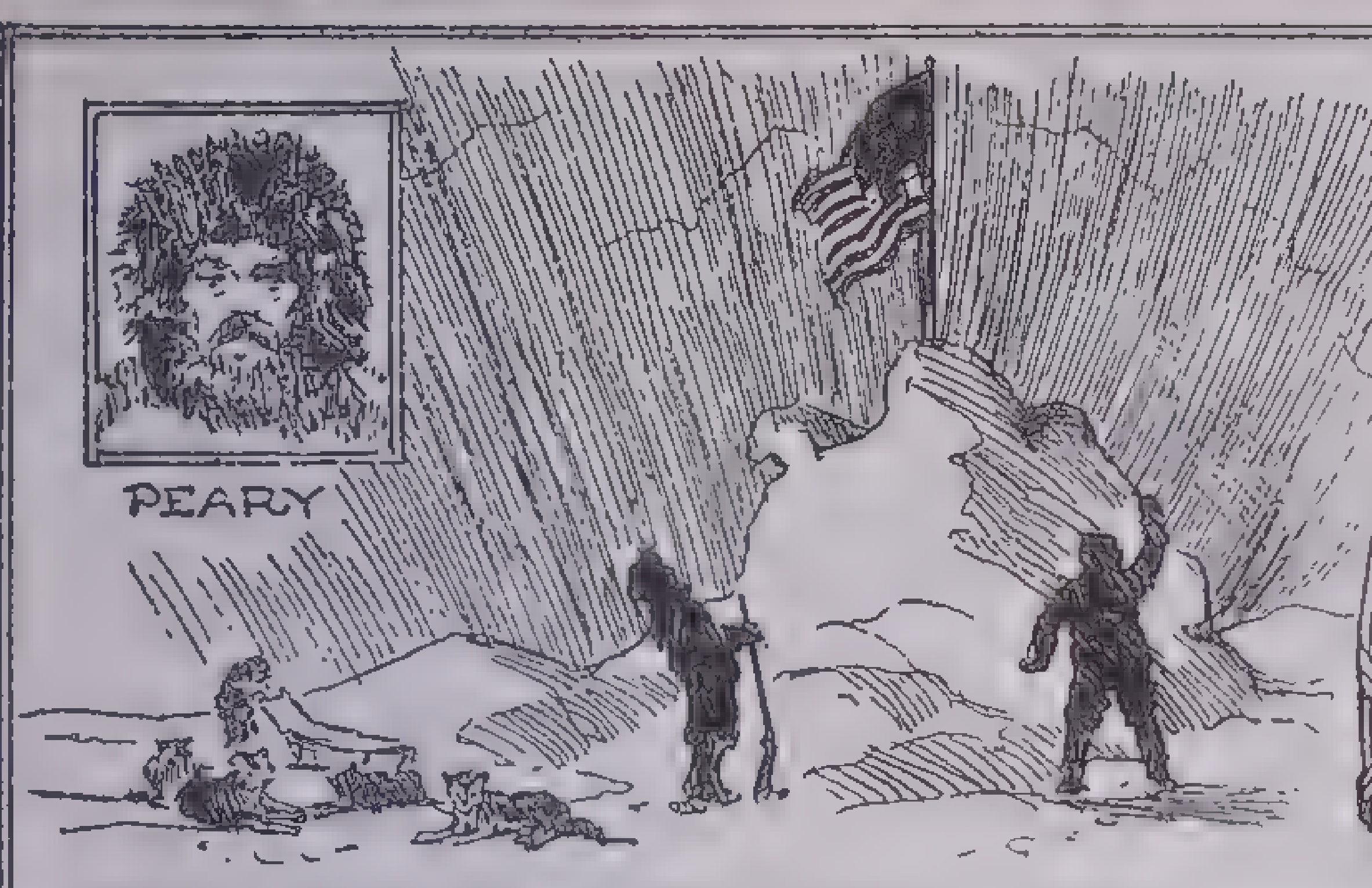
Roosevelt returned from Central Africa, June 10, and his unconcealed displeasure with the way things were going served to strengthen the reaction against Taft. The Congressional election, 1910, seated many Democrats both in the House and the Senate.

Constructive Legislation.—Many important progressive measures were enacted during Taft's four years. Postal savings banks were established, 1910. The Mann-Elkins Act, 1910, still further enlarged the powers of the Interstate Commerce Commission. The Mann White Slave Act was adopted that year. Parcel post was established, 1912. Civil government was recognized in Alaska, 1912. The Drug Label Act, 1912, was adopted in an attempt to prevent the adulteration of drugs. Another act in 1912 provided for U. S. coast-trade vessels to go toll-free through the Panama Canal. The Department of Labor was created, and a Secretary of Labor was added to the President's Cabinet, 1913.

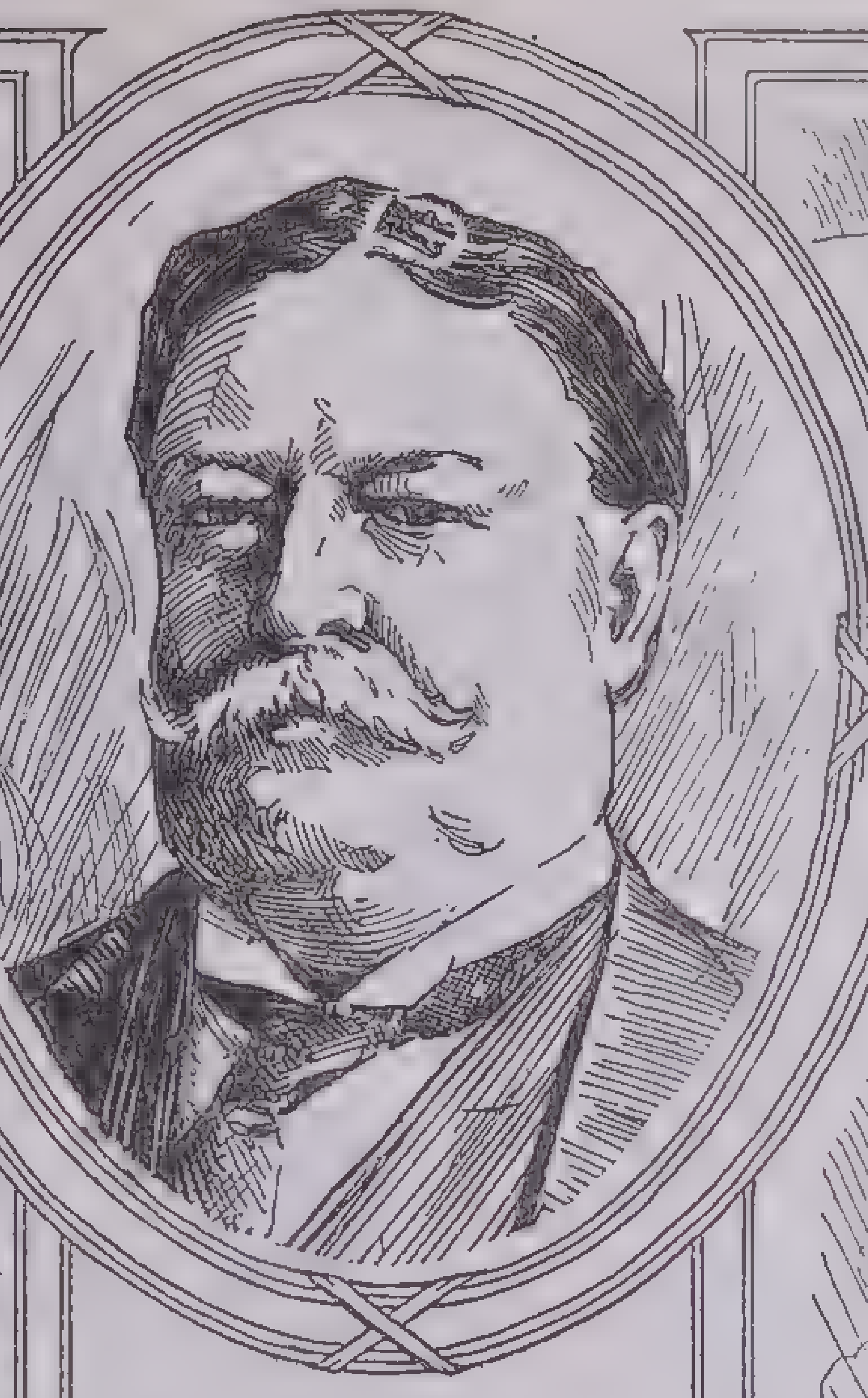
Mexican Revolution.—A revolution in Mexico led by the democratic Francesco Madero drove out the Diaz government in 1911. Madero was unable to uphold his reforms, however, and in two years was himself overthrown and murdered by Victoriano Huerta, who proclaimed himself President. Taft had sent U. S. troops to patrol the border, but permitted no intervention beyond an embargo, 1912, on arms and ammunitions that were being shipped across the border. He refused to recognize the Huerta government, February 1913, and left that difficult problem for his successor, Woodrow Wilson.

Constitutional Amendments. — Two changes in the Constitution were passed upon during the latter part of Taft's term. The Sixteenth Amendment (in effect February 1913) empowered Congress to levy an income tax. The Seventeenth (in effect May, 1913, after Taft went out of office) changed the method of choosing United States Senators from election by state legislatures to direct election by the people.

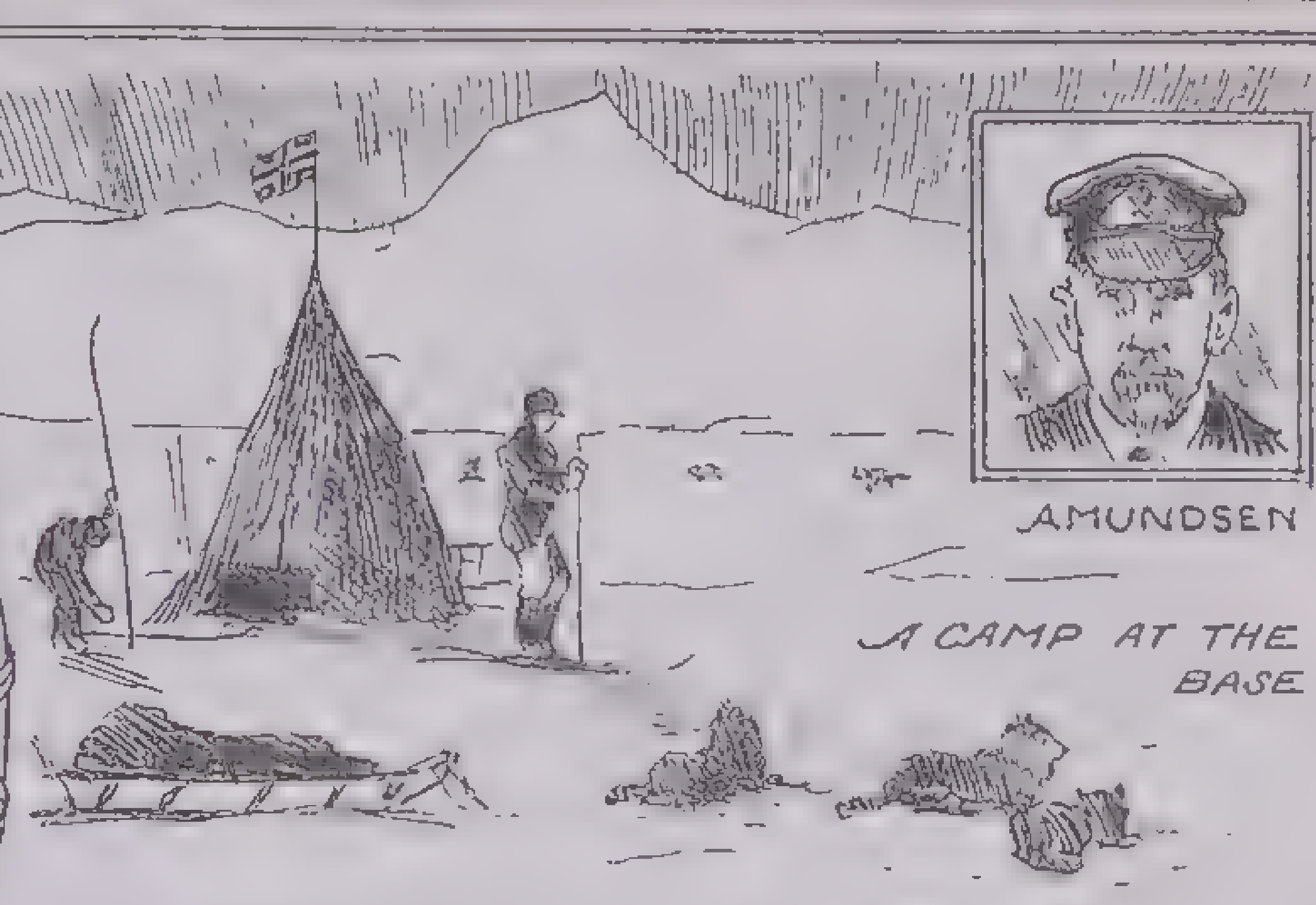
Election of 1912.—Taft's judicial temperament, which led him into conservative channels and his unaggressive support of progressive principles estranged Roosevelt and other progressive leaders. In 1912 Roosevelt came out against Taft for the Republican nomination. When Taft was nominated, however, in the national convention, the Roosevelt forces withdrew and nominated their leader on a new Progressive ticket. He called his program the "new Nationalism." It was a stirring campaign with Taft standing pat and Roosevelt crying out for "an enlarged measure of social and industrial justice." The Democrats nominated Woodrow Wilson



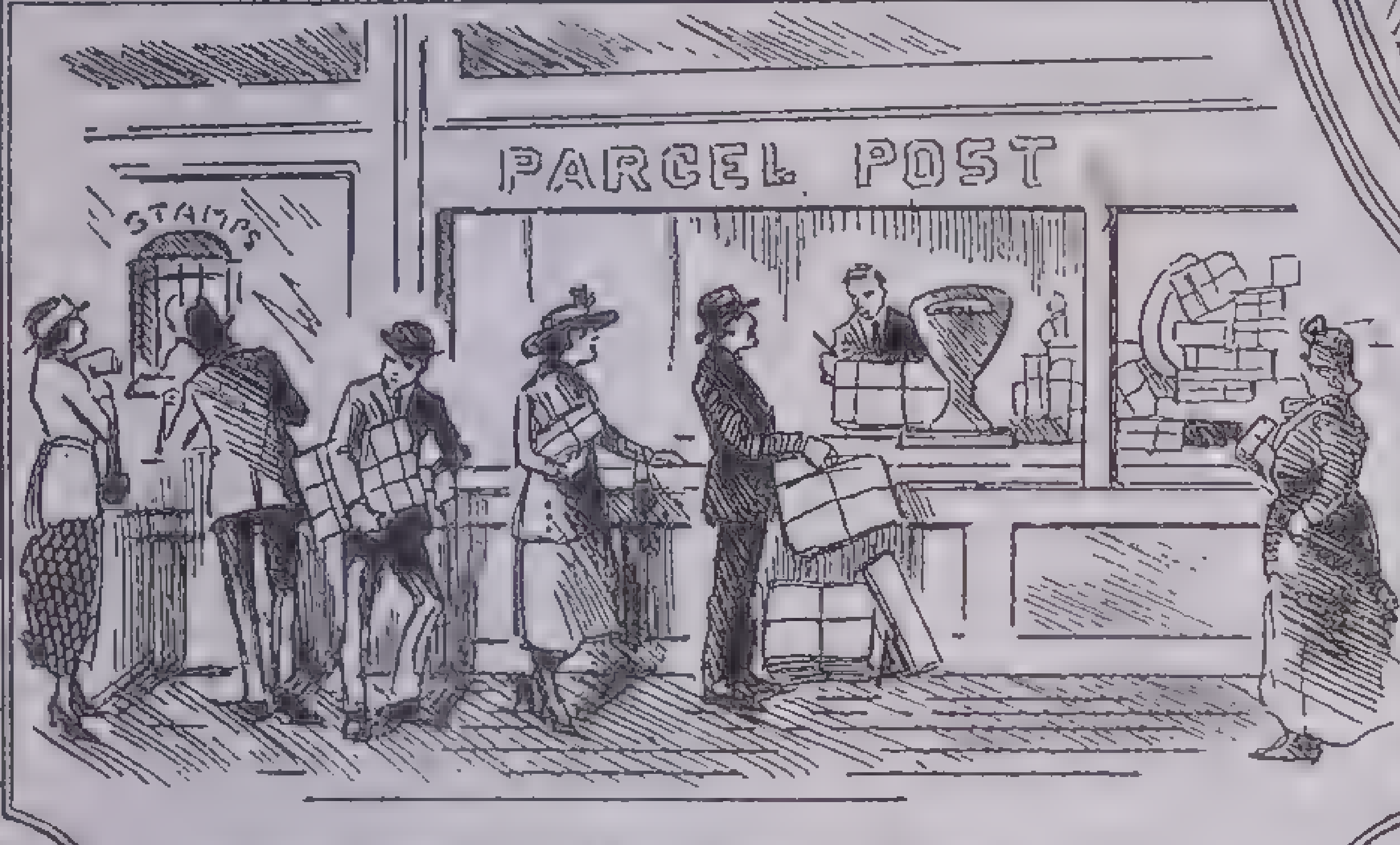
PEARY REACHES NORTH POLE – 1909



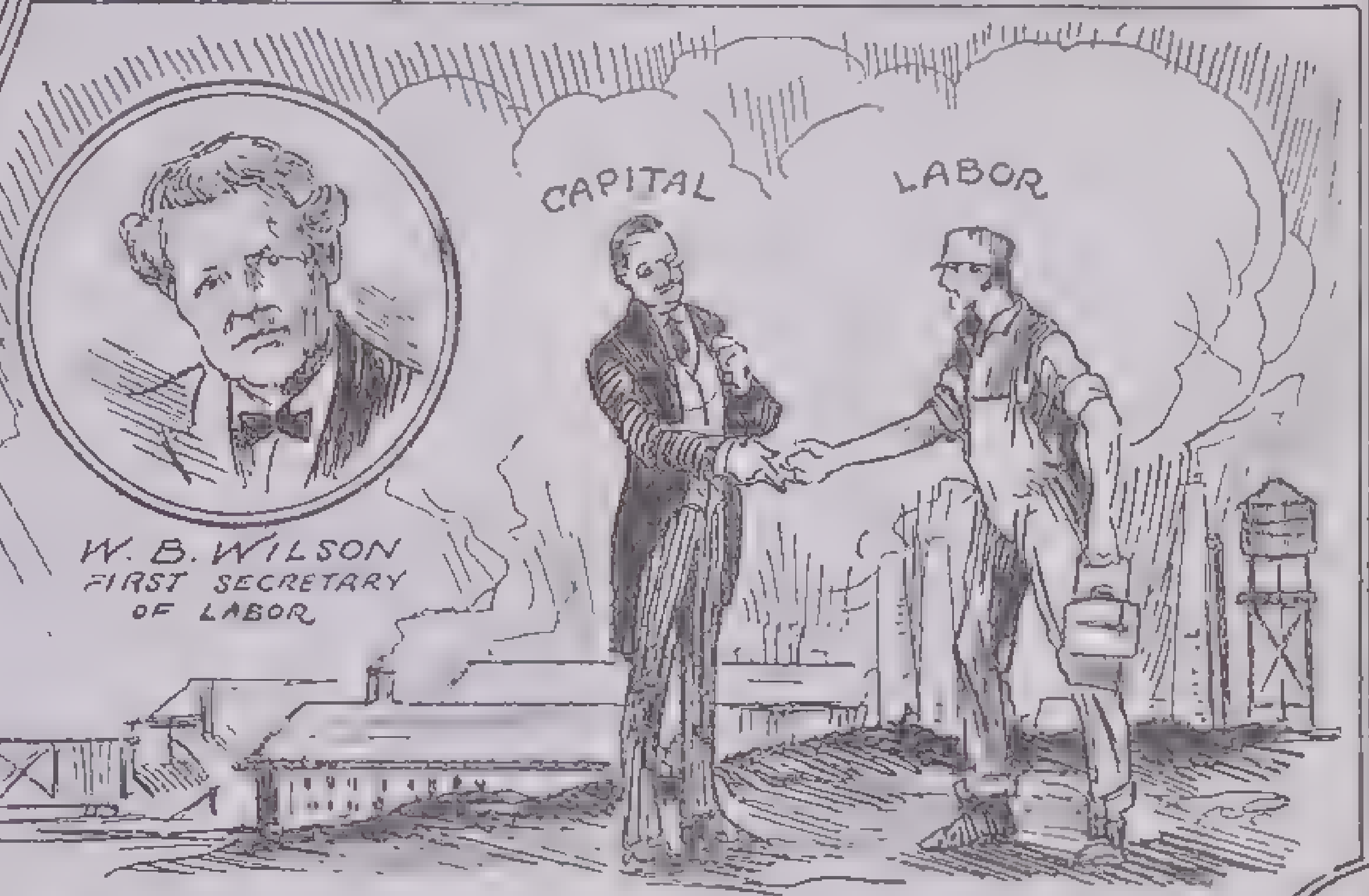
WILLIAM H. TAFT
1909 TO 1913


AMUNDSEN
A CAMP AT THE BASE

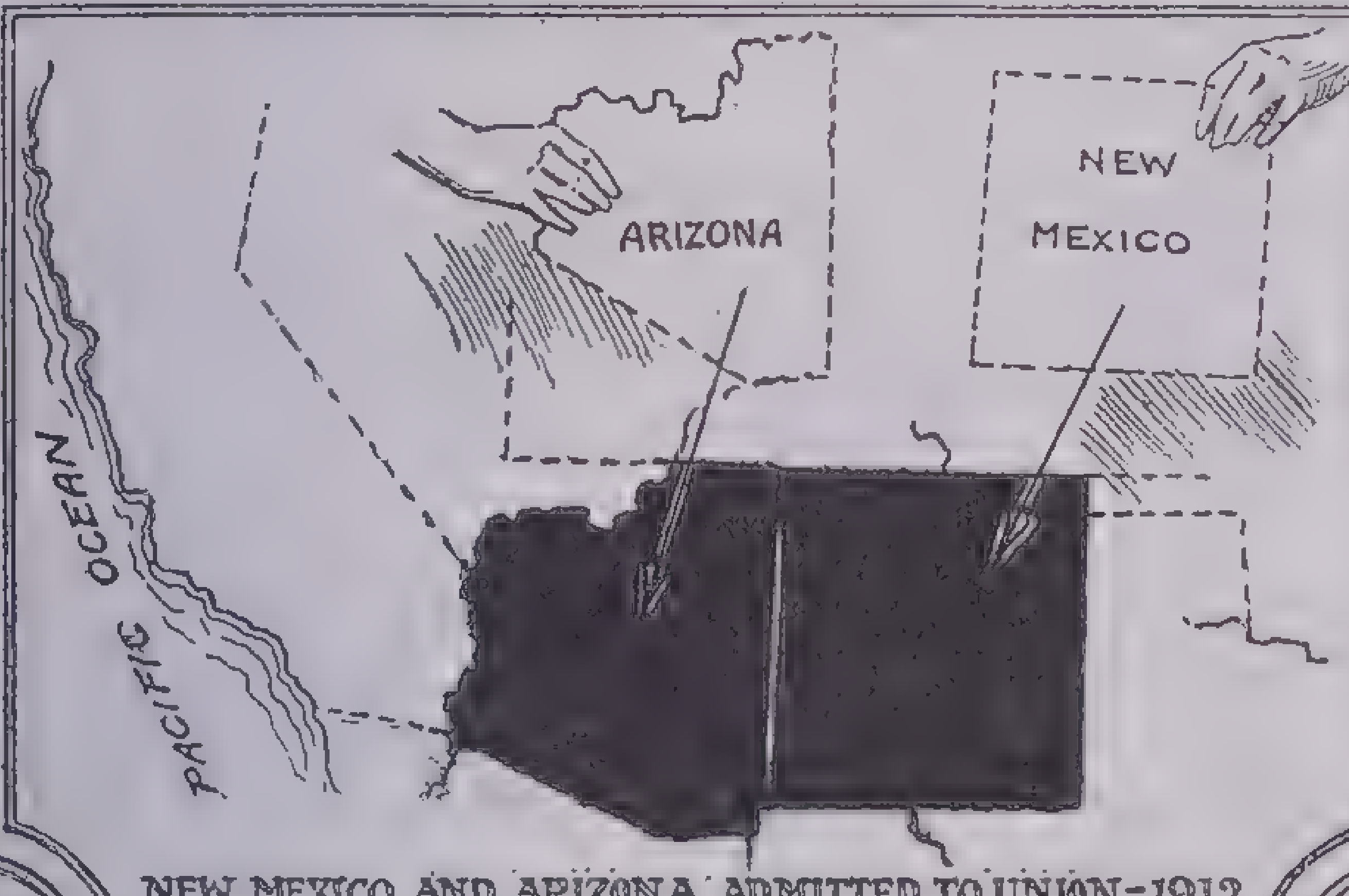
AMUNDSEN REACHES SOUTH POLE – 1911



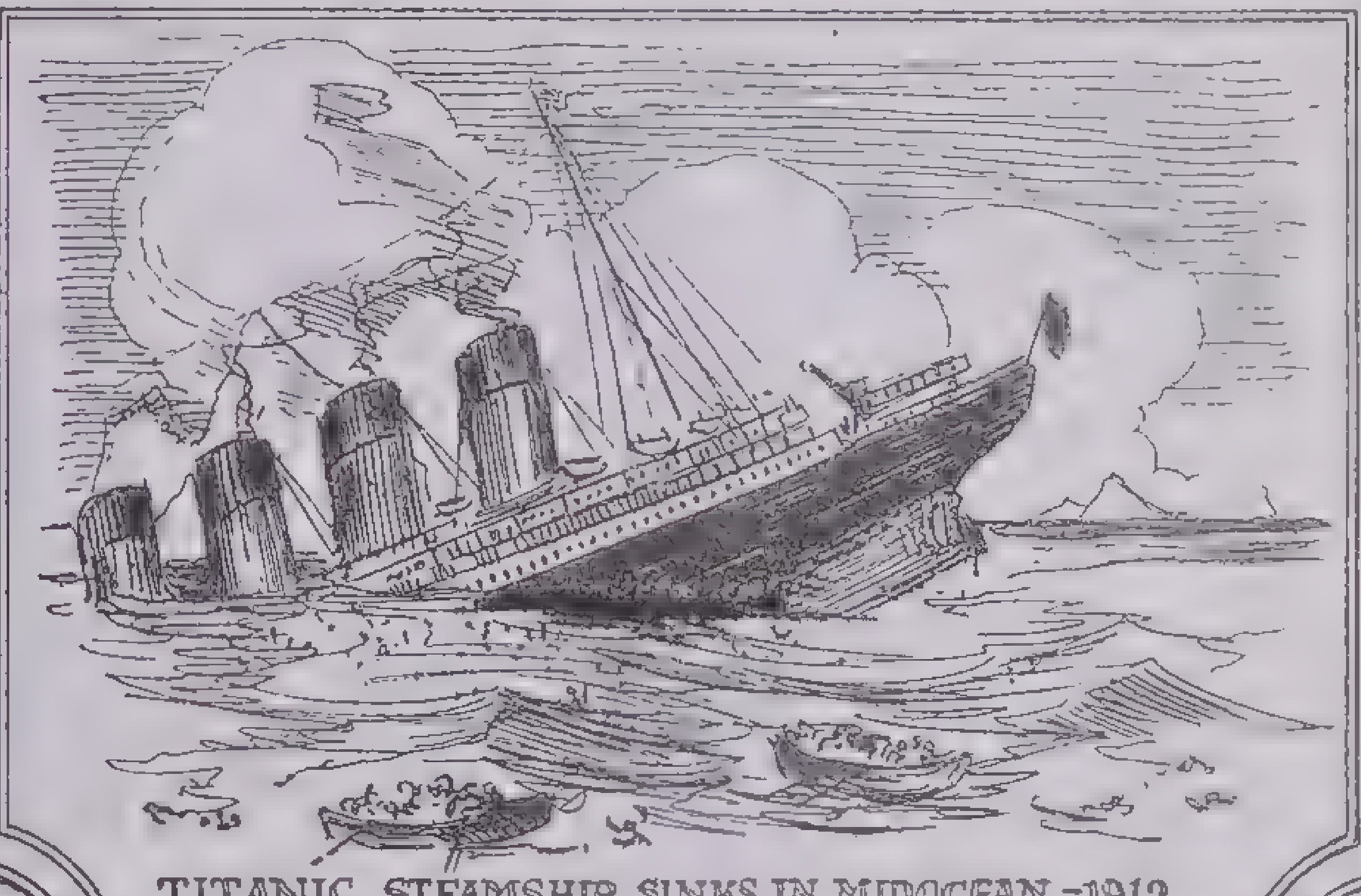
PARCEL POST SYSTEM INSTITUTED – 1913



DEPARTMENT OF LABOR BILL SIGNED BY TAFT – 1913



NEW MEXICO AND ARIZONA ADMITTED TO UNION – 1912



TITANIC STEAMSHIP SINKS IN MIDOCEAN – 1912

through the still potent influence of William Jennings Bryan. The Republican vote was thus hopelessly split and Wilson was elected with 435 electoral votes to Roosevelt's 88, and Taft's 8.

Woodrow Wilson—1913–1921

Woodrow Wilson, the schoolteacher President, was a specialist in government. Before he became a teacher he had written *The State,* a great book on government. Then he had taught government at Princeton, became president of that university and been governor of New Jersey. He had fooled the politicians who expected him to be a docile party tool and had openly defied and crippled their machine.

It was largely the success of Wilson's reform program in New Jersey that won him the support of the people. He came into office with no reticences about his intentions to break the monopolies and restore individual competition: in fact, to battle "everything which bears even the semblance of privilege or of any kind of artificial advantage."

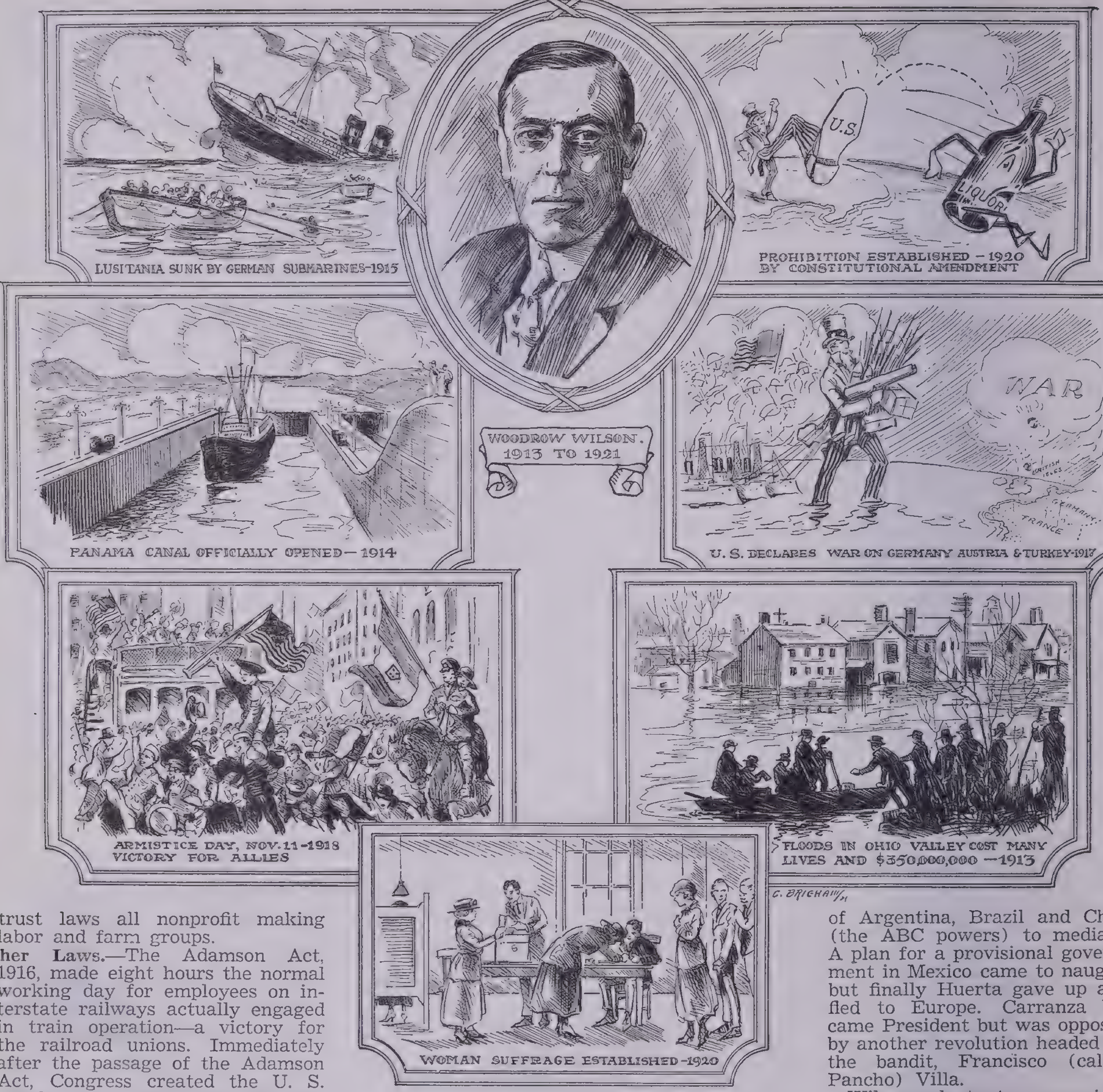
One thing he did came as a surprise and a delight to the nation: this was walk into Congress and to deliver his messages in person. Wilson was a brilliant speaker and quickly won the confidence of both Houses by his knowledge and certainty.

Legislation. Tariff.—The Democrats had promised to lower the high protective tariffs to which the Payne-Aldrich Act was holding the country; and in April 1913 Wilson called a special session of Congress for tariff revision. The Underwood Act was passed, October 1913. It put raw wool, lumber, iron ore and steel rails on the free list, lowered the duties on sugar and some 900 other articles about 20 per cent, established free trade with the Philippines and provided for a graduated income tax.

Currency Reform.—The Glass-Owen Federal Reserve Act, December 1913, was framed to make the American currency system more flexible. It organized all the national banks of the country into 12 regional reserve banks under a Federal Reserve Board, composed of the Secretary of the Treasury, the Comptroller of Currency and five other members appointed by the President. This board was given the power to command the transfer of funds from one bank to another and to permit the issue by any member bank of Federal Reserve notes, a new system of paper money meant eventually to replace all old national bank notes. It is one of the most important laws ever passed in the United States. It does away with the old subtreasury system which perforce withheld vast sums from circulation, and keeps in circulation always enough money to meet the needs of any special section. It puts all the nation's money on call in time of regional panic. And above all, it prevents the monopoly of currency by big bankers or groups of bankers by keeping the banks under government control. It was re-enforced by the Rural Credits Act (1916) that arranged for special groups of banks to lend money to farmers.

Trust Control.—The Federal Trade Commission Act, Sept. 1913, established a five-member commission to keep an eye on all big corporations (except banks and railroads) engaged in interstate or foreign trade. It was required to publish violations and abuses and enforce the laws against unfair competition.

The Clayton Antitrust Act, 1914, was framed to help the government further close in on the trusts. It listed in detail all the practices condemned by the courts; especially it forbade rebates, secret agreements, price privileges and interlocking directorates between banks, railroads, coal companies, etc. It said that the labor of a human being is not a commodity—and exempted from anti-



LUSITANIA SUNK BY GERMAN SUBMARINES—1915

PROHIBITION ESTABLISHED —1920 BY CONSTITUTIONAL AMENDMENT

WOODROW WILSON. 1913 TO 1921

PANAMA CANAL OFFICIALLY OPENED—1914

U. S. DECLARES WAR ON GERMANY AUSTRIA & TURKEY-1917

ARMISTICE DAY, NOV. 11-1918 VICTORY FOR ALLIES

FLOODS IN OHIO VALLEY COST MANY LIVES AND $350,000,000 —1913

WOMAN SUFFRAGE ESTABLISHED-1920

trust laws all nonprofit making labor and farm groups.

Other Laws.—The Adamson Act, 1916, made eight hours the normal working day for employees on interstate railways actually engaged in train operation—a victory for the railroad unions. Immediately after the passage of the Adamson Act, Congress created the U. S. Employees Compensation Commission to administer benefits for civil employees of the Federal Government. The Literacy Test Act was passed over Wilson's veto in 1917. This law excluded from the United States all immigrants who could not read; it was another measure urged by organized labor to keep out competing immigrants. A Federal Board of Vocational Education was created, 1917, by an act that appropriated Federal money to the states for teaching home economics, trades and industrial subjects.

Mexico.—Taft had left the Mexican situation for Wilson to deal with. Wilson would not recognize the Huerta government because he said it was built on treachery and murder. Neither would he intervene to settle Mexico's troubles, but left Mexico to herself to work out or fight out her own civil salvation. Wilson did send John Lind to Mexico, however, 1913, proposing an armistice and popular elections for president in which Huerta was expected to take no part. Huerta flatly refused and Wilson resumed his policy of watchful waiting.

Suddenly on April 10, 1914, a boatload of American sailors going ashore for gasoline at Tampico and landing at a forbidden pier were arrested. They were speedily released, and official apology was given, but the salute to the American flag that Admiral Mayo demanded, was refused. Wilson ordered the navy to occupy Vera Cruz, April 21, to prevent the landing of arms for Huerta's forces from a German vessel known to be due. The city was taken at the cost of 18 lives; and 6,000 more troops were sent to the spot.

The President did not want a war with Mexico and he accepted the offer of Argentina, Brazil and Chile (the ABC powers) to mediate. A plan for a provisional government in Mexico came to naught, but finally Huerta gave up and fled to Europe. Carranza became President but was opposed by another revolution headed by the bandit, Francisco (called Pancho) Villa.

Wilson reluctantly recognized the Carranza government, October 1915, although Carranza too had *taken* the presidency without holding a popular election. Villa not only continued to keep northern Mexico in confusion but in a rage of spite against U. S. recognition of Carranza, his rival, one night in March 1916 made a murderous raid on the small town of Columbus, N. M.

With Carranza's consent, Wilson sent 6,000 men under Brig. Gen. Pershing into Mexico to capture Villa. Through desert and hills and passes where Villa and his outlaws knew how to hide in safety and ease, Pershing pursued him, going 400 miles into Mexico in a nine-month fruitless search. Villa made other raids into Texas and escaped uncaught. By the end of 1916 the whole U. S. National Guard was on the Mexican border—110,000 men.

In 1917 on the verge of entering the World War Pershing was recalled. Mexico adopted a new constitution; Carranza was elected President and took over the suppression of Villa. Ambassadors were again exchanged. Wilson's policy of watchful waiting had done two things: it convinced all Latin-America that the United States had no thought of conquest; and it left the United States unentangled with a home war when her entry into the World War became inevitable.

World War.—The World War had been going on since 1914. It began with Austria-Hungary's declaration of war on Serbia, July 28. By the end of 1916 Serbia, Russia, France, Belgium, England, Japan, Montenegro, Italy, Portugal, Rumania and Greece were allied against the Central Powers—Germany, Austria-Hungary, Turkey and Bulgaria. Wilson stood for the strictest neutrality from the first, both by proclamation, Aug. 4, 1914, and by popular appeal, Aug. 18, when he exhorted the people to abstain from heated discussions, to be neutral "not only in act but in word and thought."

It was a high aim, but it was impossible for the American people to remain neutral. Eight million of them were related to men fighting on one side or the other in Europe. Trade contacts with Germany were almost at once wiped out by Allied command of the sea. Trade contacts with the Allies increased and piled up huge profits. Germany met this situation by sending secret agents to spread propaganda in the United States, damage munition factories and otherwise interfere with munitions production and shipment to the Allies. The people were horrified by tales of German ruthlessness in Belgium and Serbia and the unheard-of practice of showing no mercy to noncombatants at sea. And an inevitable sense of unity with the Allies developed.

Germany drew an imaginary circle around the British Isles, named the area within it the "war zone" and proceeded to plant submarines and mines in that region to destroy enemy merchantmen without regard for neutral property or lives. On Feb. 24, 1915, Wilson sent a warning to Germany that she would be held to "strict accountability" for the future destruction of U. S. ships or U. S. citizens. Germany answered by pointing to Great Britain's seizure of Germany-bound food. She complained of the sale of munitions to her enemies and protested her right to intercept them by any means or at any cost.

Neutrality.—So Germany's submarine warfare with its new tactics continued. She sank merchantmen at sight and refused to provide for the safety of crew and passengers. The British liner *Falaba* was sunk with American citizens on board. Five ships flying the U. S. flag were torpedoed—some within and some outside the war zone. The climax came when the English liner *Lusitania* was sunk without warning off the Irish coast, May 7, 1915; 1153 lives were lost; 113 were American citizens.

Though Germany had warned passengers against sailing on the *Lusitania* and claimed that the liner was carrying munitions of war, horror and indignation swept the United States. Wilson ordered both the navy and the army to be increased in strength. But he would not fly into war except as a last resort. In a series of notes he demanded disavowal and reparations from Germany. Germany's evasiveness brought forth the third severe note in July, demanding that Germany "square her policy with the principles of humanity" and notifying her that further disregard for "the rights of neutrals and the sacred immunities of noncombatants" would be held "deliberately unfriendly." Then Germany promised not to torpedo liners or merchantmen without warning or without giving noncombatants time to leave the ship.

But again, March 24, 1916, the British steamer *Sussex* was torpedoed and American citizens were killed. Wilson sent his ultimatum: Germany must repudiate and abandon unrestricted submarine warfare or all relations would be severed. The promise was given, May 5, that merchantmen "shall not be sunk without warning and without saving human lives."

Election of 1916.—This is largely what re-elected Wilson in 1916. "He kept us out of war" was the slogan of the campaign, but his final success in securing Germany's promise to abide by the international rules of cruiser warfare was the decisive factor in the election. The Republicans nominated Charles E. Hughes of the Supreme Court, former governor of New York. The election was close with the 13 electoral votes of California in doubt for several hours and then going to Wilson. Wilson received 277 electoral votes; Hughes, 254.

Efforts Toward Mediation.—Wilson now hoped that Europe would listen to proposals of peace. On Dec. 18 he sent notes to the warring nations, each identically worded, proposing mediation. Germany was again evasive; the Allies would consider peace on no terms except "complete restitution, full reparation and effectual guarantees." And Wilson's conviction that the only just peace would have to be a "peace without victory" found utterance in the famous speech of Jan. 22, 1917, in which he showed the world's need for a League of Nations.

Nine days later plans for mediation were made impossible by Germany's declared retraction of her promises and announcement that she was resuming unlimited submarine warfare. And it was discovered that Germany was baiting Mexico to line up with the Central Powers on promise of the return of the "former Mexican provinces" now a part of the United States.

America Joins the Allies.—In the middle of March, three American ships were deliberately and defiantly sunk by German submarines. On April 2, 1917 Wilson asked Congress to declare that war already existed. On April 6 Congress "resolved . . . that the state of war between the United States and the Imperial German Government which has thus been thrust upon the United States is hereby formally declared." This war, said Wilson, was for "the ultimate peace of the world." The nation was with him: that half of the people who had deplored his procrastination now applauded; the half which held with his pacific idealism recognized the inevitable and backed their prophet in this "war to end all wars."

The United States was amazingly unprepared for war, but its organization was as amazingly rapid. Instant and passionate was the public response to Wilson's "call to service." "Politics is adjourned," he said. The important things were food and clothing, coal for ships and factories, steel for arms and ammunition, ships to carry men and supplies, rails and locomotives, horses, mules, cattle: all were essential for the army, the navy and the impoverished Allies. Competition too was suddenly adjourned and personal luxury. Manufacturers vied with each other to give over their plants to government service. Class vied with class and laborer with artisan to measure up to the need. As in every war there was some profiteering, some advantage taken of the sudden demand for big production; but there was less of this abuse than in other wars.

Mobilization.—In three months there were over a million volunteers. But Wilson felt that a more effective army could be raised and trained by more scientific and less dramatic means. The Selective Service Act was passed, May 18, to enlist a million men 21–30 years old. By June 5, 1917, 9,586,000 were registered; by June 1918 a million more, and by Sept. 1918 13 million (18–45 years of age). Gen. John J. Pershing was made commander in chief of the American Expeditionary Forces. He was in France by June 13, 1917 and sent back word that 3,000,000 men were needed. The first small U. S. contingent set foot in France on June 26. By the end of 1917 troops were going over at the rate of 30,000 a month. By the end of the war (Nov. 1918) the U. S. army numbered 3,665,000 men and 2,086,000 of them were in Europe.

The Council of National Defense was created to organize and centralize the war activity of the nation. It was headed by the Secretaries of War, Navy, Interior, Agriculture, Commerce and Labor. It operated through State Councils of Defense and sundry specialized committees on transportation, communication, public information, etc., and a women's committee to co-ordinate the war work of American women.

The American National Red Cross knitted, rolled surgical dressings, made hospital garments and ministered alike to fighting men, the wounded and starving refugees.

The Espionage Act, June 1917, prohibited interference with the draft or the sale of government bonds, provided punishment for disloyalty in speech or printed word and suppressed several ultraliberal publications. It created the Exports Administrative Board and gave the President power to limit the exportation to neutrals of goods that might be destined for the enemy. It published a world list of business houses with which U.S. firms were warned not to trade. And by Feb. 1918 all foreign trade was in the hands of the Government.

Liberty Loans.—Wars cost money. The United States needed huge sums to prepare for war and to wage it. The Allies needed huge sums to keep going. The American people gave freely. By June 1917 they had loaned $3,000,000,000 to the government by buying Liberty Bonds. In four war issues and a fifth called the Victory Loan almost 21½ billion dollars were subscribed to pay for the war; in June 1919 the interest-bearing debt of the United States was almost 25¼ billions.

The War Boards.—Six great War Boards were created to meet the emergencies of war. The Lever Act, Aug. 1917, created two of them: the Food Administration headed by Herbert C. Hoover and the Fuel Administration headed by Harry A. Garfield. "Food will win the war" was heard from coast to coast; and the people gladly skimped on sugar, observed wheatless and meatless days to aid in a just distribution, planted and harvested and frowned on hoarders. The Fuel Administration was not so popular. Manufacturers objected to the fuelless Mondays commanded Jan.–Mar. 1918. But co-operation triumphed and in four weeks 30,000,000 tons of coal were thus made available to keep war goods moving by rail and transport. The appeal to save gasoline by giving up Sunday pleasure driving met with instant response. In two months a million barrels of gasoline had been saved and ten shiploads had gone overseas.

In Dec. 1917 the Railroads War Board was taken over by the government with Wm. G. McAdoo director. Drastic economies were enforced and all operations were subordinated to the mobilization of troops and war supplies. The War Trade Board under Vance McCormick took charge of foreign and domestic trade with war success its sole aim. The Shipping Board under Edward N. Hurley built ships with unprecedented dispatch, confiscated enemy ships in American ports and commandeered neutral ships being built in America until a 3,000,000 tonnage was added to the U. S. merchant marine. The War Industries Board was given into the able hands of Bernard M. Baruch who organized and unified all American industry to wartime pace. He fixed prices, kept competition secondary to the speeding up of production and was quite successful in holding quality to a high level and having enough supplies on hand when they were needed.

The AEF.—Money and unlimited material aid were what the Allies expected of the United States, but not much real help on the battlefield. In fact U. S. fighting ability was at first underestimated by Germany and by the Allies alike. How could any army recruited suddenly from farm and city street, briefly trained and inexperienced, stand shoulder to shoulder with the seasoned Allied forces, let alone wage an independent campaign?

But men and more men were needed. Russia had withdrawn from the war, 1917. Germany was preparing a tremendous drive for the Spring of 1918. At least 3,000,000 men were needed at the front, but 3,000 miles of Atlantic infested with submarines lay between the United States and the enemy. The miracle was performed; the American Expeditionary Forces were on the line 500,000 strong by the end of the first year; 10,000 troops were landing daily in 1918. In the last engagement of the war (Sept. 20–Nov. 11, 1918) 1,200,000 U. S. troops took part.

At first, through the whole winter of 1917–18, American divisions were brigaded with divisions of the French and British armies. Pershing's great struggle was for recognition of the AEF as an independent combat army. But in the fateful days of the German Spring drive (1918) he subordinated this aim to the crisis and sought only to be *used* to stop the grilling advance. "Infantry, artillery, aviation—all that we have are yours to dispose of as you will," he said to General Foch (March 28).

Spring, 1918.—The offer was accepted. Germany had begun her last desperate offensive to break the Allied line before the American forces could be massed against her. Her whole strength was piled upon the western front from Ypres to Chateau-Thierry. The channel ports were in danger; Paris was threatened. Here into Picardy the best of the American divisions were hurried. The Allies were all but exhausted.

By April 1 the Germans had almost reached Amiens and were within two miles of the French-British transportation railroad. But the Allied line held; and in three more weeks the American First Division (28,000 men) was on the front near Montdidier. On May 28 they attacked the German positions and took Cantigny and held it in the face of a vicious three-day bombardment. "These men can fight," a high German officer reported to the Supreme Command.

Belleau Wood.—In June two regiments of the U. S. Marines of the Second Division drove the Germans out of Belleau Woods. This was one of the most vital strongholds in Germany's intended drive toward Paris. The Woods were impenetrable: thick forest, brush, jagged rocks and Germans. For three days the Marines fought with utmost bravery and sweeping losses—and gained a mile. It was one of the most bitter battles of the war. They attacked again, June 9, and after two more weeks of bitter fighting the woods were taken; Vaux was taken; Boureshes was taken; and the German advance was stopped.

The Turning Point.—The Third Division was on the bank of the Marne east of Chateau-Thierry. Here on July 15, the 38th regiment held and drove back two German divisions so decisively that the engagement has been called the turning point of the war. Certainly from this moment on the morale of the German private was broken. The German army was in retreat and could not again undertake the offensive.

First American Army.—At last (July 24) Foch consented to the integration of the First American Army as an independent unit. By Aug. 10 it was organized (about 600,000 men) and under Pershing's full command. On Sept. 13 it took the St. Mihiel salient, reducing with ease in a day a position for four years considered impregnable. The American forces took 16,000 prisoners, 443 guns, reoccupied 175 square miles and 70 towns and restored the main Paris-Verdun-Toul-Nancy railroad.

Two weeks later the U. S. unit was on the Meuse-Argonne front. Sedan, the crucial railhead of the German communications, was the objective. Germany considered the Argonne Forest her strongest, untakeable defense: a deathtrap of machine-gun pits and cannon-swept roads. The American advance began Sept. 26 northward between the eastern edge of the Forest and the Meuse River. By Sept. 28 village after village had been retaken with the bitterest kind of man-to-man fighting, rifle and bayonet against machine-gun fire. By Oct. 10 the Forest was won. On Nov. 1 began the last advance to shatter the Kriemhilde line. And on the 6th two American divisions were opposite Sedan. The German army was unnerved and in retreat. Nothing but the Armistice, Nov. 11, saved it from annihilation.

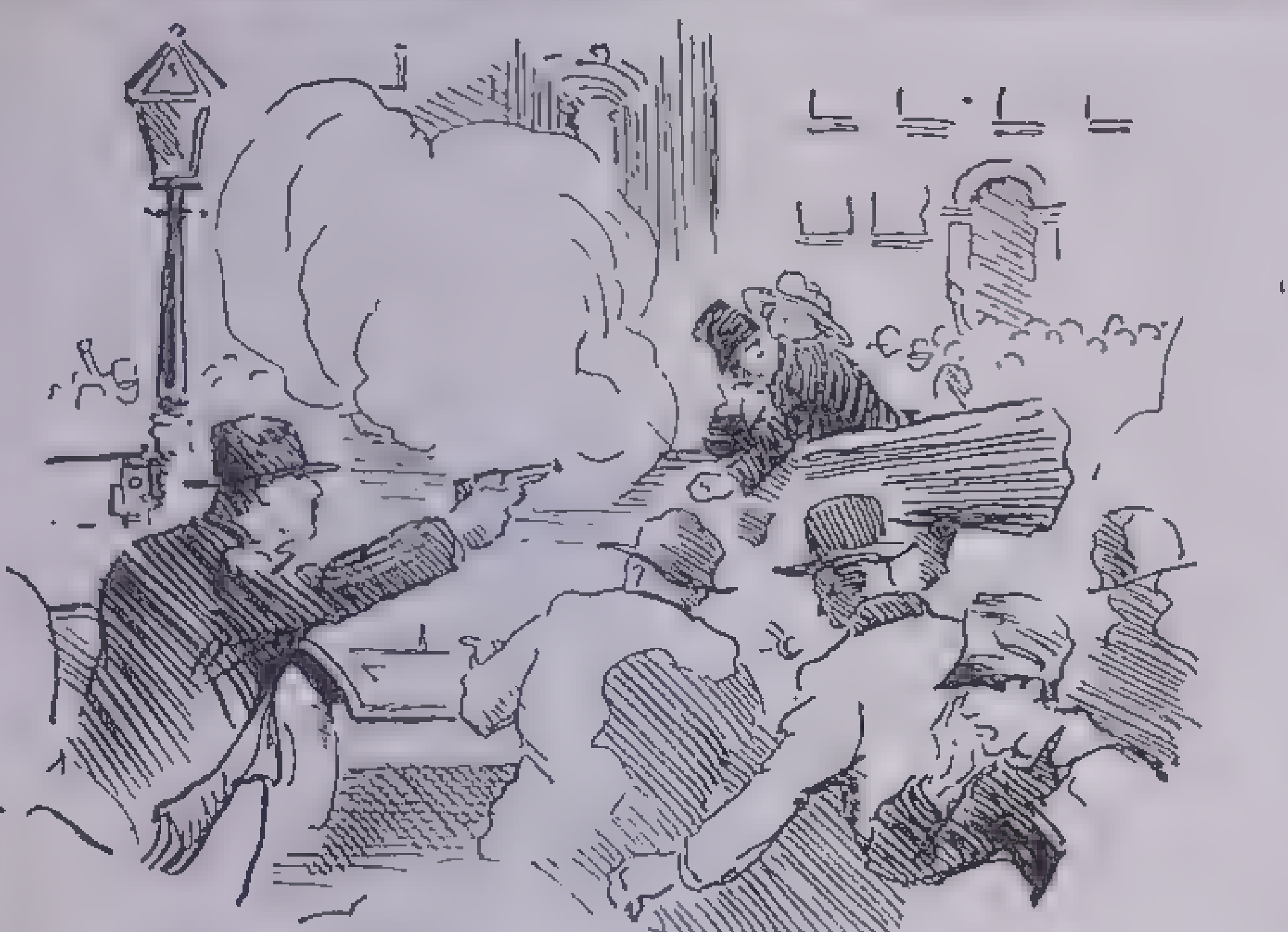
Armistice.—Already before the fall of Sedan the allies of Germany had sued for peace. Bulgaria had surrendered, Sept. 29; Turkey, Oct. 30. Austria-Hungary asked for an armistice Oct. 30 and signed it Nov. 4. "The gravity of the military situation admits of no delay," said Hindenburg as early as Oct. 3 on the heels of Bulgaria's default; and on that day Germany appealed to Wilson for an armistice based on the Fourteen Points. "Retire at once from France and Belgium. Guarantee representation of the German people"—were among the conditions cited by Wilson. There could be no peace in a peace that might later be repudiated by a ruling few.

It was far more than the "gravity of the military situation" that forced Germany's hand. Shock and surprise at the news of impending military defeat worked a tremendous reaction among the German people who suddenly realized they had been duped by their leaders. Wilson's peace propaganda had long been undermining the popular militarism. By Nov. 4 there was revolution in Germany, quickened daily by the Kaiser's unwillingness to abdicate. And by Nov. 9 Germany was a republic.

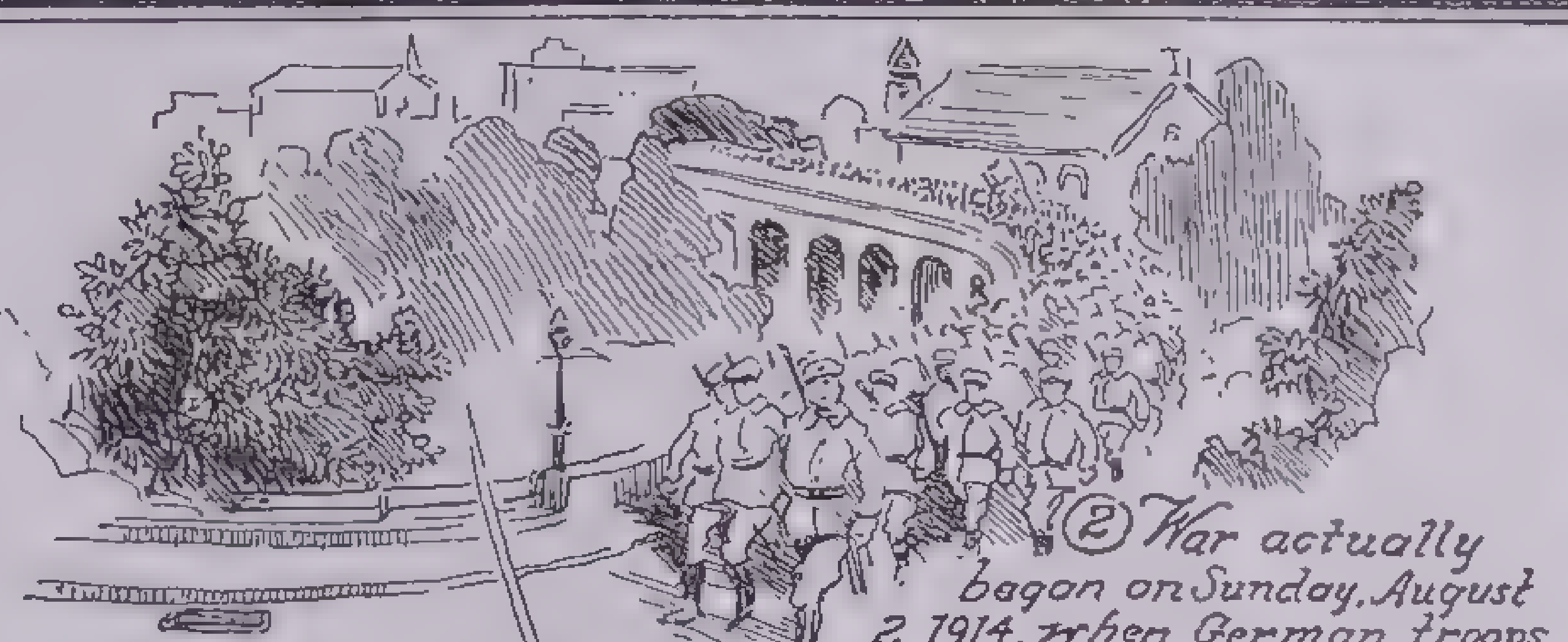
On Nov. 8 Foch put the written terms of the Armistice in the hands of the German representatives. The Armistice was signed at 5 A.M. on Nov. 11, 1918 and by 11 o'clock the war was over.

The terms were severe. Germany was to get out of Belgium at once, surrender 10 battleships, 14 cruisers, 50 destroyers and *all* her submarines (129). She had also to surrender thousands of machine guns, airplanes, railroad cars and munitions and tolerate U. S. and Allied armies of occupation on the west bank of the Rhine.

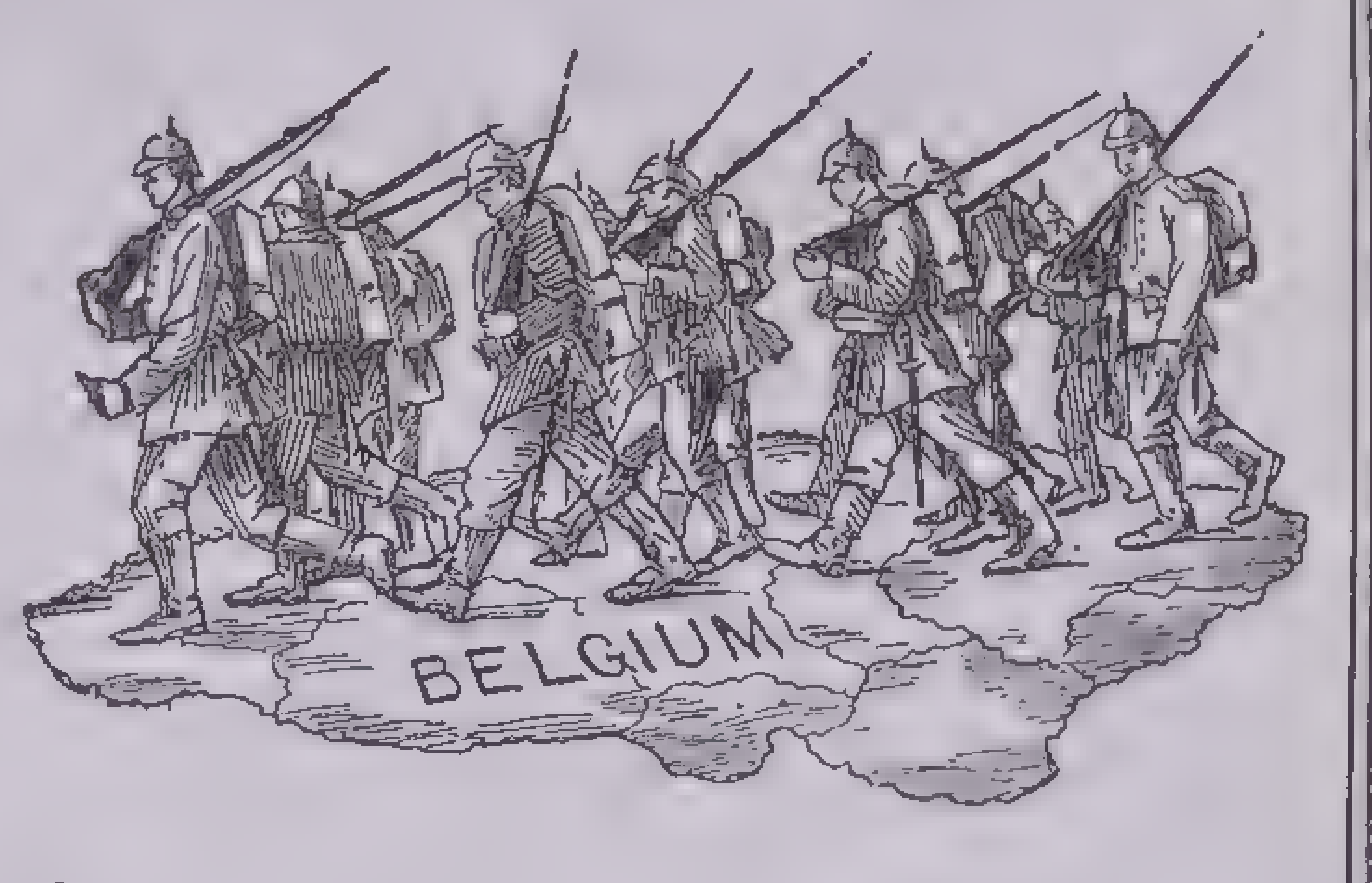
The WORLD WAR



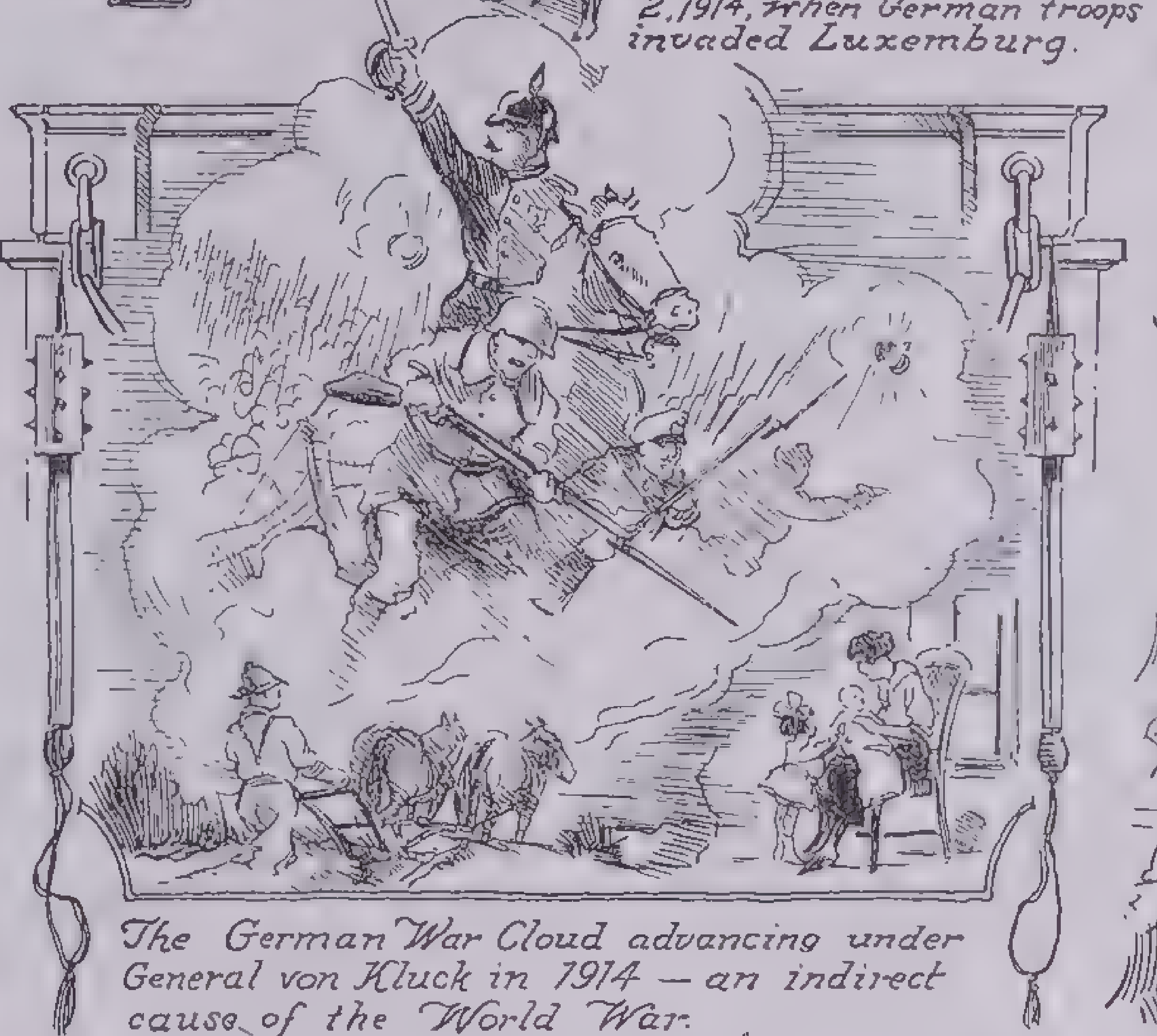
① Archduke Franz Ferdinand, heir apparent of Austria-Hungary, was assassinated by a Serbian student at Sarajevo, Bosnia, on June 28, 1914 —— a direct cause of the war.



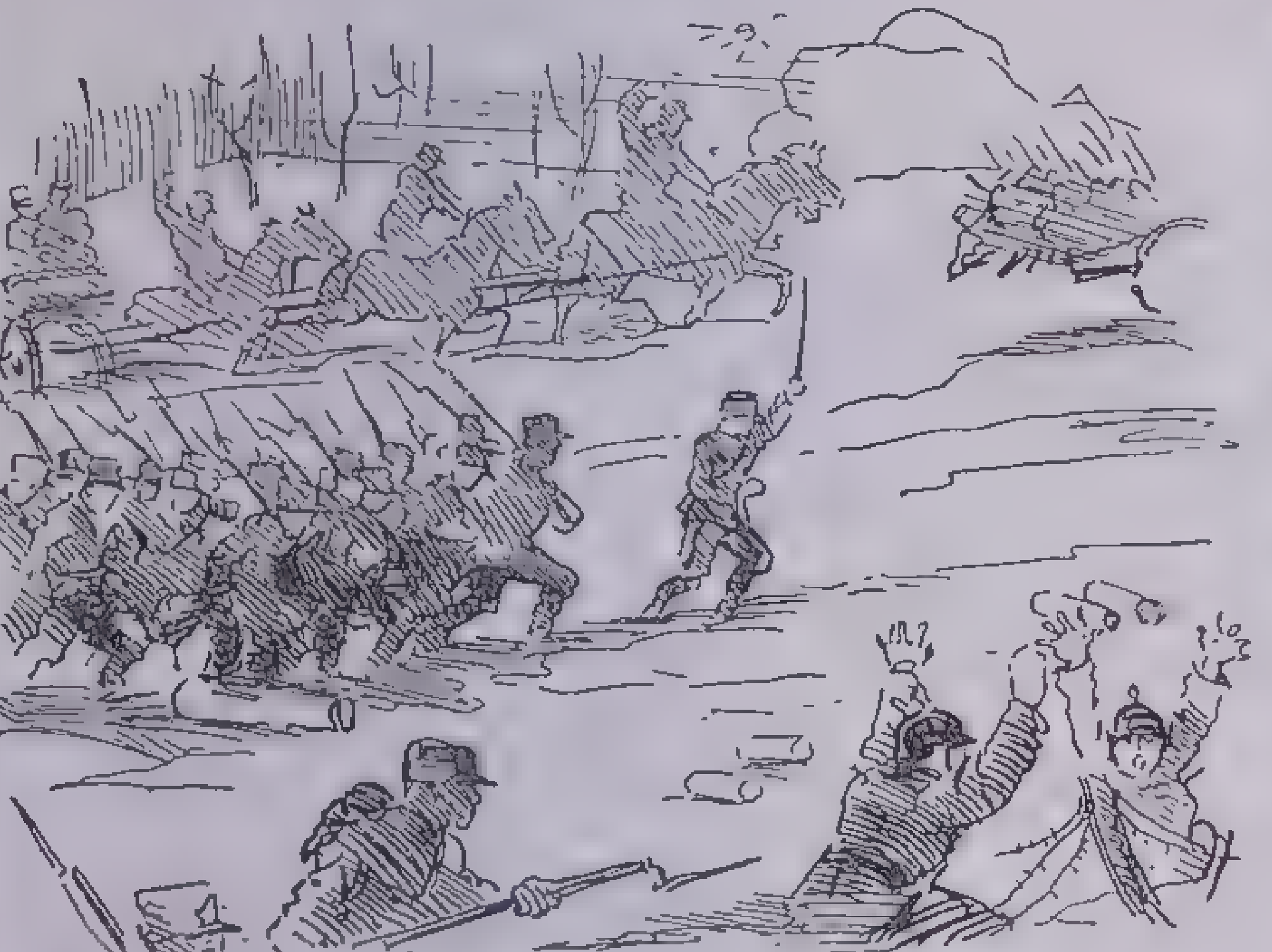
② War actually began on Sunday, August 2, 1914, when German troops invaded Luxemburg.



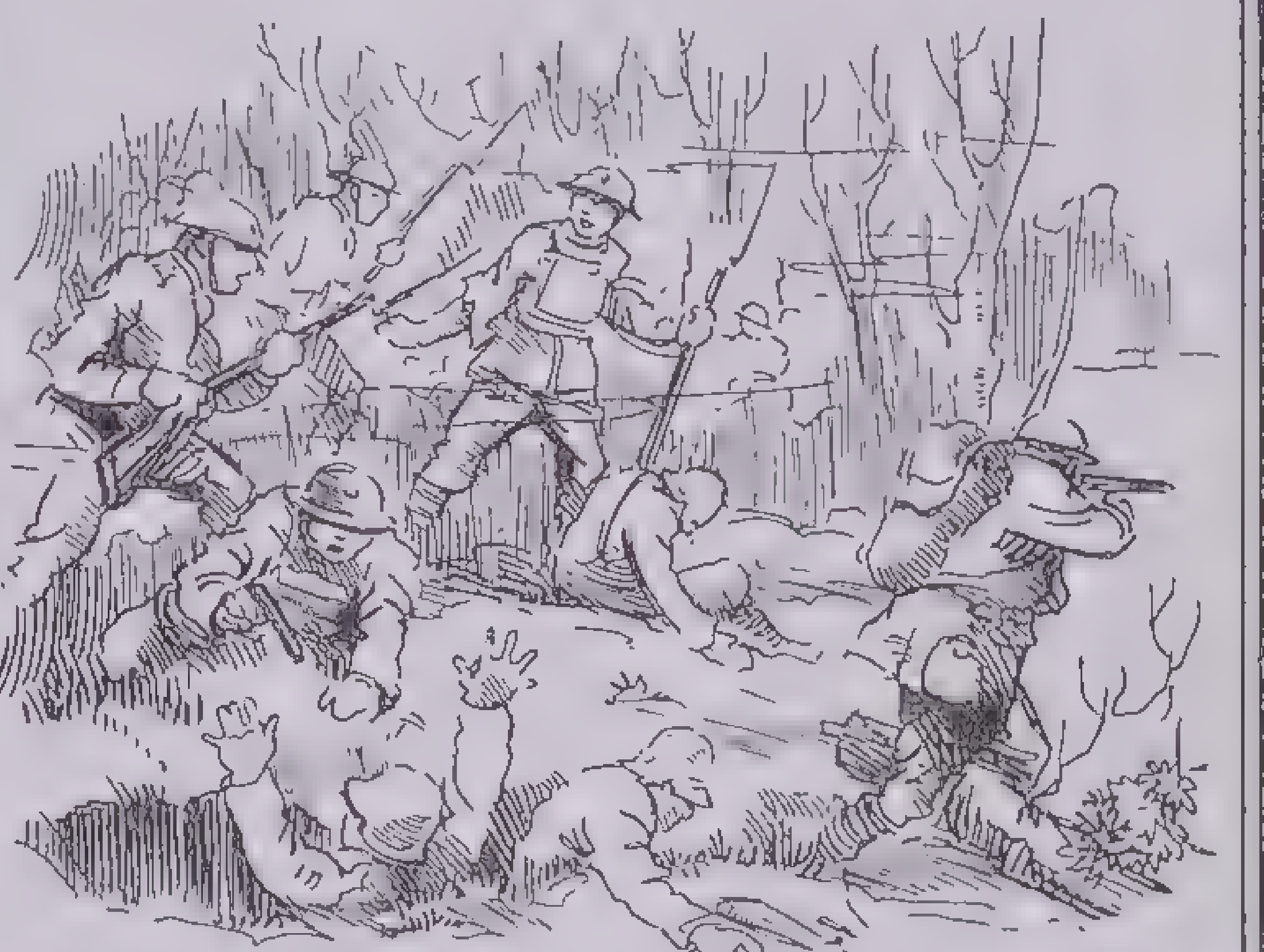
③ On August 4th, 1914 Germany invaded Belgium - a pitiless destruction of homes, churches, cemeteries etc. —



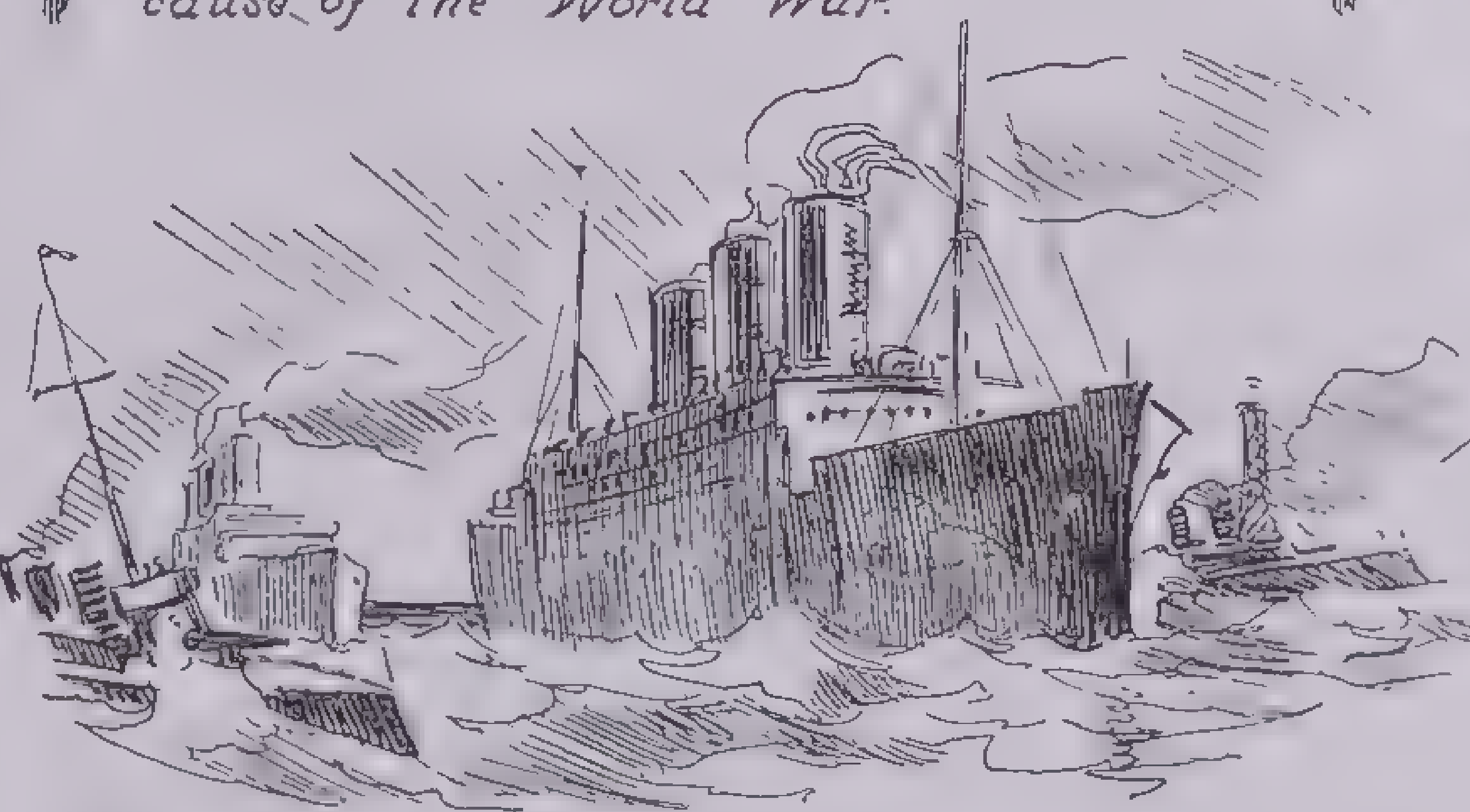
The German War Cloud advancing under General von Kluck in 1914 — an indirect cause of the World War.



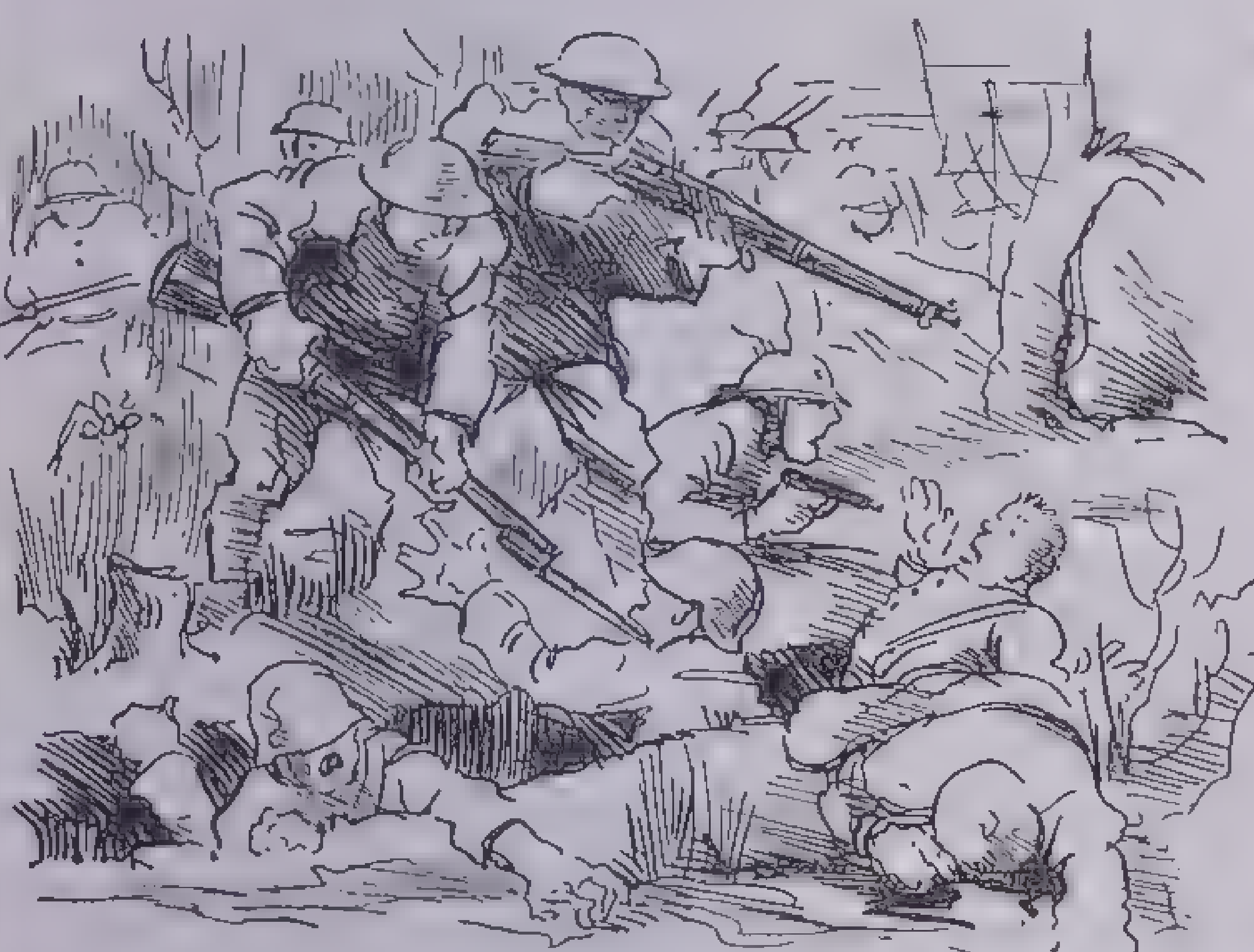
④ German invaders hurled back across the Marne by French and British in the First Batle of the Marne - September 1914



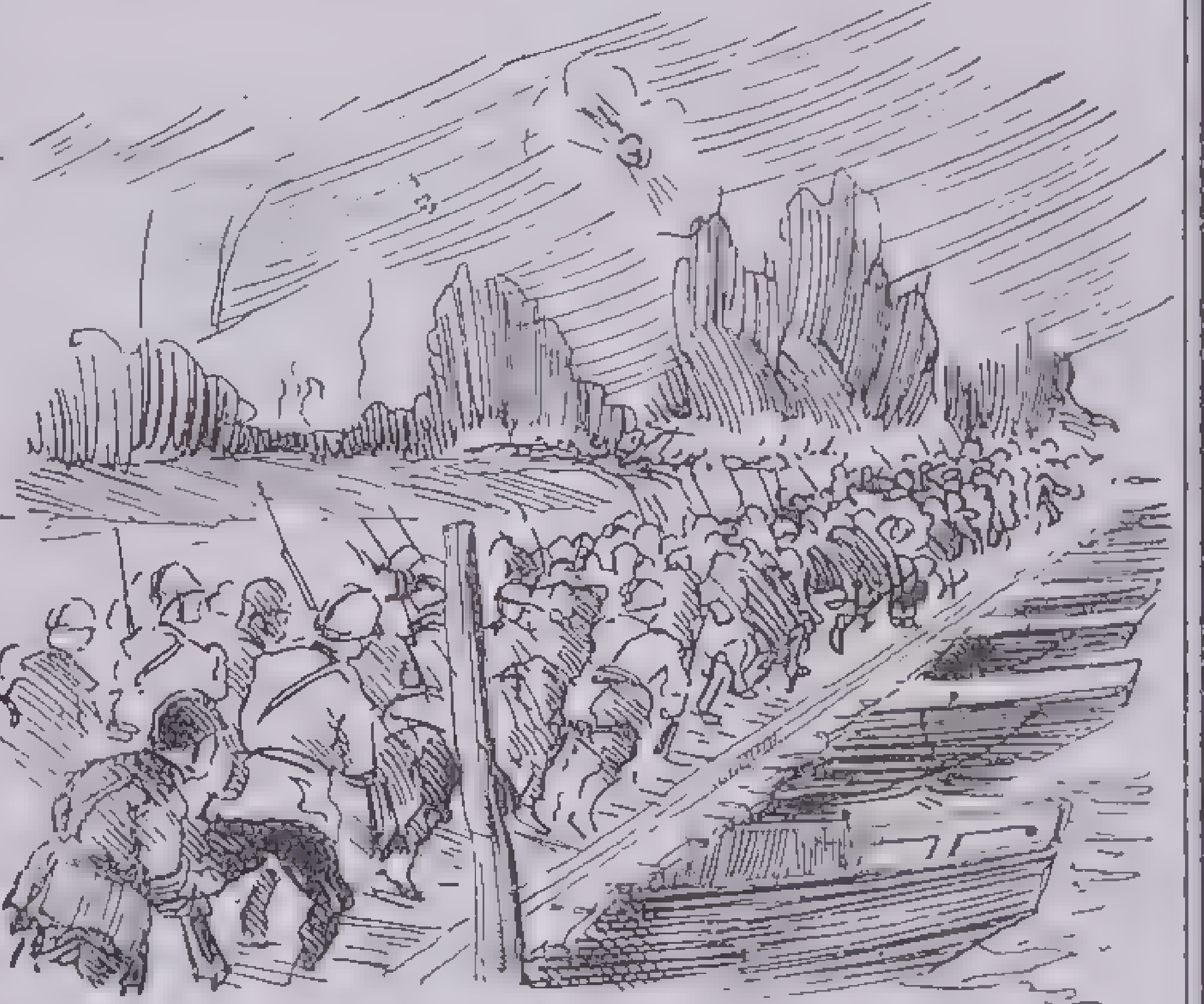
⑥ Belleau Woods - where the Marines stopped the Kaiser on his way to Paris.



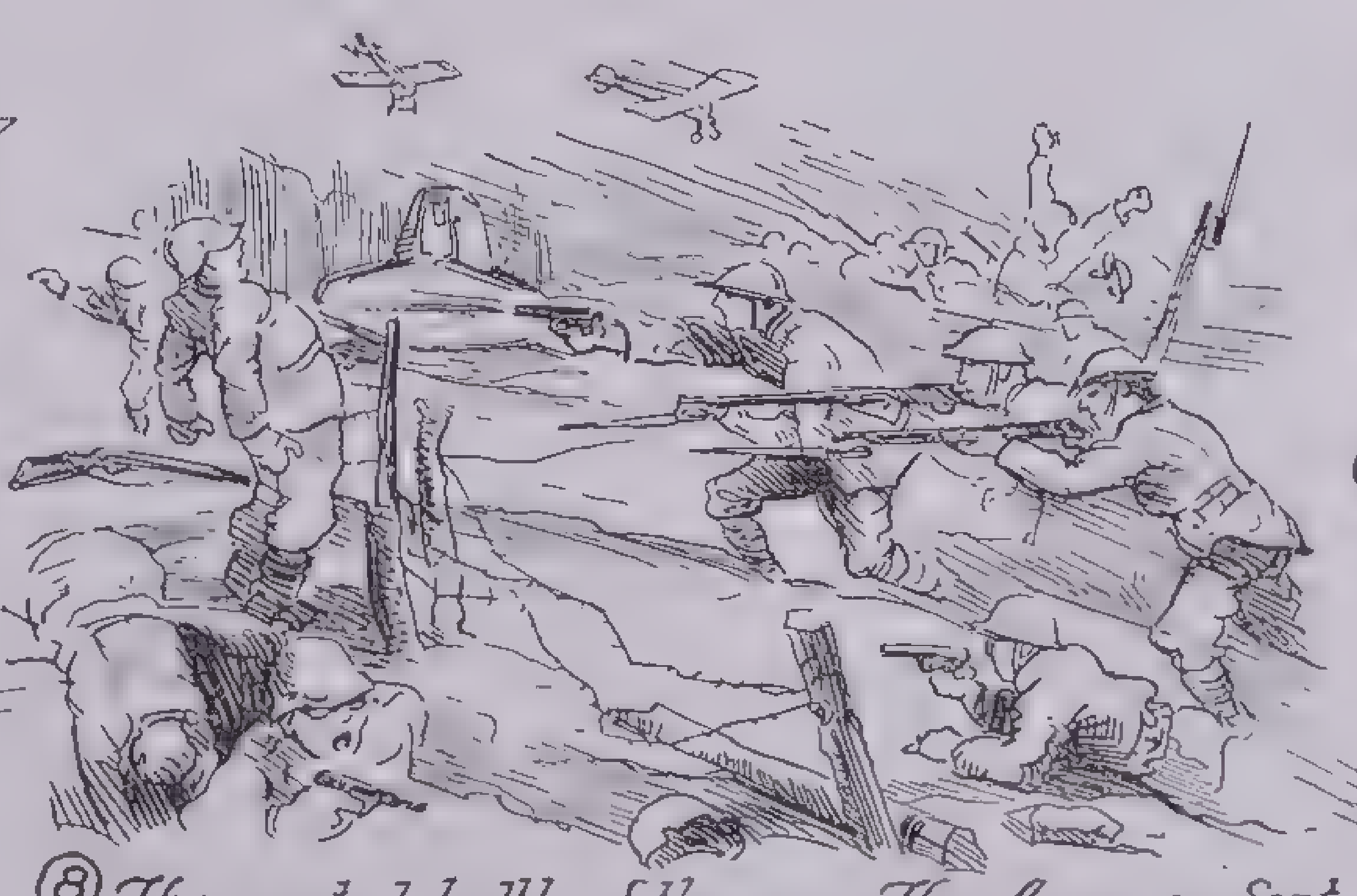
⑤ American Army swarms across the Ocean 1917-18 —— The Convoy shown above.



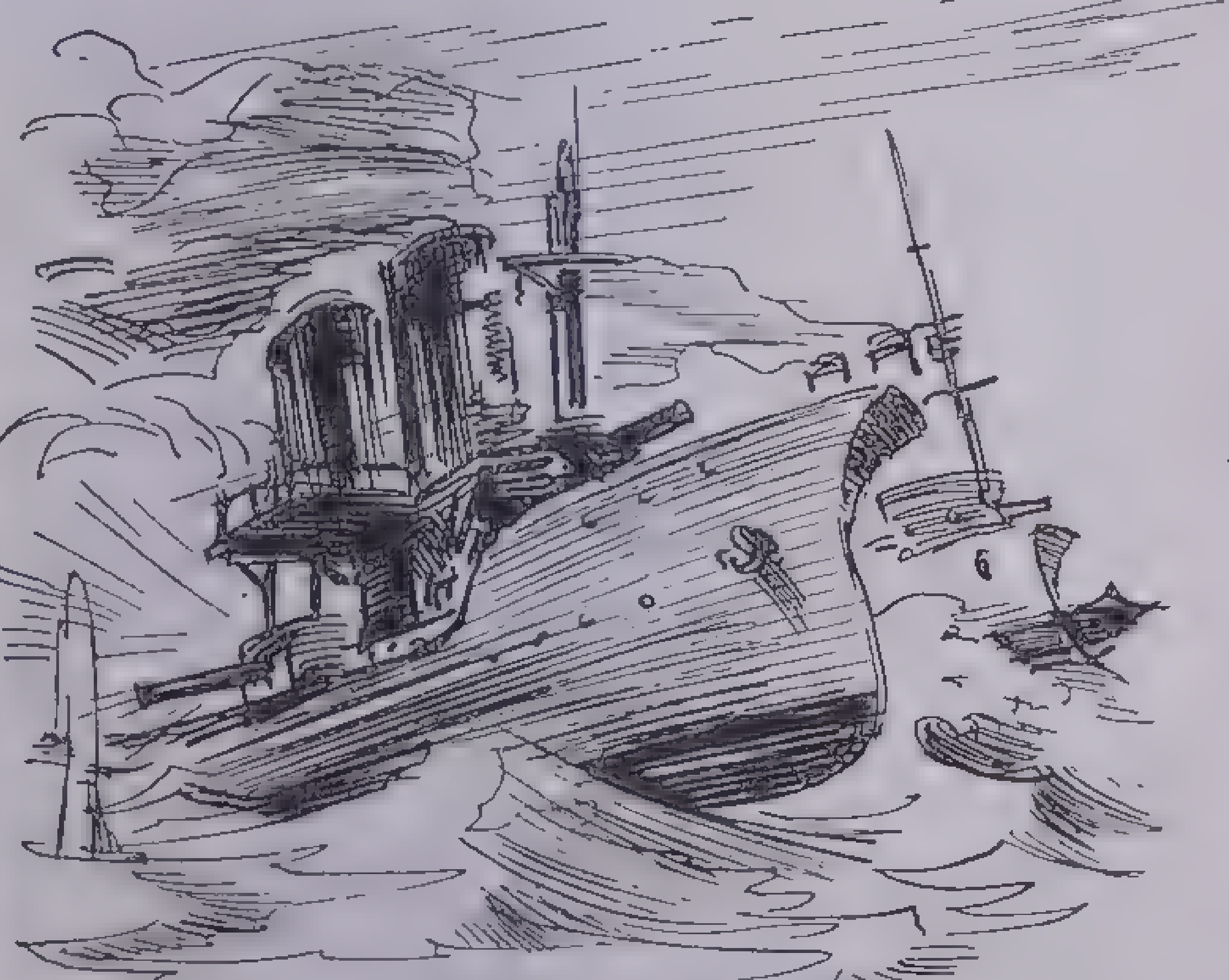
⑦ Gallantry of our soldiers at Chateau Thierry turned fighting in favor of the Allies — 1918



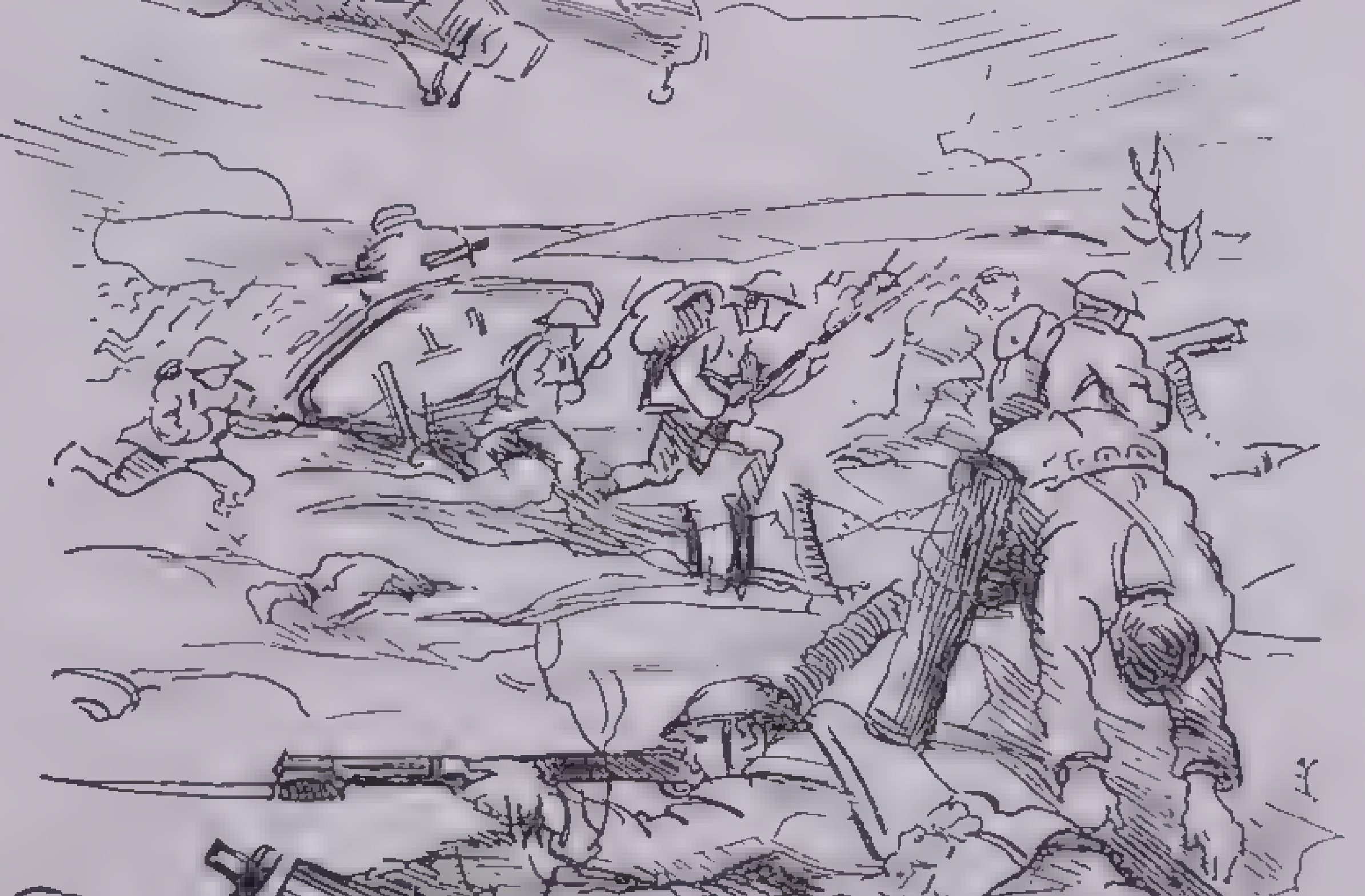
⑨ Bagdad Railway Line and German world empire broken by gallant Italians at the Piave River, 300,000 prisoners and 5000 guns captured October 1918



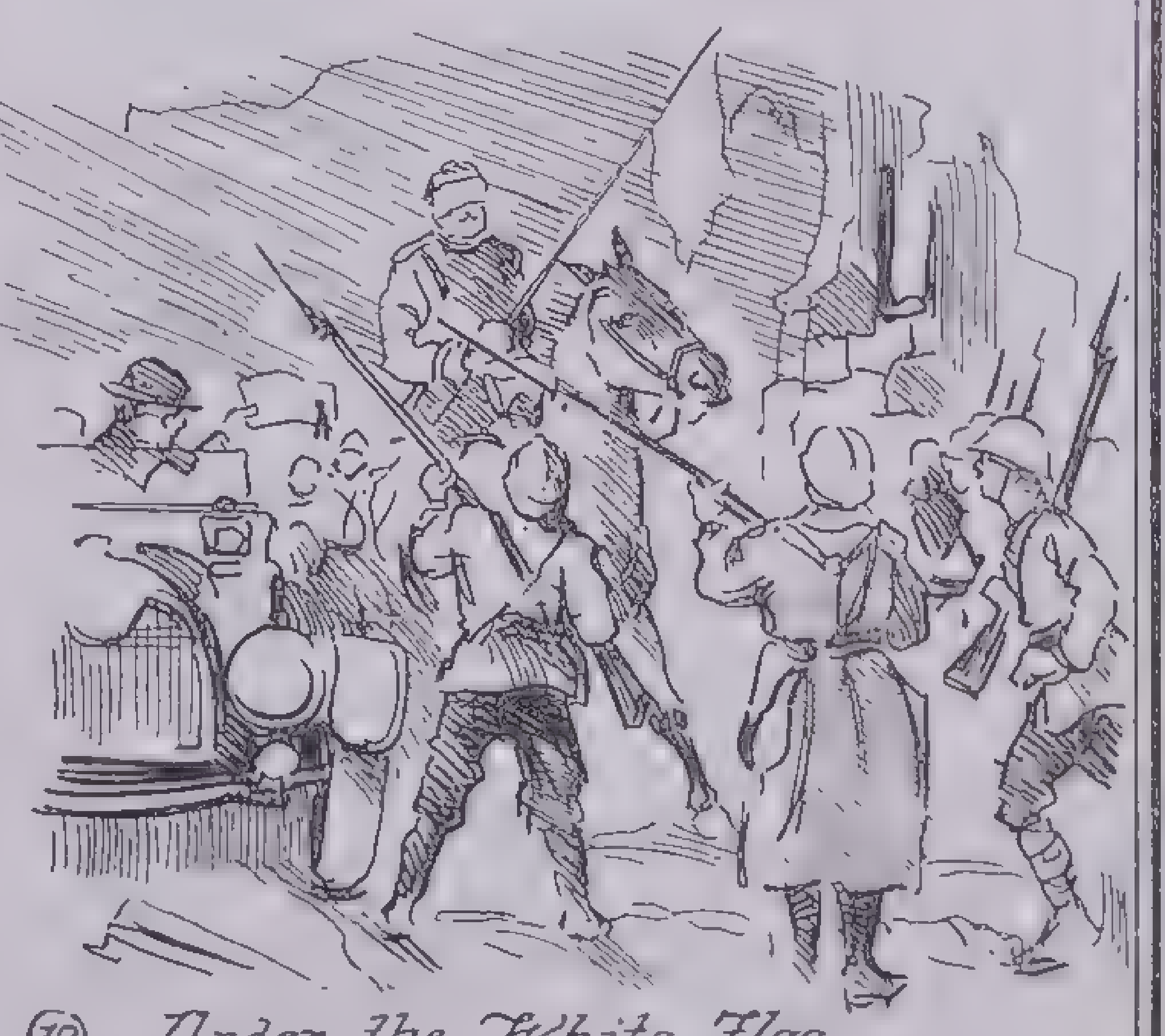
⑧ The greatest battle of the war, The Argonne Sept. 26-1918 American troops with superhuman persistence push on to a glorious victory.



⑩ First great naval battle of the war was fought by German and British Fleets off Jutland, Denmark, May 31, 1916. Both sides claim victory.

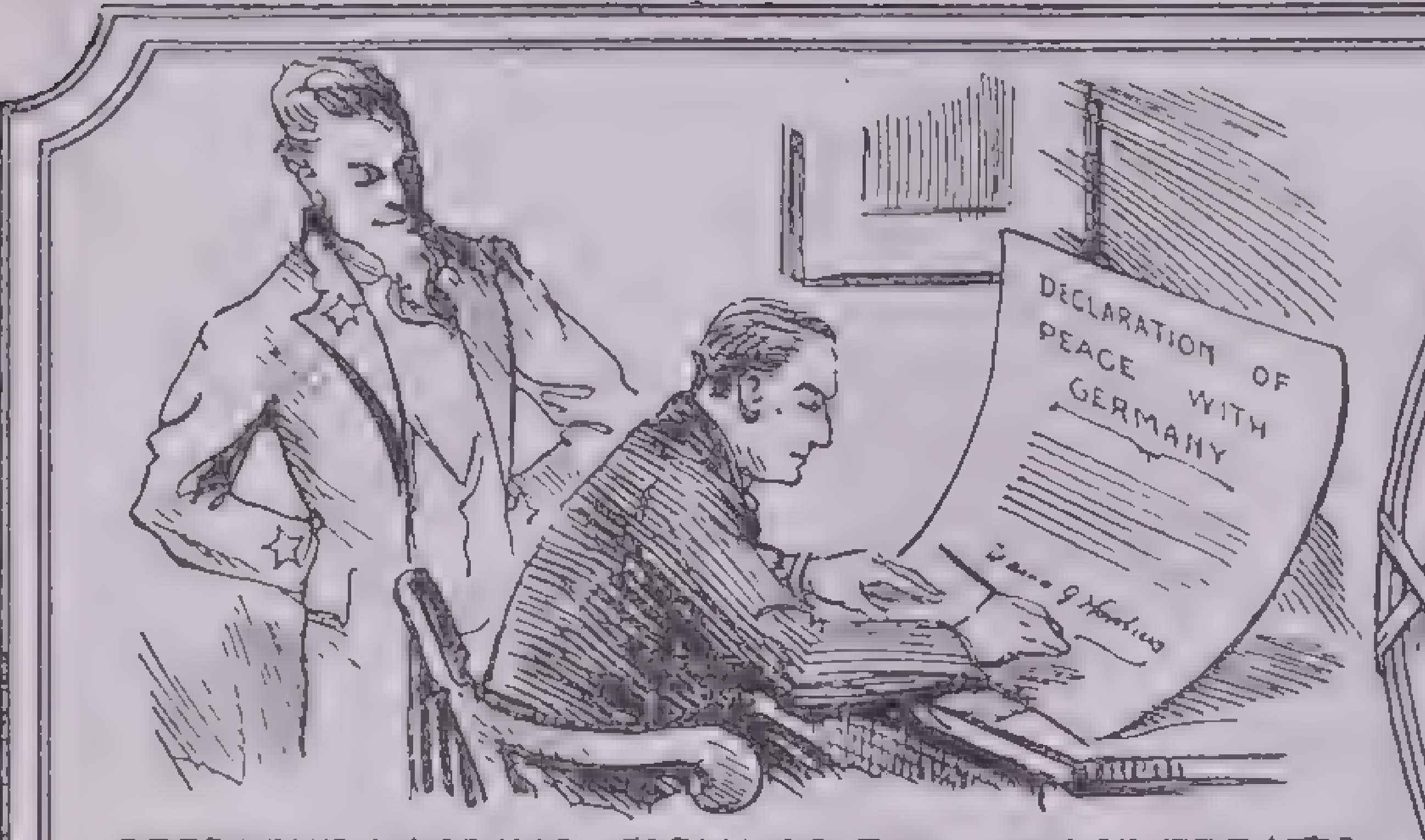


⑪ American and British troops force their way through twelve miles of defense between Cambrai and St. Quentin, Oct. 1918

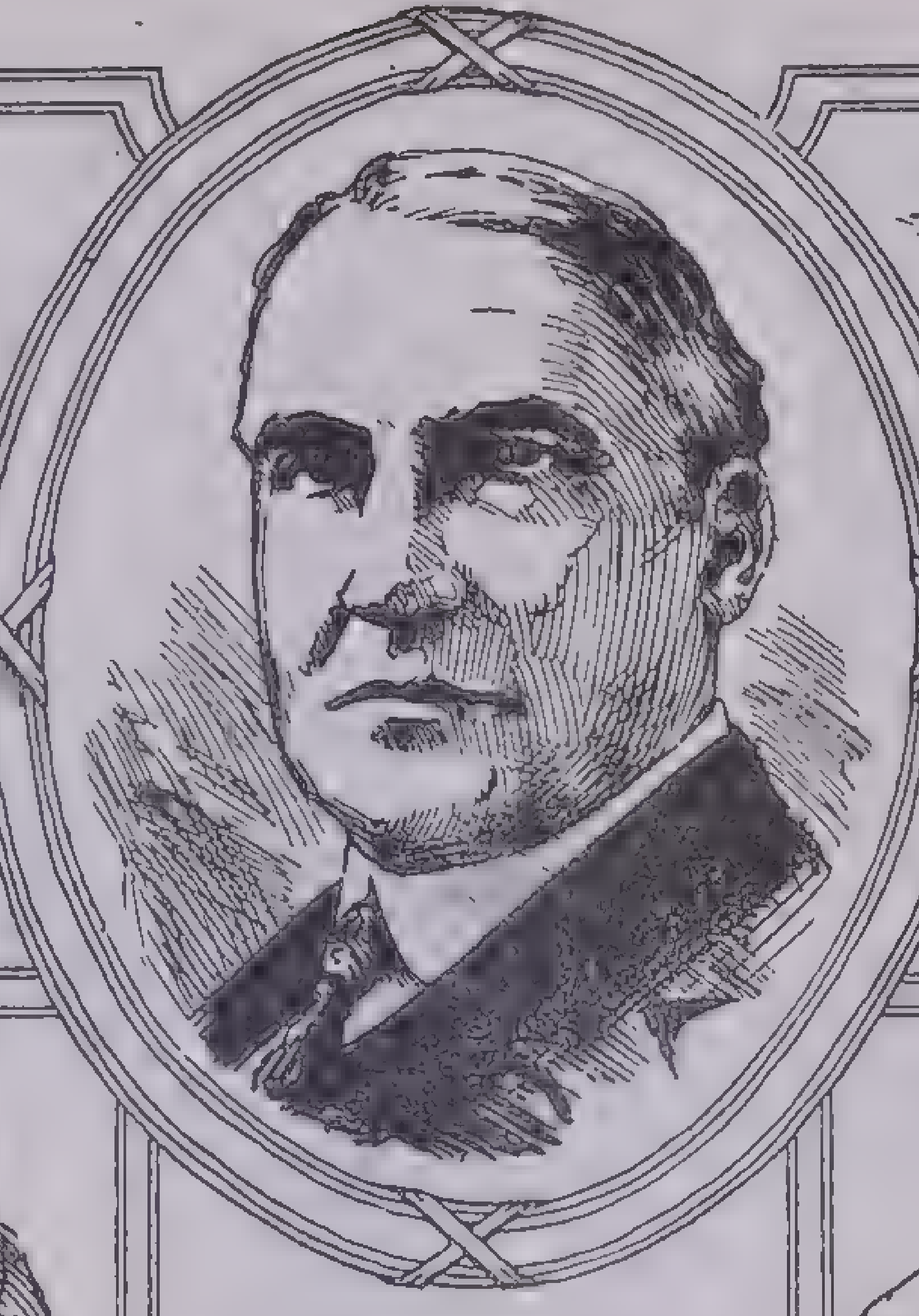


⑫ Under the White Flag - Preceded by a trumpeter and carrying white flags. German plenipotentiaries present themselves to French outposts on the night of Nov. 7, 1918. The beginning of the end of the world's great war - Armistice signed November 11-1918 Germany conquered. Treaty of Versailles signed - 1919 & League of Nations formed.

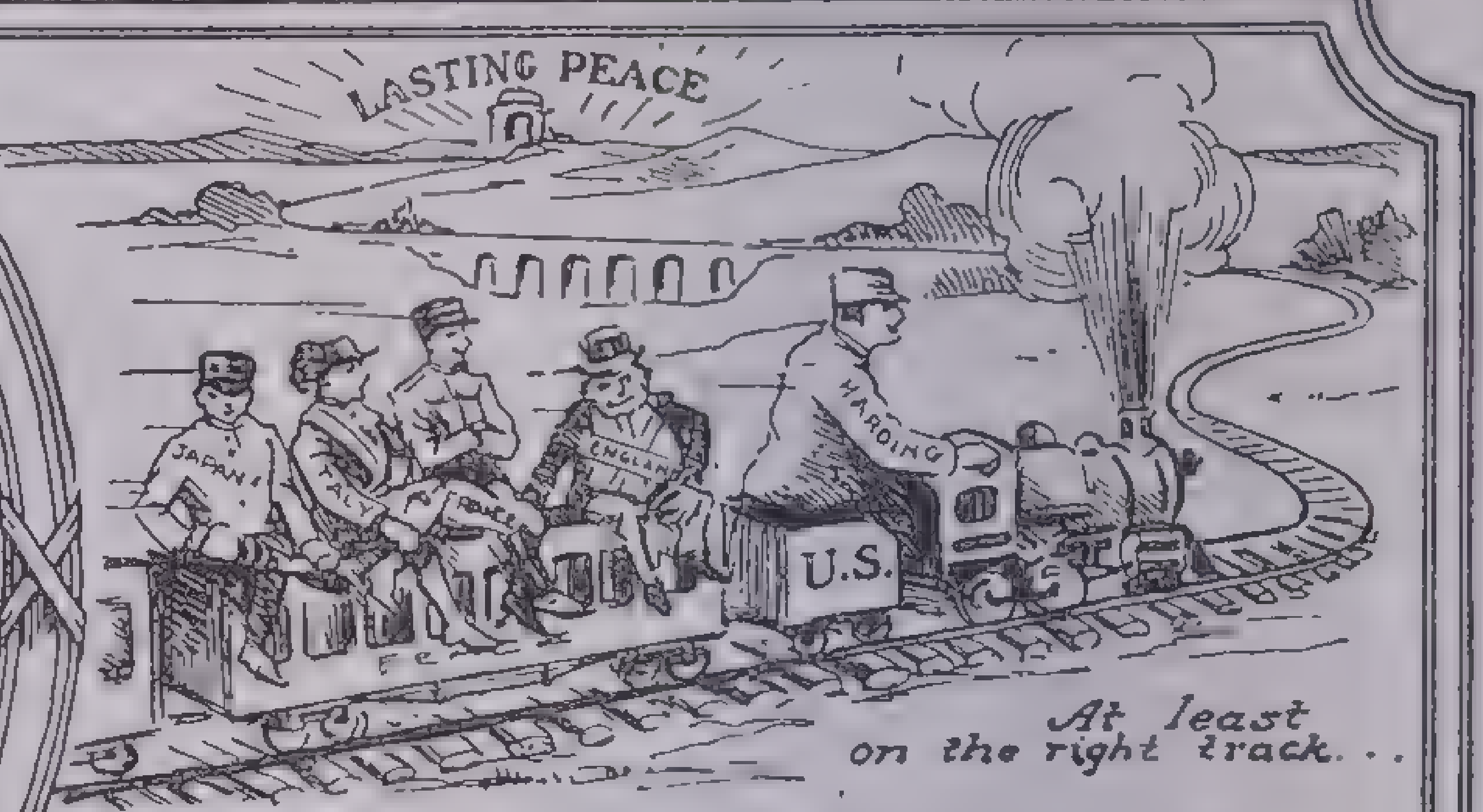
Brigham —


DECLARATION OF PEACE WITH GERMANY
Warren G Harding

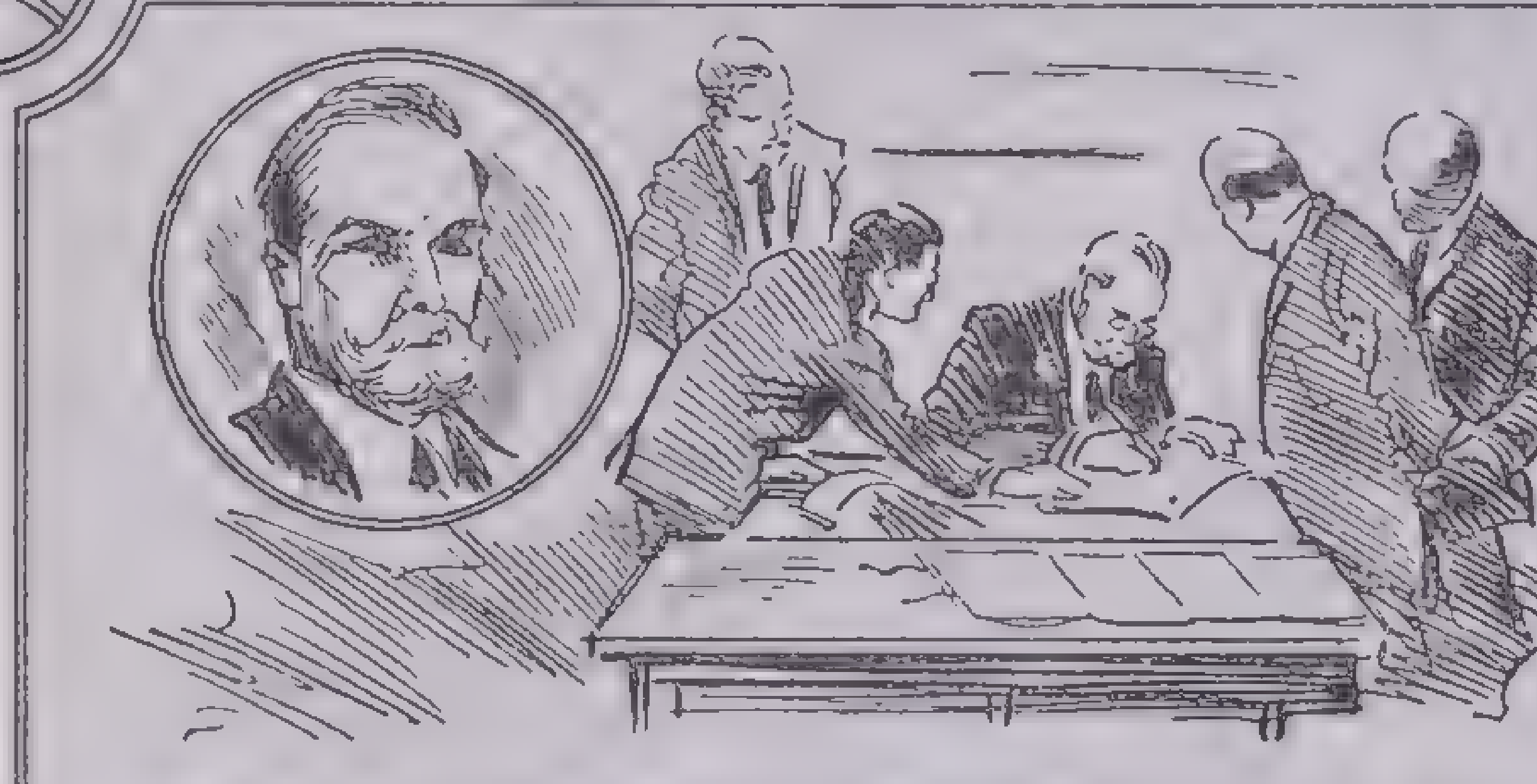
PRESIDENT HARDING SIGNING THE PEACE TREATY WITH GERMANY AT RARITAN N.J. JULY 1921



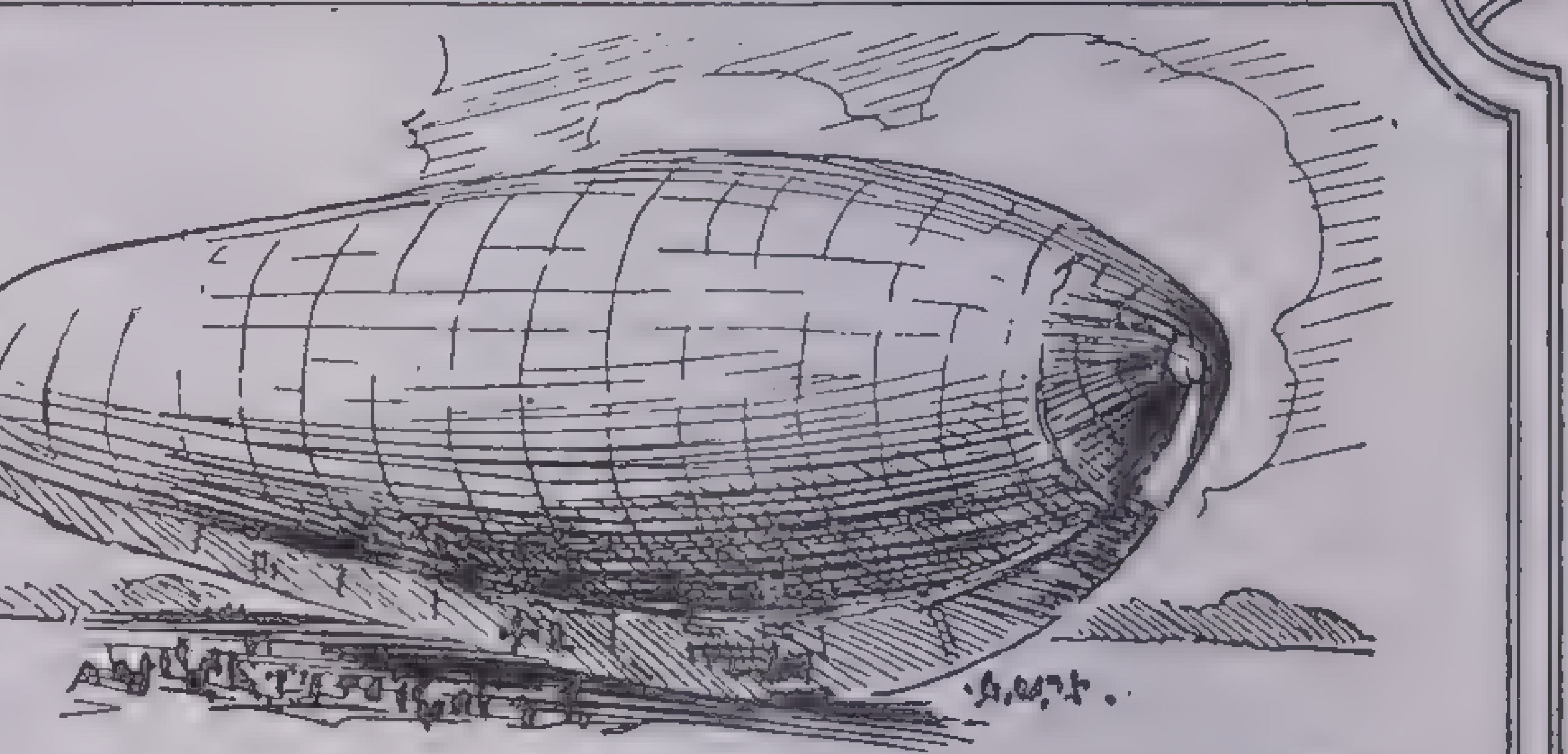
WARREN G. HARDING
1921 TO 1923



THE DISARMAMENT CONFERENCE HELD AT WASHINGTON D.C., NOVEMBER 1921



SECRETARY HUGHES SIGNING THE 10 YEAR NAVAL HOLIDAY TREATY IN THE ASSEMBLY HALL OF THE DAUGHTERS OF THE AMERICAN REVOLUTION FEB. 1922



THE ROMA PURCHASED FROM ITALY— CARRYING A CREW OF 8 OFFICIERS AND 23 MEN DESTROYED FEBRUARY 1922

The Fourteen Points of Wilson's world-peace theories were to be incorporated in the peace treaty, except that the Allies would interpret for themselves the "freedom of the seas" and "restoration" clauses.

The Fourteen Points.—The fourteen points that Wilson considered the necessary basis of a "just and lasting peace" were set forth in his idealistic speech to Congress, Jan. 8, 1918. How deeply the words took root in the warring world was not revealed until the failing Central Powers looked to him to hold the coming peace to justice.

"Open covenants openly arrived at" was the first point. 2. "Absolute freedom of navigation on the high seas" in peace and war. 3. "Equality of trade conditions among all nations." 4. "Reduction of national armaments." 5. Settlement of colonial claims in justice to native and claimant alike. 6. Evacuation of all Russian territory. 7. Restoration of Belgium. 8. Return of Alsace-Lorraine to France. 9. Realigning of the Italian frontier in justice to adjacent nationalities. 10. Autonomy of all the nationalities of Austria-Hungary. 11. Realigning the Balkan boundaries according to nationalities. 12. Turkey for Turkey, but autonomy of all her subject peoples. 13. An independent Poland. 14. "An association of nations formed under specific covenants" to afford "mutual guarantees of political independence and territorial integrity to great and small states alike."

Peace Conference.—Wilson sailed for Paris, Dec. 4, 1918, to attend the Peace Conference in person. To those who criticised the unprecedented step he replied only that he knew of no business that should take precedence over the peace of the world. He had the League of Nations at heart. Who else was its spokesman, its prophet and engineer in one?

Europe received him with a wild enthusiasm. One half the world looked to him to frame a just peace, the other half to save them from an unjust one. But it was easier to plan than make a peace. Of the 39 governments that sent delegates only the United States seemed to have no special selfish purpose. The nationalistic interests of the others could not be downed, and the victors were eager to crush the defeated foe.

The Fourteen Points survived the Conference but with drastic alterations. For the sake of the greater issue of a League of Nations Wilson compromised on certain details after long and bitter debate. He finally had to accept Japan's remaining in Shantung, a German concession in China that Japan took during the war and he agreed to separate the Saar from Germany. He was forced to let the Allies exact crippling reparations from Germany. No appeal to temper the sum to her ability to pay could budge them.

Thus Wilson lost face in all quarters: with the Allies for his stand against some of their closest aims; in the United States where his political enemies were fanning the agitation for a "strong peace" to destroy Germany; and with liberals everywhere for his failure to put through the promised "peace of conciliation." But for this "the ingredients were lacking at Paris," said Colonel House, Wilson's friend and counsellor.

Treaty of Versailles.—Wilson did, however, win his battle for the League of Nations. The Covenant of the League was written into the Peace Treaty of Versailles, signed at Versailles, June 1919. This one thing mattered: the League was a reality that would provide the cure for all other Treaty ills. And Wilson came home to present the Treaty and the Covenant to the American people for their ratification.

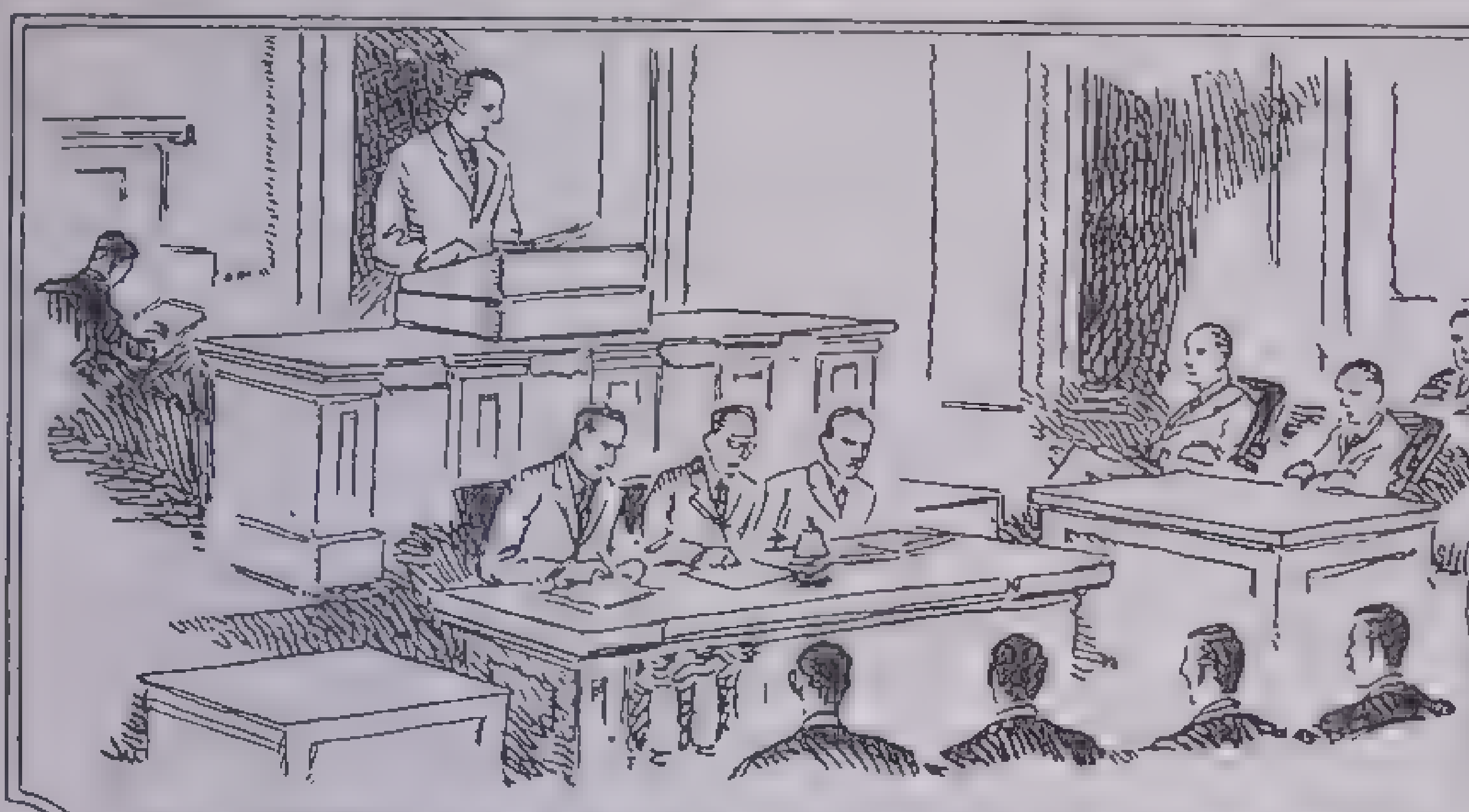
In 1918 he had asked the people to return a Democratic Congress as token of their continued support. This partisan appeal lost him the nation and a hostile Republican Senate sat waiting to hear and judge the Treaty and the Covenant of the League. They would have none of it as it stood and proposed reservations that Wilson too would have none of because they would nullify the treaty.

Article X of the Covenant was the stumbling block: that League members were "to respect and preserve as against external aggression the territorial integrity and political independence of all members of the League." This especially was opposed by isolationists as an "entangling alliance."

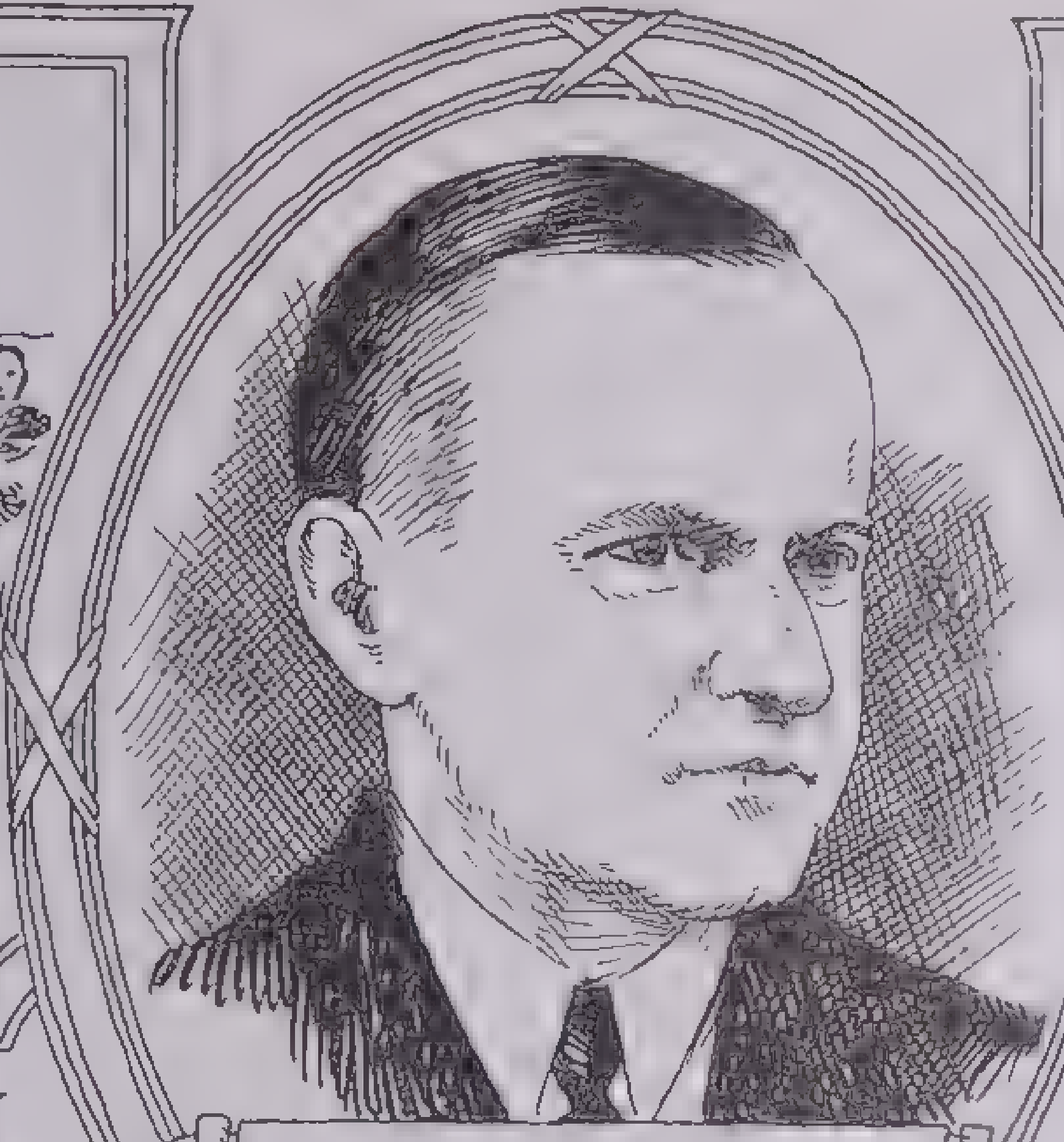
Disappointed and disillusioned but undeterred, Wilson set out on a speaking tour of the United States, Sept. 1919. He still believed in the people and sought the people's belief in his peace to force the Senate's ratification. At Wichita, Kans., Sept. 26, his strength broke and he never fully recovered from the complete nervous collapse that followed. The nation lost its inspiration and its leader, the League its advocate. And the United States ended up outside the League and outside the World Court for which the League provided.

Other Events.—During Wilson's second term another Amendment to the Constitution was ratified by the states. The Eighteenth Amendment (ratified in 1919) prohibited after one year the manufacture, sale and transportation of intoxicating liquors. The Volstead Act, passed Oct. 1919, to enforce the Amendment, became law over the President's veto.

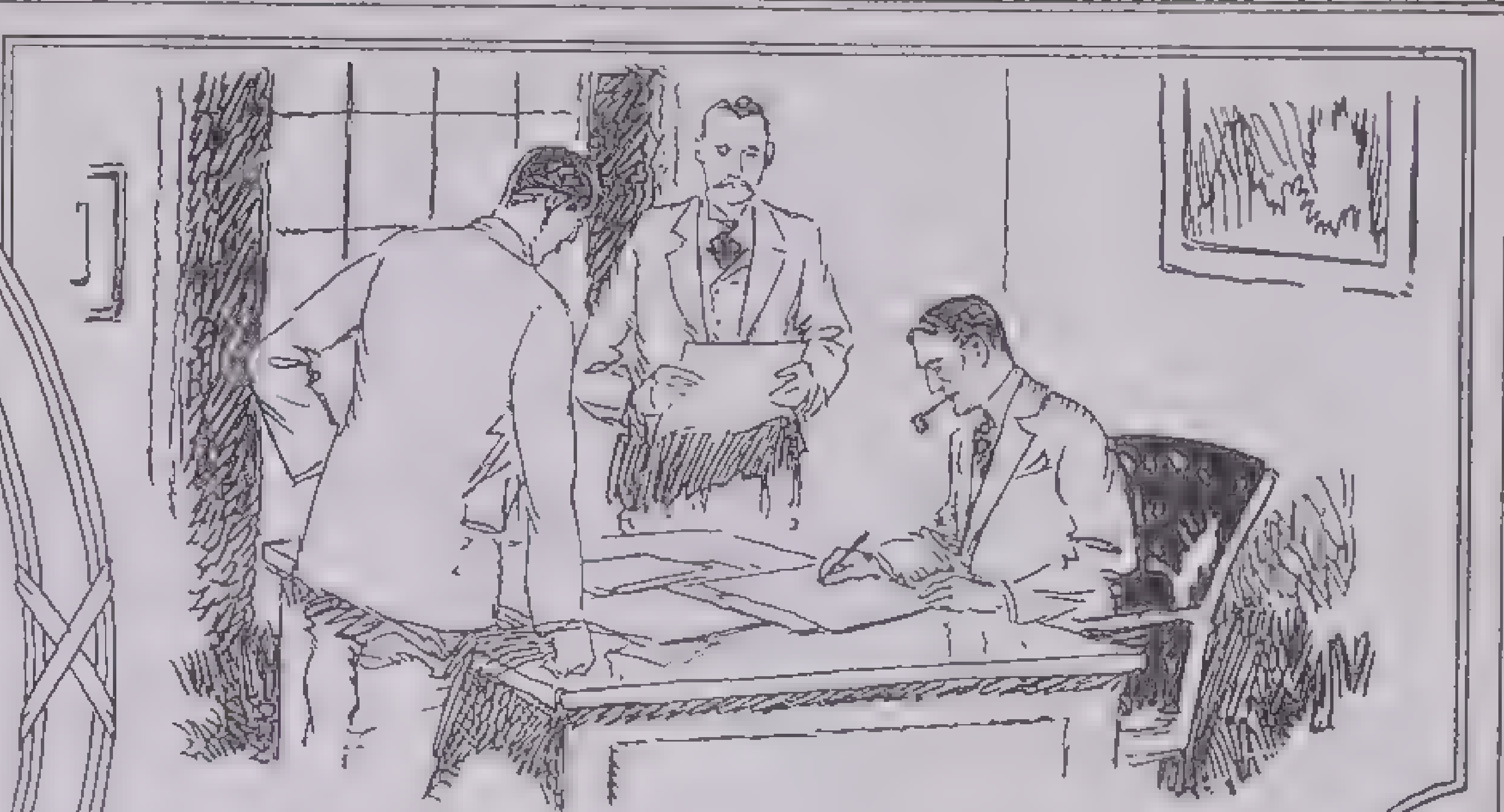
Election of 1920.—"The League vs. Nationalism" was the issue of the 1920 election. The Democrats nominated Gov. James M. Cox of Ohio for President and Franklin D. Roosevelt for Vice-President. The Republicans nominated Warren G. Harding for President and Gov. Calvin Coolidge of Massachusetts for Vice-President.



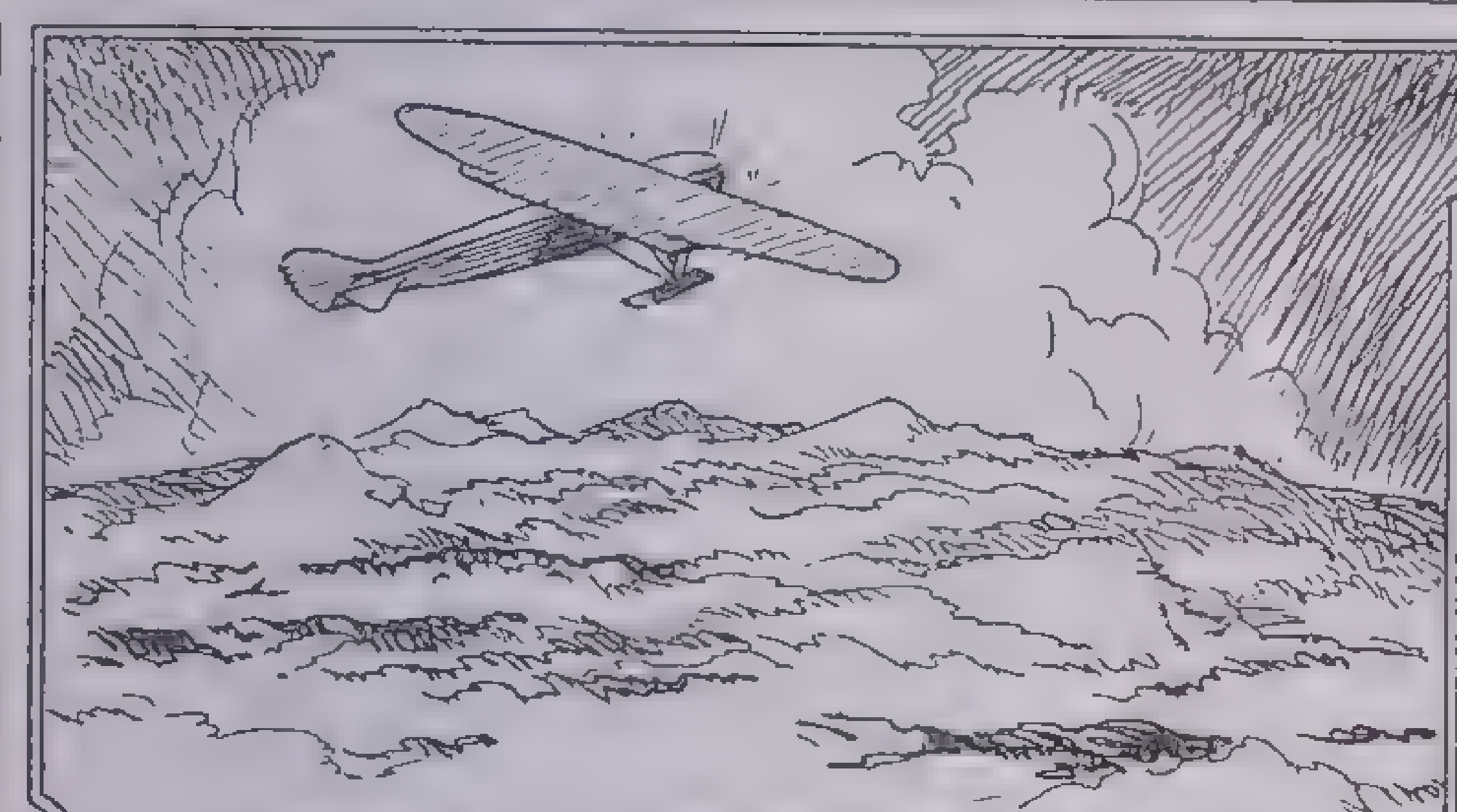
PRESIDENT URGES CONGRESS TO REDUCE GOVERNMENT EXPENSES AND TAXES



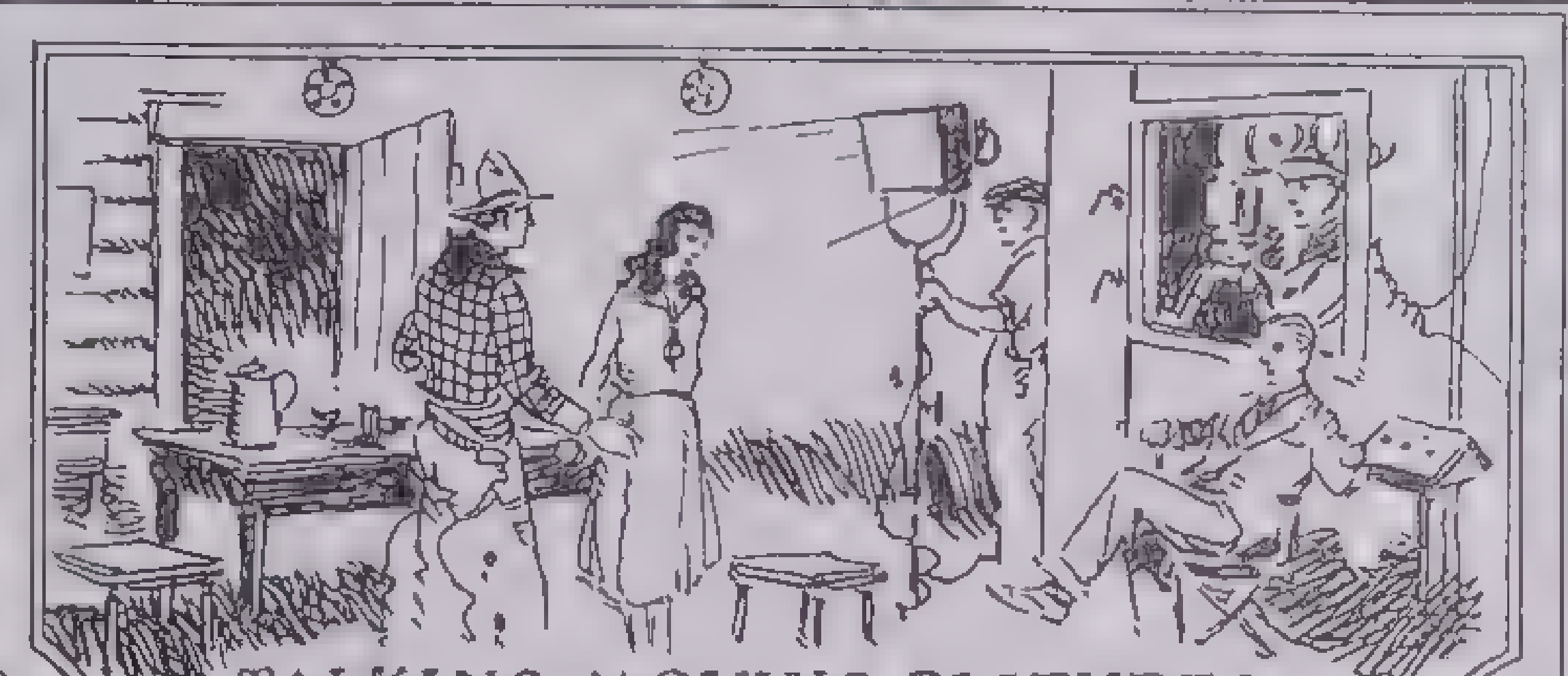
CALVIN COOLIDGE
1923 TO 1929



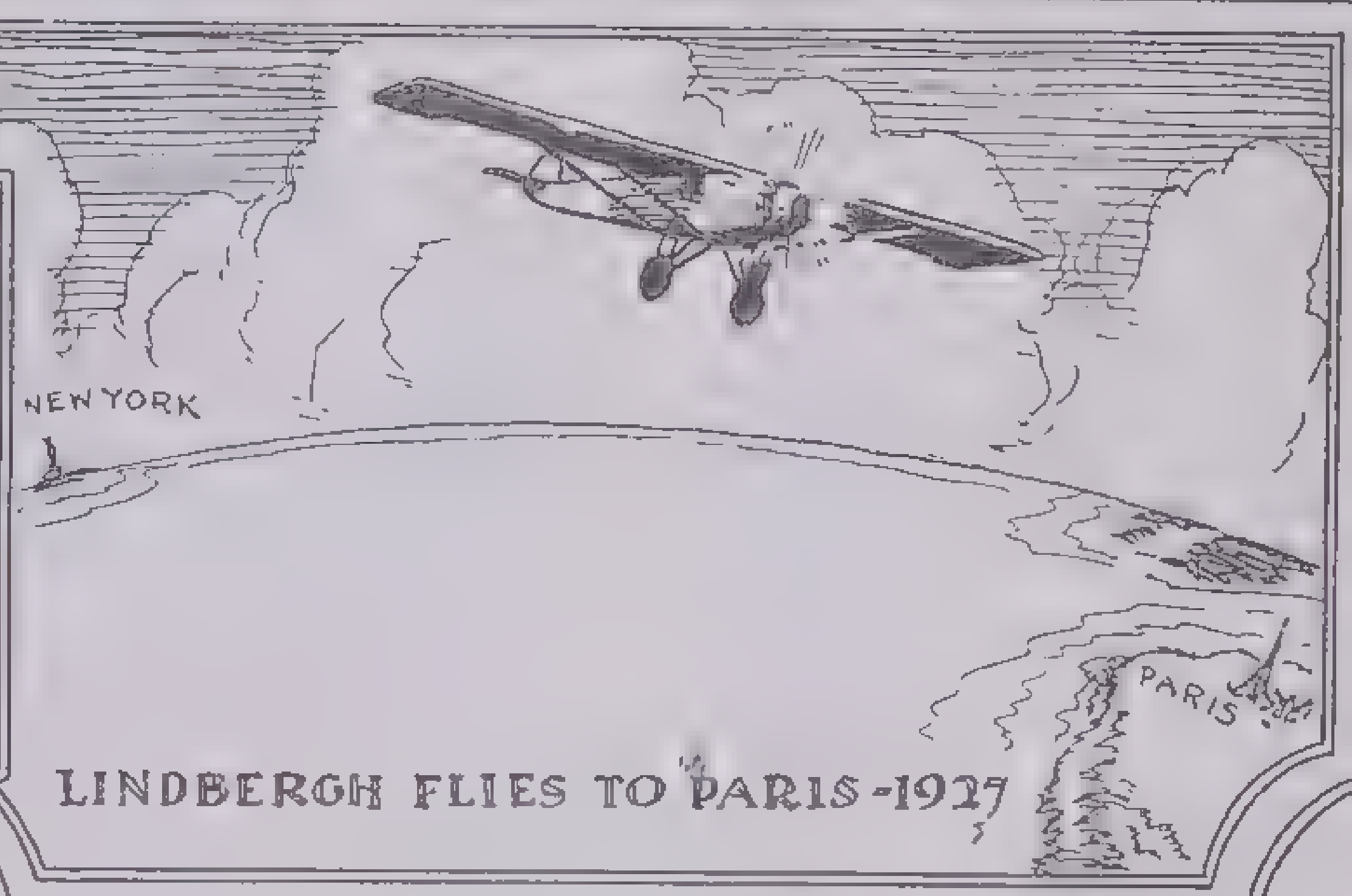
DAWES REPARATIONS PLAN-1924



BYRD FLIES TO NORTH POLE-1926



TALKING MOVING PICTURES COMMERCIAL SUCCESS-1928



LINDBERGH FLIES TO PARIS-1927

The people rallied to the old safe tradition of non-interference in Europe. Harding was elected with 404 electoral votes on a "no-League" platform. Cox, lame defender of Wilson's idealism, received 127.

Warren G. Harding—1921–1923

Harding came into office on the wave of a great reaction. He was popular, but it was neither popularity nor greatness that gave him the election. It was reaction to the old motto, "No entangling alliances." That and a cry for the "normalcy" that the people thought would mean stabilized business and increased prosperity. Internationalism was repudiated; business boomed.

The Cabinet.—Harding's Cabinet was the talk of the nation and continued to be so into the years of Coolidge's administration. Some men he chose had unquestionable ability, notably Charles E. Hughes, his Secretary of State, and Herbert C. Hoover, Secretary of Commerce. Most of the others were undistinguished men, personal friends too greatly trusted or political associates to whom office was due. Harding's Secretary of the Interior, Albert B. Fall, was forced to resign in 1923 and later served a penitentiary sentence for leasing the Teapot Dome oil lands (a navy oil reservation) to private interests. Harding's friend and Attorney General, Harry M. Daugherty, was discovered in shady and unexplainable practices and forced to resign (1924). His Secretary of the Navy Edwin Denby was found incompetent.

Foreign Relations.—The first thing on Harding's program was officially to end the state of war still existing between Germany and the United States. Three separate treaties were put through with Germany, Austria and Hungary and ratified by the U. S. Senate, Oct. 18, 1921. Parts of the Treaty of Versailles were incorporated in these, but they were carefully worded to keep the United States uninvolved in the League of Nations.

Washington Naval Conference. — The most important event of Harding's administration was the conference for the limitation of armaments, Nov. 12, 1921–Feb. 6, 1922. He called together those nations interested in Pacific Ocean problems, specifically, the United States, Great Britain, France, Italy and Japan. China was included and Holland, Belgium, Portugal. The first agreement was for a naval holiday: no capital ships (i.e. ships of 10,000 tons or more with 8-inch calibre guns) were to be built before 1936 by the United States, Great Britain, Japan, France and Italy. This was the Five-Power Naval Pact that gave Great Britain and the United States each 525,000 tons, Japan 315,000 tons, and France and Italy each 175,000 tons of capital ships. It called also for the scrapping of 66 capital ships in each of the navies of the United States, Japan and Great Britain.

Five other treaties were negotiated at this conference. The Four-Power Treaty, signed Dec. 13, 1921, was an agreement between the United States, Great Britain, France and Japan to respect and protect the insular rights of each in the Pacific. The Five-Power Treaty bound the signers to observe the international code in submarine warfare and to forswear the use of poisonous gas. By the Nine-Power Treaty to Preserve the Integrity of China, Japan agreed to give up Shantung within six months and China to pay for the improvements made there by Germany and Japan. There was a Chinese Customs Treaty. The Pacific Cable Treaty upheld Japan's mandate over Yap but gave the United States equal rights in the matter of trans-Pacific cables.

World Court.—Ever since the Hague Tribunal was established. 1899. certain presidents of the United States, (notably Roosevelt, Taft and Wilson) had been in favor of compulsory arbitration. In 1920 Elihu Root proposed a court of arbitration very similar to the actual Permanent Court of International Justice (popularly called the World Court), established by the League of Nations in December of that year. But the popular mind in America held out for a *qualified* membership. Harding, too, still stressed nonentanglement in the League in his strong message to the Senate, Feb. 1923, urging that the United States join this World Court. But the question remained undecided at the time of his death in August.

Other Events.—Harding was strong for government economy and pushed through the first Federal Budget Bill, June 1921. In February 1923 an important agreement was made with England to wipe out England's war debt to the United States by the end of 62 years.

Harding's Death.—Harding died in San Francisco Aug. 2, 1923, on his way home from Alaska, which he had visited in the interest of conservation.

Calvin Coolidge—1923–1929

Calvin Coolidge, the Vermont Yankee, was visiting his father's home in Plymouth, Vt. when the news came of President Harding's death. He took the oath of office in the dim light of a kerosene lamp at two o'clock in the morning, Aug. 3, 1923, sworn in by his father, a justice of the peace in that small Vermont town. Then he left at once for Washington.

Coolidge's Position.—His first message to the nation, Dec. 1923, left the people no doubt where he stood on the main issues of the times. He earnestly wished to continue Harding's government economy program. He believed in the tariff and not in vacillating revisions. He believed in reducing taxes. He was against the soldiers' bonus, for which there was then much agitation. He was against government relief for farmers. He was against the League of Nations and *for* the World Court.

He made no active move for the Administration housecleaning for which the people were clamoring as one corrupt transaction after another came to light on the part of men in Harding's cabinet. He forwarded the investigations into their strange deals but would make no snap dismissals until malfeasance was proved.

Legislation. Mellon Plan.—Ever since the World War taxation on the war-profit incomes of individuals and corporations had provided the bulk of the national revenue. But the war was over, the emergency drain on the treasury was reduced; thousands of government employees in emergency wartime jobs were no longer on the pay-roll. And it seemed reasonable now to reduce the surplus and grade down the taxes to some accord with government needs. Andrew W. Mellon, Secretary of the Treasury, in 1924 proposed a plan to reduce income taxes to a peacetime rate. The revision was to be progressively downward, reducing the earned-income taxes as well as surtaxes of individuals and corporations. Industry approved the Mellon Plan, but Congress, reflecting popular suspicion, looked askance at it, as a bill that might prosper the prosperous. And when the bill went through (1924) it differed vastly from Mellon's original proposal. But by 1926 when the question came up again, the temper of Congress itself had changed as the result of general increased prosperity and such legislation was no longer a bugaboo. The Income Tax Bill (Feb. 1926) decreased the rates still further.

Immigration Act.—The Immigration Act of 1924 established a quota system that gave entry to only 2 per cent annually of the number of natives of any one country living in the United States in 1890. Immigration from Canada and Mexico only was not restricted. This reduced the yearly influx to 150,000.

Soldiers' Bonus.—Like Harding, Coolidge was opposed to veterans' compensation. The government had already hailed the returned disabled soldier with free hospitalization and all kinds of rehabilitation programs and given to the fit a prolongation of the privileges of their War Risk Insurance. Seventeen states had come forward with cash bonuses. But jobless ex-service men continued to hold a grudge against the inevitable and Congress was flooded with bill after bill proposing adjusted compensation. "I am opposed to the bonus," said Coolidge in reply to public insistence. The World War Adjusted Compensation Act was passed over Coolidge's veto, May 17–19, 1924.

Election of 1924.—At the Republican nominating convention Coolidge was nominated almost without opposition, and Charles Gates Dawes of Illinois (author of the Dawes Plan—see next paragraph) was named for Vice-President. The Democratic convention nominated John W. Davis; Senator La Follette's Progressive party chose him as candidate. But Coolidge won by the greatest popular vote ever given a presidential nominee up to that time with 7,339,417 more votes than Davis and 2,516,561 more than the combined vote of Davis and La Follette. The Electoral College gave Coolidge 382 votes, Davis 136 and La Follette 13 (the votes of Wisconsin).

Dawes Plan.—Germany had been failing to pay the reparations exacted of her under the Treaty of Versailles for "all the loss and damage" sustained by the Allies. And France had accordingly moved into the Ruhr mining regions (1921) in an attempt to compensate herself for Germany's default. Dispute followed dispute, and in 1923 the United States proposed a commission to work out a settlement. Charles G. Dawes headed this commission, investigated Germany's budget and reported to the Reparations Commission regarding Germany's exact ability to pay. The Dawes Plan revised the whole reparations schedule, extended the time, pared down the amounts due and arranged for the collection and distribution of the payments.

World Court Again.—In Jan. 1926 Coolidge again took up the matter of joining the World Court. Public sentiment had strengthened in favor of the world-peace movement. And when the Senate voted again, Jan. 27, 1926, there were only 17 adverse votes. It made five reservations, however. The most important, the 5th, stipulated that the Court shall not "without the consent of the United States entertain any request for an advisory opinion touching any dispute or question in which the United States has or claims an interest." When the Court conferred in Geneva, Sept. 1926, it was found that the 5th reservation could not be granted. Coolidge would not urge the Senate to retreat from its demands. The United States remained outside with "no prospect of adhering to the World Court."

Election of 1928.—Coolidge was still popular in 1928 but he did not "choose to run" for President. He gave his support to the Republican nominee, Herbert C. Hoover, who had won public admiration as wartime food administrator and public confidence as Secretary of Commerce. The Democrats nominated Alfred E. Smith, former Governor of New York. Hoover was elected by a majority of more than 6,000,000. He received 444 votes in the Electoral College to 87 for Smith.

Herbert C. Hoover—1929–1933

That the wheels of prosperity could stop going round evidently did not occur to the new President any more than it did to the people. "I have no fears for the future of our country," said Hoover in his inaugural speech, March 4, 1929.

Signs of the Times. Agricultural Marketing Bill.—Even the prolonged distress of the farmers was not interpreted as a sign of danger. But to keep a campaign promise Hoover called a special session of Congress, April 16, 1929, to take up farm relief and revise the tariff. The Agricultural Marketing Bill, passed June 15, established a Federal Farm Board and set aside $500,000,000 for loans to farmers' co-operative groups. But agricultural prices stayed way down in foreign markets. The government stepped in and bought bushels of wheat and bales of cotton into the billions in order to forestall surpluses. But the farmers still could not make a penny more than the cost of production.

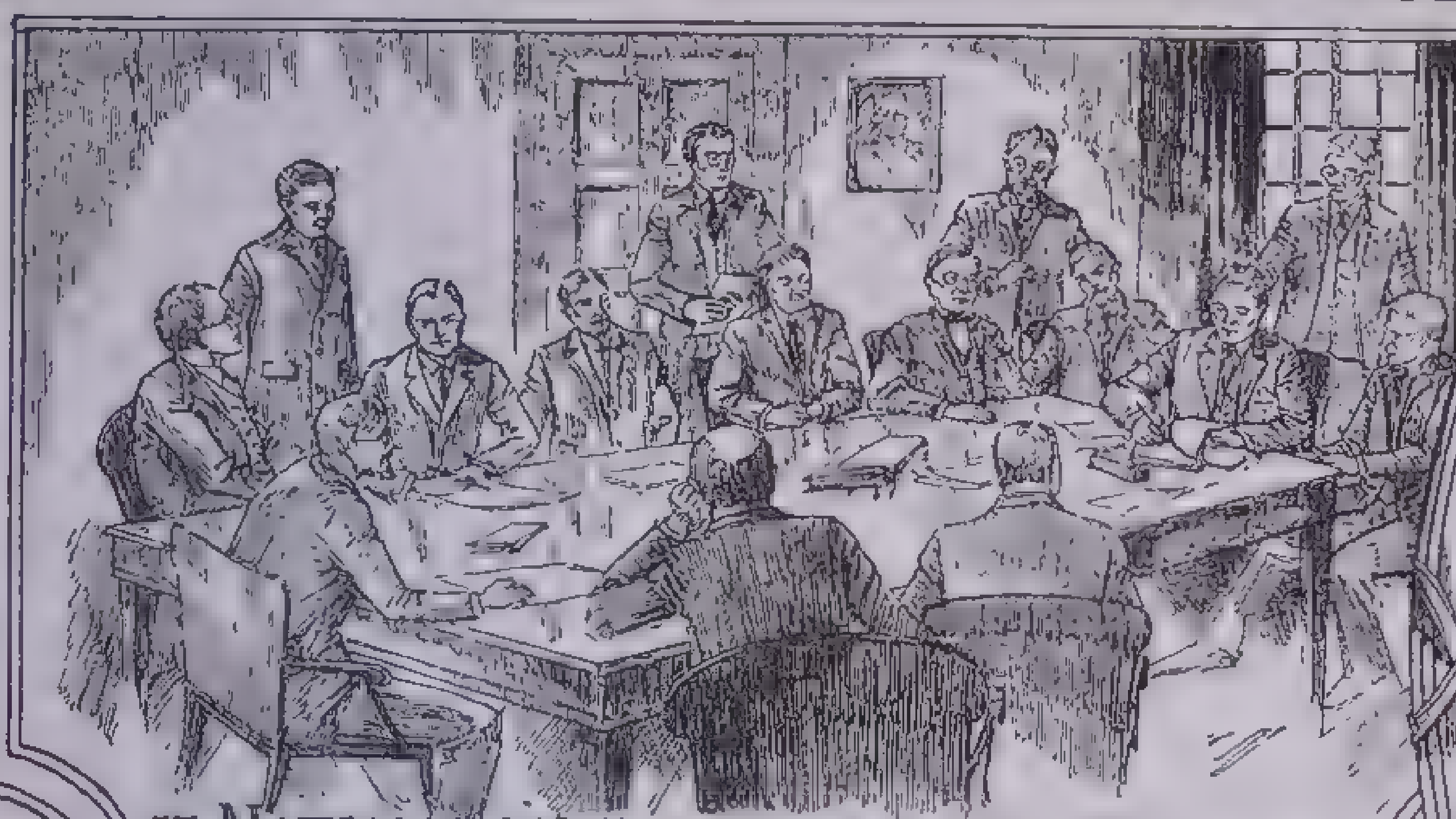
Hawley-Smoot Tariff.—The obvious remedy might have been to lower the tariff barriers and thus facilitate world buying and selling. Instead the Hawley-Smoot Tariff Act, May 28, put higher rates on about a thousand commodities. This was the highest protective tariff passed by Congress to date. Hoover had advised increasing the rates on farm products only, but duties on manufactured goods also were raised. And when the bill went through again in a revised form (the Hawley-Smoot-Grundy Tariff, June 1930) rates on everything were raised again and 25 nations retaliated with high tariffs on U. S. goods. Consequently in less than two years the United States lost $5,326,000,000 in world trade.

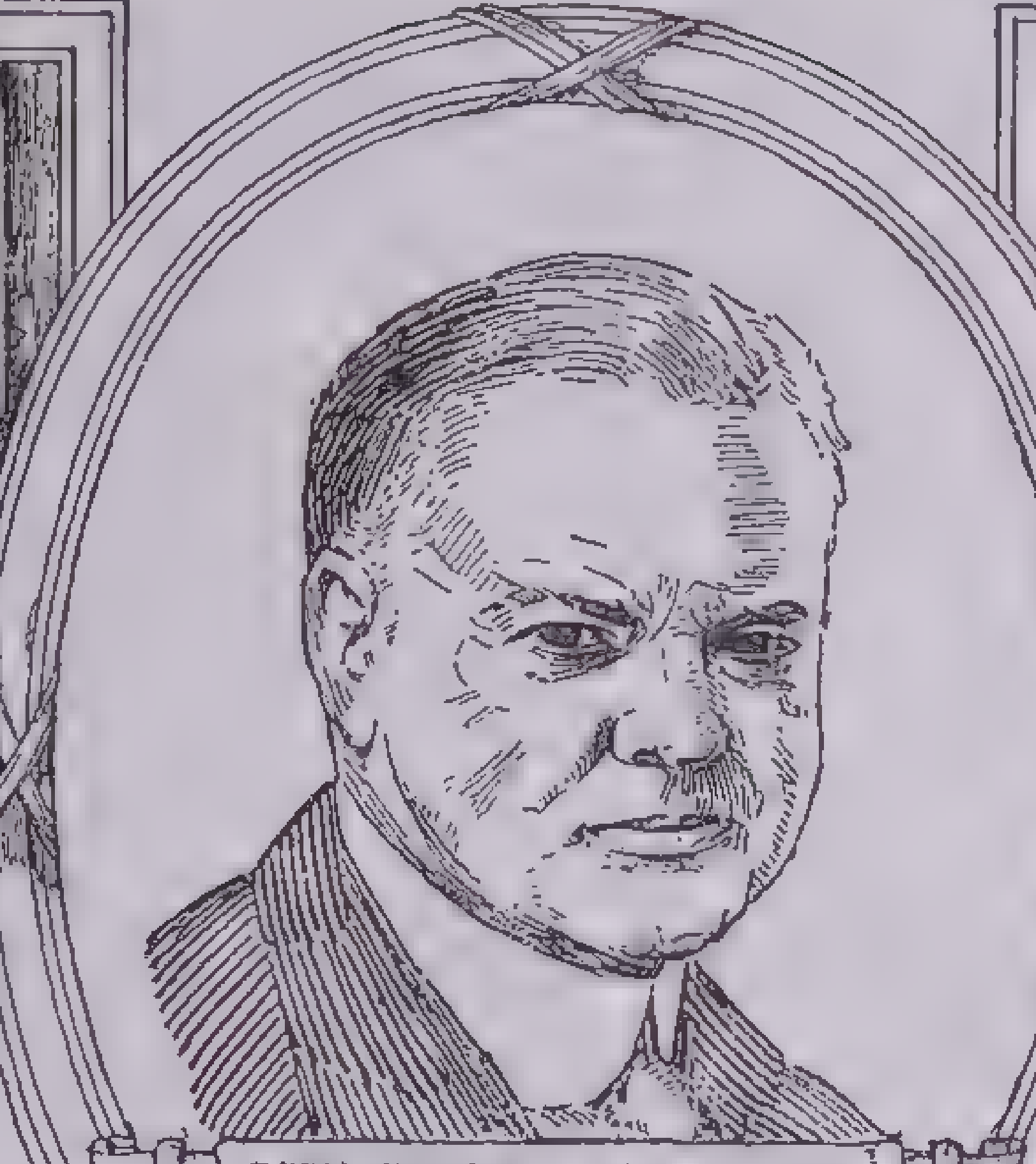
Wickersham Commission.—Hoover came into office believing that crime prevention was the "dominant national problem." He was aghast at the prevalence of bootleggers and machine-gun bandits, at the murders, kidnapings and holdups that at once terrorized the people and thrilled the young. He appointed a commission, May 1929, headed by George W. Wickersham, to investigate lawlessness and law enforcement. The first report came back Jan. 1931 and found the methods of prohibition enforcement at the root of all evil. It was not only profitable to break the law—but fun! The recommendations of the commissionars themselves, however, were so confused, at once opposing and recommending the repeal of the 18th Amendment, that the Wickersham commission's report was not taken seriously.

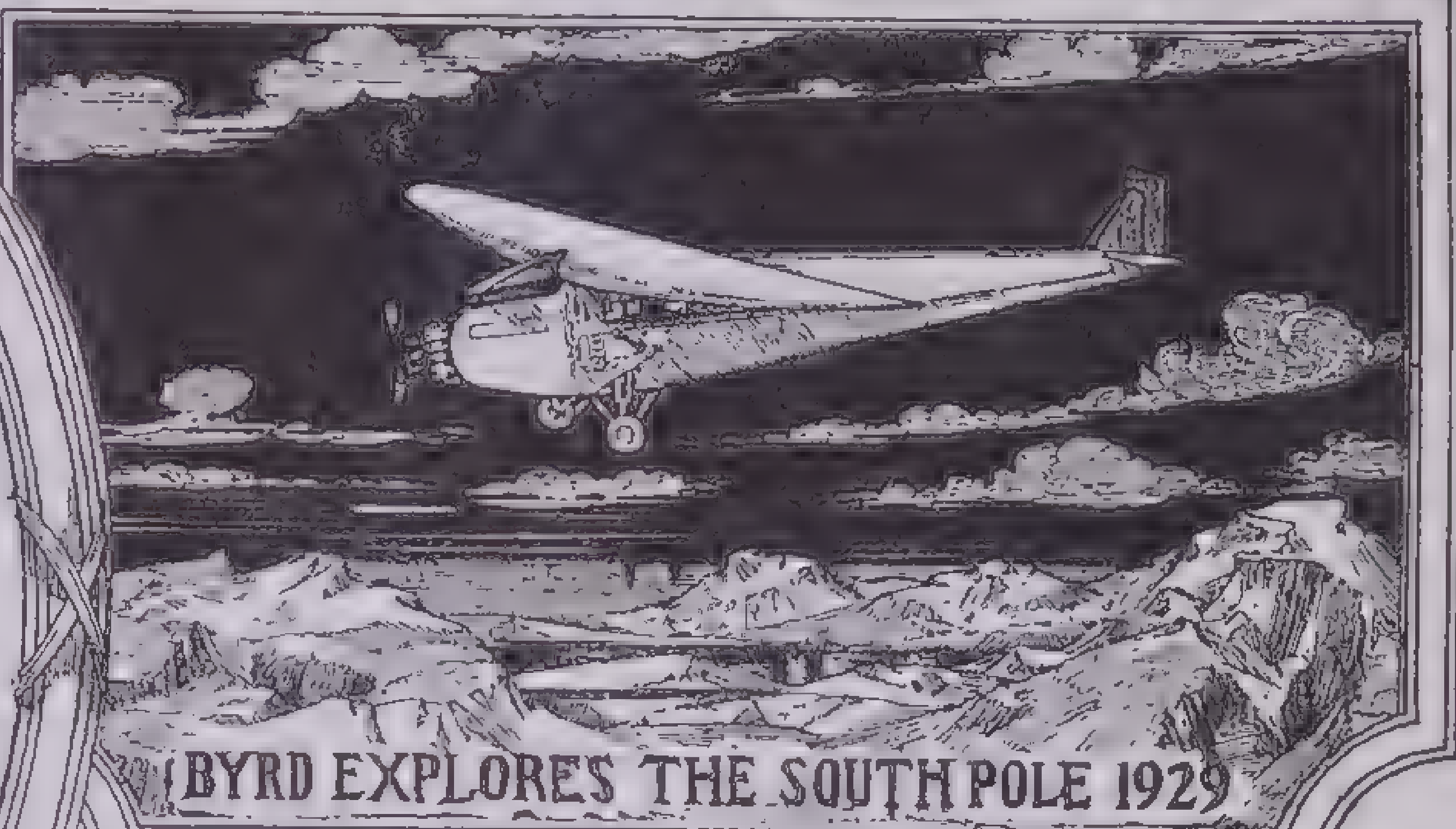
The Crash: Oct.–Nov. 1929.—Blind confidence that prosperity begets prosperity lured the nation deeper and deeper into speculation. "Buy stocks today and be a millionaire tomorrow" was the prevailing psychology. And just as the old homestead was mortgaged for funds to gamble on a mansion, the crash came. In Oct. 1929 the stock market went to pieces; 16,410,030 shares were suddenly for sale. Huge fortunes and modest lifetime savings were lost overnight; men and women of all walks of life were made penniless.

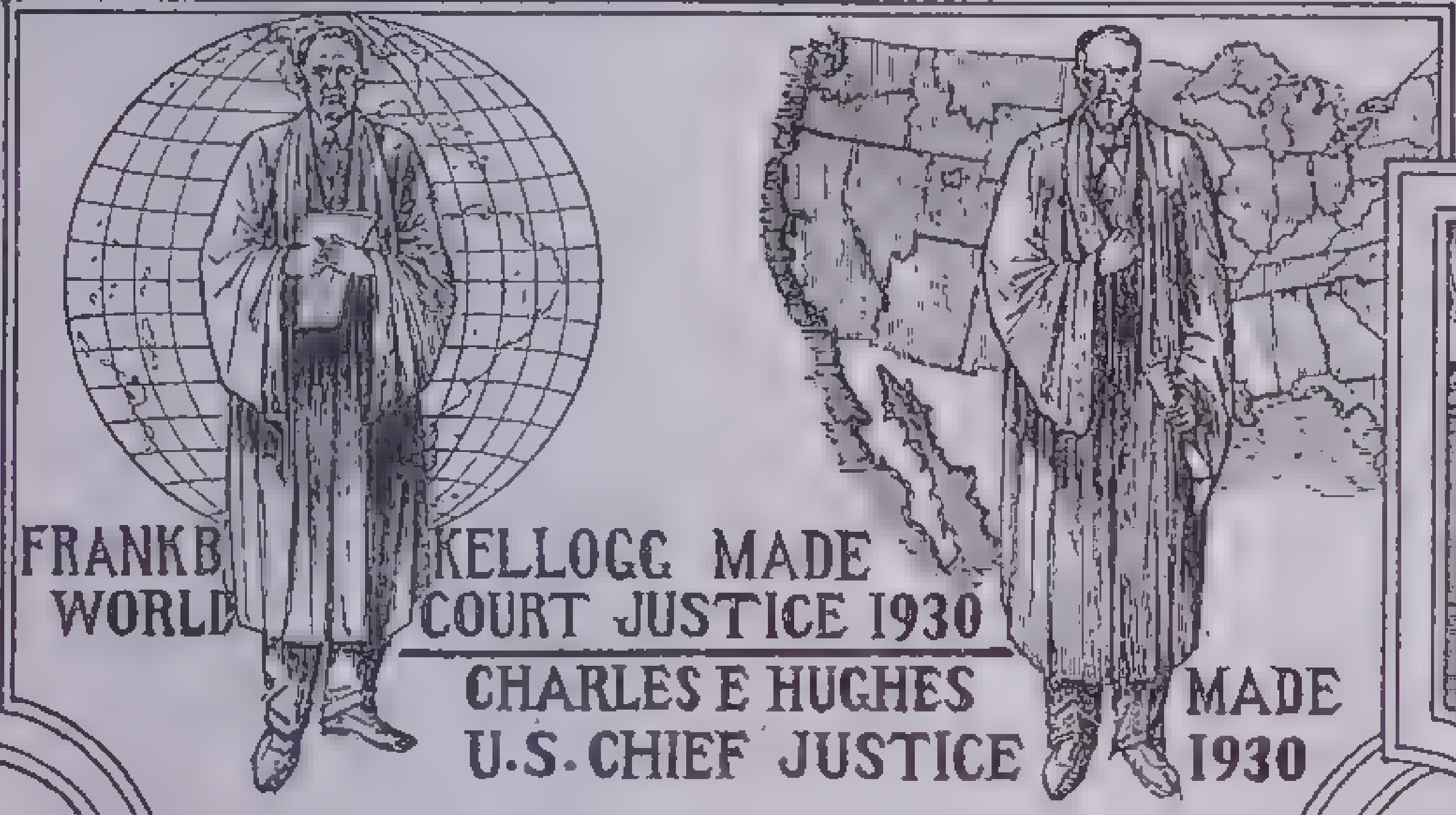
The government began a crusade of optimism, telling the people that "everything is fundamentally sound"; the worst will be over in 60 days; then in six months, that the nation has "passed the worst." But closed banks and factories gave the lie to the promise. The unemployed numbered 7,000,000 within a year and 15,000,000 by 1933. People were without money, without homes, without work, without spirit. The youngsters who stepped from childhood into life with no jobs in sight were without hope. Local and state charities could not begin to cope with the problem of destitution.

Depression Measures.—Hoover was definitely opposed to measures for Federal relief on various political and moral grounds. But he launched a huge program of public works in 1930

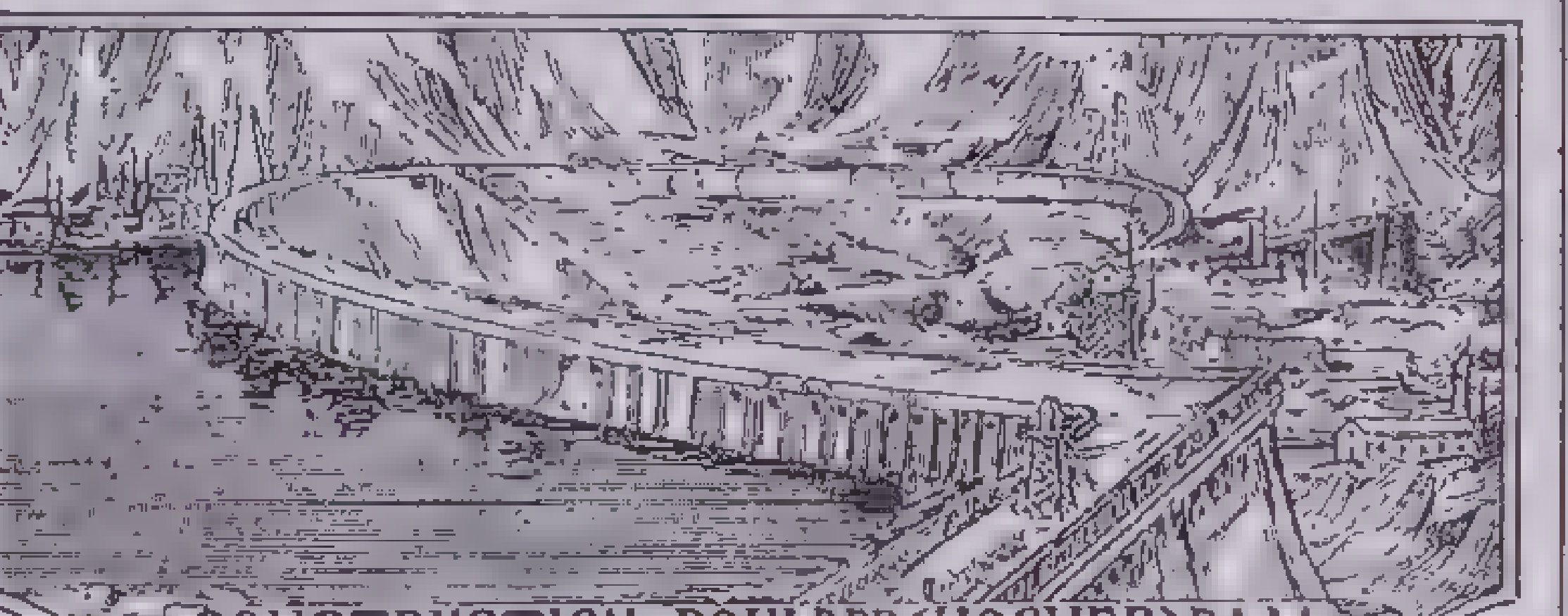

15 NATIONS SIGN ANTI-WAR TREATY 1929

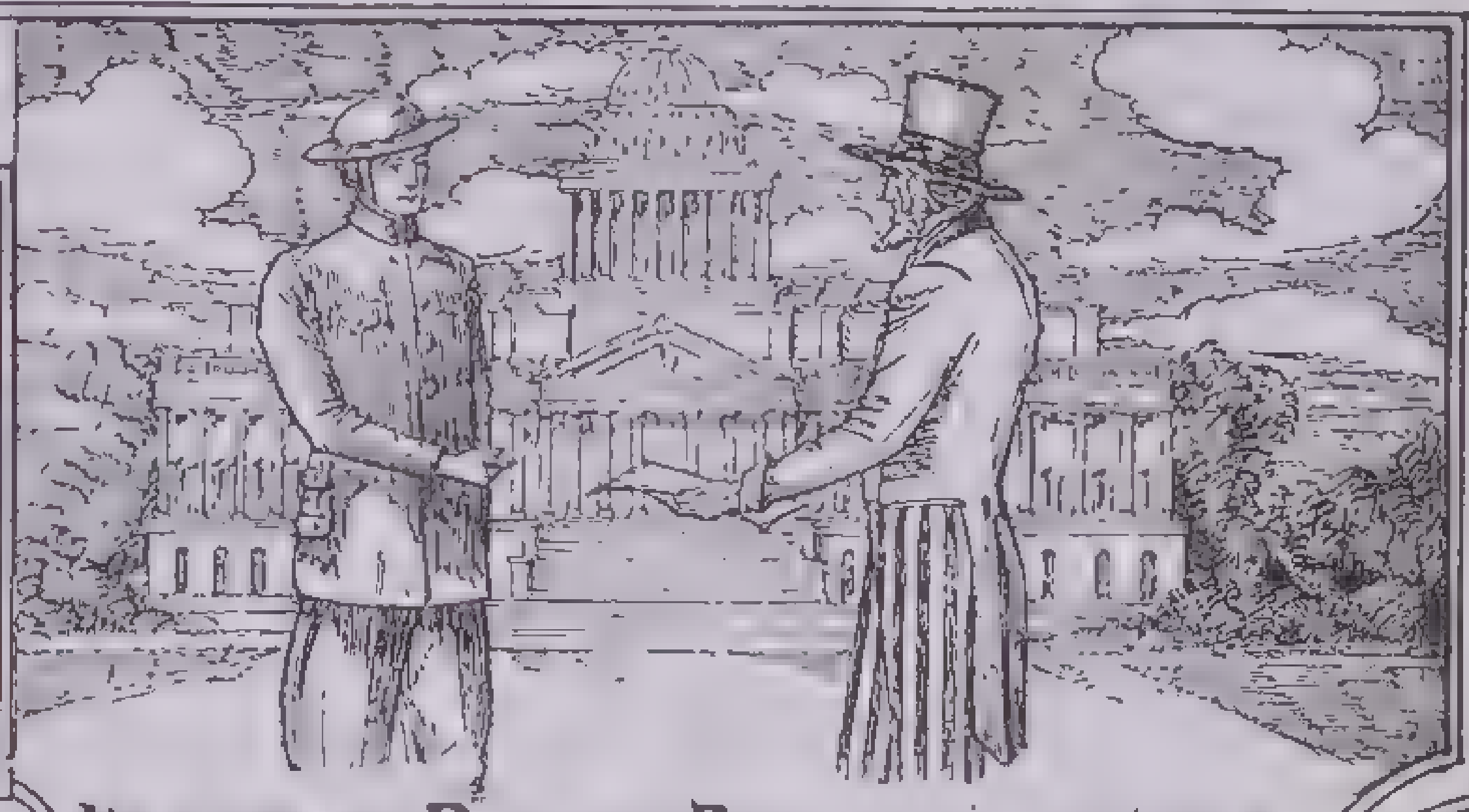

HERBERT HOOVER 1929 TO 1933


BYRD EXPLORES THE SOUTH POLE 1929


FRANK B KELLOGG MADE WORLD COURT JUSTICE 1930

CHARLES E HUGHES MADE U.S. CHIEF JUSTICE 1930


CONSTRUCTION OF BOULDER (HOOVER) DAM STARTED 1930


VETERANS BONUS BILL PASSED 1931

to stem unemployment, proposed the bankers' pool of $500,000,000 (1931) in an attempt to save the little banks, and in 1932 passed the bill for the Reconstruction Finance Corporation with $2,000,000,000 to loan to banks, railroads and other industries. Charles G. Dawes headed this Corporation, which it was hoped would lift industry and the nation with it out of the depression.

But nothing could, short of world-recovery. The economic disaster that had struck the United States was only part of the desperate plight of the world. But mere contemplation of world-distress could not cure the bitter plight of the homeless and jobless. Federal relief was needed to give the millions enough to eat and wear and do.

But the Treasury had a deficit of $900,000,000 in 1931, $2,000,000,000 by June 1932. Taxes had to be increased. Luxuries were taxed: automobiles, theater tickets, etc.; bank checks were taxed and telephone and telegraph messages. Income taxes were raised with a surtax on million-dollar incomes. But still the revenue was inadequate.

Moratorium.—The whole world situation was intensified by the problem of foreign debts. Europe owed the United States $238,000,000 and found it increasingly impossible to pay. In June 1931 Hoover proposed a one-year moratorium on *all* international debts, partly to save Germany from utter collapse and partly to give America's own debtors a chance to recuperate and eventually pay. When the year was over, however, the payments were smaller and smaller or were postponed indefinitely. Finland alone paid in full.

Foreign Affairs. Young Plan.—In 1929 Owen D. Young became chairman of the International Reparations Committee. He revised the system of payments, making them collectable through a Bank of International Settlements at Basle, Switzerland. Germany's reparations were again drastically cut. The main endeavor of the conference, however, was to do away with the old spirit of retaliation and put the question on a strict basis of world-finance.

London Naval Conference. — America joined Great Britain, France, Italy and Japan in a naval conference in London, Jan. 21–Apr. 22, 1930. This conference called a halt till 1936 to the renewed activity in war construction, especially of cruisers and submarines. The United States, Great Britain and Japan signed the treaty. France and Italy did not, apprehensive of their Mediterranean interests. The treaty called for naval parity between Great Britain and the United States, but allowed either one to increase her strength in emergency.

League of Nations; World Court.—Hoover's position on the League of Nations was that the United States would be "glad to co-operate with . . . endeavors to further scientific, economic and social welfare and to secure the limitation of armaments." In fact by 1931 the United States was participating in some activities of the League, though it was technically not a member.

In 1928 Elihu Root had framed a formula that would satisfy the contended 5th reservation of the United States and at the same time be acceptable to the League and the Court. The Root Protocol granted the United States the privilege of consultation with the Court Council to learn whether American interests were involved before any question came before the Court. This seemed at last a basis for agreement, but the Senate would not adopt it.

Other Events.—In February, 1933, the 20th Amendment to the Constitution was ratified. It abolished the "lame duck Congress" (that is, the session starting in December after a November election in which members not reelected still had seats—new members were not seated until 13 months after election) and changed inauguration day from March 4 to January 20,

Election of 1932.—Hoover was renominated by the Republican party. The Democrats nominated Gov. Franklin D. Roosevelt of New York. He toured the country promising the people what they wanted—a New Deal. Business man, farmer, laborer and unemployed, the financier who had lost his bank and the little man who had mortgaged his home, one and all were eager to believe in relief and recovery. The result was a landslide for Roosevelt. He received 472 electoral votes to Hoover's 59 and 22,821,857 popular votes to Hoover's 15,761,841.

Franklin D. Roosevelt—1933–

Franklin D. Roosevelt, the 31st President, came into office at the peak of the banking crisis. There was a run on almost every bank in the United States that had not already closed its doors. In Jan. 1933 the banks of Nevada had been closed by the governor's proclamation; in February Louisiana followed suit. On Feb. 14 the governor of Michigan proclaimed all Michigan state banks temporarily closed. Panic swept the country and by March 1 half of the states had suspended banking. On the morning of inauguration day, March 4, Gov. Lehman shut the banks of New York.

In the midst of the nation's terror Franklin D. Roosevelt took his oath of office and on March 5, 1933 proclaimed a nationwide "bank holiday" that closed every bank in the United States and saved the country from ruin.

Recovery Measures.—He called a special session of Congress for March 9, and on that same day the Banking and Gold Control Act was passed. This bill gave the Secretary of the Treasury the power to reopen the national banks as rapidly as their condition would warrant, and to appoint conservators for those that were insolvent. There was a sudden surge of faith in the decision and promptness of the new President; many banks were reopened (though some too soon) and public deposits began to dribble back.

The Economy Bill, March 20, 1933, reduced federal salaries and lopped off about half the amount being paid out in veterans' benefits. Roosevelt expected to save the government about $500,000,000 by this act.

Some $150,000,000 yearly revenue was expected from the sale of 3.2 per cent beer, now authorized by another emergency measure, March 22, 1933. The 21st Amendment, repealing the prohibition amendment, went into effect in December, 1933.

The AAA.—How to relieve the mortgage-ridden farmer was one of the first considerations of this special Congress. The Agricultural Adjustment Act, May 12, 1933, provided for the reduction of cultivated land in the United States by some 40,000,000 acres in order to regulate surpluses and raise agricultural prices. The crops and livestock thus lost to any individual farmer would be paid for out of a tax on the processing of butter, cheese and other dairy products, wheat, corn, meat, sugar, wool, cotton, etc. for market. Beyond this the Emergency Farm Mortgage Act, also May 12, authorized the Federal Land Banks (created by Congress in 1916) to make loans to farmers for various purposes, such as to buy land, fertilizers, livestock, etc., to pay off old debts, refinance farm mortgages, and to give to farmers who were mortgaged up to their necks cash to work their farms.

During the first year of its existence the AAA processing tax covered all the benefits paid out. In 1932 the largest farm population in the history of the United States totalled the smallest cash income ever reckoned on the books: $4,377,000,000. In 1935 the total income of the American farmer was $6,900,000,000; and one-quarter of that two-billion dollar increase was directly due to benefit payments. In addition, the AAA provided money for drought relief, conservation of food and of seeds and the eradication of livestock diseases.

A Dollar is 59 Cents.—To satisfy the inflationists in Congress who believed that inflation and nothing but inflation could raise prices to the desired level, amendments to the AAA were adopted along with the bill. They gave the President power to replace $3,000,000,000 worth of government bonds with paper money, to reduce the gold content of the dollar not more than 50 per cent and to reestablish bimetallism as he saw fit. No gold was to be exported from the United States after April 19,. On Jan. 31, 1934 Roosevelt fixed the value of the American dollar at 59.06 cents.

The NRA.—The famous experimental National Industrial Recovery Act was passed June 16, 1933. It declared an emergency in unemployment, shattered industry, lowered standards of living and lowered public morale. It created the National Recovery Administration (NRA), headed by General Hugh S. Johnson, to formulate the codes for the reorganization and government control of industry. Fair-play codes were drawn up by Johnson and representatives from every industry to which they were to apply. The codes established a 40-hour week and a minimum weekly wage between $12 and $15. They abolished the sweatshop regime and forbade the employment of children under 16 years of age. They provided for collective bargaining between labor and employers, and required the books of all business houses to be accessible to government inspection at all times. A legion of boards and agencies to do the work of the NRA was co-ordinated by a National Executive Council under the direction of Donald Richberg.

Thumbs Down.—Big Business was heartily in favor of the banking and beer measures designed to rescue finance and industry and increase the government revenue; but it was thumbs down on socialistic experiments that might pay a mortgage on a farm, abolish sweatshops or child labor or drag business transactions into the light of day.

The processing tax of the AAA was declared unconstitutional (Jan. 1936) by the Supreme Court on the ground that it violated state rights. The NRA was declared unconstitutional (May 1935) on the grounds that Congress could not delegate authority to the President without well defined specifications of the authority and that no delegation of authority could apply Federal authority to intrastate activities.

The FERA.—To meet the staggering problem of unemployment relief, the Federal Emergency Relief Administration was created, May 12, 1933, with its message to the jobless millions: "You shall not starve." It appropriated $500,000,000 to be spent in direct relief, that is, for food, clothing, shelter, fuel and *work*.

All manner of agencies and programs were active under the FERA and in co-operation with it. The Federal Surplus Relief Corporation, for instance, organized under the AAA, bought and distributed farm surpluses to fed and clothe the destitute. The Rural Rehabilitation Program paid for labor in food, farm implements, livestock, etc. There was a Student Aid Program designed to keep the young in school and college. This was later incorporated in the National Youth Administration, set up in 1935. A Resettlement Administration gave hundreds of families the chance to make a new start especially on new lands in Alaska.

By the end of 1935 most of the direct and work relief of the FERA was abandoned to forestall the "spiritual and moral disintegration" that a continued dole necessarily creates. The unemployed and unemployable were thus turned back upon state and local funds.

The Civil Works Administration was a temporary set-up, created Nov. 8, 1933, and put in motion in one week to tide 4,000,000 men over the dreadful winter of 1933–34. $400,000,000 was transferred from the FERA for this emergency. All the jobs undertaken were three-month jobs only. There was work on streets and roads, public buildings, parks, waterways. Pest elimination and clerical work also were included. The FERA was closed out June 30, 1938.

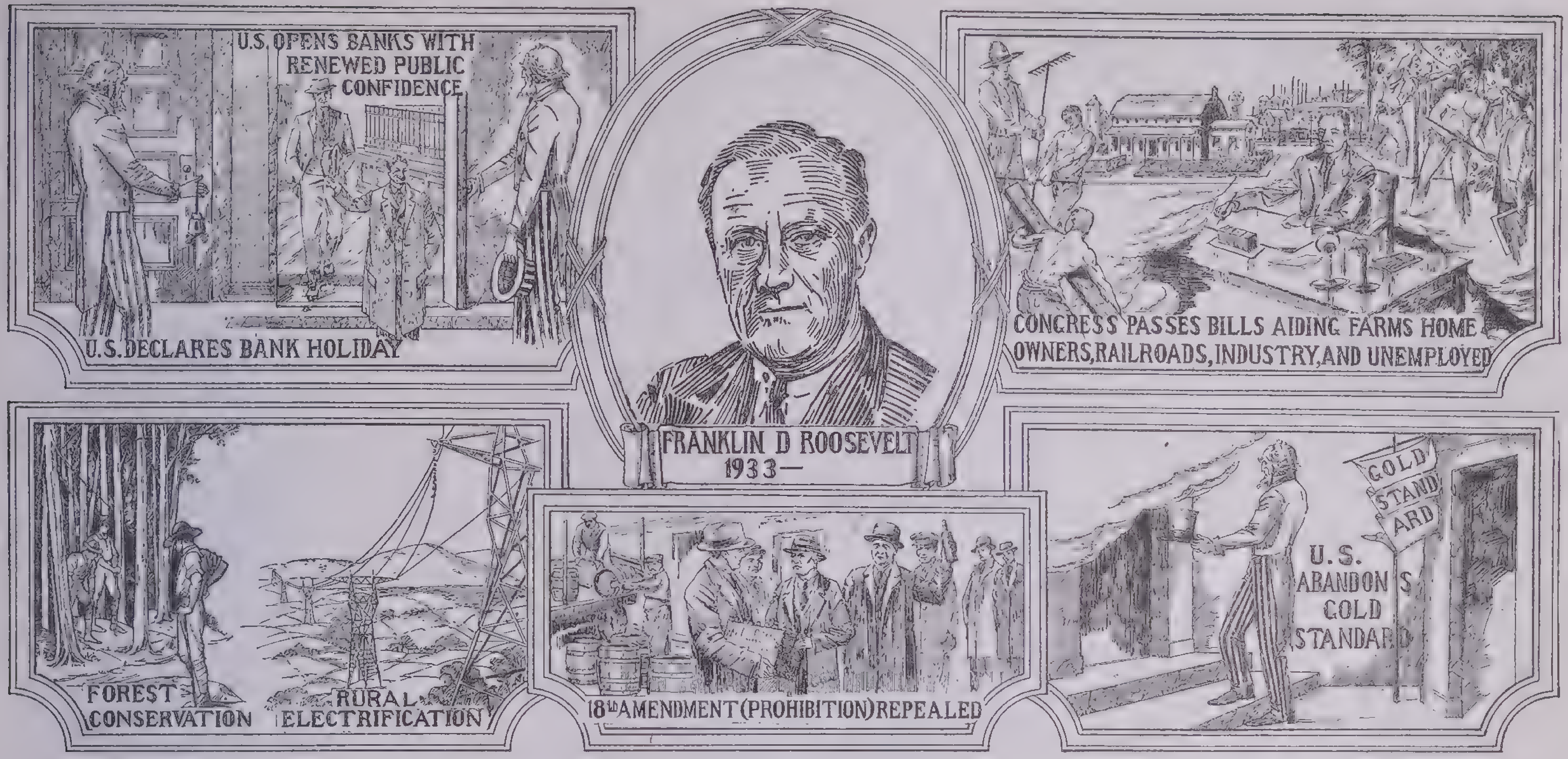
The WPA.—The Civil Works Administration stopped on the dot of April 1, 1934. Its work was taken over by the Public Works Administration, which in turn gave way to the Works Progress Administration (WPA) on May 6, 1935. This was designed to scratch off the relief rolls the names of "the maximum number of persons in the shortest time possible." This vast organization operated through practically all the relief agencies in the United States. Men were put to work through the U. S. Employment Service on highways and streets, public buildings, water supply and sewer systems, parks, playgrounds, airports, etc. There were also projects on forestation, sanitation, flood and erosion control and education—69,152 projects were listed by Jan. 1, 1936 at a total cost to Federal and State governments of $1,169,650,880.

The CCC.—The Civilian Conservation Corps, created March 31, 1933, was one of the most popular of all the New Deal efforts to make jobs for the jobless. Young men 18 to 28 years of age were regimented into camps and put to work building wild life reserves, national parks, erosion control dams, fire breaks, etc. They planted trees, fought forest fires and carried through pest and rodent elimination programs. By June 30, 1935 one million men had been in the CCC. $1,204,560,000 was spent in this service by March 1, 1936. Roosevelt's economy move to cut the enrollment down to 300,000 by July 1936 was violently opposed and the program was extended.

The TVA.—The Tennessee Valley Authority, established May 18, 1933, is the hugest social and economic welfare service in the world. Its purpose is the development of the Tennessee River region and it provides with electric power and fertilizes parts of seven states: Tennessee, Virginia, North Carolina, Georgia, Alabama, Kentucky and Mississippi. The PWA provides funds for its vast program of reforestation, flood control, soil erosion control, population distribution, educational and vocational opportunities. The TVA was fought tooth and nail by the big power interests, but was upheld by the Supreme Court, Feb. 1936.

Foreign Affairs.—The United States recognized the new Russian Soviet government, Nov. 1933, and sent William C. Bullitt as ambassador. The Tydings-McDuffie Act, 1934, provided for the final independence of the Philippine Islands in ten years. The independence of Cuba, too, was guaranteed, 1934, by the repeal of the Platt Amendment. Adherence to the World Court again came up in the Senate, Jan. 1935, and was again defeated.

Election of 1936.—In the eyes of some, Roosevelt loomed as a Hitler or a Mussolini. To the conservatives he seemed a Red, a communist, a "cock-eyed experimenter" and the tool of a radical "brain trust" (the name applied to his advisers from colleges and universities). Loud and violent were


U.S. OPENS BANKS WITH RENEWED PUBLIC CONFIDENCE
U.S. DECLARES BANK HOLIDAY
FRANKLIN D ROOSEVELT 1933—
CONGRESS PASSES BILLS AIDING FARMS HOME OWNERS, RAILROADS, INDUSTRY, AND UNEMPLOYED
FOREST CONSERVATION
RURAL ELECTRIFICATION
18th AMENDMENT (PROHIBITION) REPEALED
GOLD STANDARD
U.S. ABANDONS GOLD STANDARD

the campaign harangues of his critics. But he was renominated unanimously at the Democratic convention with J. N. Garner for Vice-President. The Republicans nominated Alfred M. Landon of Kansas with Colonel Frank Knox of Illinois for Vice-President. Roosevelt was re-elected in 1936 with a more astounding landslide than in 1932. He carried every state but Maine and Vermont; and received 523 electoral votes to Landon's 8. The popular vote for Roosevelt was 27,561,612; for Landon 16,681,913.

Roosevelt's Second Administration.—In 1937 for the first time the President was inaugurated in January (20th) instead of in March; and for the first time the Congress that met at the beginning of the year was composed of representatives chosen at the elections of the preceding November—no more hold overs or lame ducks! Early in February the President urged the Congress to reform the Federal judiciary by adding new judges to Federal courts—one for each justice who stayed on the bench after he reached the age of retirement (70 years). Many of the President's loyal followers joined the opposition to this suggestion—it was packing the Supreme Court, they said, and a scheme to get a majority of that Court favorable to the measures of the New Deal. The efforts of the Administration to pass the proposed bill were unsuccessful. In March and April the Supreme Court decided several important constitutional cases in favor of the New Deal; and in June Justice Van Devanter of the Supreme Court announced his resignation. The President's appointee to the vacancy was U. S. Senator Hugo Black of Alabama. Rumors that Senator Black had been a member of the Ku-Klux Klan delayed his approval by the Senate and robbed the Administration of some of the prestige it would have gained by securing a larger representation on the Court that was favorable to New Deal legislation. Early in 1938 still another Justice of the Supreme Court, Sutherland of Utah, retired, and the President thus gained his objective of putting new blood in the Court. But the method he had urged brought the Administration much criticism.

Labor Unrest.—The vote of organized labor had been a considerable factor in the re-election of the President, and early in the new administration there was an outburst of sitdown strikes in which employees occupied the property of their employers and stayed there until they got what they were striking for. The new strikes were engineered by the Committee for Industrial Organization (C.I.O.) in an attempt to organize all workers in the automobile and steel industries. The Administration was accused by employers and by a large part of the press of encouraging this new and disturbing form of economic warfare. The Department of Labor aided in the settlement of several disputes (mostly in favor of labor), and the President finally appealed to both sides with the Shakespearean phrase, "A plague on both your houses."

Big Business and the Government.—The people's mandate to the President had not won organized capital to his support. The strikes undertaken to enforce obedience to the rulings of the National Labor Relations Board made Big Business apprehensive—and so did the uncertainty of what was to be the Administration's policy on such questions as monopolies, corporation taxes and other possible reform measures that might delay the return of prosperity. The end of 1937 and the early months of 1938 witnessed a "recession"—growing unemployment, decreased production, smaller sales and other signs of discouragement. The Administration accused a faction in Big Business of intentionally impeding recovery and of raising the cost of living by boosting prices. Big Business insisted that the recession was the fault of the Administration's dangerous and frightening policy.

Neutrality and Foreign Affairs.—The civil war in Spain and the invasion of China by Japan made Congress the more eager to guard against anything that might involve the United States in war. In April 1937 Congress adopted a joint resolution on neutrality, supplementing resolutions of 1936 and 1935 and giving the President power to forbid shipment of arms to countries at war or to a country in civil war; and after such a proclamation he was authorized to forbid the shipment of materials other than actual war supplies. Travel by an American citizen on the ship of a belligerent country was declared unlawful except under regulations to be made by the President. The effort to avoid war was plain; so was Congress's willingness to put the responsibility on the Chief Executive.

Roosevelt's Third Administration. — Defeating W. Willkie in 1940, Roosevelt became the first third term president. Congress passed the Lend-Lease Bill for all-out aid to England, China and Russia. A large army was drafted. Japan attacked the United States December 7, 1941, and the U. S. entered the war. See World War II, p. 805c.

SUMMARY

The main tendencies in American history may be briefly summed up for five main periods of that history: (1) ending with 1789, the adoption of the Constitution; (2) 1829, Jackson's election; (3) 1865, the end of the Civil War; (4) 1913, before the World War; and (5) today, in the midst of economic and political confusion.

1789.—The discovery and the settlement of the New World grew out of the Commercial Revolution that followed Renaissance and Reformation. It was part of the expansion of Europe, of movements across oceans. Away from the Old World, pioneers in the New chafed at restraint. Having used their strength in wars against the Indians and the French, they took advantage of war in Europe to break with England and to set up a new nation. They borrowed ideas and principles of government, a little from ancient Greece, a little from Switzerland and Holland, more from English and French thinkers and leaders. But the new nation was really distinctive and new, unlike anything that had gone before.

1829.—In forty years the nation had grown from four million to 13 million, and from 13 states to 24. The United States had fought in 1812-15 a second War of Independence—helped again by wars in Europe. And European politics had made it possible for us to spread our rule west to the Mississippi. Jefferson and Jackson (just elected President in 1828) made the government more truly a government of the people. Parties in politics were becoming more powerful. Slavery, states rights, tariffs, other new issues were coming to the fore—issues economic and regional as well as political and partisan.

1865.—Five years before this date, the Census had shown almost 31½ million inhabitants in a United States with two-thirds more area than in 1829—spreading from ocean to ocean. The War between the States that ended in 1865 proved that sectional differences could not split this great country into two nations. The war ended slavery and the plantation system of the Old South. The Industrial Revolution and the Agricultural Revolution had come to all the nation. The power of wealth—in trade, transportation and manufacturing—was greater than ever before: the North and the Middle West were rich and strong—had held the Union together, were in power. The railroads — with help from the Federal Government—ran all the way to the Pacific.

1913.—In 50 years the population of the United States had nearly trebled—from 31½ million to 92 million. And in 1910 the area of the U. S. was one-fifth more than at the end of the Civil War; all the new territory was at a distance—Alaska, Hawaii and other island possessions. In this and many other ways we had become a World Power. The South, since 1876 free from hateful Reconstruction control, was gradually becoming industrial with foundries, railways and cotton mills. Big business seemed to be even more powerful than 50 years before. Labor organizations were getting stronger. The election of 1912 had put a Democrat in the White House—the almost unbroken Republican control of the Government for 50 years was threatened. Reform of corrupt city and state governments was attempted.

Today.—The hopes of reform and of unparalleled prosperity that we had in 1913 were not realized. America went into the World War in Europe, made it possible for the Allies to win by helping with men and money, would not join the League of Nations that was planned to make more world wars forever impossible. The world-wide depression of the 1930s ended the war prosperity. Our Federal Government with a New Deal attempted to secure Reform, Recovery and Relief—and in this tremendous task assumed greater control over industry, business and the individual. The emergency added to the powers of the Chief Executive.

THE LEAGUE OF NATIONS

During the World War the centuries-old plan of organizing nations into an association for the preservation of peace and the supervision of international affairs was warmly and actively discussed. It was advocated by former President Taft of the United States, by Sir Edward Grey and Lord Robert Cecil of England, by Léon Bourgeois of France and by General Jan Christiaan Smuts of South Africa. In the United States the League to Enforce Peace, the League of Free Nations Association and other organizations were formed to familiarize the public with the idea. It received the approval in 1916 of President Wilson, who ultimately made it the cornerstone of his foreign policy. Government commissions in the United States, Great Britain and France studied alternative plans. At Paris the Peace Conference approved the principle of a league on January 25, 1919, and a draft Covenant of the League on February 14. The final draft of the Covenant was approved April 28 and, largely because of the insistence of President Wilson, was embodied in the treaties of peace. The League of Nations actually began to operate on January 10, 1920.

The basic machinery provided by the Covenant consists of the Assembly, the Council and the Secretariat. The assembly represents the many member states,[1] each of which, with three delegates, has a single vote. The Council is composed of the delegates of the four permanent members (Great Britain, France, Italy[2] and Soviet Russia) and of eleven nonpermanent members elected by the Assembly—three each year to serve for 3 years. China was elected the latest nonpermanent member, to represent the Far East after the resignation of Japan, formerly a permanent member of the Council. The other members of the Council in 1937 were Bolivia, Chile, Ecuador, Latvia, New Zealand, Poland, Rumania, Spain, Sweden and Turkey. The permanent Secretariat, with its staff of over 600 men and women, is headed by a Secretary-General appointed by the Council with the approval of the majority of the Assembly. The Secretariat has about 400 offices in the League of Nations Palace in Geneva. The Palace, which was finished in 1936, has 2,000 seats in its Assembly Hall.

League Membership and Governing Bodies.—The membership of the League includes most of the nations of the world, fifty-four states having such membership in 1938, after Guatemala, Honduras, Nicaragua and Paraguay had resigned in 1937 and 1938. Germany, admitted in 1926, withdrew in 1935. Japan withdrew in 1935 in protest against the League policy toward the Japanese invasion of Manchuria in 1931. The United States is not a member, although it participates officially and unofficially in various committees and activities and registers its treaties in the Geneva office. The League Covenant provides that if the United States joins the League, it shall have a permanent seat in the council. The reasons why the United States has not become a member are many. Most important was the general objection in the United States to Article 10, binding "members . . . to respect and preserve as against external aggression the territorial integrity and existing political independence of all members of the League." This seemed likely to embroil us in European quarrels, and there is longstanding distrust of any foreign entanglement. Lastly at the time the question was raised at the end of the World War, membership in the League was a Wilson policy, and his political enemies opposed it on that ground. Since 1935 the United States has been a member of the International Labor Organization at Geneva, but this connection is possible without membership in the League itself. The United States has co-operated in such activities as economic conferences, disarmament, traffic in opium and other dangerous drugs, double taxation, the protection of children, communications and transit, trade restrictions and so on.

Under the Covenant the Assembly meets "at stated intervals and from time to time as occasion may require at the Seat of the League or at such place as may be decided upon." (Article 3.) Usually it meets only once a year, in September, at Geneva. "The Assembly may deal at its meetings with any matter within the sphere of action of the League or affecting the peace of the world." (Article 3.) The approval of two-thirds of the Assembly is ncessary for the admission of a new state to membership in the League. "Any member of the League may, after two years' notice of its intention so to do, withdraw from the League, provided that all its international obligations and all its obligations under this Covenant shall have been fulfiled at the time of its withdrawal." (Article 1.)

The Council must meet at least once a year. It held four sessions annually until 1929, when it was decided that three sessions a year would permit more frequent attendance of prime ministers or foreign ministers without requiring their too frequent absence from attention to national affairs. At its meetings the Council may deal "with any matter within the sphere of action of the League or affecting the peace of the world." (Article 4.) The Council has extensive powers to keep members of the League from going to war; and should

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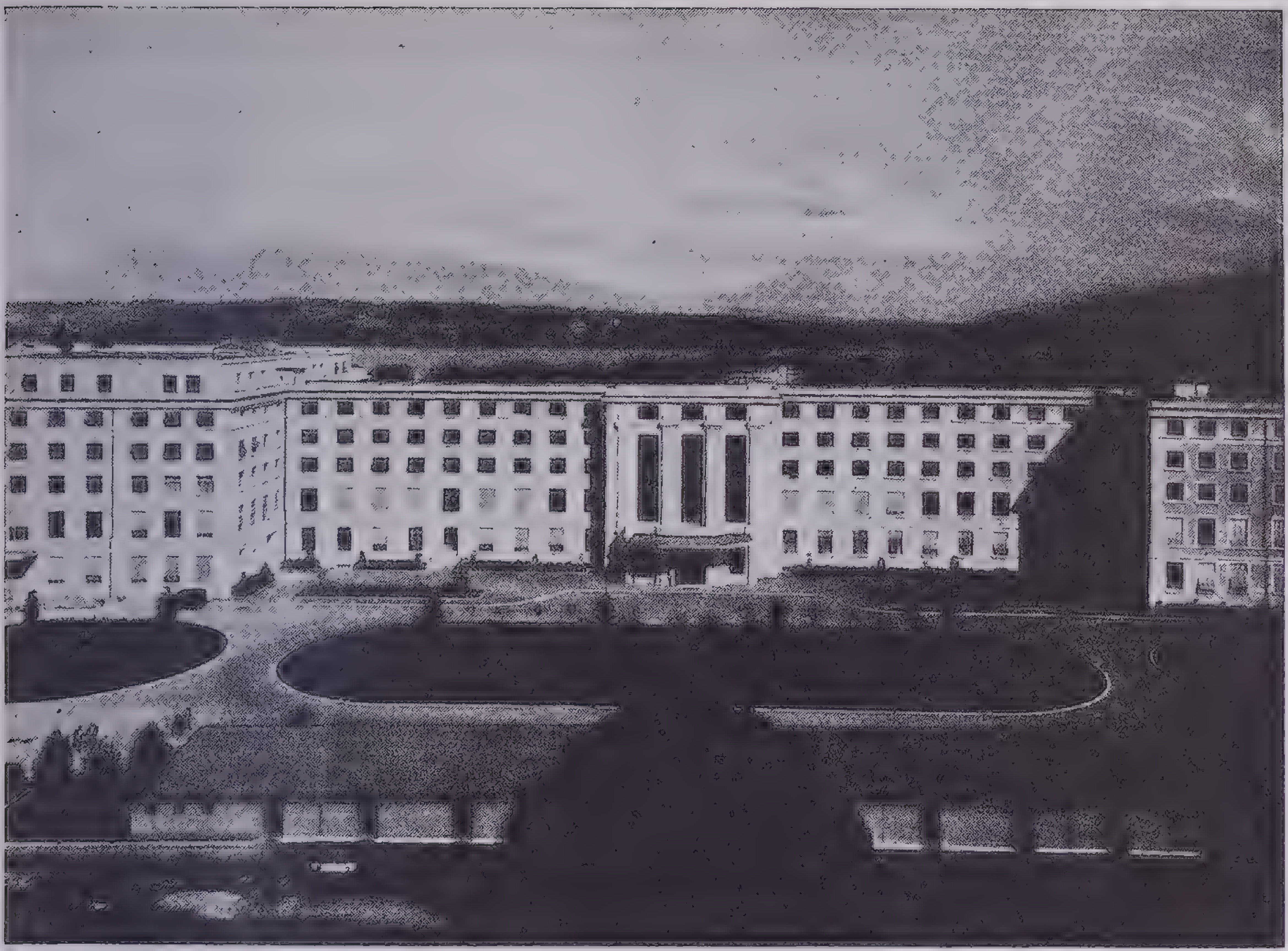
[1] The members were: Abyssinia, Afghanistan, Albania, Argentina, Australia, Belgium, Bolivia, British Empire, Bulgaria, Canada, Chile, China, Colombia, Cuba, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Estonia, Egypt, Finland, France, Greece, Haiti, Hungary, India, Iraq, Irish Free State, Italy, Latvia, Liberia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Panama, Persia, Peru, Poland, Portugal, Rumania, Salvador, Siam, South Africa, Spain, Sweden, Switzerland, Turkey, Union of Soviet Socialist Republics, Uruguay, Venezuela and Yugoslavia.

[2] In 1937 Italy announced its withdrawal from the League.



Courtesy Swiss Federal Railroads

Palace of the League of Nations, Geneva, Switzerland
Main entrance of the Secretariat Building

any member of the League resort to war in disregard of its Covenants, it is the duty of the Council "to recommend to the several governments concerned what effective military, naval or air force the Members of the League shall severally contribute to the armed forces to be used to protect the covenants of the League." (Article 16.) Provision is made to apply financial and economic sanctions against the "covenant-breaking state." Except where expressly provided otherwise, "decisions at any meeting of the Assembly or of the Council shall require the agreement of all the Members of the League represented at the meeting." (Article 5.) Such decisions are recommendations, not instructions, to member governments.

The Secretariat is the continuously functioning organ of the League and is assuming a growing importance. It is divided into sections as follows, each specializing on the subjects indicated: political, financial, economic relations, communications and transit, minorities, mandates, disarmament, health, opium traffic and social questions, intellectual co-operation, legal, information. Very real and somewhat successful efforts have been made to have its members (now about 600) represent the small powers as well as the large and to have them regard themselves as officials of an international organization rather than of a national state. They are League employees and are paid by the League. Because the Secretariat is a continuing body, both the Council and the Assembly depend upon it for information bearing on the questions that arise, as well as for purely secretarial assistance. The Secretariat is becoming more and more the executive organ of the League.

The expenses of the League are paid by contributions of its members according to their ability to pay, which is determined by the Assembly. The burden is borne by the big Powers, because they are assessed more heavily and because the others do not pay promptly. At one time in 1934 thirty-five members were in arrears on their dues and the total of the arrears amounted to more than the present annual budget of $10,000,000.

Functions and Responsibilities.—The general functions of the League of Nations fall into two main categories, "to promote international co-operation and to achieve international peace and security" (Preamble.) Although high hopes were entertained that the League would be successful in preventing wars, attention is now centering more and more in the League's work for international co-operation in numerous other matters. For such co-operation there have been created a large number of technical and advisory committees composed mainly of experts. Commissions of the League aided in the economic restoration of Austria, Hungary, Greece and Bulgaria. The League helped restore more than half a million war prisoners to their homes in twenty-six different nations. The Refugee Settlement Commission has aided in the settlement of homeless millions, notably in the repatriation to Greek territory of one and a half million Greeks who had lived in Turkey for generations. Under League auspices there have been summoned a number of world economic conferences to deal with the problems of finance, trade and tariffs. Even if it has not been successful in more fundamental matters, the League has obtained international agreements on customs formalities on the export of hides, skins, bones, meat and other animal products, on the suppression of counterfeiting and on the unification of laws relating to bills of exchange, promissory notes and checks. A good measure of success has attended efforts to standardize international practices for transportation by rail, rivers, canal or sea. The League's Public Health Organization has fought typhus and cholera epidemics in eastern Europe and has won the adoption of certain agreements toward standardization of medical measurements, definitions and methods. It has standardized serums, vaccines and biological products and has endeavored to standardize statistics of disease and deaths. Tests have been made with various remedies for malaria, and international studies are being made of tuberculosis, leprosy and syphilis. Through the permanent Epidemiological Intelligence Service, operating through centers in Geneva and in Singapore, infectious diseases are kept from spreading by ship throughout the world. Through other committees the League has worked to abolish slavery, to end the international traffic in women and children and the trade in obscene publications. In its efforts to keep the production of narcotics down to the limits necessary for medical and scientific requirements, the League of Nations has been very aggressive, if not perfectly successful.

Through its membership of outstanding scientists, the Committee on Intellectual Co-operation has sought to educate the world in the spirit of peace, has assisted states in the organization and improvement of educational services and has promoted a disinterested discussion of intellectual subjects. As a result of its work, offensive material in history and other textbooks has been omitted to the advantage of good relations between geographical neighbors. International co-operation in radiobroadcasting and in the work of public libraries and museums has come within the sphere of this Committee's activities.

Special territorial responsibilities have been assigned to the League. It administered the affairs of the Saar Valley until 1935, when its inhabitants in a plebiscite conducted by the League voted in favor of their administration as a part of Germany. The Free City of Danzig was ruled in part by an executive or high commissioner appointed by the League. Under the terms of the peace treaties, territories surrendered by Turkey and Germany were governed by mandatory countries selected by the League to administer such regions in behalf of the inhabitants. Each year mandatory powers have to report to Geneva, where such matters fall within the jurisdiction of the Permanent Mandates Commission. There is good reason to question whether the lofty purposes of such mandates have been fulfiled. The League has likewise assumed a large responsibility toward the interests of racial minorities, placed by treaty or by other circumstance under the rule of a people of different race. Although the minorities question has been often discussed by the Council and the Assembly, it is difficult to say just what success has attended the efforts of the League in this direction.

For the general function of achieving international peace and security, the League of Nations has very elaborate machinery. In the first place the Covenant provides against wars of aggression by requiring each member state "to respect and preserve as against external aggression the territorial integrity and existing political independence of all Members of the League." (Article 10.) In the second place the Covenant provides (Articles 12, 13) for the continuation of arbitration as a method of settling disputes. The members agree that whenever any dispute shall arise between them that they recognize to be suitable for submission to arbitration and that cannot be satisfactorily settled by diplomacy, they will submit the whole subject matter to arbitration or judicial settlement. If the dispute cannot be submitted to arbitration or judicial settlement, the members agree that before going to war they will submit the matter to the Council, which shall initiate the processes of conciliation (Article 15). Should any member resort to war in disregard of these covenants, it is regarded as having committed an act of warfare against all members of the League, which agree to institute an immediate economic boycott (Article 16). Furthermore, any war or threat of war is declared a matter of concern to the whole League, which "shall take any action that may be deemed wise and effectual to safeguard the peace of nations." (Article 11.)

Affiliating Organizations.—Aiding the League of Nations in its work of peace but technically independent of it is the Permanent Court of International Justice, established in 1921. Its judges are elected by the Assembly and Council of the League, meeting simultaneously; its budget is part of that of the League. The Court sits at The Hague. It has power to act for any two states that agree to submit disputes to it; for those states that recognize its compulsory jurisdiction; and for states that have signed treaties and international agreements that provide for the submission to the Court of any dispute arising under them. The Council of the League may ask the Court for advisory opinions.

The International Labor Organization also is connected with the League of Nations but is independent of it, so that nations outside the membership of the League can join the Labor Organization. The machinery of the Organization is patterned on that of the League of Nations, both workers and employers being represented in the national delegations. Its chief function is the improvement of labor conditions. Its procedure is to prepare recommendations and to draft conventions for adoption by member states on such matters as woman and child labor, nightwork, unemployment, labor exchanges and the like.

Action and Attainment.—How successful the League of Nations has been in preventing serious disputes from leading to war is a matter of much debate. The first really serious political dispute settled by the League was in 1920 when Finland and Sweden disagreed over the Åland Islands in the Gulf of Bothnia. The islanders had voted for a return to Swedish allegiance. Finland granted them self-government but would not let them secede. The League Commission reported against secession and in favor of more freedom under Finnish rule. In the controversy over the city of Vilna, the Council had to bow before accomplished facts when Poland refused to recognize the award of Vilna to Lithuania and in 1920 occupied it by military means. In 1923 the League granted Vilna to Poland. The dispute between Poland and Germany over the meaning of the plebiscite in Upper Silesia after the World War was solved by the League, which in 1921 awarded the greater part of the territory and population to Germany but gave Poland at least three-quarters of the region's economic resources. In 1921 the League of Nation's Council forced a settlement of a boundary dispute between Albania and Yugoslavia. The quarrel of Great Britain and Turkey in 1923 over the boundaries of Mosul, with its oil resources, was settled by a decision of the Council in favor of England. In 1925 quick action by the Council ended a war that had begun when the Greeks invaded Bulgaria after the murder of Greek sentinels on the border between the two states. In 1934 the League settled its first American dispute, that between Peru and Colombia over the possession of Leticia, a small Colombian port on the Amazon River that had been seized by Peru. It was returned to Colombia.

The League recognizes "that the maintenance of peace requires the reduction of national armaments to the lowest point consistent with national safety and the enforcement by common action of international obligations." (Article 8.) Its efforts in the direction of disarmament, however, have been failures. Although it has been able to prevent some wars, it has not been successful in all such efforts. In 1933 after long study of the Japanese seizure of Manchukuo, the League recommended that the territory be returned to China and that China and Japan should arbitrate their disputes with the help of a League committee. Japan immediately gave notice of withdrawal from the League but has retained possession of the Pacific islands held as mandate for the League. Even more serious was the League's unsuccessful attempt in 1936 to keep Italy from her conquest of Ethiopia, a member of the League. When Italy by appealing to arms seemed to have broken the pledge of Article 15, the economic sanctions of Article 16 of the Covenant were invoked and for the first time applied: but they did not prevent the conquest of Ethiopia.

The failures of economic sanctions and of other League efforts to prevent wars, the withdrawal of Japan and Germany from League membership and the complete inability of the League to deal with the Spanish Civil War have made many critics think the League ineffectual. Recently there has been increasing talk of eliminating weaknesses in the system of the League of Nations, but nothing has yet been done to remedy its defects. It is hard to find a way to bring Japan and Germany back into League membership. It is difficult to interest all member nations in the justice of causes to which they are not parties and to expect them to sacrifice trade in economic sanctions. It is especially difficult to find any tool or weapon against powerful aggression.

In 1938 Great Britain under Prime Minister Neville Chamberlain adopted the policy of going alone—without the League—in attempts to reach a peaceable understanding with Germany and Italy. As Britain had been the strongest sponsor of the League, Chamberlain's admission that the League was powerless and that Britain must act on her own part to avert war seemed a serious blow to the prestige of the League of Nations as a force for the settlement of serious international disputes. The League is, however, still a nucleus around which some more effective organization may be built in the future and a co-ordinating center for many valuable international undertakings of a constructive social nature.

HISTORICAL DICTIONARY

Achaean League, a confederation of Greek city-states, formed originally in 280 B.C. to resist the domination of Macedonia. In the century from 245 to 146 B.C. the Achaean League developed into the nearest approach to a modern democratic federal government that was created in ancient times. Including most of the important cities of the southern part of the peninsula except Sparta, the Achaean League was the strongest force for Greek unity during the period of its existence. In 146 B.C. the Roman conquest of Greece broke up the League and in doing so destroyed Greek independence.

Actium, a great sea battle fought off the west coast of Greece in 31 B.C. between the forces of Antony and Cleopatra on the one side and Octavius (later Augustus Caesar) on the other. At least 200 ships on each side were engaged. When the battle was at its height the Egyptian squadron of Cleopatra withdrew, leaving Antony's fleet to fight it out alone. The superior mobility of Octavius's light galleys decided the issue; Antony's fleet was set on fire and practically destroyed. Antony had personally made his escape following the withdrawal of Cleopatra; his action was stigmatized in ancient times as gross cowardice. The battle ended the long rivalry for the mastery of the Roman world and enabled Octavius to establish himself as the first Roman emperor.

Afghanistan, a landlocked country in southwestern Asia. It has had a continuous history since the days of Alexander the Great, who is believed to have founded the present-day cities of Herat and Kandahar. It later fell under the nominal control of Bagdad, was ruled by Persia, then was overrun by tribes from Turkey and became Mohammedan in religion; today there are no more zealous followers of Mohammed than in Afghanistan. Turkish rule ended in 1747, with the assassination of Nadir Shah, the last of the Turks who held it; and an Afghan dynasty was instituted. England often found itself in conflict with the Afghan state because it was contiguous to India; many expeditions were sent into Afghanistan, but the natives refused to acknowledge the English as overlords. In 1841 the British, then occupying Kabul, were compelled to evacuate the country. They later recaptured Kabul and exacted penalties, but after numerous succeeding campaigns all they gained was the possession of Khyber Pass. In 1907 a treaty was signed that acknowledged Afghan independence.

Amanulla was the ruler of Afghanistan in 1928. He was a progressive sovereign, and after a tour of European capitals, attempted to westernize his country. The devout Mohammedans resisted his efforts, and he was deposed by hill tribes led by Habibullah, an ignorant water carrier. Amanulla and his family fled the country by airplane, thus saving their lives. The water carrier, in turn, was deposed and killed, and the rule passed to Nadir Khan, uncle of Amanulla, who had not attempted reforms not desired by his people. In 1932 a new constitution was drafted, guaranteeing many reforms. Nadir Khan was assassinated in 1933, and his 19-year-old son Fahir Shah succeeded him.

Agincourt, a famous battle of the Hundred Years War between England and France, fought October 25, 1415. An invading English army, commanded by King Henry V in person, numbering not more than 15,000, severely defeated over 50,000 French. There are wide discrepancies in the accounts of the number of men killed, but it is certain that the French loss was heavy and the English very small. The victory had no immediate strategic results, as the English army was too small to undertake an extensive conquest. Its chief value to Henry V was to rouse the confidence and patriotic pride of the English nation and enable Henry to secure the support of Parliament for a larger-scale invasion a year later.

Alabama Claims, claims preferred by the United States against Great Britain for damages inflicted on American shipping during the American Civil War by certain Confederate cruisers, chief among which was the *Alabama,* which had been constructed in England and allowed by the British Government to take to sea in violation (as the United States alleged) of the international obligations of neutrality. Following a long correspondence the two nations agreed by the Treaty of Washington (1871) to submit the question to a board of arbitration consisting of one American, one English and three neutral commissioners. The Treaty of Washington also defined the obligations of neutrals in wartime with respect to the points in dispute.

The tribunal met in Geneva on December 15, 1871, and after much negotiation announced its decision on September 14, 1872. The American contentions were in the main sustained; damages of $15,500,000 were paid by Great Britain. The case is notable in the history of international relations as one of the earliest instances of a grave dispute being settled by peaceful means.

Albania, a kingdom in the western part of the Balkan Peninsula, occupied by a people who have had a turbulent history for more than 2,000 years. Occupying a mountainous country, an environment that inspires a love of freedom, they have always resisted efforts to subjugate them. About 270 B.C. they were conquered by Pyrrhus of Epirus. Soon regaining their freedom they retained it against the onslaughts of the Greeks, the Serbs and the Bulgars. In the 15th century when the Turks, in their thrust into Europe, tried to conquer the Albanians, their leader George Castriota or Scanderbeg I (1404–68), defeated successively 23 armies of the sultan; but finally the country fell to the Turks. The Albanians acknowledged only nominal political authority, but as time passed many adopted the Mohammedan religion of the conquerors. In the first Balkan War (1912), fought by the Balkan states to rid themselves of the influence of Turkey, Albanians took no part, hesitating to fight on the side of Christian nations. After the defeat of Turkey, the victorious countries—Greece, Serbia, Montenegro and Bulgaria—sought to divide Albania among them; but Italy and Austria-Hungary vetoed the plan, though Albania lost some of its territory. In 1913 an international commission of control was established, and Prince William of Wied, a German, was invited to become king. Shortly after the World War began, he abandoned the country, and a period bordering on anarchy followed. Italian and Austrian troops entered the country in 1915 and 1916, and some of the minor battles of the war were fought on Albanian soil.

After the war the independence of Albania was recognized by the Allied Powers following an unsuccessful effort by Italy to secure control. The present government is a limited constitutional monarchy, set up in 1928 when Ahmed Zog, President of the Republic since 1925, took the crown. Treaties with Italy in 1926, 1927 and 1937 provide for a defensive alliance. Italy conquered Albania in 1939. Here the Axis powers defeated Greece, 1941.

Albigenses, a sect of heretics opposing the authority of the Church and the priesthood that flourished in the south of France in the late 12th and early 13th centuries. In 1209 Pope Innocent III, angered by the murder of a papal legate who had been commissioned to inquire into the extent of the heresy, organized the Albigensian Crusade with the purpose of stamping it out. Under the leadership of the fanatical and savage Simon de Montfort, a merciless war of extermination was carried out. Towns were sacked, and the entire populations butchered; more than 20,000 persons, the majority women and children, were the victims of these massacres. In 1229 the Treaty of Paris ended the military phase of the Crusade, but hunting down and destroying the remnants of the sect continued into the 15th century.

Alexandrian Library, the most famous library of the ancient world, founded originally in the early 3d century B.C. by the Egyptian kings Ptolemy I and Ptolemy II. In the time of Julius Caesar (47 B.C) the library is believed to have contained something like 700,000 papyrus rolls—roughly the equivalent of 100,000 volumes of modern print. These rolls would of course be of priceless value to modern scholars, but they have all been lost.

In 641 A.D. Alexandria was captured by the Arabs under the Caliph Omar. A story arose several centuries later that this Caliph, as an act of religious fanaticism, ordered the books of the Alexandrian Library distributed to be burned as waste in the public baths. Few modern scholars believe this occurred. Gibbon, one of the first scholars to question the truth of the legend, points out that by the 7th century the Alexandrian Library had probably already lost most of the works of value that it originally contained and adds sardonically "if the ponderous mass of Arian and Monophysite controversy were indeed consumed in the public baths the philosopher will allow, with a smile, that it was ultimately devoted to the benefit of mankind."

Algeciras Conference, a meeting of representatives of European Powers at Algeciras, Spain, in 1906, to negotiate for zones of influence in Morocco. There had been an agreement, previously entered into between Great Britain and France to the effect that France should be free to work out its designs in Morocco, and that Great Britain should not be disturbed in its plans in Egypt. Spain approved the arrangement, for it had been awarded a zone on Morocco's coast. Germany objected and demanded that it be given rights in the area. War threatened, and the conference was called to settle all questions involved. Germany was denied its sphere of influence; the plans of the other nations were not changed in any important respect.

The diplomatic defeat sustained by Germany was an important contributing factor to the bitterness between Germany and France that was one of the strong forces working for a war.

Alsace-Lorraine, two eastern provinces of France that have long been a bone of contention between France and Germany. Seized by the French during the wars of the 17th century, Alsace-Lorraine was retaken by Germany at the close of the Franco-Prussian War (1871). Two hundred years of French government had made the population, especially in Lorraine, predominantly French in language, customs and sympathies. The German Government attempted to Germanize the provinces, making the study of the German language compulsory in the public schools and adopting various other measures calculated to wean the population from its French allegiance. These efforts were upon the whole unsuccessful down to the close of the World War. Throughout this period of German rule the recovery of the "lost provinces" was a fond dream of patriotic Frenchmen. By the Treaty of Versailles (1919) Alsace-Lorraine was awarded to France.

Ancyrean Inscription or **Monumentum Ancyranum,** a long inscription in Latin and Greek engraved on the walls of the Augusteum, a temple in the city of Angora (ancient name, *Ancyra*) in Asia Minor. The inscription relates the *Res gestae divi Augusti* (the deeds of the deified Augustus) and is of great importance as a historical source for the period of Augustus's career. The inscription is a copy from two bronze tablets, now lost, prepared under Augustus's own supervision and placed before his mausoleum in Rome.

Andersonville, a military prison of the Confederate Government established in southwestern Georgia in 1864. The prison consisted of a stockade 15 feet high, enclosing 26½ acres of land through which ran a small brook. No barracks or other substantial shelters were provided, and the prisoners made shift as best they could by contriving rude tents of blankets and rags or burrowing in the ground. By the middle of the summer of 1864 there were about 30,000 prisoners confined in the stockade—the space available was less than 4 square yards to the man. Overcrowding, insanitation, undernourishment and exposure produced a fearful mortality from disease. Approximately 13,000 men died out of a total admitted of 49,500.

After the war the popular demand for vengeance found a scapegoat in Henry Wirz, the prison superintendent, who was tried before a military court and hanged (Nov. 10, 1865), thus adding judicial murder to the already sufficiently disgraceful story of Andersonville.

Arabia, the great peninsula of southwestern Asia, lying between the Persian Gulf and the Red Sea, has a history reaching back at least 4,000 years. The earliest records deal only with its northern section—the pathway from old Egypt around the end of the Mediterranean to Syria and Palestine, where the tramp of armies resounded during the conflicts between the Egyptian corner of Africa and western Asia. The earliest known people in Arabia were the *Minaeans.* There are many references to them in the Old Testament. They had an extensive kingdom, as has been learned from inscriptions, and it is believed to have existed until about 650 B.C. When Cambyses subdued Egypt in 525 B.C., Arabia became Persian and was made a province. The Romans invaded the country in 24 B.C. and established a temporary and limited authority several times during the first 3 centuries of the Christian era. The outstanding person in Arabia's later history is Mohammed (*c.* 570–632). The rise and spread of Mohammedanism from its source in Arabia is traced in the section on Medieval History. The strongest figure in present Arabian history is Abdul Aziz ibn Saud, proclaimed king in 1926, who has become known to the western world as the ruler and dictator of the interior principality of Nejd. He organized the tribes against the Turks in the World War; since then he has added Hejaz to his domain, now known as the Kingdom of Hejaz and of Nejd. In 1932 the name of Arabia was changed to the Kingdom of Saudi Arabia. Great Britain clings to the southwest Yemen coast, at Aden; Oman, in the southeastern coastal area, is an independent kingdom.

Arbela, a decisive battle fought in 331 B.C. between the Macedonians under Alexander the Great and the Persians under Darius, resulting in the complete defeat of the Persians and in Alexander's capture of Babylon. The battle is more correctly called the battle of Gaugamela, as it took place on the plains of Gaugamela more than 30 miles west of Arbela (modern Erbil). Alexander's force numbered about 40,000 infantry and 7,000 cavalry; the exact number of the Persian army is not known, but it is believed to have exceeded 200,000. The battle was a masterpiece of tactical skill on the part of Alexander, and it demonstrated to the whole eastern world how futile were mere numbers in opposition to discipline, organization and mobility. Napoleon's comment on the battle has been made famous by the historian Creasy: "Alexander deserves the glory that he has enjoyed for so many centuries and among all nations; but what if he had been beaten at Arbela, having the Euphrates, the Tigris and the deserts in his rear, without any strong places of refuge, nine hundred leagues from Macedonia!"

Argentina, one of the most progressive nations of South America, first visited by white men in 1516 when Juan Diaz de Solis, a Spaniard, sailed up a broad river in search of a direct route to India, the goal of all the earlier explorers. The leader and a number of his men were killed by native Indians, and the remainder returned home. Eleven years later Sebastian Cabot, son of John Cabot, leading a Spanish expedition, named the stream the Rio de la Plata (Silver River), because there seemed to be silver in the vicinity. Cabot built a fort near the present city of Rosario, on the Parana River, and thus established the sovereignty of Spain.

Early Settlements. Mendoza, a nobleman of Spain, sailed to the Plata in 1535 and founded Nuestra Senora de Buen Ayre (Our Lady of the Good Air), but it was abandoned during the next year. In 1580 a permanent settlement was made there. Spaniards from the homeland settled Asuncion in 1537 and Santa Fé in 1573, and other Spaniards coming down from Peru founded Tucuman in 1565 and Cordoba in 1573. The Spanish Government then united them all as a dependency under the viceroyalty of Peru. This connection continued until 1776. Buenos Aires now gained prominence, and the viceroyalty of the Rio de la Plata was formed; it included the vast region of the present Argentina, Bolivia, Paraguay and Uruguay.

The news of the French Revolution and of the dissensions of Europe in the Napoleonic Wars acted like an electric shock on all South America. A movement for independence spread over the whole continent, and after a long period of turbulent struggle, the Spanish and Portuguese dominion was shaken off.

Argentina achieved practical independence in 1824, although formal recognition by Spain was not conceded until 1842. In the middle years of the 19th century the country was torn by factional strife; between 1835 and 1852 a dictatorship under Manuel de Rosas established a semblance of civil order at the price of a cruel and capricious despotism. After the overthrow of Rosas in 1852 there was a long period of civil war over the position of the province of Buenos Aires in the newly established republic or Argentine Confederation. By 1880 the major difficulties had been composed by concession, and the city of Buenos Aires became the capital.

Throughout its history as a republic Argentina has suffered from domestic revolutions, but the most serious internal complications have been peaceably settled. Several boundary disputes have been submitted to international arbitrations: in 1889 the United States minister to Argentina settled the boundary line between Argentina and Chile in the Atacama region; the king of England determined the Patagonia-Chile boundary in 1902, giving Argentina 15,600 square miles and Chile 21,000 square miles of territory. The lasting peace between the two countries was symbolized in the erection of a great statue, *Christ of the Andes,* on the crest of the Andes Mountains on the Argentina-Chile boundary line. In 1915 the three greatest nations in South America—Argentina, Brazil and Chile—called the *ABC Powers,* signed a treaty agreeing to submit all questions of a controversial character to arbitration before engaging in war. During the World War Argentina was placed in a delicate position. The German submarine campaign seriously interfered with Argentine commerce. But the country contained more than 60,000 German settlers, and sentiment was seriously divided. The Government managed to preserve neutrality. Argentina became a member of the League of Nations; it later withdrew its support but rejoined the League in 1932.

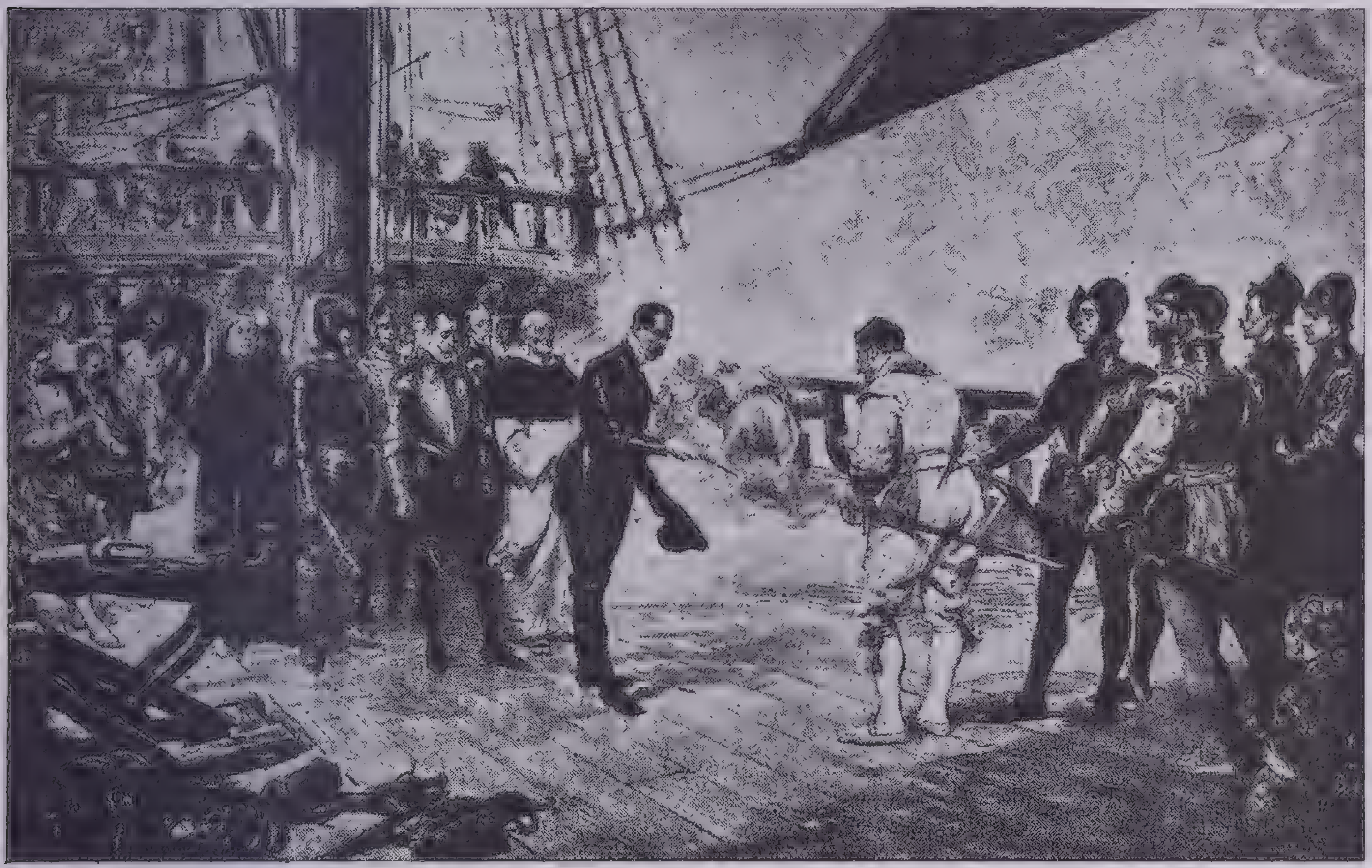
Argonne, The, a wooded region in eastern France, the scene of severe fighting throughout the World War. For more than 4 years it was held by the Germans, who had so fortified it that the position was considered impregnable. After long preparation, a final Allied effort was made to drive out the Germans. Nearly 900,000 American troops under the personal direction of General Pershing had the cooperation of the French in the attack. The struggle raged from September 26 to November 6, 1918, and ended with the evacuation of the Germans.

Five days later came the Armistice and the end of the war.

Arianism, the doctrines professed by the followers of Arius, a deacon of Alexandria (*c.* 256–336 A.D.), condemned as heretical by the Council of Nicaea in 325 A.D. The essential feature of Arianism was its denial of the equality of the person of the Son with that of the Father in its conception of the Holy Trinity. Arianism thus tended to a denial of the divinity of Christ.

In spite of its formal condemnation by the Council, Arianism continued to flourish throughout the 4th century, especially in the East, and the controversy repeatedly threatened to disrupt the church.

Armada, a word originally meaning any fleet of war vessels but usually applied specifically to the Invincible Armada fitted out by Philip II of Spain for a war upon England.



From the painting by Seymour Lucas

Surrender of the Spanish Armada

An artist's impression of the scene aboard Sir Francis Drake's *Revenge* after the final defeat, in July, 1588, of the Armada sent by Spain to England. The Spanish admiral, the duke of Medina-Sidonia, is surrendering his sword to Drake

The war was the outcome of a long course of intrigue conducted by Philip to possess himself of the English throne and re-establish Roman Catholicism in England. Finding all his efforts to gain his ends by diplomacy foiled by the shrewd and slippery counterdiplomacy of Elizabeth, the English Queen, Philip gave up plotting and scheming in 1588 in favor of open force. Affairs had been brought to a crisis by the execution in 1587 of Mary Stuart, on whom hopes for a Catholic succession had been centered.

The Invincible Armada was the most formidable naval force ever assembled up to its time—130 ships, 27,000 soldiers and sailors. In addition to the fleet itself a supporting army of 33,000 men was waiting in the Netherlands under the command of one of the ablest soldiers of the period, Alexander Farnese. To contemporaries it appeared that the fate of England was sealed.

The Armada, under the command of the duke of Medina Sidonia, arrived in the English Channel late in July 1588. It was immediately attacked by the English, whose smaller and more mobile craft were able to work havoc among the ponderous and unmanageable Spanish ships without suffering any substantial loss themselves. Three engagements took place, each disastrous for the Armada, and the Spanish admiral attempted to withdraw. The English had cut off retreat by way of the Channel, and it was necessary to sail all the way around the British Isles to reach the open ocean. Storms accomplished what the English had left undone; more than half of the ships were lost at sea, and only 54, battered and bedraggled, reached Spain. The disaster broke the Spanish sea power and marked the beginning of English maritime greatness.

Austerlitz, a town of central Europe about 70 miles north of Vienna, famous as the scene of one of the greatest battles of the Napoleonic Wars, fought in 1805 between France on one side and Austria and Russia on the other. The battle is also called the *Battle of the Three Emperors* because Napoleon, Alexander I of Russia and Francis of Austria were present. Napoleon's 65,000 men defeated 82,000 of the allies. The allied losses amounted to 12,000 killed and wounded and 15,000 prisoners; Napoleon's total loss was fewer than 7,000. The Peace of Pressburg followed, by which Napoleon took territory from Austria and made Bavaria and Württemberg kingdoms with French rulers.

Australia, the island continent of the South Seas. The first permanent white settlers were convicts sent from England in 1788. Within a century thereafter was established the Commonwealth of Australia, a group of states covering the entire continent united under the British flag.

Whether French, Portuguese or Dutch navigators first saw the continent is not certain. There is some evidence that French vessels skirted the shores as early as 1521. Not until the 17th century, however, was there any extensive exploration. In 1642 the Dutch navigator, Jansen Tasman, sailed to the south of Australia and touched the island that is now called *Tasmania* in his honor, but which he named *Van Dieman's Land*. No claim of ownership was made after these early voyages, as it was not thought that the country was of any value.

Great Britain's attention was attracted to Australia and New Zealand by a voyage of Captain James Cook. In 1769 he was sent to Tahiti, in the Society Islands, to observe a transit of Venus. This accomplished, he sailed southwest to New Zealand, passed through the strait between the two main islands and gave to it his name, then proceeded westward to Australia, reaching the coast where Sydney now stands. Map makers had not charted this section of the shore, and the inlet into which Cook sailed he named *Botany Bay,* because the scientist of the cruise found there a number of plant specimens unknown in Europe. Cook continued up the coast, nearly lost his vessel on Great Barrier Reef and named the country *New South Wales.* So important were the discoveries he reported on his return to England that in 1772 he was sent back to continue his explorations.

First Settlers. The first white people to settle in Australia were a shipload of convicts sent there from England in 1788. The settlement was made at Botany Bay, and later other convicts were sent there. As their terms of sentence expired, most of them remained as free settlers, acquiring land from the British Government and becoming independent farmers and ranchers. During the years that the transportation of convicts was in force, the total may have reached 150,000; many of them were transported for minor offenses, such as would now be termed misdemeanors.

Stories of Australia's advantages brought more adventurers and settlers from England. Capt. P. P. King required 5 years to sail around the great island and carefully map it, completing his task in 1822. He was influenced to do this by the previous exploit of Captain Flinders, who had sailed around the continent in 1803 and partially mapped it, naming it *Terra Australis.* Previously the Dutch had called it *New Holland.* While King was engaged in his work of exploration, other men were penetrating inland, locating and marking on their maps the mountains and rivers.

The first settlements made were along the seacoast of New South Wales, but it was not long before newcomers began to venture northward. Queensland, north of New South Wales, was founded in 1826, the first settlement being a convict colony at what is now Brisbane. Victoria, to the south, was made a Crown colony; South Australia was settled at Adelaide; Western Australia was organized with its center at Perth, but the great central area, from the ocean on the north down to the boundary of South Australia, was left without organization until 1927 and was known as *Northern Territory.* In that year it was divided into two almost equal parts, North Australia and Central Australia; they remain territories, having been divided for administrative purposes only.

Political Structure. Previous to 1901, each of the states was independent. Some adopted the commercial policy of free trade, while others levied protective tariffs. Many differences arose that were reconciled with difficulty. About 1850 efforts at union were made but were unsuccessful. A Federal Council was established in 1885, a sort of clearinghouse for ideas looking to a union, but not all the colonies joined it. Six years later a convention in Sydney took the first steps toward federation. In 1898 a proposed Australian Constitution was submitted to the people. It was adopted, and on January 1, 1901, the Commonwealth of Australia came into existence.

It is the policy of the Commonwealth that Asiatics shall not be admitted, for the Government is determined that Australia shall be a white man's country. In the World War, the Commonwealth valiantly supported the Allies; the Australian soldiers, together with those from New Zealand, were called *Anzacs,* a word coined from the initial letters of the Australia-New Zealand Army Corps. They fought bravely in the disastrous Gallipoli campaign and in almost every battle in France.

Recent History. The Imperial Conference in London in 1926 instituted the British Commonwealth of Nations, whereby Great Britain, the Irish Free State, the Union of South Africa, Newfoundland, Australia and New Zealand became to all intent independent of one another but were still joined in a federation in which the interests of one were the interests of all. In 1929 the election brought in a Labor government. In 1933 West Australia wished to become a separate Dominion, but the appeal to Parliament in 1935 was refused.

Austria, a state of the German Reich since March 12, 1938; before the World War the leading state of the Austro-Hungarian Dual Monarchy; one of the chief nations of Europe throughout modern history.

The nucleus of the later Austrian state was a territory south of the Danube and east of the Enns only a few hundred square miles in extent. In the late 8th century this territory was annexed to the empire of Charlemagne and was peopled predominantly by German-speaking colonists from neighboring Bavaria. After the death of Charlemagne the country was invaded from the east by the Hungarians, but in 955 it was reunited with the revived German Empire (the Holy Roman Empire) by Otto I. It became the natural frontier region or *mark* to the east of the Empire; its German name, *Oesterreich,* means east realm.

In the 12th century the original mark of Oesterreich was considerably enlarged and made a duchy under the energetic Babenberg family, which had held the mark since 976. The Babenbergs did much to extend and consolidate the prestige of the new duchy. Duke Henry (1141–77) moved the capital to the rising town of Vienna on the Danube. In the early 13th century substantial acquisitions of territory were made by Duke Leopold VI and Duke Frederick the Quarrelsome. When the Babenberg line became extinct in 1246, the Duchy of Austria was the wealthiest and most desirable of all the German states of the Holy Roman Empire.

The next landmark in the early history of Austria was the enthronement of the Hapsburg family in 1282. Following the death of Fredrick the Quarrelsome, the last of the Babenbergs, a dispute over the disposition of the duchy arose between Rudolph of Hapsburg, elected Holy Roman Emperor in 1273, and Ottaker of Bohemia, who had been accepted by the minor Austrian nobles as duke of Austria. Ottaker refused to recognize the imperial election of Rudolph. A series of wars followed and Ottaker was killed in battle (1278). The duchies of Austria and the adjoining Styria thus fell into the hands of Rudolph, who in 1282 bestowed them on his sons Albert and Rudolph. The Hapsburg family remained the ruling house of Austria for 636 years, until the end of the World War. The later political importance of Austria was largely owing to its being the center of the hereditary Hapsburg dominions.

In the 14th and 15th centuries Austria was troubled by internal dissension; the early Hapsburgs failed to establish a strong central government. This failure arose partly from a politically stupid family policy that kept the territory divided between two and sometimes more brothers, and partly from the decay of feudal authority that was going on all over Europe. A new era began with the reign of Maximilian I, Duke of Austria and Holy Roman Emperor (1493–1519). Under Maximilian the Duchy of Austria became an indivisible hereditary unit, and a beginning was made toward the establishment of a centralized administration.

On Maximilian's death in 1519 Austria fell to his grandsons Charles and Ferdinand. Complex marriage alliances fostered by Maximilian had placed enormous dominions under the control of the Hapsburg family. Charles was King of Spain in his own right and in 1519 was elected Holy Roman Emperor as Charles V. By an agreement made in 1521 known as the Partition of Worms, Charles gave up to Ferdinand his rights in the Austrian duchy. In 1526 Ferdinand was elected to the vacant throne of Bohemia, and after a long struggle he secured as well the kingdom of Hungary (1547).

Ferdinand continued and improved the attempts of his grandfather Maximilian to reform the administrative system and centralize authority in himself. His long reign (1526–64) is generally taken as marking the rise of Austria to a position of European importance.

Throughout the reign of Ferdinand the dangerous advance of the Ottoman Turks up the Danube threatened to engulf Austria. Under their greatest sultan, Suleiman the Magnificent (1520–66), the Turks expanded their power over the whole Balkan area, pushed into Hungary and repeatedly laid siege to Vienna. Ferdinand was hard pressed and was forced to make humiliating concessions to Suleiman and to surrender territory. Fortunately for the cause of Christianity in central Europe, the Turks became involved in wars in Asia and stopped their thrust into Austria.

The rise of Protestantism in Germany under the leadership of Martin Luther began a long period of religious controversy and war throughout western Europe. In the reign of Ferdinand Protestantism made strong headway in the Austrian territories, and at the beginning of the 17th century, in spite of efforts made to suppress it, the new religion was professed by the majority of the people of Austria, Bohemia and Hungary.

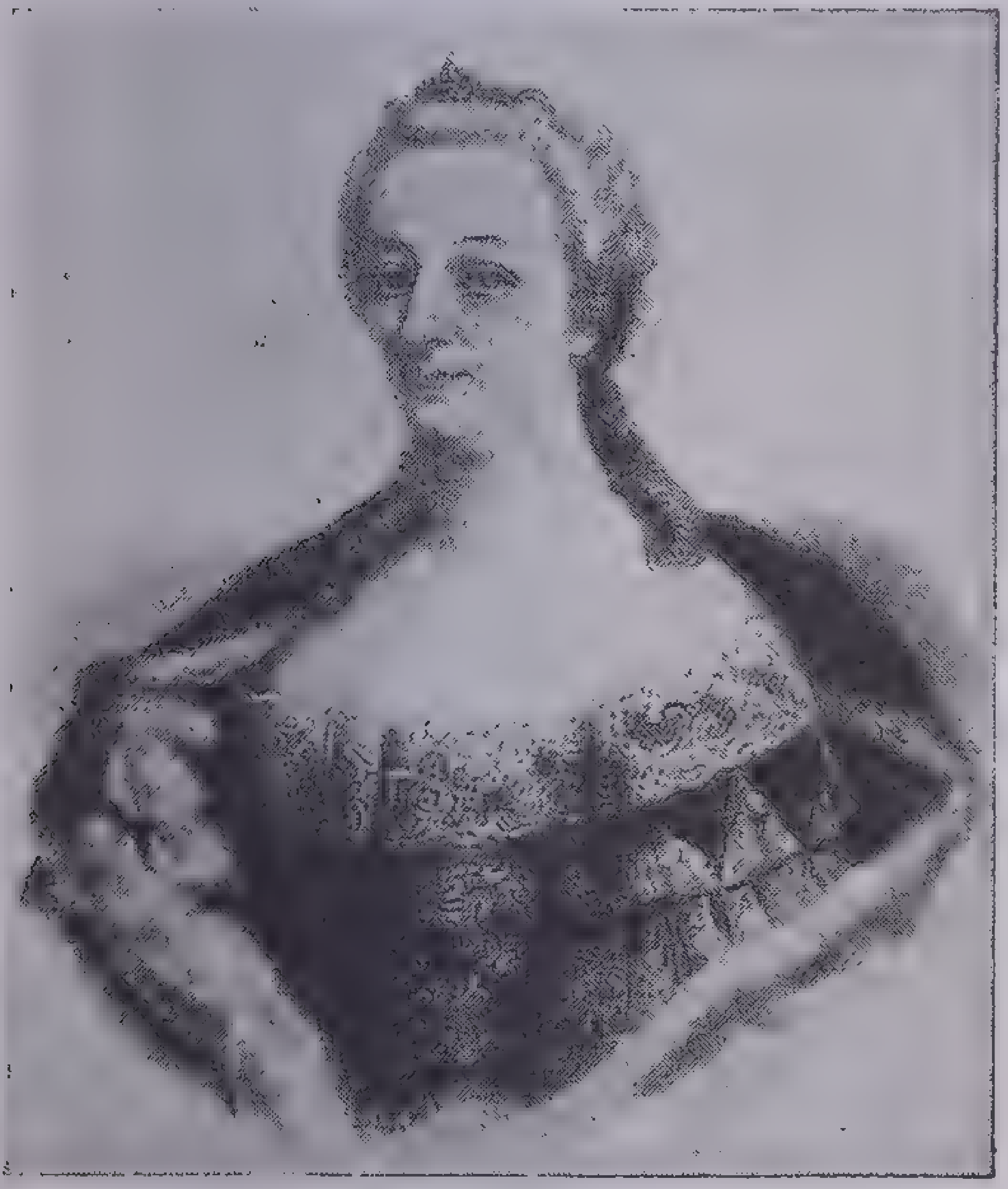
In 1617 a long family quarrel concerning the succession to the Austrian lands was settled in favor of the Archduke Ferdinand, who in 1619 became Ferdinand II of the Holy Roman Empire. Ferdinand's determination to stamp out Protestantism throughout his dominions led to the Thirty Years' War (1618–48). Beginning with an uprising in Bohemia, the struggle ultimately was carried on all over central Europe. Complex political and economic as well as religious interests became involved. The war was one of the most destructive and bloody conflicts ever fought; whole provinces were depopulated, cities sacked and burned, agricultural lands devastated. From its terrible effects Germany did not recover economically and culturally for 100 years.

In the early period of the Thirty Years' War Ferdinand was successful in imposing the Roman Catholic reaction. He treated heretics with great severity, blew up Protestant churches, seized and burned vernacular Protestant Bibles. But beginning in 1630 with the intervention of Gustavus Adolphus of Sweden, the tide of war turned against him. In 1635 France, under the leadership of the ambitious Cardinal Richelieu, entered the war, and, although the struggle continued destructively for 13 years longer, it became ever more clear that the attempt to re-establish Roman Catholicism as the sole religion in Germany must fail.

Peace was concluded by the Treaty of Westphalia in 1648. One of the main results of the Thirty Years' War was its disintegrating effect on the old Holy Roman Empire, which continued to exist in name only. The Austrian Hapsburgs from this time forward gave up the attempt to maintain anything more than a nominal overlordship of Germany and devoted themselves more exclusively to their own hereditary lands—Austria, Bohemia and Hungary. In the century following the Thirty Years' War the rulers of Austria succeeded in creating something like a unified state out of their heterogeneous territories. The power of the monarchy was slowly increased and consolidated, although it was impossible out of the complex of agitating nationalities—Germans, Czechs, Hungarians and many other racial groups—to weld a strong national state on the model of Louis XIV's France.

In the dynastic wars of the late 17th century, which revolved chiefly about Louis XIV's effort to expand his influence, the Austrian Hapsburgs took a prominent part. Each new treaty remade the map of Europe, but the main result of these miserable struggles was the impoverishment of the people. At the end of the War of the Spanish Succession (1701–14), the longest and most ferociously contested, the general exhaustion brought about a 25-year period of comparative peace.

The Austrian ruler from 1711 to 1740 was Charles VI. With him the male line of the Hapsburgs died out. For many years Charles had attempted to secure the succession of his daughter Maria Theresa and had tirelessly agitated and bargained to get the European Powers to accept and guarantee the so-called Pragmatic Sanction recognizing her rights. In this he was successful, but upon his death the Pragmatic Sanction proved of little avail to secure Maria Theresa's peaceful accession. Frederick II, King of Prussia, remarked that Charles would have done better for his daughter if he had left her a "well-equipped army of 150,000 men." As soon as Charles died in 1740 Austria's neighbors, led by Frederick, attacked Maria Theresa in one of the most outrageous and openly aggressive wars in history. In this struggle, the War of the Austrian Succession, Frederick seized and held the rich province of upper Silesia, and Austria lost other territories in Italy; but Maria Theresa was able to keep her throne. Peace was finally signed at Aix-la-Chapelle in 1748.



Maria Theresa

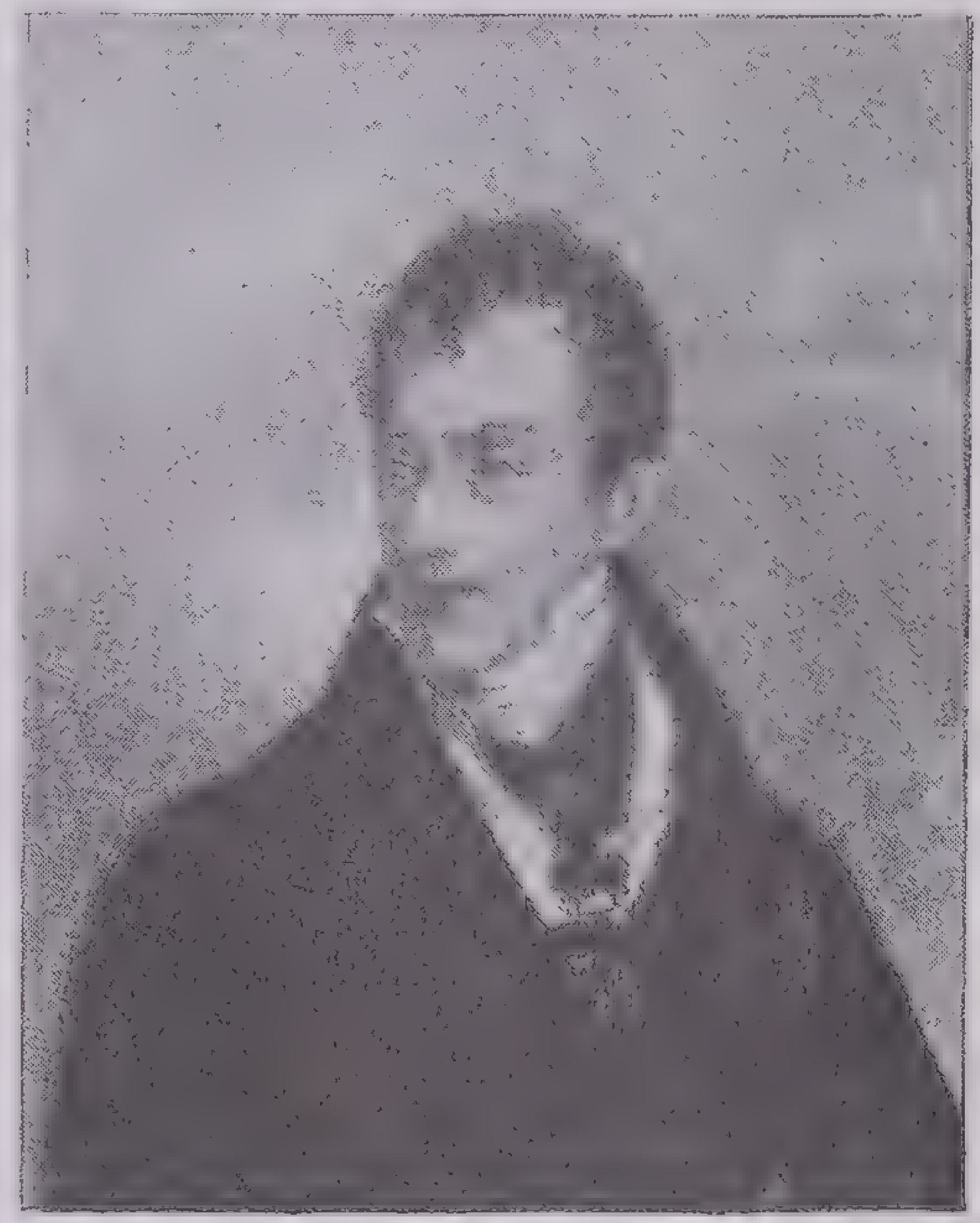
Ten years of peace followed the Treaty of Aix-la-Chapelle, and in the interval Maria Theresa made an alliance with France. She thereupon renewed the war with Prussia, and the struggle quickly involved the other European Powers. This second phase of the rivalry between Frederick and Maria Theresa is called the *Seven Years' War,* but it is really a part of the conflict that began in 1740. In the end Austria was forced to cede Silesia to Prussia. The Seven Years' War ended with the Treaty of Paris, 1763.

Maria Theresa's reign lasted from 1740 to 1780. She accomplished many notable internal reforms in the financial administration, in the codification of the law and in education. In spite of two terrible and unsuccessful wars, the net result of her reign was favorable to Austria. Her son Joseph, styled Joseph II of the Holy Roman Empire, succeeded to the Austrian dominions upon Maria Theresa's death. He continued many of his mother's policies and attempted to govern as an "enlightened despot," following the theory of government made popular by Frederick of Prussia. His reign lasted 10 years. Although he made a noble attempt to abolish serfdom, to establish religious freedom and to improve generally the condition of the lower classes, his autocratic methods aroused resentment even among the people who benefited most by his reforms, and his own summing up of his life's work was a confession of failure. He died in 1790, at the very time that the revolutionists of France were tearing to shreds the political theory of which he was the last great representative.

The Napoleonic Wars (1796–1815) remade Europe. The Holy Roman Empire, for 900 years a symbol if not a reality of power, was finally broken up. In 1806 Francis II, the last Holy Roman Emperor, abandoned his nebulous title and became Francis I, Emperor of Austria.

Austria joined the early coalitions against Napoleon and was severely humiliated by Napoleon's victories at Marengo (1800) and especially at Austerlitz (1805). In 1809 she attempted to recover her lost prestige, but was defeated by Napoleon at Wagram and forced to sign the Treaty of Schönbrunn, which stripped her of outlying territory and reduced her practically to a satellite state of the French Empire. In 1810 the forced friendship of Austria and Napoleon was cemented by the marriage of Napoleon and Marie Louise, the Emperor Francis's daughter. In 1812 Austria supported Napoleon's campaign against Russia, but after the disastrous French retreat from Moscow the hollowness of the Austro-French alliance became quickly apparent. Austria denounced the alliance as soon as it seemed safe to do so and in 1813 joined the Russo-Prussian coalition against France. At the battle of Leipzig, October 18, Napoleon was decisively defeated, and Austria was once more able to take her status as an independent power.

The final defeat of Napoleon in 1815 found Austria in a remarkably strong position. To the shrewd and unscrupulous diplomacy of Prince Clemens Metternich she owed much of her recovery. At the Congress of Vienna, 1815, Metternich was without doubt the most influential figure, and his policies dominated not only Austria's but most of continental Europe's politics for the next 30 years.



Prince Metternich

Metternich's ruling idea was to reestablish the Europe of the 18th century; to wipe out the French Revolution as far as possible; to bring about a lasting stability for the *status quo.* He has been denounced as the worst of reactionaries by modern liberals, but he was a necessary product of his times. In 1815 Europe was sick of revolution and bloodshed; for the moment it craved only peace and rest, whatever might be the cost to liberty and the "rights of man." In expressing this desire for stability and order, Metternich merely summed up what the overwhelming majority of influential men were thinking.

Shortly after the Congress of Vienna the three Powers Austria, Russia and Prussia associated themselves in the celebrated Holy Alliance, which became, under Metternich's skilful guidance, a powerful force for reaction and suppression. Originally conceived by the pious and idealistic Czar Alexander as an expression of his desire that government be conducted according to the principles of Christianity, the Holy Alliance furnished an excellent example of the perversion of high idealism in the hands of realistic diplomacy. The actions of the Holy Alliance expressed the political philosophy of Machiavelli's *Prince* rather than the philosophy of the Sermon on the Mount.

Metternich's domination of Austrian affairs continued until the popular uprisings of 1848. In the rumble of revolution that swept over Europe in that year, Metternich fled for his life, and for a time it seemed that a democratic government would be established in Austria. But the revolution failed. With the help of Russian troops Francis Joseph I, the Emperor, was able to crush the rebelling Hungarians, while his own forces put down the radical students and workmen who for a time had seized control of Vienna.

Automo
halt!
Zollrevis
Schärdin

Underwood & Underwood

Germany Absorbs Austria: Nazi Troops Cross the Frontier at Schärding

A German tank passes under the double-headed Austrian eagle. On March 13, 1938, thousands of troops, police and members of Nazi organizations entered Vienna and took over the Austrian Government

The fiasco of 1848 was a severe blow to the liberal movement in Austria. In the following two decades some liberalizing constitutional reforms were granted, but the period in general may be called one of absolutist reaction.

In 1866 Austria received a humiliating defeat at the hands of Prussia in the Seven Weeks' War. With dramatic suddenness the leadership of the German countries passed from Austria's hands to Prussia's. Austria was effectually frozen out of the unified German Empire that many of her statesmen had dreamed of building under Austrian suzerainty and was forced to look on impotently while Bismark's policy of "blood and iron" took the initiative in German affairs.

The immediate consequences of the Seven Weeks' War was to force Austria temporarily out of any influence in European politics and to turn its energy to its own reorganization. The most important problem was the settlement of the long-standing difficulty of Austria's relations with Hungary. In 1867 a compromise plan was adopted, which provided for a federal union of Austria and Hungary under the name of Austria-Hungary, each country maintaining a considerable local autonomy, but united in the person of the sovereign and in foreign affairs.

The Austro-Hungarian Dual Monarchy established in 1867 continued in existence down to the close of the World War. Although rated as one of the Great Powers, there were grave elements of weakness and disunion in the state that presaged its ultimate breakup. Full of pushing and conflicting nationalities, threatened on the south by the boiling caldron of the Balkans, on the north and east by the Russian Colossus, on the west by the agitating Italian subjects of *Italia irredenta,* in no country of Europe were the statesmen less sure of their ground, more harried by problems they could not solve, more fearful of revolution and civil war. "Ramshackle," "worm-eaten," "tottering"; so the Imperial and Royal Government of Austria-Hungary came to be described by its enemies and friends alike during the closing years of the 19th century and the fateful first decade of the 20th.

The part that Austria-Hungary played in the tragedy of the World War is described in a separate article. At the close of that war the Austro-Hungarian Monarchy was broken up in fragments; from its dismemberment arose the independent states of Czechoslovakia, Hungary and the Austrian Republic, while large pieces of territory went to Italy, Poland, Yugoslavia and Rumania. Austria proper was left without a seaport, reduced to a population less than 8,000,000, surrounded by the customs frontiers of the newly arisen states, a "fish out of water" as one of its own statesmen described it.

The 10-year period following the World War was one of grave economic distress and increasing internal dissension. Though Austria was organized as a republic, it nevertheless became clear that, lacking some solution for the serious economic problems, the political stability necessary for a workable democracy could not be attained. Some form of dictatorship was inevitable. The world depression of the 1930s accelerated the process of decay of democratic methods. In 1931 an attempt to deal with the economic difficulty by forming a customs union with Germany was blocked by the opposition of France, still pursuing the vindictive policy of keeping the German peoples in a state of weak disorganization.

In 1933 the dictatorship that all observers saw must come was established under Chancellor Engelbert Dollfuss. In the meantime the Nazi party had risen to power in Germany and many Austrians who had vigorously supported the *Anschluss* or customs union in 1931 now looked with horror on the possibility of Nazi domination of Austria.

On July 25, 1934, Chancellor Dollfuss was murdered by a group of Nazi adherents. A period of disorder followed. The efforts of the Nazis to secure control were frustrated by Premier Mussolini of Italy. Finally Kurt von Schuschnigg succeeded with Italian support in establishing a stable government. In 1936 he reached an agreement with Hitler by which Germany promised noninterference in Austria's internal affairs. Early in 1938, Hitler, having reached an understanding with Mussolini, was able to force a reconsideration of the 1936 agreement and secure a dominating influence over the Austrian Government. In March of 1938 the government of Chancellor Schuschnigg was forced out of office by pressure from Germany, and Austria was incorporated with the German Reich under the threat of a military invasion.

Austrian Succession, see *Succession Wars.*

Babylonia, an ancient country that lies within the basin of two great rivers, the Euphrates and the Tigris. Thousands of years ago these streams entered the Persian Gulf by separate mouths. Since then the debris-laden floods have built up an alluvial plain that has gradually encroached on the gulf until it now extends perhaps 200 miles beyond what was the shore line 6,000 years ago. A single mouth now takes care of the waters from both rivers.

Topography. The topography of the Babylonian country would seem proof that here was where prehistoric man first began to leave written records of his existence. Then, as today, his three most essential needs were food, shelter and a certain degree of safety. Here they were to be found in larger measure, or to be obtained with less effort than elsewhere, except in Egypt. The climate was mild and agreeable, the country was protected by high mountains to the east and north, while to the west stretched away a desert not easily crossed by enemies. Food was abundant and easy to obtain. The streams and the waters of the gulf swarmed with fish. Flooded every year by the waters of the streams, the fertile plain was covered by vegetation. Here lurked an abundance of game, and the rich soil required but little cultivation to produce heavy crops of various grains or many kinds of fruit. With nature thus making it possible for man to obtain food, shelter and safety with little effort, it would seem that he devoted some of his abundant leisure to recording the daily happenings of his life, the result being a crude form of picture writing. This writing developed into a more clear and concise system, the characters being incised on clay tablets. Thousands of these are in existence and they are the chief records of the early Babylonians.

These records show that Babylonia was a land flowing with milk and honey. It is not surprising that tradition should have located here the Garden of Eden, that primeval place "out of which God made to grow every tree that is pleasant to the sight and good for food." Agriculture reached a high state of development, made possible by a stupendous system of dikes to protect the land in times of flood, coupled with canals for irrigating purposes and for transportation. The remains of this skilfully planned system still cover the land like a network. Among the various crops cultivated were cereals, olives, grapes, citrus and other fruits. Many kinds of vegetables were also grown. The fauna included both wild and domestic animals. In the mountains to the north were to be found lead, copper and iron, as well as sandstone, basalt and alabaster.

Early History. The earliest records of Babylonia start about 4500 B.C. This was the beginning of the dynasty of Opis. There is no knowing just how long the first inhabitants, the Sumerians, had been there, or if the Semitic tribes had already arrived. Thereafter, dynasty followed dynasty, king followed king, war followed war, but Babylonia continued to prosper, and its capital, Babylon, while often captured and occasionally destroyed, increased its magnificence until it ranked as the greatest city of the ancient world.

Babylon. The city of Babylon was in existence as early as 3800 B.C., and was made the capital of all Babylonia about 2094 B.C. It was captured five times during the next 1,300 years and utterly destroyed by Sennacherib, Assyrian King, in 689 B.C. He not only razed every building but opened a canal and let waters of the Euphrates flow over the site. It was promptly rebuilt, again destroyed and then rebuilt a third time. It was greatly enlarged and beautified by Nebuchadnezzar (605–562 B.C.), and its safety was assured by high walls girding an area of about 12 square miles. The remains of these walls have been traced and they have a total length of about 15 miles.

Nebuchadnezzar endeavored to outdo the Egyptian pharaohs in the construction of huge works requiring an immense amount of labor. Perhaps his greatest achievement, next to the magnificent royal palace, was the celebrated Hanging Gardens (one of the Seven Wonders of the ancient world), built to please his wife, Amytis, who was homesick for the mountains of her native land. From the descriptions it is assumed that these were mounds or towers, the terraces covered with earth from which arose plants and trees giving the appearance of mountains covered with vegetation.

It is probable that Nebuchadnezzar also rebuilt the Tower of Babel mentioned in Genesis 11. Its site has been found, but all that remains is a large hole in the ground, where bricks used in the construction of the tower had been dug out for later and smaller buildings.

The Fall of Babylon. The passing of Nebuchadnezzar marked the end of the Babylonian Empire. A new kingdom, the Medo-Persian, had come into existence. Headed by an energetic leader, Cyrus, the Persians defeated the Babylonians and captured the city. Not favored as a capital by the Persians, its population decreased and its buildings decayed until finally its location was forgotten.

Babylonian Writing. The Babylonians devised a system of writing, termed cuneiform because the characters were marked on soft clay with a triangular tool so that they were wedge-shaped. The clay tablets were about 6 by 3 inches in size and perhaps an inch thick. Those bearing records of importance were preserved in libraries, the one found at Hippur containing over 30,000 tablets. These were deciphered by means of trilingual inscriptions; one of the best-known is the Behistun Rock, an inscription on a cliff in western Persia telling in three languages the deeds of Darius, a Persian king.

Scientific Achievements. The Babylonians contributed much to the advancement of astronomy. They foretold eclipses of the sun and moon, divided the zodiac into 12 signs and mapped the constellations of the zodiac. They devised a calendar that divided the year into months, weeks, days, hours and minutes, using a sundial for the hours of sunlight and a water clock for those of darkness. Other inventions were duodecimal numbers and measures of capacity, weight and length.

Later History. Babylonia fell to the Greeks after the death of Alexander in 323 B.C. The Parthians next had possession. It was conquered by Turkey in 1638, who held it until the end of the World War. With much of the surrounding territory it was then mandated to Great Britain. In 1930 the mandate was relinquished and it is now the independent Kingdom of Iraq.

Bacon's Rebellion, a revolt in the colony of Virginia in 1676 led by Nathaniel Bacon, a member of the governor's council, against the oppressive rule of Berkeley, the royal governor. Berkeley's oppressions included levying excessive taxes, unfairness in qualifying voters, injustice in laying tobacco duties as well as other inequalities. Revolt broke out in 1676 when he refused to take protective measures against the Indians. Bacon had asked the governor for permission to lead the settlers against Indians who had attacked his plantation, but he was refused. Bacon then proceeded to defensive measures against the governor's orders; there was considerable fighting and Jamestown was burned. Bacon died in the midst of the rebellion; left without a leader, his followers abandoned their aims and the trouble subsided; but Berkeley felt it necessary to demonstrate his authority and hanged several of Bacon's lieutenants. His severity made an unfavorable impression on Charles II, King of England, who remarked, "The old fool has taken more lives in that naked country than I have for the murder of my father," and Berkeley was removed from the governorship.

Balaklava, a historic battle of the Crimean War (1854-56), in which Russia fought the allied forces of Great Britain, France and Turkey. Because orders were misunderstood or incorrectly conveyed, a British cavalry force of 670 charged a large body of Russian cavalry protected by infantry and met with appalling disaster; only 198 of the attacking column survived. "It is magnificent," said a French general who witnessed the action, "but it is not war." The incident has been immortalized in Tennyson's poem, "The Charge of the Light Brigade."

Barbary States, the four countries of North Africa that border the Mediterranean Sea. In ancient times they were called *Mauretania, Numidia, Africa Propria* and *Cyrenaica.* These names were later changed to Morocco, Algeria, Tunis and Tripoli. Today the last two are known as Tunisia and Libya (Italian spelling, *Libia*). The first three were settled by the Romans, who ignored the native tribes; and the last by the Greeks and Phoenicians. Carthage was founded by hardy voyagers from Phoenicia.

After the disintegration of the Roman Empire in the 5th and 6th centuries, the North African coast was swept by the Mohammedan conquest, and in the succeeding centuries it became the western stronghold of the Mohammedan power. From the 15th to the 19th century the country was infested by Moorish and Turkish pirates and by desperate adventurers from all countries, who terrorized shipping on the Mediterranean and exacted tribute from the maritime Christian nations. These outrages were at their height in the 16th and 17th centuries. Europe was filled with stories of captures by the pirates, of slavery at the oars of their galleys and of hairbreadth escapes.

Efforts by the European Powers to suppress the pirate menace were unsuccessful until the 19th century. The lead was taken by the United States in its wars with Tripoli (1801-05; 1812-15). The power of the pirates was finally broken by the French conquest of Algeria (1830-47).

Bartholomew, St., Massacre of, a massacre of Huguenots in France begun at midnight in the city of Paris on the morning of August 24 (St. Bartholomew's Day), 1572, and carried later to the principal towns throughout France. From 20,000 to 70,000 Protestants were butchered in cold blood by bands of armed men acting under threats of execution by their superior officers. The massacre was ordered by the weak and terrified Charles IX, urged on by his mother, Catherine de' Medici, who bitterly hated and feared both the religious opinions and the growing political power of the Huguenot faction and its leader, Gaspard de Chatillon Coligny. Coligny was one of the victims of the massacre.

The Massacre of St. Bartholomew is one of the outstanding horrors of the savage religious struggle of the second half of the 16th century.

Bastille, a name used in early times for any fortified castle but later applied specifically to a great eight-towered building in Paris that was used as a state prison during the 17th and 18th centuries. Especially in the reigns of Louis XIV and Louis XV the Bastille acquired an odious repute as the place of confinement of political prisoners. Particularly notorious was the system of imprisonment by *lettres de cachet*—orders for imprisonment issued in the name of the king by which any designated person could be seized and confined without any chance to face his accusers or to know the nature of the charge against him. "These orders signed by your Majesty are often filled in with obscure names of which your Majesty cannot possibly have heard. They are at the disposal of your ministers, and it would appear, in view of the great number which are issued, of their clerks as well. . . . . . The result is, Sire, that no citizen in your kingdom can be assured that his liberty will not be sacrificed to a private grudge; for no one is so exalted that he is safe from the ill will of a minister or so insignificant that he may not incur that of a clerk in the employ of the farm [tax collectors]. The day will come, Sire, when the multiplicity of abuses of the *lettres de cachet* will lead your Majesty to abolish a custom so opposed to the constitution of your kingdom and the liberty which your subjects should enjoy."

As is evident from this protest of a French court of law (1770), the arbitrary imprisonments through *lettres de cachet* aroused widespread resentment, and the Bastille, as representing this tyranny in visible form was bitterly execrated by the populace. One of the first acts of violence of the French Revolution was the storming of the Bastille by a Paris mob, on July 14, 1789. The commandant was killed and his head impaled on a pike.

In the following year the old building was razed. Lafayette sent the key of the Bastille to George Washington with a note declaring that the spirit of liberty exhibited in America had inspired the French to overthrow despotism in their own land.

Modern scholars have pointed out that the Bastille was actually a much milder place of confinement than the popular hatred would lead one to suspect. Especially in the reign of Louis XVI (1774-93) many extraordinary privileges were allowed and in some respects the Bastille might be better described as a club than as a prison. Fraternization was permitted among the prisoners and they were supplied with excellent food and clothing. The popular horror stories were carried over from earlier times.

Bavarian Succession, see *Succession Wars.*

Belgium, a small kingdom on the North Sea coast of Europe. As early as 50 B.C., when he was the Roman proconsul in Gaul, Julius Caesar fought and conquered the Belgae and added their province to Gaul. In his *Commentaries* he paid high tribute to the Belgae, calling them the bravest of his foes. The territory remained Roman for about 500 years, and until 1830 its history is inseparable from that of the Netherlands, the two being known as the *Low Countries.*

Early History. Belgium was part of the Frankish kingdom of Charlemagne. After Charlemagne's death and the consequent weakening of the Frankish authority, the greater part of eastern Belgium became a part of the German Duchy of Lorraine; the western section, known as *Flanders,* was long controlled by the kings of France. Flanders today comprises the two provinces of Western Belgium. During the latter part of the Middle Ages, though political fortunes were variable, the Low Countries experienced a great degree of prosperity, and the present Belgian towns of Namur, Ghent, Antwerp and Brussels became important centers of industry and art. Before 1400 Burgundy was a strongly established state between France and Germany, and in 1384 it annexed Flanders and tried to arrest the growing power of its cities.

Under Spanish and Austrian Rule. By the marriage of the daughter of the Burgundian King, Charles the Bold, to Maximilian of the House of Hapsburg, control of Belgium passed to the Hapsburgs upon the death of Charles. A grandson from this marriage became Charles I (Charles V of the Holy Roman Empire), who ascended the throne of Spain in 1516 and made the Low Countries Spanish provinces. Under his son and successor, Philip II, the Protestant section of the Low Countries (roughly, the modern Netherlands) rebelled and won independence, while Catholic Belgium remained under Spanish rule. At the close of the War of the Spanish Succession in 1713, Belgium was given to Austria. The son and successor of Maria Theresa, Joseph II, sought to add the Netherlands to his possessions and thus unite it to Belgium and impose free navigation of the Scheldt River. In this he was only partly successful; the general dissatisfaction, coupled with administrative harshness, in 1787 led Belgium to declare its independence. It was forced back under Hapsburg rule but was given numerous governmental concessions. The part of the Low Countries nearest France was taken by the French during the French Revolution, and Belgium remained under this control until after the downfall of Napoleon; the last great battle of the Napoleonic Wars was on Belgian soil, at Waterloo. The country was then united to the Netherlands by the Congress of Vienna (1815).

United with the Netherlands. This disposition of Belgium proved generally unsatisfactory. Belgium and the Netherlands were not moved by the same impulses. Belgium was agricultural and Catholic; Holland was commercial and Protestant. The new constitution favored Holland above Belgium, and the latter objected to the primacy of the Dutch language in both sections. In 1830-31, Belgium revolted and secured independence. In 1839 the neutrality of the new state was guaranteed by Great Britain, France and Prussia, a fact of tremendous import, for when the World War began in 1914 and Germany invaded Belgium, Great Britain declared war upon Germany because it had violated Belgian neutrality.

An Independent Kingdom. The first king of the new Belgium was Prince Leopold of the German House of Saxe-Coburg, who ascended the throne as Leopold I. Holland had refused to recognize the independence of Belgium and sent an army to conquer it, but the Powers forced the Dutch to retire. No further historical developments of note occurred until the death of the king brought his son Leopold II to the throne in 1865. The new king added the vast area of the Belgian Congo, more than 900,000 square miles, to the possessions of his small nation. Leopold II died in 1909, and succession to the throne fell to his nephew Albert I, whom the World War was destined to make a national idol and a world hero. Until the war united the nation in common defense, the years of Albert's reign saw a struggle of political parties for ascendency and a steady development of the resources of the kingdom.

Belgium in the World War. Belgium had no interest in any of the issues that precipitated the World War. The political disputes of the continent and the racial mixtures of the Balkan area were entirely foreign to its problems. Its part in the war was determined by an accident of geography; Belgium happened to lie on the easiest military road from Germany to France. Upon the declaration of war by Germany against France, German troops appeared on Belgium's eastern frontier with a demand for passage through the country. Germany proposed, if necessary, to consider the German agreement to respect Belgian neutrality as a "scrap of paper." King Albert replied that "Belgium is a nation, not a road," and for 2 weeks his little army resisted the German advance. Step by step, the Belgians were pushed back, but those 2 weeks gave France and Great Britain time to mass their armies to meet the German onslaught. Disaster was spread in the wake of the German passage. Cities were occupied and partially destroyed, and demands for heavy indemnities were made. Eventually Germany held the entire country except the far southwest corner, from which it could not dislodge the remnant of the defending army, led in person by the king. During the war the Belgian Army fought with the Allied forces; about 80,000 Belgian soldiers were killed, wounded or were taken prisoners; 6,000 civilians were killed and 125,000 men, women and children were driven out of Belgium into Germany. The morale of the Belgians was strengthened by the heroic attitude of Cardinal Mercier, whom German threats could not silence.

Underwood & Underwood
Albert I and Elizabeth
The beloved wartime king and queen of the Belgians

After the War. By the Treaty of Versailles it was provided that the first $500,000,000 paid by Germany in indemnities should be applied to the rehabilitation of Belgium. Reconstruction of the devastated country was begun at once, and within 5 years had been nearly completed. In March, 1934, King Albert died and his eldest son was crowned King of the Belgians as Leopold III. In 1940 during the 2nd World War Germany attacked and invaded neutral Belgium. England and France responded to Belgium's call for aid but the German Blitzkrieg quickly conquered Belgium.

Benedictine Order, the earliest of the great monastic orders of western Europe, founded by St. Benedict (480?-543?). Disgusted by the worldly life that he observed in Rome, Benedict withdrew to Subiaco near Rome where he began a life of rigid renunciation. He soon attracted a group of devoted followers. About 515 he composed his *Regula Monachorum* or *Rules of Life for Monks* setting forth his ideals of the truly religious life. This work became the accepted rule of Western Monasticism. In 529 Benedict founded the first Benedictine monastery at Monte Cassino. In the following two centuries the Benedictine order grew with great rapidity, and became the most important agent in spreading Christianity over western Europe. To the Benedictines must also be credited the preservation of most of the literary classics of the ancient world that survived the long cultural darkness of the Middle Ages.

In the 13th century, the high noon of European monasticism, it is estimated there were as many as 30,000 Benedictine monasteries; many of these were abandoned with the rise of the great orders of mendicant friars founded by St. Dominic and St. Francis. By the 15th century the number of Benedictine communities had fallen to 15,000. With the Protestant Revolt and the decline of medieval ideals that accompanied the expansion of Europe in the 16th and 17th centuries the Benedictines lost the dominance of the religious cultural life of Europe that they had enjoyed for hundreds of years.

Bering Sea Controversy, a disagreement between the United States and Great Britain over seal fisheries in the Bering Sea that was submitted to arbitration in 1893 with the result that the United States' claim of jurisdiction over sealing in waters beyond its territorial domain was denied, and Great Britain was awarded damages of $473,000.

The Pribilof Islands in the Bering Sea north of the Aleutian Islands are the principal home of the valuable fur seal. As part of the Alaska Territory, these islands were subject to the jurisdiction of the United States, but the United States assumed the further right of regulating sealing over the whole of the Bering Sea, claiming that only by such regulation could the ultimate extermination of the herd be prevented. Efforts to enforce this assumed jurisdiction led to diplomatic protests, and the whole question was finally referred to a board of eight arbitrators—two to be appointed by each of the interested powers and one to be appointed by each of four heads of neutral states, the president of the French Republic, the king of Italy and the king of Norway and Sweden.

In 1911 the United States, Great Britain, Russia and Japan agreed by treaty to abolish pelagic or open-sea sealing, thus effecting by mutual agreement what the United States had unsuccessfully attempted on its own responsibility.

Bhutan, a small state in the Himalaya Mountains, on the border between Tibet and British India. While its area is now only 18,000 square miles, it was originally much larger, comprising parts of the northern provinces of Assam and Bengal in India. In 1864 the natives were charged by the British with outrages in India, and the territory was reduced to its present proportions. In return for the territory taken by the British, the Government of India guarantees an annual subsidy to Bhutan. The Government is entirely in the hands of the natives, but there is an agreement that in its foreign relations it shall be guided by the advice of the India Government.

Blenheim, a decisive battle of the War of the Spanish Succession, fought August 13, 1704, at Blenheim, Bavaria, between the French and Bavarian armies, commanded by Marshals Tallard and Marsin, and the English and Austrian armies under the Duke of Marlborough and Prince Eugene. The battle resulted in the heavy defeat of the French and Bavarians. The losses of the English and Austrians amounted to 4,500 killed and 7,500 wounded; of the French and Bavarians, 11,000 surrendered as prisoners, and an unknown number (exceeding 10,000) were killed.

The battle is of historical importance because it gave a crushing blow to the vast military and political power of France, which had dominated western Europe for 30 years and appeared at the opening of the 18th century to be invincible. The war dragged on for nearly 10 years, but the tide of French ascendancy under Louis XIV had definitely been turned, and France was forced to take the defensive.

Bohemia, a central European province that in early days was under the sway of various groups; at one time it was an independent state, then a crownland of Austria-Hungary and finally the western province of the new state of Czechoslovakia. The territory that became Bohemia was occupied by a tribe called the *Boii,* a Celtic people who in the century before the beginning of the Christian Era were driven out of Germany. In the 6th-century Slavic people known as the Czechs came from the east and made permanent settlements. They were converted to Christianity by the Germans and existed until the 12th century as vassals of Germany. The Germans then permitted them to organize a kingdom, and the next 100 years was the period of their greatest power.

Eventually the kingdom fell into the hands of the Hapsburgs, whose religious persecutions of the people had no small part in bringing on the Thirty Years' War (1618-48). Bohemia suffered much during this war; lost two-thirds of its population and for more than a century was completely stagnant. Then the old spirit of the Czechs was revived; it ultimately won recognition for Czech instead of German as the official language of the province. At the end of the World War the Czechs were incorporated into the new republic of Czechoslovakia. In 1938 and 1939 Germany made Czechoslovakia a part of the German Reich; Bohemia and Moravia being protectorates.

Bolivia, one of the two countries of South America without ocean frontage. With Peru, it shares the ancient glory of the empire of the Incas, an Indian race once dominant in western South America. Pizarro, a Spaniard, conquered the Incas in 1523, and when his reports of vast mineral wealth in the region reached Spain there was an influx of people seeking riches. These adventurers enslaved the Incas, and so thoroughly were the latter kept under the lash in the mines that opportunity for resistance against oppression did not come until 1780. In that year a formidable revolution under an Inca chieftain, Tupac Amaru, threatened the power of Spain in that part of the continent, but Spanish arms were victorious. Not long after Pizarro's conquest the territory was made part of the viceroyalty of Peru, by which it was governed until after 1776; in that year the viceroyalty of Rio de la Plata (later Argentina) was organized of which Bolivia was ultimately made a part.

Steps toward Independence. The events in Europe brought a desire for independence among all classes. Through smuggled printed matter the people learned of the French Revolution and were later aware that in 1808 Napoleon had placed his brother Joseph on the throne of Spain. They refused to accept Joseph as their king and in 1809 began a revolution to rid themselves of foreign rule. The Spanish soldiers were on the point of quelling the disturbance when a force of patriots from Buenos Aires came to the assistance of the rebels. The southerners were defeated, but the Bolivians refused to lay down their arms, and the warfare continued for a dozen years. Finally in 1823 a force under General Sucre was dispatched from Colombia, and it aided the Peruvian and Bolivian people to throw off the government of Spain.

Political Troubles. The next year a congress was called and, in a proclamation issued August 6, 1825, established the independence of Upper Peru. On the 11th of the same month the four southern provinces organized the republic of Bolivia, and a constitution was drawn, 1827, by the great liberator, Bolivar. So grateful were the Bolivians for the assistance of General Sucre that he was offered the presidency of the country for life, but he served only 2 years; though he had proved to be a fine soldier, he was a poor administrator. Following Sucre, Santa Cruz became president and established a dictatorship. He also usurped control in Peru and combined Peru and Bolivia into one government, with himself as protector. The union was dissolved when he died. Thereafter, in practically continuous procession, one dictator followed another. Within a period of 90 years the country had about 70 dictators. In 1931 a more liberal government was established under the presidency of Dr. Daniel Salamanca.

The Gran Chaco War with Paraguay, which was carried on persistently with great loss to both sides during the years from 1928 to 1935, was finally ended by the mediation efforts of the other leading South American nations and the United States.

Brazil, a large country in South America, whose territory was early sought by Spain, Portugal and the Netherlands. It became a Portuguese possession by a strange decree. In 1500 a Spaniard, Vicente Pinzon, touched that part of the coast of South America and claimed it in the name of his king. In the same year Cabral, a Portuguese, took possession of it for Portugal. These conflicting claims would have caused complications had not the two countries agreed to abide by the Papal bull of Alexander VI, promulgated in 1493, when news of the discovery of Columbus electrified the Old World. The Pope declared that to Spain should be given all new lands found west of a line running north and south from a point 100 leagues west of the Azores and Cape Verde Islands, and that Portugal should have all new lands found east of that line. No one foresaw what benefits would accrue to either nation from this decree as the extent and location of the new lands were unknown. Both Spain and Portugal were displeased, and in 1494 they agreed on a new line, to run 370 leagues west of the Cape Verde Islands; in 1529 the line was placed 297½ leagues from the Molucca Islands. As far as the North American continent was concerned, England, France and the Netherlands ignored the Pope's decree, but adherence by Portugal and Spain gave Brazil to Portugal and the remainder of South America to Spain.

Settlement and Conflicting Claims. Amerigo Vespucci twice visited this coast. On his second voyage (1503) he left a small settlement and returned to Portugal with a cargo of dyewood, called *braza* because of its peculiar color, and from this incident the name Brazil was given to the little settlement he had founded. The first colony was formed in 1532 by Martin de Souza. Bahia was established in 1549; for about 215 years it was the capital of the colony. French Huguenots established themselves in 1555 on an island in the Bay of Rio de Janeiro, but the Portuguese forced them out in 1567 and then founded the town of Rio de Janeiro on the mainland. During European political complications Spain seized Brazil (1580) and held it for more than 50 years, when the Netherlands took most of it as a result of war between the Dutch and the Spaniards. Portuguese and Spaniards combined to drive out the Dutch, and in this effort they had the active assistance of native chiefs, an act that leveled the barrier between Indians and whites and resulted in intermarriage. Not until 1662 did the Netherlands admit final defeat. Portugal made little effort to colonize Brazil, but instead gave Portuguese men of affairs each 300 miles of ocean front with unlimited extensions into the interior. These proprietors worked the natives very hard and endeavored to enslave them, but slavery of the Indians was frowned upon, and after 1680 negro slaves were imported from Africa. Slavery was not wholly abolished until 1888.

Brazil Becomes an Empire. During the Peninsular War in Europe, France invaded Portugal, and the Portuguese royal family fled to Brazil for refuge, and from there governed Portugal for about 15 years. When King John VI returned home in 1821, leaving his son Dom Pedro as prince regent of Brazil, the country declared its independence and established an empire with the youthful Dom Pedro as Emperor.

Dom Pedro disappointed the new Brazilian nation; in many respects he was a failure as a ruler. When his father died in Portugal, the Portuguese throne was left to the son, but Brazil was not thus to be rid of him. He refused to return to Portugal and named his daughter as successor to John VI. His unpopularity increased until he was forced to abdicate in 1831, and his son, at the age of 5, became Emperor Dom Pedro II. A succession of politicians as regents for the young emperor distracted the nation by their intrigues, and when the youth was 15 years old he was declared of legal age so that his authority might be direct and the regency abolished. He was crowned as emperor in 1840. Dom Pedro II stands out as one of the most enlightened rulers of all time. He knew that Brazil would not long wish to remain a monarchy in a continent of republics, and in 1889, when discontent became widespread, he stepped aside. He was then asked to leave the country so that he might not influence the trend of events. His private property was respected, and he was offered an annuity of $2,500,000, but this he rejected.

A Republic Formed. In November 1889 Dom Pedro sailed for Portugal, and within 15 months after his departure a republican constitution was adopted. One president followed another in quick succession; revolutions were started frequently, the purpose of one of them (1893) being the restoration of the monarchy. These revolts halted the progress of the nation temporarily, but on the whole Brazil has prospered. After 1920 the Congress decided to remove the national capital far inland at some future date, to free the Government from the political intrigues in the congested coast districts. No one knows when the new capital will be built, but its future site has been located near the center of the country, 1,000 miles from the coast.

The nation joined the allied countries in the World War, and its navy gave assistance to the American Navy on patrol duty. In 1922 Brazil gave adherence to the League of Nations, but its membership was withdrawn in 1927, when it was refused one of the permanent seats in the Council of the League. A reciprocal trade pact with the United States was signed in February 1935.

The world economic depression of the 1930s was seriously felt in Brazil. The Government took many extraordinary measures to prevent economic collapse, attempting in one instance to maintain the world price of coffee by burning large quantities.

Late in 1937 a dictatorial regime (apparently of a Fascist type) was set up under the control of President Getulio Vargas. A rigid censorship of news was established, and the recent trend of events is obscure.

Brest-Litovsk, Treaty of, the treaty concluding a separate peace between Germany and the newly established Bolshevik government of Russia during the World War. The treaty was signed on March 2, 1918, after revolution, economic collapse and a succession of military defeats had made it utterly impossible for Russia to continue fighting. The terms of the treaty were harsh in the extreme, providing for wide annexations of territory, heavy indemnities and oppressive economic control by the Central Powers of Russian supplies of food, oil and other material.

By the conclusion of a separate peace with Russia, Germany was able to free large bodies of troops for a final effort to win the war in the west before the growing American army in France should become strong enough to affect the issue. But with the diplomatic ineptitude that characterized their conduct of the entire war, the Germans failed to estimate at its true value the moral effect of imposing such ruthless terms on a defeated enemy; throughout the allied countries the treaty roused a hatred and determination for vengeance that played no small part in drawing up the crushing terms of the Treaty of Versailles at the end of the war. By one of the clauses of the Treaty of Versailles, Germany surrendered the gains she had taken by the Treaty of Brest-Litovsk.

buccaneers, pirates and adventurers who harried the West Indies and the coast of South America in the 17th century and attained through their numbers, unity and organization almost the position of a recognized national power. The buccaneers were recruited chiefly from groups of English, Dutch and French smugglers, who carried on an illegal trade in slaves and merchandise with the Spanish possessions. Increasing in strength they established several strongholds on various West Indian islands and ultimately succeeded in virtually controlling the entire Caribbean basin and Gulf of Mexico. They allied themselves with foreign Powers, helping the English to capture Jamaica in 1655 and taking sides in the English-French and English-Dutch wars. They chiefly preyed on Spanish commerce, however, and for this reason were not molested seriously by the English, the only European Power capable of putting them down. For half a century their plundering raids rendered life and property insecure in all the coast towns; probably the strongest factor in breaking them up at the beginning of the 18th century was the impoverishment of the communities that had supported them.

Bulgaria, one of the small kingdoms of the Balkan Peninsula, was first settled by a part of the horde that during the early centuries migrated from western Asia to central Europe. These tribes were supposed to be Slavs, and they were followed, probably in the 5th century, by the Bulgars, who had separated from the Huns, to whom they were racially related. The Slavs and the Bulgars ultimately lived together in peace, as neither could drive the other away. They intermarried, and their descendants became the Bulgarians of the present day.

Early History. The Romans claimed sovereignty in this area, which they called *Moesia.* The new settlers were not friendly to the Roman power in the east, represented after 323 A.D. by the Byzantine Empire, and captured some Byzantine territory. After the middle of the 9th century, the Bulgars adopted Christianity, and in the 10th century the country reached its greatest dimensions—from the Black Sea west to the Adriatic Sea and north to the Carpathian Mountains. It was destined to be divided, however, by Byzantine power, into eastern and western parts, the cause being religious differences. In 1186 the Bulgarians rallied and established their nation anew, with the capital at Tirnova, but they were overthrown by Serbia, then rapidly becoming a great Slavic power.

Turkish Rule. Within a few years occurred an event that was momentous for Europe. In 1361 the Turks secured for the first time a solid foothold in Europe when they captured Adrianople. Bulgaria was scanned enviously, and between 1388 and 1393 the Turks conquered the country, and destroyed the capital city. The rule of Turkey continued without interruption for about 500 years, and there were no historical events of interest until the last part of the 19th century. In 1878 there was a serious revolt against Turkish rule, and it was quelled with such ruthlessness that all Europe was horrified at the atrocities committed. Russia intervened in behalf of Bulgaria, and a Russo-Turkish war resulted, in which Turkey met defeat. Russia was actuated by a desire to unite all Slavic people and bring them under its direct influence, thereby strengthening its position in Europe. At the successful conclusion of this war Bulgaria was given large accessions of Turkish territory, and an outlet to the Aegean Sea; but the powers of Europe feared this augmentation of Slavic influence, and at the Congress of Berlin (1878) refused to permit Turkey's territory in Europe to be so much reduced. The Bulgarian boundary was set north of the Balkan Mountains; the strip of seacoast was denied it, and the small state was left under the control of Turkey, with a prince of the people's choice on the throne. Thereafter for more than 20 years a semblance of peace was maintained, broken only by racial unfriendliness and jealousy of Serbia, a country that viewed with disfavor the growing power and importance of the Bulgars. In 1879 Prince Alexander of Battenberg, of the house of Hesse, was elected czar.

End of Turkish Rule. In 1887 the Powers recognized the right of Prince Ferdinand of Saxe-Coburg to the throne, and national aspirations of Bulgaria in favor of independence became more pronounced. The Turkish rulers in Constantinople made it plain that the diplomatic representative from Bulgaria to Turkey was only an emissary of a vassal state, and this angered the Bulgarians, who believed their country to be equal in all respects to any other in the Balkan area. In October 1908 Prince Ferdinand proclaimed the independence of Bulgaria, to which Eastern Rumelia had been joined. Negotiations were concluded for payment of indemnities to Turkey, and by consent of the Powers in 1909 Prince Ferdinand was recognized as king of the independent state.

War with Turkey. In the Turkish part of the Balkan Peninsula, particularly in Albania, oppression of the Christian population did not abate, and racial hatreds were also stirring in the small independent parts of the peninsula. In 1912 Bulgaria joined with Greece, Serbia and Montenegro and declared war upon Turkey.

The Allies were successful; Turkey was deprived of all of its European possessions except a small area including the cities of Adrianople and Constantinople, and Albania was declared independent. But quarrels at once arose among the victors over the division of the conquered territory, as both Serbia and Bulgaria wished a part of Albania, and Saloniki, on the Aegean Sea, was desired as a Bulgarian port.

Second Balkan War. In 1913 these quarrels led to another alliance of Greece, Serbia, Montenegro and Rumania, against the single state of Bulgaria. The addition of Rumania assured the defeat of Bulgaria in this Second Balkan War, with the result that Bulgaria was forced to yield a considerable part of its territory.

Bulgaria in the World War. The next year the World War began. Bulgaria guessed wrong in throwing its fortunes with Germany and Austria-Hungary and joining with its ancient enemy, Turkey, in a four-Power confederation to oppose almost all the rest of the world. In 1918 when Bulgaria sensed the impending defeat of the Germanic Powers, it ceased fighting, the king fled the country and his son Boris became his successor. When the treaty of peace was signed at Neuilly, Bulgaria lost all the territory it had conquered from its neighbors during more than 3 years of war, and its boundaries were fixed definitely by the Treaty of Lausanne in 1923, so that the country should not have an outlet to the sea.

Recent History. Since the war the rights of minority races, not only in Bulgaria but in all the Balkan states, were established on a basis more satisfactory than ever before, and Bulgaria slowly emerged from internal political disorders. In 1924 Greece allowed Bulgaria a sea outlet through the Aegean; in 1930 two royal houses were united in close bonds by the marriage of King Boris of Bulgaria to Princess Giovanni, daughter of the King and Queen of Italy. In 1935 King Boris declared martial law and ordered a new constitution. In 1941 Bulgaria allowed Germany use of its territory during World War Number Two in the Balkans. See World War II, p. 805.

Burgundy, once a powerful kingdom between early France and medieval Germany, and now a part of France. Its first known settlers were a Germanic people who migrated into Gaul; they did not mix with the natives they found there, but established their own kingdom. Their first conquerors were the Franks in the 6th century. Then early France controlled it; but by marriage between a princess of Burgundy and a male of the House of Hapsburg it became Austrian. In the reign of King Louis XI it was seized and made a part of France.

Byzantine Empire, known also as the Eastern, the East Roman, and the Later Roman Empire, which existed for more than 1,000 years with its capital at Constantinople. With Gratianus, Theodosius had been coruler of the Roman world and had been entrusted with affairs in the East. When Gratianus was killed in a battle with Maximus, a usurper, Theodosius began a campaign that made him sole Emperor of the East and the West, thus uniting the great Roman Empire for the last time. Following his death in 395, the vast domain was divided between his two sons, Arcadius and Honorius, the former receiving the empire in the East, the latter the Western Roman world.

Early History. With Arcadius, the independent history of the Eastern or Byzantine Empire began. Between 395 and 1453, when it came to an end, it was ruled by 107 emperors. Only a few of these are worthy of a place in a brief historical record; several were Westerners elevated to power during the Crusades, and of these the first was Baldwin I. Of the 107 who ruled, 20 were assassinated, 18 were blinded or otherwise mutilated by their enemies, 8 died in battle, 12 were forced to abdicate, 12 died in prison or in monasteries to which they had fled for protection and 3 starved to death. There was a constant struggle for supremacy among warring hosts, and finally the power of the Turks prevailed; the Turkish leader, Mohammed II, captured Constantinople in 1453.

Preserver of Civilization. For centuries the service to the world that made the Byzantine period remarkable was not realized. It conferred two great benefits on western civilization. First, the empire stood solidly between the non-Christian hordes of Asia and the growing civilization of Europe; it warded off attacks that, had they been successful, might have inundated Europe and retarded its advancement for hundreds of years. Second, Constantinople (during most of the period also known as *New Rome*) was a depository of the learning of the world, it preserved the best in art and literature of the Golden Age of the Western Empire; it became the home of the greatest scholars of the time, and when the Imperial City fell, there was an exodus that carried to central and western Europe the best thought of the age. This knowledge, which had been largely preserved and augmented, was widely diffused, and all Europe soon responded to the impulse. Because the thoughts of men were thus turned toward a new era, some historians place the end of the medieval period at 1453, though others prefer to begin the modern period at 1492, the date of the discovery of America by Columbus. The brief difference in time between the two dates is not important; the change from the medieval to the modern age did not come in a year or in a decade; but its advent, gradually recognized in the new outlook, was discernible in the last half of the 15th century.

Cade's Rebellion, an uprising in England in 1450 led by an Irish adventurer, Jack Cade. The rebellion expressed the discontent of the lower classes with the misgovernment of the group of powerful noblemen who controlled the incompetent King Henry VI. Particularly irritating to the people was the ignominious English failure in the war with France, burdensome taxation, chiefly to enrich court favorites, and corruption in the administration of justice that made the lives and property of small men insecure. Jack Cade succeeded in raising a force of 30,000 men in Kent; he marched upon London practically unopposed and entered the city in triumph. But he made no attempt to control his undisciplined mob of adherents, and they gave themselves up to pillage and excess. Lacking any directing organization, they were quickly put down by the citizens of London. Jack Cade fled to Sussex where he was hunted out and killed. Shakespeare has dramatized Cade's rebellion in the second part of *King Henry VI* (Act IV).

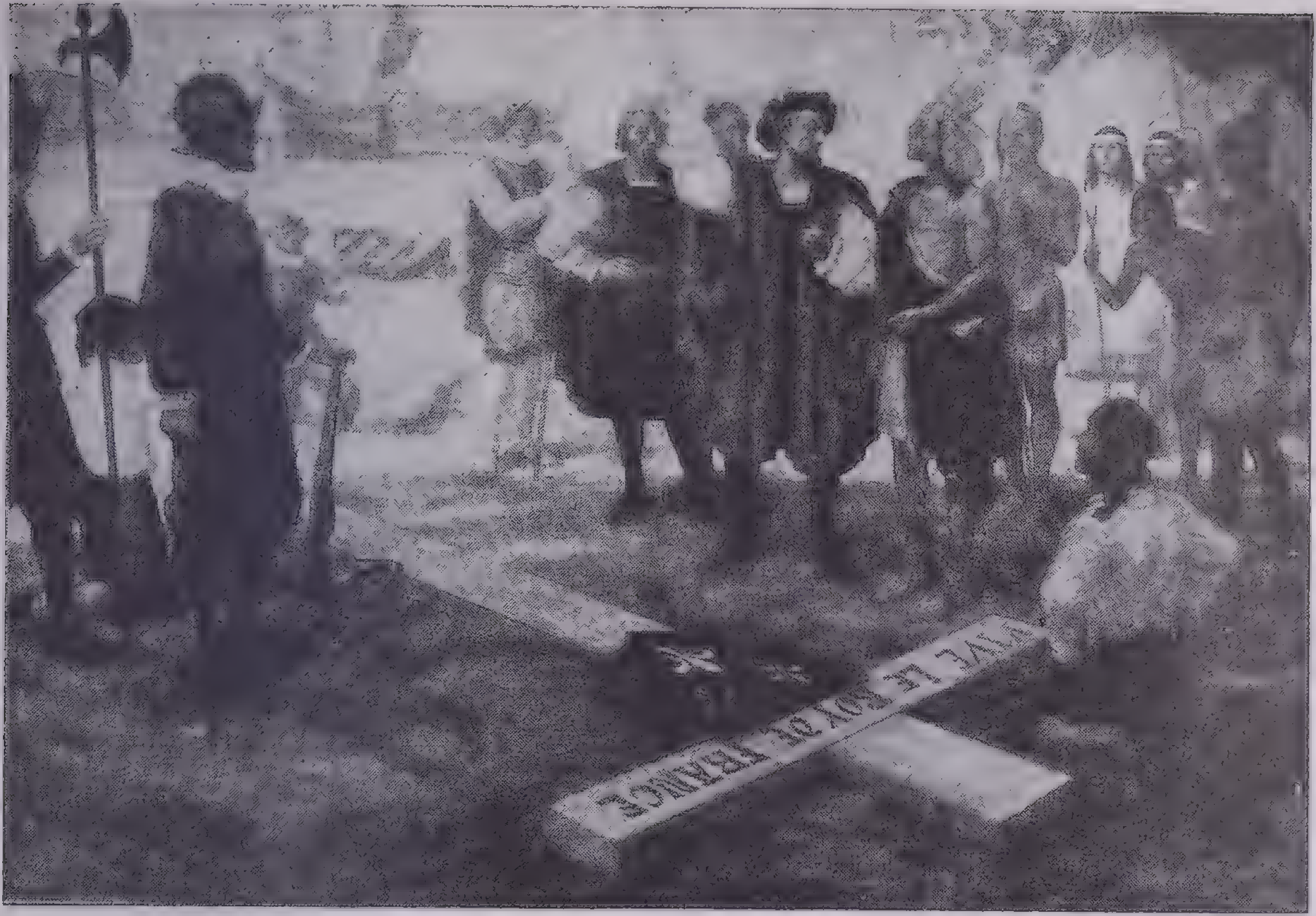
Canada, a geographical division of North America. It is often understood to be the Dominion of Canada, which is assumed to include all of North America, mainland and islands, that lie north of the United States, exclusive of Alaska. This conception is erroneous, for there are two divisions —the Dominion of Canada, which comprises nine provinces and two territories; and Newfoundland, comprising the island of Newfoundland, and the territorial division of Labrador, on the Atlantic seaboard. Newfoundland was a dominion until 1934, when it sought return to the status of colony. The Atlantic coast of Canada was known more than 900 years ago, and the country has contributed to the making of world history for nearly 350 years, but the political unit known as the Dominion of Canada came into existence within the memory of men yet living.

Earliest Adventurers. The Northmen, sea rovers of the medieval period, went beyond Greenland in their wanderings westward from Scandinavia and found the coast of North America. The earliest-known date connected with them is 986, and the first Norse leader of whom there is a record was one Herjulfson. Fourteen years later, Leif Ericson explored the same coast. Tradition says he ventured along the entire Canadian shore and a considerable distance down the coast of the present United States, and because of the pleasing aspect of the adjacent country called the new land Vinland or Vineland.

These Norsemen had no realization of the importance of their discoveries, and Europe was to know nothing of the vast continent until after Columbus had pointed the way nearly 500 years later. Henry VII of England thought so little of the proposed enterprise of Columbus that he refused assistance; but in 1497 he equipped a vessel for John Cabot, an Italian navigator, and authorized him to take possession in the name of England of any new land he might find. Cabot sailed directly westward and reached the Gulf of St. Lawrence, and this voyage was later made the basis of England's claim to the entire continent of North America.

The first serious effort to explore and people the northern part of the continent was made by the French. While Columbus was on his way home from his last voyage in 1504, fishermen from Brittany and the Basque regions of France had found rich fishing grounds off the Newfoundland Banks. They were followed in 1506 and 1508 by French exploring parties in the region of the Gulf of St. Lawrence; these accomplished little, but Verrazano added to the national interest in America when in 1524 he explored the Atlantic coast from the vicinity of North Carolina to Labrador.

The next exploration was by Jacques Cartier, who sailed into the Gulf of St. Lawrence in 1534 and 1535 and discovered that the gulf was the mouth of a vast river and waterway system. He continued his prog-


VIVE LE ROY DE FRANCE

From the painting by A. Sherriff Scott in the Seigniory Club, Montreal

Jacques Cartier Lands on the Shore of Gaspé Bay, July 24, 1534

ress up the river, gave it its name, penetrated as far as the Indian village of Hochelega, where now stands Montreal (950 miles from the open sea) and took possession of the land in the name of the king of France. The immensity of this vast domain and its potentialities led the French Government to begin the establishment of a colonial empire, and to Samuel de Champlain France owes much of its early success in planting settlements.

The Work of Champlain. The first voyage of this leader was made in 1603. In the next year he and De Monts brought the first colony to the New World and settled it on an island in the St. Croix River; in the next year it was moved to Nova Scotia. This colony was broken up in 1613 by the English; later it was revived. From 1604 until his death in 1635 Champlain was the foremost French colonizer. In 1608 he founded the town of Quebec, the first permanent settlement in French America. Three years later for the purpose of trading with the Indians he made a temporary settlement where Montreal now stands. In 1609, while engaged with the friendly Algonquin and Huron Indians in a raid against the Iroquois, he found the beautiful lake that later was named for him. Heading westward, he discovered Lake Huron in 1615 and Lake Ontario in 1616. When he reported these explorations to the king of France, he was made governor of Quebec, and from 1619 to 1629 he voyaged home every year in the interests of New France.

Indian Alliances. The friendships Champlain formed with the Indians had a marked effect upon Canadian history and contributed indirectly to the eventual loss of French Canada to the English. Champlain aided the Algonquins and Hurons against the Iroquois. The Iroquois were members of the powerful Indian federation called the Five Nations, and in the following years this federation was to oppose the French by joining the English in the intercolonial wars. The allegiance of the Algonquin and Huron tribes to France was more than offset by the co-operation commanded by the English from the tribes farther south. The Hurons in 1649 were almost effaced by the Iroquois.

Frontenac Explorations. Frontenac, who succeeded Champlain, inspired exploration of the great West by Marquette, Joliet, Tonty and others. These missionaries and explorers reached the Mississippi River and followed that stream to its mouth. Their work gave to France the Mississippi Valley, and they left flourishing trading posts at Niagara, Mackinac and less important points.

The Church promptly followed the flag into New France, and early in the 17th century churchmen began to exert an influence so powerful that in time it often overshadowed the civil authority. The priests were ardent pioneers, and many a settlement would have ceased to prosper and others would have been abandoned had it not been for the fervor of the early fathers. In 1642 religious enthusiasts gave a permanent character to Montreal, and not long afterward Laval-Montmorency was transferred from a bishopric in Arabia to become head of the Roman Catholic Church in French America.

Political Changes. During the early years the New World adventurers were guided only by their own judgment and the wishes of the king. In 1627 a general charge of mismanagement led the sovereign, through Richelieu's influence, to place nearly complete control of the settlements in the hands of the Company of the Hundred Associates (incorporated as the Company of New France), not only for the purposes of government but also to have a monopoly of the fur trade, now grown to large proportions. This arrangement was undisturbed until 1663. In the latter year Louis XIV dissolved the Associates and placed New France under control of the Crown, this direct oversight continuing for about a century. The sovereign exercised his authority through a governor, a secretary and a superior council, all appointed by himself, and these officials were responsible only to him. For the last 3 years of French control in Canada (1760–63) the country was under military rule. The last French and Indian War had been in progress since 1754 and was to end with the cession of Canada to the British in 1763.

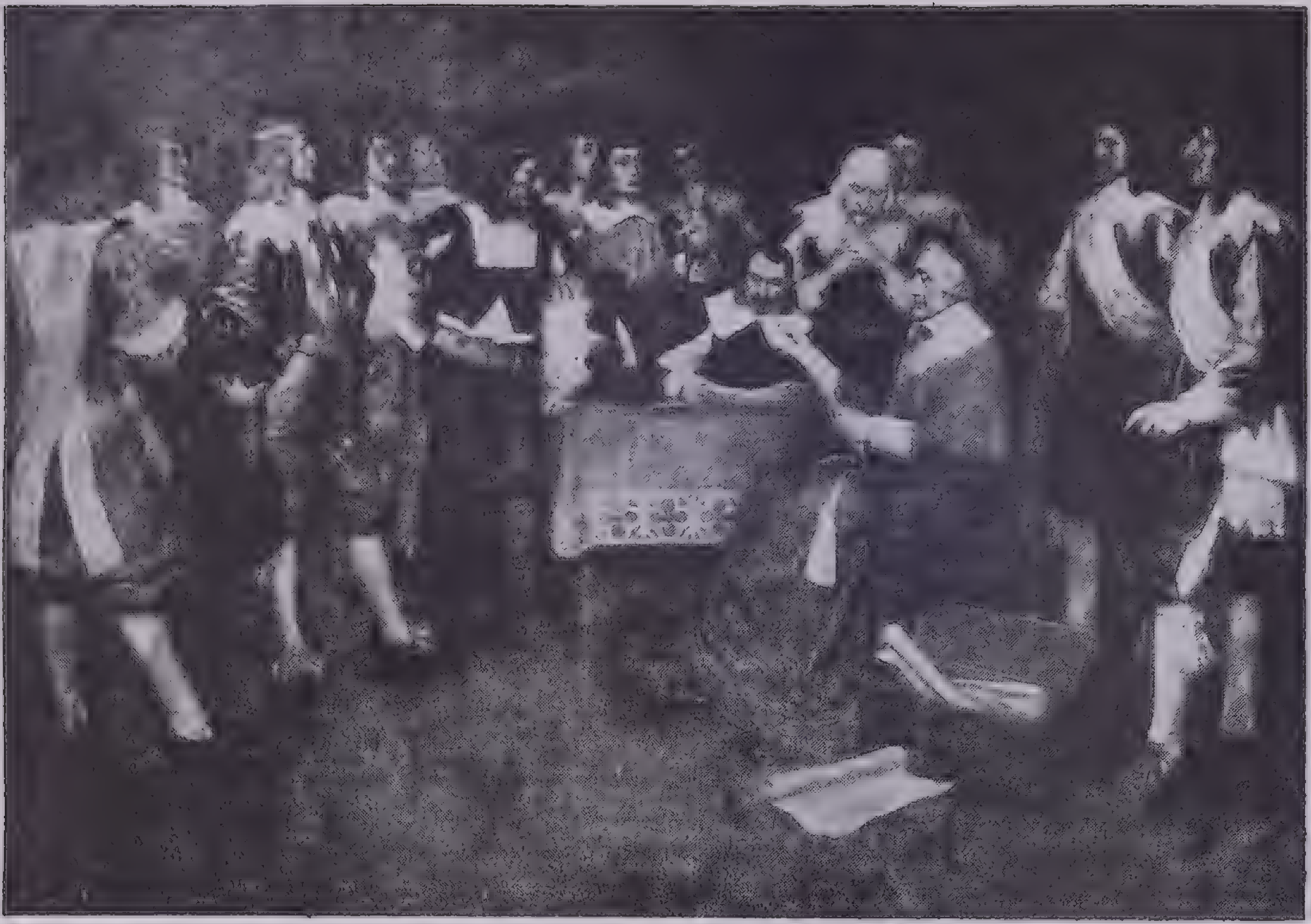
Intercolonial Wars. A series of wars in Europe that began in 1689 found England and France opposed as enemies. The first was known in America as King William's War and in Europe as the War of the Grand Alliance (1689–97). The French in Canada attacked the English at the south, killed many settlers and gained some territory, which was returned at the end of the war.

The second was Queen Anne's War, known in Europe as the War of the Spanish Succession (1701–14). The French Canadians attacked the English again, and in the far south the Spaniards from Florida fell upon the English. In this war the ferocity of the Indians resulted in several horrible massacres. The English took Acadia in 1710, renamed it Nova Scotia and have held it to this day. At the end of the struggle the English were also given by treaty the Hudson Bay region and Newfoundland. It was a costly war for New France.

The third was King George's War or in Europe the War of the Austrian Succession (1744–48). The French and the Spaniards in America were again allies against the English colonies. Louisburg, on Cape Breton Island, was taken by the British, but at the end of the war was restored to France, much to the chagrin of the English colonials who had captured it.

The last was called the French and Indian War; in Europe it was known as the Seven Years' War (1756–63). It was fought with greater severity than any of the three wars that preceded it and was a supreme disaster to French interests on the American continent. The British captured Louisburg again, as well as forts Duquesne and Niagara, and as a crowning victory, took Quebec. At Quebec the French lost their leader Montcalm; and the English commander Wolfe was killed. The treaty that closed the war gave Great Britain all the French territory east of the Mississippi River. Only two tiny islands in the Canadian area were left to France—St. Pierre and Miquelon, south of Newfoundland.

Great Britain Assumes Control. The Treaty of Paris (1763) brought the French in Canada under the gov-



From the painting by A. Sherriff Scott in the Seigniory Club, Montreal

Cardinal Richelieu Signing the Charter of the Company of the Hundred Associates

ernment of their traditional enemies, but the transfer was accomplished with little friction. Not more than 500 officials, titled personages, rich merchants and the like left Canada for France; the 60,000 French subjects resident in Canada resigned themselves to their new allegiance, but they refused to be Anglicized. The number of English in Canada at the time did not exceed 500. For many years the belief was held in England that the expected flood of Englishmen into Canada would soon make the whole population British, but this hope was not realized. The great mass of the French people insisted that their old mode of life should not be disturbed, and in 1774 the British Parliament showed colonizing wisdom by the passage of the Quebec Act, which gave formal recognition to the old French civil laws and institutions and assured to the Roman Catholics freedom of worship. This explains why the Province of Quebec to this day remains largely New France, with more than half the people speaking French, with large and influential newspapers printed in that language and the majority of the people adherents of the Roman Catholic Church. The Quebec Act also extended the Province of Quebec west and south to the Mississippi and Ohio rivers, but this territory south of the Great Lakes and east of the Mississippi was ceded to the United States in the peace treaty that closed the American War of Independence in 1783.

The French Loyal to Britain. The wisdom of the Quebec Act was soon demonstrated. In 1776 when the English colonies south of Canada began their war for independence, they hoped to be joined by Quebec and even sent an expedition there to turn its people to the cause of the colonies. The effort was in vain; the French population remained loyal to the British Government, and many enlisted to help fight England's battles.

Not all people in the southern English colonies favored independence. There were many British sympathizers, and some 40,000 of these, including ministers, judges and former high officials, abandoned their homes and property and went to Canada. These people were known as *United Empire Loyalists.* Most of these loyalists settled west of Quebec in Upper Canada, now Ontario, but a large group went to Nova Scotia. The Nova Scotia contingent of United Empire Loyalists soon became dissatisfied because of lack of representation in the legislative assembly; they petitioned for a new government, and in 1784, out of the western part of Nova Scotia, New Brunswick was formed.

Division of Canada. The region north of Lake Ontario was being settled by people of a character far different from the majority in the east; they were largely United Empire Loyalists and emigrants from England. Realizing that the two sections had little in common, in language, traditions, religion, laws and mode of life, the westerners petitioned the English Parliament for a separate government. The Canada Act of 1791 accomplished the separation; what is now known as Quebec became Lower Canada, and what is roughly Southern Ontario was named Upper Canada. York, which later became Toronto, was made the capital of the latter. North and west of Upper Canada stretched the unbroken wilderness, a large part of it under control of the Hudson's Bay Company. In Lower Canada the population was about 130,000, mostly French; in Upper Canada there were only 20,000, almost entirely English. Each section was given a legislative council, whose members were appointed for life by the king; there were to be an assembly elected by the people and a governor and an executive council appointed by the king.

Westward Expansion. The only knowledge possessed by the eastern part of Canada regarding the great West was contained in the periodic reports of the Hudson's Bay Company. That organization's plans did not include settlement of the country in which it operated, except the establishment of trading posts, and these were widely scattered; but the East had a vision of a vast national domain, and even while the War of 1812 was sorely taxing the provinces, they furnished men and means to explore the country westward to the Pacific Ocean. Chief among the leaders of these expeditions were George Vancouver and Alexander Mackenzie. Their work inspired Lord Selkirk in 1812 to found a settlement on the Red River, and this modest effort marked the beginning of the development of Manitoba. In the next 20 years development companies had located more than 150,000 people in the wilderness.

Responsible Government Achieved. The people were governed by forces over which they had no control; all legislative and executive policies were dictated from London, for even though the elected assembly might propose measures, it was possible for officials to refuse them recognition. In 1837 a protest resulted in a brief uprising called the *Patriot's War,* which brought forcibly to the attention of Great Britain the need of reform.

Lord Durham was sent to Canada to investigate and report on conditions. As a result of his observations, Upper and Lower Canada in 1841 were again made a single province by the Act of Union. It was given certain executive and legislative recognition, a step in the direction of making the Government responsible to the people. For more than 20 years the struggle continued, until the principles the people fought for were officially recognized.

Confederation. A union of all the provinces had for a number of years been under consideration by leaders of Canadian thought. By 1860 a union of the far eastern provinces—Nova Scotia, New Brunswick and Prince Edward Island—had been discussed, and in 1864 a convention was proposed that should consider the subject from a national standpoint. It was held in Quebec, and this body proposed more than 70 resolutions that should be the basis of government of a confederation of all the provinces. Delegates were sent to London to press their reports upon Parliament, and on July 1, 1867 Parliament passed the British North America Act establishing the Dominion of Canada. Eventually it was accepted by all the provinces except Newfoundland, which preferred to remain a colony of Great Britain. One feature of the Act was the division of the province of Canada again into two units—Quebec and Ontario.

Rebellion in the West. In 1869 the Dominion Government secured from the Hudson's Bay Company the surrender of its territorial rights in the great Northwest. This precipitated the following year a rebellion of 10,000 half-breeds (métis) in the newly acquired Rupert's Land against the incorrectly reported intention of the Dominion to surround them with restrictions and possibly confiscate their lands. The uprising was led by Louis Riel, hence was known as Riel's Rebellion. This leader organized a form of government and forbade Dominion officials to enter Rupert's Land to enforce decrees. A force of soldiers was despatched to the scene, but before its arrival Riel escaped into the United States and his followers scattered.

Dominion Expansion. In 1870 the Dominion Parliament created the province of Manitoba, and the name of Fort Garry, the capital, was changed to Winnipeg. British Columbia, which had developed rapidly along the Pacific coast, was invited to enter the Dominion, but the thousands of miles between it and the powerful East prompted a refusal. It did not become a province until 1885, after the completion of the Canadian Pacific Railroad.

In 1905 the districts of Alberta, Athabaska, Saskatchewan and Assiniboia were broken up, and the new provinces of Alberta and Saskatchewan were formed. Thus was completed an unbroken line of provincial members of the Dominion stretching from coast to coast. In 1912 the provinces of Manitoba and Ontario were extended northward to Hudson Bay, more than doubling their area, and Quebec was extended to Hudson Strait. That province lost a part of its northeastern corner when in 1927 about 112,400 square miles were awarded to Labrador. North of the three western provinces is Northwest Territories, comprising the three administrative districts of MacKenzie, Keewatin and Franklin; adjoining Alaska, in the far northwest, was the Territory of Yukon, which was joined to British Columbia in 1937.

In the British Commonwealth. In the British Imperial Conference in 1926 the great dependencies of the British Empire gave voice to their desire for an independent status. British statesmen had long foreseen such a demand, and without coercion or argument the British Commonwealth of Nations became a reality. The Dominions of Canada, Newfoundland and New Zealand, the Commonwealth of Australia, the Union of South Africa, the Irish Free State and the mother country of Great Britain and Northern Ireland were joined in a seven-sided union in which no one was to be superior to any other; all were invested with independence of action, but all were to remain joined by ties of tradition in loyalty to the British Empire as a whole.

In the World War Canada contributed heavily in men and material to the cause of Great Britain and demonstrated, with the other overseas dominions, the essential solidarity of the British Empire. During the 2nd World War Canada conscripted man power for defense only, her economic and industrial resources for war purposes, cared for war prisoners and allowed volunteers to enter the war.

Cannae, a great battle of the Second Punic War, fought in 216 B.C. between the Carthaginians commanded by Hannibal and the Romans under the Consuls Caius Terentius Varro and Lucius Aemilius Paulus. The battle marked the high point of Hannibal's invasion of Italy and very nearly resulted in the destruction of Rome. The Carthaginian force was about 50,000—40,000 infantry and 10,000 cavalry; the Roman army was nearly twice as large. Hannibal's masterly tactics in the Battle of Cannae have been admired by military students ever since—in the World War the German General Staff spoke of attaining a "Cannae" as the leading aim of military plans.

The essential feature of Hannibal's plan was a weak center and strong wings so as to entice the enemy into a position where he could be attacked from both sides. The plan was a thorough success. "Jammed and packed by their own mass and momentum between the hostile columns, helpless and hopeless, unable to fight or fly, the men were hewn down where they stood. It was a carnival of cold steel, a butchery, not a battle." The Roman army was almost annihilated; at least 50,000, perhaps 70,000, were killed. Hannibal's loss was less than 6,000. That the Battle of Cannae did not result in the complete collapse of Rome proves better than anything else in their whole history the invincible fighting stamina of the Roman people.

Carolingians, a line of Frankish kings who succeeded the Merovingians, the first dynasty of the Franks. The name was derived from Charles the Great (Charlemagne). The first Carolingian king was Pepin or Pippin, who was crowned in 751. Charlemagne, the first great Frankish monarch and the greatest in the line, was the son of Pepin. The dynasty ruled until 987, when it was succeeded by the Capetians.

Carthage, the greatest of the colonies of ancient Phoenicia. Situated at a strategic point on the Mediterranean coast of Africa, with a fertile surrounding territory and a harbor large enough for many vessels, Carthage became the greatest maritime and commercial power of the ancient world and the political rival of Rome. Practically nothing is known of its early history. In his *Aeneid* Vergil repeats the legendary story of its founding by Queen Dido, and he links this story with his equally legendary account of the founding of Rome, giving a poetical explanation of the deadly warfare that later grew up between the two cities. It is probable that Carthage was originally a small trading post established in the 9th or 10th century B.C. With the waning of Phoenician power in the East, Carthage carried on and expanded the Phoenician civilization in the West. It is likely that many of the wealthy families of Tyre and Sidon emigrated to Carthage in the 8th and 7th centuries B. C., when those rich Phoenician cities were attacked by the Assyrians. At any rate, Carthage grew rapidly both in population and wealth about this time, and had become, in the 6th century, the commercial capital of the Mediterranean world.

We know very little of the Carthaginian civilization and government until the 3d century, when Carthage came actively into conflict with Rome, and even for this late period our information is derived chiefly from hostile sources. The government was republican in form and an oligarchy of wealth in fact. The spirit of the ruling class was predominantly commercial; they hated war and disorder as expensive interruptions to trade, and they preferred rather to buy than to fight their way out of difficulties. Their military establishment illustrates the materialistic character of their civilization; their army was made up largely of foreign mercenaries, thus contrasting strongly with the citizen army of Rome. In the small-scale local warfare that accompanied the early history of Carthage these mercenary armies were effective enough; but in a desperate national struggle taxing the whole resources of the state Carthage felt sorely the lack of a spirit of sacrificing patriotism.

The story of Carthage's rivalry with Rome under the leadership of Hamilcar and Hannibal and of her final downfall in 146 B. C. is told in the article on Rome.

Chalons, Battle of, a great battle fought in 451 A. D. in which Attila and his Huns were defeated by an army of Romans and Visigoths. The battle saved western Europe from being overrun by wild barbarian tribes from central Asia and thus enabled the cultural traditions of Greece and Rome to be carried through the Middle Ages into modern times.

Chartists, a political movement for democratic reform that commanded many adherents in England in the middle decades of the 19th century. The so-called *People's Charter* was a six-point program demanding: (1) annual Parliaments; (2) universal manhood suffrage; (3) vote by ballot; (4) equal electoral districts; (5) abolition of property requirement for members of Parliament; and (6) salary payments for members of Parliament.

The Chartist movement first became of political importance in 1839 when great mass meetings were held and there was much talk of violence if the demands of the Chartists were not granted. The Government refused any concessions, and rioting that followed was put down by force. In the year 1848 when revolutionary activity disturbed all Europe, the English Chartists made another attempt to overawe the Government, but without success. With improvement of economic conditions the movement gradually lost influence.

Ultimately almost all the objectives of the Chartist movement were attained in England in the typically English way of slow evolution; the Chartists contended for sound and desirable principles, but they were poorly led, and their political ineptitude probably postponed the ends they sought rather than hastened them.

Chile, one of the most advanced countries of South America. Its geographical form is such that its government is attended with some difficulty, although most of its people are located in the central third of its area. It occupies about half of South America's Pacific coast line, a distance of 2,700 miles; but it averages less than 90 miles in width. Its history is associated largely with the central third of the country. Magellan in 1500 was probably the first European to reach Chile; its systematic settlement began 40 years later., The Spaniards found it difficult to conquer the country. It was inhabited by a hardy Indian race, known as the *Araucanians,* who savagely resisted the Spanish penetration.

In 1535 after the Incas of Peru and Bolivia were subdued, a Spanish chieftain, Almagro, marched south from Peru but returned after 2 years of fighting with little success. In 1540 Valdivia's second expedition was able to hold its ground. In 1541 he founded Santiago, on its present site, Concepcion in 1550 and Valdivia, named for himself, in 1552. These settlements established the ownership of Chile by the Spanish Crown. The difficulty in reaching the country made settlement slow. On the east, the Andes interposed an almost insuperable barrier; the west coast could be reached only by a voyage around Cape Horn. Added to these obstacles was the continued hostility of the Araucanians. For more than 300 years they opposed the advance of white people, and not until late in the 19th century were they persuaded that further resistance was unwise. During these 3 centuries or more the government was administered by officials appointed by the viceroy of Peru.

Independence Gained. Conditions in Europe tended to bring freedom almost simultaneously to all the Spanish countries of South America. Napoleon had invaded Spain and placed his brother Joseph on the Spanish throne. The colonies, deeply affronted, one by one renounced their allegiance to the revolutionary government in Spain. Chile took this step in 1810 by ordering the Spanish captain general to resign; rule by a junta government was established to continue in power as long as France held Spain. Clashes with military authority were frequent, and by 1814 Spanish authority had been restored in Chile; but in 1817 Argentina sent soldiers across a mountain pass to the assistance of the Chilean patriots, and Spanish power was definitely broken. During the next year the independence of the country was proclaimed, but one more battle was fought before the last Spanish stronghold surrendered. Even then Spain refused to concede Chile's independence until 1844.

Quarrels with Neighbors. The nitrate fields of upper Chile are its greatest sources of wealth, and they were acquired through a war fought to establish boundaries. In 1879 Chile took the port of Antofogasta, owned by Bolivia, to protect the treaty rights of its nationals. Peru became an ally of Bolivia in the controversy, but these allies were easily defeated, and in 1880 the Chileans were in possession of all the area in dispute. In the treaty that followed Chile took the province of Antofagasta from Bolivia, cutting that country off from the sea, and also took Tarapaca from Peru. In addition Peru surrendered Tacna and Arica for 10 years; at the end of that time a vote was to be taken in the two provinces to determine their future allegiance. This vote was to occur in 1894, but it was never held; the countries involved could not agree upon the details that should govern the balloting. Thus the Tacna-Arica dispute remained a disquieting diplomatic incident. The good offices of the United States were solicited in 1925 to settle the matter, and General Pershing was sent at the head of a commission to hold the delayed plebiscite; but the quarrelsome attitude of the nations prevented a decision at that time. In 1929 peace was secured by the cession of Arica to Chile and Tacna to Peru.

Internal Affairs. Civil strife marks the history of all Spanish-American countries; Chile has proved no exception to the rule. The most serious disturbance was in 1891 between President Balmaceda and the Congress over the question of the national budget. The adherents of the latter raised a force that defeated the Regular Army and then occupied the capital city. The United States showed its sympathy with the Balmaceda government and incurred factional hostility. Sailors from an American vessel on shore leave were later attacked and one was killed. This incident nearly led to war, but the Chilean Government made full amends.

ABC Powers. Argentina, Brazil and Chile, the three powerful nations of the continent, offered their services as mediators between the United States and Mexico in 1914, when an incident at Vera Cruz nearly plunged the two nations into war. Chile and Argentina, close neighbors along a boundary more than 1,000 miles in length, have pledged perpetual peace and have erected on the crest of the Andes on the boundary line a great statue, *Christ of the Andes,* as a memorial to their pacific relations.

The World War and After. Chile remained neutral during the war, but its nitrate fields were the chief source of munitions material for the Allied countries. In 1925 a new and more liberal Constitution was adopted. This followed a revolt of the military power against usurpation of too great authority by the President, who was forced to flee. As soon as the new constitution was in force, he was recalled to his post.

China, one of the oldest and largest nations, with a recorded history dating back more than 3,000 years, with an area more than 4,000,000 square miles and a population exceeding 400,000,000.

China's early history and cultural background are outlined in the general article on Oriental history. The later history of China is the story of China's discovery and exploitation first by the Powers of the western world and later by the newly imperialistic Japan.

The period of European penetration of China began in the 16th century. The early Christian missionaries were quickly followed by pushing commercial interests. Friction arose between the Chinese and the white men who came as missionaries preaching a doctrine of peace and good will, and as traders and soldiers with a doctrine of greed and force. The Chinese can hardly be blamed for not understanding at once the western psychology. They soon decided that the foreigners were not to be trusted. Reverent toward their own ancient religion, they considered themselves superior to people who professed a religion they did not always practice. They began to feel that any concessions they made to nations represented by the missionaries were granted to an inferior race. This was illustrated by the Opium War. The sale of that drug had been prohibited in 1839. But the traffic was profitable to Europeans, and Great Britain opposed the decree. A brief war followed; China was compelled to open five ports to trade, pay a large indemnity and give the island of Hong Kong to the British. There were several other armed invasions of China by European nations. Spheres of influence were set up along the coast. Here the nations established themselves, setting up their own governments and law courts.

Dismembering of China. Emulating the European nations and reviving old claims, in 1894 Japan drove the Chinese out of Korea, capturing Port Arthur and Weihaiwei, taking by a forced treaty the Liaotung peninsula and Formosa. Russia, Germany and France protested, and Japan was compelled to resign Liaotung; but Russia obtained Port Arthur and Talienwan, with numerous other privileges; Germany secured Kiauchan and concessions in Shantung; Great Britain gained the lease of Weihaiwei. These concessions were in return for loans made to pay the huge indemnity exacted by Japan.

The Boxer Rebellion. The weakness of the Chinese Government, emphasized by the result of the struggle with Japan, brought into existence a reform movement, but it was opposed by the dowager empress, as well as an antiforeign element, the Boxer association. Encouraged by the empress, this association determined to expell all foreigners. The foregn legations at Peking were besieged and were not

Underwood & Underwood

Marble Boat of the Summer Palace at Peiping

A stationary marble boat in the lake surrounding the Summer Palace at Peiping, China, was built by the Great Dowager Empress Tze-hsi (1835–1908) with funds voted by her council for a navy. It was used as a pleasure villa by the Empress, who frequently entertained guests with refreshments on the lower deck, from which a fine view of the lake is obtained. The boat is now a show place. The Summer Palace is one of the palaces in the Imperial City, that portion of Peiping which was the seat of the imperial and republican governments until 1928, when the capital was removed to Nanking

relieved until 2 months later when an international army entered the area. An indemnity of $333,000,000 was assessed, and China was compelled to grant many concessions, forbid any antiforeign societies, and punished membership in them by death.

Russo-Japanese War. One result of the Boxer Rebellion was an agreement that Russia would evacuate Manchuria. Her refusal was one of the reasons for the war with Japan in 1904. Russia suffered a crushing defeat, and Japan secured dominance in Korea, as well as many other advantages.

China a Republic. The reform element in China increased in power and in 1908 a limited constitution was proclaimed. A political revolution followed in 1910–11 and China became a republic, the first President being Dr. Sun Yat Sen. His successor was Yuan Shai Kai. South China favored the republic, but North China wished a return to a monarchy. An internal war threatened, but Japan prevented the formation of a new monarchy.

In the World War. English and Japanese troops drove the Germans from their concessions in Shantung. Japan demanded this area but was forced to return it to China after the war.

Internal Troubles. Since the end of the World War China has been torn with civil strife. To make bad matters worse, in 1931, on the pretext of protecting Japanese residents there, Japanese troops entered Manchuria and within 2 months had possession of the entire country with its population of 30,000,000 people. China retaliated by proposing a boycott of Japanese products but Japan crushed the movement by immediate military action. Troops were landed at Shanghai in January 1932, and the Chinese section was bombarded. Chinese troops who endeavored to defend the city were quickly defeated.

The Japanese Invasion. An unimportant clash between Japanese and Chinese soldiers near Peiping on July 7, 1937, quickly developed into a war of huge proportions with a tremendous loss of life. After almost 3 months of incessant onslaught the Japanse entered Shanghai, which was captured on November 9. Three weeks later nearly all of North China was under Japanese control. Nanking was captured in December, and although much more Chinese territory was taken in 1938, 1939, 1940 and 1941 the Chinese fought on courageously.

Colombia, a republic in the extreme northwestern corner of South America. It was reduced to its present size in 1903 when the Province of Panama seceded.

Early History. The earliest history of the country was associated with the Panama area. Balboa, crossing the narrow isthmus, was the first white man to view the Pacific Ocean. Pizarro explored the western coast as far down as Peru; on land Quesada conquered the native tribes, and by 1540 had made the country a dependency of Spain, calling it the *Province of New Granada.* Growth in population was slow; for more than 175 years it retained its colonial status. In 1718 it was raised to the dignity of a viceroyalty. In the revolutionary movement that swept all South America while the Napoleonic Wars were distracting Europe, Colombia revolted and declared its independence. From 1819 to 1822 Colombia and the present countries of Venezuela and Ecuador formed a republic, vast in area, under the name of the Republic of Colombia. In all these enterprises Simon Bolivar was the great leader; he has aptly been termed *the South American Liberator.* The union continued until 1829, when what is now Colombia became the Republic of New Granada. A step toward greater liberties for the people was taken in 1858; the separate provinces were erected into states, joined loosely under a central government, and became known as the Confederation of Granada.

Advancement through Revolutions. As in many other South American countries, the political evolution of Colombia has been marked by frequent revolutions. The most serious of these occurred from 1860 to 1863 and resulted in a new government and a new state. A new constitution was framed, the nine states approved it and the present name, United States of Colombia, was adopted. But the federation was too loosely cemented and another 3-year revolution (1884–86) resulted in forming a more powerful central government. Thereafter the revolutionary spirit was held more closely in subjection.

Secession of Panama. In 1900 the Province of Panama protested against the corruption of the Government, and as a means of quieting the rising discontent was given a measure of self-government; but this concession failed to appease the people, and in 1903 the province declared its independence. The United States promptly recognized Panama, and since then has acted as a peacemaker between Colombia and its rebel province. The parent country charged that the United States had fomented the rebellion in order to further its interests in connection with the projected Panama Canal. Circumstances gave a certain credibility to the charge. The United States had tried to effect a treaty with Colombia that would clear the way for canal construction, but the Colombian Congress had rejected the treaty in September 1903. Two months later Panama declared itself free. The Colombian Government endeavored, by reversing its attitude, to conciliate both the United States and Panama; the effort continued for several years. Colombia sought from the United States an indemnity of $25,000,000 to compensate it for the loss of Panama, when it was evident that the province was forever lost. It was impossible for Colombia to wage war against Panama, for its new government was protected by a force of American marines. For 20 years (1903–23) the quarrel between the American Government and Colombia continued; in 1923 the United

States confirmed the Treaty of 1903 and ordered the indemnity paid.

Conspiracy of Catiline, an attempt led by Lucius Catiline in 63 B.C to overthrow the Roman Government and establish a reign of terror. The plot was detected and frustrated by the vigilance of the consul, Cicero, whose volent orations, *In Catilinam* (Against Catiline), are our principal source of information about the episode, and his connection with the case has probably invested it with a greater importance than it truly deserves. It is nevertheless interesting for the question of Roman constitutional law that it involved and for the light it sheds on political and social conditions of the last years of the Roman Republic.

The constitutional question raised by the conspiracy of Catiline was whether the Senate had the right to confer extraordinary power on the chief magistrates (consuls) through the "extreme decree" (*senatus consultum ultimum*) conveyed in the formula *Videant consules ne quid res publica detrimenti capiat* (the consuls shall see that the state suffers no harm). In the emergency of the conspiracy of Catiline the Senate passed this decree; Cicero, the consul, held that he was thereby authorized to suspend the regular operation of the laws and (with the advice of the Senate) put to death four ringleaders of the conspiracy who had been arrested with incriminating documents upon them. By this action he violated the right of *provocation* or appeal, one of the oldest and most jealously guarded rights of Roman citizens. Three years later Cicero paid dearly for his boldness when he was forced into exile by a law exiling anyone who had put Roman citizens to death without trial.

Constance, Council of, one of the great ecumenical councils (that is, representative of the whole Church) of the Roman Catholic Church, summoned by the pseudo-Pope John XXIII in 1414. The council was called to consider serious questions then agitating the Church, among which were the rival claims to the papal chair of three alleged popes (John XXIII, Gregory XII, Benedict XIII) and the heretical doctrines being spread in central Europe by John Huss. The council was the largest and most brilliant held up to that time; more than 18,000 priests and 80,000 laymen assembled in the little Swiss city to watch and also to influence the proceedings.

John XXIII had hoped that the council would confirm his right to the papal seat; but the council under the leadership of Jean de Gerson and Pierre d'Ailly broke away from John's leadership and declared itself the supreme power in the Church. John was deposed, the other two claimants were forced to resign, and the council finally elected Martin V, thus ending the rivalry that had split the Church into contending factions.

The Council of Constance in the meantime had condemned the doctrines of John Huss and had arrested him and burned him at the stake after he had come to Constance voluntarily under a pledge of safe conduct given by the Emperor Sigismund.

Historically the chief importance of the Council of Constance is its attempt, at first successful, to assert the superiority of an ecumenical council to the Pope in the government of the Church. For a considerable time in the 14th century the whole system of administration of the Church hung in the balance; after the Council of Constance the supremacy of the Pope was not seriously shaken.

Corpus Iuris (Body of the Law), the great collection of Roman laws compiled under the direction of the Emperor Justinian about 530 A.D. The importance of this work is described by the German scholar, W. S. Teuffel, as follows: "Though Justinian, in causing these collections to be made, besides the craving to immortalize his name, was governed by the autocratic idea of establishing mechanical uniformity, foreclosing controversies among lawyers and debarring the judge from the exercise of his individual opinion, still it was he who rescued the treasures of ancient jurisprudence, otherwise doomed to destruction, rendered possible an historical treatment of Roman Law, . . . and laid the foundation of all further development of that law."

Costa Rica, one of the states of Central America, first seen by white men when Columbus discovered its shores on his fourth voyage (1502). The Spaniard Avila landed there in 1513, conquered the natives and took possession of the land in the name of the king of Spain. Hernandez settled there in 1523. When the land south of Mexico was conquered for that country by Cortez (1522–25), Costa Rica was joined with the other provinces in the captaincy general of Guatemala, of which it remained a part until freedom was gained in 1821. Since that time it has been a republic, with a history more peaceful than that of any of its Central American neighbors. In 1856 William Walker, an American adventurer, invaded the country but was repulsed. Costa Rica joined its sister states in forming the Central American Federation, though half-heartedly, for it preferred an existence apart from the strife of its northern neighbors. The most important dispute in the history of the country was a disagreement with Colombia over their boundary. Before it was settled, Panama seceded from Colombia, and the boundary question became a cause between Costa Rica and Panama; in 1921 it was settled by the arbitration of Chief Justice White of the United States Supreme Court.

Council of Ten, The, the supreme governing body of the Venetian Republic during the last 5 centuries of its existence (1310–1797). It had its origin in a secret tribunal set up to suppress a popular uprising early in the 14th century, but it soon succeeded in usurping the entire executive power of the state. Its arbitrary methods of government, enforced by secret arrests and condemnations, by assassinations, by a complicated espionage system that pried into private as well as public matters, have made it execrated by all lovers of democratic traditions, but in its favor must be pleaded the usual excuse of tyrannical government—that the alternative was intense factional strife amounting to anarchy.

Crédit Mobilier of America, a joint-stock company created by the stockholders of the Union Pacific Railroad Company when that road was under construction, and later the railroad's fiscal agent in completing its building. The Federal Government had given the railroad vast tracts of land along its route and guaranteed large subsidies to enable the construction to proceed. The amount the Government had guaranteed was nearly double the actual requirements, and the Crédit Mobilier reaped immense profits. Its stock in the year preceding the completion of the railroad in 1869 paid dividends of more than 400 per cent. An inquiry into the matter promised scandalous developments. To quiet the investigation, blocks of stock were sold to government officials at much less than market value. It was found that the Vice-President of the United States (Schuyler Colfax), the Speaker of the House of Representative, three senators and a number of representatives held blocks of the stock. The disclosures created intense excitement, but there was not sufficient evidence on which to base expulsions from Congress or to prosecute the offenders in the courts. Later investigations partly exonerated some of the accused persons.

Crusades, a series of great movements by the Christian nations of western Europe to wrest the Holy Land from the possession of the infidel Turks. The crusades are conventionally considered as beginnning with Pope Urban II's appeal to the Council of Clermont in 1095 and ending with the recapture of Acre by the Turks in 1291. Sporadic revivals of the crusading spirit continued, however, throughout the 14th century with an increasing admixture of political motives as distinct from religious. It was not until 1453, when Constantinople was captured by the Turks, that it became clear to everyone that no further effective effort could be made.

In 637 Jerusalem and the Holy Sepulcher had fallen into the hands of the Saracens, but for nearly 400 years Christians were permitted to make pilgrimages to the great shrine of their religion, and the Latin Church in Jerusalem was allowed liberty of worship. In the 11th century the Seljuk Turks swept westward from Asia, possessed themselves of the Holy Land and brought to an end the era of comparative good will. Stories of brutality and persecution and of extortionate levies on pilgrims began to reach western Europe.

In 1095 Alexius Comnenus, Emperor of the Eastern Roman Empire, wishing to regain the provinces that had been taken by the Turks, appealed to Pope Urban II for aid. The opportunity was eagerly seized by the Pope, who saw an opportunity to recover for Latin Christianity the Greek Christians of the East, and who strongly felt the humiliation and danger to both branches of Christianity of the rising power of the infidels. Urban also realized that nothing could so strongly make for unity among the western nations as a holy war against a common enemy.

At this juncture Peter of Amiens, a priest called *the Hermit,* returned from the East, where he had seen and experienced many of the hardships endured by the Christians of Jerusalem. He was welcomed by the Pope who made him leader of the propaganda that was to awaken Christendom to activity. Peter traveled throughout all western Europe, preaching eloquently. Late in 1095 the Pope addressed a plea to the Council of Clermont that was the last word necessary to invoke the crusading spirit: "Go now and take the sword of the Maccabees and protect the people of God. . . . The barbarous Turks have planted their colors on the very shores of the Hellespont, hence they threaten war to all the states of Christendom. Unless you oppose a mighty barrier to their triumphant course, how can Europe be saved from invasion?"

The First Crusade was begun in 1096, with an enrolment exceeding 200,000. It was divided into two armies. The first marched under Peter the Hermit. He had no authority, and there was practically no discipline. It resulted in a ghastly tragedy, and Peter's army was destroyed. Many were killed on the way through Hungary and Bulgaria, on account of the outrages they committed on the inhabitants. The second army was under experienced commanders, like Godfrey and Baldwin; it captured Jerusalem, slaughtered the inhabitants, and its leaders set up a kingdom that endured until Saladin retook the city in 1187. It then remained in the hands of the Turks until General Allenby entered it at the head of British troops in 1917.

In all, there were four principal Crusades and five minor ventures. One of the most remarkable and most ill-advised was the Children's Crusade in 1212. About 30,000 French children, probably half of them under the age of 12, reached Marseille, where the water front stopped them. Many returned home, but thousands were lured upon boats with the promise of free passage to the Holy Land; several vessels were wrecked, and those that escaped storms sailed to Alexandria, where the children were sold into slavery. Another section of this crusade, 20,000 strong, started from Germany but got no farther than Geneva. Thousands died of exposure and hunger, and few reached home again.

Cuba, an island of natural beauty, called the *Pearl of the Antilles,* was Spanish from the day of its discovery until 1898. It was first seen by white men when Columbus landed there on his first voyage, in October 1492. He thought he had found India, though informed by the natives that the land was an island. So large was it that Columbus returned a second time before he was convinced that he had not reached the mainland. In all, he visited it three times and gave it four names: first, Juana, for the son of Ferdinand and Isabella, who was Juan; second, Fernandina, for Ferdinand; third, Santiago, for Spain's patron saint; fourth, Ava Maria, an honor acknowledging the guardianship of the Virgin Mary over his enterprises; but the native name, Cuba, survived.

Courtesy Pan American Airways

El Morro, Havana, Cuba

At the entrance to the harbor stands this massive fortress, erected in the 16th century to protect the city from English, French and Dutch pirates

Early Days. In 1511 Diego Columbus, son of Christopher, sent a colonizing force of about 300 men to Cuba; these adventurers founded Santiago and San Christóbal de la Habana, on the southern coast. The latter did not flourish, so it was moved to the north coast and in 1519 became the foundation of the present-day Havana. The Spanish conquerors began almost at once a persistent persecution of the natives. The Indians were enslaved and treated with such severity that the whole race was in danger of extermination. To maintain a supply of slave labor, Negroes were imported from neighboring islands of the West Indies. In reward for his activity in establishing settlements, Diego Columbus had been given the right to name Cuba's governors. This privilege he relinquished in 1537, and the first governor named by Spain was Hernando de Soto, who later achieved fame as the discoverer of the Mississippi River. De Soto and his successors in office lived in fear of enemy attacks. That these fears were justified was proved by the burning of Havana by the French in 1538 and again in 1584. English naval vessels were also marauders, and pirates that infested the sea were another danger. During the Seven Years' War in Europe, England captured and held Havana and thus controlled the fate of the island. It was given back to Spain when peace was restored. Thereafter for nearly a generation, under benevolent rulers sent from Spain, Cuba enjoyed an area of prosperity.

Tyrannical Rule. With the beginning of the 19th century there was a radical change in governmental policy. With a few notable exceptions, every captain general sent from the mother country was a tyrant. Cuba's lot was not rendered easier when Spain lost its South American colonies in the South American revolutions (1810–30). The bitterness of Spain over these losses seemed to inspire its Cuban governors to hold the people in subjection by ruthless force.

The Spanish misrule in the island and the desire of the slave owners of the southern United States for new territory for the exploitation of negro slavery led to many American efforts, legal and illegal, to annex Cuba. As early as 1825 President John Quincy Adams tried to buy the island from Spain, and the proposal was repeated by Presidents Polk and Buchanan. In the meantime various filibustering expeditions, in which greed, adventure and patriotism were mixed, tried to get by force what could not be had by negotiation. In 1854 President Pierce asked the American ministers to Great Britain, France and Spain to confer on the Cuban situation. They made a report known as the *Ostend Manifesto,* recommending that the United States offer to buy Cuba for $120,000,000 and if the offer was refused should forcibly annex it. The Ostend Manifesto pleased almost no one; in Europe it was denounced, in the United States it was received coldly.

The story of Cuba and its relations with the United States in the latter years of the 19th century is told in the article on United States History. The Spanish-American War (1898) resulted in Cuba's independence from Spain practically under a United States protectorate. The Cubans were bitterly dissatisfied with American interference, and there was an influential body of opinion in the United States that opposed American imperialism in Cuba.

Political conditions continued to be unstable and confused. The curses of the Latin American countries—revolution, governmental corruption, dictatorship—have tortured Cuba for many years. In 1925 a comparatively solid regime was established by President Gerard Machado, but the violently repressive measures that he adopted to maintain himself led to his overthrow in a bloody insurrection in 1933. Several presidents have followed Machado, but none has yet been successful in establishing an orderly and free government.

Czechoslovakia, one of the new nations of central Europe that came into existence as a result of the World War (1914–18) when an effort was made to organize new states on the basis of "self-determination of peoples." The area occupied largely by this new country was the ancient home of the Czechs, a Slavic people who entered Europe in one of the waves of migration in the early centuries. Before the end of the 6th century they had settled in what later were known as Bohemia, parts of Silesia and Moravia, and soon became the dominant element in a mixed population. While all Slavs once spoke a language that all the race could understand, the Czechs, because of their solidarity, evolved a language of their own, now spoken by about 10,000,000 people. They made Bohemia one of the most important countries of Europe and for centuries resisted the efforts of their neighbors to subjugate them. Finally in 1526 the last independent king gave way to the Austrian rule of the house of Hapsburg. While the Czechs lost their independence, they steadfastly held to the idea that some day they would regain it. They secretly supported the Allies in the World War, believing that if the German-Austro-Hungarian cause were defeated, a new Czech state might arise. This was accomplished when in October 1918, before the final collapse of the Central Powers, the new state of Czechoslovakia was recognized by the Powers. A constitution was adopted in 1920, and Thomas Garrigue Masaryk, a scholar, statesman and patriot, was chosen as the first president. While it was decreed that no president may serve more than two terms, this disability was removed so far as it related to Masaryk, who was invited to continue in office for life.

After the war Czechoslovakia became a member of the Little Entente, a combination of Powers formed to maintain the *status quo* in central and eastern Europe. During the postwar decade the Little Entente was an important block in the French structure of collective security. In the years following 1933 the rising power of the Nazis of Germany severely shook the solidarity of the Little Entente, and Czechoslovakia, although continuing to be allied with France, found herself ever more dangerously threatened by the new Germany. When in March 1938 Germany seized and annexed Austria, the danger to Czechoslovakian independence was greatly increased. The French and Soviet governments pledged themselves anew to fight any German attempt to repeat the Austrian *coup,* and almost all Europe mobilized for war. The Treaty of Munich gave border districts to Germany, who broke this treaty and absorbed all Czechoslovakia in 1938 and 1939.

Dawes Plan, a temporary settlement of the problem of German war reparations reached in 1924 by an international commission headed by the American banker and administrator Charles G. Dawes. The Treaty of Versailles, which ended the World War, assessed penalties on defeated Germany in the enormous sum of $32,000,000,000. In the succeeding years it became evident that payments even of the interest could not be met. In an effort to enforce collection, France invaded the Ruhr, but the invasion resulted only in a further dislocation of the German economic system without producing the hoped-for payment. At the beginning of 1924 an impasse had been reached that gravely threatened the financial stability of all Europe. The purpose of the Dawes Commission was to devise a workable plan to set the German finances in order and obtain in reparations payments the maximum amount possible within Germanys' capacity. The plan provided for annual payments on a rising scale ultimately reaching $600, 000,000 a year. No limit was fixed on the total amount to be paid. A machinery was provided by which the payments were to be met.

The Dawes Plan remained in force until 1929, when an effort was made to effect a final settlement of the whole amount to be paid. A second international commission headed by Owen D. Young drew up the Young Plan that scaled down the annual payments and fixed the total amount to be paid at $7,827,000,000. This was to be paid over a period of 59 years. The Young Plan was accepted as a permanent settlement of the whole problem, but the world depression that began just as the plan was adopted was followed by a repudiation by Germany of all further obligations. Although the Young Plan remained legally in force in 1938 there have been no payments under it since 1931, and it is almost inconceivable that payments will ever be resumed.

decemvirate, a commission of 10 men (Latin *decem,* ten, and *vir,* man) appointed in the early Roman Republic (*c.* 450 B.C.) to draw up a written code of laws and thus end abuses of partisan interpretation of the traditional law by patrician magistrates. The decemvirate produced the code known as the *Law of the Twelve Tables,* which became the foundation of all later Roman law. The accounts of Livy and Dionysius, almost our sole literary sources for the story of the decemvirate and its work, were written more than 4 centuries after the events and contain, along with some kernels of historical truth, a large mass of legend and political falsehood. The very famous story of Virginia, slain by her own father to save her from falling into the clutches of the villainous Appius Claudius, is regarded as an invention by most modern scholars. A more plausible view of the character of Appius Claudius, the leader of the decemvirate, is given by G. W. Botsford, who regards him as a great liberal leader of patrician rank but of popular sympathies, not altogether unlike President Roosevelt in our own day. "It is far easier, however, to believe that these stories are aristocratic falsehoods for blackening the memory of the decemvirs than it is to imagine that the man who gave his country the priceless treasure of just laws could be himself a monster of injustice and cruelty."

Decisive Battles of the World. In 1853 the English historian, Edward Creasy, published a famous historical book, *Fifteen Decisive Battles of the World,* which was an attempt to interpret world history in terms of great crucial military movements. Another English writer, Henry Hallam, had attracted Creasy's attention by writing of the Battle of Tours (732 A.D.): "It may justly be reckoned among those few battles of which a contrary event would have essentially varied the drama of the world in all its subsequent scenes." Taking this criterion of what constitutes a decisive battle, Creasy selected the following as the great turning points in world history:

The Battle of Marathon, 490 B.C.
The Defeat of the Athenians at Syracuse, 413 B.C.
The Battle of Arbela, 331 B.C.
The Battle of the Metaurus, 207 B.C.
The Victory of Arminius over the Roman Legions under Varus (Teutoburg Forest), 9 A.D.
The Battle of Chalons, 451 A.D.
The Battle of Tours, 732.
The Battle of Hastings, 1066.
Joan of Arc's Victory over the English at Orleans, 1429.
The Defeat of the Spanish Armada, 1588.
The Battle of Blenheim, 1704.
The Battle of Pultowa, 1709.
The Victory of the Americans over Burgoyne at Saratoga, 1777.
The Battle of Valmy, 1792.
The Battle of Waterloo, 1815.

Since Creasy's day there have been three other battles that seem of similar importance—the Battle of Gettysburg, 1863; the Battle of Sedan, 1870; and the Battle of the Marne, 1914. A brief account of each of these battles showing why they were important may be found under their names.

Denmark, one of the Scandinavian countries of northern Europe. Its early history is mixed with mythology. That it was inhabited in the Stone Age is known, for kitchen middens and other evidences have been unearthed to testify to the existence of early peoples. The first of whom there is historical record were the Cimbri. At an early day they were conquered by the Angles, the Saxons and the Jutes. The Danes were established by the 6th century, after the migration of the Angles to England. They occupied the peninsula of Jutland and the numerous islands near the mainland. Their descendants became the adventurous, romantic, warring vikings, Northmen who ventured far in exploration and conquest, reaching Iceland and probably the coast of the North American continent. A French priest named Ansgar carried Christianity to Denmark in the 9th century, and by the 10th century a line of kings had been established. The first important monarch was Canute (955–1035), a Danish king who conquered England; he completed the Christianizing of his country and did much to give it an orderly government. Several kings who followed him extended the Danish domain, but the next great sovereign was Margaret, whose reign of 37 years (1375–1412) saw Denmark, Norway and Sweden united under a joint ruler by the Union of Kalmar (1397). Two obscure reigns followed, and then the leading men by election chose Christian I as their ruler (1448). He founded the House of Oldenburg, which held the throne continuously until 1863. Christian's reign was followed by a long series of insurrections in Norway and Sweden until finally they became independent of Denmark. While the Crown had been bestowed upon the House of Oldenburg in 1448, and each new king had been elected from that house, it was not until 1660 that its hereditary right to the succession was established. Thus the right of the nobility to name the sovereigns was taken away, and other rights they had held were curtailed, but it was more than 100 years later before the condition of the peasantry began to improve. In 1767 the abolition of serfdom was begun and completed in 1787. Denmark was drawn into the Napoleonic Wars through the close relations of that country and France, and disaster resulted from fighting against the countries allied against the French; in 1807 Denmark was humiliated by having to turn its entire navy over to England.

In the 19th century the long dispute between Denmark and Prussia over the duchies of Schleswig and Holstein acquired an international importance. These two districts occupy the neck or isthmus joining Denmark with the Continent. The territory is inhabited by a mixed population of Germans and Danes, and since early times it had been a bone of contention. In 1864-66 Bismarck solved the Schleswig-Holstein question in characteristic blood-and-iron fashion; he simply seized and annexed the district to Prussia. This act was denounced as a cynical *schwindel;* but, lacking support from the outside, Denmark was compelled to acquiesce. At the end of the World War a plebiscite brought the return to Denmark of the predominantly Danish northern section of the disputed territory.

Denmark remained neutral during the World War; but the loss of commerce through the allied blockade and the destruction of shipping by the German submarine campaign was seriously felt. Since the war Denmark like the other Scandinavian countries, has made great progress toward a co-operative economy. In 1940 during the 2nd World War Germany without warning occupied Denmark.

Donation of Constantine, a document attributed in the Middle Ages to the Emperor Constantine, now generally recognized as a forgery, conferring upon the papal see the temporal sovereignty of Italy and the "provinces, places and citizens" of the Western Empire. The Donation of Constantine was of great importance in the later Middle Ages in bolstering the claims of the Pope to political power. It was probably composed some time in the 8th century.

Ecuador, located in the northwestern part of the South American continent. It is triangular in form, with its base on the Pacific Ocean. Before the coming of the first white people, an ancient race of Indians called the *Quitus* lived there. At an unknown date they were subdued by other Indians, the *Caras.* In 1475 the great Inca nation, whose stronghold was in Peru, marched north under Capac the Great and conquered the Caras. When Capac died the two parts of the empire were divided between his sons; Huascar received Peru, and Atahualpa took Ecuador. They soon fought for sole control, and Atahualpa won.

Then came the conquering whites under the Spaniard Pizarro. With only a few men he captured and murdered Atahualpa in 1533. The Inca Empire surrendered, and its vast territory became a Spanish possession. In 1563 it was formed into a presidency under the viceroyalty of Peru but in 1740 was placed under control of New Granada; Quito, which had been Atahualpa's stronghold, was made the capital. This continued to be the status of Ecuador until after 1800, when all Spanish South America flamed with the spirit of independence.

Freedom from Spain. The tyranny of the Spanish overlords alone did not bring about the demand for independence. When Napoleon in 1808 placed his brother Joseph on the throne of Spain, the Spanish in South America refused to accept a foreigner and a commoner as their king and declared themselves free. Ecuador was one of the last to achieve independence, but it was finally assured by the battle of Pichincha in 1822, when the patriots, led by Bolivar, defeated the monarchy's army. The Province of Quito then joined New Granada and Venezuela, and the three were organized as the Republic of Colombia. The union dissolved in 1829, and the Province of Quito became the Republic of Ecuador in 1830.

A Period of Strife. The new government was swayed by domestic strife. There were frequent revolutions, stirred up by power-seeking leaders. Within a few years the Church entered the conflict, and the Clerical party tried to control the affairs of the State. In 1850 a Clerical politician seized the presidency, but he was dismissed from office by the Liberals, who kept control for 10 years. In 1860 nearly a dozen men sought the presidency; in the struggle for supremacy the Clerical party won, and two presidents of that party served in office; the second tried to impose a religious despotism upon the country and was assassinated in 1875. This struggle between Church and State went on until 1904, when the Liberals were finally able to maintain the civil authority.

In no other South American country has the revolutionary spirit been so rampant. Ecuador has been peaceful only when some dictator has been strong enough to impose his will upon all factions. The last constitution framed for the nation was adopted in 1927; it is the thirteenth that has been put into effect since 1830.

Egypt, located in the northeastern part of Africa. The earliest history of Egypt is obscure, but the beginning of its continuous civilization dates from about 8000 or 7000 B.C. The story can be read in the archeological works discovered there, although the continuous written record does not begin until about 5000 B.C.

Up to that time the country was inhabited by Cushites, a Hamitic people. They probably migrated from the plateaus of Central Asia by way of the Isthmus of Suez, the same route followed later by the Egyptians themselves. The small Cushite states existed for centuries before they were subdued by Menes, whose dynasty lasted for 8 centuries. From Menes to the Persian conquest in 527 B.C. 26 dynasties are recorded. The Persian dynasty following this conquest was the 27th, and four more dynasties follow, the third ending in 332 B.C. with the conquest of Alexander the Great. Menes was the first monarch of whom there is actual record—and some scholars think this name stands for three different kings. He (or they) reigned about 5000 B.C., was supposed to have founded Memphis, to have united upper and lower Egypt, centralized the government and firmly established a new dynasty. The 31 dynasties, of which his was the first, have been grouped as follows, according to the historian Manetho: Dynasties I-XI, Ancient Empire; Dynasties XI-XVIII, Middle Empire; and Dynasties XVIII-XXXI, New Empire. Some of these dynasties, however, are of comparatively little importance.

The kings of Dynasties II, III and IV left the structures at which the world has marveled ever since. These include the vast Pyramid of Sakkara (the most ancient monument in Egypt) and the three pyramids and the famous Sphinx at Giza.

Later kings left inscriptions on their monumental works, and the translations of these have added much to our knowledge of this ancient state. Apparently each one of these kings (among them warriors who invaded the neighboring countries of Asia, but without noteworthy results) built a new capital city, none far from Memphis.

Succeeding dynasties saw a lessening of central power, for local princes usurped some of the powers of the kings. The Golden Age of Egypt, when literature and art were at their height, began about 2000 B.C. Kings of Dynasty XII extended their conquests southward; the new riches aroused the ambitions of princes who thirsted for power, and for about a century the country was the scene of civil strife. It was during Dynasty XII that the famous Lake Moeris and the Labyrinth were constructed.

Lack of strong central authority opened the way for conquest from outside and resulted in the period of the Hyksos, or Shepherd Kings, who made up the Dynasties XV, XVI and XVII. These foreign invaders came from Asia, but their exact origin is not certainly known.

They held power for about 100 years, the last surrendering to native rule about 1580 B.C., on being driven out by Amenophis I, first ruler of the Great Theban Dynasty XVIII. He was the first Egyptian who made his country's power felt east of the Mediterranean, beginning a period of Asian conquests. He built up a united nation and conquered both Phoenicia and Palestine but did not live to consolidate his gains. Under him and his successors a desire for conquest arose, with a military caste that first introduced into Egypt the use of the horse in war. The character of the people changed for the worse, but they became masters of the region extending from Ethiopia to the Euphrates.

Under Thothmes I and III the palaces of Karnak and Luxor were built, and Egypt ruled as far as Nineveh. Between these rulers came Thothmes II, who shared his reign with Hatshepsut, his sister and queen. It was she who sent Egypt's first fleet abroad (to Ethiopia and Somali) about 1500 B.C., to secure gold and incense for the temples. Another famous king of the same dynasty was Amenophis IV (about 1410 B.C.), son of Thothmes III. He substituted the worship of the sun for that of the god Amen. At his death, however, the old faith was restored.

Egypt was at the height of its glory and the beginning of its decay under Dynasty XIX, to which Ramses I and II and Mineptah (son of Ramses II and probably the Pharaoh of Exodus) belonged. Ramses I was the first ruler in Dynasty XIX, about 1350 B.C. Ramses II (about 1330 B.C.) continued a war in Syria begun by his father and after 20 years ended it by marrying his enemy's daughter. He retained Palestine and a part of Phoenicia for his country. This king erected many monuments to himself, but he also removed kingly names from others and substituted his own, so as to give the impression that his exploits and prowess were far greater than they really were. Ramses II, son of Seti I, and known as *Ramses the Great,* is called the most brilliant figure in Egyptian history and is among Egypt's most famous builders. He defeated the Hittites in battle and made a treaty with them. Seti built the Temple of Amen at Thebes, called the most splendid single chamber ever built. Ramses II is charged with surrendering Egypt to the Assyrians, from whom the Greeks helped to free it again. This started a Greek settlement in Egypt; many Greeks came to learn the wisdom of the Egyptians.

Ten kings bearing the name *Ramses* ruled in Dynasty XX. Ramses III delivered his land from numerous raids of plunderers and in turn plundered parts of Syria and Palestine. This dynasty is marked by no outstanding accomplishments and in fact shows a weakening of power. No great figure appeared after Dynasty XX until, in Dynasty XXVI, Necho II (609-594 B.C.) conquered Syria again and killed Joshua. He lost his power, however, when Nebuchadnezzar of Babylon defeated him at Carchemish. At home he constructed a canal that connected the Nile and the Mediterranean with the Red Sea; he built a fleet that he sent around Africa, manned by Phoenician sailors. The last ruler of this dynasty was Psammetich II, who was defeated by Cambyses (525 B.C.), whereupon Egypt became a province of Persia.

This overlordship continued until 414 B.C., when the Persians were expelled, but the same oppressors returned in 343 B.C. Alexander the Great conquered the land in 332 B.C. and

Entrance to the Great Pyramid of Cheops

For 20 years much of the labor of the Egyptian countryside was conscripted to haul huge limestone blocks from the banks of the Nile to build the Great Pyramid at Giza. One hundred thousand men toiled at its building for the 3 months of each year when there were no crops to be cultivated or harvested. The Great Pyramid was named for Cheops, who lived sometime during 2900–2877 B.C. Inside its polished stone depths are the burial chambers of the king and his queen. The outer covering of marble has been worn away by erosion with the passing of the years. The pyramids were built in a series of huge steps; at each level, a simple machine resembling a crude lever crane was placed to hoist the blocks to the next level. The Great Pyramid covers 13 acres and when first built reached to a height of 482 feet founded Alexandria, which became famous as the principal center of Greek civilization. On his death in the same year, Ptolemy, one of his generals, became ruler (323 B.C.) and raised Egypt to high rank. Under this first Ptolemy, a wise and considerate ruler, Egypt, as a Greek state, was allowed virtual independence and attained a foremost place among the world's nations. Never had she been so prosperous; commerce flourished, the people were contented and Alexandria became a cultural center. A succession of nine Ptolemys followed; the next to the last, Ptolemy XIII, left the kingdom to his daughter, Cleopatra, and his son, Ptolemy XIV. Cleopatra's ambition made her sole ruler, but partly through her intrigues with the Roman general, Antony, the kingdom was lost, Rome occupied the country and Egypt's history as an independent nation was not regained for centuries.

Rome ruled Egypt until the fall of the Empire, 476 A.D. During the latter part of the Roman rule Egypt was given little attention and, without the support of the Empire, fell an easy prey to the Saracens in 641. Egypt became a highly important Mohammedan territory, with Cairo one of the leading Moslem centers. There followed first a period of Fatamite rule (969-1171) and then of Ambyite control (1171-1250). Hoping to lessen the grip of Islam, the crusaders had struck at Cairo but failed. From 1250 to 1517 Egypt was controlled by the order of the Mamelukes set up by Saladin; they extended their power over a large part of Africa, Syria and Arabia. In 1517 the Turks, under Selim I, defeated the Mamelukes, but they still remained a force to be reckoned with. When Napoleon invaded Egypt in 1798 he found the Mamelukes opposing him. He gained and held control until 1801, when he was expelled by the Turks, who were helped by the British.

In 1811 Mehemet Ali became ruler of Egypt by the massacre of the Mamelukes; under his control Egypt progressed rapidly in civilization. He considerably extended its boundaries and (by the Treaty of London, 1841) was made Viceroy of Egypt, as a representative of the Ottoman Empire. The independent position of the rulers of Egypt was much strengthened in 1867, by an imperial decree, which established the succession of the descendants of Mehemet Ali, under the title *khedive* (king). Still greater powers were granted in 1872, and in 1874-5 Ismail Pasha, the ruler at that time, greatly extended Egyptian territory, annexing the Sudan to Darfur and finally reaching the shores of Victoria Nyanza. He favored the building of the Suez Canal. In 1874 Gen. Charles George Gordon was appointed Governor General of the Sudan and did much to suppress the slave trade. The finances of the country became so involved that they were placed under European management and the country under English and French control. In 1879 Ismail was forced by the French and British to abdicate and was succeeded by his son Tewfik. Arabi Pasha gathered an army of followers and revolted against European influence. The rebellion was suppressed by the British army and navy, the French taking no part. As a result the dual control ended, and since then Great Britain has been the practical ruler of Egypt, despite the occasional protest of France and other European Powers.

Following the establishment of dual French-British rule about 1880 a serious revolt began in the Sudan under the leadership of a Moslem, Mohammed Ahmed, who pretended to be the Mahdi or redeemer. The rebellion was difficult to suppress. In 1883 a British army under Hicks Pasha was totally routed. General Gordon was taken and killed (1885). The chief result was that the Mahdi drove the Egyptians out of the Sudan and left the way open for future occupancy by the British.

For a number of years there were various efforts to bring about Egyptian independence, and eventually Great Britain made a treaty that gave Egypt practically all it asked for. The predominant position of Great Britain in Egypt was formally recognized by France in the Anglo-French Agreement of 1904. A British protectorate was abolished in 1922 and Egyptian independence was declared, subject to British reservations, which demanded that Egypt should conform to Britain's wishes in its foreign relations and that the English should maintain such a force as would be necessary to protect the Suez Canal and keep open its route to the south of the continent.

In 1922 King Fuad ascended the throne and, in the face of continued Nationalist opposition to foreign influence, maintained and strengthened his position. The British, however, continued to maintain some hold on Egypt, keeping a governor general in charge of the Sudan and as commander of the Egyptian army. This the Nationalists resented and they persisted in anti-British agitations that culminated (1924) in the assassination of the governor general. British demands caused the fall of the ministry, but in the next elections the Nationalists again triumphed. However, a new premier, more in accord with the British, was appointed. Again in 1926 the Nationalists won a marked victory. Two years later, King Fuad ordered a 3-year dissolution of the Parliament and suspension of the constitutional clause calling for elections after Parliament had been dissolved. He took this step without any British pressure, with a view to freeing the country from its long period of disturbance and to restoring economic stability.

In 1936 a new Anglo-Egyptian treaty was drawn up, following a series of riots led by students. The treaty ended the military occupation of Egypt, leaving only enough troops to guard the Suez Canal. Other provisions eased tension in the Sudan. Britain withdrew her high commissioner and supported Egypt's entrance into the League of Nations. In 1936 King Fuad died. His son Farouk succeeded. See 2nd World War, p. 805.

Estonia, a Baltic nation that came into existence as a result of the World War and the fall of the Russian Empire. Its people are a distinct racial stock, the *Estonians,* who have made their home along the Baltic Sea for many centuries. After the World War, when many new states were established on the basis of "self-determination of peoples," the Estonians leagued three provinces of old Russia into a state in which they could be dominant.

The Estonians were not subordinate to any other Power until early in the 13th century, when the Danes occupied their land. This control was brief, for in 1346 the German Knights of the Sword, who had occupied the country south of Estonia a century before, drove out the Danes. The Knights of the Sword held the country until their order was dissolved in 1561, when Sweden came into control. In 1721 the entire Baltic area, now comprising Estonia, Lithuania and Latvia, passed to the possession of Russia.

In 1917 Czarist Russia gave way to a Communist government, and in the next year each of the three provinces declared independence. Stable governments were not established until 1920, because German troops occupied the area, hoping to annex the three provinces to Prussia. This would have occurred had Germany won the war. In 1934 a new constitution was voted, and the country was placed under martial law to fight the influence of the Nazis. In 1935 all political parties were abolished. In 1940 Estonia first yielded naval bases to Russia and later was compelled to become a part of the Russian Soviet.

Ethiopia, a country in northeastern Africa with a history nearly as old as that of old Egypt. The extent of the land in ancient times is unknown, but it covered a large area adjoining Egypt. As early as 2000 B.C. Ethiopia was known to the Egyptians who at that time called the country *Punt.* It is called *Phut* in the Bible.

Of the long succession of ancient rulers only one stands out—the queen of Sheba, who, hearing of the glories of King Solomon, paid him a visit. The father of her son and successor was reputed to be Solomon. The country lost some of its provinces to Egypt, and at an uncertain date the word *Ethiopia* lost its significance, and the country became known by the name of its northern province, Abyssinia, though the people have never ceased to call themselves Ethiopians. One of the most famous rulers of modern times was Menelik II. In 1889 he defeated the prince who was ruler and seized the throne, claiming his descent from the ancient queen and Solomon. His rule was enlightened, and he lived until 1913. His successor was his grandson, Lij Yasu, aged 17. This new king was licentious and a drunkard and refused to uphold the religion of Mohammed. He was soon deposed, and a daughter of Menelik, Zauditu, was made queen; her cousin, Ras Tafari, was appointed as regent. Zauditu died in 1930, and Ras Tafari came to the throne as Emperor Haile Selassie I. He was crowned amid barbaric splendor as "King of Kings of Ethiopia, Conquering Lion of the Tribe of Judah, Elect of God and Light of the World." In 1923 the nation discarded the name *Abyssinia* and officially declared that the ancient name *Ethiopia* should be restored.

The Italian Invasion. A treaty between Ethiopia and Italy, establishing protectorate relations, had existed since 1889. In 1896 a dispute over the interpretation of the treaty led to an Italian invasion. Menelik II succeeded in trapping and nearly destroying the Italian army at Aduwa. The humiliating defeat rankled in the breasts of patriotic Italians for many years, and the thirst for revenge played no small part in the Italian attack on Ethiopia in 1935.

On December 5, 1934, Italian troops came to blows with the Ethiopian escort of an Anglo-Ethiopian boundary-line commission at Walwal, and some Italians were killed. Mussolini protested to the League of Nations, claiming that Ethiopia had violated their treaty. He asked for reparations, yet continued building roads into Ethiopia. This incident precipitated war with Italy.

By a treaty made in 1906 Italy had joined France and England in guaranteeing the integrity of Ethiopia, and in 1923 Italy had endorsed Ethiopia's entrance into the League of Nations; but the affair at Walwal in 1934 created a breach neither nation would cross. Italy made plans to invade the country. Great Britain and France tried to dissuade Mussolini. The situation became acute, and Great Britain was forced to mobilize its fleet in the Mediterranean. Italy refused advice, withdrew her delegates from the League of Nations and pressed forward until, on May 5, 1936, Addis Ababa, the chief stronghold, was taken. Emperor Haile Selassie fled to England. In 1941 during the Second World War, England defeated the Italians, recaptured Ethiopia and restored Haile Selassie to the throne.

Underwood & Underwood

The Salute of a Conquered People

Ethiopian soldiers from the Province of Tigré learn to give the Italian Fascist salute after their surrender in the spring of 1936

feudal system, an institution based on ownership of land and the personal relationship of landlord and tenant that flourished in Europe throughout the later Middle Ages. It probably had its origin during the later Roman Empire. In theory, the king owned the land, retained the larger part and divided the remainder among his retainers. After Charlemagne the government was less stable, and eventually, to promote security, the ruler divided his vast estates among the nobles and the great warriors and gave them sovereignity over their lands. In return, these landowners pledged their fealty to the king, guaranteeing aid to him whenever he needed it, which included the raising of armies for his defense when war threatened.

The land of each retainer was called a *fief.* It was customary for holders of large fiefs to subdivide them in turn among their own retainers. The owner of a fief was known as lord, liege or suzerain; the one holding it was a vassal, retainer or liegeman. Each vassal gave his pledge of loyalty and military service, and in turn the lord pledged protection. At the bottom of the classes were the submerged serfs. These were the laborers, bound to the fief, who passed with the land at every change of masters.

From the point of view of modern civilization there is much to be criticized in the feudal state, but it was an admirable system for the times in which it existed, and for centuries it flourished in France, England, Germany, Scotland and parts of Italy and Spain. The times were troublous, and every class of society found security in a system that afforded protection against the prevalent lawlessness. It also proved a bulwark of strength against outside foes. One historian declares, "It was the mailed feudal horseman and the impregnable walls of the feudal castle that foiled the attacks of the Danes, the Saracens and the Hungarians." The great weakness of feudalism was that it prevented the formation of strong central governments; each lord was a sovereign over his fief. As it became necessary in the evolution of society to centralize control, the feudal state disappeared.

filibuster, a term first applied to pirates who plundered Spanish possessions in the Americas. Later it was used to describe private military expeditions into countries that were at peace with the country from which the expedition was launched. There are numerous instances of filibustering in which American citizens have been engaged. In 1855 William Walker of Tennessee invaded Nicaragua with a small force and captured the Government but later fled to Honduras for safety, where he was arrested and shot. From New Orleans a filibustering expedition went to Cuba, but its leader, Lopez, was shot, and his followers were dispersed.

In legislation a filibuster is a weapon used to delay action. It consists of long speeches to consume time, the use of dilatory motions and the like. It is a device of the minority members intended to confuse and defeat the plans of the majority.

Finland, formerly the most northwesterly province of Russia, an independent republic as a result of the World War and of the effort to erect new states on the basis of "self-determination of peoples." The ancient Finns lived a nomadic tribal life, each community independent of all others, but in the 12th century Sweden began a conquest of the lower-peninsular section. Stubborn resistance of the native population kept the Swedes from complete domination for nearly 100 years. The Swedes carried Christianity into the new territory, and Swedish became the language of official life and of the upper classes; the peasants clung to the Finnish tongue.

The eastern boundary of Finland was only about 25 miles from St. Petersburg, the Russian capital, and Russia felt it necessary to control the Finnish area. In 1721 after struggles with Sweden Russia took over some of the territory. The final invasion came in 1809, and all Finland became Russian. The czar's government promised to preserve the Finnish constitution, respect the laws of the country and permit the Lutheran religion to be maintained. These promises were kept until 1899, when the local governing body was deprived of all power in matters affecting both Finland and Poland. Finnish liberty was gradually curtailed. The army was merged into that of Russia, the Russian language was made the official tongue in the government, and Russians were placed in many official positions. By 1910 Finnish freedom was practically at an end, and the country became merely another grand duchy of the Russian Empire. This condition continued until the fall of the Russian Empire in 1917.

In 1918 the Communist Government of Russia granted the grand duchy full independence, and Finland set up a republican form of government in 1919. Finland became a member of the League of Nations in 1920. When a constitution was adopted in 1919, national prohibition was established; in 1925 the Communist party was outlawed, and in 1930 Communists were forbidden to hold office in Parliament. In 1932 an armed Communist rebellion was quickly suppressed. In 1940 Russia attacked Finland, who resisted bravely until overwhelmed. Russia took much Finnish territory. The remainder of Finland remained free, almost as large as California. See World War II, p. 805.

Flodden Field, a battle fought in Northumberland in the north of England, Sept. 9, 1513, between the army of James IV of Scotland and English forces led by the Earl of Surrey. King James died on the field, and his army lost close to 10,000 men; the English loss was less, but so worn were Surrey's victorious troops that they did not pursue the retreating Scots. Of little historical importance, the battle has acquired fame chiefly from the spirited description of it in the 6th canto of Sir Walter Scott's *Marmion.*

France, a republic of eastern Europe, one of the great Powers.

Who the earliest inhabitants were in the area now called France is a most obscure matter. Skeletal remains from the later Paleolithic Age have been discovered, as in the Cro-Magnon grotto, and the name "Cro-Magnards" was given by archeologists to that particular skeletal type. Deep in dark caves have been found paintings, chiefly of animals and sometimes showing much skill; other relics include drawings on bone and horn and carvings in ivory. The first tribes of which we have any definite glimpse are the Ligurians and the Iberians. The Iberians are probably represented by the Basques of today, of whom an emigrant group exists in South America.

Early Gaul. The Gauls (or Kelts) overran the region, driving back the peoples already there, and to it they gave their name. Gradually they became organized into political units, with a Druid priesthood, a privileged class devoted to arms, common people attached to the land. These common people received scant protection from the loosely framed state and therefore often sought the patronage of dominant chieftains. The Romans penetrated into the southeast (*Gallia Narbonensis*) and colonized Aquae Sextiae (Aix) and Narbo (Narbonne). Vercingetorix, chief of the Arverni, was successful in arousing united effort against Roman encroachment but was defeated in 52 B.C. at Alesia by the superior discipline of Caesar's legions and in 46 graced Caesar's triumph at Rome. From that date Gaul began to be a center of Roman civilization. Roads were built, commerce was developed, Roman institutions were willingly adopted. Three Roman emperors—Antoninus Pius, Claudius and Caracalla—were of Gallic origin; and after Caracalla had conferred the right of Roman citizenship upon all inhabitants of the empire, the Gauls styled themselves *Romans* and their speech *Romance.* For over 400 years Gaul was loyal to Rome. In the 4th century Arles, Paris, Reims or Trèves were residences of Roman emperors of the East.

But slowly barbarian raids, internal revolts, oppressive taxation, the rise of a rich landed class, with the ruin of small proprietors and the consequent reversion to the old relation of patron and dependent, undermined a system whose administration grew less and less efficient. Christianity was introduced in the 1st century A.D., underwent severe persecutions, existed for a time as a democratic institution side by side with aristocratic paganism, triumphed in the reign of Theodosius (379-95 A.D.) and thereupon itself took on aristocracy, drawing from privileged families the members of a hierarchy that exercised a secular as well as a spiritual administration. An infiltration of barbarians into the Roman state was constantly going on, until the army began to be recruited from them solely and to be officered by such foreigners as Stilicho the Vandal. Visigoths, Burgundians and Franks established themselves peaceably in Gaul, and in 451 they united under command of the Roman general Aetius to defeat the hordes of Attila the Hun at Châlons (451)—one of the decisive battles of history.

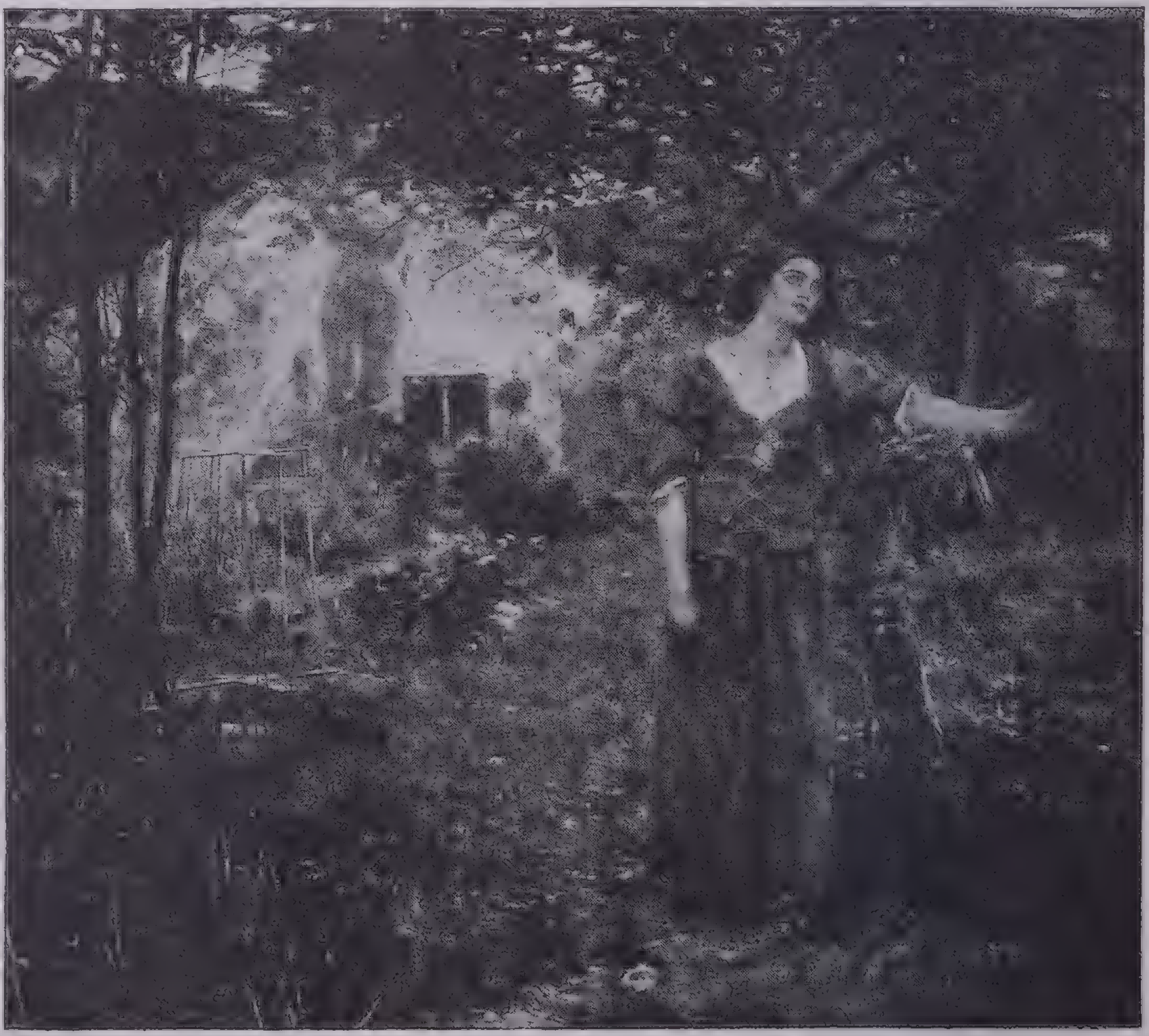
The Franks. Clovis, King of a Frankish tribe, was converted to Christianity after having won at Soissons (486) a complete victory over Syagrius, a Roman general who after the fall of the Western empire (476) had fashioned a small state on his own account. Clovis was baptized at Reims on Christmas Day in 496 and with him were baptized 3,000 Franks. He now proceeded to conquer the Burgundian and Visigothic kings, murder minor Frankish kings that stood in his way and become king of all the Franks, founding the Merovingian dynasty. Though professedly an orthodox trinitarian Christian and a stout champion of his bishops against the heretic Arian Visigoths and Burgundians, Clovis remained essentially a bloody-minded barbarian. His kingdom, divided among his four sons, was united in 558 but straightway divided again in 561. Later, the four parts were reduced to three—Austrasia (the Rhineland, with capital at Metz), Burgundy (with capital at Orléans) and Neustria (with capital at Soissons). The Franks of Neustria, the nucleus of modern France, spoke the corrupt Latinized language they had acquired from the subject inhabitants of Romanized Gaul, but those of Austrasia spoke a Low German dialect resembling modern Plattdeutsch. Burgundy was in time united with its Romance neighbor Neustria. Feuds raged, the Merovingian dynasty declined, in Austrasia a court functionary known as the *mayor of the palace* became in effect king; and in 687 one Pepin of Herstal, *mayor* at that time, conquered Neustria and united the Franks again. The later Merovingian kings are known as the *rois fainéants* (do-nothing kings). In 714 Pepin was followed by his son Charles Martel (The Hammer) who between Tours and Poitiers defeated the Saracen invaders commanded by Abd-er-Rahman in a decisive battle and saved France and all northern Europe from the Moslems. His power was divided between his sons Carloman (Austrasia) and Pepin the Short (Neustria), but Carloman abdicated, and later Pepin, as sole ruler, sent to the Pope to inquire who was the true monarch—he who wore the crown or he who held the authority. The Pope decided in Pepin's favor, so Pepin was accordingly chosen king by an assembly of Frankish nobles at Soissons in 751, anointed and crowned. In return he twice crossed the Alps to aid the Pope against Aistulf, King of the Lombards, and he bestowed on the Pope a donation of land by which was established that temporal power of the papacy that lasted until 1870.

The Empire of Charlemagne. His kingdom was divided between his sons Carloman and Charles, but on Carloman's death Charles (whom we know as Charlemagne, that is, Charles the Great,) usurped the entire government. Charlemagne conquered the kingdom of Lombardy, subdued Bavaria and crossed the Pyrenees against the Moslems but was defeated at Saragossa and in his retreat through the mountains at Roncesvalles lost his famous paladin Roland, celebrated in medieval romance. From 772 to 804 he was at war with the Saxons, whom at last he subdued. In 800 he received at St. Peter's in Rome the crown of the Roman empire of the West; in 802 at an assembly at Aix-la-Chapelle he exacted an oath of allegiance to him as Caesar. Thus began the so-called Holy Roman Empire, of which it was said that it was neither holy nor Roman nor an empire. Charlemagne did something to bring a little light into the darkness by having manuscripts copied, establishing schools and attracting to his court such scholars as Alcuin and Eginhard (who wrote the emperor's *Life*). But his realm had no internal cohesion; its varied peoples had not been welded together, and already the Vikings were harrying the northern coasts of France. His successors could not maintain the unity of the realm, which in less than 30 years split into three kingdoms. Within a century France was a collection of small feudal states. By the beginning of the 10th century Norsemen were settled on French soil. The agreement of Verdun partitioned the Carlovingian empire and made definite separation between eastern and western Franks; the lands of the first becoming eventually modern Germany, those of the second becoming modern France. When Louis V, King of the Franks, died in 987, his brother Charles of Lorraine was disregarded, and an assembly at Senlis chose as King of the Franks Hugh Capet, son of an overlord known to history as Hugh the Great and styled duke of France and Burgundy. Thus was founded the Capetian dynasty, which for almost 9 centuries ruled France. The Capetian kings had long and involved struggles with the feudal nobles in general and later with the younger branches of their own family that held sway in the great duchies. In the 11th century theirs were but small dominions, with only two important towns, Paris and Orléans. Almost the sole element of unity in France was furnished by the fact that none of the feudal *seigneurs* was willing to admit the dominance either of the Pope or of a German monarch.

The Crusades. Louis VI (1108–37) and Philip Augustus (1180–1223) were able men, and Philip was unscrupulous as well as able. The Crusades began to stir western Europe; Louis VII took the lead in the second Crusade, which was preached by Bernard of Clairvaux and which was surrounded by many difficulties and ended disastrously. Philip was associated with Richard Coeur de Lion of England and Frederick Barbarossa in the third Crusade, but he abandoned it and returned home. In 1203-04 he won Normandy from King John of England, whose succession had been recognized in that duchy (William, Duke of Normandy, having been the William the Conqueror of English annals), and England's continental power was lost when the abbeys, nobles and towns of Anjou, Maine, Pitou and Touraine (having first declared in favor of Arthur, son of John's elder brother) made their submission to the Capet. No longer did two rival monarchies confront each other in France. The forces of a European coalition engineered by John were thoroughly defeated; Languedoc was reduced by the war of extermination called the *Albigensian Crusade,* led by Simon de Montfort; feudalism yielded to the throne, and the throne ruled the entire kingdom. Philip organized the university of Paris (called at first the *Studium*), oldest of European universities, but Abélard, Fulbert of Chartres, Anselm, Lanfranc and Gerbert (Silvester II) had already lent distinction to the French schools. The abbey church of St. Denis had been rebuilt, the cathedral of Notre Dame had been begun; both are among the glories of French architecture. French manners were beginning to be imitated at European courts, and French speech was already on the way to becoming the medium of diplomacy and an accomplishment of the cultured. Guilds were forming in the towns.

The Hundred Years' War. Louis IX (known as St. Louis) led two disastrous crusades, but his justice and fair dealing gained for the crown new influence and prestige, and his efforts toward peace set an example sorely needed. His memory was long revered. Philip IV (1285–1314) fell into a quarrel with the papacy and finally obtained the election of a Frenchman, Bertrand de Goth, as Clement V. In 1309 Clement removed the papal residence from Rome to Avignon, where it remained until 1376. Charles IV (1322–28) was the last of the direct line of Capetian kings, and the crown then passed to a younger branch, the Valois, of whom seven ruled France (1328–1498). During the period of the Valois reigns was fought (with intervals of truce) the Hundred Years' War with England, which actually persisted for 116 years (1337–1453); and Louis XI (1461–83) destroyed the power of the great fiefs and thus laid the basis of absolute monarchy. Down to the appearance of Joan of Arc the Hundred Years' War went generally in favor of the English—as, for example, at Crécy, at Poitiers, at Agincourt. The English held all of France north of the Loire when suddenly a peasant girl, Jeanne d'Arc, gained access to Charles VII, who entrusted to her the command of an army with which in 2 months (May–July 1429) she raised the siege of Orléans, defeated the English at Patay (June 18) and brought the reluctant Charles to be crowned at Reims. Captured by the Burgundians at Compiègne, she was sold by them to the English and on May 30, 1431, was burned alive as a heretic in the market place of Rouen. She became the French national heroine and after nearly 5 centuries was canonized (1920). Steadily the English were driven out of a reawakened France, until there was left to them only Calais, which they were to hold for another hundred years.

The Huguenots. A futile invasion of Italy was undertaken by Charles VIII. With his successor, Louis XII, the throne passed to the Valois-Orleans branch, to devolve next upon Louis's cousin the Count of Angoulême, who reigned as Francis I from 1515 to 1547. Most of his showy reign was taken up with ambitious campaigns against his rival Charles V, Emperor of the Holy Roman Empire. He concluded with Leo X in 1516 a concordat (agreement) by which ecclesiastical patronage was assigned to the crown. An admirer of things Italian, he liked to be considered a patron of Renaissance art. Henry II married Catherine de' Medici, took from Germany the three bishoprics of Metz, Toul and Verdun and captured Calais. The Reformation was now making itself felt, especially among artisans, laborers and shopkeepers, and toward it Henry took an attitude of persecution that could only encourage the religious wars, a succession of which now afflicted the country. The massacre of St. Bartholomew (1572) was a blow at Calvinism but an utterly useless political crime, and in 1573 partial toleration was granted by Charles IX in the peace of La Rochelle. The Protestants (Huguenots) found leaders in Gaspard de Coligny, the Prince de Condé and Henry, son of Antoine,



From the painting by Jules Bastien-Lepage in the Metropolitan Museum of Art

Joan of Arc

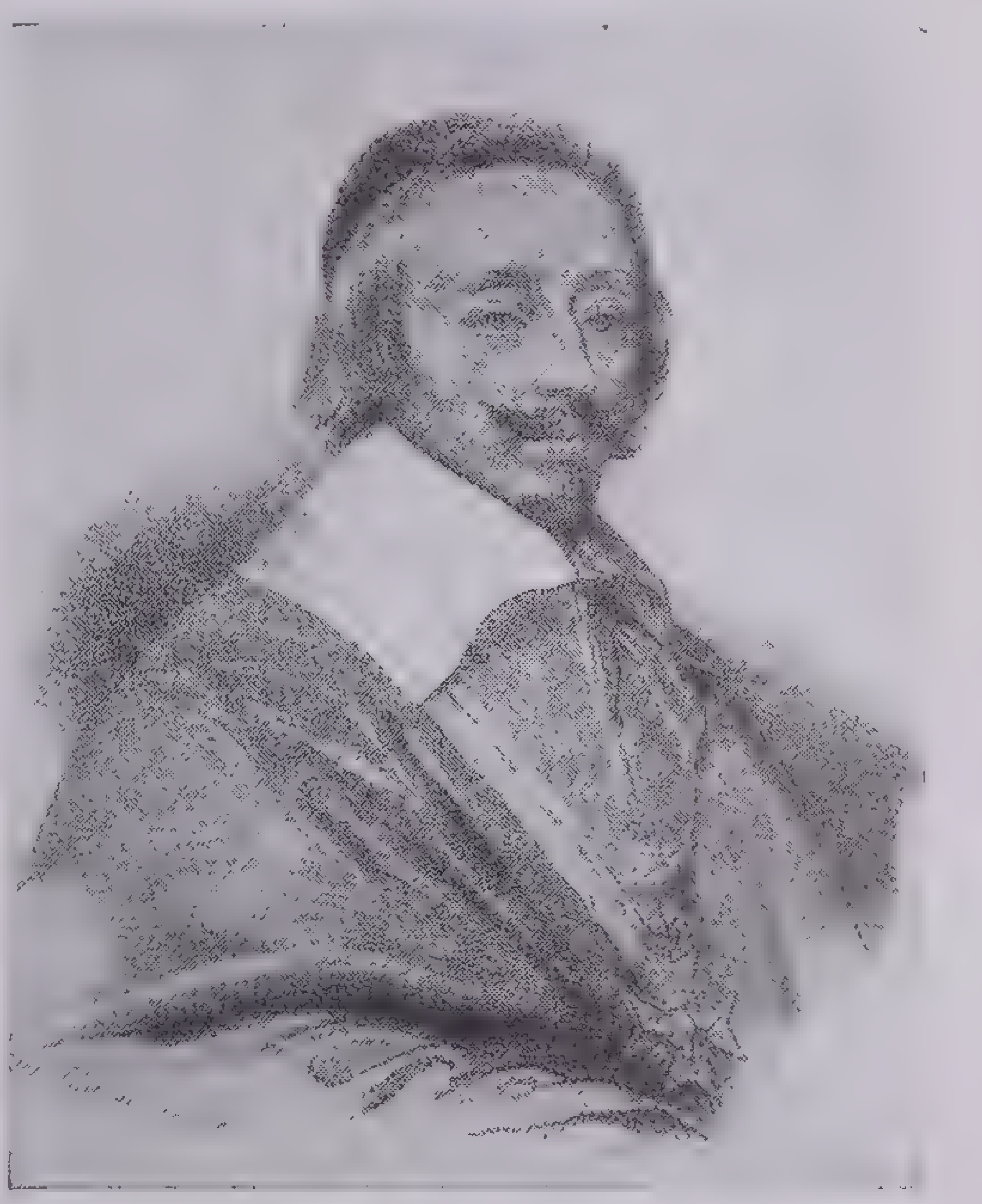
Joan is depicted here as a young girl in the garden of her home at Domremy. Her vision is shown at the left by a vague figure of St. Michael in armor. The original painting also has misty figures of St. Catherine with her hands clasped and St. Margaret weeping

King of Navarre, who belonged to the Bourbon branch of the Capetian dynasty.

Henry won a Huguenot victory at Ivry, and public opinion forced a summoning of the States-General, which met at Paris in December 1592. The first States-General (or legislative assembly) had been convoked by Philip IV in 1302. This body was made up of three estates—the clergy, the nobles and the bourgeoisie or middle class (known as the *third estate*)—and had continued to meet from time to time during the 15th century. In 1593 Henry abjured Protestantism and in 1594 was crowned at Chartres. After so many years of civil war the land was in disorder and heavily in debt. The new king (known as Henry of Navarre and as Henry IV) issued in 1598 the *Edict of Nantes,* which assured to Protestants freedom of conscience, political rights, equality in employment and authorization of a limited degree of public worship. With the aid of his able finance minister the Duc de Sully he strove to improve conditions both in the rural districts (where he reduced taxes on the peasants) and in the towns (where he encouraged industries). Sully was more especially interested in rural economy, and he drained marshes, prohibited destruction of forests, permitted free export of grain. Olivier de Serres wrote on scientific agriculture, conducted a model farm and sought to foster silk culture. The king was a believer in centralized power and by often arbitrary methods extended royal prerogatives. There was no union of classes, but the people came to look to the throne as their protector against the selfish license of the nobles. Henry was assassinated by a fanatic in 1610.

The Great Cardinals. His son Louis XIII, was but 9 years old, so the Queen Mother Marie de' Medici was declared regent. A council of regency was formed from among the nobles, who thus were again in a position to renew their struggles for offices and pelf. Just after Louis had been declared of age the States-General met (1614), only to dissolve. It did not meet again until the revolution of 1789. From 1624 to 1642 Cardinal Richelieu, who had been secretary to Marie de' Medici, was Louis's chief minister, with viceregal powers. Richelieu increased the power of the crown and lessened that of the nobles; suppressed an uprising of the Huguenots, who had sought English aid; defeated various conspiracies; joined with Sweden in the Thirty Years' War. He depleted the treasury, neglected peasants and working class alike, thought only of autocracy and uniformity and broke down such public spirit as existed. The French Academy was established by him in 1635.

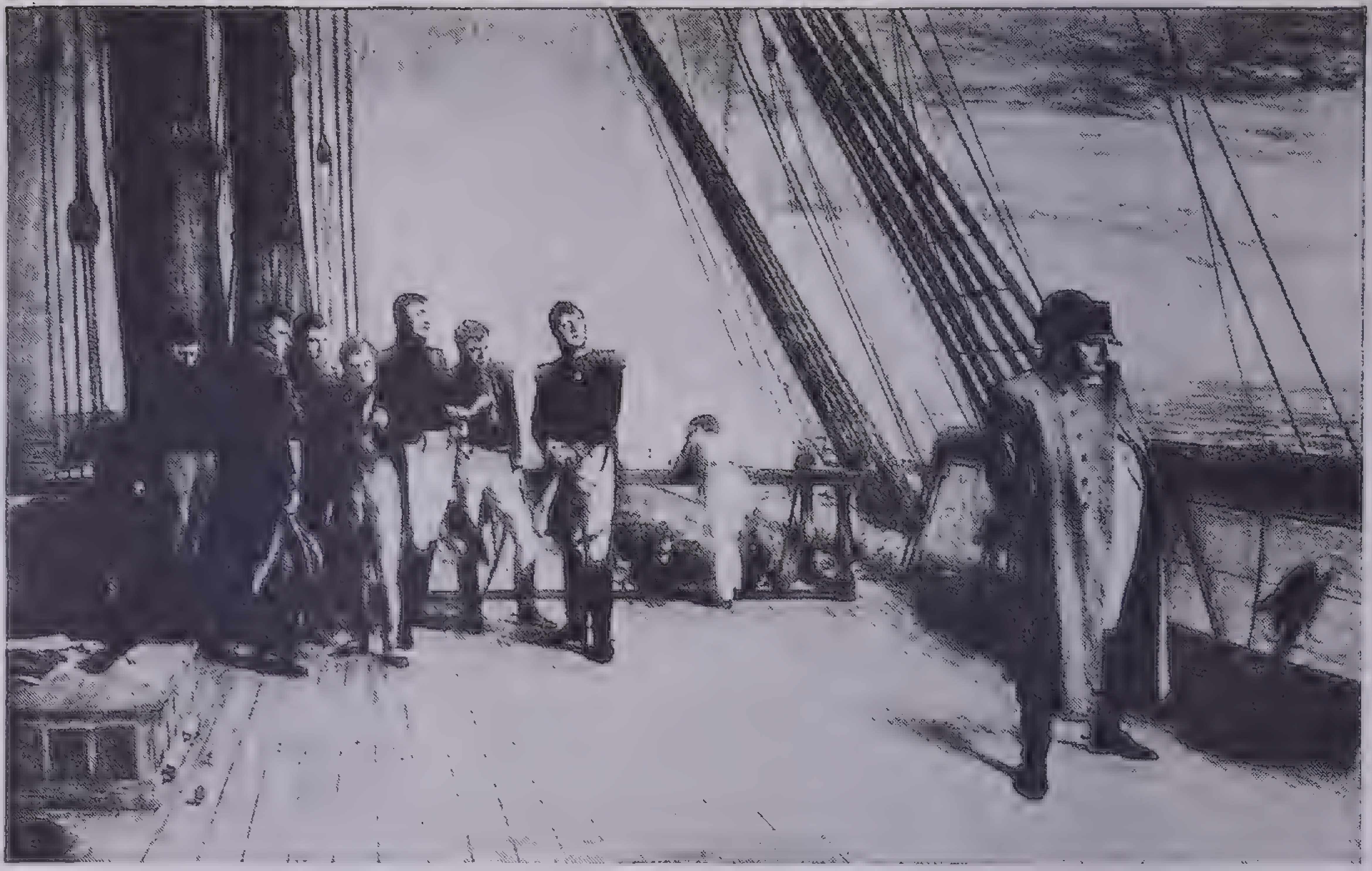
One of those whom Richelieu had enlisted in the service of France was a Sicilian minor cleric named Mazarini, who later became Cardinal Mazarin and in 1642 succeeded to the ministry vacated by Richelieu's death. Retained in office by the Queen-regent Anne of Austria during the minority of her son Louis XIV, he continued the foreign policy of Richelieu that aimed at humbling Austria through the Thirty Years' War, which was concluded by the peace of Westphalia (October 1648). He likewise maintained Richelieu's centralizing policy in internal affairs and thus brought about the petty civil strife known as the wars of the Fronde (*fronde* being the name of a sling used by the *gamins* of Paris), in which opposition to him was led by the nobles and the Parlement of Paris, a corporation of lawyers and judges forming the highest court of the realm, whose duty it was to register royal edicts. During the Thirty Years' War, hostilities with Spain had sprung up, and these he concluded by the treaty of the Pyrenees, through which France gained considerable territory, and a marriage was arranged between Louis XIV and Maria Theresa, Infanta of Spain. On the death of Mazarin in 1661 Louis assumed the reins of government, and ever afterwards he held them, though greatly assisted by Colbert, minister of finance, and Louvois, minister of war.


Cardinal Richelieu

The Grand Monarch. From 1667 wars were almost constantly in progress, including the Dutch war and that with the Grand Alliance (composed of Bavaria, England, Holland, with the later addition of Savoy, Saxony and Spain). But in the personalized rule of Louis, the France of his day seemed to discover a symbol of national unity and prestige. He delighted in the role of *Grand Monarque* and *Le Roi Soleil* ("The Sun King"). Into the vast Palace of Versailles he poured revenues wrung from "the hard hands of peasants." Nearly every king and princeling in Europe tried to imitate his excess of luxury and his material pomp. French art, dress, manners, literature, science, speech, even French preaching (as exemplified in Bossuet) became models. In the outward trappings of regal state Louis was outstanding in the 17th century. But there was about him nothing greatly original. Industrious and tenacious he was, and he used for his own purposes with some skill the material provided for him. He saw France dominant in arms and even had Charles II of England in his pay. But in 1685 he annulled by proclamation the Edict of Nantes and thus drove abroad (to America as well as to England and continental countries) some 300,000 of his best subjects, who carried with them their arts and industries. French Protestants established silk manufacture in England. Louis's *dragonnades* were among the meanest of persecutions. After a reign of 72 years, the longest in European history, he left his country weighed down with debt and in wretched condition.

Up to 1734 the reign of Louis XV, great-grandson and successor of Louis XIV, was peaceful and prosperous, thanks to his prime minister, Bishop (later Cardinal) Fleury. But then France became involved in the war of the Austrian Succession (1740–48), by which it gained nothing; and in the Seven Years' War (1756–63), through which, as the ally of Austria against Prussia and England, it lost India and in the American phase (the French and Indian War) Canada and Louisiana. The government was managed by appointees named by the king's mistresses; finances sank into utter disorder; voices of dissatisfaction with the monarchy began to dare to make themselves heard. "After us the deluge" is a saying ascribed to the thoroughly dissolute king; and whether the saying is his or not, it expresses him.

The Revolution. The 20-year-old grandson of Louis XV, Louis Augustus, succeeded to the crown as Louis XVI. The privileged classes demanded and obtained the successive dismissals of two able ministers of finance, Turgot and Necker; and the unchecked extravagances of Calonne, who followed Necker, led to the financial difficulties that were the immediate cause of the French Revolution, the fundamental causes of which had long been at work. The Revolution opened with the gathering of the States-General on May 4, 1789—its first meeting since 1614. Paris revolted, and on July 14 the old state prison of the Bastille was captured by a mob (it was razed in 1790–91). On July 14, 1790, the king swore to support the constitution then in the making, but in 1791 he and the royal family attempted escape. They were arrested and brought back. In August 1792 royalty was "suspended" by the Legislative Assembly; in September the National Convention declared it abolished; in January 1793 the king was tried and executed for treason against the nation. In October the queen, Marie Antoinette of Austria, styled "the widow Capet," followed him to the guillotine. Some of his troubles have been blamed upon her. Louis had recognized the independence of the United States in 1778 and had sent an army and a navy that rendered material assistance in the war against Great Britain.



Napoleon on the Bellerophon

On July 15, 1815, Napoleon went aboard the *Bellerophon* in the harbor of Rochefort and was taken to Plymouth. It was the beginning of the last stage of his life's journey. From Plymouth he was transported to the island of St. Helena, where he lived a captive until he died on May 5, 1821, in his 52d year. This well-known painting by Sir William Q. Orchardson, in the National Gallery, London, shows him with the companions who, with the permission of the British authorities, followed him into captivity. From left to right they are: Colonel Planat, General de Montholon, Surgeon Maingaut, Count de Las Cases, Generals Savary, Lallemand and Bertrand. The boy is Las Cases' son.

In September 1792 the French defeated at Valmy an army of Prussians and Austrians that had invaded France with the avowed purpose of restoring order and monarchy, and in November the Austrians were beaten at Jemappes in the Austrian Netherlands. A coalition consisting of Great Britain, Holland, Spain, Portugal, Tuscany and Naples was formed against France, and the French suffered defeat at Neerwinden. In April 1793 was formed the Committee of Public Safety that became the supreme power. A revolutionary tribunal was organized to pronounce judgment without appeal. The Girondins (the moderate republicans in the Convention) were overthrown by their opponents, the Montagnards (party of the Mountain), whose leaders were Danton, Marat and Robespierre; and there were wholesale executions in Paris and elsewhere. Robespierre became the virtual head of France; while he remained so, the *Reign of Terror* was at its height, with trials only a farce and the guillotine continually busy. He was eventually overthrown and executed as Danton already had been; Marat was assassinated by Charlotte Corday. French arms were successful against a second coalition of foreign powers, the victory of Fleurus over the Austrians gave France the Netherlands (1794), and in 1795 the Batavian republic was formed, to last until 1806. A revolt in Vendée was put down. The Convention placed legislative power in the hands of two councils, the Ancients and the Five Hundred; and executive power in those of a Directory of five members. The so-called *revolt of the section* was suppressed by a young artillery officer named Napoleon Bonaparte. The Convention was dissolved, and the Directory took its place. This was the real close of the Revolution.

Rise of Napoleon. During the Directory Bonaparte, who had been placed at the head of the army of Italy, waged his victorious Italian campaigns. As a result of internal anarchy, the Directory was replaced (1799) by the Consulate, composed of three members, of whom Bonaparte was one; and a new constitution went into effect, vesting all real authority in Bonaparte as First Consul. This piece of trickery, backed by the force of his grenadiers, is known to French history as the *coup d'état* of the 18th Brumaire of the year VIII, for the Revolution had brought in a new calendar that still was in use (the day was November 9). A fresh coalition was formed against France, but the victories of Dessaix, Kellermann and Lannes at Marengo and of Moreau at Hohenlinden brought the peace of Lunéville with Austria, and internal conditions forced England to the peace of Amiens. Bonaparte now found it easy to get himself made consul for life and a new constitution adopted. It was but a step for him to become emperor in 1804, with the title Napoleon I.

The French people were weary of revolution. They believed that at last they had a man that would govern them firmly and wisely. The firmness was soon in evidence; the wisdom left much to be desired and grew less as time went on. While Napoleon was in power, the internal history of France was the history of the elaboration of a system more ruthlessly despotic than the monarchy of Louis XIV, a system of which in last analysis the only directive principle was this adventurer's unbounded and contemptuous egoism. He fancied himself destined to be another and greater Charlemagne, the supreme overlord of a vast federation. Though a time had come when conditions were favorable to the working out of a new and better order for France and thus for all Europe, he turned back to borrow from the old order some of its worst features. The press was muzzled. Bureaucracy of an intricate sort was developed to serve Napoleonic designs. Insolent police agents (*agents provocateurs*) were everywhere, guided at their worst by the shifty and cynical Fouché. Indirect taxation, which had been abolished, was restored. Education was made a state monopoly, controlled by the Université de France. The constitution of 1799 (the year VIII) had provided three representative assemblies: the *corps législatif* to pass laws; the tribunate to discuss them; the senate with power to annul laws that were unconstitutional. Under Napoleon the tribunate disappeared altogether, without a plebiscite; the *corps législatif* forfeited its law-framing powers to an imperial council, whose members Napoleon appointed; and senators were directly nominated by the emperor, who frequently declared war solely on his own authority.

End of the Empire. Napoleon's foreign policy was one of grandiose war-making, with the object of using French armies to reshape the map of Europe to suit himself. Into the tangle of these Napoleonic wars it is unnecessary to go. Their material gains were evanescent. Nelson's victory at Trafalgar (1805) definitely gave Britain control of the sea. So the emperor now undertook land campaigns against Russians, Prussians, Austrians, Spanish, Portuguese and (in the Spanish peninsular campaign) English. He caused all Europe to suffer through his attempt to clamp down on it his *continental system,* by which British goods were to be excluded.

Napoleon's ill-starred invasion of Russia (1812) ended in pitiful retreat. The battle of Leipzig, so-called "battle of the nations," saw him driven back into France (1813) by Austrians, Prussians, Russians and Swedes. Then in 1814 France was invaded, and the emperor abdicated. The Comte de Provence, brother of Louis XVI, now ascended the throne as Louis XVIII, a title he had already assumed on the supposed death of Louis XVII (1795). Napoleon, permitted to retain the title of emperor, was sent to Elba (a little island in the Mediterranean, east of Corsica), which he received as a sovereign principality. Disputes among the allies at the Congress of Vienna encouraged him to escape to Cannes. He made a triumphal progress to Paris and for the *Hundred Days* was again emperor. Defeated at Waterloo (Belgium) by Belgians, English, Hanoverians and Prussians, he abdicated a second time and was sent as a prisoner of war to the island of St. Helena in the south Atlantic. After his death (1821) a cult of hero worship grew up around the memory of him and his false ideas of "glory," and even in the 20th century European dictators postured in imitation of him.

Monarchy Again. Louis XVIII, who had fled to Ghent, was restored to his throne. He imported into France the English constitutional system complete, suppressed conspiracies and turned somewhat reactionary but retained his popularity. His younger brother the Comte d'Artois succeeded him as Charles X. He was a representative of the *émigrés* that had left France during the Revolution and had returned no wiser. Supported by the clerical party, he entered on a reactionary course and finally, with the Prince de Polignac (an émigré) as prime minister, issued by a *coup d'état* a body of ordinances that changed the method of election and restricted freedom of the press. This resulted in the *July revolution* of 1830 ("the three glorious days"), which forced him to abdicate. His successor was Louis Philippe, son of the Duc d'Orleans (executed during the Revolution), who was proclaimed king as Louis Philippe I. He accepted a constitution framed for him and at first was so democratic in spirit and manner that he was dubbed the *Citizen King* (le Roi Citoyen). But in the face of the demands of Fourier, Saint-Simon and their partisans for a new social order, the king turned reactionary, and there were insurrections at Lyons and Paris. By the marriage of his son, the Duc de Montpensier, to the sister of the Queen of Spain he alienated not only the British, who saw in it an attempt to revive the Bourbon tradition of French predominance in Spain, but also practically all of the continent. The revolution of February 1848 deposed him, and a republic was proclaimed in the name of a provisional government.

Napoleon III. The third son of Louis Bonaparte (brother of Napoleon I and king of Holland in 1806–10), Charles Louis Napoleon, was elected president of this second republic. In December 1851 he executed a *coup d'état* by which all his leading opponents were arrested and the Assembly was dissolved. By a plebiscite a new constitution proposed by him was accepted, and he was made president for 10 years. By another he became emperor in December 1852. In him the new constitution centralized all authority.

For fifteen years things went well in France. Communications were developed; commerce and agriculture were greatly improved; education received notable impetus; manufactures expanded; imports and exports trebled in value; unemployment was reduced to a minimum. In Paris, Baron Haussmann, prefect of the Seine, carried out an extensive program of rebuilding; Marseilles and Lyons were similarly transformed. The universal exposition of 1867 surpassed anything else of the kind ever held. An alliance was formed between France and Great Britain, and their combined forces with those of Sardinia took the side of the Ottoman Empire against Russia in the Crimean War. Russia's defeat and the meeting at Paris of a congress to determine conditions of peace lent to Napoleon III, in the eyes of his people, additional prestige. In 1859 France was allied with Victor Emmanuel of Sardinia in the Italian war that opened the way for liberty and unity in Italy and obtained Nice and Savoy for France. But Napoleon's scheme for setting up in Mexico an empire under Maximilian, brother of the emperor of Austria, ended with the withdrawal, at the urgent demand of the United States (Feb. 12, 1866), of the French troops promised to Maximilian, who in 1867 was captured and shot.

In spite of a revised constitution embodying liberal reforms and endorsed by a plebiscite, Napoleon's reign shortly came to an end—with the disaster of the Franco-Prussian war into which he had plunged.

The Republic. The National Assembly, convened at Bordeaux, deposed the emperor and abolished the empire for a republic. Paris passed through a period of butchery and arson known as the *Commune.* The first president was Louis Thiers (1871–73, resigned), who had negotiated peace with the Germans. In 1875, during the presidency of Marshal MacMahon (1873–79), a constitution was voted that provided that the president should be elected by a senate and a chamber of deputies united as a national assembly, that he should serve for a term of 7 years and be eligible for re-election. Thus, and by one vote, the third republic was formally established. During the presidency of Sadi Carnot (1887–94), General Boulanger, who had been minister of war, headed a movement of revolutionary groups and of monarchists and Bonapartists. He seemed to be about to become dictator when the movement collapsed and Boulanger fled to Belgium. Carnot was assassinated by an anarchist at Lyons in 1894. His successor, Jean Casimir-Perier, resigned in less than 7 months (January 1895), to be followed by Félix Faure, who died suddenly while in office (1899). An anti-Semitic movement had been steadily growing, and a few days before Casimir-Perier resigned office this movement flared up in dramatic events connected with *l'affaire Dreyfus.* Capt. Alfred Dreyfus, a Jewish artillery officer connected with the general staff of the army, had been tried by court-martial on the charge of having betrayed to a foreign power secrets of national defense. He now was convicted, publicly degraded and sentenced to be transported to the penal Devil's Island (Île du Diable) off the coast of French Guiana. This piece of flagrant injustice brought down a storm of political agitation upon the republic, in which already 37 ministries had been formed and held office since Thiers resigned in 1873. Years later Dreyfus was exonerated and rehabilitated. In 1905, during the presidency of Émile Loubet (1899–1906), the Separation Act was promulgated, by which it was declared that the republic neither recognized nor remunerated any form of religion (except in the case of chaplains).

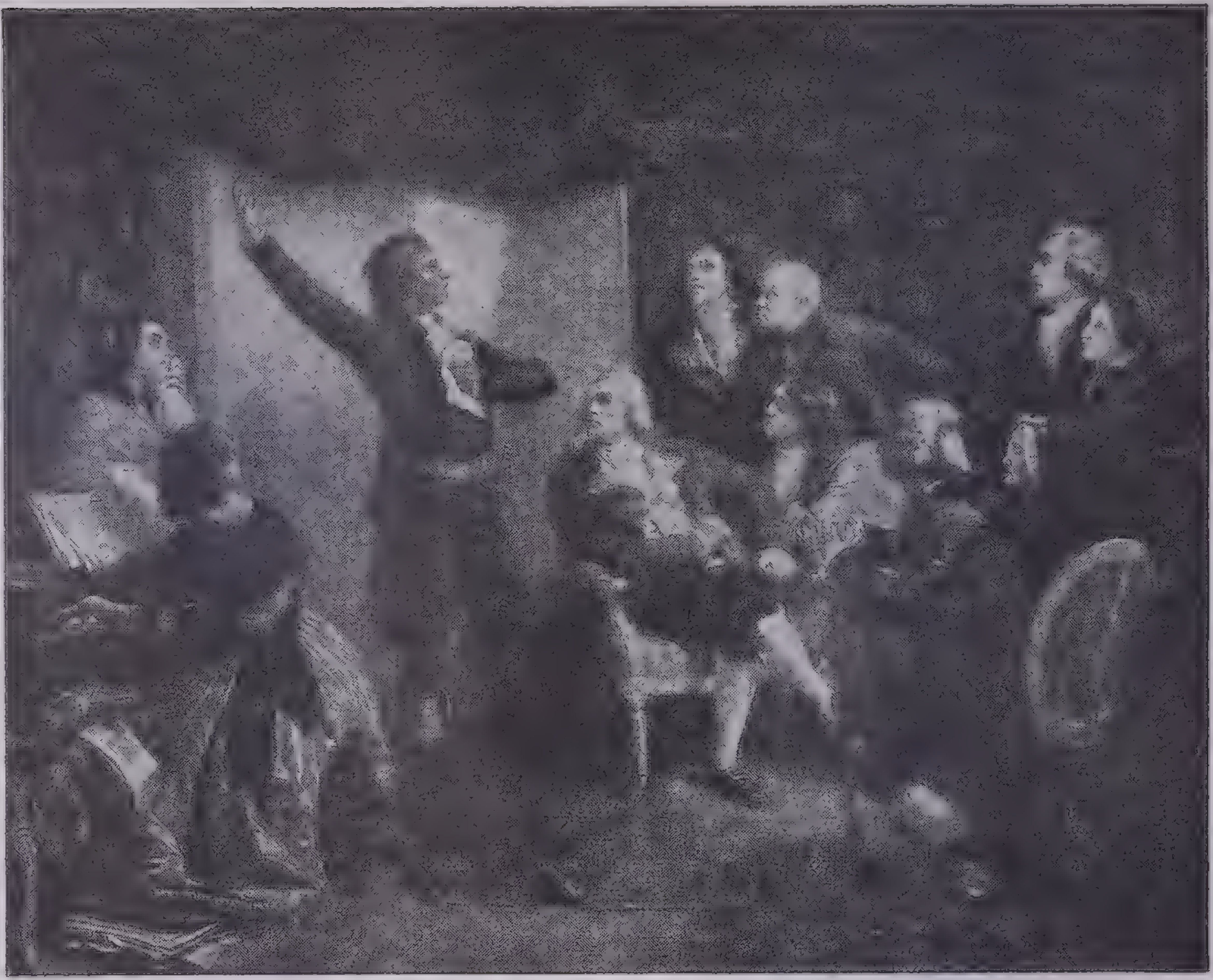
Succeeding presidents were: Armand Fallières (1906–13); Raymond Poincaré (1913–20); Paul Deschanel (1920, resigned); Alexandre Millerand (1920–24); Gaston Doumergue (1924–31); Paul Doumer (1931, assassinated in 1932); Albert Lebrun (1932–). During the World War, in the administration of Poincaré, the French army under the leadership of such generals as Joffre and Foch, displayed a high degree of fortitude and morale, while the nation as a whole revealed remarkable qualities. At the peace France received her "lost provinces" of Alsace and Lorraine, and a huge indemnity was assessed against Germany. Unfortunately, Georges Clémenceau, French Premier and chief spokesman for the nation, carried into the negotiations a spirit of revenge that was later to have its ill effects on the affairs of central Europe. For a time after the war France was financially the leading continental power. Before long, however, she showed signs of her old political instability, with constant changes in ministry and an increase of internal discord. In the 66 years up to 1938 the republic had seen the fall of 102 cabinets.

Recent Events. In the April–May elections of 1936 a heavy leftist majority was returned to the Chamber of Deputies. Throughout France there were indications of a powerful movement by labor to secure the enactment of socialistic legislation. Shortly after the elections a new device for bringing pressure to bear on the government was evolved by the leaders of French labor. This was the famous *sit-down* strike. Instead of quitting work and evacuating the factories in the old fashion, workmen came to work and then simply sat down at their machines, thus making it impossible without resorting to violence to operate the factories with substitutes or strikebreakers. The sit-down strike method spread over France with astonishing rapidity. In June 1936 there were nearly 1,000,000 workers idle, and the whole economic machinery of the nation was gravely dislocated. In this crisis Leon Blum, a socialist, became premier. Under his leadership an extensive program of liberal labor legislation was adopted that temporarily ended the unrest of the working classes.

The Blum government, known as the People's Front, remained in office until June 1937. The financial situation had grown very serious. An enormous public debt (about 18 billion dollars) and mounting deficits in the budget required desperate remedies. Blum requested emergency powers, and his government fell when the senate refused to grant them. Blum was followed by Camille Chautemps.

The Chautemps government fell at the height of the European crisis precipitated by Germany's seizure of Austria. Blum returned to power for a few weeks but was again forced to resign. A new cabinet was formed by Édouard Daladier, who received almost dictatorial powers to deal with government finances. When Germany attacked Poland in 1939, France and England declared war on Germany.

Germany conquered France in 1940. See World War number 2, page 805c.



From the painting by Isidore Alexandre Auguste Pils

The French Revolution: Rouget de Lisle Singing the Marseillaise

On the night of April 24, 1792, a young captain of engineers, Claude Joseph Rouget de Lisle, composed what became the hymn of the French Revolution and one of the most stirring songs of freedom ever written. He was stationed at Strasbourg, where a column of volunteers was about to leave for Paris, and the song received its first hearing at the house of the Strasbourg mayor. All the way to Paris the line of volunteers sang the *Chant de guerre de l'armée du Rhin*, as it was called. The whole Army of the North adopted the song, but it was not until a battalion from Marseille brought the song to the capital that it was taken up by the revolutionaries

French Revolution, the great political and social upheaval of France at the end of the 18th century that developed into the Napoleonic Wars and effected the transformation of the old European order. The Revolution began with what appeared to be a peaceable meeting of the States-General in May 1789. Its first stage was marked by a thoroughgoing but nonviolent series of changes in forms of state and social organization accomplished by the National Constituent Assembly (formed from the States-General), in session June 1789 to September 1791. The second stage, the period of the newly elected Legislative Assembly (October 1791 to August 1792), was marked by the failure of the limited monarchy that had been established by the Constitution of 1791—a failure chargeable chiefly to the nonco-operative attitude of the king and his immediate circle and to the efforts of foreign Powers to crush the Revolution by force. The third stage began with the assembling of the National Convention in September 1792 and ended with the downfall of Robespierre, July 1794. It was marked by the substitution of violence for debate under the increasing threat of foreign interference, by the abolition of the monarchy, followed by the trial and execution of King Louis XVI, and by the Reign of Terror under the dictatorship of the Committee of Public Safety. The fourth and final stage of the Revolution proper is that of the bourgeoisie's reaction and the establishment of the Government of the Directory under the Constitution of the Year III of the Republic (1794–95).

The Revolution did not end in 1795; in a larger sense the whole period of the Napoleonic Wars (1796–1815) is a part of the French Revolutionary epoch, and even after 1815 the ideas of the Revolution continued to dominate the political life of Europe. But the period from 1789 to 1795 may conveniently be taken as the period of the Revolution itself; the later developments are rather the results of the Revolution.

Long before 1789 it was evident to every observing contemporary that the state of affairs in France could not forever endure. Throughout the 18th century discontent had been growing both more intense and more articulate. The list of social and governmental abuses was long and impressive. The lower classes, peasantry and urban proletariat were crushed under a grinding poverty made worse by a grossly corrupt and unequal system of taxation. The educated upper middle classes, business and professional men, found intolerable the governmental restrictions of their business activities and the freedom from taxation enjoyed by the privileged orders—the nobility and the clergy. It was to these men—the bourgeoisie—that the philosophical radicalism of Voltaire, Rousseau, Montesquieu and the Encyclopedists appealed. Even among the privileged classes there were many enlightened individuals who realized that reforms must be made. But Louis XV and Louis XVI, whose reigns preceded the Revolution were both incapable of taking any statesmanlike steps that might have brought about a peaceful change; Louis XV (1715–74) was an utterly worthless debauchee, the sum of whose political philosophy was contained in the cynical answer to suggestions that the monarchy was in danger: "It will surely last as long as I; my successor may take care of himself." Louis XVI (1754–93) was incapable of grasping political realities, although personally anxious for his people's welfare.

In 1788 the governmental mismanagement had brought affairs to a sorry pass indeed—the nation was bankrupt. Every imaginable financial expedient—short of reform of taxation—had been tried and had failed. In the emergency the king finally consented to a measure that had been demanded with increasing loudness for the past several years, the convocation of the States-General, an ancient representative body that had not met during the previous 175 years. It was hoped that in some way the States-General would be able to find a way out of the overwhelming difficulties of the Government.

The States-General consisted of representatives of the three classes or Estates of French society: the clergy (First Estate), the nobility (Second Estate) and the commons (Third Estate). The Third Estate was numerically the strongest; it had as many representatives as the First and Second Estates together. It was accordingly of great moment to settle whether the vote of the States-General should be by head or by order; if the vote was taken by order the numerical strength of the Third Estate was nullified, since on most questions it was to be expected that the First and Second Estates, representing the privileged classes, would vote together. If the vote was taken by head, however, the Third Estate would be able to control matters.

The dispute about the method of voting brought about the first really revolutionary act of the States-General. Led by Mirabeau and Sieyès, the Third Estate broke away from the privileged orders and organized themselves into a new body—the National Assembly—which they boldly declared was the legal voice of France. They were joined by many of the clergy and by a few liberal nobles. After a feeble resistance the king acquiesced, and the National Assembly, dominated by the representatives of the Third Estate, became an effective legislative body ready to take up the task of reforming the French government.

It is a common error to suppose that the Third Estate was elected by and represented the great submerged mass of the French people—the 20,000,000 peasants, artisans and laborers. In truth the Third Estate represented not this vast lower class—voteless, illiterate, truly forgotten men—but the small although strong and compact group of business and professional men—the bourgeoisie. It happened that the aims of the bourgeoisie coincided at the moment with many of the inarticulate longings of the lower classes, who vaguely attributed all their miseries to the king, the nobles and to the system on which these had grown fat.

The National Assembly remained in session from June 1789 until September 1791. In these years it brought about sweeping reforms. "No other body of legislators has ever demolished so much in the same brief period. The old form of government, the old territorial divisions, the old financial system, the old judicial and legal regulations, the old ecclesiastical arrangements, and, most significant of all, the old condition of holding land—serfdom and feudalism—all were shattered."[1] An entirely new constitution, resembling in some ways the Constitution of the United States and in other ways the governmental system of England, providing for a strictly limited monarchy under the effective control of an elective legislative assembly was instituted. When the National Assembly dissolved itself, it seemed to many that the work of change was accomplished, and that an era of peace and prosperity was about to begin.

Unfortunately the legislative program of the National Assembly did nothing to relieve the economic distress of the people. A radical movement began to gain headway among the turbulent Parisian populace—a movement that soon found able leaders in such men as Danton, Robespierre and Marat. Even more dangerous to the stability of the new constitution was the reactionary movement that was stirring in the outside world; hundreds of nobles called *émigrés* had fled the country taking with them as much of their property as they could smuggle out, and they were actively raising a counter-revolutionary army of their own and were seeking assistance from foreign Powers. Early in 1791 the king himself had attempted to join this exodus; he and the queen had been arrested in the midst of their flight and were now virtually prisoners in the Tuileries Palace in Paris. Thus the Legislative Assembly that met in October 1791 was confronted with grave difficulties.

In 1792 foreign intervention passed from threat to reality. An army of Austrians and Prussians, led by the insolent and reactionary-minded duke of Brunswick, began an invasion of France with the avowed purpose of "putting an end to the anarchy in the interior of France." This ill-timed announcement roused the whole nation to a fierce spirit of resistance. The Legislative Assembly lost control of the situation; a series of violent insurrections of the mob occurred in Paris. Finally on August 10, 1792, the Legislative Assembly broke up after voting to authorize a new election on the basis of universal manhood suffrage for delegates to a National Convention.

The 40-day interval between the end of the Legislative Assembly and the meeting of the National Convention was a time of wild disorder. The radical leaders of the Paris mob, of whom Danton was the chief, gained control of the city. In an effort to terrify the Royalists who remained in France and if possible to deter further advance by the army of the Duke of Brunswick, Danton adopted a fearful policy. At his instigation more than 2,000 persons guilty or suspected of Royalist sympathies were summarily butchered in what became known as the September Massacres. The royal family was seized and placed under close arrest in the gloomy prison of the Temple.

The newly elected National Convention met in Paris on September 21. In the meantime the Duke of Brunswick had been defeated at the battle of Valmy; Paris and the Revolution were temporarily safe from foreign attack. A great change in spirit had taken place; ideas that were radical in 1789 were now thought conservative; ideas that were conservative in 1789 were now proscribed. The first official act of the National Convention was to declare the monarchy abolished. Within a few weeks it was determined to bring the king to trial. The day of peaceful reform was over. The enemies of the Revolution, both abroad and at home, had forced it to defend itself, and it defended itself with the only effective weapon available—a reign of terror.

So dramatic and horribly fascinating were the events of the next year and a half that in popular thought they are often represented as the whole Revolution or at least the most characteristic part of the Revolution. In reality the Reign of Terror, which began shortly after the establishment of the dictatorship of the Committee of Public Safety in the spring of 1793, was not a necessary part of the Revolution at all—it was an effort to preserve the accomplished Revolution from the attacks of the reactionaries. Given the situation that existed at the beginning of 1793—a newly established government threatened by agitation within and foreign enemies without—the Reign of Terror was the inevitable outcome.

In December 1792 Louis XVI was tried before the National Convention and condemned to death by a narrow vote. The Conservative party in the Convention, called the *Girondists,* opposed the king's execution, and it seems possible that if they had steadfastly hung together they could have retained control; but many of their members were afraid to support what might be a losing cause, and these vacillators, as it turned out in the event, held the balance of power. Once the Girondists had lost the crucial test vote on the question of executing the king, their influence rapidly declined, and after the Committee of Public Safety had secured control the Girondists were liquidated or purged, to borrow the phraseology of contemporary revolution.

The Committee of Public Safety, under the dominance of Danton, Robespierre and St. Just, remained in power until the spring of 1794. The executions of enemies and suspected enemies of the Republic went forward with shocking ferocity. Marie Antoinette, the widow of Louis XVI, was dragged before the Revolutionary Tribunal and after a mockery of a trial was sent to the guillotine. Many of France's ablest men also perished, among them the great chemist Lavoisier and the promising young poet André de Chénier. In the provinces outside Paris an indiscriminate butchery, far bloodier and less controlled than the guillotinings in the city, swept away thousands of victims, most of them quite innocent.

Yet it is easy to overestimate the extent of the Reign of Terror and to forget the desperate provocation that brought it about. Not more than 3,000 persons were executed in Paris during the whole course of the Committee of Public Safety's control; perhaps 10,000 were slaughtered in the provinces. Estimating the victims of the September Massacres at 5,000 and the miscellaneous butcheries before and after at 2,000, we may estimate that the total number of lives sacrificed to the Revolution did not exceed 20,000—a fearful toll, to be sure, but fewer than the number of persons killed in any of the world's famous battles.

Early in 1794 the fury of the Reign of Terror against counterrevolutionaries had spent itself. The leaders were quarreling among themselves. Robespierre first got the upper hand, and Danton, along with his friend Camille Desmoulins, was arrested and sent to the guillotine; but in July 1794 Robespierre fell a victim to the savage passions he himself had set in motion. With his fall and execution the Reign of Terror ended.

The National Convention remained in session for a year after the fall of Robespierre. During this last period it was dominated by upper-middle-class sentiment—by the bourgeoisie. Reforms in the interest of the lower classes were dropped. The Constitution of the Year III (dating from the abolition of the monarchy, September 22, 1792), was a typically bourgeois document, restricting suffrage to taxpayers who had lived a year in one place, thus excluding 90 per cent of the people from a share in the government, and scarcely more radical in its social and economic orientation than the "great machine for the manufacture of Philistines" that Matthew Arnold called the British Constitution.

By the Constitution of the Year III the executive power of government was entrusted to a board called the *Directory.* The Directory ruled France until 1799, when it was overthrown by a *coup d'état* executed by Napoleon. Thus the republic was transformed into a military dictatorship.

Germany, a nation of central Europe. Until 1871 Germany was not a unified nation but a group of small states, combined at times into rather loose confederations. In 1871 it became the German Empire and within a generation developed into one of the strongest military powers in the world and took an important place in the cultural development of Europe.

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[1] Hayes, Carlton J. H., *Political and Social History of Modern Europe,* Macmillan.

Earliest Peoples. People have lived in the German territory since the Stone Age, possibly more than 50,000 years ago. The written record begins with the appearance of the Romans there. The ancient Germans are supposed to have migrated from upper Asia, in nonhistoric times, passing by the Caucasus and north of the Caspian Sea to central Europe. Like the Celts, they were tall and fair, with blue eyes and light or red hair.

In 113 B.C. a Roman general was defeated by the native tribes; but in 102 B.C. Marius went there and in turn defeated them. Neither of these leaders carried back to Rome much information about the people except that they were tall and light-haired and good fighters. The Romans must have encountered numerous tribes, principally the Celts. Caesar partially conquered the country, but the tribes refused to acknowledge Roman supremacy. In 9 A.D. the Germans or Teutons, as they were then called, ended Roman domination when Arminius defeated the invaders in a battle in the Teutoburg Forest. Because this battle decided that Germany should be Teutonic and not Latin, historians agree that it was one of the 15 decisive battles of the world.

German History Begins. The formation of what later developed into Germany had its important beginnings in France (Gaul). The Franks, who occupied northwestern Germany, moved west into Gaul and under Clovis drove out the Roman legions, gave their name to the country and assimilated many German tribes. When Charlemagne came into power there, his domain covered not only France but also a large part of Germany. Under his rule the Germans made considerable progress toward national unity and an orderly civilization. With the conversion of the Saxons the German race became predominantly Christian, and for the first time laws common to the whole empire were enacted. Soon after Charlemagne's death his empire was divided (by the Treaty of Verdun, 843). Ludwig, one of his grandsons, received the territory east of the Rhine and was thereafter known as Louis the German. With this event the real history of Germany begins.

The Holy Roman Empire. There was, however, no united Germany. Duchies were organized, such as those of Bavaria, Saxony, Franconia, Swabia and Lorraine. There was no acknowledged head of the country until Otto the Great came to the throne in 936. He was crowned by the Pope in 962 as the first German Holy Roman Emperor, and he became the strongest monarch in Europe, though he maintained his ascendancy only by constant warfare. His successors did not possess his ability, and soon the nobility withdrew their support and usurped local power. In 1024 another strong king, Conrad II, regained some of the royal prestige and added to his realm the kingdoms of Poland on the east and Burgundy on the west. Because the Pope crowned each Holy Roman Emperor in turn, he felt that he had the right to intervene in current affairs, and this led to a long conflict. One emperor, Henry IV, was forced by Pope Gregory VII to abandon some of his assumed rights. At first he resisted and even succeeded in having the Pope declared deposed. Later (1076) he submitted and was forced to do penance as a beggar at the doors of the Pope.

Hohenstaufen Emperors. In the first half of the 12th century the House of Hohenstaufen (Ghibellines) came into power after a conflict with the Saxons (Guelphs). Some of its members were strong rulers, much devoted to the welfare of their nation. The greatest was Frederick I, or Frederick Barbarossa (1152–90). He defeated the Mohammedans in two battles and was killed in Pisidia, leading the Germans in the Third Crusade. His immediate successors, Henry VI and Philip, were inferior. They could not withstand the political pressure of the Pope and the nobles. When the Hohenstaufen era passed, Germany degenerated into a loose confederacy of rival states. The imperial crown often was given to the highest bidder, and order was not restored until the advent of the House of Hapsburg. The period of the Hohenstaufen emperors was the great age of medieval chivalry. It was the time of the crusades, of German romance writers (minnesingers) and, at the same time, of a continuous struggle against the supremacy of the Pope and the corruption of the clergy. In many respects this period was already foreshadowing the Reformation.

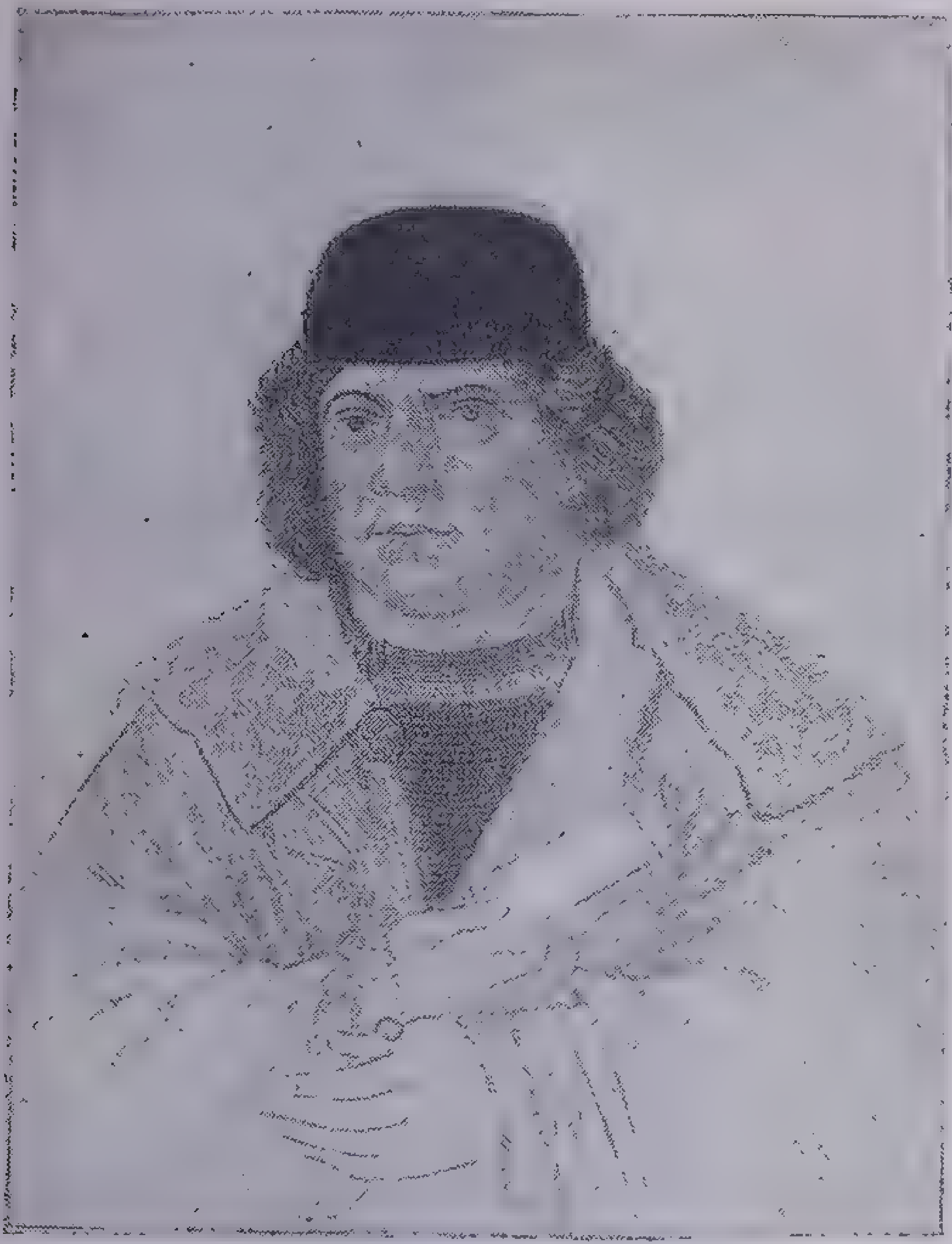
The House of Hapsburg. The German Imperial Electors in 1273 chose Rudolph of Hapsburg as emperor, and from that date to the end of the World War this famliy occupied a large place in European history. Rudolph was strong enough to enforce royal authority, and he began the practice that was to root Hapsburg rule firmly in central Europe—the appointment of members of his family to rule in high places. He named his son Adolphus to rule in Austria, which had fallen to Germany by conquest, and Hapsburgs were thus imposed upon Austria for hundreds of years. In 1493 Maximilian I came to the throne and married Mary, daughter of Charles the Bold of Burgundy.

Within the next few decades Switzerland won its freedom from Germanic Austria. The Hussite War, a religious uprising, was fought in Bohemia because Emperor Sigismund, who had promised a safe conduct for John Huss, the religious revolutionary, deserted him when he was condemned as a heretic by the Council of Constance and allowed him to be burned at the stake. The religious differences among the people could not be harmonized, and the next great period in Germany centered around the Reformation, which began in 1517 as a protest against certain practices that had grown up in the Church. Others had objected to what they termed abuses, but it was Martin Luther who gave impetus to the movement for reform by nailing upon the church door of Wittenburg a protest containing 95 charges. He did not accuse the Church itself but rather individuals who served it.

In 1522, partly as a result of ideas of personal freedom engendered by the Reformation, partly as a protest against the evils of serfdom, a general uprising of peasants broke out. It was ruthlessly suppressed by the feudal lords. Perhaps 100,000 peasants were killed, and the German peasantry sank into a wretched condition from which it did not emerge until the 19th century. Even Martin Luther, himself of peasant stock, condemned the rebellion, saying, "To rebel against the princes was to rebel against God." From this time on the Protestant movement was in the hands of the nobles, who for various personal and political reasons preferred Luther's beliefs to those of the Catholic Church.

The Thirty Years' War. The Reformation stirred Europe profoundly, for it spread throughout most of the northern countries. The Roman Catholic Church set up the Counter Reformation, but the Protestant movement could not be checked, and the two faiths grew increasingly antagonistic. It was not until the Peace of Augsburg (1555) that the German Church was freed from the control of Rome and the Pope. German princes could at last embrace either Catholicism or Lutheranism. But when a Catholic, Ferdinand, was placed on the throne of Bohemia, open warfare between Catholics and Protestants began that was to last for 30 years. The conflict is known as the Thirty Years' War (1618–48). It was a gigantic struggle and bitterly contested. It was fought mostly in Germany; but all the important nations of Europe took part. Before it ended Germany was impoverished, thousands of people had been killed, industry had been practically destroyed and Germany had no longer a united government. Local princes had usurped power in their respective localities. One central authority gave way to something like 200 small units, none of which acknowledged more than nominal allegiance to the Crown. The war was ended by the Treaty of Westphalia in 1648. The political provisions of this treaty were important in that they remained practically unchanged for 2 centuries. Switzerland and Holland became independent, France became the strongest Power on the continent, Spain lost her leadership and the Holy Roman Empire declined to a mere name. Germany, after this treaty, once more became a loose confederation of practically independent states.

The Rise of Prussia. This largest unit of Germany had its beginning in the small Duchy of Brandenburg, which early in the 15th century was ruled by Frederick of the House of Hohenzollern. The family remained



From the portrait by Hans Holbein the Younger

Martin Luther

in power in Germany from then until 1918. East Prussia, which had belonged to Poland, was annexed in 1618, and during the next 50 years other principalities were added to the expanding Prussian area. The Swedes tried to take Brandenburg in 1675, but the Prussians drove them away. This increased the province's prestige. Later it became a refuge for persecuted religionists.

In 1701 Emperor Leopold made a kingdom of Brandenburg and Prussia, and Frederick the Elector was crowned first King of Prussia. Second in succession was Frederick II, known as Frederick the Great. This monarch was admired throughout Europe not only for his military talents, courage and energy but also for his intellectual gifts. He was a disciple of Voltaire and was himself an author of many works of considerable merit. His court, like that of Catherine the Great of Russia, was a center of the cultural life of the time.

Frederick II became involved in two great wars—the War of the Austrian Succession (1740–48) and the Seven Years' War (1756–63). When the Hapsburg Emperor Charles VI died in 1740 and was succeeded by his daughter Maria Theresa, Frederick II took advantage of his neighbor's weakness to annex to Prussia the Austrian province of Silesia. France joined Frederick in this disgraceful war, and Austria was forced to make a humiliating peace. Eight years later, having secured the support of France, Maria Theresa renewed the struggle. The desperate Seven Years' War followed. Frederick, attacked on all sides, was pushed to his last man and his last thaler; but with the financial help of Great Britain, he at length was able to beat back his enemies. He retained Silesia for Prussia.

In the three partitions of Poland among the Powers during the reign of Joseph II, Prussia secured West Prussia and joined it to East Prussia. The kingdom was so powerful that when Napoleon Bonaparte planned to conquer Europe he knew that he would have to humble Prussia. He succeeded and took half of Prussia's territory; but this was restored in the reign of Francis II when the Congress of Vienna (1815) reorganized the boundaries of Europe.

Prussia against Austria. During the 18th century Prussia had become so powerful that its voice was practically the voice of Germany. Prussia's ambitions clashed with those of Austria, and a struggle between the two was unavoidable. Napoleon had formed the Confederation of the Rhine, a union of small states, to oppose the strength of Prussia and Austria. The Congress of Vienna, however, formed all the German states into a confederation headed by Austria, but this was broken up by the Prussian-Austrian rivalry. Another attempt at unification began with the formation of a customs union among the states. It was fairly successful and advanced the general desire for German solidarity. A national parliament convened at Frankfort to further the federation, but the Prussian-Austrian antagonism defeated the plan. In the meantime Prussia was advancing industrially and culturally and was drawing other states into economic co-operation.

Building the German Empire. William I came to the throne of Prussia in 1861. He chose for his chancellor, Otto von Bismarck, who must be credited with the final establishment of a united German nation. Bismarck planned to reduce the power of Austria, the stumbling block in the path to complete unification. The excuse for making war on Austria was a relatively unimportant dispute over control of Holstein and Schleswig. Bismarck declared that Austria had violated a treaty and sent troops into Holstein. The war was thus started in June 1866, and in 7 weeks (The Seven Weeks' War) Austria was humbled. Schleswig and Holstein were annexed to Prussia, and Italy received Venice from Austria in return for the promise it had given to keep out of the war. Austria was declared expelled from among the German states.

A North German Confederation was immediately formed, with Bismarck in control of Prussian and German statecraft. He saw an opportunity to strengthen his hold upon the Continent by suggesting a Hohenzollern prince on the throne of Spain, knowing of the hostility of France to such a scheme. A war with France was desired to restore Alsace and Lorraine to Germany and to assure German ascendancy on the Continent; the Spanish episode furnished the excuse.

Bismarck published part of a dispatch from King William to the French Emperor, and thus goaded France into a declaration of war. The Franco-German War (1870–71) lasted less than a year but was disastrous to France. Alsace and a part of Lorraine were taken by Germany, thereby sowing some of the seeds of the World War, and an indemnity of a billion dollars was demanded and paid. Napoleon III lost the French throne and the Third Republic was established. German unity had been achieved, and the North German Confederation was welded into the modern German Empire; William I, King of Prussia, was crowned German Emperor, and it was decreed that the two crowns should be hereditary in the House of Hohenzollern. Germany now began to expand, but her lust for power became so oppressive on her subjects that many of them migrated to America. Bismarck continued in his post of power to the end of the reign of William I in 1888, and through the brief reign of his son Frederick III, who died after 3 months as emperor-king. The succession fell to William II, who believed he was the "anointed elector of the Divine Will." The new emperor and the aged but crafty Bismarck were not long in accord on questions of policy. Bismarck soon resigned at William's request.

Courtesy German Railroads Information Office

Frederick the Great

To Prussia's leader in the Seven Years' War this bronze equestrian statue by Christian von Rauch was erected on Unter den Linden, Berlin, about 1851. The bas-reliefs on the pedestal depict events in the life of the monarch. The small statues around the base are of Frederick's generals

The Last Hohenzollern. In the years following 1876 Germany developed industrially and economically within her own borders and also founded colonies in Africa and extended her commerce to many parts of the world. Germany became a world Power. When two German missionaries in China were killed in 1898, Germany not only asked for proper indemnity but demanded and received a territorial concession in the Province of Shantung, including the port of the Kiaochow Peninsula. It was established as a German protectorate.

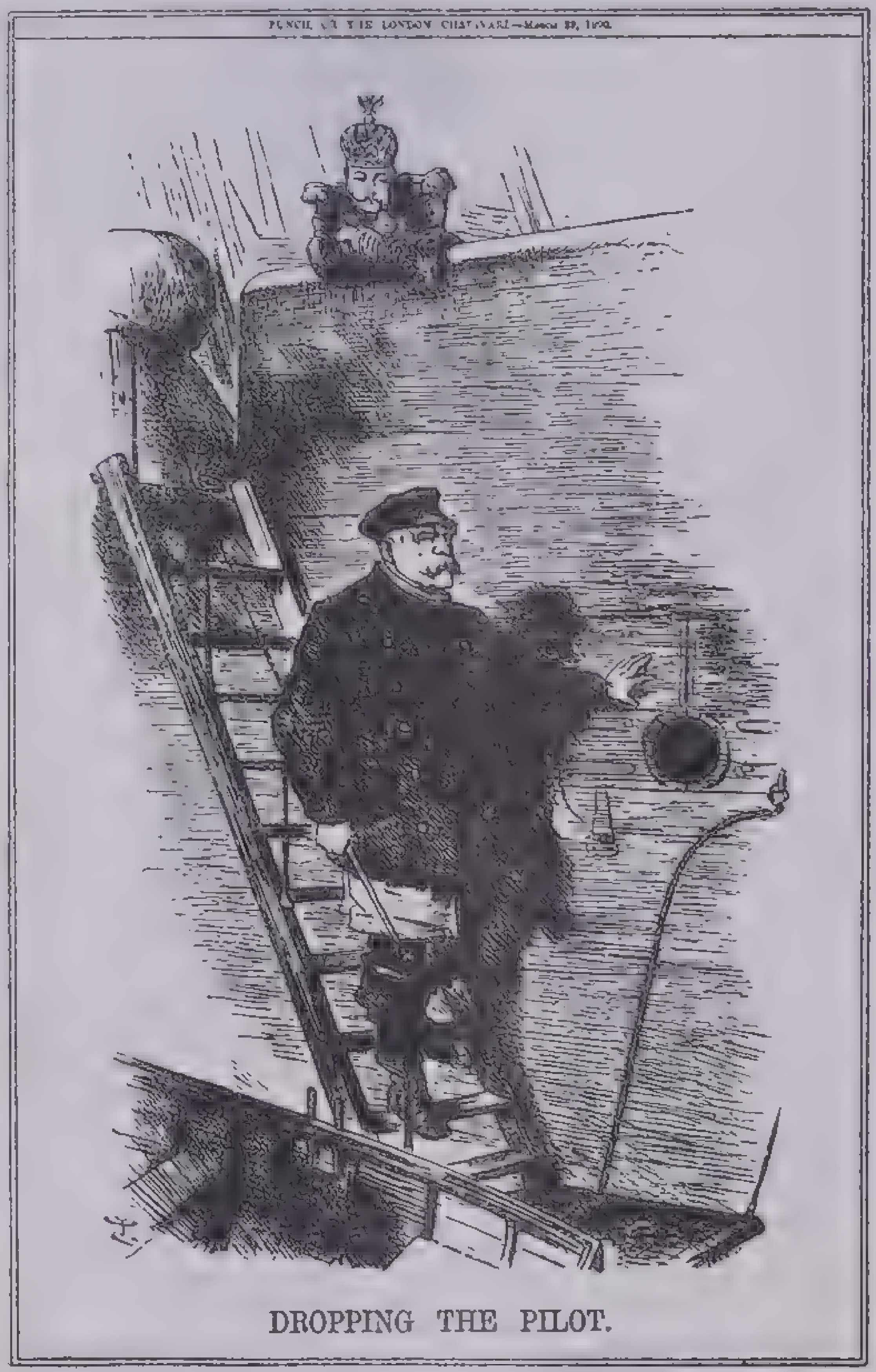
At home particular attention was given to industry, and Germany began to be a serious contender for the markets of the world. This movement developed a very large sea trade, and a strong navy was developed, ostensibly to protect the country's commerce. Great Britain anxiously watched the building of a sea force far stronger than Germany's commercial interests required, for it appeared that the emperor's real desire was eventually to challenge English supremacy on the sea. Another German coup caused anxiety in England. By an arrangement with Turkey, Germany was given permission to build a railroad through Turkey to Bagdad and eventually to the Persian Gulf, giving an unbroken line of communication from Berlin to the Indian Ocean. This move was interpreted as a challenge to Britain's power in India.

Both Powers began to make alliances. Germany, Austria-Hungary and Italy formed the Triple Alliance, balanced by Great Britain, France and Russia in the Triple Entente. To test the strength of the friendship between England and France, Germany undertook to gain a foothold, commercial at first, in North Africa, while Russia was busily engaged in the Russo-Japanese War. Most of Europe outside the Triple Alliance was growing restive over the clear ambition of Germany to become the greatest world Power, and at a conference in 1906 at Algeciras, Spain, called to discuss the German inroads into Morocco, the German demands were denied by placing Morocco under control of France and Spain.

In 1908 Austria-Hungary, with the consent of Germany and Turkey, annexed the provinces of Bosnia and Herzegovina; this alarmed Russia and Serbia, but Germany's approval of the action prevented hostilities. The political and racial problems of Europe were rapidly nearing a crisis. On June 28, 1914, the Archduke Francis Ferdinand and his wife were assassinated in the streets of Sarajevo, in Bosnia. This act was the spark that precipitated the World War.

World War. At the outset of the war Germany was better prepared than any of the allied nations. Until the end of 1916 the advantages were on Germany's side. After that the defeat of the Crown Prince's army at Verdun, the participation of the United States on the side of the Allies and the increasing unrest at home turned the tide against Germany. General Foch's offensive in July 1918 along the Marne completely reversed the aspect of the war. The German army began to retreat, and surrender was only a question of time.

William abdicated his throne and fled for safety to the Netherlands on November 10, 1918, and the next day the Armistice was signed. On June 28, 1919, the victorious allies met at Versailles to impose the terms on defeated Germany. The Big Four, the principal statesmen of the conference—President Wilson, Premier Lloyd George of Great Britain, Premier Clemenceau of France, and Orlando, chief of the Italian delegation—fixed on Germany the entire responsibility for the war. By the terms of the treaty Germany was obliged to pay a sum of 33 billion dollars in cash, goods and ships. (Within a few years Germany's inability to pay these reparations was generally acknowledged.) In addition to the reparations, all German colonies were retained by the Allied Powers, and the provinces of Alsace and Lorraine were returned to France. Danzig was made a Free City, and other minor territorial adjustments were made at Germany's expense. Finally the German army was reduced to 100,000 men. Germany's war casualties were estimated to be greater than those of any other nation—about 1,700,000 dead and 4,500,000 wounded.


PUNCH, OR THE LONDON CHARIVARI.—MARCH 29, 1890.

DROPPING THE PILOT.

From Punch, March 29, 1890

A Famous Cartoon

Sir John Tenniel's drawing was inspired by Bismarck's resignation after his clash with the young Emperor William II. Bismarck had renewed an order preventing cabinet members from reporting to the emperor in the absence of the cabinet head, the office held by Bismarck. When Bismarck refused to revoke the order, the emperor demanded his resignation

The German Empire came to an end, and amidst utter confusion a Socialist republic was proclaimed. A national constitution was adopted at Weimar in August 1919, and Friedrich Ebert was chosen as the first president. The country had almost insurmountable difficulties to face besides payment of the huge indemnities to the Allied Powers. Several communist uprisings were put down with difficulty.

In 1924 in an effort to learn Germany's full ability to meet reparations payments a commission headed by the American Charles G. Dawes studied the situation and substantially reduced Germany's liability. Germany tried to meet its new obligations, but the world economic depression beginning in 1929 made this impossible. Another commission reported in 1930 that Germany could not meet payments even on the revised basis. Later in 1930 at President Hoover's suggestion a moratorium on all interallied and German debts was agreed upon for a year.

In 1925 Marshal von Hindenburg, leader of the German armies in the World War, had been elected president. This choice was looked upon with misgivings by the Allied Powers, for it might mean that an attempt would be made to restore the old monarchy to which Hindenburg had once sworn allegiance. This fear proved groundless. When his term expired in 1932, he was enthusiastically re-elected. By this renewed expression of confidence the nation for a time averted the threat of Adolf Hitler and his millions of followers to destroy the government and institute a Fascist regime.

But by adroit political moves Hitler secured the election (1933) of a sufficient number of his followers to the Reichstag to dominate that body. Hindenburg was forced to recognize Hitler in the government, and Hitler became chancellor in 1934. The Hitler organization, called the *Nazis* (National-Socialist party), was not satisfied with mere co-operation in governmental affairs; Hitler bent all of the state agencies to his will and within a brief time realized his ambition to become the one dominating personality in Germany.

Hitler at once set out to deprive all Jews of civil and property rights. This persecution, based on the Nazi theory of the superiority of the Nordic race, attempted to eliminate from the German population all non-Aryan elements. He decreed sterilization for about 400,000 German subjects, men and women, to the end that the nation should thenceforth provide only strong and able-bodied children. He abolished the boundaries of the 23 states and provinces of the old Germany, declaring that only one united country under one rule should exist. Under his leadership Germany began to rearm, in violation of the Treaty of Versailles. In 1936 Germany withdrew from the League of Nations, formed an alliance with Fascist Italy and strengthened her relations with Japan. Italy and Germany assumed leadership in the Fascist opposition to Communism.

Hitler's rule has been an autocracy unexampled in history since ancient days. His campaign against the Jews, against both Protestants and Catholics, his efforts to restore the pagan faith of the Goths, his subversion of all culture and learning to the needs of the state, his regimentation of all people to the prime demands of a Nazi philosophy, his forced elections to vote him "confidence," his executions of leaders who oppose him, his ruthless methods of carrying out edicts and his various public pronouncements intended to allay suspicions abroad but subsequently repudiated—all make him not merely a baffling problem but a menace in the efforts of nations to avert another war.

Underwood & Underwood

Adolf Hitler

Hitler, born at Braunau, Austria in 1889, founded the Bavarian Nationalist Socialist Worker's party in 1919. In February 1925 he reorganized the National-Socialist (Nazi) party, the powerful Fascist group attempting to strengthen Germany and unite Germanic countries. He became a German citizen in 1932 and unsuccessfully opposed von Hindenburg in the presidential elections. On January 28, 1933, Hitler selected a German cabinet at the request of von Hindenburg and named himself chancellor. Upon the death of von Hindenburg on August 2, 1934, he united the offices of chancellor and president, assigning the combined duty to himself for life

On March 7, 1936, German troops took possession of the Rhineland, the zone created by the Treaty of Versailles and guaranteed by the Locarno Pact. Hitler had increased the armament of the country to the detriment of its economic condition. His hostile attitude toward the Soviet Republic had created a tension that might lead to war. He was charged with permitting German "volunteers" to aid the insurgents in the Spanish Civil War; and in 1938 he had repudiated entirely any obligations to the terms of the Versailles Treaty, including Germany's war guilt, and announced a united Germany restored, purged, able to withstand all comers.

In March 1938 Hitler made his most daring move. He marched troops into Vienna, annexed Austria and declared a drive to unite all Germanic peoples under his rule. The action was not unexpected. Austria had been economically weak ever since it was made an independent nation after the World War. Before Hitler's regime there had been efforts at *Anschluss* or union, that were prevented largely by the attitude of France and Italy, which naturally disapproved any such strengthening of Germany. But Mussolini and Hitler agreed on a policy of mutual support and noninterference. With Italy's attitude clear Hitler did not hesitate to march boldly into Austria.

Later Germany annexed Czechoslovakia. In 1939 when Poland refused to turn over Danzig and The Polish Corridor, Germany attacked Poland. Then France and England declared war on Germany. See Second World War, page 805c.

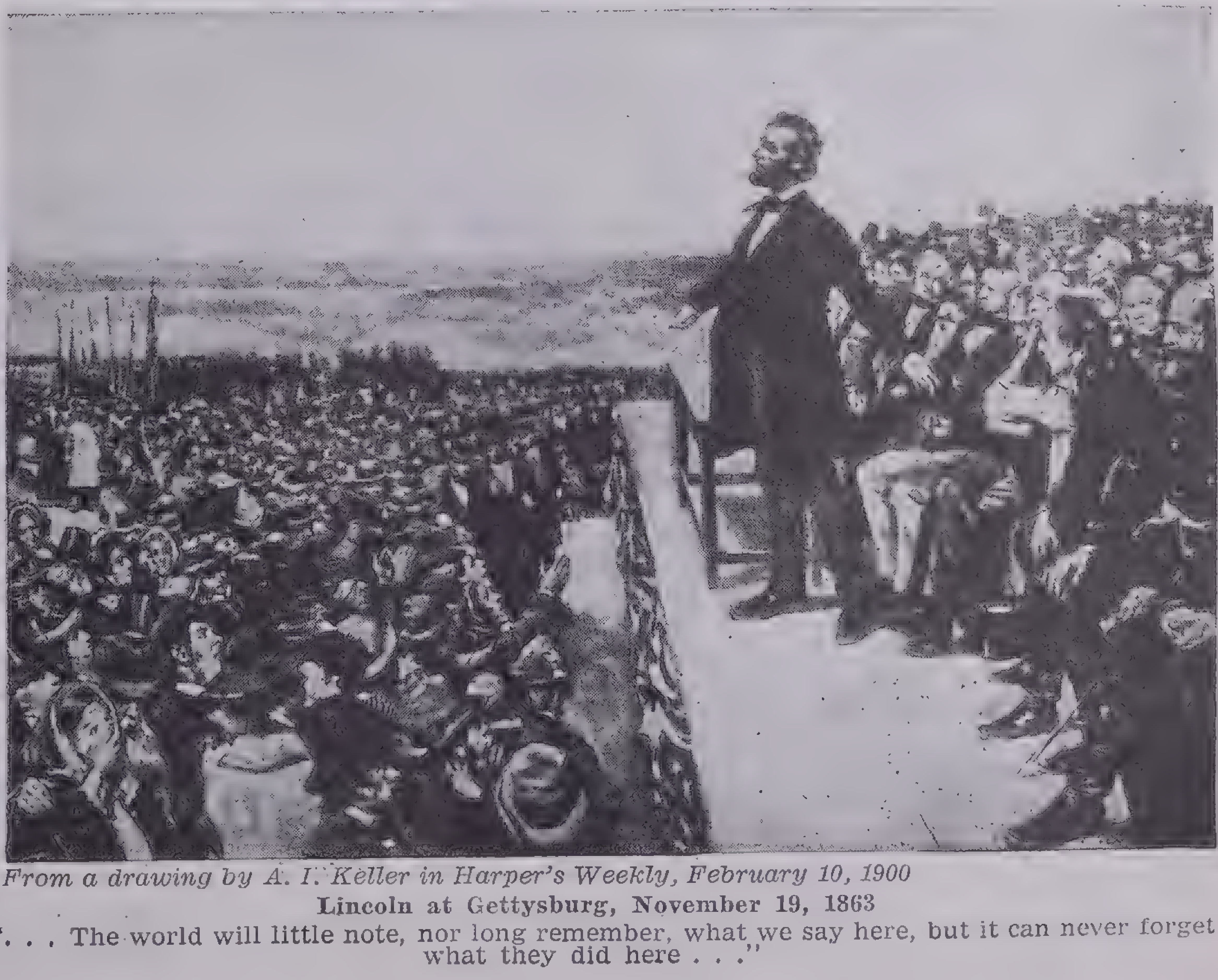
Gettysburg, a battle of the American Civil War, fought July 1–3, 1863, between the Confederate Army of Northern Virginia under Lee and the Union Army of the Potomac under Meade. The battle stopped Lee's second invasion of the North.

Many critics have called the battle of Gettysburg the decisive battle of the Civil War, and if some single battle must be selected as marking the turning point of the war, it is perhaps better entitled to that rank than any other.

In view of the great disparity of ultimate resources between the two sections the only real hopes for Southern victory depended on (1) possible foreign intervention and (2) possible defeatism in the North—the feeling that victory was not worth the cost in men and money. On the first of these hopes the battle of Gettysburg had little effect, as it came long after the real crisis of the foreign intervention movement, which was strong in 1861–62 but had definitely been disposed of by July 1863. On the second Confederate hope, the hope of Northern defeatism, the results of Gettysburg were rather more favorable than adverse to the South. The fact that Lee was permitted to escape with his army intact loomed larger in the Northern mind than the fact that he had been defeated in a great battle. Lincoln, in particular, was bitterly disappointed by the outcome at Gettysburg. He could not understand why Lee was allowed to escape.

Girondists, a political party during the French Revolution, so named from the circumstance that many of their ablest leaders were from the department of Gironde in the south of France. The Girondists first gained prominence upon the convening of the Legislative Assembly elected under the Constitution of 1791, which provided for a strictly limited monarchy. In this Assembly the Girondists represented the moderate republican sentiment—they favored a further diminution of the powers of the king, and most of them hoped for the ultimate abolition of the monarchy; but they were against the immediate extreme measures favored by the radicals. The National Convention that assembled in Paris in the fall of 1792 was a far more radical body than the Legislative Assembly of 1791. The Girondists, who had been radicals the year before, were now the extreme conservatives. They sat on the right of the convention hall. On the left sat the radical extremists, led by such men as Robespierre, St. Just and Danton. (This is the origin of our modern terms *right* and *left* for conservatives and radicals.)

In the struggle for control of the National Convention the Girondists were at first the dominant party; but their influence rapidly declined as the convention began more and more to reflect the threats and passions of the Paris mob. The crucial test came on the question of executing Louis XVI; the Girondists tried to prevent this violent measure but were outvoted (January 16, 1793). From this time forth they faced an increasingly powerful opposition that first deprived them of political influence and finally sent their leaders to the guillotine. In June 1793, 29 Girondist leaders were expelled from the National Convention; the party of the left, led by Danton, Marat and Robespierre, now in supreme control, inaugurated the Reign of Terror. Most of the Girondist leaders, including the famous Madame Roland, were executed in October of the same year.



From a drawing by A. I. Keller in Harper's Weekly, February 10, 1900

Lincoln at Gettysburg, November 19, 1863

". . . The world will little note, nor long remember, what we say here, but it can never forget what they did here . . ."

gnostic heresy, a mystical cult prominent in the early history of Christianity. Its leading feature was a combination or fusion of Christianity with the mystical doctrines of Oriental and later Greek philosophy. The Greek word *gnosis,* from which Gnosticism takes its name, means knowledge; but the knowledge claimed by the Gnostics was not a scientific or rational knowledge but a secret revelation to be understood only by initiates. The influence of Gnosticism on the development of early Christianity was undoubtedly very great, both through the symbolisms and ideas that were imported into Christianity from the Gnostics, and through the opposition to Gnosticism as a competitor to Christianity, which led the early Christian leaders to a more exact statement of the characteristic Christian doctrines to distinguish them from the Gnostic heresy.

Granada, the most important of the Moorish kingdoms established in Spain by the Arabs. The Moors were finally expelled in 1492 by the armies of Ferdinand and Isabella. It is related of Bobadil, the Moorish leader, that as he left Granada he tarried on a hilltop for a last view of his beloved city, and that hill became known as the *Hill of Tears.* His sorrowful exclamation as he turned his eyes away from the enchanted land is remembered as the "last sigh of the Moor." Granada now forms three provinces in southern Spain; the most important bears the same historic name.

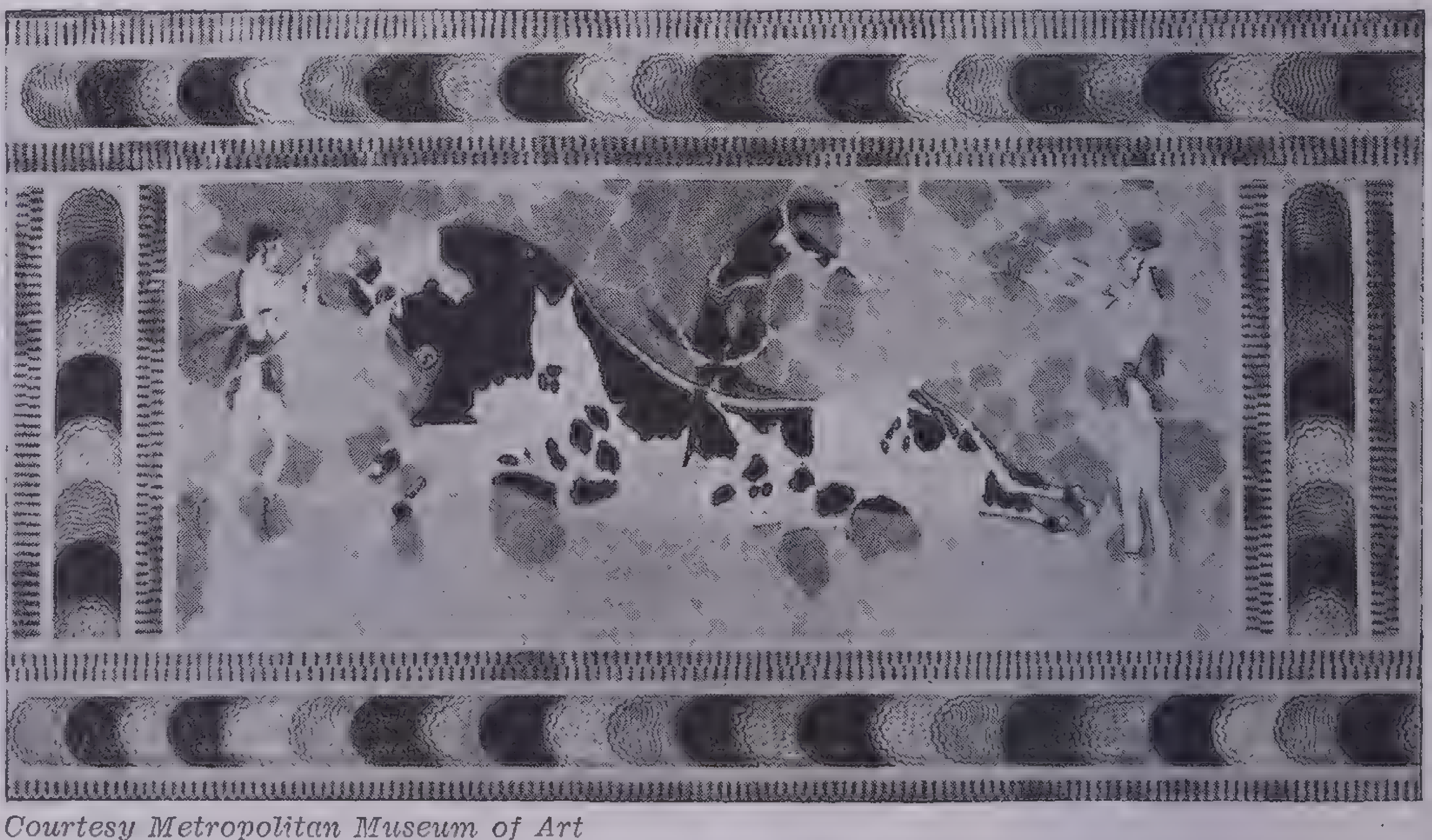
Grand Remonstrance, a list of grievances adopted by the English Parliament in 1641 against King Charles I. It included protests against every illegal act of his entire reign. The monarch sent an evasive reply; this led to the Civil War, the execution of the king in 1649 and the period of the Commonwealth, in which Cromwell ruled the country.

Greece.—When we turn from the stories of ancient Oriental peoples and of the ancient Egyptians to the story of the Greek peoples, we become at once aware of a striking difference. "Among the Greeks," said Hegel in his *Philosophy of History,* "we feel ourselves immediately at home." We are no longer in a world of heavy despotism, in which the whole motive and purpose of the state may lie in the caprices of a tyrant. We have reached a civilization in which for the first time free institutions begin to make their appearance—institutions that pay some regard to reason and that on this basis of reason seek to recognize and aid the individual citizen. Hence in the best period of Greek history we encounter a freshness, a verve, a spiritual vitality quite lacking in the systems that grew up along the Nile, and in Mesopotamia. Furthermore, this Greek life was made easier for us to understand because the Greeks developed a beautifully expressive language, and because reading and writing were practised as never before and records were, in spite of much destruction, comparatively abundant.

The history of Europe before the birth of Christ is, so far as we have it, chiefly a history of the Greeks and the Romans. Other races and nations there were, but these remained primitive and rude, whereas the Greeks and Romans (who inherited and borrowed much from the Greeks) were making to human life contributions of outstanding significance. It has been said that no other race ever did so many different things well as did the Greeks. Many of the things most valued by intelligent people in the culture of our own day have been transmitted from the Greeks; and it is interesting to find old Roger Bacon (in his *Opus Maius*) insisting, prior to the Renaissance, that the Greek culture was providentially ordained, just as the Hebrew culture had been, and was equally to be studied.

We get dimly our first sight of the Greeks as a wandering Aryan folk ranging the country south and east of the Black Sea and then, perhaps about 1500 B.C., shifting down into what we now call the Balkan Peninsula and there conflicting and mingling with the earlier civilization that we call Minoan, made known to us through the excavations by Dr. A. J. Evans at Cnossus in Crete. It appears that this southward migration took place in a series of waves, of which the final was the Dorian. The Greeks were known to themselves by the collective name of *Hellenes.* They spoke a common language whose chief three variations were Aeolic, Doric and Ionic. They crossed the Aegean to Asia Minor and there made settlements. They took their way into the Black Sea and settled along its southern and northern edges. Going westward, they founded towns in the southern part of the Italian peninsula in a region that came to be known as Magna Graecia; undertook settlements in Sicily; and established a colony at Massalia (Marseilles).

By the 7th century B.C., Athens, Corinth, Sparta, Thebes were flourishing cities to whose inhabitants Troy and Mycenae were already legendary, as they are to us. Vanished was the pre-Hellenic world that had surrounded the Aegean. But when we speak of ancient Greece we do not mean a single, united country that combined under one government the settlements on the west coast of Asia Minor and the Hellenes who lived in Greece proper. For although these all had similar customs and spoke the same language and were known to one another as Hellenes, they were divided into many small communities, each (though it might have an area of but a few square miles) with its own independent government. Aristotle in writing on the constitutions of the Greek states listed 158 of these communities. Greece proper was, as a reference to maps will show, pierced far inland by arms of the sea and much divided by mountains. Some of the city-states were on islands or upon distant coasts. These geographical factors and the consequent difficulty of communication help to explain the persistent separation of the Hellenes into these little districts. Athens, largest of the Hellenic cities, had at its maximum a population probably not more than 350,000 or roughly about that of Indianapolis (census of 1930). The Hellenes influenced the course of civilization not by physical force but through a new efflorescence of ideas and a vital extension of human consciousness. They were united not superficially by the military power of an imperial autocrat, such as the Nebuchadnezzar of whom we read in the Book of Daniel, but fundamentally by race, by speech and (which was even more important) by a religion of the same general form and a culture of the same general type. Those outside the Hellenic group they called *hoi barbaroi,* "barbarians," meaning peoples whose language they could not understand and whose ways of living seemed to them outlandish. This is the sense in which the word barbarian is used throughout the New Testament (as, for example, in I Cor., 14:11).



Courtesy Metropolitan Museum of Art

Athletes of Ancient Crete

A charging bull is tossing a female toreador while a youth vaults over his back. From a fresco of the late Minoan period (1500–1350 B.C.) in the museum at Candia, Crete

Class Distinctions. At the time when they swung down from the north into Greece proper, the Hellenes were socially divided, though with no very sharp cleavage, into "commoners" and *noblesse,* and in war they were commanded by a king, who was head-man of one of the noble clans and was looked upon as generalissimo among his peers. As the earlier inhabitants were conquered and the Hellenes settled down in communities, survivors of the aborigines (except in some cases when populations were quite exterminated) were forced into slavery as farm laborers, artisans and unskilled workers. In Sparta these survivors formed a distinct servile class, serfs owned by the state and compelled to work the land to which they were attached and to render service in war. Some freemen of the Hellenes also engaged in humbler gainful occupations, but more of them were farm proprietors, landlords, shipwrights and traders. The priestly class had no such power and consequence as in Mesopotamia and Egypt. Priests and priestesses officially performed sacrifices and were guardians of temples and shrines, but they were not organized into a body of special initiates with exceptional influence and privileges. When the Greeks sought particular advice on religious matters they found it in the *oracle,* a supposedly inspired response given by a deity through the mouth of a priest or priestess. Certain centers, such as Delphi, grew up, to which inquirers went to receive the *themistes,* the divine instructions as to what it was right to do.

Through the Homeric poems, the *Iliad* and the *Odyssey,* we have glimpses of what is termed Homeric society—that is, of the way in which the Hellenes were presumably living in the period during which these poems originally took form. Therein we see each little district ruled over by a king who is the leader in war, acts as judge and may even exercise arch-priestly functions, officiating at sacrifices and offering up prayers. Associated with him was a council (*boulē*) of elders, whose opinion he must obtain on any public action. Then the matter was brought before an assembly of the people in the market place (*agora*). Common folk were apparently not allowed to do any talking, however; and on one occasion in the *Iliad,* when Thersites, a "commoner," arose and expressed his views, Odysseus roundly pummeled him and made him sit down. In fact, in the Homeric poems the common people cut practically no figure at all. Yet already in the society these poems describe we can recognize the origins of the oligarchies and democracies of the historical Greece with which we have to deal, and even the beginnings of the constitutional systems of modern times.

Forms of Government. Monarchy survived longer in some places than in others; in the 6th century B.C. it still was in existence in Cyprus, Cyrene and Sparta. But gradually it was replaced by *oligarchy;* that is, government by a few families or persons. At Athens, about which we have fuller records, the change had taken place by the close of the 8th century B.C. There the hereditary king, whose rule was for life, was succeeded by three *archons* or magistrates elected annually. An advisory council (*boulē*) represented a privileged noble class that asserted its claim to power on the basis of birth and of landownership. Elsewhere the arrangement was much the same. Sometimes the council usurped authority over the archons. Sometimes, perhaps, the oligarchy was not unduly oppressive. But everywhere the privileged class had a way of assuming that it alone was the state. It tried to maintain an air of exclusiveness and aloofness by transmitting the laws by word of mouth, as a kind of esoteric knowledge, and even by having its own special forms of religious worship in which "commoners" could take no part.

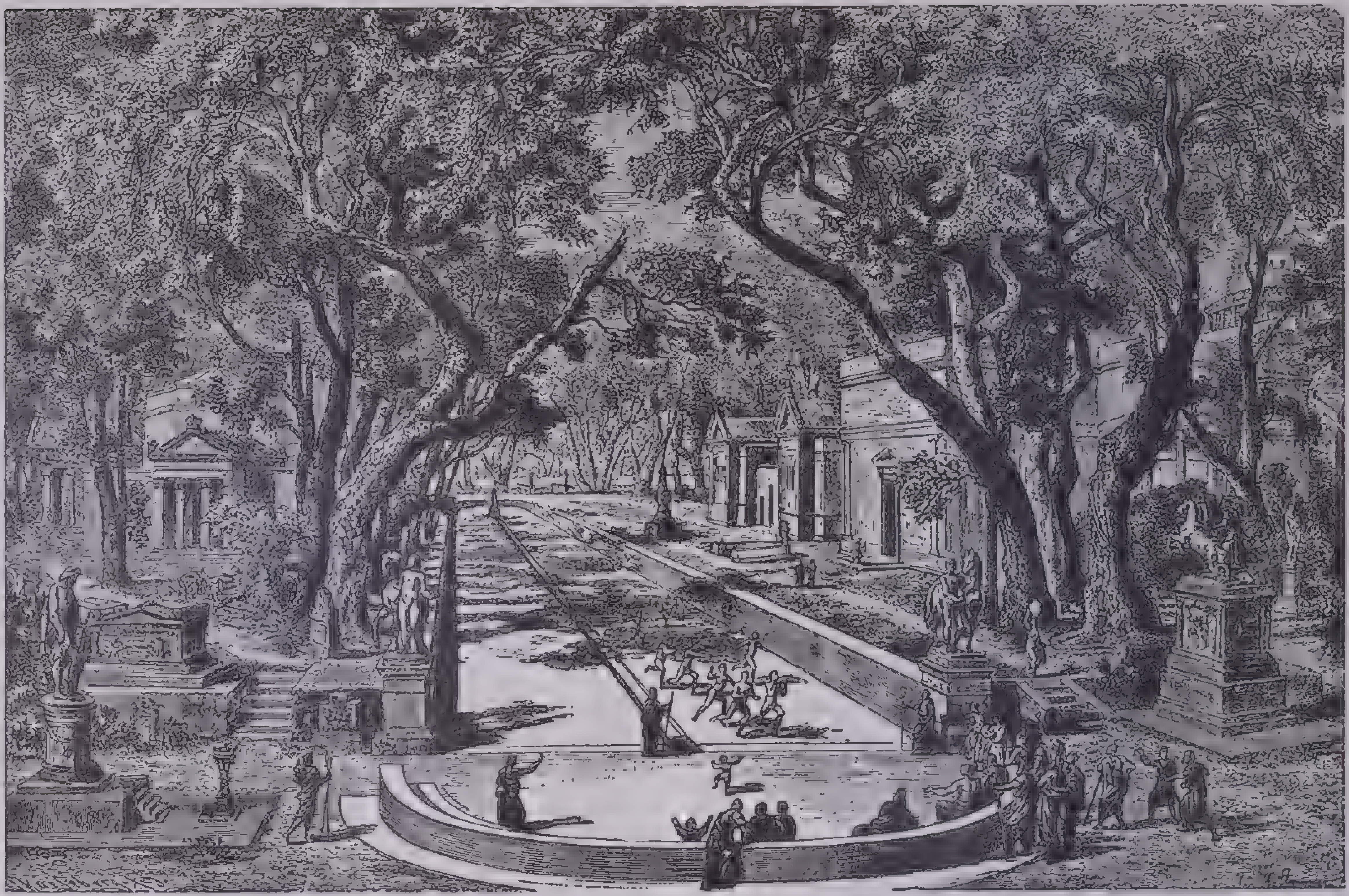
Another form of government among the Hellenes was that of the *tyrants* (*turannoi*). The Greek word did not mean what *tyrant* has come to mean with us. It signified a ruler whose rule, no matter how wisely he might govern, was not that of a legitimate monarch but was unconstitutional—in violation of the law. Not all Greek states passed through this phase; and of those that did, not all passed through it at one and the same time. Nor was it always a step intervening between oligarchy and democracy; for at Corinth, to mention one example, it was followed by an oligarchy that endured (with a slight interruption) for two centuries and a half. In Greek literature the rule of the tyrants is universally denounced; but modern scholars have sometimes taken the position that tyrants helped to break down the power held by the privileged class under the oligarchies and thus to pave the way for democracy—that even when, as in the case of Corinth, an oligarchy followed, it was a new sort of oligarchy in which *nouveaux riches* kept the old family aristocracies from being completely dominant.

In Athens, Solon (*c.* 638–*c.* 558 B.C.), whose name came to be synonymous with political wisdom (so that our own lawmakers have, at times with a satirical connotation, been termed Solons), received plenary powers and proceeded to reorganize the state. The common people, especially the farmers, were wretchedly burdened with debt. They had borrowed money at high rates from the capitalist class and pledged their farms in payment or otherwise put themselves in pawn to their creditors. Through the countryside, farms were marked by mortgage pillars, bearing the name of the lender and the amount of the debt. Men were being sold to slavery to satisfy the rich or were struggling hopelessly in a condition of poverty and virtual serfdom. Having remedied this situation, Solon went on to confer new powers up on the *ecclesia,* that general assembly of freemen which under monarchy had met to ratify the proposed measures of the king but which had remained devoid of any real authority. To the *ecclesia* were granted election of the archons, the right of passing laws and the right of calling the archons to account for anything they did in office. Every freeborn native, whether belonging to the privileged class or not, had a vote in this assembly. Legislation was drafted by a council (*boulē*) of 400 members, elected annually by the people. Courts of justice were instituted in which the jury was chosen by lot from all the citizens. But citizens were divided into four classes, according to the amount of land they owned, and only those belonging to the first class were eligible to the offices of archon and treasurer. To the lowest class no offices were open. Thus we see that the state as reformed by Solon was not yet a democracy. It was not until about the beginning of the Peloponnesian war that democracy had become the prevailing form of government among the Greeks. Solon's state was known to the ancients as a *timocracy* (*timo-kratia*)—that is, a government under which honors were apportioned according to property.

Athenian Citizenship. In course of time, mainly through the reforms of Cleisthenes and Pericles, the property qualification was abolished in the Athenian state; officials were paid; the citizen was allowed fees not only for serving in the courts or on the council but even for attending the assembly; the rich were taxed as they had not previously been; the privileged class ceased to be of importance. The system was a *direct* one, such as was possible in a comparatively small city-state, not a *representative* one like that of the United States. Aliens, whether temporarily or permanently resident, and those who, though native born, were of foreign descent, were ineligible for office; could not vote in the assembly, hold land, own a house, or plead in the courts except through a *patron.*

In the 5th century B.C. there existed for a while an experiment usually referred to by historians as the Athenian Empire. This was a league between Athens and several other city-states, in which Athens sought to introduce democratic institutions and over which Athenian jurisdiction was exercised to the extent that actions at law could be brought and justice done between citizens of the member states. Had this Athenian Empire extended the rights of citizenship, as the Roman Empire later did, instead of restricting them, it might have endured much longer. Some tradition of Greek unity was maintained by the Delphic *amphictyony* (League of neighbors), organized to protect and administer the shrine of Apollo at Delphi and to do somewhat toward lessening the cruelties of warfare. More significant were the Olympic games, which from 776 B.C. were held every 4 years for more than 1,000 years and helped to sustain, as against the narrowness of political divisions, the idea of a pan-Hellenic life.

Reaching westward and southward from Attica, of which Athens was the



Athletic Training of Spartan Youth: Dromos or Course for Foot Races

chief city, and connected with it by only the isthmus of Corinth (from 4 to 8 miles wide), was the lower end of the Greek peninsula, called by the Greeks the Peloponnesus ("the island of Pelops") and now known as the Morea. There was the storied Mycenae, capital of that Agamemnon who, as the most powerful king in Greece, led the Greek forces in the legendary expedition against Troy. There was Argos, in earlier historical times the strongest state in all that region, and there were Sicyon and Corinth, allies of Argos. There, too, was Sparta, that warlike country whose system of iron discipline added a familiar adjective to our language. The institutions and laws of Sparta were attributed to the mythical Lycurgus. They were designed, at all events, with the one purpose of making the state an efficient military machine.

The Spartan System. Remote from the sea and thus without the trade of the coastal towns, inferior in numbers to many of the neighbor states, Sparta sought to compensate for these disadvantages by converting its district into a barrack. Taken from their families at the age of seven, the boys were trained by state officials, who drilled them in gymnastics and military exercises. They were kept on short rations and inured to hardship. Included in their curriculum were some poetry and music, but of a simple and martial kind. The men were drilled daily and ate at the public mess, where the favorite bill of fare was barley broth. Even the women had to learn gymnastics, though in some respects they were treated with greater consideration than in the other Greek states. Perhaps the nearest modern parallel to the Spartan system was the life of the Scottish Highlands in the days of armed clans and warring chieftains. The Spartan farm lands were tilled by the servile class, the *helots,* who, as we have seen, were attached to the land (as the Russian peasants were until liberated by Alexander II). These *helots,* who had been free people until conquered by the Spartan invaders, detested the Spartans; and the Spartans, always in fear of an insurrection, had a fashion of murdering those helots that seemed likely to be troublemakers.

Sparta got into conflict with Argos, conquered it, controlled the area between Mt. Taygetus and the Myrtoan Sea and became the leading state of the Peloponnesus. It had sway over all the territory you find set down on the maps as Laconia. At the west, on the other side of the Peloponnesus, were the Messenians, another Doric people. The Spartans now turned their attention to them, and two long, fierce wars resulted. Most of the Peloponnesian states were drawn in—Corinth and Elis (which was in the northwest) on Sparta's side; Argos, Arcadia (just north of Laconia) and Sicyon on the side of Messenia. After about a century of struggle, the Messenians were subdued and made helots. It was not until some three hundred years later that Messenia regained its independence and took its place once more among the states of Greece. But when the Spartans attacked Tegea, in the lower part of Arcadia, they met their match. The Tegeans destroyed or captured the Spartan troops and put the captives at work in the fields as slaves. Sparta found it advisable to accept the Tegeans as allies and (*c.* 560 B.C.) a treaty was made between the two states by which the Tegeans recognized the hegemony or leadership of Sparta in the Peloponnesus and the Spartans assigned to Tegea a station on the left wing (a position of honor) in the battle line of the Spartan and allied armies. Owing to lack of records, we know less of the Spartan constitution than of the Athenian. There was a curious dual kingship—perhaps a compromise in a feud between families, perhaps a device for forestalling absolutism (like the dual consulship at Rome). The kings had judicial, archpriestly and military functions, the last being the most important. A council or senate (*gerousia*) served in an advisory capacity, its membership composed of those released from military duty in their sixtieth year. Laws were passed by an assembly of all the citizens, and the assembly also chose annually five ephors (*ephoroi,* overseers) whose powers gradually increased until they were the *de facto* heads of the state, the kings being no more than figureheads.

The Persians and Marathon. In the 6th century B.C. the Greek cities of Ionia, along the western coast of Asia Minor, were made part of the dominion of Lydia by King Croesus, who, because of his fondness for things Greek, permitted them a high degree of autonomy. Later, they were conquered by Harpagus, general of King Cyrus of Persia. Refugees from the city of Phocaea settled at Elea (Velia) in southern Italy, and a group from Teos colonized the town of Abdera in Thrace. Darius crossed the Bosporus and extended the Persian empire as far as Thessaly, in the northeastern corner of the Greek peninsula, just below Macedonia, whose king Amyntas lost no time in acknowledging Persian sovereignty. Aristagoras, acting tyrant of Miletus under the overlordship of Persia, promised to subdue for the Persians the Aegean island of Naxos, about halfway between Asia Minor and Greece. He failed in the attempt (501 B.C.) and, fearful of the consequences, announced that he would no longer be tyrant but would lead a revolt of the Ionian cities against Persia. He sought help in Greece. Sparta refused but Athens sent 20 ships and Eretria (in Euboea) contributed five. Aristagoras took and burned Sardis but was soon driven back to the coast (499 B.C.). The Athenians went home; the Persians won an easy victory over the revolted cities in the naval battle of Lade (496 B.C.) and destroyed Miletus (495 B.C.).

Darius next set out to punish Athens and Eretria for their part in the expedition against Sardis. The Persian fleet of three hundred ships was destroyed in a storm while rounding the promotory of Mt. Athos and the land forces were defeated by the Thracians. By 490 B.C. Darius had ready a new army and fleet. Eretria was captured and razed and most of the inhabitants were sent into Asiatic slavery. Then the Persian Army crossed the narrow Euripus strait from Euboea into Boeotia and appeared in Attica on the plain of Marathon, about 22 miles from Athens. Thither marched the 9,000 heavy-armed troops of the Athenians and camped on the hills above the plain. There they were joined by the little army of 1,000 men from the town of Plataea (in southern Boeotia), which was under Athenian protection. At the advice of Miltiades, one of the Athenian generals, immediate battle was decided on, and under his command the Greek line charged down the slope. The Persians at last gave way and either took refuge on board their ships or were driven in confusion into the tidal marshes. The Persians had 6,000 killed in action; the Athenians, 192. Miltiades immediately led his force back to Athens and presently the Persian fleet hove in sight, believing that the city was undefended; but when the Persians saw the Athenians drawn up to welcome them, the ships turned about and sailed away. Marathon is considered one of the decisive battles of history; for had it not been won by the Greeks, Greece would surely have become a Persian province and the whole subsequent course of events in Europe would have been different.

In the decade following the battle of Marathon the most influential Athenian citizen was Themistocles. He felt that Persia had not yet done with Greece; and as he considered the extensive and intricate coast line of the Greek peninsula and the many islands that lay near, he was convinced that the future of Athens was on the sea and that a strong navy was the need of the hour. A safe harbor was developed at Piraeus, about 4 miles from Athens, maritime trade was encouraged, Athenians became familiar with a seafaring life and by 480 B.C. the state had a navy of 200 triremes, constituting the most powerful fleet in all Greece. Aristides, the stoutest opponent of Themistocles and a man who believed in sticking to the land, was ostracised—that is, the assembly voted him into exile for 10 years. Sure enough, Xerxes, the successor of Darius, got together an army of possibly a million men drawn from 46 nations, and in the spring of 480 B.C. this army passed over the Hellespont (the Dardanelles) into Europe, taking 7 days and nights to cross the bridge of boats. Athens, a league of the chief Peloponnesian states except Achaea and Argos, the Boeotian towns of Plataea and Thespiae and a few other states—in reality only a small part of Greece—united for defence. The advance of the Persian host was disputed at Thermopylae, a narrow pass leading from Thessaly. For 3 days the Greeks held the pass. Then, when the Persians had learned of a mountain path leading to the rear of the Greek position, the main Greek army withdrew. Leonidas, with 300 Spartans and 700 Thespians, declined to fall back and he and his little band were slain to the last man.

The Greeks again Victorious. Xerxes reached Athens only to find it abandoned. The people had been taken to Troezene and the islands of Aegina and Salamis. The Persians destroyed the city—but the Athenians still had their fleet. Meanwhile the Persian fleet rounded the promontory of Sunium (at the tip of Attica) and assembled by the island of Salamis, just opposite Piraeus. In September a day-long naval engagement took place between the Hellenic and Persian fleets in the strait between Salamis and Attica. Watching from a throne upon the side of Mt. Aegaleos on the Attic shore, Xerxes saw his galleys outmanoeuvered and outfought, 200 of them destroyed and the remainder in flight. With a part of his land forces he marched back to Sardis, leaving the other part, under the command of Mardonius, to winter in Thessaly. Mardonius was defeated by the Greeks at Plataea in Boeotia in 479 B.C. On the very same day the crews of the Greek fleet, which had crossed to Asia, gained a complete victory over those of the Persian fleet in the land battle of Mycale on the coast of Asia Minor. At Himera in northern Sicily—on the same day, it is said, as the battle of Salamis—the Greeks won another sweeping victory over invaders, this time against a much superior force of Carthaginians led by Hamilcar.

Plataea was succeeded by nearly 50 years of comparative peace. Wars there were, but minor wars, of a less engrossing and troublesome and dangerous sort. The Peloponnesian states still looked to Sparta as leader, but under the primacy of Athens another league was formed, the Confederacy of Delos (called so because at Delos were its treasury and the meeting place of its deputies), and this was joined by coast towns of Thrace and Asia Minor and by Aegean islands. Athenian prestige steadily increased and Sparta watched with smoldering jealousy.

The Great Age of Athens. It was in this period that the Athens of Pericles and Socrates and Plato arose, the Athens of Greek tragedy and comedy, the Athens of the Academy and the Lyceum. We must note that the Athenian constitution was so altered that a poor citizen might be chosen to the archonship or other office. This was important as an extension of democracy. But the outward story of those days, with its bickerings, squabbles, rivalries and strife, holds no such significance as does that which Gilbert Murray terms "the inner history, the history of thought and feeling and character." This was the Great Age of Athens, the age of an outburst of creative activity unique in the ancient world and perhaps unequalled in any time.

During the administration of Pericles, the great democratical prime minister of Athens, "long walls" were built to connect the city with Piraeus, its port, commerce was developed and the city was rebuilt and beautified. The Parthenon, of which Emerson wrote that

> Earth proudly wears the Parthenon
> As the best gem upon her zone

this was only the chief of many architectural glories of the Athens of Pericles. Standards of intelligence and taste were elevated. Pericles served the state for more than thirty years, triumphed over the attacks of his enemies, gained not a single drachma from his public labors.

Before the death of Pericles (429 B.C.) the Peloponnesian war had begun (431 B.C.). It started with invasions of Attica by Sparta and dragged on until 404 B.C. On the one side were the Peloponnesian league, headed by Sparta, and the league's allies (Boeotia, Phocis and other states): on the other, Athens and its allies. The Athenians won their share of victories on land and sea, but in 415–13 B.C. they attempted, with the largest combined armament ever sent out by a Greek state up to that time, an ill-starred invasion of Sicily. In 411 B.C. a group of rich men, eager to make peace with Sparta in order to escape contributions to the Athenian war-chest and equally eager to see oligarchy re-established, hatched a conspiracy that overthrew the Athenian constitution and placed the state in the control of four hundred of the tory class. Although the constitution was shortly restored by the citizens, it was restored with changes: payment for attendance at the assembly and on juries was abolished, and the franchise was restricted by certain property qualifications. The war was ended by the capture of the Athenian fleet at Aegospotami in the Thracian Chersonese and the surrender of Athens after a four-months' blockade by sea and land. Thus perished the Athenian Empire.

Spartan Ascendancy. Sparta now became the dominant power in Greece, but not for long. The direction of things passed to a clique of rich Spartans, the character of the Spartan state was greatly changed, and other Greeks cordially disliked Spartan management. In 371 B.C. the Spartans were thoroughly defeated at Leuctra (in Boeotia) by the Thebans under the command of Epaminondas, the foremost general of his day. Epaminondas organized a short-lived Theban hegemony, which on his death (362 B.C.) fell straightway to pieces. The next outstanding phase of Greek history is to be found in the rise of Macedon, which previously had had no share in the affairs of Greece. Indeed, beyond the fact that kings of Macedon were allowed to have a part in the Olympic games, the Macedonians were hardly admitted to be Greeks at all. Nevertheless their language was Greek and they were presumably a mixture of Illyrian tribes with Greeks left behind by the southward migration into the Hellenic peninsula. They were Greek in their sympathies, too, and the Macedonian court fancied Greek ways.

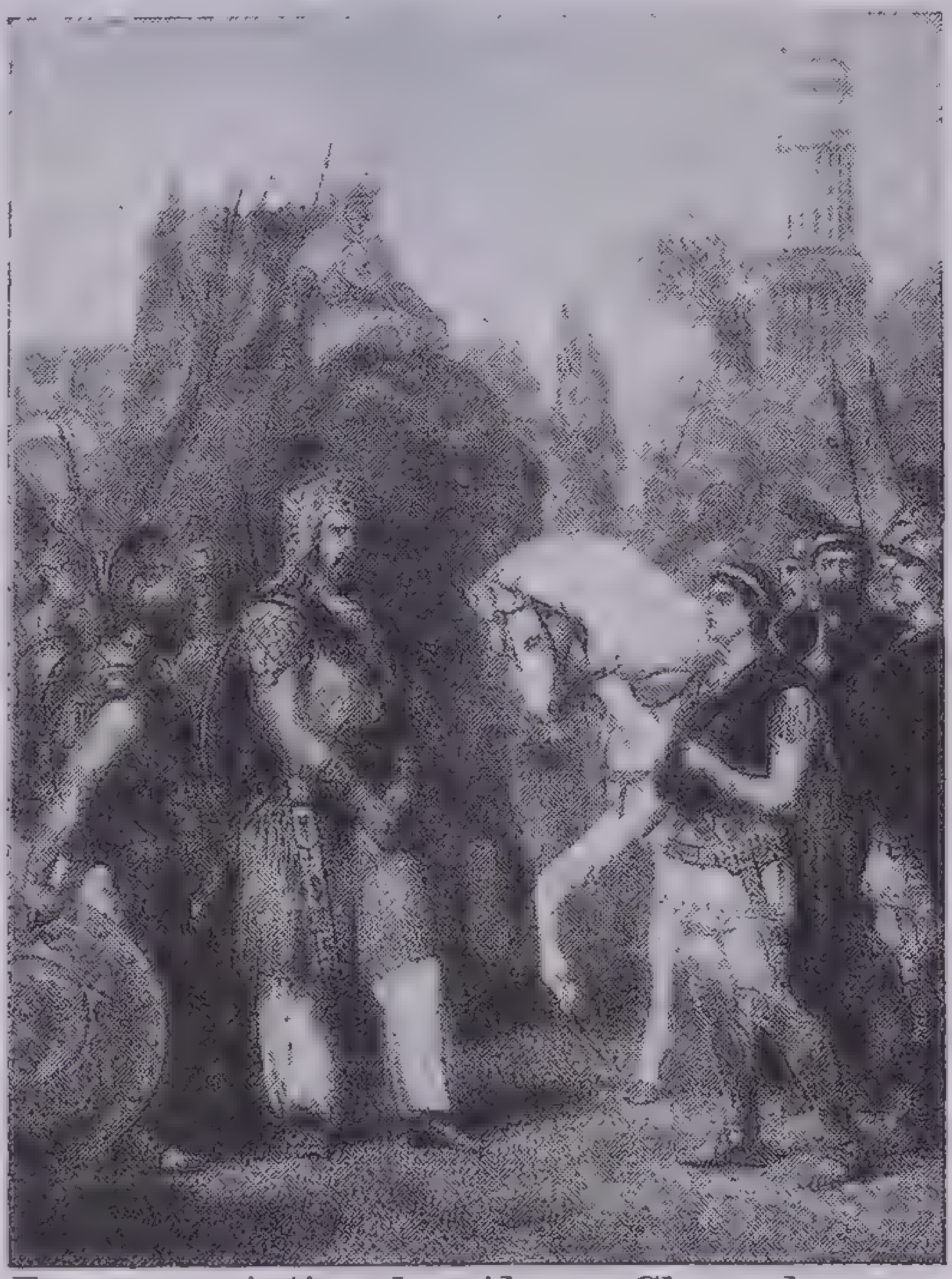
Alexander the Great. Philip II of Macedon (382–336 B.C.; reigned 359–336 B.C.), an uncommonly capable ruler, invented the Macedonian phalanx, developed a highly organized and efficient army and moved to bring all Greece into a confederacy under his leadership. The orator Demosthenes sought in his impassioned *Philippics* (whence another word entered our English vocabulary) to arouse the Athenians to the danger of Philip's scheme; and at length, after Philip had well advanced his conquests, Athens and her allies prepared to act. They were utterly routed by Philip at the Battle of Chaeronea (in Boeotia) in 338 B.C. A congress of Greek states held at Corinth declared war against Persia and recognized Philip as commander in chief of the united Greek force. In 336 B.C. he was killed by an assassin having a private grievance. He was succeeded by his son Alexander, surnamed the Great.

Alexander (356–323 B.C.) had been specially educated for his task of empire building. Aristotle was among his tutors. He learned responsibility in actual service. At Chaeronea he was commander of the cavalry. He was a man of high spirit and vast energy, with many of the qualities of military leadership, but with a streak of erratic violence and savage cruelty. In 344 B.C. he crossed the Hellespont for a series of wanderings and conquests that ended only with his death. He defeated the Persians at Issus, took the Phoenician cities of Sidon and Tyre, captured Gaza, subdued Egypt and founded Alexandria, which became for a space perhaps the world's greatest city. Then he turned back and at Arbela (331 B.C.) defeated the Persians a second time. On he went, through what now are Persia and Afghanistan and down into India as far as the river Hyphasis (the modern Sutlej). His men refused to go further, so he faced about and proceeded to Persepolis and thence to Susa and Babylon and at Babylon he died. His empire was divided among his generals, being split into the three principal kingdoms of Asia, Egypt and Macedonia. Greek speech, architecture, worship and everyday customs had been widely spread.

Cultural Supremacy. As early as 211 B.C. the Romans began to intermeddle in Greek affairs. In 146 B.C. they destroyed Corinth and declared all Greece subject to Rome. The Peloponnesus and northern Greece south of Thessaly were formed into the Roman province of Achaia. Thessaly was incorporated with Macedonia. Achaia was governed by a proconsul except for a short period (15–44 A.D.) when it was administered by an imperial legate. This arrangement continued until the reorganization of the Roman Empire by Diocletian. Athens, Sparta and some other states retained at least a nominal independence as free communities.

Hellenic culture was treated with high respect. Romans went to Athens for intellectual training, and that city became an academic center whose schools formed the leading university of the Roman world. Greek teachers and literary men were esteemed at Rome. Cicero said that it was the Greek poet Archias who inspired him with a fondness for literature, and both Cicero and Horace studied at Athens. Travelers visited Greece to view its works of art, which until Nero made his tour of the country (66–7 A.D.) were left undespoiled except when, as in the case of Sicyon, they were sold to satisfy avaricious Roman creditors. For the capitalists and traders of Rome preyed upon the Greek folk, many of whom lived in an insecure fashion and had frequently to be supported by doles. Most of the wealth remaining in Greece was held by a few who owned large tracts of land.

From the Barbarians to Christianity. In the days of the late Empire, Greece was included by Constantine I (the Great) in the prefecture of Illyricum, Thessaly being incorporated with Macedonia. The old worship persisted until about 600 A.D. but the Christian faith made sure headway. The Olympic games were interdicted by a decree of Theodosius I (the Great) in 394 A.D., and in 529 Justinian I closed the schools of Athens. Greek culture declined. Beginning with the invasion by Alaric's Visigoths in 395–96, barbarian raids were frequent. At the close of the 6th century began an immigration of Slavs, which led to the withdrawal of the Greeks from the mountainous interior to the cities and coastal plains. The pastoral newcomers scattered Slavic local names over the regions they occupied. By the 10th century they had made their submission to the Eastern emperor and been almost wholly Christianized. The Slavs were followed by various other immigrants, especially by Vlachs (Wallachians) and Tosks (Albanians). From the end of the 11th century Greece became a disputed land, fought over and ravaged by Sicilian Normans, Venetians, the emperors of Nicaea, the French, the Byzantine emperors, the Ottoman Turks. Under such conditions substantial improvement was impossible. From 1460 to the early part of the 19th century Greece was, save for a brief conquest of the Morea by Venice, subject to Turkey. Forced labor might be demanded, all Christians had to pay a special poll tax and Christian youths were taken by forced levy from their homes to recruit the Janissaries (Turkish standing army). There was, however, a calculated religious tolerance and the Christian clergy, who customarily administered the law, enjoyed particular favors with the design of maintaining their support of Turkish dominion.



From a painting by Alonzo Chappel

Porus Surrenders to Alexander

An episode in Alexander's campaign in India was the surrender of the Indian Rajah Porus about 326 B.C. The emperor was then about 30 years old

Modern Greece. In 1821 was inaugurated a revolt that had been aroused by a reawakened national feeling, due in large measure to the labors of Adamantios Coraës (1748–1833), upon which is based the literary language of modern Greece. A prolonged struggle ensued. France, Great Britain and Russia came to the aid of the Greeks and in the battle of Navarino the combined British, French and Russian fleets annihilated the Turkish-Egyptian fleet (October 20, 1827). It was for this war of revolution that Lord Byron volunteered; for it he drilled troops and advanced large sums. He died at Missolonghi and there his heart was buried. The convention of London (May 7, 1832) declared Greece an independent kingdom. Prince Otho (or Otto), second son of King Ludwig I of Bavaria, was chosen by the London conference to be king of Greece. As he was not of age, a regency of three persons governed until July 1, 1835. Otho reigned, with Bavarian advisers, as an absolute monarch until 1843, when he was forced to accept a constitution and dismiss his Bavarians. In 1862 a military revolt broke out and a national assembly deposed the king. At British suggestion, the national assembly in 1863 elected to the throne, with the title of George I, Prince William George of Schleswig-Holstein-Sonderburg-Glücksburg, whose father shortly ascended the throne of Denmark as Christian IX and whose sister Alexandra married the Prince of Wales, afterward Edward VII. Britain ceded to Greece the seven Ionian islands, which since 1815 had been under a British protectorate.

In 1896–97 some of the inhabitants of Crete endeavored, with the aid of Greek troops, to free the island from Turkish rule and annex it to Greece. Turkey declared war on April 17, 1897, and in but little more than a month the Greeks were defeated. Wars with Turkey in 1912–13 and with Bulgaria in 1913 resulted in the addition of Macedonia, Epirus and the Aegean islands to Greek territory.

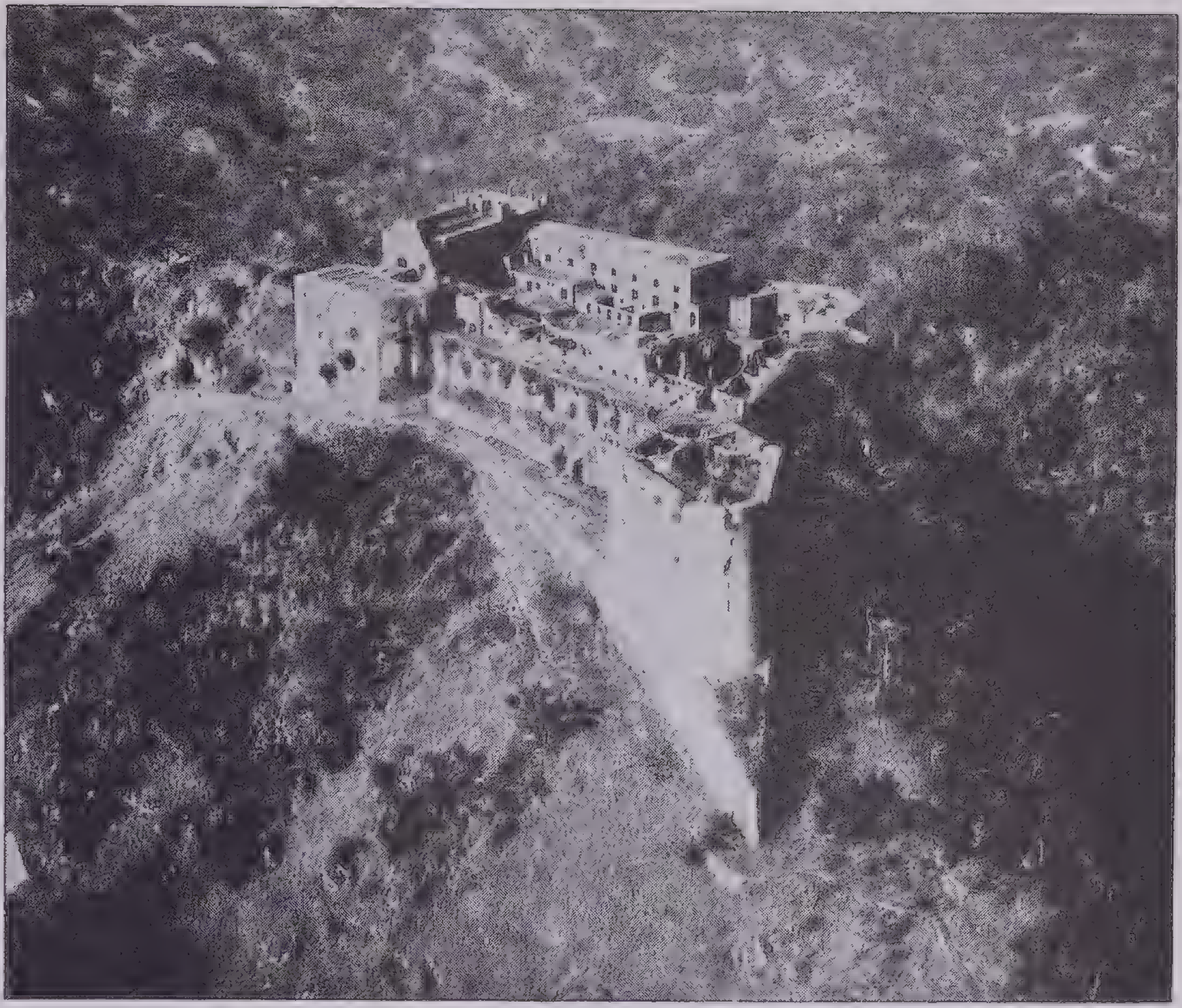
King George was assassinated in 1913 and his son and successor Constantine I abdicated in 1917, to be succeeded by his son Alexander, who died in 1920. Constantine was recalled by a plebiscite but abdicated a second time in 1922. His son and successor George II was compelled by the national assembly to leave the country in 1923. In 1924 a vote of the assembly to overthrow the monarchy and establish a republic was indorsed by a plebiscite, and on May 1 the Republic was proclaimed.

Following the World War, the treaty of Sèvres gave to Greece western and eastern Thrace and part of the west coast of Asia Minor. In 1922 the Greeks were defeated and driven out by Mustapha Kemal, and Greeks to the estimated number of 1,500,000 were expelled from Turkey. In 1930 a Greco-Turkish entente was established by Eleutherios Venizelos. The monarchy was restored in 1935 and George II returned to the throne. In 1940 Greece courageously repulsed Italian attacks on the Albanian frontier. In 1941 Germany and Italy conquered Greece and Crete. England unsuccessfully aided Greece. See World War No. 2, page 805c.

Guatemala, the most northerly of the Central American republics. It was discovered by Columbus in 1502 and was a part of the vast Spanish lands in the Americas until 1821. After Cortez conquered Mexico, he sent his ablest lieutenant, Alvarado, to subdue the lands to the south. This was accomplished by 1523, and Central America, including all the present-day republics except Panama, was made the Captaincy General of Guatemala, under the government of the Viceroy of New Spain. The part that was Guatemala proper, being nearest to Mexico, suffered more from Spanish misrule than the provinces farther south, and here Spain left a record of tyranny. It is on record that in the 15 years of its rule no fewer than 300,000 native Guatemala Indians were killed every year. While later conditions were better, Spain's record of misgovernment was exceedingly bad down to 1821. In 1821 Guatemala declared its independence, but was conquered by Mexico, under Iturbide, in 1822, and was added to the Mexican Empire. It broke away in 1823 and joined its four southern neighbors in the Confederation of Central America. This union dissolved in 1839, and the independent status of each was restored. Several times since then Guatemala has tried to restore the union. The last attempt was made in 1921, when the Central American Federation was proposed. The plan was abandoned in 1922.

There has been almost constant political ill-feeling among the Central American states, and this has led to bloodshed at various times. Guatemala has had a fairly stable government, for the Indian portion of the population, never courageous or strong enough to assert itself after centuries of Spanish oppression, is docile and tractable.

Guelphs and **Ghibellines,** two powerful factions in Italy during the medieval period whose activities embraced much of the history of the country for 2 centuries. The Guelphs were the patriot party, demanding freedom from the Holy Roman Empire; the Ghibellines, the party of royalty, supporting the foreign emperors (German) who ruled the country. After liberation from German rule, the Guelphs became the advocates of democracy against the aristocratic party that the Ghibellines supported.



Courtesy Pan American Union

Henri Christophe's Citadel in Haiti

Built on top of an almost inaccessible mountain, *Le Bonnet à l'Éveque* (The Bishop's Cap) by Henry I (Henri Christophe), the Negro king of Haiti. Construction of Citadelle La Ferriere, considered one of the most marvelous engineering feats of modern times, took from 1804 to 1819. Its shape is that of a gigantic prow pointing toward the magnetic North Pole. The walls are from 80 to 130 feet high and from 20 to 30 feet thick. A miniature palace, named for the king's favorite bird, *Le Ramier* (ringdove), was erected at one end of the parade ground. The garrison could house 10,000 men

Haiti, a large West Indian island discovered by Columbus in 1492. It was first colonized by the Spaniards and long remained under Spanish rule. In 1496 Bartholemew Columbus, a brother of Christopher, took a company there and founded the town of Santo Domingo, the first white settlement in the New World. There were thousands of native Indians on the island, but within a few years most of them were killed by the white settlers. Negroes were brought from Africa as slaves, and soon they formed more than half the population. After that colonization was neglected.

Development of a Black Republic. During the 17th century the Spaniards permitted French buccaneers to establish a base at the western end of the island, when they promised not to prey upon Spanish shipping. Within 50 years (by the Treaty of Ryswick, 1697), that part of Haiti was ceded to France. The colony was very prosperous; but, because no rights were permitted the increasing colored population, they revolted in 1791. A reign of terror and lawlessness followed for 2 years, but in 1793 the Revolutionary French Government gave the blacks their freedom.

At about this time, certain British interests decided to interfere in Haiti. The blacks were organized and led by a patriot, Toussaint L'Ouverture, and by 1798 the British were driven from the island. L'Ouverture was then master of all Haiti. In 1801 Napoleon sent an expedition to reconquer Haiti; L'Ouverture was captured and taken to France, where he died in prison. From then until 1825 the island was French, but in 1825 its independence was acknowledged. By 1843 the people of the eastern two-thirds of the island broke away from Haiti and set up what is now the Dominican Republic, with Spaniards loyal to the mother country in control. The Negroes of Haiti organized a republic when France renounced its authority in 1825, and then began years of political turmoil. Despotism and constitutional rule alternated. No man raised to the presidency felt certain of his life and liberty; several fled, and one was assassinated in 1915. This resulted in a period of anarchy and an appeal to the United States to restore order.

American Authority Established. The United States navy asserted its authority but left Haitians in charge of many of the governmental functions under American oversight. An American officer was placed in charge of the customs, as it was necessary to remodel Haiti's finances. The United States set up a virtual protectorate, built up and trained a constabulary force of 2,500 men and established a school for training officers for this force and for the civil service. In 1926 the president was elected to succeed himself, the first in a century who had served an entire term. In 1929 a new insurrection ended in the killing of five natives by a marine detachment. The President of the United States sent an investigating committee to the island in 1930. The commission reported that it would be advisable to end American occupation as soon as possible. In 1930 the presidential election was orderly. A part of the American forces was sent home, but it was decided to maintain the American financial agent in charge of the customs until 1936, the date of the expiration of the treaty. A new treaty was made in 1935, under which the United States kept some control, but the marines were withdrawn and policing was left in the hands of Haitian troops.

Hampton Roads Conference, a meeting of representatives of the United States Government and of the Confederate States on February 3, 1865, in the endeavor to reach terms of peace. The Union was represented by President Lincoln and Secretary of State Seward; Vice-President Stephens headed the Confederate delegation. Lincoln refused to consider a treaty of peace and would not listen to any proposal short of surrender of the Confederate army, the abolition of slavery and restoration of the Union. The conference was therefore fruitless.

Hanseatic League, also known as the Hansa, a league of medieval German cities, united for protection of their commerce against robbers and pirates. In 1241 Hamburg and Lübeck agreed to protect the land route between the North and Baltic seas; this alliance is frequently referred to as the beginning of the Hanseatic League although temporary combinations for commercial purposes had occurred earlier. Bremen quickly joined them, and at the height of its influence more than 80 cities, chiefly ports on the North Sea and Baltic coasts, were in the compact. The Hanseatic League was soon able to obtain special privileges for its merchants in foreign countries, and thus practically to monopolize the trade of all northern Europe. The league maintained armed forces both on land and at sea, and conducted negotiations with foreign governments. It reached the height of its power and prosperity in the 14th century when it conducted a war against King Waldemar IV of Denmark and obtained in 1370 a guarantee of freedom to trade and a cash indemnity. With the shifting of commercial routes in the 15th century and better government protection, the league declined, but Hamburg, Bremen and Lübeck continued their relations and under the German Empire were permitted to retain their status of free cities.

Hastings, a battle fought on October 14, 1066, at Senlac Hill near Hastings on the southern coast of England between an invading Norman force under Duke William (later William I of England) and an English army under King Harold II. The invasion was undertaken by Duke William to make good a vague hereditary claim to the English Crown. The battle resulted in the complete defeat of the English after a desperate contest. Harold was killed, and all organized resistance to William collapsed. The battle utterly changed the course of English history, as it introduced a foreign domination of England that ultimately fused itself with the original English nation.

Helots, a class of state slaves or serfs in ancient Sparta. They had no citizenship rights, but in time of war they were pressed into military service, serving as light-armed troops for the most part, although in grave emergencies they might be organized as part of the regular army in which case they were sometimes granted freedom as a reward for bravery on the battlefield. In normal times they were distributed among property owners to work as agricultural laborers. The general treatment of the Helots was harsh and cold-blooded; when their numbers increased so that they seemed a danger to the state, they were systematically massacred.

Holy Alliance, a compact entered into by the monarchs of Russia, Prussia and Austria in 1815, after the downfall of Napoleon. Its published intent was to unite the governments of the signers into a Christian brotherhood, and in all their acts to exemplify the tenets of the Christian religion. All other nations of Europe joined the Holy Alliance except England and Turkey; England refused, Turkey was not invited. Behind the professed reason for the Alliance's existence was the determination of the Powers to resist all popular efforts to liberalize governments and to stifle all movements that might endanger the thrones of Europe. The Alliance, called by its enemies the *Holy Aggies,* had no influence after 1830.

Holy Roman Empire, the realm in central Europe whose ruler claimed to be legal successor of the emperors of ancient Rome. It bore the title *Holy* because the Empire was related to the Church. The emperors claimed sovereignty over all the governments growing out of the empire of Charlemagne, but actually their influence was limited to the German strongholds and to Italy. The Holy Roman emperors were elected by the German electors; when an emperor proved unusually strong, he was able to extend his influence widely enough almost to justify the name Holy Roman Empire for his realm. Voltaire in commenting on the incongruity of the name, said the Holy Roman Empire was "neither holy, nor Roman, nor an empire." Napoleon's early victories destroyed whatever semblance of empire central Europe maintained, and the name had no meaning after 1806.

Honduras, a Central American republic. Columbus landed on its shores on his fourth voyage, (1502). In 1524 Cortez, after conquering Mexico, sent one of his lieutenants, Cristobal de Olid, to establish a settlement on the coast of what is now Honduras. De Olid proceeded to declare independence and make himself ruler. Cortez followed in 1525 and punished the upstart; he strengthened the colony before returning to Mexico and left it in charge of a royal governor. In 1539 all Central America south of Mexico was made one province, the Captaincy General of Guatemala, and Honduras remained a part of it until all secured their independence in 1821. The Spanish rule that prevailed throughout the area for 300 years was noted for its severity. Laws were occasionally enacted for the protection of the native Indians, but they were generally disregarded.

The five Central American countries—Guatemala, Honduras, Nicaragua, Salvador and Costa Rica—all won their independence and have several times tried to form a political union, but jealousies made any union short-lived. The first effort was the Confederation of Central America, which existed from 1823 until 1839. The last was the Central American Federation, proposed in 1921 and abandoned in 1922.

Honduras, like the other republics in Central America, has had numerous revolutions. Twice the Government asked for services of United States marines to restore order and protect property.

Huguenots (apparently a French corruption of the German *Eidgenossen,* confederates, oath-comrades), the name applied to the Calvinist Protestants of France by their religious opponents during the factional struggles of the 16th and 17th centuries. They had many able leaders, such as Condé, Admiral Coligny and for a time Henry of Navarre. At the head of the Catholic party, below the throne, were the members of the Guise family. The throne gave active assistance to the Guise faction and helped to promote the Massacre of St. Bartholomew (August 24, 1572). The Edict of Nantes (1598) placed Huguenots and Catholics on a plane of political equality; when it was rescinded (1685) and the Huguenots were deprived of religious liberty, many of them left France, some emigrating to the American colonies, particularly to South Carolina.

Hungary, a small central European republic. For 1,000 years it has been the home of the Magyars. They were originally an Asiatic people, related to the Finns. When they first became historically important, they lived in what is now southern Russia. Before the 10th century bands of Magyars swept into the region of the Danube River, conquered the early peoples they found there and made homes for their race in what later became Hungary and Transylvania. They were aggressive and quarrelsome and preyed continually upon their neighbors in Italy and Germany until Otto the Great of Germany broke their power in 955. In the years following 975 under their king Geyza they embraced Christianity. His son Stephen was crowned in the year 1000 and reigned for 40 years. After his death Latin became the official language and the Magyar tongue was neglected. Soon after 1090 the Hungarians conquered and added to their realm the provinces of Dalmatia, Croatia and Slavonia. Ladislas I was then king (1077–95); he raised the country to new heights, introducing from France a new culture the Hungarians had never before known. In the next two centuries there was a large influx of Germans from the north, who introduced the science of mining and kindred industrial undertakings.

Great progress toward a stable political organization was made in the 13th century. The reckless generosity of Andrew II (king, 1205–35) in conferring land upon a small group of favorites led the lesser nobles in 1222 to

Courtesy Hungarian State Tourist Department

Birthplace of a Hungarian Hero

In the city park of Budapest the Hungarians have built a replica of the castle in Transylvania where Hunyadi János was born about the year 1387

demand protection. Andrew was forced to grant the famous *Golden Bull,* sometimes called the Hungarian Magna Charta, which protected the nobles from arbitrary arrests and confiscations and provided for regular meetings of the Diet or council. Andrew's successor Bela IV (1235–70) strengthened the monarchy by recovering from the great feudal lords much of the land that had been given away by his father. In spite of an invasion of Mongol hordes that overran and cruelly ravaged the country in 1241 Bela was able, by a prudent policy of inviting foreign colonization and encouraging building, to raise the general level of prosperity. The next important king was Louis I, known as *the Great* (1342–82). He continued Bela's policy of strengthening the central government and putting down the illegal turbulence of the great lords. In his reign the Ottoman Turks began their formidable push into southeastern Europe; and for more than 3 centuries Hungary was a battleground in the struggle between Turk and Christian.

The next king Sigismund was one of the most famous figures of the Middle Ages. A German by birth, he became king of Hungary in 1387 through his marriage with Mary, daughter of Louis I. In 1396 he led a great crusade against the Turks but was badly defeated by a huge Turkish army under the Sultan Bajazet. He was elected Holy Roman Emperor in 1410. It was at the instance of Sigismund that a great church council was assembled at Constance in 1414 to settle the disputed succession to the papacy and deal with the rising heretical movement of John Huss of Bohemia. As king of Hungary, Sigismund introduced reforms into the military organization that greatly strengthened Hungary in the warfare with the Turks. His grand scheme for uniting Christendom under the leadership of the Holy Roman Empire failed, but he gave Hungary a period of strong and intelligent government and succeeded in overcoming entirely the prejudices that his foreign birth had aroused in the early years of his reign.

Sigismund died in 1437. His son-in-law Albert of Austria, a member of the House of Hapsburg, became Albert V of the Holy Roman Empire and king of Hungary. His reign lasted only 2 years, but it established a claim to the Hungarian crown by the Hapsburg family that was never abandoned.

The Turks continued to menace the security of eastern Europe. In 1444 King Ladislas of Poland and Hungary was disastrously defeated at Varna, and it seemed probable that Hungary would become a Turkish province. But a strong leader had arisen who put new life into the Hungarians and saved his country and perhaps Europe. This was Hunyadi János or John Hunyadi (*c.* 1387–1456), the great national hero of Hungary. The defeat at Varna, far from discouraging, only spurred Hunyadi to greater efforts. Appointed regent to govern Hungary during the minority of the new king, Hunyadi carried on unremitting warfare with the Turks; although he was defeated on more than one battlefield, he eventually won a decisive victory at Belgrade (1456).

After Hunyadi's death the Hungarian Diet elected his son Matthias king. The election was disputed by the Hapsburg emperor Frederick III, and a treaty was signed (1462) providing that the Hungarian throne should pass to Frederick if Matthias should die without heirs. This treaty later acquired importance in supporting the Hapsburg claim to the throne.

Matthias I, usually called *Matthias Corvinus,* was probably the ablest of the Hungarian kings, and his reign (1458–90) marks the high point in the history of independent Hungary. He continued his father's vigorous crusades against the Turks, fought successful wars with Bohemia and with Frederick III and gained substantial cessions of territory. A great patron of literature and art, he made Hungary, next to Italy, the most important cultural center of Europe. He reorganized the internal administration, reformed the tax structure and established a harsh but regular and fair system of dispensing justice. His death in 1490 plunged the nation into a fierce struggle that ultimately resulted in the loss of national independence.

The period from the death of Matthias to the crushing defeat of the Hungarians at the battle of Mohács in 1526 is a sorry record of civil disorder. The ambitious intrigues of the powerful noble John Zapolya (1487–1540), the rebellions of the peasants (1514) led by George Dózsa, the weakness of King Ladislas II (king, 1490–1516), the infancy of the next king Louis II (king, 1516–26) the continued incursions of the Turks, all contributed to the general anarchy. The final disaster came when Solyman the Magnificent at the head of 100,000 Turks utterly routed the Hungarians at Mohács on August 29, 1526. The Hungarians lost 20,000 men including their king Louis II. Within a few years Hungary was broken up: the eastern part including the capital city Buda, fell to the Turks; the western part to the Austrian Hapsburgs.

In the later 16th and early 17th centuries Hungary was a prey both to the fierce religious warfare of Catholic and Protestant and to the rapacious land hunger of Turk and Hapsburg. The attempts of the Hapsburg emperor Rudolph II to enforce Catholic uniformity in western Hungary led to a revolt (1604–06) led by Stephen Bocskay, resulting in the establishment of partial religious liberty. The terrible Thirty Years' War (1618–48) did not seriously affect Hungary, although many Hungarian nobles took up arms on the Protestant side. But the accession of Emperor Leopold I in 1657 brought a new policy of persecution. In 1678 the patriot Imre Tököly headed a rebellion and even allied himself with the Turks in a desperate attempt to shake off the hated Hapsburgs. The Turks marched on Vienna (1683) and would probably have succeeded in taking it but for the timely assistance given the Austrian defenders by an army of Germans and Poles led by the Polish king, John Sobieski. Leopold took the offensive and in 1686 captured Buda (modern Budapest). He crushed out the remnants of the revolt with great savagery and forced the Hungarians to accept the House of Hapsburg as the perpetual hereditary ruling house. Within the next 30 years the Turks were driven entirely out of Hungary, chiefly by the brilliant military leadership of Prince Eugene of Savoy, who entered the service of the Austrian emperor after being denied a commission by his own king Louis XIV of France. By the Treaty of Passarowitz (1718) the Turks lost their last hold in Hungary.

The history of Hungary from this date until the close of the World War is part of the history of the Hapsburg empire centered in Austria. Numerous efforts were made to shake off the Austrian yoke; the patriot Franz Rákóczy led a struggle for liberty from 1703 to 1711 that resulted in considerable concessions but failed of its aim to achieve independence. During the reigns of Charles VI (1711–40) and Maria Theresa (1740–80) the Hungarians were conciliated and developed a feeling of loyalty to the ruling house. The European revolutionary movement, beginning in France in 1789 and carried over the continent by Napoleon, again roused the Hungarians to a sense of national consciousness and a strong desire for independence. In 1848–49 a revolt led by Louis Kossuth was ruthlessly put down, and Hungary was treated for a time as a conquered province. A fairly satisfactory arrangement was finally reached in 1867 with the formation of the Dual Monarchy of Austria-Hungary, which allowed Hungary practical self-government. The story of the Dual Monarchy is told in the article on Austria.

The Partition of the Monarchy. The World War put an end to Austria-Hungary as a dual monarchy. The country was broken up, and most of its territory was divided among Rumania and the new states of Czechoslovakia and Yugoslavia. Hungary, reduced to a fraction of its former size, became a republic. Michael Karolyi, who had been appointed prime minister by Charles I, assumed the post of president. In 1919 the Communists interposed to form a Communist State similar to Russia, but after a few months the Bolshevist leader, Bela Kun, was deposed, and Hungary returned to a conservative government. A new parliament voted to continue the old constitution, which had been discarded by Bela Kun, and Admiral Horthy was chosen as regent. It was voted to return to a monarchical government, but until a ruler was selected Horthy would continue as regent. Charles made two attempts to unseat the government and return as king, failing each time. He retired to the Madeira Islands, where he died in 1922. Ex-Empress Zita, with her children, moved to Spain and afterward to Switzerland and made every effort to put her son the Archduke Otto on the Hungarian throne.

The political picture of all southeastern Europe was radically changed in 1938 by the German seizure of Austria, which marked the return of Germany to first-class military status. German expansionist ambitions as announced by Adolf Hitler included a general hegemony of the old Hapsburg dominions as well as of the whole Balkan area. Therefore in the Second World War, Hungary was compelled by Germany to join the Axis. See World War II, p. 805.

Iceland, a large island kingdom in the North Atlantic Ocean. At some time in the 8th century a group of Celts landed on the southern shore of this island, but most of the world did not know of Iceland's existence until about 870, when Northmen, (from what is now Norway) sighted and named it. They were soon followed by colonizers who wished to be free from a tyrannical ruler. These pioneers made several settlements, the principal one being Reykjavik, now 1,000 years old and the capital of the island.

For a time there was no organization among the settlements; each was independent of the others, but after 930 a delegation was sent to Norway to prepare a code of laws. These at first were not effective, but with the coming of the missionaries about 980 better order prevailed, and by the year 1000 Christianity was adopted. Norway believed that Iceland should acknowledge itself as her colony, but the islanders fought to maintain their independence and did not submit until 1262. Eighteen years later the crowns of Norway and Denmark were united, with Denmark the stronger power, and from that time Danish influence was paramount in Iceland. When the Reformation spread throughout Northern Europe, Denmark imparted it to Iceland, and since then the island has been largely Protestant.

England controlled Iceland for a short time during the Napoleonic Wars, but in 1815 the Congress of Vienna returned it to Denmark. Nothing of a political nature disturbed the friendly relations between the mother country and the island for about 60 years, but during that period there was a growing demand for local self-government, which was granted in 1874.

The next step was a demand for complete independence, and a satisfactory compromise was reached. Iceland was declared independent in 1918, with the provision that for 40 years the king of Denmark should also be king of Iceland.

Iceland has the oldest parliament in the world, known as the *Althing.* In 1930 the country celebrated the Althing's 1,000th year.

India, a huge Asiatic dependency of the British Empire. It is not a united nation; the people speak more than 200 languages and dialects. In religion they are greatly divided; the 238 million Hindus are opposed by the 77 million Mohammedans, and their differences cannot be reconciled. There are minor faiths that have more than 15 million adherents. Another complication that adds to the country's difficulties is the caste system, which is more highly developed than in any other country.

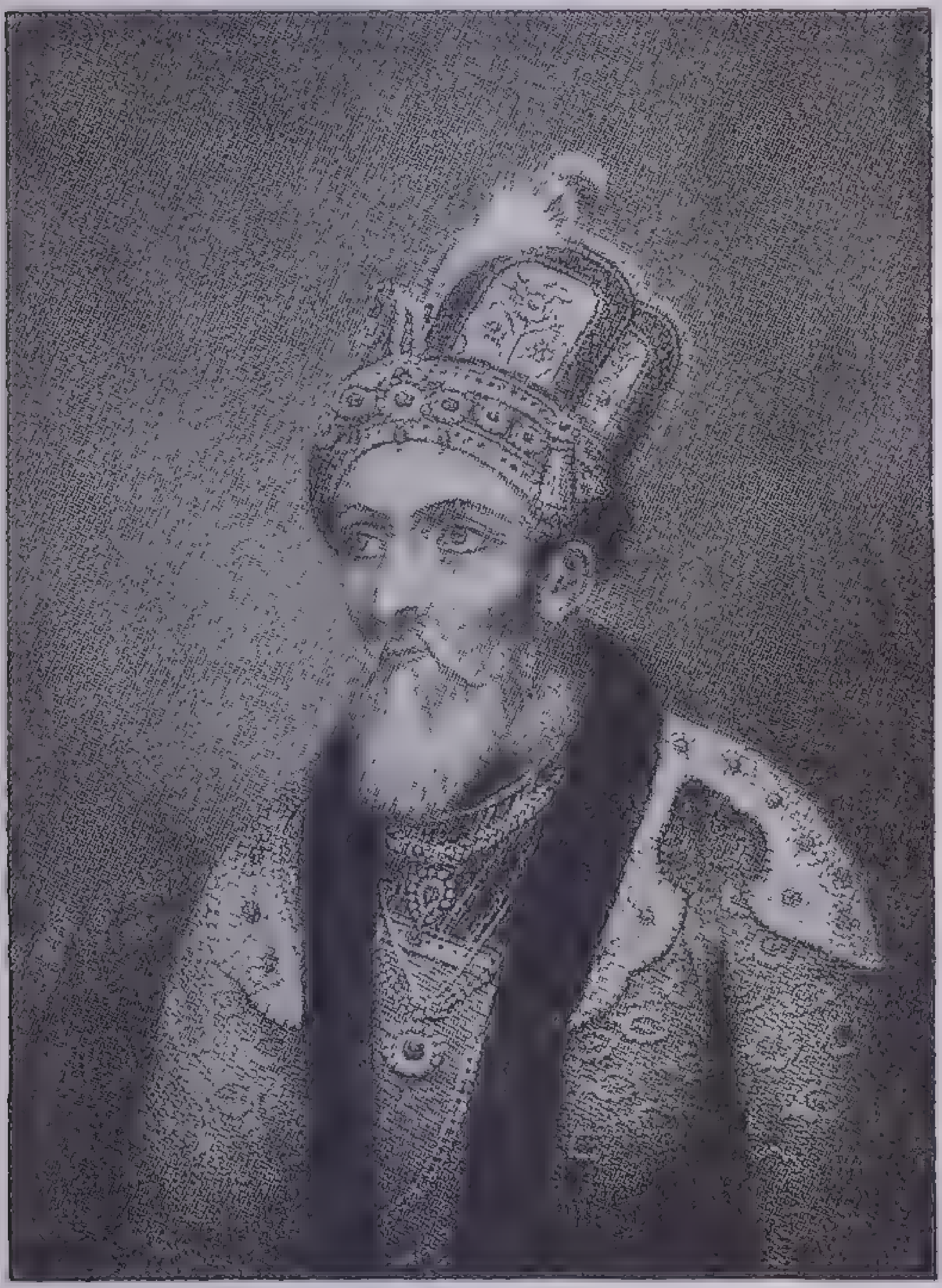
Early History. The early history of India is shrouded in mystery. Hindu writings say that as early as 2000 B.C. a wave of migration came from the northwest. In time the newcomers dominated the supposed original inhabitants, the Dravidians, a people that, so far as known, had no connection with any other people or clan. The invaders are described as *Aryans,* whose original home was in west central Asia, and from whom most of the races of Europe sprang.

The Hindu element spread slowly over northern India and by 600 B.C. had penetrated the tablelands in the south. There were many internal wars, some of major importance, as references to them are found in the legends of the Indian epics, the *Mahabharata* and the *Ramayana.* At the time when authentic history began (about 557 B.C., the reputed date of the birth of Buddha), there were at least 10 Hindu kingdoms in the peninsula.

The Mohammedan Invasion. Darius the Great had invaded India in the 6th century B.C. but was turned back after he had conquered the Punjab in the northwest. Alexander the Great took his army into India in 327 B.C. but made little impression upon the country. Much more important were the Mohammedan invasions beginning soon after the year 1000. The Sultan Mahmud was the first Mohammedan to secure a foothold by conquest, and succeeding dynasties humbled more and more the decreasing power of Hindu rulers. Four centuries later the Mongol or Mogul invaders swept into India from the north. The most notable of the leaders was Timur or Tamerlane. He entered India in 1398 and began a ruthless rule, during which he gathered rich spoils and caused the murder of at least 100,000 people. He took Delhi and made himself emperor of Mohammedan India. Shah Jahan, fifth in line after Timur, ascended the throne in 1628. He raised Mohammedan architecture to the height of its glory; he built the wondrous Taj Mahal, the tomb of his favorite wife, Mumtaz-i-Mahal. A thousand men were employed for 21 years in its construction. After Shah Jahan had reigned for 30 years he was imprisoned by his son Arungzebe, who seized the throne; under him the Mohammedan Empire reached its highest power. After his death a decline set in because of pressure from the outside. The Persians under Nadir Shah made a successful invasion in 1739, captured and sacked Delhi and carried away treasure whose value cannot be estimated. The coherence of the Mogul Empire then vanished; each prince seized power in his province and declared it an independent state. Hindus and Mohammedans, natural adversaries, took what they could by might.

British Ascendancy. Before this time Europeans had become interested in India. Venetians, inspired by the tales of Marco Polo, came in 1498; the Dutch occupied trading posts, and in 1602 the British East India Company appeared. It was destined to play a most important role in the future of the peninsula. The French were entrenched in the northeast, in what is now French Indo-China, and British and French rivalry was intense. Each supported rival claims of local princes for power, but in 1751 the English Lord Clive turned the tide in favor of his country. The land was by no means pacified—5 years later the Indian Governor of Bengal captured Calcutta, took 146 British prisoners and confined them in a small prison known as the *Black Hole.* Only 23 survived the stifling quarters until the next morning. Clive avenged the deaths of these men; and in 1757 he took the provinces of Behar and Bombay. That year marks the beginning of British ascendency throughout India.

The East India Company. For 100 years a strange system of government prevailed in India. The East India Company had been chartered in 1590 with a monopoly of trade in India and the British colonies throughout the East. The Company had to assume the task of preserving order so that its interests might be protected, hence it became the chief political power of the peninsula. The Company defeated three Indian princes in battle and won political authority over Bengal and Orissa but promised to pay the princes about $4,000,000. Clive, as head of the Company, soon repudiated a part of this agreement and eventually the remainder, declaring the amount excessive and unnecessary. He also forced reforms in native administration of affairs.



Last of the Mogul Rulers of India
Shah Saraz-o-dain Bahadur (1773–1862), once king of Delhi, was renamed king when the Sepoy Mutiny began (May 10, 1857). He was later exiled by the British

In 1773 the British Government appointed a governor general for India, but he had little control over the affairs of the Company. A council of four members managed the Company from Calcutta, and it sharply disagreed with Warren Hastings, the first governor general. Hastings was an able administrator, but his methods were rather highhanded. He offended the native princes so much that they joined with the French in a rebellion, which was quickly suppressed. In 1784 an Indian Board of Control was appointed, and this marked the beginning of the end of political power of the East India Company.

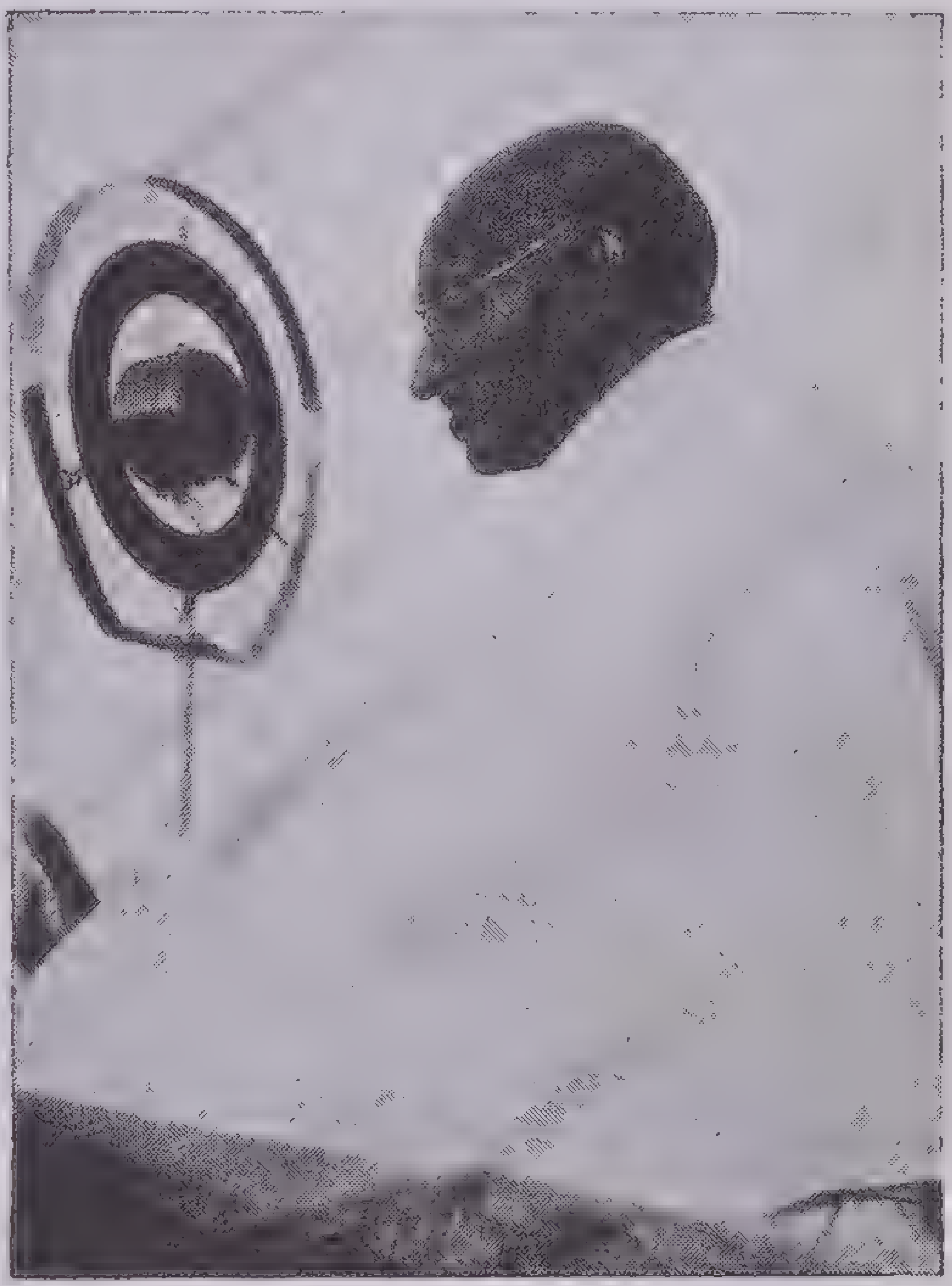
Lord Cornwallis succeeded Hastings as governor general (1786). He put down a series of disturbances, and more native territory (in Mysore Province) was ceded to the British. British supremacy, however, could be maintained only by military force.

Among the men entrusted to command was Sir Arthur Wellesley, who was afterward created Duke of Wellington. After his defeat in the American Revolutionary War, Lord Cornwallis returned as governor general a second time. Some of his successors improved internal conditions, and others spent most of their time in quelling insurrections. These uprisings grew in intensity and violence until the Sepoy Mutiny broke out around Delhi in 1857. The Sepoys were in the British service, but they turned on the British and soon became masters of the situation. General Wheeler and his troops were captured and massacred at Cawnpore, and English women and children were butchered. A British contingent was besieged in Lucknow, but the Cawnpore incident was not repeated, for Sir Henry Havelock rescued the garrison. For more than 2 months the wildest disorders prevailed around Delhi, but the co-operation of some Indian princes with the British kept the situation fairly well localized.

Direct British Control. The Sepoy Mutiny put an end to the control of any part of India by the East India Company. In 1858 all political power was transferred to the Crown, and a secretary of state for India was added to the British Cabinet. In 1877 Queen Victoria of England was proclaimed Empress of India. The chief British administrative officer in India now received the title of viceroy, and the viceroys often were men of outstanding administrative capacity. They gave their time to building up a strong Indian Empire and to improving the lot of the native population.

The Independence Movement. Many of the leaders among the natives had been educated in European and American universities. They returned home determined to introduce western civilization to their countrymen. Thus a spirit of nationalism was aroused that was to grow until the existence of British rule was threatened. To counteract the growing trend toward independence, King George V and Queen Mary journeyed to India in 1911; the capital was removed from Calcutta to its ancient seat Delhi, and amid splendors seldom witnessed the British king and queen were crowned emperor and empress of India.

The unrest was allayed for only a brief period. Among the Indians who had visions of a united and independent India was Mohandas Karamchand Gandhi, called *Mahatma* or leader, by his followers. He was a lawyer who had received a liberal education in London. He introduced a new method of getting the results sought by Nationalists—a campaign of nonco-operation with the British in everything pertaining to the daily lives of the people. The natives were asked to accept no positions under the Government, to give no assistance to any government agency, to purchase no goods made by British factories, to make their cloth on home looms. The only tax levied upon every Indian was a small one on salt. Gandhi advised his followers to refuse to pay this tax and led many followers to the seashore to make salt in violation of law. He was arrested and spent several months in jail. Shortly after his release he resumed his campaign of nonco-operation. At a round-table conference in London in 1931 every shade of opinion was represented. The conference was forced to adjourn without results, and upon his return home Gandhi was again arrested for opposition to the Government's policies. Definite promises of a dominion form of government were not acceptable to the Nationalists; they restated their demands for independence. The Government was forced to outlaw all Nationalist activities, and a deadlock in negotiations resulted. Possibly the one deterrent to an agreement to accept dominion status was the unalterable objection of the Hindus and Mohammedans to meet in agreement upon any common policy.



Underwood & Underwood
Mahatma Gandhi, Indian Nationalist Leader

In 1935 the Government of India Act passed Parliament, and the Marquess of Linlithgow was appointed Viceroy in 1936. He brought about many reforms, launched a new Federal system and set up a new Provincial Legislature. The India Act also established a federation embracing British India and the native states. On February 6, 1935, Sir Samuel Hoare pledged a government policy that would make India a Dominion.

Iran (Persia), now a comparatively minor state in western Asia; in ancient times a great imperial power. In its early history, it was a part of the Empire of Assyria. The northern section, known then as Iran and later as Media, revolted and won its independence. The Medes then overran both Assyria and Persia. The Persians were allied to a certain extent with the Medes in language and literature. In the middle of the 6th century B.C., Cyrus the Great defeated Astyages, King of the Medes, and thus the vassal state became the master, Media was merged into Persia, and the Persian Empire came into being.

Cyrus was an able and crafty warrior, and he began a career of conquest that soon enlarged the empire until it stretched from the Mediterranean eastward into India as far as the Indus River. His son and successor Cambyses extended his possessions westward into Egypt. After the short rule of Smerdis, a usurper, Darius I came to the throne and throughout a reign of 36 years continued the career of conquest begun by his two great predecessors. He added Macedonia and Thrace, in the European Balkan area, to the Persian Empire and tried to conquer Greece but failed at the historic battle of Marathon (490 B.C.).

Darius's son Xerxes, reaching the throne in 485 B.C., tried to accomplish what his father had failed to do. He raised the largest army that the world had ever known, possibly a million men and also built a large fleet. With these joint forces, he felt that he would be able to subjugate Greece. The fleet was destroyed at Salamis (480 B.C. and Mycale 479), and the army was routed at Plataea (479 B.C.). His efforts exhausted the resources of his empire, and, under his son, Artaxerxes I, the end of the period of glory was at hand. One after another his successors strove to regain prestige, but Alexander the Great swept away the empire and joined Persia to his vast domain. When Alexander died in 323 B.C., Persia and Syria were given to the dynasty of the Seleucidae, which soon lost them. They were alternately Greek and Roman, until Persia again fell into Persian hands, and the Sassanian dynasty of kings was established (226 A.D.).

These kings brought back to Persia a semblance of its old renown, but in 642 the Saracens became masters of the country. The Seljuks followed the Saracens, but Genghis Khan, the irresistible Mongol invader, took the country, and a Persian-Mongol dynasty was founded in 1251. Timur or Tamerlane, one of the greatest conquerors in all history, in 1392 released the people from these oppressors, and divided the kingdom among his sons.

Persia was a sort of football among the warring clans for several hundred years, with no history worth recording. In 1795 a representative of the Kadjar family reunited the country and founded a dynasty that continued to rule Persia until 1925. In 1906 Persia adopted parliamentary government, and the shah, formerly an absolute monarch, was limited in power by a premier at the head of a ministry and a parliament to manage finances. During that period of a century and a quarter, Persia's history included some internal disturbances, considerable interference by foreign powers, and the establishment of spheres of influence by Great Britain and Russia. The World War disposed of Russia as far as Persia was concerned, and in 1921 Great Britain also finally withdrew. In 1925 the then reigning Shah Ahmed Mirza was dethroned because he refused to attend to affairs of state and spent most of his time in Paris, and the Kadjar dynasty came to an end. Reza Khan, the premier and commander in chief of the army, was placed upon the throne by vote of the National Assembly and became the first shah of the new dynasty of Pahlevi, the name of his family. In 1935 Persia changed its name again to Iran, by which it had been known in earlier days. See World War II, p. 805.

Iraq, a kingdom of the northeastern Arabian peninsula. Under various names, notably Mesopotamia (mid-river land), this country has been a scene of activity ever since men began to make history. Between the Tigris and Euphrates rivers there rose, flourished and fell the powerful nations of Assyria and Babylonia. In 1932 B.C. the Hittites conquered the land. A Chaldean power was built up, and in 606 B.C. western Asia was divided between Media and Chaldea. As its share Chaldea took Mesopotamia. Less than 100 years later (538 B.C.) it was conquered by the Persians, who in the meantime had the Medes in subjection. It was later a Roman province, but Emperor Jovian surrendered most of it to Persia in 363 A.D. Three hundred years later it was Turkish; then it was taken by the Mongols in 1258 and again by Turkey in 1638. Thereafter it remained a part of the Turkish Empire until after the World War.

During the war (in 1917) Bagdad was captured by a British army. By the Treaty of Sèvres (1920), between Turkey and the Allied Powers, Turkey lost Syria, Palestine and Mesopotamia. They were made independent states under mandate to members of the Allied nations until they were able to assume the responsibilities of self-government. Mesopotamia was mandated to Great Britain and given the name Iraq. In 1924 Great Britain and Iraq made a treaty that gave more independence to Iraq but did not violate the spirit of the mandate.

Turkey meanwhile protested the loss of its former oil fields in the north near Mosul and tried to stir up the people there against King Faisal. The League of Nations heard Turkey's complaint but rejected its plea and awarded Mosul to Iraq. In 1928 Great Britain relinquished its mandated power and permitted the country to become an independent kingdom; however, the English continued to give political and economic assistance to Iraq in an advisory capacity until such time as the country was admitted to membership in the League of Nations in 1932.

Iraq has not been a peaceful country since it became independent. Its dictator and minister of defense, Jafar Pasha al-Askari, was assassinated in October 1936. His successor, Gen. Bakr Sidkey Pasha, was shot to death on August 1, 1937 as well as his chief of staff, Maj. Mohamed Ali Jawdat, who was commander of the Iraq Air Force. As a result, the new Cabinet was formed, headed by Premier Eamil Midfai.

Ireland or **Eire,** southern Ireland, from 1922 to 1937 the Irish Free State; the southern and larger part of the second largest of the British Islands.

It is not known who were the first inhabitants of Ireland or whence they came. Long before the Christian Era Greek and Roman writers referred to it as Hibernia. Irish legends say that the earliest inhabitants did not know the use of fire or metal, and that they were conquered or exterminated about 504 B.C. by the Scots, a Celtic tribe. The first authentic records of the Scots say that in the 4th century A.D. they raided Roman Britain and crossed the Channel into Gaul in search of plunder. At that time the island was divided into several provinces, each with its own leader, but all seem to have given a certain amount of allegiance to the king of Meath, the most important province. They worshiped various gods to whom human sacrifices were made by their priests, the druids.

Conversion to Christianity. The most important event in the early history of Ireland, an event still potent in shaping the destiny of the Irish people, was the arrival of Saint Patrick. It was about 432 that he began his labor of converting Ireland to Christianity. He had been a slave in Ireland for 6 years and had studied and traveled in Europe. He was sent to Ireland by Pope Celestine and worked there for 30 years. When he died nearly all the country had been converted to the new faith. One result of his efforts was that many schools and monasteries were built. These were educational as well as religious centers, and many scholars from England and the Continent visited them for instruction. From the Irish schools missionaries were sent out to spread Christianity all over Europe. For a time Ireland was as important as Rome in propagating the new religion.

The Danish Invasion. Ireland was well on the way to becoming highly civilized late in the 8th century but the coming of the Danes stopped progress. They were ferocious and relentless fighters; they took possession of the coast towns and pillaged the country for a considerable distance inland. For more than 2 centuries the Danes and the Irish fought for control. The issue was settled in 1014, when the Irish won a decisive battle near the present site of Dublin. Brian Boroihme (or Brian Boru), the Irish leader, was slain on the battlefield, and his name is still remembered in song and story. Brian had established an orderly government; after his death the country lapsed into near anarchy and there was widespread human misery. As a result Ireland fell an easy prey to the next invasion.

The Anglo-Normans. The Normans had conquered England at the battle of Hastings in 1066. It was not long before they sought to acquire Ireland. The opportunity came when Dermond MacMurrough, a deposed Irish king, asked Henry II, the English king, to help restore him to the throne. Pembroke and other Norman knights put him back in power; in return he gave large grants of land to the Normans and their followers. Now began a long period of plunder and oppression. The Irish rebelled unsuccessfully, but English power in Ireland began to decline. In time the descendants of the Normans were absorbed into the native population and became more Irish than the Irish themselves. Only in Dublin and its immediate neighborhood, known as the *Pale,* did the English regain control. Elsewhere the country was almost free of alien influence.

Tudor Rule. When Henry VIII established the Church of England, he destroyed the Irish monasteries and confiscated their wealth. Ireland was not much disturbed by the bitter religious struggle in England during the reigns of Edward and his sister Mary, but late in Elizabeth's reign a series of rebellions in Ireland required years to put down. Towns and villages were burned, crops were destroyed, and many people were killed. It is estimated that the population was reduced by a third, and a third of the land was distributed among the English nobles. As in England, the Anglican Church was made the established Church, but the Irish, almost without exception clung to their ancient faith, although for so doing they were denied all civil rights and forbidden to hold any public office.

Underwood & Underwood

Eamon de Valera

The prime minister of Ireland, who was born in New York and educated in Ireland, has fought for Irish independence since his early youth. He was sentenced to death in 1916 after the Sinn Fein (republican party) revolt but was released. When the Irish Free State was created with a dominion status in 1921, de Valera conducted a 2-year civil war for more complete independence. In 1927 he sat in the Dail (House of Commons), organized a new party (the Fianna Fail) and five years later became president. In 1938 he was elected prime minister of the sovereign state of Eire, official name for the provinces of Connacht, Leinster and Munster and nine counties of Ulster province

Cromwell and Charles I. Large areas of land in Ulster were forfeited to the English Crown during the reign of James I. They were distributed among English nobles, who colonized them with English and Scotch settlers. There was much discontent among the Irish. Led by Rory O'Moore, they rebelled and drove out many of the interlopers. Instead of punishing the rebels, Charles asked for Irish help in his struggle with the English Parliament. He had declared war on Parliament, and at first his army was successful; but Parliament's New Model army defeated the Royalists, and Charles was beheaded.

Parliament and Cromwell now determined to punish all Ireland for the O'Moore rebellion and the assistance given Charles and crush the power of the Catholic Church in that country. With 10,000 veterans Cromwell stormed the town of Drogheda in 1649 and killed every defender as well as the women and priests. He then captured Wexford and killed its entire garrison. The next spring Clonmel was captured and an Irish army led by Hugh O'Neale was crushed. Thousands of the Irish were sold into slavery in America. It has been estimated that more than a half million inhabitants of Ireland were banished or killed while Cromwell was in power. Besides other rewards, Cromwell's soldiers received large grants of Irish land—about 11 million acres in all.

William and Mary. James II, a Catholic, was king of England for but 3 years when he was dethroned (1688) by a revolution headed by William of Orange. James won the support of the French King Louis XIV and tried to regain the throne. He had many enthusiastic supporters in Ireland, but his army was utterly defeated in 1690 at the battle of the Boyne, and Ireland was again under English rule. The country's few industries were crushed by English laws, and the people were treated so cruelly that many emigrated to other lands. More land was confiscated and distributed among Englishmen, so that the evils of absentee ownership were made worse.

The Act of Union. During the next 100 years there were many insurrections, but they accomplished little, except that in 1782 the Irish Parliament was made independent. A more serious revolt led by Wolfe Tone broke out in 1798. Encouraged by the rise of the French people against their oppressors, the Irish determined to try again for political and religious liberty. The rising failed, but William Pitt, then the English Premier, determined to end the conditions that caused the revolts. The Act of Union joined the countries in a single kingdom, but neither country was satisfied. Robert Emmet led an unsuccessful rebellion. In 1829 the laws were changed to permit Catholics to hold office and sit in the British Parliament, but the Irish people demanded greater liberty and another insurrection was threatened in 1841. Then came the famine of 1846–47; the potato crop, on which the peasants depended, was a failure. Thousands died of starvation; other thousands emigrated, chiefly to the United States.

The Demand for Home Rule. After the famine there were some changes in the land laws as well as in those governing trade, and conditions in Ireland improved somewhat, but there was no lessening in the demand for home rule. Gladstone, who became prime minister in 1868, tried several times to give Ireland a greater measure of independence, but these bills were rejected—though the Land Act of 1881 remedied some of the abuses in the tenancy of land. Premier Asquith introduced a third bill in 1912, but this aroused so much opposition from the Protestants in Ireland, especially in Ulster, that there was danger of civil war. The outbreak of the World War ended the struggle for a time.

Ireland in the World War. Thousands of Irish joined the British army when the war started, but in 1916 the Sinn Fein Society fomented a rebellion in Dublin that cost many lives and destroyed much property. It was crushed by English troops. Sir Roger Casement, the leader, and a number of his confederates were hanged. There was war in Ireland from January 1919 to May 1921 with bitter brutality on either side. The outcome was the establishment in December 1921 by an Anglo-Irish treaty of the Irish Free State, embracing all of Ireland except the six northern counties.

Recent History. Arthur Griffith was made president and Michael Collins served as premier. De Valera, however, led the extreme Nationalists in opposing the dominion form of government. He and his party insisted on complete independence and began a civil war against their own countrymen. Griffith died in 1922; and shortly afterwards Collins was assassinated by De Valera sympathizers. The next year the De Valera faction abandoned its guerrilla warfare but until 1927 would not sit in the Dail, the Irish House of Commons. De Valera became president in 1932. A quarrel with Great Britain over the payment of land purchase annuities followed. England tried to collect the annuities by a tariff on importations from Ireland. This contributed to the economic depression and increased the opposition to the De Valera government. A trade agreement with Great Britain in 1935 improved conditions; it provided for the exchange of British coal for Irish cattle.

In 1937 a new constitution was adopted. It called for a 2-house legislative body, and set up a 7-year term for the president. The name of the country was officially made Eire. The new constitution provided for a president elected by popular vote. The intent of the constitution makers was that the chief executive should not be a partisan. The election was set for May 4, but in April de Valera and William T. Cosgrave (head of the opposition to Valera) agreed on a candidate and so made the election a mere matter of form as there was no candidate willing to challenge the decision of these leaders. They chose Dr. Douglas Hyde (1860–), Ireland's greatest Gaelic scholar. The fact that Hyde is a Protestant had an excellent effect on the North of Ireland, which had kept aloof from the government of the Irish Free State partly on political grounds and partly because the southern counties were predominantly Roman Catholic. In April 1938 the Irish and British governments signed a 3-year accord settling many of their differences. It ended the tariff war that had begun in 1932 when De Valera stopped paying Britain the land annuities amounting to about £4,700,000 a year; Ireland paid some £10,000,000 and Great Britain abandoned the claim to annuities. Free trade opened British markets to Irish farm and dairy products. The ports of Bere Haven, Cobh (Queenstown) and

Lough Swilly were transferred to Ireland. De Valera's political status in Ireland was greatly improved by his securing this agreement, as the main contention of the Cosgrave party opposing him was that De Valera's hatred of Britain was costing Ireland too much in trade.

Italy, a south European nation that has greatly increased in international importance in the last two generations.

Always in historic times the name *Italy* (Italia) when used in a geographical sense has meant the peninsula that like a jack boot projects from the continental mass of Europe into the Mediterranean sea. The name gradually has been extended northward to indicate the area bounded by the natural arc of the Alps stretching from the Adriatic at the east to the French Riviera on the west. But in a political sense the term *Italy* has had different meanings at different periods.

Goths and Lombards. In 476 A.D. Odoacer, an officer of the barbarian mercenaries of the Western Empire, led a revolt of these troops by which the puppet Emperor Romulus Augustulus (475–476) was deposed, and the office and title of emperor of the West were extinguished. Odoacer was recognized as king by the tribesmen, *dominus noster* (our ruler) by the Romans and by the Eastern emperor as vicegerent with the title of *Patrician.* Theodoric, King of the East Goths, led an Ostrogothic invasion into Italy, where, after he had won three victories over Odoacer, he entered upon an arrangement by which he and Odoacer were jointly to rule the land. The treacherous Theodoric with his own hands murdered Odoacer at a banquet (493) and for 33 years was head of what virtually was an independent kingdom, though with a formal show of homage to the Eastern emperor. The realm is said to have been prosperous; but Theodoric, who further distinguished himself by putting to death the philosopher Boethius and Boethius's father-in-law, the editor and historian Symmachus, appears to have been after all a sanguinary barbarian of a type beloved in Teutonic legend, which devoted a whole cycle to him under the name *Dietrich von Bern.*

In 534 Belisarius, able Byzantine general, invaded the Ostrogothic kingdom and after a series of victories captured the king, Vitiges, who was sent prisoner to Constantinople. Thus Italy was restored (539) to the Eastern Empire, only to be recovered by the Gothic warrior king Totila. In 552 it was won back by Justinian's officer Narses; Totila was mortally wounded, and the Ostrogothic kingdom, having passed briefly to his successor Teias, came to an end. At Ravenna an exarch (governor general) now administered the government in the name of the Byzantine emperor. Ere long, however, the Lombards (Longobardi), led by Alboin, began to move down into the peninsula, leaving untouched Venice, Ravenna, Genoa and Rome but occupying the valley of the Po, establishing a capital at Pavia and driving a wedge southward through the interior. The Goths had been more like an army of occupation than were the Lombards, who had rather the character of a migratory nation. In their sphere of control the Lombards established what we now should call a feudal pattern of government. From them the portion of northern Italy still styled *Lombardia* derived its name.

The Franks. The popes at Rome called to their aid against the Lombards the Franks of Charles Martel and Pepin the Short. Pepin forced the Lombard king Aistulf to relinquish Ravenna and certain other territorial acquisitions, and these he turned over to the papacy, thus laying the foundation of the Papal States. In 744 Charlemagne deposed his father-in-law Desiderius, the last Lombard king, and incorporated the Lombard kingdom with that of the Franks; and in 800 on Christmas day he was crowned by Leo III in St. Peter's and proclaimed representative of the ancient Roman emperors. Thus was inaugurated the so-called Holy Roman Empire, styled *holy* from the interdependence of the papacy and those monarchs who as theoretical successors to the emperors of the West asserted an equally theoretical authority over the nations of central and western Europe. This alliance was to prove a significant factor in medieval history.

The City-States. Eight Carolingian kings were recognized by Italy, the last being Charles the Fat (deposed in 888). Next followed ten kings of the "Italian succession" (though not all were actually Italian), of whom the last was Berengar II (951–961). During this obscure and confused period anarchy prevailed. The Saracens overran Calabria (the toe of the boot) and Apulia (the heel) and captured Bari from the Byzantine Greeks, but later the Greeks retook the city and made it the headquarters of a Byzantine governor. Government at Rome fell into notorious decline. The Magyars invaded northern Italy and laid it waste. Feudal nobles, little and big, everywhere asserted their local independence of the titular king, and bishops tried to do the same. National feeling was utterly lacking. Finally Berengar in desperation formally ceded his kingdom to Otho I (the Saxon), King of Germany, whom he acknowledged as overlord. Shortly Otho deposed Berengar, and in 962 he was proclaimed emperor of the Holy Roman Empire. Thus came to be accorded to the elected king of Germany the shadowy right to be considered king of Italy and successor to the Roman *imperatores.* The empire was indefinite and divided, with the idea of it centered at Rome and the physical strength of it lying on the other side of the Alps; and in the peninsula was fostered the tradition of aristocratic republics in conflict both with pope and with emperor. Influences were at work that tended gradually to break up Italy into separate states and to hold feudalism strongly in check. Venice continued to be a Greek "free city," Pisa and Genoa were slowly developing toward autonomy, Rome proclaimed itself a commonwealth, and Milan was taking the lead in the north.

In the southern part of the peninsula and regarded as politically outside Italy in the stricter sense were the maritime town of Naples, the Lombard duchy of Benevento and some other units; and beyond the toe of the boot was Sicily, in the hands of the Saracens. Norman adventurers, over a space of years, subdued and consolidated Apulia, Calabria and Sicily, forming the kingdom of the Two Sicilies, held as a fief of the papal see. This kingdom was later the most formidable obstacle to Italian unity; in it feudalism long maintained a hold; through it came French interference in Italy.

The Investitures. From 1075 to 1122 prevailed the struggle between the papacy and the emperors Henry IV and Henry V that was called the *quarrel of investitures.* It arose from an attempt to deprive the emperor of rights previously enjoyed by him in the bestowal of ecclesiastical dignities. Gregory VII and Henry IV tossed excommunications back and forth, and Henry set up a Pope of his own, Clement III, who crowned him emperor in 1084. At last a convention known as the *Concordat of Worms* was drawn up (1122) between Calixtus II and Henry V, by which *temporal investiture* (by the sceptre) was assigned to the emperor as temporal sovereign and *spiritual investiture* (by cross and ring) to the Pope. Thereafter popes were to be elected by the cardinals. After 47 years of war there was peace. During that time each side had made concessions to the town communities in order to win their support. Thus now blossomed forth the republics, in which the chief executives (varying in number) were known by the ancient title of consuls, and the usual structure of government consisted of a privy council, a "grand council" of privileged citizens and an assembly (*parlamento*) of all classes and including the entire adult citizenry. Milan and Pisa especially prospered, and programs of public works were entered upon by them, with strong emphasis on the Latin tradition. At Rome the monk Arnold of Brescia preached the temporal deposition of the Pope, and a short-lived republic were established.

Domestic Strife. But the long quarrel between Pope and emperor had cursed Italy with the spirit of partisan warfare, and a chaos of municipal antagonisms broke out, based on petty jealousies and rivalries and rendered still more complicated by the strife of the Guelphs (the papal and popular party) and the Ghibellines (the imperial and aristocratic party). During the reigns of the emperors Lothair II and Conrad III civil discord increased; but Frederick I (Barbarossa) five times entered Italy to restore order and insist upon his imperial rights over the Lombard cities, which, with the exception of Montferrat and Pavia, were eventually in league against him. After more than 20 years, during which Milan was destroyed, Frederick had failed to tame his rebel dominions, and in 1176 his army was defeated at Legnano. In 1183 was concluded the *Peace of Constance,* by which the quarrel between the emperor and the

Italian communes was settled in a manner similar to that in which the Concordat of Worms had settled the dispute between the emperor and the papacy. Frederick retained the right of confirming the consuls by his legates and of appointing supreme courts of appeal.

Pope against Emperor. His son and successor Henry VI claimed the Two Sicilies by right of marriage and was recognized in 1194, and this was by way of being an equivalent for the loss of imperial authority in the north. Henry's son Frederick II, a cultivated monarch at whose court Italian began to take form as a literary language, seemed to have a firm grasp upon the peninsula, which he dominated from both north and south; but the Pope (Innocent IV) had a crusade preached against Frederick, and his death (1250) after defeat by the Bolognese at Fossalta marked the beginning of the end of German dominion in Italy. For a few years more it lingered, represented by Conrad IV and Conradin (Conrad V); then Charles of Anjou, brother of Louis IX of France, who was invited by the papacy to Italy to lead the Guelph faction, defeated Conradin and executed him at Naples (1268). Rudolf of Hapsburg (Rudolf I), chosen emperor in 1273 after what was termed *the great interregnum,* kept out of Italy, which he called "the lion's den." The papacy, having first requested the aid of another French noble, Charles of Valois, brother of Philip IV (*le Bel*) of France, and then having quarreled with Philip, was in 1309 removed to Avignon and there remained until 1378. Even after that, from 1378 to 1417, it was divided by what is known in church history as *the great schism of the West,* with rival pontiffs at both Avignon and Rome. The imperial title became in reality only a nuisance to the princes that held it. In the reign of Louis IV the old struggle between empire and papacy flared up again, and the diet at Frankfort confirmed a decree to the effect that the German king did not need papal sanction to make valid his imperial election. This position was defined and strengthened by the *golden bull* of Nuremburg (1356). Frederick IV was the last emperor to go to Rome to be crowned (1452). Here it need only be said that the notion of a western Europe united as one empire-church steadily declined, that the Reformation and the Renaissance still further weakened it, that the nation-states arose to replace it, and that nothing but an empty title endured until in 1806 Francis II (Francis I of Austria) resigned and ended the title, that it might not be seized by Napoleon and incorporated in the Napoleonic system.

During the period from the latter part of the 11th century to the close of the 13th, Italy, in spite of miserable political conditions, prospered in manufactures and commerce and shone in letters and the arts. Its civilization was more advanced than that of any other part of Europe. Pisa, Genoa and Venice became busy maritime centers with trade not only in the western Mediterranean but in the Levant and as far as the Black Sea. Verona, Florence and Milan developed important industries. Florence had its Bargello palace, its churches of Santa Croce and Or San Michele; Pisa, its cathedral, baptistery and leaning tower (campanile); Venice, its basilica of San Marco. Cimabue was painting. Dante was writing the *Vita Nuova.*

The Despots. With the beginning of the 14th century we come to the *age of the despots.* During the civil wars leaders had been chosen for their military ability and usually from the nobles because they had been trained in the profession of arms. These *captains of the people* received extraordinary and indefinite powers, with the common result that they regarded themselves superior to the law and appropriated all power and evolved into despots. In the beginning they sought the favor of the middle class by freeing it from military service, disarming the nobles and carrying on warfare not by local militia, as had been the case in the republics, but by bands of *condottieri*—Italian mercenaries ready to fight for anybody that paid them. Then little by little these magnificoes assumed the character of kinglets and set up dynastic pretensions. It was a time of cruelty, intrigue, bribery and cunning, and it made the Italian type of statecraft long synonymous with treachery. It had a later flowering in the *Principe* (Prince) of the Florentine Macchiavelli, which though granting place to private virtue based politics wholly upon expediency and pointed the way to such conscienceless autocrats on a large scale as the French Louis XIV, with his motto "*I am the state!*"

Among the despots none was more thoroughgoing than Gian Galeazzo Visconti of Milan, whose short-lived dynasty was succeeded by that of Francesco Sforza, a *condottiere* of exceptional quality. At Florence, Cosimo de' Medici (the Elder) heir to a great fortune, was conspicuous. At Venice, which differed markedly from other Italian states, the doge (chief magistrate), originally elected by the people, had later been reduced to a figurehead of the grand council, which had excluded the popular assembly from any share in government. The establishment of the Council of Ten stabilized oligarchy to such an extent that it continued until the end of the republic (1797). Cola di Rienzi led a revolution at Rome, and there was a brief republic, hailed at first by the poet Petrarch. Under Nicholas V (Pope, 1447–55) the papacy regained some of its lost prestige, and learning was greatly encouraged. In the south, Alfonso the Magnanimous, King of Sicily and Sardinia, succeeded to the throne of the kingdom of Naples and by his patronage of classical scholarship was a prominent figure of the earlier Renaissance. In these five major dominions, as in the minor states, the trend was all toward despotism, relieved somewhat by the general interest in the new learning and in literature, science and the arts. At Florence that complex being Lorenzo de' Medici (the Magnificent) was the patron of Politian (Poliziano) and Pico della Mirandola and of the young Michelangelo, who studied at the school of sculpture in Lorenzo's gardens.

Invasions. The year 1492, in which Lorenzo died, was for the Italian peninsula a year of marked significance. In 1492 the Genovese Columbus by his discovery of America ended the commercial predominance of Venice. In 1492 came to the throne of France the Charles VIII who 2 years later was to invade Italy. In 1492 fell Granada, ending by its fall the war between the Moors and Ferdinand II of Aragon and Sicily, leaving that king free to compete with France for supremacy in Italy. In 1492 Rodrigo Borgia became Pope as Alexander VI, a Pope who, with his appalling son, Cesare Borgia, viewed the papacy as only a secular instrument and acted accordingly. It has been noted that Alfonso the Magnanimous succeeded to the throne of Naples. He did so through asserting by force a claim based on his adoption by Joanna II, Queen of Naples (1414–35). But the lady had adopted also René, Duke of Anjou; and René, too, had found Italian supporters. The house of Anjou had bequeathed to Louis XI of France its claim to Naples, but this claim Louis had not asserted. In 1494 Louis's son and successor Charles VIII set out on an expedition to Italy, a venture designed not merely to revive the claim but also to serve as prelude to a far wilder scheme for taking Constantinople and being crowned emperor of the East. Defeated at Fornovo by the troops of a coalition, Charles was compelled to return to France. Next on the French throne was Louis XII, a cousin of Charles. Louis as duke of Orléans was another claimant to Italian territory, for his grandmother had been a daughter of Gian Galeazzo Visconti, first Duke of Milan. His claim was, however, void, for title to the duchy could be vested in male heirs only. Nevertheless, it would serve; so Louis took Milan from the Sforza. Then he looked toward Naples and made an alliance with Ferdinand II of Aragon and Sicily (Ferdinand V of Castile and León, who broke his promises to Columbus) by which the kingdom of Naples was to be divided between Ferdinand and himself. Ferdinand seized it all and thus reunited the old realm of the Two Sicilies. Louis afterward sought the aid of Maximilian I of the nebulous Holy Roman Empire; but Maximilian likewise turned on him, joined the so-called Holy League with Ferdinand of Aragon, Henry VIII of England, Pope Julius II and the states of Switzerland and Venice. France was driven from the peninsula but soon returned under the leadership of the new king, Francis I, who warred indecisively with Charles V, Holy Roman Emperor (Charles I of Spain). Finally, by the peace of Cambrai (1529) France relinquished Italy though it retained the duchy of Burgundy, which Charles V had claimed on the ground that it had been stolen from his grandmother, Mary of Burgundy (daughter of Charles the Bold), by Louis XI.

Thenceforward to 1796 the Italian peninsula had in fact no political history of its own.

For most of that time it was, with the exception of the papacy, just a bundle of little states under the sovereignty of Spain and directed by an absentee government in Madrid. There were, of course, more wars. That of the Spanish Succession, between Louis XIV of France and the bulk of western Europe, was in part fought in Italy. Louis, determined to enforce the claim of his grandson Philip of Anjou to the throne of Spain, was opposed by an alliance of Austria, Denmark, Great Britain, Holland, Portugal and some German states. Victor Amadeus, Duke of Savoy, joined the Austrians (1704); France invaded Piedmont; under the leadership of Prince Eugène of Savoy (Marlborough's associate at Blenheim) the French were expelled. By the peace of Utrecht (1713) Victor Amadeus, in recognition of the services of the house of Savoy, received Sicily; in 1720 this was exchanged for Sardinia, and the title of king of Sardinia was assumed by Victor. After further involved dynastic battlings, the close of the 18th century found Modena and Genoa protectorates of France while Austria controlled the duchy of Milan and the grand-duchy of Tuscany.

The Age of Napoleon. Now across the Alps came Bonaparte leading the eager army of the French Directory. The Jacobin ideas set in motion by the Revolution had already reached Italy, and there was no lack of native acclaim for the Corsican who, it was said, brought freedom. He, addressing his soldiers (those "new French," as people called them), reminded them: "I lead you into the most fertile plain in the world. There you will find great towns, rich provinces, honor, glory, riches." Writing home to the Directory, he said: "We will levy 20,000,000 francs in exactions in this country." His military success was swift and thorough. The underhand diplomacy of the treaty of Campo Formio (1797) split the ancient republic of Venice, giving most of it to Austria but reserving to France the Ionian Islands (in the Adriatic) and the Venetian fleet that later was to aid Napoleon in his Egyptian scheme. Overnight the Cisalpine republic sprang up, with Milan for its capital. Soon Genoa was remodeled into the Ligurian Republic; French troops backed the establishment of a republic at Rome, whence Pope Pius VI was straightway taken as a prisoner to France; Naples became by benefit of French arms the Parthenopean republic. All these republics of a sort collapsed as the French gave way before the attacks of a coalition in which Austria, Britain and Russia were the leaders. Russia withdrew, but Bonaparte on his return from the Egyptian fiasco launched an expedition against the Austrians; and Desaix, Lannes and Kellermann by their decisive victory at Marengo (1800) made possible the peace of Lunéville (1801) and the reorganization of Italy. (It was during the undercover bargaining of this period that Bonaparte obtained the retrocession of Louisiana territory from Spain.) Having established the Concordat with Pius VII and been crowned emperor of the French, Napoleon crowned himself at Milan (1805) with the iron crown of the Lombards. To Eugène Beauharnais, viceroy of the so-called kingdom of Italy that replaced the Cisalpine and Ligurian republics, he declared, "Your system of government is simple: the Emperor wills it to be thus." His brother Joseph and his marshal Murat successively occupied the throne of Naples. By decree (1809) he in effect annexed Rome and the Papal States.

Risorgimento. The readjustments consequent upon the fall of Napoleon left Victor Emmanuel I, King of Sardinia, the only native monarch in Italy. Austria directly governed Lombardy and Venetia; and, through either arms, alliances or the rule of Austrian princes, was dominant in the peninsula. Now ensued the *Risorgimento* (resurgence). Popular unrest under Austrian supremacy was voiced in the poems of Giacomo Leopardi (1798–1837) and manifested in the growth of such societies as the Carbonari. There were numerous uprisings. Giuseppe Mazzini (1805–72) organized his "Young Italy" movement. Charles Albert, King of Sardinia, headed a war against Austria (1848–49), but after his defeat at Novara he resigned the throne in favor of his son Victor Emmanuel. With the Count di Cavour (1810–61) as prime minister and chief adviser, Victor Emmanuel supported Britain and France in the Crimean War, joined with Napoleon III in the war of 1859 to expel Austria from Italy, obtained the cession of Lombardy to Piedmont (Venetia being retained by Austria) and ceded Nice and Savoy to France (1860). After Victor Amadeus of Savoy had taken Sardinia in exchange for Sicily, Spain took Sicily back, then surrendered it to Austria. Don Carlos of Bourbon (son of Philip V of Spain) later conquered both Sicily and Naples and was recognized (1738) as king of the Two Sicilies: but having succeeded to the Spanish crown, he relinquished them to his son Ferdinand. During the Napoleonic regime in Italy Joseph Bonaparte and Joachim Murat had successively ruled in Naples. In 1815 Ferdinand with Austrian aid had re-entered Naples, and since that time Bourbon autocrats had misgoverned the Two Sicilies by espionage, imprisonment and execution.

Giuseppe Garibaldi

United Italy. Now, in 1860, revolution burst out and red-shirted volunteers led by the patriot Giuseppe Garibaldi (1807–82) captured Sicily and Naples. When, on February 18, 1861, Victor Emmanuel assumed the title of king of Italy (Victor Emmanuel II), the Two Sicilies were absorbed into his new realm. He allied himself with Prussia against Austria in the war of 1866 and thus gained the province of Venetia. Rome, after a show of resistance, surrendered to his army (1870) and in 1872 was declared the capital of a united Italy. Extraterritoriality was granted to the papacy for St. Peter's, the Vatican and Lateran palaces and the papal residence at Castel Gandolfo. There remained also the little Apennine community of San Marino, smallest of the world's republics, an enclave with its own grand council.

Irredentism. Victor Emmanuel was succeeded in 1878 by his son Humbert I. In that year the Irredentists began to be active. These were partisan groups formed for the object of achieving the incorporation with Italy of regions near the Italian border and having large Italian-speaking populations—such as Trieste and Trento. The term *Italia irredenta* (Italy unredeemed) was used in this connection. Popular disappointment because Italy had not shared in the plunder resulting from the Russo-Turkish war of 1877–78, whereas Austria gained the protectorate of Bosnia-Herzegovina, was the moving cause. Irredentists were eventually kept under police surveillance, and the ferment died away as steps were taken toward the Triple Alliance. This alliance with Germany and Austria was concluded in 1882 and by renewals continued until 1914. Internal reforms were in progress from 1881 to 1887.

Colonial Expansion. The year 1882 saw the beginnings of a colonial policy when the bay of Assab, on the African side of the Red Sea, with a neighboring island and adjacent villages, was permanently taken over. In 1885 Beilul and Massawa were occupied, and subsequently the zone around Massawa was increased. These maneuverings were observed by John, Negus of Abyssinia, with a not unjustified suspicion. Hostilities followed, and in 1887, near Dogali, a small Italian force was destroyed with the exception of one man that escaped. In 1889 a treaty was signed with Menelik, King of Shoa and one of two claimants to the Abyssinian throne, whereby Italy recognized Menelik as emperor of Ethiopia, and Menelik recognized the Italian colony, which in 1890 was named Eritrea. When Menelik found that Italy was pleased to construe an article of that treaty as virtually making Abyssinia an Italian protectorate, he denounced the instrument.

At home the question of the temporal power of the papacy was brought forward and became the topic of long discussions that reached no understanding. There were threats that the papacy might withdraw from Rome altogether. In 1889 a popular movement placed a statue of Giordano Bruno (*c.* 1548–1600), philosopher of the Renaissance, in the Campo dei Fiori, where he had been burned at the stake. Local conditions in Sicily had produced widespread discontent, and clubs or groups known as *fasci* (bundles) were formed among the peasants and workmen. Rioting occurred, and the *fasci* were suppressed. Meanwhile Menelik, in view of continued Italian encroachments topped by an expedition to occupy Tigré, determined to assert his status as an independent ruler. In 1896 at Aduwa he won a decisive victory over the Italian force. The Italian cabinet resigned, and a treaty was ratified with Menelik by the terms of which his independence was recognized and an indemnity was paid. In 1898 there were bread riots, especially at Milan, where barricades were thrown up, and a state of siege was declared. King Humbert was shot by an anarchist at Monza in 1900 and was succeeded by his son Victor Emmanuel III. From 1904 to 1907 labor troubles were much in evidence among dock hands, farm laborers and industrial workers. An earthquake, the greatest recorded disaster of its kind, in 1908 shook southern Calabria and eastern Sicily, destroying Reggio and Messina (where a tidal wave added to the calamity). Austria's unwise treatment of its Italian subjects (as, for example, in compelling Italian-speaking students to attend German-Austrian universities) and Austrian activities in the Balkans culminating in the annexation of Bosnia tended to weaken popular support of the Triple Alliance. The war with Turkey in 1911–12 resulted in the annexation of Tripoli by Italy and the colony of Libya was established.

The World War. Italy finally joined the Allies in the World War, though not until May 1915, and even then declared war on Austria only. War against Germany, Italy's other partner in the old Triple Alliance, was not declared until about a year later. To Allied success Italy did not greatly contribute. Goerz (Gorizia) was taken in 1916, and a line of mountain warfare was established and held in the Dolomite Alps along the frontier between northeastern Italy and Austria. As a result of the war Italy received Trento and Trieste; and in 1924 Fiume became definitely Italian.

Fascism. As in other countries, high prices and unemployment marked the years immediately following the war. There was recurrence of the unrest that often had troubled Italian statesmen and that had led, especially in the decade prior to the war, to heavy emigration. A journalist named Benito Mussolini, previously of radical views, organized a movement called *Fascismo,* whose members, mostly younger men, were known as *fascisti* or (from their garb) *Black Shirts.* Here, as once before in modern Italian history, we encounter "bundles"—the *fascisti* having for a symbol the *fasces* or bundles of birch rods with an axe bound to them carried before Roman magistrates as an emblem of office. On October 30, 1922, a column of Black Shirts marched on Rome, demanding the resignation of the cabinet. The king deemed it advisable to send for Mussolini, whom he made premier and asked to head a new government. By means of his Fascist party, the new premier throttled the parliamentary order (with senate and chamber of deputies) that previously had existed under the monarchy. Parliamentary elections came to consist of votes of approval of lists of candidates selected by the Fascist general council. In 1934 even this gave way to a national council of corporations, to govern Italy as a totalitarian state of the corporate pattern. The members represent the councils of corporations, in which delegates of workers meet with delegates of capital and Fascist members hold the balance of power. Each of these corporations directs its special branch or field of national life. The monarch grew increasingly to be a figurehead, as Mussolini took the title Il Duce (leader). The government became of the sort imposed by Napoleon on his viceroy Eugène Beauharnais.

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Benito Mussolini

On October 30, 1922, Mussolini directed the march on Rome and presented Victor Emmanuel III with his list of cabinet members which was immediately accepted by the king. Mussolini named himself premier. The march on Rome was the climax of the early activities of the Fascists, the conservative nationalistic group organized by Mussolini in 1919 to oppose socialistic and communistic tendencies and to strengthen the national government. After Mussolini's appointment as premier he strengthened his party and his own powers and embarked upon a campaign of empire building and internal construction—building roads, bridges and dams and restoring ruins

Conquest of Ethiopia. In 1935 a border encounter was made the excuse for an invasion of Ethiopia. While the League of Nations debated at Geneva an appeal laid before it by the Negus Haile Selassie, Mussolini sent more than 300,000 well-equipped troops into Ethiopia. Though Ethiopia was unprepared for resistance and, owing to restrictions forced on it by the Powers, most inadequately armed throughout, it maintained a courageous defensive. It was not until May 1936 that the Duce, having recalled one commander in chief and made drastic use of the resources of modern warfare, was in a position to announce the conquest of Ethiopia and hail the Italian king as its emperor. This conquest impaired the influence of the League of Nations. In 1941, during the Second World War, English victories in Ethiopia brought about the return of Emperor Haile Selassie to the throne.

Rome-Berlin Axis. A settlement of the *Roman question* was brought about when in 1929 the Lateran treaty was signed and ratified. This created the state of Vatican City, with the supreme pontiff as its sovereign. Mussolini and Hitler of the German Reich were frequently united in matters of foreign policy, thus establishing what journalists styled the *Rome-Berlin axis.* Both were in favor of the rebel cause in the Spanish civil war. In 1937 the Italian foreign office announced that 40,000 Fascist soldiers were in Franco's army. Under Mussolini's tutelage, imperialism grew apace. Mussolini's sabre-rattling speeches before vast outdoor audiences were greeted with tremendous cheers. He revived the old Roman notion of the Mediterranean as *mare nostrum* (our sea). Military courses were made a compulsory part of public education. Even boys of from 4 to 6 were enrolled in that division of the Fascist "youth organization" known, with a slant at Romulus and Remus, as *figli della lupa* (sons of the wolf). In 1940 Italy entered the Second World War on the side of Germany, just before the conquest of France, when it appeared England would quickly ask for peace. See World War number 2, page 805c.

Jacobins, a political party during the French Revolution, originally the members of a club or society that met in the Jacobin convent in Paris. In the early stages of the Revolution (1789–92) the Jacobins represented sentiment favoring moderate republicanism. After the assembling of the National Convention, the Jacobins became the party of extreme radicalism; the Girondist purge early in 1793 placed the Jacobins in supreme control. The most famous Jacobin leader was Robespierre; upon his execution (July 1794) the Jacobin party was broken up.

Japan, an island empire off the east coast of Asia with territory on the mainland, one of the great military powers, an Oriental nation with a long history and many old traditions that has become a world power in the last few generations. Japanese history goes back to a mythical period. The ruling family claims descent from the gods. Jimmu Tenno, as founder, established himself in Japan in 660 B.C. according to the traditions of the nation.

There were two types of people in early Japan. The conquerors overcame the native Ainus, of whom a remnant—short, thickset and hairy people—still occupy their ancient home in the northern part of the islands. The conquerors at first were divided into three groups—the Tsukushi, the Idzumo and the Yamato. In time the Yamato clan controlled the other two, but the groups intermarried and gradually merged into a united Japanese nation. The early emperors had never had a fixed capital; when an emperor died, the royal residence of the succeeding monarch was at once moved to a new palace, built at a distance. Up to the year 794 Japan had about 60 capitals. In 794 the capital was located at Kyoto, and it remained there until 1868. Then it was moved to the more important town of Yedo, renamed Tokyo, where it still remains.

In the year 552 Buddhist missionaries entered Japan from Korea. As Korea was then Chinese, there came with the missionaries the language, mode of writing, customs and the arts of the mainland. Teachers, skilled workmen and learned men also followed the religious pioneers. In 621 Buddhism had been spread so effectively by the missionaries that it was declared the state religion.

Early Japan was a feudal state. Actual power was in the hands of leading families, but they found it convenient to uphold the prestige of the emperor and still prevent him from taking an active part in affairs.

Courtesy Japan Tourist Bureau

Miyajima, Japan, a Shrine Built Over the Water

The buildings of these Shinto shrines are all connected by broad corridors or galleries that stretch over the sea. When the tide is coming in, the whole edifice seems to be floating on the water. Rising out of the sea to a height of some 53 feet can be seen a huge *torii* (gateway)

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Japanese Actor as a Samurai

The samurai were a hereditary warrior caste who played a ruling part in Japanese life from the middle of the 10th century until the latter part of the 19th century. In the year 1871 conscription was introduced into the army to take the place of hereditary military service, and the samurai, who had held a life-and-death power over the commoners, lost their rank and privileges. The samurai had a code of chivalry corresponding to that of medieval knighthood: each was pledged to benevolence, helpfulness and honor. The word of a samurai was considered inviolate, and his acknowledgment of debt began with the words: *You can shame me in public if I fail to pay.* Public shame or the cutting of his hair was the greatest disgrace to a samurai. His two swords were a sign of honor; the long one was used for actual combat, the short one for beheading an enemy after death or for suicide if faced with defeat. The samurai were known also for their skill in elaborate forms of swordsmanship. The lantern, bearing the family crest, was carried by all Japanese. In unlit streets, the face of anyone abroad at night could not be seen, but the candle lighting up the crest identified the bearer

Internal Strife. For centuries civil wars filled most of the pages of Japan's history. The seclusion of the emperor made it possible for the rival clans to pursue their aims without serious interference from the throne. In 1167 one Kiyomori, chief of the Taira clan, became premier. He married his daughter to the emperor in order to entrench himself in power. For 14 years he met the assaults of enemy clans, but in 1185, 4 years after his death, his clan was annihilated. The strife between the civil and the military powers took on a new aspect with the defeat of the Taira clan and the predominance of their enemies, the Minamoto clan. The civil government was left at Kyoto, but the military established headquarters at Kamakura in the east on Tokyo Bay. The leader of the Minamoto, Yoritomo, received the title of *shogun* or military governor.

The first Europeans to enter Japan were Portuguese in 1542. This led to intercourse with Europe and to the introduction of firearms. Christianity was introduced by Francis Xavier in 1549, and in 1582 the missionaries reported 150,000 converts in all. In 1593 a party of Spanish missionaries arrived. They quarreled with the Portuguese Jesuits. This dispute led to official Japanese action against the missionaries. War was declared against Christianity, and a policy of exclusion of foreigners was put into effect. The period that followed was marked by a strong national spirit that greatly advanced literature and art; and the only foreign influence was Dutch and was limited to commerce and trade.

Contact with the United States. In 1853–54 occurred an incident that led Japan to change from a medieval empire to a powerful modern nation. The exclusion policy forbade alien vessels to enter any Japanese port, but Commodore Perry of the United States Navy sailed to Japan and anchored his squadron in Tokyo Bay. He delivered a friendly and conciliatory letter from the United States Government asking for a commercial treaty and sailed to China. He returned the next year and found the Japanese willing to discuss a treaty of peace and friendship. The treaty was signed 6 weeks later and the modernization of Japan was begun. In 1860 a Japanese delegation visited the United States, and in 1861 official Japanese commissions visited European capitals.

There was much internal struggle in Japan between conservative and liberal elements, and the power of the shogun (army chief) grew less and that of the emperor grew greater. French officers were called to Japan to reorganize the army; British seamen were invited to build up the navy; Americans set up a modern educational system; Dutch engineers designed internal improvements. In 1889 a Constitution was adopted, a parliament was established, and Japan became in theory a constitutional monarchy; but the military group remained the strongest factor.

War with China. In 1894 war was declared against China over affairs in Korea, where the Japanese had gone in large numbers and were protesting against the treatment they were receiving. China was quickly defeated; the victors took Formosa and the Pescadores, between Japan and Formosa. These were the first additions to Japanese territory. In 1910 Japan formally annexed Korea as a part of its empire and renamed it *Chosen*.

The Russian Defeat. Population in Japan had grown rapidly, and new homes had to be found on the Asiatic mainland to relieve overcrowding. There was a stream of emigration to Korea and to the Chinese Province of Manchuria. Russia's interests in the Far East ran counter to those of Japan. Russia threatened to take Manchuria, fortified Port Arthur and thus threatened Korea and tried to extend her influence in Korea. Japan declared war in 1904 and another Japanese victory was scored. The southern half of Sakhalin Island was ceded to Japan by Russia. Russia agreed to withdraw from Manchuria, leaving it under Chinese control, and to stop Russian activities in Korea.

Japan in the World War. The World War found Japan enlisted on the side of the Allied nations. Japanese troops took no part in the campaigns in Europe but did help to take Germany's territory in China. At the close of the war Japan was accepted as one of the five great world Powers and received a mandate over former German islands north of the equator.

Annexation of Manchuria. In 1931 there were about 200,000 Japanese residents in Manchuria. On the pretext of protecting their interests, a Japanese army was sent there and in a 60-day campaign took the entire province of more than 200,000 square miles, containing 30 million people. This clearly meant to China the loss of Manchuria, and resentment was bitter. An economic boycott of Japan was decided upon by the Chinese in Shanghai, the chief commercial city, and this gave Japan an excuse for attacking Shanghai. In the early days of 1932 Japanese troops, warships and an aerial fleet attacked the city. Inferior Chinese forces put up a stubborn defense but finally had to give way. The native section of Shanghai was completely destroyed, and the country for several miles around was laid waste.

Meanwhile the United States had proclaimed to the world that it would recognize no claim that Japan might make with respect to the conquered province, and the League of Nations adopted the American attitude. However, Japan ignored all protests and made Manchuria into a Japanese province, although it is technically an independent nation, renaming it Manchukuo. Henry Pu-yi, who had been the child emperor of China at the time of the overthrow of the Manchu dynasty, was established as president and in 1934, under Japanese auspices, was crowned as emperor of the new nation.

At the coronation Pu-yi's name was changed to Kang Te. This conquest developed the power of the military party, and in 1936 an uprising against the Cabinet resulted in murders of officials and the establishment of martial law. A new Cabinet formed, dominated by the militarists. Meanwhile Japan had quit the League of Nations because it criticized her seizure of Manchuria. Japan then continued aggression against China in the Jehol district.

Invasion of China. Apparently determined to dominate all eastern Asia, in July 1937 Japan launched a determined attack on China. The Japanese military machine functioned with its usual efficiency; there was wholesale slaughter of Chinese troops and civilians, and 3 months later the Japanese had possession of Shanghai. Shortly afterward they controlled much of North China. On Dec. 7, 1941, Japan attacked the United States at Pearl Harbor, joining Germany and Italy in the war. See World War II, p. 805.

Latvia, a republic on the Baltic Sea in northern Europe. The Letts and the Lithuanians, now occupying neighboring countries, are of the same racial stock. They have occupied their little corner of the European continent since earliest recorded European history, but the Letts remained a purer blood race, for the Lithuanians mixed largely with Germans and Finns. There was trade with the Letts in ancient times, for Phoenician and Roman coins have been found in their soil. They never had a country of their own until after the World War. Until about 1560 they were under German rule. The southeast Baltic area was then divided among Denmark, Sweden, Lithuania and Poland. When Poland was dismembered in 1795, what is now Latvia was taken by Russia.

The new Government of Russia, after the 1917 Revolution, did not object to the erection of new states on its western border, in conformity with the idea of "self-determination of peoples." Germany tried to put a German prince upon a Latvian throne, but one week after Germany's defeat the Latvian Republic was proclaimed (November 18, 1918). In 1920 peace was signed by Russia, Germany and Latvia acknowledging Latvia's independence. Thousands of Letts returned to their homeland from Russia and Poland. Latvia joined the League of Nations in September 1921. A constitution was adopted in 1922. In 1935 Premier Karlis Ulmanis dissolved Parliament, proclaimed martial law and set up a dictatorship. In 1940 Russia made Latvia a part of the Soviet.

Lepanto, a great naval battle fought off the coast of Greece on October 7, 1571, between the Spanish and Italian fleets under Don John of Austria and a Turkish squadron under Ali Pasha. The Turkish force was almost entirely destroyed, and the naval power of the Ottomans that had been threatening to convert the whole Mediterranean into a Turkish lake was shattered so badly that it never again became formidable to the Christian Powers. "There was a man sent from God whose name was John," exulted Pope Pius V when the news of the great victory reached Rome.

G. K. Chesterton's poem, *Lepanto,* should be read by all who wish to feel the atmosphere that surrounded this "Last Crusade."

Lewis and Clark Expedition, a military exploring expedition of what is now the northwest section of the United States. When President Thomas Jefferson purchased the Louisiana Territory from France in 1803, there was a general desire to learn something of the character of the new possession. Jefferson appointed his private secretary, Meriwether Lewis, to head an exploring expedition, and the latter chose his friend, Captain William Clark, to accompany him as second in command. With a company of 45 they started from a point now St. Louis on May 14, 1804. The course of the Missouri River was followed for 1,600 miles, when in October the party halted for the winter. In the following April the expedition continued on its westward course; the Rocky Mountains were first seen in May 1805 and on November 7 the Pacific Ocean was reached. Progress had been slow, because of the necessity of making maps and surveys all along the route. Incredible hardships were borne unflinchingly. The return trip, over the same route, was more easily made, as the party floated downstream on the Missouri, and St. Louis was reached September 23, 1806. The total distance traveled was about 8,500 miles. Exhaustive reports were made to the President and to the Congress. By passing through the Oregon country, which was not included in the Louisiana Purchase, Lewis and Clark established on behalf of the United States a claim to that important territory. The services of the members of the expedition were appropriately recognized. Lewis and Clark were given large tracts of land, and other associates were allotted smaller tracts. Lewis was made governor of the Louisiana Territory; Clark was appointed to the territorial militia with the rank of general and was made Indian agent in the Louisiana domain.

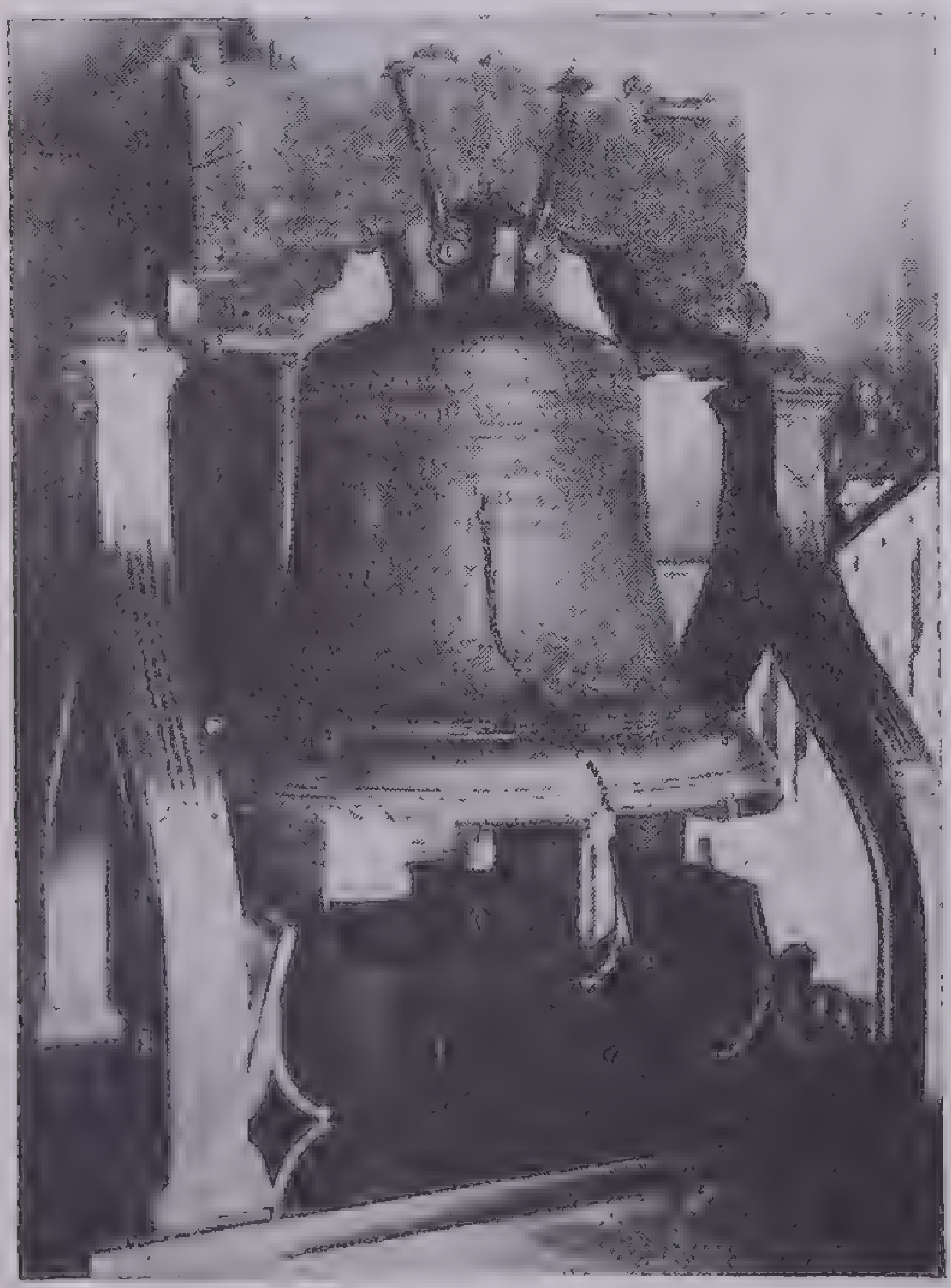
Liberation, War of, the name given by the Germans to the national uprising against Napoleon in 1813–14 that resulted in the freeing of the German states from French occupation and influence. Following Napoleon's invasion of Russia and the virtual destruction of the *Grande Armée* in the fall and winter of 1812, Czar Alexander I led an army over the Niemen into Germany, proclaiming that he had come to liberate Europe from Napoleon's despotism. On March 17, 1813, the King of Prussia, Frederick William III, summoned his countrymen to arms in the famous manifesto *An mein Volk.* The patriotic movement that had been stirring all Germany under the leadership of Baron Stein now burst out in flame, and the whole nation rushed to war with wild enthusiasm. On October 16–18, 1813, was fought the great Battle of Leipzig, in which Napoleon was decisively beaten by a combined army of Prussians, Russians, Austrians and Swedes.

Liberia, a Negro republic on the west coast of Africa. It was founded as a homeland for former slaves. In 1816 the National Colonization Society of America was established to set up the new state. The first emigrants left the United States in 1820, intending to locate on a harbor south of Sierra Leone, but the climate was found unhealthful and the local attitude not friendly, for there was a flourishing slave trade all along the coast. The promoters then made a treaty with native black rulers a little south of the original point of landing. Each person in the new colony received 30 acres for cultivation. Great difficulties and extreme hardships were encountered. A few Negroes returned to the United States with the agents of the society, but the majority remained.

The population of the colony increased by immigration and by assimilation with local tribes. New settlements were established. In 1847 most of the assistance and encouragement from the outside were withdrawn. The Liberians then felt strong enough to organize a stable government, and in 1847 they established a republic with a system modeled on that of the United States.

The country still is but little developed. The Firestone Rubber Company opened plantations in Liberia in 1926. In 1931 the League of Nations proved charges of slavery there; this resulted in a wholesale governmental upset. The United States controls Liberian customs, and an international control of the whole country is under consideration.

Liberty Bell, one of the most revered relics of the Colonial period in the United States. It was made in England in 1752 for the Pennsylvania State House, but in transit to the colonies its tone was injured through accident, and it was recast in Philadelphia in 1753. At that time around its upper surface were cast the words, "Proclaim liberty throughout all the land unto all the inhabitants thereof" (*Leviticus* 25:10), a quotation singularly prophetic, as it was destined to perform that service for a new nation. On July 8, 1776, it was rung to summon the people of Philadelphia to listen to the first public reading of the Declaration of Independence. During the Revolutionary War, when the British were in possession of Philadelphia, the bell was sunk in the Delaware River, to be restored later to the tower of the State House, known as *Independence Hall.* When the bell was tolled during the funeral services for Chief Justice Marshall, on July 8, 1835, it was so badly cracked that it has never been rung since. Iron supports have been riveted around the inside to prevent further cracking. Since 1854 the bell has stood on a pedestal inside the front entrance to the Hall, facing the small park that is Independence Square, where it is viewed by hundreds of people every day; and it has been exhibited at expositions and World's Fairs and along the route—always with great enthusiasm.



Underwood & Underwood

Liberty Bell

Libya, a North African Italian colony that includes the former state of Tripoli. In ancient times Carthage possessed the Libian coast; when Carthage was destroyed, Libya fell to Rome. During the next 1,000 years it had no history of note but was successively in the hands of the Vandals, Greeks and Arabs, becoming a Mohammedan stronghold. In the 16th century it fell to the Turks. In 1804 the pirates of Tripoli and neighboring states became a great menace in the Mediterranean. The United States sent Commodore Decatur there with a fleet; he routed the pirates and made it possible for shipping to operate normally in the Mediterranean.

In 1835 the Turks deposed the king of Tripoli and Turkish authority became absolute. Italy won a short war with Turkey in 1911 and took possession of Tripoli. It has become an outlet for overcrowding in the homeland. The Italian administration divided the country into two provinces, Tripolitania in the west and Cirenaica in the east. Both are on the Mediterranean shore.

Licinian Rogations, a group of proposals for settling the long strife between the patrician and plebeian orders and introducing necessary social reforms in the ancient Roman Republic, first offered by the tribunes, Caius Licinius Stolo and Lucius Sextius Lateranus, about 377 B.C. and finally enacted into law after 10 years of agitation. The Licinian-Sextian Laws provided:

1. One of the two consuls (the highest executive magistrates) must be a plebeian.
2. Interest already paid on debts should be deducted from the principal, and the balance of the debt paid in three annual instalments.
3. No person should be allowed to occupy more than 500 jugera (about 300 acres) of public land.
4. No person should be allowed to pasture more than 100 cattle or 500 sheep on the public land.

The Licinian-Sextian Laws mark a turning point in Roman constitutional history comparable with the great Reform Bill of 1832 in England. In the later republic, especially after the Second Punic War (218–202 B.C.), the provisions regarding the public lands were disregarded, and the growth of great estates worked by slaves with the consequent impoverishment of the mass of the people became one of the main factors in the decline of the republic's stability and strength.

In the patrician-plebeian strife the Licinian-Sextian Laws stand for the decisive victory of the plebeians; after the passage of the laws the patricians rapidly lost their special influence and position, and by 300 B.C. the patrician-plebeian distinction was no longer of any political or social importance.

Liechtenstein, a small principality of central Europe between Austria and Switzerland. It has an area of only 65 square miles. Until the Seven Weeks' War (1866) between Austria and Prussia, it was a member of the German Confederation of the Rhine. After that Liechtenstein was practically a dependency of Austria and continued so until after the World War. On November 7, 1918, Liechtenstein declared its complete independence. In 1920 it arranged a treaty by which Switzerland administers its postoffices and telegraph; and in 1923 Liechtenstein and Switzerland entered into a customs union.

Lithuania, a small European country on the Baltic Sea. The people of Lithuania are racially akin to the Letts of Latvia. Although the Letts never had an independent government until 1918, the Lithuanians were self-governing in the 13th century. In 1386 the reigning Grand Duke Jagello married the Polish Queen Hedwig. After that the two countries formed a political union, although Lithuania's influence was a minor one.

When Poland was divided among the Powers in 1795, most of Lithuania fell to Russia. It continued to be a Russian province until after the Russian revolution during the World War. In February 1918 a Lithuanian republic was proclaimed, though boundary-line disputes between Poland have not yet been settled. The new Government's chief work has been to introduce modern thought and devices into a land that had been kept more or less primitive by the indifference of Russian autocracy. In 1923 Memel and its territory was detached from East Prussia and was given to Lithuania by international authority rising out of the Treaty of Versailles. It is Lithuania's only seaport. Memel had been a sore spot ever since, for Germany regarded it as rightfully hers. In 1939 the German Government took over Memel and fortified it.

In 1938 a serious European crisis was precipitated by an ultimatum addressed by Poland to Lithuania. Lithuania, unable to secure any support among the great Powers, capitulated to the Polish demands and war was averted. While the Second World War was in progress, Lithuania was made a part of the Russian Soviet.

Little Entente, a series of agreements signed in 1920 by Poland, Czechoslovakia, Yugoslavia and Rumania, by which they pledged united action to uphold their liberties and to support France against Germany. The Little Entente put itself on record as opposed to a political union of Germany and Austria, as such action would establish a strong power so near their own borders that their safety would be jeopardized. The solidarity of the Little Entente began to be undermined after the Nazi party obtained power in Germany. Germany reached an understanding with Poland and began to exercise increasing influence in the lower Balkan nations, particularly Rumania. The inactivity of the Little Entente at the seizure of Austria by Germany in

1938 indicated to most observers that its political importance was nearly ended.

Locarno Conference, a meeting of representatives of seven of the great Powers of Europe at Locarno, Switzerland, in 1925, at which were signed treaties intended to insure peace in Europe. These were: (1) A Rhineland Security Compact that provided that France and Germany should never again take up arms against each other; that Germany should join the League of Nations; that there should be a neutral Rhine zone where the zone touches Belgian, French and German soil; that the frontiers between France and Germany should be guaranteed by Great Britain, France, Belgium, Germany and Italy.

(2) Arbitration agreements between Germany and France, Germany and Belgium, Germany and Poland, Germany and Czechoslovakia.

The Pact of Locarno was widely hailed as marking the first definite break in the after-war bitterness of Europe, and it was thought that further settlements of European problems in the "spirit of Locarno" might ultimately lay the ghost of the World War and open a new era. Later events disappointed these high hopes. The German occupation of the Rhineland in March 1936 struck a nearly fatal blow to the Locarno Pact, and the war psychology of the Europe of 1938 shows that Locarno, like many treaties of the past, has become a mere "scrap of paper."

Lollards, the followers of John Wycliffe's religious reformation in England in the late 14th and early 15th centuries. The Lollard movement was political and social as well as religious and drew its chief support from the suppressed and poverty-ridden peasantry. In religious teaching the Lollards anticipated many of the ideas of Protestantism a century and a half later, condemning the use of images in churches, the temporal power of the clergy, ecclesiastical decorations, the ceremony of the mass and pilgrimages to the tombs of the saints. In 1401 a special statute for the suppression of the Lollards was adopted, and during the 15th century they were severely persecuted.

Luxemburg, one of the smallest countries on the Continent (999 sq. mi.). It was first a political entity as a province of the Holy Roman Empire. In 1354 it was made a grand duchy of Germany with a grand duke as ruler. The ambitious state of Burgundy, between Germany and France, took it in 1443; and, when Burgundy was swallowed up, it fell to Spain but was soon again attached to Germany by the Treaty of Utrecht at the end of the War of the Spanish Succession.

The Congress of Vienna, called in 1815 to reorganize Europe after the wars of Napoleon, again gave to Luxemburg the status of a grand duchy and made it a part of the German Federation. In 1831, when Belgium became independent, the grand duchy was divided between Belgium and Holland. Holland's share comprised little more than the capital city, Luxemburg, but 8 years later Belgium ceded more territory and the combined area was placed under the control of the Netherlands.

After the Seven Weeks' War (1866) the Netherlands wished to sell Luxemburg. Germany interposed, and an international conference in London the following year made Luxemburg an independent state, the other Powers guaranteeing it protection and neutrality. Its grand duke continued to be a Netherlander until the reigning house ceased to exist, when the throne fell to Adolphus, Duke of Nassau, a German, who assumed the title Grand Duke of Luxemburg. Regardless of the neutrality guaranteed by the Powers, Germany's armies marched into and through the country at the beginning of the World War, and overran it for some time. After the war local political reforms were instituted, including universal suffrage. During the Second World War, in 1940, Germany, contrary to her treaty, again overran Luxemburg just prior to the invasion and conquest of France. The rulers fled with their families.

Lydia, an ancient kingdom in Asia Minor bordering on the Mediterranean Sea. Its story connects the age of myths with the facts of history. Nobody knows who its early inhabitants were; they may have been Aryans from central Asia or of Semitic descent, as the names of some of their kings suggest. There was mineral wealth in the land, particularly gold in the bed of the Pactolus River. The people received the alphabet from the Greeks, who got it from the Phoenicians, and in turn the Lydians gave the Greeks some of their ideas on religion. The greatest and the last of the kings of Lydia was Croesus, whose name is still a synonym for wealth. He was overthrown in 546 B.C. by Cyrus the Great, and Lydia became a Persian province. In later times the Greeks, the Romans and the Saracens occupied it, and at last Turkey in 1413. It remained in Turkey's hands as a part of Anatolia, which constitutes most of the modern republic of Turkey.

Macedonia, an ancient land of uncertain territorial limits, lying northeast of Greece and fronting on the Aegean Sea. Not much is known of the Macedonians before 480 B.C., when they were conquered by Persia and compelled to assist Xerxes in his invasion of Greece. After the Persian defeat in 479 B.C., Macedonian independence was restored. The civilization of the country developed after the Greek pattern and reached a high state before the accession of Philip II in 359 B.C. He became powerful enough to put Greece under his control. His son Alexander the Great not only held his ascendency in Greece but put more than half of the known world under his dominion. At his death, Macedonia fell to Antipater, one of Alexander's generals. Strong control ceased at this point, for one war succeeded another until finally Macedonia was subjugated by the Romans in a series of wars ending in 146 B.C. When the Roman Empire was divided, about 395 A.D., Macedonia became a part of the Eastern Empire, and eventually, in the 15th century, it fell to the Turks. The character of the population had in the meantime undergone a complete change; it was now mainly Slavic. Turkish dominion brought a long period of repression; the sympathies of the entire world were aroused. Several times the Powers intervened to stay the heavy hand of the Turk, but not until the Balkan War of 1912 wrested control from Turkey did relief reach the people. Macedonia was then divided among Greece, Bulgaria and Serbia.

Manchukuo, a state organized under Japanese tutelage from the former Chinese Province of Manchuria. Its independence from China was proclaimed February 18, 1932. A League of Nations commission headed by the Earl of Lytton reported that Manchukuo's alleged revolt from China was merely a pretext for the setting up by Japan of a puppet state; and the commission recommended that an autonomous government be established free from Japanese control. Japan, however, ignored the protests of the League and continued its policy of maintaining complete control of the Manchukuoan Government although the Japanese Government still adhered to the legal fiction that Manchukuo was an independent state.

Marathon, a great battle fought in 490 B.C. between the invading Persians and the Greeks (Athenians and Plataeans). The plain of Marathon is on the east coast of Attica about 18 miles northeast of Athens. The Persian forces, supported by their fleet, occupied the plain near the shore; the Greeks were drawn up on the low sloping hills rising from the plain. The Greeks numbered perhaps 10,000; the Persians were much more numerous but probably did not amount to the 110,000 that ancient tradition states. Owing chiefly to the skilful tactics of Miltiades, the Greek commander, and to the superior discipline and élan of the Greek troops, the Persians were thoroughly routed. The Greeks attempted to set fire to the Persian fleet and thus cut off all escape; but the Persians fought desperately and succeeded in getting to sea with only a small loss. Herodotus gives the losses in the battle as 192 for the Greeks and 6,400 for the Persians.

The victory broke up the first Persian attempt to enslave Greece and inspired the whole Hellenic race with new confidence. It is not too much to say that all Greece means in art, philosophy and poetry, all Greece has contributed to modern civilization, was made possible by the Battle of Marathon.

Marne, the series of battles along the River Marne in northern France (September 5-8, 1914), between the German I and II Armies of the right wing advance into France and the French and British armies. After 4 days of furious and bloody fighting the German front was broken through, necessitating a general German retreat. The Germans fell back to prepared entrenchments along the Aisne River, and as a direct outcome of the Marne battle the war in the West was converted from a war of free maneuvering to a deadlock in impregnable entrenchments.

The defeat on the Marne broke up the whole German plan for winning the war; Paris, which a few days earlier had seemed doomed, was safe. The war settled down to what was essentially a long-siege operation in which ultimate victory had to go to the side that commanded the greatest total resources. Although the Allies did not win the war with the Battle of the Marne, it can be said that Germany lost it.

Mason and Dixon's Line, a line surveyed between 1763 and 1767 by two English surveyors whose names it bears, separating the states of Pennsylvania and Maryland. The survey was made to establish the boundary between William Penn's Pennsylvania and Lord Baltimore's Maryland, regarding which there had been dispute. The line would have no added historic significance had it not marked later, with extensions east and west, the approximate line of division between the slave and the free states of the Union. The surveyors marked it with milestones; one side of each have the letter *P* and the other the letter *M*. Every fifth milestone contained the sculptured arms of Penn and Baltimore. Eventually nearly all the stones were stolen, to serve as foundation stones for buildings, doorsteps and the like, but many were later recovered and restored to their positions.

Media, an ancient land that is now the northwestern part of Persia. The inhabitants, the Medes, were allied to the Persians in religion and language. Media was a vassal province of Assyria from 811 B.C., but shook off the Assyrian yoke about 708 B.C., and the Medes made Ecbatana their capital. The site of this ancient city is now believed to be that of the modern town of Hamadan, where are the reputed tombs of Mordecai and Esther. The most famous of the Median kings was Cyaxeres, who reigned about 40 years (625–585 B.C.). In league with Nabopolassar, King of Babylon, he conquered Assyria in 604 B.C., and extended their power westward to the Mediterranean Sea. Media held Persia in subjection until 549 B.C., when Cyrus the Great conquered it, and Persia became the mistress rather than the vassal; this event marked the beginning of the greatness of the Persian Empire.

Merovingians, the line of Frankish kings who first governed Gaul after it was taken from the Romans. Clovis, the first powerful Merovingian monarch, in 486 took advantage of the dying Roman Empire to give battle for possession of Gaul. He gained a decisive victory. Clovis was the only important king of the dynasty. He divided his dominions among his four sons, and decadence set in. Ambitious officers finally pushed the last Merovingian from the throne, and in 752 the Carolingian line was established.

Metaurus, a battle fought in 207 B.C. near the Metaurus River on the northern Adriatic coast of Italy between the Roman legions under Livius Salinator and Gaius Claudius Nero and a Carthaginian and Gallic army under Hasdrubal, brother of the great Hannibal. In the battle the Carthaginian invaders were cut to pieces, Hasdrubal himself was killed and the most dangerous crisis of the Second Punic War was successfully passed by Rome. If the Carthaginians had won this battle, it would have been impossible to prevent Hasdrubal from joining his brother Hannibal with heavy reinforcements, and although it may be too much to say that in that event the fate of Rome would have been sealed, it is hard to believe that even the courage and stamina of the Romans could have survived another assault of the sort Hannibal had inflicted in 218–216 B.C. when he had first appeared in Italy at the head of adequate forces.

There can be little doubt that the victory of Rome in her long life-and-death struggle with Carthage was the victory of modern civilization; however much we may admire the genius of Hannibal we must realize that the triumph of Carthage rather than Rome would have meant the ruin of all the best features of the Greco-Roman world. "He who grieves over the battle of Zama" (the battle in which Hannibal was finally defeated), "should carry his thoughts to a period 30 years later, when Hannibal must, in the course of human nature have been dead, and consider how the isolated Phoenician city of Carthage was fitted to receive and to consolidate the civilization of Greece, or by its laws and institutions to bind together barbarians of every race and language into an organized empire, and prepare them for becoming, when that empire was dissolved, the free members of the commonwealth of Christian Europe." So Thomas Arnold describes the issue that was really at stake in the battle of Metaurus.

Mexico, a Spanish-speaking republic southwest of the United States, had an existence shrouded in myths for about 600 years. During this prehistoric period it was occupied by a people called *Toltecs,* who apparently migrated to the country and settled north of the present City of Mexico about the year 754. About 50 miles from the present capital are ruins of two of their cities. After 300 years the Toltec power was overthrown, and these people moved south and east, establishing themselves in Guatemala, Honduras and Yucatan. Their conquerors were the Chichimecas, and they formed their main colonies not far from the volcano named Popocatepetl, close to the present City of Mexico. In time other tribes pushed in from the north and gradually disputed their rule. Chief of the newcomers were the Aztecs, who settled directly east of the present capital city, on the shores of Lake Texcoco, in what is now the state of Texcoco, probably in the year 1325.

The Aztec Period. The first authentic date in Mexican history is 1376, when the ambitious and intelligent Aztecs had reached a commanding position in the country. By intermarriage of their chieftains into neighboring tribes, by conquest of smaller tribes and by activity in establishing trade relations they eventually became supreme. They founded the city of Tenochtitlan, the present City of Mexico, and made it their capital. The name of the first really great ruler of the Aztec Empire was Montezuma II, who was chosen in 1502. After a peaceful rule of 17 years, Aztec supremacy was challenged by white adventurers from Spain who were searching for wealth. Their leader was Hernando Cortez, and his armed group comprised 700 of his countrymen. In 1519 he landed on the Mexican coast and founded the town of Vera Cruz. His men wished to go no farther, but Cortez burned his vessels so there might be no turning back and started for Tenochtitlan; his company knew that ahead of them was either victory or death. Cortez and Montezuma met in the latter's capital. Most reports agree that Montezuma received the visitors in a friendly manner, but when he protested against the Spaniards' assumption that they were conquerors, he was imprisoned by Cortez. Montezuma's brother and nephew rallied the Aztecs, and Cortez found it necessary to retire from the city. Montezuma was killed, possibly by Spanish orders while he was held a prisoner, as he was no longer an asset to his captors; and the defense of Tenochtitlan fell to his successor, Cuitlahuatzin. A memorable seige followed. The defense of the city was one of the heroic episodes of history; it lasted 3 months, but the superior arms and military strategy of the Spaniards triumphed. Cortez presented a new empire to his royal master, and it was named New Spain.

The Spanish Period. The conqueror assumed the role of civil administrator, but so many complaints against his rule reached Spain that he went home to justify his actions. Of more than 60 viceroys that succeeded him, not one was of historic importance; some were able men, and nearly all were of the Spanish nobility. The new country was held in loyalty without difficulty of a serious nature until Napoleon subjugated Spain during the Peninsular War (1807–14). There naturally ensued a chaotic condition in the government of New Spain, and in 1814 the people took advantage of it to begin a struggle for independence. Among their leaders Hidalgo, Morales and Guerrero are the best known.

One of the leaders on the side of Spain was Iturbide. He secretly favored the cause of the revolutionists and evolved a scheme to effect liberation of the country, known as the Plan of Uguala. This plan contemplated complete independence from Spain, with the proviso that a Spanish prince should be invited to occupy the Mexican throne. Although all parties agreed in principle to the proposal, no member of the royal house would consent to become king of the new and rough American state. The Mexicans then insisted upon independence, and in 1821 Spain was forced to give its assent.

Empire, then Republic. Iturbide, though a royalist, had given help of consequence to the independence movement, and in 1823 he was chosen first emperor. A strong faction refused to accept him, and his resignation was forced after a few months. The revolutionary leaders who had thus disposed of Iturbide maintained authority until the new Congress could be elected. That body in October 1824 proclaimed Mexico a republic. Then followed domestic discord and struggles for power on the part of ambitious men for more than 50 years. Two names deserve mention—Santa Anna and Bustamante. The former, a soldier as well as President of the Republic, figured in the war with the United States (1846–47) by which Mexico lost an empire in what is now the southwestern section of the United States.

Again an Empire. In 1857 a controversy arose over the sale of unimproved Church lands that led to what is known as the War of the Reform, in which Church and State were opposed. The president was forced into exile, and Benito Juarez became president (1860). He improved the administration of affairs, but precipitated a crisis when he decreed for 2 years the suspension of payments on debts owed in Europe. England, Spain and France were deeply affected by this order, and in 1862 sent an expedition to enforce orderly payments. The first two countries soon withdrew their forces. France then openly announced its intention to organize an empire, and defeated all opposition. In July 1863 Mexico was proclaimed an empire, and Maximilian, Archduke of Austria, was invited to become its emperor. He accepted on condition that the action of the Assembly of Notables, which had chosen him, be approved by the people. Because the army of France could exert pressure, an affirmative vote was recorded. Maximilian entered Mexico in May 1864 and established his court at Chapultepec, close to the capital city. He faced at once a condition of great disorder. He sought to rule wisely and to win the support of his new subjects, but they were restrained from violence only by a display of force by the French army under Marshal Bazaine. The United States had been engaged in the Civil War during these years of French ascendency in Mexico. After that war ended, the American Government applied the Monroe Doctrine to the situation; it bluntly told France that its intervention in affairs on the American continent would not be tolerated, and Emperor Napoleon III ordered the withdrawal of his army from Mexico.

As soon as Maximilian was informed of the French intent, he declared he would abdicate the throne, but was dissuaded by the Church party and the royalists. The patriot party, headed by Juarez, organized their forces on the departure of the French troops. To assure his personal safety, the emperor left the capital for an armed camp and a siege of the City of Mexico began in March 1867. It ended in May in a victory for the revolutionists; Maximilian was captured, tried by court-martial and shot June 19, while his wife, the youthful Empress Carlotta, was in France urging Emperor Napoleon III to continue protection to the Mexican throne.

The Second Republic. Within a month Juarez was again in power, busily engaged in reorganizing the republic. He asked the old Congress to call an election for president; as no choice was recorded, the Congress confirmed his continued occupancy of that office, and he held it until his death in July 1872. Juarez's successor, Tejada, abused his power and precipitated a new revolution. Out of the troubled affair emerged a strong character, General Porfirio Diaz, who was elected president over Tejada in November 1873. Diaz was able to name his successor, Gonzalez; at the end of Gonzalez's term, the people changed the Constitution so that Diaz could again be president, and he was continuously re-elected until his term of service in the office totalled 26 years. Diaz raised Mexico to a high place in the family of nations and gave to his country a period of the greatest prosperity it had ever known. In 1910 it was proposed to elect him for another term, but his enemies were strong enough to offer opposition of a united character. Francisco Madero was the rival candidate; Diaz defeated him, but his end was near. In power again, he took measures to suppress the ambition of Madero, but the latter rallied under his banner all who were opposed to Diaz, and with promises of reforms that appealed to the people began a revolutionary movement. It succeeded beyond expectation; peace negotiations resulted in the resignation of Diaz and a call for a new election. Madero was the choice for president, and he was inaugurated in November 1911. All

Photo by Hugo Brehme, Mexico City

Cathedral of Mexico City

This massive structure—dating from 1573—stands on the site of an Aztec *teocalli* or temple, destroyed by the Spaniards under Hernando Cortés in 1521 his good intentions were frustrated by another revolution, headed by Zapata, who also had opposed Diaz. The adherents of Madero were slowly overcoming their foes in a series of military engagements, when General Huerta, leader of the Government's forces, went over to the rebels. Madero and others were imprisoned, and Madero and several officials were murdered—by Huerta's orders, it was charged. Huerta forced himself upon the nation as provisional president, and faced at once another revolution headed by General Venustiano Carranza, Governor of Coahuila State. Carranza secured a following strong enough to justify announcing himself as provisional president, and in this ambition he had much sympathy officially from the United States, whose Government looked upon Huerta as an usurper and a murderer.

President Wilson sought to induce the warring factions to agree to an armistice, to be followed by an honest election, a plan to which Huerta would not agree. The Mexican Congress was antagonistic to him; he ordered the arrest of 110 of its members and forcibly dissolved its sessions. He ordered a new congressional election, hoping for a majority to confirm him in power. The Constitutionalists, under Carranza, Villa and Obregon, won some victories over him, and after Villa captured Torreon, Caranza established himself temporarily as First Chief.

The American Incident. Meanwhile President Wilson ordered United States warships to Vera Cruz. A number of American sailors had been arrested at Tampico. Admiral Mayo of the United States Navy demanded their release, an apology and a salute to the American flag. The first two demands were met, but the salute was denied. Wilson asked Congress for authority to demand the salute by the use of armed force, and on April 21, 1914, an American fleet bombarded and seized Vera Cruz. An attempt was made to settle the difficulty through mediation by the ABC Powers (Argentina, Brazil, Chile), but no agreement was reached. Wilson continued his policy of "watchful waiting." The Constitutionalists continued their successes against Huerta, and finally, in July 1914 Huerta resigned, to be succeeded by Carbajal. At the suggestion of the United States, Carranza took the post of Minister of Foreign Relations, so that he might head the government when it was reorganized. Carranza would not accept the provisional presidency but demanded an election. Villa broke with Carranza, calling him a traitor, and began a campaign in opposition to him which soon developed into banditry. Both he and Zapata set up rival governments, but the United States recognized Carranza. Villa in his subsequent career crossed the international boundary and killed American citizens. By permission of Carranza, a United States force entered Mexico to capture him, but the mountain fastnesses protected him from Funston and Pershing, leaders of the American Expedition. In 1917 Caranza by election became the first constitutional president the country had had since Madero's election in 1911.

Peace Follows Disorder. Obregon succeeded Carranza in 1920, and in 1924 Calles followed Obregon. In 1928 Obregon was again called to be a candidate but was assassinated before the election, and Portes Gil was chosen president. His administration was marked by an effort to rehabilitate the revolution-torn country. American relations with Mexico were much improved by the skilful diplomacy and common-sense tact of Dwight W. Morrow, American banker, who was appointed ambassador by President Coolidge.

In 1934 General Lazaro Cardenas was elected president for a 6-year term as the leader of the National Revolutionary Party pledged to the support of socialistic measures. Since Cardenas's election Mexico has instituted many social and economic changes in the direction of communism. The Government's effort to weaken the influence of the Roman Catholic Church and to introduce antireligious and anticapitalist doctrines into the public educational system have aroused strong opposition within the country and much criticism abroad. In 1938 a critical international situation was created by the Mexican Government's expropriation of American- and British-owned oil properties. In 1940 Avila Camacho became president, defeating Almazán in a spirited campaign. See World War II, p. 805.

Mississippi Bubble, a speculative scheme promoted in France from 1717 to 1720 by a Scotchman, John Law. In 1716 Law, a man of great plausibility and real commercial genius, formed a group of bankers and speculators who founded the Banque Générale with the general purpose of acquiring trading monopolies in the New World and in the Orient. Early in the 18th century the possibilities of commercial exploitation of the distant parts of the world seem to have cast a kind of spell over the minds of Europeans; contemporary with John Law's activities in France the famous South Sea Bubble was exciting the speculators of England. Law's operations expanded rapidly after the establishment of the Banque Générale. He began to issue large amounts of paper currency that was accepted at par and even above par throughout France. He obtained the confidence of the Government and was actually made Comptroller General of Finance in January 1720. The inevitable crash came in May 1720. Many thousands of investors were ruined and a panic was precipitated. Law escaped from France but was not able to salvage anything for himself from the wreck.

Monaco, a principality in southwestern Europe, one of the smallest independent states in the world. Until 968 Monaco had been a possession of the Holy Roman Empire. At that time Otho I ceded it to the ruling house of Genoa, whose representative was Grimaldi. His descendants have since occupied the throne. In 1814 the kingdom of Sardinia took Monaco under its protection; in 1848 France became its protector and continues as such today, though it exercises no internal control. In 1911 the new Constitution took away some of the rights of the prince. Monaco's chief town, Monte Carlo, is the world's greatest gambling center, and the revenue from gaming meets all the expenses of the principality.

Mongolia, a large section of northern Asia, 1,875,000 square miles in area, most of it nominally a part of China, tween Siberia and China proper. In 1912, while China was building its new republic, Russia exerted its influence to effect a lessening of the bond between Mongolia and China. This was an easy task, for the late Manchu emperors of China had guaranteed Mongolia local self-government, and it appeared that the new Chinese Republic sought to repudiate the agreement. Russia agreed to protect the Mongol inhabitants against the Chinese with the result that Mongolia was divided as between north and south, and Outer Mongolia became in a sense independent but with Russian leanings. Both Russia and China agreed not to colonize it. In 1915 all Mongolia repudiated its Chinese relation and formed a republic; however, its territory became overrun with Germans, Russians and other refugees from war-torn Europe, and Mongolia sought the protection of China. In 1921 another republic was proclaimed in protest against the alleged brutality of the Chinese local rulers. Russian influence again became predominant, but by treaty in 1924 the Soviets agreed to withdraw their troops from the area.

Nantes, Edict of, an edict issued by Henry IV of France in 1598 granting limited religious toleration and equality of political rights to the Huguenots (French Protestants). The Edict of Nantes brought to an end the bitter and bloody religious feuds that had distracted France for more than half a century. It is famous for its farseeing and statesmanlike conciliation in an age when the spirit of conciliation was extremely rare. Its opening article declares a general amnesty:

> We have, by this perpetual and irrevocable edict, established and proclaimed and do establish and proclaim,
>
> I. First, that the recollection of everything done by one party or the other between March 1585, and our accession to the Crown, and during all the preceding period of troubles, remain obliterated and forgotten as if no such things had ever happened.

The Edict of Nantes remained in force until 1685, when it was revoked by Louis XIV. Its revocation was an act of cruel bigotry and a political blunder of the first magnitude, as its immediate result was to force the emigration from France of some 300,000 of her thriftiest and most substantial citizens.

Naseby, a battle between the forces of Oliver Cromwell and King Charles I of England in the Civil War waged by Parliament against Charles. Fought June 14, 1645, it was a defeat for the royalists. The forces of the king were so badly routed that he could not put another army into the field.

Nepal, an independent kingdom between Tibet and British India in the Himalaya Mountains. It was a Buddhist kingdom in the 7th century and remained so until 1324, when it was invaded by a prince of India. More than 450 years afterward it was conquered by the Moslems (1790). As British interests in India were jeopardized, English troops were sent into Nepal; they were first defeated but were successful in 1791, and a treaty was arranged. During the Sepoy Rebellion of 1857, Nepal gave timely assistance to the British, and relations have since remained amicable. Nepal's independence is guaranteed by Great Britain, and in return for that protection the British control the kingdom's foreign policy.

Netherlands, The, commonly called *Holland,* a part of what was known as the *Low Countries* of ancient and medieval times. The Low Countries included the Netherlands, Belgium and Luxemburg. Before the beginning of the Christian Era three peoples occupied this area—the Belgae in the south, conquered by Caesar; the Batavi in the center; and the Frisii in the north. The two peoples north of the home of the Belgae were not subdued by Rome until the 1st century A.D. Charles the Great (Charlemagne) became master of the Low Countries, and when his kingdom was broken up, its parts were so distributed that the effects are apparent today in the languages spoken. The Frankish kingdom, now France, acquired most of the section that is now Belgium; Lorraine, the central portion; and emerging Germany, the northern section. The people at the south, known as *Walloons,* use French very largely today; the Flemings, in the center, use both French and German; and the northern portion is distinctly Dutch.

A Plaything of Royalty. The section known as *Flanders,* now in Belgium, was close to Burgundy, now a part of France. By a marriage involving the royal houses of Flanders and Burgundy, the latter obtained sway throughout the Low Countries after 1369. A hundred years later a Burgundian-Hapsburg marriage (Maximilian of Hapsburg to Mary of Burgundy) transferred to the powerful Hapsburgs the real sovereignty of the section. In 1549 Charles V transferred the rule of the Low Countries to Spain.

The Dutch Republic. The southern part of the Low Countries was predominantly Catholic, and the northern part, now the Netherlands, strongly Protestant. The country was torn with religious troubles resulting from the effort of Philip II of Spain to unite all under one faith. In 1568 the Prince of Orange, who had fled to save his life, returned to the Netherlands with an army to liberate his people from oppression, and war raged for 40 years. On the Spanish side, the Duke of Alva was the leader of Philip's armies until his recall in 1573. His successor, Requesens, was slain in battle, and his soldiers gave themselves over to pillage and massacre of the helpless people, who turned, as their last hope for protection, to William of Orange. He formed a union to drive out the Spaniards, and after that had been accomplished a league of northern provinces was formed, called the *Dutch Republic,* which ultimately became the Netherlands. In 1581 these seven northern provinces declared their independence from Spain, but the southern provinces returned to their Spanish allegiance.

Harris & Ewing

Queen Wilhelmina and Princess Juliana of The Netherlands

An unsettled condition prevailed for 100 years. William of Orange was assassinated in 1584, and his son Maurice succeeded him, and with Barneveldt led the Netherlands party. The assistance of the Protestant Queen Elizabeth of England was briefly given to the Dutch, but was withdrawn without accomplishment of results. In 1609 a 12-year truce was arranged. War was resumed at the end of the truce, but in 1646 Spain asked for peace. In the general reorganization of Europe made by the Peace of Westphalia in 1648, the Netherlands was declared an independent republic, with a *stadtholder* as its executive head. The Low Countries now rose to their greatest height as a trading and sea power, and the importance thus achieved brought new jealousies and new enemies. Sometimes one European Power, and sometimes another came to the assistance of the Dutch Republic.

The Kingdoms. During Napoleon's meteoric career, he gained control and organized the Kingdom of Holland, and in 1806 put his brother Louis on the throne. Louis served his new subjects so much better than he served his brother that Napoleon recalled him, and the Republic was made a part of the French Empire. The Congress of Vienna (1815) joined Holland and Belgium in the Kingdom of the Netherlands, and Luxemburg was made a grand duchy of the kingdom. Catholic Belgium was not pleased to share a political union with Protestant Netherlands, and in 1830 it revolted. In a final settlement in 1839 Belgium and the Netherlands became separate kingdoms.

Colonial Expansion. As early as 1602 the Dutch East India Company was organized, and in 1621 the Dutch West India Company began operations. The latter colonized the New World around New York and held its possessions there until 1664, when they were lost to the English; they were recovered for a brief period of 15 months, then went finally to the English. The Dutch East India Company added a great empire to the Netherlands, including Java, a part of Borneo, the Celebes, the Moluccas and half of New Guinea. These tropical possessions are very rich and contain 30,000,000 people, whose industry contributes vast wealth to the Netherlands. In 1922 Netherlands India was abolished as a colony and made an integral part of the kingdom.

The World War. The Netherlands occupied an unpleasant position during the World War. A small, weak country, even had it desired, it could render little assistance to either side. Its people were divided in their sympathies, and it was only by the exercise of watchfulness that the country could retain a neutral attitude. The blockades set up on both sides caused severe suffering in the Netherlands, and its commerce with its colonies was greatly curtailed. At the end of the war the German emperor, after abdicating his throne, sought refuge at Doorn, in the Netherlands, and was permitted to remain.

The present ruler of the Netherlands is Queen Wilhelmina, who succeeded to the throne upon the death of her father, William III, in 1890. Her daughter Juliana, born in 1909, is heiress to the throne. In January 1937 Juliana married Prince Bernhard zu Lippe-Biesterfeld of Germany. In 1940 Germany attacked the Netherlands without warning and quickly conquered it. See 2nd World War, 805.

Newfoundland, a large island off the east coast of British North America. Politically dependent on Newfoundland is the large triangular tract on the mainland called *Labrador*. Newfoundland has been a British Crown colony since 1934, when a financial crisis forced it to abandon its previous Dominion status.

Early History. The island was discovered by John Cabot in 1497, when he was sent by Henry VII on a voyage to the New World to claim for England any new lands he might find. Henry's affairs at home prevented his following the advantage gained for England by Cabot, and it was about 100 years before the English turned their attention seriously to exploration and settlement across the ocean. In the meantime the claim of England to Newfoundland was never abandoned, and it therefore is the oldest possession of the English on the American continent. During the century of England's inactivity other nations were learning about the wealth in the sea surrounding the island. The fisheries attracted the French, Spanish and Portuguese, as well as the English. Sir Humphrey Gilbert took formal possession of Newfoundland for England in 1583, but the French continued to dispute England's claims.

By the Treaty of Ryswick (1697), which closed the War of the Grand Alliance in Europe (1689–97), France gained legal claims to its settlements on the southwest coast. Sixteen years later, however, England's claim to all

Newfoundland was established by the Treaty of Utrecht, signed at the close of the European War of the Spanish Succession, but fought in America as Queen Anne's War (1702–13). England at that time gave to France certain codfishing rights, an agreement that was later to result in many disputes. This treaty also reserved to France ownership of the islands of St. Pierre and Miquelon, off the southern coast of Newfoundland, as headquarters for its fisheries, and these are still under the French flag.

Slow Development. Circumstances conspired to retard the settlement and growth of the colony. The fishermen wanted no interference with their industry; of the interior of the island practically nothing was known; the fishing colonies believed the land had no value except along the coast as a place to dry their fish in summer, and the fleets spent the extremely cold winters in their European ports. When the fishing season was over in the late autumn, the bleak colony was left uninhabited. So influential were these fisherfolk that settlement was all but forbidden; until 1813 it was not possible to obtain a land title, and for a time after that date no building, however modest, could be erected except under license. All political control was in the hands of the fishing captains, but between 1820 and 1832, when land titles were obtainable and there were no longer restrictions on building, immigration added thousands of people to the population.

In 1832, a measure of representative government was provided. As in the British provinces on the mainland, a struggle began to secure a government wholly responsible to the people and not merely to king and Parliament; this reform was accomplished in 1855.

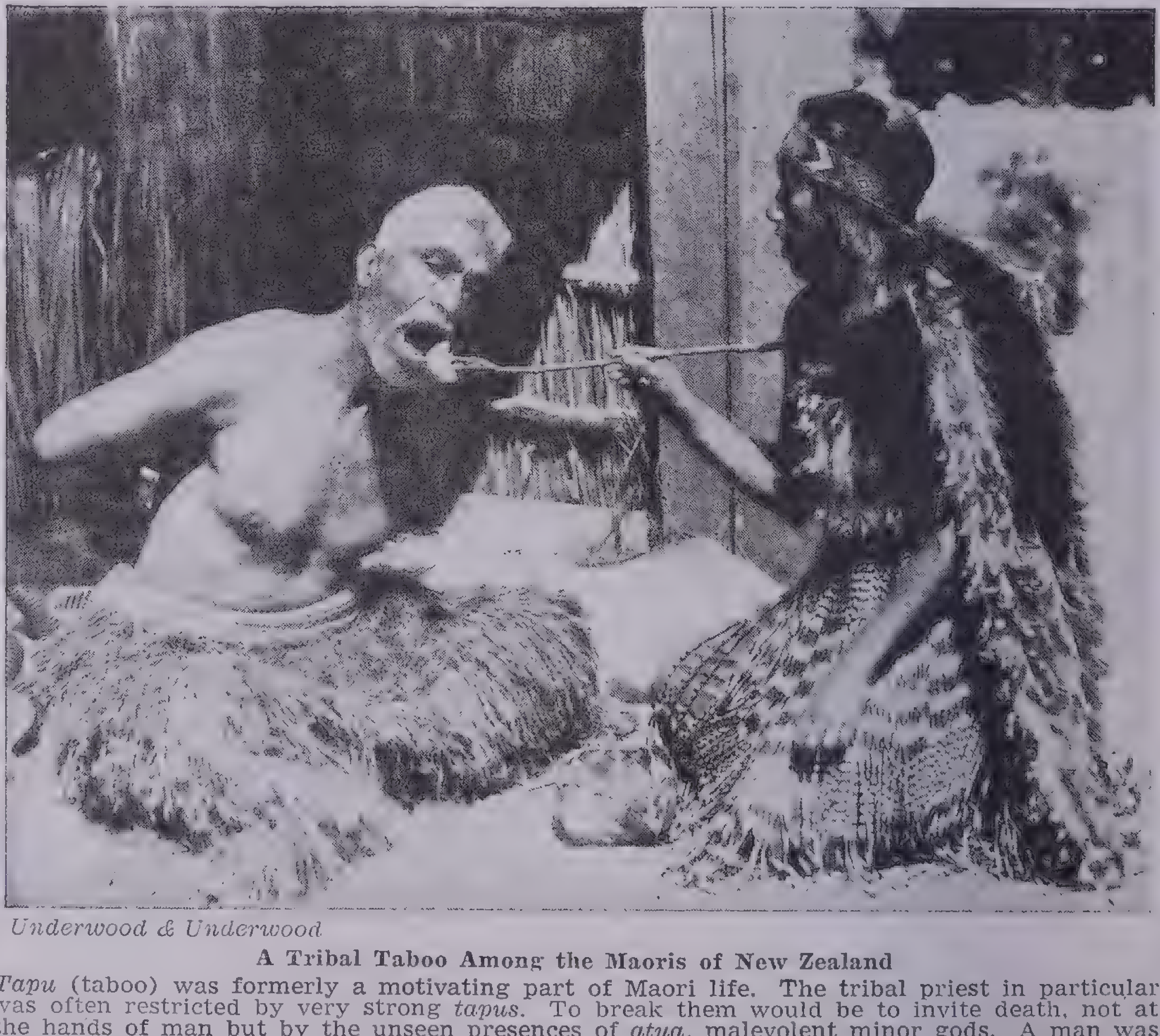
Fisheries Disputes. The Treaty of Utrecht in 1713 had guaranteed to France exclusive rights to the cod fisheries on the west coast, and there the conflict between the French and the British reached an acute stage. The French claimed that their sea rights on the Gulf of St. Lawrence extended to the mainland and denied the right of the British to make settlements there. The British and French governments endeavored to reach an agreement, but the people of Newfoundland refused to recognize any except British rights. The coast people even went to the extreme of cutting off the supply of bait to the French; the latter struck back by attempts to confiscate the lobster industry of the British, in violation of what the French claimed as treaty rights. In 1891 it was discovered that for nearly 60 years British naval officers had been illegally acting to enforce French rights. Finally in 1904 the French relinquished their rights in return for territory in West Africa and indemnities to fishermen amounting to about $512,000.

Refusal to Enter the Dominion. After the passage of the British North America Act in 1867 and the organization of the Dominion of Canada, efforts were made to secure Newfoundland as a member. In 1869 an election in the island rejected the opportunity by a decisive majority. The question arose again on later occasions and each time was decided adversely. After the Newfoundland Government was practically bankrupt in 1895 there was an unsuccessful effort to join the Dominion of Canada, but it would not become responsible for the Newfoundland debt. In 1918 the British Government raised the status of Newfoundland from that of a colony to a dominion of the Empire. In 1926 Newfoundland was made one of the seven members of the British Commonwealth of Nations. During the depression years beginning in 1930 Newfoundland found it impossible to maintain its status of dominion and in 1934 again became a Crown colony.

In 1927 for the first time Newfoundland had one export more valuable than codfish—paper and pulp, an industry established by Lord Northcliffe in 1909. And in 1927 a great paper mill at Corner Brook was taken over by a large manufacturer in the United States. This new industry, increased tourist and sportsman trade and the importance of St. John's in international aviation have all tended to alter the colony's almost medieval status.

New Zealand, an isolated country comprising two large islands and several smaller ones in the South Pacific Ocean. It is a member of the British Commonwealth of Nations, an important unit in the world-encircling British Empire, and one of the most progressive and liberal countries in the world.

Early Explorations. The Dutch explorer Tasman from a base in the Dutch East Indies explored the coast of Australia and in 1642 touched the island that in his honor is now named Tasmania. He sailed eastward in the same year and found the islands that are now New Zealand. When he reported his discovery to the Dutch authorities, they named the group Nieuw Zeeland, meaning new sea land. No advantage was derived from Tasman's exploit; as far as known, no white man visited there again for 127 years. In 1769 Capt. James Cook was sent by the British Government to Tahiti, in the Society Islands, to observe a transit of Venus. Afterward he sailed south and west and landed on North Island of the New Zealand group. He found the natives unfriendly and to assure the safety of himself and his men, as he thought, he killed several of one of the tribes that attacked him. In retaliation, the natives later caught, killed and ate the entire crew of one of his vessels. Cook then adopted a more conciliatory attitude, and before he sailed for England established better relations, which were cemented by his gift of seeds for planting and of hogs and chickens to form the nucleus of a meat supply. The natives eagerly accepted the gifts and showed adaptability in making use of them. Cook subsequently made three other voyages to the islands—in 1773, 1774 and 1777. From the last trip he never returned; leaving New Zealand early in 1778, he discovered the Sandwich Islands (now Hawaii), sailed up the coast of North America and returned for the winter



Underwood & Underwood

A Tribal Taboo Among the Maoris of New Zealand

Tapu (taboo) was formerly a motivating part of Maori life. The tribal priest in particular was often restricted by very strong *tapus.* To break them would be to invite death, not at the hands of man but by the unseen presences of *atua,* malevolent minor gods. A man was under this *tapu* after he had handled the remains of the sacred dead. Under such circumstances he could not touch any food with his hands. Should he do so, such was the belief, the food would kill him. He therefore was fed as illustrated here by two natives of the Lake Rotorua district on North Island. The spell of *tapu* was removed by a ceremony called *puré* to the Sandwich group, where he was murdered by the natives in 1779.

The Maoris. The natives whom Cook found in New Zealand were known as *Maoris.* They seem to be of Polynesian origin and are of powerful physique. Before the English finally came to settle in the islands, the Maori tribes were frequently engaged in warfare against one another. The first to reach New Zealand except for exploration were missionaries in 1814; they were well received, and others followed very soon.

First Settlements. The nucleus of a British colony was thus established, and by 1833 an English agent, called a resident, was appointed to act for the London Government in control of the colony's affairs. Six years later, encouraged by reports sent to England, the first shipload of colonist farmers was sent out. In 1840 the Maoris turned over the sovereignty of the islands to Great Britain, and control was vested in the New Zealand Company, which had been chartered in London to settle and build up the colony. In 1850 the company surrendered its charter to the British Government, so that a local government could be established.

Early Government. The first constitutional assembly met in 1855, but local rule was disturbed during the next 10 years by native uprisings. The last one, in 1866, marked the end of rebellion; as rapidly as possible the Maoris were given a part in the government, and as they had advanced rapidly in civilization, they came to feel that the white man's rule was also their rule. Maori participation in public affairs has reached the point today where the natives are voters, and a number sit in the Dominion House of Representatives.

Economic Experiments. New Zealand has rapidly developed an advanced and prosperous civilization. Public education has reached a plane as high as in Europe or America. New Zealand has been one of the boldest pioneers in social and economic legislative experiments of the type known as *state socialism.* Many landowners complained of high taxes; the Government bought the land if the owners desired to sell and leased it in parcels not exceeding 2,000 acres for 999 years, a term that was later changed to 66 years; any lessee may purchase this land up to 95 per cent of its value, to reduce the annual rental, but cannot fully separate the title from the state. The Government owns and operates the railroads, the telegraphs and the telephones. It enters into competition with bankers by lending money under specified conditions to counties and cities for the construction of public works. In 1905 the Workers' Dwelling Act was passed which provided for the erection of homes to rent at 5 per cent of their cost, plus insurance. New Zealand was the first country to pass compulsory arbitration laws for the settlement of labor disputes. There is rigid exclusion of Chinese, Japanese and natives from the Pacific islands. In the elections of 1935 a labor ministry was returned to power for the first time.

Nicaea, Council of, the first general or ecumenical council of the Christian Church held at Nicaea in Asia Minor in 325 A.D. The Council is chiefly noted for its promulgation of the Nicene Creed and its condemnation of Arianism. Meeting under the aegis of Constantine the Great, the first Roman emperor to recognize Christianity, the Council of Niceae was an enormous force both for the political and religious unity of the Roman Empire.

Nicaragua, the largest of the republics of Central America. This region was discovered by Columbus on his fourth voyage (1502). Twenty years later Dávila discovered and named Lake Nicaragua and prepared for the establishment of settlements there. In 1523 the lieutenants of Cortez came down from Mexico, conquered the native Indians and erected the entire isthmian territory into the Captaincy General of Guatemala. This existed until 1821, when Mexico gained its independence from Spain, and the Central American states also declared themselves free.

Political Organization. The five states felt the need of union, and the Confederation of Central America was formed; but jealousy and political disorders caused the union to be dissolved in 1839. Other attempts to organize a union failed; the last one, formed in 1921, was the Central American Federation; it was dissolved a year later. Nicaragua's independent status dates from the dissolution of the Confederation in 1839. Two years later trouble arose with Great Britain over the territory known as the *Mosquito Coast.* The United States gave support to Nicaragua and prevented the English from annexing the strip to the British Empire. The matter was adjusted in the Clayton-Bulwer Treaty of 1850, by which the sovereignty of Nicaragua was recognized there.

The Clayton-Bulwer Treaty was the first official pronouncement on the matter of an interoceanic canal. In it was the stipulation that when such a waterway was built its route should be across Nicaragua, and that Great Britain and the United States together should guarantee its neutrality, but that neither country should fortify it. This treaty remained in force until 1901.

Internal Troubles. Nicaragua was much disturbed in 1855 when William Walker, an American, attempted in a filibustering expedition to conquer the country and transform it into a slave-holding state. Here was the first opportunity the states of Central America had to take united action without the display of national jealousies. They drove Walker away in 1857, but he returned to renew his effort at conquest and was captured and shot (1860). In 1893 during a revolution involving the choice of a president, the intervention of Honduras led to a short war with that Republic. In 1895 Nicaragua, Honduras and Salvador formed the Greater Republic of Central America and invited Guatemala and Costa Rica to join them. Almost before a constitution was framed, the demands of Honduras for primacy ended the union.

In 1901 the Hay-Pauncefote Treaty abrogated the Clayton-Bulwer Treaty and made new agreements for the construction of a Nicaragua canal, and in 1914 the United States and Nicaragua entered into a treaty for the same purpose. Building a canal through Nicaragua was again discussed in 1938 as an item in a huge defense program for the United States. Internal discord troubled the administration of Nicaraguan affairs for many years. During a revolution in 1909 two citizens of the United States were tortured and executed. The United States intervened and made it possible for the Conservatives to defeat the Liberal Zelaya who had executed the two Americans. In 1912 conditions were so serious that the United States was asked to send marines to restore peace and preserve order; their presence was so necessary that a legation guard remained until 1925. The United States supervised the elections in 1928, 1930 and 1932. The marines were withdrawn early in 1933 when the country seemed tranquilized. But one revolution followed another and in 1936 the National Guard ousted the president and vice-president, but the Congress chose a new president representing the same party (Liberal).

Norway, a nation of northern Europe whose history was long linked with that of the other Scandinavian countries, Denmark and Sweden. The country was inhabited in the late Stone Age, but the earliest records show that its first historic people were Teutonic. A legendary period is filled with sagas of this northland; and the myths of its gods and goddesses occupy a great place in the world's literature.

Early History. The known history of Norway and the other Scandinavian countries begins in the 8th century with stories of the hardy sea-rover vikings. They ventured far from Scandinavia, possibly because of limited food supply, planted colonies in Ireland, Greenland, the Hebrides and northern France—and tradition says they visited the shores of North America led by Leif Ericson in 999 or 1000. Two viking chiefs brought Christianity to Norway, Olaf I Trygvesson (969–1000) and Olaf II (995–1030). Each had been a wanderer and adventurer. Olaf I, king in 995, attempted to Christianize Norway and unite Scandinavia, but he was defeated in a battle made famous by Longfellow's "Saga of King Olaf." The second Olaf, called St. Olaf, won Norway and Sweden for himself and the new religion, but in 1029 he was driven out of Norway by Canute of Denmark—the same Canute who invaded England. Olaf was killed the next year in an attempt to recover his throne, but his son Magnus I regained it in 1035. From that date until 1319 only native kings governed Norway; but since then there has not been a native on the throne.

Union of Denmark and Norway. In 1319 there was no direct descendant of Haakon V to take the throne, and the national assembly elected Magnus Ericksson of Sweden, son of the daughter of Haakon. The grandson of Magnus, Olaf, was elected king of Denmark in 1375; after his brother's death he ruled both Norway and Denmark, and thus the two countries were joined under one crown. Upon Olaf's death in 1387, his ambitious mother Margaret succeeded to the double throne, and 2 years after her accession she joined Sweden to her realm and was queen of the three countries until her death. The union of the three was confirmed by the *Union of Kalmar* in 1397.

Union of Sweden and Norway. From this time until 1814 Norway remained in this union; but the Napoleonic Wars inaugurated a change that had momentous results. Because Denmark gave assistance to Napoleon, the Powers that overthrew him punished that country by depriving it of Norway, which was given to Sweden (1815). The Norwegians revolted and offered to make the Danish crown prince their king on a basis of independence; but the great Powers would not sanction this proposal and gave permission to Crown Prince Bernadotte of Sweden to enter Norway and reduce it to submission. Norway could offer no resistance and had to accept a compromise. It was agreed that the Swedish king should also be king of Norway, and Norway should retain its new constitution and have full freedom in local affairs. This arrrangement was kept, and no serious discord resulted until 1895, when the Norwegians demanded their own national flag and the right to inaugurate their own independent consular service. These questions were debated until 1899, when the king approved the request for a Norwegian commercial flag.

Courtesy Norwegian Travel Information Bureau

A Viking Ship Surviving from the Age of the Sea Rovers

Eleven hundred years ago this light and graceful ship was probably a Norwegian queen's pleasure yacht. Ships similar to these but larger and heavier for deep-sea sailing may have brought Leif Ericson to America about 1000 A.D. The one pictured here was dug up at Oseberg farm 50 miles south of Oslo, Norway, in 1904, from the grave of a queen. It is built of oak and has a high stem and stern, elaborately carved. It was propelled either by sail or oars

Norway Independent. The matter of a separate consular service developed into a demand for complete severance of the political union with Sweden, and after many attempts at conciliation, during which the king had vetoed a consular act of the Norwegian Storthing (Parliament), Norway declared its independence. The crown was offered in a friendly gesture to the son of the aged King Oscar II, but the offer was rejected. After expressing the hope that Norway and Sweden might live in the friendliest relations, the Storthing voted to invite Prince Charles of Denmark, second son of the Danish crown prince, to become the first king of free Norway. King Christian IX of Denmark sanctioned the plan, and Charles was crowned as Haakon VII in 1905.

Events in the New Kingdom. Norway has become one of the most advanced nations of modern Europe. In 1909 all women who paid taxes were given the ballot, and 4 years later the taxpaying qualification was removed; thus all adult women are permitted to vote, and they may also be members of the legislative body. Farmers' cooperatives have been very successful; liquor profits go to the state, and the liquor traffic is rigidly supervised; workmen's-compensation laws have been adopted.

During the World War, though Norway suffered from the blockade set up by both sides, and its commerce was greatly curtailed, the country was able to observe neutrality. In 1940 Germany without warning attacked Norway who called on England for aid. The call was too late. Germany conquered and occupied Norway. See World War Number 2, page 805c.

nullification, disregard of or refusal to obey or enforce laws. In American history nullification refers to the right claimed by a state to render null and void any Act of Congress it did not wish to support. In 1798 Kentucky passed a resolution declaring the Alien and Sedition Laws void within that state, and sent copies of its resolution to the other states, where it was received coldly. In 1799 that state again declared that any legislature should feel free to nullify any Federal law deemed obnoxious to it. In 1828 the first serious test of the supremacy of the Federal power occurred. South Carolina objected to a protective-tariff law recently passed, declaring it sectional in its operation and favoring only New England. Another tariff law passed in 1832 further infuriated that state, and a convention was called to pass a nullification order. It was in this manner that the doctrine of State Rights arose.

omnibus bill, any legislative proposal that embraces a number of unrelated titles. It received its name from the old-time omnibus, into which it was customary to crowd people and baggage to the limit of its capacity. In derision the Compromise of 1850 was called an omnibus bill. Both in theory and practice it is unwise to include more than one title in a legislative act, and most state constitutions limit each proposed law to one specific item of legislation.

Palestine, the Holy Land of Christians, as cradle of the Christian religion and sepulcher of the Christ, and the country of the ancient Hebrews. During one long period of its ancient life, one section was known as *Canaan,* and the southwestern part as *Philistia;* the people, as *Canaanites* and *Philistines,* respectively. The latter first applied the name *Canaan* (the *Promised Land* of the Israelites) to the land west of the Jordan River. The modern development of Palestine is along the shore of the Mediterranean, north of Hejaz; the Sinai peninsula forms part of its western boundary.

The history of Palestine before the penetration by the Israelites in the 13th and 12th centuries B.C. is little known. Babylonian, Egyptian, Hittite and Amorite battled for supremacy. The influx of Israelites that probably began about 1300 B.C. is the first historical event that we can trace that permanently affected the country.

For 3 centuries and perhaps longer the Israelites slowly expanded their control of the country. Their most stubborn enemies were the Philistines. The heroic traditions of these Israelite-Philistine struggles are preserved in the early books of the Old Testament.

About 1030 B.C. the Israelites formed a united kingdom under Saul, whose immediate successors were David and Solomon. About 100 years later it was divided into two kingdoms, Israel and Judah, northern and southern, respectively. The northern fell to the Assyrians in 722 B.C.; the southern, to the power of Babylonia under Nebuchadnezzar in 586 B.C., when he captured Jerusalem. After each of these events, thousands of the Israelites were carried away captive.

When Babylonia was taken by Cyrus the Great of Persia, he permitted the Jewish exiles to return home (536 B.C.), and Palestine became a Persian province attached to Syria. When Alexander the Great swept into Asia, a large Greek emigration followed, and Greek influence persisted to the time of the Roman invasion. Jerusalem was taken by the Romans in 63 B.C., and for about 100 years most of Palestine was again a part of Syria, then a Roman province. Palestine belonged to Rome or to Byzantium until A.D. 614, when it fell again to Persia, Persia held it until about 635, when it came under Mohammedan control.

The Crusades temporarily interrupted Mohammedan rule, but the Kingdom of Jerusalem, set up by the Crusaders in 1099, was retaken by Saladin after an existence of only 90 years. The Ottoman Turks held Palestine from 1516 to 1918, when General Allenby, at the head of a British force, captured Jerusalem, and for the first time in 400 years a Christian flag floated over the city.

Turkey had joined its fortunes with Germany in the World War. After the defeat of the Central Powers Turkey was stripped of its possessions in Asia outside of Anatolia, and the new states of Palestine, Syria and Transjordania were formed. Palestine was placed by the League of Nations under mandate to Great Britain, to be held until it was sufficiently advanced to merit an independent government.

As soon as the Turks were deprived of their rights in Palestine, the Jews of the world felt it was the time to establish there a new Jewish state, for they had been people without a national home since the dispersal following the Roman occupation of Jerusalem in 70 A.D. The British officially encouraged the idea, and many thousands of Jews emigrated and took up homes there. There is, however, one great obstacle to the complete success of the Jewish ambition—the inhabitants are of mixed races, and the Mohammedans, especially, are numerically strong. It has not yet proved possible for Arab and Jew to find a common ground of understanding, and the Government is pledged to respect the interests of both groups. In 1937 the British Royal Commission after long study proposed a partition of Palestine in three sections as a solution to the problem of Arab-Jewish discord. The partition plan was condemned by the World Zionist Congress and tabled for further study by the League of Nations.

Panama, the newest of the states of Central America. Columbus first sighted the land that is now Panama on his fourth voyage (1502), when he explored the Caribbean seacoast for nearly the entire length of Central America. Eleven years later Balboa crossed the isthmus, and "from a peak in Darien" was the first white man to view the Pacific Ocean. From these very early days this narrowest part of the isthmus was recognized as a desirable trade route between the two oceans, and thus Panama has always been of more importance than any of its neighbors. Until 1821 the country was held by Spain. In that year Mexico threw off the Spanish yoke and was followed at once by the Central American states. Three years previously Bolivar had liberated from Spain the northern countries of South America, and Panama, sensing greatest security with the new Republic of Colombia, asked to be united with it. At that time Colombia embraced not only the territory it now covers but Venezuela and Ecuador as well. When these latter formed independent governments in 1831, the parts remaining, Colombia and Panama, were formed into the Republic of New Granada.

Nine years later (1840) Panama desired independence, and with another Colombian province attempted secession, but the effort failed. Realizing that conciliation was essential, Colombia organized the State of Panama in 1855 and gave it comparative freedom in the conduct of its local affairs; but the new state was not fitted for self-rule, and in 1885 the Colombian Government withdrew all privileges, and the government of Panama was again administered from Colombia's capital, Bogotá. From 1846 to 1903 there were 53 revolutions in the Panama area, and the mother country was able to suppress them until the 1903 uprising, which was successful. Early in the next year a republican constitution was adopted. Colombia charged that the United States had helped the revolutionists in order to secure influence over the nation through which the Panama Canal would run. The United States promptly recognized the new republic and made a treaty by which a strip of land 10 miles wide, through whose center the canal was to be dug, was leased to the United States. For this concession the United States paid 10 million dollars and agreed to pay $250,000 a year as rental, beginning after 9 years. This strip was named the Canal Zone. The United States received full authority within the Zone and became responsible for sanitation in the teminal cities of Colon and Panama. With the revenue from the canal concession and the thousands of Americans always in the country, Panama is the most prosperous of all Central American states. Its government is fairly stable, with the powerful friendly influence of the United States behind it. A new treaty was signed March 2, 1936, ending the guarantee of the United States to maintain the independence of Panama and stipulating that no new private business shall be carried on in the Canal Zone.

Paraguay, an inland republic of South America. It was the home of the Guarani Indians when Juan De Solis discovered Paraguay in 1515. The first of the explorers to reach far inland was Sebastian Cabot who in 1527 sailed for several hundred miles up the Rio de la Plata, the Parana and the Paraguay. On the Parana he built a rude fort. Three years later Diego Garcia placed a settlement at the same point and gave it its present name Asuncion. Garcia terrorized the natives, and they killed him; his successor Martinez de Irala, was more tolerant and soon the settlement was prosperous.

The colony had been placed under the viceroyalty of Peru at the time when Bolivia was a part of Peru, but there was little attempt at government from so great a distance. This gave the people almost entire control of their affairs and led to the seizure of large authority by the Jesuits. For a century and a half they exercised both religious and civil authority and established strict legal codes. The Jesuit power was broken in 1768, the control was taken from Peru, and Paraguay united with Rio de la Plata.

Freedom and Isolation. When Napoleon placed his brother Joseph on the throne of Spain, Paraguay, following the example of Spain's other South American colonies, declared its independence. The Spanish governor was sent home in 1811, and a local triumvirate assumed control. The strong man of the three was Gaspar Francia, and from 1816 until his death in 1840 he was dictator and won the admiration of the great hero-worshiper Thomas Carlyle. Francia permitted no interference with his policies, and to exclude all outside influences he closed the country's borders against all nations and declared the Paraguay River closed to foreign commerce. Francia's successor, Carlos Antonio Lopez, was forced to adopt a more liberal policy. The plan of national isolation was abandoned, a new constitution was adopted, and reforms were numerous.

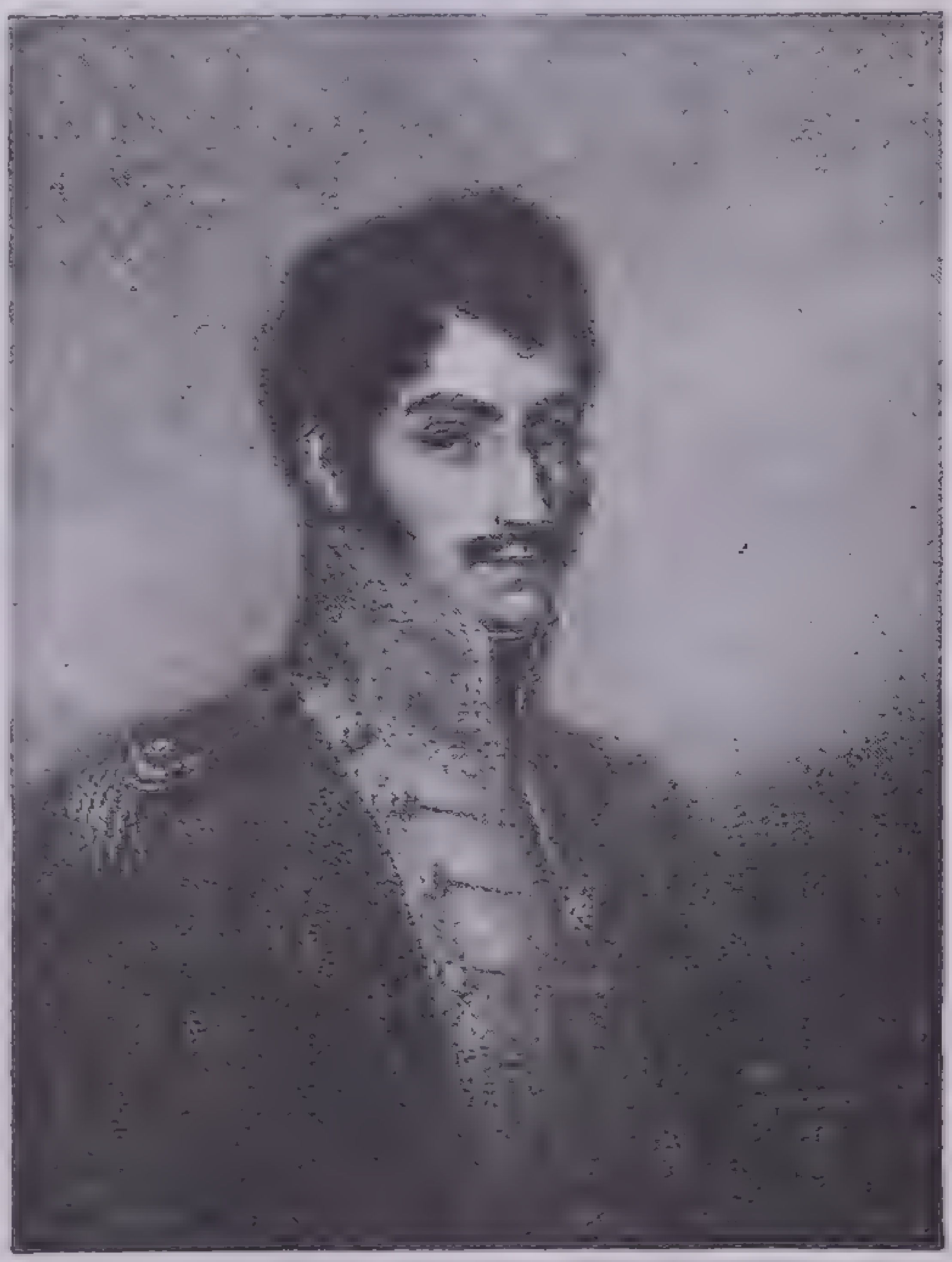
The son of Lopez (Francisco Solano Lopez) rose to power in 1862 and nearly destroyed his country. It was his ambition to rule over an empire that would reach to the sea. He quarreled with Brazil, Argentina and Uruguay and fought them in a war that lasted from 1865 to his death in 1870. This despot sent to their destruction hundreds of thousands of the men and boys of Paraguay, and when peace was declared little more than a nation of women and children was left.

Since the World War Paraguay has continued to struggle with the political problem of establishing stable government. A bloody war with Bolivia over a disputed border area called the Gran Chaco was ended by mediation in 1935, but the settlement left powerful factions dissatisfied. Colonel Rafael Franco, who obtained the presidency in 1936 after a military *coup* and established a totalitarian state, was himself forced from office less than 2 years later by similar methods. Factional dissensions on the Paraguay-Bolivia dispute were complicated by the clash of political and economic theories. Felix Paiva, who became president in August 1937, gave up Franco's program of state socialism and claimed to be a believer in representative government, but he had been made president by an army group and not by the votes of the citizens.

Persia, see *Iran.*

Peru, a South American Republic, the home of an ancient tribe of Indians known as the *Incas,* who gave to their wide domain a civilization that is the admiration of scholars today. Their glory perished with the coming of the white men. As far as is known, the name of the tribe was adapted from the designation of the ruler, who was called Inca. Nearly a dozen Incas preceded the first known to Europeans, and there may have been many others. In 1525 the empire was divided between the Inca Huascar, who took the southern part, and Atahualpa, who received the north with his capital in Quito. The empire of the two extended from Ecuador west into what is now Brazil, southeast to the Paraguay River and south into Chile.

The brothers quarreled for power, and Atahualpa conquered Huascar, thus coming into possession of the Inca Empire. Such was the situation when Pizarro, a cruel, despotic Spaniard, with a few courageous troops, landed on the shores of Peru. The Incas were paralyzed with fear when they viewed the horses and their white riders. They thought each horse and man to be one indivisible form; only when one man fell from his horse and the natives saw that the horse was merely a conveyance for a human being did the Inca fright subside. Pizarro captured Atahualpa, and the Indians gathered a ransom in gold to effect their Inca's release. Pizarro took the treasure, murdered his prisoner and marched forward to the conquest of the empire for Spain. With their artillery, cavalry and armor they easily made themselves masters of the land, though the Incas fought bravely with the rude weapons at their command. In November 1533 Pizarro entered Cuzco, the second capital city. He had undertaken the conquest for the fabled gold and silver of the country, and what he found far exceeded his expectations. The precious metal was so plentiful that, according to a legend, as iron was entirely lacking, the horses of the expedition were shod with gold.


Simon Bolivar, South American Liberator

The treasure of gold and silver stored at Cuzco was melted down and divided among the Spanish soldiers. Pizarro placed a puppet Inca emperor on the throne, marched back to the sea and there established a fort and settlement to provide a center from which it would be easier to repel invaders. That settlement became Lima, the present capital city.

Pizarro himself met the fate his cruel rule merited. He quarreled with Almagro, second in rank, and civil war raged between the two. Almagro was defeated and killed, but his enraged followers fell upon Pizarro and put him to the sword (1541).

Rumors of outrages against the natives of Mexico and Peru reached Spain and a code of laws intended to improve their lot was passed. The viceroy who was sent to Peru to enforce the new rule was so cruel that he was deported to Panama. Not until 1551 was there established anything approaching control exercised under direct supervision of the mother country; but the great distance from the homeland and the incentive to work for personal power and wealth were factors that led to a continuation of abuses against the natives and suppression of many rights of the rapidly increasing Spanish population. Only one native revolt that had serious consequences disturbed the Spanish rule. In 1780 Tupac Amaru gathered a force of Incas by the promise of winning freedom from their oppressors. At first successful, in the end they met inglorious defeat. Amaru and his entire family were slain, and white supremacy was established anew.

Independence. Napoleon I placed his brother Joseph on the throne of Spain in 1808. This was not an immediate signal for revolt in Peru, as it was in other Spanish-American colonies, though probably the presence of more than 20,000 soldiers was a large factor in holding the viceroyalty in continued subjection for a time. Peru was therefore the last of Spain's possessions in South America to set up the standard of independence, and it could do so only with the help of the freed states. In 1820 a Chilean army under General San Martin landed at Lima, and it was at once augmented by English volunteers. In 1822 the Spanish garrisons capitulated, and the Peruvian republic was proclaimed. San Martin announced himself as its protector, but when San Martin met Simon Bolivar, the other great liberator, San Martin withdrew and left the field to Bolivar—why, no one knows.

Early Years of the Republic. The royalists did not admit their defeat, and there was much pacification work left for Bolivar. Several battles were fought between the Peruvians and the rejuvenated Spanish forces, culminating in a final victory for the patriot army at Ayacucho. During these early years Bolivar had set himself up as dictator, a post he resigned on the cessation of hostilities. He was at once reappointed however and continued in control until just before the adoption of a constitution in 1826, and the election of the country's first president. Unsettled conditions naturally bred unrest, and one man after another rose to power only to be quickly deposed.

A short war with Spain threatened in 1864 over a Spanish charge of affront and injuries to Spanish subjects. The President of Peru signed an inglorious treaty, was declared a traitor and was ousted. A dictatorship followed, during which Peru joined with Ecuador, Bolivia and Chile in a declaration of war against Spain. The Spaniards bombarded Callao, then withdrew and thereafter made no trouble. In 1879 Peru and Bolivia were involved in a boundary war with Chile, whose consequences disturbed all three countries until 1929. Fighting had ceased in 1883 with Chile the victor. The Chileans received the province of Tarapaca, and for 10 years held the provinces of Tacna and Arica north of Tarapaca. It was agreed that after ten years an election should be held by the people of Tacna and Arica to determine their permanent allegiance, but Chile interposed such electoral conditions that the vote was never taken. Finally in 1929 after vain efforts by the United States and other Powers to effect a settlement, a treaty was signed that gave Arica to Chile and Tacna to Peru. In 1933 a new constitution was drafted that forbade any president's re-election unless 5 years intervened between his terms. In the same year President Luis

Sanchez Cerro was assassinated and Gen. Oscar Benavides was chosen to take his place by the Peruvian Congress. In the 1936 election the candidate of the Leftist party (forbidden to vote) and of the Social Democrats received a plurality but was disqualified by the Constituent Assembly. The Assembly dissolved Congress and gave almost dictatorial powers for 3 years to Benavides.

Phoenicia, a great commercial and colonizing power of the eastern Mediterranean in ancient times. The earliest history of Phoenicia is unknown, but it was a flourishing country in 1500 B.C., had a separate existence until after 850 B.C., and its commercial supremacy was not lost until 500 years afterward. The infertile Phoenician land lay in a narrow strip from 10 to 15 miles wide along the eastern shore of the Mediterranean Sea for a distance of about 150 miles with mountains on the eastern border. The people, Semitic in origin, were obliged to turn to the sea for a livelihood, and Phoenicia rose to be the greatest maritime power of the very early centuries. At first their sailors did not venture farther than the Strait of Gibraltar, for they feared the unknown expanse of ocean beyond the Pillars of Hercules; but when the mariners had once sailed past that narrow channel, their argosies were seen wherever there were people with whom to trade.

The unexcelled dyes of Tyre and the silver and brass vessels beautifully wrought in Sidon were exchanged for tin from England, ivory from Africa, copper from Cyprus, and gold, incense and pearls from Arabia. A remarkable people, the Phoenicians acquired wide reputation for the manufacture as well as the dyeing of textiles, work in glass as well as in metals, mining and the expert building of temples, tombs and other structures. To protect their vast commerce they built a navy to patrol their lines of trade. Wherever they went, they absorbed a knowledge of the arts practiced and contributed of their own knowledge to other peoples. To facilitate communication, they invented (it seems likely) the first written alphabet, later adopted by the Greeks, and from and through them by the civilized world. Beginning about 850 B.C., Phoenicia was taken in turn by Assyria, Babylonia, Persia and Egypt, and in 332 B.C., by Alexander the Great. It maintained its name until 64 A.D., when, under Roman rule, it was merged with Syria. In the centuries following the Assyrian conquest of Phoenicia itself the great Phoenician colony Carthage was growing up in the western Mediterranean on the north shore of Africa.

Readers of the Bible find numerous references to the two great Phoenician cities Tyre and Sidon. Hiram, King of Tyre, supplied the cedars of Lebanon with which Solomon built the Temple at Jerusalem; many of the master workmen employed in its construction were from Sidon. The Old Testament refers to the Phoenician territory as part of Canaan and gives to its inhabitants the name Sidonians.

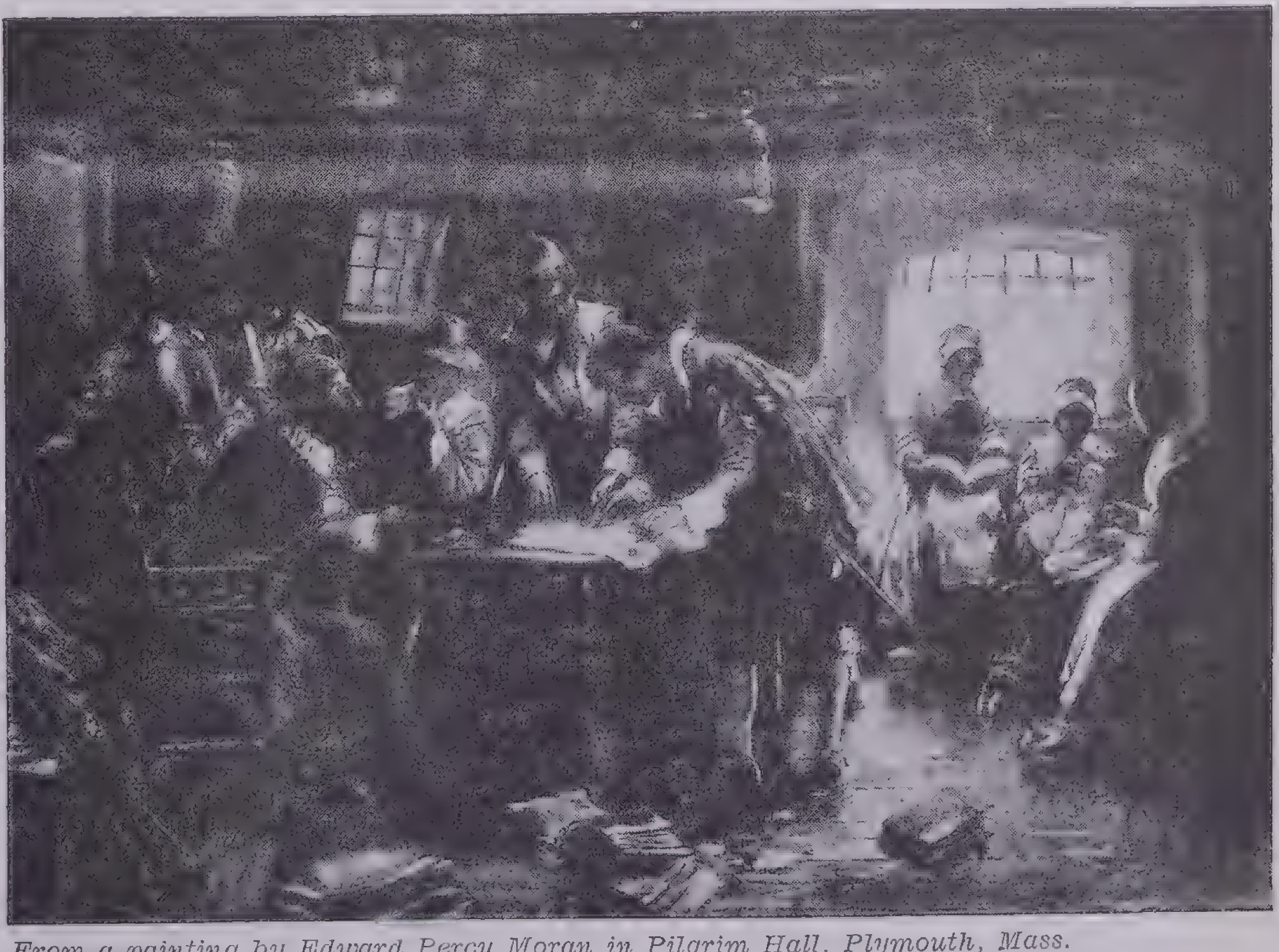
Pilgrims, the band of Separatists who sailed to America in 1620 and founded Plymouth Colony. They were of the original group of religionists who left England for Holland to secure freedom of worship. Governor Bradford, one of the devoted band, referred to them as "pilgrims and strangers on the earth," hence the first name came to be applied to all the Plymouth pioneers.

Compact of the Pilgrims. In the cabin of the *Mayflower* on the evening before landing the 31 heads of families represented adopted and signed a solemn agreement that was to serve as a basis of their government in the New World. It has become known as the *Compact of the Pilgrims.* In text, spelling and punctuation the following is an exact copy:

> In ye name of God, Amen. We whose names are underwritten, the loyall subjects of our dread soveraigne Lord, King James, by ye Grace of God of Great Britaine, France & Ireland King, Defender of ye Faith, etc. Haveing undertaken, for ye Glorie of God, and advancemente of ye Christian Faith and Honour of our King and countrie, a Voyage to plant ye first Colonie in ye Northerne part of Virginia, doe by these presents solemnly and mutually in ye Presence of God, and of another, Covenant & Combine our selves togeather into a Civill body Politick, for our better Ordering & Preservation & Furtherance of ye ends aforesaid; and by Vertue hereof to enact, constitute, and frame such just & equall lawes, ordinances, Acts, Constitutions & Offices, from Time to Time, as shall be thought most meete & convenient for ye generall good of ye Colonie, unto which we promise all due submission and obedience.

The 102 Pioneers. The world is indebted to William Bradford, second governor of Plymouth, for the names of the passengers on the *Mayflower* as published in his valuable *History of Plimouth Plantation.* These names follow in exactly the phraseology of the Bradford volume:

> The names of those which came over first, in ye year 1620, and were by the blessing of God the first beginers and (in a sort) the foundation of all the Plantations and Colonies in New-England; and their families.
>
> Mr. John Carver; Kathrine, his wife; Desire Minter; & 2. man-servants, John Howland, Roger Wilder; William Latham, a boy; and a maid servant, & a child yt was put to him, called Jasper More.
>
> Mr. William Brewster; Mary, his wife; with 2. sons, whose names were Love & Wrasling; and a boy was put to him called Richard More; and another of his brothers. The rest of his children were left behind, & came over afterwards.
>
> Mr. Edward Winslow; Elizabeth, his wife; & 2. men servants, caled Georg Sowle and Elias Story; also a little girle was put to him called Ellen, the sister of Richard More.
>
> William Bradford, and Dorothy, his wife; having but one child, a sone, left behind, who came afterward.
>
> Mr. Isaack Allerton, and Mary, his wife; with 3. children, Bartholmew, Remember, & Mary; and a servant boy, John Hooke.
>
> Mr. Samuell Fuller, and a servant, caled William Button. His wife was left behind, & a child, which came afterwards.
>
> John Crakston, and his sone, John Crakston.
>
> Captain Myles Standish, and Rose, his wife.
>
> Mr. Christopher Martin, and his wife, and 2. servants, who were Salomon Prower and John Langemore.
>
> Mr. William Mullines, and his wife, and 2. children, Joseph & Priscilla; and a servant, Robart Carter.
>
> Mr. William White, and Susana, his wife, and one sone, caled Resolved, and one borne a shipbord, caled Peregriene; & 2. servants, named William Holbeck & Edward Thomson.
>
> Mr. Steven Hopkins, & Elizabeth, his wife, and 2. children, caled Giles, and Constanta, a doughter, both by a former wife; and 2. more by this wife, caled Damaris & Oceanus; the last was borne at sea; and 2. servants, caled Edward Doty and Edward Lister.
>
> Mr. Richard Warren; but his wife and children were lefte behind and came afterwards.
>
> John Billinton, and Elen, his wife; and 2. sones, John & Francis.
>
> Edward Tillie, and Ann, his wife; and 2. children that were their cossens, Henery Samson and Humility Coper.
>
> John Tillie, and his wife; and Eelizabeth, their doughter.
>
> Francis Cooke, and his sone John. But his wife & other children came afterwards.
>
> Thomas Rogers, and Joseph, his sone. His other children came afterwards.
>
> Thomas Tinker, and his wife, and a sone.
>
> John Rigdale, and Alice, his wife.
>
> James Chilton, and his wife, and Mary, their doughter. They had an other doughter yt was married, came afterwards.
>
> Edward Fuller, and his wife, and Samuell, their sonne.
>
> John Turner, and 2. sones. He had a doughter came some years after to Salem, wher she is now living.



From a painting by Edward Percy Moran in Pilgrim Hall, Plymouth, Mass.
Signing the Mayflower Compact

> Francis Eaton, and Sarah, his wife, and Samuell, their sone, a yong child.
>
> Moyses Fletcher, John Goodman, Thomas Williams, Digerie Preist, Edmond Margeson, Peter Browne, Richard Britterige, Richard Clarke, Richard Gardenar, Gilbart Winslow.
>
> John Alden was hired for a cooper, at South-Hampton, wher the ship victuled; and being a hopfull yong man, was much desired, but left to his owne liking to go or stay when he came here; but he stayed, and maryed here.
>
> John Allerton and Thomas English were both hired, the later to goe mr of a shalop here, and ye other was reputed as one of ye company, but was to go back (being a seaman) for the help of others behind. But they both dyed here, before the shipe returned.
>
> There were allso other 2. seamen hired to stay a year here in the country, William Trevore, and one Ely. But when their time was out, they both returned.
>
> These, bening aboute a hundred sowls, came over in this first ship; and began this worke, which God of his goodnes hath hithertoo blesed; let his holy name have ye praise.

Early Distress. The Pilgrims landed where the city of Plymouth, Mass., now stands; they occupied an Indian settlement whose inhabitants had left after being greatly reduced in numbers by a pestilence. The first winter was one of incredible hardship. Disease, exposure to the intense cold and scarcity of food cost the colony half its members; among the dead was Governor Carver. Late in the spring of 1621 about 50 more Separatists from Leyden joined the colony, and William Bradford was chosen as the second governor. Within the next few years there rose to fame in the annals of American history such names as Miles Standish, John Alden and Priscilla Mullins (spelled Mullines in Bradford's book).

Poland, one of the new republics of central Europe that gained its independent existence as a result of the World War. For 1,000 years what is now Poland had periods of high accomplishment and inglorious recession, but fortune almost always kept its people prostrated and at the mercy of the more powerful. "Unhappy Poland" is a phrase that embodies much of the nation's history. Its people are Slavs.

As early as the 4th century there were many inhabitants in this region, settled in scattered communities, but little civilized. Not until the 9th and 10th centuries did the real history of the country begin.

During the reign of Mieczyslas I (962–992) the scattered settlements were welded into something like unity. This king held his power by the grace of the German emperor, whose vassal he was, and under German influence Christianity was substituted for paganism. His son and successor, Boleslas the Brave (992–1025), broke away from German influence, and the independent kingdom he proclaimed was not disturbed for about 200 years, though numerous wars had to be fought to maintain national freedom.

Five Hundred Years of Turmoil. A Mongol horde descended upon the land in 1240 and defeated a coalition of Poles, Silesians and Teutonic Knights in a great battle at Liegnitz in 1241. The solidarity of the Poles was destroyed, as the conquerors divided the country into small political units and took from it considerable territory. An influx of Germans, who inspired industrial development on a primitive scale, raised the morale of the people, and under a new leader, Ladislas I, between 1306 and 1333 some national unity was restored. The succeeding reign (1333–70) of Casimir III (the Great) brought the establishment of a form of parliamentary government. Casimir's successor was his nephew Louis, King of Hungary, and Louis's daughter Jadwiga became Poland's queen in 1384. By her marriage in 1386 to Jagello, Prince of Lithuania, Poland and Lithuania were united politically. Jagello became Ladislas II of Poland and founded the dynasty (called Jagellonic) which ruled for about 200 years.

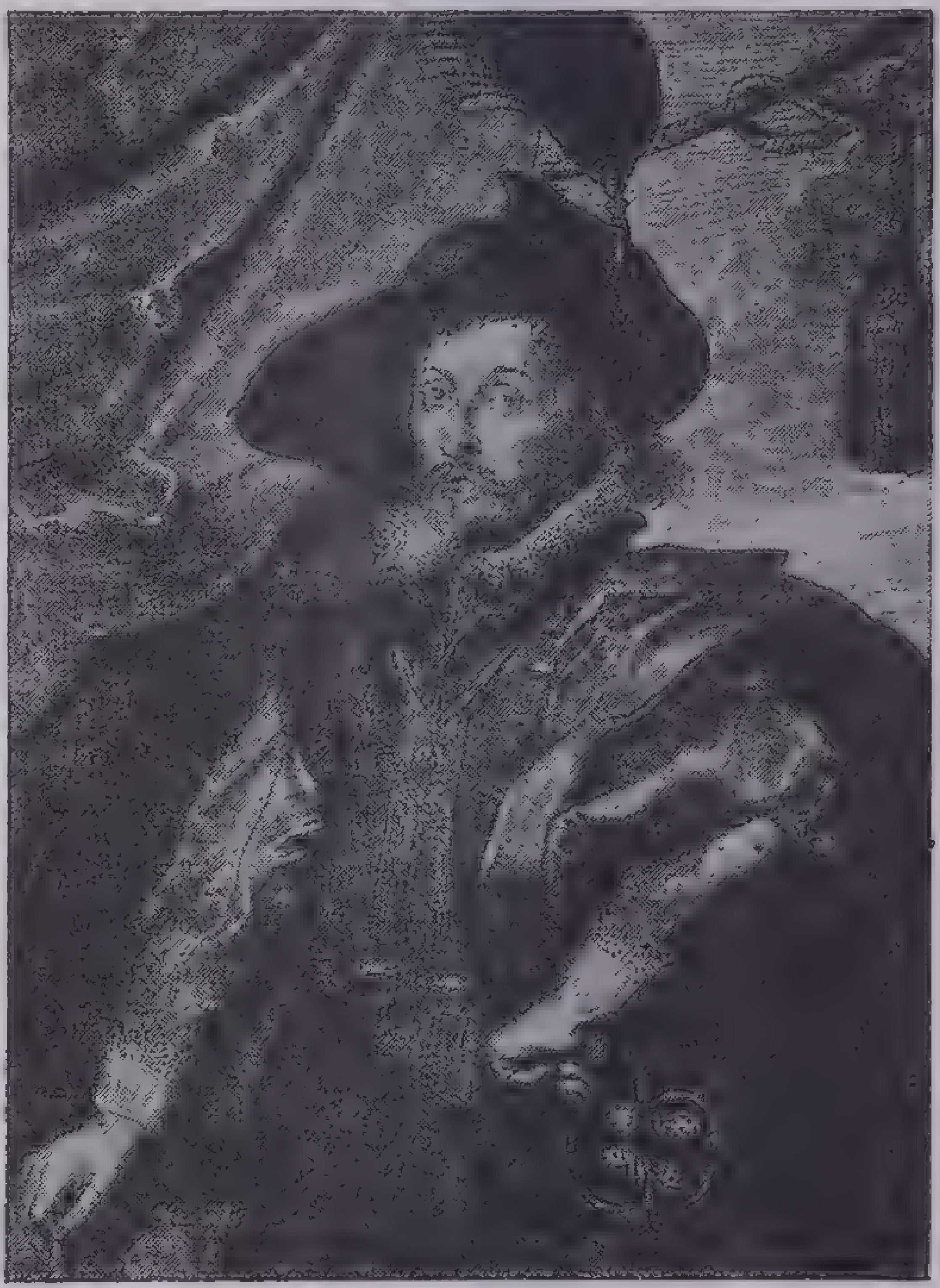
For more than 100 years the Poles had carried on an intermittent warfare with the Teutonic Knights, a powerful military order founded during the crusades. In the 13th and 14th centuries the Teutonic Knights had overrun Prussia and had organized it as a state of the Holy Roman or German Empire. The Polish kings desperately opposed the German expansion but were nearly helpless in the face of the superior organization and military skill of the knights. But with the regeneration of Polish nationalism under the vigorous regime of Jagello, a more effective resistance was offered. In 1410 Jagello administered a crushing defeat to the Germans at Tannenberg in East Prussia; from that time forth the threat of the knights declined. A half century later King Casimir IV (1447–92) conducted a successful war against the knights and by the Treaty of Thorn (1466) made Polish vassals of them.

The next 150 years was the period of Poland's greatest brilliance. Under the great kings Sigismund I (1506–48) and Sigismund II (1548–72) trade and industry flourished, strong commercial towns grew up, and Poland became one of the centers of European culture. The University of Krakow, where the Polish astronomer Copernicus studied, became the leading university east of Italy and the Rhine.

The Protestant movement that began in Germany in 1517 spread rapidly in Poland. Sigismund I, although personally a Roman Catholic, was too much a son of Renaissance humanism to adopt a severely repressive policy. Sigismund II was even less inclined than his father to enforce religious conformity with rope and faggot, and during the latter half of the 16th century Poland was probably the most tolerant state in an intolerant Europe.

The splendor of the reigns of the two Sigismunds concealed the growth of a serious political disease that ultimately proved the ruin of Poland. This was the tendency toward decentralization in the increasing turbulence and independence of the nobility. In the great states of western Europe, such as England and France, the 16th century saw the breaking down of the independence of the old feudal nobilities and the concentration of power in the central monarchy. In Poland this trend was reversed. Upon the death of Sigismund II in 1572 Poland began a process of disintegration and reversion to medieval feudalism.

From the time of Jagello until 1572 the Polish succession had been hereditary; from 1572 onward the kings were elected by the Diet or council of nobles. The elections were often manipulated by foreign bribery, and the Diet rarely displayed any higher motive than the selfish interests of its individual members. An amazing provision of the constitution made the Diet's government of the country the most inefficient that can be imagined. To take effect the decisions had to be unanimous; the dissent of a single noble—the famous *liberum veto*—was sufficient to block any legislation. The *liberum veto* became in time an almost ludicrous device for preventing progress in the government; in the 16th century patriotic tradition held it in check, but by the end of the 17th century it was used on all occasions as a mere obstruction.



From the portrait by Peter Paul Rubens

Sigismund III of Poland

Sigismund reigned from 1587 until his death in 1632, and for a period, 1594–1604, occupied the Swedish throne as well through inheritance from his father, John III

After the death of Sigismund II Poland enjoyed a brief period of continuing prosperity and foreign respect under the elected king, Stephen Báthory (1575–86). But his successor the Swedish Vasa, Sigismund III (king 1587–1632), was unable to make head against the forces of disintegration that were to make the next 150 years a long agony of decay. His stupid policies of foreign war and religious bigotry did much to hasten the inevitable decline. In the reign of Ladislas IV (1632–48) there was a partial recovery, but toward the end of the reign an uprising of the Ukrainian Cossacks and invasions of the Tatars egged on by the Ottoman Turks brought the country to the verge of ruin. The reign (1648–68) of Ladislas's successor, John Casimir, was marked by devastating wars with the Russians and the Swedes and by a bloody civil war between Casimir and Prince Lubomirski.

In spite of the political corruption

and the exhausting warfare that had characterized the sorry epoch of Casimir, Poland was still capable of heroic national effort. In 1674 John III, more usually known as John Sobieski, was elected to the throne. He was one of the greatest military leaders of his time, and Europe owed much to him for defending it against the inroads of the Turks; he defeated them after they had actually reached the gates of Vienna (1683). In his rule he was opposed by Poland's aristocracy and was hampered by foreign intrigues, but he left the country better for his patriotic efforts. Before 1700 Poland was a country of 12,000,000 people, and though nominally a kingdom it was dominated by a class of nobles who unmercifully oppressed the peasantry. Through indifference of the nobility Poland lost the Ukraine to Russia in 1667, and then began Russia's entry into the affairs of the country, which was to end in its destruction.

Underwood & Underwood

Church of St. Mary in the Free City of Danzig

The *Marienkirche,* one of the world's largest Protestant churches, is a vast Gothic structure capable of seating 25,000 people. It was begun in 1343 and finished in 1502

Three Partitions of Poland. Prussia and Russia desired to annex the country to their domains. One of their puppets, Poniatowski, was elected to the throne, and though he was a Pole, his choice caused revolt among the people. Using the revolutionary spirit as an excuse, the two plotting countries stepped in, ostensibly to restore order; but when this was accomplished, each took some Polish territory. They were joined by Austria, although the moral sense of Maria Theresa, the Austrian ruler, was revolted by the coldblooded act. This first partition occurred in 1772. In 1791 there was an attempt to revise the Constitution so that the government might be made more liberal. This angered the nobility, and Catherine the Great sent an army from Russia to prevent any developments that would decrease the power of the nobles and tend to make a strong state. Frederick the Great of Prussia approved the Russian scheme, and when quiet was restored in 1793, each took another slice of Polish territory. For 2 years no further inroads were made, and Poland was preparing to resist future efforts to blot out the nation. The people were inspired by the example of the French Revolution, then in progress, to battle for their rights. Under the leadership of Pontiatowski and Kosciusko, a Polish army prepared to meet the foe they knew would come. In 1795 a Triple Alliance of Russia, Prussia and Austria marched into Poland; its patriots could not cope with so formidable a force, and Warsaw was quickly taken. The king was forced to abdicate, and all Poland was divided among the three Powers of the Triple Alliance. The country no longer existed. Russia took the greatest portion, but Prussia and Austria received their shares.

Russian Domination. Thirty-five years later (1830) the Poles rallied, drove the Russians out of Warsaw and attempted to form a republic; but the Russians returned in overpowering weight and recaptured the city. Minor efforts against the oppressors later were frustrated, and these so angered Russia that a campaign was instituted against everything Polish. The Polish language was prohibited and the Russian tongue was substituted by decree, but the Russian Government could only compel its use as the official language; the Poles ignored it in social life. Russia began to dominate every part of the industrial and political life of the country, and until after the World War the Poles were in complete subjugation.

Again a Free Country. In the World War, Russia, from the outset one of the Allied nations, was forced to fight the armies of Germany and Austria. Unfortunately these battles were on Polish soil, with Warsaw as the objective of the enemy. Early in 1914 the Germans drove against Warsaw, but the Russians repulsed them. In 1915 the tide of victory changed, and Russia was driven completely out of Poland. Both sides ravaged the country, and the condition of the Poles was pitiable. Germany promised to make Poland an independent kingdom in return for its support during the remainder of the war, but as the offer included only the territory that had been Russian and not the lands that had been taken in the partitions of the country by Germany and Austria, the Poles rejected all overtures, and in 1918 proclaimed a republic. Pilsudski, Poland's leading military man, was made dictator, and Paderewski, the great pianist, was appointed premier. At the Peace conference of Versailles Paderewski pleaded successfully for recognition of a free Poland and for enlarged territory. The treaty gave the country parts of Posen and West Prussia and took from Germany a strip along the Vistula River so that Poland might have access to the sea. This river strip was called the *Polish Corridor.* The German city of Danzig at the mouth of the Vistula was set up as an independent state under the protection of the League of Nations.

Dissatisfied because it had not been given a seaport outright, Poland began in 1925 to build a port east of Danzig at the town of Gdynia. In 1923 in an effort to placate Poland in its territorial demands, the city of Vilna and surrounding country was declared Polish by the Council of Ambassadors appointed to dispose of the matter. Lithuania also claimed Vilna, and a state of war was precipitated. The League of Nations finally decided the question in favor of Poland, and the Lithuanian capital was moved to Kovno.

In 1938 the long-standing antagonism between Poland and Lithuania resulted in an ultimatum sent by Poland demanding a resumption of diplomatic relations and abandonment by Lithuania of all claims to Vilna. The ultimatum was dispatched at the height of the European crisis produced by Adolf Hitler's seizure of Austria, and Lithuania capitulated. In 1939 Germany attacked and conquered Poland which was divided between Germany and Russia. See World War Number 2, page 805c.

Polish Succession, see *Succession Wars.*

Portugal, the most southwesterly country in Europe. It has been a republic since 1911; previously it had been a united kingdom for about 800 years. Once one of the most powerful states of Europe, with colonial possessions of first rank, today it is a minor Power with practically no influence in world affairs.

The Phoenicians and the Carthaginians had trading posts at different places on what is now the coast of Portugal, but the early history of Portugal is not distinguished from that of the other parts of the Iberian peninsula. Later came the Romans; and in the 5th century, before Rome had lost its commanding power, the Visigoths descended upon Portugal; in the 8th century the Moors began to dominate it and impressed their mode of life so effectually that Moorish influence is felt even today. Hundreds of years were required to drive the Moors from the continent. This was finally accomplished in 1492.

A United Country. About midway

in the struggle against Mohammedanism (1095) Alfonso IV of León called to his aid Count Henry of Burgundy, to whom were given the counties of Oporto and Coimbra in payment for the services of himself and his Christian knights. Henry married the natural daughter of Alfonso and proceeded to extend his possessions. At his death in 1112 his wife devoted herself to establishing a stable government for their infant son, who as Alfonso I became the first king (1140–85) of united Portugal. Alfonso's reign was notable for extensions of his realm, taken from the Moors, and for his capture of Lisbon, which he made his capital in 1147. During the next two reigns Portugal reached its greatest territorial extent.

Colonial Expansion. Soon after the nation was firmly established, Portuguese sailors added to the domain by many explorations. The reign of John I (1481–1533), was made notable by the exploits of his son Henry the Navigator, who sailed along Africa's coast in search of a route to India and reached hitherto unknown lands. Madeira and the Azores were added to the Portuguese realm before John's death. Other explorers followed Henry along the African shore; the Cape Verde Islands were discovered; Dias rounded the Cape of Good Hope; in 1497 Vasco da Gama, most noted of all Portuguese sailors, passed the Cape and found the way to India. In 1493 a bull of Pope Alexander VI and in 1494 the Treaty of Tordesillas divided the New World between Spain and Portugal, giving Portugal title to Brazil. In 1580 Philip II of Spain, grandson of King Manuel, won the succession and annexed Portugal to Spain. For 60 years this relation continued, and then in 1640 the duke of Braganza drove the Spanish officials from Lisbon and caused himself to be crowned as John IV, thus establishing the House of Braganza. The rule of the Braganzas was terminated only when Portugal became a republic.

Decline of Power. The commercial advantages the country enjoyed by reason of its colonies were not followed up, and Portuguese commercial supremacy declined. Portugal made political alliances to strengthen its position, particularly with England. This English alliance brought Portugal into the conflict with Napoleon as an ally of England, and when the Peninsular War was fought, both France and Spain were enemies of Portugal because of its English alliance.

The intricacies of the European situation nearly wiped out Portugal. In 1796 Spain declared war upon Great Britain and entered into an agreement with France to dismember Portugal. The French occupied Lisbon, and but for the assistance of Great Britain, which sent General Wellesley (later Duke of Wellington) to the rescue, the French-Spanish plan might have succeeded. Before the arrival of the British, John VI fled to Brazil and from there tried to govern his homeland. When he returned, he found the people clamoring for government by a constitution, and he was forced to accede to the demand in 1822. In the same year Brazil declared its independence; this so incensed the nation that John was deposed by the army in favor of his son Miguel. The people would not accept Miguel; but with British assistance John's son Pedro became king. A period of revival set in. Educational facilities were increased, slavery in the colonies was abolished (1869), railroads were built, and the economic life of the nation was raised to heights not before known. Then in 1889 came King Carlos, who began a reign of such extravagance and mismanagement that in 1908 he and the crown prince were assassinated.

The successor of Carlos and the last king of Portugal was Manuel II, who endeavored to reform the administration of government. Discord and corruption had made conditions so unbearable that his abdication was forced late in 1910; he sought refuge in England, where he died in 1932. A republican constitution was adopted early in 1911.

The World War and After. The terms of a treaty with Great Britain compelled Portugal in case of war to assist the former with a force of at least 10,000 men. When the World War began, Portuguese troops in Africa attacked German colonies there to protect their own territory, but until 1916 the republic took no part in the conflict in Europe. In that year nearly 50 German vessels that had taken refuge in Portuguese harbors to be safe from capture by the Allies were confiscated by Portugal. Upon refusal to comply with Germany's demand for their release, war was declared by the Central Powers, and Portugal sent more than the required 10,000 soldiers into service. The new republic had not been solidly established when the World War began. At its close the Government was yet on a precarious footing, and disturbances of the public peace were frequent. In a revolution against the Cabinet in 1918 Paes, President of the Republic, was assassinated. A brief army dictatorship followed, but civil authority was soon restored. In 1928 General Antonio Oscar de Fragosa Carmona seized the Government and succeeded in having himself elected to the presidency within a few months. He has since continued to dominate Portuguese affairs and has established a form of government resembling the dictatorships of Fascist Italy and Germany. A corporative state was provided by the Constitution of 1934 with an upper house of the legislature, the Corporative Chamber, representing guilds, corporations and professions. In the Spanish Civil War (1936–38) Portugal furnished a friendly base for the operations of the insurgent leader Francisco Franco.

pragmatic sanction, a statement or decree relating to affairs of state, issued by the head of a government with the force of fundamental law. The one best-known in European history was issued by Charles VI, Holy Roman Emperor, in 1713, declaring that in the absence of male heirs his domain should be inherited by his daughter Maria Theresa. The other Powers agreed to accept his will in the matter, but after the death of Charles (1740) they tried to prevent her accession; her efforts to win her rights led to the War of the Austrian Succession.

Reconstruction, the period in the history of the United States during which the states of the late Confederacy were being reorganized for admission again into the Union. The end of the Civil War left them without state governments, and they were ruled by Federal troops and political appointees from the North. This was the era of *carpet-bag government*—power exercised by temporary, alien authority. Many abuses of power were inevitable, and there was rejoicing both in the North and the South when the last of the seceded states was given back to its own control. This was in 1877, at the beginning of the administration of President Hayes, who appointed a former Confederate army officer, David M. Key of Tennessee, as postmaster general.

Rome. The earliest connected histories of Rome were written about 200 B.C.; the traditional date for the founding of the city is 753 B.C. There was thus a period of more than 500 years during which Rome made history but no adequate records were kept. Early in the 2d century when the Romans began to busy themselves with history writing, they had to fill up the gaps with myth and legend. There were a few meager records to go by—tables of the law, lists of the chief officers of the state and a mass of word-of-mouth traditions; but of real materials for history, hardly any. It is not therefore surprising that the history that was written was a rather confused jumble of invented stories, dealing chiefly with exploits of legendary heroes and exaggerations and distortions of a thin framework of facts.

Nearly all the writings of these earliest Roman historians in the period between 200 and 150 B.C. have been lost. We know the names of many of them and in some instances have a passage or two from their works quoted by later historians or grammarians; but for practical purposes our knowledge of their work rests on the writings of two men who lived in the 1st century B.C., that is, 150 years after the earliest group of writers. These were Titus Livius, usually called simply *Livy,* and Dionysius of Halicarnassus. The Roman histories that they wrote represented merely the standardized ideas that were current in their time, and in all probability they themselves were fully aware of the uncertainty of their data and the purely conventional character of the stories they told.

> "It is not easy," wrote Livy "to determine between either the facts or the writers, which of them deserves the preference: I am inclined to think that history has been much corrupted by means of funeral panegyrics and false inscriptions on statues; each family strives by false representation to appropriate to itself the fame of warlike exploits and public honors. From this cause certainly both the actions of individuals and the public records of events have been confused. Nor is there extant any writer, contemporary with those events, on whose authority we can certainly rely."

Courtesy Italian Tourist Information Office

Ruins of a Roman Aqueduct

In the Campagna Romana, the low-lying country district outside of Rome, are ruins of the stone and masonry aqueducts built to carry water from the lakes in the neighboring hills to the city. The water flowed through covered troughs that in some places were underground and in other places were supported by imposing arches of varying heights adapted to give a continuous slope from the hills to Rome. First of the 11 aqueducts built from the 4th century B.C. to the 3d century A.D. was the Aqua Appia built in 312 B.C. by Appius Claudius, the censor. Some of the most striking ruins in the Campagna are the arches of the Aqua Claudia, begun in 38 A.D. by Caligula and finished in 52 A.D. by Claudius. Ten miles of arches appear above ground

All Roman history before 250 B.C. is therefore open to suspicion; some of the main facts and approximate dates may be relied on but none of the elaborate detail. Sometimes plausible explanations have been given by modern scholars for the early stories, but there is no general agreement. The most reliable traditions probably relate to institutional and legal development, although we must beware here of giving much credence to the stories of individual exploits. We know a great deal about the Roman constitutional system of the late republic and empire, and we can surmise with fair accuracy how some of its features must have developed, but the subject is beset with difficulty at every step, and the greatest experts are at variance.

The conventional date for the founding of the city, 753 B.C., has no historical value. The first event of Roman history on which we can place much dependence was the overthrow of the monarchy and the establishment of the republic about 509 B.C. Rome at this time had been in existence for several centuries and had grown perhaps from a small trading post to the richest and most powerful community of Latium, the section of central Italy extending about 40 miles south of the river Tiber. Tradition has handed down the names of seven legendary kings—Romulus, the founder; Numa Pompilius, to whom was attributed the institution of the Roman religion; Tullius Hostilius; Ancus Martius; Lucius Tarquinius Priscus; Servius Tullius and Lucius Tarquinius Superbus. The names of the last three are probably historical, although the detailed legends we have about them must be rejected. The utmost that we can say with confidence is that after some kind of civil disturbance the last king, Lucius Tarquinius Superbus (the Proud), was forcibly expelled from the city and that a group of leaders established a new form of government—a republic.

For more than a century after its establishment the new republic was forced to fight for its very existence. Probably the most powerful people in Italy at this time were the Etruscans, a strange and unidentified race who occupied the land along the seacoast north of the Tiber and had established strong colonies in other parts of the peninsula, notably in Campania, north of the modern Bay of Naples. There is some kernel of truth in the tradition that the exiled King Tarquin was supported by the Etruscans in an effort to regain his throne. The famous story how Horatius and his two friends held off the whole army of the Etruscan King Lars Porsena while their fellow townsmen cut down the bridge over the Tiber and thus saved the city is probably an invention intended to explain away a heavy defeat sustained by the Romans. At any rate the Etruscans were the principal enemies of the Romans for nearly 100 years.

In addition to the comparatively civilized Etruscans, there were other dangerous foes. Fierce tribes lived in the mountains to the south and east. These were the Volscians, the Aequians and the Sabines. The savage and devastating warfare of the frontier went on constantly between these barbarian highlanders and the more civilized agricultural Romans and their allies in Latium. The small Roman farmers were at the mercy of pillaging raids—sudden incursions that could not be foreseen and guarded against.

The Latin League. Very early (perhaps as the tradition has it, in 493 B.C.) the infant Roman Republic gave the first proof of its genius for political organization by forming with the lowland communities south of the Tiber whose language and blood was the same as that of the citizens of Rome the Latin League, an alliance for mutual defense against the mountaineers and the Etruscans. At the time of its formation the smaller communities of the Latin League stood on an equality with Rome, but it was inevitable that Rome should eventually absorb the whole leadership. At first there was an arrangement by which Rome and the smaller towns were to furnish army commanders in alternate years. In the course of time this arrangement broke down; Rome furnished all the commanders. Gradually the Latin League was converted from an alliance of sovereign units into a confederacy of Roman dependents. It was Rome's first step on the career of expansion that was ultimately to extend to the whole ancient world.

The external history of the first century of the republic from *c.* 509 to *c.* 395 B.C. thus revolves principally about the efforts of the Latin League to beat off the Volscians, Aequians, Sabines and Etruscans, and the gradual rise of Rome to the suzerainty of the League. By 395 B.C. the Latin League with Rome at its head had successfully risen to unquestioned dominance in central Italy. The Volscians and Aequians had been driven back to the mountains and were no longer dangerous; the Etruscan power had greatly declined; the Romans had seized and sacked Veii, the largest Etruscan city and Rome's only serious rival among the middle Italian cities; and a century of warfare had made the Romans the hardiest and most military people in the world.

While the republic was struggling for its life with its foreign enemies, great changes were taking place in its internal politics and institutions. There were two great social ranks or orders in ancient Rome—the *patricians* or noble class and the *plebeians* or commons. How the two orders originated we do not know; it has been suggested that the patricians were the descendants of the original settlers and the plebeians were later immigrants. At any rate the patricians apparently formed a closed group of privilege. They alone could hold public office and sit in the council of state—the Senate. They alone could act as priests, judges and commanders of the army. They alone could enjoy possession of the public lands. The much more numerous plebeians were expected to perform the duties of citizenship—service in the army, labor on the public works—

but had not the patrician privileges. But the plebeians were free citizens—they had the right to buy, sell and make contracts, the right to vote in the public assemblies and the right to intermarry among themselves (but not with patricians).

Patricians and Plebeians. The internal history of the Roman Republic from 509 to *c.* 300 B.C. is chiefly concerned with the struggle of the plebeians for equal political rights and with the constitutional system that grew up as a result.

At the beginning of the republic the administrative system was extremely simple. The executive power was vested in two *consuls* elected from among the patricians for a term of 1 year. The consuls were elected by a majority vote of the *centuries* (companies of the army), in which plebeians were more numerous than patricians, but which was so organized as to give controlling votes to a wealthy minority. The chief power in the state, however, was the *Senate,* a permanent council of the leading patricians. The Senate had existed in the regal period—indeed most scholars regard the revolution by which the kings were expelled as a contest for supremacy between the king and the Senate.

Two features of the office of consul require to be especially noted: the fact that *two* were appointed and the shortness of the term of office. Many additional offices or magistracies were added as the Roman constitutional system developed, but these remarkable features were always preserved. The Romans had an almost fanatical dislike of entrusting power to a single man. They appointed two consuls so that one might act as a check on the other; they made the term of office short to prevent any ambitious man from establishing a tyranny.

Very early in the republic's career (*c.* 494 B.C.) a serious clash developed between the plebeians and the patricians. It seems probable that the grievances of which the plebeians complained were mainly economic—harsh treatment of debtors, excessive rent exactions for the use of land and, perhaps most galling of all, the fact that there could be no effective appeal from an injustice done by a patrician, since the whole public administration was in patrician hands. The tradition that has come down to us says that the plebeian army seceded—deserted its commanders, marched off to a hill afterwards called the *Sacred Mount* and threatened to found a new city. Something of this sort may have happened, although it is difficult to believe that a revolution could occur in so orderly and disciplined a way. At any rate the plebeians forced an extraordinary concession from the patrician Senate. A new magistracy was invented—the tribunate. Henceforth the plebeians were to have two officers of their own choosing called *tribunes of the people* (*tribuni plebis*). The persons of the tribunes were to be inviolable (*sacrosanct*), that is, no one could arrest or interfere with them during their terms of office. The tribunes were empowered to protect from arrest any plebeian who appealed to them. In this protective function they were superior to the Senate, the consuls or any judge. Apparently the original intention was to provide a means of preventing injustices to individuals, but gradually the tribunes expanded their power until it amounted practically to the power to tie up the whole machinery of the state by forbidding magistrates to carry out their functions.

The Assemblies. Shortly after the institution of the tribunate the assembly of tribes (*comitia tributa*) seems to have been organized. The town of Rome and the surrounding farm land was divided in sections or wards called *tribes* (Latin, *tribus*). This division was probably much older than the republic and originated in the army organization of the kings. When the plebeians met to elect their tribunes or to discuss matters of common interest, it became customary for the vote to be taken by tribes, a majority of the tribes deciding the question or the election. The vote within each tribe was by head. When it was first organized (*c.* 471 B.C.) this *comitia tributa* consisted of 21 tribes. To be enrolled in a tribe a plebeian had to be a landowner. This last fact shows us that it is a mistake to regard the patricians as exclusively the wealthiest, and the plebeians as exclusively the poorest, class.

The *comitia tributa* in the later republic became the chief legislative assembly. Another important assembly was the *comitia centuriata* (assembly of the centuries), which originally was simply the army organized in companies. Very early in republican times the *comitia centuriata* began to be called together by the consuls to decide important questions of public policy, and thus it acquired a legislative power. The *comitia centuriata* consisted (after the time of King Servius Tullius, to whom the main features of its organization were attributed) of 193 centuries divided in five classes of foot soldiers according to a ranking based chiefly on wealth. The century was an artificial unit (not consisting of 100 men as might be supposed); indeed, there were 80 centuries of the first or wealthiest class and 20 centuries of the second class—a clear majority of the vote by centuries but undoubtedly a very small minority of the whole number of voters. Thus the *comitia centuriata* was in no sense a democratic body but one in which a small group of wealthy citizens held the controlling votes. The *comitia centuriata* elected the consuls; it was the only power competent to pronounce a sentence of death upon a Roman citizen; in conjunction with the Senate (*auctoritas patrum*) its resolutions had from a very early date the binding force of law.

A great advance was made between 451 and 449 B.C. when the first successful effort was made to draw up a written code of laws. Previous to this time it seems that the law was pretty much what the patrician magistrate said it was; there was no systematized written code that every one agreed on. Law was a matter of custom and oral tradition and was a patrician monopoly. In 451 a committee of 10 (the *decemvirs*) was appointed to draw up an authoritative code. Our chief literary authorities (Livy and Dionysius) tell us a number of interesting stories about this committee and its work; unfortunately they could not possibly have known much about it. About all we can be sure of today is that a code of laws was drawn up, that it was called from that time forth the *Law of the Twelve Tables,* and that this law became the fundamental source and groundwork of all subsequent legal evolution.

Other Gains for the Plebeians. Drawing up the Law of the Twelve Tables was itself an important victory for the plebeians, but they very soon gained other concessions. By the *Valerian-Horatian Laws* of 449 B.C. it was provided that resolutions of the *comitia tributa,* the control of which was practically in the hands of the plebeians, should, with the consent of the Senate, have the force of law. Thus the *comitia tributa* was placed on a legislative level with the *comitia centuriata,* where patrician influence was dominant.

Shortly after this (*c.* 445 B.C.) the *Canuleian Law,* one of the first laws passed by the *comitia tributa,* abolished the old prohibition of intermarriage between the orders, thus striking at patrician exclusiveness in its most vulnerable point.

The goal of the plebeians was to secure admission to the highest office of the state—the consulship. About 444 B.C. a compromise was reached on this issue. A new office was invented, the office of consular tribune or military tribune with consular power. This was to be open to plebeians. The consular tribunes offered a device for conceding the demands of the plebeians for a share in the government executive without granting them the honor and nobility conferred by the consulship. In our own day we are familiar with "acting" officers of various sorts, who have the power but are denied the title. The consular tribunate was a kind of acting consulship.

Although the consular tribunate was obviously conceived as a concession to the plebeians, it is a curious fact that no plebeian managed to get elected to the office for about 50 years; nothing could better indicate the extent to which the *comitia centuriata* that elected the magistrates was under patrician control.

About the time of the invention of the consular tribunate, a new office, the *censorship,* was instituted. Perhaps the best guess as to the origin of this office is that it represents a compensation to the patricians for the loss they had sustained in agreeing to the consular tribunes. The duty of the censors was to make a register of the citizens and to assign each man to his proper tribe. In later times the censors became invested with a general supervisory power over manners and morals.

We thus see that by 400 B.C. the plebeians had made substantial progress; through their leaders (the tribunes) and their assembly (the *comitia tributa*) they had attained a considerable independence of action. The concessions they had won made it inevitable that they would ultimately succeed in breaking down completely the old patrician monopoly. As the most numerous body in the state they were destined to be controllers of the state.

Invasion by Gauls. In 390 B.C. Rome faced a dramatic crisis—perhaps the most serious that had yet arisen. Fierce tribes of barbarians from the north, the Gauls, descended in great numbers upon Italy, ravaging the countryside and driving the terrified northern Italians before them. A Roman-Latin army went forth to meet them. About 12 miles north of Rome on the little river Allia the Romans were utterly defeated. The army was cut to pieces and before any further defense could be organized, the Gauls were upon the city itself. A terrible sack followed. The city was largely burnt; many women and children were taken captive. The Gauls finally withdrew after levying a heavy tribute—1,000 pounds of gold, the story goes.

In later times the Romans made up a heroic legend out of this terrible disaster; it was said that the great soldier Camillus drove the Gauls away. It seems more likely that they left voluntarily after gathering as much plunder as possible. The black day of the defeat on the Allia was long remembered in Rome, and in aftertimes few things aroused more terror in the city than the report of a Gallic *tumultus,* a stirring of that wild and dangerous race that lived in unlimited numbers on the far side of the Alps.

The city quickly recovered from the Gallic invasion. Under the leadership of Camillus the citizens set to work to rebuild their ruined homes. Within a few years Rome was again on her way to expansion. In 387 B.C. four new tribes were admitted to Roman citizenship. These were in lower Etruria around the captured city of Veii. In 383 B.C. Rome founded a colony at Antium on the Latian coast. In 381 B.C. the town of Tusculum was united to Rome with full citizenship rights.

More Gains for the Plebeians. In the internal struggle between patrician and plebeian a great step was taken in 367 B.C. by the *Licinian-Sextian Laws.* They had three main provisions:

1. One consul each year was to be a plebeian.
2. Holding of public land by any individual was henceforth to be limited to 500 *jugera* (about 300 acres).
3. Interest payments on debts were to be deducted from the principal and the remainder of the debts to be paid in three annual instalments.

As a sop to the patricians who lost exclusive tenure of the consulship, a new patrician office, the *praetorship,* was instituted. The praetors were to act as judges in civil cases, a power formerly exercised by the consuls.

While the passage of the Licinian-Sextian Laws did not end the struggle of the orders, it was now clear that the plebeians must ultimately gain everything they sought. In 366 B.C. the tribune Sextius, co-author of these laws, became the first plebeian consul. In 351 B.C. a plebeian was elected to the office of censor. In 339 B.C. the tribune Publilius Philo brought forward the *Publilian Law* providing that:

1. One censor must be a plebeian.
2. Senatorial confirmation of laws passed by the *comitia centuriata* was to be a mere matter of form.
3. The competence of the *comitia tributa* was to be increased.

In 337 B.C. this same Publilius Philo (apparently a man of great ability and popularity) was elected to the praetorship, thus breaking the patrician monopoly of that office. In 312 B.C. the censor Appius Claudius Caecus conferred the franchise on a large new class of landless city dwellers. In 287 B.C. by the *Hortensian Law* the *comitia tributa* became competent to pass legisation without the consent of the Senate. Sometime in this period plebeians began to be seated in the Senate in large numbers. By 285 B.C. the last vestige of patrician privilege had disappeared, and in later times the patrician-plebeian distinction died out altogether for practical purposes; but the constitutional system that had developed from the long political war remained.

The Golden Age. The 2 centuries after the passage of the Licinian-Sextian Laws, roughly the period from 350 to 150 B.C., is the Golden Age of the Roman Republic. It perhaps looked to after ages a little more golden that it really was. In the days of the late republic and early empire men fondly dreamed of the rugged simplicity, incorruptibility and patriotic fervor that were supposed to have been universal in those earlier times and used to attribute most of the evils of their own day to the gradual decay of the great Roman virtues. We do not know enough of the real life of the period to form a clear judgment on it, but we may feel sure that the virtues were exaggerated and that many harsh and terrible features of the old Roman civilization were overlooked.

Conquest of Italy. Beginning about the middle of the 4th century B.C. Rome entered on a series of wars with the neighboring communities that ultimately resulted in a complete Roman conquest of Italy. The important steps were the Samnite Wars, 343–341 B.C.; 326–304 B.C.; 298–290 B.C.; the war with the Latin allies, 340–338 B.C.; and the war with Tarentum, 281–272 B.C. The Samnites, a powerful nation in the interior of the peninsula, by the middle of the 4th century B.C. had extended their penetration over much of lower Italy. It was inevitable that there should be a contest between Samnium and Rome for supremacy that could not end until one or the other power was reduced to dependency. Rome eventually emerged victorious. Although we know little enough of the details, it is clear that this struggle with Samnium was desperate, and the outcome was doubtful for a long time. In 321 B.C. a Roman army was surrounded and forced to surrender at the battle of the Caudine Forks. The Roman consuls commanding the army consented to the enemy's terms of peace, and the army was allowed by the Samnite leader Pontius to escape after being made to "pass under the yoke" in token of submission. The Roman Senate repudiated the terms agreed to by the consuls and renewed the war.

The wars with the Samnites reached a climax in 295 B.C. when the Romans defeated a combined army of Samnites, Etruscans and Gauls at the battle of Sentinum. By this battle the Romans broke up the coalition of their enemies, and although the Samnites fought on bravely for another 5 years they no longer could contend on equal terms.

After the Samnites had been reduced, Rome turned her attention to the south of Italy. She made war on the city of Tarentum, a Greek community on the gulf between the heel and the toe of the boot-shaped peninsula. The Tarentines sought aid from abroad, and about 280 B.C. Pyrrhus, King of Epirus, came with a strong body of troops trained in the Macedonian tactics of Alexander the Great. He won two victories over the Romans, but the Romans fought so savagely as to inspire the famous remark, "Another such victory will ruin us." Pyrrhus was finally defeated at the battle of Beneventum, 275 B.C., and he withdrew to Greece. The failure of Pyrrhus ended serious resistance to the Roman power in Italy. Tarentum surrendered. Rome was the undisputed mistress of the whole peninsula.

The Punic Wars. But a vaster struggle was impending on a larger stage. On the north coast of Africa across the Mediterranean Sea was the great city of Carthage, older probably than Rome and the leading maritime and commercial power of the world. The Romans had very early come in contact with the Carthaginians, several treaties had been made between the two states and by the beginning of the 3d century B.C. a large commercial traffic was carried on.

In 264 B.C. began the first of the great Punic Wars, the long life-and-death struggle between Rome and Carthage for the dominance of the western Mediterranean. The war began with a Roman attempt to seize the island of Sicily. In 260 B.C. in the first great naval battle of Roman history the newly created Roman navy defeated the Carthaginians off Mylae near the northeastern corner of Sicily. A few years later, having greatly increased the size of their fleet, the Romans won another naval victory off Ecnomus on the south side of the island. They then transported an army to Africa, where, under the leadership of the consul Regulus, they seriously endangered Carthage herself. The Carthaginians rallied, however, and in 255 B.C. inflicted a crushing defeat on the invading Romans, capturing Regulus and practically destroying the army. In Sicily the Romans had been more successful. They had driven the Carthaginians nearly out of the island by 249 B.C. The brilliant military skill of Hamilcar Barca, who took over the Carthaginian command in Sicily in 247, kept the Romans at bay for 6 years; but finally in 241, when both sides were too weakened to continue the war, the Carthaginians sued for peace. By the terms of the peace, Carthage agreed to the evacuation of Sicily and paid a heavy war indemnity.

The period from 241 to 218 B.C. was an armed truce rather than a peace. Shrewd men both in Rome and Carthage saw clearly that sooner or later the war would be renewed. Hamilcar Barca, the great Carthaginian leader who had been forced to surrender to the Romans in Sicily, was bent upon revenge. In 237 B.C. Hamilcar went to Spain, and in the next 9 years he built up a strong Carthaginian power there. With him were his young sons (called the *lion's brood*) Hannibal, Hasdrubal and Mago. Hamilcar was killed in 229.

In 221 B.C. the command of the Spanish Carthaginian army fell to the young Hannibal, who was then 26 years old, and who later proved himself one of the greatest military geniuses of history. In the Second Punic War, which Hannibal, almost single-handed, waged against Rome during the years 218–202 B.C., Rome was forced to the most desperate straits, and *dirus* Hannibal was ever after remembered as the most terrible enemy the Romans ever encountered.

The war began with Hannibal's astonishing march over the Alps with an army of 50,000 men. In spite of tremendous losses occasioned by the hardships of the passage, Hannibal held his army together and, having once gained the fertile lowlands of the Po Valley, maintained himself on Roman soil for 15 years, defeating army after army that Rome sent against him. But his hopes of rousing the Gauls, the Sannites and the other Italian peoples that had been subjugated by Rome in the preceding 2 centuries to a war of liberation against Roman dominance were disappointed. Rome's conquered allies, in the main, clung to their Roman ties, and all Hannibal's military brilliance and political skill were unable to break up the Italian unity that Rome had built. Rome won the Second Punic War and the dominance of the ancient world not on the battlefields of Zama and the Metaurus but in the Senate Chamber where, during 250 years, Roman statesmen had debated and adopted measures drawing Italy into a common interest and common destiny with Rome that not even the genius of a Hannibal was able to destroy.

The first 3 years of the war were uniformly disastrous for the Romans. Hannibal overwhelmed two great Roman armies at the Lake Trasimene and at Cannae, a battle that has been called "a carnival of cold steel, a butchery," where more than 50,000 Roman soldiers were killed, gained control of most of southern Italy and occupied Capua, the second city of the peninsula. Then the tide turned.

Pushed to extremity, Rome fought with fierce energy; Hannibal was slowly forced to take the defensive; Capua was recaptured after a long siege; a Roman army in Spain under Publius Cornelius Scipio attacked and captured the city of New Carthage and broke up the work of colonization begun by Hamilcar. There was one more tense moment of the war—a second Carthaginian invasion from the north (207 B.C.) led by Hannibal's brother Hasdrubal. At the head of 50,000 men Hasdrubal appeared in the valley of the Po, bent on joining forces with his brother; but the *di immortales* favored the Romans. At a decisive battle on the Metaurus Hasdrubal's army was destroyed and Hasdrubal himself killed. It was the end of Hannibal's last real chance. The war ended in 202 B.C. when Hannibal, who had been recalled to Africa to defend Carthage, was defeated at the battle of Zama by a Roman army led by Publius Cornelius Scipio.

By the terms of peace Carthage was reduced to an unimportant power. The greater part of her magnificent navy was surrendered and burnt; Spain was delivered over to Rome; a heavy annual war tribute was laid on; and, most galling of all, Carthage was forbidden to make any war without the consent of Rome. These terms were severe but by no means excessive, considering the provocation. Nevertheless the expression *Carthaginian Peace* has ever since meant crushing terms dictated to the vanquished at the point of the sword.

The Second Punic War is the great turning point in Roman history. Up to this time the story of Rome is the story of a growing Italian city-state; after this the story of Rome is the story of the ancient world. The day of Italian isolation was over; the next half century saw the spread of the Roman power over the whole northern Mediterranean.

Up to the time of the Second Punic War the Romans had come only slightly into contact with the advanced and complex civilization of Greece. Beginning about this time the influence of Greek culture—manners, art, philosophy, poetry—becomes increasingly important, until a kind of fusion of the two diverse civilizations took place and produced what we speak of as the Greco-Roman world.

Conquest of Greece. Immediately after the battle of Zama, Rome began a course of interference in the internal affairs of the Greek states. At the beginning there was no thought-out plan of conquest; Rome became involved in Grecian affairs as a necessary consequence of the war with Hannibal, whose political combinations extended throughout the East. No greater mistake could be made than to suppose that Rome set out deliberately to conquer the world and succeeded in doing so by waging a series of victorious aggressive wars. The truth is that Rome's empire was thrust upon her; it grew step by step almost automatically; each new acquirement outside Italy brought with it new responsibilities, new "spheres of influence" in the modern phrase and hence new entanglements.

After the defeat of Carthage there was no balance of power in the ancient world; Rome was so much stronger than any independent state that it was inevitable that she should eventually swallow them all. The conquest of the Greek states took place in four main stages—the Second Macedonian War (200–196 B.C.), the Asiatic War (192–189 B.C.), the third Macedonian War (171–167 B.C.) and the destruction of Corinth (146 B.C.). The military details of these wars are of less importance than the results. By them Rome became the governing center of a vast provincial empire and was confronted with new and enormous problems of administration.

The social and economic consequences were even more important than the political. The Greeks were the most civilized people of the ancient world and the most artistic and intellectually versatile people that ever lived. Though Rome conquered Greece physically, Greece conquered Rome intellectually; but the conditions of this intellectual conquest were the worst imaginable. Vast numbers of Greek slaves poured into Italy. The artistic riches of the Greek world were suddenly at the mercy of a rude and barbarous race of soldiers. Greek culture in the hands of the Romans was two-edged—it civilized, but at the same time it corrupted. As we study Roman civilization of the late republic and the empire we are continually struck by the strange contradiction it presents of essential savagery in the midst of an advanced civilization—by the contradiction of a Cicero, the student of Plato and Sophocles, attending the bloody spectacles of a gladiatorial arena.

The Third Punic War (149–146 B.C.) is perhaps the most disgraceful episode in Roman history. It was a war of revenge, pure and simple, without any of the political justification that can be urged for most of Rome's foreign wars. Rome could not forget that *dirus* Hannibal had once shaken the state to its foundations. There was a strong party, led by the implacable Cato, that felt that the terms of peace granted after the battle of Zama were too lenient; they wanted Carthage blotted utterly from the earth. For many years Cato used to end all his speeches in the Senate, whatever the subject, with the bloodthirsty demand, *"Delenda est Carthago"* ("Carthage must be destroyed!"). A pretext finally arose and a Roman fleet appeared before Carthage demanding that the city disarm itself completely. The Carthaginians complied, hoping to satisfy the Romans; but the disarmament was only a trick to secure a more complete submission. When the Carthaginians were no longer in a position to refuse, the Roman commander threw off the mask and announced that the city was to be leveled to the earth and the population deported to an inland desert settlement. Too late the Carthaginians rose in a desperate resistance; they held off the Romans during a long siege, but finally in 146 B.C. the city was taken and reduced to ashes. Those inhabitants who survived were sold into slavery.

Reforms of the Gracchi. The wars of the first half of the 2d century B.C. ended all foreign threats to Rome's supremacy. The center of interest shifted back to Italy. The century from 133 to 31 B.C. was one of continuous internal turmoil. It began with the reform efforts of the Gracchi brothers, Tiberius and Caius and ended with the establishment of the empire under Octavius after the battle of Actium.

Tiberius Sempronius Gracchus was elected tribune for the year 133 B.C. He belonged to one of the most distinguished Roman families; his mother, Cornelia, was the daughter of Scipio Africanus, the conqueror of Hannibal; his father had been twice consul. Gracchus was an excellent example of the idealistic and patriotic young aristocrat in politics, burning for reform.

No one could deny that reform of some sort was necessary. In the half century following the Second Punic War an economic and social revolution had transformed the life of Rome and in most respects had transformed it for the worse.

As the first step in his New Deal program, Tiberius Gracchus brought forward the *Sempronian Law,* proposing an extensive redistribution of public lands. The Sempronian Law was not an especially radical proposal, as it only demanded the enforcement of the famous Licinian Laws of 367 B.C.; but the Licinian Laws had long been a dead letter, and Gracchus's attempt to revive the principle of public control of public lands was looked upon by the wealthy class as a direct threat to their time-honored rights. Gracchus succeeded in getting his law enacted in the *comitia tributa,* although in order to do so he resorted to unconstitutional means. When he attempted to secure his own reelection to the tribunate (another violation of the law), the cry was raised that he was aiming at the establishment of a *tyrannis* or monarchy, and he was murdered in a riot.

Ten years later Tiberius's brother Caius took up the work of reform. In many respects he was an abler man than Tiberius. He revived the land-distribution law of Tiberius and succeeded in carrying several further pieces of legislation designed to limit the power of the wealthy senatorial class. For 2 years he maintained his power and popularity. But in 121 B.C. having failed to secure his re-election to the tribunate for a third term, he was declared a public enemy by the Senate and was murdered as his brother had been.

The failure of the Gracchi brothers to effect reforms peaceably marked the beginning of the end of democratic process in Rome. Henceforth the strife of faction became ever more violent; constitutional methods were more and more abandoned in favor of force, until the Roman Republic finally broke up in a near anarchy.

Marius and Sulla. The 20-year period after the death of Caius Gracchus in 121 B.C. saw the rise to power of the great rivals, Caius Marius and Lucius Cornelius Sulla. Marius, the rude and uneducated son of a peasant, first attained prominence by his military skill and organizing ability in the Jugurthine War (113–105 B.C.). In 102–101 B.C. he defeated a dangerous horde of barbarians, the Cimbri and Teutons, that threatened to overrun Italy from the north. He was elected seven times to the consulship. After these great triumphs of his early career he became involved in bitter political rivalry, was driven into exile for a time and in the end blackened his reputation for all time by engaging in the organized murder of his personal and political enemies.

Sulla, who became Marius's chief foe, was an aristocrat by birth and sympathy. A military leader of perhaps even greater ability than Marius, he was the first to solve the political problems of the republic by the use of the army. In 82 B.C. upon returning from a successful war against Mithridates, King of Pontus, Sulla led his army to Rome and seized the government. He put down all opposition by a ruthless policy of murder. Each day he would publish a list of persons whom he wished killed; the persons thus "proscribed" were declared public enemies, a price was set on their heads, and they were hunted down like beasts. At first these proscriptions were confined to those who had opposed Sulla politically; but later they were extended to satisfy mere private grudges of Sulla's partisans. In some cases a man was proscribed merely because one of Sulla's favorites coveted his property.

After the dictatorship of Sulla (82–79 B.C.) political life at Rome degenerated into a struggle of ambitious individuals to secure the supreme power. It is difficult to trace any politics of principle in the intrigues and conspiracies that filled the next 30 years. We know this period better than any other in Roman history because it is the period of the adult life of Cicero, and his voluminous writings, especially his orations and personal letters, have largely survived.

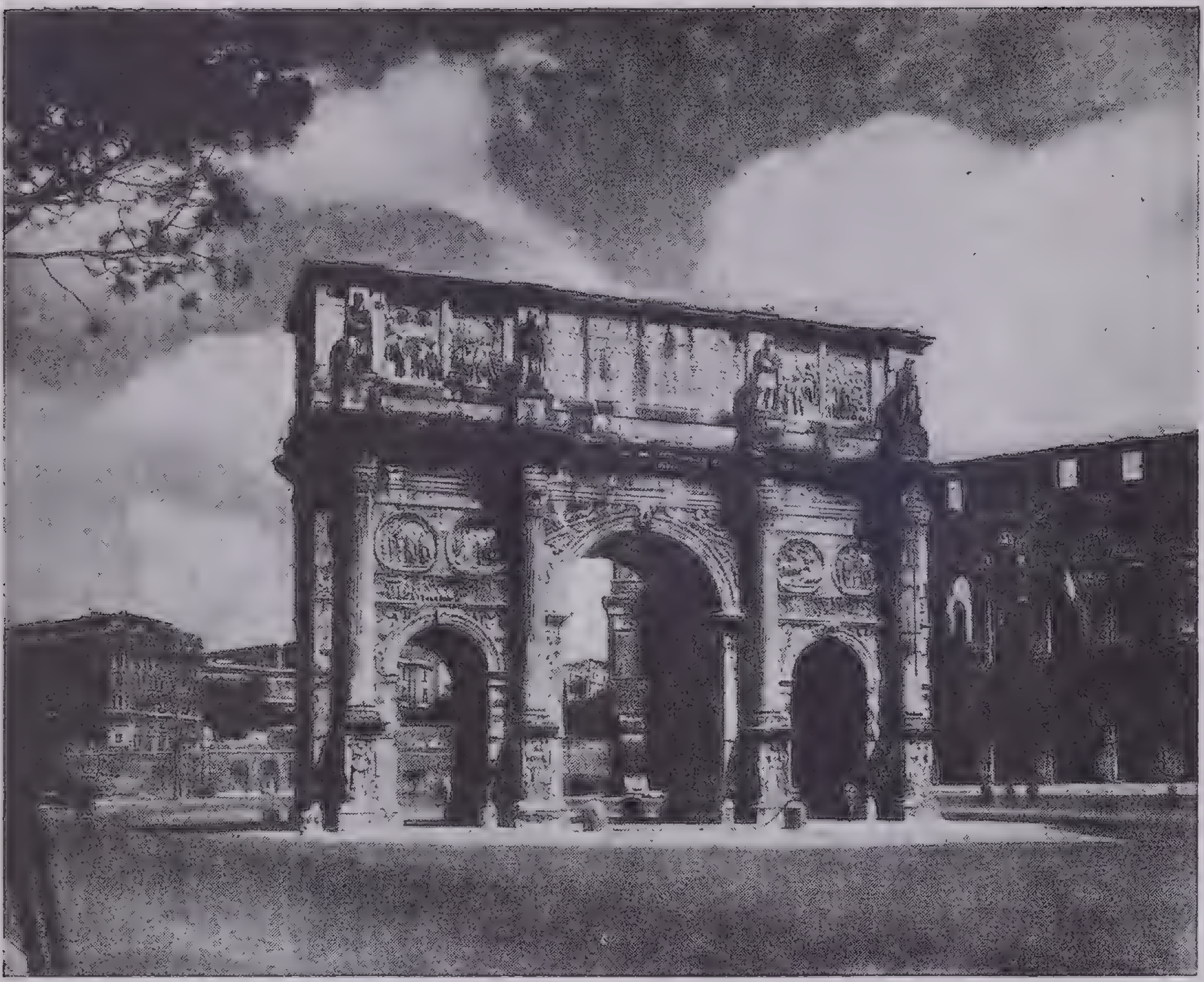
Rise of Caesar. The leading personalities and events of this crowded time must be passed over with brief mention. In 63 B.C., the year of the consulship of Cicero, occurred the conspiracy of Catiline, a revolutionary movement led by an impoverished and profligate noble. The conspiracy was detected and thwarted by the vigilance of Cicero. In 60 B.C. Julius Caesar became consul, and in conjunction with Marcus Crassus, a rich banker, and Gnaeus Pompey, a popular military hero, formed the political combination called the First Triumvirate, which practically ruled Rome for the next 10 years. In 58 B.C. Caesar began the conquest of Gaul that enabled him to develop his genius for military leadership and to train a personally loyal army that he was later able to use to overthrow the senatorial government and thus make himself dictator.

Cicero has given us vivid pictures of the corruption and violence that characterized the time. "The only man who has the least interest in the good of the state," he wrote to his friend Atticus, "is Cato, and he talks as if he were in Plato's Republic instead of in Romulus's sewer." Most of the nobility (the senators) believed that whatever else might happen their fish ponds would be safe, and in this spirit they made no effort to remedy the terrible social and economic conditions that were rapidly ruining the republic. Elections and jury trials were decided by one of two methods —bribery or rioting. Rival politicians patrolled the streets supported by armed bands of gladiators. The bulk of the urban population was an illiterate and pauperized rabble ready to sell itself to any demagogue. The competition of slave labor had ruined the free workmen and destroyed the solid middle class that had been the backbone of the republic for centuries.

From the statue in the Vatican Museum
Augustus Caesar

In 49 B.C. Caesar, at the head of an army fresh from the conquest of Gaul, marched into Italy and seized the government. Pompey, his old political ally, headed the opposition. A civil war lasting intermittently for 4 years resulted in the complete triumph of Caesar. He was made dictator for life, and he at once set about a reorganization of the state that effectually ended the 400-year-old republic.

In 44 B.C. Caesar was assassinated by a group of disgruntled aristocrats who could not bear the loss of their ancient liberties; but the assassination did not cure the political diseases of Rome; it merely removed the one Roman of transcendent executive genius and plunged the state into a new civil war to determine which of several mediocrities should take up where



Courtesy Italian Tourist Information Office

Arch of Constantine at Rome

The triumphal arch of Constantine, leading to the *Via dei Trionfi,* was built by the Emperor Constantine in 315 A.D. to commemorate his victory over Maxentius. The entablature with its sculptured frieze was made in his time; the carvings between the columns are survivals of Trajan's and Hadrian's reigns

Caesar had left off. There was no chance of restoring a vigorous and stable democracy. Caesar had instituted many reforms. He abolished the custom of farming out the collection of taxes to bidders; he built public edifices; he granted citizenship to many of the provincial cities and defended the people against the official class.

The Civil War. In the civil war that followed Caesar's death the Senatorial party was led by Brutus, Cicero and Cassius; the party of the people, by Antony, Octavius and Lepidus. The contest for supremacy ended with the destruction of the hopes of the senatorial oligarchy in the battle of Philippi (42 B.C). The Second Triumvirate, of Antony, Octavius and Lepidus, now ruled the Roman world. Antony became enamored of Cleopatra, Queen of Egypt, and betrayed his allegiance to Rome; finally the fleets of Antony and Cleopatra prepared to fight Octavius at Actium. The queen fled with her ships, and Antony was defeated (31 B.C.). Lepidus, a weak member of the Triumvirate, soon lost all influence and dropped from sight.

Of the three leaders, then, only Octavius remained. His acts were tempered with wisdom and justice; the Senate proclaimed him *Augustus* (the majestic), but he preferred to be called *princeps,* the first citizen. He took for himself the powers of the tribunes in Rome and of the proconsuls in the colonies and in effect assumed the prerogatives of an emperor. The Roman Republic ended with him, and the career of the Empire was launched.

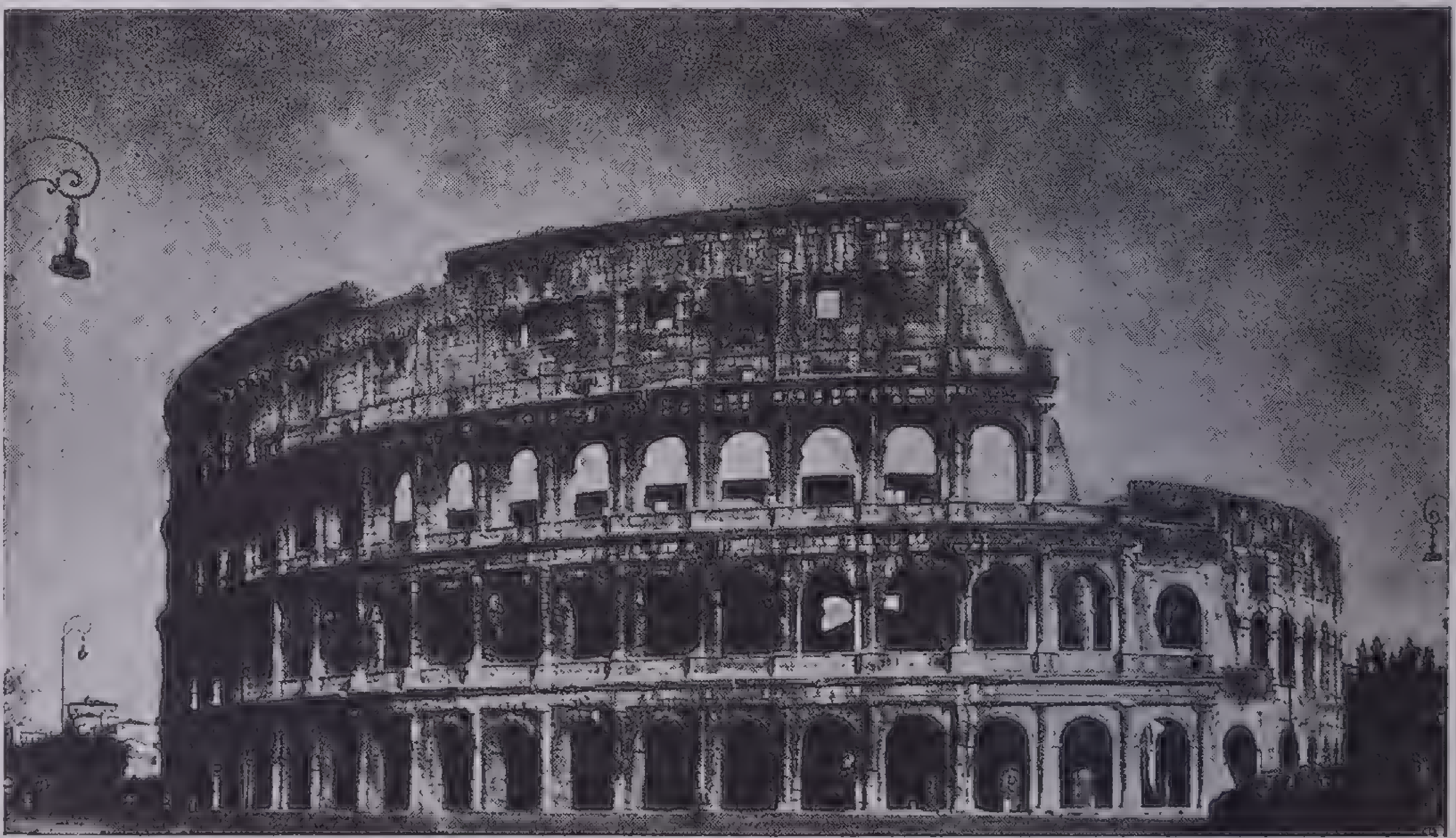
The Roman Empire. Augustus, sole remaining member of the Second Triumvirate, rode into power with a complaisant Senate behind him, and he found himself vested with practically unlimited power. With him the history of the Empire began, though the government was still formally a republic.

The wealth and splendor of the city had advanced with its territorial aggrandizement and civic development. What had once been a town of bricks became a city of superb marble palaces. It could boast 420 temples, 5 theaters for the drama, 2 amphitheaters, 7 circuses of vast extent, 16 public baths and 14 aqueducts, besides mighty monumental pillars, triumphal arches, porticoes and lofty columns and obelisks.

Upon the death of Augustus, his unscrupulous stepson Tiberius ascended the throne. He established the system of spying upon Roman officials that later emperors long employed. Caligula, Claudius and Nero followed in succession. The name Nero became a synonym for all that is wicked; he persecuted the Christians (64–67 A.D.) and, when much of the city was destroyed in a mighty conflagration, charged them with burning Rome. Titus and Vespasian, father and son, were exceptions to the tyranny of other emperors, and five "Good Emperors"—Nerva, Trajan, Hadrian, Antoninus Pius and Marcus Aurelius—deserved their fair fame. Yet the third and fourth persecutions of the Christians occurred under Trajan and Marcus Aurelius. These five emperors ruled from 96 to 180 A.D.

Commodus, the son and successor of Marcus Aurelius, was an infamous ruler, and from his reign most historians date the beginning of Rome's decline. Following him was a succession of rulers chosen by the army and called *Barracks' Emperors,* and the power of the army was dominant throughout their period (193–284). Two names stand out above the common run of rulers of these 200 years —Alexander Severus (222–35), a good man who tried to rule well; and Diocletian (284–305), who realized that one man could not rule successfully so vast an empire.

Diocletian divided it into the Empire of the East and the Empire of the West, naming Maximian joint emperor with him, to rule over the East. The two parts were united again under



Courtesy Italian Tourist Information Office

The Colosseum, Rome

The Colosseum, which could accommodate 50,000 spectators at its chariot races, gladiatorial combats and wild-animal shows, was begun by Vespasian in 70 A.D. and finished under Titus and Domitian a decade later. It is considered the most striking of Roman antiquities existing today. This amphitheater is an excellent example of Roman architectural methods: the columnar style of the Greeks is linked with the arch or vault of the Etruscans

Constantine, known as *Constantine the Great,* sole emperor from 323 to 337. He moved the seat of government from Rome to his newly founded city, Constantinople, on the Bosporus; in 312 he gave liberty to the Christians and 10 years later made the Christian religion the official faith of his empire. The Church received an impetus from him that enabled it to survive and even to grow during the turbulent years that followed.

After Constantine's death, Roman rule was first in the hands of his sons, Constantine, Constans and Constantius II, and they were followed by Julian (361–63), called the *Apostate,* whose rule was imposed by the army, and who tried to uproot Christianity and restore paganism but failed. Another important name was that of Theodosius the Great, whose reign covered the years from 379 to 395. He was appointed emperor of the East by Gratianus, and upon Gratianus's death the Western throne was taken by a usurper, Maximus, who ruled for 5 years. Theodosius overthrew Maximus in 388 and appointed Valentinian II, son of Gratianus, to the throne in Rome. To end a revolt in 390, Theodosius caused the death of 7,000 persons in Thessalonica.

The division of the vast empire into two parts, the diverse interests of the widely separated groups, the misrule to which they were so frequently subjected and the tribes on the borders avid for territory and loot, all contributed to the downfall of the great Roman state.

The Huns pillaged Rome in 410; the Goths, Visigoths, Franks and other tribes pounced upon unprotected spots; the Vandals took North Africa, the Visigoths captured Spain and southern Gaul, and the Huns weakened the empire in the East. The plea of Pope Leo the Great availed to prevent the sack of Rome by the Huns under Attila in 452; but it fell to the Vandals in 455, who looted it at their pleasure. No longer was a Roman emperor a potent force. In 476 Romulus Augustulus, "Little Augustus," ascended the throne, but within a year he was dethroned by the Germans under Odoacer.

This date is conventionally taken as the end of the Roman Empire in the West, but the student should be warned against the common notion that any sharp break occurred. To contemporaries the year 476 seemed in no way remarkable; they were not conscious of any such event as the fall of the Roman Empire. Very slowly over a period of several centuries the Roman civilization had been decaying, and it became gradually replaced by the civilization we call medieval; the transition between the two types of civilization occurred most rapidly in the 5th century. That is really all that is meant by the statement that the Roman Empire fell in 476 A.D.

Roundheads, an uncomplimentary name applied to the followers of Oliver Cromwell in England, because they wore their hair close-cropped. Their opponents, the followers of the king, were known as *Cavaliers* and were distinguished by long, flowing curls.

Rumania, a kingdom of the Balkan states of southern Europe. Its first people in historic times were the Dacians who migrated from Thrace across the Danube River shortly before 335 B.C., probably to escape from the path of the conquering Alexander the Great. They occupied their new home in such numbers that the first Roman general who made conquests in that section did not dare to attack them. Augustus Caesar did attack them in 10 B.C., but with little success; so valiantly did the Dacians fight that it is said the Romans paid them tribute to be free from molestation. It was not until 106 A.D. that they came fully under the power of Rome. On Trajan's Column in Rome the Dacian arms are carved to commemorate the victory. Roman colonists were sent at once to occupy the territory. Because it lay in the paths of migration, Dacia was for centuries a barbarian battleground. It was in turn possessed by the Huns, Slavs, Bulgars and others. During these centuries two independent provinces—Wallachia and Moldavia—came into existence. In the 16th century Turkey overran the Balkan Peninsula, and the two provinces were conquered by the Mohammedans. It was no willing allegiance, however, and for many years Wallachia and Moldavia fought savagely against the Turks.

Toward the close of the 16th century Michael the Brave of Wallachia united the two provinces, and this was the weak beginning of the Rumanian nation; but on the death of Michael in 1601 the union was left without a strong protector, and Turkey again asserted its authority, though Rumania kept itself free from further Turkish settlement. An attempt by Peter the Great in 1711 to free the provinces resulted in failure, and the rule of the Turk became harsher. The governors appointed were from the Greek provinces of Turkey, and they made the Greek language the official tongue. In the changing rule in Europe as the result of wars, the political allegiance of the people was shifted among the Powers. After peace was concluded in 1777, Bessarabia, which had been annexed to the Rumanian provinces, was transferred to Russia, and Bukowina, another province, was given to Austria. After the successful conclusion of the Greek War of Liberation (1829), the power of the Turk was broken in Rumania, the Greek governors were sent home and more power was given to the natives; but in the treaty by which Turkey relinquished control, Russia was assigned the post of protector of the provinces along the Danube, including Rumania. This hold continued until 1856, when Russia lost a war of 3 years's duration against Turkey and its allies.

The Congress of Paris in 1856 established the United Provinces of Wallachia and Moldavia; 3 years later Prince Cuza, a native, was invested with governing power and in 1861 was enthroned as Alexander John I. In 1878 the Congress of Berlin, called by the nations to adjust Russian and Turkish affairs, declared Rumania to be an independent nation; 3 years later the people decided that their country should be a kingdom. From that year the modern state of Rumania dates its history. The first monarch of the new kingdom was Prince Charles of Hohenzollern, who had become prince of Rumania in 1866. His reign was long, and he proved to be an enlightened monarch. Rumania did not join the other Balkan states in the first Balkan war (1912) against Turkey; but in the second war, against Bulgaria, which followed immediately, Rumania was an ally of Greece and Serbia; the object of the three was to deprive Bulgaria of some of the fruits of the preceding struggle. Bulgaria was defeated, and Rumania secured the Dobrudja province. Soon after peace was concluded, King Carol died in October 1914, after the beginning of the World War. He was succeeded by Crown Prince Ferdinand, whose consort was Princess Marie.

The kingdom endeavored to maintain a position of neutrality early in the World War, but its sympathy with the Allies, intensified by its hatred of the Turks, who fought with Germany, led it to join the Allies. The Rumanians were actuated in part, also, by the hope of liberating Transylvania from the rule of Austria-Hungary. The Rumanians entered the field in force against the Austro-Hungarians, but were badly defeated, and Bucharest, the capital, was taken. When the Allied Powers were finally victorious, Rumania received Transylvania, Bessarabia and Bukowina after these peoples had voted for the transfer.

Ferdinand and Marie were not crowned until 1922. The king died in 1927, and his grandson Michael, aged 5, son of Prince Carol and Princess Helene, was proclaimed king. The Government was placed in the hands of three regents. In 1930 Carol, who had renounced his right to the throne in 1926, became king and removed his son Michael, giving him the title of crown prince.

Rumania became a member of the Little Entente, the group of Balkan Powers formed after the World War as part of the French system of collective security and maintenance of the settlement of Versailles. With the rise of the Nazi party in Germany and the consequent German rearmament, the solidarity of the Little Entente was much weakened. Both geography and economics tend to push Rumania into closer relations with Germany. In 1940 Rumania yielded much territory to Hungary, Bulgaria, and Russia. Due to threats Rumania in 1941 allowed German troops to occupy her country. Carol fled. See 2nd World War, p. 805c.

Russia, see *U.S.S.R.*

Rye House Plot, a plan developed in 1683 by English Whigs (successors to the Parliamentarians of Cromwell's time) to waylay and kill King Charles II and his brother and place a Protestant, the duke of Monmouth, on the throne. The assassination was planned to take place at Rye House, the country place of one of the conspirators. The burning of a house where the king was staying caused a change in his tour, and the plot failed. Several alleged conspirators were beheaded.

Salic Law, a code of the Salian Franks, promulgated in the 5th century, that dealt with crimes, injuries and inheritances. What makes it important in history was one of its phrases: "No portion of Salic land shall come to a woman; but the whole inheritance of the land shall come to the male sex." This rule seemed essential because of military duties owed to the king by landholders; but, its provisions were later to be applied against women who inherited kingdoms, and several wars were fought to secure the rights of women to become sovereigns. The most important of these was the War of the Austrian Succession, in which Maria Theresa fought for the crown of Austria.

Salvador, smallest of the Central American republics, and one of the most prosperous and progressive. After the conquest of Mexico, Cortez sent one of his lieutenants, Alvarado, south to conquer the local tribes; he brought into subjection all Central America, and in 1527 was made governor of the region, known then and until 1821 as the Captaincy General of Guatemala. When Mexico became free from Spain in 1821, the Central American states also declared their independence. Salvador joined its neighbors in a confederation with Mexico for 2 years, but in 1823 joined with the other states south of Mexico in the Confederation of Central America that existed until 1839. Its history since then as an independent republic has been uneventful; it has a good government and has exhibited little enthusiasm for the various unions that have been proposed. It agreed in 1921 to enter the Central American Federation, but in 1922 the enterprise was abandoned because the states could not agree upon the relative power to be exercised by each. In 1927 Guatemala, Honduras and Salvador agreed on a policy of joint action on Central American questions of common interest to the three nations.

Scotland, since 1707 a part of the United Kingdom, which later became the United Kingdom of Great Britain and Ireland. It was called *Caledonia* by the Romans, who occupied the island of Britain before the Christian Era and had subjugated Scotland as far north as the Firth of Forth by the year 82 A.D.

Early History. The Romans departed in 412 because their legions were needed for home defense, and the island was left to its native peoples. In Caledonia these came to be identified as the *Picts,* descendants of Celtic invaders, and they were dominant until end of the 5th century when there was an invasion of Scots from Ireland. These people settled east of the domain of the Picts.

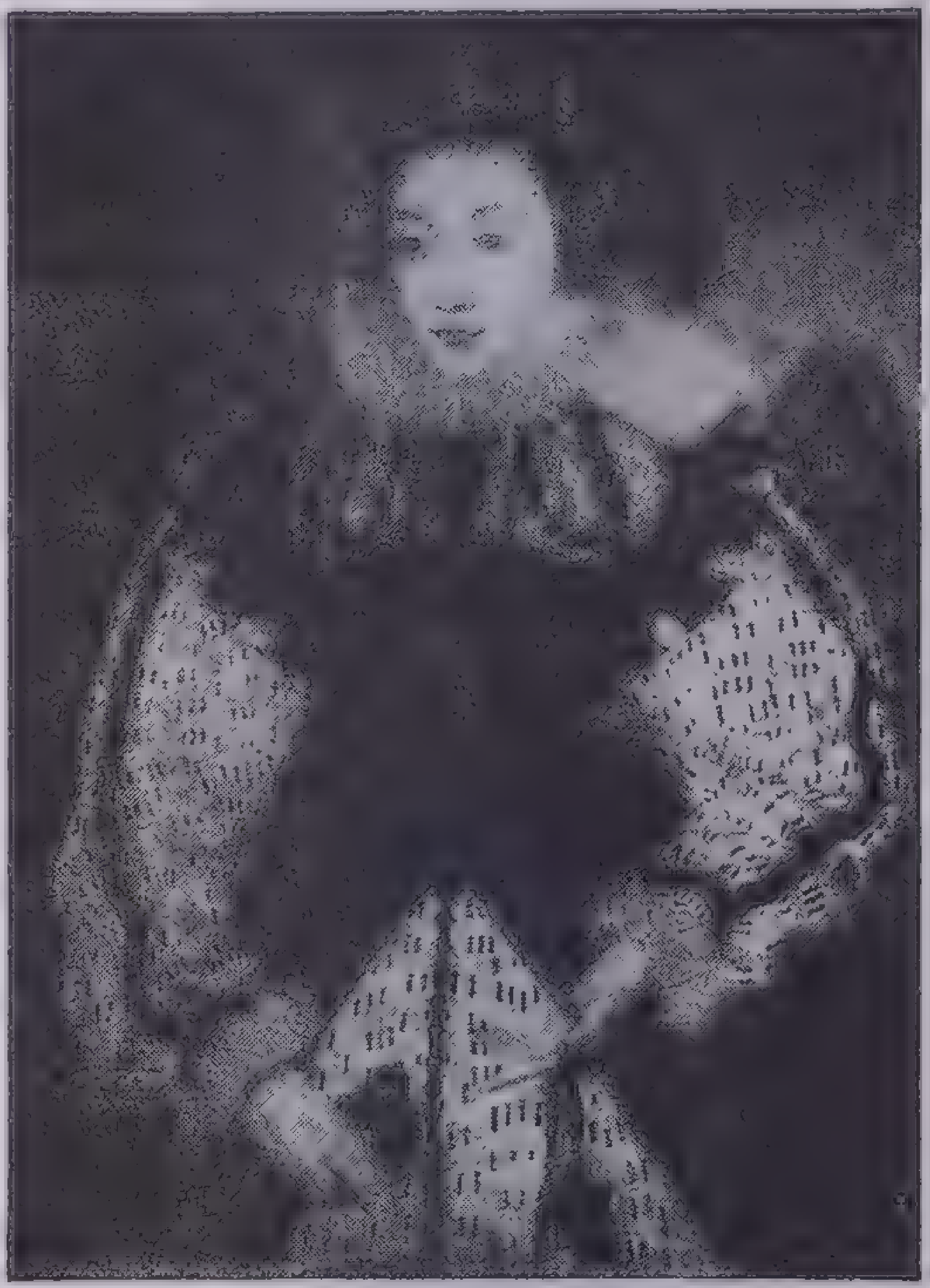
The Picts and the Scots, close neighbors, united in 844, Kenneth MacAlpin, King of the Scots, becoming ruler. The territory thus joined was called Albainn, but later it took the name Scotland, from the Scots. The daughter and successor of Kenneth married a king of the Celts, who were settled farther north, and from this family union of the states came a more formidable force to resist the onslaughts of the invaders from England, though the latter took and held numerous islands, including the Orkneys and the Shetlands.

Succeeding kings fought for territorial advantage, until Malcolm II (1005–34) established the border between England and Scotland where it is today. With Malcolm's death the line of kings established by MacAlpin ended, and his nephew Duncan came to the throne. Duncan was murdered by Macbeth, who in 1040 made himself king. Shakespeare's *Macbeth* is a thrilling account of the events of the period but is not historically accurate. Macbeth, in turn, was slain by Duncan's son, who became king as Malcolm III in 1058. This king was English in sympathy, for he was married to a sister of Edward, an English prince. He introduced the feudal system into Scotland and joined the English to resist the coming of the Normans. When in 1066 William the Conqueror succeeded at the battle of Hastings in forcing Norman rule upon England, Malcolm welcomed to Scotland many who fled from William's new rule. Malcolm's English marriage and the Norman Conquest resulted in the gradual introduction of English thought and mode of life into the country. After the death of Malcolm III, his three sons ruled Scotland in succession. Only one, David I (1124–53), was important; by his wise and ambitious rule he so advanced his country that England's jealousy was intensified, which led to measures to humble the Scots. In 1175 William the Lion, successor to David, was defeated in battle, and Scotland became a vassal state of England. Fifteen years later Richard the Lion-Hearted was heavily bribed to induce him to relinquish his rights, but succeeding English kings continued to assert an overlordship.

In 1293 the regular hereditary succession to the throne failed. Robert Bruce and John of Baliol disputed for the throne. It was given to Baliol, who was the selection of Edward I of England. English dominance of Scotland was made more secure when Edward I ended Baliol's rule and appointed a Scottish governor.

The War for Independence. The Scots bitterly resented this English interference in their affairs and rose in rebellion under the leadership of William Wallace. In 1297 Wallace won the battle of Stirling; but in the next year the English won at Falkirk. Wallace was tried unfairly for his part in the uprising and executed in 1305. Then Robert Bruce, grandson of the Bruce just mentioned, appeared as Scotland's champion. At the battle of Bannockburn (1314) he decisively defeated the English and drove them from the country. For the next 15 years Bruce ruled as Robert I and was succeeded by his son, David II. From the date of Bannockburn until 1328, when Scotland's independence was formally conceded, there was intermittent warfare of an indecisive character.

The Stuart Ascendancy. David II died childless, and Robert II, grandson of Robert Bruce, who had been high steward, came to the throne, beginning the succession of the House of Stuart, named for the former hereditary office of the founder. Robert III followed him, and then James I was crowned. He was followed in turn by others of the same name; James IV married the daughter of Henry VII of England, thus uniting the two royal houses. When Henry VIII became king, he made war upon James and defeated him at Flodden Field in 1513. In that year James V came to the Scottish throne. He was defeated in battle by the English in 1542 and survived only a few days. The throne was left to his infant daughter, known as Mary Queen of Scots. She married the worthless Darnley and thereby lost some of her loyal support; she then married Bothwell, not knowing in her bewilderment the best and wisest course to pursue. This further alienated her supporters, and she was obliged to relinquish the throne in 1567, and her infant son became king as James VI. Mary made an attempt to regain the crown, but was defeated and then fled to England, where for 19 years she remained a prisoner. Queen Elizabeth of England, being told that her own throne would not be secure as long as Mary lived, was persuaded to sign her death warrant, and Mary was beheaded in 1587.


From the painting attributed to François Clouet

Mary, Queen of Scots

Union of the Two Crowns. On the death of Elizabeth in 1603, James VI of Scotland, son of Mary Queen of Scots, became also king of England, and was crowned as James I of England. His son, Charles I, succeeded him in 1625. In the English civil war that resulted from Charles's effort to establish his personal rule, Charles was defeated and in 1649 was beheaded. The Scots named his son, Charles II, as their king, but Cromwell at once went to war with Scotland over this succession and Charles fled to France for safety. Upon Cromwell's death and the end of the Protectorate in England, Charles was welcomed back to England and ruled as king of Scotland and England until his death in 1685. He was succeeded by his brother, who was known as James VII of Scotland and James II of England. The English Revolution of 1688 drove him from the throne. Scotland joined the revolution to preserve its religious freedom, and when William and Mary were chosen sovereigns of England, the majority of Scots also accepted them. A small group that held out for James was crushed by William with great severity.

Political Union. In 1702 Anne, daughter of James VII of Scotland and James II of England, became the English queen. The relations of Scotland and England never having been satisfactory and the importance of a closer union being obvious, to prevent further alienation and possible destruction of commercial ties, the subject of political union was broached. At first the Scots were strongly opposed to the idea but were finally won over. Accordingly the Scottish Parliament was permanently dissolved, the English Parliament was enlarged in number to admit Scottish members and in 1707 the separate history of Scotland ended. Thenceforth the union was known as Great Britain.

Serbia (or Servia), a southern Slav country of the Balkans with a history dating back more than 1,000 years; the chief unit in the kingdom of Yugoslavia set up after the World War.

Early History. When the Roman power reached eastward into the Balkan Peninsula, the few natives there were conquered, and the province was named *Moesia.* It was held more or less securely by Rome until the fall of the empire, when there followed invasions by the Huns, Ostrogoths, Lombards, Avars and other lesser forces. In the 7th century (*c.* 640) the Serbs migrated from Galicia to the locality, possibly upon the invitation of Emperor Heraclius of Constantinople who desired that the disturbing Avars be swept aside. From their new home the Serbs extended their territory by conquest until it reached the Adriatic Sea. In the 9th century the Serbs accepted Christianity. The 10th and 11th centuries were full of warfare with Greeks, Bulgarians and Hungarians and among the different groups of the Serbs themselves. In the 11th century the Byzantine emperors sought to bring the Serbs more completely under their control, but they lost even nominal authority, and the country proclaimed its entire independence and established the kingdom of Serbia. The Pope recognized their king in 1077, but for a long time the Serbs had to fight to maintain the political integrity.

Between the proclamation of independence and the middle of the 14th century, Serbia was busily engaged in extending its domain, under a dynasty notable for its venturesome kings. Notable in this dynasty were Stephen Nemanya, its founder in 1168, and Stephen Dushan (1331–55), who was crowned emperor of the Serbs and Greeks in 1346. At the end of his reign his empire embraced Bosnia, Albania, Thessaly, Macedonia and parts of modern Bulgaria and Greece.

Turkey Conquers Serbia. Soon after the death of Stephen Dushan the Turks invaded the country. At the battle of Kossovo (1389) Turkey won possession of the country, and many loyal Serbs fled into Montenegro (or Czerna Gora). Within 50 years the subjection of the entire Serbian area was accomplished, and Mohammedanism spread from Turkey into the new possessions. Severe oppression marked Turkish rule. The people were reduced to the status of serfs. An attempt to shake off the tyranny occurred in 1804 under the great patriot Czerny Djordje or Karageorge (Black George, 1766–1817). It was partly successful, and slight self-government was permitted, but when the Napoleonic Wars were at their height, Turkey again fastened its rule securely upon the country. This condition continued until Turkey was defeated in a war with Russia in 1828–29, which resulted in liberating Greece and securing self-government for Serbia under a native hereditary prince, but still under the sway of Constantinople. Until 1860 Serbia was stirred by repeated attempts of Austria and Russia, through quarrels with Turkey, to dominate the state. In that year Prince Michael believed it possible to unite all Serbs into one nation. He secured the withdrawal of the Turkish garrisons, and seemed about to accomplish his designs when he was assassinated by political rivals of the House of Karageorgevitch (1868). His successor, Milan, organized a constitutional government and in 1876 assisted by Montenegro, began another but unsuccessful war against Turkey.

Independence Again Achieved. A war between Russia and Turkey, in which Serbia tardily joined, followed almost at once. At its conclusion the Congress of Berlin (1878) declared Serbia independent, and 2 years later it became a kingdom. Internal rivalry and a futile war with Bulgaria led a later king, Alexander, to amend the Constitution to suit his pleasure. This arbitrary procedure angered not only the army but the entire populace, and in their wrath they assassinated the king, his queen Draga, two of her brothers, two members of his Ministry, and about 40 others (1903). The leaders in the sanguinary revolt restored the old Constitution and placed Peter, a junior in the royal line, on the throne.

Then the old racial feud with Austria-Hungary was renewed. Austria-Hungary annexed Bosnia and Herzegovina, Slav territory in 1908, and followed this stroke by imposing prohibitive tariffs. Serbia retaliated with a tariff war and prepared for a military struggle. Serbia's friend and racial ally, Russia, interposed and a general European war seemed probable. The threatening stand taken by Germany, however, forced Russia to back down and restored a semblance of peace.

Serbia joined Bulgaria, Montenegro and Greece in the Balkan War of 1912; at its successful conclusion Serbian territory was nearly doubled at the expense of Turkey.

Beginning of the World War. On June 28, 1914, Serbian conspirators committed an act that brought about the World War. Inspired by hatred of Austria-Hungary, a Serbian fanatic assassinated the Archduke Francis Ferdinand and his wife in the streets of Serajevo, in Bosnia. The Government of Austria-Hungary charged Serbia officially with responsibility for the murders and declared it to be part of a plot to bring about the dismemberment of the Dual Monarchy. Demands were made that Serbia could not honorably meet, and on July 28 Austria-Hungary declared war on Serbia. Russia went at once to the defense of Serbia; Germany allied itself with Austria-Hungary; France joined the coalition against the Germanic Powers because of its treaty obligations; Great Britain entered the conflict because of German violation of the neutrality of Belgium; soon nearly all the civilized world was ranged on one side or the other in the greatest conflict the world ever experienced. The entire Serbian area was occupied by the enemy until after the close of the war. When peace came, the Austro-Hungarian Monarchy was dismembered, and the Serbs realized their ambition to organize a united state. Serbia became the chief member of the new Kingdom of the Serbs, Croats and Slovenes, a name later changed to Yugoslavia.

Shays' Rebellion, an uprising in Massachusetts (1786–87), led by Daniel Shays, who had been a captain in the Revolutionary War. Displeased with the callous attitude of the courts in foreclosing mortgages, with officeholders who drew salaries deemed excessive and with high taxes and other administrative abuses, Shays led a band of about 600 malcontents in a threat against the supreme court of the state, sitting at Springfield. The court adjourned until the mob dispersed. A little later, about 1,200 strong, Shays' force advanced to the arsenal in the same city, to secure arms. The state militia scattered the followers of Shays and arrested the leaders. Fourteen were sentenced to death but were pardoned by Governor John Hancock. Shays escaped to Vermont and was afterwards pardoned.

Siam, a small country of the Malay Peninsula in southeastern Asia. Its early history is unknown. The native people believe that their first king was a direct descendant of Buddha. For centuries the country was harried by invasions of peoples from the north, wars and the elevation of one dynasty after another. About the year 1350 the name of King Phra Rama Thiboda appears upon the record. That the country was very ancient is known from the fact that this king built a capital called *Ayuthia* on the ruins of an old town whose name even then had been lost. Phra Rama Thiboda was an able leader and he extended his realm south and east into Cambodia (now a part of French Indo-China) and the Malay Peninsula.

For 200 years the country flourished; about 1550 began a series of wars involving Burma, Pegu (now Southern Burma), Cambodia and Siam. In another 200 years (1759), Burma captured Ayuthia; 10 years later it subdued the whole country and established there a Burmese king. In a short time the Burmese were driven out by a Chinese adventurer who declared himself king under the name of P'ya Tak and made Bangkok his capital. After a short reign he was assassinated, and one of his generals, Yaut Fa, seized the throne in 1782 and established the dynasty that still rules. The present king, Ananda Mahidol (b. 1926), nephew of Prajadhipok, is the 9th since Yaut Fa.

Foreign Trade. In the 17th century Siam encouraged trade with Japan, China and the Portuguese. This intercourse ceased during the period of internal disorders. About 1820 commerce with these nations and with others in Europe was revived. Treaties with the United States (1825) and Great Britain (1855) put trade on a secure basis. In 1893 France quarreled with Siam over the boundary of Annam, and a French army occupied Bangkok to enforce its demands. By the treaty that followed, France gained some Siamese territory. This disturbed Great Britain; but in 1909 a treaty between Siam and Great Britain gave Britain an interest in southern Siam and did away with British authority elsewhere in Siam. European imperialism had decreased Siam's territory fully one-third within 50 years, but security is now guaranteed for the future. King Prajadhipok and his queen came to the throne in 1925. They were educated in European universities and made efforts to introduce western reforms into the government.

In 1932 a new constitution, providing many of the features of the British limited monarchy, was offered by Prajadhipok. The king, however, retained considerable power. In 1935 a *coup d'état* forced the abdication of Prajadhipok. His 11-year-old nephew Ananda Mahidol was proclaimed king. The *coup d'état* was not a victory for democracy but rather a reaction by a small oligarchy against Prajadhipok's liberal policies.

Spain, a nation of southwestern Europe, once a leading maritime and colonial Power of the world.

Fully 1,100 years before the Christian Era the adventurous Phoenicians founded colonies at Cadiz. When the Greeks and Romans reached Spain hundreds of years later, the people they found were known as *Celtiberians,* and their land as *Iberia* or *Hispania.* The peninsula that now contains Spain and Portugal is called the *Iberian Peninsula,* and in the early days no political boundaries existed to separate the two.

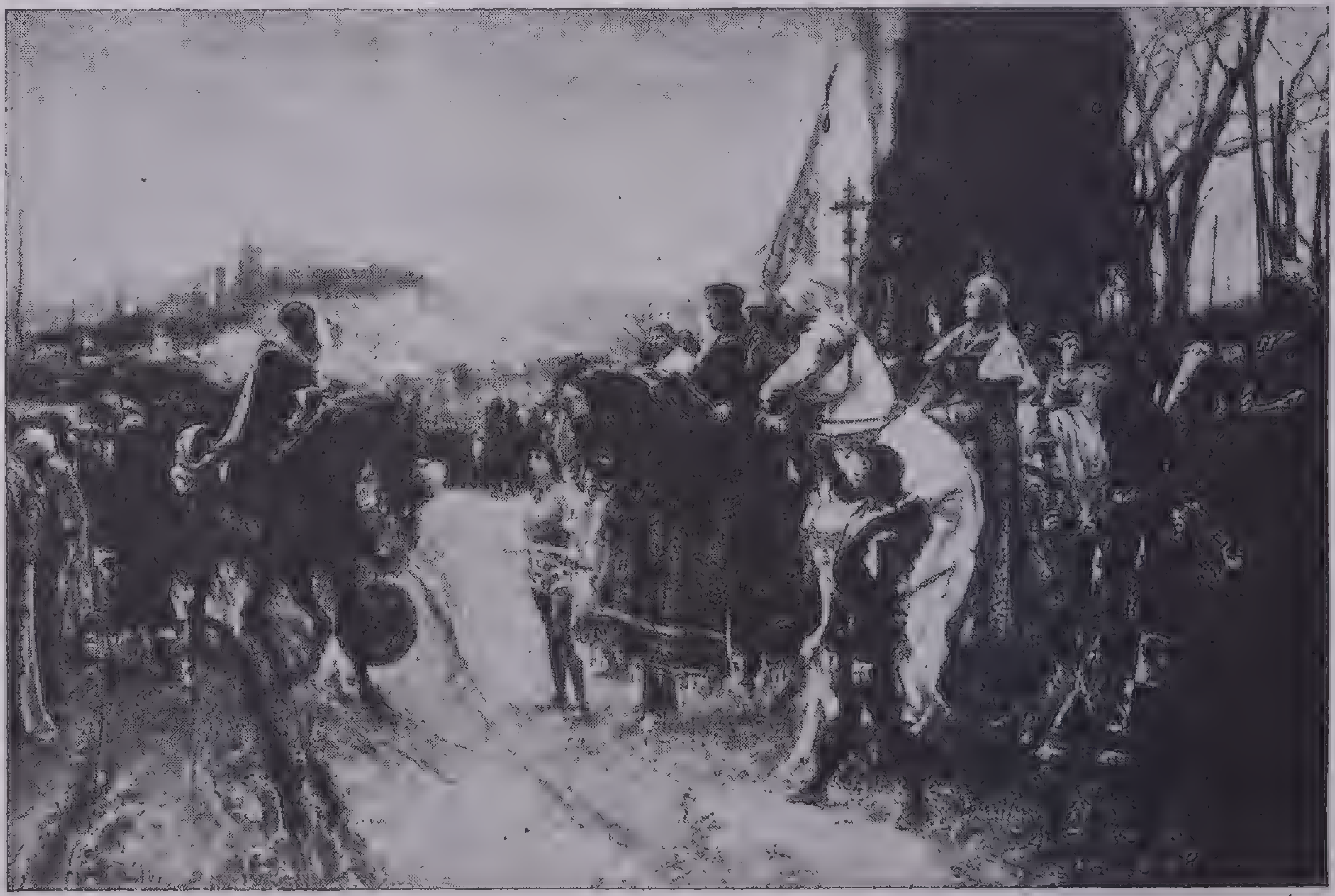
Before the Second Punic War (218–201 B.C.), Carthage took possession of Spain as a base from which to attack Rome. In turn Rome took it from Carthage during that war and made it a Roman province. With the decline of Rome Gothic tribes swept into the peninsula. Andalusia may have got its name from the Vandals—first Vandalusia, then Andalusia. The Suevi and Alan (a Scythian tribe) settled in the west, including in their territory part of what is now Portugal. The Visigoths took the peninsula before the year 575, imposing their authority everywhere.

The Coming of the Moors. The first great turning point in Spanish history centered in the coming of the Moors from Africa in 711–712. They conquered the land and imposed their language and customs upon the people. These invaders were not destructive of order; on the contrary they were builders, and many marvelous palaces—such as the Alhambra at Granada, the great mosque at Cordova and the alcazars (fortresses and royal palaces) in various cities—stood as types of their civilization for more than a thousand years until they were destroyed in the Civil War of 1937–38. The Arab conquerors built or greatly enlarged such cities as Valencia, Cordova, Granada and Toledo, that today present in their architecture a mixture of Moorish and modern types. The Moors were in Spain for more than 700 years. They developed learning, advanced literature, irrigated vast waste spaces and made Spain the peer of any European country.

Union of Aragon and Castile. In 1469 King Ferdinand of Aragon married Queen Isabella of Castile (the same Isabella who later gave assistance to Christopher Columbus), and though there followed unity of action, for 10 years there was no political union of these kingdoms. Incessant warfare was waged by them and associated kingdoms against the Moors, who were finally driven from Spain in 1492. The Golden Age of Spain followed; Ferdinand and Isabella raised the country to heights it had never known before, and for a century it was among the most important Powers in the world.

Expansion and Decline. Isabella's generosity to Columbus within a few years added a foreign empire to Spain's possessions. Through discovery, exploration and settlement Mexico, Central America, most of South America, the southern tip of what is now the United States and a large area in the American southwest became parts of the Spanish domain. Numerous islands also were made Spanish, including the Philippines, Cuba, Jamaica, Puerto Rico and Santo Domingo. In Europe the Netherlands came under Spanish rule, and for a time Naples, Sardinia, Milan and other south European areas were ruled by the ambitious Spaniards; their dominions then encircled the earth. To punish England, Spain's chief rival for world power, Philip II sent the powerful Spanish Armada against the English. His announced reason was that the throne of England belonged to him instead of Elizabeth through his marriage to Queen Mary (1554) and partly because he wished to avenge the execution of Mary, Queen of Scots. The "Invincible Armada" consisted of 130 war vessels, manned by 19,000 soldiers and 8,000 sailors. It sustained one of the greatest defeats in naval history (1588), and from that time Spain's greatness waned.

Spain was drawn into the Thirty Years' War (1618–48) because of its possession of the Spanish Netherlands. It had the most powerful and best-trained infantry in Europe, but at the battle of Rocroi in 1643 Spain was defeated so badly that its prestige never was regained. At the close of the war Spain lost the Netherlands, Naples, Milan, Sardinia and Sicily. When Charles II died (1700), France wished to place a prince of its choice upon the Spanish throne, which would re-



From the painting by Francisco Pradilla

The Surrender of the Moors at Granada

The last Mohammedan state in Spain was Granada, surrendered by its leader Boabdil to Ferdinand and Isabella of Castille and Aragon in 1492 sult in a political union of France and Spain. Great Britain headed a coalition of Powers to defeat this purpose; finally (1713) the Prince of Anjou was enthroned; he was the first king of the Spanish House of Bourbon, which except for two brief periods held the throne until the country became a republic in 1931.

The loss of so much of its foreign territory enabled Spain to center its attention more on home affairs, and prosperity returned for a time. After the Seven Years' War (1756–63), in which nearly all Europe was embroiled, Spain acquired the vast Louisiana Territory from France, which was deprived of nearly all of its North American possessions; however, in 1800, Louisiana was returned to France, and Napoleon in turn (1803) sold it to the United States.

Loss of South America. In the Peninsula War (1807–14) Great Britain went to the assistance of Spain against Napoleon's effort to maintain his brother Joseph on the throne. The French were defeated, and the Spanish Ferdinand VII was restored to power. A series of South American revolts during the next 15 years lost to Spain all its vast possessions on that continent; each province proclaimed itself a republic.

Internal Warfare. On Ferdinand's death in 1833 the kingdom was left to his young daughter Elizabeth. Her mother, Maria Christina, became regent, fought the Clerical party and instituted many reforms in order to hold the throne for her daughter; but in 1868 Elizabeth's abdication was forced. The Cortes (representative assembly) voted to continue the monarchy, but Amadeo, a prince of the House of Savoy, was chosen king. He reigned only 2 years; his resignation was forced in 1873, and a short-lived republic was founded. Several able men were in turn at the head of the new government but were not able to establish order. General Martinez Campos, at the head of the army, restored the monarchy in 1875, and Alfonso XII, son of the deposed Queen Elizabeth, was placed on the throne. The Bourbon line again ruled Spain.

Recent History. During this reign Spain was stripped of its last foreign possessions of worth. Cuba rebelled and with the help of the United States obtained its freedom. The struggle that brought this about was called the Spanish-American War; at its close Puerto Rico and the Philippine Islands were ceded to the United States for $20,000,000. In 1902 Alfonso XIII became king in his own right; he had been proclaimed king in his infancy in 1886 and in the interim had ruled through a regency. He gave the early years of his reign to building up his exhausted country, and possibly Spain never had a more popular monarch. His queen was the English Princess Victoria Eugenia of Battenberg.

Spain's Part in the World War. During the World War Spain was divided in its sympathies, but was able to maintain a position of neutrality. After the war political unrest permeated the country. Strikes occurred in nearly all large cities, and one or two provinces demanded complete home rule. The unrest was augmented by a campaign begun in 1921 against the Riff tribesmen in North Africa that displayed the Spanish military power at its worst; after 3 years of desultory fighting, France came to Spain's assistance, and the Riffs were finally subdued in 1926.

Republic Established. The disclosures of military inefficiency, for which civilians were blamed, brought about a crisis, and General Primo de Rivera proclaimed a dictatorship in 1924 in order to preserve the monarchy and to "free Spain from professional politicians." Rivera's downfall came in 1930, and there was an attempt to restore parliamentary government; but such was the temper of the people that during the next year the royal family was exiled, and on April 14, 1931, a republican form of government was established on the ruins of the Bourbon dynasty.

The new republic, under the provisional presidency of Niceto Zamora, was faced with a strife of factions that made orderly democracy impossible. First there was the bitterly contested question of local autonomy, the Catalonians in particular demanding virtual secession from the central Government. There was an explosive Church-State problem complicated by economic as well as religious dissension; there was the Left-Right social and economic class war with its long history of violence. There was the democracy-dictatorship struggle. Finally there was the intrigue of ambitious and ruthless individuals with no political principle except their own aggrandizement. The ferocity of passion engendered by years of revolution, anarchy, suppression and dictatorship was such that no imaginable governmental program could have commanded the support of any large majority. In the first free election held under the republic 25 parties were represented.

The republic carried on precariously for 6 years. Its constitution, adopted December 9, 1931, established in theory a thoroughgoing democracy. More important probably than the machinery of government that it set up was its radical religious and economic legislation. The constitution declared the complete separation of Church and State and the secularization of education; marriage was made a civil contract dissoluble by mutual consent. The Government received wide powers to confiscate private property in the interests of a national economy.

During 1932 and 1933 the Government proceeded with its program of secularization and redistribution of lands formerly held in large estates. The Jesuit Order was dissolved and its property was seized. More than 50,000,000 acres of land were expropriated and a beginning was made of actually reassigning it to small holders; but the Government's program, instead of easing the internal tension, resulted in increased hatreds.

On February 16, 1936, a new Cortes was elected having a large Leftist majority. General Francisco Franco, who commanded in Spanish Morocco, led an army to Spain with the intention of overthrowing this radical Government and establishing a military dictatorship. Franco was supported by the large property interests of Spain, by those who favored the re-establishment of the Roman Catholic Church, by most of the officers of the army and by a majority of the regular troops. Most important of all, he had (at first secretly and later openly) the help of Premier Mussolini of Italy.

Franco's rebellion united the various factions that had made Spain's political life the most turbulent of Europe. Spain quickly separated into two major groups, Insurgents and Loyalists.

Underwood & Underwood

Civil War in Spain: Barcelona Citizens Prepare for Street Fighting by Erecting a Barricade

The Loyalists had control from the start of the eastern half of the peninsula, including the large cities of Barcelona and Madrid. The Insurgents controlled the west. A bloody and destructive civil war was carried on from 1936 to 1939.

The Spanish civil war soon took on international importance. Italy and later Germany supported Franco. France and the Soviet Union supported the Loyalists. Had the war been confined to the Spaniards alone it could not possibly have lasted more than a short time. By April 1938 it appeared that the Loyalist cause was crumbling, owing chiefly to the men and munitions poured into the conflict by Italy and Germany. The material support given to the Loyalists by France and the Soviet Union grew weaker as both those nations became involved in difficult internal crises. At the same time help from Italy for Franco became stronger. He finally won a complete victory, and became head of a peaceful government.

Spanish Succession, see *Succession Wars.*

Soviet Union, see *U.S.S.R.*

Succession Wars, four conflicts in European history that involved the great Powers and kept the Continent in turmoil for the better part of 80 years. In each case the cause centered about the succession to a throne.

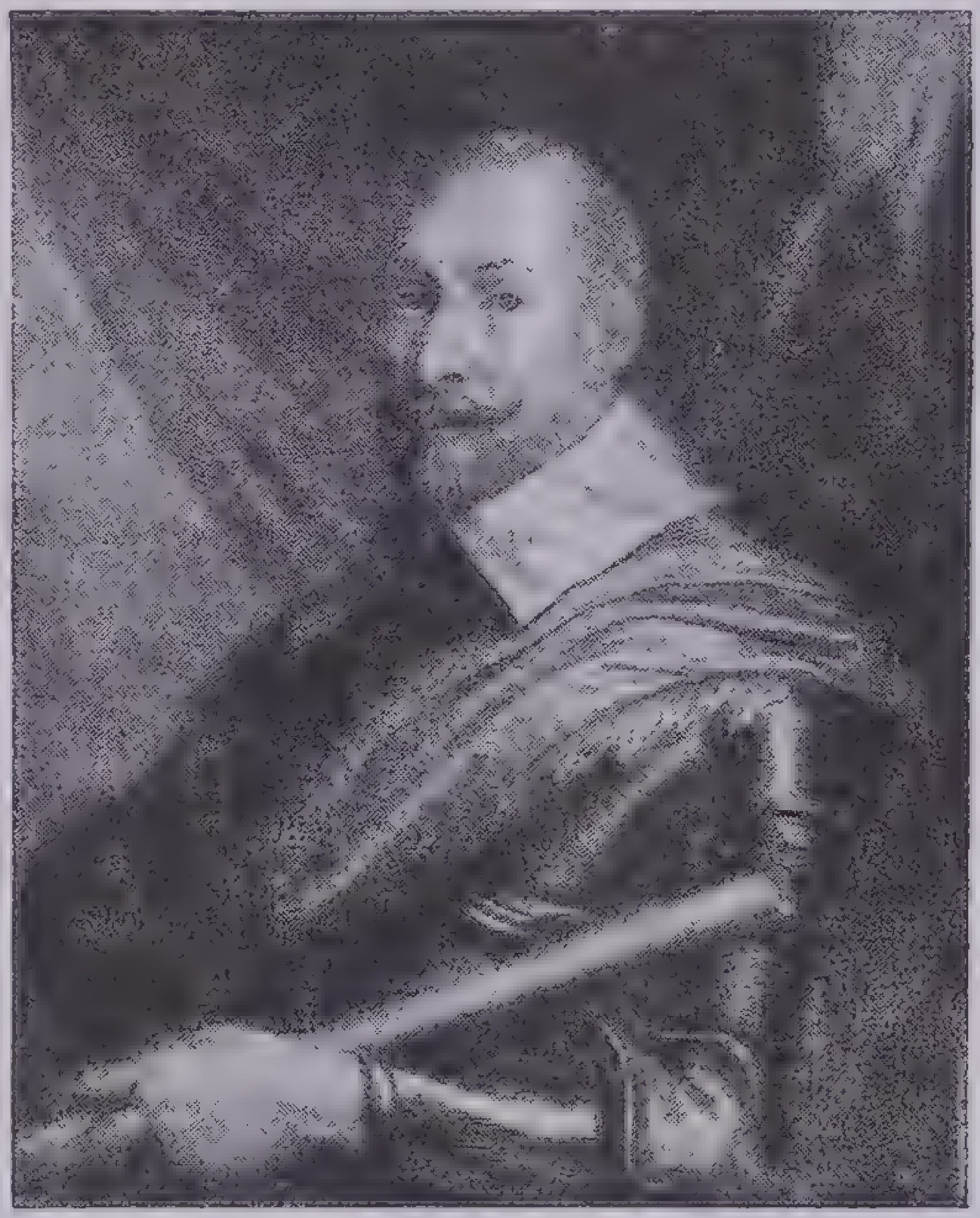
War of the Spanish Succession. Charles II of Spain (King 1665–1700) was childless. The Powers noted three valid claimants to the crown as his successor. They agreed that of the three Joseph Ferdinand of Bavaria should be chosen, because the power of France was already too great to permit a French prince to ascend the Spanish throne to join the countries of France and Spain in an alliance; but the chosen prince died, and the Powers selected Archduke Charles of Austria. Then Charles II of Spain died, and his will bequeathed the throne to Philip of Anjou, a French prince. The Powers protested; France was firm, and war was declared in 1701. It ended in 1714 with the defeat of France, but French diplomacy by making concessions elsewhere succeeded in keeping Philip on the Spanish throne. This war extended to the American colonies of the Powers and was known in American history as *Queen Anne's War.*

War of the Polish Succession. Polish nobles chose as king of Poland Stanislas Leszczynski, whose daughter Mary was queen of Louis XV of France. Russia and Austria in 1733 declared war to prevent the succession. France was defeated 2 years later, and the father-in-law was denied the throne.

War of the Austrian Succession. When Charles VI of Austria died in 1740 he desired his daughter Maria Theresa to succeed him. The other Powers had agreed to abide by his wish, but when Charles passed from the scene, the Powers broke their word and tried to keep Maria from the succession. Prussia, Bavaria, Saxony, France and Spain joined in war on her. By an alliance with England and Holland, the coalition was defeated and Maria Theresa received the title of empress through her agreement that her husband, Francis of Lorraine, should become emperor. The American phase of this war was known as *King George's War.* The struggle continued from 1740 to 1748.

War of the Bavarian Succession. Maximilian III Joseph of Bavaria died in 1777 without an heir. Austria tried to control the succession, but Prussia had a like ambition and war was declared. The other Powers intervened after hostilities had continued during 1778 and 1779, and the two contenders relinquished their claims. There were no important battles in this war; and it was called the *Potato War* because the main operations concerned provisions for the armies.

Sweden, the easternmost of the three Scandinavian countries in the north of Europe. In legend and saga its history reaches back for more than 1,000 years and is closely associated with the history of Norway and Denmark.



From the portrait by Sir Anthony Van Dyck

Gustavus Adolphus

The existence of Sweden as a fairly united national state may be conveniently dated from the reign of King Sverker (1134–55), who first joined in a firm political combination the warring tribes of Goths and Swedes. During the next 2½ centuries many of the later Swedish institutions took shape—a hereditary nobility was founded; the clergy became recognized as constituting a separate social order; primitive codes of law were introduced.

By the Union of Kalmar in 1397 Sweden, Norway and Denmark were joined together under Queen Margaret, although the three countries retained their own distinctive institutions and liberties.

An Independent State. Denmark held the position of greatest power and influence in the Union, and in time Sweden chafed under the limitations imposed upon it. In 1523 the country seceded and chose Gustavus Vasa as its king. The Reformation spread into Sweden, and the country embraced Lutheranism as its state religion. Great progress was made in Swedish affairs under this enlightened monarch; but under his successors advancement was halted by religious struggles that convulsed nearly all of Europe.

Sigismund, grandson of Gustavus Vasa, was elected king of Poland through the efforts of his Polish mother, and he was forced in 1599 to relinquish the crown of Sweden to his uncle, Charles IX. Charles died in 1611, and his son Gustavus Adolphus, the greatest of the Swedish kings, succeeded at the age of 17. Gustavus made peace with Denmark, fixed the Russian frontier and then fought a war with Poland over Sigismund's claim to the Swedish crown. He was actually defeated but made a peace that was advantageous to Sweden. His intervention on the Protestant side in the Thirty Years' War secured the Protestant triumph in northern Europe. He lost his life at the battle of Lützen, 1632. His daughter Christina, a minor, succeeded him and affairs of state were conducted under the regency of a great prime minister, Oxenstiern. By the time Christina could rule in her own right, Sweden had risen to be one of the greatest Powers in Europe. She abdicated 10 years after she came of age, and was succeeded by Charles X who ruled for 6 years (1654–60).

Charles XI succeeded at the age of 4 and died after a reign of 37 years (1660–97), in which he reorganized the political structure of the state. He was succeeded by his son, Charles XII, then only 15, who became one of the most famous characters in Swedish history. He was a military genius, but his wars exhausted the resources of Sweden. In 1709 he was defeated by Peter the Great of Russia in the great battle of Poltava and was forced to cede territory on the eastern side of the Baltic Sea. He met his death during an invasion of Norway. When he died, the people denied the throne many of its powers by the adoption of a constitution that placed authority in the hands of the Diet. Rule soon centered in a coterie of nobles, however, and in 1777 Gustavus III secured a new constitution that restored many former prerogatives of the Crown.

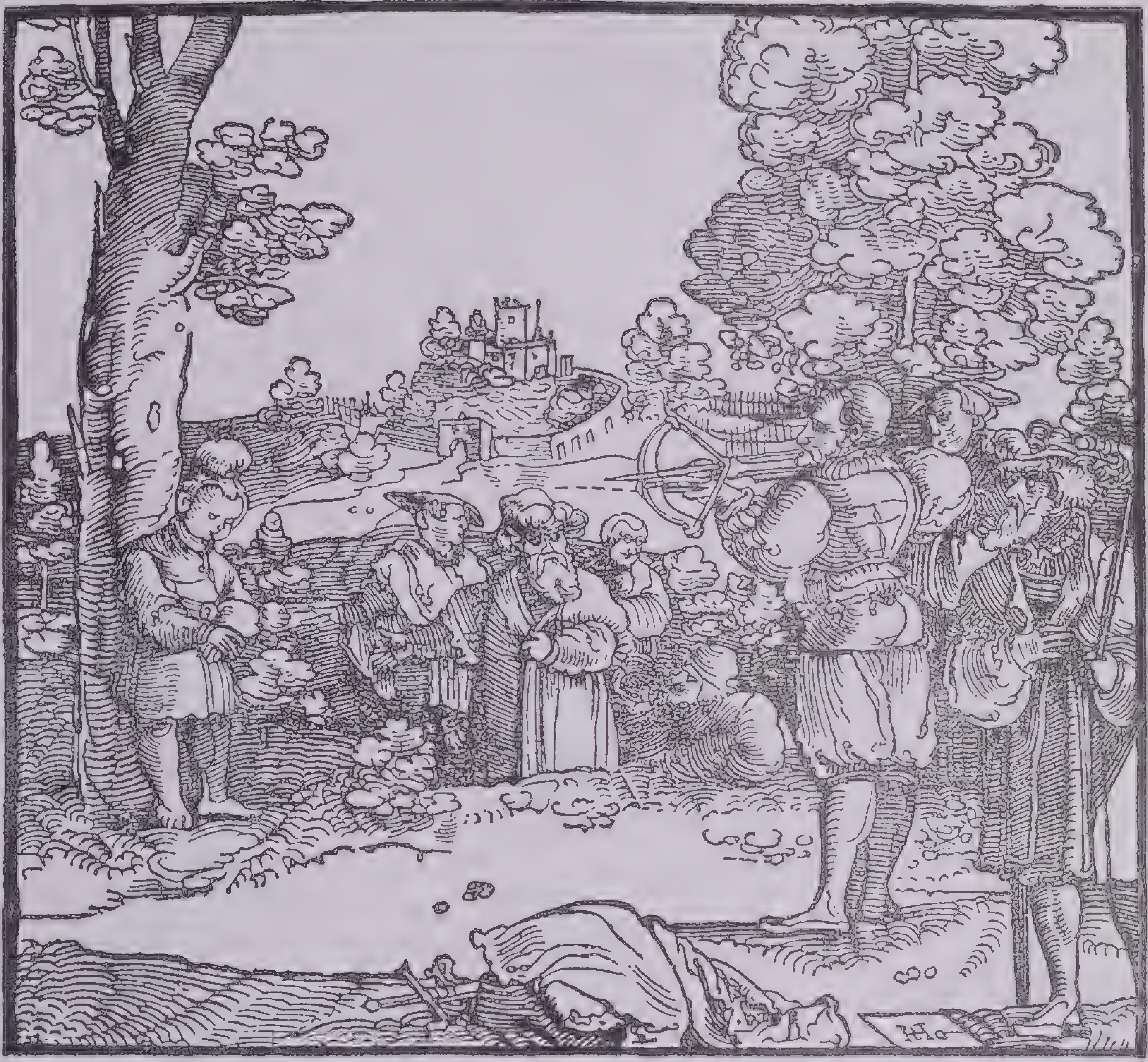
The Napoleonic Era. Sweden favored the coalition of the great Powers of Europe against Napoleon. When Napoleon's career ended and he was sent to St. Helena (1815), the Congress of Vienna (because Denmark had aided the French) took Norway from Denmark and gave it to Sweden. Dissatisfied with this transfer, Norway offered to accept a Swedish king if it could be independent; the plan was rejected by the great Powers, and the crown prince of Sweden was sent to Norway with an army to put down the insurrection. The Swedish king was made king of Norway, and this dual arrangement continued until 1905. Norway retained the right to live under its own constitution and to be practically independent in local affairs.

House of Bernadotte. In 1818 Charles XIII died, leaving no heir; but he named Bernadotte, who had been one of Napoleon's marshals, to succeed him. Bernadotte reigned as Charles XIV. The Swedes regarded him as an alien, but his sons Charles XV and Oscar II endeared themselves to the people, and under their constitutional rule the nation prospered.

Separation of Sweden and Norway. The increasing importance of Norway as a commercial nation led to a request for its own commercial flag and for the right to appoint consuls independent of Sweden. The result of unsuccessful negotiations led Norway to demand independence under a king chosen from Sweden. The Swedish monarch rejected the plan to appoint one of his sons as the Norwegian king; after expressing the hope that the two countries would continue friendly relations, the Norwegian Parliament in 1905 chose Prince Charles of Denmark to be their king.

The World War and After. King Oscar died in 1907 and was succeeded by his son, Gustav V. During the World War Sweden steadfastly maintained its neutrality, being assisted in this attitude by Denmark and Norway, the three having entered into a neutrality pact upon the outbreak of the war. Their commerce suffered greatly through the blockade. In 1925 councils of arbitration were established by the three Scandinavian Powers to decide any controversies that might arise among them. There was a new personal union of Norway and Sweden in 1929, when Crown Prince Olaf of Norway married the Swedish Princess Martha.

Sweden, like the other Scandinavian countries, has attracted much attention, especially since the world business depression of the 1930s, as a country that has successfully introduced much advanced social legislation but has at the same time kept the essentials of a free, capitalistic economy. In the antagonism between Fascism and Communism that has shaken all Europe since the World War, Sweden has frequently been pointed to as the outstanding example of the so-called *middle way.* Sweden's success in dealing with modern economic problems without resort to dictatorial methods has been possible chiefly through the high average intelligence and education of Sweden's people.



From a woodcut by Hans Schaeufelen (1493–1540)

William Tell: A Legendary Episode in the Struggle for Swiss Independence

Switzerland, a group of states in the heart of western Europe.

Early History. The earliest inhabitants were two distinct peoples, the Rhaetians and the Helvetians. They were well established there when a Roman army reached the area (*c.* 58 B.C.), and conquered both tribes. So important to Roman trade did this Alpine territory become that it was connected by fine roads with the city of Rome. Even before the fall of the empire enemies from without descended upon this outpost, notably the Burgundians and the Alamanni, about 400 A.D., who in turn were overpowered by the Franks. The Burgundians accepted Christianity in the 5th century; but not until missionaries from Ireland came in the 7th century under St. Columban did the Alamanni turn from paganism. After the vast realm built up by Charlemagne was divided, Switzerland fell to German conquerors, and in the 11th century was a part of the (German) Holy Roman Empire. In the 13th century the House of Hapsburg, destined to become a mighty power in Europe, extended its authority from Austria southward through Switzerland. Its severe rule led to the revolt of three provinces—Uri, Unterwalden and Schyz. They entered into an alliance to resist the rule of Austria and began a long struggle that finally resulted in Swiss independence.

The Wars for Liberation. About 1315 the first battle against Austrian tyranny was won at Morgarten, and it was so decisive that more than 70 years of peace followed. One result of the victory was that five other provinces, including Lucerne and Berne, joined the confederation. Two more victorious battles had to be fought before the Austrian hold on the confederacy began to weaken. The first was at Sempach in 1386 and the other at Nafels in 1388. Innumerable instances of bravery have been recorded of the patriots. There is the legend of William Tell's encounter with the tyrant Gessler, who compelled Tell to shoot an apple from the head of his son. Another tale, better substantiated, describes the act of Arnold von Winkelried, who in the front rank of soldiers gathered Austrian spears into his arms and died with them piercing his breast so that his companions could advance through the gap he had made. His last cry was, "Make way for liberty!" In 1415 the Swiss took the offensive and forced Austria to relinquish the canton (province) of Aargau and later that of Thurgau.

They then fought off the threat of Charles the Bold of Burgundy and in 1499 resisted the attempt of the Austrian Maximilian I to put them again under domination. They won six successive battles, and Austria's power over them was forever broken; however, until their complete independence was acknowledged in the Treaty of Westphalia (1648), after the devastating Thirty Years' War, they kept themselves in readiness to defend their liberty. During the wars other cantons and towns to the number of five joined the confederation.

Switzerland suffered during the 16th century from wars of religion induced by the Protestant Reformation. Though the Reformation began in Germany, it spread quickly to Switzerland, which was made largely Protestant through the preaching of Calvin and Zwingli. Zwingli had converted the northern cantons to acceptance of the new religion; but the southern part of the country remained true to the Roman Catholic Church. In 1531 open warfare broke out between the two factions, and Zwingli, leading his forces at the battle of Kappel, was killed. Calvin made his seat at Geneva and led western Switzerland into the Protestant fold.

Political Advancement. The Swiss Confederation was a loose union of the cantons with the aristocracy in control in many of them, especially the larger ones. The French Revolution inspired the Swiss to revolt against the aristocrats; what the result would have been it is impossible to state, but a new turn of affairs came in 1798, when Napoleon invaded Switzerland and reorganized the country into the Helvetic Republic. In 1803 he dissolved this organization and restored the cantonal system. French influence remained paramount during Napoleon's ascendancy; French became the language of the western cantons and remains so today. German is the dominant tongue in the North and East, and Italian in the South. The Congress of Vienna (1815), called to reorganize Europe after the Napoleonic Wars, reaffirmed independence of the Swiss people. The system of independent cantonal government was continued but it engendered strife over religious differences and favored aristocracy against democracy. In 1848 a closer union was effected under a new constitution, and in 1874 more efficient government was secured when added powers were given to the Federal state, and a greater degree of direct democracy was adopted. During the World War Switzerland was a troubled state. It was entirely surrounded by warring nations engaged in a desperate fight for their existence. The Swiss managed to maintain neutrality. When the League of Nations was organized, Geneva was chosen as its nonpartisan seat, and in a sense, that Swiss city is the capital of the world.

In recent years Switzerland has become a refuge for political malcontents fleeing the dictatorial governments of Germany and Italy. The Swiss Government has maintained the right of asylum in spite of strong pressure, especially from Germany.

Syracuse, one of the outposts of early Greek colonization founded by adventurers from Corinth (*c.* 735 B.C.). Located on the island of Sicily it became one of the most prosperous cities of antiquity. It was an important center of Greek literature and art from the 5th century B.C. to its capture by the Romans in 212 B.C. in one of the campaigns of the Second Punic War. Thereafter the power of Syracuse declined.

The present-day city of Syracuse is near the ruins of the old town. During the Peloponnesian War between Athens and Sparta (431–404 B.C.), the Athenians sent a great expedition to seize Syracuse. After a long siege (415–413 B.C.), the Athenians were disastrously defeated, and a large part of their navy was destroyed. The failure of the Syracusan expedition led directly to the final crushing of Athens by Sparta.

Syria, one of the states set up at the end of the World War from the dismemberment of the Ottoman Empire. It lies north of Palestine at the east end of the Mediterranean. Since its establishment in 1920 nominally an independent state, Syria has been administered by France under a League of Nations mandate.

Native opposition to French control has led to many uprisings and much bloodshed; economic difficulties and the Arab Nationalist movement have complicated the problem. The most serious disorders occurred from 1925 to 1927 in a rebellion of the Druses (a mystical sect of Moslems) in the region called *Jebel.* The League of Nations Mandate Commission severely censured the French military governor for his treatment of the Druses. In 1933 an attempt at settlement was made by a Franco-Syrian treaty; but the Syrian Nationalists opposed any conciliation not including full independence and sovereignty, and disorder and rioting continued during 1934 and 1936. On September 8, 1936, a new Franco-Syrian treaty was signed providing for the establishment of an independent Syria: this was submitted to the League of Nations for final approval.

In 1920 Great Lebanon or the Republic of Lebanon was proclaimed as an independent state under the French mandate. Its capital is Beyrouth.

The State of Syria, formed in 1925, has Damascus as its capital. The governments of Latakia and Jebel Druse are both under direct French control. The French policy is to make Lebanon and Syria independent and to introduce them as members of the League of Nations.

Tarpeian Rock, a precipitous cliff that formed a part of Capitoline Hill, one of the Seven Hills of ancient Rome. Legend says its name was taken from Tarpeia, daughter of the governor of the citadel during the rule of Romulus. The Sabines, a neighboring tribe, besieged Rome, and the account states that in return for the gift of golden bracelets the Sabines wore on their arms, Tarpeia opened the gates of the city. As soon as entrance was thus secured, the Sabines killed the treacherous maiden and buried her at the foot of the cliff. In later Roman times, persons convicted of treason were hurled to death from the rock.

Thermopylae, a narrow mountain pass in Thessaly, the scene of a battle (480 B.C.) in which the defenders won imperishable glory. In 490 B.C. the Persian King Darius had been defeated at Marathon in an attempt to conquer Greece. Ten years later his son and successor, Xerxes I, renewed the war with an enormous army. A small force of 7,000 Spartans, Athenians and lesser allies met the invader at the pass of Thermopylae. For 2 days the attackers endeavored to force their way through but were held back. On the evening of the second day a traitor, Ephialtes, one of the defenders from Thessaly, disclosed to Xerxes' generals a secluded path by which they could get around the pass and attack the Greeks from the rear. When this treachery was disclosed to Leonidas, the Spartan leader, he dismissed all of his followers except his Spartans, the Thespians and the Thebans, and with only 1,400 men made a valiant stand against the hosts of Xerxes. The Thebans surrendered; all the others died, and the road to Athens was open to the enemy.

Tibet, a country in Southern Asia but little known to the outside world. Not only is it difficult to reach but until recent years foreigners have been forbidden to enter. Of its early history little is known except that about 750 A.D. it extended southward across the Himalaya Mountains into India. No strong figure dominated Tibet until the great conqueror, Genghis Khan added it to his Asiatic empire. Kublai Khan, grandson of Genghis, established the Mongol dynasty in China, and its sway extended to Tibet. There followed a struggle for religious ascendancy; Buddhism, which entered from China, and shamanism, already rooted in the country, were supplanted by Lamaism, brought from India, and this faith still dominates the lives of the people. The Grand Lama or supreme religious head appoints a temporal head of the state. In 1642 Chinese conquerors occupied Tibet, and they confirmed the temporal sovereignty of the Grand Lama in 1650. China retained a tenuous political control.

The British sent an embassy from India in 1774 and again in 1790 to negotiate a commercial treaty; but they were not successful, for Tibetans charged that the English had at times given comfort to Tibet's enemies. The frontier of the country remained closed to the British until 1903. Then, the Manchu dynasty in China being unable to maintain control in Tibet, another English expedition entered the country. It was opposed by the waning Chinese authority but resulted in a British-Chinese agreement for trade relations and a further stipulation that recognized Chinese sovereignty.

The Manchu Dynasty was overthrown in 1911 and the Chinese Republic was established. The Chinese soldiers in Tibet joined the revolution but at once affronted the Tibetans by their lawlessness. The new China sent an army to reconquer the country, but the British interposed on behalf of the Tibetans. Finally in 1914 it was suggested that the northern part of Tibet should acknowledge Chinese authority, but that the southern part, Outer Tibet, should build up its own government. China protested this arrangement and would not sign the agreement, with the result that though China claims all Tibet as Chinese territory, its influence throughout the country is slight.

Tirol, before the World War a crownland of Austria-Hungary in the region of the Alps Mountains, one of the finest scenic parts of Europe. With the disintegration of Austria-Hungary the northern part of the Tirol was given to the new republican Austria; and the southern part, about two-fifths of the entire area, to Italy. The population of the section turned over to Italy was predominately German speaking. The Fascist regime of Mussolini determined to eliminate all German influence within the province and to that end instituted a repressive campaign. Italian was made the sole tolerated language; teaching German to the children was prohibited; families with conspicuously German names were forced to assume new Italian names. These measures aroused bitter hatred in the population.

Tower of London, originally an English fortress and prison in the days of feudalism. Its construction was begun in 1078 under the direction of William the Conqueror. The site selected was that of an earlier fortress that may have been built by Roman soldiers. Today the Tower comprises a group of buildings, but their only use is as an armory, barracks and museum. It contains the royal jewel stronghold, including crowns, scepters and riches of gold and jeweled ornaments. The Tower is of great historic interest. Here Anne Boleyn, Lady Jane Grey and her husband Lord Dudley, Sir Thomas More and Sir Walter Raleigh were beheaded, and here some of them are buried.

Underwood & Underwood

The Towers of Europe Along the Bosporus

These towers and fortifications are at Bebek, a few miles north of Istanbul. They were built by Mohammed II of Turkey (1430–81) to commemorate the site of the first Turkish settlement in Europe. Mohammed II was called Mohammed the Conqueror because he conquered Constantinople and added Serbia, Bosnia, the Crimea and Albania to the Turkish Empire

Triple Alliance, an agreement between three nations for mutual protection and assurance of a balance of power among states with opposing ambitions. There have been three important triple alliances in European history. The first was in 1668, with England, the Netherlands and Sweden in league to prevent Louis XIV of France from absorbing the Low Countries (Belgium and the Netherlands). In 1717 Great Britain, France and the Netherlands joined to oppose Spain's ambitions. The most important triple alliance was formed in 1882 by Germany, Austria-Hungary and Italy to stop the Russian advance in the Balkan Peninsula and to prevent a declaration of war by France against Germany. This alliance continued until 1915, the second year of the World War. Because the agreement had not been abrogated, Germany and Austria-Hungary expected Italy to become their ally in that great conflict, but Italy declared that the issues of the war were entirely foreign to the original purpose of the alliance; and in 1915 Italy declared war against Austria-Hungary and in 1916 likewise against Germany.

Turkey, a Power whose territories once covered a large part of western Asia, Eastern Europe and North Africa; now a small republic in the extreme western part of Asia, with a few hundred square miles in Europe around Istanbul (formerly Constantinople).

Early History. The people who developed into the most feared Power in the world originally came from central Asia, in Turkistan, so called because it was then the home of the Turks. They were pushed in large numbers out of Turkistan by the advance of the Mongols under Genghis Khan. In the 13th century they established themselves in the west of Asia, in the land of the Seljuks, a line of Turks who had preceded them. As the power of the Seljuks decreased, the strength of the newcomers increased, and under the leadership of the House of Osman they became a formidable nation, the nucleus of the Ottoman Empire.

In the middle of the 14th century, the Ottomans began to push across the straits into Europe, taking Gallipoli in 1354. In 1381 they took Adrianople and made that city their capital; they pushed farther and conquered Serbia, Bulgaria, Rumania and Wallachia. In 1402 their sultan, Bajazet, was taken prisoner by Timur or Tamerlane, the great Asiatic conqueror, and for a few years the Turkish movement toward the west was stopped; but in 1421 under Sultan Amurath II Macedonia and Greece were conquered, as was Hungary soon afterward. The Byzantine Empire was crushed when the Turks under Mohammed II took Constantinople in 1453. That city at once became the Turkish capital, instead of Adrianople. Because the fall of Constantinople caused an exodus of Greek scholars to all parts of Europe, to which they carried new culture, this date is considered by some historians as marking the end of the medieval period and the beginning of the modern period of history.

By 1500 the Turkish conquest moved into Africa. Egypt and later Tripoli and Tunis were subdued. Solyman the Magnificent (1520–66) brought the empire to its greatest height of power. He fought his way so far north in Europe that Vienna was endangered. By this time European Powers were alarmed lest the invader should master the Continent. When Turkey sought to win the island of Cyprus, the Holy League was formed by Venice, Spain and the Pope to dispute the further progress of the foe. In the battle of Lepanto (1571), the Turks were badly defeated, and the decline of the empire began.

The Struggle with Persia. The power of Persia was thrown against Turkey, and in 1605 Persia won a signal victory at Basra, took some Turkish territory, including, in 1623, the ancient city of Baghdad. In 1638, however, Baghdad was retaken. In 1683 siege was once more laid to Vienna, and it would have been successful but for intervention of the Poles and the Germans to save Central Europe.

Europe versus Turkey. During the next 100 years all the then great Powers of Europe fought the inroads of the Turks, and one by one their strongholds fell. In 1695 Peter the Great took Azov; the Austrians liberated Hungary, and a part of the Ukraine. The Turks had some successes; they retook Azov, and recovered some territory from Venice; but these gains were followed by the loss of Serbia and Wallachia. Russia went actively against the common foe of Europe and retook Azov and won the Crimea. In 1737 it was decided to force the division of Turkey by the Powers, but a victory against Austria defeated this plan. During the last half of the 18th century and the first half of the 19th, the Turks gained nearly as much as they lost. In the Crimean War (1854–56), Russian power was challenged by the forces of England, France, Sardinia and Turkey, because Russia sought the extension of the Russian Empire into Asia. The Allies won, and Russia was forced into a treaty guaranteeing the integrity of the Turkish Empire.

Rebellion in Turkish Europe. When Germany and France were embroiled in the Franco-Prussian War (1871), Russia again turned envious eyes toward Turkey and demanded the right to maintain a fleet in the Black Sea, contrary to provisions of the treaty ending the Crimean War. Russian influence stirred the Turkish provinces in Europe to revolt, and Herzegovina, Bulgaria, Serbia and Montenegro endeavored to free themselves but were without success. In 1878 Russian forces nearly captured Constantinople, but fear of Russian expansion led the Powers to intervene.

Africa Revolts. North Africa began a revolutionary movement against Turkey about 1880; in 1883 Great Britain sent forces to preserve order, and the power of the Turks was weakened; but the sultan still held to a tenuous control, relinquishing it only in 1911, when Italy defeated Turkey and took Tripoli.

The Armenian Massacres and the Balkan War. In the meantime in 1896 Turkish massacres of Armenians led the Powers of Europe to violent protest. The Turks pursued a ruthless policy of war and pillage until in 1908 a Young Turks party was organized to bring about reforms. Its leaders had been educated in western Europe, and it was their ambition to create a modern state in Turkey. They forced Sultan Abdul Hamid to create a constitutional government, but it was such in form more than in fact. Although Turkish dominions in Europe had been heartened by the early success of the reform movement, they rebelled when repression was renewed, and in the Balkan War freed the Balkan states from the rule of the sultan. Constantinople and Adrianople were the only two cities of importance left to Turkey in Europe. Meanwhile Turkey had become embroiled with Greece, and later with Italy, over the sovereignty of Tripoli.

Underwood & Underwood

Women of New Turkey

Modern Turkish women have discarded the heavy Moslem veil since a decree issued in 1925 by the National Assembly created by Kemal Atatürk, President of Turkey, abolished the fez for men and removed women from the seclusion of the harem. In 1925 Kemal abolished polygamy, and in the following year he made civil marriages necessary. In 1928 he replaced the Arabic alphabet with Roman letters, and Turkish numbers with Arabic figures. Islam was discarded as the state religion, slavery was abolished and the Gregorian calendar and new law codes were adopted. In 1934 women were enfranchised and the present National Assembly of 399 members includes 17 women

End of the Turkish Empire. German influence in Turkey was strong; the Germans had dreams of a zone of influence extending from Berlin to the Persian Gulf, and Turkey had permitted the building of a railroad across its territory toward the southern sea. When the World War began this road had reached Bagdad. Turkey joined Germany in the war, and her control of the entrance to the Black Sea was probably the most important factor leading to the military collapse of Russia in 1917–18. Great Britain tried hard to break a line of communication through the Turkish and German forces; the Dardanelles-Gallipoli campaign was one of the most fiercely contested struggles of the war.

When peace was signed after the defeat of the Central Powers, Turkey lost all its European area except a small section around Constantinople and had left only the peninsula of Anatolia in Asia. The new states of Arabia, Iraq, Palestine, Transjordania and Syria were set up out of territories that had once belonged to Turkey.

The Turkish Republic. In postwar Turkey one man stands out above all his fellows as the founder of the new Turkish state: Kemal Atatürk, a soldier trained in Germany, and a scholar with a European education. Refusing to accept the humiliating terms imposed upon Turkey by the Allies in the Treaty of Sèvres, Kemal Pasha organized his countrymen to resistance and successfully defied the Powers to execute their treaty. In 1922 the Treaty of Sèvres was replaced by the Treaty of Lausanne recognizing the independence of Turkey. The old monarchy was abolished and the sultan was exiled. A republic was formed, and the capital was moved from Constantinople to Angora in the central part of Anatolia. Mustafa Kemal was chosen President of the Republic of Turkey; Kemal instituted many reforms. In dress the fez has disappeared in favor of European headwear; the women have been emancipated from the veil; monogamous marriage has been put into effect; and the Arabic alphabet of 127 letters has been abandoned in favor of one with the Roman or English form of letters. The 24-hour day has been adopted instead of the traditional two 12-hour periods; the caliphate has been abolished, and as far as Turkey is concerned there is no official head of Mohammedanism.

Uncle Sam, the personification of the United States, its people and its government as a tall, thin character with chin beard, dressed in garments of the early 19th century, clothing and hat being decorated with the Stars and Stripes, the national emblem. The nickname of *Uncle Sam* is believed to have originated during the War of 1812 when Samuel Wilson, a government inspector of beef at Troy, N.Y., was always called *Uncle Sam.* After the inspection of the beef, it was shipped to an army contractor named Elbert Anderson and was always marked "U.S.—E.A." A joking workman, being asked what those letters meant, replied that he did not know, unless they were for Uncle Sam and Elbert Anderson.

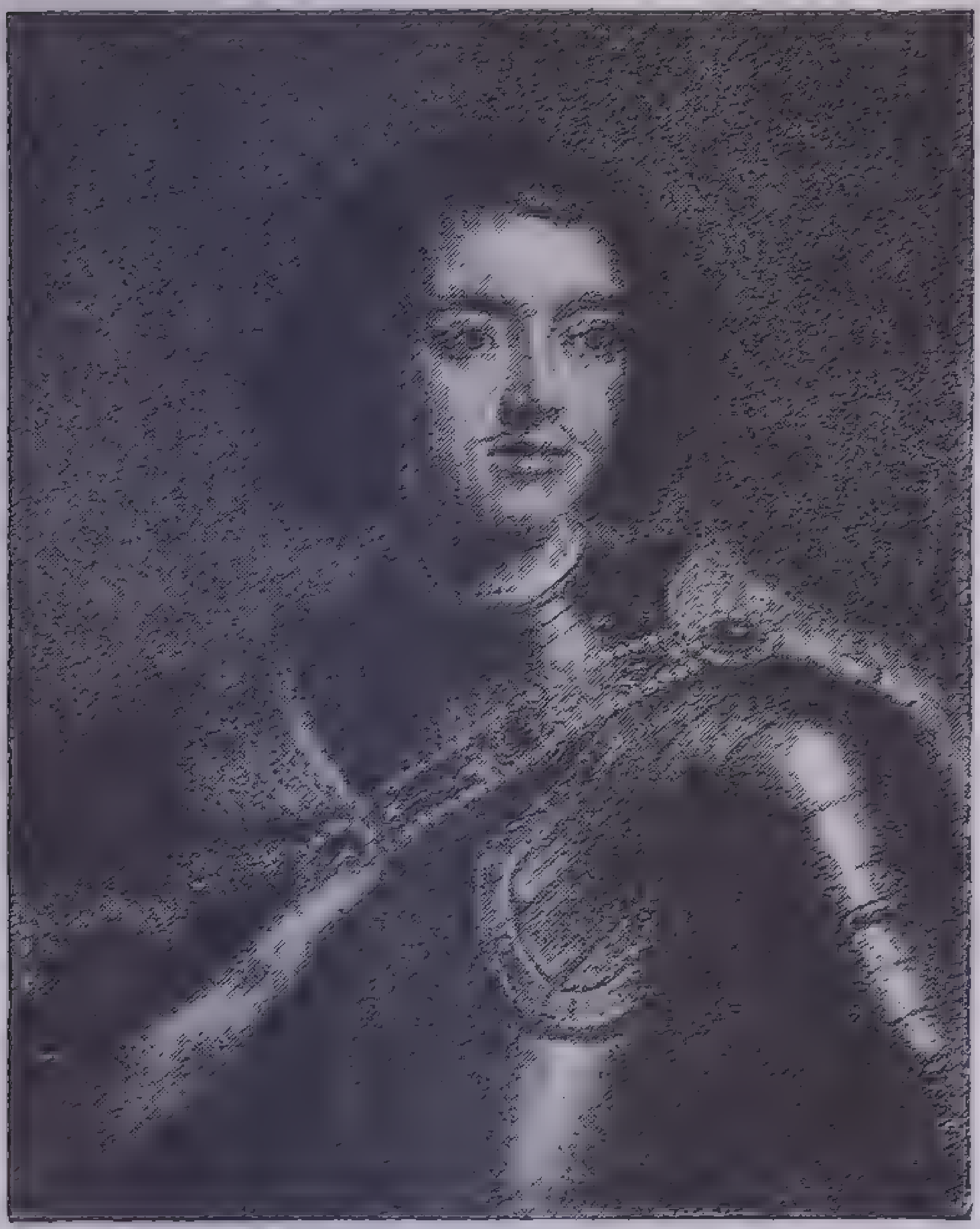
Underground Railroad, secret routes by which northern abolitionists aided slaves to escape to freedom in the North and in Canada. The whites along the routes, usually through Pennsylvania and Ohio, gave food and shelter to the fleeing Negroes. One who took personal charge of a slave in flight was known as a *conductor;* and all who gave money and other assistance were *stockholders;* thus the term *railroad* came to be applied to the enterprise. Probably 3,500 slaves were thus assisted to freedom within 30 years.

Union of Socialist Soviet Republics (U.S.S.R.), formerly Russia, a country so large that its territory in Europe and Asia covers one-sixth of the land area of the earth. For hundreds of years an absolute monarchy, it is now the seat of the most extensive economic and governmental experiment in history—the experiment of communism. The word *Russia* has disappeared from the official maps of Europe, and the term *Union of Socialist Soviet Republics* has been substituted.

In the 300 years of her existence as an organized state, Russia has left a profound imprint on European culture. The country has always been a land of sharp contrasts, owing in part to the peculiar admixture of Asiatic and European elements. Great natural resources, as yet only partially developed, and the creative potentialities of the Russian people, combine to reserve for the country an important role in the future history of Western civilization.

The First Invaders. When Greece and Rome were at the height of their ancient glory, the Russian plains were inhabited by wild tribes entirely unknown to the outside world. The first invaders were Slavs and Finns from the region of the Baltic Sea; they pushed their way southward from Lake Ladoga to the Dnieper River, where they settled. In the 9th and 10th centuries some of the Northmen sailed east across the Baltic and explored the interior of Russia from the rivers, which they traversed for long distances. They came in contact with the local Slavs.

About the middle of the 9th century Rurik, a Northman, took a band of followers down the Volkhov River from Lake Ladoga to Novgorod, where great disorder prevailed among the northern settlers. He and his followers were known as *Varangians* from a Scandinavian word that meant confederates or pledged men. His errand was in response to an invitation to restore peace. The year of his arrival is set at 862, and this date is given by some historians as the beginning of the Russian state. But there was no continuous existence of a united country for 500 years, and there was no czar until the 15th century. Rurik left his son Igor to rule the territory he had pacified, and Igor made his capital at Kiev. From this center he subdued the neighboring tribes. This period is known as the period of the Kiev state. Though the Northmen were only a small part of the population, they wielded an immense influence. In the course of time they blended with the Slavic peoples, who were the original settlers. Until



Peter the Great

the Mongol invasion in 1224, Norse rulers held sway; the most notable were Olga, widow of Igor, who ruled from 945 to 957, and who was baptized in the Christian faith, and Vladimir the Great (980–1015). The latter made successful forays against other tribes and widely extended his domains.

During Vladimir's reign most of the people were converted to Christianity, and the Greek Orthodox faith became the official religion in Russia. The successors of Vladimir divided their rule among their sons and the Kiev state broke up again into many discordant and petty principalities.

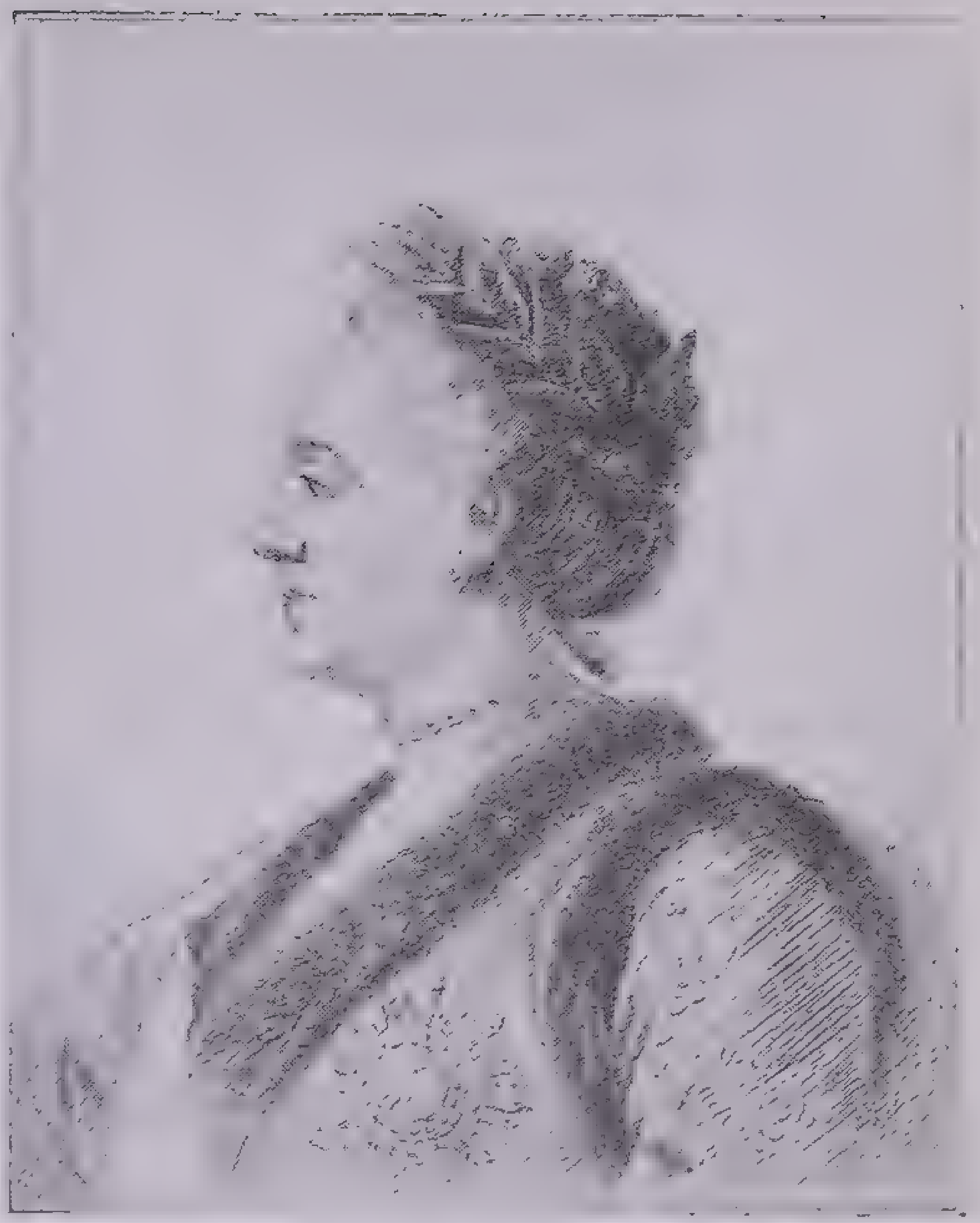
The Mongol Invasion. In 1224 the Mongol hordes from Asia fell upon Russia between the Black Sea and the Don River. The princes of Russia (the Norse rulers) went at once to the help of the native peoples against the pagan invaders, but the Mongols under Genghis Khan defeated them decisively near the Sea of Azov. A period of quiet followed, but a more severe blow was struck in 1238 when Batu Khan met the Vladimir prince and his army in a great battle; the prince was killed, and his army was destroyed. Two other Mongol campaigns placed the country entirely at the mercy of the foreigners; and during these campaigns incredible damage was done, including the destruction of Moscow, Vladimir and other important towns. Self-government ended and Russia suffered a decline in all the arts and industries that had their rude beginnings before the coming of the enemy. The country was cut off from contact with western Europe for nearly 300 years and during that time made little advance. It was deprived of the inspirational benefits of the Renaissance, and the Protestant movement did not touch it. The history of the Russian people might have run forward with that of western Europe had not Genghis Khan and his successors set up their barrier between the Slavs and their neighbors; but oriental customs were introduced by the conquerors, and even today parts of Russia are more Oriental than European.

Expulsion of the Mongols. The first of the events that ultimately relieved the country of its enemy was a victory gained by Grand Prince Dimitri on the Don River in 1380. Ivan III (1462–1505) delivered the final blow for the liberation of his country in 1480. Moscow then became the seat of Russian power, and in the west Russia became known as *Muscovy.* The rule of the Mongols now came to an end, the grandson of Ivan was enthroned at the age of three as Ivan IV (1533). During his minority Russia was torn by political strife.

The First Czars. When Ivan IV came of age he assumed the title of czar and began onslaughts in all directions to enlarge his empire. Livonia and Estonia were conquered, and he subdued the khanates of Astrakhan (1552) and Kazan (1554); western Siberia was also brought within Russian control. He was savage and cruel during the latter half of his reign and won the name, *Ivan the Terrible.* During his reign the power of the Boyars or Russian nobility was broken and centralized royal authority was established. Ivan's son Feodor was the last ruler of the House of Rurik. A succession of quarreling, murderous czars followed until 1613, when a national assembly met to choose a new reigning house. This date can be taken as the beginning of Russia as an organized state. The choice fell upon Michael Feodorovitch Romanov, and in that year he became czar and the first representative of the House of Romanov, which continued to hold the throne until the Communist Revolution of 1917 put an end to Russian nobility.

The Early Romanovs. Michael ruled until 1645 and was succeeded by his son Alexis, whose reign ended in 1676. The nobles who exercised control during the minority of Alexis quarreled incessantly, but the empire was enlarged by the voluntary addition of the Cossack territory of Little Russia. Feodor, son of Alexis, became czar in 1676 and reigned until 1682. At his death Peter, the third son of Alexis, was made a coruler with his mentally unbalanced half brother Ivan. A half sister, Sophia, was made Princess Regent; she attempted to drive Peter from the throne but was herself driven from power and into a convent. Peter became sole ruler in 1689.

Peter the Great. Peter's rule of 36 years was one of steady progress under wise guidance. He built a new capital, St. Petersburg, on land taken from the Swedes, on the Neva River near the Baltic Sea and introduced for the first time into Russia much of the advanced thought of the progressive western world. He built the first Russian ships, organized an army, founded schools and inaugurated a considerable commerce. He left to his successors in 1725 a strong, centralized, stable government, such as Russia had never before enjoyed. Many of Peter's reforms attempting to westernize the customs of the country were strongly opposed by the nobility and the clergy. All opposition, however, was ruthlessly put down, as Peter was determined at any cost to make Europeans of the half-Asiatic Russians.



Catherine the Great

The introduction of the system of bureaucracy, modeled on the German system, resulted in severing the intimate relationship between the Russian landed aristocracy and their peasants. The nobility were forced to leave their estates and come to the capital to seek favor from the court. In the opinion of some historians this reform was one of the more remote but important causes of the Russian Revolution 200 years later. Peter's son Alexis had died in 1718, and when Peter died in 1725 the crown passed by will to Peter's wife, Catherine I who held the throne for only two years; upon her death in 1727 there was a succession of rulers who added little to the national scene. Under Empress Elizabeth (1741–62), daughter of Peter the Great, Russia again gained in power and prestige. Friendly relations with France were established, and in splendor and pomp court life in Russia began to rival the court of Versailles.

Catherine the Great. In 1762 Catherine II, a German princess of Anhalt-Zerbst, gained power through intrigue. She was the wife of the half-demented Peter III and headed a conspiracy against him that resulted in his assassination, whereupon she ascended the throne and ruled for more than 30 years (1762–96). Catherine, known to history as *Catherine the Great,* was headstrong, ambitious, immoral; but she was one of the greatest rulers in Europe during the 18th century. Under her rule Russia became a first-rate power. Internally she built up commerce and industry to new high levels; she made many changes for the better in the administration of her Government, introduced better educational facilities and was tireless in her efforts to impart western civilization to Russia. In foreign relations she proved herself as great a diplomat as any in Europe. With Frederick the Great of Prussia she inspired the partition of Poland and secured the greater part of it; two successful wars with Turkey won the

Crimea and pushed the western frontier to the Dniester River. Catherine was a great patron of the arts and letters; she corresponded with all the great writers and philosophers of her time and under her rule Russia first began to develop a national literature.

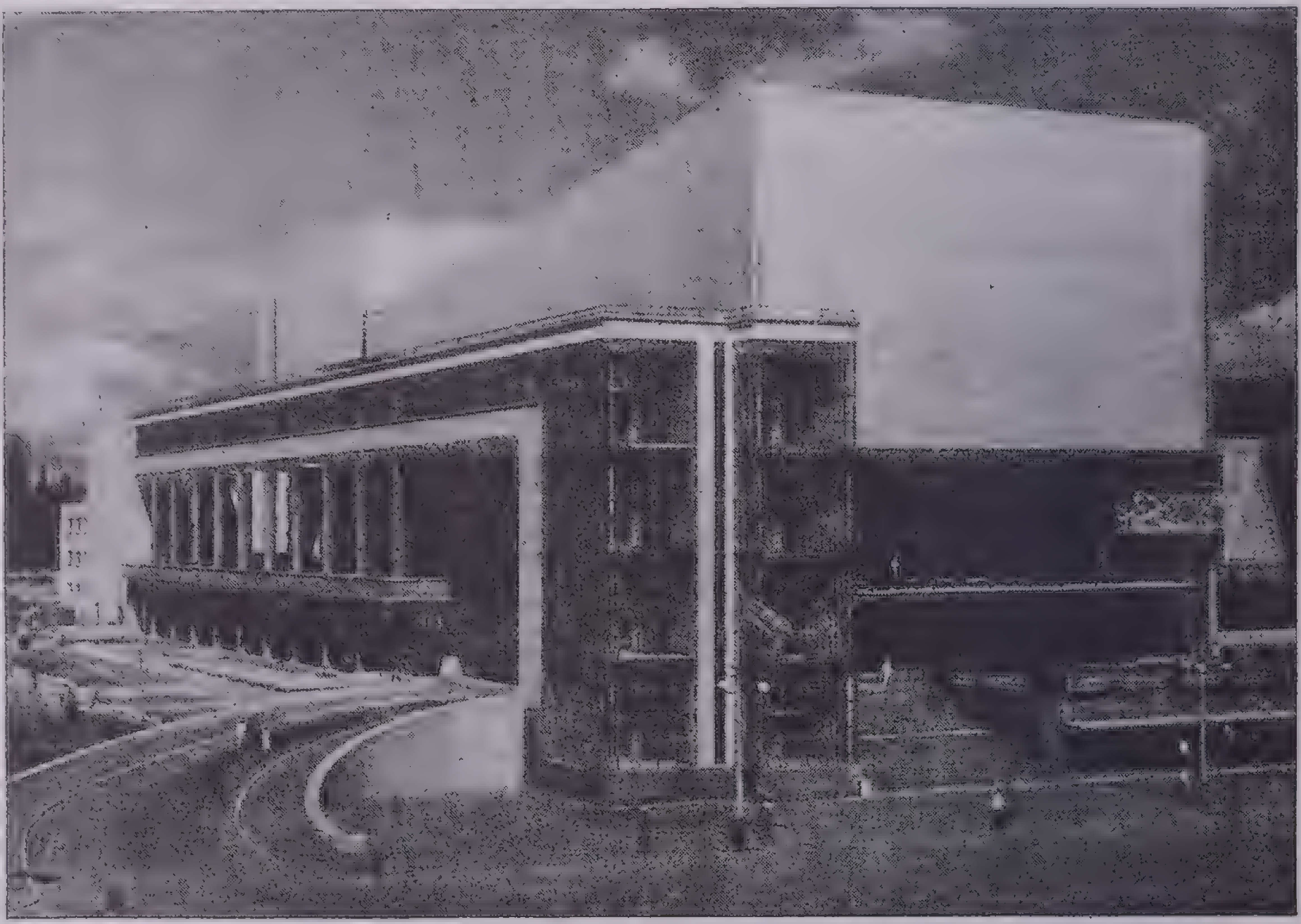
The Nineteenth Century. Catherine's son, Paul I, succeeded her in 1796. He introduced the secret-police system of espionage that was to be so hated by Russians everywhere and that contributed not a little to the eventual downfall of the monarchy. Alexander I (1801–25), who followed Paul, joined the European coalition against France but after the defeat of Russian arms formed a working agreement with Napoleon. In 1812 Napoleon turned on him for disobedience to the mandate he had leveled against England and invaded Russia. Napoleon's disastrous retreat from Moscow marked the beginning of his downfall and gave the excuse for Alexander to join the Allies in the battles that brought about Napoleon's ruin. Russian arms also gained new territory in Georgia and beyond the Caucasus in other parts of the South during his reign.

Alexander was followed by Nicholas I, his younger brother, in 1825; this reign of 30 years was eventful. Through a war with Persia (1828) a part of Armenia became Russian; Nicholas gave assistance that led to Greek independence from Turkey in 1829; a revolt in Poland was crushed in 1832. The Crimean War, begun before the death of Nicholas, ended in the next reign with Russia's loss of a part of Bessarabia and the opening of the Black Sea to all commerce.

Alexander II, known as the *Czar liberator,* succeeded Nicholas in 1855 and reigned for 26 years. He started as a benevolent reformer, granting freedom to the serfs in 1861. Circumstances changed him to a more despotic ruler when revolutionary activity of the Nihilists was directed against him. The Nihilists were usually young people of the nobility who denied all the established beliefs in politics, religion and morals. They were eager to educate and uplift the common people but, failing in their efforts, organized secret terror organizations. Alexander was killed by the explosion of a bomb in the hands of one of these revolutionists in 1881. His reign was the Golden Age of Russian literature. Dostoevski, Turgenev, Gogol and many other Russian writers achieved world renown and their works were translated into all European languages. The czar's son, Alexander III, succeeded to the throne in 1881. Facing the revolutionary spirit of the Nihilists, he chose advisers who could be depended on to repress disorders by any measures, however stern. Russia was filled with strategem, intrigues and the suppression of popular rights. The Jews were ordered segregated within certain limits and were denied property rights. Their pitiable condition gave rise to riots and many killings. The czar tried to maintain friendly relations with the Powers but nearly came to war with Great Britain over territorial expansion in Asia. A commission finally settled the boundaries marking the limits of Russian and British interests in Afghanistan. During the reign of Alexander, construction of the Trans-Siberian Railway was begun. Alexander died in 1894 and was succeeded by his son, Nicholas II, who was fated to be the last of the long line of the Romanovs and the last Russian czar.

Nicholas II. Repression of the peasantry and of enemies of the monarchic system continued under the new czar; the secret police used their powers unsparingly, and their espionage continued to send thousands of people, many of them innocent, to exile in bleak Siberia. There were periods when repressive measures were lifted; at such times the czar showed himself desirous of raising Russia to a higher social plane, but he was the victim of a system that nullified his efforts. Beginning in 1901 the strongest revolutionary movement the country had ever witnessed taxed every energy of the Government. Its causes were the persecution of subject peoples, particularly the Poles, the repressive measures forced upon the peasantry at home and the discontent resulting from the unsuccessful Russo-Japanese War (1902–04), caused by Russia's refusal to withdraw from Manchuria. Strikes with accompanying violence became more and more common. A throng of strikers appeared at the Winter Palace in 1905 to present a petition to the czar in person. They were fired on by the troops, and this Red Sunday massacre intensified the feeling against the reactionary advisers of the monarch. The Government was finally forced to grant a few reforms, one of which was freedom of worship. A mutiny of the Black Sea fleet hastened the decree establishing the semblance of a legislative body called the *Duma.* Its majority membership was composed of representatives of privileged classes, and although it originally was only an advisory or consultative body, little by little its powers were broadened; but its every act had to receive the sanction of the Crown before it could become effective; and, when it demanded reforms not in keeping with the governmental policy, these were refused.

By the summer of 1914 the struggle of class against the Government reached a stage so acute that a revolution was imminent. It was only avoided by the beginning of the World War, which immediately involved Russia. The people dropped their internal differences, and the Duma pledged all the country's resources to the prosecution of the war.



Courtesy Intourist, Inc.

Modern Architecture and a People's Theater in Soviet Russia

The Gorki Municipal Dramatic Theater at Rostov-on-Don has its own company that presents regular performances

Russia in the World War. From the first the Government showed insincerity in its pledges to the people. To secure fullest co-operation of all, it promised the Poles and the Galicians sweeping reforms in the administration of their affairs in return for their loyalty to the cause of Russia and the Allies. When Russian arms were partially victorious in 1915, these promises were nullified by further repression; in 1916 when the fortunes of war turned against them, there was a renewal of promises of still more extended future reforms. The millions of Russian soldiers fought with stoical bravery, but their soldierly qualities suffered by reason of maladministration throughout the official ranks. Supplies were lacking; money that should have been spent for them went in too large measure into private coffers. The soldiers became weary of futile endeavor; they were told by revolutionists that the bureaucrats in Petrograd (St. Petersburg) secretly favored the German cause and were withholding ammunition from the front.

The Revolution. A revolutionary movement gained such momentum that in the spring of 1917 the czar was forced to abdicate the throne in favor of his infant son, with Grand Duke Michael as regent. Michael also soon abdicated. The czar and his family were made military prisoners in the royal palace. The army supported the revolution at home and, cheered by support from the Allies, attempted for a time to continue war. Revolutionary propaganda, however, combined with defeat on the German and Austrian fronts, led to complete demoralization of the Russian troops. Thousands of soldiers were deserting the ranks and returning to their homes. Kerensky, the head of the Provisional Government formed after the Czar's abdication, was too weak to cope with the situation. In the meantime under the leadership of the Bolsheviks (members of the left wing of the Russian Socialist party) Councils of Soldiers' and Workmen's Deputies were formed everywhere. In July 1917 the Bolsheviks, under the leadership of Nikolay Lenin attempted to overthrow the Provisional Government but were unsuccessful, and Lenin was forced into temporary hiding. But in October of the same year Kerensky's Government was overthrown and he was compelled to flee.

The Communists were already so powerful that an All-Russian Congress of Workers and Soldiers set up a new government in November 1917, with Lenin as Premier and Leon Trotsky as Minister of War. Lenin was a great revolutionary leader. In energy, ruthlessness and complete devotion to a cause he can be matched only by one other figure in Russian history—Peter the Great; but the changes effected by Lenin in the Government and the life of the Russian people were more sweeping and profound than those brought about by Peter. At the end of 1917 Russia was in the hands of the revolutionary leaders. Mass murders of former officials and members of the upper class spread throughout the country. At the same time the dreaded Cheka, a secret-police organization, was executing numbers of people on suspicion of anti-revolutionary sympathies. In July 1918 the Communist authorities caused Nicholas II and his entire family to be removed to a small town in Siberia, where at night they were herded into the cellar of the house in which they had been confined and shot. A separate peace with Germany was signed at Brest-Litovsk in March 1918. The border states of Poland, Estonia, Livonia, Latvia and Finland were given up. Opposition to Communist rule at once developed at home. Opponents of the new regime, called *White Russians,* raised several armies in the South of Russia and in Siberia. They were defeated by the new Red armies of Trotsky. Wherever opposition showed itself, it was put down, and the Communist power was soon supreme.

After the Revolution. The new Government was reared on the basis of the supremacy of the working class. Karl Marx, originator of the theory of the Communist state, provided the main ideas upon which the new Russia was built. Lenin put Marx's ideas into practice. He had absolute faith that in time an ideal society would arise in which everyone would work unselfishly for the common good of all. Until the establishment of such a society it was essential, in Lenin's opinion, that Russia be ruled by an iron dictatorship of the working class. The name Russia was abandoned, and in its place the country was officially named the Union of Socialist Soviet Republics. The capital was moved to Moscow, and in 1924, after Lenin's death, the name of the old capital was changed from Petrograd to Leningrad. The workers were put in possession of the factories; private ownership of land was abolished; mines and forests were confiscated. The wealthy were by these strokes reduced to poverty; the intellectual classes were placed in a position of inferiority to the proletariat. A reign of terror resulted in the removal by violent means of thousands who stood in the way of the successful course of the revolution.

Before the end of 1922 there was utter demoralization of industry and society; the new Government was groping for a way out of chaos but was as strongly determined as ever to maintain the supremacy of the workers. To add to national misery, a widespread famine occurred in 1924. Upon the death of Lenin in 1924 there followed a conflict of men and policies. Trotsky attempted to assume leadership. He was opposed by Joseph Stalin. Trotsky desired to continue the policy of attempting to spread the revolution outside Russia. Stalin favored concentration on Russian problems, and in particular on a program of conciliation between the Government and the peasants, as he realized that a sound agriculture was essential to the welfare of the state. Stalin further desired a compromise with the outside capitalistic world, believing that the technologies of the capitalistic countries should be introduced into Russia with all possible speed. Stalin was successful in getting his ideas adopted, and Trotsky was eventually driven from the country.

The building of the Communist state progressed slowly while theories new and startling to the rest of the world were being tried. In 1929 a plan was evolved to improve the economic condition of the Soviet Union; the *Five-Year Plan* was put into effect to increase the output of industry two and one-half times its 1929 level by the end of the year 1933. To attain this end there was universal conscription of labor. The Government reported this achievement accomplished early in 1932 and then announced the Second Five-Year Plan to complete the rehabilitation of Russian industry. Under the new dictator Stalin the army and air forces were greatly increased, and all opposition to Stalin's policies within the Communist party was ruthlessly put down. The Soviet Union was recognized formally by the United States and most European Powers. By its 16th anniversary the Soviet Union had emerged as a first-rate European Power.

Recent Events. The Second Five-Year Plan began January 1, 1933. It called for an increase of 114 per cent in industrial output during the 5 years; great extension of rail lines and inland waterways; the building of many electric power plants; a large increase in tillable soil and agricultural equipment and a tremendous increase in the national budget. On July 13, 1935, the Soviet Republic signed a trade pact with the United States that greatly increased its exports and imports. There has been a similar increase in trade with other countries.

The complete control of the Soviet press and the rigid censorship exercised by the Government over the dispatches of foreign correspondents have made it difficult for the outside world to learn the truth about conditions in the Soviet Union. In 1937 and 1938 there were many evidences of serious discontent and a desperate strife of factions within the country. A large number of former revolutionary leaders were tried and executed on charges of treason and sabotage under circumstances that led many foreign observers to suspect that the regime of Stalin is much less stable than it formerly seemed.

The German seizure of Austria, the crushing of the Loyalists in the Spanish civil war and the financial and political conditions in France have combined to produce a new European situation. Fascism, represented by Germany and Italy in Europe and by Japan in the Far East, made immense gains in prestige and power during the years 1937 and 1938. In 1939 Russia and Germany made a treaty of friendship and non-aggression. However, Germany attacked and invaded Russia in 1941. Russia joined England and fought valiantly. See World War II, p. 805.

Union of South Africa, a strong British state in the extreme south of the continent, one of the members of the British Commonwealth of Nations. It consists of four states—Cape of Good Hope, Natal, Orange Free State and the Transvaal. The earliest settlements were on the ocean route, near the Cape of Good Hope, close to the tip of the continent. Though Bartolomeu Dias and Vasco da Gama sailed here, the Portuguese made no attempts at colonization. The Dutch came first in 1652, the settlers being people who had been driven from the Netherlands by religious persecution; French Huguenots joined them, and all thrived under Dutch rule until 1806, when the British took the colony during the wars with Napoleon. Thus the Cape of Good Hope colony became British.

Many of the Dutch, enraged at the British conquerors, left the colony about 1835 and trekked north, founding new homes in Natal. They organized a republic in 1839, but again the British conquered them, and another trek occurred, first to the Orange River then to the Transvaal. Continued friction between the British and the Dutch finally led to the South African War, 1899–1902. In that war the Dutch (Boers) of the Orange Free State joined their Transvaal kins-

Courtesy South African Railways and Harbours

Memorial to Cecil John Rhodes near Cape Town, Union of South Africa

George Frederic Watts's figure on a horse symbolizes energy, a characteristic of the great empire builder. The Memorial is on the *Groot Schuur,* near Cape Town, where he had his residence and which is now the residence of the prime minister of the Union

men against the British. When the English, after 3 years of serious fighting, ended the Boer resistance, the influence of Great Britain became dominant in all four colonies. By treating the vanquished liberally, the British soon completely won the good will of the Dutch element in the population, and some of the Boer leaders attained important rank in shaping the policies of the Empire. In 1906 representative government was established, and Boers at once occupied prominent places in the political organization. In 1909 a union of the provinces was proposed, and after several meetings a constitution was adopted, and the Union of South Africa came into existence in May 1910. Generals Botha and Smuts helped the British to conquer German Southwest Africa early in the World War, and at the Peace Conference at Versailles they represented the Union. Each was later chosen to be premier of the Union.

Uruguay, one of the South American republics. It was first known to white people as *Banda Oriental.* The first white man to visit it (1516) was Juan de Solis, a Spaniard; but the native Indians resisted his attempts to establish a settlement. A later effort in 1603, backed by a considerable company of soldiers, was likewise a failure; not until 1726 was the first permanent Spanish settlement in Uruguay established.

Portuguese Claims. Meanwhile the Portuguese from Brazil had been pushing southward along the Atlantic coast, and though Spain had good reason to claim the territory that became Uruguay, the Portuguese colony to the north also laid claim to it. Little by little Brazilian settlements were extended down the coast until they were close to the Rio de la Plata and crowding near to the Spanish Buenos Aires district. The relations between the Spaniards and the Portuguese at first were friendly, for each profited by trade with the other, and for more than a generation there were no disturbances; but in 1680, when the Portuguese fortified the river across from Buenos Aires, the Spaniards were made painfully aware of the Brazilian invasion of their territory. A Spanish force drove the Portuguese away, and Spaniards were rushed in to take possession. The next 100 years were spent in making Spanish occupancy secure against the rivalry of Portugal; soon after 1800 Brazil definitely abandoned its claims. In 1807 a British fleet (Great Britain and Spain being then at war) captured Montevideo but could not hold it and were repelled in an attempt to take the main stronghold of Buenos Aires.

Independence and War. In 1810 Argentina began the struggle that resulted in its independence, and Uruguay joined its forces with the more powerful colony. Four years later the Spaniards were driven from Montevideo by the assistance of an army sent from Buenos Aires; independence was achieved, and a republic was formed. The people of the little country were nearly exhausted from the war, and the Brazilians at once attempted to reassert their authority. A Brazilian force captured Montevideo in 1817, and the Uruguayan head of the state sought refuge in Paraguay. The Portuguese thereupon annexed Uruguay to Brazil. Patriotic citizens awaited a favorable moment, then raised a force of men in Buenos Aires and attacked the invaders. By 1828 the Brazilians had been decisively defeated, and Uruguayan independence was again recognized.

The New Republic. The present Republic of Uruguay dates from 1830. For a short time there was peace, but in 1832 civil war broke out between rival political factions. This continued intermittently for many years. Only since 1910 has Uruguay been fairly free from political instability and civil strife. In 1865 Uruguay joined Brazil and Argentina in a war against Paraguay. The dictator of Paraguay Francisco Solano Lopez was ambitious to extend his domain to include a sea frontage. For 5 years Paraguay resisted the greatly superior forces of the allies with astonishing stubborness but was finally crushed. Uruguay has made advancement in spite of numerous revolutions and changes of administration. A new constitution, adopted in 1934, wrote into the fundamental law a great deal of advanced social legislation. The president for the 1931–35 term, Dr. Gabriel Terra, was re-elected for the next 4 years though the new constitution voted by Terra's followers and the former constitution, which he had overthrown, both forbade a president's succeeding himself.

Vatican City, the smallest independent state in the world, consisting of only 108.7 acres, located in the city of Rome, under the legislative, executive and judicial authority of the Pope. It was established in 1929 through an agreement between the Government of Italy and representatives of the head of the Roman Church, which settled the famous *Roman Question,* a controversy that had existed between the Church and the State since 1871. For more than 1,100 years the Pope was a temporal ruler as well as the spiritual head of the Roman Catholic Church. In 756 Pepin the Short gave to the Church certain provinces in central Italy over which the Pope might exercise all the authority of a temporal sovereign; Charlemagne confirmed the gift of his predecessor and added to it. These provinces and the cities within them, including Rome, were known as the *Papal States.* These states, with the exception of a small area surrounding Rome, became a part of united Italy in 1860. In 1870 King Victor Emmanuel II entered Rome, and in 1871 he made it the capital of the new united kingdom. Thus deprived of his temporal realm, Pope Pius IX, after protesting his loss, shut himself up in the Vatican and made himself virtually a prisoner. His successors followed his example. The Italian Government voted a yearly income of 3,225,000 lire, besides the possession of the Vatican and other buildings of the Church adjacent thereto. This annual allowance no Pope would accept.

The right to be considered a temporal as well as a spiritual ruler was never abandoned, and in 1929 a way was found to bring about a return of temporal power, though in a very restricted territory. The present territory of Vatican City, no larger than a good-sized city park, was given by the Italian Government to the Church, in which the Pope should exercise supreme authority. The area includes the Vatican buildings, Saint Peter's Church, other Church structures, and all of the secular interests of Rome embraced within the Vatican City limits. Italy gave 750,000,000 lire (about $40,000,000) to Vatican City in cash payment of the annual amounts consistently refused after 1871, and 1,000,000,000 lire (about $53,000,000) in Italian state bonds.

Vatican City has its own system of postage stamps, railroad (600 yards in length), independent broadcasting station for the use of the Pope in transmitting his messages to the world, individual state flag and telegraph, telephone and water systems.

Venezuela, a republic of the northern part of South America. It was first seen by white men when Columbus sailed along the coast in 1498. Amerigo Vespucci visited its shores during the next year and named the country *Venezuela* or Little Venice, because the homes built upon piles near Lake Maracaibo reminded him of the canal streets of Venice. There was no further activity for about 20 years; then settlers appeared at Cumana, on the east central coast. In 1527 Coro, in the far west on the Gulf of Maracaibo, was established; both Cumana and Coro exist today, and the latter was the Venezuelan Government's headquarters for the first 50 years of the country's history.

Financial Needs of Kings. Charles V, Holy Roman Emperor (Charles I of Spain), needed money badly in 1527 and in return for a loan gave the entire Venezuelan colony to a company of German bankers. The lessees expected to find fabulous wealth in their new possession—gold even lying on the ground—and when they were disappointed in not securing riches suddenly, they raided the native colonies and enslaved the Indians. So scandalous was the behavior of the invaders during the next 20 years that the king was forced to cancel their concession. Eighty years later the country's resources were again pledged to a private corporation to obtain greater revenues to the Crown; this time abuses were checked, and the arrangement was fairly satisfactory. Government was retained in the hands of the Crown, but it was administered until 1731 from Santo Domingo. This concession was canceled in 1778, and the capital was removed to Caracas in 1786.

Struggle for Independence. The act of Napoleon in placing his brother Joseph on the throne of Spain in 1808 was distasteful to the colony of Venezuela, as to other South American colonies held by Spain, and a movement for independence was soon under way. The leader of the revolutionary forces was Simon Bolivar, called the *South American Liberator.* Early in 1810 a revolutionary group deposed the captain general and organized a council to rule as long as a foreigner occupied the Spanish throne. In the next year Bolivar induced the Venezuelans to declare complete independence. The struggle for freedom extended over a period of about 10 years. The royalists sent large armies to Venezuela, which were not finally defeated until 1821. In 1819 Bolivar was chosen dictator of the country and became President of the new Republic of Colombia, which included Venezuela.

Courtesy Pan American Union

In the Simon Bolivar House, Caracas, Venezuela

Pomegranate trees grow in the patio of the house where the South American liberator was born on July 24, 1783

Venezuela a Republic. In 1829 Venezuela separated from Colombia under the leadership of José Páez and became a separate republic. There was comparative peace for about 15 years, then political factions became aligned against one another, and civil upheavals were almost continuous until 1870. Meantime in spite of the quarrels of liberals and conservatives advancement was made. Slavery was abolished in 1854, and in 1864 a new constitution was adopted.

Boundary Disputes. Twice Venezuela has been involved in serious altercations with European nations. Great Britain early laid claim to a large part of the country south and east from the Orinoco River as a part of its Guiana territory. Venezuela sought a settlement by arbitration. Great Britain demanded certain concessions before it would consent to any submission to arbitration. The British Government sent naval forces to occupy the mouth of the Orinoco River and built fortifications on land. Finally, when war appeared certain, President Cleveland of the United States, in a sharp note to the British Government, applied the Monroe Doctrine to the strained situation, and Great Britain did not advance its threat of force. Arbitration won in 1897, and the boundary was set where it still remains. Venezuela's contentions were in the main upheld.

Two Dictators. In 1901 Cipriano Castro became President and assumed the role of dictator. It was his refusal to fund the debts to Europe that in 1902 caused the British, German and Italian governments to blockade Venezuela's chief ports to force payment of the debts. Again the United States Government intervened, and all of the involved questions were settled by arbitration. In 1908 Castro went to Europe for medical treatment; he placed Vice-President Gomez in power during his absence.

On his return, Castro was charged with a plot to assassinate Gomez and was deposed. The Congress made Gomez provisional President. Castro attempted to force his way back to power but was unsuccessful. Gomez took advantage of his position as provisional President to establish one of the most repressive and merciless dictatorships in history. He developed the petroleum industry of the country and built fine roads. He remained in power until his death in 1935. Then there was a liberal reaction. A new constitution was adopted in 1936 that tried to keep Venezuela's money at home—80 per cent of bank deposits must be invested in the country—to counteract the effects of Gomez's relations with foreign capital. The new constitution recognized labor unions, provided for an 8-hour day and in many other ways went to the opposite extreme from the peonage of Gomez's rule.

Verdun, Treaty of, the earliest important political treaty in modern European history. Charlemagne left his vast empire to his son Louis the Pious. When Louis died in 840, his three sons fought for the domain. In 843 an agreement was reached and reduced to writing whereby one son, Charles, received the region west of the Rhine River, which became the nucleus of modern France; Louis received the greater part of modern Germany, east of Charles's domain but separated from it; Lothair became emperor and received territory between the North Sea and the Jura Mountains, the southern part of which in later centuries became the foundation of present-day Italy and the northern part included Lorraine, which was to be disputed between France and Germany for more than 1,000 years.

Versailles, Treaty of, the document that made the peace at the close of the World War. The Peace Conference was held (January 10 to June 28, 1919) in the Hall of Mirrors (*Galerie des Glaces*) of the Palace of Versailles, which had been the scene of the coronation of William I of Prussia as German emperor in 1871.

A great staff of specialists working in committees drafted separate parts of the treaty. Each committee made its part as severe as possible—fearing that other committees might be lenient. There was a tremendous pressure of public opinion on each of the Big Four—Clemenceau of France, Lloyd George of Great Britain, Orlando of Italy and Wilson of the United States—to make the terms severe. An English historian of the Conference, Dr. H. W. V. Temperley, calls the treaty "crushing and severe to a high degree" and he says of it: "No great diplomatic instrument has ever been so speedily modified, revised or altered." The treaty was signed on January 10, 1920.

By the terms of the Treaty the League of Nations was set up, and Germany lost all its colonial possessions throughout the world; the important ones were German Southwest Africa, German East Africa, Togoland and Kamerun; its "sphere of influence" in China in the Shantung district was restored to China. East Prussia was split into two parts to establish the Free City of Danzig and to give Poland access to the sea. Alsace and Lorraine, given to Germany after the Franco-Prussian War of 1870, were returned to France. The coal mines of the Saar Valley in Germany were ordered turned over to France for 15 years. Small territories, such as Schleswig and two on the border of Belgium, were given to Denmark, Belgium and Luxemburg. Nearly all the German navy was ordered delivered to the Allies, as well as a large part of the country's merchant marine. German sailors sank many of the war vessels after they had been delivered into British waters.

Courtesy French Government Tourist Bureau

Palace of Versailles

A view of the palace where the peace treaty between the Allies and Germany terminating the World War was signed June 28, 1919. The sumptuous palace was erected during the reigns of Louis XIV and Louis XV. The artificial pool shown is at the head of a flight of stone steps, which presented a fountain-adorned vista that every 18th-century monarch envied and tried to duplicate in building his own miniature Versailles

The Treaty of Versailles made Germany responsible for damages done the Allies during the War, but it did not set these damages. That whole question was further involved because each of the Allies wanted to pay its war debts out of funds to be secured from Germany. A Reparations Commission in April 1921 assessed Germany 132 billion gold marks (about 33 billion dollars) in 42 annual payments. When these payments were not made, the Dawes Commission (1924, headed by Charles G. Dawes of the U.S.) adjusted the payments to the German Reich's ability to pay based on a survey made by the Commission. Again the payments were not made, and the Young Plan (1929, headed by another American, Owen D. Young) worked out another method of payment; but Germany defaulted in 1931.

Whether reparation demands were too high or the world depression came too soon, the demands that grew out of the Versailles Treaty for a German indemnity were not met. Many other terms of the Treaty were made null and void by the passage of time. Hitler's remodeling of Germany created a huge new war machine where the Peace Treaty had forbidden an army. The colonies that were taken from Germany were demanded back by Hitler, and many students of international affairs who wanted peace urged that the colonies should be restored. The League of Nations that the Treaty set up failed to check Japan in Manchukuo or Italy in Ethiopia.

Vienna, Congress of, a notable assemblage of officials of the governments of Europe called to meet in Vienna in October 1814 to readjust the map of the Continent after the downfall of Napoleon. The monarchs of Russia, Prussia, Austria, Denmark and Bavaria were present in person. The main work of the Congress was done by the representatives of Austria, Prussia, Russia, Britain and (in spite of protests) France. Lord Castlereagh acted for Britain, Metternich for Austria and Talleyrand for France. When the Congress finally adjourned in June 1815, the following readjustments had been made in an effort to secure the balance of power in Europe and with no attention to the claims of nationalities.

The Austrian Hapsburg rule was restored, and Austria received as additional territory in the Tyrol Venetia, Dalmatia, Galicia and Salzburg. The Prussian monarchy was restored, and to its domain were added a considerable portion of Poland, some of Saxony and other land in Germany. A German confederation of 39 states was formed, with Austria at its head. The Netherlands, including what is now Belgium and the Netherlands, was set apart as a kingdom. Sweden's control of Norway was confirmed. The kings of Spain, Sardinia, Tuscany and Modena were restored to their thrones, and the Papal States were returned to the authority of the Pope. Great Britain secured many islands as its portion of the readjustment.

Waterloo, the last engagement of the armies of Napoleon against the Allied Powers of Europe, fought near Brussels, on the field of Waterloo June 18, 1815. The French force consisted of 70,000 men and 246 cannon; the Allies, under the English duke of Wellington, had 67,600 men and 156 guns. The battle raged all day without decisive result; about 7:30 in the evening the Prussian General Blücher arrived with overwhelming reinforcements for Wellington. The struggle was at once renewed with increased intensity, and Napoleon suffered a terrible defeat. He lost 30,000 men, killed and wounded; the allied loss was 22,000. This was a battle that Europe thought would never be fought. Napoleon had abdicated as emperor of France and had been exiled to Elba, a small island in the Mediterranean. In March 1815 he escaped, returned to France and was enthusiastically greeted by his old army. Recruiting many new levies, he marched against the Allies and met them at Waterloo in a final challenge. The interval between his escape from Elba and the date of his second abdication is called *the Hundred Days.*

The battle of Waterloo ended Napoleon's career and may thus justly be rated as one of the decisive battles of the world. Nevertheless it is impossible to believe that Napoleon could long have maintained himself even if he had won at Waterloo. He had all Europe against him; France was exhausted; in the long run, as he himself said, "The greater force always overcomes the lesser."

Whisky Insurrection, an uprising of the farmers in western Pennsylvania in 1794. In the early national period settlers in widely scattered districts found it difficult to transport their corn and other grains to markets in the centers of population. Some of them, notably in western Pennsylvania, converted their grain into whisky, thus lessening the transportation difficulty, as what they then had to sell was much less bulky. To make whisky was not contrary to law, but the Government levied a considerable tax upon such distilled products. The Pennsylvanians objected to the tax and ill-treated the revenue officers sent to collect it. President Washington sent 15,000 militiamen to the region to enforce collection, and the insurrection soon subsided. This was the first occasion that the Government used its power to enforce a Federal statute within a state; hence the incident is important in the history of American jurisprudence.

Witenagemot, a council of leading men in the Anglo-Saxon period of England, existing to give advice and assistance to the king. It was composed of thanes, bishops, abbots and nobles. So great was their influence that under extraordinary conditions they could depose the monarch and elect his successor. After the Norman Conquest, William the Conqueror caused its name to be changed to the Great Council, and he continued to recognize the validity of the body. In the struggle for individual rights in England, the Great Council was destined to develop into the English Parliament.

World War, the great conflict of 1914–18 among the principal Powers, including the United States. So many nations were involved, the war was so long, the losses in men and money were so severe, the methods of modern scientific warfare were so horrible and the effects so manifold and lasting that this is well called the Great War.

Causes of the War. The war may be called in general terms a conflict between pan-Germanism and pan-Slavism—that is, racial ties bound together Germany and Austria on the one hand and Russia and Serbia on the other, and racial antipathies separated these two groups. The same phenomenon may be called the growth of nationalism—the unrest in Serbia and the unwillingness of the Serbs to be a part of the Austro-Hungarian Empire in which they had no natural national place.

The rapid growth of the German Empire since its foundation in 1871 at the end of the Franco-Prussian War, the bitter feeling between Germany and France that resulted from this war, the fear and distrust that Russia in the East and Great Britain in the West both felt of Germany's growing military power and its professed international policy of pushing toward the East (*Drang nach Osten*)—these facts are important in any list of the reasons for a World War.

The immediate cause was the assassination (June 28, 1914) at Sarajevo by a Serbian of the Austrian archduke and heir to the throne, Francis Ferdinand. The Austrian authorities made impossible demands of Serbia—apparently expecting to provoke a war that would crush Serbia without involving any other Powers. Nearly all historians now agree that the German Emperor attempted to restrain Austria and that he did not want war.

Who Was in the War. When Austria actually declared war (July 28), Russian forces mobilized; and then (Aug. 1) Germany declared war on Russia. Within 3 days France and Great Britain were on the side of Serbia opposing Germany and Austria—drawn in by their obligation to preserve the neutrality of Belgium, which had been guaranteed in 1839 by Great Britain, France, Prussia, Russia and Austria. Japan declared war on Germany in August 1914.

Turkey came into the war (September 1914) on the side of Germany and Austria against her old-time enemy Russia and in the hope of regaining lost territory. Bulgaria got offers from both sides in the summer of 1915 but in October declared war on Serbia. Rumania declared war on Austria in August 1916. Greece finally joined the Allies in June 1917. Other Powers also came in nominally or actually against Germany, Austria and Turkey—for example, Liberia, Honduras and Siam.

Italy in 1882 had joined Germany and Austria in a Triple Alliance, but at the beginning of the war Austria had not consulted Italy, and so Italy declared her neutrality and soon afterward demanded certain cessions from Austria as compensation for disturbing the balance of power and as the price for continued neutrality. The privileges that Austria would not give Italy were promised her under the Treaty of London (April 26, 1915) by the Allies (Britain, France and Russia), and this brought Italy into the war (May 23) against her old friends of the Triple Alliance.

The United States was neutral during the early part of the war, and Woodrow Wilson was re-elected in 1916 because "He kept us out of war." President Wilson hoped to make peace, but early in 1917 the German policy of unrestricted submarine warfare brought the United States into the war (April 6) on the side of the Allies.

In the spring of 1917 Russia had practically dropped out of the war after a series of defeats at the hands of the Central Powers. These defeats coupled with internal revolution resulted in the abdication of Czar Nicholas II a few weeks before the United States came into the war. In November 1917 the Bolshevik Government of Russia declared for peace.

Even this brief outline of the action of the different Powers shows how wide the scope of the World War was.

Actual Operations of the War. These were so varied that they cannot easily be described in a short summary. The German forces advanced through Belgium, defeated the French and the British in northern France and threatened Paris but were checked at the Marne (Sept. 6–10, 1914). Thereafter the fighting on the west front was trench warfare with both armies dug in. On the east the Russians had been defeated by the Germans at Tannenberg (Aug. 27, 1914), but they showed a strong offensive against the Austrians.

In 1915 the Allies made no gains and suffered many losses. They began the ill-fated move against Turkey in the Gallipoli campaign. In 1916 the battle of Jutland (May 31) was not a decisive victory for the Allies, but it kept the German fleet from causing further trouble. Fighting on the western front in Frace was indecisive with terrible losses.

The year 1917 was marked by the German policy of submarine warfare that finally brought the United States into the war against Germany. The land fighting in France was bloody, indecisive, a futile attempt to break up the entrenched lines of the opposing armies. The British use of armed tanks with caterpillar tread in November at Cambrai promised a break. In October and November the Italians were crushingly defeated by German and Austrian forces at Caporetto.

In 1918 the American Expeditionary Force arrived in large numbers and in July at the second battle of the Marne defeated a huge German offensive. The Allied victories that followed finally broke up trench warfare. The Italians gained a victory in September on the Piave. President Wilson's Fourteen Points, a program for international justice, weakened German morale; and suddenly the war ended (Nov. 11, 1918).

World War, Second.—The series of compromises following the first world war may well be called the Truce of Versailles. It was not as cruel as the Brest-Litovsk Treaty which Germany previously forced on Russia. The League of Nations lacked the force necessary to preserve peace, so much desired by the United States, England and France and pledged by all important nations. During the nineteen thirties the Allied Nations depended upon love of peace, and disarmament for collective security, while Germany, Japan and Italy were secretly building the greatest war machine of all time. In 1931 Japan took Manchuria. Germany withdrew from the League in 1934, and announced rearmament in 1935; Italy attacked Abyssinia in 1935 and soon conquered it. The aggressors, Germany and Italy, joined formally with Japan in the Anti-Comintern pact in 1936. German troops entered the Rhineland in 1936. Japan attacked China in 1937. In 1938 Germany made Austria a German State. Czechoslovakia, threatened by Germany, deserted by England and France, on Hitler's Munich treaty promising no further aggressions, yielded to German rule in 1938. Bohemia and Moravia were next taken into the German Reich. These German aggressions were accomplished without firing a shot, one by one. England and France did not consider any one of them of sufficient importance to justify a war. Hitler and Mussolini achieved tremendous popularity and power from their countrymen.

Germany and Italy made a treaty of friendship with Russia. In the Spring of 1939, Germany took Memel; and Italy, Albania. The above aggressions were of great strategic and military value. Germany next demanded Danzig and the Polish Corridor. Poland refused, and on September 1, 1939, Germany attacked Poland. In Poland Hitler first demonstrated the blitzkrieg technique, a cyclonic highly mechanized attack and penetration. With powerful airforce protection, tanks knifing into and behind the Polish lines, followed by infantry and artillery, Germany conquered Poland and the Free City of Danzig in 17 days. Germany allowed Russia, who had not entered the war, to possess eastern Poland. England and France, who had guaranteed Poland's integrity, following many serious treaty breaches by Germany, German threats of war and demands for more territory, declared war on Germany September 3, 1939.

In a surprise move in 1940 Germany captured Denmark and Norway. Germany next invaded and conquered the Netherlands, Belgium and France; England losing many men and materials of war. Italy entered the war on Germany's side just before France fell. France withdrew from the war. England's colonies gave her tremendous aid. Both sides attempted to blockade the other, England practically driving the Axis powers from the sea. The Axis destroyed many English ships by submarines, raiding ships, and bombing planes, and severely damaged English cities and military objectives with bombing planes. English bombers wrought much destruction on Axis military objectives.

Winston Churchill became Prime Minister of England. Wealth and labor were conscripted. Australia joined England in the war.

In 1940 and 1941 English and Australian troops defeated the Italians and conquered Ethiopia, Eritrea, Italian Somaliland and Iraq. The former king of Ethiopia (Abyssinia) was restored to his throne.

The neutral United States began a tremendous defense program. Japan, Rumania, Bulgaria and Hungary joined Germany and Italy as the Axis. Italy made war on Greece in 1940 and suffered heavy losses in Albania and Greece, until Germany came to her rescue in 1941 when Greece and Crete were conquered. Likewise in 1940 Russia attacked and defeated Finland, taking much Finnish territory, Lithuania, Latvia and Estonia into Russia.

In 1941 the fury of the war increased. Germany attacked and conquered Yugoslavia, broke her treaty of friendship and economic cooperation with Russia, attacked Russia and captured much of Western Russia, but failed to capture Leningrad and Moscow before a terrifically cold winter arrived. Finland joined the Axis Powers. Germany lost many troops and much of the Russian territory during the 1941-1942 winter.

During the years 1937 to 1941 Japan conquered much Chinese territory, including Hong Kong, and sent many troops into Thai in 1941. While conducting peace negotiations in Washington, Japan, seeing her strategic opportunity, attacked the United States at Pearl Harbor, Hawaii, December 7, 1941.

Terrific destruction was wrought on the United States fleet situated at Pearl Harbor.

Following the German pattern, in 1942 Japan with overwhelming blitzkrieg force conquered Wake, Guam and the Philippine Islands from the United States. General MacArthur so ably and valiantly led the Philippine defense that he was made commander in chief of the Allied forces in the Australian theatre of war. The United States sent many troops and much war equipment to Australia and Ireland. Japan rapidly conquered Malaya, Singapore, Borneo, Sarawak, Java and Burma, cutting off China's principal source of supply. Japan occupied many Pacific islands, and landed a strong force on New Guinea. The Allies took possession of Madagascar. The Japanese lost heavily at the hands of the Americans in the naval battle Midway Island, and at the hands of the Australians and Americans in the Battle of the Coral Sea.

In Egypt and Libya the tide of war swayed back and forth. Malta was bombed continuously. In the 1942 summer, Field Marshal Rommel led the Germans and Italians in a brilliant victory over superior Allied forces, driving deep into Egypt about 100 miles west of Alexandria.

After conquering Crimea from the Russians, during the summer of 1942 Von Bock led the Axis forces in an overwhelming southeast drive through Russia toward the rich oil producing Caucasus, and captured much territory. General Timoshenko led the valiantly defending Russians, who inflicted terrific losses on the Axis.

The English wrought terrific destruction to cities making war supplies for the Germans through airforce bombing. The Axis nations were Germany, Italy, Japan, Rumania, Bulgaria, Hungary and Finland. England, United States, Russia, China, Australia, Canada, Mexico, Nicaragua, Costa Rica, Santo Domingo, San Salvador, Honduras, Haiti, Cuba, Panama and several South American nations constituted the militant Allied Nations. France, Poland, Belgium, Holland, Denmark, Norway, Yugoslavia, Czechoslovakia, Greece were conquered Allies. These nations under the heel of the Axis experienced great suffering, starvation and death. Prior to the 1942 summer the Allies, unprepared for war, fought a defensive delaying war until they could build an airforce, tanks and motorized equipment superior to the Axis. They, trying to cut off necessary war supplies, drove the Axis from the Atlantic, excepting the submarines which sank a very great number of Allied ships. The United States hastened to develop into the world's greatest arsenal, furnishing under the Lend-Lease plan war supplies to the Allied nations in all corners of the world. The Axis aim was to win the war quickly before the Allies could prepare, and to sink Allied ships, cutting Allied supply lines.

In 1942-1943 many Free French joined the Allies under De Gaulle and Giraud. Americans won victories near Solomon Islands, in Bismarck Sea, on New Guinea and Guadalcanal. Terrific Battles were fought in Russia, China, Tunisia and Burma, the initiative gradually swinging to the Allies. In a 2000 mile drive the Allies captured Egypt, Libya, Algiers and Tunisia and thus drove the Axis from Africa.

Courtesy American Museum of Natural History

Dinosaur Footprints

These fossil footprints, 34 inches in length and breadth, were excavated from the Red Mountain Coal Mine near Cedaredge, Colorado, by the American Museum-Sinclair Expedition in 1937. They are evidence of the iguanodont dinosaur, a mighty monster 30–35 feet tall. The prints were removed in 8,000-pound sandstone blocks from the 80-million-year-old Mesaverde formation of Wyoming, Utah and Colorado. The huge reptile walked on his hind legs. The picture shows the left and right footprints in a stride (*white line*) of 15 feet, 2 inches; the center block shows similar tracks, parts of other trails. He stepped in soft peat, and blown sand filled his prints. With the passing of the ages, the peat became coal, and the sand became sandstone. When miners cut out the coal deposit, the prehistoric giant's footprints were exposed. Fossil plants and bones of other dinosaurs also have been removed from this formation

BIBLIOGRAPHY

Archeology

Lawrence Griswold, *Tombs, Travel and Trouble*, Hillman-Curl, N.Y., 1937, $3.00
Stanley, Casson, *Progress of Archaeology*, Whittlesey House, N.Y., 1935, $2.00
A. A. Morris, *Digging in Yucatan*, Doubleday Doran, Garden City, N.Y., 1931, $2.50
A. A. Morris, *Digging in the Southwest*, Doubleday Doran, Garden City, N.Y., 1933, $2.50
R. V. Magoffin, *Magic Spades: Romance of Archaeology*, Garden City Pub. Co., Garden City, N.Y., 1929, $1.79
E. H. Morris, *The Temple of Warriors*, Scribners, N.Y., 1931, $5.00
C. L. Woolley, *Digging Up the Past*, Scribners, N.Y., 1931, $2.00
Jennie Hall, *Buried Cities*, Macmillan, N.Y., 1922, $2.00
M. I. Rostovtzeff, *Out of the Past of Greece and Rome*, Yale Univ. Press, New Haven, 1932, $2.00
Howard Carter, *The Tomb of Tutankh-Amen*, Doubleday Doran, N.Y., 1924, $5.00

Ancient History

H. S. Chapman, *Stories of Ancient Peoples*, Houghton Mifflin, Boston, 1929, 80c
James Baikie, *Wonder Tales of the Ancient World*, Macmillan, N.Y., 1915, $1.75
Dorothy Mills, *The Book of the Ancient World for Younger Readers*, Putnam, N.Y., 1923, $2.00
Mary Macgregor, *The Story of Rome*, Stokes, N.Y., 1932, $5.00
Dorothy Mills, *The Book of the Ancient Romans*, Putnam, N.Y., 1927, $2.50
Mary Macgregor, *The Story of Greece*, Stokes, N.Y., 1931, $5.00
Margaret E. Wells, *How the Present Came from the Past*, Vol. II, Macmillan, N.Y., 1932 (*rev. edit.*), $1.00
Marjorie and C.H.B. Quennell, *Everyday Life in Archaic Greece*, Putnam, N.Y., 1931, $2.50
Dorothy Mills, *The Book of the Ancient Greeks*, Putnam, N.Y., 1925, $2.50
Josephine H. Greenwood, *Our Heritage from the Old World*, Appleton-Century, N.Y., 1921, $1.80
James Baikie, *Ancient Assyria*, Macmillan, N.Y., 1916, $1.00
James H. Breasted, *Ancient Times, a History of the Early World*, Ginn, Boston, 1935 (*2d rev. edit.*), $2.00
Gertrude Atherton, *The Immortal Marriage*, Boni & Liveright, N.Y., 1927, $2.50 (Periclean Age)
Wm. S. Davis, *A Friend of Caesar*, Macmillan, N.Y., 1931, $2.50

Medieval History

D. C. Peattie, *Story of the Middle Ages*, Grosset & Dunlap, N.Y., 1937, 50c
Rosamond J. Mitchell, *Life and Adventure in Medieval Europe*, Longmans, Green, N.Y., 1934, $2.25
Louise Lamprey, *In the Days of the Guild*, Stokes, N.Y., 1918, $2.50
Wm. S. Davis, *Life on a Medieval Barony*, Harpers, N.Y., 1923, $3.50
Dorothy Mills, *The Middle Ages*, Putnam, N.Y., 1935, $2.50
A. B. Paine, *The Girl in White Armor*, Macmillan, N.Y., 1927, $1.50
E. M. Tappan, *When Knights Were Bold*, Houghton Mifflin, Boston, 1911, $3.00
Gertrude Hartman, *Medieval Days and Ways*, Macmillan, N.Y., 1937, $2.50
Harold Lamb, *The Crusades*, Garden City Pub. Co., Garden City, N.Y., 1930, $1.00
G. G. Coulton, *Medieval Scene*, Harvard Univ. Press, Cambridge, Mass., 1930, $1.50
C. H. and S. B. Harding, *Story of the Middle Ages*, Scott, Foresman, N.Y., 1912, 88c

Oriental History

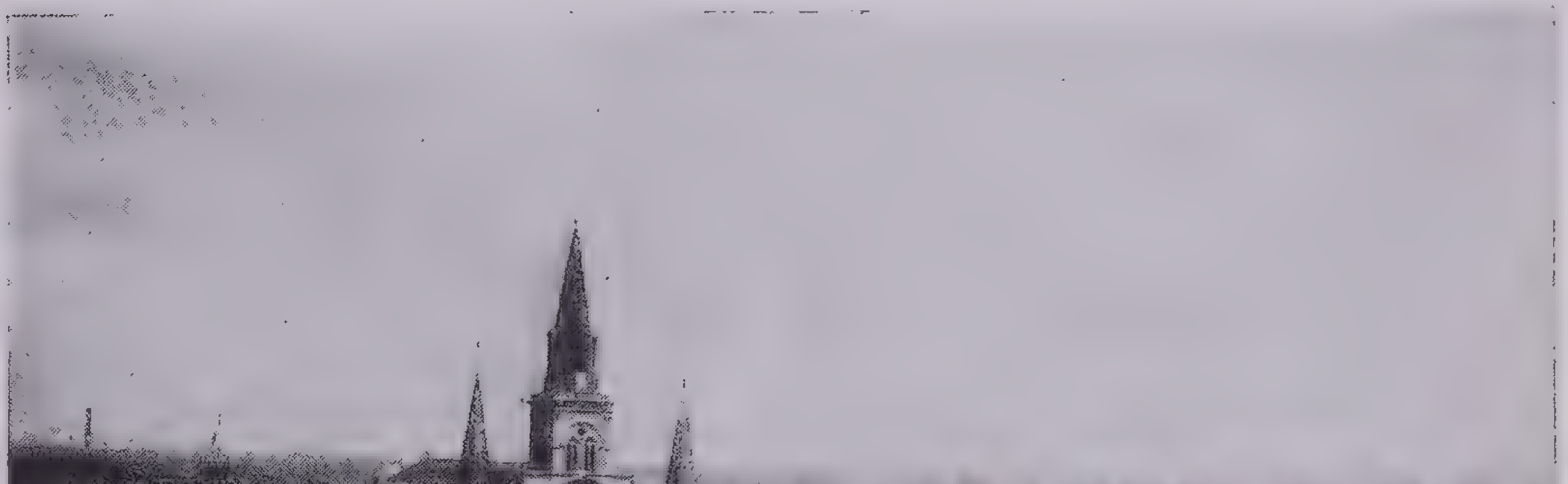
H. G. Childe, *New Light on the Most Ancient East*, Appleton-Century, N.Y., 1934, $4.00
E. L. Meadowcroft, *Gift of the River*, Crowell, N.Y., 1937, $2.00
E. Seeger, *The Pageant of Chinese History*, Longmans, Green, N.Y., 1934, $3.00
Bunji Omura, *The Last Genro*, Lippincott, Phila., 1938, $3.50
Lin Yu-t'ang, *My Country and My People*, Reynal & Hitchcock, N.Y., 1935, $3.00
K. J. Saunders, *Pageant of Asia*, Oxford Univ. Press, N.Y., 1934, $5.00
H. H. Gowen, *Asia; A Short History*, Little, Brown, Boston, 1926, $3.50
H. Tiltman, *The Far East Comes Nearer*, Lippincott, Phila., 1937, $3.00
Willard Price, *Children of the Rising Sun*, Reynal & Hitchcock, N.Y., 1938, $3.00
James M. Bertram, *First Act in China*, Viking, N.Y., 1938, $3.00
Harold Lamb, *Genghis Khan*, Garden City Pub. Co., Garden City, N.Y., 1927, $1.00
T. E. Lawrence, *Revolt in the Desert*, Garden City Pub. Co., Garden City, N.Y., 1927, $1.00
M. A. Nourse, *The Four Hundred Million; a Short History of China*, Bobbs-Merrill, Indianapolis, 1935, $3.50

World History

D. C. Peattie, *Child's Story of the World*, Simon & Schuster, N.Y., 1937, $2.50
S. King-Hall, *Child's Story of Civilization*, Morrow, N.Y., 1933, $1.00
V. M. Hillyer, *A Child's History of the World*, Appleton-Century, N.Y., 1931, $2.00
Dorothy M. Stuart, *Boy Through the Ages*, Doubleday Doran, Garden City, N.Y., 1926, $3.00
Dorothy M. Stuart, *Girl Through the Ages*, Lippincott, Phila., 1933, $2.50
Gertrude Hartman, *The World We Live in and How it Came to Be*, Macmillan, N.Y., 1933, $2.50
G. T. Hallock, *The Boy Who Was*, E. P. Dutton, N.Y., 1928, $2.00 (Events from 553 to 1821)
L. C. Marshall, *Story of Human Progress*, Macmillan, N.Y., 1928 (*rev. edit.*), $3.50
Marion F. Lansing, *Man's Long Climb*, Little, Brown, Boston, 1933, $1.75
H. W. van Loon, *Story of Mankind*, Garden City Pub. Co., Garden City, N.Y., 1926, $1.00
E. Erleigh, *In the Beginning*, Doubleday Doran, Garden City, N.Y., 1926, $1.75
Geoffrey Parsons, *The Stream of History*, Scribners, N.Y., 1928, $5.00
J. H. Breasted, *Conquest of Civilization*, Harpers, N.Y., 1926, $5.00
J. H. Robinson, *The Ordeal of Civilization*, Harpers, N.Y., 1926, $5.00
H. G. Wells, *Outline of History*, Garden City Pub. Co., Garden City, N.Y., 1931, $1.49
H. C. Knapp-Fisher, *Outline of World History for Boys and Girls*, E. P. Dutton, N.Y., 1932, $3.00
Philip Gosse, *History of Piracy*, Longmans, Green, N.Y., 1932, $3.50
H. C. Knapp-Fisher, *The Modern World—A Pageant of Today*, E. P. Dutton, N.Y., 1934, $2.50
Hayes, Noon and Wayland, *World History*, Macmillan, N.Y., 1932, $2.50
H. E. Barnes, *An Intellectual History of the Western World*, Random House, N.Y., 1935, $5.00

History of Other Lands

Alice Dalgliesh, *Long Live the King*, Scribners, N.Y., 1937, $1.60
Annabel Williams-Ellis and F. J. Fisher, *The Story of English Life*, Coward-McCann, N.Y., 1936, $3.75



Courtesy New Orleans Association of Commerce

Jackson Square in the Heart of Old New Orleans

The *Place d'armes*, where the Sieur de Bienville laid out the town in 1718, is the modern Jackson Square. Buildings left to right: the Cabildo, government building erected in 1795, scene of the transfer of Louisiana from Spain to France and from France to the United States in 1803; St. Louis Cathedral, erected 1794 on the site of Louisiana's first church; the Presbytery, used originally by the Cathedral priests; Pontalba Apartments, one of the two rows of brick apartment-style dwellings, erected by the Baroness Pontalba. In the center of the square is the monument to Andrew Jackson, designed by Clark Mills and unveiled in 1856

Courtesy New England Council

Old Ironsides

The U.S.S. *Constitution*, now in the Navy Yard, Charlestown, Mass., survived a battle with the British ship *Guerriere*, in the War of 1812. Oliver Wendell Holmes's poem, *Old Ironsides*, saved her from dismantling in the 1830s, and in 1925 she was rebuilt.

J. R. Green, *Short History of the English People*, Blue Ribbon, N.Y., 1929, 98c
C. R. and S. B. Harding, *Story of England*, Scott, Foresman, N.Y., 1929, 92c
H. E. Marshall, *Island Story: A Child's History of England*, Stokes, N.Y., 1920 (rev. edit.), $5.00
Francis Hackett, *Henry VIII*, Liveright, N.Y., 1929, $3.00
Lytton Strachey, *Elizabeth and Essex*, Blue Ribbon, N.Y., 1932, $1.00
John Buchan, *Oliver Cromwell*, Houghton Mifflin, Boston, 1934, $4.50
[illegible], Appleton-Century, N.Y., 1938, $2.00
Lytton Strachey, *Queen Victoria*, Blue Ribbon, N.Y., 1931, $1.00
H. E. Marshall, *Scotland's Story*, Stokes, N.Y., 1920, $5.00
Stefan Zweig, *Mary, Queen of Scotland*, Garden City Pub. Co., Garden City, N.Y., 1935, $1.00
M. G. Hindus, *Humanity Uprooted*, Jonathan Cape and Harrison Smith, N.Y., 1929, $3.50
Mary Macgregor, *The Story of France*, Stokes, N.Y., 1920, $5.00
Emil Ludwig, *Napoleon*, Garden City Pub. Co., Garden City, N.Y., 1926, $1.75
Ida Tarbell, *Life of Napoleon Bonaparte*, Macmillan, N.Y., 1922, $2.50
Jeannette Eaton, *Young Lafayette*, Houghton Mifflin, Boston, 1932, $2.50
Hildegarde Hawthorne, *The Phantom King* (Napoleon's son), Appleton-Century, N.Y., 1932, $2.50
Elliot Paul, *Life and Death of a Spanish Town*, Random House, N.Y., 1937, $2.50
John Buchan, *The Path of the King*, Burt, N.Y., 1936, $.75
V. G. Childe, *The Dawn of European Civilization*, Knopf, N.Y., 1925, $5.00
J. E. Gillespie, *A History of Europe, 1500-1815*, Knopf, N.Y., 1928, $5.00
F. L. Benns, *European History Since 1870*, Crofts, N.Y., 1931, $3.00
J. H. Robinson and C. A. Beard, *Development of Modern Europe*, Ginn, Boston, 1929, Vol. 1, $2.20; Vol. 2, $2.60
[illegible] *Europe*, Harpers, N.Y., 1932 (rev. edit.), $3.50
Carl Wittke, *A History of Canada*, Knopf, N.Y., 1935, $3.00
George M. Wrong, *The Canadians: The Story of a People*, Macmillan, N.Y., 1938, $3.50
W. A. Roberts, *Sir Henry Morgan, Buccaneer and Governor*, Covici, Friede, N.Y., 1933, $3.00
Howard Pyle, *Book of Pirates*, Harpers, N.Y., [illegible]
L. Wilson, *Cortes the Conqueror of Mexico*, E. P. Dutton, N.Y., 1937, 60c
W. Prescott, *Conquest of Mexico*, Doubleday Doran, N.Y., [illegible]
W. Prescott, *Conquest of Peru* (2 vols.), [illegible], N.Y., 1932, $[illegible] each
[illegible], *The Story of Mexico*, Stokes, N.Y., [illegible], $5.00
Stuart Chase and M. Tyler, *Mexico*, Macmillan, N.Y., [illegible]
[illegible], *Mexico*, Viking, N.Y., 1938, $2.50
Hildegarde Angell, *Simon Bolivar, South American Liberator*, Norton, N.Y., 1930, $3.00

American History

D. C. Peattie, *The Story of America*, Grosset & Dunlap, N.Y., 1931, 50c
H. W. van Loon, *The Story of America*, Liveright, N.Y., 1927, $5.00
Gertrude Hartman, *These United States and How They Came to Be*, Macmillan, N.Y., 1932, $[illegible]
Elsie Singmaster, *Book of the United States*, Doubleday Doran, N.Y., 1926, $2.00
A. Dalgliesh and L. Maloy, *America Begins*, Scribners, N.Y., 1938, $1.60
B. and E. Hader, *Picture Book of States*, Harpers, N.Y., 1932, $3.00
R. G. Adams, *The Gateway to American History*, Little, Brown, Boston, 1927, $3.00
W. F. Gordy, *American Beginnings in Europe*, Scribners, N.Y., 1925, $1.12
J. T. Adams, *Epic of America*, Blue Ribbon, N.Y., 1931, 98c
L. M. Hacker, R. Modley and G. R. Taylor, *The United States: A Graphic History*, Modern Age, N.Y., 1937, 75c
Leo Huberman, *"We, the People,"* Harpers, N.Y., 1932, $2.50
C. A. and Mary R. Beard, *The Rise of American Civilization*, Macmillan, N.Y., [illegible]
H. U. Faulkner, *American Political and Social History*, Crofts, N.Y., 1937, $[illegible]
C. A. Beard, *The Presidents in American History*, Messner, N.Y., 1935, $2.00
C. A. Beard, *An Economic Interpretation of the Constitution*, Macmillan, N.Y., [illegible]
Marie A. Lawson, *Hail Columbia!* Doubleday Doran, N.Y., 1931, $2.50
E. M. Allen, *America's Story as Told in Postage Stamps*, Whittlesey House, N.Y., 1930, $2.50
W. C. Langdon, *Everyday Things in American Life*, Scribners, N.Y., 1937, $3.00
I. B. Richman, *The Spanish Conquerors*, Yale Univ. Press, New Haven, 1921, $2.50
Esther Averill, *The Voyages of Jacques Cartier*, Domino, N.Y., 1937, $3.00
Agnes Repplier, *Pere Marquette, Priest, Pioneer and Adventurer*, Doubleday Doran, Garden City, N.Y., 1929, $1.50
Francis Parkman, *LaSalle and the Discovery of the Great West*, Little, Brown, Boston, 1927, $2.75
Alice M. Earle, *Child Life in Colonial Days*, Macmillan, N.Y., 1899, $2.50
Caroline D. Emerson, *Old New York for Young New Yorkers*, E. P. Dutton, N.Y., 1932, $2.00
Jacqueline Overton, *Long Island's Story*, Doubleday Doran, Garden City, N.Y., 1929, $2.50
A. A. Knipe, *Everybody's Washington*, Dodd, Mead, N.Y., 1931, $2.00
Helen Nicolay, *Boy's Life of Washington*, Appleton-Century, N.Y., 1931, $2.00
T. G. Frothingham, *Washington, Commander in Chief*, Houghton Mifflin, Boston, 1930, $5.00
Jane Darrow, *Nathan Hale, A Story of Loyalties*, Appleton-Century, N.Y., 1932, $2.00
R. S. Holland, *Mad Anthony*, Appleton-Century, N.Y., 1931, $2.00
Mary H. Wade, *The Boy Who Loved Freedom* (Jefferson), Appleton-Century, N.Y., 1930, $[illegible]
Albert J. Nock, *Jefferson*, Harcourt, Brace, N.Y., 1926, $2.75
Claude G. Bowers, *Jefferson and Hamilton*, Houghton Mifflin, Boston, 1925, $5.00
Claude G. Bowers, *Jefferson in Power*, Houghton Mifflin, Boston, 1936, $3.75
Gertrude Atherton, *The Conqueror* (Hamilton), Stokes, N.Y., 1932 (rev. edit.), $2.50
Helen Nicolay, *The Boy's Life of Benjamin Franklin*, Appleton-Century, N.Y., [illegible], $2.00
Bernard Fay, *Franklin, Apostle of Modern Times*, Little, Brown, Boston, 1929, $5.00
K. Roberts, *Northwest Passage*, Doubleday Doran, Garden City, N.Y., 1937, $2.75
Burton J. Hendrick, *The Lees of Virginia*, Halcyon House, N.Y., 1935, $1.29
F. L. Paxson, *History of the American Frontier*, Houghton Mifflin, Boston, 1924, $2.75
Stewart E. White, *Daniel Boone*, Doubleday Doran, Garden City, N.Y., 1926, $3.50
B. F. and Marquis James, *Courageous Heart* (Andrew Jackson), Bobbs-Merrill, Indianapolis, 1934, $2.00
M. V. Charnley, *Jean Lafitte, Gentleman Smuggler*, Viking, N.Y., 1934, $2.50
Constance Rourke, *Davy Crockett*, Harcourt, Brace, N.Y., 1934, $2.50
Julia Davis, *No Other White Men* (Lewis and Clark), E. P. Dutton, N.Y., 1937, $2.00
F. W. Seymour, *Meriwether Lewis, Trail-Blazer*, Appleton-Century, N.Y., 1937, $2.00
Margaret Bell, *Women of the Wilderness*, E. P. Dutton, N.Y., 1938, $3.50
H. R. Driggs, *The Pony Express Goes Through*, Stokes, N.Y., 1935, $2.50
Francis Parkman, *The Oregon Trail*, Little, Brown, Boston, 1925, $2.00
Edwin L. Sabin, *Buffalo Bill and the Overland Trail*, Lippincott, Phila., 1914, $1.75
John W. Thomason, *Gone to Texas*, Scribner, N.Y., 1937, $2.75
Marquis James, *The Raven* (Sam Houston), Blue Ribbon, N.Y., 1929, $1.00
Gertrude Atherton, *California: A History*, Blue Ribbon, N.Y., 1935, $1.00
F. S. Drake, *Indian History for Young Folks*, Harpers, N.Y., 1927, $3.00
W. E. Barton, *Life of Abraham Lincoln*, Bobbs-Merrill, Indianapolis, 1925, $10.00
Carl Sandburg, *Abe Lincoln Grows Up*, Harcourt, Brace, N.Y., 1928, $2.50
Ida Tarbell, *Life of Lincoln*, Macmillan, N.Y., 1926, $1.25
Irving Bacheller, *A Boy for the Ages* (Lincoln), Farrar & Rinehart, N.Y., 1937, $2.00
Gamaliel Bradford, *Lee the American*, Houghton Mifflin, Boston, 1928, $3.50
John Drinkwater, *Robert E. Lee*, Houghton Mifflin, Boston, 1928, $1.[illegible]
Booker T. Washington, *Up From Slavery*, Doubleday Doran, Garden City, N.Y., 1901, $2.00
Claude G. Bowers, *The Tragic Era*, Halcyon House, N.Y., 1929, $.98
H. Hagedorn, *Boys' Life of Theodore Roosevelt*, Harpers, N.Y., 1922, $1.75
Henry F. Pringle, *Theodore Roosevelt*, Harcourt, Brace, N.Y., 1932, $3.50
Douglas Branch, *The Cowboy and His Interpreters*, Appleton-Century, N.Y., 1926, $2.50
Irving Crump, *The Boy's Book of Cowboys*, Dodd, Mead, N.Y., 1934, $2.00
Will James, *Lone Cowboy: My Life Story*, Scribners, N.Y., 1932, $2.50
Lucy Larcom, *A New England Girlhood*, Houghton Mifflin, Boston, 1924, $1.75

League of Nations

W. Hulbert, *Cease Firing!* Macmillan, N.Y., 1929, $1.50
G. Slocombe, *A Mirror to Geneva*, Henry Holt, N.Y., 1938, $3.00
Essential Facts, Educational Committee, League of Nations Assn., N.Y., July 1937, $.05
A Brief History of the League of Nations, Educational Committee, League of Nations Assn., N.Y., 1936, $.25
J. S. Bassett, *The League of Nations*, Longmans, Green, N.Y., 1928, $3.50

CHRONOLOGICAL HISTORY OF THE WORLD

Universal history may conveniently be treated in three principal divisions:

I. **Ancient History,** which begins with the earliest written records and terminates A.D. 476, with the destruction of the Roman Empire.

II. **Medieval History,** which extends from the fall of Rome, A.D. 476, to the discovery of America, 1492.

III. **Modern History,** which commences at the latter epoch and continues to the present time.

The events that mark the separation between the *first* and *second* periods, are the irruption of the Teutonic tribes, the consequent fall of the western Roman Empire and the foundation of the modern European states; between the *second* and *third*, are the extension of learning by the invention of printing, the taking of Constantinople, the maritime discoveries by Spain, Portugal and other European countries, with the more extensive use of firearms.

I. **Ancient History** may be subdivided into six periods:

1. The nebulous period, comprising the fragmentary accounts of the early Assyrians, Babylonians, Egyptians, Chinese, Hindus and Hebrews, down to 2000 B.C.

2. The Mosaic period, from the time of Hammurabi to 1200 B.C., during which history passes from the realm of legend to that of fact.

3. The Assyrian-Babylonian period, which witnessed a long series of Assyrian conquests, the zenith of Babylonia, the rise of Greece and Rome and the foundation of the Persian Empire—1200 to 529 B.C.

4. The Persian-Macedonian period, from 529 to 323 B.C., during which both the Persians and the Greeks reached their greatest achievements.

5. The Greco-Roman period, from 323 B.C. to the Christian era, saw the decline of the Greeks and the coming universal power of the Romans.

6. The period of the Roman Empire, from the time of Christ to 476, was notable for the foundation of Christianity, Christian persecutions, the division of the empire, Roman luxury and corruptions and the incursion of the Teutonic hordes.

II. **Medieval History** may be treated in the following five periods:

1. *First,* the foundation of the modern states of western Europe, A.D. 476–622, when the Saxons invaded Britain, 449; the Visigoths settled in Spain, 507; the Ostrogoths in Italy, 493; and the Franks began the formation of the French monarchy, 481.

2. The *second* comprehends the age of Mohammed, with the propagation of his creed and the establishment of the states that embraced his religion, to the Treaty of Verdun, 622–843.

3. The *third* embraces the period from the Treaty of Verdun, when the empire of the West was divided, to the First Crusade, 1096. In this interesting period the monarchy of Charlemagne fell to ruin, the Capetian dynasty began to reign in France, Italy was parceled out among a number of petty princes, and Otto commenced the long-continued struggle against feudalism in Germany.

4. The *fourth* is the romantic or heroic period of the crusades, 1096–1273, in which the Roman legal code, the foundation of modern jurisprudence, began to be studied.

5. The *fifth,* from 1273 to 1492, beheld the revival of the fine arts in Italy, the taking of Constantinople and diffusion of its learned men, the revival of letters, the discovery of America, 1492.

III. **Modern History** falls conveniently into five periods:

1. The period of the Reformation, including its commencement by Luther, 1517, till the termination of the long series of religious wars by the Treaty of Westphalia in 1648. This period produced many important changes in Europe.

2. The period from 1648 to the death of Louis XIV in 1715, during which Russia entered European politics and Great Britain began to assume large influence on the Continent.

3. The period from the death of Louis XIV to the Congress of Vienna, 1815, which marked the fall of Napoleon. In this period the independence of the United States was established, Prussia advanced to the front rank of European powers, the French Revolution occurred and the world witnessed the rise and fall of Napoleon.

4. From the Congress of Vienna, 1815, to the opening of the World War, the era of Industrial Revolution.

5. From the beginning of the World War to the present time, a period of political and economic confusion.

PARALLEL OUTLINES OF UNIVERSAL HISTORY

FROM THE DAWN OF HISTORY TO THE TIME OF HAMMURABI. B. C. 5000-2000

Characteristics of the Centuries	Babylonia—Assyria	Egypt	Arts and Sciences	Literature
B. C. 5000-4000 Civilization develops in Mesopotamia and Egypt as farmers and pottery makers settle in cities.	5000(?). Susa, Kish and other Sumerian city-states develop in Mesopotamia.	4221(?). Sun calendar invented; earliest date in history.	5000(?). [illegible]	No written literature known.
B. C. 4000-3000 Bronze Age. Dawn of recorded history. Civilization spreads in Egypt, Mesopotamia and the Aegean area.	4000(?). Deluge destroys Kish. 3800(?). Nippur and Agade grow. 3500(?). Sumerian culture spreads. Lagash (Shinar), Ur and Tepe Gawra thrive. Elam a powerful tribe on Persian border. 3100(?). Semitic tribes settle in Asia Minor, including Canaanites in Palestine.	4000(?). Abydos capital of predynastic kings. 3400(?). Menes begins First Dynasty, uniting Upper and Lower Egypt with capital at Memphis. 3200(?). Third Dynasty; pyramid era begins. 3100(?). Fourth Dynasty; zenith of Early Egyptian Empire under Cheops and Chefren.	4000(?). Hieroglyphic writing in Egypt and cuneiform writing in Mesopotamia. 3500(?). [illegible] 3200(?). [illegible] in Sakkara, Egypt. 3100(?). Era of the great pyramids and the Sphinx. 3050(?). [illegible]	[illegible]

TO THE TIME OF HAMMURABI B. C. 3000-2000

[illegible]	[illegible]	[illegible]	Arts and Sciences	Literature
B. C. 3000-2000 Great migrations of Aryan peoples from their centers in southwest Asia. Chinese civilization evident.	3000?. [illegible] 2750?. [illegible] 2600?. [illegible] 2650?. Elam conquers Akkad and rules all Babylonia [illegible]. 2300?. Ur drives out Elam and restores Babylonian power. Nineveh rises. 2100?. Rival city-states battle for Babylonian rule. 2000?. [illegible]	3000?. [illegible] Dynasty [illegible] 2750?. [illegible] 2500?. [illegible] 2300?. Egypt [illegible] 2100?. [illegible]	3000?. Use of copper [illegible] in Egypt and Crete. [illegible] of glass, papyrus, pottery and [illegible]. 2700?. [illegible] Chinese Empire; silk industry develops. 2500?. Aryans spread into India, Persia and Asia Minor, having the horse [illegible]. 2205?. Yu founds Hsia Dynasty in China. 2100?. [illegible] builds great ziggurat at Ur. 2000?. [illegible] in Mesopotamia.	[illegible] Egyptian Book of the Dead. Code of Hammurabi.

FROM HAMMURABI TO THE PERIOD OF ASSYRIAN ASCENDANCY, B. C. 2000-1200

Characteristics of the Centuries	Asia	Egypt	Europe	Arts and Sciences	Literature
B. C. 2000-1200 Spread of Phoenician and Aegean civilizations around the Mediterranean. Development of Chinese and Hindu cultures. Rise of Hittite and Hebrew states in Asia Minor and Aeolian cities in Greece. Decline and revival of Egyptian power. Laws of Moses.	2000?. Aryan Hittites subdue Semitic peoples, settle in Asia Minor, and begin wars with Babylonia. 1900?. Assyria rises to power. 1800?. [illegible] Assyria [illegible] from Mesopotamia. 1766?. T'ang founds Shang Dynasty in China. 1750?. Barbarian Kassites take Babylonia where they rule five centuries, absorbing older cultures. 1500?. Feudal system develops in China. 1450?. Hindu Aryan kings at war in central India; Magadha the leading state. 1385?. Hittites drive out Egyptians and rule Asia Minor. 1300?. Era of the Exodus. 1280?. Shalmaneser I [illegible] Assyrian Empire, [illegible] Hittites, rebuilds Assur and Nineveh, founds Calah.	2000?. Egypt declines as rival feudal lords battle for power. 1800?. Hyksos ("Shepherd" kings) from Asia conquer and rule Egypt, bringing in the horse and traces of Mesopotamian culture. 1580?. Hyksos kings driven out by Egyptians. Thebes capital of New Empire. 1479?. Thothmes wins battle of Megiddo: Egypt rules Phoenicia and Asia Minor. 1400?. Zenith of New Empire in Sudan, Ethiopia and Asia Minor. 1300?. Moses leads the Hebrews from Egypt. Era of the Ramses Pharaohs.	2000?. Aeolian peoples settle in Greece. Phoenician traders ply the Mediterranean. 1700?. Zenith of power of Crete: Cnossus and Phaestus centers of art and learning. 1500?. Ionian and Dorian cities grow on Greek mainland, while Troy, Mycenae and Tiryns dominate Aegean. 1450?. Cnossus and Phaestus destroyed. 1350?. Phoenician traders reach England. 1250?. Thebes, capital of the Boeotians, rises to power in Greece.	2000?. Industry thrives in Phoenician states, while art and learning are nourished in Crete and Babylonia. 1600?. Linear writing used by Greeks. 1500?. Monotheism spreads in Egypt. Era of cliff tombs there. 1330?. Temples at Karnak and Abu-Simbel in Egypt.	Papyri of Egypt. The Vedas of India (oral form). Mythology of Greeks and Hebrews takes fixed form. Rise of Sanskrit languages in Asia. Chinese *Book of Changes*. Laws of Moses.

THE ASSYRIAN-BABYLONIAN PERIOD, B. C. 1200-700

Characteristics of the Centuries	The Hebrews	Africa	Asia	Europe	Arts and Sciences	Literature
B. C. 1200-1000 Heroic age of Greece; Hebrews reach their highest point of national power. Beginning of the Medo-Persian nations. Celts disperse over western Europe and into British Isles.	1180–1020(?). Era of the Judges. 1020(?). Samuel, last Judge of Israel. Saul, first king. Wars with the Philistines. 1010. Death of Saul; David becomes sole king.	1180–1050. Egypt divided. 1100(?). Utica founded.	1200(?). Phrygians (Greeks) invade Asia Minor, conquer Hittites. 1184(?). Troy taken by Greeks. 1123. Chow dynasty begins in China. Chinese in Korea. 1115. Tiglath-Pileser founds new Assyrian Empire, wins Syria. 1050. Bactrian Empire grows in Persia. 1020. Gaza rises.	1100. Alba Longa flourishes in Latium. 1050. Rhodes flourishes. 1020. Phoenicians have forts in Spain (Cadiz).	1150. Irrigation and architecture revive in Babylonia. 1115. Mariner's compass known in China.	Early Hebrew literature. Dictionary of Chinese completed by Pa-out-she.
B. C. 1000-900 Homeric age. Celts already in Britain, with bronze in use. Phoenician trade extended to India. Temporary decline of Assyria.	1000. Jerusalem becomes Hebrew capital. 975. Solomon anointed king. 960. Temple of Solomon.	975. Egypt ruled by Lybian (Negro) armies. 950. Shishak establishes 21st Dynasty, revives power of Egypt, wars with neighbors.	1000. Phrygians rule Asia Minor. 970. Solomon and Hiram, King of Tyre, form an alliance; also Solomon and Pharaoh. 950. Brahmanism develops in northern India.		1000. Phoenician alphabet comes into use. 970. Solomon extends his commerce to India; builds Palmyra, Baalbec and other cities.	The *Zend-Avesta* of Zoroaster.
B. C. 900-800 Accurate Assyrian chronology begins. Decline of Phoenician cities.	933. Division of Hebrews into kingdoms of Israel and Judea. 930. Egypt sacks Jerusalem. 885. Samaria capital of Israel. 875. Ahab and Jezebel. 850. Warfare with Philistines. 840. Athaliah rules Judea, Jehu in Israel.	850. Civil wars in Egypt between dynasty of Bubastis and priests of Amon. 845(?). Phoenicians found Carthage.	900. Bithynians enter Asia Minor, win part of Phrygia. 880. Assurnasirpal revives Assyrian capital of Calah. 850. Shalmaneser III rules at Calah. 840. Urartu grows in Armenia.	900. Hallstat culture of Celts develops in south France. 875. Rise of Sparta to power in Greece. 845. Rise of Argos in Greece. 820. Laws of Lycurgus.	900. The Rhodians advance the art of navigation.	Homer, Greek poet. Homer's poems brought into Greece. Hindu "Brahmanas."
B. C. 800-700 Ethiopian supremacy in Egypt. Assyrian conquests continue; Babylonia rises to height of its power.	790. Jehoash wars with Syria. 781–740. Reign of Jeroboam in Israel. 760. Era of Amos. 733. Pekah, King of Israel, besieges Jerusalem. 721. Samaria taken by the Assyrians; Ten Tribes carried into captivity. 700. Hezekiah, King. Sennacherib invades Judah.	745. Kashta of Ethiopia takes south Egypt, founding 25th Dynasty. 721. Pankhi of Ethiopia takes all of Egypt.	800. Lydia grows in Asia Minor. 760. Carchemish grows in Mesopotamia. 750. Assyria controls Persia. 745–728. Reign of Tiglath-Pileser III; Assur his capital. 736. Tiglath-Pileser III conquers Syria. 721. Shalmaneser, King of Assyria, takes Samaria. 721. Media rises in Persia. 715. Cimmerii from Europe conquer Urartu and Phrygia. 705. Sennacherib rebuilds Nineveh, conquers Syria.	800. Etruscans (from Lydia?) settle in Italy. 776. First Olympic games. 763. Messenian wars in Greece. 760. Greek migrations to Italy and Africa begin. 753. Legendary date of founding of Rome by Romulus and the Tarquins; Sabine War. 734. Carthaginians found Syracuse in Sicily. 725. Cumae grows to power in Italy.	800. Metal coins used in Lydia. 790. Corinthians employ triremes, or vessels with three banks of oars. 763. Assyrians record eclipse of the sun. 721. Eclipse of the moon observed at Babylon. 710. Roman calendar reformed; year divided into 12 months.	Development of Upanishad philosophies in India. Greek lyric poetry flourishes.

THE ASSYRIAN-BABYLONIAN PERIOD, B. C. 700-529

Characteristics of the Centuries	Hebrews	Asia	Africa	Europe	Arts and Sciences	Literature
B. C. 700-600 Zenith and fall of Nineveh and Assyrian Empire. Media rises to power. Teutonic and Slav races migrate west and north from Aryan center.	870. Manasseh, king.	681–668. Chaldean King Esarhaddon takes Sidon, revives Nineveh, expands Assyrian Empire to zenith of its power. 605. Medes raid Assyria, destroy Nineveh. Assyrians win Syria from Egypt.	670. Assyrians ravish Egypt. 660. Psammetichus founds 26th Dynasty; Memphis the capital. Egypt again independent. 621. Carthage grows to power. 610. Pharaoh-Necho, King of Egypt. 605. Necho loses Syria at Carchemish.	673. Tullius Hostilius, King of Rome, destroys Alba Longa. 658. Byzantium founded by Greeks. 640. Latins conquered by the Romans. 616. Tarquinius Priscus, King of Rome. 604. Illyria conquered by Macedon.	640. Spherical form of the earth and true cause of lunar eclipses taught in Athens. 621. Draconian code formulated in Athens. 610. Pharaoh-Necho begins a canal between the Mediterranean and Red Sea. A Phoenician fleet sails around Africa.	Iambic verse introduced. Greek alphabet adopted. *Deuteronomy.* Alcaeus and Sappho, Greek poets.
B. C. 600-500 Zenith and fall of Babylon. Long reign of Nebuchadnezzar; he ravages Egypt. The seventy years' captivity of Judah. Rise of Persia.	597. Conquest of Jerusalem by Nebuchadnezzar. 591. Ezekiel prophesies in Chaldea. 586. Captivity of Judah completed, Jerusalem destroyed, Temple burnt. 579. Jews carried to Babylon. **Persia** 560. Cyrus, King of Persia; Susa and Persepolis his capitals. 538. Cyrus takes Babylon, frees the Hebrews. 536. Persian Empire rules from Syria east to India. 535. Temple rebuilt at Jerusalem. 529. Death of Cyrus; Cambyses, King of Persia.	594. Rise of Magadha Empire in India. 589. Babylon invades Phoenicia. Medes in Lydia and Armenia. 572. Nebuchadnezzar takes Tyre. 562. Croesus, King of Lydia, subjects Asia Minor, but is defeated by Cyrus. 538. Babylon taken by Cyrus.	594. Greek state, Naucratis, rises in Africa. 581. Egypt invaded by Nebuchadnezzar. 569. Amasis, Cyrene Greek leader, becomes King of Egypt. 550. Carthage rules the Mediterranean, takes Sicily. 536. Pythagoras visits Egypt. 535. Cyrus invades Egypt.	594. Solon, Archon of Athens. 578. Servius Tullius, King of Rome walls the city. 569. Roman and Etruscan cultures mingle. 550. Marseilles founded by Phoenicians. 541–527. Pisistratus, tyrant at Athens. 529. Miltiades rules Thrace.	594. Solon's code supersedes that of Draco in Athens. 578. Money coined at Rome. 569. Babylon's era of magnificence under Nebuchadnezzar. 535. Lao-tse teaches in China.	Jain philosophies in India. Gautama, Founder of Buddhism. Zoroastrian doctrines in Persia. Poems of Anacreon.

THE PERSIAN-MACEDONIAN PERIOD, B. C. 529-323

Characteristics of the Centuries	Persia	Greece	Rome	Other Countries	Arts and Sciences	Literature
	525. Cambyses conquers Egypt and makes it a Persian province. 521. Darius I, King of Persia and Egypt. 508. Darius extends his rule to the Indus.	527. Pisistratus dies, after seizing Athens. 510. Followers of Pisistratus expelled; Democracy established at Athens by Cleisthenes.	509. The Tarquins expelled from Rome; Etruscan War; the Capitol finished.	525. Carthaginians in Spain (Cadiz).	525. Library at Athens; era of Aristides and Heraclitus. 509. Establishment of a republic at Rome.	Confucius, the Chinese philosopher.
B. C. 500-400 Zenith of Persia; and the glorious century of Greece. Struggles of patricians and plebeians at Rome.	500. The Ionians revolt and burn Sardis. 490. Darius sends an army into Greece. 487. Egypt revolts, and is subdued by Xerxes. 485. Xerxes, King of Persia.	494. Themistocles fortifies Piraeus. 490. Battle of Marathon. 485. Themistocles builds fleet.	494. Tribunes of the people chosen. 471. *Lex Publilia* gives legislative authority to plebeian assembly.	500. Kingdom of Ceylon, India, founded by Vijaya. 490–400. Celts develop in France and Spain (La Téne). 480. Syracuse repels invasion of Carthaginians.	490. The Temple of Minerva built in Rome. 485. Zenith of Etruscan culture, excelling in music, drama and architecture.	Pindar, the greatest of the Greek lyric poets. Aeschylus, Sophocles.

THE PERSIAN-MACEDONIAN PERIOD

Characteristics of the Centuries	Persia	Greece	Rome	Other Countries	Arts and Sciences	Literature
	480. Xerxes bridges Hellespont, invades Greece and wins at Thermopylae.	480. Greeks end Persian invasion, winning battle of Salamis.			480. Ancient Suez canal opened.	
						Tragedies of Euripides.
		479. Battle of Plataea ends Persian threat.	474. Etruscans defeated in naval battle by Hiero of Syracuse.			
		478. Athens founds Delian League.				Comedies of Aristophanes.
	465. Persia loses all Asia Minor; Artaxerxes king.	467–61. Leadership of Cimon. Rise of Pericles.	472. Beginning of *comitia tributa*.	465. Egypt declines under Persian rule.	465. Building of the long walls between Athens and Piraeus and Athens and Phalēron.	
		457–55. War of Spartans and Boeotians against Athens.	458. Cincinnatus, Dictator.			
			450. Laws of the 12 Tables.	450. Patna grows in India.	450. Parthenon begun.	
	445. Nehemiah rebuilds Jerusalem.		445. Patrician-plebeian marriage legalized.		445. Herodotus in Egypt.	
		444–29. Athens under Pericles.				
				435. Samnites rule southern Italy.	435. The battering ram used in war.	
			443. Censorship instituted.			
	431. Jews and Samaritans in conflict.	431. Peloponnesian War between Athens and Sparta.	435. Border wars.			
		430. Great plague weakens Athens.		415. Athens fails to win Syracuse.		
		413. Disastrous defeat of Athenians at Syracuse.				
						Sanskrit grammar, *Panini*.
		411. Athens governed by the "400." Alliance of Sparta with Persia.	411. Roman famine.			
		409. Alcibiades leads Greeks into Byzantium.			409. Hippocrates advances medicine.	Philosophies of Plato and Aristotle.
				407. Carthage invades Sicily.		
		404. Athens surrenders to Sparta after long siege. End of Peloponnesian War.	401. Rome conquers Veii.			
B. C. 400-300 Decline and fall of Persia before Alexander the Great; Greek language and civilization extended all through Asia Minor. Roman wars with the Samnites. Internal quarrels of the Romans diminish.		404–03. Government of Thirty Tyrants at Athens.		400. Delhi founded.	400. Catapults used in war.	
	401. Greeks defeat Persians at Cunaxa.					
			390. Rome destroyed by the Gauls. Camillus dictator.			
		400. Sparta, supreme in Greece, invades Asia.				
		399. Socrates executed.				
						Anabasis of Xenophon.
	387. Greek cities of Asia made tributary to Persia.		376–367. Patrician-plebeian political struggle leads to Licinian Laws.			
	370. Persia and Egypt at war.	370. Predominance of Thebes; decline of Athens.		370. Persia and Egypt at war.		
					369. Celestial globe studied.	
		364. Death of Epaminondas at battle of Mantinea.				
		360. Macedonia grows under Philip II.			360. Philippics of Demosthenes delivered.	
						Orations of Demosthenes and Aeschines.
	343. Persians sack Sidon.	343. Philip conquers Sparta, attacks Athens.	343. Samnian War, continued 53 years.	343. Persia conquers Egypt; last native Egyptian king flees to Ethiopia.		
			340. War with the Latins.	340. Carthage again defeated in Sicily.	340. Aqueducts speed growth of Rome.	
	338. Royal family destroyed with poison.	338. Athenians and Thebans defeated at Chaeronea. Philip master of Greece.	338. Dissolution of Latin League. Latin settlements reduced to Roman dependencies.			
	336. Darius III., King.	336. Philip assassinated; Alexander the Great succeeds him.				
		335. Alexander conquers Greeks, sacks Thebes.			335. Caustic art invented.	Philosophies of Zeno and Epicurus.
	334. Alexander invades Persia.					
		333. Battle of Issus.				
		332. Alexander takes Tyre and Egypt.		332(?). Caledonian tribes united under Fergus.	332. Alexandria, Egypt, founded.	Mencius, Chinese teacher.
	331. Battle of Arbela. Darius defeated by Alexander, who takes Persia and marches east into India.					
		327. Alexander masters northern India.	327. Second Samnite War begins.			
		323. Death of Alexander. Wars of his generals for rule of his empire continues to 281. Perdiccas regent for Asia, Antipater for Greece, and Ptolemy for Egypt.				

THE GREEK-ROMAN PERIOD, B. C. 323-200

Characteristics of the Centuries	Rome	Greece	Asia Minor	Egypt, Carthage	Other Countries	Arts and Sciences	Literature
	321. Roman army surrenders to the Samnites at Caudine Forks.						
	320. Samnites defeated at Luceria.		320. Egypt holds Palestine.	320. Ptolemy I (Soter) carries 100,000 Jews into Egypt.	320. Magadha Empire in India grows under Chandragupta.		First work on mechanics written by Aristotle.
		319. Cassander assumes the throne of Macedon, rebuilds Thebes.					
	317. Syracuse and Sicily usurped by Agathocles.					317. Commerce of Macedon with India through Egypt.	Idyls of Theocritus.
		315–301. War among ambitious generals, Antigonus, Lysimachus, Cassander and others.					
	312. War with the Etruscans.		312. Seleucus I takes Babylon, establishes Seleucid dynasty.		312. War between Syracuse and Carthage.	312. The Appian Way constructed.	
						310. Aqueducts and baths in Rome.	
					306. Seleucids invade India.		
			301. Battle of Ipsus. Alexander's empire divided anew, into four parts: Syria, Macedon, Greece, Egypt.		301. Seleucids invade Asia Minor.		
B. C. 300-200 Semi-Greek kingdoms built on the ruins of the Persian empire; in Egypt the Ptolemies; in Syria, the Antiochi. Many Jews at Alexandria. Rome mistress of Italy; then, victorious over Carthage, extends her influence to Greece and Spain. Peasant proprietors replaced by slaves in Italy.				300. Golden Age of the Ptolemies.			Euclid, the celebrated mathematician.
	295. Invasion of Celts repelled at Sentinum.	295. Athens and Thrace vie for rule of Macedonia.				293. Sun dial erected at Rome.	
			291. Seleucus founds Antioch, Edessa and Laodicea.			290. The Colossus of Rhodes built.	
	290. Peace with Samnites.						
	286. Law of Hortensius.		285. The Scythians invade Asia Minor.	285. Phoenicia united to Egypt.		285. Dionysius founds the solar year.	*Ramayana*, Epic, India.
	281. War with Tarentum.	284. Achaean League against Macedonia.					
	280. Italy invaded by Pyrrhus.			283. Death of Ptolemy Soter. Ptolemy Philadelphus, King of Egypt.		283. Pharos lighthouse built at Alexandria.	The Septuagint begun at Alexandria.
		279. Invasion of Gauls repulsed at Delphi.	281. Antiochus Soter succeeds Seleucus and wars with Egypt.				
	266. Rome mistress of all Italy.	277. Antigonus of Macedonia and Pyrrhus of Epirus battle for mastery.					
	264. First Punic War.						
	260. Great Roman naval victory at Mylae.			269. Egypt allied to Rome.			Persian Chronicle written.
	255. Roman army under Regulus crushed by Carthaginians at Tunes.	268. Second incursion of Gauls.			266. Empire of Asoka rules all India.	266. Silver money coined at Rome.	Berosus, Babylonian historian.
			262. Invasion of the Gauls.				
	229. Suppression of Illyrian pirates.	250. Parthia revolts from Macedon.		256. Greeks defeat Egyptian fleet.			
	225. The Gauls repulsed in Italy.			246. Ptolemy Euergetes subdues Syria.	246. Ch'in Dynasty of China founded by Huang Ti.		
	219. Hannibal takes Saguntum, and crosses the Alps.		226. Seleucus III, King of Syria.	236–229. Hamilcar Barca establishes Carthaginian colony and military base in Spain.		224. Archimedes makes known his discoveries in mechanics.	
		220. The Social War. Philip of Macedonia joins the Achaeans against Sparta.	223. Antiochus the Great, King of Syria.		226. Pergamum flourishes.		
	218. Second Punic War. Hannibal defeats the Romans at Ticinus and Trebia.						Plautus, Latin poet.
				221. Ptolemy Philopator, King.			Hebrew Scriptures translated.
	216. Varro at Cannae totally defeated by Hannibal.	214. Alliance of Philip and Hannibal. Rome enters Greece, allied to Sparta.		217. Ptolemy defeats Antiochus at Raphia.			
	206. Carthaginians driven out of Spain.				214. Burning of the Books in China.	206. Gold coined at Rome.	
	204. Scipio carries the war into Africa.		203. Judea conquered by Antiochus.	205. Ptolemy Epiphanes, King. Egypt a Roman protectorate.	202. Han Dynasty in China founded by Liu Pang.	202. Art of printing known in China.	Ennius, Roman poet. Moschus, bucolic poet.
	202. Hannibal defeated at Zama. End of war.			202. End of second Punic War. Rome wins Spain.	200. Hun power grows in central Asia.		

THE GREEK-ROMAN PERIOD—200-60 B. C.

Characteristics of the Centuries	Rome	Greece	Asia Minor	Egypt, Carthage	Arts and Sciences	Literature
B. C. 200-100 Greece, Macedonia, Carthage and Spain under Roman rule; decline of the Roman oligarchy; the Gracchi begin the democratic revolution which ends in the empire. Eastern luxury introduced among the Romans.	200. Second Macedonian war. Achaeans and Sparta join Rome against Macedonia.					
	200–150. War with Gallic tribes. Subjugation of Spain.		198. Jews assist Antiochus in expelling the Egyptian troops from Jerusalem.	198. Egypt loses her Syrian possessions to Antiochus.	198. Books, with leaves of vellum, introduced by Attalus, King of Pergamus.	
		197. Philip defeated by Rome at Cynoscephalae. Rome controls Achaean League.				Comedies of Plautus.
			190. Scipio of Rome defeats Antiochus at Magnesia.			
	188. Rome rules eastern Mediterranean.		188. Antiochus killed. Syria a Roman province.			
				181. Ptolemy VI at war with Syria.		
	179–178. Tiberius Sempronius Gracchus (father of the tribune) pursues policy of conciliation in Spain.	179. Perseus reigns in Macedonia.				
				174. Cato's embassy to Carthage.		Epics of Ennius.
			172. Antiochus IV, King of Syria.			
		171. Third war with Rome.				
			170. Jerusalem plundered by Antiochus Epiphanes.		170. Paper invented in China.	First library opened in Rome.
		168. Rome wins Macedonia at Pydna.				
			165. Judas Maccabeus expels the Syrians.			Book of Daniel
	155. Romans unsuccessful in Spain against Gauls.		161. Jews make a treaty with Rome.	164. Egypt admits Roman supremacy.	162. Hipparchus teaches trigonometry.	Comedies of Terence.
				152. Masinissa defeats the Carthaginians.		
	151. Third Punic War. Conquest of Carthage and of Corinth. Greece annexed to the Roman empire.			151. Joint reign of Philometer and Physcon in Egypt.		*De Agri Cultur.* of Cato.
	149–139. Bloody Spanish revolts under Viriathus.					
	134–133. Slave insurrections in Sicily.	146. Corinth destroyed by the Romans. Greece becomes a Roman province.		146. Carthage taken and destroyed by the Romans.	146. Alexandria the center of commerce.	
					140. Clock wheels invented by Ctesibius.	Histories of Polybius.
				145. Ptolemy Physcon becomes sole King of Egypt.		
			134. Invasion of Judea by Syria during strife between Pharisees and Sadducees.			
	133. Spain becomes a Roman province after Numantia is destroyed. Unsuccessful reform effort of Tiberius Gracchus.				133. Equestrian order a distinct class in Rome.	
	130. Rome expands into Southern Gaul.				130. Revival of learning in China with spread of Buddhism	
				129. Physcon driven from his throne for cruelty.		
	123. Caius Gracchus, Tribune, reforms Roman laws and social system. His defeat and death at the hands of the senatorial party begins long political struggle.			123. Carthage rebuilt as Junonia.	123. Romans found Aix in France.	
					110. First sumptuary law at Rome.	
	113. First great migration of the German tribes, Cimbri and Teutons.					Doctrines of Buddha put in Pali language (Ceylon).
	109. Rome occupies Numidia.					
	104. Teutoni defeat Romans in Gaul and cross Pyrenees.		103. Civil war in Judea; Aristobulus, king.			
	101. Cimbri defeated by Marius at Vercellae.					
B. C. 100-55 A. D. The Romans govern all the countries around the Mediterranean. Corrupt rule of the Roman oligarchy is followed by civil wars and establishment of the empire.					98. Roman schools of oratory on Greek models instituted.	
	91. Social war in Italy. Roman allies demand citizenship rights.				90. Rome grants citizenship to all Italians.	
	88. War with Mithridates of Pontus.			88. Rome dominates Egypt.		
			86. Mithridates takes all Asia Minor.			
	82. Sulla made dictator of Rome after civil wars. Proscribes political enemies.			82. Revolt in Upper Egypt, Thebes destroyed.		Libraries of Athens sent to Rome by Sulla.
	75. Bithynia a Roman province; war with Mithridates renewed.		74. Rome conquers Mithridates.		74. The Romans possess gold mines in Asia Minor, Macedonia, Sardinia and Gaul; and silver mines in Spain.	
	71. Servile War under Spartacus. 65. Syria becomes a Roman province. 65. Pompey clears eastern Mediterranean of pirates. Defeats Mithridates.					
	63. Catiline's conspiracy detected and suppressed by Cicero.		63. Syria and Judea under Roman rule.			
	60. First triumvirate—Pompey, Crassus and Caesar. Caesar consul.					

THE GREEK-ROMAN PERIOD—60 B. C.-1 A. D.

Characteristics of the Centuries	The Roman Empire	Egypt, Carthage	Arts and Sciences	Literature
B. C. 55-1 A. D.	55. Caesar passes the Rhine, defeats the Germans and Gauls, and invades Britain. 53. Crassus defeated and killed at Carrhae in Parthia.	55. Auletes restored by Rome after revolt.		Cicero, *Orations, Essays, Letters.* Caesar, Julius, *Commentaries.*
	51. Caesar completes conquest of Gaul, which becomes a Roman province. Vercingetorix, last great Gallic leader, surrenders.	51. Cleopatra shares Egyptian throne.	50. A water mill erected on the Tiber at Rome.	Lucretius, *De Rerum Natura.* Sallust, *Histories, Memoirs.*
	49. Civil war between Caesar and Pompey. Caesar, Dictator. 48. Battle of Pharsalia—Pompey defeated by Caesar. Death of Pompey in Egypt. 47. Caesar takes Alexandria and conquers Egypt and North Africa.			Catullus, *Poems*
		46. The African war.		
	44. Caesar assassinated. Antony master of Rome.	45. Caesar rebuilds Carthage.	45. Caesar introduces Julian calendar in Rome.	The Alexandrian library burnt.
	43. Second triumvirate—Octavius Caesar, Mark Antony and Lepidus. 42. Battle of Philippi; defeat and death of Brutus and Cassius.	43. Cleopatra poisons her brother and rules alone.		
	37. Herod, King of Judea under Rome.	36. Cleopatra obtains from Antony a grant of Phoenicia, Cyrene, and Cyprus.		Vergil, *Georgics, Aeneid.*
	32–31. War between Antony and Octavius. By the battle of Actium (31), Octavius acquires the empire.	31. Defeat at Actium.		
	30. Republic of Rome becomes a monarchy in fact though retaining republican forms.	30. Suicide of Antony and Cleopatra; Egypt passes to Rome.	30. Direct trade of Rome with India. Silk and linen factories in the empire.	Horace, *Odes, Satires, Letters.*
	27. Titles of Augustus and Emperor conferred on Octavius.		27. Treasures of Egyptian art brought to Rome. The Pantheon built.	
	23. Agrippa subdues all Spain.		22. Pantomimic dances introduced on the Roman stage.	
	19. Death of Vergil. 18. Parthians defeated. 15. Cantabria, Austria and other territory conquered by Drusus. 13. Augustus assumes the title of Pontifex Maximus.		19. Aqueducts constructed by Agrippa.	
	11. Germany subdued by Germanicus.		12. Roman legions settled in fixed camps, which soon grow into cities—Bonn, Trier and Mayence.	Livy, *History of Rome.*
	5. Varus appointed Governor of Syria, and Cyrenius Governor of Judea. 4. Birth of Jesus four years before the so-called Christian era. Death of Herod.		8. Calendar corrected by Augustus. 4. Chinese adopt Taoism.	

PERIOD OF THE ROMAN EMPIRE, A. D. 1-61

Characteristics of the Centuries	Development of Christianity	The Roman Empire	Arts and Sciences	Literature
1-100 A. D. Christianity founded amid persecutions. Roman Empire continues to expand.		1. Peace with the Parthians. 9. Varus defeated by Germans, halting Roman spread to north.	1. Maya cities growing in Central America.	Ovid *Metamorphoses*, poems.
		14. Augustus dies; Tiberius, Emperor. 17. Germanicus leads Roman armies into barbarian East.		
	25. Pontius Pilate, Governor of Judea. 26. John the Baptist begins his ministry.	26. Thrace invaded by Rome.	26. The Druids in Germany.	Philosophies of Seneca.
	27. Jesus baptized by John. 29. Twelve Apostles sent abroad.	29. Agrippina banished.		
	33(?). Crucifixion of Jesus.	37. Tiberius succeeded by tyrant Caligula.		
	40. Disciples first called Christians at Antioch. 41 St. Peter, first Bishop of Rome.			
	50. Paul preaches at Athens.	54. Nero, Emperor; a profligate and tyrant.	50. Cologne founded.	
	60. Paul imprisoned in Rome.	61. Revolt of the Britons under Queen Boadicea.		

PERIOD OF THE ROMAN EMPIRE—62–381 A. D.

Characteristics of the Centuries	Development of Christianity	The Roman Empire		Arts and Sciences	Literature
	64. First persecution of Christians by Nero. Paul visits Jerusalem. 66. Jews at war with Romans; Paul beheaded. 70. Destruction of Jerusalem by Titus. The Jews dispersed.	64. Rome burns; Nero blames Christians. 69. Vespasian, Emperor, reforms government and army.		64. Nero's golden palace built — of great extent.	Epictetus, *Discourses*. Tacitus *Germania, History, Annals*, etc. Pliny's *Natural History*.
	79. Cletus, Bishop of Rome. 95. Second persecution of the Christians by Domitian.	79. Pompeii and Herculaneum destroyed by eruption of Vesuvius. 80. Agricola governs Britain, reduces Wales and enters Caledonia. 83. Rhine-Danube frontier fortified. 98. Trajan, Emperor; Roman Empire at its greatest extent.		78. The Capitol at Rome rebuilt. Baths, bridges, the Forum built. Age of classic art.	Plutarch, *Lives of Illustrious Men*.
100-200 A. D. Zenith of Roman empire. The good emperors. Persecutions of the Christians continued.	107. Third persecution by Trajan. 118. Fourth persecution by Hadrian. 134. Heresy of Marcion. 150. Canon of Scriptures fixed about this time.	100. The Huns migrate westward. 117. Hadrian, Emperor; makes a journey through the provinces; visits Britain and builds there a wall from the Tyne to Solway Firth; Armenia and Mesopotamia abandoned. 138. Antoninus, Emperor; 145–152 defeats the Moors, Germans, and Dacians; stops the persecution of the Christians. 161. Marcus Aurelius, Emperor; 169, war with Marcomanni 193. Army rules Rome, makes Septimus Severus Emperor. 196. Byzantium captured by Rome.		130. Great buildings of Palmyra. 132. Ptolemy, celebrated Egyptian astronomer and geographer. 164. Seleucia destroyed.	Quintilian *Rhetoric and Criticism*. Galen writes on medicine.
200-300 A. D. Emperors chosen by the army. Frontier tribes troublesome. Persecutions continue.	202. Fifth persecution under Septimius Severus. 235. Sixth persecution under Maximinus. 250. Seventh persecution of the Christians. 262. Paul, Bishop of Samosatia, denies the divinity of Jesus Christ. 272. Persecution of Christians under Aurelian. 283. The Jewish Talmud composed. Religious ceremonies multiplied. Pagan rites imitated by the Christians. 296. Monks in Spain and Egypt.	202. Septimius Severus revives Roman frontier defenses. 212. Caracalla, Emperor. Frontier wars renewed. 226. Artaxerxes begins the new kingdom of Persia. 232. Persian war. 222–235. Alexander Severus, Emperor. 235. War with barbarians on Rhine and Danube. 241. The Franks first mentioned in history. 251. Confederacy of the Franks established between the Rhine and Elbe. Irish kings rule at Tara. The Persians victorious in Asia Minor. 256–69. Goths invade Asia Minor and Greece. 261. Sapor, the Persian, takes Antioch, Tarsus and Caesarea. 264. Odenatus of Palmyra is succeeded by his wife Zenobia, who reigns as Queen, independent of Rome. 268. Claudius II defeats Goths. 270. Aurelian, a great warrior, becomes emperor; 271, defeats the Goths and Alemanni; 273, reduces Palmyra and takes Queen Zenobia prisoner; 274, Franks, Spain and Britain reduced to obedience; 275, Aurelian killed. 277. Probus, Emperor; 280, defeats the Germans; 282, defeats the Persians, takes Ctesiphon. 284. Diocletian, Emperor. Nicomedia his capital. With three sub-emperors he fortifies the frontier against barbarian invaders. 286. Diocletian divides empire. 291. The Franks spread over northwest Europe. 296. Diocletian sends ambassadors to China. Persians defeat Romans at Carrhae.		215. Caracalla grants right of Roman citizenship to all the provinces to increase tax revenue. 235. Alexandrian School of Philosophy founded. 261. Followers of Mani and Zoroaster active in the East. 276. Rome surrounded with a wall. 284. Diocletian's Baths.	Tertullian, *Apology, Tracts*. Origen, theologian. Plotinus's Neoplatonism.
300-388 A. D. Constantine moves the capital of the empire to Constantinople and professes Christianity. Rise of Christian monasticism. Great church disputes and growing corruptions. Increasing frontier troubles.	303. Persecution under Diocletian. 306. Persecution of Christians stopped by Constantine. 313. Edict of Milan issued by Constantine legalizing Christianity. 325. Council of Nicaea; Arianism condemned; Nicene Creed proclaimed. 356. First schism in Roman Church.	304. Diocletian resigns the empire to Constantius. 306. Constantine the Great, first Christian Emperor, defeats the Franks. 313–323. Constantine and Licinius joint emperors. 330. Constantine founds Constantinople as the new Roman capital. 337. Death of Constantine, and accession of his sons. 364. Division of the Empire between Valentinian and Valens.		330. Constantinople seat of art and literature. 364. Forts built on the Rhine.	*Zend-Avesta* finished. Eusebius's ecclesiastical history. Gothic Bible of Ulfilas.
		Western Empire	Eastern Empire		
	373. Bible translated into the Gothic language. Death of Athanasius. 381. Second General Council at Constantinople.	364. Valentinian, Emperor. 368. The Saxons invade Britain, but are defeated by Theodosius. 375. Valentinian defeats the Germans, unites Empire after Valens dies. 379. The Lombards move south through Germany toward Italy. Other barbarian tribes move west and south across France.	364. Valens, Emperor. 376. Hungary and South Russia invaded by the Huns. 379. Theodosius the Great becomes a zealous supporter of Christianity. He subdues the Balkan tribes.	375. Chinese culture and Buddhism reach Japan.	Latin (Vulgate) Bible of Jerome.

PERIOD OF THE ROMAN EMPIRE—388-476 A. D.

Characteristics of the Centuries	Development of Christianity	Western Empire	Eastern Empire	Arts and Sciences	Literature
388-500 A. D. Invasions of barbarians. Gradual breakdown of Western Empire.		390. Insurrection at Thessalonica put down by Theodosius with great cruelty.	388. Theodosius defeats Maximus, and rules the Western Empire.		Chrysostom, *Homilies*, *Commentaries*, *Epistles*.
	392. St. Chrysostom, Patriarch of Constantinople, leads reform of clergy.	392. Theodosius becomes sole Emperor of the East and West.		392. Impulse given to the development of mathematics at Alexandria.	
		394. Empire finally divided between the sons of Theodosius.	394. Egypt included in Eastern Empire.		
		401. Europe overrun by the Visigoths under Alaric.	401. Pallava Empire rises in southern India.		
	402. Innocent I., Bishop of Rome.				Augustine, *Confessions*, *City of God*.
		406. Vandals settle in Spain and Gaul.			
		410. The Goths under Alaric sack and burn Rome.			
		412. Rise of the Vandal power in Spain.			
		413. Burgundian kingdom grows on the Rhine.		413. Coptic church rises in Egypt.	
	416. The Pelagian heresy condemned.				
		420. The Franks form a kingdom, under Pharamond, on the lower Rhine.		420. China united, learning revives.	
		424. Valentinian III., Emperor.			
				425. Theodosius establishes public schools and attempts the restoration of learning.	
		426. Britain evacuated by the Romans.			
		428. Romans defeated by the Franks and Goths.			
	431. Third General Council at Ephesus.		431. Armenia divided by the Persians and Romans.		
	432. St. Patrick preaches the gospel in Ireland.				
		433. Attila, leader of the Huns, begins warfare that gives him rule from central Asia west to the Atlantic.			
	435. Nestorianism prevails in the East.			435. Theodosian Code published.	
			437. Pannonia, Dalmatia and Noricum gained from the Western Empire.		
		439. The Vandals, under Genseric, form Kingdom of Africa, take Carthage and plunder Italy.			
		441. Roman territories invaded by the Huns, Persians and Saxons.	442. Attila in Thrace.		
	443. The Manichaean books burned in Rome.				
		445. Famous embassy from Britain soliciting aid against the Picts.			
	447. Eutyches asserts the existence of only one nature in Jesus Christ.	448. Arrival of Saxons in Britain.			
			450. Marcian, Emperor, refuses to pay tribute to the Huns.	450. Buddhism in Burma.	
	451. Fourth General Council at Chalcedon.	451. Battle of Chalons. Attila defeated by Romans and Goths.		452. City of Venice founded.	
		453. Death of Attila; Hun Empire collapses.	457. War with the Goths.		
		458. Franks, under Childeric I, conquer as far as the Loire and take Paris.			
			465. Great fire at Constantinople.		
		468. The Visigoths under Eric establish their kingdom in Spain.			Decline of Latin literature with barbarian invasions.
			474. Zeno, Emperor; a turbulent reign.		
			475. Theodoric becomes chief of the Ostrogoths and invades the empire.		
		476. Odoacer, King of the Herulii, takes Rome, and the Western Empire ends.			

FROM THE FALL OF ROME TO THE AGE OF MOHAMMED, A. D. 476-511

Characteristics of the Centuries	The Eastern Empire	British Isles	Italy and the Church	France	Arts and Sciences	Literature
	480. An earthquake destroys greater part of Constantinople.			481. Clovis I, founder of the French monarchy.		
	491. Anastasius I, Emperor. Rioting and war over accession.	484. Saxons and Angles settled in Britain.	484. Christians persecuted by the Vandals.	486. Battle of Soissons gained by Clovis.	486. Rise of the feudal system in France under Clovis.	
		490. Sussex and Wessex kingdoms formed by Anglo-Saxons.	493. Italy conquered by Ostrogoths under Theodoric.			Boethius's *Consolation of Philosophy*.
				496. Christianity introduced into France.		
500-600 A. D. Great disorders in the West. Beginnings of feudalism; power of the clergy increases. In the East, the great reign of Justinian.	502. Invasions by the Persians.				507. Long wall of Thrace built to keep out Goths.	
				510. Clovis makes Paris his capital.	511. The Salic law in France.	

FROM THE FALL OF ROME TO THE AGE OF MOHAMMED, A. D. 514-617

Characteristics of the Centuries	The Eastern Empire	British Isles	Italy and the Church	France	Arts and Sciences	Literature
	514. Revolt of Vitalianus. Constantinople besieged unsuccessfully by rebels. 528–65. Reign of Justinian; zenith of Eastern Empire.				514. Use of the burning glass in warfare.	
	529. Belisarius defeats the Persians.		529. Order of the Benedictine Monks instituted.	529. France wins Thuringia.	529. The schools of Athens suppressed.	Writings of Gregory the Great.
	532. Riot over outcome of games at circus complicated by political dissension of "blue" and "green" factions. 30,000 killed.			532. Burgundy conquered by Childebert.	532. The Christian era instituted. Rebuilding of great Cathedral of St. Sophia.	Code of Justinian, *Corpus Iuris*.
	536. Belisarius conquers Vandal Empire in Africa.	542(?). Death of King Arthur.	536. Italy conquered by Belisarius, for Justinian. 539. Milan ravaged by the Goths.	536. Ostrogoths surrender Gaul to the French.	536. Manufacture of silk introduced from China into Europe by monks.	Persian literature thrives under the Sassanids.
	540. North Africa, Corsica, and Sardinia annexed to the Eastern empire.				550. Manuscript copying in monasteries receives great impulse from Cassiodorus and associates.	
	552. Narses rules Italy for the Empire. End of the Ostrogoths.	552. Celtic tribes united in north.	552. Italy ruled by Eastern Empire. Ostrogoth Kingdom ends.	557. Church of St. Germain de Prés built at Paris.		
	558. A plague extends over Europe and Asia and lasts about 50 years. 563. Persia defeats the Empire in the East; zenith of Sassanid power in Persia. 565. Death of Justinian.	559. Saxon heptarchy begins. 563. St. Columba converts the Picts to Christianity.		558. Clotaire I unites France.	559. The Saxon laws promulgated. The king's authority limited by the Witenagemot.	
			568. Italy conquered by the Lombards.	568. Feudal wars in France; power of the nobles grows.	568. The feudal system established in Italy by the Lombards. Written laws compiled by the Visigoths in Spain.	
		575. East Anglia a kingdom.	575. First Monastery built in Bavaria.			Greek the official language of the Empire.
		597. St. Augustine introduces Christianity into Britain.	597. Gregory, Bishop of Rome, establishes the Papacy.			
600-700 A. D. Rise and rapid spread of Mohammedanism from Arabia to India on the east and Carthage on the west.	600. Eastern Empire spread over Hungary, Poland, and Prussia, under Tiberius II. 602. Invasion by the Persians, who win Asia Minor.	604. St. Paul's Church founded by Ethelbert of Kent.	607. The Pantheon of Rome dedicated to Christianity.		607. Brahmanism rises in India.	
Christianizing of Germany.	610. Heraclius takes Constantinople and makes himself ruler. 612. Syria ravaged by the Arabs. 614. Jerusalem taken by the Persians.	617. St. Peter's (now Westminster Abbey) founded.		612. France again united. Merovingians and Pepins rule.	617. Ethelbert publishes the first code of laws in England.	

THE AGE OF MOHAMMED TO THE TREATY OF VERDUN, A. D. 622-689

Characteristics of the Centuries	The Empire and the Saracens	British Isles	Italy and the Church	France	Arts and Sciences	Literature
	622. The Hegira, or Mohammed's flight from Mecca to Medina. 632. Death of Mohammed.	622. Northumbria chief kingdom.	625–640. Churches of Jerusalem, Antioch and Alexandria lost to the Christian world by the sweep of Mohammedanism.	628. Dagobert I builds the Church of St. Denis, the sepulture of the French kings.	622. Painting flourishes in China.	*Beowulf.*
	633. Saracens under Omar take Jerusalem.	633. Mercia chief kingdom. 638. Irish and Scots at war.		638. Kingdom divided by Clovis II and Sigebert, King of Austrasia.	633. Mohammedanism and the power of the caliphs established in the East.	*The Koran.*
	673. Saracens, now ruling Asia Minor and all north Africa, fail to capture Constantinople.		664. Synod of Whitby establishes Roman Church in Britain.		673. Ravenna, Italy, center of classic revival. 678. Greek fire used in war.	Caedmon's *Paraphrase of Scripture.*
	680. Kingdom of Bulgaria founded.		680. The Sixth General Council at Constantinople.		689. Japanese laws codified.	

THE AGE OF MOHAMMED TO THE TREATY OF VERDUN, 698-841 A. D.

Characteristics of the Centuries	The Empire and the Saracens	British Isles	Italy and the Church	France	Arts and Sciences	Literature
700-800 A. D. Christianizing of Europe continues. Hostile caliphates of Bagdad and Cordova. Mohammedan advance in the West checked by Charlemagne, who nominally restores the Western Roman Empire. Norse ravages begin.	698. Carthage destroyed by the Saracens. 698–716. Anarchic conditions. 709. North Africa subdued by the Saracens. 711. Saracens invade Spain and central Asia. Kingdom of Visigoths destroyed at battle of Guadalquivir. 717. Leo III, Emperor. Saracen attack on Constantinople repulsed. 726–842. Contest over image worship. 746. Saracens defeated by Constantine V. 755. Saracen caliph of Cordova rules Spain. 762. Caliph Almanzor builds Bagdad and makes it his capital. 785. Empire invaded by Harun-al-Raschid, Caliph of Bagdad.	700. Anglo-Saxon octarchy. 705. Law code of Ine of Wessex enforced. 735. Death of the Venerable Bede. 757. Rise of Mercia under Offa. 787. First recorded invasion of the Danes into England, Ireland and Scotland.	698. Picts adopt Christianity. 726. The Emperor Leo forbids image worship. 728. Ravenna rebels over edict prohibiting image worship. 752. The Pope dethrones Childeric, King of France. 754. Lombard invasion repelled. 756. Papal states founded. Donation of Pepin. 772. Adrian I appeals to Charlemagne for help against Lombards. 787. Seventh General Council of Nicaea. Image worship controversy continues. 795. Leo III, Pope, recognizes supremacy of Charlemagne.	700. Aquitaine, Burgundy, and Provence become separate dukedoms. 714. Charles Martel, Duke of Austrasia. 725. Charles Martel subdues Bavaria. 732. Franks defeat the Saracens at Tours. 751. End of Merovingian line of French kings. Pepin the Short, first of the Carolingian line. 774. Charlemagne, sole ruler of Franks, wins Lombard Italy and repulses the Danes.	698. Christianity greatly extended among the German nations in the north of Europe, but almost exterminated in Africa by the progress of Mohammedanism. 716. The art of making paper introduced by the Arabs. 740. Saracens encourage learning. Ignorance, profligacy, and misery in western Europe. 785. Golden period of learning in Arabia under the Caliph Harun-al-Raschid. 793. Foundation of schools in monasteries and cathedrals by Charlemagne.	Golden age of Saracen literature begins. *Romance of Antar.* Alcuin's letters and biographies.
800-900 A. D. Norse ravages continue. Feudal wars. Charlemagne's empire falls to pieces.	800. Spain divided between Saracens of Cordova and Christians of Asturias. 803. The Saracens ravage Asia Minor. Aghlabide caliphs rule north Africa. 813–14. War with Bulgarians. 823. Saracens conquer Crete. 829. Theophilus, Emperor.	813. Egbert, King of Wessex, defeats the Britons. 827. The seven kingdoms united by Egbert. Invasion of the Danes. 840. Kenneth unites the Scots and Picts and becomes king of Scotland.	800. Charlemagne reforms the Church. 824. Christianity carried to Denmark and Sweden. 827. Saracens invade Sicily. 841. Rise of Venetian sea power and art.	800. Charlemagne founds the new Western Empire and is crowned at Rome. 817. Louis I divides the empire. 841. Norsemen conquer Normandy. Franks admit Norman independence.	800. Agriculture and horticulture encouraged by Charlemagne; and in Spain under the caliphs. 802. Arabian horses introduced into Spain. 813. Transient revival of learning under Charlemagne. The golden epoch of Arabian literature. 828. St. Mark's Church at Venice begun. 840. Feudal system in its zenith. Japanese art and trade thrive.	Beginning of the Icelandic skalds. Arabian histories of Mecca and Medina.

FROM THE TREATY OF VERDUN TO THE FIRST CRUSADE, 843-850 A. D.

Characteristics of the Centuries	[illegible]	The British Isles	Italy and the Church	France and Germany	Spain, Russia and Lesser Countries	Arts and Sciences	Literature
	844. Decline of the caliphate [illegible] Greeks and the Saracens.	844. Irish drive out the Danes. 850. Danes invade England.	843. Lothair King of Italy. 846. The Saracens destroy the Venetian fleet and besiege Rome.	843. Treaty of Verdun, Charles I. (the Bald), King of France. Ludwig I, King of Germany.	843. Ramiro I elected King of Oviedo. 845. Norsemen sack Paris and Hamburg. 850. Persecution of the Christians in Spain.	843. Hereditary nobility and the clergy dominant in matters of state. 850. Roman and common law introduced.	Orfrid's *Gospel Book.*

FROM THE TREATY OF VERDUN TO THE FIRST CRUSADE, 856-921 A. D.

Characteristics of the Centuries	The Empire and Saracens	The British Isles	Italy and the Church	France and Germany	Spain, Russia and Lesser Countries	Arts and Sciences	Literature
900-1000 A. D. Norse ravages and conquests continue; also feudal wars. The people in terrible suffering.	858. Great war with Saracens. Caliph Omar devastates Asia Minor. 866. Greek Church separates from Rome. 867. Basil inaugurates the Macedonian dynasty, reviving the Empire. 875–76. Basil defeats Saracens in Cilicia. 878. Saracens driven out of Sicily. 886. Leo VI, Emperor. 890. Southern Italy subject to the Greek Empire. 907. Russian expedition against Constantinople. 921. Fatimite caliphs rule north Africa.	856. Danes settle in England. 867. The Danes conquer Northumbria. 878. Alfred the Great defeats the Danes. 886. Alfred takes London. 901. Edward the Elder the first to take the title of "Rex Anglorum."	856. Louis II at Pavia rules Italy. 858–63. Advance of power of Papacy under Nicholas I. "False Decretals," a forgery, used to increase papal pretensions. 866. Schism of the Greeks begins. 867. Eighth Council at Constantinople. 877. Saracens take Syracuse. 890. Arnulf, Emperor of Germany, takes Rome. 912. The Normans in France become Christian. 921. Bohemia becomes Christian.	858. Invasion of France by the Germans defeated. 860–900. Seacoast towns and river settlements depopulated by constant pirate raids of Northmen. 870. Lorraine divided by France and Germany by Treaty of Mersen (Charles the Bald of France, Ludwig the German of Germany). 875. Rivalry for Imperial crown between Ludwig the German and Charles the Bald. 879. Louis III and Carloman reign jointly. 885. Paris besieged by the Northmen under Rollo. 898. Charles III, King of France. 899. Hungarians invade Germany. 911. Northmen gain permanent foothold in Normandy. 912 Conrad I, Emperor of Germany.	860. Gorm unites Jutland and the Danish isles. 862. Ruric the Norman, Grand Duke of Novgorod. 867. Alfonso the Great in Spain. 873. Sancho Inigo, count of Navarre. 875. Harold, first King of Norway. 889. Arpad lays the foundation of Hungary. 901. Republics of Venice and Genoa founded. 914. Beginning of Golden Age of the Saracens in Spain.	856. Moorish architecture develops. 862(?). Norsemen reach Iceland. 890. Trial by jury; fairs and markets in England. 900. England divided into counties, hundreds, and tithings.	Bible in Slavonian. *Translations* of Alfred the Great. *Anglo-Saxon Chronicle.* The *Elder Edda.*

FROM THE TREATY OF VERDUN TO THE FIRST CRUSADE, 925-1031 A. D.

Characteristics of the Centuries	The Empire and Saracens	The British Isles	Italy and the Church	France and Germany	Spain, Russia and Lesser Countries	Arts and Sciences	Literature
1000-1100 A. D. Increasing and beneficent power of the Church exerted in the direction of order. Normans in Italy and Sicily. The Norman conquest of England. Quarrels between popes and emperors begin.	941. Romanus gains a naval victory over the Russians. 959. Emperor Romanus II. 961. Crete recovered from Saracens by Nicephorus. 969. Fatimite caliphs rule Egypt and Syria. 975–1025. Period of greatest Byzantine power. Joannes Zimisces, Emperor (969–76) and Basil II (976–1025). Saracens, Bulgarians defeated. 1005. Mahmud, Ghazni Emperor, rules Persia and north India. 1018. Bulgaria again reduced to a Grecian province.	925. Athelstane King of England. 943. Malcolm I, King of Scotland. 955. Dunstan, abbot of Glastonbury, rises to great power. 985. Danish invasion under Sweyn. 997–1015. Ravages of Northmen nearly continuous. Ethelred II, King. 1002. General massacre of Danes ordered by Ethelred. 1005. Malcolm, King of Scotland; Brian Boru, King of Irish. 1016. Edmund II and Canute, King of the Danes, divide rule of England. 1031. Canute subdues Scotland.	940. Italy in anarchy. 955. Baptism of Olga, and conversion of Russia to Christianity. 959. St. Dunstan, Archbishop of Canterbury, attempts to reform the Church. 961–67. Otto the Great of Germany invades Italy, captures Rome and deposes Pope John XII. After period of confusion and war, Otto's son Otto II is crowned emperor by John XIII. 989. Greek Christianity spread in Russia by Vladimir. 999. Hungary becomes a fief of the Church. Gerbert, scholar and mathematician, becomes Pope as Silvester II. 1024. John XIX, Pope.	918–36. Germany ruled by Henry the Fowler. 936. Louis IV, King of France. Otto, German Emperor, expands his domain and repulses the Hungarians. 950. Bohemia annexed to Germany. 954. Hugh, Duke of Burgundy and and Aquitane. 960. Hugh Capet, Duke of France. 964. Italy united to the empire of Germany. Beginning of Holy Roman Empire. Tuscany becomes a dukedom. 986. Louis V, last of the Carolingians. 988. Hugh Capet, King, and founder of the Capetian line of French kings. 1015. Empire at war with the Poles. 1024. Conrad II, Emperor. 1031. Henry I, King of France.	936. Asturias becomes León. 940. Ramiro, King of León, defeats the Moors at Simancas. 955. Sancho I, King of León. 960. Sung Dynasty rises in China. 973. St. Stephen, King of Hungary, gives it written laws. 981. Vladimir the Great, the first Christian ruler of Russia. 985. Sweyn I of Denmark invades England. 989. Norsemen in Spain. 1015. Russia divided among the 12 sons of Vladimir. 1016. Canute II, King of Denmark. 1019. Norway conquered by Canute. Danish ascendancy. Baltic States Christianized. 1031. Caliphate of Cordova ends	936. Printing used in China. 939. Cordova, in Spain, becomes famous as a center of science, learning, industry, and commerce. 941. The figures of arithmetic brought into Europe by the Saracens. Linens and woolens manufactured in Flanders. 982. Dublin a trade center. Vikings visit Greenland. 986. Venice and Genoa rule the Mediterranean. 999. Vikings reach America. 1024. Musical scale of six notes invented by Guido Aretius.	Firdusi's *Book of Kings.* Avicenna's writings on philosophy and science.

THE 11TH

Characteristics of the Centuries	The Church	Eastern Empire	The British Isles	France
1000-1100 A. D. Continued	1041. Normans at Apulia rule South Italy. 1047. Clement II attacks vice of simony in church. Beginning of great age of power of papacy (1046-1305). 1048. Leo IX the first Pope to keep an army. 1054. Excommunication of the Patriarch of Constantinople and the Greeks. 1059. Quarrel between the popes and the German emperors on question of investiture. 1059. Council under Nicholas II decrees that future nominations to papacy be made by the cardinal, *i. e.*, the higher clergy, and that nominee should be of Roman clergy. 1066. Pope Alexander II. 1073. Quarrel of Pope Gregory VII (Hildebrand) with the Emperor Henry IV. 1077. Submission of Henry IV to the Pope at Canossa. 1084. Triumph of Henry IV over Gregory. The order of the Carthusians instituted by Bruno. Normans sack Rome. 1095. Peter the Hermit preaches against the Turks.	1042. First invasion of the Seljuk Turks. 1043. The Russians invade Thrace and are repulsed by the Greeks. 1054. Theodora, last of the Macedonian dynasty. 1059. Turks and Slavs invade frontiers. 1067. Emperor Romanus III defeated and taken prisoner by the Turks, who rule Asia Minor, Mesopotamia and Persia. 1074. Syria and Palestine subdued by Saracens. 1081. Alexius I (Comnenus), Emperor. Robert Guiscard invades the empire and defeats Alexius. 1087. Christian kingdom of Jerusalem overthrown by Saladin.	1035. Duncan and Macbeth vie for Scottish throne. 1042. The Saxon line restored under Edward the Confessor. End of Danish rule. 1051. William, Duke of Normandy, visits England. 1066. Harold II, last Anglo-Saxon king, killed at the battle of Hastings. William the Conqueror, King of England and Normandy. 1070. Feudal system centralized under king. 1072. England controls Scotland. 1076. Rebellion in Normandy. 1085. Stern repression of feudal turbulency by William. 1086. The Domesday tax survey. 1087. William invades France. 1093. Malcolm III, of Scotland, invades England and is slain. End of Gaelic rule in Scotland.	1041. "Truce of God" enjoined by church limits feudal warfare to two days a week. 1060. Philip I. 1066. William, Duke of Normandy, wins the crown of England. 1070. Rise of the troubadours in Provence. 1073. Normans conquer Maine. 1079. Birth of Abélard. 1087. War with England. Robert, Duke of Normandy, opposes William Rufus.

PERIOD OF THE CRUSADES,

Characteristics of the Centuries	The Church	Eastern Empire	The British Isles	France
1100-1200 A. D. Quarrels between popes and emperors continue; zenith of papal power; Frederick Barbarossa. Feudal wars lessen; advance in power of kings and of towns at expense of the feudal baronage. The Crusaders. Improved judicial arrangements in England.	1096. The First Crusade. 1100. Study of theology receives new impulse. 1122. Concordat of Worms settling dispute between Empire and Papacy over investitures. 1123. First Lateran or Ninth General Council. 1127. Pope Honorius II makes war against Roger, King of Sicily. 1139. Second Lateran or Tenth General Council. 1147. The Second Crusade begun by Bernard of Clairvaux. 1154. Pope Adrian IV, an Englishman. 1160. Albigenses begin to appear. 1167. Rome taken by Frederick Barbarossa.	1099. Invasion by the Crusaders. Battle of Ascalon. Jerusalem stormed by Godfrey of Bouillon. Establishment of kingdom of Jerusalem. 1104. Battle of Acre. 1109. Tripoli taken by Crusaders. 1124. Tyre taken by Crusaders. 1143. Manuel Comnenus, Emperor, makes peace with the Turks. 1156. Manuel invades Italy but is repulsed. 1172. Turks conquer armies of Manuel.	1100. Henry I, King of England, unites the Normans and Saxons. 1107. Henry quarrels with Anselm, Archbishop of Canterbury, on question of investitures. 1124. David I promotes civilization in Scotland. 1135-54. Reign of Stephen. Civil disorder rampant. 1154. Henry II, King of England. 1158-1164. Reforms of Clarendon; Thomas à Becket, Archbishop of Canterbury. 1168. English invade Ireland. 1172. Henry conquers Ireland.	1096. Many French noblemen take part in the First Crusade. 1147. Louis VII joins the Second Crusade. 1154. Half of France under English rule. 1159. War with the English. 1170. Rise of the Waldenses, heretic Christians.

CENTURY, 1035-95, A. D.

Germany and Italy	Spain	Russia	Lesser Countries	Arts and Sciences	Literature
1039. Henry III defeats the Bohemians and Hungarrians.	1035. Ramiro I, King of Aragon.	1036. Russia reunited by Jaroslav.	1035. Hardicanute, King of Denmark.	1035. Romanesque architecture develops.	
1053. Henry makes his son, Henry, King of the Romans.	1054. Saracens driven from Portugal.	1054. Russia divided. Civil wars and great distress.	1055. The Turks reduce Bagdad and overturn the empire of the caliphs.	1055. First age of scholastic philosophy.	Runic inscriptions.
			1060. Robert Guiscard, Duke of Apulia.		
				1062. Surnames first used among the English nobility.	Anselm.
	1065. Alfonso, King of Castile and León.		1065. Jerusalem taken by the Saracens. 1067. Polish conquests in Russia.		
			1068. Olaf III, King of Norway. 1070. Khmer Empire flourishes in Cambodia.	1068. Shoeing horses introduced into England.	
1072. Henry IV quarrels with the Pope over the investiture of bishops.					The Cid.
1073. Saxons revolt.	1073. Christian conquest of Spain under way.	1073. Kiev, Russian capital, raided by Slav nomads.	1073. Maya Empire flourishes in Central America; Chichen-Itza, center of science and architecture.		
1076. Civil wars rend the Empire. Henry declares Pope Gregory VII deposed at Council of Worms. Gregory replies by excommunicating Henry. 1077. Henry humbles himself before Pope at Canossa. 1080. Henry degrades the Pope and triumphs.	1076. Time of the Cid.				*Domesday Book.*
			1084. Bohemia made a kingdom by Henry IV of Germany.		
	1085. Toledo taken from the Moors by the Cid.				*Song of Roland.*
1090. The Popes continue their struggle against the empire. 1092. Revolt of Henry's son Conrad.			1090. Sicily taken from the Saracens by Roger the Norman.	1090. Fortresses at Newcastle and Carlisle built.	
	1094. Pedro I, King of Navarre and Aragon. 1095. Pedro wins Valencia.				

A. D. 1096-1273

Germany and Italy	Spain	Russia	Lesser Countries	Arts and Sciences	Literature
			1096. Flanders spreads rule over the Dutch.		William of Poitou, troubadour.
	1104. Alfonso I, King of Navarre and Aragon.	1100. Feudal rulers vie for control.	1105. War between Normans and Slavs in Poland.	1100. Rise of Gothic architecture; era of cathedral building begins.	
1111. Henry V compels the Pope to crown him.					Omar Khayyám.
1119. War between Pisa and Genoa.	1118. Alfonso captures Saragossa.		1119. Charles the Good, Count of Flanders.	1118. Knights Templar instituted.	Scholastic philosophy reaches a high point under Abélard.
1125. Lothair II opposed by Frederick and Conrad, Duke of Swabia. 1134. Albert the Bear conquers Brandenburg.				1125. Inca kingdom rises in Peru.	
1139. Dissensions of the Guelphs and Ghibellines.	1139. Saracens defeated at Ourique. Portugal becomes a kingdom.		1139. Independence of Sicily recognized.	1140. Gratian collects the canon law.	
		1147. Moscow founded.			
1152. Frederick I, Barbarossa, Emperor of Germany and Italy.			1150. Sweden welcomes Christians.	1150. Magnetic needle known in Italy.	*Nibelungenlied.*
1158. The Emperor Frederick becomes King of Bohemia.	1157. Castile and León divided.		1158. Persia taken by the Mongols.	1158. Bank of Venice established.	
1162. Siege and sack of Milan by Frederick. 1167. Rome taken by Frederick.		1168. Russians conquer Kiev.	1167. League of the Italian cities.	1168. Colleges of law, philosophy and theology at Paris.	
1170. Lombard League holds north Italy against Frederick.	1171. Seville is capital of Arabic Spain.		1171. Saladin, Sultan of Egypt, conquers Syria, Assyria and Arabia. Fatimite dynasty ends.		

PERIOD OF THE

Characteristics of the Centuries	Italy and the Church	Eastern Europe	The British Isles	France
1200-1300 A. D. Rise of universities and of mendicant friars. Quarrels between popes and emperors still continue; Frederick II of Germany. Last crusades. English liberties recognized by the crown. Hanse League established. Great conquests of Tartars in Asia: they overrun Russia and establish a dynasty at Moscow.	1190. Third Crusade. 1198-1216. Pontificate of Innocent III. Papal power reaches greatest height. 1202. The Fourth Crusade. Constantinople taken. 1215. Fourth Lateran Council against the Albigenses. Dominican order founded. 1228. [illegible] 1237-50. [illegible] 1248. Ghibellines take Florence. 1267. [illegible]	1189. Turks and Slavs overrun the Danube. 1204. The Crusaders plunder Constantinople. Empire divided between Baldwin at Constantinople, Theodore at Nicaea and Alexius at Trebizond. 1228. [illegible] 1241. Mongols invade the Empire. 1244. Jerusalem retaken by Turks. 1261. Emperor Michael Palaeologus recovers Constantinople. 1268. The Mongols invade Asia Minor and take Antioch.	1189. Richard I engages in the Third Crusade. 1193. John attempts to seize the crown in the absence of Richard. 1199. John, King of England. 1208-13. Quarrel of John with Innocent III over investiture. England placed under interdict. 1215. Magna Charta signed at Runnymede. 1216. Henry III, King. 1230. O'Neills and O'Donnells rule Ulster. 1242. War with France. 1258. Famous Parliament at Oxford, providing a council of barons. 1265. First Parliament with representative knights of shires. Civil war led by Simon de Montfort.	1189. Philip Augustus one of the leaders of the Third Crusade. 1204. Touraine, Anjou and Normandy annexed to France. 1214. Battle of Bouvines. Philip II puts down rebellious barons. 1226. Louis VIII conducts crusade against the Albigenses. 1226. Louis IX, Saint Louis, King. 1248. Albigenses finally crushed. 1258. France expands. Treaty of Corbeil. 1267. Burgundy falls to the crown.

PERIOD OF THE RENAISSANCE.

Characteristics of the Centuries	Italy and the Church	Eastern Europe	The British Isles	France
1300-1400 A. D. Growth of cities and trade—especially in Italy, where also literature and art, inspired by Dante and Giotto, make progress. Popes at Avignon; papacy now terribly corrupt. Era of Wycliffe: his teaching spreads in Bohemia. Invention of gunpowder. Mariner's compass comes into use in the West.	1271. [illegible] 1282. The Sicilian Vespers; [illegible] 1296. Struggle of the Church [illegible] 1303. Boniface VIII arrested by agents of Philip IV of France. 1309. Seat of the popes transferred to Avignon. 1311. General Council at Vienne. 1325. A century of war begins between city states of Italy. 1339. Struggle in Rome between the Colonna and the Orsini. 1347. [illegible]	1299. Othman invades Nicomedia and establishes the Ottoman empire. 1300. Genoese control trade of Black Sea. 1310. Knights Hospitallers settle in Rhodes. 1320. Civil war. 1326. Orchan, Sultan of the Turks, takes Nicomedia and Nicaea. 1355. Turkish Empire expands rapidly.	1272. Edward I. 1283. England and Wales united. 1290. Expulsion of Jews. 1291. Bruce and Baliol contend for the crown of Scotland. 1295. Model Parliament of Edward I. 1297. War between England and Scotland. 1300. Silverplate used in England. 1305. William Wallace beheaded. 1306. Robert Bruce proclaimed King of Scotland. War with England continued. 1311. Power of king restricted by Parliament. 1314. Scots defeat the English at Bannockburn. 1327. Peace. Independence of Scotland. Deposition of Edward II. 1328. Struggle for the French crown begins. 1346. Battle of Crécy. 1348. The Black Death.	1270. France at war with Castile. 1285. Philip IV, King. Strengthens monarchy. 1296-1304. Philip quarrels with Pope Boniface VIII over taxation of church property. 1297. Invasion of Flanders. 1302. First appearance of the States-General in France. 1304. War with Flanders. 1306. [illegible] 1308. Papal residence transferred to Avignon. 1314. [illegible] 1328. Philip VI. 1339. [illegible] 1346. [illegible] 1360. [illegible] ceded to England. 1348. The Black Death.

CRUSADES—Concluded

Germany	Spain	Russia	Lesser Countries	Arts and Sciences	Literature
1183. [illegible] by Treaty of Constance.	1188. Alfonso IX. King of León.	1186. Incursion of Huns and Poles into Russia.	1189. Saladin directs all his efforts against the Crusaders, but is defeated.	1190. [illegible]	
1190. Henry VI. Emperor and King of Italy, takes Sicily.		1200. Riga founded.	1198. [illegible]	1200. [illegible] 1200–1300. Age of scholastic philosophy. [illegible]	[illegible]
1212. Children's crusades. 1215. Frederick II. Emperor. 1215–1268. Ghibelline-Guelph dissension throughout empire.	1212. The Christians gain the Battle of Navas de Tolosa.		1214. Feudal wars in the Netherlands. 1215. Tartary and China overrun by Genghis Khan.		[illegible]
	1217. Ferdinand, King of Castile.	1224. Mongolian invasion, known as the "Golden Horde."	1222. Hungarian liberty assured by Charter of Andrew II.	1222. University of Padua founded.	
1226. Teutonic Knights receive feudal powers. 1228–29. Frederick II conducts crusade. Makes treaty with Sultan.	1230. Castile and León united by Ferdinand III. who takes large territory from the Moors.	1236. Second Mongolian invasion. Moscow burned. 1238. Russian independence overthrown by the Tartars. Khan of Kiptchak Grand Duke.		1231. [illegible] 1238. [illegible]	[illegible]
1239. Frederick quarrels with Pope a second time.			1241. Mongolian invasion of Europe under Batu Khan.	1240–1340. Great era of Gothic architecture. 1247. First war fleet in Spain.	[illegible]
1250. Conrad IV. Emperor: feudal barons at war. 1256. Beginning of Hanseatic League.	1252. Alfonso the Learned.		1258. Mongols win Bagdad.		
	1263. Portugal [illegible]		1264. Kublai Khan makes Peking [illegible] capital.	1265. Parliament in England.	

—A. D. 1273-1492

Germany	Spain	Russia	Lesser Countries	Arts and Sciences	Literature
1273. Rudolf, Emperor, founds House of Hapsburg, revives power of the Empire, quells feudal barons and takes Austria. 1278. Rudolph defeats Ottocar.	1274. Crown of Navarre passes to France.		1284. Pisa and Genoa at war.	1272. First patent of nobility granted in France.	[illegible]
1291. Swiss League formed.	1291. James II. King of Aragon.	1290. Khan of Kiptchak wields strong rule in Russia.	1290. Wenceslas, King of Bohemia, takes Cracow.	1285. Institution of the three great courts of law in England. Cimabue, the first of modern painters at Florence.	
1298. Albert I. Emperor.	1300. Dissensions in the Moorish state.	1300. Moscow made the capital. Kremlin begun.	1299. Foundation of the Ottoman Empire.	1300. Rapid advances in civilization—revival of ancient learning—improvements in the arts and sciences—general progress of the age. 1302. Mariners' compass invented at Naples.	[illegible]
1304. Rise of the Swiss towns.			1307. [illegible] 1307. [illegible]	1305. [illegible] in France, Italy and Portugal.	
1308. Henry of Luxemburg, Emperor. Switzerland independent.	1312. Alfonso XI. King of Castile and Leon.			1311. Governmental reforms in England.	Duns Scotus.
1314. Louis of Bavaria and Frederick of Austria [illegible] to the throne.		1323. Finland invaded by Russians.	1315. Swiss defeat Austrians at Morgarten. 1319. The Oligarchy of Venice established.		
1322. Frederick of Austria [illegible]	1327. Arrival of 200,000 Moors to assist Granada.	1332. Ivan I. revives the Russian state.		1320. Clocks constructed [illegible] 1325. Advanced political theories of Marsiglio of Padua.	Wycliffe's Translation of Bible.
1338. Diet of Frankfort. The estates of the empire defy papal interdict.	1340. Moors defeated at Salado.		1343. Poland revives under Casimir.	1335. [illegible]	William of Occam.
1348. The Black Death.		1347. [illegible] of Novgorod.		1347. Manufactures and commerce improve in England.	

PERIOD OF THE

Characteristics of the Centuries	Italy and the Church	Eastern Empire	The British Isles	France
	1354. Rienzi killed; papal dominion restored.	1355. John Palaeologus, Emperor.	1356. Edward, the Black Prince, wins the battle of Poitiers.	1356. King John defeated and taken prisoner at Poitiers.
				1358. Revolt of oppressed peasantry (*Jacquerie*).
	1372–79. War between Venice and Genoa.	1373. Treaty with the Ottoman emperor.	1376. Death of the Black Prince. English retreat in France.	
	1378. Schism of the West: Pope Urban VI acknowledged in England; Clement VII in France, Spain and Scotland.	1381. The emperor a vassal of the Turks.	1381. Wat Tyler leads peasant revolt.	1380. Charles VI, King. 1381. Nobles end independence of the cities.
	1389. Boniface IX and Benedict XIII, Popes.	1389. Bajazet, Sultan of the Turks, defeats Serbs.	1385. The Scots, assisted by France, invade England.	1386. Fruitless attempt to invade England.
		1399. Turks win Greece.	1399. Henry IV, King. House of Lancaster begins. Revolts in Ireland.	
1400-1500 A. D. Turks take Constantinople. Revival of learning and advance of art in the west—especially in Italy. End of Tatar rule in Russia. Invention of printing. Gunpowder generally used in war. Formation of modern "middle classes." Maritime discoveries: The cape route to India; the New World. End of the Middle Ages.		1402. Bajazet defeated and made prisoner by Tamerlane, at the battle of Angora.	1406. James I, King of Scotland.	
	1409. The Council of Pisa.			1410. Civil war between Orléans and Burgundy.
	1414. Council of Constance.	1414. Mohammed revives Turkish power.	1414. Henry V claims the French crown. 1415. Lollards suppressed.	1415. Defeat by the English at Agincourt.
	1416. Huss and Jerome burned for heresy.			
		1425. Emperor John VII visits Italy to obtain help against the Turks.	1422. Death of Henry V. Ascension of Henry VI. War with France.	1422. Henry VI proclaimed at Paris King of France and England.
	1429. Schism of the West ended.			1429. Joan of Arc saves Orleans. Charles VII crowned at Reims.
	1431. Medici rise in Florence.	1431. Turks spread into southeast Europe.		1431. Joan of Arc burned.
		1444. Vladislas, King of Poland, defeated and killed by the Turks.	1444. Truce with France.	1444. Henry, King of England, marries Margaret of Anjou.
	1448. Liberties of the German church are restricted.	1448. Constantine XII, last of the Greek emperors.	1450. Insurrection of Jack Cade. Richard, Duke of York, claims the throne.	
		1453. Siege and capture of Constantinople by the Turks, ending the Eastern Empire.		1453. End of the Hundred Years' War, with England holding only Calais in France.
	1454. Struggle between Cosmo de' Medici and the aristocracy. 1458. The French rule in Genoa.		1455. Wars of the Roses begin.	
		Ottoman Empire		
		1460. Greece subjected to the Turks.	1460. James III, King of Scotland. 1461. Edward IV, King. House of York.	1461. Louis XI, King. Feudal nobles lose power to the crown.
	1463. War of Venice with the Turks.			
		1464. War with Hungary.		
	1469. Lorenzo de' Medici succeeds Piero at Florence.		1470. Warwick restores Henry VI temporarily.	
	1471. Increase of the power of the Medici. Rise of learning. Sixtus IV, Pope.		1471. Warwick and Lancastrians defeated at Barnet.	
			1475. Edward IV invades France.	1475. War between France and Burgundy. 1477. Artois and Burgundy united to France.
		1480. Otranto taken.	1480. War between England and Scotland.	
		1481. Bajazet II, Sultan.		
			1485. Battle of Bosworth Field ends Wars of Roses. Tudor line begins with Henry VII.	1491. Brittany united to the crown.

PERIOD OF THE REFORMATION AND

Characteristics of the Centuries	Italy and the Church	British Isles	Germany	Spain and Portugal	France
	1492. Alexander VI, Pope.	1492. Henry VII invades France.	1493. Maximilian I, Emperor.	1492. Conquest of Granada. Jews driven from Spain.	
1500-1600 A. D.	1498. Savonarola executed at Florence.			1498. Vasco da Gama reaches India via Cape of Good Hope.	1498. Louis XII. 1499. Conquest of Milan.

RENAISSANCE—Continued

Germany	Spain	Russia	Lesser Countries	Arts and Sciences	Literature
			1353. Establishment of the Ottomans in Europe.		Froissart's *Chronicles.*
1355. Promulgation of the Golden Bull regulating the selection of the emperor.					
					Boccaccio.
			1359. Hungarian conquests on the Danube.		
	1365. France at war with Navarre.		1369. Tamerlane makes Samarkand the capital of his new empire.		Wycliffe.
1378. Wenceslas (King of Bohemia), Emperor.					Chaucer.
	1380. Feudal wars in Spain; English invasions.	1380. Tatar war. Dimitri Ivanovitch checks them at the Don.	1380. Venice rules the Mediterranean and grows wealthy from trade with the East.		
		1382. Moscow burned.	1385. War between Austria and Switzerland.		
			1386. Battle of Sempach. Swiss defeat Austrians.	1386. Jan van Eyck invented oil painting.	Petrarch.
1394. The emperor imprisoned at Prague.					
		1395. Tamerlane invades Russia. Russia under the Mongol Tartars until 1480.	1399. Invasion of India by Tamerlane.		
1400. Rupert, Count of Palatine, Emperor.				1400. Wood engraving develops.	
	1407. John II, King of Castile.				
			1409. Germans invade Scandinavia.	1409. University of Leipzig founded.	
		1410. Battle of Tannenburg. Poles and Lithuanians defeat Teuton barons. Power of Teutonic knights broken.			
1411. Sigismund (King of Hungary), Emperor.					
				1411. University of St. Andrews founded.	
			1414–18. Council of Constance.		
	1416. Alfonso V, King of Aragon and Sicily.				
1419–1436. The Hussite wars in Bohemia.					
				1425. Arts promoted in Italy.	
			1430. Aztec Empire rises in Mexico.		
	1430. War between Castile and Granada.				
				1436. Public library, Florence.	
1438. House of Austria (Hapsburg) established. Albert II (King of Bohemia and Hungary), Emperor.		1441. Kiptchak Mongols divide Russia.			
			1444. Hungarians and Poles overwhelmed by Turks at Varna.	1447. Library of the Vatican founded.	
			1450. Kingdom of Delhi enlarged.	1450. Flourishing period of trade in western Europe, particularly in Flanders, New Netherlands, Belgium, and a portion of France. Gutenberg's printing press, first in Europe.	
	1452. Civil war in Navarre, in which Castile and Aragon join.				Thomas à Kempis, *Imitation of Christ.*
1453. Austria made an hereditary duchy by Emperor Frederick III.			1453. Poland's independence confirmed.		
	1454. Henry IV of Castile.		1454. Poland at war with the Teutonic order.		
			1456. Hunyadi defeats Turks at Belgrade.		
			1458. Hungary vigorous under Matthias Corvin.	1460. Copper-plate engraving invented.	
		1462. Ivan the Great takes the title of czar.			Villon's *Poems.*
				1464. Post offices in France and England.	
			1466. Prussia a fief of Poland.		
			1468. Uzun Hassan, master of Persia.		
1469. Invasion of the Turks.	1469. Marriage of Ferdinand of Aragon with Isabella of Castile.		1470. Sten Sture, Regent of Sweden.		Malory's *Morte d'Arthur.*
		1472. Ivan marries Sophia, niece of the Greek emperor.		1473. Printed musical notes. Large library founded at Ofen.	
1477. Marriage of Maximilian and Mary of Burgundy.				1477. Watches made at Nuremberg. First book printed in England by Caxton.	
	1479. Union of Castile and Aragon.	1479. Great invasion of the Tatars.			
		1481. Power of the Tartars annihilated by Ivan III.			
	1488. Diaz claims Cape of Good Hope trade route for Portugal.		1485. Matthias of Hungary takes Vienna.		

RELIGIOUS WARS, A. D. 1492-1648

Russia	Scandinavia	Ottoman Empire	Lesser Countries	Arts and Sciences	Literature
			1492. America discovered by Columbus.		
		1493. War with Egypt, Hungary and Venice.		1493. Printing press at Copenhagen. Era of discovery in the New World begins.	
			1499. Voyage of Amerigo Vespucci.		More's *Utopia.*
			1502. Sufi sole Sovereign of Persia.	1502. St. Peter's and other great churches built.	

PERIOD OF THE REFORMATION

Characteristics of the Centuries	Italy and the Church	British Isles	Germany	Spain and Portugal	France
1500-1600 A. D. The Reformation. Immense development of new life in Europe.	1503. Naples annexed to the Spanish crown. Julius II, Pope. 1506. St. Peter's begun (Rome).		1503. Much of Italy yielded to native princes.	1503. Spain rules Naples.	
		1509. Henry VIII, King.		1510. Portuguese colonize Brazil, India and Java.	1510. Council of Tours.
Power of Spain, and her conquests in America.	1512. Decline of Borgia power.	1512. War with France.	1512. Maximilian divides the empire into 10 circles.		
The monarchy strong in England.	1513. Pope Leo X, patron of literature and the arts. Italy under foreign rule.	1513. Battle of Flodden Field; English defeat Scots.	1514. Peasants' revolt in Hungary.	1516. Charles, King of all Spain and the Netherlands.	1515. Francis I invades Italy.
		1517. Wolsey, chancellor and cardinal.	1517. Beginning of the Reformation.		
	1520. Luther excommunicated.		1519. Charles V, King of Spain and Holy Roman Emperor.	1519. Conquest of Mexico by Cortez.	1520. Field of Cloth of Gold.
			1521. Diet of Worms. Luther refuses to recant.		1521. War with Spain and the Empire.
	1525. Spanish ascendency by the victory of Pavia.		1525. Peasants' revolt crushed.	1525. Spain and the Empire defeat France and win Italy.	1525. Francis defeated and taken prisoner at Pavia.
	1527. Sack of Rome by soldiers of Charles V.	1534. Act of Supremacy. Church of England established. 1536. Dissolution of monasteries by Henry VIII.	1529. Turks invade Germany, besiege Vienna.	1534. Spain takes Tunis.	1532–1544. Struggle for possession of Italy. Diplomatic intrigues of Francis. Growth of absolutism.
	1540. Order of Jesuits founded by Loyola.	1543. Invasion of France.	1543. War with France.	1540. Lisbon the market of the world.	
	1545. Council of Trent.				
	1550. Julius III, Pope.	1547. Formal establishment of Protestantism. Edward VI, King.	1547. Schmalkaldic War. Insurgent German princes against Charles V.	1547. The Inquisition set up.	1547. Henry II, King; Catherine de' Medici, Queen.
		1553. Mary, Queen of England. Catholicism restored. 1555. Persecution of the Protestants. Ridley, Latimer burned.	1555. Peace of Augsburg establishes principle of *cuius regio eius religio;* each prince to decide the religion of his territory.		1552. New war with Charles V. France expands.
	1559. Termination of French wars in Italy.	1558. Elizabeth, Queen. Rise of the Puritans. Protestant church restored. Jesuits spread over Ireland.	1556. Charles V abdicates. Empire separates from Spain.	1556. Philip II, King of Spain.	1558. Calais recovered.
			1564. Maximilian II, Emperor.	1564. Acquisition of the Philippines. 1567. Duke of Alva, Governor of the Netherlands.	1562. Religious liberty granted to the Huguenots. Huguenot wars. Era of Catherine de' Medici.
	1569. Florence a grand duchy.	1568. Mary, Queen of Scots, takes refuge in England. Irish unrest grows.		1570. Revolt of Moriscos crushed. 1571. Battle of Lepanto. Spread of Turks halted.	1572. Massacre of St. Bartholomew.
		1576. English sea power develops under Drake and Hawkins.	1576. Rudolph II (King of Bohemia and Hungary), Emperor.		1577. Religious war.
	1585. Pope Sixtus V restores the Vatican library.	1584. Raleigh's colony in Virginia. 1585. War with Spain. 1587. Mary, Queen of Scots, executed. 1588. Spanish Armada destroyed.	1585. Religious wars renewed.	1580. Portugal passes under Spanish dominion. 1588. Defeat of the Spanish Armada.	1580. Religious wars sap French strength. 1588. Revolt of Paris. 1589. House of Bourbon begins with Henry IV. 1590. Siege of Paris raised by the Spaniards.
1600-1700 A. D. The Thirty Years' War, at first a life struggle of Roman Catholics and Protestants, results in downfall of Spain and the ascendancy of France, which reached its zenith under Louis XIV.	1592. The Rialto and Piazza di San Marco built at Venice. 1600. Giordano Bruno burned for heresy at Venice.	1600. East India Company formed. 1603. Union of England and Scotland under James I. 1605. Gunpowder Plot. 1607. English settlement at Jamestown.	1594. Turkish invasion renewed. 1608. Protestant union under Frederick the Elector.	1598. Philip III, King of Spain. 1601. Portuguese reach Australia. 1604. Peace with England.	1598. Edict of Nantes—toleration granted to the Protestants. Peace with Spain. 1608. Quebec founded.
The battle of civil and religious liberty fought out in England under the Stuarts.	1609. Leghorn becomes the emporium of the Levant trade.	1609. Smuggling thrives as taxes are raised.		1609. Expulsion of the Moors. 1614. Golden Age of Art in Spain and the Netherlands.	1610. Henry IV assassinated. King Louis XIII. Marie de' Medici regent. 1614. Last assembly of the States-General.
Rise of modern science and philosophy.	1618. Conspiracy of De Bedmar to subject Venice to Spain.	1618. Sir Francis Bacon, lord chancellor. 1620. Pilgrims sail in *Mayflower*.	1618. Thirty Years' War begins. 1620. Battle of Prague.	1621. Dutch War.	1618. Thirty Years' War begins with France torn by court intrigues.

AND RELIGIOUS WARS—Continued

Russia	Scandinavia	Ottoman Empire	Lesser Countries	Arts and Sciences	Literature
			1506. Poland under Sigismund the Great.	1505. Trade thrives in the Netherlands.	Erasmus's *Praise of Folly, Colloquies.*
1510. Renewed Tatar invasions. Moscow extends rule over Russia.		1512. Selim I, Sultan.	1511. Cuba conquered. 1512. Florida discovered.		
	1513. Christian II, King of Norway and Denmark.	1514. Persians defeated; Kurdistan added to the empire.	1513. Discoveries of Balboa. 1516. Rio La Plata entered.		Italian literature flourishes; Colonna, Ariosto and Machiavelli.
		1517. Turks win Egypt.	1517. First patent granted by Spain for the importation of Negroes into America. 1519. Spaniards, under Cortez, conquer Mexico.	1517. Luther and the Protestant Reformation.	Sachs founds the German drama.
	1520. Christian, King of Sweden. His barbarities arouse rebellion in Sweden. Massacre in Stockholm. 1523. Gustavus Vasa, King of Sweden. Union of Kalmar dissolved.	1520. Soliman the Magnificent, Sultan. 1521. Belgrade taken.		1522. Circumnavigation of the globe by Magellan.	Luther's *Bible.*
		1526. Invasion of Hungary. Battle of Mohacs. Hungarians routed. 1529. Invasion of Germany. Siege of Vienna.	1526. Mogul dynasty in India founded by Baber.		Rabelais.
	1532. Union of Norway and Denmark. 1535. Reformation sweeps over all the Baltic region.		1533. Spain conquers Peru and Texas. 1537. Calvin establishes theocratic regime at Geneva.	1530. Jorgens invents the spinning wheel for flax. 1535. First English Bible printed.	Calvin's *Institutes of Religion.*
1547. Ivan the Terrible, Czar.			1545. Mines at Potosi discovered. 1548. Jesuits invade Japan.	1545. Vesalius makes important contributions to the study of anatomy. 1548. Orange trees introduced into Europe.	First English Prayer Book.
		1551. Tripoli and Arabia [illegible]			Camöens's *Lusiad.*
1552. Mongols quelled. Ivan extends his rule into central Asia and Siberia.			1553. Michael Servetus burned at Geneva.		Copernicus's *Revolutions of the Celestial Bodies.*
	1560. Eric XIV, King of Sweden. 1563. Seven Years' War between Sweden and Denmark.	1559. Military power of the Turks at its greatest height under Soliman. North Africa conquered.	1556. Akbar raises the Indian empire to its greatest splendor. 1560. Poland becomes a major power. 1568. Revolt begins in Netherlands.	1559. Carriages introduced into Paris. 1560. Knives first made in England.	Fox's *Book of Martyrs.* Tasso's *Jerusalem Delivered.*
1571. Russia devastated by the Tatars, and Moscow burned.	1570. Peace of Stettin.	1570. War with Venice. 1571. Battle of Lepanto. Turkish fleet destroyed.	1570. Siamese state breaks up. Akbar extends his Empire in India.	1573. Titian, colorist, painter, at height of fame.	Ronsard's *Poems.* Cellini's *Autobiography.*
1578. Alliance of Sweden and Poland against Russia.		1578. New war with Persia. Turks win Crimea.	1579. Beginning of the Republic of Holland.	1580. English make paper. 1582. Gregorian calendar introduced.	Spenser's *Faerie Queene.*
1585. Boris Godunov, Regent.	1588. Christian IV, King of Denmark.		1585. Persia acquires great power under Abbas the Great.	1586. Tobacco introduced into Europe.	Montaigne's *Essays.*
			1590. Japan rejects Jesuits, invades Korea.	1590. Microscope invented.	Shakespeare's *Dramas.*
1598. Boris Godunov begins a new dynasty. Peasants made serfs.	1600. Charles IX, King of Sweden.	1595. Power in Hungary declines; revolt of Wallachia.		1600. First opera, Florence.	Bacon's *Essays.* Douay Bible.
1609. Poles invade Russia. 1613. Michael Fedorovich, Czar, founds the house of Romanov. 1617. Finland ceded to Sweden.	1609. Gustavus Adolphus, King of Sweden. 1611. War between Sweden and Denmark. 1616. Sweden dominates the North.	1618. Great Persian victory at Shibi. 1620. War with Poland. End of internal wars.	1605. Jahangir, Mogul Emperor of India. 1609. Independence of the Netherlands recognized. 1616. China and Manchuria united.	1606. Gilbert's electrical discoveries. 1608. Telescopes in Holland. 1614. Napier invents logarithms. 1615. Coffee in Venice. 1616. Harvey discovers the circulation of the blood. 1619. Slavery introduced in English-American colonies. 1620. Thermometers invented.	Authorized English version of the Bible. Lope de Vega's *Dramas.* Cervantes's *Don Quixot.*

PERIOD OF THE REFORMATION

Characteristics of the Centuries	Italy and the Church	Great Britain	Germany	Spain and Portugal	France
1600-1700 A. D. Continued	1626. St. Peter's dedicated. 1628. War following death of the duke of Mantua. 1631. Influence of France increases.	1625. Charles I, King. 1627. War with France. 1628. Petition of Right.	1628. Victories of Wallenstein. 1629. Edict of Restitution demands that Church property converted by Protestants be restored, thus renewing war. 1630. Gustavus Adolphus invades Germany.	1625. Naval war with England.	1624. Ministry of Cardinal Richelieu. 1627. War with England over the Huguenots. 1628. Siege of La Rochelle.
		1637. Hampden resists collection of ship money. 1641. Grand Remonstrance of Parliament against Charles I. 1642. Long Parliament convened. 1645. Charles defeated at Naseby.	1631. Capture and sack of Magdeburg by imperial soldiers of Tilly. 1632. Battle of Lutzen. 1640. Frederick William of Prussia.	1639. Loss of the Japanese trade. 1640. Portugal regains independence. Revolts in Spain.	1638. Invasion of Spain. 1640. Turin taken by the French. 1643. Louis XIV, King.
	1647. Revolt of Naples under Masaniello.	1647. Fox founds the Society of Friends. 1648. Imprisonment and trial of Charles I.	1648. Treaty of Westphalia. Terrible devastation throughout Germany as result of Thirty Years' War.		1648. Wars of the Fronde.

FROM THE PEACE OF WESTPHALIA TO

Characteristics of the Centuries	Italy and the Church	Great Britain	Germany	Spain and Portugal	France
1600-1700 A. D. Continued		1649. Commonwealth under Cromwell. 1652. War with Holland. 1653. Cromwell, Lord Protector. Ireland subdued.		1654. Brazil recovered from the Dutch. 1655. War with England.	1649. Siege of Paris. 1653. Mazarin enters Paris in triumph.
	1658. Venice at war with the Turks to keep Eastern trade routes open.	1660. Charles II, King. Stuarts restored. 1663. First English newspaper. 1666. Great fire in London.	1658. Leopold I, Emperor. 1660. Turks push further into the Balkans and Hungary.	1660. Portugal and Spain at war.	1659. Peace of the Pyrenees. 1660–1683. Ministry of Colbert.
	1670. War between Genoa and Savoy.	1668. Triple alliance of England, Sweden and Holland against France. 1670. Secret Treaty of Dover with France. 1672. War with Dutch.			1667. War with Spain in the Netherlands. 1672. War with Holland.
	1676. French yield Messina to Spain.	1679. Habeas Corpus act passed.	1673. War of Austria and France. 1676. General revolt of the Hungarians. 1680. Part of Alsace seized by France.	1673. War with France to protect Holland, part of which is lost.	1678. Peace with Holland and Spain restores tranquillity to Europe. 1680. France the most formidable power in Europe.
	1685. Venice wins against Turks. 1689. Alexander VIII, Pope.	1685. James II, King. Rise of the Whigs and Tories. Monmouth's rebellion. 1688. Revolution. 1689. William III, King, and Mary II, Queen. War with France.	1683. Siege of Vienna by the Turks. 1686. Buda taken from the Turks. 1687. Joseph I, King of Hungary.	1683. War with France renewed. 1689. Revolt in Catalonia in favor of France.	1685. Revocation of the Edict of Nantes. Huguenots flee France. 1688. War of the Allies against France.
1700-1800 A. D. Astounding growth of the British Empire. Government in England more or less representing the will of the people. Development of manufactures in England. Inventions and discoveries. Immense advance in arts and sciences. Independence of the United States. The French Revolution, which powerfully influences social, political and intellectual progress for the next hundred years.	1690. Italian Protestants win toleration. 1693. 50,000 killed in earthquake and eruption of Mt. Etna, Sicily.	1690. Battle of the Boyne. James defeated, returns to France. 1694. Bank of England formed. 1697. General peace. 1698. Irish begin export of linen.	1690. Joseph I, elected King of the Romans. 1697. Victories of Prince Eugene over the Turks.	1691. Incursion of the French into Aragon. 1700. Death of Charles II precipitates European war of Spanish Succession.	1693. Naval defeat by English at La Hogue. 1697. General peace of Ryswick between France and the Allies.
	1706. French driven from Italy by Prince Eugene. 1707. All Spanish possessions in Italy abandoned.	1701. War of the Spanish Succession. 1704. Gibraltar taken by English. 1707. Act of Union of England and Scotland. First united Parliament of Great Britain meets. 1713. Peace of Utrecht. England acquires large American possessions. 1714. George I, King.	1701. Hague alliance. Hohenzollern dynasty founded in Prussia. 1707. The Allies defeat France. 1711. Charles VI, Emperor.	1701. Philip V, King. 1705. Barcelona taken by the Allies. 1713. Philip reunites Spain.	1702. Invasion of Holland. Revolt of the Huguenots. 1704. Defeat at Blenheim. 1708. France ruined by constant war. 1713. Peace of Utrecht—perpetual separation of the crown of France and Spain. 1715. Death of Louis XIV; Louis XV, King.

AND RELIGIOUS WARS—Concluded

Russia	Scandinavia	Ottoman Empire	Lesser Countries	Arts and Sciences	Literature
				1626. Mogul rulers build superb temples in India.	Grotius's treatises on law.
			1628. Dutch East India Company thrives.		
				1630. Gazettes first published in Venice.	Descartes's Philosophies.
1632. War with Poland. Poles advance to Moscow.	1632. Christina, Queen of Sweden; Oxenstierna, Regent.	1632. Murad revives the power of the Sultan.	1634. English take Bengal from Portuguese.	1634. Japan withdraws from world contacts. 1635. French Academy founded by Cardinal Richelieu.	
		1637. Troubles on the Tatar frontier. Bagdad taken by the Turks. 1639. Last invasion of Persia.	1639. Great naval victory of Van Tromp, of Holland, over the Spanish fleet at the Downs. 1640. Madras, India, founded.	1639. Printing in America. 1642. New Zealand discovered.	
1645. Rapid progress under Alexis.	1645. Peace between Sweden and Denmark.	1645. War with Venice.	1645. Manchu Dynasty founded, China.		

THE DEATH OF LOUIS XIV. A. D. 1648-1715

Russia	Scandinavia	Ottoman Empire	Other Countries	Arts and Sciences	Literature
		1650. Janissaries rule the Empire.			Corneille's *Tragedies.*
1654. Russian victories in Poland and Ukraine.	1654. Charles X, King of Sweden.		1653. Peace brings prosperity to the Netherlands.	1654. Air pump invented.	
	1657. War between Denmark and Sweden.				Milton's *Poems.*
	1660. Arts and sciences flourish.	1661. War with Austria. 1662. Invasion of Hungary.	1660. Sobieski, Polish general, defeats the Tartars.	1660. Western Europe adopts coffee. 1662. Royal Society founded in England.	Molière's *Dramas.*
1667. Peace with Poland.		1664. Turks defeated at St. Gotthard by Germans. Morocco independent.	1666. Mogul Emperor Aurangzeb rules India.	1666. Canal of Languedoc built. 1667. Gobelin tapestry manufactured in Paris.	Boyle's *Skeptical Chemist.*
1671. The Cossacks subjugated.	1671. Christian V, King of Norway and Sweden.	1672. Invasion of Poland.	1674. Sobieski, King of Poland.	1671. Foundation of the Academy of Architecture at Paris.	Bunyan's *Pilgrim's Progress.*
		1678. First war with Russia.	1678. Mahratta kingdom in India wins Mogul domain.		Locke's *Essays.*
	1680. Diet of Stockholm. Sweden reorganized.				Bossuet's *Sermons.*
1682. Ivan and Peter, Czars.		1682. War with Austria. 1683. Defeat at Vienna by the Poles under John Sobieski.		1681. Museum of Natural History founded in London. Jardin des Plantes founded at Paris. 1684. Differential and integral calculus.	Racine's *Tragedies.*
1689. Peter the Great.		1687. Revolution in Constantinople, Soliman II, Sultan.	1686. Deccan, India, conquered. 1689. Mogul power at its height in India.		
1692. First trade with China.	1693. The King of Sweden declared absolute.	1690. Recovery of Belgrade from the Austrians.	1695. Brussels bombarded by the French.	1692. First opera in London.	
1698. Rebellion of *Streltsi* crushed by Peter the Great.	1697. Charles XII begins to reign. Denmark, Poland and Russia form an alliance against Sweden.	1699. Peace of Karlowitz. The Ottoman power in Europe broken.			Newton's *Principia.*
1700. Peter the Great wars with the Northern Powers.	1700. Defeat of the Allies at Narva.		1700. Chinese conquer Tibet.		
1703. St. Petersburg founded. Russian territory extended to the Baltic.	1702–1706. Charles XII sweeps Poland and Russia.		1704. Stanislaus I, King of Poland.	1703. Russian newspaper established at St. Petersburg.	
1708. Charles XII of Sweden invades Russia. 1709. Peter the Great defeats Charles.	1709. Charles XII routed at Pultowa. Swedish power broken.	1710. War with Russia.			Flourishing period of French literature.
1716. Finland conquered.	1715. Charles returns to Sweden.			1714. Rise of commerce in Austria.	

FROM THE DEATH OF LOUIS XIV TO

Characteristics of the Centuries	Italy and the Church	Great Britain	Germany	Spain and Portugal	France
1700-1800 A. D. Continued	1718. Sicily and Naples united.	1718. War with Spain. 1720. South Sea Bubble; financial panic.	1718. Quadruple alliance against Spain. 1720. Prussia grows under Frederick William.	1718. Spanish power wanes.	1718. The Quadruple alliance against Spain. 1720. Mississippi Bubble.
	1730. Clement XII, Pope.	1727. George II, King of England.	1733. War of the Polish Succession.	1725. Spain and Austria allied. 1734. Conquest of Sicily and Naples by Don Carlos.	1726–43. Ministry of Cardinal Fleury. 1733. The Polish Succession involves France in war.
	1744. Italy invaded by the French and Spaniards. 1746. French and Spaniards driven from Lombardy by Austrians.	1739. War with Spain. 1743. Fall of Walpole. 1745. Troubles in Scotland. Invasion of Young Pretender.	1740. War of the Austrian Succession. Maria Theresa rules Bohemia and Hungary. 1745. Francis I, husband of Maria Theresa, Emperor.	1746. Ferdinand VI, King. 1755. Earthquake at Lisbon kills 50,000.	1740. The Austrian Succession brings war. 1744. War with England and Austria. 1747. War with Holland.
	1762. Temporal power of the Popes restricted.	1756. Alliance with Prussia. 1760. George III, King. 1762. War with Spain. 1763. Peace of Paris. Canada and East Louisiana won by England.	1756. Seven Years' War—Austria, France and Russia against Prussia and England. Frederick the Great, although reduced to desperate straits, ultimately triumphs.	1756. New era of prosperity. 1762. Spain invades Portugal, wins Louisiana.	1760. Loss of all Canada. 1764. Jesuits expelled.
	1773. Jesuits expelled from Rome.	1775. War with the American Colonies. 1776. British army takes possession of New York. Hessians hired for service in America. 1781. Surrender of Cornwallis at Yorktown.	1772. First partition of Poland. 1778. War of the Bavarian succession. Bavaria seized by Germany.	1767. Jesuits expelled from Spain.	1770. Marriage of the dauphin to Marie Antoinette. 1774. Louis XVI, King. Turgot unsuccessfully attempts financial reforms. 1776. Franklin in Paris. 1778. Alliance with America. 1780. French, Dutch and Spanish leagued against English.
		1783. Treaty of Versailles. Independence of the United States acknowledged.	1786. Death of Frederick the Great.	1783. California settled. 1788. Spain joins in war against England. 1788. Charles IV, King.	1783–87. Financial ministry of Calonne. Deficit increases. 1788. Financial crisis. States-General summoned. 1789. French Revolution begins.
	1796-1797. Napoleon's Italian campaign.	1793. First coalition against France directed by England. 1798. Nelson destroys French fleet near Alexandria.	1792. War with France. 1793. First coalition against France. Prussia wins part of Poland. 1797. Napoleon's Austrian campaign.	1796. Spain joins France in war with England.	1792. War with Germany. France declared a republic. 1793. King and Queen beheaded. Reign of Terror. 1795. Napoleon Bonaparte commands the army. 1796. War in Italy. 1797. Napoleon in Austria.
	1798. Roman republic proclaimed by the French.	1798. Second coalition against France. 1801. Union of England and Ireland.	1800. France defeats Austria.		1798. Expedition to Egypt. 1800. Battle of Marengo.
1800-1900 A. D. Industrial revolution. Democratic institutions spread in Europe. Rise and fall of Napoleon. Formation of German Empire. Colonization of Africa and Asia by European Powers. Rapid growth of the United States.	1802. Napoleon, President of the Italian Republic. 1805. Napoleon crowned King of Italy. 1808. Rome annexed by Napoleon to the kingdom of Italy.	1803. Successful war in India. 1805. Napoleon defeated at Trafalgar. 1806. Fourth coalition against France. 1808. Wellesley invades Spain.	1804. The emperor of Germany becomes emperor of Austria. Holy Roman Empire ends. 1806. Confederation of the Rhine. 1809. Peace of Vienna.	1803. Napoleon dominates Spain. 1805. Battle of Trafalgar. 1808. Madrid taken by the French. Joseph Bonaparte, King.	1802. Napoleon, President of the Italian Republic. War with England. 1804. Napoleon I, Emperor of the French. 1805. Battle of Austerlitz. 1806. Battle of Jena. 1807. War with Russia. Invasion of Portugal. 1809. Battle of Wagram. 1810. Continental peace except with Spain.
		1812. War with the United States.	1812. Austria in alliance with France against Russia. 1813. War of German Independence.	1812. Battle of Salamanca.	1812. Russian campaign. 1813. Battle of Leipzig.
	1814. Fall of Napoleon. Kingdom ceases. Jesuits re-established.			1814. Ferdinand VII restored.	1814. Allies enter Paris. House of Bourbon restored. Napoleon exiled to Elba.
	1815. Italian states revived; Austria dominates Italy.	1815. British defeated at New Orleans. Wellington victorious at Waterloo. The Allies enter Paris.	1815. German League. Congress of Vienna. Prussia wins more territory.	1815. American colonies set up independent republics.	1815. Hundred Days' War. Battle of Waterloo. Napoleon, defeated, abdicates.

THE FALL OF NAPOLEON, A. D. 1715-1815

Russia	Scandinavia	Ottoman Empire	Other Countries	Arts and Sciences	Literature
	1718. Charles XII invades Norway and is killed.	1717. Turks lose Belgrade.			
1721. Peter assumes the title "Emperor of all the Russians."	1721. Peace of Nystadt ends war between Sweden and Russia.	1723. Turks and Russians attempt to dismember Persia.	1723. Jesuits expelled from China.	1721. Inoculation for smallpox introduced.	Pope, Defoe and Swift.
1727. Treaty with China.					
1730. Peter II, last of the Romanovs, dies.	1730. Christian VI, King of Denmark.	1734. Turks driven from Persia by Nâdir Shah.	1733. Frederick Augustus II, King of Poland.	1728. Behring Strait discovered.	Montesquieu and Voltaire.
1740. Ivan VI, Czar.	1741. Swedes driven out of Finland by Russians.	1740. Renewed invasion of Turkey by Persia.	1739. India invaded by Persia. Delhi sacked. 1744. Hostilities between the French and English in India.	1740. Linnaeus begins systematic teaching of natural history.	
		1745. Defeat of Turks at Kars.	1746. Dutch take Java.		
1756. Russia joins Seven Years' War against Prussia.			1756. Calcutta taken by the Nabob of Bengal. English massacred.	1750. Franklin's discoveries in electricity.	Voltaire, Diderot and Rousseau.
1762. Catherine II reigns.			1761. China wins Mongolia.	1761. Potatoes first planted in France.	
1768. War with the Ottoman Empire.	1772. Despotism reestablished in Sweden by Gustavus III.	1768. Egypt independent under the Mamelukes.	1765. Establishment of the English in India. 1766. Power of the Mamelukes revived in Egypt under Rodyan and Ali Bey. 1772. Poland dismembered.	1767. First spinning machine in England. 1768–79. Voyages and discoveries in the Pacific of James Cook. 1769. Watt improves steam engine.	Lessing, Burke, Blackstone, Goldsmith and Adam Smith.
1774. Revolt of the Cossacks. 1776. Potemkin dominates Russia.			1774. Warren Hastings first governor-general of India. 1776. Lord Pigot governor general of the East Indies.	1774. Priestley discovers oxygen.	Kant's critical philosophy.
1787. War with the Turks. Russia expands to the South.		1783. Russia takes Crimea. 1787. Disastrous war with Austria and Russia.	1788. English take Australia.	1781. Balloon invented. 1782. Lavoisier founds modern chemistry. 1783. Fitch operates steamboat on Delaware River.	Gibbon's *History*.
	1792. Gustavus IV, King of Sweden.				
		1794. Bulgaria devastated.	1794. Polish revolt quelled.	1793. Metric system of weights and measures.	Burns's *Poems*.
			1795. Final partition of Poland.		
1796. Unsuccessful war with Persia.			1797. Swiss revolution. Helvetian Republic declared.	1796. Jenner discovers vaccination. 1797. Malthus announces his doctrine.	Schiller's works.
1801. Alexander, Czar.	1801. After destruction of Danish fleet by English at Copenhagen Denmark and Sweden accede to the alliance between England and Russia.	1798. War with the French in Egypt.	1801. Shinto forces dominate Japan.	1801. Volta's battery invented.	Goethe's *Dramas* and *Poems*.
1804. War with Persia. 1805. Russia joins the coalition against France.		1803. Insurrection of Mamelukes at Cairo.	1806. Louis Napoleon, King of Holland.	1804. Code Napoléon reforms French law.	
1807. Treaty of Tilsit.	1808. Finland invaded by the Russians. 1809. Charles XIII, King of Sweden.	1807. War against Russia and England. 1809. Russians defeated.		1807. Fulton's steamboat. 1808. Lithography invented. 1810. First steamboat built in Europe.	Cuvier's *Natural History*.
1812. Invasion of Napoleon. Moscow burned. French Grand Army destroyed in retreat.		1812. Mohammed Ali rules Egypt. 1813. Serbia invaded by Turkish army.	1812. The Poles declared a nation by Napoleon. Diet of Warsaw. American war with England.		Chateaubriand.
	1814. Union of Sweden and Norway as two kingdoms under one monarch.	1814. Malta falls to England.		1814. Steam carriages and gas lights used in England.	
1815. The Holy Alliance formed.			1815. William I, King of the Netherlands.	1815. Safety lamp invented by Davy.	Wordsworth's *Poems*.

FROM THE FALL OF NAPOLEON TO THE OPENING

Characteristics of the Centuries	United States	Great Britain	Prussia, Austria	France	Spain and Portugal
1800-1900 A. D. Continued	1816. U. S. Bank incorporated. 1817. James Monroe, President.	1816. Bombardment of Algiers. The Bey compelled to abolish slavery.	1815–48. Era of reaction under Metternich.		1815. Union of Portugal and Brazil under John VI. 1817. Slave trade abolished.
	1818. Great Lakes Treaty with England. 1821. Monroe re-elected. Missouri compromise bill passed.	1820. George IV, King. Cato street conspiracy. 1821. Trial of Queen Caroline.	1819. Carlsbad Resolutions suppressing freedom of education. 1821. Insurrection in Moldavia and Wallachia.	1818. France joins in Holy Alliance. 1821. Death of Napoleon at St. Helena.	1820. Revolutionary movement put down with help of Holy Alliance.
	1823. Monroe Doctrine.			1824. Charles X, King.	
	1829. Andrew Jackson, President.	1828. Wellington ministry. Irish disturbances. 1830. William IV, King. Difficulties with China. 1832. Reform bills prevent serious revolts.		1830. Algiers taken by the French. Revolution. Louis Philippe, King.	
		1834. Gradual abolition of Negro slavery in West Indies.	1833. Zollverein (German customs union) formed.	1833. Peerage abolished.	1833. Isabella II, Queen of Spain. Portugal a constitutional monarchy.
	1837. Independence of Texas acknowledged. Martin Van Buren, President. 1841. Death of Harrison, and succession of Tyler.	1837. Victoria, Queen. 1838–48. People's Charter agitation. 1840. War with China over the opium trade. War in Syria; Great Britain an ally of Austria and Turkey.	1840. Frederick William, King of Prussia.	1840–48. Reaction and corruption under Guizot. 1844. War with Morocco.	1837. The monasteries in Spain dissolved. 1842. Insurrection in Barcelona.
	1845. Texas annexed to the U. S.; Polk, President. 1846. War with Mexico. The Oregon Treaty with Great Britain, settling the northwestern boundary of the U. S.	1845. Severe Irish famine. 1846. Repeal of the English corn laws.			1846. Civil war in Portugal.
	1848. Gold discovered in California. 1849. Zachary Taylor, President. Railroad from Boston to New York.	1848. Civil war in Ireland. Habeas Corpus Act suspended.	1848. Revolution in Hungary. Francis Joseph, Emperor. 1849. New Constitution promulgated for Austria.	1848. Abdication of Louis Philippe, and a republic proclaimed. Louis Napoleon, President. Bloody insurrection in Paris.	
	1850. Attempted invasion of Cuba by filibusters. Texas boundary settled. Fugitive Slave Law passed.	1850. The war in Lahore ended. The Punjab annexed to the British Crown. English forces defeated in South Africa by the Kafirs.	1850. Hanover withdraws from the Prussian alliance. New constitution for Prussia. Hungarian revolt under Kossuth put down.		1851. Death of Godoy, "Prince of Peace."
	1853. Franklin Pierce, President.	1853. Kafir war ended.		1852. Louis Napoleon declared Emperor.	
	1854. Treaty with Japan.	1854. Crimean War. Treaty of alliance with France.		1854. Crimean War against Russia.	
	1855. Panama Railroad completed.	1855. British fleet bombards and partially destroys Canton, China.	1856. Hungarians granted amnesty.	1856. Peace with Russia.	
	1857. Dred Scott decision. James Buchanan, President. Great financial panic.	1857. Rebellion in India begins. King of Delhi proclaimed Sovereign of India.			
	1859. John Brown's raid on Harpers Ferry.	1858. Property qualification for members of Parliament abolished. 1860. Rebellion in India subdued.	1859. Austria at war with France and Sardinia.	1859. War with Austria. 1860. Era of colonial expansion in Africa and the Pacific.	1859. War with Morocco. 1860. Defeat of the Moors.
	1861. Secession of the Confederate States. Opening of the Civil war, 1861–1865. Abraham Lincoln, President. 1863. Gettysburg; Vicksburg turns tide of war in favor of Union. Draft riots in New York city.	1861. Dispute with United States over arrest of Mason and Slidell.	1861. William I, King. New constitution for Austria. Civil and political rights granted Protestants.	1863. The French occupy Mexico.	
	1865. Assassination of President Lincoln; Andrew Johnson, President. 1866. Civil Rights Bill passed.	1865. Fenian outbreaks in Ireland.	1864. Austria and Prussia at war with Denmark. Schleswig-Holstein seized. 1866. Prussia and Austria at war. Battle of Sadowa. First parliament of the German Confederation.	1864. Maximilian accepts Mexican crown. 1867. French forced to withdraw from Mexico.	1864. Rupture with Peru. 1865. Dispute with Chile. Valparaiso shelled.

OF THE WORLD WAR—A. D. 1815-1914

Italy and Greece	Russia, Scandinavia	Other Countries	Arts and Sciences	Literature
1815. Kingdom of Two Sicilies restored.	1815. Poland united to Russia.		1815. The abolition of the slave trade by the Congress of Vienna.	Scott's *Novels*.
		1817. The Mahratta power completely overthrown in India by the British.	1817. Public schools established in Russia.	Byron, Shelley, Coleridge.
		1819. Bolivar, President of Colombia, South America. Peru and Guatemala independent. Brazil independent.	1819. The steamship *Savannah* makes the first trip across the Atlantic.	
1821. Austrian invasion of Italy.				
1822. Greek revolution. Declaration of Independence.		1822. Iturbide, Emperor of Mexico.		
		1824. Mexico a republic.	1824. Inland navigation develops in Europe and United States. Railway opened in England.	
	1826. Nicholas I crowned at Moscow. War against Turkey.	1826. Missolonghi and Athens taken by the Turks.		Vast increase in periodical literature.
		1829. Venezuela independent.		Balzac's *Novels*.
	1830. Polish revolt put down. Armenia conquered.	1831. Belgium independent, Leopold I, King.	1831. Reaper invented. Faraday discovers electromagnetic induction.	Poe's *Poems* and *Tales*.
1832. Kingdom of Greece founded.		1833. Santa Anna, President of Mexico.	1832. Trade-unions spread in Europe.	Hawthorne's writings.
			1837. Morse patents the telegraph.	Emerson's *Essays*.
		1839. Turkey at war with Egypt.		
		1840. William I abdicates as King of Holland.	1840. Penny postage in England.	Pushkin, Heine.
		1842. Insurrection in India. China opens treaty ports.	1842. Ether anesthesia introduced.	
1843. King of Greece accepts a constitution.				Victor Hugo's works.
		1845. China makes trade treaty with United States.		
		1847. Soulouque, President of Haiti.	1847. Great canal from the Durance to Marseilles completed. Railroad building in Germany. Sewing machine invented and patented.	Gogol, Flaubert.
1848. Rising of the great Italian cities in revolution.	1848. Revolt of Holstein against Denmark is supported by Frederick VII of Prussia.	1848. Holland receives a constitution. Insurrection in Ceylon. Hungary declared independent.		Longfellow's *Poems*.
1849. Victor Emmanuel, King. Rome surrenders to the French; Garibaldi leaves city. Bourbon rule begins.				
			1850. Great agitation on slavery in United States.	Darwin, Tennyson, Dickens and Browning.
		1851. Discovery of gold in Australia. Dutch expand in the East Indies.	1851. Daguerre makes important contributions to photography. Railway between Moscow and St. Petersburg opened.	George Eliot, Lowell and Ruskin.
		1852. Buenos Aires taken by the liberating army. War between the Turks and Montenegro.		
	1853. War declared against Turkey.	1853. Turkish-Russian War.	1853. Perry's expedition to Japan.	
1854. Sardinia joins Crimean War.	1854. War with France and England. Siege of Sebastopol.	1854. Commercial treaty between United States and Japan.		
1855. Important concordat between Italy and Austria.	1855. Alexander II, Emperor.	1855. Santa Anna abdicates the presidency of Mexico.	1855. Bessemer's steel process patented.	Spencer's *Philosophy*.
	1856. Evacuation of Crimea.	1856. China at war with England and France.		
	1858. Partial emancipation of the serfs.	1858. Massacre of Christians in Turkey. Suez Railroad completed.		
1859. War with Austria.	1859. Charles XV, King of Sweden and Norway.		1859. Telegraphic communication between India and England. Petroleum discovered in Pennsylvania.	Huxley, Renan and Dumas.
1860. Garibaldi lands in Sicily and assumes dictatorship. Sicily and Naples liberated.			1860. Pony express between Mississippi and Pacific Coast.	
1861. Victor Emmanuel II, King of Sardinia, first King of Italy.	1861. Russian serfs emancipated.	1861. Canton restored to the Chinese by the French and English.		
1862. Insurrection in Greece.				
			1863. Abolition of slavery in the United States.	Blackmore's *Lorna Doone*.
1864. Florence made the capital of Italy.	1864. Russia drives Caucasian tribes into Turkey. Schleswig-Holstein seized by Prussia and Austria.	1864. Nankin, China, taken by Gordon for the Imperialists.	1864. Red Cross organized at Geneva.	
1865. Ionian Isles made over to Greece.			1865. Antiseptic surgery introduced.	
1866. Austrian war. Venetia proclaimed a part of Italy.	1866. Inauguration of trial by jury in Russia. War with Bokhara wins Russia more of central Asia.	1866. Fenians invade Canada. Repulsed.	1866. Open-hearth steel process introduced. Successful Atlantic cable.	Meredith, Taine, Arnold, Wallace.

FROM THE FALL OF NAPOLEON TO THE OPENING

Characteristics of the Centuries	United States	Great Britain	Prussia, Austria	France	Spain and Portugal
1800-1900 A. D. Continued	1867. General amnesty proclamation. Alaska bought. 1869. U. S. Grant, President. Union Pacific railway opened for traffic. 1869–76. Era of reconstruction. Carpetbaggers. Ku-Klux Klan. 1877. R. B. Hayes, President. 1879. Specie payment resumed. 1881. James A. Garfield, President, assassinated; Chester A. Arthur, President. 1885. Grover Cleveland, President. Apache Indian War. 1886. Haymarket riots, Chicago. 1889. Benjamin Harrison, President. Johnstown flood. 1892. Homestead steel strike. 1893. Grover Cleveland, President. 1894. Coxey's "Army." Labor troubles. Severe business depression. 1897. William McKinley, President. 1898. War with Spain. Hawaii annexed. 1899. Cuba, Puerto Rico and Philippines won.	1867. Reform bills. 1870. Irish Land Act passed. 1873. Payment of Alabama claims to the United States. 1875. Suez Canal bought. 1877. Queen Victoria proclaimed Empress of India. 1885. Wars in Sudan. 1887. Queen's Jubilee. 1889. Great labor strikes. 1890. Stanley returns from Africa. 1894. Manchester ship canal opened. 1895. Federation of Australia effected. 1896. South African troubles begin. 1897. Queen's Diamond Jubilee. 1899. War with Boers in South Africa.	1867. Autonomy for Hungary announced. Emperor crowned King of Hungary. 1870. War with France. Battle of Sedan. 1871. King of Prussia proclaimed Emperor of Germany. 1871. William I, Emperor; Alsace-Lorraine taken. 1878. Congress of Berlin to settle eastern problems. Occupation of Bosnia by Austria. 1882. Triple Alliance, Germany, Austria, Italy. 1885. Germany acquires colonies in Africa. 1888. Accession and death of Frederick III. William II, Emperor. Germany, Austria 1890. Bismarck dismissed in Germany. 1891. Triple Alliance renewed. 1893. Anti-Jesuit law repealed. 1894. Treaty with Russia. 1895. Kiel Canal opened. 1896. Germans adopt new code of laws.	1869. New constitution promulgated. 1870. War declared against Prussia. Battle of Sedan. Surrender of Metz. 1871. Capitulation of Paris. Peace ratified. 1873. Marshal MacMahon, President. 1874. Cambodia taken. 1881. Protectorate of Tunis. 1883. Madagascar colonized. 1890. War in Africa. 1891. Panama Canal scandals. 1894. Dreyfus convicted of treason. 1897. Fashoda incident. 1899–1906. Dreyfus case agitates nation.	1874. Alfonso XII, King. 1875. Civil war. 1893. War in Morocco. 1898. Spain loses American war.
1900 to date Japan becomes a world Power. Great commercial expansion in France, Germany, Japan, Great Britain and America. Power of the press grows. World War involves the principal nations.	1901. Philippine revolt quelled. 1902. Cuban independence effected. 1904. Panama Canal work begun. 1906. Earthquake at San Francisco. 1908. Financial panic. 1911. Standard Oil Trust ordered broken up by Supreme Court. 1912. Theodore Roosevelt bolts Republican Party. Woodrow Wilson, Democrat, elected. 1913. Federal Reserve Act.	1901. Edward VII, King. 1902. Alliance with Japan. 1903. Irish land bill passed. 1908. Old Age Pension law adopted. 1910. George V, King. 1912. Minimum wage law.	1902. Czechs trouble Austria. 1904. German troops defeated in Africa. 1905. Germany disturbs Morocco question. 1908. Austria absorbs Bosnia and Herzegovina.	1904. Disestablishment of Roman Catholic Church. 1905. Morocco partitioned. *Entente Cordiale* with Great Britain. 1906. Dreyfus cleared. 1908. Morocco further invaded. 1913. Poincaré, President.	1902. Alfonso XIII, King of Spain. 1908. Manuel II, King of Portugal. 1910. Portugal becomes a republic.

FROM THE WORLD WAR

Characteristics of the Centuries	United States	Great Britain	Prussia, Austria	France	Spain and Portugal
Era of educational and social philanthropies.	1914. Intervention in Mexico. 1915. Sinking of *Lusitania* alarms nation. 1916. Villa raids New Mexico. 1917. United States joins Allies in war. 1918. Men and money rushed to Europe. 1919. Prohibition in effect. 1920. Women granted the vote. 1921. Harding, President. 1924. Strict immigration law.	1914. Joins Allies in war against Germany. 1915. Naval victory over Germany. 1916. Irish revolt. 1917. Women granted the vote. Food shortage caused by submarine war. 1921. Irish revolt flames. 1922. Irish Free State formed.	1914. Germany and Austria in war against Allies. 1915. Submarine warfare begun. 1916. New drive to Paris pushed. 1917. Germans win in Russia. 1918. Republics formed in Germany, Austria. 1920. Horthy controls Austria. 1922. German Republic quells opposition. 1924. Reparation plan put in operation.	1914. Germans invade France. 1915. Bitter fighting in France. 1916. French power weakens. 1917. Armies in the trenches. 1918. World War ends. 1919. Peace arranged at Versailles. 1922. Order and trade restored after war. 1923. Military occupation of Ruhr. 1924. Serious inflation.	1915. Revolts in Portugal. 1919. New revolts in Portugal. 1921. Disasters in war in Morocco stir Spain.

OF THE WORLD WAR—Concluded

Italy and Greece	Russia, Scandinavia	Other Countries	Arts and Sciences	Literature
	1867. Alaska sold to the United States.	1867. Egypt claims independence. Mexico evacuated by French; native rule restored.		
			1868. Suez canal formally opened.	
1869. Vatican Council opened at Rome.				
1870. Rome is made the capital of Italy. Pope forcibly deprived of temporal sovereignty. Doctrine of papal infallibility adopted.		1870. Fenian raid in Canada.	1870. Railway from Calcutta to Bombay. Mont Cenis Tunnel completed.	Turgenev, Dostoevski.
	1871. Electric telegraph between Russia and Japan.	1871. Feudalism ended in Japan.		
			1873. European calendar introduced into Japan.	
		1876. First Chinese railway. Revolt against Turks in Bulgaria.	1876. Telephone invented by Bell.	
	1877. Russian War against Turkey.	1877. Diaz, President of Mexico.		
1878. Humbert, King. Leo XIII, Pope.	1878. Spread of Nihilism in Russia.	1878. Montenegro, Serbia and Rumania independent.	1878. Edison's incandescent lamp.	Ibsen, Tolstoy, Björnson.
	1881. Alexander III, Emperor, following assassination of Alexander II.			
1882. Death of Garibaldi. Triple Alliance with Germany and Austria.		1882. Japanese constitution.	1882. Pasteur finds disease bacilli. Panama Canal begun by French.	
		1883. Korea independent.		
			1884. Linotype machine.	
1885. War with Ethiopia.	1885. Ship canal from St. Petersburg to Cronstadt opened.		1885. Revised version of Old Testament published.	
		1886. Upper Burmah annexed to British India.		
1887. Alliance of Italy with Austria-Hungary and Germany.			1886. Statue of Liberty unveiled, New York harbor.	Mark Twain, Whitman, Zola.
	1888. Central Asian railway opened.			
			1889. Eiffel tower in Paris.	
	1890–1892. Famine in Russia.	1890. First Japanese Parliament opened.		
			1891. Canadian Pacific Railway completed. Rotary steam turbine.	Hardy, Chekhov, Gorki.
1891. Triple Alliance renewed.				
			1892. Gasoline internal combustion engine. Electric induction motor.	
1893. Pope's Jubilee at Rome.		1893. Kruger, President of (Dutch) Transvaal in South Africa.		
	1894. Nicholas II, Czar.	1894. China and Japan at war; Japan wins Korea and Formosa.		Brandes's *Essays*.
	1895. Jews driven from Russia.	1895. Belgium acquires African colony. Cuban revolution begins.	1895. X rays discovered.	
1896. Ethiopia routs Italy at Adowa.	1896. Census in Russia.	1896. European states divide Sudan.		Mitchell, James, Howell.
	1897. Control of Siberia liberalized.	1897. Turko-Grecian war.		
	1898. Russia leases Port Arthur.	1898. United States annexes Hawaii.	1898. Radium discovered.	
		1899. British and Dutch at war in South Africa. "Open Door Policy" in China adopted.		Kipling's *Stories* and *Poems*.
1900. Victor Emmanuel III, King of Italy.		1900. Boxer outbreak in China quelled by foreign troops.		
			1901. First radio signal sent across Atlantic.	
	1902. Trans-Siberian Railway opened.	1902. Cuba independent.	1902. The Hague Arbitration Court opened.	
1903. Pope Pius X.		1903. Panama independent.	1903. Wrights' airplane flies. Motion pictures developed.	Lagerlöf, Strindberg, Wilde.
	1904. War between Japan and Russia.	1904. Japan defeats Russia and begins era of Asiatic aggression.		
	1905. Russia yields Manchuria to Japan.	1905. Norway independent of Sweden.		
	1906. First Russian Duma.		1906. Simplon tunnel opened.	Tagore, France, Conrad.
1908. Sicilian earthquakes.			1909. Bleriot flies English Channel.	
1910. Greek constitution revised.		1910. Montenegro a kingdom.	1910. Discovery of North Pole announced.	
1911. Italy wins Tripoli from Turkey.		1911. Revolt in Mexico.	1911. South Pole reached.	
1912. Greece wins larger area.		1912. Balkan uprising drives Turkey from Europe; China becomes a republic.		

TO THE PRESENT: 1914 AND AFTER

Italy and Greece	Russia, Scandinavia	Other Countries	Arts and Sciences	Literature
1914. Italy deserts Triple Alliance.	1914. Russia joins Allies in World War.	1914. Japan joins Allies in World War.	1914. Panama Canal opened.	Yeats, Wells, Shaw.
1915. Italy joins Allies.	1915. Russian armies disorganized.	1915. Bulgaria and Turkey join Germany in World War; Armenians massacred.		
1916. Italian armies defeated.	1916. Death of Rasputin.	1916. Rumania joins Allies but is conquered by Austria.		
1917. Revolt in Greece.	1917. Bolshevist revolt in Russia.	1917. British win Palestine.		
1918. World War ends.	1918. Separate peace, Russia and Germany.	1918. Hungary a republic.		
1919. D'Annunzio seizes Fiume.		1919. Czechoslovakia, Yugoslavia, Poland and small Baltic states independent.	1919. First transatlantic flight.	Hamsun, Lewis, Cather.
		1920. League of Nations organized.		
1921. Revolts in Italy.	1921. Peace in Russia.	1921. Mexican disturbances quiet.		
1922. Mussolini, Dictator of Italy.	1922. Soviet Union formed. Church suppressed.	1922. Egypt independent; Turks depose Sultan.	1922. Radio broadcasting develops.	

CHARACTERISTICS OF THE CENTURIES	UNITED STATES	GREAT BRITAIN	GERMANY, AUSTRIA	FRANCE	SPAIN AND PORTUGAL
Democratic institutions lose ground as Fascist and Communist states rise.		1926. General strike.	1926. Germany admitted to League of Nations.		
	1927. Mississippi floods.	1927. Autonomous Dominions.	1927. Allies leave Germany.		1927. Portuguese in revolt.
	1929. Herbert Hoover, President; financial panic.	1929. Unrest in India.			
	1931. Depression.	1931. Financial crisis. Gold standard abandoned.	1931. Severe economic depression. Hitler becomes popular leader.		1931. Republic proclaimed. Alfonso XIII outlawed.
	1933. F. D. Roosevelt, President.		1933. Nazi party carries Reichstag elections. Hitler receives dictatorial powers. Anti-Semitic activity. Censorship.		1933. Church property expropriated. Redistribution of land. Secularization of marriage, education.
	1935. W.P.A. established. National Labor Relations Act. Social Security Act.	1935. Concentration of warships in Mediterranean to restrain Italian conquest of Ethiopia.	1935. Saar Territory recovered. Compulsory military service breaks Treaty of Versailles.	1935. Sit-down strikes develop as new industrial warfare technique.	
	1936. Soldier's bonus distributed. Presidential election; Roosevelt reelected. Sit-down strikes; rise of C.I.O.	1936. George V dies. Edward VIII King. Nonintervention policy in Spain. Edward VIII abdicates.	1936. Remilitarization of Rhineland. German-Japanese alliance. Rome-Berlin Axis formed.	1936. People's Front government of Léon Blum. Extensive program of socialistic legislation.	1936. Civil war breaks out. Loyalist republican government attacked by insurgents under Franco.
	1937. Labor troubles continue. Tension with Japan over war in Far East. U.S.S. *Panay* bombed and sunk.	1937. Coronation of George VI. New conservation government of Neville Chamberlain.	1937. Germany supports Spanish rebels. Protestant church resists Nazification.		1937. Italy, Germany aid insurgents. Loyalists aided by Russia.
	1938. Business recession; President Roosevelt announces plans for renewed government spending to invigorate industry. Administration at odds with Congress.	1938. Chamberlain policy of "European appeasement." Anthony Eden resigns. Large-scale rearmament program pushed. Munich Pact averts war.	1938. Germany annexes Austria and Czechoslovakian border districts. Anti-Semitism, militant nationalism intensified.	1938. People's Front government falls in financial crisis. Daladier receives dictatorial powers.	1938. Franco's drive to end war reaches Mediterranean. Loyalist cause crumbles. France, Britain refuse intervention.
	1939. Huge defense program. Trade agreements with Brazil and Turkey. Serious coal strike in Appalachian fields. Reorganization of executive agencies in Washington.	1939. Britain inaugurates a "stop-Hitler" campaign. Guarantees Polish, Rumanian and Greek borders. Conscription decreed. Alliance with France and Turkey. Declares war on Germany. Blockades German exports and imports.	1939. Annexation of Memel, Bohemia and Moravia. Rome-Berlin Axis strengthened. Germany invades Poland. Danzig returns to Reich. Germany at war with England and France. Germany and Russia annex Poland.	1939. Refuses to give up African colonies to Italy. Concludes alliance with Great Britain. War declared on Germany. Gamelin is Commander in Chief.	1939. Spanish war ends. Franco becomes head of government.
Old World suffers from war and threats of war.	1940. Cash-carry plan insisted upon in large sales to England and France. Neutrality maintained. National Labor Relations Board settles labor problems. Tremendous defense preparations made. National registration and conscription.	1940. Unsuccessfully opposes invasion of Norway, Holland, Belgium and France by Germans. Italy joins Germany. Winston Churchill chosen Prime Minister. Wealth and labor conscripted.	1940. Germans capture Denmark, Holland, Norway, Belgium and France. Italy enters war as ally of Germany. Japan and Rumania join with Germany and Italy.	1940. Premiers: First Daladier, second Reynaud, third Petain. Weygand succeeds Gamelin as Allied Generalissimo. France conquered by Germany and Italy.	1940. Spain rebuilds. Spain and Portugal neutral.
World War II. The "Axis," Germany, Japan, Italy, Finland, Rumania and Bulgaria against almost all other nations of the world, the 'Allies.'	1941. Tremendous defense program. Roosevelt, Pres.; Wallace, Vice-Pres. Lend-Lease Act aids England, China and Russia. Germany sinks U. S. ships. Neutrality Act repealed. Japan attacks U. S. at Pearl Harbor. U. S. joins Allies in World War II.	1941. Bombing raids damage England severely. England retaliates in Germany and Italy. England aids Greece. Many ships sunk. England conquers Ethiopia, Italian Somaliland, Eritrea, and Iraq. Allied with Russia. Japan conquers Hong Kong.	1941. Submarines and bombs do much damage to England and English shipping. Germany conquers Yugoslavia, Greece. Invades Russia.	1941. France under yoke of Germany and Italy.	1941. Neutrality maintained.
	1942. Japan captures Wake, Guam and Philippines. U. S. builds tremendous Army, Navy and Air force. Much shipping destroyed. Normandie burns and capsizes. Japan bombed. Price ceilings to stop inflation. Rationing. Japan loses naval battles of Coral Sea and Midway Island, invades three Aleutian islands. U. S. invades Solomon Islands.	1942. Submarines sink many allied ships. Japan conquers Malaya and Singapore. Japan invades Burma and New Guinea. British troops capture Madagascar. Germany bombed.	1942. Germany suffers heavy losses in Russia. Submarines sink many allied ships. Terrific aerial bombardment by England. Unrest in conquered nations. Drives deeply into Russia.	1942. Great suffering. Germany executes many Frenchmen in reprisals. German favorites, Laval and Darlan, in power.	1942. Neutrality maintained.
	1943. U. S. captures Guadalcanal, part of New Guinea, and Algeria: Wins important victory in Bismarck Sea. Alcan Highway in operation. Boys 18 drafted. Women in Military Services. Wins Battle of Africa. Conquers Attu I. from Japs.	1943. Recaptures Egyptian territory. Gen. Montgomery captures Libya. India demands independence. Gandhi, imprisoned, fasted 21 days. Germany heavily bombed. Chief menace is the submarine. Conquer Axis in Africa.	1943. Suffered severe losses in Russia. Bombings by Allies continue. Submarines sink many allied ships. Defeated and driven from Africa.	1943. Darlan, aiding Allies assassinated. De Gaulle and Giraud lead free French in Africa, fight Axis. Many ships join Allies. Axis defeated in Africa.	

TO THE PRESENT: 1914 AND AFTER

ITALY AND GREECE	RUSSIA, SCANDINAVIA	OTHER COUNTRIES	ARTS AND SCIENCES	LITERATURE
1924. Greece a republic.		1924. Kemal, Dictator of Turkey, westernizes the people.		
	1927. Industrial growth forced in Russia.	1927. Civil war in China. Iraq independent.	1927. Lindbergh flies Atlantic.	
1929. Temporal power of Pope restored.	1929. Finland thrives.		1929. Press censorship spreads. Sound motion pictures developed.	
	1931. Russia makes rapid economic progress. Trade agreements and nonaggression pact with France.	1931. Japan seizes Manchuria; sets up puppet state of Manchukuo.	1931. Air conditioning becomes popular.	Karel Capek
		1932. Revolution in Siam. Turkey joins League of Nations.		Noel Coward
	1933. Second 5-year plan begun. Liquidation of kulaks. Severe food shortage.	1933. Revolt in Cuba ends dictatorship of Machado.		H. H. Richardson (Australia)
1935. Italy attacks Ethiopia. Sanctions imposed by League of Nations.	1935. Repression of Trotskyist counterrevolution.	1935. War between Bolivia and Paraguay over Gran Chaco territory ended.	1935. Color motion pictures develop. Streamline railway trains.	Emil Ludwig Thomas Mann Stephen Vincent Benét
1936. Conquest of Ethiopia completed. Sanctions withdrawn. Italy intervenes in Spanish Civil War.	1936. New Constitution providing for theoretical democracy.	1936. Chiang Kai-shek rouses China against Japan.	1936. *Normandie*, *Queen Mary*, world's largest ocean liners. San Francisco-Oakland bridge opened. Boulder Dam finished.	Ernest Hemingway Eugene O'Neill Pearl Buck
1937. Italy withdraws from League of Nations. Acts with Germany in Rome-Berlin axis.	1937. Tension with Italy over Spanish War. Tension with Japan over Sino-Japanese War.	1937. Japan pushes invasion of China. Dictatorship in Brazil.		Maxwell Anderson
1938. Anglo-Italian treaty recognizes Italy's conquest of Ethiopia and eases tension in Mediterranean.	1938. Purge of alleged counter revolutionaries continues. Soviet does not fight to protect Czechoslovakia.	1938. Poland forces concessions from Lithuania. Japanese invasion of China checked. Mexico expropriates foreign oil properties. Czechoslovakia relinquishes border districts to Germany, Hungary and Poland.	1938. Howard Hughes round-the-world flight in record time: 91 hours, 8 minutes, 10 seconds. New York to New York.	
1939. Italy demands Tunisia. Death of Pope Pius XI and election of Cardinal Pacelli as Pius XII. Conquest of Albania.	1939. Soviet wants Triple Alliance with France and Great Britain. Russia enters into trade and friendship agreements with Germany. Divides Poland with Germany.	1939. Czechoslovakia broken up. Japan takes Hainan and Spratly Islands in Pacific. Death of King Ghazi of Iraq.	1939. Discovery of invisible glass. Liner Queen Elizabeth launched. Cyclotron invented for smashing atoms.	Robert E. Sherwood Carl Van Doren
1940. Italy joins in war on side of Germany. France conquered. Italy makes war on Greece. Italy suffers heavy losses in Greece, Albania and Africa.	1940. Russia wins war with Finland, takes territory. Norway attacked and conquered by Germany. Russia takes over Lithuania, Latvia and Estonia.	1940. Australia joins England in war against Germany. War continues between Japan and China. Japan wins more Chinese territory. Denmark, Holland and Belgium conquered by Germany. Axis dominates Balkans. Michael, King of Rumania, Carol abdicates and goes to Spain. Rumania cedes territory. Rumania and Japan join "Axis."	1940. World's wars make United States center of scientific research. Super telescope on Mount Palomar is built.	The Time of Your Life, by Saroyan, and Grapes of Wrath, by Steinbeck
1941. Germany and Italy conquer Greece.	1941. Russia attacked and invaded by Germany, Finland and Rumania. England and Russia become allies. Great suffering in Norway.	1941. Japan and China continue war. Carol goes to Havana. Germany conquers Yugoslavia and Hungary. Japan enters Thai. U. S. freezes Japanese credits. Allies control Iran. Japan makes war on U. S. and England.	1941. Nylon, rayon and cellophane much used.	Countee Cullen Richard Llewellyn D. W. Brogan H. M. Pulham, Esq. by J. P. Marquand
1942. Great suffering in conquered Greece. Heavy fighting in Libya and Egypt.	1942. Russia repels Axis, recaptures much Russian territory, inflicts severe damage on enemy. Not at war against Japan. Sweden neutral. Germany drives to Caucasus.	1942. Heavy fighting in Egypt and Libya. King Carol in Mexico. Japan conquers Sumatra, Java and Borneo. Chinese valiantly fight Japanese. Turkey, Switzerland neutral. Japan captures Malaya, Singapore, Burma and Sarawak.	1942. Great advances in aviation and war machinery. Synthetic rubber developed.	Delilah by Marcus Goodrich Kabloona by Gontran de Poncins Out of the Night by Jan Valtin
1943. Allies capture Libya. Heavy Italian casualties in Russia. Italy loses all African territory.	1943. Received lend-lease aid from U. S. Russia regains much territory lost last summer and fall, in great winter victory.	1943. Japan loses Guadalcanal, part of New Guinea, many ships, and Naval Battles near Solomon Islands, and in Bismarck Sea. Madame Chiang Kai-shek visits U. S. Japan loses Attu Island.	1943. U. S. leads world in war production.	

PARALLEL OUTLINES OF AMERICAN HISTORY

I. PERIOD OF DISCOVERY AND EXPLORATION, 1492-1607

Rulers	Spanish Explorers
1474-1516. Ferdinand and Isabella.	1492. Columbus discovers the Bahama Islands and Hispaniola (Haiti).
	1493–1496. Columbus discovers Jamaica and other islands.
	1498–1500. Columbus on his third voyage discovers the mainland of South America without knowing it.
	1499–1507. Amerigo Vespucci visits the American coast.
	1502–1504. Columbus further explores the coast on his last voyage.
	1510. Spanish settle at Darien, in Panama.
	1513. Ponce de León visits Florida; Balboa sees the Pacific.
	1515. Havana is founded; Cuban Indians are subdued.
1516–56. Charles I.	1516. Rio La Plata is discovered by Solis.
	1519–1521. Cortez conquers the Aztecs in Mexico; Magellan's ship makes the first round-the-world trip.
	1520–1527. Spanish ships explore the Atlantic coast.
	1525–1533. Pizarro conquers the Incas in Peru.
	1530. Spanish colonization of South America begins.
	1534. Mendoza founds Buenos Aires.
	1542. De Soto reaches the Mississippi River.
1556–1598.	1540–1542. Coronado explores from Mexico north into Colorado.
Philip II.	1565. Spain settles St. Augustine, Fla., the oldest town within the present United States.
1598–1621. Philip III.	1605. Santa Fe, N. M., settled.

Rulers	Portuguese Explorers
1495–1521. Emanuel I.	1500. Cabral discovers Brazil and enters the Amazon. Cortereal skirts the coast of Labrador.
	1530. Settlement of Brazil begins.

Rulers	English Explorers
1485–1509. Henry VII. 1509–1547. Henry VIII. 1547–1553. Edward VI. 1553–1558. Mary. 1558–1603. Elizabeth. 1603–1625. James I.	1497. The Cabots skirt the coasts of Labrador and New England. 1565. Hawkins visits Florida. 1576–1578. Frobisher seeks a Northwest Passage in Canada. 1577–1580. Drake, sailing around the world, skirts the shores of South America, Mexico and California. 1583. English attempt a settlement in Newfoundland. 1584. English take possession of Virginia. 1587. Raleigh plants a colony at Roanoke Island, North Carolina, but it is lost; there Virginia Dare was the first American-born child of English parents. 1602. Gosnold explores the shores of New England. 1603. Pring explores the Massachusetts coast. 1606. English companies are formed to plant colonies in America.

Rulers	French Explorers
1515–1547. Francis I. 1547–1559. Henry II. 1559–1560. Francis II. 1560–1574. Charles IX. 1574–1589. Henry III. 1589–1610. Henry IV.	1504. French fishermen visit the Newfoundland Banks. 1524. Verrazano explores the North Atlantic coast. 1534–1535. Cartier explores the Canadian shore and enters the St. Lawrence. 1562. Huguenots under Ribault settle in South Carolina, but the Spanish drive them away. 1567. French ships attack the Spanish fort at St. Augustine. 1603. Champlain arrives in the St. Lawrence. 1604. Champlain plants a colony in Acadia (Nova Scotia). 1605–1606. French continue explorations along the New England coast.

II. THE COLONIAL PERIOD, 1607-1783

English and Dutch Colonies	French Colonies	Spanish and Portuguese Colonies
1607. First permanent English settlement in America, Jamestown, Va.	1608. Quebec founded.	
1609. Hudson River explored by Dutch.	1609. Lake Champlain discovered.	
1615. Dutch place forts on Hudson River.	1615. Lake Huron explored.	
1619. First representative government in America set up at Jamestown.		
1620. Pilgrims land in Massachusetts.		1620. Church quarrels disturb Mexico.
1626. New Amsterdam founded.		
1630. Boston founded.	1630. English invade Canada.	1630. Dutch win Brazil.
1634. Maryland settled by Catholics.	1634. Lake Michigan explored.	1634. Central American Indians subdued.
1635. Connecticut Valley settled.		
1636. Rhode Island settled. Harvard University, first in United States, founded.		1636. Colonial trade monopolized by Spanish Crown.
1638. Swedes settle in Delaware.		1638. Bogota founded.
	1642. Montreal founded.	1642. Spain conquers Chile.
1647–1664. Stuyvesant governor of New Netherland.		
1655. Dutch conquer Swedish settlements.		1655. Portugal recovers Brazil from Dutch.
1663. Settlement of Carolina arranged.	1663. Traders and missionaries venture beyond Lake Superior.	
1664. New Jersey and New York taken by English, ending Dutch North Atlantic colonies.		
1669. Locke's Carolina Constitutions drafted.	1669. La Salle explores Ohio River.	
1675. Indian wars in New England.		
1676. Bacon's Rebellion in Virginia.		
1681. Pennsylvania granted to Penn.	1681. La Salle descends Mississippi River.	1681. Indian revolts in New Mexico and Arizona.
1686–1689. Andros, royal governor of New England.		1689. Buccaneers ravage Spanish Main.
1690. Indians raid Mohawk Valley, New York.		
1692. William and Mary College founded; Salem witchcraft delusion.		1692. Gold found in Brazil.
	1699. Biloxi, Mississippi, founded.	
1701. Yale College founded; Captain Kidd hanged.		
1704. Newspaper published in Boston.		
1706. French and Spanish invade Carolina.		
1711–1715. Indian wars in Carolina.	1711–1713. English invade Canada.	1711. French take Rio de Janeiro.
1718. Law's Arkansas project fails.	1718. New Orleans founded.	
1729. Separation of North and South Carolina.	1729. Indians raid Natchez settlement.	
1733. Savannah, Georgia, founded.		1733. Jesuit missions set up in Arizona.
	1743. Explorers sight the Rockies.	1743. Pirates take Manila treasure fleet.
1745. Indian wars in New York.	1745. English capture Louisburg.	
	1749. Forts built in the Ohio valley.	1749. Spain and Portugal agree on boundaries of their colonies.
1754. Congress of Albany plans border defenses.		
1754–1763. French and Indian War.		
1759. Wolfe captures Quebec.	1755. English exile Acadians.	1759. Brazilian trade expands.
		1761. English take Havana.
1763. Peace; English win Canada and East Louisiana; Indians led by Pontiac alarm frontier settlements.		1763. Spain wins Havana and West Louisiana, yields Florida to England.
1765. English Stamp Act inspires colonial congress of protest.		1765. Spanish trading restrictions eased.
1766. Stamp Act repealed but colonial unrest continues.		1766. Acadian exiles settle in Louisiana.
1767. English Townshend Acts stimulate colonial desire for liberty.		1767. Spain expels Jesuits from her territories.
1768. English troops quartered in Boston.		1768. French in Louisiana attempt revolt against Spain
1770. Boston massacre.		1769. Spanish missions established in California.
1771. Settlement begun in Kentucky and Tennessee.		
1773. Boston Tea Party; Committees of Correspondence organized.		1773. Destructive earthquakes in Central America.
1774. First Continental Congress meets; Kentucky grows rapidly.		
1775. American Revolution begins; battles, Lexington and Bunker Hill.		
1776. Declaration of Independence adopted; British leave Boston but win New York; Virginia adopts first constitution; Washington takes Trenton.		1776. Viceroyalty of Buenos Aires set up, governing Uruguay, Paraguay and Bolivia. Tucson founded.
1777. Lafayette arrives; British win Philadelphia; Burgoyne surrenders.		
1778. British invade the South; France joins in war against England.		
1779. John Paul Jones challenges English naval supremacy.		
1780. English win the Carolinas.		1780. Revolt in Peru.
1781. Articles of Confederation effective; Cornwallis surrenders, ending war.		1781. British take Guiana.
1783. England and Europe acknowledge American independence.		1783. Florida is returned to Spain.

III. FROM THE END OF THE REVOLUTION TO THE CIVIL WAR, 1783-1861

THE UNITED STATES			BRITISH NORTH AMERICA	LATIN AMERICA AND THE WEST INDIES
POLITICAL EVENTS	ADMINISTRATIONS	SOCIAL AND INDUSTRIAL PROGRESS		
	1783–1787. Confederation of independent states.	1784. First successful daily newspaper in America; Fitch's steamboat tried out.	1784. Tories fleeing United States colonize Ontario and New Brunswick.	
1785. Church disestablished in Virginia; foreign ambassadors appointed.				
1786. Shay's rebellion in Massachusetts; Constitutional convention called. 1787. Constitution drawn up; disposal of Northwest Territory decided.		1786. Cotton planting extended in the South.	1786–1796. Lord Dorchester, Governor-General.	1786. European rivalry in Guiana.
1789. Organization of the executive, legislative, and judicial departments of the new government. The first Congress meets in New York.	**George Washington,** *President.* John Adams, *Vice-President.* Thomas Jefferson, *Secretary of State.* Alexander Hamilton, *Secretary of Treasury.* Henry Knox, *Secretary of War.* Edmund Randolph, *Attorney-General.* F. A. Muhlenburg, *Speaker of the House.* John Jay, *Chief Justice, Supreme Court.*	1789. Control over foreign commerce passes from the states to the Federal Government. North Carolina establishes the first of the state universities.	1789 and 1793. Sir Alexander Mackenzie explores the Athabasca region.	1789. Many Carolina planters move to Louisiana.
1790. First decennial census is taken. Congress decides to locate the national capital on the Potomac. Assumption of the public debts of the several states. Passage of the first excise law.		1790. Samuel Slater sets up cotton machinery at Pawtucket, R. I. First patent law is passed.	1790. British Parliament appropriates £3,110,000 to reimburse the Loyalists for their losses in the American Revolution.	
1790–1795. War with the Indians north of the Ohio.		1790–1799. Rapidly increasing demand for cotton.		
1791. Organization of the Bank of the United States. Ratification of the first ten amendments to the Constitution. Admission of Vermont into the Union.			1791. Constitutional Act passed by British Parliament separating Canada into Upper and Lower provinces. French law was continued in Lower while English law was established in Upper Canada.	1791. Beginning of the negro insurrection in Haiti.
1792. Admission of Kentucky. Formation of the first political parties under the Constitution.		1792. Founding of Williams College.		1792. Sugar first refined in Louisiana. The process was commercialized in 1794 by Boré.
1793. Cornerstone of national capitol laid by Washington. Genet's meteoric career as minister from France.	**George Washington,** *Re-elected President.* John Adams, *Re-elected Vice-Pres.*	1793. Whitney invents the cotton gin; cotton production greatly stimulated. Establishment of a mint at Philadelphia. Rapid expansion of America.	1793. Legislature of Upper Canada provides for gradual abolition of slavery.	
1794. Whisky insurrection in Western Pennsylvania. Jay Treaty with England. Wayne defeats the Indians.		1794. Mail boats and passenger boats are established on the Ohio. Founding of Bowdoin College.	1794. Toronto made capital of Upper Canada. 1794–1795. Political disputes in Lower Canada.	1794. Toussaint L'Ouverture becomes leader of the Haitian revolt.
1795. Treaty with Spain. Treaty at Greenville with the Indians north of the Ohio.				1795. Subjugation and deportation of Jamaican maroons (descendants of runaway slaves). France takes Spanish part of Haiti.
1796. Admission of Tennessee. Washington issues his farewell address, September 17. The French Directory issues a decree against American commerce.			1796. Surrender by Great Britain of military posts in United States Northwest Territory.	
1797. Special session of Congress to consider relations with France. The X. Y. Z. overtures. *Constitution* launched.	**John Adams,** *President.* Thomas Jefferson, *Vice-President.*	1797. The first patent for a cast-iron plow is granted Charles Newbold of New Jersey. A financial panic.	1797. Beginning of construction of Sault Ste. Marie Canal.	
1798. Adoption of the Eleventh Amendment. Passage of the Alien and Sedition laws. The Virginia and Kentucky Resolutions. The Navy Department is established. Naval quasi-war with France.		1798. "Hail Columbia" is composed by Joseph Hopkinson. First salt manufactory established in Ohio.		
1800. The capital is removed from Philadelphia to Washington. Treaty with France ends alliance of 1778.		1800. India rubber is imported into the United States.	1800–1812. Many Americans and Scots immigrate into Upper Canada.	1800. Transfer of Louisiana from Spain to France.
1801. John Marshall is appointed Chief Justice. 1801–1805. War with Tripoli.	**Thomas Jefferson,** *President.* Aaron Burr, *Vice-President.*	1801. New York *Evening Post* is founded by Alexander Hamilton.		
1802. Spain withdraws the right of deposit at New Orleans. U. S. Military Academy established.		1802. The Du Pont powder works established.		1802. French capture l'Ouverture.
1803. Louisiana is purchased from France for $15,000,000. Admission of Ohio. Case of Marbury *vs.* Madison is decided.		1803. Tobacco is exceeded by cotton as an export crop. First shipment of anthracite coal from Lehigh to Philadelphia. Grain cradle is patented.	1803. Slavery made illegal in Lower Canada.	1803. Great Britain reacquires British Guiana by treaty. France abandons effort to subjugate Haiti.
1804. Adoption of the Twelfth Amendment. Hamilton killed in a duel by Burr. 1804–1806. Lewis and Clark expedition.				1804–1806. Dessalines Emperor of Haiti; massacre of White population.
1805–1807. Conspiracy of Aaron Burr.		1805. Robert Fulton originates the marine torpedo.		
1806–1808. The European "Continental System" brings distress on American shippers.	**Thomas Jefferson,** *Re-elected President.* George Clinton, *Vice-President.*	1806. Passage of a bill for the construction of the Cumberland Road. Gas for lighting is used in Newport, R. I.	1806. Quarrels in Lower Canada between French and English over taxation. First French-Canadian newspaper, *Le Canadien.*	1806. British attack Argentina. 1806–1811. Christopher, President (King 1811–1820) of Haiti.
1807. The Embargo Act passed.		1807. Successful trip of Fulton's steamboat, the *Clermont,* from New York to Albany.		

III. FROM THE END OF THE REVOLUTION TO THE CIVIL WAR—Continued

THE UNITED STATES			BRITISH NORTH AMERICA	LATIN AMERICA AND THE WEST INDIES
POLITICAL EVENTS	ADMINISTRATIONS	SOCIAL AND INDUSTRIAL PROGRESS		
1808. Foreign slave trade ended.		1808. American Fur Company founded by J. J. Astor.		1808. Royal family of Portugal emigrates to Brazil.
1809. The Embargo Act is repealed and a nonimportation act passed. 1810–1814. The United States takes possession of West Florida.	**James Madison,** *President.* George Clinton, *Re-elected Vice-Pres.*			1809. Ecuador tries for independence. 1810. Revolutionary movements begin in Argentina and Chile. 1810–1815. Revolt led by Hidalgo in Mexico unsuccessful.
1811. Battle of Tippecanoe with the Indians. Henry Clay and John C. Calhoun first appear in the House of Representatives.		1811. The first steamboat leaves Pittsburgh for New Orleans. Beginning of an era of state banking activity.		1811. Paraguay declares independence. Revolution begins in Columbia and Venezuela.
1812. War declared against Great Britain. Admission of Louisiana. War with Algerian pirates.		1812. Invention of stoves built with grates to secure draft.	1812. Canada remains loyal to England during American war.	1811–1812. Francisco Miranda, Dictator of Venezuela.
1813–1814. War with the Creeks. 1814. The Hartford Convention proposes amendments to weaken the Constitution.	**James Madison,** *Re-elected President.* Elbridge Gerry, *Vice-President.*	1814. Francis Scott Key composes "Star Spangled Banner."	1813. Lord Selkirk plants an agricultural colony on Red River.	1814. Simon Bolivar, Dictator of Venezuela, is driven out by royalist army.
1815. Captain Decatur forces Dey of Algiers to renounce tribute. Treaty of peace with England ratified.		1815. First ocean steamboat trip, New York to Norfolk.		1815–1821. Guerrilla warfare in Mexico.
1816. Second Bank of the United States is chartered. Admission of Indiana. American Colonization Society founds Liberia. Increased agitation for internal improvements. First tariff primarily for protection is passed.		1816. Church of the Disciples is formed. The first steamer on Lake Ontario appears. The first savings bank in America is opened at Philadelphia.		
1817. Admission of Mississippi. Congress prohibits foreign vessels engaging in the United States coasting trade. 1817–1818. Seminole War.	**James Monroe,** *President.* D. D. Thompkins, *Vice-President.*	1817. First instruction of deaf mutes in America by T. H. Gallaudet, at Hartford, Connecticut.	1817. Bank notes issued at Montreal.	1817–1823. Bernardo O'Higgins, Director of the Chilean State, defeats Spain.
1818. Admission of Illinois.		1818. First steamer on Lake Erie, the *Walk-in-the-Water*.		1818. Bolivar renews war for independence. 1819–1830. Civil war and confusion in Argentina.
1819. Admission of Alabama. Florida purchased by the United States. Financial panic. Maine separated from Massachusetts. Dartmouth College case, and case of McCulloch *vs.* Maryland decided by Supreme Court.		1819. Combination sail and steamship *Savannah* made transatlantic trip.		1819. Republic of Colombia founded, comprising New Granada, Venezuela and Ecuador.
1820. Admission of Maine. The Missouri Compromise adopted.			1820. Agitation in Upper Canada. Dalhousie College founded at Halifax.	1820. Peru revolts.
1821. The second Missouri Compromise and the admission of Missouri.	**James Monroe,** *Re-elected President.* D. D. Thompkins, *Re-elected Vice-Pres.*	1821. New York Stock Exchange organized. First public high school in United States opened in Boston.		1821. Independence proclaimed in Peru, Nicaragua, Salvador and Costa Rica. John VI. returns from Brazil to Portugal.
1822. The independence of South American republics recognized.		1822. Gaslight introduced into Boston.		1822. Brazil declares independence and makes Dom Pedro emperor. Iturbide declared emperor of Mexico.
1823. President Monroe states the "Monroe Doctrine" in his annual message to Congress.		1823. Champlain Canal, connecting the Hudson at Albany with Lake Champlain, opened.		1823. Revolt led by Santa Ana overthrows Iturbide.
1824. Protective policy greatly extended by an act of Congress. Visit of La Fayette to the United States.			1824. Founding of the Canada Co. to promote colonization in the district about Lake Huron.	1824. Mexico adopts federal constitution. Bolivar establishes Peruvian independence. 1824–1839. Federal republic of Central America.
1825. Presidential election is thrown into the House of Representatives and results in the choice of Adams. 1825–1831. Dispute with Georgia over Indian land cessions.	**John Q. Adams,** *President.* J. C. Calhoun, *Vice-President.*	1825. Erie Canal is completed.		1825. Uruguay revolts from Brazil, achieving independence in 1828. Upper Peru separates from Peru, taking name of Bolivia.
1826. Deaths of Thomas Jefferson and John Adams, July 4th.		1826. The Quincy tramway, sometimes called the first railroad in the U. S., is built from Quincy to tidewater, 3 miles away.	1826. Bytown (later Ottawa) founded.	1826. Panama Congress called by Bolivar, with a view to general Latin-American federation.
1827. Convention between U. S. and Great Britain to settle northeastern boundary. Anti-Masonry has its rise.		1827. Baltimore & Ohio Railroad is chartered. First rail laid July 4, 1828.		
1828. Tariff of Abominations passed.		1828. Webster's *Dictionary* issued.		1828. Mexican civil war. Peru at war with Bolivia and Chile.

III. FROM THE END OF THE REVOLUTION TO THE CIVIL WAR—Continued

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1829. The Postmaster General made a member of the President's Cabinet. Spoils system adopted.	**Andrew Jackson,** *President.* John C. Calhoun, *Re-elected Vice-Pres.*	1829. Process of manufacturing galvanized iron is perfected.	1829. Opening of Welland Canal. 1829–1830. Discontent in the Maritime Provinces.	1829. Venezuela withdraws from Republic of Colombia. Slavery abolished in Mexico. 1829–1833. Santa Ana dictator in Mexico.
1830. West Indian trade is opened to American vessels. The Webster-Hayne debate in the Senate.		1830. Organization of the Church of Latter Day Saints (Mormons). Chloroform discovered. Carolina Railroad begun. B. & O. Railroad opened to traffic.	1830–1831. Efforts at conciliation in Lower Canada thwarted by Papineau.	1830. Ecuador separates from Colombia; Flores, first President.
1831. The Anti-Masonic party holds the first national nominating convention. Rise of the Abolitionists. Garrison publishes the *Liberator*.		1831. Opening of the first school for the blind. McCormick invents the first successful reaper.	1831. Disputes arise over Maine boundary.	1831. Upon abdication of Dom Pedro I., his son, Dom Pedro II., becomes Emperor of Brazil.
1832. National Republican party frames the first party platform. Black Hawk War. New tariff law enacted. Nullification in South Carolina. Jackson vetoes the U. S. Bank Bill.		1832. The Ohio River joined to Lake Erie by canal. First street railway in the U. S. commences in New York. Pork-packing industry begins in Chicago.	1832. Opening of Rideau Canal. Legislature formed in Newfoundland.	1832. Colombia adopts name of New Granada, with new constitution; Santander, President.
1833. U. S. deposits removed from the National Bank.	**Andrew Jackson,** *Re-elected President.* Martin VanBuren, *Vice-Pres.*	1833. Carolina Railroad completed. Ross Winans builds the first typical American passenger cars. Oberlin, Ohio, first coeducational college, founded.		1833. Santa Ana, President of Mexico. Chile adopts new constitution.
1834. Congress creates the Indian Territory. National debt is extinguished. Whig party first takes its name.		1834. McCormick patents an improved reaper.	1834. The Ninety-two Resolutions, a French Canadian declaration of rights.	1834–1839. Confederation of Peru and Bolivia under Santa Cruz.
1835–1842. Second Seminole War.		1835. Morse invents magnetic telegraph; Colt, the revolver. J. G. Bennett begins publication of New York *Herald*. Business panic.	1835. A royal commission investigates the governor and assembly of Lower Canada.	1835. Anglo-American settlers declare Texas independent of Mexico. 1835–1852. Rosas dictator in Argentina.
1836. Admission of Arkansas. Roger B. Taney is made Chief Justice.		1836. Friction match is patented. Wesleyan College founded, first in America for women. 1836–1838. Invention of the screw propeller.		1836. Massacre by Mexican troops at Alamo, Texas. Samuel Houston, President of Texan Republic, defeats Mexican Army at San Jacinto, and captures Santa Ana.
1837. Admission of Michigan. Great financial panic.	**Martin Van Buren,** *President.* R. M. Johnson, *Vice-President.*	1837. Massachusetts State Board of Education is organized with Horace Mann as secretary. Invention of the hot-air blast in iron smelting. Audubon's *Birds of America* issued.	1837. British quell insurrections led in Lower Canada by Papineau and in Upper Canada by Mackenzie.	
1838. "Underground railroad" begins aiding fugitive slaves to escape from the South. 1838–1839. "Aroostook War" between Maine and New Brunswick.		1838. First shipment of grain from Chicago. *Great Western* and *Sirius* cross the Atlantic. National Road opened to Illinois.		1838. Guatemala overthrows Central American Union. Emancipation of slaves completed in British colonies, Jamaica, Barbadoes, Bahama, Bermuda, Guiana, etc. 1838–1841. M. B. Lamar, President of Texas.
1839–1847. Anti-Rent agitation in New York.		1839. Vulcanized rubber patented by Goodyear.	1839. With consent of both Canadas, Parliament passes Union Act on the Durham plan.	1839–1841. War between Peru and Chile.
1840. Passage of Subtreasury Bill.		1840. Adams Express Company begins operation between New York and Boston.		
1841. The Subtreasury Act repealed. 1841–1842. Quarrel between President Tyler and the Whigs.	**Wm. H. Harrison,** *President.* John Tyler, *Vice-President.* (Harrison dies April 4, 1841, and is succeeded by **Tyler**).	1841. Dorothea Dix begins her 40 years' crusade for the better treatment of the insane. Horace Greeley establishes the New York *Tribune*. First steam fire-engine built and used in New York.	1841. First Parliament of the United Canadas opens, June 14.	1841–1845. Samuel Houston again President of Texas.
1842. Dorr's Rebellion in Rhode Island. 1842–1848. Frémont's explorations of the West.		1842. Buffalo connected with the East by railway. First use of anaesthesia in a surgical operation by Dr. Crawford W. Long, of Athens, Ga.	1842. Webster-Ashburton Treaty adjusts boundary between Maine and New Brunswick.	1842. Second federation of Central America established. Paraguay independent.
1843. Bunker Hill Monument dedicated.		1843. Oregon Trail opened.	1843. Opening of McGill University at Montreal and King's College at Toronto.	1843. Dominican Republic separates from Haiti.
1844. First treaty with China secures commercial rights for U. S. Mobs drive Mormons from Illinois.		1844. Manufacture of iron rails in this country begins. First successful use of the telegraph.	1844. Toronto *Globe* founded.	1844. Lopez, President of Paraguay.
1845. Admission of Florida. Annexation of Texas by joint resolution and admission of Texas as a state. U. S. Naval Academy established at Annapolis.	**Jas. K. Polk,** *President.* Geo. M. Dallas, *Vice-President.*	1845. Petroleum discovered near Pittsburgh. Separation of Southern from Northern Methodist and Baptist churches, resulting from quarrels over slavery.		1845. English and French blockade Buenos Aires.
1846. Oregon Treaty with Great Britain. Admission of Iowa. Wilmot Proviso fails.		1846. The sewing machine is invented by Elias Howe. Smithsonian Institution founded. First slate quarry in Vermont is opened.		1846. Treaty with New Granada giving U. S. right of way across Isthmus of Panama. 1846–1861. Civil war in Ecuador.

III. FROM THE END OF THE REVOLUTION TO THE CIVIL WAR—Concluded

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1846–1848. War between Mexico and the U. S.		1846–1848. Great wave of immigration from Ireland.		
1847. Salt Lake City settled by Mormons.		1847. Richard M. Hoe invents the rotary printing press. Use of adhesive postage stamps authorized.	1847–1854. Earl of Elgin, Governor of Canada, pursues policy of pacification.	1847. Soulouque, a Negro, President of Haiti.
1848. Organization of the Free-Soil party. Admission of Wisconsin. Peace with Mexico; California, Arizona and New Mexico won.		1848. The Associated Press first organized. First school for the feeble-minded opened. Discovery of gold in California.		1848. Peace between Mexico and U. S.
1849. Creation of the Department of Interior. California applies for statehood.	**Zachary Taylor,** *President.* Millard Fillmore, *Vice-President.* (Death of President Taylor July 9, 1850. **Fillmore** becomes President.)	1849. Rush of goldseekers to California.	1849. Rebellion Losses Bill, to pay for property destroyed in rebellion of 1837, passed.	1849. Soulouque proclaimed Emperor of Haiti. War of Central American Federation against Guatemala. Confederation defeated.
1850. "Compromise of 1850" admits California and adjusts other slavery questions. Clayton-Bulwer Treaty with Great Britain ratified.		1850. First national labor organization formed. Government grant of land to the Illinois Central Railroad, for stimulating railroad building. First census of manufactures. 1850–1860. Period of railroad consolidation.	1850. Parliament House burned in Montreal riots.	1850. Cuba invaded by American filibusters under Lopez.
1851. Vigilance committees bring law and order to California.		1851. H. J. Raymond founds the New York *Times.* The B. & O. Railroad reaches the Ohio. Western Union Telegraph Company established. Hudson River and Erie railroads opened.	1851. Renewed agitation over clergy reserves. Parties split into factions.	1851. Second filibustering expedition against Cuba; Lopez captured and shot.
1852. Deaths of Clay and Webster.		1852. Publication of *Uncle Tom's Cabin.*	1852. Laval University chartered.	1852. Brazil ends the slave trade.
1853. The Gadsden Purchase from Mexico.	**Franklin Pierce,** *President.* Rufus King, *Vice-President.*	1853. N. Y. Clearing House established. Chicago is reached by rail.		1853. Republican constitution framed for Argentina; civil war until 1862.
1854. Commodore Perry secures commercial treaty from Japan. Native American party (the "Know-Nothings") becomes prominent. Ostend manifesto. Kansas-Nebraska Act.		1854. The Mississippi River is reached by rail from the East. Elevator patented by Otis.	1854. McDonald ministry settles the clergy reserves question, abolishes seigniorial tenure, and makes a reciprocity treaty with U. S.	1854. Castilla revolution in Peru; slavery abolished. Abolition of slavery completed in New Granada, Venezuela and Ecuador.
1855. Troubles in Kansas.		1855. St. Louis is reached by rail. Bessemer steel process patented. Panama railroad opened.		1855. William Walker, filibuster from U. S., invades Nicaragua.
1856. First Republican national convention. Civil strife in Kansas.		1856. First bridge across the Mississippi built at Rock Island, Illinois.	1856. Legislature for Vancouver Island established. Gold discovered on Fraser River, British Columbia.	1856–1857. Walker driven out of Nicaragua.
1857. The Dred Scott Decision. Mormon rebellion in Utah. Great financial panic.	**James Buchanan,** *President.* J. C. Breckenridge, *Vice-President.*	1857. Attempt to lay first telegraphic cable across the Atlantic fails. First state school of agriculture, Lansing, Michigan.		1857. Mexico adopts a new constitution. 1857–1863. Civil war in New Granada.
1858. Lincoln-Douglas debates in Illinois. Admission of Minnesota. Second treaty with China ratified.		1858. Second attempt to lay cable successful temporarily. First transatlantic message. Gold discovered near Pike's Peak. Overland stage line organized.	1858. Governor is appointed for British Columbia. Ottawa made capital. Decimal coinage adopted.	1858. Soulouque dethroned, Haitian Republic re-established; regime of chronic disorder ensues.
1859. Admission of Oregon. John Brown's raid on Harper's Ferry.		1859. First petroleum well dug. Photolithography introduced.	1859. Reformers at Toronto demand separation of Upper from Lower Canada.	1859. End of civil wars in Argentina.
1860. Democratic party splits on slavery question. Lincoln elected over Breckenridge, Bell and Douglas. South Carolina secedes, Dec. 20.		1860. Salt first attains commercial importance in Michigan. Oil fever in the Allegheny River valley. Gold rush to Colorado. Pony Express starts.	1860–1864. George Brown urges a federation of all British North American provinces.	1860. William Walker is captured and shot in Honduras.

IV. PERIOD OF THE CIVIL WAR AND RECONSTRUCTION, 1861-1876

THE UNITED STATES			BRITISH NORTH AMERICA	LATIN AMERICA AND THE WEST INDIES
POLITICAL EVENTS	ADMINISTRATIONS	SOCIAL AND INDUSTRIAL PROGRESS		
1861. Admission of Kansas. Trouble with England over the *Trent* affair. Southern States form the Confederacy. Battle of Bull Run; blockade of Confederate ports.	**Abraham Lincoln,** *President.* Hannibal Hamlin, *Vice-President.*	1861. First message sent over transcontinental telegraph lines.	1861. Nova Scotia legislature asks for a general federation.	1861–1864. Dominican Republic temporarily subject to Spain. Bolivia in anarchy. Juarez, President of Mexico.
1862. Legal tender notes, "greenbacks," issued. Slavery abolished in the territories and District of Columbia. Seven Days, Antietam and Fredericksburg campaigns; Grant wins in the West; Farragut takes New Orleans. Treaty with Great Britain for the suppression of the slave trade.		1862. Passage of the Morrill Act to found agricultural colleges. Passage of the Homestead Act. Union Pacific railroad chartered. First use of ironclad ships in warfare.		1862. Napoleon III plans to erect Mexican Empire for Archduke Maximilian.
1863. Proclamation of Emancipation, Jan. 1. Draft riots in New York. Admission of West Virginia. National Banking Act passed. Chancellorsville, Gettysburg, Vicksburg and Chickamauga campaigns.		1863. Organization of the Brotherhood of Locomotive Engineers. Delivery of mail by carriers begins.		1863. New Granada renames itself Colombia. Mexico occupied by French army.
1864. Fugitive Slave Act (of 1850) repealed. Admission of Nevada. Premium on gold. Modoc Indian War begins. Grant drives toward Richmond; battles at Wilderness and Spotsylvania. Sherman marches through Georgia.		1864. Postal money orders first issued. First sleeping-car is built. Northern Pacific Railroad chartered.		1864. Maximilian crowned Emperor of Mexico. War in Paraguay.
1865. Thirteenth Amendment ratified. President Lincoln shot. General amnesty is proclaimed, following the end of the war.	**Abraham Lincoln,** *Re-elected President.* Andrew Johnson, *Vice-President.* (On death of Lincoln **Johnson** becomes President.)	1865. First organization of the Standard Oil Company.	1865. Quebec legislature endorses Union Resolutions.	1865. Insurrection in Jamaica suppressed. U. S. protests against French interference in Mexico. 1865–1870. Brazil and Argentina in alliance at war with Paraguay.
1866. Civil Rights Bill passed over the president's veto. Organization of the Ku Klux Klan. Shoshone Indian War.		1866. First permanently successful Atlantic cable laid. Salmon canning on the Columbia River begins. Massachusetts passes an eight-hour law for children.	1866. Union Resolutions endorsed by Nova Scotia and New Brunswick. Reciprocity treaty with U. S. expires; not renewed. Fenian raid from U. S. into Canada fruitless.	1866. Spain shells Valparaiso, Chile.
1867. Plan of military reconstruction of the South adopted by Congress. Admission of Nebraska. Purchase of Alaska from Russia. Organization of the Grangers.		1867. Beginning of the manufacture of steel rails in the U. S. Ground wood pulp first used for making paper.	1867. Canadian Union Act passed by Imperial Parliament, providing federation of all British North American provinces ratifying. Upper Canada, renamed Ontario, separated from Lower Canada, renamed Quebec.	1867. French troops withdraw from Mexico. Native forces overthrow Maximilian's government and put him to death. Republic re-established.
1868. President Johnson impeached, tried and acquitted. Six southern states readmitted to representation in Congress. Fourteenth amendment ratified. Burlingame treaty with China signed. 1868–1874. "Carpetbag" rule in the South.		1868. Westinghouse airbrake first successfully applied. First Siemens-Martin open-hearth furnace built. Founding of Cornell University.	1868–1872. Sir John Young, afterward Lord Lisgar, Gov. Gen. Fenian raid repelled.	1868–1878. Cespedes insurrection in Cuba. Santo Domingo proposes to join United States.
1869. Organization of National Prohibition Party. Disbandment of the Ku Klux Klan. Woman suffrage, upon equal terms with men, established in Wyoming.	**U. S. Grant,** *President.* Schuyler Colfax, *Vice-President.*	1869. Passage of eight-hour law for federal employees. Invention of the refrigerator car. First transcontinental railroad completed.	1869. Dominion purchases the vast territory of the Hudson Bay Co. Newfoundland refuses to join the Confederation.	1869. Filibusters invade Cuba. Asunción taken by the Allies.
1870. Fifteenth Amendment ratified.		1870. Opening at Boston of first kindergarten in the U. S. Steel rails first used on railroads.	1870. Manitoba enters Dominion as a province. 1870–1871. Fisheries dispute with U. S. adjusted by treaty.	1870. Insurrection in Cuba. 1870–1890. Blanco, Dictator of Venezuela.
1871. First Civil Service Reform Bill enacted. Legal Tender Act is decided to be constitutional. "Tweed Ring" in New York is exposed. Treaty with Great Britain.		1871. Hoe perfecting press completed. Texas Pacific Railroad begun. Great Chicago fire.	1871. British Columbia joins the Confederation. Uniform currency provided.	1871. Brazil provides for gradual abolition of slavery. Juarez, President of Mexico.
1872. Act for removing political disabilities passes Congress. Geneva award of $15,000,000 to U. S. Modoc Indian War in California.		1872. Invention of duplex telegraphy. Import duties on tea and coffee abolished. Yellowstone Park organized. Bonanza mines on the Comstock lode discovered.	1872. Dominion Parliament offers subsidy to promote building of Canadian Pacific R. R. 1872–1878. Earl of Dufferin, Gov. Gen.	
1873. Crédit Mobilier investigation by Congress. One-cent postal cards issued. The demonetization of silver.	**U. S. Grant,** *Re-elected President.* Henry Wilson, *Vice-President.*	1873. Great financial panic throughout the country. The Westinghouse automatic airbrake is introduced.	1873. Prince Edward Island enters Dominion. 1873–1878. Alexander McKenzie, Premier, with Liberal ministry.	1873. Slavery abolished in Puerto Rico.
1874. Organization of the Greenback party. Democrats control the House of Representatives for first time since 1856.		1874. The Eads Bridge across the Mississippi at St. Louis completed. First trunk pipe line from oil regions to Pittsburgh. Barbed-wire manufacture begins.		1874. Religious orders suppressed in Mexico.

IV. PERIOD OF THE CIVIL WAR AND RECONSTRUCTION, 1861-1876—Concluded

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1875. Exposure of the Whisky ring. Act authorizing the resumption of specie payments.		1875. Hoosac Tunnel is completed. Founding of Smith and Vassar colleges for women. *Tom Sawyer* issued.	1875. Dominion Court of Appeals (Supreme Court) established. Mounted police organized in western territories.	
1876. Sioux War. Massacre of Custer's troops by Sitting Bull. Admission of Colorado. Great corruption found in War Department.		1876. Export of dressed beef begins. Great Centennial Exposition at Philadelphia. Bell patents the telephone. Founding of Johns Hopkins University.	1876. Intercolonial railway opened, tying Halifax to Quebec.	1876. Venezuela repudiates papal authority.

V. PERIOD OF ECONOMIC DEVELOPMENT, 1877-1896

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1877. The Electoral Commission decides the contested election in favor of Hayes. Withdrawal of troops from the South. "Molly Maguires" hanged in Pennsylvania. War with the Nez Percé Indians.	**R. B. Hayes,** *President.* W. A. Wheeler, *Vice-President.*	1877. Edison devises the phonograph. Great railroad strike at Pittsburgh. Pope bicycle built. Goodyear welt machine brought into use.		1877. Porfirio Diaz leads a Mexican revolution and becomes President.
1878. Bland-Allison Silver Bill passed over the President's veto.		1878. Introduction of the probation system for criminal offenders. Introduction of incandescent lights by Edison. First telephone exchange.	1878. Election endorses Conservative "national policy" of protective tariffs. 1878–1883. Marquis of Lorne, Gov. Gen. 1878–1891. Sir John A. McDonald, Premier, with Conservative ministry.	1878. Argentine and Paraguay boundary arbitrated. Cuban revolt quelled.
1879. United States Government resumes specie payment. Women permitted to practice before United States courts.		1879. French Atlantic cable laid. Steamboat traffic on the Mississippi reaches maximum. Organization of First Christian Science Church.		1879–1884. Chile makes war on Peru to acquire nitrate deposits. Chile victorious, Peru exhausted.
		1880. Edison builds the first electric railroad at Menlo Park. U. S. takes first rank among the nations in agricultural products. 1880–1890. Decade of great railroad building.	1880–1881. Commission investigates Canadian Pacific R. R.	1880–1884. Gonzalez, President of Mexico. 1880. Buenos Aires becomes capital of Argentina.
1881. President Garfield is shot July 2. 1881–1884. Lieutenant Greeley's Arctic explorations.	**J. A. Garfield,** *President.* C. A. Arthur, *Vice-President.*	1881. Organization of the American Federation of Labor. International Cotton Exposition at Atlanta, Georgia.		1881. Treaty between Chile and Argentina divides Patagonia between them.
1882. Congress passes act to exclude Chinese laborers for 10 years. Edwards law for the suppression of polygamy. Apache Indian War.	(On death of Garfield, **Arthur** becomes President.)	1882. Reorganization of the Standard Oil Company as a trust. Tolls abolished on the Erie Canal. District school system abolished by Massachusetts.	1882. Northwest Territory divided and organized.	1882–1899. Heureux, President of Dominican Republic.
		1883. Brooklyn Bridge opened. First canneries for Alaska salmon established. Northern and Southern Pacific railroads completed. Standard Time adopted.	1883–1888. Marquis of Lansdowne, Gov. Gen. 1883. Riots in Newfoundland.	
1884. Creation of the Bureau of Labor in the Department of the Interior.		1884. Great floods in the Ohio Valley. Financial panic.		1884–1911. Diaz, President of Mexico.
1885. Apache War in New Mexico.	**Grover Cleveland,** *President.* T. A. Hendricks, *Vice-President.*	1885. Long-distance telephone and electric railway introduced.	1885. Canadian Pacific R. R. completed. Riel Rebellion in the Northwest subdued.	
1886. Silver certificates authorized.		1886. Railroad strikes and anarchistic riots in Chicago. Wire nails first manufactured. Statue of Liberty unveiled.	1886. Dispute with U. S. as to jurisdiction and fishing rights in Behring Sea referred to arbitration. Vancouver founded.	1886. Colombia adopts new constitution. Slavery abolished in Cuba.
1887. Passage of the Interstate Commerce Bill.		1887. First vestibuled Pullman train in service. Beet sugar first successfully produced in U. S. at Alvarado, Cal.	1887. Liberal party agitates for reciprocity with U. S.; Conservatives oppose it.	
1888. The states begin the introduction of the Australian ballot. New Chinese Exclusion Bill enacted by Congress.		1888. Washington Monument finished. Great Blizzard in the East.		1888. Final act of Brazil abolishing slavery immediately.
1889. Admission of North Dakota, South Dakota, Washington and Montana. Pan-American Congress meets in Washington.	**Benj. Harrison,** *President.* Levi P. Morton, *Vice-President.*	1889. Oklahoma is opened for settlement. Johnstown flood.		1889. Revolution in Brazil expels Emperor and establishes republic.
1890. Admission of Idaho and Wyoming. McKinley Tariff Act. Sherman Silver Purchase Act. Sioux War; Sitting Bull killed. Passage of Pension Bill.		1890. The United States takes first place among the nations in the production of iron. Passage of the Sherman Anti-Trust Law.		1890. Revolution and financial revulsion in Argentina.
1891. Formation of the People's Party. Massacre of Italians in New Orleans.		1891. Opening of the cog railroad to the top of Pike's Peak. St. Clair railway tunnel opened. Weather Bureau organized.		1891. Civil war in Chile. U. S. sailors attacked Fonseca, President of Brazil.

V. PERIOD OF ECONOMIC DEVELOPMENT, 1877-1896—Concluded

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1892. Behring Sea dispute referred to arbitration.		1892. Great strike at Homestead Ironworks. Long-distance-telephone line between New York and Chicago formally opened.		
1893. Equal suffrage granted to women in Colorado. Settlement of the Behring Sea dispute. Repeal of law requiring purchases of silver. Chinese exclusion policy adopted.	**Grover Cleveland,** *President.* A. E. Stevenson, *Vice-President.*	1893. Great financial depression. World's Columbian Exposition at Chicago. World's parliament of religions at Chicago. Edison patents the kinetoscope, first motion-picture machine.	1893–1898. Earl of Aberdeen, Gov. Gen.	1893. Naval revolt in Brazil. Insurrections in Argentina. 1893–1910. Zelaya, President of Nicaragua.
1894. New treaty with Japan. Passage of the Wilson Tariff Act. Republic of Hawaii is recognized. "Coxey's Army" marches on Washington.		1894. The U. S. attains first rank among nations in the volume of its manufactures. Great railroad strike from Ohio to the Pacific coast. Also miners' strike and "Debs insurrection."	1894. Imperial Conference at Ottawa of delegates from eight self-governing British dependencies.	
1895. Income tax declared unconstitutional by the Supreme Court. Special message of the President on the Venezuelan question.		1895. Harlem ship canal opened. The name "yellow journalism" first applied to sensational papers.		1895. Boundary dispute between Venezuela and Great Britain becomes critical. Cuban insurrection.
1896. Equal suffrage granted to women in Utah and in Idaho. Admission of Utah. Great agitation for the free coinage of silver.		1896. Sault Ste. Marie Canal completed. Niagara Falls electric power turned on in Buffalo, N. Y.	1896. Dispute between Manitoba and Dominion ministry over Catholic school rights. 1896–1911. Sir Wilfrid Laurier, Premier.	1896. Gen. Weyler administers Spanish reconcentrado policy in Cuba.

VI. PERIOD OF NATIONAL EXPANSION

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1897–1898. Decisions of the Supreme Court that railroad rate agreements violate the Anti-Trust Law.	**Wm. McKinley,** *President.* G. A. Hobart, *Vice-President.*	1897. The steel rail pool collapses. Sextuplex telegraphy invented. Universal postal congress meets in Washington. Union Pacific Railroad sold to the reorganization committee.	1897. Dominion Parliament gives British a preferential tariff. Discovery of gold in the Klondike. Rush of miners thither.	1897. Venezuelan boundary adjusted by arbitration. Weyler leaves Cuba.
1898. South Dakota adopts initiative and referendum. Annexation of Hawaii. Congress orders forcible intervention in Cuba; war with Spain follows. Battles at Manila, El Caney and Santiago quickly bring peace. Greater New York formed.		1898. Commercial treaty with France signed. Boston builds a subway. Method of mercerizing cloth is patented.	1898–1904. Earl of Minto, Gov. Gen.	1898. U. S. battleship *Maine* destroyed by explosion in Havana harbor. Cuba and Puerto Rico taken by United States.
1899. War in the Philippine Islands, led by Aguinaldo, against American domination.		1899. Great commercial and financial prosperity. First juvenile courts organized in Chicago.		1899. Cuba under protectorate of U. S. Venezuela boundary settled. Castro, Dictator of Venezuela.
1900. Congress passes act providing civil government for the Philippines. Civil government established in Alaska. American forces sent to China.		1900. Floods damage Galveston.	1900. Rapid colonization of Canadian Northwest, largely by emigrants from U. S.	1900. Civil war in Colombia.
1901. Passage of Platt Amendment relating to Cuban independence. "Open-door policy" for China announced.	**Wm. McKinley,** *Re-elected President.* Theo. Roosevelt, *Vice-President.* (On death of McKinley, Sept. 14, **Roosevelt** becomes President.)	1901. Formation of the United States Steel Corporation. Pan-American Exposition held at Buffalo. Discovery of the Texas oil field.		1901. War between Venezuela and Colombia. Pan-American Congress at Mexico.
1902. Civil government established in the Philippines.		1902. Great strike of anthracite coal miners. The Carnegie Institution of Washington is established.	1902. Canadian-Australian cable laid.	1902. Revolution in San Domingo. Destructive eruption of Mt. Pelée.
1903. Alaskan boundary tribunal in London decides in favor of the United States. Creation of the Department of Commerce and Labor. Canal treaty with Panama ratified.		1903. Pacific cable completed. Wright brothers fly their airplane.	1903. Joint commission on Alaskan boundary decides favorably on claims of U. S. New transcontinental railway authorized.	1903. Independence of Panama declared under guardianship of U. S. Panama Canal Zone organized.
		1904. Exposition at St. Louis. Work on Panama Canal commences. New York subway opened.	1904–1911. Earl Grey, Gov. Gen.	1904. Strained relations between Venezuela and U. S. Venezuela made to pay European debts.
	Theo. Roosevelt, *Re-elected President.* C. W. Fairbanks, *Vice-President.*	1905. Investigation of insurance companies in New York begins.	1905. Saskatchewan and Alberta become members of the Dominion.	1905. Movement to establish confederation of Canada and British West Indies. U. S. assumes protectorate of Dominican Republic.
1906. Riot at Brownsville, Texas. Military occupation of Cuba. Passage of pure-food and drug-inspection law. Interstate Commerce Commission given more power.		1906. Earthquake hits San Francisco.	1906. Life-insurance investigation in Canada.	1906. Pan-American Congress at Rio de Janeiro. Destructive earthquake at Valparaiso, Chile.

VI. PERIOD OF NATIONAL EXPANSION—Continued

THE UNITED STATES			BRITISH NORTH AMERICA	LATIN AMERICA AND THE WEST INDIES
POLITICAL EVENTS	ADMINISTRATIONS	SOCIAL AND INDUSTRIAL PROGRESS		
1907. Admission of Oklahoma. Pure Food Law in effect. 1907–1909. United States fleet makes a round-the-world cruise.		1907. Jamestown Exposition. Financial panic.	1907. Demonstration against Japanese at Vancouver. Mine strikes.	1907. Finances of San Domingo put under supervision of U. S.
1908. The United States remits the Chinese Boxer indemnity.		1908. Tunnels opened under East River and Hudson River, New York. Great strike of coal miners in Pennsylvania.		
1909. Congress proposes income-tax amendment.	**Wm. H. Taft,** *President.* J. S. Sherman, *Vice-President.*	1909. Exposition at Seattle. Hudson-Fulton Celebration at New York. Peary reaches the North Pole.		1909. U. S. withdraws army from Cuba.
1910. Equal suffrage granted to women in the state of Washington. Passage of postal savings bank law.		1910. I. W. W. starts labor disputes.		1910. Pan-American Congress at Buenos Ayres.
		1911. Standard Oil monopoly broken up.		1911. Revolts in Mexico end Diaz control.
1912. Admission of Arizona and New Mexico. Progressive party formed.		1912. Moderate-priced automobile is marketed.		1912. Trans-Andean railway opened.
1913. Department of Labor created. Federal income tax and direct election of senators made effective.	**Woodrow Wilson,** *President.* T. R. Marshall, *Vice-President.*	1913. Parcel Post service begun. Serious Ohio floods. Federal Reserve System created.		1913. New revolt in Mexico.
1914. U. S. declares neutrality in European War. A. B. C. powers mediate dispute between U. S. and Mexico.		1914. Panama Canal opened.	1914. Parcel Post begun. Canada joins in World War.	1914. New revolt in Mexico leads to U. S. occupation of Vera Cruz.
1915. Sinking of *Lusitania* rouses sentiment against Germany.		1915. Federal Trade Commission formed. Expositions in California.		1915. U. S. takes control in Haiti.
1916. Wilson continues appeals for arbitration and peace.		1916. Great industrial expansion with war orders; 8-hour railway labor law.	1916. World War losses increase.	1916. Villa pursued into Mexico after U. S. raid.
1917. War declared against Germany. Military conscription adopted. First U. S. troops reach France, June 26.	**Woodrow Wilson,** *Re-elected President.* T. R. Marshall, *Re-elected Vice-Pres.*	1917. Liberty Loans issued. Government takes control of railroads.	1917. Woman suffrage and military conscription adopted.	1917. U. S. buys Virgin Islands from Denmark.
1918. 2,500,000 U. S. soldiers in France. U. S. men in battle, the Somme, St. Mihiel, the Argonne. Wilson proposes 14 Points for Peace. Armistice ends World War.		1918. Food and fuel rationed by Federal authorities. Industry expands rapidly, especially munitions and shipbuilding. Aircraft industry develops. Daylight-saving time adopted.	1918. Draft riots in Quebec.	1918. Several Latin countries join Allies in World War, but take little active part.
1919. Wilson goes to Europe to promote League of Nations, but Senate rejects it. National Prohibition effective.		1919. U. S. and English fliers cross the Atlantic. Steel and coal strikes.	1919. Serious strikes.	1919. Peace dawns in Mexico.
1920. National woman suffrage in effect.				1920. Bolivia and Chile threaten war.
1921. Formal peace with Germany ratified. International Conference on Armament Reduction at Washington.	**Warren Harding,** *President.* Calvin Coolidge, *Vice-President.* (On death of Harding in 1923, **Coolidge** becomes President.)	1921. Industrial pace slackens. Radio broadcasting begun. Home electrical appliances multiply.		1921. U. S. pays Colombia for rape of Panama.
1923. U. S. troops leave Germany.		1923. First New York-California nonstop airplane flight.	1923. Canada and U. S. make trade treaty.	
1924. Japanese exclusion policy becomes effective. European immigration restricted. Oil land lease scandals. Ku-Klux Klan revived.		1924. U. S. Navy planes make round-the-world flight.		1924. Calles, President of Mexico. U. S. troops leave Dominican Republic.
1925. Adjustment of European war debts undertaken.	**Calvin Coolidge,** *Re-elected President.* Chas. G. Dawes, *Vice-President.*	1925. Dirigible *Shenandoah* wrecked. Coal miners strike.		1925. Machado, President of Cuba.
		1926. U. S. Navy plane flies over North Pole. Exposition at Philadelphia. Sound motion pictures accepted.	1926. Great Britain makes Canada an autonomous Dominion. Ontario gold rush.	1926. Mexico takes for poor lands of the Church and great estates.
1927. Exchange of Ministers with Canada begun.		1927. Lindbergh makes first Atlantic solo flight. Serious Mississippi floods.	1927. Government sale of liquor succeeds.	1927. U. S. halts civil war in Nicaragua. Mexico takes oil lands.
1929. Kellogg Peace Treaty put into effect, signed by 62 nations.	**Herbert Hoover,** *President.* Charles Curtis, *Vice-President.*	1929. Economic boom results in stock-market collapse. Byrd flies over South Pole.	1929. Disputes with U. S. over rum runners.	1929. Tacna-Arica dispute ends. Revolt in Haiti.
1931. European war-debt moratorium.		1931. Economic conditions grow worse. Empire State Building put up.	1931. New Welland Canal opened.	1931. Many revolts in Latin America.
1932. Bonus seekers driven from Washington. New National Bank law.		1932. Reconstruction Finance Corporation attempts to halt industrial panic.	1932. Empire Economic Conference, Ottawa.	1932. Chaco War in South America.
1933. National Prohibition ended. "Lame Duck" Congress ended. Russia recognized. New Deal relief and employment programs started. Farm and home loan laws.	**Franklin Roosevelt,** *President.* John N. Garner, *Vice-President.*	1933. National bank holiday. Gold standard abandoned. Tennessee Valley Authority created. Exposition in Chicago. Dirigible *Akron* wrecked.	1933. Newfoundland faces bankruptcy.	1933. Revolt drives Machado from Cuba.
1934. Philippine independence law passed. Stock exchange and public utility regulation increased.		1934. Dollar devalued. Textile strikes cause riots. Droughts and dust storms.	1934. Newfoundland under British control. Dionne quintuplets born.	1934. American antiwar treaty adopted. U. S. leaves Haiti.
1935. National Social Security law adopted. Bank deposits insured. New Deal reforms checked when declared unconstitutional.		1935. Economic recovery stirs. Federal emergency relief program is extended, using $4,500,000,000.	1935. Central Bank of Canada opens. 1935. Conservative reaction wins elections. Mackenzie King, Prime Minister.	1935. Mexico takes more church property. Chaco war ends.

VI. PERIOD OF NATIONAL EXPANSION—Concluded

THE UNITED STATES			British North America	Latin America and the West Indies
Political Events	Administrations	Social and Industrial Progress		
1936. New soldiers' bonus paid. Agricultural relief law found unconstitutional. Merchant Marine laws revised.		1936. Heavy tax program fails to meet national deficit. Shipping strike on Pacific.	1936. Canadian Supreme Court invalidates "New Deal" legislation of Bennett government.	1936. Monroe Doctrine replaced by Common Front policy.
1937. Presidential inauguration changed to January. Feeling against Japan develops.	**Franklin Roosevelt,** *Re-elected President.* John N. Garner, *Re-elected Vice-Pres.*	1937. Labor-union conflicts and sit-down strikes check recovery. Serious Ohio River floods. Price-fixing made legal.		1937. Vargas, Dictator of Brazil, suspends republican constitution.
1938. Secretary Hull denounces international anarchy; "contagious scourge of treaty-breaking." United States sponsors plan to relieve plight of European refugees.		1938. Business recession. Administration plans new recovery program. Severe floods in Southern California.	1938. Semi-Fascist movement gains ground in Quebec. Partial suppression of freedom of speech and press. Trade agreement with United States.	1938. Fascist-Communist agitation shakes South America. Mexico expropriates large foreign oil properties. Pan-American Congress stresses American solidarity.
1939. Trade agreements with Great Britain, Brazil and Turkey. Felix Frankfurter and William O. Douglas made Supreme Court Justices. Justice L. D. Brandeis retires. Harry L. Hopkins made Secretary of Commerce and Frank Murphy, Attorney General. Supreme Court permits taxes on state and federal salaries. Hugo Black made Supreme Court Justice.		1939. Roosevelt announces national health program. New York World's Fair and Golden Gate Exposition open.	1939. King George VI and Queen Elizabeth visit Canada and the United States. Lord Tweedsmuir, Governor General of Canada, dies. Canada declares war on Germany.	1939. Devastating earthquake in Chile. Brazil concludes trade agreement with United States.
1940. Murphy made Supreme Court Justice. Strict neutrality kept. Senator William Borah dies. Law, restricting sale of war supplies to belligerents to cash-and-carry plan, vigorously applied. Robert H. Jackson—Attorney General.		1940. Federal Housing Act assists private construction. National Labor Relations Board arbitrates business and labor disputes. Both World's Fairs open for second year. Aliens registered; National registration and conscription.	1940. No conscription. Volunteers go to war in Europe. Laws passed for collective bargaining.	1940. Mexico continues seizure of foreign-owned oil properties. Refuses arbitration.
1940-41. United States secures new aviation bases in Atlantic. Postmaster General Frank C. Walker, Secretary of War Henry L. Stimson, Secretary of Navy Frank Knox, Secretary of Com. Jesse Jones. Chief Justice Hughes and Justice McReynolds resign from U.S. Supreme Court. Harlan F. Stone new Chief Justice. New Justices Jackson and Byrnes. Neutrality Act repealed.	1941. Franklin D. Roosevelt, 1st third-term president; Henry A. Wallace, Vice-President.	1941. United States prepares tremendous defense program. Lend-Lease aid given England and Russia. Germany sinks many U. S. ships. Japanese credits frozen. U.S. troops defend Iceland.	1941. Canada speeds up aid to England.	1940. Pres. of Mexico General Manuel Avilo Camacho. 1941. Duke of Windsor, Governor of Bahamas. England and Mexico renew diplomatic relations. Panama exiles ruler. Americas present united front.
Dec. 7, 1941. Japan attacks U. S. at Pearl Harbor. U. S. declares war vs. Japan, Germany, Italy.				
1942. All Central and South American countries, except neutral Chile and Argentina, cooperate with U. S. U. S. in total war. Japan captures Guam, Wake Islands, Philippines. Both sides lose many ships. U. S. leaders Marshall, MacArthur, Nimitz, Hart, Wainwright. Ambassador Leahy recalled from France. U. S. bombs Japan. Japan defeated in battles of Coral Sea and Midway Island. U. S. invades Solomon Islands.		1942. Tremendous war productions. U. S. aids allies, England, Russia, China and Australia. War time adopted. U. S. builds mighty Army, Navy and Airforce. U. S. Army and Navy in many parts of world. Shortage of rubber and oil. Price ceiling to prevent inflation. Rationing.	1942. Canada makes mighty wa effort in total war. Natio votes conscription for ove seas.	1942. Important Pan American Conference at Rio de Janeiro. Argentina and Chile remain neutral. All others fully cooperate with U. S. in war effort. German submarines sink many ships.
1943. U. S. captures Guadalcanal, part of New Guinea, and Algeria, wins important victory in Bismarck Sea. Eisenhower, King and Arnold leaders also. Conquers Axis in Africa. Occupies Amchitka. Conquers Japanese on Attu Island.		1943. W. B. Rutledge replaces Justice Byrnes. Boys 18-21 drafted. Women volunteers accepted in Military Services. Alcan Highway in operation. U. S. leads world in production of materials of war.	1943. Canada imprisons tremendous number of Axis soldiers.	

NOTABLE WARS OF HISTORY

(The figures prefixed to the names of leaders, battles, etc., indicate to which of the two contesting parties the leader belonged, or by which the victory was won; they correspond to the numbers used in the column giving the names of the contesting parties.)

NAME OF WAR, CONTESTANTS AND DATES	CAUSE OF CONFLICT	LEADERS	CHIEF BATTLES AND INCIDENTS	RESULTS AND COMMENTS
Trojan War—c. 1200 B. C. (1) Greeks vs. (2) Trojans	Aegean Greek civilization opposes advance of younger Doric Greeks.	(1) Agamemnon, Achilles, Ulysses. (2) Hector.	(1) Siege of Troy.	Capture and destruction of Troy. Doric Greeks supreme.
Messenian Wars—c. 700–456 B. C. (1) Spartans vs. (2) Messenians.	Conflicting ambitions of city-states.		(1) Siege of Mount Ithome.	Messenians become Helots (slaves to Spartans).
Persian Wars—500–479 B.C. (1) Persians vs. (2) Greeks.	Aid given by Athens and Eretria to revolting Ionic Greek cities, leading to burning of Sardis, c. 497.			
a. First Persian Expedition—493 B.C.	Continued plans of Darius for subjugating Greece.	(1) Mardonius, Xerxes, Darius. (2) Miltiades, Leonidas, Themistocles, Aristides.	(2) Marathon (490). (1) Thermopylae. (1) Athens (burned). (2) Salamis. (2) Plataea.	Partial success against Macedonians and Thracians.
b. Second Persian Expedition—490 B.C.				The Athenians are victorious and the Persians retreat to Asia Minor.
c. Third Persian Expedition—481–480 B.C.	Xerxes desires to avenge his father's defeat.			Xerxes retreats to Persia after his defeat at Salamis.
d. Fourth Persian Expedition—479 B.C.	War continued by troops which Xerxes left behind.			All Persian invasions and attempts to subjugate Greece cease.
Peloponnesian War—431–404 B.C. (1) Sparta and Allies vs. (2) Athens and Allies. a. First Period—431–421 B.C. b. Second Period or Decelean War—413–404 B.C.	Envy of Sparta and her allies at Athens' growing power and influence. Discontent among some of the Athenian subject states. Athens leads the Ionic Greeks; Sparta, the Doric.	(1) Brasidas, Lysander. (2) Cleon. Alcibiades serves Athens, Sparta and Athens in turn.	(1) Invasion of Attica, Siege of Plataea, Amphipolis. (2) Mitylene, Sphacteria, Expedition against Syracuse. (1) Aegospotami, Surrender of Athens.	By the peace of Nicias (421) both sides are to restore conquests and prisoners but terms are imperfectly carried out. The Spartans tear down the walls of Piraeus and Athens. Athens becomes an independent ally of Sparta. Sparta is now supreme in Greece.
Gauls' Invasion of Italy—390 B.C. (1) Gauls vs. (2) Romans.	Growing power and ambition of barbarian Gauls conflict with Roman self-assurance.	(1) Brennus. (2) Manlius Capitolinus.	(1) Battle of the Allia. Sack of Rome.	Gauls retire on payment of ransom. The overthrow of Rome had no permanent effect on her fortunes.
Greek Sacred War—339–338 B.C. (1) Macedonians vs. (2) Athenians, Thebans.	Rivalries of Greek city-states give ambitions of Philip of Macedon an opportunity to develop.	(1) Philip of Macedon. (2) Demosthenes.	(1) Chaeronea.	Philip gains leadership of Greece. Henceforth Greece is under the control of Macedonia.
Samnite Wars—343–290 B.C. (1) Romans vs. (2) Samnites.	A duel between two rival races for supremacy in Italy.	(1) Fabius Maximus, Lucius Papirius Cursor. (2) Gaius Pontius.	(2) Caudine Forks. (1) Sentinum.	Indecisive.
a. First Samnite War—343–341 B.C.	Campanians implore aid of Romans against Samnites.			
b. Second or Great Samnite War—327–304 B.C.	The occupation of Palaeopolis by the Samnites. In 311 the Etruscan cities joined in the war against Rome.			Samnites sue for peace but retain their independence.
c. Third Samnite War—298–290 B.C.	The Samnites enter Lucania and refuse to withdraw.			Samnites defeated but not crushed.
Wars of Alexander the Great in Asia—334–328 B.C. (1) Greeks vs. (2) Persians. Egyptians, Bactrians. Hindus.	A war of conquest, a scientific expedition and a journey of discovery.	(1) Alexander the Great, Nearchus. (2) Darius III.	(1) Granicus, Issus, Siege of Tyre, Arbela.	Alexander conquers Asia from the Mediterranean Sea to the Indus and begins the Hellenizing of the East. Founds Alexandria in Egypt. The empire breaks up after Alexander's death, 323.
Roman War with Tarentum and Epirus—282–272 B.C. (1) Romans vs. (2) Tarentum and Epirus.	Pyrrhus, having won supremacy in Greece, takes part in Italian wars against the growing power of Rome.	(1) Manius Curius. (2) Pyrrhus.	(1) Beneventum, Tarentum. (2) Heraclea, Asculum.	Pyrrhus returns to Epirus and his allies one by one submit to Rome, which is left supreme from Straits of Messina to the River Arno.
First Punic War—264–241 B.C. (1) Romans vs. (2) Carthaginians.	A struggle for supremacy in Sicily.	(1) P. Claudius Pulcher, C. Lutatius Catulus, M. Atilius Regulus. (2) Hamilcar Barca, Hanno.	(1) Mylae, Agrigentum, Ecnomus. (2) Drepana.	Carthaginians yield Sicily and pay indemnity. Carthage retains the Western Mediterranean and Rome is launched on her career of conquest.
Second Punic War—218–201 B.C. (1) Romans vs. (2) Carthaginians.	A duel to the death between Rome and Carthage. Pretext, Hannibal's attacks on Saguntum in Spain.	(1) Q. Fabius Maximus, Publius Scipio. P. Cornelius Scipio Africanus. (2) Hannibal, Hasdrubal.	(1) Syracuse, Capua, Metaurus, Zama. (2) Ticinus, Trebia, Trasimen, Cannae.	Carthage forced to give up Spain, to pay an annual tribute, to surrender her fleet, and to agree not to go to war without the permission of Rome.
Greco-Roman War—214–146 B.C. (1) Romans vs. (2) Greeks.	Alliance of Philip, King of Macedon, with Carthage.	(1) T. Quinctius Flamininus, L. Aemilius Paulus. (2) Philip of Macedon, Perseus.	(1) Cynoscephalae, Pydna.	Macedonia becomes a Roman province.
Third Punic War—149–146 B.C. (1) Romans vs. (2) Carthaginians.	Ambitious Romans uneasy until Carthage is completely destroyed.	(1) Scipio Africanus. Scipio Aemilianus.	(1) Siege of Carthage.	Carthage destroyed. Most of her territory becomes a Roman province of Africa.
Jugurthine War—111–105 B.C. (1) Romans vs. (2) Jugurtha of Numidia.	Jugurtha, disregarding intervention of Rome, captures Citra and massacres male population.	(1) Marius. (2) Jugurtha.	(1) Muthul, Citra.	Numidia divided. The war reveals the corruption and incapacity of the Senatorial Government of Rome.
Marsian or Social War—90–88 B.C. (1) Romans vs. (2) Italian Allies.	Italian socii (allies) are denied the right of Roman citizenship.	(1) Marius. Sulla.	(1) Asculum.	Roman citizenship granted to all Italian residents.
Three Mithridatic Wars—88–63 B.C. (1) Romans vs. (2) Pontines and Armenians.	Ambition of Mithridates VI and his massacre of thousands of Romans in his territory.	(1) Sulla, Lucullus. Pompey. (2) Mithridates.	(1) Chaeronea, Orchomenus, Cabira, Tigranocerta.	Reorganization of the East, Pontus, Syria and Cilicia become Roman provinces.

Gallic War—Wars of the Roses

Name of War, Contestants and Dates	Cause of Conflict	Leaders	Chief Battles and Incidents	Results and Comments
Gallic War—58–51 B.C. (1) Romans vs. (2) Tribes of Gaul.	Desire to extend the Roman Empire.	(1) Julius Caesar. (2) Vercingetorix. Ariovistus.	(1) Siege of Alesia.	Conquest and organization of Gaul by Caesar. Gauls Romanized; boundaries of the old world enlarged.
Second Roman Civil War—49–31 B.C. First Period, 49–45 B.C. (1) Followers of Caesar vs. (2) Followers of Pompey.	Struggle for mastery between Caesar, conqueror of Gaul, and Pompey, conqueror of the East.	(1) Caesar. (2) Pompey and his sons.	(1) "Crossing the Rubicon." Pharsalus, Thapsus, Munda.	Caesar is appointed dictator for life. He is the founder of the new monarchy at Rome.
Second Period, 43–42 B.C. (1) Friends of Caesar (Second Triumvirate) vs. (2) Caesar's Assassins.	Assassination of Caesar, 44 B.C.	(1) Antony, Octavius, Lepidus. (2) Brutus, Cassius, Sextus Pompey.	(1) Philippi.	Brutus and Cassius, defeated, commit suicide.
Third Period—31–30 B.C. (1) Octavius vs. (2) Antony.	A continued struggle for supreme power.	(1) Octavius. (2) Antony, Cleopatra.	(1) Actium.	Triumph of Octavius, end of the Republic and beginning of tne Empire.
Jewish War—A.D. 66–70 (1) Romans vs. (2) Jews.	Revolt of the Jews against Rome.	(1) Titus, son of Emperor Vespasian.	(1) Siege of Jerusalem.	Destruction of Jerusalem and the temple.
Dacian Wars—86–107. (1) Romans vs. (2) Dacians.	Roman desire to expand.	(1) Domitian, Trajan. (2) Decebalus.		Dacia is made a Roman province. Roman conquest and Empire reaches its highest point.
Invasion of Roman Empire by Northern Barbarians—375–493. (1) Romans vs. (2) Teutons and (Huns) Teutonic Tribes; Visigoths, Vandals, Suevi, Franks, Burgundians, Ostrogoths, Alemanni, Jutes, Saxons, Angles, Lombards.	The Huns (Mongolians) press upon the Teutons, who are forced to seek new lands within the boundaries of the Roman Empire.	(1) Valens, Stilicho Aetius, Leo (Bishop of Rome). (2) Alaric, Walja (Visigoth); Genseric (Vandal); Hengist and Horsa (Saxons); Attila (Hun); Theodoric the Great (Ostrogoth).	(1) Battle near Chalons (451). (2) Adrianople, Sack of Rome. Visigothic kingdom of Tolosa (Toulouse), (415–507). Vandals settle in Africa (429–534). Burgundians occupy Rhone Valley (443). Angles, Saxons and Jutes invade England (449), Huns and Ostrogoths ravage Gaul. Huns destroy Lombardy. Vandals plunder Rome (455). Odoacer gains ascendancy in Rome. The fall of the Roman Empire (476).	Overthrow of the Roman Empire in the West, though it continued in the East until 1453. This blending of Roman and Teutonic elements under the influence of the Christian religion and what remained of classic civilization formed the civilization of the Middle Ages.
Saracen or Mohammedan Wars—709–1492. (1) Saracens (Arabs) vs. (2) Christian nations, Persia and Egypt.	Saracens are ambitious to found a world-wide Mohammedan empire.	(1) Tarik, Abderrahman, Mohammed II, Harun al Rashid, Abdallah. (2) Charles Martel, Constantine, Palaeologus, Ferdinand of Aragon, the Cid.	(1) Damascus, Jerusalem, Alexandria, Carthage (697), Xeres (Spain), Granada, Toledo. (2) Constantinople (716), Tours, Las Navas de Tolosa (1212). (1) Constantinople (1453). (2) Granada (1492).	The Saracens attempted to conquer and convert Europe at three different times between 710 and 1492. Their power began to wane from the latter date. The Saracens won Spain, all north Africa, Egypt, and central Europe as far as Vienna, but were badly beaten in France and later driven out of Spain.
Crusades—1096–1291. (1) European Christians vs. (2) Turks and Moslems. First Crusade—1096–1099.	The appeal of the eastern emperor for aid, the desire to recover the Holy Sepulcher from the infidels, the love of adventure, and hope of gain.	(1) Peter the Hermit, Godfrey of Bouillon, Robert of Normandy.	(1) Nicaea, Antioch, Jerusalem.	Jerusalem is subdued and a transient kingdom is founded.
Second Crusade—1147–1149.	Preaching of Saint Bernard.	(1) Conrad III of Germany, Louis VII of France.		Armies almost annihilated by hunger, disease and the enemy.
Third Crusade—1189–1192.	Capture of Jerusalem by Saladin.	(1) Richard I of England, Philip Augustus of France, Frederick Barbarossa of Germany. (2) Saladin.	(1) Acre.	The Latin Christians secure by treaty the privilege of visiting the tomb of Christ for three years without molestation.
Fourth Crusade—1201–1204. (1) Crusaders vs. (2) Eastern Empire.	Appeals of Innocent III. Through influence of the Venetians the Crusaders turn aside to attack Constantinople.	(1) Dandolo, Baldwin of Flanders.	(1) Sack of Constantinople.	Division of Eastern Empire. The Venetians get the monopoly of trade of the Aegean and Ionian seas.
Fifth Crusade—1228–1229.	Vow of Frederick II. of Germany. He goes under Pope's excommunication.	(1) Frederick II.		Frederick secures a truce for 10 years and the restoration of Jerusalem to the Christians.
Sixth Crusade—1248–1254.	Louis IX of France starts on a crusade via Egypt.	(1) Luois IX later St. Louis.	(1) Damietta. (2) Expedition to Cairo.	Louis is captured in battle and released on payment of heavy ransom and evacuation of Damietta.
Last, Seventh Crusade—1270–1291.	Louis IX goes against Mohammedans of Tunis, Prince Edward of England to Syria.	(1) Louis IX, Prince Edward.	(2) Acre, last Christian stronghold in Syria, falls (1291).	The results of the crusades were development of commerce, introduction of new customs, products and manufactures, increase in freedom of lower classes, especially townsmen, and the power of the Crown.
Hundred Years' War—1337–1453. (1) English vs. (2) French.	The conflict of interests of the French and English kings in Guienne, Flanders and Scotland. Edward III advances claim by descent to the throne of France.	(1) Edward III. Edward the Black Prince. Henry V. Duke of Bedford. (2) Du Guesclin, Charles V, Joan of Arc	(1) Crécy, Calais, Poitiers, Agincourt, Treaty of Troyes. (2) Orleans (1429), Castillon (1453).	England loses all her land in France except Calais. During the earlier stage of this war about one-third of the population of western Europe perished from the Black Death.
Austro-Swiss War—1386–1388. (1) House of Hapsburg vs. (2) Swiss Confederation.	Hapsburgs assert feudal rights over the peasants of the Swiss cantons.	(1) Leopold III of Austria. (2) Arnold von Winkelried.	(2) Sempach, Näfels.	Independence of Swiss secured.
Wars of the Roses—1455–1485. (1) Yorkists (White Rose) vs. (2) Lancastrians (Red Rose).	Misgovernment under Henry VI encourages Richard, Duke of York, representing the second line of descent from Edward	(1) Richard, Duke of York. Edward IV. Richard III. (2) Duke of Somerset.	(1) St. Albans, Northampton, Towton, Barnet, Tewkesbury. (2) Wakefield, Bosworth Field.	Henry Tudor (Lancastrian in the female line) secures throne as Henry VII. By his marriage with Elizabeth of York he unites the warring factions

French Civil Wars—American Revolution

NAME OF WAR, CONTESTANTS AND DATES	CAUSE OF CONFLICT	LEADERS	CHIEF BATTLES AND INCIDENTS	RESULTS AND COMMENTS
	III, to claim the throne against Henry VII (third line).	Queen Margaret. Earl of Warwick ("Kingmaker"), first a Yorkist and then a Lancastrian. Henry VII.		and establishes an almost despotic rule in England.
French Civil Wars—1562–1598. (1) Catholics vs. (2) Huguenots (Protestants).	Massacre of Huguenots at Vassy is a signal for uprising.	(1) Duke of Guise, Henry III. (2) Catherine de' Médici. Condé, Coligny, Henry of Navarre (Henry IV).	(1) Dreux, Jarnac, Montcontour, Massacre of St. Bartholomew, Siege of Paris. (2) Arnay-le-Duc, Coutras, Arques, Ivry.	By the Edict of Nantes (1598) the Huguenots are given equal political rights with Catholics, limited freedom of worship, the possession of La Rochelle and other strong places as cities of refuge.
War of Liberation of the Netherlands—1565–1609. (1) Spain vs. (2) Revolted provinces in the Netherlands.	Political and religious tyranny of Spain. Duke of Alva enforces the Inquisition.	(1) Duke of Alva. Alexander of Parma. (2) William of Orange Jan van Olden, Barneveldt, Maurice of Nassau.	(1) Mechlin, Haarlem. (2) Brill, Siege of Leyden, "Spanish Fury" at Antwerp. Pacification of Ghent (1576). Union of Utrecht (1579). Declaration of Independence (1581).	By the peace of Westphalia (1648) the independence of the seven northern provinces, the United Netherlands, is recognized. The ten southern provinces continue under Spanish rule until 1713.
Thirty Years' War—1618–1648. (1) German Protestants and their Allies, England, Holland, Sweden and France vs. (2) Imperial German Catholics and their allies, Spain, Italy.	Religious and political disputes between Catholics and Protestants. The war passes through four phases—(1) Bohemian-Palatinate. (2) Danish. (3) Swedish. (4) Swedish-French.	(1) Frederick, Elector Palatine, Mansfield, Gustavus Adolphus (Sweden). Turenne and Condé (France). (2) Emperor Ferdinand II, Maximilian of Bavaria, Tilly, Wallenstein.	(1) Stralsund, Edict of Restitution, Breitenfeld, Lützen. (2) White Hill, Magdeburg, Nördlingen.	This war is closed by the peace of Westphalia. Alsace thereby goes to France, Switzerland is separated from the Empire and the Palatinate is divided. The secularized lands of northern Germany are secured to Protestantism while leaving to Catholicism, Austria, Bohemia and Bavaria. Germany is left desolate.
Civil War in England—1642–1649. (1) Royalists (Cavaliers) vs. (2) Parliamentarians (Roundheads) allied with Scots (to 1647).	Charles I attempts to force a personal government on England. His disputes with Parliament covered (1) taxation, (2) privileges of Parliament, (3) religion, (4) control of the militia.	(1) Charles I, Prince Rupert, Montrose. (2) Cromwell, Essex, Fairfax, Leslie.	(2) Marston Moor, Naseby, Preston.	The war determines the army leaders to bring Charles I to trial and execution (1649). A Commonwealth was then established without King or House of Lords but with Oliver Cromwell as Protector (1653 to 1659).
Spanish Succession; in America **Queen Anne's War**—1701–1714. (1) France, Spain and Bavaria vs. (2) Austria, England, Holland, Portugal, Savoy.	Acceptance by Louis XIV of the bequest of the Spanish dominion to his grandson, Philip of Anjou, in violation of the partition treaty to which he had consented.	(1) Vendôme, Villars, Leopold of Dessau. (2) Duke of Marlborough, Eugene of Savoy, Heinsius.	(2) Gibraltar, Blenheim, Ramillies, Turin, Oudenarde, Malplaquet.	By the peace of Utrecht in 1713 and that of Rastadt in 1714 Spain and the Indies go to Philip of Anjou; Naples, Milan, Sardinia and former Spanish Netherlands to the Austrians. England receives Newfoundland, Acadia and Hudson Bay Territory from France and Gibraltar from Spain.
Northern War—1700–1721. (1) Sweden vs. (2) Russia, Poland, Denmark, Saxony.	Peter the Great joins Poland, Denmark and Saxony for the purpose of despoiling Sweden, the first power of the North, of her Baltic ports.	(1) Charles XII. (2) Peter the Great (Russia), Augustus II of Saxony.	(1) Invasion of Denmark. Narva, Invasion of Saxony. (2) Poltava.	By the peace of Nystadt (1721) Sweden cedes large territories to Russia. Russia takes the place of Sweden as the foremost power of the North.
War of the Austrian Succession—1740–1748. (1) Austria, supported by Hungary, Bohemia, England, Holland and Saxony vs. (2) Prussia, France, Spain, Bavaria.	When Maria Theresa succeeded her father, Charles VI of Austria, Frederick the Great of Prussia seized Silesia. This precipitated a struggle for Austrian territories. At the death of Charles VI of Austria the right of Maria Theresa to the throne is contested chiefly by Frederick the Great of Prussia who seizes Silesia.	(1) Maria Theresa, George II of England, Charles of Lorraine, Duke of Cumberland. (2) Frederick the Great of Prussia, Saxe.	(1) Dettingen. (2) Mollwitz, Chotusitz Prague, Fontenoy, Hohenfriedburg, Soor.	By the Treaty of Aix-la-Chapelle Silesia is secured to Prussia, which state now becomes a great European power. This war is one phase of the long rivalry between France and Great Britain for seapower and dominion in America and India.
Seven Years' War in America **French and Indian War**—1756–1763. (1) England, Prussia vs. (2) France, Austria, Russia, Spain, Sweden.	Maria Theresa wishes to regain Silesia. Hostilities between French and English in America and India. George II's concern for his ancestral territory of Hanover.	(1) Frederick the Great, Duke of Cumberland. Wolfe (America), Robert Clive (India). (2) Daun (Austria), Charles of Lorraine, Montcalm (America).	(1) Dresden, Rossbach, Leuthen, Zorndorf, Minden. (2) Kolin, Hohkirchen, Kunersdorf. *In America:* (1) Louisburg, Fort Duquesne, Quebec. *In India:* (1) Plassey, Wandewash.	The peace of Paris (1763) gives to England Canada, the supremacy in India, and certain islands, especially in the West Indies. Prussia retains Silesia. This war really founded the British Empire, which is based on sea power and colonial dominion.
American Revolutionary War—1775–1783. (1) English Colonies in America aided by France vs. (2) England.	Colonists' spirit of independence grew with imposition of taxes without their consent, interference with local self-government by English officers, and the development of different economic outlooks.	(1) Washington, Greene, Allen, Putnam, Montgomery, Schuyler, Arnold, Stark, Sullivan, Lee, Gates, Wayne, Campbell, Morgan, Lafayette, de Kabl, Steuben, Kosciusko, Rochambeau. (2) Percy, Howe, Pigot, Carleton, Clinton, Cornwallis, Burgoyne, Baum, Tarleton, Rawdon.	*1775:* (1) Bunker Hill, Ticonderoga. (2) Lexington, Quebec. *1776:* (1) Trenton. (2) Brooklyn, White Plains, Ft. Washington. *1777:* (1) Princeton, Saratoga, Bennington. (2) Brandywine, Germantown. *1778:* (1) Monmouth. (2) Savannah. *1779:* (1) Stony Point, Chemung. (2) Savannah. *1780:* (1) Kings Mountain. (2) Charleston, Camden. *1781:* (1) Cowpens, Eutaw Springs, Yorktown. (2) Guilford Courthouse.	England conceded the independence of the American colonies, to which was granted all territory east of the Mississippi except Florida and Canada. American success inspired oppressed people in Europe, especially France, to revolt against their rulers.

French Revolution—War of Italian Liberation

Name of War, Contestants and Dates	Cause of Conflict	Leaders	Chief Battles and Incidents	Results and Comments
Wars of the French Revolution—1789–1799. (1) Revolutionary France vs. (2) Coalitions of England, Austria, Prussia, Holland, and Spain. The Empire, Russia. a. First Coalition—1792–1797.	Intrigues of emigrés; horror of Europe at the execution of the king; French offer of aid to revolutionists in other countries.	(1) Dumouriez, Kellermann, Jourdan, Hoche, Pichegru, Napoleon Bonaparte, Moreau. (2) Duke of Brunswick, Coburg, Charles of Austria.	(1) Valmy, Occupation of Nice and Savoy, Jemmapes. Execution of king (1793). Annexation of Belgium, Fleurus, Lodi; Siege of Mantua. (2) Mainz, Neerwinden, Kaiserslautern, Wurzburg.	By peace of Campo Formio (1797) the French frontier is advanced to the Rhine, Venice is given to Austria and the Cisalpine and Ligurian republics founded in Italy under French control.
b. Bonaparte's Egyptian Expedition—1798–1799.	Bonaparte aims to attack Great Britain's power in India and dreams of conquering the East.	(1) Napoleon Bonaparte. (2) Nelson (England).	(1) Battle of the Pyramids. (2) Aboukir, Acre.	Nelson's victory removes a serious menace to British power in India and cuts off the French in Egypt.
Napoleonic Wars—1799–1815. (1) France under Napoleon vs. (2) European Powers led by England. a. Second Coalition—1799–1802.	The mistakes of the government of the Directory and the prestige of Nelson's victory enable Great Britain to form the Second Coalition. In the later stages this series of wars was kept aflame by Napoleon's insatiable lust for power and England's determination to end his dominance. Napoleon's inability to match English sea power was his greatest weakness.	(1) Napoleon, Joubert, Moreau. (2) Suvarov, Melas, Archduke John.	(1) Marengo, Hohenlinden. Napoleon's passage of the Alps (Great St. Bernard). (2) Novi.	Peace of Luneville with Austria (1801); peace of Amiens with England (1802); Surrender of England's conquests except Trinidad and Ceylon; Malta to be restored to Knights of Malta.
b. Third Coalition—1805.		(1) Napoleon. (2) Nelson, Mack, Alexander I (Russia), Kutuzov.	(1) Ulm, Austerlitz. (2) Trafalgar.	As a result of his brilliant successes Napoleon in 1804 took the title Emperor of the French.
c. (Fourth) War with Prussia and Russia—1806–1807.			(1) Double battle of Jena and Auerstadt. Berlin decree. Friedland.	By the treaties of Tilsit (1807) Russia recognizes Napoleon's relatives as kings of Naples, Holland and Westphalia and consents to Napoleon's control of the Confederation of the Rhine and the grand duchy of Warsaw. Alexander and Napoleon combine to dominate Europe.
d. Peninsular War—1808–1814.	Rebellion of Spain against Joseph Bonaparte, whom Napoleon had placed on the throne.	(1) Soult, Massena. (2) Duke of Wellington.	(1) Corunna. (2) Talavera, Lines of Torres Vedras, Albuera, Salamanca, Vittoria, Toulouse.	French expelled from Spain and Portugal.
e. Fifth War with Austria—1809.		(1) Napoleon. (2) Archduke Charles.	(1) Aspern, Wagram.	Austria cedes territory.
f. Invasion of Russia—1812.	Alexander's refusal to enforce Napoleon's continental system, and other causes of dispute.	(1) Napoleon, Marshal Ney. (2) Kutuzov, Barclay de Tolly.	(1) Smolensk, Borodino. (2) Burning of Moscow. Retreat from Moscow.	Flower of the French Army lost. Napoleon's armor of invincibility forever tarnished.
g. War of Liberation—1813–1814.	The oppressed states of Germany rise against Napoleon's tyranny, Prussia taking the lead.	(1) Napoleon, Ney, Macdonald. (2) Frederick, William III, Francis I, Alexander I, Blücher, Bernadotte.	(1) Lützen, Bautzen, Dresden. (2) Dennewitz, Leipzig (Battle of the Nations). Allies enter Paris.	Driven from Russia in 1812, from Germany in 1813, Napoleon in 1814 was forced to surrender France itself. By the Treaty of Fontainebleau he was given the Island of Elba and an annual revenue of 2,000,000 francs.
h. Waterloo Campaign—1815.	Quarrels among the allies and dissatisfaction of French with Louis XVIII. tempt Napoleon to return from Elba.	(1) Napoleon, Ney. (2) Wellington, Blücher.	Napoleon lands at Cannes (March 1); enters Paris March 20. (1) Ligny. (2) Quatre Bras, Waterloo, (June 18).	Waterloo marks the final downfall of Napoleon. In the Congress of Vienna the allies reconstructed Europe, erecting barriers against democratic movements and liberal ideas.
War of 1812—1812–1815. (1) United States vs. (2) Great Britain.	Destruction of American commerce, blockading of American ports and impressment of American sailors as a corollary of the British struggle with Napoleon. Indian troubles on the frontier were partly inspired by British traders.	(1) Hull, Dearborn, Harrison, Perry, Macdonough, Jackson. (2) Brock, Ross.	(1) Thames, Lake Erie, Lake Champlain, New Orleans. (2) Detroit, Queenstown, Chryslers' Farm, Bladensburg.	Treaty of Ghent restored prewar situation, but England did not revive old claims. The war brought America industrial self-sufficiency and showed her naval power. Northwest U. S. boundary was definitely fixed.
War of Grecian Independence—1821–1829. (1) Greeks, aided by England, Russia and France vs. (2) Turks.	Revived feeling of Greek nationality, stimulated by a widespread secret society working for a restoration of a Greek empire at Constantinople.	(1) Ypsilanti, Diebitsch (Russia), Marco Bozzaris, Byron (England). (2) Ibrahim Pasha.	Massacre of Greeks at Chios. (1) Navarino, Adrianople. (2) Missolonghi.	The treaty of Adrianople, 1829, compelled Turkey to acknowledge the independence of Greece, which chose as king the Bavarian Prince Otto I.
Mexican War—1846–1848. (1) United States vs. (2) Mexico.	Boundary disputes, the annexation of Texas, and pressure of American pioneers westward.	(1) Taylor, Scott. (2) Santa Ana, Ampudia.	(1) Buena Vista, Monterrey, Cerro Gordo, Chapultepec, Churubusco. Mexico occupied.	Treaty of Guadelupe Hidalgo set Texas boundary, gave U. S. California, Utah, Arizona, New Mexico and adjacent territory.
Crimean War—1854–1856. (1) Russia vs. (2) Turkey aided by Great Britain, France and Sardinia.	The political status and future of the Turkish Empire. Immediate cause, the claim of Russia to a protectorate over all Greek Christians living under the sultan's rule.	(1) Menshikov, Gorchakov. (2) Canrobert, Pelissier (France), Raglan, Simpson (England).	(1) Balaclava. (2) Alma, Siege of Sebastopol, Inkermann.	In the peace of Paris (1856) Russia's claim to a protectorate is disallowed, the Danube is opened to navigation and the Black Sea is closed to war vessels of all powers.
War of Italian Liberation—1859–1861. (1) Sardinia-Piedmont and France vs. (2) Austria.	Rebellion of Italians against foreign rule; France joined to strike a blow at her old enemy, Austria.	(1) Victor Emmanuel, Napoleon III, Garibaldi. (2) Francis Joseph II, Gyulay.	(1) Montebello, Magenta, Solferino. Peace signed at Zurich, Nov. 10, 1859.	Victor Emmanuel, starting with Lombardy won Parma, Modena, the papal legations, Sicily and Naples, together with the title, King of Italy. Venetia followed in 1866 and the addition of Rome in 1871 completed the unification of Italy.

Name of War, Contestants and Dates	Cause of Conflict	Leaders	Chief Battles and Incidents	Results and Comments
American Civil War—1861–1865. (1) Federal Government of United States vs. (2) Southern Confederacy, consisting of: Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas and Tennessee.	The underlying causes of the war were: (a) Conflict between the doctrines of state sovereignty and nationalism. (b) Sectional antagonism over numerous issues concerning negro slavery. The immediate cause was the secession of Southern States. The reasons for secession, as given by Southern leaders, were: (a) Northern hatred of slavery and slander of slaveholders; the political campaign against the slave-holding interest, and the endorsement of such exploits as the John Brown raid. (b) The misinterpretation of the Constitution by the North, the repudiation of the Dred Scott decision, and the enactment by Northern states of "personal liberty laws."	(1) Lincoln, Stanton, Grant, McClellan, Sherman, Sheridan, Thomas, Meade, Reynolds, Pope, Buell, Farragut, Porter. (2) Davis, J. E. Johnston, A. S. Johnston, Lee, Jackson, Beauregard, Stuart, Longstreet, Bragg, Hood, Hill, Van Dorn, Early.	*1861:* (2) Bombardment of Ft. Sumter, Bull Run. *1862:* (1) West Tennessee campaign, Shiloh, New Orleans, Murfreesboro, Antietam. (2) Jackson's Shenandoah Valley campaign, Seven Days (Richmond), Bull Run, Fredericksburg. *Monitor* and *Merrimac* fought first battle of ironclad ships; result a draw. *1863:* (1) Vicksburg, Gettysburg, Chattanooga. (2) Chancellorsville, Chickamauga. *1864:* (1) Sherman's March through Georgia, Atlanta, Nashville, Sheridan's Shenandoah Valley conquest. (2) Wilderness, Spotsylvania, Cold Harbor, Lynchburg. *1865:* (1) Siege of Petersburg, leading to Lee's surrender at Appomattox.	The Union was preserved. Slavery was abolished. Secession as a working program was shown to be impracticable. The war cost the lives of nearly one million able-bodied men. The national debt was increased to $2,750,000,000 An incalculable amount of property was destroyed. Foreign immigration was stimulated. The industrial development of the North was speeded. The South suffered a severe economic setback.
Austro-Prussian (or Seven Weeks) War—1866. (1) Prussia with smaller North German States, and Italy vs. (2) Austria, Hanover, Saxony, and South German States.	Friction over Schleswig-Holstein enables Bismarck to force Austria into a war for supremacy in Germany.	(1) William I, Prince Frederic Charles, Moltke, Victor Emmanuel. (2) Benedek, Archduke Albert, Gablenz, Prince Charles of Bavaria.	*In Bohemia:* (1) Soor, Koniggrätz or Sadowa. (2) Trautenau. *In the West:* (1) Aschaffenburg. (2) Langensala. *In Italy:* (2) Custozza, Lissa.	Closed with the peace of Prague, Aug. 23, 1866, which authorized the reestablishment of the Federated German States, excluding Austria; Austria ceded Venetia to Italy, and her rights in Schleswig-Holstein to Prussia. Hanover, Hesse, Nassau also are annexed to Prussia.
Franco-Prussian War — 1870–1871. (1) France vs. (2) Prussia supported by all German States including South.	Jealousy of France at Prussian gains and friction over Hohenzollern candidacy for the throne of Spain. Bismarck's falsification of the "Ems dispatch" tricked France into a declaration of war.	(1) Napoleon, Macmàhon, Bazaine. (2) William I, Moltke, Prince Frederic Charles, Crown Prince Frederic William.	(1) Saarbrucken. (2) Weissenberg, Wörth, Vionville, Gravelotte, Sedan, Capitulation of Metz, Orleans, Capitulation of Paris.	Closed in 1871 with the Treaty of Versailles with the following results: (1) The French military power was destroyed; (2) the western frontier of Germany was rendered secure; (3) The German Empire was established; (4) Germany acquired Alsace and Lorraine.
Russo-Turkish War—1877–1878. (1) Russia vs. (2) Turkey.	Turkish misgovernment and revolts in her Christian subject provinces, which were barbarously put down ("Bulgarian atrocities") arouse all Europe, but Russia alone declares war.	(1) Grand Duke Nicholas, Gurka, Grand Duke Michael, Alexander II. (2) Suleiman Pasha, Osman Pasha, Mukhtar Pasha.	(1) Passages of the Danube at Shitova. Shipka Pass, Plevna, Storm of Kars.	By the peace of San Stefano Montenegro, Servia and Rumania become independent; Bulgaria remains tributary but receives a Christian prince; Russia obtains large indemnity and part of Armenia and also Bessarabia.
Chinese-Japanese War—1894–1895. (1) Japan vs. (2) China.	Rival claims to suzerainty over Korea.	(1) Ito, Yamagata, Oyama, Nogi. (2) Tso, Yeh, Wei.	(1) Yalu River, Port Arthur, Wei-hai-wei, Niuchuang.	Treaty of Shimonoseki, signed April 17, 1895, removed Korea from Chinese influence; ceded Formosa and the Pescadores to Japan, and awarded to the latter an indemnity of $180,000,000.
Spanish-American War—1898. (1) United States vs. (2) Spain.	Sympathy for the oppressed Cubans. A growing spirit of imperialism in America, fostered by propaganda. Blowing up of U. S. battleship *Maine*.	(1) Dewey, Sampson, Schley, Shafter, Roosevelt, Miles, Wood. (2) Montijo, Cervera.	(1) Manila Bay, Santiago, El Caney.	By the treaty of Paris, Dec. 10, 1898, Spain recognized the sovereignty of the United States in Cuba, and ceded to that country the Philippines, Puerto Rico and Guam, in consideration of $20,000,000.
South African or Boer War—1899–1902. (1) Great Britain vs. (2) Transvaal, Orange Free State.	Resistance by the Boers (Dutch) to the British Government in the Transvaal.	(1) Roberts, Kitchener, French. (2) Cronje, Botha, De Wet, Delarey.	(1) Siege of Ladysmith, Paardeberg. (2) Colenso, Spion, Kop, Vaal, Krantz, Magersfontein.	Boers surrendered May 31, 1902; are granted the right of self-government under British Sovereignty, and united with other self-governing British colonies in South Africa.
Russo-Japanese War — 1904–1905. (1) Japan vs. (2) Russia.	Conflict of interests in Manchuria; growth of Russian power in Asia; pressure of population in Japan.	(1) Togo, Kurokl, Oku, Nodzu, Oyama, Nogi. (2) Kuropatkin, Alexieff, Makarov, Stoessel, Stakelberg, Linevich.	(1) Port Arthur and Chemulpo, Vladivostok, Yalu River, Dalny, Siege of Port Arthur, Mukden, Sea of Japan.	Closed Sept. 5, 1905, by Treaty of Portsmouth by which Korea passes under control of Japan, China regains Manchuria, and Japan is granted important railroad rights. Russian military weakness was shown, while Japan rose to rank as a major power.
Balkan Wars—1912–1913. a. First Balkan War— (1) Bulgaria, Greece, Serbia, Montenegro vs. (2) Turkey.	Turkish misrule and atrocities, combined with racial and religious hatred.	(1) Czar Ferdinand, Crown Prince Constantine, Gen. Savov, King Peter.	(1) Lule Burgas, Adrianople, Janini, Scutari, Kirk, Kilissa.	Albania, a new state, was formed; Turkey lost nearly all European territory; Serbia, Greece and Bulgaria were enlarged.
b. Second Balkan War— (1) Greece, Serbia, Montenegro, Rumania vs. (2) Bulgaria.	Bulgaria, dissatisfied with her portion, makes war on her allies.	(2) Nazim Pasha, Muktor Pasha.	(1) Siege of Adrianople; Rumania invades Bulgaria.	Bulgaria lost much of the territory won from Turkey.

World War— Second World War

NAME OF WAR, CONTESTANTS AND DATES	CAUSE OF CONFLICT	LEADERS	CHIEF BATTLES AND INCIDENTS	RESULTS AND COMMENTS
The World War—1914–1918. (1) *The Allies:* Serbia, Russia, Great Britain and Dominions, France, Belgium, Japan, Greece, Rumania, Montenegro, Portugal, Italy, United States. (China, Brazil, Cuba and other countries declared war but did not participate.) (2) *The Central Powers:* Austria-Hungary, Germany, Bulgaria, Turkey.	Assassination of Archduke Francis Ferdinand of Austria-Hungary by a Serbian peasant was an excuse for a test of power between jealous nations whose enmity was kept alive by propaganda while manpower and economic strength were built up after past wars. German desire for economic and political expansion had been held in check by other nations, giving her belief in the right of her cause.	(1) Joffre, Nivelle, Petain, Foch, French, Haig, Albert I, Grand Duke Nicholas, Allenby, Byng, Jellicoe, Beatty, Lyautey, Brusilov, Kerensky, Diaz, Cadorna, Putnik, Pershing, March, Bliss, Bullard, Sims, Benson. (2) Crown Prince William, von Tirpitz, von Hindenburg, Ludendorff, von Moltke, Mackensen, Falkenhayn, Burian, Enver.	*East:* (1) Przemysl, Lodz. (2) Tannenberg, Masurian Lakes, Dunajec, Warsaw, Kovno. *West:* (1) 1st Marne, 2d Ypres, Verdun, Somme, Arras, Cambrai, 2d Marne, Chateau-Thierry, Belleau Wood, St. Mihiel, Meuse-Argonne, Hindenburg Line. (2) Mons-Charleroi, 1st Ypres, Neuve-Chapelle, Artois, 3d Ypres, Picardy, Lys, Oise. *South:* (1) Gorizia, Piave, Bagdad, Jerusalem. (2) Caporetto, Dardanelles, Monastir. *Asia:* (1) Tsingtao. *Naval:* Helgoland, Jutland.	Germany lost her commercial position; surrendered her fleet; her military autocracy fell; her colonies passed to her opponents; Alsace-Lorraine and parts of Schleswig and of Silesia seceded. The map of Europe was made over: Poland, Czechoslovakia, Yugoslavia, Hungary and small states on the Russian frontier became independent. Italy recovered and redeemed her lost provinces. Europe became industrially stagnant; Russia starved and Germany, Austria and Italy were torn with internal disorders. Republics were established and monarchies fell.
Russian Revolutionary War—1917–1920. (1) Russian Bolsheviki (Revolutionists) vs. (2) White Russians assisted by troops and supplies sent by the World War Allies.	Overthrow of imperial government in Russia by Bolshevik Revolution caused Russia's withdrawal from the World War. Allies, fearing the spread of revolutionary ideas, angered by the Bolshevik repudiation of Russia's debts and wishing to rebuild a Russian opposition to Germany, sent expeditions against the Bolsheviks. Former Russian nobility and owners of property fought the revolution because it dispossessed them of their privileges.	(1) Lenin, Trotsky, Felix Dzerzhinsky, Chicherin. (2) Yudenich, Kolchak, Denikin, Wrangel.	(1) Execution of Czar Nicholas and his family (July 16, 1918). (2) British and American expedition at Archangel. (3) Reign of Terror against counterrevolutionaries. Organization of the *Cheka* or secret tribunal for crushing opponents of the revolution. (4) Occupation of Vladivostok by Japanese. (5) Civil War in South of Russia and in Baltic area.	Foreign efforts to crush Communists failed. Russian people were united in patriotic determination to control their own affairs. Lenin and Trotsky emerged as Russia's strong men. Communist activity was dispersed over the capitalistic world.
Italo-Ethiopian War—1935–36. (1) Italy vs. (2) Ethiopia.	Disputes over border infringements between Ethiopia and Italian colony of Eritrea. Fundamental cause was Italy's desire for colonial expansion.	(1) Mussolini, Emilio de Bono, Pietro Badoglio. (2) Haile Selassie.	(1) Imposition of Sanctions by League of Nations. (2) Bombing of Ethiopian towns by air raids. (3) Capture of Addis Ababa with flight of Ethiopian ruler, Haile Selassie.	Ethiopians easily crushed by modern military equipment of Italians. Impotence of League of Nations to prevent conflict involving a great Power demonstrated. Italy obtained large undeveloped African territory as field of exploitation.
Spanish Civil War—1936–39 (1) Loyalists vs. (2) Insurgents. (3) Unofficial participation by Italy and Germany on side of Insurgents. Support of Loyalists by Soviet Union and France.	Counterrevolution by supporters of the old regime financed by powerful outside interests. Religious strife over attempted disestablishment of Roman Catholic Church. Economic and social strife between the Left and Right.	(1) Francisco Largo Caballero, Manuel Azaña, Juan Negrin, José Miaja. (2) Francisco Franco, Emilio Mola.	(1) Siege of Madrid. (2) Large scale aerial bombardments of civilian population in Madrid, Barcelona, Valencia. (3) Capture of Bilbao by Insurgents. (4) Drive to Mediterranean by Insurgents. (5) Submarine activity and naval blockades.	International tension among the great Powers. Testing of modern military equipment and new tactics of warfare. Franco gained control over all Spain.
Chinese-Japanese War—1937– (1) Japan vs. (2) China.	Japanese expansionist ambitions; resurgence of nationalistic spirit in China under the leadership of Chiang Kai-shek. Chinese resentment at Japanese encroachment in North China.	(1) Juichi Terauchi, Kenkichi Ueda, Seishiro Itagaki, Fumimaro Konoye. (2) Chiang Kai-shek, T. V. Soong, German and Russian military advisers.	(1) Capture of Shanghai and Nanking by Japanese. (2) Destructive air raids on Chinese cities, particularly Canton. (3) Guerrilla tactics by Chinese. (4) Huge losses of property and life on both sides without decisive results.	Japanese occupy large portions of Chinese territory. Severe economic dislocation in both China and Japan. Militant nationalist sentiment rises in China.
Second World War—1939– (1) The Axis: Germany, Italy, Finland, Rumania, Japan, Bulgaria, Hungary vs. (2) The Allies: Poland, Great Britain, France, Denmark, Norway, Belgium, Holland, Greece, Yugoslavia, Russia, United States, China, Mexico, Cuba, Haiti, Central American Nations, and South American Nations (except Argentina and Chile which remained neutral).	Germany, Italy and Japan desire expansion.	(1) Axis: Hitler, Goering, Rommel, Brauchtsch, Runstedt, Leeb, Mussolini, Homma, Yamashita, Muto, Sato, Beck, Goebbels. (2) Allies: Wavell, Churchill, Stalin, Voroshilov, Timoshenko, Budenny, Marshall, MacArthur, Nimitz, Hart, Brett, Wainwright, Sutherland, Blamey, Gamelin, Weygand, Eisenhower, Montgomery, Alexander, King, Arnold, Pound, DeGaulle, Giraud.	Germany and Russia conquer Poland. Germany occupies Denmark. Germany conquers Norway, Holland, Belgium, Luxembourg, France, Yugoslavia, Greece and Hungary. England conquers Ethiopia, Italian Somaliland, Eritrea and Iraq. Germany invades Russia. Tremendous battle of Russia. Battle of Atlantic. Japan attacks United States at Pearl Harbor. Japan conquers much Chinese territory, Wake, Guam, The Philippines, Malaya, Sumatra, Java, Borneo, Burma. U. S. wins at Coral Sea and Midway Island. Americans capture Guadalcanal, part of New Guinea; win naval victories near Solomon Islands and in Bismarck Sea. Allies conquer Axis in Africa and Attu I.	

CHRONOLOGICAL TABLES OF RULERS

ASSYRIAN RULERS BEFORE THE PERSIAN CONQUEST

Early Babylonian chronology is uncertain; the dates shown indicate the approximate times the several dynasties were in power. Names of individuals are seldom definitely known.

B.C.	
2500	Dynasty of Ur.
2300	First Dynasty of Babylon—11 kings.
2160	Dynasty of Sisku—11 kings.
1780	Kassite Dynasty—36 kings.
1203	Dynasty of Isin—11 kings.
1070	Seacoast Dynasty—3 kings.
1050	Betbazi Dynasty—3 kings.
1030	Elamite Dynasty—1 king.
1025	Second Babylonian Dynasty—19 kings.
730	Dynasty of Sape (obscure, merges into Persian Conquest.)

KINGS OF EGYPT

Early Egyptian chronology is uncertain; the dates shown indicate the approximate time the various dynasties were in power. Individuals of special importance in history or art are named.

B.C.	
3400	I Dynasty, founded by Menes.
	II Dynasty.
2980	III Dynasty.
2900	IV Dynasty, includes Khufu (Cheops), Khafre, Menkure.
2750	V Dynasty.
2625	VI Dynasty.
2475	VII and VIII Dynasties.
2445	IX and X Dynasties.
2160	XI Dynasty.
2000	XII Dynasty, includes
2000	Amenhemet I.
1970	Sesostris I.
1935	Amenhemet II.
1906	Sesostris II.
1887	Sesostris III.
1849	Amenhemet III.
1801	Amenhemet IV.
1788	XIII to XVII, or Hyksos, Dynasties.
1580	XVIII Dynasty, includes
1557	Amenhotep I.
1547	Thothmes I.
1501	Thothmes II. and Thothmes III.
1448	Amenhotep II.
1420	Thothmes IV.
1411	Amenhotep III.
1375	Amenhotep IV.
1358	Tutankhamen.
1350	XIX Dynasty, includes
1315	Ramses I.
1313	Seti I.
1292	Ramses II.
1225	Merneptah.
1209	Seti II.
1200	XX Dynasty, includes
1198	Ramses III.
1090	XXI Dynasty.
945	XXII Dynasty, includes
945	Sheshonk.
745	XXIII Dynasty.
718	XXIV Dynasty.
712	XXV Dynasty, includes
688	Tirhakah.
663	XXVI Dynasty, includes
663	Psammetichus I.
609	Necho.
593	Psammetichus II.
588	Apries.
569	Amasis II.
525	XXVII Dynasty (Persian).
405	XXVIII to XXX Dynasties.
30	Egypt becomes a Roman province.

KINGS AND RULERS OF ENGLAND

A.D.	
827	Saxon Heptarchy ends and seven kingdoms unite as England.
827	Egbert.
838	Ethelwolf.
858	Ethelbald.
860	Ethelbert.
866	Ethelred I.
872	Alfred.
901	Edward the Elder.

KINGS AND RULERS OF ENGLAND—Continued

925	Athelstan.
940	Edmund I.
946	Edred.
955	Edwy.
959	Edgar.
975	Edward II, the Martyr.
978	Ethelred II.
1016	Edmund II, Ironside.
1016	Canute.
1035	Harold I, Harefoot.
1039	Hardicanute.
1041	Edward III, the Confessor.
1066	Harold II.
1066	William the Conqueror.
1087	William II, Rufus
1100	Henry I, the Scholar.
1135	Stephen (of Blois).
1154	Henry II, Plantagenet.
1189	Richard the Lion-hearted.
1199	John Lackland.
1216	Henry III.
1272	Edward I.
1307	Edward II.
1327	Edward III.
1377	Richard II.
1399	Henry IV of Lancaster.
1413	Henry V.
1422	Henry VI.
1461	Edward IV.
1483	Edward V.
1483	Richard III.
1485	Henry VII, Tudor.
1509	Henry VIII.
1547	Edward VI.
1553	Mary I.
1558	Elizabeth
1603	James I, Stuart.
1625	Charles I.
1649	Commonwealth.
1653	Oliver Cromwell, Protector.
1658	Richard Cromwell.
1660	Charles II.
1685	James II.
1689	William III and Mary II.
1694	William alone.
1702	Anne.
1714	George I.
1727	George II.
1760	George III.
1820	George IV.
1830	William IV.
1837	Victoria.
1901	Edward VII.
1910	George V.
1936	Edward VIII.
1936	George VI.

KINGS OF FRANCE

A.D.	
448	Merovech.
456	Childeric.
481	Clovis, grandson of Merovech.
511	Thierry, Childebert, Clodomer and Clotaire I.
558	Clotaire alone.
561	Charibert, Gontran, Sigebert and Chilperic.
583	Clotaire II of Soissons.
596	Thierry II and Theodobert II, kings of Austrasia.
614	Interregnum.
628	Dagobert and Charibert.
638	Siegebert II and Clovis II.
655	Clotaire II.
660	Childeric II.
679	Thierry III.
690	Pepin Heristal, Mayor of the Palace.
692	Clovis III.
695	Childebert III.
711	Dagobert III.
714	Charles Martel.
715	Childeric II.
720	Thierry IV.
742	Childeric III.
752	Pepin the Short.
768	Charlemagne and Carloman.
814	Louis the Debonnaire.
840	Charles the Bald.
877	Louis II the Stammerer.
879	Louis III and Carloman.
884	Charles the Fat.
888	Eudes.
898	Charles III the Simple.
922	Robert, Usurper.
923	Rodolph.

KINGS OF FRANCE—Continued

936	Louis IV the Stranger.
954	Lothaire.
986	Louis V the Lazy.
987	Hugh Capet, Usurper.
996	Robert.
1031	Henry I.
1060	Philip I.
1108	Louis the VI the Gross.
1137	Louis VII.
1180	Philip II Augustus.
1223	Louis VIII the Lion.
1226	Louis IX (St. Louis).
1270	Philip III the Bold.
1285	Philip IV the Fair.
1314	Louis X the Quarrelsome.
1316	John I, 8 days.
1316	Philip V the Long.
1322	Charles IV the Fair.
1328	Philip VI of Valois.
1350	John II the Good.
1364	Charles V the Wise.
1380	Charles VI the Beloved.
1422	Charles VII the Victorious.
1461	Louis XI.
1483	Charles VIII.
1498	Louis XII.
1515	Francis I the Gentleman.
1547	Henry II.
1559	Francis II.
1560	Charles IX.
1574	Henry III.
1589	Henry IV the Great.
1610	Louis XIII the Just.
1643	Louis XIV the Great.
1715	Louis XV.
1774	Louis XVI.
1804	Napoleon Bonaparte, Emperor.
1814	Louis XVIII.
1824	Charles X.
1830	Louis Philippe.
1848	Second Republic, Louis Napoleon, President.
1852	Napoleon III, Emperor of the French.
1870	Third Republic.

KINGS OF GERMANY

A.D.	
843	Louis or Ludwig the German.
876	Louis or Ludwig the Younger.
882	Charles the Fat.
887	Arnulf.
900	Louis or Ludwig the Child.
911	Conrad I.
918	Henry I the Fowler.
936	Otto I the Great.

In 962 Otto the Great secured the crown of the Holy Roman Empire; from this date until 1806 the list of Holy Roman emperors is nearly identical with the list of kings of Germany. But after 1556 (abdication of Charles V) the authority of the Holy Roman emperors was chiefly confined to the hereditary possessions of the House of Hapsburg. In 1701 the Elector Frederick III of Brandenburg assumed the title of Frederick I, King of Prussia. In 1871 William I of Prussia became German emperor.

KINGS OF PRUSSIA

A.D.	
1701	Frederick I.
1713	Frederick William I.
1740	Frederick II, the Great.
1786	Frederick William II.
1797	Frederick William III.
1840	Frederick William IV.
1861	William I, crowned German Emperor 1871.

EMPERORS OF GERMANY AND KINGS OF PRUSSIA

A.D.	
1871	William I.
1888	Frederick III.
1888	William II.
1918	German Republic established.

HOLY ROMAN EMPERORS

A.D.	
800	Charlemagne.
814	Louis I the Debonnaire.
840	Lothaire I.
855	Louis II.
875	Charles II the Bald.
877	Interregnum.
881	Charles III the Fat.
887	Interregnum.
896	Arnulf.
899	Interregnum.
901	Louis III, of Provence.
905	Interregnum.
962	Otto I, the Great.
973	Otto II.
983	Otto III.
1002	Henry II. the Lame.
1024	Conrad II.
1039	Henry III the Black.
1055	Henry IV.
1077	Rudolph, killed in battle.
1080	Henry IV, reinstated.
1106	Henry V.
1125	Lothaire II.
1138	Conrad III.
1152	Frederick I, Barbarossa.
1190	Henry VI.
1198	Philip.
1208	Otto IV.
1212	Frederick II.
1250	Conrad IV.
1254	Interregnum.
1273	Rudolph of Hapsburg.
1291	Adolph of Nassau.
1298	Albert of Austria.
1308	Henry VII of Luxemburg.
1314	Louis IV.
1347	Charles IV.
1378	Wenceslas.
1400	Robert, Count Palatine.
1410	Sigismund.
1438	Albert II of Austria.
1440	Frederick III.
1493	Maximilian I.
1519	Charles V.
1556	Ferdinand I.
1564	Maximilian II.
1576	Rudolph II.
1612	Matthias.
1619	Ferdinand II.
1637	Ferdinand III.
1658	Leopold I.
1705	Joseph I.
1711	Charles VI.
1742	Charles VII.
1745	Francis I.
1765	Joseph II.
1790	Leopold II.
1792	Francis II, till 1806.
1806	Confederation of the Rhine. Francis II renounces title of Holy Roman Emperor and King of Germany and takes the title of Francis I, Emperor of Austria.

EARLY KINGS OF ITALY

A.D.	
476	Odoacer.
493	Theodoric.
526	Amalasunta and Athalric.
534	Theodotus.
536	Vitiges.
540	Interregnum.
541	Totila.
552	Interregnum.
553	Tejas.
	End of Gothic Kingdom in Italy.

KINGS OF MODERN ITALY

A.D.	
1861	Victor Emmanuel II of Sardinia.
1878	Humbert I.
1900	Victor Emmanuel III.

KINGS OF MEDIA

B.C.	
634	Cyaxares I.
595	Astyages.
559	Cyaxares II or Darius.
536	Cyrus the Great, who forms the Medo-Persian Empire.

KINGS OF THE PERSIANS

B.C.	
559	Cyrus the Great.
529	Cambyses or Ahasuerus.
522	Smerdis or Artaxerxes.
521	Darius or Hystaspes.
486	Xerxes the Great.
465	Artaxerxes Longimanus.
425	Xerxes II.
425	Sogdianus.
424	Ochus or Darius Nothus.
404	Artaxerxes Mnemon.
361	Artaxerxes Ochus.
338	Arses.
336	Darius Codomanus.
330	Alexander the Great conquers Darius. End of Persian Empire.

GOVERNORS AND JUDGES OF THE ISRAELITES

The dates shown are not substantiated by modern research, but are the result of early Biblical study.

B.C.	
1491	Moses.
1451	Joshuah.
1405	Othniel.
1323	Ehud.
1305	Shamgar.
1285	Deborah and Barak.
1255	Gideon.
1236	Abimelech.
1232	Tola.
1210	Jair.
1188	Jephthah.
1182	Ibzan.
1175	Elon.
1165	Abdon.
1157	Eli.
1137	Samson.
1116	Samuel.

KINGS OF THE JEWS

B.C.	
1095	Saul.
1055	David and Ishbosheth.
1048	David.
1015	Solomon.
975	Division of the Kingdom.

KINGS OF JUDAH

B.C.	
975	Rehoboam.
958	Abijam.
955	Asa.
914	Jehoshaphat.
889	Jehoram.
885	Ahaziah.
884	Athaliah.
878	Jehoash.
839	Amaziah.
810	Azariah.
742	Ahaz.
727	Hezekiah.
698	Manasseh.
643	Amon.
641	Josiah.
610	Jehoahaz.
610	Jehoiakim.
610	Jehoiachin.
598	Zedekiah.
588	Nebuchadnezzar destroys Jerusalem.

KINGS OF ISRAEL

B.C.	
975	Jeroboam.
954	Nadab.
953	Baasha.
930	Ela.
929	Zimri
929	Omri.
917	Ahab.
897	Ahaziah.
896	Jehoram.
884	Jehu.
856	Jehoahaz.

KINGS OF ISRAEL—Continued

841	Jehoash.
826	Jeroboam II.
773	Zachariah.
772	Shallum.
772	Menahem.
761	Pekahiah.
759	Pekah.
730	Hosheah.
721	Shalmanezer, King of Assyria, takes Samaria. End of the Kingdom of Israel.

PRINCES OF JUDEA

(Called the Maccabees)

B.C.	
166	Judas Maccabeus.
161	Jonathan.
143	Simon.
135	John Hyrcanus.

KINGS OF JUDEA

B.C.	
107	Aristobulus.
106	Alexander Jannaeus.
79	Alexandra.
70	Hyrcanus.
70	Aristobulus.
63	Hyrcanus restored.
40	Antigonus.
37	Herod the Great.
3	Archelaus.
A.D.	
8	Judea becomes a Roman province.

EMPERORS OF ROME

B.C.	
31	Augustine Caesar.
A.D.	
14	Tiberius.
37	Caligula.
41	Claudius.
54	Nero.
68	Galba.
69	Otho.
69	Vitellius.
70	Vespasian.
79	Titus.
81	Domitian.
96	Nerva.
117	Hadrian.
138	Antoninus Pius.
161	Marcus Aurelius Antoninus and Lucius Verus.
170	Marcus Aurelius alone.
180	Commodus.
193	Pertinax.
193	Julian, 66 days.
193	Septimius Severus.
218	Heliogabalus.
222	Alexander Severus.
235	Maximinus.
236	Gordian the Elder.
236	Pupeinus and Balbinus.
238	Gordian the Younger.
244	Philip.
249	Decius.
251	Gallus.
253	Emilianus.
254	Valerian and Gallienus, his son.
260	Gallienus alone.
268	Claudius II.
270	Aurelian.
275	Tacitus.
275	Florianus.
276	Probus.
282	Carus.
283	Carinus and Numerianus.
284	Diocletian.
304	Constantius and Galerius.
211	Caracalla and Geta.
217	Marcinus.
306	Constantine the Great.
337	Constantine II, Constantius and Constans.
361	Julian the Apostate.
363	Jovian.
364	Empire is divided.

ROMAN EMPERORS OF THE WEST

A.D.	
364	Valentinian.
367	Valentinian and Gratian.
375	Valentinian II and Gratian.
383	Valentinian II alone.
392	Eugenius.
394	Theodosius master of the whole Roman Empire, which is divided between his sons at his death, Jan. 17, 395.
395	Honorius.
423	Valentinian III.
454	Petronius Maximus.
454	Avitus.
455	Interregnum.
456	Majorian.
461	Severus.
467	Anthemius.
472	Olybius.
473	Glycerius.
474	Julius Nepos.
476	Augustulus.
476	Rome taken by Odoacer, at which event Western Empire ends.

ROMAN EMPERORS OF THE EAST

A.D.	
364	Valens.
378	Interregnum of 5 months.
379	Theodosius the Great.
395	Arcadius.
408	Theodosius II.
450	Marcianus.
457	Leo the Great.
474	Leo II.
474	Zeno.
491	Anastasius I.
518	Justin I.
527	Justinian I.
565	Justin II.
578	Tiberius II.
582	Mauritius.
602	Phocas.
610	Heraclius.
641	Constantine III.
641	Constans II.
668	Constantine IV.
685	Justinian II.
695	Leontinus.
698	Tiberius III.
705	Justinian II restored.
711	Philip Bardanes.
713	Anastasius II.
716	Theodosius III.
718	Leo III the Isaurian.
741	Constantine V Copronymus.
775	Leo IV.
780	Constantine VI and Irene.
797	Irene alone.
802	Nicephorus I.
811	Michael I.
813	Leo III.
821	Michael II the Stammerer.
829	Theophilus.
842	Michael III.
867	Basil I the Macedonian.
886	Leo VI the Philosopher.
911	Alexander and Constantine VII. Porphyrogenitus.
919	Romanus I, Lecapenes, Christopher, Stephen and Constantine VIII.
945	Restoration of Constantine VII.
959	Romanus II.
961	Nicephorus Phocas II.
969	John Zimisces.
975	Basil II and Constantine IX.
1025	Constantine alone.
1028	Romanus III Argyrus.
1034	Michael IV the Paphlagonian.
1041	Michael V Calaphates.
1042	Zoe and Theodora.
1042	Constantine X Monomachus.
1054	Theodora restored.
1056	Michael Stratioticus.
1057	Isaac Comnenus I.
1059	Constantine XI Ducas.
1067	Romanus Diogenes.
1071	Michael VII Parapinaces, Andronicus I, Constantine XII.
1078	Nicephorus Botaniates III.
1081	Alexius Comnenus I.
1118	John Comnenus I.
1143	Manuel Comnenus.
1180	Alexius Comnenus II.

ROMAN EMPERORS OF THE EAST—Continued

1183	Andronicus.
1185	Isaac Angelus.
1195	Alexius Angelus.
1203	Isaac Angelus restored.
1204	Alexius Mourzoufle.
1204	Baldwin I.
1206	Henry.
1217	Peter de Courtenay.
1220	Robert de Courtenay.
1228	John de Brienne and Baldwin II.
1237	Baldwin alone.
1261	Michael Paleologus.
1283	Andronicus II.
1295	Michael IX.
1328	Andronicus III.
1341	John Cantacuzene.
1355	John Paleologus.
1391	Manuel.
1425	John Paleologus II.
1448	Constantine XIII.
1453	Constantinople taken by Turks, and end of Empire.

RULERS OF RUSSIA

A.D.	
1328	Ivan I.
1340	Simeon.
1353	Ivan II.
1359	Demetrius II.
1362	Demetrius Donskoi.
1389	Basil III.
1425	Basil IV.
1462	Ivan III.
1505	Basil V.
1533	Ivan the Terrible.
1584	Feodor I.
1598	Boris Godonov.
1605	Feodor II.
1606	Demetrius the Pole.
1610	Ladislaus of Poland.
1613	Michael Romanov.
1645	Alexis.
1676	Feodor III.
1682	Ivan V and Peter I.
1721	Peter I took title of Czar.
1725	Catherine I.
1727	Peter II.
1730	Anne.
1740	Ivan VI.
1741	Elizabeth.
1762	Catherine II the Great.
1796	Paul.
1810	Alexander I.
1825	Nicholas I.
1855	Alexander II.
1881	Alexander III.
1894	Nicholas II.
1917	Abdication of Nicholas, last of the czars.

KINGS OF SPAIN

A.D.	
1469	Kingdom of Spain formed by marriage of Isabella to Ferdinand V.
1516	Charles I.
1556	Philip II.
1598	Philip III.
1621	Philip IV.
1665	Charles II.
1700	Philip V of Bourbon.
1724	Louis I.
1746	Ferdinand VI.
1759	Charles III.
1788	Charles IV.
1808	Ferdinand VII.
1808	Joseph Bonaparte.
1813	Ferdinand VII resumes.
1833	Isabella II.
1870	Amadeo I.
1874	Alfonso XII.
1886	Alfonso XIII.
1931	Republic proclaimed.

KINGS OF SCOTLAND

A.D.	
843	Kenneth McAlpin.
858	Donald I.
862	Constantine I.
877	Aed.
878	Eochaed.
889	Donald II.
900	Constantine II.
943	Malcolm I.
953	Indulf.
959	Duff.
963	Culen.
970	Kenneth II.
987	Constantine III
995	Kenneth III.
1002	Malcolm II.
1033	Duncan I.
1039	Macbeth.
1057	Malcolm III.
1093	Donald III.
1094	Duncan II.
1098	Edgar.
1107	Alexander I
1127	David I.
1153	Malcolm IV.
1165	William.
1214	Alexander II.
1249	Alexander III.
1286	Margaret.
1292	John Baliol.
1306	Robert I.
1329	David II.
1371	Robert II.
1390	Robert III.
1406	James I.

KINGS OF SCOTLAND—Concluded

1437	James II.
1460	James III.
1488	James IV.
1513	James V.
1542	Mary Stuart.
1567	James VI who in
1603	became James I of England.

KINGS OF SYRIA

B.C.	
312	Seleucus I Nicanor.
281	Antiochus I Soter.
261	Antiochus II Theus.
246	Seleucus II Callinicus.
226	Seleucus III Ceraunus.
223	Antiochus III the Great.
187	Seleucus IV Philopater.
175	Antiochus IV Epiphanes.
164	Antiochus V Eupator.
162	Demetrius I Soter.
150	Alexander I Balas.
145	Demetrius II Nicanor.
144	Antiochus VI Theus.
143	Diodotus or Tryphon.
139	Antiochus VII Sidetes.
130	Demetrius II Nicanor.
126	Alexander II Zebina.
124	Seleucus V.
123	Antiochus VIII Grypus.
97	Seleucus VI Nicanor.
93	Antiochus Eusebes.

KINGS OF SYRIÀ—Concluded

92	Antiochus IX Grypus.
91	Philip.
90	Demetrius Euchares.
85	Antiochus Dionysius.
83	Tigranes.
69	Antiochus Asiaticus.
65	Syria becomes a Roman province.

KINGS OF SWEDEN

A.D.	
966	Eric the Victor.
994	Olaf.
1026	Edmund Jacobson.
1035	Edmund or Amand III.
1041	Haakon.
1056	Steinkel.
1060	Inge I.
1054	Halstan.
1080	Philip.
1100	Inge II.
1130	Ragwald.
1133	Magnus I.
1144	Sverker II.
1150	Eric X.
1162	Charles VII.
1168	Canute.
1192	Sverker III.
1211	Eric XI.
1220	John I.
1223	Eric XII.
1250	Waldemar.

KINGS OF SWEDEN—Concluded

1276	Magnus II.
1290	Birger II.
1318	Magnus III.
1365	Albert.
1397	Margaret.
1411	Eric XIII.
1441	Christopher.
1448	Charles VIII.
1458	Christian I.
1520	Christian II.
1528	Gustavus I Vasa.
1560	Eric XIV.
1569	John III.
1592	Sigismond I.
1606	Charles IX.
1611	Gustavus Adolphus II.
1632	Christina.
1654	Charles X.
1660	Charles XI.
1697	Charles XII.
1718	Ulrica Eleonore.
1720	Frederic.
1750	Adolphus Frederic.
1771	Gustavus Adolphus III.
1792	Gustavus Adolphus IV.
1809	Charles XIII.
1818	Charles John XIV.
1844	Oscar Frederic.
1859	Charles XV.
1882	Oscar II.
1907	Gustaf V.

POPES OF THE ROMAN CHURCH

Date of Election or Consecration A. D.	
c. 41	B. Petrus
c. 67	S. Linus
c. 79	S. Cletus (*Anencletus*)
c. 91	S. Clemens I
c. 100	S. Evaristus
c. 109	S. Alexander
c. 119	S. Sixtus (*Xystus*)
c. 128	S. Telesphorus
c. 138	S. Hyginus
c. 142	S. Pius
c. 157	S. Anicetus
168	S. Soter
177	S. Eleutherus
c. 190	S. Victor I
c. 202	S. Zephyrinus
218	S. Calixtus I
222	S. Urbanus I
230	S. Pontianus
235	S. Anterus
236	S. Fabianus
251	S. Cornelius
253	S. Lucius
254	S. Stephanus I
257	S. Sixtus (*Xystus*) II
259	S. Dionysius
269	S. Felix
275	S. Eutychianus
283	S. Gaius
296	S. Marcellinus
307	S. Marcellus
309	S. Eusebius
310	S. Melchiades (*Miltiades*)
314	S. Sylvester
336	S. Marcus
337	S. Julius
352	S. Liberius
366	S. Damasus
384	S. Siricius
398	S. Anastasius I
402	S. Innocentius I
417	S. Zosimus
418	S. Bonifacius I
422	S. Celestinus I
432	S. Sixtus III
440	S. Leo I
461	S. Hilarus
468	S. Simplicius
483	S. Felix III
492	S. Gelasius
496	S. Anastasius II
498	S. Symmachus
514	S. Hormisdas
523	S. Joannes I
526	S. Felix IV
530	Bonifacius II
532	Joannes II
535	S. Agapetus I
536	S. Silverius
537	Vigilus
555	Pelagius I
560	Joannes III
574	Benedictus I
578	Pelagius II
590	S. Gregorius I (*the Great*)
604	Sabinianus
607	Bonifacius III
608	S. Bonifacius IV
615	S. Deusdedit
619	Bonifacius V
625	Honorius
640	Severinus
640	Joannes IV
642	Theodorus I
649	S. Martinus
654	S. Eugenius I
657	S. Vitalianus
672	Adeodatus
676	Donus
678	S. Agatho
682	S. Leo II
684	S. Benedictus II
685	Joannes V
686	Conon
687	S. Sergius I
701	Joannes VI
705	Joannes VII
708	Sisinnius
708	Constantinus I
715	S. Gregorius II
731	S. Gregorius III
741	S. Zacharias
752	Stephanus II
752	Stephanus III
757	S. Paulus I
767	Constantinus II
768	Stephanus IV
772	Hadrianus I
795	S. Leo III
816	Stephanus V
817	S. Paschalis I
824	Eugenius II
827	Valentinus
827	Gregorius IV
844	Sergius II
847	S. Leo IV
855	Benedictus III
858	S. Nicolaus I
867	Hadrianus II
872	Joannes VIII
882	Marinus I
884	Hadrianus III
885	Stephanus VI
891	Formosus
896	Bonifacius VI
896	Stephanus VI (VII)
897	Romanus
897	Theodorus II
898	Joannes IX
900	Benedictus IV
903	Leo V
903	Christophorus
904	Sergius III
911	Anastasius III
913	Lando
914	Joannes X
928	Leo VI
929	Stephanus VIII
931	Joannes XI
936	Leo VI (VII)
939	Stephanus IX
942	Marinus II
946	Agapetus II
955	Joannes XII
963	Leo VIII
964	Benedict V
965	Joannes XIII
973	Benedict VI
974	Benedictus VII
983	Joannes XIV
984	Bonifacius VII
985	Joannes XV
996	Gregorius V
999	Sylvester II (*Gerbert*)
1003	Joannes XVII (*Sicco*)
1003	Joannes XVIII
1009	Sergius IV
1012	Benedict VIII
1024	Joannes XIX
1033	Benedictus IX
1045	Gregorius VI
1046	Clemens II
1048	Damasus II
1049	S. Leo IX
1055	Victor II
1057	Stephanus X
1058	Benedict X
1059	Nicolaus II
1061	Alexander II
1073	S. Gregorius VII
1080	Victor III
1088	Urbanus II
1099	Paschalis II
1118	Gelasius II
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1143	Celestinus II
1144	Lucius II
1145	Eugenius III
1153	Anastasius IV
1154	Hadrianus IV
1159	Alexander III
1181	Lucius III
1185	Urbanus III
1187	Gregorius VIII
1187	Clemens III
1191	Celestinus III
1198	Innocentius III
1216	Honorius III
1227	Gregorius IX
1241	Celestinus IV
1243	Innocentius IV
1254	Alexander IV
1261	Urbanus IV
1265	Clemens IV
1271	Gregorius X
1276	Innocentius V
1276	Hadrianus V
1276	Joannes XXI
1277	Nicolaus III
1281	Martinus IV
1285	Honorius IV
1288	Nicolaus IV
1294	S. Celestinus V
1294	Bonifacius VIII
1303	Benedictus XI
1305	Clemens V
1316	Joannes XXII
1334	Benedictus XII
1342	Clemens VI
1352	Innocentius VI
1362	Urbanus V
1370	Gregorius XI
1378	Urbanus VI
1378	Clemens VII
1389	Bonifacius IX
1394	Benedict XIII
1404	Innocentius VII
1406	Gregorius XII
1409	Alexander V
1410	Joannes XXIII
1417	Martinus V
1431	Eugenius IV
1447	Nicolaus V
1455	Calixtus III
1458	Pius II
1464	Paulus II
1471	Sixtus IV
1484	Innocentius VIII
1492	Alexander VI
1503	Pius III
1503	Julius II
1513	Leo X
1522	Hadrianus VI
1523	Clemens VII
1534	Paulus III
1550	Julius III
1555	Marcellus II
1555	Paulus IV
1559	Pius IV
1566	S. Pius V
1572	Gregorius XIII
1585	Sixtus V
1590	Urbanus VII
1590	Gregorius XIV
1591	Innocentius IX
1592	Clemens VIII
1605	Leo XI
1605	Paulus V
1621	Gregorius XV
1623	Urbanus VIII
1644	Innocentius X
1655	Alexander VII
1667	Clemens IX
1670	Clemens X
1676	Innocentius XI
1689	Alexander VIII
1691	Innocentius XII
1700	Clemens XI
1721	Innocentius XIII
1724	Benedictus XIII
1730	Clemens XII
1740	Benedictus XIV
1758	Clemens XIII
1769	Clemens XIV
1775	Pius VI
1800	Pius VII
1823	Leo XII
1829	Pius VIII
1831	Gregorius XVI
1846	Pius IX
1877	Leo XIII
1903	Pius X
1914	Benedictus XV
1922	Pius XI
1939	Pius XII

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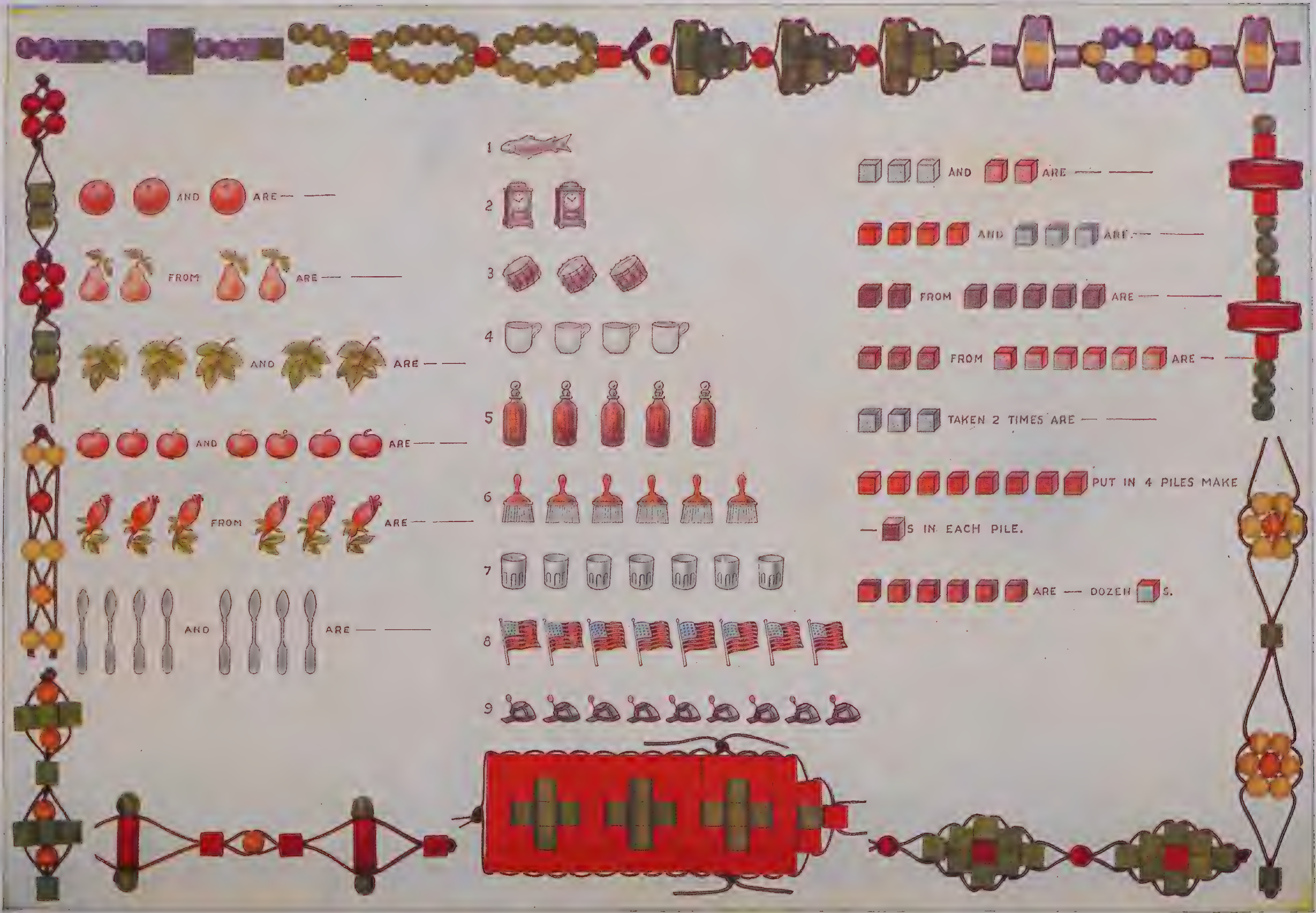
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Objects and Designs for Primary Number and Bead Work

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BOOK VII: MATHEMATICS

HISTORY OF MATHEMATICS

How and when men first got the idea of numbers we do not know; we can only guess. We do know that some five or six thousand years ago in ancient Mesopotamia and Egypt men knew how to count and they recognized many simple geometrical relations.

Greek Mathematics.—Mathematics as a science really begins with the Greeks, 500 or 600 years before the Christian era. The Greeks originated the essential idea of demonstration or proof, which sharply distinguishes modern mathematics from the empirical, trial-and-error mathematics of earlier times.

The great names in Greek mathematics were Thales, Pythagoras, Eudoxus, Euclid, Archimedes, Eratosthenes, Apollonius and Diophantus. In the work of three of these men, representatives of a great mass of mathematical activity, we can trace the progress made by the Greeks in the three main branches of mathematical thought to which they made significant contributions.

Euclid, who lived about 300 B.C., was the great systematizer of geometry. For more than 2,000 years the words geometry and Euclid have meant the same things. As late as 1900 school children all over Europe studied geometry directly from Euclid's great textbook the *Elements,* and even today geometry texts are really renderings of Euclid's book in modern language.

We do not know now how much of the *Elements* was Euclid's original creation and how much was a compilation of the results of others. It is generally thought that Euclid made a systematic digest of the geometrical knowledge current in his time. This should not blind us to Euclid's greatness, although it helps us to realize that he stood, as Newton once said of himself, "on the shoulders of giants."

Archimedes (*c.* 287 B.C.–212 B.C.) was the most fertile and versatile scientific genius of antiquity. He lived in Syracuse during the turbulent times of the Second Punic War. In 212 B.C. the city was captured and sacked by Roman soldiers. Marcellus, the Roman commander, gave orders that Archimedes must be spared. A band of plunderers broke into Archimedes's house and found him in his study contemplating some geometrical figures drawn in sand. Questioned, "Are you Archimedes?" the mathematician merely asked the marauders not to disturb the diagrams. The soldiers cut him down.

In the history of mathematics Archimedes is important for his essentially modern grasp of the idea of *limits,* which lies at the foundation of the integral calculus. He treated the problem of circle mensuration more completely than any of his predecessors and arrived at the first mathematical approximation of the number π—less than 3 1/7 and greater than 3 10/71. There had been earlier guesses at the value of π than this, but they had been based upon mere measurement of the diameters and circumferences of circles. Archimedes went at the problem from the point of view of theoretical mathematics and developed a method that would give the value of π to any desired degree of approximation.

Archimedes's name is associated with many discoveries in mechanics. He first formulated the laws of the lever and is alleged to have said, "Give me a place to stand, and I will move the earth." He investigated the principles of buoyancy and displacement of liquids, and by means of them detected the fraud of substitution of base metal for gold in a crown made for King Hieron of Syracuse. He invented the rotary pump now called *Archimedes's screw,* and his ingenious war machines played an important part in the defense of Syracuse against the Roman assault. These mechanical inventions he considered of little importance compared with his work of pure research.

The development of arithmetic and algebra by the Greeks was small compared with their contribution to geometry, but in Diophantus (d. about 300 A.D.) they produced a great algebraist. He was handicapped by the lack of a convenient number system, but he made great strides in one of the most difficult branches of mathematics, the theory of numbers, and many of the problems he investigated have not yet been fully solved.

Classical Problems.—Much of Greek mathematics was concerned with attempts to solve the three classical geometrical problems and the paradoxes of Zeno. The three geometrical problems were as follows:

1. To trisect a given angle.
2. To construct a cube having a volume twice that of a given cube.
3. To construct a square of area equal to that of a given circle.

After Descartes had invented the analytic geometry in the 17th century, it became evident that the first two of these problems are impossible under the traditional Greek restriction that the constructions be made with compass and a straightedge only. They are impossible because their analytic statement involves equations of a higher degree than the second, and it can be shown that any geometric construction with compass and straightedge, no matter how complicated and no matter how many circles and straight lines we draw, will only locate points in a plane that are solutions of first or second degree equations.

The limitation of constructions to those made with compass and straightedge is interesting. The Greeks, so far as we know, were unaware of the relation between geometric constructions and algebraic equations of various degrees. Yet the compass and straightedge restriction that they imposed divides geometry into an elementary and a higher section precisely as it is divided on the basis of modern analysis. Any problem that can be reduced to the solution of a quadratic equation can be solved geometrically by compass and straightedge; any problem not reducible to a quadratic equation is impossible by compass and straightedge.

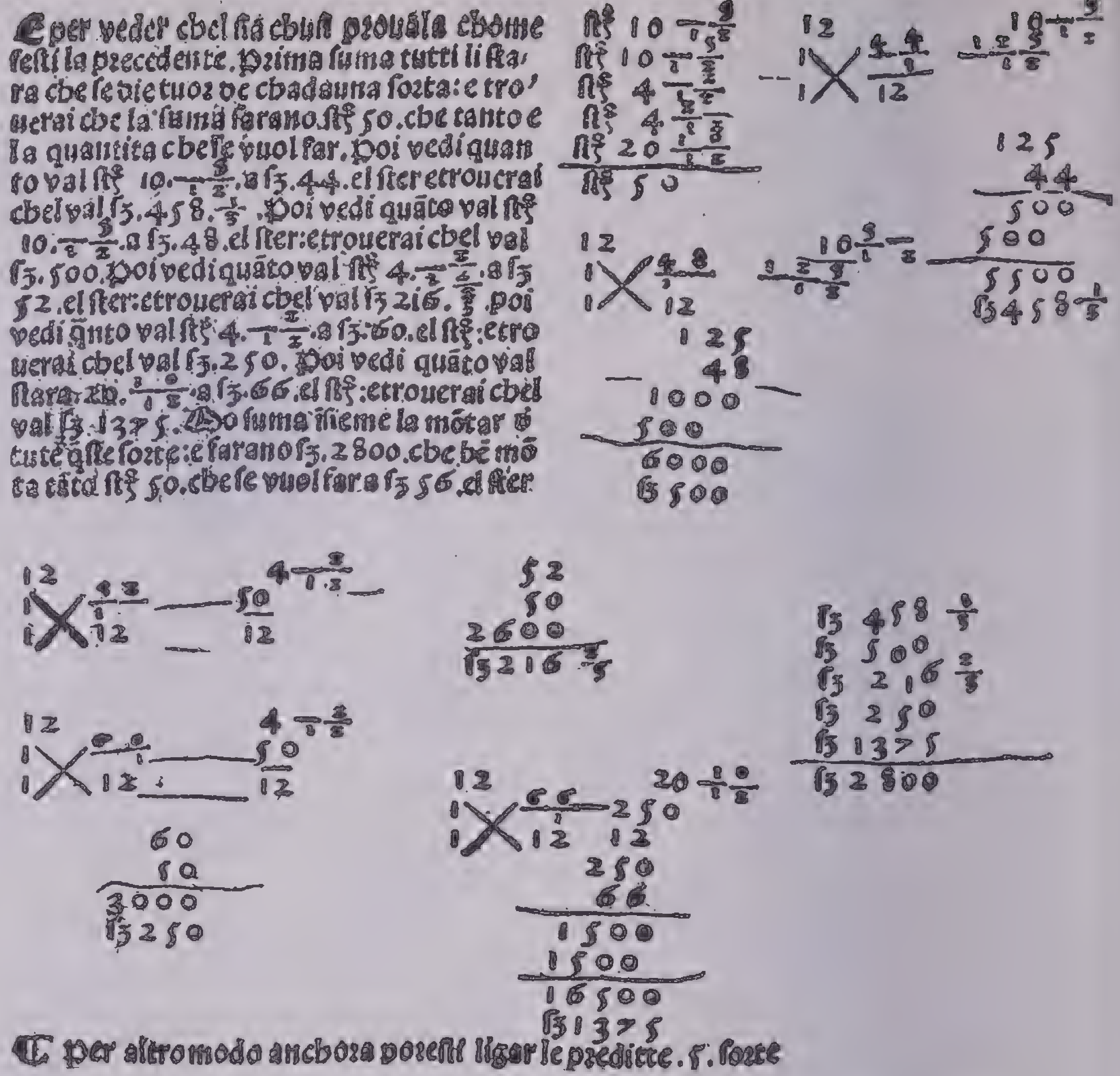
The third classical problem, that of squaring the circle, is of a different sort. Equations equivalent to the trisection and duplication problems are easily derived; they are seen to be of the third degree, that is, they are cubic equations. But it is impossible to state the problem of squaring the circle in the form of an algebraic equation. It was not until the end of the 19th century that there was a rigorous proof that squaring the circle is geometrically impossible.

The problem is that of determining the number π. Archimedes's method was that still taught in geometry texts—calculating the perimeters of polygons with a large number of sides and thus approaching more and more nearly to the true value of the circumference of the inscribed or circumscribed circle. In modern times more convenient methods have been devised depending upon infinite series, and the value of π has been calculated to more than 700 places of decimals. It was shown by F. Lindemann in 1882 that π is a number of the type called *transcendental,* that is, it is irrational itself, and every rational power of it and every sum of different rational powers of it are irrational. An *irrational* number is one that cannot be expressed as the ratio of two whole numbers however large. A *transcendental* number is a special kind of irrational that cannot be the root of a rational algebraic equation of any degree.

The *paradoxes of Zeno* are important in the history of mathematics because they are related to the knotty problem of continuity, in many ways the central problem of mathematics. The best known of Zeno's paradoxes is that of *Achilles and the Tortoise.* Suppose that a tortoise is fleeing from Achilles, and that Achilles runs 10 paces while the tortoise runs 1. Suppose that Achilles, at the beginning of the pursuit, is 10 paces behind the tortoise. When Achilles has covered these 10 paces, the tortoise will be 1 pace ahead; when Achilles covers that distance, the tortoise will be 1/10 of a pace ahead; when Achilles has advanced this 1/10 of a pace, the tortoise will be 1/100 of a pace ahead. It is evident, therefore, said Zeno, that Achilles can never overtake the tortoise. Since we know that in real life Achilles does overtake the tortoise, it may seem that this cavil is of little consequence. But paradox or contradiction in formal logic is intolerable to the mathematician, for it destroys his whole science. Zeno must be answered not by an appeal to the facts of experience but by an appeal to logic. As a matter of fact, Zeno's paradox and others like it have never been answered to the satisfaction of all mathematicians and have lain at the bottom of many fiercely contested disputes in mathematics and philosophy.

The Moslems.—European mathematics stood practically still for a thousand years following the decay of Alexandrian study in the first centuries of the Christian Era. The Romans did not produce a single first-rank mathematician in the whole of their history, and the same is true of northern and western Europe throughout the Middle Ages. The original work in mathematics in medieval times was confined to the Moslems or Arabs. The work of their leading thinkers filtered into Europe chiefly through the cultural contacts formed by the crusaders and the presence of Moslem scholars in Spain.

Our knowledge of Moslem mathematics is sketchy. Some scholars have urged that the leading Moslem thinkers should rank with the geniuses of 16th and 17th-century Europe, Galileo, Descartes, Leibnitz and Newton, as the founders of modern science. So high an estimate is an exaggeration, but it is true that arithmetic and algebra owe much of their basic material to the Arabs, and that without the Arabic system of numerals modern science cannot be imagined.



E per veder chel ſia chuſi prouala chome feſti la precedente. Prima ſuma tutti li kara ra che ſe die tuor de chadauna ſorta: e trouerai che la ſuma ſarano ſtʒ 50. che tanto e la quantita che ſe vuol far. Poi vedi quanto val ſtʒ 10 5/12. a ſʒ 44. el ſter e trouerai chel val ſʒ 458 1/3. Poi vedi quato val ſtʒ 10 3/12. a ſʒ 48. el ſter: e trouerai chel val ſʒ 500. Poi vedi quato val ſtʒ 4 [illegible]. a ſʒ 52. el ſter: e trouerai chel val ſʒ 216 2/3. poi vedi qnto val ſtʒ 4 2/12. a ſʒ 60. el ſtʒ: e trouerai chel val ſʒ 250. Poi vedi quato val ſtara 20 10/12. a ſʒ 66. el ſtʒ: e trouerai chel val ſʒ 1375. Do ſuma inſieme la motar de tute qſte ſorte: e ſarano ſʒ 2800. che ben mota tanto ſtʒ 50. che ſe vuol far a ſʒ 56. el ſter

Per altro modo anchora poreſti ligar le predicte .5. ſorte

Page from the First Commercial Arithmetic, Published at Venice, 1485–88

The 16th and 17th Centuries.—The century and a half between the publication of Copernicus's new theory of the solar system (1543) and Newton's *Principia* (1687) saw an immense advance. More mathematical development occurred in this period than in all previous history together. Mathematics passed from infancy to maturity, from a kind of learned game cultivated as a magic art to an elaborate discipline, at once the servant and the master of the rising giant of modern science.

The invention of algebraic symbols, the systematized treatment of trigonometry, the application of algebra to geometry (analytic geometry), the invention of logarithms, the foundations of the theory of probability and the invention of the calculus all date from this time.

An astonishing expansion of astronomy, mechanics and optics parallelled the advance of mathematics. The leading mathematicians were also the leading astronomers and physicists, and we should not think of the three sciences as separate, for they form closely related sections of a general advance of knowledge.

Two Italians, Niccoló Tartaglia (1500–57) and Jerome Cardan (1501–76), are famous in the history of algebra for their solution of the general cubic equation. Tartaglia obtained a considerable fame about the year 1535 by his victory over a Venetian scholar named Florido in a contest of mathematical skill. Tartaglia proved in this contest that he had discovered new methods for solving cubic equations. Cardan, a professor at the University of Milan, had long been at work on an algebraic treatise; hearing of Tartaglia's success over Florido, Cardan sought and obtained under a solemn pledge of secrecy an explanation of Tartaglia's methods. Then Cardan broke his promise and published Tartaglia's contribution as his own in 1545, and in spite of the fact that historical scholarship has proved Tartaglia's prior claim, the method is still known as *Cardan's solution.*

François Viète, the earliest of the great French mathematicians, was born in 1540. His studies in geometry and trigonometry were the first substantial contributions made to those sciences since the time of the Greeks. He was also the greatest algebraist of his time, and it is to him that we owe the introduction of many of the common symbols of algebra. His most important achievement was his systematic use of letters to represent numbers.

Viète acquired a European reputation by his controversial powers and particularly by his worsting of a contemporary mathematician Adrianus Romanus in a contest of mathematical skill. He gave the earliest known solution (by compass and straightedge) of the famous *Problem of Apollonius,* "To construct a circle tangent to three given circles." Henry IV of France employed Viète to decipher a secret code used by Philip II of Spain. Philip had been so sure his cipher could not be solved that when he found that the French were aware of the contents of his letters, he complained to the Pope that witchcraft was being used against him.

Johannes Kepler (1571–1630) is best known for his three laws of planetary motion, which are discussed in the section ASTRONOMY. Only a first-rate mathematician could have deduced these laws from the mass of observational data assembled by the great stargazer, Tycho Brahe. Kepler's work was the foundation on which Newton built his great structure of mathematical mechanics.

René Descartes (1596–1650), famous in the history of philosophy and physics as well as mathematics, originated *analytic geometry.* This was a great step forward; it ranks with

Newton and Leibnitz's creation of the calculus as the most important contribution to mathematics that can be attributed to the genius of a particular man.

The basic idea of analytic geometry is the representation of the points of a plane by sets of numbers or coordinates. This enables us to trace a relationship between algebraic functions and geometric curves.

Descartes's invention of the analytic geometry overshadows his other mathematical work, but he made valuable contributions in almost every branch of mathematics.

Early in the 17th century a Scotchman John Napier (1550–1617) and an Englishman Henry Briggs (1561–1630) made jointly the discovery of logarithms. Mathematical theory was advanced by investigating the nature of logarithms and the methods for calculating them, and the use of logarithms to shorten the tedious computations of trigonometry and celestial mechanics enabled a rapid advance in those sciences.

When we consider the methods used by Briggs in producing the first table of common logarithms (which contained the logarithms of the numbers from 1 to 20,000 calculated to 14 decimal places), we are astonished at his tremendous industry. To obtain an individual logarithm Briggs made 47 successive extractions of an irrational square root, carrying the calculation to 17 or 18 decimal places. He then had to make a multiplication of two numbers each 18 figures in length! To this day there has been no new calculation of logarithms on so extensive a scale, and Briggs's *Arithmetica Logarithmica,* published in 1624, is still the basic work from which modern tables are constructed. It is remarkable for its accuracy as well as for the amazing labor involved in its original calculation.

The theory of mathematical probability, which has become a powerful tool of modern research, was founded by two Frenchmen, Blaise Pascal (1623–62) and Pierre de Fermat (1601–65). Pascal's attention was drawn to the subject in 1654 by a question proposed by a French nobleman regarding the equitable division of the stakes in an unfinished game of cards. It is one of the ironies of scientific history that so apparently trivial a question as the awarding of money at a gaming table should have had such far-reaching results.

Both Pascal and Fermat were fertile mathematical creators. Fermat's studies in the theory of numbers show his astonishing insight. He is a worthy fourth in the company of Archimedes, Descartes and Newton. It is remarkable that throughout modern history France has generally led the world in mathematical thought. Any list of the 50 leading mathematicians of history would contain many more Frenchmen than mere population proportion would predict. Fermat was one of the first mathematical minds of that mathematical nation.

Modern mathematicians are still at work in the fields opened up by Fermat. There is in particular a proposition known as *Fermat's last theorem* that has not yet been generally proved. This proposition appears in a note written on the margin of one of the books of Fermat's private library:

> It is impossible to partition a cube into two cubes, or a biquadrate into two biquadrates, or generally any power higher than a square into two powers of like degree. I have discovered a truly wonderful proof of this, which, however, this margin is too narrow to hold.

In modern terms this proposition is usually stated as an equation insoluble in integers: When n is greater than 2, the equation $x^n + y^n = z^n$ has no solution in integers. When n is equal to 2, the equation has an infinite number of solutions (e.g. $x=3$, $y=4$, $z=5$), but if n is greater than 2, no integral solution is known. It has been proved that the theorem is true for all values of n less than 14,000, but efforts to prove or disprove its general truth have been unsuccessful. It is hard to believe that Fermat had a demonstration of this theorem that would be satisfactory to modern criticism, but no proposition that he said he had proved has ever been disproved since his time.

Isaac Newton (1642–1727) was the greatest mathematician that ever lived. In 1687 appeared his *Philosophiae Naturalis Principia Mathematica,* usually called simply the *Principia.* This book announced the three laws of motion and (implicitly) the law of universal gravitation. For more than 200 years mathematicians and astronomers accepted the *Principia* as the fundamental statement of natural law and devoted their efforts to working out the scheme in greater detail. In our own day the Newtonian system is giving way to the theory of relativity, but as A. S. Eddington has remarked, "To imagine that Newton's great scientific reputation is tossing up and down in these latter-day revolutions is to confuse science with omniscience."

In pure mathematics Newton's contributions were as far-reaching as in physics and astronomy. It is needless to discuss the rival claims of Newton and Gottfried Leibnitz (1646–1716) to the invention of the branch of mathematics now called the calculus. There is enough glory to go round, and it does not detract from our estimate of the genius of either man that the other worked along similar lines and arrived independently at similar results. Upon the calculus is based the whole of modern engineering and physics.

Newton also discovered many theorems in algebra and geometry. The *binomial theorem* is perhaps the most important.

The 18th Century.—Mathematicians of the 18th century devoted themselves mainly to working out the system of mechanics founded by Newton and to the discovery of new theorems in the calculus. The Bernoullis (James, 1654–1705; John, 1667–1748; Daniel, 1700–1782), Jean le Rond d'Alembert (1717–83), Leonhard Euler (1707–83), Joseph Lagrange (1736–1813) and Pierre Simon Laplace (1749–1827) were the chief figures in this development. At the end of the century appeared Laplace's great work *La Mécanique Célèste* in which the whole resources of the contemporary mathematical synthesis were applied to the mechanics of the solar system, and the theory of its motions was worked out in detail.

Great Names of Recent Times.—Early in the 19th century came a period of criticism of fundamental assumptions that resulted in a great flowering of mathematical activity and a new concept of the nature of mathematical truth. What almost amounts to a revolution took place in the work of Karl Friedrich Gauss (1777–1855), Niels Abel (1802–29), Augustin Louis Cauchy (1789–1857), Évariste Galois (who died in 1832 before he was 21) and Karl Jacobi (1804–51). Out of this renaissance grew the far-reaching ideas of non-Euclidean geometry, the theory of groups, the theory of the continuum and the modern analysis of the nature of mathematical logic.

A mere list of the important mathematicians of the 19th century would require considerable space. The greatest of them all was Gauss. Geometry, the theory of numbers, the theory of elliptic functions, astronomy, optics and electricity were all indebted to him for searching analysis.

Since the middle of the 19th century the advance in mathematics has been rapid. Its use in the speculations of present-day physics gives a special importance to the creation of non-Euclidean geometry. For 2,000 years the geometry of Euclid's *Elements* had held a special place in the thinking of educated Europe. The propositions of Euclid appeared to be perfect examples of indubitable truth, perhaps the only kind of real truth that man could attain. But in 1830 Nikolai Lobachevsky (1793–1856) published a new system of geometry in which the Euclidean postulate regarding parallel lines was denied. He showed that it was possible to construct self-consistent systems of geometry on various assumptions.

The introduction of this Lobachevskian geometry showed the necessity for a new conception of the nature of mathematical truth. Henri Poincaré (1854–1912), one of the greatest of recent mathematicians, said: "By truth we mean *freedom from contradiction,* nothing more."

Other types of non-Euclidean geometry were later introduced by Georg Riemann (1826–66).

The study of n-dimensional space also originated in the 19th century. The geometry of two dimensions (plane geometry) may be treated analytically by algebraic equations in two variables. Solid geometry may be treated by the use of three variables. Although we can no longer draw the figures, it is possible to have an analytic geometry of four dimensions or, indeed, of any number of dimensions. In the hands of Hermann Minkowski, early in the 20th century, a four-dimensional geometry was used as a framework for a new system of physics. This was the famous space-time continuum that became the cornerstone of Einstein's Theory of Relativity.

BEGINNING NUMBER WORK

Only the careless, stupid or ignorant teacher and parent will underestimate the prime importance of the first 50 or 100 hours in which a child concerns himself with numbers. Though our knowledge of childhood is imperfect, we are pretty sure that the first 3 years of life are more important than any other 3 or 6 years of life as far as the main structure of a child's physique and total personality are concerned. In a certain sense the first-grade teacher meets a child only after it is too late to do much with him. By then he is an "old dog," unlikely to learn new fundamental tricks of presenting himself to the world or interpreting the world to himself. If the first number work does not consist of the best types of experiences, then wrong biases, unfortunate emotional attitudes, even unconscious blocks will pester and impede the child so greatly that superior teaching later on will hardly make up for the handicap imposed earlier.

Objectives.—The main purpose of beginning number work is to help the child organize his world quantitatively. Just as it is fruitful for him to live in a world of color, of distance, of sound, and just as he does live in a world of likes and dislikes and a world of things and people, he also should begin to live in a world of increasing quantitative precision. To grow up partly means to live in a world not of a long way but of "2 miles"; not of a short time but of "10 minutes"; not of a pocketful of pennies but of "15 pennies"; not in a world of "I need some more" but of "I need 7 more." His world must become more precise in the sense that he goes to the store to get not a bagful of eggs but a dozen eggs. This organization of the child's life quantitatively should be so active that he can recognize number relationships and then little by little actually manipulate them for himself. Arithmetic is a way of *thinking,* the most accurate way yet invented.

Methods.—If this is general principle, what is the general philosophy of method? Instead of starting by learning precise number facts such as seven added to three makes ten, the child should proceed in his directed learning from general ideas and statements to precise ones. In short he should begin with reading in which quantitative ideas and phrases are inserted in meaningful and carefully planned processions; and then he should go on to exact computation. The first steps in number work should not be computation and drill work but general reading work with such a content that number ideas will occur in the general stream of the pupils' thinking and experience. In this sense first work in arithmetic may seem incidental to the child; but there is nothing incidental about it to the one who assumes responsibility for teaching him reading, the warp and woof of beginning school work. Give the child a series of stories well within his experience and understanding in which he will meet quantitative ideas in a planned order. In the first few months of reading he should meet in varied context such quantitative ideas as the following: many, bigger, bigger than, biggest, large, small, five, larger, six, largest, number, smaller, smallest, near, count, seven, nine, each, tall, taller, tallest, high, fewer, higher, more, highest, much, most, circle, square and so on. From such general words in quantitative phrases the child gradually and in a carefully planned fashion drifts to increasingly precise quantitative situations until he wants to know—and hence is ready to learn—not that Mary has many dolls and Jean has fewer dolls but that Mary has five dolls and Jean three; then also he naturally inquires, "How many more dolls has Mary than Jean?"

Reality and Certainty.—A third idea deals with the general characteristics of a fact that has been learned. Take as an illustration the number combination $5+2=7$. With other addition facts and related subtraction facts, this forms the main technical knowledge of arithmetic that the child learns in first and second grades. The fact that the visual pattern $\boxed{5+2=}$ is read $\boxed{\begin{array}{c}7\\ \hline \textit{seven}\end{array}}$, just as the three letters c-a-t are read *cat,* is an aspect of this number combination most easily seen; but learning this fact and all the other facts should have as background or foundation the following general feelings: First, a sense of reality; not $5+2$ to be remembered like a sequence of nonsense syllables, but $5+2$ as a real fact, $5+2$ which has been experienced as 5 marbles plus 2 marbles or 5 ducks plus 2 ducks and so on. The sheer computation of $5+2=7$ should be further supported by an almost religious conviction of its truth. No matter who denies it, $5+2=7$, not 8 or 6 or 52. My mother may tell me when to go to bed, but even she has not the right to tell me that $5+2=8$. There is no personal opinion about it. In the learning of $5+2$ it is well for the child not only to see that it really happens and that it is really so but as far as possible he should discover this eternal truth for himself. To learn by discovery instead of just being told requires the light touch in teaching and real insight into the dynamics of learning that deserve far more discussion than this mere mention. The rigor and vigor of the child's learning will be further reinforced if a sense of personal ownership can be woven into the learner's experience. When a child reads about Columbus or about Indians, he is reading about something that is not his property; but when he writes $5+2$ and follows it with a 7, it was his own energy that did the writing and his own knowledge that caused him to write the 7 with confidence.

Each bit of personal responsibility and personal ownership that can echo through a child's organism will stand his first learning in good stead. To these more subtle characteristics of good learning in first number work, add a sense of security and stability. It may be rainy today but sunny tomorrow; warm this summer but cold next winter; but $5+2=7$ day in and day out. Prices may be down one year and up the next, and we may guess about it 10 years in advance; but that $5+2=7$ is a secure and permanent fact. My father may be a big shot on my street, well known in town, but nationally a nobody; but that $5+2=7$ is *universally* true. These feeling tones, over and above the effects of drill and correctness of answers, make for a nonchalance that distinguishes the good learner from the not-so-good learner.

At the beginning the child should learn to identify numbers with quantities seen in pictures, and the pictures should be varied so that the numbers are not tied to sticks, bananas, rocks or birds but refer to any collection. They are universally applicable.

Natural Way to Think.—The number sequences should become natural ways for the child to think. Before precise computation in addition and subtraction, gross comparisons should be made, such as: Which is more, 21 or 12? Which number is less, 18 or 14? What number comes between 56 and 58? As this is going on his quantitative vocabulary should be enlarged by the sort of reading which has already been recommended.

Hints on Practice.—After this type of background has been carefully and skilfully laid, the child could proceed to the 100 addition facts that go from $0+0$ to $9+9$ and to the 100 subtraction facts that go from $0-0$ to $18-9$. In teaching the first precise arithmetic computations many fascinating problems arise, such as: In what order should the number combinations be taught? Should addition and subtraction be taught together? If there is not time for the child to discover for himself by experimentation the truth of all the 200 facts, should his actual experimentation be limited to the first few? Or should the experimentation and verification be scattered over the whole field? Are some number facts inherently harder than others, and if so, what should be done about the variation in difficulty? These questions and many others of equal importance often must be answered on a basis of personal judgment. Though any one teacher may be impressed with the virtue of his own judgment, others have contrary judgments. That some number facts are inherently more difficult than others is based on sound psychological theory and careful research. Some types of drill have been proved far more fruitful than others. The following comments, though they are not supported by as overwhelming investigation as we might wish, have presumptive evidence to support them.

Some addition facts can well be taught and mastered before subtraction is introduced, but subtraction should not be postponed in its entirety until the 100 addition facts are possessed by the child. Since zero presents special difficulty because of its peculiarity, we should not start teaching $0+0$ first on the theory it gives the smallest answer; and perhaps we should not teach $1 - 1$ first, for a variety of reasons. There are many orders, but the following is as good an order as any and superior to many: $2 + 2$, $5 + 2$, $2 + 6$, $1 + 5$, $5 + 1$, $2 + 1$, $1 + 2$ and so on, until a first block with answers of relatively small numbers is mastered. After this first block of addition has been mastered, the related subtraction facts should come in for attention.

Before learning has proceeded very far, the dynamic relationships should be taken advantage of. The child should see that $2 + 3 = 5$, $3 + 2 = 5$, $5 - 2 = 3$, $5 - 3 = 2$ are alike, a group or brothers and sisters; and he should realize that $18 - 9$, $3 + 6$, $7 - 0$ and $4 + 4$ are as neighbors living on the same street but are not brothers and sisters.

The learning of $7 + 8$ does something for the learning of $8 + 7$, but it does not guarantee that learning. No doubt $8 + 7 = 15$ somewhat facilitates the learning that $15 - 7$ leaves 8. It is doubtful pedagogy to assume that the learning of any combination will guarantee the learning of some other. The transfer is large but not perfect. You and I can infer the result of $9 + 3$ by knowing what $3 + 9$ is, but we should always remember that children are not little adults, and that their powers of inference are children's and not adults' powers.

With flash cards, oral exercises and written drills of various kinds, the child soon begins to practice. Among the many specifications of good drill two are representative. First, practice that leads to error or frustration is either worthless or worse than no practice. It probably would be better for a second-grade youngster, busy and concerned with many things other than arithmetic, to take a nap than to drill and get it wrong. Practice should be successful; but in spite of this, we know very well there will be error. Error should be immediately checkmated by correction and by successful practice on the specific item that was wrong.

A second major specification is that all number combinations should not be practiced an equal number of times. The textbook buyer may well wonder why it is that in many schools $2 + 2$, which is pretty easy, actually appears in many textbooks and drill materials far more frequently than does $7 + 9$; but a child should be as sure of both these combinations as he is of his own name. We often tolerate practice that is distributed among the items practiced upon in fantastic and foolish ways. In general, $7 + 9$ should appear in drill work after it has been taught as frequently or more frequently than an easier combination such as $5 + 4$.

Three specifications of useful practice are: (1) make it successful by basing it upon adequate instruction and understanding; (2) insist on immediate correction of error followed by right responses; (3) distribute the drill so that the harder items are never slighted but always receive adequate attention.

Help from Parents.—One further observation is needed. Parents *do* help their children at home, even though the school advises against it. The methods of learning arithmetic that children use in school now vary in both small and large ways from the methods that mature people learned when they were in school. If the child learns one system of teaching in school and then is taught another method by parents at home, the net result is often confusion. If and when parents help children at home with their schoolwork, they should do it only if they have become thoroughly acquainted with the techniques of teaching and the specific methods used at school, and they should render such help only under the guidance of the teacher in the classroom.

ARITHMETIC

The following pages present in orderly fashion the essentials of arithmetic so that from them one may learn for himself the minimum computational skills of arithmetic as used in everyday life; and so that parents and teachers may have a guide as they want to help children to learn the essentials of arithmetic as commonly taught in the first nine grades of American schools.

Following this main section is a graded list of verbal problems, arranged school grade by school grade. They make use of various social situations and demand facility in using addition, subtraction, multiplication and division with whole numbers, fractions, decimals, denominate numbers and the three cases of percentage. Section Two can be thought of as applying the skills which are explained and practiced in Section One.

Section Three spreads out a large array of the useful facts that one needs in meeting the daily demands of arithmetic.

Beginning Arithmetic

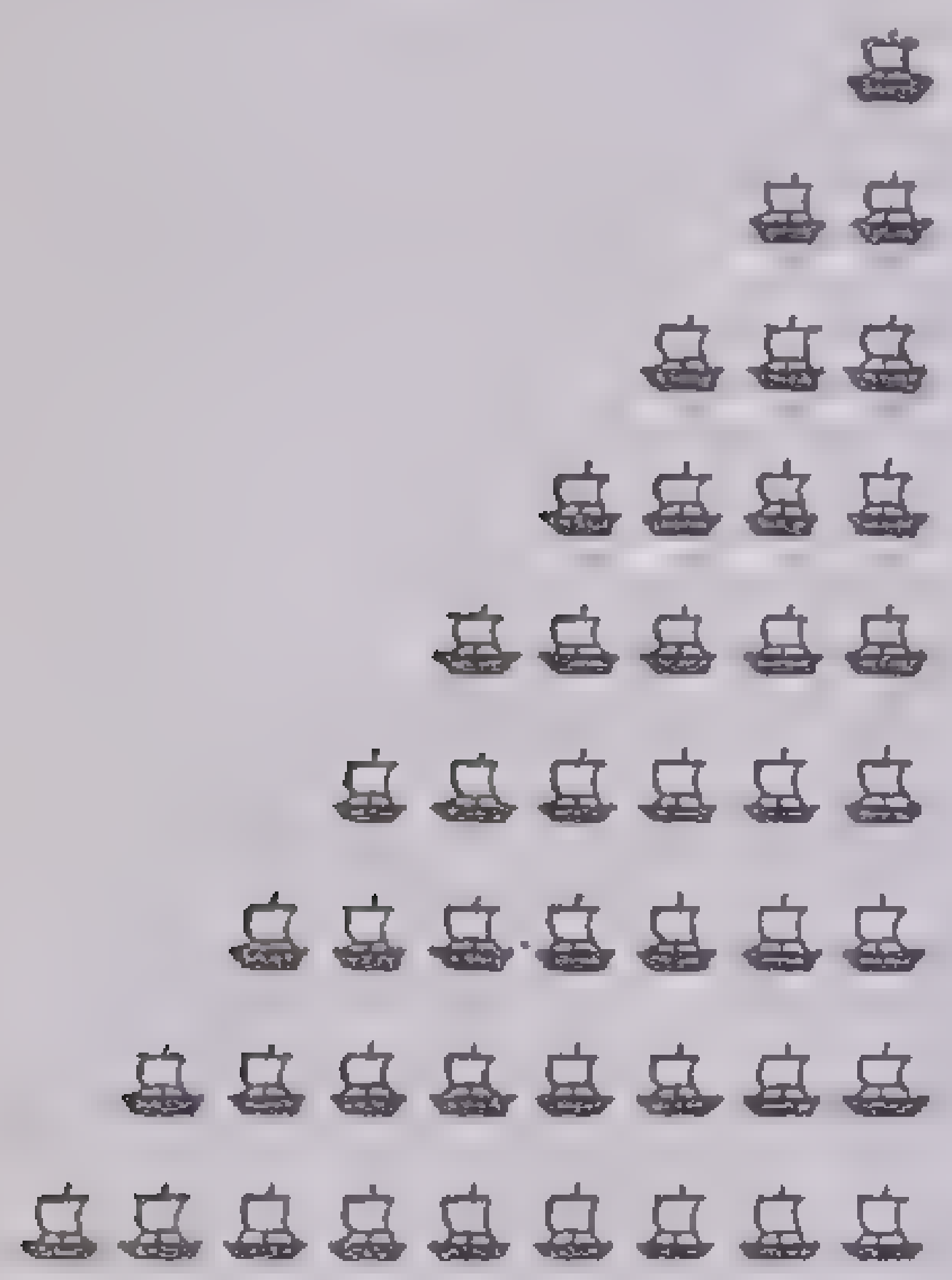
It is very difficult for the observer of the child to make up his mind just when the first notions of number are consciously possessed by the youngster. We are certain however that the first notions are very important. There is truth in the old saying that "As the twig is bent so grows the tree." In guiding young children in arithmetic it is prudent to make haste slowly, to be sure that the youngster really understands the basic facts and the basic ideas, that he knows, for example, that $2 + 2 = 4$ as surely and as naturally as he knows his own name. Serious caution is here recorded against hurrying the child along in arithmetic to new topics when the old topics are only half mastered, or when the old topics are still objects of uncertainty and fear. If these pages are used by the adult for his own learning, let him also take this caution to heart.

Arithmetic is a language and a very precise language, but the basic words of the language must be thoroughly mastered. We begin the child's work not with number facts at all, such as 6 is 2 larger than 4. Rather, we begin with the less precise notions. From these less precise ideas we carry the child on to the beautiful precision of arithmetical computation. Introduce the child, then, to quantitative thinking in terms of stories or in talk about what the child sees around him. Such phrases as these form the feeling basis for good work in arithmetic and it is important for a child to begin to feel and think in quantitative relationships as a matter of course before he practices actual computation. Remember, if we hurry the child into computation, such as $7 + 8 = 15$, before he has notions of quantity and comparison, we ask him to indulge in a whole series of nonsense syllables. Perhaps the reader will remember that when he was in the fourth grade he could find that the quotient of $7326 \div 24$ was $305\frac{6}{24}$. However, if he were asked, "What does this quotient mean?" or "What does this quotient tell us about the 24 and the 7326?" he was at loss to give a commonsense answer. The following sentences are samples of the kinds of reading, the kinds of thinking and the kinds of talk that a youngster should indulge in and thoroughly understand before he takes up his first work in addition and subtraction of whole numbers.

"Uncle Jim is *taller* than Aunt Maria." Later through measurement the child will get to know that "Uncle Jim is $3\frac{3}{8}$ inches taller than Aunt Maria," but the unspecified comparison is the first step. "It is not *many* days until Christmas." "This apple is *bigger* than that one, and here is an apple *biggest* of all." "My hand is *large;* your hand is *small.* My hand is *larger* than yours." "Father sits in the *largest* chair when we eat supper." "Mother, I have eaten *one* cooky. Might I have *another* cooky?" "Pick me out the *smallest* pencil of these *five.*" "Do you see that this blue pencil is *smaller* than that red one?" "It is not very *far* to school, but it is *farther* to school than it is to the store." "That tree is pretty *high,* but the one beside it is *higher,* and the tree across the street is the *highest* of the *three* trees." "I think we had better take a *few more* sandwiches on our picnic." "This is a □, and this is a ○." "It is only a *short* time until recess, but it will seem *shorter* if you think about your school work than if you dream of things that happened *long* ago." "The *longest* day I ever spent was when the automobile broke down out in the country." "All of us know about *pennies;* most of us know about *nickels;* and quite a few of us know about *dimes.* Another word for *penny* is *cent.*" "James was the *first* at school today, Mary came *second,* and Tubby was *third.*" Use sentences and stories to organize what the child sees around him in ways that these sentences suggest.

When the child has without knowing it indulged in quantitative thinking by these verbal comparisons, he will drift through his play and his life at home as well as through his instruction at school to more precise skills. His own needs will make him find more accurate statements than "I have *some* cookies." He will need to know that he has *three* cookies, and his little brother has *four* cookies. He has already learned, unless he has lived in a very unstimulating environment, that he is *six* years old or *seven* years old. He is beginning to use numbers.

None of us has a very good notion of what a *million* is, but we all should know the first numbers very well.



Here is one.
Here are two.
Here are three.
Here are four.
Here are five.
Here are six.
Here are seven.
Here are eight.
Here are nine.

Keep in mind that there are two purposes in this early number work: The first is the sequence idea, such as 1, 2, 3, 4, 5, etc.; 5 comes after 4; 3 is between 2 and 4, and so on. The second purpose is to get clearly in mind what the *five-ness* of a group is, what the *four-ness* of a group is. Pictures of many kinds will enrich the child at this critical period. Give heed to the caution that the child must not get the positions of numbers as the only relationship. Illustrations of quantity are given at the right.

These illustrations are adapted from a *Number Stories Reader* for first-grade children. The mastery of the quantity of small numbers should not be left to luck or chance.

Counting is almost universally satisfactory, and the child should early learn to count through 100. Do not have the child get thoroughly in mind what three things are or what six things are and then leave him in the lurch with only vague ideas as to what larger quantities will be. The adapted illustration for 16, 17 and 18 should be used as simply the suggestion to supply actual scenes where the various numbers from one to 20 can be looked at by the learner and looked at leisurely.

Many drill devices of one kind and another to build up naturalness and use should be patiently provided for the child. For example: Tell the numbers that are missing from each row.

Row 1.	5	6	7	—	9
Row 2.	4	5	—	7	8
Row 3.	6	—	8	9	10

Use not only the three rows supplied here but at least five or six times as many.

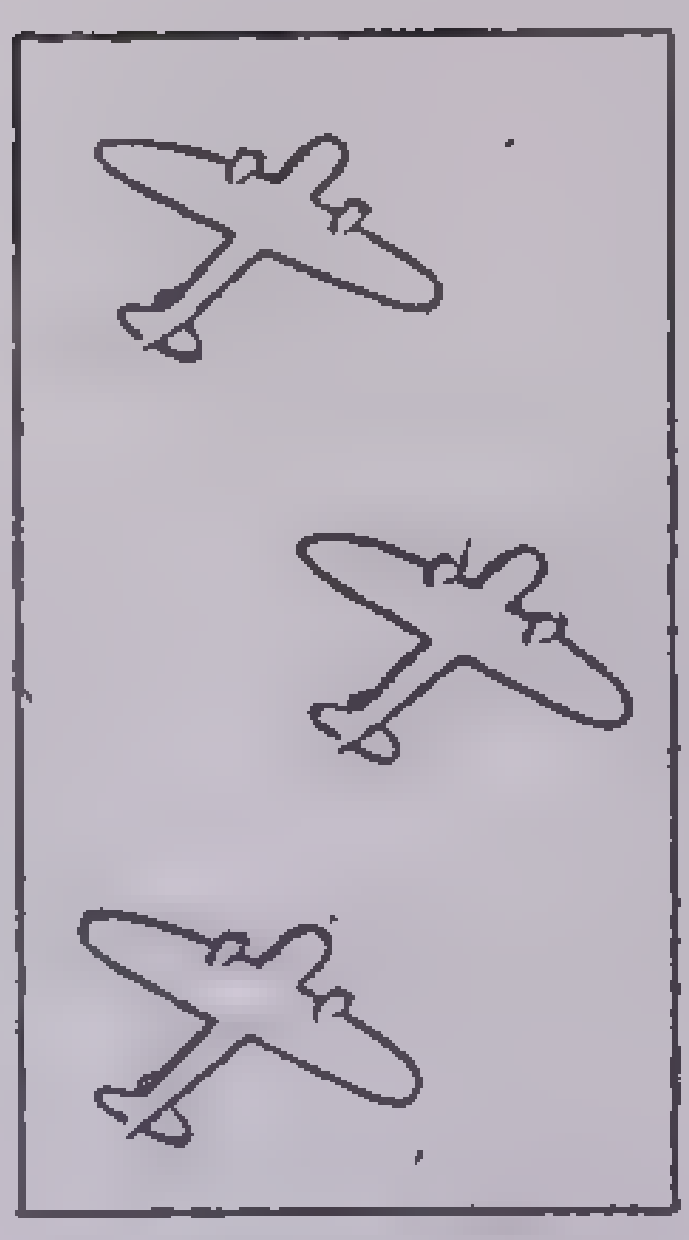
Even though you want to hurry on to learn the addition facts, take time to insure comparisons and general judgments concerning numbers. Such little exercises as the following are useful.

Which Is More?

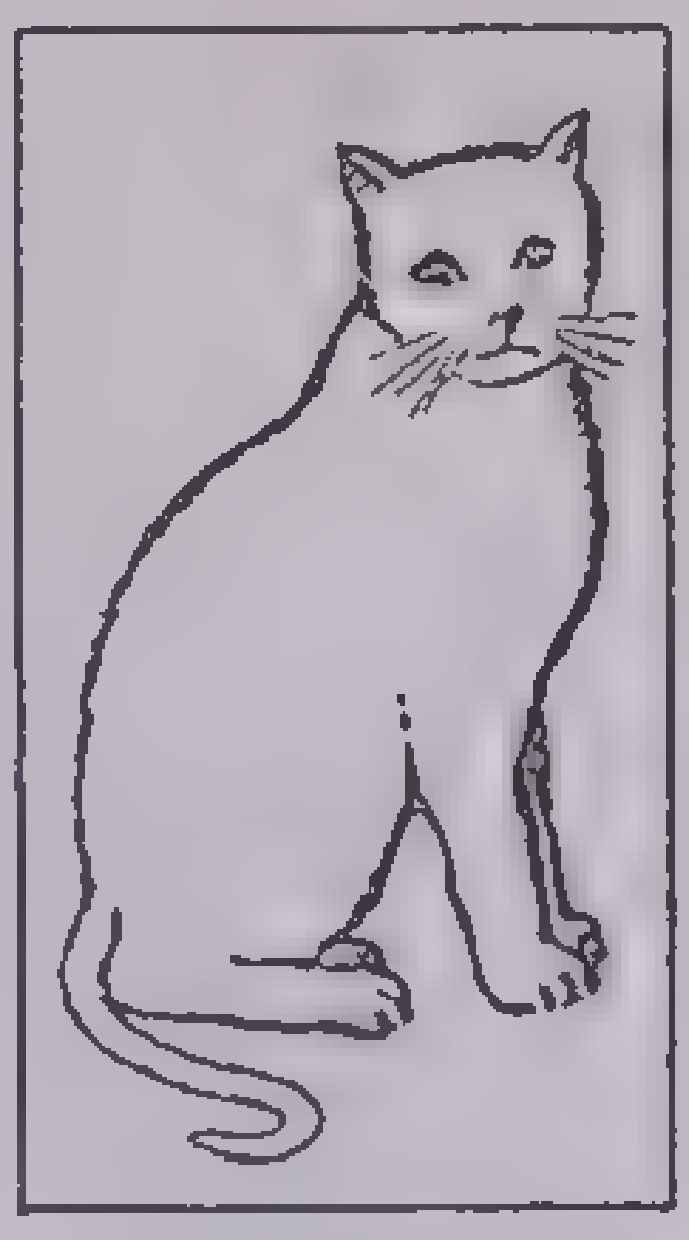
1. 3 bears or 5 bears?
2. 9 fish or 2 fish?
3. 6 rocks or 1 rock?
4. 7 birds or 18 birds?

Which Is Most?

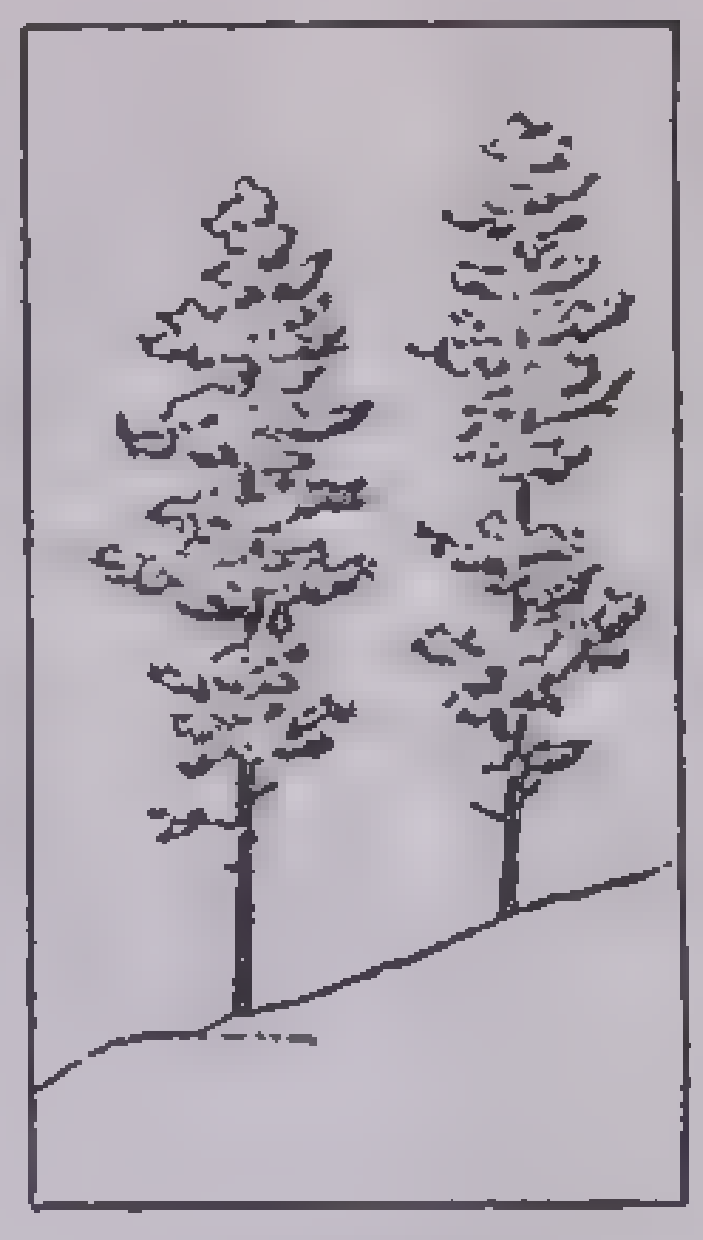
1. 5 bears or 3 bears or 8 bears?
2. 7 rocks or 10 rocks or 2 rocks?
3. 9 birds or 1 bird or 12 birds?
4. 16 fish or 6 fish or 4 fish?



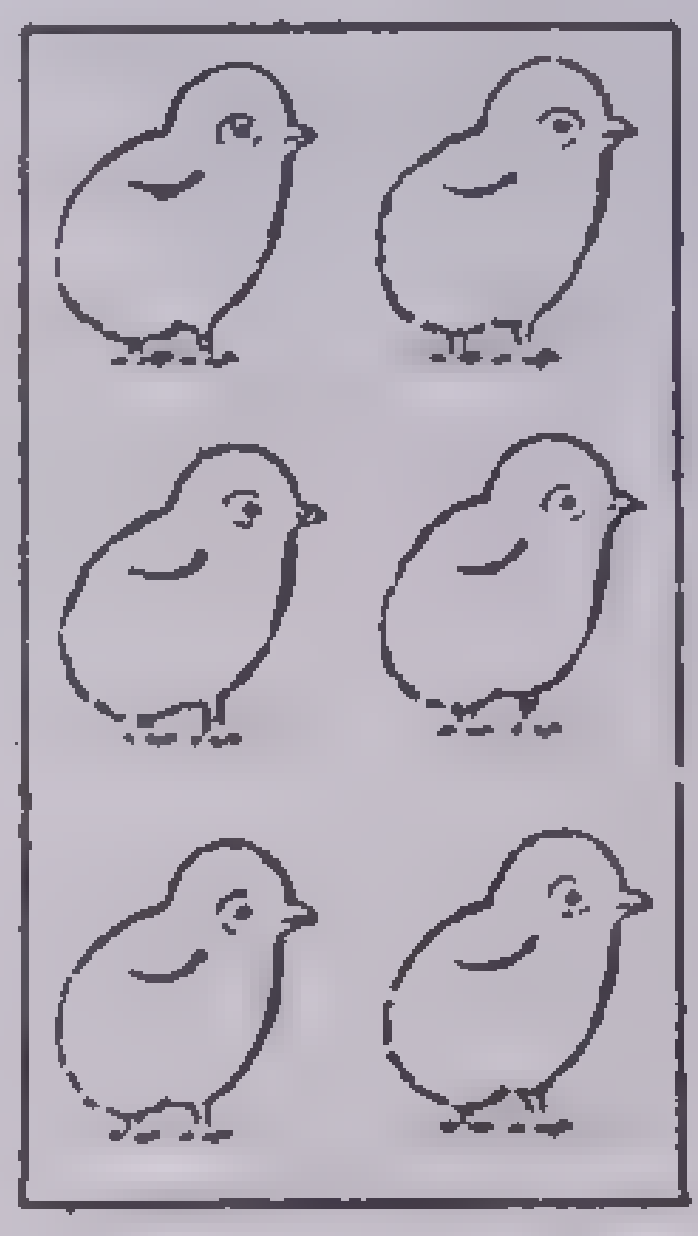
3 AIRPLANES



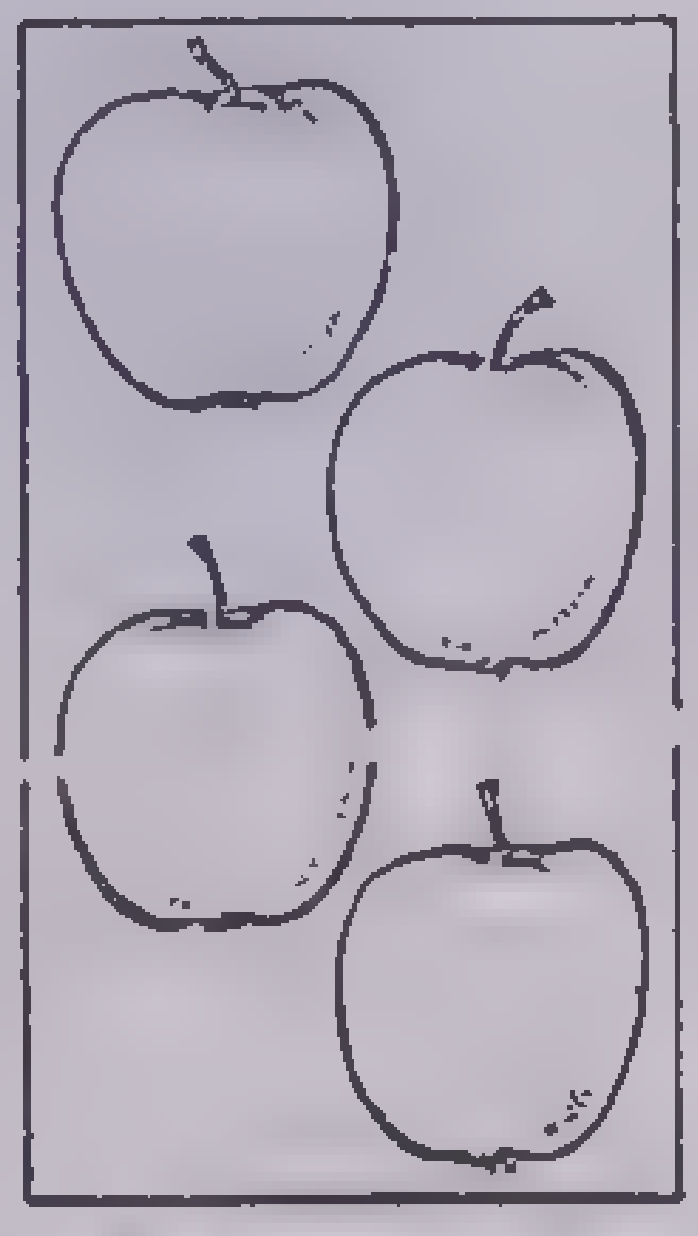
1 CAT



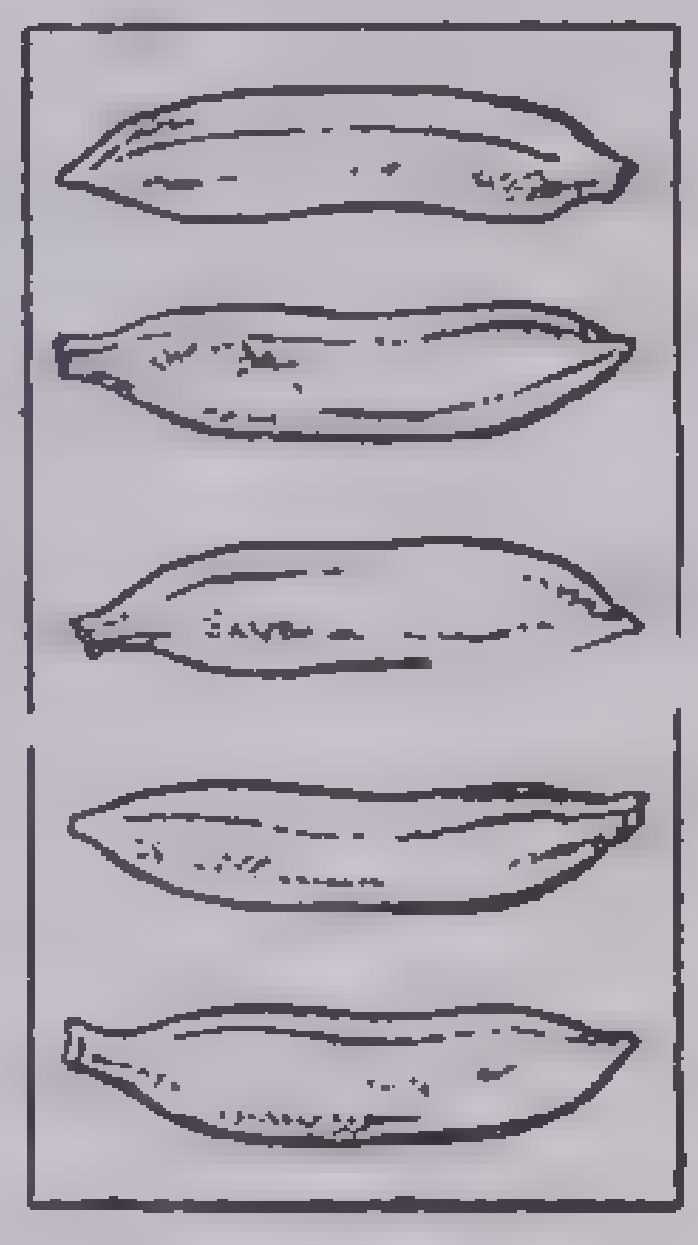
2 TREES



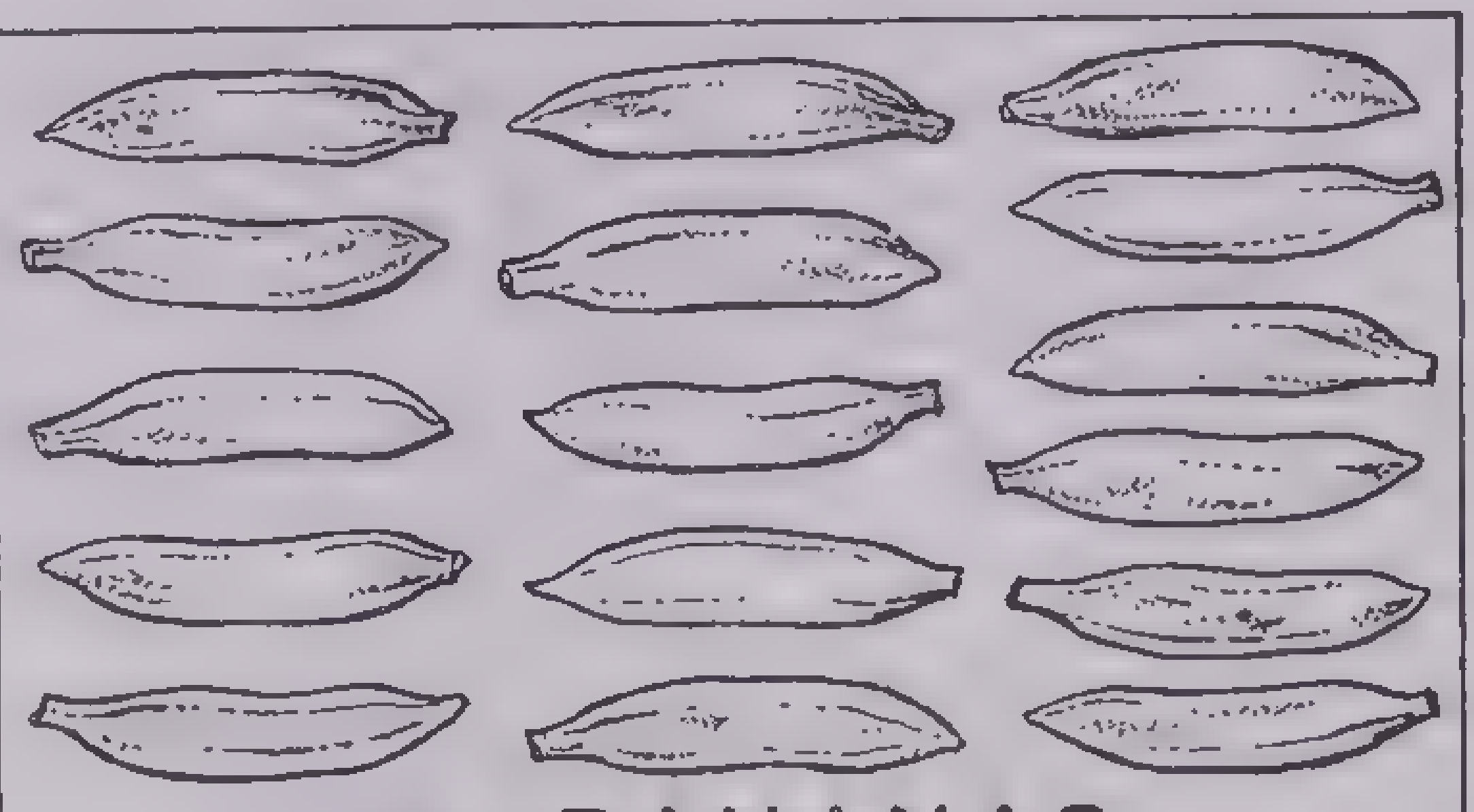
6 CHICKS



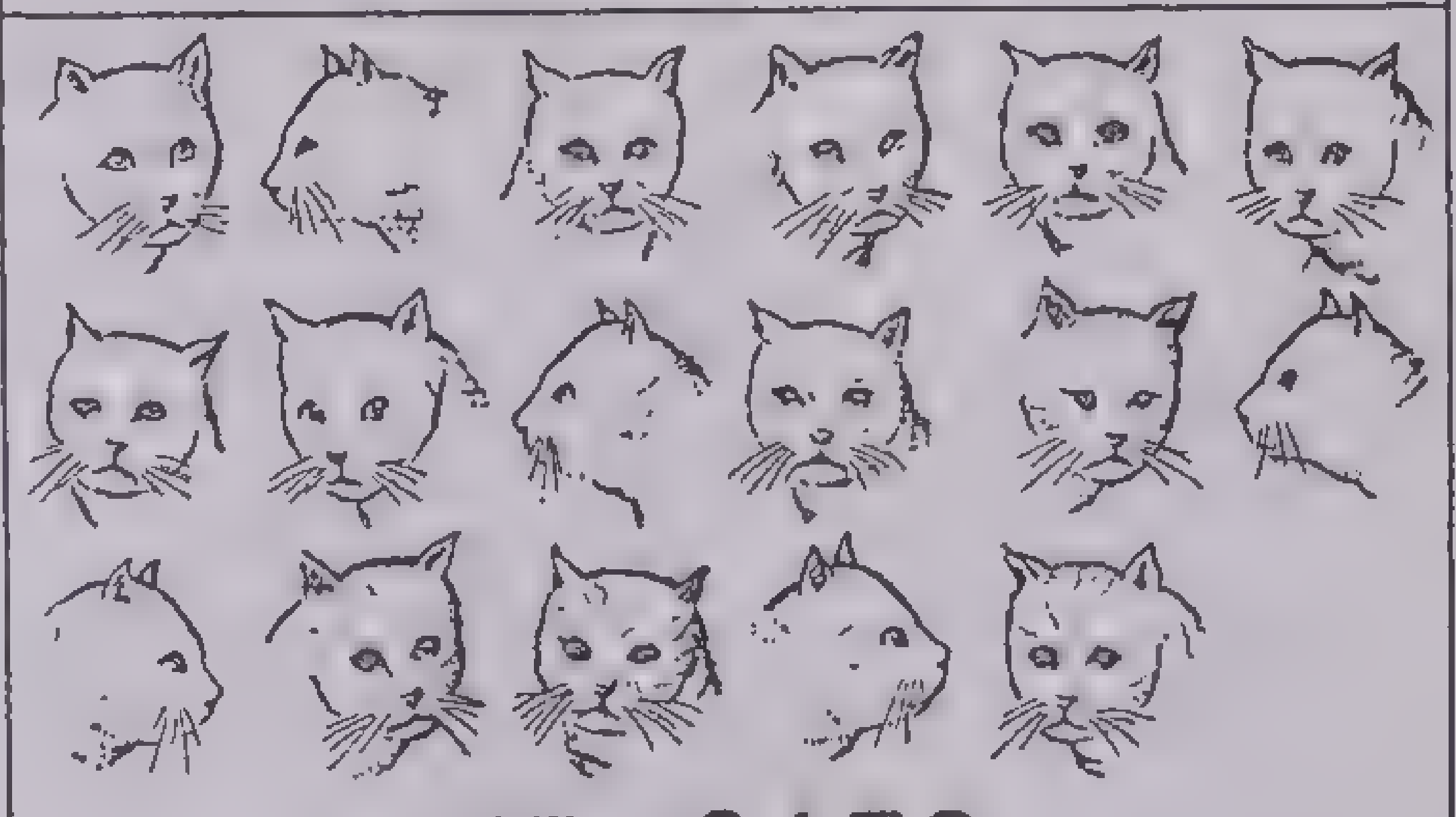
4 APPLES



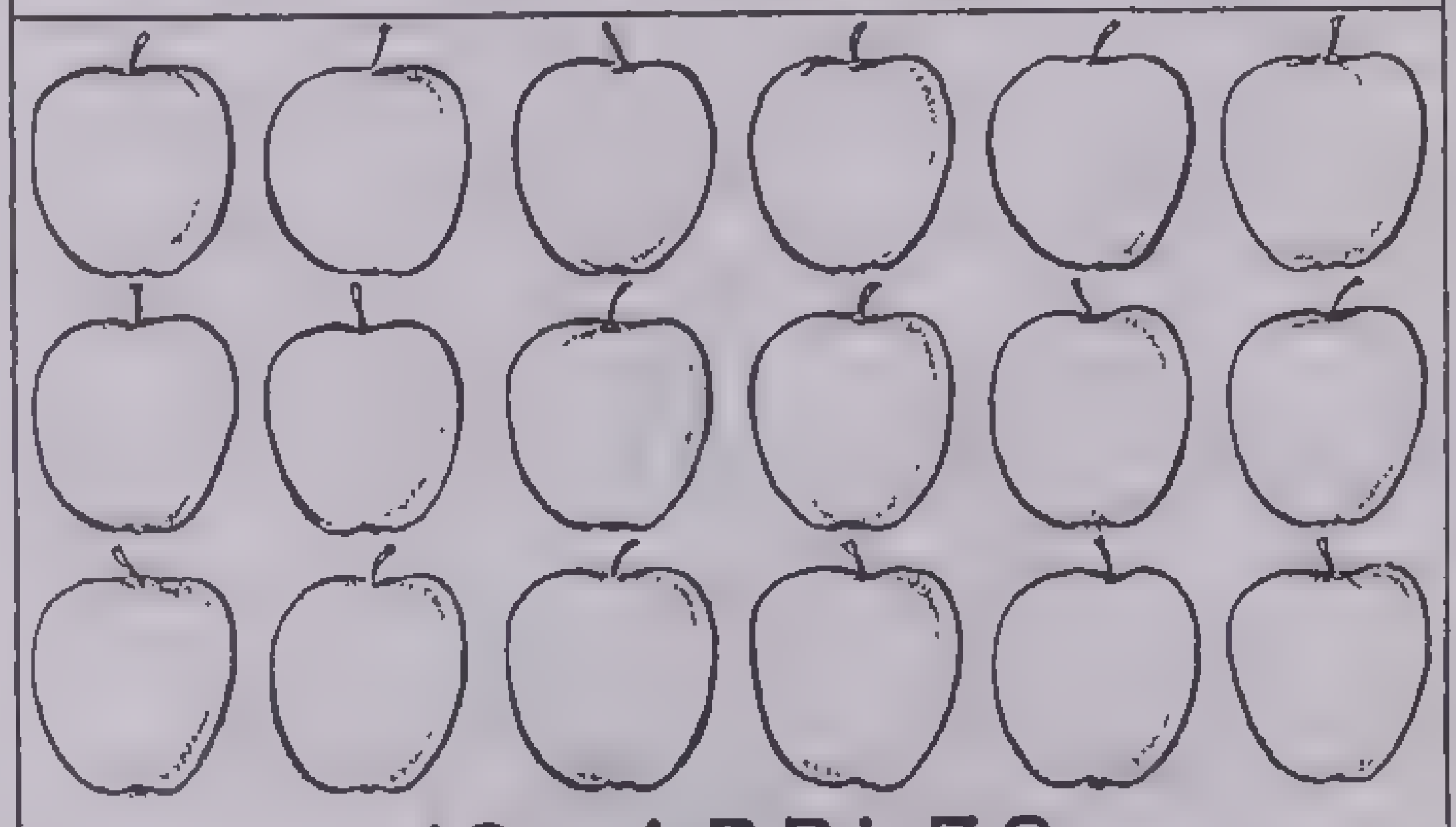
5 BANANAS



16 BANANAS



17 CATS



18 APPLES

With this work done a number chart such as the following should be about as natural to the child, and he should be as easy with it as he is with drinking his milk and easier with it than he is with eating his spinach. In this particular chart he should tell what numbers are missing.

Counting to 100

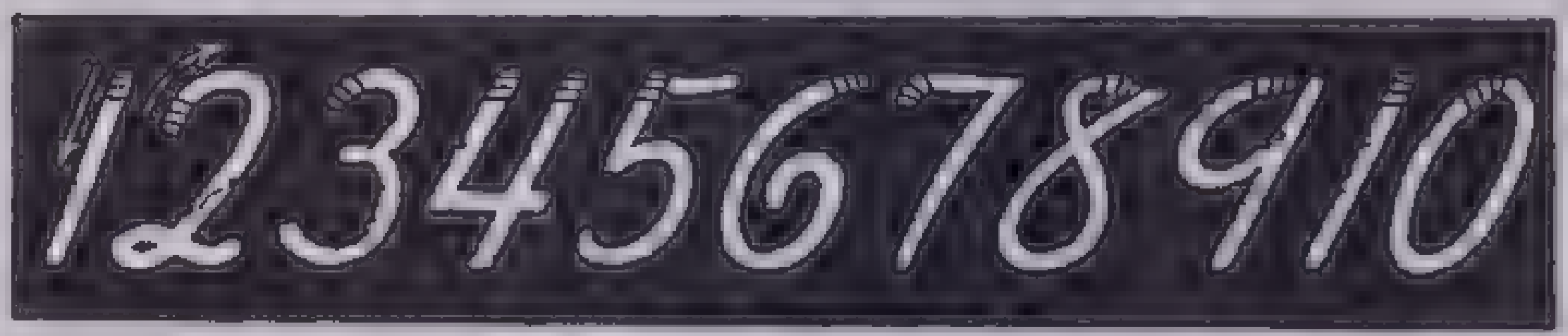
	10	20	30	40	50	60	70	80	90	100
1	11	21	31	41	51	61	71		91	
2	12	22	32	42	52	62		82	92	
3	13	23	33		53	63	73	83	93	
4	14	24	34	44	54	64	74	84		
5	15	25	35	45	55	65	75	85	95	
6	16	26		46	56	66	76	86	96	
7	17	27	37	47		67	77	87	97	
8	18	28	38	48	58	68	78	88	98	
9	19	29	39		59	69	79	89	99	

Some children have difficulty in writing and reading numbers. One should be on the constant lookout for the tendency to write seventeen as 71. Do not be out of patience with the child. He pronounces the seven-ness of the 17 first. It is natural to write the 7 first as in 71. A few children do have real difficulty and probably do see numbers backward. In the early writing of numbers be sure to see that 3 is not written backwards, and that the 9 and 6 are not confused. There is fine scientific literature concerning reading numbers backwards or upside down and other visual handicaps. Should one himself be bothered this way, or should he be responsible for a child who is uncertain in his eye-hand relations, contact with an expert in child psychology should be made.

In the first year's work the child should make sure that he understands pennies, nickels and dimes. Many children will know all about this before they undertake the study of the first year's work in arithmetic, but they should be reviewed to make certain that while a nickel is only one and five pennies are five, one nickel is worth just as much as five pennies. The nickel does not weigh so much as five pennies, but it will buy as much.

As far as possible let the child have experience with actual buying and the actual making of simple change instead of confining his experience with money to illustrations or to pasteboard counters.

If early attention should be given to accurate writing, then the dotted lines in the chart below suggest where the youngster should begin in writing each number.



If the reader is disturbed by the outline above, which is concerned solely with the work of the first grade, and feels that more work should be given in the first grade, let him remember that this feeling is probably due to the fact that when he himself was a child he was jammed through much more work. It is probably unwise to give the child more than is outlined above in the first grade. He will learn faster when he is more mature. If other (and perhaps more important) purposes of education at this early age are taken care of adequately, there will not be time for more work than this.

Second-Grade Arithmetic

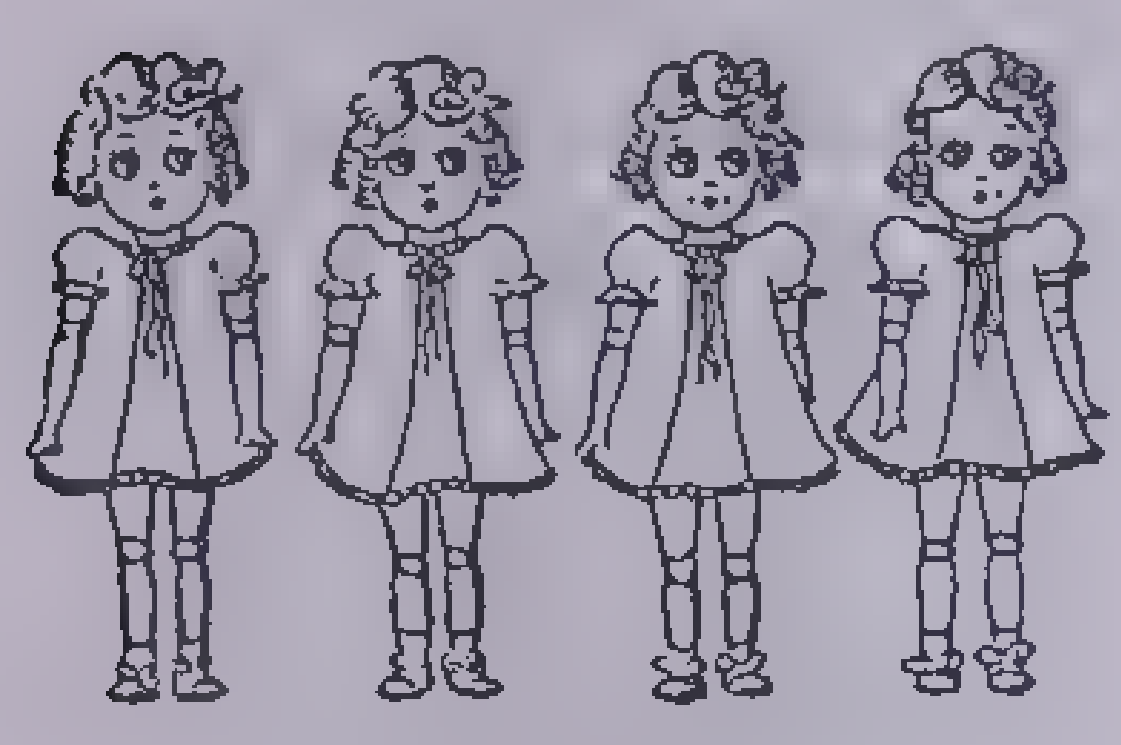
The child should approach the second year in arithmetic feeling that numbers are his friends; being able to count and read to 100; having clearly in mind the relative relationships and social values of pennies, nickels and dimes; able to write the numbers from 1 to 10, and with some notion of the natural use of the ordinals, such as, "This is the *first* time that I have had a cold this winter but the *fifth* time that I have fallen down while I was skating."

The work of the second grade is to learn the one hundred basic addition facts and the one hundred basic subtraction facts and to apply these facts to very easy column addition and to subtraction with two or three figures, but with no carrying in the addition and no borrowing (or carrying) in the subtraction. He should also begin first steps in solving problems.

Before supplying specific suggestions relative to the learning of the one hundred addition facts and the one hundred subtraction facts, we must pay attention to several important considerations of general use.

Consideration 1. The addition and subtraction facts must not be merely memorized—they must be understood. Their meaning must be grasped. For example, that Mr. White's telephone number is 6801 and not 7305 is a fact with no meaning except for engineering purposes in a particular telephone exchange. Mr. White's telephone might have been any other number. If the child doesn't grasp the meaning of 4 + 8 makes 12, then all he knows is that 4 + 8 is tied to 12, not because there is any sense in it, but because it just happened to be so. The tying of the number facts to the proper sums in addition and the tying of the number facts to the proper differences in subtraction must not be like telephone numbers. The child must see the experience of 4 + 8 leading to 12 because it really is 12. It did not happen to be 12. It could not have been 11. It wasn't just luck that it wasn't 13. It really is true that 4 + 8 = 12.

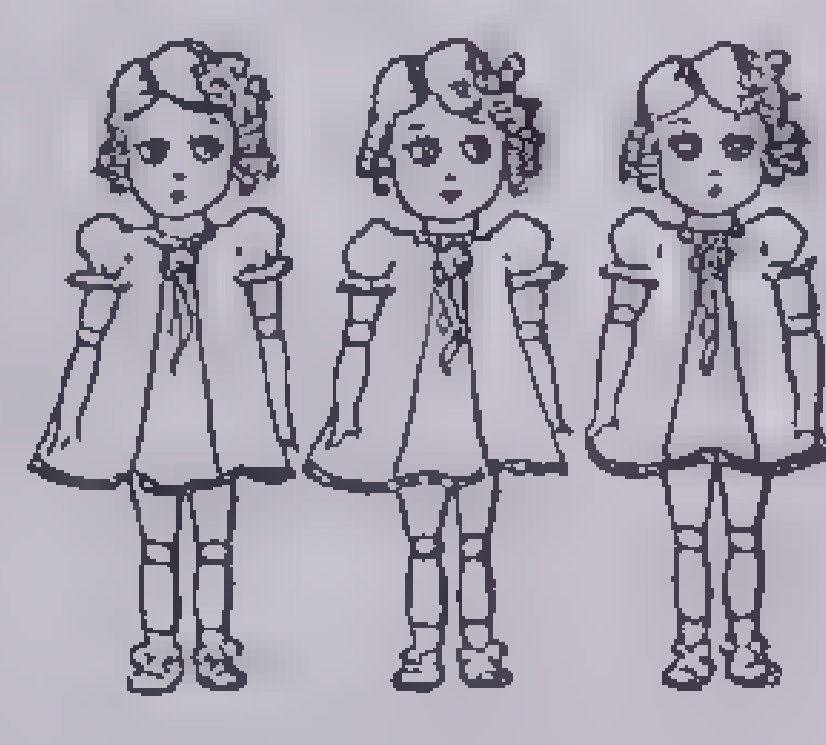
Much of the cloudiness and unreality of arithmetic to youngsters finds its birth and nursery in the fact that in the lower grades children memorize the simplest and basic arithmetic facts as nonsense syllables instead of understanding them as reasonable and necessary facts. So the child, as he is learning and cannot quite remember that the sum of 4 + 8 is 12, should have recourse only to charts that give the numbers and to a configuration that lets him see that they are really so. To give a child the symbols 4 + 3 = 7 is all right if it is simply the shorthand for the picture. Until the child sees the reasonableness of number combinations and sees them actually happening, 4 + 3 = 7 seen in numbers only will never have the meaning or the power or the surety for the child as the same number fact will have if he learns it against the repeated contemplation of the pictures below.



4 DOLLS

4+3=____

7−4=____

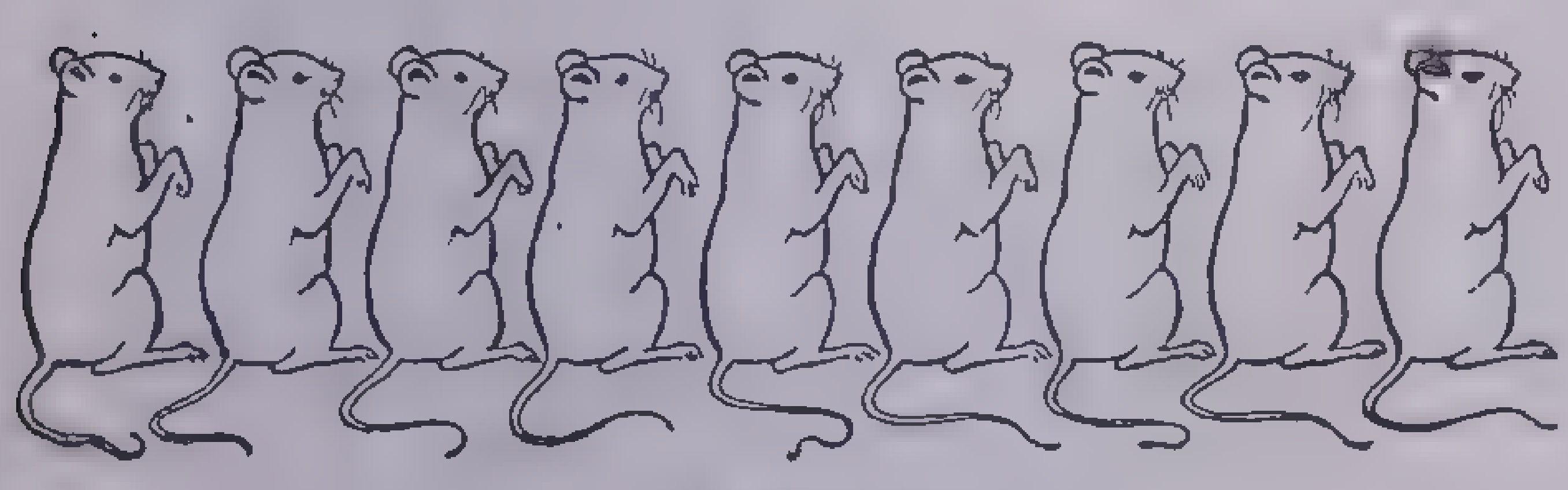


3 DOLLS

3+4=____

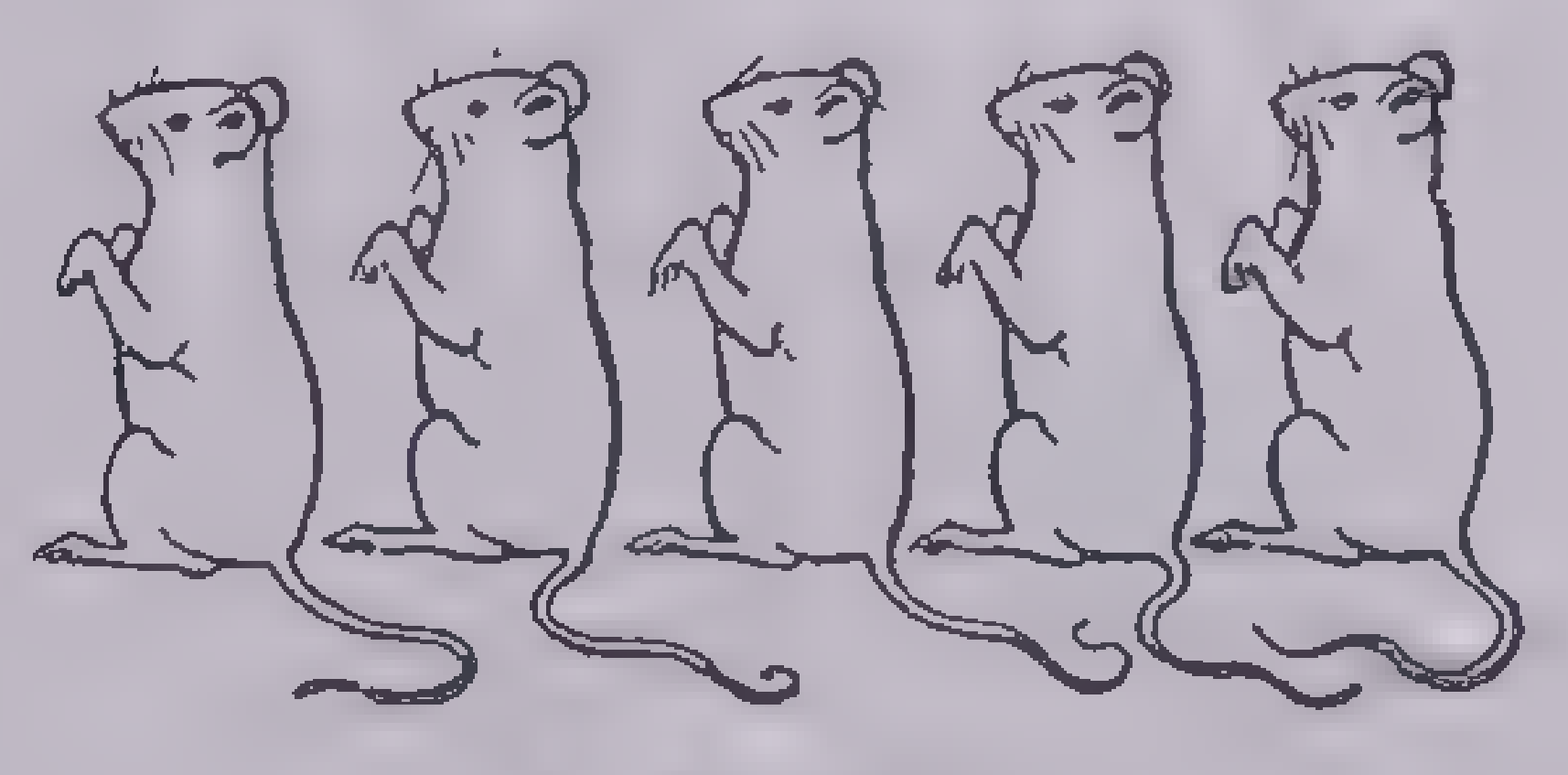
7−3=____

Consideration 2. To the extent that the child can learn to discover the number facts for himself instead of being told them arbitrarily by the teacher, the sounder and better the learning. It is not enough for the teacher to say: "Learn these for related facts, 9 + 5 = 14, 5 + 9 = 14, 14 − 9 = 5, 14 − 5 = 9." It is far better for the teacher to say: "Let's learn today about 9, 5, 14. You can find it out for yourself by studying this picture."



9 MICE

9+5=____ 5+9=____

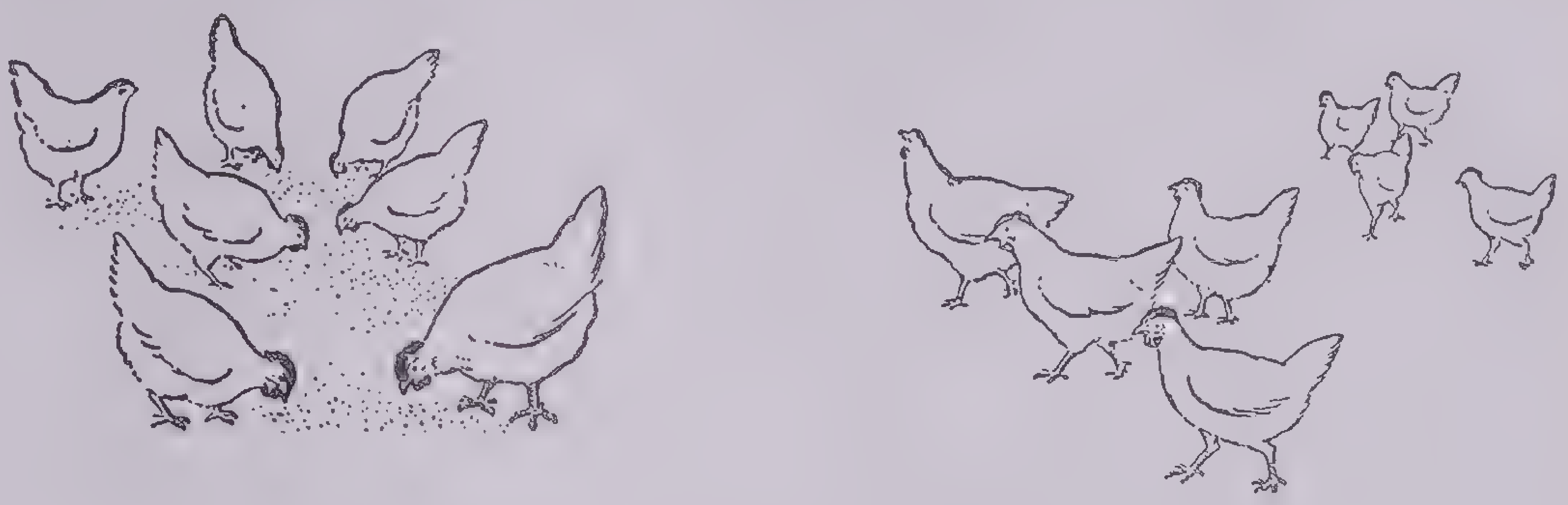


5 MICE

14−9=____ 14−5=____

Do not teach the child the number facts or let him discover them only in terms of the same type of illustrations—not mice or dolls or candles all the time. Throw all sorts of things that he sees in his everyday life into number configurations.

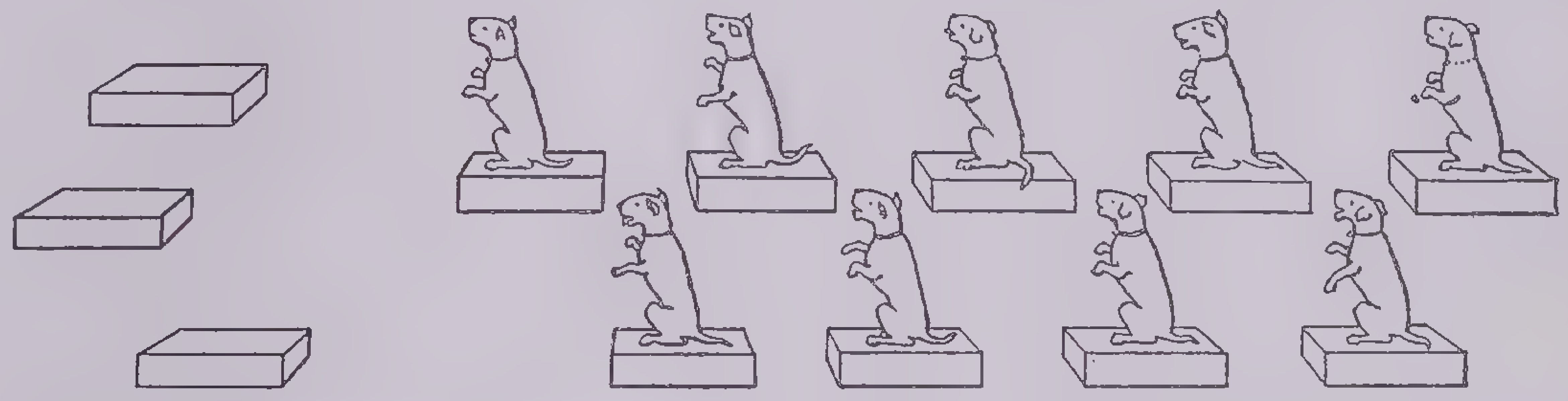
There follows some actual material that has been used experimentally with second-grade children. These few samples will suggest to the reader the type of discovery learning that is the most productive of lasting results.



It is suppertime. How many chickens in all?____

7 chickens are eating and ____ more are coming.

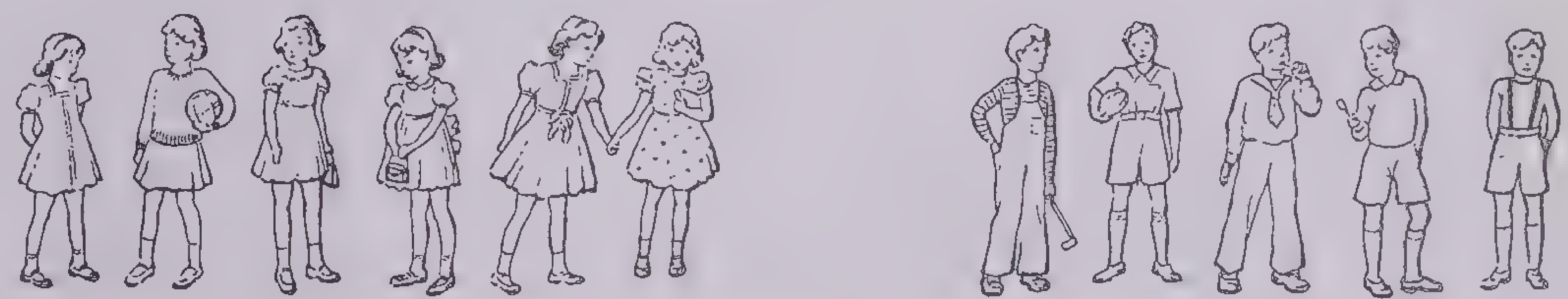
7+8=____ 8+7=____ 7+____=15 8+____=15



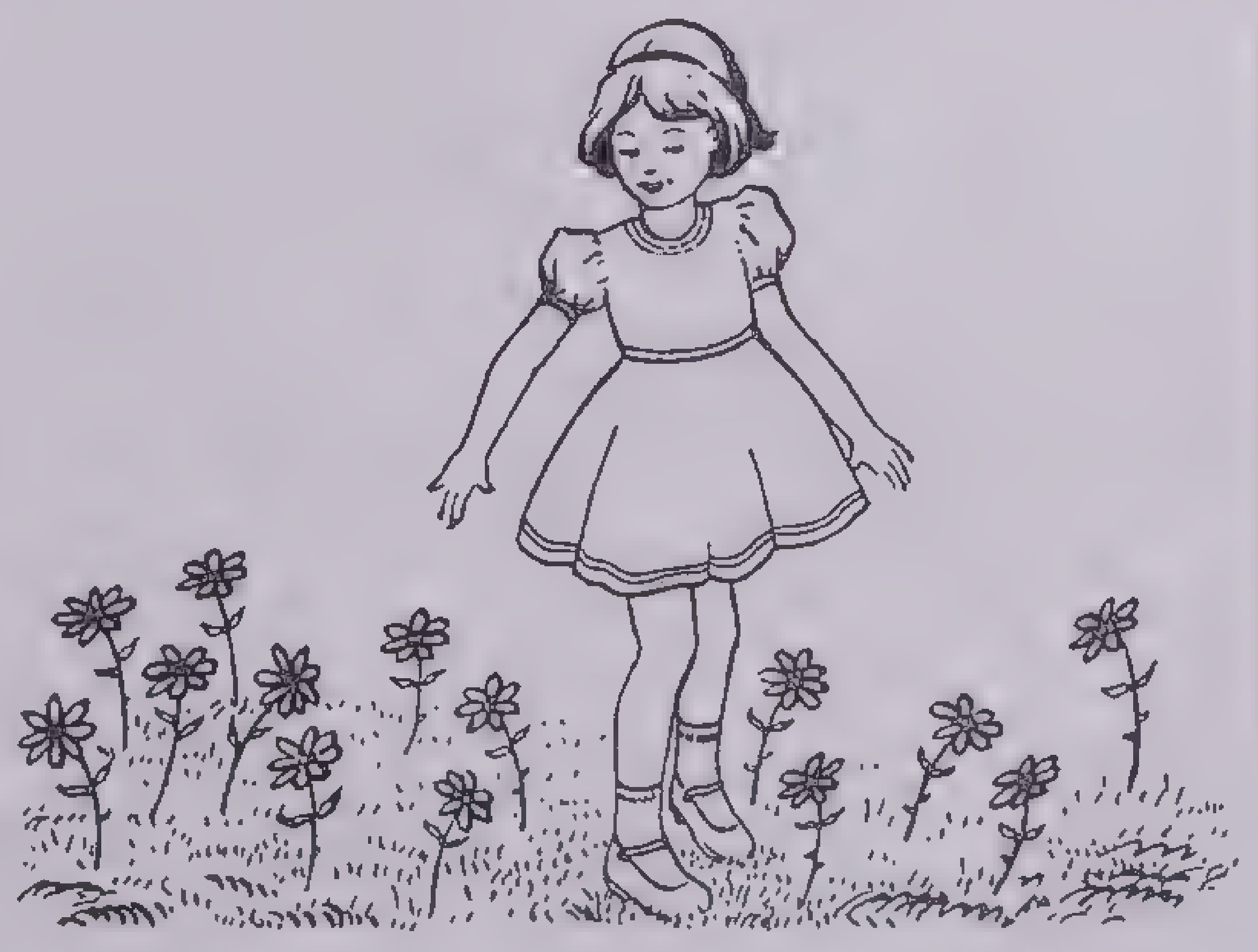
How many boxes are there in all? ____ How many dogs are there? ____

How many dogs do we need to have one on every box? ____

3+____=12 12=9+____ 3+9=____ 9+3=____

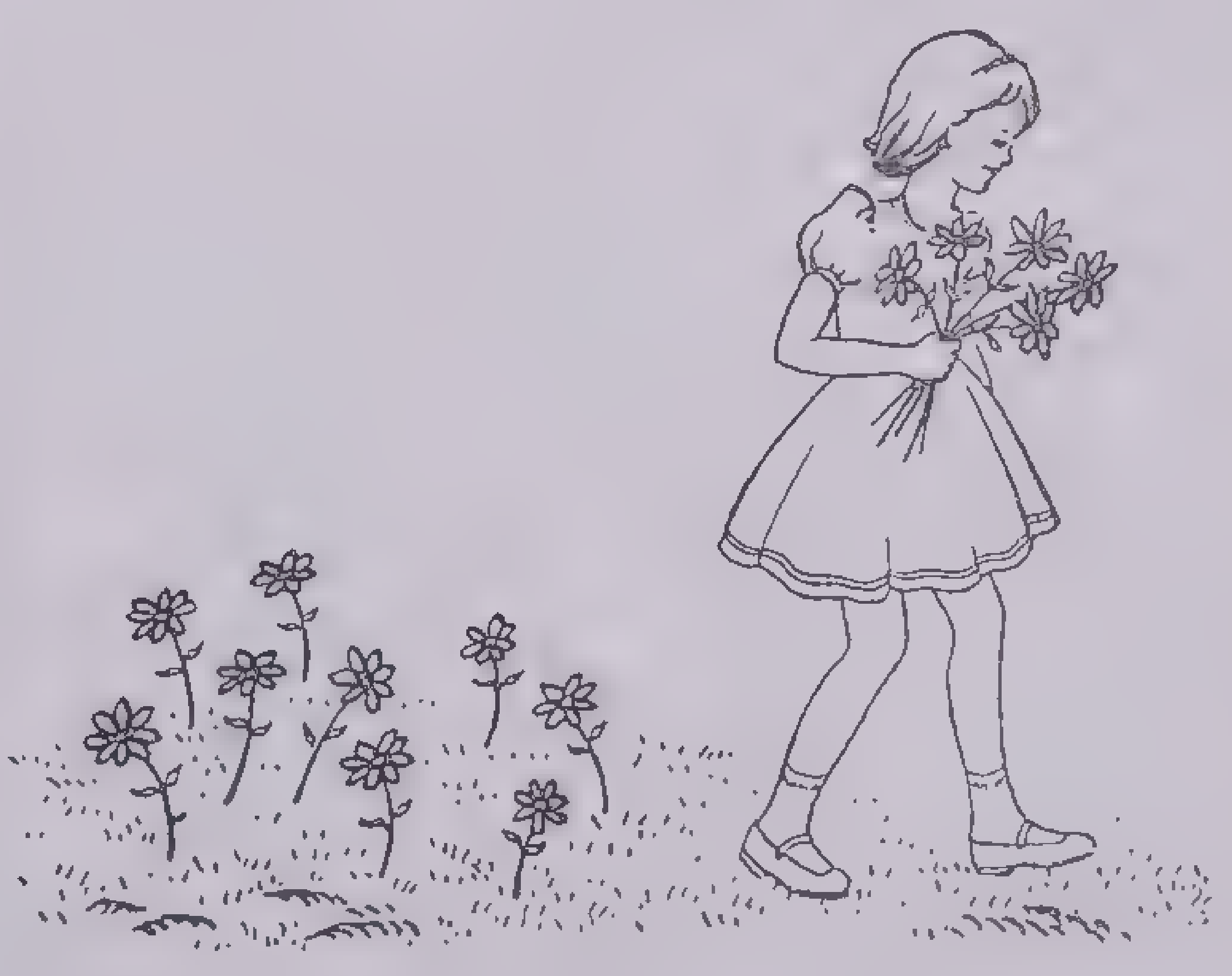


6 girls and 5 boys make ____ children in all.



How many flowers did Helen find?____

5+9=____ 9+5=____



There were ____ flowers in the first picture. Helen picked ____ flowers. How many are left? ____ 14−5=____. If Helen had picked 9 flowers, ____ would be left. 14−9=____.

Consideration 3. In addition to the consideration of understanding that the facts are really so and the consideration of discovering the truth for oneself, a third consideration of more technical nature must be in the background of competent learning. Some number combinations are inherently more difficult than others. Many of our textbooks give more practice on 2 + 2 than they give on 9 + 6. Then we wonder why youngsters know 2 + 2 very well but even as bridge players in middle age have to count on their fingers to get the sum of 9 + 6. In giving drill on addition and subtraction, as well as in other areas of number work, the amounts of drill should be distributed roughly in proportion to the relative difficulty of the computations. The ten most difficult subtraction combinations and the ten easiest combinations are set out below. Opposite each of these is the number of practices that the average child really needs to be sure of his first learning. Individuals will vary in the amount of practice, but this chart will give a rather dependable if rough guide.

Ten Most Difficult		Ten Easiest	
Combination	*Number of Practices*	*Combination*	*Number of Practices*
14 − 9	42	3 − 0	5
13 − 9	31	6 − 0	5
14 − 8	31	5 − 5	5
15 − 8	31	5 − 0	5
13 − 8	31	0 − 0	5
14 − 6	31	7 − 7	5
16 − 9	30	3 − 1	5
13 − 5	30	1 − 0	4
14 − 5	29	3 − 3	4
13 − 4	29	7 − 0	4

Consideration 4. In some cases to know that 4 + 6 = 10 helps you to remember that 10 − 6 = 4. The older pedagogy in arithmetic, however, greatly overestimated the amount that knowing the addition facts contributed to learning the subtraction facts. Each addition fact and each subtraction fact should be discovered and understood in its own manner. One takes unnecessary risks if he thinks that the learning of 8 + 9 = 17 is a complete insurance that 9 + 8 = 17 also will be learned. Both 8 + 9 and 9 + 8 should receive specific and calculated consideration.

A sound procedure is to teach about fifteen of the easier addition facts before taking up subtraction at all. Then take up the subtraction facts that are related to the addition facts already learned. Only after this separate introduction into addition and subtraction should the related addition and subtraction facts be taught. In the end (or perhaps for the harder half of both series of facts) related learning from the very first is wise, as 9 + 7, 7 + 9, 16 − 9, 16 − 7. This mixed learning should not begin until a good deal of addition in and of itself has been mastered and a good deal of subtraction in and of itself has been mastered.

Consideration 5. A last consideration is the matter of maintaining these number combinations after they have been first learned. They should be reviewed in mixed or random order rather than in tabled order. Sufficient examples of this are given in subsequent paragraphs.

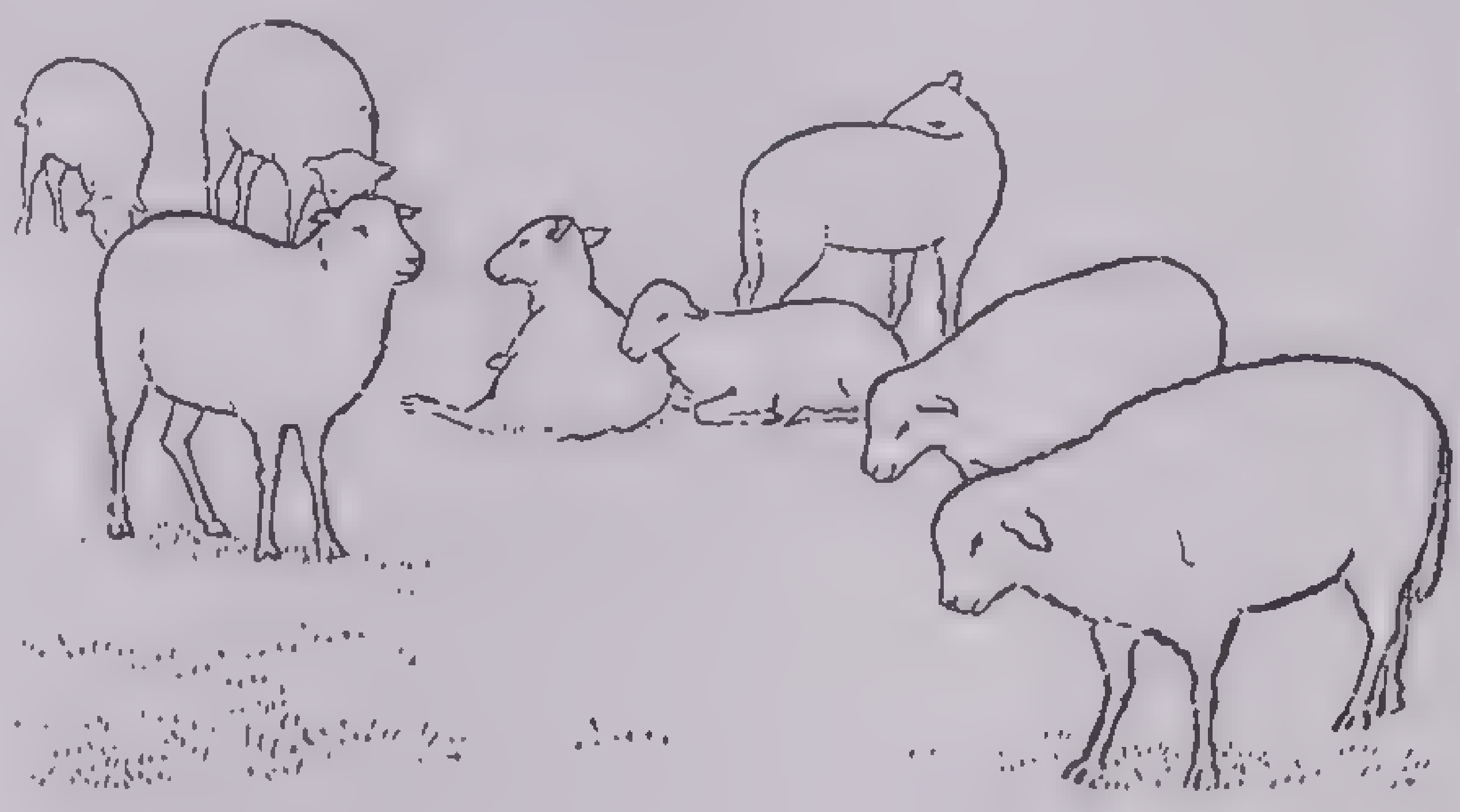
We are now taking up in more specific fashion concrete suggestions for this all-important task of learning the hundred addition and hundred subtraction facts. Remember that the learning of the two hundred facts is the warp and woof of second-grade arithmetic.

Order of Teaching

There is probably no one order of teaching the one hundred addition and the one hundred subtraction facts that for some mysterious reason is better than any other order or sequence. But the order given below is defensible in light of what scientific research has found to be true, and it has stood the test of actual use in thousands of successful classrooms.

In learning for one's self or in guiding the learning of others, remember these cautions:

1. Go on to new facts only when those that are learned are *well* learned. That is, do not pass on to learning 5 + 5 = 10 until the fact that 2 + 2 = 4 is really known.
2. Review previously learned facts *frequently* and in *random order*. Avoid memorizing the so-called tables.
3. Learn only a few facts at any one time. Be content to forge ahead bit by bit.



How many sheep are there?

Groups of Facts and Their Sequence

Group 1

2	1	5	4	1	2
+2	+5	+1	+4	+2	+1

Group 2

5	1	8	2	3	1	3	1	4
+5	+8	+1	+3	+2	+1	+3	+4	+1

Now begin subtraction. Teach the following groups as take-away subtraction.

If you have 5 and take away 4, how many are left?

Group 3

8	3	3	5	6	5	5	2
−4	−1	−2	−4	−3	−1	−3	−1

5	4	6	6	10	9	9
−2	−2	−1	−5	−5	−8	−1

Now review in random order the 15 addition facts and the 15 subtraction facts learned in Groups 1, 2 and 3, above.

Before going on, use Group 3 to gain experience with additive subtraction. The thinking is, for example: If James has 3 pigs but needs 5 in order to enter his pigs in a 4-H Club contest, how many more pigs must he get? What must be added to 3 to get 5? 3 and how many more make 5?

Remember that a pupil, to use subtraction in different situations, must be able to think, "5 *take away* 3 leaves 2," and also, with equal ease, "3 and *how many more* make 5?"

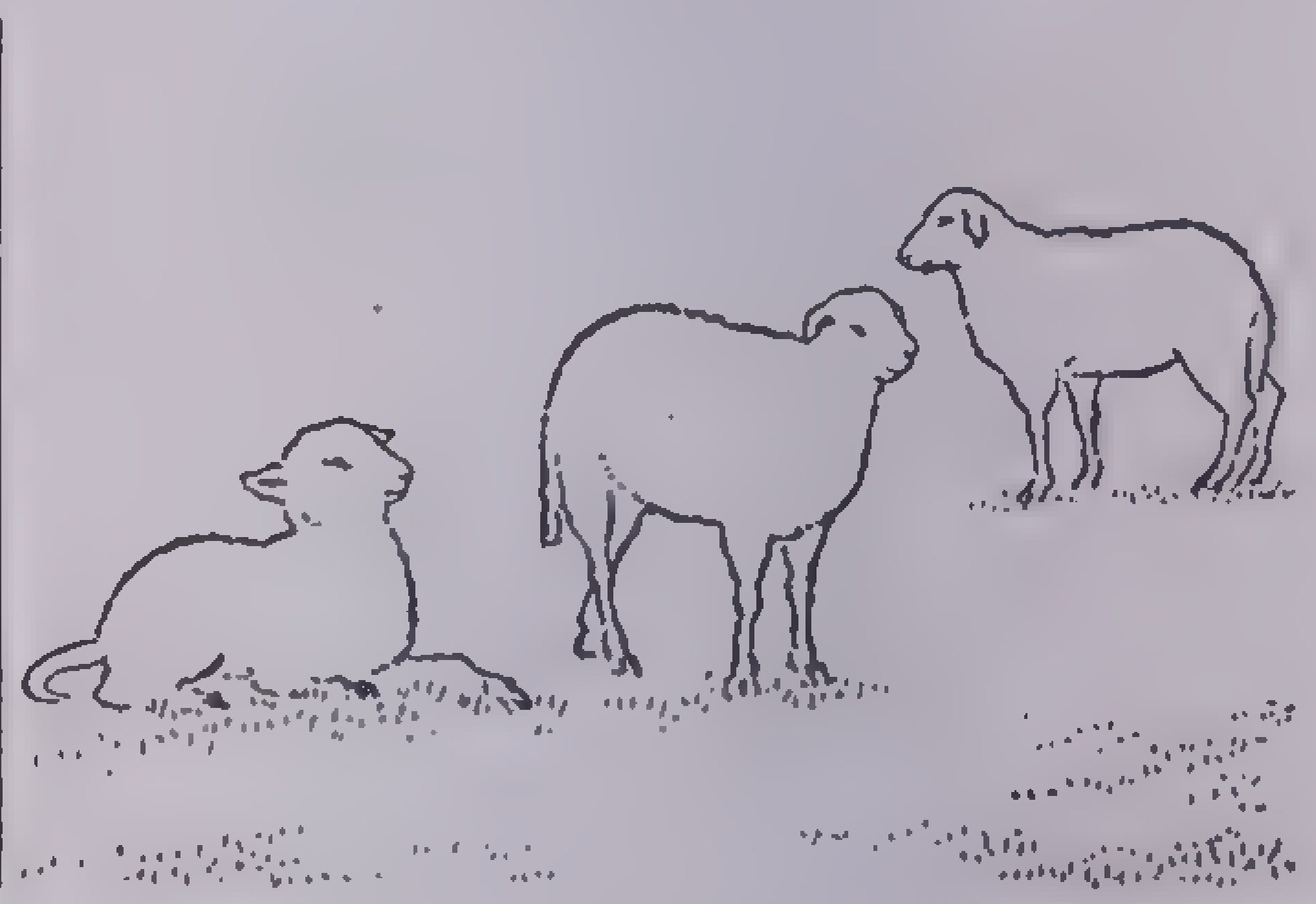
Beginning with Group 4 teach addition and subtraction units. There are four units in Group 4.

Group 4

4	2	6	6	1	9	10	10
+2	+4	−2	−4	+9	+1	−1	−9

3	5	8	8	6	1	7	7
+5	+3	−5	−3	+1	+6	−1	−6

Review in mixed order Groups 1–4 above. As Group 5 and on are learned, take time for the learner to see that the larger facts are seen to be really true and have the child *actually discover for himself* the correct answers. The truth of every fact need not be discovered or its truth demonstrated, but at least every fifth new fact should be actively attacked by the child rather than have him simply accept the answer. Below is a suggested picture to use for active discovery.



5 sheep have gone.
There are ____ sheep left.
8 − 5 = ____ 8 − ____ = 3

4	5	9	9	1	7	8	8
+5	+4	−5	−4	+7	+1	−7	−1

4	6	10	10	2	7	9	9
+6	+4	−4	−6	+7	+2	−2	−7

Review Groups 1–4 in mixed order. If a few facts still are not known accurately or are given correctly but slowly and uncertainly, take time at once to help the child know each one as surely as he knows 1 + 1 = 2.

Group 5

3	1	4	4	5	2	7	7
+1	+3	−3	−1	+2	+5	−5	−2

6	3	9	9	8	2	10	10
+3	+6	−6	−3	+2	+8	−8	−2

After Group 5 is mastered and mixed review successfully completed, give some attention to

(*a*) learning the ordinals, first, second, . . . tenth,

(*b*) counting by 2s and 5s through 100, and

(*c*) careful writing of numbers.

Group 6

4	3	7	7	6	2	8	8
+3	+4	−3	−4	+2	+6	−6	−2

7	3	10	10
+3	+7	−7	−3

Take time for mixed review and for reasonable amounts of written as well as oral work. Teach that the + sign means plus or add; and that the − sign means minus or subtract.

GROUP 7

$$\begin{array}{rrrr} 6 & 7 & 12 & 14 \\ +6 & +7 & -6 & -7 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 9 & 8 & 18 & 16 \\ +9 & +8 & -9 & -8 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 2 & 9 & 11 & 11 \\ +9 & +2 & -2 & -9 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 4 & 8 & 12 & 12 \\ +8 & +4 & -4 & -8 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 5 & 6 & 11 & 11 \\ +6 & +5 & -5 & -6 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 3 & 9 & 12 & 12 \\ +9 & +3 & -3 & -9 \\ \hline \end{array}$$

Review in mixed order Groups 1–7. Take arithmetic more and more out of sheer drill into the world all about the child so that little by little he lives in a world of number as well as a world of varying color, different distances, and so on. Number stories or stories written to use number facts naturally and sincerely are among the best types of reading for the young child.

Teach the two forms in addition,

$$\begin{array}{r} 5 \\ +4 \\ \hline \end{array} \text{ and } 5 + 4.$$

Also teach the two forms in subtraction

$$\begin{array}{r} 5 \\ -4 \\ \hline \end{array} \text{ and } 5 - 4.$$

GROUP 8

$$\begin{array}{rrrrrrrr} 7 & 4 & 11 & 11 & 9 & 6 & 15 & 15 \\ +4 & +7 & -7 & -4 & +6 & +9 & -9 & -6 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 8 & 3 & 11 & 11 \\ +3 & +8 & -8 & -3 \\ \hline \end{array}$$

$$\begin{array}{rrrrrrrr} 7 & 5 & 12 & 12 & 9 & 8 & 17 & 17 \\ +5 & +7 & -7 & -5 & +8 & +9 & -9 & -8 \\ \hline \end{array}$$

GROUP 9

$$\begin{array}{rrrrrrrr} 7 & 6 & 13 & 13 & 9 & 5 & 14 & 14 \\ +6 & +7 & -7 & -6 & +5 & +9 & -9 & -5 \\ \hline \end{array}$$

$$\begin{array}{rrrrrrrr} 8 & 7 & 15 & 15 & 9 & 4 & 13 & 13 \\ +7 & +8 & -8 & -7 & +4 & +9 & -9 & -4 \\ \hline \end{array}$$

Review in mixed order Groups 1–9.

GROUP 10

$$\begin{array}{rrrrrrrr} 8 & 6 & 14 & 14 & 9 & 7 & 16 & 16 \\ +6 & +8 & -8 & -6 & +7 & +9 & -9 & -7 \\ \hline \end{array}$$

$$\begin{array}{rrrr} 8 & 5 & 13 & 13 \\ +5 & +8 & -8 & -5 \\ \hline \end{array}$$

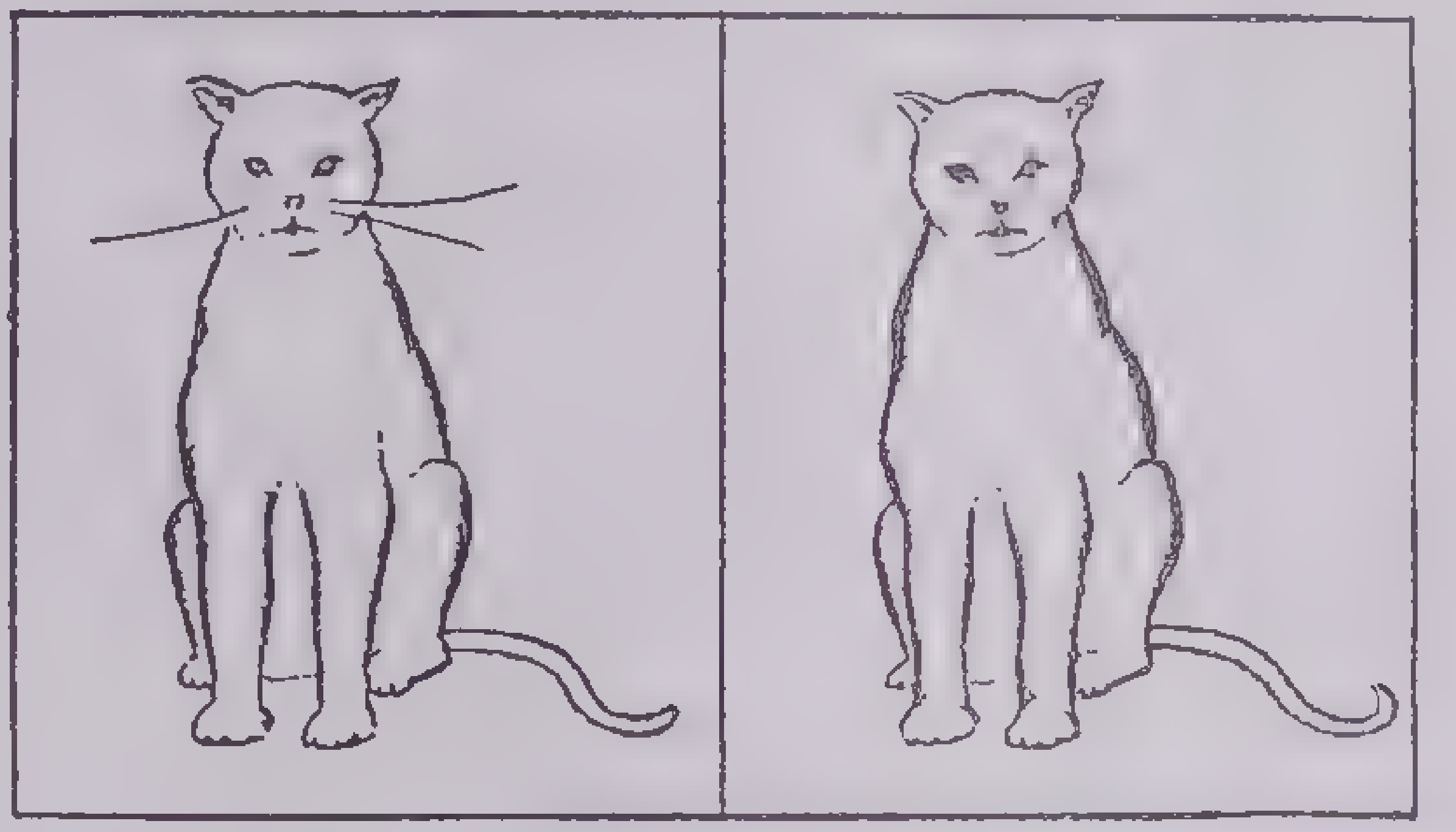
With the one hundred addition facts and the one hundred subtraction facts *surely* mastered the child is ready to begin to like arithmetic, not dislike it, to view it as his friend, not his enemy, to use it as a tool in everyday needs, not feel it is a burden and a bore.

Zero in Addition and Subtraction

Zero must not be neglected. It is easy for the adult, of course, but not for the child.

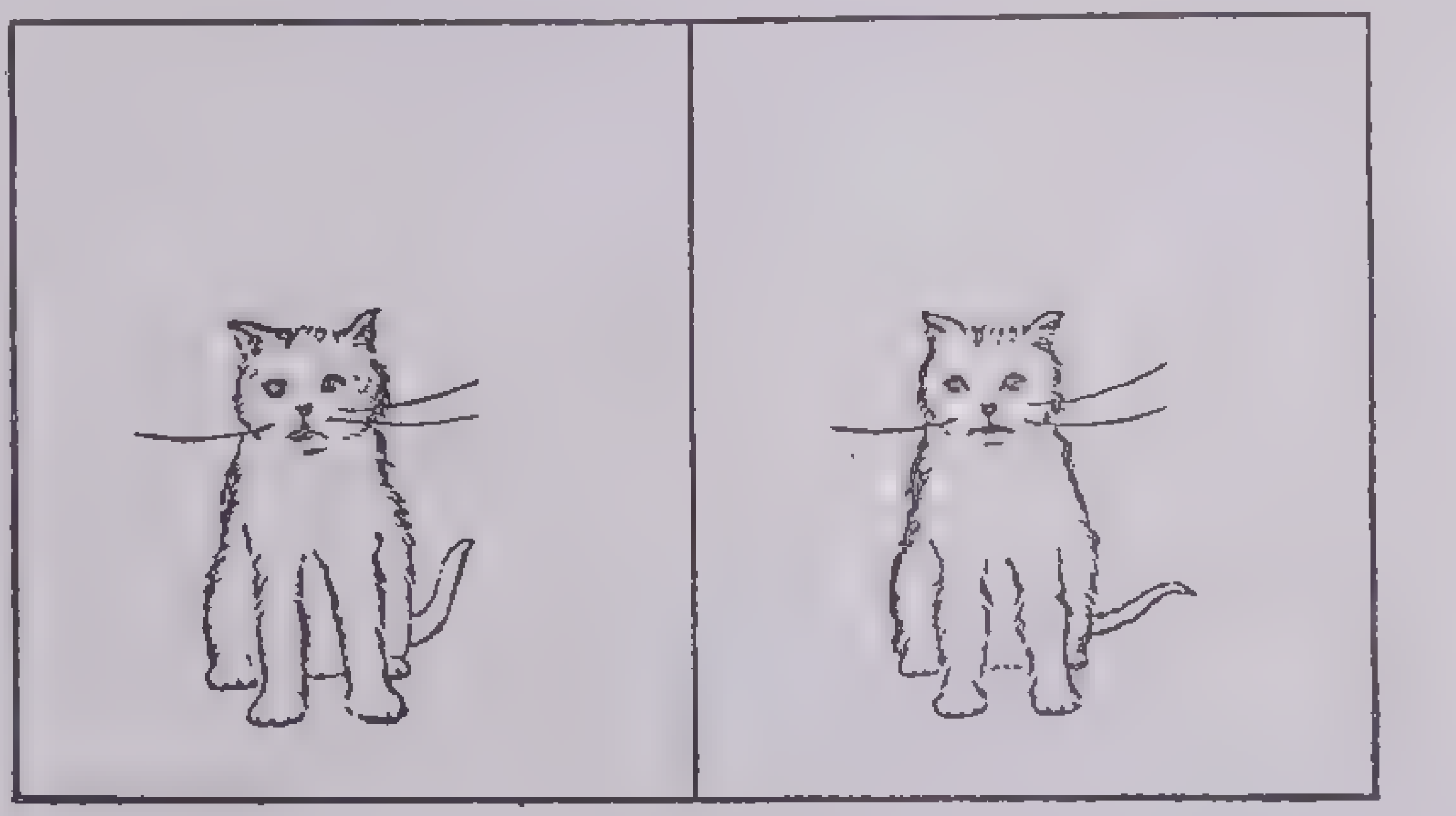
Those who have a right to speak with some authority about arithmetic and its "hard spots" almost always stress the need of special attention to the *meaning* of zero in addition and subtraction.

Use pictures such as these to make the meaning of zero clear.



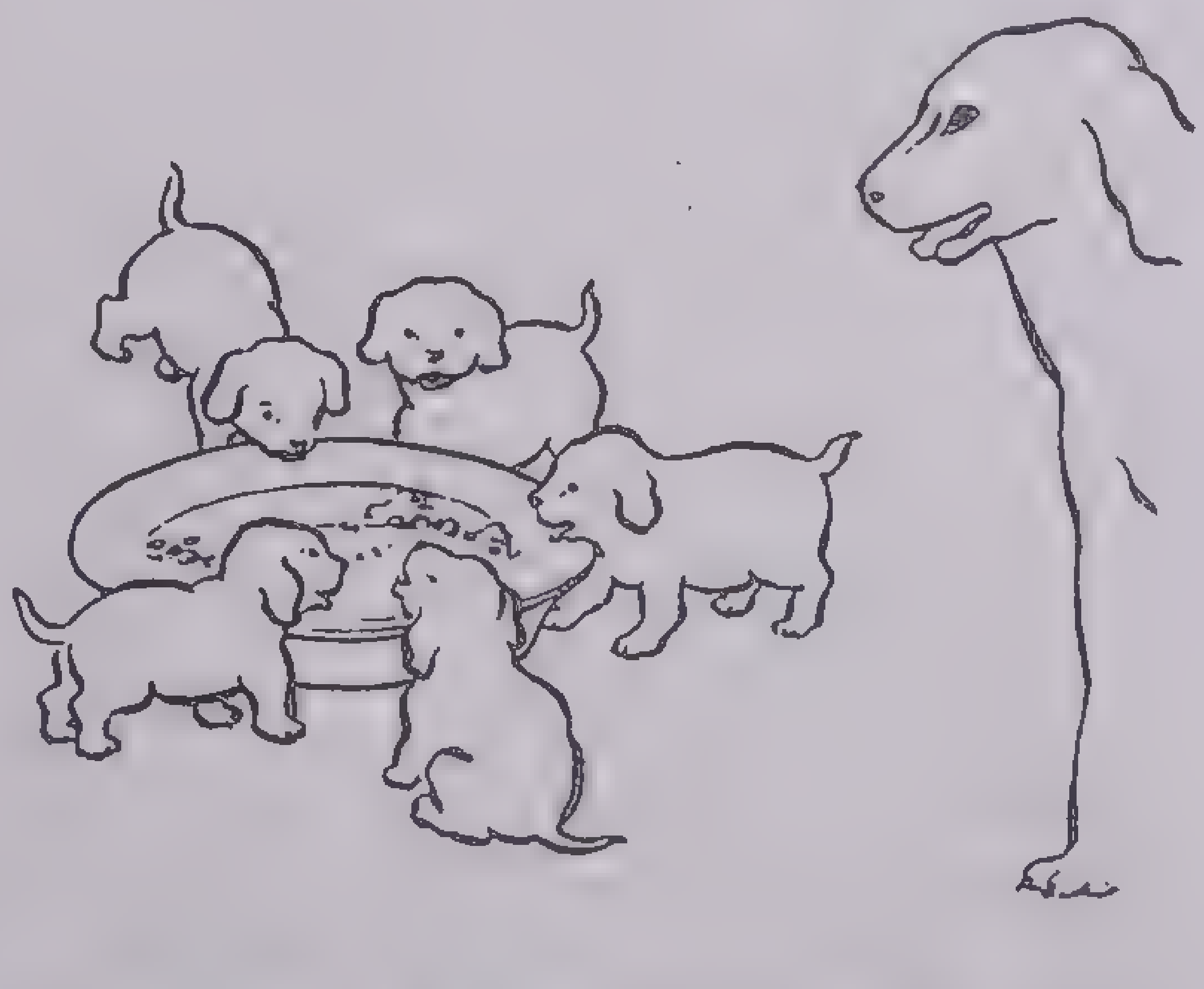
Tabby had 3 whiskers. But look at the next picture.
3 − 3 = ____

Tabby lost 3 whiskers so now she has ____.
3 − ____ = 0

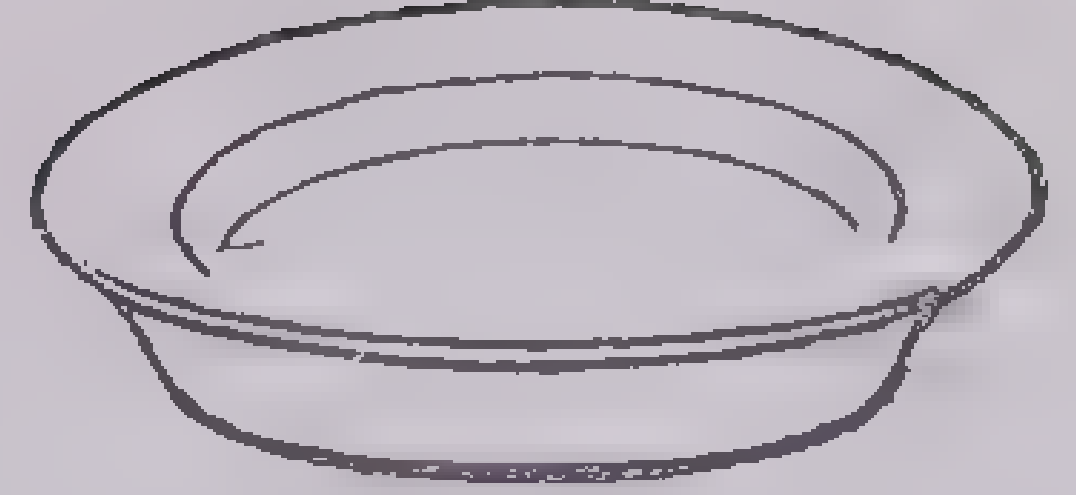


Puss has 3 whiskers too.
3 − 0 = ____

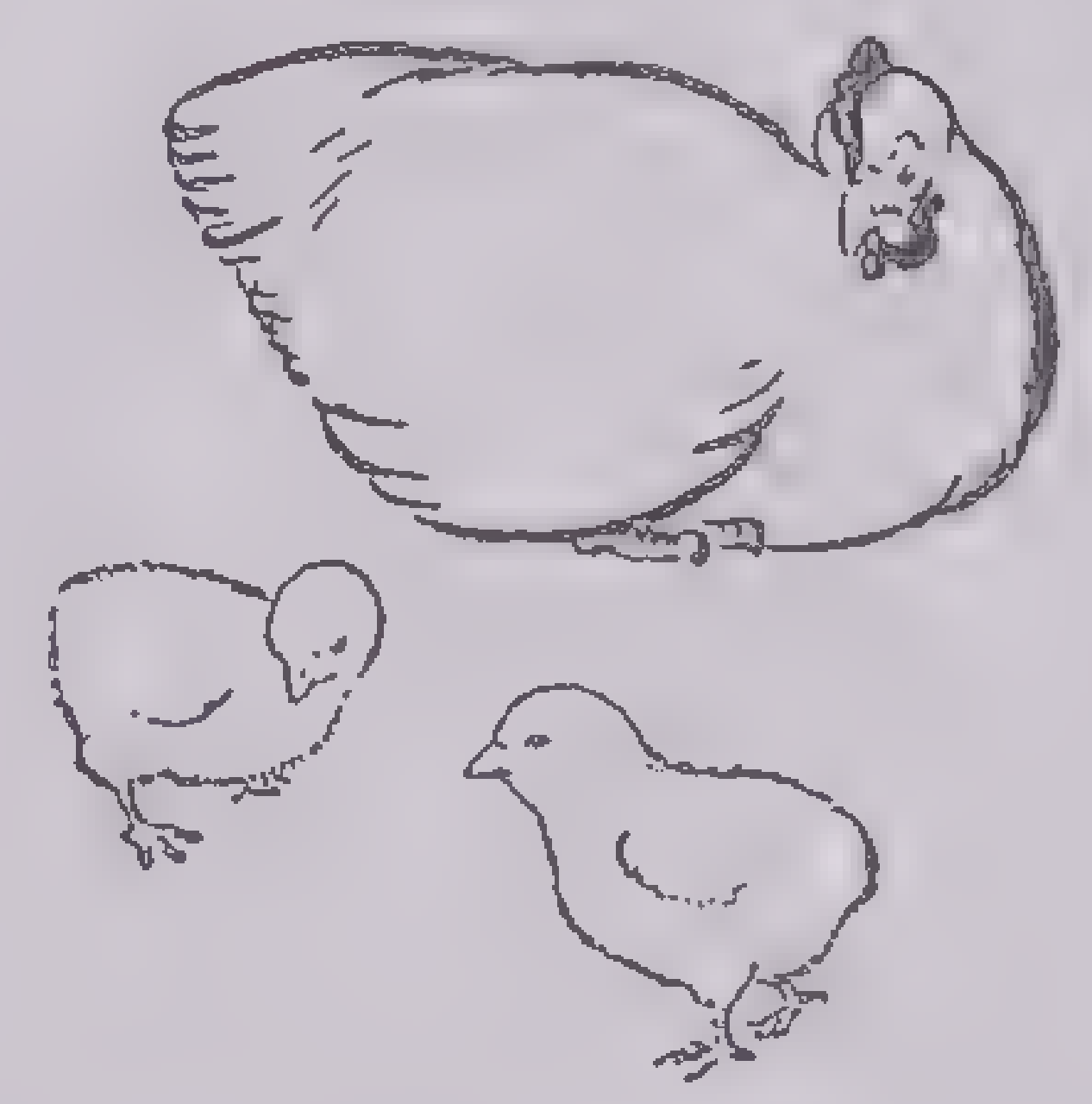
But Puss has lost 0 whiskers so she has ____ now.
3 − ____ = 3.



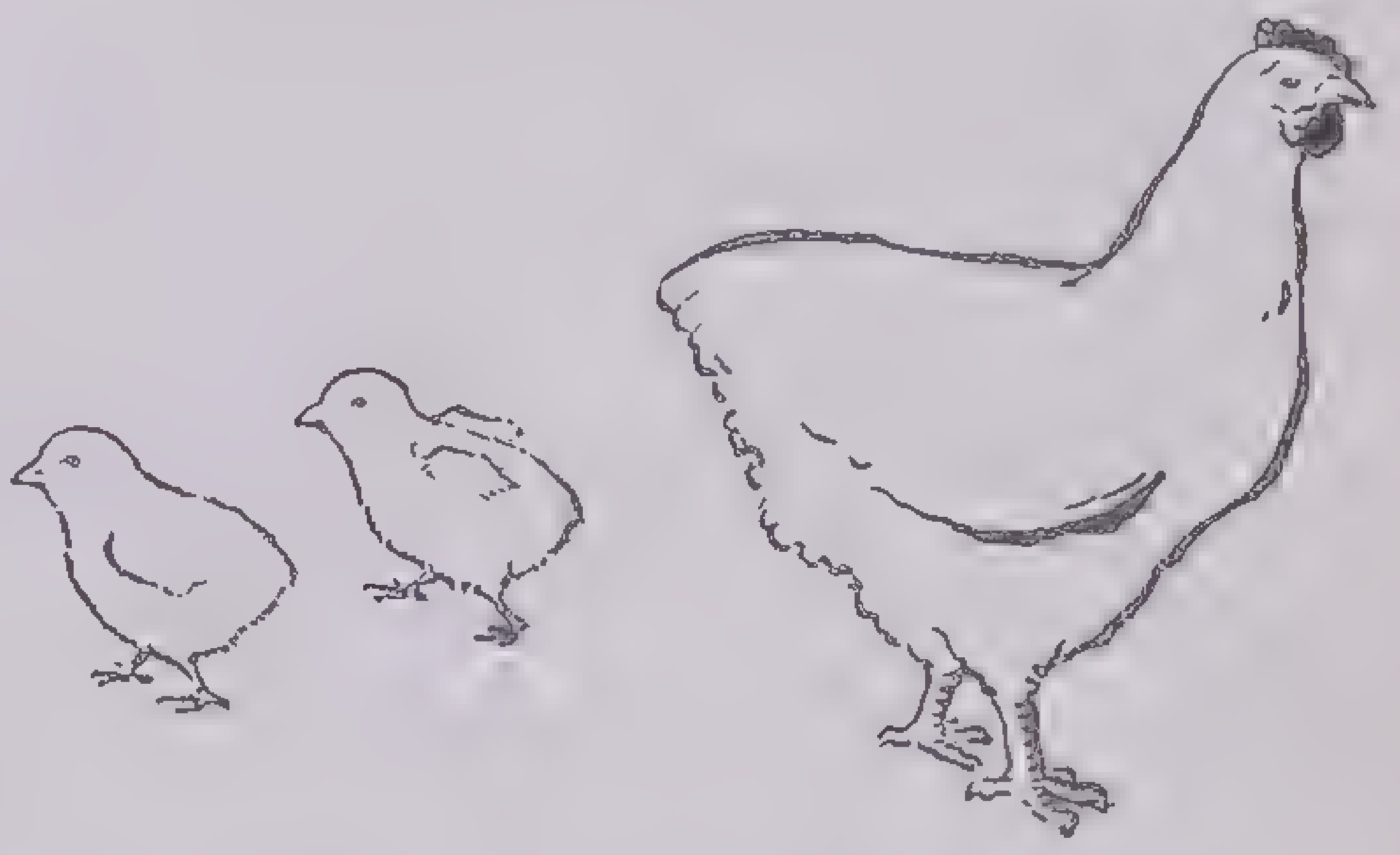
Here are 5 puppies eating their supper. They are all happy so none of them wants to go away. If none of them goes away, then there are still 5 puppies. 5 − 0 = 5 5, take away none, ____ are left. 5 − ____ = 5



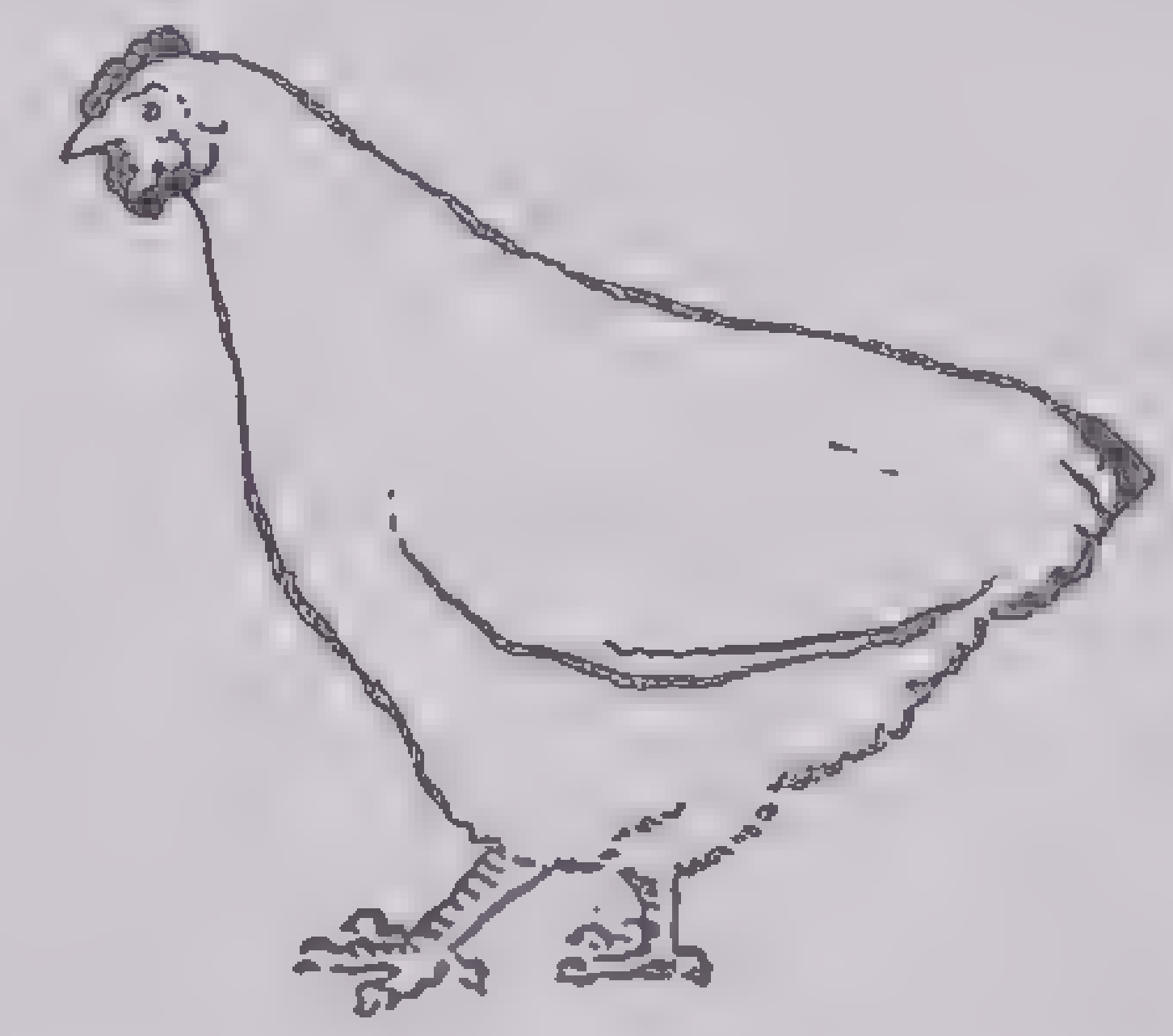
Now the puppies have eaten everything, and their mother calls them away. All 5 of the puppies go away so there will be no puppies left. 5, take away 5, nothing (0) is left.
5 − 5 = 0 5 − ____ = 0 5 − 0 = ____



Biddie, the hen, watches to see that her 2 chicks do not run away. Now look at the next picture.



No chick has run away so there are still 2 chicks. 2 − 0 = ____
Now look at the next picture.



When Biddie turned her back, the 2 chicks ran away. Now there are __ chicks
2 − 2 = ____ 2 − ____ = 0
2 − ____ = 2 2 − 2 = ____

Once "the way zero works" is clear, the child generally understands how to use it.

GROUP 11

5 + 0, 0 + 5, 5 − 0, 5 − 5
0 + 0, 0 + 1, 0 + 2, 0 + 3
3 − 3, 3 − 2, 3 − 1, 3 − 0
8 + 0, 7 − 7, 0 + 9, 6 − 0

A Test in the Basic Facts

When the child can read the answers to the examples below accurately and with reasonable speed, he may be considered to have mastered the one hundred addition and the one hundred subtraction facts. Only the harder facts are used in this test.

Notice the signs. Remember to add if the sign is +. What should be done if the − sign is used?

$$\begin{array}{rrrrr} 9 & 9 & 8 & 7 & 8\\ +5 & -4 & +5 & +6 & +6\\ \hline \end{array}$$

$$\begin{array}{rrrrr} 17 & 12 & 8 & 9 & 16\\ -9 & -5 & +7 & +6 & -9\\ \hline \end{array}$$

$$\begin{array}{rrrrr} 13 & 13 & 7 & 14 & 9\\ -5 & -7 & +5 & -6 & +8\\ \hline \end{array}$$

$$\begin{array}{rrrrr} 14 & 15 & 13 & 9 & 15\\ -9 & -8 & -9 & +7 & -9\\ \hline \end{array}$$

$$\begin{array}{rrrrr} 8 & 6 & 9 & 0 & 7\\ +0 & -6 & -9 & +0 & -0\\ \hline \end{array}$$

The Addition of Whole Numbers

Addition of whole numbers is usually mastered in Grade Three. Grades Four to Eight should systematically review this skill and extend mastery to long and larger examples. The next paragraphs explain the process step by step.

Adding Three Numbers

Colleen, aged 8 and Billy, aged 6 were visiting at their uncle's farm. They were gathering the eggs. Billy found 4 eggs in one nest and 5 eggs in another. Colleen found only one nest; it had 8 eggs in it.

"Oh," said Billy, "we must have about a hundred eggs."

"No, no, there can't be that many," said Colleen, "I'll count them when we get to the house."

$$\begin{array}{r} 8\\ 5\\ 4\\ \hline 17 \end{array}$$

The example shows how Colleen wrote the numbers on a paper.

We add the numbers this way:
Add 4 and 5, think 9.
Add 9 and 8, think 17.

Add the numbers in each of these examples:

$$\begin{array}{cccccccccc} 2 & 8 & 7 & 9 & 8 & 7 & 7 & 1 & 9 & 6\\ 6 & 4 & 3 & 1 & 7 & 2 & 2 & 5 & 3 & 0\\ 3 & 2 & 4 & 2 & 1 & 5 & 6 & 4 & 5 & 2\\ \hline \end{array}$$

$1 + 2 + 5 =$ $\quad$ $6 + 3 + 1 =$
$8 + 1 + 6 =$ $\quad$ $7 + 2 + 4 =$
$5 + 3 + 2 =$ $\quad$ $5 + 6 + 3 =$

Adding Large Numbers

That evening Colleen and Billy were playing Frog-Pond. Each tin frog had a number on it, but they couldn't see the numbers until they caught the frogs.

Colleen said: "I'll add the scores for both of us."

Example A shows Colleen's numbers.

A
$$\begin{array}{r} 36\\ +53\\ \hline 89 \end{array}$$

She added her numbers this way:
3 and 6 are 9. She wrote 9 under 3.
3 and 5 are 8. She wrote 8 under 5. Can you read Colleen's score?

Example B shows Billy's numbers,

B
$$\begin{array}{r} 13\\ 4\\ 21\\ \hline 38 \end{array}$$

Colleen added them this way:
1 and 4 are 5; 5 and 3 are 8. She wrote 8 under 1.
2 and 1 are 3. She wrote 3 under 2. Can you read Billy's score?

Copy these numbers and add them:

$$\begin{array}{rrrrrrrr} & & 20 & 1 & 38 & 31 & & 43\\ 46 & 52 & 41 & 62 & 41 & 51 & 72 & 61\\ 23 & 63 & 14 & 31 & 50 & 6 & 41 & 21\\ \hline \end{array}$$

Finding What Sums End In

The next morning the two children went with their uncle to feed the little chickens. One old hen had 15 babies, and another had 8.

Colleen said, "I'll show you how my teacher tells us to add 15 and 8, and we'll know how many chicken babies both hens have."

So she used her finger and wrote the numbers in the soft sand. Look at Example A to see how they appeared.

A
$$\begin{array}{r} 8\\ +15\\ \hline 23 \end{array}$$

8 and 5 are 13. 13 ends in 3. So the sum of 8 and 15 ends in 3. You know the answer must be more than 13. The answer is the next number after 13 that ends in 3. The next number after 13 that ends in 3 is —. How many baby chicks were there?

Look at Examples B and C.

B
$$\begin{array}{r} 8\\ +25\\ \hline 33 \end{array}$$

C
$$\begin{array}{r} 8\\ +35\\ \hline 43 \end{array}$$

Why do both sums end in 3?

Why is 33 instead of 23 the right answer for Example B?

What number belongs on each line?

1. 4 and 7 are ______. The sum of 4 and 7 ends in ______.
2. 7 and 8 are ______. The sum of 7 and 8 ends in ______.
3. 2 and 7 are ______. The sum of 2 and 7 ends in ______.
4. 6 and 9 are ______. The sum of 6 and 9 ends in ______.

To find the sum of 35 and 7 you must think:

The sum must end in ______.
The sum must be larger than ______.
The next number after 35 that ends in 2 is ______.
The sum is 42.

Can you give the sums for the examples below?

28 and 5 $\quad$ 42 and 9 $\quad$ 67 and 8
19 and 7 $\quad$ 63 and 8 $\quad$ 43 and 9
32 and 8 $\quad$ 31 and 9 $\quad$ 29 and 3

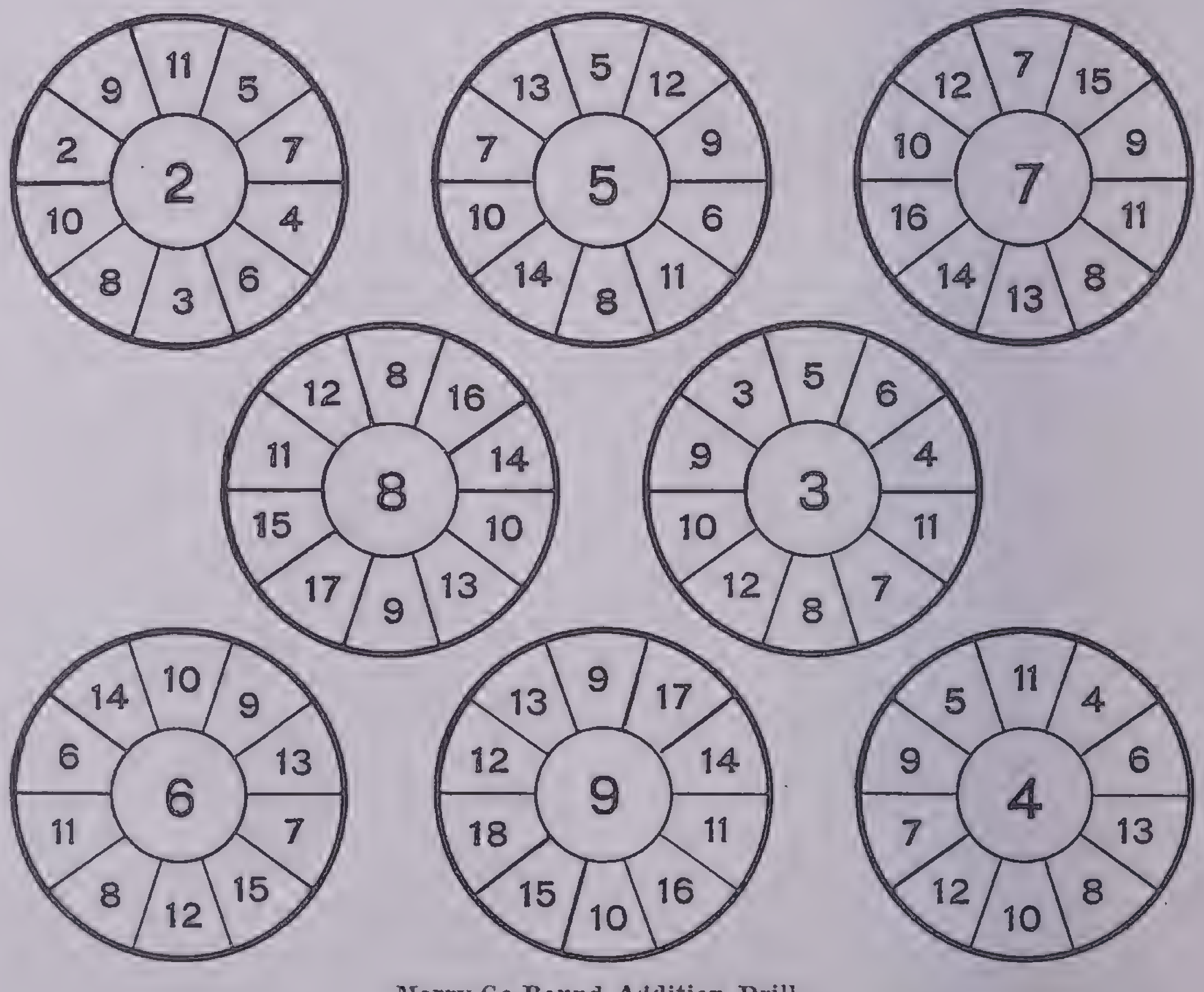
Finding Sums for Longer Columns

You add 4 numbers just as you add 3 numbers, but you have one more number to add.

A
$$\begin{array}{r} 6\\ 8\\ 7\\ 9\\ \hline 30 \end{array}$$

This is the way to add Example A: Think "9 and 7 are 16; 16 and 8 are 24; 24 and 6 are 30." Say "16, 24, 30."

The sum for Example A is 30.



Merry-Go-Round Addition Drill
Add the center number to each of the other numbers

Can you give the sums for these examples?

A	B	C	D
16 + 5	29 + 7	10 + 2	16 + 6
12 + 2	18 + 4	29 + 3	14 + 9
23 + 6	19 + 5	37 + 6	20 + 3
18 + 0	40 + 2	17 + 2	37 + 2

Can you find the sums for these examples?

	5	4		1	7	1	4
7	1	8	6	8	7	8	3
6	3	8	3	9	7	9	2
9	9	2	7	4	6	9	7

Getting Ready to Carry in Addition

You know that 11¢ is 1 dime and 1 penny. The number 11 is often used without meaning money; 11 means 1 *ten* and 1 *one*.

24 cents is the same as ______ dimes and ______ pennies.

The number 24 means 2 tens and 4 ones.

1. The number 28 means ______ tens and 8 ones.
2. The number 45 means ______ tens and 5 ones.
4. The number 50 means ______ tens and ______ ones.
5. The number 66 means ______ tens and ______ ones.

Carrying in Addition

Every example below contains a special skill in addition. These must be understood.

Add the numbers in Example A.

A	35
	28
	34
	7

8 and 5 and 4 are 17.
17 means ______ ten and ______ ones.
We write ______ and carry ______.
Find the sum for the tens' column.
Remember to add the figure we carry.

What is the sum for Example B?

B	28
	17
	39
	84

In Example B the sum of the figures in ones' column is 24.

Study Example B.
24 means ______ tens and ______ ones.
We write ______ and carry ______.
How do we get the 8 in the answer?

Look at Example C.

C	18
	54
	29

The sum for ones' column is ______.
We should write ______ and carry ______.

Now find the sum for this example.

In each example below add the figures in the ones' column. What figure should you carry?

57	42	18	26	39
24	25	27	5	46
	14	37	38	8

Copy the examples below and add:

	58		10	9	62
57	37	8	56	38	71
22	49	79	43	26	31
18	32	9	4	5	8

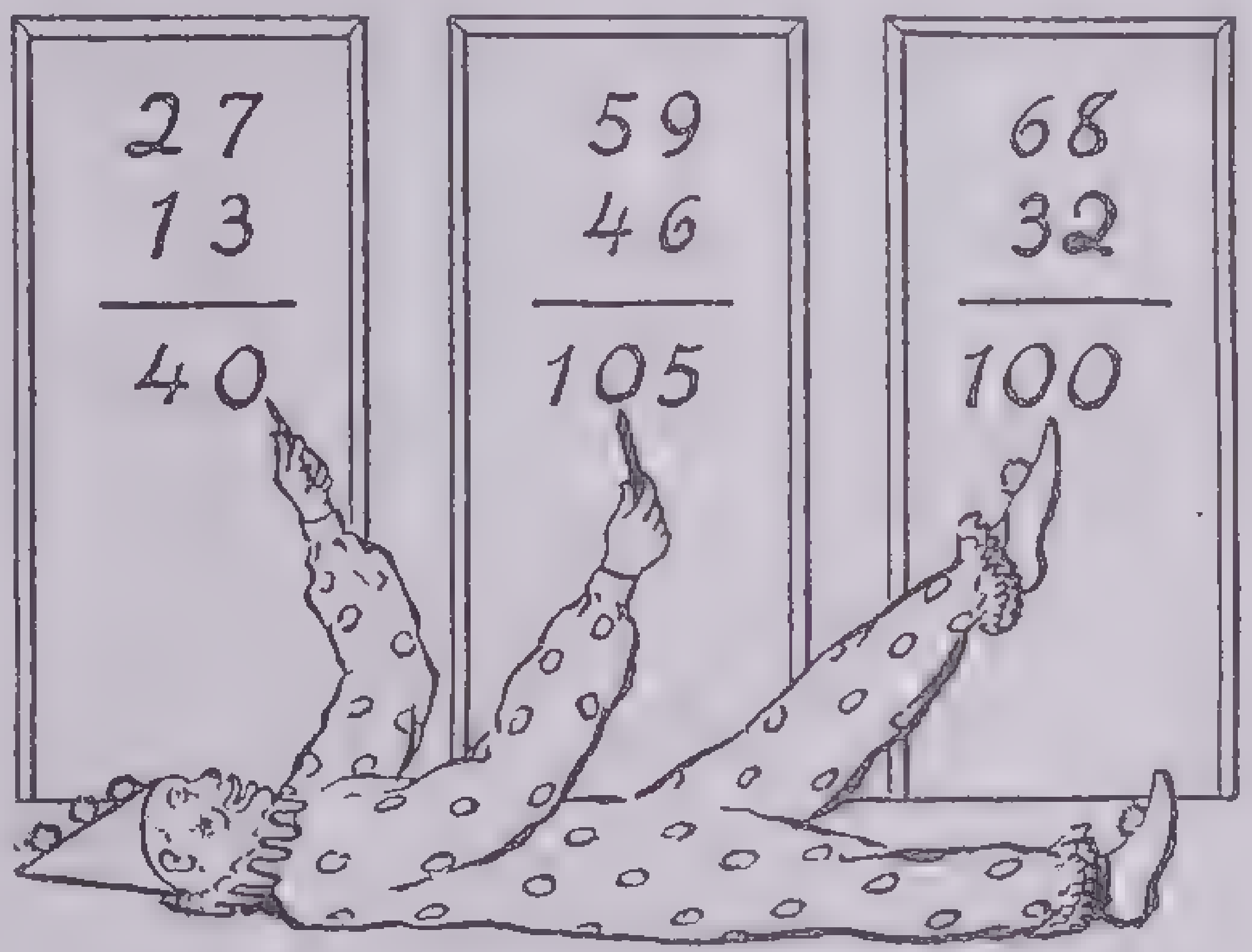
Adding and Checking

Find the sum for each example below. Check your work by adding down. If you do not get the same answer when you add down that you got when you added up, you have made a mistake. If you make a mistake, add again.

	56	25	75	12	8	66
82	23	42	82	4	52	77
27	18	69	11	62	9	82
14	9	1	12	39	12	9

Zero in Addition

Notice the zeros in the next examples:



A	6
	61
	23
	90

Examples A, B and C have zero difficulties.

What is the sum of the figures in the ones' column in Example A?

What is done with the 0? The trick is to remember to write zero.

What figure do we carry?

What is the sum for tens' column?

Copy the examples below and add. Look out for zeros in the answers. Check your work.

	23			15	
6	52	49	86	38	34
30	2	60	7	9	20
44	33	24	7	38	36

Example B shows another zero difficulty.

B	25
	34
	47
	106

What is the sum for the ones' column?

What is carried to the tens' column? The trick is to remember to write 0 in the answer.

What is the answer for Example B?

Copy the examples below and add. Look out for zero in the answers. Check your work.

51		3	48	85
32	57	20	5	61
4	50	33	16	48
22	98	24	33	6

Zero will trick us twice in Example C if we are not careful.

C	63
	84
	53
	200

The sum for ones' column is ______.
We write ______ and carry ______.
The sum for tens' column is ______.
What is the sum for Example C?

Copy the examples below and add. Look out for zeros in the answers. Check your work.

		31	58	41
46	53	6	8	25
8	63	39	24	60
56	24	24	10	94

Something New in Carrying

D	167
	+152
	319

Work Example D to find the sum.
Find the sum for ones' column.
Find the sum for tens' column.
What figure do we carry?
What is the answer?
In this example we carry from the tens' column.

Copy the examples below and add:

				408	104
281	49	203	357	3	28
584	245	189	162	67	313

Carrying Twice

In Example E what figure must we carry from the ones' column to the tens' column.

E	188
	17
	107

What figure must we carry from the tens' column to the hundreds' column?

How many times must we carry?

Copy Example E and add.

Copy the examples below and add.

	385	226	423	257
275	79	192	92	19
628	361	75	106	188

Test in Addition

If you can add correctly the examples below, you can add well enough for ordinary business needs. Do not look at the answers until your work is finished.

88	88	$ 4.79	757	$ 10.87	8318
56	62	.15	495	56.18	1958
3	23	.32	502	79.33	43
80	86	9.96	270	22.25	64
13	75	6.38	919	95.58	7906
240	334	$21.60	2943	$264.21	18289

$$\begin{array}{rrrrrr}
\$\ .40 & 46 & 485 & 961 & \$\ 54.74 & 6180 \\
.78 & 8 & 770 & 803 & 8.93 & 7654 \\
.34 & 29 & 816 & 21 & .52 & 8645 \\
.67 & 95 & 937 & 1 & .20 & 4138 \\
.86 & 4 & 296 & 495 & 90.07 & 8442 \\
.37 & 48 & 826 & 98 & 56.37 & 5027 \\
\hline
\$3.42 & 230 & 4130 & 2379 & \$210.83 & 40086
\end{array}$$

Essentials of Subtraction of Whole Numbers

Use the following material to master subtraction. Review the one hundred subtraction facts given in Second Grade work, if that is necessary.

Learning What ⊟ Means.

Colleen and Billy were helping get ready for Colleen's birthday party. They needed 10 candles for the cake. Billy brought 6 candles from the next room. *How many fewer* did he have than he needed?

To find *how many fewer* we subtract.

Mother had 12 eggs in a sack. She used 6 for Colleen's cake. How many were left?

To find *how many are left* we subtract.

Colleen paid 7 cents for red candles and 5 cents for white ones. How much more did she pay for red candles than for white ones?

To find *how much more* we subtract.

How much less did Colleen pay for white candles than for red ones?

To find *how much less* we subtract.

This sign always tells us to subtract. ⊟

When we subtract, the answer is called the *difference*.

Give the difference for each example:

$$\begin{array}{rrrrrrr}
10 & 8 & 6 & 7 & 9 & 10 & 7 \\
-3 & -4 & -5 & -4 & -1 & -6 & -5 \\
\hline
\end{array}$$

Look at the sign in Example A.

$$\begin{array}{lr}
\textbf{A} & 8 \\
 & -3 \\
\hline
 & 5
\end{array}$$

It is a *minus* sign. This sign tells us to subtract. We read Example A this way:

8 minus 3 is 5.

B 8 − 3 = 5

Example B shows another way to write:

8 minus 3 is 5. We read it this way:
8 minus 3 equals 5.

Read these examples and give the answers:

6 minus 2 is ; 8 − 4 = ; 7 − 7 = ;
7 minus 4 equals ; 3 − 1 = ;
8 − 5 =

Remember we subtract to find:

(a) the difference between two numbers,

(b) to find how much larger one number is than another,

(c) to find what might be added to one number to equal another number or

(d) to find how much is left when some is taken away.

Subtracting with Large Numbers

Each example below shows a hard spot in subtraction of whole numbers.

When Colleen and Billy were playing the Frog-Pond game, Colleen's score was 89 and Billy's was 38. How much less was Billy's score than Colleen's?

Example A shows the answer.

$$\begin{array}{lr}
\text{A} & 89 \\
 & -38 \\
\hline
 & 51
\end{array}$$

The difference between 9 and 8 is 1. 1 is written under the 8.

The difference between 8 and 3 is 5. 5 is written under 3.

Billy's score was how much less than Colleen's?

Find the differences in these examples:

$$\begin{array}{rrrrrr}
75 & 98 & 165 & 63 & 128 & 172 \\
-22 & -64 & -52 & -21 & -11 & -80 \\
\hline
\end{array}$$

This next drill is useful if the student is slow or uncertain.

MISSING NUMBERS

$$\begin{array}{rrrrrrr}
* & 2 & 6 & 4 & 9 & * & * \\
+7 & +* & +* & +* & +* & +3 & +9 \\
\hline
9 & 10 & 9 & 13 & 13 & 12 & 16
\end{array}$$

The pupils in Colleen's room gave a play. These problems tell about it. Find the answers.

1. There are forty-six children in Colleen's room. Twenty-one were in the play. How many were not in the play?
2. There were 12 girls and 9 boys in the play. How many more girls than boys were in the play?
3. The boys spend twenty-five cents for the play, the girls spent forty-six cents. How much less did the boys spend than the girls?

TENS AND ONES IN SUBTRACTION

The number 96 means 9 tens and 6 ones. Change one of the 9 tens to 10 ones. Then 96 is the same as 8 tens and 16 ones.

1. The number 82 means 8 tens and 2 ones; or 7 tens and ______ ones.
2. 64 is the same as 5 tens and ___ ones.
3. 85 is the same as 7 tens and ___ ones.

Colleen and Aunt Clair are making a quilt. They need 95 red pieces for it. They have cut 37. How many more do they need?

Look at Example A.

$$\begin{array}{lrl}
\text{A} & 95 & \text{red pieces} \\
 & -37 & \text{red pieces} \\
\hline
 & 58 & \text{red pieces}
\end{array}$$

We cannot subtract 7 from 5. So we think: 95 is the same as 8 tens and 15 ones. Now we can subtract:

7 from 15 is ______.

3 from 8 is ______.

Now try Example B.

$$\begin{array}{lr}
\text{B} & 91 \\
 & -54 \\
\hline
 & 37
\end{array}$$

Can you subtract 4 from 1?

Change one of the 9 tens to ones. Then think: 4 from ______ is 5. Do not forget you took one ten from the 9. Think 5 from ______ is 3.

The answer for Example B is ______.

Copy the examples below and subtract:

$$\begin{array}{rrrrrrr}
46 & 64 & 88 & 38 & 37 & 92 & 56 \\
28 & 29 & 69 & 25 & 18 & 45 & 18
\end{array}$$

CHECKING SUBTRACTION FOR ACCURACY

Careful work in subtraction involves checking for accuracy.

Colleen took 85 Christmas seals home from school to sell. She sold 27 to Mrs. Brown. Her mother wanted the rest.

"How many seals have you left for me, Colleen?" she asked.

"I'll subtract 27 from 85 and find out," said Colleen.

Colleen subtracted but made a mistake.

$$\begin{array}{r}
85 \\
-27 \\
\hline
68
\end{array}$$

"I can sell you 68 seals," she said.

She handed the seals to her mother.

"Please count them to see if they are all there," said Colleen.

"There are only 58 seals here," mother said.

If Colleen had checked her work she would have found out her answer was wrong.

Look at Colleen's work to find what was wrong.

Example A shows how to check subtraction.

$$\begin{array}{lrl}
\text{A} & 68 & \\
 & -39 & \leftarrow \\
\hline
 & 29 & \leftarrow \\
\textit{Check:} & \mathit{68} &
\end{array}$$

To check Example A add the numbers the arrows point to.

What is the sum of 39 and 29?

Where is this sum written?

If this sum is not the same as the top number in the example, the work should be done again.

Is 35 the correct answer for Example A?

The arrows point to the numbers we should add to check Example B

$$\begin{array}{lrl}
\text{B} & 58 & \\
 & -25 & \leftarrow \\
\hline
 & 34 & \leftarrow \\
 & \mathit{59} &
\end{array}$$

What is the sum of 25 and 34?

Where is this sum written?

Is it the same as the top number in the example?

Should we work Example B again?

Here is Example B worked again. The arrows show which numbers to add when we check.

$$\begin{array}{rl}
58 & \\
-25 & \leftarrow \\
\hline
33 & \leftarrow \\
\mathit{58} &
\end{array}$$

The sum of 25 and 33 is ______.

Is 33 the correct answer?

Copy the examples below with their answers. If an answer is wrong, erase the answer and work the problem again.

$$\begin{array}{rrrrrrr}
54 & 82 & 34 & 96 & 25 & 78 & 62 \\
-18 & -69 & -11 & -28 & -13 & -23 & -21 \\
\hline
36 & 13 & 12 & 68 & 12 & 45 & 41
\end{array}$$

Work the examples below. Check your work.

$$\begin{array}{rrrr} 53 & 91 & 75 & 62 \\ \underline{-12} & \underline{-68} & \underline{-18} & \underline{-31} \\ \\ 95 & 67 & 18 & 75 \\ \underline{-28} & \underline{-28} & \underline{-9} & \underline{-26} \end{array}$$

A NEEDED CAUTION

Research workers have studied the errors which children and adults make in subtraction. The next paragraphs report the two most frequent errors. To know where error is apt to occur is a good way to avoid wrong work.

First cause of error is inaccurate knowledge of the one hundred subtraction facts. 12 − 5 = 8 is wrong, 12 − 5 = 7 is correct. Do you *know* the subtraction facts? If not, review them. You will find them all in the section above headed "Second Grade Arithmetic."

Second cause of error is to forget that one has changed a number.

$$\text{Wrong} \longrightarrow \begin{array}{r} 82 \\ \underline{-37} \\ 55 \end{array} \qquad \text{Correct} \longrightarrow \begin{array}{r} 82 \\ \underline{-37} \\ 45 \end{array}$$

Because to get 12 to use in subtracting 7, the 8 has to be thought 7. One sees the 8 but must remember that 7 is used.

$$\text{Wrong} \longrightarrow \begin{array}{r} 900 \\ \underline{-627} \\ 373 \end{array} \qquad \text{Correct} \longrightarrow \begin{array}{r} 900 \\ \underline{-627} \\ 273 \end{array}$$

Most of the above work is right, but forgetting took place at the finish. The 9-0-0 must be thought 8-10-0, then 8-9-10. The 3 in the ones' column is correct in the answer, the 7 is also correct; but then the one who did the work forgot that the 9 must be thought of as 8. Why?

Remember, to avoid these two causes of error, one should always check.

TRICKS IN SUBTRACTION

The pupil and teacher should know that subtraction is often more difficult for a given student than addition. There are good reasons for this. One insurance against wrong work in subtraction is a clear understanding of several well known "tangles." These are clearly pointed out in the next paragraphs.

One evening Colleen was doing subtraction examples.

"I learned some tricks in subtraction today," she said to her father, "I'll show them to you."

$$\text{A} \quad \begin{array}{r} 50 \\ \underline{-23} \\ 27 \end{array}$$

Colleen wrote Example A on paper. She subtracted and got the correct answer. Before she subtracted, she thought zero or 10. Why? She thought of 5 as ———. Why?

Copy the examples below and subtract.

$$\begin{array}{rrrrrr} 20 & 40 & 60 & 80 & 90 & 70 \\ \underline{-13} & \underline{-18} & \underline{-21} & \underline{-27} & \underline{-19} & \underline{-12} \end{array}$$

"Here's a zero that tricked me today," said Colleen, as she worked Example B.

$$\text{B} \quad \begin{array}{r} 53 \\ \underline{-48} \\ 5 \end{array}$$

She wrote 5 for her answer. She did not write zero under the four.

A zero is not put in when it comes at the left in the answer.

Copy the examples below and subtract. Do not write zero if it comes at the very left in the answer.

$$\begin{array}{rrrrrrr} 81 & 80 & 75 & 87 & 63 & 66 & 58 \\ \underline{75} & \underline{78} & \underline{69} & \underline{78} & \underline{58} & \underline{57} & \underline{49} \end{array}$$

Here is the last example Colleen showed her father.

Look at Example C.

$$\text{C} \quad \begin{array}{r} 55 \\ \underline{-8} \\ 47 \end{array}$$

How did she get the 7?
How did she get the 4?
Copy these examples and subtract:

$$\begin{array}{rrrrrrrr} 67 & 75 & 36 & 15 & 92 & 87 & 75 & 70 \\ \underline{8} & \underline{9} & \underline{7} & \underline{8} & \underline{9} & \underline{8} & \underline{6} & \underline{5} \end{array}$$

PRACTICE METHODS IN SUBTRACTION

Copy the examples below and subtract.

Check your answers. Look out for tricks!

$$\begin{array}{rrrrrrrr} 64 & 60 & 73 & 66 & 41 & 80 & 97 & 33 \\ \underline{58} & \underline{18} & \underline{7} & \underline{19} & \underline{39} & \underline{42} & \underline{58} & \underline{3} \\ \\ 91 & 72 & 80 & 85 & 60 & 92 & 24 & 80 \\ \underline{76} & \underline{69} & \underline{58} & \underline{30} & \underline{2} & \underline{27} & \underline{16} & \underline{5} \end{array}$$

HARDER SUBTRACTION

$$\text{A} \quad \begin{array}{r} 683 \\ \underline{-159} \\ 524 \end{array}$$

In Example A before you subtract think of the 3 as 13.

Then you must think of the 8 as changed to 7. What is the *difference* in Example A?

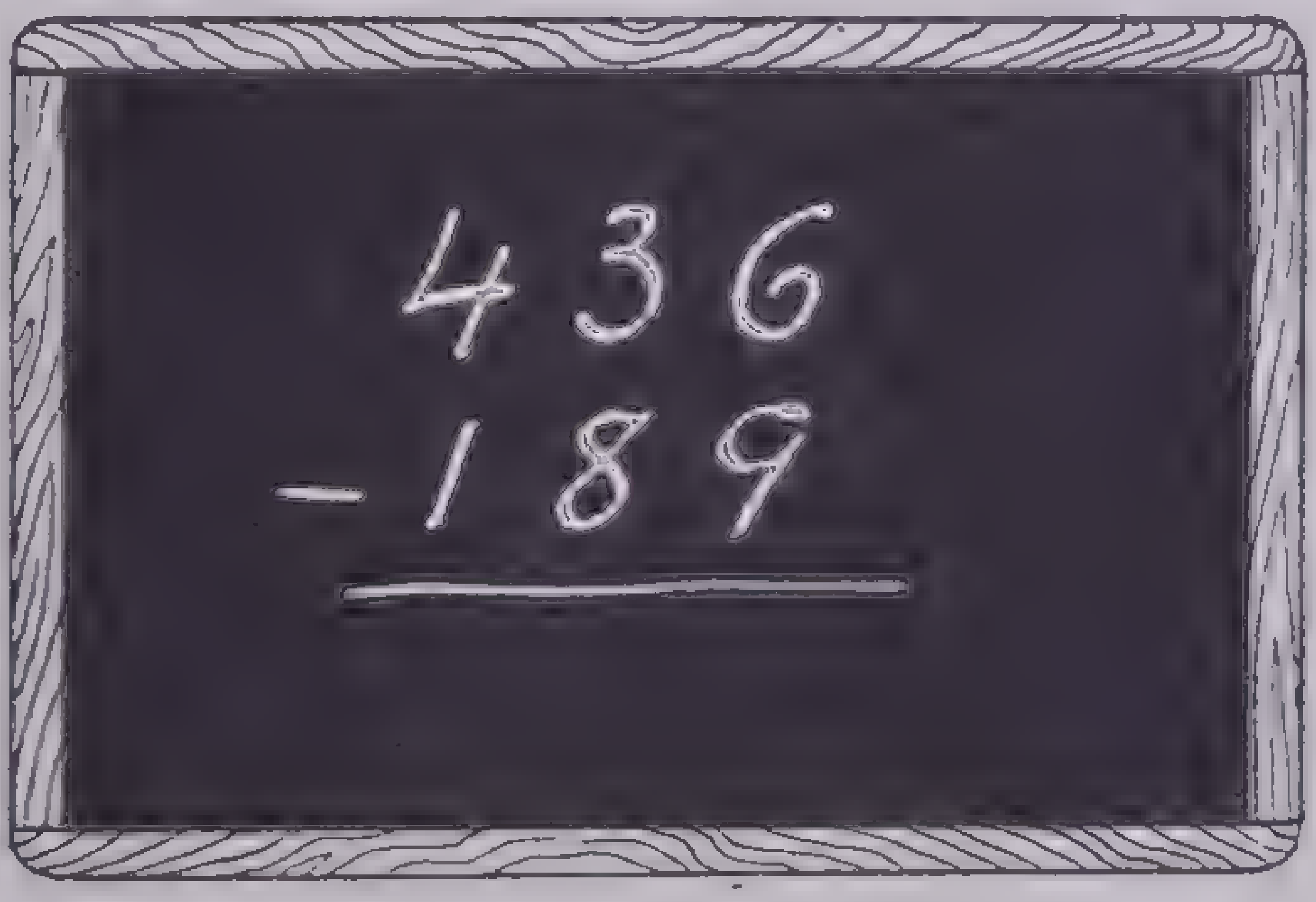
Copy the problems below and subtract:

$$\begin{array}{rrrrrrr} 634 & 568 & 812 & 562 & 527 & 974 & 437 \\ \underline{416} & \underline{281} & \underline{354} & \underline{239} & \underline{490} & \underline{218} & \underline{312} \end{array}$$

CHANGING NUMBERS IN SUBTRACTION

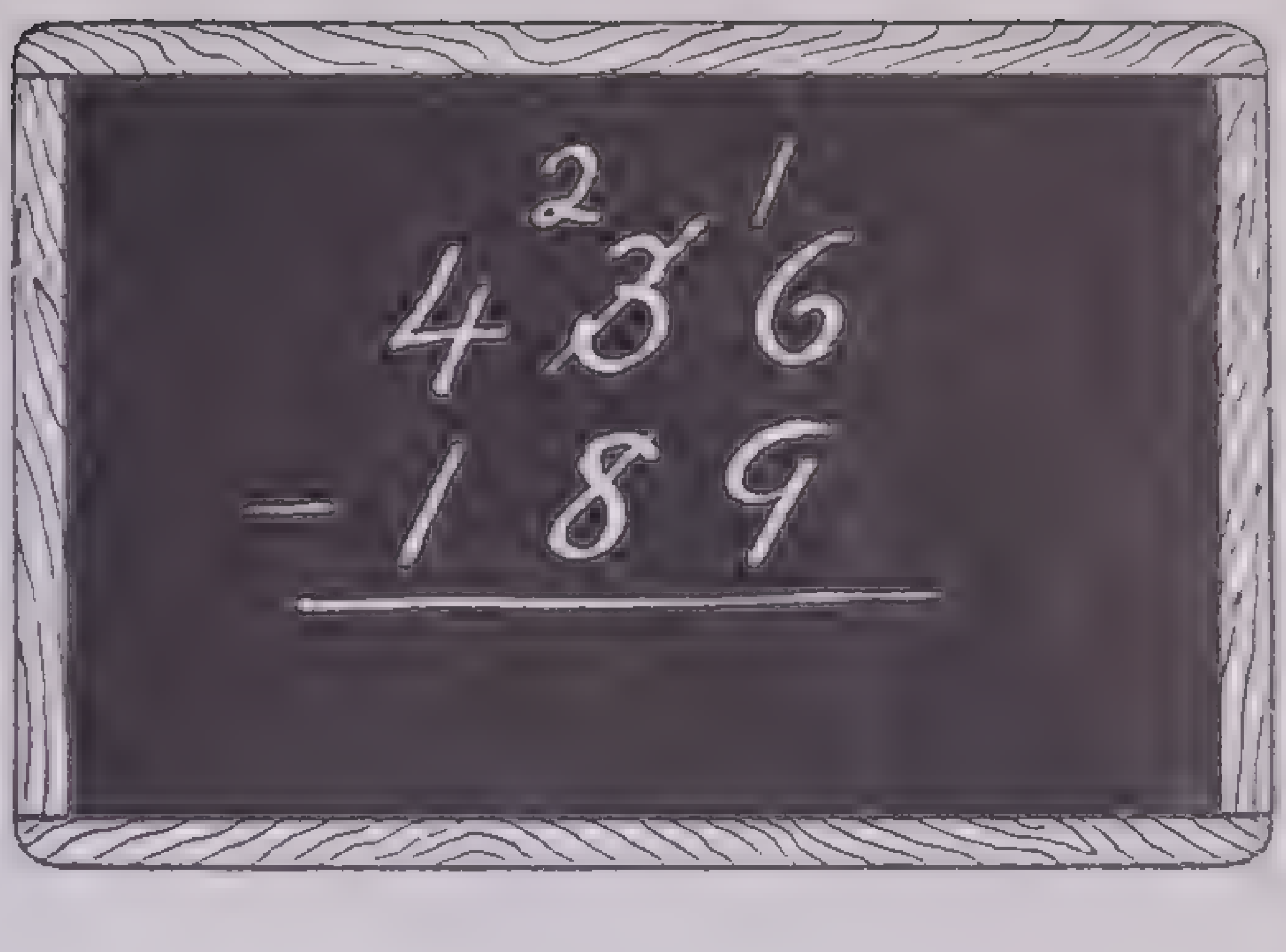
You know that you must change numbers in some subtraction examples before you can work them.

Study the next work.



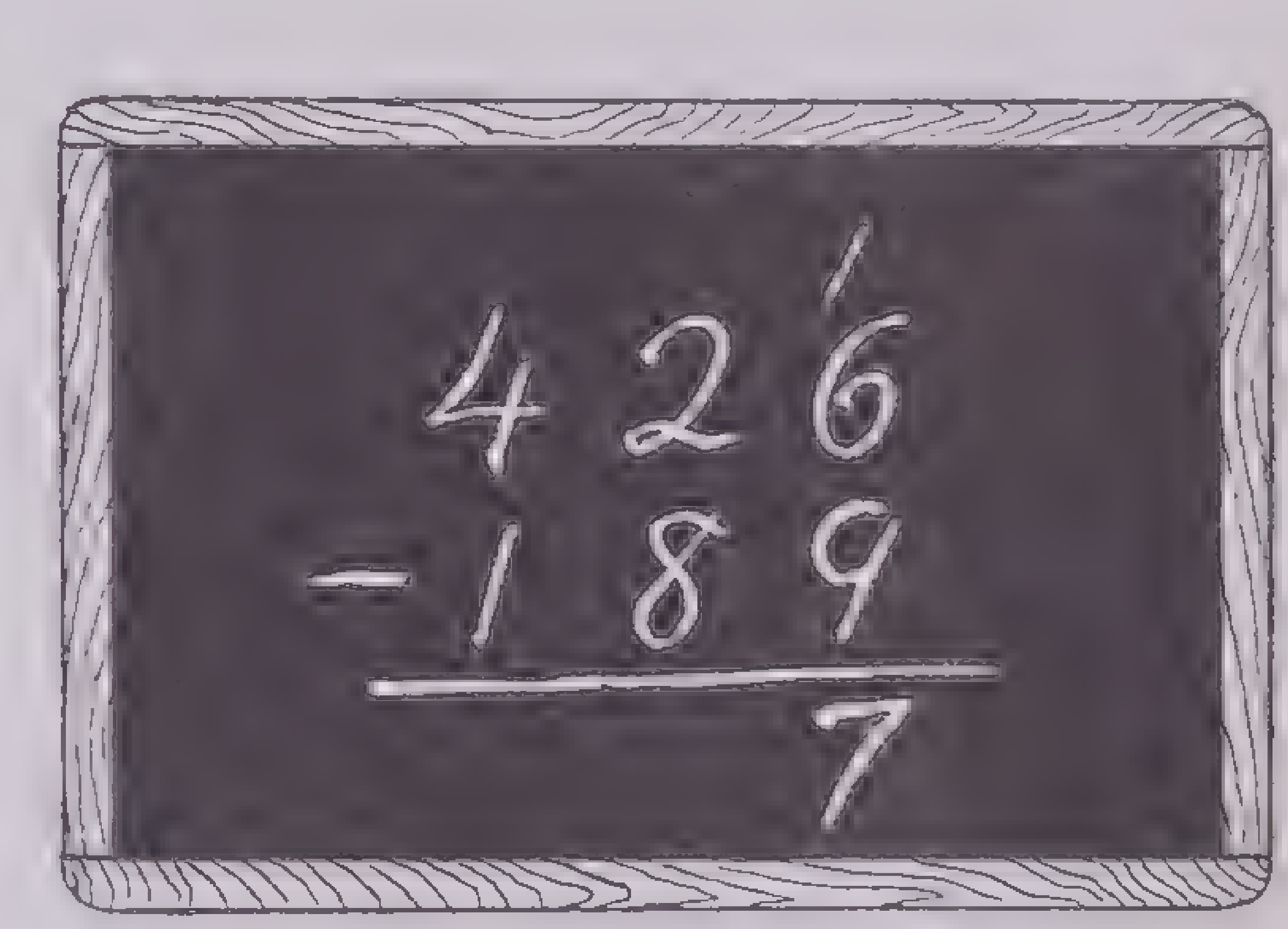
A

This slate shows that 189 is to be subtracted from 436.



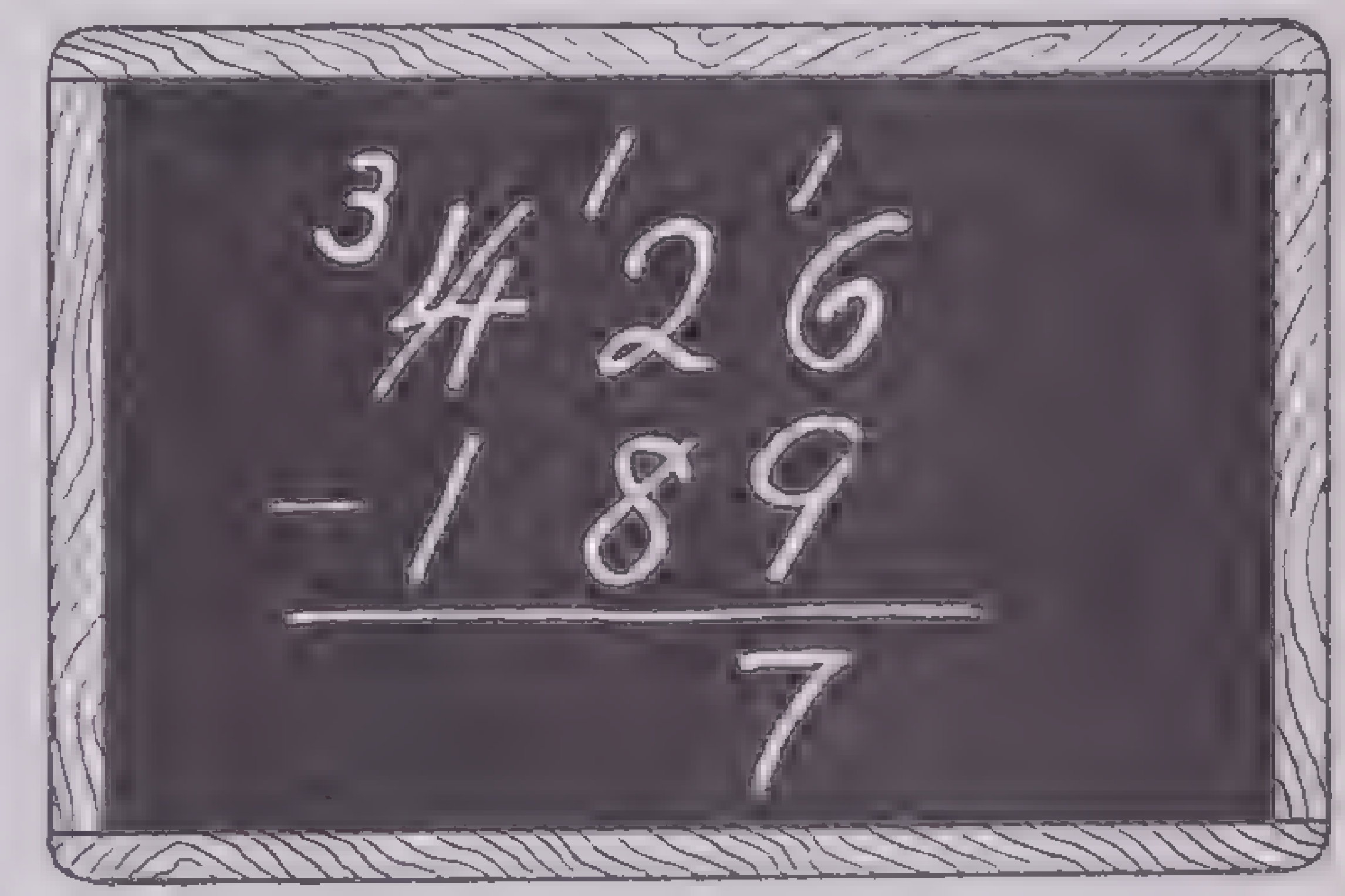
B

This slate shows that the 6 must be changed to 16. Then the 3 becomes 2. Why?



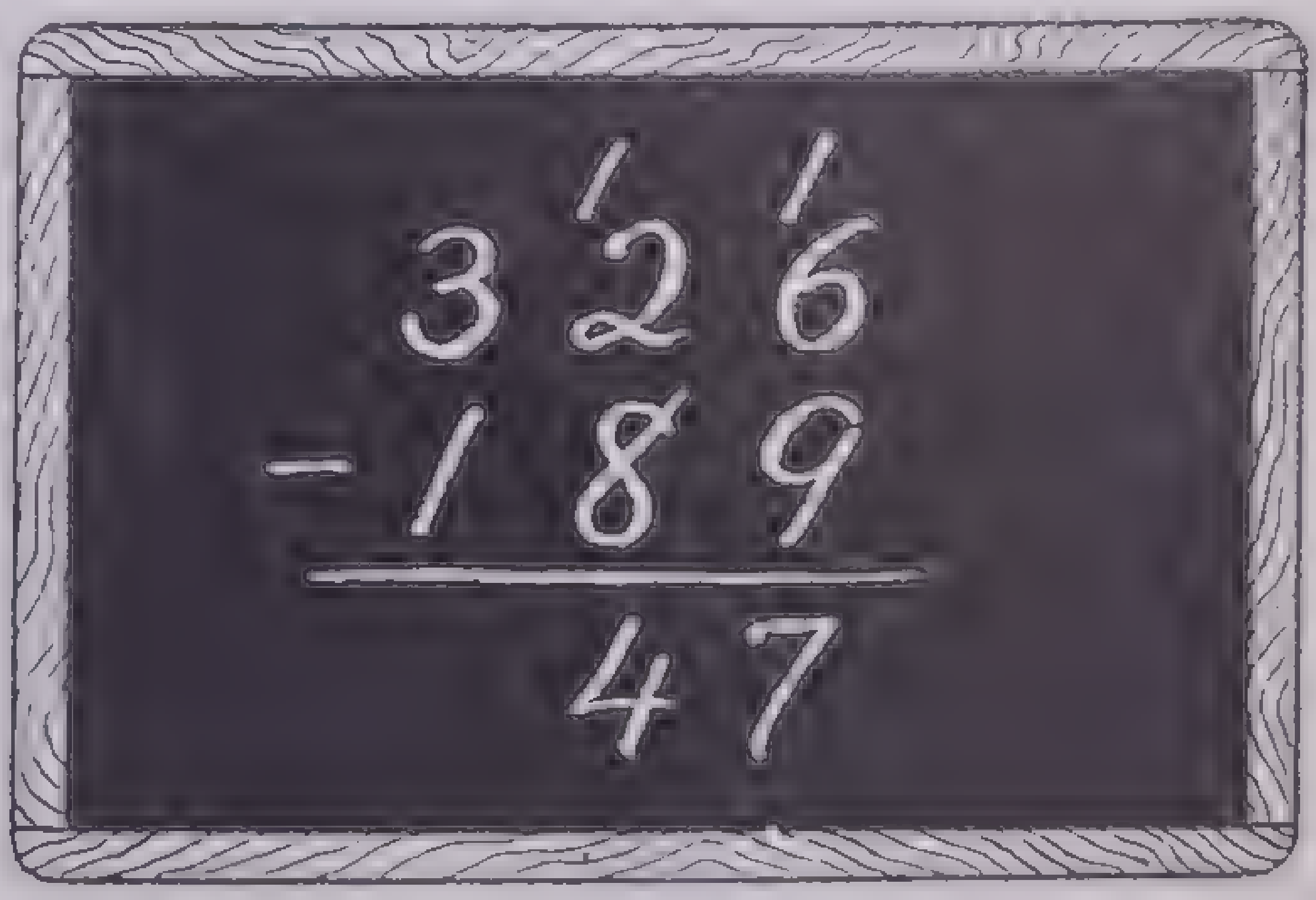
C

This slate shows a 7 in the answer. How do we get the 7?



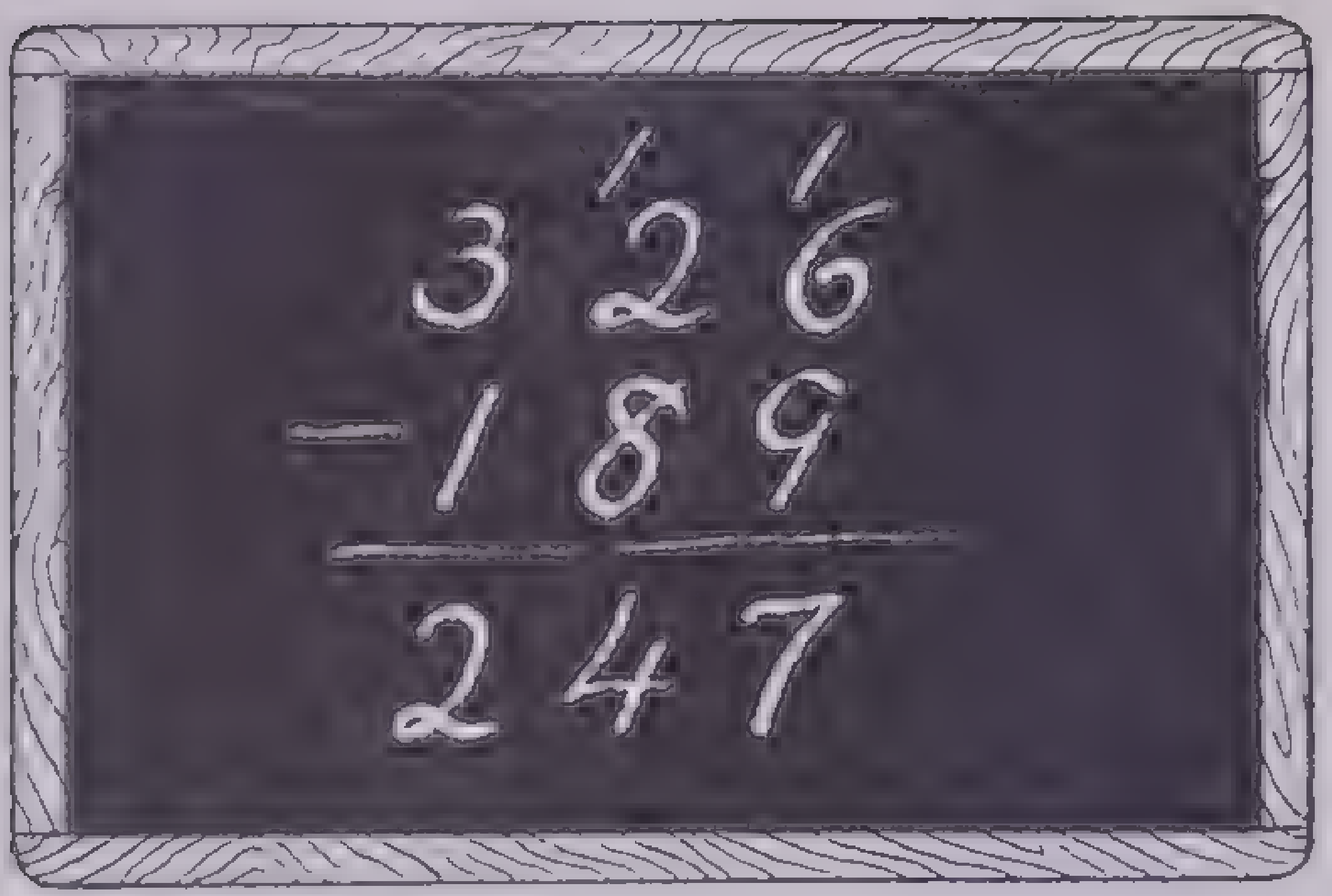
D

This slate shows that the 2 must be changed to 12. Then the 4 becomes 3. Why?



E

This slate shows a 4 in the answer. How do we get the 4?



F

This slate shows a 2 in the answer. How do we get the 2?

These six subtraction slates show the changes that were made in the example. When you subtract, do not write down the changes in the figures. Just think of the figures as changed.

See if you can think the changes we must make to subtract in the first example in the row below.

835	506	437	812	878	550	447
156	325	418	345	169	178	286

We must think of the 5 as ______.

What numbers do we use to get the 7 in the answer?

What numbers do we use to get the 6 in the answer?

Copy the other examples and subtract:

$$\text{B}\quad\begin{array}{r} 305 \\ -186 \\ \hline 119 \end{array}$$

In Example B you cannot subtract 6 from 5. You cannot take 1 from 0 to change the 5 to 15.

Take a 1 from the 3. Think of the 3 as 2 and the 0 as ten. Then take a 1 from this 10. Think of the 10 as 9 and the 5 as 15. Now subtract.

How did you get each figure in the answer?

Now try Example C.

$$\text{C}\quad\begin{array}{r} 704 \\ -546 \\ \hline 158 \end{array}$$

We must change the 4 to ____.
What do we do to change the 4?
We subtract 6 from ______.
We subtract 4 from ______.
We subtract 5 from ______.

Subtract in each example and check your answer.

730	804	826	504	482	829
252	527	675	385	40	764

You know you cannot subtract a larger number from a smaller number. Always look at a subtraction example to see if the top number as a whole is larger than the number below it.

Find the numbers below which you cannot subtract. Copy the other examples and subtract.

538	537	321	762	791	354
274	782	108	950	287	400

WATCHING ZERO IN SUBTRACTION

In some subtraction problems you will find a tricky zero. Watch for a tricky Zero in each example below.

A	B	C	D	E
573	728	706	300	974
−267	−509	−497	−128	−376
306	219	209	172	598

1. In Example A how do we get 0 in the answer?
2. In Example B how do we get 1 in the answer?
3. Look at Example C. How do we get the 0 in the answer? How do we get the 2 in the answer?
4. Look at Example D. What changes must we make in the zeros where we subtract?
5. In Example E how do we get the 9 in the answer?

Subtract in these examples. Watch the zeros.

856	502	820	692	400	603
267	298	708	398	128	114

Subtraction Test

If you can do the next examples accurately and "easily," you can subtract well enough to meet the demands of ordinary needs of business and the home. Do not refer to the answers until your work is done.

938	\$1.20	4920	7343	\$246.74	99790
349	.15	289	5694	58.78	59986
589	\$1.05	4631	1649	\$187.96	39804

244	940	\$71.53	8492	37680	48449
50	283	29.54	708	10875	8379
194	657	\$41.99	7784	26805	40070

\$7.48	332	8420	5359	\$984.49	88378
1.98	37	3050	2562	696.61	30669
\$5.50	295	5370	2797	\$287.88	57709

Multiplication of Whole Numbers

Basic to all good work in multiplication is absolute mastery of the one hundred multiplication facts. The following paragraphs give suggestions how to make these facts possess real meaning to the learner.

Daddy, Colleen and Billy were playing with Billy's toy builders.

Billy picked up *two* blocks and *five* sticks and made a toy boy. Then he made another toy boy like the first one.

How many blocks were used to make one boy?

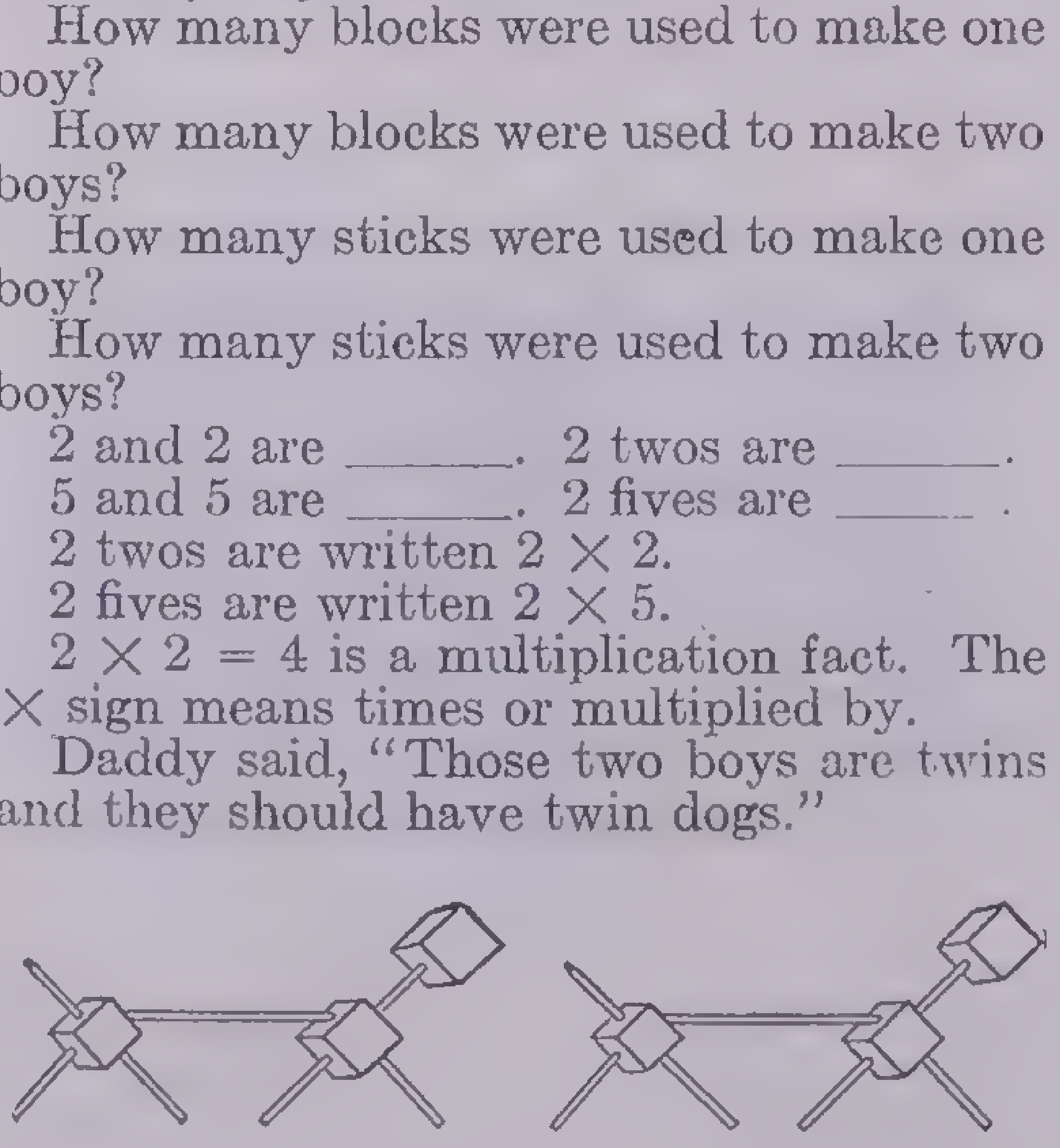
How many blocks were used to make two boys?

How many sticks were used to make one boy?

How many sticks were used to make two boys?

2 and 2 are ______. 2 twos are ______.
5 and 5 are ______. 2 fives are ______.
2 twos are written 2×2.
2 fives are written 2×5.
$2 \times 2 = 4$ is a multiplication fact. The × sign means times or multiplied by.

Daddy said, "Those two boys are twins and they should have twin dogs."



So Colleen made the twin dogs.

How many blocks were used to make one dog?

How many blocks were used to make two dogs?

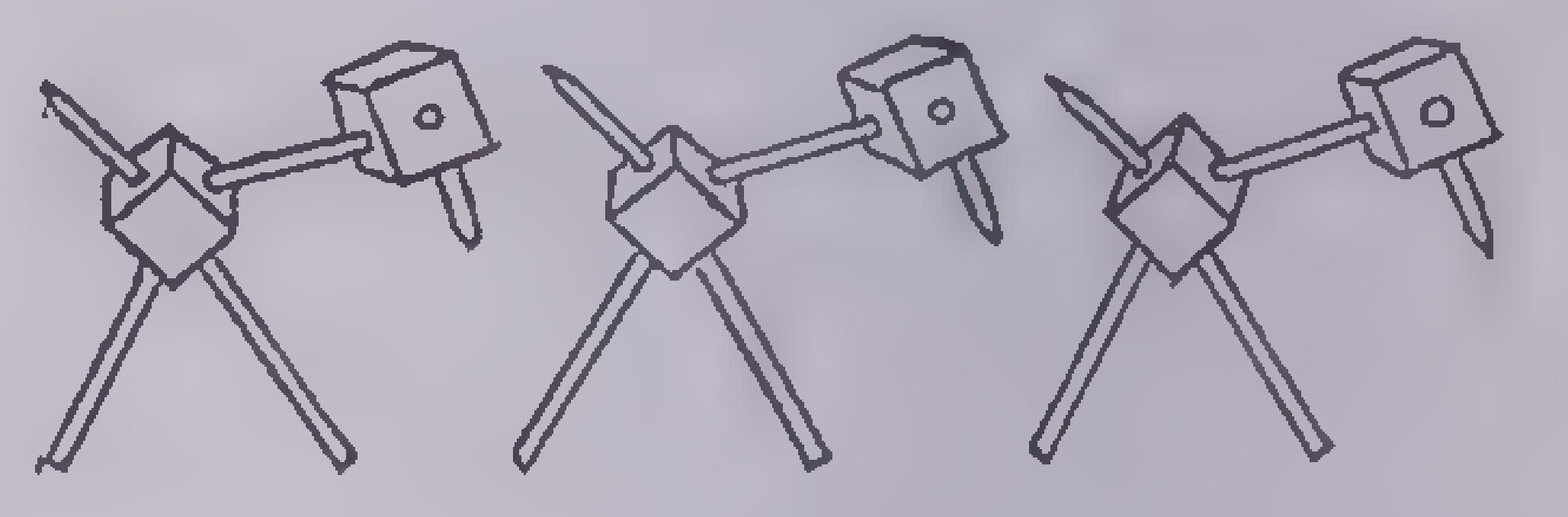
How many sticks were used to make one dog?

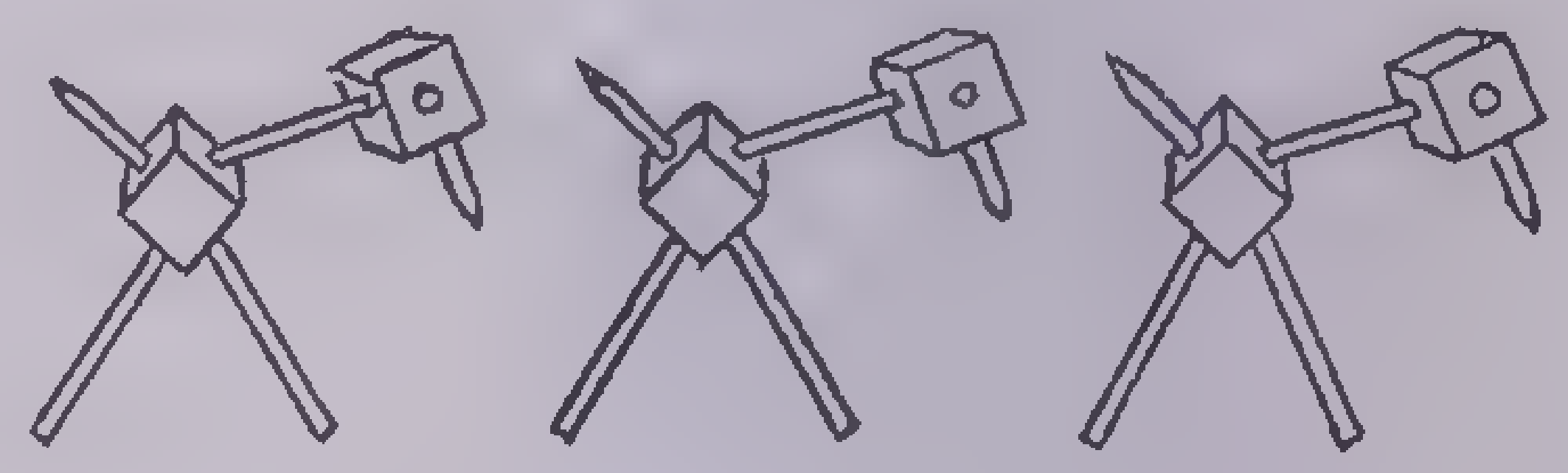
How many sticks were used to make two dogs?

3 and 3 are ______. 2 threes are ______. $2 \times 3 =$ ______.

7 and 7 are ______. 2 sevens are ______. $2 \times 7 =$ ______.

Billy said, "I shall make three chickens for each of the two boys." Then he made three chickens.





How many blocks were used to make one chicken?

How many blocks were used to make six chickens?

2 and 2 and 2 and 2 and 2 and 2 are ______.

6 twos are ______. $2 \times 6 =$ ______.

We need not go to the work of adding the next five twos, $2 + 2 + 2 + 2 + 2$, if we know the multiplication fact $2 \times 5 = 10$.

Another multiplication fact is $4 \times 4 = 16$.

4×4 means taking 4 four times. By addition this would be $4 + 4 + 4 + 4 = 16$. If we have memorized $4 \times 4 = 16$, we save the work of adding.

There are one hundred multiplication facts which every good worker in arithmetic knows accurately and quickly.

One of these 100 facts is $5 \times 6 = 30$. Add the next addition example.

$$\begin{array}{r} 6 \\ 6 \\ 6 \\ 6 \\ 6 \\ \hline \end{array}$$

It is 6 taken five times. Do you get 30? It is easier to memorize $5 \times 6 = 30$ than it is to do a long addition example.

The Hundred Basic Multiplication Facts

Learn the next multiplication facts. They are in *25* groups. Learn one group at a time. Notice the multiplication facts which use zero. As soon as the learner discovers for himself—but not before—that learning one fact helps learning its reverse, as $3 \times 7 = 21$ helps in learning $7 \times 3 = 21$, use this discovery. Avoid learning tables as was formerly the unwise practice. It is permissible to organize the facts into tables *after* mastery but not during learning.

The one hundred multiplication facts

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
1		2		3		4		5	
5	3	1	3	2	0	8	7	1	3
2	3	0	2	4	6	1	3	9	5
10	**9**	**0**	**6**	**8**	**0**	**8**	**21**	**9**	**15**
4	8	3	0	1	7	3	0	2	0
0	2	1	8	5	0	6	2	8	1
0	**16**	**3**	**0**	**5**	**0**	**18**	**0**	**16**	**0**
6		7		8		9		10	
6	5	4	3	8	2	1	0	2	3
1	4	2	4	5	1	3	0	2	7
6	**20**	**8**	**12**	**40**	**2**	**3**	**0**	**4**	**21**
6	1	0	8	5	9	2	4	6	5
3	4	9	3	7	1	6	4	0	6
18	**4**	**0**	**24**	**35**	**9**	**12**	**16**	**0**	**30**
11		12		13		14		15	
2	0	1	3	1	0	4	1	2	7
5	7	2	0	8	5	3	1	9	2
10	**0**	**2**	**0**	**8**	**0**	**12**	**1**	**18**	**14**
5	4	5	3	5	9	1	6	2	2
3	1	5	8	1	3	6	5	3	0
15	**4**	**25**	**24**	**5**	**27**	**6**	**30**	**6**	**0**
16		17		18		19		20	
3	8	6	7	0	7	9	4	5	9
9	0	2	1	3	4	2	5	0	5
27	**0**	**12**	**7**	**0**	**28**	**18**	**20**	**0**	**45**
9	1	4	7	9	5	6	8	4	8
0	7	8	7	4	8	9	7	9	8
0	**7**	**32**	**49**	**36**	**40**	**54**	**56**	**36**	**64**
21		22		23		24		25	
6	5	7	8	7	6	9	0	4	6
4	9	6	9	5	6	7	4	6	7
24	**45**	**42**	**72**	**35**	**36**	**63**	**0**	**24**	**42**
7	8	6	9	4	9	7	8	9	2
9	4	8	9	7	6	8	6	8	7
63	**32**	**48**	**81**	**28**	**54**	**56**	**48**	**72**	**14**

If you cannot give the correct products for these 100 examples about as fast as you can read, you should practice on them until you can. Lay a paper over the answers and then write the products or say them to someone else or to yourself. Slip the paper down and look at the answers if you need to, but mark the examples that bother you and practice most on them when you have some spare time.

A Useful Caution About Zero

A multiplication with zero in it often seems unnatural. When we multiply, the answer is usually larger than either of the numbers used, as $2 \times 6 = 12$. The answer 12 is larger than either the 2 or the 6.

But $4 \times 0 = 0$, $0 \times 7 = 0$. Add four zeros. Or take 7 no times at all. Notice the following.

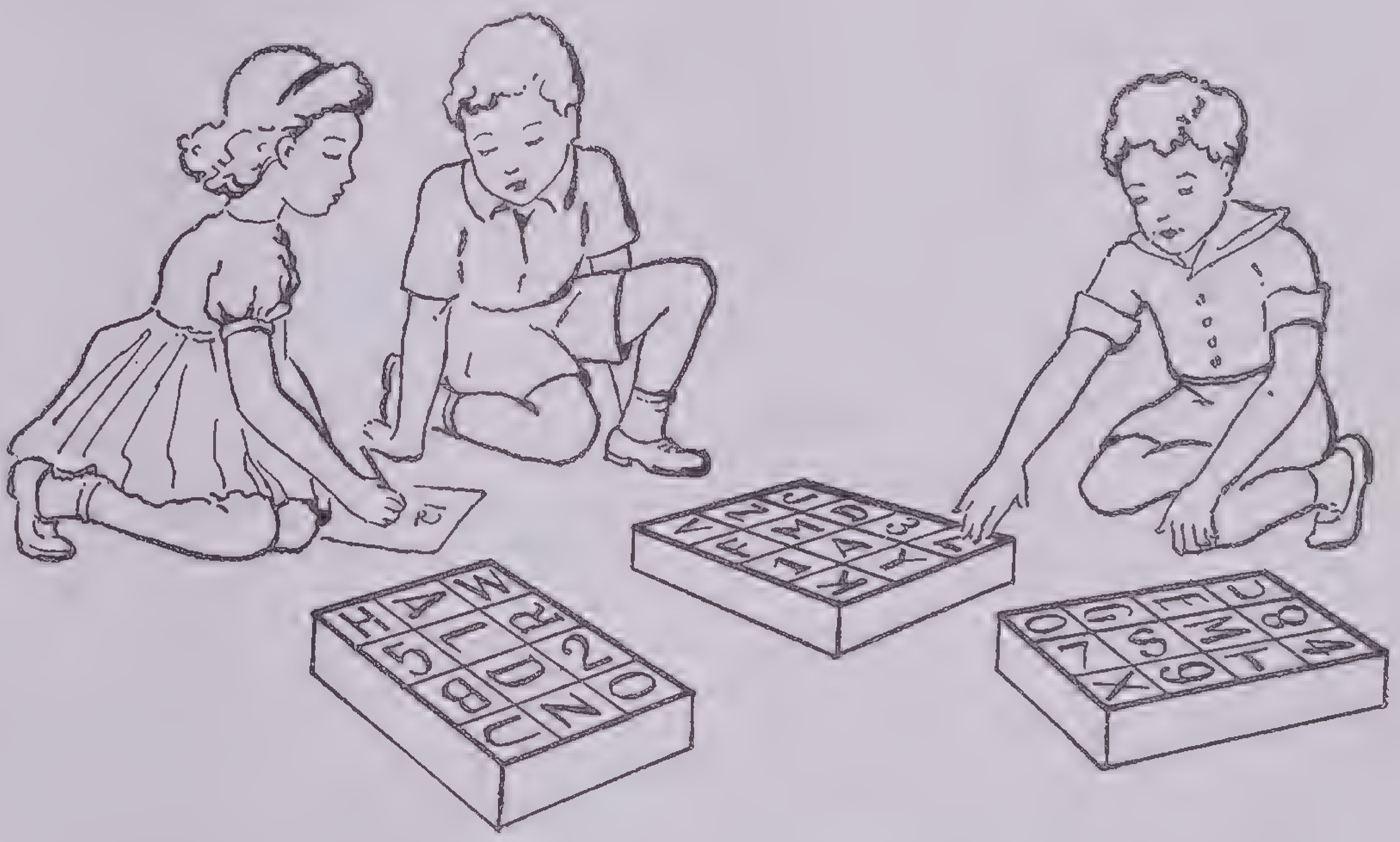
$$\begin{array}{lcl} 4 + 1 = 5 & \qquad & 0 + 8 = 8 \\ 4 - 1 = 3 & & 8 - 0 = 8 \end{array}$$

But $\qquad$ *But*

$$\mathbf{4 \times 0 = 0} \qquad \mathbf{0 \times 8 = 0}$$

Multiplying Large Numbers

One day Colleen and Billy were helping their little cousin, Charles, build things with his blocks as shown in the picture.



"How many blocks has Charles?" asked Billy.

"Each box has 12 blocks in it," said Colleen.

"I'll add 12 and 12 and 12."

Add

$$\begin{array}{lr} \text{A} & 12 \\ & 12 \\ & 12 \\ \cline{2-2} & 36 \end{array}$$

Example A shows the numbers Colleen wrote. What is the sum?

"Charles has 36 blocks," Colleen said. "And I can show you an easier way to get the answer."

Multiply

$$\begin{array}{lr} \text{B} & 12 \\ & \times 3 \\ \cline{2-2} & 36 \end{array}$$

She wrote Example B and multiplied 12 by 3.

"3×2 is 6," she said, and wrote 6.

"3×1 is 3," she said, and wrote 3.

Was the answer the same both times?

In Example C 24 is multiplied by 2.

$$\begin{array}{lr} \text{C} & 24 \\ & \times 2 \\ \cline{2-2} & 48 \end{array}$$

To get the 8, think: "2 times 4 is 8."

To get the 4, think: "2 times 2 is 4."

What is the answer for Example C?

Example D shows how to multiply 54 by 2.

$$\begin{array}{lr} \text{D} & 54 \\ & \times 2 \\ \cline{2-2} & 108 \end{array}$$

How do we get the 8 in the answer?

How do we get the 10?

The answer for Example D is ______.

Find the answer for Example E.

$$\begin{array}{lr} \text{E} & 82 \\ & \times 3 \\ \cline{2-2} & \end{array}$$

3 times 2 is ______. Write ______.

3 times 8 is ______. Write ______.

What is the answer?

Multiply in the examples below:

$$\begin{array}{ccccccc} 93 & 74 & 32 & 52 & 81 & 53 & 41 \\ \underline{2} & \underline{2} & \underline{4} & \underline{3} & \underline{3} & \underline{2} & \underline{3} \end{array}$$

Copy the examples in Rows A and B. Then find the answers.

$$\begin{array}{lrrrrrr} \text{Row A.} & 30 & 60 & 101 & 100 & 340 & 30 \\ & \underline{\times 2} & \underline{\times 3} & \underline{\times 4} & \underline{\times 8} & \underline{\times 2} & \underline{\times 5} \end{array}$$

$$\begin{array}{lrrrrrr} \text{Row B.} & 103 & 102 & 424 & 309 & 101 & 310 \\ & \underline{\times 3} & \underline{\times 4} & \underline{\times 2} & \underline{\times 1} & \underline{\times 6} & \underline{\times 2} \end{array}$$

Multiplication with Carrying

$$\begin{array}{lr} \text{A} & 23 \\ & \times 4 \\ \cline{2-2} & 92 \end{array}$$

Look at Example A.

First think: "$4 \times 3 = 12$."

The 2 is written in the answer.

Carry the one to the next column.

Next multiply the 2 in 23 by 4.

Think: "$4 \times 2 = 8$."

Now add the one you carried. Think: "$8 + 1 = 9$."

In Example B first think: "$3 \times 7 = 21$."

$$\begin{array}{lr} \text{B} & 17 \\ & \times 3 \\ \cline{2-2} & 51 \end{array}$$

What figure is written in the answer?
What figure do you carry?
Now think: 3 × 1 = 3.
Add the 2 that you carried.
What figure is written in the answer?

What figure is carried in each example below? Make sure you understand how each answer is gotten.

$$\begin{array}{rrrrr} 19 & 79 & 49 & 28 & 38 \\ \times 7 & \times 6 & \times 3 & \times 7 & \times 7 \\ \hline 133 & 474 & 147 & 196 & 266 \end{array}$$

Copy the problems below and multiply:

$$\begin{array}{rrrrrrr} 14 & 78 & 24 & 29 & 33 & 15 & 22 \\ \times 7 & \times 2 & \times 6 & \times 3 & \times 7 & \times 5 & \times 9 \\ \hline \end{array}$$

Checking Multiplication

When you multiply, you can check your work by multiplying again. If you do not get the same answer both times you have made a mistake.

Multiply in each example. Check your work by multiplying again.

$$\begin{array}{rrrrrrr} 32 & 17 & 95 & 25 & 13 & 74 & 32 \\ \times 5 & \times 4 & \times 2 & \times 3 & \times 6 & \times 4 & \times 9 \\ \hline \end{array}$$

Look at Example A.

$$\begin{array}{lr} \text{A} & 142 \\ & \times 3 \\ \hline & 426 \end{array}$$

Do we have a figure to carry to tens' column?
What do we carry to hundreds column?
How do we get the 4 in the answer?

Find the answer for each example:

$$\begin{array}{rrrrrr} 415 & 131 & 274 & 223 & 372 & 132 \\ \times 2 & \times 7 & \times 2 & \times 4 & \times 2 & \times 4 \\ \hline \end{array}$$

$$\begin{array}{lr} \text{B} & 102 \\ & \times 8 \\ \hline & 816 \end{array}$$

How do we get the 6 in Example B?
What do we carry to the tens' column?
Next we think: 8 × 0 = 0; 0 + 1 = 1.
Why do we add 1?
How do we get the 8 in the answer?

Multiply in each example below:

$$\begin{array}{rrrrrr} 121 & 104 & 100 & 130 & 307 & 103 \\ \times 6 & \times 8 & \times 6 & \times 7 & \times 2 & \times 5 \\ \hline \end{array}$$

Carrying Twice in Multiplication

Sometimes we have to carry more than once when we multiply.

Look at Example A.

$$\begin{array}{lr} \text{A} & 258 \\ & \times 3 \\ \hline & 774 \end{array}$$

What figure do we multiply first?
What figure do we carry?
What figure do we multiply next?
What figure do we carry?
How do we get 7 in the answer?

Watch out for the zero in Example B.

$$\begin{array}{lr} \text{B} & 135 \\ & \times 3 \\ \hline & 405 \end{array}$$

How do we get 5 in the answer?
How do we get the other figures in the answer?

Copy these examples and multiply:

$$\begin{array}{rrrrrr} 237 & 854 & 269 & 32 & 131 & 426 \\ \times 4 & \times 2 & \times 3 & \times 8 & \times 9 & \times 4 \\ \hline \end{array}$$

Look at Example A.

$$\begin{array}{lr} \text{A} & 23 \\ & 42 \\ \hline & 46 \\ & 92 \\ \hline & 966 \end{array}$$

By what figure do we multiply first?
How do we get the 92?
How do we know that the 2 in 92 should be written under the 4 in 46?
What do we do next to get 966 for the answer?
Study each of the examples below until you think you can multiply in each one.

$$\begin{array}{lr lr lr lr} \text{B} & 42 & \text{C} & 41 & \text{D} & 63 & \text{E} & 72 \\ & 24 & & 54 & & 12 & & 14 \\ \hline & 168 & & 164 & & 126 & & 288 \\ & 84 & & 205 & & 63 & & 72 \\ \hline & 1008 & & 2214 & & 756 & & 1008 \end{array}$$

Each of the examples below is partly worked. Where should the next figure be written in working each example?

Copy the examples and finish them.

$$\begin{array}{rrrrr} 53 & 82 & 71 & 22 & 72 \\ 12 & 32 & 45 & 23 & 23 \\ \hline 106 & 164 & 355 & 66 & 216 \end{array}$$

Now find the answers for the examples below.

$$\begin{array}{rrrrrrr} 21 & 72 & 53 & 34 & 40 & 31 & 92 \\ 48 & 24 & 12 & 21 & 72 & 29 & 12 \\ \hline \end{array}$$

Multiplying by Large Numbers with Carrying

In Example A first we multiply the 69 by 4.

$$\begin{array}{lr} \text{A} & 69 \\ & 34 \\ \hline & 276 \\ & 207 \\ \hline & 2346 \end{array}$$

4 × 9 = 36. Where do we write the 6?
What figure do we carry?
Does 4 × 69 = 276?
Next we multiply 69 by 3.
3 × 9 = 27. Where do we write the 7? What figure do we carry? How do we get the 20 in 207?
What do we do next to get 2,346?
Study these examples until you know how to do them.

$$\begin{array}{lr lr lr lr} \text{B} & 37 & \text{C} & 37 & \text{D} & 58 & \text{E} & 75 \\ & 18 & & 36 & & 34 & & 25 \\ \hline & 296 & & 222 & & 232 & & 375 \\ & 37 & & 111 & & 174 & & 150 \\ \hline & 666 & & 1332 & & 1972 & & 1875 \end{array}$$

Now copy the examples below and multiply.

$$\begin{array}{rrrrrrr} 54 & 38 & 44 & 68 & 97 & 68 & 29 \\ 43 & 35 & 63 & 25 & 23 & 44 & 36 \\ \hline \end{array}$$

Multiplying by Numbers Ending in Zero

Example A shows how to multiply 75 by 10.

$$\begin{array}{lr} \text{A} & 75 \\ & 10 \\ \hline & 00 \\ & 75 \\ \hline & 750 \end{array}$$

First we multiply 75 by 0.
0 × 5 = 0. 0 × 7 = 0.
We now multiply 75 by 1.
What must we do next to get the 750?
10 × 75 = 750. We can get this answer by just writing 0 after 75.
To multiply any number by 10, write 0 after the number.
Write the answers to these examples, without copying them.

10 × 39   10 × 74   10 × 68   10 × 93
10 × 62   10 × 91   10 × 55   10 × 38

Now study Examples B and C.

$$\begin{array}{lr lr} \text{B} & 42 & \text{C} & 42 \\ & 20 & & 20 \\ \hline & 00 & & 840 \\ & 84 & & \\ \hline & 840 & & \end{array}$$

Example B shows how to multiply 42 by 20.
Is the answer correct?
Example C shows a shorter way to multiply 42 by 20.
First write 0 under the 0 in 20.
Now multiply 42 by 2. 2 × 42 = 84
Write 84 at the left of the 0 in the answer.
Copy these examples and multiply the short way.

$$\begin{array}{rrrrrrr} 18 & 65 & 28 & 37 & 42 & 72 & 68 \\ 30 & 70 & 40 & 30 & 90 & 50 & 60 \\ \hline \end{array}$$

Zero in Multiplication

$$\boxed{\begin{array}{rrrr} \text{Bobby} & \text{Mary} & \text{George} & \text{Colleen} \\ 350 & 406 & 483 & 900 \\ 58 & 92 & 70 & 36 \\ \hline 2800 & 812 & 33810 & 5400 \\ 1750 & 3654 & & 2700 \\ \hline 20300 & 37352 & & 32400 \end{array}}$$

The box above shows four multiplication examples that Miss Jones had Bobby, Mary, George and Colleen work on the blackboard.

"The zeros in these examples are tricky," she said as they began to work. "We'll watch to see whether or not you make any mistakes."

None of the four children made mistakes.

How did George save work in his example?

Copy the four examples in the picture without the work and multiply. When you have finished compare your work with the picture. Correct any mistakes you make.

Now copy the examples below and multiply.

250	406	90	600	950
48	23	48	18	70
703	808	670	500	940
28	90	32	28	28

Multiplying Numbers with Four Figures

This example shows how to multiply 1932 by 36.

$$\begin{array}{r}1932\\ 36\\ \hline 11592\\ 5796\\ \hline 69552\end{array}$$

By what figure do we multiply first?
By what figure do we multiply next?
How do we know in which column to write the 6 in 5796?

Copy the examples below and multiply.

1440	1659	1089	1746	88	186
63	38	75	29	92	70

Multiplying by Three-Figure Numbers

Study the examples until you think you can work them.

$$\begin{array}{lr}\text{A} & 197\\ & 143\\ \hline & 591\\ & 788\\ & 197\\ \hline & 28171\end{array}\qquad\begin{array}{lr}\text{B} & 514\\ & 246\\ \hline & 3084\\ & 2056\\ & 1028\\ \hline & 126444\end{array}\qquad\begin{array}{lr}\text{C} & 257\\ & 185\\ \hline & 1285\\ & 2056\\ & 257\\ \hline & 47545\end{array}\qquad\begin{array}{lr}\text{D} & 306\\ & 293\\ \hline & 918\\ & 2754\\ & 612\\ \hline & 89658\end{array}$$

Now copy the examples below and multiply.

483	379	195	234	148
185	249	379	384	369

A GOOD WAY TO CHECK MULTIPLICATION

In Example A below, the number we multiply by is 38.

We call 38 the *Multiplier*. You know that 7 × 8 gives the same answer as 8 × 7. The answer is the same no matter which of the two numbers you use as multiplier. Does 38 × 47 give the same answer as 47 × 38? In Example A the multiplier is 38. To check the work multiply as in Example B.

$$\begin{array}{lr}\text{A} & 47\\ & 38\\ \hline & 376\\ & 141\\ \hline & 1786\end{array}\qquad\begin{array}{lr}\text{B} & 38\\ & 47\\ \hline & 266\\ & 152\\ \hline & 1786\end{array}$$

This time use 47 as the multiplier. If the two answers are different there is a mistake. Is 1786 the right answer?

Multiply and check in each example.

79	325	485	725	291
63	296	29	423	183

ZERO IN THE MULTIPLIER

Examples A and B below show two ways to multiply 247 by 340.

$$\begin{array}{lr}\text{A} & 247\\ & 340\\ \hline & 000\\ & 988\\ & 741\\ \hline & 83980\end{array}\qquad\begin{array}{lr}\text{B} & 247\\ & 340\\ \hline & 9880\\ & 741\\ \hline & 83980\end{array}$$

How do we get the row of three zeros under the multiplier in Example A?

In Example B we first write 0 under the 0 in the multiplier.

Then we multiply by 4.

4 × 247 = 988. We write 988 at the left of the zero, so that the 8 is in the same column as the 4 that we multiplied by.

We next multiply by 3.

3 × 247 = 741. The 1 in 741 is written in the same column as the 3 we multiplied by.

Which number is the multiplier in Example C?

$$\begin{array}{lr}\text{C} & 175\\ & 500\\ \hline & 87500\end{array}$$

We first write a zero under each zero in the multiplier.

Then we multiply by 5. 5 × 175 = 875.

The figure 5 in the 875 must be written in the same column as the figure 1 in 175.

Check Example C by using 175 for the multiplier.

Multiply in each example below. Check your work using the other number as the multiplier.

528	279	370	128	200	163
150	500	259	560	35	700

ZERO IN THE MIDDLE OF THE MULTIPLIER

In Example A we first multiply 227 by 5.

$$\begin{array}{lr}\text{A} & 227\\ & 305\\ \hline & 1135\\ & 6810\\ \hline & 69235\end{array}$$

Next we multiply by 0. We write 0 under the 3 in 1135. Are the zeros in the same column?

Next we multiply by 3. We write 681 at the left of the 0, so that the 1 would be in the same column as the 3 in 305.

Be careful of the zeros as you multiply in the examples below.

109	358	475	509	209	279
700	107	170	83	270	200

Test in Multiplication

If you can work each of the following examples correctly, you will be able to use multiplication in all practical problems in business. Do not use the answers until all the work is done.

Examples

A.	68	$.75	7824
	5	7	9
B.	89	$6.15	793
	95	83	19
C.	686	$30.86	9283
	329	217	724
D.	321	$683	98107
	90	70	400
E.	923	$72.25	45769
	180	307	904

Answers

A.	340	$5.25	70416
B.	8455	$510.45	15067
C.	225694	$6696.62	6720892
D.	28890	$47810	39242800
E.	166140	$22180.75	41375176

Essentials of Division of Whole Numbers

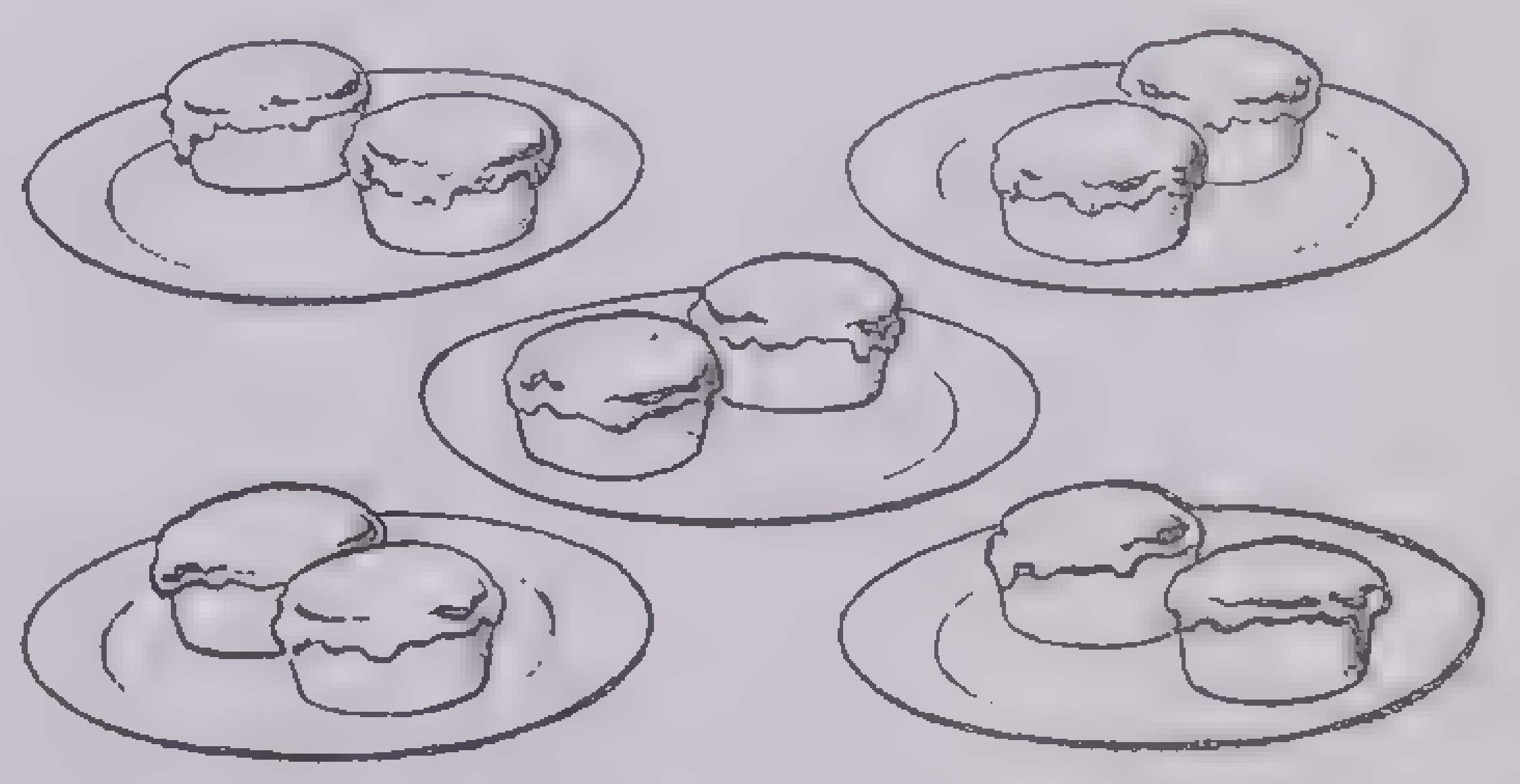
Considerable space is given to division because it is so important and because it is the most complicated process to learn. Long division unless carefully taught becomes a scourge to many children and turns what ought to be bright and happy school exercises into dull and unhappy experiences in failure.

There is no royal road to learning division. When parents notice that their children are beginning to fear and fail division, patient review and study rather than scolding or teasing are clearly called for.

The treatment of division that follows may be used as a dependable guide to learning for both the adult who wishes to improve himself and for the child who wishes to be strengthened by success rather than weakened by failure in this important topic of mathematics. In learning division do not skip a single paragraph or any of the drill.

Dividing by Two

Mother baked 10 little cakes for Mary to give to her friends on Valentine Day. Mary put the 10 cakes on paper plates. She put 2 cakes on each plate. How many plates did Mary use for the cakes?



To answer this question we must think: "How many twos are in 10?"

$$\begin{array}{r}5\\ 2\overline{)10}\end{array}$$

The example shows how many twos there are in 10.

The answer for the example is 5. It is written above the 0.

Read the example this way: "2 into 10 is 5."

If 10 is divided into groups of 2, there are 5 such groups.

Look at Example A. Read it in this way: "2 into 14 is 7."

Read the other examples, B–H.

$$\begin{array}{cccc} A & B & C & D \\ 7 & 6 & 5 & 4 \\ 2\overline{)14} & 2\overline{)12} & 2\overline{)10} & 2\overline{)8} \\ E & F & G & H \\ 3 & 2 & 9 & 8 \\ 2\overline{)6} & 2\overline{)4} & 2\overline{)18} & 2\overline{)16} \end{array}$$

7 times 2 is 14; so there are 7 twos in 14.

9 times 2 is 18; so there are 9 twos in 18.

8 times 2 is 16; so there are 8 twos in 16.

Each row below shows three ways to write the same thing. Give the answer to each example.

——— × 2 = 10. How many twos in 10? $2\overline{)10}$

——— × 6 = 12 How many twos in 12? $2\overline{)12}$

——— × 7 = 14 How many twos in 16? $2\overline{)16}$

Read the examples below.

$$\begin{array}{ccccccc} 2 & 2 & 2 & 2 & 2 & 2 & 2 \\ 4\overline{)8} & 7\overline{)14} & 5\overline{)10} & 6\overline{)12} & 9\overline{)18} & 3\overline{)6} & 8\overline{)16} \end{array}$$

What number times 4 is 8? How many fours in 8?

Now give the answers to these examples.

— × 4 = 8 How many fours in 8? $4\overline{)8}$

— × 6 = 12 How many sixes in 12? $6\overline{)12}$

— × 9 = 18 How many nines in 18? $9\overline{)18}$

Read the examples and give the answer.

$2\overline{)12}$ $2\overline{)18}$ $2\overline{)14}$ $9\overline{)18}$ $5\overline{)10}$ $8\overline{)16}$

DIVIDING THINGS INTO EQUAL GROUPS

Mother gave Mary and Charles 12 pieces of candy. "You may divide the candy equally between you," she said.

To divide 12 into two equal groups we think, "12 divided by 2 is what?" 12 divided by 2 is the same as 2 into 12. The answer is 6.

12 pieces of candy divided into 2 equal groups mean 6 pieces in each of the 2 groups.

Give the answers to the examples below.

A

2 × — = 12
2 × — = 18
8 × — = 16.
3 × — = 6

B C

$2\overline{)12}$ 12 divided by 2 is —.

$2\overline{)18}$ 18 divided by 2 is —.

$8\overline{)16}$ 16 divided by 8 is —.

$3\overline{)6}$ 6 divided by 3 is —.

A NEW SIGN

This sign (÷) tells us to divide.
It is called the division sign.

Example A (14 ÷ 2 = 7) shows a short way to write: 14 divided by 2 is 7.

Read it: "14 divided by 2 is 7."

Give the answers:

1. 2 into 8 is ———.
2. $6\overline{)12}$
3. 2 ÷ 2 =
4. 14 divided by 7 is ———.
5. 8 ÷ 4 =
6. 3 into 6 is ———.
7. 18 ÷ 2 =
8. 2 into 12 is ———.

DIVIDING BY THREE

A

$$\begin{array}{cccc} 7 & 8 & 6 & 9 \\ 3\overline{)21} & 3\overline{)24} & 3\overline{)18} & 3\overline{)27} \\ 4 & 3 & 1 & 5 \\ 3\overline{)12} & 3\overline{)9} & 3\overline{)3} & 3\overline{)15} \end{array}$$

Give the answers to the examples below.

B

— × 3 = 27
3 × — = 24
3 × — = 18
3 × — = 9

C	D
How many threes in 27?	$3\overline{)27}$
How many threes in 24?	$3\overline{)24}$
How many threes in 18?	$3\overline{)18}$
How many threes in 9?	$3\overline{)9}$

DIVIDING NUMBERS EVENLY

When we divide 18 by 2, the answer is 9. There is nothing left over. We say, "18 is divided *evenly* by 2."

1. Which of the numbers below can you divide evenly by 2.

5 6 4 9 7 14

10 11 8 10 12 19

2. The next number smaller than 9 that you can divide evenly by 2 is 8. Look at each number below. What is the next smaller number that you can divide evenly by 2?

9 11 17 3 5 19 15

3. Which of the numbers below can you divide evenly by 3?

5 12 9 14 20 22

14 16 18 3 21 17

4. The next number smaller than 20 that you can divide evenly by 3 is 18. The next number smaller than 10 that you can divide evenly by 3 is 9.

Look at each number in the row below. What is the next smaller number that you can divide evenly by 3?

16 10 5 14 20 17 7 11

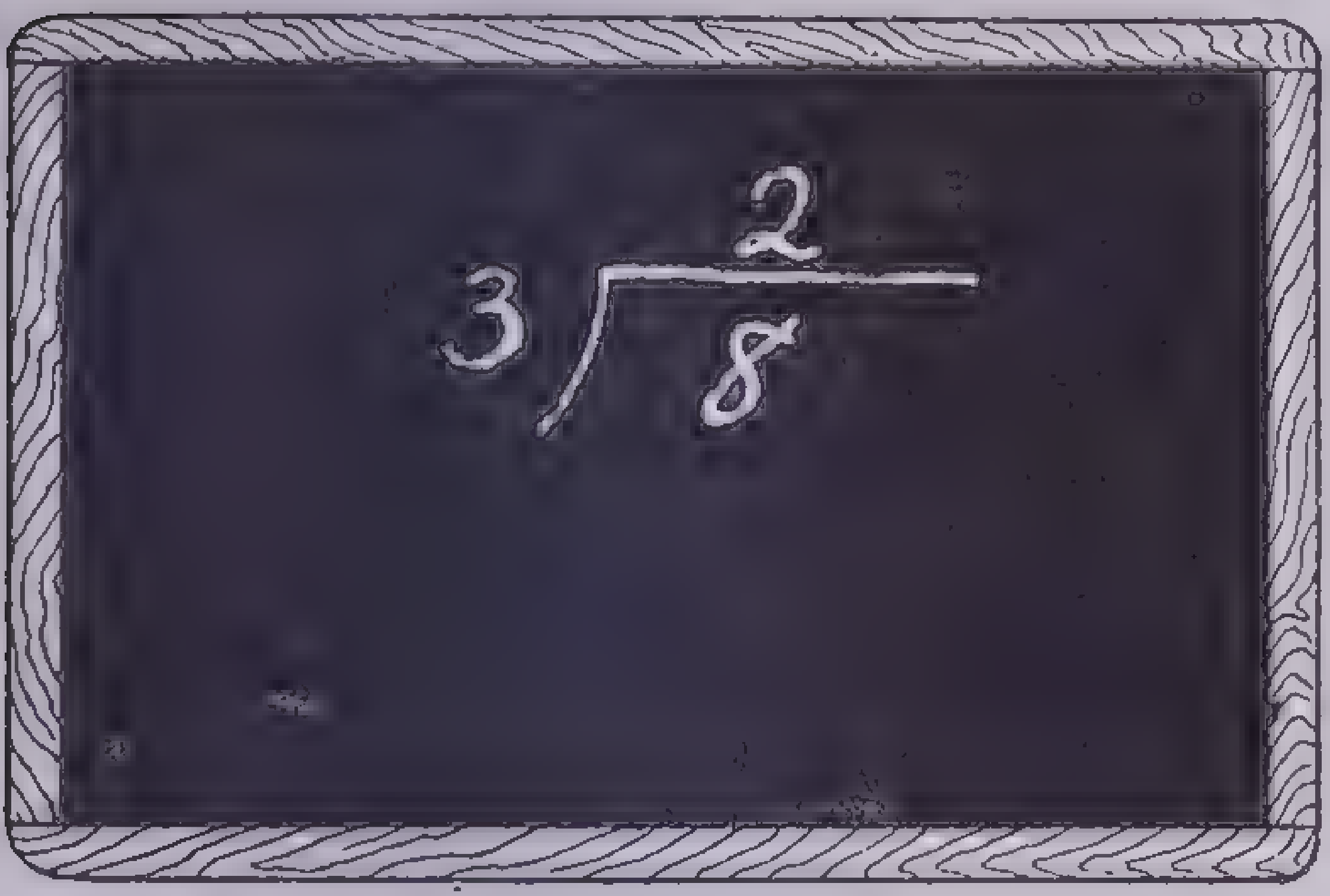
The Ninety Basic Division Facts

Learn the facts given below. Learn a group at a time. Make up review drills so as not to forget learned facts when you are learning new ones.

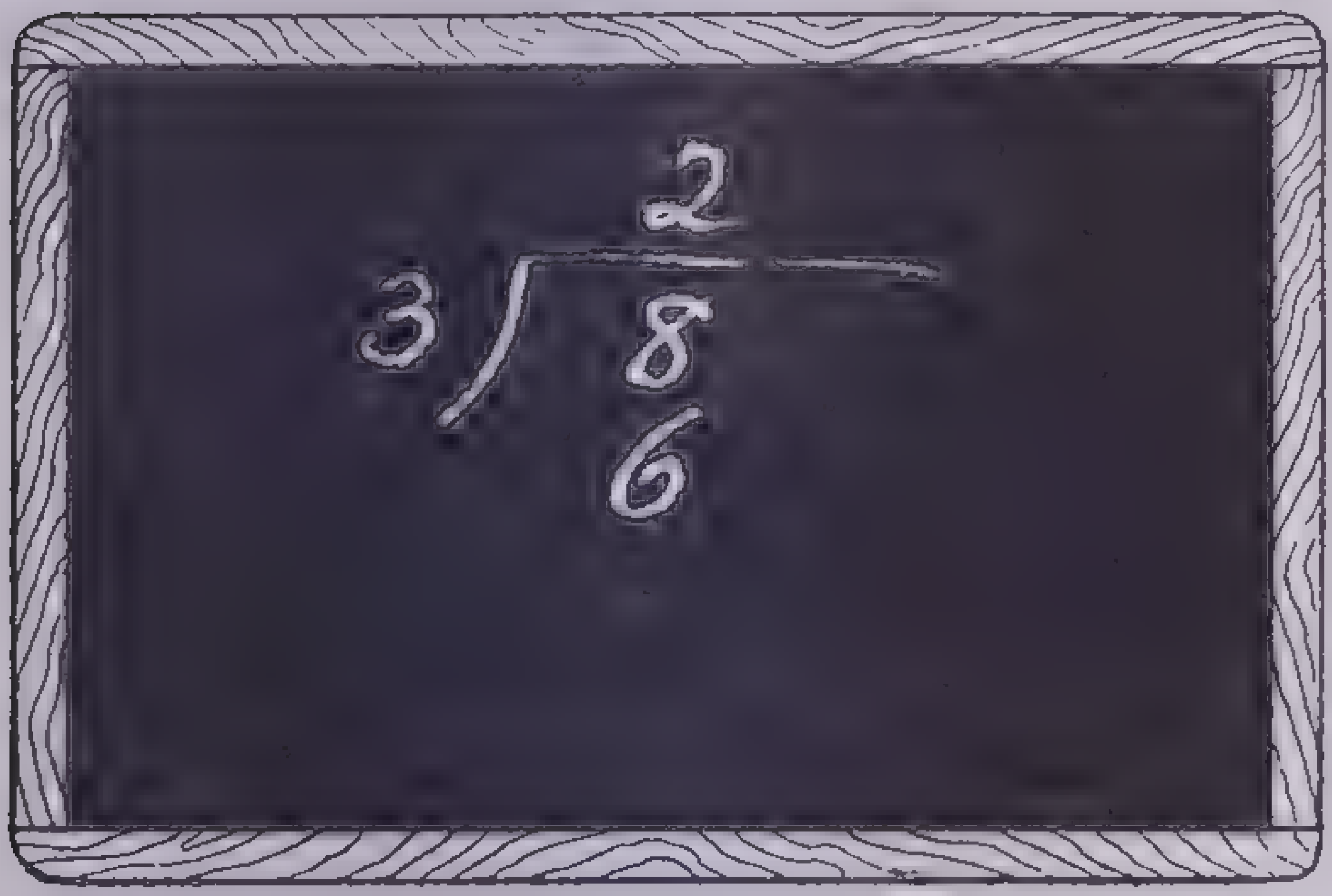
2	4	6	0	9
$1\overline{)2}$	$4\overline{)16}$	$3\overline{)18}$	$2\overline{)0}$	$1\overline{)9}$
1	5	4	9	7
$5\overline{)5}$	$4\overline{)20}$	$3\overline{)12}$	$2\overline{)18}$	$1\overline{)7}$
1	4	9	2	1
$3\overline{)3}$	$2\overline{)8}$	$3\overline{)27}$	$2\overline{)4}$	$1\overline{)1}$
3	3	5	4	4
$2\overline{)6}$	$1\overline{)3}$	$3\overline{)15}$	$5\overline{)20}$	$1\overline{)4}$
5	8	7	3	8
$1\overline{)5}$	$2\overline{)16}$	$3\overline{)21}$	$4\overline{)12}$	$5\overline{)40}$
2	9	0	2	1
$6\overline{)12}$	$9\overline{)81}$	$7\overline{)0}$	$8\overline{)16}$	$9\overline{)9}$
5	9	1	5	1
$6\overline{)30}$	$7\overline{)63}$	$8\overline{)8}$	$9\overline{)45}$	$6\overline{)6}$
1	0	4	9	8
$7\overline{)7}$	$8\overline{)0}$	$9\overline{)36}$	$6\overline{)54}$	$8\overline{)64}$
7	4	6	7	8
$9\overline{)63}$	$6\overline{)24}$	$8\overline{)48}$	$6\overline{)42}$	$9\overline{)72}$
0	2	0	1	5
$1\overline{)0}$	$5\overline{)10}$	$4\overline{)0}$	$2\overline{)2}$	$2\overline{)10}$
3	0	8	9	1
$5\overline{)15}$	$3\overline{)0}$	$4\overline{)32}$	$5\overline{)45}$	$4\overline{)4}$
7	2	0	7	3
$2\overline{)14}$	$3\overline{)6}$	$5\overline{)0}$	$4\overline{)28}$	$3\overline{)9}$
6	7	2	5	9
$2\overline{)12}$	$5\overline{)35}$	$4\overline{)8}$	$5\overline{)25}$	$4\overline{)36}$
8	6	6	6	8
$3\overline{)24}$	$1\overline{)6}$	$4\overline{)24}$	$5\overline{)30}$	$1\overline{)8}$
8	7	5	0	2
$6\overline{)48}$	$8\overline{)56}$	$7\overline{)35}$	$9\overline{)0}$	$7\overline{)14}$
4	7	2	9	0
$8\overline{)32}$	$7\overline{)49}$	$9\overline{)18}$	$8\overline{)72}$	$6\overline{)0}$
3	3	5	6	3
$6\overline{)18}$	$9\overline{)27}$	$8\overline{)40}$	$6\overline{)36}$	$7\overline{)21}$
6	3	4	6	8
$7\overline{)42}$	$8\overline{)24}$	$7\overline{)28}$	$9\overline{)54}$	$7\overline{)56}$

Division with Remainders

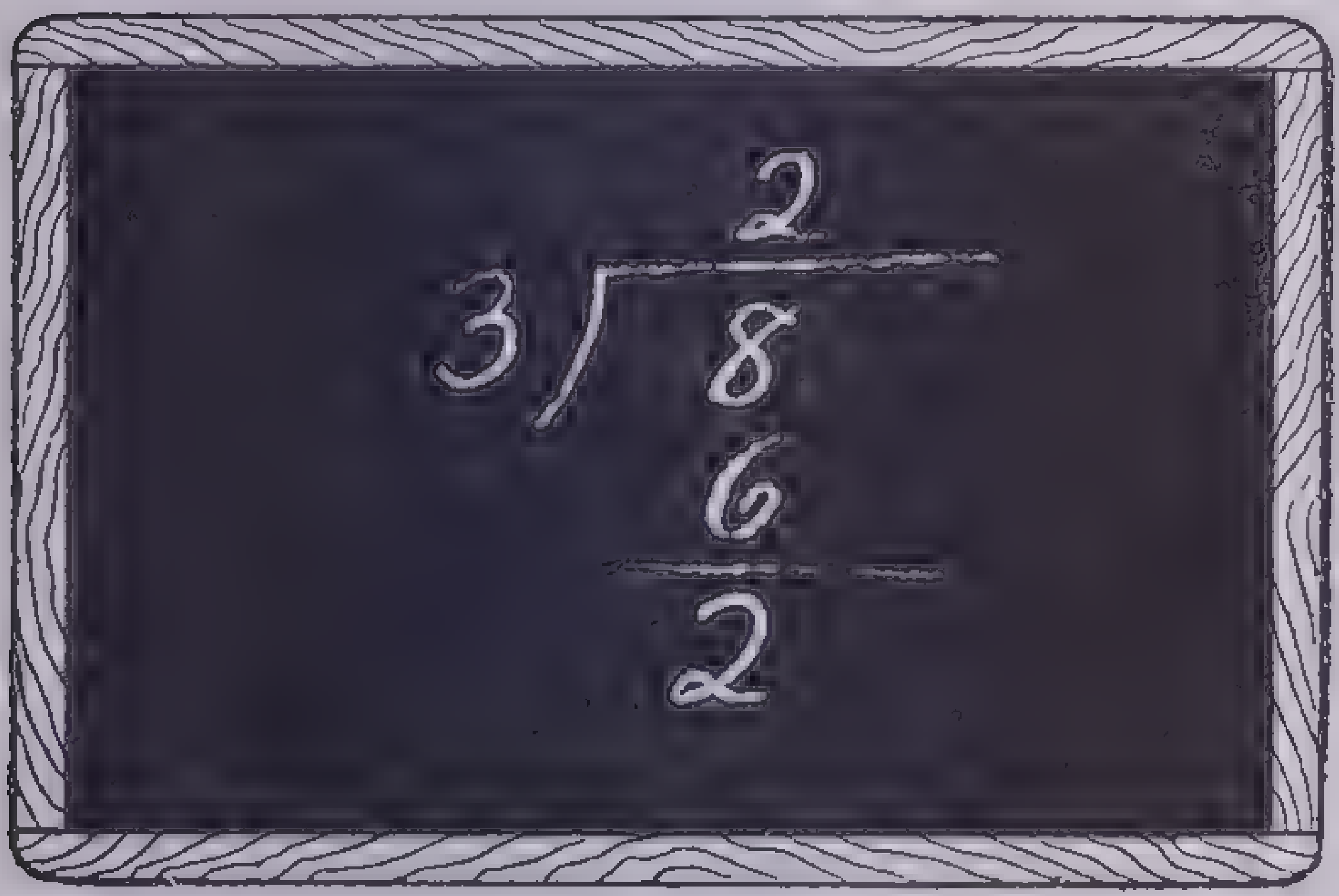
This picture shows how to divide 8 by 3.



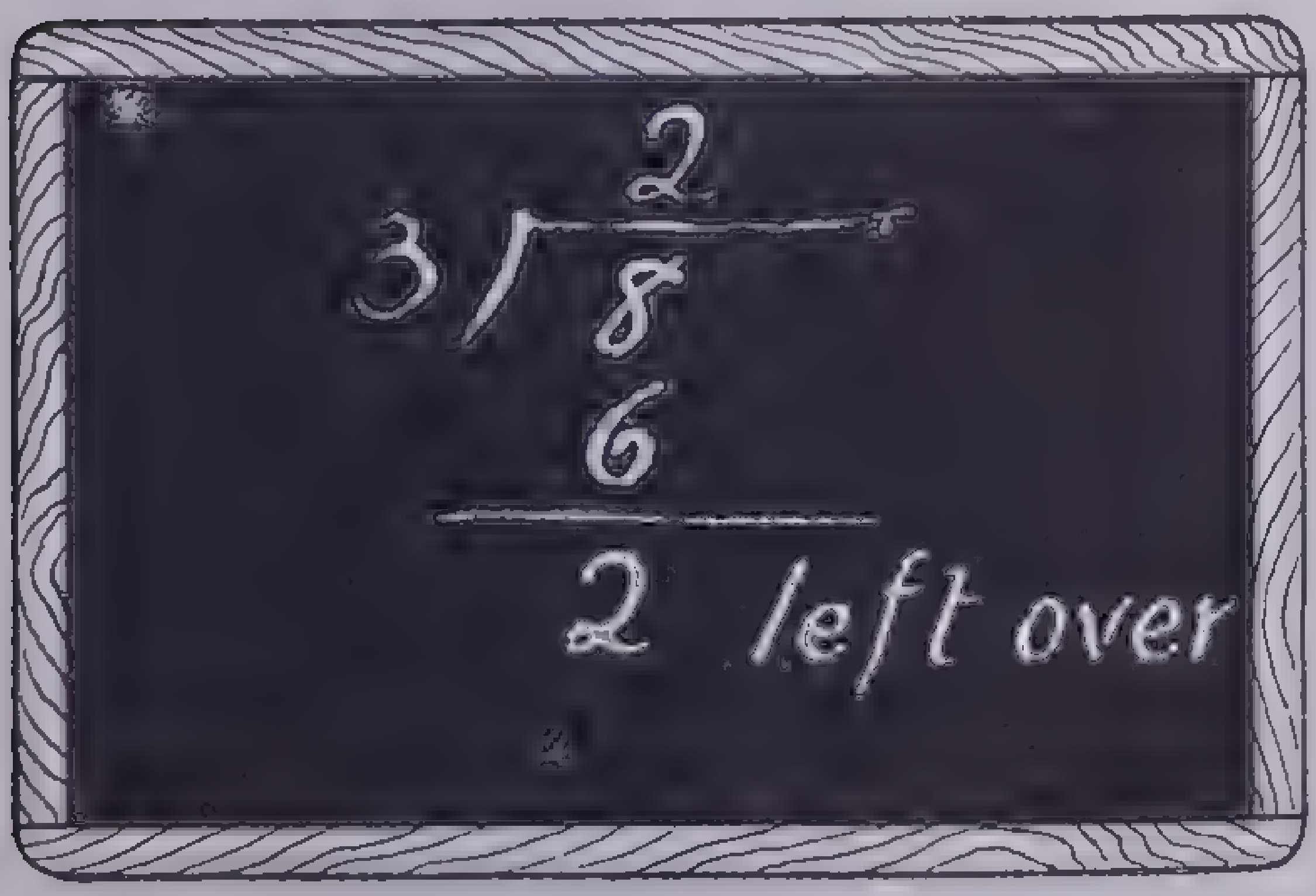
1. To Divide.—We cannot divide 8 evenly by 3. The next number smaller than 8 that we can divide evenly by 3 is 6. We think: "3 into 6 is 2." 2 is written above the 8.



2. To Multiply.—We think: "2 × 3 = 6." 6 is written under the 8.



3. To Subtract.—We think: "8 − 6 = 2." 2 is written under the 6.



4. 2 is smaller than 3. We cannot divide 2 by 3. So 2 is left over. 8 ÷ 3 = 2 and 2 left over.

When we see that the number left over is smaller than the number we divide by, we compare these two numbers.

Example A shows how to divide 17 by 2.

$$\text{A}\quad \begin{array}{r} 8 \\ 2\overline{)17} \\ \underline{16} \\ 1 \end{array}$$

To Divide.—The next number smaller than 17 that we can divide evenly by 2 is 16. 16 ÷ 2 = 8. We write 8 over the 7.

To Multiply.—Think: "8 × 2 = 16." We write 16 under 17.

To Subtract.—Think: "17 − 16 = 1." We write 1 under the 6.

To Compare.—Think: "Is the 1 that is left over smaller than the number we divided by?"

The number we have left over is called the *remainder.* The remainder should always be smaller than the number we divide by.

Read the answer to Example A this way: "7, and 1 remainder."

Now try Example B.

$$\text{B}\quad 3\overline{)20}$$

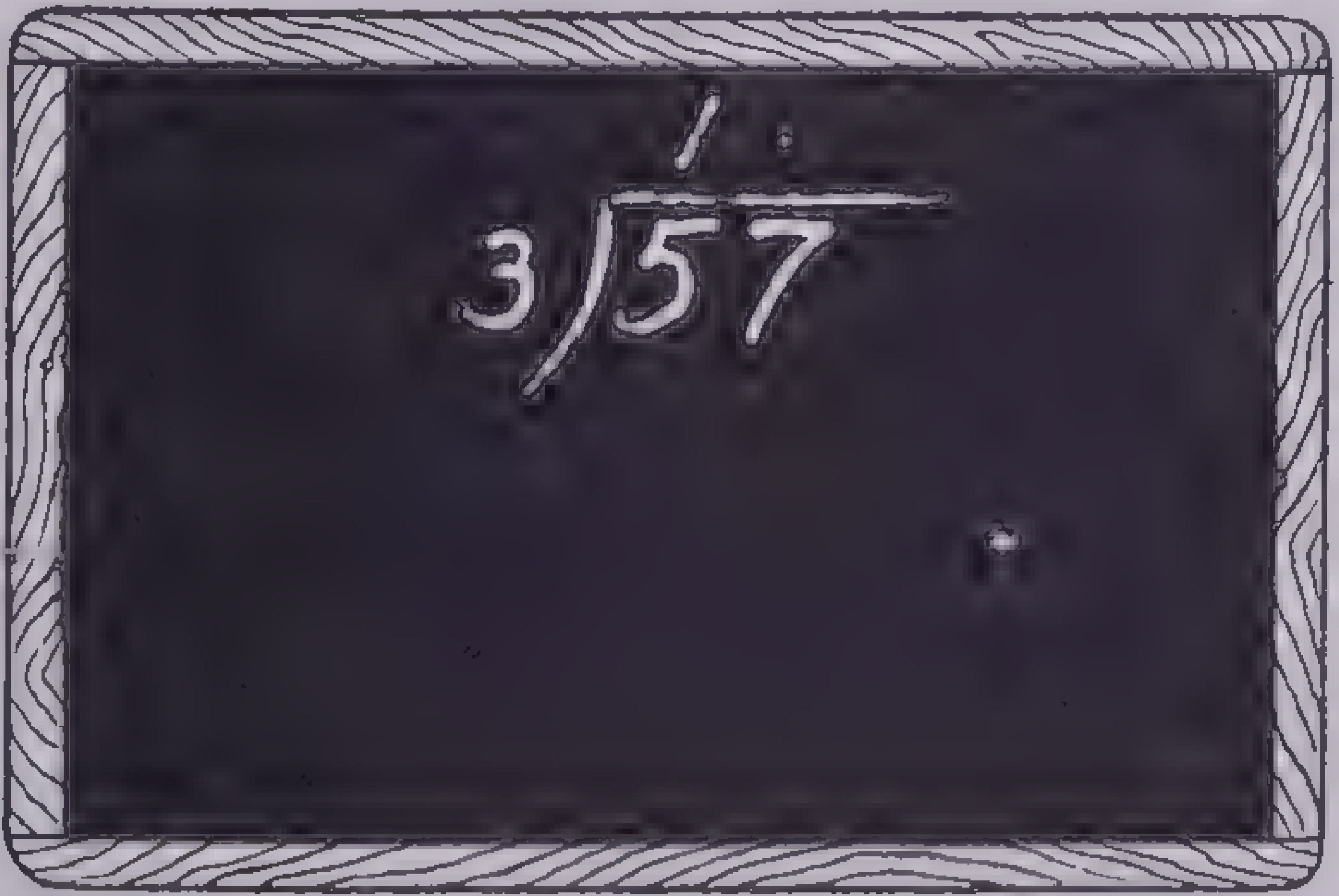
What is the next number smaller than 20 that we can divide evenly by 3?
What do we write above the 0?
What do we multiply?
What do we write under the 20?
When we subtract, what numbers do we get?
Is this number too small to be divided by 3?
What is the remainder?
The answer is ———, and ——— remainder.

Copy the examples below and divide. Each answer has a remainder.

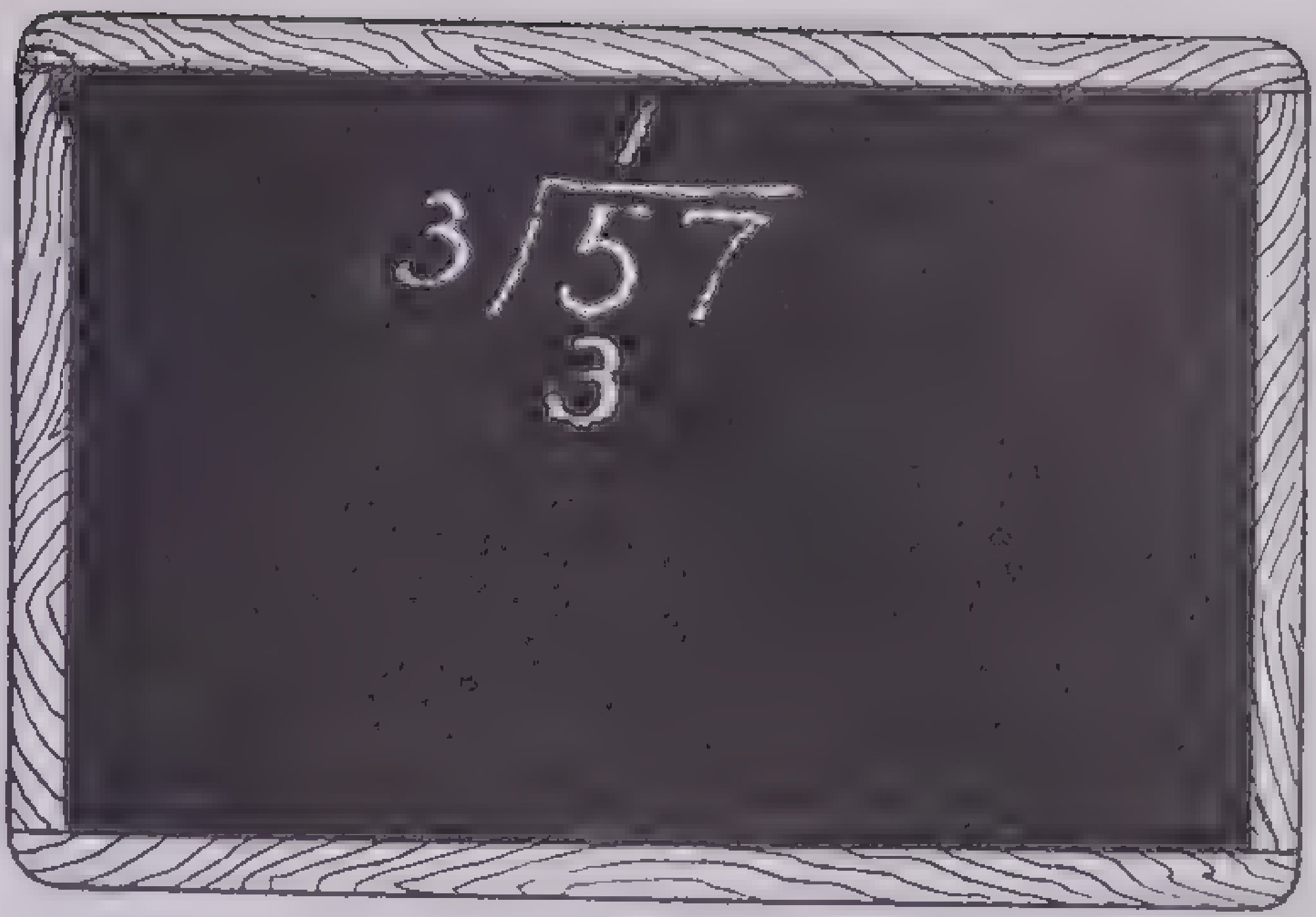
$3\overline{)16}$ $2\overline{)17}$ $3\overline{)17}$ $3\overline{)8}$
$2\overline{)15}$ $3\overline{)22}$ $3\overline{)19}$ $3\overline{)11}$
$2\overline{)5}$ $3\overline{)4}$ $3\overline{)29}$ $3\overline{)26}$
$3\overline{)7}$ $3\overline{)5}$ $2\overline{)21}$ $3\overline{)14}$
$3\overline{)25}$ $2\overline{)9}$ $2\overline{)11}$ $2\overline{)23}$
$3\overline{)20}$ $3\overline{)13}$ $3\overline{)28}$ $2\overline{)25}$
$3\overline{)10}$ $2\overline{)19}$ $2\overline{)7}$ $2\overline{)27}$
$3\overline{)23}$ $2\overline{)3}$ $2\overline{)13}$ $2\overline{)29}$

Dividing a Two-figure Number

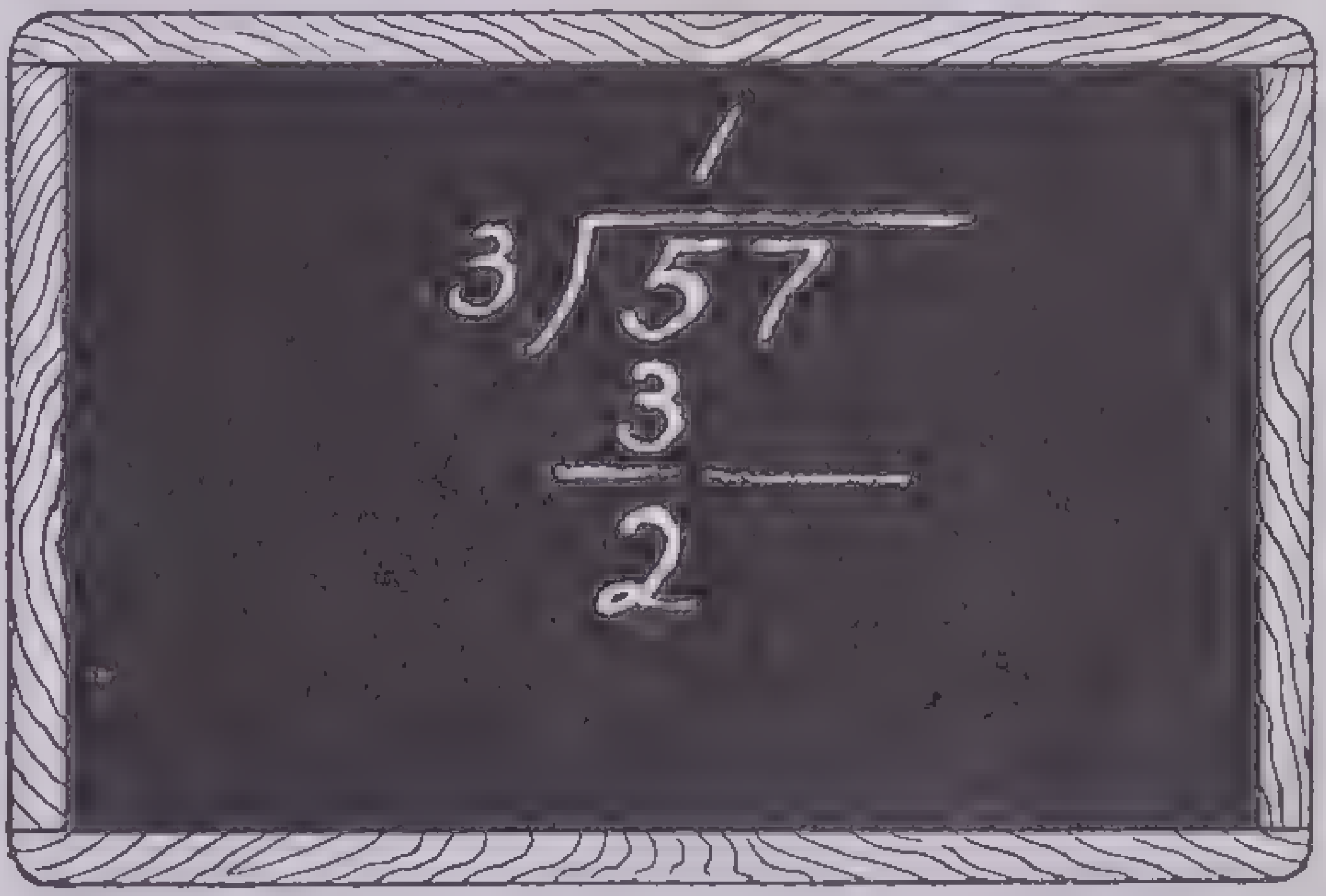
The slates show how to divide 57 by 3.
To divide 57 by 3, we first divide 5 by 3.



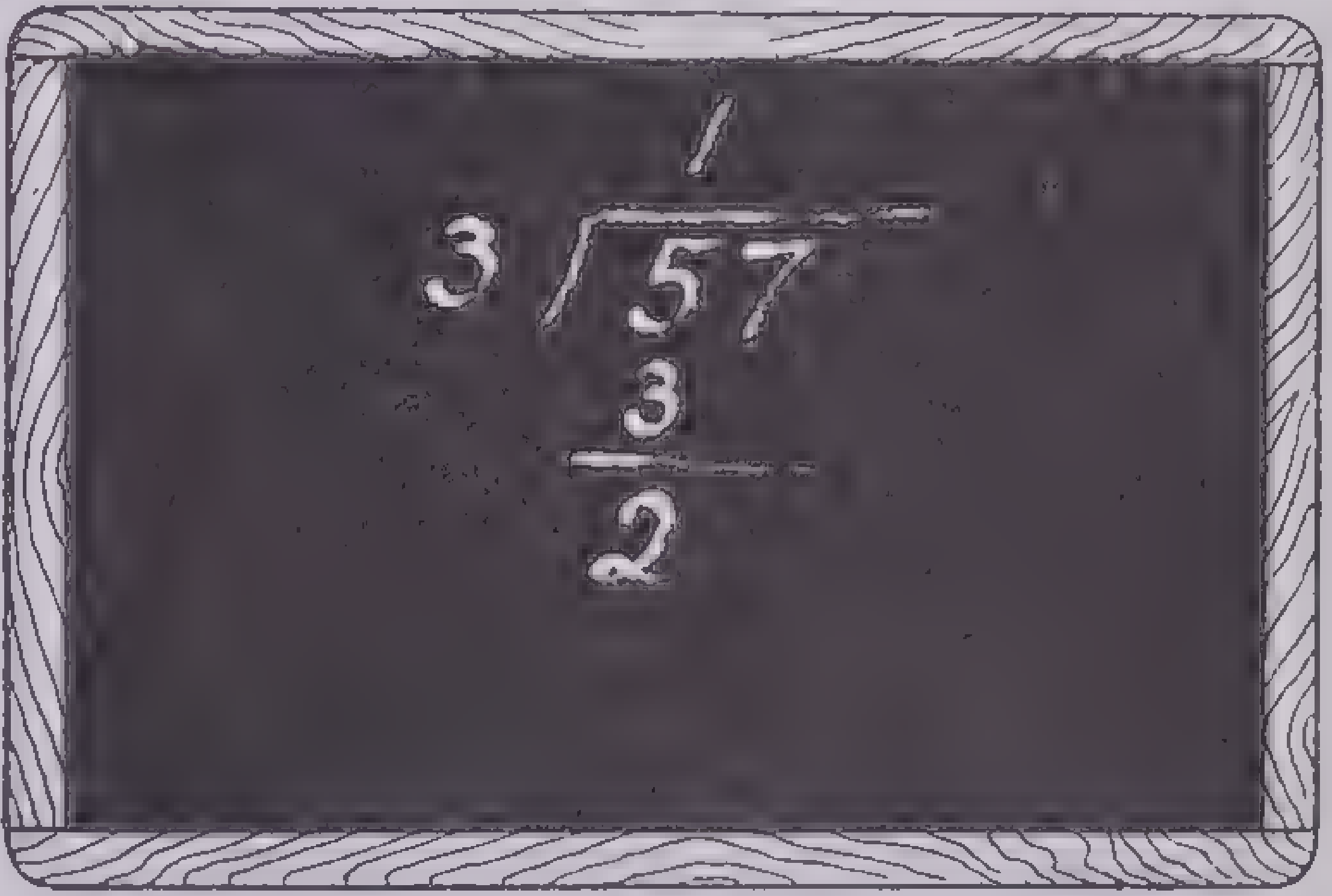
1. To Divide.—The next number smaller than 5 we can divide evenly by 3 is 3. 3 ÷ 3 = 1. 1 is written above 5.



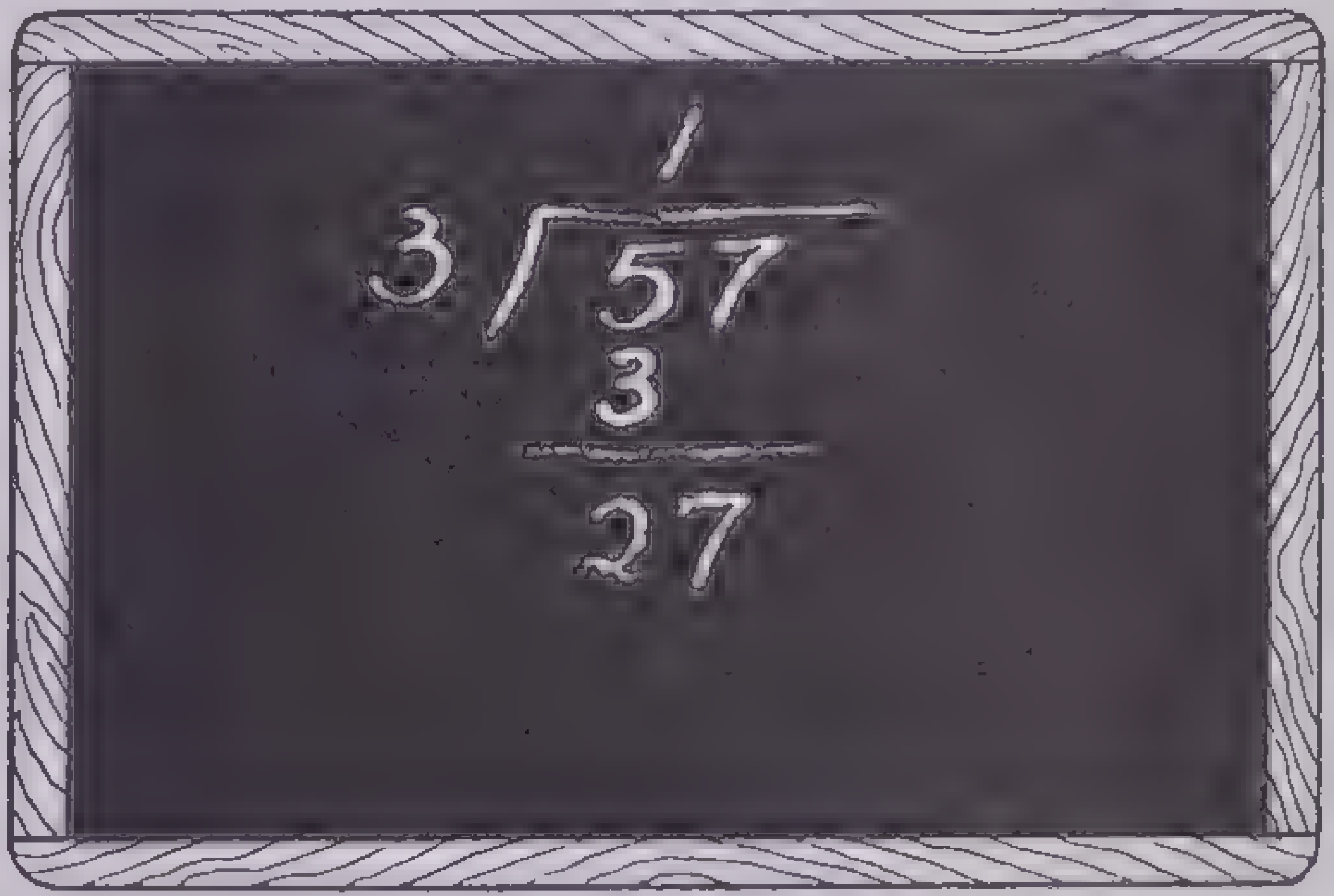
2. To Multiply.—We think: "1 × 3 = 3." 3 is written under 5.



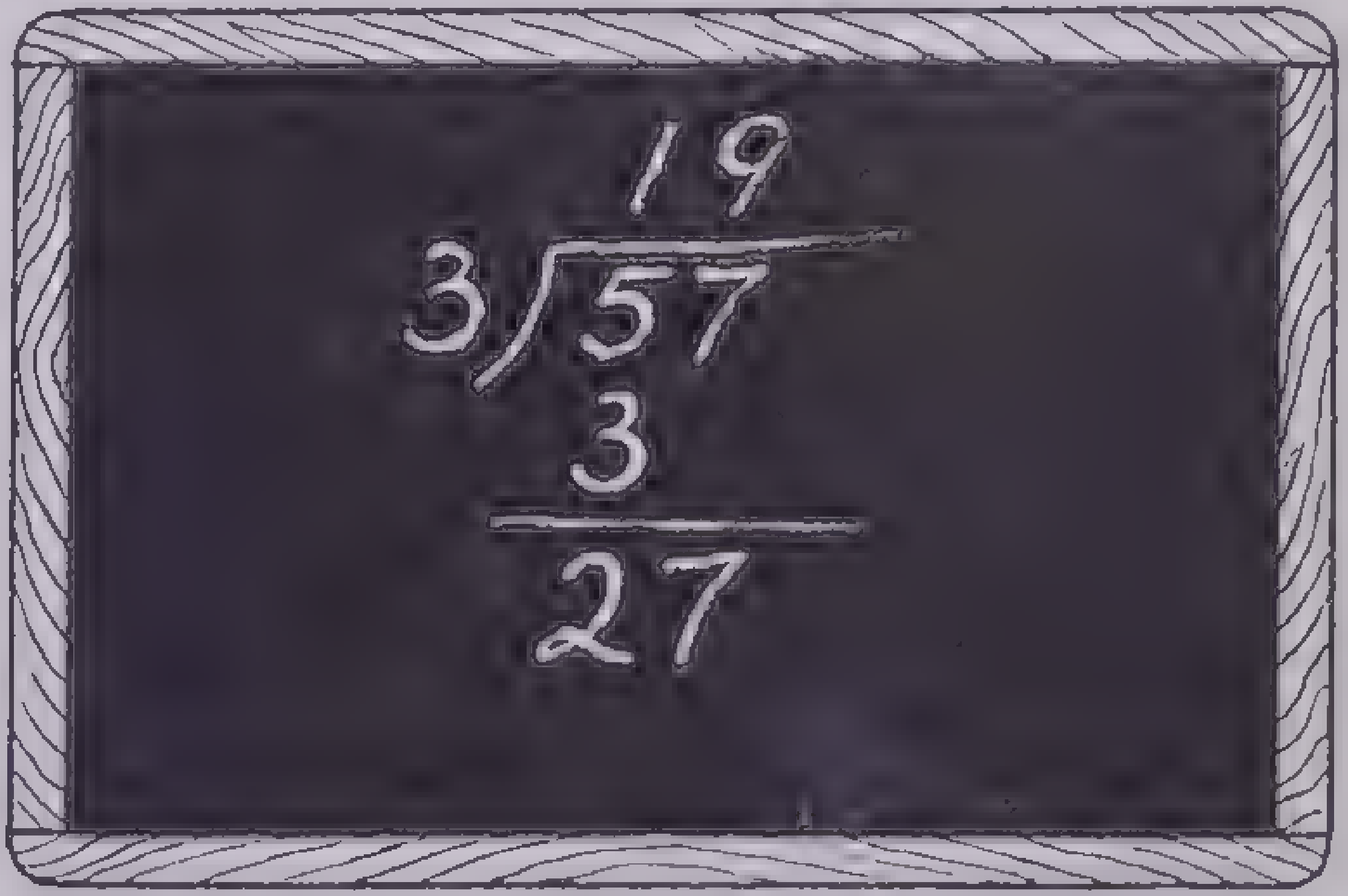
3. To Subtract.—We think: "5 − 3 = 2." 2 is written under 3.



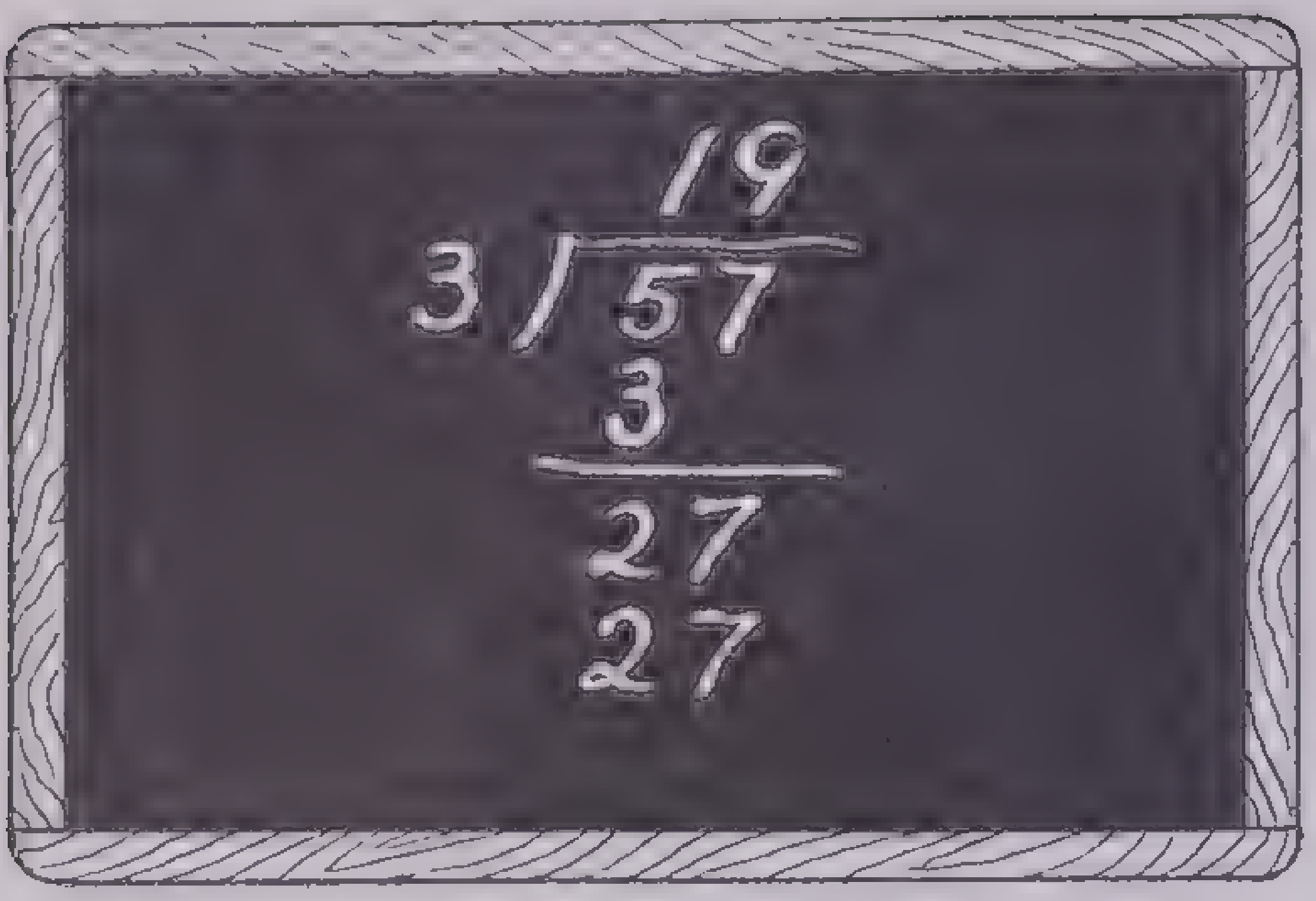
4. To Compare.—The figure under the 3 should be smaller than the number that we divide by. Is 2 smaller than 3?



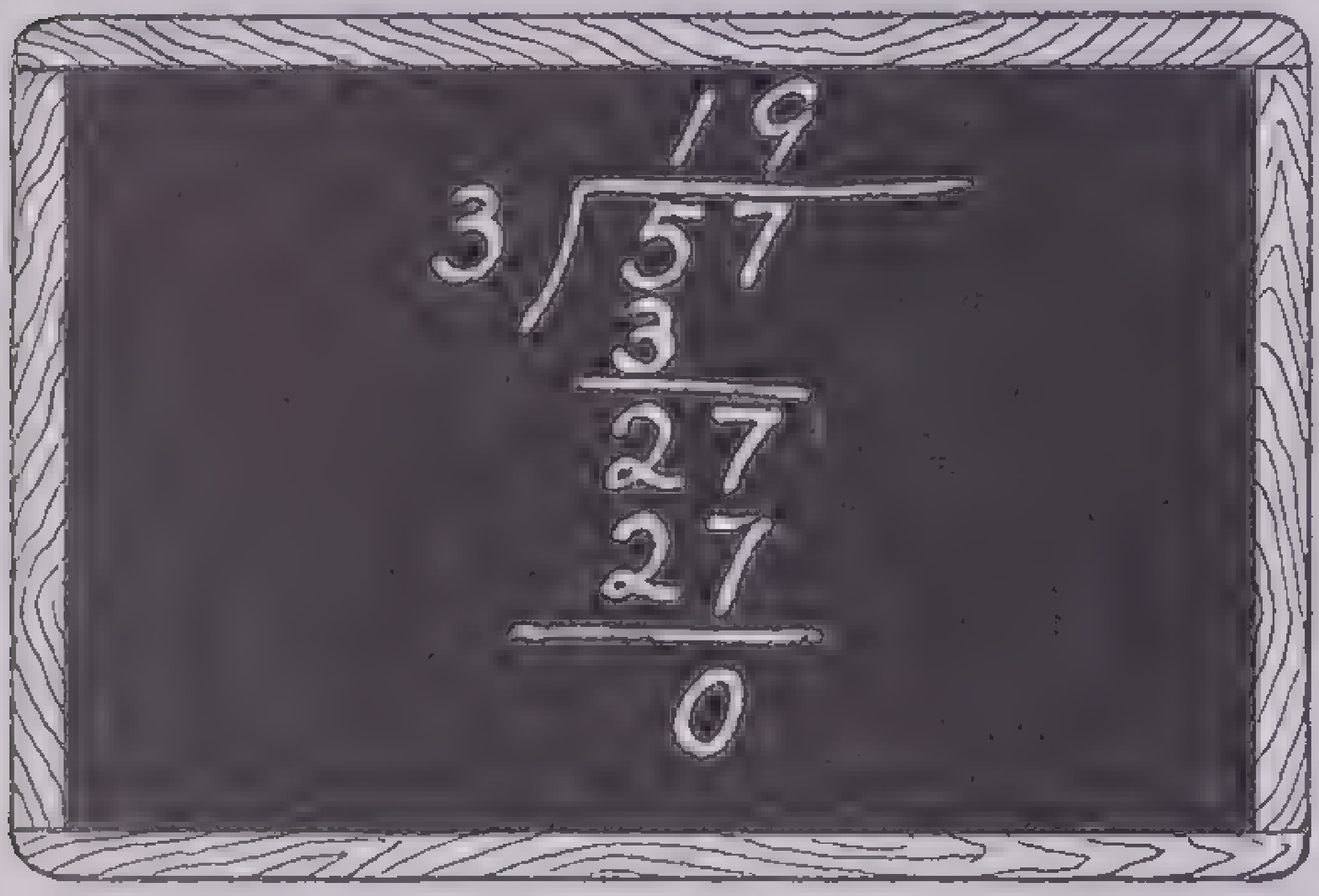
5. 7 is written after the 2. We say that we bring down the 7 from the 57.



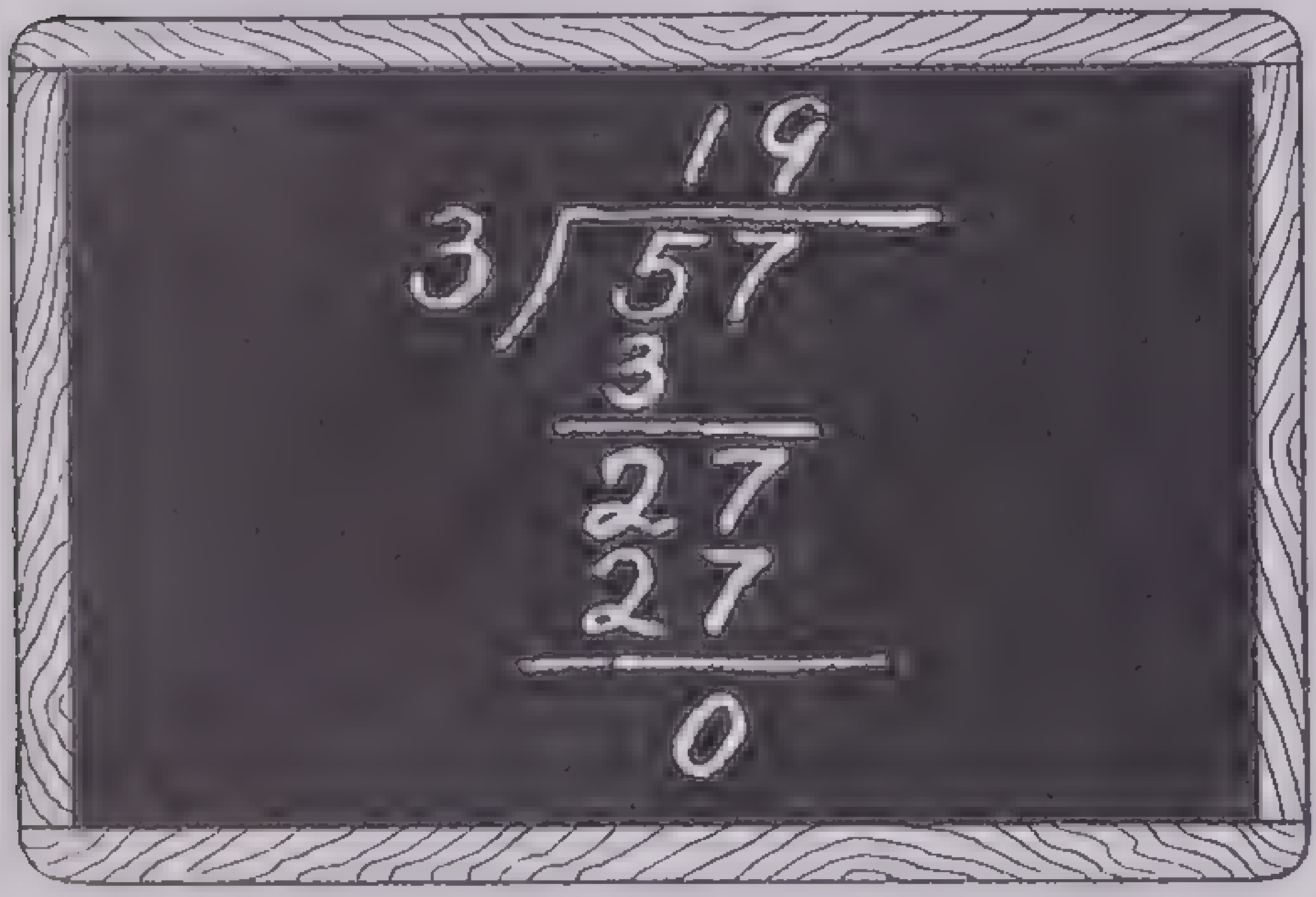
6. To Divide.—We can divide 27 evenly by 3. We think: "3 into 27 is 9." 9 is written above 7.



7. To Multiply.—We think: "9×3 = 27." 27 is written under 27.



8. To Subtract.—We think: "27 − 27 = 0." 0 is written under 27.



9. To Compare.—The number under 27 should be smaller than the number that we divide by. Is 0 smaller than 3?

10. To Bring Down.—There are no more figures to bring down; so the example is finished.

To work an example like 3)57, we do 5 things: **1.** Divide. **2.** Multiply. **3.** Subtract. **4.** Compare. **5.** Bring down. These are the 5 steps in division.

SOMETHING NEW IN DIVISION

A 82
3)246
24
6
6

Example A shows how to divide 246 by 3.

How do we get the 8 in the answer?

What do we get when we subtract 24 from 24? Do we write the 0?

Now we bring down the 6.

Now finish example A.

In 246 there are 82 groups with 3 in each group.

Copy the examples below and divide.

2)156 3)102 3)249 3)48 2)124 2)192

DIVIDING ZERO

When zero is divided by a number, the answer is always zero. 0 divided by 3 is zero. 0 ÷ 4 is 0.

Read these examples and give the answers:

4)0 7)0 3)0 9)0 2)0

CHECKING DIVISION

Mary and Charles wished to divide 86 marbles between them. Mary got a pencil and paper from her desk.

"I'll divide 86 by 2 to find out how many marbles each of us will get."

After she had divided, she said: "We'll each have 43 marbles."

"Are you sure?" asked Charles.

"Yes," answered Mary, "I checked my work."

Example A shows how Mary divided.

Example B shows how she checked her work by multiplying 43 × 2.

43
A 2)86 B 43
8 ×2
6 86
6

Look at the answer for Example B. Is it the same as the number she divided in Example A?

If it is not the same Mary made a mistake.

We multiply 60 by 3 to check Example C.

What is the answer when we multiply 60 by 3? Is it the same as the number we divided?

What is the correct answer for Example C?

C 60 *Check*
3)180 60
18 ×3
0 180
0

Divide the examples below. Check your work.

3)174 3)153 3)186 2)116 2)140 3)93

The next number smaller than 13 that you can divide evenly by 4 is 12. Look at each number below. What is the next smaller number that you can divide evenly by 4?

11 19 25 37 27 14 23

5 21 17 15 33 35 6

Look at Example A.

7
A 4)29
28
1

What is the next number smaller than 29 that we can divide evenly by 4?

How do we get 7 in the answer?

How do we get 28?

How do we get the 1?

Divide:

4)21 4)24 4)18 2)11 4)5 4)36

Dividing Large Numbers

In example A we divide 776 by 4.

A 194
4)776
4
37
36
16
16

How do we get the 1 in the answer?

How do we get each figure in the number 37?

How do we get each figure in the number 16 just under 36?

How many figures do we bring down?

Find the answers for:

3)1773 2)1640 3)234 4)300 2)1640

4)1276 2)364 4)928 2)512 4)948

DIVISION WITH REMAINDERS

Example A shows how to divide 219 by 4.

A 54
4)219
20
19
16
3

How do we get the 5 in the answer?

How do we get the 19 under 20?

How do we get 16?

The 3 is the remainder.

Divide:

2)171 8)169 3)191 4)1263 4)179 4)214

CHECKING DIVISIONS WITH REMAINDERS

Example A shows how to divide 214 by 4.

Example B shows how to check the work.

→ 53
A → 4)214 B → 53
20 → ×4
14 212
12 → +2
→ 2 214

To check Example A first we multiply the answer by 4.

4 × 53 = ———.

Then we add the remainder.

212 + 2 = ———.

If the work is right, this sum is the same as the number divided.

Is the answer for Example A correct?

Copy the examples below and divide. Check your work. If an answer is wrong, divide again.

2)94 3)199 4)111 4)339 2)605 3)278

Example A shows how to divide 327 by 3.

A
109
3)327
3
2
0
27
27

After we subtract 3 from 3 what figure do we bring down?

3 will not go into 2. So 0 is written in the answer. 0 times 3 is 0.

We write 0 under the 2.

Then we subtract 0 from 2 and bring down the 7.

How do we get the 9 in the answer?

Always put a zero in the answer in division if you cannot divide after you bring down a figure.

Copy these problems. Find the answers. Be careful with 0 in the answer.

$3\overline{)920}$ $6\overline{)5724}$ $2\overline{)1406}$ $4\overline{)3900}$ $7\overline{)420}$ $5\overline{)540}$

Example A shows how to divide 215 by 7.

$$\text{A}\quad\begin{array}{r} 30 \\ 7\overline{)215} \\ \underline{21} \\ 5 \\ \underline{0} \\ 5 \end{array}$$

How do we get 3 in the answer?

What figure do we bring down?

We write 0 in the answer because 7 will not go into ———.

How do we get the 0 under the 5?

The answer is ——— and ——— remainder.

Work the examples below. Be careful about answers that have zeros.

$4\overline{)242}$ $6\overline{)365}$ $7\overline{)216}$ $3\overline{)151}$ $2\overline{)351}$ $5\overline{)402}$

Example A shows how to divide 1201 by 6.

$$\text{A}\quad\begin{array}{r} 200 \\ 6\overline{)1201} \\ \underline{12} \\ 0 \\ \underline{0} \\ 1 \\ \underline{0} \\ 1 \end{array}$$

After we get the 2 in the answer and subtract 12 from 12, we bring down 0 from the 1201.

6 will not go into 0; so we write 0 in the answer.

The next figure that we bring down is the 1. Why do we write another 0 in the answer?

The answer is 200 and 1 remainder.

Now study Example B.

$$\text{B}\quad\begin{array}{r} 200 \\ 6\overline{)1201} \\ \underline{12} \\ 01 \end{array}$$

We bring down the 0 and write 0 in the answer.

Then we bring down the 1 and write it beside the 0.

We write another 0 in the answer because 6 will not go into 1.

Remember: Always write a figure in the answer for each figure you bring down.

Be careful about the zeros as you divide in each of these examples:

$6\overline{)5881}$ $4\overline{)2961}$ $8\overline{)6723}$ $4\overline{)3201}$ $9\overline{)4055}$

Carrying in Division

$$\text{A}\quad\begin{array}{r} 36 \\ 5\overline{)180} \end{array}$$

To divide 180 by 5, first think: "5 goes into 18 three times."

Write the 3. Think: "3 × 5 is 15; 18 − 15 is 3."

Now think: "5 into 30 is 6." Write 6 above the zero in 180. Think: "6 × 5 is 30; 30 − 30 is 0."

Is there a remainder? Check the work.

Explain how to get the answer for Example B without writing down the work.

$$\text{B}\quad\begin{array}{r} 64 \text{ and 3 remainder} \\ 6\overline{)387}\qquad\qquad\quad \end{array}$$

You must carry in the examples below. What does the last figure in each example become when you carry? In the first example 4 becomes 14.

$9\overline{)464}$ $9\overline{)472}$ $8\overline{)273}$ $6\overline{)142}$ $9\overline{)521}$

$8\overline{)331}$ $7\overline{)365}$ $6\overline{)433}$ $9\overline{)321}$ $7\overline{)274}$

Two Figure Divisors

Example A shows how to divide 2184 by 52.

$$\text{A}\quad\begin{array}{r} 42 \\ 52\overline{)2184} \\ \underline{208} \\ 104 \\ \underline{104} \end{array}$$

Will 52 go into 2? Will 52 go into 21? Will 52 go into 218?

Look at the 5 in 52, and the 21 in 218.

Think: "5 goes into 21 four times."

The 4 is written above the 8 in 218 to show that 52 goes into 218 four times.

How do we get the 208?

How do we get the 104?

We now divide 104 by 52.

Study the examples below until you think you can work them. Copy them without the work and divide.

$$\text{A}\ \begin{array}{r} 31 \\ 22\overline{)682} \\ \underline{66} \\ 22 \\ \underline{22} \end{array}\qquad \text{B}\ \begin{array}{r} 69 \\ 70\overline{)4830} \\ \underline{420} \\ 630 \\ \underline{630} \end{array}\qquad \text{C}\ \begin{array}{r} 14 \\ 62\overline{)868} \\ \underline{62} \\ 248 \\ \underline{248} \end{array}$$

Now divide in these examples:

$31\overline{)868}$ $24\overline{)312}$ $13\overline{)302}$ $62\overline{)868}$

$53\overline{)1696}$ $31\overline{)6882}$ $52\overline{)2236}$ $51\overline{)1275}$

Checking Division with Two Figures

Example A shows how to divide 4845 by 51.

Example B shows how to check the work.

$$\text{A}\ \begin{array}{r} \rightarrow 95 \\ \rightarrow 51\overline{)4845} \\ \underline{459} \\ 255 \\ 255 \end{array}\qquad\qquad \text{B}\ \begin{array}{r} \rightarrow 95 \\ \rightarrow \underline{51} \\ 95 \\ \underline{475} \\ 4845 \end{array}$$

When you divide by a number with two figures, you check your work just as you do when you divide a number with one figure. Is the answer in Example A correct?

Check the two figure division problems you just worked.

Two-Figure Divisors and Remainders

Example A shows how to divide 132 by 32.

$$\text{A}\quad\begin{array}{r} 4 \\ 32\overline{)132} \\ \underline{128} \\ 4 \end{array}$$

To find out how many times 32 will go into 132, use the 3 in 32 and the 13 in 132.

Think: "3 will go in 13 four times."

The 3 is written over the 2 in 132 to show that 32 goes into 132 four times.

How do we get the 128 that is under 132?

What do we do to get the 4?

Compare the 4 with the divisor? Is it smaller than the divisor? 4 is the remainder.

Divide in each of the examples below:

$70\overline{)524}$ $89\overline{)360}$ $63\overline{)757}$ $33\overline{)75}$ $20\overline{)98}$

The correct answer figure in division is often smaller than the figure we try first.

Look at Example A below. This shows how to divide 78 by 13.

$$\text{A}\quad \begin{array}{r} \textit{Trial 1} \\ 7 \\ 13\overline{)78} \\ \underline{91} \end{array}\qquad\qquad \begin{array}{r} \textit{Trial 2} \\ 6 \\ 13\overline{)78} \\ \underline{78} \end{array}$$

In Trial 1 we see that the first figure in the answer is too large.

We try 7 because the 1 in 13 goes into the 7 in 78 seven times.

Why is 91 written under 78?

91 is too large to be subtracted from 78.

Now we try the next number smaller than 7.

How do we know 6 is not too large?

Find answers for the following examples:

$48\overline{)289}$ $43\overline{)87}$ $91\overline{)283}$ $29\overline{)89}$

Something to Watch

$$\text{A}\quad\begin{array}{r} 8 \\ 34\overline{)3025} \\ \underline{272} \\ 30 \end{array}$$

In Example A we see that 34 will not go into 30. We need to find how many times 34 goes into 302; so we try 3 into 30.

We might think the first answer figure is 10 because 3 goes into 30 ten times.

Never try a number larger than 9 in the answer.

In Example A we try 9 first in the answer.

But 9 is too large, 9 × 34 = 306.

We try 8 next. Is 8 correct? Why?

Copy Example A and finish it. Check your work.

Find the answers to the examples below:

$33\overline{)307}$ $\qquad 68\overline{)609}$ $\qquad 79\overline{)709}$ $\qquad 84\overline{)801}$

Find by just looking at the work below which figures in the answers are too large. Which ones are too small?

$$\text{A}\ \begin{array}{r} 9 \\ 79\overline{)704} \\ \underline{711} \end{array} \qquad \text{B}\ \begin{array}{r} 7 \\ 47\overline{)383} \\ \underline{329} \\ 54 \end{array} \qquad \text{C}\ \begin{array}{r} 9 \\ 23\overline{)207} \\ \underline{207} \end{array}$$

$$\text{D}\ \begin{array}{r} 9 \\ 54\overline{)485} \\ \underline{486} \end{array} \qquad \text{E}\ \begin{array}{r} 8 \\ 29\overline{)225} \\ \underline{232} \end{array}$$

Division Answers with Two Zeros

Example A shows how to divide 210560 by 70.

$$\text{A}\ \begin{array}{r} 3008 \\ 70\overline{)210560} \\ \underline{210} \\ 560 \\ \underline{560} \end{array}$$

Why is 5 written below 210?

70 will not go into 5; so 0 is written in the answer above the 5.

6 is brought down and written beside the 5.

70 will not go into 56; so 0 is written in the answer above 6.

Why is the 0 written after 56?

Why is 8 written in the answer?

How do we know that the answer is all there?

Division Practice

Every time you bring down a figure you must write a figure in the answer, even if it is zero.

Be careful of the zeros.

$10\overline{)20036}$ $\qquad 89\overline{)231406}$ $\qquad 54\overline{)486762}$

$46\overline{)87412}$ $\qquad 23\overline{)205}$ $\qquad 33\overline{)3082}$

When you divide by 16, 17, 18, 19, you often have to try 3, 4 or 5 different figures before you get the correct answer. If you try your answers without writing them down, you will save yourself some work.

Copy Example A on your paper.

A $18\overline{)95}$

Since 1 goes into 9 nine times, first try 9 in your answer.

Just think: "9 × 18 is 162."

9 is too large. How do you know?

Try 8 next. Think: "8 × 18 is 144."

8 is too large.

Try 7. Is it too large?

Try 6. Is it too large?

Try 5. Think: "5 × 18 is 90."

5 is correct. Why?

If you learn to multiply without writing the numbers down, you will not need to erase when you are trying figures in the answer.

Try to do these examples without erasing.

$19\overline{)90}$ $\qquad 18\overline{)80}$ $\qquad 17\overline{)70}$

$15\overline{)90}$ $\qquad 16\overline{)75}$ $\qquad 14\overline{)68}$

Dividing by Numbers with Three Figures

Example A shows how to divide using a three-figure division.

$$\text{A}\ \begin{array}{r} 25 \\ 364\overline{)9184} \\ \underline{728} \\ 1904 \\ \underline{1820} \\ 84 \end{array}$$

364 will not go into 9 or 91 so we must try it into 918.

Look at the 3 in 364 and 9 in 918.

Think: "3 goes into 9 three times."

3 is too large. How do we know?

So we use 2. Where do we get 190?

How do we get the 5?

What is the remainder?

Now work the examples below:

$221\overline{)1763}$ $\qquad 745\overline{)6705}$

$628\overline{)3438}$ $\qquad 931\overline{)8496}$

Below are examples correctly worked, clearly showing how every difficulty in division should be met. Study each one until you clearly understand it. Then work the problems in the test which follows. Remainders are written as fractions.

$$\begin{array}{r} 708\frac{1}{8} \\ 8\overline{)5665} \\ \underline{56} \\ 65 \\ \underline{64} \\ 1 \end{array} \qquad \begin{array}{r} 37\frac{13}{70} \\ 70\overline{)2603} \\ \underline{210} \\ 503 \\ \underline{490} \\ 13 \end{array} \qquad \begin{array}{r} 8\frac{73}{734} \\ 734\overline{)5945} \\ \underline{5872} \\ 73 \end{array}$$

$$\begin{array}{r} 58 \\ 34\overline{)1972} \\ \underline{170} \\ 272 \\ \underline{272} \end{array} \qquad \begin{array}{r} 35\frac{34}{39} \\ 39\overline{)1399} \\ \underline{117} \\ 229 \\ \underline{195} \\ 34 \end{array} \qquad \begin{array}{r} 2001\frac{29}{60} \\ 60\overline{)120089} \\ \underline{120} \\ 089 \\ \underline{60} \\ 29 \end{array}$$

Test in Division of Whole Numbers

If you can work each example correctly, you will be able to use division in the practical affairs of everyday life. Do not use the answers until all your work is done.

$$\begin{array}{r} 98 \\ 9\overline{)882} \end{array} \qquad \begin{array}{r} 6\frac{11}{94} \\ 94\overline{)575} \end{array}$$

$$\begin{array}{r} 57\frac{2}{5} \\ 5\overline{)287} \end{array} \qquad \begin{array}{r} 46 \\ 82\overline{)3772} \end{array}$$

$$\begin{array}{r} \$7 \\ 85\overline{)\$595} \end{array} \qquad \begin{array}{r} 900 \\ 81\overline{)72900} \end{array}$$

$$\begin{array}{r} 111\frac{1}{52} \\ 52\overline{)5773} \end{array} \qquad \begin{array}{r} 90 \\ 52\overline{)4680} \end{array}$$

$$\begin{array}{r} 9\frac{11}{702} \\ 702\overline{)6329} \end{array} \qquad \begin{array}{r} \$50 \\ 90\overline{)\$4500} \end{array}$$

$$\begin{array}{r} \$7 \\ 69\overline{)\$483} \end{array} \qquad \begin{array}{r} 5002\frac{61}{80} \\ 80\overline{)400221} \end{array}$$

$$\begin{array}{r} 70\frac{2}{13} \\ 13\overline{)912} \end{array} \qquad \begin{array}{r} \$4 \\ 740\overline{)\$2960} \end{array}$$

$$\begin{array}{r} 100\frac{9}{28} \\ 28\overline{)2809} \end{array} \qquad \begin{array}{r} 43\frac{101}{758} \\ 758\overline{)32695} \end{array}$$

$$\begin{array}{r} 45\frac{16}{17} \\ 17\overline{)781} \end{array} \qquad \begin{array}{r} \$7 \\ 70\overline{)\$490} \end{array}$$

$$\begin{array}{r} 8\frac{5}{23} \\ 23\overline{)189} \end{array} \qquad \begin{array}{r} 2589\frac{11}{76} \\ 76\overline{)196775} \end{array}$$

$$\begin{array}{r} 7\frac{20}{49} \\ 49\overline{)363} \end{array} \qquad \begin{array}{r} 267\frac{30}{37} \\ 37\overline{)9909} \end{array}$$

$$\begin{array}{r} 37 \\ 13\overline{)481} \end{array} \qquad \begin{array}{r} 819\frac{107}{129} \\ 129\overline{)105758} \end{array}$$

$$\begin{array}{r} 35\frac{34}{39} \\ 39\overline{)1399} \end{array} \qquad \begin{array}{r} 1579 \\ 98\overline{)154742} \end{array}$$

$$\begin{array}{r} 36\frac{51}{590} \\ 590\overline{)21291} \end{array} \qquad \begin{array}{r} 78\frac{2}{57} \\ 57\overline{)4448} \end{array}$$

$$\begin{array}{r} 395\frac{35}{38} \\ 38\overline{)15045} \end{array} \qquad \begin{array}{r} 6\frac{37}{78} \\ 78\overline{)505} \end{array}$$

Fractions and Small Mixed Numbers

The come and go of everyday affairs make frequent use of fractions.

The denominators that actually happen in the real affairs of real people are surprisingly few. We deal with halves, thirds, fourths, fifths, twelfths, sixteenths, but rarely, if ever, with seventeenths, forty-firsts and the like. The explanations on how to use fractions in the following paragraphs deal almost wholly with fractions which the reader might sometime use in handling his own affairs rather than those which he might read here and never have occasion to see or use again.

There are four main ideas of ever recurring use in working with fractions. These form a steady foundation for an understanding of the subject.

Main Ideas

I. A fraction may be used in connection with a single object or with a collection. "One half of an apple" is clear in meaning. One half of a dozen apples is also meaningful.

II. A fraction uses two numbers, has two parts. Each part does its own work or tells its own part of the story. Thus $\frac{2}{5}$ of anything means the thing is divided into 5 equal parts. This is the story of the denominator 5. 2 of the 5 equal parts are used. The numerator 2 in the fraction $\frac{2}{5}$ names or enumerates the number of equal parts divided.

III. Fractions can be changed in form but not in value. $\frac{1}{2} = \frac{2}{4}$. $\frac{2}{4}$ is a different form but has the same value as $\frac{1}{2}$.

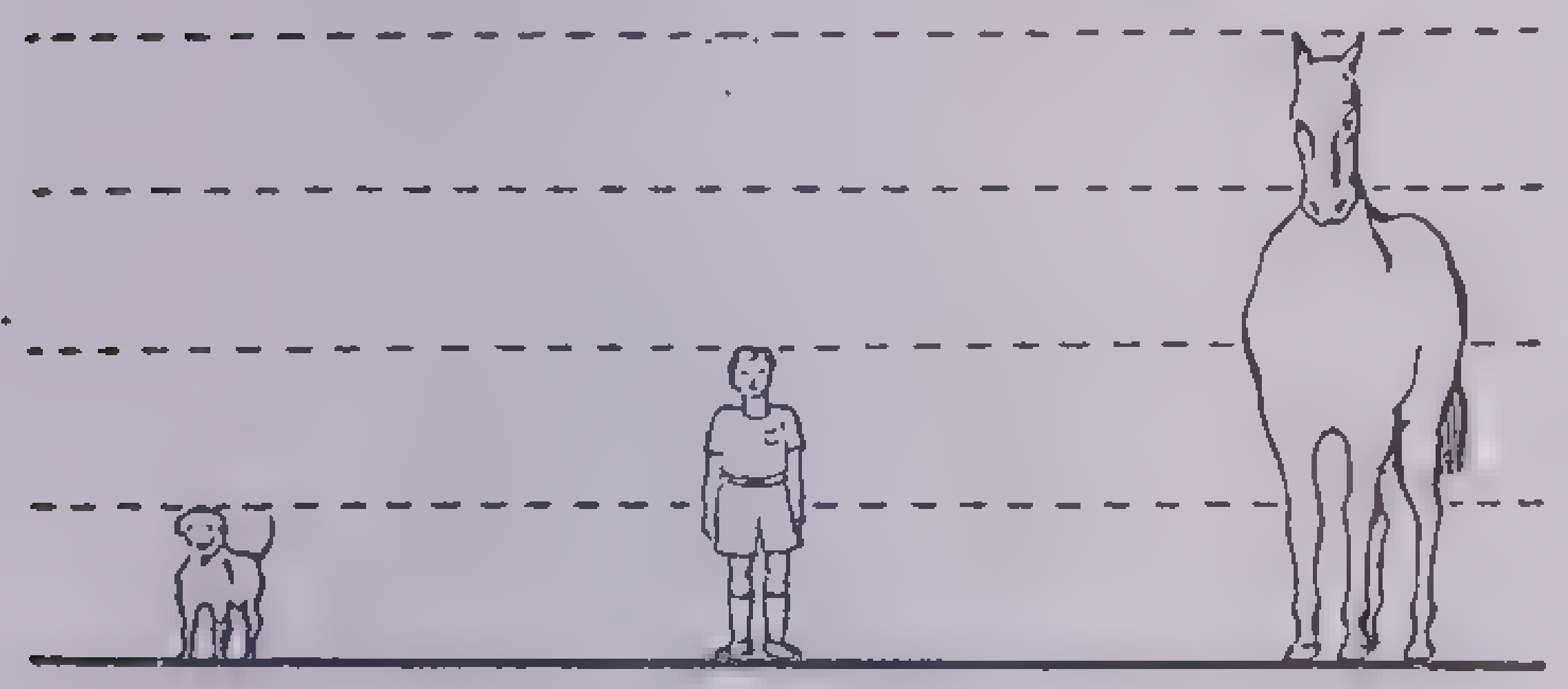
IV. The form but not the value of a fraction may be changed by multiplying or dividing both numerator and denominator by the same number. But to add to or subtract the same number from both numerator and denominator is not permissible. Thus:

$$\frac{2 \times 6}{5 \times 6} = \frac{12}{30} \text{ or } \frac{12 \div 6}{30 \div 6} = \frac{2}{5}$$

yields different forms but unchanged values.

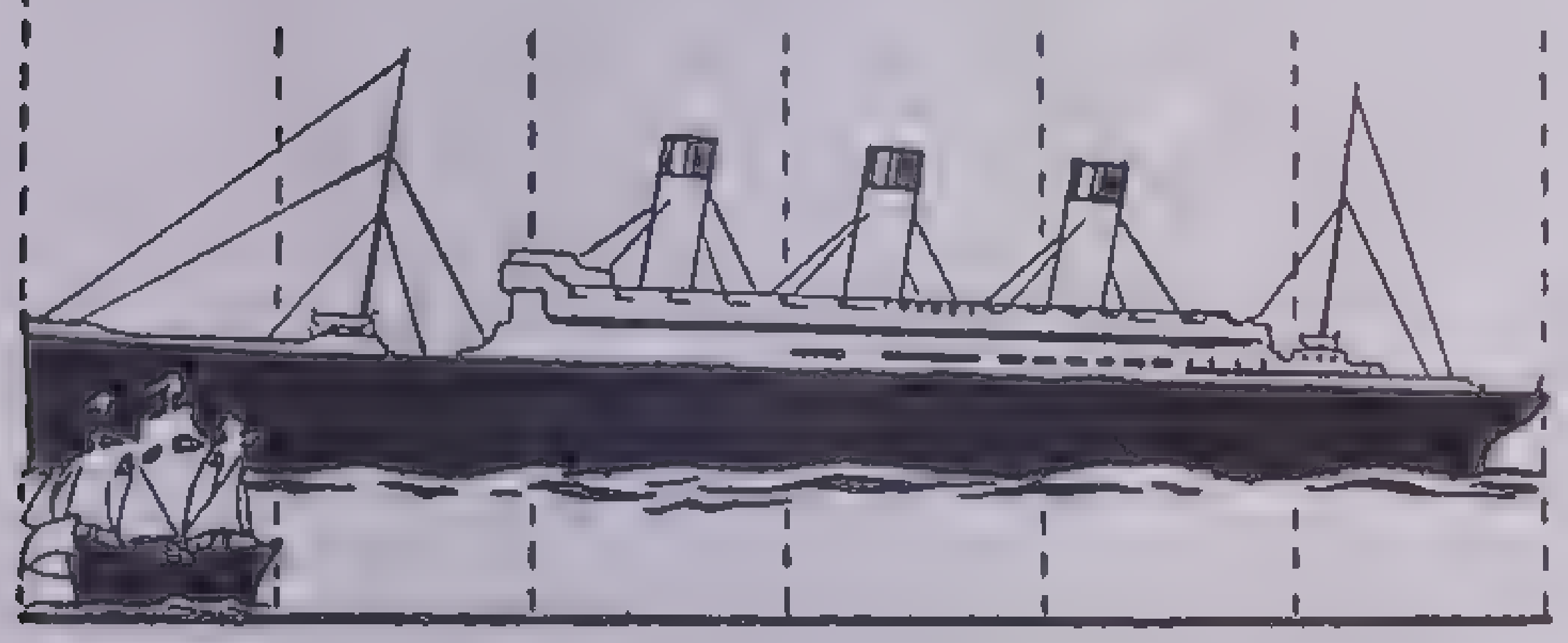
The treatments of addition, subtraction, multiplication and division given below are straightforward and clear-cut. Due regard has been given to pointing out "hard spots" known to exist in learning.

Fraction Ideas in Pictures

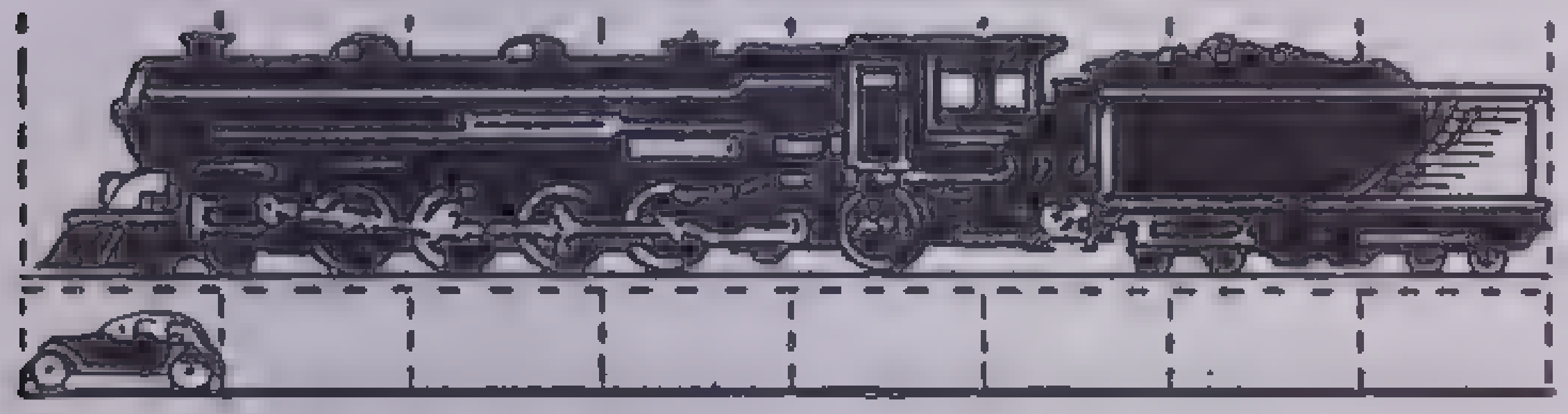


Jack is $\frac{1}{2}$ as tall as the horse. Is the dog $\frac{1}{2}$ or $\frac{1}{4}$ as tall as the boy? Is the dog $\frac{1}{2}$ or $\frac{1}{4}$ as tall as the horse?

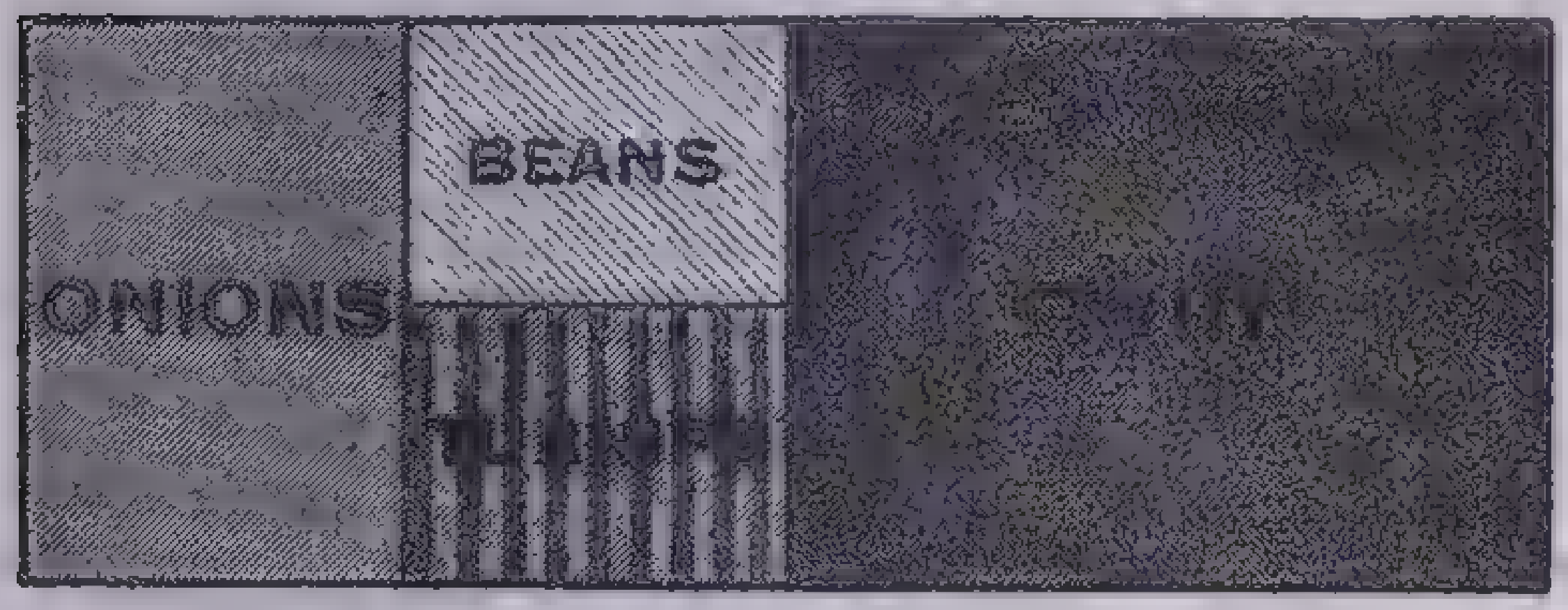
The horse is 2 times as tall as the boy and ____ times as tall as the dog.



The large ship is 900 feet long. The small ship is about ______ as long as the large ship.

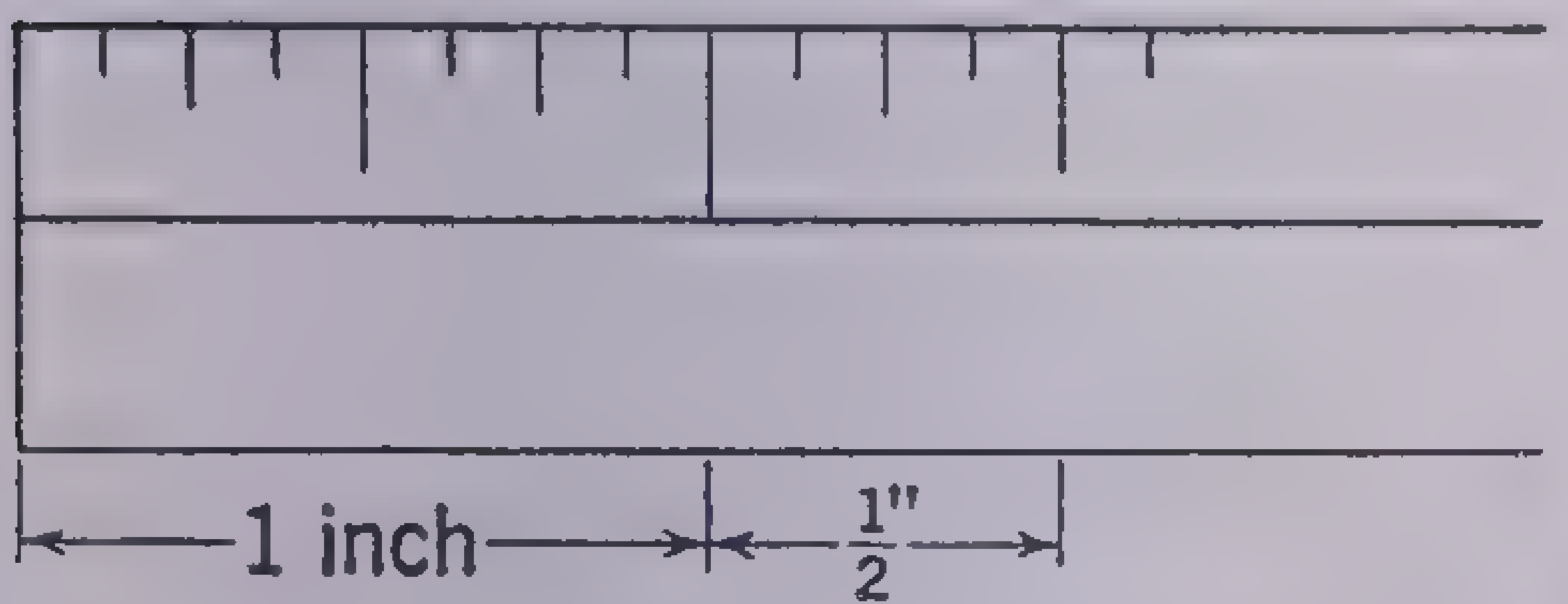


This Ford is about $\frac{?}{8}$ as long as the engine. The engine is about ______ times as long as the Ford.



What fraction tells how much of this garden is used for onions? For beans? For turnips? For corn?

$\frac{1}{2}$ as much ground is used for onions as for corn. $\frac{1}{2}$ as much ground is used for turnips as for onions.



The smallest parts of an inch shown on this ruler are eighths.

$\frac{8}{8}$ inch = 1 inch.

How many fourths equal 1 inch? How many halves equal 1 inch?

Adding Fractions and Fractions

Three fifths of Mary's books are story books, and one fifth of them are school-books. What fraction of her books are story books and school-books?

$$\begin{array}{c}\frac{3}{5}\\ \frac{1}{5}\\ \hline \frac{4}{5}\end{array}$$

The example shows the answer. We add the 1 and the 3. Think: "1 + 3 = 4."

We write this 4 above 5 as shown in the answer. The answer is $\frac{4}{5}$ *of her books.*

$$\frac{3}{5} + \frac{1}{5} = \frac{4}{5}$$

To find the sum of $\frac{2}{7}$ and $\frac{4}{7}$ we add the 2 and the 4. Then we write this sum over 7. The answer is $\frac{6}{7}$.

Look at this example: $\frac{1}{7} + \frac{3}{7} = \frac{4}{7}$. The 1, 3 and 4 are called the *numerators* of the fractions. The 7 in each fraction is called the *denominator.*

When both denominators in an addition example are the same, we use that denominator in the sum.

Write these fractions: numerator 2, denominator 9; numerator 5, denominator 9. What is their sum?

Find the sums below. Some of the answers will be 1. Thus $\frac{8}{8} = 1$.

$$\begin{array}{cccccccc}\frac{1}{8} & \frac{3}{7} & \frac{1}{6} & \frac{1}{3} & \frac{1}{5} & \frac{2}{3} & \frac{1}{9} & \frac{1}{15}\\ \frac{7}{8} & \frac{4}{7} & \frac{5}{6} & \frac{1}{3} & \frac{2}{5} & \frac{1}{3} & \frac{4}{9} & \frac{7}{15}\\ \hline\end{array}$$

Changing Fractions to Simplest Form

Mary and Kathryn were riding their bicycles. They were riding on a cement walk $\frac{1}{8}$ of a mile long. They rode down the walk and back again. What fraction of a mile did each girl ride?

$$\begin{array}{c}\frac{1}{8}\\ \frac{1}{8}\\ \hline \frac{2}{8} \text{ or } \frac{1}{4}\end{array}$$

What 2 fractions should we add?

What are their numerators?

What denominator do both have?

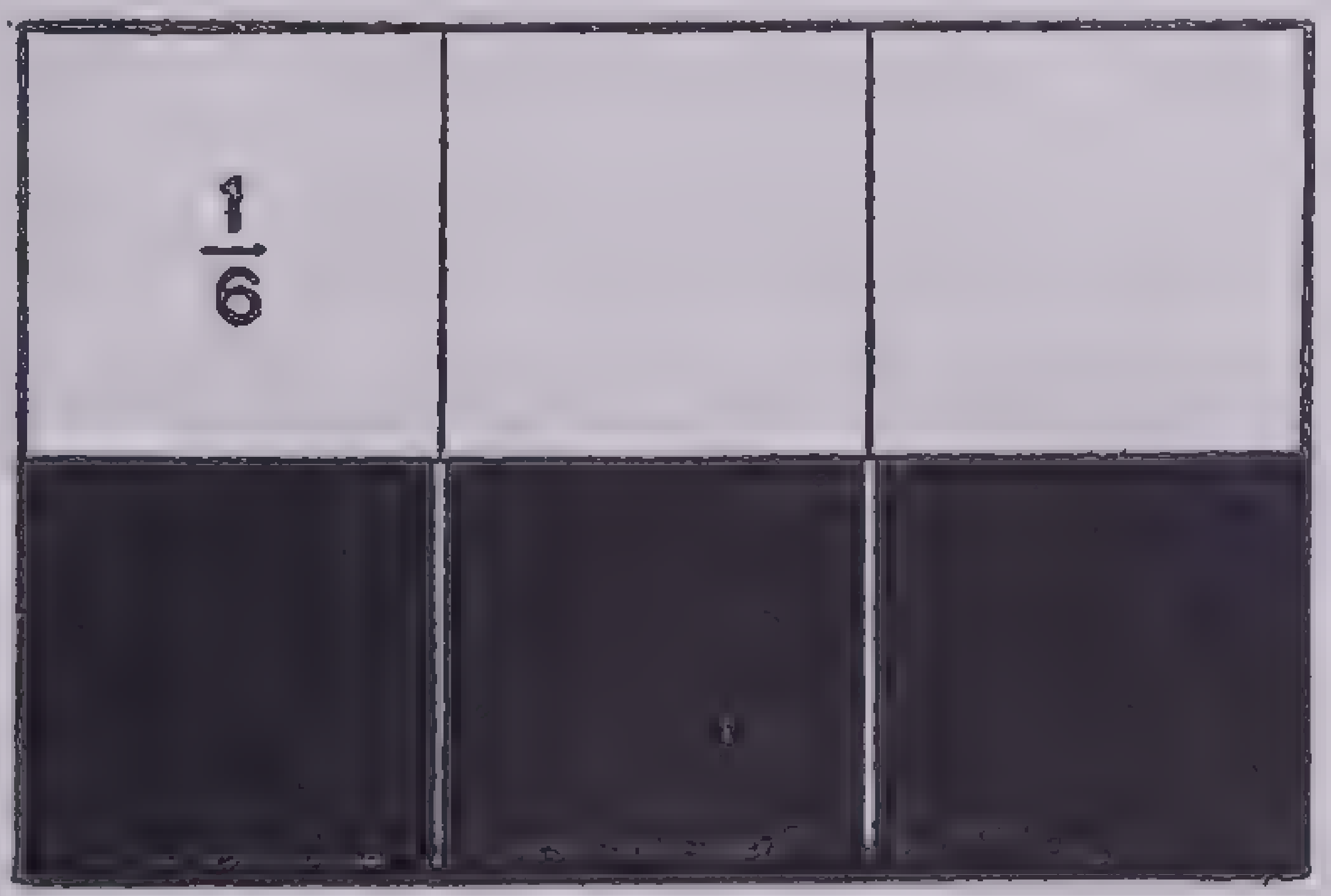
How do we get 2 for the numerator of the answer?

Why is 8 the denominator?

$\frac{2}{8}$ is the same as $\frac{1}{4}$; so the answer is $\frac{1}{4}$ mile.

When we add fractions, we should always give the answer in the simplest way or in the *simplest form* that we can.

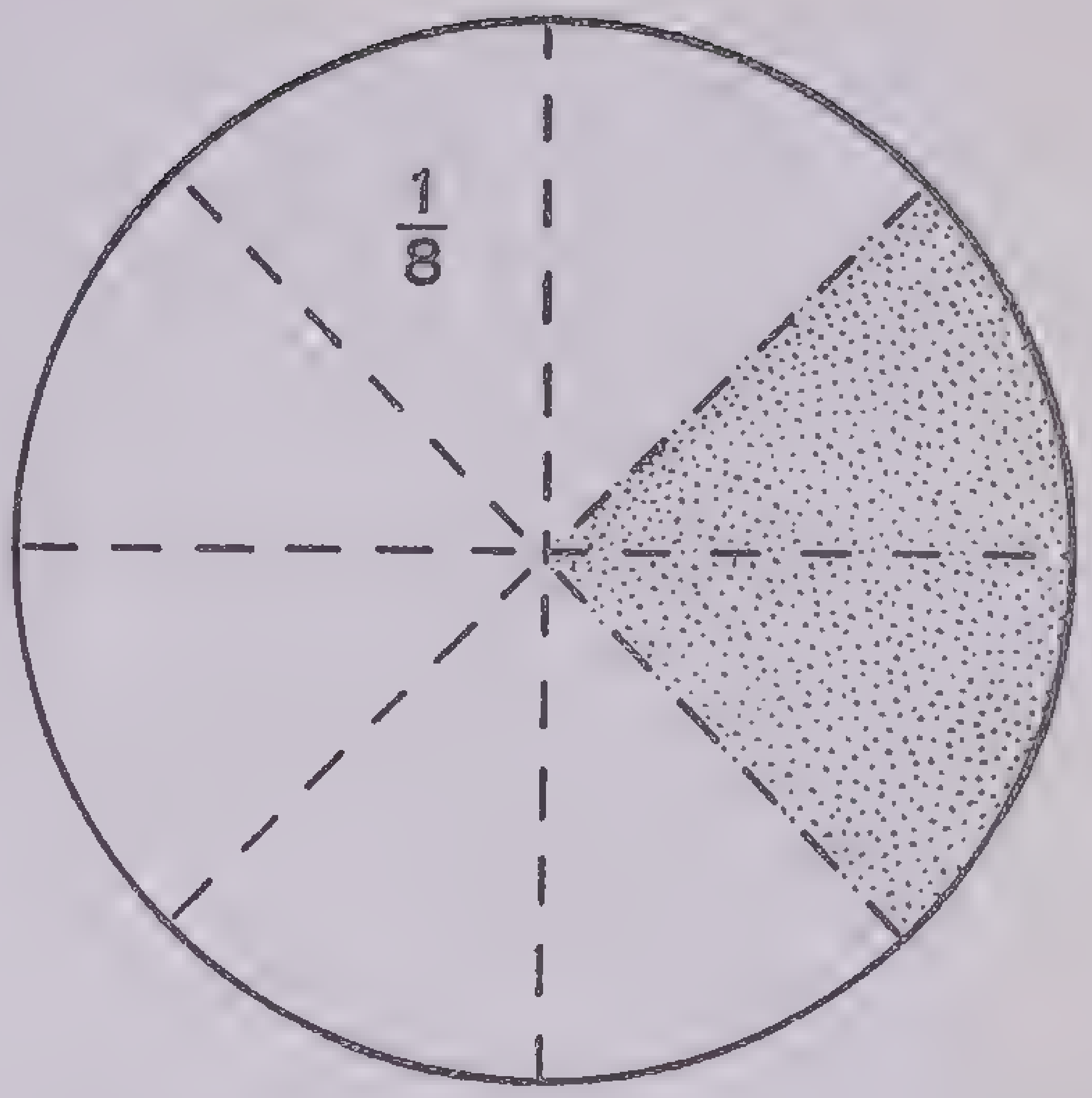
The simplest form for $\frac{2}{8}$ mile is $\frac{1}{4}$ mile.



$\frac{3}{6}$ of the rectangle above are black.

How many halves of the rectangle are black? $\frac{3}{6} = \frac{?}{2}$.

We can change $\frac{3}{6}$ to $\frac{1}{2}$ by dividing both the numerator and denominator by 3.



$\frac{2}{8}$ of the circle above are black. How many fourths of the circle are black?

What is the largest number by which we can divide both the 2 and the 8 in $\frac{2}{8}$? $\frac{2}{8} = ?$

The largest number by which we can divide both the 8 and the 24 in $\frac{8}{24}$ is 8.

$$\frac{8 \div 8}{24 \div 8} = \frac{1}{3}; \text{ so } \frac{8}{24} = \frac{1}{3}.$$

By what number do you divide *both* the numerator and denominator in each of these fractions to change them to their simplest forms?

$$\frac{4}{8} \quad \frac{6}{12} \quad \frac{3}{9} \quad \frac{7}{14} \quad \frac{8}{10} \quad \frac{9}{12} \quad \frac{4}{16} \quad \frac{3}{12}$$

Practice in Adding Fractions

Study Examples A, B and C below.

A $\frac{1}{16} + \frac{3}{16} = \frac{4}{16}$ or $\frac{1}{4}$

B $\frac{1}{8} + \frac{3}{8} = \frac{4}{8}$ or $\frac{1}{2}$

C $\frac{1}{9} + \frac{2}{9} = \frac{3}{9}$ or $\frac{1}{3}$

Explain to yourself how to find the answer for each example.

In Example A to change $\frac{4}{16}$ to $\frac{1}{4}$, we divide *both* numerator and denominator by 4. How do we change $\frac{4}{8}$ to $\frac{1}{2}$ in Example B?

How do we change $\frac{3}{9}$ to $\frac{1}{3}$ in Example C?

Add in each example below. Be sure to change each answer to its simplest form.

$$\begin{array}{cccccccc}\frac{5}{12} & \frac{4}{10} & \frac{5}{9} & \frac{5}{12} & \frac{1}{9} & \frac{3}{8} & \frac{1}{10} & \frac{1}{8}\\ \frac{1}{12} & \frac{1}{10} & \frac{2}{9} & \frac{5}{12} & \frac{2}{9} & \frac{1}{8} & \frac{7}{10} & \frac{5}{8}\\ \hline\end{array}$$

Adding Fractions Whose Sum is a Mixed Number

Mary lives $\frac{2}{3}$ of a mile from her school. How far does she walk in going to school and home again?

Example A shows the answer.

A $\frac{2}{3} + \frac{2}{3} = \frac{4}{3} = 1\frac{1}{3}$

How do we get the $\frac{4}{3}$?

We know that $\frac{3}{3} = 1$. So $\frac{4}{3}$ is $\frac{1}{3}$ more than 1.

$\frac{4}{3} = 1\frac{1}{3}$. Mary must walk $1\frac{1}{3}$ miles.

Fractions like $\frac{4}{5}$, $\frac{1}{3}$ and $\frac{1}{4}$ are less than 1. They are called *proper fractions.*

Fractions like $\frac{5}{3}$, $\frac{8}{5}$ and $\frac{7}{6}$ are called *improper fractions.* They are equal to 1 or more than 1.

Numbers like $1\frac{1}{3}$, $2\frac{4}{7}$ and $3\frac{1}{2}$ are *mixed numbers.*

A mixed number is made up of a whole number and a fraction.

Whenever you get an improper fraction in an answer, change it to a whole number or a mixed number. Mixed numbers are more easily thought about than improper fractions.

Change each proper fraction below to its simplest form. Change each improper fraction to a mixed number or to a whole number.

$\frac{5}{3}$ $\frac{11}{6}$ $\frac{8}{12}$ $\frac{17}{16}$ $\frac{13}{13}$ $\frac{17}{13}$ $\frac{7}{5}$ $\frac{8}{16}$ $\frac{9}{27}$ $\frac{5}{4}$

Add the examples below, change each proper fraction in your answer to its simplest form. Change each improper fraction to a mixed number or to a whole number:

$$\begin{array}{cccccccccc} \frac{1}{6} & \frac{2}{3} & \frac{1}{12} & \frac{4}{5} & \frac{3}{8} & \frac{1}{6} & \frac{1}{4} & \frac{3}{5} & \frac{1}{3} & \frac{1}{15} \\ \frac{5}{6} & \frac{2}{3} & \frac{7}{12} & \frac{4}{5} & \frac{3}{8} & \frac{5}{6} & \frac{3}{4} & \frac{4}{5} & \frac{1}{3} & \frac{4}{15} \\ \hline \end{array}$$

Colleen's mother was making a Christmas cake. She used $\frac{5}{8}$ lb. of raisins and $\frac{5}{8}$ lb. of walnuts.

How many pounds of nuts and raisins did she use?

$$\begin{array}{l} \frac{5}{8} \\ \frac{5}{8} \\ \hline \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4} \end{array}$$

Look at the example.

How do we get the 10 in $\frac{10}{8}$?

Why do we use 8 for the denominator in $\frac{10}{8}$?

$\frac{10}{8}$ is an improper fraction; so we change it to $1\frac{2}{8}$.

We know that $\frac{2}{8}$ in $1\frac{2}{8}$ can be changed to $\frac{1}{4}$.

$\frac{10}{8}$ in its simplest form is $1\frac{1}{4}$.

Always change the fraction part of a mixed number in an answer to its simplest form. It is easier to think about fractions when they are in simplest form.

Now change all the improper fractions below to mixed numbers or whole numbers:

$\frac{10}{7}$ $\frac{18}{12}$ $\frac{24}{15}$ $\frac{9}{6}$ $\frac{12}{12}$ $\frac{30}{16}$ $\frac{15}{8}$ $\frac{12}{9}$

ADDING FRACTIONS WITH DIFFERENT DENOMINATORS

The grocery store is $\frac{1}{4}$ mile in one direction from Bobby's home. The school is $\frac{1}{2}$ mile from his home in the other direction. If he walks from school to the grocery store, how many miles has he walked?

To get the answer we must add $\frac{1}{4}$ and $\frac{1}{2}$.

We cannot add the numerators of $\frac{1}{4}$ and $\frac{1}{2}$ because the denominators are not the same.

We must change $\frac{1}{4}$ or $\frac{1}{2}$ so that the denominators will be the same.

We cannot change $\frac{1}{4}$ to halves; but we can change $\frac{1}{2}$ to fourths.

Look at Example A.

$$\text{A} \quad \begin{array}{l} \frac{1}{2} = \frac{2}{4} \\ \frac{1}{4} = \frac{1}{4} \\ \hline \qquad \frac{3}{4} \end{array}$$

$\frac{1}{2}$ is changed to $\frac{2}{4}$.

How do we get the 3 in $\frac{3}{4}$?

Why is 4 the denominator?

How far is it from Bobby's school to the grocery?

We cannot add two fractions until they have the same denominators. Sometimes we must change one of them so that their denominators will be the same.

$$\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$$

This work shows how to change $\frac{2}{3}$ to ninths.

We multiply 3 by 3 to get 9. We multiply both numerator and denominator by 3 to change $\frac{2}{3}$ to ninths.

To change a fraction to an equal fraction with a larger denominator, we must multiply both numerator and denominator by the same number.

ADDITION WITH UNLIKE DENOMINATORS

Study each example below until you know how it is solved. Now copy each example, close the book and add.

$$\text{A} \; \begin{array}{l} \frac{1}{2} = \frac{4}{8} \\ \frac{3}{8} = \frac{3}{8} \\ \hline \qquad \frac{7}{8} \end{array} \qquad \text{B} \; \begin{array}{l} \frac{1}{4} = \frac{2}{8} \\ \frac{1}{8} = \frac{1}{8} \\ \hline \qquad \frac{3}{8} \end{array} \qquad \text{C} \; \begin{array}{l} \frac{7}{12} = \frac{7}{12} \\ \frac{1}{3} = \frac{4}{12} \\ \hline \qquad \frac{11}{12} \end{array} \qquad \text{D} \; \begin{array}{l} \frac{5}{16} = \frac{5}{16} \\ \frac{1}{4} = \frac{4}{16} \\ \hline \qquad \frac{9}{16} \end{array}$$

$$\text{E} \; \begin{array}{l} \frac{1}{2} = \frac{2}{4} \\ \frac{3}{4} = \frac{3}{4} \\ \hline \qquad \frac{5}{4} = 1\frac{1}{4} \end{array} \qquad \text{F} \; \begin{array}{l} \frac{5}{6} = \frac{5}{6} \\ \frac{1}{2} = \frac{3}{6} \\ \hline \qquad \frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3} \end{array}$$

Add. Be sure to change all answers to simplest terms:

$$\begin{array}{cccccccc} \frac{9}{10} & \frac{4}{5} & \frac{2}{3} & \frac{7}{15} & \frac{1}{2} & \frac{3}{8} & \frac{3}{4} & \frac{1}{2} \\ \frac{3}{10} & \frac{3}{10} & \frac{2}{3} & \frac{8}{15} & \frac{1}{6} & \frac{7}{8} & \frac{1}{8} & \frac{1}{6} \\ \hline \end{array}$$

Adding Fractions and Whole Numbers

Mary's mother was going to visit a sick neighbor. She told Mary that she could visit with Colleen $\frac{1}{2}$ hour and with Lenore 1 hour. How long did Mary visit with both girls?

To find the answer we must add a whole number and a fraction.

Example A shows how to do this.

$$\text{A} \; \begin{array}{r} 1 \\ \frac{1}{2} \\ \hline 1\frac{1}{2} \end{array}$$

When we add fractions and whole numbers, we must write the fraction in a separate column. Copy Example A. Now add the fraction. The sum of the fraction column is ———. Add the whole number column. The sum is a mixed number.

Mary visited ——— hours with Colleen and Lenore.

$$\text{B} \; \begin{array}{r} 5 \\ 3\frac{1}{2} \\ \hline 8\frac{1}{2} \end{array}$$

What kinds of numbers are added in example B to get the sum?

How do we get $8\frac{1}{2}$ for the answer?

The fraction is in a separate column.

Study the Examples A to E until you know how to add in each case. Then copy them without the work and add. Compare with the book.

$$\text{C} \; \begin{array}{r} 7 \\ \frac{1}{6} \\ \hline 7\frac{1}{6} \end{array} \qquad \text{D} \; \begin{array}{r} 9 \\ 2\frac{3}{5} \\ \hline 11\frac{3}{5} \end{array} \qquad \text{E} \; \begin{array}{r} 1\frac{3}{8} \\ 30 \\ \hline 31\frac{3}{8} \end{array}$$

Now add the examples below:

$$\begin{array}{cccccc} 1 & 5 & 1\frac{3}{8} & 4 & 24 & 7\frac{2}{3} \\ \frac{1}{7} & 1\frac{2}{3} & 7 & 1\frac{8}{15} & 3\frac{11}{17} & 8 \\ \hline \end{array}$$

CHANGING TWO FRACTIONS IN ADDITION

Miss Jones gave Colleen and Billy a box full of broken crayons. She asked them to sort them into piles of different colors. They found that $\frac{1}{2}$ of the crayons were blue, and $\frac{1}{3}$ were red.

The blue and red together were what part of the box of broken crayons?

To answer this question we must find the sum of $\frac{1}{2}$ and $\frac{1}{3}$.

Before we can add, we must change $\frac{1}{2}$ and $\frac{1}{3}$ to fractions with the same denominator.

$\frac{1}{2}$ cannot be changed to thirds; $\frac{1}{3}$ cannot be changed to halves.

The smallest denominator that we can use for both fractions is 6. We get the 6 by multiplying the 2 in the $\frac{1}{2}$ by the 3 in the $\frac{1}{3}$.

$$\text{A} \; \begin{array}{l} \frac{1}{2} = \frac{3}{6} \\ \frac{1}{3} = \frac{2}{6} \\ \hline \qquad \frac{5}{6} \end{array}$$

In Example A, how do we change $\frac{1}{2}$ to sixths?

How do we change $\frac{1}{3}$ to sixths? $\frac{1}{3} = \frac{?}{6}$

How do we get the 5 and 6 in $\frac{5}{6}$?

What part of the box of broken crayons were red and blue?

The smallest denominator that we can use in adding $\frac{1}{2}$ and $\frac{1}{7}$ is 14. $\frac{1}{2}$ cannot be changed to sevenths; $\frac{1}{7}$ cannot be changed to halves. So we multiply the denominators to get the denominator we should use.

When we add $\frac{1}{4}$ and $\frac{1}{8}$, we use 8 for our denominator because $\frac{1}{4}$ can be changed to eighths.

What denominator should we use in adding $\frac{1}{2}$ and $\frac{1}{6}$? Why?

What denominator should we use in adding $\frac{1}{2}$ and $\frac{1}{5}$? Why?

What denominators should we use when we add in each of the examples below? Why?

A

$$\begin{array}{cccc} \frac{1}{5} + \frac{1}{10} & \frac{1}{4} + \frac{3}{8} & \frac{3}{5} + \frac{1}{8} & \frac{1}{3} + \frac{5}{8} \\ \frac{3}{4} + \frac{1}{9} & \frac{1}{6} + \frac{1}{7} & \frac{3}{7} + \frac{3}{5} & \frac{4}{9} + \frac{1}{3} \\ & \frac{1}{6} + \frac{1}{2} & \frac{4}{9} + \frac{3}{5} & \end{array}$$

Study the four addition examples below until you think you understand how they are done. Copy them, without the work, close the book and add.

$$\text{B} \; \begin{array}{l} \frac{1}{2} = \frac{3}{6} \\ \frac{1}{3} = \frac{2}{6} \\ \hline \qquad \frac{5}{6} \end{array} \qquad \text{C} \; \begin{array}{l} \frac{1}{2} = \frac{5}{10} \\ \frac{3}{5} = \frac{6}{10} \\ \hline \qquad \frac{11}{10} \text{ or } 1\frac{1}{10} \end{array}$$

$$\text{D} \; \begin{array}{l} \frac{1}{7} = \frac{10}{70} \\ \frac{1}{10} = \frac{7}{70} \\ \hline \qquad \frac{17}{70} \end{array} \qquad \text{E} \; \begin{array}{l} \frac{3}{4} = \frac{9}{12} \\ \frac{1}{3} = \frac{4}{12} \\ \hline \qquad \frac{13}{12} = 1\frac{1}{12} \end{array}$$

Now add each of the examples below:

$$\begin{array}{ccccccc} \frac{1}{3} & \frac{1}{2} & \frac{1}{3} & \frac{2}{9} & \frac{1}{3} & \frac{1}{6} & \frac{1}{7} \\ \frac{1}{4} & \frac{3}{5} & \frac{4}{7} & \frac{3}{4} & \frac{5}{8} & \frac{3}{5} & \frac{3}{10} \\ \hline \end{array}$$

Adding Fractions and Mixed Numbers

Billy's mother bought $1\frac{1}{3}$ lb. of lemon drops and $\frac{1}{2}$ lb. of peanut brittle. How many pounds of candy did she buy altogether?

Example A shows how to add $1\frac{1}{3}$ and $\frac{1}{2}$.

$$\text{A}\quad\begin{array}{rcr} 1\frac{1}{3} & = & 1\frac{2}{6} \\ \underline{\frac{1}{2}} & = & \underline{\frac{3}{6}} \\ & & 1\frac{5}{6} \end{array}$$

Fractions are written in a column of their own.

What denominator do we use in adding $\frac{1}{3}$ and $\frac{1}{2}$?

How do we change $\frac{1}{3}$ to sixths?

How do we change $\frac{1}{2}$ to sixths?

We add the fraction column first. How do we get $\frac{5}{6}$ as the sum of the fraction column?

Why is 1 written beside $\frac{5}{6}$ in the answer?

The answer for the problem is ———.

Study the examples below until you think you understand the work. Then copy them without the work, close the book and find the answers. See if your answers are like those in the book.

$$\text{B}\quad\begin{array}{r} 2\frac{1}{5} \\ \underline{\frac{1}{5}} \\ 2\frac{2}{5} \end{array}\qquad\qquad \text{C}\quad\begin{array}{rcr} 3\frac{1}{2} & = & 3\frac{5}{10} \\ \frac{3}{10} & = & \underline{\frac{3}{10}} \\ & & 3\frac{8}{10} \end{array}$$

$$\text{D}\quad\begin{array}{rcr} 3\frac{1}{3} & = & 3\frac{3}{9} \\ \frac{1}{9} & = & \underline{\frac{1}{9}} \\ & & 3\frac{4}{9} \end{array}\qquad\qquad \text{E}\quad\begin{array}{rcr} \frac{2}{3} & = & \frac{8}{12} \\ 7\frac{1}{4} & = & \underline{7\frac{3}{12}} \\ & & 7\frac{11}{12} \end{array}$$

Now add these fractions and mixed numbers below:

$$\begin{array}{cccccc} 10\frac{2}{3} & \frac{1}{4} & \frac{1}{2} & \frac{1}{3} & \frac{1}{2} & \frac{1}{4} \\ \underline{\frac{1}{5}} & \underline{13\frac{1}{5}} & \underline{7\frac{5}{16}} & \underline{12\frac{3}{8}} & \underline{14\frac{3}{10}} & \underline{5\frac{5}{8}} \end{array}$$

Look at Example A.

$$\text{A}\quad\begin{array}{rcr} \frac{1}{4} & = & \frac{2}{8} \\ 4\frac{1}{2} & = & \underline{4\frac{4}{8}} \\ & & 4\frac{6}{8}\text{ or }4\frac{3}{4} \end{array}$$

Study it until you know how to work it.

How do we get $4\frac{6}{8}$ in the answer?

How do we get $4\frac{3}{4}$?

Now add in the examples below:

$$\begin{array}{ccccc} \frac{1}{2} & 4\frac{1}{3} & 5\frac{3}{5} & 2\frac{1}{4} & 5\frac{1}{3} \\ \underline{3\frac{3}{10}} & \underline{\frac{1}{6}} & \underline{\frac{1}{15}} & \underline{\frac{1}{4}} & \underline{\frac{5}{12}} \end{array}$$

CHANGING SUMS TO THEIR SIMPLER FORMS

Example A shows how to add $5\frac{2}{3}$ and $\frac{2}{3}$.

$$\text{A}\quad\begin{array}{l} 5\frac{2}{3} \\ \underline{\ \ \frac{2}{3}} \\ 5\frac{4}{3}\text{ or }5+1\frac{1}{3}=6\frac{1}{3} \end{array}$$

The sum of the fraction column is $\frac{4}{3}$.

What kind of number is $5\frac{4}{3}$?

$5\frac{4}{3}$ is the same as $5+\frac{4}{3}$ or $5+1\frac{1}{3}$, or $6\frac{1}{3}$.

You should never leave an improper fraction in the answer, even if it is part of a mixed number.

Study the examples below until you think you understand the work. Then copy the examples without the work, close the book, and add.

$$\text{B}\quad\begin{array}{l} \ \ \frac{1}{3} \\ \underline{1\frac{2}{3}} \\ 1\frac{3}{3}=1+1=2 \end{array}$$

$$\text{C}\quad\begin{array}{rcr} 9\frac{1}{2} & = & 9\frac{7}{14} \\ \underline{\frac{5}{7}} & \underline{=} & \underline{\frac{10}{14}} \\ & & 9\frac{17}{14}=9+1\frac{3}{14}=10\frac{3}{14} \end{array}$$

Now add these examples below. Give each sum in its simplest form.

$$\begin{array}{cccccc} 1\frac{2}{5} & \frac{1}{2} & 6\frac{1}{3} & \frac{1}{2} & 8\frac{1}{2} & 8\frac{5}{16} \\ \underline{\frac{1}{2}} & \underline{1\frac{5}{8}} & \underline{\frac{2}{3}} & \underline{6\frac{3}{5}} & \underline{\frac{7}{9}} & \underline{\frac{3}{4}} \end{array}$$

Example A shows how to add $3\frac{5}{6}$ and $\frac{1}{2}$.

$$\text{A}\quad\begin{array}{rcr} 3\frac{5}{6} & = & 3\frac{5}{6} \\ \underline{\frac{1}{2}} & = & \underline{\frac{3}{6}} \\ & & 3\frac{8}{6}=4\frac{2}{6}\text{ or }4\frac{1}{3} \end{array}$$

How do we get $3\frac{8}{6}$?

How do we get $4\frac{1}{3}$?

Give the sum for each example below in its simplest form.

$$\begin{array}{cccccc} 10\frac{3}{16} & 9\frac{8}{9} & 7\frac{4}{5} & 4\frac{5}{6} & 9\frac{3}{5} & 80 \\ \underline{\frac{7}{8}} & \underline{\frac{2}{3}} & \underline{\frac{7}{10}} & \underline{\frac{1}{6}} & \underline{\frac{13}{15}} & \underline{20\frac{2}{3}} \end{array}$$

HOW TO ADD IN A NEW KIND OF EXAMPLE

Look at Examples A, B, C and D below.

$$\text{A}\quad\begin{array}{l} \frac{1}{4} \\ \underline{\frac{1}{4}} \\ \frac{2}{4}\text{ or }\frac{1}{2} \end{array}\qquad\qquad \text{B}\quad\begin{array}{rcl} \frac{1}{12} & = & \frac{1}{12} \\ \underline{\frac{1}{4}} & = & \underline{\frac{3}{12}} \\ & & \frac{4}{12}\text{ or }\frac{1}{3} \end{array}$$

$$\text{C}\quad\begin{array}{rcl} \frac{1}{3} & = & \frac{2}{6} \\ \underline{\frac{1}{2}} & = & \underline{\frac{3}{6}} \\ & & \frac{5}{6} \end{array}\qquad\qquad \text{D}\quad\begin{array}{rcl} \frac{1}{6} & = & \frac{4}{24} \\ \underline{\frac{1}{8}} & = & \underline{\frac{3}{24}} \end{array}$$

In Example A both denominators are the same.

In Example B one fraction has a denominator we use when we add.

In Example C we multiply one denominator by the other to find the denominator to use when we add.

In Example D both denominators can be divided evenly by the same number. Both 6 and 8 can be divided by 2. Now look at Example C. Can you divide any number except 1 evenly into both 2 and 3?

Now look at Example A.

$$\text{A}\quad\begin{array}{rcl} \frac{1}{4} & = & \frac{5}{20} \\ \underline{\frac{3}{10}} & = & \underline{\frac{6}{20}} \\ & & \frac{11}{20} \end{array}$$

If we multiply 4 by 10 we do not get the smallest denominator that we can use.

The denominator to use is the smallest number that can be divided evenly by both 4 and 10.

To find it try 2 × 10. 2 × 10 is 20. 20 can be divided evenly by 4. So 20 is the denominator to use.

Of course we could have used 40 as the denominator. But then we would have had to change the answer to its simplest form. See if you get the same answer by using 40 as denominator. Reduce your answer to its simplest form. Study the examples below until you think you know how each is worked.

$$\text{B}\quad\begin{array}{rcl} \frac{5}{6} & = & \frac{25}{30} \\ \frac{9}{10} & = & \underline{\frac{27}{30}} \\ & & \frac{52}{30}=1\frac{22}{30}=1\frac{11}{15} \end{array}$$

$$\text{C}\quad\begin{array}{rcr} 5\frac{1}{6} & = & 5\frac{3}{18} \\ \frac{1}{9} & = & \underline{\frac{2}{18}} \\ & & 5\frac{5}{18} \end{array}\qquad\qquad \text{D}\quad\begin{array}{rcr} 8\frac{1}{10} & = & 8\frac{3}{30} \\ \frac{4}{15} & = & \underline{\frac{8}{30}} \\ & & 8\frac{11}{30} \end{array}$$

$$\text{E}\quad\begin{array}{rcr} \frac{5}{16} & = & \frac{15}{48} \\ 11\frac{1}{6} & = & \underline{11\frac{8}{48}} \\ & & 11\frac{23}{48} \end{array}$$

Now find the sums for the examples below:

$$\begin{array}{cccccc} \frac{9}{10} & \frac{5}{6} & 8\frac{5}{6} & \frac{5}{8} & 4\frac{1}{10} & 7\frac{7}{10} \\ \underline{\frac{5}{6}} & \underline{1\frac{1}{4}} & \underline{\frac{3}{8}} & \underline{16\frac{1}{12}} & \underline{\frac{3}{4}} & \underline{3\frac{1}{15}} \end{array}$$

Adding Two Mixed Numbers

Example A shows how to add 2 mixed numbers.

$$\text{A}\quad\begin{array}{r} 15\frac{1}{5} \\ \underline{17\frac{3}{5}} \\ 32\frac{4}{5} \end{array}$$

How do we get the $\frac{4}{5}$?

How do we get the 32?

What is the answer?

Study the examples below until you think you know how to do the work. Copy them, without the work, close the book and add.

$$\text{B}\quad\begin{array}{r} 7\frac{1}{7} \\ \underline{8\frac{3}{7}} \\ 15\frac{4}{7} \end{array}\qquad\qquad \text{C}\quad\begin{array}{rcr} 8\frac{1}{2} & = & 8\frac{2}{4} \\ \underline{7\frac{1}{4}} & \underline{=} & \underline{7\frac{1}{4}} \\ & & 15\frac{3}{4} \end{array}$$

$$\text{D}\quad\begin{array}{rcr} 9\frac{1}{2} & = & 9\frac{3}{6} \\ 4\frac{1}{3} & = & \underline{4\frac{2}{6}} \\ & & 13\frac{5}{6} \end{array}\qquad\qquad \text{E}\quad\begin{array}{rcr} 1\frac{1}{4} & = & 1\frac{3}{12} \\ 9\frac{1}{6} & = & \underline{9\frac{2}{12}} \\ & & 10\frac{5}{12} \end{array}$$

Now solve these examples.

$$\begin{array}{cccccc} 3\frac{3}{8} & 7\frac{2}{3} & 6\frac{2}{9} & 14\frac{5}{12} & 4\frac{1}{4} & 7\frac{1}{9} \\ \underline{5\frac{1}{2}} & \underline{6\frac{1}{4}} & \underline{7\frac{1}{6}} & \underline{6\frac{3}{8}} & \underline{6\frac{1}{6}} & \underline{6\frac{5}{6}} \end{array}$$

ADDING THREE FRACTIONS OR MIXED NUMBERS

Example A shows how to add when we have more than 2 fractions or mixed numbers.

$$\text{A}\quad\begin{array}{r} 4\frac{1}{3} \\ 6\frac{2}{3} \\ \underline{\frac{1}{3}} \\ 10\frac{4}{3}\text{ or }11\frac{1}{3} \end{array}$$

Write the 3 numbers so that the fractions are in a column.

Why do we not change any of the fractions?

How do we get the denominator 3 in the answer?

Is $10\frac{4}{3}$ or $11\frac{1}{3}$ the better answer?

In Example B we use 12 for the denominator.

$$\text{B}\quad\begin{array}{rcl} \frac{1}{3} & = & \frac{4}{12} \\ \frac{1}{6} & = & \frac{2}{12} \\ \frac{3}{4} & = & \underline{\frac{9}{12}} \\ & & \frac{15}{12}\text{ or }1\frac{3}{12}\text{ or }1\frac{1}{4} \end{array}$$

Twelve is the smallest number that each of the denominators will divide evenly.

Add the fractions and mixed numbers in the examples below:

$$\begin{array}{rrrrr}
\frac{1}{3} & 3\frac{1}{3} & 17\frac{3}{4} & 10\frac{1}{4} & 7\frac{1}{5} \\
\frac{1}{3} & 2\frac{1}{4} & 9\frac{1}{2} & 2\frac{1}{4} & 3\frac{2}{5} \\
\frac{1}{3} & 1\frac{1}{12} & 2\frac{1}{8} & \frac{1}{8} & 4\frac{1}{10} \\
\hline
\end{array}$$

If you can work the following examples correctly and easily, you can add fractions well enough to meet the ordinary demands of business in everyday life. Do not refer to the answers until the work is finished.

$$\begin{array}{lrrrrr}
\text{A} & \frac{1}{3} & \frac{4}{9} & \frac{5}{6} & 3 & \frac{1}{4} \\
 & \frac{1}{3} & \frac{4}{9} & 4 & 2\frac{2}{3} & \frac{3}{4} \\
\cline{2-6}
 & \frac{2}{3} & \frac{8}{9} & 4\frac{5}{6} & 5\frac{2}{3} & \frac{4}{4} \text{ or } 1
\end{array}$$

$$\begin{array}{lrrrrr}
\text{B} & \frac{3}{8} & \frac{2}{3} & \frac{1}{10} & \frac{2}{3} & \frac{1}{2} \\
 & \frac{1}{4} & \frac{5}{6} & \frac{2}{5} & \frac{5}{12} & \frac{1}{6} \\
\cline{2-6}
 & \frac{5}{8} & \frac{9}{6} \text{ or } 1\frac{1}{2} & \frac{1}{2} & \frac{13}{12} \text{ or } 1\frac{1}{12} & \frac{2}{3}
\end{array}$$

$$\begin{array}{lrrrrr}
\text{C} & \frac{2}{5} & \frac{2}{3} & \frac{1}{4} & \frac{7}{12} & \frac{3}{10} \\
 & \frac{1}{6} & \frac{1}{4} & \frac{3}{10} & \frac{2}{15} & \frac{1}{6} \\
\cline{2-6}
 & \frac{17}{30} & \frac{11}{12} & \frac{11}{20} & \frac{43}{60} & \frac{7}{15}
\end{array}$$

$$\begin{array}{lrrrrr}
\text{D} & 6\frac{1}{2} & 2\frac{1}{3} & 9\frac{1}{5} & 3\frac{7}{15} & 2\frac{3}{8} \\
 & \frac{3}{8} & \frac{1}{8} & \frac{1}{5} & \frac{11}{12} & \frac{5}{8} \\
\cline{2-6}
 & 6\frac{7}{8} & 2\frac{11}{24} & 9\frac{2}{5} & 4\frac{23}{60} & 3
\end{array}$$

$$\begin{array}{lrrrrr}
\text{E} & 7\frac{1}{4} & 8\frac{1}{3} & 3\frac{1}{2} & 7\frac{1}{3} & 1\frac{3}{8} \\
 & 3\frac{1}{5} & 2\frac{3}{5} & 4\frac{7}{10} & 2\frac{2}{3} & 9\frac{5}{12} \\
\cline{2-6}
 & 10\frac{9}{20} & 10\frac{14}{15} & 8\frac{1}{5} & 10 & 10\frac{19}{24}
\end{array}$$

$$\begin{array}{lrrrrr}
\text{F} & \frac{5}{6} & 5\frac{2}{5} & 8\frac{5}{16} & \frac{1}{2} & \frac{1}{3} \\
 & \frac{1}{3} & \frac{7}{10} & 2\frac{1}{16} & \frac{7}{8} & \frac{3}{4} \\
 & \frac{5}{8} & 3\frac{1}{2} & 3 & \frac{3}{4} & 9 \\
\cline{2-6}
 & 1\frac{19}{24} & 9\frac{3}{5} & 13\frac{3}{8} & 2\frac{1}{8} & 10\frac{1}{12}
\end{array}$$

Essentials of Subtraction of Fractions

Subtraction of a Fraction from a Fraction

Colleen drank $\frac{2}{3}$ of a glass of orange juice at breakfast time. Billy drank $\frac{1}{3}$ of a glass. How much more did Colleen drink than Billy?

To find the answer subtract $\frac{1}{3}$ from $\frac{2}{3}$.

$$\begin{array}{lr}
\text{A} & \frac{2}{3} \\
 & \frac{1}{3} \\
\cline{2-2}
 & \frac{1}{3}
\end{array}$$

We subtract the numerator of $\frac{1}{3}$ from the numerator of $\frac{2}{3}$.

The difference between the numerators is 1. So we write the 1 over the denominator 3.

$$\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$$

Colleen drank $\frac{1}{3}$ of a glass more than Billy did.

Look at the examples below. Tell how the answers were found.

B $\frac{3}{5} - \frac{1}{5} = \frac{2}{5}$ C $\frac{5}{7} - \frac{1}{7} = \frac{4}{7}$

D $\frac{5}{13} - \frac{1}{13} = \frac{4}{13}$

E $\frac{5}{12} - \frac{1}{12} = \frac{4}{12}$ or $\frac{1}{3}$

F $\frac{3}{17} - \frac{3}{17} = \frac{0}{17}$ or 0

G $\frac{7}{9} - \frac{4}{9} = \frac{3}{9}$ or $\frac{1}{3}$

Practice in subtracting fractions. Be sure the answers are in their simplest form.

$$\begin{array}{rrrrrrr}
\frac{7}{8} & \frac{1}{4} & \frac{5}{10} & \frac{7}{12} & \frac{8}{9} & \frac{3}{5} & \frac{3}{8} \\
\frac{3}{8} & \frac{1}{4} & \frac{1}{10} & \frac{5}{12} & \frac{2}{9} & \frac{3}{5} & \frac{1}{8} \\
\hline
\end{array}$$

SUBTRACTING FRACTIONS WITH DIFFERENT DENOMINATORS

Example A shows what we must do to subtract $\frac{1}{6}$ from $\frac{1}{3}$.

$$\begin{array}{lrcr}
\text{A} & \frac{1}{3} & = & \frac{2}{6} \\
 & \frac{1}{6} & = & \frac{1}{6} \\
\cline{4-4}
 & & & \frac{1}{6}
\end{array}$$

First $\frac{1}{3}$ was changed to sixths.
$\frac{1}{6}$ was copied under $\frac{2}{6}$.
How was the numerator in the sum found?
Why was 6 used for the denominator?

Look at Example B.

$$\begin{array}{lrcrcl}
\text{B} & \frac{5}{6} & = & \frac{5}{6} & & \\
 & \frac{1}{2} & = & \frac{3}{6} & & \\
\cline{2-2} \cline{4-4}
 & & & \frac{2}{6} & = & \frac{1}{3}
\end{array}$$

Why was $\frac{3}{6}$ written after $\frac{1}{2}$?
How was the 2 in the $\frac{2}{6}$ found?
How do we change $\frac{2}{6}$ to $\frac{1}{3}$?
Why do we change $\frac{2}{6}$ to $\frac{1}{3}$?

We cannot subtract one fraction from another fraction until they have the same denominator.

Study the examples below until you think you understand how to subtract in each one. Be prepared to explain all the work in each example.

$$\begin{array}{lrcl}
\text{C} & \frac{5}{6} & = & \frac{5}{6} \\
 & \frac{1}{3} & = & \frac{2}{6} \\
\cline{4-4}
 & & & \frac{3}{6} \text{ or } \frac{1}{2}
\end{array}
\qquad
\begin{array}{lrcl}
\text{D} & \frac{5}{8} & = & \frac{5}{8} \\
 & \frac{1}{2} & = & \frac{4}{8} \\
\cline{4-4}
 & & & \frac{1}{8}
\end{array}$$

$$\begin{array}{lrcl}
\text{E} & \frac{1}{2} & = & \frac{2}{4} \\
 & \frac{1}{4} & = & \frac{1}{4} \\
\cline{4-4}
 & & & \frac{1}{4}
\end{array}
\qquad
\begin{array}{lrcl}
\text{F} & \frac{1}{4} & = & \frac{3}{12} \\
 & \frac{1}{12} & = & \frac{1}{12} \\
\cline{4-4}
 & & & \frac{2}{12} \text{ or } \frac{1}{6}
\end{array}$$

PRACTICE IN SUBTRACTING FRACTIONS

Be sure that all your answers are in simplest form.

$$\begin{array}{rrrrrrr}
\frac{11}{12} & \frac{1}{2} & \frac{3}{4} & \frac{3}{4} & \frac{1}{4} & \frac{1}{2} & \frac{2}{3} \\
\frac{1}{4} & \frac{3}{10} & \frac{1}{3} & \frac{3}{16} & \frac{1}{8} & \frac{1}{8} & \frac{7}{12} \\
\hline
\end{array}$$

Subtracting a Whole Number from a Mixed Number

Mary was hunting some goods for a doll's dress. She found a piece of silk $39\frac{1}{2}$ inches long. She used just 34 inches to make the dress. How much did she have left?

Example A shows the answer.

$$\begin{array}{lrl}
\text{A} & 39\frac{1}{2} & \text{in.} \\
 & 34 & \text{in.} \\
\cline{2-3}
 & 5\frac{1}{2} & \text{in.}
\end{array}$$

In Example A notice the fraction is in a separate column. There is nothing to subtract from $\frac{1}{2}$; so $\frac{1}{2}$ is written in the answer. 39 − 34 = 5.

Mary had $5\frac{1}{2}$ in. of silk left.

Subtract in each of these examples:

$$\begin{array}{rrrrrr}
4\frac{1}{3} & 17\frac{3}{8} & 8\frac{3}{4} & 6\frac{1}{2} & 9\frac{7}{16} & \frac{8}{9} \\
2 & 5 & 7 & 4 & 8 & \frac{5}{9} \\
\hline
\end{array}$$

CHANGING TWO FRACTIONS IN SUBTRACTION

Example A shows how to change two fractions in subtraction.

$$\begin{array}{lrcr}
\text{A} & \frac{1}{2} & = & \frac{5}{10} \\
 & \frac{1}{5} & = & \frac{2}{10} \\
\cline{4-4}
 & & & \frac{3}{10}
\end{array}$$

The fractions must have the same denominators before we can subtract.

Why can we not use 5 as the denominator?

We use 10 as the denominator because 5 × 2 = 10

How do we change $\frac{1}{2}$ to $\frac{5}{10}$? $\frac{1}{5}$ to $\frac{2}{10}$?

How do we get the 3 and the 10 in the answer?

Find the difference in each of the examples below:

$$\begin{array}{rrrrrr}
\frac{2}{3} & \frac{3}{4} & \frac{2}{3} & \frac{5}{7} & \frac{4}{5} & \frac{1}{2} \\
\frac{1}{2} & \frac{1}{3} & \frac{1}{10} & \frac{1}{2} & \frac{1}{3} & \frac{2}{9} \\
\hline
\end{array}$$

Subtracting Proper Fractions from Mixed Numbers

Example A shows how to subtract a proper fraction from a mixed number.

$$\begin{array}{lrcr}
\text{A} & 1\frac{2}{3} & = & 1\frac{4}{6} \\
 & \frac{1}{2} & = & \frac{3}{6} \\
\cline{4-4}
 & & & 1\frac{1}{6}
\end{array}$$

We subtract in the fraction column first.

We cannot subtract until the denominators are alike.

How do we get the $\frac{4}{6}$? the $\frac{3}{6}$?

How do we get the answer $1\frac{1}{6}$?

Be sure to change your answers to simplest form in the examples below:

$$\begin{array}{rrrrrr}
3\frac{5}{9} & 2\frac{1}{2} & 9\frac{1}{2} & 8\frac{3}{4} & 7\frac{3}{8} & 3\frac{3}{4} \\
\frac{1}{9} & \frac{1}{3} & \frac{1}{5} & \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \\
\hline
\end{array}$$

Subtracting Fractions from Whole Numbers

Example A shows how to subtract $\frac{1}{2}$ from 4.

$$\begin{array}{lrcr}
\text{A} & 4 & = & 3\frac{2}{2} \\
 & \frac{1}{2} & = & \frac{1}{2} \\
\cline{2-2} \cline{4-4}
 & & & 3\frac{1}{2}
\end{array}$$

Since we must have a fraction from which to subtract $\frac{1}{2}$, we change 4 to $3\frac{2}{2}$. $\frac{2}{2}$ and $\frac{1}{2}$ have the same denominator so we can subtract.

What is the answer?

Example B shows how to subtract $\frac{1}{4}$ from 3.

$$\begin{array}{lrcr}
\text{B} & 3 & = & 2\frac{4}{4} \\
 & \frac{1}{4} & = & \frac{1}{4} \\
\cline{4-4}
 & & & 2\frac{3}{4}
\end{array}$$

We must change 3 to $2\frac{4}{4}$.
How do we know $2\frac{4}{4}$ equals 3?
How do we get the $2\frac{3}{4}$ in the answer?

How must you change the upper numbers in each of these examples before you can subtract?

$$\begin{array}{cccccc} 3 & 7 & 8 & 9 & 6 & 9 \\ \underline{\tfrac{1}{4}} & \underline{\tfrac{2}{3}} & \underline{\tfrac{1}{2}} & \underline{\tfrac{3}{5}} & \underline{\tfrac{1}{7}} & \underline{\tfrac{1}{3}} \end{array}$$

Subtracting Fractions from Mixed Numbers

Study the two subtraction examples below:

$$\begin{array}{lrcrcr} & & \text{Step 1} & & \text{Step 2} & \\ \text{A} & 1\tfrac{1}{4} & = & 1\tfrac{1}{4} & = & \tfrac{5}{4} \\ & \tfrac{1}{2} & = & \tfrac{2}{4} & = & \underline{\tfrac{2}{4}} \\ & & & & & \tfrac{3}{4} \end{array} \qquad \begin{array}{lrcrcr} & & \text{Step 1} & & \text{Step 2} & \\ \text{B} & 1\tfrac{1}{6} & = & 1\tfrac{1}{6} & = & \tfrac{7}{6} \\ & \tfrac{1}{3} & = & \tfrac{2}{6} & = & \underline{\tfrac{2}{6}} \\ & & & & & \tfrac{5}{6} \end{array}$$

In Example A, Step 1 shows how we change the example so that both denominators are alike.

We cannot subtract $\tfrac{2}{4}$ from $\tfrac{1}{4}$; so we must do the work in Step 2.

Look at Example B. What is done in Step 1?

Why is $1\tfrac{1}{6}$ changed to $\tfrac{7}{6}$ in Step 2?

Find the answer for each example in the row below.

$$\begin{array}{ccccc} 1\tfrac{2}{5} & 1\tfrac{2}{5} & 1\tfrac{1}{2} & 1\tfrac{1}{16} & 1\tfrac{1}{10} \\ \underline{\tfrac{3}{5}} & \underline{\tfrac{1}{3}} & \underline{\tfrac{7}{8}} & \underline{\tfrac{1}{4}} & \underline{\tfrac{3}{5}} \end{array}$$

Now study the subtraction work in Example C below:

$$\begin{array}{lrcr} & & \text{Step 1} & \\ \text{C} & 10\tfrac{1}{3} & = & 9\tfrac{4}{3} \\ & \tfrac{2}{3} & = & \underline{\tfrac{2}{3}} \\ & & & 9\tfrac{2}{3} \end{array} \qquad \begin{array}{lrcrcr} & & \text{Step 1} & & \text{Step 2} & \\ \text{D} & 3\tfrac{1}{4} & = & 3\tfrac{2}{8} & = & 2\tfrac{10}{8} \\ & \tfrac{3}{8} & = & \tfrac{3}{8} & = & \underline{\tfrac{3}{8}} \\ & & & & & 2\tfrac{7}{8} \end{array}$$

$$\begin{array}{lrcrcr} & & \text{Step 1} & & \text{Step 2} & \\ \text{E} & 3\tfrac{1}{5} & = & 3\tfrac{3}{15} & = & 2\tfrac{18}{15} \\ & \tfrac{1}{3} & = & \tfrac{5}{15} & = & \underline{\tfrac{5}{15}} \\ & & & & & 2\tfrac{13}{15} \end{array}$$

In Example C $10\tfrac{1}{3}$ is changed to $9\tfrac{4}{3}$. We know $10 = 9\tfrac{3}{3}$; so $10\tfrac{1}{3} = 9\tfrac{4}{3}$

Why do we change $10\tfrac{1}{3}$ to $9\tfrac{4}{3}$?

We now subtract $\tfrac{2}{3}$ from $\tfrac{4}{3}$. Why is 9 in the answer?

In Example D, Step 1, what change was made? Why?

Why was $3\tfrac{2}{8}$ changed to $2\tfrac{10}{8}$ in Step 2?

How do you know that $3\tfrac{2}{8} = 2\tfrac{10}{8}$?

In Example E, how was $2\tfrac{18}{15}$ found?

Copy and work the subtraction examples in the row below.

$$\begin{array}{cccccc} 5\tfrac{3}{16} & 7\tfrac{1}{2} & 9\tfrac{1}{17} & 10\tfrac{1}{5} & 19\tfrac{1}{9} & 5\tfrac{1}{10} \\ \underline{\tfrac{1}{2}} & \underline{\tfrac{3}{5}} & \underline{\tfrac{14}{17}} & \underline{\tfrac{3}{4}} & \underline{\tfrac{1}{3}} & \underline{\tfrac{1}{7}} \end{array}$$

Subtract in the examples below. Be sure your answers are in simplest form.

$$\begin{array}{cccccc} 1\tfrac{2}{5} & 8\tfrac{1}{12} & 7\tfrac{1}{5} & 1\tfrac{1}{10} & 13\tfrac{1}{5} & 1\tfrac{1}{10} \\ \underline{\tfrac{5}{6}} & \underline{\tfrac{1}{6}} & \underline{\tfrac{3}{5}} & \underline{\tfrac{7}{10}} & \underline{\tfrac{1}{4}} & \underline{\tfrac{1}{2}} \end{array}$$

SUBTRACTION USING SMALL COMMON DENOMINATORS

$$\begin{array}{lrcr} \text{A} & 3\tfrac{1}{4} & = & 3\tfrac{3}{12} \\ & \underline{\tfrac{1}{6}} & = & \underline{\tfrac{2}{12}} \\ & & & 3\tfrac{1}{12} \end{array}$$

In Example A why can we not use 6 for the denominator when we subtract?

We can divide both 6 and 4 by ———; so we know that the denominator to use is smaller than 6 × 4. 12 is a smaller common denominator.

Can 2 × 6 or 12 be divided by 4?

What is the answer for the problem?

Study the examples below until you think you know how to do them.

$$\begin{array}{lrcr} \text{B} & \tfrac{3}{8} & = & \tfrac{9}{24} \\ & \underline{\tfrac{1}{6}} & = & \underline{\tfrac{4}{24}} \\ & & & \tfrac{5}{24} \end{array} \qquad \begin{array}{lrcl} \text{C} & 12\tfrac{3}{6} & = & 12\tfrac{15}{30} \\ & \underline{\tfrac{3}{10}} & = & \underline{\tfrac{9}{30}} \\ & & & 12\tfrac{6}{30} \text{ or } 12\tfrac{1}{5} \end{array}$$

$$\begin{array}{lrcl} \text{D} & \tfrac{7}{10} & = & \tfrac{21}{30} \\ & \underline{\tfrac{1}{6}} & = & \underline{\tfrac{5}{30}} \\ & & & \tfrac{16}{30} \text{ or } \tfrac{8}{15} \end{array}$$

Copy them without the work. Close your book and subtract. Now compare with the book.

Subtract in the examples below.

$$\begin{array}{ccccccc} \tfrac{5}{8} & \tfrac{3}{4} & 15\tfrac{1}{6} & 4\tfrac{1}{4} & 7\tfrac{7}{10} & \tfrac{5}{6} & 20\tfrac{1}{8} \\ \underline{\tfrac{1}{6}} & \underline{\tfrac{1}{6}} & \underline{\tfrac{2}{15}} & \underline{\tfrac{3}{10}} & \underline{\tfrac{1}{4}} & \underline{\tfrac{2}{9}} & \underline{\tfrac{3}{10}} \end{array}$$

Subtracting Mixed Numbers

$$\begin{array}{lrcr} \text{A} & 52\tfrac{3}{4} & = & 52\tfrac{6}{8} \\ & \underline{12\tfrac{1}{8}} & = & \underline{12\tfrac{1}{8}} \\ & & & 40\tfrac{5}{8} \end{array}$$

Note that the fractions are in a separate column.

Why was $52\tfrac{3}{4}$ changed to $52\tfrac{6}{8}$?

How do we get the $40\tfrac{5}{8}$ in the answer?

Look at Examples B, C, D and E. Copy the examples without the work and subtract. Correct any mistakes you make.

$$\begin{array}{lr} \text{B} & 3\tfrac{4}{5} \\ & \underline{2\tfrac{1}{5}} \\ & 1\tfrac{3}{5} \end{array} \qquad \begin{array}{lrcl} \text{C} & 10\tfrac{3}{4} & & \\ & \underline{7\tfrac{1}{4}} & & \\ & 3\tfrac{2}{4} & = & 3\tfrac{1}{2} \end{array}$$

$$\begin{array}{lrcr} \text{D} & 8\tfrac{2}{3} & = & 8\tfrac{8}{12} \\ & \underline{5\tfrac{1}{4}} & = & \underline{5\tfrac{3}{12}} \\ & & & 3\tfrac{5}{12} \end{array} \qquad \begin{array}{lrcr} \text{E} & 14\tfrac{1}{4} & = & 14\tfrac{3}{12} \\ & \underline{4\tfrac{1}{6}} & = & \underline{4\tfrac{2}{12}} \\ & & & 10\tfrac{1}{12} \end{array}$$

Now find the answers to these subtraction examples.

$$\begin{array}{cccccc} 15\tfrac{5}{9} & 8\tfrac{5}{6} & 9\tfrac{1}{2} & 9\tfrac{2}{3} & 15\tfrac{5}{12} & 12\tfrac{3}{8} \\ \underline{5\tfrac{2}{9}} & \underline{4\tfrac{1}{8}} & \underline{6\tfrac{1}{4}} & \underline{9\tfrac{2}{5}} & \underline{12\tfrac{1}{8}} & \underline{11\tfrac{1}{3}} \end{array}$$

Study these four subtraction examples until you think you know how to do them. Copy them without the work. Close the book and find the differences.

$$\begin{array}{lr} \text{F} & 2\tfrac{1}{5} \\ & \underline{1\tfrac{1}{5}} \\ & 1 \end{array} \qquad \begin{array}{lrcl} \text{G} & 19\tfrac{7}{10} & = & 19\tfrac{21}{30} \\ & 9\tfrac{1}{6} & = & \underline{9\tfrac{5}{30}} \\ & & & 10\tfrac{16}{30} \text{ or } \tfrac{8}{15} \end{array}$$

$$\begin{array}{lrcl} \text{H} & 18\tfrac{3}{4} & = & 18\tfrac{9}{12} \\ & 12\tfrac{1}{12} & = & \underline{12\tfrac{1}{12}} \\ & & & 6\tfrac{8}{12} \text{ or } 6\tfrac{2}{3} \end{array} \qquad \begin{array}{lrcr} \text{I} & 9\tfrac{3}{4} & = & 9\tfrac{3}{4} \\ & 3\tfrac{1}{2} & = & \underline{3\tfrac{2}{4}} \\ & & & 6\tfrac{1}{4} \end{array}$$

Subtract in each example below.

$$\begin{array}{cccc} 15\tfrac{1}{4} & 22\tfrac{1}{2} & 39\tfrac{2}{3} & 14\tfrac{3}{4} \\ \underline{5\tfrac{1}{12}} & \underline{12\tfrac{1}{3}} & \underline{19\tfrac{3}{5}} & \underline{4\tfrac{1}{2}} \end{array}$$

Copy the four examples below without the work. Then subtract with your book closed.

$$\begin{array}{lrcr} \text{J} & 2\tfrac{3}{4} & = & 2\tfrac{3}{4} \\ & 1\tfrac{1}{2} & = & \underline{1\tfrac{2}{4}} \\ & & & 1\tfrac{1}{4} \end{array} \qquad \begin{array}{lrcr} \text{K} & 3\tfrac{1}{2} & = & 3\tfrac{3}{6} \\ & 2\tfrac{1}{3} & = & \underline{2\tfrac{2}{6}} \\ & & & 1\tfrac{1}{6} \end{array}$$

$$\begin{array}{lrcr} \text{L} & 4\tfrac{5}{6} & = & 4\tfrac{10}{12} \\ & 1\tfrac{3}{4} & = & \underline{1\tfrac{9}{12}} \\ & & & 3\tfrac{1}{12} \end{array} \qquad \begin{array}{lr} \text{M} & 3\tfrac{5}{6} \\ & \underline{1\tfrac{4}{6}} \\ & 2\tfrac{1}{6} \end{array}$$

Subtract in each example below.

$$\begin{array}{cccc} 9\tfrac{7}{15} & 3\tfrac{1}{3} & 3\tfrac{1}{2} & 10\tfrac{2}{3} \\ \underline{3\tfrac{4}{15}} & \underline{1\tfrac{1}{4}} & \underline{2\tfrac{1}{3}} & \underline{4\tfrac{3}{8}} \end{array}$$

Copy the four examples below without the work.

$$\begin{array}{ll} \text{N} & 7\tfrac{7}{8} \\ & \underline{5\tfrac{3}{8}} \\ & 2\tfrac{4}{8} \text{ or } 2\tfrac{1}{2} \end{array} \qquad \begin{array}{lrcl} \text{O} & 8\tfrac{7}{10} & = & 8\tfrac{7}{10} \\ & 6\tfrac{1}{5} & = & \underline{6\tfrac{2}{10}} \\ & & & 2\tfrac{5}{10} \text{ or } 2\tfrac{1}{2} \end{array}$$

$$\begin{array}{lrcl} \text{P} & 5\tfrac{5}{6} & = & 5\tfrac{5}{6} \\ & 2\tfrac{1}{3} & = & \underline{2\tfrac{2}{6}} \\ & & & 3\tfrac{3}{6} \text{ or } 3\tfrac{1}{2} \end{array} \qquad \begin{array}{lc} \text{Q} & 14\tfrac{2}{3} \\ & \underline{14\tfrac{2}{3}} \\ & 0 \end{array}$$

Subtract in the following examples.

$$\begin{array}{cccc} 11\tfrac{1}{4} & 6\tfrac{13}{15} & 9\tfrac{7}{10} & 13\tfrac{2}{3} \\ \underline{11\tfrac{1}{4}} & \underline{4\tfrac{1}{3}} & \underline{7\tfrac{3}{5}} & \underline{4\tfrac{3}{10}} \end{array}$$

Subtracting More Difficult Mixed Numbers

Example A shows how to subtract a mixed number from a mixed number.

$$\begin{array}{lrcrcr} & & \text{Step 1} & & \text{Step 2} & \\ \text{A} & 4\tfrac{1}{3} & = & 4\tfrac{10}{30} & = & 3\tfrac{40}{30} \\ & 1\tfrac{7}{10} & = & 1\tfrac{21}{30} & = & \underline{1\tfrac{21}{30}} \\ & & & & & 2\tfrac{19}{30} \end{array}$$

Study the work in Step 1 until you can explain why $4\tfrac{10}{30}$ is changed to $3\tfrac{40}{30}$ in Step 2.

Why is there only one step in getting ready to subtract in Example B?

$$\begin{array}{lrcr} \text{B} & 85\tfrac{1}{3} & = & 84\tfrac{4}{3} \\ & 23\tfrac{2}{3} & = & \underline{23\tfrac{2}{3}} \\ & & & 61\tfrac{2}{3} \end{array}$$

Study the examples below until you think you know how to do them. Then copy them without the work and subtract.

$$\begin{array}{lrcrcr} \text{C} & 1\tfrac{1}{10} & = & 1\tfrac{3}{30} & = & \tfrac{33}{30} \\ & \tfrac{8}{15} & = & \tfrac{16}{30} & = & \underline{\tfrac{16}{30}} \\ & & & & & \tfrac{17}{30} \end{array}$$

$$\begin{array}{lrcrcr} \text{D} & 7\tfrac{1}{9} & = & 7\tfrac{2}{18} & = & 6\tfrac{20}{18} \\ & \tfrac{5}{6} & = & \tfrac{15}{18} & = & \underline{\tfrac{15}{18}} \\ & & & & & 6\tfrac{5}{18} \end{array}$$

$$\begin{array}{lrcrcr} \text{E} & 12\tfrac{1}{10} & = & 12\tfrac{3}{30} & = & 11\tfrac{33}{30} \\ & 4\tfrac{5}{6} & = & 4\tfrac{25}{30} & = & \underline{4\tfrac{25}{30}} \\ & & & & & 7\tfrac{8}{30} \end{array}$$

Now subtract in the examples below:

$15\frac{5}{8}$	$1\frac{1}{5}$	$18\frac{2}{3}$	$2\frac{1}{4}$	$8\frac{7}{15}$
$\frac{9}{10}$	$\frac{7}{15}$	$9\frac{3}{4}$	$1\frac{5}{6}$	$7\frac{2}{3}$

Subtracting a mixed number from a whole number.

Example A shows how to subtract a mixed number from a whole number.

$$\text{A}\quad \begin{array}{rcr} 18 & = & 17\frac{3}{3} \\ \underline{5\frac{2}{3}} & = & \underline{5\frac{2}{3}} \\ & & 12\frac{1}{3} \end{array}$$

Before we can subtract $5\frac{2}{3}$ from 18 we must change 18 to $17\frac{3}{3}$.

Now look at Example B.

$$\text{B}\quad \begin{array}{rcr} 9 & = & 8\frac{3}{3} \\ \underline{8\frac{1}{3}} & = & \underline{8\frac{1}{3}} \\ & & \frac{2}{3} \end{array}$$

Why was 9 changed to $8\frac{3}{3}$ before subtracting $8\frac{1}{3}$?
Why is there no whole number at the left of $\frac{2}{3}$?

Now subtract the following examples:

4	9	8	12	11	19
$2\frac{1}{2}$	$3\frac{2}{3}$	$6\frac{5}{6}$	$11\frac{2}{3}$	$2\frac{1}{7}$	$12\frac{3}{4}$

Test in Subtraction of Fractions

If you can subtract correctly in the examples below, you can subtract well enough for all ordinary business needs. Do not look at the answers until you finish the work.

$\frac{8}{15}$	$3\frac{2}{3}$	$6\frac{1}{2}$	$\frac{1}{2}$	$\frac{11}{12}$	$\frac{4}{5}$
$\frac{1}{15}$	3	5	$\frac{1}{4}$	$\frac{4}{15}$	$\frac{7}{15}$
$\frac{7}{15}$	$\frac{2}{3}$	$1\frac{1}{2}$	$\frac{1}{4}$	$\frac{13}{20}$	$\frac{1}{3}$

$\frac{1}{3}$	$5\frac{2}{3}$	4	6	6	$6\frac{1}{8}$
$\frac{4}{15}$	$\frac{2}{3}$	$\frac{7}{15}$	$5\frac{2}{3}$	$1\frac{1}{5}$	$\frac{5}{16}$
$\frac{1}{15}$	5	$3\frac{8}{15}$	$\frac{1}{3}$	$4\frac{4}{5}$	$5\frac{13}{16}$

$10\frac{1}{9}$	$5\frac{3}{4}$	$6\frac{13}{15}$	$6\frac{4}{5}$	$9\frac{1}{2}$	$10\frac{2}{5}$
$\frac{8}{9}$	$5\frac{1}{10}$	$6\frac{1}{3}$	$1\frac{3}{5}$	$3\frac{9}{10}$	$9\frac{4}{5}$
$9\frac{2}{9}$	$\frac{13}{20}$	$\frac{8}{15}$	$5\frac{1}{5}$	$5\frac{3}{5}$	$\frac{3}{5}$

$20\frac{1}{9}$	$9\frac{2}{15}$	$7\frac{1}{16}$	$2\frac{1}{4}$	$1\frac{1}{10}$	$2\frac{11}{12}$
$10\frac{7}{12}$	$7\frac{2}{3}$	$\frac{5}{16}$	$1\frac{1}{3}$	$\frac{1}{4}$	$\frac{3}{4}$
$9\frac{19}{36}$	$1\frac{7}{15}$	$6\frac{3}{4}$	$\frac{11}{12}$	$\frac{17}{20}$	$2\frac{1}{6}$

Essentials of Multiplication of Fractions

Multiplying a Fraction by a Fraction

Example A shows how to multiply $\frac{1}{2} \times \frac{1}{4}$. $\frac{1}{2}$ of $\frac{1}{4}$ means $\frac{1}{2} \times \frac{1}{4}$.

$$\text{A}\quad \tfrac{1}{2} \times \tfrac{1}{4} = \tfrac{1}{8}$$

First multiply the two numerators.
Why is 1 written in the numerator of the answer?
Next multiply the two denominators.
Why is 8 written in the denominator of the answer? $\frac{1}{2} \times \frac{1}{4} = ?$

Study Examples B, C and D below until you know how to do them. Copy the examples without the answers and multiply.

$$\text{B}\quad \tfrac{1}{2} \times \tfrac{1}{5} = \tfrac{1}{10} \qquad \text{C}\quad \tfrac{2}{3} \times \tfrac{2}{5} = \tfrac{4}{15}$$
$$\text{D}\quad \tfrac{1}{3} \times \tfrac{2}{3} = \tfrac{2}{9}$$

When we multiply two fractions, how do we get the numerator in the answer? How do we get the denominator in the answer?

Show by multiplying that $\frac{1}{3} \times \frac{1}{4}$ is the same as $\frac{1}{4} \times \frac{1}{3}$.

PRACTICE IN MULTIPLYING FRACTIONS

$\frac{1}{2} \times \frac{3}{4}$	$\frac{3}{5} \times \frac{3}{4}$	$\frac{1}{2} \times \frac{1}{12}$
$\frac{3}{7} \times \frac{1}{2}$	$\frac{2}{3} \times \frac{1}{7}$	$\frac{2}{3} \times \frac{1}{5}$
$\frac{1}{3} \times \frac{1}{2}$	$\frac{1}{3} \times \frac{2}{5}$	$\frac{1}{16} \times \frac{1}{2}$
$\frac{1}{12} \times \frac{1}{2}$	$\frac{1}{3} \times \frac{4}{5}$	$\frac{1}{4} \times \frac{1}{9}$
$\frac{1}{8} \times \frac{1}{3}$	$\frac{2}{3} \times \frac{2}{5}$	$\frac{1}{6} \times \frac{1}{7}$

A SHORT CUT IN MULTIPLYING FRACTIONS

Look at Example A.

$$\text{A}\quad \frac{2}{3} \times \frac{3}{5} = \frac{6}{15} = \frac{2}{5} \qquad \text{B}\quad \frac{2}{\underset{1}{\cancel{3}}} \times \frac{\overset{1}{\cancel{3}}}{5} = \frac{2}{5}$$

How did we get the 6 in $\frac{6}{15}$ in Example A?
How did we get the 15 in $\frac{6}{15}$?
What did we divide both the 6 and the 15 by to get $\frac{2}{5}$?
Now study Example B.
Both the 3 in the denominator of $\frac{2}{3}$ and the 3 in the numerator of $\frac{3}{5}$ can be divided by 3. So we crossed out the 3 in $\frac{3}{5}$ and wrote 1 above it. This means we divided each of these numbers by 3.
Now we multiply 2 by the new numerator, 1, and write 2 as the numerator of the answer.
Then we multiply the new denominator, 1, by 5 and write 5 in the answer. Did we get the same answer both times?

$$\text{C}\quad \frac{2}{\underset{1}{\cancel{3}}} \times \frac{\overset{2}{\cancel{6}}}{7} = \frac{4}{7}$$

In Example C the 3 in $\frac{2}{3}$ and the 6 in $\frac{6}{7}$ were both divided by ———.
6 is crossed out and 2 put above it, because 6 ÷ 3 = 2.
3 is crossed out and 1 put below it, because 3 ÷ 3 = 1.
When we use this short cut we must always divide a numerator and a denominator by the same number. This short cut is called canceling.

Copy the examples below, which can be worked by the short cut. Multiply in each one you copied.

$\frac{2}{3} \times \frac{9}{11}$	$\frac{1}{2} \times \frac{2}{5}$	$\frac{7}{10} \times \frac{5}{8}$
$\frac{2}{5} \times \frac{1}{2}$	$\frac{1}{6} \times \frac{9}{17}$	$\frac{2}{3} \times \frac{6}{7}$
$\frac{3}{4} \times \frac{8}{11}$	$\frac{4}{7} \times \frac{1}{8}$	

Multiplying Fractions and Whole Numbers

Example A shows how to multiply 4 by $\frac{1}{8}$. 4 is the same as $\frac{4}{1}$.

$$\text{A}\quad \frac{1}{\underset{2}{\cancel{8}}} \times \frac{\overset{1}{\cancel{4}}}{1} = \frac{1}{2}$$

By what number did we divide both the 4 and the 8?
Why did we cross out the 8 and write 2?
Why did we cross out the 4 and write 1?
How did we get the 1 in $\frac{1}{2}$? How did we get the 2 in $\frac{1}{2}$?

$$\text{B}\quad \overset{4}{\cancel{8}} \times \frac{1}{\underset{1}{\cancel{2}}} = \frac{4}{1} \text{ or } 4$$

In Example B we may think of 8 as 8 over 1, or $\frac{8}{1}$, but it is not necessary to write the 1 under the 8.
The 8 and the 2 are both divided by ———?
How do we get the numerator of $\frac{4}{1}$? To get the denominator in $\frac{4}{1}$ we multiply the one in $\frac{8}{1}$ by 1; $\frac{4}{1}$ is the same as 4.

$$\text{C}\quad 3 \times \frac{2}{7} = \frac{6}{7}$$

In Example C we think of 3 as $\frac{3}{?}$.
Why can we not use the short cut?
How do we get the 6 in the answer?
How do we get the 7 in the answer?
Is $\frac{6}{7}$ in its simplest form?

Multiply in each example below.

$\frac{1}{6} \times 8$	$16 \times \frac{1}{8}$	$3 \times \frac{1}{8}$	$7 \times \frac{2}{15}$
$2 \times \frac{3}{5}$	$3 \times \frac{4}{5}$	$\frac{1}{16} \times 5$	$9 \times \frac{2}{5}$
$\frac{1}{15} \times 5$	$4 \times \frac{7}{9}$	$3 \times \frac{2}{7}$	$10 \times \frac{1}{5}$

MIXED NUMBER ANSWERS

$$\text{A}\quad \overset{3}{\cancel{9}} \times \frac{5}{\underset{2}{\cancel{6}}} = \frac{15}{2} = 7\tfrac{1}{2}$$

$$\text{B}\quad 7 \times \frac{3}{5} = \frac{21}{5} = 4\tfrac{1}{5}$$

$$\text{C}\quad \frac{3}{\underset{2}{\cancel{8}}} \times \overset{3}{\cancel{12}} = \frac{9}{2} = 4\tfrac{1}{2}$$

How do we get $\frac{15}{2}$ in the answer in Example A? How do we get the $7\frac{1}{2}$?
Study Examples A, B and C. Then copy them without work and multiply.

Multiply in the examples below. Be sure to change your answers to the simplest forms.

$4 \times \frac{2}{3}$	$6 \times \frac{4}{9}$	$8 \times \frac{7}{15}$	$10 \times \frac{2}{3}$
$\frac{5}{6} \times 5$	$7 \times \frac{3}{8}$	$3 \times \frac{3}{4}$	$7 \times \frac{1}{2}$

$7 \times \frac{4}{9}$ $15 \times \frac{7}{10}$ $5 \times \frac{4}{9}$ $4 \times \frac{2}{9}$

USING THE SHORT CUT TWICE IN AN EXAMPLE

A

$$\frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{4}}} \times \frac{\overset{2}{\cancel{8}}}{\underset{5}{\cancel{15}}} = \frac{2}{5}$$

In Example A the short cut is used twice. Both 3 and 15 were divided by ———.

Why was 1 written above 3?

Why was 5 written below 15?

8 and 4 were both divided by ———.

What was done when 8 and 4 were both divided by 4?

What numbers were multiplied to get the 2 in $\frac{2}{5}$?

Is $\frac{2}{5}$ in simplest form?

When we divide both a numerator and a denominator by the same number, we say we cancel.

In which of the examples below can you cancel twice? In which can you cancel once? In which can you not cancel?

$\frac{3}{10} \times \frac{8}{15}$ $\frac{5}{9} \times \frac{3}{10}$ $\frac{3}{5} \times \frac{5}{8}$ $\frac{12}{13} \times \frac{1}{6}$

$\frac{1}{2} \times \frac{7}{9}$ $\frac{1}{5} \times \frac{7}{10}$ $\frac{3}{5} \times \frac{15}{16}$ $\frac{3}{4} \times \frac{5}{8}$

$\frac{2}{3} \times \frac{3}{8}$ $\frac{1}{3} \times \frac{4}{5}$

Multiplying with Mixed Numbers

A Step 1 Step 2

$$\frac{1}{4} \times 2\frac{2}{3} \qquad \frac{1}{4} \times \frac{8}{3} \qquad \frac{1}{\underset{1}{\cancel{4}}} \times \frac{\overset{2}{\cancel{8}}}{3} = \frac{2}{3}$$

In Step 1 the example is rewritten, $2\frac{2}{3}$ is changed to an improper fraction.

We think: "There are $\frac{3}{3}$ in 1; there are $\frac{6}{3}$ in 2; $\frac{6}{3} + \frac{2}{3} = \frac{8}{3}$."

What canceling is done in Step 2?

How is $\frac{2}{3}$ found?

Be sure to change a mixed number to an improper fraction before you multiply.

Change these mixed numbers to improper fractions.

$1\frac{1}{4}$ $4\frac{3}{4}$ $7\frac{1}{3}$ $1\frac{1}{8}$ $3\frac{1}{7}$

$3\frac{2}{3}$ $2\frac{5}{16}$ $9\frac{2}{5}$ $2\frac{1}{9}$ $5\frac{7}{12}$

Study the 2 examples below until you think you know how they are worked.

B

$$\frac{7}{12} \times 2\frac{1}{14} = \frac{\overset{1}{\cancel{7}}}{12} \times \frac{29}{\underset{2}{\cancel{14}}} = \frac{29}{24} = 1\frac{5}{24}$$

C

$$1\frac{4}{5} \times \frac{5}{8} = \frac{9}{\underset{1}{\cancel{5}}} \times \frac{\overset{1}{\cancel{5}}}{8} = \frac{9}{8} = 1\frac{1}{8}$$

Now multiply in the examples below, change mixed numbers to improper fractions before you multiply. Cancel wherever you can. Change the answers to their simplest forms.

$3\frac{1}{5} \times \frac{1}{4}$ $1\frac{5}{8} \times \frac{1}{4}$ $\frac{1}{10} \times 8\frac{3}{4}$

$\frac{1}{6} \times 1\frac{1}{5}$ $\frac{5}{16} \times 1\frac{1}{5}$ $5 \times \frac{1}{7}$

$\frac{9}{10} \times \frac{8}{15}$ $2\frac{2}{5} \times \frac{3}{8}$ $1\frac{1}{5} \times \frac{5}{9}$

$1\frac{2}{3} \times \frac{3}{5}$ $\frac{3}{4} \times 1\frac{1}{4}$ $\frac{3}{4} \times 1\frac{1}{8}$

Multiplying Whole Numbers and Mixed Numbers

Copy the six examples below and find the answers without looking at the book. Check your answers with the answers given here.

A

$$6\frac{5}{12} \times 4 = \frac{77}{\underset{3}{\cancel{12}}} \times \overset{1}{\cancel{4}} = \frac{77}{3} = 25\frac{2}{3}$$

B

$$10 \times 1\frac{3}{8} = \overset{5}{\cancel{10}} \times \frac{11}{\underset{4}{\cancel{8}}} = \frac{55}{4} = 13\frac{3}{4}$$

C

$$4 \times 1\frac{5}{6} = \overset{2}{\cancel{4}} \times \frac{11}{\underset{3}{\cancel{6}}} = \frac{22}{3} = 7\frac{1}{3}$$

D

$$3 \times 1\frac{1}{12} = \overset{1}{\cancel{3}} \times \frac{13}{\underset{4}{\cancel{12}}} = \frac{13}{4} = 3\frac{1}{4}$$

E

$$7 \times 7\frac{1}{7} = \overset{1}{\cancel{7}} \times \frac{50}{\underset{1}{\cancel{7}}} = 50$$

F

$$6 \times 7\frac{1}{6} = \overset{1}{\cancel{6}} \times \frac{43}{\underset{1}{\cancel{6}}} = 43$$

Now multiply in these examples:

$2\frac{8}{10} \times 5$ $8 \times 2\frac{11}{16}$ $4 \times 6\frac{1}{4}$ $3 \times 2\frac{13}{15}$

$9\frac{1}{2} \times 6$ $3 \times 9\frac{1}{3}$ $6 \times 9\frac{5}{12}$ $6\frac{2}{3} \times 6$

Multiplying Mixed Numbers

A

$$2\frac{2}{5} \times 4\frac{1}{6} = \frac{\overset{2}{\cancel{12}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{5}{\cancel{25}}}{\underset{1}{\cancel{6}}} = 10$$

How did we get the $\frac{12}{5}$ in Example A?

How did we get the $\frac{25}{6}$?

By what number did we divide 5 in $\frac{12}{5}$?

By what number did we divide 12 in $\frac{12}{5}$ and 6 in $\frac{25}{6}$? How did we get the 10 in the answer?

Copy the four examples below and find the answers without looking at the book. If you get a wrong answer, study the work below.

$$1\frac{2}{3} \times 2\frac{1}{3} = \frac{5}{3} \times \frac{7}{3} = \frac{35}{9} = 3\frac{8}{9}$$

$$6\frac{1}{2} \times 7\frac{1}{3} = \frac{13}{\underset{1}{\cancel{2}}} \times \frac{\overset{11}{\cancel{22}}}{3} = \frac{143}{3} = 47\frac{2}{3}$$

$$1\frac{1}{4} \times 9\frac{1}{6} = \frac{5}{4} \times \frac{55}{6} = \frac{275}{24} = 11\frac{11}{24}$$

$$7\frac{4}{5} \times 2\frac{1}{3} = \frac{\overset{13}{\cancel{39}}}{5} \times \frac{7}{\underset{1}{\cancel{3}}} = \frac{91}{5} = 18\frac{1}{5}$$

Find the answers:

$7\frac{1}{12} \times 2\frac{1}{5}$ $8\frac{3}{4} \times 4\frac{2}{5}$ $2\frac{1}{10} \times 8\frac{1}{3}$

$3\frac{2}{3} \times 1\frac{3}{4}$ $2\frac{2}{15} \times 1\frac{1}{8}$ $1\frac{1}{8} \times 9\frac{1}{12}$

$3\frac{5}{6} \times 11\frac{1}{6}$ $8\frac{1}{6} \times 9\frac{2}{3}$

MULTIPLYING WITH LARGE MIXED NUMBERS

Example A shows the way you already know to multiply 24 by $12\frac{1}{2}$.

A

$$24 \times 12\frac{1}{2} = \overset{12}{\cancel{24}} \times \frac{25}{\cancel{2}} = 300$$

Example B shows an easier way.

B

$$\begin{array}{r} 24 \\ 12\frac{1}{2} \\ \hline 48 \\ 24 \\ \hline 288 \\ 12 \\ \hline 300 \end{array}$$

First we multiply the 24 by the 2 in 12; then by the 1 in 12.

Then we add to get 288.

Next we multiply 24 by $\frac{1}{2}$.

$\frac{1}{2} \times 24 = 12$.

Then we add the 12 to 288.

Copy examples C, D, E and F, without the work and multiply. Compare with the answers below. Are your answers correct?

$$\begin{array}{r} \text{C} \\ 47 \\ 15\frac{1}{2} \\ \hline 235 \\ 47 \\ \hline 705 \\ 23\frac{1}{2} \\ \hline 728\frac{1}{2} \end{array} \qquad \begin{array}{r} \text{D} \\ 630 \\ 21\frac{2}{3} \\ \hline 630 \\ 1260 \\ \hline 13230 \\ 420 \\ \hline 13650 \end{array} \qquad \begin{array}{r} \text{E} \\ 22\frac{3}{4} \\ 8 \\ \hline 176 \\ 6 \\ \hline 182 \end{array} \qquad \begin{array}{r} \text{F} \\ 175\frac{2}{3} \\ 16 \\ \hline 1050 \\ 175 \\ \hline 2800 \\ 10\frac{2}{3} \\ \hline 2810\frac{2}{3} \end{array}$$

Multiply in each of the problems below.

$$\begin{array}{r} 928\frac{1}{2} \\ 5 \\ \hline \end{array} \qquad \begin{array}{r} 729 \\ 368\frac{1}{3} \\ \hline \end{array} \qquad \begin{array}{r} 58\frac{4}{9} \\ 36 \\ \hline \end{array} \qquad \begin{array}{r} 25\frac{3}{4} \\ 12 \\ \hline \end{array} \qquad \begin{array}{r} 9671\frac{1}{3} \\ 28 \\ \hline \end{array}$$

Test

If you can multiply correctly and readily in the problems below, you can multiply fractions well enough for all ordinary business needs.

$\frac{1}{3} \times \frac{1}{6} = \frac{1}{18}$

$\frac{4}{5} \times \frac{3}{8} = \frac{3}{10}$

$\frac{1}{12} \times 3 = \frac{1}{4}$

$\frac{4}{5} \times \frac{5}{8} = \frac{1}{2}$

$1\frac{1}{15} \times \frac{3}{10} = \frac{8}{25}$

$3 \times 3\frac{1}{3} = 10$

$4\frac{1}{4} \times 1\frac{1}{4} = 5\frac{5}{16}$

$\frac{5}{8} \times \frac{5}{14} = \frac{25}{112}$

$\frac{2}{9} \times \frac{5}{12} = \frac{5}{54}$

$\frac{3}{16} \times 8 = 1\frac{1}{2}$

$\frac{2}{9} \times \frac{15}{22} = \frac{5}{33}$

$\frac{3}{8} \times 3\frac{1}{3} = 1\frac{1}{4}$

$5 \times 1\frac{2}{9} = 6\frac{1}{9}$

$7\frac{1}{5} \times 2\frac{11}{12} = 21$

$\frac{1}{7} \times \frac{2}{11} = \frac{2}{77}$

$\frac{2}{15} \times \frac{7}{16} = \frac{7}{120}$

$9 \times \frac{5}{6} = 7\frac{1}{2}$

$\frac{2}{15} \times \frac{3}{4} = \frac{1}{10}$

$1\frac{1}{8} \times \frac{8}{15} = \frac{3}{5}$

$1\frac{13}{16} \times 4 = 7\frac{1}{4}$

$3\frac{1}{9} \times 1\frac{7}{8} = 5\frac{5}{6}$

Essentials of Division of Fractions

Dividing a Fraction by a Fraction

Example A shows how to divide $\frac{1}{4}$ by $\frac{1}{8}$.

A Step 1 Step 2

$$\frac{1}{4} \div \frac{1}{8} \qquad \frac{1}{4} \times \frac{8}{1} \qquad \frac{1}{\cancel{4}} \times \frac{\overset{2}{\cancel{8}}}{1} = \frac{2}{1} \text{ or } 2$$

Which fraction is the divisor?

In Step 1 two changes are made in rewriting the problem. The division sign has been changed to a multiplication sign.

The divisor $\frac{1}{8}$ has been changed to $\frac{8}{1}$.

When we change the divisor, $\frac{1}{8}$, to $\frac{8}{1}$ we *invert* the divisor.

In Step 2, $\frac{1}{4}$ and $\frac{8}{1}$ are multiplied.

What canceling was done? How was the $\frac{2}{1}$ found?

Study the six examples below. Copy them without the work and divide. Now compare with the book.

B
$$\frac{1}{12} \div \frac{2}{3} = \frac{1}{\underset{4}{\cancel{12}}} \times \frac{\overset{1}{\cancel{3}}}{2} = \frac{1}{8}$$

C
$$\frac{7}{12} \div \frac{3}{4} = \frac{7}{\underset{3}{\cancel{12}}} \times \frac{\overset{1}{\cancel{4}}}{3} = \frac{7}{9}$$

D
$$\frac{1}{3} \div \frac{5}{6} = \frac{1}{\underset{1}{\cancel{3}}} \times \frac{\overset{2}{\cancel{6}}}{5} = \frac{2}{5}$$

E
$$\frac{8}{15} \div \frac{2}{3} = \frac{\overset{4}{\cancel{8}}}{\underset{5}{\cancel{15}}} \times \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{2}}} = \frac{4}{5}$$

F
$$\frac{5}{8} \div \frac{11}{12} = \frac{5}{\underset{2}{\cancel{8}}} \times \frac{\overset{3}{\cancel{12}}}{11} = \frac{15}{22}$$

G
$$\frac{7}{12} \div \frac{5}{6} = \frac{7}{\underset{2}{\cancel{12}}} \times \frac{\overset{1}{\cancel{6}}}{5} = \frac{7}{10}$$

Now divide in the examples below. Remember to change the signs and to invert the divisor.

$\frac{2}{3} \div \frac{2}{3}$ $\quad \frac{3}{16} \div \frac{7}{16}$ $\quad \frac{1}{5} \div \frac{5}{7}$

$\frac{3}{5} \div \frac{2}{3}$ $\quad \frac{4}{9} \div \frac{13}{15}$ $\quad \frac{5}{7} \div \frac{5}{6}$

$\frac{7}{15} \div \frac{2}{3}$ $\quad \frac{3}{7} \div \frac{5}{7}$

$\frac{2}{3} \div \frac{5}{6}$ $\quad \frac{1}{5} \div \frac{4}{5}$

Mixed Numbers in Answers

A
$$\frac{3}{8} \div \frac{5}{16} = \frac{3}{\underset{1}{\cancel{8}}} \times \frac{\overset{2}{\cancel{16}}}{5} = \frac{6}{5} = 1\frac{1}{5}$$

Which fraction is the divisor in Example A?

Why is 2 written above 16? 1 below 8?

How are 6 and 5 in the $\frac{6}{5}$ found?

How is $1\frac{1}{5}$ found?

Study the four examples below. Copy them without the work and find the answers.

B
$$\frac{2}{3} \div \frac{7}{15} = \frac{2}{\underset{1}{\cancel{3}}} \times \frac{\overset{5}{\cancel{15}}}{7} = \frac{10}{7} = 1\frac{3}{7}$$

C
$$\frac{15}{16} \div \frac{3}{4} = \frac{\overset{5}{\cancel{15}}}{\underset{4}{\cancel{16}}} \times \frac{\overset{1}{\cancel{4}}}{\cancel{3}} = \frac{5}{4} = 1\frac{1}{4}$$

D
$$\frac{2}{9} \div \frac{1}{15} = \frac{2}{\underset{3}{\cancel{9}}} \times \frac{\overset{5}{\cancel{15}}}{1} = \frac{10}{3} = 3\frac{1}{3}$$

E
$$\frac{1}{2} \div \frac{3}{8} = \frac{1}{\underset{1}{\cancel{2}}} \times \frac{\overset{4}{\cancel{8}}}{3} = \frac{4}{3} = 1\frac{1}{3}$$

Divide in the eight examples below. Remember to change the sign and invert the divisor. Change the answers to their simplest forms.

$\frac{2}{3} \div \frac{5}{9}$ $\quad \frac{9}{16} \div \frac{4}{16}$ $\quad \frac{11}{15} \div \frac{2}{3}$ $\quad \frac{3}{5} \div \frac{2}{5}$

$\frac{3}{4} \div \frac{5}{8}$ $\quad \frac{8}{9} \div \frac{2}{5}$ $\quad \frac{7}{8} \div \frac{3}{4}$ $\quad \frac{9}{10} \div \frac{3}{4}$

Using Divisors with Numerator 1

Study the four examples below. Copy them without the work and divide. Compare your answers with the book.

A
$$\frac{3}{8} \div \frac{1}{4} = \frac{3}{\underset{2}{\cancel{8}}} \times \frac{\cancel{4}}{1} = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

B
$$\frac{1}{7} \div \frac{1}{9} = \frac{1}{7} \times \frac{9}{1} = \frac{9}{7} \text{ or } 1\frac{2}{7}$$

C
$$\frac{3}{4} \div \frac{1}{8} = \frac{3}{\underset{1}{\cancel{4}}} \times \frac{\overset{2}{\cancel{8}}}{1} = \frac{6}{1} \text{ or } 6$$

D
$$\frac{5}{16} \div \frac{1}{4} = \frac{5}{\underset{4}{\cancel{16}}} \times \frac{\overset{1}{\cancel{4}}}{1} = \frac{5}{4} \text{ or } 1\frac{1}{4}$$

Divide in each of the examples below.

$\frac{3}{5} \div \frac{1}{10}$ $\quad \frac{2}{3} \div \frac{1}{6}$ $\quad \frac{5}{12} \div \frac{1}{6}$ $\quad \frac{8}{9} \div \frac{1}{3}$

$\frac{7}{8} \div \frac{1}{4}$ $\quad \frac{3}{16} \div \frac{1}{8}$ $\quad \frac{7}{15} \div \frac{1}{5}$ $\quad \frac{6}{7} \div \frac{1}{14}$

Dividing a Whole Number by a Fraction

Example A shows how to divide 10 by $\frac{2}{5}$.

A
$$10 \div \frac{2}{5} = \frac{\overset{5}{\cancel{10}}}{1} \times \frac{5}{\underset{1}{\cancel{2}}} = \frac{25}{1} \text{ or } 25$$

How is 10 written the second time?

What is done with the divisor?

What is done with the division sign?

How is the 5 above the 10 found?

How is $\frac{25}{1}$ found?

Copy the four examples below without the work. Close the book and divide. We need not write 1 under the number to be divided. Since $\frac{15}{1}$ means the same as 15, we write 15, and so on.

$$15 \div \frac{5}{8} = \overset{3}{\cancel{15}} \times \frac{8}{\underset{1}{\cancel{5}}} = 24$$

$$6 \div \frac{2}{7} = \overset{3}{\cancel{6}} \times \frac{7}{\underset{1}{\cancel{2}}} = 21$$

$$9 \div \frac{3}{4} = \overset{3}{\cancel{9}} \times \frac{4}{\underset{1}{\cancel{3}}} = 12$$

$$12 \div \frac{3}{4} = \overset{4}{\cancel{12}} \times \frac{4}{\cancel{3}} = 16$$

When you divide in each of the examples below think of 3 as $\frac{3}{1}$, 5 as $\frac{5}{1}$, 8 as $\frac{8}{1}$, and so on.

$3 \div \frac{1}{4}$ $\quad 8 \div \frac{6}{7}$ $\quad 12 \div \frac{2}{3}$ $\quad 4 \div \frac{7}{12}$

$5 \div \frac{2}{3}$ $\quad 9 \div \frac{3}{4}$ $\quad 8 \div \frac{1}{2}$ $\quad 3 \div \frac{1}{5}$

Dividing a Proper Fraction by a Whole Number

Example A shows how to divide $\frac{2}{7}$ by 14.

A
$$\frac{2}{7} \div 14 = \frac{\overset{1}{\cancel{2}}}{7} \times \frac{1}{\underset{7}{\cancel{14}}} = \frac{1}{49}$$

The divisor 14 is thought of as $\frac{14}{1}$ before it is inverted.

When $\frac{14}{1}$ is inverted it becomes $\frac{1}{14}$.

How is the answer $\frac{1}{49}$ found?

Study the examples below until you can work them without using the book.

B
$$\frac{3}{4} \div 15 = \frac{\overset{1}{\cancel{3}}}{4} \times \frac{1}{\underset{5}{\cancel{15}}} = \frac{1}{20}$$

C
$$\frac{15}{16} \div 3 = \frac{\overset{5}{\cancel{15}}}{16} \times \frac{1}{\underset{1}{\cancel{3}}} = \frac{5}{16}$$

D

$$\frac{7}{8} \div 5 = \frac{7}{8} \times \frac{1}{5} = \frac{7}{40}$$

E

$$\frac{1}{2} \div 15 = \frac{1}{2} \times \frac{1}{15} = \frac{1}{30}$$

Be careful to invert the divisors and change the signs when you divide in the examples below.

$\frac{2}{3} \div 7$ $\frac{1}{9} \div 6$ $\frac{3}{4} \div 4$ $\frac{5}{9} \div 5$

$\frac{15}{16} \div 2$ $\frac{7}{8} \div 7$ $\frac{7}{12} \div 3$ $\frac{8}{17} \div 2$

Dividing a Mixed Number by a Fraction

Example A shows how to divide $3\frac{1}{2}$ by $\frac{1}{2}$.

A Step 1 Step 2

$$3\frac{1}{2} \div \frac{1}{2} = \frac{7}{2} \times \frac{2}{1} = \frac{7}{\underset{1}{\cancel{2}}} \times \frac{\overset{1}{\cancel{2}}}{1} = 7$$

In Step 1 three changes are made: $3\frac{1}{2}$ is changed to $\frac{7}{2}$; $\frac{1}{2}$ is rewritten as $\frac{2}{1}$. The ÷ becomes ×. What canceling is done in Step 2?

Study the four examples below until you know how to work them.

B

$$3\frac{5}{6} \div \frac{2}{3} = \frac{23}{\underset{2}{\cancel{6}}} \times \frac{\overset{1}{\cancel{3}}}{2} = \frac{23}{4} \text{ or } 5\frac{3}{4}$$

C

$$5\frac{2}{3} \div \frac{5}{9} = \frac{17}{\underset{1}{\cancel{3}}} \times \frac{\overset{3}{\cancel{9}}}{5} = \frac{51}{5} \text{ or } 10\frac{1}{5}$$

D

$$1\frac{3}{4} \div \frac{3}{8} = \frac{7}{\underset{1}{\cancel{4}}} \times \frac{\overset{2}{\cancel{8}}}{3} = \frac{14}{3} \text{ or } 4\frac{2}{3}$$

E

$$10\frac{3}{4} \div \frac{3}{16} = \frac{43}{\underset{1}{\cancel{4}}} \times \frac{\overset{4}{\cancel{16}}}{3} = \frac{172}{3} \text{ or } 57\frac{1}{3}$$

Now divide in the examples below:

$2\frac{13}{17} \div \frac{2}{5}$ $1\frac{7}{10} \div \frac{3}{8}$ $4\frac{1}{2} \div \frac{3}{4}$ $5\frac{2}{3} \div \frac{3}{4}$

$7\frac{2}{3} \div \frac{5}{6}$ $3\frac{3}{8} \div \frac{9}{10}$ $9\frac{1}{9} \div \frac{2}{3}$ $6\frac{5}{8} \div \frac{5}{8}$

Dividing a Mixed Number by a Whole Number

Example A shows how to divide $12\frac{2}{3}$ by 16.

A

$$12\frac{2}{3} \div 16 = \frac{\overset{19}{\cancel{38}}}{3} \times \frac{1}{\underset{8}{\cancel{16}}} = \frac{19}{24}$$

When the example was rewritten, what change was made in the sign? How was $12\frac{2}{3}$ changed? How was 16 changed? How was the 19 above 38 found? How was the 8 below 16 found?

Now look at Examples B and C. Notice the changes made in working each example.

B

$$4\frac{2}{5} \div 11 = \frac{\overset{2}{\cancel{22}}}{5} \times \frac{1}{\underset{1}{\cancel{11}}} = \frac{2}{5}$$

C

$$7\frac{3}{5} \div 4 = \frac{\overset{19}{\cancel{38}}}{5} \times \frac{1}{\underset{2}{\cancel{4}}} = \frac{19}{10} \text{ or } 1\frac{9}{10}$$

Divide in the examples below:

$6\frac{3}{4} \div 3$ $6\frac{4}{5} \div 8$ $3\frac{2}{5} \div 7$ $3\frac{11}{15} \div 6$

$7\frac{1}{5} \div 9$ $5\frac{1}{4} \div 3$ $2\frac{4}{11} \div 2$ $7\frac{1}{2} \div 2$

Dividing a Whole Number by a Mixed Number

Example A shows how to divide 50 by $1\frac{1}{4}$.

A

$$50 \div 1\frac{1}{4} = 50 \div \frac{5}{4} = \overset{10}{\cancel{50}} \times \frac{4}{\underset{1}{\cancel{5}}} = 40$$

What change was made the first time the example was rewritten?

The second time it was rewritten the division sign was changed to ———. The $\frac{5}{4}$ was inverted to $\frac{4}{5}$.

How were the 10 and 1 found? How was 40 found?

When we use a mixed number as a divisor, we first change it to an improper fraction.

Study the four examples below. Copy them without the work and divide.

B

$$4 \div 8\frac{2}{3} = \overset{2}{\cancel{4}} \times \frac{3}{\underset{13}{\cancel{26}}} = \frac{6}{13}$$

C

$$4 \div 2\frac{2}{5} = \overset{1}{\cancel{4}} \times \frac{5}{\underset{3}{\cancel{12}}} = \frac{5}{3} \text{ or } 1\frac{2}{3}$$

D

$$8 \div 9\frac{1}{9} = \overset{4}{\cancel{8}} \times \frac{9}{\underset{41}{\cancel{82}}} = \frac{36}{41}$$

E

$$12 \div 2\frac{3}{4} = 12 \times \frac{4}{11} = \frac{48}{11} \text{ or } 4\frac{4}{11}$$

Find the answers to the following examples.

$15 \div 2\frac{1}{2}$ $4 \div 2\frac{2}{3}$ $12 \div 3\frac{3}{4}$ $5 \div 1\frac{3}{4}$

$6 \div 3\frac{3}{8}$ $4 \div 1\frac{1}{5}$ $8 \div 8\frac{2}{3}$ $16 \div 2\frac{2}{5}$

$9 \div 1\frac{1}{8}$ $7 \div 2\frac{1}{10}$ $6 \div 1\frac{1}{2}$ $10 \div 1\frac{1}{4}$

Dividing a Fraction by a Mixed Number

Example A shows how to divide $\frac{1}{2}$ by $3\frac{1}{4}$.

A $\frac{1}{2} \div 3\frac{1}{4}$

$$\frac{1}{2} \div \frac{13}{4} = \frac{1}{\underset{1}{\cancel{2}}} \times \frac{\overset{2}{\cancel{4}}}{13} = \frac{2}{13}$$

What change was made the first time the example was rewritten?

What two changes were made the second time it was rewritten?

Look at Example B.

B

$$\frac{4}{9} \div 2\frac{8}{15} = \frac{\overset{2}{\cancel{4}}}{\underset{3}{\cancel{9}}} \times \frac{\overset{5}{\cancel{15}}}{\underset{19}{\cancel{38}}} = \frac{10}{57}$$

All changes were made in one step. What were they?

Explain to yourself how the answer was found.

Copy the examples below without the work and divide:

$$\frac{5}{6} \div 1\frac{2}{3} = \frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{6}}} \times \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{5}}} = \frac{1}{2}$$

$$\frac{3}{8} \div 2\frac{1}{16} = \frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{8}}} \times \frac{\overset{2}{\cancel{16}}}{\underset{11}{\cancel{33}}} = \frac{2}{11}$$

$$\frac{4}{5} \div 3\frac{1}{3} = \frac{\overset{2}{\cancel{4}}}{5} \times \frac{3}{\underset{5}{\cancel{10}}} = \frac{6}{25}$$

$$\frac{3}{8} \div 5\frac{1}{4} = \frac{3}{\underset{2}{\cancel{8}}} \times \frac{\overset{1}{\cancel{4}}}{\underset{7}{\cancel{21}}} = \frac{1}{14}$$

Now divide in the examples below.

$\frac{8}{9} \div 2\frac{2}{15}$ $\frac{1}{2} \div 2\frac{1}{3}$ $\frac{15}{16} \div 1\frac{1}{8}$

$\frac{2}{5} \div 2\frac{4}{15}$ $\frac{1}{6} \div 1\frac{5}{12}$ $\frac{11}{12} \div 2\frac{1}{3}$

$\frac{3}{4} \div 1\frac{1}{8}$ $\frac{2}{7} \div 3\frac{1}{2}$ $\frac{8}{9} \div 3\frac{1}{3}$

Dividing a Mixed Number by a Mixed Number

Example A shows how to divide $6\frac{3}{4}$ by $5\frac{2}{5}$.

A

$$6\frac{3}{4} \div 5\frac{2}{5} = \frac{27}{4} \div \frac{27}{5} =$$

$$\frac{\overset{1}{\cancel{27}}}{4} \times \frac{5}{\underset{1}{\cancel{27}}} = \frac{5}{4} \text{ or } 1\frac{1}{4}$$

The example was rewritten with the mixed numbers changed to improper fractions. What changes were made when the example was rewritten the second time? What canceling was done? How was $\frac{5}{4}$ found? How was $1\frac{1}{4}$ found?

Look at Example B.

B

$$2\frac{1}{5} \div 3\frac{1}{2} = \frac{11}{5} \times \frac{2}{7} = \frac{22}{35}$$

How do we get the $\frac{2}{7}$ when the example is rewritten?

Why was no canceling done?

Is $\frac{22}{35}$ in simplest form?

Copy the four examples below without the work and divide.

C

$$1\tfrac{3}{4} \div 3\tfrac{1}{2} = \frac{7}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{7} = \frac{1}{2}$$

D

$$4\tfrac{2}{3} \div 2\tfrac{2}{5} = \frac{\overset{7}{\cancel{14}}}{3} \times \frac{5}{\underset{6}{\cancel{12}}} = \frac{35}{18} \text{ or } 1\tfrac{17}{18}$$

E

$$6\tfrac{2}{5} \div 1\tfrac{1}{15} = \frac{\overset{2}{\cancel{32}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{3}{\cancel{15}}}{\underset{1}{\cancel{16}}} = 6$$

F

$$8\tfrac{2}{3} \div 2\tfrac{2}{5} = \frac{\overset{13}{\cancel{26}}}{3} \times \frac{5}{\underset{6}{\cancel{12}}} = \frac{65}{18} = 3\tfrac{11}{18}$$

Now divide in the examples below:

$2\frac{2}{9} \div 5\frac{1}{3}$ $10\frac{3}{8} \div \frac{9}{10}$

$1\frac{2}{3} \div 1\frac{1}{12}$ $3\frac{3}{4} \div \frac{2}{10}$

$5\frac{5}{6} \div 2\frac{2}{3}$ $5\frac{1}{4} \div 3\frac{1}{3}$

$4\frac{3}{5} \div \frac{1}{10}$ $6\frac{3}{4} \div 2\frac{7}{10}$

Test

If you can work the following examples correctly and "easily" you can divide fractions well enough to work the problems you will meet in the ordinary business of life. Do not use the answers until you have worked all the problems.

A $\frac{2}{3} \div \frac{2}{3} = 1$ $\frac{1}{4} \div \frac{3}{8} = \frac{2}{3}$
$\frac{1}{2} \div \frac{2}{5} = 1\frac{1}{4}$

B $\frac{1}{16} \div \frac{1}{8} = \frac{1}{2}$ $\frac{3}{10} \div \frac{1}{4} = 1\frac{1}{5}$
$\frac{1}{3} \div \frac{1}{2} = \frac{2}{3}$

C $10 \div \frac{5}{8} = 16$ $15 \div \frac{10}{11} = 16\frac{1}{2}$
$9 \div \frac{1}{3} = 27$

D $\frac{5}{8} \div 10 = \frac{1}{16}$ $\frac{10}{11} \div 15 = \frac{2}{33}$
$\frac{1}{3} \div 9 = \frac{1}{27}$

E $2\frac{1}{4} \div \frac{1}{4} = 9$ $6\frac{2}{3} \div \frac{8}{15} = 12\frac{1}{2}$
$3\frac{1}{3} \div \frac{1}{2} = 6\frac{2}{3}$

F $4\frac{2}{5} \div 8 = \frac{11}{20}$ $4\frac{1}{8} \div 3 = 1\frac{3}{8}$
$1\frac{2}{3} \div \frac{1}{6} = 10$

G $8 \div 4\frac{2}{5} = 1\frac{9}{11}$ $7 \div 10\frac{1}{2} = \frac{2}{3}$
$\frac{3}{10} \div 1\frac{5}{16} = \frac{8}{35}$

H $2\frac{1}{2} \div 2\frac{2}{5} = 1\frac{1}{24}$ $2\frac{1}{5} \div 2\frac{3}{5} = \frac{11}{13}$
$1\frac{1}{3} \div 1\frac{1}{8} = 1\frac{5}{27}$

I $1\frac{1}{6} \div 1\frac{5}{9} = \frac{3}{4}$ $1\frac{3}{4} \div 1\frac{1}{9} = 1\frac{23}{40}$
$4\frac{1}{3} \div 2\frac{1}{4} = 1\frac{25}{27}$

Decimals

a	12.0
b	12.1
c	12.2
d	12.3
e	12.4
f	12.5
g	12.6
h	12.7
i	12.8
j	12.9
k	13.0

Squares *a* to *k* show how miles are recorded on an automobile speedometer. The first little square (*a*) records that the car has been driven exactly 12 miles. The number in the second square (*b*) is a *decimal fraction* and it tells us that the speedometer now records 12 and 1-tenth miles.

Square (*g*) records 12 and 6-tenths miles.

Square (*j*) records 12 and 9-tenths miles.

What should the next one record?

Square (*k*) is read 13 and no-tenths or 13.

We can write 12 and 1-tenth as $12\frac{1}{10}$ using the denominator 10.

Write the other tenths this way.

Look at Row A.

Row A: $2\frac{3}{10}$ $7\frac{1}{10}$ $5\frac{4}{10}$ $7\frac{9}{10}$

We can also write the numbers in Row A:

2.3 7.1 5.4 7.9

Now look at rows B and C.

Row B shows the tenths from $\frac{1}{10}$ to $\frac{10}{10}$ written as *common fractions*.

Row C shows these tenths written as *decimal fractions*.

Row B

$\frac{1}{10}$ $\frac{2}{10}$ $\frac{3}{10}$ $\frac{4}{10}$ $\frac{5}{10}$ $\frac{6}{10}$ $\frac{7}{10}$ $\frac{8}{10}$ $\frac{9}{10}$ $\frac{10}{10}$

Row C

.1 .2 .3 .4 .5 .6 .7 .8 .9 1.0

Read each number below. Say "and" for a decimal point between two figures. Which are common fractions and which are decimal fractions?

15.2	.7	$12\frac{4}{10}$	$2\frac{1}{10}$	$\frac{10}{10}$
9.8	3.2	13.7	$9\frac{3}{10}$	1.0
324.1	.5	15.0	$75\frac{1}{10}$	$\frac{2}{5}$

Any fraction can be written in decimal form and any decimal can be written as a common fraction.

Decimal System of Notation

The word *decimal* comes from the Latin word for ten. Why are the numbers we use called a *decimal system?*

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units	*Decimal point*	Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths	Millionths
2	7	4	1	0	3	5	.	8	6	9	7	4	3

The place value for each figure in a large number is shown above.

The whole-number part is at the left of the decimal point. This part of the number is read *2 million 741 thousand 35.*

The decimal-fraction part is at the right of the point. This part is read *869,743 millionths.*

Read the entire number. Say "and" for the point.

Give the place value of each figure in the following numbers: 718,370; 3.14; 124.739; 5,938,701; 274,936.

Write in figures each decimal in these statements:

1. The average thickness of a human hair is three thousandths of an inch.
2. Some of the motor parts in an automobile are measured accurately to five ten-thousandths of an inch.
3. In photographing a golf club striking a golf ball, the film was exposed for five millionths of a second.
4. An inventor perfected measuring gauges that were accurate to one hundred-thousandth of an inch.
5. Later the accuracy of these gauges was increased to eight millionths of an inch, then to four millionths and finally to two millionths.

Essentials of Addition and Subtraction of Decimals

Adding Tenths

Example A shows how to add tenths.

$$\text{A}\quad \begin{array}{r} 1.1 \\ 2.1 \\ 3.3 \\ \underline{1.4} \\ 7.9 \end{array}$$

Notice that the decimal points are written in a straight line in a column. The tenths are written in a column. The whole numbers are also written in a column.

Before we begin to add, we should put a decimal point in the answer exactly in line with the decimal points in the numbers we are adding.

We now add just as we have always added. The sum of tenths is 9 tenths. We write the 9 in the same column as the tenths are in. Now add the whole number column. This sum is written in the same column as the numbers added.

$$\text{B}\quad \begin{array}{r} .8 \\ .2 \\ \underline{.1} \\ 1.1 \end{array}$$

In Example B how do we know that the decimal point is placed correctly in the answer?

The sum of the figures in tenths column is 11. What figures do we write in the answer? Read the answer 1 and 1 tenth.

Write the answer using a common fraction.

In Example C one of the numbers to be added is 2. It is written with a decimal point and a zero to show that there are no tenths.

$$\text{C}\quad \begin{array}{r} 1.1 \\ 2.0 \\ 3.2 \\ \underline{2.9} \\ 9.2 \end{array}$$

What should we do first in adding these numbers?

Read the answer. Write it using a common fraction.

Add in the examples below. Keep the columns straight. Put the decimal point in the answer under the decimal points in the numbers you add.

8.2	21.2	95.7	79.0	.2	40.6
3.5	19.3	.8	6.7	.3	2.5
				.7	57.6

180.6	78.3	3.2	72.0	3.9	38.2
895.2	1.2	4.6	9.6	1.2	19.1
72.5	.9	3.7	81.1	6.0	4.3
				5.6	7.8

When is the decimal point read as *and?*

Read the numbers below:

A	7.1	126	28.4	3.0	.5
B	12.8	75.1	.6	18.3	.7

Rewrite the numbers in Rows A and B using common fractions in place of the decimal fractions. Change the common fractions to their simplest forms.

Example C shows that $\frac{1}{2}$ can be changed to $\frac{5}{10}$ and then written as .5.

.5 may be written as 0.5 to show there is no whole number.

C $\frac{1}{2} = \frac{5}{10} = .5$

Write the numbers below using decimal fractions:

D:	$2\frac{1}{2}$	$\frac{9}{10}$	$\frac{1}{5}$	$2\frac{7}{10}$
E:	$3\frac{1}{5}$	$7\frac{1}{10}$	$4\frac{0}{10}$	$\frac{5}{10}$

Write in figures using decimal fractions: nine-tenths, four and five-tenths, 7-tenths, five-tenths, twenty and one-tenth, 3-tenths

Subtracting Tenths

Example A shows how to subtract 4.2 from 9.4.

A 9.4
4.2
5.2

Notice that the decimal points are kept in a straight column. First we place the decimal point where it belongs in the answer. How do we know where to put it? How do we get the 2? How do we get the 5?

B 7.4
1.8
5.6

In Example B how do we get the 6? How do we get the 5?

Are the decimal points in a straight column?

Example C shows how to subtract 25.9 from 236. 236 is written as 236.0. The zero

C 236.0
25.9
210.1

shows that there are no tenths. How do we know where to put the decimal point in the answer? From what number was 9 subtracted to get the 1 in the answer? Read the answer.

Subtract in the examples below. Keep the numbers and the decimal points in a straight column.

.8	7.6	40.3	37.3	62.0
.3	1.9	3.4	31.4	32.5

64.4	8.2	8390.4	75.4	19.8
1.9	1.4	4213.6	28.1	12.8

Writing Decimals as Hundredths

We read the decimal fraction 324.19, "Three hundred twenty-four and nineteen hundredths." It can also be written $324\frac{19}{100}$.

We read the decimal fraction 0.51, "Fifty-one hundredths." It can be written $\frac{51}{100}$.

When there are two figures at the right of the decimal point, we read the two figures as hundredths.

So $\frac{3}{100} = .03$ $\frac{7}{100} = .07$ $\frac{9}{100} = .09$ $\frac{4}{100} = .04$

Write as decimal fractions: $\frac{5}{100}$, $\frac{8}{100}$, $\frac{6}{100}$, $\frac{7}{100}$

Read the numbers below:

Row A:	.12	1.02	.87	75.25	25.00	.80
Row B:	1.12	9.07	99.98	63.82	18.00	.90

Write the numbers below using decimal fractions.

Row C:	$\frac{70}{100}$	$1\frac{70}{100}$	$1\frac{7}{100}$	$85\frac{85}{100}$	$\frac{50}{100}$	$\frac{5}{100}$
Row D:	$\frac{25}{100}$	$\frac{18}{100}$	$4\frac{7}{100}$	$75\frac{2}{100}$	$\frac{60}{100}$	$\frac{2}{100}$

ADDING AND SUBTRACTING HUNDREDTHS

Example A shows how to add hundredths.

A 2.11
.40
.28
.10
2.89

Notice that the figures and decimals are in straight columns. We put the decimal point in the answer directly under the others. How do we get the 9 in the answer? How do we get the 8? How do we get the 2? Read the answer.

Write the following numbers in a column for adding. Keep the decimal points in a straight column. Add the numbers: 35.2, 60.00, 11.9, 23.4.

Add the examples below:

.28	1.25	127.30	926.72	73.00
.21	.77	5.87	241.81	28.00

SUBTRACTION

Look at Example B.

B 4.72
1.30
3.42

Notice that the decimal points are in a straight column. How did we know where to put the decimal point in the answer?

Study the five examples below until you know how to do the work. Copy them without their answers and work them without looking at the book.

C	1.30	D	5.00	E	7.02
	.06		.35		6.98
	1.24		4.65		.04

F	16.42	G	28.71
	12.88		7.71
	3.54		21.00

In Example E the 0 is put in the answer to show that the answer is 4-hundredths and not 4-tenths. Read the answer to Example G as 21 or as 21 and no-hundredths.

Subtract in the following examples.

.48	2.37	8.90	32.61	13.01	976.72
.20	1.02	.09	6.39	12.87	22.65

Add in the following examples.

.28	5.28		92.04	400.81
.72	.29	738.20	28.01	10.87
.31	6.78	921.75	75.20	9.32
.12	.12	17.28	62.83	.75

Decimals of Three and Four Figures

The three-figure decimal 384.765 is read, "Three hundred eighty-four and seven hundred sixty-five thousandths."

The four-figure decimal 275.7658 is read "Two hundred seventy-five and seven thousand six hundred fifty-eight ten-thousandths."

When there are four figures at the right of the decimal point, we read them as ten-thousandths.

Study these numbers and the way to read them:

325.720 . . . . . . .325 and 720-thousandths
18.0023 . . . . . . .18 and 23-ten-thousandths
.275 . . . . .275-thousandths
.2761 . . . . .2761-ten-thousandths

Read the numbers below.

Row A:	.289	2.119	.0006	15.003
Row B:	.400	7.823	.6221	17.0003

Write 228-thousandths using decimals.

Write 6891-ten-thousandths using decimals.

C 16.2973
12.1761
28.4734

How do we know where to put the decimals point in the sum in Example C?

How do you read the answer?

Add in the examples below.

2.743	9.4000	18.9487	28.7514
12.293	12.7213	2.8764	1.7643
		3.2124	2.7141

Example D shows how to subtract 207.436 from 529.175.

D 529.175
207.436
321.739

Notice that the decimal point in the answer is directly in line with the decimal points in the numbers we are subtracting. Read the answer.

Subtract in the examples below.

2.000	37.903	771.9000	256.071
.175	2.761	25.8121	191.983

Read the decimals in Row A and Row B.

Row A: .3 .03 .003 .0003 .4 .40 .400 .4000

Row B: 27.82 283.015 7670.0073 78.0005 92.200

Another way to read decimals is to read the first number in Row B as two, seven, point, eight, two, or as 27 point 82.

Read the other numbers in Row B this way.

Write the numbers below, using decimals.

Row C: $\frac{3}{10}$ $\frac{85}{100}$ $\frac{48}{1000}$ $\frac{5}{20}$ $200\frac{9}{10}$

Row D: $4\frac{3}{4}$ $\frac{9}{50}$ $\frac{8}{10000}$ $17\frac{1}{4}$ $628\frac{3}{5}$

Test in Addition of Decimals

If you can correctly and easily work all the examples below, you know enough about addition of decimals to work any problems involving addition of decimals that may occur in ordinary everyday life. Solve these examples without looking at the answers until all are finished.

			55.4	418.0
3	4.7	5.7	23.6	29.3
6	3.8	.2	27.8	17.8
9	8.5	5.9	106.8	465.1

7		5.84		5.29
2	.08	.70	19.88	.98
5	.93	6.93	1.23	1.75
14	1.01	13.47	21.11	8.02

	.883	.1267		7.1154
.80	.600	.2319	.0765	3.2210
.64	.021	.3700	.0017	.0076
1.44	1.504	.7286	.0782	10.3440

				85.276
	.75		7.8843	19.302
	.83		6.9271	7.876
.33	.96	.693	.4693	9.732
.08	.51	.281	.8440	89.841
.75	2.81	.530	9.2137	.321
1.16	5.86	1.504	25.3384	212.348

Test in Subtraction of Decimals

If you can work the following problems "easily" and correctly, you know enough about subtraction of decimals to solve any problem that may occur in ordinary business of everyday life.

.7	.8	.7	.9	.4
.2	.6	.4	.5	.2
.5	.2	.3	.4	.2

.68	.70	.40	.32	.80
.35	.26	.06	.29	.03
.33	.44	.34	.03	.77

1.25	1.00	2.50	1.15	7.0
.59	.28	.28	.86	6.8
.66	.72	2.22	.29	.2

5.12	4.00	7.31	7.385	8.000
.68	.92	.93	.625	.129
4.44	3.08	6.38	6.760	7.871

4.03	6.03	3.745	4.446
3.94	5.00	3.688	3.847
.09	1.03	.057	.599

Essentials of Multiplication of Decimals

Example A shows how to multiply a decimal by a whole number. We multiply

$$\begin{array}{lr} \text{A} & 231.78 \\ & 5 \\ \hline & 1158.90 \end{array}$$

exactly as we do in whole numbers. There are two figures at the right of the decimal point in 231.78, so there will be two figures at the right of the decimal in the answer. Read the answer. We say we point off two decimal places when we put the decimal points at the left of the 9 in the answer.

In multiplying a decimal by a whole number, begin at the right of the answer and point off as many decimal places in the answer as there are in the number which you multiply.

How many decimal places does each number below have?

.69 2.83 .4855 6.75 9.234

In Example B we multiply exactly as we would in whole numbers.

$$\begin{array}{lr} \text{B} & .017 \\ & 23 \\ \hline & 51 \\ & 34 \\ \hline & .391 \end{array}$$

It is not necessary to write zeros at the left of 51 and 34.

There are 3 decimal places in .017 so we point off 3 places in the answer.

In Example C there are three decimal places in .075.

When we point off three places in the answer we get four point eight zero zero or 4.8. Study Examples D–G.

$$\begin{array}{lr} \text{C} & .075 \\ & 64 \\ \hline & 300 \\ & 450 \\ \hline & 4.800 \\ & \text{or } 4.8 \end{array} \qquad \begin{array}{lr} \text{D} & .1382 \\ & 24 \\ \hline & 5528 \\ & 2764 \\ \hline & 3.3168 \end{array} \qquad \begin{array}{lr} \text{E} & .5 \\ & 8 \\ \hline & 4.0 \\ & \text{or } 4 \end{array}$$

$$\begin{array}{lr} \text{F} & .1015 \\ & 4 \\ \hline & .4060 \\ & \text{or} \\ & .406 \end{array} \qquad \begin{array}{lr} \text{G} & .0009 \\ & 3 \\ \hline & .0027 \end{array}$$

In any answer we may cross off all the zeros at the right of the decimal figures if no other figure comes after the zeros.

Why is only one zero cut off in Example E?

Copy Examples C to G without the work and multiply.

Multiply in the problems below. Cut off any zero that is not needed in the answers.

.8	.0006	.083	.15	4.0014
9	20	29	37	690

.125	.0704	.073	.095	28.75
48	512	7	4	4

Multiplying Decimals by 10, 100 and 1000

Example A shows the long way to multiply 1.079 by 100. By the long way we first

$$\begin{array}{lr} \text{A} & 1.079 \\ & 100 \\ \hline & 107.900 \end{array}$$

write a zero under each zero in the multiplier. Then we multiply. There are three decimal places in 1.079; so we point off three places in the answer. The two zeros at the right of 107.900 may be crossed off.

Example B shows a short way to multiply 1.079 by 100. To multiply the short way

$$\begin{array}{lr} \text{B} & 1.079 \\ & \curvearrowright \\ & 107.9 \end{array}$$

we move the decimal point *two* places to the right.

Do we get the same answer both ways? Example C shows how to move the decimal point when we multiply by 10. How many zeros are there in 10? How many places to the right do we move the decimal point in the answer?

Example C shows that 10 × .328 = 3.28.

$$\begin{array}{lr} \text{C} & .328 \\ & \curvearrowright \\ & 3.28 \end{array}$$

Multiply each number in Row A by 10 by moving the decimal point one place to the right.

Row A: 96.072 .7 53.28 .006 7.8 .08

Multiply each number in Row B by 100 by moving the point to the right the correct number of places.

Row B: .56 28.73 25.002 .006 2.95 .008

Example D shows how to multiply .79 by 1000.

$$\begin{array}{lr} \text{D} & .790 \\ & \curvearrowright \\ & 790. \\ & \text{or} \\ & 790 \end{array}$$

We must first put a zero at the right of .79 before we can move the decimal point three places to the right. The answer is a whole number.

When we multiply by a 1000, we should move the decimal point three places to the right. The answer is a whole number.

To multiply a number by 10, 100 or 1000, move the decimal point as many places to the right as there are zeros in the multiplier.

Multiply in each example below by moving the decimal point to the right the correct number of places.

10 × 93.2 100 × .9

1000 × 28.37 10 × 3.1521

100 × .003   1000 × 7.2
1000 × 212.212
100 × 90.02
10 × .8

Multiplying a Whole Number by a Decimal

Example A shows how to multiply 65 by 2.8.

A
65
2.8
520
130
$182.\cancel{0}$

Which number is the multiplier?

How many decimal places does it have?

Why is one decimal place pointed off in the answer?

Do we start at the right or left to point off decimal places?

When multiplying a whole number by a decimal, point off as many decimal places in the answer as there are decimal places in the multiplier.

B
8
.07
.56

C
112
6.7
784
672
750.4

D
39
.25
195
78
9.75

E
824
.115
4120
824
824
94.760

In Example B why are there two decimal places in the answer?

In which answer in the four examples above could a zero have been crossed off?

Study the four examples above until you know how to do them. Copy them. Then multiply and compare your answers with those above.

Multiply in the examples below.

285	78	4	7800	4800	5283
.7	.09	.05	.05	.007	9.21

Multiplying a Decimal by a Decimal

Example A shows how to multiply 3.78 by 1.6.

A
3.78
1.6
2268
378
6.048

We multiply exactly as we would with whole numbers.

There are two decimal places in 3.78.

There is one decimal place in 1.6.

There is a total of 3 places in the answer.

When multiplying a decimal by a decimal, point off as many places in the answer as there are total places in the multiplier and number multiplied. Do not cross off zeros before you point off the answer.

In Example E why are 4 decimal places pointed off in the answer?

Do we need zeros in the answer in Example B?

Copy the four examples below without the work and multiply.

B
1.25
.28
1000
250
.3500

C
.29
1.2
58
29
.348

D
13.7
2.4
548
274
32.88

E
2.54
.23
762
508
.5842

Multiply in each example below.

9.82	3.91	28.7	16.28	88.8
.4	1.03	9.5	.93	4.5

Putting Zeros in Decimal Answers

Example A shows how to multiply .08 by .03.

A
.08
.03
.0024

How do we get the 24 in the answer?

Why do we point off 4 decimal places in the answer?

We must write two zeros at the left of 24.

Copy the examples without the work and multiply.

B
28
.0012
56
28
.0336

C
.08
4
.32

D
.07
.06
.0042

E
.061
1.3
183
61
.0793

Multiply in the examples below.

8.3	.027	2.83	.08	.015	.209
.002	.01	.009	.9	2.8	15.1

Multiplying by .1, .01 and .001

Example A shows 1.83 multiplied by .1. Why were three decimal places marked off in the answer?

A
1.83
.1
.183

B
$\underset{\curvearrowleft}{1.83}$
.183

The work in Example B shows how to multiply 1.83 by .1 simply by moving the decimal point one place to the left.

There is one decimal in .1 so we move the decimal point in 1.83 *one place to the left.*

Multiply each number below by .1 by moving the decimal point in the number one place to the left.

Row A: 8.93 10.4 35.906 75.1 100.8

To multiply by .01, we move the decimal point two places to the left. .01 × 38.2 = .382

Multiply each number in the row below by .01 by moving the decimal point in the number two points to the left.

Row B: 91.7 238.42 8036.7 455.02 57.08

To multiply a number by .001, we move the decimal point three places to the left.

Multiply each number in Row C by .001 by moving the decimal point three places to the left.

Row C: 5728.7 6728.4 283.7 9687.4

Sometimes we must write one or more zeros at the left of a number before we can move the point to the left.

To multiply 7.2 by .001 we must write two zeros at the left of the 7 before we can move the decimal point three places. .001 × 7.2 = .0072

When we multiply the whole number 68 by .01, we think of 68 as having a decimal point at the right of it.

.01 × 68 = ____   .1 × 8 = ____
.001 × 45 = ____

Multiply each of the numbers below by .1, .01 and .001 by moving the decimal point correctly.

Row D:	7.8	68	.54	2.23	3.7
Row E:	2.0	8	29.1	45.1	4.45
Row F:	6.7	.8	700	5281	32.1

Test

If you can work the following examples correctly and readily, you know enough of the multiplication of decimals to solve any problem in multiplication of decimals that may occur in everyday life.

.24	7.3	.8	.13	.9
4	2	5	7	.4
.96	14.6	4.0	.91	.36
54	24	46	95	607
3.8	.56	1.8	.37	.509
205.2	13.44	82.8	35.15	308.963
39	.0083	.097	.07	.9
.0004	28	4	3	.1
.0156	.2324	.388	.021	.09
8.04	9.51	.28	7.6	9.4
8.08	4.08	5.7	.4	1.9
64.9632	38.8008	1.596	3.04	17.86
1.42	3.7	.0017	19	.25
.0003	.004	4.2	9.2	.12
.000426	.0148	.00714	174.8	.0300

Essentials of Division of Decimals

Dividing a Decimal by a Whole Number

Example A shows how to divide 128.4 by 3.

A $3\overline{)128.4}$

$$\begin{array}{r} \cdots\cdots\cdots\cdots \\ 42.8 \\ 3\overline{)128.4} \\ \underline{12} \\ 8 \\ \underline{6} \\ 24 \\ \underline{24} \end{array}$$

Before we divide we should put the decimal point where it belongs in the answer.

When there is no decimal point in the divisor, we put the decimal point in the answer directly above the one in the number to be divided. Then we divide as in whole numbers. Check the answer by multiplying 42.8 by 3.

In Example B before we divide we put the decimal point in the answer directly above the decimal point in the number; .8 is a reasonable answer, for the answer must be less than 1. Why?

B
$$\begin{array}{r} .8 \\ 4\overline{)3.2} \\ \underline{3\ 2} \end{array}$$

Multiply .8 by 4 to check the answer.

In Example C how do we know where to put the decimal point in the answer?

C
$$\begin{array}{r} .04 \\ 9\overline{).36} \\ \underline{36} \end{array}$$

In $4\overline{)3.2}$ no zero is written above 3, but in $9\overline{).36}$ a zero is written above 3.

We write this 0 because each place at the right of a decimal point must have a figure on it.

The 0 in the answer shows that when 36 hundredths is divided by 9 the answer is 4 hundredths or .04.

For each of the examples below tell why the decimal point is put where it is in the answer.

D $\begin{array}{r} .004 \\ 6\overline{).024} \end{array}$ E $\begin{array}{r} .21 \\ 25\overline{)5.25} \end{array}$

F $\begin{array}{r} .1 \\ 8\overline{).8} \end{array}$ G $\begin{array}{r} .01 \\ 148\overline{)1.48} \end{array}$

Copy the four examples above without the answers. Divide. Now look and see if your answers are correct.

Divide in the examples below.

$4\overline{)1.28}$ $2\overline{).16}$ $4\overline{)22.48}$ $6\overline{).3624}$ $5\overline{).85}$

$7\overline{).63}$ $6\overline{)2.46}$ $2\overline{).224}$ $51\overline{)2.04}$ $14\overline{)71.4}$

Remainders in Division

Look at Example A. It shows how to divide 1.6 by 26.

A
$$\begin{array}{r} .06 \\ 26\overline{)1.60} \\ \underline{1\ 56} \\ 4 \end{array}$$

How do we know where to put the decimal point in the answer?

26 will not go into 16; so we write a 0 in the answer above 6.

We write the 0 because each place at the right of a decimal point must have a figure in it.

We will write a 0 at the *right* of 1.6.

How do we get the 6 in the answer?

The remainder is less than $\frac{1}{2}$ of 26; so the answer is *correct to the nearest hundredth.*

If the remainder had been 14 or more, it would have been more than $\frac{1}{2}$ of 26, the divisor. Then the answer to the nearest hundredth would have been .07.

Example B shows how to get the answer to the nearest thousandth, for 1.6 ÷ 26.

B
$$\begin{array}{r} .061 \\ 26\overline{)1.600} \\ \underline{1\ 56} \\ 40 \\ \underline{26} \\ 14 \end{array}$$

Before we could bring down the 0 that is written after the 4, we had to write a second 0 at the right of 1.60.

The answer shown in Example B is 61-thousandths and 14 remainder.

The remainder 14 is *more* than $\frac{1}{2}$ the divisor; so .061 is not the answer to the nearest thousandth.

The answer to the nearest thousandth is .062.

Copy Examples C and D and find the answers to the nearest thousandth.

C $17\overline{)28.2}$ D $5\overline{).74}$

For each example in Row A find the answers to the nearest tenth.

Row A: $5\overline{)1.7}$ $2\overline{).25}$ $59\overline{)4.63}$

In Row B find the answers to the nearest hundredth.

Row B: $8\overline{).137}$ $25\overline{)7.63}$ $14\overline{)19.5}$

In Row C find the answers to the nearest thousandth.

Row C: $5\overline{)20.832}$ $9\overline{).07}$ $25\overline{)2.3}$

For each example below find the answer to the nearest thousandth if it does not come out without remainder for hundredths or tenths.

$7\overline{).04}$ $45\overline{)70.2}$ $204\overline{)5.1}$ $5\overline{)2}$

$8).413$ $38\overline{)3.51}$ $.107\overline{).99}$ $8)45$

Dividing a Decimal by a Decimal

In Example A to divide 287.5 by 7.5, we first move the decimal point so that the divisor will be a whole number. The arrow shows how to move the decimal point one place to the right to make 7.5 a whole number.

A
$$\begin{array}{r} 38. \\ 7.5\overline{)287.5} \\ \curvearrowright \qquad \curvearrowright \\ \underline{225} \\ 625 \\ \underline{600} \\ 25 \end{array}$$

Whenever we move the decimal point in the divisor one place to the right, we must also move the decimal point in the number we are dividing one place to the right.

The arrow shows the place to which we move the decimal point in 287.5.

Next we write the decimal point where it belongs in the answer. We write it exactly above the place to which the arrow under 287.5 points.

Now we divide as we would in whole numbers.

The answer is 38 and 25 remainder.

In Example B we first make the divisor a whole number.

B
$$\begin{array}{r} 1.3 \\ .51\overline{).670} \\ {}^\wedge\ \ \underline{51^\wedge} \\ 160 \\ \underline{153} \\ 7 \end{array}$$

To do this we move the decimal point 2 places to the right.

The caret (∧) at the right of 1 shows where to put the point. We move the decimal point in .67 two places to the right. What does the caret at the right of 7 show?

The decimal point in the answer is directly above the caret in .670.

Why do we put the 0 at the right of .67?

Write the examples below with carets to show the places to which you should move the decimal points.

$.025\overline{).693}$ $7.8\overline{)5931.6}$ $2.28\overline{).19}$

$6.5\overline{)5670.1}$ $5.93\overline{)2026.21}$ $.42\overline{).72}$

Divide to the nearest thousandth if necessary.

$.7\overline{)98.54}$ $2.7\overline{)1436.9}$ $40.7\overline{)168.35}$

$.008\overline{).76543}$ $6.6\overline{).6}$ $8.3\overline{)2.95}$

Dividing by .1, .01 and .001

A
$$\begin{array}{r} 83.1 \\ .1\overline{)8.31} \\ {}^\wedge \quad {}^\wedge\ \end{array}$$

In Example A 8.31 is divided by .1.

The decimal point in .1 is moved one place to the right. Why?

Why is the decimal point in 8.31 also moved one place to the right?

Is the answer correct? We can get the same answer 83.1 by simply moving the decimal point in 8.31 one place to the right.

Divide each of the numbers by .1 by simply moving the decimal point one place to the right.

.28 32.4 1.6 .728 1.54

Example B shows how we can divide 8.31 by .1 by moving the decimal point one place to the right.

Example C shows how we can divide 8.31 by .01 by moving the decimal point two places to the right.

Example D shows how we can divide 8.31 by .001 by moving the decimal point three places to the right.

B $8.31 \div .1 = 8.\underset{\curvearrowright}{3}1 \div .\underset{\curvearrowright}{1} = 83.1$

C $8.31 \div .01 = 8.\underset{\curvearrowright}{31} \div .\underset{\curvearrowright}{01} = 831$

D $8.31 \div .001 = 8.\underset{\curvearrowright}{310} \div .\underset{\curvearrowright}{001} = 8310$

In Example D before we can move the decimal point three places we must write a 0 at the right of 8.31.

When we divide a whole number by .1, .01 or .001, we should think of a decimal point as being at the right of the whole number.

$75 \div .1 = 75. \div .1 = 750$

Divide each of the numbers below by simply moving the decimal point the correct number of places.

$8.25 \div .01$
$.923 \div .001$
$73.4 \div .01$
$17.2 \div .1$
$77.4 \div .1$
$.4 \div .001$
$8960 \div .001$
$3.2 \div .001$

Dividing a Whole Number by a Decimal

Example A shows how to divide 15 by 2.5.

A
$$\begin{array}{r} 6. \\ 2.5\overline{)15.0} \\ {}^\wedge\ \underline{150{}^\wedge} \end{array}$$

How many places to the right do we move the decimal point in 2.5?

How many places to the right should we move the decimal point in the number we are dividing?

We think of whole number 15 as one five point zero.

Is 6 a reasonable answer?

Study the four examples below. Copy them without the work, the carets and zeros and get the answers. Compare with the book.

B
$$\begin{array}{lr} & 15. \\ .4 & \overline{)6.0} \\ {}^\wedge & \underline{4}\ {}^\wedge \\ & 20 \\ & \underline{20} \end{array}$$

C
$$\begin{array}{lr} & 1.33 \\ 1.5 & \overline{)2.000} \\ {}^\wedge & \underline{1\ 5{}^\wedge} \\ & 50 \\ & \underline{45} \\ & 50 \\ & \underline{45} \\ & 5 \end{array}$$

D
$$\begin{array}{lr} & 14. \\ .5 & \overline{)7.0} \\ {}^\wedge & \underline{5}\ {}^\wedge \\ & 2\ 0 \\ & \underline{2\ 0} \end{array}$$

E
$$\begin{array}{lr} & 4.16 \\ 1.2 & \overline{)5.000} \\ {}^\wedge & \underline{48{}^\wedge} \\ & 20 \\ & \underline{12} \\ & 80 \\ & \underline{72} \\ & 8 \end{array}$$

Divide in the examples below.

$.4\overline{)3}$ $\quad 7.5\overline{)6}$ $\quad .39\overline{)567}$ $\quad .87\overline{)5}$

$1.25\overline{)4}$ $\quad 3.21\overline{)487}$ $\quad .03\overline{)982}$ $\quad .7\overline{)9}$

Test

If you can work the following problems easily and correctly, you know enough of the division of decimals to work any problem that may occur in ordinary everyday life. Some of these problems will have remainders.

$$\begin{array}{r} 2.07 \\ 21\overline{)43.47} \end{array} \quad \begin{array}{r} .1267 \\ 5\overline{).6335} \end{array} \quad \begin{array}{r} .0911 \\ 8\overline{).7288} \end{array}$$

$$\begin{array}{r} 8.73 \\ 74\overline{)656.25} \end{array} \quad \begin{array}{r} .048 \\ 14\overline{).672} \end{array} \quad \begin{array}{r} .091 \\ 21\overline{)1.911} \end{array}$$

$$\begin{array}{r} .034 \\ 78\overline{)2.652} \end{array} \quad \begin{array}{r} .003 \\ 248\overline{).744} \end{array} \quad \begin{array}{r} .091 \\ 7\overline{).64} \end{array}$$

$$\begin{array}{r} .107 \\ .12\overline{).01284} \end{array} \quad \begin{array}{r} .903 \\ 5.9\overline{)5.329} \end{array} \quad \begin{array}{r} 3.405 \\ 3.7\overline{)12.6} \end{array}$$

$$\begin{array}{r} .989 \\ 9.1\overline{)9} \end{array} \quad \begin{array}{r} .013 \\ 307.5\overline{)4} \end{array} \quad \begin{array}{r} 50 \\ .36\overline{)18} \end{array}$$

$$\begin{array}{r} .625 \\ .96\overline{).6} \end{array} \quad \begin{array}{r} .299 \\ 12.02\overline{)3.6} \end{array} \quad \begin{array}{r} 3.134 \\ 2.68\overline{)8.4} \end{array}$$

Denominate Numbers

Numbers such as 2, 7, 4½, 3.7 are called *abstract* numbers. Numbers such as 2 feet, $7, 4½ hours or 3.7 miles are *denominate* numbers.

There are a few Tables of Measure or Tables of Denominate Numbers that everyone should know.

Tables of Measure

Length

12 inches (in.) = 1 foot (ft.)
3 feet = 36 inches = 1 yard (yd.)
5½ yards = 16½ feet = 1 rod (rd.)
320 rods = 5280 feet = 1 mile (mi.)

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)

Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet = 1 cord (cd.)

Money

1 mill = $\frac{1}{10}$ cent ($.001)
10 mills = 1 cent ($.01 or 1¢)
10 cents = 1 dime ($.10 or 10¢)
10 dimes = 1 dollar ($1.00 or $1)

Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)

Dry Measure

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Liquid Measure

4 gills (gi.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
30 days = 1 month (mo.)
12 months = 1 year (yr.)
365 days = 1 year
366 days = 1 leap year

Addition of Denominate Numbers

Example A shows how to add minutes and seconds.

A
$$\begin{array}{r} 5 \text{ min. } 22 \text{ sec.} \\ \underline{7 \text{ min. } 11 \text{ sec.}} \\ 12 \text{ min. } 33 \text{ sec.} \end{array}$$

Notice that there is a column for seconds and a column for minutes. First we add the numbers in the seconds' column. 22 sec. + 11 sec. = ——— sec. Then we add the numbers in the minutes' column. What word is written after 12?

Example B shows how to add years and months.

B
$$\begin{array}{r} 3 \text{ yr. } 4 \text{ mo.} \\ \underline{2 \text{ yr. } 5 \text{ mo.}} \\ 5 \text{ yr. } 9 \text{ mo.} \end{array}$$

In Example B months are written in one column and years in another column.

How do we get the 9 mo.? What is the answer?

Example C shows how to add 3 lb. 3 oz., 5 oz., 4 lb. 1 oz., and 9 lb.

C
$$\begin{array}{r} 3 \text{ lb. } 3 \text{ oz.} \\ 5 \text{ oz.} \\ 4 \text{ lb. } 1 \text{ oz.} \\ \underline{9 \text{ lb.}\phantom{ 1 \text{ oz.}}} \\ 16 \text{ lb. } 9 \text{ oz.} \end{array}$$

Ounces are the smaller measure. So we put them in the column on the right. Notice how the 5 oz. and the 9 lb. are written.

How do we get the 16 lb.?

Copy the examples below and add.

$$\begin{array}{r} 12 \text{ min. } 38 \text{ sec.} \\ \underline{9 \text{ min. } 15 \text{ sec.}} \end{array} \qquad \begin{array}{r} 4 \text{ lb. } 7 \text{ oz.} \\ 1 \text{ lb. } 8 \text{ oz.} \\ \underline{4 \text{ lb.}\phantom{ 8 \text{ oz.}}} \end{array}$$

$$\begin{array}{r} 2 \text{ mo. } 1 \text{ wk.} \\ 2 \text{ mo. } 2 \text{ wk.} \\ \underline{7 \text{ mo.}\phantom{ 2 \text{ wk.}}} \end{array} \qquad \begin{array}{r} 2 \text{ bu. } 1 \text{ pk.} \\ 3 \text{ bu. } 2 \text{ pk.} \\ \underline{6 \text{ bu.}\phantom{ 2 \text{ pk.}}} \end{array}$$

$$\begin{array}{r} 3 \text{ qt. } 7 \text{ oz.} \\ 4 \text{ qt.}\phantom{ 7 \text{ oz.}} \\ \underline{6 \text{ qt.}\phantom{ 7 \text{ oz.}}} \end{array} \qquad \begin{array}{r} 28 \text{ yd. } 1 \text{ ft.} \\ 1 \text{ ft.} \\ \underline{16 \text{ yd.}\phantom{ 1 \text{ ft.}}} \end{array}$$

Changing Answers to Simplest Form

A
$$\begin{array}{r} 10 \text{ min. } 52 \text{ sec.} \\ 7 \text{ min. } 12 \text{ sec.} \\ \underline{8 \text{ min. } 10 \text{ sec.}} \\ 25 \text{ min. } 76 \text{ sec.} \\ \text{or} \\ 26 \text{ min. } 16 \text{ sec.} \end{array}$$

In Example A the sum of seconds is ______.

The sum of minutes is ______.
76 sec. is more than 1 min.
We must change the answer to simplest form.
The simplest form for the answer is 26 min. 16 sec. Why?

B 5 yd. 2 ft.
7 yd. 1 ft.
1 yd. 1 ft.
2 yd. 1 ft.
15 yd. 5 ft.
or
16 yd. 2 ft.

In Example B what is the sum of the column for feet? Of the column for yards?
5 feet is more than 1 yard.
Change the answer to its simplest form.

Change each of the following to simplest form.

3 bu. 7 pk.
30 min. 89 sec.
7 wk. 30 da.
2 hr. 71 min.
1 T. 2500 lb.

1 mi. 5670 ft.
4 yd. 5 ft.
10 qt. 5 pt.
5 pk. 13 qt.

Study Examples C, D and E below until you know how to work them. Copy them without the work and add.

C 9 ft. 10 in.
7 ft. 3¼ in.
8½ in.
16 ft. 21¾ in. or
17 ft. 9¾ in.

D 5 yd.
3 yd. 2 ft.
2 ft.
8 yd. 4 ft. or
9 yd. 1 ft.

E 1200 lb.
1600 lb.
1900 lb.
4700 lb. or
2 T. 700 lb.

Add the problems below. Be sure your answers are in simplest form.

2 bu. 3 pk.
4 bu. 1 pk.
1 bu. 2 pk.

2 hr. 28 min.
30 min.
3 hr. 40 min.

4 gal. 3 qt.
1 gal. 2 qt.
3 qt.

2 mi. 1280 ft.
4 mi. 1020 ft.
5 mi. 4321 ft.

2 ft. 4½ in.
3 ft. 8½ in.
4 ft.

2 wk. 4 da.
3 wk. 5 da.
7 wk. 6 da.

Subtraction of Denominate Numbers

Examples A, B and C show how to subtract measures.

A 8 hr. 40 min.
2 hr. 20 min.
6 hr. 20 min.

We subtract first in the minutes column. How do we get 20 min.? How do we get 6 hr.?

In Example B notice that 3 da. is written under 6 da.

B 3 wk. 6 da.
3 da.
3 wk. 3 da.

How do we get the 3 da. in the answer? There is no number to subtract from 3 wk.; so we just write 3 wk. as the answer in that column.

In Example C how do we get the 2 ft. in the answer?

C 7 yd. 2 ft.
6 yd.
1 yd. 2 ft.

How do we get the 1 yd.?
Is the answer in its simplest form?

Copy Examples D, E and F without the answers. Subtract and compare with the work below. Work over any you have wrong.

D 3 bu. 2½ pk.
1 bu.
2 bu. 2½ pk.

E 4 yd. 9 in.
2 yd. 3 in.
2 yd. 6 in.

F 28 ft. 7¼ in.
14 ft. 2¾ in.
14 ft. 4½ in.

Subtract in the examples below.

28 T. 1840 lb.
12 T. 1232 lb.

45 min. 25 sec.
28 min. 18 sec.

3 pk. 7 qt.
2 pk. 4 qt.

7 yr. 9 mo.
3 yr. 6 mo.

5 hr. 10 min.
1 hr. 5 min.

8 gal. 3 qt.
4 gal. 3 qt.

Now look at Example A.

A 47 ft. 2 in.
12 ft. 3 in.

. . . .

Think:
46 ft. 14 in.
12 ft. 3 in.
34 ft. 11 in.

We cannot subtract 3 in. from 2 in., so we think of 47 ft. 2 in. as 46 ft. 14 in.
To get 14 in. we take 1 ft. from 47 ft., change it to 12 in. and add the 12 in. and the 2 in.
We now subtract 3 in. from 14 in.
What numbers do we subtract in the column for feet?

Copy the three examples below without the answers.
Subtract and compare your answers with those below.

B 6 hr. 10½ min.
3 hr. 20½ min.
2 hr. 50 min.

C 6 ft. 2 in.
1 ft. 10 in.
4 ft. 4 in.

D 4 bu.
1 bu. 3 pk.
2 bu. 1 pk.

Subtract in each example below.

8 lb. 3 oz.
2 lb. 7 oz.

42 wk. 2 da.
40 wk. 5 da.

4 mi. 400 ft.
1 mi. 1800 ft.

3 pk.
1 pk. 4 qt.

10 lb. 4 oz.
9 lb. 8 oz.

5 hr. 20 min.
2 hr. 30 min.

Multiplying Measures

In Example A we multiply 4 ft. 2 in. by 3.

A 4 ft. 2 in.
3
12 ft. 6 in.

How do we get the 12 ft.? How do we get 6 in.?

In multiplying we will often get answers that should be changed to simplest form. Study the examples below.

B 3 lb. 8 oz.
2
6 lb. 16 oz. or
7 lb.

C 4 ft. 2½ in.
4
16 ft. 10 in.

D 4 mo. 20 da.
4
16 mo. 80 da. or
18 mo. 20 da.

Multiply in each of the examples below. Be sure your answers are in simplest form.

2 T. 420 lb.
3

7 da. 22 hr.
7

2 lb. 7 oz.
5

4 mi. 220 ft.
5

2 ft. 6 in.
5

4 qt. 1 pt.
4

Dividing Measures

Example A shows how to divide 127 ft. 6 in. by 30.

A

(1) 4 ft.
30)127 ft. 6 in.
120
7 ft.

(2) 4 ft.
30)127 ft. 6 in.
120
7 ft. 6 in.
or 90 inches

(3) 4 ft. 3 in.
30)127 ft. 6 in.
120
7 ft. 6 in.
or 90 inches
90 inches

In Step 1: Divide 127 ft. by 30. Write 4 ft. in the answer. How do we get the 7 ft.

Step 2: Bring down the 6 in. and change the 7 ft. 6 in. to inches. Notice where the 90 is written.

Step 3: Divide the 90 by 30. Notice where the 3 in. is written in the answer.

Check 127 ft. 6 in. ÷ 30 by 4 ft. 3 in. × 30.

In Example B we first divide 37 ft. by 4.

B 9 ft. 4 in.
4)37 ft. 4 in.
36 ft.
1 ft. 4 in.
or 16 in.
16 in.

Why is 9 ft. written in the answer?
How do we get 1 ft. 4 in.?
How do we get 16 in.?
Where is the 4 in. written in the answer?

Copy the four examples below without the answers.

Divide and compare your work with that below.

C 4 hr. 6 min.
4)16 hr. 24 min.

D 3 ft. 9 in.
3)11 ft. 3 in.

E 500 lb.
5)1 T. 500 lb.

F 3 lb. $\frac{3}{4}$ oz.
4)12 lb. 3 oz.

An Important Caution

Unless one is on guard he is apt to make errors when working with compound denominate numbers. The reasons for these errors are explained below.

Hard Spot in Addition. Study Examples A, B and C below. Notice that exactly the same numbers are used but a different number is carried in each instance and that the figures in the sums vary.

A 27
11 (1 is carried and 2 is in the ones' column.)
64
102

B 2 ft. 7 in.
1 ft. 1 in. (1 is carried, and 0 not 2 is in the answer.)
6 ft. 4 in.
10 ft. 0 in.

C 2 lb. 7 oz.
1 lb. 1 oz. (No carrying. 12 in answer, not 0 or 1.)
6 lb. 4 oz.
9 lb. 12 oz.

Hard Spot in Subtraction. Study Examples D, E and F below. Notice the similarity of the numbers but the differences in the computation.

D 42 (Carrying 1, 4 becomes an unseen 3; 2 becomes 12.)
−13
29

E 4 bu. 2 pk. (6 pk., not 12; 3 not 9 in answer.)
−1 bu. 3 pk.
2 bu. 3 pk.

F 4 hr. 2 min. (Use 62 min.; 59 min. in answer.)
−1 hr. 3 min.
2 hr. 59 min.

Hard Spots in Multiplication and Division. Notice how the carrying differs in Example H from the carrying in Example G even though the multiplication is in both instances 4 × 3.

G 23 (4 × 3 = 12. Write 2, carry 1.)
×4
92

H 2 ft. 3 in. (4 × 3 in. = 12 in. Write 0 *not* 2; carry 1 ft.)
× 4
9 ft. 0 in.

Study Examples I and J.

I 13 (5 into 6 goes once with 1 to carry.)
5)65

J 1 hr. 13 min. (5 into 6 hr. goes once with *60 min.* not 1 to carry.)
5)6 hr. 5 min.

Test

If you understand denominate numbers well enough to work the following examples correctly and readily, you can work any problem concerned with denominate numbers that may occur in every day life. Do not use the answers until all your work is done.

Group 1

Add in the following examples.

4 gal. 2 qt.
3 gal. 1 qt.
7 gal. 3 qt.

2 mi. 250 ft.
1 mi. 1000 ft.
3 mi. 1250 ft.

1 ft. 10 in.
3 ft. 4 in.
5 ft. 2 in.

5 T. 200 lb.
1 T. 1800 lb.
7 T.

4 hr. 21 min.
8 hr. $9\frac{1}{2}$ min.
12 hr. $30\frac{1}{2}$ min.

12 bu. 3 pk.
30 bu. 3 pk.
43 bu. 2 pk.

Group 2

Subtract in the following examples.

4 qt. 1 pt.
3 qt.
1 qt. 1 pt.

20 lb. 12 oz.
6 lb. 8 oz.
14 lb. 4 oz.

12 yd.
9 yd. 2 ft.
2 yd. 1 ft.

3 pk. 4 qt.
1 pk. 7 qt.
1 pk. 5 qt.

7 mo. 23 da.
6 mo. 10 da.
1 mo. 13 da.

55 min. 10 sec.
24 min. 40 sec.
30 min. 30 sec.

Group 3

Multiply in the following examples.

3 wk. 2 da.
3
9 wk. 6 da.

1 T. 200 lb.
5
5 T. 1000 lb.

4 yr. 2 mo.
6
25 yr.

4 mi. 324 ft.
10
40 mi. 3240 ft.

7 rd. $2\frac{3}{4}$ ft.
4
28 rd. 11 ft.

1 ft. $3\frac{1}{2}$ in.
8
10 ft. 4 in.

15 pk. 4 qt.
9
139 pk. 4 qt.

3 da. 14 hr.
7
25 da. 2 hr.

Group 4

Divide in the following examples.

1 hr. 10 min.
5)5 hr. 50 min.

4 bu. $\frac{1}{3}$ pk.
6)24 bu. 2 pk.

2 pk.
7)3 bu. 2 pk.

1 qt. $1\frac{7}{8}$ pt.
8)15 qt. 1 pt.

5 lb. 1 oz.
9)45 lb. 9 oz.

2 gal. $\frac{3}{8}$ qt.
8)16 gal. 3 qt.

SECTION TWO

VERBAL PROBLEMS

PROBLEM SOLVING

There are several kinds of problems to be solved in the following pages. There are good ways and poor ways to solve problems, just as there are good ways and poor ways to do anything else, such as making a toy airplane or washing dishes.

Before you try solving a problem read it carefully. Ask yourself such questions as these:

1. Have I read the problem so carefully that I know exactly:
   - (*a*) What does it mean?
   - (*b*) What question will the solution answer?

   Take time to read problems carefully.

2. What facts in the problem do I need to use in solving it?

   Some problems contain facts which are not needed in solving them. Such facts can be neglected.

3. What will a reasonable answer be?

   By thinking through the problem before working it, can I see very nearly what the answer must be? What must the name of the answer be?

   Practice estimating answers before solving problems.

4. What must be done in order to solve the problem?

   Here you must think how to arrange the various facts to get the correct answer. Numbers may be added, subtracted, multiplied or divided. Sometimes more than one of these four processes must be used. Sometimes the form but not the value of some of the numbers must be changed.

After solving the problem, ask yourself:

5. Is my answer a reasonable one? Does it tell what is asked for?

6. Is my work correct? Have I checked to see that no little mistake has been made?

It is not necessary that you ask yourself the exact questions printed above, but it is important that you train yourself to think about problems by asking yourself, in your own words, questions like these.

The Study of a Problem

By studying the problem below, the questions asked about it, and the solution, you will see how asking yourself questions about a problem will help you to solve it correctly.

PROBLEM: Mrs. Bailey bought a dining room suite for $180. This was the reduced price, a 10% discount having been allowed on the regular price of the suite. What was the regular price of the suite?

Careful reading: (*a*) Was $180 the regular price? (*b*) Is the regular or the reduced price asked for?

What Facts to Use: (*a*) What use must be made of the 10%? (*b*) $180 is what per cent of the regular price? (*c*) Must a per cent not given in the problem be used?

A Reasonable Answer: (*a*) Will the answer be more or less than $180? (*b*) Which of these estimates is the best one for the answer? $150? $200? $250?

What To Do: (*a*) Will finding 10% of $180 get the answer? (*b*) Will adding 10% of $180 to $180 get the answer? (*c*) Would the answer be found by getting the answer to the question: If $180 equals 90%, what equals 100%? (*d*) What question would be answered by working the example .90)180?

Now work the problem and then answer the following questions:

(*a*) Does your own answer look reasonable? Just what does it tell?

(*b*) Is your answer exactly correct? Are you sure you have not made even a small mistake in figuring? Did you check your work for accuracy?

Problems for the Third Grade

1. Three boys baked potatoes. John baked 6, Harry baked 2, and Charles baked 7. How many potatoes did all three boys bake? (*Answer, 15 potatoes*)

2. Charles had a garden. In it he planted 4 rows of corn, 8 rows of carrots, and 6 rows of peas. How many rows of these three things did he plant? (*18 rows*)

3. Frank and John stopped at one farm that had three kinds of chickens. There were 228 white, 349 black, and 117 yellow chickens. How many chickens were there on this farm? (*694 chickens*)

4. Aunt Claire had many jars of food on the shelves. May counted 78 jars of beans, 42 jars of tomatoes, and 63 jars of beets. How many more jars of beets than of tomatoes did she count? (*21 jars of beets*)

5. Dick bought a tablet of 175 pages for 10 cents. Jack bought a tablet of 90 pages for 5 cents. How many more pages were in Dick's tablet than Jack's. (*85 pages*)

6. Jim and Charles together have $21 in the bank. Jim has $12 in the bank. How much does Charles have in the bank? (*$9*)

7. Margaret cut out 3 kinds of trees. She cut out 32 trees of each kind. How many trees did Margaret cut out altogether? (*96 trees*)

8. Chuck brought in 42 apples. The children ate all but 7. How many of the apples did they eat? (*35 apples*)

9. Fred had his kite up in the air with 125 feet of string on it. Some of the string caught in a tree when the kite came down. Fred had 98 feet of string left. How many feet of string did he lose? (*27 feet*)

10. Margaret made 8 cooky hearts. She divided them equally among 4 friends. How many cooky hearts did she give to each friend? (*2 cooky hearts*)

11. Florence used 16 paper flowers on her valentines. She put 2 on each valentine. On how many of her valentines did she put paper flowers? (*8 valentines*)

12. Harry walks 3 miles each day to get the cows. How far does he walk in 5 days to get the cows? (*15 miles*)

13. Anne put 30 pennies in her bank in 3 weeks. She put in the same number of pennies each week. How many pennies did she put in each week? (*10 pennies*)

14. The library has 27 books about plants and animals. 9 of these books are on each shelf in the corner. How many shelves are in the corner? (*3 shelves*)

15. Charles was fined 12 cents for returning 4 books late. The fine was the same for each book. How much was the fine for each book? (*3¢*)

16. Fred counted 120 benches on one side of the ball field. Each bench would hold five people. How many people would all these benches hold? (*600 people*)

17. The man who sells popcorn and ice cream at the ball field sold 132 ice cream cones one day. The day before he sold 5 times as many. How many cones did he sell the day before? (*660 cones*)

18. Sarah made a flower bed in one corner of the garden. The seeds for the flowers that she wanted to plant in it cost 75 cents. Sarah had only 39 cents. How much more money did she need to buy the seeds? (*36¢*)

19. Eva's father wrote some letters. Each one weighed 1 ounce. All the letters together weighed 2 pounds. How many letters did he write? (*32 letters*)

20. Evelyn learned that in the far north there are 24 daylight hours in each day during the summer. How many daylight hours are there in 5 days? (*120 hrs.*)

Problems for the Fourth Grade

1. Jim counted 48 children ahead of him waiting to ride on a little train in the park. The train could haul 8 children each trip. How many trips did the train make before Jim could ride? (*Answer, 6 trips*)

2. Ann's uncle gave her a box of candy. After she had eaten some, there were 42 pieces left. She divided them equally among 7 friends. How many pieces did she give each friend? (*6 pieces*)

3. Miss Wolff gave Tom a box of pencils. She told him to put 5 dozen pencils on her desk and to give the others to Miss Reed. How many pencils should he have put on Miss Wolff's desk? (*60 pencils*)

4. Sue had 67 paper dolls. When she added her sister's paper dolls to hers, she had 125 dolls. How many paper dolls did her sister have? (*58 paper dolls*)

5. Sarah cut out cookies for Aunt Claire. It took Sarah 2 minutes to cut out each dozen. Aunt Claire had enough dough for 10 dozens. How long did it take Sarah to cut them out? (*20 min.*)

6. Tom's father went fishing 7 times one summer. He caught 217 fish in all. What was the average number of fish he caught each time? (*31 fish*)

7. The shelf on which Nell keeps her books is 30 inches long. 29 inches of this shelf are filled with books. Nell has two more books. One book is 2 inches thick, and the other is 3 inches thick. Can she put one of these books on the shelf besides the ones already there? Why?

8. The children are stringing popcorn to trim the Christmas tree. They can make a string 9 feet long from 1 pint of popcorn. How many pints of popcorn will they need to make 108 feet of this trimming? (*12 pt.*)

9. Joan cannot decide whether to give her baby brother a toy bear that costs 55c or some blocks that cost 39 cents. How much more will Joan have to spend for the bear than for the blocks? (*16¢*)

10. Harold and his father used 2 cans of light blue paint for the walls of Bobby's room. This paint cost 63 cents a can. For the ceiling they used 1 can of buff paint that cost 49 cents. How much did the paint for the walls cost? How much did all this paint cost? (*Walls $1.26; all $1.75*)

11. John read that in this country there are 167 museums for art, 415 for history, 24 for machines and 175 for other things. How many museums are there in this country? (*781 museums*)

12. The driver of a bus told Harry that 23 persons had paid $17.70 each for their round-trip tickets. How much was paid for all these tickets? (*$407.10*)

13. Jack is making a small loom for weaving. He will use 4 pieces of wood. A large piece 24 in. long will make the two pieces for the sides. It will take a piece 16 in. long to make the two ends. How many inches of wood does he need in all? (*40 in.*)

14. In a story that Jim is writing he wants to tell Lincoln's age when he died. He knows that Lincoln was born in 1809 and died in 1865. How old should Jim say that Lincoln was when he died? (*56 yrs.*)

15. Marie is making candy baskets for a party. She has to make 15 baskets. Each one will have 12 hearts on it. How many hearts will Marie need for all these baskets? (*180 hearts*)

16. A certain large city receives 125,000 pieces of mail a day with wrong addresses, and 40,000 with no street addresses. The post office finds the correct addresses for about 29,000 of all these. For about how many of these pieces of mail do they not find correct addresses? (*136,000 pieces*)

17. The expenses for a party that Marie, Joan and Anna gave were $1.35. Marie paid $\frac{1}{3}$ of the expenses, Joan paid $\frac{2}{6}$, and Anna paid 45 cents. Did the girls share the expenses equally? (*Yes*)

18. Helen divided a pie equally among herself and 5 other girls. What fraction of the pie did she give each girl? (*$\frac{1}{6}$ pie*)

19. John and his father are cutting enough potatoes to plant 26 rows with 85 hills in each row. They will put 1 piece of potato in each hill. How many pieces of potato will they need? (*2210 pieces*)

20. Clarence had 24 small pigs. One day he gave them 6 gallons of milk. How many quarts was that for each pig? (*1 qt.*)

21. The children charged each person who came to see their circus 5 cents. Those who took part in it did not pay. There were 16 that took part in the circus and 32 others who watched. John said they should have taken in \$2.40. Jack said they should have taken in \$1.60. Which was right? *(Jack)*

22. Larry and Sally together bought 32 pansy plants. Each paid for $\frac{1}{2}$ of the plants. How many plants did each child buy? *(16 plants)*

23. One Saturday the children worked from 8 A.M. to 12 noon, and from 1 P.M. to 4 P.M. How many hours did they work that Saturday? *(7 hr.)*

24. James bought enough chicken wire at 4 cents a foot to go around his garden. His garden is 18 feet square. How much did he pay for the chicken wire? *(\$2.88)*

25. Helen read that the sky was clear for a total of 63 hours during the last week of May. What was the average number of hours a day that the sky was clear during the week? *(9 hr.)*

Problems for the Fifth Grade

1. Mary's mother gave her a five-dollar bill with which to buy food. The food cost \$4.32. How much money should Mary have returned to her mother? *(Answer, 68¢)*

2. John's father has charge of weighing the grain at the grain elevator. One noon he asked John to write on cards the weight of four truckloads of grain as each was weighed. Below are the weights that John wrote for the four trucks and their loads.

Truck 1	6,469 lb.	Truck 3	6,893 lb.
Truck 2	10,432 lb.	Truck 4	7,126 lb.

What was the total weight in pounds of the four trucks with their loads? *(30,920 lb.)*

3. Susan helped her mother choose the furniture for one of the bedrooms. They bought a desk for \$7.50, a bed for \$18.75, a chair for \$2.50, and a bench for \$2.50. What was the total cost of the furniture? *(\$31.25)*

4. Uncle Jim told Frank that there are 3 sections of land in his farm. Frank knew that there are 640 acres in a section of land. How many acres are there in his uncle's farm? *(1,920 acres)*

5. How many 49-pound sacks will 2,205 pounds of flour fill? *(45 sacks)*

6. Ralph earned \$3.25 delivering packages during one month. How much more than \$2 did he earn? *(\$1.25)*

7. Bill began selling magazines in April. This is what he earned during the first six months:

April	\$0.28	July	\$0.98
May	\$0.36	August	\$1.32
June	\$0.98	September	\$1.40

How much money did he earn selling magazines during these six months? *(\$5.32)*

8. The fence around a farmer's poultry lot is 321 yards 2 feet long. The fence is how many feet long? *(965 ft.)*

9. Last June Joe worked every morning picking strawberries. Here is a record of the number of quarts he picked during one week:

Monday	8 qt.	Thursday	12 qt.
Tuesday	10 qt.	Friday	13 qt.
Wednesday	17 qt.	Saturday	12 qt.

How many quarts did he pick? *(72 qt.)*

10. The number of pupils in the Grove School is 427. The library in this school has 5,124 books. This averages how many books for each pupil? *(12 books)*

11. If Alice practices on the piano 15 minutes each day, how many hours and minutes does she practice in 17 days? *(4 hr. 15 min.)*

12. Lois earned 48 cents. She gave her father 24 cents to save for her. Did she give him $\frac{1}{3}$, $\frac{1}{4}$ or $\frac{1}{2}$ of the 48 cents she had earned? ($\frac{1}{2}$)

13. Bill earns \$0.70 a day. How much does he earn in 36 days? *(\$25.20)*

14. There are 1,207 pupils in the Central School. 669 of them are boys. How many of the pupils are girls? *(538 girls)*

15. Sam's house is 23 feet high. The store building near his house is 46 feet high. The store building is how many times as high as Sam's house? *(2)*

16. John wanted to know how many bushels there were in a load of rye his uncle was hauling to market. There were 3,584 pounds of rye in the load. John's uncle said there are 56 pounds of rye in a bushel. How many bushels were in the load? *(64 bu.)*

17. Andy and his brother delivered milk each day. They usually left 6 quarts of milk at a small hotel. One morning they found a note asking them to leave 18 more quarts. The milk that the hotel wanted that morning would fill how many one-gallon cans? *(6 one-gallon cans)*

18. For his share of the food for a camping trip Walter bought:

5 cans of milk at 9c a can
3 doz. eggs at 18c a doz.
5 lb. of sugar at 6c a lb.
2 lb. of bacon at 28c a lb.

The store clerk gave him a bill for \$2.35. Was the bill correct? If it was correct, write \$2.35 for the answer. If it was wrong, write the correct sum. *(\$1.85)*

19. It cost Mary \$1.25 to make 5 pounds of candy. She sold the 5 pounds for \$1.75. What profit did she make on each pound of candy? *(10¢)*

20. Brownville raised \$3,000 for charities. Of this amount \$500 was given to the Girl Scouts and the Boy Scouts. Tell whether \$500 was $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, or $\frac{1}{6}$ of the \$3,000 that they raised. ($\frac{1}{6}$)

21. Rose and her parents live 200 miles from New York. They averaged 25 miles an hour in driving their car to visit some friends in New York. How many hours did it take them to drive to New York? *(8 hr.)*

22. Ruth's mother measured out $5\frac{1}{2}$ cups of sugar. She used $2\frac{2}{3}$ cups of this sugar to make a cake and $\frac{3}{4}$ cup to make some frosting. How much was left of the $5\frac{1}{2}$ cups of sugar? ($2\frac{1}{12}$ *cups*)

23. The swimming pool in the Memorial School is 60 feet long and 30 feet wide. Jack swims all the way around it once each day. How far does he swim in going around the pool each day? *(180 ft.)*

24. Edward sold all the beans he had raised in his garden to three of his mother's friends. He sold $1\frac{1}{2}$ pounds to Mrs. Moore, $2\frac{3}{4}$ pounds to Mrs. Murphy, and $1\frac{3}{8}$ pounds to Mrs. Burnham. How many pounds of beans did he sell? ($5\frac{5}{8}$ *lb.*)

25. Jean made 12 pounds of candy to sell at the church play. She spent 75 cents for sugar, 10 cents for chocolate, 48 cents for butter, 10 cents for milk. She sold the candy for 30 cents a pound. After she had paid for the materials, how much money did she have left from the sale of the candy? *(\$2.17)*

26. The floor of the porch on Jennie's house is 9 feet long and 6 feet wide. Find its area in square feet. *(54 sq. ft.)*

27. Roy's garden is 24 feet long and 18 feet wide. How many yards of fence are needed to go all the way around it? *(28 yd.)*

28. Jane, Mildred and Dorothy bought 12 yards of ribbon for their dresses. Jane used $3\frac{1}{4}$ yards, and Mildred used $3\frac{3}{4}$ yards. How many yards were left for Dorothy's dress? *(5 yd.)*

29. Mr. Jones pays \$12 a bushel for grass seed. One peck of this grass seed plants an acre. How much will enough seed to plant 40 acres of grass cost him? *(\$120)*

30. These are the weights of Elsie and her friends:

Elsie	61 lb.	Alice	63 lb.	Grace	66 lb.
Betty	67 lb.	Belle	70 lb.	Julia	67 lb.

What is the average weight of the six girls? ($65\frac{2}{3}$ *lb.*)

Problems for the Sixth Grade

1. Joan's mother had $\frac{1}{4}$ of a large pie left from dinner. She gave Anne and two friends each $\frac{1}{3}$ of what was left. What fraction of the whole pie did each get? (*Answer,* $\frac{1}{12}$)

2. Mr. Smith told the boys that there were 855 lambs in all and that they would put 95 in each car. How many cars did they need for all the lambs? *(9 cars)*

3. Margaret dried a peeled potato in the oven to see how much water it would lose. It weighed $\frac{3}{8}$ pound before it was dried and $\frac{1}{16}$ pound afterward. The weight when dried was what fraction of the first weight? $\frac{1}{16} \div \frac{3}{8} = —$. ($\frac{1}{6}$)

4. Charles needed $2\frac{1}{4}$ feet of rubber to make treads for his toy tractor. He found $\frac{2}{3}$ of a foot of old rubber tubing in his father's garage. How much more did he need? ($1\frac{7}{12}$ *ft.*)

5. Dorothy and Sarah were to make the sandwiches for the Saturday hike of their club. They decided that a dozen sandwiches would be enough for 4 girls. At that rate how many sandwiches should they have made for the 16 girls in the club? *(48 sandwiches)*

6. In a horseshoe contest in Florida, 52 players walked a total of 268 miles in going from stake to stake. This was an average of ——— miles per player. ($5\frac{2}{13}$ *mi.*)

7. Sam has 750 stamps in his album. Don has $3\frac{1}{2}$ times as many as Sam. How many has Don? *(2625 stamps)*

8. Bill and his cousin Tom visited their grandmother in Cleveland for three weeks. They returned home by airplane. It took Tom $17\frac{2}{3}$ hours to get to his home in San Francisco, and Bill $19\frac{3}{4}$ hours to get to his home in Seattle. How much less time did Tom's trip take than Bill's? ($2\frac{1}{12}$ *hr.*)

9. Ann's father is 6 feet $1\frac{1}{2}$ inches tall. Ann is $11\frac{3}{4}$ inches shorter than her father. How tall is Ann? *(5 ft. $1\frac{3}{4}$ in.)*

10. Sarah weighs 80 pounds 4 ounces. Dorothy is 5 pounds 14 ounces lighter than Sarah. How much does Dorothy weigh? *(74 lb. 6 oz.)*

11. Margie bought some large red apples for her Valentine party, at the rate of 6 for 25 cents. She bought enough to give one apple to each of 24 children. How much did the apples cost her? *($1)*

12. Dorothy Cook has $6\frac{2}{3}$ yards of red ribbon to use for Valentine party decorations. Into how many pieces, each $\frac{2}{3}$ of a yard long, can she cut this ribbon? *(10 pieces)*

13. Marie bought 54 cents worth of sugar and 78 cents worth of fruit at a store. She gave the clerk a five-dollar bill. The clerk gave her the following change: 3 pennies, 1 nickel, 1 half dollar and 3 one-dollar bills. Marie said the change was not correct and asked for more. How much more should the clerk have given her? *(10¢)*

14. Fred divided 2 gallons 1 quart of maple syrup equally among 3 of his friends. How much maple syrup did he give each friend? *(3 qt.)*

15. By April 1 Charles had saved $4.18, and his brother, Tom, had saved $5.00. On April 2 Charles spend $1.35 of his money for a catcher's glove; Tom spent $2.69 for a tennis racket. How much less money did Tom have left than Charles? *(52¢)*

16. Dick and Jack measured their heights to find out how much taller Dick was than Jack. Dick was 5 feet 2 inches tall and Jack was 4 feet $11\frac{1}{2}$ inches tall. How much taller was Dick than Jack? *($2\frac{1}{2}$ in.)*

17. By using a pedometer and measuring tape Jim found that his average step is 27 inches and that his father's is 30 inches. He compared their steps by finding what fraction his step is of his father's. Jim's step is ——— of his father's. ($\frac{9}{10}$)

18. Water makes up about .70 of the total weight of our bodies. Water makes up how many pounds of the body of a man weighing 162.5 pounds? *(113.75 lb.)*

19. At one place in India the yearly rainfall is 450 inches. At one place in Africa it is only $\frac{3}{10}$ inch. The rainfall at the place in India is how many times that of the place in Africa? *(1,500 times)*

20. Ann had 175 sheets of paper, all exactly alike. She found that they weighed 1.75 pounds. How much did each sheet of the paper weigh? *(.01 lb.)*

21. Dorothy timed two lumberjacks as they cut down 3 trees. They spent 8 minutes 40 seconds on the first tree, 10 minutes 35 seconds on the second, and 9 minutes 6 seconds on the third. What was their average time per tree? *(9 min. 27 sec.)*

22. Ralph needs 25 feet of wire for his miniature ship model. He has one piece 16 feet 7 inches long and another that is 8 feet 9 inches long. Allowing 3 inches for joining the wires, find whether or not he has enough. *(Yes)*

23. The school dentist found that the teeth of $83\frac{1}{3}\%$ of the children in Miss Brown's room needed dental attention. There are 30 children in her room. How many children needed to go to the dentist? *(25 children)*

24. A salesman drove his car 25 miles on Wednesday. The distance driven on Thursday was equal to 472% of that driven on Wednesday. How far did he drive on Thursday? *(118 mi.)*

25. Mr. Jackson's cows give milk that is $3\frac{3}{4}\%$ butter fat. How many pounds of butter fat could be obtained from 160 pounds of this milk? *(6 lb.)*

26. How many crayon boxes, each $4'' \times 4'' \times 6''$, can be placed in a carton whose dimensions are $1' \times 1' \times 1'$? *(18 boxes)*

27. A rectangular tank for dipping sheep is 40 inches wide, 4 feet deep and 8 feet long. Find its volume in cubic feet. *($106\frac{2}{3}$ cu. ft.)*

28. The dimensions of a lawn in the shape of a right triangle are: base, 32 feet, altitude, 52 feet. Allow 1 pound of seed for every 225 square feet. About how much grass seed will be needed to plant the lawn? *(4 lb. [$3\frac{157}{225}$])*

29. Mr. Johnson has a potato patch in the shape of a parallelogram which has a base of 32 feet and an altitude of 16 feet. He plans to average a peck of potatoes from each four hills. He allows $1\frac{1}{2}$ square feet per hill. How many bushels does he expect from his potato patch? *($21\frac{1}{3}$ bu.)*

30. In an arithmetic contest, the sixth grade of Harris School made a score of 78.5, and the sixth grade of Milton School made a score of 80.3. How much higher was the Milton School's score than that of the Harris School? *(1.8)*

Problems for the Seventh Grade

1. Mr. Brown's regular working week is 45 hours. For this time he is paid 58 cents an hour. When he works more than 45 hours in one week, he is paid "time and a half" for the overtime. This means that each hour of overtime is counted as $1\frac{1}{2}$ hours. During one week in May Mr. Brown worked 51 hours. For how many hours should he have been paid at the rate of 58 cents? *(Answer, 54 hr.)*

2. Which is cheaper, a yard of cloth a yard wide at $1.50 a yard, or a yard of cloth $1\frac{1}{2}$ yards wide at $2.25 a yard? *(They cost the same.)*

3. Alice has four pieces of Christmas wrapping paper. Their dimensions are as follows: $18'' \times 18''$, $17'' \times 19''$, $15'' \times 21''$, $12'' \times 24''$. Find the area and perimeter of each piece. *(324 sq. in., 72 in.; 323 sq. in., 72 in.; 315 sq. in., 72 in.; 288 sq. in., 72 in.)*

4. Mr. Stout had his house weather-stripped and storm-proofed. He figured that he would use only 75% as much coal as last winter. He used 12 tons last winter. How many tons does he expect to save this winter? *(3 T.)*

5. The factory whistle near Bob's home blows at 6:00 o'clock each day. Bob cannot hear it at his home until $3\frac{1}{2}$ seconds after it starts to blow. Sound travels through the air at the rate of 1,130 feet per second. About how far from the factory does Bob live? *(3,955 ft.)*

6. Mr. Marks bought 9 tons of coal in July instead of waiting until the busy season. He was billed for this coal at $12 per ton. On the bill was this notice: "Summer discount of $16\frac{2}{3}\%$ if paid before September 1." How much did he save by buying 9 tons of coal in July and paying the bill before September 1? *($18)*

7. Mrs. Sands received a bill for $46.78 dated January 1. The bill had the following discount notice: "4%, 10 days; 2%, 15 days." What would be the net amount of this bill if paid on January 10? What would the net amount be if paid on January 13) *($44.91; $45.84)*

8. Miss Allison's wages are $25 per week. Is it correct to say that she earns exactly $100 each month? If it is not correct, find her average monthly wages. *(no; $108.33)*

9. Mr. Blank's salary for 1935 was $2,400. His salary for 1936 showed an increase of 10%. For his 1937 salary, he received a decrease of 10%. Which was the larger, his 1935 salary or his 1937 salary? *(1935 salary)*

10. On a camping trip the Phillips boys took the following canned goods: 1 can of spinach, weighing 1 pound 1 ounce; 2 cans of pears, weighing 2 pounds 3 ounces each; 2 cans of sliced peaches, weighing 10 ounces each; 3 cans of corn, weighing 1 pound 8 ounces each; 2 cans of plums, weighing 1 pound 12 ounces each. What was the total weight of these canned goods? *(14 lb. 11 oz.)*

11. Mr. Allen, who is a salesman for a bookstore, made sales totaling $2,660 in one month. Would he have made more money by accepting a salary of $150 or by accepting a salary of $75 plus an 8% commission on his sales of more than $1,500? How much more? *($75 plus 8% commission; $17.80 more)*

12. Betty Mann is paid $\frac{3}{4}$ cent a pound for packing plain chocolates and 1 cent a pound for packing fancy bonbons. How much should she receive for packing 28 lb. of plain chocolates? For packing 22 pounds of fancy bonbons? *(21¢; 22¢)*

13. Mrs. Gray stopped at the Main Street Garage to have her automobile repaired. The mechanic started work at 10:20 and finished at 11:10 o'clock. The labor cost of this repair was $1. This was a rate of how much an hour for labor? *($1.20)*

14. The Airway Lines operate a daily airplane from Newark, N. J., to Oakland, Calif. The average cost per trip of running the plane is $2,000. The average profit per trip is $375. The profit is what per cent of the cost? Give your answer to the nearest whole per cent. *(19%)*

15. The Johnson family left their home on Monday at 10 A.M. on a vacation trip to Glacier National Park. They reached the park on Wednesday at 11:45 A.M. How long did the trip to the park take? *(2 da. 1 hr. 45 min.)*

16. One day after baking a cake, Mrs. White had 3 egg yolks left over. She decided to use them for custard. Her recipe for custard calls for 1 pint of milk, 2 egg yolks, and $\frac{1}{4}$ cupful of sugar. How much milk and sugar should she have used with the three egg yolks? *($1\frac{1}{2}$ pt. milk, $\frac{3}{8}$ c. sugar)*

17. A diagram is drawn to the scale 1 inch equals 4 feet. To make a larger diagram of the same object, which of the following scales would you use: $\frac{1}{2}$ inch equals 4 feet, 1 inch equals 2 feet or $\frac{1}{2}$ inch equals 2 feet? *(1″ = 2′)*

18. One side of a trapezoid is 14 feet long. The side parallel to it is 8 feet long. A side perpendicular to these parallel sides is 6 feet long. Find the area of the trapezoid. Make a diagram if you need to. (*66 sq. ft.*)

19. Jim Eaton uses his bicycle to deliver groceries for the Star Store. He keeps a record of the distances he travels for the store. During one week these distances were 4.8 miles, 3.4 miles, 5.0 miles, 4.2 miles, 5.7 miles, and 7.9 miles. What was the total distance Jim traveled for the store during the week. (*31 mi.*)

20. The Parker family have an income of $3,000 a year. Their budget divides their income as follows: food, 20%; shelter, 22%; clothing, 15%; operating costs, 12%; savings, 16%; advancement, 15%. How much money should they set aside each month for each part of their budget? (*Food, $50; shelter, $55; clothing, $37.50; operating costs, $30; savings, $40; advancement, $37.50*)

21. Our baby weighs 18 pounds. This is 200% of what he weighed when he was born. How much did the baby weigh when he was born? (*9 lb.*)

22. The state is building 45 miles of road in our county. 36 miles have been completed. What per cent has been completed? (*80%*)

23. The seating capacity of a certain theater is 952. If the theater is filled to $87\frac{1}{2}\%$ of its capacity, how many people have been seated? (*833 people*)

24. The school children have collected 4 bushels 2 pecks of potatoes for 6 Thanksgiving boxes. If divided equally among the six boxes, what amount of potatoes will go in each box? (*3 pk.*)

25. The Corner Drug Store delivered 2 gallons 1 pint of ice cream on Monday, 3 gallons 2 quarts on Tuesday, 1 gallon 3 quarts 1 pint on Wednesday, 4 gallons 1 quart 1 pint on Thursday, and 3 gallons 1 pint on Friday. How much ice cream did the store deliver during the five days? (*15 gal.*)

26. The average weight of a carload of wheat is 40.93 tons. The average weight of a carload of corn is 37.31 tons. What is the average difference in weight of a carload of wheat and a carload of corn? (*3.62 T.*)

27. A cistern of 56-gallon capacity was $\frac{2}{3}$ full of water. After a rain the cistern was $\frac{5}{6}$ full. How many gallons did the rain add to the water in the cistern? (*$9\frac{1}{3}$ gal.*)

28. A certain factory uses $2\frac{1}{5}$ tons of coal in a day. Another factory uses $1\frac{2}{3}$ times as much coal in a day. What amount of coal is used daily by the second factory? (*$3\frac{2}{3}$ T.*)

29. Miss Carter, a clerk in the principal's office, was dividing paper into piles of 5 sheets each for an examination that 723 students were going to take. If she took 5 sheets for each student and 200 extra sheets, how many sheets of paper did she take in all for the examination? (*3,815 sheets*)

30. Mrs. Fox is making sandwiches for the sewing club. She plans to make 2 sandwiches for each of the 24 members of the club. She uses 2 slices of bread for each sandwich. If one loaf of bread makes 12 slices, how many loaves will she need? (*8 loaves*)

31. What is the value of a straight pile of wood 32 feet long, 8 feet wide, and 6 feet high at $12 a cord? (1 cord = 128 cubic feet.) (*$144*)

32. A dealer in delivering a 30-gallon cask of oil spilled 4.5 gallons. What per cent was spilled? (*15%*)

33. On farm wagons going over common level dirt roads it takes a force equal to .025 of the weight of the wagon and its load to draw them. What force will draw 45 bushels of wheat on a 1,200-pound wagon over such roads? (1 bushel wheat equals 60 pounds.) (*97.5*)

34. During the summer Sam sells books. He gets a $12\frac{1}{2}\%$ commission on each book sold. The books sell for $1.75 each. How much does Sam receive per book sold? (*$21\frac{7}{8}$¢*)

35. During the spring games Albert came to bat 36 times. He struck out 8 times. What per cent of the time did he strike out? (*$22\frac{2}{9}\%$*)

Problems for the Eighth Grade

1. An investment at $4\frac{1}{2}\%$ interest brings in $225 annually. How much is invested? (*Answer, $5,000*)

2. Recent figures show that labor costs take 44.6% of railroad revenues. If one year's total railroad labor costs amount to $2,250,000,000, what is the amount of the railroad revenues for that year? (*$5,044,843,049.32*)

3. An automobile salesman receives 5% commission. He sells 10 cars at $850 each during April. Find his commission during April. (*$425*)

4. At a fire sale a discount of $33\frac{1}{3}\%$ is allowed on men's suits and $\frac{1}{4}$ off on all other articles. Find the total discount allowed Mr. White if he buys two suits listed at $36 each, 1 pair of shoes listed at $6 and 3 shirts listed at $4 each. (*$28.50*)

5. Mr. North sold his radio for $54. This was 72% of its cost. Find the cost of the radio. (*$75*)

6. From 1920 to 1930 the population of Lawnville increased from 126,464 to 142,272. What was the per cent of increase? (*$12\frac{1}{2}\%$*)

7. On June 1 a merchant had a stock of goods valued at $1,250. By June 30 he had sold all but $7\frac{1}{2}\%$ of the goods. What was the value of the goods that he had not yet sold? (*$93.75*)

8. Tim won the 100-yard dash in the Garfield Junior High School swimming meet. His time was 2 minutes 43 seconds. Bill's time for the 100-yard dash was 3 minutes 4 seconds. Bill was how many seconds behind the winner? (*21 sec.*)

9. One day the Allen Bakery baked 375 loaves of white bread, each weighing 1 pound 4 ounces, and 500 loaves of white bread, each weighing 1 pound. What was the weight of the entire amount of white bread baked that day? (*968 lb. 12 oz.*)

10. In one pound of graham flour there are .137 of a pound of protein, .022 of a pound of fat, .703 of a pound of starch and .02 of a pound of mineral matter. The rest is water. How much water is there in one pound of graham flour? (*.118 lb.*)

11. Mrs. Baker needs the following lengths of curtain material for three rooms: $18\frac{1}{2}$ yards, $19\frac{1}{3}$ yards, $26\frac{5}{6}$ yards. How many yards of curtain goods does she need in all? (*$64\frac{2}{3}$ yd.*)

12. During one week Julia slept $8\frac{1}{4}$ hours, $9\frac{1}{2}$ hours, $8\frac{3}{4}$ hours, $10\frac{1}{6}$ hours, $9\frac{1}{3}$ hours, $8\frac{2}{3}$ hours and $9\frac{1}{3}$ hours. How many hours did she sleep in all? Julia is supposed to sleep $9\frac{1}{2}$ hours each night. How much more or less than $9\frac{1}{2}$ hours a night did Julia average? (*64 hr.; $\frac{5}{14}$ hr. less*)

13. Mr. Plumb has two pieces of garden hose, one $43\frac{1}{2}$ feet in length and the other $56\frac{1}{4}$ feet in length. It is 134 feet from the water hydrant to Mr. Plumb's garden. How many feet do the two pieces of hose, fastened together, lack of reaching from the hydrant to the edge of the garden? (*$34\frac{1}{4}$ ft.*)

14. A farmer sold 1345 pounds of milk to a dairy company on Monday; 973 pounds on Tuesday; 1097 pounds on Wednesday; 896 pounds on Thursday; and 964 pounds on Friday. How many pounds of milk did he sell to the company during the five days? What was the average number of pounds he sold per day? (*5,275 lb.; 1,055 lb.*)

15. What is the difference in the rate of yield on the actual investment between a 7% $1,000 bond selling at $900 and a 6% $1,000 bond selling at $800? (*.28% [.277%] in favor of the 7% bond*)

16. The list price of a certain canoe is $160. The sales price is $160 less a discount of $64. What rate of discount is allowed? (*40%*)

17. Mr. Sands lent Mr. Young $500. Mr. Young agreed to pay 5% interest. After some time Mr. Young sent to Mr. Sands a check for $562.50 to "square accounts." Assuming that he figured the interest correctly, for how long a time had Mr. Young kept the money? (*2 yr. 6 mo.*)

18. In order to put through a business deal, Mr. Morris borrowed $2400 for 8 months at $4\frac{1}{2}\%$. What was the amount of interest on the loan? (*$72*)

19. A bank discounted a note (that is, deducted the interest from the face of the note) at the time the loan was made. The note was for $810 @ 6% for 45 days. What amount was actually given by the bank? (*$803.925*)

20. To run his book store and make a fair profit, Mr. Anderson determines selling price by adding $62\frac{1}{2}\%$ of the first cost to the first cost. When first cost of a book is $0.98, what is the selling price? *$1.59, actually $1.59\frac{1}{4}$*)

21. A man wants to rope off a piece of ground in the form of a circle for use as a prize ring at the County Stock and Poultry Fair. The diameter of the ring is to be 30 feet. How many feet of rope must he buy? Allow 5 extra feet for knots. (*$99\frac{2}{7}$ ft. [100 ft.] or 99.248 ft. [100 ft.]*)

22. Suppose you are thinking of buying a house as an investment. You figure you can rent it for $55 a month. The taxes, insurance and upkeep will cost you $184 a year. If you want to make 7% net on your money, what is the highest price you could pay for the house? (*$6,800*)

23. Some swimming pools have fresh water running into them continuously so that the water is entirely changed every

hour. Find the number of gallons of fresh water needed per hour to change entirely the water in a pool whose average depth is 5 feet and which is 25 feet wide and 75 feet long. Figure 7.5 gallons per cubic foot. *(70,312.5 gal.)*

24. One acre of scrub timber will furnish 50 cross ties such as are used in laying railroad tracks. If 1,200,000,000 cross ties are used per year in the United States, how many acres of scrub timber must be cut yearly to meet this demand? *(24,000,000 A.)*

25. Mr. Charles built a rectangular cistern in which to store kerosene a safe distance from his house. The cistern was 4′ × 4′ × 6′. How much kerosene could he store in the cistern, figuring 7.5 gallons per cubic foot? *(720 gal.)*

26. Mr. and Mrs. Frank Merrill borrowed $1,600 at 7% per annum, in order to finish building their home. In 2 years and 8 months they paid back the loan with the interest. How much had it cost them to borrow the $1,600. *($298.67)*

27. The area of the Mississippi basin is 1,250 thousand square miles. The area of the Amazon basin is 2,500 thousand square miles. What per cent of the Amazon basin is the Mississippi basin? What per cent of the Mississippi basin is the Amazon basin? *(50%; 200%)*

28. The Midwestern Tire Company received an invoice for $1,500 worth of tires at successive trade discounts of 20%, 10% and 5%. What should have been the amount of the check sent in payment for these tires? *($1,026)*

29. Edward Farr sold aluminum ware one summer while he was in college. His total sales amounted to $1,616. He received a check for $202 as his commission. What per cent of his total sales was he given as his commission? *(12½%)*

30. The small circle in the middle of the gymnasium has a radius of 2 feet. This space is used whenever basketball is played. What is its area? *(12.56 sq. ft.)*

31. An electric range costs $98.75 cash. If bought on the instalment plan it costs $10 down plus 12 monthly payments of $8.50 each. How much more does this range cost by the instalment plan than by the cash plan? *($13.25)*

32. Roy's father had a square field containing 1,600 square rods. Roy knew that the area of a square is equal to the square of the length of one side. He knew that the length of each side of his father's field was equal to the square root of 1,600. Roy got 400 rods as his answer, but he made a mistake. What should he have found as the length of one side of the field? *(40 rd.)*

33. A train left Chicago at 10:15 A. M., Central Standard Time, and arrived in Pittsburgh at 8:15 P. M., Eastern Standard Time. The distance traveled by the train was 468 miles. What was the average distance traveled per hour? *(52 mi. per hr.)*

34. Which is cheaper, ribbon costing 89 cents a yard or ribbon costing $1 a meter? A meter equals 1.09 yards. *(Ribbon costing 89¢ a yard)*

35. A factory valued at $80,000 is insured against fire for $60,000. What per cent of the value of the factory is not covered by fire insurance? *(25%)*

SECTION THREE

INFORMATION

This section discusses almost all the practical everyday uses of arithmetic.

The Bank and the Community

Ancient records show that there were banks at least four thousand years ago. We know very little about these early banks, except that their chief use to the community was probably the safekeeping of money.

In those days the kind of money in use differed not only from country to country but also from city to city. Men who traveled from city to city, or who had business dealings with the people of neighboring communities, had the problem of handling many different kinds of money. One of the earliest services of banks was exchanging money of one kind for another kind.

Records have been found on clay tablets showing that the business transactions of thousands of years ago required the borrowing and lending of money. It was therefore a natural result for these ancient banks to lend money and to collect interest on it.

In the modern community, banking is perhaps the most important business. The bank serves not only all the other businesses of the community, but also the men and women who are not in business. Just as the banks of long ago did, the modern bank provides for the safekeeping, the exchanging and the lending of money. It also serves the community in many other ways.

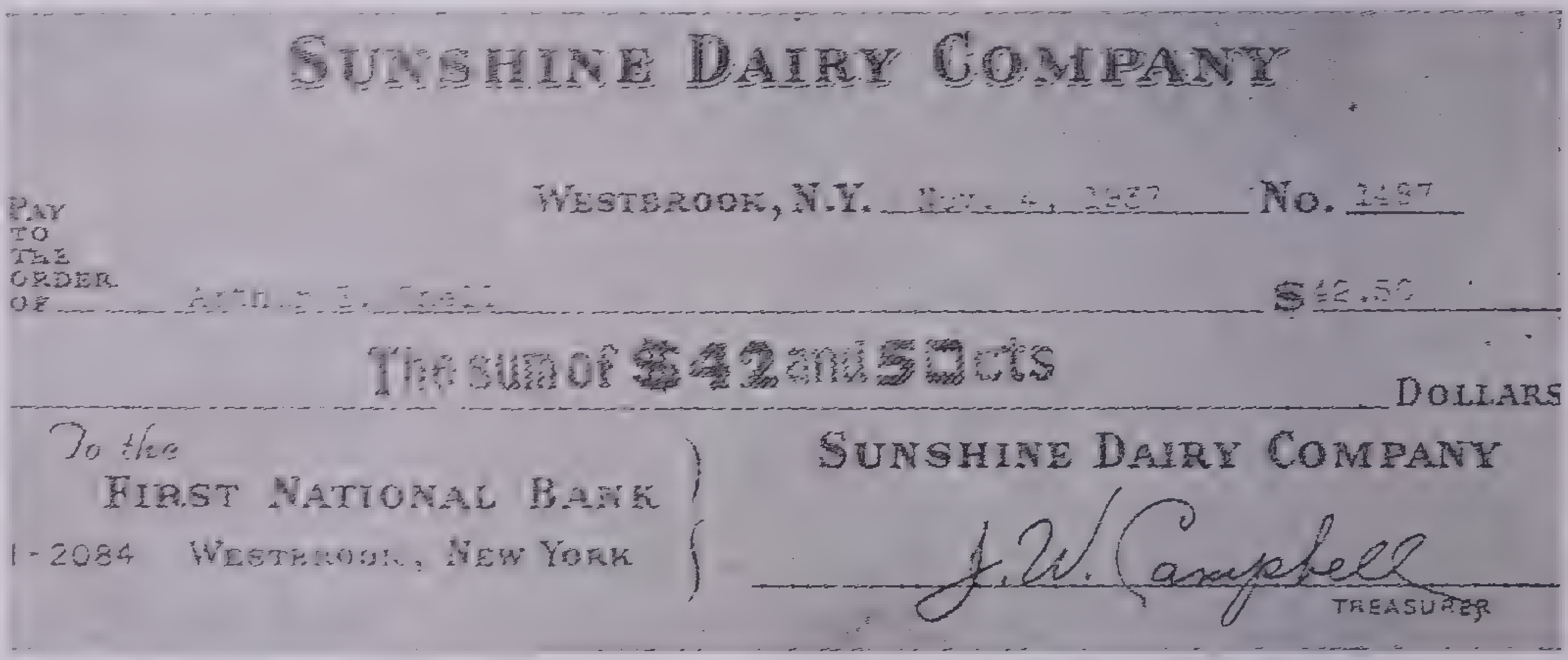
The modern bank assists the people of the community in saving money. For this purpose banks provide savings accounts which pay interest on the money left in them. Special accounts are also provided for saving money for Christmas, vacations and other purposes.

The modern bank provides checking accounts for its customers. Men and women put their money in these accounts and pay it out by writing checks, which may be given to the persons to whom the money is to be paid.

The modern bank does much more for the safekeeping of money than the ancient bank did. Money is kept in strong steel safes and vaults. In this country the Government has arranged with most banks to insure bank accounts. This means that the money that any person has in a bank, up to $5,000, will be repaid from a special fund if the bank is unable to pay out of its own funds.

Bank provides safety-deposit boxes in their vaults, which may be rented by customers for the safekeeping of important papers and valuable articles.

Banks also distribute information about money and money matters and handle the money affairs of those who are ill, who are traveling, or who have died.



SUNSHINE DAIRY COMPANY

WESTBROOK, N.Y. [illegible] No. [illegible]

PAY TO THE ORDER OF [illegible] $ [illegible]

The sum of $42 and 50 cts DOLLARS

To the FIRST NATIONAL BANK

1-2084 WESTBROOK, NEW YORK

SUNSHINE DAIRY COMPANY

J. W. Campbell

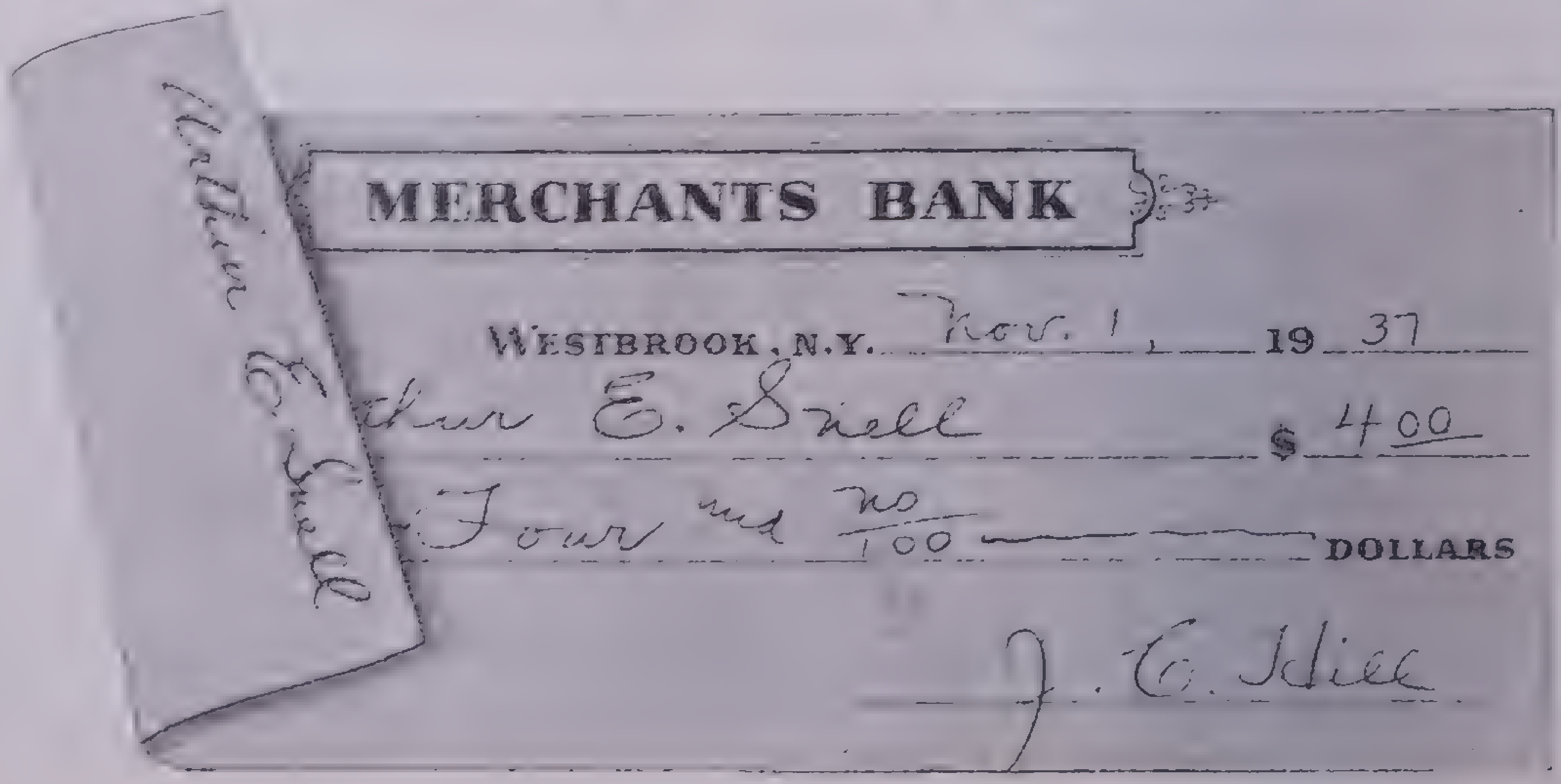
TREASURER

FACTS ABOUT CHECKS

A check is a bill of exchange drawn upon a bank and payable upon demand.

The check shown below has been *endorsed*. In endorsing a check the person to whom it is made out must be careful to write his name on the back in exactly the same form as it appears on the front of the check.

A cashier's check, a bank draft or a certified check may be used to send money in situations in which an ordinary check might not be accepted. Cashier's checks are usually used in sending money to persons living in nearby places. Bank drafts are used in sending money to distant places. A certified check is used when the person paying the money wants his own canceled check as receipt.



Arthur E. Snell

MERCHANTS BANK

WESTBROOK, N.Y. Nov. 1, 19 37

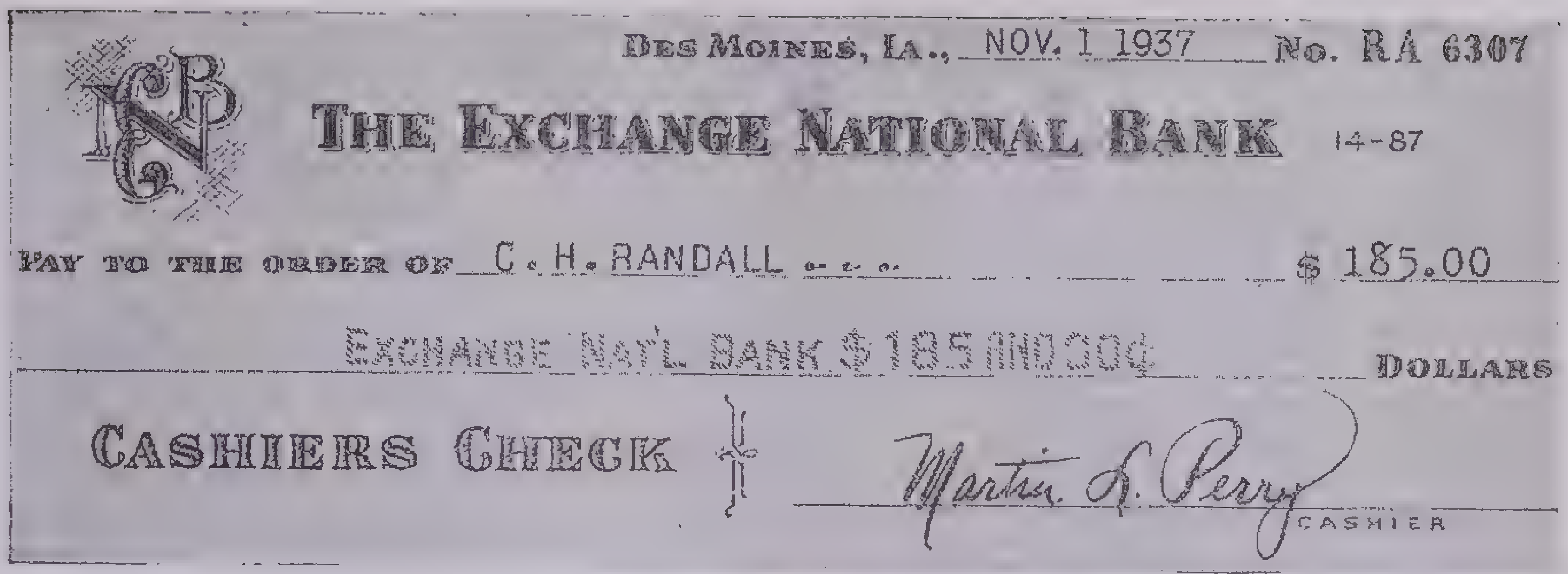
thur E. Snell $ 4 00

Four and no/100 DOLLARS

J. E. Hill

Cashier's Check

A cashier's check is a bank's own check drawn on itself. Banks will usually cash a cashier's check of another bank if the person to whom it is payable can identify himself.



DES MOINES, IA., NOV. 1 1937 No. RA 6307

THE EXCHANGE NATIONAL BANK 14-87

PAY TO THE ORDER OF C. H. RANDALL $ 185.00

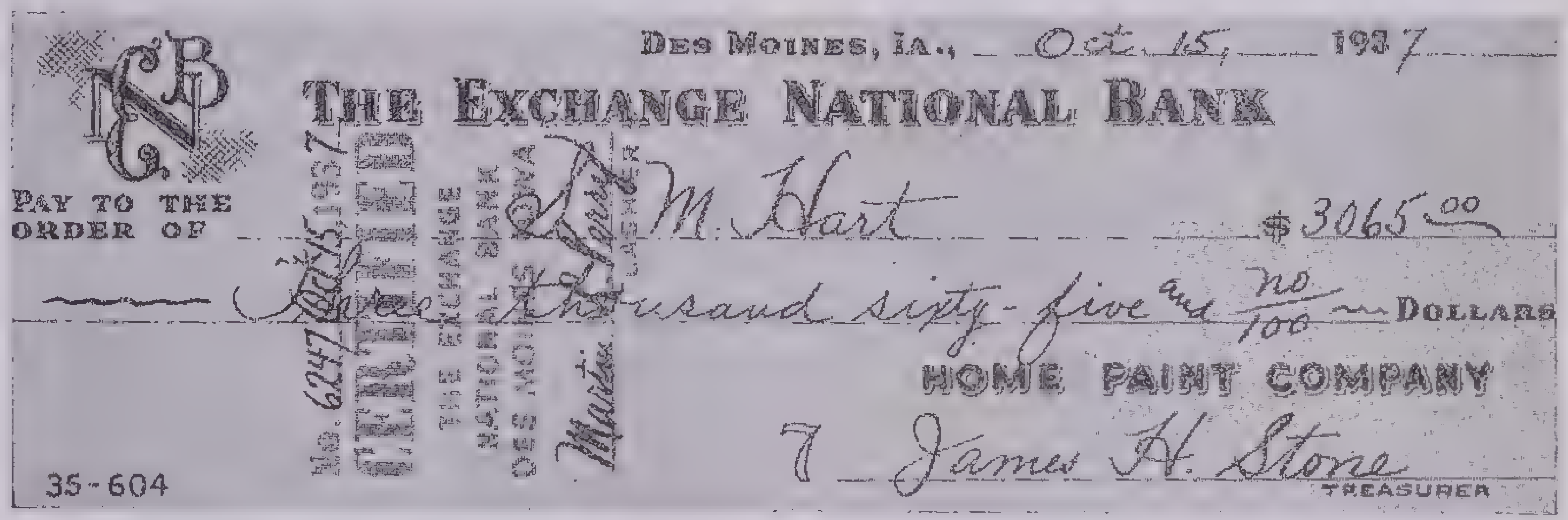
EXCHANGE NAT'L BANK $185 AND 00¢ DOLLARS

CASHIERS CHECK

Martin L. Perry CASHIER

A Certified Check

Notice that the word *certified* has been stamped near the left end of this check and that it has the signature of the *cashier*. This is called a *certified check*. A bank marks a check in this manner to show that it certifies or guarantees that the check is good for the amount written on it.



DES MOINES, IA., Oct. 15, 1937

THE EXCHANGE NATIONAL BANK

PAY TO THE ORDER OF M. Hart $3065.00

Three thousand sixty-five and no/100 DOLLARS

No. 6247 Oct 15 1937 CERTIFIED THE EXCHANGE NATIONAL BANK DES MOINES IOWA Martin L. Perry CASHIER

HOME PAINT COMPANY

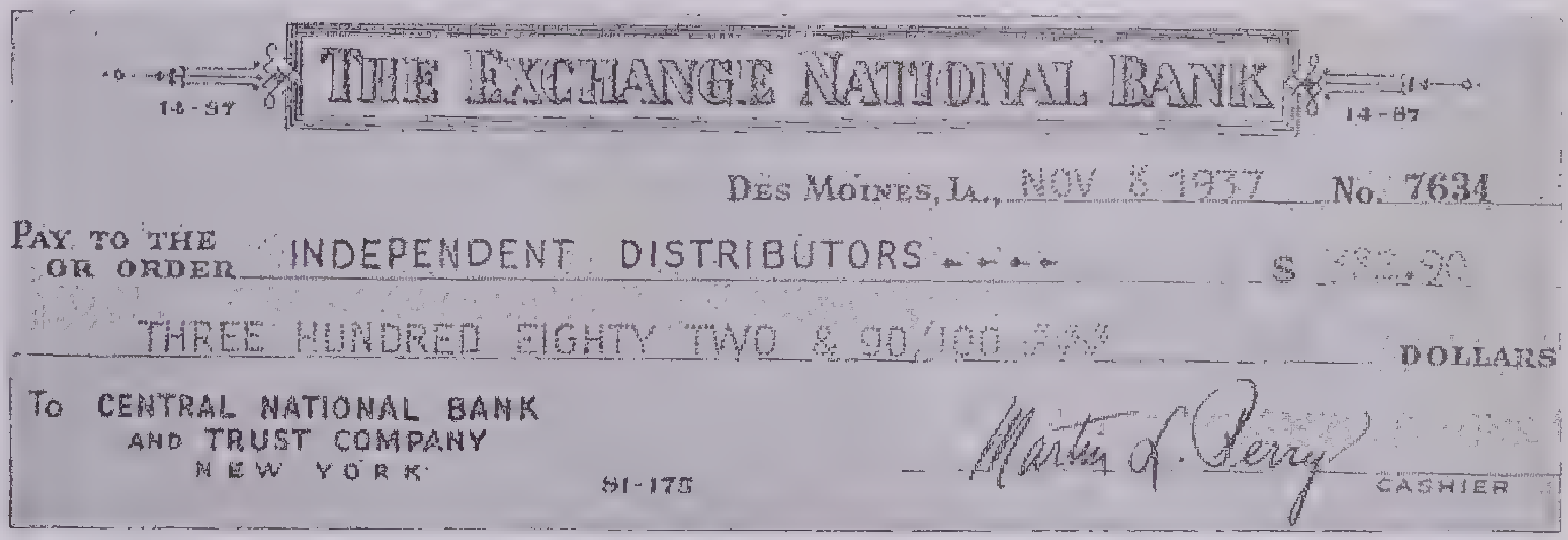
James H. Stone TREASURER

35-604

A Bank Draft

The check shown here is a bank draft. It is a check drawn by a bank on another bank. By means of the draft below the Exchange National Bank has ordered the bank in New York to pay $382.90 to the Independent Distributors. Banks usually have accounts at several banks in different parts of the country.

A draft is drawn on a bank located in the same part of the country as the person or company to whom it is payable.



14-87 THE EXCHANGE NATIONAL BANK 14-87

DES MOINES, IA., NOV 8 1937 No. 7634

PAY TO THE OR ORDER INDEPENDENT DISTRIBUTORS $ 382.90

THREE HUNDRED EIGHTY TWO & 90/100 DOLLARS

To CENTRAL NATIONAL BANK
AND TRUST COMPANY
NEW YORK

81-175

Martin L. Perry CASHIER

Percentage and Its Uses

The Meaning of Per Cent. The symbol % is read "per cent."

It means by the hundred or hundredths.

Percentage is a method of writing or expressing a quantity just as decimals, fractions and mixed numbers are.

Per cents, decimals and fractions are three ways of saying the same thing. Read across the page.

	Fraction	*Decimal*	*Per Cent*
a.	$\frac{4}{10}$	.4	40%
b.	$\frac{7}{10}$	.7	70%
c.	$\frac{1}{2}$	.5	50%
d.	$\frac{1}{4}$	.25	25%
e.	$\frac{1}{3}$	$.33\frac{1}{3}$	$33\frac{1}{3}\%$
f.	$\frac{1}{2}$ of $12 = 6$	$.5 \times 12 = 6$	50% of $12 = 6$
g.	$\frac{2}{3}$ of $48 = 32$	$.66\frac{2}{3} \times 48 = 32$	$66\frac{2}{3}\%$ of $48 = 32$
h.	$3\frac{1}{2} \times 4 = 14$	$3.5 \times 4 = 14$	350% of $4 = 14$
i.	$\frac{3}{10} \times 60 = 18$	$.3 \times 60 = 18$	30% of $60 = 18$
j.	$\frac{1}{8} \times 16 = 2$	$.125 \times 16 = 2$	$12\frac{1}{2}\%$ of $16 = 2$

As you see from the examples above:

1. Any fraction can be written as a decimal or a per cent.
2. Any decimal can be written as a fraction or a per cent.
3. Any per cent can be written as a fraction or a decimal.

Two decimal places represent hundredths. Per cent means hundredths. So to change a per cent to a decimal move the decimal point two places to the left. Leave out the per cent sign when you change a per cent to a decimal.

Change the per cents below to decimals:

23% 50% 28% 13% 72%
1% 67% 19% 19% 85%

Now write each per cent above as a common fraction. Are the per cents below correctly changed to decimals and fractions?

a. 3% means .03 or $\frac{3}{100}$

b. 3.4% means .034 or $\frac{3.4}{100}$

c. $12\frac{1}{2}\%$ means .125 or $\frac{12\frac{1}{2}}{100}$ or $\frac{1}{8}$

d. 60% means .60 or $\frac{60}{100}$ or $\frac{3}{5}$

Certain difficult per cents need special attention:

1. *Per Cents More Than a Hundred.* The whole number 1 represents 100%. 100% of 5 is one of 5 or all of 5, or 5 itself. 300% of anything means just 3 times that thing. 300% of 5 is 3 × 5 or 15.

Study the work below until you understand it:

$$120\% = \left\{ \begin{array}{l} 100\% = 1 \\ \underline{+20\% = +.20} \\ 120\% \text{ or } \ 1.20, \end{array} \right.$$

a mixed decimal

$$250\% = \left\{ \begin{array}{l} 200\% = 2 \\ \underline{+50\% = +.50} \\ 250\% = \ 2.50, \end{array} \right.$$

a mixed decimal

$$120\% = \left\{ \begin{array}{l} 100\% = 1 \\ \underline{+20\% = +\frac{1}{5}} \\ 120\% = \ 1\frac{1}{5}, \end{array} \right.$$

a mixed number

$$250\% = \left\{ \begin{array}{l} 200\% = 2 \\ \underline{+50\% = +\frac{1}{2}} \\ 250\% = \ 2\frac{1}{2}, \end{array} \right.$$

a mixed number

Example A shows how to find 108 per cent of \$251. Since 108 per cent is the same

$$\begin{array}{lr} \text{A} & \$251 \\ & 1.08 \\ \hline & 2008 \\ & 251 \\ \hline & \$271.08 \end{array}$$

as $\frac{108}{100}$, we multiply by 1.08. Per cent means "decimal times."

Find the following:

180% of \$20	225% of \$25
133⅓% of \$125	103% of \$5
200% of \$18	112½% of \$18

Change each per cent or fraction to its equivalent forms:

Per Cent	*Decimal*	*Mixed Number*
300%	....	....
....	4.25	....
....	....	$2\frac{3}{4}$
....	3.17	....
....	....	$1\frac{1}{8}$
....	....	$2\frac{1}{5}$
120%	....	....
....	2.47	....
249%	....	....
....	3.07	....
....	2.04	....
....	....	$5\frac{13}{100}$

2. *Per Cents with Fractions.* Per cents like 3½%, 6⅔%, 12½% and 16⅔% are often used. Each of these includes fractional parts of 1 per cent.

Whole per cents mean hundredths and are written in the first two places to the right of the decimal point.

Study the following examples. They will help you to understand fractions of a per cent.

1. $\frac{1}{4}\% = .00\frac{1}{4}$ (.0025)
2. $16\frac{2}{3}\% = .16\frac{2}{3}$ ($\frac{1}{6}$)
3. $45\frac{1}{2}\% = .45\frac{1}{2}$ (.455)
4. $\frac{1}{3}\% = .00\frac{1}{3}$
5. $128\frac{1}{2}\% = 1.28\frac{1}{2}$ (1.285)
6. $1\frac{3}{4}\% = .01\frac{3}{4}$ (.0175)
7. $28\frac{1}{2}\% = .28\frac{1}{2}$ (.285)
8. $\frac{3}{8}\% = .00\frac{3}{8}$ (.00375)
9. $180\% = 1.80$ ($1\frac{4}{5}$)
10. $17\frac{1}{2}\% = .17\frac{1}{2}$ (.175)

Change each per cent or decimal fraction to its equivalent forms:

Per Cent	*Decimal*	*Fraction*
25%	....	....
75%	....	....
50%	....	....
14%	....	....
2%	....	....
20%	....	....
....	.4 (.40)	....
....	.15	....
....	.3 (.30)	....
....	.03	....
....	....	$\frac{1}{2}$
....	....	$\frac{1}{5}$
....	....	$\frac{3}{4}$
....	....	$\frac{13}{100}$
4%	....	....
80%	....	....
7%	....	....

10%	....	....
90%	....	....
9%	....	....
....	.81	....
....	.9 (.90)	....
....	.06	....
....	.60	....
....	....	$\frac{1}{4}$
....	....	$\frac{3}{5}$
....	....	$\frac{7}{100}$
....	....	$\frac{9}{100}$

Percentage has three uses: (1) To find a per cent of a number. (2) To find what per cent one number is of another. (3) To find 100% of a number when we know a given per cent of the number. The following discussion illustrates these three uses.

Finding a Per Cent of a Number

The most common use of percentage is to find a given per cent of a number.

The question: A given per cent of a known number equals what number?

Remember: "Per cent of" means "decimal times." 3% of 9 = .03 × 9 =

Method: In finding "Per cent of" we multiply by a fraction or a decimal which equals the per cent.

1. What does 24% of \$36 equal?
2. Find 69% of 75.

$$\begin{array}{lr} \text{A} & \$\ 36 \\ & .24 \\ \hline & 144 \\ & 72 \\ \hline & \$8.64 \end{array} \qquad \begin{array}{lr} \text{B} & .75 \\ & 69 \\ \hline & 675 \\ & 450 \\ \hline & 51.75 \end{array}$$

Problem 1 is solved in Example A; problem 2 in Example B. We may change "per cent of" to fractions when the per cent is equivalent to an "easy" fraction—such as 33⅓% = ⅓, 50% = ½, etc.

In the following problems use either a decimal or a fraction, whichever is easier for you.

Find	*Method I*	*Method II*
16⅔% of 132	132 $\times .16\frac{2}{3}$	$\frac{1}{6} \times 132 =$
12½% of 132	132 $\times .12\frac{1}{2}$	$\frac{1}{8} \times 132 =$
8% of 125	125 $\times .08$	$\frac{8}{100} \times 125 =$
125% of 244	244 $\times 1.25$	$\frac{5}{4} \times 244 =$
33⅓% of 66	66 $\times .33\frac{1}{3}$	$\frac{1}{3} \times 66 =$
¼% of 24	24 .0025	$\frac{1}{100} \times 24 =$

Finding What Per Cent One Number Is of Another

In many problems we need to find what per cent one number is of another.

Question: What per cent one known number is of another known number.

Remember: What per cent of means "what part of" or "what fraction of."

Method: Make a fraction of the two numbers. Divide the numerator by the denominator, change the decimal answer to a per cent.

A. 8 is what per cent of 24?
B. 150 is what per cent of 300?
C. 510 is what per cent of 85?

A $\frac{8}{24} = \frac{1}{3}$ or $3\overline{)1.}$

$$\begin{array}{r} .33\frac{1}{3} = 33\frac{1}{3}\% \\ 3\overline{)1.00}\phantom{= 33\frac{1}{3}\%} \\ \underline{9}\phantom{= 33\frac{1}{3}\%} \\ 10\phantom{= 33\frac{1}{3}\%} \\ \underline{9}\phantom{= 33\frac{1}{3}\%} \\ \frac{1}{3}\phantom{= 33\frac{1}{3}\%} \end{array}$$

B $\frac{150}{300} = \frac{1}{2}$ or $2\overline{)1.}$

$$\begin{array}{r} .5 = 50\% \\ 2\overline{)1.0} \\ \underline{1\ 0} \end{array}$$

C $\frac{510}{85} =$

$$\begin{array}{r} 6. = 600\% \\ 85\overline{)510.} \\ \underline{510} \end{array}$$

Notice Example. C. Answers may be greater than 100% as well as less than 100%. Remember: *The number about which the problem is asked is always the numerator in the fraction,* and this is true whether it is larger or smaller than the other number. When the numerator is larger than the denominator the answer will be more than 100%.

Now work the following problems:

1. 725 is what per cent of 825?
2. 320 is what per cent of 25?
3. 25 is what per cent of 320?
4. Find what per cent 32.5 is of 820.

Which of the two questions below would be answered by solving the examples? Check (√) the correct answer.

1. $\frac{385}{428} = 428\overline{)385}$
   (a) — What per cent is 385 of 428? (b) — What per cent is 428 of 385?
2. $\frac{25}{450} = 450\overline{)25.}$
   (a) — What per cent is 25 of 450? (b) — What per cent is 450 of 25?

Practice in finding missing percents.

1. 200 is ——— per cent of 25.
2. 1 yd. is ——— per cent of 1 ft.
3. \$8 is ——— per cent of \$24.
4. 5 is ——— per cent of 20.
5. 5 miles is ——— per cent of 25 miles.
6. 100 is ——— per cent of 50.
7. 1 day is ——— per cent of 1 wk.
8. 12 is ——— per cent of 144.
9. 5 is ——— per cent of 10.
10. 25 is ——— per cent of 480.

Finding the Whole (100%) When a Per Cent of It Is Known

Question: A known number is a certain per cent of some number. What is that number? Or what is 100% of it?

Remember: You are to find 100% of the whole.

Method: The given per cent is changed to a decimal and used as a divisor. The known number is the dividend.

Example A shows how to find the number of which 30 is 15%.

A
$$\begin{array}{r} 200 \\ .15\overline{)30.00} \\ \underline{30} \end{array}$$

First we change 15% to a decimal .15.
Then we divide 30 by .15.
What is the answer?

Work the examples below.

10 is 25% of ——.
$32 is 1% of ——.
12 is 6% of ——.
280 is 25% of ——.
$8.20 is 60% of ——.
98 is 10% of ——.
$6.28 is 5% of ——.
12 is 42% of ——.
37¢ is 50% of ——.
144 is 100% of ——.

Using mixed number per cents in finding numbers.

Example B shows how to find the amount of which $2500 is 12½%.

B
$$\begin{array}{r} \$20000 \\ .125\overline{)\$2500.000} \\ \underline{250} \end{array}$$

How do we change 12½% to a decimal?

To check the answer find 12½% of $20,000.

Is the answer correct?

Find the missing number in each example below.

25 is 12½% of ——.
283 is 66⅔% of ——.
34 is 16⅔% of ——.
80 is 45% of ——.
44 is 5½% of ——.
12 is 32⅓% of ——.

Using per cents larger than 100 in finding numbers.

21 is 105% of ———.

See Example C.

C
$$\begin{array}{r} 20 \\ 1.05\overline{)21.00} \\ \underline{210} \\ 0 \end{array}$$

Check the answer by finding 105% of 20.

Is the answer correct?

Find the missing answer in the examples below.

$62 is 140% of ——.
$25 is 300% of ——.
820 is 105% of ——.
28 is 320% of ——.
15 is 200% of ——.
12 is 280% of ——.

The chart below shows the three uses of percentage:

To Find	*Sample*	*Solution*	*Remember*
A per cent of a number.	Find 5% of 38.	$\begin{array}{r} 38 \\ \underline{.05} \end{array}$	*Per cent of* means decimal times.
What per cent one number is of another.	25 is what per cent of 300?	$\frac{25}{300}$ or $300\overline{)25}$	What *per cent of* means what fraction of. The answer is written in per cent.
100% of the number when we know a given number.	If 32 is 25% of a number, what is 100%?	$.25\overline{)32.}$	Find the 100% by using the given % as divisor in decimal form.

Solving Problems in Percentage

The actual figuring in percentage is easy if you understand how to multiply and divide decimals. In a completed percentage example there are always three facts. These are two numbers and a per cent. In any problem to be solved one of these is missing. The answer to be found is the third fact. The part of percentage work that calls for *real thinking* is the question of what example to write in order to solve the problem. Take time to study the problem before writing anything.

For each of the problems below, draw a circle around the solution that will correctly solve the problem.

PROBLEM	SOLUTION			
1. Find 13% of 196.	$.13\overline{)196}$	$\begin{array}{r} 196 \\ \underline{\times .13} \end{array}$	$\frac{13}{196} = \begin{array}{r} . \\ 196\overline{)13.} \end{array}$	$\begin{array}{r} 196 \\ \underline{\times 13} \end{array}$
2. 82 is what % of 246?	$\begin{array}{r} 2.46 \\ \underline{\times 82} \end{array}$	$\frac{246}{82} = \begin{array}{r} . \\ 82\overline{)246} \end{array}$	$\begin{array}{r} 246 \\ \underline{\times .82} \end{array}$	$\frac{82}{246} = \begin{array}{r} . \\ 246\overline{)82.} \end{array}$
3. Find 100% of N if 87 equals 16% of N.	$\begin{array}{r} . \\ .16\overline{)87.00} \end{array}$	$\begin{array}{r} 87 \\ \underline{\times .16} \end{array}$	$\frac{16}{87} = \begin{array}{r} . \\ 87\overline{)16.} \end{array}$	$\frac{87}{16} = \begin{array}{r} . \\ 16\overline{)87.00} \end{array}$
4. 465 is what % of 150?	$\frac{150}{465} = \begin{array}{r} . \\ 465\overline{)150.} \end{array}$	$\frac{465}{150} = \begin{array}{r} . \\ 150\overline{)465.} \end{array}$	$\begin{array}{r} 465 \\ \underline{\times 1.50} \end{array}$	$\begin{array}{r} 465 \\ \underline{\times .15} \end{array}$
5. Find 125% of 560.	$\begin{array}{r} . \\ 1.25\overline{)560.00} \end{array}$	$\begin{array}{r} 560 \\ \underline{\times .125} \end{array}$	$\begin{array}{r} 560 \\ \underline{\times 1.25} \end{array}$	$\frac{125}{560} = \begin{array}{r} . \\ 560\overline{)125.} \end{array}$
6. Find 100% of N when 85 equals 150% of N.	$15\overline{)85}$	$\begin{array}{r} 85 \\ \underline{\times .15} \end{array}$	$\begin{array}{r} . \\ 85\overline{)15.00} \end{array}$	$\begin{array}{r} . \\ 1.5\overline{)85.0} \end{array}$
7. If 425 is 100% of N, what % of N is 220?	$\frac{425}{220} = \begin{array}{r} . \\ 220\overline{)425.} \end{array}$	$\begin{array}{r} 425 \\ \underline{\times 2.20} \end{array}$	$\frac{220}{425} = \begin{array}{r} . \\ 425\overline{)220.} \end{array}$	$\begin{array}{r} . \\ .220\overline{)425.000} \end{array}$
8. Find ½% of 96.	$\begin{array}{r} 96 \\ \underline{\times .005} \end{array}$	$\begin{array}{r} 96 \\ \underline{\times .05} \end{array}$	$\begin{array}{r} 96 \\ \underline{\times .5} \end{array}$	$\frac{96}{2}$
9. What is the whole if 150% of it is 750?	$15\overline{)75}$	$\begin{array}{r} . \\ 1.50\overline{)750.00} \end{array}$	$\frac{150}{750} = \begin{array}{r} . \\ 750\overline{)150.} \end{array}$	$\begin{array}{r} 750 \\ \underline{\times 1.5} \end{array}$

Uses of Percentage

INTEREST

1. *Interest* is money paid for the use of money.

2. The amount of money on which the interest is paid is called the *principal.*

3. The *rate* is a given per cent such as 2%, or 5%, etc., of the principal.

4. The unit of *time* in figuring interest is usually one year. If the time is more or less than a year, it is figured as a fraction of a year. So 6 months = ½ year; 3 years 6 months = 3½ or $\frac{7}{2}$ years.

5. The *amount* is the principal plus the interest. In interest problems you are usually asked to find either the interest or the rate. Two important formulas are: $r = \frac{i}{pt}$, and $i = prt$. In these formulas p stands for principal, t for time, and r for rate.

The following examples show the methods of working interest problems:

Example A: Find the interest on $1800 at 6% for 1 year and 6 months.

$$\begin{array}{l} i = p \times r \times t \\ \qquad\ \downarrow \quad\ \downarrow \quad \downarrow \\ i = \$1800 \times .06 \times 1\tfrac{1}{2} \end{array}$$

$$\begin{array}{rl} \$1800 & \rightarrow \text{principal} \\ .06 & \rightarrow \text{rate} \\ \hline \$108.00 & \rightarrow \text{interest for one year} \\ \times 1.5 & \rightarrow \text{time (1 yr. 6 mo.)} \\ \hline \$162.00 & \rightarrow \text{interest for } 1\tfrac{1}{2} \text{ yr., } \textit{Answer} \end{array}$$

Example B: Mr. Jones paid the bank $162 interest on a loan of $1800 for 1 year and 6 months. What rate of interest did he pay?

$$r = \frac{i}{pt} = \frac{\$162}{1800 \times \frac{3}{2}}$$

$$\overset{900}{\cancel{1800}} \times \frac{3}{\cancel{2}} = 2700$$

$$\begin{array}{r} .06 = 6\% \ \textit{Answer} \\ 2700\overline{)162.00} \\ \underline{162\ 00} \end{array}$$

Use the formula i = prt to find the interest for 6 months on each principal below:

$328 at 2%	$2025.75 at 10%
$850 at 6%	$218.50 at 2%
$95.60 at 1½%	$100 at 5%

Use the formula to find interest on the following:

$175 at 2% for 9 mos.
$250 at 6% for 8 mos.
$2500 at 2½% for 2¼ yr.
$345 at 6% for 6 mo.

Use the formula $r = \frac{i}{pt}$ to find the rate of interest in the following examples.

Principal $1250; interest $125.50; time 2½ yr.

Principal $180; interest $10.80; time 1 yr.

You may know the interest and the rate and wish to find the principal.

For this process use the principal formula, $p = \frac{i}{r}$.

Example A: An investment which earns 5% interest nets $50 a year. How much money is invested?

$$p = \frac{i}{r} = \frac{\$50}{.05} = \$1000 \qquad .05\overline{)50.}^{\ 1000}$$

Or you may know the principal and interest and wish to know the amount due at the end of the period of time. For this use the amount formula with A standing for amount.

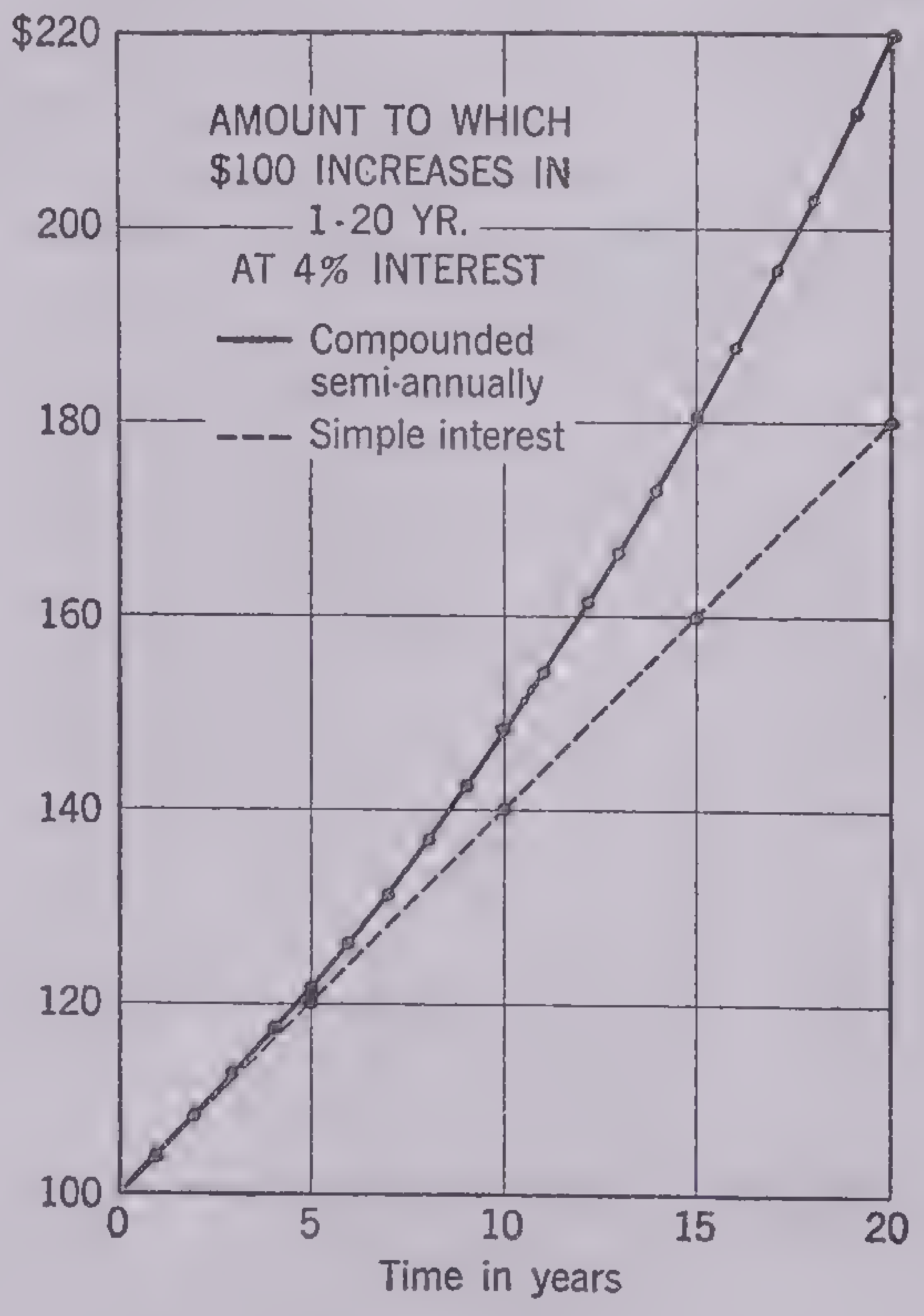
A = p + i

Example B: What is the amount of a $1000 loan at 5% for 1 year?

A = p + i = $1000 + $50 = $1050

Now fill in the blanks in the table below:

	Principal (p)	*Rate (r)*	*Interest (i)*	*Time (t)*	*Answers*
1.	$600	6¾%	Find interest	2 yr.	
2.	Find principal	4%	$300	1 yr.	
3.	$900	7½%	Find interest	3 yr. 6 mo.	
4.	$4000	3½%	Find interest	1 yr. 4 mo.	
5.	$5000	Find rate	$250	1 yr.	
6.	$6000	6%	Find interest	1 yr. 3 mo.	
7.	Find principal	5½%	$68.75	1 yr.	
8.	$800	Find rate	$78	1 yr.	
9.	$600	4½%	Find amount	2 yr.	
10.	$1000	6%	Find interest	1 yr. 7 mo. 11 da.	
11.	$750	2¾%	Find amount	9 mo.	



On the graph above what principal is used for both kinds of interest?

What rate is used for both?

Along the base line we represent the time in years.

The scale extends from ____ year to ____ years.

What do we represent along the vertical line?

The amount to which $100 increases is always more than $100, so we start the vertical scale at $100 instead of $0.

Each small square along the scale represents $ ____.

According to the graph, how much would $100 amount to in 5 years? 10 years? 15 years?

According to the graph, for about how long was there only a small difference between the amounts at simple interest and at compound interest?

In 8 years the $100 amounted to about how much at simple interest? At compound interest? What is the difference?

In 20 years how much more did the $100 amount to at compound interest than at simple interest?

When interest is added to the principal and then earns interest, we say that the interest is *compounded.*

The principal then earns *compound interest.*

Example A: At 4% compounded semi-annually how much will $300 earn in 1 year?

1. i = prt = $300 × .04 × ½ = $6

$$\begin{array}{rr} 2. & \$300 \\ & \underline{6} \\ & \$306 \end{array}$$

3. i = $306 × .04 × ½ = $6.12

4. 6. + 6.12 = $12.12, amount $300 will earn in 1 yr.

The following table shows:

GROWTH OF SAVINGS AT 3% INTEREST COMPOUNDED SEMIANNUALLY

Monthly Deposit	*1 Year*	*2 Years*	*3 Years*	*4 Years*	*5 Years*
$ 1	$ 12.20	$ 24.76	$ 37.70	$ 51.03	$ 64.76
$ 2	24.40	49.52	75.41	102.08	129.56
$ 5	60.98	123.80	188.50	255.17	323.86
$10	121.96	247.60	377.04	510.41	647.79

1. According to the table above a monthly deposit of $1 will amount to $—— in 1 year. $—— in 3 years. $—— in 5 years.

2. By this plan, how much will be deposited in 5 years? How much interest will the money earn?

3. A monthly deposit of $5 will amount to how much in 5 years at 3% *interest compounded semi-annually?*

4. At 3% compounded semiannually, how much money should a person deposit each month in order to save about $75 in 3 years? About $650 in 5 years?

Borrowing Money from a Bank

The note pictured here is a *promissory note.* It is so called because it contains a promise to pay.

The amount is called the *principal* of the note. The note says the interest is 5% per annum. For this note

$$i = prt$$

$$i = \overset{4}{\cancel{400}} \times \frac{5}{\cancel{100}} \times \frac{\cancel{90}}{\underset{\cancel{90}}{\cancel{360}}}$$

$$i = \$5$$

Use the formula to find interest on the following:

$240 @ 6% for 60 da.
$1500 @ 5½% for 6 mo.

Notice that the note pictured at the right is payable "on demand." This means the money is due any time Mr. Steele wishes to ask for it.

The principal of a note plus the interest is called the *amount* of the note.

The date on which a note is due is called the *date of maturity.* The note at the right matured June 9, 1938. A bank collects interest on all notes *in advance.* Such notes are called *discounted* notes. A discounted note does not earn any more interest until after maturity. Notice that the rate of interest is shown on the note for the time after maturity until the note is paid.

The discount on this note is $48.13. The interest that a bank collects in advance is called *bank discount.*

$$i = prt$$

$$i = \$3500 \times .055 \times \tfrac{1}{4}$$

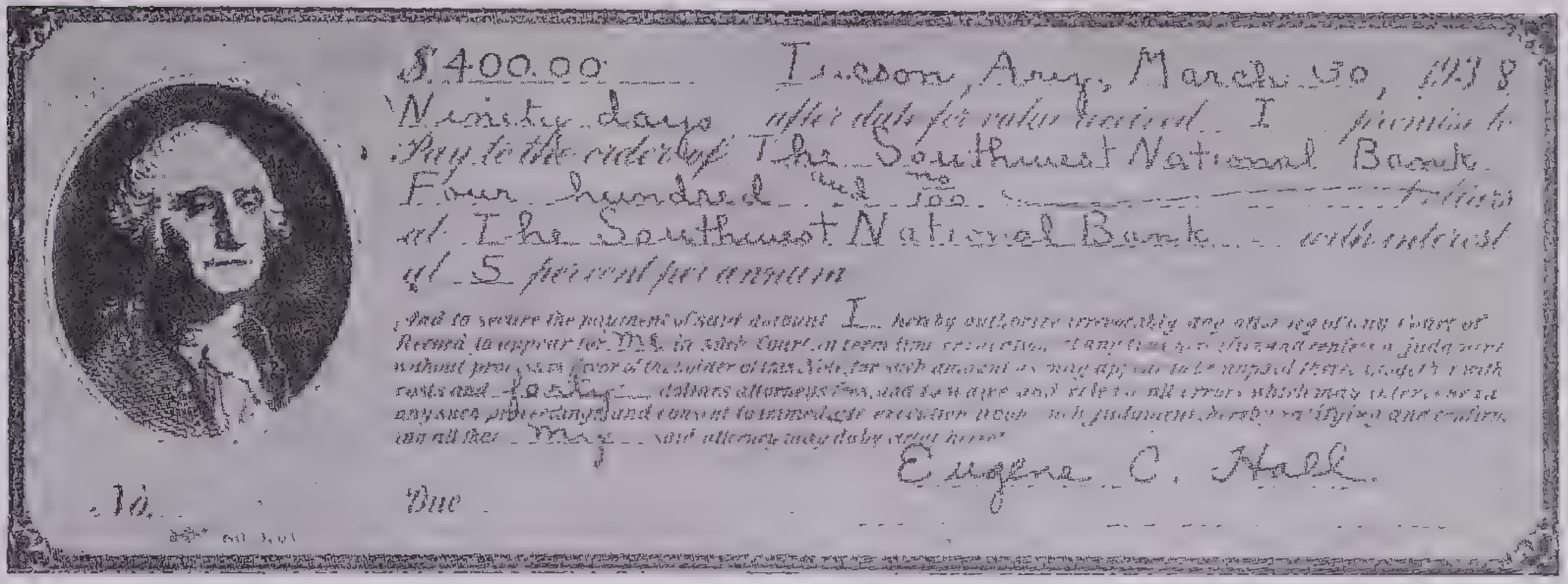
$$i = \$48.13$$

The amount of money received after the note is discounted is called the proceeds. The proceeds of this note were $3451.87.

Bankers and others having a great deal of interest to figure make use of a table like this.

6% Interest Table

Time	*$1*	*$2*	*$3*	*$4*	*$5*	*$6*	*$7*	*$8*	*$9*	*$10*	*Time*
1 da.	.00017	.00033	.0005	.00067	.00083	.001	.00117	.00133	.0015	.00167	1 da.
2 da.	.00033	.00067	.001	.00133	.00167	.002	.00233	.00267	.003	.00333	2 da.
3 da.	.0005	.001	.0015	.002	.0025	.003	.0035	.004	.0045	.005	3 da.
4 da.	.00067	.00133	.002	.00267	.00333	.004	.00467	.00533	.006	.00667	4 da.
5 da.	.00083	.00167	.0025	.00333	.00417	.005	.00583	.00667	.0075	.00833	5 da.
6 da.	.001	.002	.003	.004	.005	.006	.007	.008	.009	.01	6 da.
7 da.	.00117	.00233	.0035	.00467	.00583	.007	.00817	.00933	.0105	.01167	7 da.
8 da.	.00133	.00267	.004	.00533	.00667	.008	.00933	.01067	.012	.0133	8 da.
9 da.	.0015	.003	.0045	.006	.0075	.009	.0105	.012	.0135	.015	9 da.
10 da.	.00167	.00333	.005	.00667	.00833	.01	.01167	.01333	.015	.01667	10 da.
20 da.	.00333	.00667	.01	.01333	.01667	.02	.02333	.02667	.03	.03333	20 da.
1 mo.	.005	.01	.015	.02	.025	.03	.035	.04	.045	.05	1 mo.
2 mo.	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10	2 mo.
3 mo.	.015	.03	.045	.06	.075	.09	.105	.12	.135	.15	3 mo.
4 mo.	.02	.04	.06	.08	.10	.12	.14	.16	.18	.20	4 mo.
5 mo.	.025	.05	.075	.10	.125	.15	.175	.20	.225	.25	5 mo.
6 mo.	.03	.06	.09	.12	.15	.18	.21	.24	.27	.30	6 mo.
7 mo.	.035	.07	.105	.14	.175	.21	.245	.28	.315	.35	7 mo.
8 mo.	.04	.08	.12	.16	.20	.24	.28	.32	.36	.40	8 mo.
9 mo.	.045	.09	.135	.18	.225	.27	.315	.36	.405	.45	9 mo.
10 mo.	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	10 mo.
11 mo.	.055	.11	.165	.22	.275	.33	.385	.44	.495	.55	11 mo.
1 yr.	.06	.12	.18	.24	.30	.36	.42	.48	.54	.60	1 yr.
2 yr.	.12	.24	.36	.48	.60	.72	.84	.96	1.08	1.20	2 yr.

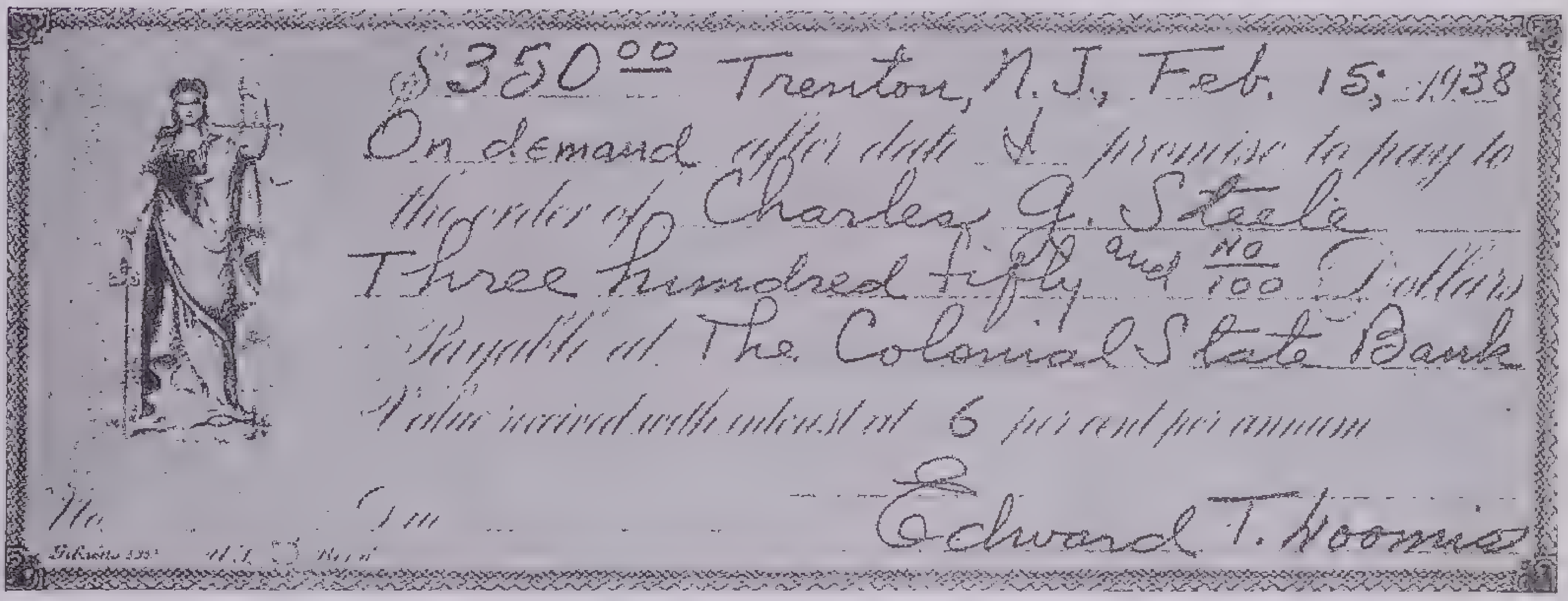


$400.00 Tucson, Ariz., March 30, 1938
Ninety days after date for value received I promise to
Pay to the order of The Southwest National Bank
Four hundred and no/100 Dollars
at The Southwest National Bank with interest
at 5 per cent per annum

Eugene C. Hall

No. Due

Promissory Note

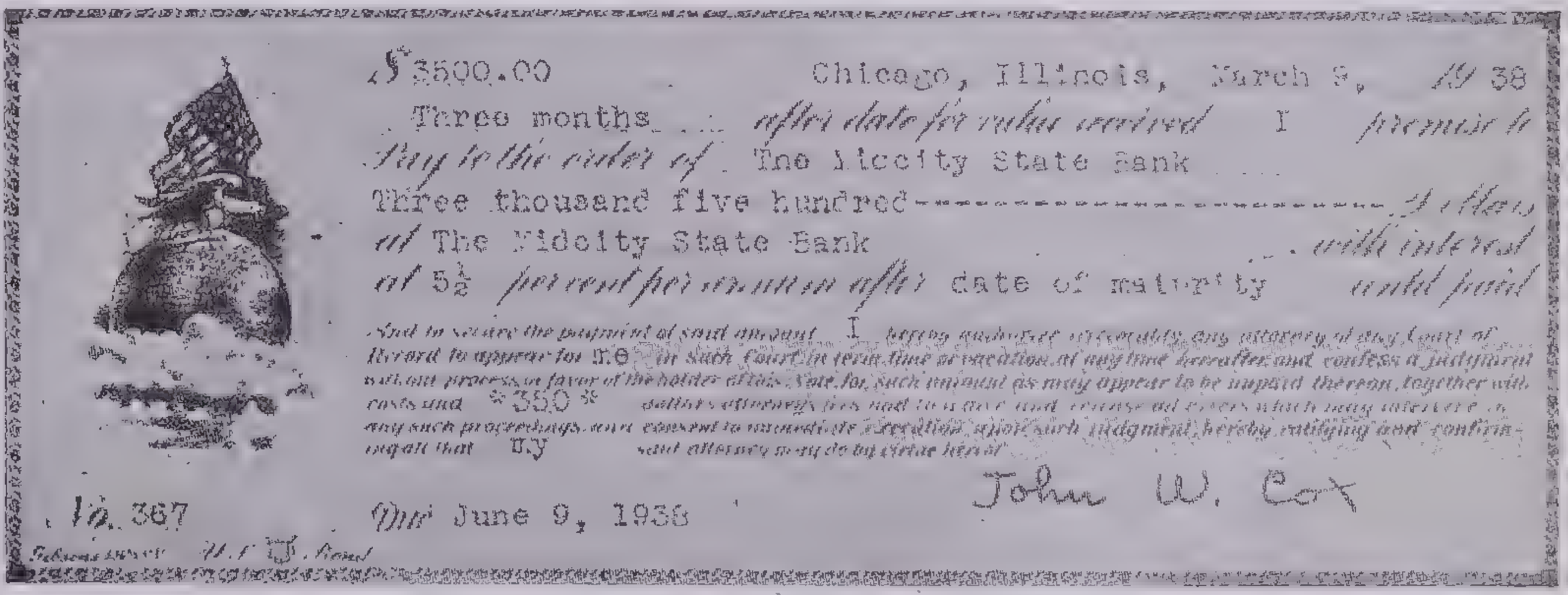


$350.00 Trenton, N.J., Feb. 15, 1938
On demand after date I promise to pay to
the order of Charles G. Steele
Three hundred fifty and no/100 Dollars
Payable at The Colonial State Bank
Value received with interest at 6 per cent per annum

No. Due

Edward T. Loomis

Promissory Note Payable on Demand



$3500.00 Chicago, Illinois, March 9, 1938
Three months after date for value received I promise to
Pay to the order of The Fidelity State Bank
Three thousand five hundred------------------------------Dollars
at The Fidelity State Bank with interest
at 5½ per cent per annum after date of maturity until paid

And to secure the payment of said amount I hereby authorize irrevocably any attorney of any Court of Record to appear for me in such Court in term time or vacation, at any time hereafter, and confess a judgment without process in favor of the holder of this Note, for such amount as may appear to be unpaid thereon, together with costs and *350* dollars attorney's fees and to waive and release all errors which may intervene in any such proceedings, and consent to immediate execution upon such judgment, hereby ratifying and confirming all that my said attorney may do by virtue hereof.

No. 367 Due June 9, 1938

John W. Cox

Promissory Note Giving Date of Maturity

6%-60-Day Method of Finding Interest

In computing interest, 360 days are generally considered one year; 60 days, ⅙ year. This gives an easy way of finding the interest on a sum of money at 6% for 60 days. Find the interest on $3000 at 6% for 60 days.

$$\overset{30}{\cancel{\$3000}} \times \frac{\cancel{6}}{\cancel{100}} \times \frac{\cancel{60}}{\underset{\cancel{60}}{\cancel{360}}} = \$30$$

The interest is $30. It can be found by dividing $3000 by 100.

To find the interest at 6% for 60 days, move the decimal point in the principal two places to the left.

The table on the next page shows the number of days from any day of any month to same day of any other month (no allowance for leap year). Bankers and others use tables like this in figuring interest and discount.

Table of Time

FROM ANY DAY OF	TO THE SAME DAY OF THE NEXT											
	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
JANUARY	365	31	59	90	120	151	181	212	243	273	304	334
FEBRUARY	334	365	28	59	89	120	150	181	212	242	273	303
MARCH	306	337	365	31	61	92	122	153	184	214	245	275
APRIL	275	306	334	365	30	61	91	122	153	183	214	244
MAY	245	276	304	335	365	31	61	92	123	153	184	214
JUNE	214	245	273	304	334	365	30	61	92	122	153	183
JULY	184	215	243	274	304	335	365	31	62	92	123	153
AUGUST	153	184	212	243	273	304	334	365	31	61	92	122
SEPTEMBER	122	153	181	212	242	273	303	334	365	30	61	91
OCTOBER	92	123	151	182	212	243	273	304	335	365	31	61
NOVEMBER	61	92	120	151	181	212	242	273	304	334	365	30
DECEMBER	31	62	90	121	151	182	212	243	274	304	335	365

Table Showing Amount Accumulated at End of a Period of Years by Paying $1 at Beginning of Each Year in the Period

Yrs.	2%	2½%	3%	3½%	4%	5%	6%	*Yrs.*
1	1.020	1.025	1.030	1.035	1.040	1.050	1.060	**1**
2	2.060	2.076	2.091	2.106	2.122	2.152	2.184	**2**
3	3.122	3.153	3.184	3.215	3.246	3.310	3.375	**3**
4	4.204	4.256	4.309	4.362	4.416	4.526	4.637	**4**
5	5.308	5.388	5.468	5.550	5.633	5.802	5.975	**5**
6	6.434	6.547	6.662	6.779	6.898	7.142	7.394	**6**
7	7.583	7.736	7.892	8.052	8.214	8.549	8.897	**7**
8	8.755	8.955	9.159	9.368	9.583	10.027	10.491	**8**
9	9.950	10.203	10.464	10.731	11.006	11.578	12.181	**9**
10	11.169	11.483	11.808	12.142	12.486	13.207	13.972	**10**
11	12.412	12.796	13.192	13.602	14.026	14.917	15.870	**11**
12	13.680	14.140	14.618	15.113	15.627	16.713	17.882	**12**
13	14.974	15.519	16.086	16.677	17.292	18.599	20.015	**13**
14	16.293	16.932	17.599	18.296	19.024	20.579	22.276	**14**
15	17.639	18.380	19.157	19.971	20.825	22.657	24.673	**15**
16	19.012	19.865	20.762	21.705	22.698	24.840	27.213	**16**
17	20.412	21.386	22.414	23.500	24.645	27.132	29.906	**17**
18	21.841	22.946	24.117	25.357	26.671	29.539	32.760	**18**
19	23.297	24.545	25.870	27.280	28.778	32.066	35.786	**19**
20	24.783	26.183	27.676	29.269	30.969	34.719	38.993	**20**
21	26.299	27.863	29.537	31.329	33.248	37.505	42.392	**21**
22	27.845	29.584	31.453	33.460	35.618	40.430	45.996	**22**
23	29.422	31.349	33.426	35.667	38.083	43.502	49.816	**23**
24	31.030	33.158	35.459	37.950	40.646	46.727	53.865	**24**
25	32.671	35.012	37.553	40.313	43.312	50.113	58.156	**25**
26	34.344	36.912	39.710	42.759	46.084	53.669	62.706	**26**
27	36.051	38.860	41.931	45.291	48.968	57.403	67.528	**27**
28	37.792	40.856	44.219	47.911	51.966	61.323	72.640	**28**
29	39.568	42.903	46.575	50.623	55.085	65.439	78.058	**29**
30	41.379	45.000	49.003	53.429	58.328	69.761	83.802	**30**
31	43.227	47.150	51.503	56.334	61.701	74.299	89.890	**31**
32	45.112	49.354	54.078	59.341	65.210	79.064	96.343	**32**
33	47.034	51.613	56.730	62.453	68.858	84.067	103.184	**33**
34	48.994	53.928	59.462	65.674	72.652	89.320	110.435	**34**
35	50.994	56.301	62.276	69.008	76.598	94.836	118.121	**35**
36	53.034	58.734	65.174	72.458	80.702	100.628	126.268	**36**
37	55.115	61.227	68.159	76.029	84.970	106.710	134.904	**37**
38	57.237	63.783	71.234	79.725	89.409	113.095	144.058	**38**
39	59.402	66.403	74.401	83.550	94.026	119.800	153.762	**39**
40	61.610	69.088	77.663	87.510	98.827	126.840	164.048	**40**

Discount

Single Discounts. A discount is a reduction in price; it is an amount taken off the regular price. Sometimes discounts are expressed as fractions of the price, like "$\frac{1}{3}$ off the regular price" or "marked down $\frac{1}{6}$". More often discounts are expressed as per cents. A discount of 5% for cash would be 5% off the regular price. The price after the discount has been taken off is called the *net price.*

Study the problems below. Notice that they are all solved by the use of percentage.

1. Mrs. Jones bought a coat at a spring sale. The coat was marked $50. The merchant gave her a discount of 10%. What did she pay for the coat?

Solution: 10% = .1 $50 × .1 = $5
$50 − $5 = $45, *Answer.*

2. Mrs. Creston was allowed $30 discount for paying cash for her new rugs. She paid $240. What was the rate of discount?

Solution: The original price was $240 + $30 = $270. $30 ÷ $270 = $.11\frac{1}{9}$ or $11\frac{1}{9}$% = rate of discount.

3. On a bill of goods a discount of 6% came to $24. What was the list price of the goods?

Solution: 6% = $24.

$400
100% or list price = .06)$24.00

Successive Discounts. If two or more discounts are offered, each must be figured in order, and each must be figured on the new base—the net price after the previous discount has been subtracted. *Cash discount* is always figured on the *net.*

What must Mr. Jackson pay on a bill amounting to $400 if he takes advantage of a trade discount of 20% and a cash discount of 3%.

Solution:
20% of $400 = $80
$400 $320
−80 Trade discount × .03
$320 $9.60 Cash discount
$320 − $9.60 = $310.40, *Answer.*

Study the problems above until you understand them.

Now fill in the blanks in the listing below.

	List Price	*Discount*	*Rate of Disc.*	*Selling Price*
1.	$750	$25	....	....
2.	....	$200	25%	....
3.	....	....	50%	$780
4.	$8,000	....	$\frac{1}{5}$%	....
5.	$1,000	....	25%, 2%	....

Commission Merchants and Brokers

Commission merchants and brokers earn their livings by buying and selling for others, charging them a per cent of the cost price or of the selling price as commission.

The amount that a commission merchant collects from a buyer is called the *gross proceeds.* The amount that he returns to the seller, after deducting commissions, freight and other charges, is called the *net proceeds.*

1. A real estate agent sold Mrs. Plumb's restaurant for her. After taking out his 5% commission, he gave Mrs. Plumb $8075. For how much did he sell the restaurant?

Net proceeds = $8075 = 95% of selling price
$8075 ÷ .95 = $8500
$8500 = selling price.

2. John Jones took subscriptions for magazines during the summer. His commission was 10%. His subscriptions amounted to $320. What was his commission?

Solution: 10% of $320 = .1 × $320 = $32

3. Mary Anderson received $42 as commission for selling $280 worth of women's coats. What was the rate of her commission?

Solution: We must find what per cent $42 is of $280.

.15 or 15%
280)42.00

Study the problems above until you understand them.

Now fill in the blanks in the following table:

	Amt. of Sale	*Commission*	*Rate*
1.	$2500	$125.00	....
2.	....	$35.50	$\frac{1}{3}$%
3.	$7850	....	5%
4.	....	$205.00	8%
5.	$25.00	$5.00	....

Stocks and Bonds

Stocks

When a business becomes large, it often happens that the original owners take in partners. They sell part of the ownership of their business. To do this they have to secure a written permit from the state government. Such a permit is called a *charter*. The business is now a *corporation*. In organizing the corporation the amount of money invested in the business is called the *capital stock*. The capital stock is divided into *shares* (usually of $100 each), called *shares of stock*.

The owner of one or more than one of these shares is called a *stockholder*. As evidence of ownership each stockholder has a *stock certificate* showing the number of shares he owns and the par value of each.

Any stockholder is a part-owner of the business and is entitled to his share of the profits of the business. The profits that are divided among the stockholders are called *dividends*.

The *market value* of stock is the price at which it can be bought or sold in open market. A stock investment is more speculative than a bond investment, owing to the changes in the market value. The prices of stocks are quoted each day in the newspapers.

Common stocks, those already described, make the stockholder a part-owner of the corporation and give him a vote in the control of the business and a share in its profits.

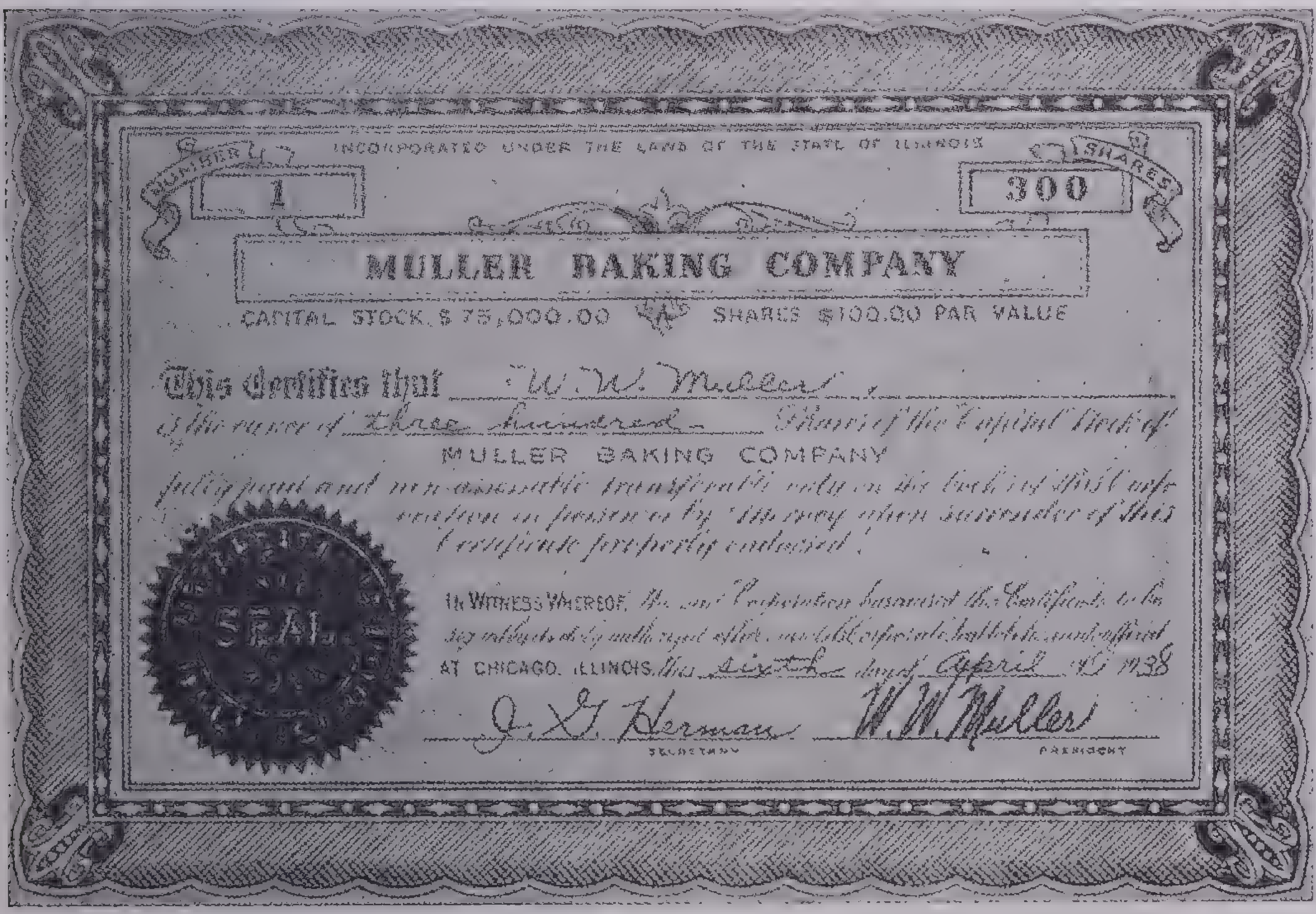
Preferred stocks do not give the owner a vote, and he shares in the earnings only to the extent of the dividends guaranteed in the certificate. Preferred stock usually guarantees in the certificate a dividend from 5 per cent to 7 per cent.

In *cumulative preferred stock*, if for any reason the company cannot pay the dividends, the dividends accumulate until the company does make enough money to pay them. These dividends must be paid before dividends on the common stock are paid.

BONDS

A *bond* is essentially the same as a note in that it is security for a loan. When a large corporation wants to borrow a large sum of money, it may not be able to find a bank able or willing to lend so much. So the corporation divides the loan into amounts of $100, $500, $1000 or larger amounts.

A *coupon bond* when issued has small coupons attached, one for each interest date. When the coupons are due they may be cut off and deposited with a bank for collection.



INCORPORATED UNDER THE LAWS OF THE STATE OF ILLINOIS

NUMBER 1

SHARES 300

MULLER BAKING COMPANY

CAPITAL STOCK $75,000.00 SHARES $100.00 PAR VALUE

This Certifies that W. W. Muller

is the owner of three hundred Shares of the Capital Stock of

MULLER BAKING COMPANY

IN WITNESS WHEREOF,

AT CHICAGO, ILLINOIS, this sixth day of April 19 1938

J. G. Herman
SECRETARY

W. W. Muller
PRESIDENT

SEAL

Stock Certificate

Registered bonds have the name and address of the holder of each bond registered on the books of the company, and a check is sent to the owner for the interest when it is due.

School districts, counties, towns, cities, states and our national Government often borrow money by bond issues to meet certain debts or expenditures.

Corporation bonds are usually secured by a mortgage on the property of the corporation.

A person who buys and sells bonds is called a *broker*. The charge the broker makes for buying and selling the bonds is called *brokerage*.

Listed bonds are those that are bought and sold by *brokers* who belong to some *exchange*.

A $100 bond is a promise to pay $100 at a certain time and to pay interest at a specified rate.

When a bond sells for less than its *face value* (par value) it is said to sell *below par*; it is said to sell *above par* when it sells for more than its face value.

Market prices of bonds are quoted in percentages of their face value. Thus, "Wheels Incorporated, 5s, 1939, $105\frac{1}{2}$" means that a $1000 bond of the Wheels Company due in 1939, paying $50 a year interest (5% of $1000), is selling at $105\frac{1}{2}\%$ of its face value, or $1055.

A broker's charges for buying a $1000 bond range from $1.50 to $2.50.

Accrued interest is the interest the bond has earned since the last interest was paid.

If on May 19, you buy a 6% bond "with interest payable April 1 and October 1," it has been 48 days since the last interest was paid. If it is a $1000 bond, the buyer pays the seller $8 accrued interest.

$$\frac{48}{360} \times \frac{6}{100} \times \$1000 = \$8$$

The *current yield* on a bond is the yield for a single year. It is found by dividing the annual interest by the bond's cost.

Profit and Loss

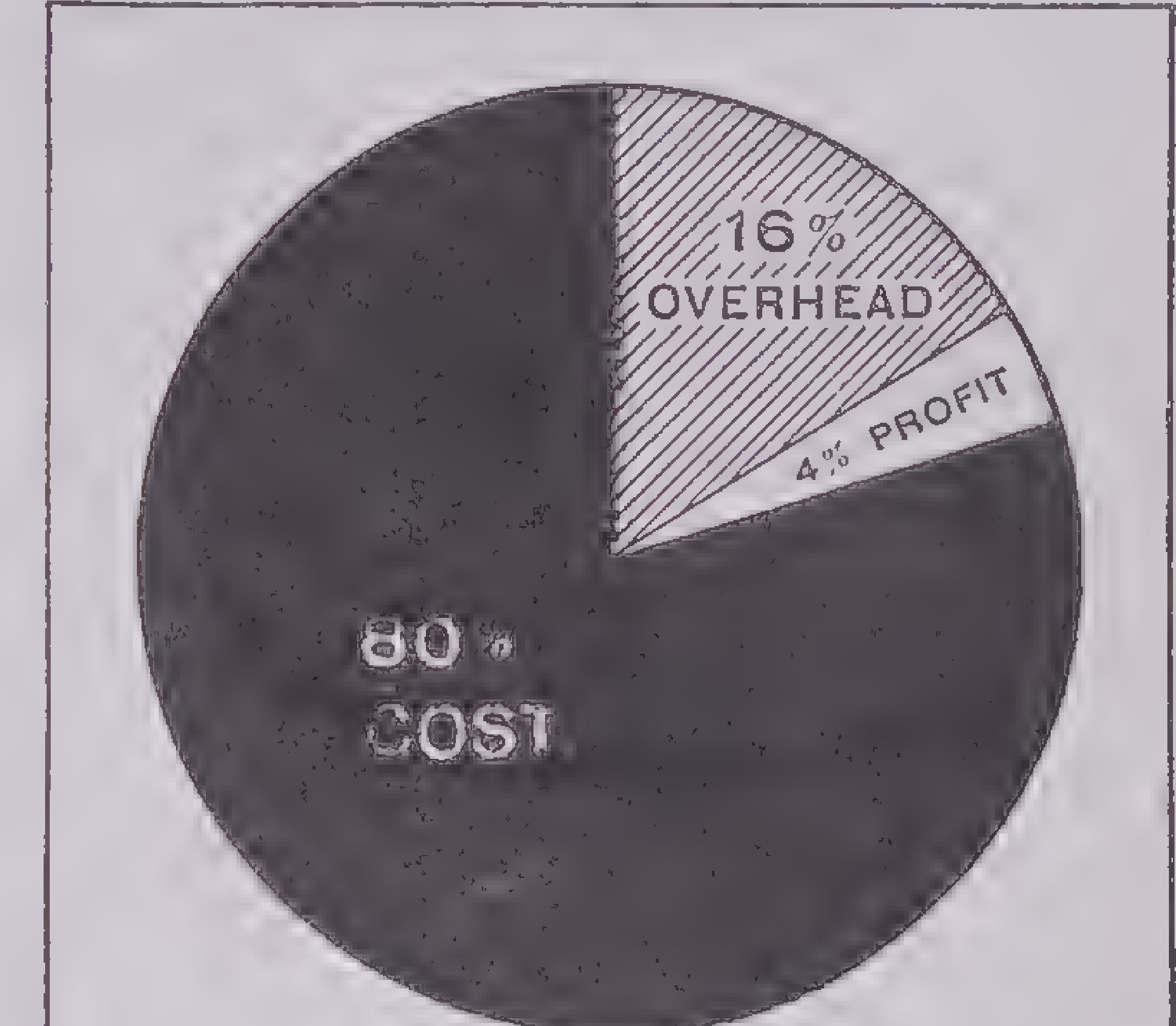
The amount left from the sale of merchandise after deducting the cost and all expenses is *net profit*, or profit.

The difference between the selling price and the cost of merchandise is called *margin* or gross profit.

The *rate of margin* is usually thought of as a per cent of the retail selling price of an article, and it is figured on the selling price.

To find the rate of margin on a pair of shoes costing $4 and selling for $6, first find the amount of margin. $6 − $4 = $——. Then find what per cent $2 is of $6.

Figuring Profit and Loss. The graph below shows how a well-managed store divides the selling price of certain kinds of merchandise. The graph shows that the selling price is thought of as 100%.



HOW THE STORE'S
INCOME IS DIVIDED

1. According to this graph, 80% of the selling price goes for the cost of the merchandise, 4% goes for profit, and 16% goes for overhead.

2. This store sells hairbrushes according to this plan. The selling price of the brushes is 75¢ each. How many cents are paid to the wholesaler for each brush?

3. How many cents are paid out for overhead?

4. How many cents are kept as profit?

5. What is the amount of the margin on each brush?

6. Find the per cent of margin.

The profit on each hairbrush is 3¢. According to the graph this profit is 4% of the selling price. The per cent of profit was figured on the selling price. In large businesses the per cent of profit is always figured on the selling price. In small stores the per cent of profit is sometimes figured on the cost price or wholesale price.

An article is sold at a loss when the selling price is less than the sum of the cost price and the overhead.

Below are the wholesale prices, overhead and selling prices of several articles. For each article tell whether there was a profit or a loss. What was the amount of the profit or loss? What per cent of the selling price was the profit or loss?

Article	*Cost Price*	*Overhead*	*Selling Price*
Belt	$ .33	$ .14	$ .50
Hairbrush	.90	.21	1.00
Fountain Pen	2.00	.65	3.00
Chinaware	.51	.17	.85
Hair Tonic	.39	.16	.50
Scratch Pads	.14	.06	.20

INSURANCE

Insurance is an agreement by one party, the *insurer*, for a consideration, the *premium*, to compensate another party, the *insured*, against losses arising from certain causes.

The *insurance policy* is the contract containing the agreement between the two parties. The sum of money specified in the policy to be paid in case of loss is called the *face of the policy*.

Life Insurance

Life insurance is a contract in which the *insurer* for a consideration called the *premium*, agrees to pay a specified sum of money upon proof of the death of the *insured* or at some fixed time.

The table below shows life expectancy of persons from the age of 10 years to 95 years.

At Age	*Number Living*	*Expectancy of Life*
10	100,000	48.7 yr.
15	96,285	45.5 yr.
20	92,637	42.2 yr.
25	89,032	38.8 yr.
30	85,441	35.3 yr.
35	81,822	31.8 yr.
40	78,106	28.2 yr.
45	74,173	24.5 yr
50	69,804	20.9 yr
55	64,563	17.4 yr.
60	57,917	14.1 yr
65	49,341	11.1 yr.
70	38,569	8.5 yr
75	26,237	6.3 yr.
80	14,474	4.4 yr.
85	5,485	2.8 yr.
90	847	1.4 yr.
95	3	.5 yr

Mr. Walker who is 25 years of age, decided to take out a life insurance policy for $5,000. Such a policy would guarantee his wife $5,000 from the insurance company upon his death.

Mr. Walker asked Mr. Fay, an insurance man, how much a $5,000 policy would cost. Mr. Fay explained that the cost would depend upon Mr. Walker's age and upon the kind of policy that he bought. The annual premium rates that the insurance company charged for each $1,000 of insurance for four kinds of policies are shown below.

Age	*5-Year Term*	*Ordinary Life*	*20-Payment Life*	*20-Year Endowment*
20	$11.60	$18.50	$28.40	$47.50
25	12.00	20.70	30.40	48.10
30	12.60	23.50	33.20	48.80
35	13.50	27.00	36.70	50.00
40	15.00	31.70	41.00	51.80
45	17.60	38.00	46.50	54.80
50	22.50	46.60	53.80	59.60
55	31.10	58.30	64.00	67.60
60	45.50	74.60	78.30	80.20

Are the rates for all four kinds of policies higher or lower for the older ages than for the younger ages?

For which kind of policy is the rate lowest?

If Mr. Walker should buy 5-year term insurance, he would have to pay $12 per year for each $1,000 of insurance. His annual premium would be $12. How much would his annual premium on $5,000 be?

Mr. Fay explained that the 5-year term insurance had a low premium rate because it protected him for 5 years only and had no investment features.

If Mr. Walker should stop paying the premium during the 5 years, the policy would be canceled, and the insurance company would owe him nothing. At the end of 5 years he would have to take out a new policy at the 30-year-age rate if he wanted to keep himself insured.

If Mr. Walker should take out a $5,000 ordinary life policy, he would have to pay an annual premium of 5 times $\_\_\_\_\_\_$ (or $______) as long as he lived. This kind of policy has a savings feature because a part of each annual premium will be returned in cash to Mr. Walker if he should ask to have the policy canceled. This amount of money is known as the *cash value* of the policy. This kind of policy also has a *loan value*. For example, after 5 years Mr. Walker could borrow $228.80 on his policy without canceling it.

What would his annual premium be on a 20-payment life policy for $5,000? Mr. Walker would have to pay only 20 annual premiums on this policy. We say that it would be paid up in 20 years. This kind of policy also has a cash and a loan value. It would have a cash value of $2,522.95 at the end of 20 years or would pay Mrs. Walker $5,000 when he died.

What would his annual premium be on a 20-year endowment policy for $5,000? This policy would be paid up in 20 years and would then have a cash value of $5,000. Why is the annual premium high?

The kinds of life insurance include ordinary life or whole life; the limited-payment life, the most common of which is the 20-year payment; the endowment policy; and term insurance.

For *the ordinary* or *whole-life policy* the insured pays a set annual premium during his life, which guarantees that at his death any person designated in the policy will receive the amount of the insurance. The person to whom the money is paid is called the *beneficiary*.

On *the limited-payment policy*, by paying a higher annual premium for a limited number of years, such as ten, twenty, twenty-five, the insured may have the protection for the rest of his life.

The endowment policy guarantees to the insured a cash payment of an agreed amount to be paid at the end of the term for which the policy is written. If death occurs during the term the beneficiary receives the amount of the insurance.

The term policy protects the insured for a specified number of years only, such as five, ten or twenty. The policy is renewable. The annual premium is smaller than in any other kind of policy.

Property Insurance

Insurance policies on property may be of the following kinds:

An Open Policy in which the sum to be paid is not stated, but is to be determined after the loss has occurred. In such a policy a limit is set to the amount to be paid. The open policy is a form often used in insuring goods in storage.

The Valued Policy, for which the maximum sum of money to be paid is stated on the policy.

The Blanket Policy, which covers several items of property, such as a whole group of buildings.

In property insurance the premium paid is a specified rate on the amount insured, or a specified rate per $100. Premiums are payable in advance for the entire term of the policy, which is usually a period of one, two or three years.

Suppose Mr. Carl owns property worth $8,000, which he insures for 80% of its value at 0.5%. The *amount* of his insurance will be $6,400, and his premium will be 0.5% of this amount or $32. If his property is destroyed by fire and the loss is estimated at $5,000, the company pays the $5,000. But if the loss had been $7,000, the company would have paid but $6,400, the amount agreed upon in the policy.

The three most common forms of property insurance are *fire, theft* and *liability*.

A fire insurance policy is an agreement to compensate the insured against *actual*

FIRE INSURANCE RATES FOR ONE-YEAR POLICIES IN SUNSET HEIGHTS

Building	*Roof*	*Rate per $100*	
		Building	*Contents*
Brick dwelling	Approved	$ .17	$.23
Brick dwelling	Unapproved	[illegible]	.27
Frame dwelling	Approved	.25	.32
Frame dwelling	Unapproved	.30	.36
Private garage, brick	Approved	.28	.34
Private garage, brick	Unapproved	.32	.38
Private garage, frame	Approved	.40	.46
Private garage, frame	Unapproved	.44	.50

COMBINED FIRE, LIGHTNING, TORNADO AND HAIL INSURANCE
RATES PER $100

Property Insured	[illegible]	[illegible]	[illegible]
Farm buildings and contents	$1.20	$2.20	$3.25
Live stock	1.00	2.00	3.00
Grain in cribs, bins and farm elevators	1.00		
Hay, straw, fodder and ground feed	3.00	6.00	9.00
Harvesters, threshers and combines	2.00	—	—
Deduct from above for buildings with:			
Approved roofs	.10	.20	.30
Approved lightning-rods	.05	.10	.15

losses arising from *accidental* fires. The loss by fire includes any damage resulting from use of chemicals or water used in extinguishing the fire. Fire caused by lightning is usually included under accidental fire.

Cost of fire insurance depends on the risk of loss. It is affected by such factors as: Is the property in a city with adequate water pressure, or is it in the country; of what material is the building built, and for what is it being used; and what is the nature of the neighboring buildings?

The tables on the preceding page show comparative rates for farm and city property, and for different types of buildings.

Example A: 1. Mr. Jones' farm buildings are valued as follows: house $6,000; barn $4,500; other buildings, $1,500. These buildings all have approved roofs and are equipped with approved lightning rods. Mr. Jones has decided to insure these buildings for 80% of their value. He will receive a policy for what amount of insurance?

80% of $12,000 = $9600, face of policy.

2. According to the table, the 1-year rate per $100 for this type of building is $1.20 minus a total of 15¢ for approved roofs and lightning rods. The rate for 1 year is $——— per $100 of insurance. What is the 2-year rate? 3-year rate?

3. Mr. Carter has decided to take a 3-year policy. How much will his premium be?

4. How much will he save by taking a 3-year policy rather than taking a new policy each year for 3 years?

Automobile Insurance

The automobile owner usually carries one or more of the following kinds of insurance:

Risk	*Premium*
Fire, lightning and transportation	$2.70
Theft, robbery and pilferage	3.00
Public liability, $5,000 and $10,000	27.00
Property damage, $5,000	10.00
Collision or upset, $50 deductible	14.00

Under public liability insurance the company will pay damages in proportion to the premium paid by the insured. In collision insurance the company will pay the sum necessary to repair the car of the insured after a collision. Most owners of cars agree to pay for all the damages less than $50.

Accident and Health Insurance

Accident and health policies guarantee a definite amount of money to the individual for physical injury, and to his beneficiaries in case of death. One can insure against accident alone, but it is not customary to issue a health policy only.

Other Insurance

Marine insurance. Owners of steamship lines may protect themselves against loss of ship and cargo. They may also carry a liability policy to cover damages claimed by passengers.

Tornado insurance. Insurance of property against damages by storms.

Rain insurance. All sorts of indoor and outdoor activities, likely to be affected by weather are now regularly covered by rain insurance—ball games, conventions, picnics, etc. All forms of rain insurance must be taken out 5 days before the event.

The home owner may insure against loss of household effects by fire, burglary, theft and larceny.

The owner of an apartment house may insure against breakage of plate glass windows, etc.; against theft, and against injuries to any workmen on the building. This last is taken care of by the Workmen's Compensation Insurance Policy. This policy will indemnify the workers for loss of time due to injuries sustained in the performance of their work.

Manufacturers and other concerns with many employees may carry *holdup insurance.* Such a policy will indemnify the insured if a messenger is robbed of the payroll money, etc.

Postal and express insurance insures against loss of mailed or expressed articles, letters, etc.

Fidelity insurance insures the firm against loss of money through theft by its employees.

Baggage insurance for travelers safeguards against loss of baggage by fire, theft, burglary or larceny.

Annuities. Only 5 per cent of the men who try to invest their own capital are able to keep even the principal until they are 65. Because it is so difficult to keep money safe and earning something at the same time, many persons put their money into the care of insurance companies by buying an annuity policy. The policy matures when the policyholder reaches a certain age, and the policyholder receives an income from the company the rest of his life.

Cost of Annuities

GUARANTEED ANNUITY

Annual Premiums for Each $10 Monthly Annuity
Maturity Age, 65

	MEN		WOMEN		
Age At Issue	*Annual Premium*	*Estimated Average Annual Dividend*	*Annual Premium*	*Estimated Average Annual Dividend*	*Age At Issue*
20	$16.68	$8.86	$18.35	$9.75	20
25	20.52	8.55	22.58	9.40	25
30	25.61	8.25	28.17	9.07	30
35	32.58	7.97	35.83	8.77	35
40	42.55	7.71	46.78	8.48	40
45	57.79	7.49	63.52	8.23	45
50	83.62	7.32	91.85	8.04	50
55	135.90	7.26	149.16	7.96	55

TAXATION

The cost of government is paid by the people. The money paid for such purposes is called *taxes.*

Taxes are *direct* and *indirect.*

A *direct* tax is a tax levied upon a *person* or upon his *property* or *income.* In some states a *poll* or head tax is levied upon every person of voting age. The Federal Government and many of the state governments levy taxes upon the incomes of individuals and corporations—*income taxes.*

These are *direct* taxes.

Indirect taxes include *duties* on imported goods, internal revenue taxes on alcoholic liquors, tobacco and so on. It is clear that every user of an article so taxed must pay the price increase due to such tax.

Most of the money needed to meet state, county and city expenses is raised by *property tax.*

Property tax is of two kinds:

1. Tax on real estate. Real estate is immovable property, such as farms, mines, factory buildings, railroads and houses.

2. Tax on personal property. Personal property is movable property, such as automobiles, furniture, cattle, stocks and bonds, and money.

In addition to a property tax some states have other taxes, such as gasoline tax, sales tax, auto licenses, inheritance tax and income tax. Not all states tax the same things.

To decide the amount of property tax, assessors determine the value of the property to be taxed. This is called the *assessed valuation.* From this *assessed valuation* and the amount of tax to be raised, the *tax rate* is set.

The tax rate may be expressed in various ways.

In some states it is a certain number of dollars on $100 or $1,000; in others it is a certain rate per cent; in still others a certain number of mills (tenths of a cent) on the dollar.

Work the examples following:

1. A tax rate of 10 mills on the dollar is how much per $100?

2. A tax rate of $3 per $100 is how much per $1,000?

3. A tax rate of $25 per $1,000 is how much per $100?

Finding the Tax Rate. The total assessed valuation of all the assessed property of the town of Alexandria was $4,500,000 in 1938. The town's budget for the year was $135,000. What must the rate of taxation be to raise this amount?

To find the answer, we must find what per cent $135,000 is of $4,500,000. The quotient is .03. How do we find this? The answer is 3%. This means that each property owner should pay taxes at the rate of $3 per $100 of assessed valuation.

Find the tax rate of each of the following cities:

1. Assessed valuation $100,000; tax $3,900.

2. Assessed valuation $200,000; tax $7,800.

3. Assessed valuation $2,195,000; tax $85,000.

Finding the Amount of Tax. The tax rate of a certain city is $1.50 per $100. Find the amount of tax on property valued at $5,000. The assessed value is 50 times $100; the amount of tax is $1.50 × $50 = $75.

Special Taxes

Amusement taxes are levied upon tickets to various kinds of amusements, such as theaters, circuses, concerts and football games.

Inheritance taxes are levied by the states and by the Federal Government upon inherited estates.

The gasoline tax is levied according to the benefit derived by the taxpayer. He pays on the number of gallons of gas he buys. Every state in the Union has a gasoline tax. The amount of the tax varies from state to state.

Special licenses, such as fishing and hunting, yield a large amount of revenue.

Income Tax

Many of the states now impose a tax on certain incomes. In a general way the state income tax laws follow those of the Federal Government.

Federal Taxes. To support the Federal Government, the people are not taxed directly upon the property they own. The expenses are met chiefly by:

1. Tariffs, duties or customs, which are levied upon goods imported from other countries.
2. Internal revenue, which is levied upon things made in this country, the greatest amount coming from liquor and tobacco products.
3. Income tax, levied upon the incomes of individuals and corporations. The first income tax was passed in 1913.

Principal Sources of Federal Income in 1936

Internal Revenue	
Income Taxes	$1,427,000,000
Estate and Gift Taxes	379,000,000
Tobacco and Alcohol Taxes	1,007,000,000
Taxes on Manufactured Goods	383,000,000
Other Internal Revenue Taxes	317,000,000
Customs Duties, or Tariff	387,000,000
Miscellaneous Income	216,000,000

The expenditures of the United States Government in 1936 included:

Recovery and Relief	$2,777,000,000
Veterans' Pensions and Benefits	2,349,000,000
Interest and Principal on Debts	1,153,000,000
National Defense, Army and Navy	764,000,000
Civil Departments and Courts	717,000,000
Agricultural Adjustment Administration	543,000,000
Civilian Conservation Corps	486,000,000
Other Expenditures	91,000,000

The table below shows receipts and expenditures of the United States Government for 8 years. They are given to the nearest tenth of a billion dollars. 4.1 means 4.1 billion dollars, or $4,100,000,000.

Year	*Receipts*	*Expenditures*
1929	4.0	3.8
1930	4.2	4.0
1931	3.2	4.1
1932	2.0	5.2
1933	2.1	5.1
1934	3.1	7.1
1935	3.8	7.4
1936	4.1	8.9

The first Federal income tax law was passed in 1913. It imposed a tax of 1% on the excess of income over $3,000 for single individuals and over $4,000 for husband and wife. An additional tax was charged on incomes in excess of $20,000. Since 1913 the rates have been changed several times.

BUDGETING

It is important for a family to plan its expenditures. A family budget is a plan for the wise use of the family income. A budget is an account made out in advance showing probable income and probable expenses.

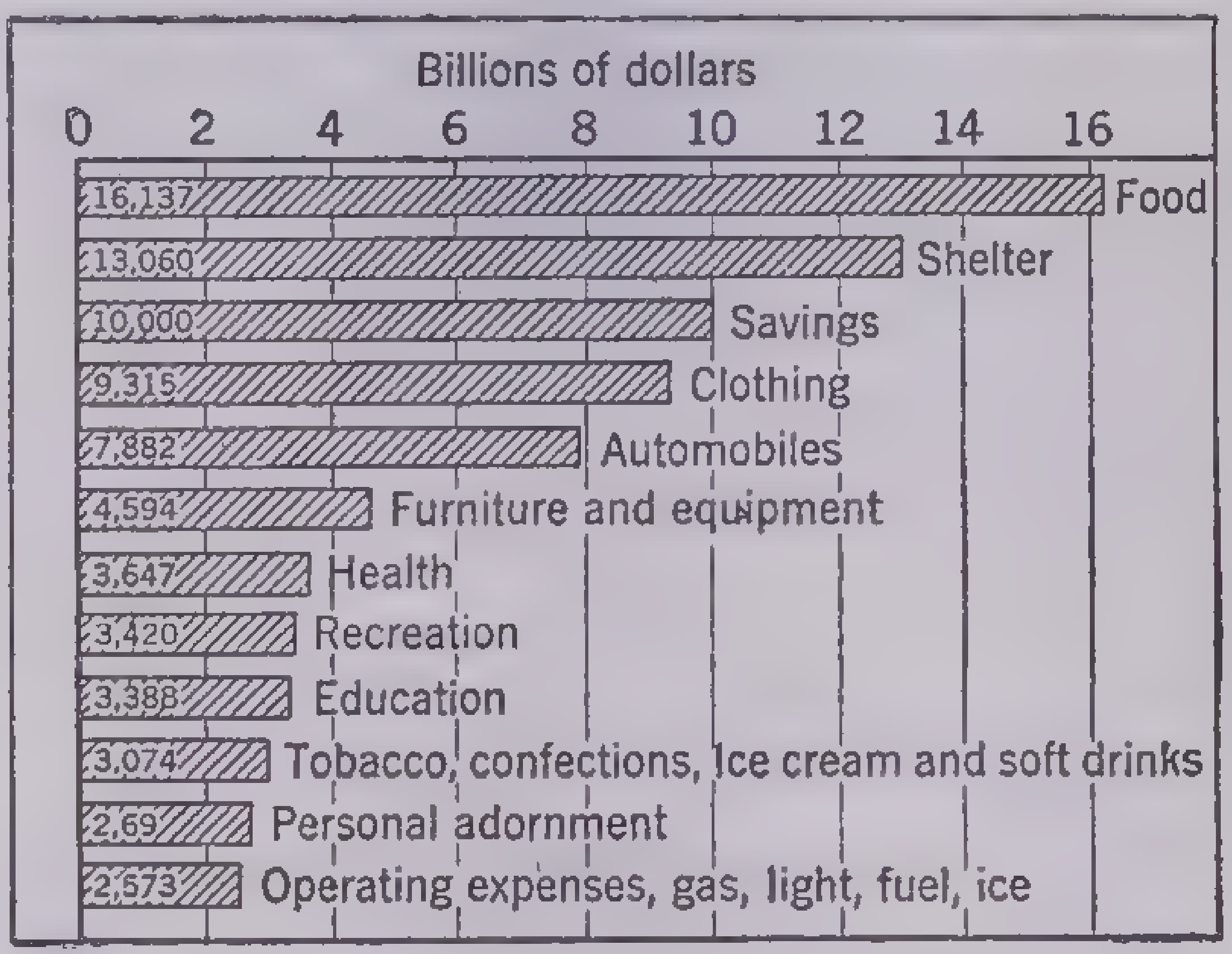
The United States Department of Agriculture publishes a family budget that suggests the following headings for the budget.

Estimated income.

Estimated expenditures.

1. Food
2. Shelter (heat and rent)
3. Running expenses (such as electricity, gas, servants)
4. Furniture
5. Clothing
6. Health (doctor, dentist, medicines, vacation)
7. Personal development (education, lectures, theater)
8. Automobile
9. Savings

The graph below shows the total amount of money spent in the United States for the several items that are included in family budgets on a slightly different classification.



It is impossible to say exactly how any family should budget its income.

The following table shows the per cent of different incomes for the main classes of expenditure.

MONTHLY BUDGET FOR A FAMILY OF FOUR

Monthly Income ⟶	*$125*	*$150*	*$175*	*$200*	*$250*	*$300*
Food	38%	32%	28%	26%	22%	21%
Shelter	24%	24%	24%	23%	22%	22%
Clothing	14%	15%	15%	15%	15%	15%
Operating Costs	10%	10%	12%	12%	12%	13%
Savings	8%	10%	11%	12%	15%	15%
Advancement	6%	9%	10%	12%	14%	14%

Many banks, department stores and other business agencies furnish budget guides.

In making any budget:

1. Estimate your income.
2. Estimate your expenses.
3. Plan to save something.

Planning Community Budgets

The local governments in most communities plan budgets each year to find out how much money they will need to raise by means of taxes. Governments and families differ in one important way in planning budgets. Families plan their bugdets to determine how to spend and save the amount they know they will earn. Governments plan their budgets to determine how much income they must have to take care of the expenses they know they will have.

Complete Budget for Town of Sand Springs for 1938

General Fund	$ 69,000
Street Department	18,000
Library Fund	9,000
Park Fund	32,250
Sewer Bonds	9,750
Town Bonds	15,000
County Tax	19,500
High School	69,000
Elementary Schools	122,250
School Bonds	18,750

Above are the amounts for the divisions of the budget for the town of Sand Springs. This budget shows that the town had to raise a total of $——— by means of taxes.

Three divisions of this budget are planned by the Sand Springs school board. What is the total of the three?

Sand Springs is in Morris County and must pay its share of the county expenses. The county officials estimate the county expenses and divide the cost among the towns and townships. According to the budget above, Sand Springs's share for 1938 was $———.

All the other divisions of the budget are planned by the Sand Springs town council. What is their total?

Instalment Buying

Probably a little less than one-fifth of the total retail sales in the country for a given year are made on the instalment plan.

It is estimated that 90 per cent of the pianos, 90 per cent of the washing machines, 80 per cent of the radios and refrigerators, 70 per cent of the furniture, 60 per cent of the automobiles, 27 per cent of the farm machinery, 25 per cent of the jewelry bought in a year are bought on the deferred payment plan.

By this plan a cash payment is made at the time of the purchase and the balance is paid in equal weekly or monthly payments until the whole is paid.

Because only a small amount of cash is needed at the time of purchase, and because the payments seem easy to meet, the purchaser often fails to consider the higher price he is paying.

This difference between the cash price and the instalment price is called the *instalment charge.*

There are several reasons for the increased cost in instalment buying: Sometimes the purchaser is unable to complete the payments and the reclaimed article must be sold at a loss by the company. There is an extra expense for bookkeeping. The company pays out more interest on money it must borrow because cash is not received for goods.

The *rate of interest* paid on instalment purchases is usually high. It sometimes runs from 10 per cent to more than 100 per cent.

Mrs. Gibson bought an electric washing machine at the Home Department Store on an instalment plan. She paid $12.50 when she bought the machine and $5 a month for ten months. She could have bought this same machine for $50 if she had paid cash for it. How much could she have saved by paying cash? ($12.50)

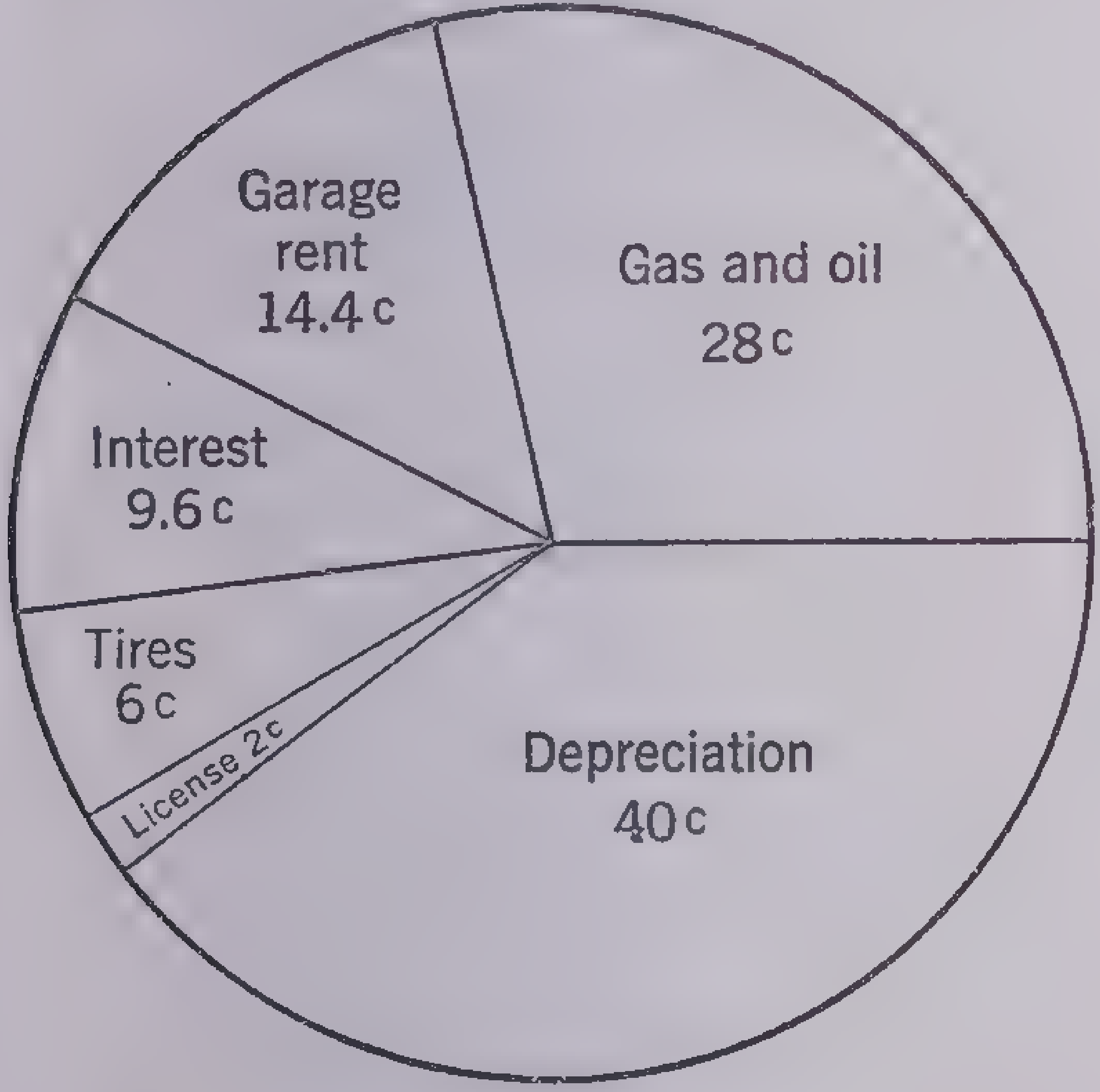
The rate of interest can be found approximately by using the formula $R = \frac{24P}{C(n+1)}$, where P is the instalment charge; C is the cash price less the down payment; n is the number of payments. Using the facts from the problems above.

$$R = \frac{24\ (\$12.50)}{\$37.50\ (11)} = 73\%$$

Although the instalment plan of buying has often the two disadvantages—a high rate of interest and the danger of losing the article after having partly paid for it—it has some advantages. It provides a method by which persons can buy articles at the time they need them or want them instead of waiting until sufficient money is saved.

Cost of Owning an Automobile

Suppose Mr. Highland takes $1,200 from his savings bank and buys an automobile. He loses $36 a year (3%) interest and must charge this loss against owning the car. If he could rent his garage for $5 a month, he must charge this against the car. At the end of 4 years he turns the car in on a new car and is allowed $500 for the old car. He must charge this $700 depreciation against the car.



This graph shows how each dollar of Mr. Highland's money is spent, assuming that he runs the car 10,000 miles a year. If the total cost is $600 a year, how much does he pay for each item?

Cost of Owning a Home

1. Mr. Witt has $7,000 invested at 5%. He decides to use it to buy a house and lot. He finds that 2½% of the value of the property should be allowed each year for depreciation, since a house gets less valuable as it gets older. The annual taxes on the house are $100. Fire insurance is $10 a year; water rent $25; coal $115. How much does the house cost him by the month? If he could rent a heated apartment for $80 a month, how much did he save a year by owning his home?

Interest on $7,000 @ 6%	$420.00
Depreciation 2½% of $7,000	175.00
Taxes	100.00
Fire insurance	10.00
Water rent	25.00
Coal	115.00
Annual cost	$945.00

$960 − $945 = $15 saving.

The Streamliner City of Salina

Westbound—Read Down **Eastbound—Read Up**

Streamliner No. 99 Daily	Streamliner No. 105 Daily		Between KANSAS CITY, TOPEKA and SALINA No Extra Fare *Central Time*			Streamliner No. 100 Daily	Streamliner No. 106 Daily
5.00	11.00	Lv	**Kansas City** (Un. Pac.)..........Mo.		Ar	10.30	1.38
5.05	f 11.05	Lv	Kansas City....................Kan.		Lv	f 10.22	f 1.32
5.42	11.42	Lv	Lawrence..........................	"	Lv	9.46	12.56
6.12	12.08	Ar	**Topeka**...........................	"	Lv	9.18	12.30
6.12	....	Lv	**Topeka**...........................	"	Ar	9.18	....
f 6.35	....	Lv	St Mary..........................	"	Lv	....B..	....
f 6.47	....	Lv	Wamego..........................	"	Lv	f 8.38	....
7.02	....	Lv	Manhattan........................	"	Lv	8.22	....
7.23	....	Lv	Junction City....................	"	Lv	7.55	....
f 7.45	....	Lv	Chapman..........................	"	Lv	....G..	....
7.58	....	Lv	Abilene..........................	"	Lv	7.27	....
f 8.09	....	Lv	Solomon..........................	"	Lv	....G..	....
8.30	....	Ar	**Salina** (Un. Pac.)...............Kan.		Lv	7.00	....

2. Mr. Cline had an opportunity to rent a house for $50 a month or buy it for $5,400. He estimated that the yearly cost of the house would be:

Interest on $5,400 @ 6%	$324.00
Depreciation 2½% of $5,400	135.00
Taxes	120.00
Fire insurance	10.00
	$589.00

Rent would have been $600; saving, $11.

Methods of Travel

Today the traveler has a choice of many ways of traveling. He may travel by railroad, by airplane, by automobile, by bus or by boat.

Railway Accommodations. The traveler by railroad may obtain a timetable from the railroad. This timetable gives the time of arrival and departure of trains. It lists information about Pullman-car and dining-car facilities, and train numbers and names. Train running-time between certain places must be adjusted for differences in standard time belt. The train time in railroad timetables is based on Standard Time, not Daylight Saving Time.

Part of a timetable is shown above. The center column shows the stations, and the left columns show stops of westbound trains, and the columns to the right show the time eastbound trains stop at the same stations.

Timetables for travel by bus are similar to those for railroads.

Day coaches are provided for regular travel, but travelers must make arrangements for such special train accommodations as Pullman sleepers, diners and parlor-car seats. The railroad makes extra charges for these services. On practically all railroads children under 12 years of age may travel on half-fare tickets.

Railroads sell several different kinds of tickets: the regular one-way fare (from 2 to 3 cents per mile); the round-trip ticket (which costs less than the two one-way fares). The passenger may buy a mileage book and pay fare based on the actual number of miles traveled.

Airplane travel. The timetable just below shows the schedule of a plane out of the Newark Airport.

Baggage fare is free up to 35 pounds. Over that the charge is one half of 1 per cent of the traveler's fare for each additional pound.

Using the Mails

All post cards and letters that are written or typewritten must be sent as *first-class mail.* Mail that is sealed to prevent opening must also be sent *first class.*

NEW YORK—ATLANTA—MIAMI

Trip 11-9 Daily	Trip 19-7 Daily	Air Miles	Passengers are Requested To Be At Ticket Office 10 Minutes Before Scheduled Departure Time	Trip 10-12 Daily	Trip 8-2 Daily
AM	PM		(N. Y. City Ticket Offices)	PM	AM
7.15	6.15		Lv 51 Vanderbilt Ave. (ET)... Ar	11.55	8.45
7.25	6.25		Lv 167 W. 32nd St. (ET)..... Ar	11.45	8.35
8.00	6.00	0	Lv Newark (ET)............. Ar	11.10	8.00
a7.40	6.40	72	Lv Camden (ET)............ Ar	e11.05	7.20
a8.30	7.30	164	Lv Baltimore (ET).......... Ar	.....	6:30
9.30	△8.10	203	Lv Washington (ET)......... Ar	9.40	△5.50
.....	9.05	301	Lv Richmond (ET)........... Ar	.....	5.00
.....	10.20	474	Lv {Greensboro-High Point. Winston-Salem (ET)...} Ar	.....	3 45
●11.55	11.05	559	Lv Charlotte (ET)........... Ar	●7.15	3.00
.....	11.45	636	Lv Spartanburg (ET)......... Ar	.....	2.20
12.25	11.55	802	Ar Atlanta (CT)............. Lv	4.45	12.10
4.55	12.25		Lv Atlanta (CT)............. Ar	△11.50	△12.05
●6.35	.....	875	Lv Macon (ET).............. Lv	12.15	.....
8.00	△3.15	1085	Ar Jacksonville (ET)......... Lv	10.45	△11.15
.....	4.10		Ar Daytona Beach (ET)...... Lv	.....	10.15
.....	.....		Ar Orlando (ET)............ Lv	9.30	.....
.....	5.05	1298	Ar Vero Beach (ET)......... Lv	.....	9.15
10.05	5.45	1367	Ar W. Palm Beach (ET)...... Lv	8.20	8.35
$10^{P}_{M}40$	$6^{A}_{M}20$	1429	Ar Miami (ET).............. Lv	$7^{A}_{M}45$	$8^{P}_{M}00$

The postage rate on post cards is 1 cent to any place in the United States. The rate on all other first-class mail is 3 cents per ounce when addressed to someone in another town or city, and 2 cents per ounce when addressed to someone living in the same community. The rate for local first-class mail is only 1 cent per ounce if the post office does not have delivery service.

In figuring postage a fraction of an ounce is counted as an additional ounce. $4\frac{1}{2}$ ounces are figured as 5 ounces.

Special Delivery letters are delivered by a special postman as soon as they arrive at the post office. For this service the sender pays 10 cents additional postage on each letter.

The post office keeps a careful record of *registered* letters and guarantees to pay the sender the amount for which the letter was registered if it is lost. The post office charges additional postage for registering letters; the amount depends upon the value placed upon the letter.

Money can be sent safely by ordinary first-class mail by buying a *postal money order*. The fee charged for a money order varies with the amount of the money order.

First-class letters sent by *air mail* cost 6 cents per ounce.

Newspapers and periodicals may be sent unsealed by others than the publishers by *second-class mail*. The rate on this class of mail is 1 cent for each 2 ounces or fraction.

Circulars, miscellaneous printed matter, advertisements, greeting cards in unsealed envelopes and merchandise may be sent by *third-class mail*, if the weight is not more than 8 ounces, for $1\frac{1}{2}$ cents for each 2 ounces or fraction. Books and catalogs of 24 pages or more, seeds, cuttings, bulbs, roots and plants may be sent *third-class* for 1 cent each 2 ounces or fraction.

Merchandise, books, printed matter and all other mailable matter not included in first-, second- and third-class mail, weighing over 8 ounces, may be sent *fourth-class* or *parcel post*. Postage rates are based on weight and zones. Weight is limited to 70 pounds.

Using the Telegraph and Telephone

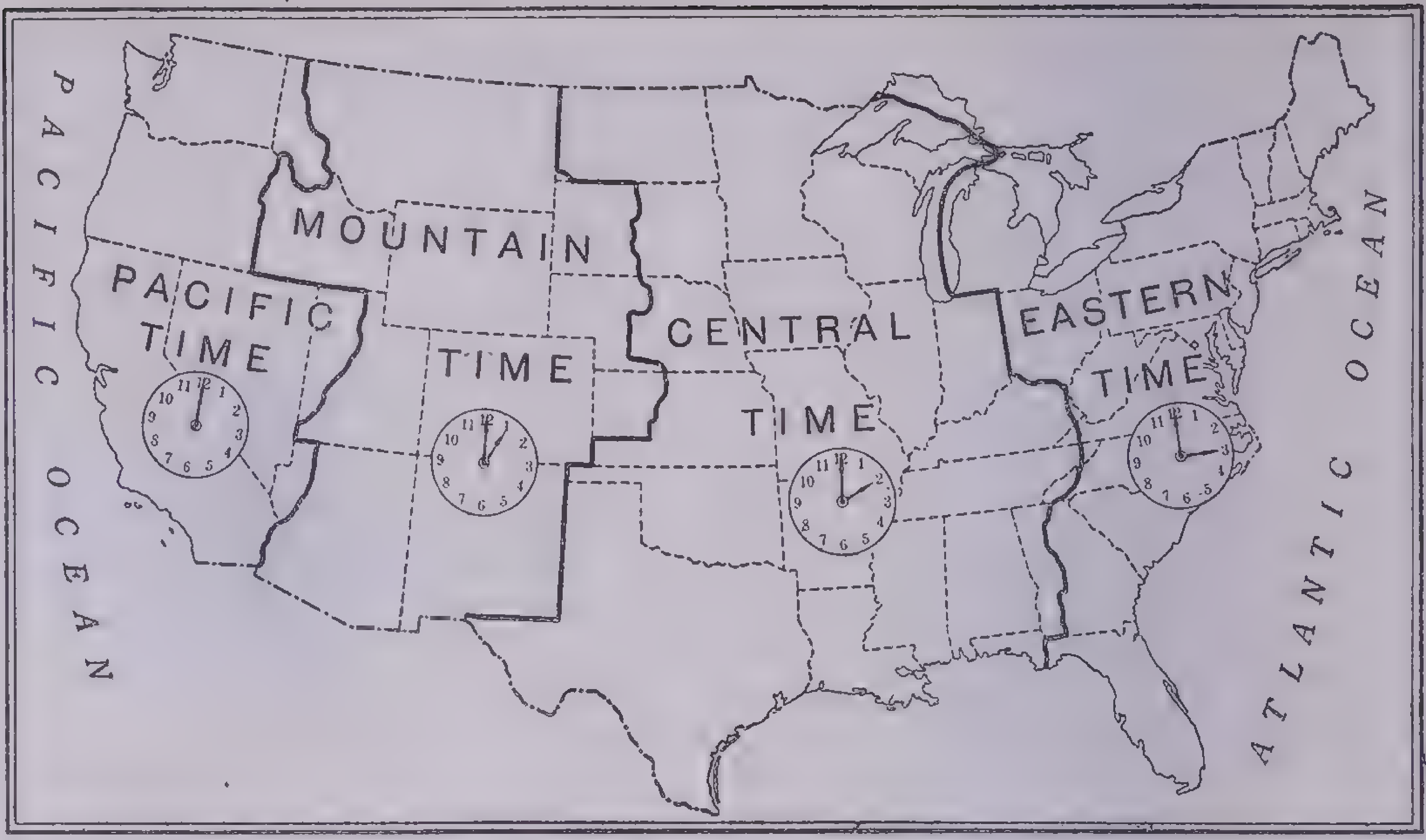
Classes of Telegraph Messages and Rates. There are four classes of telegraph service: full-rate telegram, day letter, night letter and night message.

Full-rate telegram service is quickest and most expensive; night messages are cheaper but are not delivered until the next morning; night letters and day letters are for longer messages, generally 50 words (minimum rate) or more. The minimum rate on full-rate telegrams applies to 10 words or less. Money (by telegraph money order), flowers and candy can be sent by telegraph. Time service and special blanks for birthday greetings are supplied by telegraph companies.

The Federal Government charges a 5% tax on all telegraph messages. The rates for telegraph messages vary with the distance the messages go. Consult your local telegraph company for specific rates.

Illustrative Problem: Mrs. Dorr, who lives in Leland, sent a telegram to a St. Paul florist ordering flowers. The message contained 25 words. To send a message from Leland to St. Paul would cost 42 cents for the first ten words and $2\frac{1}{2}$ cents for each additional word. What was the cost of the telegram Mrs. Dorr sent, including the tax?

Telephone. Telephone companies provide the following kinds of telephone service:



Time Zones of the United States

1. Residence individual or business individual
2. Residence party line (two or more parties)
3. Flat-rate residence
4. Private line
5. Party line (many parties in villages and towns)
6. Private branch exchange

The manual and the dial are two types of telephones. In the manual, an operator makes the connection; in the dial the connection is made automatically by the caller dialing the number.

Telephone bills are rendered monthly to subscribers and include: the regular local service charge (paid in advance); toll service, and other charges, for the previous month's out of town calls; telegrams and cablegrams sent by telephone; and additional local message charges for calls made in previous month above contract allowance. Coin telephones and telephone booths are for public use.

Illustrative Problem: The charge for a residence individual service line in certain cities is $4 for 50 messages. What is the average cost per message? The rate for each additional message starts with 5 cents. (The rates grow less as more calls are made.) Why should the rate for the first 50 messages be so much greater?

Latitude and Longitude

Because our world is so nearly spherical in shape, distances on the earth are measured along the arcs of circles.

Distances north and south are measured along *meridian* lines. These lines all pass through both the north and south poles. They are called *great circles* and are all equal in length.

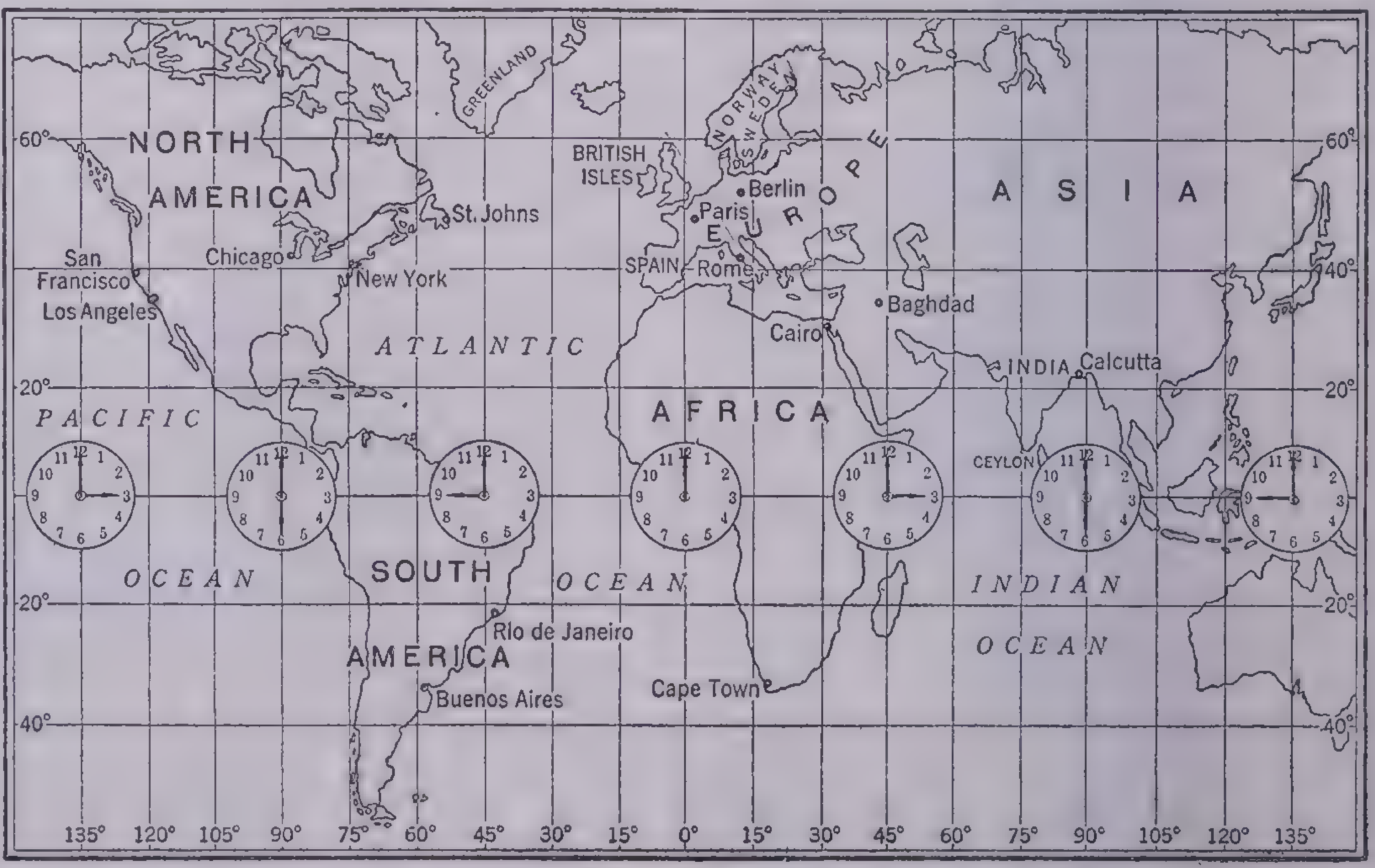
Distances east and west are measured on circles which run parallel to the equator. These circles get smaller as they get nearer to the poles.

Table of Circular Measure

60 seconds ($''$) = 1 minute ($'$)
60 minutes = 1 degree (°)
360 degrees = 1 circumference

In measuring latitude we start at the equator.

In measuring longitude we start from the prime meridian which passes through



Time Around the World

Greenwich, England near London. The length of a degree of latitude any where and of longitude at the equator is $\frac{1}{360}$ of the earth's circumference—$69\frac{1}{6}$ miles.

Longitude and Time

The revolution of the earth makes the sun and moon appear to have a daily schedule of travel, and gives us differences in time for places having different longitude.

Since the earth revolves on its axis from west to east, the sun seems to travel from east to west.

So any set time comes earlier to any certain place than to any place west of it.

The sun time of any place is known as its local time. If all places kept local time, it would cause much confusion. In 1883 the railroads of the United States adopted Standard Time. The country is divided into four sections. *Eastern Standard Time* takes the local time of the 75th meridian; *Central Standard Time* takes the local time of the 90th meridian; *Mountain Standard Time* takes the local time of the 105th meridian; *Pacific Standard Time* takes the local time of the 120th meridian.

The map on the preceding page shows the boundaries of each of the time zones. In cities that are on the border line of two sections, as for instance, Atlanta, the standard times of both are used.

The world clock on the preceding page shows the time in many other places in the world when it is noon at the prime meridian.

The earth makes one complete revolution (360°) every 24 hours. Each point on the earth's surface moves through:

360° of longitude in	24 hours.
15° of longitude in	1 hour.
15′ of longitude in	1 minute.
15″ of longitude in	1 second.

Leap Year

Years divisible by 4 are leap years, but of the centennial years (years ending in 00) only those divisible by 400 are leap years.

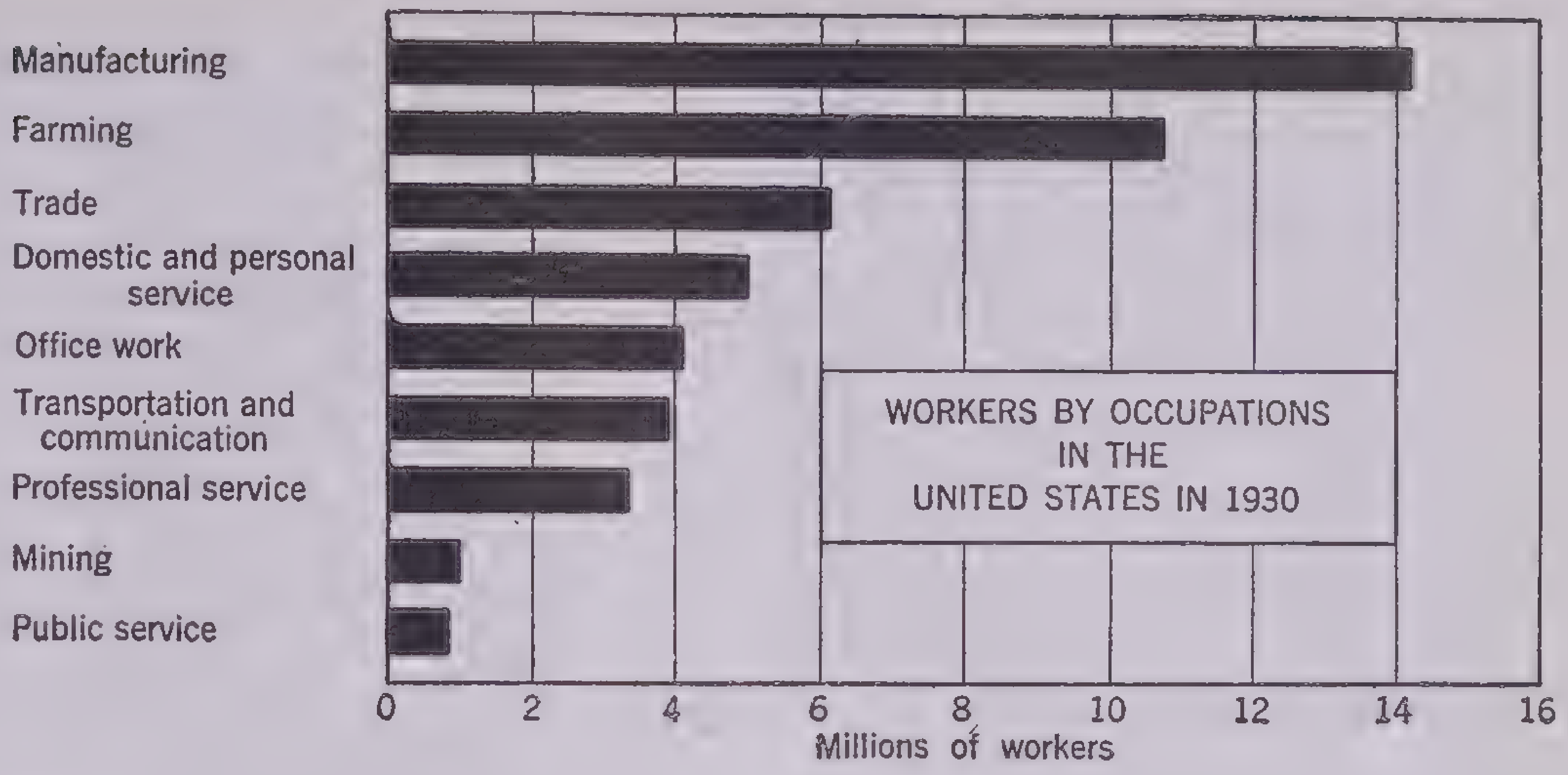
The earth requires 365 days, 5 hours, 48 minutes, 49.7 seconds to complete its revolution around the sun.

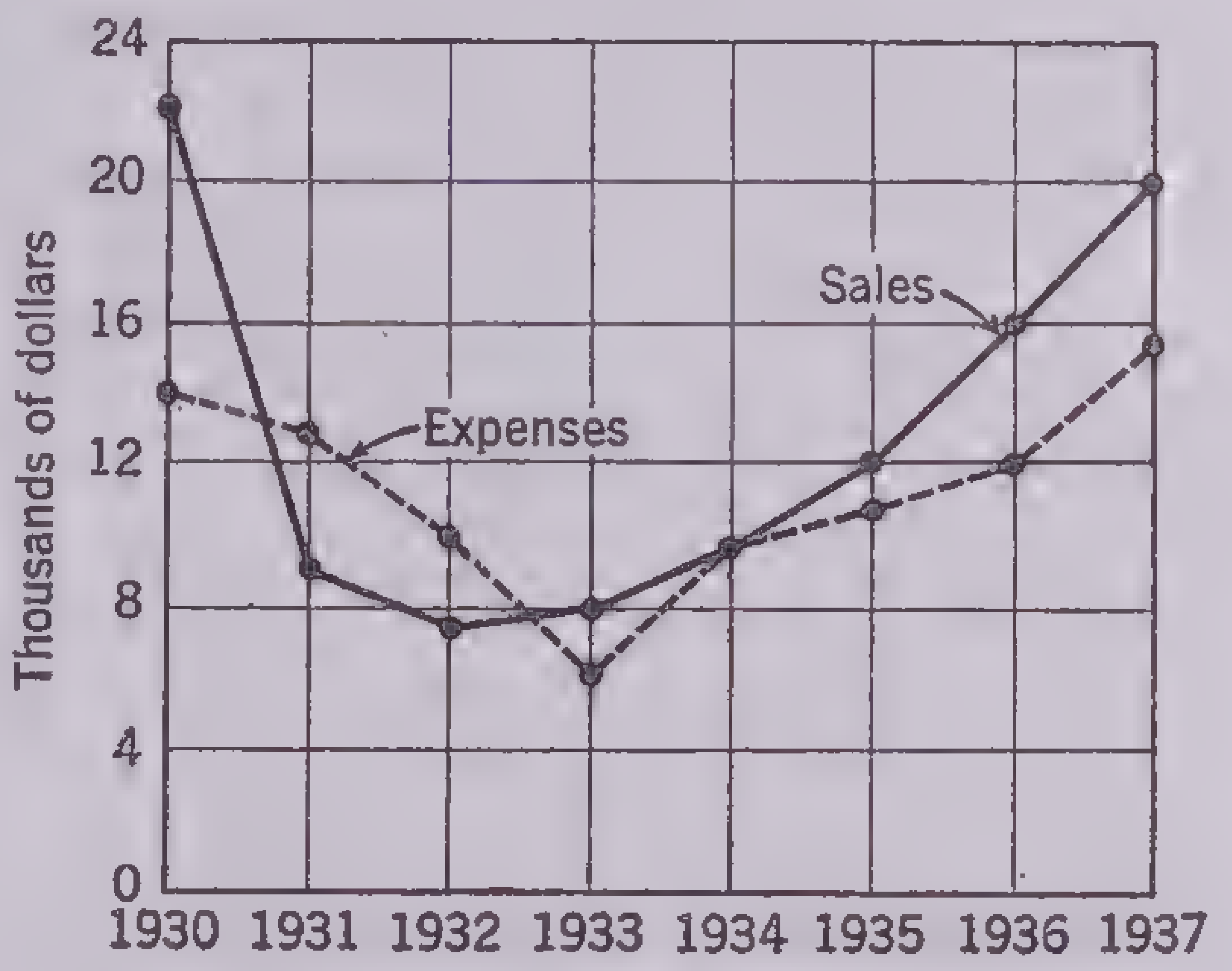
This is a little less than $365\frac{1}{4}$ days. By considering three successive years as common years and the fourth as a leap year of 366 days there is a gain of time. To correct this the extra day is added only to every fourth centennial year.

GRAPHS

Graphs are pictures of facts. By means of graphs important facts can be quickly presented to the reader. Graphs are used so extensively today that it is very important for every one to be able to read them correctly. Here are a few suggestions for reading graphs accurately.

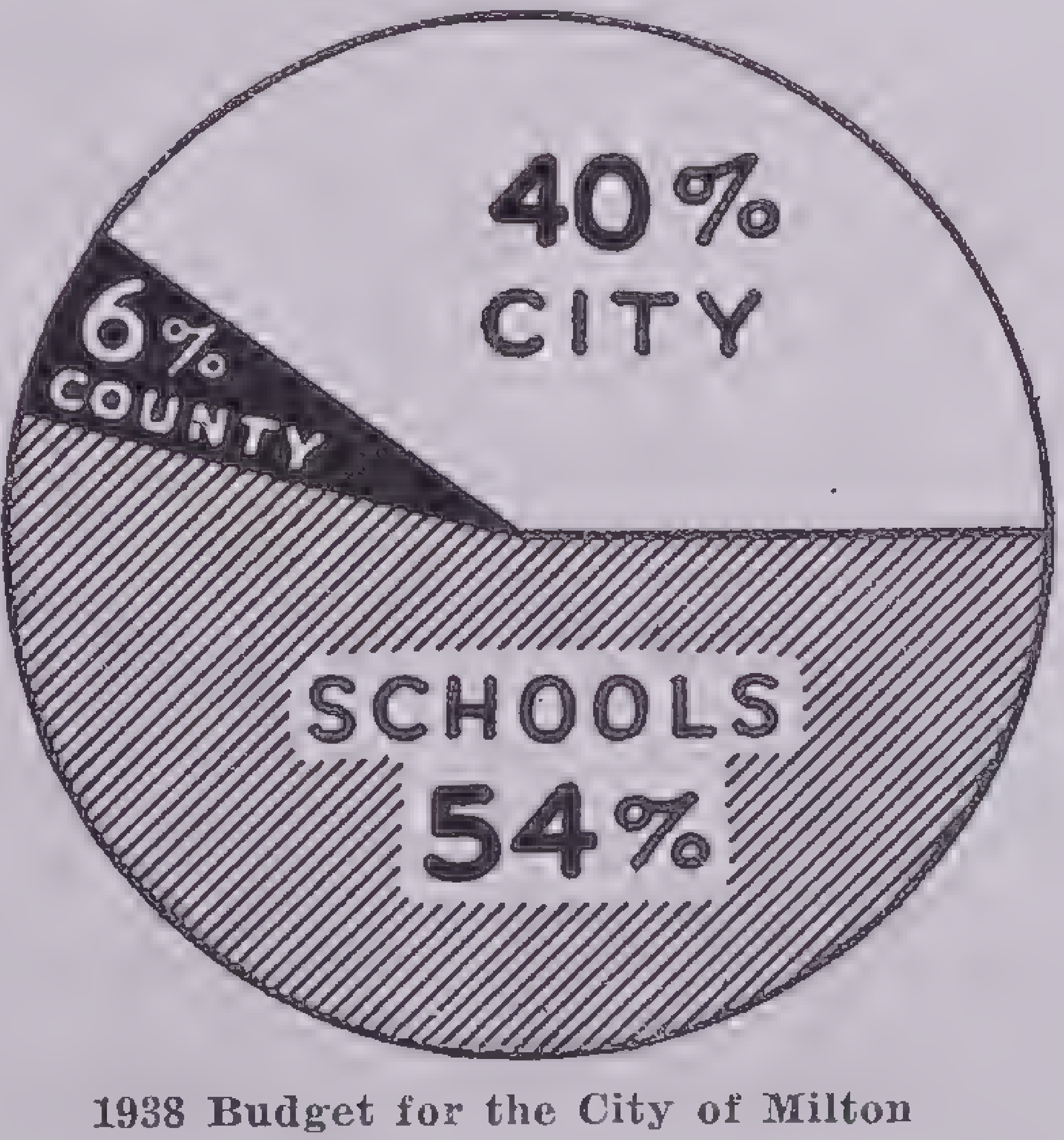
1. First, read the title or legend of the graph carefully and get a clear idea of what is to be shown.
2. Now study the graph itself and note how the facts are shown, whether by bar, broken line, circle or picture. See if there is any legend or explanation on the graph that will help you.
3. Next study the scales at the sides of the graph.
4. Answer such questions about the graph as the following:





SALES AND EXPENSES OF COMMUNITY STORE

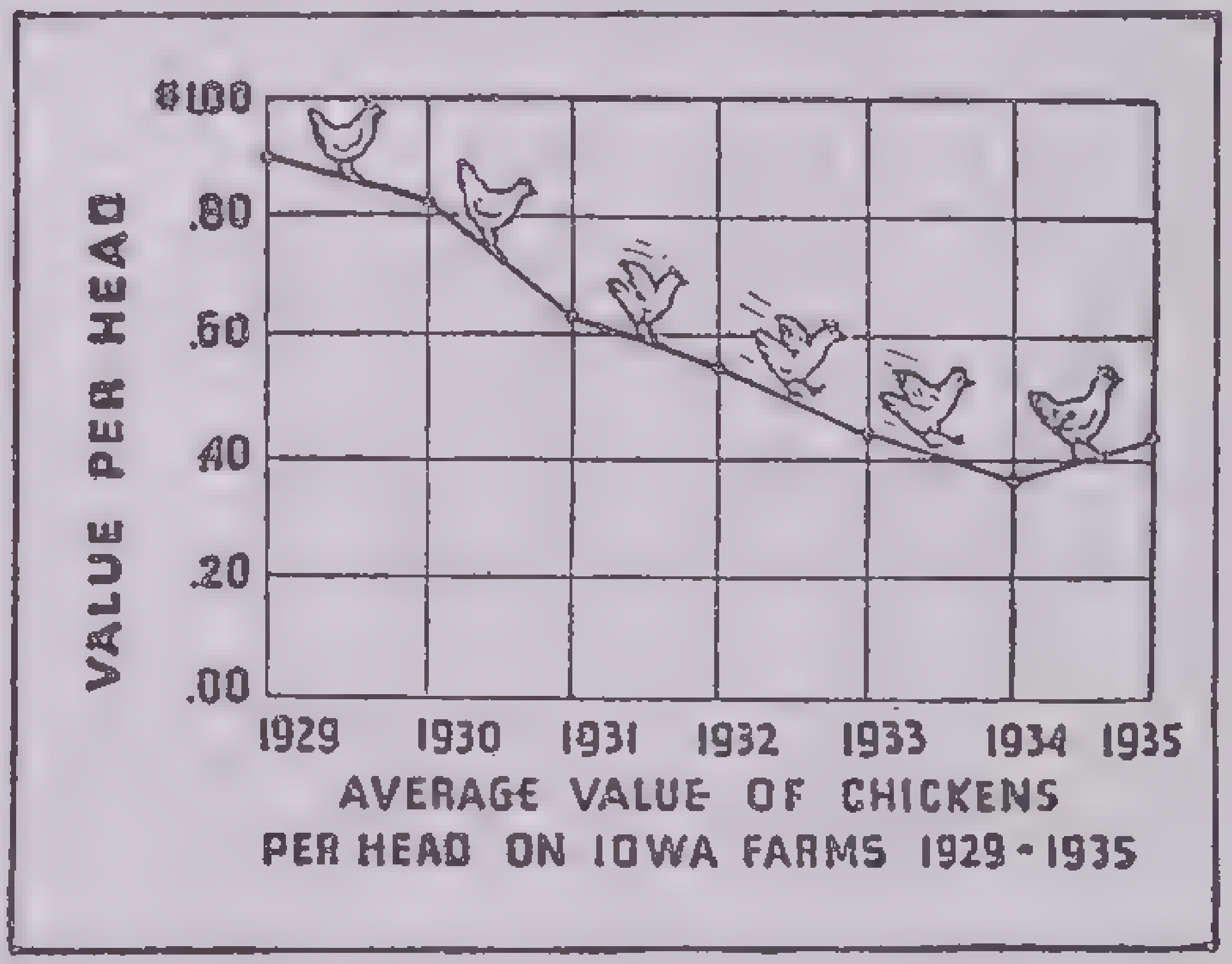
1. What is the *title* of the *line graph?*
2. The dotted line represents ...., and the solid line represents.......
3. The numbers on the *vertical scale* represent .... of dollars.
4. In what year did the store have the largest amount of sales? The smallest amount?
5. In what years were sales almost equal?
6. In what years did the store have a profit? A loss? Neither a profit nor a loss?



1938 Budget for the City of Milton

7. What is the *title* of the *circle graph?*
8. For what did the city of Milton plan to spend the most money? The least money?
9. About how many *degrees* were used to show the part of the budget planned for the city? For the county? For the schools?

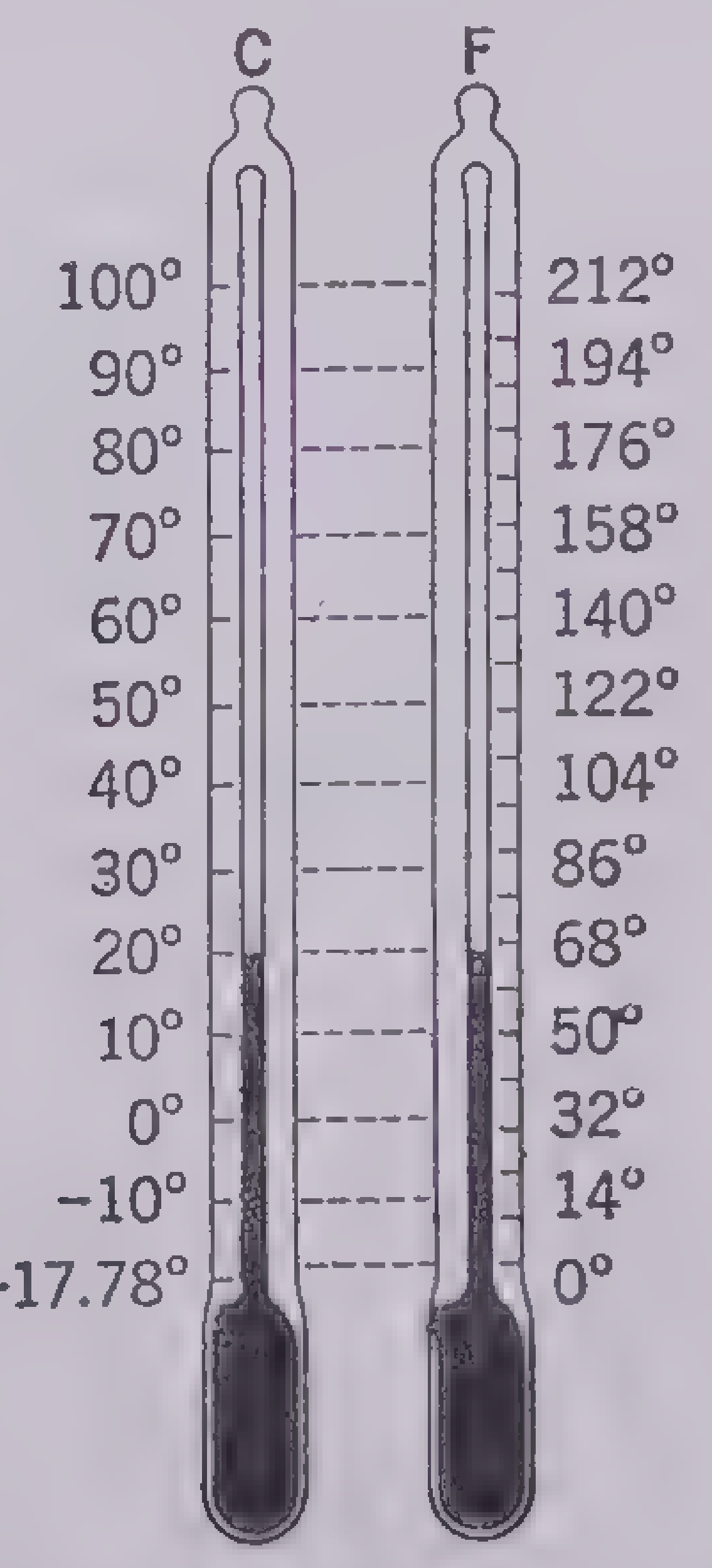
The graph above is a horizontal *bar graph.* The bottom horizontal bar is the base line. The numbers along the base line show the scale, that is, the number of workers represented by bars of different lengths. This scale is in millions. It begins with 0 and goes to 16 million. Some bar graphs are made with vertical bars.



A *picture graph* or *pictograph* is shown above. Value per head of chickens is shown both by picture and line.

Measuring Temperature

On the thermometer which we regularly use, 32° is the freezing point of water and 212° is the boiling point. This is called the *Fahrenheit scale.* Most scientists use a thermometer on which 0° marks the freezing point and 100° marks the boiling point of water. This is called the *Centigrade scale.*



The thermometers in the picture just above show the corresponding temperatures on the Fahrenheit scale thermometer (marked F.) for any temperature on the Centigrade Scale thermometer (marked C.)

Since there is a constant relationship between the two scales, a formula has been worked out for converting one to the other. The formula is $F = \frac{9}{5}C + 32$.

Below is a graph of this formula.

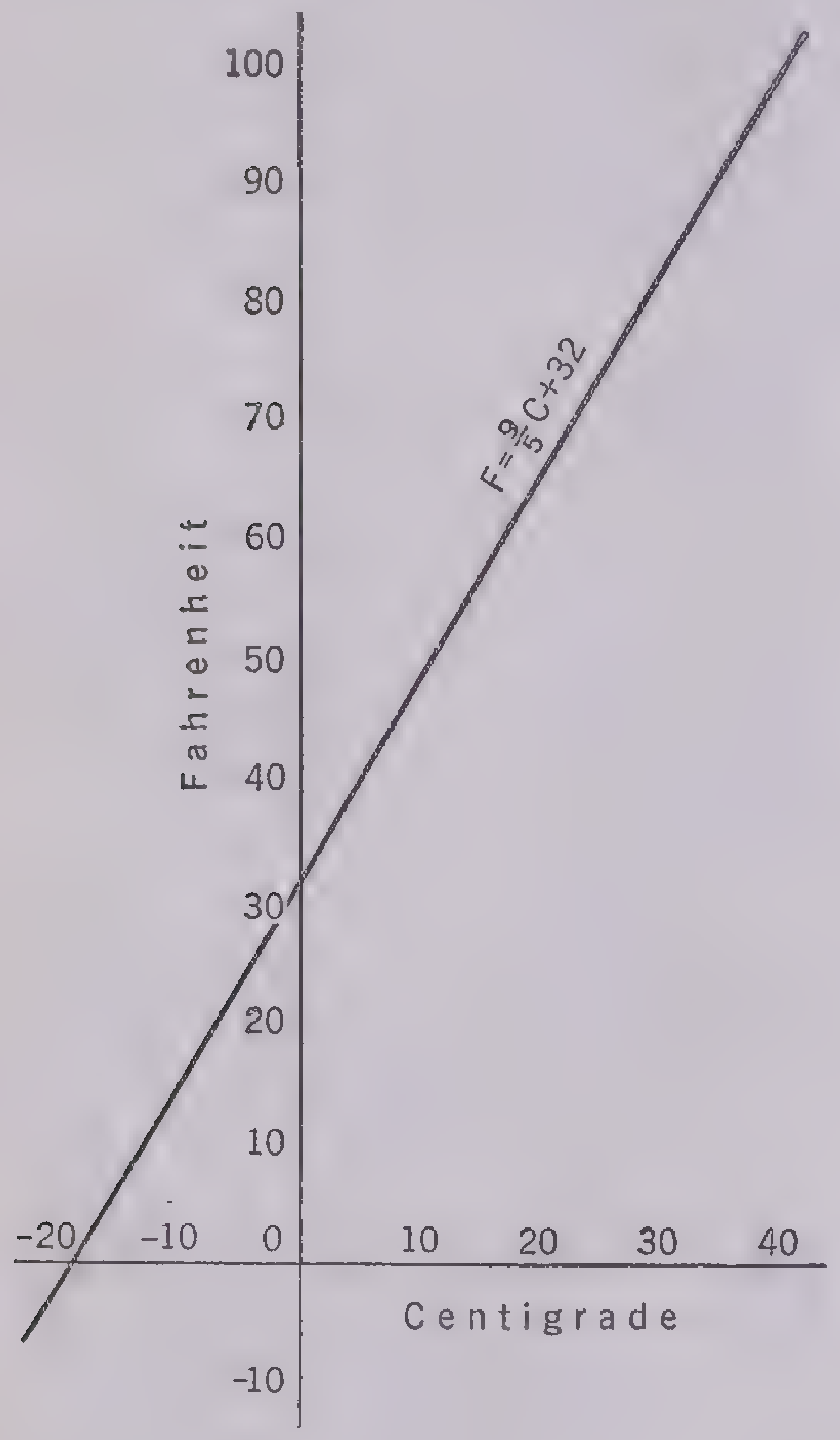


Table of Squares and Square Roots

Number	*Square*	*Square Root*	*Number*	*Square*	*Square Root*	*Number*	*Square*	*Square Root*
1	1	1.000	**41**	1681	6.403	**81**	6561	9.000
2	4	1.414	**42**	1764	6.481	**82**	6724	9.055
3	9	1.732	**43**	1849	6.557	**83**	6889	9.110
4	16	2.000	**44**	1936	6.633	**84**	7056	9.165
5	25	2.236	**45**	2025	6.708	**85**	7225	9.220
6	36	2.449	**46**	2116	6.782	**86**	7396	9.274
7	49	2.646	**47**	2209	6.856	**87**	7569	9.327
8	64	2.828	**48**	2304	6.928	**88**	7744	9.381
9	81	3.000	**49**	2401	7.000	**89**	7921	9.434
10	100	3.162	**50**	2500	7.071	**90**	8100	9.487
11	121	3.317	**51**	2601	7.141	**91**	8281	9.539
12	144	3.464	**52**	2704	7.211	**92**	8464	9.592
13	169	3.606	**53**	2809	7.280	**93**	8649	9.644
14	196	3.742	**54**	2916	7.348	**94**	8836	9.695
15	225	3.873	**55**	3025	7.416	**95**	9025	9.747
16	256	4.000	**56**	3136	7.483	**96**	9216	9.798
17	289	4.123	**57**	3249	7.550	**97**	9409	9.849
18	324	4.243	**58**	3364	7.616	**98**	9604	9.899
19	361	4.359	**59**	3481	7.681	**99**	9801	9.950
20	400	4.472	**60**	3600	7.746	**100**	10,000	10.000
21	441	4.583	**61**	3721	7.810	**101**	10,201	10.050
22	484	4.690	**62**	3844	7.874	**102**	10,404	10.100
23	529	4.796	**63**	3969	7.937	**103**	10,609	10.149
24	576	4.899	**64**	4096	8.000	**104**	10,816	10.198
25	625	5.000	**65**	4225	8.062	**105**	11,025	10.247
26	676	5.099	**66**	4356	8.124	**106**	11,236	10.296
27	729	5.196	**67**	4489	8.185	**107**	11,449	10.344
28	784	5.292	**68**	4624	8.246	**108**	11,664	10.392
29	841	5.385	**69**	4761	8.307	**109**	11,881	10.440
30	900	5.477	**70**	4900	8.367	**110**	12,100	10.488
31	961	5.568	**71**	5041	8.426	**111**	12,321	10.536
32	1024	5.657	**72**	5184	8.485	**112**	12,544	10.583
33	1089	5.745	**73**	5329	8.544	**113**	12,769	10.630
34	1156	5.831	**74**	5476	8.602	**114**	12,996	10.677
35	1225	5.916	**75**	5625	8.660	**115**	13,225	10.724
36	1296	6.000	**76**	5776	8.718	**116**	13,456	10.770
37	1369	6.083	**77**	5929	8.775	**117**	13,689	10.817
38	1444	6.164	**78**	6084	8.832	**118**	13,924	10.863
39	1521	6.245	**79**	6241	8.888	**119**	14,161	10.909
40	1600	6.325	**80**	6400	8.944	**120**	14,400	10.954

SQUARE ROOT

Rule.—

1. Point off the number into periods of two figures each, commencing at the right, or at the decimal point. Find the greatest square in the left-hand period, and write its square root as the first figure in the root. Subtract the square of this first root figure from the left-hand period and bring down the next period for a new dividend.

2. For a trial divisor, multiply the root already found by 2, and annex one cipher. Divide the new dividend by the result thus obtained, and write the quotient as the next figure in the root. Add the last-found figure of the root to the trial divisor, and multiply the sum by this same last-found figure of the root. Subtract the product from the new dividend and bring down the next period for a second new dividend.

3. Continue this process until all the remaining periods have been brought down and the root obtained.

Notes.—1. There must be a figure in the root for every period in the power.

2. In pointing off a number involving a decimal, as 31462.874, start at the decimal point and divide into periods going to the left on the whole number and to the right on the decimal. In case there is but one figure in the right-hand period of the decimal, annex a cipher to complete the period. Thus the above number pointed off into periods would appear, 3'14'61.87'40.

Example: Find the square root of 576 sq. ft.

Solution: 5'76|24
4
44|176
176

Roman Numerals

The Romans wrote all their numbers from 1 to 30 by using the letters I, V, and X. The table shows the Roman numerals from 1 to 10.

I	1	VI	6
II	2	VII	7
III	3	VIII	8
IV	4	IX	9
V	5	X	10

They wrote the numbers from 11 to 20 by writing an X before the numerals I to X, as shown in the table.

XI	11	XIII	13
XII	12	XIV	14
XV	15	XVIII	18
XVI	16	XIX	19
XVII	17	XX	20

By using the Roman numerals shown in the table the Romans wrote all the numbers from 1 to 100.

I = 1
V = 5
X = 10
L = 50
C = 100

I written *after* a letter adds 1.
LI = 51
V written *after* a letter adds 5.
LV = 55
X written *after* a letter adds 10.
LX = 60

I written *before* a letter subtracts 1. IX is 1 less than 10, or 9.

X written *before* a letter subtracts 10. XC is 10 less than 100, or 90.

The table shows the letters the Romans used for the numerals from 100 to 1,000.

C = 100
D = 500
M = 1,000

They used the same plan as in writing smaller numbers. A letter of lesser value before one of greater value is subtracted from the larger one. A letter of smaller value after one of greater value is added to the greater one.

$CD = 500 - 100 = 400$
$DC = 500 + 100 = 600$
$MC = 1{,}000 + 100 = 1{,}100$
$MDCCCXCIII = 1{,}000 + 500 + 300 + 90 + 3 = 1{,}893$

MENSURATION

Words Used in Mensuration.—When two straight lines make a square corner, they are said to form a *right angle*. Angle ABC in Fig. 1 is a right angle. A right angle is a 90° angle. Any angle which is smaller than a right angle is called an *acute angle*. Angle PQR in Fig. 1 is an acute angle. Any angle which is larger than a right angle is called an *obtuse angle*. Angle XYZ in Fig. 1 is an obtuse angle. When one line makes a right angle with another line, the lines are said to be *perpendicular*. In Fig. 1, we may say that AB is perpendicular to BC, or that BC is perpendicular to AB.

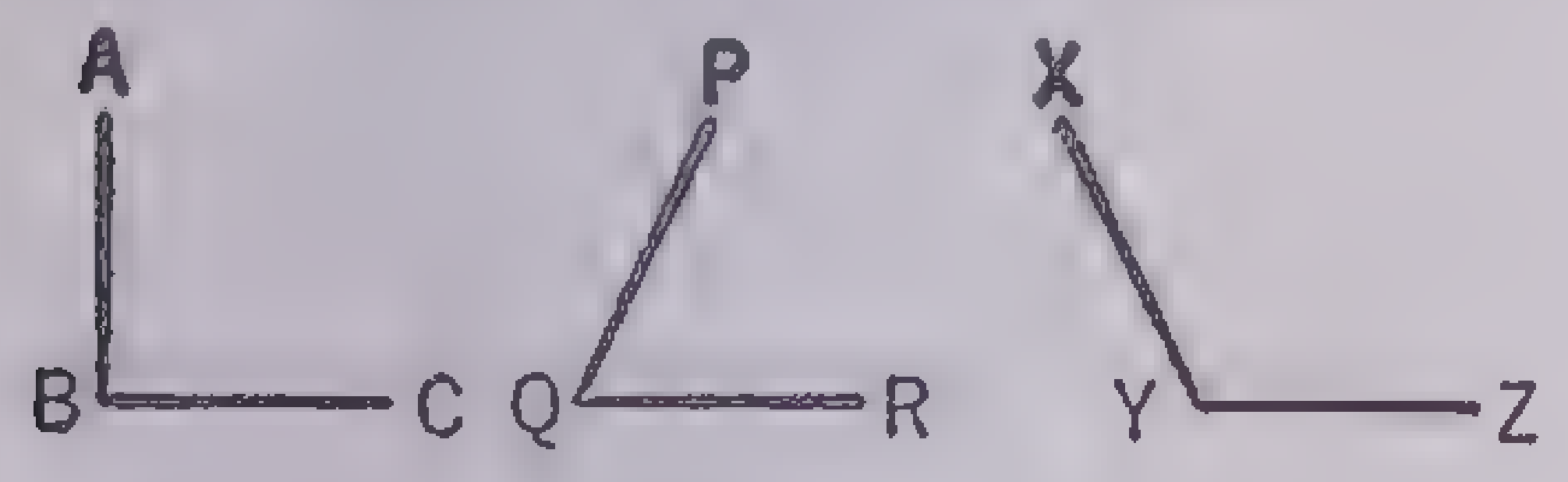


FIG. 1

Parallel lines are lines which are at all points the same distance apart. The lines in Fig. 2 are parallel.

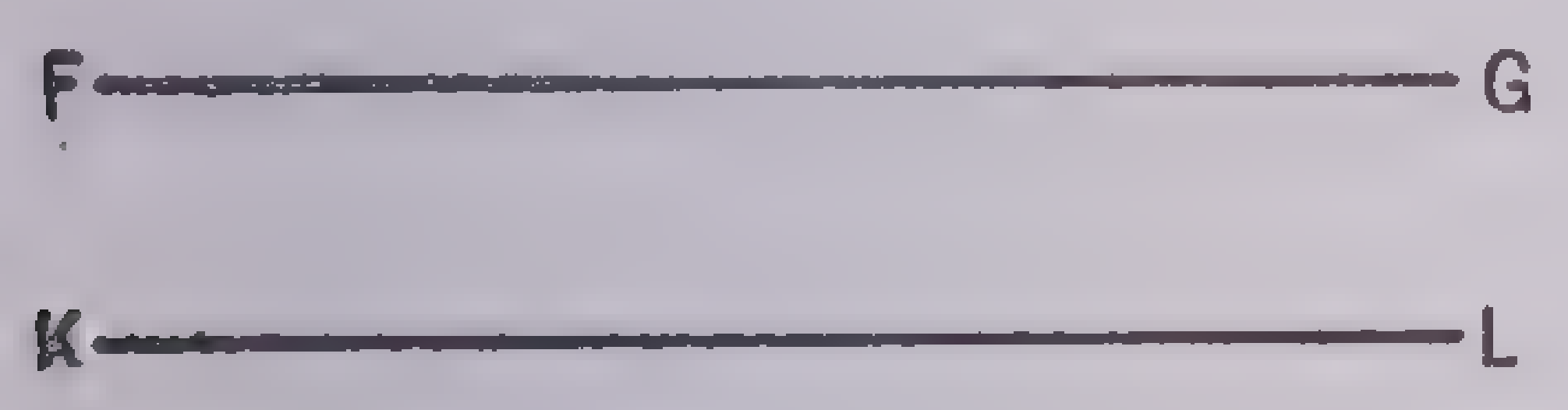


FIG. 2

A *parallelogram* is a figure bounded by two pairs of parallel lines. Fig. 3 is a parallelogram. The *base* of a parallelogram is the side on which it rests. NW is the base of the parallelogram in Fig. 3. The *altitude* of a parallelogram is the height of the parallelogram measured along a line perpendicular to the base. See Fig. 3. An altitude may be drawn from any point along the base of the parallelogram.

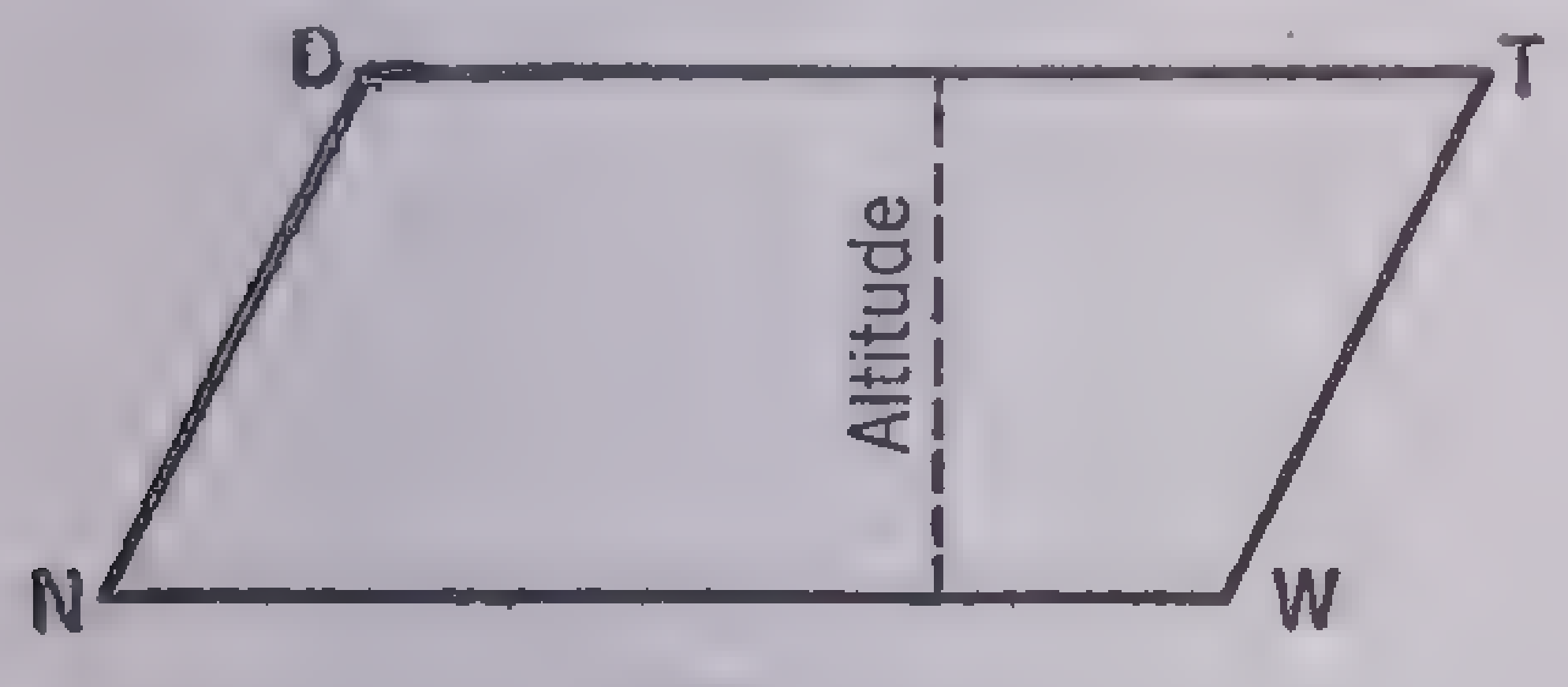


FIG. 3

A *rectangle* is a parallelogram whose angles are all right angles. Fig. 4 is a rectangle. Its base is 6 inches, and its altitude is 4 inches.

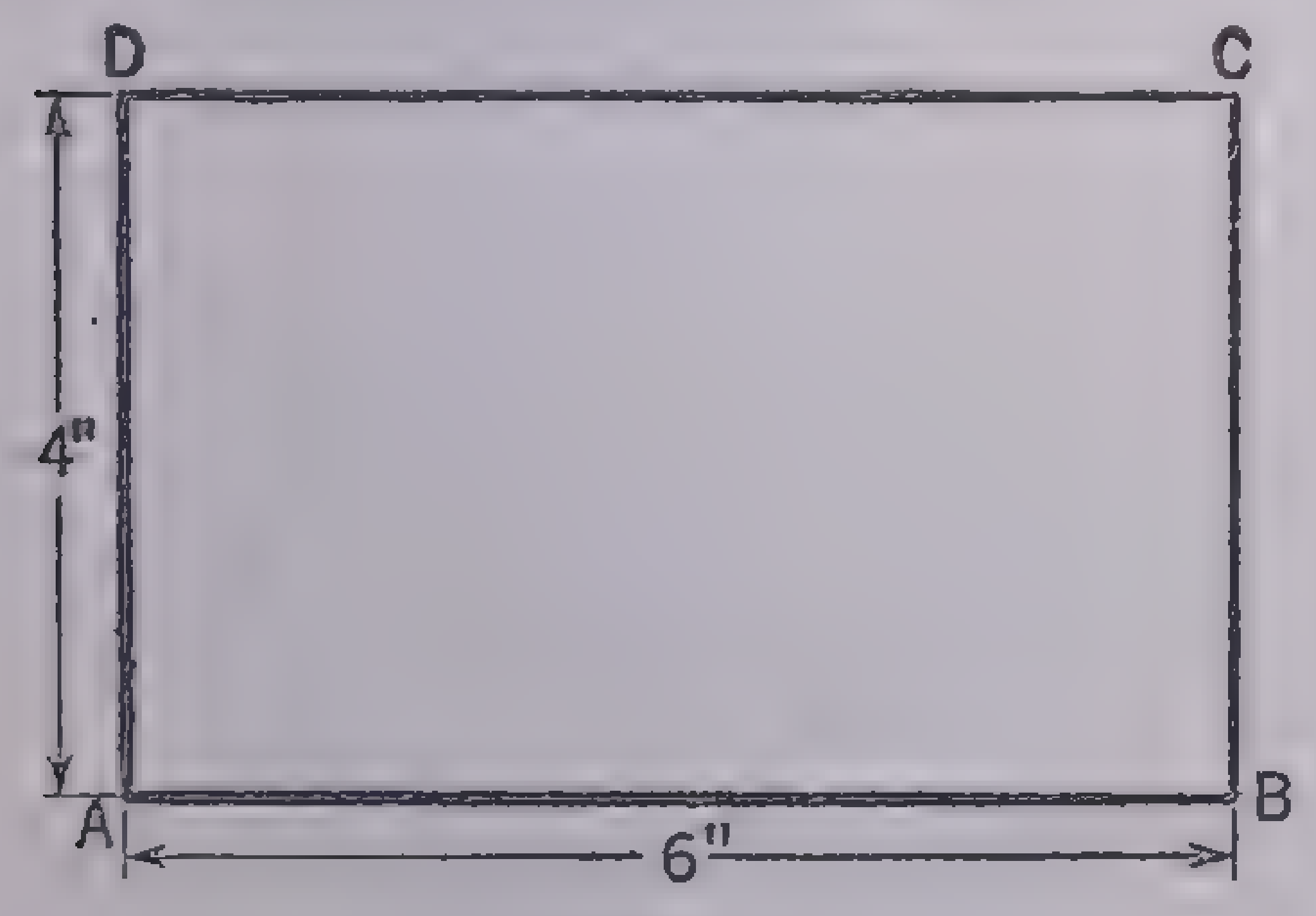


FIG. 4

A *trapezoid* is a four-sided figure which has only one pair of parallel sides. It has two bases (the parallel sides). For convenience, the longer base is called B and the shorter base is called b. The altitude is measured by a line perpendicular to the two bases. Fig. 5 is a trapezoid. Base B is 7 feet; base b is 5 feet; and the altitude is 4 feet.

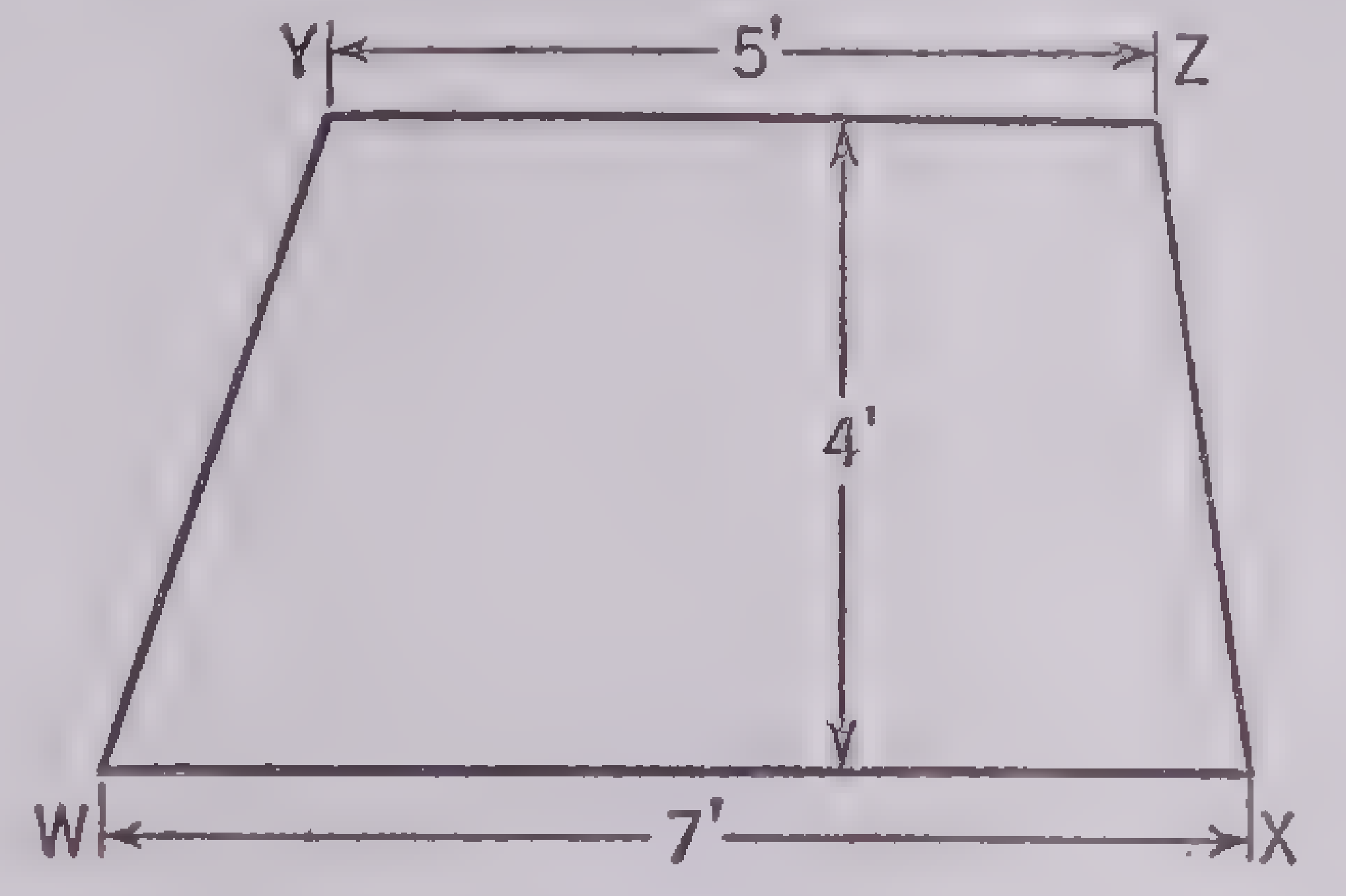


FIG. 5

A *triangle* is any closed figure which has three straight sides. Fig. 6 and Fig. 7 are triangles. The side upon which a triangle rests is called the *base*. DS is the base of the triangle in Fig. 6. The *altitude* is a line perpendicular to the base which shows the height of the triangle. The altitude always extends to the *vertex*, or the point, of the angle which lies opposite the base. Notice the altitude in the triangle in Fig. 6.

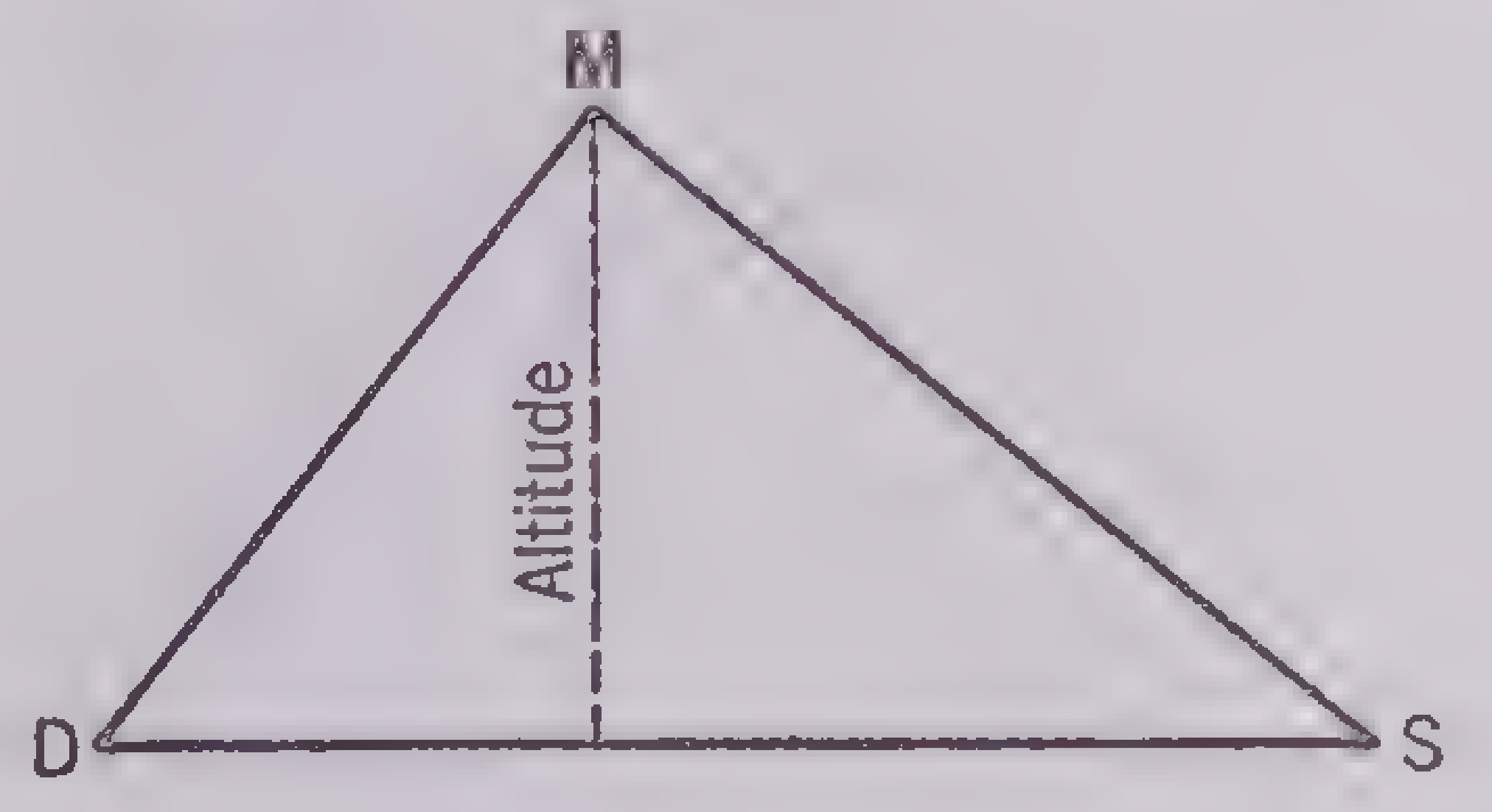


FIG. 6

A *right triangle* is any triangle in which one of the angles is a right angle. See Fig. 7.

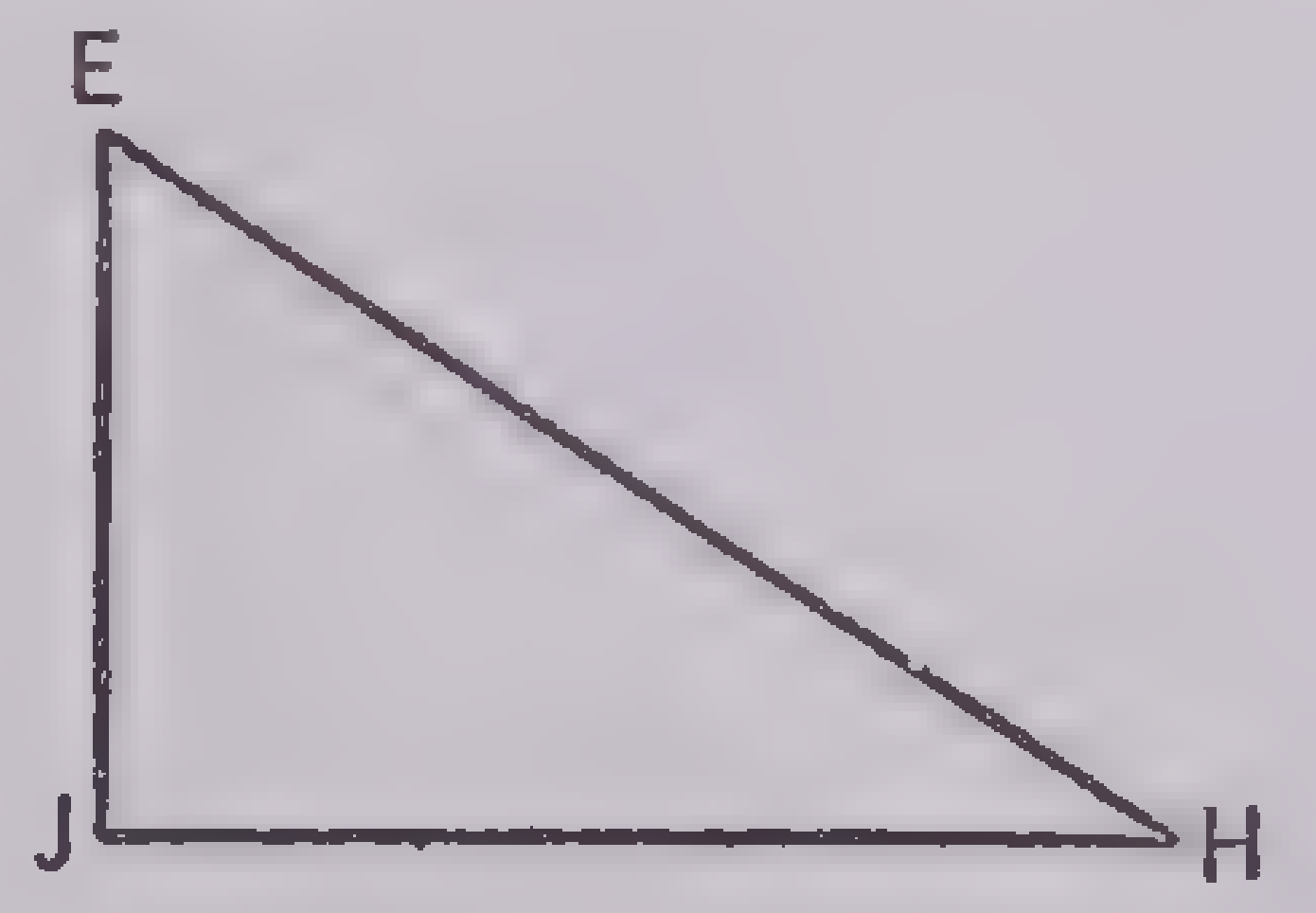


FIG. 7

The measurements which determine the size of a figure are called its *dimensions*. The dimensions of the rectangle in Fig. 4 are 4 inches and 6 inches. The *perimeter* of any figure is the total distance around its edges (the sum of the lengths of its sides). The perimeter of Fig. 4 is 20 inches (6 in. + 4 in. + 6 in. + 4 in.).

There are certain names for the different parts of a circle. The bounding line of a circle is called the *circumference*. In Fig. 8 the curved line from X to Y to P to Z to X is the circumference. A straight line from the center of a circle to any point on its circumference is called a *radius*. The plural of radius is *radii*. In Fig. 8, OY, OX and OZ are all radii of the circle.

A *diameter* is any straight line that begins and ends at the circumference of a circle and passes through the center. In Fig. 8, YOZ is a diameter of the circle.

In any circle one diameter equals *two* radii. In any circle the circumference is slightly over 3.14 times as long as the diameter. This number 3.14 (or about $\frac{22}{7}$) is represented by the Greek letter π (pronounced *pie*). The formula for finding the circumference of a circle is $c = \pi d$, or $c = 2\pi r$.

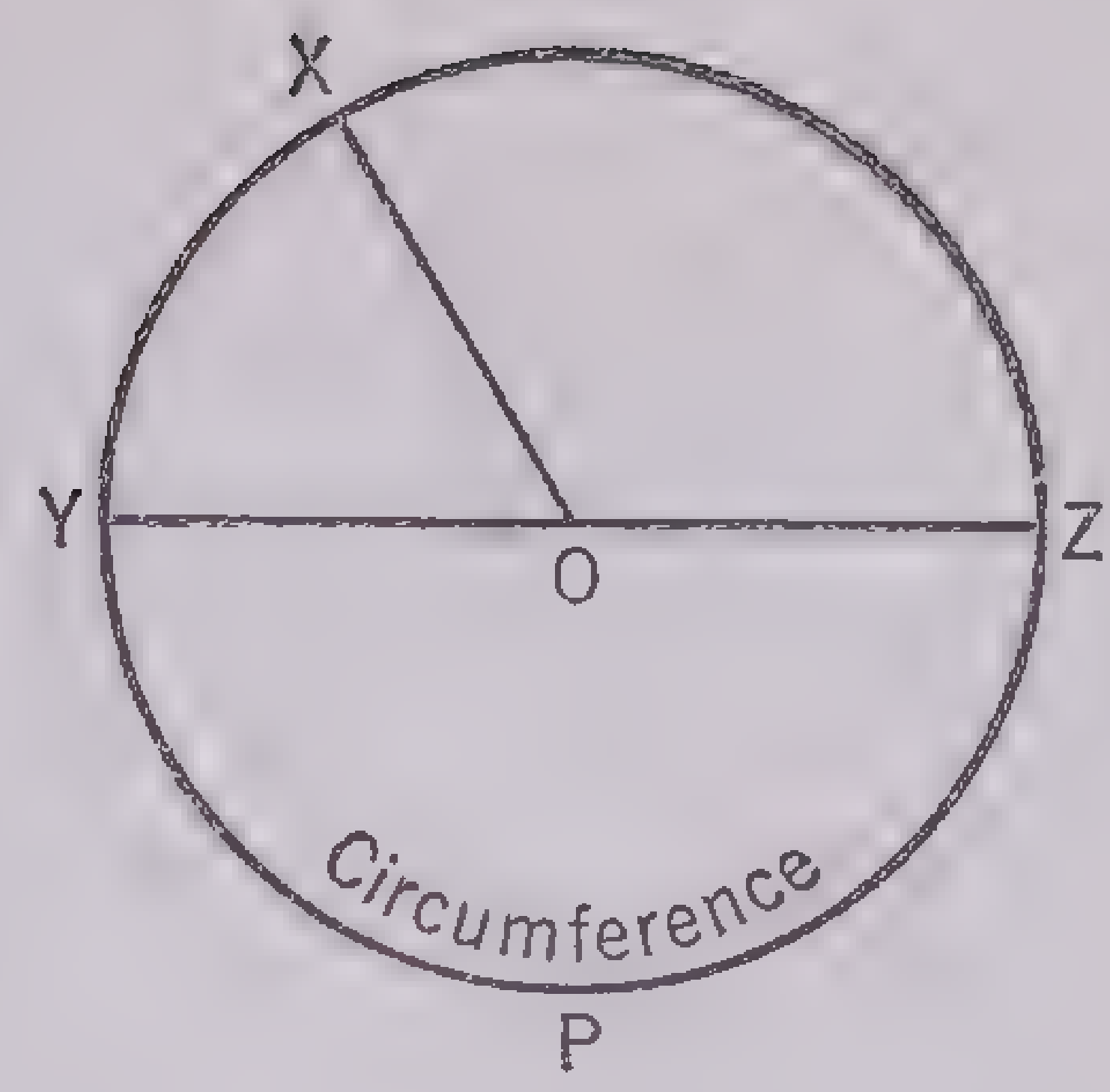


FIG. 8

Scale drawing means drawing an object so that a certain distance on the drawing represents a certain distance on the object. The *scale* shows exactly how much larger or smaller than the object the drawing is. Thus, 1″ : 20′ means that one inch on the drawing represents 20 feet of the actual size of the object drawn.

How To Find Areas.—The area of any figure means the *amount of space* or the *surface* which the figure covers. Area is *always* measured in *square units*. Areas of figures are found by multiplying the dimensions according to certain rules. Before dimensions can be multiplied, they must always be expressed in the *same units*.

To find the areas of parallelograms, trapezoids, triangles, or circles, study the rules and examples which are given below.

Area of a parallelogram = base × altitude. $A = a \times b$ or $A = ab$

Area of a trapezoid = $\frac{1}{2}$ the altitude × the sum of the two bases. $A = \frac{1}{2}a \times (B + b)$ or $A = \frac{1}{2}a(B + b)$

Area of a triangle = $\frac{1}{2}$ of the base × the altitude. $A = \frac{1}{2}a \times b$ or $A = \frac{1}{2}ab$

Area of a circle = πr^2. πr^2 means $\pi \times r \times r$. $\pi = \frac{22}{7}$ or 3.14

Example A: Find the area of a parallelogram having a base of 2 yd. and an altitude of 7 ft. *The Solution:* We must change dimensions to the same units before we can multiply. 2 yd. = 6 ft. $6 \times 7 = 42$. The area of the parallelogram is 42 sq. ft.

Example B: Find the area of a trapezoid with these dimensions: longer base, 16 ft.; shorter base, 8 ft.; altitude, 7 ft. *The Solution:* $A = \frac{7}{2}(16 + 8) = \frac{7}{2} \times 24 = 84$. The area of the trapezoid is 84 sq. ft.

Example C: Find the area of a triangle having a base of 1 ft. and an altitude of 5 in. *The Solution:* 1 ft. = 12 in. $\frac{1}{2} \times 12 \times 5 = 30$. The area of the triangle is 30 sq. in.

Example D: Find the area of a circle with a radius of 9 ft. *The Solution:* Area $= \pi r^2 = 3.14 \times 9 \times 9 = 254.34$. The area of the circle is 254.34 sq. ft. (If $\frac{22}{7}$ is used for π, the answer will be $254\frac{4}{7}$ sq. ft.)

Practice in Finding Areas.—Find the area of each figure below:

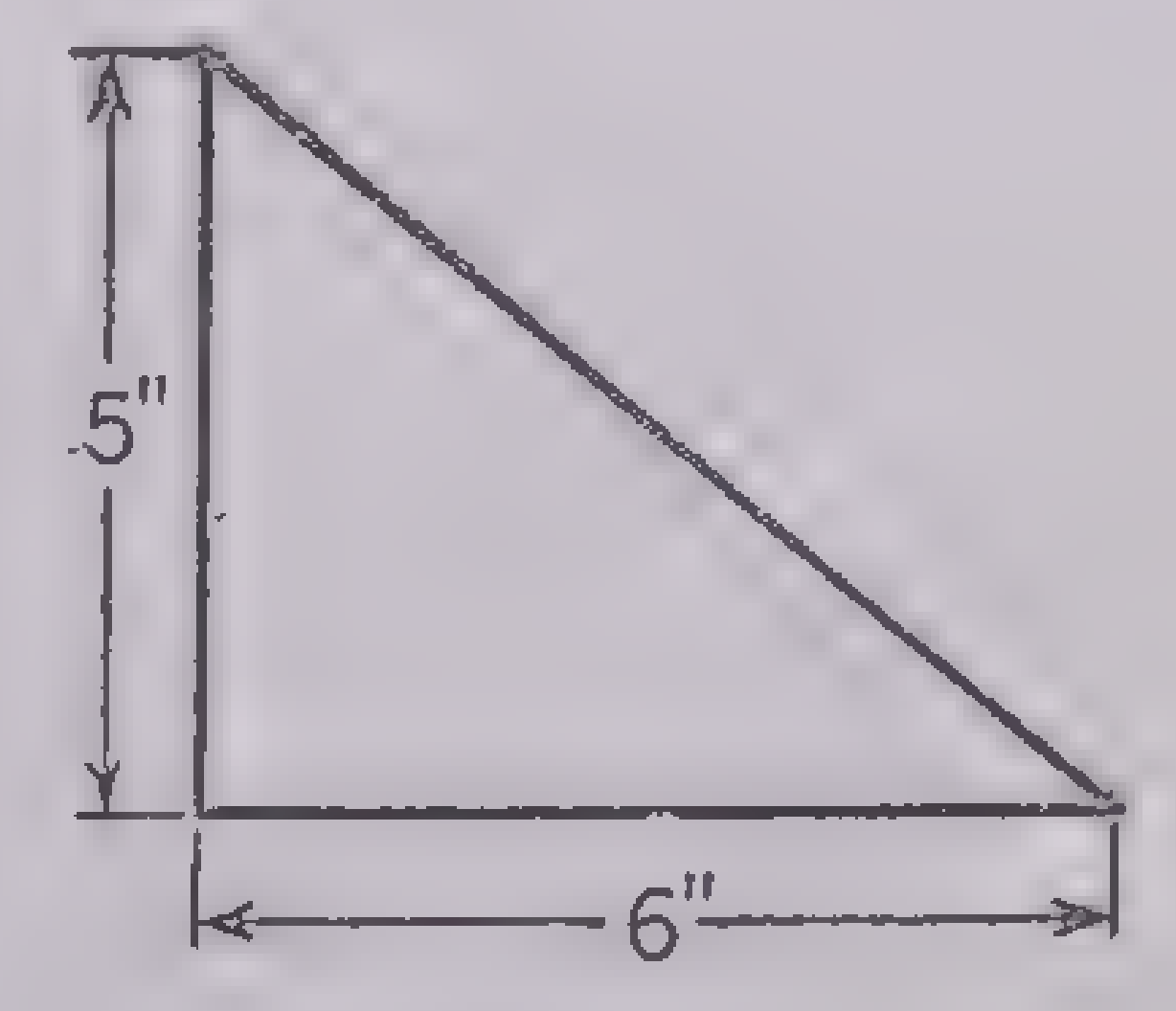


FIG. 1

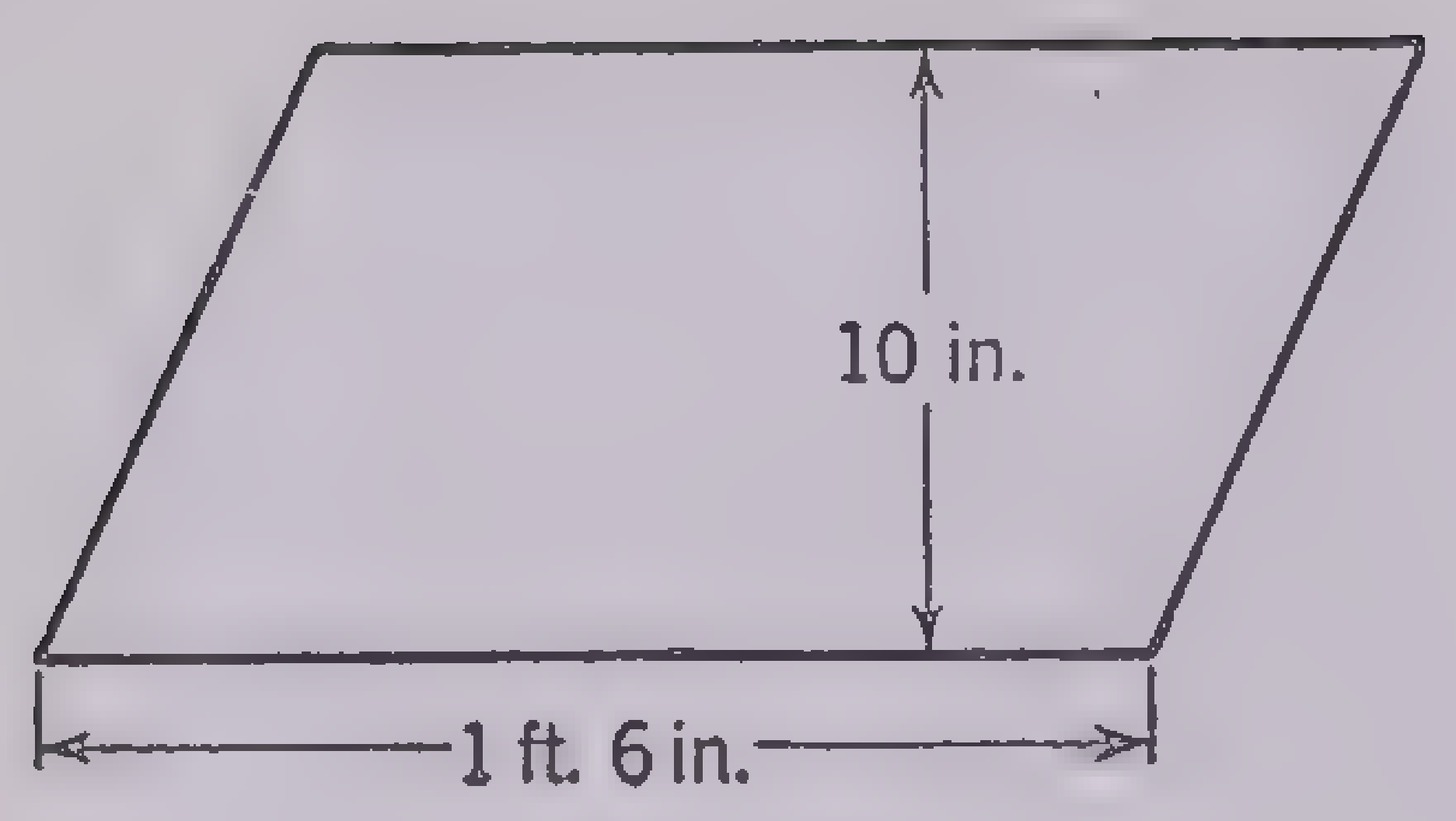


FIG. 2

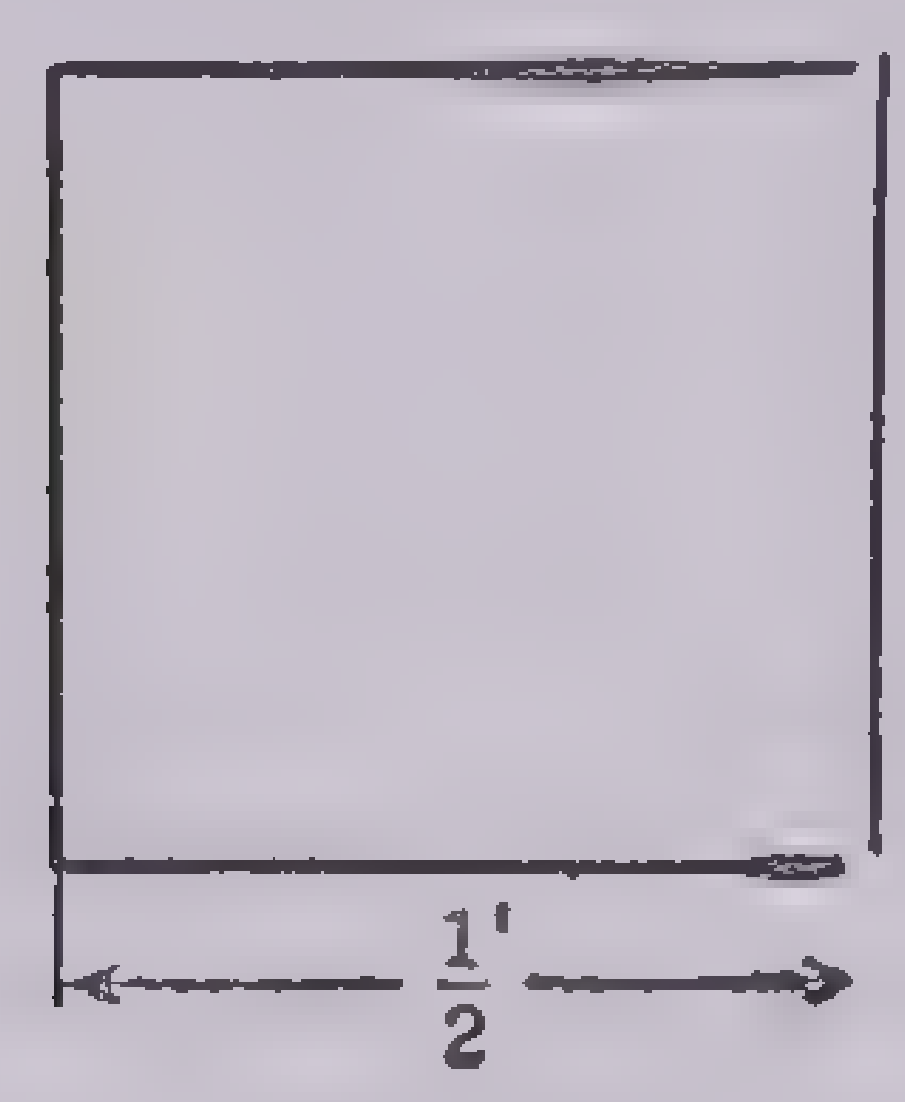


FIG. 3

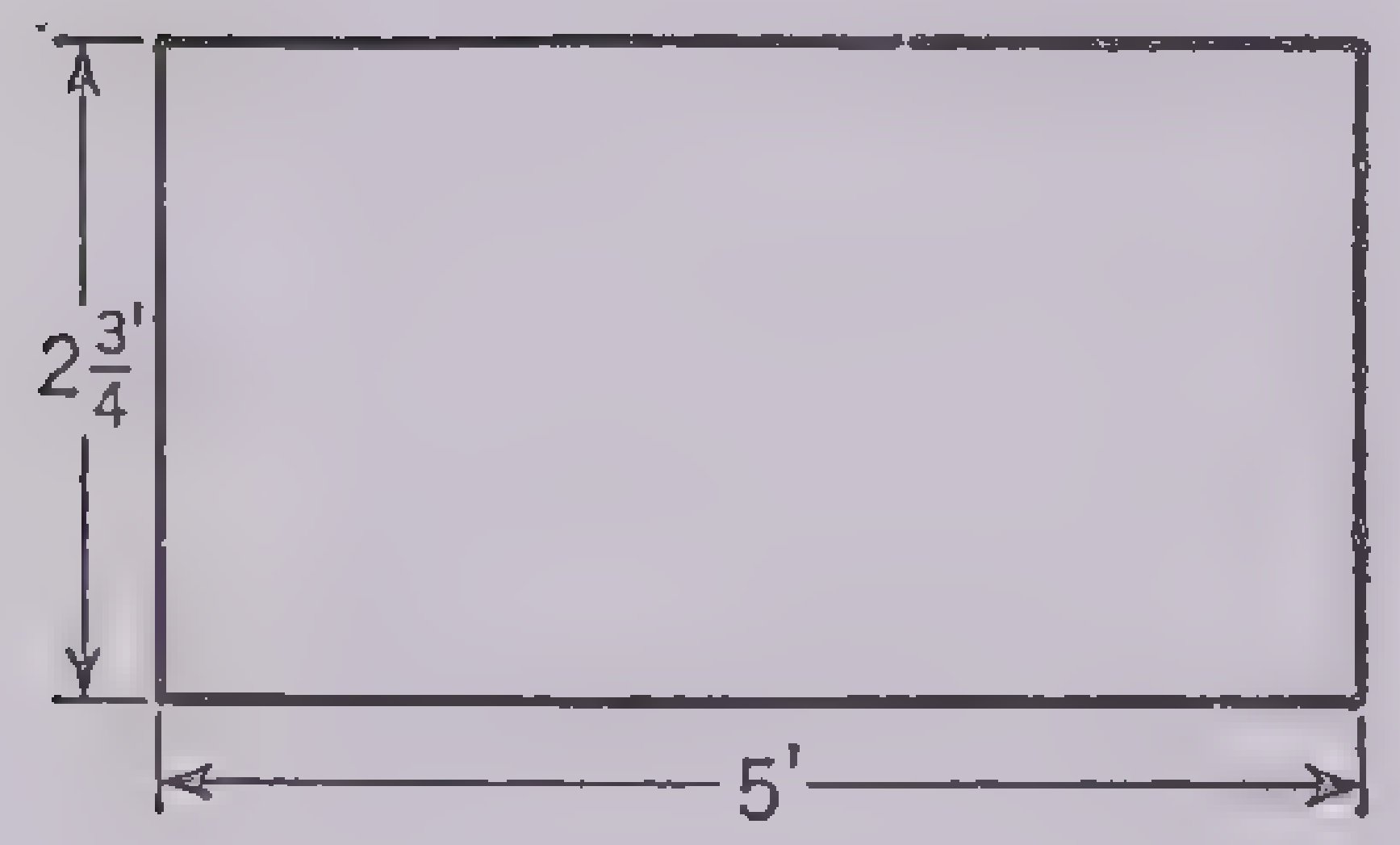


FIG. 4

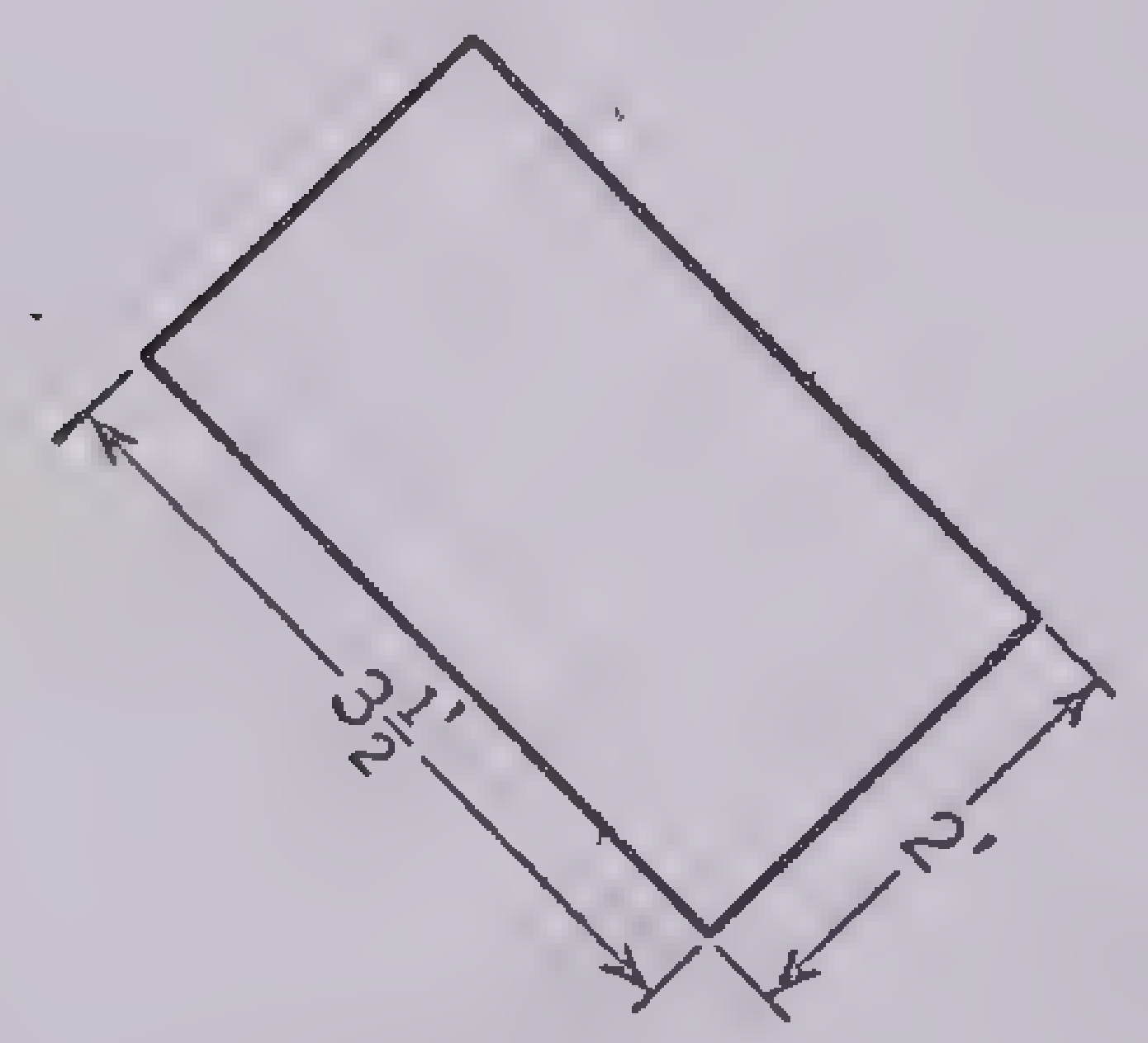


FIG. 5

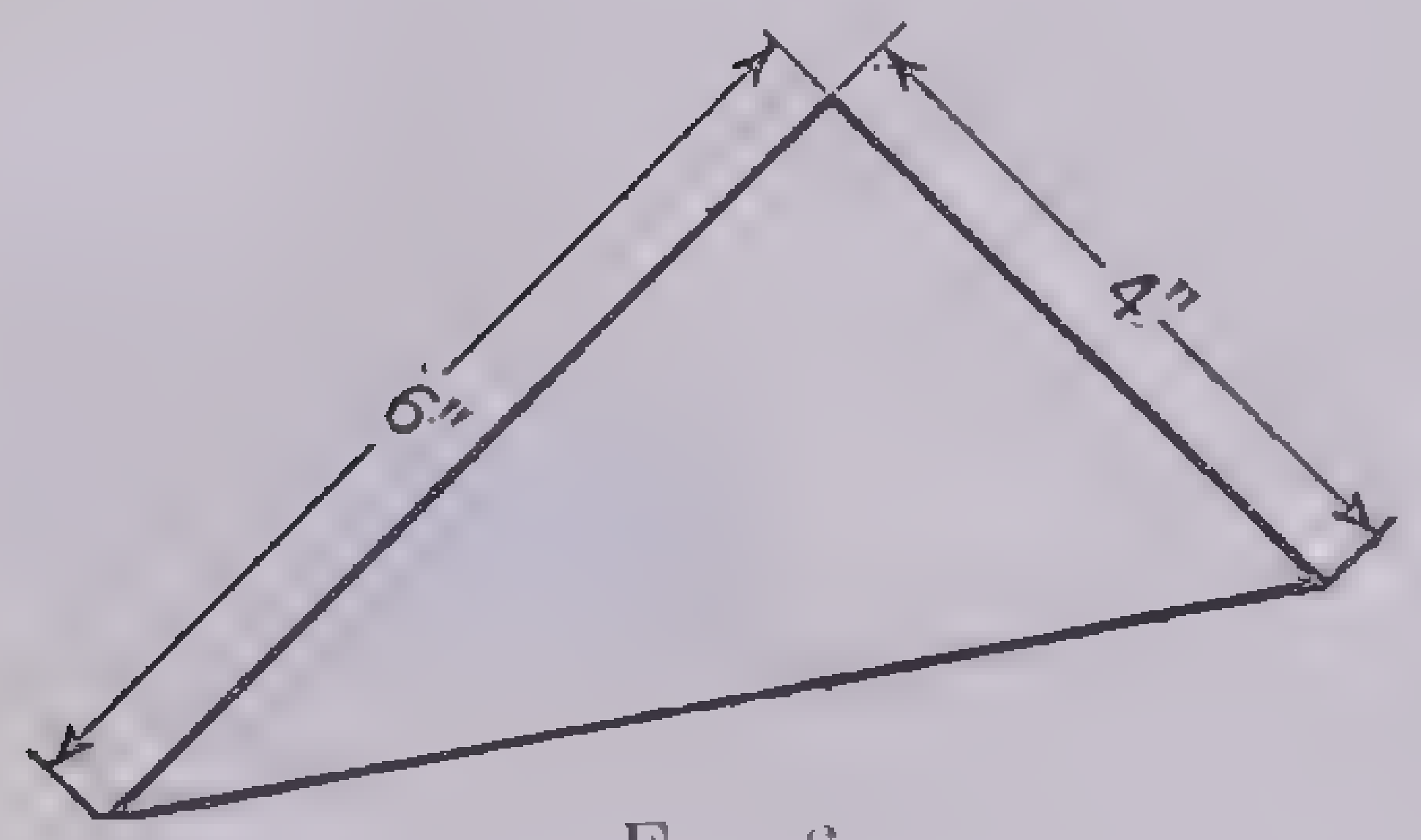


FIG. 6

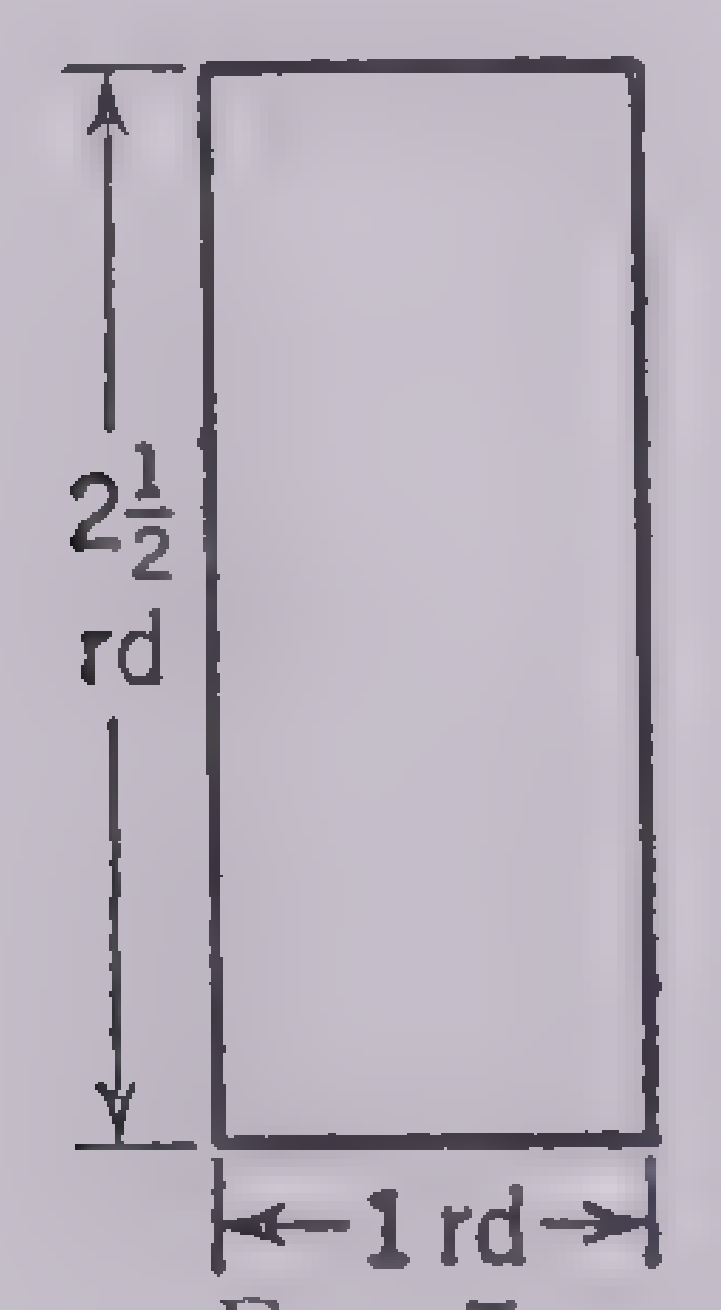


FIG. 7

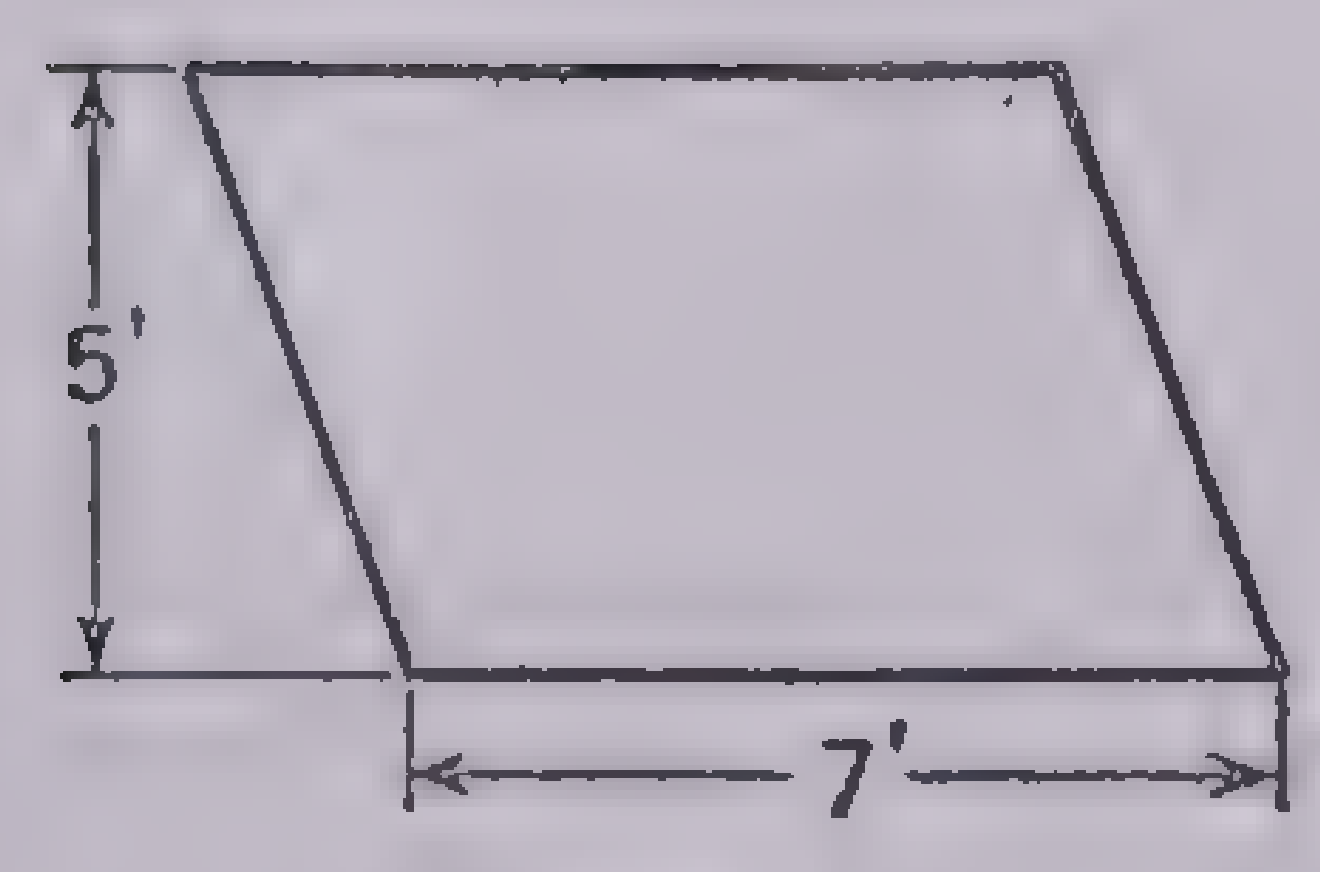


FIG. 8

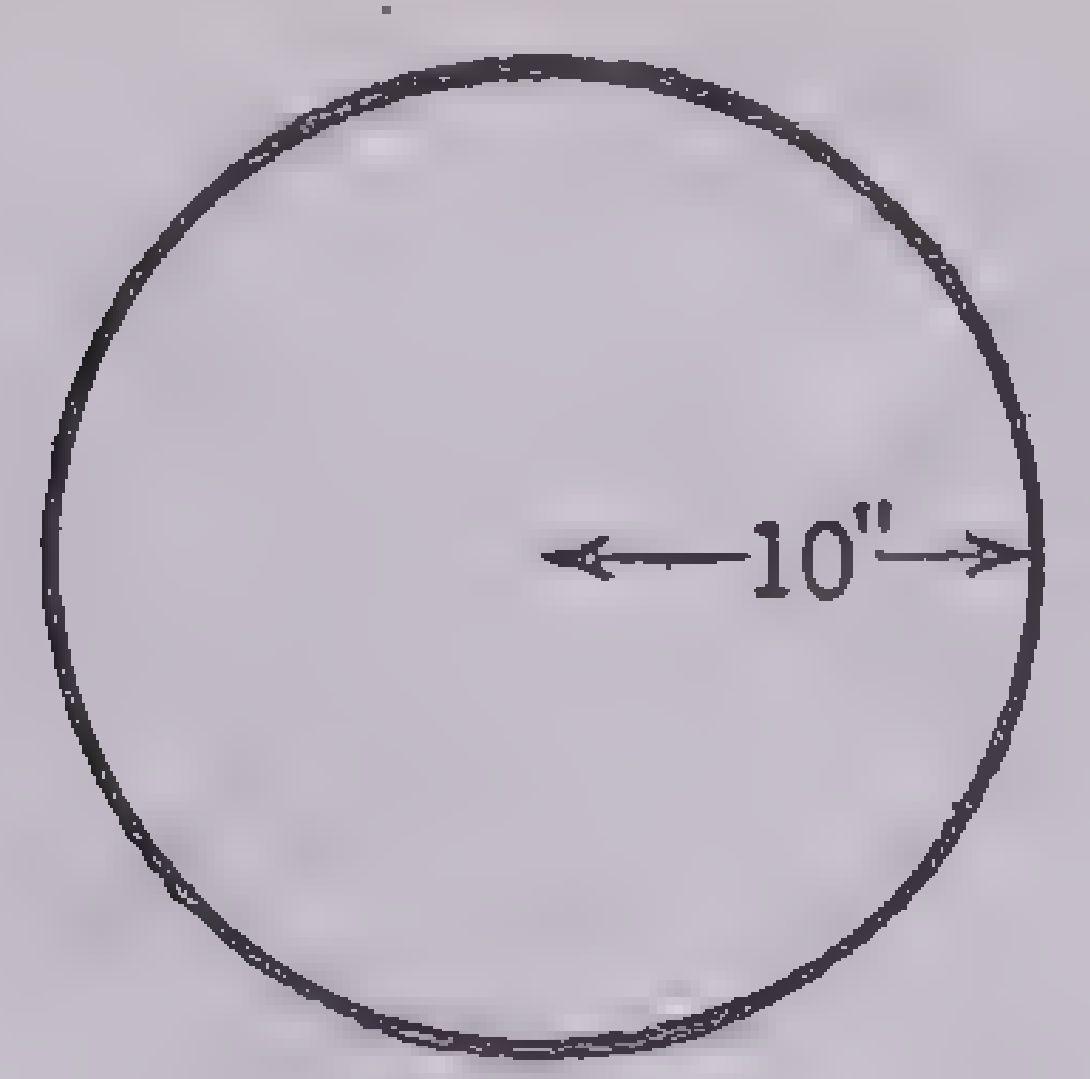


FIG. 9

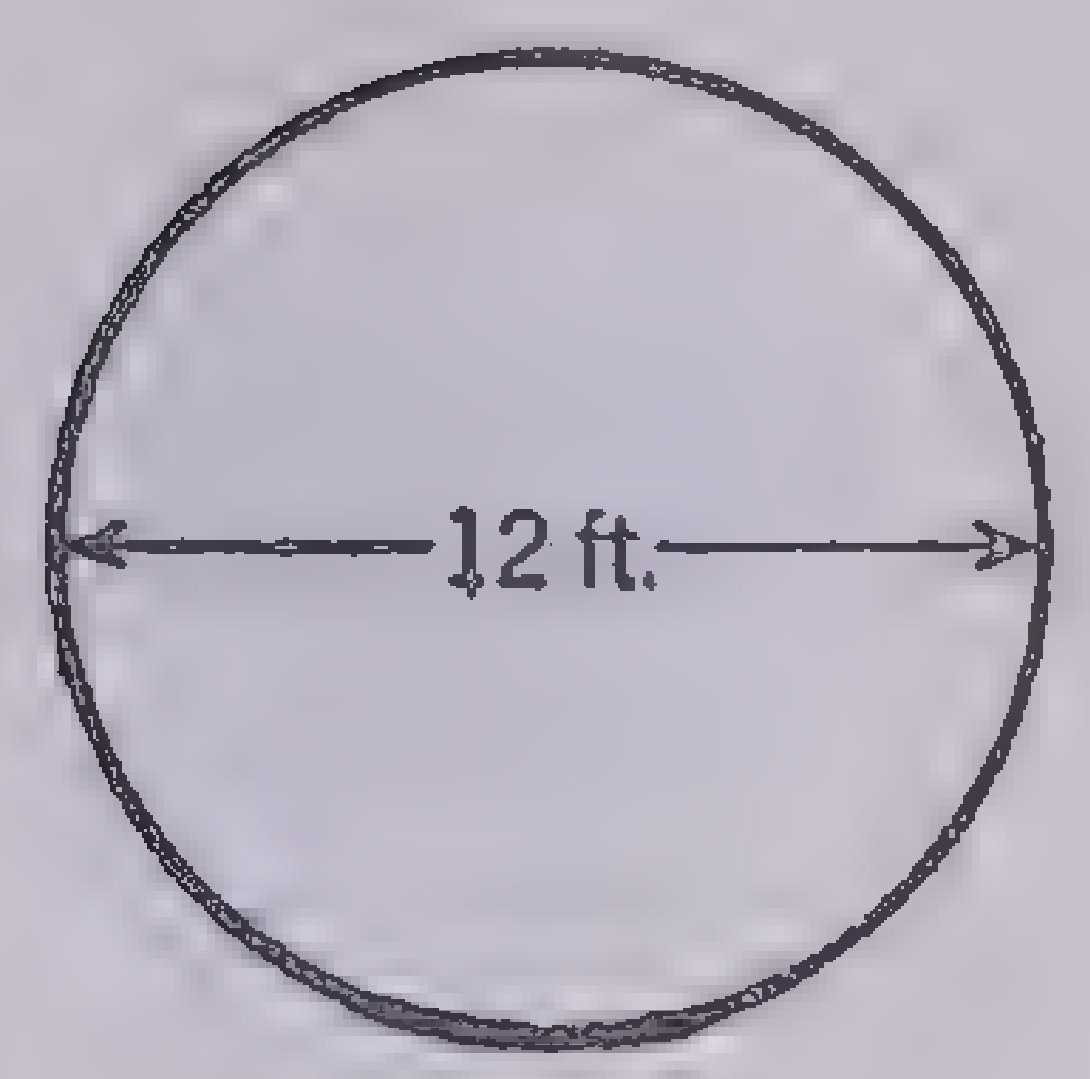


FIG. 10

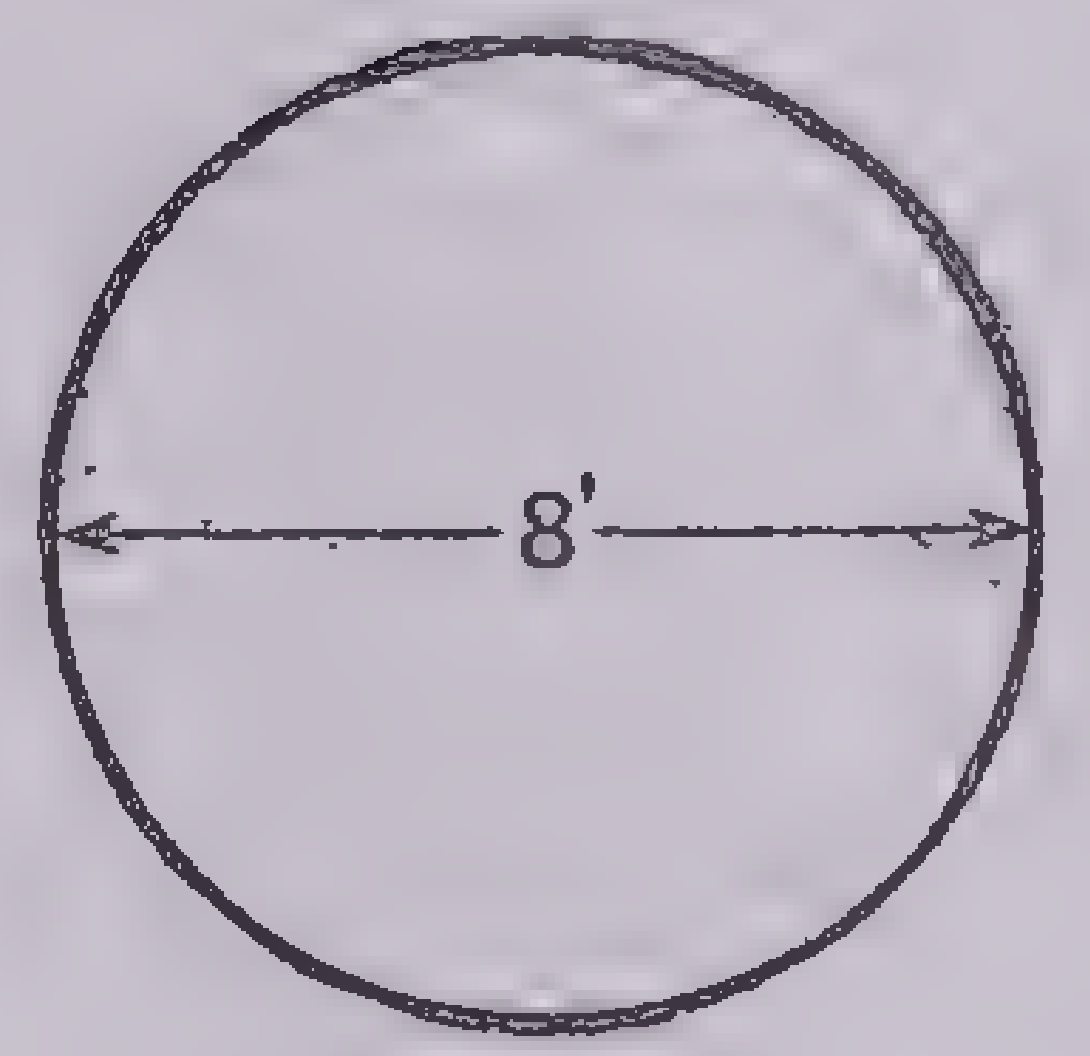


FIG. 11

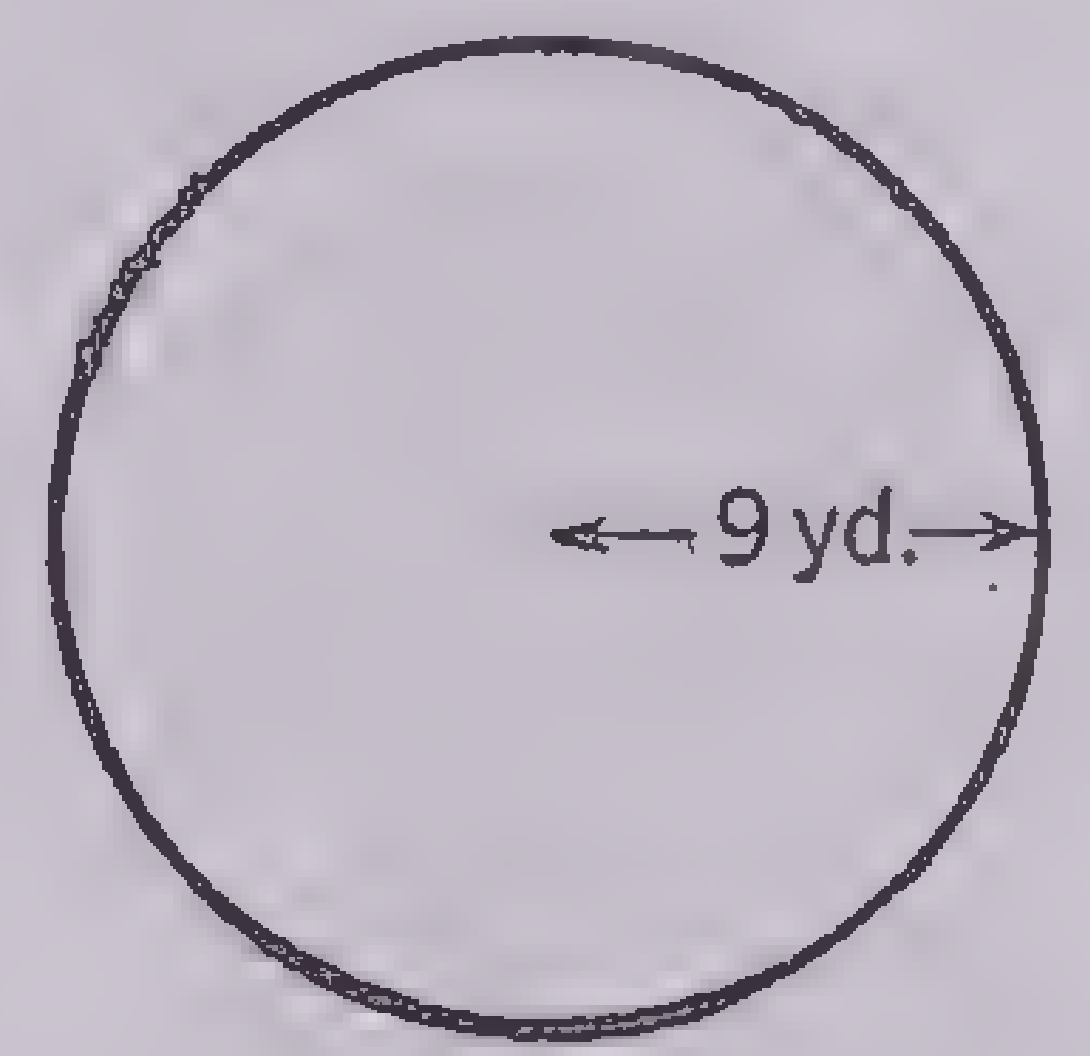


FIG. 12

Fig. 1: Area = 15 sq. in.

Fig. 2: Area = 1 sq. ft. 36 sq. in. or 180 sq. in.

Fig. 3: Area = $\frac{1}{4}$ sq. ft. or 36 sq. in.

Fig. 4: Area = $13\frac{3}{4}$ sq. ft.

Fig. 5: Area = 7 sq. ft.

Fig. 6: Area = 12 sq. in.

Fig. 7: Area = $2\frac{1}{2}$ sq. rd.

Fig. 8: Area = 35 sq. ft.

Fig. 9: Area = 314 sq. in.

Fig. 10: Area = 113.04 sq. ft.

Fig. 11: Area = 50.24 sq. ft.

Fig. 12: Area = 254.34 sq. yd.

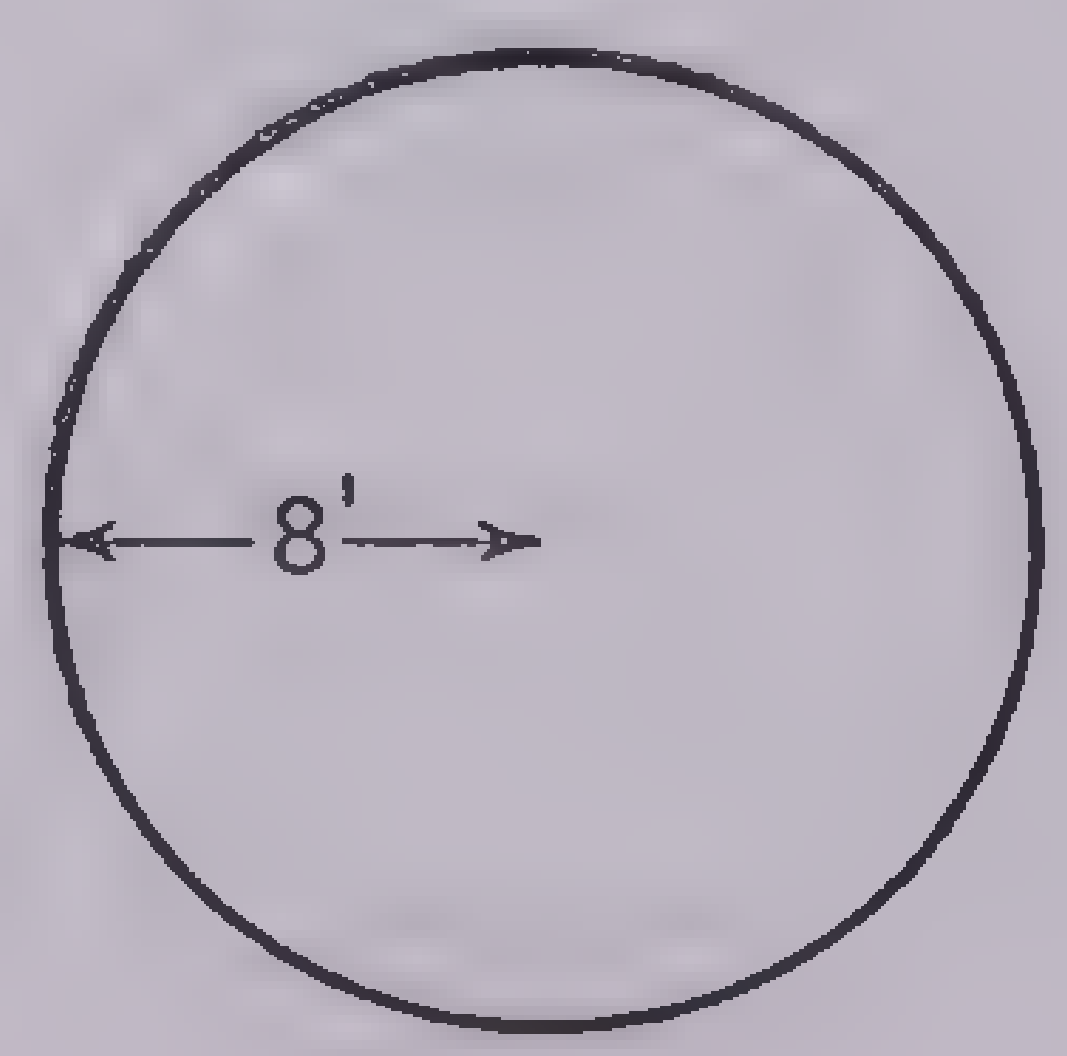
How to Find the Circumference of a Circle.—When you know the length of the radius of a circle, you can find the length of its circumference by using this formula: $C = 2\pi r$. In this formula C stands for the circumference, and r stands for the radius; as you know, π equals approximately 3.14 or $\frac{22}{7}$.

Study the next examples:

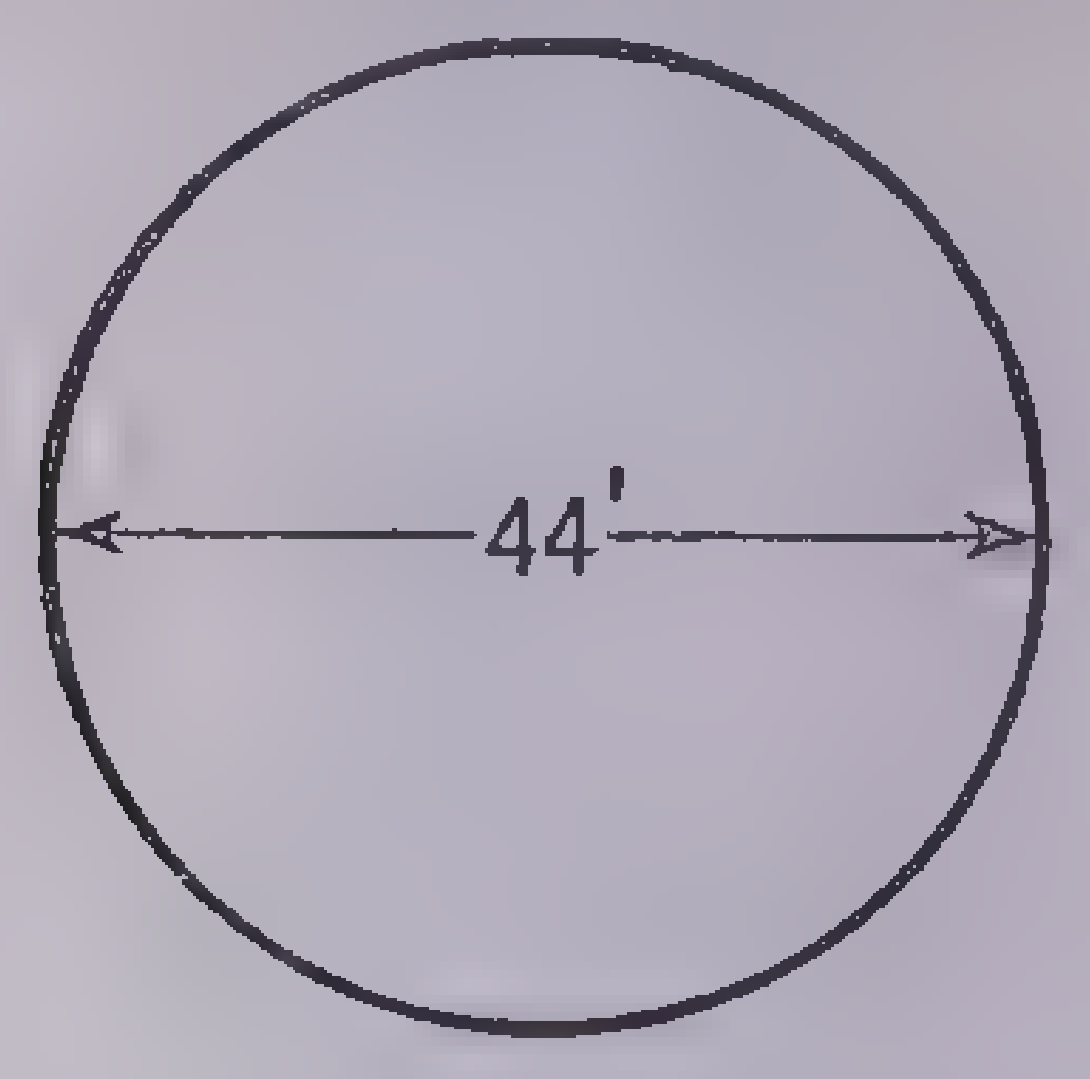
1. Find the circumference of this circle.

$C = 2\pi r$

$C = 2 \times \frac{22}{7} \times 8' = \frac{352'}{7} = 50\frac{2}{7}'$, *Answer.*



2. Find the circumference of this circle.

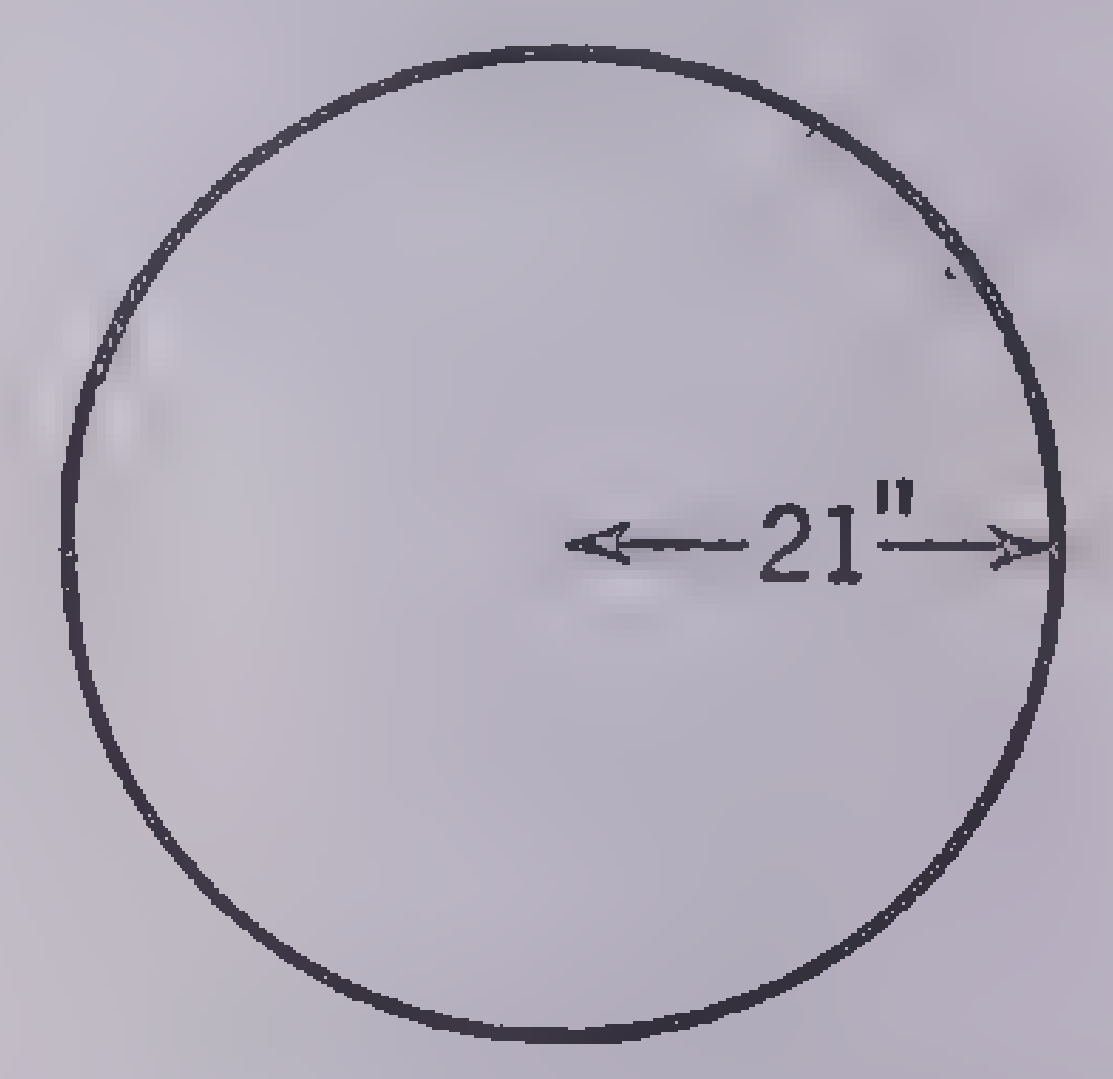


NOTE: Since diameter is 44 ft., radius is 22 ft.

$C = 2\pi r$

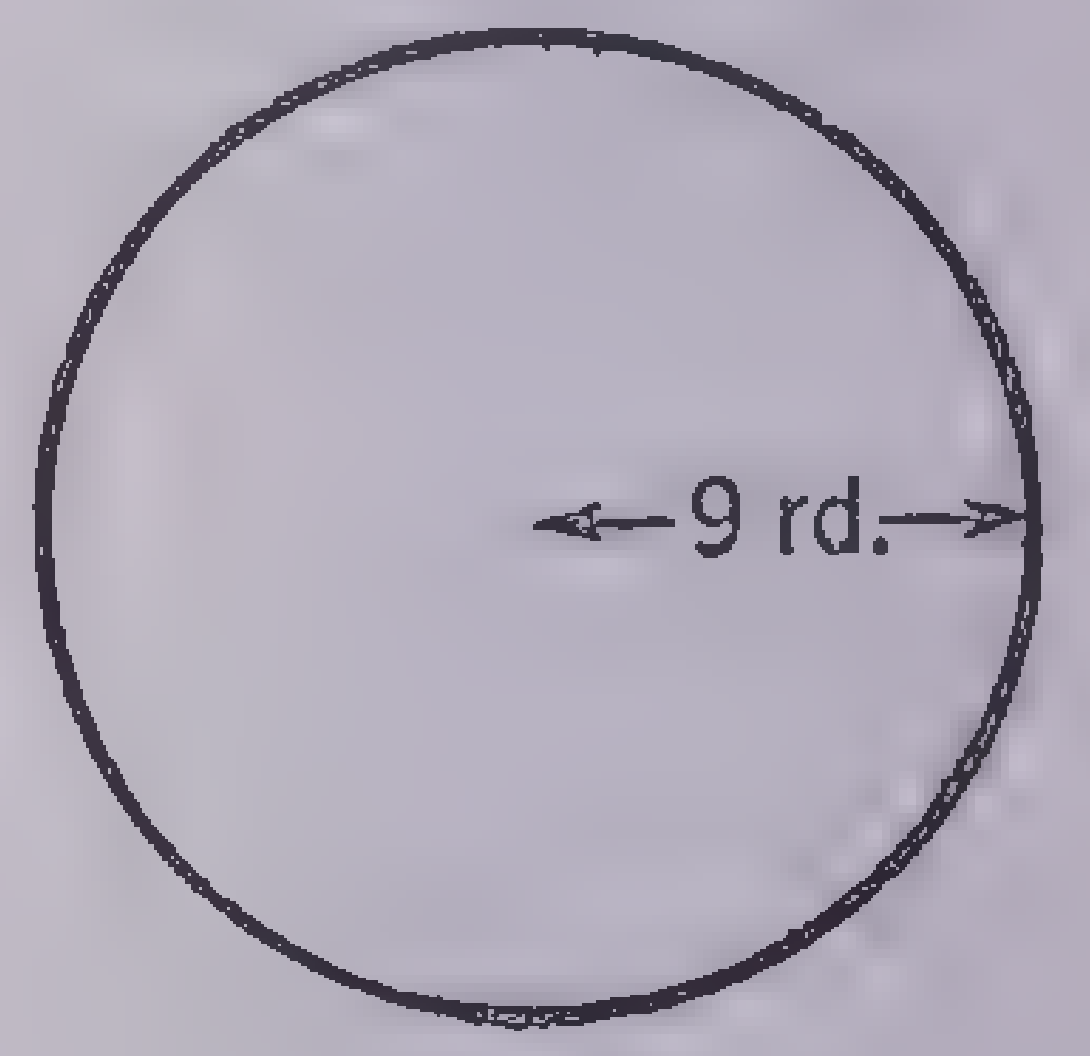
$C = 2 \times \frac{22}{7} \times 22$ ft. $= \frac{968}{7}$ ft. $= 138\frac{2}{7}$ ft., *Answer.*

3. Which answer given below is the correct one for the circumference of this circle?

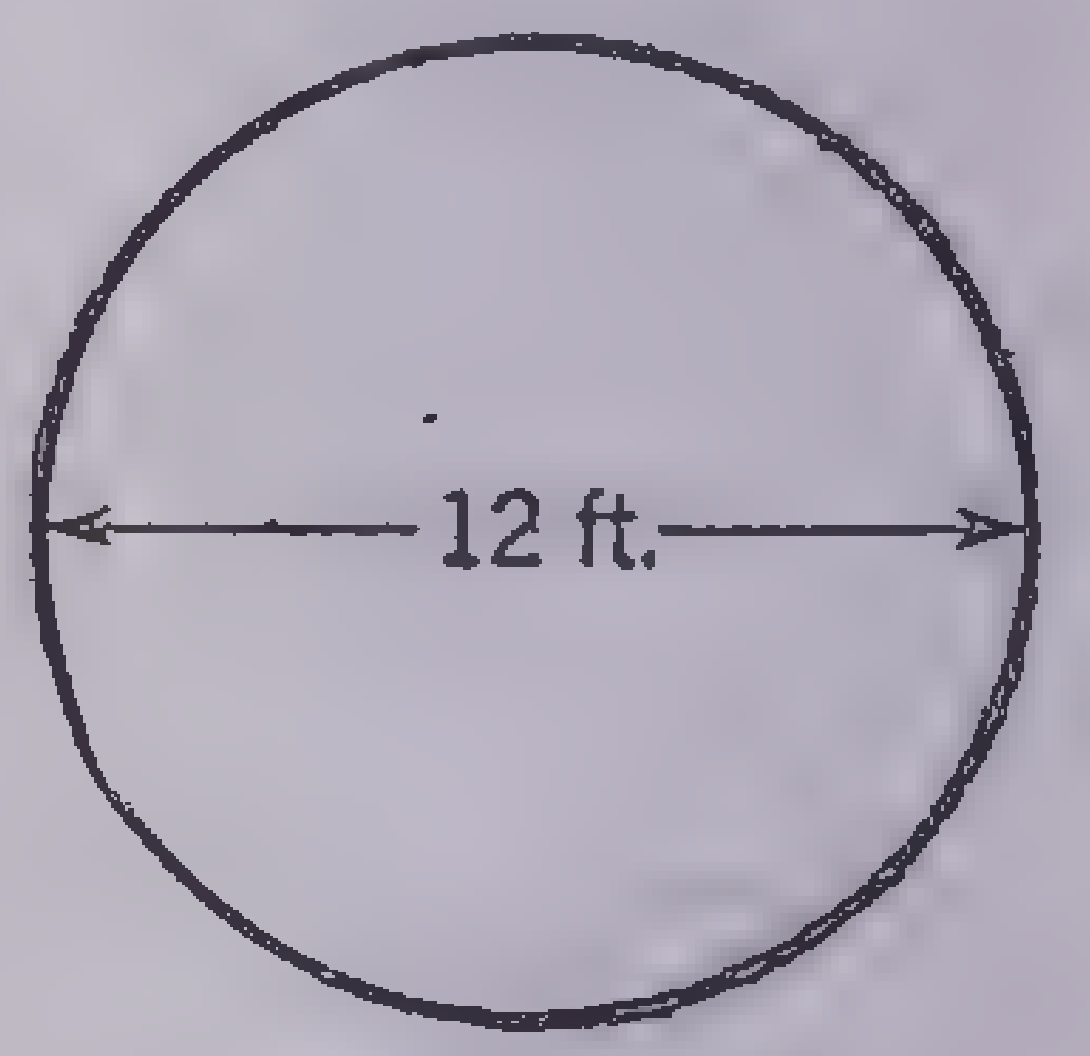


(*a*) 6 in. (*b*) $121\frac{2}{7}$ in.
(*c*) 132 in. (*d*) 264 in.

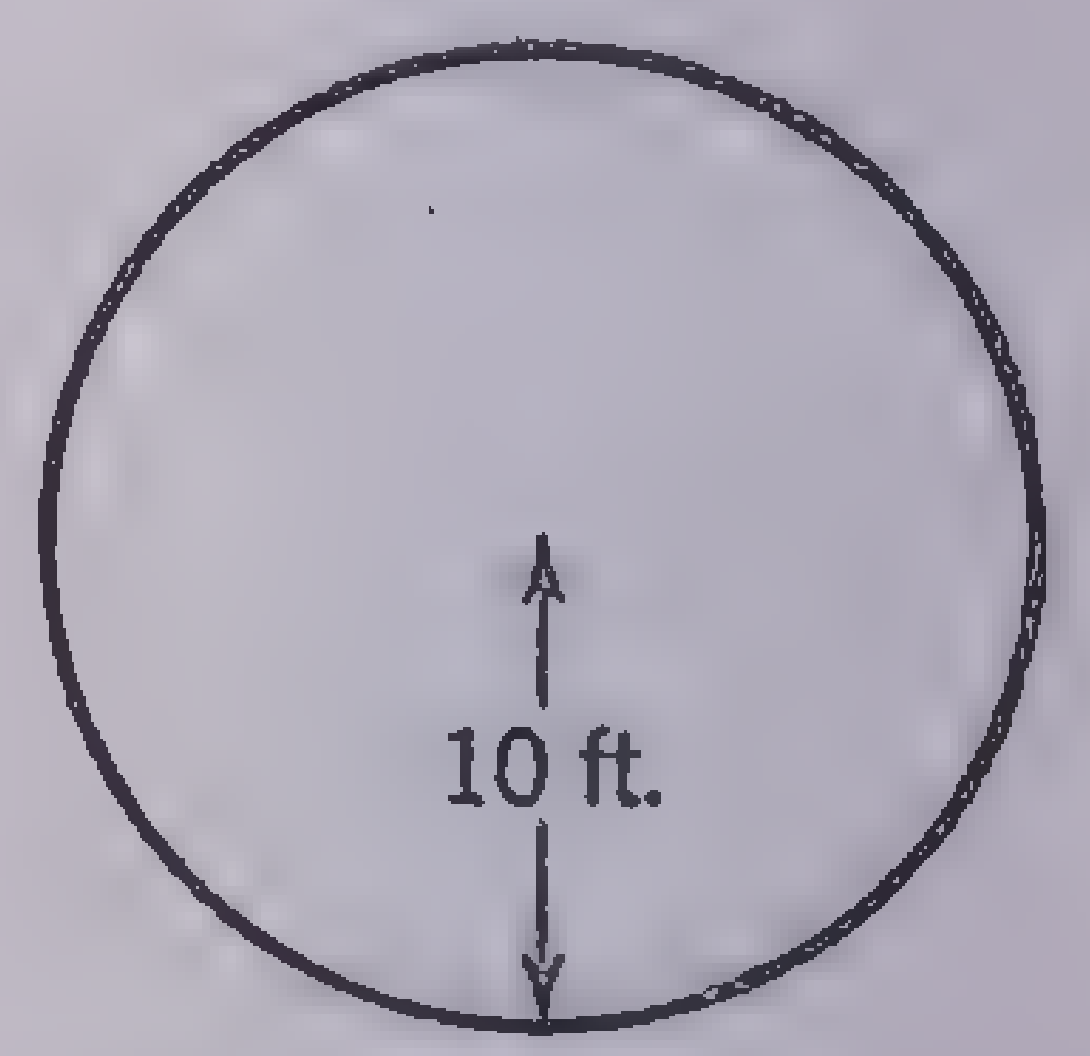
Practice in Finding Circumferences.—Find the circumference of each of the four circles shown.



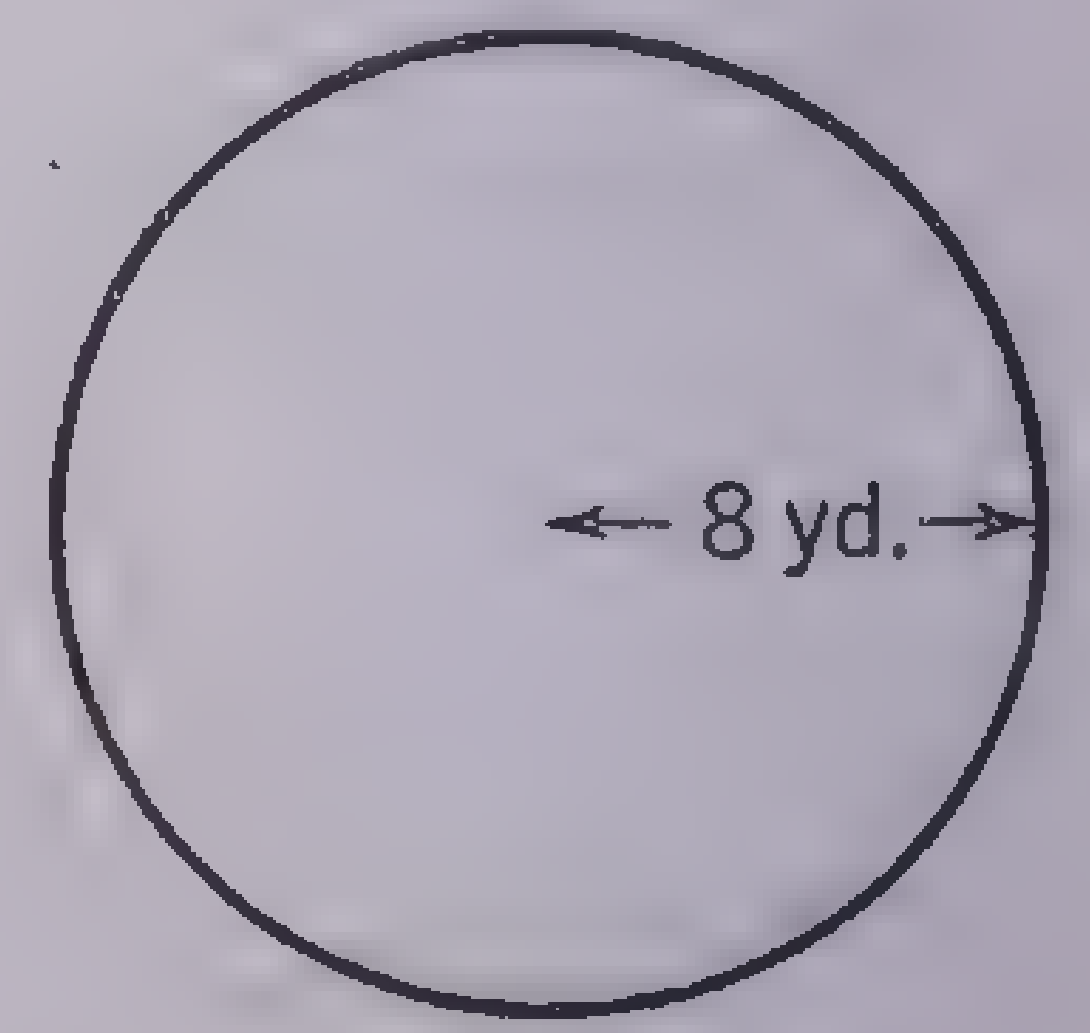
Answer, 56.52 rd.



Answer, 37.68 ft.



Answer, 62.8 ft.



Answer, 50.24 yd.

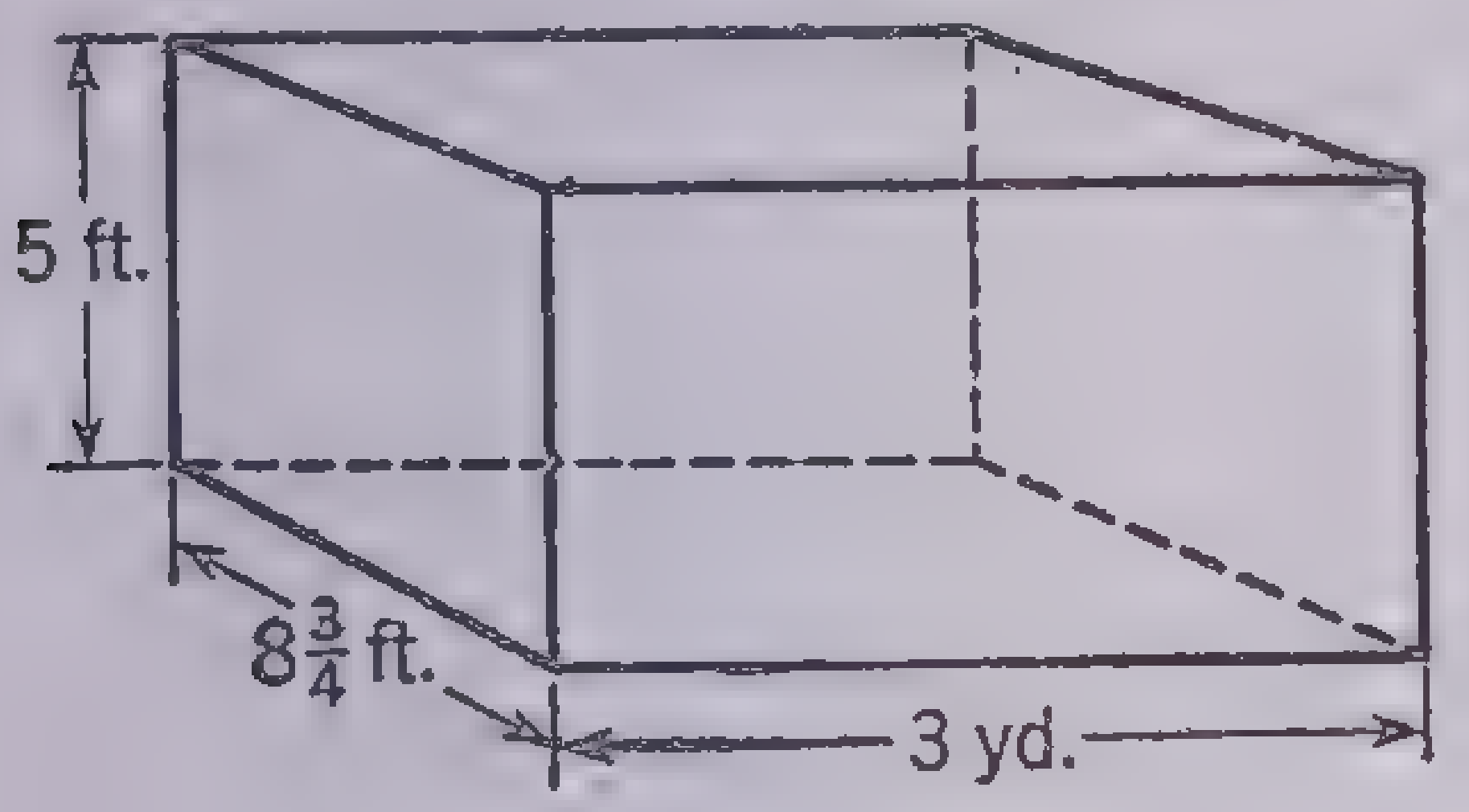
Finding Volumes.—The formulas needed in finding volumes are given below.

Two facts are true of all volume: (*a*) Volume, or capacity or bulk, is measured in *cubic units.* (*b*) In finding volumes all dimensions used must be in the same units before they are multiplied.

To Find the Volume of a Rectangular Solid.

Formula: $V = l \times w \times h$

Sample: Find the volume of the rectangular solid shown below.

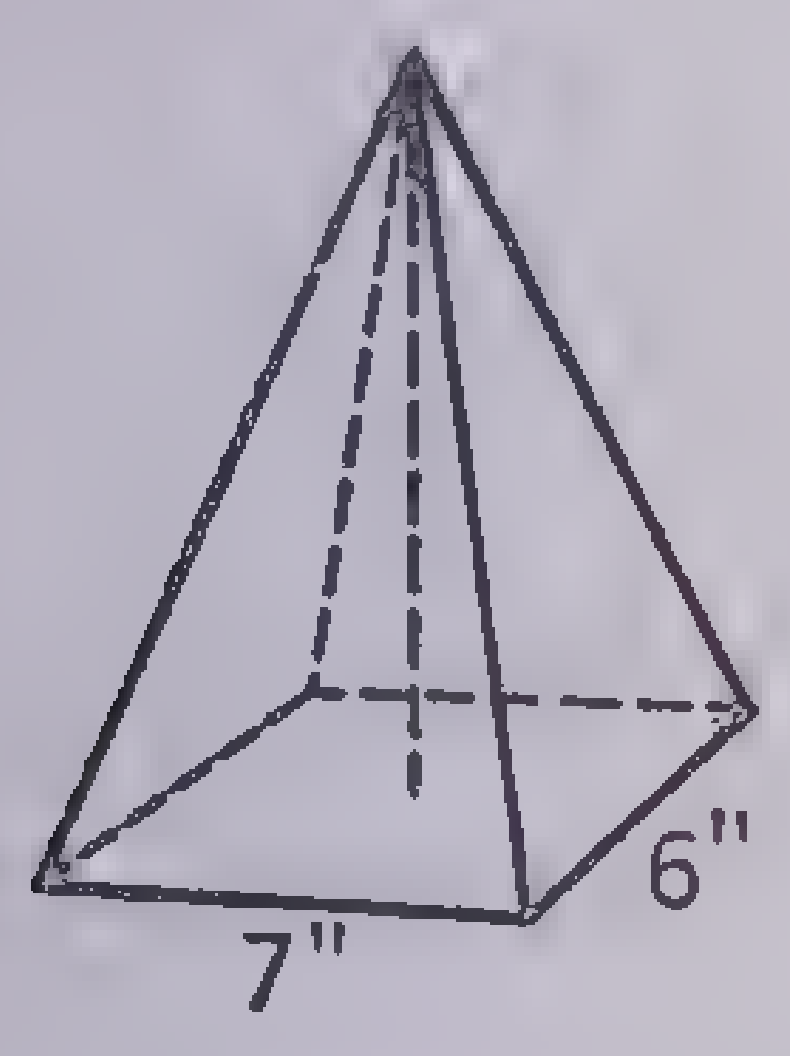


1. Change 3 yd. to 9 ft. before you multiply.
2. Volume $= 5 \times 8\frac{3}{4} \times 9 = 393\frac{3}{4}$ (cu. ft.)

To Find the Volume of a Pyramid.

$$\text{Formula: } V = \frac{\text{area of base} \times \text{altitude}}{3}$$

Sample: Find the volume of the pyramid.



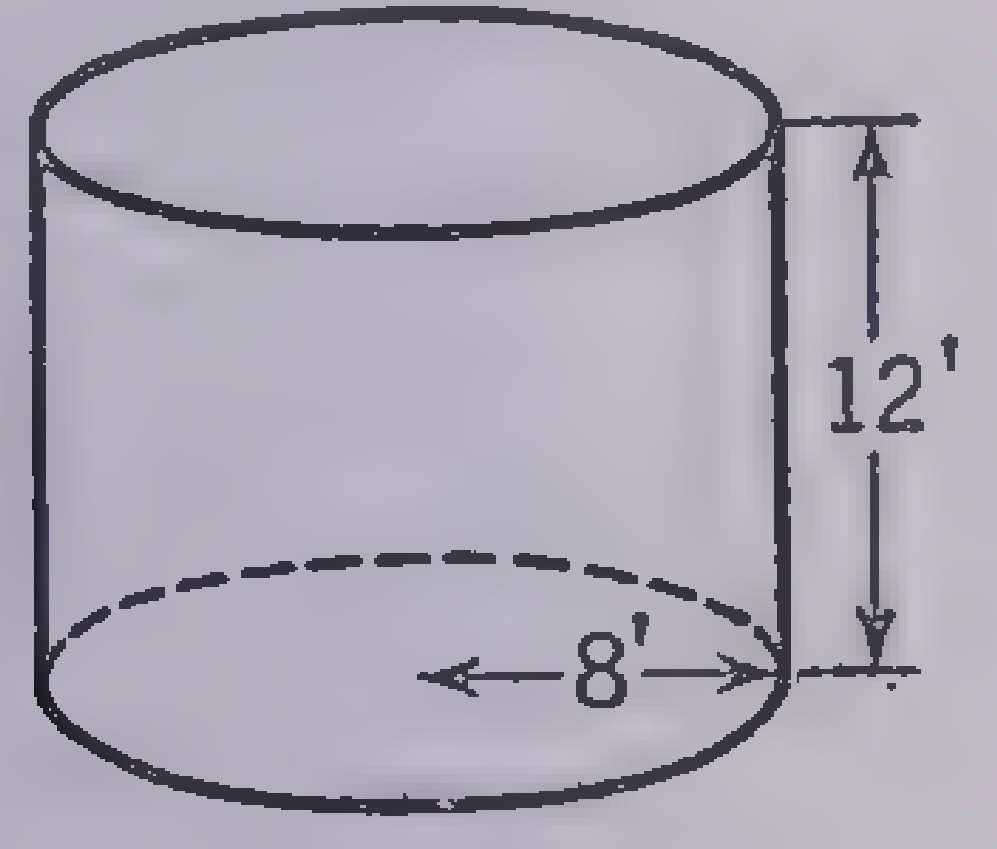
1. Area of base = 42 sq. in.
2. Area of base × altitude $= 42 \times 10 = 420$ (cu. in.)
3. $V = 420$ cu. in. ÷ 3, or 140 cu. in.

To Find the Volume of a Cylinder.

Formula: $V = B \times h$

In this formula B = area of base. The area of base (a circle) is given by the formula $A = \pi r^2$.

Sample: Find the volume of this cylinder:



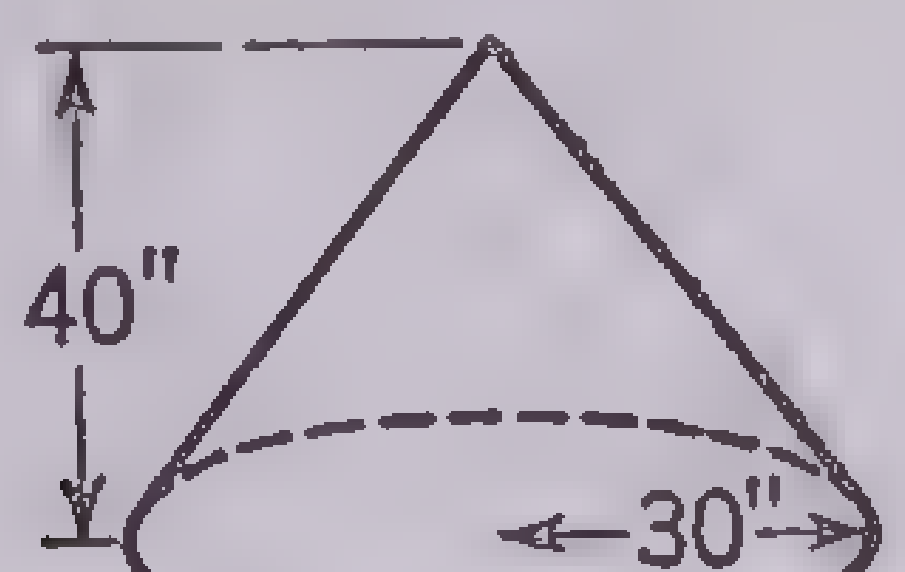
1. Area of base $= \frac{22}{7} \times 64 = 201\frac{1}{7}$ (sq ft.)
2. $V = 201\frac{1}{7} \times 12 = 2413\frac{5}{7}$ (cu. ft.)

To Find the Volume of a Cone.

$$\text{Formula: } V = \frac{B \times h}{3}$$

If radius is known, area of base (B) is given by the formula $A = \pi r^2$.

Sample: Find the volume of this cone:



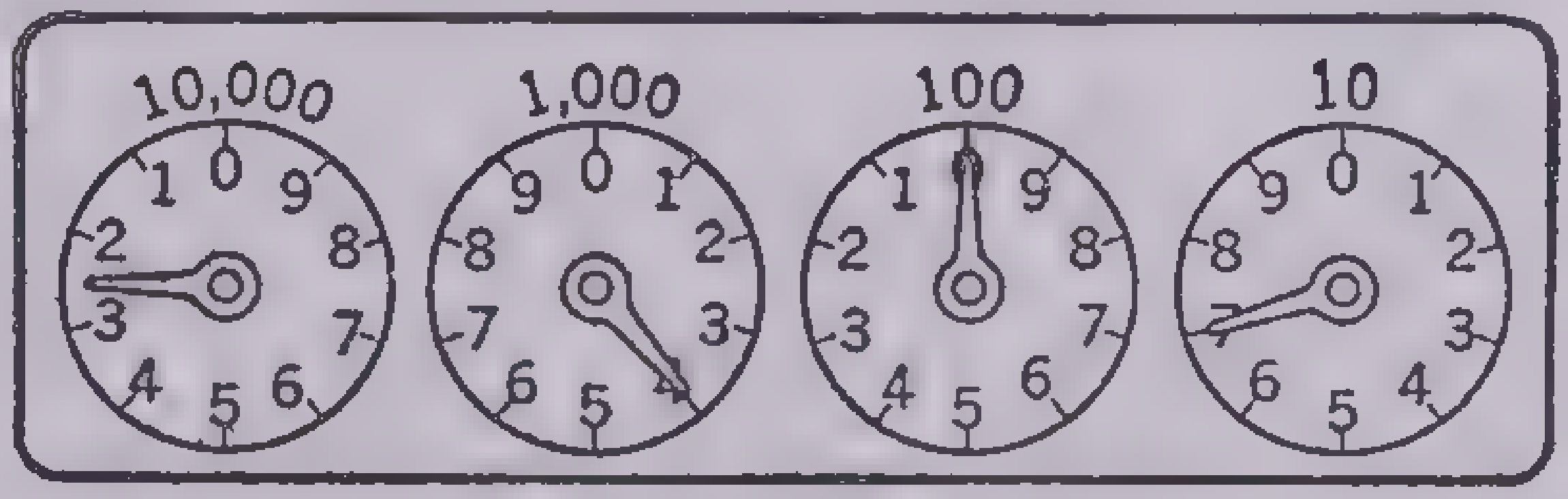
1. Area of base $= \frac{22}{7} \times 900 = 2{,}828\frac{4}{7}$ sq. in.
2. Area of base × altitude $= 113{,}142\frac{6}{7}$ cu. in.
3. $V = 113{,}142\frac{6}{7}$ cu. in. ÷ 3, or $37{,}714\frac{2}{7}$ cu. in.

Practice in Finding Volumes.—The following table gives the dimensions of some solids, like tanks and grain bins. Sometimes you must find the area of the base before you can find the volume of a solid.

Important: $7\frac{1}{2}$ gal. = 1 cu. ft. 1 bu. = $1\frac{1}{4}$ cu. ft. 1 cu. yd. = 1 load Use $\pi = \frac{22}{7}$.

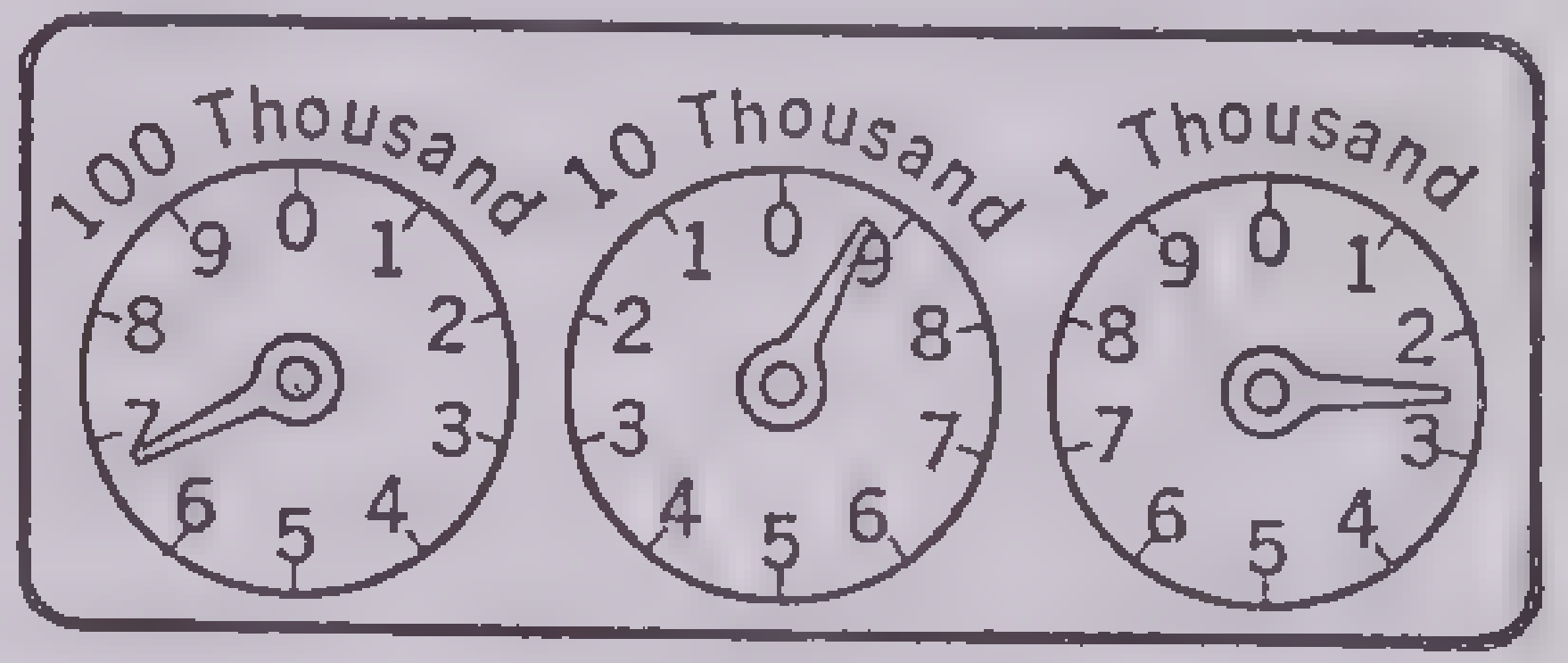
	KIND OF SOLID	r	l	w	h	B	V
1.	Silo				30′	200 sq. ft.	6,000 cu. ft.
2.	Grain bin		16′	12′	10′		1,536 bu.
3.	Egyptian pyramid				90′	A square, 40 yd. on a side	432,000 cu. ft.
4.	Gasoline tank	2′			10′		$942\frac{6}{7}$ gal.
5.	Pile of coal	5′			6′		$125\frac{5}{7}$ bu.
6.	Pyramid				10″	10″ × 12″	400 cu. in.
7.	Rectangular cellar		20′	15′	9′		100 loads
8.	Conical grain hopper	6′			9′		$339\frac{3}{7}$ cu. ft.
9.	Cylinder	10″			2′		$4\frac{23}{63}$ cu. ft.
10.	Cylindrical oil tank	$3\frac{1}{2}$′			30′		$8{,}662\frac{1}{2}$ gal.

Measures of Electricity and Gas.—The unit for measuring electricity is the *kilowatt-hour.* The *electric meter* is an instrument that shows how many kilowatt-hours of electricity have been used. An electric meter has dials like those in the picture. On the dial farthest to the right, each division represents 1 kilowatt-hour. On the second dial, each division represents ten kilowatt-hours, on the third dial each division represents one hundred kilowatt-hours, and so on. When the hand on the first dial at the right makes a complete circuit from 0 to 0, the hand on the second dial moves one division; that is from 0 to 1 or 1 to 2 or 2 to 3. Similarly, when the hand on the second dial makes a complete circuit, the hand on the third dial moves one division; when the hand on the third dial makes a complete circuit, the fourth dial hand moves one division.



An Electric Meter

We read each dial by taking the number to which the hand is pointing or has just passed by. Notice that the numbers on the first and third dials are read from left to right, and those on the second and fourth dials are read from right to left. The complete reading of the meter is obtained by writing down the numbers on the dials in order, from left to right. The electric meter shown on this page reads 2,407 k.w.h.



A Gas Meter

Gas meters are similar to electric meters except that they register cubic feet. The *cubic foot* is the unit of measurement of gas. To get the reading of a gas meter, write down the reading of each of the dials, starting at the left; then annex two zeros. The gas meter above reads 69,200 cubic feet.

1. The dials of a gas meter read 7-5-5 on the first of one month, and 7-9-3 on the first of the next month. What should have been the amount of the bill for the month if the rate was $1.70 per 1,000 cubic feet? (*Ans., $6.46*)

2. On January 1, 1938, an electric meter read 7-9-6-3, and on February 1, 1938, the reading was 8-0-7-4. What should have been the amount of the bill if the rate was 9 cents per kilowatt-hour? (*Ans., $9.99*)

Measures Used in Building Construction.—A *board foot* is a piece of lumber 1-inch thick, 12-inches wide and 1-foot long. The formula below may be used to find the number of board feet in a board.

$$\text{Number of board feet} = \frac{twl}{12}$$

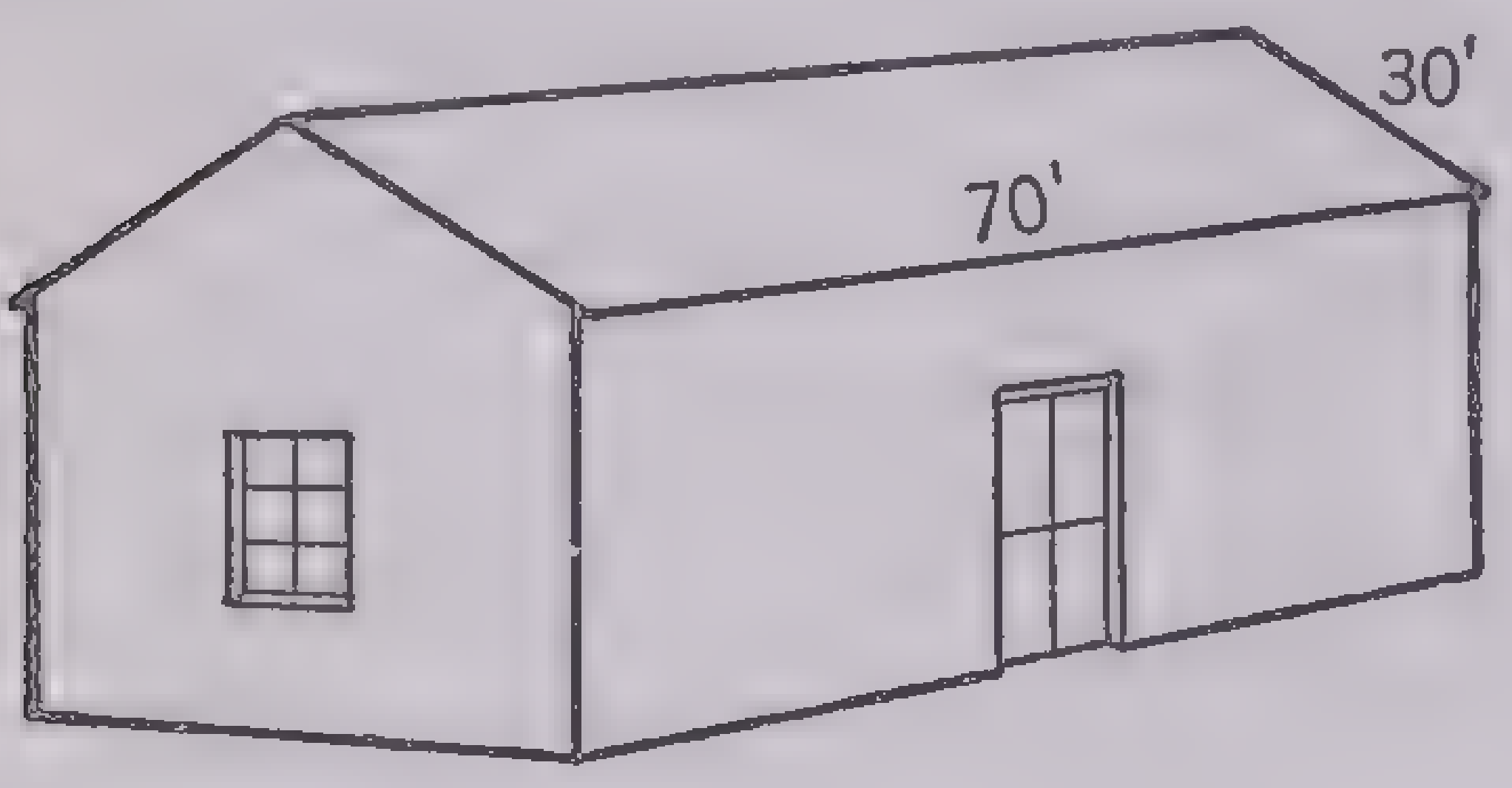
In this formula, t represents thickness in inches, w the width in inches, and l the length in feet. Boards less than 1-inch thick are counted as 1-inch thick.

Find the number of board feet in a board 1″ × 12″ × 14′.

Substituting in the formula, number of

$$\text{board feet} = \frac{1 \times 12 \times 14}{12} = 14.$$

Some carpenters figure 1,000 shingles per 100 square feet when shingles are laid 4 inches to the weather, and 750 shingles per 100 square feet when laid 5 inches to the weather. The drawing below shows a roof.



Find the difference in cost between shingling both sides of it when the shingles are laid 4 inches to the weather and when they are laid 5 inches to the weather. The cost of the shingles is $7.25 per 1,000. (*Ans., $87*)

NOTE: Shingles laid "4″ to the weather" have 4″ of their surface exposed; those laid "5″ to the weather" have 5″ exposed.

$70 \times 30 \times 2 = 4{,}200$ square feet, number of square feet on the 2 sides of the roof.

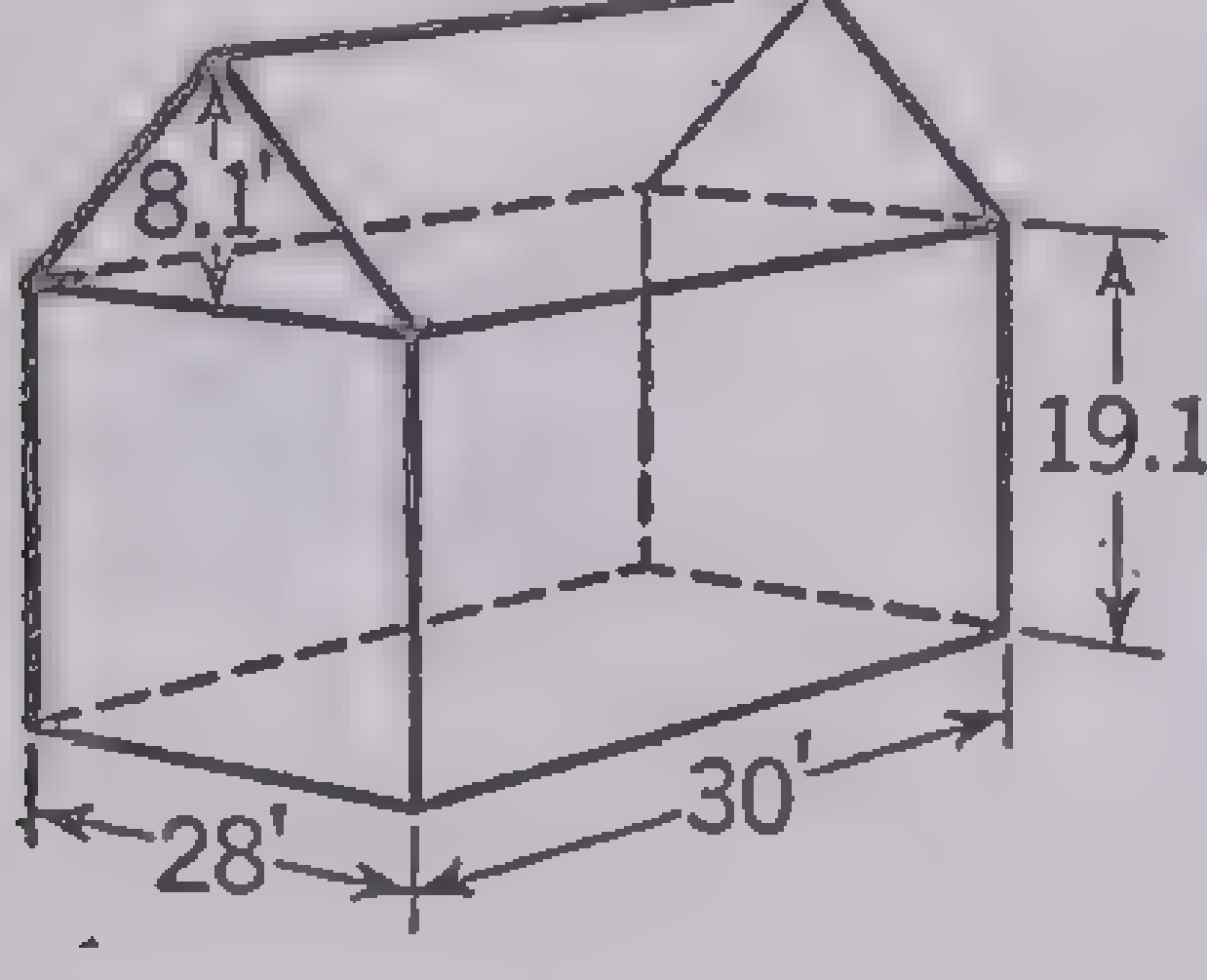
If shingles are laid 4 inches to the weather, it takes 1,000 shingles per 100 square feet.

$42 \times 1{,}000 = 42{,}000$ shingles.
At $7.25 per 1,000,
$\$7.25 \times 42 = \$304.50$

If shingles are laid 5 inches to the weather, it takes 750 shingles per 100 square feet.

$42 \times 750 = 31{,}500$ shingles.
At $7.25 per 1,000,
$\$7.25 \times 31.5 = \$228.38$
$\$304.50 - \$228.38 = \$76.12$, difference in price.

Two formulas used to estimate the cost of a painting job are $P = \frac{1}{9}l \times h \times c$ for rectangular surfaces, and $P = \frac{1}{18}l \times h \times c$ for triangles, where P = cost of job, l = length in feet, h = height in feet, and c = cost per sq. yd. Use these formulas to estimate the cost of painting the walls and gables (but not the roof) of the building of the figure, taking $c = 85¢$. (*Ans., $230.66*)



$P = \frac{1}{18}l \times h \times c$
For the 2 triangular ends,

$$P = \frac{1}{\underset{9}{\cancel{18}}}(28 \times \overset{.9}{\cancel{8.1}} \times 85) \times \cancel{2}$$

$P \times \$21.42$
$P = \frac{1}{9}l \times h \times c$
For the two sides.

$$P = \frac{1}{\underset{3}{\cancel{9}}}(\overset{10}{\cancel{30}} \times 19.1 \times .85) \times 2$$

$P = \$108.23$
For the two ends,
$P = \frac{1}{9}(28 \times 19.1 \times .85) \times 2$
$P = \$101.01$
Total cost = $230.66

Contractors and builders must estimate the cost of materials to be used in constructing a house or building. Many use this formula in estimating the number of bricks needed for walls, etc.: $B = 22(l \times w \times h)$, where B = number of bricks, l = length in feet, w = width in feet, and h = height in feet. Use this formula to find B needed for the base of a monument $8' \times 8' \times 10'$. (*Ans., 14,080 bricks*)

Carpeting.—Carpet is made in various widths, the more common being 27 in. and 36 in. It is sold by the yard in length regardless of its width.

In estimating the number of yards of carpet required for a room, the "strip method" is generally used. The strips are laid either lengthwise or crosswise, and as there is usually some waste in matching the pattern, it is necessary to buy more carpet than would otherwise be required to cover the floor.

Example: How many yards of carpet 27 in. wide will be required for a room 18′ 9″ long and 16′ 4″ wide, if the strips run lengthwise and 9 inches per strip are allowed for matching?

Solution.
16′ 4″ = 196 in.
$196 \div 27 = 7\frac{7}{27}$ or 8 strips.
$18' \; 9'' + 9'' = 19\frac{1}{2}'$, length of 1 strip.
$19\frac{1}{2}' \times 8 = 156'$, total length.
156 ft. ÷ 3 = 52 yd. carpet.

Explanation. — Since the strips run lengthwise, each strip covers 27 inches of the width of the floor. The number of strips is found by dividing the width of the room by the width of one strip. In this case 7 strips leave uncovered a strip 7 in. wide extending the entire length of the room, to cover which an additional strip must be purchased. Every strip must be as long as the room is *long*, and since 9 in. is wasted in matching, each strip must be purchased 9 in. longer than the room, or $18' \; 9'' + 9'' = 19\frac{1}{2}$ ft. The entire length of carpet is found by multiplying the length of each strip by the number of strips required. The length is then reduced to yards.

Papering.—Wallpaper is put up in single rolls 8 yards long and in double rolls 16 yards long. For a room of ordinary height, 5 strips can be cut from a double roll but only 2 from a single roll. Therefore, double rolls are more economical than single rolls.

American wallpaper is generally 18 inches wide, and unless otherwise stated that width is used in this work. Imported papers are of various widths.

If there was no waste in papering, the number of rolls could be found by dividing the area to be papered by the area of one roll. This method is not practical, however, and paper hangers use the method explained in the following example.

Example: How many double rolls of paper will be required for the walls of a room 24 feet long, 19 feet wide, and 9 feet high, if 36 feet are deducted for the width of doors, windows, mantels, etc.?

$$\text{Perimeter of room} = \begin{cases} 24 \times 2 = 48 \text{ ft.} \\ 19 \times 2 = \underline{38 \text{ ft.}} \end{cases}$$
$$86 \text{ ft.}$$

$86' - 36' = 50$ feet of wall to be papered.

Ratio and Proportion

To compare 7 with 10, we write 7 over 10 to form a fraction. To compare the number by saying 7 is .7 of 10 or 70% of 10, we divide 7 by 10.

The *ratio* of 7 to 10 is $\frac{7}{10}$ or .7 or 70%.

To find the ratio of one number to another number, we may write the numbers as a fraction, or we may divide the first number by the second number.

1. The ratio of 15 to 12 is $\frac{15}{12}$ or $\frac{5}{4}$ or $1\frac{1}{4}$ or 1.25 or 125%.

2. The ratio of 28 to 7 is $\frac{28}{7}$ or 4 or 400%.

The ratio of one number to another may always be written as a common or decimal fraction or as a per cent, and sometimes as a mixed number.

3. The ratio of 40 to 120 equals what common fraction?

To get the answer, think: 40 is $\frac{40}{120}$ or $\frac{1}{3}$ of 120.

We usually write ratios in the simplest form.

4. The ratio of 150 to 50 is $\frac{150}{50}$ or 3.

We need not always read the common fraction ratios as fractions. $\frac{150}{50}$ may be read as 150 over 50.

Ratios such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$ and $\frac{5}{6}$, are easy to work with. Ratios such as $\frac{171}{285}$, $\frac{77}{83}$ and $\frac{19}{71}$ are difficult to work with and should usually be changed to decimals or to per cents.

A statement which tells us that 2 ratios are equal is called a proportion.

$\frac{3}{4} = \frac{9}{12}$ is a proportion.

This proportion may also be written 3:4 = 9:12 (or 3:4::9:12).

This is read 3 is to 4 as 9 is to 12, meaning that 3 has the same relation to 4 that 9 has to 12.

A proportion has four terms. In the proportion 3:4 = 9:12 the first term is 3; the second term is 4; the third term is 9; the fourth term is 12.

The first and fourth terms are called the *extremes*.

The second and third terms are called the *means*.

The means and extremes are the same if the proportion is written in fraction form: $\frac{3}{4} = \frac{9}{12}$.

The Law of Proportion. The product of the means equals the product of the extremes. In the proportion 3 : 4 = 9 : 12, $4 \times 9 = 3 \times 12$, for 36 = 36.

Test out the law for these proportions:

(*a*) $\frac{5}{7} = \frac{10}{14}$ (*b*) 6 : 12 = 5 : 10
(*c*) 2 : 9 = 4 : 18

If you know three terms of a proportion, you can always find the missing one.

Study these samples:

(*a*) $\frac{3}{M} = \frac{15}{20}$ Find M
$3 \times 20 = 15 \times M$. Proportion law
60 = 15M
M = 4

(*b*) M : 5 = 3 : 15
$15 \times M = 3 \times 5$
15M = 15
M = 1

Find what X equals in each of the proportions below.

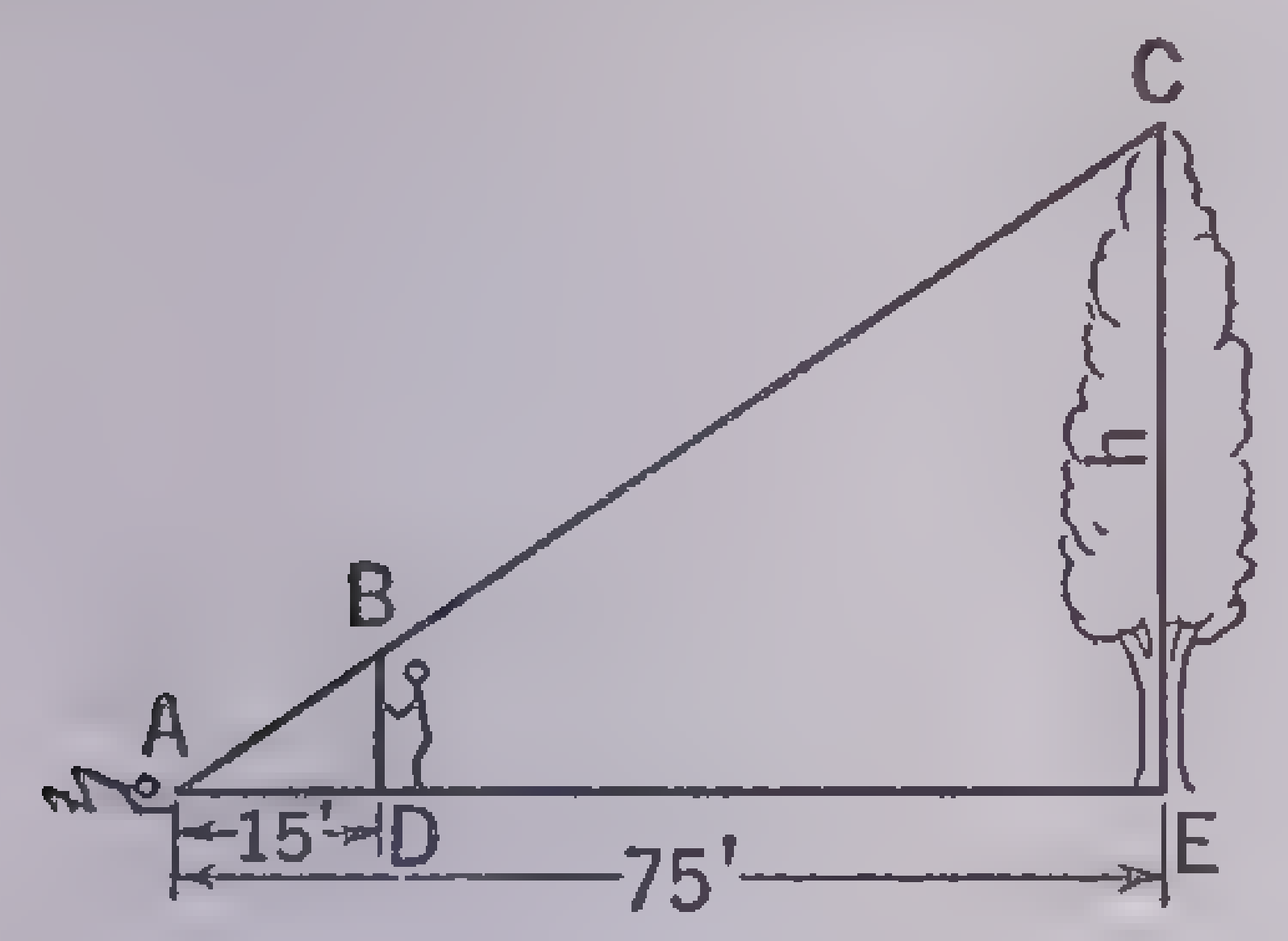
1. $\frac{1}{2} = \frac{X}{8}$ X ......
2. 2 : 4 = X : 10 X ......
3. X : 10 = 50 : 100 X ......
4. $\dfrac{2}{X} = \dfrac{9}{27}$ X ......
5. $\dfrac{4}{12} = \dfrac{X}{36}$ X ......
6. 7 : 10 : : X : 20 X ......

Indirect Measurement

A Practical Use of Ratio and Proportion. Finding the height of the tree CE by indirect measurement.

1. Walk away from the tree until you can see the top of it easily when you are

bent over with your head on the ground. This is point A on the diagram.



2. Have someone move the 10-foot pole BD back and forth until you can just see the top of it in line with the top of the tree. The pole must be held perpendicular to the ground.

3. Measure the distance from A to D and from A to E.

4. The right triangles ADB and AEC are similar, because one acute angle is the same in both of them.

5. The height of the tree can be figured from the ratio of corresponding sides of these triangles.

The corresponding sides in the triangles are CE and BD, and AE and AD.

If you represent CE, the height of the tree, by h, the ratio of CE to BD is h to 10 or $\frac{h}{10}$.

The ratio of AE to AD is 75 to 15 or $\frac{75}{15}$.

Then $\frac{h}{10} = \frac{75}{15}$.

$15h = 750$

$h = 50$ ft., height of tree.

Picture Definitions of Arithmetical Terms

$$\underset{\text{Figures}}{\underset{\uparrow\uparrow\uparrow\uparrow}{7854}} \leftarrow \text{Numbers}$$

The *number* 7854 has four *figures* in it.

$$\left.\begin{array}{r}8\\37\\275\end{array}\right\}\leftarrow\text{Whole Numbers}$$

A number expressed without the use of a fraction is called a *whole number*.

$$\left.\begin{array}{r}9\\32\\325\end{array}\right\}\leftarrow\text{Arabic Figures}$$

The figures 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are called *Arabic* figures.

$$\left.\begin{array}{r}\text{I}\\\text{X}\\\text{XC}\end{array}\right\}\leftarrow\text{Roman Numerals}$$

Letters of the alphabet, I, V, X, L, C, D and M, were used for figures before the Arabic figures were invented.

$$\left.\begin{array}{r}4\\12\\100\end{array}\right\}\leftarrow\text{Even Numbers}$$

Even numbers are numbers that can be evenly divided by 2. 100 ÷ 2 = 50. 100 is an even number.

$$\left.\begin{array}{r}1\\7\\21\end{array}\right\}\leftarrow\text{Odd Numbers}$$

Odd numbers are numbers that cannot be evenly divided by 2. 9 ÷ 2 = $4\frac{1}{2}$. 9 is an odd number.

Terms that are sometimes used in addition, subtraction, multiplication and division are shown below.

Addition

$$\begin{array}{r}61\leftarrow\textit{addend}\\45\leftarrow\textit{addend}\\\underline{15}\leftarrow\textit{addend}\\121\leftarrow\textit{sum}\end{array}$$

Subtraction

$$\begin{array}{r}173\leftarrow\textit{minuend}\\\underline{65}\leftarrow\textit{subtrahend}\\108\leftarrow\textit{difference}\end{array}$$

Multiplication

$$\begin{array}{r}369\leftarrow\textit{multiplicand}\\\underline{7}\leftarrow\textit{multiplier}\\2583\leftarrow\textit{product}\end{array}$$

Division

$$\begin{array}{r}2\leftarrow\textit{quotient}\\\textit{divisor}\rightarrow52\overline{)107}\leftarrow\textit{dividend}\\\underline{104}\\3\leftarrow\textit{remainder}\end{array}$$

The *multiplicand* and *multiplier* are sometimes called *factors* of the *product*. The *factors* of a number are the numbers which when multiplied give that number. 2 and 3 are *factors* of 6.

Terms Used in Common Fractions

$\frac{3}{4}$←Common Fraction

$$\left.\begin{array}{l}3\leftarrow\text{Numerator}\\4\leftarrow\text{Denominator}\end{array}\right\}\text{Terms of the Fraction}$$

A *common fraction* is written using both a *numerator* and a *denominator*. The *denominator* is the number below the line. The *numerator* is the number above the line. The numerator and denominator are called the *terms* of a fraction.

$\frac{8}{12} = \frac{2}{3}$←Lowest Terms of $\frac{8}{12}$

Reduced to lowest terms means changed to simplest form.

$\frac{2}{3} = \frac{8}{12}$←Higher Terms

Reduced to higher terms means changed to an *equal* fraction with a larger numerator and denominator.

$\frac{2}{9}$←Proper Fraction

A *proper fraction* is a fraction that is less than 1.

$\frac{8}{3}$←Improper Fraction

$\frac{3}{3}$←Improper Fraction

An *improper fraction* is a fraction that is equal to or greater than 1.

$3\frac{2}{3}$←Mixed Number

A *mixed number* is a whole number *and* a common fraction.

$\frac{3}{4}\rightleftarrows\frac{4}{3}$ Invert

Invert is to turn upside down. If $\frac{3}{4}$ is inverted, the result is $\frac{4}{3}$. If 5 is inverted, the result is $\frac{1}{5}$.

$\frac{2}{3} = \frac{8}{12}$←L. C. D.

$\frac{3}{4} = \frac{9}{12}$←L. C. D.

The *lowest common denominator*, often written L. C. D., is the smallest denominator that can be used in working an example in addition or subtraction of fractions.

Terms Used in Decimal Fractions

$$\underset{\underset{\text{Decimal Point}}{\uparrow}}{.7}\leftarrow\text{Decimal Fraction}$$

A *decimal fraction* is a fraction written with a point at the left of it. It has no written denominator. This point is called a *decimal point*.

3.25←Mixed Decimal

A *mixed decimal* is a whole number and a decimal.

$$\left.\begin{array}{r}3\text{ qt.}\\16\text{ mi.}\\4\text{ hr.}\end{array}\right\}\leftarrow\text{Denominate Numbers}$$

Measures such as 3 quarts, 16 miles and 4 hours are called *denominate numbers*.

3 hr. 15 min.←Compound Denominate Numbers

Measures such as 3 hr. 15 min. are called *compound denominate numbers*.

$$\begin{array}{r}2\\8\\0\\\underline{6}\\4\overline{)16}\\4\leftarrow\text{Average}\end{array}$$

To find the *average* of four numbers, we first add the numbers, then divide the sum by 4.

@

@ means *at*. Three pairs of shoes @ \$3 means 3 pairs of shoes at \$3 a pair.

$A = ab$←Formula

The area of a square is equal to the altitude times the base. By letters to represent words and sentences, we say the same thing in the *formula*, $A = ab$.

%

The sign above means *per cent*. 25% is read "25 per cent." Per cent means hundredths.

$$\begin{array}{r}\$100\leftarrow\text{Principal}\\\underline{.06}\leftarrow\text{Rate}\\\$6.00\leftarrow\text{Interest}\end{array}$$

Interest is money paid for the use of money. It is usually a certain per cent of the amount borrowed, which is the *principal*. It is reckoned by the year. The per cent is called the *rate of interest*. The interest on \$100 at a rate of 6% is \$6 for 1 year.

$$\begin{array}{r}\$16.00\leftarrow\text{List price}\\\underline{6.40}\leftarrow40\%\text{ Discount}\\\$\ 9.60\\\underline{.96}\leftarrow10\%\text{ Discount}\\\$\ 8.64\\\underline{.43}\leftarrow5\%\text{ Discount}\\\$\ 8.21\leftarrow\text{Net Price}\end{array}$$

List price is the price at which goods are listed. A reduction in price is called a *discount*. In the example at the left, 40%, 10% and 5% are successive discounts. The price after the discount has been subtracted is called the *net price*.

$25.00←List Price
12.50←50% Discount
$12.50←Net Price

50% is the *rate of discount* in the example at the left. $12.50 is the *amount of discount.*

1°

When a circle is divided into 360 equal parts, each part is called one *degree;* we write it, "1°".

Per←For Each

Per means for each.
Example: $12\frac{1}{2}$ miles per hour.

8:05 A.M.

The time expressed above is read "eight five A. M." It means eight five *in the morning.* The A. M. comes after midnight and before noon.

8:05 P.M.

The time expressed above is read "eight five P. M." It means that the time comes *after noon* and before midnight.

$\left.\begin{matrix} \frac{1}{5} \\ .2 \\ 20\% \end{matrix}\right\}$ Equivalents

$\frac{1}{5}$, .2 and 20% all are equal. We say that they are *equivalents* or that they are equivalent to each other.

$\sqrt{64}$

The sign $\sqrt{}$ directs you to extract the *square root* of whatever number is under it. It is called a *radical sign.* Thus, $\sqrt{64} = 8$.

π

The Greek letter above is used to represent $3\frac{1}{7}$ or 3.14. This letter is called *pi.*

FORMULAS

Many of the rules in arithmetic have been stated as formulas. The most important formulas are listed below. Remember that the times sign (×) is usually omitted in formulas. Thus ab means $a \times b$.

What Is Wanted	*Formula*	*Meaning of the Letters*
Area of rectangle or parallelogram	$A = ab$	A, area; a, altitude; b, base
Area of triangle	$A = \frac{1}{2}ab$	A, area; a, altitude; b, base
Circumference of circle	$c = \pi d$ or $c = 2\pi r$	c, circumference; π, 3.14 or $3\frac{1}{7}$; d, diameter; r, radius
Diameter of circle	$d = \frac{c}{\pi}$	d, diameter; c, circumference; π, 3.14 or $3\frac{1}{7}$
Radius of circle	$r = \frac{c}{2\pi}$	r, radius; c, circumference; π, 3.14 or $3\frac{1}{7}$
Area of circle	$A = \pi r^2$	A, area; π, 3.14 or $3\frac{1}{7}$; r, radius; r^2, $r \times r$
Interest	$i = prt$	i, interest; p, principal; r, rate in per cent; t, time in years
Rate of interest	$r = \frac{i}{pt}$	r, rate in per cent; i, interest; p, principal; t, time in years
Volume of rectangular solid	$V = lwh$ or $V = Bh$	V, volume; l, length; w, width; h, height; B, area of base
Volume of a pyramid or cone	$V = \frac{Ba}{3}$	V, volume; B, area of base; a, altitude
Area of a trapezoid	$A = \frac{1}{2}a(B + b)$	A, area; a, altitude; B, lower base; b, upper base
Area of a square	$A = S^2$	A, area; S, side
Altitude of a right triangle	$a = \sqrt{c^2 - b^2}$	a, altitude; b, base; c, diagonal
Area of curved surface of cylinder	$S = 2\pi rh$	S, curved surface; r, radius of circle at top or bottom; h, height.
Number of board feet in lumber	Board ft. $= \frac{twl}{12}$	t, thickness in inches; w, width in inches; l, length in feet.

MENTAL ARITHMETIC

Problems to be solved without pencil and paper meet us every day and so do problems in which we need only a rough, an approximate answer. There are certain general rules and special methods that make mental arithmetic easy and speedy. The general speed rules are:

1. Learn the fundamental combinations of addition and multiplication.
2. Work from left to right, mentally, and not from right to left.
3. Use constantly, wherever possible, the fact that we have a decimal system of numbers, a system based on 10 and powers of 10.
4. Learn to think numbers.

The addition and multiplication combinations must become automatic or second nature. The combination 7 and 8, when you look at it and *think* addition, must spell 15 in just the same way that *c a t* spells *cat.* And the combination 7 and 8, when you look at it and think multiplication, must mean 56 just as certainly and unquestionably as a red traffic light means *Stop.*

How to Add Rapidly.—After learning the 45 combinations in addition the next step for rapidity is to learn to add mentally any two two-place numbers. With the combination of 6 and 18 associate such combinations as 16 and 8, 6 and 28, 6 and 68, 46 and 8, 26 and 38, 18 and 76, 68 and 26, 88 and 46. Read these sums from left to right; thus in reading 68 and 26 you think first 80, then 94, a glance to the right showing that one is to be carried making the 80 into 90.

4
7
8
6
4
9
3
5

In reading the sums in column addition you begin by reading the sum of the first two digits; read only the sums. Thus you here read 8, 17, 21, 27, 35, 42, 46 or 8, 17, 27 (since as you come to the 4 and 6 you notice that this adds 10 to the preceding 17), 35, 42, 46.

In adding numbers that are near to even hundreds notice that you can frequently save time by adding the full number of hundreds and subtracting the small difference.

396	388	693
425	475	281
821	863	974

Think 400 + 425 less 4, gives 821; in the second problem think $400 + 475 - 12 = 863$; in the third $700 + 281 - 7 = 974$.

How to Multiply Rapidly.—Learn the combinations automatically up to $9 \times 9 = 81$.

Learn to multiply mentally any two-place number by a single digit. Multiply *from left to right.* Add mentally. So in getting the product of 8×17, think 8×10 is 80, 8×7 is 56, added gives 136. With a little practice you can do this mentally more quickly than you can say the partial products. In 8×27, *think* 160, 56, 216.

For the Product of Any Two Teens.—To multiply any two numbers between 10 and 20, that is of any two teens, these are the steps:

First, add to one whole teen the units of the other and annex a zero. (For example, 18×17: the units are 8 and 7. To the whole of one, 18, add the units, 7, of the other, making 25. Add a zero. You have 250).

Second, add to this the product of the units of both numbers, 56: 250 plus 56 is 306—the product required. Mentally to multiply 19 by 14, the following numbers pass rapidly before your mind's eye: 19, + 4, 23, 230, 36, *266,* which is the product.

Combining this rule with the preceding rule for the product of any two-place number by a single digit gives the complete multiplication table up to 20 × 20. Thus in the product 8 × 19, the following numbers pass rapidly before the mind's eye: 80, 72, *152,* which is the product.

Products When the Tens are the Same.—If you have two numbers beginning with the same tens' digit, you add the whole of one number to the units of the other and *multiply by the tens' digit.* Then annex a zero and to this number add the product of the units. 24 × 27 is 20 × (20 + 4 + 7) + 4 × 7; in doing this mentally, you think: "27, + 4, 31, × 2, 62, 620, + 28, *648.*" If the units sum to 10 as in 87 × 83, 26 × 24, 92 × 98 or 35 × 35, the product has in the last two places the product of the units and in the first one or two places the product of the tens' digit by a number one greater. Thus 87 × 83 begins with 8 × 9 and ends with 3 × 7, 7221; 26 × 24 has 6 in the first place (2, the tens' digit, × 3, one more than the tens' digit) and 4 × 6 in the last two places, giving 624; 92 × 98 is 9 × 10 placed before 8 × 2, giving 9,016; 35 × 35 is 3 × 4 placed before 5 × 5 or 1,225.

Decimal Multipliers.—The third rule for speed is: *Use the fact that we have a decimal system.*

To multiply by 10, 100 or 1,000 annex one, two or three zeros, respectively, to the multiplicand. To multiply by 5, 50 or 500 multiply by 10, 100 or 1,000, as above, and divide by 2 since 5 is half of 10, 50 is half of 100, 500 is half of 1,000. To multiply by 2.5, 25 or 250, multiply by 10, 100 or 1,000, as before, and divide by 4, since 2.5 is one-fourth of 10, 25 is one-fourth of 100, 250 is one-fourth of 1,000. To multiply by 7.5, 75 or 750, multiply by 5, 50 or 500 and add to this product, in each case, one-half of itself because 7.5 is one-half of 10 plus one-half of the half—that is, three-quarters. Remember that 75 cents or 75 hundredths of a dollar is a half dollar plus a quarter (half of a half). Examples: 25 × 48 is $\frac{4,800}{4}$ or 1,200; 50 × 48 is 2,400; 75 × 48 is 2,400 + 1,200 or 3,600.

To multiply by $\frac{3}{4}$, think of $\frac{3}{4}$ as $\frac{1}{2} + \frac{1}{4}$; to $\frac{1}{2}$ the number add $\frac{1}{2}$ of $\frac{1}{2}$ of the number; $\frac{3}{4}$ of 48 is 24 + 12 or 36.

The numbers 50 and 25 are called *aliquot parts* of 100. Two other aliquot parts of 100 are frequently useful in quick multiplication, 12½ or one-eighth of 100 and 33⅓ or one-third of 100. If you wish to know approximately the products of 34 or 35 × 186, you can at a glance state that 33⅓ × 186 is 186 × 100 divided by 3 or 6,200, and 34 × 186 is two-thirds of 186 or 124 more than 6,200.

When you learn this method of multiplying by the nearest aliquot part, you will find it very convenient. For example, suppose you want to multiply 2,352 by 126. Break 126 into 125 plus 1. To multiply by 125 (one-eighth of 1,000) add three zeros to 2,352 and divide by 8. That makes 294,000. To this add 1 × 2,352. That makes 296,352.

To multiply 1,866 by 333, think that 333 is 333⅓ (that is, one-third of 1000), minus ⅓ (or one-third of 1). Then 1,866 × 333⅓ is 1,866 with three zeros added, divided by 3. That makes 622,000. From this subtract ⅓ of 1,866 or 622. The remainder is 621,378—the product of 1,866 by 333.

To multiply 5,292 by 751, think that 751 is 750 plus 1. To multiply by 750 (three-fourths of 1,000), add three zeros (5,292,000); divide by 2 (2,646,000); add to this one-half of itself (2,646,000 + 1,323,000 = 3,969,000). To 3,969,000 (which is 750 × 5,292) add 1 × 5,292, and 3,974,292 is the desired product of 5,292 by 751.

With a little practice you will recognize other relationships.

For instance: 67 = 66⅔ + ⅓, so that multiplying by 67 is speeded up by adding two zeros to the number to be multiplied, writing two-thirds of this number ending in two zeros and adding to it one-half the number just written with the zeros left off.

$$\begin{array}{l}
294 \times 67 = (294 \times 66\tfrac{2}{3}) + (294 \times \tfrac{1}{3}) \\
294 \times 66\tfrac{2}{3} = 29{,}400 \times \tfrac{2}{3} = 19{,}600 \\
294 \times \tfrac{1}{3} = 196 \times \tfrac{1}{2} = \qquad\qquad 98 \\
\hline
294 \times 67 = 19{,}600 + 98 = 19{,}698
\end{array}$$

Multiplication of Decimals Abbreviated.—In finding the cost of 328.4 lbs. of milk at $3.38 per hundred it is not necessary to multiply in the ordinary way $3.38 by 3.284 as this gives numbers in the fifth decimal place where nothing finally beyond the second decimal place is needed.

```
   3.380
   3.284
  ------
  10140
    676
    270
     13
  ------
  11.099 or $11.10
```

In any product of decimals remember that the first place times the first gives second place, and first times second gives third place, and so on. In such a product begin with the highest place of the multiplier and carry results one place farther than desired in the final result. If both numbers have not the same number of places, make the number of places agree by adding zeros as above.

Multiply .37628 × .41329, retaining finally only 4 places of decimals.

```
 .37628
 .41329
 ------
  15051
    376
    113
      7
      3
 ------
 .15550
```

Begin to multiply with the highest place of the multiplier, not the lowest.

Begin 4 × 2, 8 in 5th place, carry 3 from 4 × 8, making 11. Then 4 × 6, 24 + 1, 25, etc. Cross out the 8 and the 2 in upper number.

Then 1 × 6, 6, nothing to carry since 1 × 2 is less than ½, etc. Cross out 6.

Then 3 × 7, 21, + 2 carried from 3 × 6 = 18, etc. Cross out 7.

Then 2 × 3, 6, + 1 (from 14), .7. Cross out 3 above.

Then 3, carried from 9 × 3 = 27, which is nearer 3 than 2 in the fifth place.

Final result, .1555.

Short Cuts in Division.—In division many unnecessary figures can be cut off when only an approximate result is desired. If 3,280 articles are manufactured at a total cost of $18,834, what is the cost per article, to one cent.

```
            5.742                   5.74
  3280)18,834|            3280)18,834
       16,400|                 16,400
       ------|                 ------
         2434|0                  2434
         2296|0                  2296
         ----|--                 ----
          138|00                  138
          131|20                  131
          ---|---                 ---
            6|800                   7
            6|560
            -|---
             |240
```

After each division cut off one figure in the divisor and use the part left as new divisor; this will keep the right-hand digit of all the partial products in a vertical line.

Long Division Made Short.—Use the form of short division for long division. This is easy when you see that the process is the same. It will help you at the start to have the complete form of quotients and partial products retained in the explanatory solution.

```
           7
          30
         400                  437
  134)58639       for 134)58639
      53600                536
      -----                ---
       5039                503
       4020                402
       ----                ----
       1019                1019
        938                 938
       ----                ----
         81                  81
```

The Addition Method in Division.—By using the additive method of subtraction, subtracting from the dividend each part of each partial product as it is obtained, only the remainders need be written, leaving the work quite compact.

```
        437
  134)58639
       50
       101
        81
```

4 in the quotient is obtained in the usual way.

Now 4 × 134 is to be subtracted, by the additive method, from 586.

Then 4 × 4 is 16, + 0, makes 6; the 0 is the first figure in the remainder; 4 × 3, 12, + 1 carried from 16, 13, + 5, makes 18. 4 × 1, 4, + 1 carried from 18, 5, + 0 makes 5.

Then 3 × 4, 12, + 1, 13; 3 × 3, 9, + 1, carried from 13, 10, + 0, 0; 3 × 1, 3, + 1 from 10, 4, + 1 makes 5.

Then 7 × 4, 28, + 1, 29; 7 × 3, 21, + 2 from 28, 23, + 8, 31; 7 × 1, 7, + 3, 10.

50 is the first, 101 the second, and 81 the third remainder.

The Check By Nines.—When 4,328 is divided by 9, the remainder is the same as when 4 + 3 + 2 + 8 is divided by 9; 1,000 is 999 + 1, 100 is 99 + 1, 10 is 9 + 1; when 1,000 is divided by 9 the remainder is 1, when 100 is divided by 9 the remainder is 1, when 10 is divided by 9 the remainder is 1;

when 4,000 is divided by 9, the remainder will be 4 × 1 or 4;
when 300 is divided by 9, the remainder will be 3 × 1 or 3;
when 20 is divided by 9, the remainder will be 2 × 1 or 2;
8 divided by 9 gives as remainder 8.

The total remainder of 4,328 divided by 9 is 4 + 3 + 2 + 8, the sum of the digits, and out of these we can *cast a nine* leaving 8 as remainder. When you have the sum of a column of figures, nines can be cast out of each item in the list to be added, and the total remainder should be the same as the remainder when nines are cast out of the sum. In subtraction the difference of the remainders of minuend and subtrahend should be the same as the remainder when nines are cast out of the remainder (the answer). In multiplication the remainder by nines of the product is the same as the product of the remainders. In division the remainder of quotient, multiplied by remainder of divisor and added to the remainder's remainder, equals the remainder of dividend.

$$\left.\begin{array}{r}1346 \text{ rem. } 5\\ 2347 \text{ rem. } 7\\ 1350 \text{ rem. } 0\\ \underline{3574} \text{ rem. } \underline{1}\end{array}\right\} \text{Sum of remainders, 13; cast out 9, 4.}$$
$$\begin{array}{r}8617 \text{ rem. } 4\end{array}$$

$$\begin{array}{r}2347 \text{ rem. } 7\\ \underline{1346} \text{ rem. } \underline{5}\\ 1001 \text{ rem. } 2\end{array}$$

$$\begin{array}{rl}247 \text{ rem. } & 4\\ \underline{25} \text{ rem. } & \underline{7}\\ 1235 & 28, \text{ rem. } 1\\ \underline{494} & \\ 6175 \text{ prod. rem. } 1 & \end{array}$$

The Point about Decimals.—If the decimal point is kept straight, there is absolutely *no difference* between division of decimals and division of integers. If .1437 is divided by .123 your quotient will evidently be a little more than one, as 14 hundredths contain 12 hundredths once and a little over; .01437 ÷ 123 gives .1 as first place in the quotient since .1 of .123 is .0123. If in doubt multiply both dividend and divisor by 10, 100, 1,000, so as to have the divisor an integer; then the number of places in the dividend required to obtain your successive remainders equals the number of places in the quotient.

The Rule. The number of places in the quotient plus the number of places in the divisor must equal the number of places in the dividend. Remember that the quotient multiplied by the divisor must equal the dividend, except for the small remainder.

For $.123\overline{).00143}$, write $123\overline{)1.43}$, shifting the decimal point 3 places in each number, that is, multiplying dividend and divisor by 1,000.

For $.62\overline{)000143}$, write $62\overline{).0143}$; or write $.62\overline{).000143}$

Interest on Notes.—Ninety-nine notes out of a hundred are now drawn for 2 months or 3 months or 6 months and in most parts of the United States at 6% interest. Whether the interest is paid when the note becomes due or whether it is taken out in advance as discount, the method of computation is the same. Since the interest for 12 months is 6%, the interest for 2 months is 1% of the principal; the interest for 1 month is ½% of the principal; the interest for 3 months or 6 months is respectively 1½% or 3%. Remember these percentages for the different periods, and you will find it very easy to figure the interest on most notes.

To find the interest on a note of $490 for 2 months or 60 days at 6%, move the decimal point two places to the left. $4.90 is this interest. Moving the decimal point again gives the interest for one-tenth of 60 days or $0.49 for 6 days. For one month take one-half of the interest for 2 months; for 90 days add these two. Work from the interest for 60 days, and it will be easy.

To find the interest at 5% or 7%, subtract or add, respectively, to the interest that you find at the 6% rate, one-sixth of itself. For 4½% take from the interest at 6% one-fourth of itself.

As discount is nothing but interest taken out *in advance*, discount can be figured quickly by the same rule. The discount on a note of $490 for 60 days at 6% is $4.90; the bank gives to the maker of the note not $490, but $490 less the *discount*, $4.90.

Algebra Applied to Arithmetic.—In elementary algebra you learn that

$$(x + a)(x + b) = x^2 + ax + bx + ab;$$

now this rule is equally good if we substitute 10 for x. Then

$$(10 + a)(10 + b) = 10 \times 10 + 10 \times a + 10 \times b + ab$$
$$\text{or } 10(10 + a + b) + ab.$$

If you think of a and b as numbers between 1 and 9, this algebraic formula gives the complete explanation for the rule that we have given above under multiplication for the product of any two teens. Note that $10 + a$ is the whole of one number; b is the units of the other; $10 + a + b$ is one number plus the units of the other; $10x(10 + a + b)$ is the product of this sum by 10; ab is the product of the units.

An easy rule for squaring numbers under 100 follows from the algebraic formula

$$(a + b)^2 = a^2 + 2ab + b^2,$$

especially if we take $a = 50$, because in that case $2ab$ will always be $100b$.

So to square any number less than 100, consider the number as $50 + b$. Then the square of the number will be $(50 + b)^2 = 2{,}500 + 100b + b^2$, and these three quantities can be added mentally. For example, what is the square of 55? The answer is: $2{,}500 + (100 \times 5) + (5)^2$ or $2{,}500 + 500 + 25$ or 3,025.

If you want to square a number less than 50, use the formula

$$(50 - b)^2 = 2{,}500 - 100b + b^2,$$

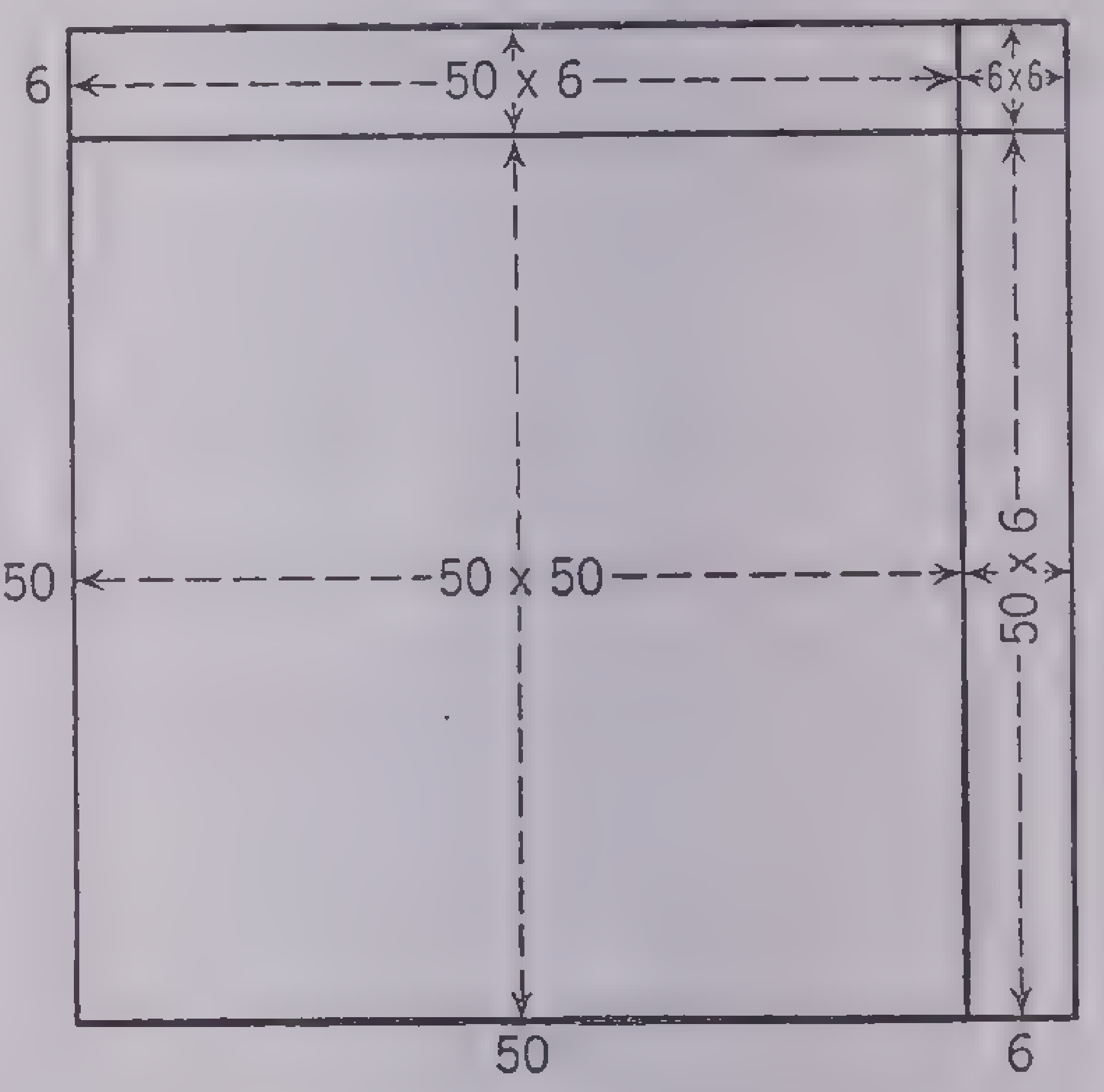
and the final answer is secured mentally and may be written immediately. For example, what is the square of 42?

$$(42)^2 = (50 - 8)^2$$
$$(50 - 8)^2 = 2{,}500 - 800 + 64 = 1{,}764$$

Review this method by figuring these problems:

$$57^2 = (50 + 7)^2$$
$$43^2 = (50 - 7)^2$$
$$64^2 = (50 + 14)^2$$

Diagram for Squares.—If you have any difficulty with the method of figuring squares just described, make a diagram to illustrate the formula. For example, what is the square of 56? How can we show in a diagram that the square of 56 is related to 50 and to 6? First build a square 50 units on a side. We know its area is 50 × 50. To make the 50 square big enough to represent a 56 square, we increase length and breadth by 6 units. The resulting area, 56 units on a side, breaks up into the following parts.



(A) 50 × 50
(B) two units each 50 × 6
(C) 6 × 6

The sum of these,
the square of the first
twice the product of the first and second
and the square of the second
makes the square of first-plus-second.

ALGEBRA

Algebra may be briefly described as the method of mathematical calculation that employs letters and symbols in statements of equality called *equations*. In its broader aspects the science covers a very wide field, but a first approach to the subject shows its close relationship to arithmetic. Many ordinary arithmetical problems are more quickly and easily solved by algebra; and the same methods may be applied to problems that could not be solved by arithmetic.

Sixteen centuries ago (*c.* 275 A.D.) a man named Diophantus lived in Alexandria, Egypt. Little is known about him, as most of his writings were lost. Enough is known, however, from the few books he left, to give him the name, "Father of Algebra." He solved many difficult problems and, in fact, used even more algebra than is taught in high schools today. More than five centuries later in the year 825 abu-Ja'far Mohammed ibn-Mūsa of Khuwārizm (now Khiva in Uzbek S. S. R.) wrote a book that gave algebra its name. He gave his book the title in Arabic *Al-jabr w-al-muqābalah.* The word *Al-jabr* means reduction, reunion, bonesetting; and the other phrase in the title of the book means comparison. Restating a problem in such a way that its solution is easily seen is a characteristic of mathematics in general, but it is peculiarly the important feature of algebra. Algebra is a method of stating a problem in certain standard forms that are easy to understand and that enable us to see through the problem. Algebra is an indispensable language for exact thinking.

If we ask what the statements in algebra are about, the first answer is *numbers.* The meaning of *number,* however, has changed much during the centuries, and algebra, as distinguished from arithmetic, really began by extending the meaning of the word *number.* Algebra is also very largely a study of the forms themselves used in its language; the various ways the same statement may be expressed, the various identities possible and the properties of the expressions for those identities.

A subject of human thought that has lasted 16 centuries, gradually becoming more and more useful and widespread, is of profound importance, not only in itself but in connection with other subjects, for the great philosopher Descartes showed that geometry also may be stated in terms of algebra, and that they are essentially one. In addition to this, within the last century physics in all its divisions has become increasingly dependent upon algebra for working out complex formulas.

Anyone familiar with the principles of arithmetic should have no difficulty with algebra. Algebra is an expansion of the fundamental processes of arithmetic, using addition, subtraction, multiplication and division of integers and fractions. It also factors products, raises numbers to powers and finds their roots.

Algebra makes a wider application of arithmetical principles, gives an extended meaning to positive and negative numbers and introduces new symbols and topics; but the transition from familiar to new ideas is so natural that the student may acquire a good grasp of the subject in all its practical usefulness without great effort on his part.

NUMBERS

Signs and Symbols.—In beginning the study of algebra, consider a few problems from ordinary arithmetic. Numbers meant to the ancients what we call whole numbers or *integers*. When integers are added, the result is in integers; for instance, adding 6 and 7 gives 13, all integers. When integers are multiplied, the result is in integers; for example, 6 times 7 equals 42. We condense these statements in the usual way of arithmetic by writing the numbers as figures and using the plus and times signs (+ and ×) to represent addition and multiplication, respectively. The sign + is read *plus* and originally meant more; the sign × is read *times* and originally meant the number of times the number was added, so that multiplication was an abbreviated addition. Writing the above arithmetically:

$$6 + 7 = 13; \quad 6 \times 7 = 42.$$

The sign = is read *equals*.

Now consider a problem out of the range memorized in arithmetic tables, for example:

$69 + 45 =$ *what number?* $69 \times 45 =$ *what number?*

This can be shortened by writing a single symbol in place of the phrase "what number." The symbol used is immaterial, and in certain arithmetic texts the question mark itself is used, thus:

$$69 + 45 = ? \quad 69 \times 45 = ?$$

It is the custom in algebra, however, to use a letter of the alphabet, chiefly because letters are convenient symbols and are easily printed. So we generally use x to stand for the unknown quantity, and the expressions now become:

$$69 + 45 = x, \quad 69 \times 45 = x.$$

Find what x equals. Using the methods learned in arithmetic, the first answer is found to be $x = 114$; and the second answer is $x = 3105$. We could have used any other letter, as y or z. One of the chief distinctions between arithmetic and algebra is the extensive use in algebra of letters to represent numbers.

Because x is used so frequently, there is a different sign for multiplication in algebra from the cross or times mark used in arithmetic. We generally use an inverted period, as:

$$69 \cdot 45 = 3105.$$

This sign must be closely watched at first, in order to avoid confusing it with 69.45, which does not indicate multiplication but a decimal number, meaning the addition of the integer 69 and the decimal fraction .45, written also as a common fraction, $\frac{45}{100}$; that is, $69.45 = 69 + 45/100$.

Consider another example from arithmetic, stated in the shorthand form:

$$69 \cdot x = 3105.$$

In words, "69 times what number will give 3105?" The answer, of course, is $x = 45$. We would find this by going through the process of division, as explained in any arithmetic. Multiplication in algebra may also be indicated by omitting the space between the letters. In other words, $a \cdot b$ and ab both mean $a \times b$. We can also consider the problem:

$$x \cdot 45 = 3105 \text{ or } 45x = 3105;$$
$$\textit{Ans. } x = 69.$$

Integers and Ratios.—The ancients encountered difficulties early in their studies. Such a simple problem as $6 \cdot x = 5$ was a puzzle. Clearly, there is no integer that can be multiplied by 6 and give 5. Indeed, they denied rather emphatically that it was multiplying at all. How could one *manifold* a number several times and arrive at a smaller number? Many people today would say the same thing, and they are quite correct, for repeating a larger number could not give a smaller number; but the difficulty vanishes when we realize that multiplying does not always mean repeating a number. Now, returning to the problem, $6 \cdot x = 5$, what is x? We know from our knowledge of arithmetic that in this problem $x = \frac{5}{6}$. That is, it is a *fraction;* or better, it is a *ratio*. No doubt you can easily appreciate from your own troubles with fractions what difficulties the ancients had to face when they ran into fractions. In fact, most of the scholars gave it up and avoided fractions altogether. The first fractions of which we have record, however, were used long before the time of Diophantus, in a very ancient manuscript in Egyptian hieroglyphics, by Ahmes. He probably copied an older document—how old is not known. His fractions, too, were unit fractions; that is, the numerator was 1, as ½, ¼, ⅙ and so on. He would have written the answer we have just discussed, not as $\frac{5}{6}$, but as $\frac{1}{2} + \frac{1}{3}$. This is not as simple as our way of writing $\frac{5}{6}$. It is an interesting fact that any number, either an integer or a fraction, may be written as the sum of unit fractions, and indeed in many ways; for instance:

$$\frac{1}{12} = \frac{1}{16} + \frac{1}{48} = \frac{1}{21} + \frac{1}{28}; \; 1 = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}.$$

The introduction of ratios was the first extension of number to include not integers alone but other numbers as well. With the new list we can always solve such a problem as dividing any number by any other number. In algebraic form this would read:

$$x : y = z; \text{ what is } z?$$

The sign : means *divided by*. Most of the methods for division you have learned in arithmetic; for example:

$$\frac{3}{4} : \frac{5}{6} = z; \text{ what is } z?$$

You remember that you turn the division problem into a problem in multiplication by inverting the divisor, so that it now reads:

$$\frac{3}{4} \cdot \frac{6}{5} = z.$$

Then cancelling the common factors in numerator and denominator and multiplying out:

$$z = \frac{9}{10}.$$

A division of one integer by another may be stated in the same way; for example:

$$24:6 = z \text{ may be written } \frac{24}{1} : \frac{6}{1} = z,$$

and this in turn may be written

$$\frac{24}{1} \cdot \frac{1}{6} = \frac{4}{1} \text{ or } 4.$$

It may be stated now that numbers are *ratios*, and when they can be reduced to ratios with the denominator 1, they are called *integers*.

Rational Operations.—The processes of arithmetic are addition, subtraction, multiplication and division. These are called the *rational operations,* because when ratios are subjected to any of these processes the result is always a ratio. If two numbers, integral or fractional, are added, multiplied, subtracted or divided, the result is a number, integral or fractional. There is, however, one problem left to consider in the case of subtraction that will be discussed shortly. The rules for carrying out the addition or subtraction of fractions are already known from arithmetic. You remember that in order to add two fractions they must be reduced to the same denominator. This is usually chosen as low as possible; for instance, to carry out

$$\frac{3}{4} + \frac{5}{6},$$

we reduce them to twelfths, although they could just as well be reduced to twenty-fourths or thirty-sixths. The problem is then restated thus:

$$\frac{9}{12} + \frac{10}{12}.$$

In words, we are to add nine-twelfths and ten-twelfths. This is just like adding nine twelves and ten twelves. We would have in this integral case 19 twelves, and in the corresponding fractional case, 19 twelfths. The problem now reads:

$$\frac{3}{4} + \frac{5}{6} = \frac{19}{12}.$$

The integral case used as an example would read:

$$9 \cdot 12 + 10 \cdot 12 = 19 \cdot 12.$$

This is an instance of a general formula that is very frequently used, for the 12 might be any number, and it would then read:

$$9 \cdot x + 10 \cdot x = 19 \cdot x \text{ or } 9x + 10x = 19x,$$

since the multiplication sign is usually omitted when letters occur in the term. A *term* is part of an expression added to or subtracted from another. Terms are separated by a plus (+) or minus (−) sign, except that we also speak of the *terms of a ratio or fraction,* which means the numerator and denominator. In $9x + 10x = 19x$, the terms on the left side of the equals sign (=) are $9x$ and $10x$. On the right side there is only one term. An expression of one term is called a *monomial;* of two terms, a *binomial;* of three terms, a *trinomial;* and of two or more terms, a *polynomial.* Note that binomials and trinomials are merely special kinds of polynomials.

We return to the statement:

$$9x + 10x = 19x.$$

The 19 is found by adding the 9 and the 10, which are called the *coefficients* of x. To find a coefficient of any number in a term, read all the other factors; for instance, in $18abbxxx$, the coefficient of a is $18bbxxx$; of bb, is $18axxx$; of xxx, is $18\,abb$; of ab, is $18bxxx$. We write bb as b^2 (b squared), and xxx as x^3 (x cubed). The term above would then be $18ab^2x^3$. It has seven simple factors, 18, a,b,b,x,x,x. We might write 18 as the product of its prime factors, $2\cdot 3^2$.

It will also be recalled from arithmetic that in a polynomial the multiplications and divisions are performed first; for instance:

$$2\cdot 3\cdot 5 + 24:6 - 8:4 = 30 + 4 - 2 = 32.$$

If additions or subtractions must be performed first, the numbers involved are enclosed in parentheses [()]; for example,

$$48:(5 + 3) = 6;\ 54\cdot(12 - 7) = 270.$$

Parentheses are used to group numbers when the numbers in each group are to be considered as a single term.

Expressions may become quite complicated, but these rules are always the same and are always applicable. Brackets [ ], braces { } and the bar — or vinculum —— also are used like the parentheses. The bar is generally used in fractional forms only; for instance, we could write the first form just used as:

$$\frac{48}{5 + 3} = 6.$$

The denominator here is not 5 or 3 but $5 + 3 = 8$. We can now write more difficult forms, as:

$$\frac{7^2 - 4^2}{7 + 4} = 3.$$

We first find $7^2 = 49$, then $4^2 = 16$, then $49 - 16 = 33$, and $7 + 4 = 11$. Finally, $33:11 = 3$. This is an example of a general form that is written:

$$\frac{a^2 - b^2}{a + b} = a - b,$$

which is the algebraic statement of the general rule: *The difference between the squares of two numbers is divisible by the sum of the two numbers, the quotient being the difference of the numbers.* You see here the value of the algebraic shorthand in condensing statements of this kind.

We return again to the form $9x + 10x = 19x$; and since the coefficients of x might be any numbers, we may write the formula:

$$ax + bx + cx + \ldots mx = (a + b + c + \ldots m)x,$$

which is the algebraic statement of the following general rule: *The sum of several terms consisting of* x *and a multiplier is a single term consisting of* x *and a multiplier that is the sum of the original multipliers.* The formula is called the *distributive law.* Try the exercises.

Exercises

(1) $3\cdot 8 + 4\cdot 9 = 60$
(2) $5\cdot 6 + 7\cdot 6 + 2\cdot 6 = 14\cdot 6 = 84$
(3) $5x + 7x + 2x = 14x$
(4) $6\cdot 3 + 8\cdot 3 - 7\cdot 3 = 7\cdot 3 = 21$
(5) $6x + 8x - 7x = 7x$
(6) $ax + bx - cx = (a + b - c)x$
(7) $5\cdot 4 + 9\cdot 4 - 2\cdot 4 - 8\cdot 4 = 4\cdot 4 = 16$
(8) $4\cdot 5 + 4\cdot 9 - 4\cdot 2 - 4\cdot 8 = 4\cdot 4 = 16$
(9) $xa + xb - xc - xd = x(a + b - c - d)$
(10) $\frac{5}{6} + \frac{7}{6} + \frac{2}{6} = \frac{14}{6} = \frac{7}{3}$
(11) $\frac{a}{x} + \frac{b}{x} + \frac{c}{x} = \frac{a + b + c}{x}$
(12) $\frac{6}{7} + \frac{8}{7} + \frac{5}{7} = \frac{19}{7}$
(13) $\frac{5}{7} + \frac{9}{7} - \frac{2}{7} - \frac{8}{7} = \frac{4}{7}$
(14) $\frac{a}{x} + \frac{b}{x} - \frac{c}{x} - \frac{d}{x} = \frac{a+b-c-d}{x}$
(15) $\frac{6}{4 + 7} + \frac{5}{4 + 7} - \frac{4}{4 + 7} = \frac{7}{4 + 7}$
(16) $a(x + y) + b(x + y) - c(x + y) = (a + b - c)(x + y)$

Positive and Negative Numbers

Positive and Negative Concepts.—We will now face a problem that not even Diophantus solved. It arises in attempting to carry out the process of subtraction for certain pairs of numbers. Given $9 - 4 = x$, the answer is $x = 5$; but suppose $4 - 9 = x$, then what is x? The ancients answered that in such a problem x cannot equal any number, and from one point of view they were right. If we try to take nine objects away when there are only four, it is of course impossible; but suppose a man has a \$4 credit at a store and buys goods worth \$9. Does he have to leave them or can he take them away? The answer, of course, is that if he has an account at that store he can take \$9 from \$4 and have a balance of \$5 that is entered on the debit side to indicate that he owes that amount. The fact that this transaction is possible is due to the existence of the debit and the credit sides of the ledger. If there were only cash transactions, it would not be possible. Debit numbers are called *negative* numbers in algebra. A negative number implies a corresponding *positive* number.

These relationships, of course, exist in cases other than money transactions; for instance, if we call moving eastward *positive,* then we would call moving westward *negative.* By the same token, if a thermometer rises 8°, we can call that positive 8, and a fall of 8° would be negative 8. If the fall were called positive, the rise would be negative. If a stone is first under a ton pull toward the north, then a ton pull south is put on it, we can call one pull positive and the other negative. Note that negative and positive are not inherent characters, but are *relative* with regard to each other. So-called negative electricity is not essentially negative; what is really meant is not that the electricity is negative, but that its electric field is the opposite of another kind of field, which is called positive. Objects are neither negative nor positive. When we speak of negative \$10, we do not mean that a kind of silver or paper money can be brought in, such that it is a negative ten. No such thing exists. Money may be worthless but cannot be negative. \$10 negative implies an account that has \$10 in the red as its entry. Ten dollars negative is just as much as \$10 positive, but it is a different kind of ten. Similarly, an airplane flight of 100 miles east is just as long as a flight 100 miles west, but it is a different kind of hundred.

From the above, it will be seen that numbers run in pairs, every one of a pair having its twin. This is exactly similar to integers and fractions. Every integer has its corresponding twin, the unit fraction; 8 corresponds to $\frac{1}{8}$, and $\frac{1}{8}$ corresponds to 8. There are cases in which the fraction or ratio has no meaning. The answer to

$$4x = 9 \text{ is } x = \frac{9}{4};$$

but suppose we were finding a certain number of men represented by x; in that case $\frac{9}{4}$ men would mean nothing. We could, however, have $\frac{9}{4}$ days' work. In other words, some objects cannot be broken up into fractional units, and others can. Some problems, therefore, permit negative numbers, and others do not. All that algebra says is that to a problem like $4 - 9$ there is an answer. Whether it will be useful in any particular case depends on the problem. It took the world many centuries to see this, and even today there are persons who do not wish to use negative numbers. Such numbers, however, are very useful. In the field of business, for instance, if a bank kept a customer's balance with every entry, it might run something like this:

Credit	Debit	Balance
\$100	. . .	+\$100
. . .	40	+60
. . .	25	+35
50	. . .	+85
. . .	97	−12
. . .	13	−25
150	. . .	+125

Every negative balance is an overdraft. Negative numbers were added to the list of numbers in order to make it possible to subtract any number from any other, just as ratios were included so that division would always be possible.

Zero.—Where positive and negative ratios are concerned, the four rational operations may be carried out with one very important exception. It occurs when a number is subtracted from itself; for instance, what is $8 - 8$? The mathematicians of ancient Greece would have answered, "Nothing." The answer we give now is, "Zero." That is, if you have \$8 in the bank, and draw \$8 by check, the account is zero or in balance, and this is very different from nothing. A check marked "No account" is very serious. A check marked "n.s.f.," which means "not sufficient funds" (the check would be an overdraft, leaving the account negative), is a different matter entirely. The sign for zero is the cipher (0). Zero is not a number in arithmetic, but it is a very peculiar number in algebra. Consider the equations:

$$0 + 0 = 0,\ 0 - 0 = 0,\ 0x = 0,\ 00 = 0.$$

The last two statements show at once that in trying to solve the problem $0x = 8$ or $0x = a$, no answer is possible, for $0x$ must give 0 and could never give 8 or a unless a itself is 0; and when $0x = 0$, x may be any number whatever. In other words, we cannot divide zero by zero and get a definite answer. That is, $\frac{0}{0}$ has no meaning and cannot be used. In dividing one number by another, we must show first that the divisor is not zero. The one exception mentioned above is this: *Division can always be carried out unless the divisor is zero.* Zero is a number in algebra half-way between -1 and $+1$ or -2 and $+2$ or, in general, between $-a$ and $+a$. We notice also: $x + 0 = x$, $x - 0 = x$, $0 + x = x$, $0 - x = -x$, $0x = 0$, $\frac{0}{x} = 0$; 0 is a ratio with 0 for the numerator, and any number for the denominator except zero itself. We now have a complete list of rational numbers to use in problems. They may be written in various ways, but are usually kept in their *lowest terms;* for instance, 8 may be written in the forms:

$$8 = 1 + 7 = 2 + 6 = 3 + 5 = 4 + 4 = 9 - 1 = 12 - 4 =$$

$$2{\cdot}4 = 3{\cdot}\frac{8}{3} = 24{:}3 = 96{:}12 = (a + 8) - a$$
$$= 2^3 \text{ and so on.}$$

These various equalities are covered in arithmetic.

Addition.—The use of negative numbers is yet to be considered. How are they added, subtracted, multiplied and divided? The problem of addition is an easy one. Suppose a bank balance of \$12 has a check drawn on it for \$5. The balance would be written +\$12, and the check −\$5. Now we meet a fact to be kept in mind. *Positive* numbers are indicated by a + sign, and so is addition. To add −5 to +12 we write $+12 + (-5)$, and read, "positive 12 added to negative 5." The result is +7, as there would be that much left in the account. Suppose next there is a balance of +\$12 and a check is drawn for \$15. This would be written +\$12 + (−\$15), and read, "positive \$12 added to negative \$15." The result would be a \$3 overdraft; that is, the account would now have the balance—\$3. We have then:

$$+12 + (-15) = -3.$$

From this example, we see that: *To add a negative number to a positive number, we find the actual difference between them and note which number is the larger; then the difference is given the sign of this larger number.* In the example, +12 is a larger number than −5; so the difference 7 is marked +; and +12 is a smaller number than −15, so the difference, 3, is marked −. The word *smaller* must not be confused with *less* or *larger* with *greater*. The term +12 is *smaller* than −15, but is *greater* than −15.

Subtraction.—Next, how is a negative number subtracted? Suppose a check were written against +\$12, and afterwards canceled. If the check was for \$3, reducing the account to +\$9, and then canceled, we are subtracting −\$3 from +\$9, and the balance goes back to +\$12. If the check had been \$15, we would have had a balance of −\$3, and if we subtract the check for −\$15 by canceling it, we go back to +\$12; that is:

$$-3 - (-15) = +12.$$

If you think about these problems a little, you will see that the subtraction of a negative number is the same as canceling its effect; that is, it amounts to adding the number with a + sign. To subtract −15 we add +15; to subtract −3, we add +3. The same statement is true for subtracting + numbers. To subtract a deposit to a bank account, cancel the amount by a check. Suppose we deposit \$12, that is, add +\$12, and then decide to take it out. We would then write a check for \$12, which is the same as adding −\$12. We have, then, the very important rule: *To subtract a number, change its sign and add the result.*

Multiplication and Division.—We must now consider how to multiply by a negative number. How are the answers to these problems derived?

$$+12{\cdot}(-3) = x;\ -12{\cdot}(-3) = x.$$

The numerical answer evidently should be $12{\cdot}3 = 36$; but what is the sign? If we did not use the minus sign (−) to mean both subtraction and the negative, we would be free to answer this question in several different ways; but if the minus sign (−) is to mean either subtraction or the negative, then there can be only one answer, which will be negative in the first case above and positive in the second. Returning to the process of subtraction, consider the following:

$$a + (-12) = a - (+12);$$
$$a - (-12) = a + (+12);$$
$$a - (+12) = a + (-12).$$

That is, if the minus sign (−) is to mean the negative and subtraction, then the combination $-(+x)$ is $-x$ and $-(-x)$ is $+x$. These are read, "Negative of a positive x is a negative x" and "Negative of a negative x is a positive x." In short: *The sign of the product of two factors is + when the factors have like signs and − when they have unlike signs.* Hence:

$$+12{\cdot}(+4) = +48;\ +12{\cdot}(-4) = -48;$$
$$-12{\cdot}(+4) = -48;\ -12{\cdot}(-4) = +48.$$

The same rule applies to division, therefore: *The sign of the quotient is + when the dividend and the divisor have like signs and − when they have unlike signs.* It might have been better for mathematicians to use differing signs to mean *subtract* and *negative;* but as it is, it works out excellently in algebra, as will be seen later on.

Summary of Laws of Signs

1. *To add two positive numbers, add the values and give the result the positive sign; to add a negative and a positive number, find the arithmetic difference of the values and give it the sign of the larger number; to add two negative numbers add the arithmetic values, and give the result the negative sign.*

2. *To subtract a positive number, make it negative and add the result. To subtract a negative number, make it positive and add the result.*

3. *To multiply by a negative number, multiply by its value and change the sign of the multiplicand. To divide by a negative number, divide by the value of the number and change the sign of the dividend.*

4. *To multiply by a positive number, multiply by the value and leave the sign of the multiplicand unchanged. To divide, proceed similarly.*

Some examples follow; they should be studied carefully.

Adding	+7	−9	+23	−45	+34	−63
and	+6	−8	−14	+26	−72	+97
gives	+13	−17	+9	−19	−38	+34

From	+13	−17	+9	−19	−38	+34
subtracting	+7	−9	+23	−45	+34	−63
gives	+6	−8	−14	+26	−72	+97

Multiplying	+23	−23	+23	−23
by	+14	+14	−14	−14
gives	+322	−322	−322	+322

Dividing	+322	−322	−322	+322
by	+23	−23	+23	−23
gives	+14	+14	−14	−14

Example 1: A man sent to another a check for \$15, leaving his balance \$165. The check was returned. What was the balance after it was canceled? *Ans.* \$180.

Example 2: An aviator flew east 35 miles, then west 76 miles, then east 92 miles. Where did he finish? *Ans.* East, 51 miles.

Example 3: If your balance at a bank is \$234, and you find that six deposits of \$3 each were worthless, what is your balance? *Ans.* \$216.

Example 4: If your bank balance is \$234, and seven checks you issued for \$3 each are returned to you and canceled, what is your balance? *Ans.* \$255.

The algebraic statements for the above problems are:

1. $165 - (-15) = 180.$
2. $+35 + (-76) + (+92) = +51.$
3. $234 - 6(+3) = 216.$
4. $234 - 7(-3) = 255.$

Solution of Simple Equations

Consider the arithmetical statements:

$$3{\cdot}5 = 15;\ 7 + 9 = 16.$$

These statements are true in the sense that they *conform to the rules of arithmetic.* In both cases the quantity to the right of the = sign is merely a *different way of writing* the quantity to the left. In algebra such statements are called *identities.*

Consider the statements:

$$3x = 15;\ 7 + x = 16.$$

Are these statements true? The answer clearly depends on what we mean by x. The first statement is true if $x = 5$; but if $x = 3$ or any number other than 5, the statement is not true. The second statement is true if $x = 9$.

A statement that two quantities are equal *conditionally* (that is, are equal *if and only if a certain value is assigned to a certain letter*) is called an *equation.*

Consider the equation:

$$3x + 5 = 11.$$

This is merely a short way of saying, "There is a number x such that 3 times x plus 5 equals 11." The two quantities $3x + 5$, and 11 are called the *members* or *sides* of the equation. The particular value of x that *makes the equation true* or *makes it an identity* is called the *root* of the equation, and this value is said to *satisfy* the equation. The equation:

$$3x + 5 = 11$$

is *satisfied* by the value 2, since

$$3{\cdot}2 + 5 = 11;$$

so 2 is the *root* of the equation.

Finding the root of an equation is called *solving* the equation. One of the important purposes of algebra is to show us the methods and rules by which we may solve equations.

By actually trying out the value 2 in the equation $3x + 5 = 11$, we see that 2 is the root. Most equations, however, are much more complicated than this, and we need methods by which to solve more difficult equations without guessing at different answers until we discover the right one.

The equation

$$3x + 5 = 11$$

is satisfied for a particular value of x, namely 2. Any other equation that is also satisfied by the value 2 is said to be *equivalent* to the equation

$$3x + 5 = 11.$$

Thus, the equations

$$2x = 4,\ 5x - 9 = 1,\ 7x + 2 = 5 + 11$$

all are *equivalent* to the equation:

$$3x + 5 = 11$$

and to one another, since the value $x = 2$ satisfies all of them.

By following certain simple rules we can *transform* any equation into a new *equivalent* equation, and we actually solve equations by making successive *transformations* until we reach an equivalent equation the root of which is obvious.

The Transformation of Equations

The four fundamental rules or *axioms* for the transformation of equations are:

1. *If the same number is added to both sides*

of an equation, the sums form an equivalent equation.

2. *If the same number is subtracted from both sides of an equation, the differences form an equivalent equation.*

3. *If both sides of an equation are multiplied by the same number, the products form an equivalent equation.*

4. *If both sides of an equation are divided by the same number, the quotients form an equivalent equation.*

Since subtracting any number is the same thing as adding the number *with its sign changed,* we see that Axiom 2 is really unnecessary; it is merely a restatement of Axiom 1. Similarly Axiom 4 is a restatement of Axiom 3, because division by any number is the same thing as multiplication by the *reciprocal* of the number; that is, by 1 divided by the number.

Suppose an equation contains a term A on either side; for example, consider the equation:

$$3x + A = 5.$$

By Axiom 1 we may add $-A$ to both sides and still have an equivalent equation. Performing the addition we write:

$$3x + A + (-A) = 5 + (-A).$$

Since $A + (-A)$ is 0, this equation is the same as:

$$3x = 5 - A.$$

The net effect of adding $-A$ has been to *transpose* A from the left side to the right side of the equation and to *change its sign.*

Any term of an equation may be transposed from either side to the other if its sign is changed, and the result will be an *equivalent* equation.

We see that transposing terms is only a convenient way of adding or subtracting equal numbers on both sides of an equation.

Consider the equation:

$$2x - 7 = 9x + 14.$$

Transposing the term $9x$ from right to left we have

$$2x - 7 - 9x = 14.$$

Transposing the term -7 from left to right we have

$$2x - 9x = 14 + 7.$$

That is

$$-7x = 21.$$

Dividing by -7 (Axiom 4), we have

$$x = -3.$$

By Axiom 3 we may multiply both sides of an equation by -1. Since -1 times any number is the same number *with its sign changed,* we may *change the signs of all the terms of an equation,* and the result will be an *equivalent* equation. In the example just given,

the equation $2x - 7 = 9x + 14$

is equivalent to $-2x + 7 = -9x - 14.$

Transposing the terms $-9x$ and 7, we have

$$9x - 2x = 7 - 14.$$

That is, $7x = -21$.

Dividing by 7 (Axiom 4), we have

$$x = -3.$$

Consider any arithmetical identity, for example:

$$3 + 5 - 2 = 7 + 14 - 15.$$

The quantity on the right is a particular number, 6; the quantity on the left also is the number 6; so each of the two sides of the identity represents the same number. It is obvious, therefore, that whatever arithmetical operation we perform on the right-hand side, the result will be the same as the result obtained by performing the same operation on the left-hand side. The possible arithmetical *operations,* we are to remember, are addition, subtraction, multiplication and division. The four axioms, then, as applied to *identities,* are obviously true because they are merely statements that the same operation always gives the same result when applied to the same number. An *equation* is an *arithmetical identity* only *if a certain value is assigned to a certain letter.* When the x of an equation is thought of as *having the value that will make the equation an identity,* we see that we can apply the axioms to *equations,* and each new equation that arises after applying one of the axioms will be an identity for the *same value of* x *as the original equation.* This is another way of saying that each new equation will be an *equivalent* equation.

Besides arithmetical identities like $4 = 2 + 2$, there are *algebraic* identities that at first glance look very much like equations. Consider, for example, the statement:

$$2(2x + 5) = 5x + 10 - x.$$

Whatever value x has, this statement is true; it is therefore an identity, not an equation. We have already given another example of an algebraic identity that has great importance in helping us to make algebraic manipulations:

$$\frac{a^2 - b^2}{a + b} = a - b.$$

Another way of writing the same equation is:

$$(a + b)(a - b) = a^2 - b^2.$$

This is true for all values of a and b. We can make the same statement in words as follows:

The product of the sum and difference of two numbers is equal to the difference of their squares.

Exercises

(1) $5x - 18 = 3x + 6$. Find x.
Add on both sides $+18$ and $-3x$, which gives $2x = 24$; therefore $x = 12$.

(2) $6x + 19 = 83 - 2x$. Find x.
Adding on both sides -19, $+2x$, we have $8x = 64$; $x = 8$.

(3) $92 - 6x = 68 - 3x$. Find x.
Adding $6x$, -68, to both sides, we have $24 = 3x$; $x = 8$.

(4) $\frac{4x}{5} = 28$. What is x?

Multiplying by $\frac{5}{4}$ on both sides, we have

$$x = 35.$$

Arithmetically stated, this problem reads, "Four-fifths of what number is 28?"

(5) $ax = b$. Find x. Dividing by a on both sides, we have

$$x = \frac{b}{a}.$$

Arithmetically stated this is, "The number a multiplied by what number gives the number b?" The answer is that a must be multiplied by the quotient of b divided by a.

Reducing the Expression.—One of the uses of algebra is to give a clearer understanding of methods already used in arithmetic and to make it plain just where they can be used.

A statement may contain definite numbers as well as letters and may even contain several letters. Terms that contain the same letters may be combined, but not those that are unlike or contain different letters; for instance:

$$4x + 3y + 21 - 8x - 6y - 13 + 19y - 16x + 24 = -20x + 16y + 32.$$

Notice in making reductions that in adding or multiplying the order of grouping the various parts is immaterial; for instance, in

$$7x - 3x + 6x + 12x - 15x,$$

we may put together the $-3x$ and $-15x$; then $+6x$ and $+12x$, the two sums canceling, leaving $7x$. Also, in

$$\frac{2}{7} \cdot \frac{3}{4} \cdot \frac{14}{5},$$

remember that 2/7 means 2 times 1/7 and so on. Multiplying the 1/7 by 14 gives 2; then 2 times 2 = 4; multiplying this by 1/4 gives 1; and 1 times 3 times 1/5 is 3/5.

We state the law that in adding several terms and in multiplying several factors the order may be any we choose. This statement, however, does not hold for subtraction or division. Combining terms or factors in the simplest way is called *reducing the expression.* Terms that add to zero, and factors whose product is 1 are merely canceled; but always think out what you are doing and do not merely cancel expressions that look alike.

The fact that we can arrange terms that stand next one another or factors that are adjacent in any order of grouping is called the *associative law.* If we may change the order of expressions, we call this the *commutative law.* Addition and multiplication are both associative and commutative; subtraction and division are neither associative nor commutative. The term $12 - (6 - 4)$ is not equal to $(12 - 6) - 4$, and $12{:}(6{:}4)$ is not equal to $(12{:}6){:}4$; also, $12 - 4$ is not $4 - 12$, nor is $12{:}4$ equal to $4{:}12$. In subtraction and division, we use parentheses freely to make clear what is meant. We shall explain how to manipulate these in the next section.

Equations in Problems

Constructing the Equation

Problem 1.—Four hundred fifty dollars is to be divided between John and Mary so that Mary will have 4 times as much as John. How much is each share?

Let j stand for the number of dollars John gets. Then 4 times j will stand for the number of dollars Mary receives. The algebraic method of writing 4 times j is $4j$.

From the problem, we know that $j + 4j = 450$. This is our equation. We wish to discover the value of j.

① $j + 4j = 450$
② $5j = 450$

(since j added to $4j$ is $5j$. The encircled figures are read, "equation 1," "equation 2" and so on. We shall use them in many problems to show just how each equation is derived from the equation before it.)

We have

② $5j = 450$
③ $j = 90$ ② $\div$ 5.

The notation "(2) $\div$ 5" after equation 3 shows that we derived equation 3 from equation 2 by dividing both sides of equation 2 by 5 in accordance with Axiom 4.

Since $j = 90$
$4j = 4 \cdot 90$ ③ $\times$ 4
$= 360.$

The answer to our problem, then, is \$90 for John and \$360 for Mary. Check this answer by seeing that all the conditions of the original problem are satisfied by these amounts. If we give John \$90 and Mary

$360, will the total be $450, and will Mary get 4 times as much as John? The answer to both questions is "Yes," so we know the answer is correct.

This problem and its solution are very simple, but if you have understood each step you have already gone a long way toward understanding what algebra is and you are ready to go ahead.

The next problem can be solved in the same way. Study it carefully, re-reading the explanation of the last problem. Remember that you are laying the foundation for all your understanding of algebra.

Problem 2.—Father and Mother have 1800 books in all. If Father has 24 times as many as Mother, how many has each?

Let M = the number of books Mother has.

Then $24M$ = the number of books Father has.

① $M + 24M = 1800$
② $25M = 1800$
③ $M = 72$ ② $\div 25$
④ $24M = 1728$ ③ $\times 24$

Check:	*Ans.*
1728	Mother, 72 books
72	Father, 1728 books.
1800	

Notice that we do not set down the units in the equations. In Problem 1 we did not write *dollars* in the equations: nor did we write *books* in the equations of this problem.

We do however set down these words in the *first lines* and in the *answer*.

At the right of ③ and ④ is written the explanation or "history" which tells exactly what was done in getting ③, namely, divide ② by 25; and in getting ④, namely, multiply ③ by 24.

When you have an answer to a problem, your first question should be, "Is my answer right?" Look back to the problem. Together they had 1800 books. To see if this is correct, add the 72 books of Mother's to the 1728 of Father's and get the total 1800. This checks the solution. We *know* it is right.

The next problem is left for you to solve.

Problem 3.—There are twice as many lights on the first floor of a house as on the second floor. There are 48 lights altogether. How many on each floor?

Problem 4.—In paying $68, I used only $5 and $2 bills. The number of $5 bills was 3 times the number of $2 bills. How many were there of each?

Let x = the no. of $2 bills.

Then $3x$ = the no. of $5 bills.

Now we cannot add the number of *bills* and get the number of *dollars*. Think this over carefully. If you count the number of bills in a pile, do you know how many dollars the pile is worth? Does it make a difference whether the bills are ones or twos or fives or tens? Seven $5 bills make how much money? 10 $5 bills? x $5 bills?

Returning to the problem, how many dollars are there in $x$$2 bills? *Ans.* $2x$ dollars. How many dollars in $3x$$5 bills? *Ans.* $15x$ dollars. The next two lines of the solution will be

$2x$ = the no. of dollars in $2 bills.
$15x$ = the no. of dollars in $5 bills.

Now we are ready to add *dollars* and find the number of dollars in all.

① $2x + 15x = 68$

because the problem says there were 68 dollars in all.

② $17x = 68$
③ $x = 4$ ② $\div 17$
④ $3x = 12$ ③ $\times 3$

Check:	*Ans.*
4 $2 bills = $ 8	4 $2 bills
12 $5 bills = 60	12 $5 bills.
$68	

Problem 5.—I pay $168 with $10 and $2 bills only, using 4 times as many 10's as 2's. How many of each?

Let x = the number of $2 bills.
Then $4x$ = the number of $10 bills.
$2x$ = the number of dollars in 2's.
$40x$ = the number of dollars in 10's.
$2x + 40x$ = the number of dollars in all.
But 168 = the number of dollars in all, therefore,

① $2x + 40x = 168$
② $42x = 168$
③ $x = 4$ ② $\div 42$
④ $4x = 16$ ③ $\times 4$

Check:	*Ans.*
4 2's = $ 8	4 2's
16 10's = 160	16 10's.
$168	

The next problem does not read like problem 4, but it is really the same kind.

Problem 6.—A dealer sold out his stock of used Fords at $430 each and Buicks at $920 each. There were 3 times as many Fords as Buicks. He received in all $15,470. How many cars of each kind did he sell?

Let x = the number of Buicks sold.

Then $3x$ = the number of Fords sold.

$920x$ = the number of dollars received for the Buicks.

$1290x$ = the number of dollars received for the Fords.

The $1290x$ was found by multiplying $3x$, the number of Fords, by 430, the number of dollars each Ford sold for.

① $920x + 1290x = 15470$
② $2210x = 15470$
③ $x = 7$ ② $\div 2210$
④ $3x = 21$ ③ $\times 3$

Check:	*Ans.*
7 Buicks at $920 = $ 6,440	7 Buicks
21 Fords at $430 = $ 9,030	21 Fords.
$15,470	

Problem 7.—A bookseller shipped dictionaries weighing 7½ pounds each, and 6 times as many algebra books weighing 2 pounds each. The total weight of the shipment was 195 pounds. How many books of each kind were shipped?

Let x = the no. of dictionaries.
Then $6x$ = the no. of algebras.
$7\frac{1}{2}x$= no. of pounds dictionaries weighed.
$12x$ = no. of pounds algebras weighed.

Why is it $12x$? Because there are $6x$ algebras at 2 pounds each.

① $7\frac{1}{2}x + 12x = 195$
② $19\frac{1}{2}x = 195$
③ $x = 10$ ② $\div 19\frac{1}{2}$
④ $6x = 60$ ③ $\times 6$

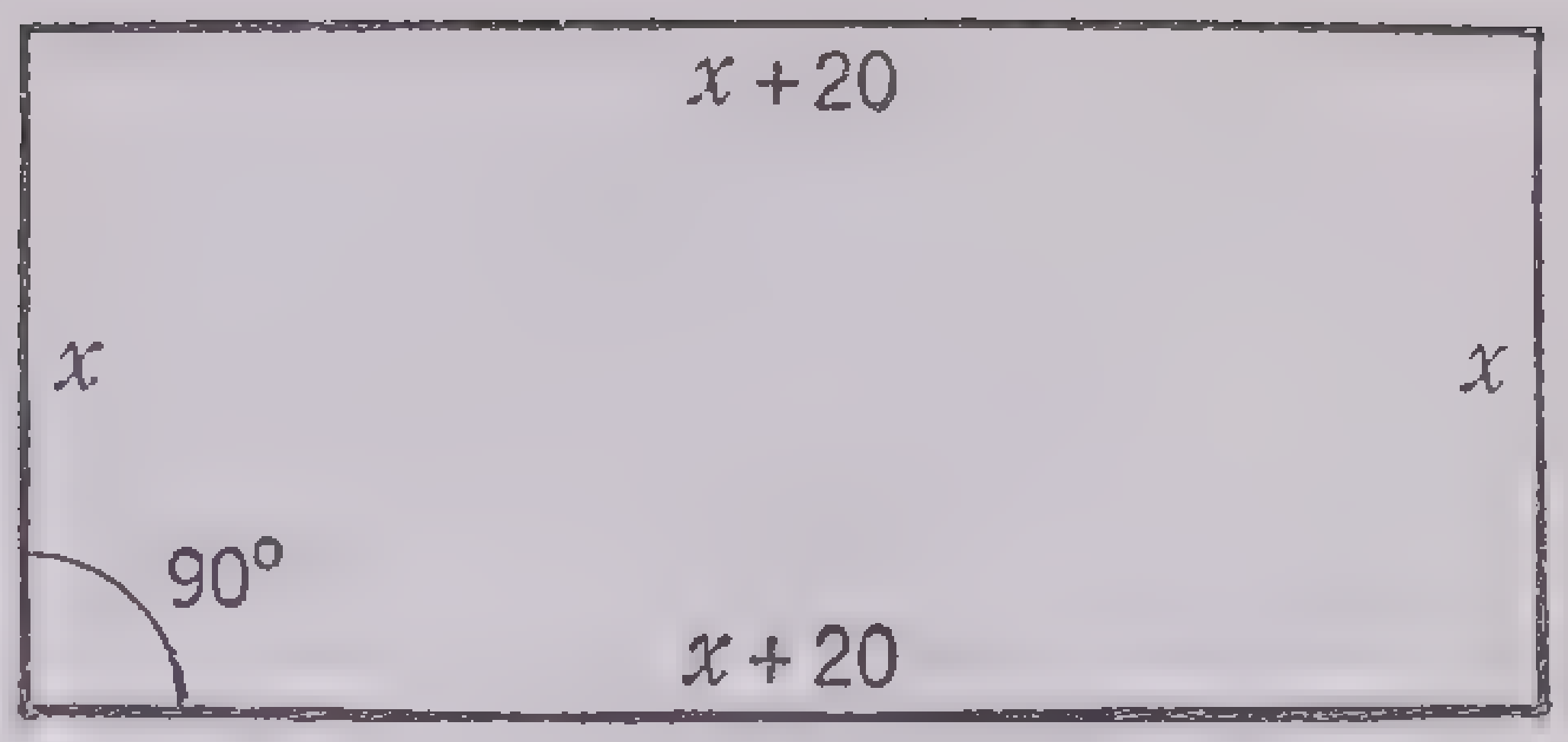
Check:
10 dictionaries at 7½ lb. = 75 lb.
60 algebras at 2 lb. = 120
195 lb.

Ans.
10 dictionaries
60 algebras.

Problem 8.—To pay $245 I use $20 and $5 bills only, 3 times as many 5's as 20's. How many of each?

Problem 9.—The perimeter of a rectangle is 136 feet. One side is 20 feet shorter than the other. Find the length of each side.

The diagram shows a rectangle. Each of its angles is a right angle. Notice that the two short sides are equal, and the two long sides are equal. The perimeter is the sum of the four sides.



Let x = number of feet in short side.

Then $x + 20$ = number of feet in long side.

Adding the four sides to get the perimeter gives $x + x + 20 + x + x + 20$. Uniting these we get $4x + 40$. Therefore,

① $4x + 40 = 136$
② $4x = 96$ ① $- 40$
③ $x = 24$ ③ $\div 4$
④ $x + 20 = 44$ ④ $+ 20$

Check:	*Ans.*
24	24 feet
44	44 feet.
24	
44	
136	

Problem 10.—Solve as in Problem 9, changing the perimeter to 150 feet, with one side 35 feet shorter than the other. *Ans.* 20 ft. and 55 ft.

State other such problems and solve them.

Problem 11.—I sold canned corn at 11 cents a can and 5 times as many cans of tomatoes at 14 cents each; also one can of peas at 12 cents. If the total receipts were $4.98, how many cans of corn and tomatoes did I sell?

Let x = the no. of cans of corn.
Then $5x$ = the no. of cans of tomatoes.
$11x$ = no. of cents for corn.
$70x$ = the no. of cents for tomatoes because there were $5x$ cans at 14 cents a can.

① $11x + 70x + 12 = 498$
② $81x + 12 = 498$
③ $81x = 486$ ② $- 12$
④ $x = 6$ ③ $\div 81$
⑤ $5x = 30$ ④ $\times 5$

Check:
6 cans corn at .11 = $ .66
30 cans tomatoes at .14 = 4.20
1 can peas at .12 = .12
$4.98

Ans.
6 cans corn
30 cans tomatoes.

Rules for Forming an Equation

One difficulty in solving the problems of algebra is the construction of the equation. Study of the problems we have solved shows that the steps to be taken are three in number. *First,* make a list of the numbers talked about in the problem but not actually given in figures. *Second,* select one of them to be represented by x and then represent the others according to their relations to this first one. *Third,* when this has been done make a statement that two things are equal, either by using some statement of the problem not used in making the list or by using two abbreviations for the same number in the list.

Study of the models and of your problems with these three rules in mind will make the formation of equations easier.

Another great help is this: when the answer to a problem is found, go over each statement of the problem very carefully to see that the answer meets every condition of the problem. This not only checks the accuracy of the answer but it makes clear the steps taken in forming the equation. Check the answer to every problem.

PARENTHESES

Parentheses [( )], as mentioned before, are used to group numbers together when the numbers in each group are to be considered as a single term. In the expression $3(x + 2)$ the parentheses mean that x and $+2$ are to be treated alike. The 3 in front of the parenthesis means that both x and $+2$ are to be *multiplied* by 3. It is read, "3 times the quantity $x + 2$" and equals $3x + 6$.

Usually parentheses must be removed from expressions before the solution can be reached. This requires close attention. When parentheses contain several terms, each must be multiplied by any factor indicating multiplication of the parentheses, as we saw above. If this factor is negative, we must change the sign of every term in the parentheses. Thus:

$$12x - 3(4x - 7) = 12x - 12x + 21 = 21.$$

This is equally true in a case having no negative factor expressed for multiplying the parentheses; for $-(4x - 7)$ is equivalent to $-1(4x - 7)$, both of which give $-4x + 7$.

Rules for Removing Parentheses

1. *Parentheses preceded by a plus sign may be removed from an expression without changing the signs of the terms in parentheses.*
2. *Parentheses preceded by a minus sign may be removed from an expression if the signs of all the terms in parentheses are changed.*
3. *In removing parentheses, each term within them must be multiplied by any number that multiplies the whole parentheses.*

Grouping Terms in Parentheses.—From the above, it follows that:

1. *Any number of terms of an expression may be enclosed in parentheses preceded by a plus sign without changing the signs of the terms to be enclosed.*
2. *Any number of terms of an expression may be enclosed in parentheses preceded by a minus sign if the signs of the terms to be enclosed are changed.*

When parentheses occur within brackets, remove the parentheses first and reduce the forms in order; for example:

$25x - 2[3x - 4(2x + 8)] =$
$25x - 2[3x - 8x - 32] =$
$25x - 2[-5x - 32] =$
$25x + 10x + 64 =$
$35x + 64.$

Such a reduction as this must be taken step by step, until you become expert in handling these forms.

Exercises

(1) Reduce $2(4x - 8) + 5(3x + 4) - 6(2x - 9) = 4x - 50$
(2) Reduce $a(bx - cy) - b(ax + dy) = -(ac + bd)y$
(3) Reduce $18 - 3[4 - 2(6 - 3)] = 24$

More Complicated Cases of Parentheses

Consider the expression:

$$(3 + 5)(2 + 4)(1 + 2).$$

Can we remove the parentheses here? Not by simply rewriting the expression without the parentheses, because these parentheses are to be multiplied together. We may remove parentheses by the rules we have just stated *only when they are separated by the + or − signs;* that is, only when they are *terms* in an expression, not *factors.*

$2 + 5(1 + 7)$ is an entirely different thing from $(2 + 5)(1 + 7)$.

The first expression means that 5 times the sum of 1 and 7 is to be added to 2; that is, 5 times 8 or 40 is to be added to 2; the expression thus equals 42.

The second expression means that the sum of 2 and 5 is to be multiplied by the sum of 1 and 7; that is, 7 is to be multiplied by 8; the expression thus equals 56.

Consider the expression:

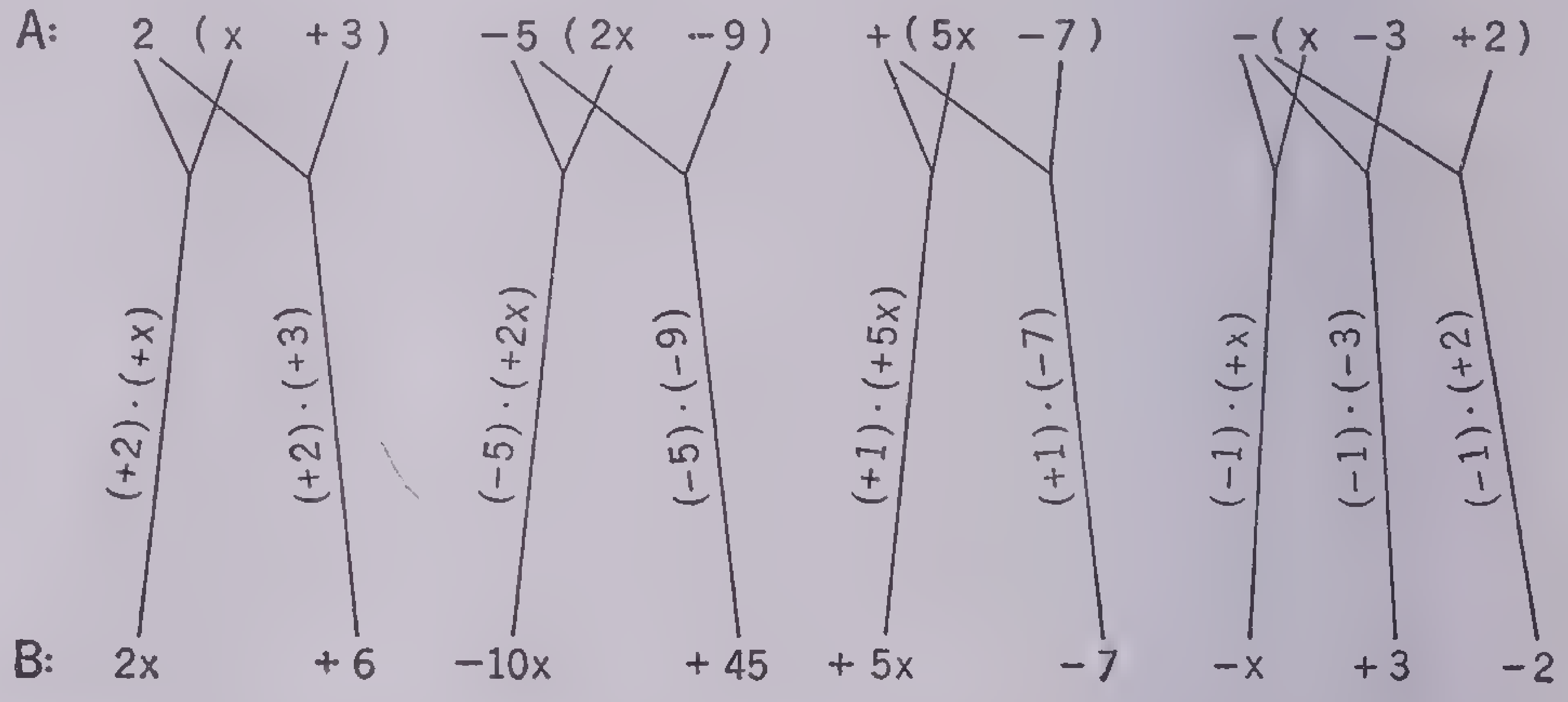
$$2(x + 3) - 5(2x - 9) + (5x - 7) - (x - 3 + 2). \qquad \text{(A)}$$

Removing parentheses according to the rules just given, we have

$$2x + 6 - 10x + 45 + 5x - 7 - x + 3 - 2. \qquad \text{(B)}$$

Reducing, $-4x + 45$.

The following diagram shows how each term in expression B is derived from expression A:



Returning now to our first expression:

$$(3 + 5)(2 + 4)(1 + 2),$$

we see that by a careful application of the rules we can, indeed, remove parentheses here too.

$(3 + 5)(2 + 4)(1 + 2) = [(3 + 5)(2 + 4)](1 + 2) =$
$[(3 + 5)(2 + 4)]\cdot 1 + [(3 + 5)(2 + 4)]\cdot 2 =$
$[(3 + 5)\cdot 2 + (3 + 5)\cdot 4] + 2[(3 + 5)\cdot 2 + (3 + 5)\cdot 4] =$
$[2\cdot 3 + 2\cdot 5 + 4\cdot 3 + 4\cdot 5] + 2[3\cdot 2 + 5\cdot 2 + 4\cdot 3\cdot 4\cdot 5] =$
$2\cdot 3 + 2\cdot 5 + 4\cdot 3 + 4\cdot 5 + 2\cdot 3\cdot 2 + 2\cdot 5\cdot 2 + 2\cdot 4\cdot 3 + 2\cdot 4\cdot 5 =$
$6 + 10 + 12 + 20 + 12 + 20 + 24 + 40 = 144$

Since $(3 + 5)(2 + 4)(1 + 2) = 8\cdot 6\cdot 3 = 144$, we see that the result of our elaborate work in removing the parentheses was correct.

No one would think of determining the value of $(3+5)(2 + 4)(1 + 2)$ by this method; but suppose we did not know what the numbers within each pair of parentheses were? Then the algebraic method would be the only one available.

Consider the expression:

(A) $(a + b)(m - n)(x - y).$

To remove parentheses:

$[(a + b)(m - n)](x - y) =$
$[(a+b)(m-n)]x - [(a+b)(m-n)]y =$
$[(a + b)m - (a + b)n]x - [(a + b)m - (a + b)n]y =$
$[(am + bm - an - bn]x - [am + bm - an - bn]y =$

(B) $amx + bmx - anx - bnx - amy - bmy + any + bny.$

A good exercise is to check this last result by letting a, b, m, n, x and y represent small easily handled numbers, such as $a = 2$, $b = 3$, $m = -1$, $n = -5$, $x = 4$, $y = -2$ and seeing that these numbers substituted in expression A and in expression B make equal totals when actually added and multiplied. Using these values for the letters, both expressions reduce to $+120$.

Problem 12.—I paid \$1.45 with nickels and dimes, using 7 fewer nickels than dimes. How many of each did I use?

Let x = the number of dimes.
Then $(x - 7)$ = number of nickels.
$5(x - 7)$ = number of cents in nickels.
$10x$ = number of cents in dimes.
$10x + 5(x - 7) = 145$, because this is the number of cents in all.

We have now set up an *equation,* the *solution* or *root* of which will tell us the number of dimes.

Removing parentheses,
$10x + 5x - 35 = 145.$
Adding x's,
$15x - 35 = 145.$
Transposing term -35,
$15x = 145 + 35.$
Reducing,
$15x = 180.$
Dividing by 15,
$x = 12$ = number of dimes.
Subtracting 7,
$x - 7 = 12 - 7 = 5$ = number of nickels.

Check this result by *seeing that the answer satisfies the conditions of the original problem.*

Ans. 12 dimes = \$1.20   5 is 7 less than
5 nickels = .25   12.
Total, \$1.45

We see that we have made no mistakes; the answer proves correct.

Problem 13.—John is twice as old as Will. Eighteen years ago John was five times as old as Will. How old are they?

Let x = Will's age now.
Then $2x$ = John's age now.
$x - 18$ = Will's age 18 years ago.
$2x - 18$ = John's age 18 years ago.
$5(x - 18) = 2x - 18$, because 18 years ago John was 5 times as old as Will.

This is our equation. Its solution will give us Will's age now.

Removing parentheses, $5x - 90 = 2x - 18.$
Transposing $2x$ and -90, $5x - 2x = 90 - 18.$
Reducing, $3x = 72.$
Dividing by 3, $x = 24$ = Will's age now.
Multiplying by 2, $2x = 48$ = John's age now.

Does this answer check?

Check: 48 (the answer for John's age) is twice 24 (the answer for Will's age). The first condition of the problem, therefore, is satisfied. Eighteen years ago John would have been 30 and Will 6; 30 is 5 times 6, which meets the second requirement of the problem, so the answer is correct.

Problem 14.—A father is twice as old as his son. Twenty-two years ago he was three times as old. How old are they now?

Let x = the son's age now.
Then $2x$ = the father's age now.
$x - 22$ = the son's age 22 years ago.
$2x - 22$ = the father's age 22 years ago.
Equation: $3(x - 22) = 2x - 22$.
Removing parentheses,
$3x - 66 = 2x - 22$.
Transposing $2x$ and -66,
$3x - 2x = 66 - 22$.

Reducing,
$x = 44$ = son's age now.
$2x = 88$ = father's age now.

Check:

$$\begin{array}{ll} \text{Now} & \text{22 Years Ago} \\ \left.\begin{array}{l}\text{Father, 88}\\ \text{Son, 44}\end{array}\right\} \textit{Ans.} & \begin{array}{l}\text{Father, 66}\\ \text{Son, 22}\end{array} \\ 88 = 2\cdot 44 & 66 = 3\cdot 22. \end{array}$$

Problem 15.—Solve: $13(8 - x) + 2(x - 6) = 2x + 1$.

Removing parentheses,
$104 - 13x + 2x - 12 = 2x + 1$.

Reducing,
$92 - 11x = 2x + 1$.
Transposing 92 and $2x$,
$-11x - 2x = -92 + 1$.

Reducing,
$-13x = -91$.
Dividing by -13,
$x = 7$.

We check this answer by seeing that it satisfies the first equation.

Check:

Does $13(8 - 7) + 2(7 - 6) = 2\cdot 7 + 1$? By carrying out the indicated arithmetic we see that it does:

$13(8 - 7) = 13$; $2(7 - 6) = 2$;
$13 + 2 = 15 = 2\cdot 7 + 1$.

Therefore 7 is *the value of* x *that makes the original equation true;* it *satisfies* the equation.

Problem 16.—Solve: $15(7x - 3) = 8(13x + 7) - 20$.

Removing parentheses,
$105x - 45 = 104x + 56 - 20$.
Transposing $104x$ and -45,
$105x - 104x = 56 - 20 + 45$.

Reducing,
$x = 81$.

Check:

Does $15(7\cdot 81 - 3) = 8(13\cdot 81 + 7) - 20$?
$15(7\cdot 81 - 3) = 15(567 - 3) = 15\cdot 564 = 8460$
$8(13\cdot 81 + 7) - 20 = 8(1053 + 7) - 20 = 8\cdot 1060 - 20 = 8460$.

The parts of an equation (or of any algebraic expression) that are separated by plus (+) or minus (−) signs are called *terms,* as we have already learned. Any term with an x in it is called an *x term.*

The steps in solving simple equations such as these are:

1. Remove any parentheses, performing any indicated multiplication and carefully noting the signs as explained in our rules for the removal of parentheses.

2. Collect all the x terms on one side and all the other terms on the other side by transposing terms (or by adding or subtracting equal numbers on both sides).

3. Add all the x terms, then all the non-x terms. (Reduce the expression.)

4. Divide by the *coefficient* of the x term.

Try these exercises, thinking first what step you will take to meet the difficulty.

Exercises

(1) $3(x - 7) = 2x - 11$
(2) $2(x + 5) = 10x - 6$
(3) $2x + 5 = 3x$
(4) $5x - 7 = 3(x + 1) - 4$
(5) $7(x - 2) = 4(x - 4)$
(6) $6x = 7(10 - x)$
(7) $8(x + 10) = 12(x + 7) - 8$
(8) $5(x + 4) = 14x - 2$
(9) $2x(1 - 9) + 3x = x(2 - 5) - 20$, which involves one new feature: it is the first time we have seen x as a factor before parentheses. There are two ways to solve this equation.

Following the rules already laid down:
Removing parentheses,
$2x - 18x + 3x = 2x - 5x - 20$.
Transposing,
$2x - 18x + 3x - 2x + 5x = -20$.
Reducing,
$-10x = -20$.
Dividing by -10,
$x = 2$.

The second way of solving the equation is to reduce (that is, add or subtract as indicated) the numbers enclosed before removing the parentheses, as:

$2x(1 - 9) + 3x = x(2 - 5) - 20$
$2x(-8) + 3x = x(-3) - 20$
$-16x + 3x = -3x - 20$
$-16x + 3x + 3x = -20$
$-10x = -20$
$x = 2$.

Either way is correct. Any way of solving an equation is correct as long as each step is carried out according to the fundamental rules.

Problem 17.—Sugar costs 34 cents a pound less than tea. Ten pounds of sugar and 6 of tea cost \$3.32. What is the price of each?

Problem 18.—Twenty-one coins, quarters and halves, amount to \$8.50. How many are there of each?

Let x = the number of quarters.
Then $21 - x$ = the number of halves.
$25x$ = the number of cents in quarters.
$50(21 - x)$ = the number of cents in halves.
$25x + 50(21 - x) = 850$
$25x + 1050 - 50x = 850$
$25x - 50x = 850 - 1050$
$-25x = -200$
$x = 8$ = number of quarters.
$21 - x = 13$ = number of halves.
Check:
$8 + 13 = 21$ = total number of coins.
Ans.
8 quarters = \$2.00
13 halves = \$6.50
Total, = \$8.50.

MULTIPLICATION

Multiplication of a Polynomial by a Monomial.—The multiplication of the forms of algebra is a very important part of the subject, because equations are solved by reversing the problem and factoring. To be able to factor easily, we must know the results of multiplication. It has been shown that if a polynomial is multiplied by a number, each term of the polynomial is multiplied by that number, giving a new polynomial; for example, to multiply $3x + 2y - 5z$ by $8a$, we take the terms in turn, and have $24ax + 16ay - 40az$. Notice again that the product of a letter times itself is written as the letter with an exponent at the upper right, as $xx = x^2$, $aa = a^2$. If the letter occurs 3 times, we use the exponent 3, as $xxx = x^3$ or $yyy = y^3$. The exponent shows how many times the letter appears as a factor, therefore *in multiplication the exponents are added.* We do the same with parentheses; for instance:

$$(x + y)(x + y)(x + y)(x + y) = (x + y)^4.$$

Multiplication of Polynomials.—If one polynomial is to be multiplied by another, we write the terms of the multiplicand each multiplied by the multiplier, then clear the parentheses and add similar terms together for the result, as:

$$\begin{aligned} &(2x + 3y)(5x + 6y) = \\ &2x(5x + 6y) + 3y(5x + 6y) = \\ &10x^2 + 12xy + 15xy + 18y^2 = \\ &10x^2 + 27xy + 18y^2. \end{aligned}$$

We notice that x^2 is read *x squared* and x^3 is read *x cubed,* because in early times they were actually thought of as the area of a square whose side was x or the volume of a cube whose edge was x. Higher powers of x are x^4 = *x to the fourth,* x^5 = *x to the fifth* and so on.

To write out the product of polynomials as above would be inconvenient, so a table of the results is made by writing the multiplicand along a horizontal line, and the multiplier terms in a column at the left. The various products are entered in the table, those from each multiplier term on the same horizontal line, and like terms in the same column. Thus, the example above would be written:

$$\begin{array}{r|llll} & 5x & +\,6y & & \\ \hline 2x & 10x^2 & +\,12xy & & = 2x(5x + 6y) \\ +3y & & 15xy & +\,18y^2 & = 3y(5x + 6y) \\ \hline & 10x^2 & +\,27xy & +\,18y^2, & \textit{Ans.} \end{array}$$

In this way it becomes easy to tell where each term came from; in the case of division what we have to do is merely to recover the missing terms. A few examples are given for you to work out for yourself, in order to see where each term comes from:

1. $(x + 5)(x + 3)$

$$\begin{array}{r|lll} & x & +\,3 & \\ \hline x & x^2 & +\,3x & \\ +5 & & +\,5x & +\,15 \\ \hline & x^2 & +\,8x & +\,15 \end{array}$$

2. $(x - 2)(x^2 - 5x - 3)$

$$\begin{array}{r|llll} & x^2 & -\,5x & -\,3 & \\ \hline x & x^3 & -\,5x^2 & -\,3x & \\ -2 & & -\,2x^2 & +\,10x & +\,6 \\ \hline & x^3 & -\,7x^2 & +\,7x & +\,6 \end{array}$$

3. $(x - 8)(x - 5)$

$$\begin{array}{r|lll} & x & -\,5 & \\ \hline x & x^2 & -\,5x & \\ -8 & & -\,8x & +\,40 \\ \hline & x^2 & -\,13x & +\,40 \end{array}$$

4. $(x + b)(x + a)$

$$\begin{array}{r|lll} & x & +\,a & \\ \hline x & x^2 & +\,ax & \\ +b & & bx & +\,ab \\ \hline & x^2 & +\,(a + b)x & +\,ab \end{array}$$

Notice that when the multiplier is negative, as in 2 and 3, all signs are changed. In example 4 the two terms ax and bx are put together in a single term by using the parentheses. Notice also that the terms without an x come only from the terms in the factors that have no x. The 15 is the product of +3 and +5, the 40 is the product of −5 and −8, the ab is the product of a and b. In example 1, the x^2 and 15 are called *end products,* and $8x$ is the *cross product.* The derivation of these names is obvious.

The last example is very important, for it shows that if we multiply a binomial of

x and a number by any binomial, the first term of the product will be x^2, the last term is the product of the two numbers, and the middle term is x multiplied by this sum of the numbers. Remembering this, we can find the factors of a trinomial starting with x^2. Such a trinomial is called a *quadratic* and will be considered at length in another section. To learn what was multiplied to give $x^2 + 7x + 12$, we must find two numbers whose product is 12 and whose sum is 7. Clearly they are 3 and 4, so the two binomials are $x + 3$ and $x + 4$. Multiply these together and prove them correct.

Special Products and Roots.—Certain typical products are so important that they must be memorized.

The first of these is the product of $x + y$ by $x - y$, that is, the product of the sum of two numbers by their difference:

$$\begin{array}{r|l} & x + y \\ \hline x & x^2 + xy \\ -y & \qquad - xy - y^2 \\ \hline & x^2 \qquad\quad - y^2. \end{array}$$

This says: *The product of the sum and the difference of two numbers is the difference of their squares.* Conversely: *The difference of the squares of two numbers can be factored into the sum of the numbers and their difference.* For instance:

$$9^2 - 4^2 = (9 + 4)(9 - 4) = 13{\cdot}5.$$

Numbers of two figures can be squared very easily this way; for instance, to find 87^2:

$$\begin{aligned} &87 + 3 = 90 \\ &87 - 3 = 84 \\ &87^2 - 3^2 = 90{\cdot}84 = 7{,}560 \\ &87^2 = 7{,}560 + 3^2 = 7{,}569. \end{aligned}$$

In the same way, find 58^2, 93^2 and 67^2.

We will now multiply $x^2 + xy + y^2$ by $x - y$.

$$\begin{array}{r|l} & x^2 + xy + y^2 \\ \hline x & x^3 + x^2y + xy^2 \\ -y & \qquad - x^2y - xy^2 - y^3 \\ \hline & x^3 \qquad\qquad\qquad - y^3. \end{array}$$

This gives us the theorem: *The difference of the cubes of two numbers is factorable into the difference of the numbers and the sum of their squares and their product.*

Example:

$$26^3 - 17^3 = 9(26^2 + 26{\cdot}17 + 17^2).$$

Exercises

(1) $(x - y)(x^3 + x^2y + xy^2 + y^3) = x^4 - y^4$
(2) $(x + y)(x^2 - xy + y^2) = x^3 + y^3$
(3) $(x + y)(x^3 - x^2y + xy^2 - y^3) = x^4 - y^4$
(4) Write the factors for $x^2 - y^2$, $x^3 - y^3$, $x^4 - y^4$, $x^3 + y^3$, $x^5 + y^5$

You will notice that $x^2 + y^2$ and $x^4 + y^4$ do not come in the list. Their factors belong to a different story in algebra, and you will find it in a more advanced study.

We will consider next the important form:

$$(x + y)(x + y) \text{ or } (x + y)^2$$

$$\begin{array}{r|l} & x + y \\ \hline x & x^2 + xy \\ +y & \qquad\ xy + y^2 \\ \hline & x^2 + 2xy + y^2. \end{array}$$

This form gives us the theorem: *The square of the sum of two numbers equals the square of the first plus twice the product of the first by the second plus the square of the second.* Conversely: *The sum of the squares of two numbers plus twice the product of the two numbers is a square, the square of the sum of the two numbers.* For example, $26 = 20 + 6$; hence, $26^2 = 400 + 2{\cdot}6{\cdot}20 + 36 = 676$. With this theorem we can find square roots, that is, the number that must be multiplied by itself to arrive at a given number.

Of what number is 6241 the square?

We will write down the form for a multiplication and fill in terms as we get them. Taking 50^2, 60^2, 70^2, 80^2, we find that the largest one we have under 6241 is 70^2. So the number we are finding is 70 plus some units. We write:

$$\begin{array}{r|l} & 70 + \\ \hline 70 & 4900 + \\ + & \qquad + \\ \hline & 6241. \end{array}$$

Now 4900 taken from 6241 leaves 1341. This is the sum of a square not larger than 9^2 and $2{\cdot}70{\cdot}$ the number, $2{\cdot}70$ is 140, $9{\cdot}140$ is 1260, and the square of 9 is 81. We see, then, that:

$$1341 = 2{\cdot}70{\cdot}9 + 9^2.$$

We now finish the table to read:

$$\begin{array}{r|l} & 70 + 9 \\ \hline 70 & 4900 + 630 \\ +9 & \qquad\ + 630 + 81 \\ \hline & 6241. \end{array}$$

In the same way, find what numbers must be squared to give 4225, 7396, 529, 9409, 6561.

Another important product is found from:

$$(x - y)^2 = x^2 - 2xy + y^2.$$

This says: *The square of the difference of two numbers equals the square of the first minus twice the product of the first by the second plus the square of the second.* It could be used also to find a square root; for example:

$$\begin{aligned} &6241 = 6400 - 2{\cdot}1{\cdot}80 + 1 \text{ and} \\ &6241 = (80 - 1)^2 = 79^2. \end{aligned}$$

These theorems are used primarily to factor expression for instance: $x^2 + 12x + 36$ is the square of x plus twice $6x$ plus the square of 6; hence it $= (x + 6)^2$; and $x^2 - 12x + 36$ is the square of x minus twice $6x$ plus the square of 6.

Exercises

(1) $x^2 - 6x + 9 = (x - 3)^2$
(2) $x^2 + 14x + 49 = (x + 7)^2$
(3) $x^2 - 14x + 49 = (x - 7)^2$
(4) $9x^2 - 24x + 16 = (3x - 4)^2$
(5) $16x^2 + 56x + 49 = (4x + 7)^2$

DIVISION

Division is the process of finding the multiplier of an expression that will give another expression. We work the table for multiplication backwards in order to find the multiplier. Suppose, for instance, we ask what multiplier of $x + 3$ will give $x^2 + 8x + 15$. Arranging the table already used for multiplication:

$$\begin{array}{r|l} & x + 3 \\ \hline & \\ & \\ \hline & x^2 + 8x + 15. \end{array}$$

It is clear that to get x^2 we must have had x in the multiplier, so we make a line for it and fill in what it would give us, thus:

$$\begin{array}{r|l} & x + 3 \\ \hline x & x^2 + 3x \\ & \\ \hline & x^2 + 8x + 15. \end{array}$$

In the $8x$ column we have so far only $3x$, hence we must have $5x$ more on the next line, and that means we have in the multiplier a term 5; we put this in and fill in the line, and find that everything is accounted for, thus:

$$\begin{array}{r|l} & x + 3 \\ \hline x & x^2 + 3x \\ +5 & \qquad\ 5x + 15 \\ \hline & x^2 + 8x + 15. \end{array}$$

The multiplier we desired is $x + 5$ and is called the *quotient* (literally, how many times) of $x^2 + 8x + 15$ divided by $x + 3$. All division problems can be handled in this way. The expressions should be put in order first, so that high powers are in front. If there are other powers of the letters they are usually entered in order. This is merely a matter of convenience. Find the quotient of:

$$15x^3 - 31x^2 + 54x - 56 \text{ divided by } 5x - 7.$$

$$\begin{array}{r|l} & 5x - 7 \\ \hline 3x^2 & 15x^3 - 21x^2 \\ & \\ +8 & \qquad\qquad\qquad - 40x - 56 \\ \hline & 15x^3 - 31x^2 + 54x - 56. \end{array}$$

We need $-10x^2$ in the second column, and that gives us the middle term of the quotient, $-2x$. Filling in this line, every term is accounted for. The quotient is $3x^2 - 2x + 8$.

As a problem with a trinomial in it, find the quotient of:

$$a^2 + b^2 - c^2 - 2ab \text{ divided by } a - b + c.$$

The work stands for the first step:

$$\begin{array}{r|lllll} & a - b + c & & & & \\ \hline a & a^2 & & & - ab + ac & \\ -b & & b^2 & & - ab & - bc \\ -c & & & - c^2 & - ac & + bc \\ \hline & a^2 + b^2 - c^2 - 2ab. & & & & \end{array}$$

We know that to get a^2, we must multiply a by a; to get b^2, we must multiply $-b$ by $-b$; to get $-c^2$, we must multiply $+c$ by $-c$. There is no other way in which these three terms could come from the given divisor. Filling in the nine terms resulting, we find everything is accounted for. Four terms cancel and two combine to make a single term.

Using this method find the quotient of:

$x^2 - y^2 - z^2 + 2yz$ divided by $x - y - z$. *Ans.* $x + y + z$.

Given terms with several factors, proceed as follows: Required to divide $36x^2yz^3$ by $4xz^2$. We get 36 from 4 by multiplying by 9; we get x^2 from x by multiplying by x; and z^3 from z^2 by multiplying by z. Then we must have also y as a multiplier. The entire quotient is $9xyz$. A single term is called a *monomial*. To divide a polynomial by a monomial, we take the polynomial term after term, just as in the problem we have finished.

Divide

$$12a^3b^2c - 20ab^4c^3 + 8a^2b^3c^2 \text{ by } 4ab^2c.$$

Proceeding term after term, we find the quotient $3a^2 - 5b^2c^2 + 2abc$.

Exercises

Carry out the divisions:

(1) $72x^4y^3z^4 : 8xy^2z^2$
(2) $36x^4 - 18x^3 + 12x^2 : 6x^2$
(3) $2a^3 + a^2 + a - 4 : (a - 1)$
(4) $3x^3 - 4x^2 - 8 : (x - 2)$
(5) $2x^4 - 3x^3 - 2x^2 + 5x - 2 : (x^2 - 2x + 1)$
(6) $27a^2x^3y^2 - 36a^2x^2y^3 + 12a^2xy^4 : 3a^2xy^2$, then divide by $(3x - 2y)$

FACTORING

To factor an expression is to find what expressions may be multiplied together to give it. It is similar to division except that no divisor is given. We first go through the terms to see what monomial will divide all of them. To factor

$$12a^2x^2 + 60a^2x + 72a^2,$$

we notice that all the numerical coefficients are divisible by 12; also that a^2 comes in every term. Taking out this monomial, $12a^2$, the quotient is $x^2 + 5x + 6$. The problem is now to factor it, if possible.

We know the factors of certain forms, having previously found the factors of $a^2 - b^2$, $a^3 + b^3$, $a^3 - b^3$, $a^4 - b^4$ and some others. If we do not have these forms, then we must proceed on the basis of knowing what kind of expressions we can multiply together to produce a form like that in the problem. Let us return to the quotient $x^2 + 5x + 6$.

If we multiply $x + 3$ by $x + 2$:

$$\begin{array}{r|l} & x + 3 \\ \hline x & x^2 + 3x \\ +2 & \qquad 2x + 6 \\ \hline & x^2 + 5x + 6. \end{array}$$

The coefficient of the second term is the sum of the 3 and 2. The last term is the product of 3 and 2.

Factor

x^2+5x+6 *Ans.* $(x+3)(x+2)$

We factored this expression by finding two numbers whose sum is 5 and whose product is 6. It is a guess-and-try method. Practice it.

Exercises

(1) $x^2+8x+12$ *Ans.* $(x+6)(x+2)$
(2) $x^2+10x+9$ *Ans.* $(x+9)(x+1)$
(3) $x^2+18x+32$ *Ans.* $(x+16)(x+2)$
(4) $x^2+22x+57$ *Ans.* $(x+3)(x+19)$
(5) $x^2-11x+18$ *Ans.* $(x-9)(x-2)$

Here the signs of the 9 and 2 must be minus, so that their sum will be -11.

(6) $x^2-15x+50$ *Ans.* $(x-10)(x-5)$
(7) $a^2-8a+12$ *Ans.* $(a-6)(a-2)$
(8) $a^2-8ab+15b^2$ *Ans.* $(a-5b)(a-3b)$
(9) $x^2+10x-24$ *Ans.* $(x+12)(x-2)$

The sum of $+12$ and -2 is $+10$; the product of $+12$ and -2 is -24.

(10) $x^2+18x-63$ *Ans.* $(x+21)(x-3)$
(11) $x^2+20x-125$ *Ans.* $(x+25)(x-5)$
(12) $a^2+6ab-55b^2$ *Ans.* $(a+11b)(a-5b)$
(13) $x^2-10x-24$ *Ans.* $(x-12)(x+2)$

The sum of -12 and $+2$ is -10; their product is -24.

(14) $x^2-18x-63$ $(x-21)(x+3)$
(15) $a^2-3a-460$ $(a-23)(a+20)$
(16) $x^2-14xy-51y^2$ $(x-17y)(x+3y)$

The next example is a little harder. At least it often takes more trials.

(17) Factor $8x^2+66x+135$

To get $8x^2$ we may multiply:

x by $8x$ or $2x$ by $4x$

To get 135 we may multiply:

1 by 135 or 3 by 45 or 9 by 15

We want the combination that will give cross products whose sum is $66x$.

Try these:

$$\begin{array}{ll} x & 1 \\ 8x & 135 \\ \hline 135x & \\ 8x & \\ \hline 143x & \end{array}$$ (Not the combination.)

$$\begin{array}{ll} x & 3 \\ 8x & 45 \\ \hline 24x & \\ 45x & \\ \hline 69x & \end{array}$$ (No.)

$$\begin{array}{ll} x & 9 \\ 8x & 15 \\ \hline 72x & \\ 15x & \\ \hline 87x & \end{array}$$ (No.)

$$\begin{array}{ll} x & 15 \\ 8x & 9 \\ \hline 120x & \\ 9x & \\ \hline 129x & \end{array}$$ (No.)

$$\begin{array}{ll} 2x & 15 \\ 4x & 9 \\ \hline 18x & \\ 60x & \\ \hline 78x & \end{array}$$ (No.)

$$\begin{array}{ll} 2x & 9 \\ 4x & 15 \\ \hline 36x & \\ 30x & \\ \hline 66x & \end{array}$$ (This is the required combination. Our factors are $2x + 9$ and $4x + 15$.) Check by multiplying.

Factor $6x^2+46x+80$.

$$\begin{array}{ll} 3x & 1 \\ 2x & 80 \\ \hline 240x & \\ 2x & \\ \hline 242x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 40 \\ 2x & 2 \\ \hline 80x & \\ 6x & \\ \hline 86x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 80 \\ 2x & 1 \\ \hline 160x & \\ 3x & \\ \hline 163x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 4 \\ 2x & 20 \\ \hline 8x & \\ 60x & \\ \hline 68x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 2 \\ 2x & 40 \\ \hline 120x & \\ 4x & \\ \hline 124x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 20 \\ 2x & 4 \\ \hline 20x & \\ 12x & \\ \hline 32x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 8 \\ 2x & 10 \\ \hline 16x & \\ 30x & \\ \hline 46x & \end{array}$$ This is the one.

Ans. $(3x+8)(2x+10)$

Factor $15x^2+28x+12$.

$$\begin{array}{ll} 5x & 2 \\ 3x & 6 \\ \hline 6x & \\ 30x & \\ \hline 36x & \end{array}$$ (No.)

$$\begin{array}{ll} 5x & 6 \\ 3x & 2 \\ \hline 18x & \\ 10x & \\ \hline 28x & \end{array}$$ (Yes.)

Ans. $(5x+6)(3x+2)$

Check:

$$\begin{array}{r|l} & 5x + 6 \\ \hline 3x & 15x^2 + 18x \\ +2 & \qquad\quad 10x + 12 \\ \hline & 15x^2 + 28x + 12 \end{array}$$

Factor $20x^2-23x+6$.

$$\begin{array}{ll} 4x & 2 \\ 5x & 3 \\ \hline 10x & \\ 12x & \\ \hline 22x & \end{array}$$ (No.)

$$\begin{array}{ll} 4x & 3 \\ 5x & 2 \\ \hline 8x & \\ 15x & \\ \hline 23x & \end{array}$$ (Yes.)

Ans. $(4x-3)(5x-2)$.

Factor $12x^2+8x-15$.

Try

$$\begin{array}{ll} 3x & 1 \\ 4x & 15 \\ \hline 45x & \\ 4x & \\ \hline 41x & \end{array}$$ (No.)

$$\begin{array}{ll} 6x & 3 \\ 2x & 5 \\ \hline 30x & \\ 6x & \\ \hline 24x & \end{array}$$ (No.)

$$\begin{array}{ll} 3x & 15 \\ 4x & 1 \\ \hline 60x & \\ 3x & \\ \hline 57x & \end{array}$$ (No.)

$$\begin{array}{ll} 6x & 5 \\ 2x & 3 \\ \hline 10x & \\ 18x & \\ \hline 8x & \end{array}$$ (Yes.)

But it still remains to decide which is minus, the 5 or the 3.

Try making it -3. This gives us $-8x$, which is wrong.

Then it must be -5.

Ans. $(6x-5)(2x+3)$

Check:

$$\begin{array}{r|l} & 6x - 5 \\ \hline 2x & 12x^2 - 10x \\ +3 & \qquad\quad 18x - 15 \\ \hline & 12x^2 + 8x - 15 \end{array}$$

Notice that the sign of 15 is minus, and that $8x$ is the *difference* between $18x$ and $10x$.

Factor $24x^2-53x-7$
Ans. $(8x+1)(3x-7)$

Factor $6a^2-11a-10$
Ans. $(2a-5)(3a+2)$

Factor $12a^2-7ab-45b^2$
Ans. $(4a-9b)(3a+5b)$.

Summary of Formulas for Factoring

$a^2 + 2ab + b^2 = (a + b)(a + b)$ or $(a + b)^2$
$a^2 - 2ab + b^2 = (a - b)(a - b)$ or $(a - b)^2$
$a^2 - b^2 = (a + b)(a - b)$
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$a^4 + a^2b^2 + b^4 = a^4 + 2a^2b^2 + b^4 - a^2b^2 = (a^2 + b^2)^2 - a^2b^2 = (a^2 + b^2 + ab)(a^2 + b^2 - ab)$
$a^n - b^n = (a - b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \ldots . ab^{n-2} + b^{n-1})$
If n is odd, $a^n + b^n = (a + b)(a^{n-1} - a^{n-2}b + a^{n-3}b^2 - \ldots . - ab^{n-2} + b^{n-1})$
$x^2 + ax + b = (x + M)(x + N)$ *in which M and N are numbers positive or negative whose sum (taking account of sign) is equal to* a *and whose product is equal to* b.

Highest Common Factor.—The product of all the common prime factors of two or more numbers is called their *highest common factor* (H.C.F.). It is the largest number that will exactly divide both numbers.

Find the highest common factor of 576 and 324. The method of doing this was known to Euclid many centuries ago and is sometimes called the *Euclidean algorithm*.[1] Stated in algebraic language, it is a problem of the distributive law and the use of parentheses. Let the H.C.F. be x, then $576 = ax$ and $324 = bx$, where we are to find a, b and x, all integers. The differences of the two numbers and their expressions is $252 = (a - b)x$, so it is also divisible by x. The differences of 324 and 252 and their expressions is:

$$72 = bx - (a - b)x = [b - (a - b)]x = [b - a + b]x = (2b - a)x,$$

and it contains x as a factor. Subtract 72 three times from 252 and we have

$$36 = [(a - b) - 3(2b - a)]x = [a - b - 6b + 3a]x = (4a - 7b)x.$$

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[1] *Algorithm* or *algorism*, like *algebra*, comes from the name of the Arabian mathematician, Mohammed of Khuwārizm. In Arabic *al-Khuwārizmi* means of Khuwārizm; but it came to mean his method—algorism.

This still contains x as a factor, and as 36 will divide 72, and the largest factor of 36 is 36, we must have $x = 36$. Going back now to 576 and 324 and dividing by x, or 36, we find that $a = 16$, and $b = 9$. Also,

$$\text{since } 36 = (4a - 7b) \cdot 36,$$
$$\text{we have } 4a - 7b = 1.$$

This is a characteristic of this process; namely, that the multipliers of the highest common factor, x or 36, will always be such that there are two numbers, c and d, that will give us the equation $ad - bc = 1$, and also, $adx - bcx = x$. Arithmetically, a and b are *prime* to each other. That means that d times the larger number minus c times the smaller will be the highest common factor itself. In the case above,

$$d = 4, c = 7, \text{ and } 4 \cdot 576 - 7 \cdot 324 = 36.$$

As an example, find the H.C.F. of 528 and 336, and find a, b, c, d.

Ans. $x = 48, a = 11, b = 7, c = 3, d = 2,$
$2 \cdot 528 - 3 \cdot 336 = 48.$

Fractions

It was proved in arithmetic that a fraction or ratio is unchanged in value if both its terms are multiplied by the same number. The terms of a fraction are the *numerator* and *denominator* or the *dividend* and *divisor*. It is perhaps a little unfortunate that the word *terms* should be used to refer to the numerator and denominator of a fraction, because this word usually means *the parts of an algebraic expression separated by plus* (+) *and minus* (−) *signs*, as we have already learned. It is necessary to distinguish carefully these two mathematical uses of the word *term*.

In the fraction $\frac{12}{18}$ the numerator is 12, the denominator 18; or we may say, the dividend is 12 and the divisor is 18. Both may be multiplied by 5 to arrive at another form of the same ratio, $\frac{60}{90}$. We could multiply both by $\frac{1}{6}$, giving the form $\frac{2}{3}$. This is usually called the fraction in its lowest form, because 2 and 3 have no common divisor other than 1; however, the simplest form of a fraction depends on the use made of it. This fraction could also be written $\frac{1}{1\frac{1}{2}}$, which would be simple for some purposes; for instance, in stating a school grade as 1 out of a possible $1\frac{1}{2}$. *Simple* is a relative term and means simple for certain purposes. The same expression may be simple or complex, according to our object.

If we do not know the numbers in numerator or denominator and use letters, we may still multiply both by the same number, represented also by a letter. For instance:

$$\frac{a}{b} = \frac{ca}{cb},$$

whatever number c is, *except zero.* (This expression is read: "a over b equals ca over cb.")

We remember that a fraction arose in trying to find a solution for an equation like $6x = 5$. In general, the fraction $\frac{a}{b}$ is the solution of the question $bx = a$, when solving for x. We can always use the equations in order to study fractions. Several important statements can be made at once.

In the equation $x = \frac{a}{b}$:

1. The numerator of a fraction, a, is the product of x and the denominator, b; or $a = bx$.

2. The denominator of a fraction, b, is the quotient of the numerator, a, divided by x; or $b = \frac{a}{x}$. For instance:

Let $x = 2/3$.
Then $2 = 3x$ and $3 = 2/x$,

$$\text{or } 2 = 3\left(\frac{2}{3}\right) \text{ and } 3 = 2 : \left(\frac{2}{3}\right),$$

by substituting the value of x for x itself. We use these theorems in solving equations like the following:

$$\frac{2x}{5} = 14, \text{ then } 2x = 5(14) = 70, \text{ and } x = 35.$$

$$\frac{2}{5x} = 3, \text{ then } 5x = \frac{2}{3}, \text{ and } x = \frac{2}{15}.$$

Notice that in the last, $5x$ and 3 have been transposed.

Reciprocals.—If we divide a number into 1, the quotient is the reciprocal of the number. This means that the product of a number and its reciprocal is 1. The reciprocal of 6 is 1/6 and of 1/6 is 6. The reciprocal of 1/4 is 4 and of 4 is 1/4. The reciprocal of 2/5 is 5/2 and of 5/2 is 2/5. Reciprocals of the integers were originally the unit fractions of a former time. Since any integer can be written as a ratio, the simplest form usually being the number over 1, as $6 = \frac{6}{1}$, we may say that any number written as a ratio gives its reciprocal by inverting the terms. The reciprocal of x is $\frac{1}{x}$.

We should notice that for every number we have its *negative*, its *reciprocal* and its *negative reciprocal.* For instance, for 3 the negative is −3, the reciprocal is 1/3, the negative reciprocal is −1/3. If now we take any one of these numbers and find the negative, the reciprocal and the negative reciprocal, we shall arrive at the same four. Let us write the results in a table thus:

Number	Negative	Reciprocal	Negative Reciprocal
3	−3	1/3	−1/3
−3	3	−1/3	1/3
1/3	−1/3	3	−3
−1/3	1/3	−3	3

This is a very interesting group of numbers, and it was indeed the introduction of the complete set that made it always possible to add, multiply, subtract or divide. Numbers come in sets of four and furnish the entire collection of rational numbers.

Proportion.—The statement of the equality of two ratios is often called a *proportion;* for instance, $2/3 = 10/15$ may also be written: $2:3 = 10:15$, which is read "2 is to 3 as 10 is to 15." Using the principles already stated, we can write $2 = 3 \cdot 10/15$, and again $3 \cdot 10 = 2 \cdot 15$. In any case, if we have $a/b = c/d$, then $ad = bc$. In arithmetic this is usually stated by saying that *the product of the means is equal to the product of the extremes.* We may now reverse the statement and from $ad = bc$ we can write the proportion above; but we might write others; for instance, given $3x = 4y$, we can write:

$$\frac{3}{4} = \frac{y}{x} \text{ or } \frac{3}{y} = \frac{4}{x} \text{ or } \frac{x}{4} = \frac{y}{3} \text{ or } \frac{x}{y} = \frac{4}{3}.$$

Proportions occur frequently in stating laws of physics and engineering; for instance, the resistance of a wire is proportional to its length, which means that if a wire of length a has a resistance c, and a wire of the same material and diameter of length b has a resistance d, then $c:d = a:b$. That is, if the length is doubled, the resistance also is doubled. To get one-third the resistance, use one-third the wire.

Certain theorems about proportions are much used; for example, in the proportion $a:b = c:d$ let each fraction equal x; then $a = bx$, and $c = dx$. Adding these gives $a + c = (b + d)x$, whence also

$$x = \frac{a + c}{b + d} = \frac{a}{b} = \frac{c}{d}.$$

In words we say, "In a proportion add the numerators of the fractions for a new numerator and the denominators for a new denominator, and the resulting fraction is equal to either of the original two." We could also have subtracted or we could first multiply by m and then by n and add, giving

$$\frac{a}{b} = \frac{c}{d} = \frac{ma + nc}{mb + nd}.$$

This theorem is used in geometry and can be used to simplify expressions in algebra.

We cannot have 0 for the denominator of a ratio. Zero is a peculiar number and cannot be a product of two numbers, unless one or both of them is zero. One of the most important laws of algebra is, "If $P \cdot Q = 0$, then $P = 0$ or else $Q = 0$ or both $= 0$." We solve equations on the basis of this law; for example, suppose $5x = 45$, then we can add −45 and have $5x - 45 = 0$ or $5(x - 9) = 0$. Now the factor 5 cannot be 0, hence $x - 9 = 0$ and $x = 9$. As another example, let $(x - 4)(x - 5) = 0$; then either $x - 4 = 0$ and $x = 4$ or else $x - 5 = 0$ and $x = 5$. That is, the solution of the expression we get by multiplying together $x - 4$ and $x - 5$, or $x^2 - 9x + 20 = 0$, is that x must be either 4 or 5. No other answer could be true. Now try the exercises.

Exercises

(1) $\frac{12}{x - 5} = 4$, then $x - 5 = 12:4 = 3$ and $x = 8$

(2) $\frac{x + 5}{x - 7} = 7$, then $x + 5 = 7x - 49$, $6x = 54$, $x = 9$

(3) $\frac{x + 6}{x - 6} = \frac{5}{3}$; cross multiplying, as in arithmetic:

$$5x - 30 = 3x + 18$$

Transposing, $5x - 3x = 18 + 30$ and $2x = 48$

Therefore, $x = 24$.

Addition of Fractions.—We have already learned that to add fractions they must be reduced to the same denominator; for instance:

$$\frac{2}{3} + \frac{3}{5} = \frac{10}{15} + \frac{9}{15} = \frac{(10 + 9)}{15} = \frac{19}{15}.$$

This is another instance of the use of the distributive law,

$$ax + bx = (a + b)x;$$

the x here is 1/15; and a is 10, b is 9. We could have used other denominators that are multiples of 15, as 30, 45, 60 or the like. If there are letters, the work goes the same; for example:

$$\frac{6}{2x} + \frac{5}{3x} - \frac{4}{x} = \frac{18}{6x} + \frac{10}{6x} - \frac{24}{6x} = \frac{4}{6x} = \frac{2}{3x}.$$

In equations, this reduction is always made. Suppose

$$\frac{3x}{7} + \frac{2x}{3} - \frac{5}{6} = \frac{41}{6}.$$

Then giving every fraction the denominator 42, we have

$$\frac{18x + 28x - 35}{42} = \frac{287}{42};$$

$$\text{and } 46x - 35 = 287,$$
$$46x = 322,\ x = 7.$$

Often the denominator 42 is not written at all. This is really not good practice, however, as false answers may result in cases in which the denominators contain letters.

Multiplication and Division of Fractions.—The rule for multiplying in arithmetic is, "Multiply together all numerators for a new numerator, all denominators for a new denominator, and the resulting fraction is the product of the given fractions." We may, however, remove from the numerator and denominator of the result factors that are the same; for instance:

$$\frac{6}{7} \times \frac{14}{9} \times \frac{15}{16} = \frac{\cancel{2}\cdot\cancel{3}\cdot\cancel{2}\cdot\cancel{7}\cdot\cancel{3}\cdot 5}{\cancel{7}\cdot\cancel{3}\cdot\cancel{3}\cdot\cancel{2}\cdot\cancel{2}\cdot 2\cdot 2} = \frac{5}{4}.$$

Do not confuse *factor* with *term*. In the fraction $\frac{x+a}{x+b}$, the numerator and denominator both have the term x, but the fraction does not reduce to $\frac{a}{b}$, because x is *not* a factor of the numerator, $x + a$, nor of the denominator, $x + b$. *Factors* are numbers that are *multiplied* together to form a *product*. *Terms* are numbers *added* together to form a *sum*. In the expression

$$x[b - (a + c - 5x) + 25]$$

the factors of the whole are x and $[b - (a + c - 5x) + 25]$. The *terms* of the second factor are b, $(a + c - 5x)$, and 25; a, c, and $5x$ are also *terms* of grouped term $(a + c - 5x)$; 5 and x are the *factors* of the *term* $5x$.

In the expression

$$2ax + bx + 5cx$$

$2ax$, bx, $5cx$ all are *terms*; each term is composed of *factors*. The factors of $2ax$ are 2, a and x; of bx, b and x; of $5cx$, 5, c and x. Notice that each term contains the factor x, called a *common factor* of the three terms, $2ax$, bx, $5cx$.

In simplifying fractions, we must keep this distinction constantly in mind. Only common factors of the whole numerator may be canceled with the same common factors of the whole denominator.

Division of fractions proceeds in the same way, for we merely invert the divisor and then multiply. Try the exercises.

Exercises

(1) $\frac{2}{3} + \frac{5}{6} - \frac{8}{9} = \frac{11}{18}$

(2) $\frac{3}{16} \times \frac{8}{9} \times \frac{12}{5} = \frac{2}{5}$

(3) $\frac{1}{24} = \frac{1}{33} + \frac{1}{88}$

(4) $\frac{1}{24} = \frac{1}{40} + \frac{1}{60}$

(5) $\frac{6}{x} + \frac{5}{2x} - \frac{10}{3x} = \frac{31}{6x}$

(6) $\frac{48}{x + a} : \frac{16}{x + b} = \frac{3(x + b)}{x + a}$

Equations with Fractions

If we wish to solve an equation containing fractional terms, it is usually necessary to transform the equation into an *equivalent* equation without fractions. This is called *clearing the equation of fractions*. It can always be done by multiplying both sides of the equation by a common multiple of all the denominators of the fractions. Any common multiple will do, but the lowest common multiple will produce the simplest equation. Unless a lower common multiple is easily seen, however, it is usually most convenient to multiply by *the product of all the denominators*. This product obviously must contain each denominator as a factor and therefore will be a common multiple, although not necessarily the lowest common multiple.

Problem 19.—One-half and one-fifth of a certain number make 28. What is the number?

Let x = the number.

$\frac{x}{2}$ = one-half the number.

$\frac{x}{5}$ = one-fifth the number.

$$\frac{x}{2} + \frac{x}{5} = 28.$$

This is a simple example of an equation to be *cleared of fractions*. To clear it, we multiply by a common multiple of the denominators, in this case, 10:

$$\frac{10x}{2} + \frac{10x}{5} = 280$$
$$5x + 2x = 280$$
$$7x = 280$$
$$x = 40$$

Check:

$\frac{1}{2}$ of 40 = 20

$\frac{1}{5}$ of 40 = 8

Sum = 28.

If any fraction is multiplied by a number that contains the denominator of the fraction as a factor, the product will be integral. That is,

$$ab \times \frac{c}{b} = ac.$$

This is the reason behind the rule that any equation may be cleared of fractions by multiplying by a common multiple of the denominators.

Problem 20.—Two-thirds of a number added to four-sevenths of it make 520. What is the number?

Let x = the number.

$$\frac{2}{3}x + \frac{4}{7}x = 520.$$

To clear of fractions, multiply by 3·7:

$$\frac{2\cdot\cancel{3}\cdot 7}{\cancel{3}}x + \frac{4\cdot 3\cdot\cancel{7}}{\cancel{7}}x = 3\cdot 7\cdot 520$$
$$14x + 12x = 10920$$
$$26x = 10920$$
$$x = \frac{10920}{26} = 420.$$

Problem 21.—One line is three times the length of another; half the shorter line is 20 inches less than the longer line. Find the length of each line.

Let x = length of shorter line.

$3x$ = length of longer line.

$$\frac{1}{2}x = 3x - 20.$$

Clearing of fractions,

$$x = 6x - 40.$$
$$-5x = -40.$$

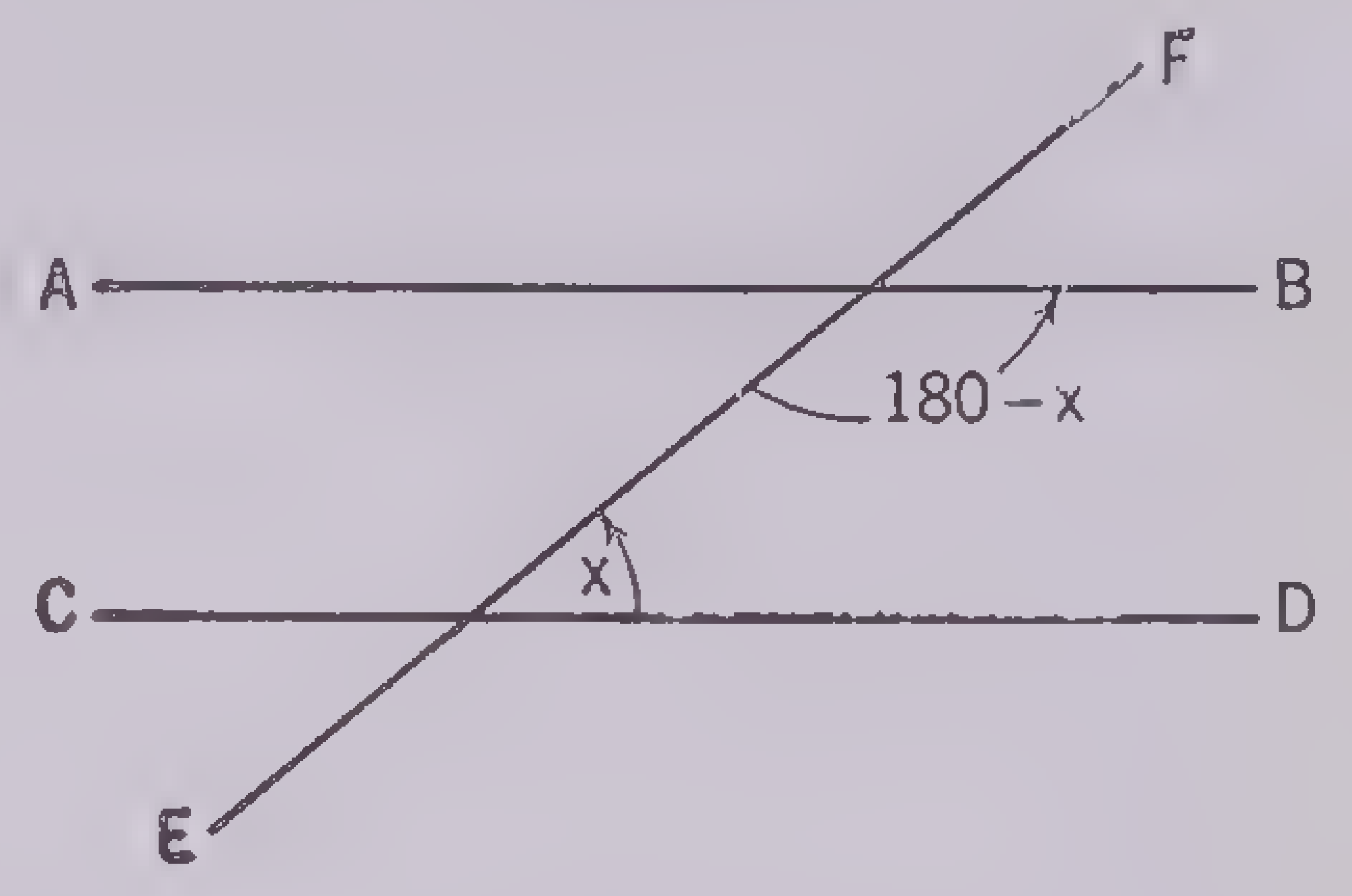
Ans. $x = 8$ = length of shorter line in inches.
$3x = 24$ = length of longer line in inches.

Check:

$$24 = 3\cdot 8 \text{ and } \frac{1}{2}\cdot 8 = 24 - 20.$$

The usefulness of algebra in solving numerical problems in geometry is indicated here.

Problem 22.—If AB and CD are two parallel lines, the line EF crossing both is called a *transversal*. It is shown in geometry that the sum of the inside angles on the same side of the transversal (indicated in the figure by the arrows) is equal to two right angles, or 180°. If one-half the smaller of these angles equals two-fifths the larger, how many degrees are there in each angle?



Problem 23.—John, James and Henry shared a sum of money so that John had $30 more than half, James $33 more than a third and Henry had the rest, which was $10. How much each did John and James have?

Let x = no. of $ in all.

Then $x/2 + 30$ = no. of $ John has.

And $x/3 + 33$ = no. of $ James has.

Adding the shares of John, James and Henry, we get

① $x/2 + 30 + x/3 + 33 + 10 = x$
② $3x + 180 + 2x + 198 + 60 = 6x$
③ $5x + 438 = 6x$
④ $x = 438$
⑤ $x/2 + 30 = 249$
⑥ $x/3 + 33 = 179$

Check:	*Ans.*
$249 John	John, $249
179 James	James, $179.
10 Henry	
438 Total	

Considerable practice is required to develop speed and accuracy in solving fractional equations.

Exercises

(1) $x/3 + x/5 + 4 = x - 3$
(2) $x/2 + x/3 + 1/2 = x - 1$
(3) $x/2 - x/5 = x/2 - 3$

(4) $\frac{x}{7} - \frac{3x}{7x} = 17$

(5) $\frac{7x - 6}{5} + \frac{x}{3} = \frac{3x - 5}{2} + x - 1$

Equation × 30

① $42x - 36 + 10x = 45x - 75 + 30x - 30$
② $52x - 36 = 75x - 105$ ① same values
③ $52x + 69 = 75x$ ② + 105
④ $69 = 23x$ ③ − $52x$
⑤ $3 = x$, or $x = 3$ ④ ÷ 23

Check: *Ans.* 3

Put 3 in place of x in original equation.

$$\frac{21 - 6}{5} + \frac{3}{3} = \frac{9 - 5}{2} + 3 - 1$$

$$3 + 1 = 2 + 3 - 1$$
$$4 = 4$$

(6) $\frac{3x - 7}{4} - \frac{3x}{11} = \frac{x - 5}{2}$

(7) $\frac{x + 1}{2} + 2 + \frac{x + 3}{4} = x$

(8) $\frac{x - 1}{7} + \frac{3x - 1}{5} + \frac{1}{7} = \frac{x - 7}{3} + \frac{4x - 3}{5}$

(9) $\frac{x-1}{2} - \frac{2}{5} - \frac{x+3}{5} = 0$

① $5x - 5 - 4 - (2x + 6) = 0$
Equation × 10

The parentheses are left in ① because the two terms of the numerator of the last fraction must be both *multiplied* and *subtracted.* The minus sign before the fraction says to subtract and our history, Equation × 10, says to multiply. Trying to do both of these at once often leads to errors.

② $5x - 9 - 2x - 6 = 0$ ① same values

Notice that the last term is minus 6 because we are instructed to *subtract* both the $2x$ and the 6.

③ $3x - 15 = 0$ ② same values
④ $3x = 15$ ③ $+ 15$
⑤ $x = 5$ ④ $\div 3$

Check: *Ans.*

$\frac{5-1}{2} - \frac{2}{5} - \frac{5+3}{5} = 0$ 5

$2 - \frac{10}{5} = 0$

$2 - 2 = 0$

(10) $\frac{5x - x + 7}{10} = 8\frac{1}{2} + \frac{x+1}{5}$

(11) $\frac{x+5}{6} - \frac{x+1}{8} = \frac{x+3}{4}$

(12) $\frac{x}{4} - \frac{x-5}{3} = \frac{x-8}{4}.$

This example looks much like those above, but is in fact much more troublesome.

① $\frac{x}{4} - \frac{x-5}{3} = \frac{x-8}{4}$

② $3x - (4x - 20) = 3x - 24$ ① × 12.

The quantity to be subtracted is $4x - 20$; we are not told to subtract as much as $4x$, but to subtract 20 *less* than $4x$. Suppose it read $30 - (25 - 20)$. This says to take from 30 a number that is 20 less than 25. This of course means from 30 take 5. The answer is 25. If we wrote $30 - 25$ we would be taking away too much, 20 too much, because we were told to take away not 25 but 25 less 20. To correct the mistake we must *put back* the 20 and write $30 - 25 + 20$ which gives 25, the correct answer.

This is the reasoning behind the rule we have already learned that in removing parentheses preceded by a minus sign (−) we change the signs of all the terms within the parentheses.

③ $3x - 4x + 20 = 3x - 24$
② same values

Do you understand the +20? Study the explanation through again. We took the whole of $4x$ but were told to take away $4x - 20$. Consequently we must *put back* the 20. We took away 20 too much, and then put it back (see *Addition and Subtraction*, this article).

④ $-x + 20 = 3x - 24$ ③ same values
⑤ $44 = 4x$ ④ $+ x + 24$
⑥ $x = 11$ ⑤ $\div 4$

Check: *Ans.*

$\frac{11}{4} - \frac{11-5}{3} = \frac{11-8}{4}$ 11

$11/4 - 6/3 = 3/4$
$11/4 - 2 = 3/4$
$11/4 - 8/4 = 3/4$
$3/4 = 3/4$

(13) $\frac{x+5}{7} = \frac{x-4}{2} - \frac{x-5}{8}$

(14) $\frac{7x-11}{45} - 1 = \frac{x+7}{15} - \frac{3x+1}{25}$

(15) $5x + 20 - 2(x + 2) = 40 - 4(x - 15)$
① $5x + 20 - (2x + 4) = 40 - (4x - 60).$

We keep the parentheses in order to avoid the mistakes that come from trying to multiply and subtract at the same time.

② $5x + 20 - 2x - 4 = 40 - 4x + 60$
① same values.

Why do we write −4 and +60? The $2x$ and 4 are *both* to be subtracted. In the last parentheses, however, we are told to take away 60 less than $4x$. When we wrote $-4x$ we took away 60 too much. Then we *put back* the 60.

③ $3x + 16 = 100 - 4x.$ ② same values.
④ $7x + 16 = 100.$ ③ $+ 4x$
⑤ $7x = 84.$ ④ $- 16$
⑥ $x = 12.$ ⑤ $\div 7$
Check: *Ans.*
$60 + 20 - 2(14) = 40 - 4(-3).$ 12
$80 - 28 = 40 - (-12) = 40 + 12 = 52.$
$52 = 52$

Problems of Time, Rate and Distance

Problem 24.—A man can ride 11 miles per hour and walk 3 miles per hour. How long will it take him to go 168 miles if he walks half the time and rides half the time?

Before trying to solve this problem we must understand the simple relation connecting rate, time and distance. One of the tasks of algebra is to use the formulas that show the relations of such quantities.

If a man walks 3 *mi/h* (read, "3 miles per hour." It is often written this way because, as we shall see, *rate* is equal to *distance* divided by *time*) for 5 hours what distance does he walk? Clearly 5 times 3 or 15 miles. In general, the number of hours times the number of miles per hour gives the total number of miles. The *time* multiplied by the *rate* equals the *distance.* Stated in the symbols of algebra, $TR = D$.

Notice that TR means T times R just as $5x$ means 5 times x. This equation may be transformed as follows:

① $TR = D$
② $T = D/R$ ① $\div R$
③ $R = D/T$ ① $\div T.$

All three equations state the same relation but from different points of view. In studying such formulas it is important to be able to see all three of these facts by looking at any one of them. If time multiplied by rate equals distance, then time equals distance divided by rate, and rate equals distance divided by time.

There is one mistake to avoid. Do not try to *learn* these formulas. Learn to make up the formula from a simple illustration, just as is done on this page.

Now reread these paragraphs thoughtfully, then reread the problem and we shall solve it.

	T	R	D
Walking	$\frac{x}{2}$	3 *mi/h*	$\frac{3x}{2}$
Riding	$\frac{x}{2}$	11 *mi/h*	$\frac{11x}{2}$
Total			168 *mi.*

Make a table and fill in the squares one at a time, beginning with those you know most about. In this case the R column can be filled in first, since we know both rates; and the total D is 168 miles.

Next decide what x is to stand for.

Let x = number of hours it takes him to go 168 miles. Then $x/2 = 1/2$ the time, that is, the number of hours he walks. We can now fill in the T column. The rest is easy because whenever we know two numbers in one *row* we can find the third by one of the three formulas.

This time we use $TR = D$.

The last step is to form an equation.

The D he walks plus the D he rides is the total D.

① $3x/2 + 11x/2 = 168$
② $3x + 11x = 336$ ① × 2
③ $14x = 336$ ② same values
④ $x = 24$ ③ $\div 14$
Check:
12 h. at 3*mi/h* = 36 miles
12 h. at 11*mi/h* = 132
168

Ans.
24 hours.
(12 hours riding and 12 hours walking.)

Problem 25.—A boy can ride on his wheel 10 miles per hour and walk 4 miles per hour. How long will it take him to go 126 miles if he rides half the time and walks half the time? *Ans.* 18 hours.

Problem 26.—Soldiers can hike an average of $2\frac{3}{4}$ miles per hour, and trucks can transport them 13 miles per hour. How long will it take a regiment to cover 115 miles if they walk $\frac{1}{3}$ of the time and ride in trucks $\frac{2}{3}$ of the time?

	T	R	D
Hiking	$\frac{x}{3}$	$2\frac{3}{4}$	$\frac{11x}{12}$
Riding	$\frac{2x}{3}$	13	$\frac{26x}{3}$
Total			115 *mi.*

The order of filling in the spaces is the same as in problem 24.

Notice the "D" hiking space. $\frac{x}{3}$ must be multiplied by $2\frac{3}{4}$; $\frac{x}{3} \times \frac{11}{4} = \frac{11x}{12}$.

① $\frac{11x}{12} + \frac{26x}{3} = 115$

② $11x + 104x = 1380$ ① × 12
③ $115x = 1380$ ② same values
④ $x = 12$ ③ $\div 115$
Check:
4 h. at $2\frac{3}{4}$ *mi/h* = 11 mi.
8 h. at 13 *mi/h* = 104
115

Ans.
12 hrs.
4 hrs. hiking
8 hrs. riding.

Problem 27.—A boy has $3\frac{1}{2}$ hours for exercise: how far can he ride with his father, at the rate of 21 miles per hour, before getting out to walk back, if he walks $3\frac{1}{2}$ miles per hour?

	T	R	D
Walking	$\frac{2x}{7}$	3½ mi/h	x
Riding	$\frac{x}{21}$	21 mi/h	x
Total	3½h		

The known numbers go in first: they are the R's and the total T.

Let x = the no. of miles he can ride. The number of miles he must walk back will be the same.

To fill in the T column use the formula $T = D/R$. (Can you get this from the formula at the top of the table?)

T walking will be $\frac{x}{3\frac{1}{2}}$. T riding will be $\frac{x}{21}$.

The fraction $\frac{x}{3\frac{1}{2}}$ is rather clumsy. Write $\frac{x}{7/2}$. It is still clumsy. We would like to get rid of the 2 in the denominator. How? Multiply the numerator and denominator by 2.

$$\frac{x}{7/2} \times \frac{2}{2} \equiv \frac{2x}{7}.$$

(Notice that the sign $\equiv$ may be used when it is convenient, to show that two expressions are actually the same, though written in different form. This is not an equation to be solved. The right side is merely the left side simplified. Such statements are called *identities.*)

This completes the table. It remains to find an equation.

The time walking plus the time riding = the total time.

① $\frac{2x}{7} + \frac{x}{21} = 3\frac{1}{2}$

② $12x + 2x = 147$ ① × 42

③ $14x = 147$ ② same values

④ $x = 10\frac{1}{2}$ ③ ÷ 14

Check: *Ans.*

10½ mi. @ 21mi/h, ½ hr. 10½ mi.

10½ mi. @ 3½mi/h, 3 hrs.

3½ hours

Problem 28.—A certain river flows one mile per hour. A fisherman finds that he can row upstream a few miles in 3 hours, but it takes him only 1 hour and 48 minutes to come back. How fast can he row in still water?

	T	R	D
Down-stream	$1\frac{4}{5}$ h	$x + 1$	$\frac{9}{5}(x + 1)$
Upstream	3 h	$x - 1$	$3(x - 1)$

The known numbers are the T upstream and the T downstream. The 1 hr. and 48 min. may better be written $1\frac{4}{5}$ h.

Let x = number mi/h he rows in still water.

What then is the R downstream? He rows through the water x miles per hour, and the current carries him along 1 mile per hour. His rowing and the current together carry him $x + 1$ miles per hour.

Going upstream, however, the current carries him *back* 1 mile every hour. His rate will be $x - 1$ miles per hour.

How can we fill in the D column? $D = TR$. D upstream is $9/5(x + 1)$. D downstream is $3(x - 1)$.

What fact will give us an equation?

Distance downstream = distance back.

① $\frac{9}{5}(x + 1) = 3(x - 1)$

② $9(x + 1) = 15(x - 1)$ ① × 5

③ $9x + 9 = 15x - 15$ ② same values

④ $24 = 6x$ ③ + 15 − 9x

⑤ $4 = x$ ④ ÷ 6.

Check: *Ans.*

R upstream is $(4 - 1)mi/h$. 4 mi/h.

R downstream is $(4 + 1)mi/h$.

3h at 3 mi/h = 9mi.

9/5 at 5 mi/h = 9mi.

Problem 29.—It takes B 12 days to do a certain piece of work that A can do in 4 days. In how many days will they do it if they work together?

Should we add the 12 days and 4 days together and answer 16 days for them both? If one man could do the work alone in 4 days would it take them both 16 days? Clearly this is not the way to proceed.

A can do what part of the work in one day? One-fourth.

B can do one-twelfth.

Let x = no. of days for both together.

If it takes them x days they would do each day $1/x$ of it.

For our equation:

The part A does in one day +
the part B does in one day =
the part both do in one day.

① $\frac{1}{4} + \frac{1}{12} = \frac{1}{x}$.

② $3x + x = 12$ ① × 12x

③ $4x = 12$ ② same values

④ $x = 3$ ③ ÷ 4.

Check: *Ans.*

A does $\frac{1}{4}$ each day 3 days for both

B does $\frac{1}{12}$ each day together.

Both do $\frac{1}{4} - \frac{1}{12} = \frac{4}{12} = \frac{1}{3}$

Therefore it takes them both 3 days.

Problem 30.—B can do a piece of work in 18 days which A can do in 15 days. How long will it take them if they work together?

Problem 31.—A boy can run around a block in 6 minutes. His father can walk it in 9 minutes. If they start from the same place, in opposite directions, how long before they will meet?

Let x = no. of minutes they go.

$\frac{1}{6}$ = part of the distance boy can run in 1 minute.

$\frac{x}{6}$ = part of the distance boy can run in x minutes.

$\frac{x}{9}$ = part of the distance father can walk in x minutes.

If we add the part the boy runs and the part the father walks, what shall we get for the total? We shall get the whole distance. How shall we put this down in the equation? If the boy ran, say, 2/3 of the distance and the father walked 1/3, both would cover 3/3 or 1.

The part the boy runs +
the part father walks =
total distance or 1.

① $x/6 + x/9 = 1$

② $3x + 2x = 18$ ① × 18

③ $5x = 18$ ② same values

④ $x = 18/5$ ③ ÷ 5

Check: *Ans.*

$\frac{18}{5} \times \frac{1}{6} = \frac{3}{5}$ of D. They will meet

$\frac{18}{5} \times \frac{1}{9} = \frac{2}{5}$ of D. in $3\frac{3}{5}$ minutes.

1 or total D.

Problem 32.—A man can walk to his office in 40 minutes or he can ride in 10 minutes. How long will it take him if he walks half the time and rides half the time?

Let $2x$ = no. of min. to reach office.

then x = no. of min. he walks.

x = no. of min. he rides.

$\frac{1}{40}$ = part of distance he walks in 1 min.

$\frac{x}{40}$ = part of distance he walks in x min.

$\frac{x}{10}$ = part of distance he rides in x min.

The part he walks + the part he rides = the total distance or 1.

① $x/40 + x/10 = 1$

② $x + 4x = 40$ ① × 40

③ $5x = 40$ ② same values

④ $x = 8$ ③ ÷ 5.

Check:

8 × 1/40 = 1/5 of distance

8 × 1/10 = 4/5 of distance

1 = total distance.

Ans.

16 min. to reach office; 8 min. walking, 8 min. riding.

Simple Interest Formula.—Write algebraically the rule: *To find the simple interest on a given principal for a given time, reduce the time to years and multiply the result by the principal and the rate of interest expressed as a decimal fraction.* This is an application of rules learned in connection with the time-rate-distance formula.

Let the principal be p, the time be t, the interest be i; then if the percentage is expressed as a decimal, r, we have $i = ptr$. For instance, the interest on \$228 for 5 years 3 months at 7 per cent is:

i = (\$228)(5.25)(.07) = \$83.79. *Ans.*

The same formula may be written:

$$p = \frac{i}{rt} \text{ or } t = \frac{i}{pr} \text{ or } r = \frac{i}{pt},$$

and solved for either p, t or r provided the other three quantities are known in each case.

SIMULTANEOUS LINEAR EQUATIONS

Elimination by Subtraction.—The type of simultaneous equations we shall now consider involves pairs of equations with two unknown quantities, as x and y. They are called simultaneous because we solve them by finding one pair of numbers that will check both equations at the same time. A linear equation is one whose graph is always a straight line, as we shall see later.

We are now ready to solve them by algebraic means.

$$(1) \quad \begin{cases} ① \; x + 2y = 11 \\ ② \; x + y = 8 \end{cases}$$

Why can we not solve this pair as we did our simple equations at the beginning of algebra? Because we have *two* unknowns, x and y. If we could eliminate one unknown we could go ahead as before.

The question then is how to get rid of one letter. There is one step that will eliminate the x's in the two equations above.

Shall we add, subtract, multiply or divide the expressions?

Try it. The one that succeeds is subtraction.

③ $y = 3$ ① − ②

This gives us one answer. Finding the other is an entirely different task. If we know that $x + y$ is 8 and that y is 3, how can we find x?

④ $x + 3 = 8$ ③ substituted in ②
We substitute the 3 in place of y in ②
⑤ $x = 5$ ④ − 3
Check: *Ans.*
① $5 + 2(3) = 11$ $x = 5$
$5 + 6 = 11$ $y = 3$
$11 = 11$
② $5 + 3 = 8$
$8 = 8$

More Subtraction.

(2) ① $5x + y = 21$
② $3x + y = 13$
③ $2x = 8$ ① − ②
④ $x = 4$ ③ ÷ 2
⑤ $20 + y = 21$ ④ sub. in ①
⑥ $y = 1$ ⑤ − 20
Check: *Ans.*
① $5(4) + 1 = 21$ $x = 4$
$20 + 1 = 21$ $y = 1.$
$21 = 21$
② $3(4) + 1 = 13$
$12 + 1 = 13$
$13 = 13$

(3) ① $6x + y = 22$ *Ans.*
② $5x + y = 19$ $x = 3$
$y = 4.$

(4) $x + 8y = 11$ (Solution is left
$x + 13y = 16$ to the student.)

(5) ① $2x + 7y = 52$
② $2x - 3y = 8$
③ $10y = 60$ ① − ②
④ $y = 6$ ③ ÷ 10
⑤ $2x + 42 = 52$ ④ in ①
⑥ $2x = 10$ ⑤ − 42
$x = 5$ ⑥ ÷ 2
Check: *Ans.*
① $10 + 42 = 52$ $x = 5$
$52 = 52$ $y = 6.$
② $10 - 18 = -8$
$-8 = -8$

Elimination by Addition.

(6) ① $8y + x = 23$
② $6y - x = 5.$

Here is something new. Subtracting one of these equations from the other will not eliminate x. What process will do so? Addition.

③ $14y = 28$ ① + ②
④ $y = 2$ ③ ÷ 14
⑤ $16 + x = 23$ ④ in ①
$x = 7$ ⑤ − 16
Check: *Ans.*
① $16 + 7 = 23$ $x - 7$
$23 = 23$ $y = 2.$
② $12 - 7 = 5$
$5 = 5$

(7) ① $6x + 9y = 66$
② $-6x - 2y = -38$
③ $7y = 28$ ① + ②
④ $y = 4$ ③ ÷ 7
⑤ $6x + 36 = 66$ ④ in ①
⑥ $6x = 30$ ⑤ − 36
⑦ $x = 5$ ⑥ ÷ 6
Check: *Ans.*
$30 + 36 = 66$ $x = 5$
$-30 - 8 = -38$ $y = 4.$

(8) $10x - 2y = 96$ (Solution is left
$8x + 2y = 84$ to the student.)

Making the Coefficient Equal.

(9) ① $5x + 8y = 34$
② $9x + 2y = 24.$

In this pair of equations neither addition nor subtraction will eliminate x or y. Why did the x's drop out in exercise 5 when we subtracted, while they will not do so in exercise 9? Because the two x's had the same coefficient. If we can alter our equations so that either the x's or the y's will have the same coefficient, we can subtract and go ahead. If we multiply ② by 4, what coefficient will y have?

③ $36x + 8y = 96$ ② × 4
④ $-31x = -62$ ① − ③
⑤ $x = 2$ ④ ÷ −31
⑥ $10 + 8y = 34$ ⑤ in ①
⑦ $8y = 24$ ⑥ − 10
⑧ $y = 3$ ⑦ ÷ 8
Check: *Ans.*
① $10 + 24 = 34$ $x = 2$
$34 = 34$ $y = 3.$
② $18 + 6 = 24$
$24 = 24$

(10) ① $6x + 4y = 90$
② $3x + 15y = 123.$

First we shall make the coefficients of the x's alike.

③ $6x + 30y = 246$ ② × 2
④ $-26y = -156$ ① − ③
⑤ $y = 6$ ④ ÷ −26
⑥ $6x + 24 = 90$ ⑤ in ①
⑦ $6x = 66$ ⑥ − 24
⑧ $x = 11$ ⑦ ÷ 6
Check: *Ans.*
① $66 + 24 = 90$ $x = 11$
$90 = 90$ $y = 6.$
② $33 + 90 = 123$
$123 = 123$

(11) $2x + 7y = 49$ (Solution is left
$6x - 5y = 17$ to the student.)

(12) ① $4x + 3y = 22$
② $3x + 5y = 11.$

In this pair we cannot make the coefficients of either x or y alike by multiplying either equation. How shall we accomplish it? By multiplying *both* equations.

③ $12x + 9y = 66$ ① × 3
④ $12x + 20y = 44$ ② × 4
⑤ $-11y = 22$ ③ − ④
⑥ $y = -2$ ⑤ ÷ −11
⑦ $4x + 3(-2) = 22$ ⑥ in ①
⑧ $4x - 6 = 22$ ⑦ same values
⑨ $4x = 28$ ⑧ + 6
⑩ $x = 7$ ⑨ ÷ 4
Check: *Ans.*
① $28 - 6 = 22$ $x = 7$
$22 = 22$ $y = -2.$
② $21 - 10 = 11$
$11 = 11.$

We can just as well solve Exercise 12 by eliminating the y's instead of the x's. Try it.

③ $20x + 15y = 110$ ① × 5
④ $9x + 15y = 33$ ② × 3
⑤ $11x = 77$ ③ − ④
⑥ $x = 7$ ⑤ ÷ 11
⑦ $28 + 3y = 22$ ⑥ in ①
⑧ $3y = -6$ ⑦ − 28
⑨ $y = -2$ ⑧ ÷ 3.

Check by comparing this pair of answers with the pair obtained by the first method. *Ans.* $x = 7$ $y = -2.$

(13) ① $\frac{2x}{3} + \frac{3y}{4} = 700$
② $y + 100 = \frac{5x}{6}$
③ $8x + 9y = 8400$ ① × 12
④ $6y + 600 = 5x$ ② × 6
⑤ $-5x + 6y = -600$ ④ transposing
⑥ $16x + 18y = 16800$ ③ × 2
⑦ $-15x + 18y = -1800$ ⑤ × 3
⑧ $31x = 18600$ ⑥ − ⑦
⑨ $x = 600$ ⑧ ÷ 31
⑩ $4800 + 9y = 8400$ ⑨ in ③
⑪ $9y = 3600$ ⑩ − 4800
⑫ $y = 400$ ⑪ ÷ 9
Check: *Ans.*
① $\frac{1200}{3} + \frac{1200}{4} = 700$ $x = 600$ $y = 400.$
$400 + 300 = 700$
$700 = 700$
② $400 + 100 = \frac{3000}{6}.$
$500 = 500$

(14) ① $\frac{x+3}{y+3} = \frac{5}{6}$
② $\frac{x-3}{y-3} = \frac{2}{3}$
③ $6(x + 3) = 5(y + 3)$ ① ×6(y+3)
④ $6x + 18 = 5y + 15$ ③ same values
⑤ $6x - 5y = -3$ ④ transposing
⑥ $3(x - 3) = 2(y - 3)$ ② ×3(y−3)
⑦ $3x - 9 = 2y - 6$ ⑥ same values
⑧ $3x - 2y = 3$ ⑦ transposing
⑨ $6x - 4y = 6$ ⑧ × 2
⑩ $-y = -9$ ⑤ − ⑨
⑪ $y = 9$ ⑩ + y + 9
⑫ $3x - 18 = 3$ ⑪ in ⑧
⑬ $3x = 21$ ⑫ + 18
⑭ $x = 7$ ⑬ ÷ 3
Check: *Ans.*
① $\frac{10}{12} = \frac{5}{6}$ $x = 7$ $y = 9.$
$\frac{5}{6} = \frac{5}{6}$
② $\frac{4}{6} = \frac{2}{3}$
$\frac{2}{3} = \frac{2}{3}.$

Rules

1. *If necessary, multiply or divide the equations by such numbers as will make the coefficients of one of the unknown quantities numerically equal.*
2. *Eliminate by addition if the resulting coefficients have unlike signs; by subtraction if they have like signs.*

Simultaneous equations need not be confined to two unknown quantities. In many problems it is necessary to use three, four or even more letters to designate the various quantities. It must always be possible, however, to form *as many distinct equations as there are unknown quantities.*

For three unknown numbers, we must have three different equations; for four unknown numbers, we must have four different equations and so on.

POWERS AND ROOTS

Powers of Numbers.—The *power* of a number is the product obtained by using that number a certain number of times as a factor. Thus, $2 \times 2 \times 2 \times 2$, written 2^4, is the fourth power of 2. In this case the *exponent*, 4, means that 2 is taken four times as a factor.

To raise a power of a number to any power, multiply the exponent of the power of the number by the exponent of the required power. Observe the following:

$$2^2 = 4,\ (2^2)^3 = 2^6 = 64,$$
$$(2^2)^2 = 2^4 = 16,\ (2^2)^4 = 2^8 = 256.$$

LAW OF SIGNS FOR POWERS: 1. *All powers of a positive number are positive.*

2. *Even powers of a negative number are positive, and odd powers are negative.*

POSITIVE	NEGATIVE
$2^1 = 2$	$(-2)^1 = -2$
$2^2 = 4$	$(-2)^2 = 4$
$2^3 = 8$	$(-2)^3 = -8$
$2^4 = 16$	$(-2)^4 = 16$

POWERS OF PRODUCTS AND QUOTIENTS: 1. *Any power of a product is equal to the product of its factors each raised to that power.*

EXAMPLE:

$$(3\cdot4)^2 = (3\cdot4)(3\cdot4) = 3\cdot3\cdot4\cdot4\cdot = 3^2\cdot4^2.$$

2. *Any power of a quotient of two numbers is equal to the quotient of the numbers each raised to that power.*

EXAMPLE:

$$\left(\frac{3}{4}\right)^2 = \frac{3}{4}\frac{3}{4} = \frac{3^2}{4^2}.$$

TO RAISE A MONOMIAL TO ANY POWER: *Raise the numerical coefficient to the required power and multiply the exponent of each letter in the term by the exponent of the required power. Make the answer positive or negative according to the law of signs.*

EXAMPLE: Find the fifth power of $-3xy^2$.

$$(-3xy^2)^5 = (-3xy^2)(-3xy^2)(-3xy^2)(-3xy^2)(-3xy^2) = -243x^5y^{10}.$$

TO RAISE A FRACTION TO ANY POWER: *Raise both numerator and denominator to the required power and give the proper sign to the result.*

EXAMPLE: What is the square of $-\frac{3a^4b^2}{8c^3x}$?

$$\left(-\frac{3a^4b^2}{8c^3x}\right)^2 = -\frac{3a^4b^2}{8c^3x} \times -\frac{3a^4b^2}{8c^3x} = \frac{9a^8b^4}{64c^6x^2}$$

Exercises

Raise to the power indicated:

(1) $(3)^4$ (4) $(-6xy^4)^3$ (7) $\left(\frac{2a}{5b^2}\right)^2$

(2) $(-2)^7$ (5) $(4a^3y^6)^5$ (8) $\left(-\frac{3x}{2y}\right)^3$

(3) $(ab^2c^3)^2$ (6) $(-1)^{10}$

Powers of Polynomials.—The method of squaring binomials has already been treated in the sections on multiplication and factoring. In general, the square of any polynomial equals the sum of the squares of each of the terms added to twice the product of each term by each term that follows. By application of this principle, we see by inspection that:

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$ and

$(a + b - c)^2 = a^2 + b^2 + c^2 + 2ab - 2ac - 2bc.$

What are the squares of $(a - b - c)$ and $(a - b + c)$?

Exercises

Square the following polynomials:

(1) $2x + 3y^2$ (3) $4a + 2b - 3c$

(2) $2a + b + c$ (4) $3b - 5x^2 - 4y$

By multiplication, raise the following to the required power:

(5) $(x + y)^3$ (7) $(4 + y)^4$

(6) $(a - b)^3$ (8) $(a - b)^4$

Roots of Numbers.—The symbol $\sqrt{}$ is called a *radical sign* or a *radical* and means that the *square root* of a number is to be taken. The number beneath the sign is the number of which the root is to be taken. Thus, $\sqrt{16} = 4$. The square root of a number is one of its two equal factors. Every positive number has a positive and a negative square root. As we have seen, two negative numbers multiplied together give a positive number, so that any positive number formed by multiplying two positive numbers together can just as well be formed by multiplying the same two negative numbers together. Thus, 4 times 4 equals 16; but -4 times -4 also equals 16. Both $+4$ and -4 are square roots of $+16$. The positive root is called the *principal square root*, indicated by the symbol $\sqrt{25}$, meaning the principal square root of 25, which is $+5$. The corresponding negative root would be $-\sqrt{25}$ or -5. If both roots are required, we use the double sign ± (read "plus or minus").

One of the three equal factors of a number is called its *cube root*; one of the four equal factors, its *fourth root* and so on. The cube root of a is written $\sqrt[3]{a}$, the fourth root of a is $\sqrt[4]{a}$. The small number in the opening of the radical sign, as 3 in $\sqrt[3]{a}$, is called the *index* of the root. When no index appears on the radical sign, the square root is meant. The process of finding a root of a number is the inverse of the process of finding a power of a number. Observe that:

Since $2^3 = 8$, therefore $\sqrt[3]{8} = 2$.

Since $(-2)^3 = -8$, therefore $\sqrt[3]{-8} = -2$.

Since $2^4 = 16$ and $(-2)^4 = 16$, therefore, $\sqrt[4]{16} = \pm 2$.

A root is called *odd* or *even* according to whether its index is odd or even.

The real root of a number, if it has the same sign as the number, is called the *principal root* of the number. Thus, the principal square root of 25 is 5, not -5; the principal cube root of 8 is 2, and of -8 is -2.

LAW OF EXPONENTS: *The exponent of any root of a number is equal to the exponent of the number divided by the index of the root.*

EXAMPLE:

$$\sqrt[3]{2^6} = 2^{\frac{6}{3}} = 2^2.$$

LAW OF SIGNS: *An odd root of a number has the same sign as the number, and an even root may have either sign.* We may confirm this law from the preceding examples.

ROOTS OF PRODUCTS AND QUOTIENTS: *Any root of a product may be found by taking that root of each of the factors and obtaining the product of the results.*

EXAMPLE:

$$\sqrt{25a^2} = \sqrt{25}\,\sqrt{a^2} = \pm 5a.$$

Any root of the quotient of two numbers is equal to that root of the dividend divided by that root of the divisor.

EXAMPLE:

$$\sqrt[4]{\frac{16}{81}} = \frac{\sqrt[4]{16}}{\sqrt[4]{81}} = \frac{\sqrt[4]{2^4}}{\sqrt[4]{3^4}} = \pm\frac{2}{3}.$$

ROOTS OF MONOMIALS: *To obtain the root of a monomial, find the required root of the numerical coefficient, annex to it the letters, each with its exponent divided by the index of the root sought, and give the proper sign to the result.*

EXAMPLE: Find the cube root of $-64x^6y^{18}$.

$$\sqrt[3]{-64x^6y^{18}} = -4x^2y^6.$$

TO FIND THE ROOT OF A FRACTIONAL TERM: *Obtain the required root of both numerator and denominator and prefix the proper sign to the resulting fraction.*

EXAMPLE: Find the square root of

$$\frac{36x^2y^8}{49a^4b^{10}}.$$

$$\sqrt{\frac{36x^2y^8}{49a^4b^{10}}} = \frac{\sqrt{36x^2y^8}}{\sqrt{49a^4b^{10}}} = \pm\frac{6xy^4}{7a^2b^5}.$$

Exercises

Find the indicated roots:

(1) $\sqrt[3]{a^3b^6c^9}$ (5) $\sqrt[4]{\frac{16a^8}{81b^4}}$

(2) $\sqrt{16x^4y^2}$

(3) $\sqrt[7]{-a^7b^{14}}$ (6) $\sqrt{\frac{9(a-b)^2}{16(a+3b)^2}}$.

(4) $\sqrt[3]{(-a^2b)^9}$

TO FIND THE SQUARE ROOT OF A POLYNOMIAL: This process is best illustrated directly from an example.

EXAMPLE: Find the square root of $x^2 + 2xy + y^2$.

$$\begin{array}{r|l}
x^2 + 2xy + y^2 & \underline{x + y} \\
 & \pm(x + y),\ Ans. \\
\underline{x^2 \qquad\qquad} & \\
\text{Trial divisor, } 2x & 2xy + y^2 \\
\text{Complete divisor, } 2x + y & \underline{2xy + y^2.}
\end{array}$$

From the section on Factoring, we already know that $x^2 + 2xy + y^2$ is the square of $x + y$, and therefore $\sqrt{x^2 + 2xy + y^2} = \pm(x + y)$. The answer will always be "plus or minus," since $-(x + y)$ as well as $+(x + y)$ may be the square root. Referring to the calculation above:

The first term of the answer, x, is found by taking the square root of x^2, the first term of the power. Subtracting x^2 leaves a remainder of $2xy + y^2$.

The second term of the answer, y, is found by dividing the first term of the remainder, $2xy$, by twice the part of the answer already found. This is called a *trial divisor*.

Now since $2xy + y^2$ equals $y(2x + y)$, then $2x + y$ is the complete divisor that, multiplied by y, gives the remainder, $2xy + y^2$; in other words the complete divisor is found by adding the second term of the answer to twice the first term of the answer.

On multiplying the complete divisor by the second term of the answer and subtracting, there is no remainder. Hence, $x + y$ is the required root.

Use the above method in following the solution of this problem: Find the square root of

$$6x + 1 - 12x^3 + 5x^2 + 4x^4.$$

(NOTE: Before the roots can be found, the example must be arranged according to the ascending or descending powers of some letter.)

$$\begin{array}{l|l}
4x^4 - 12x^3 + 5x^2 + 6x + 1 & \underline{2x^2 - 3x - 1} \\
\underline{4x^4 \qquad\qquad\qquad\qquad} & \pm(2x^2 - 3x - 1),\ Ans. \\
\quad 4x^2 & -12x^3 + 5x^2 \\
\quad 4x^2 - 3x & \underline{-12x^3 + 9x^2} \\
\qquad 4x^2 - 6x & -4x^2 + 6x + 1 \\
\qquad 4x^2 - 6x - 1 & \underline{-4x^2 + 6x + 1.}
\end{array}$$

The square roots of simpler forms involving three terms may often be found easily by factoring (see *Factoring*, this article).

Exercises

Find the square roots of the following and check by squaring the results:

(1) $4x^2 + 12xy^2 + 9y^4$

(2) $16x^2 - 56xy + 49y^2$

(3) $4a^4 + 5a^2 + 1 - 4a^3 - 2a$

(4) $4c^4 - 4c^3 + 5c^2 - 2c + 1$

(5) $12a^3 - 2a^2 - 4a + 9a^4 + 1$

(6) $a^4 - 2a^2b + 2a^2c^2 - 2bc^2 + b^2 + c^4$

EXPONENTS AND RADICALS

Exponents.—As we have already seen, an exponent is a small figure or letter written above and to the right of a number to indicate how many times the number is taken as a factor; for example, $a \cdot a \cdot a \cdot a = a^4$, meaning that a is taken four times as a factor. The exponent 1 is never written, for a^1 is the same as a.

Each of the following laws governing exponents is first stated algebraically and then followed by an explanation.

$$\boxed{a^m \cdot a^n = a^{m+n}}$$

To multiply powers of the same number, add the exponents of the number in each factor and write the sum as the exponent of the product.

EXAMPLE: Multiply $2a^2xy^3$ by $4a^3x^2$ by $3a^4x^2y^2$.

$2a^2xy^3 \cdot 4a^3x^2 \cdot 3a^4x^2y^2 = 24a^{2+3+4}x^{1+2+2}y^{3+2} = 24a^9x^5y^5$.

$$\boxed{a^m \div a^n = a^{m-n}}$$

To divide powers of the same number, subtract the exponents of the divisor from the exponents of the dividend and write the difference as the exponent of the quotient.

EXAMPLE: Divide $15a^5x^3y$ by $3a^3x^2$.

$$\frac{15a^5x^3y}{3a^3x^2} = 5a^{5-3}x^{3-2}y^{1-0} = 5a^2xy.$$

$$\boxed{(a^m)^n = a^{mn}}$$

To raise the power of a number to any power, multiply the exponent of the power of the number by the exponent of the required power and write the result as the exponent of the number.

EXAMPLE: Simplify $(3a^2bx^3)^3$.

$$(3a^2bx^3)^3 = 3^3a^{2\times3}b^3x^{3\times3} = 27a^6b^3x^9.$$

$$\boxed{\sqrt[n]{a^m} = a^{m \div n}}$$

To extract the root of a power of a number, divide its exponent by the index of the root and write the quotient as the exponent of the required root.

EXAMPLE: Find the cube root of $8a^6x^3$.

$$\sqrt[3]{8a^6x^3} = \sqrt[3]{8} \cdot a^{6\div3} \cdot x^{3\div3} = 2a^2x.$$

Zero, Negative and Fractional Exponents.—These types of exponents derive their meanings and properties from the first law quoted above. Thus in the formula

$$a^m \cdot a^n = a^{m+n},$$

if $n = 0$, then $a^m \cdot a^0 = a^{m+0} = a^m$.

Dividing by a^m, $a^0 = \dfrac{a^m}{a^m} = 1$.

Hence, *any number (except zero) having a zero exponent is equal to 1.*

Again, in the formula $a^m \cdot a^n = a^{m+n}$,
if $m = -n$, then $a^{-n} \cdot a^n = a^{-n+n} = a^0$.
But we know that $a^0 = 1$.
Therefore, $a^{-n} \cdot a^n = 1$.
Dividing by a^n, $a^{-n} = \dfrac{1}{a^n}$.

Hence, *any number with a negative exponent is equal to the reciprocal of the same number with an equal positive exponent.* By this definition it may be proved in turn that *any factor may be transferred from one term of a fraction to the other, if the sign of the exponent is changed, without affecting the value of the fraction.* Algebraically, this is stated:

$$\frac{a^{-m}}{b^{-n}} = \frac{b^n}{a^m}.$$

Referring once more to the formula for the first law of exponents,

$$\text{since } a^m \cdot a^n = a^{m+n},$$
$$\text{then } a^{\frac{1}{2}} \cdot a^{\frac{1}{2}} = a^{\frac{1}{2}+\frac{1}{2}} = a^1 = a.$$

From this we see that $a^{\frac{1}{2}}$ is one of the two equal factors of a, or is a square root of a.

Again, $a^{\frac{3}{2}} \cdot a^{\frac{3}{2}} = a^{\frac{3}{2}+\frac{3}{2}} = a^3$.

That is, $a^{\frac{3}{2}}$ is a square root of the cube of a. Stated as a general principle: *the numerator of a fractional exponent indicates a power, and the denominator indicates a root. The fraction as a whole indicates a root of a power or a power of a root.* Thus, $a^{\frac{3}{2}}$ can be written either $\sqrt{a^3}$ or $(\sqrt{a})^3$.

Radicals.—An indicated root of a number is called a *radical*, and the number whose root is required is the *radicand;* for example, $\sqrt{7a}$, $\sqrt[3]{a^4+3}$, $(a+b)^{\frac{1}{2}}$, $(x^3)^{\frac{1}{3}}$ are radicals whose radicands are $7a$, $a^4 + 3$, $a + b$ and x^3, respectively.

The *order* of a radical is shown by the index of the root or the denominator of the fractional exponent; for example, $\sqrt{a+b}$ and $(x+y)^{\frac{1}{2}}$ are radicals of the second order, and $\sqrt[3]{a+b}$ and $(x+y)^{\frac{1}{3}}$ are radicals of the third order.

A *rational number* is a number that can be expressed as an integer or fraction with integral terms; for example, 4, $\frac{1}{3}$, $\sqrt{36}$.

An *irrational number* is one that cannot be expressed as an integer or fraction with integral terms; for example, $\sqrt{2}$, $2 + \sqrt{3}$.

A *surd* is an indicated root of a rational number that is not a perfect power to the index of the root. The $\sqrt{2}$ is thus a surd, because 2 is a rational number, but is not the perfect square of any other rational number. The $\sqrt{9}$ is not a surd, because 9 is a perfect square (of 3). The $\sqrt{\frac{4}{9}}$ is not a surd, because $\frac{4}{9}$ is the square of $\frac{2}{3}$.

All surds are irrational, but not all irrational numbers are surds. Note that $\sqrt{1} + \sqrt{2}$ is irrational but it is not a surd because $1 + \sqrt{2}$ is irrational.

The notion of irrational numbers is very important not only in algebra but in all mathematics, and it is worth while to consider the idea a little more carefully. We have said that $\sqrt{2}$ is an irrational number, and that an irrational number cannot be exactly expressed as an integer or as fraction.

Consider the numbers 1.4 and 1.5.
The square of 1.4 is 1.96.
The square of 1.5 is 2.25.
That is, $(1.4)^2$ is less than 2;
$(1.5)^2$ is greater than 2.

The $\sqrt{2}$, therefore, is some number greater than 1.4 and less than 1.5. Suppose we try 1.41:

$(1.41)^2 = 1.9881$ (not quite enough).
$(1.42)^2 = 2.0164$ (slightly too much).
Try 1.414;
$(1.414)^2 = 1.999396$ (still not enough).
Try 1.4143
$(1.4143)^2 = 2.00024449$ (slightly too much).

By a systematic method taught in arithmetic for extracting square root, we may calculate $\sqrt{2}$ to as many decimal places as we please, but no matter how many decimal places we use, if we were actually to carry out the multiplication we would get an answer slightly greater than 2 or slightly less than 2.

We could never reach the exact square root of 2, although we could express it within limits of accuracy as small as desired. The value calculated to 9 decimal places is 1.414213562.

How can we be certain of this? May we not some day, by calculating long enough, find a number exactly equal to $\sqrt{2}$?

The answer is "No," and the *proof* is one of the most interesting pieces of reasoning in all mathematics. We have learned enough algebra to be able to understand the proof. Let us see what we can make of it.

Suppose there really are two integral, that is, whole numbers, such that their ratio is exactly equal to $\sqrt{2}$. These numbers might be very large, but we do not need to do any extensive calculation. Let us suppose such numbers really do exist and let us call them a and b.

We are to suppose then, that

$$\frac{a}{b} = \sqrt{2}.$$

We suppose, also, that the fraction $\frac{a}{b}$ is in its *lowest terms;* that is, that a and b have no common factor. At least one of the two numbers a and b, therefore, must be *odd*, for if both were even, we should be able to reduce the fraction $\frac{a}{b}$ to lower terms by dividing numerator and denominator by 2. Now if

$$\frac{a}{b} = \sqrt{2},\ \frac{a^2}{b^2} = 2 \text{ and } a^2 = 2b^2.$$

If any two odd numbers are multiplied together the result is an odd number. (This statement can be proved, but we need not show the proof here.)

Therefore a must be *an even number.* (If a were an odd number a^2 would be odd; but a^2 is even, because it is equal to $2b^2$, which is even.)

Since a is even, b must be odd (since both cannot be even) and b^2 also must be odd.

Since a is even, we may divide a by 2 and the result will be an integer, say c.

The equation

$$a^2 = 2b^2$$

therefore may be divided by 2 with the result

$$\frac{a^2}{2} = b^2 \text{ or } \frac{a}{2}a = b^2 \text{ or } ca = b^2.$$

But a is even.
Therefore ca is even.
But b^2 is odd.

Therefore the statement $ca = b^2$ is impossible.

This means that there cannot be two integers a and b such that

$$\frac{a}{b} = \sqrt{2}.$$

It is of no use to carry the calculation of $\sqrt{2}$ to many decimal places; though we might compute a thousand or a million decimal places, we could never express $\sqrt{2}$ *exactly*.

This analysis is worth trying to understand as it enables us to see clearly what is meant by an *irrational number*.

A surd having a rational coefficient, as $2\sqrt{2}$, is called a *mixed surd;* without the coefficient it is an *entire surd.*

Reduction of Radicals.—A radical is *reduced* or *simplified* when the radicand is integral and contains no factor that is a perfect power to the index of the radical. A radical may be simplified by separating it into two factors, one of which is its rational factor (whose root can be found exactly) and writing the latter as the coefficient of the irrational factor.

EXAMPLE: Simplify $\sqrt{20a^6}$,

$$\sqrt{20a^6} = \sqrt{4a^6 \times 5} = \sqrt{4a^6}\sqrt{5} = 2a^3\sqrt{5}.$$

A radical with a fractional radicand may be simplified by reducing it to a radical having an integral radicand.

EXAMPLE: Simplify $\sqrt{\frac{a^4}{3x^3}}$.

$$\sqrt{\frac{a^4}{3x^3}} = \sqrt{\frac{a^4 \cdot 3x}{3x^3 \cdot 3x}} = \sqrt{\frac{a^4}{9x^4}} \cdot \sqrt{3x} = \frac{a^2}{3x^2}\sqrt{3x}.$$

To reduce a mixed surd to an entire surd, raise the coefficient to a power equal to the index of the radical and put the result under the radical as a factor.

EXAMPLE: Reduce $3x\sqrt{5a}$ to an entire surd.

$$3x\sqrt{5a} = \sqrt{9x^2}\sqrt{5a} = \sqrt{9x^2 \cdot 5a} = \sqrt{45x^2a}.$$

To reduce radicals to the same order, show the given radicals with fractional exponents having the lowest common denominator; then raise each number to the power indicated by the numerator of the fractional exponent, and the common denominator will be the index of the common root.

EXAMPLE: Reduce $\sqrt{3}$, $\sqrt[3]{4}$, and $\sqrt[4]{5}$ to radicals of the same order.

$$\sqrt{3} = 3^{\frac{1}{2}} = 3^{\frac{6}{12}} = \sqrt[12]{3^6} = \sqrt[12]{729}$$

$$\sqrt[3]{4} = 4^{\frac{1}{3}} = 4^{\frac{4}{12}} = \sqrt[12]{4^4} = \sqrt[12]{256}$$

$$\sqrt[4]{5} = 5^{\frac{1}{4}} = 5^{\frac{3}{12}} = \sqrt[12]{5^3} = \sqrt[12]{125}.$$

Addition and Subtraction of Radicals.—Radicals of the same order (having the same root index) and having the same radicand are called *similar radicals.* Thus, $2\sqrt{5}$ and $4\sqrt{5}$ are similar radicals. *Only similar radicals can be united into one term by adding or subtracting.*

EXAMPLE: Find the sum of $\sqrt{18}$, $\sqrt{8}$, and $\sqrt{32}$. All these radicals are of the same order, but before they can be added they must have also the same radicand:

$$\begin{aligned} \sqrt{18} &= \sqrt{9 \cdot 2} = 3\sqrt{2} \\ \sqrt{8} &= \sqrt{4 \cdot 2} = 2\sqrt{2} \\ \sqrt{32} &= \sqrt{16 \cdot 2} = 4\sqrt{2} \\ \hline \text{Sum} &= 9\sqrt{2}. \end{aligned}$$

EXAMPLE: Unite

$$\sqrt{12} + 3\sqrt{75} - 2\sqrt{27} =$$
$$2\sqrt{3} + 15\sqrt{3} - 6\sqrt{3} = 11\sqrt{3}.$$

Multiplication of Radicals.—*Radicals, to be multiplied together, must be of the same order; that is, they must have a common root index.*

EXAMPLE: Multiply $\sqrt{3}$ by $\sqrt{7}$.

$$\sqrt{3} \times \sqrt{7} = \sqrt{3 \times 7} = \sqrt{21}.$$

Both these radicals, being square roots, are of the same order and therefore do not need to be reduced before multiplying. When radicals are not of the same order, the best method of reduction is by the use of fractional exponents, as we have seen above.

EXAMPLE: Multiply $3\sqrt{2}$ by $4\sqrt[3]{5}$.

$$3\sqrt{2} \times 4\sqrt[3]{5} = 3 \cdot 2^{\frac{1}{2}} \times 4 \cdot 5^{\frac{1}{3}} =$$
$$3 \cdot 2^{\frac{3}{6}} \times 4 \cdot 5^{\frac{2}{6}} = 3\sqrt[6]{2^3} \times 4\sqrt[6]{5^2} =$$
$$3\sqrt[6]{8} = 4\sqrt[6]{25} = 12\sqrt[6]{8 \times 25} = 12\sqrt[6]{200}.$$

Division of Radicals.—*To divide one radical by another, the radicals must be of the same order.*

EXAMPLE: Divide $6\sqrt{14}$ by $2\sqrt{7}$.

$$6\sqrt{14} \div 2\sqrt{7} = \frac{6}{2}\sqrt{14} \div \sqrt{7} = 3\sqrt{2}.$$

From the laws of exponents, remember that when two numbers are divided, the exponent of the divisor is *subtracted* from the exponent of the dividend. Naturally then, when fractional exponents are subtracted they must have a common denominator. Observe:

$$m^{\frac{1}{2}} \div m^{\frac{1}{3}} = m^{\frac{1}{2}-\frac{1}{3}} = m^{\frac{3}{6}-\frac{2}{6}} = m^{\frac{1}{6}} = \sqrt[6]{m}.$$

EXAMPLE: Divide $\sqrt[3]{2}$ by $\sqrt{2}$.

$$\sqrt[3]{2} \div \sqrt{2} = 2^{\frac{1}{3}} \div 2^{\frac{1}{2}} = 2^{\frac{2}{6}} \div 2^{\frac{3}{6}} =$$
$$\sqrt[6]{2^2} \div \sqrt[6]{2^3} = \sqrt[6]{4} \div \sqrt[6]{8} = \sqrt[6]{\frac{4}{8}} = \sqrt[6]{\frac{32}{64}} =$$
$$\frac{1}{2}\sqrt[6]{32}.$$

Note in the above example that, in order further to simplify $\sqrt[6]{4/8}$, we multiplied both numerator and denominator by 8 to get $\frac{32}{64}$. Since 2 is the sixth root of 64, we can bring it out of the radical as a coefficient; but 64 was the denominator of a fraction; therefore 2, the sixth root of 64, also must be brought out of the radical as the denominator of a fraction. Remembering that $\sqrt{a}$ is the same as $1\sqrt{a}$, the 2 is placed under the 1, giving $\frac{1}{2}$ as the coefficient of $\sqrt[6]{32}$.

We could reach the same result by using our laws of exponents as follows:

$$3\sqrt{2} \div \sqrt{2} = 2^{\frac{1}{3}} \div 2^{\frac{1}{2}} = 2^{\frac{2}{6}} \div 2^{\frac{1}{6}} = 2^{-\frac{1}{6}}$$

$$\frac{1}{2^{\frac{1}{6}}} = \frac{2^{\frac{5}{6}}}{2^{\frac{5}{6}} \cdot 2^{\frac{1}{6}}} = \tfrac{1}{2}2^{\frac{5}{6}} = \tfrac{1}{2}\sqrt[6]{2^5} = \tfrac{1}{2}\sqrt[6]{32}.$$

The only step in the above series of equalities that may not seem obvious is the transformation of $\frac{1}{2^{\frac{1}{6}}}$ into $\frac{2^{\frac{5}{6}}}{2^{\frac{5}{6}} \cdot 2^{\frac{1}{6}}}$. Why did we multiply the numerator and denominator of the fraction $\frac{1}{2^{\frac{1}{6}}}$ by $2^{\frac{5}{6}}$? We did it in order to remove the fractional exponent from the denominator. A fraction containing radicals or fractional exponents is not regarded as in its simplest form until *the denominator is rational,* that is, free from radicals or fractional exponents.

Rationalization.—The process of multiplying both terms of a fraction containing a surd by any number that will make the denominator rational is called *rationalizing the denominator.*

EXAMPLE: Rationalize the denominator of $\frac{4}{\sqrt{3}}$.

$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}.$$

Multiplying both members of the fraction by the same factor (in this case, $\sqrt{3}$) does not change the value of the fraction. The $\sqrt{3}$ is called the *rationalizing factor.* Again,

$$\frac{2}{\sqrt[3]{a^2}} = \frac{2}{\sqrt[3]{a^2}} \times \frac{\sqrt[3]{a}}{\sqrt[3]{a}} = \frac{2\sqrt[3]{a}}{\sqrt[3]{a^3}} = \frac{2\sqrt[3]{a}}{a} = \frac{2}{a}\sqrt[3]{a}.$$

A binomial having surds for one or both of its terms is called a *binomial surd,* as, $2 + \sqrt{3}$, $\sqrt[3]{2} + \sqrt{5}$.

A binomial surd, one or both of whose surds are of the second order (square roots), is a *binomial quadratic surd,* as, $\sqrt{2} + \sqrt{5}$, $x + \sqrt{y}$.

Two binomial quadratic surds differing only in the sign of one of the terms are called *conjugate surds,* as, $\sqrt{3} + \sqrt{2}$ and $\sqrt{3} - \sqrt{2}$. A binomial quadratic surd may be rationalized by multiplying it by its conjugate, for

$$(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2}) = (\sqrt{3})^2 - (\sqrt{2})^2 = 3 - 2.$$

QUADRATIC EQUATIONS

The equations we have so far considered have contained no higher power of the unknown quantity than the first. Such an equation is called a *simple* or *linear equation.* (The reason for this second name will be evident when we study the representation of equations by graphs.) An equation that contains the second power of the unknown number (that is, x^2) is called a *quadratic equation* or an equation of the *second degree.* The following are examples of quadratic equations:

① $3x^2 - 5x = 7$　④ $x^2 - 16 = 0$
② $2x^2 = 3x$　⑤ $ax^2 + bx + c = 0.$
③ $x^2 + x = 2$

The last example is especially important, as it represents the general form to which all quadratic equations may be reduced.

Thus, ① may be written:
$3x^2 - 5x - 7 = 0.$
② may be written:
$2x^2 - 3x + 0 = 0.$
③ may be written:
$x^2 + x - 2 = 0.$
④ may be written:
$x^2 + 0x - 16 = 0.$

All these are special cases of the general type

$$ax^2 + bx + c = 0,$$

in which a, b and c have different values, positive, negative or 0. However complicated a quadratic equation may be, it can always be reduced to this form.

The degree of an equation is the highest power of the *unknown* quantity. Known numbers may, of course, appear in an equation as letters and may have various exponents, but this does not affect the degree of the equation. Such an equation as:

$$a^2x + c^3x + d^5 = 1$$

is simple or linear with respect to x, the unknown quantity. If the quantities a, c, and d are treated as known, we can solve the above equation by the rules already learned:

$$\begin{aligned} a^2x + c^3x + d^5 &= 1 \\ (a^2 + c^3)x &= 1 - d^5 \\ x &= \frac{1 - d^5}{a^2 - c^3}. \end{aligned}$$

Consider the equation:

$$x^2 - 7x + 12 = 0.$$

By the rules already learned for factoring trinomials, we can factor the left-hand member thus:

$$x^2 - 7x + 12 = (x - 3)(x - 4).$$

Therefore, $(x - 3)(x - 4) = 0.$

Now *if any number of factors give a zero product, one or more of the factors must equal zero,* and *if any number of factors are multi-*

plied together, the product will be zero if any one of the factors is zero.

The equation $(x - 3)(x - 4) = 0$ will be satisfied, therefore, *by any value of* x *for which either of the two factors reduces to zero,* while any value of x which does not reduce one of the factors to zero will not satisfy the equation.

We therefore have either

$$x - 3 = 0 \text{ or } x - 4 = 0.$$

That is, $x = +3$ or $x = +4$.

These are the roots of the equation:

$$x^2 - 7x + 12 = 0.$$

We may check them by substitution as follows:

$3^2 - 7 \cdot 3 + 12 = 9 - 21 + 12 =$
$21 - 21 = 0$
$4^2 - 7 \cdot 4 + 12 = 16 - 28 + 12 =$
$28 - 28 = 0.$

Equations containing both the first and second power of the unknown number are called *complete* quadratic equations. Such, for example, is the last equation solved. If only the square of the unknown number appears the equation is called an *incomplete* or *pure* quadratic.

All incomplete quadratics can be reduced to the type:

$$ax^2 + b = 0 \text{ or } x^2 + \frac{b}{a} = 0.$$

That is, $x^2 - \left(-\frac{b}{a}\right) = 0$ or

$$x^2 - \left[\sqrt{-\frac{b}{a}}\right]^2 = 0.$$

This may be factored as a difference of two squares:

$$x^2 - \left[\sqrt{-\frac{b}{a}}\right]^2 = 0;$$

$$\left(x + \sqrt{-\frac{b}{a}}\right)\left(x - \sqrt{-\frac{b}{a}}\right) = 0.$$

That is,

$$x = \pm\sqrt{-\frac{b}{a}}.$$

We have solved the equation in this way to show how it resolves into a *problem of factoring;* if a and b were arithmetical numbers, we should simply reduce the equation to

$$x^2 = -\frac{b}{a}.$$

Then, $x = \pm\sqrt{-\frac{b}{a}}.$

Every quadratic equation has two roots, that is, there are always *two* values that will *satisfy* the equation. In advanced algebra it is proved generally that *every equation has as many roots as the highest power of* x *appearing in the equation;* that is, every equation containing x^3 (and no higher power of x) has three roots; every equation containing x^4 has four roots and so on.

We now pass to problems leading to quadratic equations.

Problem 33.—A farmer sets out apple trees so that the number of trees in a row is two more than the number of rows. If there are 624 trees, how many rows are there, and how many trees in a row?

Let x = no. of rows.
Then $x + 2$ = no. of trees in a row.
$x(x + 2)$ = no. of trees in all (624).

① $x(x + 2) = 624$
② $x^2 + 2x = 624$ ① same values
③ $x^2 + 2x - 624 = 0$ ② -624
④ $(x + 26)(x - 24) = 0$ ③ factored.

We have here two numbers multiplied together giving as a product zero. This is only possible if one or the other of the numbers equals zero.

⑤ $x + 26 = 0$
⑥ $x - 24 = 0$
⑦ $x = -26$ ⑤ $+ 26$

This cannot be the answer, for a negative number will not satisfy the conditions of the problem; i.e., there cannot be *minus* 26 rows. Therefore, the other value for x must be correct:

⑧ $x = 24$ ⑥ $+ 24$

Check: $x + 2 = 26$
24 rows of 26 = 624 trees
Ans.
24 rows; 26 trees in a row. 26 rows would be the answer if the problem read, "two fewer trees in a row than the number of rows."

Try Problem 33 with these numbers.

1. 5 more trees in a row than the number of rows; trees in all, 500.
2. 6 more trees in a row than the number of rows; trees in all, 216.
3. 8 more trees in a row than the number of rows; trees in all, 128.

Problem 34.—A rectangle is 15 feet long, and its area is 36 sq. ft. more than a square of the same width. How wide is it?

Let x = no. of ft. in width of rectangle (and square).
$15x$ = no. of sq. ft. in area of rectangle.
x^2 = no. of sq. ft. in area of square.
Area of square plus 36 sq. ft. = area of rectangle.
That is

① $x^2 + 36 = 15x$
② $x^2 - 15x + 36 = 0$ ① $-15x$
③ $(x - 12)(x - 3) = 0$ ② factored
④ $x - 12 = 0$
⑤ $x - 3 = 0$
⑥ $x = 12$ ④ $+12$
⑦ $x = 3$ ⑤ $+3$

Check:	*Ans.*
12′ by 12′ = 144 12′ by 15′ = 180 144 + 36 = 180.	Rectangle is 12 ft. wide.
Or 3′ by 3′ = 9 3′ by 15′ = 45 9 + 36 = 45.	Rectangle is 3 ft. wide.

Here we have *two* answers to one problem and both answers are correct.

Problem 35.—A rectangular room takes 68 feet of picture molding and 32 square yards of carpet. What is the size of the room?

Let x = no. of feet in width (short side).
$2x$ = no. of feet in two short sides.

$68 - 2x$ = no. of feet in two long sides, because there are 68 feet in all four sides.

½$(68 - 2x)$ = no. of ft. in length. That is, $34 - x$.

$x(34 - x)$ = no. of sq. ft. in area. That is, 288.

[Change 32 square yards to feet.]

① $x(34 - x) = 288$
② $34x - x^2 = 288$ ① same values
③ $0 = x^2 - 34x + 288$ ② $+x^2 - 34x$
④ $0 = (x - 18)(x - 16)$ ③ factored
⑤ $x = 18$, or 16

Check:	*Ans.*
18 18 16 16 — 68 ft. of molding	18′ by 16′.

18 × 16 = 288 sq. ft. ≡ 32 sq. yds.

These problems all reduced to equations in the form

$$ax^2 + bx + c = 0,$$

and in each case it was comparatively easy to find the factors by trial and error. Quadratic equations that actually appear in practical work, however, are rarely of the type with small integral roots; they do not "come out even," as the saying goes. We need a method for handling quadratics that will work regardless of whether the coefficients happen to be of the right value to make the root a small integer. Such a method is that of *completing the square.*

Consider the perfect trinomial square:

$$(x + a)(x + a) = x^2 + 2ax + a^2.$$

Note that the *coefficient* of x is *twice the square root* of the last term, a^2; that is, $2a = 2\sqrt{a^2}$. The last term, a^2, is *the square of half the coefficient* of x.

If we inquire what number must be added to an expression in the form $x^2 + mx$ to render it a perfect square, we see that this can be done by *adding the square* of $\frac{1}{2}m$; that is, $\frac{1}{4}m^2$.

Suppose now, we have a quadratic equation in the form

$$x^2 + mx + n = 0.$$

We can rewrite it as follows:

$$x^2 + mx + \tfrac{1}{4}m^2 + n - \tfrac{1}{4}m^2 = 0.$$

That is,

$(x + \frac{1}{2}m)^2 + n - \frac{1}{4}m^2 = 0$
or $(x + \frac{1}{2}m)^2 - (\frac{1}{4}m^2 - n) = 0$
or $(x + \frac{1}{2}m)^2 - [\sqrt{\frac{1}{4}m^2 - n}]^2 = 0.$

This last expression is in the familiar form of the *difference of two squares* and may thus be factored.

The factors are:

$$(x + \tfrac{1}{2}m + \sqrt{\tfrac{1}{4}m^2 - n})(x + \tfrac{1}{2}m - \sqrt{\tfrac{1}{4}m^2 - n}) = 0.$$

Whence, $x = -\frac{1}{2}m \pm \sqrt{\frac{1}{4}m^2 - n} = -\frac{1}{2}m \pm \frac{1}{2}\sqrt{m^2 - 4n}.$

Let us try this method with a numerical problem:

$$x^2 - 8x + 5 = 0.$$

The coefficient of x is -8; ½ the coefficient is -4; $(-4)^2 = +16$.

We therefore complete the square of the first two terms by adding $+16$.

$x^2 - 8x + 16 + 5 - 16 = 0$
or $(x - 4)^2 - 11 = 0$
or $(x - 4)^2 - (\sqrt{11})^2 = 0.$
$(x - 4 + \sqrt{11})(x - 4 - \sqrt{11}) = 0$
$x - 4 + \sqrt{11} = 0$
$x = 4 - \sqrt{11} = 4 - 3.32 = .68$
$x - 4 - \sqrt{11} = 0$
$x = 4 + \sqrt{11} = 4 + 3.32 = 7.32.$

Check:
$(7.32)^2 - 8 \cdot 7.32 + 5 - 53.5 - 58.6 + 5 =$
$-5.1 + 5 = 0$ (nearly).
$(.68)^2 - 8 \cdot .68 + 5 = .462 - 5.45 + 5 =$
$-4.99 + 5 = 0$ (nearly).

(Notice the slight discrepancy in the check that is always to be expected in approximate computation.)

The general quadratic equation:

$$ax^2 + bx + c = 0$$

may be solved by the method of completing the square. Its solution enables us to solve at once any quadratic equation whatever, since we can always reduce a quadratic equation to the above form.

Consider: $ax^2 + bx + c = 0$

Dividing by a, $x^2 + \frac{b}{a}x + \frac{c}{a} = 0.$

The coefficient of x is now $\frac{b}{a}$; $\frac{1}{2}$ the coefficient is $\frac{b}{2a}$; the square of $\frac{b}{2a}$ is $\frac{b^2}{4a^2}$.

Completing the square of the first two terms we have:

$$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} + \frac{c}{a} - \frac{b^2}{4a^2} = 0$$

That is,

$$\left(x + \frac{b}{2a}\right)^2 + \frac{c}{a} - \frac{b^2}{4a^2} = 0$$

$$\left(x + \frac{b}{2a}\right)^2 - \left(\frac{b^2}{4a^2} - \frac{c}{a}\right) = 0$$

$$\left(x + \frac{b}{2a}\right)^2 - \left(\frac{b^2 - 4ac}{4a^2}\right) = 0$$

$$\left(x + \frac{b}{2a}\right)^2 - \left[\sqrt{\frac{b^2 - 4ac}{4a^2}}\right]^2 = 0$$

$$\left(x + \frac{b}{2a}\right)^2 - \left(\frac{\sqrt{b^2 - 4ac}}{2a}\right)^2 = 0$$

$$\left(x + \frac{b}{2a} + \frac{\sqrt{b^2 - 4ac}}{2a}\right)$$
$$\left(x + \frac{b}{2a} - \frac{\sqrt{b^2 - 4ac}}{2a}\right) = 0$$

$$\left(x + \frac{b + \sqrt{b^2 - 4ac}}{2a}\right)$$
$$\left(x + \frac{b - \sqrt{b^2 - 4ac}}{2a}\right) = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

This last result, called the *quadratic formula*, should be committed to memory, as it is of fundamental importance in all advanced work with algebra. Any quadratic equation may be solved by reducing it to the general form and substituting the numerical value of a, b and c in the formula.

EXAMPLE: Solve by the quadratic formula $2x^2 + 5x = 3$.

$$2x^2 + 5x = 3$$
$$2x^2 + 5x - 3 = 0.$$

Now we know that $a = 2$, $b = 5$, and $c = -3$. Substituting in the formula:

$$x = \frac{-5 \pm \sqrt{25 - 4 \cdot 2(-3)}}{2 \cdot 2} =$$

$$\frac{-5 \pm \sqrt{25 + 24}}{4} = \frac{-5 \pm 7}{4}$$

$$x = \tfrac{1}{2} \text{ or } -3.$$

Check by substituting these values in the first equation:

$$2\left(\frac{1}{2}\right)^2 + 5\left(\frac{1}{2}\right) = 3 \qquad 2(-3)^2 + 5(-3) = 3$$

$$\frac{2}{4} + \frac{5}{2} = 3 \qquad 2(9) + (-15) = 3$$

$$\frac{6}{2} = 3 \qquad 18 - 15 = 3$$

$$3 = 3. \qquad 3 = 3.$$

General Rules for Solving Quadratics

1. *Reduce the equation to the form*

$$ax^2 + bx + c = 0.$$

2. *Solve by factoring, if the factors are easily seen.*

3. *If the factors are difficult to find, solve by completing the square or by substituting in the formula.*

IMAGINARY NUMBERS

The Number System.—Thus far in our study of algebra we have encountered and used the following general types of numbers: the ordinary integers or *natural numbers*—1, 2, 3, 4 and so on; *fractions*, resulting from the division of one natural number by another (both natural numbers and their fractions are rational); *negative numbers*, which are the opposite of positive numbers and result from the subtraction of a number from a lesser number; and *irrational* numbers, resulting from the attempt to extract the root of a number that is not a perfect power, such as $\sqrt{2}$. There now remains one more form to be examined.

Definition and Properties of Imaginary Numbers.—The attempt to extract an even root of a negative number results in an *imaginary number*. Having understood the definitions and properties of the other types of numbers, we need consider this case only briefly.

By reversing the definition above, it is seen that *the square of an imaginary number is negative*. This is the fundamental property of imaginaries, and it requires explanation, presenting as it does an apparent exception to the law of signs. Ordinarily we should assume that $\sqrt{-1} \times \sqrt{-1}$ is the same as $\sqrt{(-1)(-1)}$, which equals $\sqrt{+1}$, or ± 1; but this cannot be true, for we know that the square of the square root of a number must be the number itself. Therefore,

$\sqrt{-1} \times \sqrt{-1} = (\sqrt{-1})^2 = -1$, but *not* $+1$.

Since all other numbers are those whose squares are positive, they are sometimes called *real numbers*, to distinguish them from imaginary numbers, whose squares are negative.

From the definition, $\sqrt{-1}$ is an imaginary, being the indicated *even root* of a negative number. By raising $\sqrt{-1}$ to powers, we see that *even powers of* $\sqrt{-1}$ *are real, and odd powers of* $\sqrt{-1}$ *are imaginary.*

$$(\sqrt{-1})^2 = (\sqrt{-1})(\sqrt{-1}) = -1$$
$$(\sqrt{-1})^3 = (\sqrt{-1})^2\sqrt{-1} =$$
$$-1\sqrt{-1} = -\sqrt{-1}$$
$$(\sqrt{-1})^4 = (\sqrt{-1})^2(\sqrt{-1})^2 =$$
$$(-1)(-1) = +1$$
$$(\sqrt{-1})^5 = (\sqrt{-1})^4\sqrt{-1} =$$
$$+1\sqrt{-1} = +\sqrt{-1}.$$

It is customary in mathematics to denote $\sqrt{-1}$ by the letter i.

The powers of i have the curious property of repeating themselves for each increase of 4 in the exponent.

Thus:

$i^0 = +1$; $i^1 = +i$; $i^2 = -1$; $i^3 = -i$;
$i^4 = +1$; $i^5 = +i$; $i^6 = -1$; $i^7 = -i$;
$i^8 = +1$; and so on.

Roots of Quadratic Equations.—The ability to recognize real and imaginary numbers is important in identifying the roots of more advanced quadratic equations.

The roots of the general quadratic equation

$$ax^2 + bx + c = 0$$

are, as we have seen,

$$\frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ and } \frac{-b - \sqrt{b^2 - 4ac}}{2a}.$$

The expression under the radical sign, $b^2 - 4ac$, is called the *discriminant* of the equation, and its value enables us to determine the character of the roots of the equation as follows:

1. If $b^2 - 4ac$ is *positive*, the roots are *real* and *unequal*.

2. If $b^2 - 4ac$ equals *zero*, the roots are *real* and *equal*.

3. If $b^2 - 4ac$ is *negative*, the roots are *imaginary* and *unequal*.

4. If $b^2 - 4ac$ is a *square* or equals *zero*, the roots are *rational;* otherwise they are *irrational*.

Remember that all quadratic equations have two and only two roots.

Every equation may be regarded as a problem of factoring. Equations of a degree higher than the second are often difficult to factor and require for their solution refined methods. A few simple cases, however, can be handled by the methods we have already learned, and since they give us a glimpse into a fascinating field of more advanced mathematics, we give them here.

Consider the equation:

$$x^3 = 1.$$

It is obvious that 1 is a root of this equation, since 1^3 is certainly equal to 1; but this is an equation of the third degree and must have 3 roots. What are the other two?

If $x^3 = 1$
$x^3 - 1 = 0.$
Factoring, $(x - 1)(x^2 + x + 1) = 0.$

The equation $x^3 = 1$ *will be satisfied by any value of* x *that makes either of these two factors equal to zero.*

The first factor $(x - 1)$ reduces to zero for the value $x = 1$. For what values of x does the second factor $(x^2 + x + 1)$ reduce to zero?

Let $x^2 + x + 1 = 0.$
By the quadratic formula

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1}}{2} = \frac{-1 + \sqrt{-3}}{2}$$

$$\text{or } \frac{-1 - \sqrt{-3}}{2} = \frac{-1 + i\sqrt{3}}{2}$$

$$\text{or } \frac{-1 - i\sqrt{3}}{2}.$$

(In these formulas i stands for $\sqrt{-1}$.)

These last two values are just as surely roots of the equation $x^3 = 1$ as 1 itself.

The number 1, therefore, has *three different cube roots;* namely, $+1$, $\frac{-1 + i\sqrt{3}}{2}$, $\frac{-1 - i\sqrt{3}}{2}$.

It will be a good practice in algebraic manipulation to verify this result by actually multiplying twice by itself one of these unfamiliar looking cube roots of 1. The result of the multiplication should be 1.

Consider the equation:

$$x^6 - 1 = 0$$

Factoring, $(x^3 - 1)(x^3 + 1) = 0$
$(x - 1)(x^2 + x + 1)(x + 1)(x^2 - x + 1) = 0.$
Let $(x - 1) = 0$
$x = +1$
$x^2 + x + 1 = 0$
$x = \frac{-1 \pm i\sqrt{3}}{2},$
$x + 1 = 0$
$x = -1$
$x^2 - x + 1 = 0$
$x = \frac{1 \pm i\sqrt{3}}{2}.$

There are thus six distinct 6th roots of 1.

In higher mathematics it is shown that there are *n nth roots of 1.*

THE SHARK SECTION

In this section are a few especially interesting and difficult questions and some examples of mathematical recreations or games. None of the problems requires more advanced mathematics than the algebra we have studied, but all take clear thinking. They will be a good test of your skill, but you should not be discouraged if you cannot solve them, as they are tricky and hard to see through. All the problems are solved at the end of this article. You can have more fun with them, however, if you spend a little effort trying to solve them yourself before turning to the answers.

Question A.—A prisoner escaped from a certain jail. His escape was discovered after an hour had elapsed, and one of the guards started in pursuit. It was known that the prisoner had taken a particular road, the only one available. After the guard had been gone for 40 minutes, the warden set out in pursuit in his automobile. The guard, mounted on a bicycle, was able to travel 6 miles an hour faster than the prisoner, and the warden in his car could travel 44 miles an hour faster than the guard. The warden and the guard overtook the prisoner at the same time. How far were they from the jail?

Question B.—In a certain two-figure number the first digit is 2 more than the second digit. When the two digits are multiplied together and the number divided by the product, the quotient is $2\frac{2}{3}$. What is the number?

Question C.—Mary is 24 years old. She is twice as old as Ann was when Mary was as old as Ann is now. How old is Ann? This question has puzzled thousands of people, but it is easily answered by the algebra we have learned.

Question D.—Diophantus passed $\frac{1}{12}$ of his life in infancy, $\frac{1}{6}$ in youth. Then he married and passed $\frac{1}{7}$ of his life and 5 years more. Then he had a son, whom he survived by 4 years, and who attained only half his father's age. How old was Diophantus when he died?

Question E.—A farmer sold a certain number of horses for $1320, receiving the same price for each horse. If he had sold one horse less but had charged $10 more for each, he would have received the same amount. How many horses did he sell and at what price?

Question F.—Archimedes, the great Greek mathematician, is said to have detected a substitution of base metal for gold in a crown made for King Hieron of Syracuse by weighing the crown under water and comparing its apparent loss of weight with the loss of weight when an equal mass of pure gold was weighed under water. *Archimedes's Principle* is a physical law that assures us that any body immersed in a liquid loses weight or is buoyed up by a force equal to the weight of the displaced liquid. (The volume of the displaced liquid is, of course, equal to the volume of the immersed body.)

Assume that the crown made for King Hieron weighed 85 ounces in air and 80.2 ounces when immersed in water. Eighty-five ounces of pure gold was found to weigh 80.6 ounces when immersed. If the adulterant used by the rascally goldsmith was copper, and if pure gold is 2.16 times as heavy as copper, volume for volume, what was the weight of gold stolen?

Question G.—This is another famous puzzler of a type similar to Question C, but a little more difficult.

The sum of the ages of Mr. and Mrs. Jones amounts to 56 years, and Mr. Jones is twice as old as his wife was when Mr Jones was 6 years older than his wife is today. How old are Jones and his wife?

Question H.—Not many people can solve this problem, but if you put your mind to it and think clearly, there is nothing in it that you will not be able to reason out.

A caravan of elephants 2 miles long is moving at the steady rate of 5 miles an hour along a straight road. At the rear of the caravan is an officer mounted on horseback. He has a message to deliver to the leader at the front of the caravan. He rides his horse at a steady pace, gradually overtaking the caravan's head. Upon arriving at the head, he delivers his message and without stopping turns and rides back to the rear. When he arrives at the rear, he finds the whole ride, to the head of the caravan and back, has taken 2 hours. How far did the officer ride, counting his distance both ways?

Question I.—Another famous question is this "coconut problem." A considerable amount of algebraic manipulation and reasoning is necessary for its solution.

Five men spent a day collecting coconuts. They piled all that were collected in a single pile, and it was agreed that they would be divided equally among the five men. Because the men were tired, it was decided to wait until morning to count the coconuts and make the division. With this understanding, the men went to bed.

Toward the middle of the night, one of the men awoke, decided that he could not trust the other four, and that the safest thing to do would be to get his share at once. He went out to the pile and counted the coconuts. He found that the coconuts numbered an exact multiple of five with one left over. The extra coconut he threw to a monkey that happened along and taking one-fifth of the coconuts, he returned to his bed.

A little later a second man of the group awoke, passed through similar reasoning as to the inadvisability of waiting till morning for his share, and also went out to the pile and counted the coconuts. Quite unaware that anyone had been at the pile before him, he assumed that the number he found was the whole number collected. He found that the coconuts numbered an exact multiple of five with one coconut over, just as the first man had found. He, too, threw the extra coconut to the monkey and retired with one-fifth of the remainder.

The third man, the fourth man and the fifth man in turn went to the pile and counted the coconuts. Each found a multiple of five with one over, each threw a coconut to the monkey and each took what he supposed was his proper share, that is one-fifth of the whole number he found after throwing away the extra one.

In the morning the five men went to the depleted pile, counted the coconuts, and again found an exact multiple of five with one coconut over. These they divided equally. What is the smallest number of coconuts that could have been in the original pile? If the problem seems too difficult for the case of five men, try it with three men.

RECREATIONS AND GAMES

There are some interesting games you can play with algebra. One of them is this Think-of-a-number game.

Think of any number.
Double it.
Add 14.
Divide by 2.
Subtract the number you thought of.
Your answer is 7.

When you tell another person that the answer is 7 after he has made mental calculations on a number he selected himself without telling you what it was, he is frequently much mystified; but a very little algebra explains the whole trick.

Suppose x is the number thought of.
After doubling, it will be $2x$.
After adding 14, it will be $2x + 14$.
After dividing by 2, it will be $x + 7$.
After subtracting x it will be 7.

That is, $\frac{2x + 14}{2} - x = 7$.

You can think of other simple algebraic formulas that will produce similar mystification.

Here is another game where a little algebra helps you to win.

Count out 25 buttons or toothpicks and put them in a pile. Now you and your friend draw from the pile in turns. The rules of the game allow you to draw 1, 2, 3 or 4 buttons when it is your turn to play and your opponent also may draw 1, 2, 3 or 4 when it is his turn. The object of the game is to force your opponent to draw the last button. Can you see a way to make sure of winning?

There is a simple rule or formula that states the conditions under which this game can be won. Since each player may take away 1, 2, 3 or 4 on a turn, it is clear that *it is always possible to reduce the pile by 5* in each cycle of 2 turns, your opponent's turn and your own. For if your opponent takes 1 on his turn, you may take 4 on yours; if he takes 2 you may take 3; if he takes 3 you may take 2, and if he takes 4 you may take 1.

If, therefore, there are 6 buttons left *and it is your opponent's turn to play*, you can win. (His turn and yours will diminish the pile by 5, leaving the last button for his next turn); but if there are 11 or (6 + 5) buttons left with it your opponent's turn to play, you can always arrange that there be 6 buttons left with it your opponent's turn to play again; that is, you can win. If there are 16 buttons left (6 + 5 + 5), the same situation exists. Finally, if there are 21 buttons left (your opponent to play) you can win. Thus, to win, you should play first and draw 4 (25 − 21) buttons; from that point on you should draw such a number as to make 5 with whatever your opponent draws. You will thus secure the 4th, the 9th, the 14th, the 19th and the 24th buttons (numbering the buttons in the order that they are taken away from the pile).

These are the *key* buttons; if you can secure any one of them, you can secure all the higher numbered ones. It might happen that your opponent was allowed the first turn, and he might take 4, thus securing the first key button. You would then take 1 or 2, hoping that upon the next turn he would take the wrong number. Having missed the 4th button, your object would be to get the 9th, or failing that, to get the 14th and so on. If your opponent has reasoned the game out, there would be no chance of winning, *he* would secure for himself all the key buttons; but it is very unlikely that he would select the right numbers by mere accident.

The game need not be played with just 25 buttons, nor need the limit on the number drawn in a single turn be 4. If there are n buttons and the limit for each turn is agreed on as r, then the remainder of the fraction

$$\frac{n - 1}{r + 1}$$

will determine the number to draw on the first turn in order to win; that is, the first key button and the various multiples of $r + 1$ added to the first key button will determine the rest of the keys. If $n - 1$ is exactly divisible by $r + 1$, if, for example, there are 31 buttons and the limit is 5, the player who takes the first turn is at a disadvantage and must always lose if his opponent plays correctly. The remainder of the fraction

$$\frac{n-1}{r+1}$$

in this case is 0, and the key buttons are the $(r + 1)$th, the $2(r + 1)$th, the $3(r + 1)$th and so on.

Algebraic Fallacies

In manipulating algebraic symbols it is necessary to be very careful that none of the fundamental laws are violated. Surprising and absurd results can be obtained from superficially sound chains of reasoning. Here are two examples that should put you on your guard.

1. Let $x = 3$, $y = 2$, $z = 5$.

Then ① $x + y = z$

② $(x + y)(x - y) = z(x - y)$ ① × $(x - y)$

③ $x^2 - y^2 = zx - zy$

④ $x^2 - zx = y^2 - zy$ (transposing terms)

⑤ $x^2 - zx + \frac{z^2}{4} = y^2 - zy + \frac{z^2}{4}$ ④ $+ \frac{z^2}{4}$

⑥ $\left(x - \frac{z}{2}\right)^2 = \left(y - \frac{z}{2}\right)^2$

⑦ $x - \frac{z}{2} = y - \frac{z}{2}$

⑧ $x = y$.

Therefore, $3 = 2$.

What is wrong with the above series of equations? Each one seems to be derived from the previous one by sound rules. Yet they lead to an absurd result. The error actually lies in the derivation of ⑦ from ⑥. At first glance it seems perfectly legitimate to assume that if the *squares* of two numbers are equal, the numbers are equal; but a little reflection shows that this need not be true. Every number has two square roots, a positive and a negative, and the positive root is not equal to the negative. Thus:

$$(-2)^2 = (+2)^2,$$

but -2 is not equal to $+2$. An analysis will show that ⑥ in the example given is of this type; that is, the quantities

$$x - \frac{z}{2} \text{ and } y - \frac{z}{2}$$

have opposite signs. Since $x + y = z$ we have:

$$x - \frac{z}{2} = x - \frac{x+y}{2} = \frac{1}{2}x - \frac{1}{2}y$$

$$y - \frac{z}{2} = y - \frac{x+y}{2} = \frac{1}{2}y - \frac{1}{2}x$$

But $\frac{1}{2}y - \frac{1}{2}x = -\left(\frac{1}{2}x - \frac{1}{2}y\right)$.

This is the reason that we get an absurd result by equating the square roots of both sides of ⑥.

2. Suppose $a = b = 1$.

Then ① $a^2 = ab$

② $a^2 - b^2 = ab - b^2$

③ $(a + b)(a - b) = b(a - b)$

④ $a + b = b$ ③ $\div\ a - b$

⑤ $a = 0$ ④ $-\ b$

Therefore, $1 = 0$.

This is a much easier fallacy to see through than the first one. Since $a = b$, $a - b = 0$. We are prohibited by the fundamental rules of algebra from *dividing by zero*. In deriving ④ by dividing ③ by $a - b$, we committed the blunder of a concealed division by zero, which leads to the incorrect result that $1 = 0$.

GRAPHS

Definition and Uses.—The relations between numbers listed in a long table often can be brought out more clearly by means of a picture or diagram called a *graph*, which shows at a glance the position of any number relative to any other number in the series. There are various types of graphs, but the one most commonly used, and with which we are here concerned, is a system of dots and lines plotted on squared paper.

The *graphic* method of presenting numerical data has many valuable applications in business and science. It is used by statisticians to supplement their tables; by stock brokers to show the trend of prices over a given period; by newspapers and magazines to indicate circulation figures; by manufacturers in charting sales; by nurses and physicians to mark the progress of diseases; and by scientists in many branches of laboratory research. The method has proved no less useful in mathematics, and its faculty of dramatizing "cold" numbers makes it one of the most interesting chapters in algebra.

A knowledge of the construction and interpretation of graphs has many applications that will be valuable to the student.

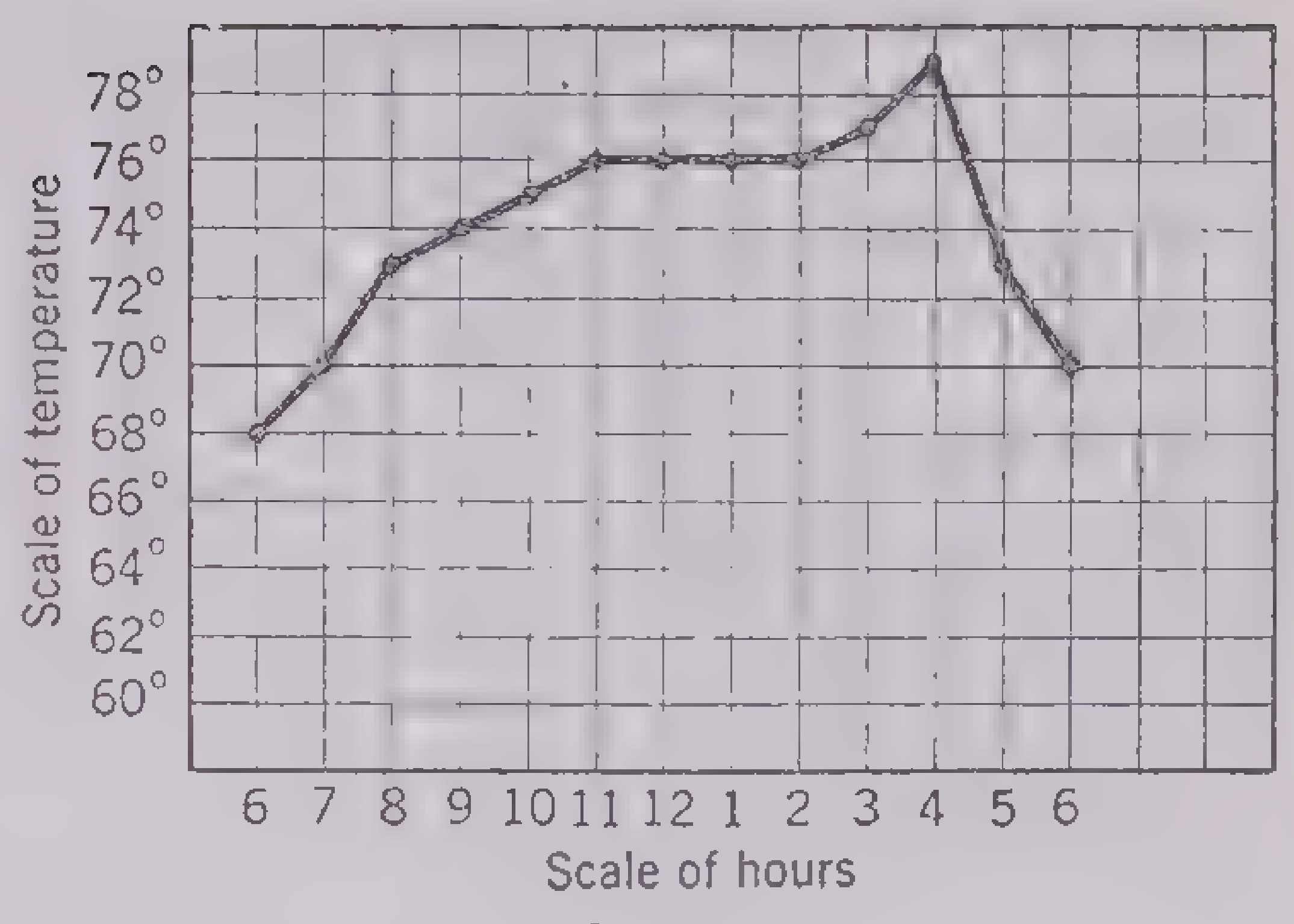
The Scale.—The scale of a graph is the relative proportion of its dimension to the corresponding objects represented. For example, study the scale of a thermometer. It is numbered up to perhaps 140° at the top and down to perhaps 40° below zero at the bottom. Temperatures are usually recorded by observers as + if above zero and as − if below zero. Our scale then goes from −40° to +140°. How many degrees is this in all? It is 140° above the zero mark and 40° below the zero mark, or 180° in all.

If you compare a very large thermometer with an ordinary small thermometer you will see that the space occupied by one degree on the large thermometer may be as much as one-fourth inch, while on the small one it is only perhaps one sixty-fourth inch. Evidently we can adapt the length of our degrees to fit any particular requirements. Would you use the same scale to record the temperatures of molten iron and the temperatures of a fever patient? The first step in the graphical method is to draw on paper a scale suited to the numbers of the problem.

Temperatures for a summer day are observed to be:

68° at 6 A.M.
70° at 7 A.M.
73° at 8 A.M.
74° at 9 A.M.
75° at 10 A.M.
76° at 11 A.M.
76° at 12 M.
76° at 1 P.M.
76° at 2 P.M.
77° at 3 P.M.
79° at 4 P.M.
73° at 5 P.M.
70° at 6 P.M.

Here are numbers that are changing, the hour of the day and the temperatures. We will represent the hours of the day on a horizontal scale by marking the first line of



GRAPH 1

the scale 6 A.M., the second line 7 A.M. and so on for 13 lines to the right, which brings us to 6 P.M.

The temperatures will be represented on a vertical or up-and-down scale. The range to be covered is from 68° to 79°. Suppose we call the lowest line 60°, the next line above 62° and so on up to 80°. We have now completed our two scales, at right angles to each other, and adapted them to the numbers we want to represent. How can we show that the temperature was 68° at 6 A.M.? By a dot on the 6 A.M. line just high enough to be on the 68° line. It is the first one at the left in the figure.

Next represent a temperature of 70° at 7 A.M. by a dot on the 7 A.M. line and just high enough to be on the 70° line. It is the second dot toward the right. Continue to plot the points as shown in the figure.

If we connect these dots with a broken line we shall have a graph that will show the approximate temperature at any hour of the day.

At about what time was the temperature highest? How does the graph show this? By the highest point, at 4 P.M. At what hours was the temperature changing very little if at all?

At 11, 12, 1 and 2 o'clock the temperature stood at 76°.

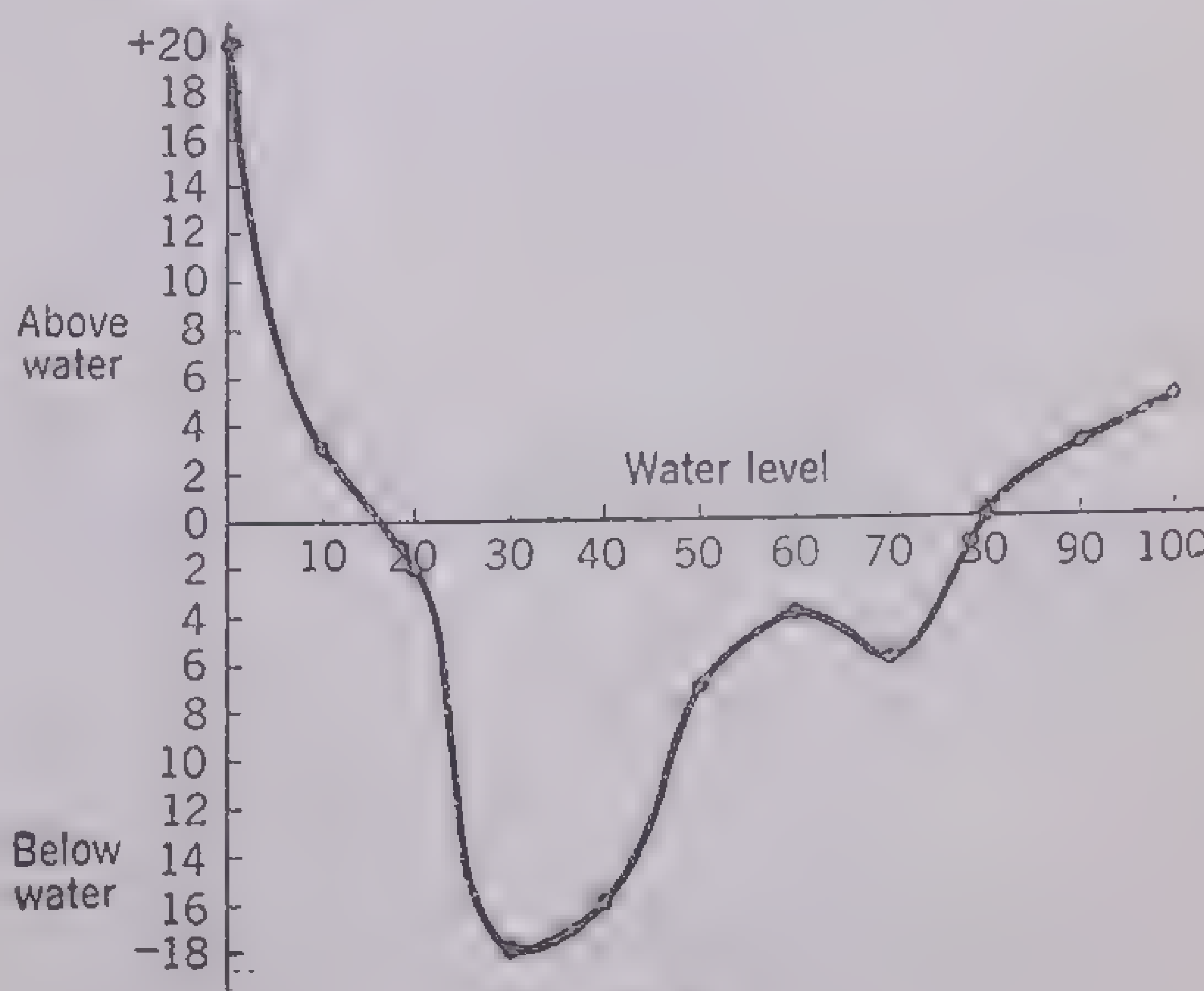
What was the coolest hour of the day? 6 A.M. This is shown by the lowest point on the graph.

As soon as we understand a graph we can see at a glance facts that would take some time to discover from a study of the table from which the graph was made. It is for this reason that graphs are used increasingly in magazines and by business and professional men.

If you secure from a stationer some properly ruled paper, you can draw these graphs yourself.

One more illustration of the use of a graph to show facts at a glance:

Measurements are made of the height of the banks of a river and of the depth of the river, at intervals of 10 feet, on a line that passes straight across the river from bank to bank.



GRAPH 2

The results are as follows, starting at the top of the left bank and making the measurements from the water level. (For convenience, heights *above* the water level are marked plus; depths *below* are marked minus.):

Distance left to right:
0 10 20 30 40 50 60 70 80 90 100
Height or depth:
+20 +3 −2 −18 −16 −7 −4 −6 0 +3 +5

The range on our horizontal scale will be 0′ to 100′. Let each space equal 5′.

The range on the vertical scale will be +20 to −18. Let each space equal 2′.

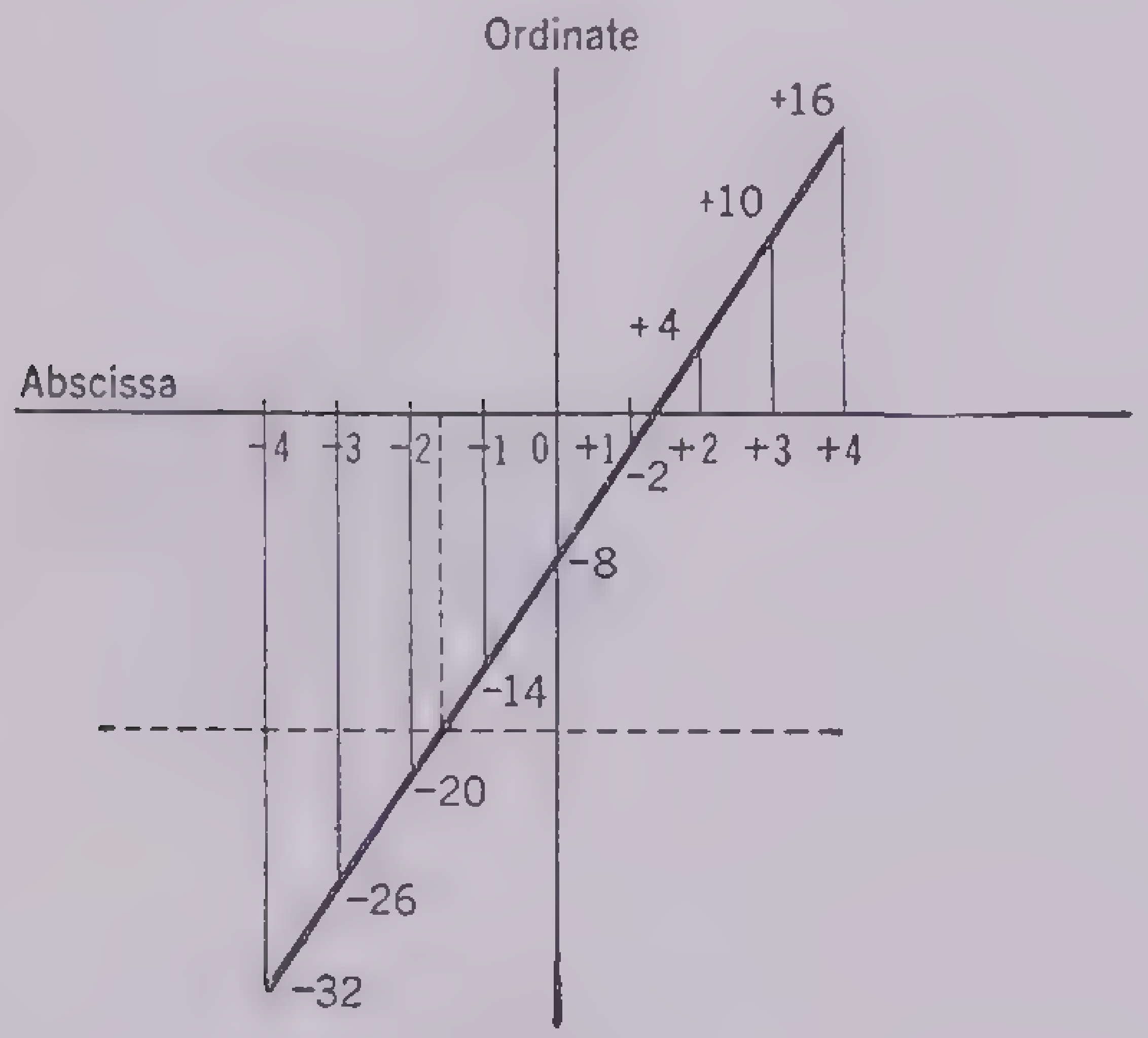
Locate the dots and connect them. This shows at a glance the approximate depth of the river at any point.

Where is the channel or deepest part of the river? About 30 feet from the top of left bank. Where is a shallow place? About 20 feet from the right edge of the river. Which bank is the steeper?

Graphs in Algebra.—A graph in algebra is really a picture of the table of values an expression can take when we give the letter it contains a series of values. From this point of view, the expression is called a *function* of the letter; for instance, $6x - 8$ is a function of x. We may tabulate some of the values it has thus:

When $x = -4, -3, -2, -1, 0, +1, +2, +3, +4$
$6x - 8 = -32, -26, -20, -14, -8, -2, +4, +10, +16.$

The values of $6x - 8$ are found by substituting arbitrary values for x in the expression. Thus, when $x = -4$, $6x - 8 = -24 - 8 = -32$. We plot these in a picture by laying off the values chosen for x on a horizontal scale, called the *abscissa* or x axis, and at each value of x we draw a perpendicular called an *ordinate* or y axis, which on its scale represents the value of $6x - 8$. Thus:



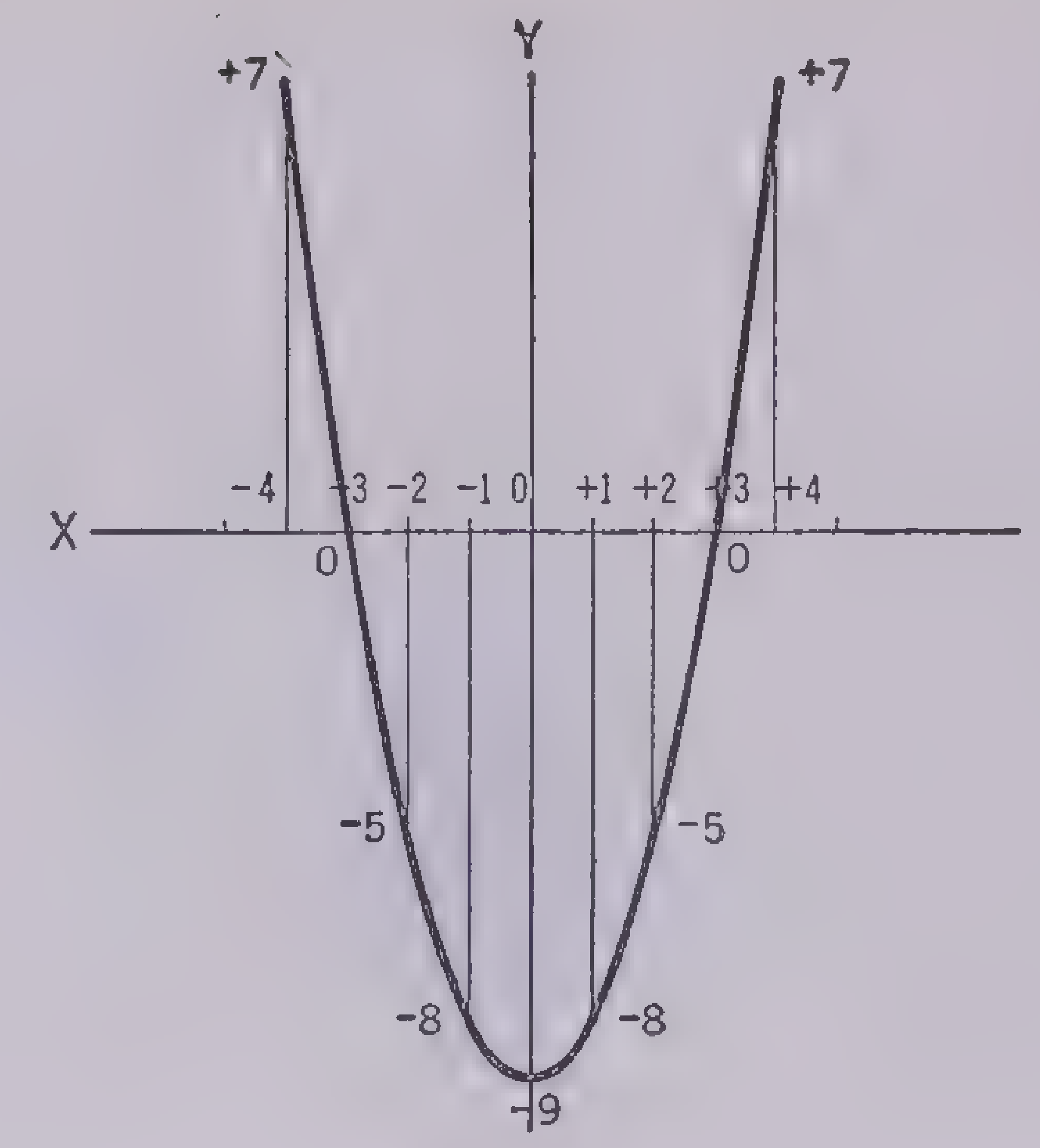
GRAPH 3

If we wish to find where $6x - 8$ has a given value, we draw a parallel to the x axis at the distance that is the value desired and notice where it crosses the graph line. In Graph 3, a line has been drawn at the distance -18, which crosses the graph line where $x = -1\frac{2}{3}$. This means, when $x = -1\frac{2}{3}$, the expression $6x - 8 = -18$.

A graph is not always a straight line for these expressions in x; for instance, let us consider the function $x^2 - 9$. The table of values is:

If $x = -4, -3, -2, -1, 0, +1, +2, +3, +4,$
then
$x^2 - 9 = +7, 0, -5, -8, -9, -8, -5, 0, +7.$

If we plot these values and draw a smooth line through the points, the line will be curved, as in the Graph 4. This type of curve is called a *parabola.*



GRAPH 4

We can use this graph equally well to find where the function has a given value.

Exercises

(1) Make a graph for $3x + 2$
(2) Make a graph for $3x - 2$
(3) Make a graph for $-3x + 2$
(4) Make a graph for $-3x - 2$
(5) Make a graph for $x^2 - 5x + 6$

The student should notice that we cannot really have a graph of an equation, but only of a function of a single letter. When we say "graph of an equation," it means that we have solved the equation for some one letter in terms of another, and then we plot the expression for the letter solved for. We may not get straight lines; for instance, in physics the formula for v, the velocity of a body that has fallen in a vacuum a distance s, is

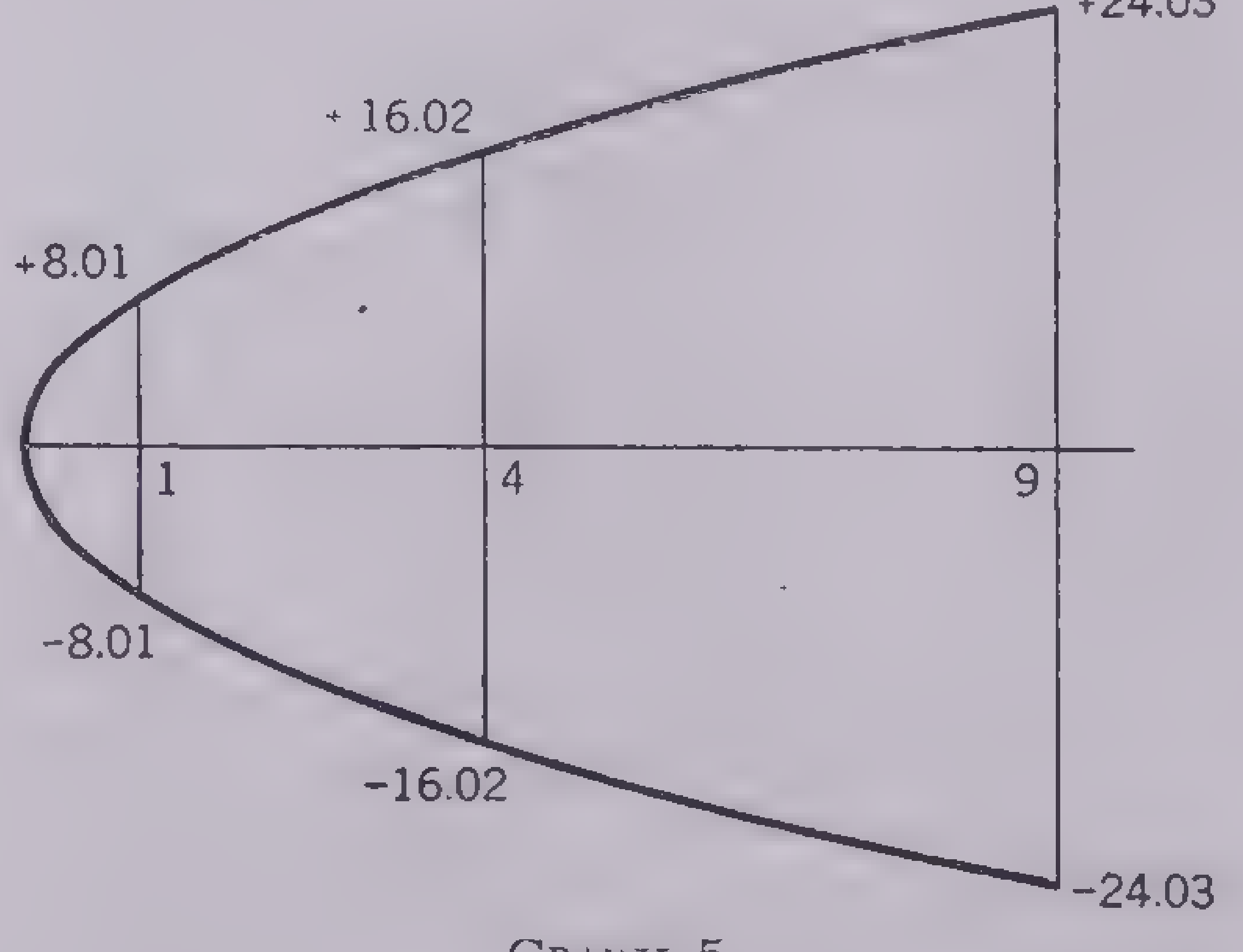
$$v^2 = 64.16s \text{ (feet per second).}$$

If we solve this for v, we will have two answers, since either a positive or a negative number will be positive when squared:

$$v = +8.01\sqrt{s} \text{ or } -8.01\sqrt{s}.$$

That means v has two values for each value of x. Choosing squares for the values of s, we have:

$s =$	0	+1	+4	+9
$v =$	+0	+8.01	+16.02	+24.03
and	−0	−8.01	−16.02	−24.03.



GRAPH 5

What is the explanation of the fact that there are two values of v for each value of s? The answer we learn in physics is that to be at a height s the body must have one of these values for a falling motion and the other for a rising motion.

Solution of Problems by Graphs

Problem 36.—Six horses and 11 cows cost \$810. Thirteen horses and 5 cows, at the same prices as before, cost \$1190. Find the cost of each animal.

Let x = the no. of \$ for 1 horse.

It is not easy to find an expression in x for the number of dollars for 1 cow. We can, however, choose some other letter to represent this number of dollars.

Let y = the no. of \$ for 1 cow.
$6x$ = the no. of \$ for 6 horses.
$11y$ = the no. of \$ for 11 cows.

From the first statement in the problem:
① $6x + 11y = 810$
From the second statement:
② $13x + 5y = 1190.$

Each equation contains two quantities that may change in value; namely, x and y. In ① if $x = 124$, y will equal 6. Try it for yourself. Substitute 124 for x; $6x$ will then be 744.

③ $744 + 11y = 810$
④ $11y = 66$ ③ − 744
⑤ $y = 6$ ④ ÷ 11
In the same way if $y = 0$ in ①
⑥ $6x + 0 = 810$
⑦ $x = 135$ ⑤ ÷ 6.

Substitute any number you choose in place of y and you can find a value for x. For every value of x there is a corresponding value for y.

Equation ① cannot be said to have an answer, but it has an unlimited number of *pairs* of *answers*. If $x = 124$ and $y = 6$, $6x + 11y$ will equal 810. Try it. $744 + 66 = 810$.

Again if $x = 135$ and $y = 0$, $6x + 11y$ will equal 810.

Try it. $810 + 0 = 810$.

You have probably already discovered that we have just the conditions needed for a graph; namely, two numbers that change together.

Make a table of values for ①:

①

x	y
0	$73\frac{7}{11}$
135	0
$129\frac{1}{2}$	3
124	6
113	12
47	48

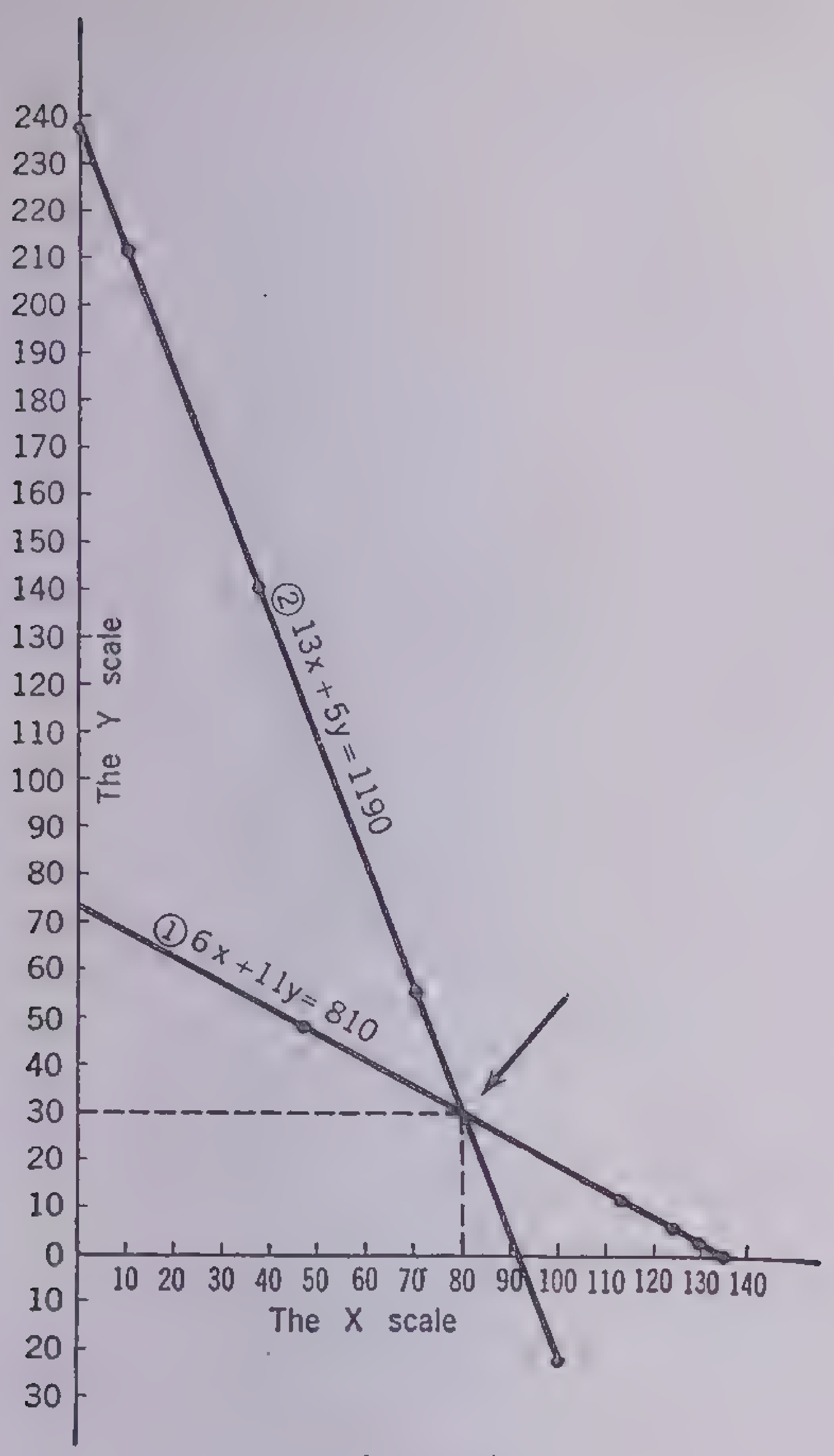
The first pair was found by letting $x = 0$. The second pair, by letting $y = 0$. The third, by letting $y = 3$, and so on. Make a similar table for ②.

②

x	y
0	238
$91\frac{7}{13}$	0
10	212
40	134
70	56
100	−22

The complete range for x, in both equations, is from 0 to 135. Let each space represent 10. It is customary to represent x on the horizontal scale or axis. The complete range for y is −22 to 238. Represent the values of y on the vertical axis, letting each space represent 10.

We are now ready to represent each pair of values by a dot on the graph. Take the first equation first. The first pair is 0 for x



GRAPH 6

and $73\frac{7}{11}$ for y. Where is the 0 line for x? It is the vertical line on which we have placed the y scale. How far upward on this line shall we go? To $73\frac{7}{11}$, that is, about $\frac{1}{3}$ of the distance from 70 to 80.

Now the second dot, $x = 135$, $y = 0$. Where is the $x = 135$ line? It is a vertical line midway between the numbers 130 and 140. How far upward on this line shall we go? Only to $y = 0$. In other words, we do not go upward at all. The dot is on the x axis. The third dot, $x = 129\frac{1}{2}$, $y = 3$. This is almost over to the 130 line, and how far up? Up 3, that is about $\frac{1}{3}$ of the distance from 0 to 10. Locate all the dots for ①.

Connect these dots with a line. The line through all these points is a *straight line*. It is called the *graph* or the *locus* of the equation. All such equations have straight line graphs and for this reason are called *linear equations*.

Draw the graph of ② in the same way, locating the dots and connecting them with a line. This, of course, will be a straight line also.

Note that the two lines intersect each other at a point indicated by the arrow in the figure. This point is the most important feature of the graph, for it contains the answer to the problem. If the plotted lines did not intersect, the problem would be impossible. Find the two numbers that locate this point. They are $x = 80$ and $y = 30$. Let us see what must be true of these numbers. How many pairs of numbers will "satisfy" ①, that is, make its two sides equal? All the pairs in our table and hundreds more pairs which we could have found in the same way. How many pairs of numbers will satisfy ②? Again the answer is an unlimited number; but of all these two sets of number pairs there is only *one* pair that will satisfy both equations; namely, 80 and 30.

These two numbers satisfy the two equations, therefore they are the answers to the problem.

Check:

6 horses at $80 cost	$480
11 cows at $30 cost	330
Total,	$810
13 horses at $80 cost	$1040
5 cows at $30 cost	150
Total,	$1190

Ans.
$80 for each horse
$30 for each cow.

Problem 37.—A farmer pays 6 men and 8 boys $32 for a day's work. The next day, paying the same wages, he pays 10 men and 2 boys $42 for the day's work. How much does he pay a man? A boy?

Let x = no. of $ for a man per day.
Let y = no. of $ for a boy per day.
① $6x + 8y = 32$
② $10x + 2y = 42$.

To derive a table of values for ①:

First let $x = 0$, then how much is $6x$?

$6x = 0$ and ① becomes $8y = 32$. Divide by 8, $y = 4$.

Next let $y = 0$, $6x$ will equal 32, and x will equal $5\frac{1}{3}$.

If we subtract $8y$ from ① it will read $6x = 32 - 8y$.

Dividing by 6 we get:

$$x = \frac{32 - 8y}{6} \text{ or } x = \frac{16 - 4y}{3}.$$

In this equation substitute any number for y and it will be very easy to find the corresponding value of x.

$$\text{If } y = 2,\ x = \frac{16 - 8}{3} = 2\frac{2}{3}$$

If $y = 3$, $x = 1\frac{1}{3}$

Table of values for ①:

①

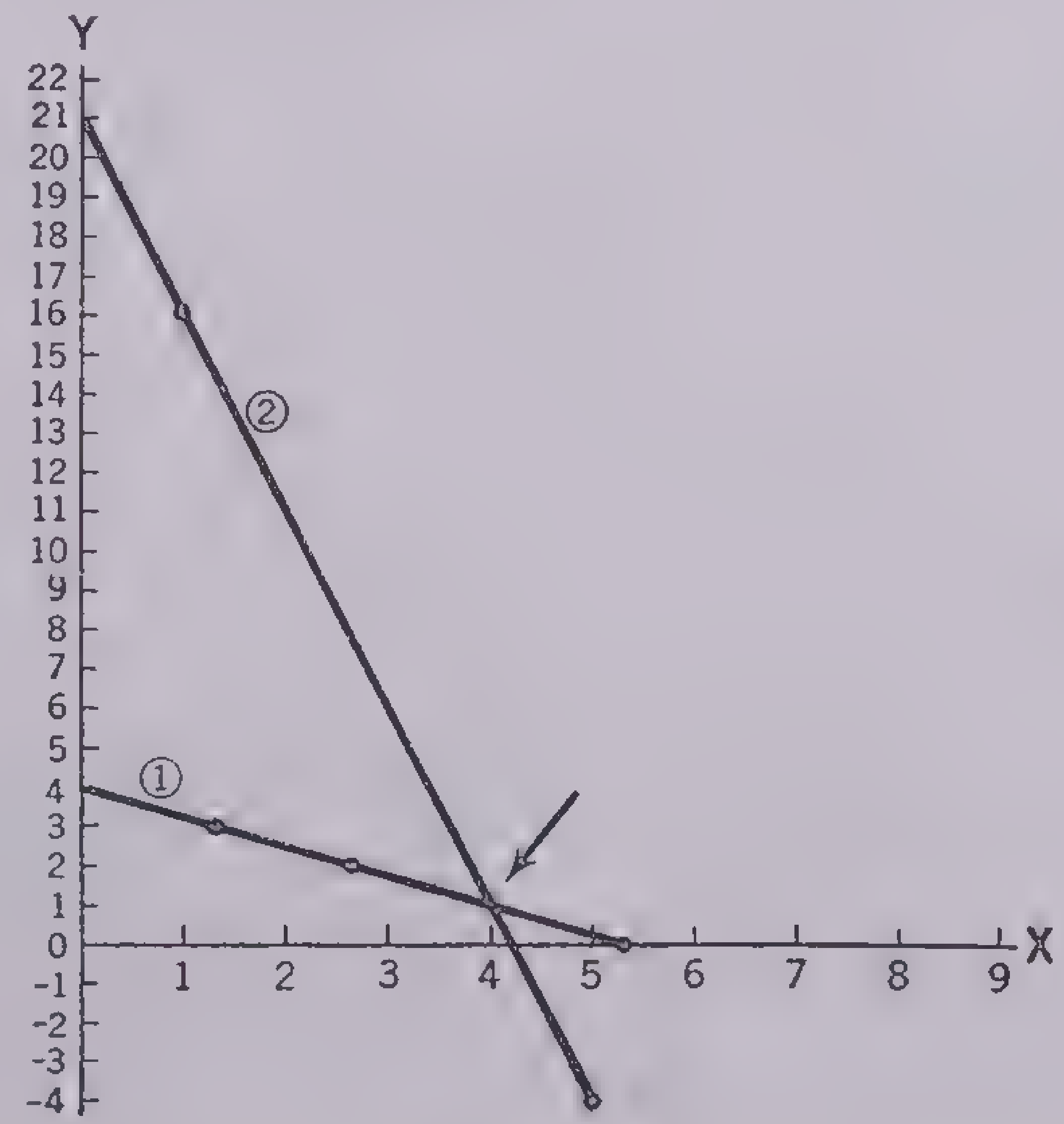
x	y
0	4
$5\frac{1}{3}$	0
$2\frac{2}{3}$	2
$1\frac{1}{3}$	3

In a similar manner, derive a table of values for ②:

②

x	y
0	21
$4\frac{1}{2}$	0
1	16
5	−4

Using these tables, plot the graph of the two equations, following the method described in the last problem.



GRAPH 7

Again the graphs intersect. What two numbers locate the intersection? $x = 4$, $y = 1$.

Try these two numbers in the problem.

Check:		*Ans.*
① 6 men at $4 =	$24	Men, $4 per day
8 boys at $1 =	8	Boys, $1 per day.
	$32	
② 10 men at $4 =	40	
2 boys at $1 =	2	
	$42.	

Problem 38.—Find two numbers such that 5 times the first is 1 less than 8 times the second, and 15 times the first equals the amount by which 47 exceeds the second.

Ans. 3, 2.

The graphical solution of this problem is left to the student.

Exercises

Solve by the graphical method:

(1) $x + 2y = 5$ $3x + 7y = 17$ *Ans.* 1, 2.
(2) $3x + 7y = 22$ $2x + y = 11$ *Ans.* 5, 1.

It is interesting to solve by the graphical method $x + y = 8$ and $x + y = 12$.

It will be found that the lines of the equations are parallel. They do not meet at all. Why not? Because it is impossible to find two numbers that will add to make 8 and at the same time add to make 12.

ADDITIONAL TOPICS

The Binomial Theorem.—The binomial theorem is a method of obtaining any indicated power of a binomial. Algebraically, it is stated as the expansion of $(a + b)^n$.

By actual multiplication, we have:

$(a + b)^2 = a^2 + 2ab + b^2$
$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$
$(a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$.

From these expansions it will be seen that for any positive integral value of n in the expansion of $(a + b)^n$:

1. The first term is a^n, the last term is b^n, and the number of terms is $n + 1$.
2. The exponent of a decreases 1 in each succeeding term; b appears in the second term and its exponent increases 1 in each succeeding term.
3. The coefficient of any term may be found by multiplying the coefficient of the preceding term by the exponent of a in that term and dividing this product by the number of the term.
4. All terms are positive if both a and b are positive; they are alternately positive and negative if b is negative.
5. The sum of the coefficients of the expansion of $(a + b)^n$ equals 2^n; the sum of the coefficients of $(a - b)^n$ equals 0.

EXAMPLE: Expand $(3a - b^2)^5$.

$(3a - b^2)^5 = (3a)^5 - 5(3a)^4(b^2) + 10(3a)^3(b^2)^2 - 10(3a)^2(b^2)^3 + 5(3a)(b^2)^4 - (b^2)^5 = 243a^5 - 405a^4b^2 + 270a^3b^4 - 90a^2b^6 + 15ab^8 - b^{10}$.

Compound Interest.—The derivation of the formula for compound interest and its method of solutions are shown as an application of the binomial theorem.

The amount of $1 at compound interest for 1 year at 4 per cent is $1.04; for 2 years, $\$1.04^2$; for 3 years, $\$1.04^3$; etc. In general, the amount of $1, when interest at r per cent is compounded periodically, is $(1 + r)^n$ for n periods. The compound interest is found by subtracting the principal from the amount. The amount of p dollars at r

per cent compounded for n periods is given by the formula $a = p(1 + r)^n$ and the interest is $I = p\,[(1 + r)^n - 1]$.

Example: Find the amount of \$1 at 6 per cent compound interest for 3 years.

$\$1.06^3 = (\$1 + .06)^3 =$
$\$1^3 + 3(1)^2(.06) + 3(1)(.06)^2 + (.06)^3 =$
$\$1 + .18 + .0108 + .000216 = \$1.191016.$

Formula for rth Term of an Expansion.—Any term of the expansion of a power of a binomial may be found by substitution in this formula for the rth term of the expansion of $(a + b)^n$:

$$\frac{n(n-1)(n-2)\ldots(n-r+2)}{(r-1)!}\,a^{n-r+1}b^{r-1}.$$

The derivation of the formula is based on the binomial theorem. An integral number n with the symbol ! following is called the *factorial of n* and is equal to the product of n and all the smaller integers.

Thus, $1! = 1$
$2! = 1{\cdot}2 = 2$
$3! = 1{\cdot}2{\cdot}3 = 6$
$4! = 1{\cdot}2{\cdot}3{\cdot}4 = 24$
$5! = 1{\cdot}2{\cdot}3{\cdot}4{\cdot}5 = 120$
$6! = 1{\cdot}2{\cdot}3{\cdot}4{\cdot}5{\cdot}6 = 720.$

Factorials of integral numbers play an important part in *combinatorial analysis*, which analyzes the possible arrangements into which a certain number of things may be grouped. The binomial theorem is closely related to this analysis.

Example: Find the 12th term of $(a - b)^{14}$.

The 12th term equals:

$$\frac{14{\cdot}13{\cdot}12{\cdot}11{\cdot}10{\cdot}9{\cdot}8{\cdot}7{\cdot}6{\cdot}5{\cdot}4}{1\cdot2\cdot3\cdot4\cdot5{\cdot}6{\cdot}7{\cdot}8{\cdot}9{\cdot}10{\cdot}11}\,a^3(-b)^{11} =$$
$$\frac{14.13.12}{1\,.\,2\,.\,3}\,a^3b^{11} = -364a^3b^{11}.$$

Arithmetic Progression.—A succession of numbers, each of which after the first is derived from the preceding number or numbers according to some fixed law, is called a *series*. A series in which each term after the first is greater or less than the preceding term by a constant quantity is called an *arithmetic progression* (abbreviated A.P.). The number that is added to any term or subtracted from it to produce the next is called the *common difference*.

In the arithmetic series—1, 3, 5, 7, 9, 11, 13, 15, 17, 19—the common difference is 2, or $d = 2$. This difference appears *once* in the *second* term, since $3 = 1 + d$; *twice* in the *third* term, since $5 = 1 + 2d$; *three times* in the *fourth* term, since $7 = 1 + 3d$ and so on. This relationship is expressed in the general form:

$$a,\ a + d,\ a + 2d,\ a + 3d,\ \ldots$$

in which a is the first term and d the common difference. (Note that the coefficient of d in any term is *one less* than the number of the term.)

Therefore, *to find the* n*th or last term of an arithmetic series:*

$$l = a + (n - 1)d$$

in which l = the nth or last term; a = first term; n = number of terms; d = common difference.

Example: Find the 16th term of the series 2, 7.12 and so on.

$$\begin{aligned} l &= a + (n - 1)d \\ &= 2 + (16 - 1)5 = 77. \end{aligned}$$

To find the sum of n *terms of an arithmetic series:* Let s = the sum of the terms and give to the other letters the same designations as above; write the sum of n terms in the usual order and in the reverse order, and add the two equal series.

$$\begin{array}{l} s = a + (a + d) + \ldots. + (l - d) + l \\ \underline{s = l + (l - d) + \ldots. + (a + d) + a} \\ 2s = a + l + (a + l) + \ldots. (a + l) + a + l \end{array}$$
or $2s = n(a + l)$ and

$$s = \frac{n}{2}(a + l) \text{ or } n\left(\frac{a + l}{2}\right).$$

Example: Find the sum of 20 terms of the series 2, 5, 8, . . .

$$l = a + (n - 1)d = 2 + (20 - 1)3 = 59$$

$$s = n\left(\frac{a + l}{2}\right) = 20\left(\frac{2 + 59}{2}\right) = 610.$$

Geometric Progression.—A series in which each term after the first is obtained by multiplying the preceding term by a constant quantity is called a *geometric progression* (abbreviated G.P.). The constant multiplier is called the *ratio*.

To find the n*th or last term of a geometric series:*

Let a be the first term of a G.P., r the ratio, n the number of terms, and l the last, or nth term.

Then the series is $a, ar, ar^2, ar^3, ar^4, \ldots$

Observe that the exponent of r is one less than the number of the term; that is,

$$l = ar^{n-1}.$$

Example: Find the 9th term of the series 6, 12, 24, . . .

In this problem $a = 6$, $r = 2$, and $n = 9$. Substituting these values in the formula:

$$l = 6 \times 2^8 = 6 \times 256 = 1536.$$

A series consisting of a limited number of terms is called a *finite series. To find the sum of a finite geometric series:*

Let a be the first term, r the ratio, n the number of terms, l the nth or last term, and s the sum of the terms.

① $s = a + ar + ar^2 + ar^3 + \ldots + ar^{n-1}$
② $rs = \quad ar + ar^2 + ar^3 + \ldots + ar^{n-1} + ar^n$ $\qquad r \times$ ①
③ $rs - s = ar^n - a$ $\qquad$ ② − ①

$$s(r - 1) = ar^n - a, \text{ and } s = \frac{ar^n - a}{r - 1}.$$

Example: Find the sum of 8 terms of the series 1, 2, 4, . . . Substituting in the last formula:

$$s = \frac{1 \times 2^8 - 1}{2 - 1} = \frac{256 - 1}{1} = 255.$$

A series consisting of an unlimited number of terms is called an *infinite series. To find the sum of an infinite decreasing geometric series:*

If the ratio r is less than 1, it is clear that the successive terms of a geometric series become numerically less and less, so that the nth term (l or ar^{n-1}) and consequently ar^n can be made infinitely small, though not absolutely equal to zero.

By the formula above,

$$s = \frac{ar^n - a}{r - 1} \text{ may be written } \frac{a - ar^n}{1 - r}$$

$$\text{or } \frac{a}{1 - r} - \frac{ar^n}{1 - r}.$$

Since, by taking enough terms, ar^n can be made infinitely small, the second fraction may be omitted. Hence, the formula for the sum of an infinite decreasing geometric series becomes:

$$s = \frac{a}{1 - r}.$$

Example: Find the sum of the series 1, $\frac{1}{10}$, $\frac{1}{100}$, . . . Substituting in the formula:

$$s = \frac{1}{1 - \frac{1}{10}} = \frac{1}{\frac{9}{10}} = \frac{10}{9} = 1\tfrac{1}{9}.$$

CONCLUSION

We may raise the question now whether every quadratic can be factored. The answer is that there are quadratics that do not have factors made up of ratios and x, and new numbers were created to factor such expressions. It becomes necessary to use numbers like the square root of 2. This number was known long ago to be inexpressible as a ratio. In fact, Pythagoras found that the ratio of the diagonal of a square and its side, which would be expressed algebraically as $\sqrt{2}$, was incommensurable. It spoiled a whole system of philosophy to know this. The $\sqrt{2}$ is the necessary number to factor $x^2 - 2 = 0$.

Other square roots are needed for other quadratics, and for equations of higher order we need much more complicated numbers. Also a new kind of number with new signs was necessary to factor expressions like $x^2 + 2 = 0$. This story belongs, however, to another chapter, and you will find it handled in advanced books on algebra.

If we raise another question, whether all numbers used in mathematics are algebraic numbers, the answer is "No." In 1882 a German mathematician, Ferdinand Lindemann, proved that the famous number π expressing the ratio of the circumference of a circle to its diameter is not the root of any algebraic equation. These numbers that are not algebraic—π and many others—are called *transcendental*. Their study leads into higher mathematics.

You can realize now that algebra is a very important subject, its chief purpose being the creation and study of numbers extensive enough to handle all kinds of problems giving rise to equations. It also presents the literal expressions themselves, in order to show the essential structure they take, and in its numerous applications these various forms of structure are present in problems in physics, engineering, chemistry, logic and many other parts of human learning. It was even brought to notice by the great philosopher and mathematician Descartes that every problem in geometry could be expressed as a problem in algebra. This was a very important step in human thinking. Algebra is necessary for a knowledge of mathematics, and its essentials should be known to every student.

Answers to Questions in the Shark Section

Answer A.—

Let x = rate or speed of travel of prisoner.

Then $x + 6$ = rate or speed of travel of guard.

And $x + 50$ = rate or speed of travel of warden.

Let d = distance from jail reached by prisoner.

Let t = time between escape and capture.

= time of prisoner on trip.

Then $t - 1$ = time of guard in pursuit.

And $t - 1\frac{2}{3}$ = time of warden in pursuit.

Since *distance traveled* = *speed* multiplied by *time* we have:

$$\begin{array}{c} ① \\ ② \\ ③ \end{array}\left\{\begin{array}{l} d = tx \\ d = (t - 1)(x + 6) \\ d = \left(t - \dfrac{5}{3}\right)(x + 50). \end{array}\right.$$

Substituting tx for d [from ①] in ② and ③ we have:

$$\begin{cases} tx = (t-1)(x+6) \\ tx = \left(t - \frac{5}{3}\right)(x+50) \end{cases}$$

$$\begin{cases} tx = tx + 6t - x - 6 \\ tx = tx + 50t - \frac{5}{3}x - \frac{250}{3} \end{cases}$$

$$④ \begin{cases} 6t - x = 6 \\ 50t - \frac{5}{3}x = \frac{250}{3} \end{cases}$$

$$\begin{matrix} ⑤ \\ ⑥ \end{matrix} \begin{cases} 30t - 5x = 30 \\ 150t - 5x = 250 \end{cases}$$

$$120t = 220 \qquad ⑥ - ⑤$$

$$t = \frac{11}{6} = 1 \text{ hour, } 50 \text{ minutes.}$$

$$6t = 11.$$

Substituting this value for $6t$ in ④ we have

$$11 - x = 6;$$

whence, $x = 5$ miles an hour

$$d = tx = \frac{11}{6} \cdot 5 = 9\frac{1}{6} \text{ miles.}$$

Ans. The prisoner traveled x or 5 miles an hour; the guard $x + 6$ or 11 miles an hour; the warden $x + 50$ or 55 miles an hour. The prisoner traveled $9\frac{1}{6}$ miles in 1 hour, 50 minutes; the guard the same distance in 50 minutes; and the warden the same distance in 10 minutes.

Answer B.—

Let x = the second digit.

Then $x + 2$ = the first digit.

Then $10(x + 2) + x$ = the number required.

$$\frac{10(x+2)+x}{x(x+2)} = \frac{8}{3}$$

$$8x(x+2) = 30(x+2) + 3x$$
$$8x^2 + 16x = 33x + 60$$
$$8x^2 - 17x - 60 = 0.$$

This equation can be factored by the trial-and-error method of factoring trinomials, but unless the factors can be seen at once, it is best to solve by the quadratic formula, which will handle any quadratic equation.

$$x = \frac{17 \pm \sqrt{17^2 + 32 \cdot 60}}{16} = \frac{17 \pm \sqrt{2209}}{16} = \frac{17 \pm 47}{16}.$$

Since the conditions of the problem require a positive result, we may disregard the negative root.

Ans. $x = \frac{64}{16} = 4$

$$x + 2 = 6.$$

The required number is therefore 64.

Check:

$$\frac{64}{6 \cdot 4} = \frac{64}{24} = \frac{8}{3} = 2\frac{2}{3}.$$

Answer C.—

Let x = Ann's age.

Then $24 - x$ = difference between the ages of Mary and Ann.

When Mary was x years old (as old as Ann is now) Ann, according to the problem, was ½ of 24 years or 12 years old.

Then $x - 12$ = difference between the ages of Mary and Ann.

Since the difference between the ages must be the same at all times in the lives of the two girls, we have:

$$x - 12 = 24 - x$$
$$2x = 36$$

Ans. $x = 18.$

Check: If Mary is now 24, she was 18 six years ago. Ann was then 12, which is ½ of 24. Ann's age therefore = 18, which meets the conditions of the problem.

Answer D.—

Let x = age of Diophantus at death.

Then $\frac{1}{12}x + \frac{1}{6}x + \frac{1}{7}x + 5$ = his age at the birth of his son.

Since his son lived $\frac{1}{2}x$ years and Diophantus survived his son 4 years, he died $\frac{1}{2}x + 4$ years after his son's birth.

Therefore,

$$\frac{1}{12}x + \frac{1}{6}x + \frac{1}{7}x + 5 + \frac{1}{2}x + 4 = x.$$

Multiplying by the common denominator 84, we have:

$$7x + 14x + 12x + 5 \cdot 84 + 42x + 4 \cdot 84 = 84x$$
$$75x + 9 \cdot 84 = 84x$$
$$9x = 9 \cdot 84$$
$$x = 84.$$

The son was born when Diophantus was 38 and died 42 years later.

Answer E.—

Let x = number of horses.

Then, $\frac{1320}{x}$ = price of one horse.

$$\left(\frac{1320}{x} + 10\right)(x - 1) = 1320$$

(Ten dollars plus the price of one horse multiplied by 1 less than the number of horses.)

$$\frac{1320 + 10x}{x}(x - 1) = 1320$$

$$(1320 + 10x)(x - 1) = 1320x$$
$$1320x - 1320 + 10x^2 - 10x = 1320x$$
$$10x^2 - 10x - 1320 = 0$$
$$x^2 - x - 132 = 0$$
$$(x - 12)(x + 11) = 0$$
$$x = 12 \text{ or } -11.$$

The negative root may be rejected as not applying to the problem.

Ans. Therefore the number of horses sold = 12.

The price of each horse $= \frac{1320}{12} = \$110.$

If 11 horses had been sold for \$120 each, the total receipts would have been 11 × \$120 = \$1320, which checks with the condition required in the problem.

Answer F.—

Let V = the volume of 85 ounces of pure gold.

And x = volume of gold stolen.

Since gold weighs 2.16 times as much as an equal volume of copper, copper must occupy 2.16 times as much space as an equal weight of gold. (This involves the idea of *density*, which is the weight per unit volume of any substance. If we indicate density by d, volume by V and weight by w, we have the simple relation $dV = w$.)

Since x is the volume of gold stolen,

$2.16x$ = volume of copper substituted;

$1.16x$ = increase in volume of metal when copper is substituted;

$V + 1.16x$ = volume of crown;

$85 - 80.2 = 4.8$ ounces = weight of water displaced by crown;

$85 - 80.6 = 4.4$ ounces = weight of water displaced by 85 ounces of pure gold.

Since the volume of the displaced water is proportional to its weight we have:

$$\frac{4.8}{4.4} = \frac{\text{Volume of Crown}}{\text{Volume of 85 ounces of gold}} = \frac{V + 1.16x}{V}$$

$$\frac{V + 1.16x}{V} = \frac{12}{11}.$$

Clearing of fractions,

$$11V + 11 \cdot 1.16x = 12V$$
$$11 \cdot 1.16x = V$$
$$x = \frac{V}{11 \cdot 1.16}.$$

Since the stolen gold was the same fraction of either the volume or the weight, we have:

Ans. Weight of gold stolen $= \frac{85}{11 \cdot 1.16} =$ 6.66⁺ ounces.

We may calculate also the *specific gravities* of gold and copper from the information stated with the question. (Specific gravity is the ratio of the weight of any substance to the weight of an equal volume of water.)

The volume of 85 ounces of gold is equal to the volume of 4.4 ounces of water—since the loss of weight in water was 4.4 ounces and Archimedes's principle states that this loss is equal to the weight of the displaced water. The specific gravity of gold is therefore $\frac{85}{4.4} = 19.3$. The specific gravity of copper is $\frac{1}{2.16} \times 19.3 = 8.9$.

Answer G.—The only real difficulty with this is getting the facts clearly in mind so that an algebraic equation can be constructed.

Let x = Jones's age now.

$56 - x$ = wife's age now.

Then $x - (56 - x)$ = difference between their ages.

And $56 - x + 6 = 62 - x$ = Jones's age when Jones was 6 years older than his wife is today.

$\frac{1}{2}x$ = Mrs. Jones's age at the same time.

(The problem says that Jones, age x, is twice as old as his wife was at the time in question; that is, his wife was $\frac{1}{2}x$ years old at that time.)

Since the difference between the ages of Jones and his wife must be the same regardless of what period in their lives we take, we have:

$$x - (56 - x) = 62 - x - \tfrac{1}{2}x$$

$$\left[\begin{array}{l}\text{Difference between}\\ \text{their ages now}\end{array}\right] = \left[\begin{array}{l}\text{Difference between}\\ \text{their ages when}\\ \text{Jones was 6 years}\\ \text{older than his wife is}\\ \text{today.}\end{array}\right]$$

$$2x - 56 = 62 - \frac{3}{2}x$$

$$3\tfrac{1}{2}x = 118$$
$$7x = 236$$

Ans. $x = 33\frac{5}{7}$ = Jones's present age.

$56 - x = 22\frac{2}{7}$ = Mrs. Jones's present age.

Check:

$22\frac{2}{7} + 6 = 28\frac{2}{7}$ = Jones's age when Jones was 6 years older than his wife is today. This was $\left(33\frac{5}{7} - 28\frac{2}{7}\right)$ or $5\frac{3}{7}$ years ago. At that time Mrs. Jones must have been $\left(22\frac{2}{7} - 5\frac{3}{7}\right)$ or $16\frac{6}{7}$ years old. $33\frac{5}{7} =$

$2 \cdot 16\frac{6}{7}$, as required by the conditions of the problem.

Answer H.—Since the officer's trip required 2 hours and the caravan is moving 5 miles an hour, the total distance advanced by the caravan must be 10 miles.

The diagram shows the various distances involved in Question H.

In this diagram, x = distance officer rode forward; $x - 10$ = distance he rode back; $x - 2$ = distance moved by the caravan while officer rode forward; $12 - x$ = distance moved by caravan while officer rode back. Since both the rates of the caravan and of the rider were steady, the ratio of the two distances must be equal for the interval while the officer rode ahead and for the interval while he rode back.

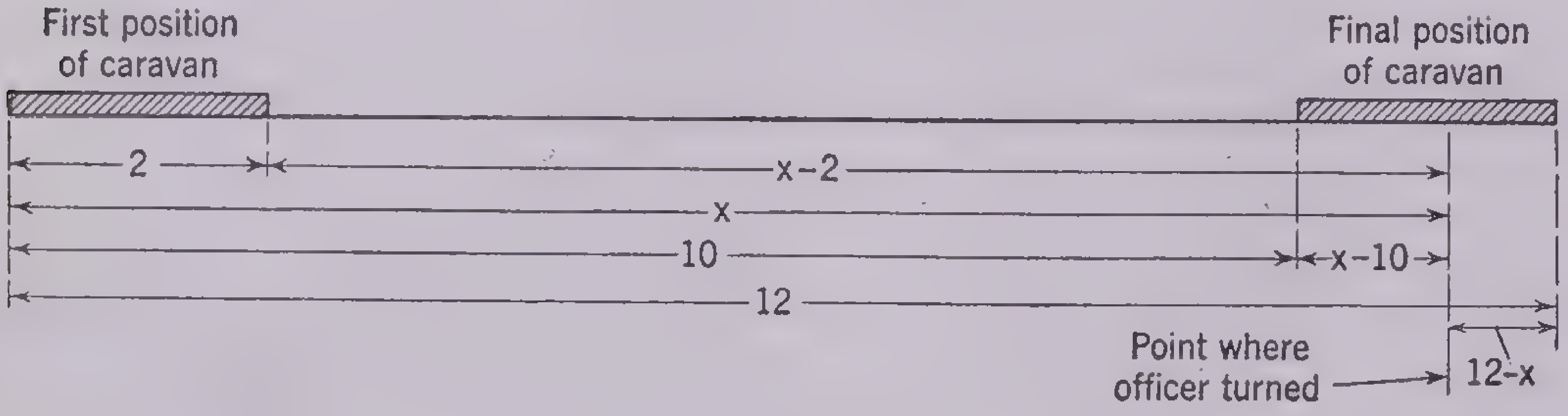
That is $\frac{x}{x-2} = \frac{x-10}{12-x}$.

Clearing of fractions,

$$x(12 - x) = (x - 2)(x - 10)$$
$$12x - x^2 = x^2 - 10x - 2x + 20$$
$$x^2 - 12x + 10 = 0$$
$$x = \frac{12 \pm \sqrt{144 - 40}}{2}.$$

Ans. $x + x - 10 = 2x - 10 = 2 \pm \sqrt{144 - 40}$ or 12.19804 miles, total distance ridden.

(We need consider only the positive result, correct to five decimal places.)


First position of caravan
Final position of caravan
2
x-2
x
10
x-10
12
Point where officer turned
12-x

If we restate the question without giving any actual lengths or distances, but call the length of the caravan l and the total distance moved by the caravan d, we find that the distance covered by the officer's ride is $x = l + \sqrt{l^2 + d^2}$. This suggests a curious geometrical relation of the problem. If the length of the caravan and the total distance covered are laid out as the two legs of a right triangle, the distance ridden by the officer will equal the hypotenuse of this triangle plus the leg representing the length of the caravan. If a pair of *Pythagorean numbers* (two numbers the sum of whose squares is a perfect square), such as 3 and 4, 5 and 12, 7 and 24, are given as the length of the caravan and the distance through which it moves, the distance covered by the officer will be an integral number; in popular phrase, the answer will "come out even."

Answer I.—We might solve the problem as it is stated, that is, the coconut problem for 5 men. But we shall gain more insight into the solution if we consider the general case, the coconut problem for n men.

If we start out in the obvious way and let x = the original number of coconuts, we find that the algebraic expressions arising after we subtract 1, divide by n and repeatedly subtract to obtain a new dividend soon grow intolerably complex. It seems more promising to attack the problem in reverse, that is, consider first the number of coconuts that are left after the last man has taken his share.

Let k = number of coconuts left by the last or nth partner = number of coconuts that were available for division in the morning.

To find the number left by the $(n - 1)$th man, we must multiply k by $\frac{n}{n-1}$ and add 1. The reason for this procedure appears when we remember that each man threw away or subtracted 1 coconut from the pile he found and then took $\frac{1}{n}$ of the remainder. Thus if each man found a pile F and left a pile L, we have the relation:

$$L = (F - 1)(1 - \frac{1}{n}) =$$
$$(F - 1)\left(\frac{n-1}{n}\right).$$

That is $L = \frac{n-1}{n}F - \frac{n-1}{n}$

$$L + \frac{n-1}{n} = \frac{n-1}{n}F$$
$$F = \frac{L}{(n-1)/n} + 1 =$$
$$\frac{n}{n-1}L + 1.$$

The above expression gives us a formula for learning the number of coconuts *found* by any man, in terms of the number of coconuts *left* by the same man, and since the number of coconuts found by any man is the number *left* by his predecessor, we can compute the number of coconuts left by any man by multiplying the number left by his successor by $\frac{n}{n-1}$ and adding 1.

We may now write the series of expressions indicating the number of coconuts at each stage.

k = no. left by last (nth) man.

① $\frac{n}{n-1}k + 1$ = no. left by $(n - 1)$th man.

② $\frac{n}{n-1}\left[\frac{n}{n-1}k + 1\right] + 1$ = no. left by $(n - 2)$th man.

③ $\frac{n}{n-1}\left[\frac{n}{n-1}\left(\frac{n}{n-1}k + 1\right) + 1\right] + 1$ = no. left by $(n - 3)$th man.

④ $\frac{n}{n-1}\left\{\frac{n}{n-1}\left[\frac{n}{n-1}\left(\frac{n}{n-1}k + 1\right) + 1\right] + 1\right\} + 1$ = no. left by $(n - 4)$ th man and so on.

This complicated-looking expression has a symmetrical form, and it is clear that we could immediately write down the number left by any man, although the expression takes up considerable space. Since the number left by any man is the number found by his successor, we would obtain the original number of coconuts by writing the nth term of the series of expressions ①, ②, ③ and ④ indicated above. (Note that each combination of brackets, ①, ②, ③ and ④, has the factor $\frac{n}{n-1}$ repeated 1, 2, 3 and 4 times, respectively.)

We may now write the expression for the original number of coconuts, that is, expression (n) of the series ①, ②, ③, ④.

Let A = the original number of coconuts.

$$A = \left(\frac{n}{n-1}\right)^n k + \left(\frac{n}{n-1}\right)^{n-1} +$$
$$\left(\frac{n}{n-1}\right)^{n-2} + \ldots \frac{n}{n-1} + 1$$

If $r = n - 1$ we have

$$A = \frac{n^n}{r^n}k + \frac{n^{n-1}}{r^{n-1}} + \frac{n^{n-2}}{r^{n-2}} + \ldots \frac{n}{r} +$$
$$1 = \frac{n^n}{r^n}k + \frac{n^r}{r^r} + \frac{rn^{r-1}}{r^r} + \frac{r^2n^{r-2}}{r^r} +$$
$$\ldots \frac{r^{r-1}n}{r^r} + \frac{r^r}{r^r} = \frac{n^n}{r^n}k +$$
$$\frac{n^r + rn^{r-1} + r^2n^{r-2} + \ldots r^{r-1}n + r^r}{r^r}.$$

The numerator of the second fraction has the familiar form of the quotient of the difference of like powers of two numbers divided by the difference of the numbers; that is, it is seen to be $\frac{n^{r+1} - r^{r+1}}{n - r}$ or $\frac{n^n - r^n}{n - r}$.

Since $r = n - 1$,
we have $n - r = 1$

and $\frac{n^n - r^n}{n - r} = n^n - r^n$.

Therefore,

$$A = \frac{n^n}{r^n}k + \frac{n^n - r^n}{r^{n-1}} =$$
$$\frac{n^n}{r^n}k + \frac{rn^n - r^{n+1}}{r^n} =$$
$$\frac{kn^n + rn^n - r^{n+1}}{r^n} =$$
$$n^n\left(\frac{k + r}{r^n}\right) - r =$$
$$n^n\left(\frac{k + r}{r^n}\right) - n + 1.$$

Since A, k, r and n all are whole numbers, and since r and n have no common factors (for $r = n - 1$), the expression $\frac{k+r}{r^n}$ must be a whole number; that is, $k + r$ must be a multiple of r^n, and we may write:

$$k + r = Mr^n.$$

Then $k = Mr^n - r$.

But the problem requires that k shall be 1 more than a multiple of n.

Let $k = Cn + 1$.
We have $Cn + 1 = Mr^n - r$
$Cn = Mr^n - r - 1 = Mr^n - n$

$$C = \frac{Mr^n - n}{n} = \frac{Mr^n}{n} - 1.$$

Since r and n have no common factors, the smallest value of M that will make C an integer is $M = n$.

The corresponding value of C is:

$$C = r^n - 1.$$

Now $k = Cn + 1$
Therefore, $k = n(r^n - 1) + 1 =$
$nr^n - n + 1 = nr^n - r$

Therefore, $k + r = nr^n$ and $\frac{k + r}{r^n} = n$.

Therefore the smallest possible value of A satisfying the conditions of the problem is:

$$A = n^n\left(\frac{k+r}{r^n}\right) - n + 1 =$$

$$n^n \cdot n - n + 1 = n^{n+1} - n + 1.$$

If $n = 5$ as in the problem, we have:

Ans. $A = 5^6 - 5 + 1 = 15625 - 4 = 15{,}621$.

It may be objected that this is more coconuts than any man could count in the time given in the problem, but it is a characteristic of mathematics that it cares nothing for such objections as these. *If* there were five men who counted coconuts under the conditions stated, then the number of coconuts must have been as determined.

That 15,621 is the correct answer may be seen by carrying out the calculations in the order given by the problem.

15,621 − 1
÷ 5 = 3,124 = number taken by 1st man.
12,496 − 1
÷ 5 = 2,499 = number taken by 2nd man.
9,996 − 1
÷ 5 = 1,999 = number taken by 3rd man.
7,996 − 1
÷ 5 = 1,599 = number taken by 4th man.
6,396 − 1
÷ 5 = 1,279 = number taken by 5th man.
5,116 − 1
÷ 5 = 1,023 = Share of each man in final division.

The problem actually required that the residue left by the last man should be divisible (with 1 over) by the number of men; that is, it was specified that $k - 1$ should be divisible by n. If we did not impose this restriction, we should have:

$$A = n^n\left(\frac{k+r}{r^n}\right) - n + 1$$

$$k = Mr^n - r$$

Or $\quad A = Mn^n - n + 1;$

where M may be any integer not 0. The smallest M is therefore 1, and

$$A = n^n - n + 1.$$

We might also inquire what the form of A would be if k is to be exactly divisible by n.

We should find, in fact, k divisible by n:

(I) If n is even:

$$A = (Pn - 1)n^n - n + 1$$

(P any integer not 0.)

(II) If n is odd:

$$A = (Qn + 1)n^n - n + 1.$$

(Q any integer including 0.)

The smallest value in case I. is:

$$A = (n - 1)n^n - n + 1.$$

The smallest value in case II. is:

$$A = n^n - n + 1.$$

Anyone who can follow through this solution to the coconut problem need not worry about his skill in handling algebra.

PLANE GEOMETRY

What Is Geometry?—Geometry treats of the properties, the construction and the measurement of geometrical figures, such as angles, triangles, parallelograms, rectangles, trapezoids, circles and polygons; it states various truths about these figures in theorems, supported by logically developed proofs, involving the use of hypotheses, axioms and postulates; it demonstrates methods of accurately drawing the figures with ruler and compass, and it shows how to determine their dimensions and areas.

While the above is all true of plane geometry, we need a more limited definition to separate it from other branches of geometry. *Plane geometry deals only with figures drawn in the same plane.* To illustrate: A square block of wood has six flat faces, each of which is called a *surface.* If the faces are made perfectly smooth, so that a good ruler, applied to any one of them, will touch the surface in every part, each face is called a *plane surface*, or a *plane.* Now, since all of the figures considered in plane geometry must lie in one plane, they can have only two dimensions, length and breadth (or width), but not thickness. If the figures consist of curved lines, such as circles, their dimensions are given in terms of the radii.

Three-dimensional figures, having thickness as well as length and breadth, will lie in more than one plane; they constitute the subject matter of solid geometry. There are other advanced and highly specialized "hyper-space" geometries, dealing with more than three dimensions, but all of them find their beginnings in the theorems of Euclid, to be discussed below.

Geometry is a branch of mathematics but, unlike arithmetic and algebra, it does not deal chiefly with numbers and equations, although it makes frequent use of them. It is concerned primarily with the study of the geometrical figures mentioned above.

Many facts that are stated in arithmetic and algebra are proved in geometry. For example, geometry shows that the area of a rectangle is the product of the base times the altitude; that the circumference of a circle equals 3.1416 times the diameter; and that the square on the hypotenuse of a right triangle equals the sum of the squares on the other two sides.

Historical Background. — Mathematics in general and geometry in particular have an ancient and honorable history. Of all the sciences its development has been accompanied by the least error. One generation of mathematicians has not been chiefly occupied with the correction of the mistakes of the previous generation but has been free to devote its energies to further developments of the science.

The virtues of mathematics, namely, precision in definition and logical exactness in reasoning, are especially evident in geometry. Its elements—the point, the line and the plane—are universal concepts, and have always meant the same thing to all peoples, thus providing a common and undisputed ground for development.

Our knowledge of what the pre-classical peoples knew about geometry is limited to what may be inferred from inscriptions and tablets. Necessity often serves as the mother of invention, and hence the earliest geometry dealt with practical problems, such as the measurement of lands. The Babylonians had formulas for areas of squares, rectangles and right triangles. They asserted that the circumference of a circle was three times its diameter. This is also the statement in the Bible, in I Kings 7:23.

The Egyptians, whose civilization goes back beyond record, had a practical use for geometry in the surveying of land, especially in the vicinity of the Nile, which so often floods its banks. In Herodotus we find: "They said also that this king divided the land among all Egyptians so as to give each one a quadrangle of equal size and to draw from each his revenues, by imposing a tax to be levied yearly. But every one from whose part the river tore away anything, had to go to him and notify what had happened; he then sent overseers, who had to measure out how much the land had become smaller, in order that the owner might pay on what was left, in proportion to the entire tax imposed. In this way, it appears to me, geometry originated, which passed thence to Hellas." The pyramids also are an enduring monument to the geometrical science of the Egyptians.

From the 7th century B. C. the Greeks came into active contact commercially and intellectually with the Egyptians. Plato, who visited Egypt, said: "Whatever we Greeks receive, we improve and perfect." By 320 B. C. a Greek, Euclid, had written a geometry, that in its translation has been used as the standard text almost universally in England until this century and is used at the present time in some places. The vogue of this text for over 2,200 years was deserved and has made the word Euclid synonymous with geometry. The Egyptians cared only for geometry as required in everyday life, but the Greeks were interested in the logical and speculative side of the science.

At an early stage in its development, students hit upon three problems that seemed insoluble and that have continued at all times to be famous in geometric study, namely:

(1) To trisect an angle.

(2) To double the cube, i.e., to construct the cube whose volume is double that of a given cube.

(3) To square the circle, i.e., to construct a square exactly equal in area to a given circle.

These problems became the incentive for much geometrical research, and while they were never satisfactorily dealt with in ancient times, those engaged in seeking the solutions were always finding out new and important geometrical truths. Many of the Greek philosophers, as Plato and Aristotle, were keenly interested in geometry. Plato wrote over the entrance to his school, "Let no one who is unacquainted with geometry enter here."

Euclid, whose name is by far the greatest in geometry, was born about 365 B. C. and wrote his *Elements* 330–320 B. C. He was extraordinarily skillful in arranging in an orderly and logical manner the facts and theorems of geometry. Very few of the separate proofs were his own, but his ability to organize and systematize all the available knowledge of geometry entitles him to the high place he holds.

There are two stories handed down from the days of Euclid which indicate that human nature does not change, and that the conflict between knowledge for its own sake and knowledge for utilitarian purposes only is not modern. When Ptolemy, the king, asked if there were no easy method of acquiring geometric knowledge Euclid replied: "There is no royal road to geometry." Literally hundreds of geometric texts have been written, whose object is to make Euclid easy, but there are many who maintain that this product of Greek culture has never been surpassed.

A youth who had begun to read geometry with Euclid, after learning the first proposition, inquired: "What do I get by learning these things?" Euclid called his slave and said: "Give him three pence, since he must make gain out of what he learns." The same is true today, for the average man uses geometry very little, yet he enjoys the advantages of many modern inventions, which are the products of applied geometry.

Practical Applications.—How is geometry used? We walk a certain distance; here is a problem of the measurement of distance. We buy a piece of ground and a drawing must be made to indicate its shape and position for the deed; here is a problem of area. A tank must be constructed to hold so many gallons; here is a question of volume. A tunnel is to be made under a river, a bridge is to be constructed, a ship is to be built; all these are but a few of the countless geometric problems. In military operations there are endless problems of geometry to solve. The position of a big gun, of an airplane, or of a submarine, is found by geometrical means.

Geometric figures play a very important part in architectural design and structure. The beauty of a cathedral, the strength and symmetry of a public building, the construction of a modern skyscraper, all involve geometric principles. Blueprints, plans for machinery and all types of mechanical drawing are based on geometric construction. Surveying is a science of lines and angles; even in the measurement of the heavens, astronomers could not do without geometry.

Geometric designs in woodwork, mosaics, tile floors, carpets, linoleum, blankets and lace patterns show but a few of geometry's everyday uses in the applied arts.

Importance in Other Fields.—Without a knowledge of geometry, progress in the study of physics is impossible. Indeed in the modern developments of physics, there has arisen a demand for peculiar concepts of space called non-Euclidean geometries and for what is known as four-dimensional geometry. At present all matter is supposed to be composed of electric charges, positive and negative. The physical and chemical properties of all substances thus depend upon the manner in which these electrical charges are arranged. In the case of crystals many geometrical solids are found in nature.

Geometry as a Study.—Geometry is founded upon statements about which there is universal agreement. This cannot be said of many other studies. History for example is supposed to deal with facts, but what passes for history in one country may not be accepted in another. Moreover if the facts themselves are not disputed, their interpretation is often open to doubt. To put it another way, that which is considered permanent or beautiful by one generation, may be forgotten or ridiculed by the next. But objects such as the monuments of Greek architecture, which found their inspiration and proportions in the laws of geometry, have gained universal admiration and approval, for the fundamental laws of geometry have been the same for all times and all peoples. Indeed it is one of the marvels of mathematics that Euclid's propositions should have come down to us through the ages with practically no alteration or improvement.

There is no subject more completely logical and understandable than geometry, for it is entirely worked out on a few assumptions which are so obviously true that they need no proof. Everybody knows that a straight line is the shortest distance between two points. Aside from these basic assumptions we are not asked to believe any of the statements in geometry; they are all demonstrated, not only by a series of logical reasons but by diagrams (constructions) as well, so that the proof can be *seen* to be understood.

Geometry shows a unity and simplicity of development that appeals to many students. It is invaluable in forming the habits of clear, direct thinking, resourcefulness and concentration so necessary in solving any type of problem. For this reason, however, it must be remembered that "there is no royal road to geometry."

FUNDAMENTALS

1. **Elements.**—The elements first met with in plane geometry are the *point* and the *line*. We also require *one plane* in which all the points and lines are supposed to lie. Before we attempt to define these terms we must consider the nature of a definition.

2. **Definition.**—A definition is a statement explaining the precise meaning of a word or phrase. It should be complete and clear and expressed in terms that distinguish the defined object from all other things.

3. **Geometrical Definitions.**—A few moments of thought will show that these basic elements of geometry really require no definition. We naturally choose for our fundamental elements the simplest; and if there were anything simpler than the point, we should choose it as our first element rather than the point itself. Here is one of the advantages of geometry as a study; we all know what is meant by a point and a line, and thus have a common body of knowledge upon which to build.

4. **Point.**—A *point* is that which has no parts; that which has position but no magnitude.

5. **Line.**—A *line* is that which has length without breadth or thickness. A line is breadthless length. Euclid's definition says: A straight line is that which lies evenly with respect to the points on itself.

6. **Axiom.**—Certain facts are so elemental that they cannot be reduced to anything simpler. They are statements that meet with universal agreement and are called *axioms*. (See §39–49).

7. **Postulate.**—A *postulate* is a geometric statement whose truth is assumed. The distinction between a postulate and an axiom is merely that the postulate is a geometric truth, while the axiom is of broader application. Many ignore or neglect this distinction, and we shall at times.

There is a certain amount of freedom in our choice of axioms and postulates. There is always a choice in the fundamental unit. If one chooses the dollar as the unit then the cent is the one-hundredth part of a dollar; if the cent is the unit then the dollar is one hundred cents.

Just as there are many different orders in which the separate stones of a building may be set, so also there have been many different lists of assumptions in geometry. We shall use the list from the New York State Syllabus in Geometry, which has itself been based on a list used by Harvard University in its entrance examinations. These postulates, 12 in number, will be constantly referred to in the theorems that follow:

List of Postulates

8. One straight line, and only one, can be drawn through two given points.
9. Two points determine a straight line.
10. Two straight lines can intersect in only one point.
11. A straight line may be produced to any required length.
12. A straight line is the shortest path between two points.
13. A circle may be described with any given point as a center and any given line as a radius.
14. Any figure may be moved from place to place without altering its size or shape.
15. Through any point outside a given line, one line and only one can be drawn parallel to the given line.
16. All straight angles are equal.
17. All right angles are equal.
18. From a given point in a given line, one perpendicular and only one can be drawn to the line.
19. Equal angles have equal complements, equal supplements and equal conjugates.

If a careful man should build a house, he might make a complete list of all the kinds of materials that entered into its construction and of the various tools that were necessary. Thousands of careful students and teachers have been over the subject of geometry, and the above postulates or assumptions are the tools that were chosen as the most necessary and convenient.

Again, in the building of a house one might try to determine the least number of tools necessary, but in actual practice it is better to have a sufficient number. As a matter of fact, some of the above list of assumptions result from the others, so the list is not so small as it might be. In a course in higher mathematics it would be proper to consider the question of the least number of assumptions, but for the beginner in geometry the number of the assumptions is not so important as their convenience. Having the assumptions listed, it is possible when one becomes more familiar with the subject, to investigate their relations.

20. **Equipment.**—What equipment does a student need in the study of geometry? When we discuss this question we shall see the relation of the practical to the theoretical.

First, the student needs a sheet of paper, a slate or a blackboard as a representation of a plane. On consideration it will be evident that no such thing as a perfect plane can be obtained. Your slate or blackboard is full of imperfections, and your sheet of paper will refuse even to be flat unless it is placed on a good desk top. However, the idea of a perfect plane is fixed in our minds. We are content if a concrete sidewalk is fairly smooth, but a plate glass window must be more accurately made, and the manufacturer of an astronomical instrument may work for months or years to obtain a smooth surface for an instrument requiring great accuracy. Even here, though, the perfect plane is not achieved.

The student must have also a pencil, a piece of chalk or an instrument of some kind in order to indicate points and draw lines. Any point that we can make with a pencil has size, but as we make the point smaller, thus approaching the ideal, we increase the accuracy of our work. A ruler is necessary to aid in the drawing of straight lines, and again this can be only approximately free from error. Finally a pair of compasses is necessary with which to draw circles. We shall leave to the reader the consideration of the question—why is a pair of compasses a more accurate instrument than a ruler?

From the earliest days the ruler and compasses have been the only instruments considered legitimate in the solution of plane geometry problems. To become proficient in many sciences requires elaborate equipment and costly apparatus, but even crude drawings made in the sand enabled the scholars of ancient Greece to attain their perfection in geometry.

21. **Drawings.**—We can now discuss the postulates §8–19 in reference to the making of geometrical drawings.

We represent points by small dots and put a capital letter, as A, in the vicinity of the point to label it.

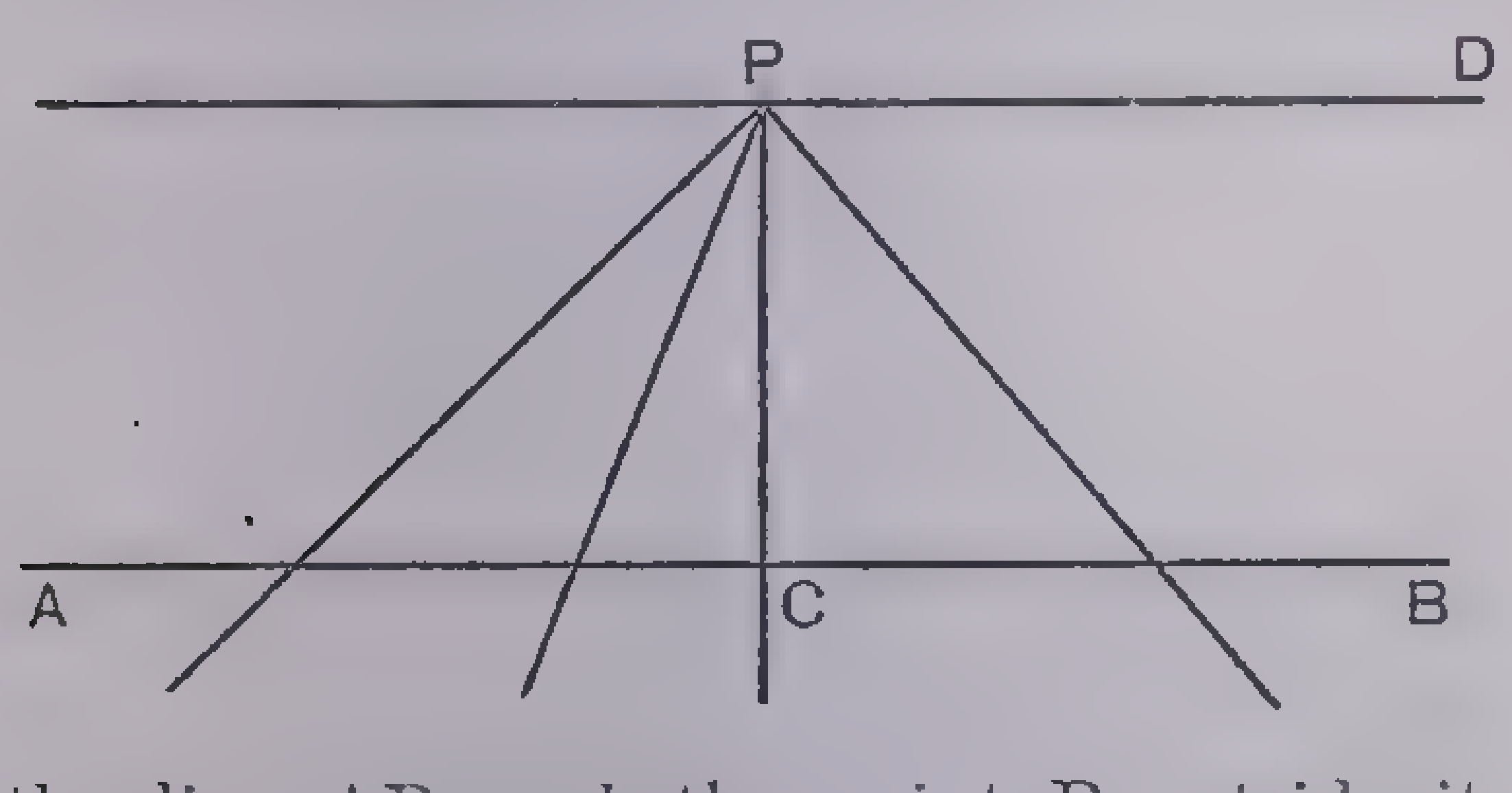
Two given points, A and B, determine the position of our ruler in drawing the line with the symbol AB, in agreement with §8–9. This line, by §11, we can extend in either direction beyond the points A or B.

With a pencil we can draw any number of paths or curves between the points A and B, but §12 tells us that the straight line drawn with a ruler is the shortest distance between the two points.

In the moving of a figure from one position to another, according to §14, we have a theoretical and practical difference. Any physical object, if moved from one position to another on the earth, would undergo many changes, due to the alteration of the force of gravity, of the atmospheric pressure, of the temperature, etc., which would change its shape, but one readily imagines the ideal solid that experiences no change.

22. **Uniqueness.**—Geometry is particularly concerned with unique objects. Unique objects in other fields, such as the highest mountain, the largest city, the worst war, have an immediate significance; the designation of any other mountain, city or war requires many words. In geometry, when two points A and B are given, the first unique object determined is the line AB, which can be prolonged in either direction.

23. **Segment.**—When we consider the portion of the line AB that lies between A and B, we have a second unique object called the *segment* AB, which has related to it a unique number, called its *length.* Consider the line AB and the point P outside it. Consider all the lines that can be drawn through P; two of these lines are unique with reference to AB, namely, PC and PD.

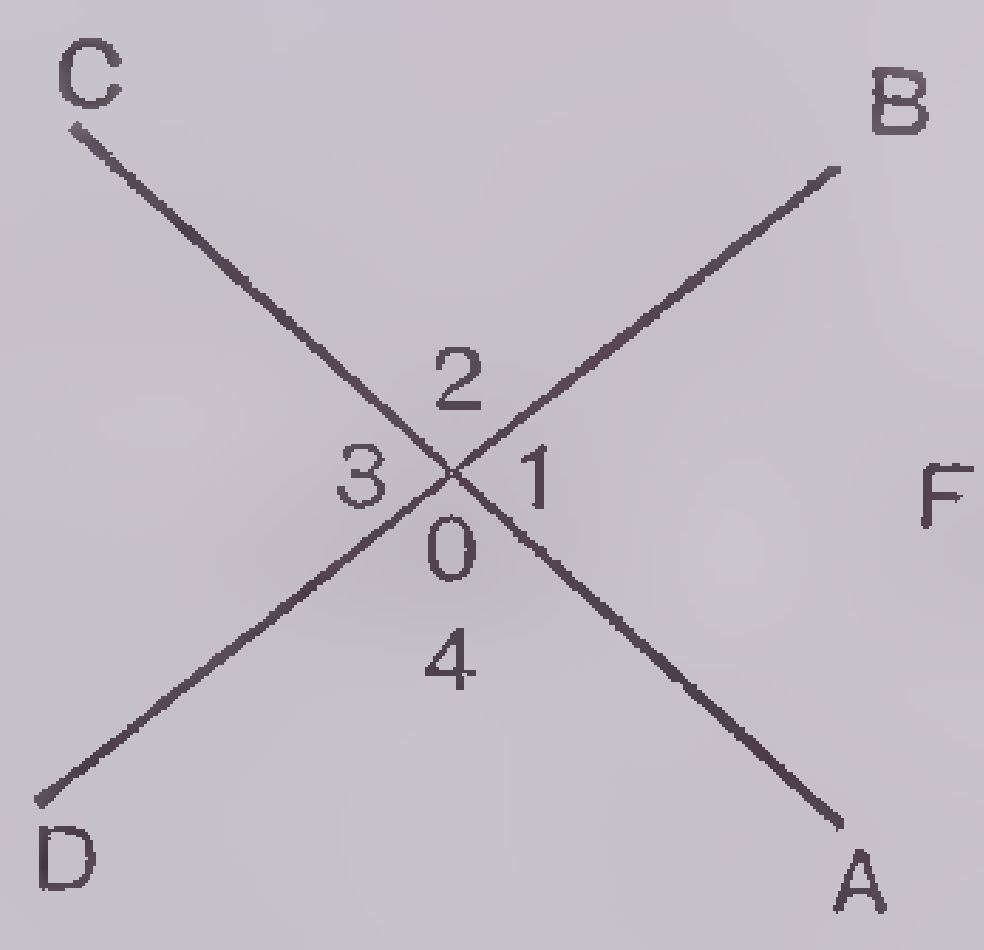


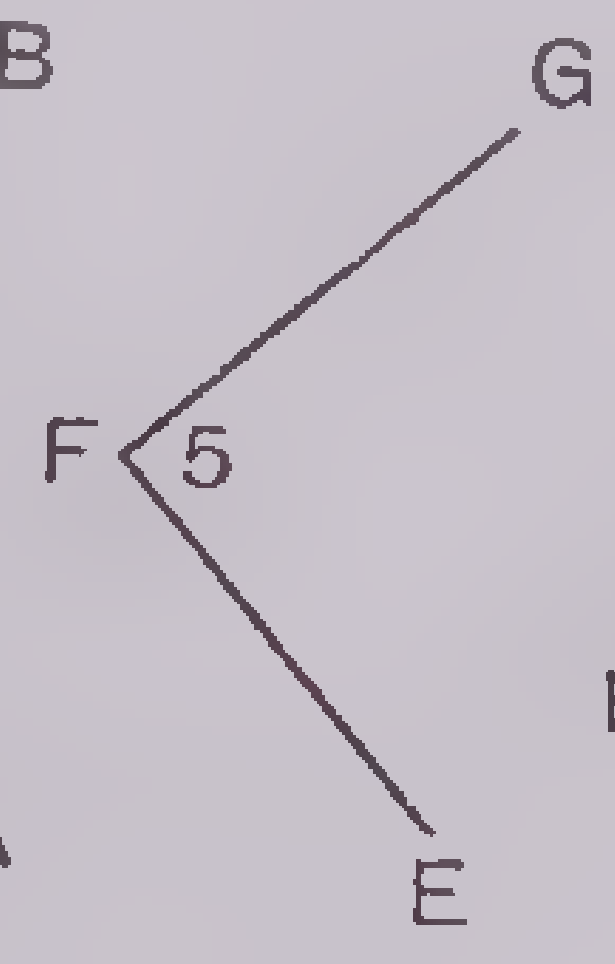
24. **Parallel.**—(Symbol II). Two lines are called *parallel* when they lie in the same plane and do not intersect however far they are produced. There is one line and one only, §15, which passes through P and is parallel to AB, namely, PD. This is a very famous postulate, and in the past there have been many attempts by well-known mathematicians to derive it from the other postulates and axioms.

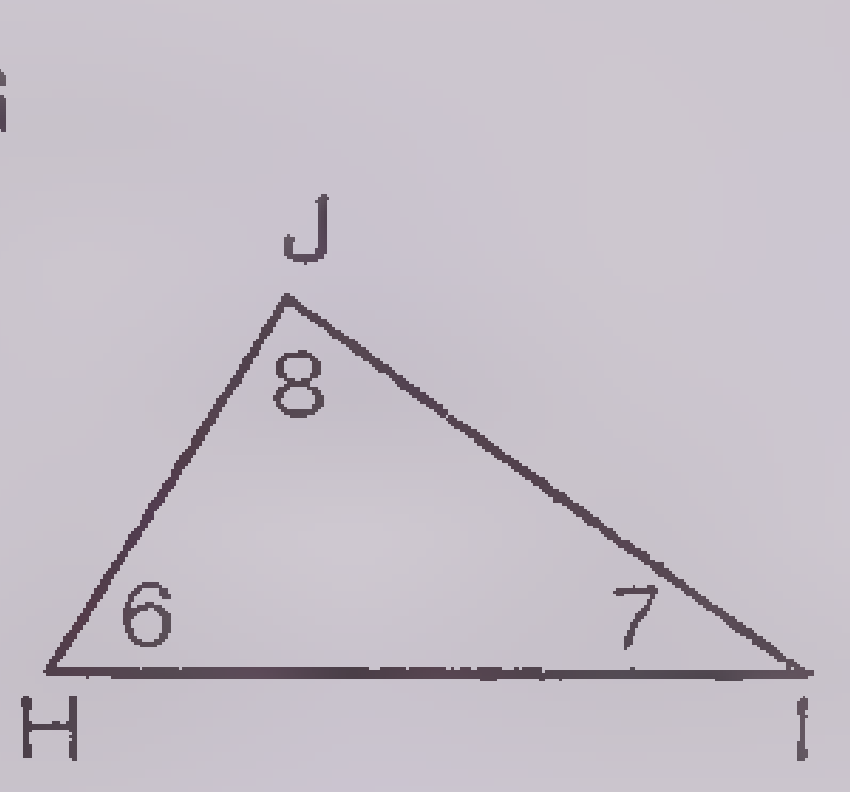
The two rails of a railroad correspond to our ideas of parallel lines; and if prolonged forever in straight lines we believe they would never meet, and it seems as if there should be some way to prove it.

The proof is impossible, however, for it has been shown that it is within the realm of possibility for something entirely different to take place. Lobachevski (1793–1856) showed that the postulate that more than one parallel can be drawn through a point to a given line leads to a consistent and, at the same time, different geometry. In this geometry the sum of the angles of a triangle is less than two right angles. Riemann (1826–1866) took as his postulate that there is no parallel to a line from a point outside it. This leads to still another consistent geometry in which the sum of the angles of a triangle is greater than two right angles. This of course leaves it to experiment or observation to find out which is the true geometry. If the true geometry is that of Euclid, then the sum of the angles of a triangle should be always two right angles.

In like manner, if we see a man in New York and again see him in Canton, China, he may have gone from one place to the other by way of either the Atlantic or the Pacific oceans, but it is also a geometric possibility that he went through the center of the earth. How he did go can be accurately answered only from observation of his trip.







25. **Ray or Half Line.**—When two lines intersect in a point the plane is divided into four parts. AC and BD intersect in O dividing the plane into the four parts 1, 2, 3, 4.

We designate a line beginning at a definite point and extending indefinitely in only one direction as a *ray*, or *half-line.* OA and OC are half-lines.

26. **Angle.**—(Symbol $\angle$). When two half-lines or rays extend indefinitely from a common point, the figure formed is an *angle.* The concept of the half-line, or ray, is introduced to secure uniqueness. When two lines as AC and BD intersect in O, we have four angles determined that we can designate by the numbers 1, 2, 3, 4. The common point is called the *vertex* and the two rays the *sides.* Thus angle 1 has the vertex O, and the sides OA and OB and can be named the angle AOB or the angle BOA; the vertex letter is always written between the two other letters. When there is no danger of ambiguity we can designate the angle by a single letter or number, thus $\angle JHI = \angle 6 = \angle H$; but it would not do to say the angle O, for there is not a unique angle at O.

27. **Straight Angle.**—Closely connected with the angle is the idea of a rotation. If OB turns counterclockwise about O, while OA remains stationary, the angle AOB will increase, and OB will ultimately coincide with OC. The angle AOC or COA is called a *straight angle.* A straight angle is formed when the sides extend in opposite directions from a common vertex and form a straight line.

28. **Geometric Figure.**—Any combination of the geometric elements, points, lines, surfaces and solids is a geometric figure.

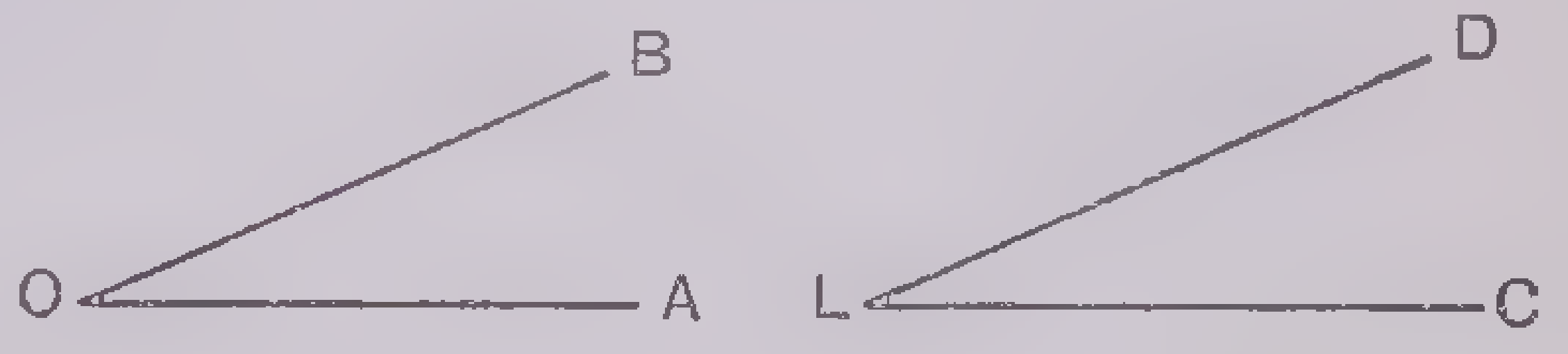
29. **Boundaries.**—The *boundaries* of a geometric figure are the points, lines or surfaces by which it is limited.

30. **Polygon.**—A *polygon* is a plane figure bounded by three or more straight lines.

Triangle.—(Symbol $\triangle$). A *triangle* is a portion of the plane bounded by three straight lines and is the simplest of the polygons.

31. **Equality.**—(Symbol $=$). Equality has various meanings in geometry. The fundamental *equality* is congruence.

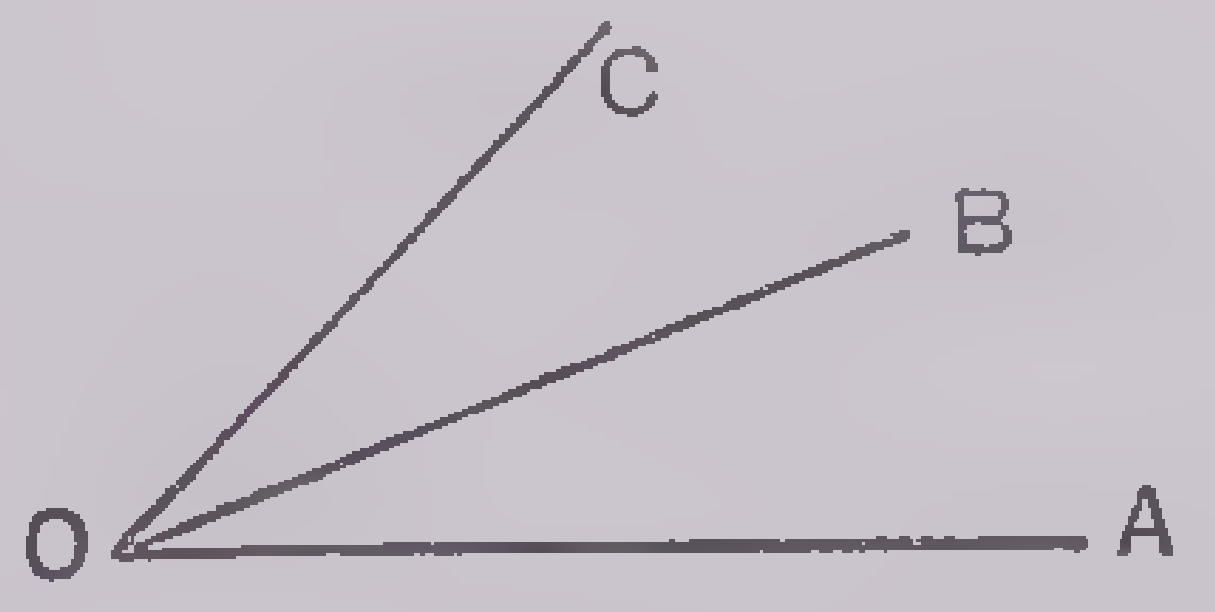
32. **Congruence.**—(Symbol $\cong$). Two geometrical figures are *congruent* if they can be made to coincide in all their parts by use of postulate §14. The segment AB is congruent or equal to segment CD if AB can be made to coincide with CD. A can be made to coincide with C, the line AB to coincide with the line CD, then if B falls on D the segments coincide throughout and are congruent. Also if AB $\cong$ CD then AB $\cong$ DC.



The two angles AOB and CLD are congruent if it is possible to place them so that OA coincides with LC at the same time that OB coincides with LD, or in general if the vertices and sides can be made to coincide at the same time. Also they can then be made to coincide in the reverse order, that is, OA with LD, and OB with LC. These two methods are denoted symbolically by $\angle AOB \cong \angle CLD$ or $\angle AOB \cong \angle DLC$.

A circle and a square however may have equal areas, but they are not capable of being made to coincide.

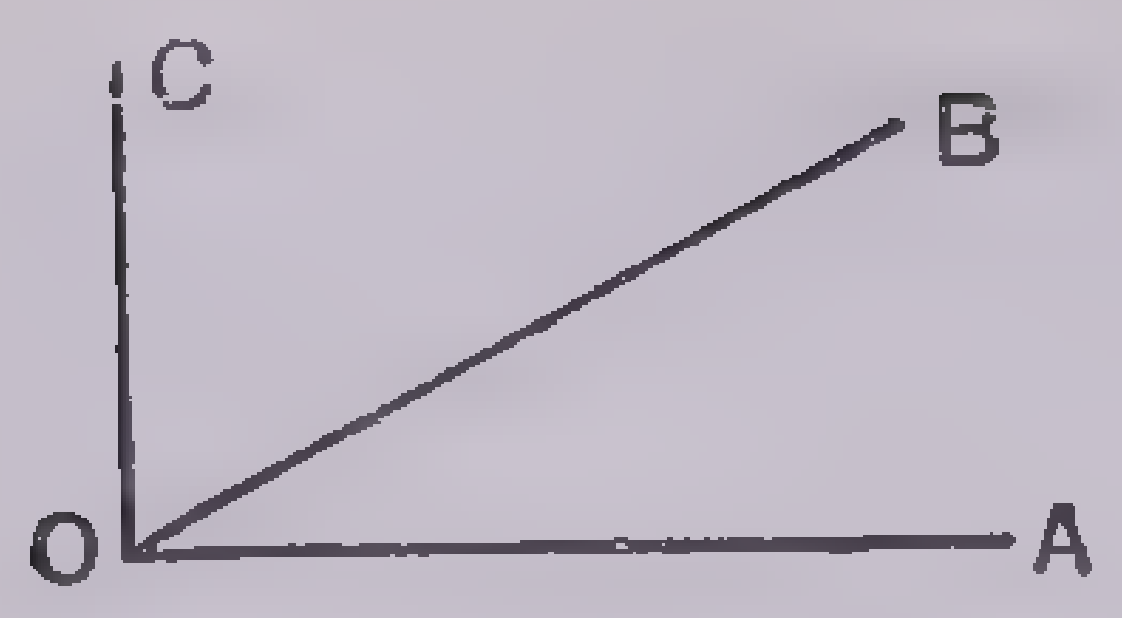
The method of showing that two figures are congruent, by placing one upon the other so that they coincide in all their parts, is called proof by the method of *superposition.*

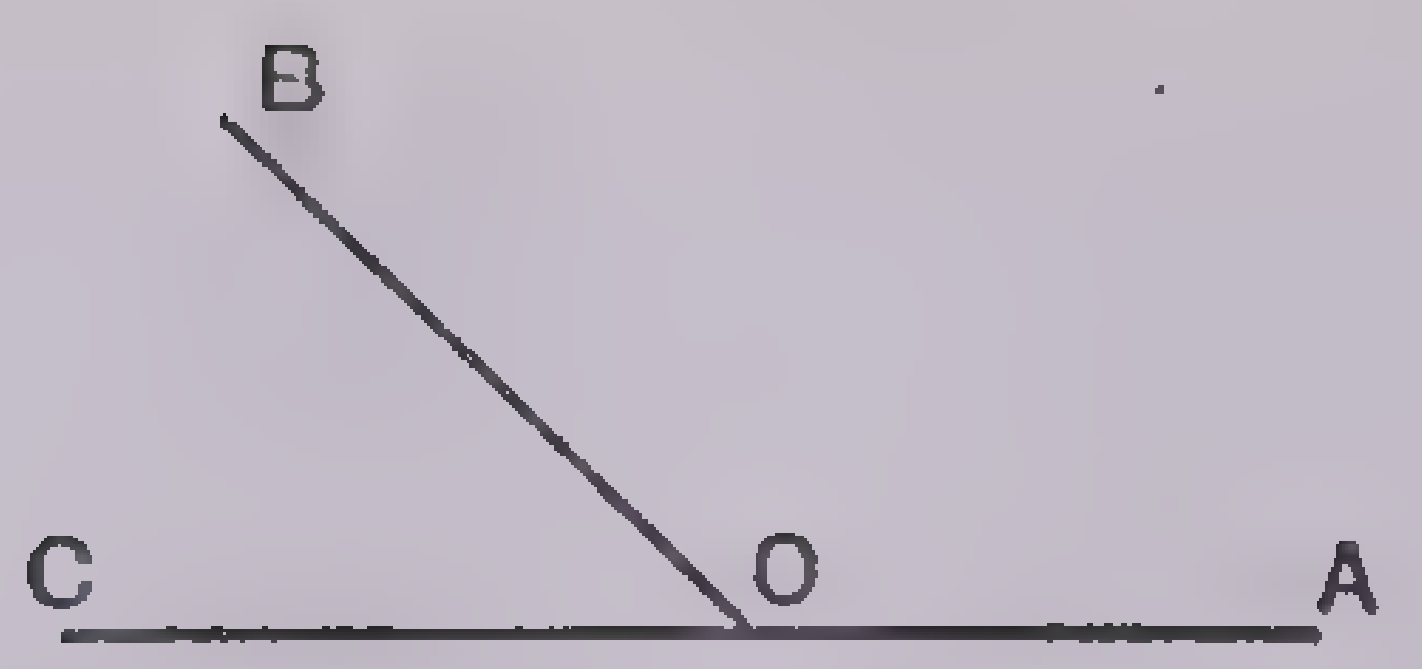


33. **Adjacent Angles.**—Two angles that have the same vertex and a common side between them are *adjacent.* Thus $\angle AOB$ and $\angle BOC$ are adjacent and $\angle AOC$ is their sum. The line OB is the common side.

34. **Right Angles.**—When two straight lines meet so that any two of the adjacent angles are equal, the angles are called *right angles.* An angle less than a right angle is called an *acute angle.* An angle greater than a right angle is called an *obtuse angle.*

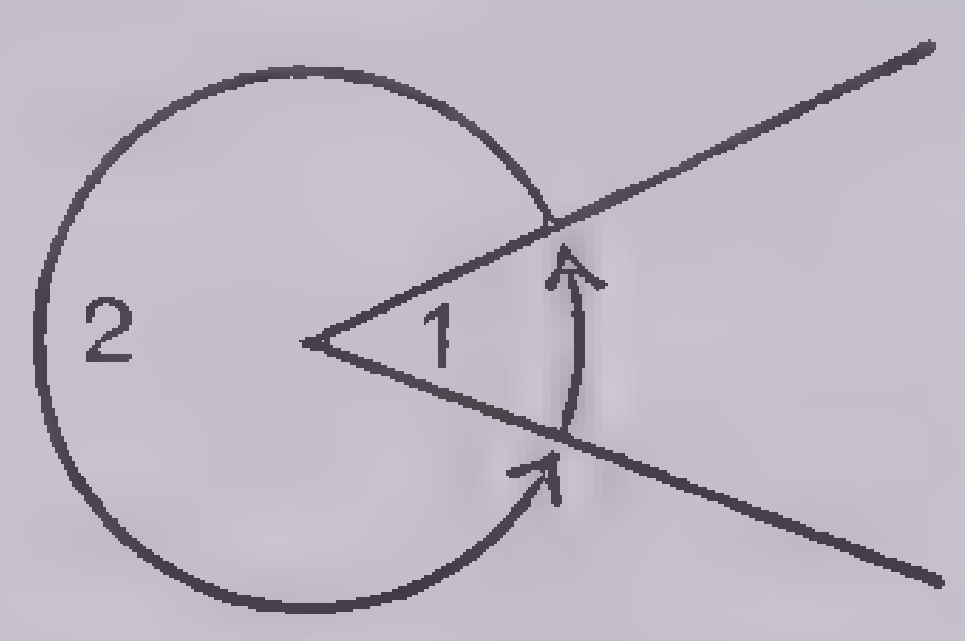
35. **Perpendicular.**—(Symbol $\perp$). Two lines are *perpendicular* when they meet to form right angles. There is but one line perpendicular to a given line at a given point, by postulate §18. This is the second unique line PC of §23.





36. Complementary Angle.—One angle is the *complement* of another when their sum is a right angle. ∠AOB and ∠BOC (left) are complementary angles.

37. Supplementary Angles.—One angle is the *supplement* of another if their sum is a straight angle or two right angles. ∠AOB and ∠BOC (right) are supplementary.



38. Conjugate Angles.—One angle is the *conjugate* of another if their sum is two straight angles or four right angles, ∠1 and ∠2 are conjugate.

List of Axioms

The 11 axioms below, together with the postulates listed in §8–19, may be called the cornerstone of geometry. They will be used many times in the proof of theorems.

39. If equals are added to equals, the sums are equal.
40. If equals are subtracted from equals, the remainders are equal.
41. If equals are multiplied by equals, the products are equal.
42. If equals are divided by equals, the quotients are equal.
43. Like powers or like positive roots of equals are equal.
44. If unequals are operated on by positive equals in the same way, the results are unequal in the same order.
45. If unequals are added to unequals in the same order, the sums are unequal in the same order; if unequals are subtracted from equals, the remainders are unequal in the reverse order.
46. Quantities that are equal to the same quantity or to equal quantities are equal to each other.
47. A quantity may be substituted for its equal in an equation or in an inequality.
48. If the first of three quantities is greater than the second, and the second is greater than the third, then the first is greater than the third.
49. The whole is greater than any of its parts and is equal to the sum of all its parts.

50. Magnitude.—Anything that is measurable is a *magnitude*. The axioms above are universal statements that apply to numerical quantities or magnitudes. They enumerate all the operations necessary in dealing with numbers.

Consider axiom 45.

7 is greater than 3, or in symbols 7 > 3,
6 is greater than 4, or in symbols 6 > 4,
Adding, 13 is greater than 7 Adding, 13 > 7.
10 equals 10 or in symbols 10 = 10
6 is greater than 4, or in symbols 6 > 4
Subtracting, 4 is less than 6 Subtracting, 4 < 6

Or course nothing can be said about the result of adding unequals to unequals that are in the reverse order, as can be seen below.

$$\begin{array}{rr} & 10 > 6, \\ & 3 < 13, \\ \text{Adding} & \overline{13} < \overline{19}, \\ \text{but} & 10 > 6, \\ & 3 < 4, \\ \text{Adding} & \overline{13} > \overline{10}. \end{array}$$

Thus the first sum may be either greater or less than the second. The reader can verify the other axioms for numbers in a similar way.

51. Solids.—All the objects that we can see are *solids*. Physics and chemistry are concerned with the nature and properties of the substances of which the physical solids are constituted, while geometry is concerned only with the shape and size of the solid. Thus a geometrical solid cannot be seen or touched and has its existence only in the imagination.

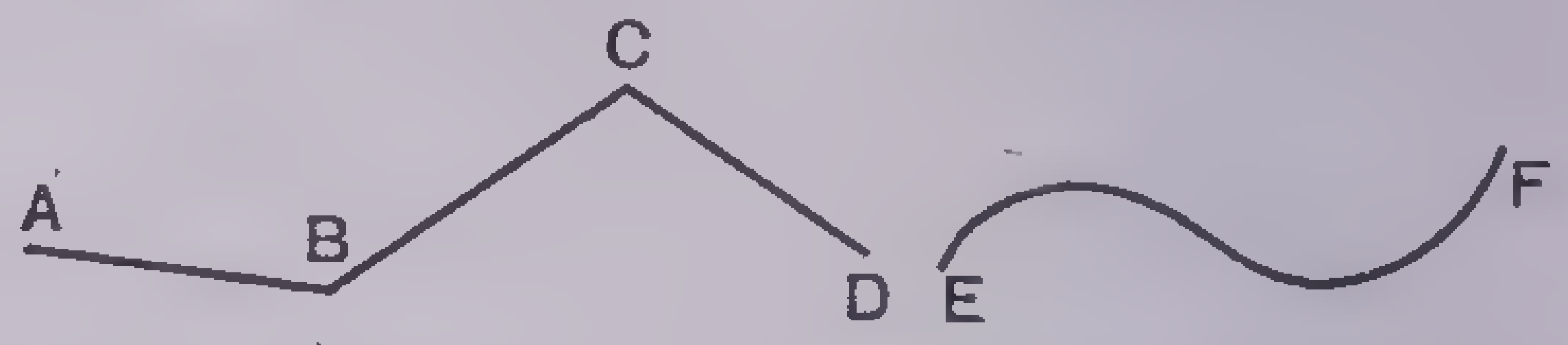
52. Geometrical Solid.—A geometrical solid is a limited portion of space.

53. Surface.—The boundaries of a geometric solid are called *surfaces*. Consider some water standing in a glass. The exposed surface of the water is neither air nor water, it is what is between the air and the water.

A sheet of paper is a representation of a surface, or rather of two surfaces, as its two faces are separated by the thickness of the paper.

54. Line.—A *line* is the intersection of two surfaces. Thus in the case of water standing in a glass, the surface of the water meets the surfaces of the glass in a curved line, or an approximate circle, if the glass is an ordinary drinking glass.

We have already considered the straight line in §5.



55. Broken Line.—A *broken line* is composed of portions of straight lines. AB + BC + CD is a broken line.

56. Curved Line or Curve.—Any line that is neither straight nor broken is a *curved line*. EF is a curved line.

57. Motion in Geometry.—Since geometry is closely connected with mechanics, which discusses the motion of physical objects, we should see the relation of motion to the fundamental elements of geometry as follows:

A moving point generates a line.
A moving line generates a surface unless it moves along itself.
A moving surface generates a solid unless it moves along itself.

58. Plane.—A definition of a plane can be given in terms of points and lines. A *plane* is a surface such that a straight line joining any two of its points lies wholly within the surface.

59. Proposition and Theorem.—Geometry is the study of the properties of figures and the relations that exist between them. The results of these studies are formulated in statements called *propositions*. A proposition that is to be proved is called a *theorem*. A theorem consists of two parts: the *hypothesis* and the *conclusion*. The hypothesis gives all the conditions that are granted or assumed. The conclusion gives the result of these conditions. From the standpoint of the student, a theorem is something that must be proved; that is, he is to reproduce the steps by which the original discovery was made.

60. Proof.—A proof is an argument or an ordered arrangement of statements by which we show the truth of an assertion. For each statement given a reason must be assigned.

These reasons must be—

(1) granted in the hypothesis,
(2) an axiom or postulate,
(3) a definition,
(4) or a theorem that has itself been previously proved.

The student must take every opportunity to learn what the axioms, postulates and definitions mean; then he will be able to write them in his own words.

Read every word in a theorem, and if there is a single word or phrase of which you do not know the exact meaning, consult the definitions; because you cannot be honest with yourself if you attempt to prove something when you do not understand what it is you are about to prove.

61. Method of Writing a Proof.—

(1) Write the theorem.
(2) Draw a figure indicating what is given.
(3) Write down the hypothesis.
(4) Write down the conclusion.
(5) Draw a line down the middle of the page and for each step written on the left of the line give the reasons on the right. This method will be followed for only a part of the propositions.

62. Symbols.—

+	plus.	⊥	perpendicular, is perpendicular to.
−	minus.		
×	times, or multiplied by.	⊥s	perpendiculars.
=	equals.	∥	parallel, is parallel to.
≎	equivalent, is equivalent to.	∥s	parallels.
≅	congruent, is congruent to.	▱	parallelogram.
∽	similar, is similar to.	▱s	parallelograms.
>	is greater than.	○	circle.
<	is less than.	ⓢ	circles.
∴	therefore.	π	ratio of the circumference to the diameter of a circle.
∵	since.		
∠	angle.		
∠s	angles.	√	square root, $\sqrt{16} = 4$.
△	triangle.	°	degrees.
△s	triangles.	′	minutes.
		″	seconds.

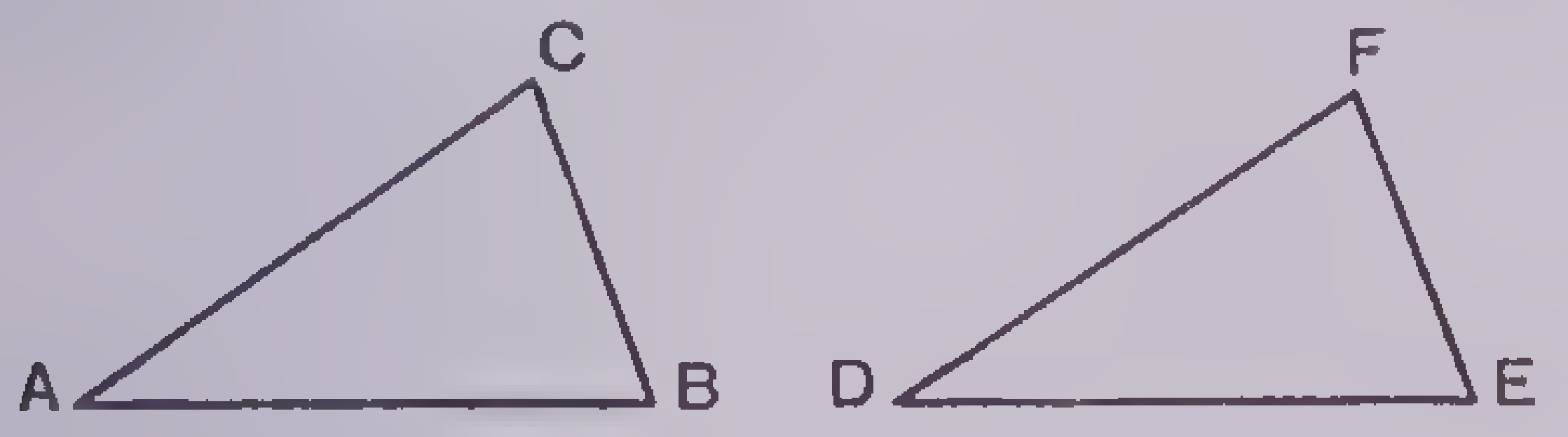
63. Abbreviations.—

Adj.	Adjacent.		
Alt.	Alternate.	Hyp.	Hypothesis.
Ax.	Axiom.	Int.	Interior.
Con.	Conclusion.	Post.	Postulate.
Cons.	Construction.	Rect.	Rectangle, Rectangular.
Corresp.	Corresponding.	Rt.	Right.
Def.	Definition.	Str.	Straight.
Ext.	Exterior.	Sup.	Supplementary.

These symbols and abbreviations are the shorthand of geometry. They are very useful in writing out proofs of the theorems, which we are now ready to consider. The theorems are here dealt with under eight general headings, entitled: Angles, Triangles and Perpendiculars; The Circle and Measure of Angles; Similar Polygons; Areas of Polygons; Regular Polygons and the Measure of the Circle, Problems of Construction; Additional Definitions, Special Cases and Theorems of Construction.

ANGLES, TRIANGLES AND PERPENDICULARS

64. Theorem 1.—If two triangles have two sides and the included angle of one equal respectively to two sides and the included angle of the other, the triangles are congruent.



Hyp. Given ⟁ ABC and DEF, in which AB = DE, AC = DF and the ∠ A = ∠ D.
Con. △ ABC ≅ △ DEF.

PROOF

Statements	Reasons
1. Place △ ABC on △ DEF so that the side AB coincides with its equal DE and so that the point A falls on the point D and the point B on the point E.	1. Post. §14. Any figure may be moved from place to place without altering its size or shape. Def. §32. The segment AB is equal to the segment DE if AB can be made to coincide with DE.
2. The side AC will coincide with the equal side DF, since ∠ A = ∠ D.	2. Def. §32. Two angles that are equal can be made to coincide. Angle A equals angle D by hypothesis.
3. Point C will fall on point F.	3. Segment AC equals segment DF by hypothesis.
4. Point B now coincides with point E, hence the side BC coincides with the side EF.	4. Post. §8. One straight line and only one can be drawn through two given points.
5. △ ABC ≅ △ DEF.	5. Def. §32. Two geometrical figures are congruent if they can be made to coincide in all their parts.

Let us consider the proof of the theorem. It is obvious that when one looks at the drawing alone it is impossible to tell what is given or what is to be proved. There are six statements that can be made regarding the two triangles (we will use the symbols of §62):

∠ A = ∠ D AB = DE
∠ B = ∠ E BC = EF
∠ C = ∠ F CA = FD

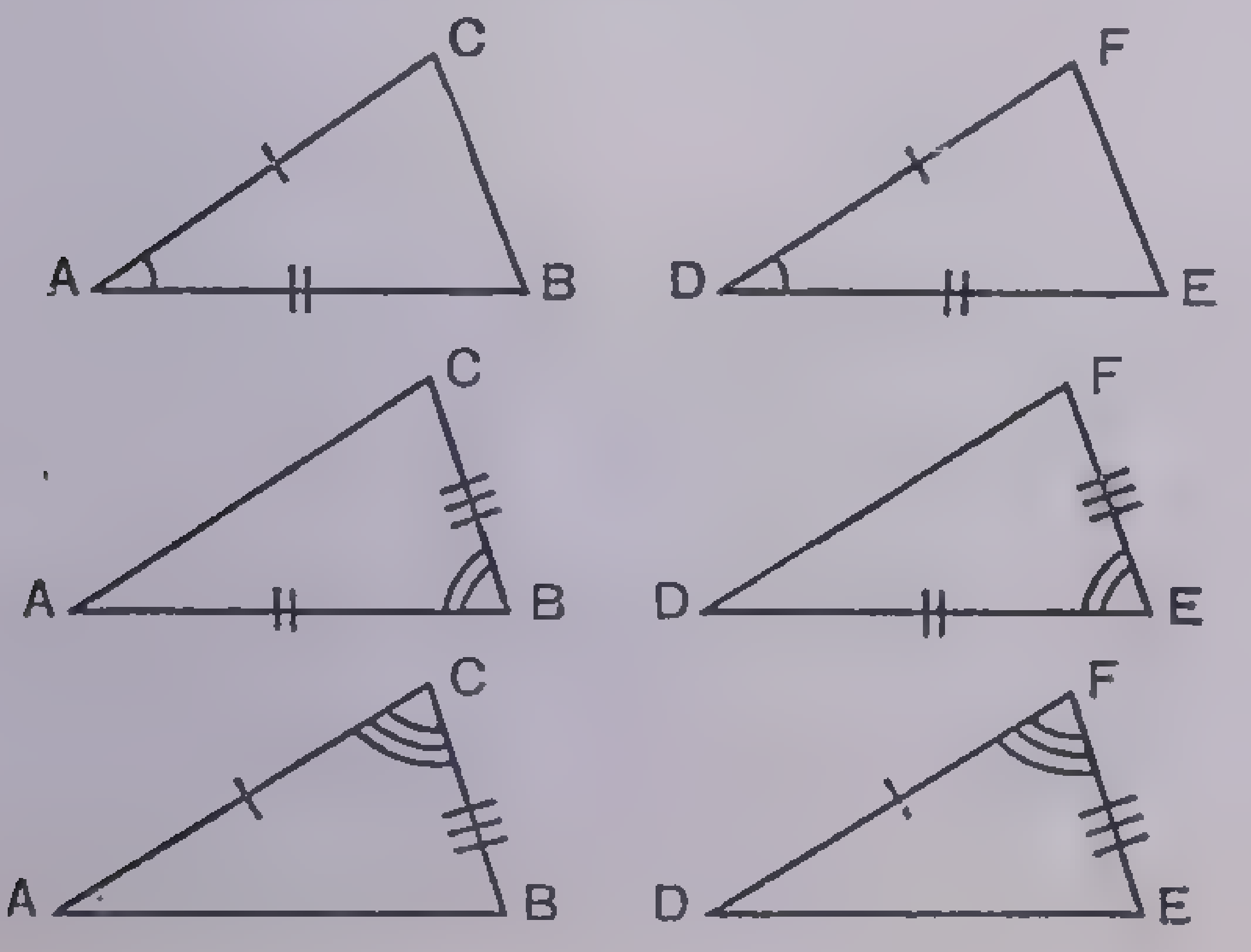
But in geometry it is not enough to tell the truth. Turning to other fields, we may write down six truths:

Water is wet.
The sky is blue.
The moon is a sphere.
There are 7 days in the week.
Honesty is the best policy.
All crows are black.

It is impossible to trace any sequence in the above statements, or to show that one is the result of any number of the others, as is required in a geometric proof.

There are three ways in which the above figures can be used to prove the same theorem, starting with the three different hypotheses,

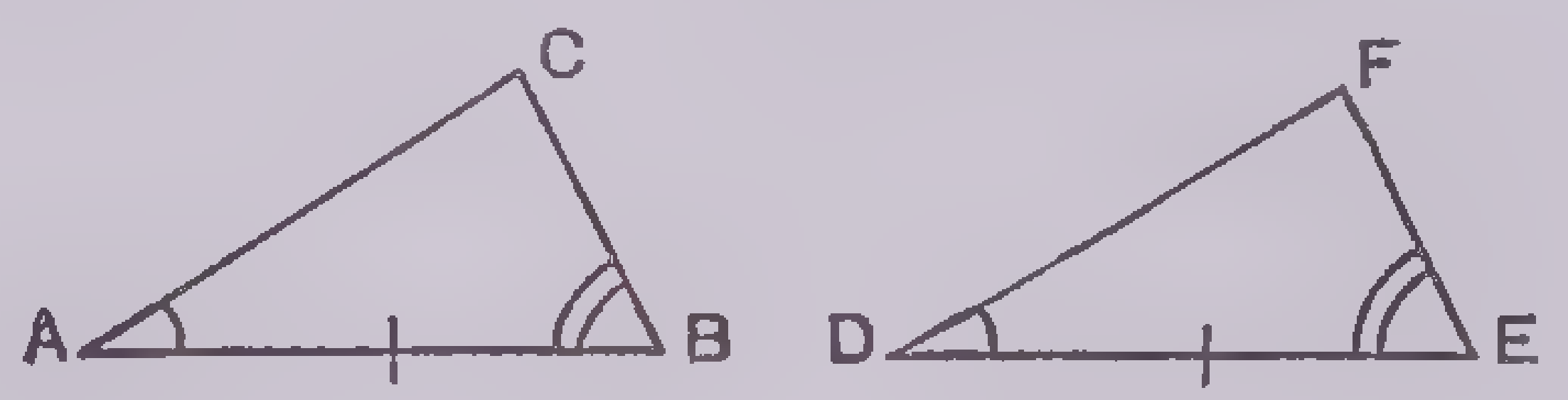
(1) AB = DE, AC = DF, ∠ A = ∠ D;
(2) AB = DE, BC = EF, ∠ B = ∠ E;
(3) BC = EF, CA = FD, ∠ C = ∠ F.



So it is especially important to know just which of these three cases has been chosen. This can often be indicated by markings on the equal segments and angles, so that immediately on looking at the figure it will be possible to tell what facts are given in the hypothesis. The three figures above give in order the three possible hypotheses enumerated above.

From this point on, we shall frequently make use of this method of indicating equal segments and angles.

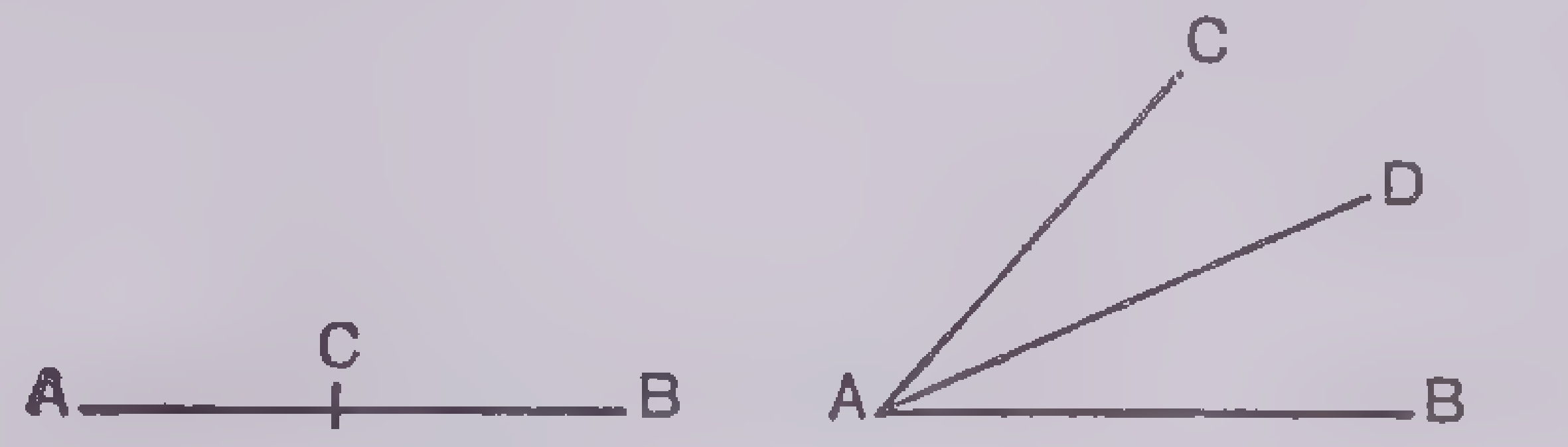
65. Theorem 2.—If two triangles have a side and the two adjoining angles of one equal respectively to a side and the two adjoining angles of the other, the triangles are congruent.



Hyp. In ⟁ ABC and DEF, AB = DE, ∠ A = ∠ D and ∠ B = ∠ E.
Con. △ ABC ≅ △ DEF.

Statements	Reasons
1. Place △ ABC on △ DEF so that AB coincides with its equal DE with A falling on D and B on E.	1. Post. §14. Any figure may be moved from place to place without altering its size or shape.
2. The line AC will coincide with the line DF and the line BC with the line EF.	2. ∠ A = ∠ D and ∠ B = ∠ E by hypothesis. Def. §32.
3. Point C will coincide with point F.	3. Post. § 10. Two straight lines can intersect in only one point.
4. △ ABC ≅ △ DEF.	4. Def. §32.

66. Isosceles Triangle.—An *isosceles triangle* has two of its sides equal.



67. Bisection.—

To bisect a segment AB is to find the point C in the interior of the segment so that AC = CB, in which case C is called the midpoint of AB.

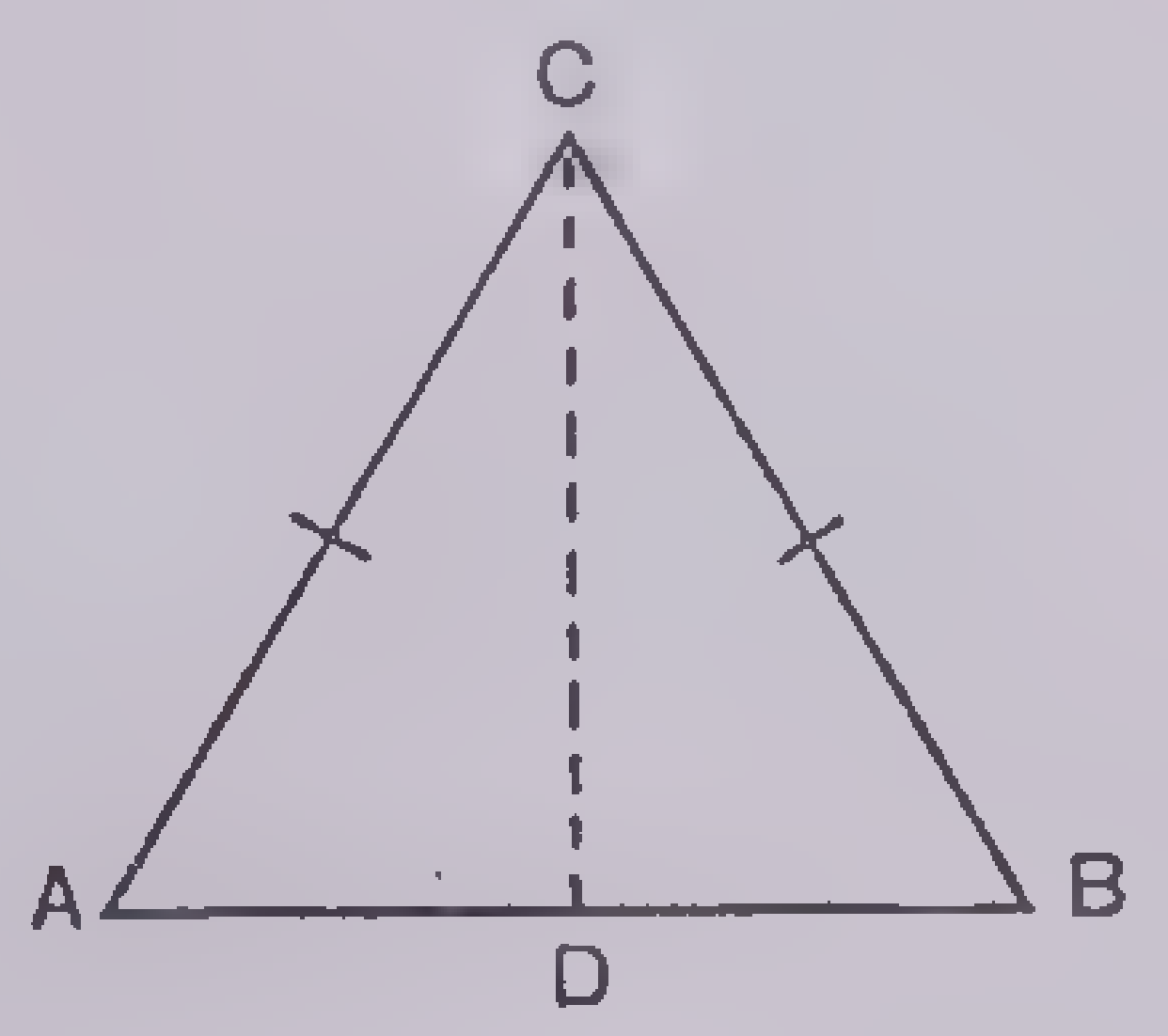
To bisect an angle BAC is to draw the half-line or ray AD so that ∠ BAD ≅ ∠ DAC, in which case AB is called the bisector of the angle BAC.

The actual method of finding the point C and the line AD with ruler and compasses will be shown later.

68. Corresponding or Homologous Parts.—When two geometrical figures can be made to coincide, any two segments that coincide are called *corresponding* or *homologous* segments, and any two angles that coincide are called corresponding or homologous angles.

Corresponding or homologous parts of congruent figures are equal.

69. Theorem 3.—In an isosceles triangle the angles opposite the equal sides are equal.

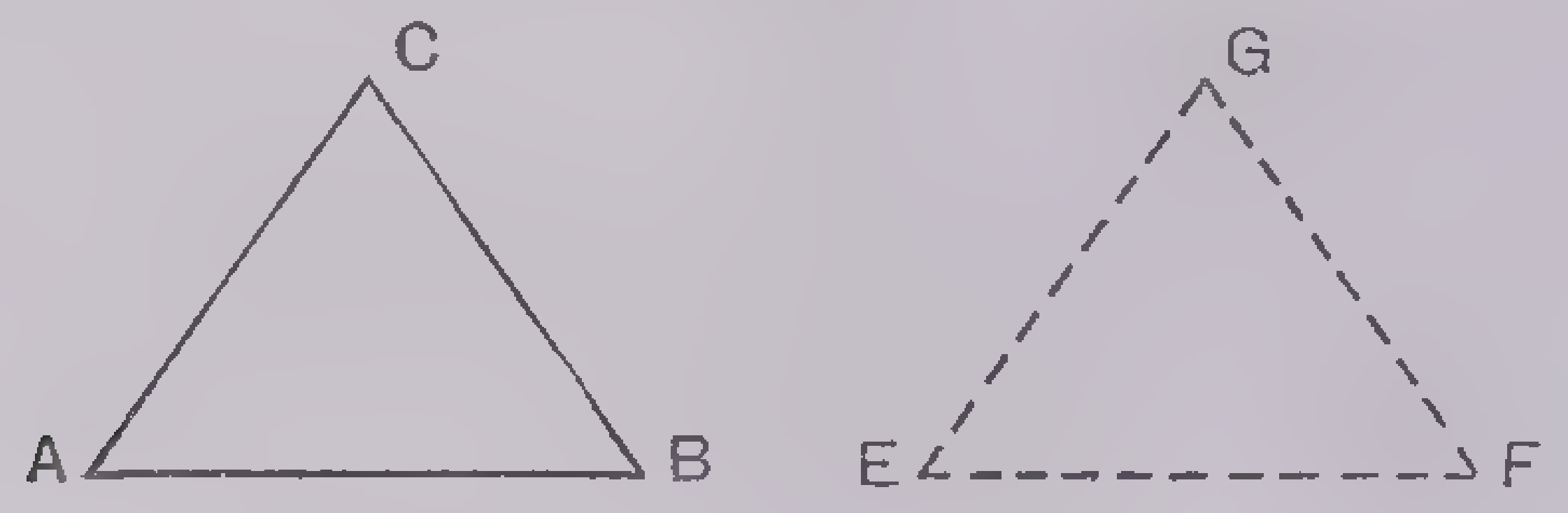


Hyp. In △ ABC, AC = BC.
Con. ∠ A = ∠ B.

Statements	Reasons
1. Draw CD the bisector of ∠ C, meeting the side AB in D. Then ∠ ACD = ∠ DCB.	1. §67. Definition of bisection.
2. AC = BC.	2. Hypothesis.
3. CD = CD.	3. Identical.
4. △ ACD ≅ △ BCD.	4. Theorem 1, §64. If two triangles have two sides and the included angle of one respectively equal to two sides and the included angle of the other, the triangles are congruent.

5. $\angle A = \angle B$.	5. Def. §68. Corresponding angles of congruent triangles.

70. Theorem 4.—If two angles of a triangle are equal, the triangle is isosceles.

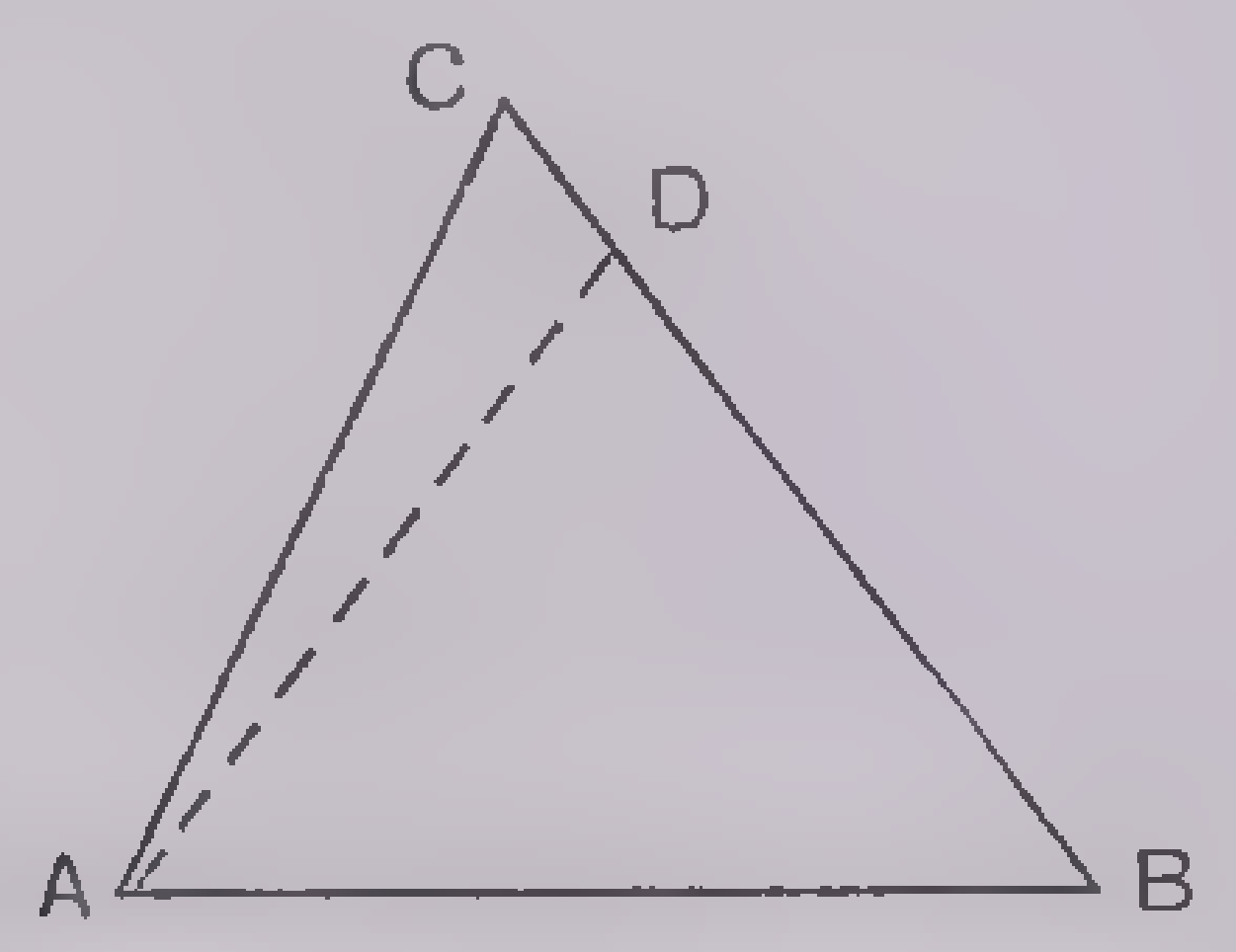


Hyp. Given $\triangle ABC$ with $\angle A = \angle B$.
Con. $AC = BC$ or $\triangle ABC$ is isosceles.

1. Suppose that EFG is ABC in a second position so that $ABC \cong EFG$.	1. Post. §14. Any figure can be moved from place to place without altering its size or shape.
2. Turn EFG over and place it on ABC so that F falls on A and E on B.	2. Post. §14. Same as above.
3. Since $\angle A = \angle B$, and $\angle B = \angle F$, $\therefore \angle A = \angle F$.	3. Ax. §46. Quantities that are equal to the same quantity or to equal quantities are equal to each other.
4. $\therefore$ the line FG falls along the line AC.	4. Def. §32. Relative to congruent angles.
5. Similarly the line EG falls on the line BC.	
6. Hence G will coincide with C.	6. Post. §10. Two straight lines can intersect in only one point.
7. $GF = AC$.	7. Def. §32.
8. But $GF = CB$.	8. Construction.
9. $\therefore AC = BC$.	9. Ax. §46. Quantities that are equal to the same quantity or equal quantities are equal to each other.

71. Converse.—If the hypothesis and conclusion of a theorem are interchanged to form a new theorem, this theorem is called the *converse* of the original theorem. It will be observed that the theorem of §70 is the converse of the theorem of §69.

72. Theorem 5.—If one angle of a triangle is greater than a second angle, the side opposite the first angle is greater than the side opposite the second angle.



Hyp. Given $\triangle ABC$ with $\angle A > \angle B$.
Con. $BC > AC$.

1. Draw the line AD meeting CB in D, forming $\angle BAD = \angle CBA$.	
2. AD will fall inside $\angle CAB$.	2. $\angle CAB > \angle BAD$ by hypothesis and construction.
3. $AD + DC > CA$.	3. Post. §12. A straight line is the shortest path between two points.
4. $\angle BAD = \angle ABD$.	4. Construction.
5. $AD = BD$.	5. Theorem 4, §70. If two angles of a triangle are equal, the triangle is isosceles.
6. $BD + DC > CA$.	6. Ax. §47. A quantity may be substituted for its equal in an equation or an inequality.
7. $BD + DC = BC$.	7. Ax. §49. The whole is equal to the sum of its parts.
8. $\therefore BC > AC$.	8. Ax. §47. A quantity may be substituted for its equal in an equation or an inequality.

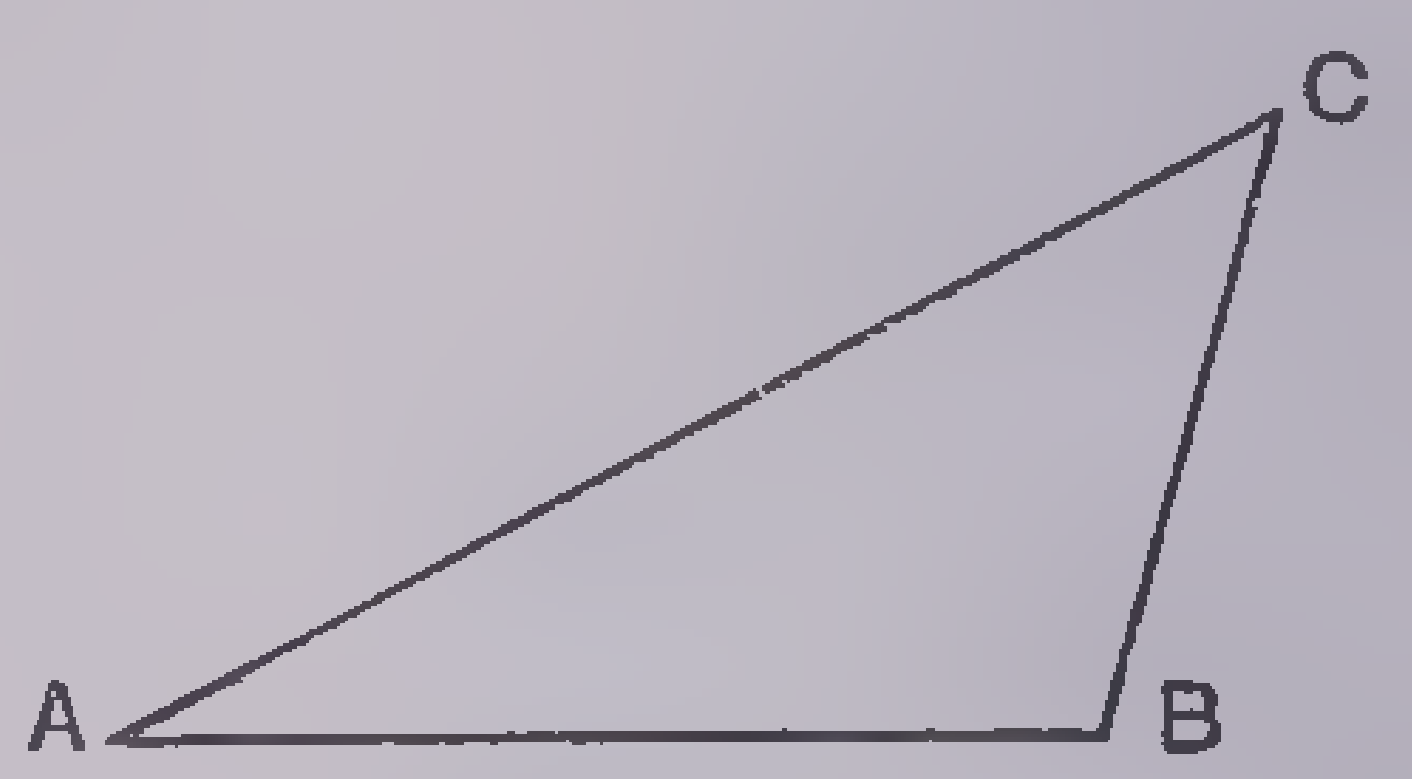
73. Proof by Exclusion.—Sometimes it is not possible or feasible to give a direct proof of a theorem, as has been done with the theorems so far considered. Another method is to make a complete enumeration of all the possible things which can happen and then to eliminate them one by one until there remains but a single possibility, and this must be the true condition of affairs.

The success of this method depends upon the completeness of the enumeration. Because a color is not green does not prove it is red. You are not sure of finding the letter that you were to mail and that you have concealed in a pocket if you overlook a single pocket in going through your clothes.

In plane geometry a line is either perpendicular to another line or it is not perpendicular to it. Hence you have but two possibilities here; disprove one and you prove the other. In the case of the relation between two numbers x and y there are three possibilities, x greater than y, x less than y or x equal to y; here you must show that two of these are impossible, in order to be certain of the true result.

We shall now have opportunity to use this method.

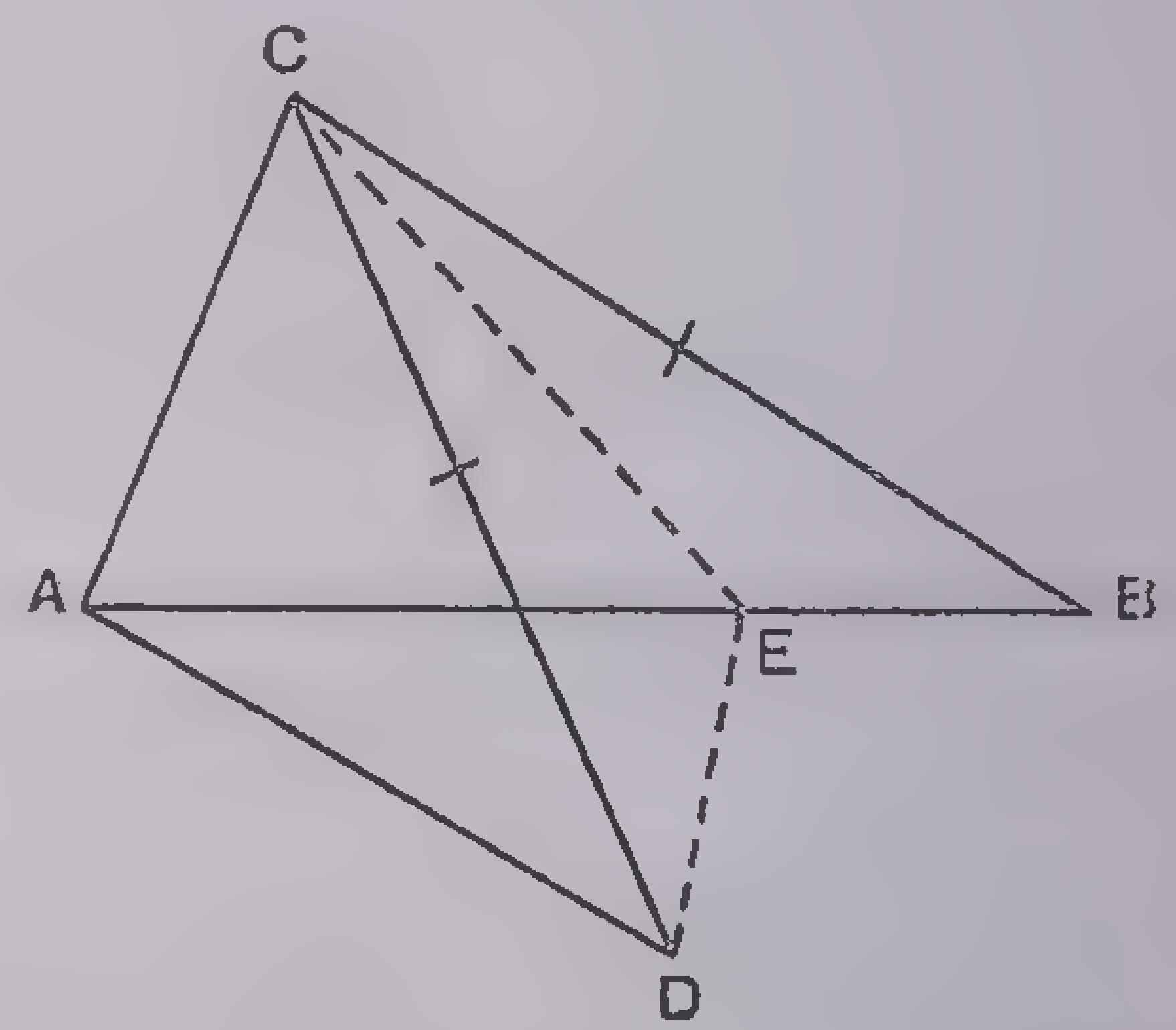
74. Theorem 6.—If one side of a triangle is greater than a second side, the angle opposite the first side is greater than the angle opposite the second side.



Hyp. Given $\triangle ABC$ with $AC > BC$.
Con. $\angle B > \angle A$.

1. There are only three possibilities regarding the $\angle$s A and B, (I) $\angle A = \angle B$, (II) $\angle A > \angle B$, (III) $\angle A < \angle B$.	1. §73.
2. (I) If $\angle A = \angle B$ then $AC = BC$, which is impossible.	2. Theorem 4, §70. If two angles of a triangle are equal the triangle is isosceles. Contradicts the hypothesis.
3. (II) If $\angle A > \angle B$ then $CB > AC$, which is impossible.	3. Theorem 5, §72. If one angle of a triangle is greater than a second angle, the side opposite the first angle is greater than the side opposite the second angle. Contradicts the hypothesis.
4. $\therefore \angle A < \angle B$ or $\angle B > \angle A$.	4. The only remaining possibility.

75. Theorem 7.—If two triangles have two sides of one equal respectively to two sides of the other, and the included angles unequal, the triangle which has the greater included angle has the greater third side.



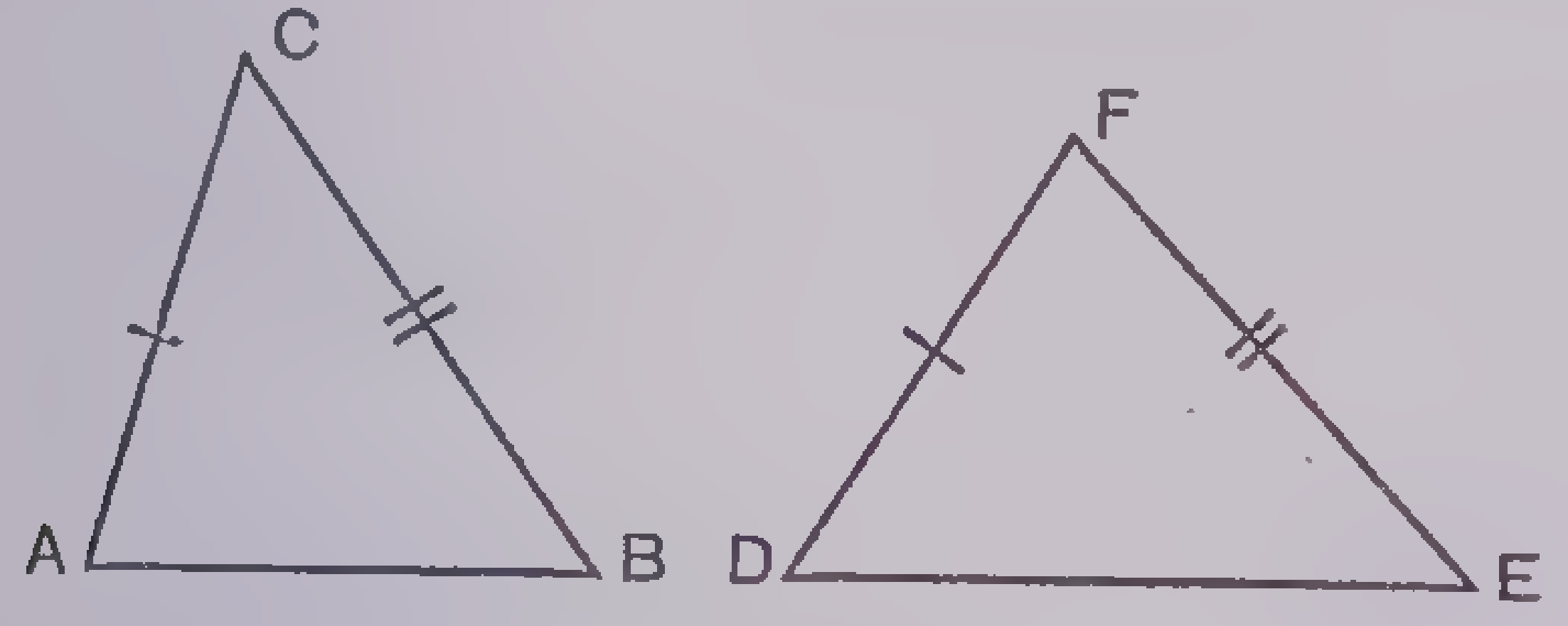
Hyp. Given $\triangle$s ABC and ADC with $AC = AC$ and $CD = CB$ but with $\angle ACB > \angle ACD$.
Con. $AB > AD$.

(Note. According to §14 we can imagine that the two triangles moved until they have one pair of equal sides in common as AC.)

1. Draw CE the bisector of the $\angle DCB$ which meets AB in E.	1. §67.
2. $CD = CB$, $CE = CE$, $\angle DCE = \angle ECB$.	2. Hypothesis, Identical, Construction.
3. $\therefore \triangle DEC \cong \triangle BEC$.	3. Theorem 1, §64. If two triangles have two sides and the included angle of one respectively equal to two sides and the included angle of the other, the triangles are congruent.
4. $\therefore DE = EB$.	4. Corresp. parts of congruent triangles, §68.
5. $AE + ED > AD$.	5. Post. §12. A straight line is the shortest distance between two points.

6. $\therefore AE + EB > AD$.	6. Replacing ED by its equal EB.
7. $\therefore AB > AD$.	7. Ax. §49. The whole is equal to the sum of all its parts.

76. Theorem 8.—If two triangles have two sides of one equal respectively to two sides of the other and the third sides unequal, the triangle which has the greater third side has the greater included angle.



Hyp. Given $\triangle$s ABC and DEF with $AC = DF$, $BC = EF$ but $DE > AB$.

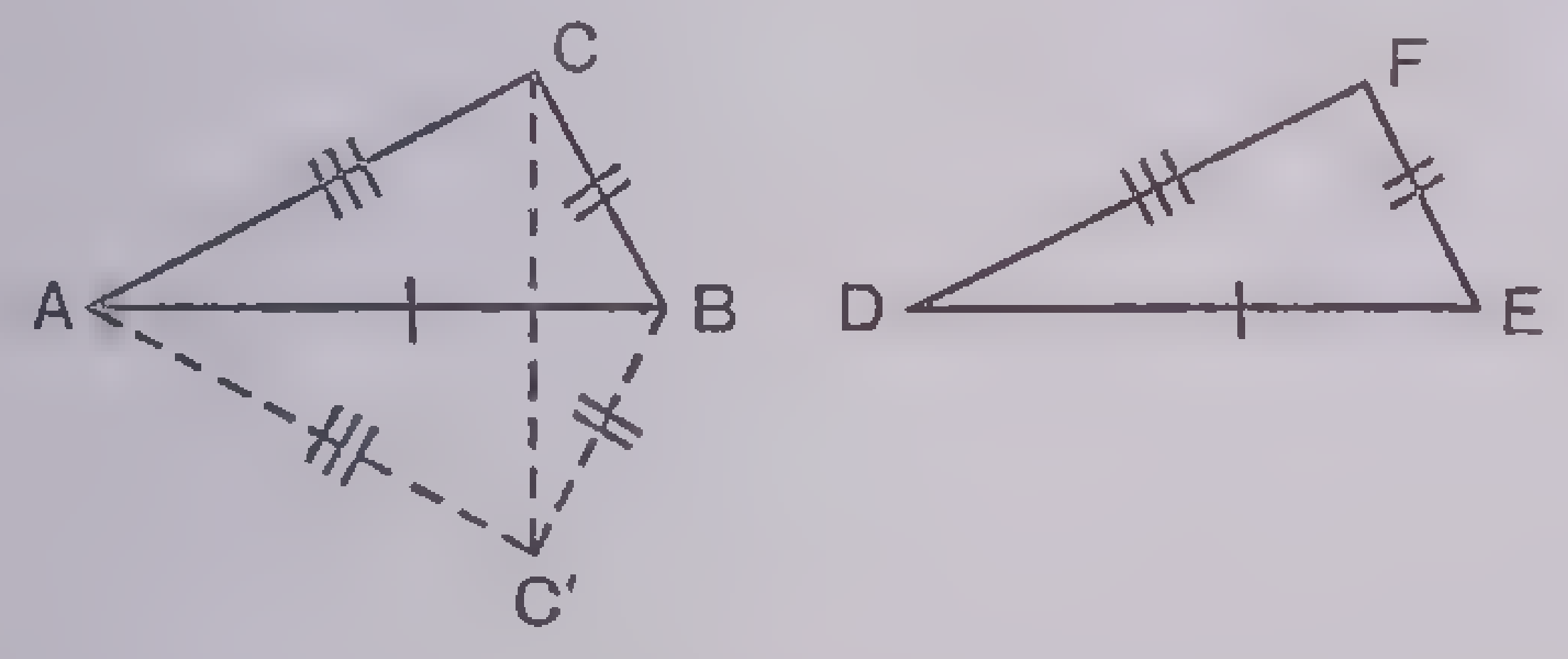
Con. $\angle DFE > \angle ACB$, or $\angle F > \angle C$.

Hint. There are only three possibilities;

(1) $\angle C = \angle F$,
(2) $\angle C > \angle F$,
(3) $\angle C < \angle F$.

Prove that the first two are impossible, hence the third must be true.

77. Theorem 9.—If two triangles have the three sides of one equal respectively to the three sides of the other, the triangles are congruent.



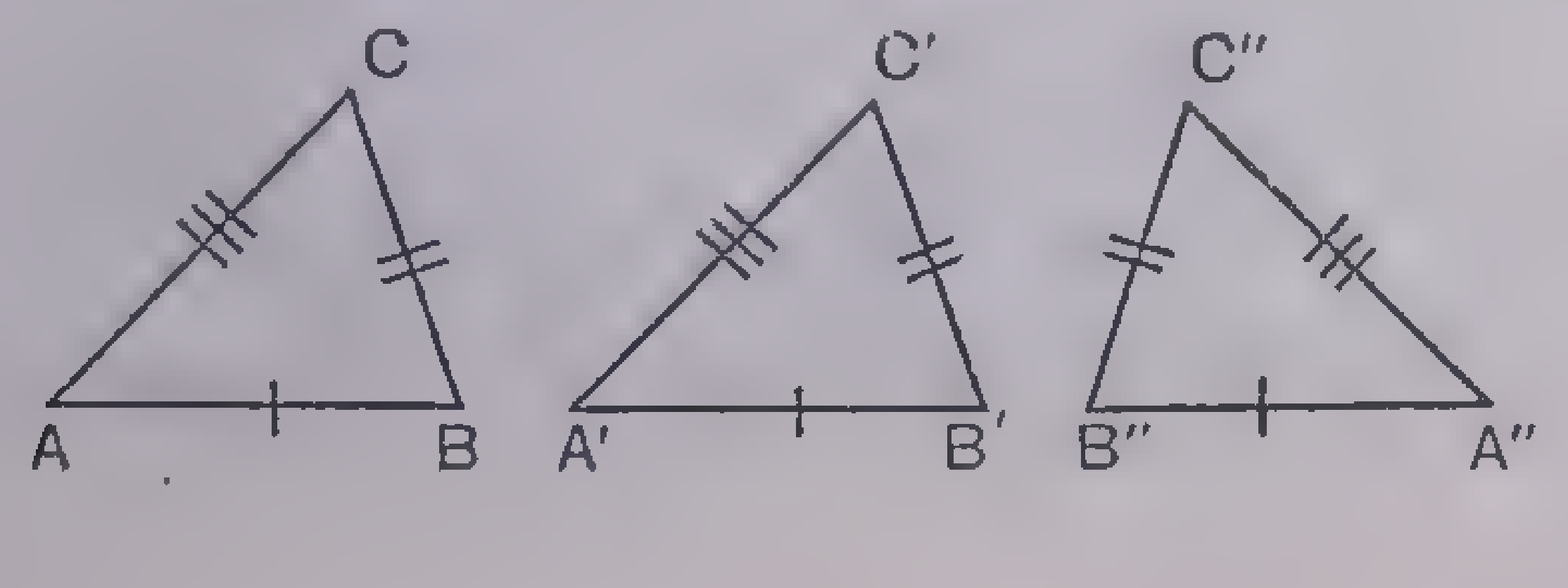
Hyp. Given the $\triangle$s ABC and DEF with $AB = DE$, $BC = EF$ and $CA = FD$.

Con. $\triangle ABC \cong \triangle DEF$.

Let AB and DE be the longest sides of their respective triangles.

1. Suppose $\triangle DEF$ is brought into the position indicated by $\triangle ABC'$ so that DE coincides with its equal AB, D falling on A and E on B and F taking the position C′.	1. Post. §14. Any figure may be moved from place to place without altering its size or shape.
2. Draw the line CC′.	2. Post. §9. Two points determine a straight line.
3. $AC = DF$, $DF = AC'$, $\therefore AC = AC'$,	3. Ax. §47. A quantity may be substituted for its equal in an equation or in an inequality.
4. $\triangle C'AC$ is isosceles and $\angle ACC' = \angle AC'C$.	4. Theorem 3, §69. In an isosceles triangle the angles opposite the equal sides are equal.
5. In the same way $\angle BCC' = \angle BC'C$.	
6. $\therefore \angle ACC' + \angle BCC' = \angle AC'C + \angle BC'C$.	6. Ax. §39. If equals are added to equals the sums are equal.
7. $\therefore \angle ACB = \angle AC'B$.	7. Ax. §47. Same as above.
8. $\therefore \triangle ABC \cong \triangle AC'B$.	8. Theorem 1, §64. If two triangles have two sides and the included angle of one respectively equal to two sides and the included angle of the other, the triangles are congruent.
9. $\triangle AC'B \cong \triangle DEF$, $\therefore \triangle ABC \cong \triangle DEF$.	9. Ax. §46. Quantities that are equal to the same quantity or to equal quantities are equal to each other.

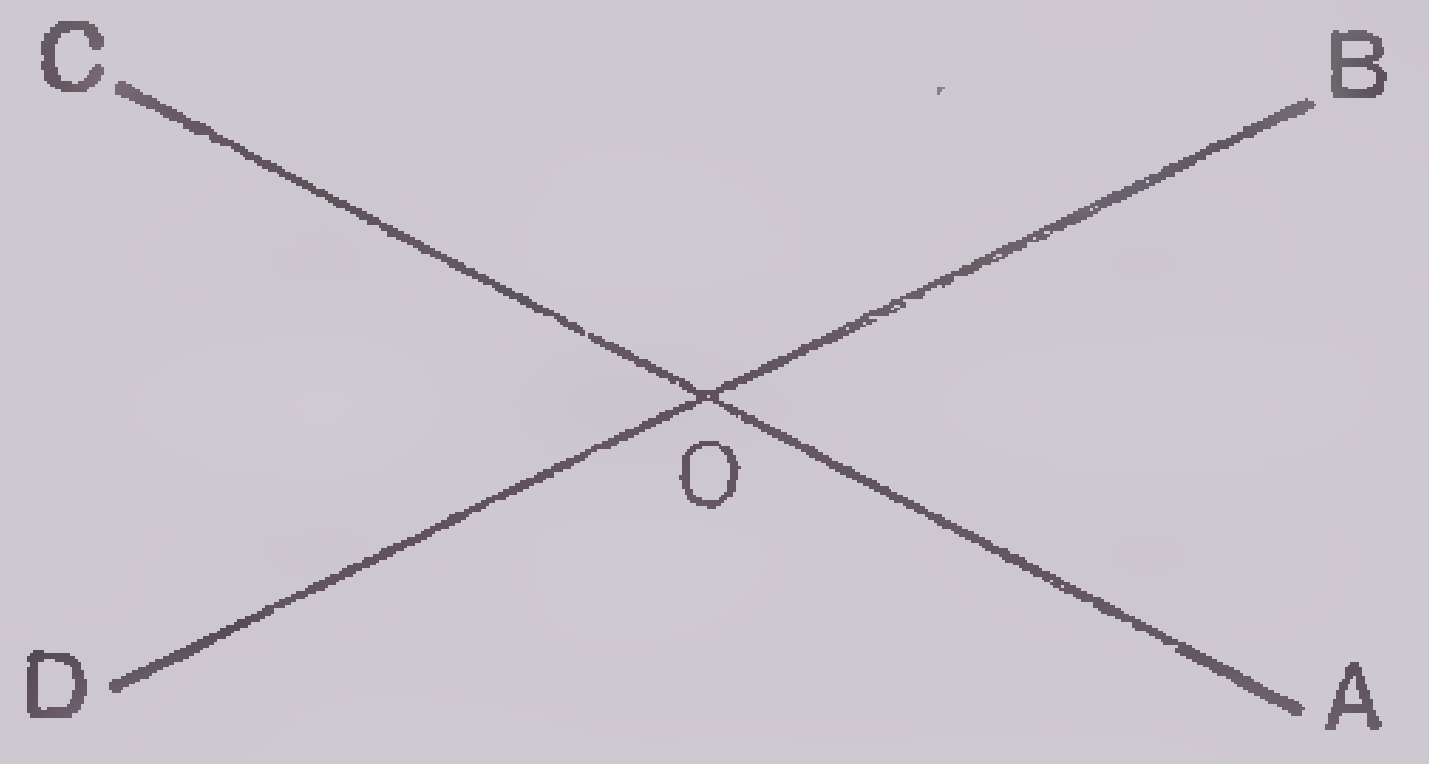
78. Symmetrical Triangles.—Consider the three $\triangle$s A′B′C′, ABC and A″B″C″ with $AB = A'B' = A''B''$, $BC = B'C' = B''C''$ and $CA = C'A' = C''A''$. If $\triangle A'B'C'$ were cut out with a knife it would be possible to slide it along to coincide with $\triangle ABC$ without removing it from its plane. In this case the two are called identical. But in order to make $\triangle A''B''C''$ coincide with $\triangle ABC$ it is necessary to remove it from the plane and turn it over. Triangles ABC and A″B″C″ are called *symmetrical triangles*.



Two congruent triangles are identical when they have their sides arranged in the same order, symmetrical when they are arranged in the opposite order.

79. Vertical Angles.—Two angles are *vertical* when the sides of one are the prolongations of the sides of the other. See figure for theorem 10. Here are two pairs of vertical angles, $\angle$s AOB, DOC and $\angle$s AOD, BOC.

80. Theorem 10.—If two straight lines intersect, the vertical angles are equal.



Hyp. Given the two pairs of vertical angles $\angle AOB$ and $\angle COD$, $\angle BOC$ and $\angle AOD$ formed by the straight lines AC and BD intersecting in O.

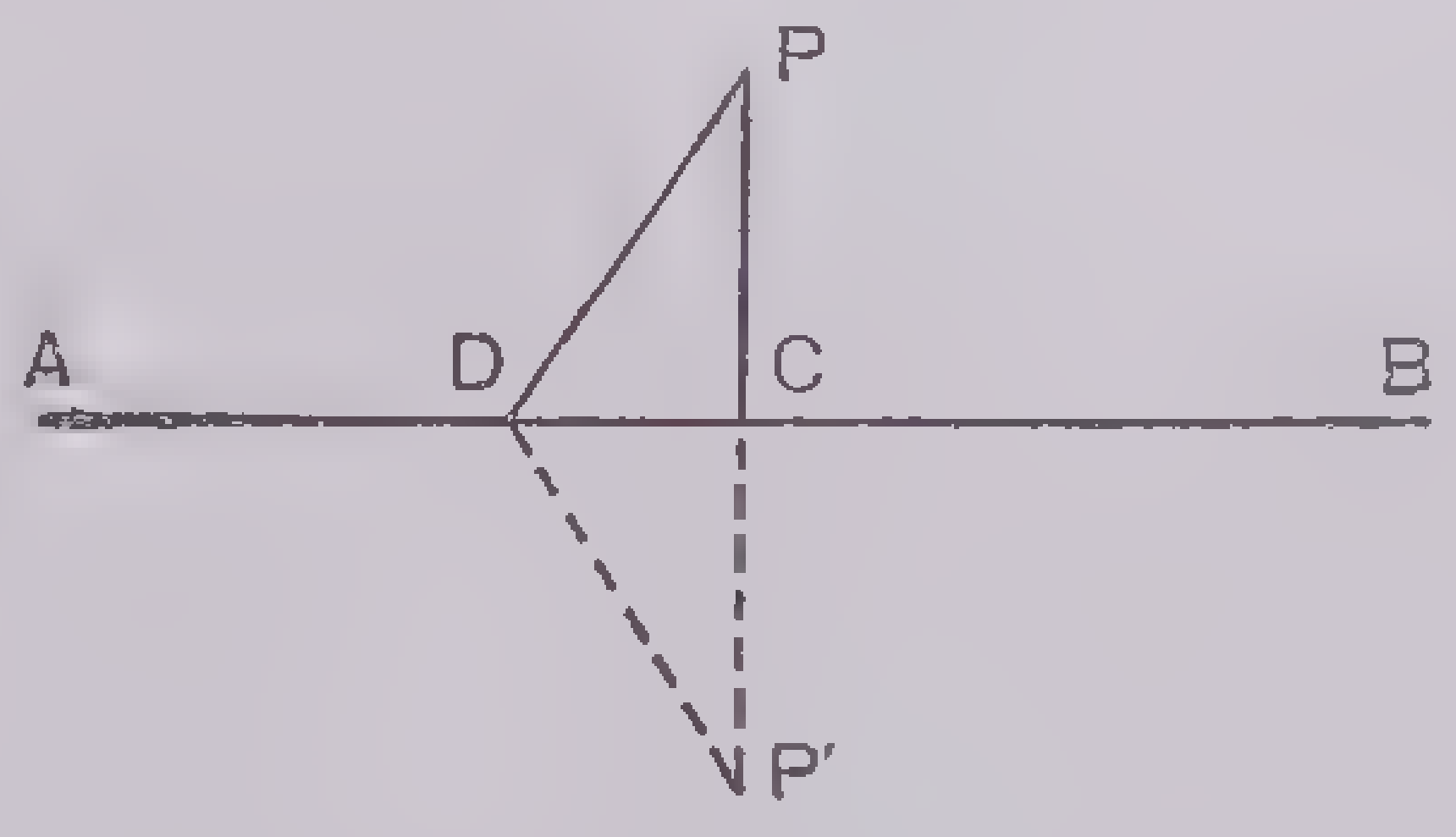
Con. $\angle AOB = \angle COD$ and $\angle BOC = \angle AOD$.

1. $\angle AOB + \angle BOC =$ a straight angle.	1. Def. §27.
2. $\angle BOC + \angle COD =$ a straight angle.	2. Def. §27.
3. $\therefore \angle AOB + \angle BOC = \angle BOC + \angle COD$.	3. Ax. §46. Quantities that are equal to the same quantity or equal quantities are equal to each other.
4. $\therefore \angle AOB = \angle COD$, subtracting $\angle BOC$ from each side of the above equality.	4. Ax. §40. If equals are subtracted from equals, the remainders are equal.

In the same way prove that $\angle BOC = \angle AOD$.

81. Theorem 11.—There is not more than one perpendicular from a given point without a line to a line.

(Note. We will assume that there is one perpendicular; the method of constructing this perpendicular will be given later on, §240.)



Hyp. Given a line AB and a point P without the line, with $PC \perp AB$ and PD any other line through P meeting AB in D.

Con. PD is not $\perp$ AB.

1. Produce PC through C to P′ making $CP' = PC$ and draw DP′.	1. Post. §11. A straight line may be produced to any required length.
2. In $\triangle$s DPC and DP′C, $\angle PCD = \angle P'CD$.	2. Def. §35. All right angles are equal.
3. $PC = P'C$.	3. Construction.
4. $DC = DC$.	4. Identical.
5. $\therefore \triangle DPC \cong \triangle DP'C$.	5. Theorem 1, §64.
6. $\therefore \angle PDC = \angle P'DC$.	6. Def. §68. Corresponding parts of congruent figures.
7. Since PCP′ is a straight line, PDP′ cannot be a straight line.	7. Post. §8. One straight line, and only one, can be drawn through two given points.
8. $\therefore \angle PDC + \angle P'DC$ is not a straight angle.	8. Def. §27.
9. $\therefore 2(\angle PDC)$ is not a straight angle.	9. Ax. §47. A quantity may be substituted for its equal in an equation or in an inequality.
10. $\therefore \angle PDC$ is not one-half of a straight angle or a right angle.	10. Ax. §42. If equals are divided by equals, the quotients are equal. Def. §27, 34. A right angle is one half of a straight angle.
11. PD is not $\perp$ AB.	11. Def. §35.

When we know how to draw the one perpendicular PC to the line AB we will be able to prove the theorem below.

From a given point without an unlimited straight line one perpendicular can be drawn to the line and only one.

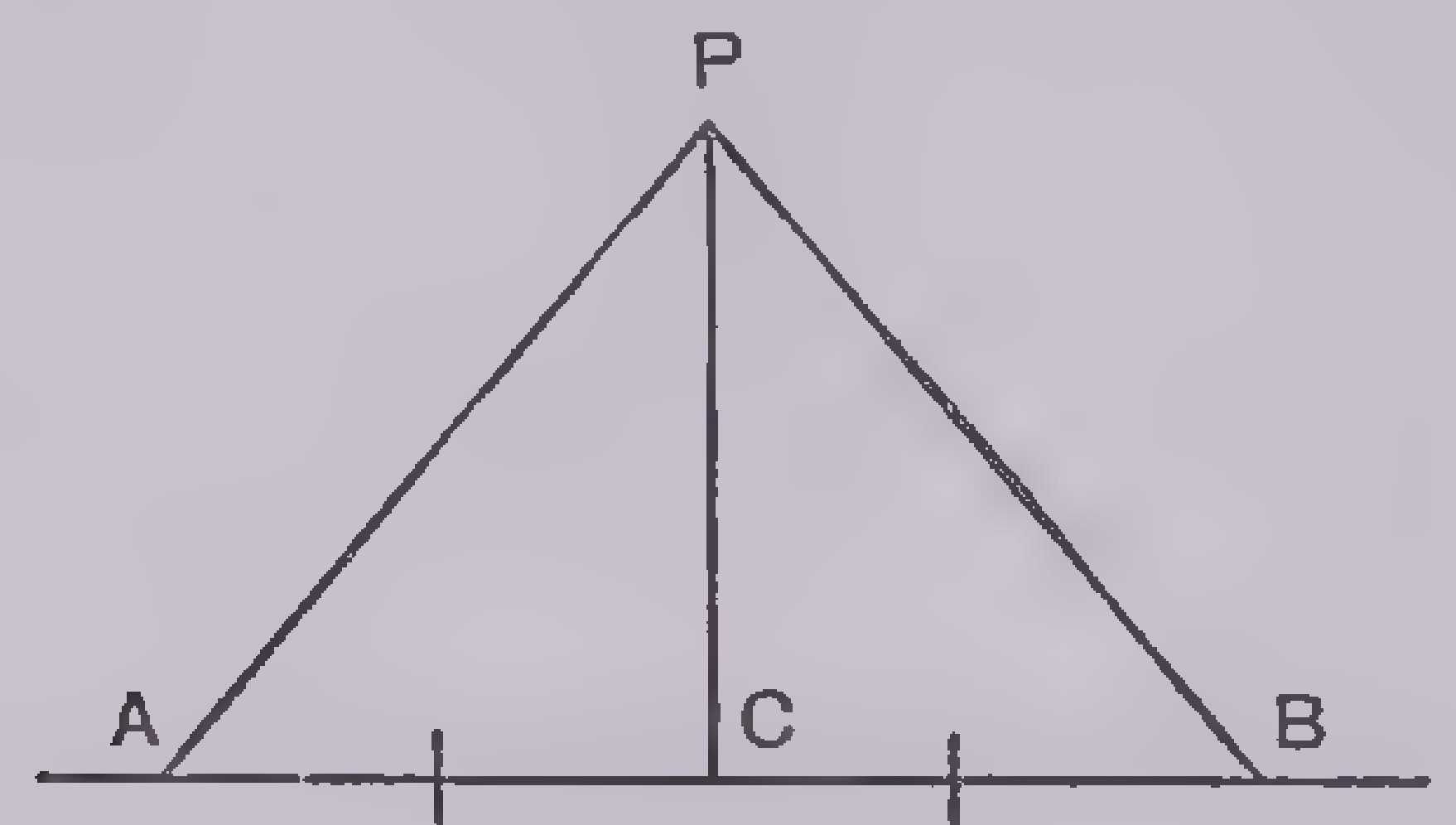
82. **Theorem 12.**—The perpendicular is the shortest line that can be drawn from a point to a straight line.

We will merely indicate the steps in the proof leaving the reader to fill in the reasons. Making use of the figure of the previous theorem we must prove that PC is less than PD.

$PC = \frac{1}{2}(PP')$, $PD = \frac{1}{2}(PD + DP')$, but $PD + DP' > PP'$.
$\therefore PD > PC$.

83. **Oblique Straight Line.**—Any line which is not perpendicular to a given line is *oblique* to the line.

84. **Theorem 13.**—If two oblique straight lines drawn from a point to a straight line meet the line at equal distances from the foot of the perpendicular drawn from the point to the line they are equal.

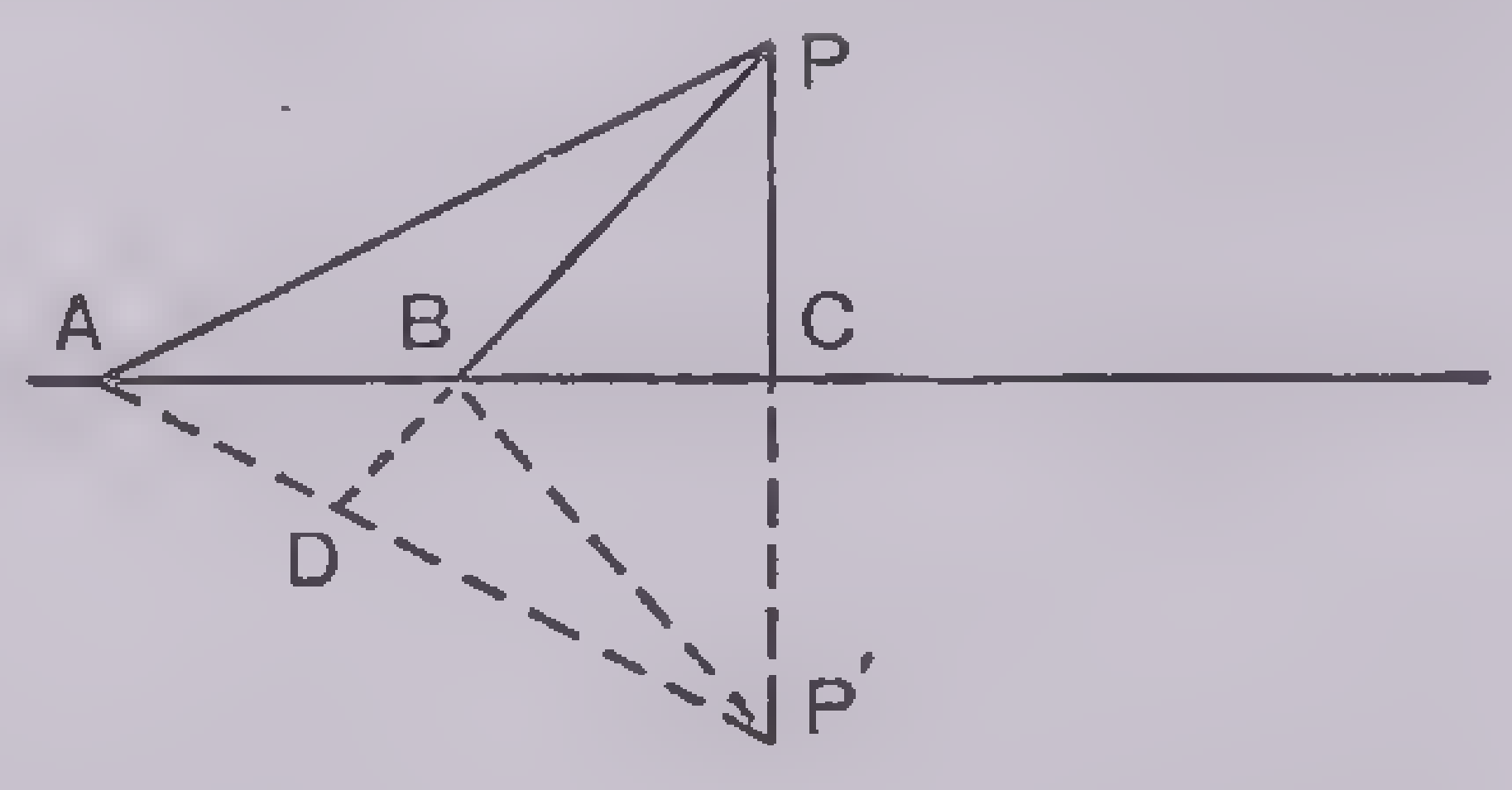


HYP. PC is the $\perp$ from P on AB, meeting it in C, the foot of the $\perp$; PA and PB, two oblique straight lines, meeting AB in A and B respectively, so that AC = CB.

CON. AP = BP.

1. $\angle ACP = \angle BCP$.	1. Both are right angles.
2. PC = PC.	2. Identical.
3. AC = CB.	3. Hyp.
4. $\therefore \triangle ACP \cong \triangle BCP$.	4. Theorem 1, §64.
5. $\therefore$ AP = BP.	5. Def. §68.

85. **Theorem 14.**—If two oblique straight lines drawn from a point to a straight line meet the line at unequal distances from the foot of the perpendicular, the more remote is the greater.



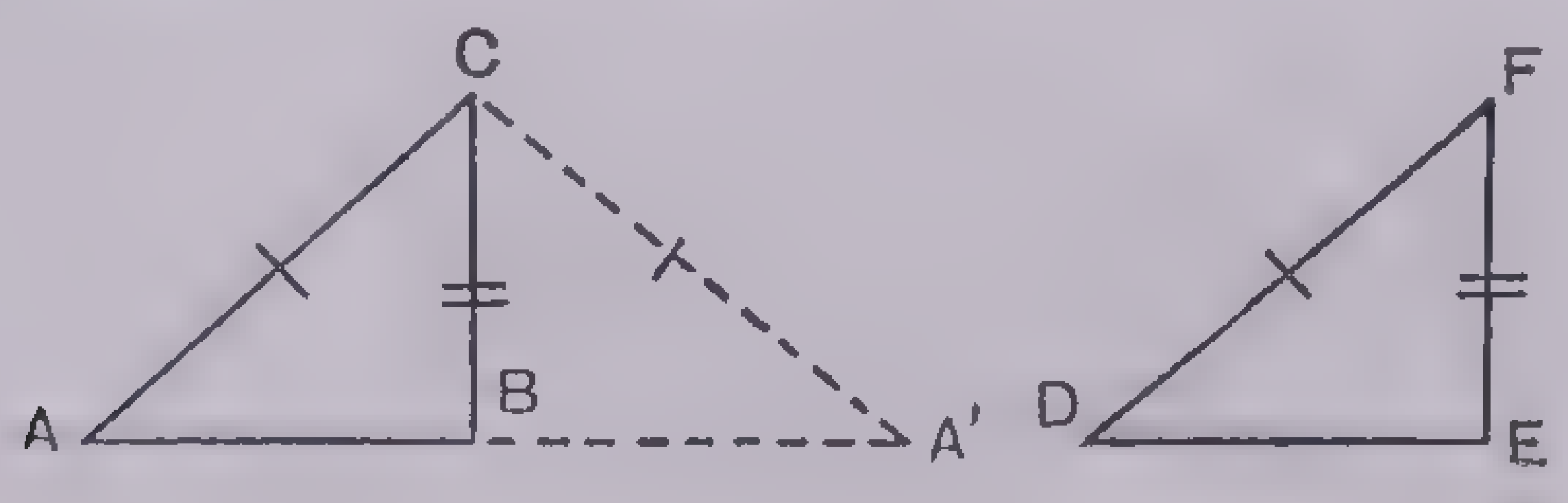
HYP. C is the foot of the $\perp$ PC from P on AB. The two oblique lines PA and PB meet AB in A and B respectively so that AC > BC.

CON. AP > PB.

1. Produce PC through C to P′ so that PC = CP′. Draw BP′, AP′. Let D be the intersection of AP′ and PB, and if AC > BC then D will be a point in the interior of the segment AP′.	1. Post. §11.
2. AD + AP > DP.	2. Post. §12.
3. $\therefore$ AD + AP > DB + BP.	3. Ax. §47.
4. DB + DP′ > BP′.	4. Post. §12.
5. Add the inequalities 3 and 4, AD + AP + DB + DP′ > DB + BP + BP′.	5. Ax. §45.
6. DB = DB.	6. Identical.
7. Subtract equation 6 from equation 5, AD + AP + DP′ > BP + BP′.	7. Ax. §44.
8. $\therefore$ AD + DP′ = AP′.	8. Ax. §47.
9. $\therefore$ PA = AP′ and PB = BP′.	9. Same proof as in Theorem 13.
10. 2AP > 2BP.	10. Ax. §47.
11. $\therefore$ AP > BP.	11. Ax. §44.

86. **Right Triangle.**—A *right triangle* is a triangle which has one of its angles a right angle. The side opposite the right angle is called the *hypotenuse*. The other two sides are called the *legs*.

87. **Theorem 15.**—If two right triangles have the hypotenuse and a leg of one respectively equal to a hypotenuse and a leg of the other, the triangles are congruent.



HYP. Given the rt. $\triangle$s ABC and DEF with the right angles at B and F respectively. AC = DF and CB = FE.

CON. $\triangle ABC \cong \triangle DEF$.

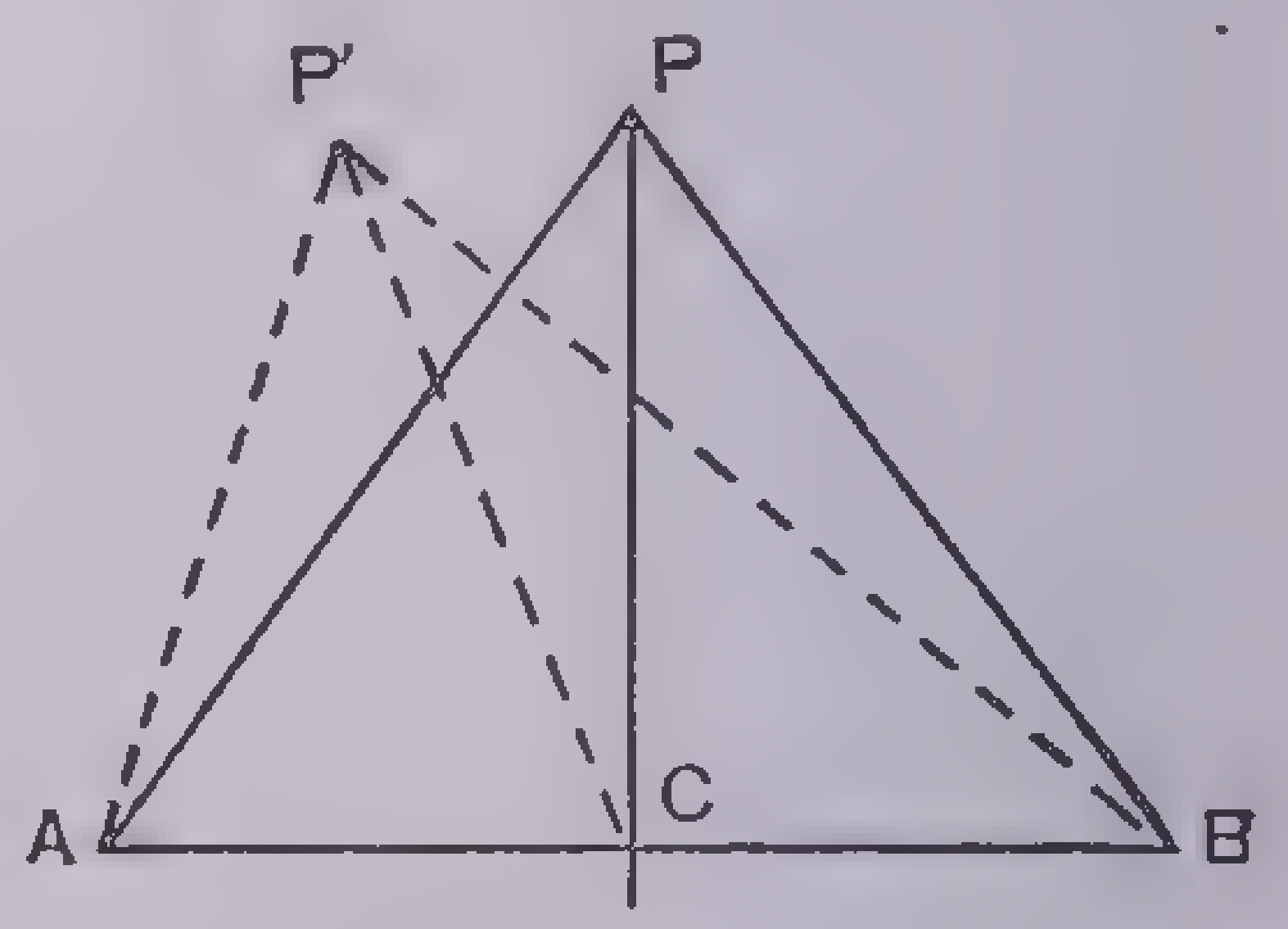
1. Place $\triangle$ DEF in the position CBA′ so that FE coincides with its equal BC, E falling on B and F on C, while D takes the position A′.	1. Post. §14.
2. ABA′ is a straight line.	2. Def. §27.
3. $\triangle$ AA′C is an isosceles $\triangle$.	3. Def. §66.
4. $\therefore \angle A = \angle D$.	4. Theorem 3, §69. Ax. §46.
5. Place $\triangle$ DEF on $\triangle$ ABC so that D falls on A and $\angle$ D coincides with its equal $\angle$ A.	
6. Point F coincides with C.	6. AC = DF by hypothesis.
7. DE coincides with AB.	7. $\angle A = \angle D$.
8. FE coincides with CB.	8. Theorem 11, §81.
9. $\therefore \triangle ABC \cong \triangle DEF$.	9. Def. §32.

88. **Locus.**—A *locus* consists of all points satisfying a given condition and of only those points satisfying the condition.

If you are given a box containing white and black balls and are told to sort out the white balls, you are to get all the white balls and none but the white balls.

In a locus problem you are to sort all the points in the plane and find those which satisfy the condition, and those only. What makes the problem different from the sorting of the white and black balls is the fact that the number of points in the plane is very great or infinite as that in any particular problem some way must be likewise found to pick out a great number at once, such as finding a line, which consists of an infinite number of points, such that all the points of the line satisfy the condition.

89. **Theorem 16.**—The locus of points equidistant from two given points is the perpendicular bisector of the line joining them.



HYP. PC is the $\perp$ to the line AB at its mid-point C.

CON. PC is the locus of points equidistant from A and B.

1. Let P be any point of the line PC and draw the lines AP and BP.	1. Post. §9.
2. AC = CB, $\angle$s ACP and BCP are rt. $\angle$s.	2. Hyp.
3. $\therefore \triangle ACP \cong \triangle BCP$.	3. Theorem 15, §87.
4. $\therefore$ AP = BP.	4. Corresponding parts of congruent triangles §68.

This proves that all points on CP are equidistant from A and B, but we must show that we have all points which are equidistant from A and B. Two methods are possible to complete the proof. First, we can show that all points which are equidistant from A and B are on PC. Second, we can show that any point which is not on PC can not be equidistant from A and B.

First Method

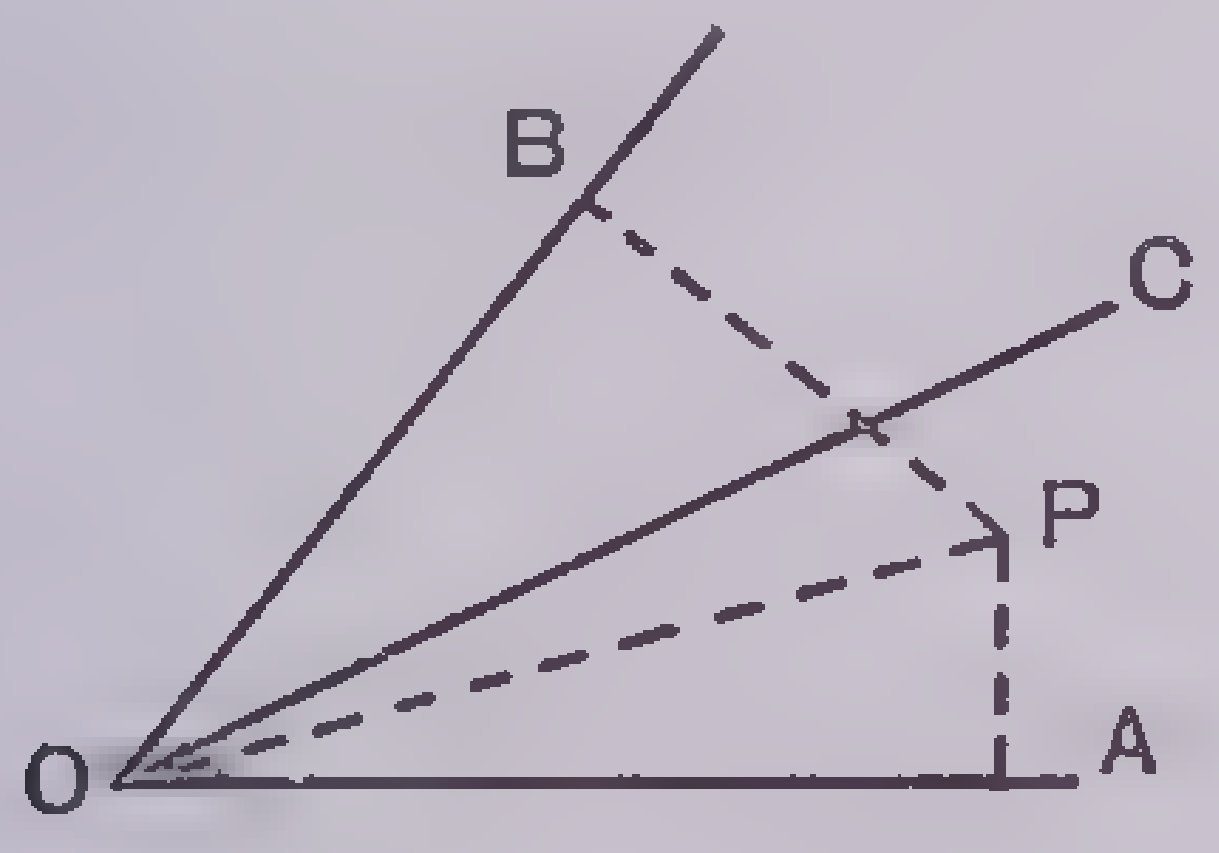
5. Let P′ be a point which is equidistant from A and B. Draw the straight lines AP′, CP′ and BP′.	
6. AP′ = P′B, AC = CB, P′C = P′C.	6. Assumed in 5. Hyp. Identical.
7. $\therefore \triangle AP'C \cong \triangle BP'C$.	7. Theorem 9, §77.
8. $\therefore \angle P'CA = \angle PCB$ = a rt. $\angle$, and P′C is $\perp$ AB at C.	8. Corresponding parts of congruent triangles, §68. Def. §35.
9. $\therefore$ Lines PC and P′C coincide, P′ must be on CP.	9. Post. §18.

Second Method

5. Let P′ be a point which is not on CP′, then draw AP′, BP′ and CP′.	
6. P′C cannot be ⊥ AB at C. ∠ ACP′ cannot equal ∠ BCP′.	6. Post. §18. Def. §35.
7. Consider the △s ACP′ and BCP′,	7.
$AC = CB$,	Hyp.
$P'C = P'C$,	Identical.
$\therefore \angle P'CB > \angle P'CA$.	Reason in 6.
8. $\therefore P'B > P'A$.	8. Theorem 7, §75.
Hence any point P′ not on PC is not equidistant from A and B.	

90. Distance from a Point to a Line.—(Theorem 12, §82. The perpendicular is the shortest distance that can be drawn from a point to a line.) This is defined to be the *distance from the point to the line.*

91. Theorem 17.—The locus of points equidistant from the sides of an angle is the bisector of the angle.



Hyp. OC is the bisector of the angle AOB.
Con. OC is the locus of all points equidistant from OA and OB.

1. Let P be any point such that its distance PB from the line OB equals its distance PA from the line OA. Draw OP.	1. Def. §90.
2. In △s OAP and OPB,	2.
$OP = OP$,	Identical.
$PA = PB$,	Assumed in 1.
$\angle PBO = \angle PAO =$ a rt. ∠.	Def. §90.
3. ∴ △ OAP ≌ △ OBP.	3. Theorem 15, §87.
4. $\therefore \angle AOP = \angle BOP$.	4. Corresponding angles of congruent triangles §68.
5. ∴ OP coincides with OC, for an angle has but one bisector.	5. Ax. §42.

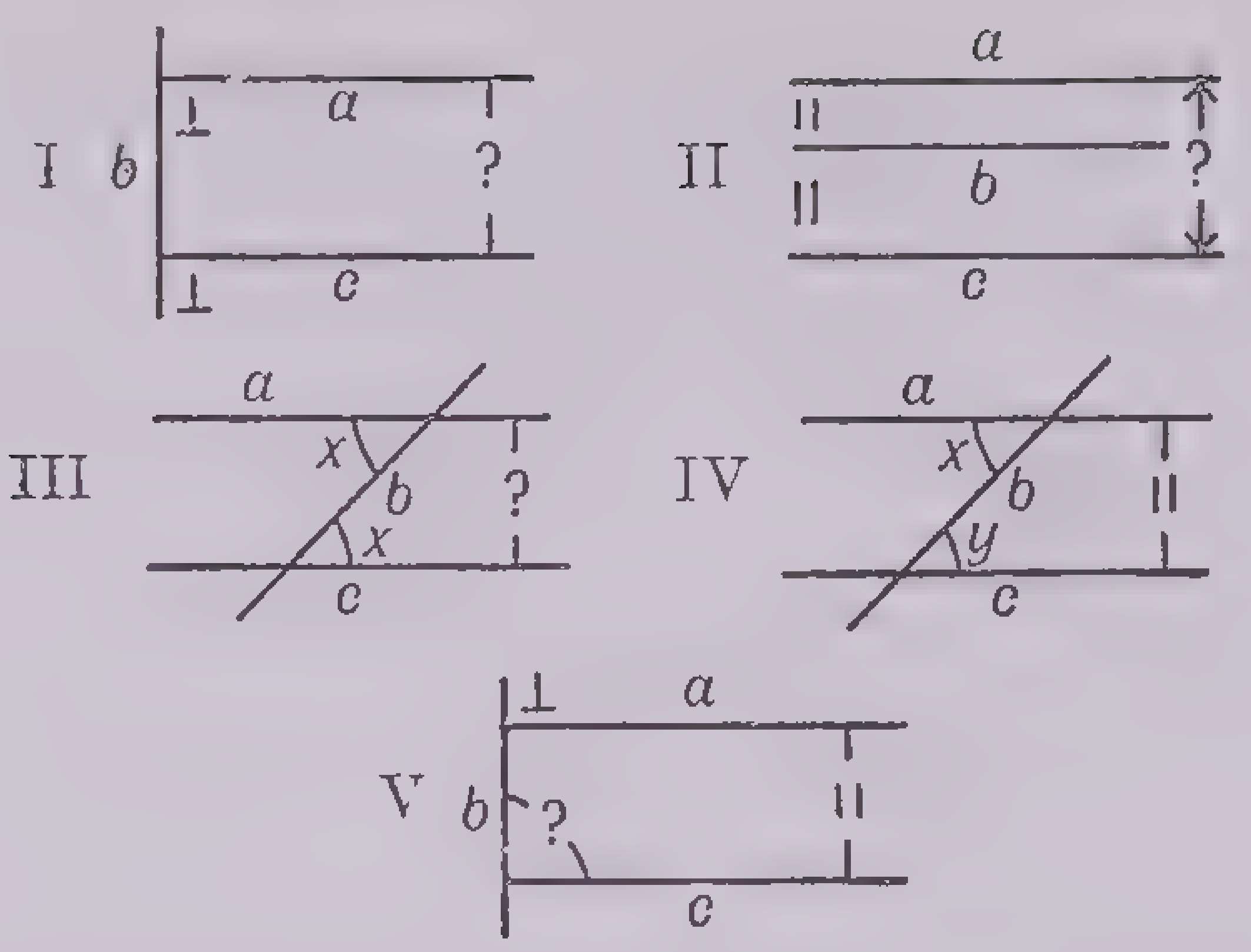
We now know that every point equidistant from OA and OB as P is on the bisector OC.

It remains to prove that every point on the bisector is equidistant from OB and OA.

6. Let P be considered as any point on OC and draw the ⊥s PA and PB to OA and OB respectively, meeting them in A and B.	
7. Consider △s OAP and OBP, $\angle POA = \angle POB$,	7. Hyp.
$OP = OP$.	Identical.
8. Place △ OBP on △ OAP so that ∠ POB coincides with its equal ∠ POA, with line OB falling on OA and line OP falling on OP.	8. Post. §14.
Since $OP = OP$, O and P will remain fixed.	
9. PB will coincide with PA.	9. Theorem 11, §81.
10. $\therefore PB = PA$.	10. Corresponding parts of congruent triangles.
And every point, as P on OC, is equidistant from A and B.	

PARALLELS AND PARALLELOGRAMS

92.—There are many propositions in geometry which have to do with the relations of three objects to each other. If we are given three objects *a*, *b* and *c*, they can be formed into pairs in three ways, *a*, *b*; *b*, *c*; and *a*, *c*. When we know the relations existing between the elements of two of the pairs, the problem is to find the relation between the two elements of the third pair. We shall give a few examples below, and the reader is advised to study the situation as indicated in each drawing, for they are all important geometrical theorems.



It is a *sine qua non* of geometry to recognize these theorems at once. In each case we have three lines given which are denoted by *a*, *b* and *c*.

Case I. Line *a* is perpendicular to line *b*, line *b* is perpendicular to line *c*; the question is the relation of *a* to *c*. In symbols, $a \perp b$, $b \perp c$, $a\ ?\ c$. The answer is given in the theorem,—Two straight lines perpendicular to the same straight line are parallel.

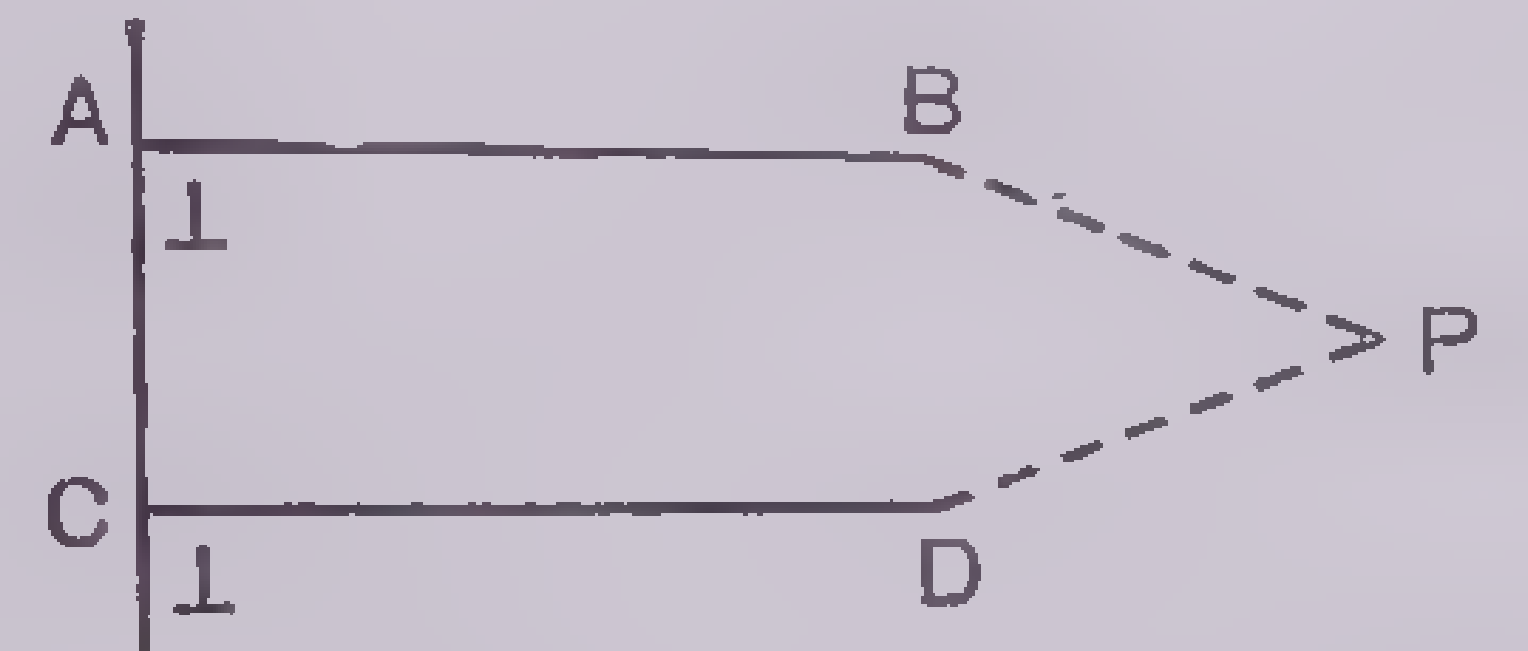
Case II. Line *a* is parallel to line *b*, line *b* is parallel to line *c*, the question is the relation of line *a* to line *c*. In symbols $a \parallel b$, $b \parallel c$, $a\ ?\ c$. The answer is given in the theorem,—Two straight lines parallel to the same straight line are parallel to each other.

Case III. Line *a* forms the angle *x* with the line *b*, line *c* forms an angle equal to *x* with the line *b*; the question is the relation of line *a* to line *c*. The answer is given in the theorem,—When two straight lines are cut by a third, if a pair of corresponding angles are equal, the lines are parallel.

Case IV. Line *a* is parallel to line *c*, line *b* forms an angle *x* with the line *a*, line *b* forms an angle *y* with the line *c*; the question is the relation of angle *x* to angle *y*. The answer is the theorem,—If two parallel lines are cut by a third line, any two corresponding angles are equal.

Case V. $a \perp b$, $a \parallel c$, $b\ ?\ c$. The answer is the theorem,—If a straight line is perpendicular to one of two parallel lines, it is perpendicular to the other.

93. Theorem 18.—Two straight lines perpendicular to the same straight line are parallel.

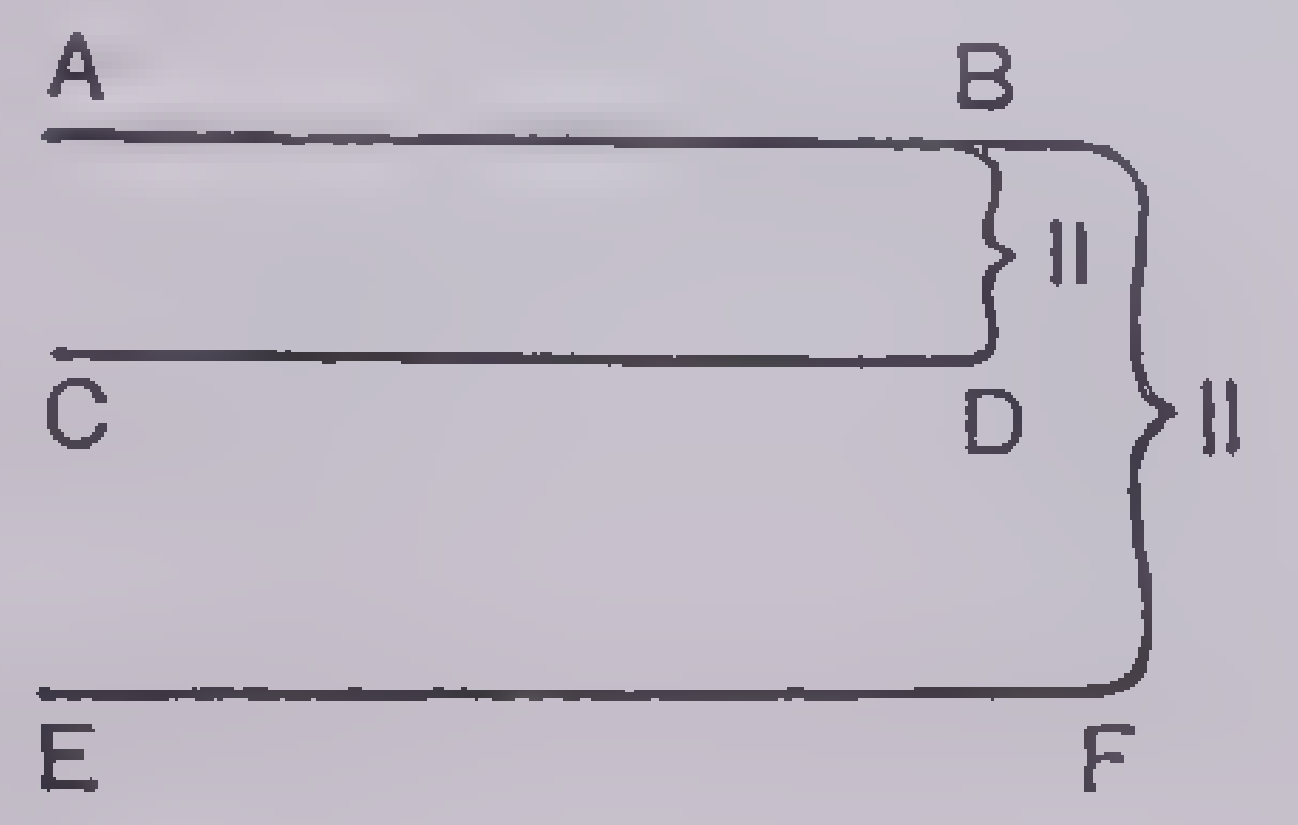


Hyp. AB and CD ⊥ to AC at A and C respectively.
Con. AB ∥ CD.

1. There are only two possibilities, either AB is ∥ CD or AB is not ∥ CD. Suppose that AB meets CD, when they are prolonged, in a point P.	1. §73. There are only two possibilities.
2. This is impossible as we would have two perpendiculars from a point to a line.	2. §81, Theorem 11. From a given point without an unlimited straight line one perpendicular, and only one, can be drawn to the line.
3. ∴ AB ∥ CD.	

94. Reductio ad absurdum.—The above proof is a sample of the proof called by some *reductio ad absurdum.* It shows that any other assumption than the given one leads to an absurdity, which in geometry means a violation of one of the postulates or axioms.

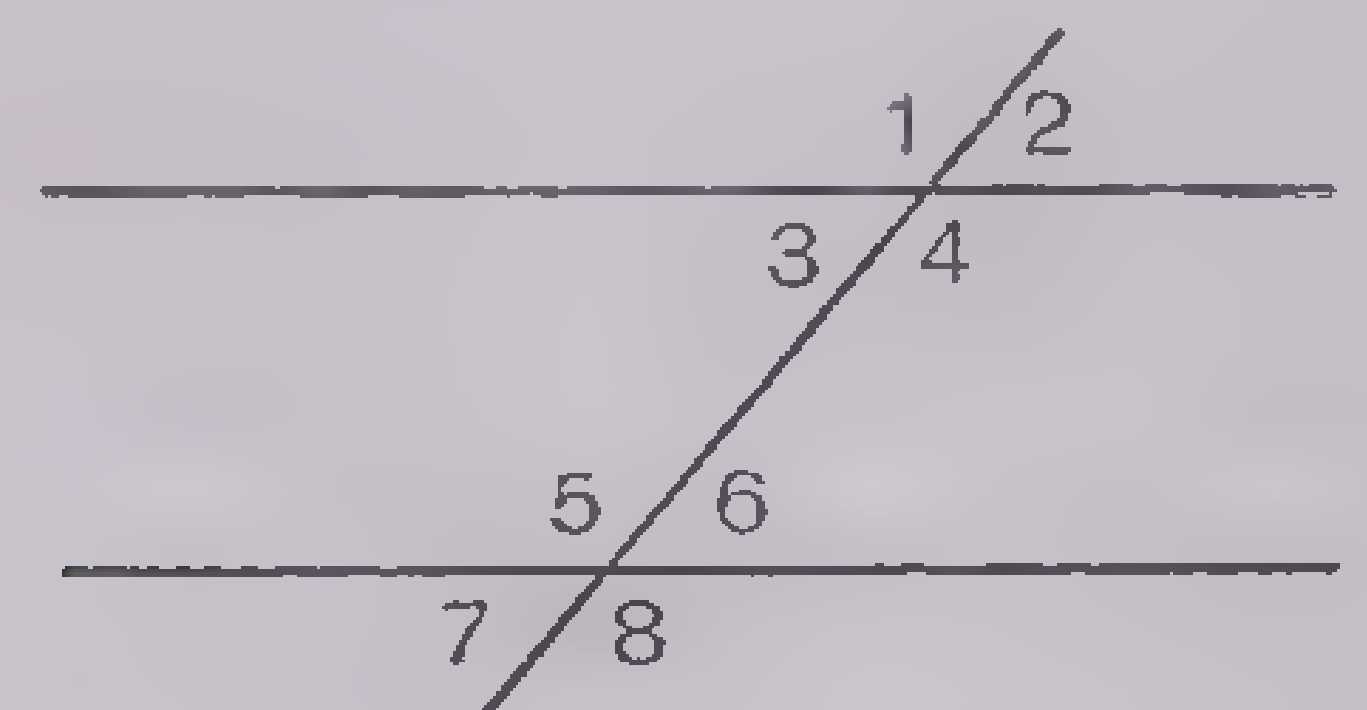
95. Theorem 19.—Two straight lines parallel to the same straight line are parallel to each other.



Hyp. CD and EF ∥ AB.
Con. CD ∥ EF.

1. Either CD is ∥ EF or CD is not ∥ EF.	1. §73. There are only two possibilities.
2. If CD is not ∥ EF, suppose they meet in a point P, then there are two lines through P ∥ AB, which is impossible.	2. §15. Post. Through any point outside a given line, one line, and only one, can be drawn parallel to the given line.
3. Hence CD ∥ EF.	

96. Transversal.—A transversal is a line cutting two or more lines.



97. Angles Formed by a Transversal.—

Exterior angles 1, 2, 7, 8.

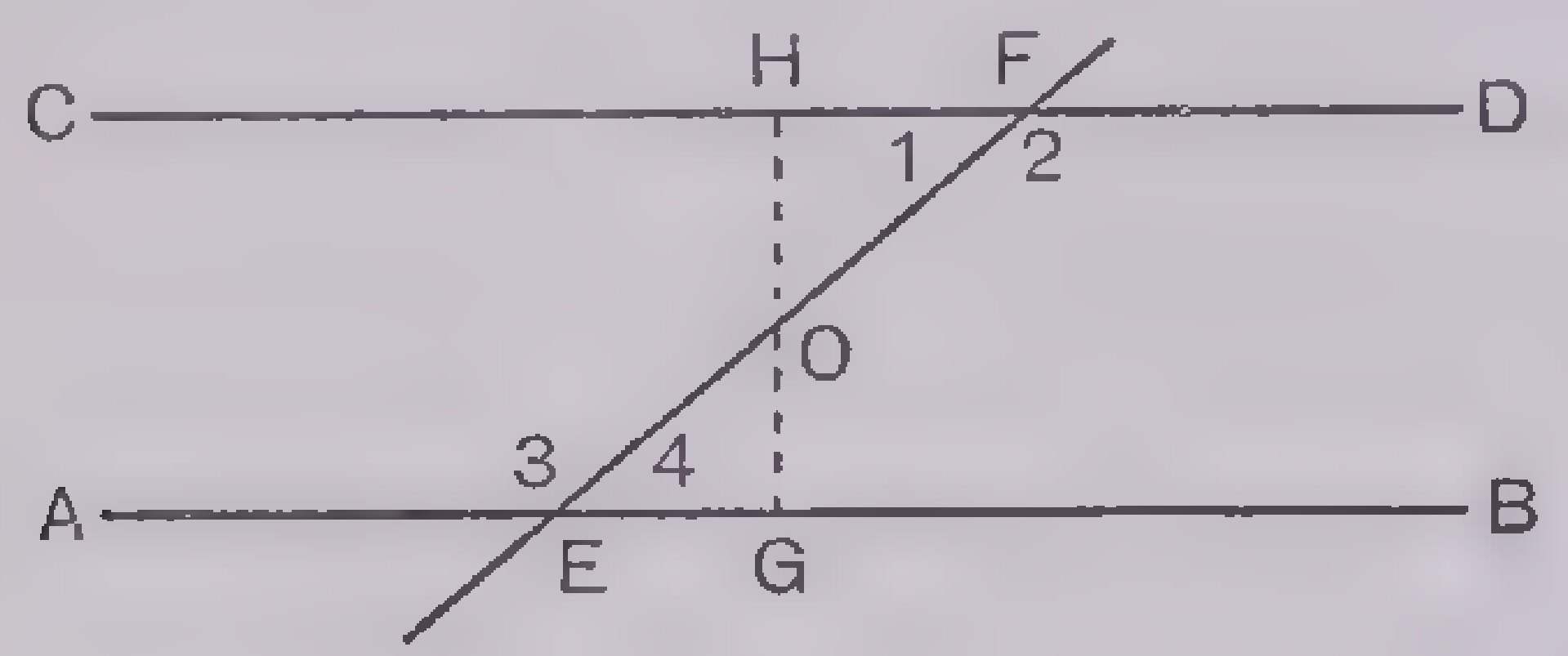
Interior angles 3, 4, 5, 6.

Alternate-interior angles; there are two pairs 3, 6; 4, 5.

Alternate-exterior angles; there are two pairs 1, 8; 2, 7.

Corresponding angles; there are four pairs 1, 5; 2, 6; 3, 7; 4, 8.

98. Theorem 20.—When two straight lines are cut by a third, if the alternate interior angles are equal, the two straight lines are parallel.



Hyp. Given the line EF meeting the lines AB and CD in E and F respectively, forming the pairs of alternate interior angles 1, 4 and 2, 3, so that $\angle 1 = \angle 4$ and $\angle 3 = \angle 2$.

Con. Line AB is parallel to line CD.

1. Bisect EF and through the point of bisection O draw OH $\perp$ CD, meeting CD in H and AB in G.

2. Consider $\triangle$s OEG and OHF.

$OF = OE$,

$\angle 1 = \angle 4$,

$\angle EOG = \angle FOH$,

$\therefore \triangle OEG \cong \triangle OHF$.

3. OG $\perp$ AB or HG $\perp$ AB, since $\angle OHF = \angle OGE$.

4. HG $\perp$ CD.

5. $\therefore$ CD $\parallel$ AB.

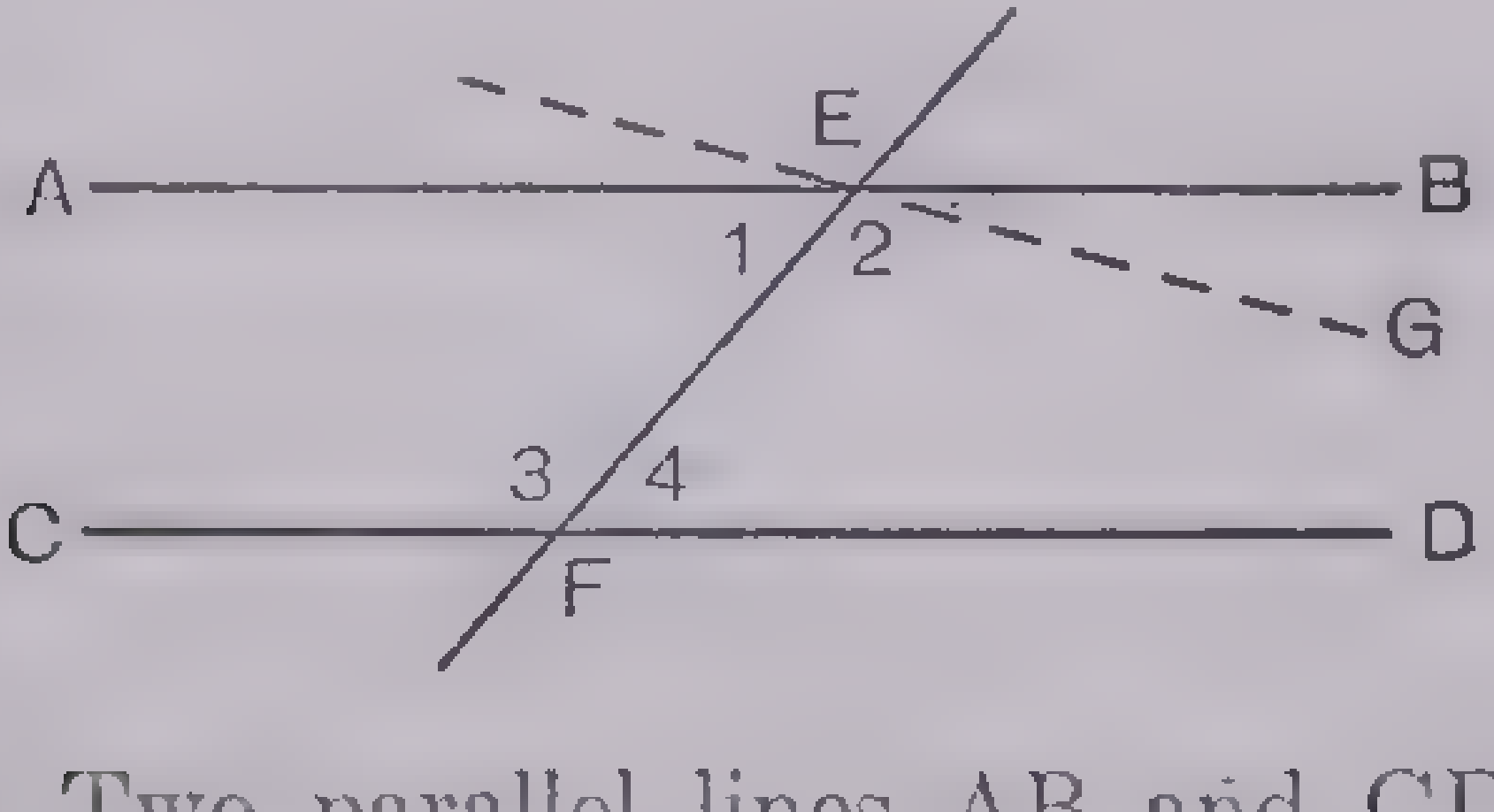
99. Theorem 21.—When two straight lineg are cut by a third, if a pair of correspondins angles are equal, the lines are parallel.

In referring to the figure of §97, it will be seen that the equality of corresponding angles always demands the equality of the alternate interior angles, so the theorem follows from theorem 20.

100. Theorem 22.—When two straight lines are cut by a third, if the sum of two interior angles on the same side of the transversal is equal to two right angles, the two lines are parallel.

Again referring to the figure of §97, if $4 + 6 =$ two right angles, since $3 + 4 =$ two right angles, then $3 + 4 = 4 + 6$ or $3 = 6$. Thus again we are brought to the equality of alternate interior angles.

101. Theorem 23.—If two parallel lines are cut by a third line, the alternate interior angles are equal.



Hyp. Two parallel lines AB and CD are cut by the line EF in the points E and F respectively, forming the pairs of alternate interior angles 1 and 4, 2 and 3.

Con. $\angle 1 = \angle 4$ and $\angle 2 = \angle 3$.

Hint. Draw the line EG through E so that $\angle GEF = 3$.

Then EF meets CD and EG, so as to form equal alternate interior angles, and EG is parallel to CD. (§98, Theorem 20.)

But EG must coincide with AB; otherwise there are two lines through E parallel to CD, but this is impossible. (§15. Postulate.)

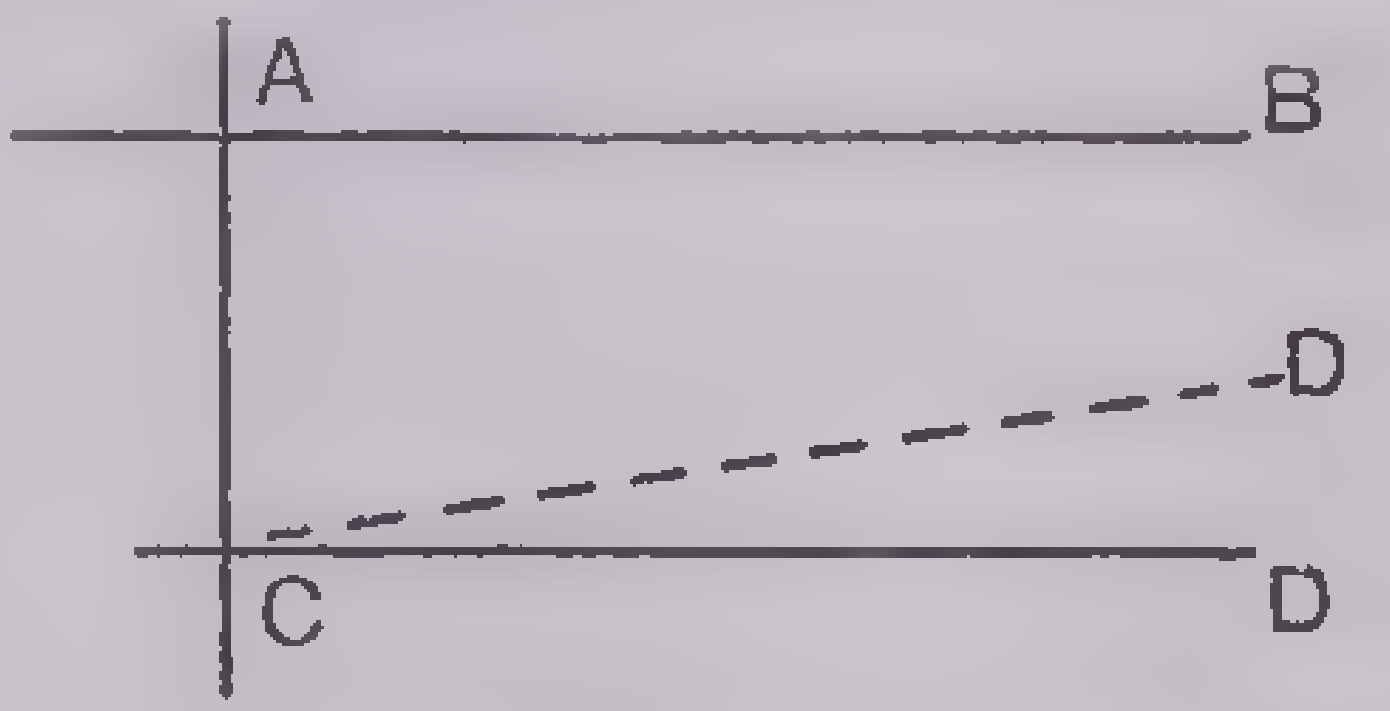
$\therefore \angle GEF = \angle 2 = \angle 3$.

102. Theorem 24.—If two parallel lines are cut by a third straight line, the alternate exterior angles are equal.

103. Theorem 25.—If two parallel lines are cut by a third straight line, any two corresponding angles are equal.

Both these theorems follow at once from §101, using the figure and definitions of §97.

104. Theorem 26.—If a straight line is perpendicular to one of two parallel lines, it is perpendicular to the other.



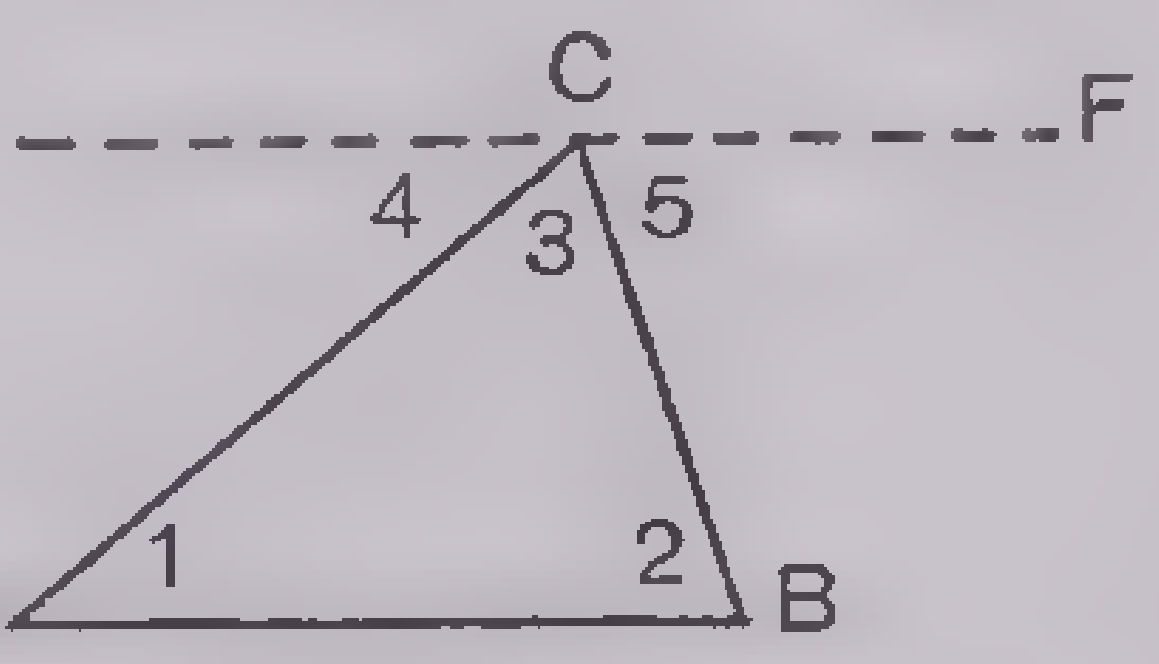
Hyp. AB $\parallel$ to CD and AB $\perp$ to AC at A. CD meets AC in C.

Con. CD is $\perp$ to AC at C.

Hint. Through C draw CD′ $\perp$ to AC. Then AB is $\parallel$ to CD′. (§93, Theorem 18.) Then CD and CD′ coincide. (§15, Postulate.)

105. Theorem 27.—If the sides of one angle are parallel respectively to the sides of another, the angles are either equal or supplementary. This follows at once from §101, §102, §103.

106. Theorem 28.—The sum of the angles of any triangle is a straight angle.



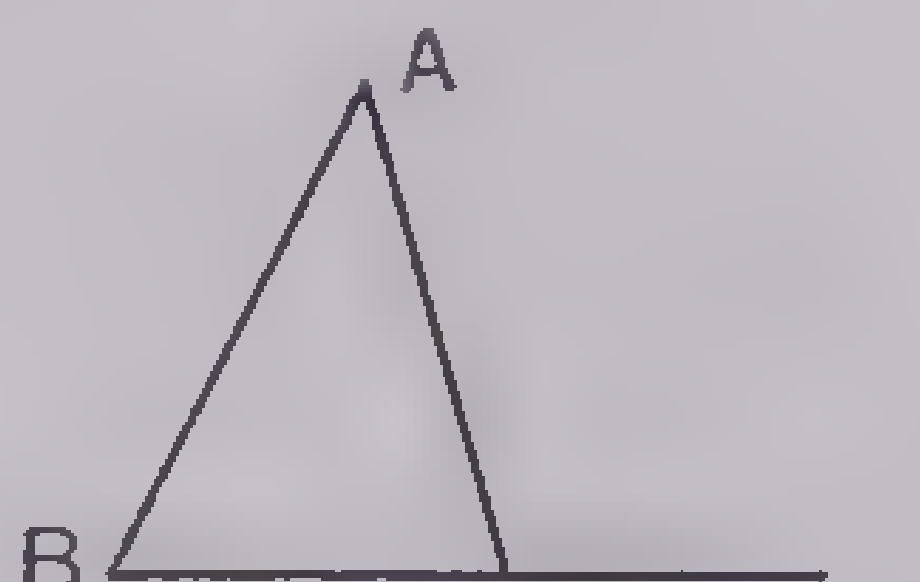
Hint. Draw CF through C parallel to AB.

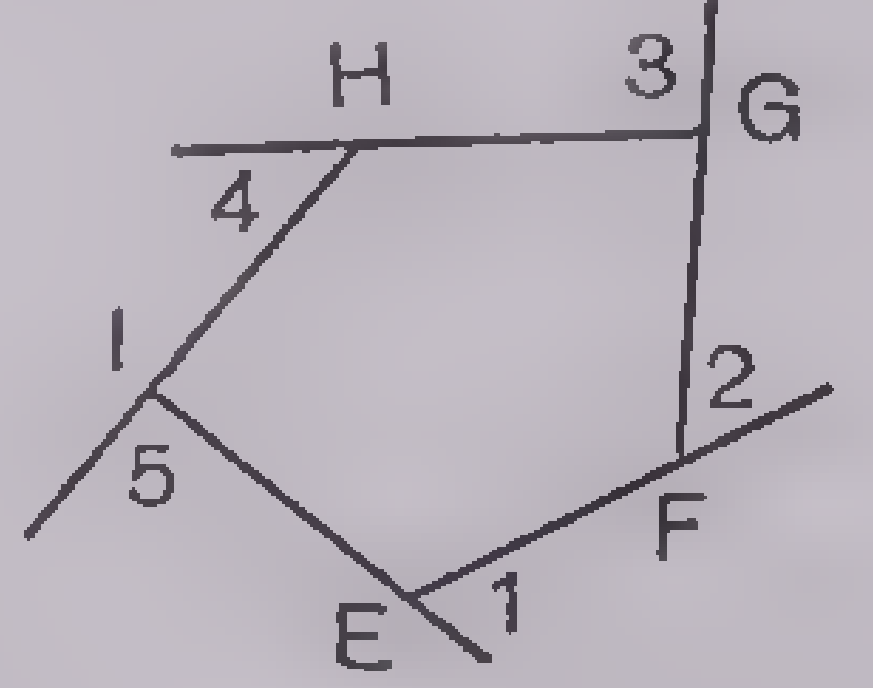
Then $\angle 1 = \angle 4$, $\angle 2 = \angle 5$, alternate interior angles.

$\angle$s $4 + 3 + 5 =$ a straight angle.

Replacing 4 by its equal 1, and 5 by its equal 2, we have $\angle$s $1 + 2 + 3 =$ a straight angle.

This is an important theorem. To know two angles of a triangle is the same as knowing all three; hence if two angles of one triangle are equal to two angles of another, the third angle of the first is equal to the third angle of the second.

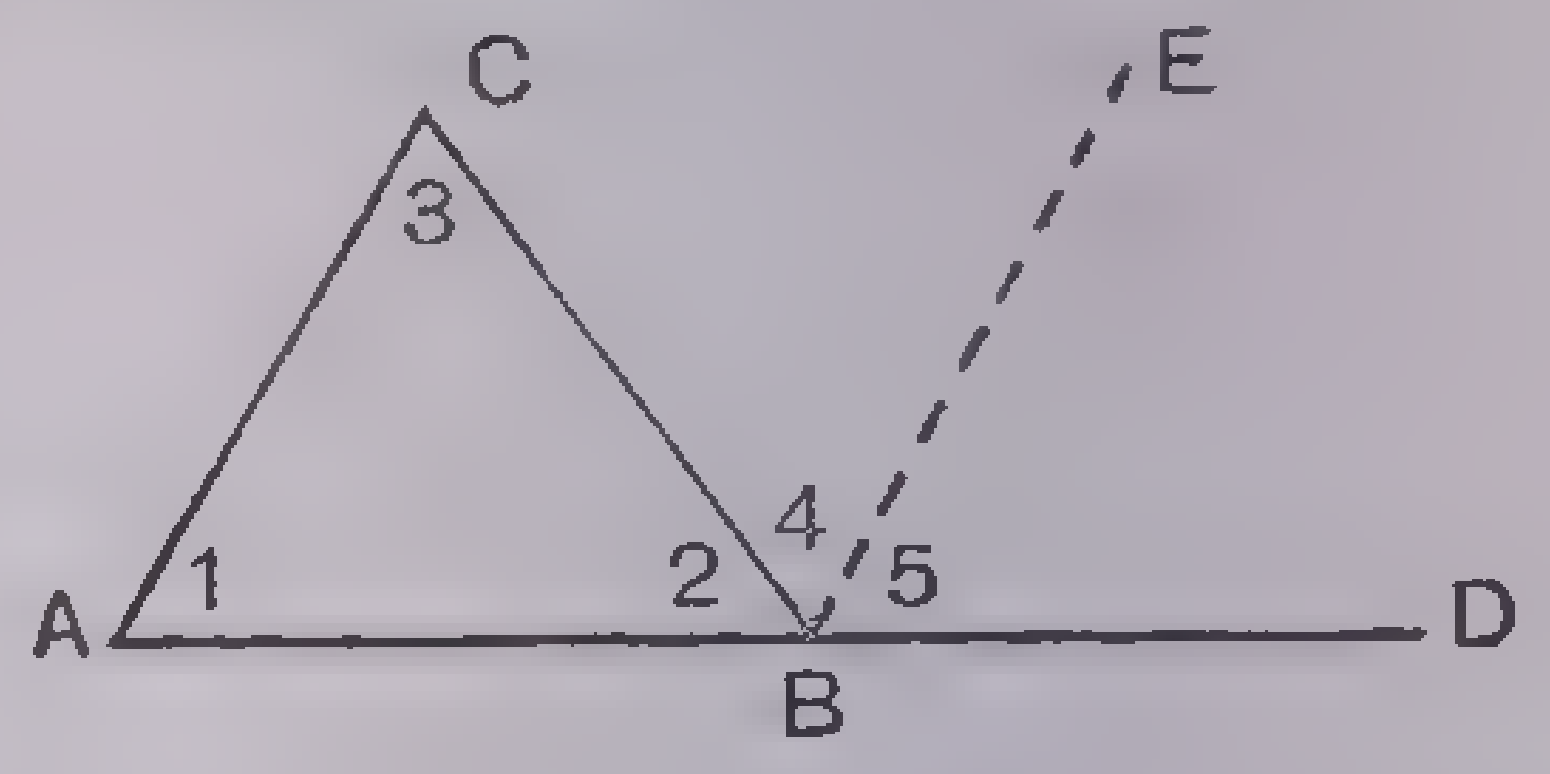




107. Exterior Angle.—If a side of a triangle as BC is produced through a vertex C to a point D, the angle ACD is called an *exterior angle* of the triangle. Each triangle has six exterior angles, as each side can be produced in two directions.

In the case of the polygon EFGHI, exterior angles are obtained by producing the sides in the same manner as for a triangle. 1, 2, 3, 4, 5 are one set of exterior angles, another set can be obtained by producing the sides in the opposite direction.

108. Theorem 29.—Any exterior angle of a triangle is equal to the sum of the two opposite interior angles.



Hyp. AB, a side of $\triangle$ ABC, is prolonged through B to a point D, giving the exterior angle CBD.

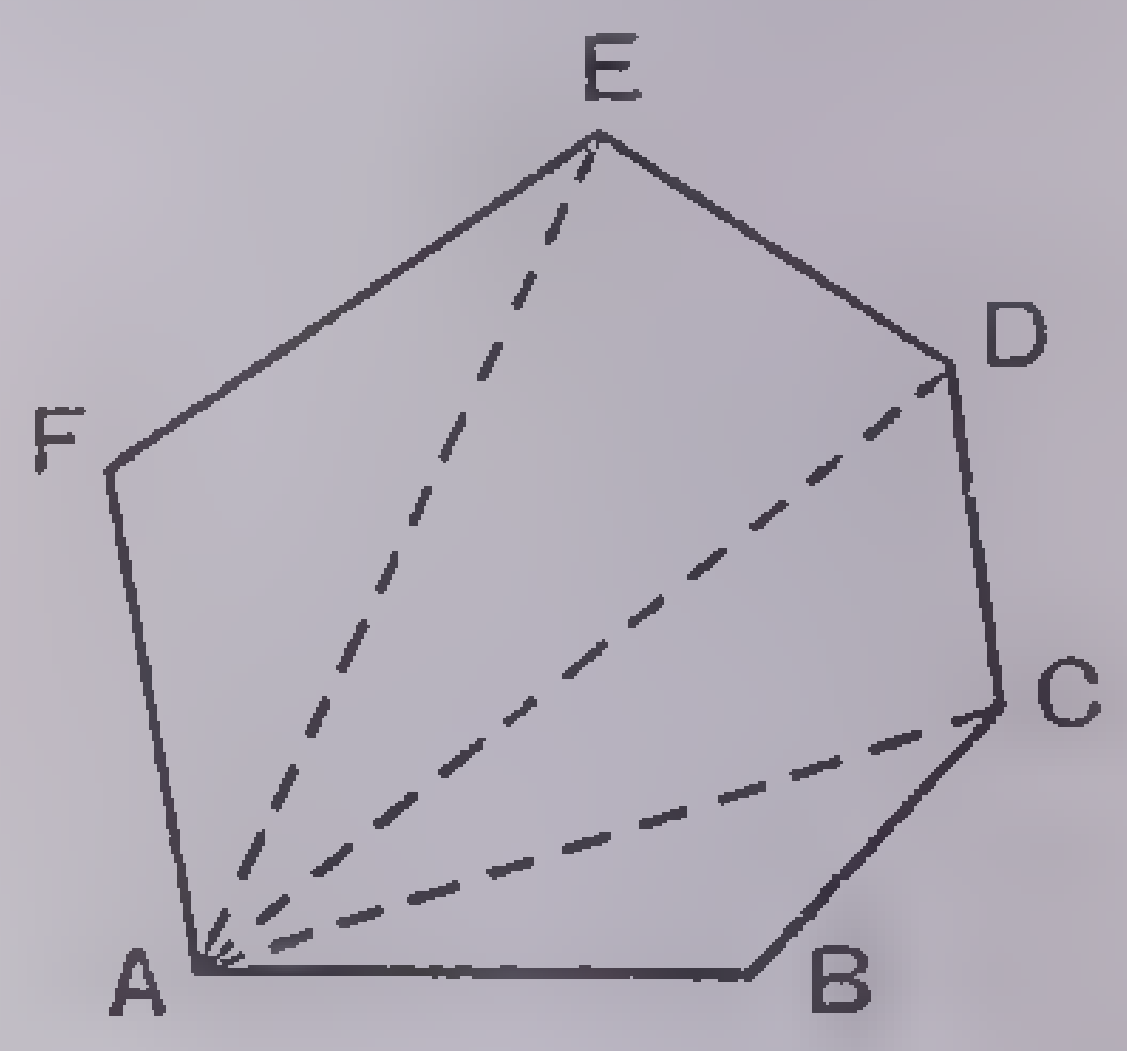
Con. $\angle CBD = \angle 1 + \angle 3$.

Hint. Draw BE through B parallel to AC.

$\angle 3 = \angle 4$ and $\angle 1 = \angle 5$.

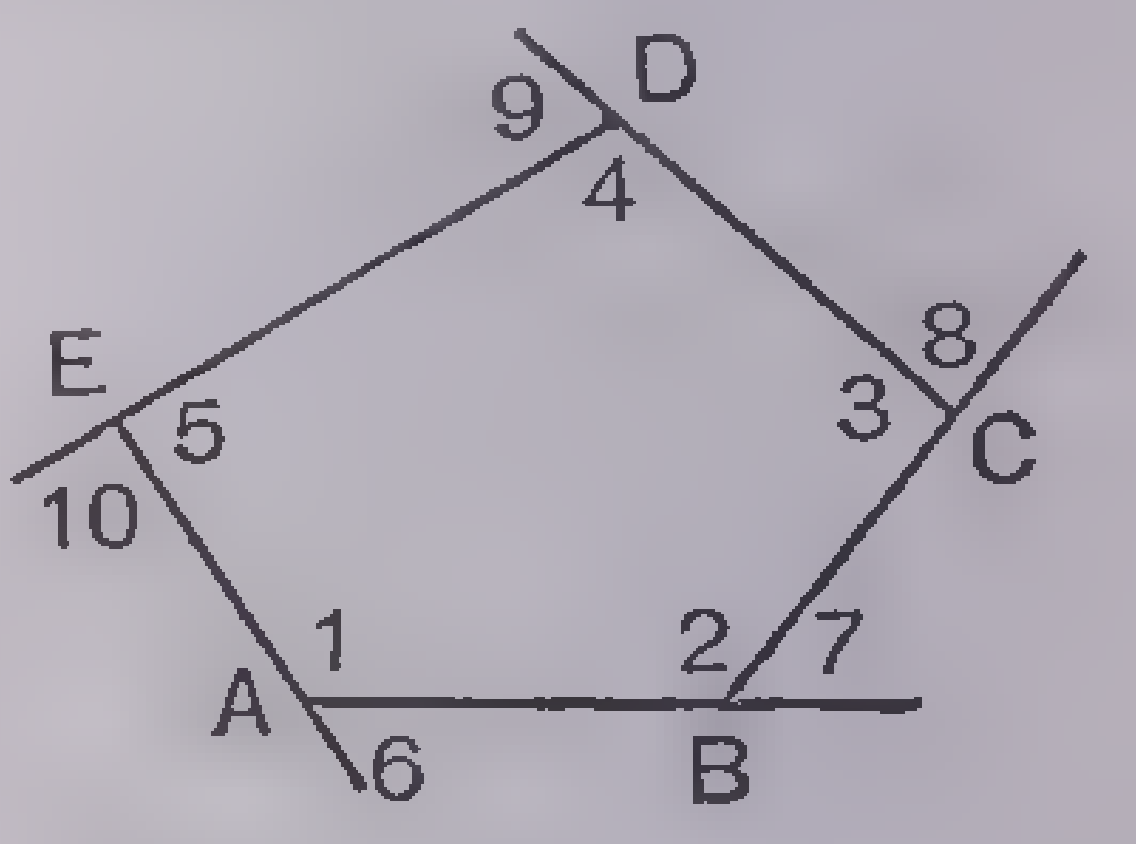
Therefore $\angle 1 + \angle 3 = \angle 4 + \angle 5 = \angle CBD$.

109. Theorem 30.—The sum of the angles of a polygon of n sides is $(n - 2)$ straight angles.



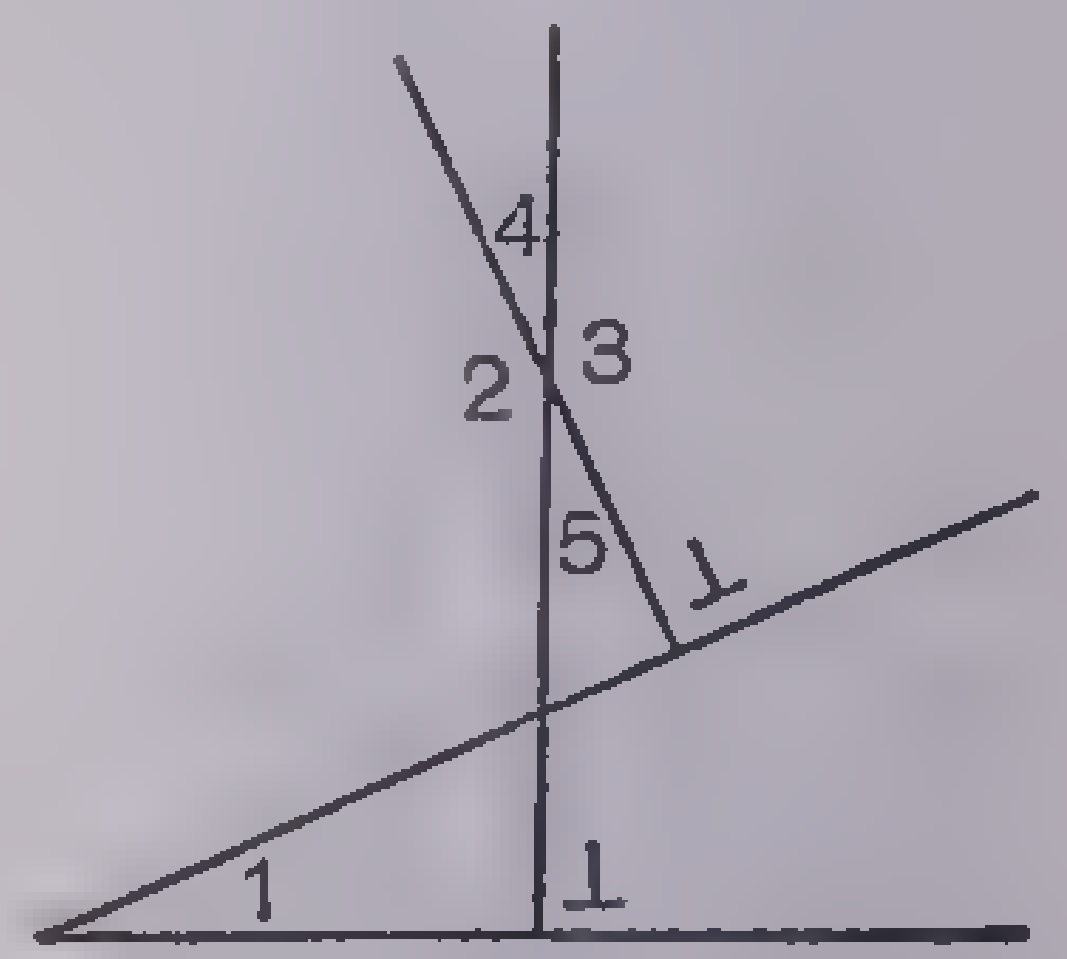
Hint. Study the number of triangles that a polygon of n sides can be cut into and remember that the sum of the angles of each triangle is one straight angle.

110. Theorem 31.—The sum of the exterior angles of a polygon, made by producing each of its sides in succession, is equal to two straight angles.



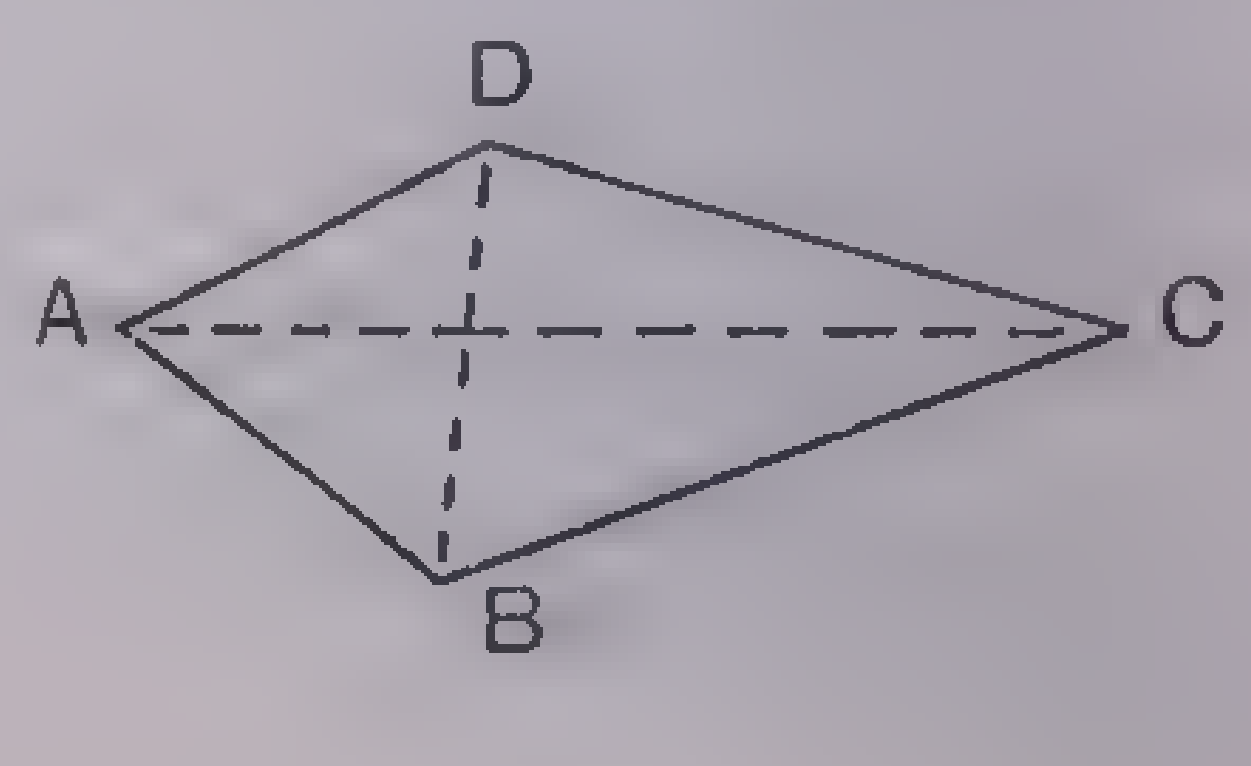
By the previous theorem, $\angle$s $1 + 2 + 3 + 4 + 5 = (n - 2)$ straight angles. At each vertex the sum of the interior and exterior angles is one straight angle, i. e., at A we have $1 + 6 =$ a straight angle. Hence $(1 + 6) + (2 + 7) + (3 + 8) + (4 + 9) + (5 + 10) = n$ straight angles. Subtracting the first equation from the second, $6 + 7 + 8 + 9 + 10 = n$ straight angles $- (n - 2)$ straight angles $= 2$ straight angles.

111. Theorem 32.—If the sides of one angle are perpendicular respectively to the sides of another, the angles are either equal or supplementary.

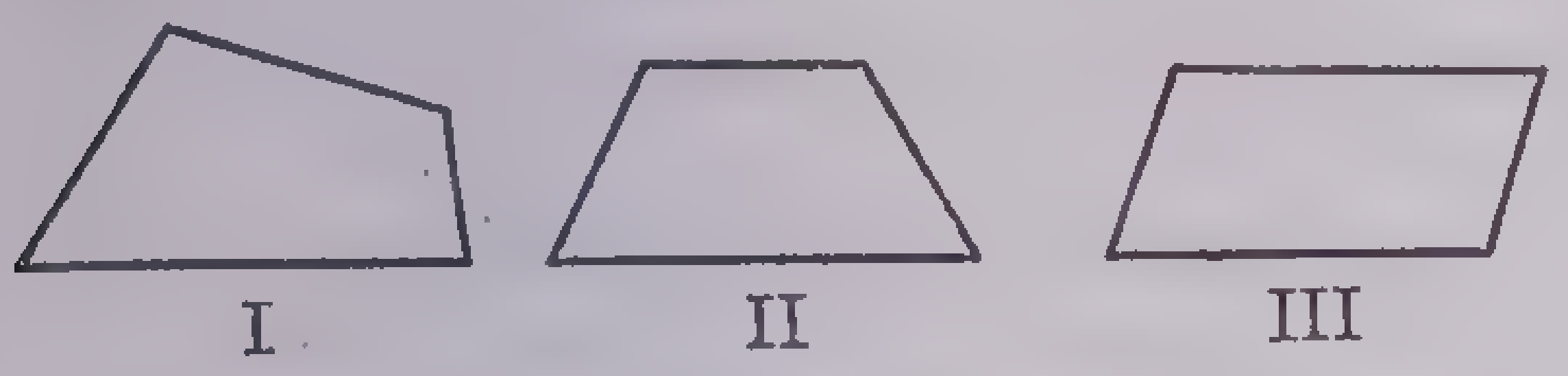


From the drawing it is evident that $\angle 1 = \angle 5 = \angle 4$, but $\angle 1$ is supplementary to both $\angle 2$ and $\angle 3$.

112. A *quadrilateral* is a portion of a plane bounded by four straight lines. The lines AB, BC, CD, DA are called the *sides*. The



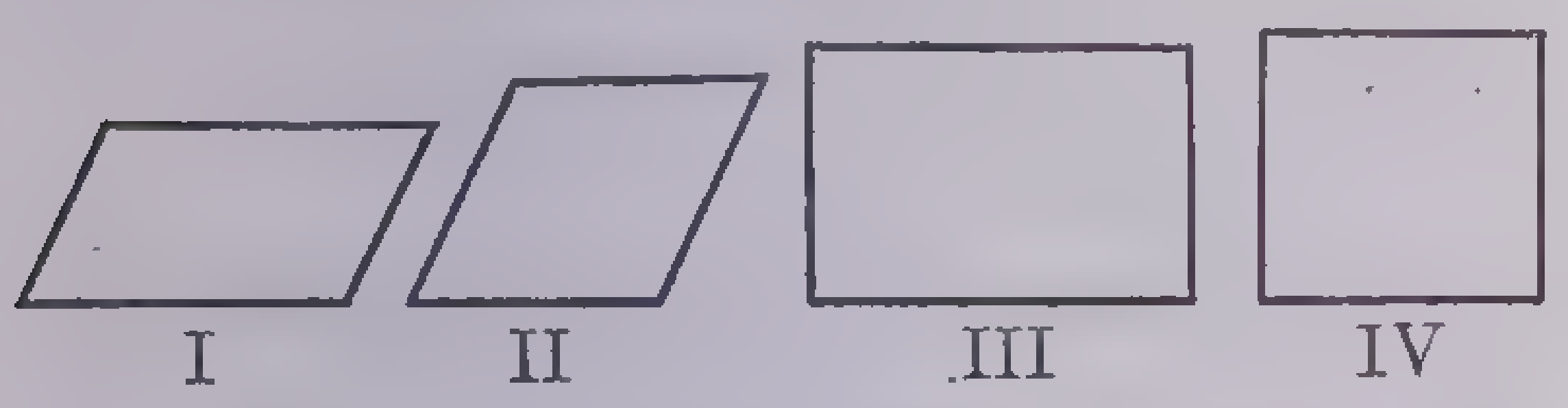
points A, B, C, D are the *vertices*. The lines AC and BD joining the opposite vertices in pairs are the *diagonals*.



A *trapezium* is a quadrilateral no two of whose sides are parallel, I.

A *trapezoid* is a quadrilateral with two and only two sides parallel, II.

A *parallelogram* is a quadrilateral whose opposite sides are parallel, III.



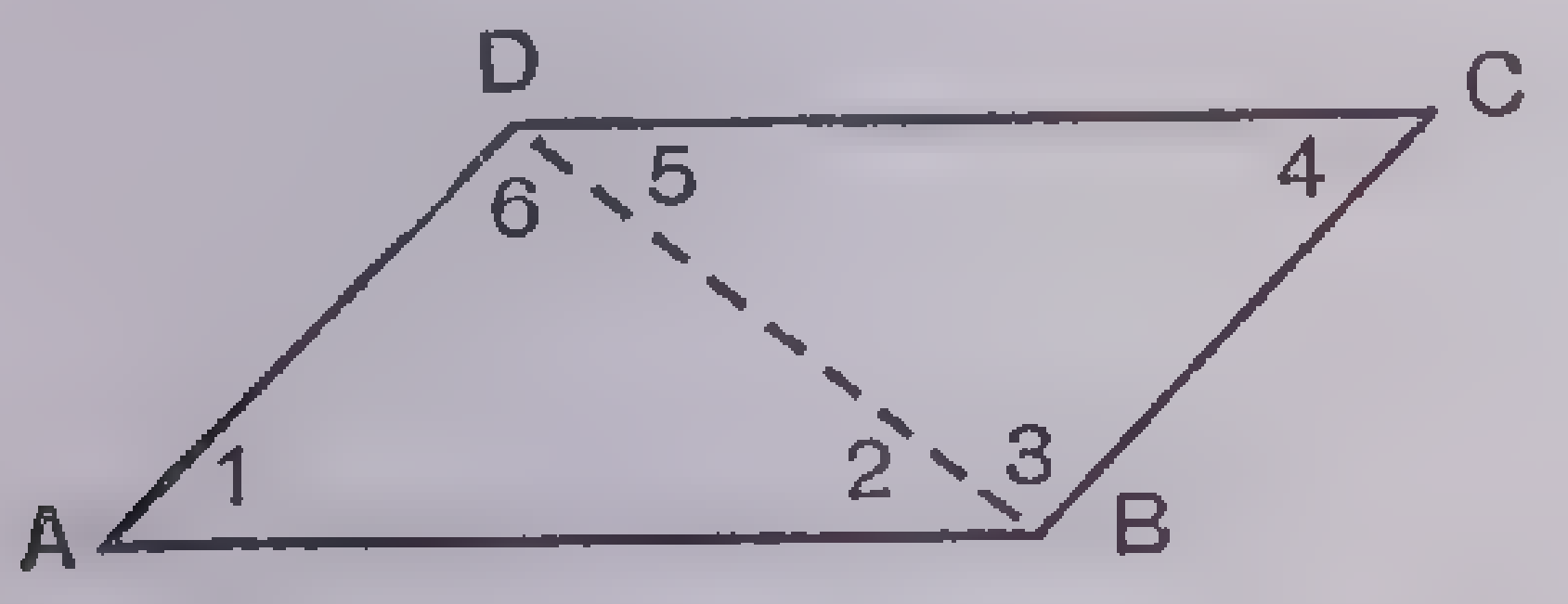
A *rhomboid* is a parallelogram whose angles are not right angles and whose adjacent sides are unequal, I.

A *rhombus* is a parallelogram whose angles are not right angles and whose adjacent sides are equal, II.

A *rectangle* is a parallelogram whose angles are right angles, III.

A *square* is a rectangle whose sides are equal, IV.

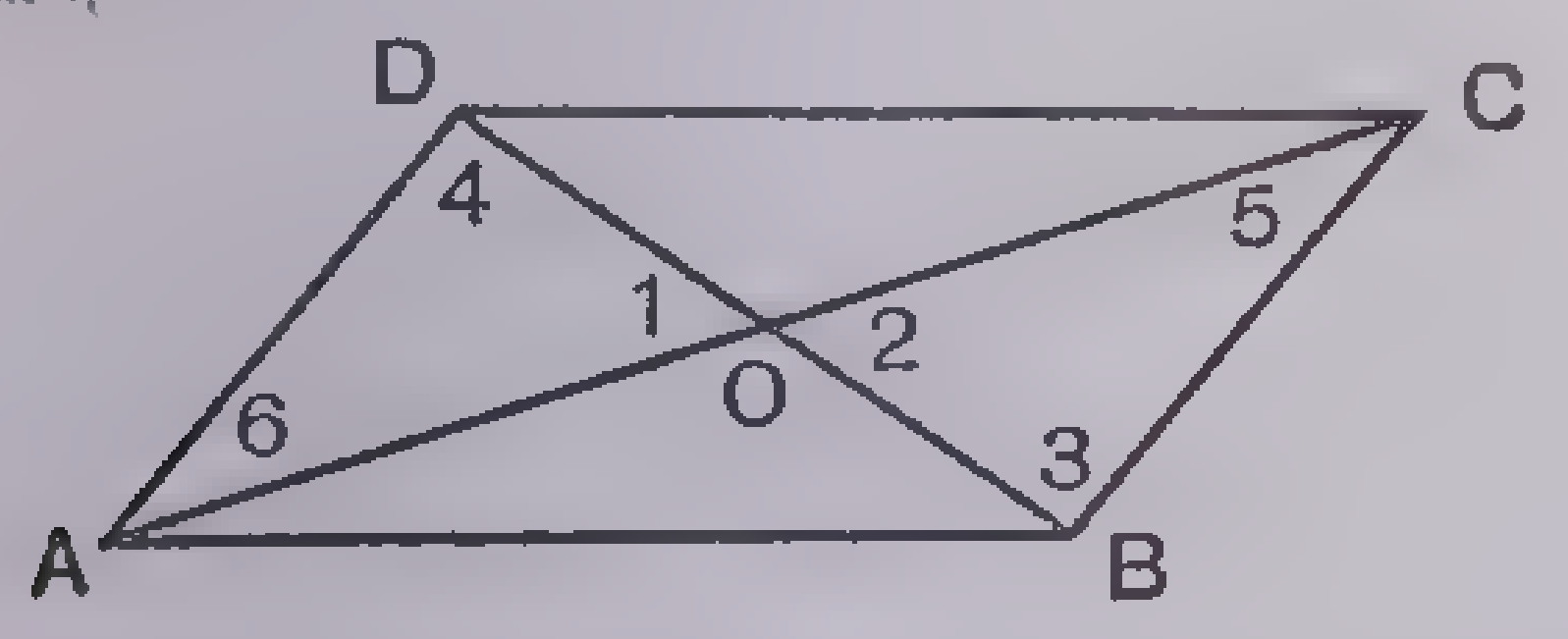
113. Theorem 33.—The opposite sides of a parallelogram are equal, and the opposite angles are equal.



Hint. Draw the diagonal BD. Prove triangle ABD congruent to triangle BCD. (§65, Theorem 2.)

Hence DC = AB, CB = DA and ∠A = ∠C.

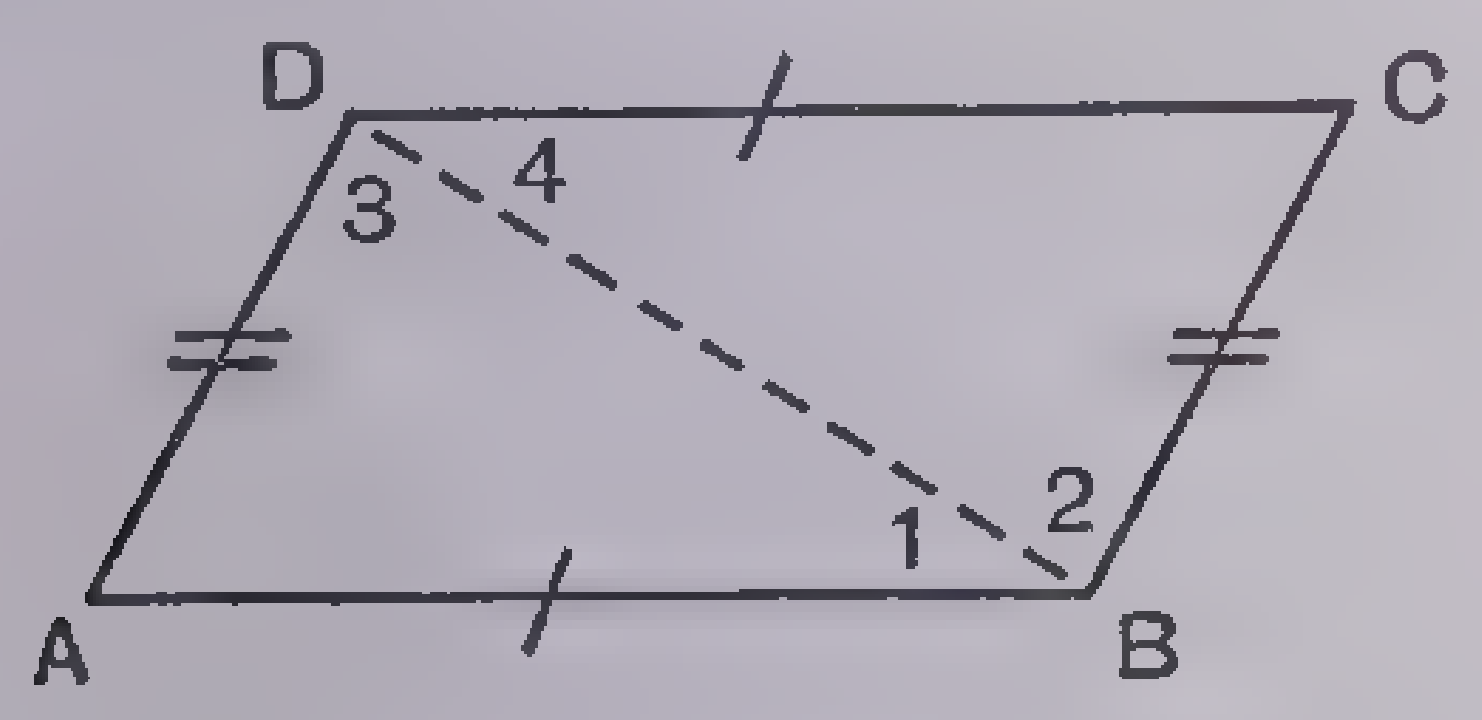
114. Theorem 34.—The diagonals of a parallelogram bisect each other.



Hint. Prove △ OAD and OBC congruent. AD = BC, ∠4 = ∠3 and ∠6 = ∠5. (§65, Theorem 2.)

Hence OB = OD, and OA = OC.

115. Theorem 35.—If the opposite sides of a quadrilateral are equal, the figure is a parallelogram.

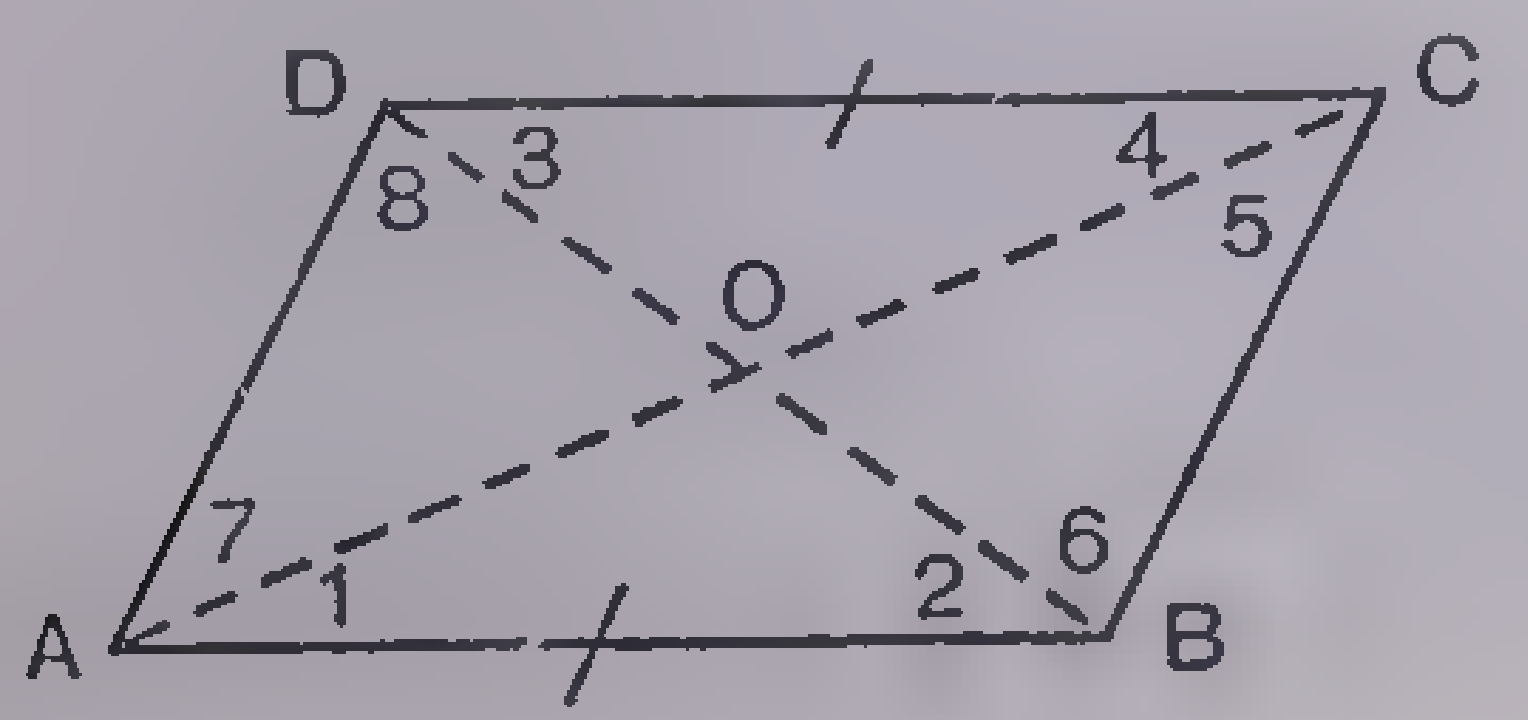


Hint. Draw the diagonal BD. △ ABD and BCD are congruent. (§77, Theorem 9.)

Hence the alternate interior angles 1 and 4 are equal, and AB and DC are parallel. (§98, Theorem 20.)

In the same way since ∠2 = ∠3, the sides AD and BC are parallel.

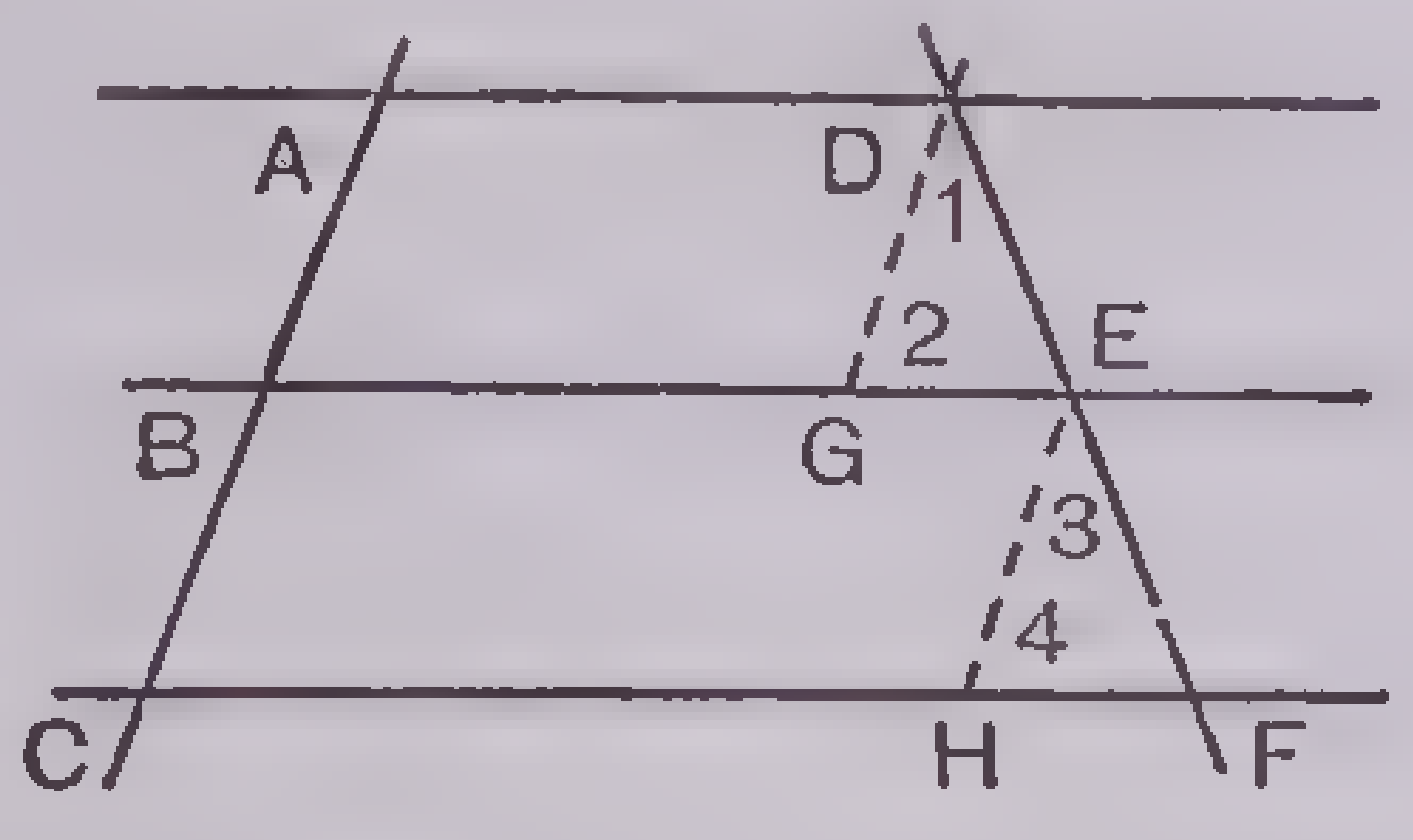
116. Theorem 36.—If two opposite sides of a quadrilateral are equal and parallel, the figure is a parallelogram.



Hyp. AB and DC are parallel and equal.
Con. ABCD is a parallelogram.

Hint. Draw the two diagonals meeting at O. Prove △ AOB and ODC congruent, then prove △ OAD and OBC congruent. Then since the alternate interior angles 5 and 7 are equal, the sides AD and BC are parallel.

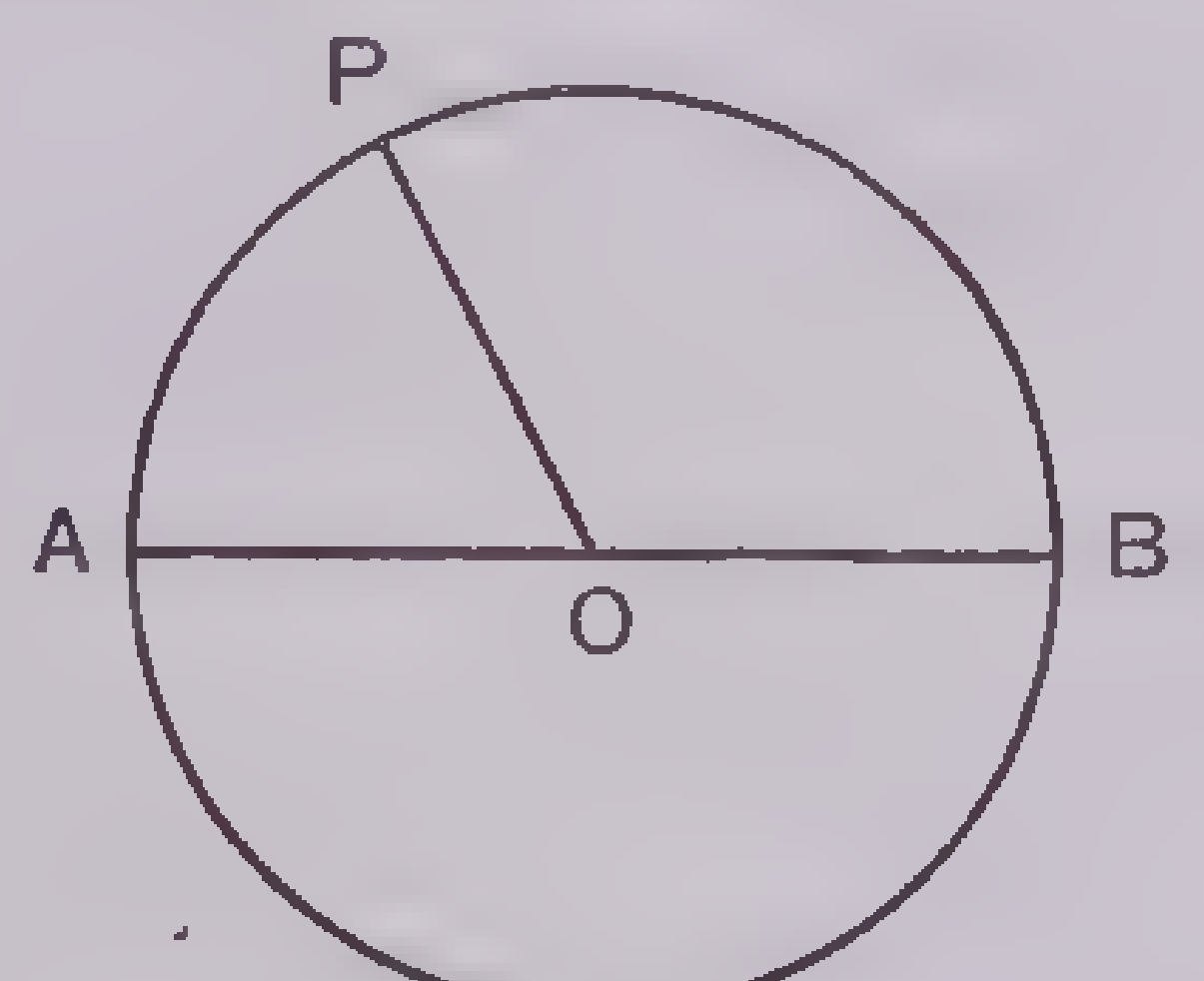
117. Theorem 37.—If a series of parallel lines cut off equal segments on one transversal, they cut off equal segments on any other transversal.



Hyp. The parallel lines AD, BE, CF cut off equal segments on AC, or AB = BC.
Con. The parallel lines cut off equal segments on DF or DE = EF.

Hint. Draw through D, DG parallel to AB and through E, EH parallel to BC. Then ABGD and BCHE are parallelograms, and DG = AB = BC = EH. Prove △ DGE and EHF congruent, ∠1 = ∠3, ∠2 = ∠4 and DG = EH.
∴ DE = EF.

THE CIRCLE AND THE MEASURE OF ANGLES



118. Circle.—A *circle* is the curved line passing through all points in a plane which are at a given fixed distance from a fixed point of the plane. When there is no ambiguity a circle can be designated by its center.

119. Center of a Circle.—The fixed point is the center.

120. Radius.—A *radius* of a circle is a straight line drawn from the center to any point of the circle and is equal to the given fixed distance.

121. Diameter.—A *diameter* is a straight line passing through the center of the circle and having its two extremities on the circle.

In the above figure O is the center, OA, OB and OP are radii, and AB is a diameter.

122. Circumference.—The *circumference* of a circle is the distance traversed by a point in making a complete circuit of the circle, the perimeter.

Note. The word circle has two distinct meanings in ordinary language. We may mean the area bounded by the circumference or we may mean only the circumference itself. It is better, from the geometrical standpoint, to understand the circle to be a curved line and not the surface bounded by the line.

A circle can be defined in terms of its locus properties, §88. A circle is the locus of points in a plane at a given fixed distance from a fixed point. When we choose a center and a radius, we divide the points of the plane into three classes: (a) those that are at a greater distance from the center than the radius and are said to be outside the circle; (b) those that are at a lesser distance from the center than the radius and are said to be inside the circle; (c) those that are at the given distance and constitute the circle itself.

123. Arc.—An *arc* is a continuous portion of a circle. AP is an arc.

124. Semicircle.—A *semicircle* is an arc which is half of a circle.

125. Major Arc.—An arc greater than a semicircle is a *major arc.*

126. Minor Arc.—An arc less than a semicircle is a *minor arc.*

If we choose two points on a circumference, as P and B, there are two arcs which have these for end points. A minor arc is described by a point which starts at P and moves clockwise to B; a major arc, by a point which starts at P and moves counterclockwise to B. The addition of a point in the major arc will do away with this ambiguity, thus PB denotes the minor arc and PAB the major arc.

127. Central Angle.—A *central angle* is the angle formed by two radii of a circle. Since all radii pass through the center, the vertex of a central angle is always at the center. Angle POB is a central angle.

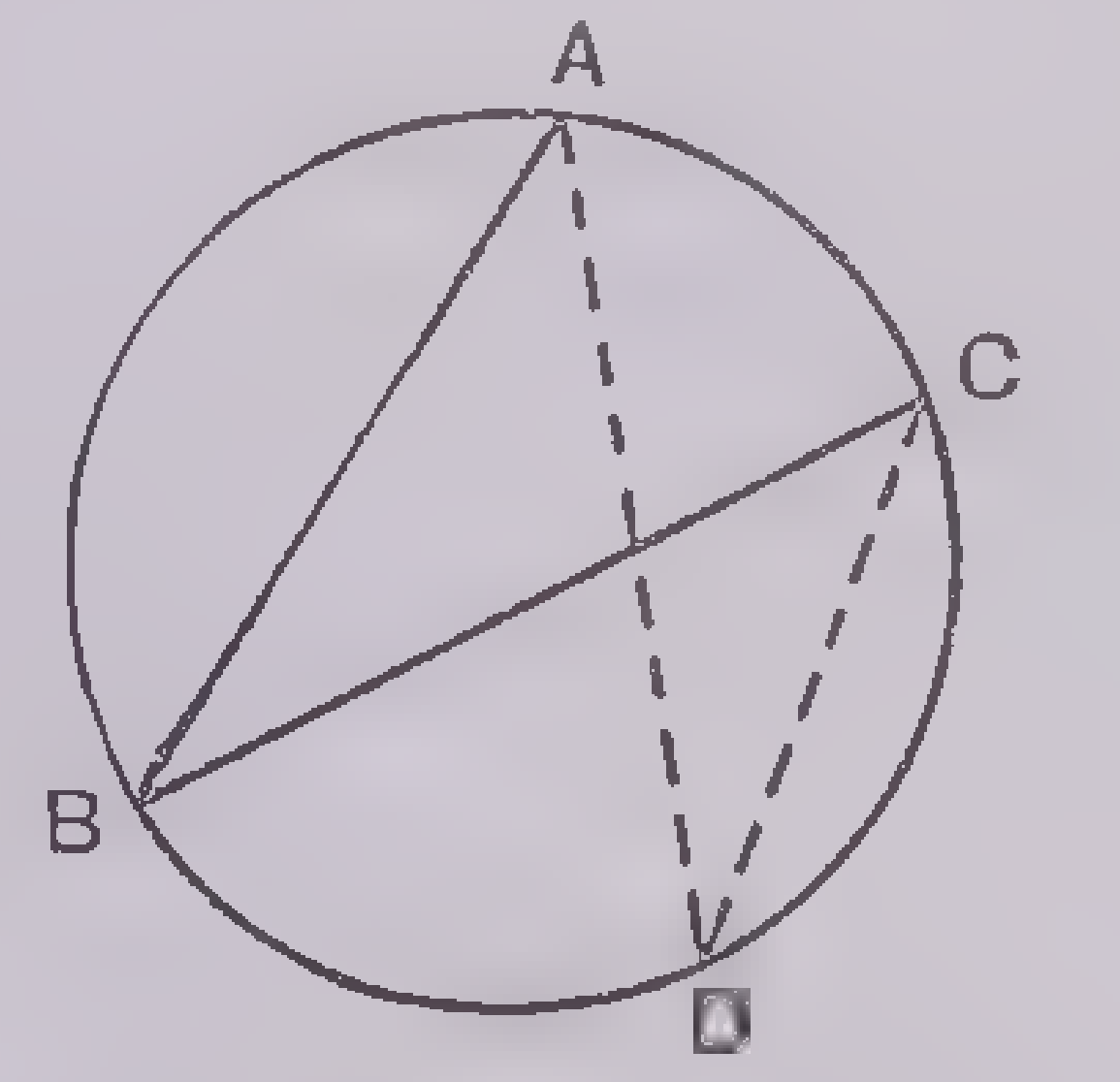
128. Intercept and Subtend.—An angle is said to *intercept* an arc included between its sides, and the arc is said to *subtend* the angle.

The angle POB intercepts the arc PB, and the arc PB subtends the angle POB. Two parallel lines will cut a circle in two pairs of points. They are said to intercept two arcs.

129. Chord.—A *chord* is a straight line joining the extremities of an arc, and the chord is said to subtend the arc. Draw the line PB and you have a chord subtending the arc PB.

130. Segment.—A *segment* is a portion of the plane bounded by an arc of a circle and its chord.

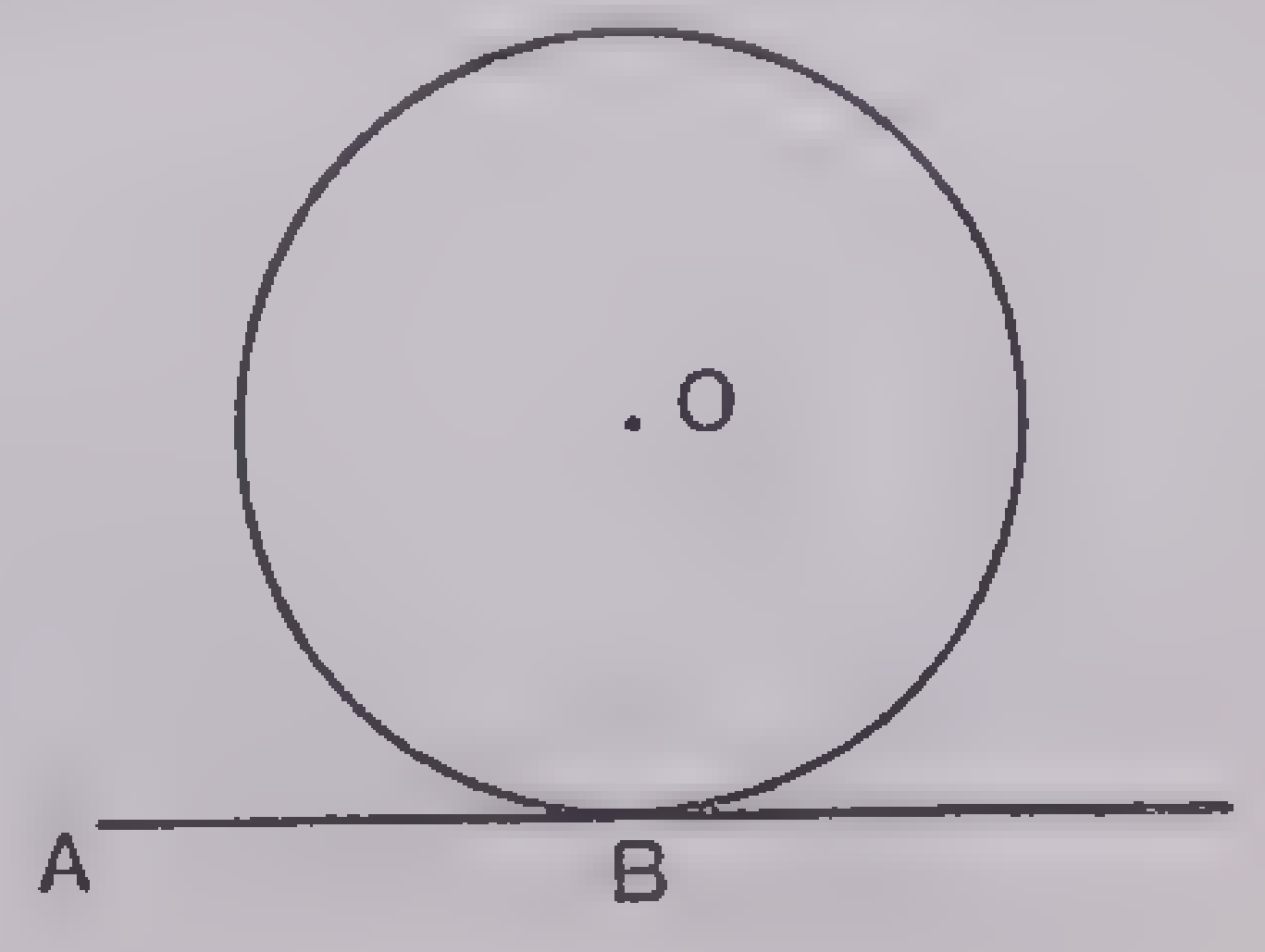
131. Sector.—A *sector* of a circle is a portion of the plane included between an arc and the radii drawn to its extremities. The radii OA and OP with the arc AP bound a sector.



132. Inscribed Angle.—An angle whose vertex is on a circle and whose sides are chords is called an *inscribed angle.* Angle ABC is an inscribed angle. An angle is inscribed in a segment when its vertex lies on the arc of the segment and its extremities pass through the ends of the segment. Angles ABC and ADC are two angles inscribed in the same segment, the segment denoted by ABC, ADC or ABDC.

133. Concentric Circles.—Circles are *concentric* when they have the same center.

134. Tangent.—A straight line is said to be *tangent* to a circle or to touch a circle when it has only a single point in common with the circumference, no matter how far the line is extended. The circle is also said to

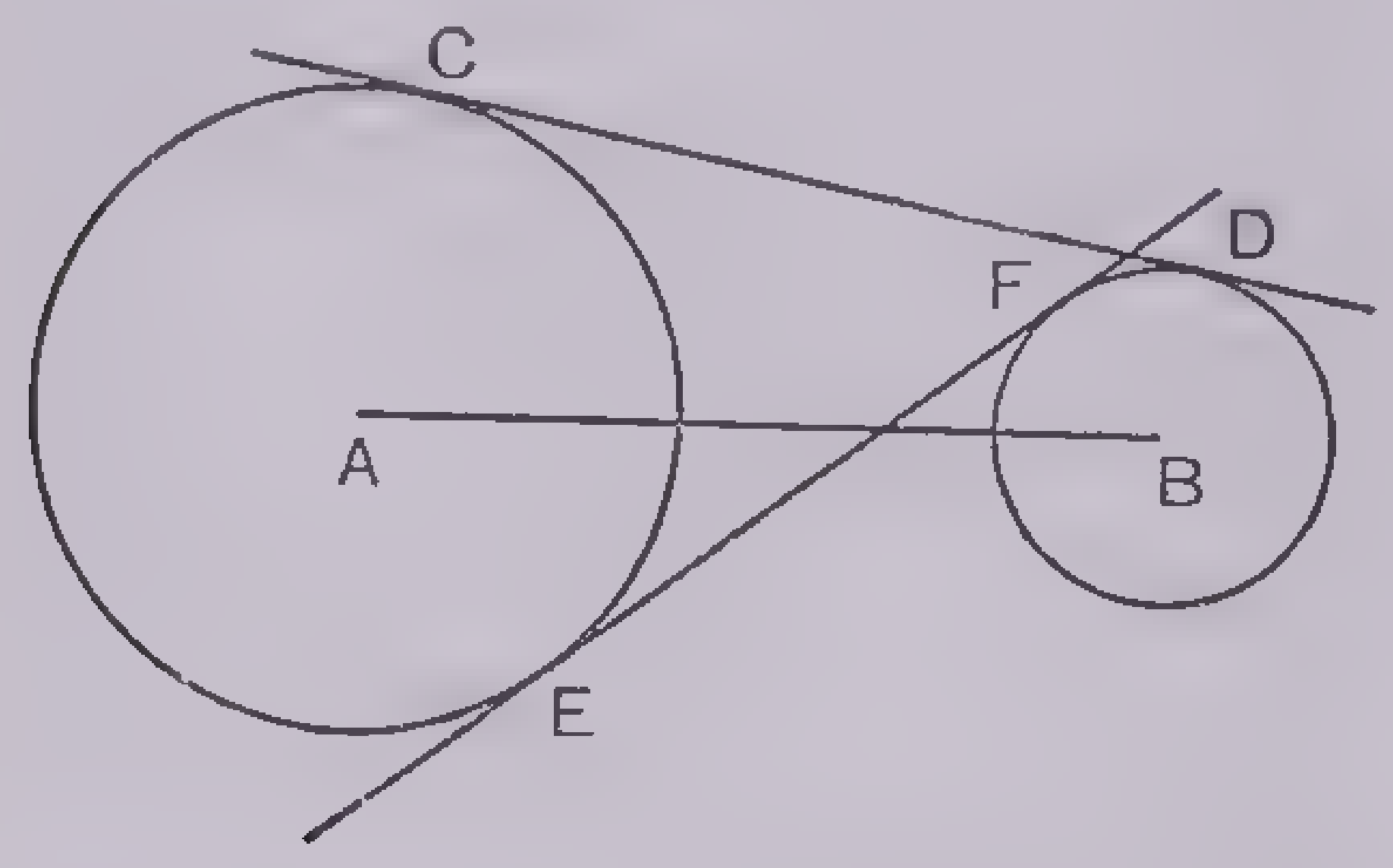


be tangent to the line. Line AB is tangent to the circle with center at O.

135. Point of Contact.—The single point which a circle and its tangent have in common is called the *point of contact.*

136. Secant.—A straight line cutting a circumference in two points is a *secant.*

137. Tangent Circles.—When two circles are tangent to the same line at the same point they are said to be tangent to each other or *tangent circles.* They are tangent internally or externally according as one circle lies entirely within or entirely without the other.



138. Common Tangent.—A line which is tangent to two circles is called a *common tangent.* An *internal tangent* passes between the two circles. A tangent which does not pass between the circles is called an *external tangent.* CD is the common external tangent to circles A and B; EF is the common internal tangent.

Postulates of the Circle

139. Line of Centers.—The line joining the centers of two circles is called the *line of centers.*

The following statements are derived from the fundamental postulates and axioms:

140.—All radii and diameters of the same circle, or of equal circles, are equal.

141.—Two circles are congruent when their radii or diameters are equal.

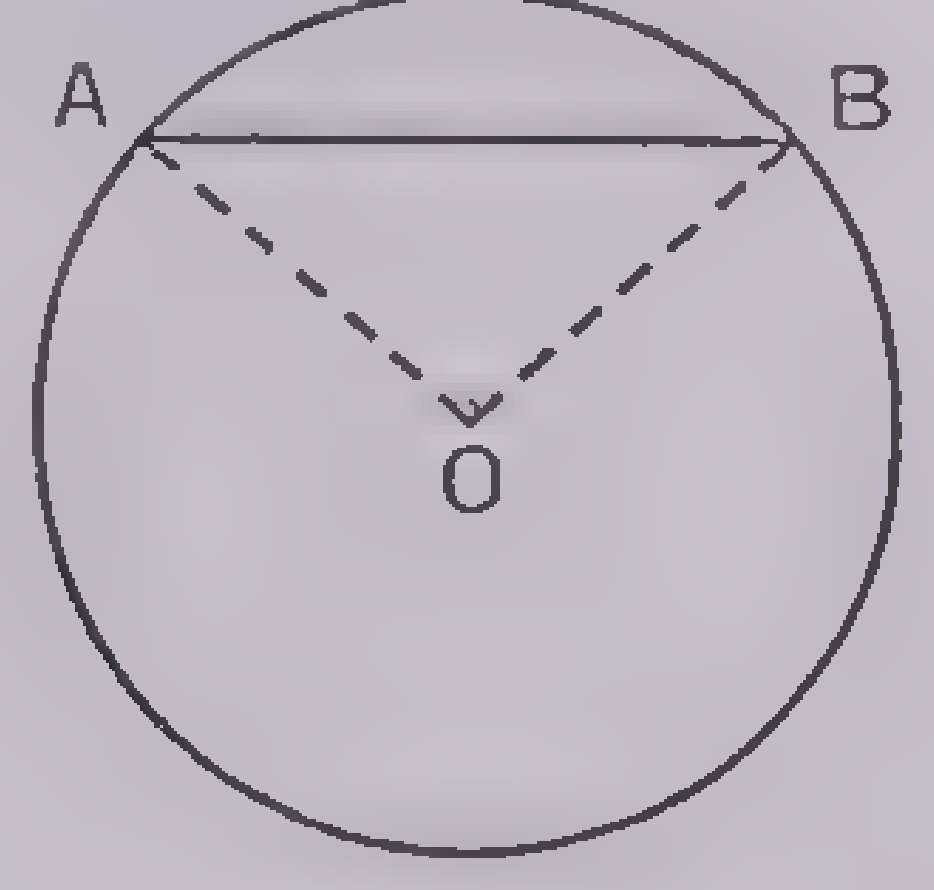
142.—Two radii or diameters of the same or of equal circles are equal.

143.—Every diameter bisects the circle and its circumference.

144.—If the centers of two equal circles which lie in the same plane be made to coincide, the circles will coincide.

145.—A radius is equal to one-half a diameter.

146. Theorem 38.—The diameter of a circle is greater than any other chord.



Hyp. AB is any chord, not a diameter, of the given circle.

Con. AB is less than a diameter.

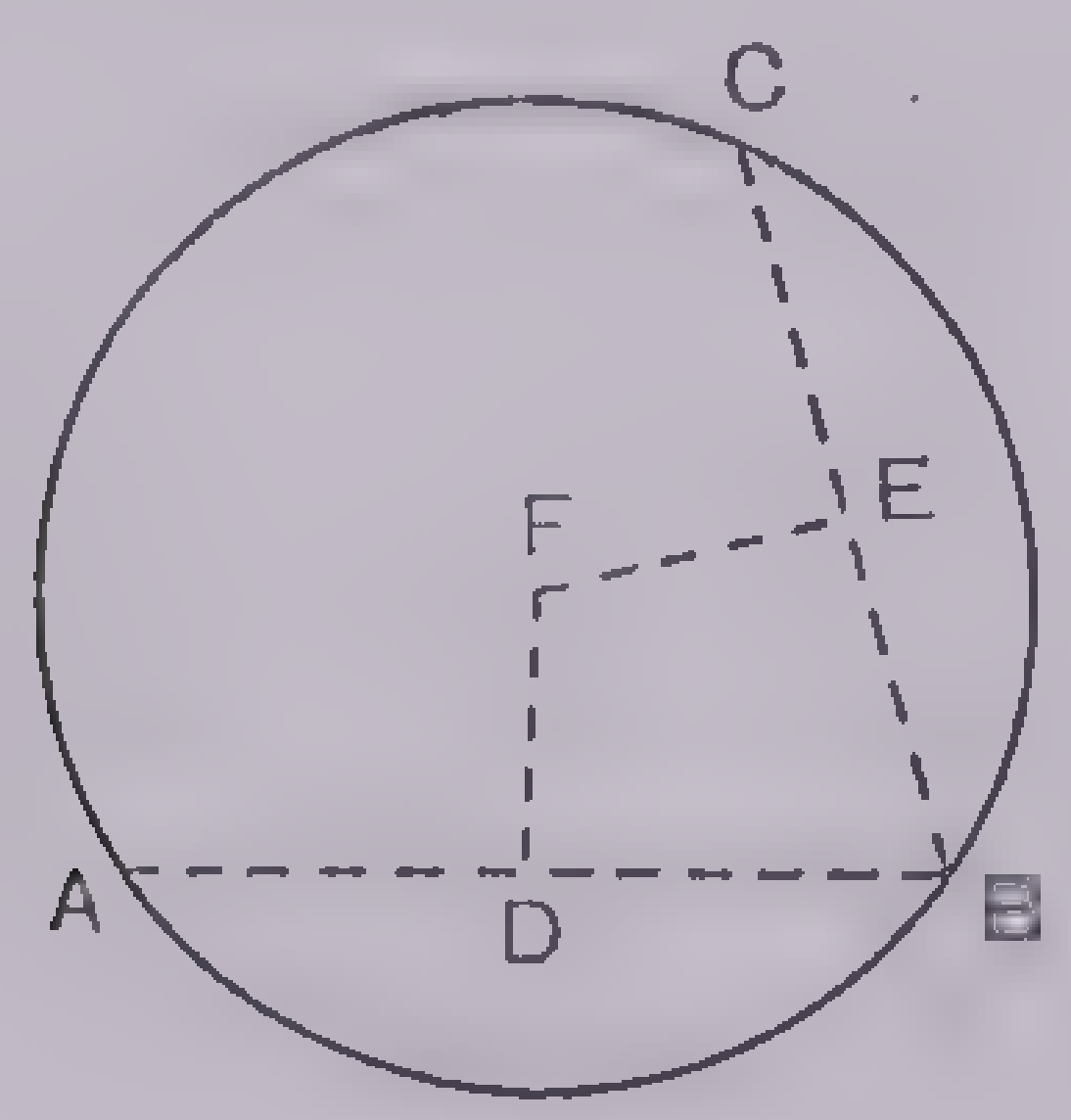
Draw the radii OA and OB.

$OA + OB > AB$. (Postulate, §12.)

$OA + OB$ is equal to a diameter.

∴ AB is less than a diameter.

147. Theorem 39.—Through three points not lying in a straight line, one circle, and only one, can be drawn.



Hyp. Given the three points A, B and C, not in a straight line.

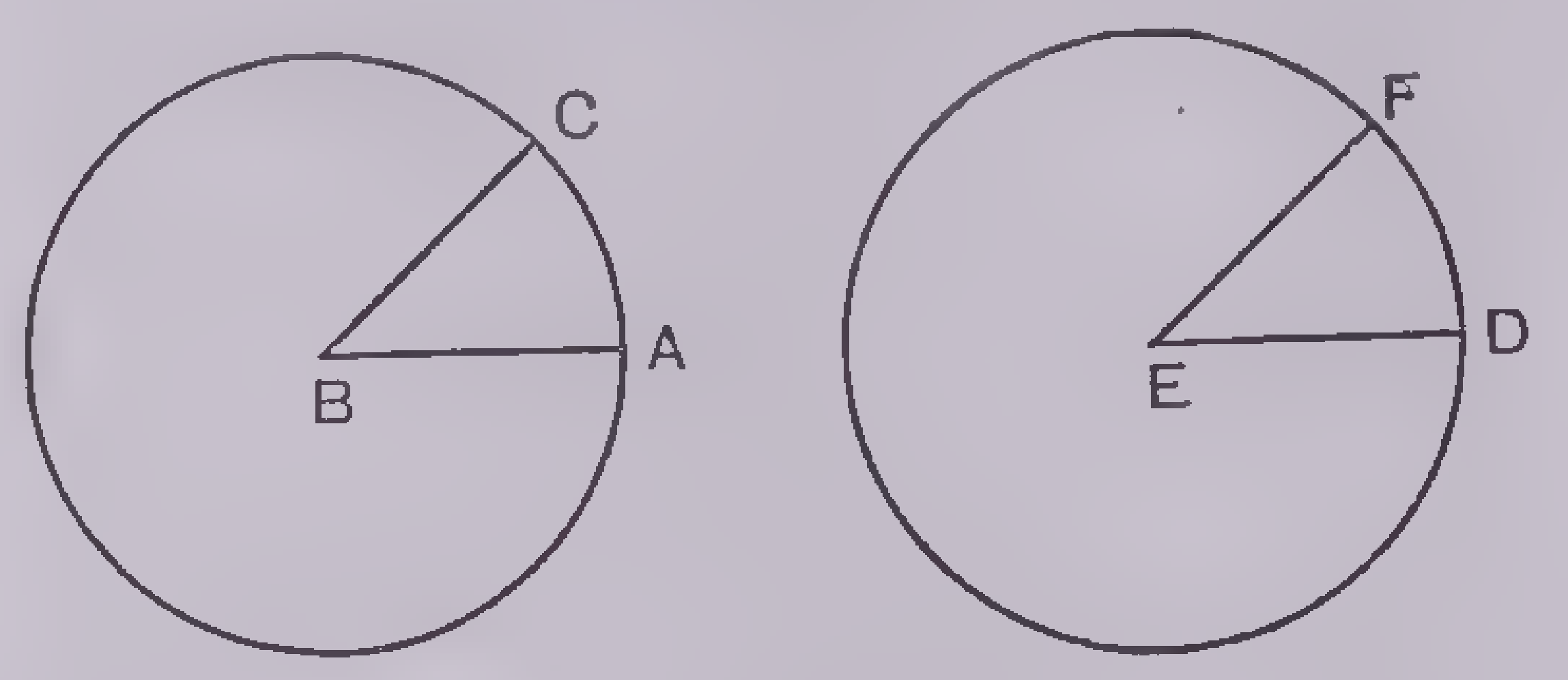
Con. One circle, and only one, can be drawn through A, B and C. Imagine a circle drawn through A, B and C, and let F be the center of this circle.

Then $AF = BF = CF$, since they are radii of the same circle.

Hence F must be on the perpendicular bisector of AB. (§89, Theorem 16.)

By the same reasoning F must be on the perpendicular bisector of CB.

∴ F is the point of intersection of the perpendicular bisectors DF and EF. These two lines must intersect, since if they do not they are parallel, which means that A, B and C are in a straight line. This proves that one center exists. There cannot be more than one center, because the two bisectors can only intersect in a single point.



148. Theorem 40.—If in the same circle or in equal circles two angles at the center are equal, the arcs which they intercept are equal.

Hyp. Given the two equal circles with the centers B and E, with the angles B and E equal, which intercept the arcs AC and DF respectively.

Con. The arc AC equals the arc DF.

Place the circle with center D on the circle with center B, so that the angle B coincides with its equal, E. Then the two circles will coincide, and the point A will coincide with D, and the point C with the point F. Hence AC will coincide with DF, since the two end points of an arc determine the arc. If the angles are in the same circle, one angle can be rotated until it coincides with the other.

Note. Many theorems in plane geometry contain the expression "in the same circle or equal circles." The shortest distance between any two points on the surface of a sphere is the arc of a certain circle passing through the two points, and this circle always has the same radius no matter what two points are chosen. So the theorems are at once useful for different circles on the sphere. When we speak of the distance between New York and London we do not mean the straight line distance but the distance measured along the circumference of a circle drawn on the earth joining the two points. Also when we compare the distances between two pairs of places, we are comparing arcs of two different equal circles.

149. Theorem 41.—If in the same circle or in equal circles two arcs are equal, the angles which they subtend at the center are equal.

The figure of Theorem 40 can be used.

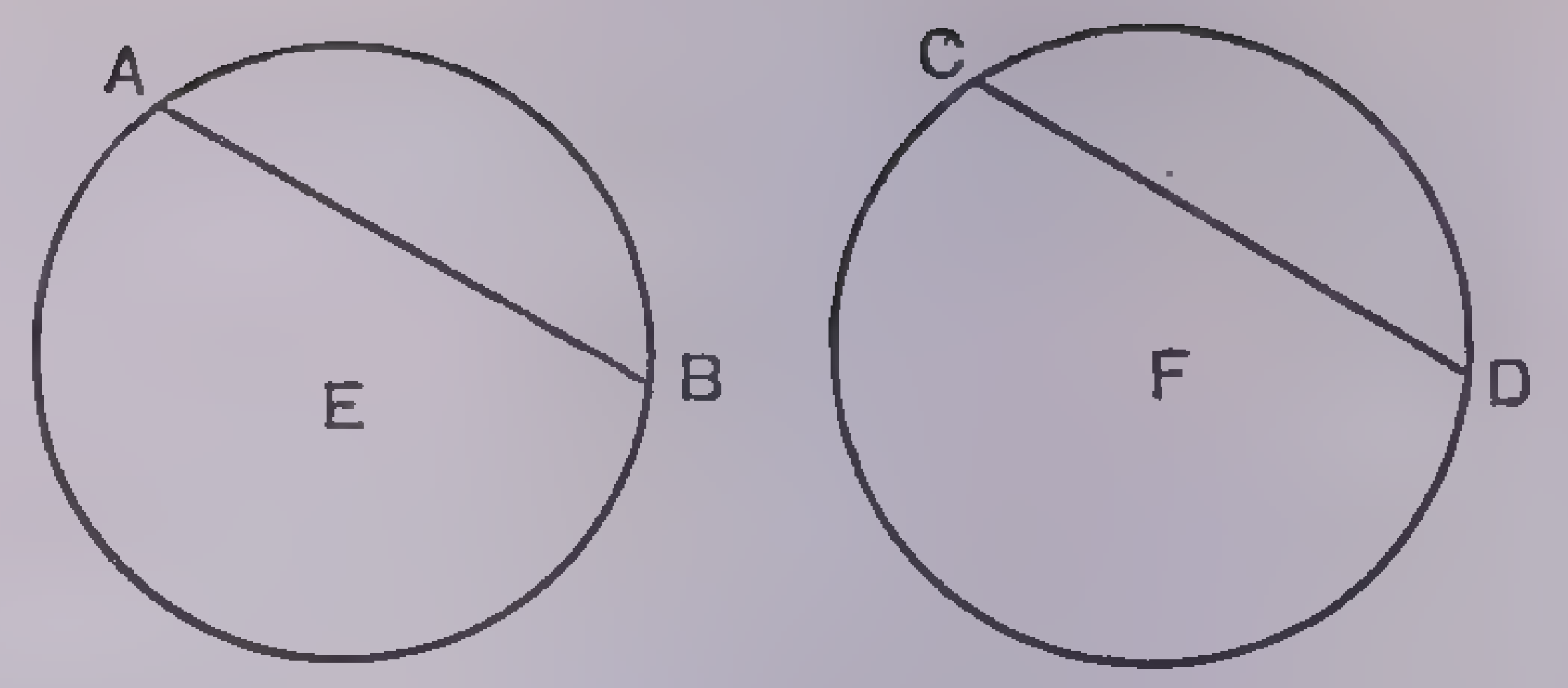
Hyp. Arcs AC and FD, drawn in the equal circles, are equal.

Con. $\angle B = \angle E$.

The proof is by superposition. Make the two circles coincide with the arcs AC and DF coinciding. Then show that the angles B and E coincide. If the arcs are in the same circle, make them coincide by a rotation.

150. Theorem 42.—If in the same circle or in equal circles two arcs are equal, the chords subtending them are equal.

Hyp. Given the equal circles E and F with the equal arcs AB and CD respectively.



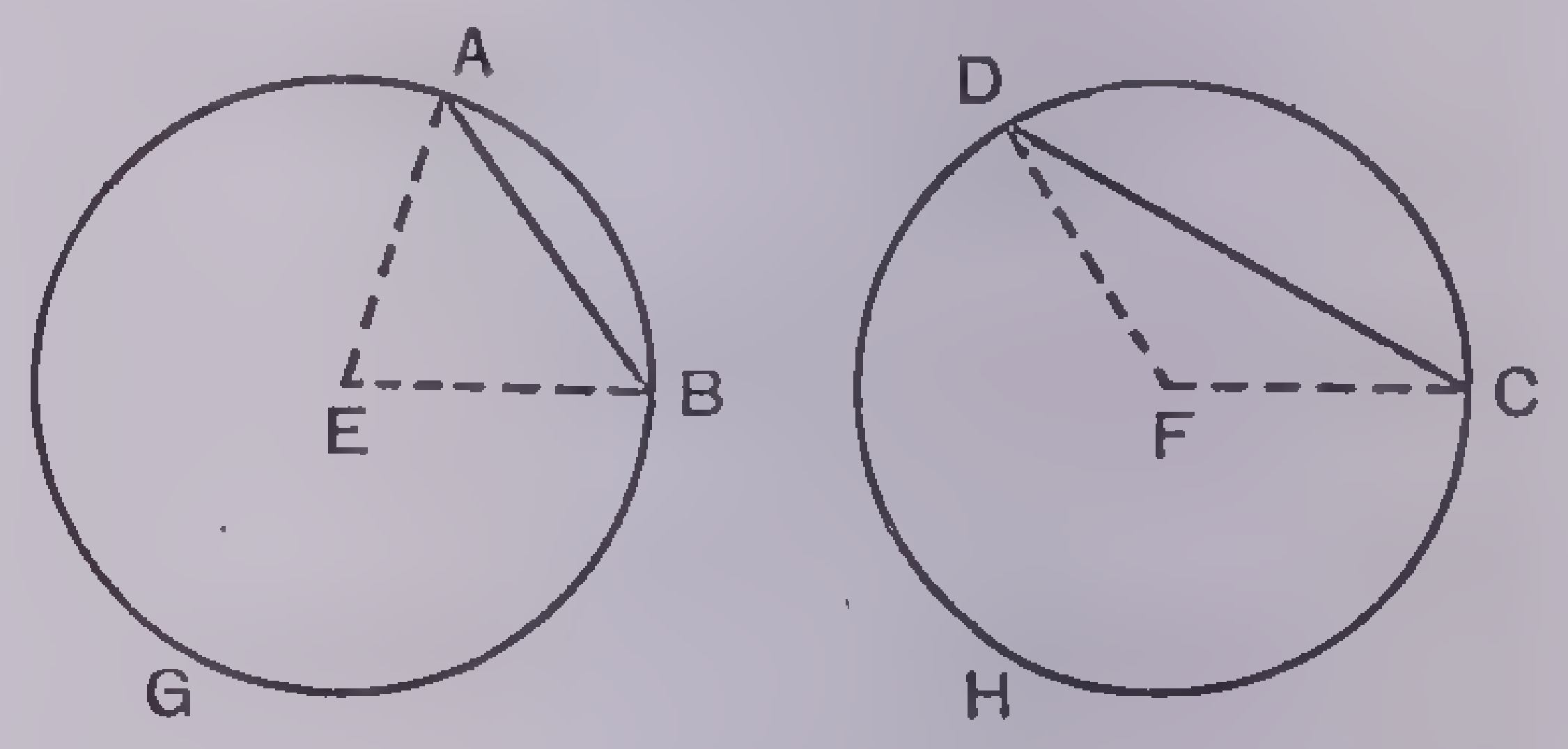
Con. Chord AB = chord CD. The proof is by superposition.

151. Theorem 43.—If in the same circle or in equal circles two chords are equal, the arcs subtended by them are equal. This is the converse of the previous theorem, and the same method of superposition can be used.

Hyp. The chord AB = chord CD.

Con. The arc AB = arc CD.

152. Theorem 44.—If in the same circle or in equal circles two arcs, each less than a semicircle, are unequal, the chords subtending them are unequal; and the greater arc is subtended by the greater chord.



Hyp. Given the equal circles E and F with the unequal arcs AB and DC respectively, with the minor arc DC > minor arc AB.

Con. Chord DC > chord AB.

Draw the radii EA, EB, FD and FC.

If the two circles are made to coincide, with FC coinciding with EB, the point D will fall on the circle E at a greater distance from B measured in the counterclockwise direction than the point A. (Arc DC > arc AB by hyp.)

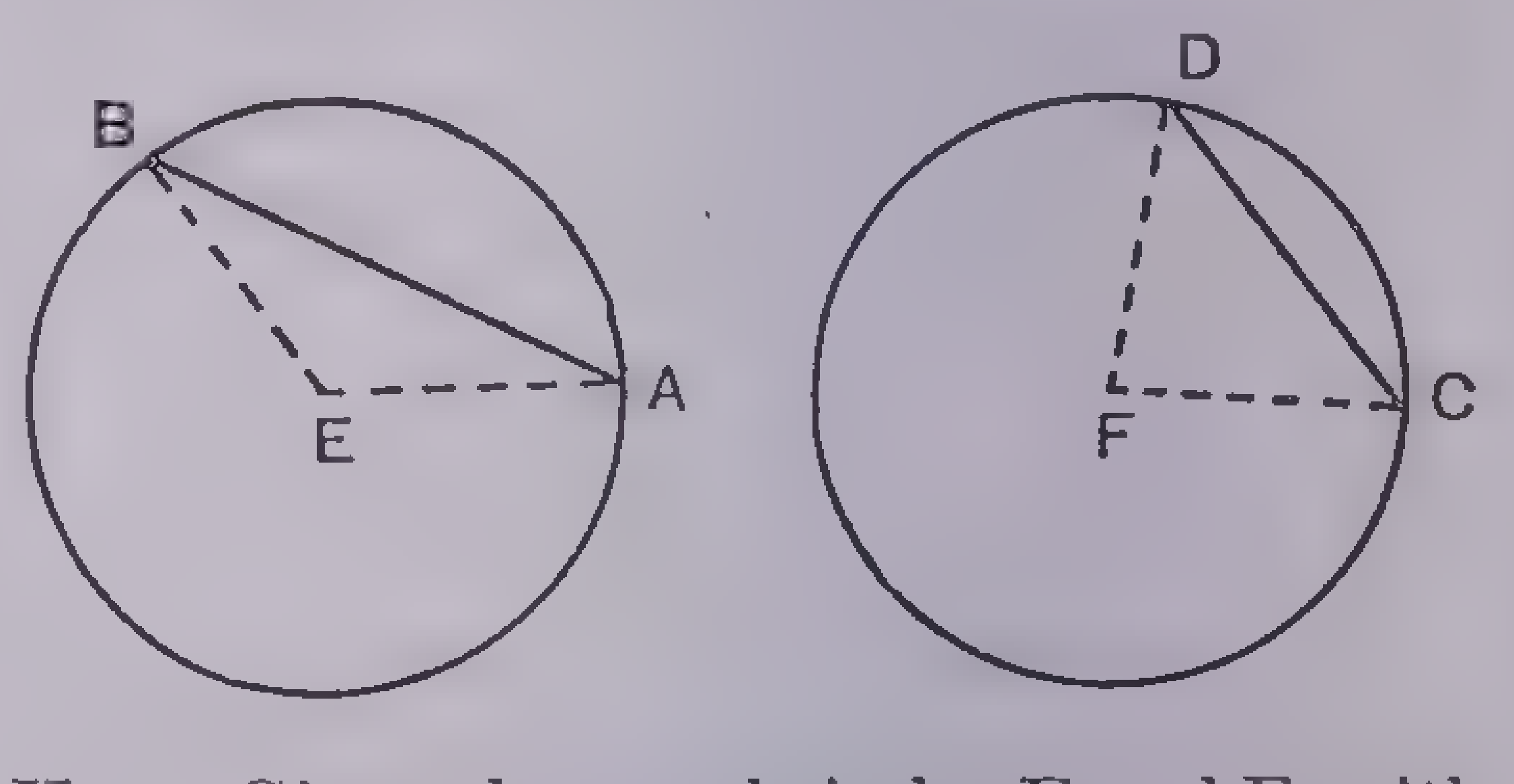
∴ $\angle CFD > \angle BEA$ (§26, Def.)

In $\triangle$s BEA and CFD, $EB = FC$, $EA = FD$ (§140, Post.)

∴ $DC > AB$ (§75, Theorem 7.)

Note. If we use the arcs which are greater than a semicircle, as BGA and CHD, then the greater arc corresponds to the lesser chord.

153. Theorem 45.—If in the same circle or in equal circles, two chords are unequal, the arcs subtending them are unequal; and the greater chord subtends the greater arc, provided neither arc exceeds the semicircle.



Hyp. Given the equal circles E and F, with the chords AB and CD unequal and $AB > CD$.

Con. Minor arc AB > minor arc CD.

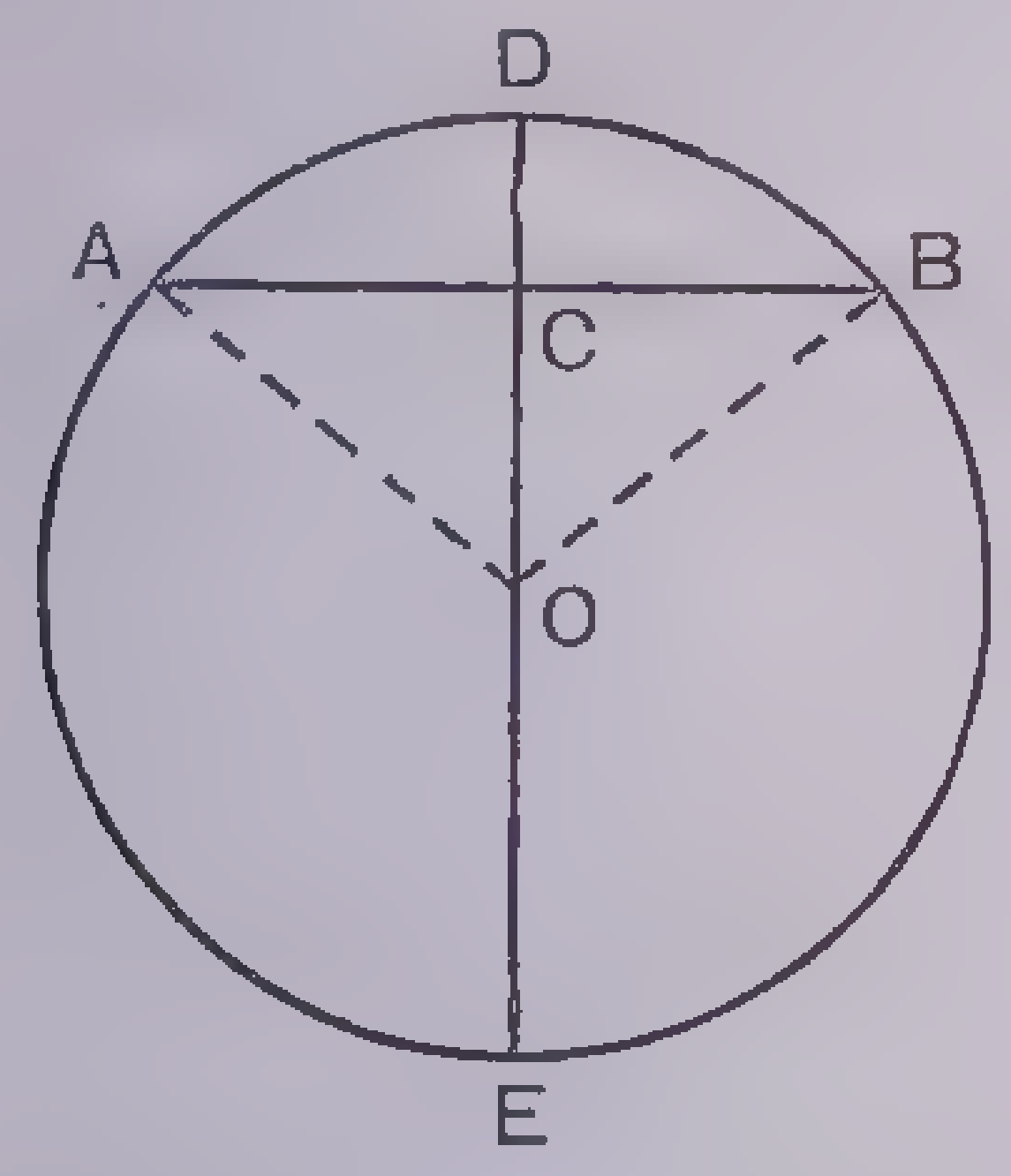
Draw the radii EA, EB, FC and FD, which are all equal by hypothesis.

In $\triangle$s EAB and FCD, $\angle AEB > \angle CFD$. (§76, Theorem 8.)

If, therefore, the circles are superposed so that EA falls on FC, the point B will fall on the circle F at a greater distance from the point C measured in a counterclockwise direction than the point D. (§26, Def.)

∴ Minor arc AB > minor arc CD.

154. Theorem 46.—The diameter perpendicular to a chord bisects the chord and the arcs which the chord subtends.



Hyp. The diameter ED is $\perp$ to chord AB, meeting it at the point C and meeting the minor arc AB at the point D, and the major arc AEB at the point E.

Con. $AC = CB$, arc AD = arc DB, arc AE = arc EB.

Draw the radii OA and OB.

The right $\triangle$ OCA and OCB have OC common and OA equal to OB.

$\therefore \triangle OCA \cong \triangle OCB$. (§87, Theorem 15.)

$\therefore AC = CB$.

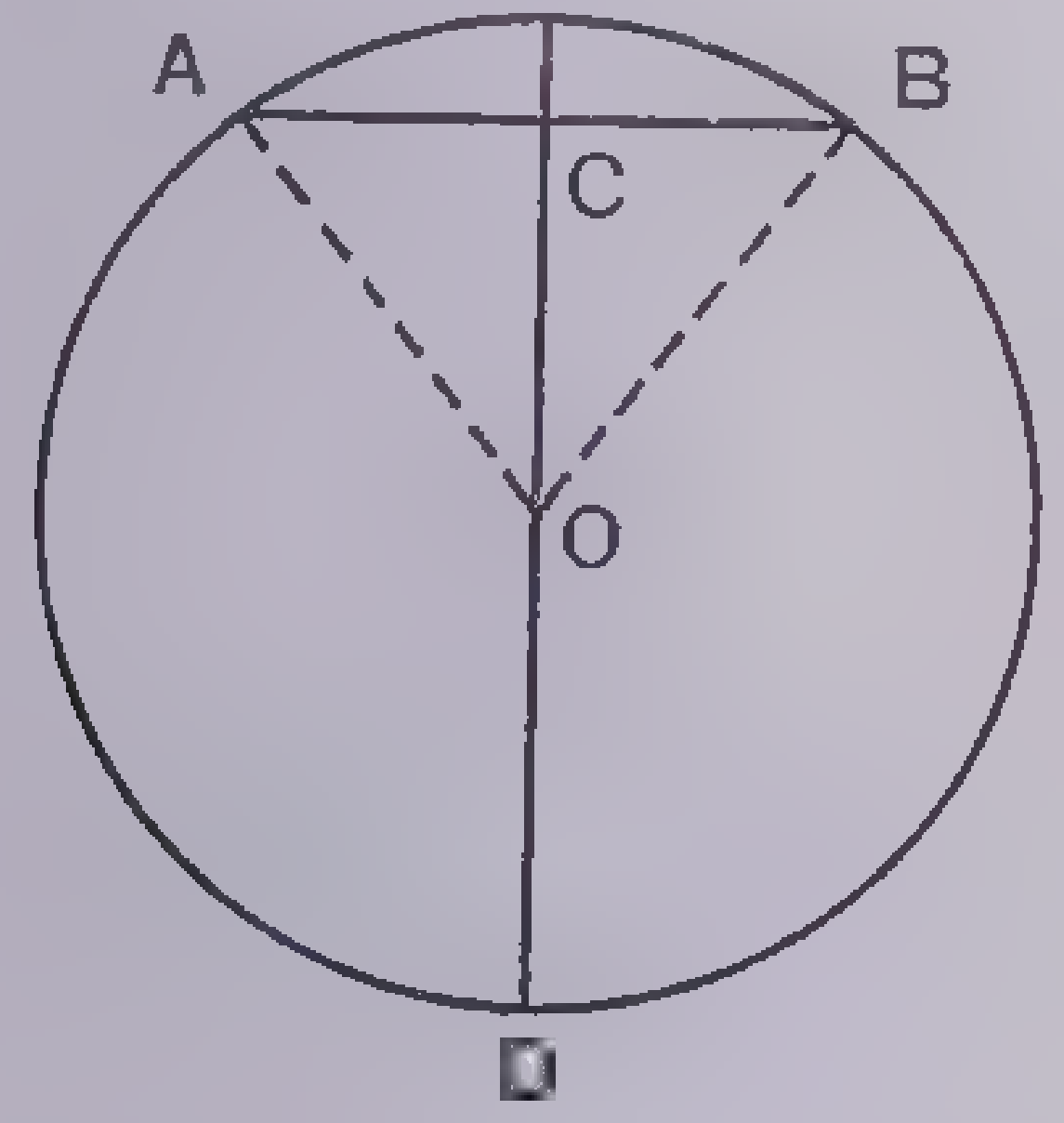
$\angle AOC = \angle COB$. (§68.)

$\therefore$ Arc AD = arc DB (§148, Theorem 40.)

Arc DAE = arc DBE (Both semicircles.)

$\therefore$ Arc AE = arc BE (§40, Axiom.)

155. Theorem 47.—The perpendicular bisector of a chord passes through the center of the circle.



Hyp. CD is the line perpendicular to the chord AB at its midpoint C.

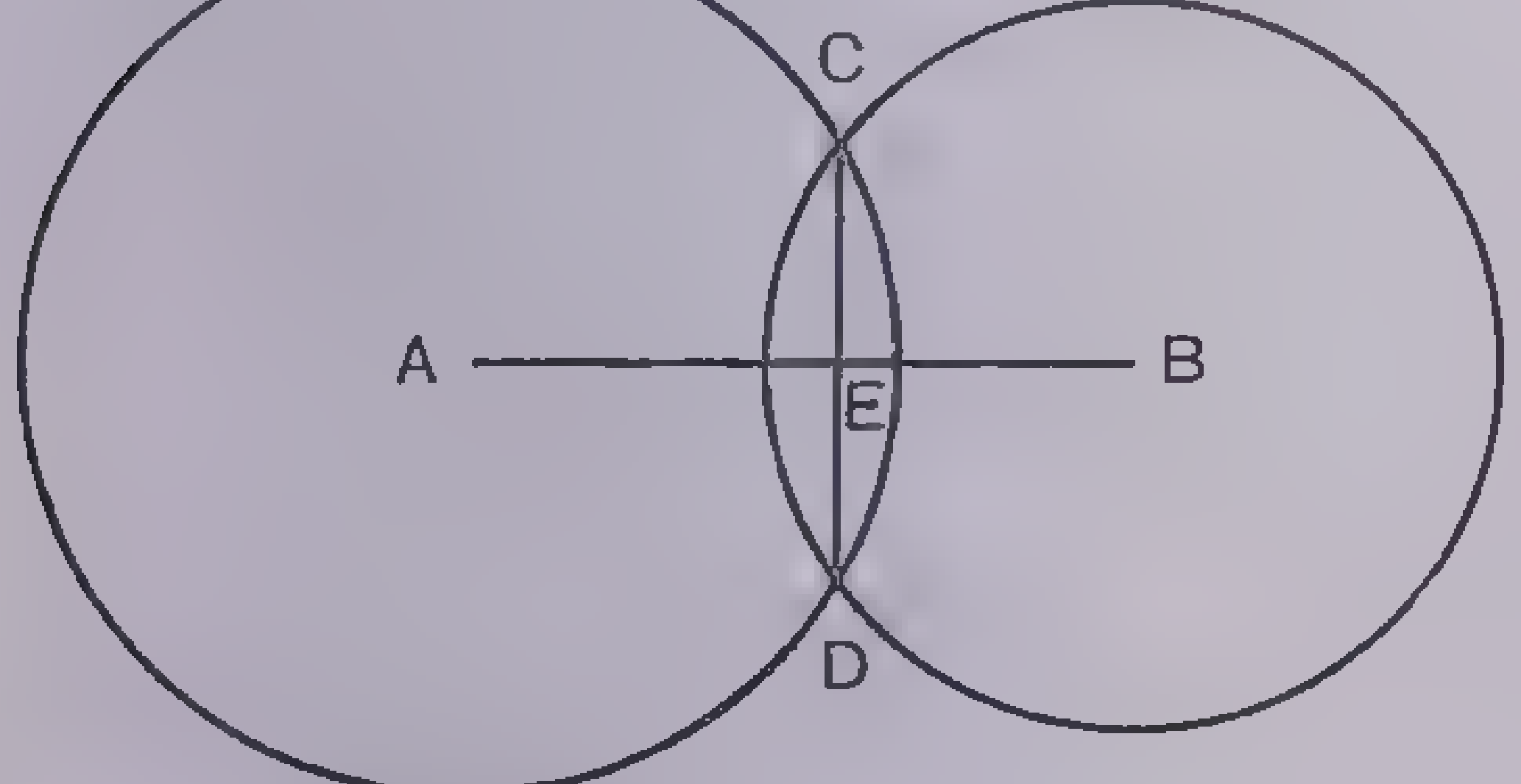
Con. CD passes through O, the center of the circle.

Draw OA and OB.

O is equidistant from A and B. (§118, Def.)

$\therefore$ O lies on CD. (§89, Theorem 16.)

156. Theorem 48.—When two circles intersect each other, the straight line through their centers is the perpendicular bisector of their common chord.

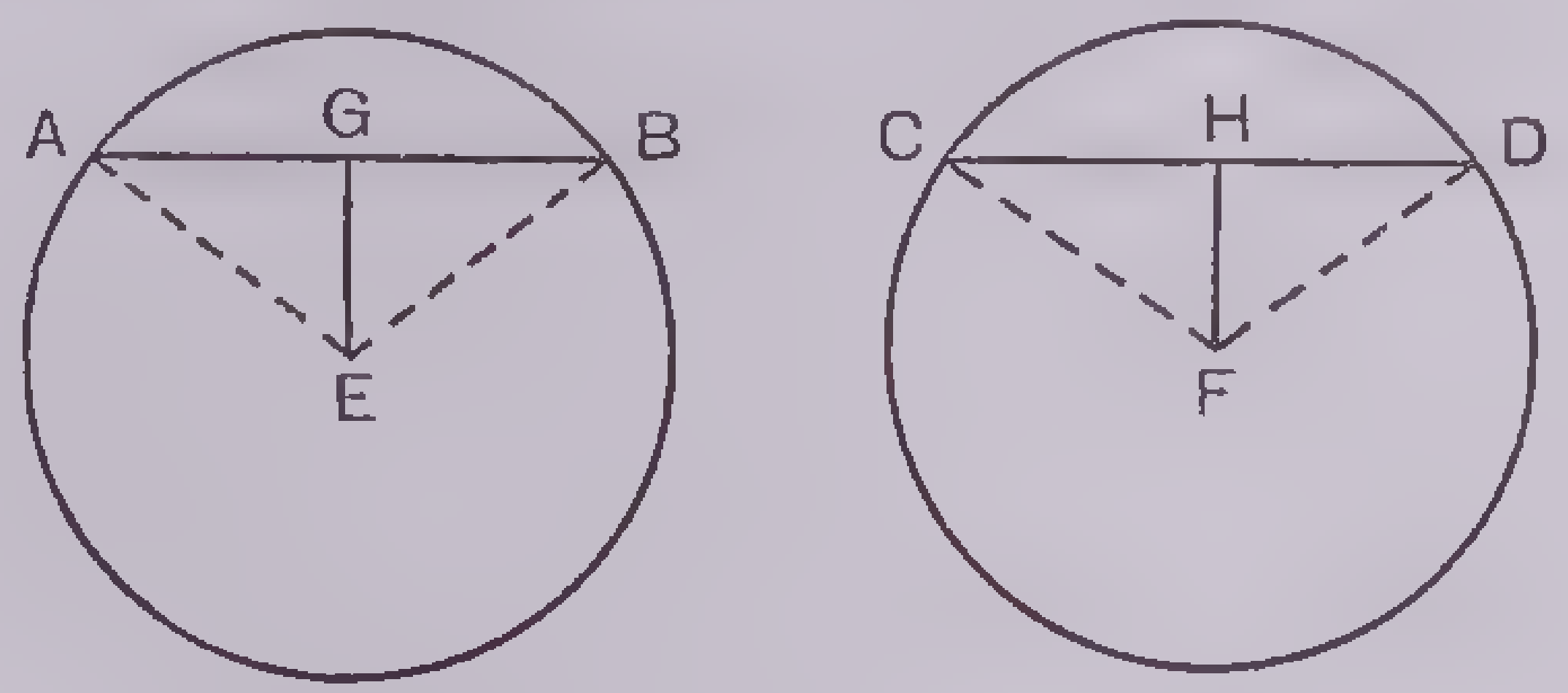


Hyp. The two given circles, A and B, intersect at C and D. CD is the common chord and AB the line of centers, intersecting at the point E.

Con. AB is the perpendicular bisector of CD.

If AB is not the perpendicular bisector of CD, draw the line perpendicular to CD at its midpoint. By the previous theorem, the line just drawn will pass through the centers of both circles, hence through the points A and B. Hence AB is the perpendicular bisector of CD. (§8. Postulate.)

157. Theorem 49.—If in the same circle, or in equal circles, two chords are equal, they are equally distant from the center.



Hyp. Given the equal circles E and F with the equal chords AB and CD respectively. EG and FH are the perpendiculars from the centers on their respective chords.

Con. $GE = HF$.

Draw the radii EA and FC.

$AG = \frac{1}{2} AB$ and $CH = \frac{1}{2} CD$. (§154, Theorem 46.)

$AB = CD$. (Hyp.)

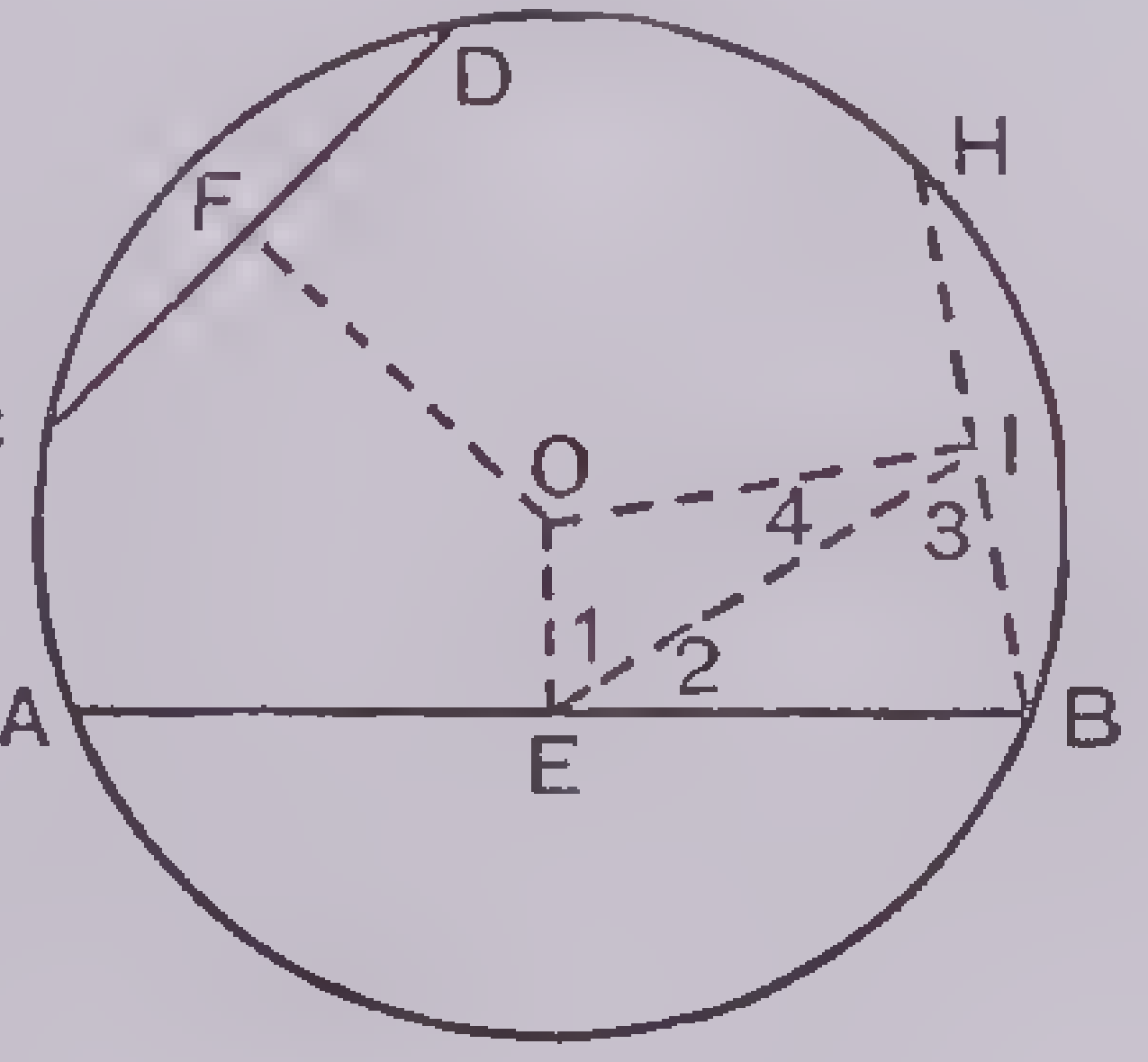
$\therefore AG = CH$.

$EA = FC$.

$\therefore \triangle AGE \cong \triangle CHF$. (§87, Theorem 15.)

$\therefore GE = HF$.

158. Theorem 50.—If in the same circle, or in equal circles, two chords are unequal, the greater chord is at the less distance from the center.



Hyp. Chord $AB >$ chord DC.

OE is $\perp$ from O on AB meeting it at E, OF is $\perp$ from O on CD meeting it at F.

Con. $OF > OE$.

Let BH be a chord equal to CD, and let OI be $\perp$ from O on BH, meeting it at I.

Draw EI.

$EB = \frac{1}{2} AB$ and $BI = \frac{1}{2} BH$. (§154, Theorem 46.)

$AB > BH$. (Construction; Hyp.)

$\therefore EB > BI$. (§44, Ax.)

$\therefore \angle 3 > \angle 2$ in $\triangle EBI$. (§74, Theorem 6.)

$\angle 1 + \angle 2 = \angle 3 + \angle 4$ (Both sums right $\angle$s.)

$\therefore \angle 1 > \angle 4$. (§45, Ax.)

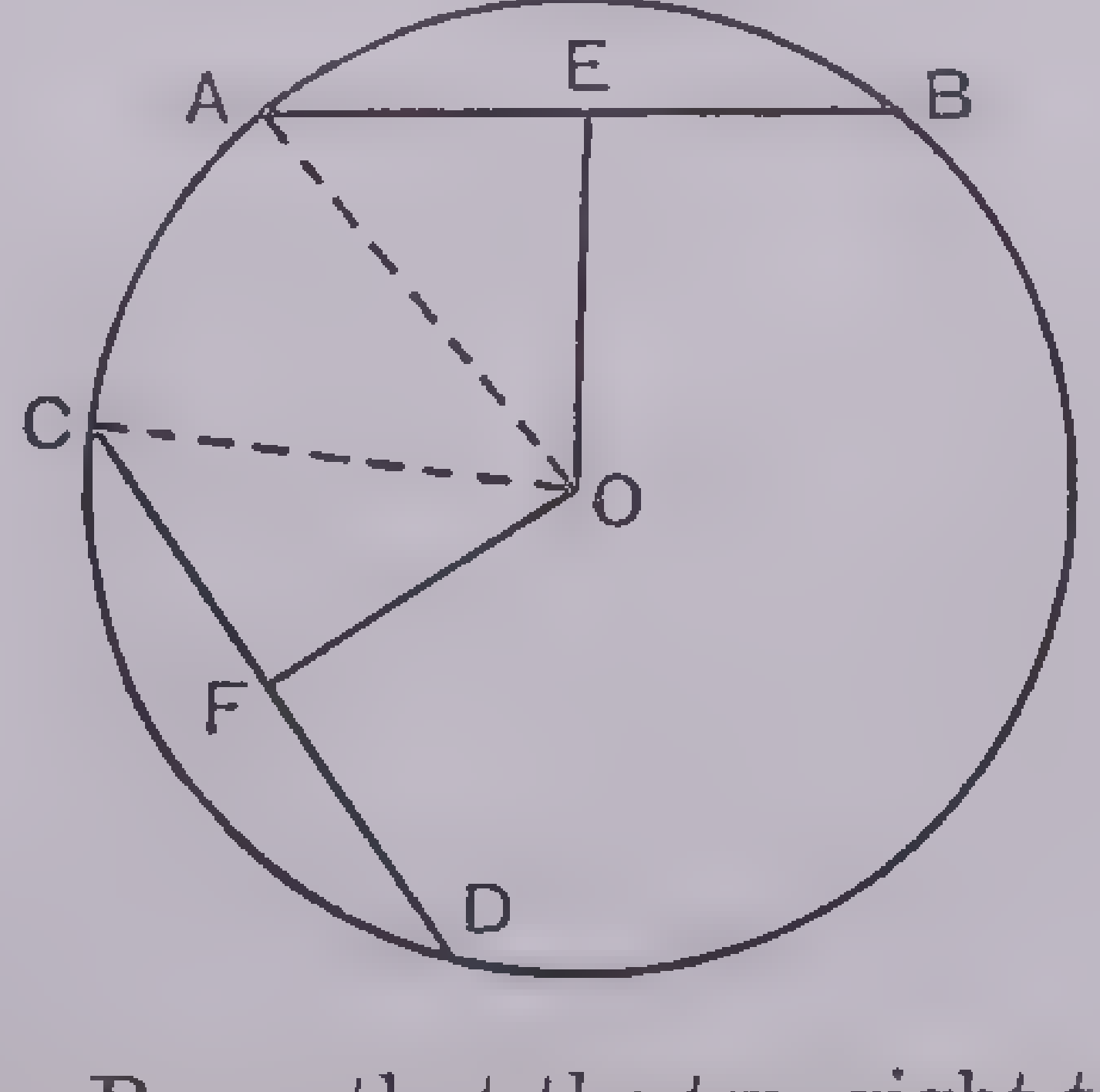
$\therefore OI > OE$. (§72, Theorem 5.)

$OI = OF$. (§157, Theorem 49.)

$\therefore OF > OE$.

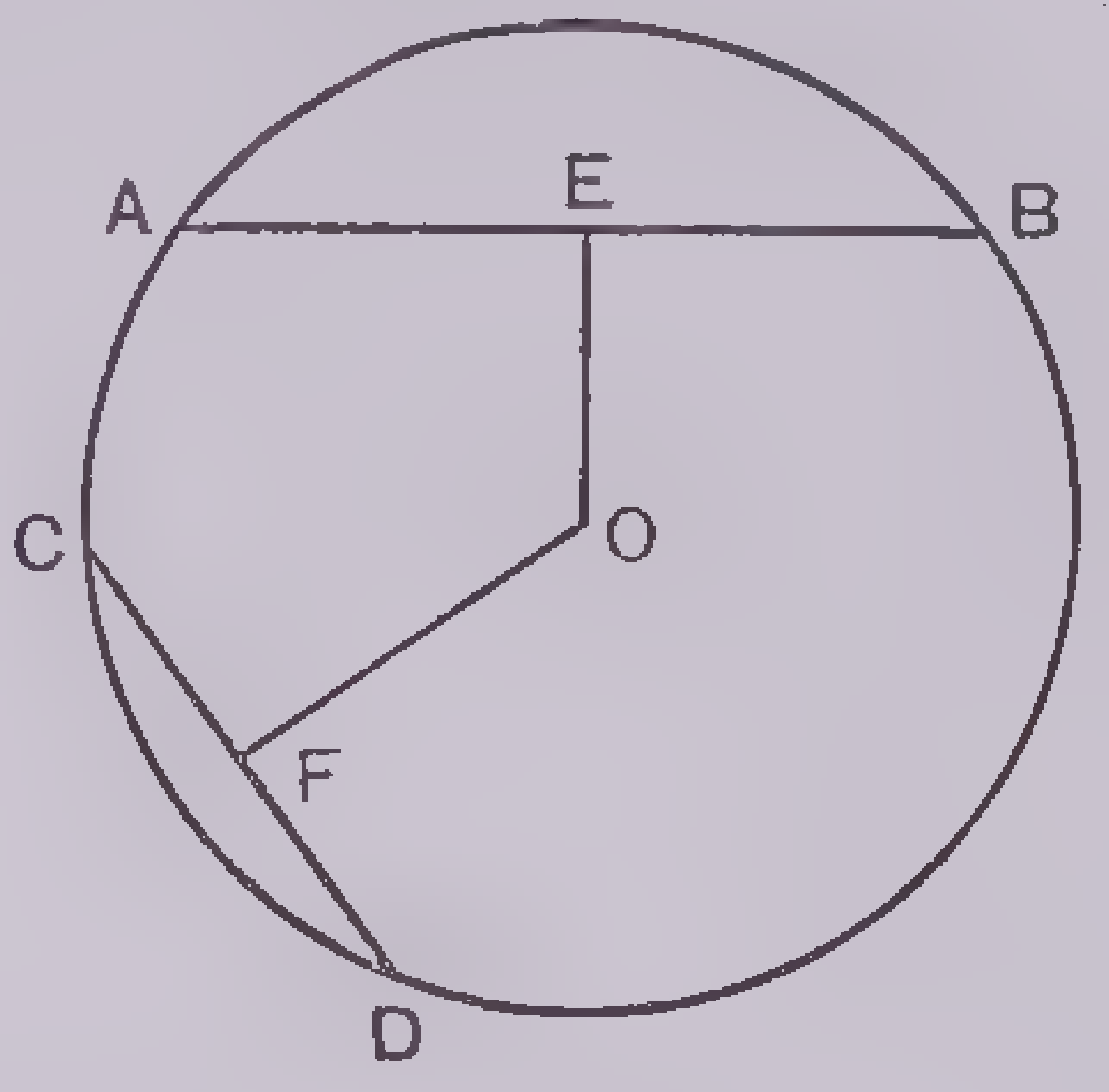
Note. The proof is the same when the chords are in different circles.

159. Theorem 51.—If in the same circle or in equal circles two chords are equally distant from the center, they are equal.



Hint. Prove that the two right triangles OEA and OCF are congruent. (§87, Theorem 15.)

160. Theorem 52.—If in the same circle or in equal circles two chords are unequally distant from the center, the chord at the less distance is the greater.



Hyp. OE is the perpendicular distance from O, the center of the circle to the chord AB, and OF is the perpendicular distance to the chord CD. $OF > OE$.

Con. $AB > CD$.

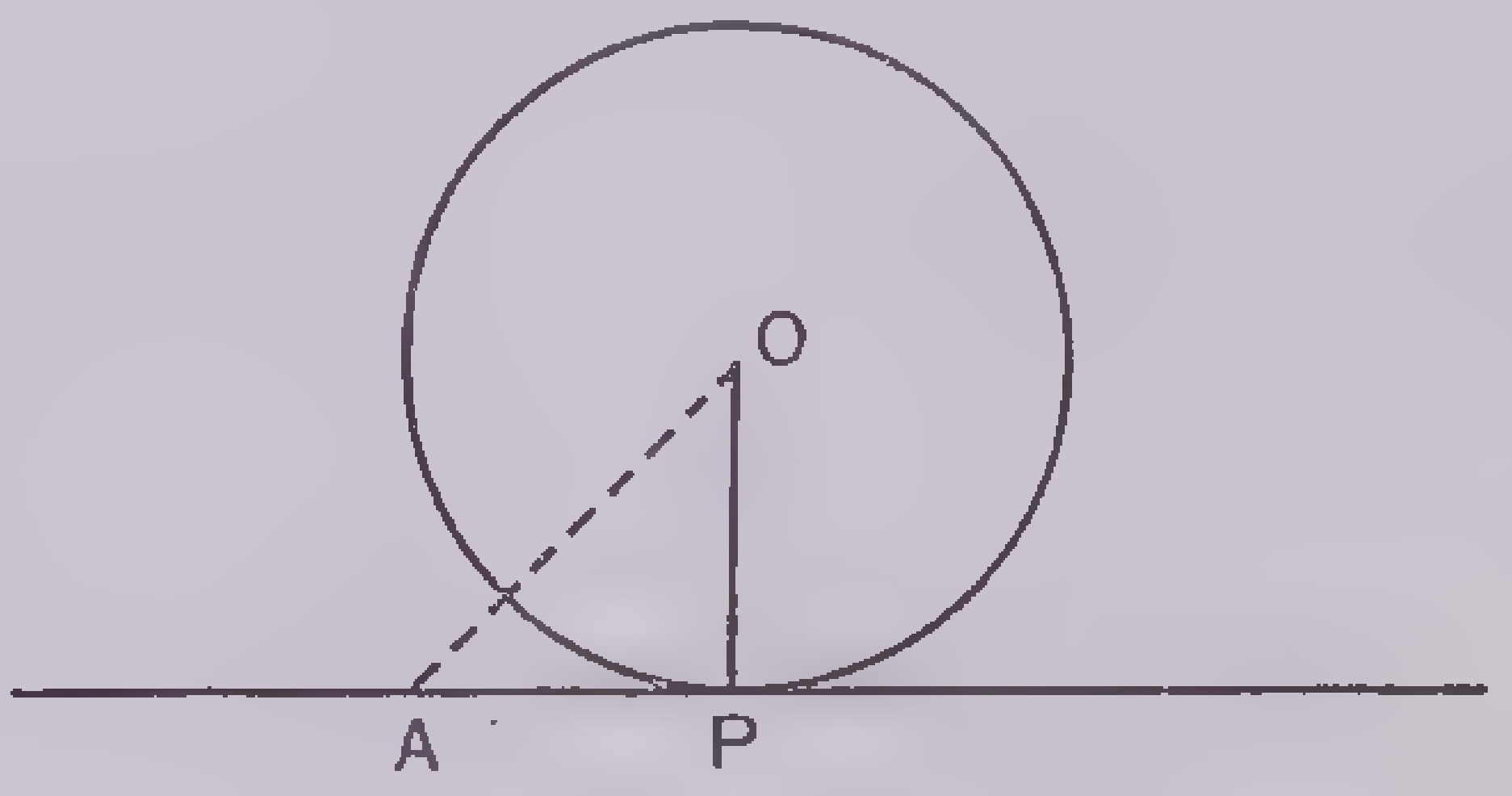
Hint. Use the method of exclusion. There are three possibilities:

(a) $AB = CD$,
(b) $AB < CD$,
(c) $AB > CD$.

§157, Theorem 49.—If in the same circle or in equal circles two chords are equal, they are equally distant from the center. This would require in case (a) that $OE = OF$, which is impossible.

§158, Theorem 50.—If in the same circle or in equal circles two chords are unequal, the greater chord is at the less distance from the center. This would require in case (b) that $OE > OF$. Hence only (c) remains as possible.

161. Theorem 53.—A straight line tangent to a circle is perpendicular to the radius drawn to the point of contact.



Hyp. PA is the tangent to the circle O at the point P.

Con. AP is perpendicular to the radius OP at P.

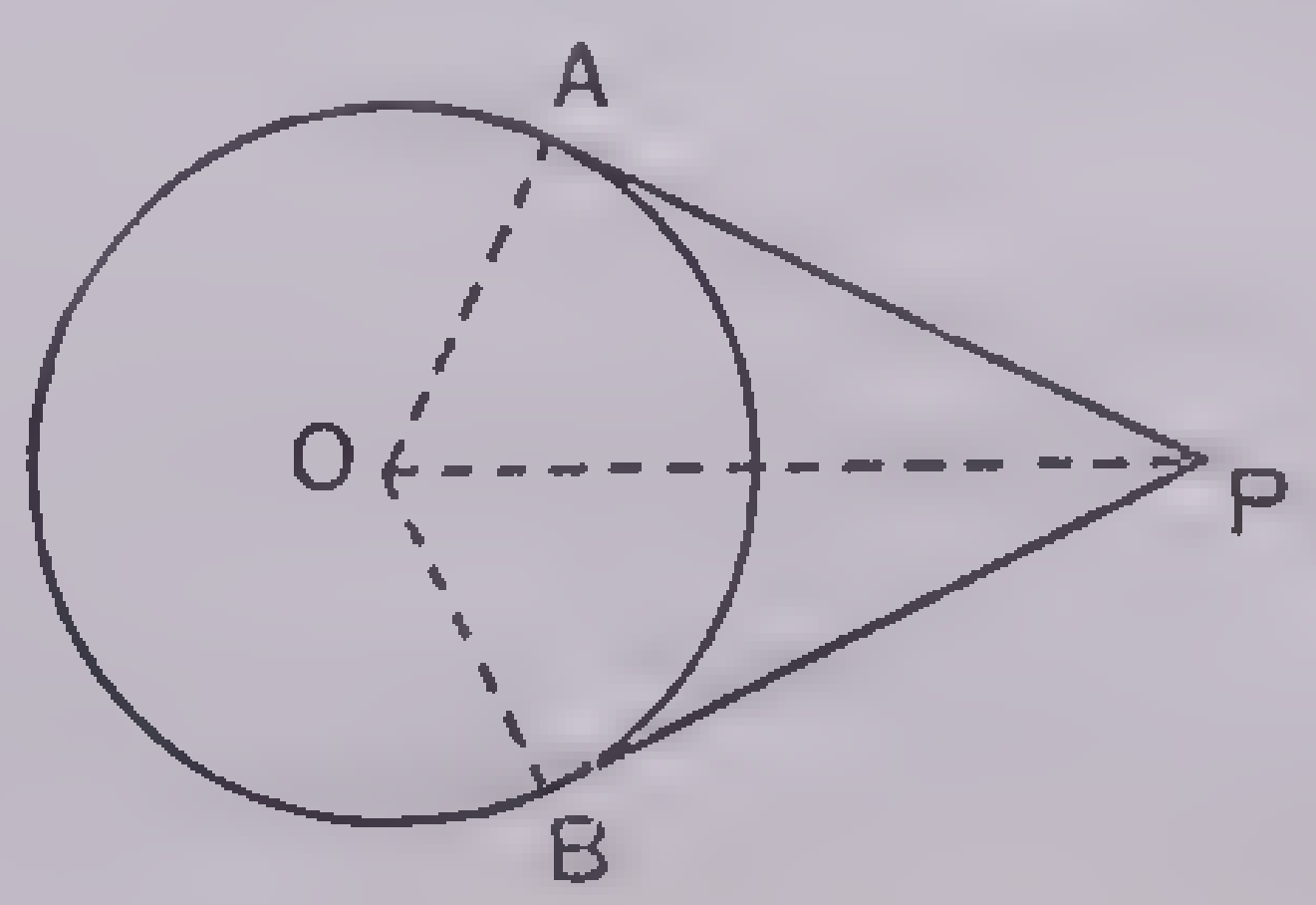
From the definition of a tangent §134 it follows that the line AP is entirely outside the circle. Take any other point A of the tangent AP and draw AO. Evidently $OA > OP$, and the least distance from O to AP is OP. Hence OP is perpendicular to AP. (§82, Theorem 12.)

Note. This shows there is only one tangent to a circle at a given point. (§18. Postulate.)

162. Theorem 54.—A perpendicular to a tangent at the point of contact passes through the center of the circle.

Hint. There is only one tangent at a point, and this tangent is perpendicular to the radius drawn to the point of contact by a previous theorem.

163. Theorem 55.—The tangents drawn to a circle from an external point are equal.



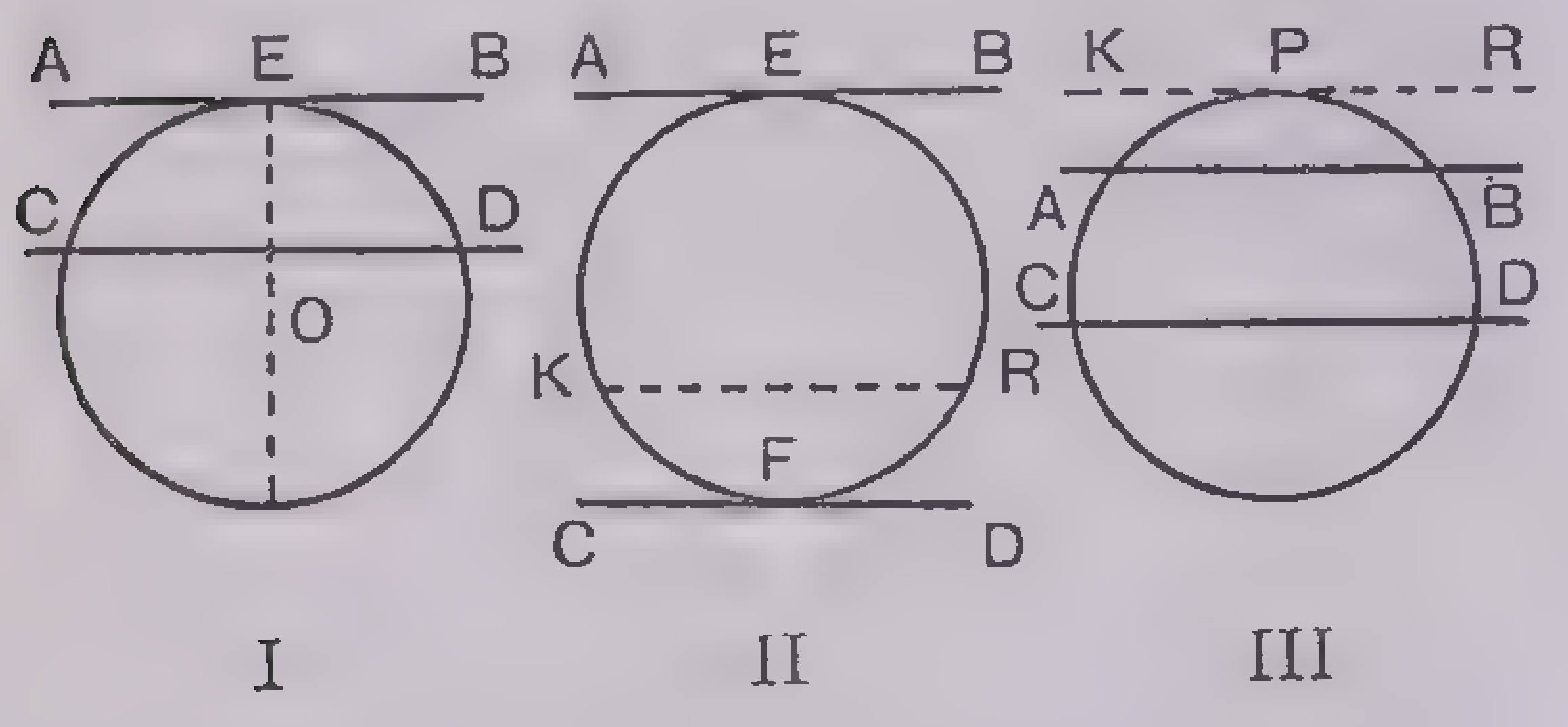
HINT. $\angle A$ and $\angle B$ are right angles. (§161, Theorem 53.)

$OA = OB$

$\therefore \triangle OPA \cong \triangle OBP$. (§87, Theorem 15.)

$\therefore AP = BP$.

164. Theorem 56.—Two parallel lines intercept equal arcs on a circle.



Case I. Only one of the parallels is tangent to the circle.

HYP. Given AB tangent to the circle at E and CD parallel to AB meeting the circle in C and D.

CON. Arc EC = arc ED.

Draw EO, which is perpendicular to AB. (§161, Theorem 53.)

OE is perpendicular to CD also. (§104, Theorem 26.)

∴ Arc CE = ED. (§154, Theorem 46.)

Case II. Both parallels are tangents.

HINT. Draw a line KR parallel to AB and meeting the circle in KR.

By Case I

arc EK = arc ER, and
arc KF = arc FR

Adding, arc EKF = arc ERF.

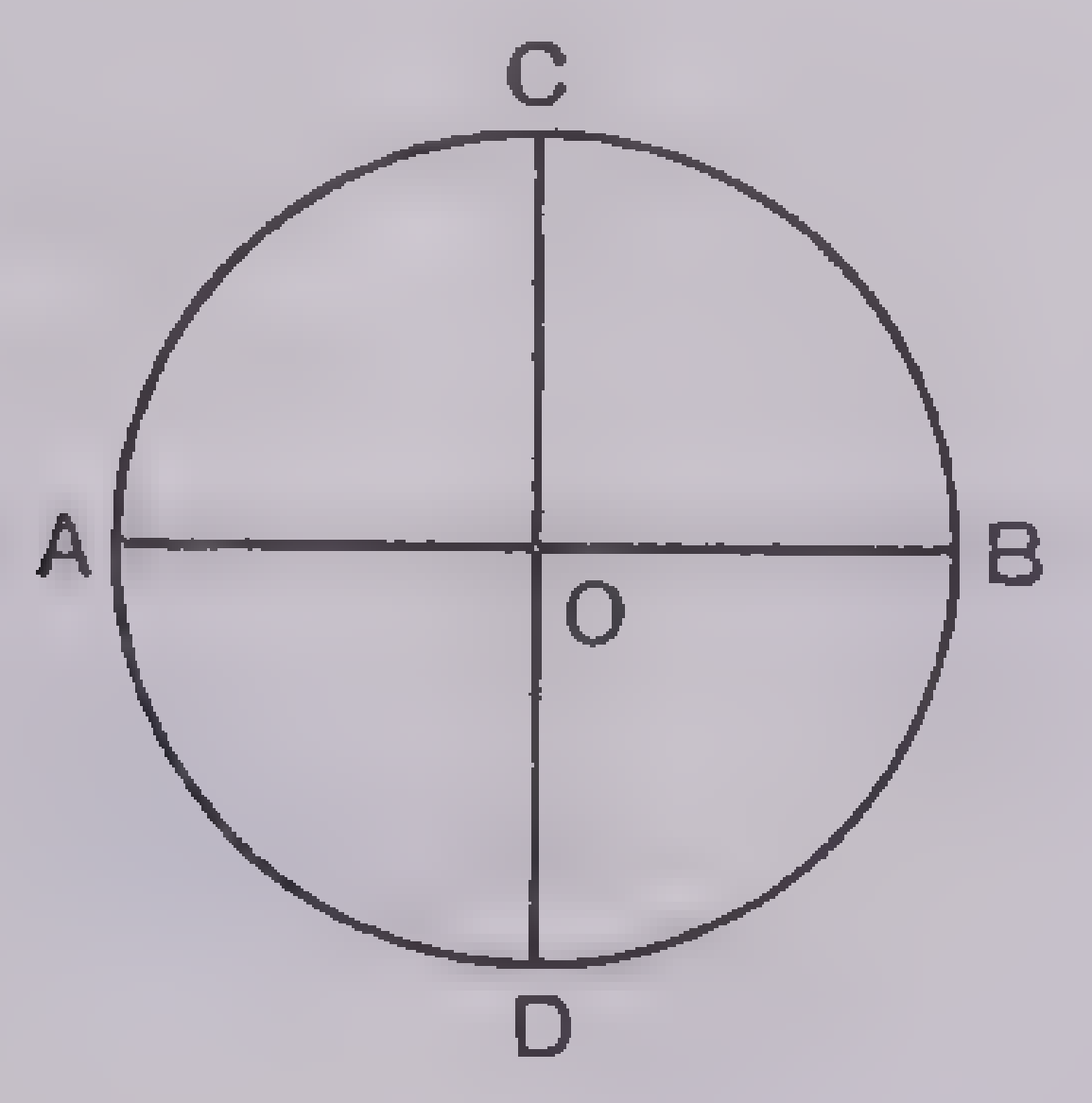
Case III. Both parallels are secants.

HINT. Draw KR parallel to AB and tangent to the circle at P. Then

arc PC = arc PD, and
arc PA = arc PB.

Subtracting, arc AC = arc BD

165. Measurement of Angles.—If we draw two diameters of a circle which are perpendicular to each other, as AB and CD, we divide the circumference of the circle into four equal arcs, AD, BD, BC and AC, and they correspond to the four equal right angles at O. In the same way if we divide the circumference into any number of equal parts and draw the radii to the points of division, we will have the same number of equal angles formed at the center of the circle.

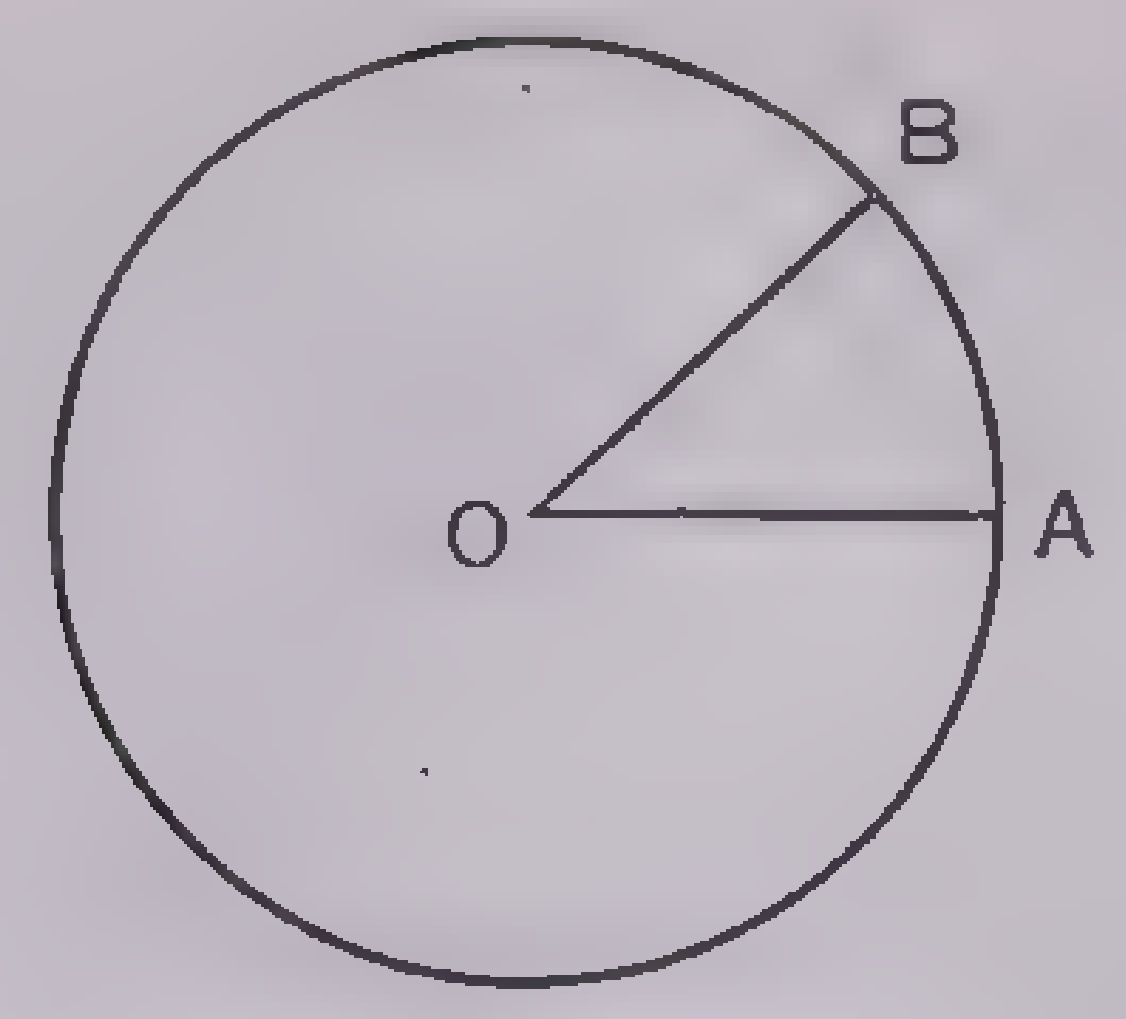


166. Degree of Arc.—When the circumference of a circle is divided into 360 equal parts, one of these parts is called a degree of arc. This corresponds to dividing an arc like BC into 90 equal parts.

167. Degree.—When a right angle is divided into 90 equal angles, we call each angle an angle of one *degree*. Symbol °. A right angle = 90°.

Minute.—When a degree is divided into 60 equal angles, each angle is called a *minute*. Symbol ′. 1° = 60′.

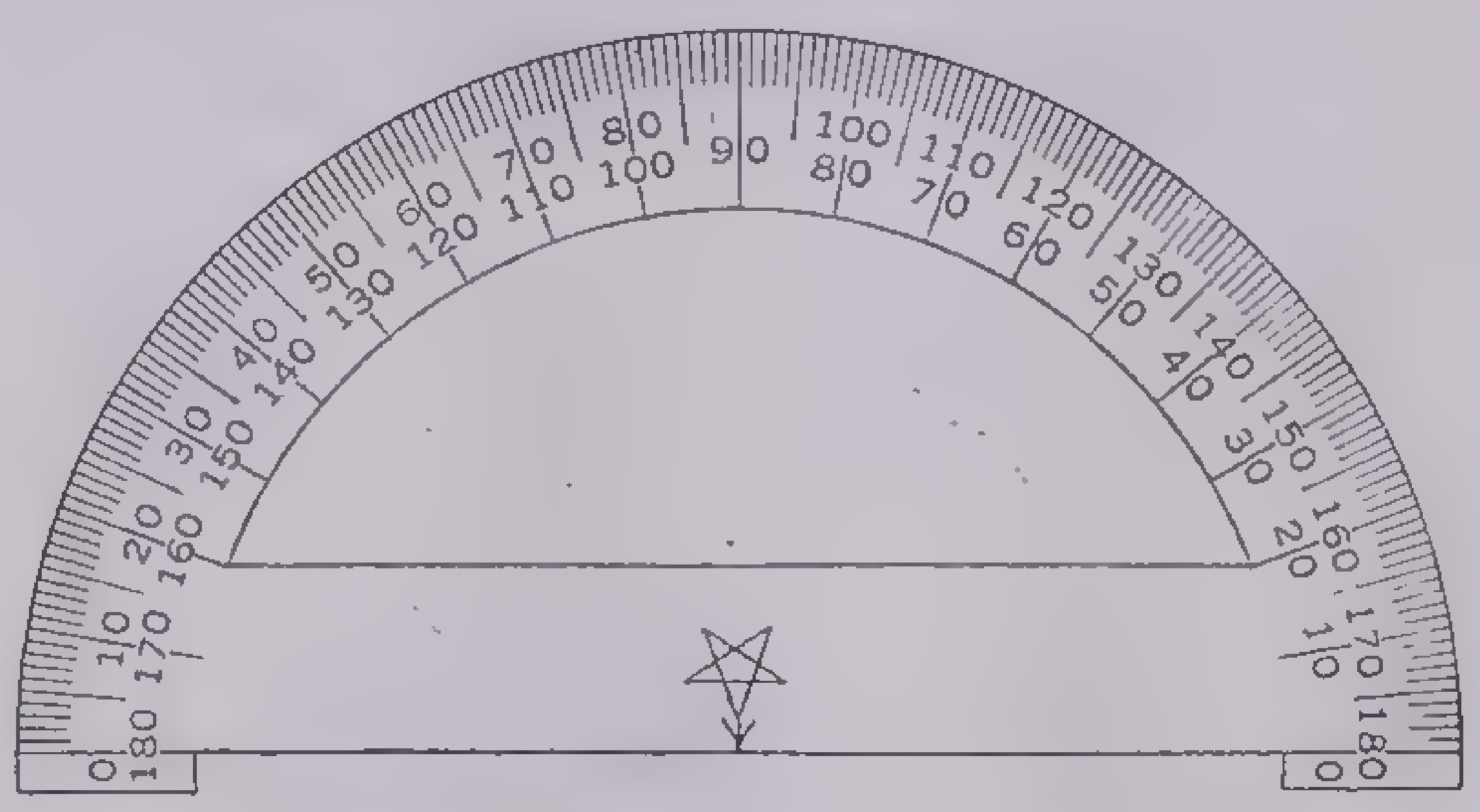
Second.—When a minute is divided into 60 equal angles, each angle is called a *second*. Symbol ″. 1′ = 60″.



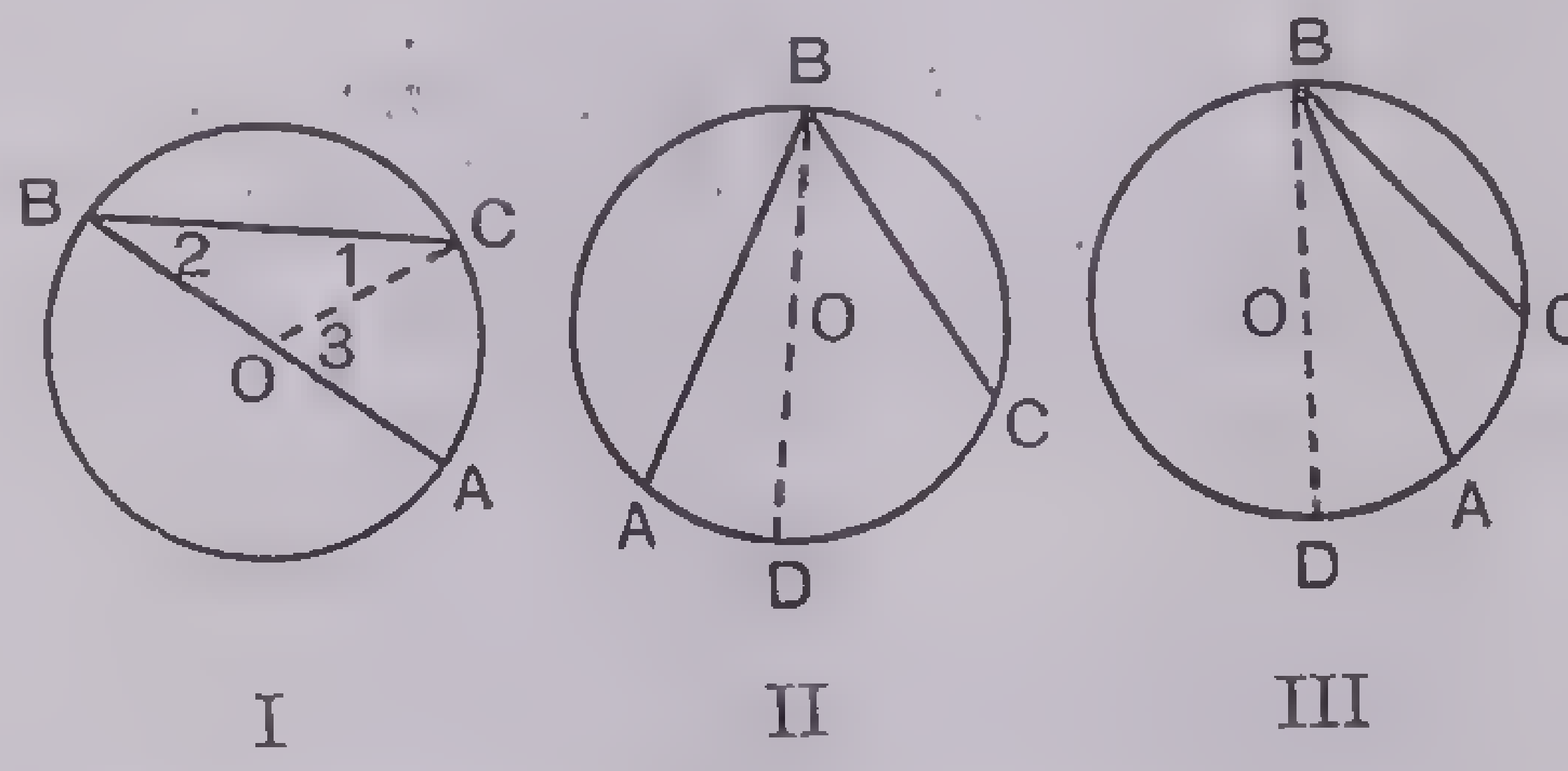
A central angle is measured by its intercepted arc, where the angle is measured in angle degrees and the arc in arc degrees. When we say that AOB = 45°, we mean that $\angle AOB$ is 45/360 of two straight angles or four right angles. When we say the arc AB is 45°, we mean it is 45/360 of the circumference of the circle.

The numbers used in the measuring of the angle and the arc which it subtends are chosen so as to be the same for the sake of convenience. To demonstrate from another field, if a railroad fare were one cent a mile, then the number giving the miles would be the same as the number giving the cost of a ticket in cents, but this does not mean that one cent is the same as one mile.

168. Protractor.—Based on the ideas just explained, the instrument in common use for the measurement of angles is called a *protractor* and is illustrated below.



169. Theorem 57.—An angle inscribed in a circle is measured by one-half of its intercepted arc.



HYP. Given the inscribed angle ABC, intercepting the arc AC.

CON. Angle ABC is measured by one-half the arc AC.

Case I. One side passes through the center O.

Draw OC.

$\angle 1 = \angle 2$. (§69, Theorem 3.)

$\angle 3 = \angle 1 + \angle 2$. (§108, Theorem 29.)

$\therefore \angle 2 = \frac{1}{2} \angle 3$.

$\angle 3$ is measured by arc AC.

$\therefore \angle 2$ is measured by $\frac{1}{2}$ arc AC.

Case II. The center of O falls inside the angle.

Draw the diameter BD, meeting the circle at D.

$\angle ABD$ is measured by $\frac{1}{2}$ arc AD. (Case I.)

$\angle DBC$ is measured by $\frac{1}{2}$ arc DC.

$\therefore \angle ABC$ is measured by $\frac{1}{2}$ arc AC.

Case III. The center of O falls outside the angle.

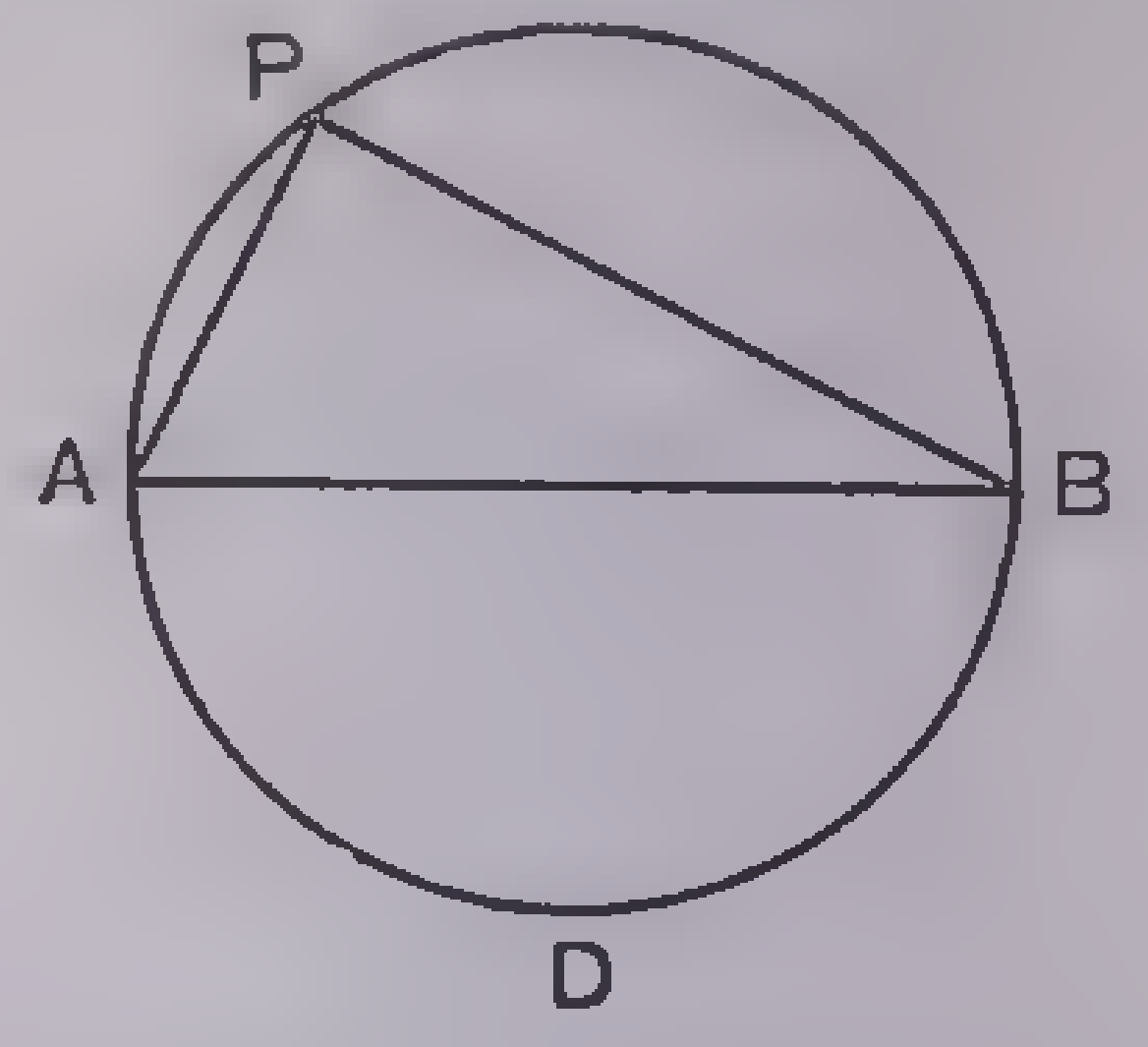
Draw the diameter BD, meeting the circle at D.

$\angle ABC = \angle DBC - \angle DBA$.

Apply Case I to each of these angles.

If arc AC is 80 arc degrees, the angle B is 40 angle degrees.

170. Theorem 58.—An angle inscribed in a semicircle is a right angle.



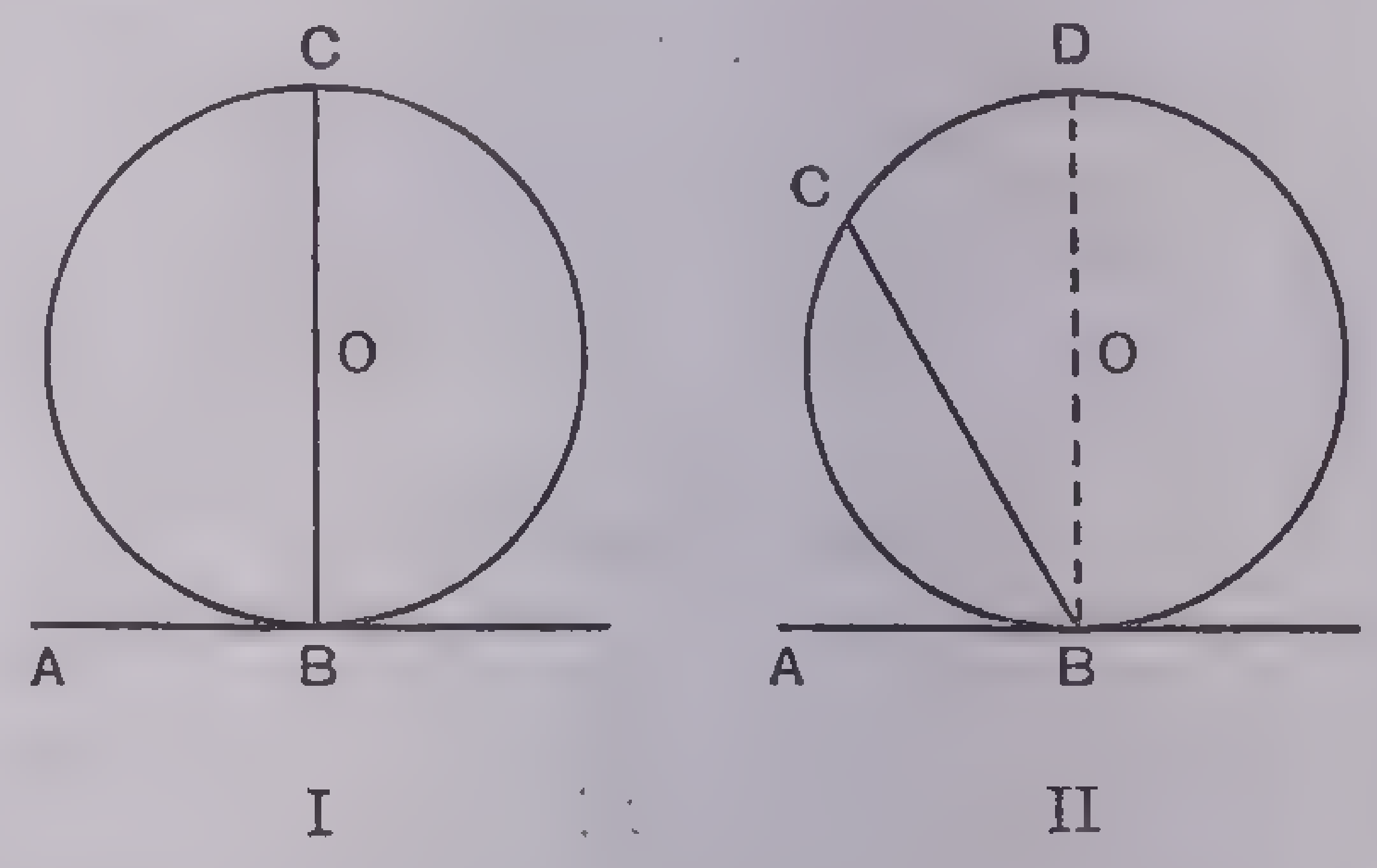
HYP. Angle APB is an angle inscribed in a semicircle.

CON. Angle APB is a right angle.

By the previous theorem, APB is measured by one-half the arc ADB, which is a semicircle. One-half a semicircle is 90 arc degrees. Therefore APB is 90 angle degrees.

NOTE. However P moves about the circle, the angle APB will always be a right angle. The locus of a point which subtends a right angle with two fixed points is a circle having the two points for the extremities of a diameter.

171. Theorem 59.—An angle formed by a tangent and a chord through the point of contact is measured by one-half the intercepted arc.



HYP. Given an angle formed by a tangent AB, at B, and a chord CB.

CON. The angle is measured by one-half the intercepted arc.

Case I. BC passes through O, the center of the circle.

$\angle ABC = 90°$. (§161, Theorem 53.)

The intercepted arc is a semicircle or 180°.

$\therefore \angle ABC = \frac{1}{2}$ arc BC.

Case II. BC does not pass through the center of the circle.

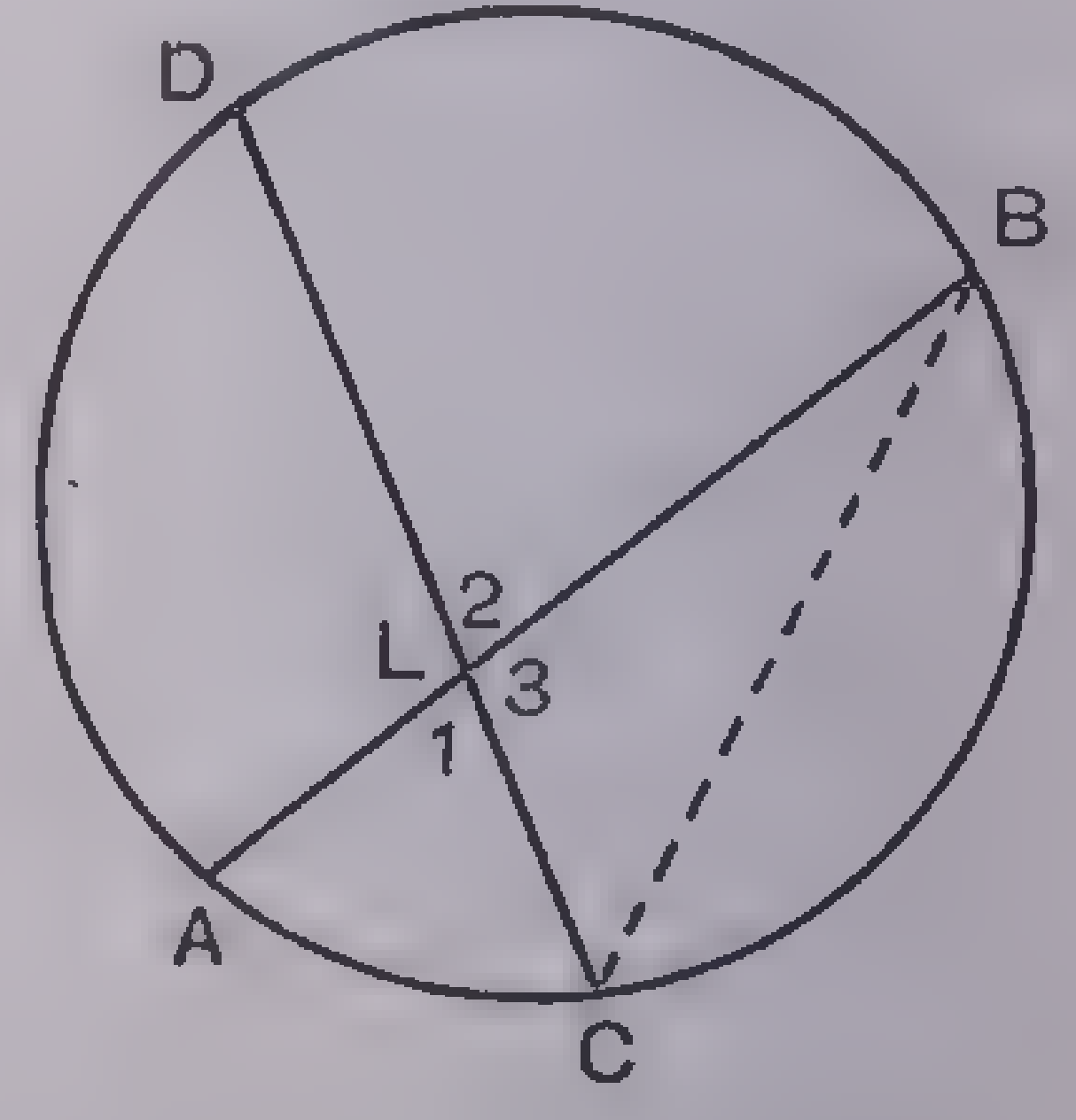
Draw the diameter BD meeting the circle at D.

$\angle CBD = \frac{1}{2}$ arc CD. (§169, Theorem 57.)

$\angle ABD = \frac{1}{2}$ arc BCD. (Case I.)

$\therefore \angle ABC = \frac{1}{2}$ arc BC.

172. Theorem 60.—An angle formed by two chords intersecting each other within a circle is measured by one-half the sum of the arc intercepted between its sides and the arc intercepted between the sides of its vertical angle.



HYP. Chords AB and CD intersecting in L to form the angles 1 and 2, which are vertical angles.

Con. $\angle 1$ and $\angle 2$ are measured by ½ (arc AC + arc DB).

Draw CB.

$\angle 1 = \angle B + \angle C$. (§108, Theorem 29.)

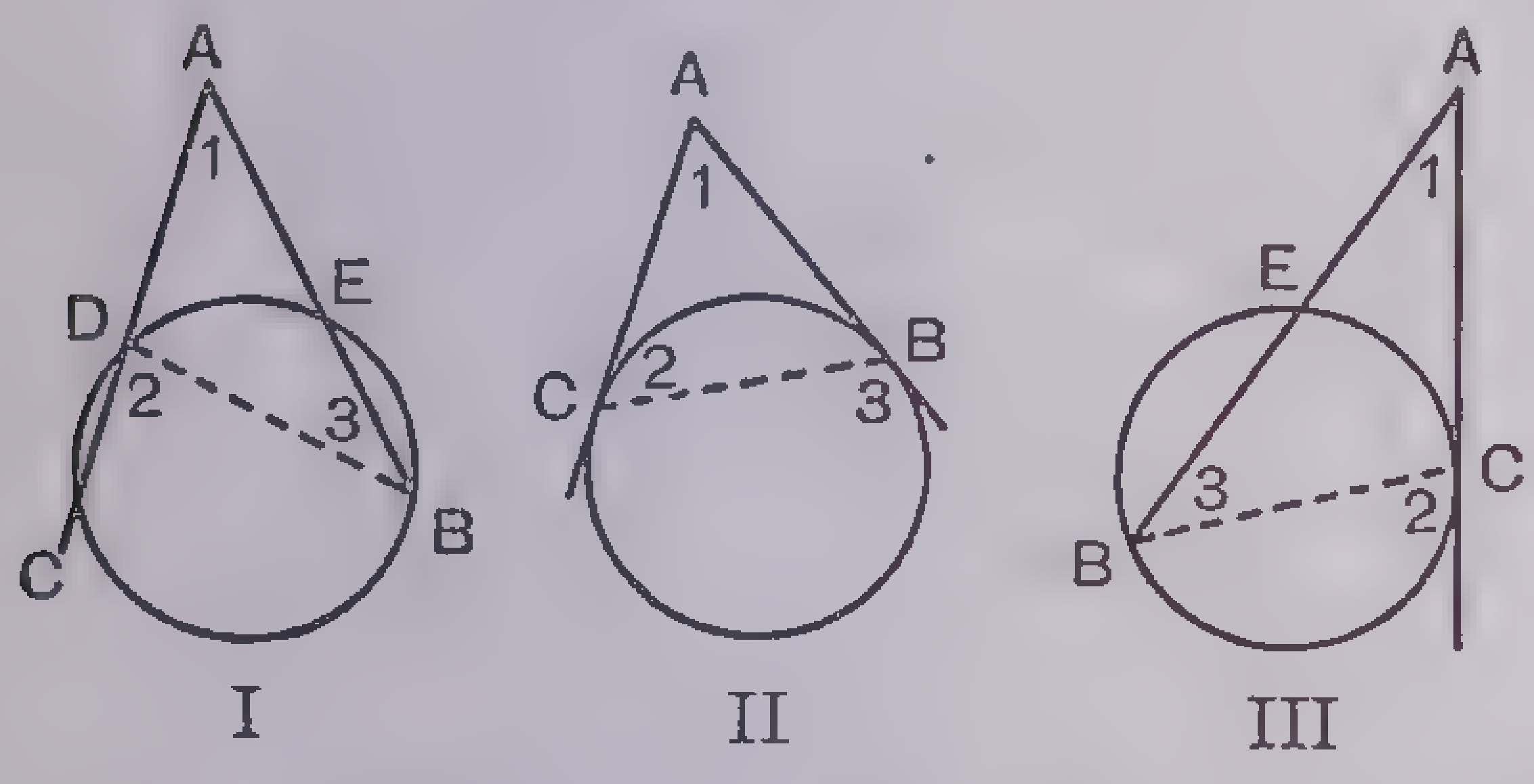
$\angle B = \frac{1}{2}$ arc AC. (§169, Theorem 57.)

$\angle C = \frac{1}{2}$ arc DB.

$\therefore \angle 1 = \frac{1}{2}$ (arc AC + arc DB).

Also $\angle 2 = \frac{1}{2}$ (arc AC + arc DB).

173. Theorem 61.—An angle formed by two secants or two tangents or a secant and a tangent intersecting without a circle, is measured by one-half the difference of the intercepted arcs.



Hyp. Case I. AB and AC are two secants meeting in the point A, outside the circle.

Con. Angle A is measured by ½ (arc BC − arc ED.)

Draw DB.

$\angle 2 = \angle 3 + \angle 1$. (§108, Theorem 29.)

$\therefore \angle A = \angle 1 = \angle 2 - \angle 3$.

$\angle 2 = \frac{1}{2}$ arc BC, $\angle 3 = \frac{1}{2}$ arc ED. (§169, Theorem 57.)

$\therefore \angle A = \frac{1}{2}$ (arc BC − arc ED).

Hint. Case II. $\angle 3 = \angle 2 + \angle 1$.

$\therefore \angle 1 = \angle 3 - \angle 2$.

Hint. Case III. $\angle 2 = \angle 3 + \angle 1$.

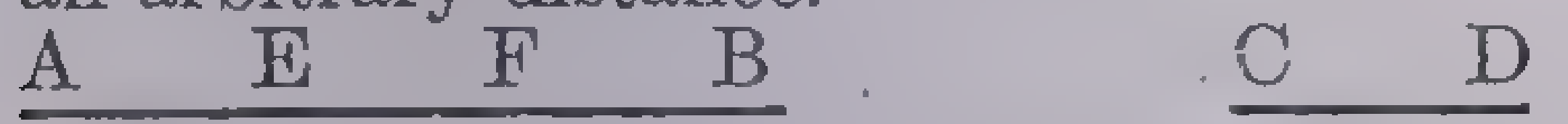
$\therefore \angle 1 = \angle 2 - \angle 3$.

SIMILAR POLYGONS

We are perfectly familiar in every day life with objects that are just alike except for size. We speak, for instance, of enlarging a photograph to two or three times its original size, or of drawing a map to a certain scale, so that one inch represents a mile. It will be the purpose of the present section to give expression to these ideas in precise geometrical language.

174. Measurement.—The first problem of measurement is that of determining a length. The unit of length must be an arbitrary distance, the straight line distance between two marks on a rod, which is fixed as the standard unit.

Each government preserves a platinum rod on which is indicated the standard unit of length, and all other units are derived from this by comparison. The French Government, at the time the metric system was established, intended that the unit of length, the meter, should depend upon the size of the earth; but the data upon which the calculations were made have since been found to be incorrect, so the meter is also an arbitrary distance.



What do we mean when we say that the rod or line AB is 3 feet long? If we take a rod or line CD, 1 foot long, and make it coincide with the line AB so that C coincides with A, then D will fall at some point E, and AE will be 1 foot. Repeating the operation on EB, D will fall on some point F; again repeating the operation on FB, if D coincides with B, we say that AB is 3 feet long. When we wish to measure 5 inches, we must divide CD into 12 equal parts and measure off one of these units 5 times.

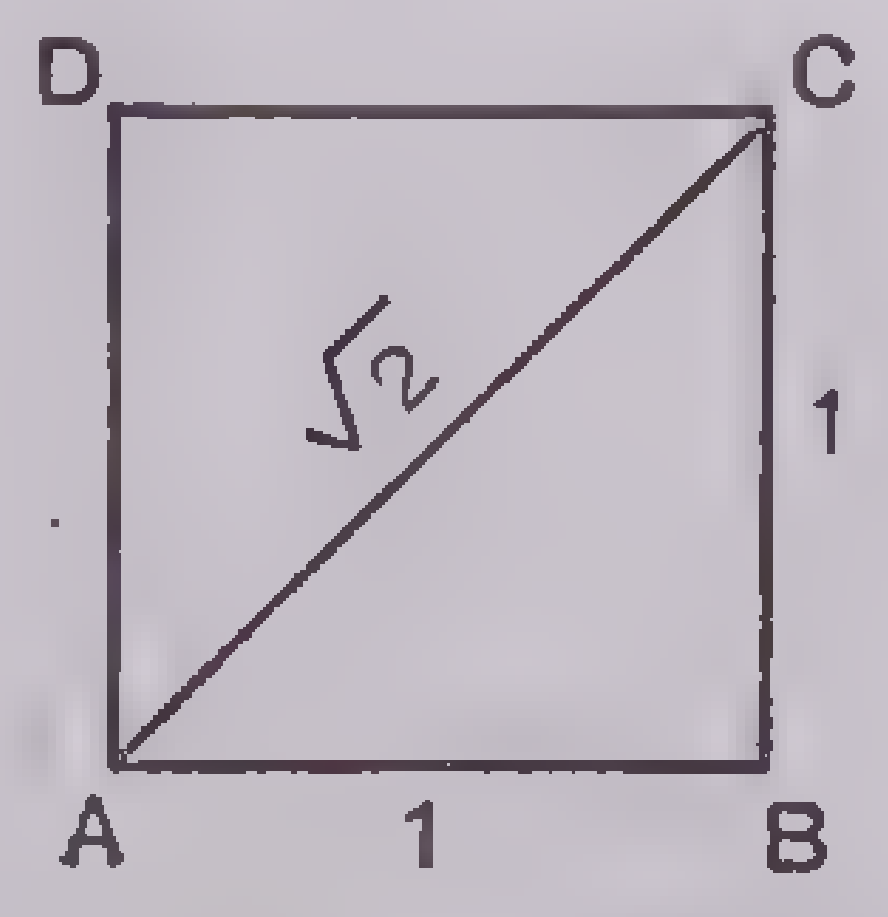
175. Ratio.—The ratio of one magnitude a to another magnitude b is the quotient resulting from dividing a by b, or a/b. It is read, the ratio of a to b. (See §180.)

176. Relation of Ratio to Measurement.—When we measured the rod AB in §174, we were in reality finding the ratio of AB to the unit length CD, that is AB/CD = 3. In finding the value of a geometric ratio, it is very important that the two distances be measured in the same units. If we were allowed to measure AB in inches while CD was measured in feet, AB/CD = 36/1 = 36. Thus any number of values could be obtained for the ratio, if this essential is neglected. The true value of the ratio is independent of the units used; thus if both AB and CD are expressed in inches AB/CD = 36/12 = 3.

177. Difficulties in Measurement.—There are difficulties in an exact treatment of measurement, which correspond to certain complications in our number system. We will illustrate some of these difficulties and show how they are related to measurement.

If we try to express 1/3 as a decimal we have an endless sequence, 1/3 = .33333 . . . which is the same as 3/10 + 3/100 + 3/1000 + 3/10000 . . . This means that if we have any numbers of rods 1/10, 1/100, 1/1000 . . . of an inch long and take 3 of the 1/10 inch rods, 3 of the 1/100 inch rods, 3 of the 1/1000 inch rods and place them end to end, we will obtain a length which is only approximately 1/3. No matter how many such rods we take, we can never obtain exactly 1/3 of an inch. The mathematician prefers, if possible, to solve his problem in a definite number of steps. Perhaps we can imagine an infinite number of steps, but life is short and we can actually carry out only a finite number. Of course, we can obtain 1/3 of an inch by dividing an inch into 3 equal parts.

But we now come to a difficulty that cannot be dismissed so easily.



If we take a square ABCD with each side one inch, then the length of the diagonal AC is $\sqrt{2}$ inches (by Theorem 83, §211). What do we mean by the ratio AC/AB? We should call this $\sqrt{2}$. But how are we to interpret it in terms of measurement? $\sqrt{2} = 1.4142. . . . = 1 + 4/10 + 1/100 + 4/1000 + 2/10000. . . .$ We can take a rod 1 inch long, 4 rods 1/10 inch long, one rod 1/100 inch long, 4 rods 1/1000 inch long, ... put them end to end and obtain an approximation to AC. In the case of 1/3 we could escape the difficulty by trisecting the unit, instead of repeatedly dividing it into 10 parts, but there is no such escape here. There is no finite number of parts into which AB can be divided, so that their sum will be exactly equal to AC. This is only a theoretical difficulty, as it is evident that we can calculate the value of $\sqrt{2}$ as closely as we please. What gives the mathematician concern is that he must use an infinite number of processes to obtain the exact result, and these can be carried out only in the imagination.

178. Commensurable Magnitudes.—Two magnitudes are said to be commensurable when there exists a unit of measure which is contained an integral number of times in each. Lines of length 2 1/3 feet and 4 3/5 feet are commensurable, for 2 1/3 = 7/3 = 35/15 and 4 3/5 = 23/5 = 69/15, thus 1/15 of a foot is contained 35 times in 2 1/3 feet and 69 times in 4 3/5 feet.

179. Incommensurable Magnitudes.—Two magnitudes are said to be incommensurable when there is no unit of measure which is contained an integral number of times in each. As explained in §177, $\sqrt{2}$ and 1 are incommensurable.

180. Proportion.—Four magnitudes, a, b, c and d, are in proportion if the ratio of the first pair equals the ratio of the second. Symbolically, $a/b = c/d$ or $a{:}b = c{:}d$. This is read, a is to b as c is to d, or a divided by b equals c divided by d. The first and third terms (a and c) are called the *antecedents;* the second and fourth (b and d) are called the *consequents.* The first and fourth terms (a and d) are called the *extremes* and the second and third (b and c) the *means.*

There are many different forms that can be derived from the equality $a/b = c/d$ by use of the axioms.

I. Thus if $a/b = c/d$,
$1 = 1$, by identity,
$a/b + 1 = c/d + 1$, §39,

therefore $\frac{a+b}{b} = \frac{c+d}{d}$, reducing to a common denominator.

From the last equation, it will be seen that the sum of the first two terms is to the second as the sum of the last two is to the fourth. This is called the *addition theorem* of proportion.

II. Again, if $a/b = c/d$,
Then $bd(a/b) = bd(c/d)$, §41,
Thus $ad = bc$, reducing.

Dividing by cd, $\frac{ad}{cd} = \frac{bc}{cd}$, §42.

Reducing, $a/c = b/d$.

This is called the *alteration theorem* in proportion, i. e., when the first term is to the third as the second is to the fourth.

III. Given $\frac{a}{b} = \frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$.

Con. $\frac{a + a_1 + a_2 + a_3}{b + b_1 + b_2 + b_3} = \frac{a}{b} = \frac{a_1}{b_1} = \ldots\ldots$

Let $\frac{a}{b} = \frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3} = r$.

Then $a = br$,
$a_1 = b_1r$,
$a_2 = b_2r$,
$a_3 = b_3r$.

Adding,

$$a + a_1 + a_2 + a_3 = br + b_1r + b_2r + b_3r, = (b + b_1 + b_2 + b_3)r.$$

$$\therefore \frac{a + a_1 + a_2 + a_3}{b + b_1 + b_2 + b_3} = r.$$

$$\text{Hence } \frac{a + a_1 + a_2 + a_3}{b + b_1 + b_2 + b_3} = \frac{a}{b} = \frac{a_1}{b_1} = \ldots\ldots$$

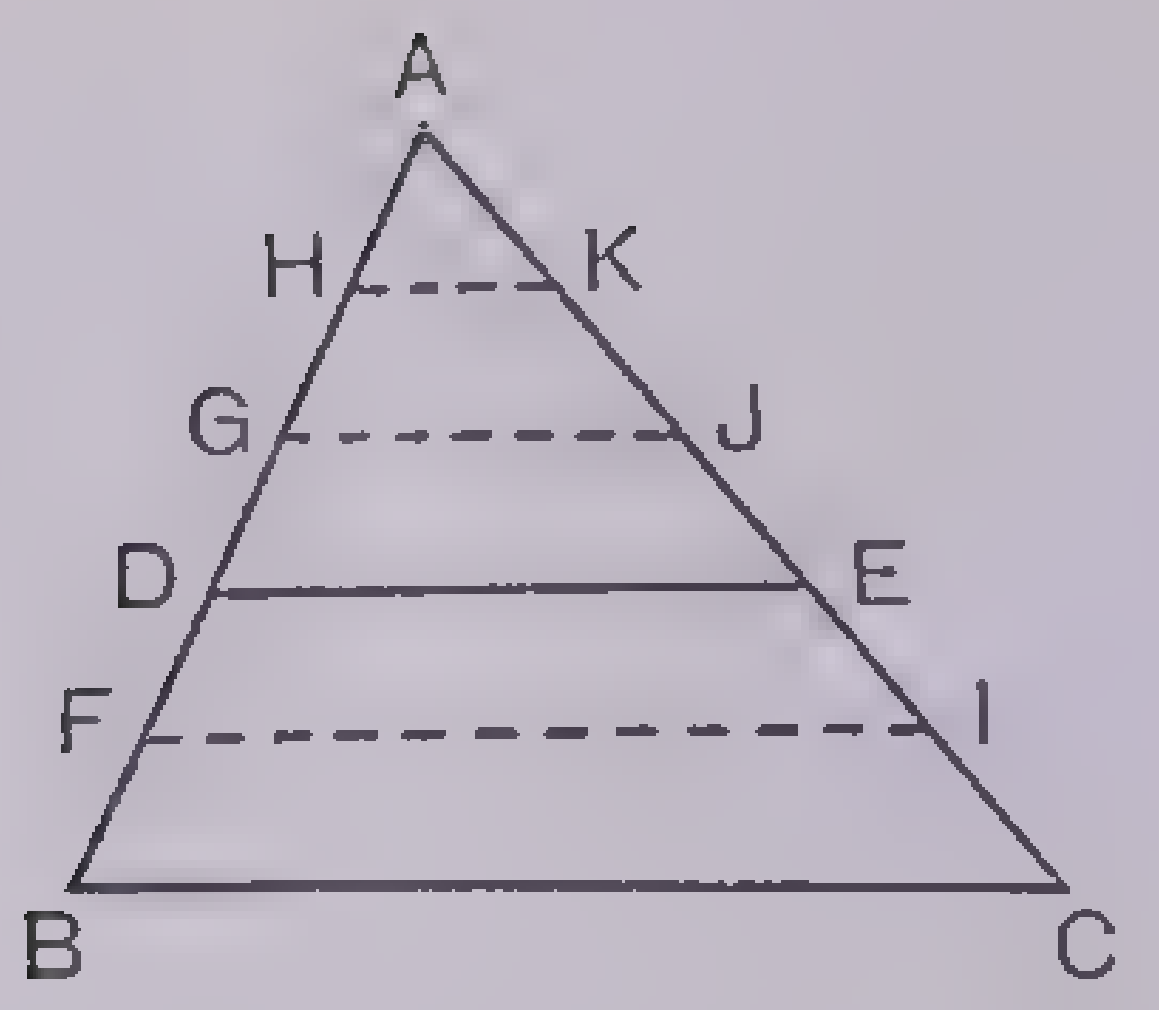
This theorem is stated as follows: If several ratios are equal, the sum of the antecedents is to the sum of the consequents as any one antecedent is to its consequent.

IV. In the proportion $a{:}b = b{:}c$, the term b is called the *mean proportional* between a and c.

V. If $a/b = c/d$,
then $b/a = d/c$.

In other words, the second term is to the first as the fourth is to the third. This is called the *inversion theorem* in proportion.

181. Theorem 62.—A straight line parallel to the base of a triangle divides the other two sides proportionally.



Hyp. The line DE parallel to the base BC of the triangle ABC meets AB in D and AC in E.

Con. $\frac{AD}{DB} = \frac{AE}{EC}$

First we shall prove the so-called commensurable case, that is, where it is possible to find a segment, as BF, which is contained an integral number of times in the two segments, BD and DA.

For the sake of clarity we will assume that BF is contained 2 times in BD and 3 times in DA. Let F, G and H be the points corresponding to the division of the segments into multiples of BF. Then draw through each of the points F, G and H lines parallel to BC which meet AC in the points I, J and K. Then by §117, Theorem 37,

$$CI = IE = EJ = JK = KA$$

$$\therefore \frac{AD}{BD} = \frac{3(BF)}{2(BF)} = \frac{3}{2},$$

$$\text{and } \frac{AE}{EC} = \frac{3(IC)}{2(IC)} = \frac{3}{2}$$

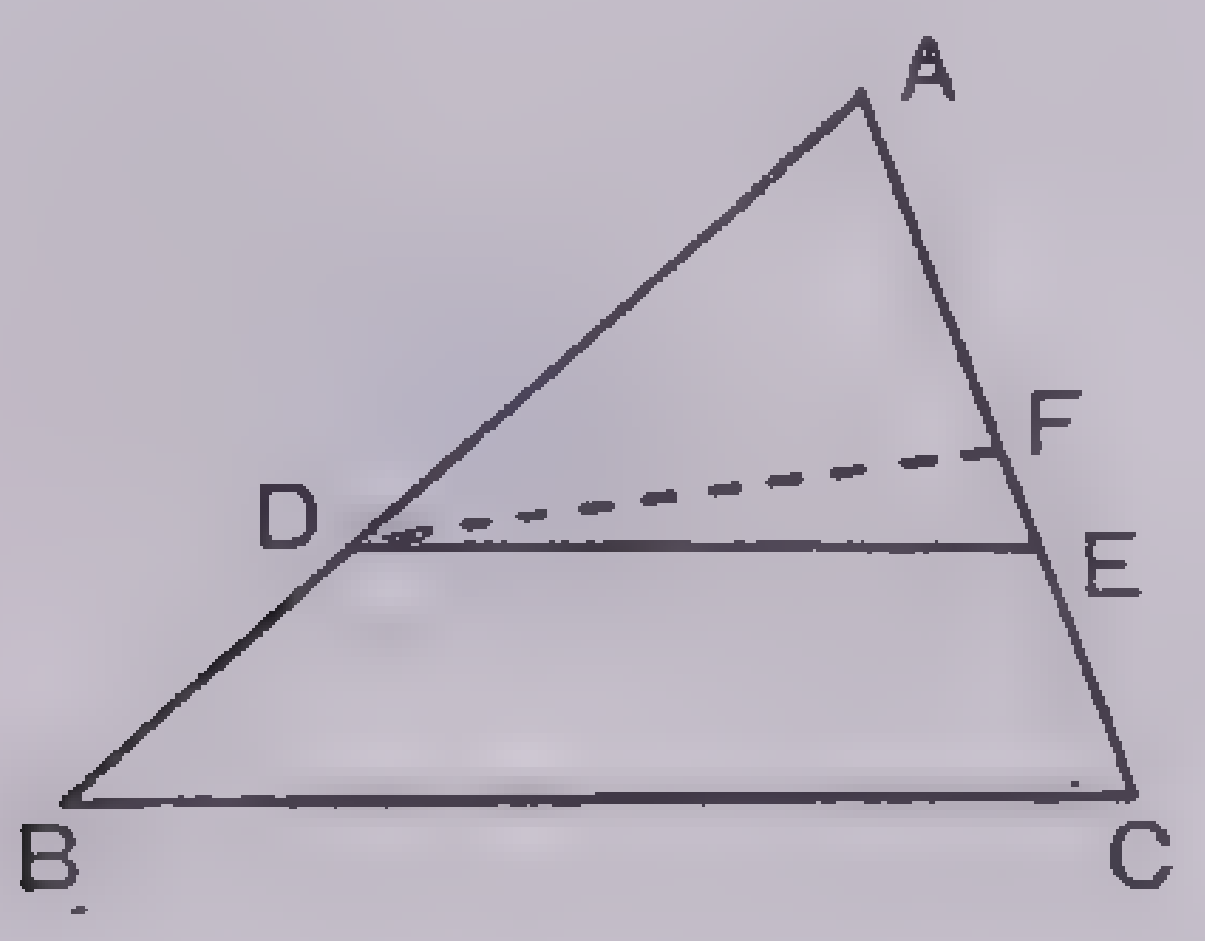
$$\therefore \frac{AD}{BD} = \frac{AE}{EC},$$

It follows also by the method of §180, that $\frac{AD}{AB} = \frac{AE}{AC} = \frac{3}{5}$.

The proof of the incommensurable case goes beyond the work in a first reading of geometry.

182. Theorem 63.—If a straight line divides two sides of a triangle proportionately, it is parallel to the third side.

This is the converse of the previous theorem.



Hyp. DE meets the sides AB and AC of △ ABC in the points D and E respectively, so that $\frac{AD}{DB} = \frac{AE}{EC}$

Con. DE is parallel to BC.

DE is either parallel to BC or it is not. If it is not parallel, draw DF through D parallel to BC, meeting AC at F.

$$\frac{AD}{DB} = \frac{AF}{FC} \text{ or } \frac{AD}{AB} = \frac{AF}{AC}. \quad (\S 181.)$$

$$\frac{AD}{DB} = \frac{AE}{EC} \text{ (Hyp.)}$$

$$\therefore \frac{AD}{AD + DB} = \frac{AE}{AE + EC}. \quad (\S 180, \text{I})$$

$$\therefore \frac{AD}{AB} = \frac{AE}{AC}$$

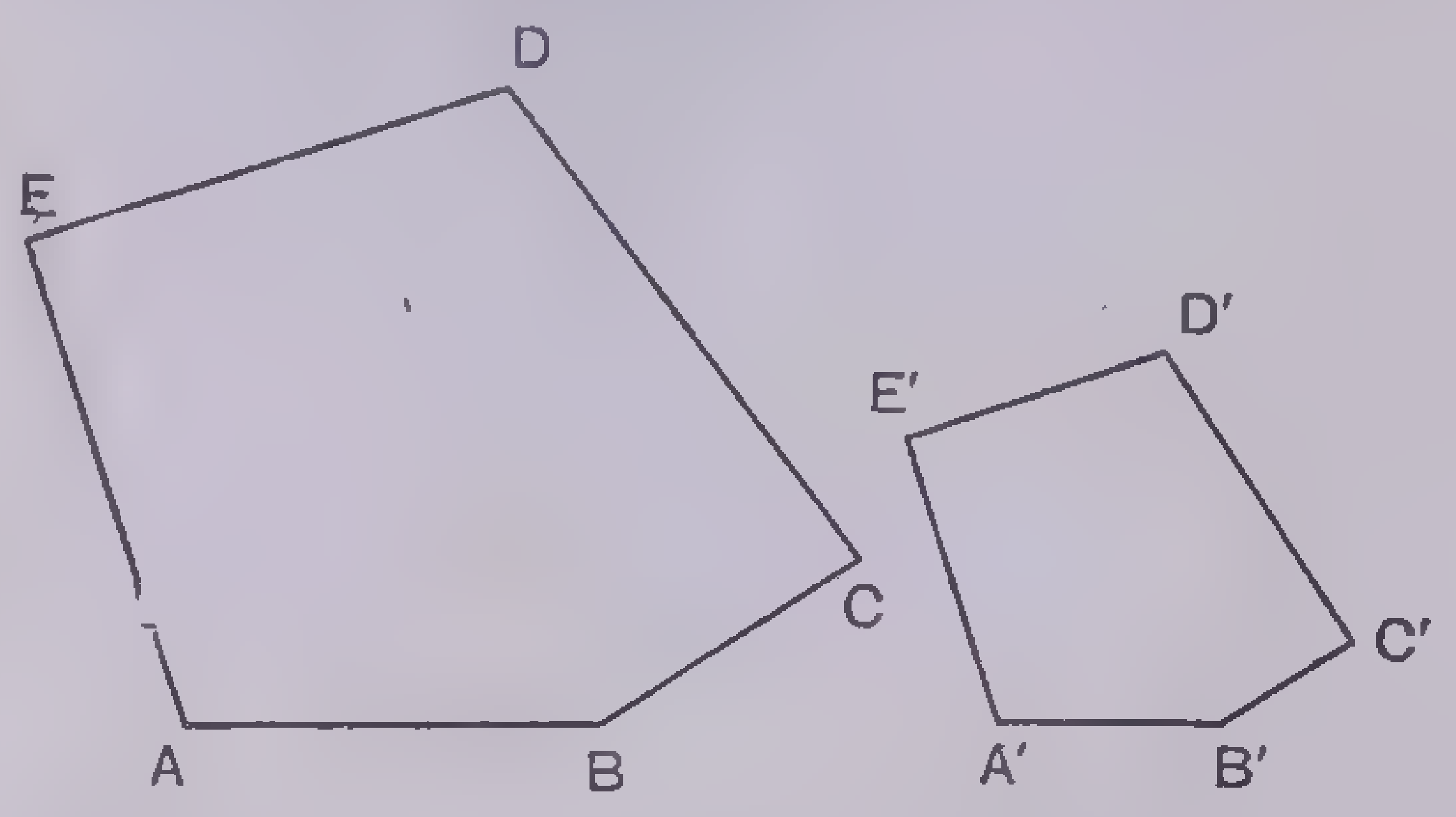
$$\therefore \frac{AF}{AC} = \frac{AE}{AC}$$

$$\therefore AF = AE.$$

∴ E coincides with F and DE is parallel to BC.

183. Polygon.—A polygon is a plane figure bounded by three or more straight lines. A polygon bounded by three lines is a *triangle*; one bounded by four lines is a *quadrilateral*; one bounded by five, a *pentagon*; one bounded by six, a *hexagon*; one bounded by eight, an *octagon*; one bounded by ten, a *decagon*, etc.

184. Convex and Re-entrant Polygons.—A polygon is convex if each of its angles is less than two right angles and re-entrant if one of its angles exceeds two right angles.



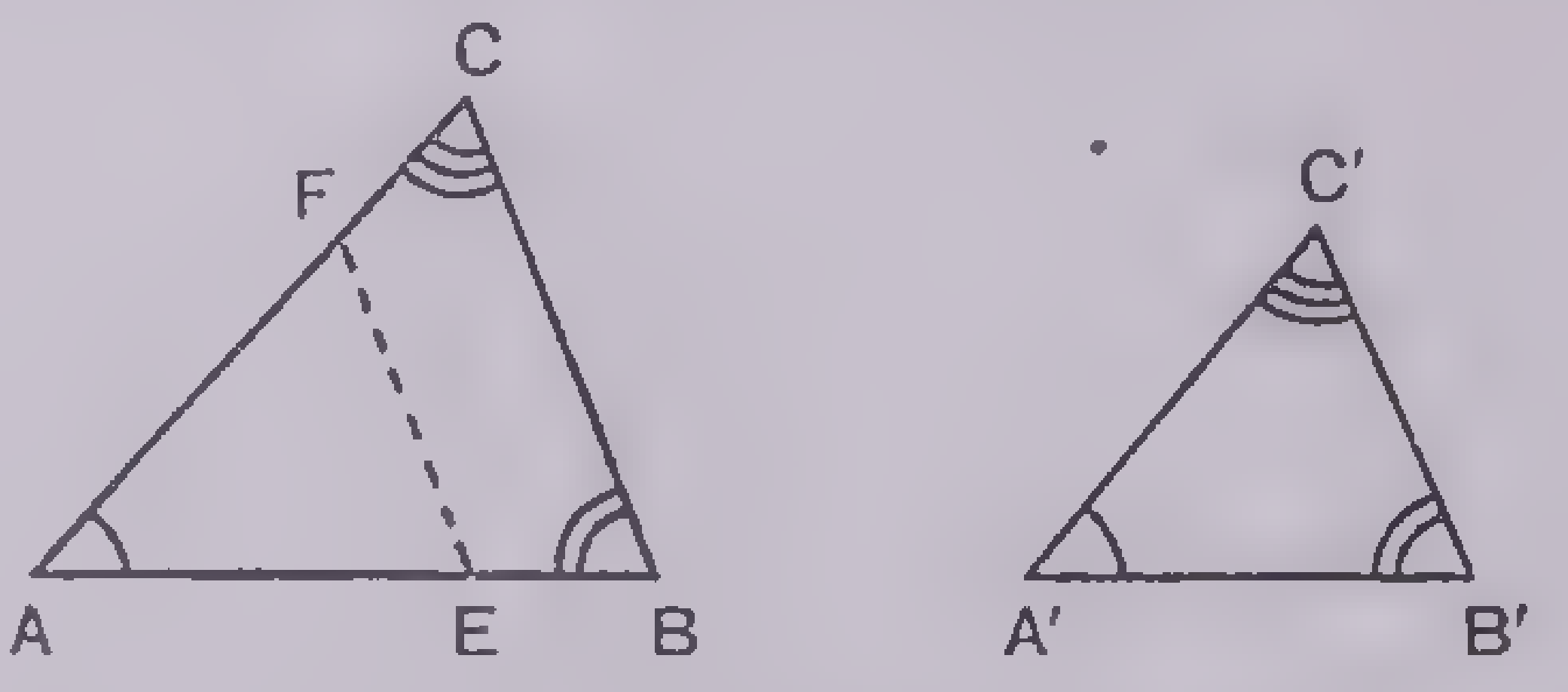
185. Similar Polygons.—Two polygons are similar (symbol ∽) when the angles of one are equal, respectively, to the angles of the other, and the sides taken in order are proportional, each to each. The conditions which must be satisfied in order that the two polygons ABCDE and A'B'C'D'E' may be similar are:

Angles equal: ∠A = ∠A', ∠B = ∠B', ∠C = ∠C', ∠D = ∠D', ∠E = ∠E',

Sides proportional:

$$\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CD}{C'D'} = \frac{DE}{D'E'} = \frac{EA}{E'A'}$$

186. Theorem 64.—If two triangles have the angles of one equal respectively to the angles of the other, the triangles are similar.



Hyp. Given the triangles ABC and A'B'C' with ∠A = ∠A', ∠B = ∠B' and ∠C = ∠C'.

Con. $\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CA}{C'A'}$

Place △ A'B'C' on △ ABC so that the equal angles A and A' coincide, and A'B' takes the position AE, A'C' the position AF, and B'C' the position EF.

∠AFE = ∠C = ∠C'. (Hyp.)

∴ FE ∥ BC. (§99, Theorem 21.)

$$\therefore \frac{AE}{AB} = \frac{AF}{AC}. \quad (\S 181, \text{ Theorem 62.})$$

Replacing AE and AF by their equals A'B' and A'C' respectively we have

$$\frac{A'B'}{AB} = \frac{A'C'}{AC} \text{ or } \frac{AB}{A'B'} = \frac{AC}{A'C'}$$

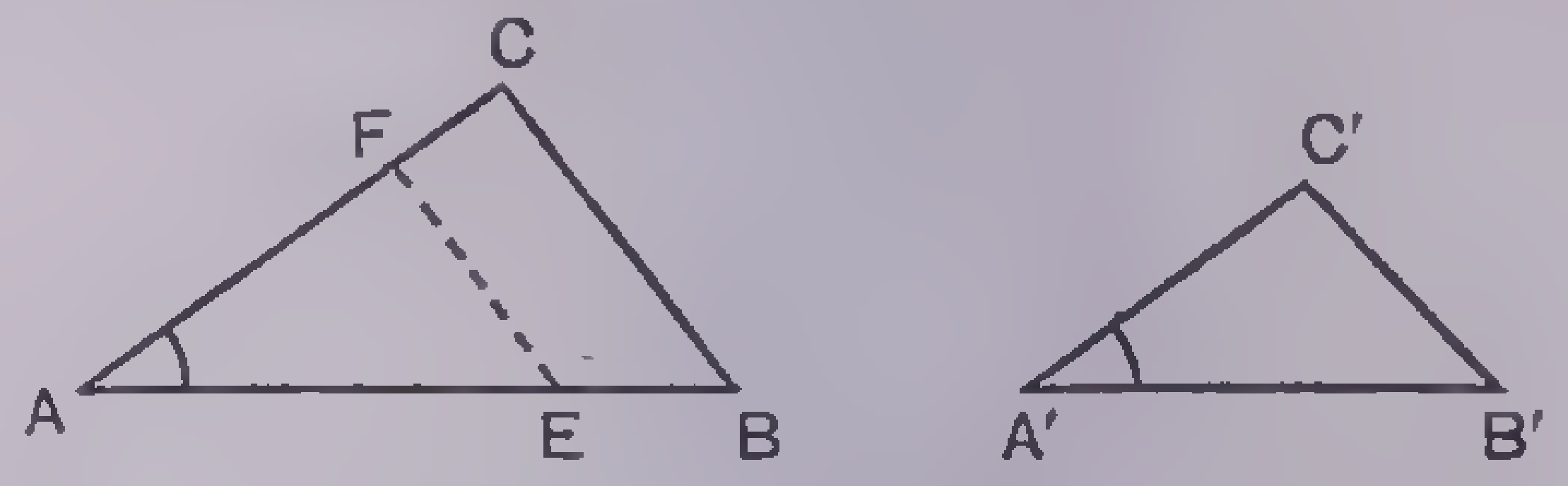
By making ∠B' coincide with ∠B we may similarly show

$$\frac{AB}{A'B'} = \frac{BC}{B'C'}$$

187. Theorem 65.—If two triangles have two angles of one equal respectively to two angles of the other, the triangles are similar.

This follows at once from the previous theorem, for if two angles of one triangle are equal to two angles of another, the third angles are also equal. (§106, Theorem 28.)

188. Theorem 66.—If two triangles have an angle of one equal to an angle of the other and the sides including these angles proportional, the triangles are similar.



Hyp. Given the triangles ABC and A'B'C' with ∠A = ∠A' and $\frac{A'C'}{AC} = \frac{A'B'}{AB}$

Con. ABC and A'B'C' are similar.

Place the △A'B'C' on △ ABC so that ∠A' coincides with its equal ∠A, and B' takes the position E, and C' the position F.

$$\frac{A'C'}{AC} = \frac{A'B'}{AB}. \text{ (Hyp.)}$$

$$\therefore \frac{AF}{AC} = \frac{AE}{AB}.$$

∴ FE ∥ BC. (§182, Theorem 63.)

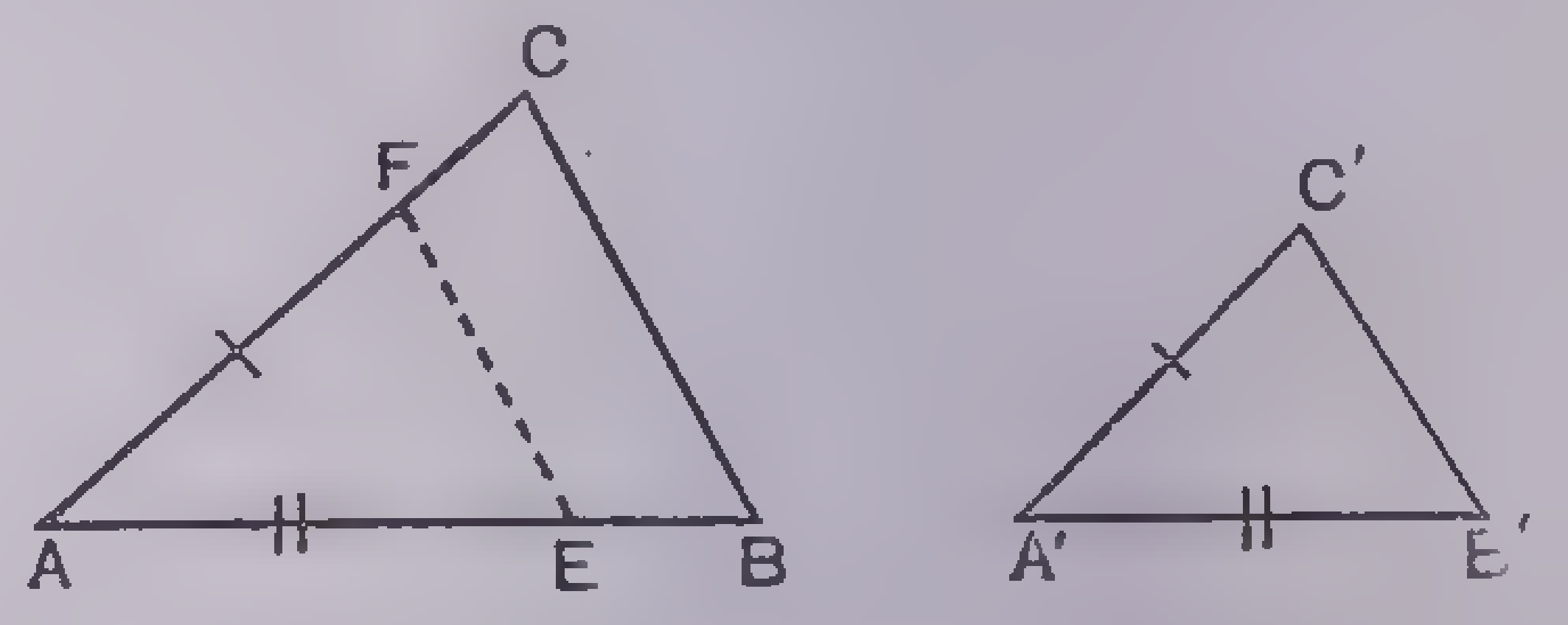
∴ ∠AFE = ∠C = ∠C'.

And ∠AEF = ∠B = ∠B'. (§102, Theorem 24.)

∠A = ∠A'. (Hyp.)

∴ △ ABC ∽ △ A'B'C' (§186, Theorem 64.)

189. Theorem 67.—If the sides of two triangles are proportional, the triangles are similar.



Hyp. Given the two triangles ABC and A'B'C' with $\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CA}{C'A'}$

Con. △ ABC ∽ △ A'B'C'.

On AC lay off AF = A'C', and on AB lay off AE = A'B'.

$$\frac{AB}{A'B'} = \frac{AC}{A'C'}. \text{ (Hyp.)}$$

$$\therefore \frac{AB}{AE} = \frac{AC}{AF}.$$

∴ △ ABC ∽ △ AEF. (§188, Theorem 66.)

∴ ∠AFE = ∠C. (§185.)

∴ FE ∥ CB. (§99, Theorem 21.)

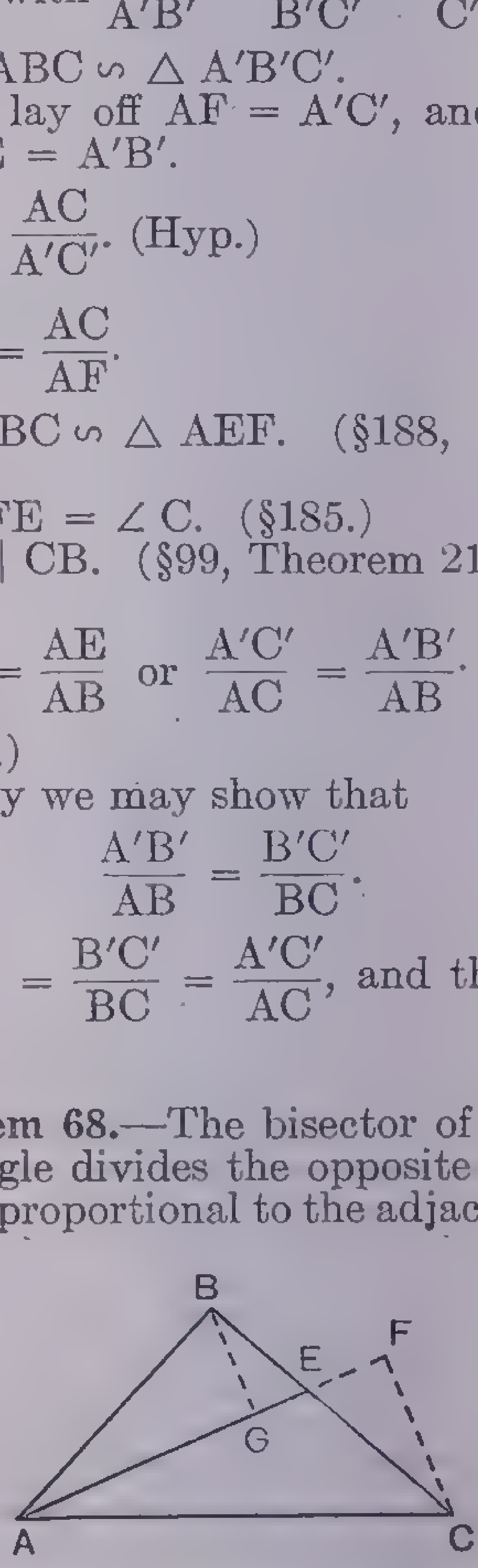
$$\therefore \frac{AF}{AC} = \frac{AE}{AB} \text{ or } \frac{A'C'}{AC} = \frac{A'B'}{AB}. \quad (\S 181, \text{ Theorem 62.})$$

Similarly we may show that

$$\frac{A'B'}{AB} = \frac{B'C'}{BC}.$$

$\therefore \frac{A'B'}{AB} = \frac{B'C'}{BC} = \frac{A'C'}{AC}$, and the △s are similar.

190. Theorem 68.—The bisector of an angle of a triangle divides the opposite side into segments proportional to the adjacent sides.



Hyp. AE is the bisector of the angle A of the triangle ABC.

Con. $\frac{BE}{AB} = \frac{EC}{AC}$ or $\frac{BE}{EC} = \frac{AB}{AC}$

Produce AE sufficiently and draw the perpendicular from C to AE, meeting AE at F, and draw the perpendicular from B meeting AE at G.

$\angle BAG = \angle FAC$. (Hyp.)

$\angle ABG = \angle AFC$.

$\therefore \triangle AGB \sim \triangle AFC$. (§187, Theorem 65.)

$\therefore \frac{AB}{AC} = \frac{BG}{CF}$.

$\angle BFG = \angle CEF$. (§80, Theorem 10.)

$\angle BGE = \angle F$.

$\therefore \triangle BGE \sim \triangle CFE$.

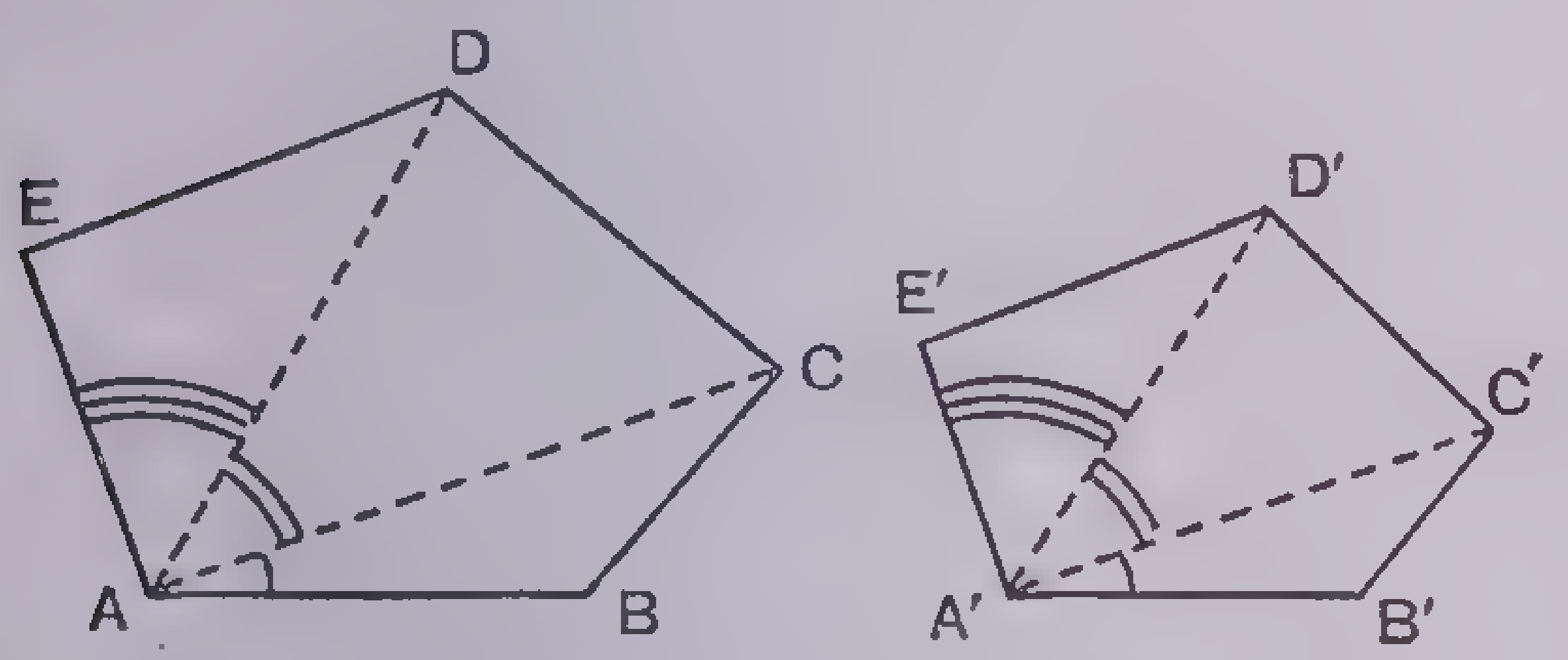
$\therefore \frac{BG}{CF} = \frac{BE}{EC}$

But $\frac{BG}{CF} = \frac{AB}{AC}$

$\therefore \frac{BE}{EC} = \frac{AB}{AC}$

191. Theorem 69.—If two polygons are composed of the same number of triangles, similar each to each and similarly placed, the polygons are similar.

We shall prove this for the case where the triangles, of which each polygon is composed, have a vertex in common.



Hyp. Two polygons, ABCDE and A′B′C′D′E′, composed of the same number of triangles which are similar each to each and similarly placed, that is, ABC similar to A′B′C′, ACD similar to A′C′D′. . . . . .

Con. ABCDE is similar to A′B′C′D′E′.

Hint. The angles of the two polygons are equal because they are either equal angles or the sum of equal angles.

$\triangle ABC \sim \triangle A'B'C'$. (Hyp.)

$\therefore \frac{A'B'}{AB} = \frac{B'C'}{BC} = \frac{A'C'}{AC}$.

$\triangle ACD \sim \triangle A'C'D'$.

$\therefore \frac{A'B'}{AB} = \frac{B'C'}{BC} = \frac{C'D'}{CD}$.

192. Theorem 70.—If two polygons are similar, they can be resolved into the same number of triangles, similar each to each and similarly placed.

Hint. Use the figure of the previous theorem, and draw the lines, AC, AD, A′C′ and A′D′. First prove ABC similar to A′B′C′, then ACD similar to A′C′D′ and so on.

193. Theorem 71.—The perimeters of two similar polygons are in the same ratio as any two corresponding sides.

Hint. Make use of the figure in Theorem 69. From the definition of similar polygons,

$$\frac{A'B'}{AB} = \frac{B'C'}{BC} = \frac{C'D'}{CD} = \frac{D'E'}{DE} = \frac{E'A'}{EA}.$$

Applying the result of §180, section III, to the above gives

$$\frac{A'B' + B'C' + C'D' + D'E' + E'A'}{AB + BC + CD + DE + EA} = \frac{A'B'}{AB} = \frac{B'C'}{BC} = \ldots\ldots\ldots\ldots \text{ or}$$

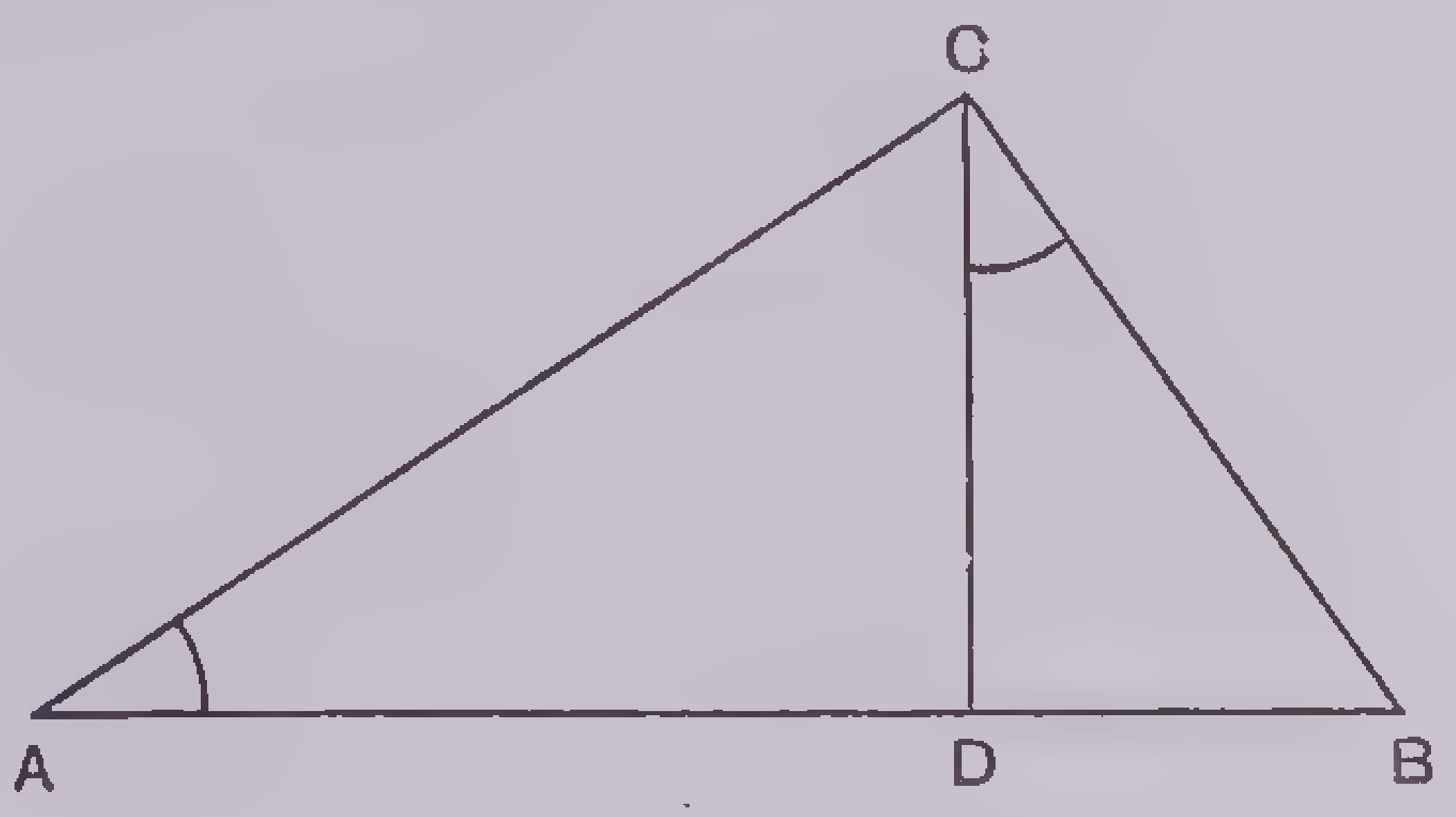
$$\frac{\text{the perimeter of P}'}{\text{the perimeter of P}} = \frac{A'B'}{AB} = \frac{B'C'}{BC}.$$

194. Theorem 72.—If in the right triangle a perpendicular is drawn from the vertex of the right angle to the hypotenuse:

(a) The two triangles thus formed are similar to the given triangle and similar to each other.

(b) The perpendicular is the mean proportional between the segments of the hypotenuse.

(c) Each leg of the right triangle is the mean proportional between the hypotenuse and the segment adjacent to that leg.



Hyp. ABC is a triangle with a right angle at C. From C a perpendicular is dropped on AB meeting AB at D.

Con. (a) $\triangle ADC \sim \triangle BCD \sim ABC$.
(b) $(CD)^2 = (AD)(DB)$.
(c) $(AC)^2 = (AB)(AD)$.
$(CB)^2 = (AB)(DB)$.

(a). $\angle A = \angle DCB$ (§111, Theorem 32.)

The $\triangle$s ABC, DBC and ADC have an acute angle equal, and a right angle equal. Therefore all their angles are equal. (§106, Theorem 28.)

$\therefore \triangle ABC \sim \triangle DBC \sim \triangle ADC$. (§187, Theorem 65.)

(b). $\triangle ACD \sim \triangle CBD$.

$\therefore \frac{AD}{CD} = \frac{CD}{BD}$.

$\therefore (CD)^2 = (AD)(BD)$.

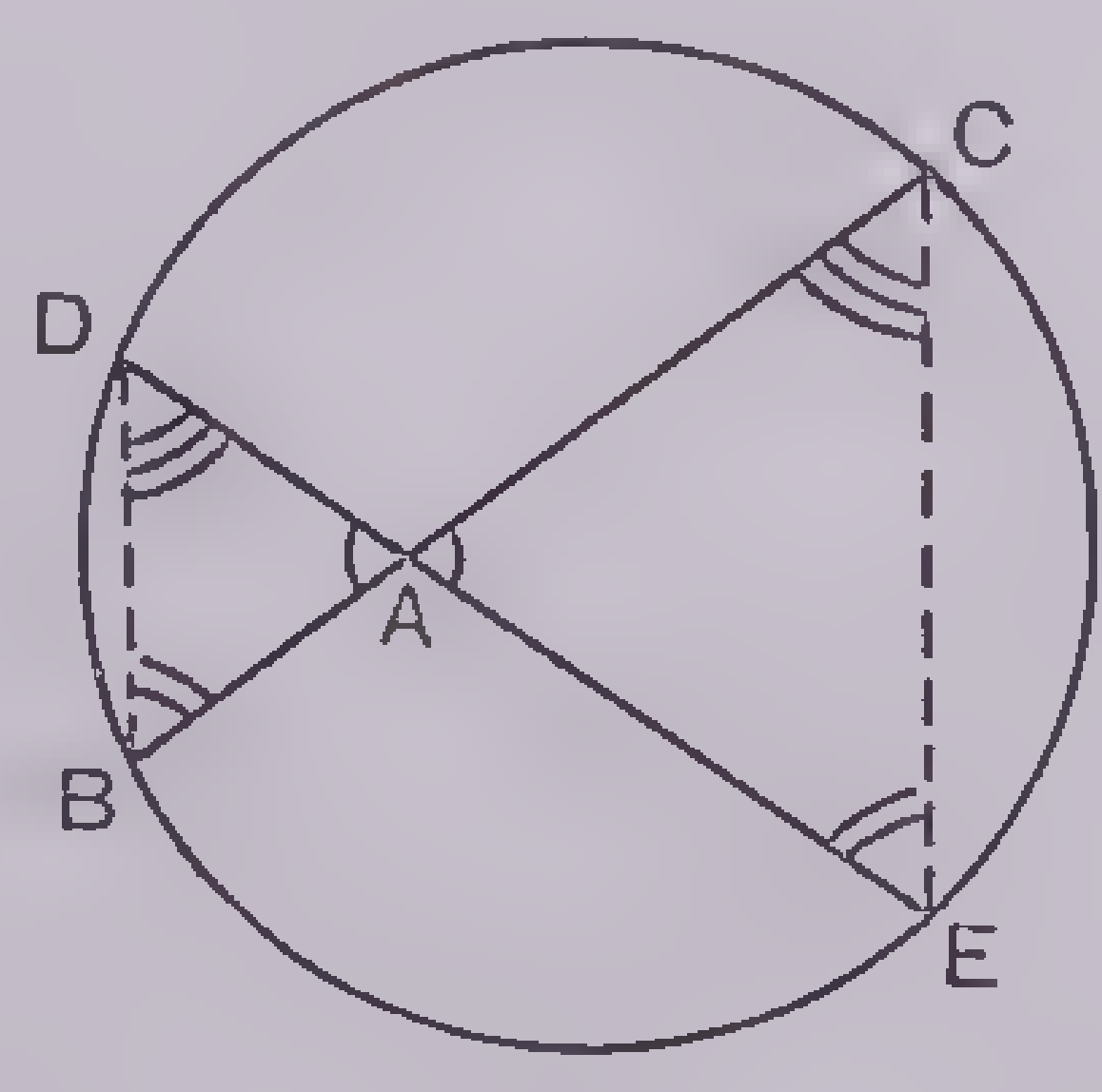
(c). $\triangle ACD \sim \triangle ABC$.

$\therefore \frac{AB}{AC} = \frac{AC}{AD}$.

$\therefore (AC)^2 = (AB)(AD)$.

Similarly $(CB)^2 = (AB)(DB)$.

195. Theorem 73.—The product of the segments of a chord that passes through a fixed point within a circle is the same for all directions of the chord.



Hyp. Let A be any point within the circle and DE any chord through A.

Con. The product (AE)(AD) is constant.

We will prove it constant by taking any other chord through A as BC and showing that $(AE)(AD) = (AB)(AC)$.

$\angle BAD = \angle EAC$. (§80, Theorem 10.)

Draw the lines DB and CE.

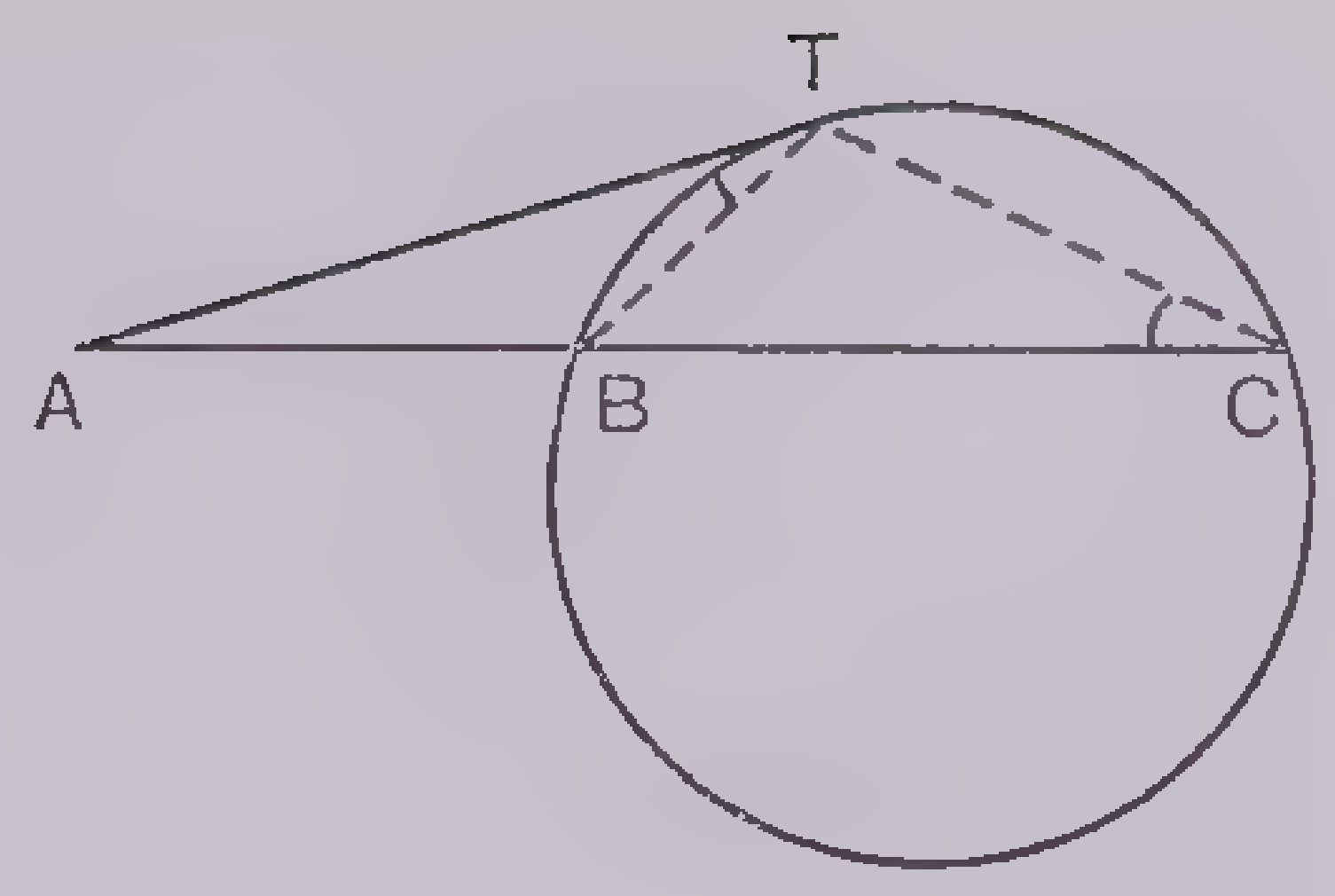
$\angle DEC = \angle DBC$. (§169, Theorem 57.)

$\angle BDE = \angle BCE$.

$\therefore \triangle AEC \sim \triangle BAD$. (§186, Theorem 64.)

$\therefore \frac{AE}{AB} = \frac{AC}{AD}$ or $(AE)(AD) = (AB)(AC)$.

196. Theorem 74.—If through a point outside a circle a tangent and a secant are drawn, the tangent is the mean proportional between the whole secant and its external segment.



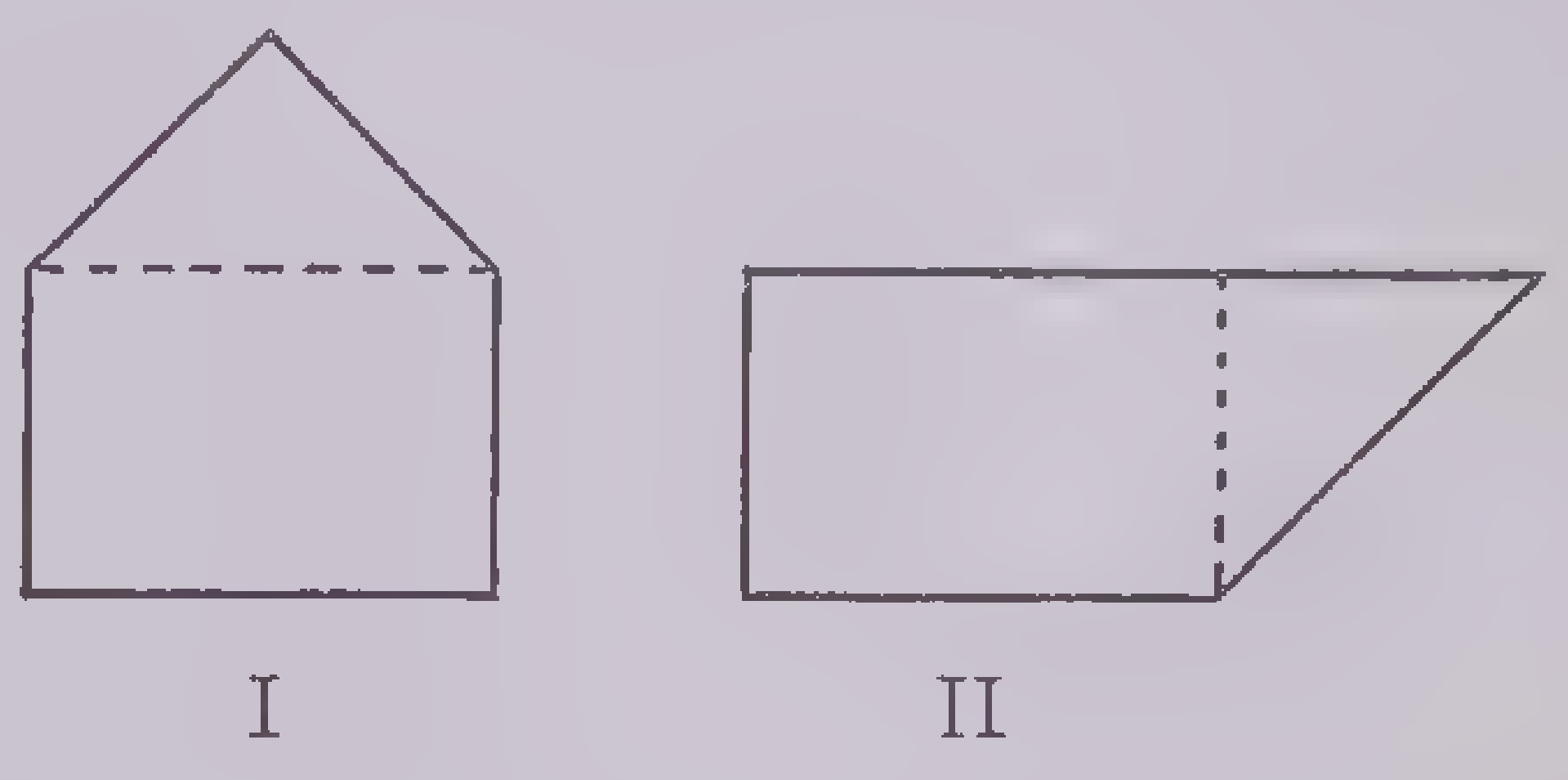
Hint. Show that the triangles ATB and ACT are similar. How is an angle formed by a tangent and a chord measured? See §171.

Hence $\frac{AC}{AT} = \frac{AT}{AB}$ or $(AC)(AB) = (AT)^2$.

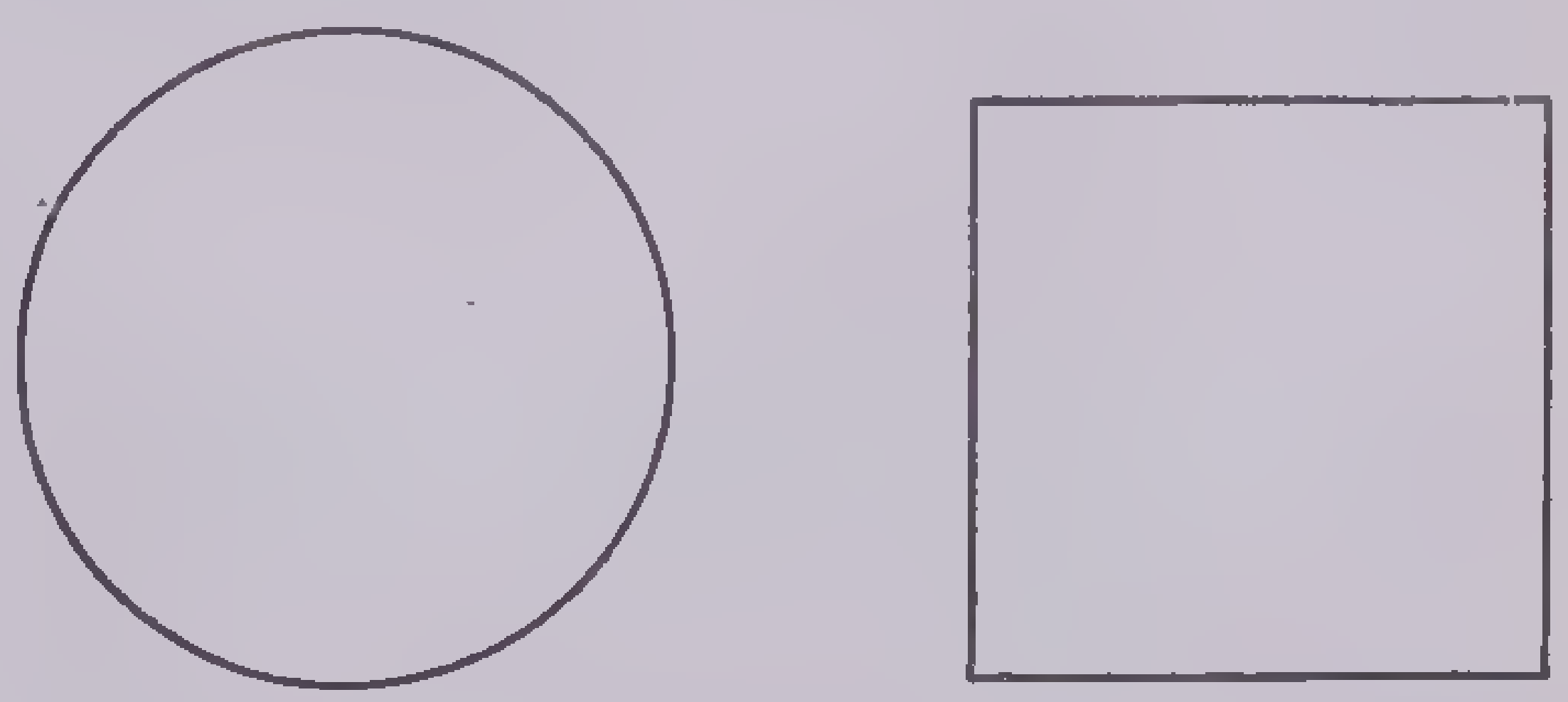
AREAS OF POLYGONS

We now come to another fundamental concept of geometry, the area of a closed figure.

197. Equal Areas; Equivalence.—Two figures which can be made to coincide are identical and have the same area. But it may be possible, in the case of two figures which do not coincide, to cut one area up in such a manner that, on rearranging its parts, it coincides with the second figure. Evidently in this case we must also say that the areas are equal.



Thus Figures I and II, which will not coincide as they stand, can be made to coincide by cutting off the triangle along the dotted line in Figure I and moving it to the position indicated in Figure II. In these circumstances the areas are called *equivalent*, symbol ⋍. However one ordinarily uses merely the term equal.



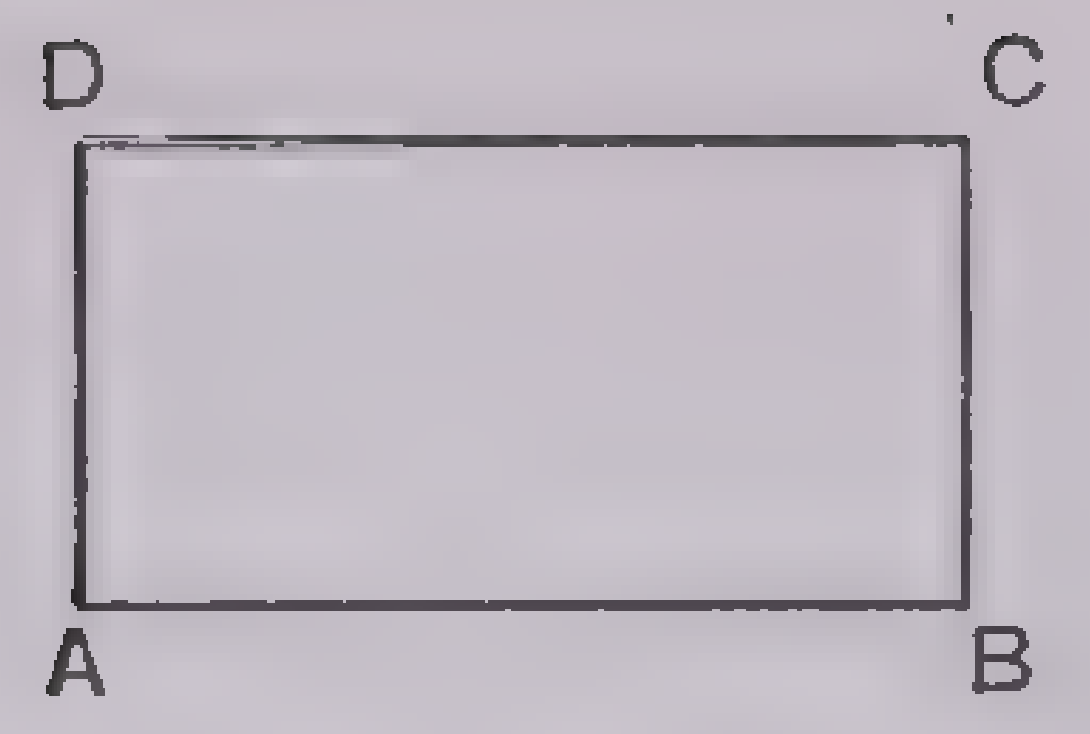
The circle and the square above may have the same area but it is not possible by a finite number of operations to divide the square into pieces, so that they will coincide with the circle. We here encounter the same kind of difficulty that occurred in the case of the incommensurable quantities, discussed in §177.

One of the famous problems of geometry is to "square the circle," i. e., to construct a square whose area is equal to the area of a given circle. In the process of cutting up the circle to form a square an infinite number of steps would be required, which cannot actually be performed.

198. Unit of Area.—The unit of area which is most convenient is the area of a square whose side is one unit in length. This square is called the unit square. If we are measuring the length of straight lines in feet it is convenient to measure the area in terms of square feet.

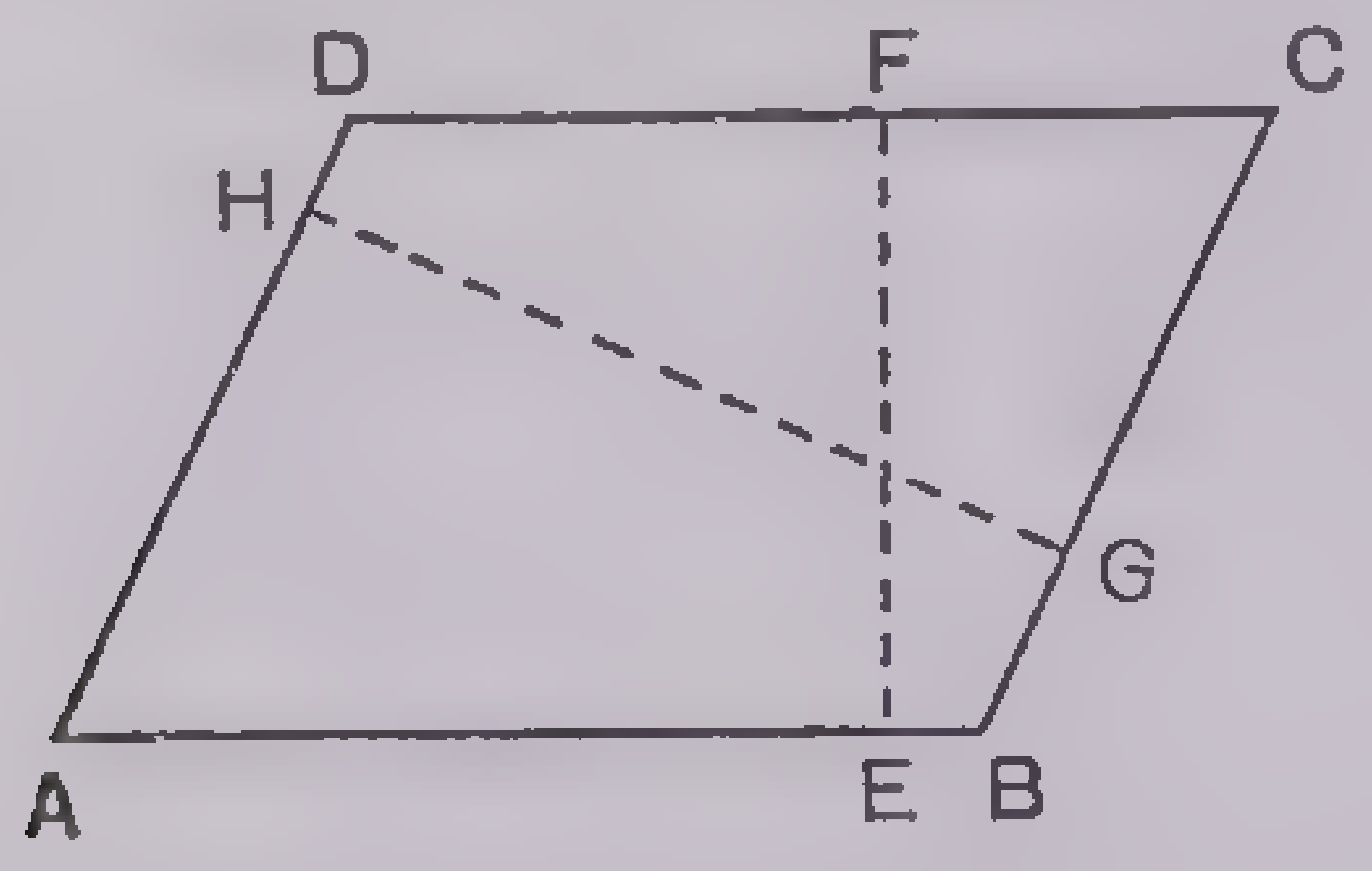
199. Area.—The area of a plane figure is its ratio to the unit square.

200. Base and Altitude of a Rectangle.—Either one of two adjacent sides of a rectangle can be considered its base. An alti-



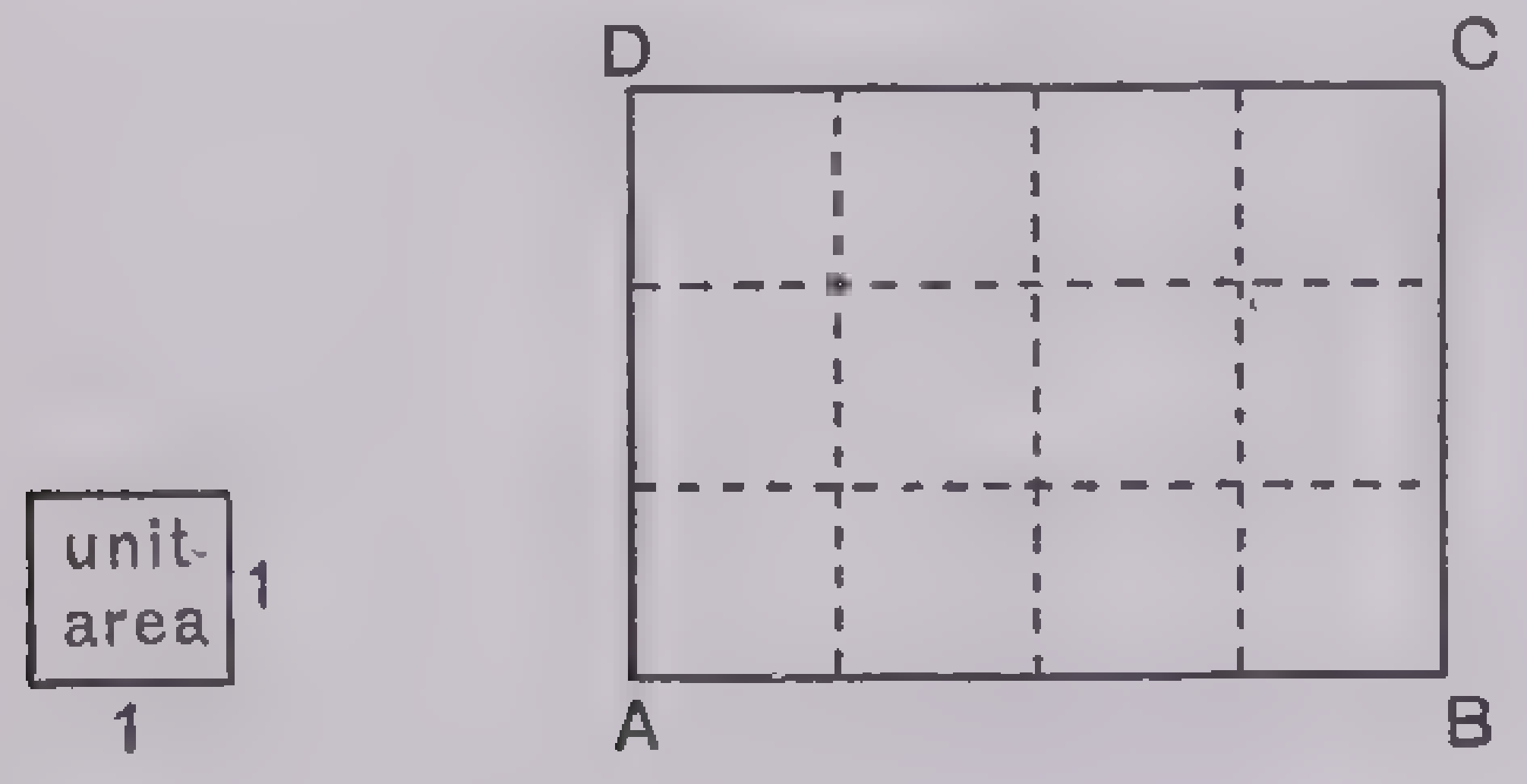
tude of a rectangle is a line drawn from any point in one base perpendicular to the other side. If AB is chosen as base, then AD is an altitude. If AD is chosen as base then AB is an altitude. If AB is chosen for the lower base, then DC is the upper base.

201. Base and Altitude of a Parallelogram.—



Either pair of parallel sides can be chosen for the bases, thus if BC is called the lower base then AD is the upper base. The corresponding altitude is the perpendicular distance between the bases. If AB and DC are the bases then EF is the altitude.

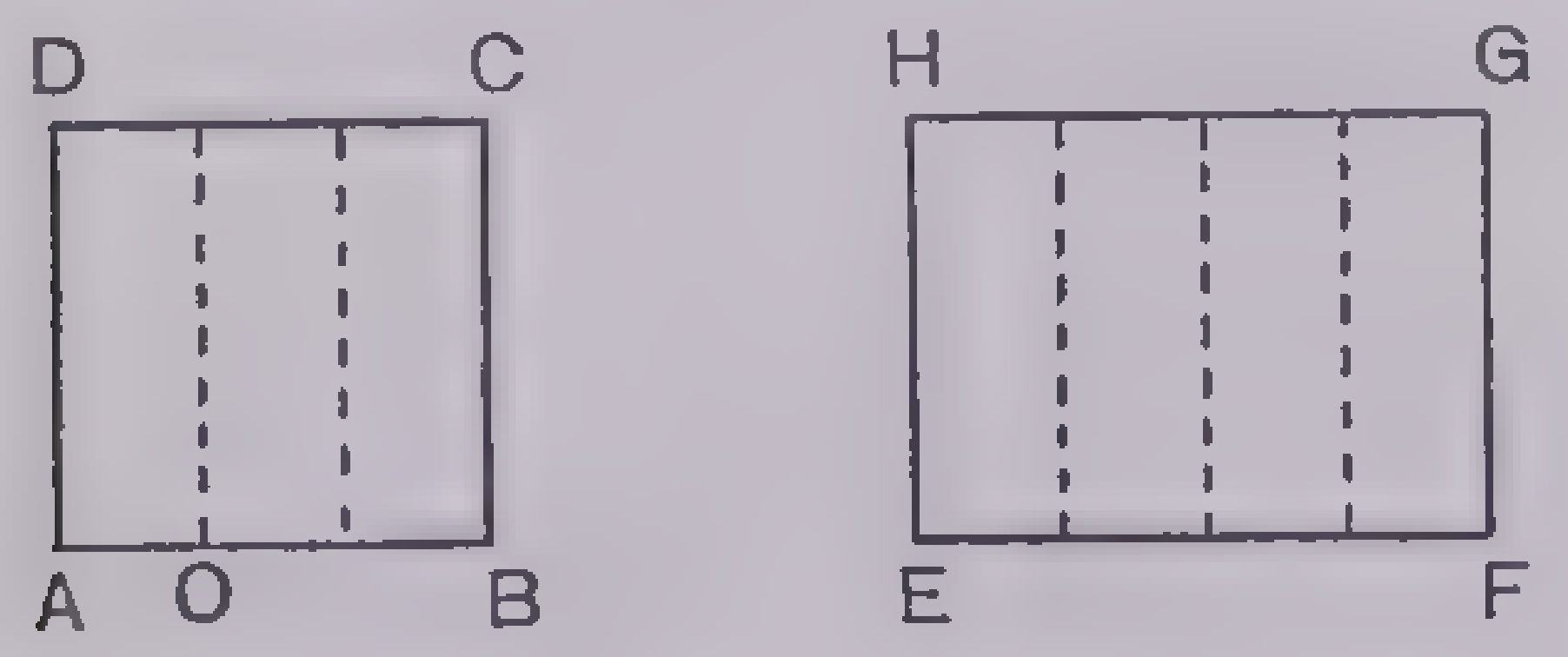
202. Area of a Rectangle.—



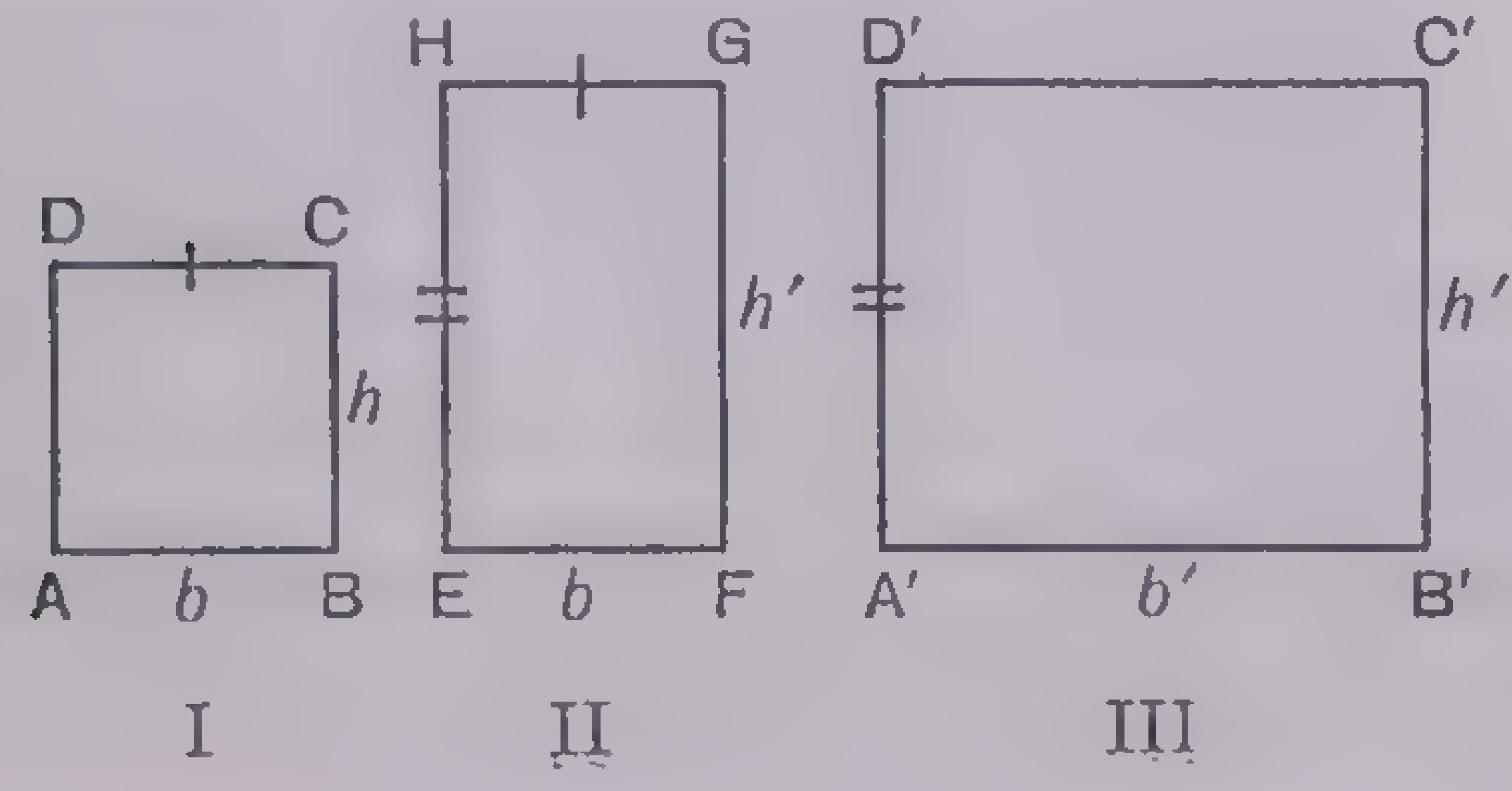
When the lengths of the two sides are commensurable with the side of the unit square, there is no difficulty in proving that the area is the product of the base and the altitude. The rectangle above has its base AB, 4 units long, and its altitude BC, 3 units long. It is evident that it can be cut into 4 × 3 = 12 squares, each congruent with the unit square. When AB and BC are not commensurable with the side of the unit square, we encounter a difficulty which we mentioned before in §197. We pass over the proof of this incommensurable case and assume the truth in all cases of the following theorem:

203. Theorem 75.—The area of a rectangle is equal to the product of its base and its altitude.

204. Theorem 76.—The areas of two rectangles having equal altitudes are to each other as their bases.

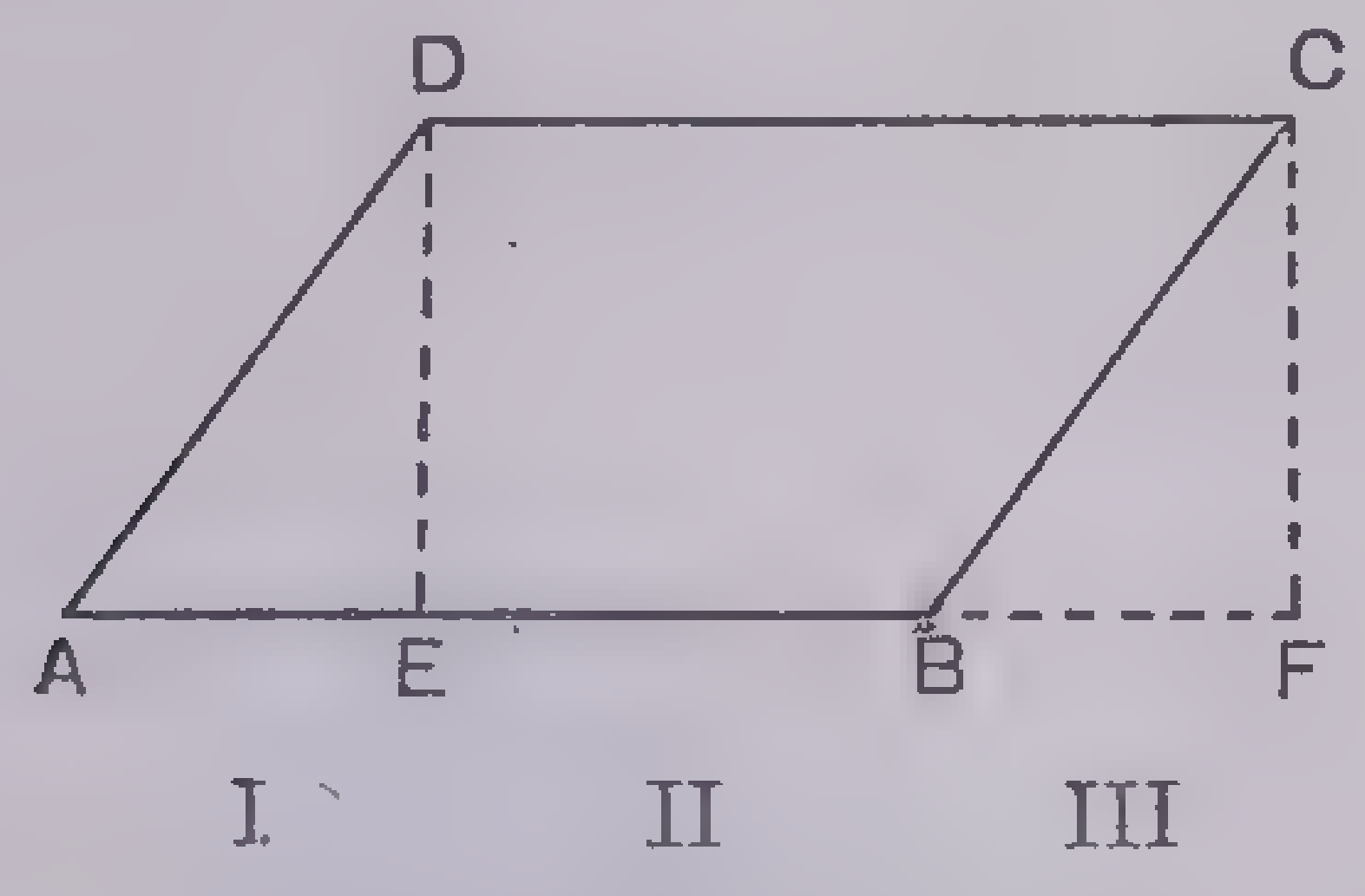


205. Theorem 77.—The areas of two rectangles are to each other as the products of their bases and altitudes.



Theorems 76 and 77 are immediate consequences of Theorem 75.

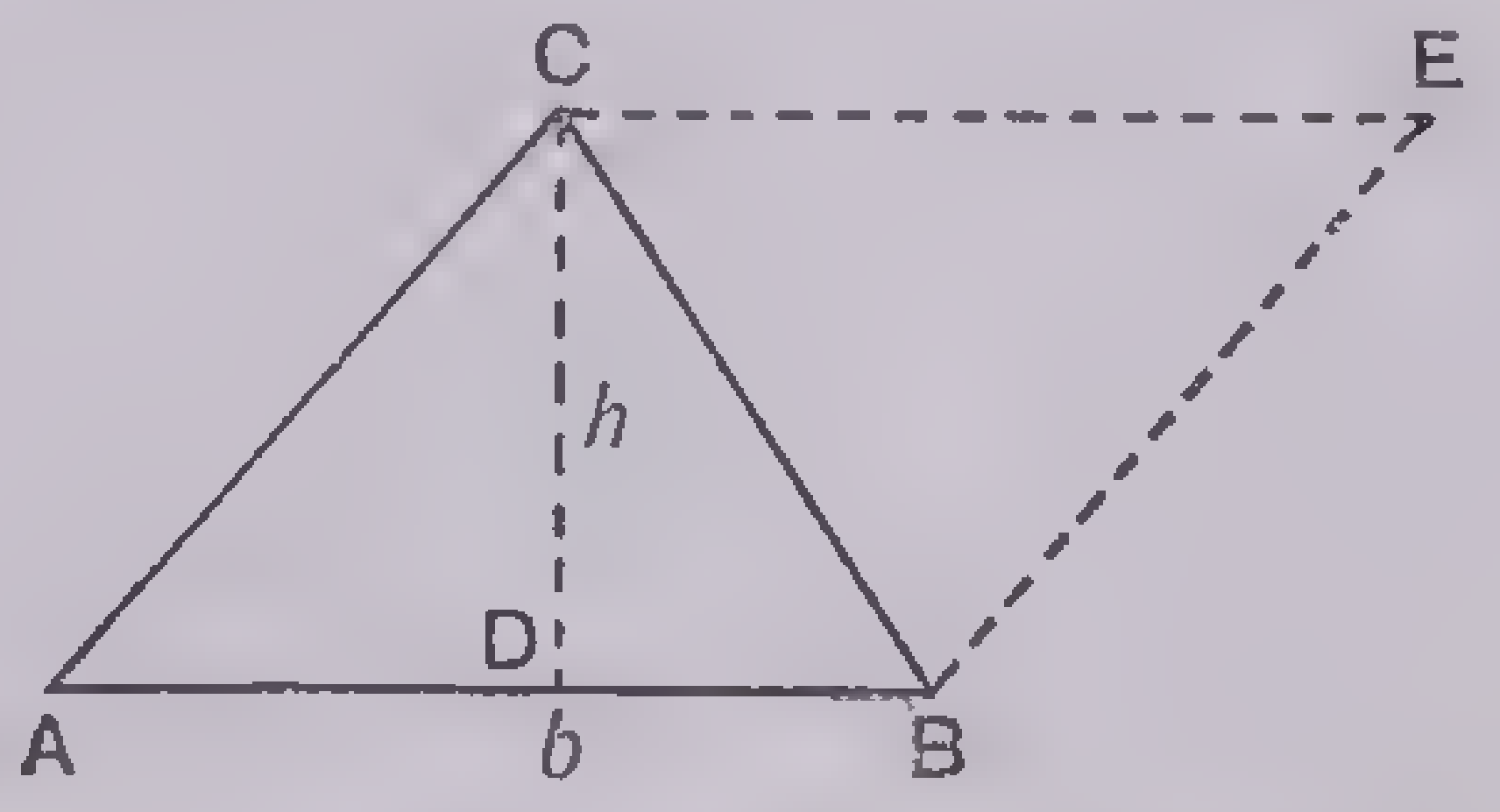
206. Theorem 78.—The area of a parallelogram is equal to the product of its base and its altitude.



Hint. Drop the perpendiculars from D and C on AB, meeting it in E and F. Show that triangle I is congruent to triangle III. The parallelogram ABCD is composed of I + II. The rectangle EFCD is composed of II + III. Since I = III, I + II = II + III. Hence the parallelogram is equivalent to the rectangle. The area of the rectangle is (DC) (DE). (§203, Theorem 75.)

Hence the area of the parallelogram is also (DC) (DE) = (base) (altitude).

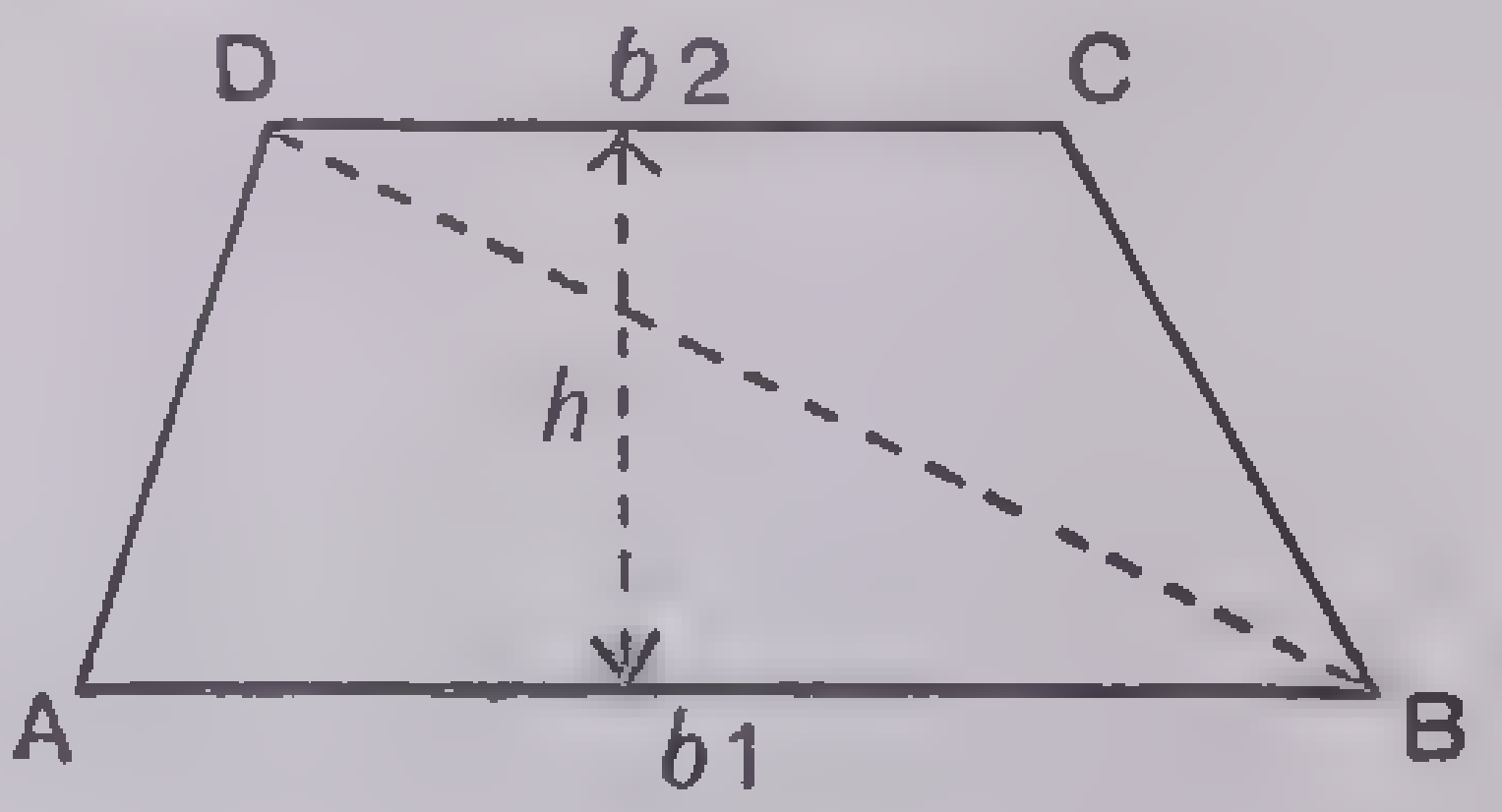
207. Theorem 79.—The area of a triangle is equal to half the product of its base and altitude.



Hint. Complete the triangle ABC into the parallelogram ABEC. Show that triangle BEC is congruent to the triangle ABC, hence ABC is one-half the area of the parallelogram. By the previous theorem the area of the parallelogram is bh, hence the area of the triangle is $\frac{1}{2}bh$. AB = b, the base of the triangle, and CD = h, the perpendicular distance from C on AB being the altitude.

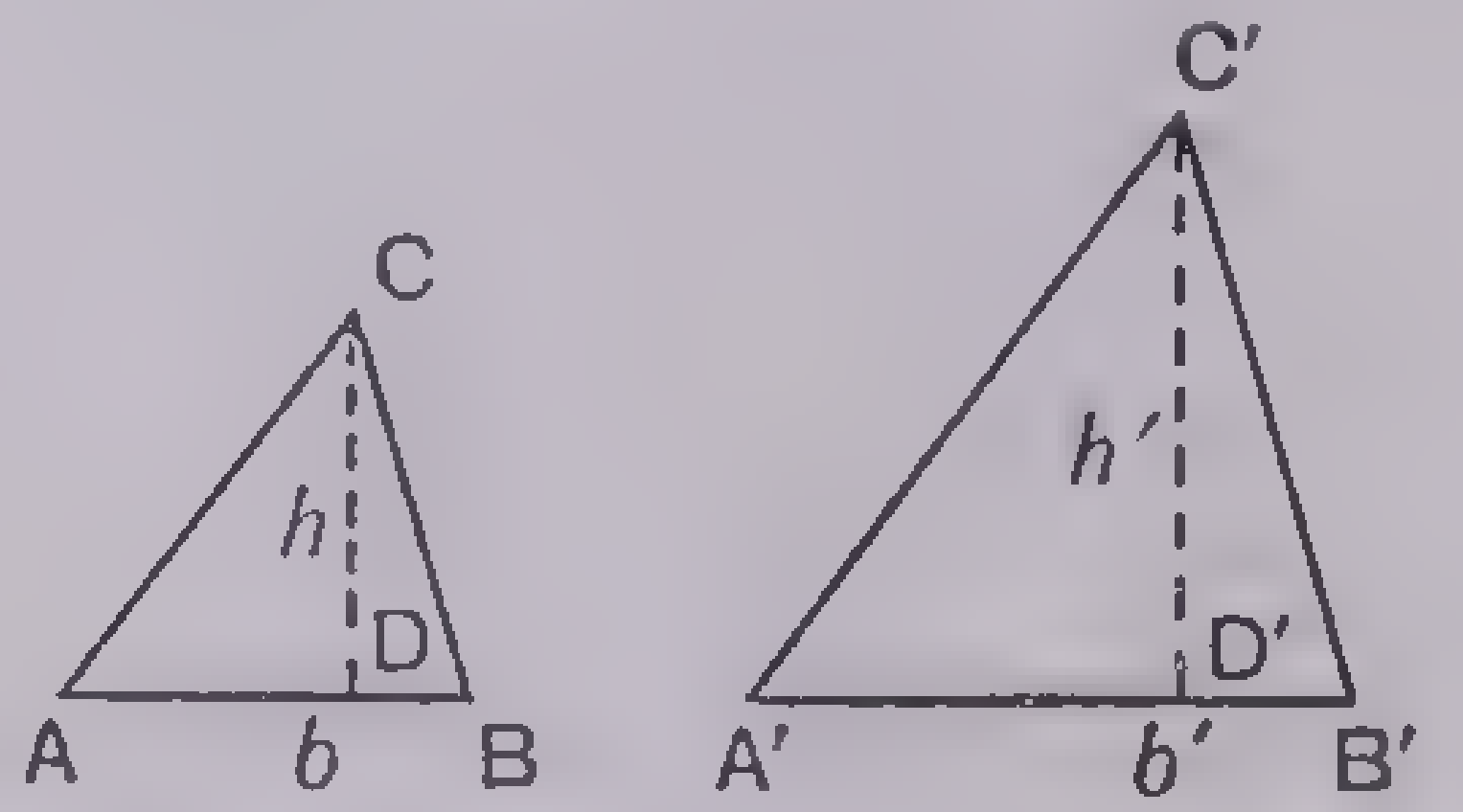
Base and Altitude of a Trapezoid.—The two parallel sides of a trapezoid are called the *bases;* and the altitude is the perpendicular distance between the bases.

208. Theorem 80.—The area of a trapezoid is equal to one-half the product of its altitude and the sum of its bases.



Hint. Draw the diagonal BD, dividing the trapezoid ABCD into the two triangles, ABD and BDC. ABD = $\frac{1}{2}b_1h$ and BCD = $\frac{1}{2}b_2h$. Therefore ABCD = $\frac{1}{2}b_1h + \frac{1}{2}b_2h = \frac{1}{2}(b_1 + b_2)h$.

209. Theorem 81.—The areas of two similar triangles are to each other as the squares of any two corresponding sides.



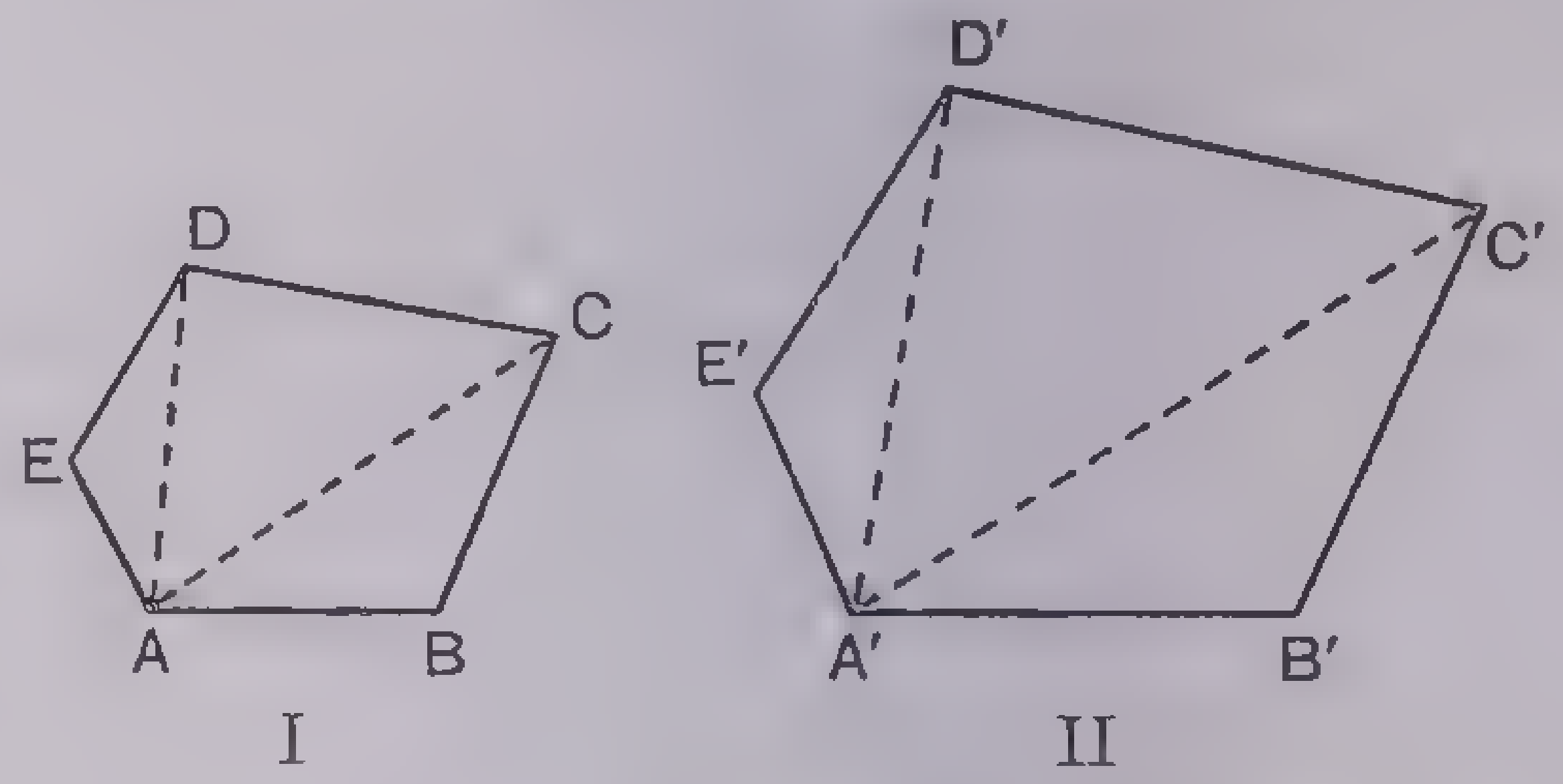
Hint. Show that $\triangle$ ACD $\backsim$ $\triangle$ A'C'D'. (§187, Theorem 65.)

$$\therefore \frac{h}{h'} = \frac{AC}{A'C'} = \frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{b}{b'}$$

Area ABC = $\frac{1}{2}bh$; area A'B'C' = $\frac{1}{2}b'h'$.

$$\therefore \frac{\text{area ABC}}{\text{area A'B'C'}} = \frac{\frac{1}{2}bh}{\frac{1}{2}b'h'} = \frac{b^2}{b'^2} = \frac{(AC)^2}{(A'C')^2} = \frac{(AB)^2}{(A'B')^2} = \frac{(BC)^2}{(B'C')^2}$$

210. Theorem 82.—The areas of two similar polygons are to each other as the squares of any two corresponding sides and also as the squares of their perimeters.



Hint. §192, Theorem 70. If two polygons are similar, they can be resolved into the same number of triangles, similar each to each and similarly placed. Resolve ABCDE into triangles ABC, ACD and ADE, which are similar to the triangles A'B'C', A'C'D' and A'D'E', respectively, into which A'B'C'D'E' is resolved.

Then $\frac{ABC}{A'B'C'} = \frac{(AB)^2}{(A'B')^2}$, $\frac{ACD}{A'C'D'} = \frac{(CD)^2}{(C'D')^2}$

and $\frac{ADE}{A'D'E'} = \frac{(DE)^2}{(D'E')^2}$. (§209, Theorem 81.)

But $\frac{AB}{A'B'} = \frac{CD}{C'D'} = \frac{DE}{D'E'}$.

$$\therefore \frac{(AB)^2}{(A'B')^2} = \frac{(CD)^2}{(C'D')^2} = \frac{(DE)^2}{(D'E')^2}.$$

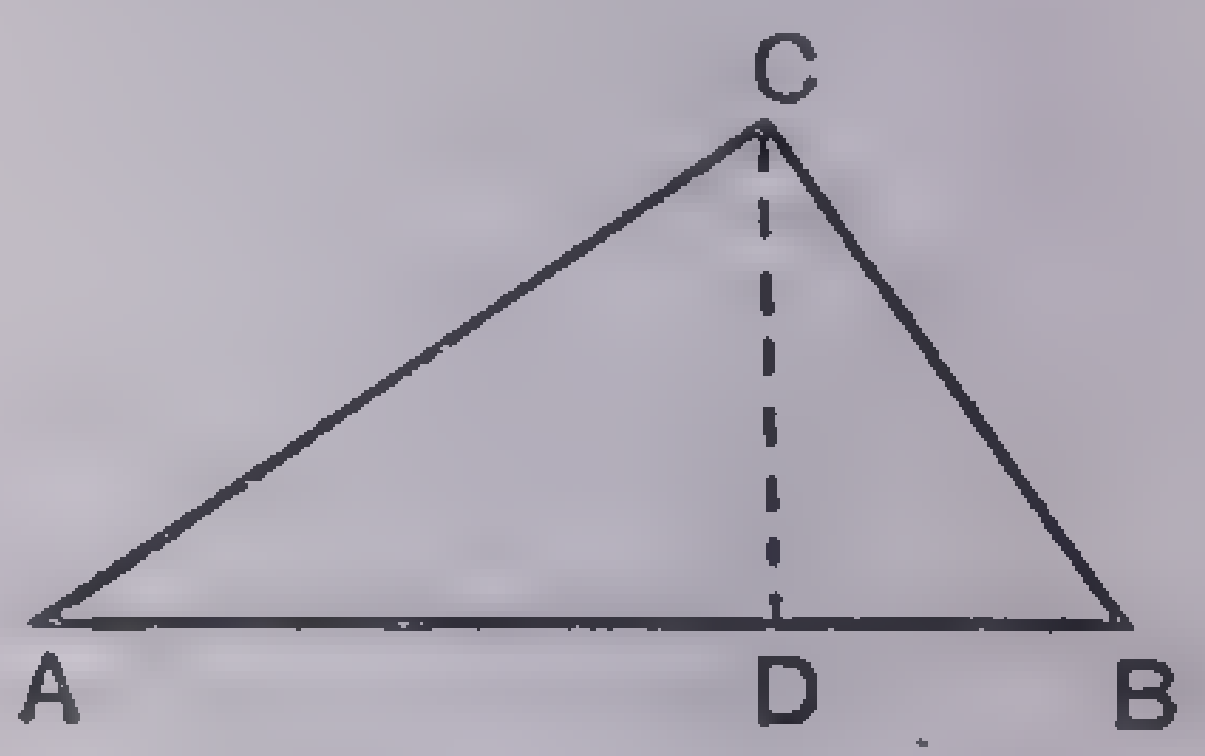
$$\therefore \frac{ABC}{A'B'C'} = \frac{ACD}{A'C'D'} = \frac{ADE}{A'D'E'} = \frac{(AB)^2}{(A'B')^2}.$$

$$\therefore \frac{ABC + ACD + ADE}{A'B'C' + A'C'D' + A'D'E'} = \frac{(AB)^2}{(A'B')^2}, \text{ or}$$

$$\frac{ABCDE}{A'B'C'D'E'} = \frac{(AB)^2}{(A'B')^2}. \text{ (§180, III.)}$$

(The second part of the theorem follows from §193, Theorem 71.)

211. Theorem 83.—The square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides.



Hyp. Given the triangle ABC with a right angle at C.

Con. $(AB)^2 = (AC)^2 + (BC)^2$.

Hint. Draw the perpendicular from C on AB, meeting it at D.

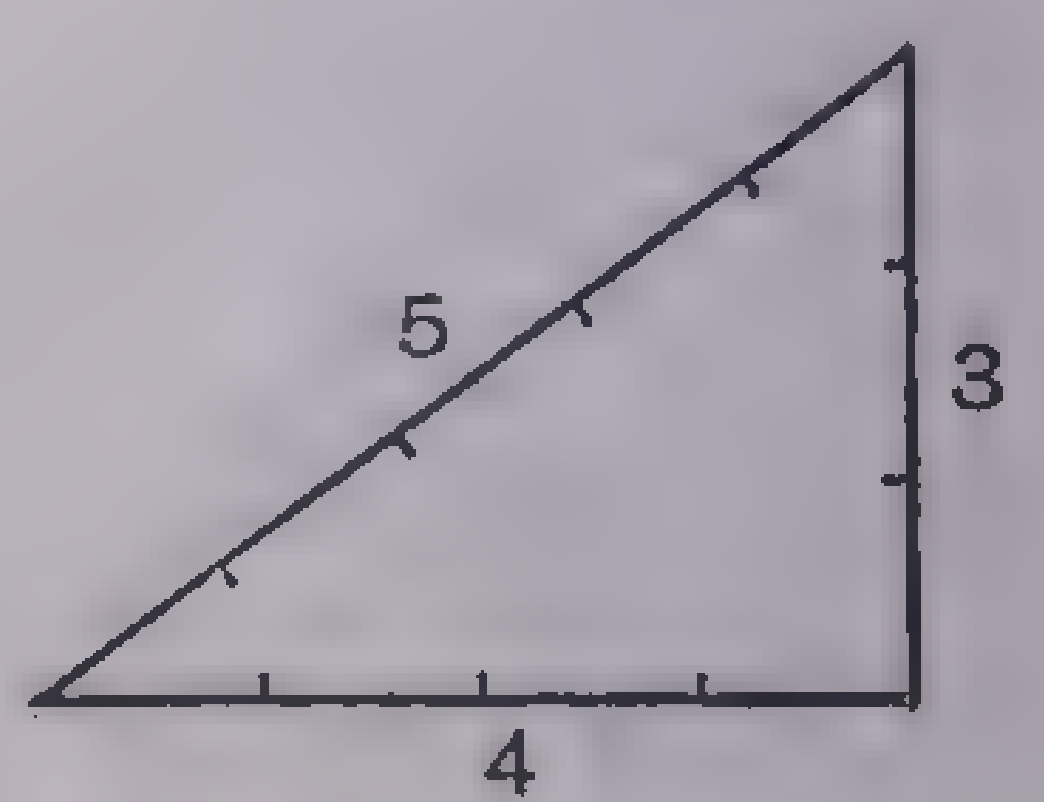
$(AC)^2 = (AB)(AD)$.

$(BC)^2 = (AB)(DB)$. (§194, Theorem 72.)

$\therefore (AC)^2 + (BC)^2 = (AB)(AD) + (AB)(DB) = AB(AD + DB) = (AB)^2$.

This theorem is one of the most important of the theorems of plane geometry. It is called the Theorem of Pythagoras, from a celebrated Greek geometer (b. 582 B. C.).

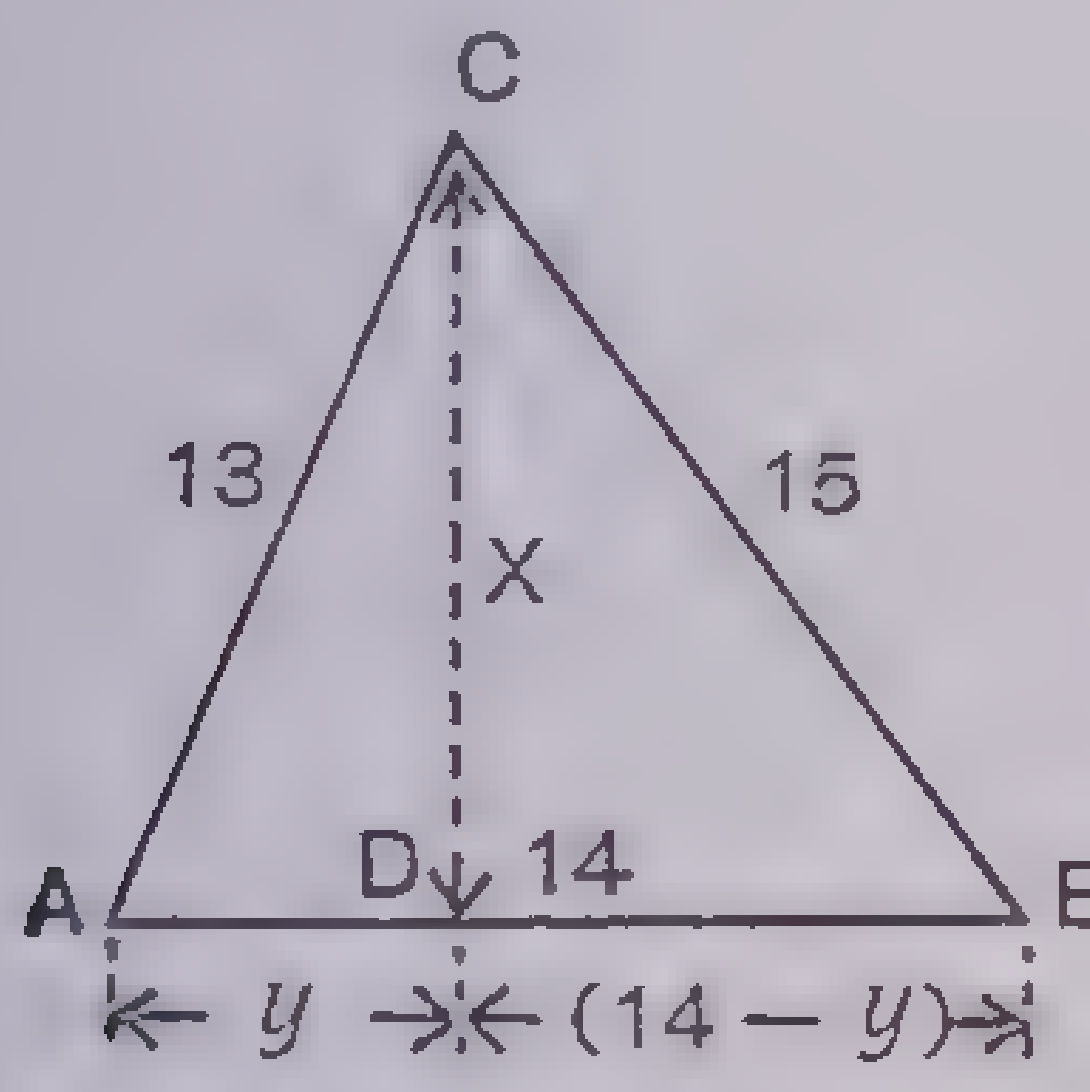
The 3, 4, 5 right triangle was known to the Egyptians, who used a rope 12 units



long, with knots in it at the proper points, to stake out a triangle whose sides should be 3, 4 and 5 units respectively, thus giving them a right angle opposite the side of 5 units.

This type of right triangle is "made to order" as an illustration of Pythagoras's theorem, for it will immediately be seen that $(5)^2 = (4)^2 + (3)^2$ or $25 = 16 + 9$. In like manner, the hypotenuse may be derived if the two legs are given, and either leg may be derived if the hypotenuse and the other leg are given.

212. Area of Any Triangle When the Three Sides are Given.—As an application of the Theorem of Pythagoras we will find the area of a triangle whose three sides are 13, 14 and 15 inches.



Let ABC be the triangle with the given sides, so that $AB = 14$, $BC = 15$ and $CA = 13$. Drop the perpendicular from C on AB, meeting it in D. Let $CD = x$, and $AD = y$, then $DB = 14 - y$. Applying the Theorem of Pythagoras to the right triangles ADC and CDB gives

(1) $x^2 + y^2 = (13)^2$,
(2) $x^2 + (14 - y)^2 = (15)^2$.
Squaring out (2) gives
(3) $x^2 + 196 - 28\,y + y^2 = 225$.
Subtracting (1) from (3) gives
(4) $196 - 28y = 56$,
or (5) $28y = 140$,
or (6) $y = 5$.
Substituting $y = 5$ in (1) gives
(7) $x^2 + (5)^2 = (13)^2$,
or (8) $x^2 = 144$,
or (9) $x = 12$.

The area equals one-half the base times the altitude $= \frac{1}{2}\ (14)\ (12) = 84$ square inches. (§207, Theorem 79.)

By the same method a general formula can be obtained for the area of a triangle with sides a, b, c. The formula is

$K = \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$,
where $s = \frac{1}{2}(a + b + c)$.

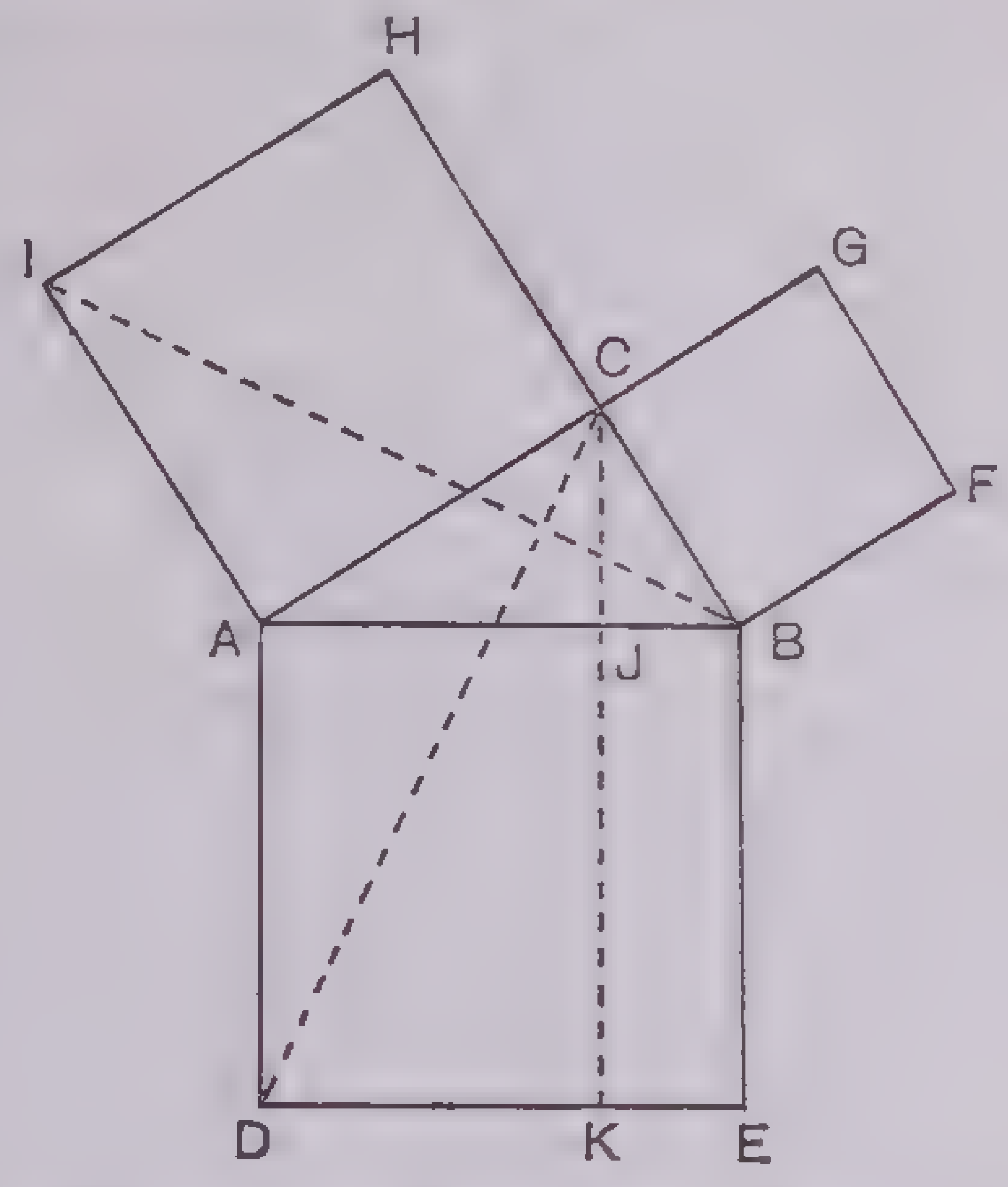
Let us apply this formula to the example above.

$a = 15$
$b = 13$
$c = 14$
$2s = a + b + c = 42$.
$\therefore s = 21$.
$s - a = 6$,
$s - b = 8$,
$s - c = 7$,
$\triangle = \sqrt{s(s-a)\ (s-b)\ (s-c)} =$
$\sqrt{(21)\ \ (6)\ (8)\ \ (7)} = \sqrt{7056} = 84$ square inches.

213.—The Theorem of Pythagoras, or Pythagorean Theorem, as it is often called, has many proofs, and its importance justifies the outline of a second one.

The proof of the theorem given in §211 with its application is *numerical* or *algebraic* rather than *geometrical*. We showed that the square *of* the hypotenuse equals . . . , etc. Now we shall show that the square *on* the hypotenuse equals . . . , etc., by actually constructing a square on it. This is another demonstration of the same theorem, but from a purely geometrical standpoint.

The square on the hypotenuse of a right triangle is equivalent to the sum of the squares on the other two sides.



Hyp. Given the triangle ABC, with C a right angle. On AB erect the square DEBA, on BC the square FGCB, on AC the square HIAC.

Con. DEBA ≎ FGCB + HIAC.

Draw CJ perpendicular to AB through C, meeting AB at J and DE at K. Draw CD and IB.

$\triangle$ IAB ≅ $\triangle$ CAD. (§64, Theorem 1.)
∴ 2($\triangle$ IAB) ≎ 2($\triangle$ CAD).
But 2($\triangle$ IAB) ≎ square HIAC.
And 2($\triangle$ CAD) ≎ rectangle ADKJ.
(§207, Theorem 79.)
∴ square HIAC ≎ rectangle ADKJ.
Similarly it may be shown that
square FGCB ≎ rectangle JKEB.
∴ Square HIAC + square FGCB ≎ rectangle ADKJ + rectangle JKEB ≎ square DEBA.

Note: When there is no risk of misunderstanding, it is more usual to employ the sign (=) instead of the sign (≎).

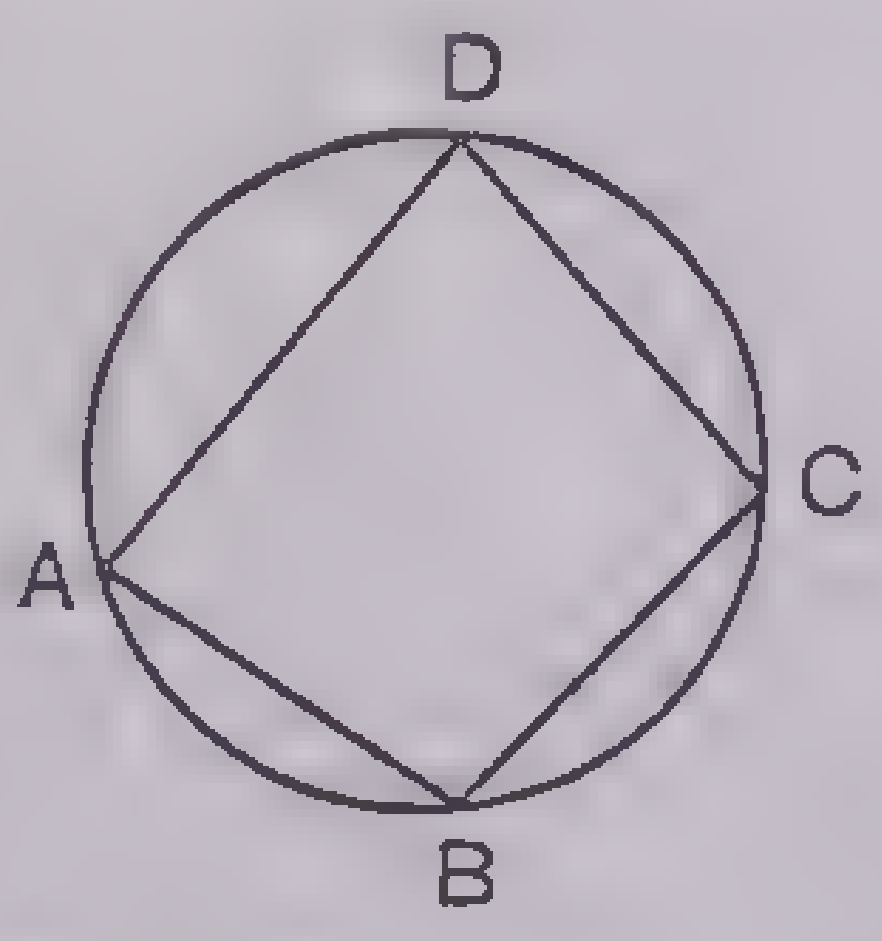
REGULAR POLYGONS AND THE MEASURE OF THE CIRCLE

214. Equilateral Polygon.—A polygon all of whose sides are equal is an equilateral polygon.

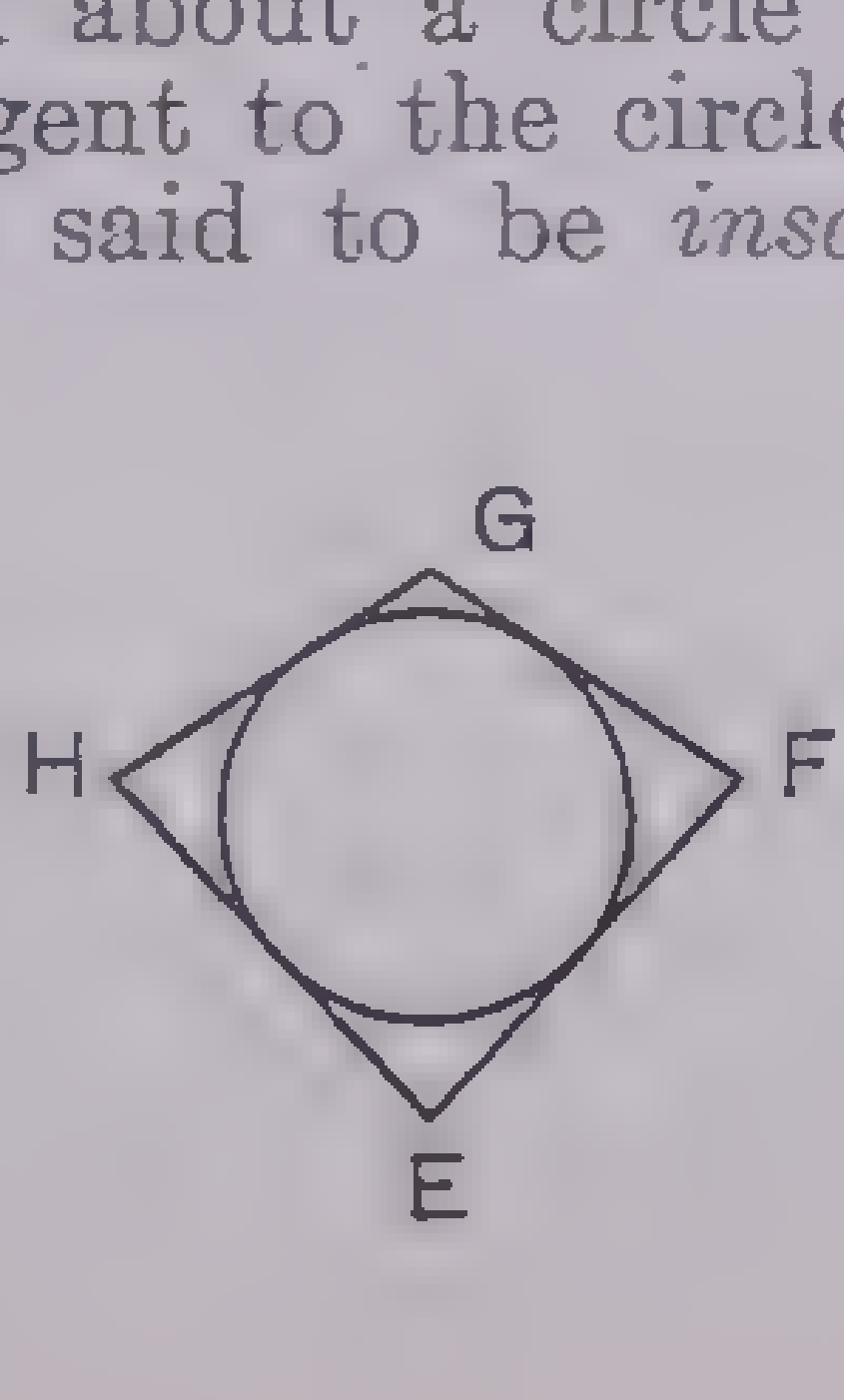
215. Equiangular Polygon.—A polygon all of whose interior angles are equal is an equiangular polygon.

216. Regular Polygon.—A regular polygon is a polygon all of whose angles and all of whose sides are equal. It is both equilateral and equiangular.

217. Inscribed Polygon.—A polygon is inscribed in a circle when all its vertices lie on the circumference, as ABCD. The circle is said to *circumscribe* the polygon.

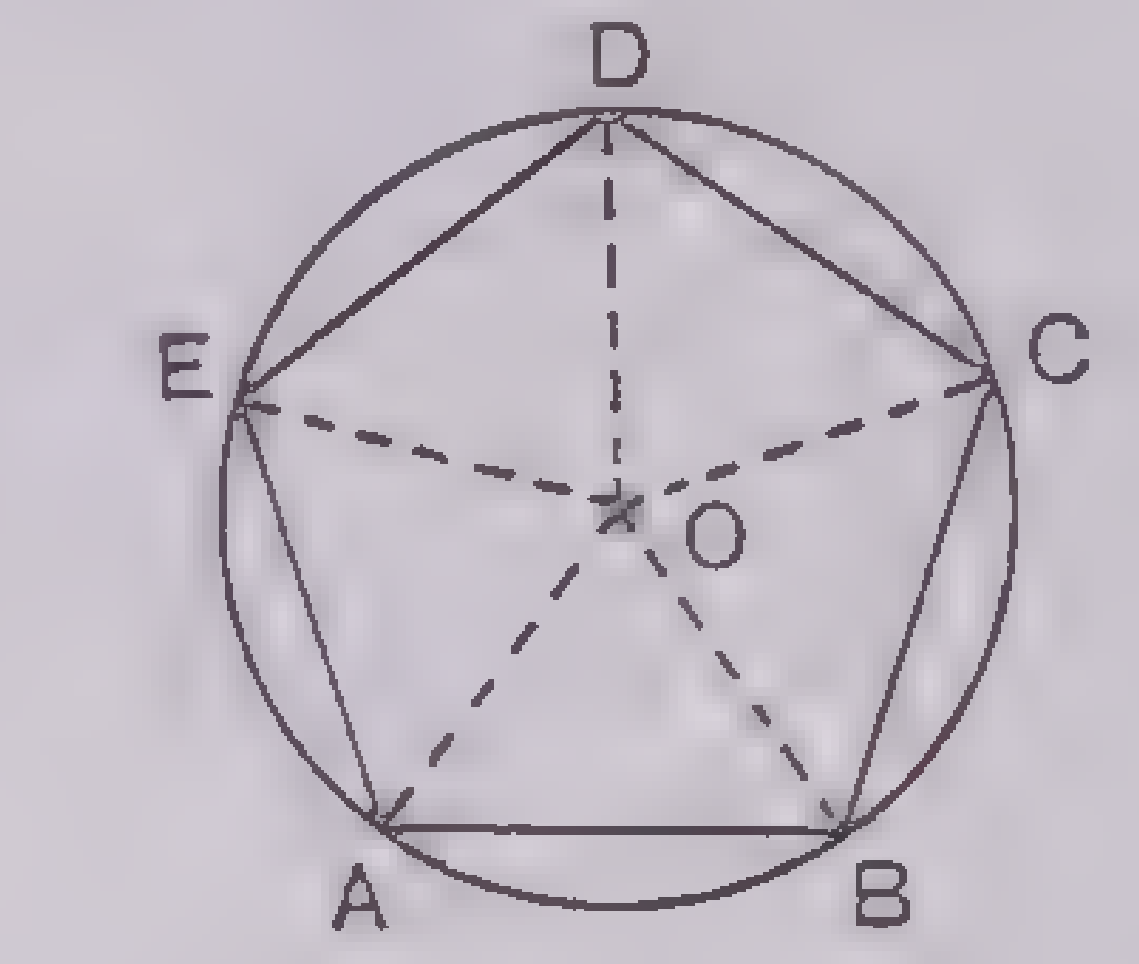


218. Circumscribed Polygon.—A polygon is circumscribed about a circle when all its sides are tangent to the circle, as EFGH. The circle is said to be *inscribed* in the polygon.



219. Apothem.—The apothem of a regular polygon is the perpendicular from the center of its circumscribed or inscribed circle to any side of the polygon.

220. Theorem 84.—An equilateral polygon inscribed in a circle is a regular polygon.



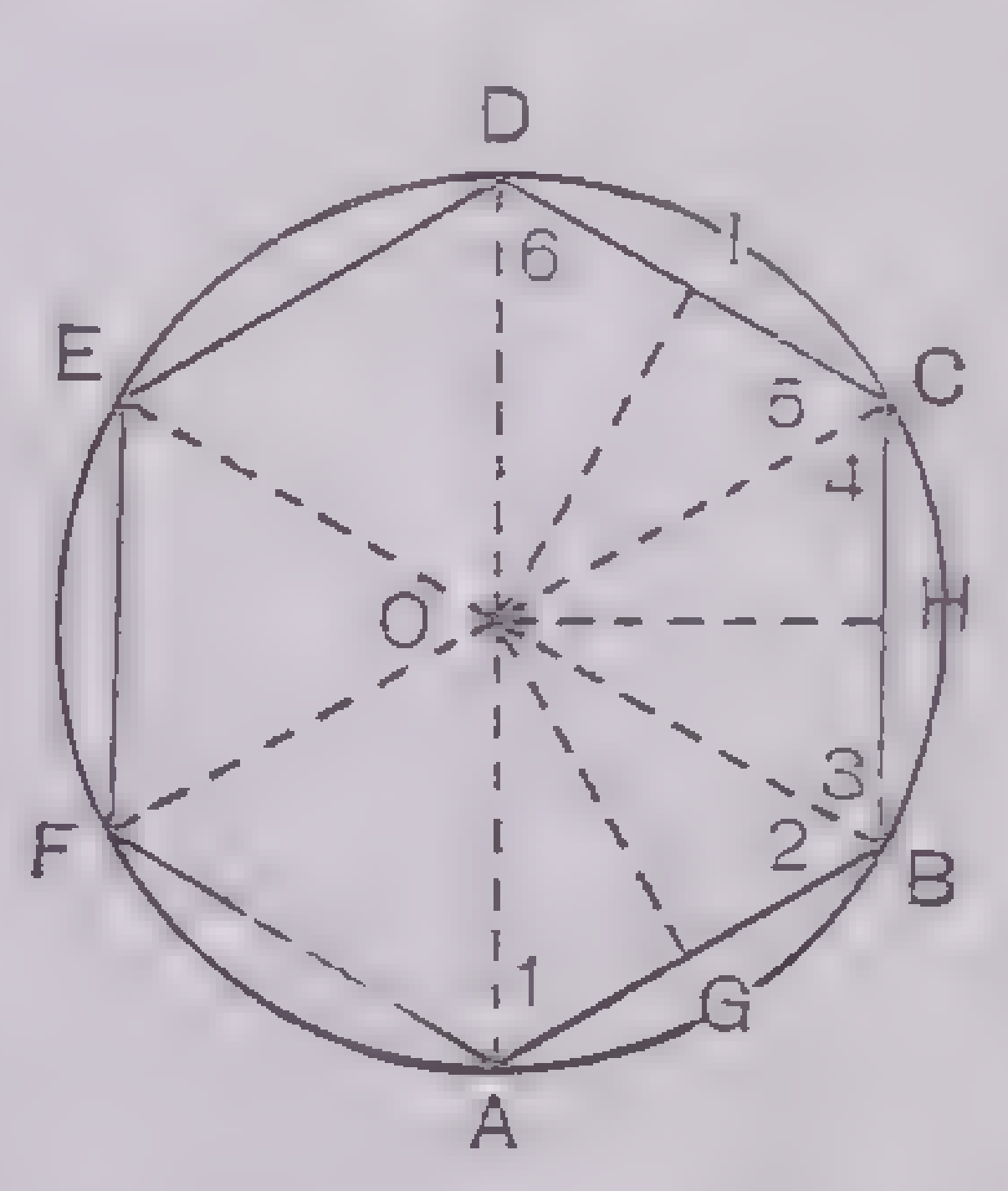
Hyp. The sides of the polygon ABCDE inscribed in the circle are equal, $AB = BC = CD = DE = EA$.

Con. The polygon is a regular polygon.

Hint. A regular polygon has all of its sides and all of its angles equal, (§216). Since the sides are equal by hypothesis, it remains to prove that the angles are equal. Angle A is measured by $\frac{1}{2}$ arc BCDE, which is 3/5 of a circumference. (§169, Theorem 57.) In the same way angle B is measured by $\frac{1}{2}$ arc AEDC, which is 3/5 of a circumference. Hence $\angle A = \angle B = \angle C = \angle D = \angle E$.

A second method of proof is to draw the radii OA, OB, OC, OD, OE, and show that all the triangles OAB, ODC, OCD. . . . . . are congruent.

221. Theorem 85.—A circle may be circumscribed about any regular polygon, and a circle may also be inscribed in it.



Hyp. Given the regular polygon ABCDEF.

Con. A circle may be circumscribed about ABCDEF, and a circle may be inscribed in ABCDEF.

Hint. Draw the circle through the three points A, B and C. Let the center of this circle be O. (§147, Theorem 39.) Draw the radii OA, OB, OC and the line OD, which we do not know to be a radius of the circle until we prove that it is.

$OB = OC$ and $AB = CD$.
$\angle 2 + \angle 3 = \angle 4 + \angle 5$.
But $\angle 3 = \angle 4$.
$\therefore \angle 2 = \angle 5$.
∴ $\triangle$ OAB ≅ $\triangle$ OCD. (§64, Theorem 1.)
∴ $OA = OD$ and OD is a radius of the circle. Similarly OE and OF are proved to be radii.

To prove that a circle can be inscribed: Draw all the perpendiculars from O to the sides of the polygon, as OG, OH, OI, . . . and prove these all equal. Then a circle with O as center and OG for radius will pass through G, H, I . . . and this circle will be tangent to the sides AB, BC, CD, . . . (§161, Theorem 53.)

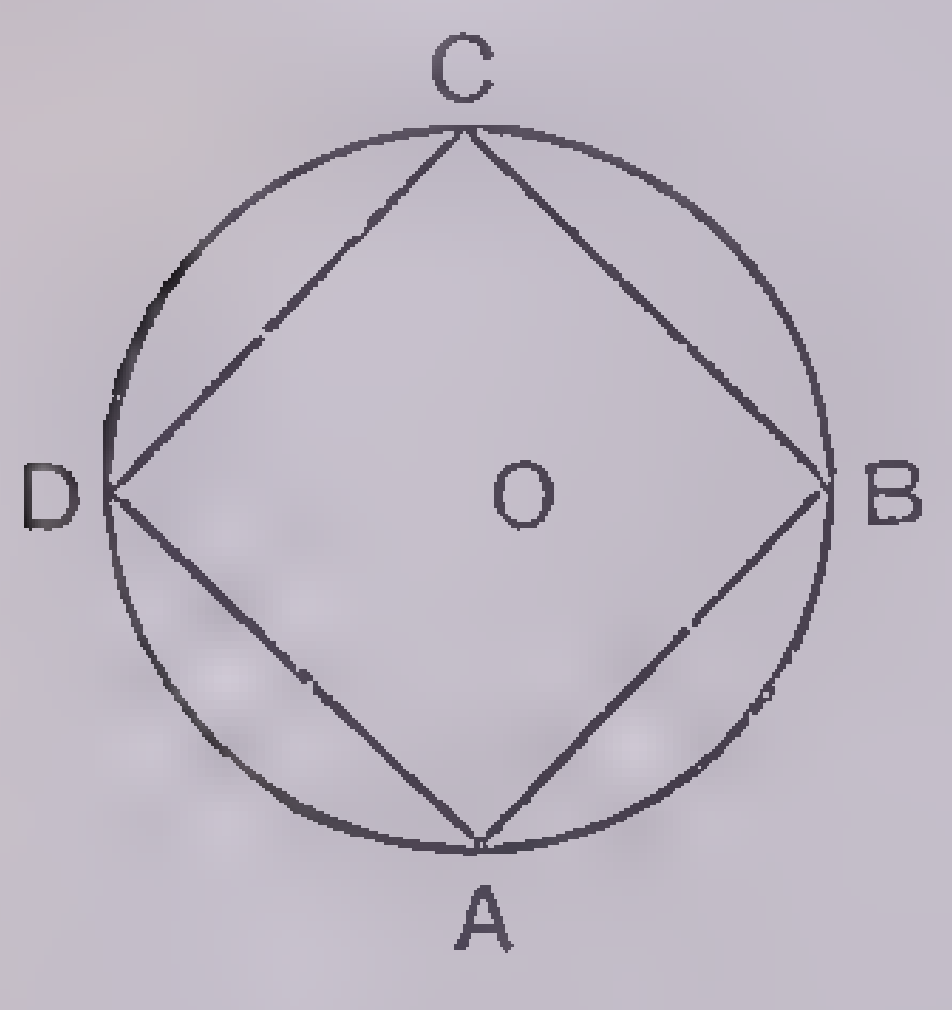
Hence the centers of the inscribed and circumscribed circle coincide.

222. Center of a Regular Polygon.—The center of a regular polygon is the common center of its circumscribed and inscribed circles, as the point O of §221.

223. Radius of a Regular Polygon.—The radius of a regular polygon is the radius of the circumscribing circle, as OA of §221.

224. Angle at the Center of a Regular Polygon.—The angle at the center of a regular polygon is the angle subtended by a side of the polygon considered as a chord of its circumscribed circle, as angle AOB of §221.

225. Theorem 86.—If a circle be divided into any number of equal parts, the chords joining the successive points of division form a regular polygon inscribed in the circle; and the tangents drawn at the points of division form a regular polygon circumscribed about the circle.



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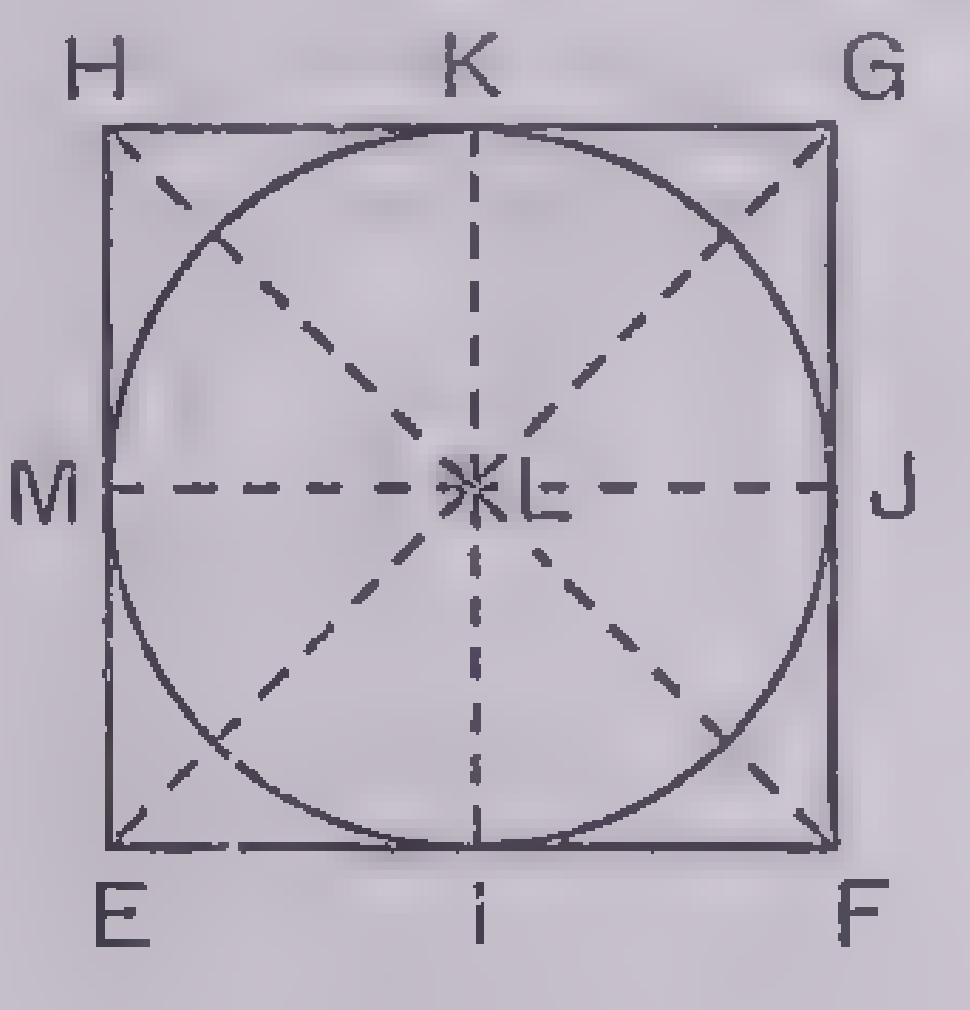


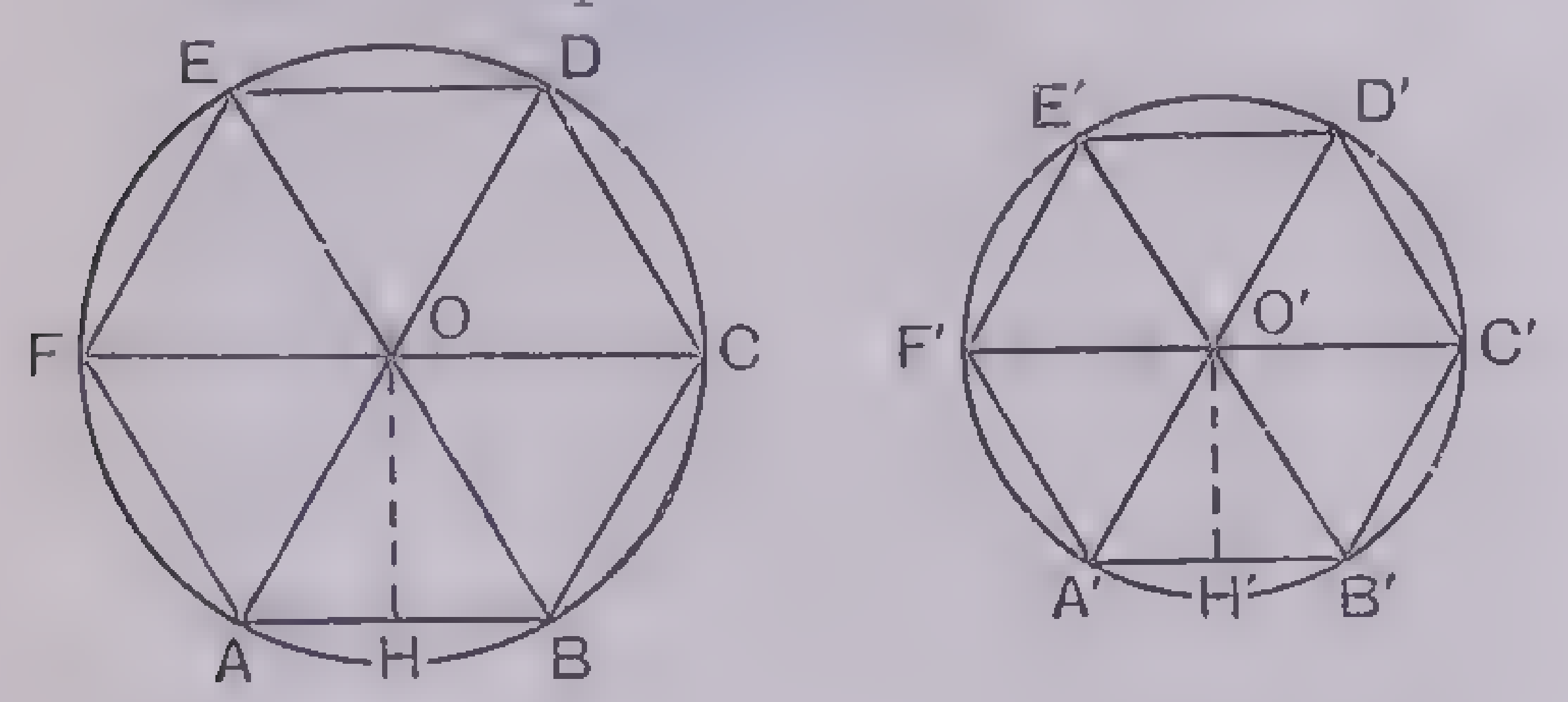
II

See Figure I. Hint. The sides AB, CB, . . . are equal, for the arcs AB, CB, . . . are equal by hypothesis. (§150, Theorem 42.) The angles A, B, ... are equal, for they are measured by equal arcs. (§169, Theorem 57.) See Figure II. Hint. Triangles LJF and LIF are congruent. (§87, Theorem 15.) Hence IF = FJ = JG = ... therefore the sides are equal, or FG = GH = HE. . . . Also ∠ IFL = ∠ LFJ = ∠ LGJ = . . . hence the angles are equal, or ∠ F = ∠ G = ∠ H = ...

226. Theorem 87.—Regular polygons of the same number of sides are similar.

Hint. We must prove that their angles are equal and that their sides are in proportion. They can be inscribed in circles. (§221, Theorem 85.) Their angles are equal, for they are measured by one-half of the same fractional part of a circumference. Since all the sides of each polygon are equal, the ratio of a side of the first to a side of the second is constant, hence the corresponding sides are in proportion.

227. Theorem 88.—The perimeters of regular polygons of the same number of sides are to each other as the radii of the circumscribed circles, or as the radii of the inscribed circles; and their areas are to each other as the squares of the radii.



Hint.

$$\frac{AB + BC + CD + DE + EF}{A'B' + B'C' + C'D' + D'E' + E'F'} = \frac{6(AB)}{6(A'B')} = \frac{AB}{A'B'} = \frac{OB}{O'B'},$$ since triangles OAB and O′A′B′ are similar. Also let OH and O′H′ be the perpendiculars upon AB and A′B′ from the centers O and O′ respectively; then the triangles OHB and O′H′B′ are similar and

$$\frac{OB}{O'B'} = \frac{OH}{O'H'}.$$ Thus

$$\frac{\text{perimeter of ABCDEF}}{\text{perimeter of } A'B'C'D'E'F'} = \frac{OB}{O'B'} = \frac{OH}{O'H'}.$$

$$\frac{\text{area of ABCDEF}}{\text{area of } A'B'C'D'E'F'} = \frac{(AB)^2}{(A'B')^2} = \frac{(\text{perimeter of ABCDEF})^2}{(\text{perimeter of } A'B'C'D'E'F')^2}.$$

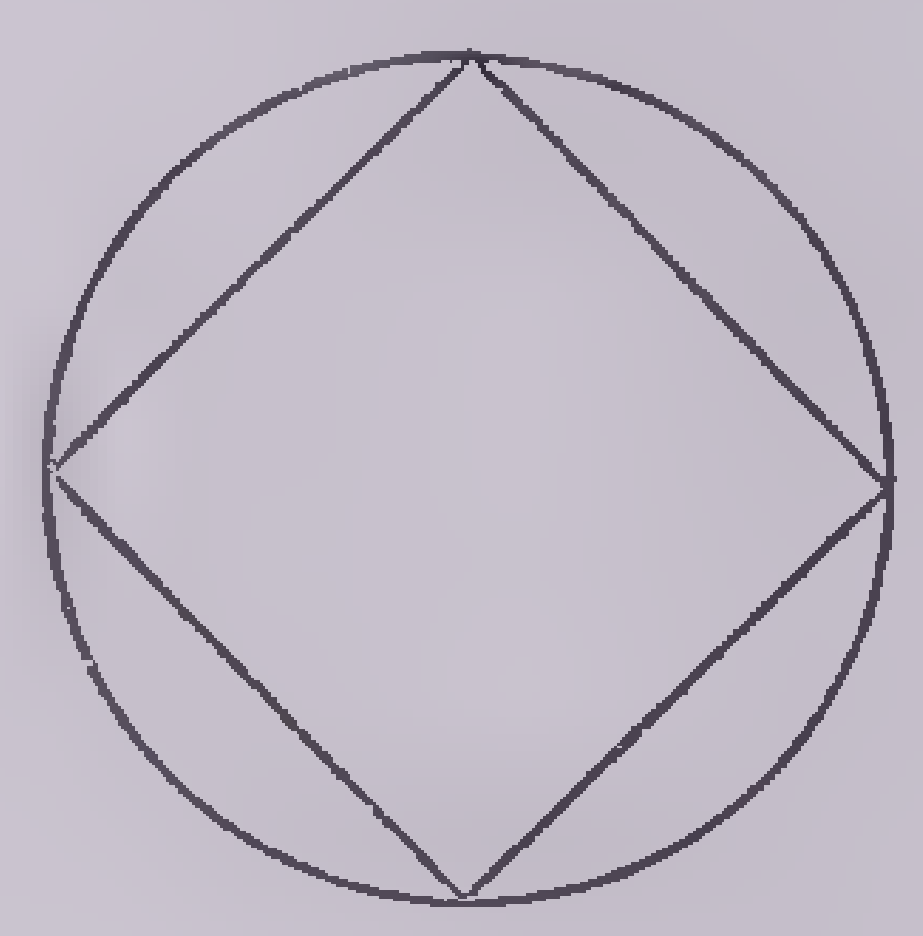
(§210, Theorem 82.) Since $\frac{AB}{A'B'} = \frac{OB}{O'B'} = \frac{OH}{O'H'}$, then $\frac{(AB)^2}{(A'B')^2} = \frac{(OB)^2}{(O'B')^2} = \frac{(OH)^2}{(O'H')^2}$. (§43, Axiom.) Therefore

$$\frac{\text{area of ABCDEF}}{\text{area of } A'B'C'D'E'F'} = \frac{(OB)^2}{(O'B')^2} = \frac{(OH)^2}{(O'H')^2}.$$

228. Theorem 89.—The area of a regular polygon is equal to one-half the product of its perimeter and its apothem.

Hint. Use the figure of the previous theorem, area ABCDEF = 6(area ABO) = 6(½) (AB) (OH) = ½(6AB) (OH) = ½ (perimeter of ABCDEF) (apothem). (§219. Definition.)

229. The Relation of the Regular Polygons to the Circle.—While the theorems on regular polygons have in themselves interest and use, they have been developed chiefly in order that they might be applied to the circle. We may look upon the circle as a regular polygon of an infinite number of sides.



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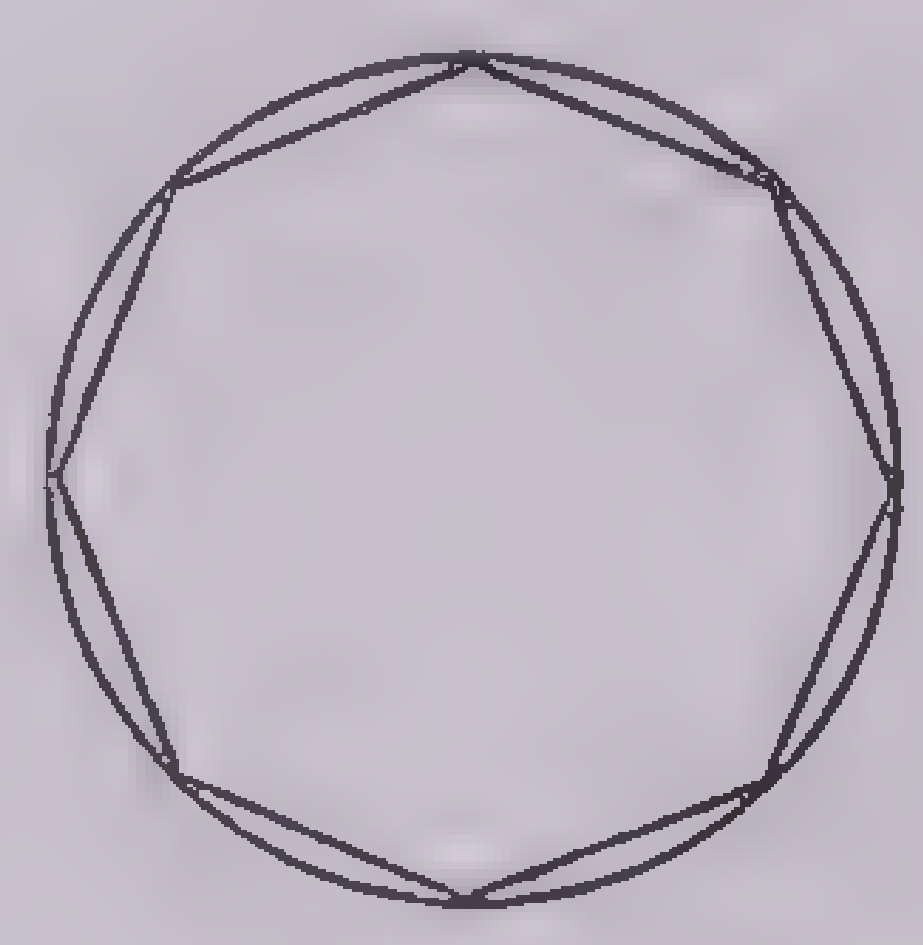


II

III

Take a series of equal circles. In the first circle inscribe a regular polygon of 4 sides (a square), in the second inscribe a regular polygon of 8 sides, in the third inscribe a regular polygon of 16 sides, in the fourth inscribe a regular polygon of 32 sides.

As this process continues the area of the polygon more nearly approaches the area of the circle, the perimeter of the polygon more nearly approaches the circumference of the circle, and the apothem of the polygon more nearly approaches the radius of the circle. If we were able to continue this process an infinite number of times, the polygon would coincide with the circle. We shall now restate our theorems for the regular polygons in such a manner that they apply to the circle.

230. Theorem 90.—The circumferences of two circles are to each other as the radii.

This follows from §227, replacing perimeter by circumference.

231. Theorem 91.—The ratio of the circumference of any circle to its diameter is a constant.

Hint. Given two circles with the radii r and r_1, with the corresponding diameters d and d_1, and with the circumferences C and C_1 then

$$\frac{C}{C_1} = \frac{r}{r_1} = \frac{2r}{2r_1} = \frac{d}{d_1}.\quad \text{(§230, Theorem 90.)}$$

Since $\frac{C}{C_1} = \frac{d}{d_1}$, $\frac{C}{d} = \frac{C_1}{d_1}$. (§180, I.)

Since $\frac{C}{d}$, or the ratio of the circumference to the diameter, is the same for any two circles, it must be a constant. This constant is always designated by the Greek letter π, or pi, pronounced "pie." Hence

$$\frac{C}{d} = \pi, \text{ or } C = \pi d.$$

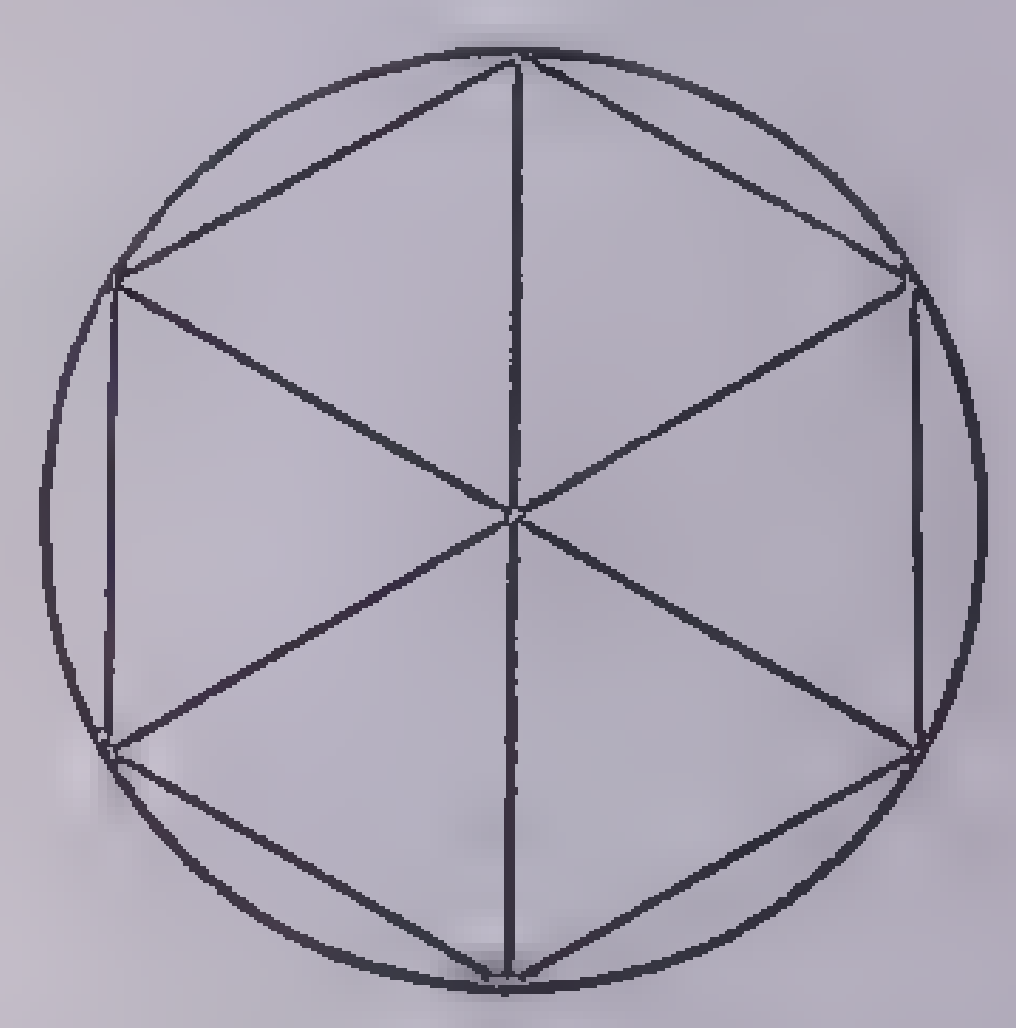
232. Theorem 92.—The areas of two circles are to each other as the squares of the radii.

Hint. This follows from §227.

233. Theorem 93.—The area of a circle is equal to half the product of its circumference and its radius; or the product of the square of the radius and the constant number π.

Hint. From §228, Theorem 89, the area of a regular polygon = ½ (perimeter) × (apothem). Considering the circle as a regular polygon of an infinite number of sides, we must replace perimeter by circumference, and apothem by radius. Therefore S = area of a circle = ½ Cr = ½ $(2\pi r)$ (r) = πr^2, replacing C by its value $2\pi r$, from §231.

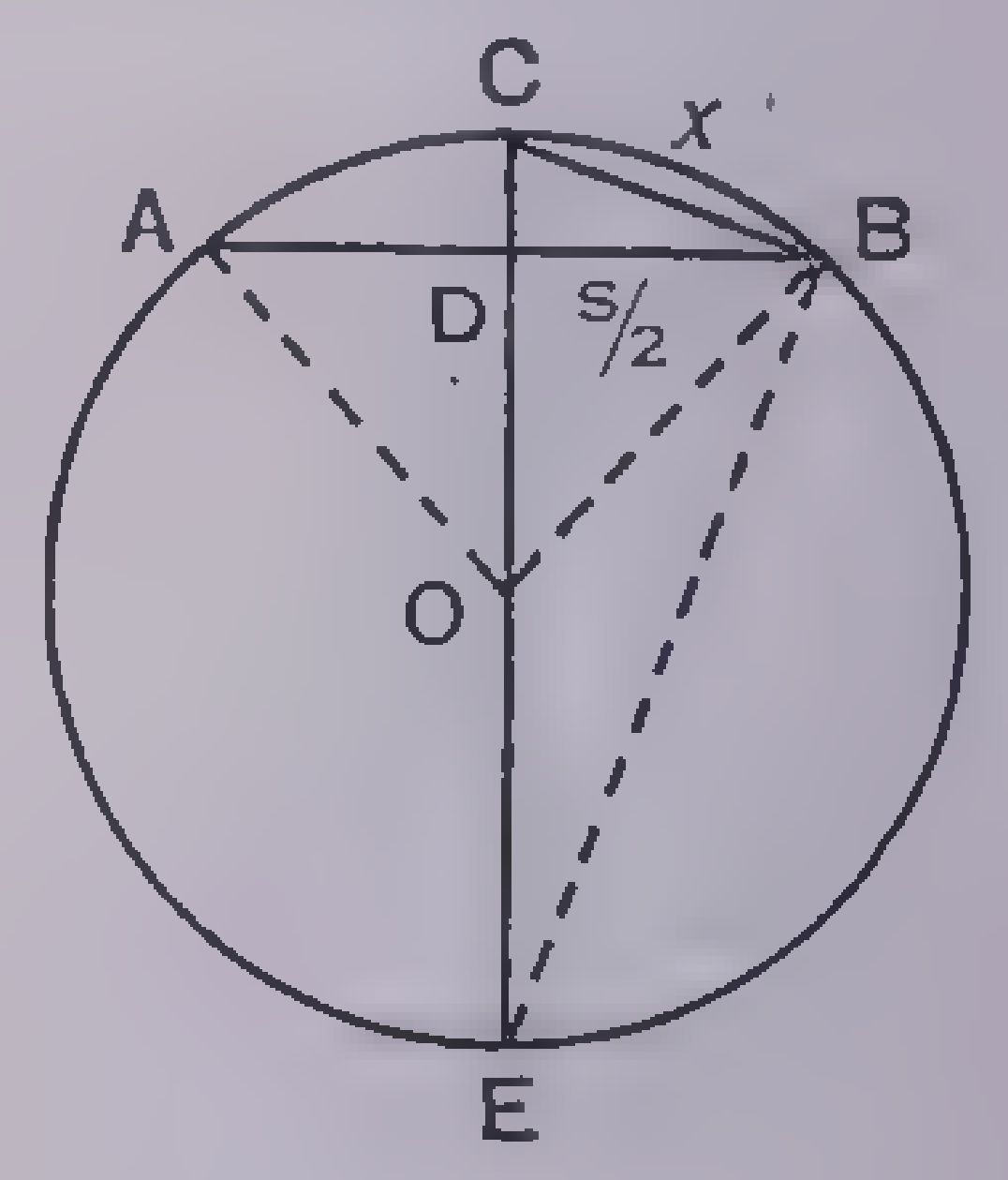
234. Computation of π.—In §257 we will show that a regular hexagon can be inscribed in a circle, and that its side is equal to the radius of the circumscribing circle.



Hence the perimeter of the hexagon is $6r$, since a hexagon has six sides. The circumference of the circle is greater than $6r$ by a certain amount. If we can calculate the perimeter of a regular polygon of 12 sides this will give us a value nearer to the circumference of the circle. (§229.) Instead of calculating the side of a regular polygon of 12 sides in terms of r, we will solve the more general problem below:

If s is the side of a regular inscribed polygon, x the side of a regular inscribed polygon having twice as many sides as the first, and r the radius of the circumscribing circle of both, find x in terms of s and r.

Hyp. Given a circle, center O and radius r. Let s = AB, the side of a regular inscribed polygon and x = CB, the side of a regular inscribed polygon of double the number of sides.



Required. To find the value of x in terms of s and r.

Hint. Draw the diameter CE and the lines OB and BE. Since chord AC = chord CB, CO is perpendicular to AB and meets it at a point D. Triangle CBE is a right triangle, and $(CB)^2 = x^2 = (CD)\ (CE)$. (§194, Theorem 72c.)

Hence $x = \sqrt{(CD)\ (CE)} = \sqrt{(CD)\ (2r)}$. But CD = CO − DO = r − DO and DO = $\sqrt{(OB)^2 - (DB)^2}$ =

$$\sqrt{r^2 - \left(\frac{s}{2}\right)^2}.\quad \text{(§211, Theorem 83.)}$$

Hence $CD = r - \sqrt{r^2 - \left(\frac{s}{2}\right)^2}$, and replacing CD by this value in $x = \sqrt{2r(CD)}$ we have the formula desired:

$$x = \sqrt{2r^2 - 2r\sqrt{r^2 - \left(\frac{s}{2}\right)^2}}.$$

If we now put $s = r$ in this equation we will find the length of the side of a regular polygon of 12 sides.

$$x = \sqrt{2r^2 - 2r\sqrt{r^2 - \frac{r^2}{4}}} = r\sqrt{2 - \sqrt{3}}.$$

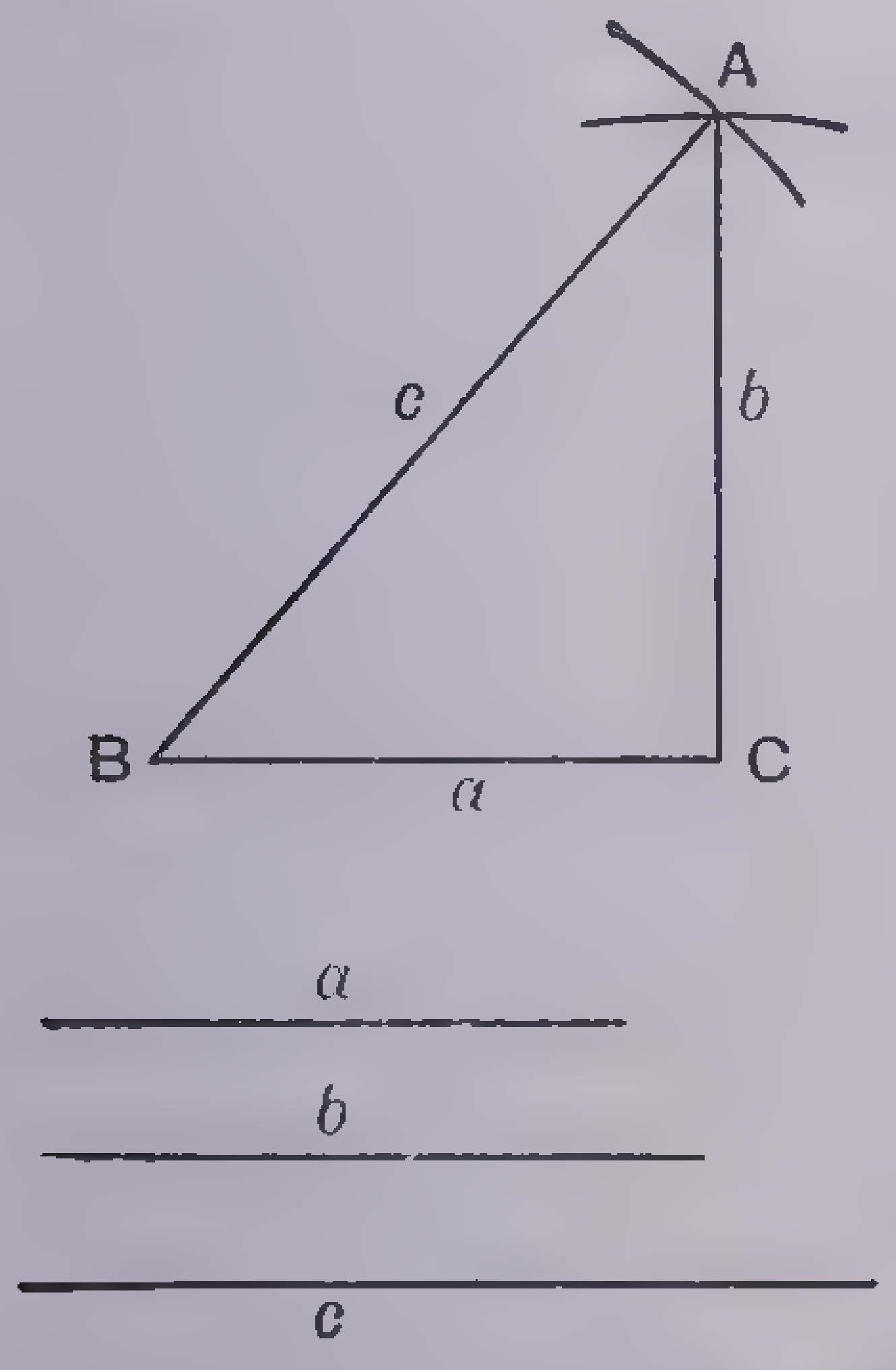
Multiplying this by 12 gives the perimeter of a regular polygon of 12 sides, the value is $6.211657r$. It is possible to continue the calculations for regular polygons of 24, 48, 96, . . . sides. When the value is calculated for a regular polygon of 1,536 sides, the perimeter of the polygon is $6.28318r$, dividing by $2r$ gives the value of $\pi = 3.14159$, correct to 5 decimal places. In advanced mathematics other and easier methods have been developed for the calculation of this important constant.

PROBLEMS OF CONSTRUCTION

235. Constructions by ruler and compasses.—The fact that we can define an object does not prove that it exists. We define a secant line as a line which cuts a circle in two points. We might define a hypersecant as a straight line which cuts a circle in three points, but it is impossible to draw such a line; in fact it is possible to prove it does not exist. Having defined a geometrical object, the mathematician proceeds, if possible, to prove that it exists. For instance, in §69 we made use of the bisector of an angle; we did not at that time tell how to construct the bisector, we merely assumed that it was possible to construct it in some as yet unknown manner. Again and again we have drawn lines which we assumed were perpendicular to each other. We will now proceed to show how to carry out these constructions with the use of the ruler and compasses.

The constructions are not always given in full, it being assumed that the methods of a previous construction need not be indicated in full in a drawing.

236. To construct a triangle, when the three sides are given.—

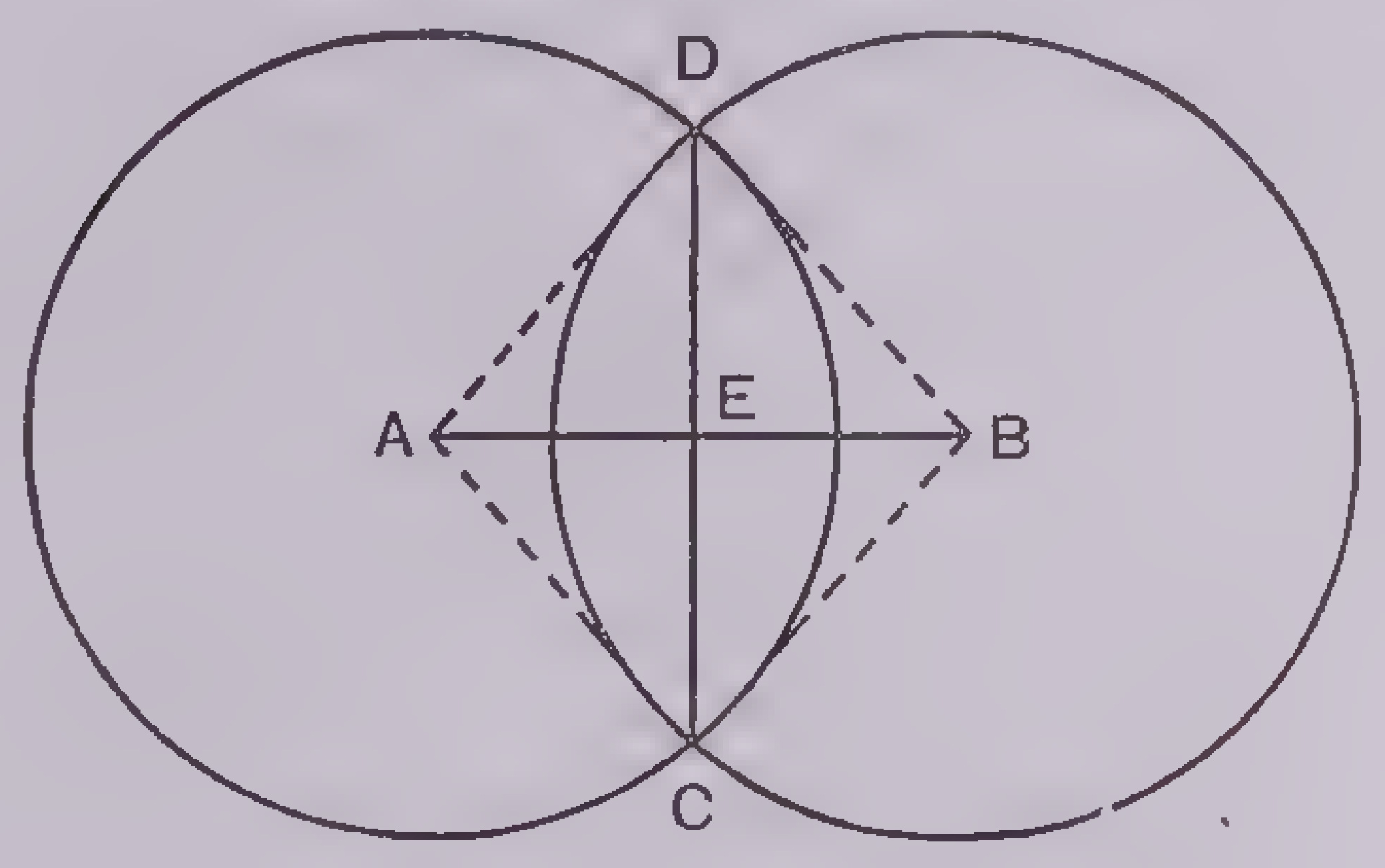


Given the three sides of a triangle a, b and c.

Required to construct the triangle with these segments for sides.

By use of the compasses mark off BC equal to a. With B as center draw a circle of radius c, with C as center draw a circle of radius b, and let these two circles intersect in A. Triangle ABC is the required triangle.

237. To bisect a given line.—

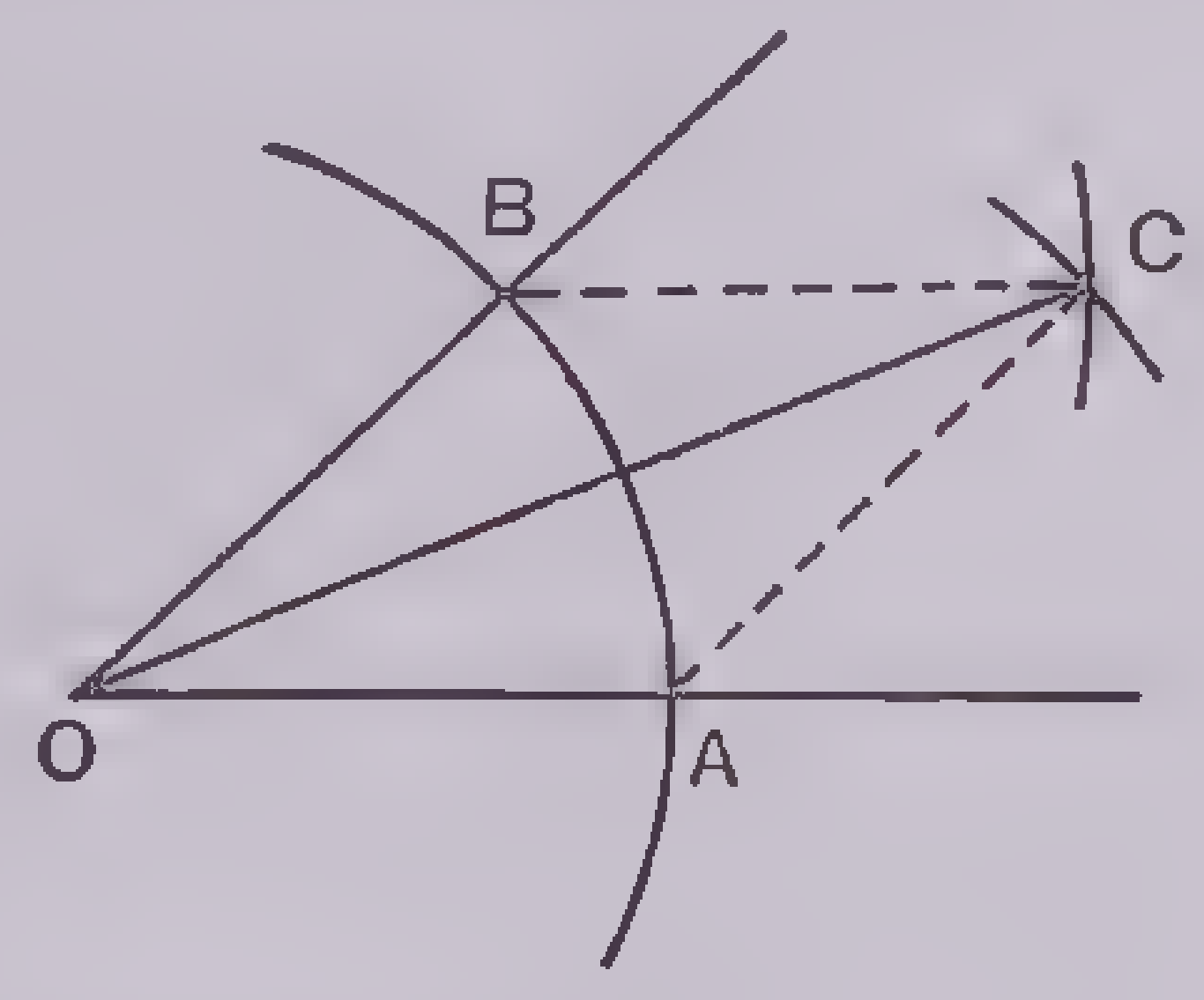


Given the line AB.

Required to construct the midpoint of AB.

Choosing a convenient radius, draw two circles with A and B as centers. Let these two circles intersect in C and D, and let CD intersect AB in E. The required midpoint of AB is E. (§91, Theorem 17.)

238. To bisect a given angle.—



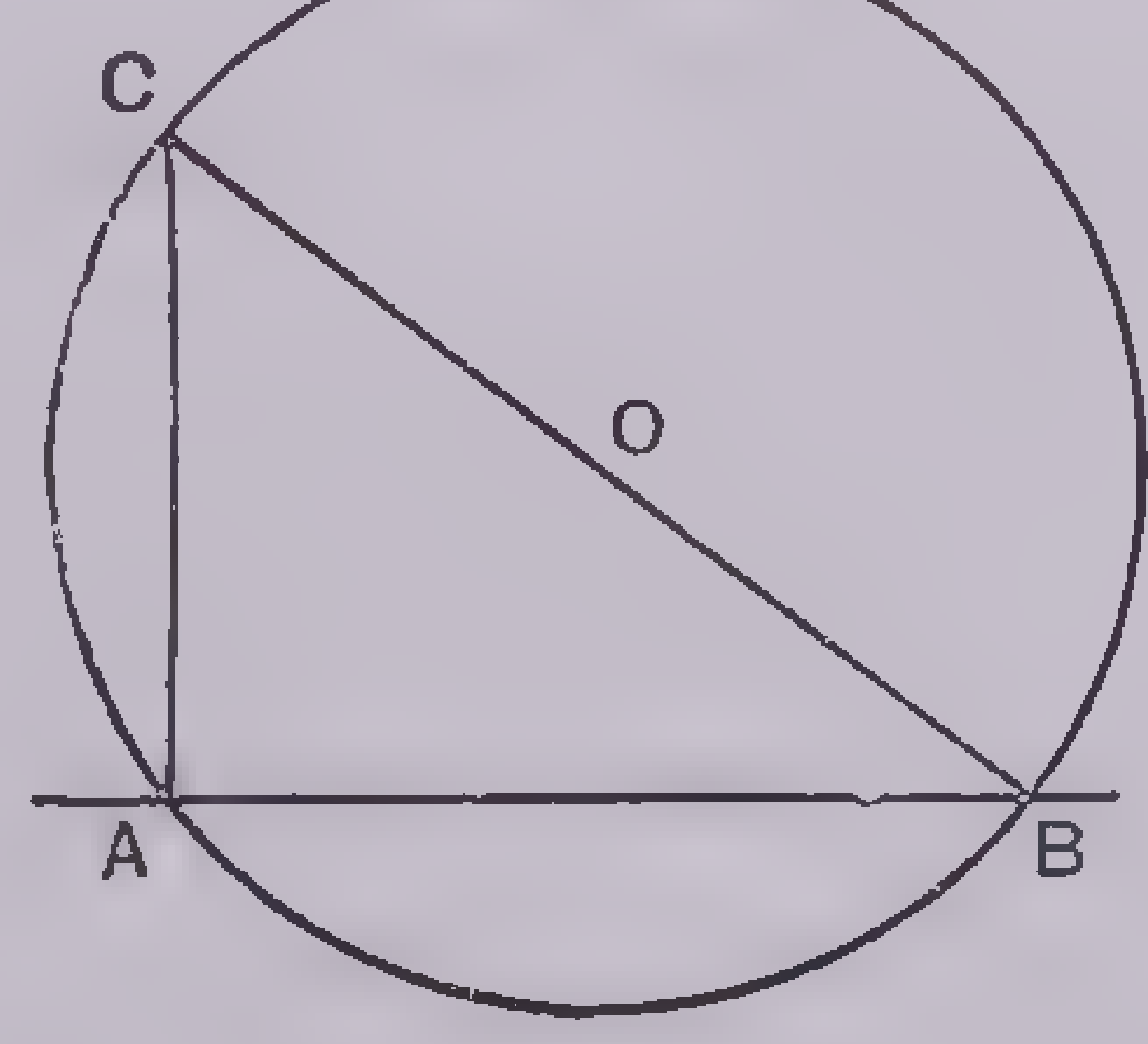
Given the angle AOB.

Required to construct the line bisecting the given angle.

Choosing a convenient radius, draw a circle intersecting the sides of the angle in A and B. Draw two circles with A and B as centers, both circles having the same radius, and let C be the point of intersection of these circles. Draw OC. OC is the required bisector.

Consider the triangles OAC and OBC; OA = OB—radii of the same circle; AC = BC—radii of two equal circles; OC is common. Therefore the triangles are congruent. (§77, Theorem 9.) Angles AOC and BOC are equal, and AC is the bisector required.

239. At a given point in a straight line to erect a perpendicular to the line.—



Given a line AB and a point A on it.

Required to construct the line through the point A perpendicular to the given line.

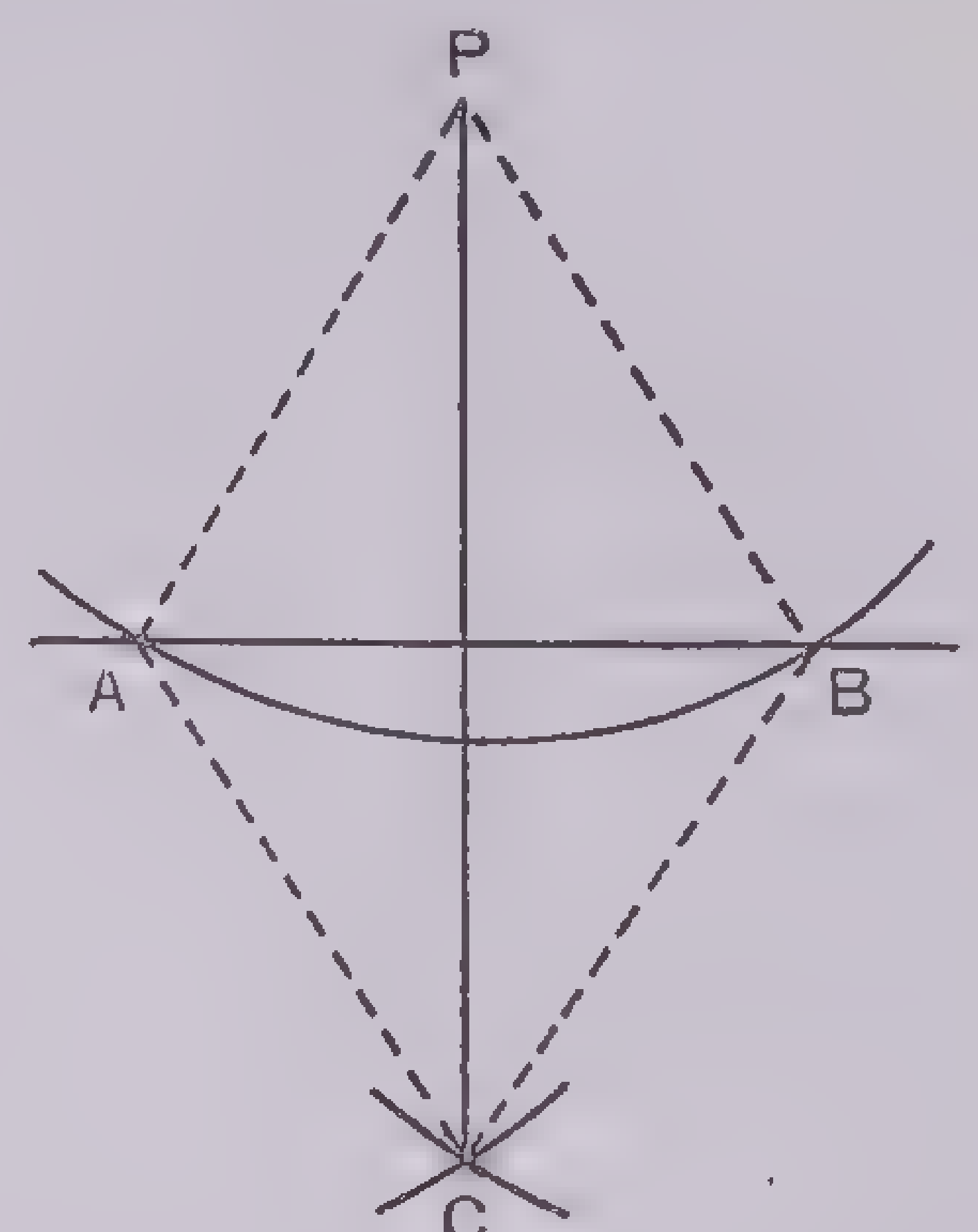
Choose a convenient point as O, and with a radius OA draw a circle cutting AB at A, and at a second point B. Draw the diameter of the circle, BC, and the line AC. Angle BAC is measured by one-half of a semicircle and thus is a right angle. (§170, Theorem 58.) Therefore AC is the required line.

240. From a given point to let fall a perpendicular upon a given line.—

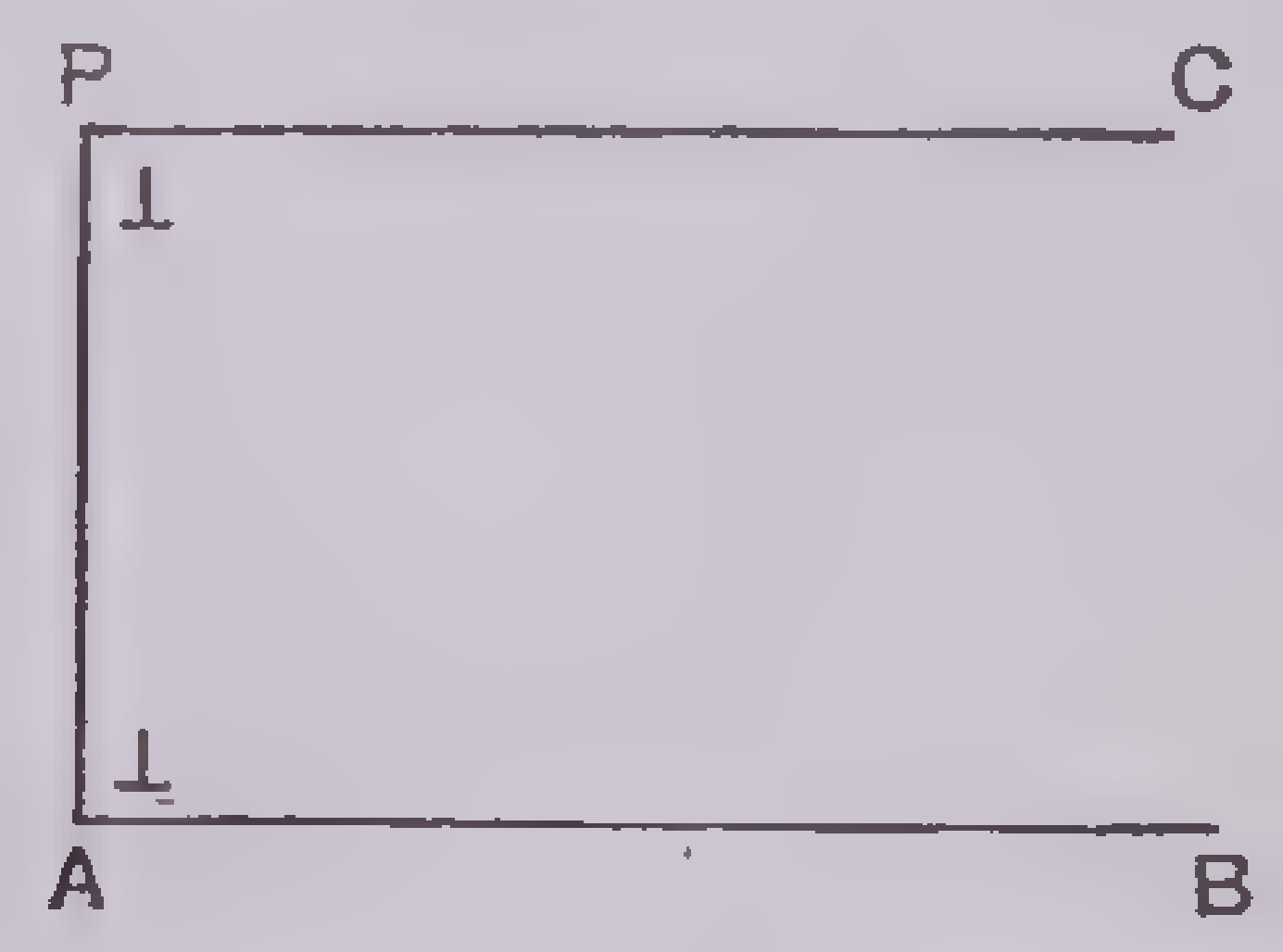
Given a line AB and a point P outside the line.

Required to construct the line through P perpendicular to AB.

Draw a circle with P as center cutting the given line in any two points, as A and B. Draw two circles with A and B as centers and having the same radius. Let these two circles intersect in C. Then AP = PB—radii of the same circle; CA = CB—radii of equal circles. Therefore P and C are each equidistant from A and B. Hence PC is the required perpendicular. (§89, Theorem 16.)



241. Through a given point to draw a line parallel to a given line.—

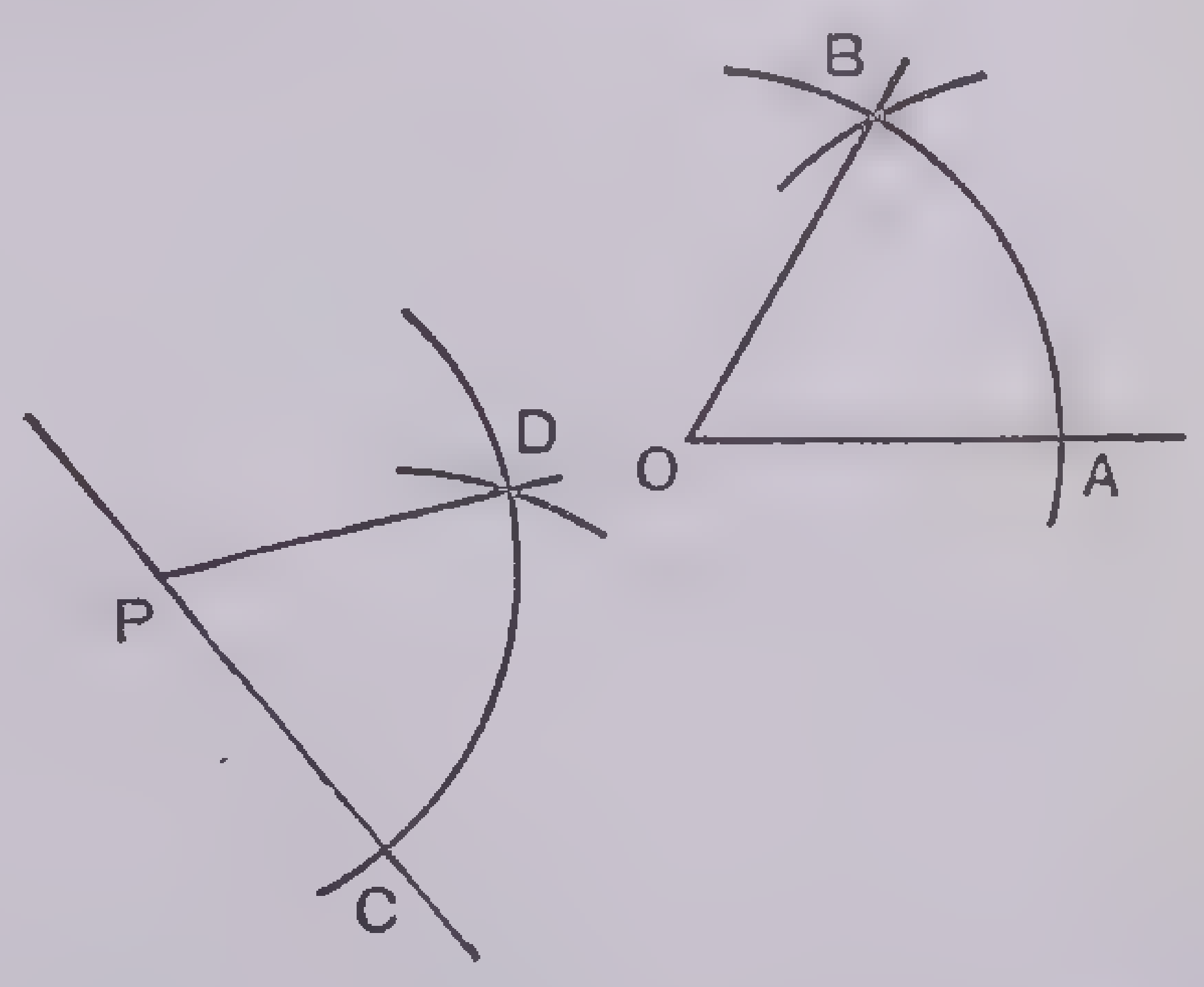


Given a line AB and a point P outside the line.

Required to construct the line through the point P parallel to the line.

From P draw the perpendicular to the line AB; let this line be PA. At P draw the perpendicular PC to the line PA. Then PC is the required parallel to AB. (§93, Theorem 18.)

242. Through a given point on a straight line, to draw a line making a given angle with the given line.—



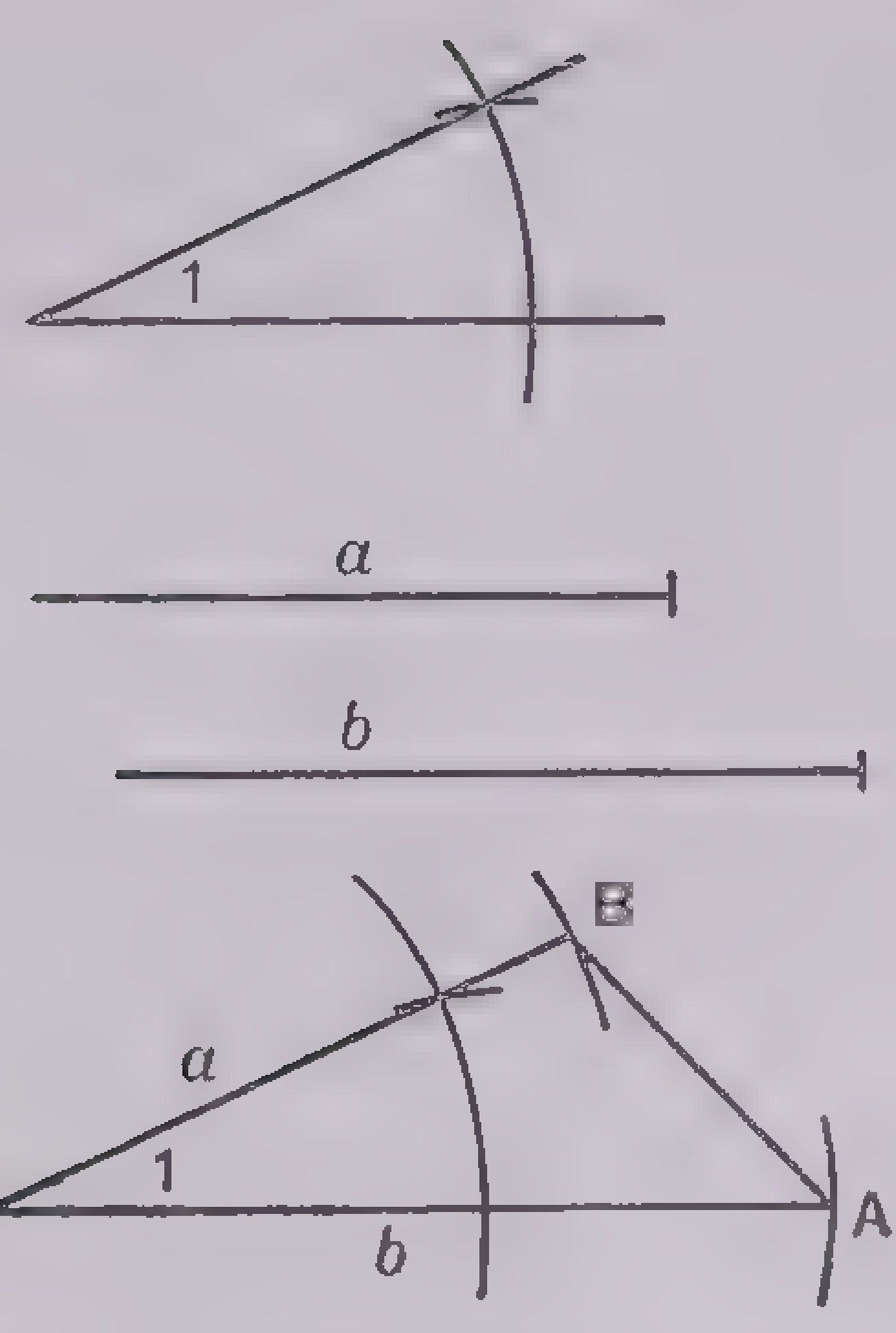
Given a line PC with a given point P upon it, let angle AOB be the given angle.

Required to draw the line through P forming with PC an angle equal to the given angle.

Draw a circle with O for center, cutting the sides of the given angle in the points A and B. With the same radius draw a circle with P for center. Draw a circle with C for center having AB for radius; let D be the point of intersection of the two arcs having P and C for centers. Angle CPD is the required angle. (§149, Theorem 41.)

243. To construct a triangle, when two sides and the included angle are given.—

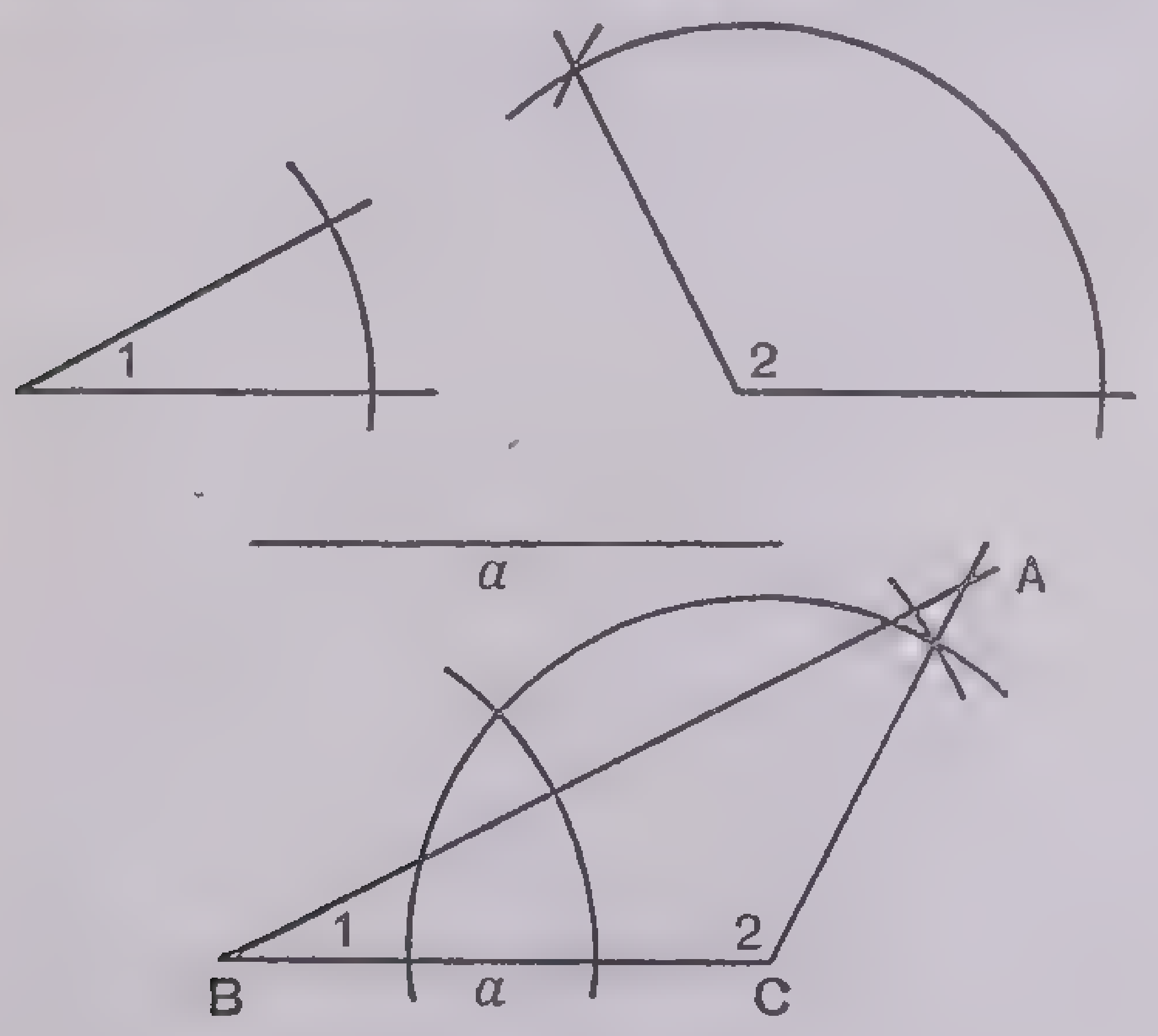
Given the angle 1 and the segments a and b.



Required to construct the triangle, which has *a* and *b* for two sides, including the given angle 1.

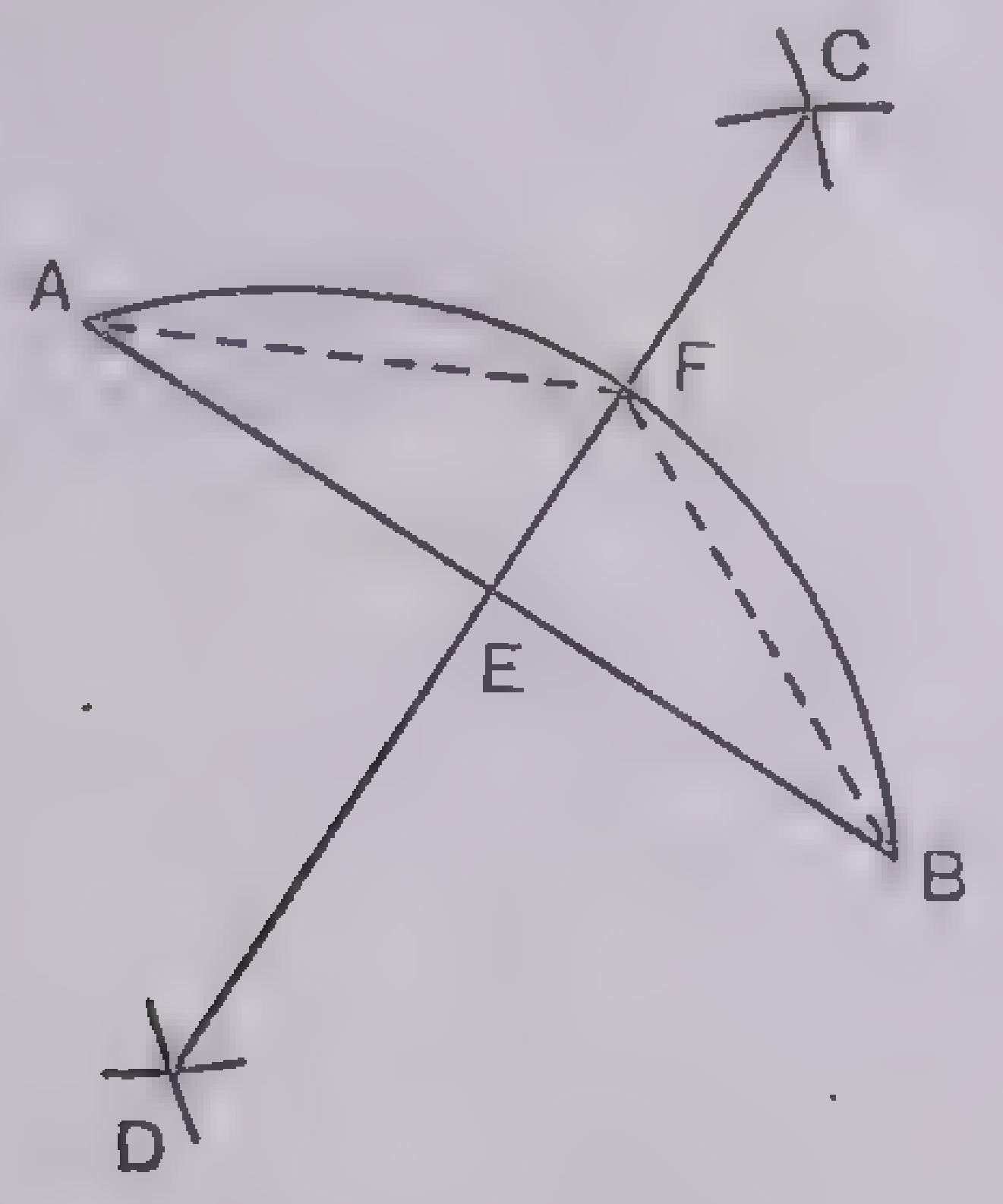
By the method of §242 construct the angle ACB equal to the given angle 1. Mark off CB equal to the segment *a*, and CA equal to the segment *b*. Draw AB. ABC is the required triangle.

244. To construct a triangle when two angles and the included side are given.—



The method is the same as the previous construction.

245. To bisect a given circular arc.—



Given the circular arc AB.

Required to construct the midpoint of the arc.

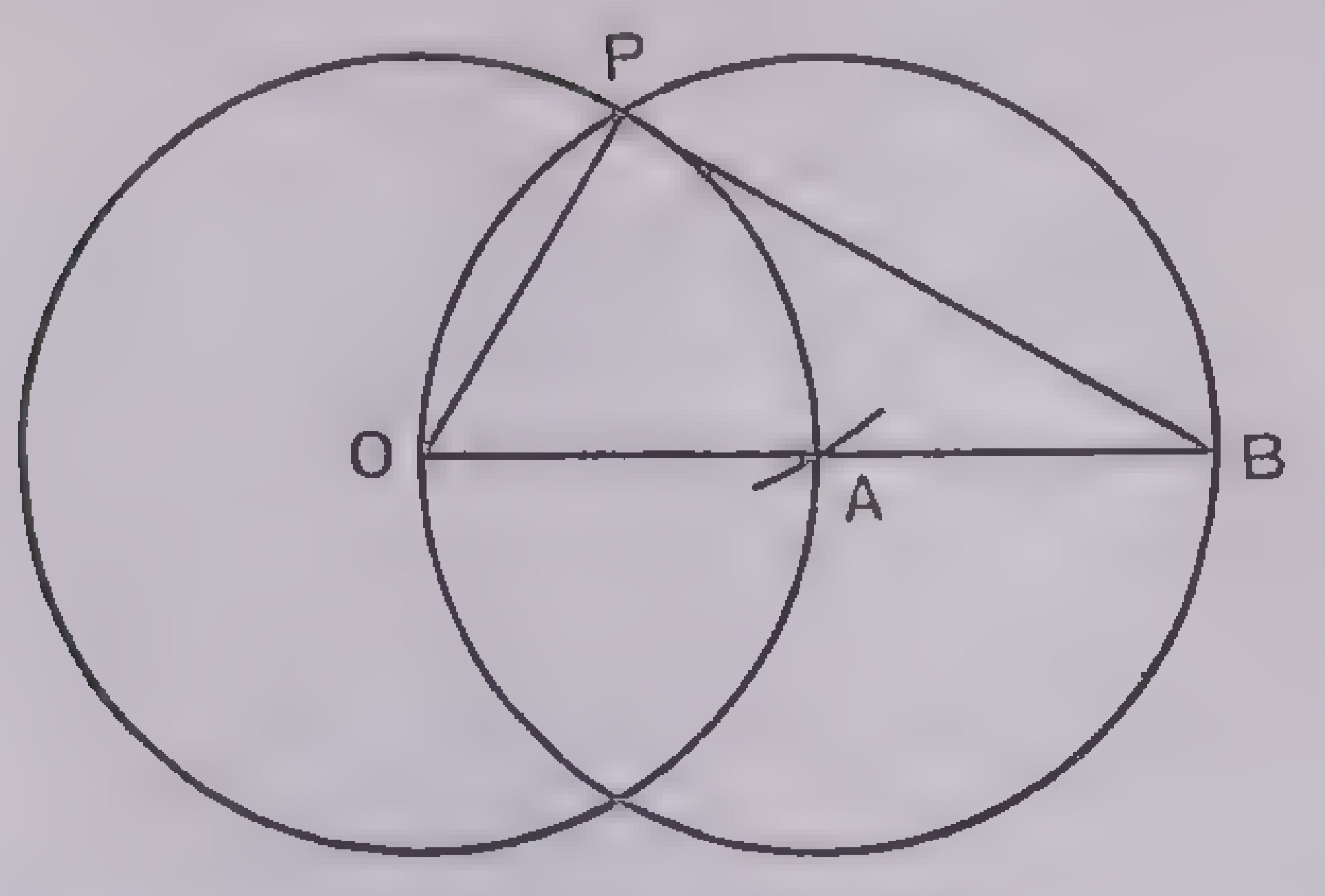
Draw the chord AB and its perpendicular bisector CD. Let the line CD meet the chord AB in E, and the arc AB in F. Draw AF and FB. Chord AF = Chord FB. (§89, Theorem 16.) Therefore arc AF = arc FB, and F is the required midpoint. (§151, Theorem 43.)

246. At a given point on a given circle to draw a tangent to the circle.—

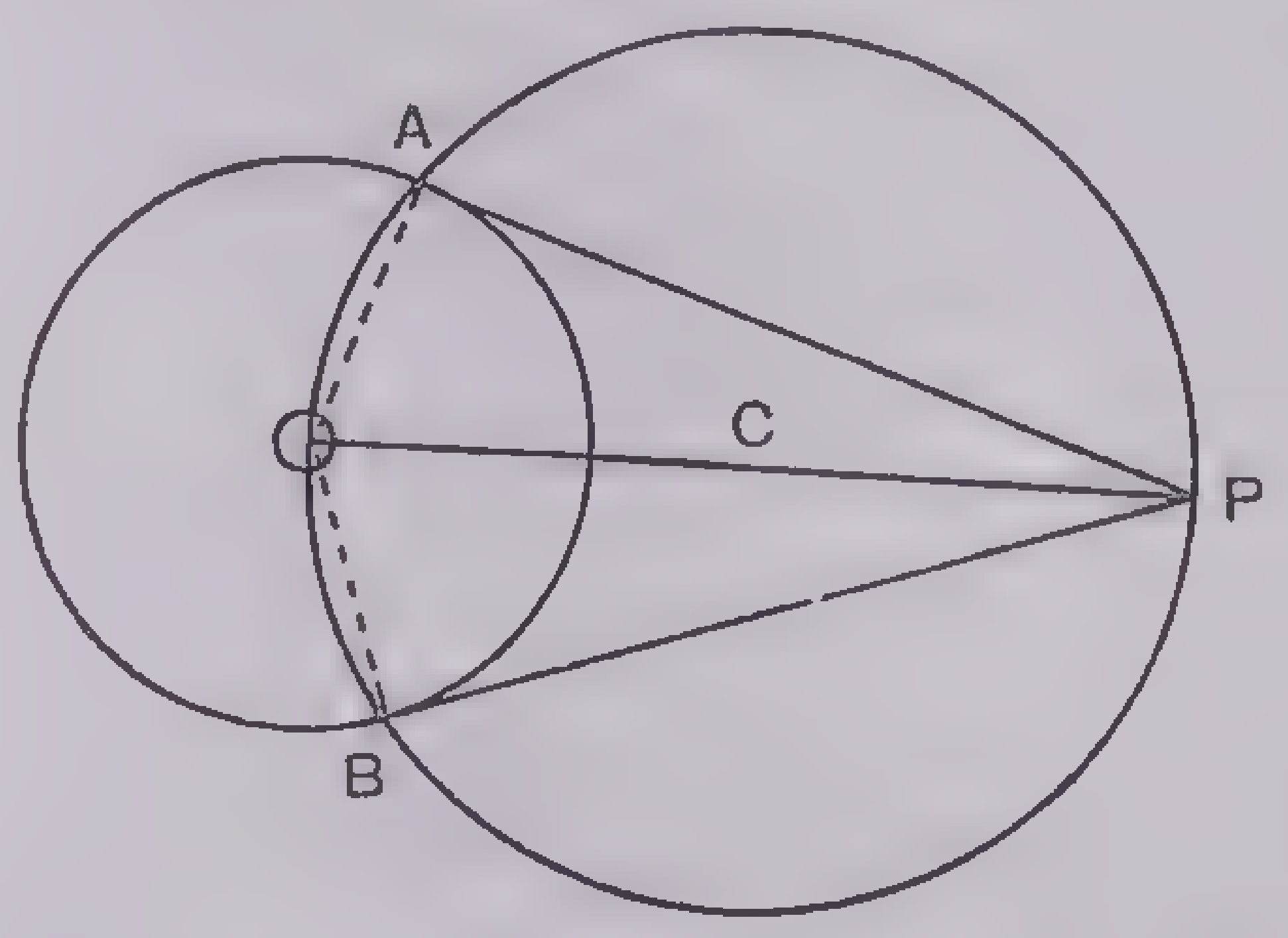
Given a circle of radius *r* with the center O and the fixed point P on it.

Required to construct the tangent to the given circle at the point P.

One method is to draw the radius OP and construct the line perpendicular to OP at the point P by method of §239. A second method is as follows: with P as center and with a radius equal to *r*, draw an arc cutting the given circle in A. With A for center draw a circle of radius *r*. This circle will pass through O and P. Draw OAB the diameter of the circle with the center A, and then draw the chord PB. Angle OPB is a right angle. (§170, Theorem 58.) Therefore PB is the required tangent. (§161, Theorem 53.) (§18. Axiom.)



247. Through a given point outside a given circle to draw tangents to the circle.—

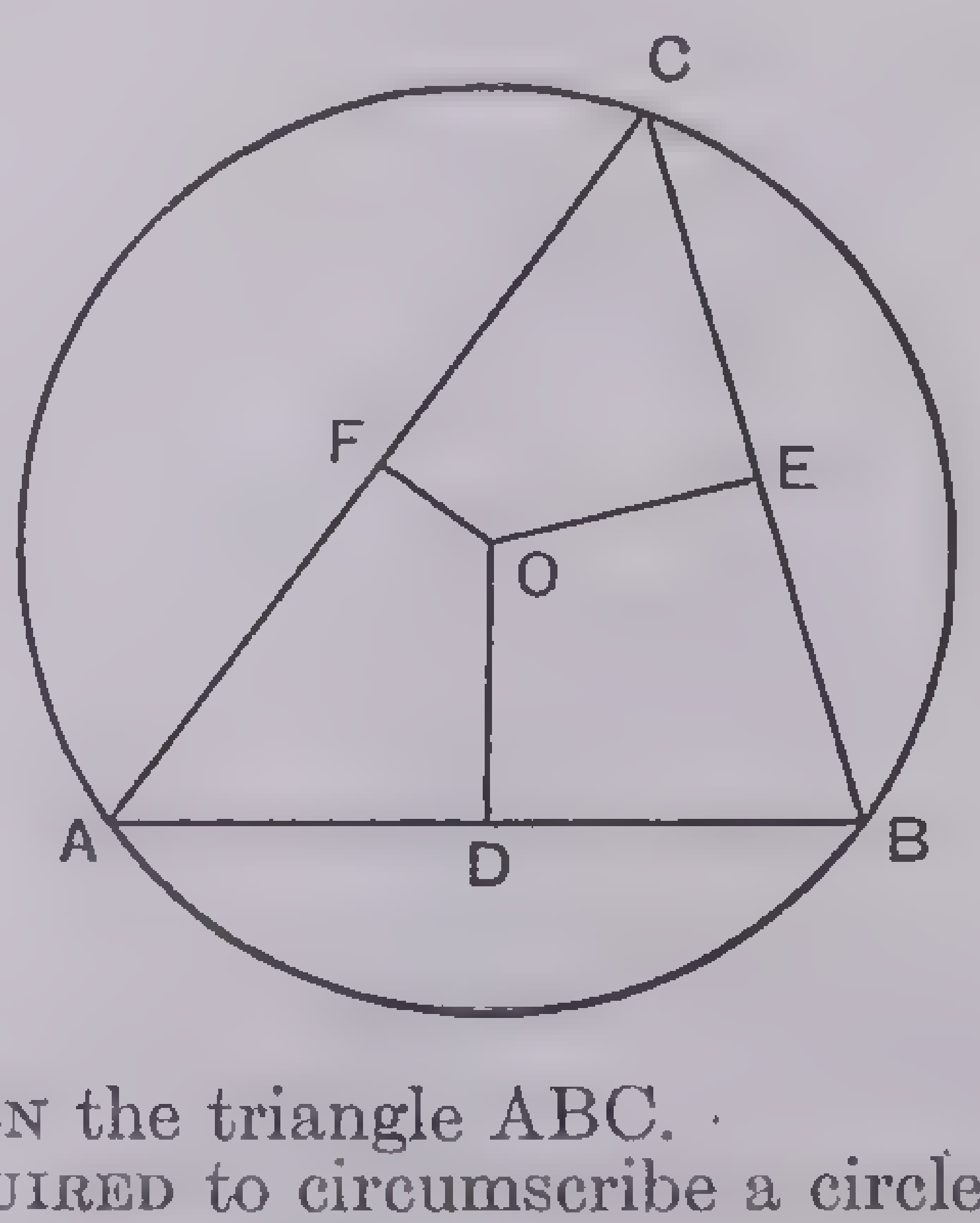


Given the circle with its center at O and the point P outside the circle.

Required to construct the tangents from P to the circle.

Draw the line OP, find the midpoint of this line C, and draw the circle with the center C and the radius OC. Let this circle intersect the given circle in the two points A and B. Draw the lines, OA, OB, AP and BP. Angles OAP and OBP are right angles. (§170, Theorem 58.) Therefore AP and BP are the required tangents. As in the previous construction, the tangent is perpendicular to the radius at its extremity.

248. To circumscribe a circle about a given triangle.—

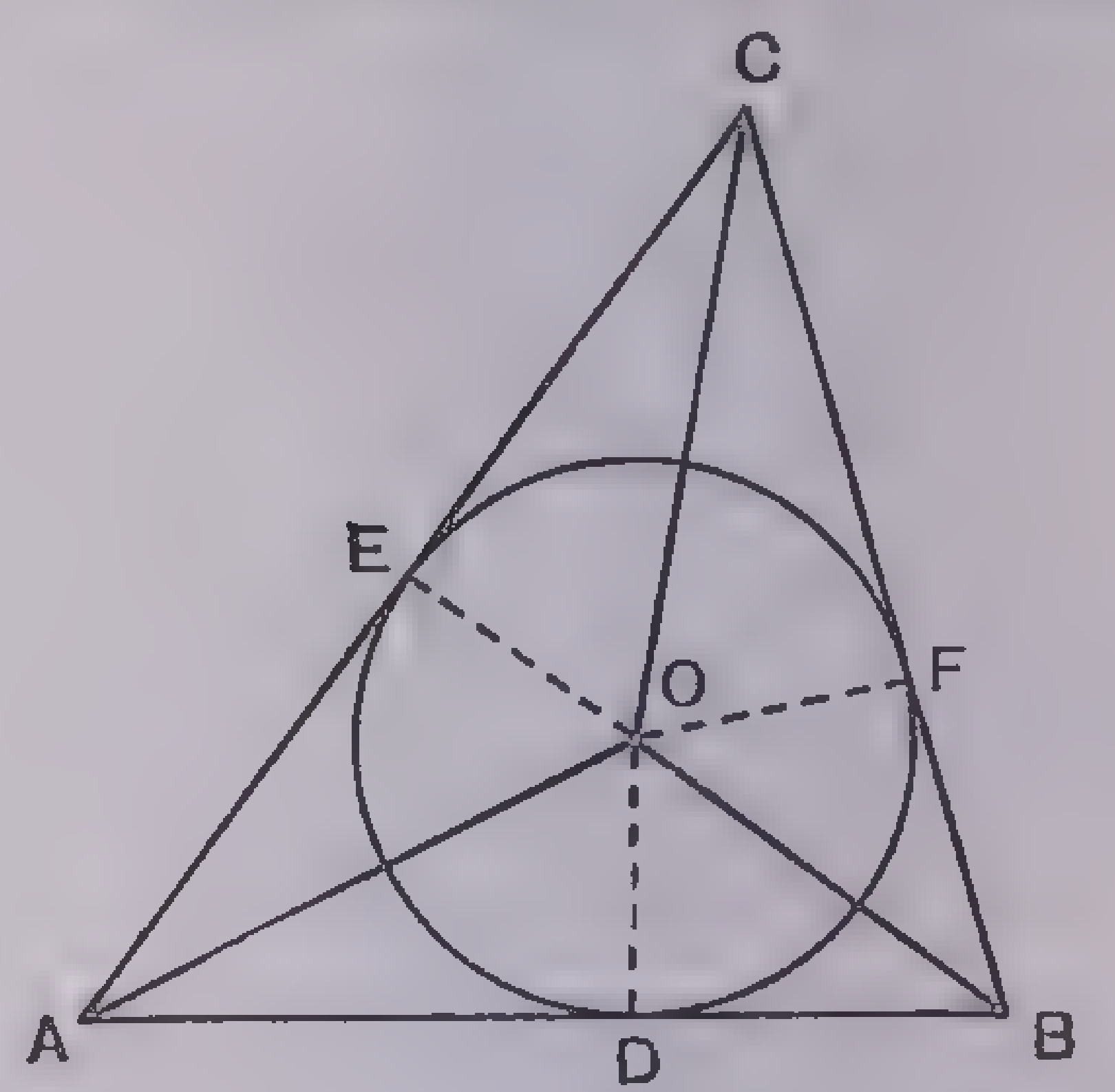


Given the triangle ABC.

Required to circumscribe a circle about ABC.

Draw the perpendicular bisectors of the sides AB and BC, and let O be their point of intersection. Designate the perpendicular bisector of AB by DO and the perpendicular bisector of BC by EO. Point O, lying in OD, is equidistant from A and B, lying in OE; it is also equidistant from B and C or OA = OB = OC. Hence the perpendicular bisector of AC also passes through FO. (§89, Theorem 16.) Since O is equidistant from A, B and C, it is the center of the required circle.

249. To inscribe a circle in a given triangle.—

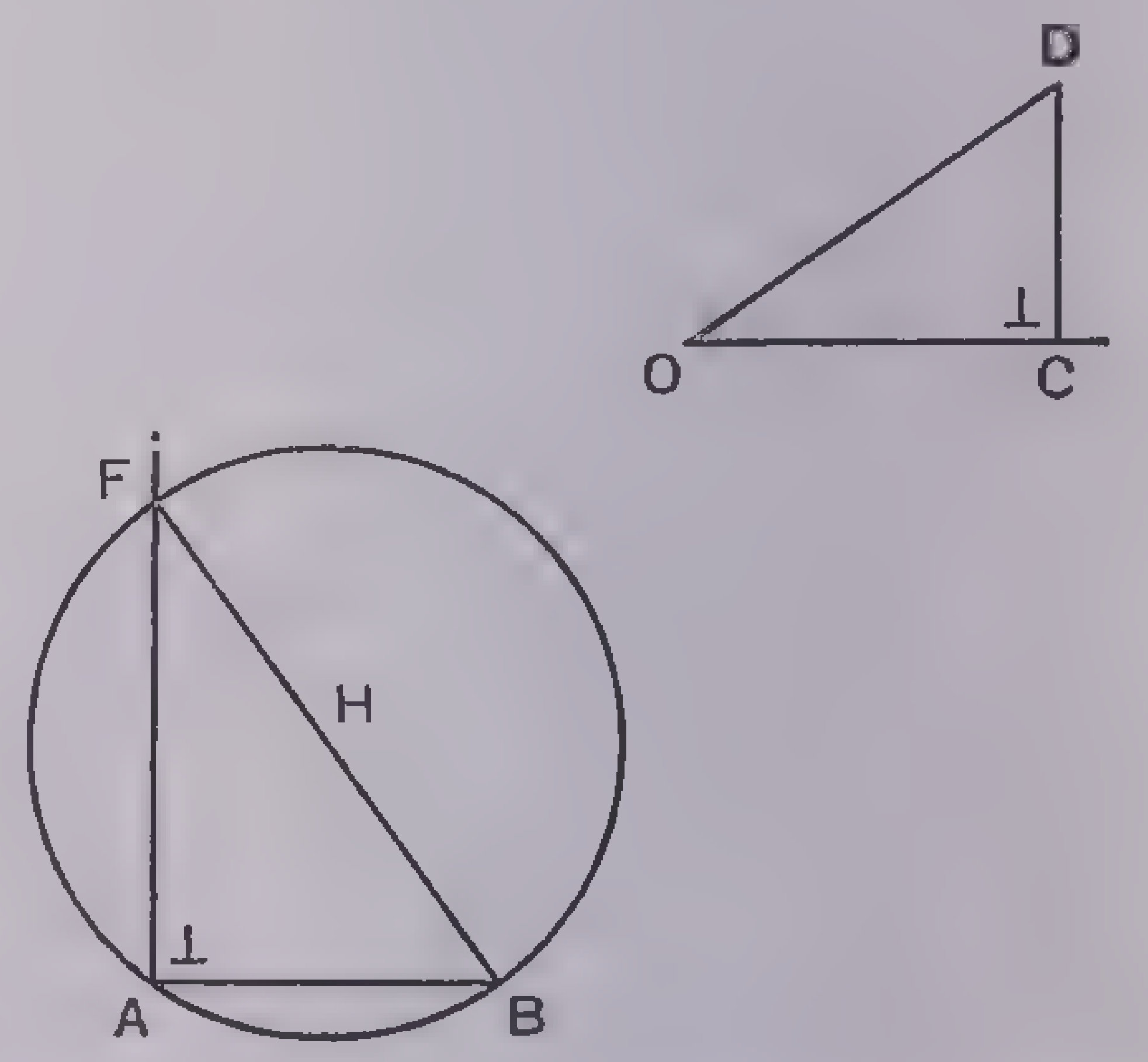


Given the triangle ABC.

Required to inscribe a circle in the triangle ABC.

Let the bisectors of the angles A and B meet in the point O. Draw the perpendiculars from O to AB, BC and CA; let these be OD, OF and OE respectively. Every point in AO is equidistant from AC and AB, hence OE = OD. Every point in OB is equidistant from BA and BC, hence OD = OF. We might observe that the bisector of angle C must also pass through the point O. (§91, Theorem 17.) Therefore O is the center of the required circle and the radius = OD = OF = OE.

250. On a given straight line as a base to construct a circular segment in which a given angle can be inscribed.—

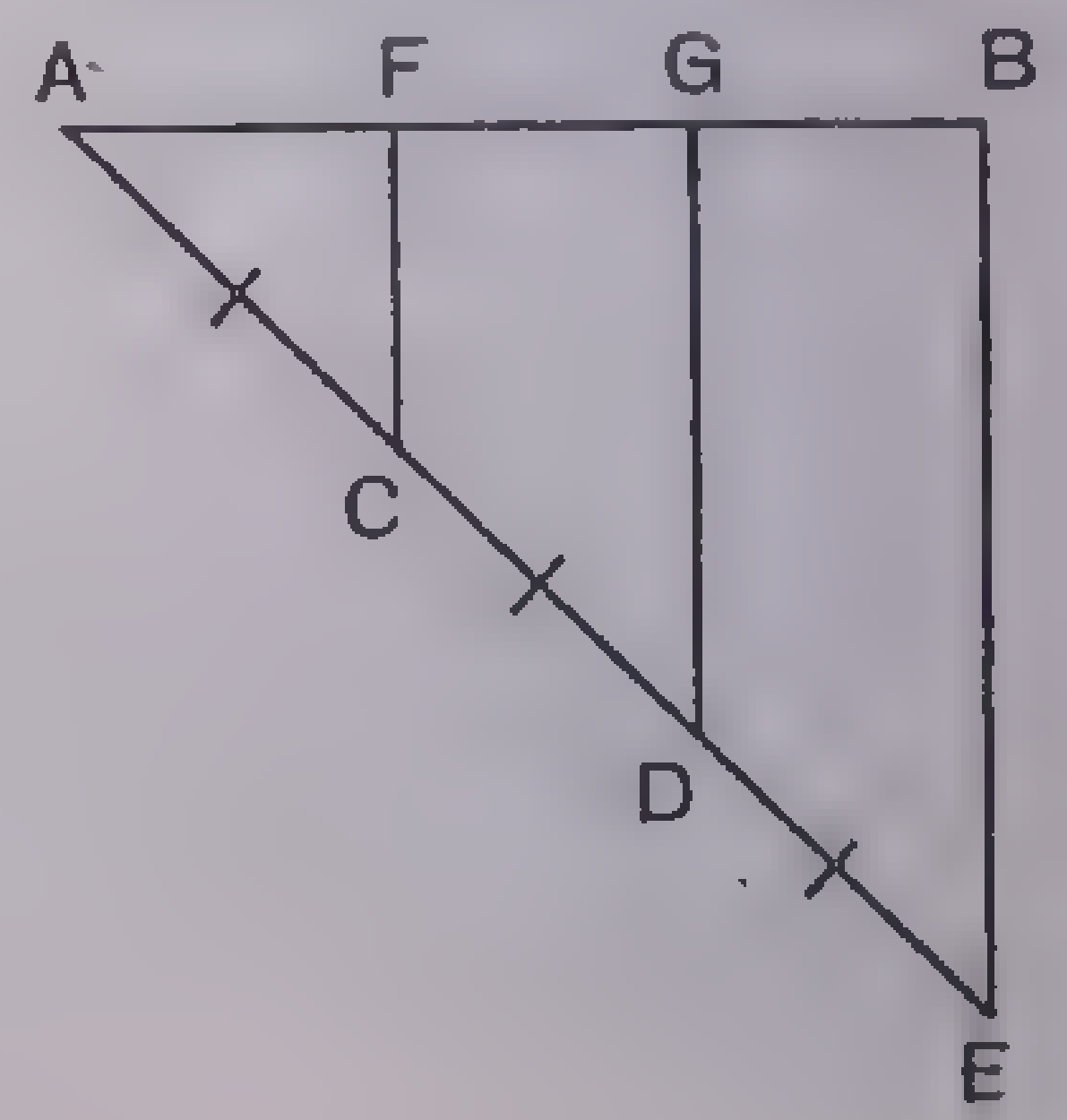


Given the angle COD and the straight line AB.

Required to construct the circular segment in which the given angle can be inscribed.

Take any point D on the side OD of the given angle and drop the perpendicular upon the side OC, meeting it in C. At the point A draw the perpendicular AF to AB; at the point B construct the angle ABF equal to the angle ODC. The triangles ABF and OCD are similar, and angle AFB equals the given angle COD. (§187, Theorem 65.) Therefore the circular segment AFB is the segment required, for any angle APB with its vertex P on this segment has the same measure, i. e., one-half of the arc AB, as the angle AFB. (§169, Theorem 57.)

251. To divide a given straight line into any number of equal parts.—

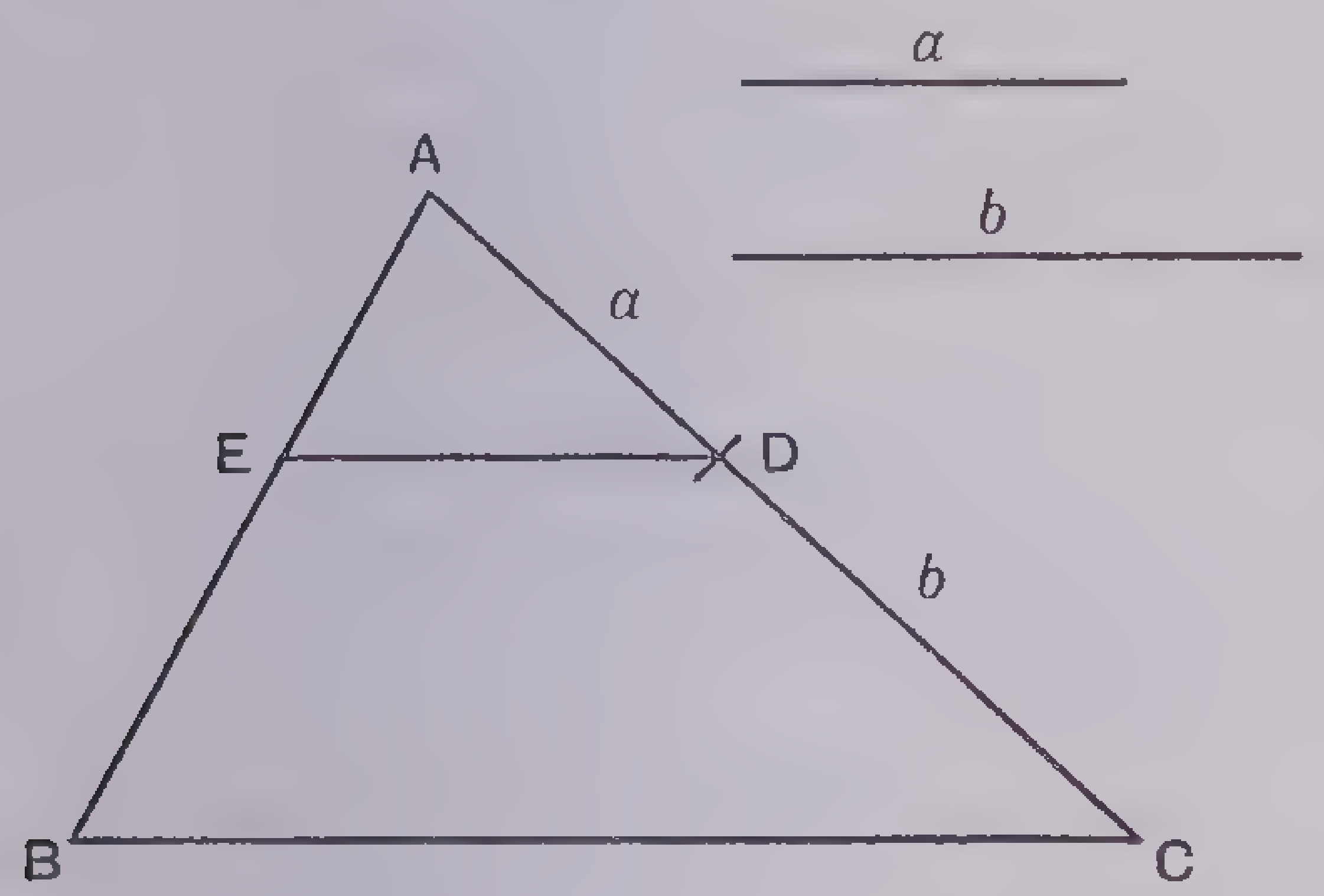


GIVEN the straight line AB.

REQUIRED to divide AB into a certain number of equal parts, say three.

Upon any line through A, as AF, lay off by repeated use of the compasses the equal line segments, AC, CD and DE. Draw the line BE, and the lines through C and D parallel to EB, meeting AB in the points F and G respectively. F and G are the required points to trisection. (§117, Theorem 37.)

252. To divide a given straight line into parts proportional to two given lines.—



GIVEN the straight line AB and two other given lines a and b.

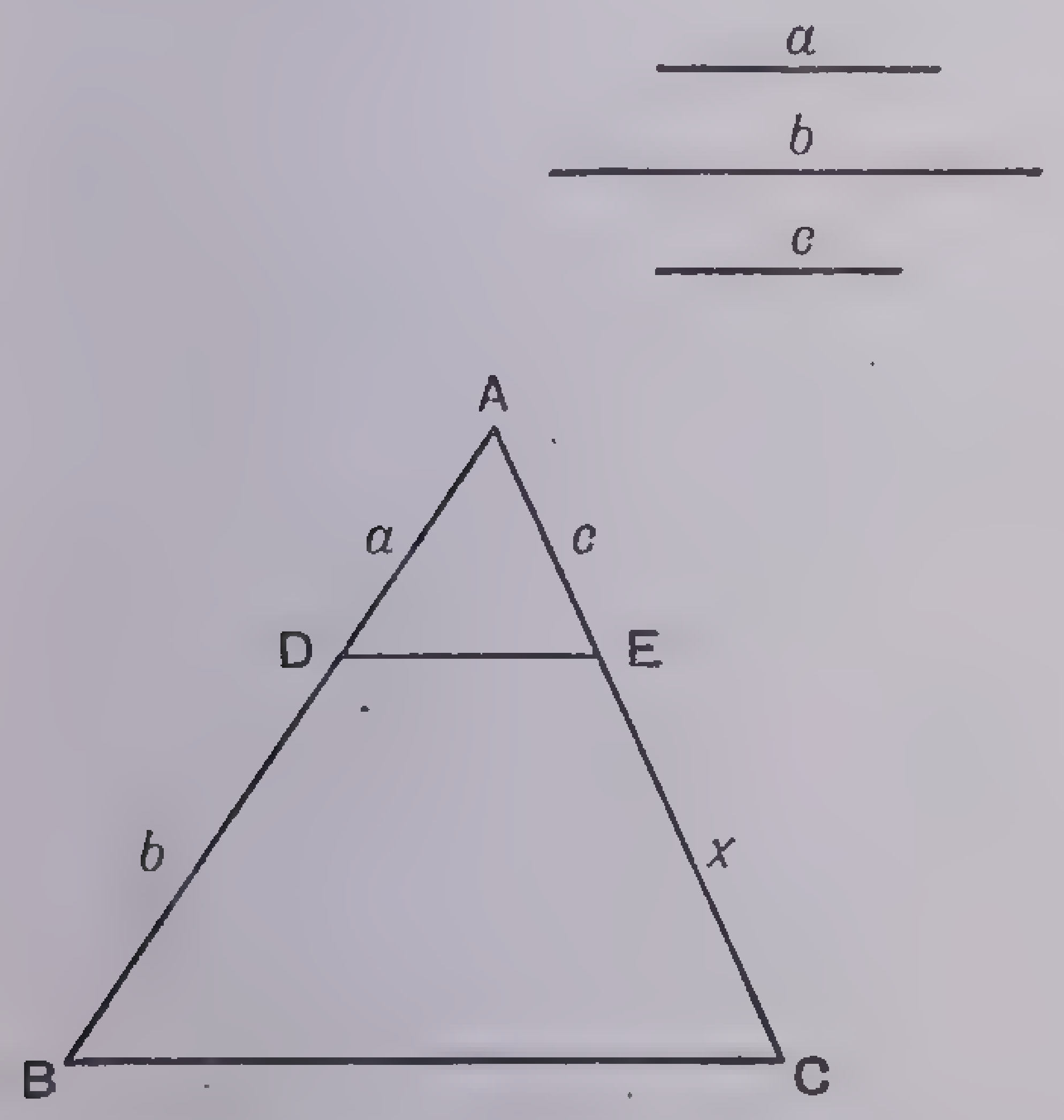
REQUIRED to divide the line AB in the ratio of a to b, or to find the point E on AB so that $\frac{AE}{EB} = \frac{a}{b}$.

Draw a line through A and on it mark off AD, equal to a, and DC, equal to b.

Draw BC and ED parallel to BC through the point D, meeting AB in E. The required point of division is E. (§181, Theorem 62.)

253. Fourth proportional.—A fourth proportional to three numbers or magnitudes a, b and c, is the quantity x defined by the equation $\frac{a}{b} = \frac{c}{x}$.

254. To find the fourth proportional to three given lines.—

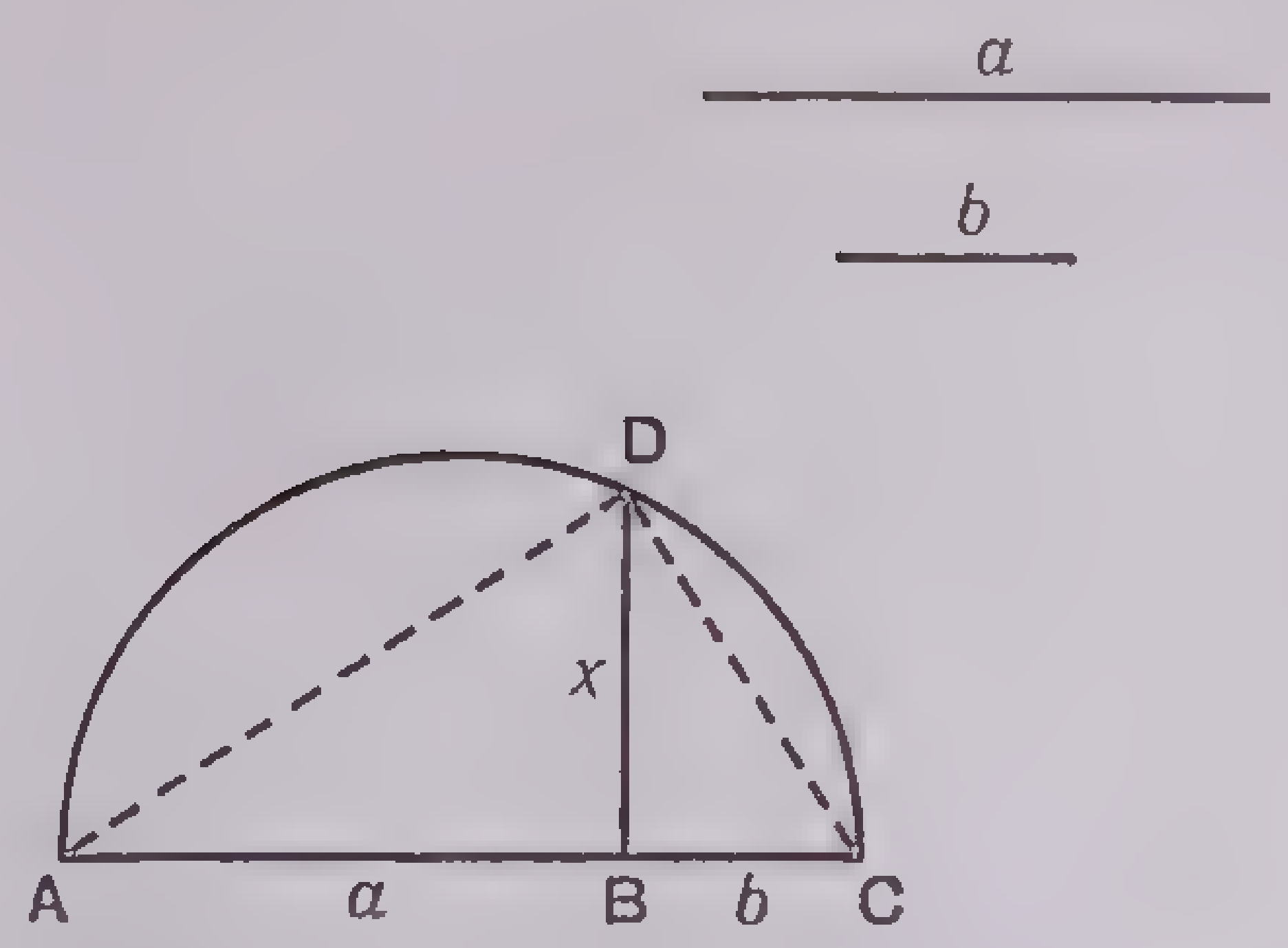


GIVEN the three lines a, b and c.

REQUIRED to construct the line which is the fourth proportional.

Draw two lines intersecting in a point A. On one of these lines lay off AD equal to a and DB equal to b, on the second line lay off AE equal to c. Draw the line DE and draw a line through B parallel to DE, meeting AE in C. Then EC $= x$ is the fourth proportional required, for $\frac{a}{b} = \frac{c}{x}$. (§181, Theorem 62.)

255. To find the mean proportional between two given straight lines.—

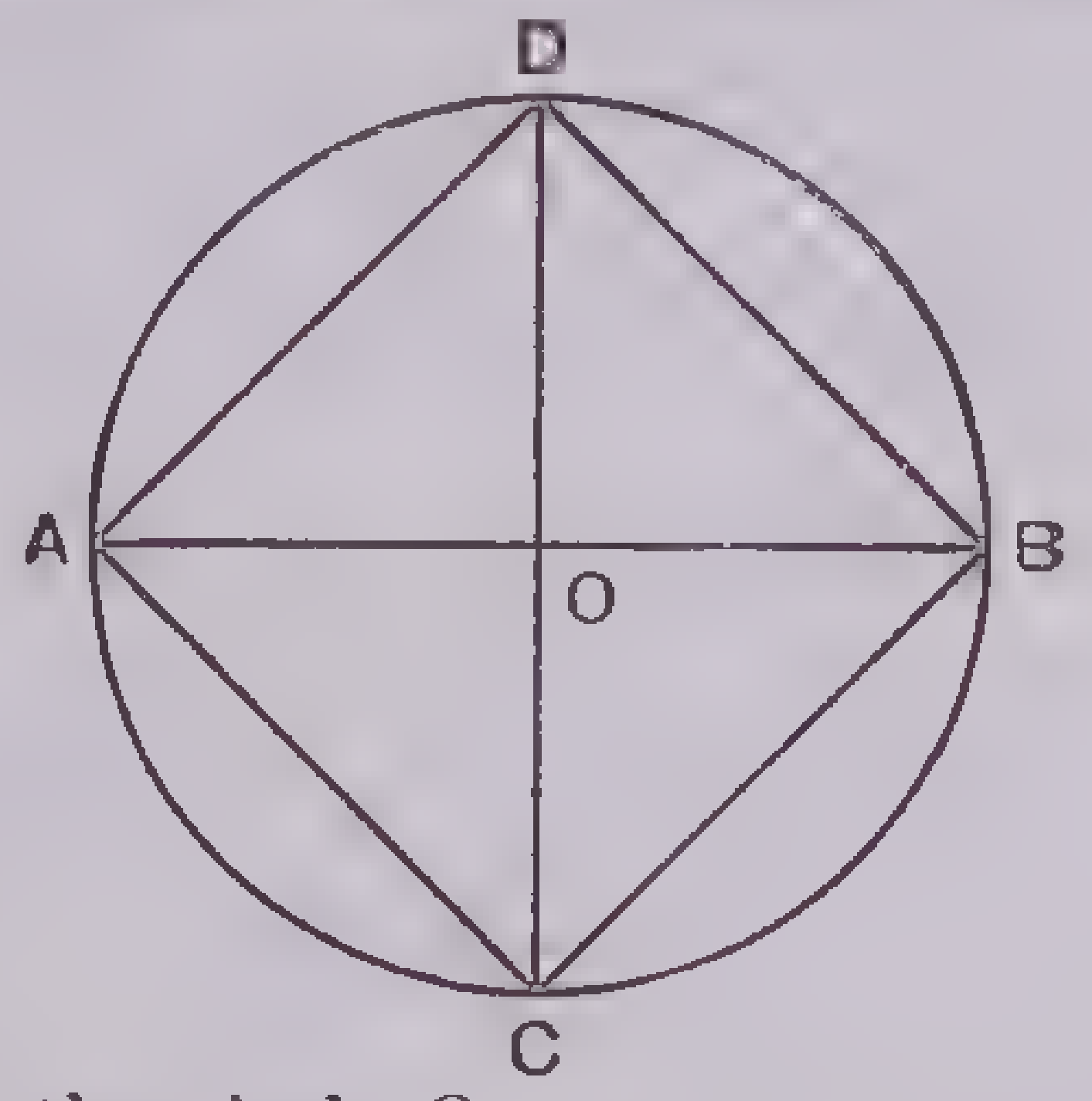


GIVEN the two lines a and b.

REQUIRED to construct the mean proportional x between the lines a and b which is defined by the equation $x^2 = ab$.

Draw a straight line through any point A. On this line measure off AB equal to a and BC equal to b. On AC as diameter draw a semicircle. Let the perpendicular to AB at B meet the semicircle in D. BD is the required mean proportional. (§194 Theorem 72.)

256. To inscribe a square in a given circle.—

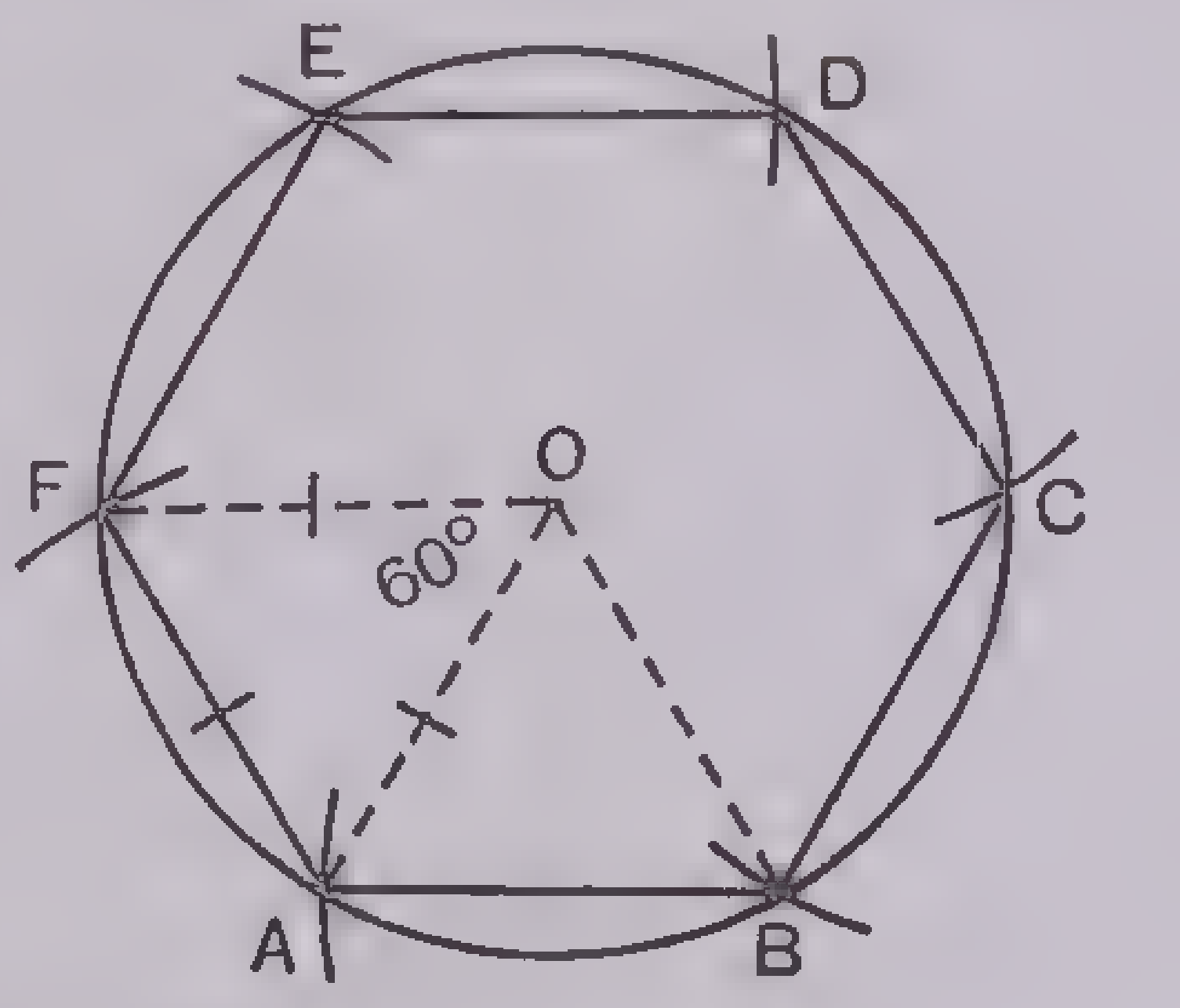


GIVEN the circle O.

REQUIRED to inscribe a square in the given circle.

Draw any diameter, as AB, and draw the diameter CD, which is perpendicular to AB at O, the center. Draw AC, CB, BD, DA, which are the sides of the required square. (§148, Theorem 40. Also §150, Theorem 42.)

257. To inscribe a regular hexagon in a circle.—

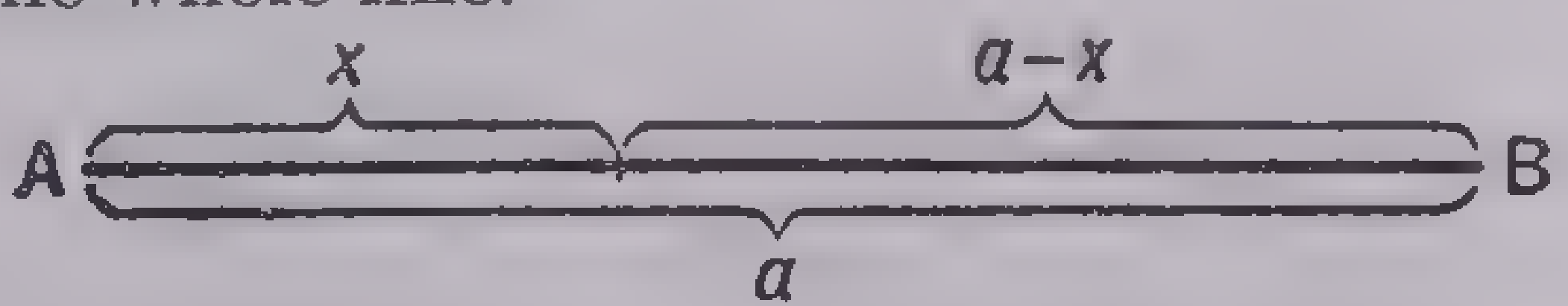


GIVEN a circle.

REQUIRED to construct a regular hexagon.

Using any point of the given circle, as A, for center, and with a radius equal to the radius of the given circle, draw an arc cutting the circle in F. Draw from O, the center of the given circle, the radii OA and OF. Triangle AOF has all its sides equal, hence all of its angles are equal. Thus angle AOF is one-third of two right angles, or one-sixth of a circumference. Hence AF is the side of the required hexagon.

258. To divide a line in extreme and mean ratio.—A line is said to be divided internally in *extreme and mean ratio* when it is divided into two segments such that the shorter is to the longer as the longer is to the whole line.



If the length of a given line AB is taken as a, the lengths of the two segments after division in extreme and mean ratio must satisfy the equation

$$\frac{x}{a-x} = \frac{a-x}{a}. \qquad (1)$$

Clearing the equation of fractions we have:

$$ax = a^2 - 2ax + x^2,$$
$$\text{or} \quad x^2 - 3ax + a^2 = 0$$

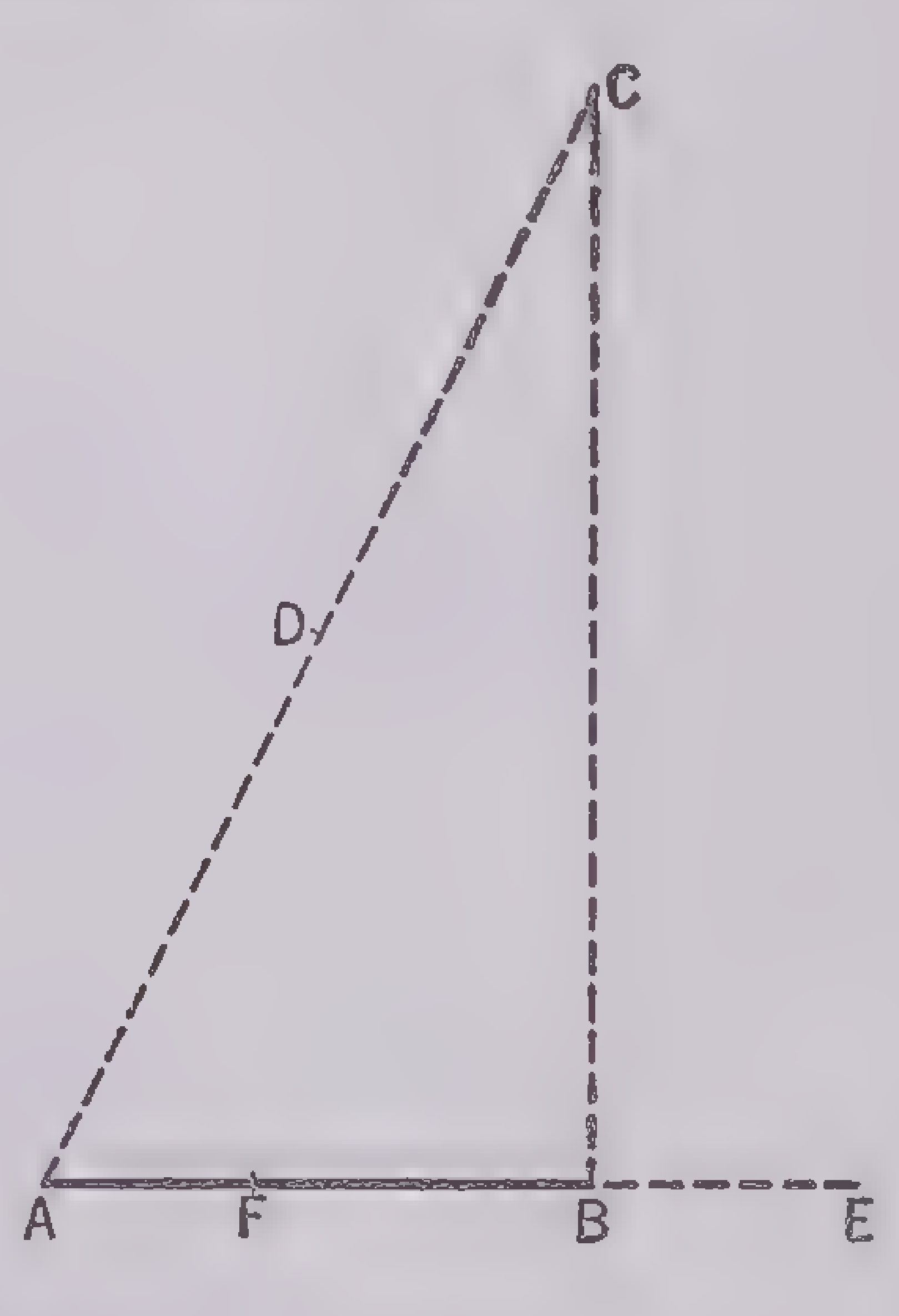
$$x = \frac{3a \pm \sqrt{9a^2 - 4a^2}}{2} =$$

$$\frac{3a \pm a\sqrt{5}}{2} = \frac{3a}{2} \pm \frac{1}{2}a\sqrt{5}.$$

The problem of dividing a line geometrically in extreme and mean ratio therefore depends upon our ability to construct a line of length equal to $a\sqrt{5}$. This can easily be done, since the hypotenuse of a right triangle with legs a and $2a$ is equal to

$$\sqrt{a^2 + 4a^2} \text{ or } a\sqrt{5}$$

We may therefore divide a line in extreme and mean ratio as follows:



Let AB be the given line.

From B erect BC ⊥ AB and equal 2 $\overline{AB}$.

Join CA.

Bisect CA in D.

Lay off BE = ½ AB on AB produced.

Lay off EF = AD.

The point F will divide AB in extreme and mean ratio.

Proof:

By construction EF = AD = $\frac{1}{2}$ AC.

$$AC = \sqrt{\overline{AB}^2 + \overline{BC}^2} = \sqrt{\overline{AB}^2 + \overline{2AB}^2} =$$

$$\sqrt{5\overline{AB}^2} = \overline{AB}\sqrt{5}.$$

$$AF = AE - EF = \tfrac{3}{2}\overline{AB} - \tfrac{1}{2}\overline{AB}\sqrt{5}.$$

This is a geometrical solution of equation (1).

NOTE: We may lay off the distance AD in either direction from E. There is thus a second point F′ such that

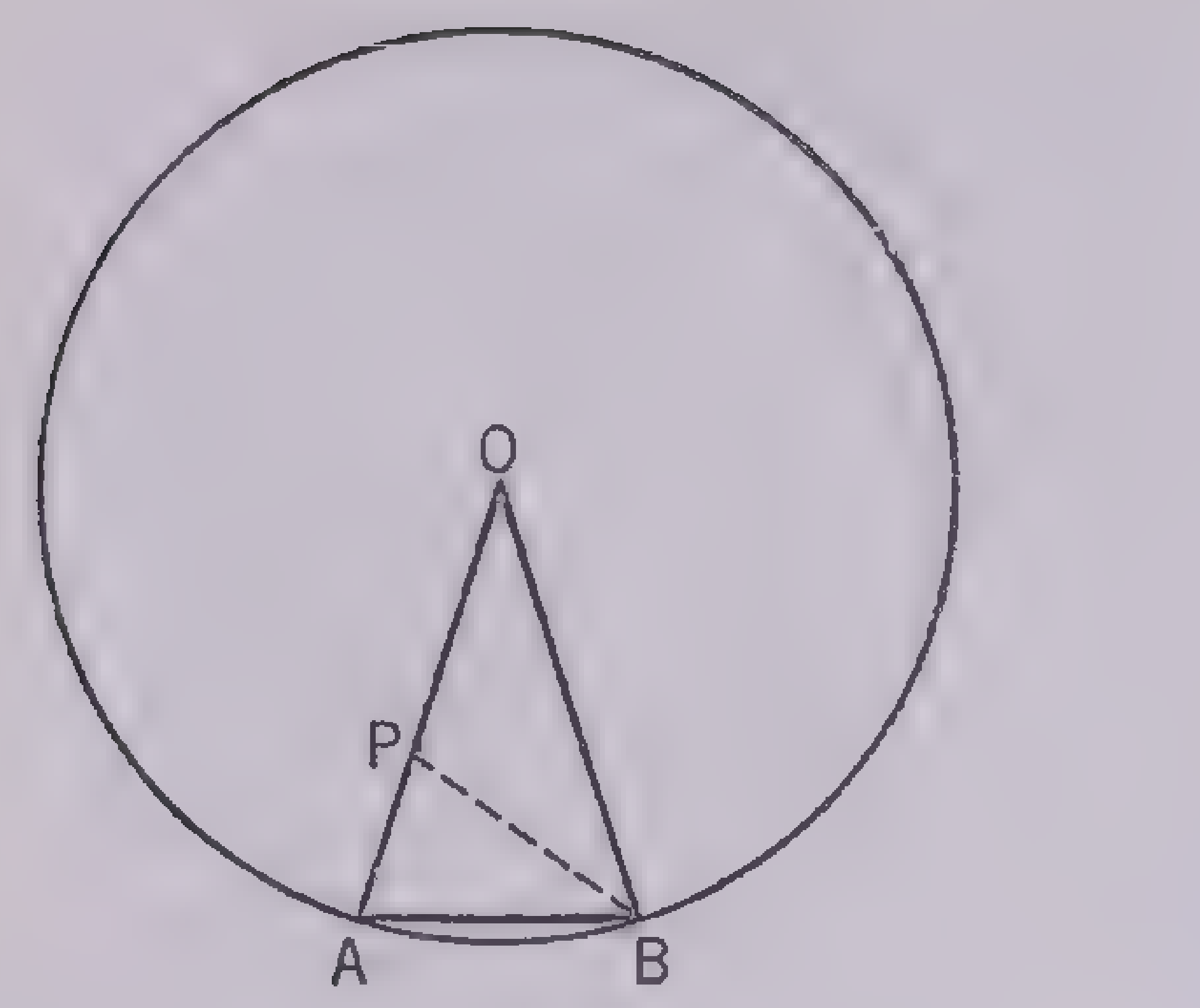
$$\frac{AF'}{F'B} = \frac{F'B}{AB}.$$

The point F′ is said to divide AB *externally* in extreme and mean ratio.

This is the second geometrical solution of equation (1).

259. To construct regular polygons of 5, 10, 15 sides.—The side of a regular decagon (10-sided polygon) inscribed in a circle is equal to the longer segment of the division of the circle's radius internally in extreme and mean ratio.

Given AB, the side of a regular decagon inscribed in a circle with center O.



To prove $\frac{AO - AB}{AB} = \frac{AB}{AO}$.

Proof: $\angle AOB = \frac{1}{10}$ the circle $= \frac{4}{10}$rt $\measuredangle$

$\angle OAB = \angle OBA$ ($\triangle ABO$ is isosceles).

$\therefore 2 \times \angle OBA + \angle AOB = 2$rt $\measuredangle$.

$2 \times \angle OBA = 2$ rt $\measuredangle - \frac{4}{10}$ rt $\measuredangle =$

$\frac{16}{10}$ rt $\measuredangle$.

$\angle OBA = \frac{8}{10}$ rt $\measuredangle = 2 \times \angle AOB$.

Draw BP bisecting $\angle$ OBA.

It is easily seen that this line divides the $\triangle ABO$ into 2 isosceles $\triangle$, that

$AB = PB = PO$,

and that $\triangle$ ABO and PAB are similar.

Therefore $\frac{AP}{BP} = \frac{AB}{AO}$.

$AP = AO - PO = AO - AB$.

$BP = AB$.

Therefore $\frac{AO - AB}{AB} = \frac{AB}{AO}$.

In §258 it was shown that the length of the shorter segment of a line of length a divided internally in extreme and mean ratio is:

$$\frac{3}{2}a - \frac{1}{2}a\sqrt{5}.$$

The longer segment is therefore

$$a - \left(\frac{3}{2}a - \frac{1}{2}a\sqrt{5}\right) =$$

$$-\tfrac{1}{2}a + \tfrac{1}{2}a\sqrt{5} =$$

$$\tfrac{1}{2}a(\sqrt{5} - 1).$$

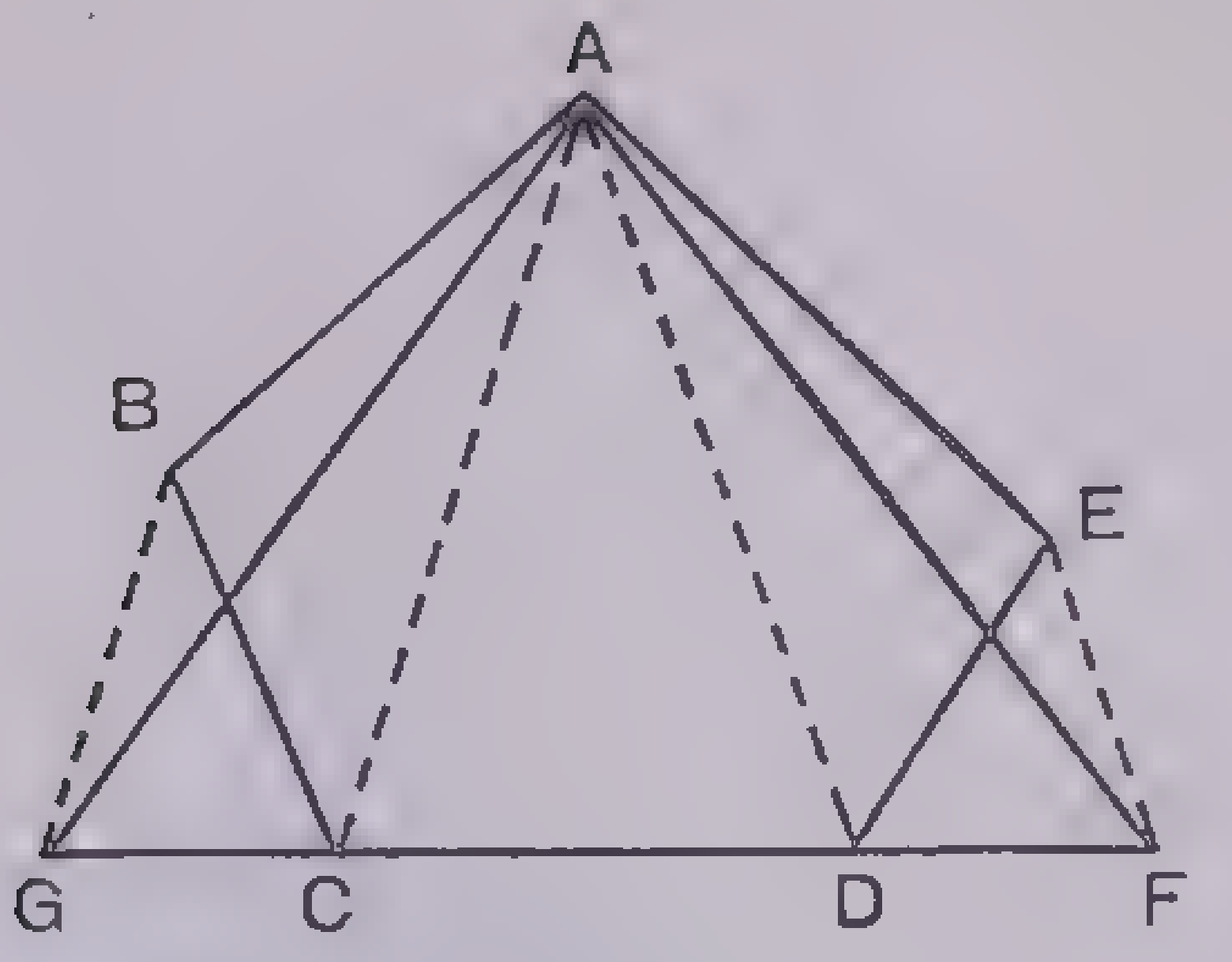
This is therefore the length of the side of a regular decagon inscribed in a circle of radius a.

To construct a regular decagon, therefore, we divide the radius of a circle in extreme and mean ratio and take the longer segment as the side of the required decagon.

We may construct a regular pentagon by joining every other vertex of a decagon.

A regular pendecagon (15-sided polygon) also may be constructed. This is easily seen if we consider that the division of a circle into 15 equal parts requires the construction of an angle equal to $\frac{360°}{15}$ or 24°. The central angle subtended by the side of a decagon is $\frac{360°}{10}$ or 36°. We may construct an angle of 60° by §257. 24° = 60° − 36°.

260. To transform any convex polygon into a triangle or a square.—

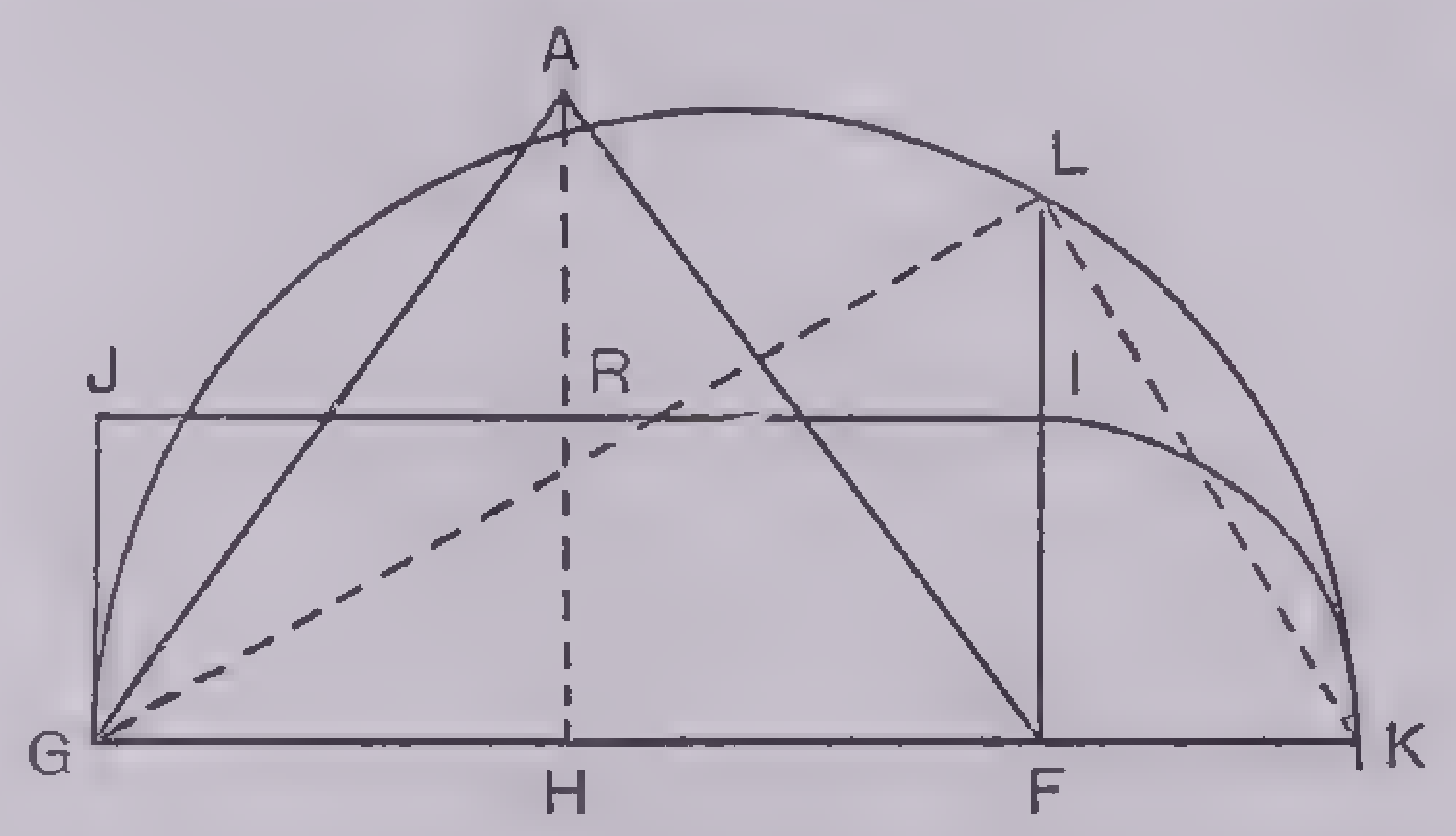


Given the convex polygon ABCDE.

Required to transform ABCDE: (a) into a triangle; (b) into a square.

(a) Choose a vertex, as A, and draw the lines AC and AD. Produce a convenient side, as CD, in both directions. Through B draw a line parallel to AC, to meet CD at G, and through E draw a line parallel to AD, meeting CD at F. Triangles ACB and AGC are equal, having a common base AC and equal altitudes, since parallel lines are everywhere equidistant. In the same way, triangles ADE and AFD are equal. Hence triangle AGF is the required triangle.

(b) Having transformed the polygon into a triangle, we will now transform it first into a rectangle and finally into a square.



Let AGF be the given triangle. Draw the perpendicular from A on GF, meeting it at H. Bisect AH, and let R be the point of bisection. Construct a rectangle which has GF for base and HR for altitude. Let GFIJ be this rectangle. The area of the rectangle equals the area of the triangle. The area of the rectangle is equal to the product (GF)(FI). If x is the side of a square of equal area then $x^2 = (GF)(FI)$. The construction of x leads back to §255. (To construct the mean proportional between two given straight lines.) Following the method of that section, we lay off FK on GF equal to FI, draw the semicircle on FK as diameter and produce FI until it intersects the semicircle at the point L. FL is the side of the required square whose area is equal to the area of the rectangle GFIJ, to the area of the triangle AGF and to the area of the polygon ABCDE.

Note. If the polygon were not convex it would be necessary in the first part of the construction (a) to subtract the areas of certain of the triangles, instead of adding them.

ADDITIONAL DEFINITIONS—SPECIAL CASES—THEOREMS OF CONSTRUCTION

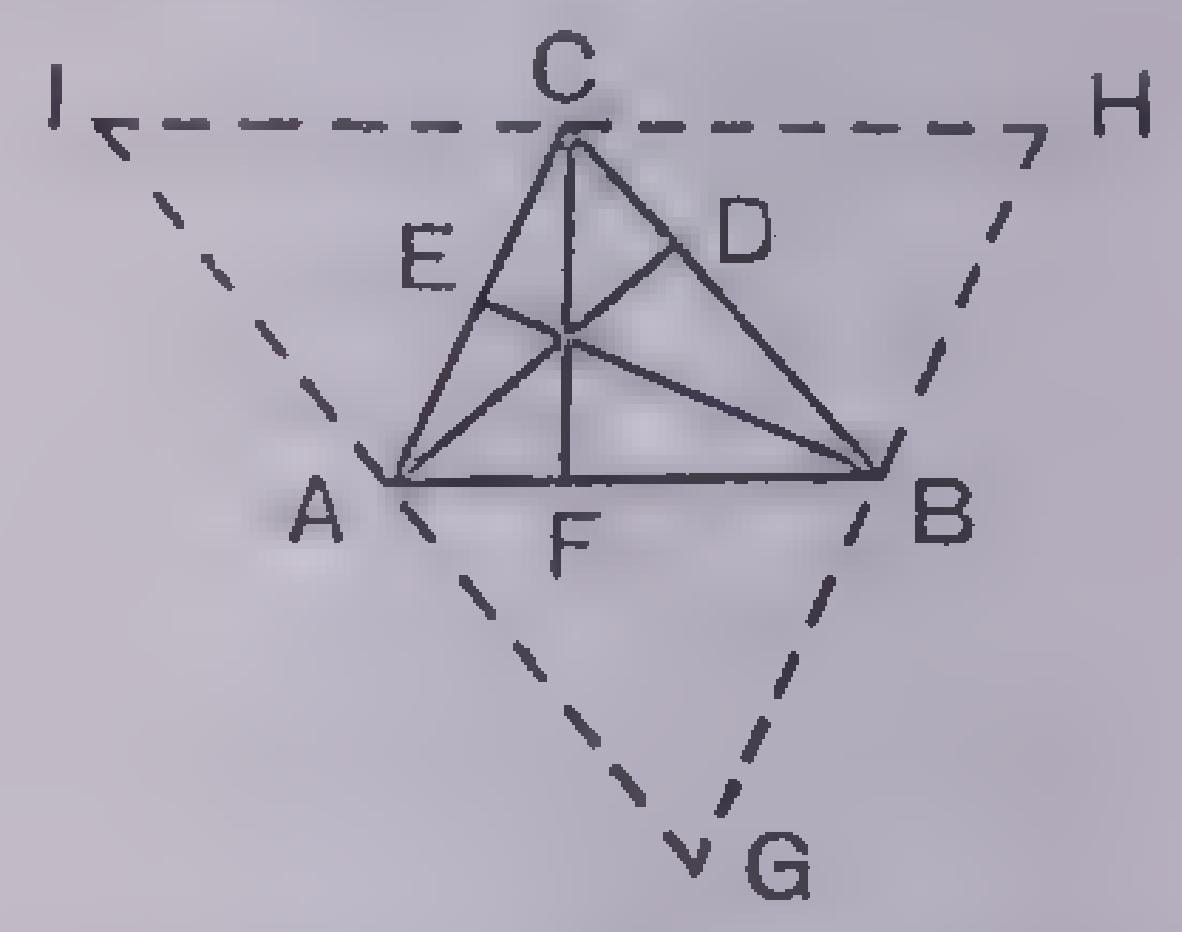
If, when three coins are tossed, they always all turn up heads, we know at once that the matter demands investigation. In a like manner in geometry, if three points are always on a straight line, we seek the reason. Again, if three lines are drawn at random in a plane there is small chance that they will pass through a single point, or that any two of them will be parallel; in general they will form a triangle.

261. Concurrent Lines.—Three or more lines meeting in a common point are called *concurrent lines.*

We will now consider a few important cases of concurrent lines.

262. Theorem.—The perpendicular bisectors of the sides of a triangle meet at a point equidistant from the three vertices. This point is called the center of the circumscribing circle, and the method of proof is given in the construction problem of §248.

263. Theorem.—The perpendiculars from the vertices of a triangle to the opposite sides meet at a point.



Hyp. Given the triangle ABC, with the perpendiculars AD, BE and CF drawn through the vertices to the opposite sides.

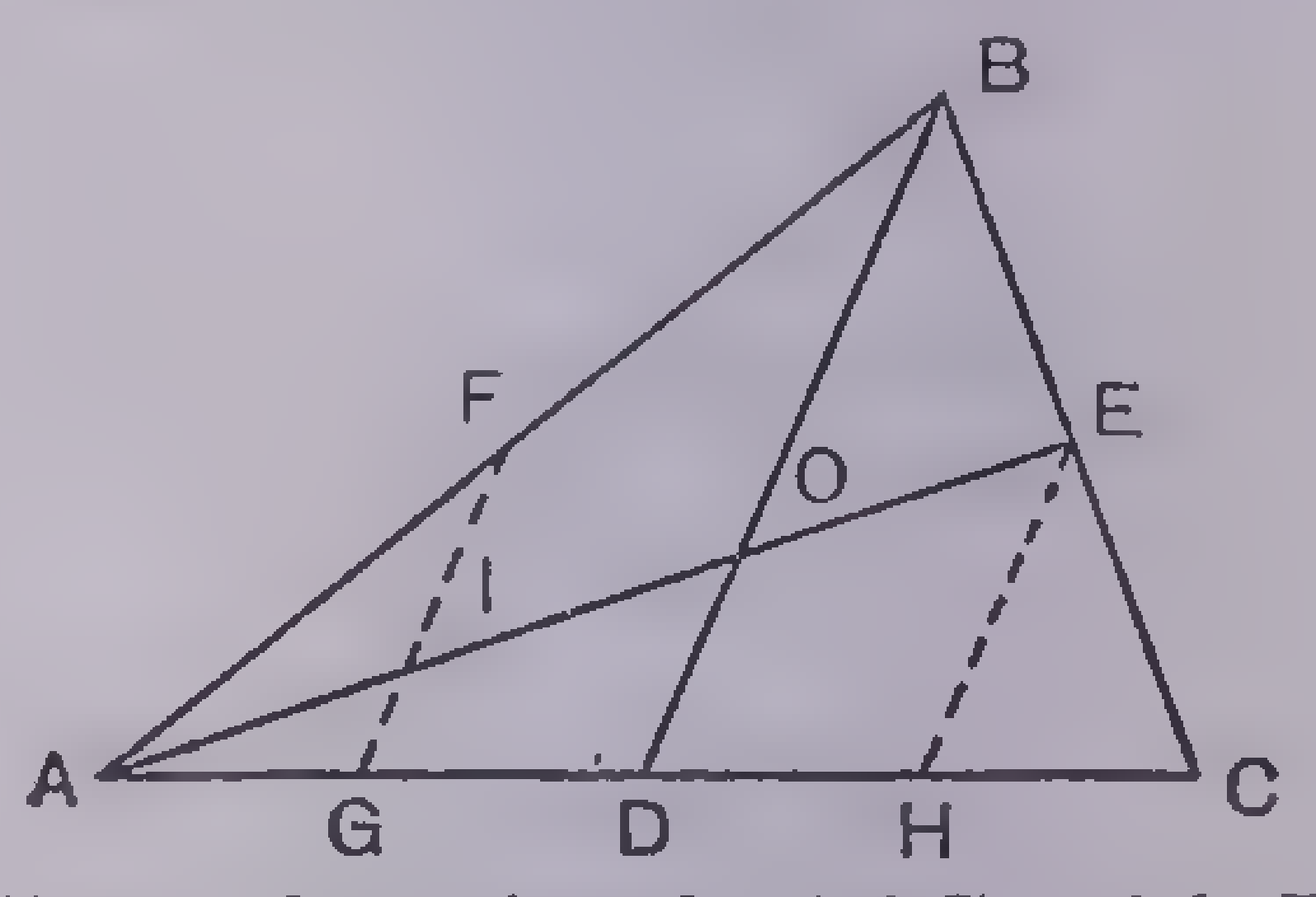
Con. The lines AD, BE and CF are concurrent.

Hint. Through each vertex of the triangle draw a line parallel to the opposite sides and let these lines intersect to form the triangle GHI. For this triangle the lines AD, BE, CF are the perpendicular bisectors, hence the proof depends upon §260.

264. Theorem.—The bisectors of the angles of a triangle meet in a point equidistant from the three sides. This point is the center of the inscribed circle, and the method of proof is indicated in §249.

265. Median.—A median of a triangle is a line connecting a vertex to the midpoint of the opposite side.

266. Theorem.—The medians of a triangle meet at a point two-thirds of the distance from each vertex to the midpoint of the opposite side.



Hyp. Given the triangle ABC, with D, E and F the midpoints of the sides AC, CB and BA respectively.

Con. The medians AE, BD and CF are concurrent.

Hint. We will draw only two medians at first, AE and BD intersecting at O. We will show that AO = 2(OE) and BO = 2(OD). Draw FG and EH through F and E respectively, so that they are parallel to BD and meet AC at G and H. Let FG and AE intersect at I. Then AG = GD = DH = HC. (§117, Theorem 37.) By the same theorem AI = IO = OE. Hence $AO = \frac{2}{3}(AE)$. In the same manner we can prove that AE and a line CF will intersect at a point O′ such that $AO' = \frac{2}{3}(AE)$.

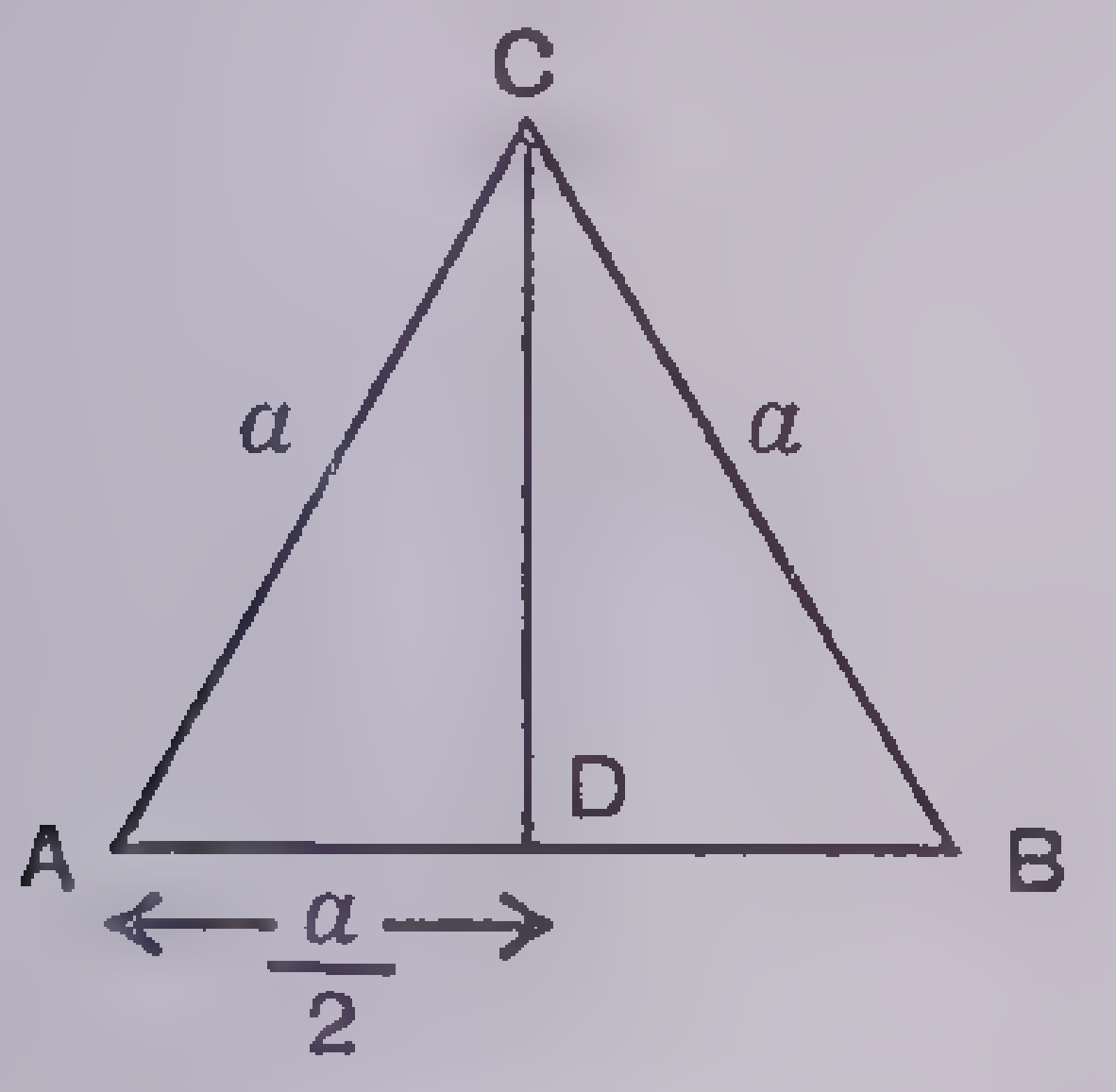
Hence AO = AO′, thus O and O′ coincide, therefore all the medians pass through O.

267. Equilateral Triangle.—A triangle is equilateral when all its sides are equal.

268. Equiangular Triangle.—A triangle is equiangular when all its angles are equal. It is easily shown that all equilateral triangles are equiangular and that all equiangular triangles are equilateral; we use one term when we are thinking primarily of the sides, the other when we are thinking primarily of the angles. Polygons of four or more sides, however, may be equiangular without being equilateral and equilateral without being equiangular. See §214-16.

269. Scalene Triangle.—A triangle is scalene when no two sides are equal.

270. Exercise.—Find the altitude and area of an equilateral triangle of side a.



Given the equilateral triangle ABC with the side a.

Required to find the altitude CD and the area of the triangle.

The point D is the midpoint of the base, hence AD = $\frac{1}{2}a$. ADC is a right triangle,

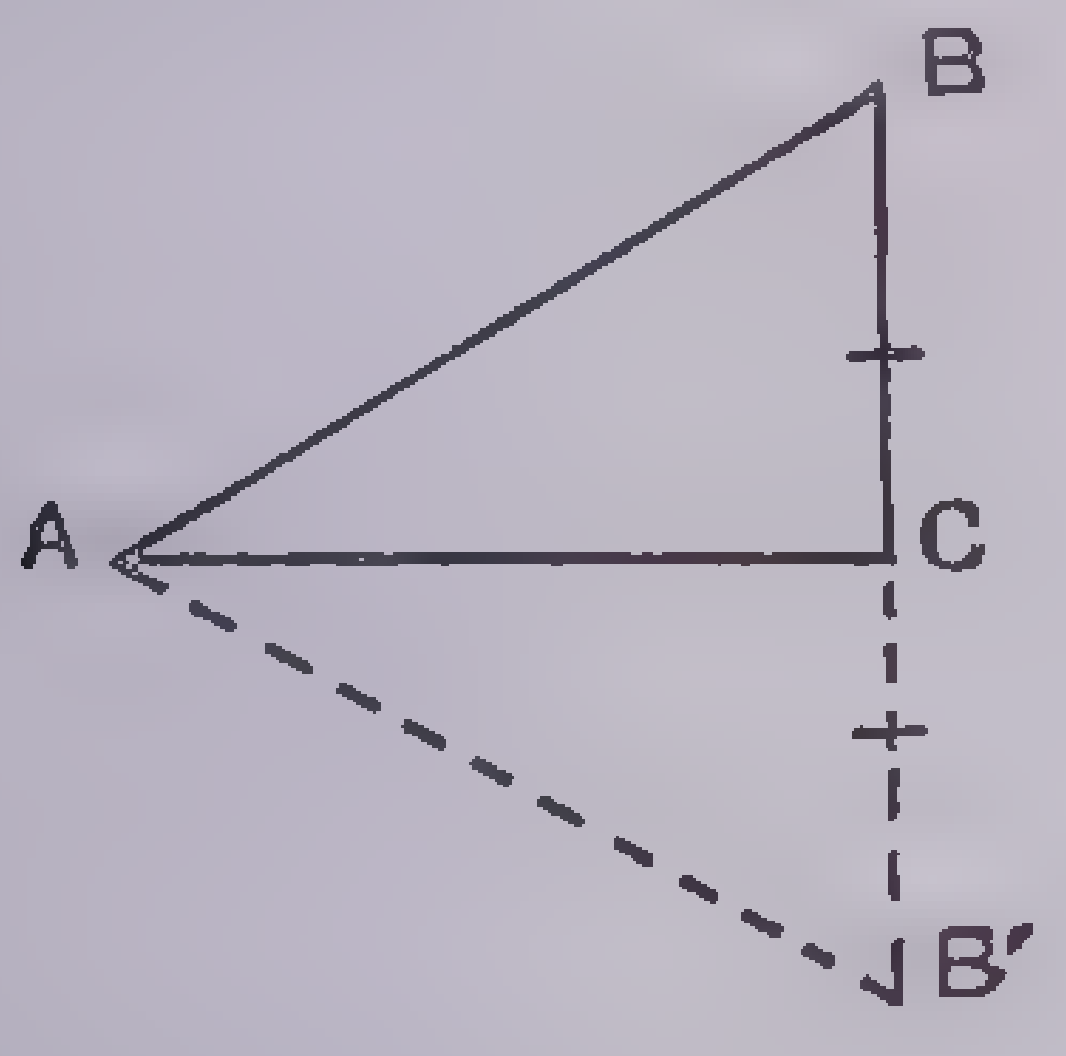
hence, $a^2 = (\text{CD})^2 + \left(\frac{a}{2}\right)^2$. (§211.)

$$\therefore (\text{CD})^2 = \frac{3a^2}{4}.$$

$$\text{CD} = \tfrac{1}{2}a\sqrt{3}.$$

The area = $\frac{1}{2}a(\text{CD}) = \frac{1}{4}a^2\sqrt{3}$. (§207, Theorem 79.)

271. Theorem.—If one acute angle of a right triangle is double the other, the hypotenuse is double the shorter side.

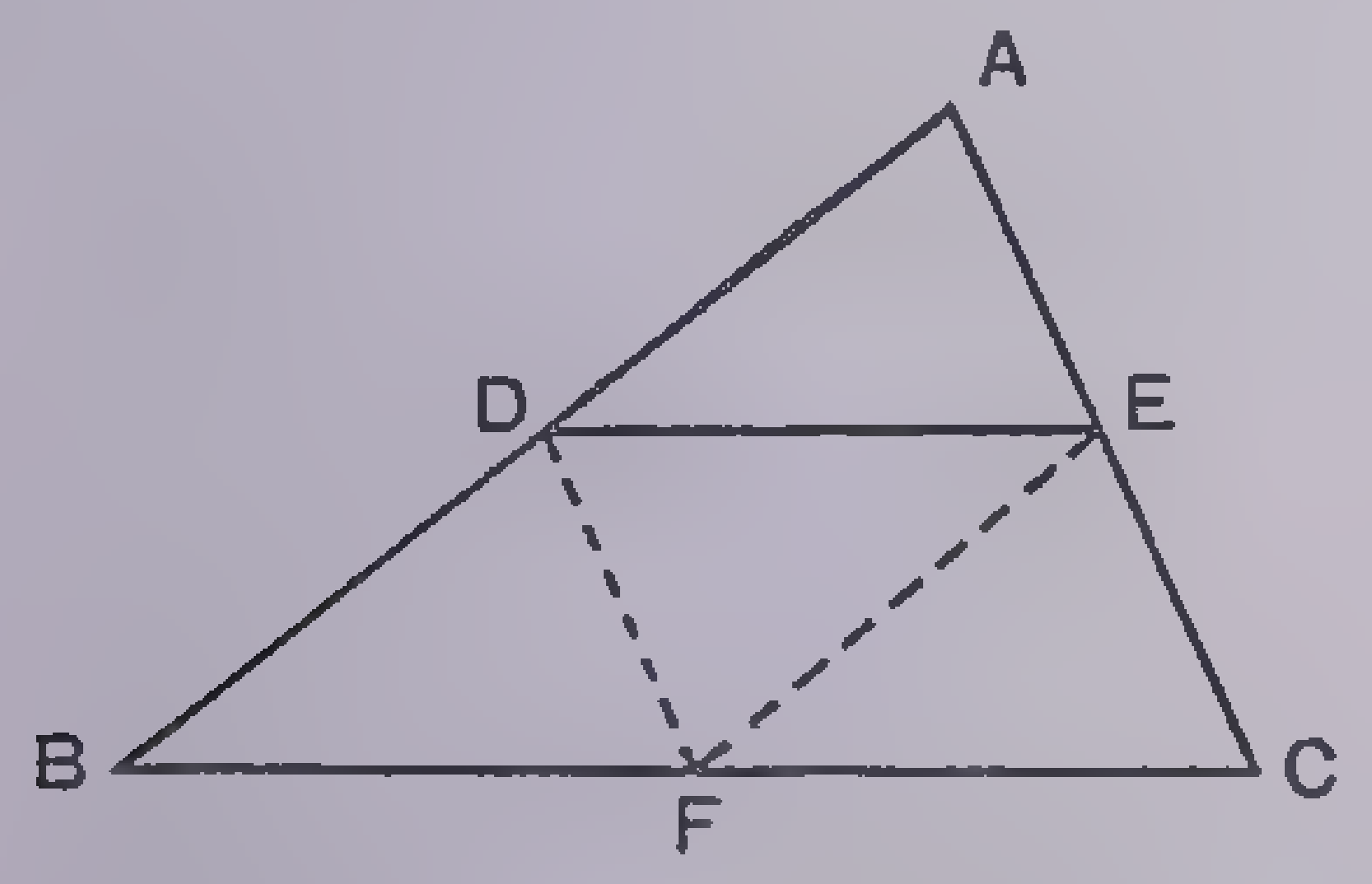


Hyp. Given the right triangle ABC with ∠ C the right angle and ∠ B = 2 ∠ A.

Con. AB is double BC.

Hint. Produce BC through C to B′, making CB′ equal to BC. Draw AB′. Triangles ABC and AB′C are congruent. ∠ BAC + ∠ B′AC = ∠ B = ∠ B′, hence the triangle is equiangular and equilateral. Thus AB = BB′, therefore AB = 2BC.

272. Theorem.—The line which bisects two sides of a triangle is parallel to the third side and is equal to one-half of the third side.



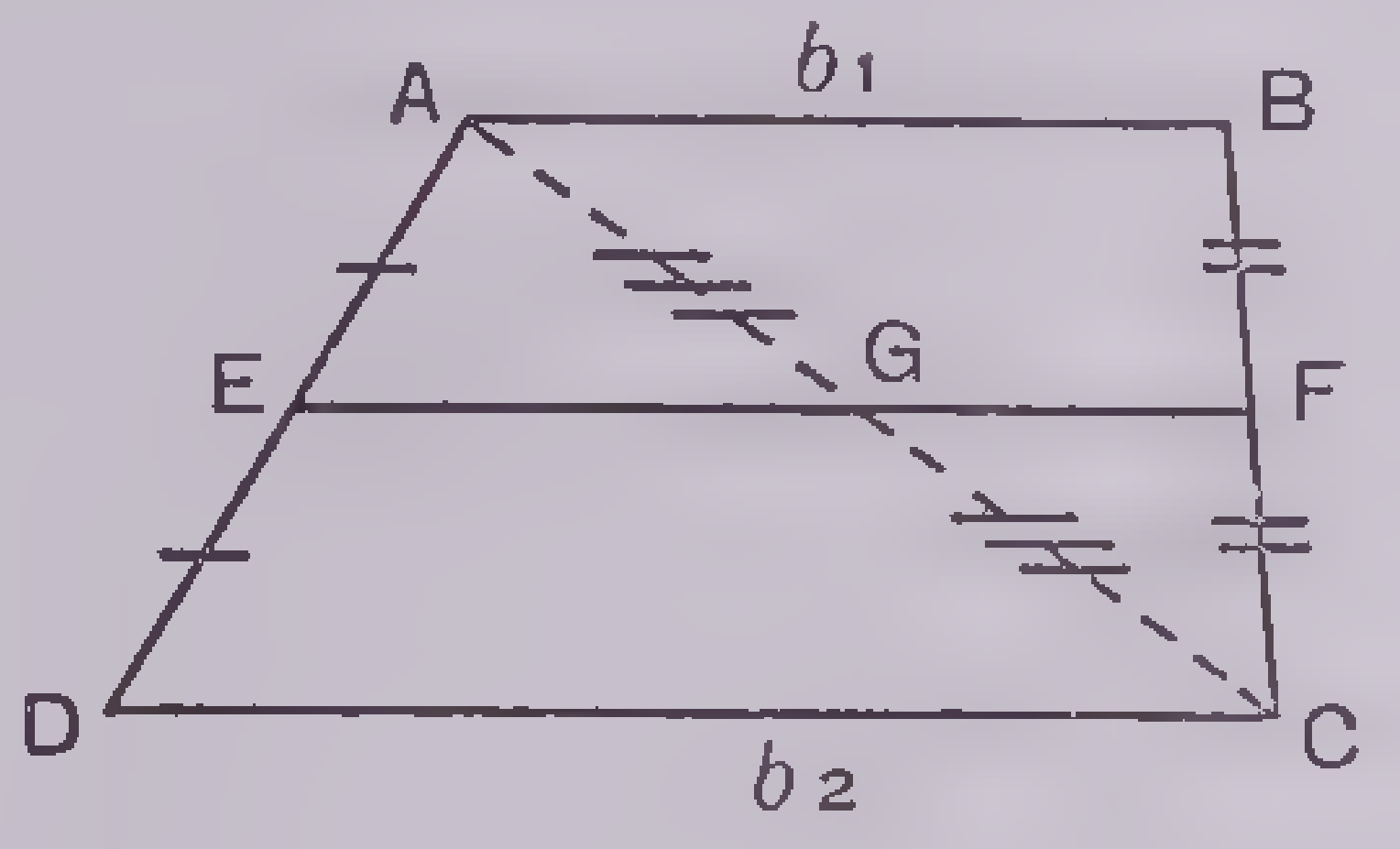
Hyp. D and E are the midpoints of the sides AB and AC respectively, of the triangle ABC.

Con. DE is parallel to BC and equal to one-half of BC.

Hint. Take F, the midpoint of BC, and draw DF and EF. DE is parallel to BC, EF is parallel to AB and DF is parallel to AC. (§182, Theorem 63. If a straight line divides two sides of a triangle proportionally, it is parallel to the third side.) Hence both DEFB and DECF are parallelograms. Thus DE = BF = FC. Therefore DE = $\frac{1}{2}$BC.

273. Theorem.—If a line is parallel to one side of a triangle and bisects a second side it bisects the third side. This is a special case of §181.

274. Theorem.—The line joining the mid points of the nonparallel sides of a trapezoid is parallel to the two bases and is equal to one-half the sum of the bases.



Hyp. Given the trapezoid ABCD, with E and F the midpoints of the non-parallel sides AD and BC respectively. Let AB = b_1 and DC = b_2.

Con. EF is parallel to AB and DC. EF = $\frac{1}{2}(b_1 + b_2)$.

Hint. Draw AC and let G be the midpoint of AC. Draw EG parallel to DC and equal to one-half of it. (§270.) Draw FG. In the same way, FG is parallel to AB and equal to one-half of AB. GF is also parallel to DC. (§95, Theorem 19.) Hence GE and GF are parts of the same straight line. (§15, Postulate.) EG = $\frac{1}{2}b_2$, GF = $\frac{1}{2}b_1$ thus EG + GF = EF = $\frac{1}{2}(b_1 + b_2)$.

275. Theorem.—Two triangles which have their sides respectively parallel or perpendicular are similar.

Hint. Prove the angles of one triangle equal to the angles of the other, and apply §186.

276. Lemma.—A lemma is a preparatory proposition laid down to shorten the demonstration of the main proposition which follows it.

277. Corollary.—A corollary is a secondary proposition, so clearly derived from the main proposition that it requires little or no proof. In the textbooks on geometry many theorems are followed by the statement of a particular case as a corollary.

278. Concyclic Points.—Three or more points which lie on a circle are called *concyclic points*. In general, four points chosen at random will not lie on a circle. When we do have four points on a circle there are many relations existing among the lines and angles which are determined by the four points. The consideration of such relations is beyond an elementary discussion of geometry.

279. Further Aspects of Geometry.—The reader who is interested in geometry need never grieve for more worlds to conquer, as did Alexander the Great. After the study of plane geometry, naturally comes the study of solid, or three-dimensional, geometry. In the developments of modern physics it is also convenient, and almost necessary, to study the geometry of four, five and of any number of dimensions. This is carried out with the assistance of the methods of algebra, in what is known as analytical geometry. Geometry also involves still more advanced work, for in order that the laws of physics may assume simple forms under all conditions, it is necessary that so-called non-Euclidean geometries should be developed.

The careful observer will see some expression of geometry in many facts of everyday life. If one walks in hilly country the shortest distance between two points is not a straight line, but a curve. There is a fascinating geometry to be seen in a spider's web, or in the cells of a comb of honey.

FORMULAS

280. Key Letters.—

a, b, c = sides of a triangle ABC.
p = perimeter.
r = radius.
c = circumference of a circle
d = diameter of a circle.
h = altitude.
$s = \frac{1}{2}(a + b + c)$.
K = area.
b = base of a triangle, parallelogram.
π = 3.14159 . . . , 22/7 approximately.

281. Length of Lines.—

Sides of right triangle, right angle at C, $a^2 + b^2 = c^2$. (§211, Theorem 83.)

Circumference of circle, $c = \pi d = 2\pi r$. (§231, Theorem 91; §234.)

Altitude of equilateral triangle, $h = \frac{1}{2}a\sqrt{3}$. (§270.)

Diagonal of square, of side a, $d = a\sqrt{2}$. (§211.)

Altitude of any triangle on side a,

$$h = \frac{2\sqrt{s(s-a)(s-b)(s-c)}}{a}.$$ (§207, Theorem 79; §212.)

Median of any triangle on side a, $m = \frac{1}{2}\sqrt{2(b^2 + c^2) - a^2}$

Bisector of angle A, opposite side a,

$$x = \frac{2\sqrt{bcs(s-a)}}{b + c}.$$

282. Areas of Plane Figures.—

Rectangle, bh. §203, Theorem 75.
Square, b^2. §203, Theorem 75.
Parallelogram, bh. §206, Theorem 78.
Triangle, $\frac{1}{2}bh$. §207, Theorem 79.
Triangle, $\sqrt{s(s-a)(s-b)(s-c)}$. §212.
Equilateral triangle, $\frac{1}{4}a^2\sqrt{3}$. §268.
Trapezoid, $\frac{1}{2}h(b_1 + b_2)$. §208, Theorem 80.
Regular polygon, $\frac{1}{2}p$(apothem). §228, Theorem 89.
Circle, $\frac{1}{2}rc = \pi r^2$. §223, Theorem 93.
Sector of a circle, $\frac{1}{2}r$(arc).

SUMMARY OF METHODS OF PROOF

I. Ways of proving triangles congruent.—

1. Two triangles are congruent if:
   - (a) Two sides and the included angle of one are equal, respectively, to two sides and the included angle of the other.
   - (b) Two angles and the included side of one are equal, respectively, to two angles and the included side of the other.
   - (c) Three sides of one are equal, respectively, to three sides of the other.
2. Two right triangles are congruent if:
   - (a) A side and an acute angle of one are equal, respectively, to a side and an acute angle of the other.
   - (b) The hypotenuse and a leg of one are equal, respectively, to the hypotenuse and a leg of the other.

II. Ways of proving lines equal.—

1. Two lines are equal if they are:
   - (a) Corresponding sides of congruent figures.
   - (b) Opposite equal angles in an isosceles triangle.
   - (c) Drawn from any point in the perpendicular bisector of a line to the ends of the line.
   - (d) Opposite sides of a parallelogram.
   - (e) Segments of parallels cut off by parallels.
2. Two lines are equal in the same or in equal circles if:
   - (a) They have equal arcs.

  (b) They are equidistant from the center.
  (c) They are tangents to a circle from the same outside point.

III. Ways of proving angles equal.—

1. Two angles are equal if they are:
   (a) Right angles or straight angles.
   (b) Complements or supplements of the same angle or of equal angles.
   (c) Equal to a third angle or to equal angles.
   (d) Corresponding parts of congruent figures.
   (e) Vertical angles.
   (f) Opposite equal sides in an isosceles triangle.
   (g) Diagonally opposite angles of a parallelogram.
   (h) Corresponding or alternate angles of parallel lines cut by a transversal.
   (i) Angles with their sides parallel or perpendicular right side to right side and left side to left side.
2. Two angles are equal in the same circle or in equal circles if they are measured by the same arc or by equal arcs.

IV. Ways of proving quadrilateral a parallelogram.—

1. A quadrilateral is a parallelogram if:
   (a) The opposite sides are equal.
   (b) One pair of sides is both equal and parallel.
   (c) The diagonals bisect each other.
   (d) The diagonally opposite angles are equal.
   (e) The consecutive angles are supplementary.
   (f) The opposite sides are parallel.

V. Ways of proving lines unequal.—

1. Two lines are unequal if they are:
   (a) Opposite unequal angles in a triangle.
   (b) Drawn from a point in a perpendicular to a line cutting off unequal segments from the foot of the perpendicular.
   (c) The third sides of two triangles which have two sides of one equal to two sides of the other but the included angle of the first is greater than the included angle of the second.
2. Two lines are unequal in the same circle or in equal circles if they are chords:
   (a) Having unequal arcs.
   (b) Unequally distant from the center of the circle.

VI. Ways of proving angles unequal.—

1. Two angles are unequal if they are:
   (a) Opposite unequal sides of the same triangle.
   (b) The angles opposite unequal sides of two triangles that have two sides of one equal to two sides of the other.
2. Two angles are unequal in the same circle or in equal circles if they are measured by unequal arcs.

VII. Ways of proving lines parallel.—

1. Two lines are parallel if where cut by a transversal:
   (a) The corresponding angles are equal.
   (b) The alternate angles are equal.
   (c) The sum of the interior angles on the same side of the transversal is equal to 180°.
2. Two lines are parallel if they are:
   (a) Parallel to the same line.
   (b) Perpendicular to the same line.
   (c) Opposite sides of a parallelogram.

VIII. Ways to prove triangles similar.—

1. Two triangles are similar if:
   (a) They are mutually equiangular.
   (b) They have their corresponding sides in proportion.
   (c) They have an angle of one equal to an angle of the other and the including sides proportional.
   (d) They have their sides parallel or perpendicular, respectively.
2. Two right triangles are similar if an acute angle of one is equal to an acute angle of the other.

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SOLID GEOMETRY

There is evidence in the earliest records that man was familiar with the forms of the principal geometric solids. He used the hemisphere, cylinder, cone, pyramid and prism (rectangular solid) in building. It is known that the Egyptians had approximate rules for determining the volumes of wells and granaries.

Solid geometry deals with objects whose points are *not* all in the same plane. A plane is a flat surface, the floor of a room being an example. The floor of a room, however, is bounded by the walls. The term *plane,* as used in geometry, means an unbounded level surface extending indefinitely in all directions. A straight line joining any two points of a plane lies entirely within the plane, that is, has all its points in common with the plane.

PLANES AND LINES

Through three points not in the same straight line, one plane and only one can be drawn. This plane, which contains the three points, is said to be *determined* by them. A plane is also determined by (1) two parallel lines, (2) a line and a point not on that line, (3) two intersecting lines.

Two distinct planes will either (1) intersect in a straight line, or (2) not meet at all, regardless of how far they extend. In the latter case, they have no points in common and are said to be *parallel.* An example of two parallel plane surfaces would be the floor and ceiling of a room. That two intersecting planes have a straight line in common can be seen by folding a sheet of paper.

Three planes, not passing through the same line but each intersecting the other two, will have three lines of intersection in all. These three lines will either meet in a point or be parallel each to each.

A line will either (1) pierce a given plane in one point, called the *foot* of the line; (2) be parallel to the plane, that is, not meet the plane, no matter how far each is extended; (3) lie entirely within the plane.

A line is said to be *perpendicular* to a plane when it is perpendicular to every line in the plane passing through its foot. An example would be the corner line of a room and the floor.

It must be remembered that all of the elements of the figures considered in solid geometry are not necessarily in the same plane, and by overlooking this important fact one may easily be led to wrong conclusions. Thus, in plane geometry, two lines that do not meet are parallel by definition; but in space geometry, there can be lines that do not meet, however far they are extended, and yet are not parallel. Such lines are called *skew lines.*

In order for two lines to be parallel in solid geometry, they must lie in the same plane.

It can be proved that between any two skew lines in space one and only one line can be drawn which will be perpendicular to both. The intersection of the floor with a wall and the ceiling with an adjacent wall are two skew lines. Their common perpendicular is the corner line. However, skew lines do not necessarily lie in parallel planes as in this example.

Perhaps the greatest difficulty confronting the beginning student in solid geometry is concerned with the representation of space figures on the plane of the blackboard or sheet of paper and with the correct interpretation of such figures when they are drawn for him or merely described in the text. Wire and cardboard models are helpful in the beginning, but as the student progresses he should become more and more independent of them. A very important result of training in solid geometry is the ability to form a correct mental image of a three-dimensional figure from a description or a drawing.

We shall now give some of the more important theorems concerning lines and planes, together with figures and proofs for some of them. In the figures, lines which are in the foreground are made heavier, so that they will appear to stand out in front of the page. Parts of the figures which could not be seen because hidden behind opaque portions are represented by broken lines.

Theorem 1.—A plane containing one and only one of two parallel lines is parallel to the other line.

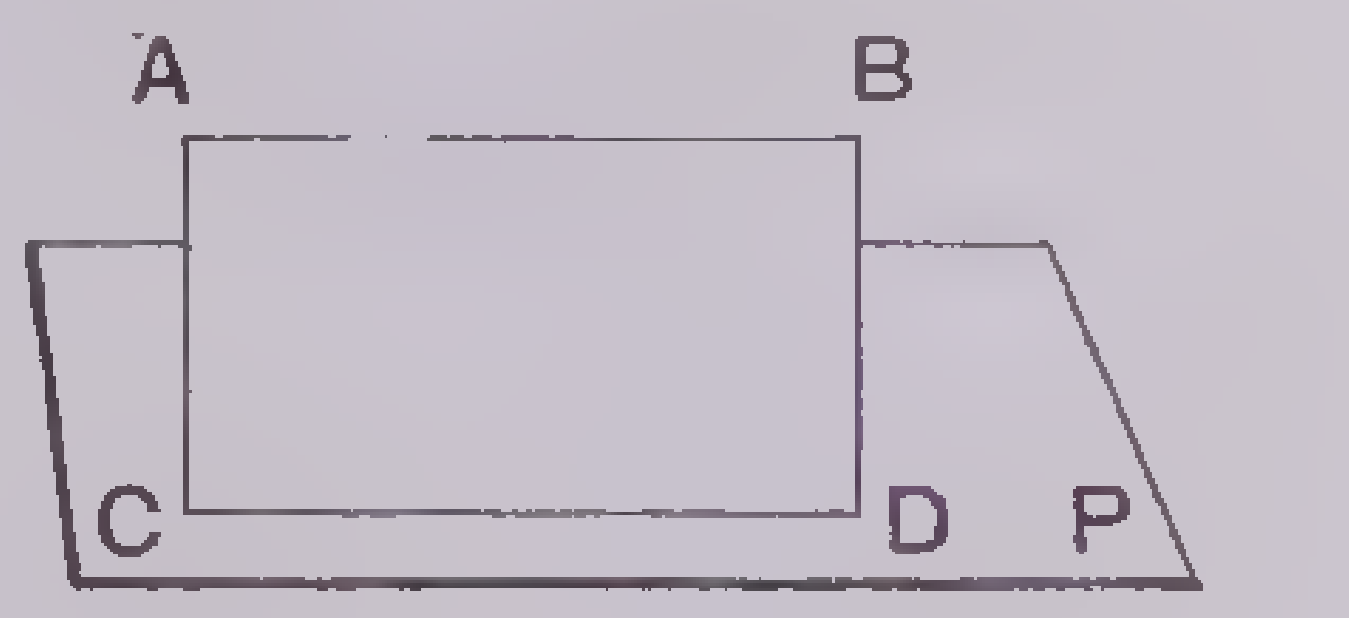


Fig. 1

Given two parallel lines, AB and CD, and plane P containing CD but not AB.

To prove plane P $\parallel$ AB.

Proof.—Since AB and CD are parallel, they determine a plane. If we suppose AB to be not parallel to plane P, then it will intersect it in some point. But this point will be on CD since AB and CD are in the same plane.

But AB and CD intersecting in this point is contrary to the hypothesis that AB and CD are parallel.

Hence our supposition that AB is not parallel to the plane P is wrong, and the only alternative is that it be parallel.

Theorem 2.—Two straight lines that are parallel to a third straight line are parallel to each other.

Theorem 3.—If a plane intersects two parallel planes, the lines of intersection are parallel.

An example of this theorem would be a wall of a room intersecting the two parallel planes formed by the floor and the ceiling.

We now give a detailed proof of a theorem which should be helpful to the reader as a connecting link between plane and solid geometry.

Theorem 4.—If two angles not lying in the same plane have their sides parallel respectively and lying on the same side of the line joining their vertices, they are equal.

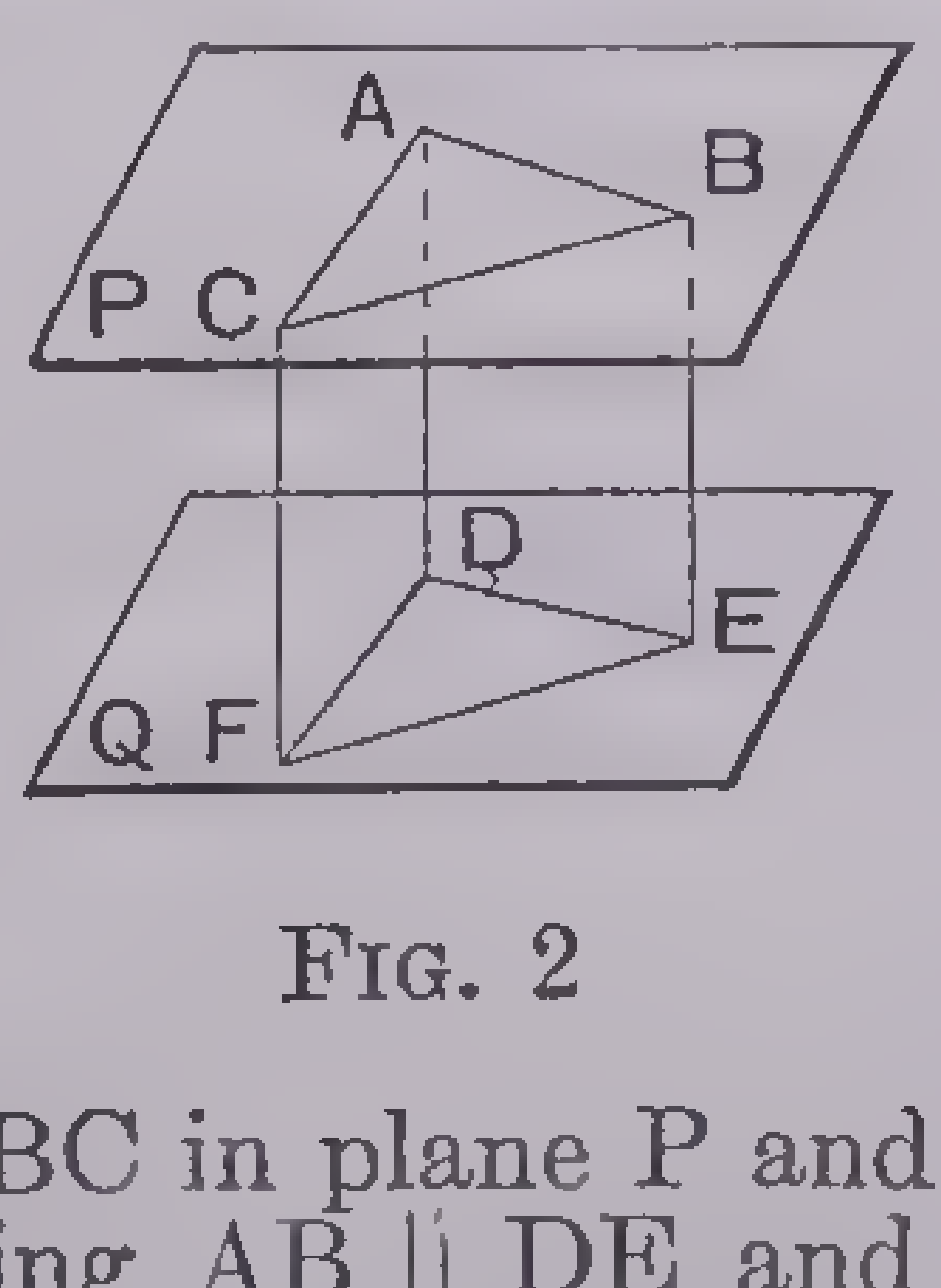


Fig. 2

Given $\angle ABC$ in plane P and $\angle DEF$ in plane Q, having $AB \parallel DE$ and $CB \parallel FE$.

To prove $\angle ABC = \angle DEF$.

Proof.—Take BA = ED and BC = EF and draw lines AD, CF, BE, AC and DF.

Both AE and CE are parallelograms. (Opposite sides are equal and parallel, AB and DE, and CB and FE.)

Hence both AD and CF are equal and parallel to BE. (Each is a side opposite BE in a parallelogram.)

Then AD and CF are equal and parallel. (Theorem 2.)

Therefore ADFC is a parallelogram and AC = DF.

Then triangles ABC and DEF are congruent. (Three sides of one equal, respectively, to three sides of the other.)

Hence $\angle ABC = \angle DEF$.

Theorem 5.—If a line is perpendicular to each of two intersecting lines at their point of intersection, it is perpendicular to the plane determined by these lines.

Theorem 6.—All the perpendiculars that can be drawn to a straight line at a given point in the line lie in a plane perpendicular to the line at the given point.

Theorem 7.—From a given point outside a plane, one line perpendicular to the plane, and only one, can be drawn.

Theorem 8.—At a point in a plane, one perpendicular can be drawn to the plane, and only one.

Definition.—The length of the perpendicular from a point to a plane is called the *distance from the point to the plane.* The distance between two parallel planes is the length of the segment of a common perpendicular lying between them.

Theorem 9.—Two planes perpendicular to the same straight line are parallel; and conversely, if one of two parallel planes is perpendicular to a straight line, the other is also.

Theorem 10.—If one of two parallel lines is perpendicular to a plane, the other is also; and conversely, two straight lines perpendicular to the same plane are parallel.

Definitions.—The projection of a point upon a plane is the *foot* of the perpendicular from the point to the plane. The projection of a line upon a plane is the *locus* of the projections of all points of the line upon the plane. The projection of a line upon a plane is itself a straight line.

The acute angle that a straight line makes with its own projection upon a plane is called the *inclination* of the line to the plane or the angle that the line makes with the plane. It can be shown that this angle is the least one that the straight line makes with any line passing through its foot and lying in the plane.

A *dihedral angle* is a figure formed by two planes meeting in a line and not extending beyond the line (Fig. 3). The line of intersection is called the *edge,* and the two planes are the *faces* of the dihedral angle. An example can be formed from two leaves of a book.

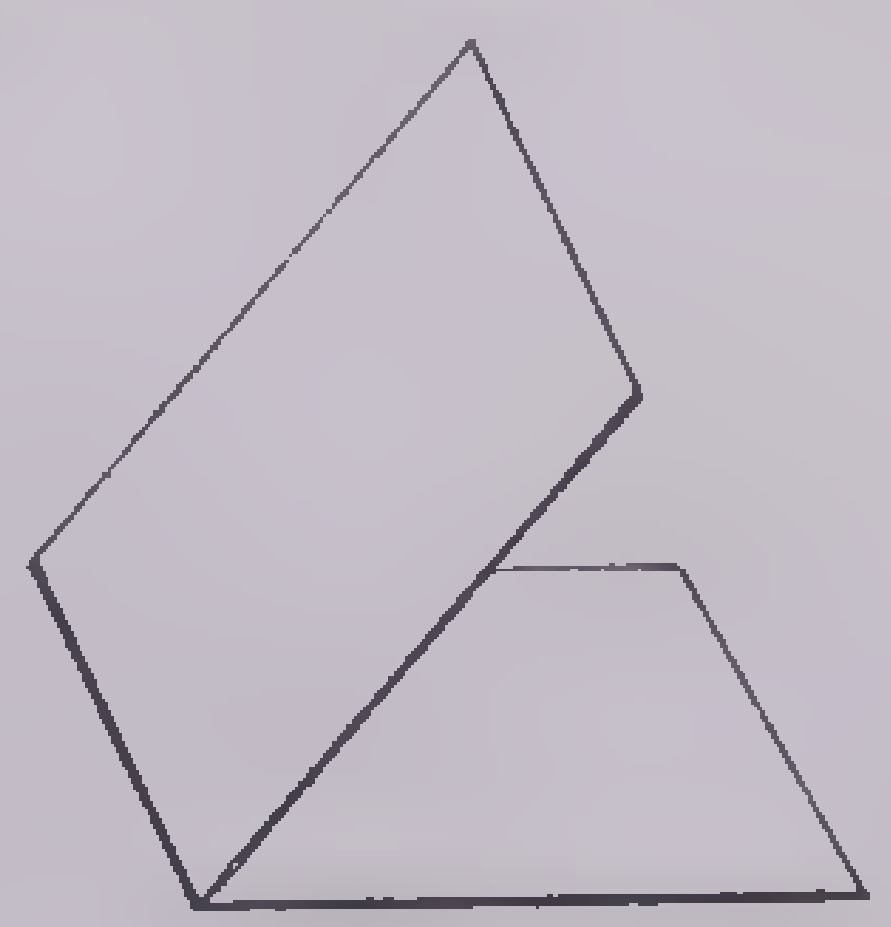


Fig. 3

The plane angle of a dihedral angle is the angle formed by two lines, one in each face, each perpendicular to the edge of the dihedral angle at the same point.

A dihedral angle is measured by its plane angle. For example, a dihedral angle whose plane angle is a right angle is a *right dihedral angle*, etc. The planes forming a right dihedral angle are *perpendicular planes.*

Theorem 11.—If a line is perpendicular to a plane, every plane containing this line is perpendicular to the given plane.

Theorem 12.—If two planes are perpendicular to each other, a line drawn in one of them perpendicular to their intersection is perpendicular to the other.

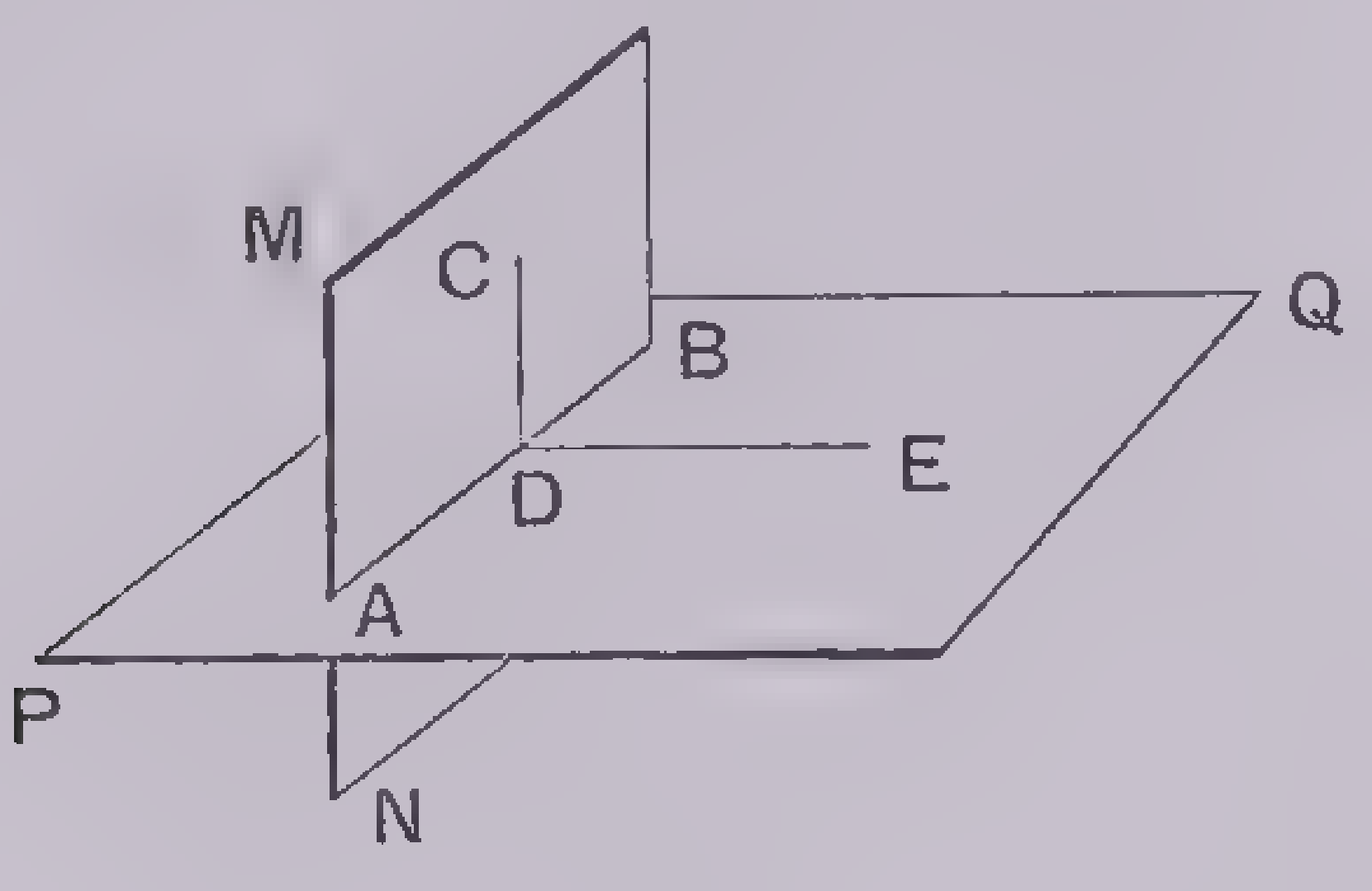


FIG. 4

GIVEN plane MN $\perp$ plane PQ, AB, their intersection, and CD $\perp$ AB in plane MN.

TO PROVE CD $\perp$ plane PQ.

PROOF.—Through D and in plane PQ, draw DE $\perp$ AB.

Then, $\angle$ CDE is the plane angle of the right dihedral angle formed by the two given perpendicular planes and hence is a right angle.

Thus, CD $\perp$ DE, and also to AB by hypothesis.

Therefore, CD $\perp$ plane PQ (Theorem 5).

Theorem 13.—If each of two intersecting planes is perpendicular to a third plane, their line of intersection is perpendicular to the third plane.

POLYHEDRONS, PRISMS, CYLINDERS

A *polyhedron* is a solid bounded completely by planes. The lines of intersection of the bounding planes are called the *edges;* the points of intersection of the edges, the *vertices;* and the polygons bounded by the edges, the *faces.* The cube (Fig. 5), in which the faces are squares, is one of the commonest examples.

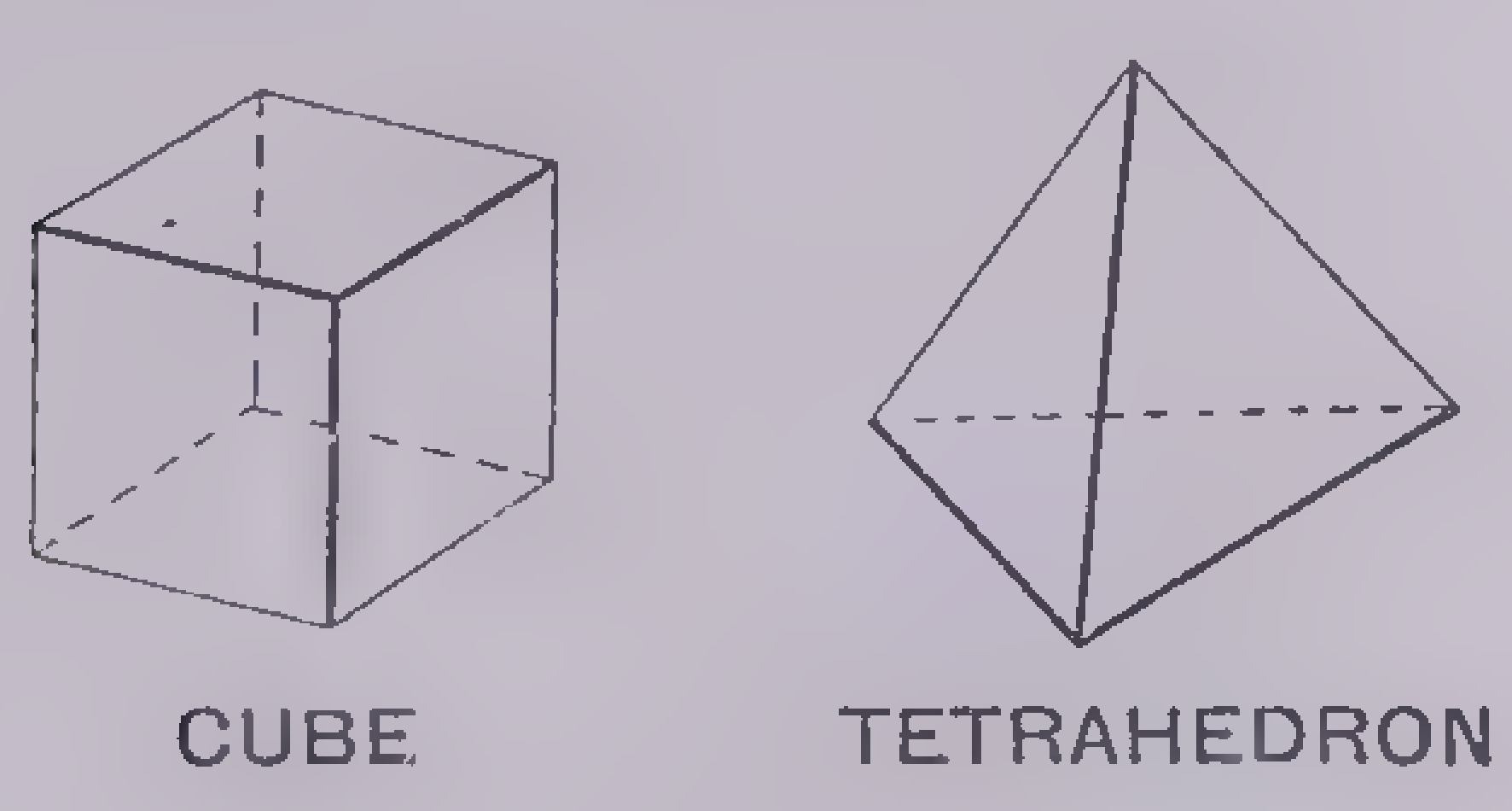


FIG. 5

A *regular polyhedron* is one whose faces are congruent regular polygons, the same number meeting at each vertex, and all the solid lying entirely to one side of each face. The cube is an example. It can be shown that there are only five regular polyhedrons. They are (1) *tetrahedron,* with four triangular faces (Fig. 5); (2) *cube,* with six square faces; (3) *octahedron,* with eight triangular faces; (4) *dodecahedron,* with twelve pentagonal faces; (5) *icosahedron,* with twenty triangular faces. Figure 6 indicates how to make cardboard models of each of these. Cut along the full lines, fold on the dotted lines and fasten the edges that meet with gummed paper.

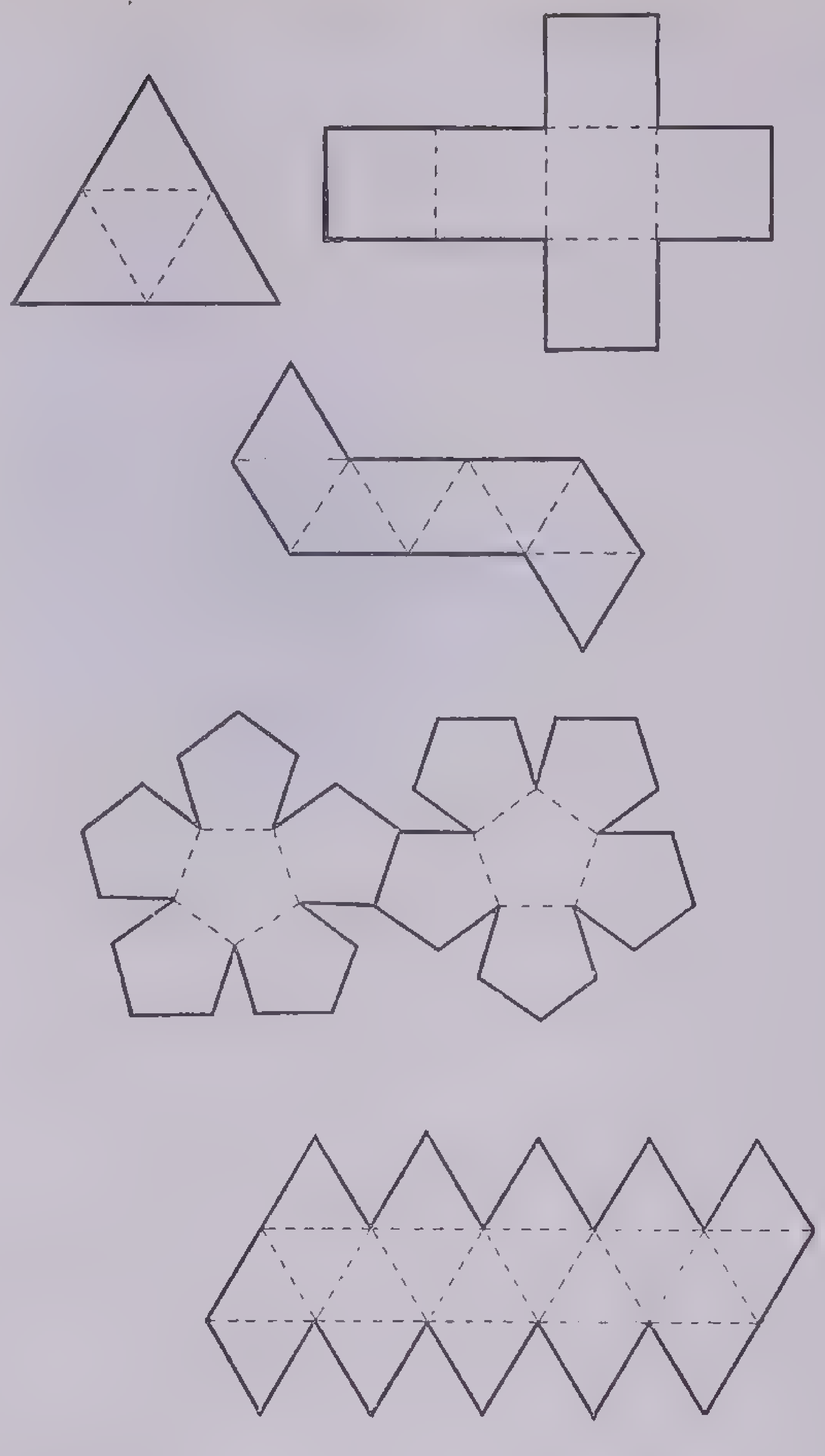


FIG. 6

Prismatic and Cylindrical Surfaces.—A moving straight line that always remains parallel to its original position and intersects a broken line not in the same plane with it, generates a *prismatic surface* (Fig. 7).

A moving straight line that always remains parallel to its original position and intersects a plane curved line not in the same plane with it generates a *cylindrical surface* (Fig. 7).

AB is the original position of the moving line, and AC the fixed line that AB constantly intersects. It is understood that the moving line extends indefinitely in both directions, and hence the surfaces do also.

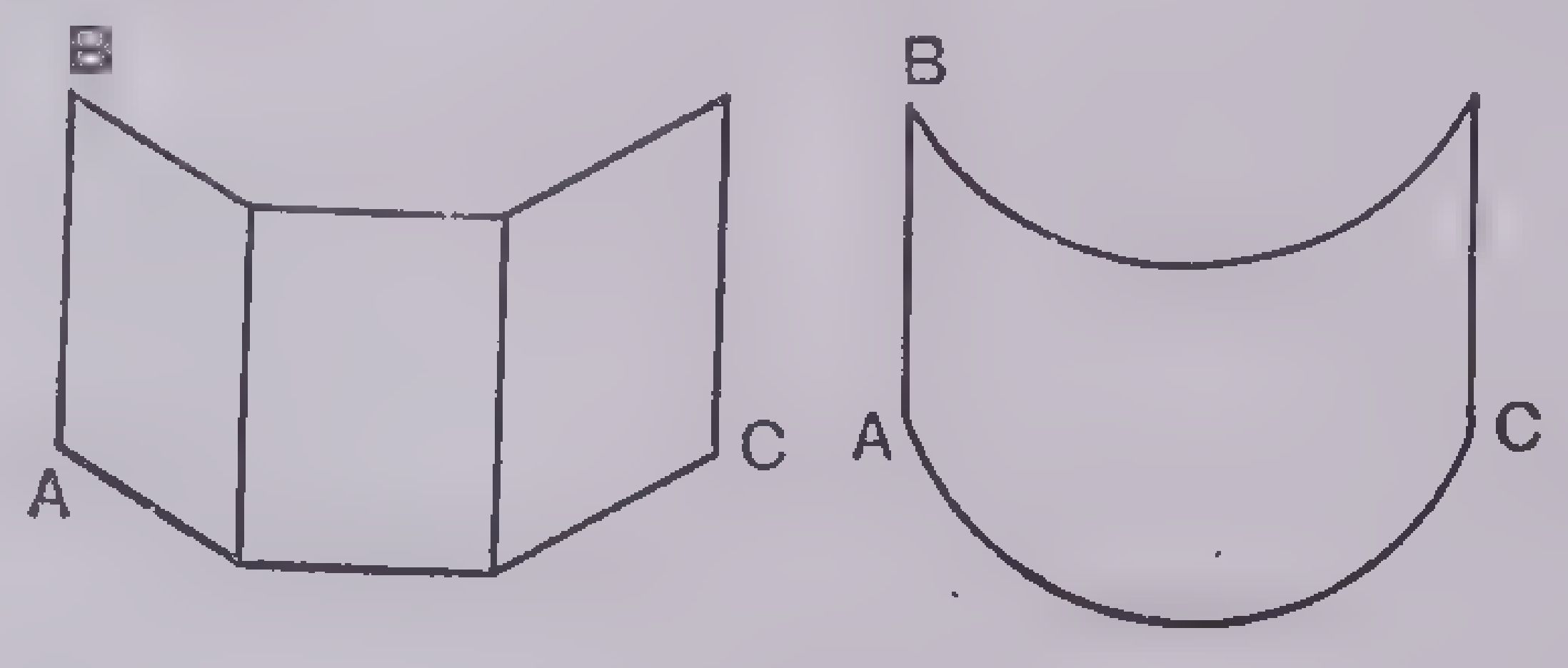


FIG. 7

The moving line is called the *generatrix,* and the fixed line or curve, the *directrix.* If the directrix is a closed line, and the generatrix moves completely over it, the prismatic or cylindrical surface is *closed.* The generatrix in any position is called an *element* of the surface generated. A plane cutting all the elements of a closed prismatic or cylindrical surface cuts the surface in a closed line. The figure bounded by this closed line is a *section.* If the cutting plane is perpendicular to an element, the section is a *right section.*

A *prism* (or a *cylinder*) is a solid formed when a closed prismatic (or a cylindrical) surface is cut by two parallel planes. The sections formed by the two parallel planes are the *bases.* (See Fig. 8 for prism.) The sides of a prism are parallelograms and are called *lateral faces.* The intersections of the faces are *lateral edges.* The *altitude* of a prism (or of a cylinder) is the perpendicular distance between its bases.

Theorem 14.—The sections of a prism made by two parallel planes are congruent.

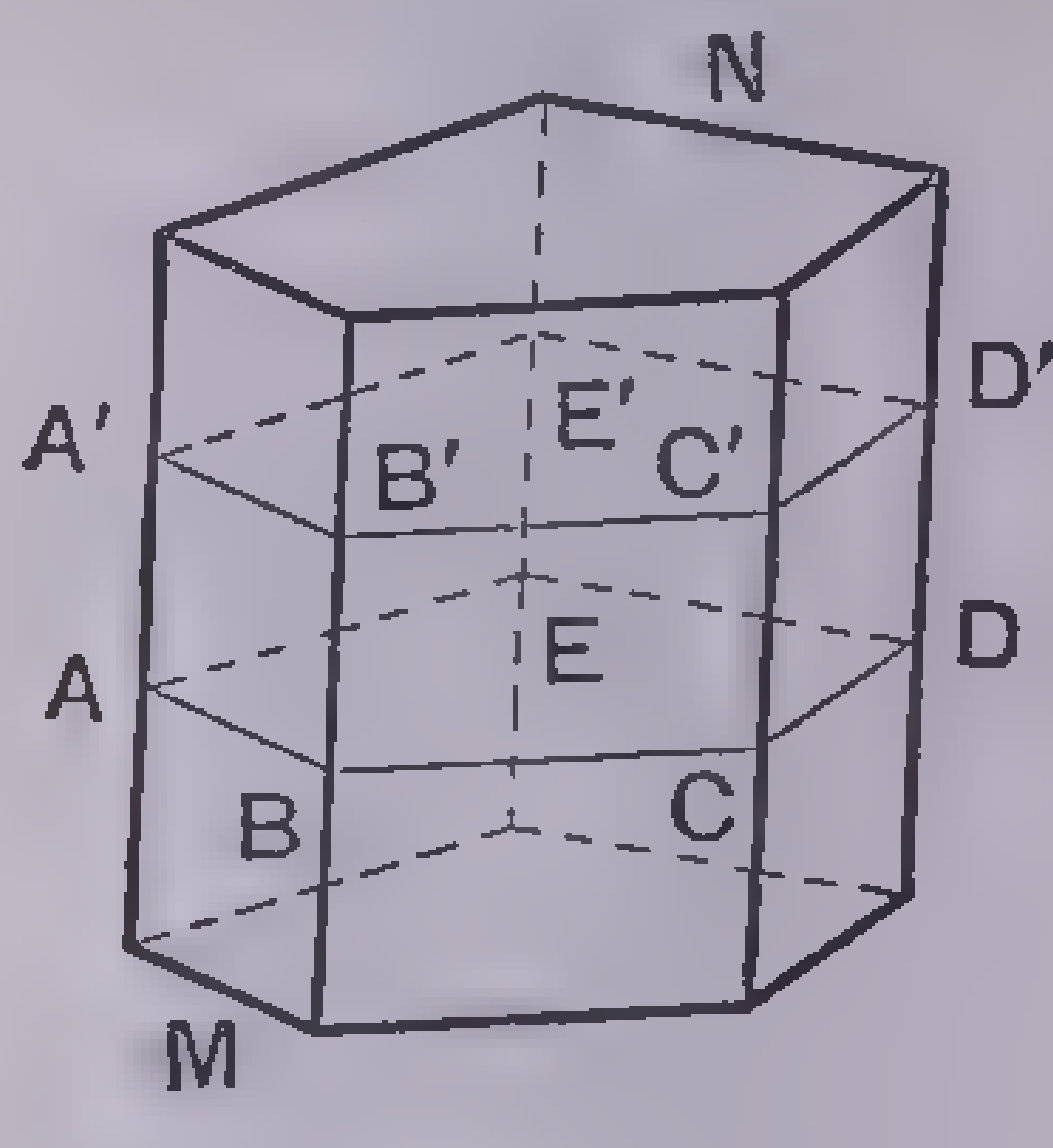


FIG. 8

GIVEN the prism MN, and the parallel sections AD and A′D′.

TO PROVE polygon AD $\cong$ polygon A′D′.

PROOF.—$AB \parallel A'B'$ (Theorem 3).

Hence, AB = A′B′. (Parallel lines cut off by two parallel lines are equal.)

Similarly, the other corresponding sides of the two polygons are equal.

Also $\angle$ ABC = $\angle$ A′B′C′ as do the other corresponding angles (Theorem 4).

The two polygons AD and A′D′ are then mutually equilateral and mutually equiangular and can be proved congruent by superposition.

DEFINITIONS.—The *lateral area* of a prism (or cylinder) is the area of the surface between the bases. The *total area* is the lateral area together with the areas of the bases.

A *right prism* (or a *right cylinder*) is one whose lateral edges (or elements) are perpendicular to the bases. Otherwise, the solid is called *oblique.* A *regular prism* is a right prism whose base is a regular polygon. A *circular cylinder* is a cylinder whose base is a circle. A *right circular cylinder* with a circle for base and having its elements perpendicular to the bases is what cylinder means in everyday conversation. Prisms are called triangular, quadrangular, etc., when their bases are triangles, quadrilaterals, etc.

Theorem 15.—The lateral area of a prism is equal to the product of the perimeter of a right section and a lateral edge.

OUTLINE OF PROOF.—The lateral area of a prism is the sum of the areas of the lateral faces. Each face is a parallelogram whose base is a lateral edge of the prism and whose altitude is a part of the perimeter of a right section.

Lateral Area of Circular Cylinder.—An *inscribed prism* is a prism whose bases are respectively inscribed in the bases of a cylinder. The cylinder is then said to be *circumscribed* about the prism (Fig. 9). A *circumscribed prism* is a prism whose bases are respectively circumscribed about the bases of a cylinder. The cylinder is then said to be *inscribed* in the prism (Fig. 9).

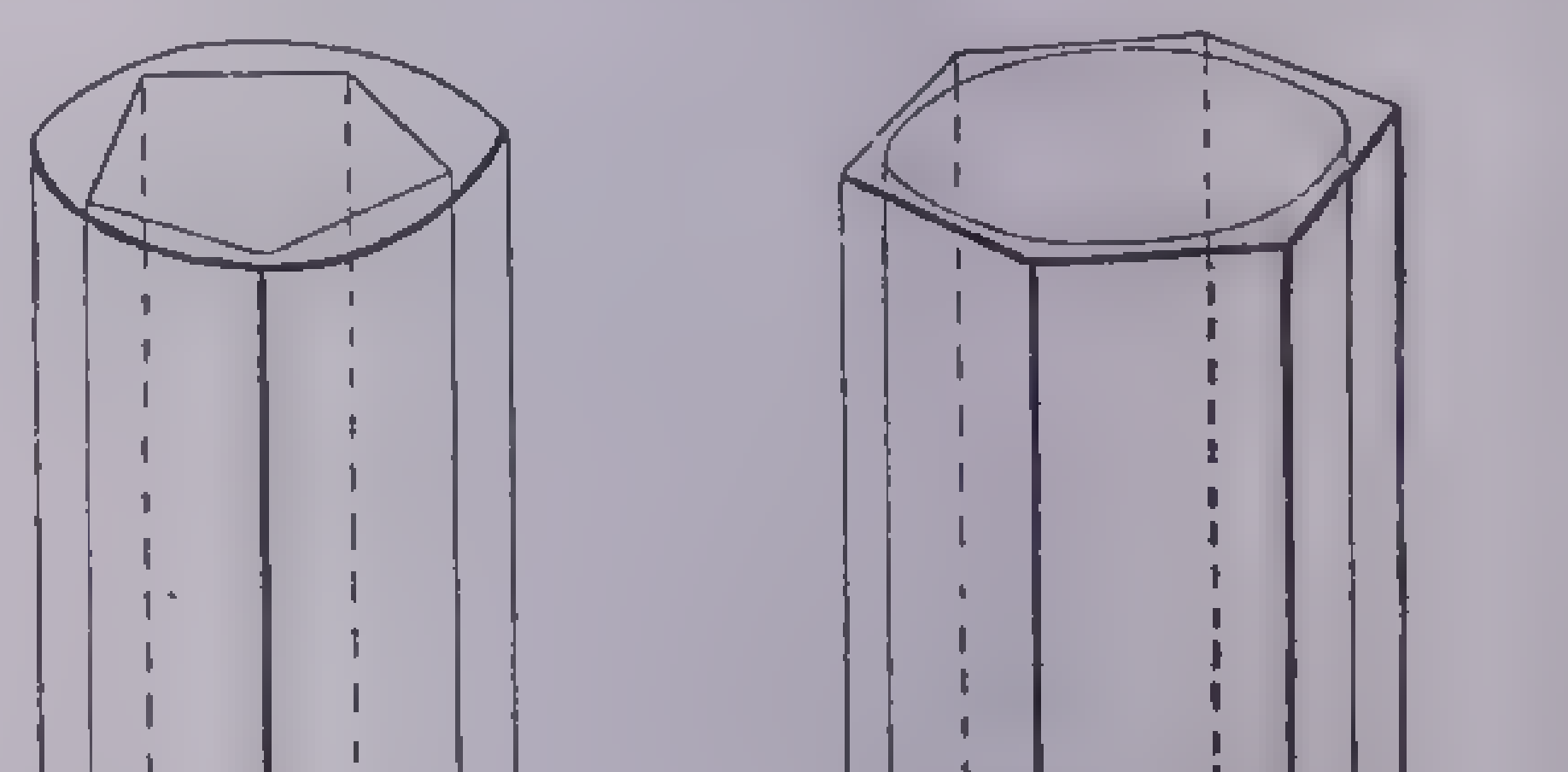


FIG. 9

The reader is familiar from plane geometry with the idea of polygons inscribed in and circumscribed about circles. As the number of sides of the polygon is doubled and redoubled and so on indefinitely, it is assumed that the perimeter and area of the polygon approach respectively the circumference and area of the circle as a limit, i. e., that the difference between the perimeter and circumference (or the two areas) can be made as small as we please by increasing the number of sides of the polygon. Indeed it was by means of this kind of argument that the formulas for the circumference and area of a circle were obtained. By a similar line of reasoning we are led to the assumption that the lateral area of the inscribed or circumscribed prism approaches closer and closer to the lateral area of the cylinder as the number of sides of the bases of the prism increases. Remembering that Theorem 15 is true for any prism, no matter how many lateral faces it has, we conclude the following theorem:

Theorem 16.—The lateral area of a circular cylinder is equal to the product of the perimeter of a right section and the length of an element. As a special case of this theorem, the lateral area of a right circular cylinder is seen to be the product of the circumference of its base and its altitude.

The reason for using both inscribed and circumscribed polygons or prisms in a discussion like the above is to make the proof more certain. The belief that the perimeter of the polygon approaches the circumference of the circle in the above argument is based on intuition rather than logic, and intuition in mathematics frequently proves wrong.

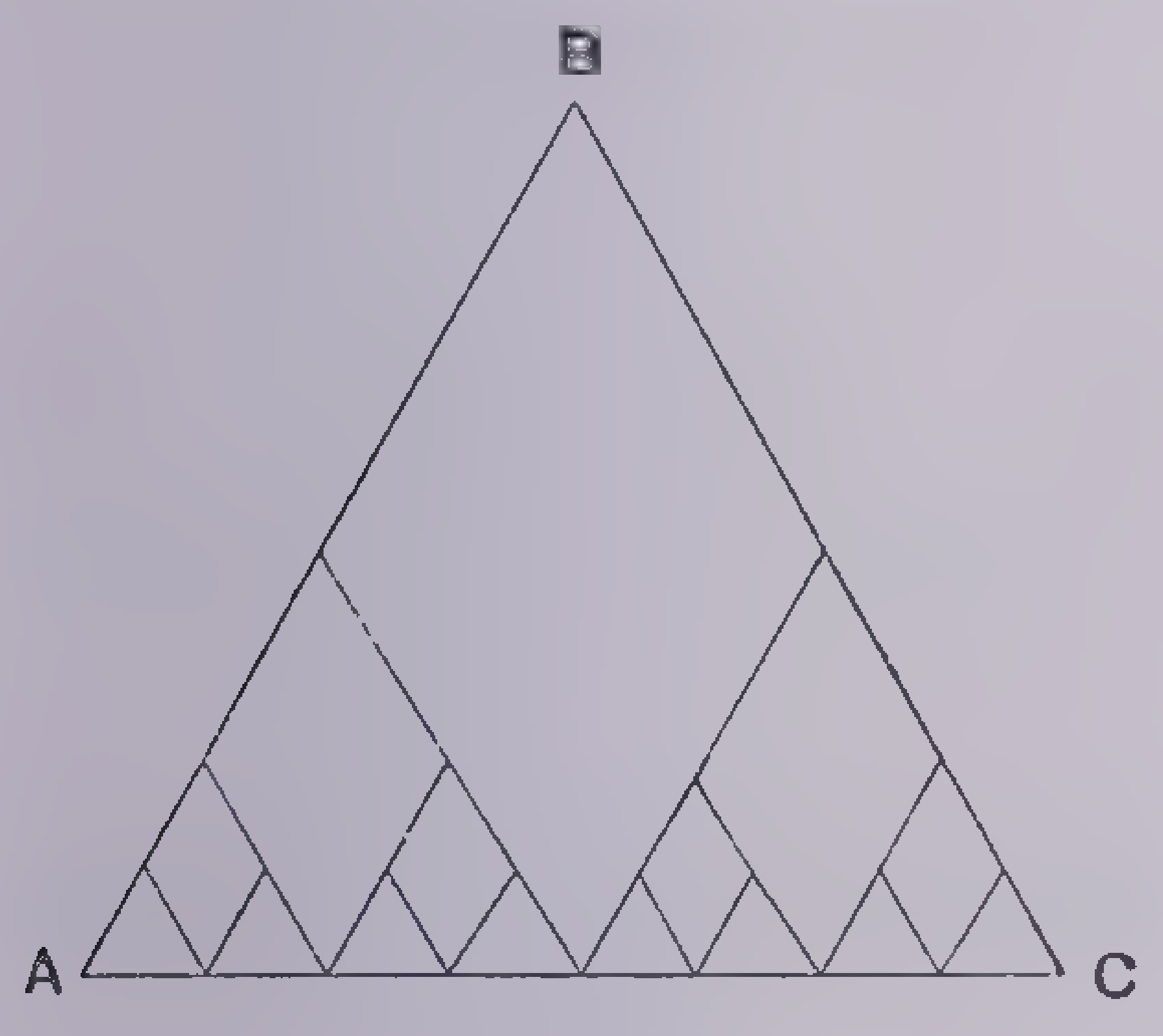


FIG. 10

To illustrate this, consider the equilateral triangle ABC in Figure 10. Connect the midpoints of the sides, thus forming two new equilateral triangles. Repeat this process on each of these two, thus forming four equilateral triangles, the sum of whose bases is equal to AC. Continue this process indefinitely until the broken line from A to C is indistinguishable from the straight line AC. Our intuition would conclude that the broken line from A to C is approaching the straight line in length as the number of pieces of the broken line is increased indefinitely. Our reasoning, however, checks up on this conclusion and tells us that, since all the triangles involved are equilateral, the length of the broken line is always twice that of AC, regardless of how many pieces there are in the broken line. Could not intuition be wrong in regard to the perimeter of the polygon and the circumference of the circle?

The chance of this error is eliminated by considering both the inscribed and the circumscribed polygons. It can be shown that their perimeters approach a common limit. Since the perimeter of the inscribed polygon is always less than the circumference of the circle, and that of the circumscribed polygon always greater, it is certain that the common limit which both perimeters are approaching is the circumference of the circle.

Volumes of Prisms and Cylinders.—The volume of any solid is the numerical measure of its magnitude in terms of some unit of measure. The unit of measure usually taken is a cube having an edge one linear unit long.

A *parallelepiped* is a prism whose bases are parallelograms. A *right parallelepiped* is a parallelepiped whose lateral edges are perpendicular to its bases. An *oblique parallelepiped* is a parallelepiped whose lateral edges are oblique to its bases. A *rectangular parallelepiped* is a right parallelepiped whose bases are rectangles. An ordinary box is an example of this last type.

The rectangular parallelepiped is usually considered the most convenient foundation for the subject of volumes. Consider the case in which the three dimensions of the rectangular parallelepiped are represented by the integers, a, b, c. (In Fig. 11, $a = 3$, $b = 4$, $c = 5$.)

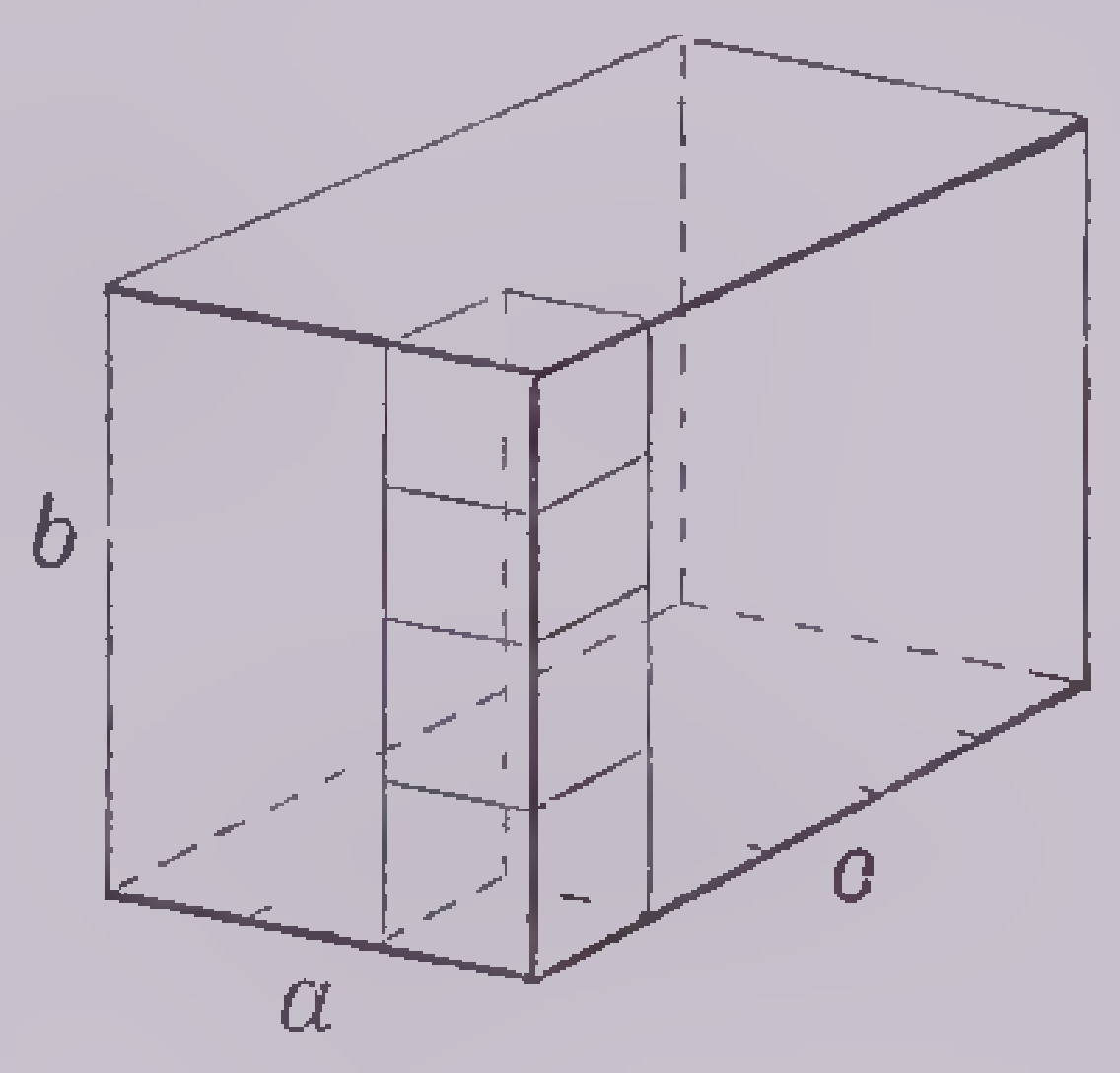


FIG. 11

It is seen that the solid can be divided into as many cubic units as are indicated by the product of the three integers. For the base of the solid can be divided into $a \times c$ squares. On each of these squares as a base, a column of b cubes can be erected, thus giving a total of $a \times b \times c$ cubic units.

If the edges (one or more) of the rectangular parallelepiped are fractions or are incommensurable with the unit of length, it can also be shown, by a method similar to that given in plane geometry for the area of a rectangle, that the volume is given by the product of the three dimensions. This leads at once to the following theorem:

Theorem 17.—The volume of a rectangular parallelepiped is equal to the product of its base and its altitude.

Theorem 18.—The volume of any triangular right prism equals the product of its base and its altitude.

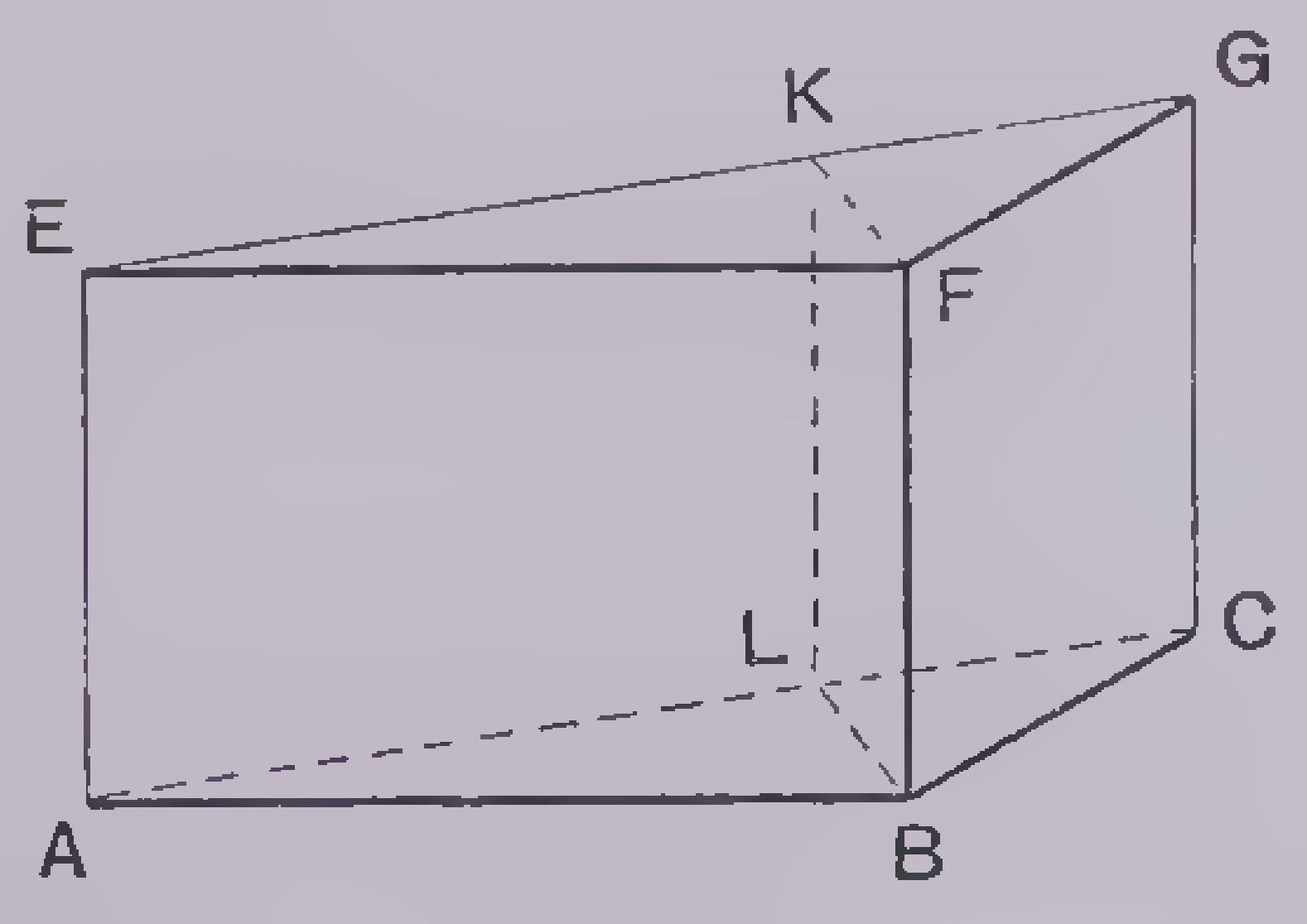


FIG. 12

In case the base, ABC, of the triangular prism is a right triangle, the volume of the prism is evidently equal to one-half the volume of a rectangular parallelepiped with the same altitude and twice the base.

If the base is an oblique triangle, suppose that AC is the longest side. Through BF, pass a plane perpendicular to the face AG. Let KL be the line of intersection of the two planes. Then, two triangular right prisms are formed, whose bases, ABL and BCL, are right triangles. Since the original volume is made up of the sum of the volumes of these two, the theorem follows for this case also.

Theorem 19.—The volume of any right prism is equal to the product of its base and altitude.

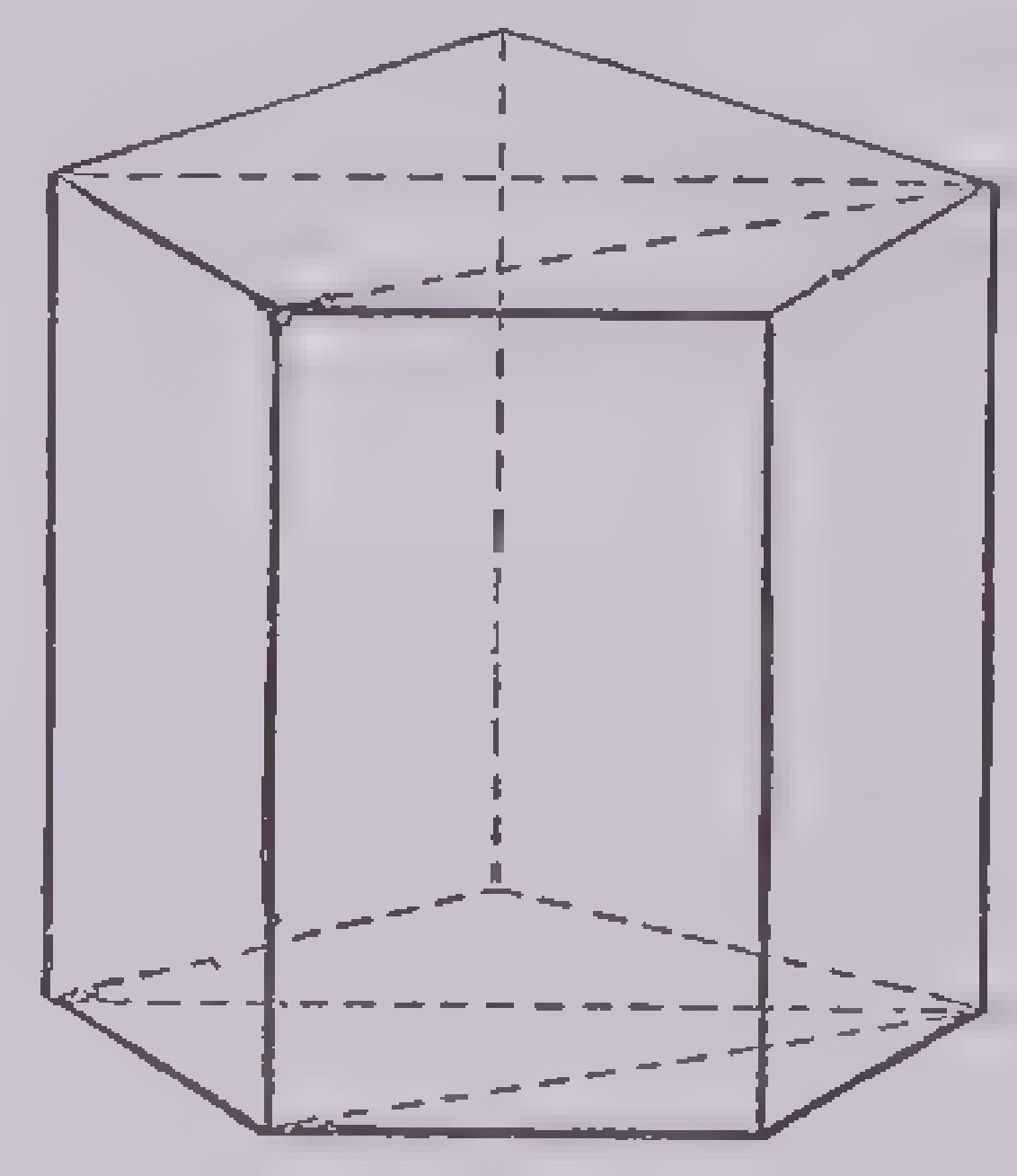


FIG. 13

By passing diagonal planes through any lateral edge as indicated in the figure, the given prism may be divided into triangular right prisms, all having the same altitude and the sum of whose bases equals the base of the given prism. Hence, the theorem follows from Theorem 18.

Reverting now to Figure 9 and the argument leading up to Theorem 16, we may conclude by a similar line of reasoning the following theorem:

Theorem 20.—The volume of any right circular cylinder equals the product of its altitude and the area of its base.

It can be proved that the volume of an oblique parallelepiped, prism or cylinder is also equal to the area of the base times the altitude.

PYRAMIDS AND CONES

A moving straight line that always passes through a fixed point and constantly intersects a broken line not in the same plane with it, generates a *pyramidal surface.* A moving straight line that always passes through a fixed point and constantly intersects a curved line not in the same plane with it, generates a *conical surface.* The fixed point is called the *vertex* of the pyramidal or the conical surface. The two parts of the surface on opposite sides of the vertex are called *nappes.*

A *pyramid* is the solid formed by cutting all the elements of one nappe of a closed pyramidal surface by a plane. A *cone* is the solid formed by cutting all the elements of one nappe of a closed conical surface by a plane (Figs. 14 and 15).

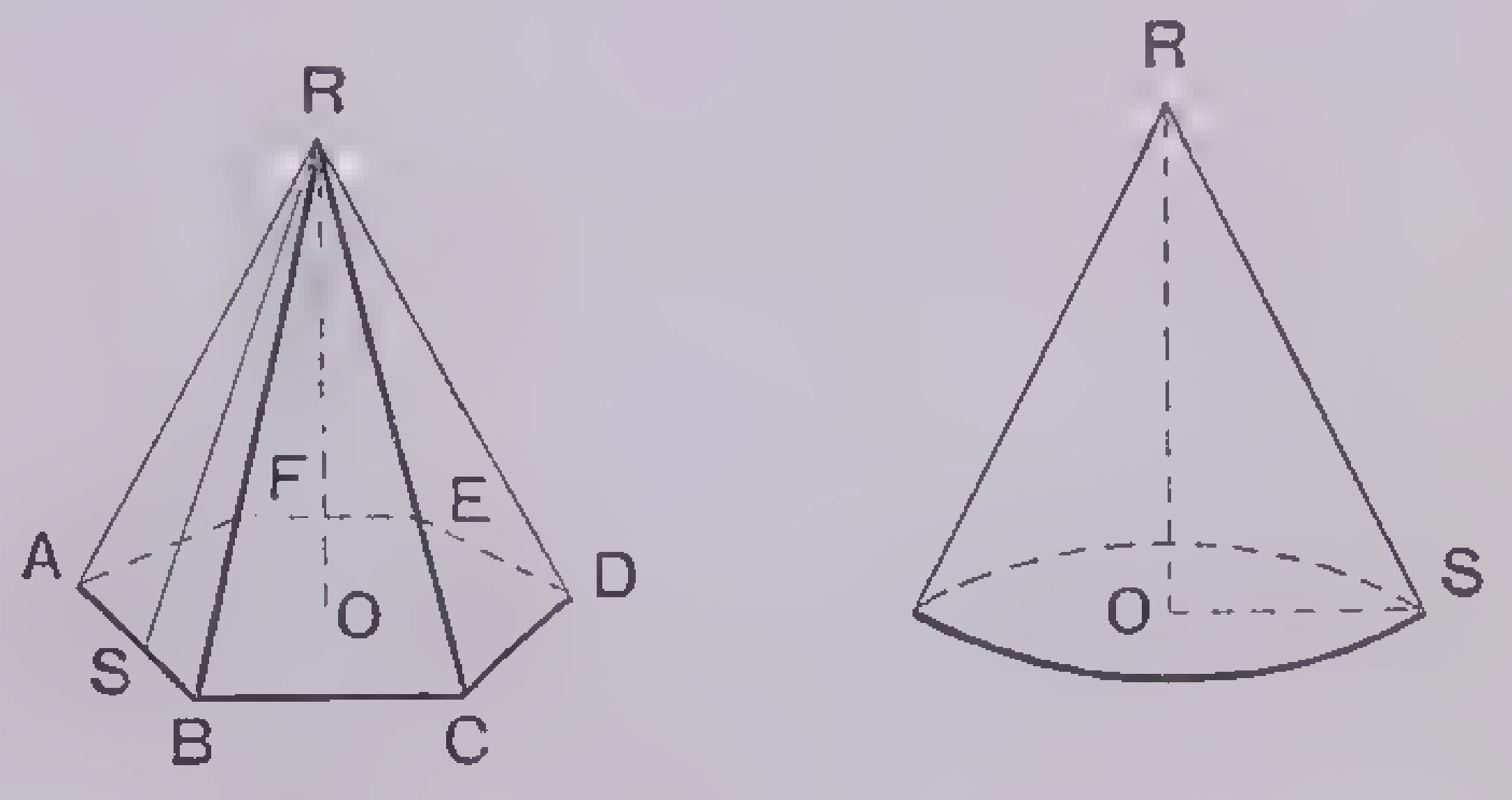


FIG. 14

The meaning of the terms generatrix, directrix, element, closed surface, base, lateral face, lateral edge, lateral area and total area in connection with pyramids and cones can readily be assumed from the corresponding definitions for prisms and cylinders. The *altitude* of a pyramid or of a cone is the perpendicular distance from the vertex to the base. Pyramids, like prisms, are classified as triangular, quadrangular, etc., when their bases are triangles, quadrangles, etc.

A pyramid whose base is a regular polygon, and whose altitude meets the center of the base, is called a *regular pyramid.* The altitude of a regular pyramid is called its *axis.* The altitude of one of the lateral faces of a regular pyramid is called the *slant height.* In Figure 14, R is the vertex, RO the axis or altitude, RB a lateral edge and RS the slant height.

A cone whose base is inclosed by a circle is called a *circular cone.* The *axis* is the line joining the vertex to the center of the base. A *right circular cone* is a circular cone whose axis is perpendicular to its base. The *radius* of a circular cone is the radius of its base. Since a right circular cone may be generated by revolving a right triangle about one of its sides as an axis, it is often called a *cone of revolution.* The length of an element of a right circular cone is its *slant height.* The right circular cone (Fig. 14) is what is usually referred to by the term cone in everyday conversation.

Theorem 21.—The lateral edges and the altitude of a pyramid or the elements and the altitude of a cone are divided proportionally by a plane parallel to its base.

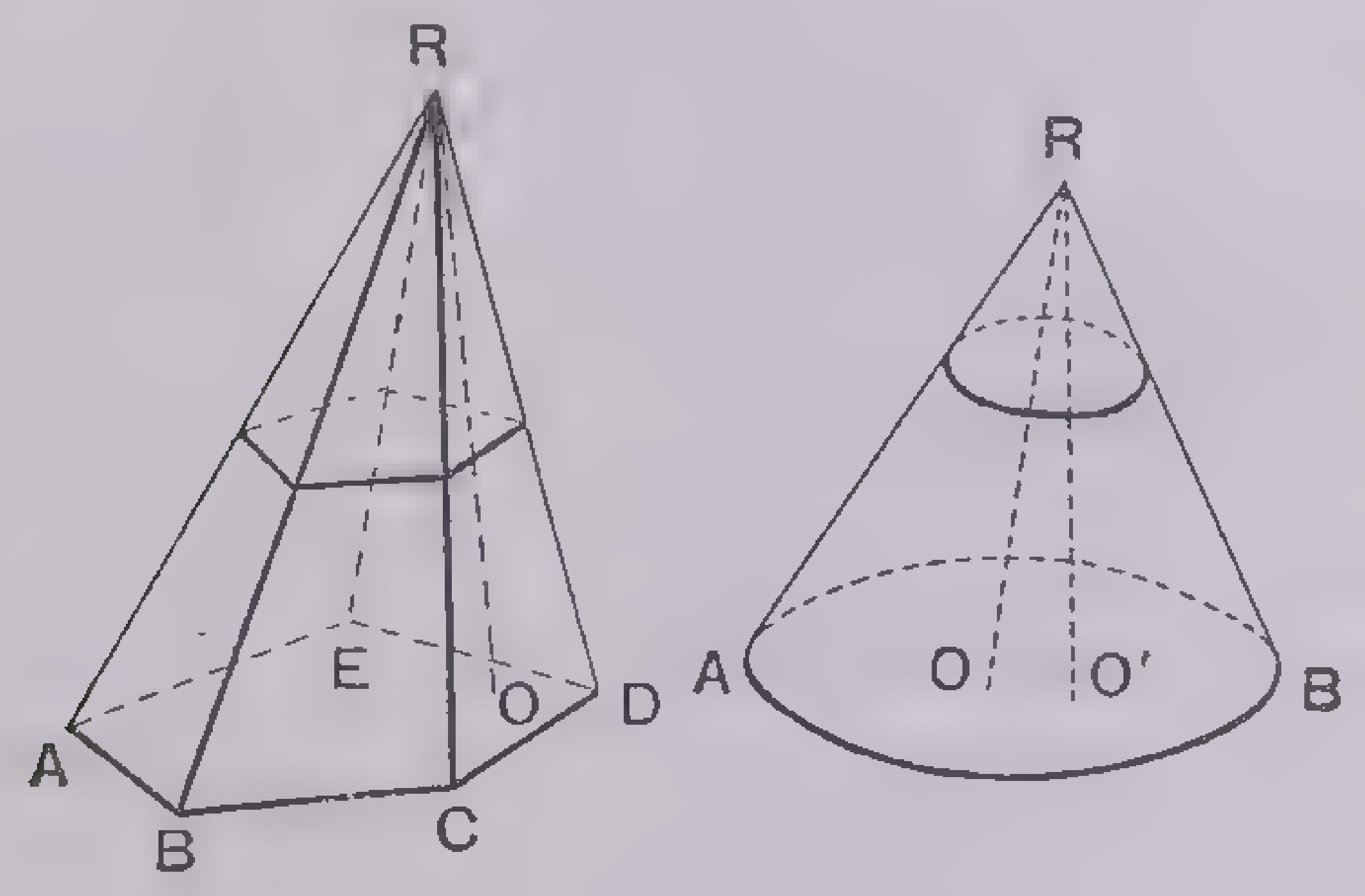


Fig. 15

In the case of the pyramid, the triangles formed in each lateral face can be proved similar. For the cone, similar triangles can be formed from the altitude and an element.

Figure 15 will also aid the reader in grasping the meaning and truth of the two following theorems:

Theorem 22.—The section of a pyramid made by a plane parallel to the base is similar to the base. (Compare Theorem 14.)

Theorem 23.—The section of a circular cone made by a plane parallel to its base is a circle, the center of which is the point where the axis intersects it.

Theorem 24.—The lateral area of a regular pyramid is equal to half the product of the perimeter of the base and the slant height. The lateral faces of a regular pyramid are congruent triangles, the altitude of each being equal to the slant height of the pyramid (Fig. 14). Hence, the formula for the lateral area is obtained by adding the areas of the lateral faces, the sum of the bases of the triangular faces being equal to the perimeter of the base of the pyramid.

Definitions.—A plane is tangent to a cone if it has one element only in common with the cone. A pyramid is said to be *inscribed in a cone* if the pyramid and cone have the same vertex and if the base of the pyramid is inscribed in the base of the cone. A pyramid is said to be *circumscribed about a cone* if the pyramid and cone have the same vertex and if the base of the pyramid is circumscribed about the base of the cone.

We have here the same relationship holding between the cone and pyramid that we found above between the cylinder and prism. As the number of faces of the inscribed or circumscribed pyramid is doubled and redoubled indefinitely, the perimeter of the base, slant height, lateral area and volume of the pyramid approach, respectively, the corresponding elements and properties of the cone. Hence, the formulas for lateral area and volume of a cone are similar to those for the pyramid.

Theorem 25.—The lateral area of a right circular cone is equal to half the product of the circumference of the base and the slant height.

Frustum.—The portion of a pyramid or of a cone included between the base and a section parallel to the base is called a *frustum of the pyramid or the cone.* The base and the parallel section are called the *bases of the frustum.* The perpendicular distance between the bases is the altitude, and the slant height is that portion of the slant height of the pyramid or of the cone included between the bases of the frustum.

Theorem 26.—The lateral area of a frustum of a regular pyramid is equal to half the product of the slant height and the sum of the perimeters of the bases.

The proof of this theorem is similar to that of Theorem 24. The lateral faces of a frustum of a regular pyramid are isosceles trapezoids.

Theorem 27.—The lateral area of a frustum of a right circular cone is equal to half the product of the slant height and the sum of the circumferences of the bases.

Theorem 28.—The volume of a triangular pyramid is equal to one-third the product of its base and altitude.

The following discussion is in no sense to be considered a proof of this theorem. Its purpose is to give a broad sketch of the proof and to make the theorem intuitively probable.

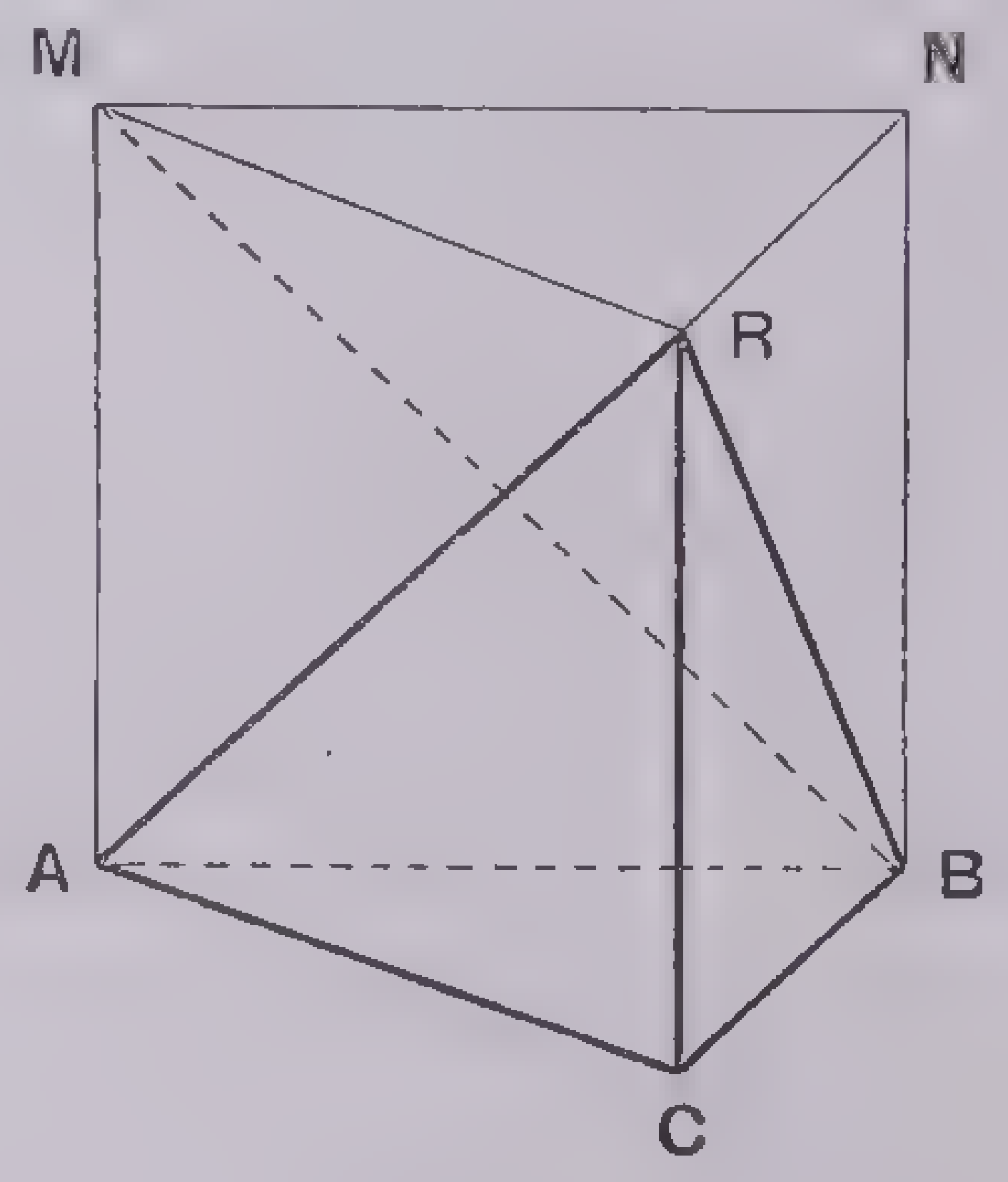


Fig. 16

In Figure 16, the triangular pyramid R-ABC, having R for vertex and ABC for base, can be shown to have one-third of the volume of the triangular prism ABC-MNR. Indeed, the triangular prism can be shown to be made up of three equivalent triangular pyramids, each having the same volume. It can be proved that two triangular pyramids have the same volume if they have equal altitudes and bases of equal areas. The pyramids R-ABC and B-MNR evidently have equivalent bases and equal altitudes and hence are equivalent. The pyramid B-MNR can be considered as having R for vertex and MNB for base. Then, pyramid R-MNB is equivalent to pyramid R-ABM, having the same altitude and equivalent bases. Thus, the prism is made up of the three equivalent pyramids, R-ABC, R-ABM and R-MNB or B-MNR. Theorem 28 would then follow from Theorem 18.

Theorem 29.—The volume of any pyramid is equal to one-third the product of its base and altitude.

Compare with Theorem 19. From one vertex of the base, draw all the diagonals of the base. Pass planes through the vertex of the pyramid and each of these diagonals. The original pyramid is then divided into triangular pyramids all having the same altitude. Then apply Theorem 28.

Theorem 30.—The volume of a circular cone is equal to one-third the product of its base and altitude.

See remarks preceding Theorem 25.

Theorem 31.—The volume, V, of a frustum of a pyramid or of a circular cone, of bases B_1 and B_2 and altitude h, is given by the formula:

$$V = \frac{h}{3}\left(B_1 + B_2 + \sqrt{B_1 B_2}\right).$$

This theorem is established by completing the pyramid or the cone on the frustum and subtracting the volume of the solid above the upper base of the frustum from the complete solid.

THE SPHERE

A *sphere* is a closed surface all points of which are equally distant from a point within, called the *center* of the sphere. A *radius* of a sphere is a straight line connecting the center to a point in the surface. A straight line connecting two points in the surface and also passing through the center is a *diameter.* A plane passing through the center of the sphere intersects the sphere in a circle, called a *great circle* of the sphere. The radius of the great circle of a sphere and the radius of the sphere are evidently equal.

Area of a Sphere.—By the area of a sphere is meant the numerical measure of the surface; that is, the number of units of area in it. Since a sphere is a curved surface, a plane unit of area cannot be applied directly to it to find its numerical measure. As in the similar case of the cylinder and cone, we must resort to a limiting process. It is based again on the notion of polygons inscribed in a circle and the fact that a sphere can be generated by revolving a semicircle about its diameter.

Theorem 32.—The area of a sphere is equal to four times the area of a great circle of a sphere.

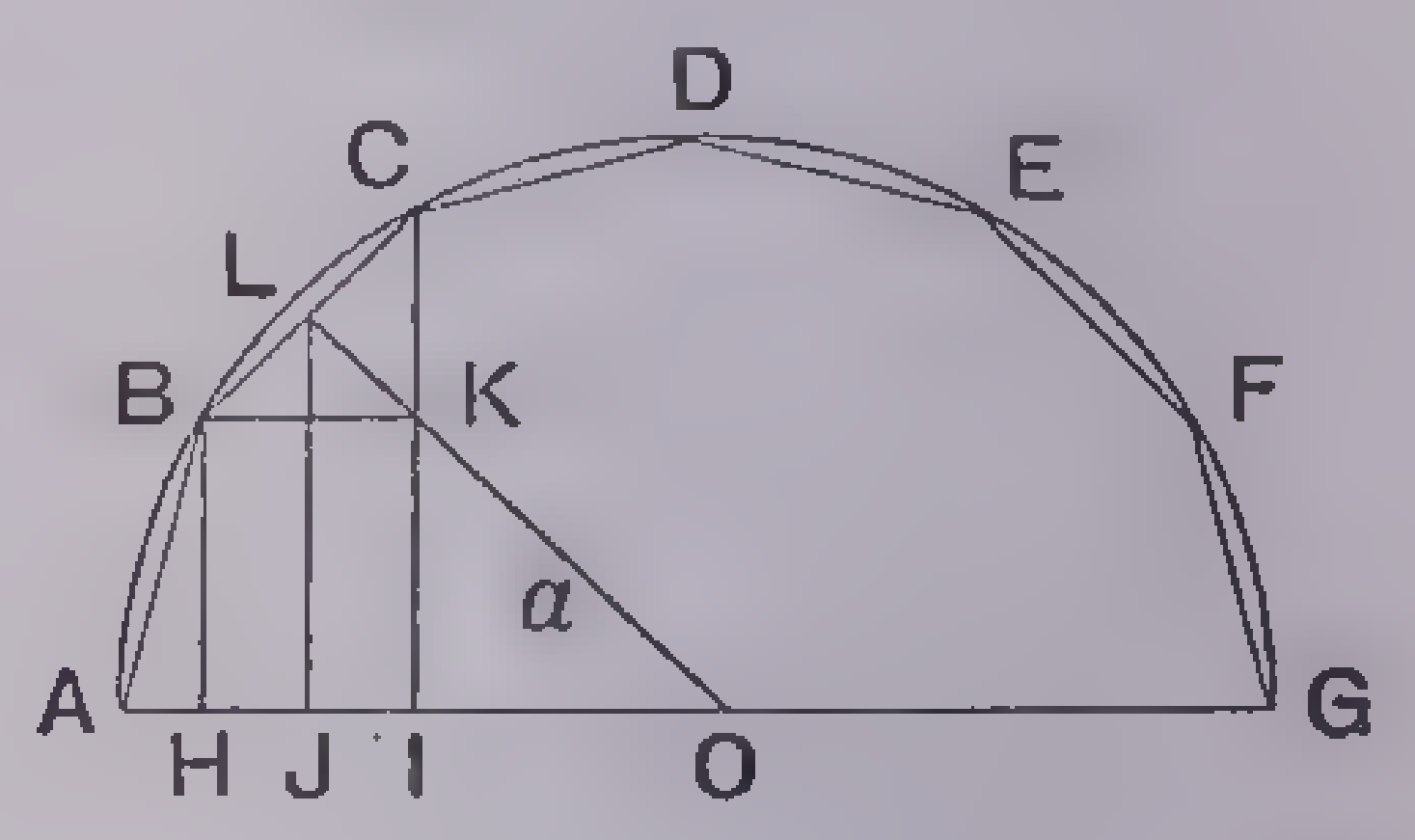


Fig. 17

Given the area S of a sphere generated by the revolution of the semicircle O of radius r about the diameter AG.

To prove that $S = 4\pi r^2$.

Proof.—Inscribe in the semicircle one-half of a regular polygon of an even number of sides, as ABCDEFG. Let a denote the apothem of the polygon, which is equal in length to the perpendicular bisector drawn to any side of the polygon from O.

When any side of the polygon, as BC, is revolved around AG, it generates the frustum of a cone, or, as in the case of AB, a cone. By Theorem 27, the lateral area of the frustum of the cone generated by BC $= \pi(CI + BH) \cdot BC$. We shall give a different form to this expression.

$\triangle BCK = \triangle OLJ$. (They are right triangles with acute $\angle CBK$ = acute $\angle OLJ$, since these angles are complements of the same angle.)

Hence, $\frac{BC}{BK} = \frac{a}{LJ}$, and since $LJ = \frac{1}{2}(Bh + CI)$, $BK = HI$, we have

$$BC = \frac{2a \cdot HI}{BH + CI}.$$

Substituting this value into the expression for the area given above:

Area generated by $BC = HI \times 2\pi a$.

Similarly, area generated by $AB = AH \times 2\pi a$, and similarly for the other sides of the polygon.

Adding these equations and denoting by S′ the area generated by the revolution of the semipolygon,

$S' = (AH + HI + \ldots)2\pi a$. But $(AH + HI + \ldots) = AG = 2r$.

Then, $S' = 4\pi ra$, which is always true as the number of the sides of the polygon is doubled and redoubled indefinitely.

Further, as the number of sides is increased, S′ approaches S, the area of the sphere, and since a approaches r, $4\pi ra$ approaches $4\pi r^2$.

Therefore, $S = 4\pi r^2$.

Volume of a Sphere.—Here, again, some kind of limiting process must be used. The following discussion is not to be considered as a rigorous proof.

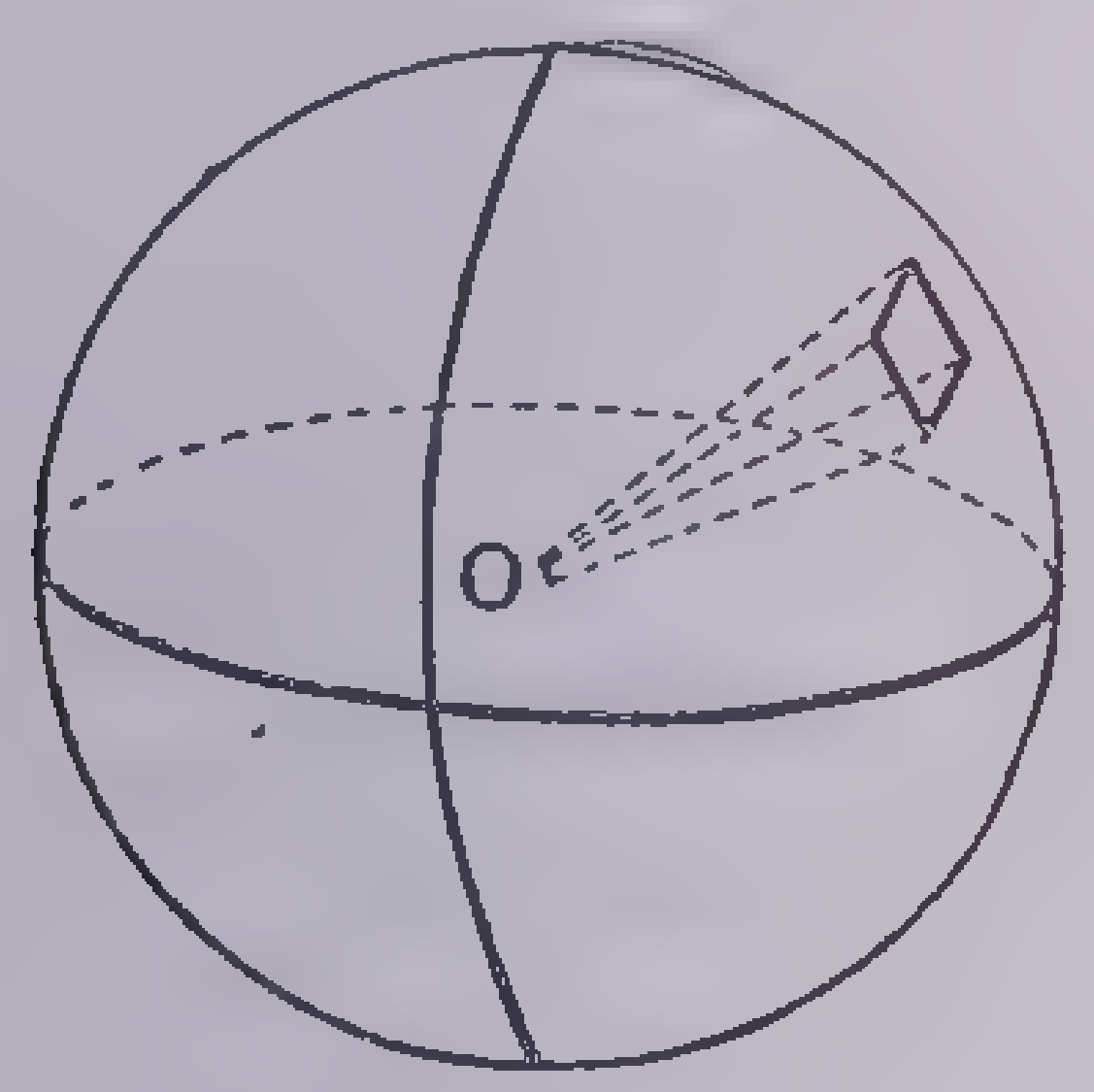


FIG. 18

Consider the volume of a sphere (Fig. 18) as the sum of the volumes of a large number of pyramids whose bases are small portions of the spherical surface (such as arise, for example, by drawing meridians and parallels for every minute of longitude and latitude on the earth's surface), so small that they may be regarded practically as plane figures, and each of whose altitudes is nearly equal to the radius of the sphere. Now, if we allow the length of each side of the base of the pyramids to become smaller and smaller and approach zero as a limit, thus at the same time increasing indefinitely the number of pyramids required to cover the sphere, the sum of the volumes of all the pyramids will approach the volume of the sphere, the sum of the areas of all the bases of the pyramids will approach the surface area of the sphere, and the altitude of each pyramid will approach the radius of the sphere. But the volume of a pyramid equals one-third its altitude times the area of its base. Hence, the following theorem:

Theorem 33.—The volume of a sphere is equal to one-third its radius times its surface area, or $4/3\pi r^3$.

DEFINITIONS.—If a line or plane has but one point in common with the sphere, it is said to be *tangent to the sphere*. A plane perpendicular to a radius of a sphere at its outer extremity is tangent to the sphere.

A *small circle of a sphere* is the intersection of the sphere with any plane not passing through its center. The *axis of a circle* of a sphere is the diameter of the sphere that is perpendicular to the plane of the circle. The *poles of a circle* of a sphere are the extremities of the axis of the circle.

In Figure 19, AMB is a great circle, CND is a small circle, NS is the axis of each, and N and S are the poles.

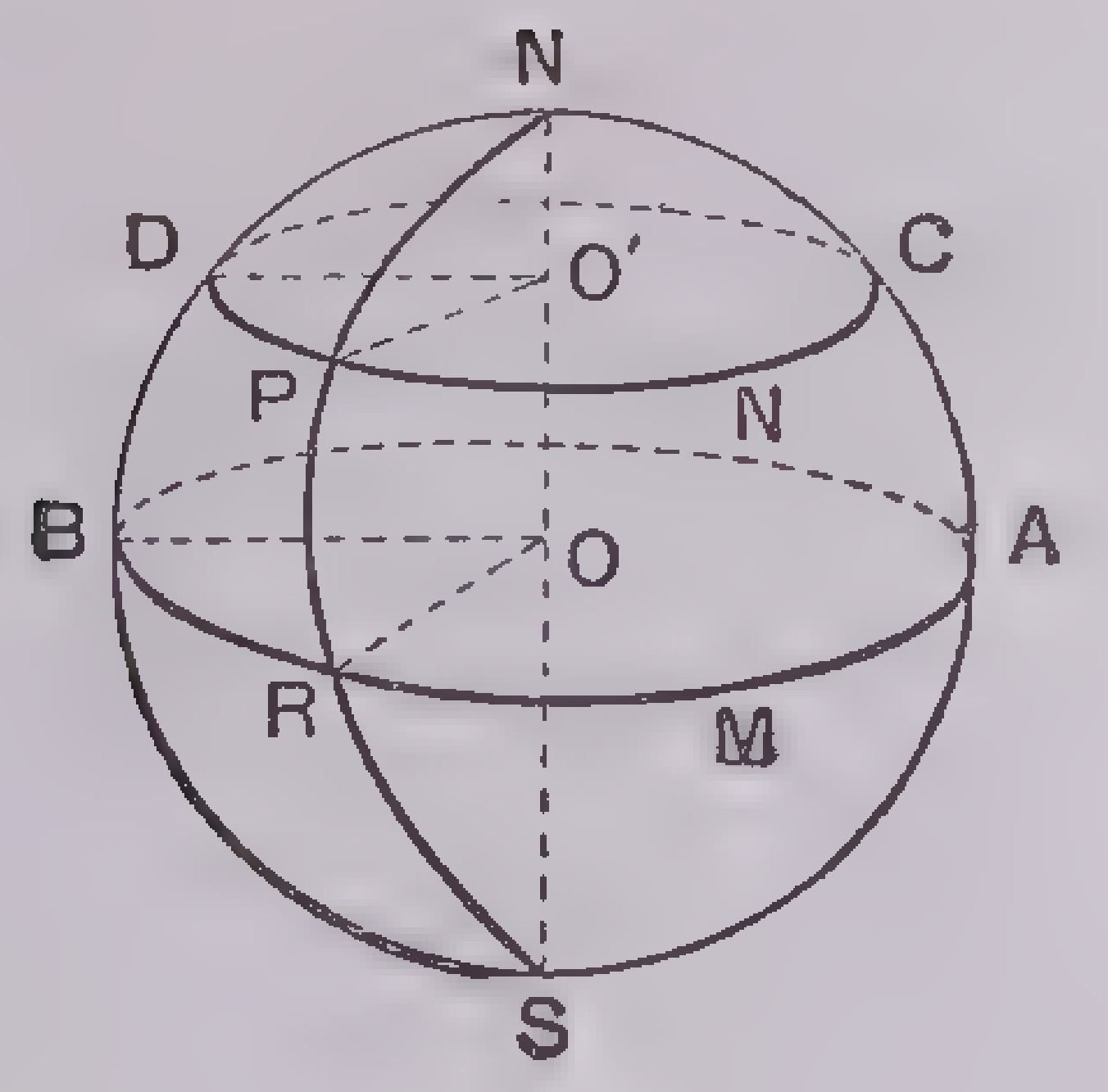


FIG. 19

Distance on a Sphere.—By the *distance between two points* on a sphere is meant the length of the minor (shorter) arc of the great circle through the two points. It can be proved that this is the shortest path on the sphere between the two points. For this reason, sailing and flying are frequently along great circle arcs.

A *quadrant* of a sphere is one-quarter of the circumference of a great circle of the sphere. The *polar distance* of a small circle of a sphere is the distance on the sphere from the nearer pole to a point in the circle.

Theorem 34.—The polar distances of a circle of a sphere are equal.

Take P and D, any two points on circle CND. Then show the polar distances NP and ND to be arcs subtended by equal chords in equal circles.

Theorem 35.—If a point on a sphere is at a quadrant's distance from each of two other points, not the extremities of a diameter, on the sphere, it is a pole of the great circle through these two points.

Referring to Figure 19, let N be the point which is a quadrant's distance from R and B. Then N is a pole of the circle ARB if NO is perpendicular to the plane of the circle. This follows from Theorem 5.

DEFINITIONS.—The portion of the surface of a sphere included between two parallel planes is called a *zone*. The volume contained between these two parallel planes is called a *spherical segment*. The circles made by the two parallel planes are called the *bases* of the zone or segment, and the distance between the planes is the *altitude* of the zone or segment. If one of the planes is tangent to the sphere, the zone or segment is called a zone or segment of one base. The zones on the surface of the earth are included between certain parallels of latitude. The torrid and temperate zones both are zones of two bases and the frigid zones both are zones of one base.

That portion of the surface of a sphere contained between the halves of two great circles of a sphere is called a *lune*. The volume of the sphere contained between these two halves is called a *spherical wedge*. The dihedral angle between the planes of the great circles bounding the lune or the wedge is called *the angle of the lune or the wedge*. A natural division of an orange is an example of a spherical wedge. In Figure 19, the portion of the sphere NRSB is a lune or a wedge. The plane angle BOR is the measure of the angle of the lune or wedge.

If a sphere is generated by the revolution of a semicircle, the solid generated by a sector whose arc is a part of this semicircle is called a *spherical sector*.

The formulas for areas and volumes of lunes, wedges, zones and segments are given in the reference list.

Spherical Angles and Triangles.—The angle formed by two arcs of circles intersecting on a sphere is the plane angle formed by the lines tangent to the arcs at the point of intersection. The angle between two great circle arcs is called a *spherical angle*. The point where the two arcs meet is the *vertex* of the angle, and the arcs are the *sides* of the angle.

Since the planes of two great circles intersect in a diameter, and the tangents at the points of intersection are perpendicular to this diameter, the angle formed by the tangents is the plane angle of the dihedral angle formed by the planes of the great circles. Thus, in Figure 19, spherical angle RNB has the same measure as the dihedral angle R-NS-B and is equal in degrees to the plane angle ROB.

A portion of a sphere bounded by three arcs of great circles is called a *spherical triangle*. If from the vertices of a spherical triangle as poles, arcs of great circles are described, another spherical triangle is formed which is called the *polar triangle* of the first.

Theorem 36.—If one spherical triangle is the polar of another, then the second is the polar of the first.

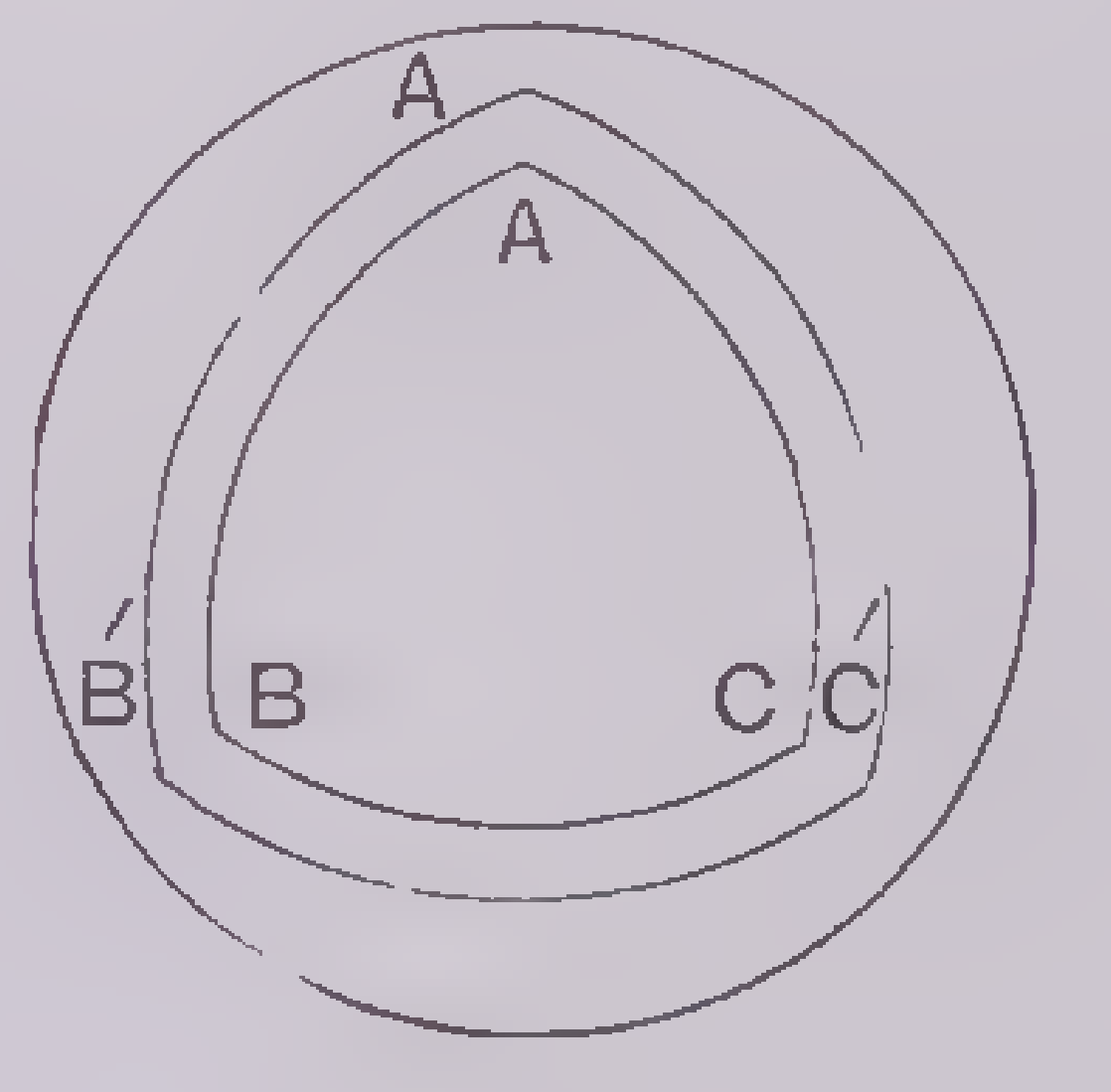


FIG. 20

GIVEN the spherical △ ABC and its polar △ A′B′C′.

TO PROVE that △ ABC is the polar triangle of △ A′B′C′.

PROOF.—Since it is given that A is the pole of arc B′C′, and C is the pole of arc A′B′, then B′ is at a quadrant's distance from both A and C (Theorem 35).

Hence, B′ is the pole of arc AC. Similarly, A′ is the pole of arc BC, and C′ is the pole of arc AB.

Two triangles on a sphere related as ABC and A′B′C′ are called *polar triangles*.

The sum of the angles of a spherical triangle is not constant, as in the case of plane triangles, but instead the following is true:

Theorem 37.—The sum of the angles of a spherical triangle is greater than 180° and less than 540°.

The excess of the sum of the angles of a spherical triangle over 180° is called the *spherical excess of the triangle*.

In the following list, the formula for the area of a spherical triangle is given.

FORMULAS FOR REFERENCE

(p and p' are perimeters of bases, B and B′ are areas of bases, h is altitude, r is radius of sphere, s is slant height, u is angle of lune, or wedge, E is spherical excess.)

Lateral area of right prism or right circular cylinder: $S = ph$.

Volume of any parallelepiped, prism or cylinder: $V = Bh$.

Lateral area of regular pyramid or right circular cone: $S = \frac{1}{2}ps$.

Lateral area of frustum of regular pyramid or right circular cone: $S = \frac{1}{2}s(p + p')$.

Volume of pyramid or cone: $V = \frac{1}{3}Bh$.

Volume of frustum of pyramid or cone: $V = \frac{1}{3}h(B + B' + \sqrt{BB'})$.

Area of sphere: $S = 4\pi r^2$.

Area of zone: $Z = 2\pi rh$.

Area of lune: $L = u/360\ (4\pi r^2)$.

Volume of sphere: $V = 4/3\pi r^3$.

Volume of spherical segment:
$V = \frac{1}{2}\pi h(r^2 + r'^2) + 1/6\pi h^3$,
where r and r' are the radii of the two bases:

Volume of spherical wedge:
$V = u/360\ (4/3\pi r^3)$.

Area of spherical triangle:
$A = \pi r^2 E/180$.

PROBLEMS

Problem 1.—Six lines of steam pipes of 3-in. diameter extend along one side and an end of a room 40 ft. by 30 ft. Find the number of square feet of heating surface.

The pipes are circular cylinders and the total lateral area is:

$2\pi \cdot 1/8(40 + 30)6 = 330$ sq. ft.

(Using $\pi = 22/7$).

Problem 2.—A pail is 12 in. in diameter at the top, 10 in. at the bottom and 12 in. deep. How many gallons will it hold?

The pail is a frustum of a right circular cone, the volume of which $= \frac{1}{3}\,12\,(36\pi + 25\pi + 30\pi) = 364\pi$ cu. in. = 5 gals. approximately, using 231 cu. in. to the gallon.

Problem 3.—Sand poured into a pile forms a right circular cone. The pile is 6 ft. high and 14 ft. across at the bottom. Find amount of sand.

$V = 1/3\pi r^2 h = 1/3\pi . 49 . 6 = 98\pi$ cu. ft. $= 308$ cu. ft.

Problem 4.—The diameter of a sphere is 12 in. and is divided into four equal parts by parallel planes. Show that the area of each zone is 36π sq. ft.

$Z = 2\pi rh$, and since r, the radius of the sphere, is constant for any one sphere, the area of a zone is proportional to its height.

Problem 5.—A pump has a water cylinder 6¼ in. in diameter. The stroke is 16 in. How many gallons are pumped per hour at an average of 90 strokes per minute?

At each stroke, water equal in volume to a right circular cylinder of height 16 in. and radius of base 25/8 in. is pumped. What is the number of gallons? *Ans.*, 191.3 gals.

Problem 6.—A water tank, having a total length of 6 ft. and a diameter of 18 in., is in the form of a right circular cylinder with two hemispherical ends. Find its capacity in gallons.

The volume is made up of a cylinder of height 54 in., radius of base 9 in., and a sphere of radius 9 in. *Ans.*, 72.7 gals.

LOGARITHMS

The common logarithm of a number has been defined as that power of 10 that equals the number. Since $10^0 = 1$; $10^1 = 10$; $10^2 = 100$; $10^3 = 1{,}000$ and so on, it is obvious that the logarithm of a number between 1 and 10 must lie between 0 and 1; the logarithm of a number between 10 and 100 lies between 1 and 2; the logarithm of a number between 100 and 1,000 lies between 2 and 3. In general we may say that a logarithm consists of two parts: (1) an integral part or whole number that depends on the number of figures in the original number. It is always one *less* than that number. For instance 379 has three figures, so its integral part, called the *characteristic*, is 2. (2) The second part of the logarithm is the decimal part called the *mantissa*. Since the characteristic of a logarithm can be written down at once without calculation, logarithmic tables print only the mantissas. In the accompanying table the mantissas are given to 4 decimal places for the logarithms of all numbers between 1 and 1,000. By the method of *interpolation* (explained below) the range of the table extends to 10,000. If any number is multiplied or divided by a perfect power of 10 (10, 100, 1,000, etc.) the logarithm of the product differs from the logarithm of the original number only in the characteristic; the mantissa is unchanged. Thus if we know the logarithm of, say, 723, we know the logarithm of 7.23, 72.3, .00723, 72,300 and so forth. The logarithms of all these numbers have the same mantissa; the characteristic depends on the location of the decimal point.

To find the logarithm of 723, we find 72 in the column at the left of the table, then look across the row to the column headed at the top by 3. We there find the number 8,591. This is the mantissa of the logarithm of 723. Since 723 lies between 100 and 1,000, the logarithm of 723 lies between 2 and 3; that is, the logarithm is 2 plus a decimal fraction. The decimal fraction is .8591. Therefore the logarithm of 723 (written log 723) is 2.8591.

We have

log 723 = 2.8591
log 72.3 = 1.8591
log 7.23 = 0.8591
log 7,230 = 3.8591
log .723 = .8591 − 1
log .00723 = .8591 − 3

In each case the mantissa is .8591 and is always positive; the characteristic is positive or negative, depending upon whether the number is greater or less than unity.

Rules For Determining the Characteristic.—

(a) For numbers greater than 1 the characteristic is positive and equal to 1 less than the number of digits preceding the decimal point.

(b) For numbers less than 1 the characteristic is negative and equal numerically to 1 more than the number of ciphers following the decimal point.

Note carefully that the logarithm of a number less than 1 consists of a *negative* characteristic and a *positive* mantissa. Actually log .723 is −1 + .8591.

For convenience in calculation it is usual, especially in trigonometric calculations, to make any negative characteristic (n) positive in form by writing $10 - n$ before the mantissa and −10 (minus ten) after the mantissa. Thus we should write log .723 not as .8591 − 1 but as 9.8591 − 10 and log .00723 not as .8591 − 3 but as 7.8591 − 10.

Examples of Use of Logarithms.—Find to three decimal places the value of

$$\frac{.691 \times .436 \times 34.7}{11.9 \times .323}$$

Look up all the logarithms of the different factors and divisors in the table.

We have:

log .691 = 9.8395 −10
log .436 = 9.6395 −10
log 34.7 = 1.5403
log 11.9 = 1.0755
log .323 = 9.5092 −10

Since .691, .436 and 34.7 are to be multiplied together, we add the logarithms as follows:

log .691 = 9.8395 −10
log .436 = 9.6395 −10
log 34.7 = 1.5403
Adding, 21.0193 −20
= 1.0193
= log (.691 × .436 × 34.7)

log 11.9 = 1.0755
log .323 = 9.5092 −10
Adding, 10.5847 −10
= .5847
= log (11.9 × .323)

Since (.691 × .436 × 34.7) is to be divided by (11.9 × .323), we subtract the logarithms. We have:

log (.691 × .436 × 34.7) = 1.0193
log (11.9 × .323) = .5847
Subtracting, 0.4346

$$= \log \frac{.691 \times .436 \times 34.7}{11.9 \times .323}$$

We now look in the table for the number corresponding to the logarithm mantissa .4346. This is just the reverse of the process of looking up a logarithm. We find the mantissa .4346 in the row headed by 27 and the column headed by 2. The first three figures of the required result, therefore, are 272. Where should the decimal point be placed? Since the characteristic of the logarithm is 0, the corresponding number lies between 1 and 10. We therefore place the decimal point after the first 2. We have

$$\frac{.691 \times .436 \times 34.7}{11.9 \times .323} = 2.72 \text{ (approximately)}$$

It is often convenient to perform all the work with the logarithms in a single addition operation. This is done by the use of *cologarithms*. The cologarithm of a number is the *logarithm of its reciprocal*. It is obtained by *subtracting the logarithm from zero*.

Since

$$\log 1 = 0 \qquad (10^0 = 1)$$
$$\log \frac{1}{n} = 0 - \log n.$$

Whenever a problem arises in which we wish to *subtract* a logarithm (a problem of division), we may obtain the same result by *adding* the cologarithm.

Let us resolve the preceding problem by the use of cologarithms.

We have

log 11.9 = 1.0755
log .323 = 9.5092 −10

To find the cologarithm (written *colog*) of 11.9 we subtract the logarithm from zero, that is, from 10 − 10.

We have

10.0000 − 10
log 11.9 = 1.0755
Subtracting, 8.9245 − 10 = colog 11.9

Similarly to find colog .323 we have

10.0000 − 10
9.5092 − 10
Subtracting, 0.4908 = colog .323

We may now solve our problem by a single operation in addition:

log .691 = 9.8395 − 10
log .436 = 9.6395 − 10
log 34.7 = 1.5403
colog 11.9 = 8.9245 − 10
colog .323 = .4908
Adding, 30.4346 − 30

$$= 0.4346$$

$$= \log \frac{.691 \times .436 \times 34.7}{11.9 \times .323}$$

With a little practice cologarithms may be written down directly from the table making the subtraction from 10.0000 − 10 mentally.

The number corresponding to a given logarithm is called the *antilogarithm.* Thus the antilogarithm of 1.5403 is 34.7; the antilogarithm of 9.6395 − 10 is .436.

Interpolation.—A 4-place logarithm table will give accurately the logarithms of numbers of 4 figures, but only the logarithms of numbers of 3 figures can be taken directly. To obtain the logarithm of a number of 4 figures *interpolation* is used. Interpolation may best be explained by an example.

Find the logarithm of 5217.

From the table we find

$$\begin{array}{rl} \log 5220 & = 3.7177 \\ \log 5210 & = 3.7168 \\ \hline \text{difference} & = .0009 \end{array}$$

Assuming, as is approximately true, that *the increase in the logarithm in the interval from 3.7168 to 3.7177 is proportional to the increase in the number from 5210 to 5220* we have

$$\begin{aligned} \log 5217 &= \log 5210 + .7 \times .0009 \\ &= 3.7168 + .00063 \\ &= 3.7174 \text{ to 4 places} \end{aligned}$$

To make interpolation easy there are printed 9 columns on the right side of the table with the differences between successive logarithms in the table multiplied by .1, .2, .3 and so on. It is therefore unnecessary to subtract the two successive logarithms. The amount to be added to the smaller logarithm is taken directly from this auxiliary table (called a *table of proportional parts*). Thus to find log 5217, we look up log 5210, finding

$$\log 5210 = 3.7168.$$

Following the row of figures across to the proportional parts table we find 6 in the column headed 7. We therefore add 6 to the last place of log 5210 to obtain log 5217.

We have log 5217 = 3.7168 + .0006
= 3.7174

Find log 1.479.

From the table, log 1.47 = .1673
Proportional part in column 9 = .0026
Adding, log 1.479 = .1699

(The decimal points and ciphers are not printed in the table.)

Find log 113.6

From the table, log 113.0 = 2.0531
Proportional part in column 6 = .0023
log 113.6 = 2.0554

With practice the proportional part may be added mentally.

Interpolation is also necessary in finding antilogarithms. The process is just the reverse of that of finding logarithms.

Find the antilogarithm of 5.2613.

From the table we find the nearest mantissa smaller than the given mantissa. In this case it is .2601 corresponding to the

TABLE OF LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	PROPORTIONAL PARTS								
											1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170						4	9	13	17	21	25	30	34	38
						0212	0253	0294	0334	0374	4	8	12	16	20	24	28	32	37
11	0414	0453	0492	0531	0569						4	8	12	15	19	23	27	31	35
						0607	0645	0682	0719	0755	4	7	11	15	19	22	26	30	33
12	0792	0828	0864	0899	0934	0969					3	7	11	14	18	21	25	28	32
							1004	1038	1072	1106	3	7	10	14	17	20	24	27	31
13	1139	1173	1206	1239	1271						3	7	10	13	16	20	23	26	30
						1303	1335	1367	1399	1430	3	7	10	12	16	19	22	25	29
14	1461	1492	1523	1553							3	6	9	12	15	18	21	24	28
					1584	1614	1644	1673	1703	1732	3	6	9	12	15	17	20	23	26
15	1761	1790	1818	1847	1875	1903					3	6	9	11	14	17	20	23	26
							1931	1959	1987	2014	3	5	8	11	14	16	19	22	25
16	2041	2068	2095	2122	2148						3	5	8	11	14	16	19	22	24
						2175	2201	2227	2253	2279	3	5	8	10	13	15	18	21	23
17	2304	2330	2355	2380	2405	2430					3	5	8	10	13	15	18	20	23
							2455	2480	2504	2529	2	5	7	10	12	15	17	19	22
18	2553	2577	2601	2625	2648						2	5	7	9	12	14	16	19	21
						2672	2695	2718	2742	2765	2	5	7	9	11	14	16	18	21
19	2788	2810	2833	2856	2878						2	4	7	9	11	13	16	18	20
						2900	2923	2945	2967	2989	2	4	6	8	11	13	15	17	19
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	6378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8

	0	1	2	3	4	5	6	7	8	9	PROPORTIONAL PARTS								
											1	2	3	4	5	6	7	8	9
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8335	8241	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	3	4

figures 182. Subtracting this from the given mantissa we have

$$\begin{array}{r} .2613 \\ \underline{.2601} \\ .0012 \end{array}$$

This is the proportional part corresponding to the required number. Following the row over to the right we find 12 in the column of proportional parts headed 5.

The figures of the required number are therefore 1825.

Since the characteristic of our given logarithm is 5, the required number contains 6 digits before the decimal point and is therefore 182,500.

Find antilog 8.2016 − 10.

Nearest smaller mantissa from the table is .2014, corresponding to figures 159.

$$\begin{array}{r} .2016 \\ \underline{.2014} \\ .0002 \end{array}$$

In the table of proportional parts in this row, no part exactly equals 2. The nearest proportional part is 3 in the column headed 1. The nearest 4-figure approximation of the required number is therefore 1591. To place the decimal point we observe that the characteristic is −2, (8 − 10); therefore there is 1 cipher following the decimal point and preceding the significant figures of the number. The required number or antilog is therefore .01591.

Powers and Roots.—With logarithms we can easily calculate powers and roots. The fundamental relation

$$\log N^x = x \log N$$

indicates the method.

Find $\sqrt{271.6}$

$$\sqrt{271.6} = (271.6)^{\frac{1}{2}}$$

$$\begin{array}{rl} \text{Therefore } \log\sqrt{271.6} = \tfrac{1}{2}\log 271.6 & \\ \text{From the table, } \log 271.6 & = 2.4330 \\ & \underline{+\ \ .0009} \\ & = 2.4339 \end{array}$$

$$\log\sqrt{271.6} = \tfrac{1}{2}\log 271.6 = 1.21695$$

$$\sqrt{271.6} = \text{antilog } 1.21695$$

Nearest smaller mantissa in the table is .2148, corresponding to figures 164.

$$.21695 - .2148 = .00215$$

Nearest proportional part corresponding to .00215 is 22 in column headed 8.

Figures of required antilog are 1648.

Since the characteristic of the logarithm is 1, there are 2 digits preceding the decimal point, and the required $\sqrt{271.6}$ is 16.48.

Find the area of a triangle having sides of 2763 feet, 7187 feet and 5892 feet.

By the formula given in plane geometry,

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$$

when a, b and c are the three sides and $s = \frac{1}{2}(a+b+c)$.

We have

$$\begin{array}{rl} a = & 2763 \\ b = & 7187 \\ c = & \underline{5892} \\ 2s = & 15842 \end{array}$$

$$\begin{array}{rl} s = & 7921 \\ s-a = & 5159 \\ s-b = & 734 \\ s-c = & 2029 \end{array}$$

$$\begin{array}{rl} \log\ s = & 3.8988 \\ \log\ (s-a) = & 3.7125 \\ \log\ (s-b) = & 2.8657 \\ \log\ (s-c) = & \underline{3.3073} \\ \log s(s-a)(s-b)(s-c) = & 13.7843 \\ \log\sqrt{s(s-a)(s-b)(s-c)} = & 6.8921 \end{array}$$

(dividing by 2)

Figures of antilog .89215 from table are 780.

$$\text{area} = 7{,}800{,}000$$

The characteristic is 6; there are therefore 7 figures preceding the decimal point. The last 3 ciphers, of course, are added merely to bring the number up to 7 figures. Only the first 3 or 4 figures are correct.

Suppose the area were required in square kilometers and it were given that 1 foot = 30.48 centimeters.

We have

$$\text{area (sq. km.)} = \frac{30.48^2 \times \text{area (sq. ft.)}}{100{,}000^2}$$

$$\begin{array}{lll} \text{log area (sq. ft.)} & = 6.89215 & \\ \log 30.48 & = 1.4840 & \\ \log 30.48 & = 1.4840 & \\ \text{colog } 100000^2 & = & \underline{-10} \\ \text{log area (sq. km.)} & = & 9.8601\ -10 \\ \text{area (sq. km.)} & = \text{antilog } 9.8601\ -10 & \\ & = .7246 \text{ or } .7247 & \end{array}$$

The uncertainty in the last figure arises because the proportional part for 6 is the same as for 7, namely 4.

The logarithm of 30.48 is repeated in the column to be added because the number we wish to calculate contains the factor 30.48 *squared.*

That colog $100{,}000^2 = -10$ is obvious when we consider that

$$100{,}000 = 10^5 \text{ and } 100{,}000^2 = 10^{10}$$

$\log 100{,}000^2 = 10$ and colog $100.000^2 = -10$

The sum of $2,163 is placed at compound interest of 3½%, compounded annually. What will be the amount after 37 years?

The amount will be

$$(1.035)^{37} \times 2163$$

$$\begin{array}{lll} \log 1.035 & = .0149 & \\ \log (1.035)^{37} & = 37 \times .0149 & = \ \ .5513 \\ \log 2163 & & = \underline{3.3351} \\ \text{Adding,} & & = 3.8864 \\ \text{This is the log of} & & \$7{,}697 \end{array}$$

It should be remembered that in raising numbers to high powers by the use of logarithms, the inaccuracy of the printed logarithm is multiplied. Since the inaccuracy in a 4-place logarithm may be as much as .00005, there may be introduced in the above result an error of 37 × .00005 (or .00185) in our value for log x. We cannot, therefore, be sure of the correctness of the figure $7,697 although we can be sure that the exact value lies between antilog 3.8846 and antilog 3.8882; that is, between $7,668 and $7,730.

Solve the equation

$$(2.374)^x = 1691$$

By the fundamental definition of logarithms we have

$$x\ (\log 2.374) = \log (2.374)^x = \log 1691$$

$$\text{Therefore } x = \frac{\log\ 1691}{\log 2.374}$$

$$\begin{array}{ll} \log 1691 & = 3.2282 \\ \log 2.374 & = \ \ .3754 \end{array}$$

$$x = \frac{3.2282}{.3754}$$

This indicated division can most easily be done by the use of logarithms.

We have

$$\begin{array}{rl} \log 3.2282 = & .5080 \\ \text{colog}\ \ .3754 = & \underline{.4255} \\ \log x = & .9335 \\ x = & 8.58 \end{array}$$

TRIGONOMETRY

I. INTRODUCTION

The primary object of elementary trigonometry is the computation of the unknown parts of a triangle when three parts, at least one of them a side, are known. The parts of a triangle are the three sides and the three angles.

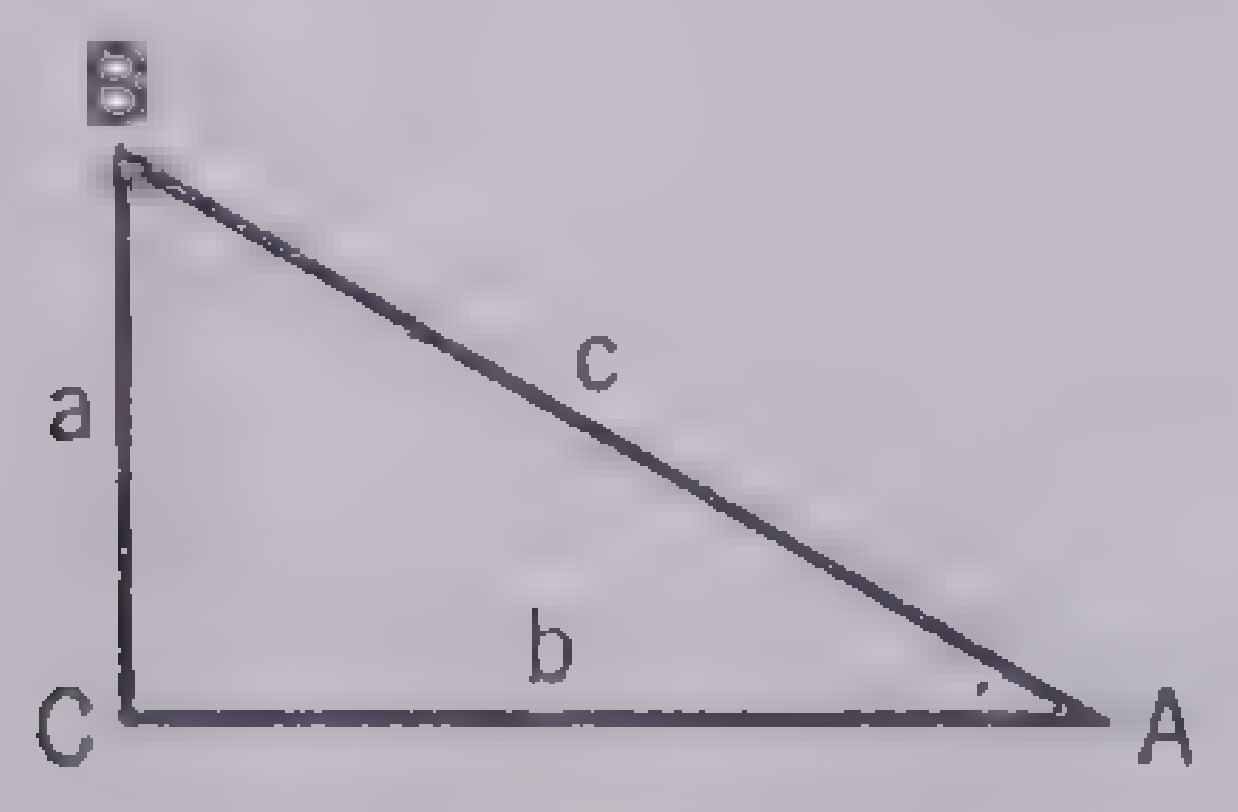


FIG. 1

Let A, B, C represent the measures of the angles and a, b, c the measures of the corresponding opposite sides of a right triangle, C being the right angle. Since similar figures have their corresponding sides proportional, it is evident that the ratios a/c, b/c and a/b do not depend on the size of the triangle but depend only on the size of the angle A or B. For this reason these ratios are called functions (more specifically, trigonometric functions) of the angle A or B. Each of these functions has a distinct name: the first is called the *sine*, the second the *cosine* and the third the *tangent* of the angle A, with the following abbreviations and definitions:

$$\sin A = a/c,\ \cos A = b/c,\ \tan A = a/b;$$
$$\sin B = b/c,\ \cos B = a/c,\ \tan B = b/a.$$

The sines, cosines and tangents of the angles less than 90° have been computed and arranged in tables, known as *natural functions* tables. From such a table the sine, cosine and tangent of any angle can be found when needed; and, conversely, when one of the functions is known, the corresponding angle can be found from the same table. Several other functions are derived from these three basic functions, and the others will be explained as we progress with the subject.

The use of a table of natural functions enables us to compute distances and angles that are inaccessible to direct measurement. For example, suppose that d represents such a distance, let us say the height of a tower or the distance between two objects on opposite sides of a river or mountain. Suppose that the distance b and the angle A are known. Since tan A = a/b, $a = b$ tan A. Now, A being known, tan A may be found from the table, and a may be found by the simple process of multiplying two known numbers. Again, suppose that an observer at A wishes to know the direction of an invisible object at B, a and b being known. Evidently, since tan A = a/b, he can find tan A, and knowing tan A, he can find A from the table.

The foregoing simple examples suggest the practical uses of trigonometry. Its theoretical importance to all branches of higher mathematics, to physics, astronomy, navigation, geography and all branches of engineering will be better appreciated after the more detailed study of the subject.

Historical Sketch.—Trigonometry (from *trigonon*, triangle, and *metron*, measure) originally dealt with the solution of triangles; that is, the computing of the three remaining unknown parts of a triangle when three parts are known; however, it has come to mean the science of angular magnitudes in general. Like arithmetic, algebra and geometry, trigonometry is indispensable for work in higher mathematics and it is exceedingly useful in every branch of physical science.

Elementary trigonometry deals largely with the solution of plane triangles; spherical trigonometry, with the solution of spherical triangles. The branch of trigonometry that treats the properties of angular magnitudes analytically is known as *goniometry* and constitutes by far the larger part of modern trigonometry.

The term *trigonometry* was not used until the 16th century, but the beginnings of trigonometry date back to antiquity. As geometry owes its origin to the practical demands of land surveying, so trigonometry arose from attempts to survey the heavens, in response to the needs of practical astronomy. For this reason the earliest results obtained related to spherical, rather than to plane, trigonometry.

Hipparchus (*c.* 160–125 B.C.), the first to fix positions on the earth by longitude and latitude, constructed a table of chords of arcs that is equivalent to a table of sines. He used this table in the solution of spherical triangles; and he is credited with the discovery of the addition and subtraction formulas for sines and cosines, from which the whole of elementary plane trigonometry could be deduced.

A new impetus was given to the development of trigonometry by the invention of logarithms by Henry Briggs and John Napier in the early part of the 17th century. The arithmetical solution of triangles had become more and more laborious, as the measurement of distances and angles had increased in precision. The invention of logarithms made it possible to replace root extraction by simple division, and to replace multiplication and division of long decimal fractions by the addition and subtraction of their logarithms. The use of logarithms called for new formulas and initiated a new epoch in the development of trigonometry. (The nature of logarithms will be explained at the point in the text of this article where they are first needed.) Computation was still further simplified by the construction of tables of logarithmic trigonometric functions by Edmund Gunter (1581–1626), who was the first to use the terms *cosine, cotangent* and *cosecant* for the sine, tangent and secant of the complementary angles. Napier's Analogies and his Rule of the Circular Parts also date from this period.

The second half of the 17th century witnessed another advance in trigonometry. Isaac Newton succeeded in expressing the sine and cosine as infinite power series of the arc; this was soon followed by James Gregory's series, expressing the tangent and secant in power series of the arc. Later in the century Leibnitz discovered simpler methods of deriving such series by differentiating series with undetermined coefficients.

Modern trigonometry dates from the beginning of the 18th century and owes its greatest debt to the incomparable Leonhard Euler (1707–83). Before his time the trigonometric functions had been thought of as certain lines connected with a central angle in a unit circle. Euler conceived of these functions as ratios depending only on the magnitude of the angle, which gave the formulas an analytical meaning and freed the advance of the science from the limitations of geometric considerations. He also brought the modern notation into general use by dropping the special symbols that were formerly used and discovered the remarkable relations linking trigonometry with algebra that follow from De Moivre's theorem, discovered by Abraham De Moivre (1667–1754)

II. TRIGONOMETRIC FUNCTIONS

For purposes of higher mathematics, it is desirable to define the angle between two lines OP_0 and OP_1 (which represent any two lines that meet) as the amount of rotation necessary to bring OP_0 into the position OP_1. OP_0 is called the initial side, OP_1 the terminal side, of the angle. The angle is given the positive sign (+) or the negative sign (−) according as the rotation is counterclockwise or clockwise. Since there is no limit to the amount of rotation that a line may undergo, it follows that an angle, as here defined, may have any positive or negative magnitude.

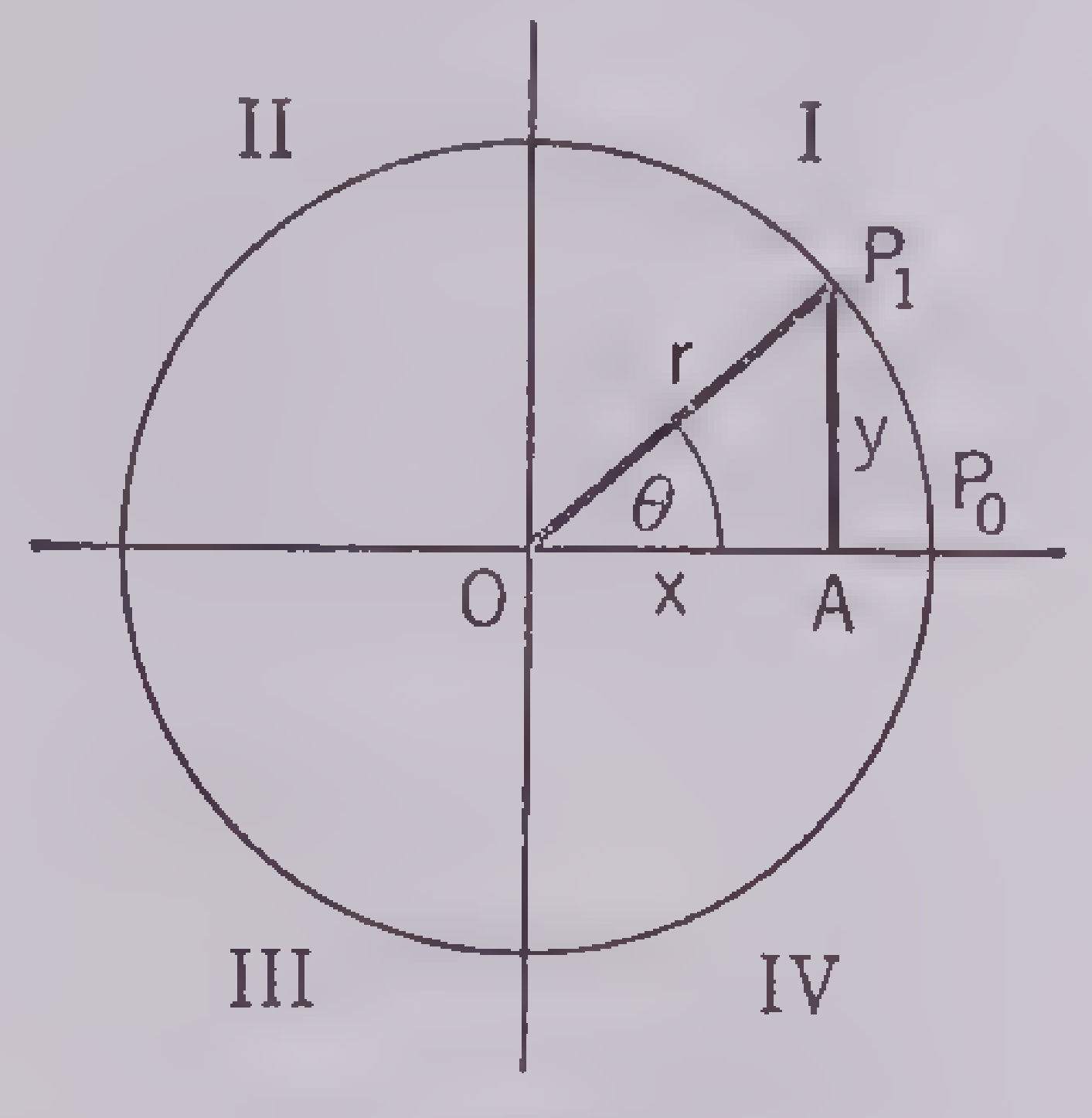


FIG. 2

Let the vertex of the angle be chosen as the origin of a rectangular system of co-ordinates, with the X-axis coinciding with the initial side of the angle. The co-ordinate axes XX′ and YY′ divide the plane into four *quadrants*, numbered, as indicated by I, II, III, IV in Fig. 1.

Let θ (the Greek letter theta) represent the angle obtained by rotating OP_0 into the new position OP_1. The angle is said to be an angle of the first, second, third or fourth quadrant, depending on the quadrant in which OP_1 lies. In this example θ is of the first quadrant.

During the rotation, the point P_0 describes an arc P_0P_1 of the circle whose center is O and whose radius is OP_0. The angle θ may be measured in degrees, minutes and seconds, as is done in elementary geometry (sexagesimal system), or in radians, that is, the number of times the length of the arc P_0P_1 contains the length of the radius. This is called the *natural* or *circular* system of angle measurement; its unit of measure is the radian, an angle subtended by an arc equal in length to the radius of the circle. When the angle is 360°, its arc is 2π times the radius; therefore,

$$360^\circ = 2\pi \text{ radians}, \quad 1^\circ = \pi/180 \text{ radians},$$
$$1 \text{ radian} = 180/\pi^\circ = 57.295^\circ \text{ approx.}$$

When we write $180^\circ = \pi$, we mean π radians, thus $360^\circ = 2\pi$, $180^\circ = \pi$, $90^\circ = \pi/2$, $45^\circ = \pi/4$ and so on.

Let s denote the length of the arc, r the radius, θ the circular measure of the angle, and A the area of the circular sector P_0 O P_1, then it follows from elementary geometry that

$$(1) \qquad s = r\theta, \qquad A = \frac{r^2\theta}{2}.$$

Let x denote the abscissa and y the ordinate of the point P_1, and let r denote the radius of the circle. The ratios x/r, y/r, y/x, r/x, r/y, x/y vary with θ, but are independent of the size of the circle. For this reason they are called *functions* of θ. Each of them has been given a distinct name (sine, cosine, tangent, cosecant, secant, cotangent, respectively) in accordance with the following definitions:

$$(2) \qquad \begin{aligned} \sin\theta &= \frac{y}{r} = \frac{\text{ordinate}}{\text{distance}}, \\ \cos\theta &= \frac{x}{r} = \frac{\text{abscissa}}{\text{distance}}, \\ \tan\theta &= \frac{y}{x} = \frac{\text{ordinate}}{\text{abscissa}}, \\ \csc\theta &= \frac{1}{\sin\theta}, \text{ that is, } \frac{r}{y}, \\ \sec\theta &= \frac{1}{\cos\theta}, \text{ that is, } \frac{r}{x}, \\ \cot\theta &= \frac{1}{\tan\theta}, \text{ that is, } \frac{x}{y}, \end{aligned}$$

where sin stands for sine, cos for cosine, tan for tangent, csc for cosecant, sec for secant and cot for cotangent.

Besides these, engineers sometimes find it convenient to use two other functions, exsecant and excosecant, and in navigation, versine and coversine. These functions are defined as follows:

$\text{exsec}\,\theta = \sec\theta - 1$, $\text{excsc}\,\theta = \csc\theta - 1$, $\text{vers}\,\theta = 1 - \cos\theta$, $\text{covers}\,\theta = 1 - \sin\theta$.

If the angle is one of the acute angles A or B of a right triangle, a and b the sides opposite these angles, and c the hypotenuse, the definitions (2) may be replaced by the following, which are generally preferred in their application to problems:

$$(3) \qquad \begin{aligned} \sin A &= a/c = \cos B, \\ \cos A &= b/c = \sin B, \\ \tan A &= a/b = \cot B. \end{aligned}$$

Since A and B are complementary angles, it follows that, as far as acute angles are concerned:

The sine of an angle is the cosine of its complement.

The cosine of an angle is the sine of its complement.

The tangent of an angle is the cotangent of its complement.

(and similarly for the secant, cosecant and cotangent).

Since (Fig. 2) OAP_1 is a right triangle, $x^2 + y^2 = r^2$. If we divide this equation in succession by r, x and y, and compare the results with (2), we obtain the *fundamental* relations:

$$(4) \qquad \begin{aligned} \sin^2\theta + \cos^2\theta &= 1, \\ 1 + \tan^2\theta &= \sec^2\theta, \\ \cot^2\theta + 1 &= \csc^2\theta, \end{aligned}$$

where $\sin^2\theta$ means $(\sin\theta)^2$ and so on.

Furthermore,

$$(5) \qquad \tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \cot\theta = \frac{\cos\theta}{\sin\theta}.$$

III. FUNCTIONS OF ANGLES GREATER THAN 90°

If the terminal side of an angle is rotated in the plane of the angle through four right angles or any number of times four right angles, it will occupy the position from which it started; and this is true, whether the rotation is in the positive or negative direction. It follows that the trigonometric functions of an angle remain unchanged, when the angle is increased or decreased by four right angles or any number of times four right angles. Therefore, if R denotes a right angle, and n any integer,

$$\begin{aligned}\sin(\theta \pm 4n\text{R}) &= \sin\theta,\\ \cos(\theta \pm 4n\text{R}) &= \cos\theta,\\ \tan(\theta \pm 4n\text{R}) &= \tan\theta,\end{aligned}\tag{6}$$

with similar equations for each of the other functions.

Because of the relations (6), the trigonometric functions are said to be *periodic functions* with *period* 4R. It will be seen presently that the tangent and cotangent have the shorter period 2R.

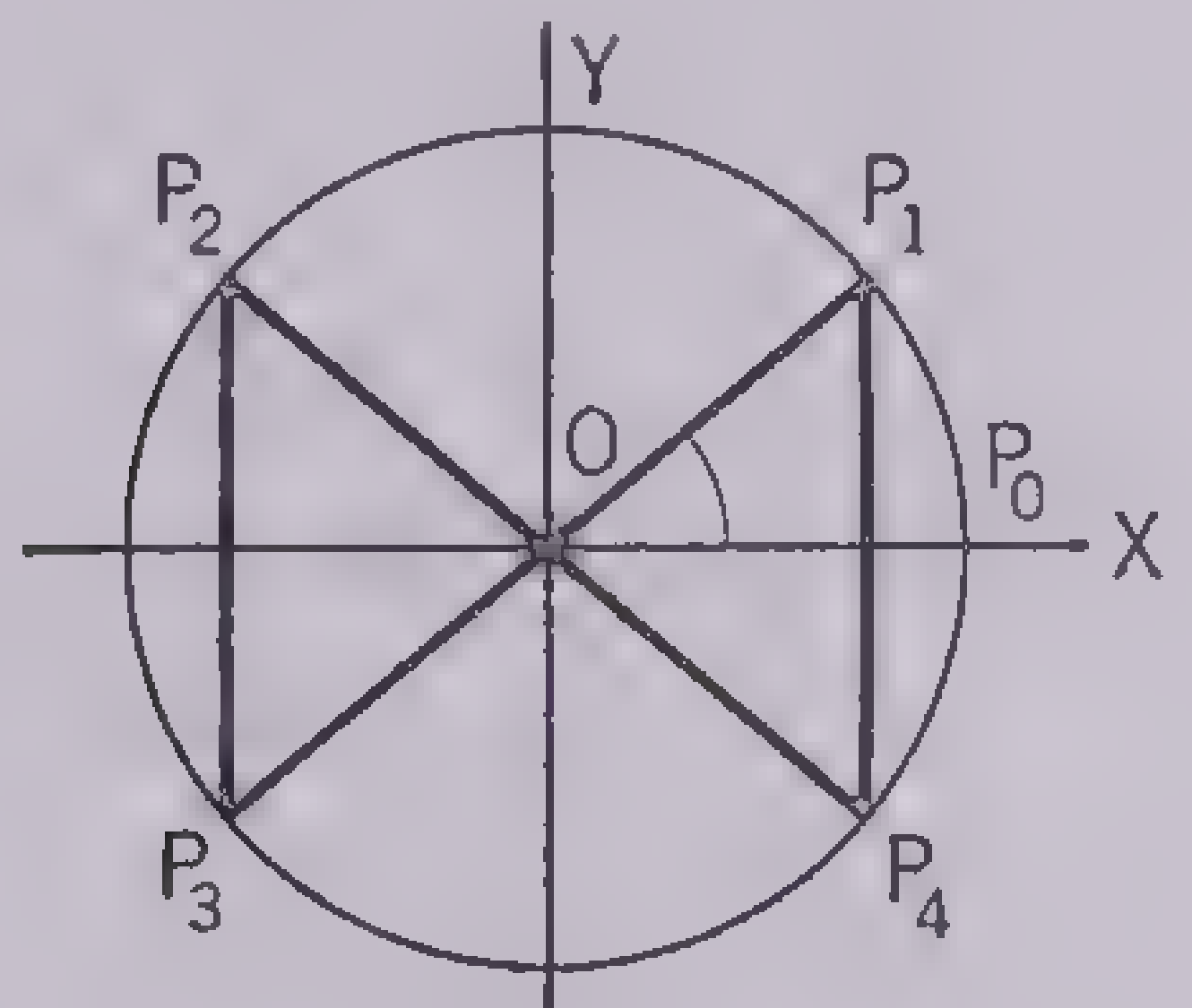


Fig. 3

Angles in the Second Quadrant.—Let P_0OP_2 represent any angle in the second quadrant. Let OP_1 be drawn symmetrical to OP_2 with respect to the Y-axis, and equal in length to OP_2, then, if P_0OP_1 be denoted by θ, the angle $P_0OP_2 = 2\text{R} - \theta$. Now the ordinates of P_1 and P_2 are equal, and their abscissas are equal, but opposite in sign; therefore,

$$\begin{aligned}\sin(2\text{R} - \theta) &= +\sin\theta,\\ \cos(2\text{R} - \theta) &= -\cos\theta,\\ \tan(2\text{R} - \theta) &= -\tan\theta.\end{aligned}\tag{7}$$

Now $2\text{R} - \theta$ and θ are supplementary angles, their sum being 2R; therefore,

The sines of supplementary angles are equal, and their cosines and tangents are equal with opposite signs.

Angles in the Third Quadrant.—Next let $P_0\,O\,P_3$ represent any angle in the third quadrant. Let $P_3\,O$ be prolonged to P_1, making $OP_1 = OP_3$, then, if $P_0\,O\,P_1$ be denoted by θ, the angle $P_0\,O\,P_3 = 2\text{R} + \theta$. In this case the abscissas of P_1 and P_3 are equal and opposite in sign, and so are their ordinates; therefore,

$$\begin{aligned}\sin(2\text{R} + \theta) &= -\sin\theta,\\ \cos(2\text{R} + \theta) &= -\cos\theta,\\ \tan(2\text{R} + \theta) &= +\tan\theta.\end{aligned}\tag{8}$$

The last of these formulas shows that the tangent has the shorter period 2R.

Angles in the Fourth Quadrant.—Let $P_0\,O\,P_4$ represent any angle in the fourth quadrant. If OP_1 be drawn symmetrical to OP_4 with respect to the X-axis, with $OP_1 = OP_4$, then, if $P_0\,OP_1$ be denoted by θ, the angle $P_0\;OP_4 = 4\text{R} - \theta$. Now the abscissas of P_1 and P_4 are equal, and their ordinates are equal with opposite signs; therefore,

$$\begin{aligned}\sin(4\text{R} - \theta) &= -\sin\theta,\\ \cos(4\text{R} - \theta) &= +\cos\theta,\\ \tan(4\text{R} - \theta) &= -\tan\theta.\end{aligned}\tag{9}$$

Negative Angles.—By (6) the angle $-\theta$ and the angle $4\text{R} - \theta$ are conterminal; therefore, from (9)

$$\begin{aligned}\sin(-\theta) &= -\sin\theta,\\ \cos(-\theta) &= +\cos\theta,\\ \tan(-\theta) &= -\tan\theta.\end{aligned}\tag{10}$$

Since any number and its reciprocal have like signs, the formulas (7), (8), (9) and (10) remain true if we write cosecant in the place of sine, secant in the place of cosine and cotangent in the place of tangent.

Formulas (6), (7), (8), (9) and (10) enable us to express the functions of any angle, whether positive or negative, in terms of the same function of an angle less than R. Whether the final result is positive or negative is easily determined by considering the signs of the co-ordinates in the quadrant in which the given angle lies. Furthermore, (3) enables us to express the result in terms of an angle less than 45°; for, if an angle is greater than 45°, its complement is less than 45°. Consequently, the numerical value of any of the six functions can be found from a table giving the values of the functions for all angles between 0° and 45°.

Such tables have been computed under the name of *natural trigonometric functions tables*. They usually give the values of the sine, cosine, tangent and cotangent for angles between 0° and 90° at intervals of one minute (1′). From such a table also an angle less than 90° can be found, when we know the value of one of its functions.

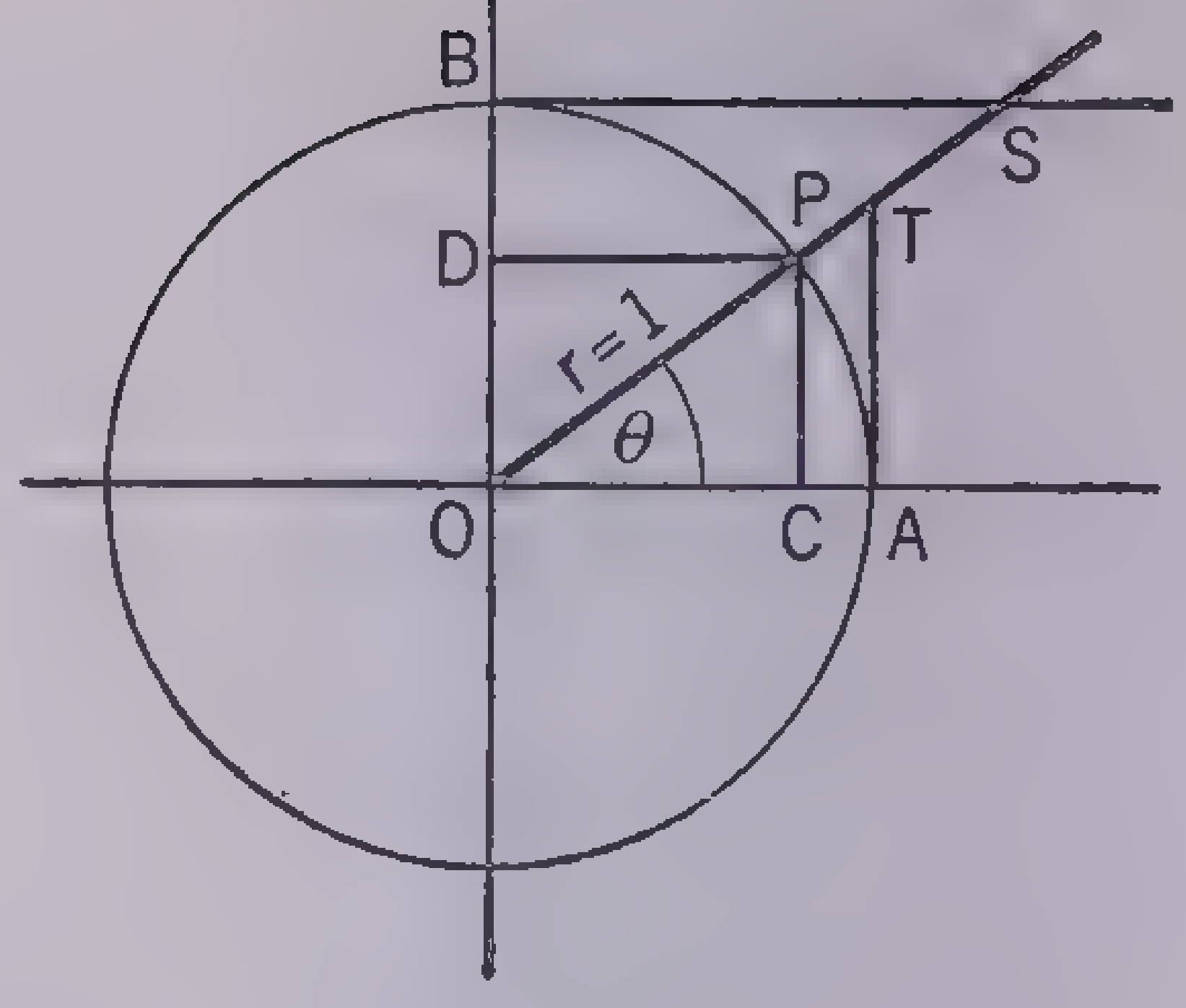


Fig. 4

The trigonometric functions may be represented by lines connected with a unit circle, as follows:

Let Θ be the given angle. With the vertex O as a center and a unit radius, draw a circle intersecting the sides of the angle in A and P, respectively. Let OB be the radius perpendicular to OA. From P draw the perpendiculars PC and PD to OA and OB, respectively. At A and B draw tangents to the circle intersecting OP prolonged in T and S, respectively. Then, OP being the unit of measure, it is easy to show that:

$$\begin{array}{ll}\sin\Theta = \text{CP}, & \cot\Theta = \text{BS},\\ \cos\Theta = \text{OC}, & \text{vers}\;\Theta = \text{CA},\\ \tan\Theta = \text{AT}, & \text{covers}\;\Theta = \text{DB},\\ \sec\Theta = \text{OT}, & \text{exsec}\;\Theta = \text{PT},\\ \csc\Theta = \text{OS}, & \text{excsc}\;\Theta = \text{PS}.\end{array}\tag{11}$$

In fact, from the definitions (2) and the property of similar triangles, we have:

TABLE OF NATURAL TRIGONOMETRIC FUNCTIONS AND OF CIRCULAR (RADIAN) EQUIVALENTS FOR DEGREE MEASURE

Angle	Radians	Sine	Tangent	Cotan.	Cosine		
0°	0	0	0	∞	1	1.5708	90°
1	.0175	.0175	.0175	57.2900	.9998	1.5533	89
2	.0349	.0349	.0349	28.6363	.9994	1.5359	88
3	.0524	.0523	.0524	19.0811	.9986	1.5184	87
4	.0698	.0698	.0699	14.3007	.9976	1.5010	86
5	.0873	.0872	.0875	11.4301	.9962	1.4835	85
6	.1047	.1045	.1051	9.5144	.9945	1.4661	84
7	.1222	.1219	.1228	8.1443	.9925	1.4486	83
8	.1396	.1392	.1405	7.1154	.9903	1.4312	82
9	.1571	.1564	.1584	6.3138	.9877	1.4137	81
10	.1745	.1736	.1763	5.6713	.9848	1.3963	80
11	.1920	.1908	.1944	5.1446	.9816	1.3788	79
12	.2094	.2079	.2126	4.7046	.9781	1.3614	78
13	.2269	.2250	.2309	4.3315	.9744	1.3439	77
14	.2443	.2419	.2493	4.0108	.9703	1.3265	76
15	.2618	.2588	.2679	3.7321	.9659	1.3090	75
16	.2793	.2756	.2867	3.4874	.9613	1.2915	74
17	.2967	.2924	.3057	3.2709	.9563	1.2741	73
18	.3142	.3090	.3249	3.0777	.9511	1.2566	72
19	.3316	.3256	.3443	2.9042	.9455	1.2392	71
20	.3491	.3420	.3640	2.7475	.9397	1.2217	70
21	.3665	.3584	.3839	2.6051	.9336	1.2043	69
22	.3840	.3746	.4040	2.4751	.9272	1.1868	68
23	.4014	.3907	.4245	2.3559	.9205	1.1694	67
24	.4189	.4067	.4452	2.2460	.9135	1.1519	66
25	.4363	.4226	.4663	2.1445	.9063	1.1345	65
26	.4538	.4384	.4877	2.0503	.8988	1.1170	64
27	.4712	.4540	.5095	1.9626	.8910	1.0996	63
28	.4887	.4695	.5317	1.8807	.8829	1.0821	62
29	.5061	.4848	.5543	1.8040	.8746	1.0647	61
30	.5236	.5000	.5774	1.7321	.8660	1.0472	60
31	.5411	.5150	.6009	1.6643	.8572	1.0297	59
32	.5585	.5299	.6249	1.6003	.8480	1.0123	58
33	.5760	.5446	.6494	1.5399	.8387	.9948	57
34	.5934	.5592	.6745	1.4826	.8290	.9774	56
35	.6109	.5736	.7002	1.4281	.8192	.9599	55
36	.6283	.5878	.7265	1.3764	.8090	.9425	54
37	.6458	.6018	.7536	1.3270	.7986	.9250	53
38	.6632	.6157	.7813	1.2799	.7880	.9076	52
39	.6807	.6293	.8098	1.2349	.7771	.8901	51
40	.6981	.6428	.8391	1.1918	.7660	.8727	50
41	.7156	.6561	.8693	1.1504	.7547	.8552	49
42	.7330	.6691	.9004	1.1106	.7431	.8378	48
43	.7505	.6820	.9325	1.0724	.7314	.8203	47
44	.7679	.6947	.9657	1.0355	.7093	.8029	46
45°	.7854	.7071	1.0000	1.0000	.7071	.7854	45°
		Cosine.	Cotan.	Tangent.	Sine.	Radians.	Angle

$$\begin{aligned}\sin\theta &= CP/OP = CP/1 = CP,\\ \cos\theta &= OC/OP = OC/1 = OC,\\ \tan\theta &= CP/OC = AT/OA = AT/1 = AT,\\ \sec\theta &= OP/CP = OP/OD = OS/OB = OS/1 = OS,\end{aligned}$$

and similarly for each of the other functions.

The lines CP, OC, AT and so on in a unit circle might be used to define the trigonometric functions. In fact, they were formerly so defined and were called *circular functions* because of the relation of these lines to the circle, and this term is still frequently used. These lines will represent the functions of angles of any magnitude, but if the angle is greater than 90°, the lines must be taken in the proper sense; that is, with the + or − sign, as the case may be.

The trigonometric lines just described are very useful in tracing the changes in the functions, as the angle changes. Let the angle change from 0° to 90°. Then CP changes from 0 to 1, OC changes from 1 to 0, AT from O to a length greater than any fixed length, the secant from 1 to a length greater than any fixed length, and so on for each of the other functions.

IV. FUNCTIONS OF SUMS AND DIFFERENCES OF ANGLES

It is frequently necessary to express a function of the sum or difference of two angles in terms of the functions of the separate angles. This is done by means of certain theorems known as addition and subtraction theorems. The principal theorems are stated below; their proofs will be given later.

Addition Theorems

$$\begin{aligned}&\sin(x+y) = \sin x\cos y + \cos x\sin y,\\ (12)\quad&\cos(x+y) = \cos x\cos y - \sin x\sin y,\\ &\tan(x+y) = (\tan x + \tan y)/(1 - \tan x\tan y)\end{aligned}$$

Subtraction Theorems

$$\begin{aligned}&\sin(x-y) = \sin x\cos y - \cos x\sin y,\\ (13)\quad&\cos(x-y) = \cos x\cos y + \sin x\sin y,\\ &\tan(x-y) = (\tan x - \tan y)/(1 + \tan x\tan y)\end{aligned}$$

To prove the first of these formulas, consider Fig. 5, in which LOM = x, MON = y, CE and CB the perpendiculars drawn from any point C on ON to OL and OM, BD and BA the perpendiculars drawn from B to EC and OL. Then, CB and CD being perpendicular to OM and OL, respectively, ∠DCB = x.

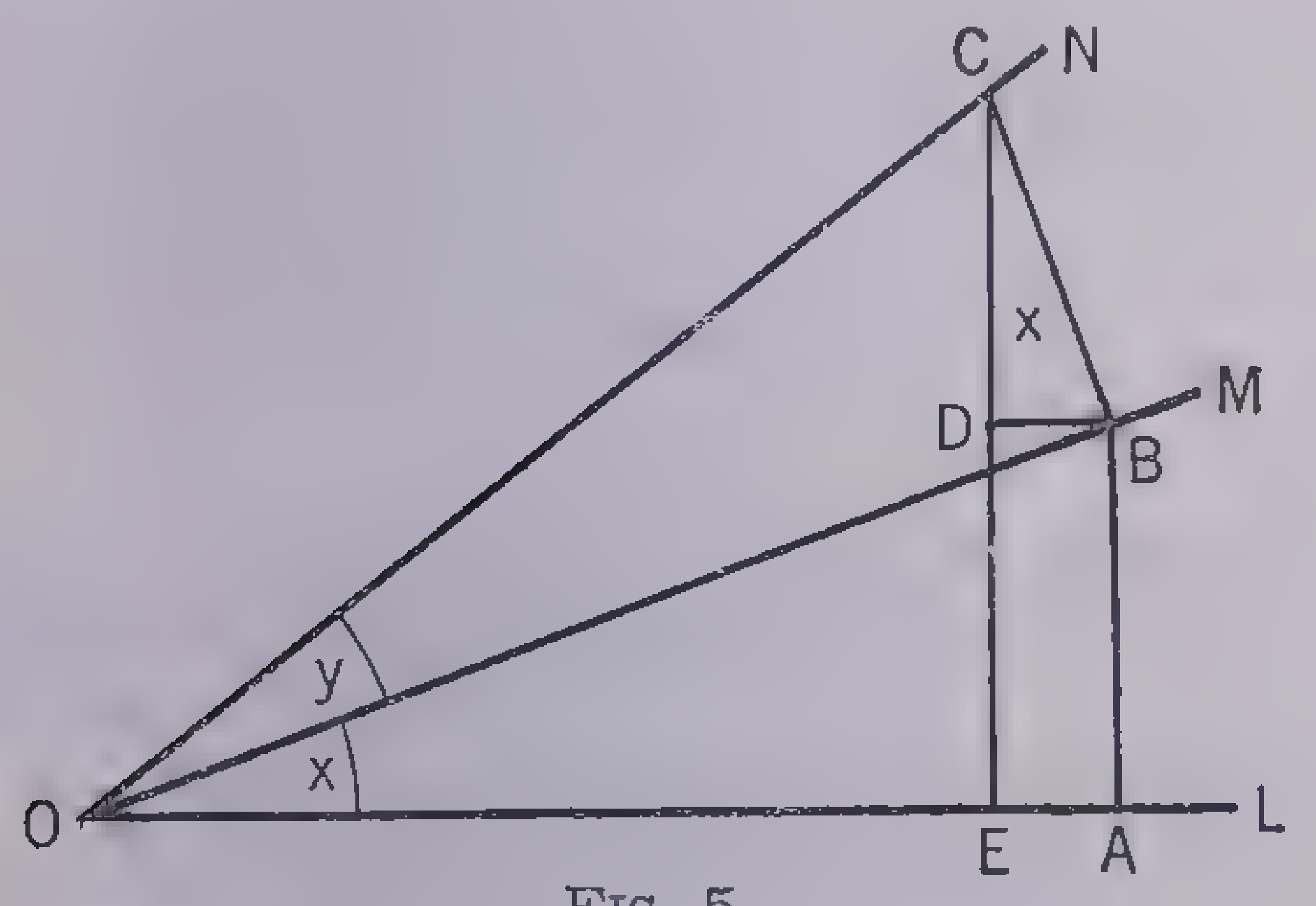


FIG. 5

Now,

$$\sin(x+y) = \frac{EC}{OC} = \frac{ED}{OC} + \frac{DC}{OC},$$

$$\frac{ED}{OC} = \frac{AB}{OC} = \frac{AB}{OB}\,\frac{OB}{OC} = \sin x\cos y,$$

$$\frac{DC}{OC} = \frac{DC}{BC}\,\frac{BC}{OC} = \cos x\sin y;$$

hence,

$$\sin(x+y) = \sin x\cos y + \cos x\sin y.$$

The second formula may be proved in like manner.

The third is obtained by dividing the first by the second, thus:

$$\tan(x+y) = \frac{\sin(x+y)}{\cos(x+y)} = \frac{\sin x\cos y + \cos x\sin y}{\cos x\cos y - \sin x\sin y} = \frac{\dfrac{\sin x\cos y}{\cos x\cos y} + \dfrac{\cos x\sin y}{\cos x\cos y}}{\dfrac{\cos x\cos y}{\cos x\cos y} - \dfrac{\sin x\sin y}{\cos x\cos y}} = \frac{\tan x + \tan y}{1 - \tan x\tan y}.$$

The formulas (13) are obtained from (12) by merely changing the sign of y and noting that by (10)

$$\cos(-y) = \cos y, \text{ and } \sin(-y) = -\sin y.$$

EXAMPLE. Let $x = 45°$, $y = 30°$; then, $\cos 75° = \cos(45° + 30°) = \cos 45°\cos 30° - \sin 45°\sin 30° =$

$$\frac{1}{2}\sqrt{2}\cdot\frac{1}{2}\sqrt{3} - \frac{1}{2}\sqrt{2}\cdot\frac{1}{2} = \frac{\sqrt{2}(\sqrt{3}-1)}{4} = 0.2588.$$

$$\cos 15° = \cos(45° - 30°) = \frac{\sqrt{2}(\sqrt{3}+1)}{4} = 0.9695.$$

The *formulas for double an angle*, namely,

$$\begin{aligned}&\sin 2x = 2\sin x\cos x,\\ (14)\quad&\cos 2x = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 = 1 - 2\sin^2 x,\\ &\tan 2x = 2\tan x/(1 - \tan^2 x),\end{aligned}$$

are obtained from (12) by taking $y = x$.

EXAMPLE: $\sin 60° = \sin(2 \times 30°) = 2\sin 30°\cos 30° = 2\cdot\frac{1}{2}\cdot\frac{\sqrt{3}}{2} = \frac{1}{2}\sqrt{3}.$

The half-angle formulas,

$$(15)\quad \sin\frac{x}{2} = \sqrt{\frac{1-\cos x}{2}},\qquad \cos\frac{x}{2} = \sqrt{\frac{1+\cos x}{2}},$$

are derived from (14) by solving the second of these formulas for $\sin x$ and $\cos x$ respectively, and replacing x by $\frac{x}{2}$.

EXAMPLE: $\sin 37\tfrac{1}{2}° = \sqrt{\dfrac{1-\cos 75°}{2}} = .60876\ldots$

$$\cos 37\tfrac{1}{2}° = \sqrt{\frac{1+\cos 75°}{2}} = .79335\ldots$$

In the application of logarithms to the solution of problems involving trigonometric functions, it is important to replace sums and differences of sines and cosines by products. This is accomplished by means of the following set of formulas:

$$\begin{aligned}&\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2}.\\ (16)\quad&\sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}.\\ &\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2}.\\ &\cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}.\end{aligned}$$

The proof is simple. To obtain the first of these formulas, add the first equation in (12) and the first in (13), which gives

$$\sin(x+y) + \sin(x-y) = 2\sin x\cos y.$$

Then put $x + y = A$, $x - y = B$, from which

$$x = \frac{A+B}{2},\quad y = \frac{A-B}{2}.$$

The other formulas of the set are proved in a similar manner.

EXAMPLE: $\sin 32° + \sin 30° = 2\sin 31°\cos 1°$.

V. ARITHMETICAL SOLUTION OF TRIANGLES

The three sides and the three angles of a triangle are called its parts. It is shown in plane geometry that three of these parts, including at least one side, determine the triangle. The remaining parts may then be computed, that is, the triangle can be solved.

The solution of right triangles is immediately effected by the use of a table of natural trigonometric functions. One angle being a right angle, only two other parts need be known, one of which must be a side. If two sides are given, one of the relations,

$$(17)\quad \frac{a}{c} = \sin A,\ \frac{b}{c} = \cos A,\ \frac{a}{b} = \tan A,$$

will enable us to find A by means of the table.

The second angle is the complement of the first. Having found A, another of the relations (17) will give the remaining side. The same equations (17) serve to find the unknown parts if one side and the angle A are given. If the angle B is one of the given parts, its complement A can be found, and once more (17) will give the remaining unknown parts.

EXAMPLE 1: At a point 100 feet from the foot of a flag pole, the top of the pole forms an angle of 65° 30′ with the horizontal line. What is the height of the pole?

SOLUTION: The foot of the pole, the top of the pole and the point from which the observation is taken, are the vertices of a right triangle, whose base is 100 feet and whose base angle is 65° 30′. Call its height a. Then the last of the equations (17) gives $a = 100 \tan 65° 30′$. Consulting a table, we find $\tan 65° 30′ = 2.1943$; hence, $a = 219.4$ feet.

EXAMPLE 2: What is the altitude (angle of elevation above the horizon) of the sun, when a steeple 150 feet high casts a shadow 300 feet long?

SOLUTION: The top of the steeple, the foot of the steeple and the end of the shadow form a right triangle. Denoting the required angle by A, the third of equations (17) gives $\frac{150}{300} = \tan A$. By consulting a table of natural tangents, we find that A = 26° 34′.

The solution of oblique triangles is usually treated under four cases. Every triangle may be considered the sum or difference of two right triangles, formed by drawing a perpendicular from one vertex to the side opposite. This suggests the possibility of solving any triangle by the method of right triangles. The reader, who follows this suggestion, should be able to solve any given triangle without undue difficulties. This method, however, is somewhat roundabout, and therefore is not usually employed by experienced computers.

The four cases of oblique triangles are:

I. Given two angles and one side, as A, B and a.
II. Given two sides and an angle opposite one of them, as a, b and A.
III. Given two sides and the included angle, as b, c and A.
IV. Given the three sides.

The solution of oblique triangles is facilitated by making use of one or the other of two relations between the sides and functions of the angles. These relations are:

THE LAW OF SINES: In any triangle the sides are proportional to the sines of the angles opposite, i. e.,

(18) $a : b : c = \sin A : \sin B : \sin C$.

THE LAW OF COSINES: The square of any side is equal to the sum of the squares of the other two sides, diminished by the product of these two sides times the cosine of the included angle, i. e.,

(19) $a^2 = b^2 + c^2 - 2bc \cos A$.

To prove these laws, consider Fig. 6, in which p denotes CD, the perpendicular drawn from the vertex C to the side opposite. In the right triangle ADC, $p = b \sin A$; in the right triangle BDC, $p = a \sin B$, whence the law of sines results by comparing these two expressions for p.

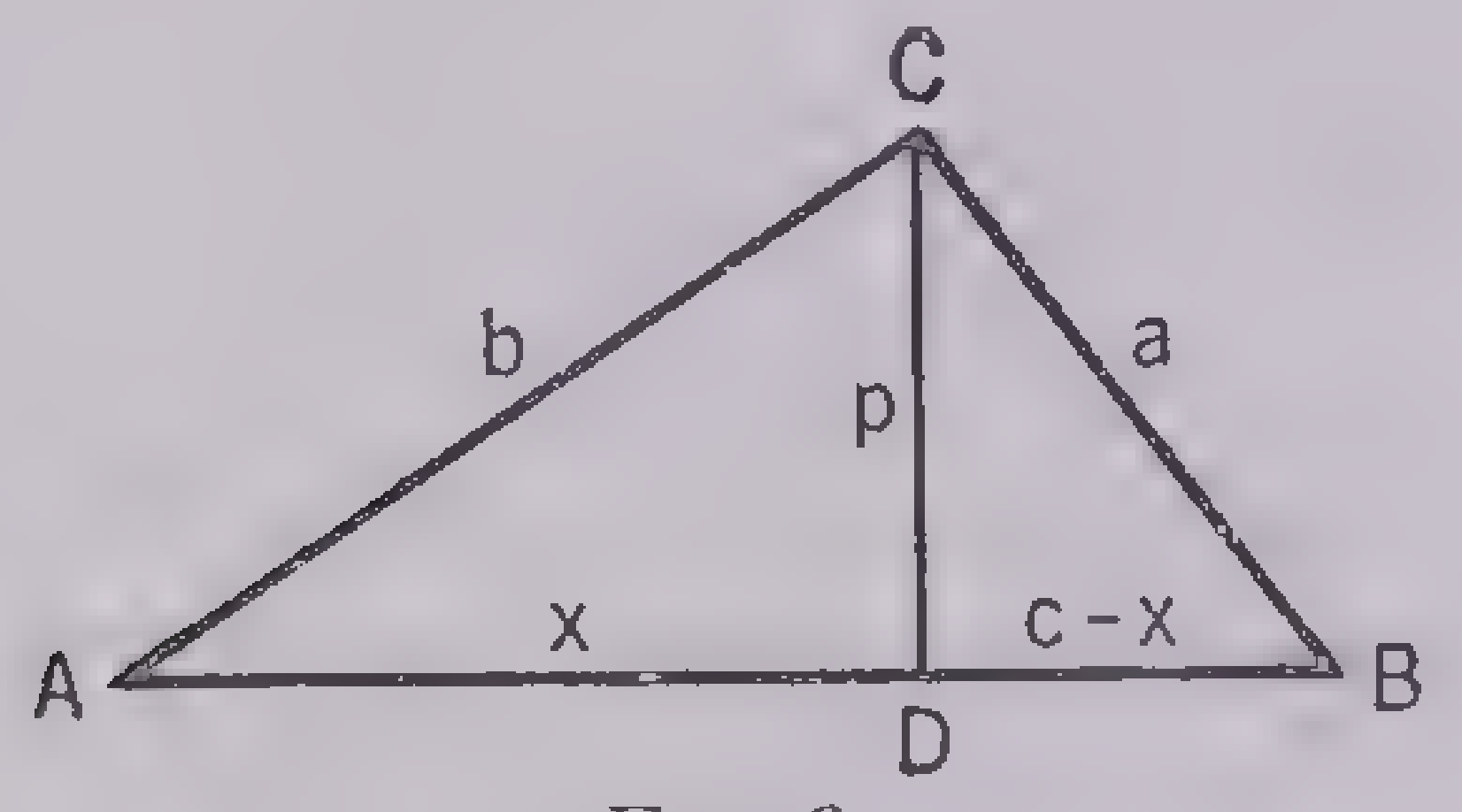


FIG. 6

The law of cosines is proved equally easily from Fig. 5. Denoting AD by x, and DB by $c - x$, we have by comparing the values of p^2 in the two right triangles,

$$p^2 = a^2 - (c - x)^2 = b^2 - x^2,$$

from which

$$a^2 = b^2 + c^2 - 2cx, \text{ but } x = b \cos A;$$

hence,

$$a^2 = b^2 + c^2 - 2bc \cos A.$$

The reader may satisfy himself that, with a slight modification in notation, the foregoing proofs hold true even if one of the angles at A or at B is an obtuse angle.

We shall now apply these laws to the solution of the four cases of oblique triangles:

CASE I: Given A, B and a.

SOLUTION: C = 180° − (A + B). If A, B and a are known, b and c may be found from the law of sines, thus:

$$b = \frac{a \sin B}{\sin A},\; c = \frac{a \sin C}{\sin A}.$$

CASE II: Given a, b and A.

SOLUTION: B may be found from the law of sines, thus:

$$\sin B = \frac{b \sin A}{a}.$$

The other parts may be found as in Case I, since we now know two angles and two sides.

B may have two values, for to every sine two supplementary angles correspond. Therefore, there may be two solutions. This is the case, if, and only if, $a<b$, as can be seen by drawing a figure.

CASE III: Given b, c and A.

SOLUTION: a may be found from the law of cosines, thus:

$$a = \sqrt{b^2 + c^2 - 2bc \cos A}.$$

Having found a, B and C are found from the law of sines.

CASE IV: Given a, b and c.

SOLUTION: Each angle may be found from the law of cosines in the form

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}.$$

VI. LOGARITHMIC SOLUTION OF TRIANGLES

When the given parts of a triangle are the results of precise measurement containing four, five or more significant figures, the arithmetical solution of triangles explained in the preceding section requires laborious and time-consuming calculations, which may be avoided by the use of logarithms.

Every positive number, N, may be expressed, exactly or to any desired degree of approximation, by some power of 10, say $N = 10^n$, where n is a positive or negative number but not necessarily an integer. We call n the common logarithm of N, which is written $n = \log N$. The common logarithms of numbers have been computed and arranged in a table of common logarithms, from which, if N is given, log N may be found, or, if log N is given, N may be found.

Consider now two numbers M and N, each expressed as a power of 10; say,

$$M = 10^m,\; N = 10^n;$$

then, from the law of exponents, it follows that

$$M \cdot N = 10^{m+n},\; M \div N = 10^{m-n},$$

$$M^k = 10^{km},\; \sqrt[k]{M} = M^{\frac{1}{k}} = 10^{\frac{m}{k}};$$

that is to say:

$$\log (M \cdot N) = m + n = \log M + \log N,$$

$$(20) \quad \log \left(\frac{M}{N}\right) = m - n = \log M - \log N,$$

$$\log (M^k) = km = k \log M,$$

$$\log (M^{\frac{1}{k}}) = \frac{m}{k} = \frac{1}{k} \log M.$$

The first of these formulas shows that the product MN may be found without multiplication, by taking log M and log N from a table of logarithms and then finding from the same table the number whose logarithm is equal to the sum of log M and log N. The other formulas lead to simial; short cuts for finding $M \div N$, M^k and $\sqrt[k]{M}$

The application of logarithms to the solution of the third and fourth cases of oblique triangles requires some additional formulas. These are:

THE LAW OF TANGENTS:

$$\frac{b + c}{b - c} = \frac{\tan \frac{1}{2}(B + C)}{\tan \frac{1}{2}(B - C)},$$

which is frequently written in the equivalent form,

$$(21) \quad \tan \tfrac{1}{2}(B - C) = \frac{b - c}{b + c} \cot \tfrac{1}{2}A.$$

THE HALF-ANGLE FORMULA:

$$\tan \frac{A}{2} = \frac{r}{s - a},$$

where

$$(22) \quad r = \sqrt{\frac{(s - a)(s - b)(s - c)}{s}}$$

—proved in the following discussion—

and $s = \dfrac{a + b + c}{2}$ or half the sum of the sides.

The law of tangents is based on the law of sines, for by the laws of proportion and by (16) and (5),

since $\dfrac{b}{c} = \dfrac{\sin B}{\sin C}$,

$$\frac{b + c}{b - c} = \frac{\sin B + \sin C}{\sin B - \sin C} =$$

$$\frac{2 \sin \frac{B + C}{2} \cos \frac{B - C}{2}}{2 \cos \frac{B + C}{2} \sin \frac{B - C}{2}} = \frac{\tan \frac{B + C}{2}}{\tan \frac{B - C}{2}}.$$

The half-angle formula may be obtained by transforming the formula expressing the law of cosines, or it may be proved by the following geometrical considerations:

Let A, B, C denote the angles and a, b, c the corresponding opposite sides, O the center and r the radius of the circle inscribed in the triangle ABC (Fig. 7). Then by geometry, since the two tangents drawn from a given point to a circle are equal, AE = AD, and CE + DB = a. Then $2AD + 2a = 2s$; $AD = s - a$, angle $OAD = \dfrac{A}{2}$ and $\tan \dfrac{A}{2} = \dfrac{r}{s - a}$.

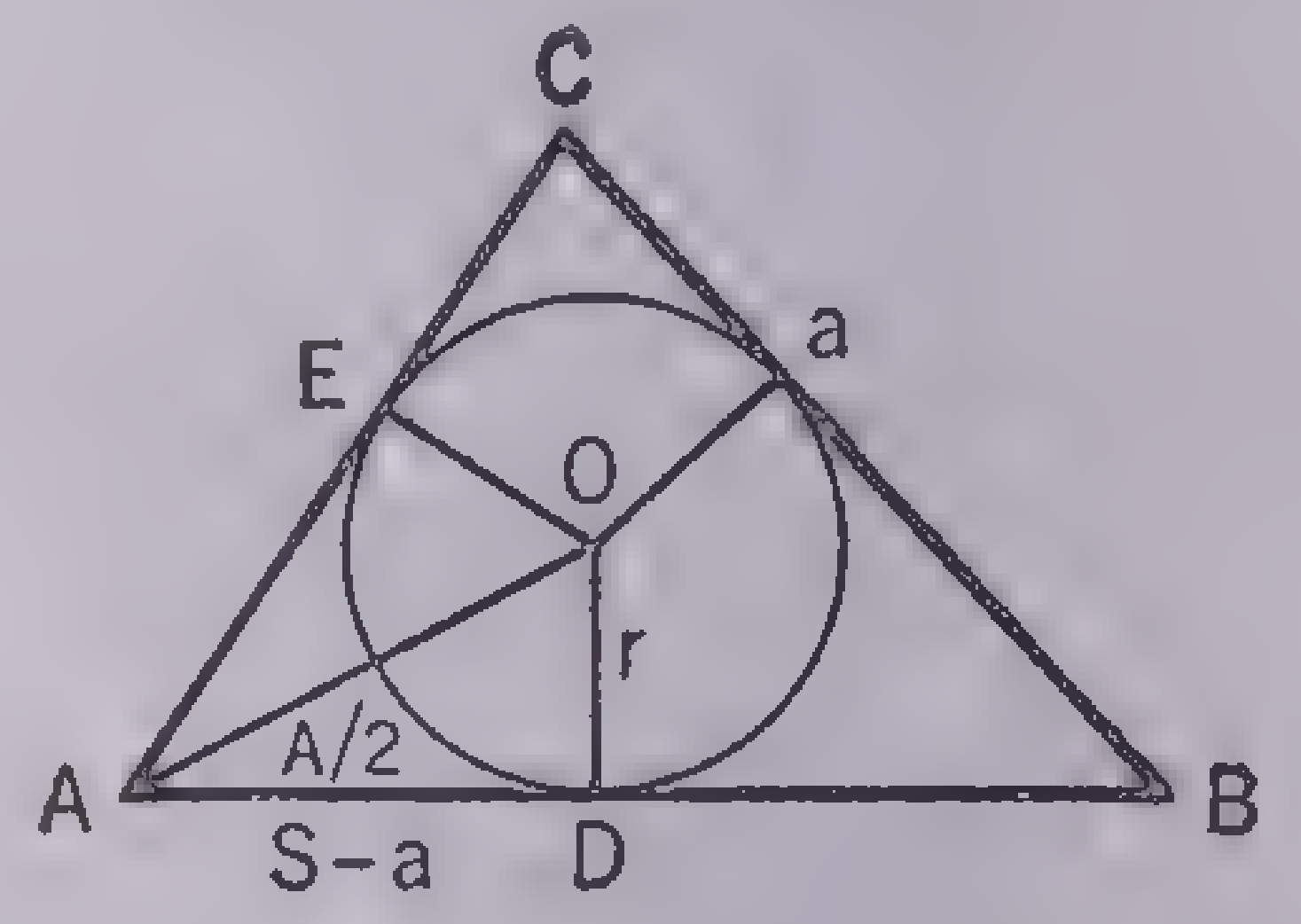


FIG. 7

It remains to show that

$$r = \sqrt{\frac{(s - a)(s - b)(s - c)}{s}}.$$

To show this, we compare the area of the triangle ABC,

$$T = \sqrt{s(s - a)(s - b)(s - c)},$$

as given in geometry, with the same area found by taking the sum of the areas of the three triangles BCO, CAO, ABO, having the common altitude r. This gives

$$T = \frac{ar}{2} + \frac{br}{2} + \frac{cr}{2} = sr,$$

since the area of a triangle equals half the base times the altitude. Comparing the two values of T, we have

$$r = \frac{\sqrt{s(s - a)(s - b)(s - c)}}{s} = \sqrt{\frac{(s - a)(s - b)(s - c)}{s}}.$$

The half-angle formula, of course, may be expressed in terms of the other angles besides A, thus:

$$(23) \quad \tan \frac{A}{2} = \frac{r}{s - a},\; \tan \frac{B}{2} = \frac{r}{s - b},\; \tan \frac{C}{2} = \frac{r}{s - c}.$$

The same remark applies to the formulas expressing the law of tangents and the law of cosines, and to any other formulas holding for *unrestricted* oblique triangles.

We have now all necessary formulas for the logarithmic solution of triangles.

CASE I: A, B and a being given, C = 2R − (A + B)—R = right angle—and b is found by the formula (law of sines),

$$\log b = \log a + \log \sin B - \log \sin A.$$

CASE II: a, b and A being given, B is found by the formula (law of sines)

$$\log \sin B = \log \sin A + \log b - \log a.$$

This gives two values of B, both of which are admissible, provided $a<b$; otherwise, only the acute value of B gives a solution.

CASE III: b, c and A being given, the angles B and C are found by the formulas (law of tangents) (21)

$$B + C = 2R - A,$$

$$\log \tan \frac{B - C}{2} = \log (b - c) - \log (b + c) + \log \cot \frac{A}{2}.$$

CASE IV: a, b and c being given, the angles A, B and C are found by the formulas (23)

$$\log \tan \frac{A}{2} = \log r - \log (s - a),$$

where (22)

$$\log r = \tfrac{1}{2} [\log (s - a) + \log (s - b) + \log (s - c) - \log s].$$

VII. TRIGONOMETRIC SERIES, THEOREMS AND HYPERBOLIC FUNCTIONS

It may be shown by purely algebraic methods, but more simply by the methods of the differential calculus, that for all real values of Θ

$$\sin \Theta = \Theta - \frac{\Theta^3}{3!} + \frac{\Theta^5}{5!} - \frac{\Theta^7}{7!} + \dots,$$

$$(24) \quad \cos \Theta = 1 - \frac{\Theta^2}{2!} + \frac{\Theta^4}{4!} - \frac{\Theta^6}{6!} + \dots,$$

$$e^{\Theta} = 1 + \Theta + \frac{\Theta^2}{2!} + \frac{\Theta^3}{3!} + \dots,$$

where e is the limit, as x approaches 0, of $(1 + x)^{\frac{1}{x}}$.

When $\Theta = 1$, the first 10 terms of the third formula (24) give

$$e = 2.71828 \dots$$

If in (24) we replace Θ by ix, where $i = \sqrt{-1}$, and remember that $i^2 = -1$, $i^3 = -i$, and $i^4 = 1$, we obtain

$$\sin (ix) = i(x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \dots),$$

$$\cos (ix) = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \dots,$$

(25)

$$e^{ix} = (1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + ..) + i(x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + ..)$$

The first two of these formulas define sines and cosines of imaginary numbers, the third shows that

$$(26) \quad e^{ix} = \cos x + i \sin x$$

Since $(e^{ix})^n = e^{inx}$ [where n equals any number],

we see further that

$$(27) \quad (\cos x + i \sin x)^n = \cos nx + i \sin nx.$$

(26) and (27) are known as Euler's and De Moivre's theorems, respectively, two of the most noteworthy and far-reaching theorems of modern analysis. In particular, when $x = \pi$, (26) shows that

$$e^{i\pi} = -1,$$

a most marvelous relation connecting the two transcendental numbers e and π.

By taking half the sum and half the difference of the two series

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots,$$

$$(28) \quad e^{-x} = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} - \dots,$$

we obtain two new functions of x, known as the hyperbolic cosine of x ($\cosh x$), and hyperbolic sine of x ($\sinh x$), respectively, thus:

$$\cosh x = \frac{e^x + e^{-x}}{2} =$$

$$(29) \quad 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \dots,$$

$$\sinh x = \frac{e^x - e^{-x}}{2} = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \dots,$$

and (25) show that

$$(30) \quad \cosh x = \cos ix, \ \sinh x = \frac{\sin ix}{i}.$$

Hyperbolic functions are extensively used in the study of physics, cartography, geology and the various branches of technology. Many definite integrals are most simply expressed by means of hyperbolic functions. They are exceptionally useful in expressing the decay of physical magnitudes subject to absorption or dissipation, such as light, electricity and radioactivity.

VIII. SPHERICAL TRIGONOMETRY

The solution of triangles formed by the arcs of great circles on a sphere requires a knowledge of the relations between the sides and angles of spherical triangles. These relations are analogous to the relations between the sides and angles of plane triangles, but they are more complicated. If a, b, c, A, B, C, represent the angular measures of the sides and corresponding opposite angles of any spherical triangle, the fundamental relations may be stated as follows:

THE LAW OF SINES:

I. $\sin a : \sin b : \sin c = \sin A : \sin B : \sin C.$

THE LAWS OF COSINES:

II. $\cos a = \cos b \cos c + \sin b \sin c \cos A,$

III. $\cos A = -\cos B \cos C + \sin B \sin C \cos a.$

Though the formulas I, II and III enable us to solve any spherical triangle, the second and third formulas are not adapted to logarithmic computations. For this purpose, the laws of cosines may be transformed so as to give the following additional formulas that greatly facilitate computation:

THE HALF-ANGLE FORMULAS:

IV. $\tan\frac{A}{2} = \sqrt{\frac{\sin (s - b) \sin (s - c)}{\sin s \sin (s - a)}}, \ s = \frac{a + b + c}{2};$

V. $\tan \frac{a}{2} = \sqrt{\frac{-\cos S \cos (S - A)}{\cos (S - B) \cos (S - C)}}, \ S = \frac{A + B + C}{2}.$

NAPIER'S PROPORTIONS:

$\tan \tfrac{1}{2}(A + B) = \frac{\cos \frac{1}{2}(a - b)}{\cos \frac{1}{2}(a + b)} \cot \tfrac{1}{2}C,$

VI. $\tan \tfrac{1}{2}(A - B) = \frac{\sin \frac{1}{2}(a - b)}{\sin \frac{1}{2}(a + b)} \cot \tfrac{1}{2}C;$

$\tan \tfrac{1}{2}(a + b) = \frac{\cos \frac{1}{2}(A - B)}{\cos \frac{1}{2}(A + B)} \tan \tfrac{1}{2}c,$

VII. $\tan \tfrac{1}{2}(a - b) = \frac{\sin \frac{1}{2}(A - B)}{\sin \frac{1}{2}(A + B)} \tan \tfrac{1}{2}c.$

Formula IV is used to compute the angles when the sides are given; V, the sides when the angles are given; VI, the remaining angles when two sides and the included angle are known, or the third angle when two sides and the opposite angles are known; VII, the remaining sides when the given parts are one side and the adjacent angles, or the third side when two sides and the opposite angles are known.

When an unknown part is found from a sine, it should be remembered that the triangle may or may not have two solutions.

Like plane triangles, every oblique spherical triangle may be solved by solving two right spherical triangles whose sum or difference is equal to the given triangle. The solution of right spherical triangles does not require the preceding formulas. They are solved more readily by two easily remembered formulas, known as *Napier's Rules of the Circular Parts.* For these and many other important developments of spherical trigonometry, the reader should consult one of the many excellent textbooks and treatises on the subject.

ADVANCED MATHEMATICS

ADVANCED ALGEBRA

Since a great portion of the subject matter of advanced algebra is concerned with the solution of algebraic equations we shall discuss first what is usually called *Theory of Equations.*

Solutions.—Consider the equation $ax + b = 0$, a first-degree equation in one unknown, x. It has a single solution or root, $x = -\frac{b}{a}$. Similarly the second-degree equation $ax^2 + bx + c = 0$ has the two solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

The two solutions may possibly be equal, as in $x^2 - 4x + 4 = 0$, but there are always two. One suspects therefore that a third-degree equation will have exactly three solutions, a fourth-degree four and so on. Such is the case. A theorem proved with more advanced tools is that an equation of the nth degree of the form $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_n = 0$, where the exponents are positive integers and the coefficients a_0, a_1 etc., are constants such as 2, 3, -5, has exactly n solutions, real or imaginary. We shall assume this theorem in our discussion. We call the expression $a_0x^n + a_1x^{n-1} + \dots + a_n$ a *polynomial* of the nth degree. It is assumed that $a_0 \neq 0$. It is important to note that this definition requires the exponents to be integers and positive. Thus $2x^3 + x - 5$ is a polynomial; but $2x^3 + x + \frac{3}{x}$ and $4x^2 + x - x^{\frac{3}{2}}$ are not. We frequently shall represent a polynomial in x by the symbol $f(x)$, read f of x; and by the symbol $f(a)$ we shall mean the value of $f(x)$ when a is substituted for x. Thus if $f(x) = 3x^2 + x - 1$, then $f(a) = 3a^2 + a - 1$, $f(2) = 3(2^2) + 2 - 1 = 13$, $f(0) = -1$, etc. Observe that if $x = a$ is a solution of an equation $f(x) = 0$, then $f(a)$ is zero identically. It should be noted that $f(x)$ does not mean the product f times x but is simply a symbol for a polynomial in x. This symbol is used in a broader sense in the calculus. We shall now consider the method of solving an equation $f(x) = 0$ when it is of degree higher than two. Sometimes the polynomial $f(x)$ can be factored. Sometimes roots can be found by trial. Usually, however, a device known as *Horner's method* is used; it enables us to find approximate solutions of the real roots of an algebraic equation of any degree as nearly accurate as we need. A natural question is "Are there formulas, like the quadratic formula, that enable us to find exact solutions of the cubic, quartic and so on?" The answer is: There is a formula for the solution of the cubic called the *formula of Cardan* (Jerome, 1501–76), and one for the solution of the fourth-degree equation (quartic equation) from Ludovici Ferrari (1522–60); but no formula to give the exact solution of a general equation of degree greater than four. This is an established theorem. Cardan's and Ferrari's solutions are rather complicated, so they will not be written here.

Descartes' Rule of Signs.—In any equation $f(x) = 0$ with real coefficients, a *permanence* of sign is said to occur whenever a term follows one of like sign, and a *variation* of sign whenever a term follows one of opposite sign. Thus $x^4 - x^3 - x^2 + x - 3 = 0$ has three variations and one permanence, the variations being at $-x^3$, x, -3 and the permanence at $-x^2$. By means of the variations in an equation $f(x) = 0$ we gain some idea of the number of its real roots. A theorem that employs this idea is known as *Descartes' rule of signs* and may be stated as follows: *The number of positive roots of an equation* $f(x) = 0$ *cannot exceed the number of variations in* $f(x) = 0$; *and the number of negative roots of* $f(x) = 0$ *cannot exceed the number of variations in* $f(-x) = 0$. Thus $x^3 - x^2 - 1 = 0$ having one variation, and $-x^3 - x^2 - 1 = 0$ having no variation, there is one positive root but no negative root; therefore in this case we see there is exactly one positive root and there are two imaginary roots.

Horner's Method.—By means of the following theorem we gain some idea of the location of the real roots of an equation: *If* $f(a)$ *and* $f(b)$ *have opposite signs, there is at least one root of* $f(x) = 0$ *between* a *and* b. Thus if $f(x) = x^3 - x^2 - 1 = 0$, $f(1)$ is -1 and $f(2)$ is $+3$. Hence we know there is a root between 1 and 2; but $f(1.4)$ is $-.216$ and $f(1.5)$ is $+.125$. Hence this root is between 1.4 and 1.5. By continuing the process with certain modifications we can get an expression for this root that is correct to as many decimal places as we wish, the first two figures being 1.4. This method was established by William George Horner (1786–1837) and is widely used. By the use of what are called *Sturm sequences* the exact number of real roots of an equation $f(x) = 0$ may be determined, but this method employs the calculus.

Complex Numbers.—In solving the quadratic equation $x^2 + x + 1 = 0$ we have as the two roots $\dfrac{-1 \pm \sqrt{-3}}{2}$ which may be written $\dfrac{-1}{2} + \dfrac{\sqrt{3}}{2}i$, and $\dfrac{-1}{2} - \dfrac{\sqrt{3}}{2}i$ where $i = \sqrt{-1}$. Such a number, which we may write as $a + ib$ where a and b are real, is called a *complex* or *imaginary* number, and the two numbers $a + ib$ and $a - ib$ are called *conjugate imaginaries*. There is a whole theory involving complex quantities but only a brief portion is included in advanced algebra. Addition, subtraction, multiplication, division, evolution and involution of complex numbers all are defined. In particular the n nth roots of a number are obtained. For example the two square roots of 1 are ± 1. The three cube roots of 1 are 1 and $-\dfrac{1}{2} \pm \dfrac{\sqrt{3}}{2}i$ that are obtained by solving the equation $x^3 - 1 = 0$. Similarly the four fourth roots of 1 are $1, -1, i, -i$ from $x^4 - 1 = 0$. Obviously the simplicity of this method ends here but by a trigonometric expression the n nth roots of a number can be found quite easily. Allowing the use of complex numbers fills in the gap that otherwise might exist between the degree of an equation and the number of roots, and in the corresponding geometric graph of a polynomial.

Permutations, Combinations and Probability.—Any arrangement of a group of objects in a definite order in a row is called a *permutation* of the objects. Thus *ab* and *ba* constitute the two permutations of the letters *a* and *b*. If there are n objects and r are taken, we call the arrangement an r permutation of the n objects. If the arrangement is considered without regard to order, we call the arrangement a *combination*. Thus *ab* and *ba* constitute the same combination but different permutations.

A preliminary theorem in the subject is this: *If a certain thing can be done in* c *ways, and if, when it has been done, a certain other thing can be done in* d *ways, the entire number of ways in which both things can be done in the order stated is* cd *ways*. We can show now that the number of permutations of n objects taken n at a time, written ${}_nP_n$ or P^n_n, is $1 \cdot 2 \cdot 3 \cdots\cdots n$ that we write $n!$; for any one of the n objects may be chosen to fill the first position in a row counting, say, from left to right. With this position filled there are $n - 1$ objects remaining to fill the second position, so we can fill the first two positions in $n(n - 1)$ ways. Then there will be $n - 2$ objects remaining for the third position, or $n(n - 1)(n - 2)$ ways of filling the first three positions. Continuing this process we have finally $n(n-1)(n-2) \cdots\cdot 1$ ways of filling all n positions or $n!$ permutations. Thus the six permutations of the three numbers 1, 2, 3, will be 123, 132, 213, 231, 312, 321. There are also formulas for the number of permutations of n objects taken r at a time, written ${}_nP_r$ or P^n_r for circular permutations; for permutations when repetition of objects is allowed; for permutations of objects not all different; and there are similar formulas involving combinations. To cite one, the formula for the combination of n things taken r at a time, written ${}_nC_r$ or C^n_r, is $\dfrac{n(n-1)(n-2)\cdots\cdot(n-r+1)}{r!}$, which incidentally is the coefficient of the $(r + 1)$th term in the expansion of $(a + b)^n$ by the binomial theorem. Problems involving arrangement, whether in geometry, algebra or any other branch of mathematics or in matters of everyday life depend on the theory of permutations and combinations.

Bound up with this theory but having even more scope is the theory of probability concerned with such questions as the probability that three persons out of five now 60 years of age will be living in 8 years, knowing that on the average two persons out of three aged 60 live to be 68. Or it may be expected from past experience that out of 10,000 buildings of a certain type 250 losses will occur through fire in one year. An owner insures one of his buildings for \$10,000. What is the probability that that building will be burned and, in particular, calling the probability P, what will be the value of P·(\$10,000), which is known as his *mathematical expectation?* The theory is of great value in insurance and statistics and naturally is applicable to games of chance. It is used in psychology and has numerous other applications.

Determinants.—Suppose we have a group of objects arranged in a particular order that we call the normal order. An *inversion* is said to occur when an object is followed by another that in the normal order precedes it. Thus if the integers 1, 2, 3 are arranged in the normal order 123, then the arrangement 321 presents three inversions since 3 is followed by 2 and 1, and 2 is followed by 1. The idea of inversions is important in the development of determinants. The expression

$$\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}$$

is called a *determinant* of order two, having two rows and two columns, the letters a, b representing rows and the subscripts 1, 2 representing columns. The quantities a_1, a_2, b_1, b_2 are called the *elements* of the determinant. Similarly the expression

$$\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$$

is a determinant of order three. We give a determinant a *value* as follows: Form all possible products by taking as factors one element and one only from each row and each column. A typical product in this determinant is $b_1\, c_2\, a_3$. Now arrange the factors in each product so that the letters are in normal order—$a_3\, b_1\, c_2$. Then count the inversions in the subscripts, the normal order being 123 . . . . . If the number of inversions is even, give the product the $+$ sign. If the number is odd, the $-$ sign. The sum of all such products is defined to be the value of the determinant. Thus the value of the above determinant is $a_1\, b_2\, c_3 + a_2\, b_3\, c_1 + a_3\, b_1\, c_2 - a_3\, b_2\, c_1 - a_2\, b_1\, c_3 - a_1\, b_3\, c_2$. Observe that this third order determinant has six terms, which is as it should be from the theory of permutations, there being six different permutations of the numbers 1, 2, 3. Similarly the value of the determinant

$$\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix} \text{ is } a_1\, b_2 - a_2\, b_1.$$

If the determinant has numerical elements we may find its value by this method. Thus

$$\begin{vmatrix} 3 & 2 \\ 1 & 2 \end{vmatrix} = 3 \cdot 2 - 2 \cdot 1 = 4.$$

Usually, however, a different method is used to evaluate a numerical determinant. Determinants are very useful in solving a system of first-degree equations. Thus, given $a_1\, x + a_2\, y = d_1$ and $b_1\, x + b_2\, y = d_2$ the solution may be written as follows:

$$x = \frac{\begin{vmatrix} d_1 & a_2 \\ d_2 & b_2 \end{vmatrix}}{\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}}, \quad y = \frac{\begin{vmatrix} a_1 & d_1 \\ b_1 & d_2 \end{vmatrix}}{\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}},$$

provided the determinant $\begin{vmatrix} a_1 & d_2 \\ b_1 & b_2 \end{vmatrix} \neq 0$.

This method, which is known as *Cramer's rule* from Gabriel Cramer (1704–52), will hold for a system of three equations in three unknowns, the determinants then being of order three, and so on. In each case the unknowns x, y, z, etc., will equal the quotient of two determinants, the denominators in every case being the determinant of the coefficients. The numerator in solving for x is obtained from the denominator by replacing the first column by the column of constants, the y numerator by replacing the second column by the column of constants, and so on. Furthermore it may be that a system of equations will not have a common solution, and the theory of determinants then finds under what conditions that is so. Determinants are used also in analytic geometry, particularly that of three dimensions, and are very valuable in more advanced mathematical work.

Partial Fractions.—It is well known that if several fractions are added, the result is a fraction whose denominator is the least common multiple of the various denominators. The inverse problem of breaking up a single such fraction into the sum of simpler fractions constitutes the material of partial fractions. A knowledge of this is particularly valuable for certain problems of the calculus.

The foregoing constitutes the usual material considered in advanced algebra. Other topics that sometimes are considered usually belong equally well or better in a different branch of mathematics.

ANALYTIC GEOMETRY

The subject matter of analytic geometry of two dimensions deals primarily with *points* and their representation by a set of two numbers called *co-ordinates*, and with the paths described by moving points called *curves*, and the *equations* of these curves. In three-dimensional geometry we add *surfaces* to the above, and attach three co-ordinates to a point instead of two. Graphing, in elementary algebra, is a part of analytic geometry.

Co-ordinates.—Co-ordinates were first used systematically by René Descartes (1596–1650) and are called, after him, *Cartesian*. Those most frequently used are *rectangular Cartesian co-ordinates*, which we shall define. Consider in a plane the perpendicular lines X′X and Y′Y called *axes*, intersecting at 0, the *origin*, as in Figure 1.

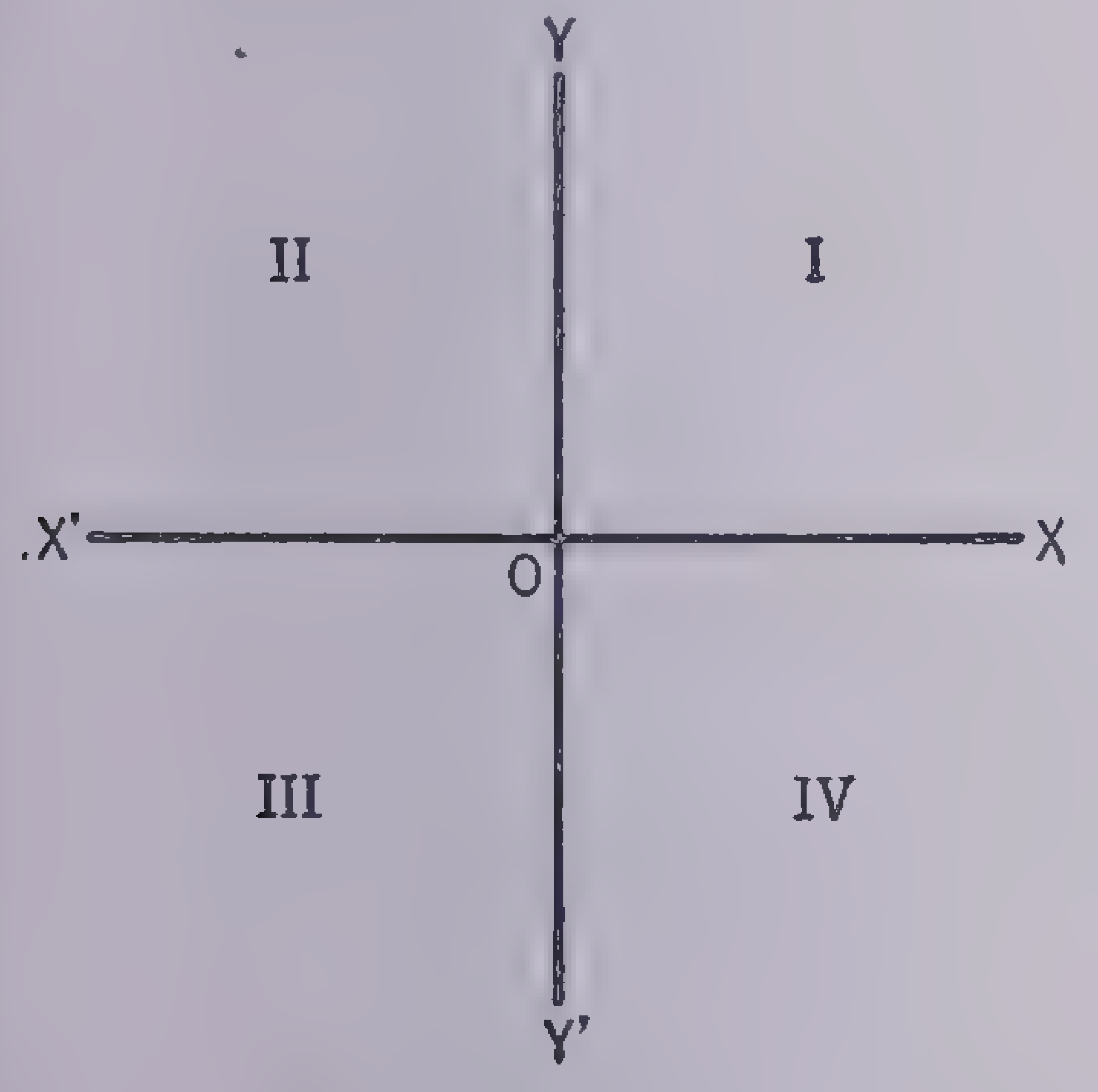


FIG. 1

We call X′X the *x axis*, Y′Y the *y axis*. The axes divide the plane into four *quadrants* as indicated. The position of a point in the plane is uniquely determined by a set of two numbers called *co-ordinates*, representing the distances from the axes to the point: a distance parallel to the x axis, called the *abscissa* or x of the point, being positive if directed to the right, negative if directed to the left; a distance parallel to the y axis, called the *ordinate* or y of the point, being positive if directed upward, negative if directed downward. The co-ordinates of a point are written (x, y) the x always being written first. Thus the point $(-3, 2)$ lies in the second quadrant. The co-ordinates of the origin are $(0, 0)$. Out of this idea of co-ordinates are developed formulas such as the distance formula

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

giving the numerical distance between the two points whose co-ordinates (x_1, y_1) and (x_2, y_2) are known; a formula giving the co-ordinates of the mid-point of a line segment and of the point dividing a segment in a given ratio; and a formula giving the *slope* of a line joining two points from which the direction of the line is determined. We choose the trigonometric tangent as the most applicable of the trigonometric functions to determine the direction of a line; and we define the *slope* of a line as the trigonometric tangent of the angle from the x axis to the line, the angle being generated by the x axis rotating counterclockwise to coincide with the line. By means of these formulas many plane geometry theorems can be proved and expressions for geometric properties can be obtained; and from these formulas others are developed and applied as the subject progresses. Analytic geometry, however, is not concerned chiefly with proving plane geometry theorems; it brings out the close relationship between algebra and geometry, and by the geometric interpretation of an algebraic equation it enables us to find geometric properties that without this method might be extremely difficult to find. Similarly we can interpret geometric properties algebraically or, as we say, *analytically*. Furthermore this method of co-ordinates is applied not only to geometry but to all branches of mathematics, indeed to all branches of science.

Curve, Locus, Equation, Graph.—Let us suppose now that a point P, with co-ordinates (x, y), moves in the plane of the co-ordinate axes, not at random but subject to some restriction that we impose. We call the path described by the moving point a *curve*. (Note that a straight line is one form of a curve.) This curve is called also the *locus* of the moving point. A familiar locus in plane geometry is a circle, being the locus of a point moving always at a constant distance from a fixed point. By *equation of a curve* we mean the equation that is satisfied by the co-ordinates of all those points, and those points only, that lie on the curve. Thus to find the equation of a curve described by the moving point P, we form a statement of equality expressing the condition that restricts the motion of P, and then replace the members of this equality by the proper analytic geometry formulas. Suppose we wish the equation of the curve described by P moving so that its distance from $(3, -2)$ always equals 5 units. Naming the co-ordinates of P as (x, y) we write our statement thus: distance of (x, y) from $(3, -2) = 5$. Using the distance formula stated in the previous section we have:

$$\sqrt{(x - 3)^2 + (y + 2)^2} = 5 \text{ or}$$
$$(x - 3)^2 + (y + 2)^2 = 25,$$

which is the equation of the required curve and also of a circle with center at $(3, -2)$ and radius 5, as is seen readily from the statement of the problem. Suppose now we are given an equation in x and y and we wish to draw the graph of the curve represented by this equation. If the type of the curve is not recognized, we proceed as follows: First, if possible, solve the equation, say, for y in terms of x. Then substitute a range of values for x, find the corresponding values for y, plot the points with these co-ordinates determined, and then draw the best possible curve through these points. This method is not too satisfactory, even when the given equation can be solved for one of the unknowns, and it is a great help if the type can be recognized at the start; here analytic geometry is very useful, for one of its functions is to classify certain curves (not all by any means), so that the types of these curves can be recognized by their equations. Even with the aid of analytic geometry, certain facts regarding the graph of a curve may escape notice, and so the calculus is brought into play, and indeed it plays a very important role in graphing.

The Straight Line and the First-degree Equation.—The simplest type of curve is the straight line, and by means of earlier formulas it is easy to show that the equation of a straight line is always of the first degree in x and y, being of the form $x = k$ (a constant), if parallel to the y axis; $y = k$, if parallel to the x axis; and in general of the form $ax + by + c = 0$. Various modifications of this equation are developed to bring out special information, such as the equation $y - y_1 = m\,(x - x_1)$, which is the equation of a line through (x_1, y_1) with slope m. The converse theorem, that *every first-degree equation in* x *and* y *is necessarily the equation of a straight line*, is proved, so that the straight line is characterized completely by a first-degree equation in x and y.

The Circle. The next simplest type of curve is the circle, defined as the locus of a point moving so that its distance from a fixed point is constant. One can easily show that the equation of a circle with center at (α, β) and radius r is $(x - \alpha)^2 + (y - \beta)^2 = r^2$. Note that this is a second-degree equation in x and y. The converse is not true, for there are curves other than circles having second-degree equations. Observe, however, that in the above equation the coefficients of x^2 and y^2 are the same and there is no xy term. Every circle has an equation of this form.

The Conics—Parabola, Ellipse and Hyperbola.—A *conic* is defined as the locus of a point moving so that its distance from a fixed point divided by its distance from a fixed line equals a constant ratio. The fixed point is called the *focus*; the fixed line, the *directrix*; and the constant ratio, the *eccentricity*. If the eccentricity numerically equals 1, the curve is a *parabola*; if less than 1, an *ellipse*; if greater than 1, a *hyperbola*. These curves are formed by plane sections of a right circular cone. The path of a projectile is a parabola. A suspension bridge forms a parabola. There are parabolic reflectors with light placed at the focus. The orbits of the planets are ellipses. An ellipse may also be defined as the locus of a point the sum of whose distances from two fixed points is constant. A hyperbola may be defined as the locus of a point the difference of whose distances is constant. The points in question are the foci. An ellipse and a hyperbola each has two foci

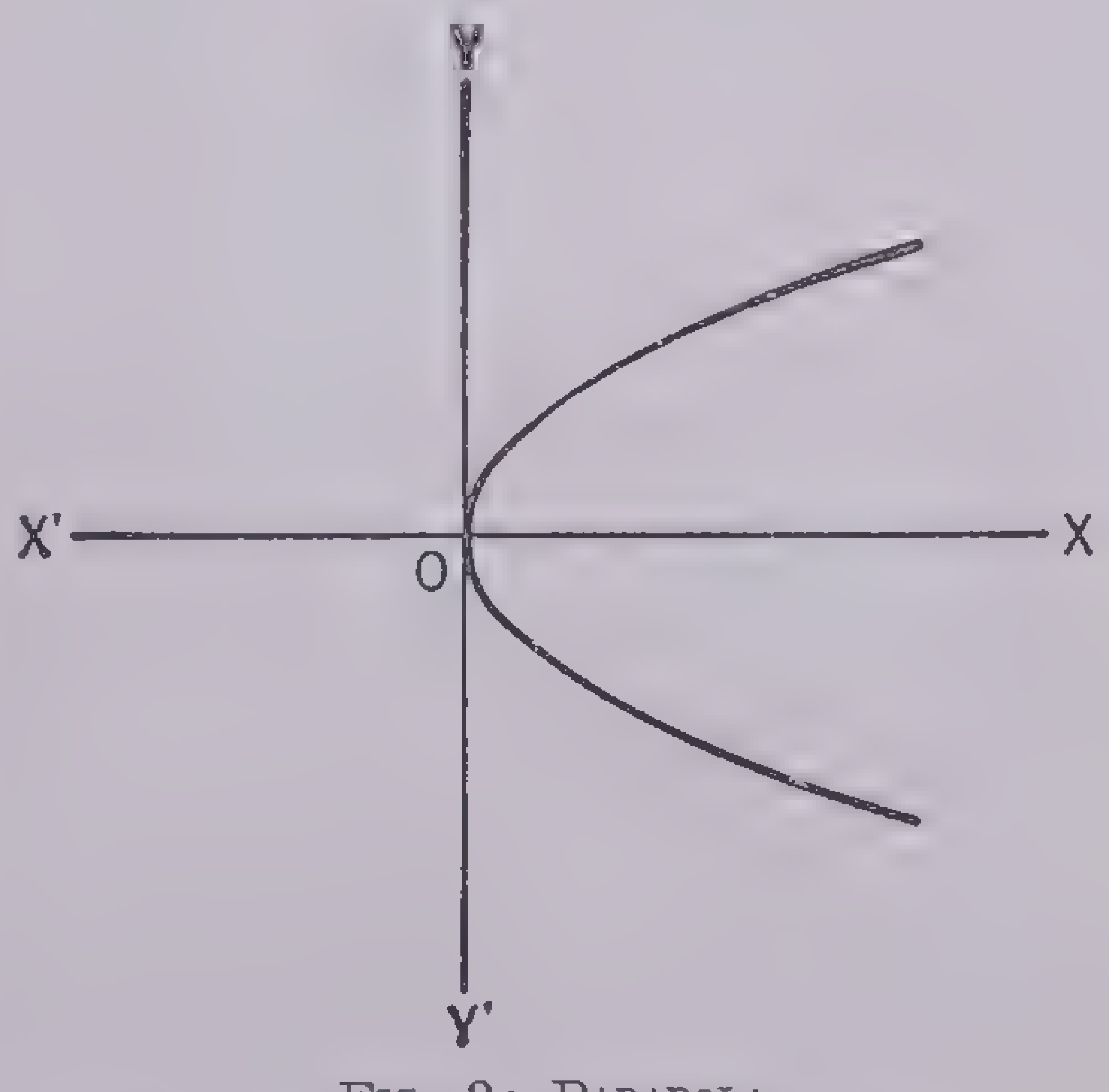


FIG. 2: PARABOLA

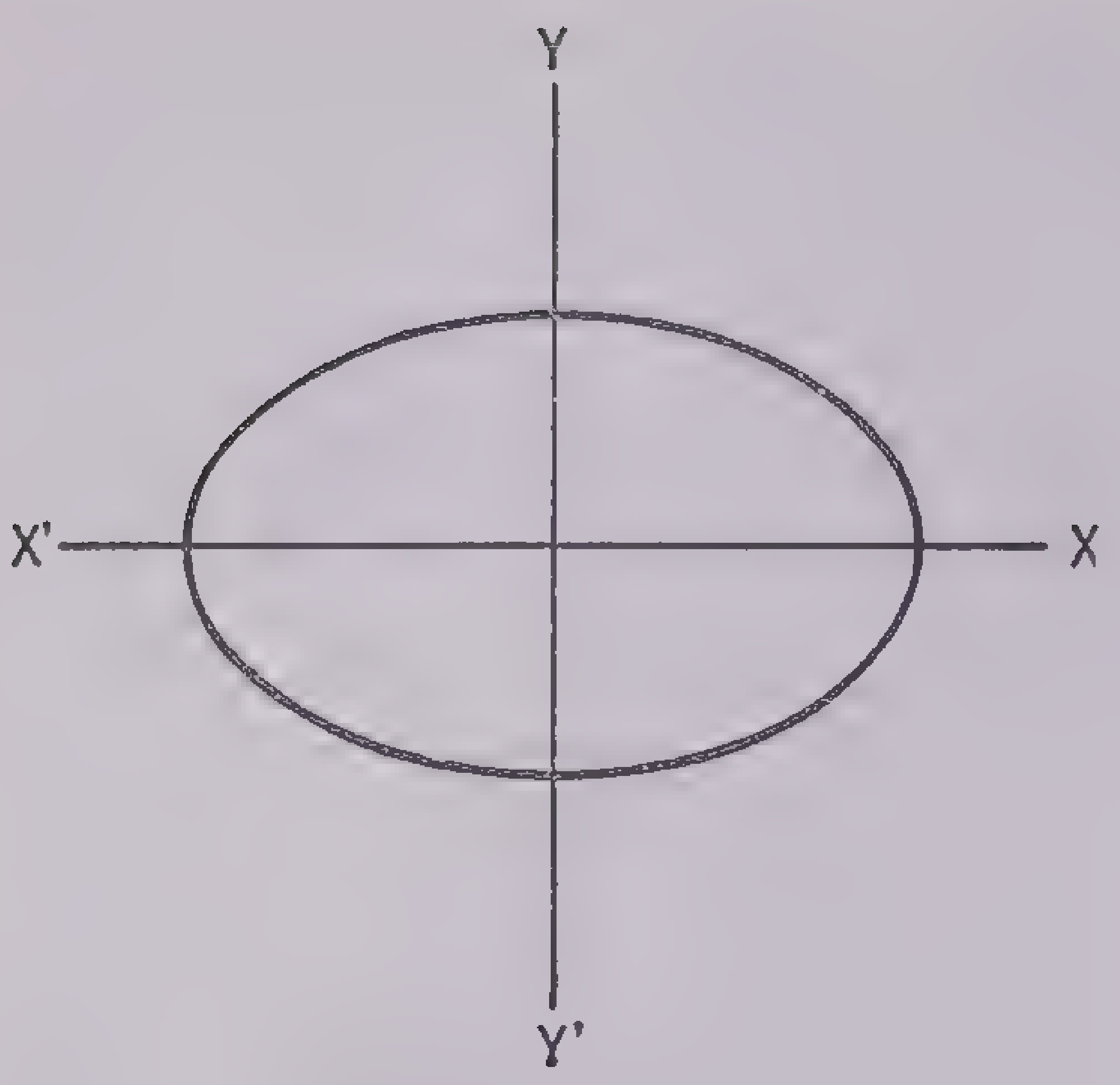


FIG. 3: ELLIPSE

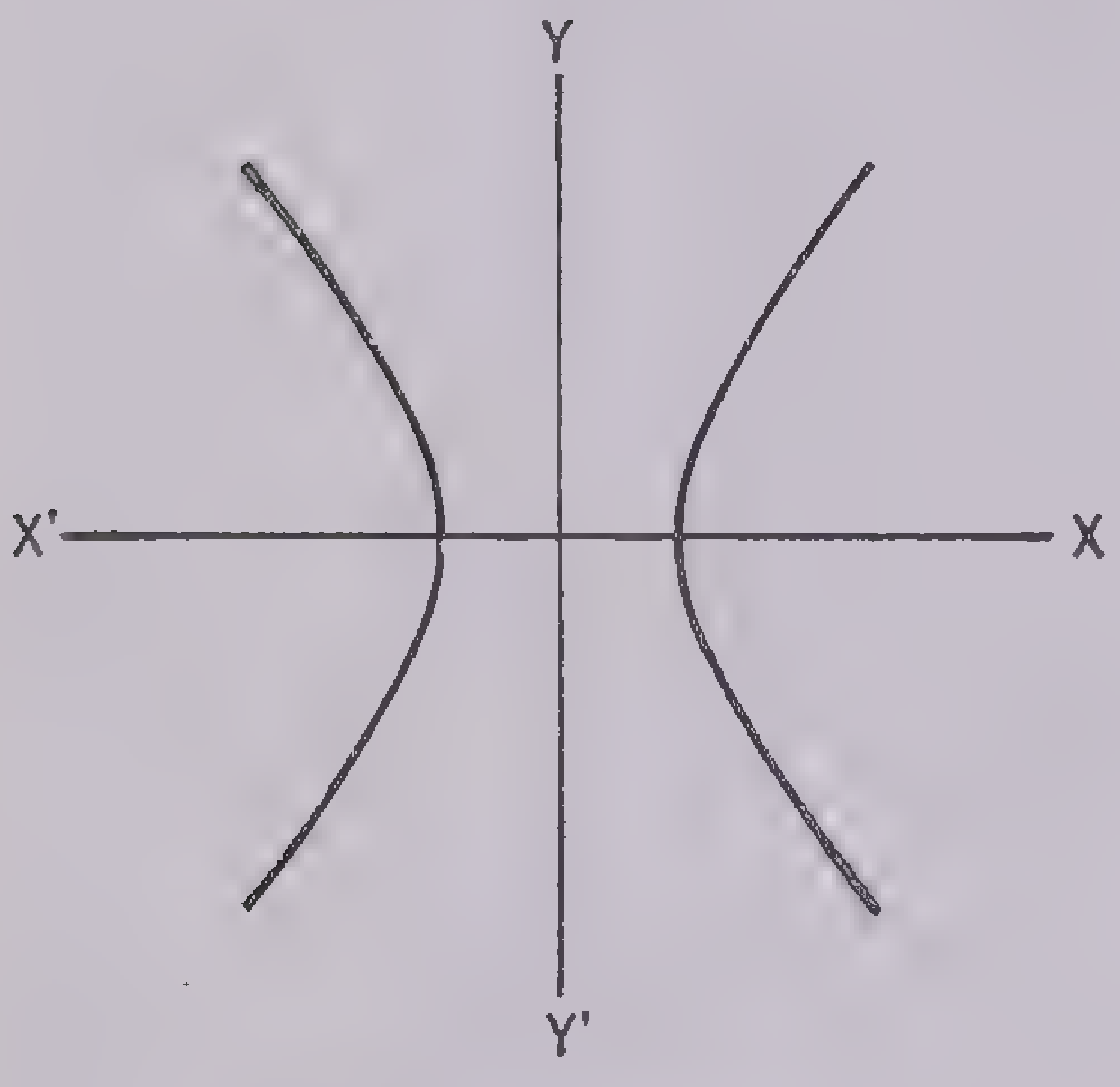


FIG. 4: HYPERBOLA

and two directrices. These three curves are shown in typical form. The equations of three typical curves are: for the parabola, $y^2 = 4x$; for the ellipse, $3x^2 + 5y^2 = 1$; and for the hyperbola, $4x^2 - 3y^2 = 1$. In the above figures the "axes of symmetry" of the curves lie along the co-ordinate axes. If such is the case or if the axes are parallel to the co-ordinate axes, there will never be an xy term in these equations. Under these circumstances the parabola equation will contain an x^2 term or a y^2 term but not both; the ellipse equation will contain both x^2 and y^2 with different coefficients but with the same sign; and the hyperbola equation will contain both x^2 and y^2 having opposite signs. The presence of x and y terms will not affect the type of curve. To handle the problem where an xy term is present, we move the co-ordinate axes by a motion parallel to themselves, called *translation,* and then employ a *rotation* until they coincide with the axes of the curve, forming a new set of axes, the $\bar{x}$ axis and $\bar{y}$ axis. Calling the new origin (h, k) and the angle from the x axis to the new $\bar{x}$ axis Θ, the equations of the transformation of co-ordinates are $x = \bar{x} \cos \Theta - \bar{y} \sin \Theta + h$ and $y = \bar{x} \sin \Theta + \bar{y} \cos \Theta + k$. Then by substituting these values for x and y in the equation of the curve and by proper reduction, a new equation is formed, the equation of the curve in $\bar{x}$ and $\bar{y}$ co-ordinates, in which there will be no $\bar{x}\bar{y}$ term and hence from which we can conclude the nature of the curve. Finally we can state that the equation of every circle, parabola, ellipse and hyperbola will always be of the second degree in x and y and, including the so-called imaginary and degenerate cases, every second-degree equation will represent a circle, parabola, ellipse or hyperbola. (A degenerate hyperbola, for example, would be $x^2 - y^2 = 0$, that is, the two lines $x + y = 0$ and $x - y = 0$.)

Polar Co-ordinates.—*Polar co-ordinates* are those in which a point P is determined by the set of two quantities r and Θ where r is the distance from the origin 0 or *pole* to P and is called the *radius vector* of P, and Θ is the angle from a directed line through 0 called the *polar axis,* to r and is called the *vectorial angle.* The angle is measured in radian measure. Thus to represent the point P with polar co-ordinates $(2, \frac{\pi}{3})$, that is, with $r = 2$ and $\Theta = \frac{\pi}{3}$ radians or 60°, we draw from 0 a half line making an angle of $\frac{\pi}{3}$ radians with the polar axis, and the point P is 2 units from 0 on this line. If the x axis is taken as the polar axis, then the point $(2, \frac{\pi}{3})$ in polar co-ordinates is the same as the point with rectangular cartesian co-ordinates $(1, \sqrt{3})$. If r is negative, say -2, we go 2 units along the half line produced through 0 in the opposite direction. Thus $(-2, \frac{\pi}{3})$ lies in the third quadrant. These co-ordinates are used chiefly in the consideration of curves that are subject to some trigonometric or logarithmic condition. Thus $r = c \cos 3\Theta$ (c being a constant) is a three-leafed rose; and $r = c\Theta$ is a spiral, as is $\log r = c\Theta$. Some other curves whose equations are best formulated from trigonometric considerations are the cissoid, the witch, the lemniscate, the conchoid and the cardioid.

Solid Analytic Geometry.—A point P in space is represented in rectangular cartesian co-ordinates by a set of three numbers (x, y, z) the quantities x, y, z, being distances measured parallel to the x, y and z axes (mutually perpendicular), respectively, from the three *co-ordinate planes,* with a convention as to sign. The general equation of the first degree in three unknowns, $ax + by + cz + d = 0$, represents a *plane,* and the equation of a straight line in three dimensions is then represented by two first-degree equations, the line being considered as the intersection of two planes. An equation of the second degree and higher represents a *surface,* and a curve then is represented by two equations, being considered as the intersection of two surfaces. Just as a second-degree equation in two unknowns in plane analytic geometry represents a circle or conic, so a second-degree equation in three unknowns in solid analitic geometry represents a sphere or a *conicoid,* for instance, the paraboloid, ellipsoid and hyperboloid.

THE CALCULUS

Introduction.—The calculus was discovered independently by both Isaac Newton (1642–1727) and by Gottfried Wilhelm Leibnitz (1646–1716). Having two main branches, the differential calculus and the integral calculus, it forms a tool with which we can more easily solve certain problems in algebra, geometry, physics and other branches of science; and in a great many cases its use enables us to solve problems that otherwise could not be handled. With a knowledge of plane geometry we can easily draw a tangent to a circle at a point; but for more complicated curves the calculus facilitates this problem, and it is essential in general if the degree of the equation of the curve is greater than four. Problems of motion involving constant speed may be readily handled through physics, but the calculus is needed in general when the speed is continually changing. Areas and volumes that have lines and planes for boundaries can be treated by plane and solid geometry; but again the calculus plays the important role when the boundaries are more complicated curves and surfaces.

The fundamental problem of the differential calculus is this: given a relation between x and y, say an equation solved for y in terms of x, such as $y = x^3 - x^2 + 2$, to find how y changes when x changes. As a simple illustration, suppose $y = 2x + 3$ and we wish to find the amount of change in y as x changes from 1 to $1\frac{1}{2}$. Now if $x = 1$, then $y = 5$, and if $x = 1\frac{1}{2}$, then $y = 6$; thus y changes from 5 to 6, that is, 1 unit as x changes from 1 to $1\frac{1}{2}$. Now let x change from 2 to $2\frac{1}{2}$; when $x = 2$, $y = 7$ and when $x = 2\frac{1}{2}$, $y = 8$; and again y changes by 1 unit. It is not difficult to see that for the above relation, $y = 2x + 3$, y y will always change by 1 unit when x changes by $\frac{1}{2}$ a unit. In such a case we say the change in y is uniform. If all changes were uniform, there would be no need for the calculus in this connection; but usually changes are not uniform. Consider $y = x^2$. Let x change from 1 to $1\frac{1}{2}$; if $x = 1$, $y = 1$; if $x = 1\frac{1}{2}$, $y = \frac{9}{4}$; hence the change in y is $\frac{5}{4}$. Now let x change from 2 to $2\frac{1}{2}$; if $x = 2$, $y = 4$; if $x = 2\frac{1}{2}$, $y = \frac{25}{4}$, and the change in y is now $\frac{9}{4}$. Let x change from 3 to $3\frac{1}{2}$; the change in y is $\frac{13}{4}$. All the changes in y are different and such is usually the case.

Function.—If we have a relation connecting x and y solved for y, say $y = x^4$ or $y = \sin 3x + \log x - 2$, we say y is a *function* of x or in general y is a function of x if y is determined when x is known. A symbol for such a relation is $y = f(x)$, read y equals a function of x, or y equals f of x. We used this notation in the above discussion of advanced algebra where $f(x)$ represented a polynomial in x. Here $f(x)$ stands for any function of x, and any other letter would serve to represent a function of x, say (gx). Given a relation $y = f(x)$, we call x the *independent variable,* and y the *dependent variable* or *function.* If we have a relation solved for x, say $x = y^2 - 5y + 1$, then we say x is a function of y. For our purposes, however, we usually consider y as a function of x.

Increment.—Consider the equation $y = x^2 - x + 1$. We wish to find an expression for the change in y when x changes from any value, as x_1, to any other value. Let us represent a change in x by the symbol Δx, calling it the *increment* of x. (This is a single quantity and cannot be broken into factors Δ and x. It means a change in x.) Similarly we represent a change in y by Δy. Letting $x = x_1$ in the above equation and letting the corresponding value of y be y_1 we have $y_1 = x_1{}^2 - x_1 + 1$. Now let x change by an amount Δx, so that the new value for x will be $x_1 + \Delta x$. As x changes, y being dependent on x will change by an amount Δy, so that the new value for y will be $y_1 + \Delta y$. We shall have then $y_1 + \Delta y = (x_1 + \Delta x)^2 - (x_1 + \Delta x) + 1 = x_1{}^2 + 2x_1 \Delta x + \Delta x^{-2} - x_1 - \Delta x + 1$. Since we wish to find Δy, we subtract $y_1 = x_1{}^2 - x_1 + 1$ from this equation, giving $\Delta y = 2x_1 \Delta x + \Delta x^{-2} - \Delta x$ and we have found an expression for the change in y when x changes from x_1 to $x_1 + \Delta x$. Thus if we wish to find the change in y as x changes from 2 to $2\frac{1}{2}$, we let $x_1 = 2$ and $\Delta x = \frac{1}{2}$. Hence $\Delta y = 2 \cdot 2 \cdot \frac{1}{2} + \frac{1}{4} - \frac{1}{2} = 1\frac{3}{4}$. Now consider again the relation $\Delta y = 2x_1\ \Delta x + \Delta x^{-2} - \Delta x$. Let us divide by Δx giving $\frac{\Delta y}{\Delta x} = 2x_1 + \Delta x - 1$. We interpret the ratio $\frac{\Delta y}{\Delta x}$ as the *average rate of change of* y over the "interval" Δx. Thus if a man walks 10 miles in 2 hours we say his average rate is 5 miles an hour, found by dividing 10 by 2, or if we let Δy equal the distance traveled (or 10) and Δx the time elapsed (or 2), we divide Δy by Δx. Observe that the above does not say necessarily that the man at all times during the 2 hours walks at the constant rate of 5 miles an hour. At times he may be moving more slowly, at times more rapidly; but 5 is the average rate over a 2-hour interval. Now if we are interested in his rate at a particular instant we shorten the interval, say to 1 hour and take the average, or $\frac{\Delta y}{\Delta x}$ over that. If this is not sufficiently accurate we take an even smaller interval, say 1 minute, 1 second or $\frac{1}{10}$ second. Even this method is not entirely accurate; but if we consider the quantity *approached* by $\frac{\Delta y}{\Delta x}$ as the interval Δx approaches zero, that quantity will be the exact rate at an instant, so we shall call it the *instantaneous* rate of change of y with respect to x. We call the quantity approached by $\frac{\Delta y}{\Delta x}$ as Δx approaches zero the limit of $\frac{\Delta y}{\Delta x}$ and write it $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$, read the limit as Δx approaches zero of $\frac{\Delta y}{\Delta x}$. In the example considered, since $\frac{\Delta y}{\Delta x} = 2x_1 + \Delta x - 1$, the right member approaches $2x_1 - 1$ as $\Delta x \to 0$, so we say $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = 2x_1 - 1$. Another symbo used frequently for this limit is $\frac{dy}{dx}$. Or if $y = f(x)$, y^1 or $f^1\ (x)$ also are used as symbols.

Derivative.—Since the process just used above can be used also without any reference to rate, we consider it from the point of view of a set of mathematical operations applied to a given relation $y = f(x)$, say $y = x^2 - x - 1$. For simplicity we shall drop the subscripts. Now, as before, we let x change by an amount Δx. As it does, y changes by an amount Δy. Subtract the original equation from the new equation, and the result equals Δy. Divide both sides of the resulting equation by Δx, giving $\frac{\Delta y}{\Delta x}$. Let Δx approach zero and consider the limit, that is, the quantity $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$. We define this limit to be the *derivative of* y *with respect to* x. We represent it by any one of the symbols mentioned. In the example considered the derivative is $2x - 1$. This limit does not always exist but functions for which this is the case are considered only in more advanced branches of the calculus. This process of finding a derivative, called *differentiation*, is absolutely fundamental in the development of the calculus.

Tangent To a Curve.—The definition in plane geometry for the tangent to a circle, that is, a line meeting the circle at one and only one point must be revised for curves other than circles. We define the tangent to a curve as follows: Let P be a point on a curve and Q a nearby point (see Fig. 5). The tangent to the curve at P is defined to be the line approached by the line PQ when the point Q approaches the point P. Now we shall see how to find the slope of the tangent to a curve $y = f(x)$ at a point P, represented in Figure 5.

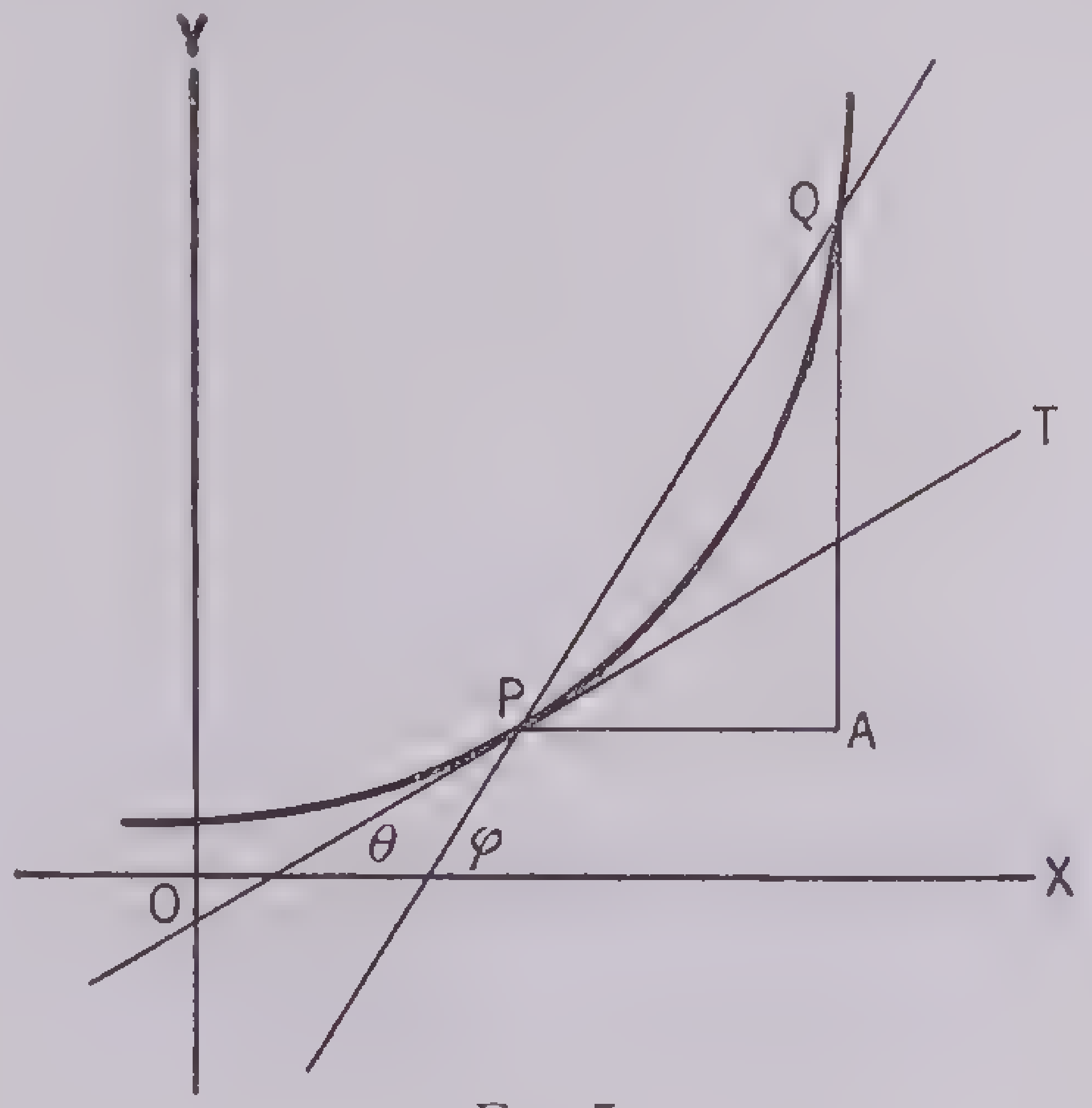


FIG. 5

Let the co-ordinates of P be (x, y), and of Q, $(x + \Delta x, y + \Delta y)$. PA $= \Delta x$, AQ $= \Delta y$. Since angle APQ $=$ angle ϕ, $\tan \phi = \frac{\Delta y}{\Delta x}$. Now as Q approaches P, Δx will approach zero, the line PQ will approach the tangent line at P and $\tan \phi$ will approach $\tan \Theta$. Hence $\frac{\Delta y}{\Delta x}$ will approach $\tan \Theta$, the slope of the tangent; but by the definition, $\frac{\Delta y}{\Delta x}$ approaches the derivative of y with respect to x when $\Delta x \to 0$. Hence the slope of the tangent to the curve $y = f(x)$ at (x, y) is exactly the value of the derivative, or $\frac{dy}{dx}$. For example, the slope of the tangent to $y = x^2 - x - 1$ at (x, y) is $2x - 1$, at the point $(2, -1)$ it is $2(2) - 1$ or 3 and so on.

Applications.—We now have seen the derivative in three roles: first its definition, $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$; next as a rate of change, which we may call its physical interpretation; and finally as the slope of the tangent to a curve, its geometric interpretation. If all rates were constant, we should not need the calculus for this physical problem. If all curves were straight lines and circles and all surfaces were planes or spheres, geometry could do without the calculus. As it is, the calculus furnishes the tools necessary for handling quantities that are not constant, and curves and surfaces more complicated than those handled by the usual methods of plane and solid geometry.

The calculus is used extensively in physics and chemistry and in all other branches of science. As an example of a problem in physics, consider the law of falling bodies, $s = \frac{1}{2}gt^2$, or $s = 16t^2$, where s is the distance traveled in a given time; g is the acceleration of gravity; and t is the number of a given second. Since velocity is the rate of change of distance with respect to time, we find the derivative of s with respect to t, that is, $\frac{ds}{dt}$. It is easily shown to be $32t$, the well-known formula for the velocity of a falling body, so we have by the calculus $v = 32t$. Again, since acceleration is the rate of change of velocity with respect to time, we find $\frac{dv}{dt}$ to be 32, that is, the acceleration. Furthermore, by the *integral calculus* we can start with the fact that the acceleration is 32, and by the process of integration, which is the inverse of differentiation, we arrive at the equation $s = 16t^2$. Or suppose we wish to find how fast the volume of a sphere is increasing at the instant when the radius is 2 inches. The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. We have $\frac{dv}{dr} = 4\pi r^2$. Hence if $r = 2$, the rate of change of the volume with respect to the radius is 16π; in other words, the volume is changing 16π times as fast as the radius.

Consider a curve $y = f(x)$ as in Figure 6. We call A a *maximum* point, being a point higher than the points near it. Similarly B is called a *minimum* point. At points A and B the tangent to the curve is parallel to the x axis, that is, the slope of the tangent is zero and therefore the derivative, $\frac{dy}{dx}$, is zero. This fact enables us to solve many interesting problems involving maximum or minimum values. For example, suppose we wish to divide the number 10 into two parts whose product shall be a maximum. Let $x =$ one part; then $10 - x$ is the other part. Call the product y so that $y = 10x - x^2$. We wish the value of x that will make y a maximum. Geometrically we wish the maximum point of the curve $y = 10x - x^2$, that is, the point where the slope of the tangent is zero, or in other words where the derivative is zero. Hence the value of x that will make y a maximum is found by equating the derivative, $\frac{dy}{dx}$, to zero and solving the resulting equation for x. We have $\frac{dy}{dx} = 10 - 2x = 0$. Hence $x = 5$ and the two parts are 5 and 5. Common sense tells us that 5 is a maximum rather than a minimum value. The calculus, using the derivative as slope, is of inestimable aid in graphing and in the determination of geometric properties of curves and surfaces. The four-step method introduced above to find the derivative of a function may always be used; but out of this method very simple formulas are derived that handle the various functions that arise. For example, if $y = x^n$, it is proved that $\frac{dy}{dx} = nx^{n-1}$; so that if $y =$

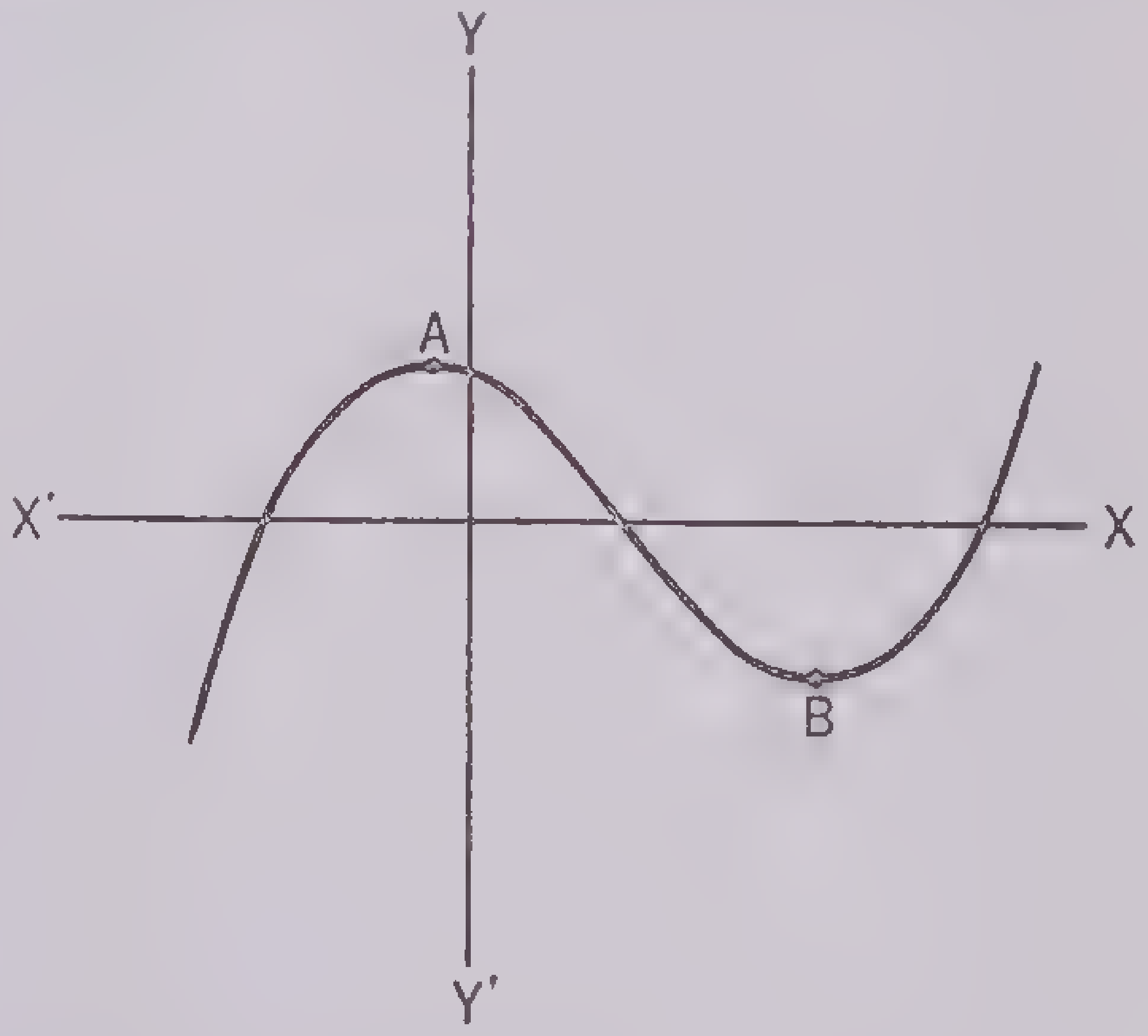


FIG. 6

x^4, then $\frac{dy}{dx} = 4x^3$; if $y = \sin x$, then $\frac{dy}{dx} = \cos x$; and other formulas of similar character. In particular, the derivative of a constant is zero.

Integration.—Integration is the inverse of differentiation. Thus if the derivative of x^2 is $2x$, the *integral* of $2x$ is x^2; but since the derivative of a constant is zero, the quantity $x^2 + 2$ is an integral of $2x$; and so are $x^2 + 3$, $x^2 + 4 \dots$, in fact $x^2 + c$ where c is any constant. We call $x^2 + c$ the *indefinite integral* of $2x$. The symbol used for integral is $\int$. Thus $\int 2x = x^2 + c$. (We usually write this $\int 2xdx = x^2 + c$, the reason appearing later.)

Definite Integral.—A particular type of integral called a *definite integral* is formed as follows: We first integrate a given expression $f(x)$. Call the result $\phi(x) + c$, that is, $\int f(x)dx = \phi(x) + c$. We then substitute some number b for x in the expression $\phi(x) + c$, giving $\phi(b) + c$ and from it subtract the expression obtained by substituting a for x in $\phi(x) + c$, that is, $\phi(a) + c$. The result is $\phi(b) - \phi(a)$. We call this expression the definite integral from a to b of $f(x)dx$ and write it $\int_a^b f(x)dx$. Thus since $\int 2xdx$ is $x^2 + c$ then $\int_1^2 2xdx = 4 - 1 = 3$. Observe that a definite integral is a number.

Applications.—There are two main problems of the integral calculus, the first being the formation of a relation between x and y say, from given data, physical, geometrical or the like. This involves the use of the indefinite integral. The second problem is the evaluation of magnitudes such as area, length, volume, moments of inertia etc. This involves the use of the definite integral. To consider a problem of the first type we shall attempt to form the law of falling bodies, $s - 16t^2$, starting with the fact that the acceleration due to gravity is 32 ft./sec.^{2} (32 ft. a second in a second). Thus $a = 32$. But $a = \frac{dv}{dt}$. Hence $\frac{dv}{dt} = 32$. Integrating we have $v = 32t + c_1$. But since $v = 0$ when $t = 0$, it follows that $c_1 = 0$. Hence $v = 32t$. But $v = \frac{ds}{dt}$. Hence $\frac{ds}{dt} = 32t$. Integrating we have $s = 16\,t^2 + c_2$. But by taking the origin of co-ordinates at the starting point, $s = 0$ when $t = 0$ and therefore $c_3 = 0$. Hence we have $s = 16\,t^2$. Note how the constants of integration are determined by given information.

The solution of problems of the second type, that is, the evaluation of magnitudes, depends on the theory that a definite integral may be considered as a limit of the sum of quantities, continually changing, the number of such increasing indefinitely —hence the sign of integration $\int$, a distorted Greek sigma (Σ), standing for summation. Finding an area is one illustration that we shall consider.

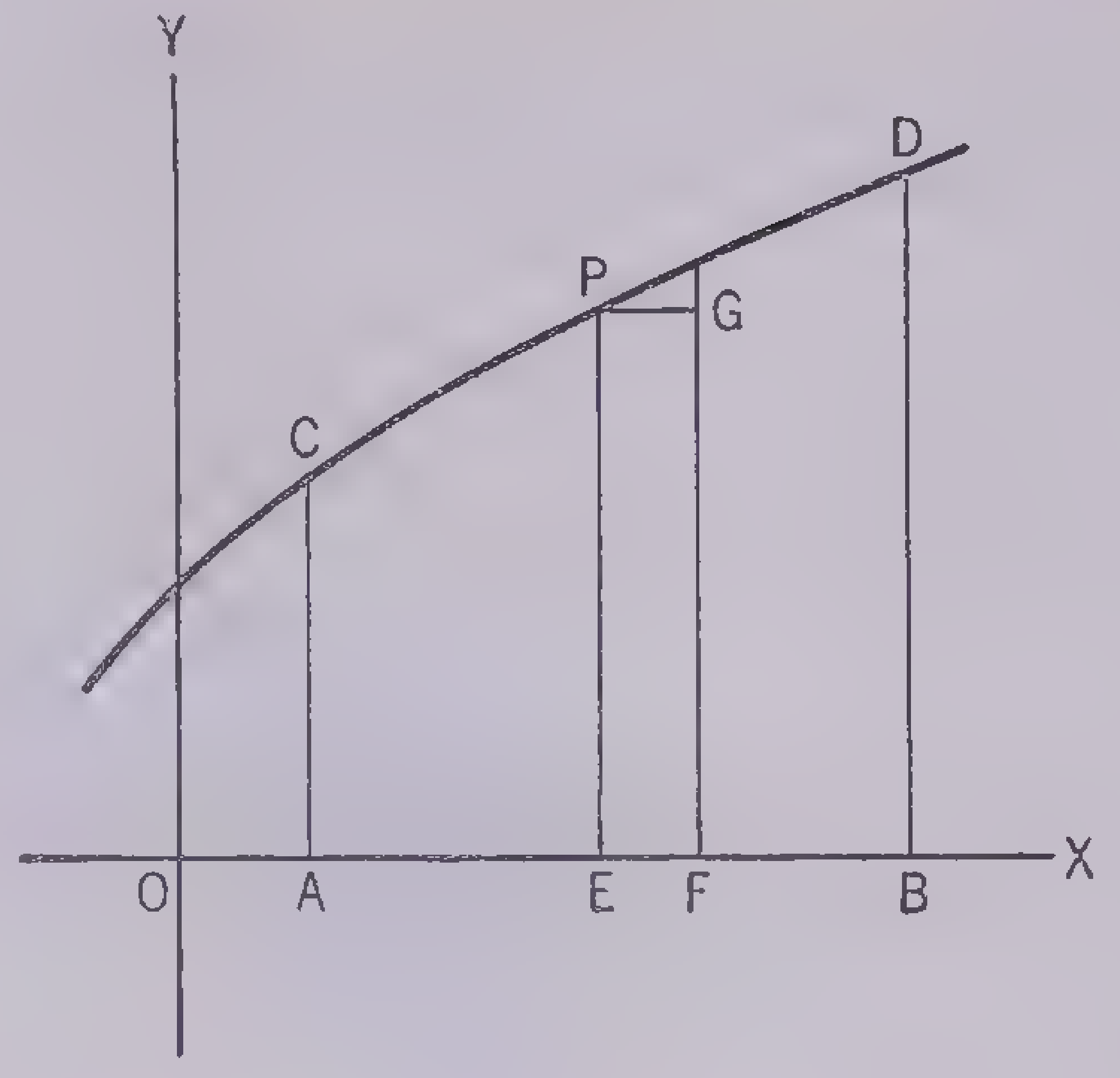


FIG. 7

Let the equation of the curve in Figure 7 be $y = f(x)$. We wish to find the area bounded by the curve $y = f(x)$, the x axis and the two lines parallel to the y axis, AC and BD, say $x = a$ and $x = b$. If we divide the portion of the x axis AB into n equal portions, calling the portions $\Delta x_1, \Delta x_2, \dots \dots \Delta x_n$ and form rectangles with these quantities as bases, for example, rectangle EFPG, and take as altitudes the ordinates of the left extremity of each Δx, calling them $y_1, y_2, \dots\dots y_n$, then the sum of the areas of these rectangles will be $y_1\Delta x_1 + y_2\Delta x_2 + \dots + y_n\Delta x_n$ or $f(x_1)\,\Delta x_1 + f(x_2)\,\Delta x_2 + \dots\dots + f(x_n)\Delta x_n$. This does not equal the required area. If we continue this process, letting n increase indefinitely and letting each Δx approach zero, the limit of this sum will be the required area. The so called fundamental theorem of the integral calculus states that under proper conditions the limit of the sum of the expression $f(x_1)\Delta x_1 + \dots\dots + f(x_n)\Delta x_n$ exists and equals $\int_a^b f(x)dx$. (A reason for using dx is now evident—we are summing quantities of the form $f(x)\Delta x$, not simply $f(x)$, and the result is $\int f(x)dx$ not $\int f(x)$. In this particular connection, Δx and dx are equal, but the reason for this requires a knowledge of the differential that is considered in more advanced work.) In this problem the function of x that we use was y. If we had used πy^2, we should have obtained a certain volume; if we had used $\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$, the result would have been the length of an arc. In other words, if a required magnitude can be written as the limit of the sum of n varying quantities, each of the form $f(x)\Delta x$ where n increases indefinitely and each $\Delta x \to 0$, to find this limit we form the definite integral $\int_a^b f(x)dx$, the evaluation of which is the required magnitude.

PREPARING FOR COLLEGE FRESHMAN MATHEMATICS

Suppose you have just graduated from high school and you are intending to enter college in the fall. You wish to know what skills you should possess in order to succeed in your college work in mathematics, chemistry, physics and other courses requiring the application of your grade- and high-school mathematics.

The following examples test whether you can solve the different kinds of problems you will meet in your beginning college work. The items in the list were determined by first-hand experience with college freshmen, by actual analysis of the requirements of first courses in college and by research on frequency of errors among freshmen.

If you can solve them readily and correctly, you are well prepared for your beginning college courses that require mathematical skills and abilities.

Whole Numbers

Practically all deficiencies in working with whole numbers result from carelessness. See how quickly you can solve these examples correctly. Do not look at the answers until you have solved the problems.

Add:

1. $\begin{array}{r} 2\,1\,1 \\ 6\,0\,8 \\ 3\,5 \\ 3\,7 \\ 7\,0\,4 \\ \hline \end{array}$ **2.** $\begin{array}{r} 7\,2\,2 \\ 9\,7\,8 \\ 4\,1\,5 \\ 1\,8 \\ 4\,0\,9 \\ 7\,2\,9 \\ \hline \end{array}$

3. $\begin{array}{r} 5\,3\,8\,1 \\ 8\,6\,5\,0 \\ 6\,8\,9 \\ 7\,8\,6\,4 \\ \hline \end{array}$ **4.** $\begin{array}{r} 5\,2\,1 \\ 5\,3 \\ 4\,8\,1 \\ 8\,0 \\ 9\,9\,4 \\ 3\,7\,0 \\ \hline \end{array}$

Answers:

1. *1,595;* **2.** *3,271;* **3.** *22,584;* **4.** *2,499.*

Subtract:

1. $\begin{array}{r} 68544 \\ 9471 \\ \hline \end{array}$ **2.** $\begin{array}{r} 94571 \\ 17863 \\ \hline \end{array}$

3. $\begin{array}{r} 261282 \\ 57185 \\ \hline \end{array}$ **4.** $\begin{array}{r} 290000 \\ 4782 \\ \hline \end{array}$

5. $\begin{array}{r} 3800000 \\ 127618 \\ \hline \end{array}$

Answers:

1. *59,073;* **2.** *76,708;* **3.** *204,097;* **4.** *285,218;* **5.** *3,672,382.*

Multiply:

1. $\begin{array}{r} 7298 \\ 256 \\ \hline \end{array}$ **2.** $\begin{array}{r} 67104 \\ 27 \\ \hline \end{array}$

3. $\begin{array}{r} 32958 \\ 701 \\ \hline \end{array}$ **4.** $\begin{array}{r} 3480 \\ 4003 \\ \hline \end{array}$

5. $\begin{array}{r} 79016 \\ 8245 \\ \hline \end{array}$

Answers:

1. *1,868,288;* **2.** *1,811,808;* **3.** *23,103,558;* **4.** *13,930,440;* **5.** *651,486,920.*

Divide:

1. $77\overline{)526442}$

2. $453\overline{)212004}$

3. $807\overline{)593950}$

4. $83\overline{)658190}$

Answers:

1. *6,836.90;* **2.** *468;* **3.** *735.99;* **4.** *7,930.*

Fractions and Mixed Numbers

ADDITION

1. Always use the least common denominator in adding fractions.
2. Add only the numerators of fractions that are expressed with common denominators.
3. Be sure to reduce fractions in answers to lowest terms.

Add:

$$1.\ \begin{array}{r} 6\\ 5\frac{3}{4}\\ \underline{2\frac{1}{2}} \end{array} \qquad 2.\ \begin{array}{r} 8\frac{3}{4}\\ 2\phantom{\frac{3}{4}}\\ \underline{\frac{5}{6}} \end{array} \qquad 3.\ \begin{array}{r} 3\frac{3}{8}\\ \frac{15}{8}\\ \underline{2\phantom{\frac{3}{8}}} \end{array}$$

$$4.\ \begin{array}{r} 11\frac{1}{3}\\ 2\frac{3}{4}\\ \underline{\frac{5}{6}} \end{array} \qquad 5.\ \begin{array}{r} 14\frac{4}{7}\\ 3\frac{1}{4}\\ \underline{7\frac{1}{2}} \end{array}$$

Answers:

1. $14\frac{1}{4}$; **2.** $11\frac{7}{12}$; **3.** $7\frac{1}{4}$; **4.** $14\frac{11}{12}$; **5.** $25\frac{9}{28}$.

SUBTRACTION

1. Always use the least common denominator in subtracting fractions.
2. Borrow when necessary; thus: $5\frac{1}{5} - 2\frac{3}{5}$ becomes $(4 + \frac{5}{5} + \frac{1}{5}) - 2\frac{3}{5} = 4\frac{6}{5} - 2\frac{3}{5} = 2\frac{3}{5}$.

Subtract:

1. $10\frac{1}{3} - \frac{1}{6} =$ **2.** $7\frac{4}{5} - \frac{1}{4} =$

3. $3\frac{3}{8} - 3 =$ **4.** $3\frac{3}{4} - 2\frac{4}{5} =$

Answers:

1. $10\frac{1}{6}$; **2.** $7\frac{11}{20}$; **3.** $\frac{3}{8}$; **4.** $\frac{19}{20}$.

MULTIPLICATION

Common denominators are not necessary in multiplication.

Cancel when possible before multiplying. Reduce product to lowest terms.

Multply:

1. $\frac{3}{8} \times \frac{4}{9} =$ **2.** $\frac{3}{5} \times 4 =$

3. $\frac{5}{6} \times 7\frac{3}{5} \times 4\frac{3}{4} =$

4. $7\frac{7}{8} \times 5\frac{4}{9} \times 3\frac{1}{7} =$

5. $\begin{array}{r} 366\frac{5}{6}\\ \underline{24} \end{array}$

Answers:

1. $\frac{1}{6}$; **2.** $2\frac{2}{5}$; **3.** $30\frac{1}{12}$; **4.** $134\frac{3}{4}$; **5.** *8,804.*

DIVISION

Change division to multiplication by inverting the divisor and changing ÷ to ×.

Divide:

1. $2\frac{1}{2} \div 5\frac{1}{3} =$ **4.** $4\frac{4}{5} \div 3\frac{3}{4} =$

2. $5\frac{2}{3} \div 6\frac{3}{8} =$ **5.** $12\frac{3}{5} \div 4\frac{1}{5} =$

3. $4\frac{5}{6} \div 9\frac{2}{3} =$ **6.** $5\frac{4}{9} \div 7\frac{7}{8} =$

Answers:

1. $\frac{15}{32}$; **2.** $\frac{8}{9}$; **3.** $\frac{1}{2}$; **4.** $1\frac{7}{25}$; **5.** *3;* **6.** $\frac{56}{81}$.

Simplification of Complex Fractions

In complex fractions the main division is indicated by a heavy line.

Simplify:

1. $\dfrac{\frac{5}{6}}{\frac{5}{6}} =$ **3.** $\dfrac{8}{\frac{4}{3}} =$ **5.** $\dfrac{\frac{1}{2}}{\frac{1}{4}} =$

2. $\dfrac{\frac{6}{3}}{4} =$ **4.** $\dfrac{\frac{1}{3}}{\frac{1}{3}} =$

Answers:

1. *1;* **2.** $\frac{1}{2}$; **3.** *6;* **4.** *1;* **5.** *2.*

Decimals

In adding and subtracting decimals you must keep the decimal points in a straight column. This keeps all digits having the same place value in the same column.

Copy each of these examples and *add.*

1. 20.04 + 7.52 + .03 + .97 =

2. 37.6 + 100.8 + 43.3 + 4.5 =

3. 0.0036 + .0566 + .2103 + .0362 =

Addition answers:

1. *28.56;* **2.** *186.2;* **3.** *.3067.*

Copy each of these examples and *subtract.*

1. 4,793.23 − 376.05 =

2. 63.094 − 4.032 =

3. 5.529 − 3.667 =

Subtraction answers:

1. *4,417.18;* **2.** *59.062;* **3.** *1.862.*

MULTIPLICATION

The number of places in the product equals the sum of the number of places in the multiplicand and multiplier.

Find the products:

1. .960 × 426 =

2. 4.603 × .0047 =

3. 2734 × .45 =

4. .0463 × .0043 =

Answers:

1. *408.960;* **2.** *.0216341;* **3.** *1,230.3;* **4.** *.00019909.*

DIVISION

A good practice is to multiply both divisor and dividend by 10, 100 or 1000, as needed to make the divisor a whole number. Multiply by moving the decimal point.

Find the quotients:

1. 155 ÷ .31 =

2. 3.182 ÷ 74 =

3. 10,000 ÷ 1.4444 =

4. 6,666.2 ÷ 74.74 =

Answers:

1. *500;* **2.** *.043;* **3.** *6,923.289;* **4.** *89.191.*

Denominate Numbers

Errors in computation involving denominate numbers usually occur in changing the form but not the value of the denominate number in carrying and borrowing. Answers should be reduced to their lowest terms.

Add:

$$1.\ \begin{array}{rr} 745 \text{ lb.} & 12 \text{ oz.}\\ 914 \text{ lb.} & 3 \text{ oz.}\\ \underline{549 \text{ lb.}} & \underline{6 \text{ oz.}} \end{array}$$

$$2.\ \begin{array}{rrr} 6 \text{ yd.} & 2 \text{ ft.} & 9 \text{ in.}\\ 4 \text{ yd.} & 1 \text{ ft.} & 7 \text{ in.}\\ \underline{18 \text{ yd.}} & \underline{3 \text{ ft.}} & \underline{6 \text{ in.}} \end{array}$$

Answers to addition:

1. *2,209 lb. 5 oz.;* **2.** *30 yd. 1 ft. 10 in.*

Subtract:

$$1.\ \begin{array}{rrr} 15 \text{ yd.} & 2 \text{ ft.} & 3 \text{ in.}\\ \underline{3 \text{ yd.}} & \underline{2 \text{ ft.}} & \underline{7 \text{ in.}} \end{array}$$

$$2.\ \begin{array}{rr} 25 \text{ lb.} & 12 \text{ oz.}\\ \underline{17 \text{ lb.}} & \underline{15 \text{ oz.}} \end{array}$$

Answers to subtraction:

1. *11 yd. 2 ft. 8 in.;* **2.** *7 lb. 13 oz.*

Multiply:

$$1.\ \begin{array}{rrr} 3 \text{ hr.} & 23 \text{ min.} & 35 \text{ sec.}\\ \hline & & 3 \end{array}$$

$$2.\ \begin{array}{rr} 15 \text{ lb.} & 8 \text{ oz.}\\ \hline & 5 \end{array}$$

Answers to multiplication:

1. *10 hr. 10 min. 45 sec.;* **2.** *77 lb. 8 oz.*

Divide:

1. $4\overline{)960 \text{ yd. } 2 \text{ ft.}}$

2. $3\overline{)9 \text{ hr. } 15 \text{ min. } 12 \text{ sec.}}$

Answers to division:

1. *240 yd. 6 in.;* **2.** *3 hr. 5 min. 4 sec.*

The Metric System

Success in solving problems involving metric units depends on a knowledge of the metric tables and their English equivalents. In the metric system one unit can be changed to another by moving the decimal point.

Change to the units indicated:

1. 1,250 mm. **2.** 790 cm.

..........km. ....mm.

..........cm. ....km.

..........m. ....m.

3. 3 km. ....mi. ....ft.

4. 100 m. ....ft. ....yd.

5. 2,500 sq. in. ....cm.^2

.........sq. ft.

6. 15 sq. yd. ....m.^2

.........sq. ft.

Answers:

1. *.00125 km.*
125.000 cm.
1.250 m.
2. *7900 mm.*
.0079 km.
7.9 m.;
3. *1.86411 mi.*
9,842.4 ft.;
4. *328.08 ft.*
109.36 yd.;
5. *16,130,000 cm.*^{2}
17.36 sq. ft.;
6. *12.5415 m.*^{2}
135 sq. ft.

The two problems below illustrate uses of the metric system.

1. If every student in a chemistry class requires 10 cubic centimeters of alcohol for an experiment, how many students can perform the experiment from a supply of one quart?

(*Answer: 94*)

2. At a certain place the acceleration due to gravity is 980.665 centimeters per second^2. Change this to feet per second^2.

(*Answer: 32.17 ft. per sec.*^{2})

Percentage

First use: To find a per cent of a given number.
Second use: To find what per cent one number is of another.
Third use: To find a number when a given per cent of it is known.

Solve the following problems:

1. 5% of .08 = ...
2. 15% of 90 = ...
3. 4.5% of 240 = ...
4. $3\frac{1}{4}$% of 736 = ...
5. What per cent of 36 is 9? ......
6. What per cent of 560 is 44.8? ....
7. What per cent of 4.25 is 1.19? ....
8. What per cent of 3.6 is .08? ....
9. 15% of N is 120; N = ...
10. .5% of N is 7; N = ...
11. 250% of N is 7.2; N = ...
12. 25% of N is 64; N = ...
13. If 450% is 60, 100% = ...
14. 7.2 is 12% of what number? ....
15. 225% of 3.65 = ...
16. If 4,360 is 160%, 100% = ...

Answers:

1. *.004;* **2.** *13.5;* **3.** *10.8;* **4.** *23.92;* **5.** *25%;* **6.** *8%;* **7.** *28%;* **8.** $2\frac{2}{9}$*%;* **9.** *800;* **10.** *1,400;* **11.** *2.88;* **12.** *256;* **13.** $13\frac{1}{3}$*;* **14.** *60;* **15.** *8.2125;* **16.** *2,725.*

Fill in the blanks below:

	DECIMAL	FRACTION	PER CENT
1.	....	$\frac{22}{7}$	....
2.	12.25	....	....
3.	....	....	140%
4.	....	$\frac{3}{5}$	....
5.	.36	....	....
6.	....	....	16%

Answers:

1. *3.143* and *314.3;* **2.** $12\frac{1}{4}$ and *1,225;* **3.** *1.4* and $1\frac{2}{5}$*;* **4.** *.555* and *55.5;* **5.** $\frac{36}{100}$ and *36;* **6.** *.16* and $\frac{16}{100}$.

Exponents, Roots and Radicals

Practice in finding square roots. Find the square roots of the following, carrying the result to two decimal places if necessary:

1. $\sqrt{1521}$
2. $\sqrt{11664}$
3. $\sqrt{65536}$
4. $\sqrt{122.4}$

Answers:

1. *39;* **2.** *108;* **3.** *256;* **4.** *11.06.*

Practice with exponents. Review the laws that govern exponents if the examples below are difficult for you.

Simplify the examples below:

1. $\left(\frac{1}{2}\right)^3 =$
2. $\left(\frac{3}{7}\right)^2 =$
3. $\left(\frac{3}{2}\right)^{-3} =$
4. $\frac{3}{10^{-2}} =$
5. $(.2)^4 =$
6. $(1.2)^4 =$
7. $\frac{25}{10^{-2}} =$
8. $\frac{1}{6(10)^{-3}} =$

Answers:

1. $\frac{1}{8}$; **2.** $\frac{9}{49}$; **3.** $\frac{8}{27}$; **4.** *300;* **5.** *.0016;* **6.** *2.0736;* **7.** *2,500;* **8.** $166\frac{2}{3}$.

Operations with Radicals

Simplify the following examples:

1. $\sqrt{4^2} =$
2. $\sqrt[3]{4^6} =$
3. $\sqrt[4]{10^8} =$
4. $\sqrt[3]{2^6} =$
5. $\sqrt{\frac{25}{16}} =$
6. $\sqrt{\frac{36}{2}} =$
7. $\frac{1}{3}\sqrt{36} =$
8. $\sqrt{72} =$
9. $\sqrt{4^{-2} \times 10^{-6}} =$
10. $\sqrt{36 \times 10^8} =$
11. $\sqrt[4]{24a^4b^6} =$
12. $\sqrt[5]{5c^5d^8} =$

Answers:

1. *4;* **2.** *16;* **3.** *100;* **4.** 2^2 or *4;* **5.** $\frac{5}{4}$; **6.** $3\sqrt{2}$; **7.** *2;* **8.** $6\sqrt{2}$; **9.** $\frac{1}{4000}$; **10.** *60,000;* **11.** $ab\sqrt[4]{24b^2}$; **12.** $cd\sqrt[5]{5d^3}$.

Exponents of the Base 10

Exponents of the base 10 in the multiplication and division of large numbers are handled like any other exponents.

Change to equivalent form involving a power of 10:

1. 4,300,000 =
2. $\frac{1}{1,000,000} =$
3. 6,500,000 =

Answers:

1. 4.3×10^6; **2.** 10^{-6}; **3.** 6.5×10^6.

MULTIPLICATION INVOLVING LARGE NUMBERS

The number 10,000,000 can be written 10^7. Multiply 400,000 by 1,000,000 → $(4 \times 10^5) \times 10^6 = 4 \times 10^{11}$.

Multiply:

1. $3 \times 10^7 \times 4 \times 10^{26} =$
2. $8,000,000 \times 3,000 \times 1,600 =$
3. $6 \times 10^{-3} \times 3 \times 10,000 =$
4. $4,000,000 \times 60,000 \times \frac{3}{4} =$

Answers:

1. 12×10^{33}; **2.** 3.84×10^{13}; **3.** *180;* **4.** 1.8×10^{11}.

DIVISION OF LARGE NUMBERS

Large numbers can be easily divided by expressing them in powers of 10 and by following the rules for exponents in division.

Complete:

1. $\frac{5 \times 10^6 \times 3 \times 10^{-4}}{15 \times 1,000} =$
2. $\frac{2 \times 10^3 \times 8 \times 10^6}{4 \times 10^9} =$
3. $\frac{4 \times 3 \times 5 \times 10^{11}}{10^{-8} \times 6} =$
4. $\frac{7 \times 30 \times 1,800,000,000}{900 \times 6,000 \times 140} =$

Answers:

1. $\frac{1}{10}$; **2.** *4;* **3.** 10^{20}; **4.** 5×10^2.

Exponents and the Decimal Point

In each example below change the decimal point so that one significant figure remains to the left of it.

Example A: $4,823 = 4.823 \times 10^3$
Example B: $.0002345 = 2.345 \times 10^{-4}$

Solve:

1. $0.6723 \times 10^{-3} =$
2. $0.4327 \times 10^{-7} =$
3. $6,273 \times 10^{-4} =$
4. $3,782 \times 10^4 =$
5. $4,000 \times 10^2 =$

Answers:

1. 6.723×10^{-4}; **2.** 4.327×10^{-8}; **3.** 6.273×10^{-1}; **4.** 3.782×10^7; **5.** 4.000×10^5.

Practice with Exponents, Roots and Radicals

Simplify:

1. $(3b)^3$
2. $(3x^{\frac{2}{3}}y^{-2})^{\frac{3}{2}} =$
3. $8\sqrt{5} \cdot 4\sqrt{5} =$
4. $\sqrt{x^2} - \left(\frac{x}{2}\right)^2 =$
5. $\sqrt{\frac{x+y}{x-y}} =$
6. $(5a^3b)^0 =$

Answers:

1. $27b^3$.
2. 3^2xy^{-3}
3. 160
4. $\frac{x}{2}\sqrt{3}$
5. $\frac{1}{x-y}\sqrt{x^2-y^2}$
6. 1

Combining Terms by Addition and Subtraction

Practice in combining similar terms. Remember the rule of signs in addition and subtraction, and the rules for removing parentheses and other symbols of aggregation.

Simplify:

1. $16 - (4b + 3 - 2b) =$
2. $-(7c + 3.2c - 4.7c) =$
3. $8.001 - (7.03 + 4) =$
4. $3c - (5c - 6) + 5 =$
5. $3s - 2r + (-3s - 2r + 1) =$
6. $8m - (4m + 6n + 9m - 4n) =$
7. $4x + [5x - (2x + 9x) - 3x] + 6 =$
8. $(6x + r) - [4t - (8t + r) - 3t] =$

Answers:

1. $-2b - 13$; **2.** $-5.5c$; **3.** -3.029; **4.** $-2c + 11$; **5.** $-4r + 1$; **6.** $-5m - 2n$; **7.** $-5x + 6$; **8.** $6x + 7t + 2r$.

Addition of Multinomials

Add the expressions in each example below:

1. $x^3 - 4x^2 - 3x$; $-6x^3 - 10x^2 - 12$; $8x^2 + 6x - 4$; $7x^3 + 9 - 13x$.
2. $6.5x + 4.2y$; $6.6x - 2.4y$; $2y - 4.8x$; $-6.3y$.

Answers:

1. $2x^3 - 6x^2 - 10x - 7$; **2.** $8.3x - 2.5y$.

Subtraction of Multinomials

To subtract algebraic numbers, change all the algebraic signs in the subtrahend and proceed as in addition.

Subtract:

1. $3x^3 - 6x^2 + 8x - 3$ from $x^5 + 7x^2 - 12x - 4$
2. $y^5 - 6y^3 - 12$ from $y - 10$

Answers:

1. $x^5 - 3x^3 + 13x^2 - 20x - 1$;
2. $-y^5 + 6y^3 + y + 2$

Insertion of Parentheses

In the following examples put parentheses preceded by a minus sign around the first two terms and parentheses preceded by a plus sign around the remaining terms.

Example:

$x - 5 + 4yz - y^2 = -(x + 5) + (4yz - y^2)$

Solve:

1. $3r - 5s + 4t - 6v + 9 =$
2. $6s - 4t + 5 + 7s - 3t =$
3. $t - s + v - 3t + 3s + v =$

Answers:

1. $-(-3r + 5s) + (4t - 6v + 9)$
2. $-(-6s + 4t) + (5 + 7s - 3t)$
3. $-(-t + s) + (v - 3t + 3s + v)$

Finding the Least Common Denominator

Find the L.C.D. in the examples below:

1. $\frac{1}{3x^{24}}, \frac{5}{8x^3z}, \frac{5}{12xy}$
2. $\frac{7}{2s^2t}, \frac{4}{3st^2}, \frac{2}{5s^4}$
3. $\frac{1}{6a^2b}, \frac{-3}{3ab}, \frac{5}{9a^2b}$
4. $\frac{-1}{(a-b)^2}, \frac{3}{a^3}, \frac{1}{a}, \frac{2}{(a-b)^3}$

Answers:

1. $24x^3yz$; **2.** $30s^4t^2$; **3.** $18a^2b$; **4.** $a^3(a-b)^3$.

Equivalent Fractions with the L. C. D.

In the examples below first find the L.C.D. and then change the fractions to equivalent forms that have the L.C.D. as denominators:

1. $\frac{1}{4x^2y^4}, \frac{7}{5xy^3}, \frac{5}{12x^2y^2} =$
2. $\frac{10}{3x^2z^5}, \frac{5}{18x^3z} =$
3. $\frac{5}{3s^2t^3}, \frac{4}{st^2}, \frac{2}{5s^4} =$

Answers:

1. $\frac{15}{60x^2y^4}, \frac{84xy}{60x^2y^4}, \frac{25y^2}{60x^2y^4}$
2. $\frac{60x}{18x^3z^5}, \frac{5z^4}{18x^3z^5}$
3. $\frac{25s^2}{15s^4t^3}, \frac{60s^3t}{15s^4t^3}, \frac{6t^3}{15s^4t^3}$

Addition and Subtraction of Algebraic Fractions

Perform the operations indicated:

1. $\frac{4}{F} + \frac{3}{.5F} - \frac{c+3}{2F} =$
2. $\frac{s}{5} - \frac{.6s}{3} + \frac{2.5s}{t} =$
3. $14r + 1.7r - \frac{7r}{3} =$
4. $32.4g - \frac{15g}{.4} + \frac{3g}{0.6} =$
5. $\frac{4}{f} + \frac{3}{.5} - \frac{.4}{3} =$
6. $\frac{10s}{9} - \frac{2t}{3} - \frac{3s}{27} =$

Answers:

1. $\frac{17-c}{2F}$
2. $\frac{2.5s}{t}$
3. $\frac{40.1r}{3}$
4. $-.1g$
5. $\frac{17.6f+12}{3f}$
6. $\frac{3s-2t}{3}$

The Signs of Fractions

A fraction has three signs: the sign of the whole fraction itself, the sign of the numerator and the sign of the denominator. Any two of these signs may be changed without changing the value of the fraction.

Supply the missing numerators and denominators:

1. $\frac{c-d}{a-b} = -\frac{\quad}{b-a} = -\frac{d-c}{\quad}$
2. $\frac{3x}{x^2-9} = -\frac{-3x}{\quad} = +\frac{\quad}{9-x^2}$
3. $\frac{m+n}{s-t} = -\frac{m+n}{\quad} = -\frac{\quad}{s-t}$

Answers:

1. $-\frac{c-d}{b-a} = -\frac{d-c}{a-b}$
2. $-\frac{-3x}{x^2-9} = +\frac{-3x}{9-x^2}$
3. $-\frac{m+n}{t-s} = -\frac{-m-n}{s-t}$

Algebraic Multiplication and Division

Multiplying Monomials and Binomials by Monomials

Perform the indicated operations in the following examples:

1. $9(\frac{1}{3}) =$
2. $\frac{1}{4}(-3) =$
3. $-3(7a) =$
4. $+2(-4k) =$
5. $7(-4b) =$
6. $\frac{-4}{m}(-3m + 2) =$
7. $\frac{-5}{x}(-2x - 4y) =$

Answers:

1. $+3$; **2.** $-\frac{3}{4}$; **3.** $-21a$; **4.** $-8k$; **5.** $-28b$; **6.** $12 - \frac{8}{m}$; **7.** $10 + \frac{20y}{x}$.

More Difficult Multiplication

Monomials and Binomials by Monomials

Perform the operations indicated:

1. $-7a^4b^3 \cdot +6b^2a^5 =$
2. $3a^2b^2c \cdot -5a^3b^3 =$

3. $-6ax(7 - 5a^3b^3c^3) =$
4. $-12abc^3(9 - 4a^2b^2) =$
5. $a^2x^n \cdot bx^{n-1} =$
6. $a^nb^n \cdot a^4b^4 =$
7. $3x^{-3}y^{-2} \cdot 4x^3y^2 =$
8. $3x^{-2}y^4 \cdot -5x^2y^{-4} =$
9. $4a^3b^2 \cdot -3a^{-\frac{1}{2}}b^{-\frac{1}{2}} =$
10. $7x^{\frac{1}{4}}y^{-\frac{3}{4}} \cdot 2x^{-\frac{3}{4}}y^{\frac{2}{3}} =$

Answers:

1. $-42a^9b^5$; **2.** $-15a^5b^5c$; **3.** $-42ax + 30a^4b^3c^3x$; **4.** $-108abc^3 + 48a^3b^3c^3$; **5.** a^2bx^{2n-1}; **6.** $a^{n+4}b^{n+4}$; **7.** 12; **8.** -15; **9.** $-12a^{\frac{5}{2}}b^{\frac{3}{2}}$; **10.** $14x^{-\frac{1}{2}}y^{-\frac{1}{12}}$.

MULTIPLICATION OF MULTINOMIALS

Multiply:

1. $a^{\frac{3}{2}}b^{\frac{1}{2}} - d$ by $a^{-1} + d^{\frac{3}{2}}$
2. $x^4 + y^4$ by $x - y$
3. $4a^{-3}b^2 - 3ab$ by $3ab^2 + 4a^2b^3$

Answers:

1. $a^{\frac{1}{2}}b^{\frac{1}{2}} - a^{-1}d + a^{\frac{3}{2}}b^{\frac{1}{2}}d^{\frac{3}{2}} - d^{\frac{5}{2}}$; **2.** $x^5 + xy^4 - x^4y - y^5$; **3.** $12a^{-2}b^4 - 9a^2b^3 + 16a^{-1}b^5 - 12a^3b^4$.

ADDITION OF FRACTIONS INVOLVING MULTIPLICATION

Find the algebraic sum:

1. $\dfrac{3a}{3b - 3} - \dfrac{5a}{5b + 4} =$
2. $\dfrac{8}{t + 3} + 5 + \dfrac{3}{7} =$
3. $\dfrac{3}{x(x - 1)} + \dfrac{5}{x^2 + y} =$
4. $\dfrac{3 + a}{3 - a} - \dfrac{a - 4}{a - 3} =$

Answers:

1. $\dfrac{27a}{(3b - 3)(5b + 4)}$
2. $\dfrac{38t + 170}{7(t + 3)}$
3. $\dfrac{8x^2 - 5x + 3y}{x(x - 1)(x^2 + y)}$
4. $\dfrac{2a - 1}{3 - a}$

DIVISION OF MONOMIALS

Perform the operations indicated in the following examples:

	Answers
1. $\dfrac{0.3x}{\frac{.2x}{3}} =$	**1.** $\dfrac{9}{2}$
2. $\dfrac{-3}{\frac{-g}{2}} =$	**2.** $\dfrac{6}{g}$
3. $\dfrac{-\frac{1}{2}}{\frac{2}{3}} =$	**3.** $-\dfrac{3}{4}$
4. $\dfrac{\frac{3k}{-4}}{\frac{2k}{-3}} =$	**4.** $\dfrac{9}{8}$

DIVISION OF MONOMIALS AND BINOMIALS BY MONOMIALS

Perform the operations indicated in the problems that follow:

1. $-3a^2b^3 \div 6ab =$
2. $10a^3b^2 \div -5a^2b =$
3. $(\frac{1}{2}x^2 + \frac{1}{4}x) \div \frac{1}{2}x =$
4. $(.3x^3 - 2.7x^4 + 1.2x^5) \div .3x^3 =$
5. $a^2b^2 - 3ab \div a^{-3}b^{-2} =$
6. $4a^{-5} - 6a^{-4} \div a^{-2} =$
7. $x^{-\frac{5}{2}} + x^{-\frac{3}{2}} - x^{-\frac{1}{2}} \div x^{\frac{1}{2}} =$
8. $a^{-\frac{1}{2}} + a^{\frac{3}{2}} - a^{\frac{5}{3}} \div a^{\frac{1}{3}} =$

Answers:

1. $\dfrac{-ab^2}{2}$; **2.** $-2ab$; **3.** $x + \frac{1}{2}$; **4.** $1 - 9x + 4x^2$; **5.** $a^5b^4 - 3a^4b^3$; **6.** $4a^{-3} - 6a^{-2}$; **7.** $x^{-3} + x^{-2} - x^{-1}$; **8.** $a^{-\frac{5}{6}} + a^{\frac{7}{6}} - a^{\frac{4}{3}}$.

DIVISION OF MULTINOMIALS BY MULTINOMIALS

Always arrange both dividend and divisor according to the ascending or descending order of exponents of the same base.

Divide in the following problems:

1. $15x^2 + x - 2 \div 3x - 1 =$
2. $x^4 - y^4 \div x + y =$
3. $a^{\frac{2}{3}} - b^{\frac{2}{3}} \div a^{\frac{1}{3}} + b^{\frac{1}{3}} =$

Answers:

1. $5x + 2$; **2.** $x^3 - x^2y + xy^2 - y^3$; **3.** $a^{\frac{1}{3}} - b^{\frac{1}{3}}$.

Special Products and Factoring

PRODUCT OF A MULTINOMIAL AND A MONOMIAL

Multiply:

1. $r_1r_2(r_1 + 4r_2) =$
2. $3d_1d^2(2d^3d_1 - 5d_1) =$
3. $x^2y(x^2y^3 - 3x + 4x^3y^2) =$
4. $-2rs(1 + rs + s^2) =$

Answers:

1. $r_1^2r_2 + 4r_1r_2^2$; **2.** $6d^5d_1^2 - 15d_1^2d^2$; **3.** $x^4y^4 - 3x^3y + 4x^5y^3$; **4.** $-2rs - 2r^2s^2 - 2rs^3$.

FACTORING BY REMOVING A COMMON MONOMIAL

Factor:

1. $aA + 2a^2 =$
2. $-.5m + 1.5n =$
3. $\frac{1}{2}ma - \frac{1}{2}mb - \frac{1}{2}mc =$
4. $p^2q^2 - 3pq^2 + 4p^3q - 12p^2q =$

Answers:

1. $a(A + 2a)$; **2.** $-.5(m - 3n)$; **3.** $\frac{1}{2}m(a - b - c)$; **4.** $pq(pq - 3q + 4p^2 - 12p)$.

PRODUCT OF THE SUM AND DIFFERENCE OF TWO TERMS

Rule: The product of the sum and the difference of two terms is the difference of their squares.

Find the products:

1. $(.5y + 1.5x)\ (.5y - 1.5x) =$
2. $(\frac{1}{2}n + \frac{1}{4}s)\ (\frac{1}{2}n - \frac{1}{4}s) =$
3. $(.9gh + .4jk)\ (.9gh - .4jk) =$
4. $(\frac{3}{4}m + \frac{1}{4}n)\ (\frac{3}{4}m - \frac{1}{4}n) =$

Answers:

1. $.25y^2 - 2.25x^2$; **2.** $\frac{1}{4}n^2 - \frac{1}{16}s^2$; **3.** $.81g^2h^2 - .16j^2k^2$; **4.** $\frac{9}{16}m^2 - \frac{1}{16}n^2$.

FACTORING THE DIFFERENCE OF SQUARES

Rule: 1. Find the square root of each square.

2. Write the sum of these square roots as one factor and their difference as the other factor.

Factor:

1. $a^2b^2 - c^2d^2 =$
2. $64 - h^2 =$
3. $x^2 - \frac{1}{16} =$
4. $25s^2 - 1 =$

Answers:

1. $(ab + cd)\ (ab - cd)$; **2.** $(8 + h)\ (8 - h)$; **3.** $(x + \frac{1}{4})\ (x - \frac{1}{4})$; **4.** $(5s + 1)\ (5s - 1)$.

SQUARE OF A BINOMIAL

The square of a binomial is equal to the square of the first term plus twice the algebraic product of the two terms plus the square of the last term.

Square:

1. $c - d$
2. $AB - CD$
3. $x - .5$
4. $4x - 5y$

Answers:

1. $c^2 - 2cd + d^2$; **2.** $A^2B^2 - 2ABCD + C^2D^2$; **3.** $x^2 - x + .25$; **4.** $16x^2 - 40xy + 25y^2$.

FACTORING TRINOMIAL SQUARES

Factor:

1. $64R^2 - 64Rr + 16r^2 =$
2. $16N^2 + 4N + \frac{1}{4} =$
3. $36 - 12P + P^2 =$
4. $.09 + .6a + a^2 =$

Answers:

1. $(8R - 4r)\ (8R - 4r)$; **2.** $(4N + \frac{1}{2})\ (4N + \frac{1}{2})$; **3.** $(6 - P)\ (6 - P)$; **4.** $(.3 + a)\ (.3 + a)$.

PRODUCT OF TWO BINOMIALS HAVING SIMILAR TERMS

Find the products:

1. $(3 - s)\ (6 - s) =$

2. $(3p + 4)(p + 2) =$
3. $(5a + 4)(a - 1) =$
4. $(x + \frac{1}{2})(x + \frac{1}{2}) =$
5. $(3r^2 - 10)(10r^2 + 3) =$
6. $(5x + 6y)(3x + 4y) =$

Answers: .

1. $18 - 9s + s^2$; **2.** $3p^2 + 10p + 8$; **3.** $5a^2 - a - 4$; **4.** $x^2 + x + \frac{1}{4}$; **5.** $30r^4 - 91r^2 - 30$; **6.** $15x^2 + 38xy + 24y^2$.

FACTORING QUADRATIC TRINOMIALS OF THE FORM: $x^2 + bx + c$.

Example: $x^2 + 5x + 6 = (x + 3)(x + 2)$

Factor:

1. $t^2 + 7t + 12 =$
2. $a^2 + .5a + .06 =$
3. $s^2 + 2s - 35 =$
4. $a^2 + 9a + 8 =$
5. $18 - 9s + s^2 =$

Answers:

1. $(t + 4)(t + 3)$; **2.** $(a + .3)(a + .2)$; **3.** $(s + 7)(s - 5)$; **4.** $(a + 8)(a + 1)$; **5.** $(6 - s)(3 - s)$.

FACTORING THE QUADRATIC TRINOMIAL: $ax^2 + bx + c$

There are more possibilities to consider in factoring an equation of this form.

Factor:

1. $2a^2 + 5ax - 3x^2 =$
2. $2y^2 + 11ty + 9t^2 =$
3. $48x^2 + 70xy + 25y^2 =$
4. $15d^4 - 31d^2e^2 + 10e^4 =$
5. $12k^2 - 34kb + 24b^2 =$

Answers:

1. $(2a - x)(a + 3x)$; **2.** *(not factorable)*; **3.** $(6x + 5y)(8x + 5y)$; **4.** $(3d^2 - 5e^2)(5d^2 - 2e^2)$; **5.** $(4k - 6b)(3k - 4b)$.

FURTHER WORK IN FACTORING

An expression often has factors which are themselves factorable. Determine to which of the following four types of expressions the multinomial belongs and use the method of factoring applicable to that type.

Types: 1. $a^2 - b^2$ 2. $a^2 \pm 2ab + b^2$ 3. $x^2 + bx + c$ 4. $ax^2 + bx + c$

1. $w_1^2 - 2w_1w_2 + w_2^2 =$
2. $15n^2 + 10an - 105a^2 =$
3. $14P - 12P^2 - 2P^3 =$
4. $a^3b + 6a^2b^2 - 7ab^3 =$
5. $4z^2 - 12zx + 9x^2 - 9x^4 =$
6. $2m^2 + 7.5mn + 4.5n^2 =$
7. $vq^2 - 2vqg + vg^2 =$
8. $3d^4 - 18d^3 - 81d^2 =$
9. $4D^2 + 4B^2 - 8DB =$
10. $h^2 - 3h - 10 =$

Answers:

1. $(w_1 - w_2)(w_1 - w_2)$; **2.** $5(3n - 7a)(n + 3a)$; **3.** $2P(7 + P)(1 - P)$; **4.** $ab(a + 7b)(a - b)$; **5.** $[2z - 3x + 3x^2][2z - 3x - 3x^2]$; **6.** $(2m + 1.5n)(m + 3n)$; **7.** $v(q - g)(q - g)$; **8.** $3d^2(d - 9)(d + 3)$; **9.** $4(D - B)(D - B)$; **10.** $(h - 5)(h + 2)$.

ADDITION OF FRACTIONS INVOLVING FACTORING

Find the algebraic sum for each of the examples below; express all answers in their simplest form:

1. $\dfrac{a - 1}{a^2 - 3a - 10} + \dfrac{3}{a^2 - 25} =$
2. $\dfrac{4}{v - 1} + \dfrac{v + 1}{v^2} =$
3. $\dfrac{5c + 2}{6c} - \dfrac{3c - 4}{8} =$
4. $\dfrac{4a - 3}{a - 5} + \dfrac{5a + 4}{4} =$
5. $\dfrac{2b - 4}{7b} + \dfrac{3b - 5}{.4} =$
6. $\dfrac{4n}{m - n} - \dfrac{3n}{m + n} =$

Answers:

1. $\dfrac{a^2 + 7a + 1}{(a^2 - 25)(a + 2)}$
2. $\dfrac{5v^2 - 1}{v^2(v - 1)}$
3. $\dfrac{-9c^2 + 32c + 8}{24c}$
4. $\dfrac{5a^2 - 5a - 32}{4(a - 5)}$
5. $\dfrac{21b^2 - 34.2b - 1.6}{2.8b}$
6. $\dfrac{n(7n + m)}{m^2 - n^2}$

Linear Equations

A linear equation is one in which the unknown appears to the first power only.

Solve for the unknown:

1. $b - 3 = 19$
2. $5x = x + 10$
3. $\dfrac{a - 7}{2} = \dfrac{a - 7}{-5}$
4. $\dfrac{2a - 12}{3a} = 2$
5. $m + 0.3 = 3$
6. $s + 4 - 3 + 2 = 0$
7. $4.5x - 8.5 = \dfrac{5x}{2} + 16.5$
8. $\dfrac{5.1}{4.25} - .42 = x$
9. $172 - 16x = 7(8 + 6x)$
10. $\dfrac{3b + 3}{4} = 3$
11. $\dfrac{5t - 3}{2} - 11 = 0$
12. $\dfrac{4s - 3}{7} - \dfrac{2s + 6}{4} = -\frac{3}{2}$

Answers:

1. $b = 22$; **2.** $x = 2.5$; **3.** $a = 7$; **4.** $a = -3$; **5.** $m = 2.7$; **6.** $s = -3$; **7.** $x = 12.5$; **8.** $x = .78$; **9.** $x = 2$; **10.** $b = 3$; **11.** $t = 5$; **12.** $s = 6$.

Substitution

Much of the mathematics required in science is concerned with the substitution of values in formulas and equations, and simplifying the result or solving for the unknown. Solve the following equations for the indicated unknown using the values given in parentheses.

1. $L = 2\pi r$
$(\pi = \frac{22}{7}, r = 7)$
2. $F = \sqrt{2\pi L}$
$(\pi = \frac{22}{7}, L = 7)$
3. $t = \sqrt{\dfrac{L}{g}}$
$(L = 4, g = 16)$
4. $V = \frac{1}{3}\pi r^2$
$(\pi = \frac{22}{7}, r = 7)$
5. $A = eh^2$
$(e = 1, h = 1)$
6. $P = \dfrac{4}{V^2}$
$(V = 3)$
7. $W = Fd$
$(d = a + b, F = -3)$
8. $F = \dfrac{mv^2}{3}$
$(m = -4, v = -3)$
9. $t = n\sqrt{\dfrac{1}{g}}$
$(g = 9, n = 3)$

Answers:

1. $L = 44$; **2.** $F = \sqrt{44}$ *or* 6.63; **3.** $t = \frac{1}{2}$; **4.** $V = 51\frac{1}{3}$; **5.** $A = 1$; **6.** $P = \frac{4}{9}$; **7.** $W = -3a - 3b$; **8.** $F = -12$; **9.** $t = 1$.

Ratio and Proportion

The ratio of two numbers is the quotient obtained when one of the numbers is divided by the other one. The ratio of 1 to 2 is $\frac{1}{2}$.

A proportion is the equality of two ratios. $\frac{1}{2} = \frac{2}{4}$.

In solving a proportion the product of the means equals the product of the extremes.

Solve the following proportions:

1. $7 : a = 30 : 75$
2. $4 : \frac{1}{2} :: b : 32$
3. $\frac{15}{18} = \frac{6}{x}$
4. $\frac{3}{x} = \frac{27}{5}$
5. $\frac{x}{\frac{3}{2}} = \frac{1.2}{7.2}$
6. $\frac{3.2x - 4}{.6} = \frac{7x - 8}{1.5}$

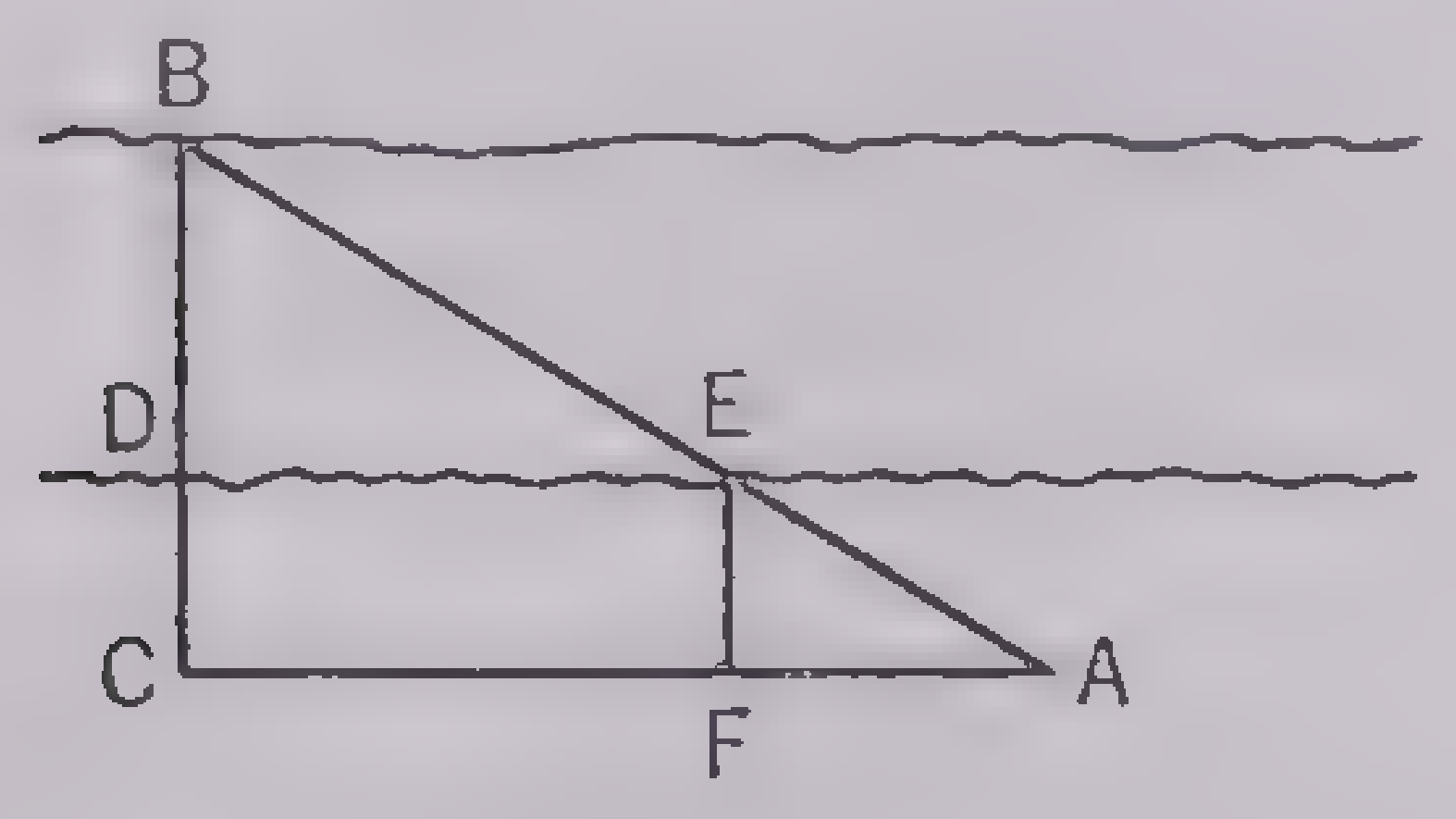
Answers:

1. $a = 17.5$; **2.** $b = 256$; **3.** $x = 7\frac{1}{5}$; **4.** $x = \frac{5}{9}$; **5.** $x = \frac{1}{4}$; **6.** $x = 2$.

Solve the following problems by use of proportion:

1. The force necessary to move a weight up an inclined plane, neglecting friction, has the same ratio to the weight as the height to which the weight is lifted has to the distance it is moved along the inclined plane. Find the force required to move a weight of 2,000 pounds up a plane a distance of 60 feet to a height of 12 feet. (*Ans., 400 lb.*)

2. When decomposed by an electric current, 18 grams of water yield 2 grams of hydrogen. How much hydrogen could be obtained from 25 grams of water? (*Ans., 2.77 g.*)



3. Find the distance across a river (BD in the diagram) given that DC = EF = 15 yd., CA = 60 yd., and FA = 12 yd. (*Ans., 60 yd.*)

Variation

PROBLEMS IN VARIATION

1. If x varies directly as the square of s and equals 162 when $s = 9$, find x when $s = 15$. (*Ans., 450*)

2. The weight of a body above the earth's surface varies inversely as the square of its distance from the center of the earth. If a body weighed 200 pounds at a distance of the earth's radius above the surface of the earth, what would it weigh at the earth's surface? (*Ans., 800 lb.*)

3. The volume of a gas varies inversely as the pressure exerted upon it, or $\frac{V}{V'} = \frac{P'}{P}$. If V' is 25 cubic inches when P is 20 pounds, what is P' when V is 15 cubic inches? (*Ans., 12 lb.*)

4. The distance which a body falls from rest varies as the square of the time in seconds during which it falls. If a body falls 144 feet in 3 seconds, how far will it fall in 5 seconds? (*Ans., 400 ft.*)

5. A beam supported at both ends and loaded at the middle bends by an amount which varies directly and jointly as the load and the cube of the length in feet, and inversely as the width in inches times the cube of the depth in inches. If a beam 20 feet long, 5 inches wide and 4 inches deep bends $2\frac{1}{2}$ inches under a load of 5,000 pounds, what load is required to produce a bend of 3 inches? (*Ans., 6,000 lb.*)

Simultaneous Equations

Simultaneous equations are solved algebraically by eliminating all the unknowns but one and then solving for the remaining unknown.

Solve for the values of the unknown by addition or subtraction:

1. $4x + y = 23$ **2.** $x + 2y = 19$
$5x - y = 13$ $x - 2y = -17$

3. $4a - 2b = 10$
$5a - 2b = 14$

Answers:

1. $x = 4$ **2.** $x = 1$ **3.** $a = 4$
$y = 7$ $y = 9$ $b = 3$

Multiplication will be needed in solving the following three examples:

1. $x + y = 10$ **2.** $2x + 3y = 13$
$2x - 3y = 22$ $5x - 4y = 21$

3. $3x - 5y = 51$
$2x + 7y = 3$

Answers:

1. $x = 10\frac{2}{5}$ **2.** $x = 5$ **3.** $y = -3$
$y = -\frac{2}{5}$ $y = 1$ $x = 12$

Solve by substitution:

1. $2y - 19 = -x$ **2.** $2a - b = 5$
$x - 2y = 17$ $5a - 2b = 14$

3. $3x + y = 11$
$5x - y = 13$

Answers:

1. $x = 18$ **2.** $a = 4$ **3.** $x = 3$
$y = \frac{1}{2}$ $b = 3$ $y = 2$

Solve by multiplying the equations:

1. $\frac{a}{14x} = 3$ **2.** $\frac{4b}{6s} = 9$
$7x = 4$ $6s = 3$

3. $\frac{x}{x + y} = 10$
$x + y = 2(x - 1)$

Answers:

1. $a = 24$ **2.** $b = 6.75$ **3.** $x = \frac{20}{19}$
$x = \frac{4}{7}$ $s = .5$ $y = -\frac{18}{19}$

Solve by dividing the equations:

1. $\frac{t}{s} = 21$ **2.** $\frac{4a}{b} = 6$
$\frac{1}{s} = 3$ $\frac{1}{b} = \frac{1}{2}$

3. $\frac{1}{2(x + y)} = \frac{1}{5x}$
$\frac{4}{x + y} = \frac{4}{5}$

Answers:

1. $t = 7$ **2.** $a = 3$ **3.** $x = 2$
$s = \frac{1}{3}$ $b = 2$ $y = 3$

Practice with Simultaneous Equations

Solve each of the following equations by the method that seems best.

GROUP 1

1. $5x + 3y = -9$
$3x - 4y = -17$

2. $4d + 6t = 4$
$3d - 4t = -31$

3. $18m + 10n = 60$
$12m - 15n = 105$

Answers:

1. $x = -3$ **2.** $d = -5$ **3.** $m = 5$
$y = 2$ $t = 4$ $n = -3$

GROUP 2

4. $\frac{2x}{3} = \frac{4y}{7} - 4$ **5.** $x + y = 5$
$x + y = 59$ $x^2 - y^2 = 45$

6. $\frac{3}{r} - \frac{5}{s} = 3$
$\frac{5}{r} + \frac{5}{s} = 1$

Answers:

4. $x = 24$ **5.** $x = 7$ **6.** $r = 2$
$y = 35$ $y = -2$ $s = -3\frac{1}{3}$

GROUP 3

7. $\frac{6}{x} = 2$ **8.** $\frac{5P}{14F} = 3$ **9.** $\frac{18}{a} = 4.5$
$\frac{3a}{2x} = 4$ $7F = 4$ $\frac{x}{a} = 9$

Answers:

7. $a = 8$ **8.** $P = \frac{24}{5}$ **9.** $x = 36$
$x = 3$ $F = \frac{4}{7}$ $a = 4$

Quadratic Equations

An equation in which the unknown appears in the second power is a quadratic. Quadratics are solved by factoring, by completing the square or by use of the general formula.

Solve by factoring:

1. $b^2 - b = 6$
Ans. $b = +3, -2$

2. $x^2 - 8x - 9 = 0$
Ans. $x = +9, -1$

3. $6x^2 - x = 12$
Ans. $x = +\frac{3}{2}, -\frac{4}{3}$

Solve by completing the square:

4. $x^2 + 3x - 28 = 0$
Ans. $x = +4, -7$

5. $a^2 + 7a = -12$
Ans. $a = -4, -3$

6. $2a^2 - 3a = 9$
Ans. $a = -\frac{3}{2}, 3$

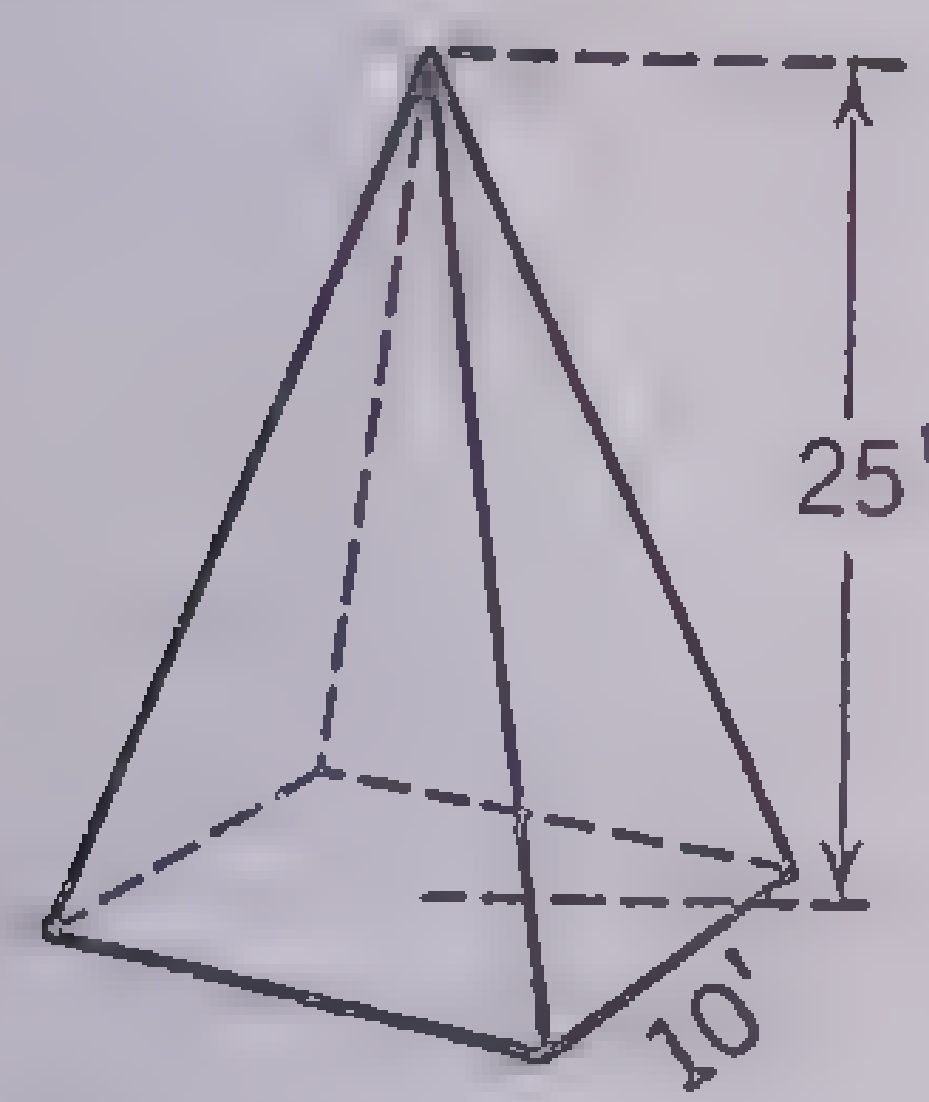
Solve by the general formula:

7. $6a^2 - 5a - 4 = 0$
Ans. $a = \frac{4}{3}, -\frac{1}{2}$

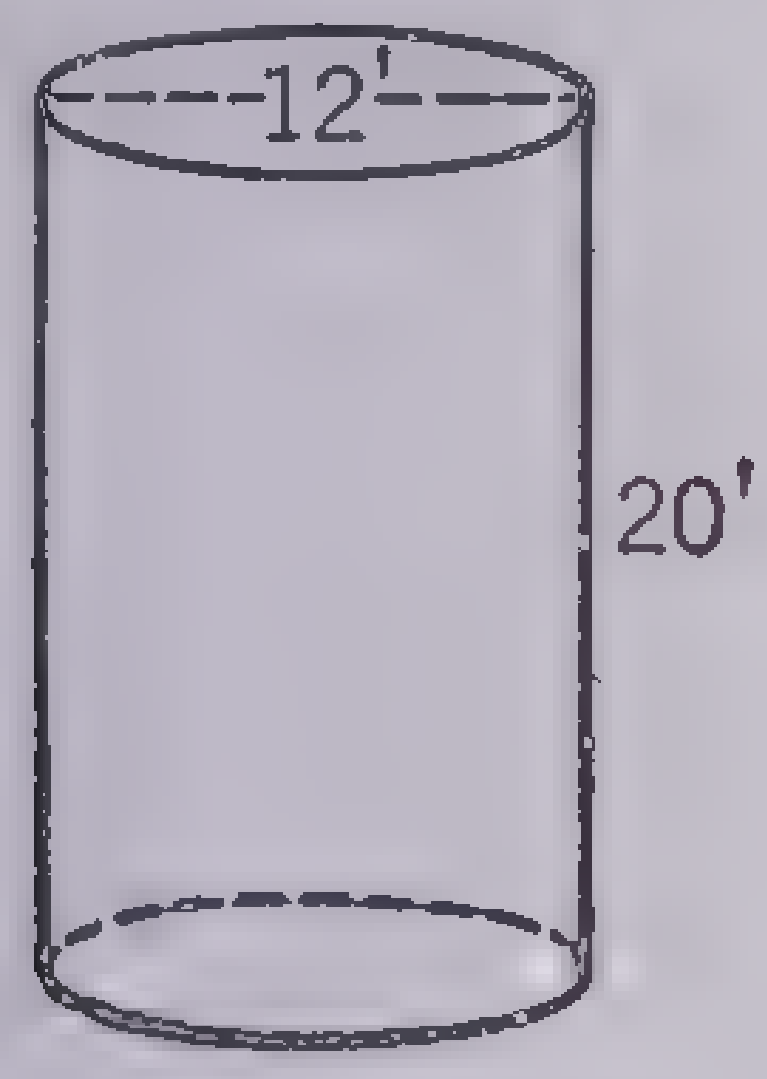
8. $3s^2 - 3s = 6$
Ans. $s = 2, -1$

9. $x^2 - 8x = 128$
Ans. $x = 16, -8$

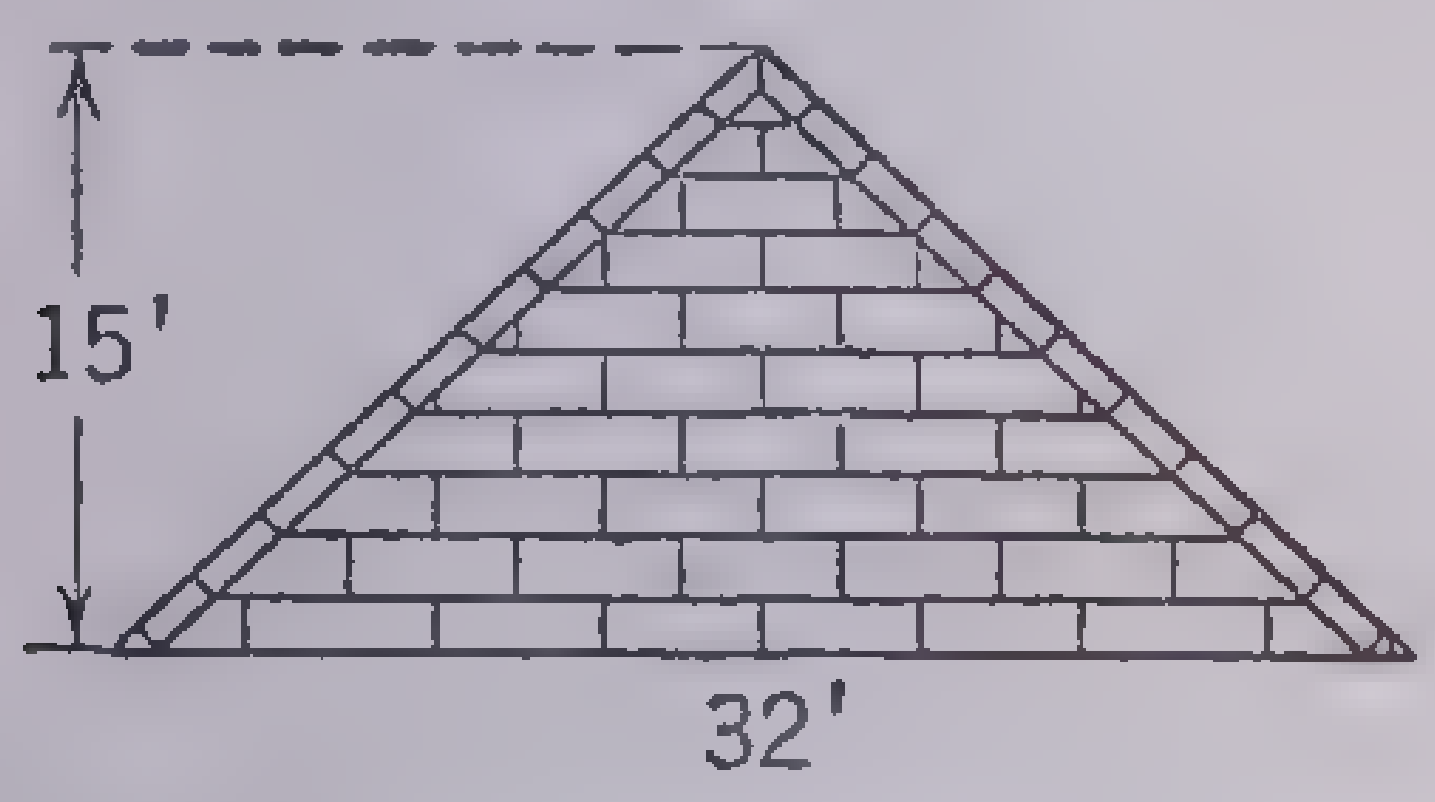
Problems in Area and Volume



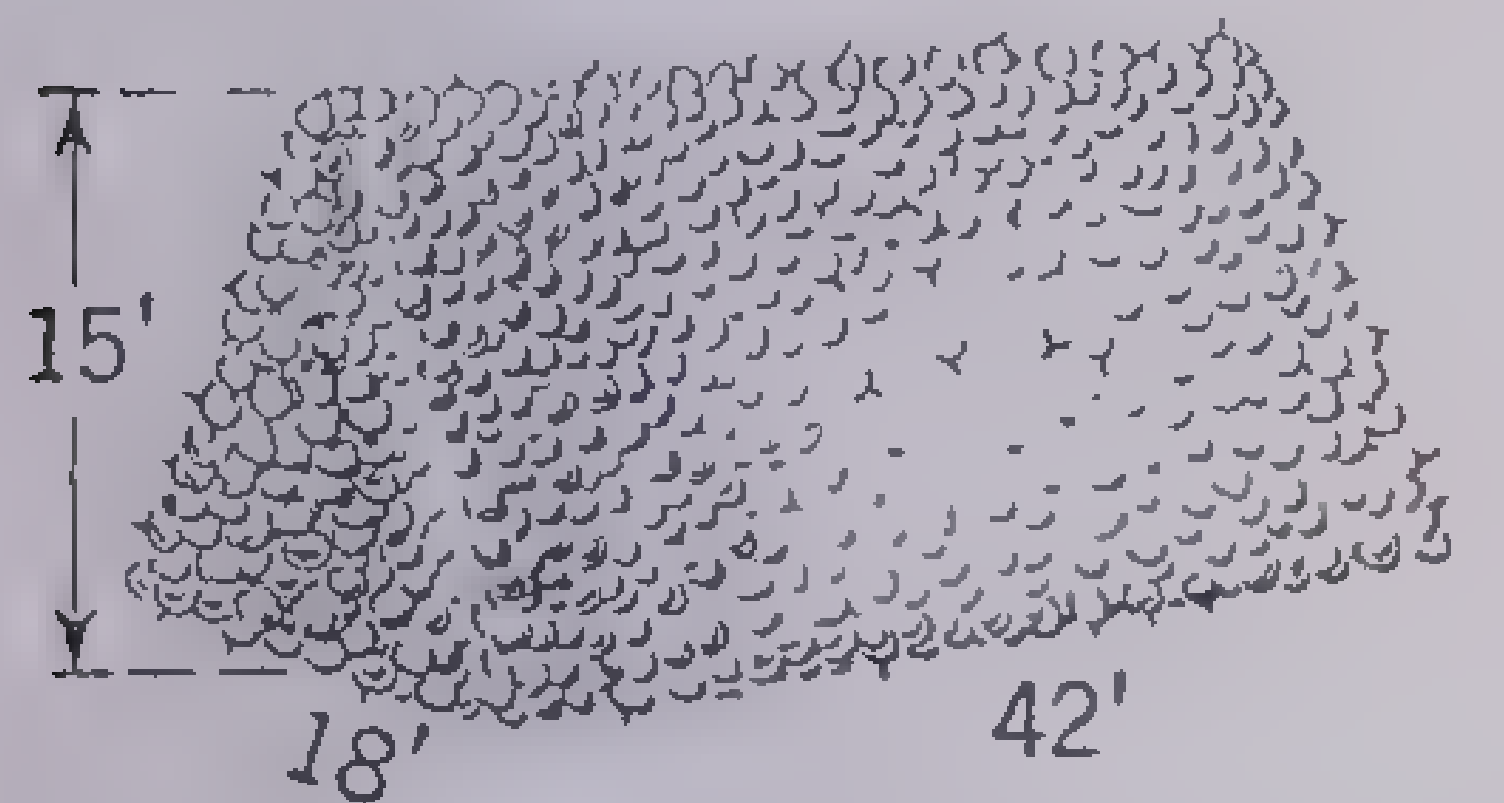
1. What is the lateral surface of this church steeple? (*Ans., 509.8 sq. ft.*)



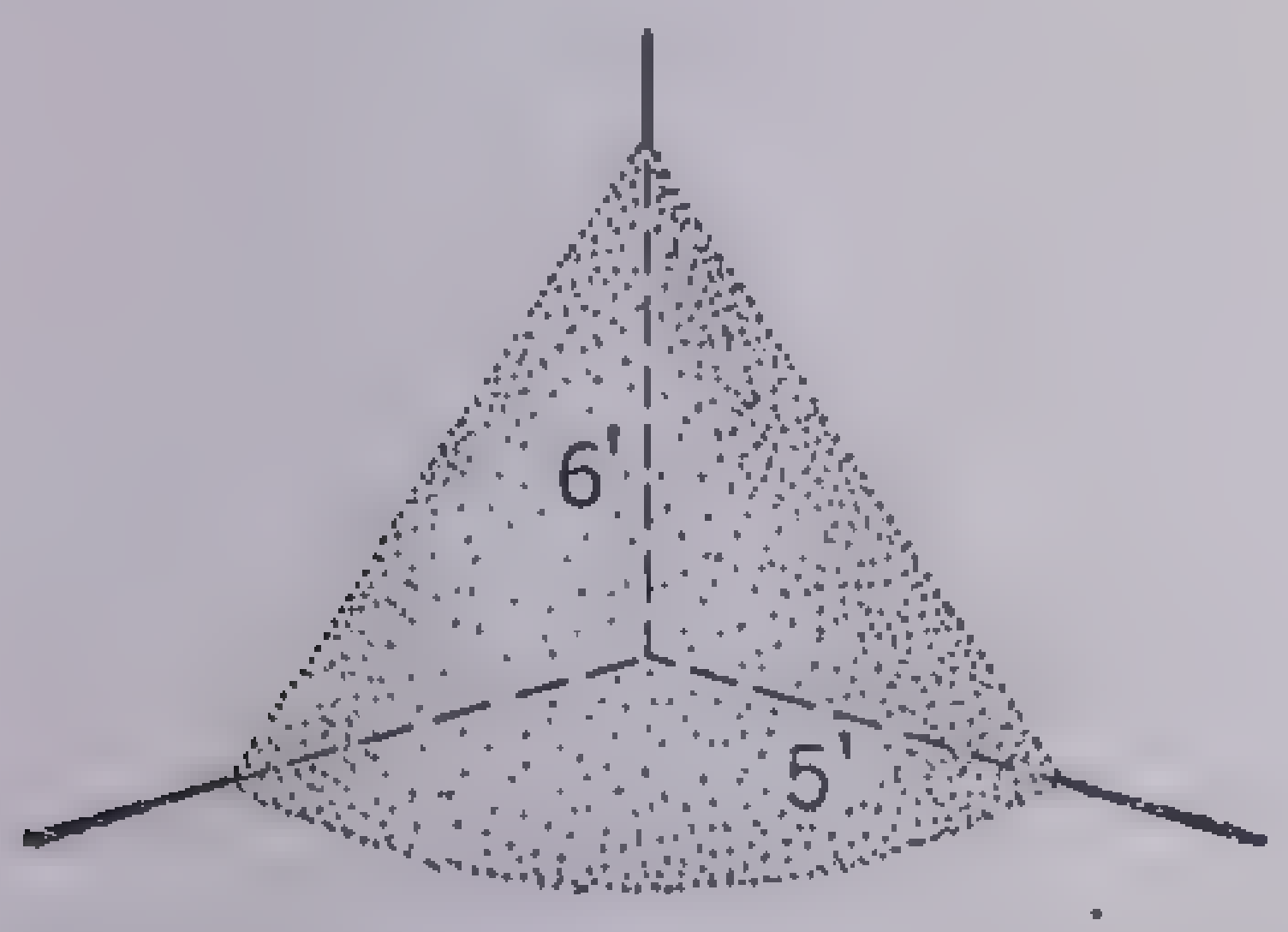
2. What is the volume of this tank in cubic feet? (*Ans., 2261.95 cu. ft.*)



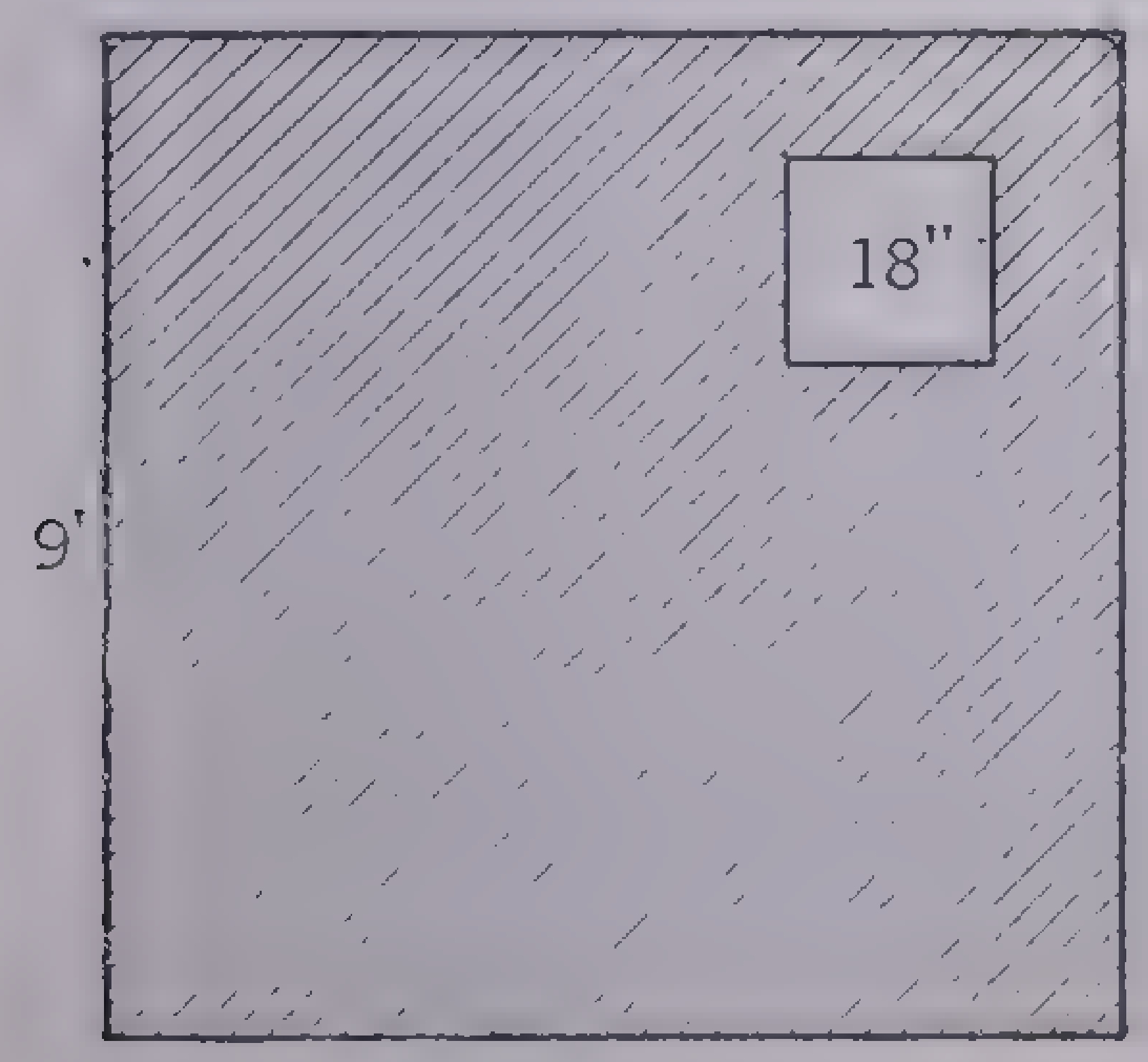
3. Find the area of this house gable. (*Ans., 240 sq. ft.*)



4. A pile of sugar beets is in the form of the triangular prism (shown) 42 feet long, 18 feet wide and 15 feet high. Find the volume of the pile in cubic feet. (Disregard irregularities in piling.) (*Ans., 5,670 cu. ft.*)



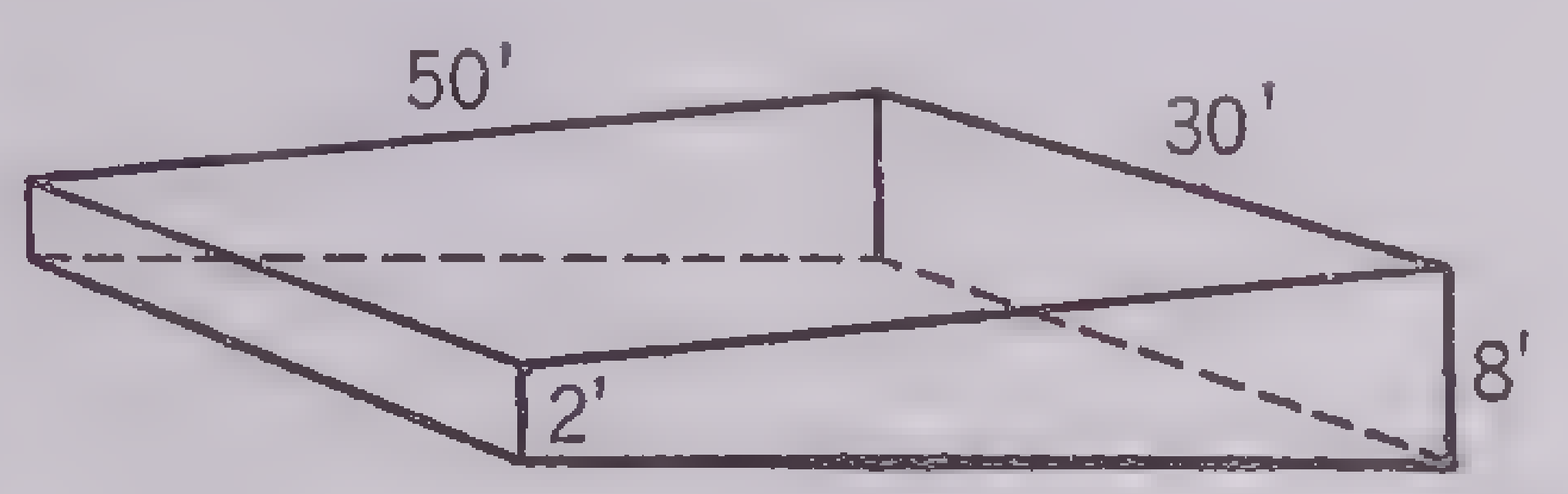
5. A quantity of grain occupies the corner of a bin as shown in the figure. How many bushels are there in the pile? (1 bu. = $1\frac{1}{4}$ cu. ft.) (*Ans., 31.416 bu.*)



6. Find the area of the shaded part of the large square above. (The unshaded part is also a square.) (*Ans., 78.75 sq. ft.*)

7. An oats bin is 12 feet by 15 feet by 14 feet. How many bushels of oats will it hold? (1 bu. = $1\frac{1}{4}$ cu. ft.) (*Ans., 2,016 bu.*)

8. An athletic field is 428 yards long. If its area is 144,764 square yards, how wide is it? (*Ans., 338.23 yd.*)



9. A swimming pool having a uniformly graduated depth has the dimensions and form shown in the figure just above. What is its capacity in gallons when completely filled? (1 cu. ft. = $7\frac{1}{2}$ gal.) (*Ans., 56,250 gal.*)

Logarithms

Difficult multiplication and division are often made very easy by the use of a table of logarithms and by a simple operation in addition or subtraction.

You will need to refer to a table of logarithms to solve the following problems.

Find the logarithms:

	Answers:
1. log .0154 =	**1.** *8.1875 − 10*
2. log .00078 =	**2.** *6.8921 − 10*
3. log .783 =	**3.** *9.8938 − 10*
4. log .00936 =	**4.** *7.9713 − 10*

Using logarithms, perform the following indicated operations:

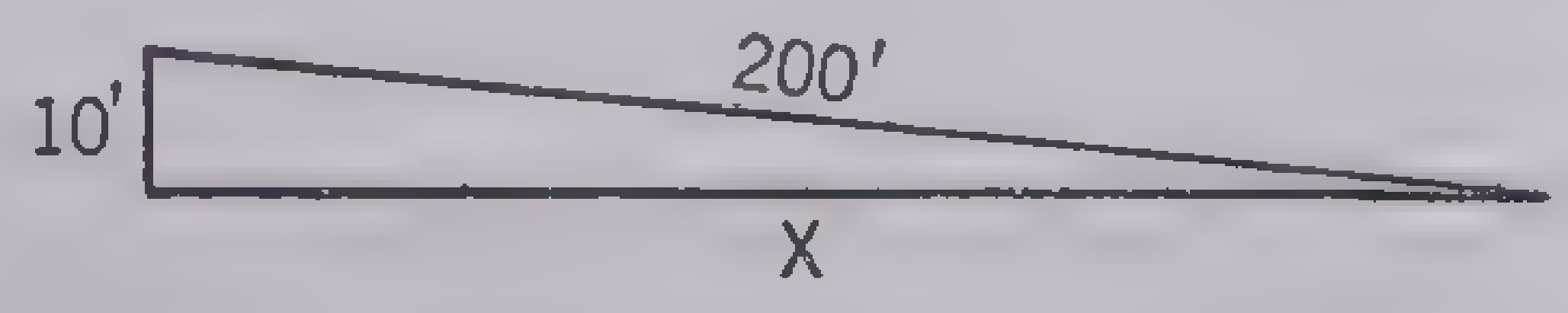
	Answers:
1. 784 × 348 =	**1.** *272,800*
2. 8,031 × .0039 =	**2.** *31.33*
3. 938 ÷ 341 =	**3.** *2.750*
4. 132,800 ÷ 1,436 =	**4.** *92.5*
5. 39^2 =	**5.** *1,521*
6. 13.3^4 =	**6.** *31,310*
7. $5.13^{.7}$ =	**7.** *3.141*
8. $5.59^{1.95}$ =	**8.** *28.66*

Some Elements of Geometry

The elements of geometry are of frequent use in mathematics and science.

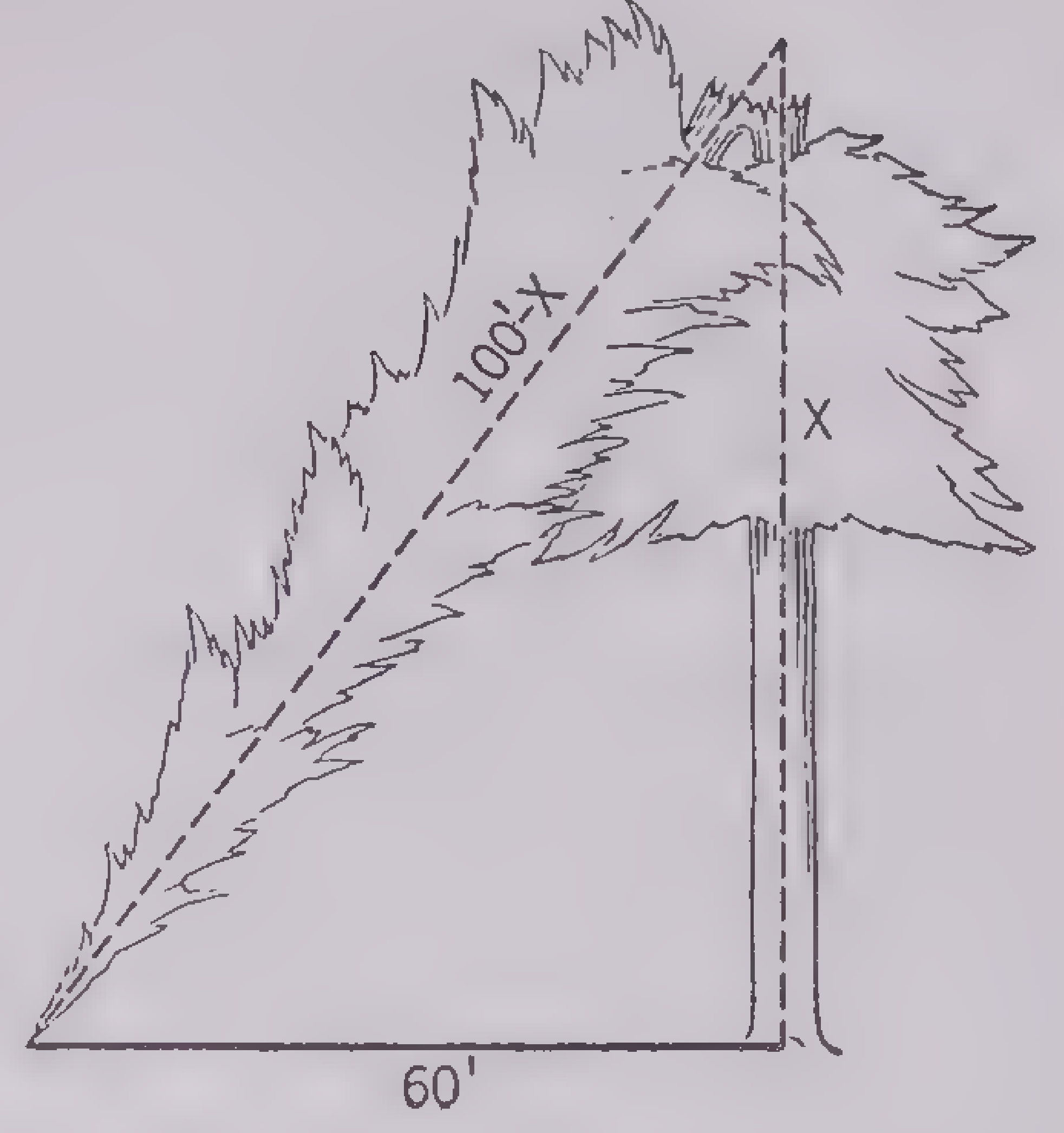
Find the answer to each problem. Make a construction illustrating the facts given in each problem.

1. An automobile travels 20 miles east and then 25 miles north. How far is it in direct line from the starting point? (*Ans., 32.01 mi.*)

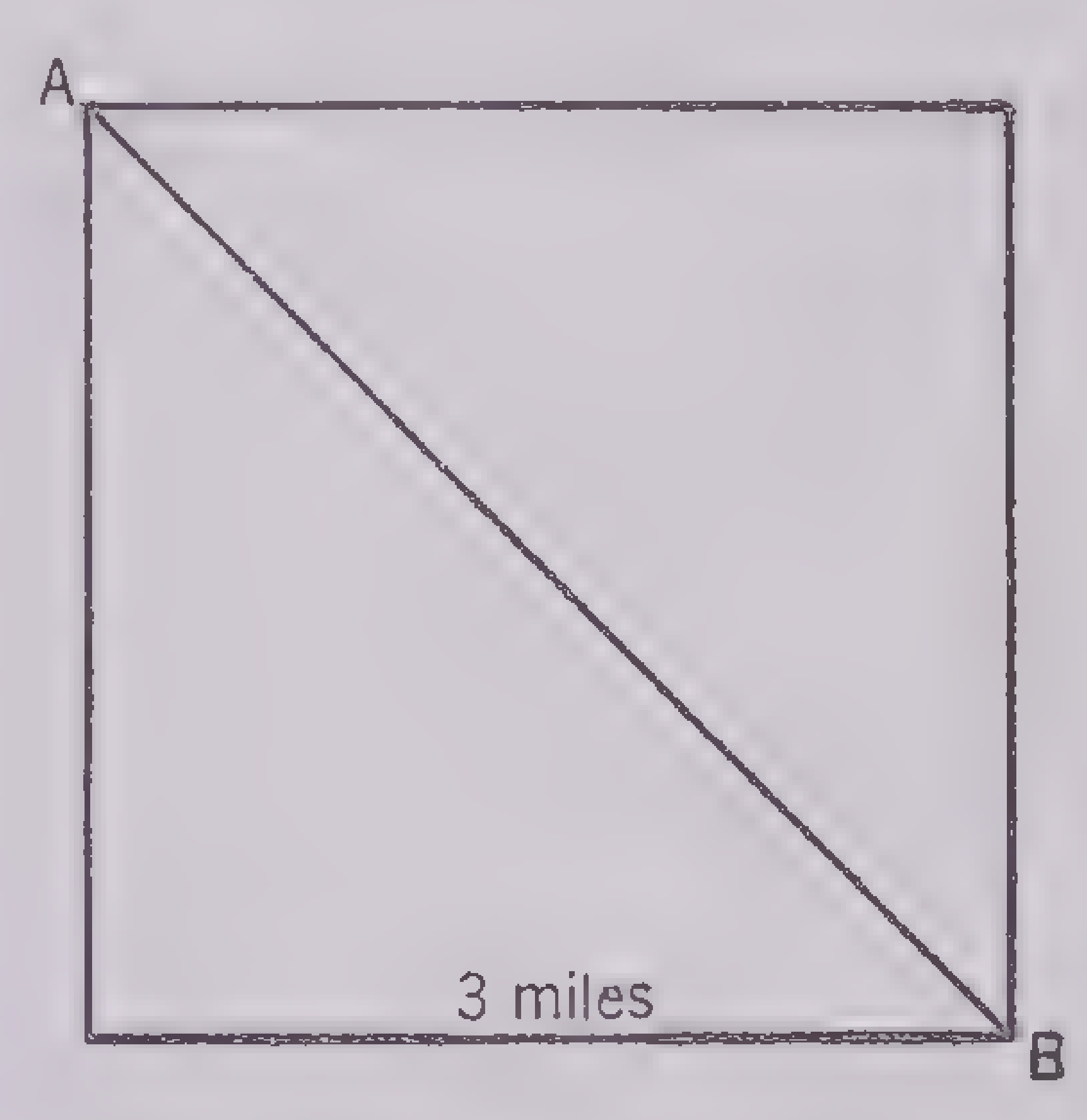


2. A road is inclined as shown in the diagram above. Find the horizontal distance, x. (*Ans., 199.74 ft.*)

3. A building 32 feet wide has a gable roof 12 feet high. Find the length of the rafters from the ridge to the plate. (*Ans., 20 ft.*)



4. A tree 100 feet high is broken down by the wind, forming a right triangle as shown in the diagram above. Find the height of the part that remains standing. (*Ans., 32 ft.*)



5. A boy living at A attends a school at B. If the square in the diagram above is 3 miles on a side, how many rods does he save by walking to school along the line AB? (320 rd. = 1 mile.) (*Ans., 562.4 rd.*)

6. Trisect a right angle.

7. Bisect a given line, AB.

8. Construct a parallelogram, given two sides and the included angle.

9. Construct a line parallel to a given line and passing through a given point.

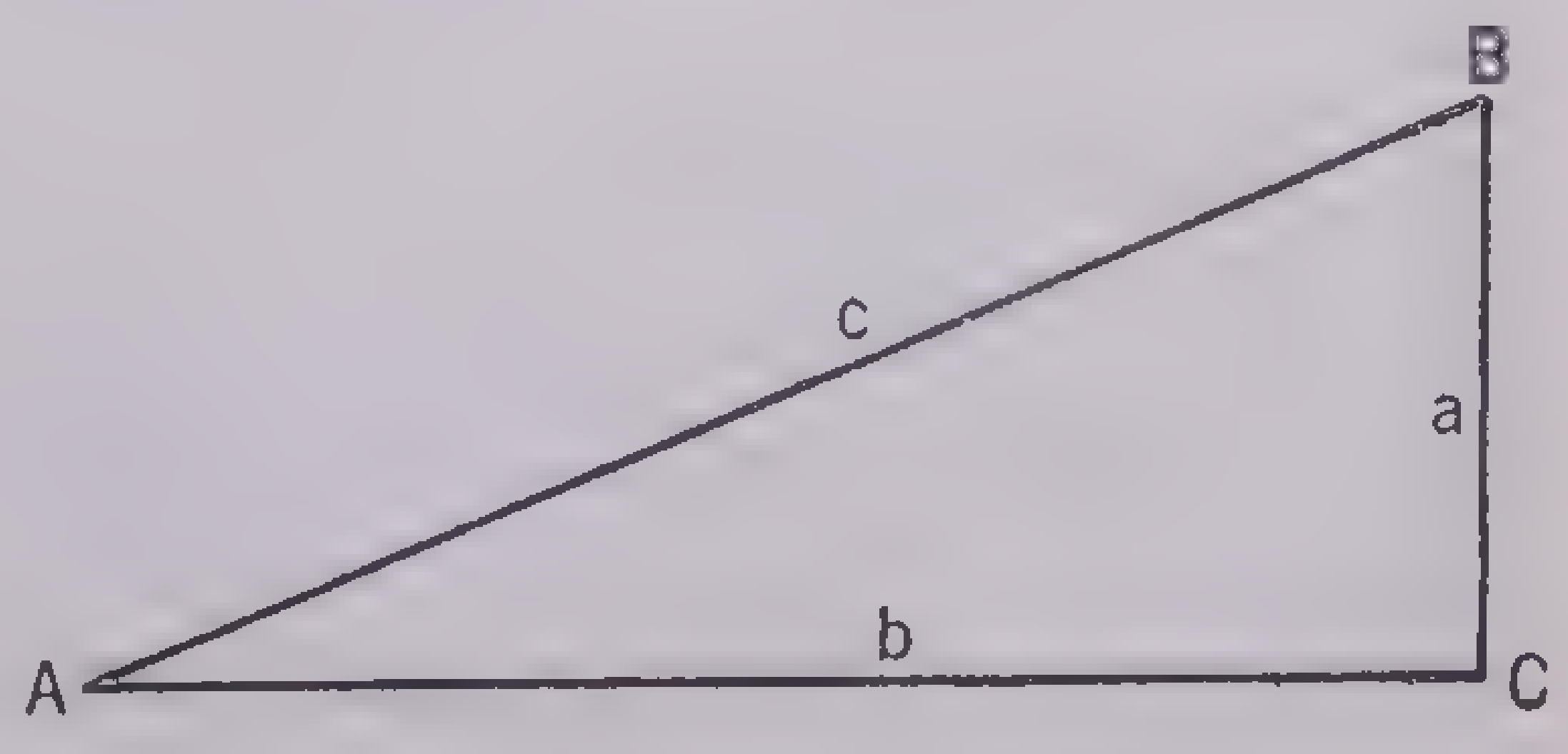
10. Draw angles of 15°, 22°, 37°, 55°, 64°, 78°, 125°, 165° and 172° by using a protractor.

Some Aspects of Trigonometry

Some knowledge of the more elementary ideas of trigonometry is assumed by many standard textbooks for first courses in college physics.

PRACTICE WITH TRIGONOMETRIC RATIOS

Find the required missing parts of the following right triangles:



1. $c = 228, A = 28°5'$
2. $b = 45, A = 62°12'$

3. $b = 54.6$, $B = 61^\circ 45'$
4. $c = 740$, $B = 29^\circ 15'$

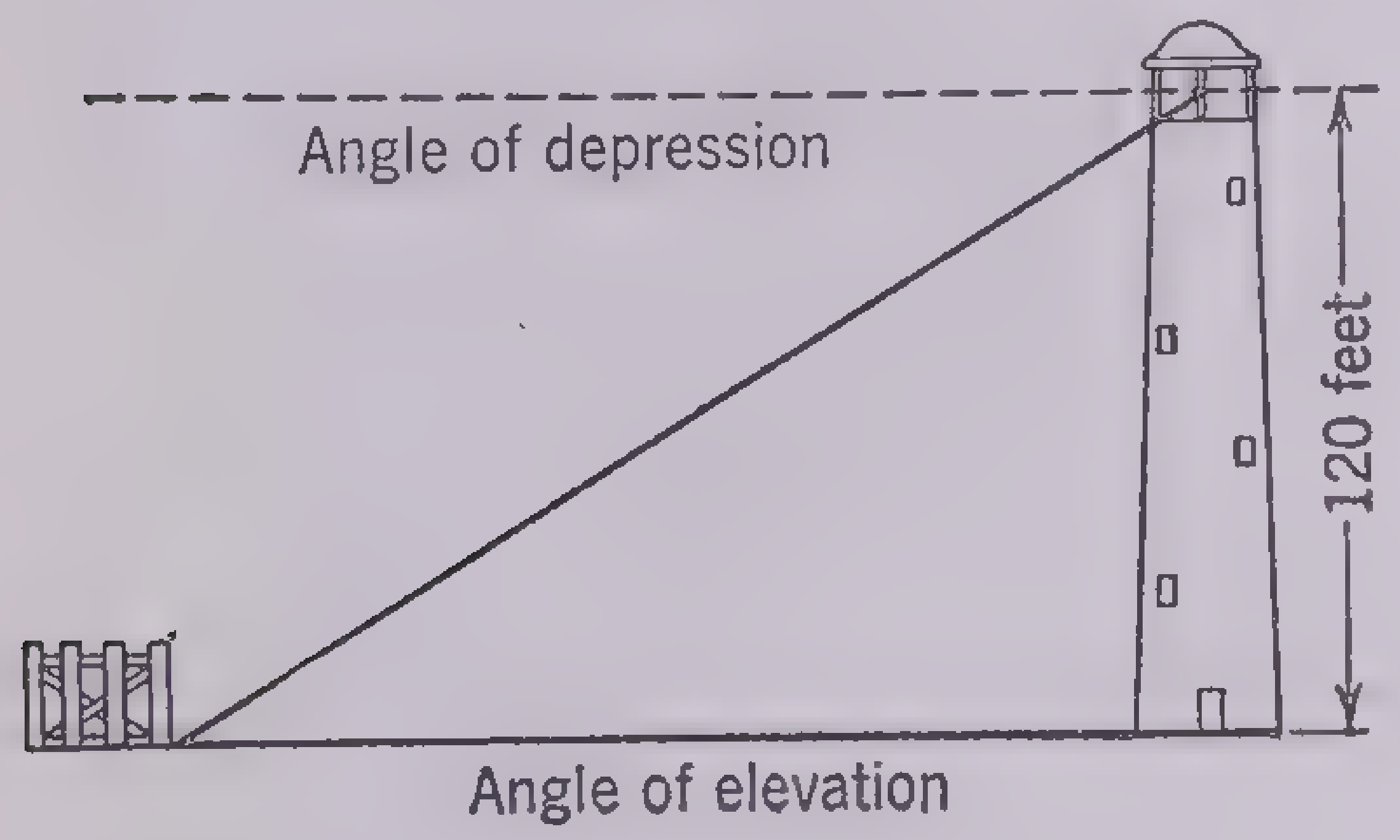
Answers:

1. $a = 107.3$, $b = 201.2$
2. $a = 85.3$, $c = 96.5$
3. $a = 29.3$, $c = 62.0$
4. $a = 645.6$, $b = 361.6$

The missing acute angle is in each case the complement of the given angle.

The following problems will indicate the possibilities of the use of trigonometry in finding unknowns.

1. Two forces are acting at right angles. If the forces are 40 and 75, find the resultant and its direction. (*Ans., 85, 28° 4′ from 75 force*)



2. From the top of a lighthouse 120 feet high the angle of depression to the waterline of a pier is found to be 28°30′. How far away is the pier? (Assume the surface is level. Note the diagram.) (*Ans., 221 ft.*)

3. A man in an airplane observes that the bases of two towers which are 5,000 feet apart on a horizontal plane subtend an angle of 54°. If he is exactly above the middle point between the towers, find the height of the airplane. (*Ans., 4,906.5 ft.*)

4. The angles of depression of two boats at sea are observed by the aid of an instrument 7 feet above the top of a cliff that rises 93 feet from the water level. The angles are found to be 45° and 30°. The boats are in a straight line with a point at the foot of the cliff directly beneath the observer. What is the distance between the boats? (*Ans., 73.21 ft.*)

5. The length of each blade of a pair of hedge shears from point to pivot is 15¾ inches. If the shears are open so that the distance between the points is 11⅝ inches, what is the angle between the blades? (*Ans., 43° 19′*)

6. Find the length of the longest shadow that can be cast by a stick 7 feet long on a horizontal plane when the sun's altitude is 57°. (*Ans., 8.346 ft.*)

Graphs

A graph is a diagrammatic representation of facts. Scientists frequently use this convenient method for presenting facts to students and the public. Businessmen use graphs to show the status of their sales, costs and profits.

Below are facts which can be made into graphs.

Represent these data by a bar graph:

1. The average lengths of time it takes various varieties of trees to grow to saw-log size (18″ diameter) are:

Red Pine	60 years
White Pine	95 years
Black Oak	130 years
White Oak	155 years
Cypress	45 years
Douglas Fir	65 years
Yellow Pine	90 years
Sugar Pine	105 years
Cottonwood	30 years
Red Gum	35 years

Construct a circle graph to show these facts:

2. A small family kept a record of its expenses for a year and found that the income was spent as follows:

Food	$520
Rent	335
Clothing	230
Savings	250
Miscellaneous	320
Total	$1,655

3. *Represent by a broken-line graph the following temperatures:*

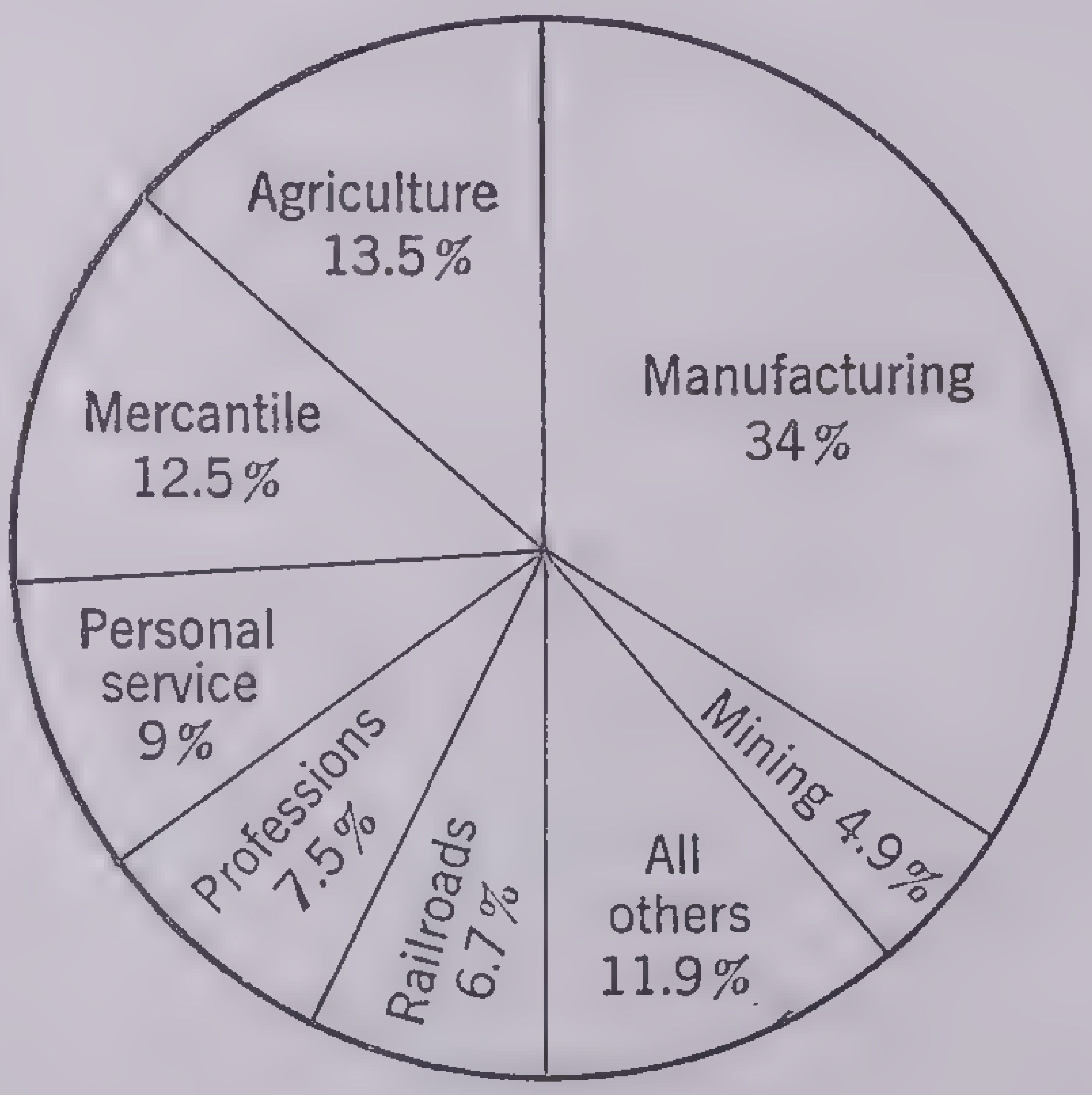
Midnight	− 15°	Noon	− 2°
2 A.M.	− 17°	2 P.M.	+ 5°
4 A.M.	− 18°	4 P.M.	+ 3°
6 A.M.	− 20°	6 P.M.	− 4°
8 A.M.	− 19°	8 P.M.	− 7°
10 A.M.	− 13°	10 P.M.	− 11°

4. *Draw graphs (on graphing paper) of the following formulas and equations:*

1. $P = 4x$ **3.** $x + 3y = 7$
2. $I = .06P$ **4.** $S = 16t^2$

Reading Graphs

Study the following graphs, then mark the statements following each one either true or false.

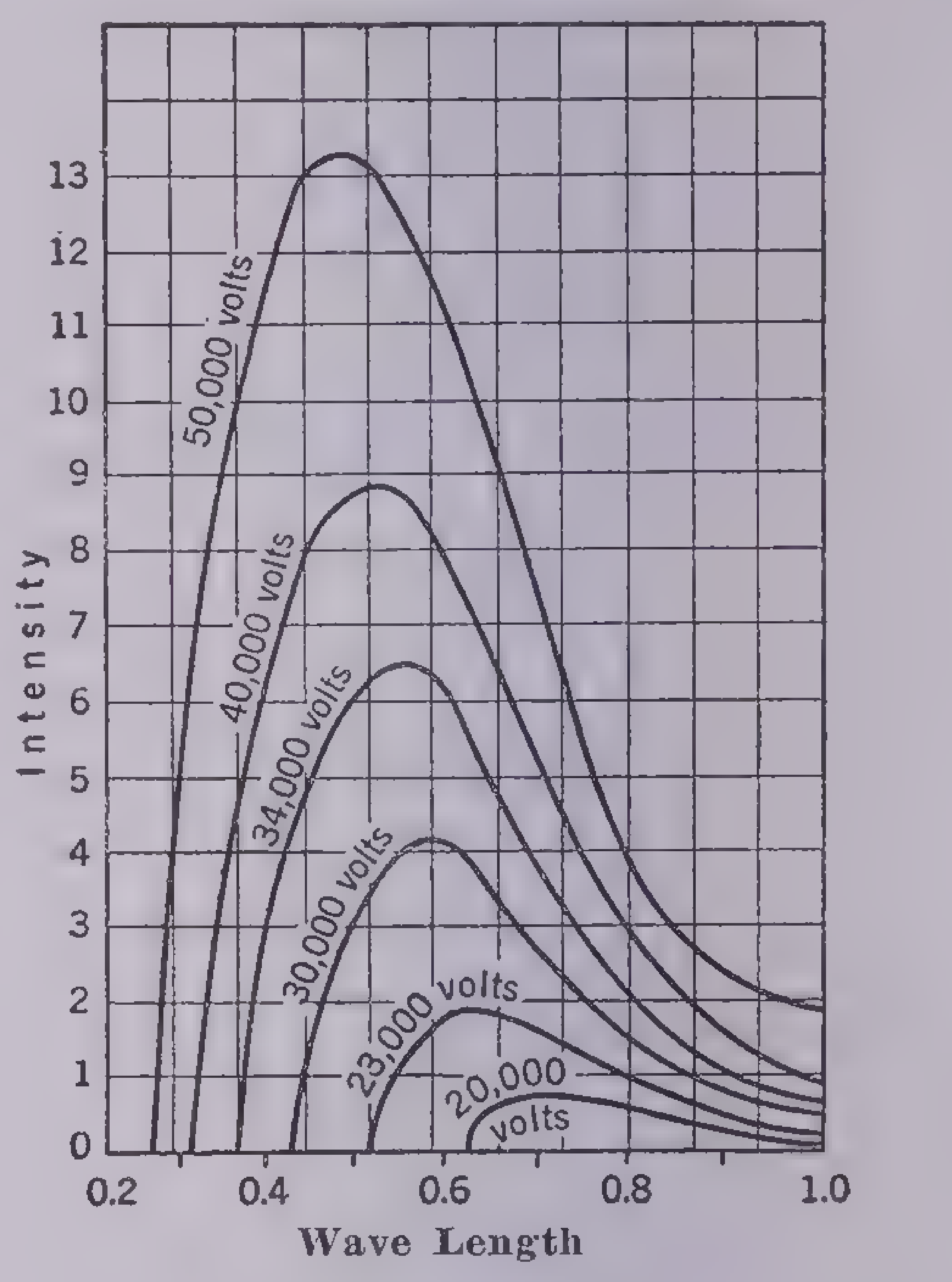


GRAPH I
Sources of the National Income

GRAPH I

T F **1.** Agriculture and manufacturing furnish more than half the national income.
T F **2.** Agriculture provides a greater portion of income than railroads and professions together.
T F **3.** Personal-service provides about one-tenth of the national income.
T F **4.** This circle graph represents 100 per cent of the national income.

GRAPH II
Radiation from a Gas-Filled X-Ray Tube at Various Voltages



GRAPH II

T F **1.** The minimum wave length generated by 50,000 volts is about .26 units in length.
T F **2.** The maximum intensity generated by 34,000 volts is about 8.8 units.
T F **3.** The wave length of the maximum intensity moves toward the shorter wave length as the voltage increases.
T F **4.** The maximum intensity of the X ray decreases as the voltage increases.

BIBLIOGRAPHY

J. W. Studebaker *et al.*, *Number Stories*, Reilly and Lee, Chicago, 1936, $1.00
David E. Smith, *The Wonderful Wonders of One-Two-Three*, McFarlane, N. Y., 1937, $1.00
David E. Smith and J. Ginsburg, *Numbers and Numerals*, Teachers College, N. Y., 1937, 35¢
David E. Smith, E. M. Luse and E. L. Morss, *Walks and Talks in Numberland*, Ginn, Boston, 1929, 72¢
Lancelot Hogben, *Mathematics for the Million*, Norton, N. Y., 1935, $3.75
Mayme Logsdon, *The Mathematician Explains*, Univ. of Chicago, Chicago, 1935, $1.75
T. Dantzig, *Number, The Language of Science*, Macmillan, N. Y., 1935, $2.50
Eric T. Bell, *Men of Mathematics*, Simon & Schuster, N. Y., 1937, $5.00
Eric T. Bell, *The Handmaiden of the Sciences*, Reynal & Hitchcock, N. Y., 1937, $2.25
David E. Smith, *History of Mathematics*, Ginn, Boston, 1923, $4.40
Vera Sanford, *A Short History of Mathematics*, Houghton Mifflin, Boston, 1930, $2.25
Henri Poincaré, *The Foundations of Science*, Science Press, N. Y., 1929, $5.00
W. W. Rouse Ball, *Mathematical Recreations and Essays*, Macmillan, N. Y., 1922, $3.50

Standard Weights and Measures of the United States

AVOIRDUPOIS WEIGHT

Dram (dr.)	= 27⅓ grains (27.34375)
Ounce (oz.)	= 16 drams, 437.5 grains
Pound (lb.)	= 16 oz., 256 dr., 7,000 grains
Legal stone (st.)	= 14 lbs.
Quarter (Eng.) (qr.)	= 28 lbs.
Quarter (Can.) (qr.)	= 25 lbs.
Cental or quintal (cent.)	= 100 lbs.
Hundredweight (Eng.) (cwt.)	= 4 qrs., 112 lbs.
Hundredweight (Can.) (cwt.)	= 4 qrs., 100 lbs.
Ton (Eng.) (T.)	= 20 cwt., 2,240 lbs.
Ton (Can.) (T.)	= 20 cwt., 2,000 lbs.

Ton of Coal. The United States ton is legally defined as 2,000 pounds but some states provide for the use of the long ton (2,240 pounds) in the coal trade. For tariff purposes Congress has fixed the ton of coal at 2,240 pounds.

TROY WEIGHT

Carat	= 3.17 grains
Pennyweight (dwt.)	= 24 grains
Ounce (oz.)	= 20 dwts., 480 grains
Pound (lb.)	= 12 oz., 240 dwts., 5,760 grs.
Hundredweight (cwt.)	= 100 lbs.

Troy is the weight used by goldsmiths and jewelers. The grains troy, apothecaries' and avoirdupois, are equal and the same in England, France, the United States, Holland and in most other countries.

The oz. troy and apothecaries' = 1.09714 oz. avoirdupois; but the lb. troy and lb. apothecaries' = only 0.82286 lb. avoirdupois, while 175 lbs. troy and apothecaries' = 144 lbs. avoirdupois.

APOTHECARIES' WEIGHT

Scruple ℈	= 20 grains	=	20 grains
Dram ʒ	= 3 scruples	=	60 grains
Ounce ℥	= 8 drams	=	480 grains
Pound ℔	= 12 ounces	=	5,760 grains

APOTHECARIES' FLUID MEASURE

		Marked
60 minims ♏ (drops)	= 1 fluid dram	f ʒ
8 drams	= 1 ounce	f ℥
16 ounces	= 1 pint	O
8 pints	= 1 gallon	C. or Cong.

1 dram = 1 teaspoonful
2 drams = 1 dessertspoonful
4 drams = 1 tablespoonful
2 ounces = 1 wineglassful
3 ounces = 1 teacupful

HOUSEHOLD MEASURES

120 drops water	= 1 teaspoon
60 drops thick fluid	= 1 teaspoon
2 teaspoons	= 1 dessertspoon
3 teaspoons	= 1 tablespoon
16 tablespoons	= 1 cup
1 cup	= ½ pt.
1 cup water	= ½ lb.
4 tablespoons flour	= 1 oz.
2 tablespoons butter	= 1 oz.
3 teaspoons soda	= ½ oz.
4 teaspoons baking powder	= ½ oz
2 cups granulated sugar	= 1 lb.
2½ cups confectioners' sugar	= 1 lb.
2½ cups wheat flour	= 1 lb.
3½ cups whole wheat flour	= 1 lb.
2½ cups buckwheat flour	= 1 lb.
5⅓ cups coffee	= 1 lb.
6½ cups tea	= 1 lb.
2 cups rice	= 1 lb.
2 cups lard	= 1 lb.
2 cups butter	= 1 lb.
2 cups graham flour	= 1 lb.
2 cups rye flour	= 1 lb.
2 cups corn meal	= 1 lb.
2 cups rolled oats	= 1 lb.
2 cups powdered sugar	= 1 lb.
2 cups brown sugar	= 1 lb.
2 cups raisins	= 1 lb.
2 cups currants	= 1 lb.
2 cups bread crumbs	= 1 lb.
9 eggs	= 1 lb.

LIQUID MEASURE

		Cubic Inches
4 gills	1 pint (O)	= 28.875
2 pints	1 quart (qt.)	= 57.75
4 quarts	1 gallon (gal.)	= 231.0
63 gallons	1 hogshead (hhd.)	
2 hogsheads	1 pipe or butt	
2 pipes	1 tun	

DRY MEASURE

		Cubic Inches
2 pints	1 quart (qt.)	= 67.20
8 quarts	1 peck	= 537.60
4 pecks	1 struck bushel	=2,150.42

CUBIC OR SOLID MEASURE

Cubic foot	= 1,728 cubic inches
Cubic yard	= 27 cubic feet, 21.033 bushels
Cord of wood	= 128 cubic feet
Shipping ton	= 40 cubic feet merchandise
Shipping ton	= 42 cubic feet of timber

Ton of displacement of a ship = 35 cubic feet

LINEAR MEASURE

3 barleycorns or 12 lines or 72 points or 1,000 mils (mi.)	1 inch (in.)
3 inches	1 palm
4 inches	1 hand
7.92 inches	1 link
9 inches	1 span
12 inches	1 foot (ft.)
3 feet	1 yard (yd.)
2½ feet	1 military pace
2 yards	1 fathom
5½ yards	1 rod, pole or perch
66 feet or 4 rods	1 chain
40 poles or 220 yards	1 furlong (fur.)
8 furlongs or 1,760 yards or 5,280 feet	1 mile
3 miles	1 league

The hand is used to measure a horse's height. The military pace is the length of the ordinary step of a man.

LAND MEASURE (SQUARE)

144 square inches	1 square foot (sq. ft.)
9 square feet	1 square yard (sq. yd.)
30¼ square yards	1 sq. pole, rod or perch
16 square poles	1 square chain (sq. ch.)
40 square poles or 1,210 square yards	1 square rood
4 square roods or 10 square chains or 160 square poles or 4,840 square yards or 43,560 square feet	1 acre
640 acres or 3,097,600 square yards	1 square mile

GEOGRAPHICAL AND NAUTICAL MEASURES

6080.27 feet or 1000 fathoms or 10 cables or 1.1528 statute miles	= 1 nautical mile
1 nautical mile per hr.	= 1 knot
60 nautical miles or 67.168 statute miles	= 1 degree
360 degrees	= 1 circumference of the earth at the equator
1 league	= 3 nautical miles

TIME

1 minute	= 60 seconds
1 hour	= 60 minutes, 3,600 seconds
1 day	= 24 hours, 1,440 minutes, 86,400 seconds
1 sidereal day	= 86,164.1 seconds
1 sidereal month	= 27.321661 mean solar days (average)
1 lunar month	= 29.530589 mean solar days (average)
Mean solar year	= 365 d. 5 h. 48 m. 46 s.

ANGULAR MEASURE

1 minute of angle or arc	= 60 seconds
1 degree of angle or arc	= 60 minutes
90 degrees of angle or arc	= 1 right angle or ¼ of circumference
Radian of angle or arc	= arc same length as radius

Radian of angle or arc = 57.295779513082°

COUNTING

12 things = 1 dozen (doz.)
12 dozen = 1 gross (gro.)
12 gross = 1 great gross
20 things = 1 score

PAPER

24 sheets	= 1 quire
20 quires or 480 sheets	= 1 ream

United States and British Units Compared

1 British Imperial bushel = 1.03205 U. S. bushels
1 U. S. bushel = 0.96895 British Imperial bushel
1 British quart = 1.03205 U. S. dry quarts
1 U. S. dry quart = 0.96895 British quart
1 British quart or gallon = 1.20094 U. S. liquid quarts or gallons
1 U. S. liquid quart or gallon = 0.83268 British quart or gallon

Value

U. S. Money

10 mills = 1 cent (ct. c., or ¢)
10 cents = 1 dime
100 cents or 10 dimes = 1 dollar ($)
10 dollars = 1 eagle

Canadian Money

100 cents = 1 dollar = $1[1]

English Money

12 pence (*d.*) = 1 shilling (*s.*) = $0.243+[1]
20 shillings = 1 pound (£) = $4.8665[1]

French Money

100 centimes = 1 franc (fr.) = $0.193[1]

Swedish, Danish and Norwegian Money

100 öre (ö.) = 1 krone or krona = $0.268[1]

Ancient Greek and Roman Weights and Measures

WEIGHT

Roman libra (pound) = .719 lbs.
Attic mina (pound) = .95 lbs.
Attic talent (60 minae) = 57 lbs.

DRY MEASURE

Roman modius = .96 peck
Attic choenix = .08 dry quart
Attic medimnos (48 choenices) = 1.47 bushels

LIQUID MEASURE

Attic cyathos = .095 liquid pint
Attic cotula = .28 dry quart
Attic chous = 3.4 liquid quarts

LONG MEASURE

Roman pes (foot) = 11.64 inches
Roman cubitus (1½ pedes) = 17.5 inches
Roman passus (pace) = 4.85 feet
Roman stadium (625 pedes) = 607 feet
Roman mile (1,000 paces) = 4,850 feet
Attic pous (foot) = 12.15 inches (up to 12.45″)
Attic cubit (1½ Attic feet, sometimes 1⅔) = 18.22 inches
Attic stadium (600 Attic feet) = 607 feet

The Metric System

During the French Revolution the French Government appointed a commission to devise a scientific system of measurement to eliminate the inconveniences of the systems being used. The metric system was the result.

An attempt was made to get an indestructible unit by surveying a long distance on the meridian through Paris and then computing the distance from the equator to the pole and taking one ten-millionth of this as the length for the primary unit. This gave a unit of 39.37 inches. This unit is called a meter.

The system is a decimal system; the number of units of one denomination which make one unit of the next higher denomination is always 10 or a power of 10. The relations of all smaller or larger units to the primary unit is shown by their names made from Latin and Greek prefixes. The Latin prefixes denote parts of the primary unit, and the Greek prefixes denote multiples of the primary unit.

Thus *centi* means $\frac{1}{100}$, so *centimeter* means $\frac{1}{100}$ of a meter.

Milli means $\frac{1}{1000}$, so *millimeter* means $\frac{1}{1000}$ of a meter.

Deka means 10, so 10 meters make a *dekameter*.

Kilo means 1000, so 1000 meters make a *kilometer*.

The metric system is used by nearly all countries except England and the United States. Even in the United States the meter is by law the standard unit of length. Our yard is really $\frac{3600}{3937}$ of a meter.

The biggest advantage of the metric system is that all reduction may be made by annexing zeros or moving the decimal point.

Tables of metric measure and a table of equivalents follow.

Metric System Tables

Units of Length

Table		*Equivalents*
10 millimeters (mm.)	= 1 **centimeter** (cm.)	= 0.3937079 inch
10 centimeters	= 1 decimeter (dm.)	
10 decimeters	= 1 **meter** (m.)	= 39.37079 inches
10 meters	= 1 dekameter (Dm.)	
10 dekameters	= 1 hektometer (Hm.)	
10 hektometers	= 1 **kilometer** (Km.)	= 3280.9 feet 0.621382 mile
10 kilometers	= 1 myriameter (Mm.)	

Units of Surface

Table		*Equivalents*
100 sq. millimeters (sq. mm.)	= 1 **sq. centimeter** (sq. cm.)	= 0.155 sq. in.
100 sq. centimeters	= 1 sq. decimeter (sq. dm.)	
100 sq. decimeters	= 1 **sq. meter** (sq. m.)	= 10.764 sq. ft.
100 sq. meters	= 1 sq. dekameter (sq. Dm.)	
100 sq. dekameters	= 1 sq. hektometer (sq. Hm.)	
100 sq. hektometers	= 1 **sq. kilometer** (sq. Km.)	= 247.114 acres

When used in measuring land the square meter is called a **centare** (ca.), the square dekameter an **are** (a.), and the square hektometer a **hektare** (Ha.).

Units of Volume

Table		*Equivalents*
1000 cu. millimeters (cu. mm.)	= 1 **cu. centimeter** (cu. cm.)	= 0.06102 cu. in.
1000 cu. centimeters	= 1 cu. decimeter (cu. dm.)	
1000 cu. decimeters	= 1 **cu. meter** (cu. m.)	= 35.314 cu. ft.

In measuring wood the cubic meter is called a **stere** (1 st. = 0.2759 cd.); a **decistere** (1 dst.) is one-tenth of a stere.

Units of Capacity

(Principal unit, the **Liter** = a cu. decimeter)

Table		*Equivalents*
10 milliliters (ml.)	= 1 **centiliter** (cl.)	= 0.6102 cu. inch
10 centiliters	= 1 deciliter (dl.)	
10 deciliters	= 1 **liter** (l.)	= 1.0567 liquid quarts 0.908 dry quart
10 liters	= 1 dekaliter (Dl.)	
10 dekaliters	= 1 **hektoliter** (Hl.)	= 26.417 gallons 2.8375 bushels
10 hektoliters	= 1 kiloliter (Kl.)	

Units of Weight

Table		*Equivalents*
10 milligrams (mg.)	= 1 **centigram** (cg.)	= 0.15432 grain
10 centigrams	= 1 decigram (dg.)	
10 decigrams	= 1 **gram** (g.)	= 15.432 grains
10 grams	= 1 dekagram (Dg.)	
10 dekagrams	= 1 hektogram (Hg.)	
10 hektograms	= 1 **kilogram** (Kg.)	= 2.20462 pounds
10 kilograms	= 1 myriagram (Mg.)	
10 myriagrams	= 1 quintal (Q.)	
10 quintals	= 1 **metric ton** (M.T.)	= 2204.621 pounds

Table of Equivalents

Common	*Metric*	*Common*	*Metric*
1 inch	= 2.54 cm.	1 cu. foot	= 28.317 cu. dm.
1 foot	= 30.48 cm.	1 cu. yard	= 0.7645 cu. m.
1 yard	= 0.9144 m.	1 cord	= 3.624 st.
1 rod	= 5.029 m.	1 liquid quart	= 0.9463 l.
1 mile	= 1.6093 Km.	1 gallon	= 3.785 l.
1 sq. inch	= 6.452 sq. cm.	1 dry quart	= 1.101 l.
1 sq. foot	= 9.2903 sq. dm.	1 bushel	= 0.3524 Hl.
1 sq. yard	= 0.8361 sq. m.	1 grain	= 0.0648 g.
1 sq. rod	= 0.2529 a.	1 ton	= 0.9072 M. T.
1 sq. mile	= 2.59 sq. Km.	1 troy ounce	= 31.1035 g.
1 acre	= 0.4047 Ha.	1 av. ounce	= 28.35 g.
1 cu. inch	= 16.387 cu. cm.	1 av. pound	= 0.4536 Kg.

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[1] These American equivalents are based on the gold standard exchange rate prevailing before 1918; since the World War French currency has been greatly devalued, 1 franc being roughly equal to $.05 during the period 1918–1938. Since the general abandonment of the gold standard during the world depression the currencies of all nations in terms of American money have fluctuated widely.

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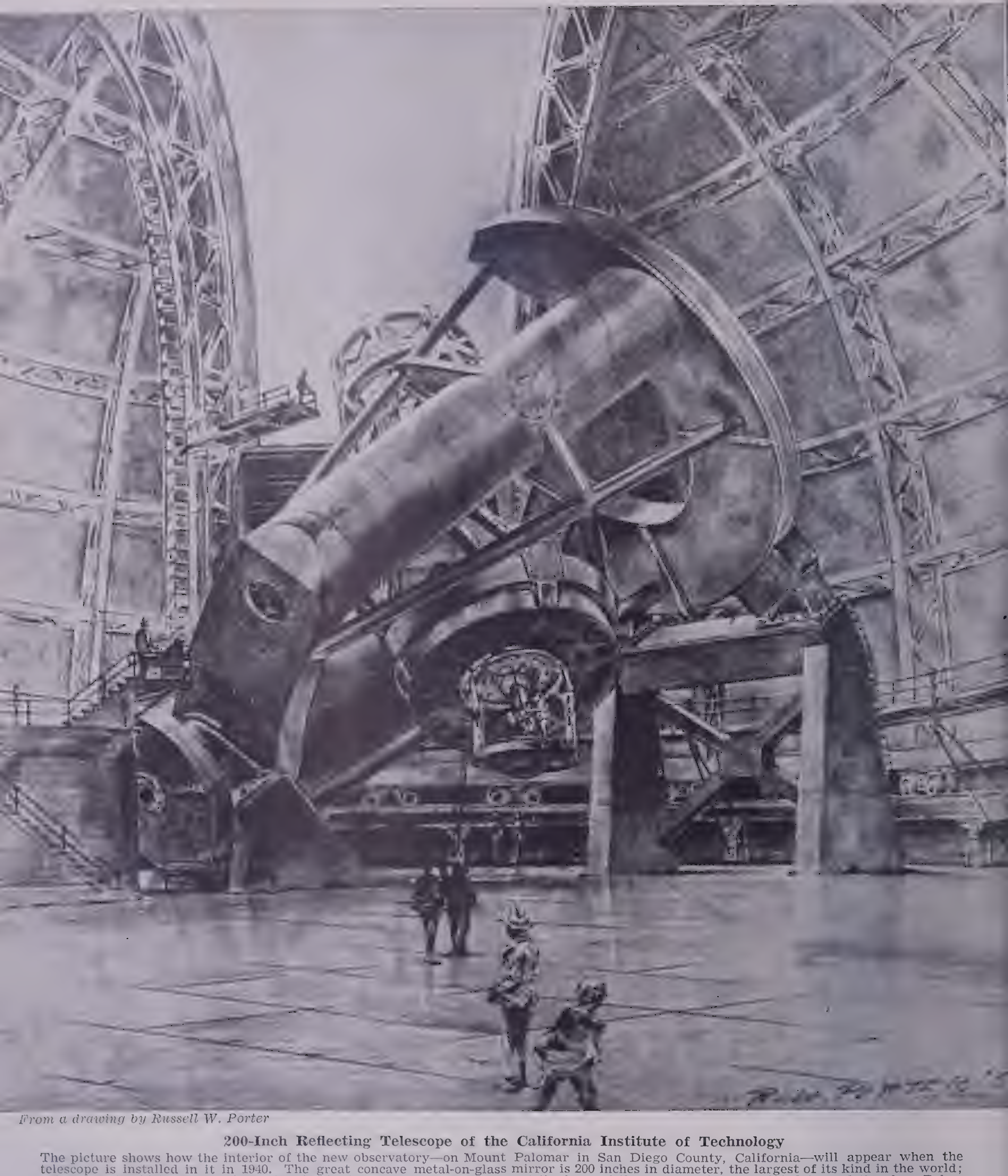


From a drawing by Russell W. Porter

200-Inch Reflecting Telescope of the California Institute of Technology

The picture shows how the interior of the new observatory—on Mount Palomar in San Diego County, California—will appear when the telescope is installed in it in 1940. The great concave metal-on-glass mirror is 200 inches in diameter, the largest of its kind in the world; a framework which supports its under side is shown in the center above at the base of the open steel tube pointed toward the sky. Below the mirror, 35 feet from the floor, the astronomer will sit, often for hours, to keep the telescope accurately focused on the stars while they are slowly photographed on plates. The stars photographed are usually so far off—entirely invisible to the naked eye—that their light is very dim, and hence 3, 6 and even more hours of continuous exposure are necessary. The telescope will permit prolonged observation of any point of the heavens by rotation of its tube about two axes: rotation of the mounting carrying the tube about the polar axis from east to west (to keep it pointing at the desired star as the earth's rotation turns the telescope) and rotation of the tube on its declination axis from north to south or vice versa (to point it at the desired star). The massive U-shaped sloping yoke at the right holds and controls the movements of the telescope tube and mirror. The yoke, driven by a clockwork mechanism, moves constantly, but only enough to keep the telescope pointed at the proper star. The telescope will be housed under a steel dome 135 feet in diameter, its upper part rotating on smoothly ground rails. The dome is provided with an open slot 30 feet wide which can be closed by sliding shutters

BOOK VIII: SCIENCE

HISTORY OF SCIENCE

In Egypt and Babylon.—Science began with the work of the Egyptians and Babylonians. Though it has often been supposed that science is very recent in man's history, it really had its origin as early as 3500 B. C. in the worship of certain heavenly bodies, principally the sun and moon, by the peoples who lived on the banks of the Nile and of the Tigris-Euphrates. Both these peoples worshiped the sun at different times in their history, and the Babylonians worshiped the moon also. Like all early religions, theirs had associated with it a special class of men, the priesthood, whose duty it was to regulate the community's relations with its god or gods. In Babylonia and in Egypt one of the principal duties of the priests was to watch the sun or moon god as it swept across the sky. By 3500 B. C. both these peoples had invented a system of writing that was used to record the actions of the gods—especially when one god ate the other, an event that today we call an eclipse. With these very records science began, for in this way the priests collected over long periods of time a tremendous mass of data on the motion of the heavenly bodies. They observed solely by the naked eye the time of rising and setting and the relative positions of stars and planets when important changes occurred in the heavens.

As these records and observations were continued, the Babylonian priests noticed that certain motions of the planets repeated themselves at regular intervals: the moon went through its various phases once every 29.5 days; the sun returned to the same position in the heavens every 365 days; eclipses recurred at regular intervals of 6,585.32 days. (The Babylonian word *saros* is still used by astronomers for this lunar cycle of 223 new moons or 6,585⅓ days.) With this information they were able to devise a calendar based on the motion of the moon. It had 12 months of 30 days each, but it was soon discovered that this made the seasons shift through the calendar year. To offset this they added an extra month every 6 years. This calendar also introduced the 7-day week and the day of rest on the seventh day. The Babylonians developed a system of arithmetic based on the number 60, and used it to divide their hours into 60 parts, which again were subdivided into 60; but each Babylonian day was divided into 12 divisions of 2 hours each.

The Babylonians were very superstitious. They studied the stars not to provide a calendar but to determine the will of the gods, whom they believed either to be the planets in the sky or in some way connected with them. Before the time of Hammurabi (in the 21st century B. C.), the Babylonians seem to have had fairly good physicians, but his famous code put such severe penalties on failure to cure the patient that medicine disappeared, and the sick were merely taken to the market place and laid out before the crowds. Any passerby who had been cured of the same disease was required to stop and give the sick man advice.

In Egypt the worship of the sun god caused the priests to record very carefully the motions of the sun and those of his messenger, the star Sirius, which rises just before the sun at the season when the River Nile floods and brings down from the mountains of Ethiopia the rich black soil that makes civilization possible in the Nile valley. The Egyptian priests had devised a calendar, based on the sun, which had 12 months of 30 days each and an extra "little month" of 5 days—all holidays. Every time the Nile flooded, however, it was necessary to relocate each man's land. This was done by the royal rope stretchers. Because they knew that the triangle with sides in the proportion of 3, 4 and 5 formed a right angle, they measured these distances on a rope and used it to resurvey the land in one of the first practical applications of plane geometry.

The Egyptians were a very practical people with remarkable ability in erecting great temples, pyramids and obelisks. In making plans for these public works and in computing the taxes that made the buildings possible, they invented a system of arithmetic with whole numbers and fractions, were able to solve simple equations, found an approximate value for pi and could approximate the areas of some triangles and trapezoids. But their system was so clumsy that it prevented them from developing more advanced mathematics.

Egyptian physicians, although they used medicines such as swine's teeth, lizards' blood and sweat from pigs' ears, were fairly successful in curing their patients. Egyptian surgeons were especially skilled in removing tumors and in operations on the eyes, but they were handicapped by the fact that their religion forbade dissection.

The Egyptians and the Babylonians were interested in science, not for truth's sake but for the practical and immediate ends it might serve.

The Greek Scientific Spirit.—The search for truth for its own sake began with the Greeks of Ionia. Thales, Anaximander and Anaximenes, great names in the history of science, separated it from religion. Then men first asked: "What is the nature of the universe? What is the first principle from which it is all made?" Their answers were too simple; they failed to see that long and patient study and investigation were necessary before this question could be answered; but they did make a beginning. Thales of Miletus (*c.* 640–546 B. C.) thought that the first principle was water; Anaximander (*c.* 611–547 B.C.) called it the Infinite; Anaximenes (*c.* 588–524 B. C.), the air; Heraclitus (*c.* 540–475 B. C.), fire or eternal flux. These descriptions of the primary element seem ludicrous to us, but we must remember that there were then no words to express scientific ideas so accurately and conveniently as those we now have. Thales was struggling for the idea of liquidity; Anaximander, for space (note this well—in the 20th century Einstein has adopted the same idea that the properties of matter are only properties of space); Anaximenes, for gas; Heraclitus, for motion.

Thales was more scientific in another respect. He gave the first proofs of geometrical theorems. Previous to his time men had known a few facts of geometry, but he proved these theorems and generalized them. The Egyptians knew the properties of *certain* triangles, but Thales showed that some of these properties are true for *any* triangle.

The study of geometry and mathematics that Thales had so well begun was carried on by Pythagoras of Samos (582–500 B.C.) and his students. In fact they became enraptured by the marvelous relationships of lines and numbers and concluded that mathematics is the key to the universe—that all is governed by mathematical law. This is quite true, but they carried it too far. They experimented with the monochord and the lengths of vibrating strings and found mathematical laws governing the formation of harmonious notes. They then formulated a picture of the universe (Fig. 1). The Pythagorean universe is a geometrical figure made entirely of circles and spheres, with a spherical earth at the center.

Empedocles (*c.* 500–435 B.C.) had an idea of the essential stuff of nature and matter entirely different from the Ionians' conception of simple single substances or Pythagoras's mathematical laws. Matter, for him, had four elements: earth, water, air and fire. He regarded everything, including the human body, as made of these four elements in varying proportions and formed by friendship and discord—today we would say by attraction and repulsion.

Leucippus (*c.* 460 B.C.) and Democritus (*c.* 460–362 B.C.) thought that matter consists of little particles called atoms, each made of the same stuff and indestructible, but of different shapes. According to his idea, fire is made up of sharp, pointed atoms; water, of smooth atoms; but Democritus did not invent the modern atomic theory; he was merely guessing. John Dalton, who originated the modern theory about a century ago, based his concepts on actual experiments. The early Greek scientists, however, although their theories rested on far too little investigation, did formulate a mass of ideas upon which later men drew to express the results of careful observation and experimentation.

In medicine the ancient Greeks did something more scientific than in physics and astronomy. Hippocrates of Cos (*c.* 460–377 B.C.) founded a great medical school where, instead of merely speculating, men studied the human body in health and in disease and practiced the most careful clinical observation. The Hippocratic Collections describe different diseases with considerable accuracy. Hippocrates and his followers dissected animals to learn more about the way the body works and were trained and skilful surgeons. Greek medicine showed what would come when science, already freed from religion, could be freed from the Greek love of philosophical speculation.

To develop mathematics this love of speculation was just what was needed. Classical Greek mathematics centered around the solution of the three classical problems: With only a compass and ruler (1) to construct a square equal in area to a given circle; (2) to trisect any angle; (3) to construct a cube having twice the volume of a given cube. All three of these we now know to be impossible, but in the attempt to solve them the Greeks developed most of the geometry of Euclid (*c.* 330–275 B.C.).

As the search for the impossible here led to valuable results, so it did again when chemistry developed from the alchemists' desire to make gold from the baser metals.

Aristotle.—Perhaps the greatest name of ancient Greece is Aristotle (384–322 B.C.). He wanted to have one all-embracing system of knowledge that would include everything that man knows. He wrote on logic, government, metaphysics, poetry, drama and education; but his greatest work was as a scientist. He discovered the principles of static mechanics, was the first meteorologist and founded zoology. Alexander the Great, who had been his pupil, sent Aristotle vast sums of money to carry on research and on his expeditions collected for him thousands of specimens of plants, animals and fish, which Aristotle examined, dissected and described. In his books on natural history Aristotle mentions over 500 animals, on 50 of which he had performed detailed dissections. He recognized that whales are not fish but mammals; studied the development of the chick in the egg; and vivisected animals, trying to learn the purpose of respiration and the function of the blood.

Even more important, Aristotle made the first attempt to classify the thousands and thousands of animals of whose existence he knew. Classification of facts is the first step any scientist takes in finding the laws of the science; in dealing with the immense mass of biological data, classification is of even greater importance than in other sciences. It was Aristotle who first recognized this and took the first step toward accomplishing it.

Aristotle took over the astronomical system of the Pythagoreans as it had been improved by Eudoxus of Cnidus (*c.* 409–353 B.C.), improved it to take account of the latest observations and fitted it into his system of knowledge. He made a great many mistakes—some because he was so eager to have one complete system, some because he was a pioneer and some because he did not have sufficiently accurate and extensive data; but he certainly had the correct method: careful observation of facts, classification of data and the formation of laws based only upon what is actually observed. He said that the earth does not move in an orbit, as Philolaus of Crotona (*c.* 480 B.C.) had suggested it might, for if it did, we would observe a displacement of the fixed stars. No such displacement was observed, said Aristotle; therefore, the earth does not move.

This is perfectly sound theory. The only flaw was in the facts: Aristotle had no idea how far away the stars are and, hence, how minute any displacement would be and how difficult to observe. It was not until 1837 that instruments were sufficiently accurate for Friedrich Bessel (1784–1846) to observe this displacement. Aristotle was a sound scientist and carried his work as far as he could. In the Middle Ages lesser men accepted as absolute truth his mistakes along with his truths, and they forgot entirely the method by which Aristotle had discovered truth.

Alexandria and the Specialists.—The torch of science passed to Alexandria in Egypt upon the breakup of the Greek world at the death of Alexander the Great in 323 B.C. Ptolemy Philadelphus, king of Egypt in 285–247 B.C., son of one of Alexander's generals, founded the great Museum of Alexandria. This was not a museum in the modern sense but more like the Institute for Advanced Study at Princeton University—a place where scholars and scientists could live and carry on their studies. It was here that some of the most glorious names in science worked and brought about the greatest flowering of science known to that time. Why did the Alexandrian school produce such great names? Because, for the first time scientists had a chance to co-operate on a large scale and because they had records of what had been done by other scientists before their time. Ptolemy collected a great library at Alexandria; he decreed that one copy of every book or manuscript that came into his domain should be deposited in the library. This meant that past knowledge was available, that men could begin where their predecessors had left off. The scientists at Alexandria were also in constant communication with scientists in other parts of the Mediterranean world.

More important still, the Alexandrian scientists had lost interest in philosophical speculation. They were quite content to work patiently on the problems at hand rather than try to proclaim one law governing all nature.

Euclid's geometry has been studied in great detail for the last 2,000 years. With the exception of the Bible, no single book has been so widely studied or has had a greater influence on men's minds. Euclid did not discover all these theorems and propositions himself. He took most of them from the works of Pythagoras, Eudoxus and other mathematicians. Why, then, was Euclid a great man? What did he do of importance? He took the single theorems and groups of related theorems that other men had discovered and proved, and he fitted them into one unified system of geometry and showed that all could be logically derived from one set of postulates, axioms and definitions. This made the *Elements* seem to the men who came after Euclid that ideal of certainty toward which all knowledge should strive. The logical form of the *Elements* was so convincing, so certain, that it was taken to be the one absolute, proved truth. This was, however, a bad thing for science, for Euclid's method had been to find a set of principles and to deduce everything from them. What science needed was more looking at facts.

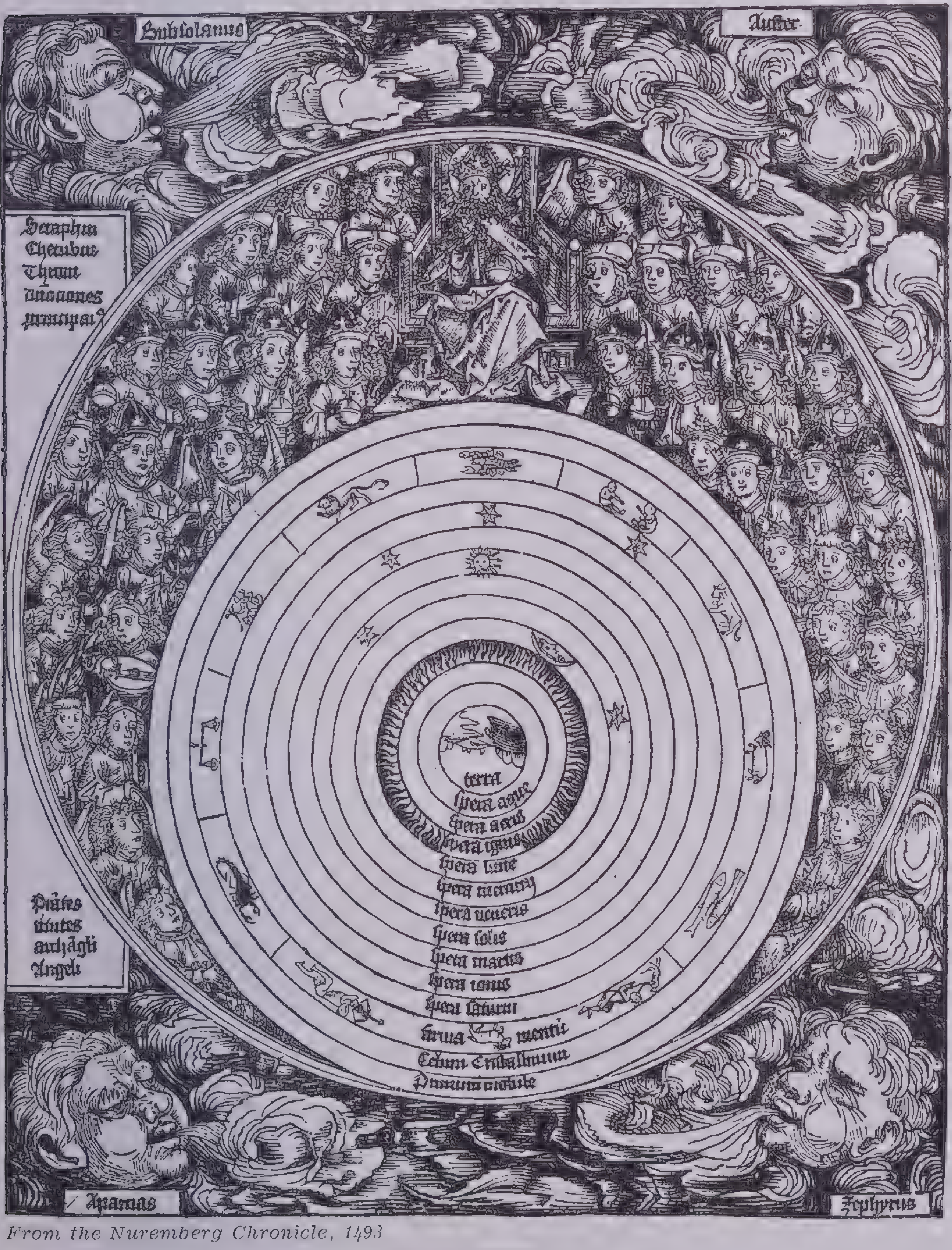
Apollonius of Perga (3rd century B.C.) applied Euclid's methods to the study of the geometry of ellipses, parabolas and hyperbolas. His book on these curves marks the highest level of Greek mathematics. Archimedes (*c.* 287–212 B.C.) applied Euclid's methods and Apollonius's results to Aristotle's mechanics, especially to the problem of finding the center of gravity of bodies and their properties when floating in a liquid. Archimedes was the first real engineer. The Babylonian and Egyptian engineers had built by rule of thumb; Archimedes applied to practical problems the discoveries that he made in studying mechanics.

At Alexandria medicine reached heights it was not again to attain in the West until the 16th century. Here human dissection was permitted, as well as vivisection of animals. Because of this, Herophilus of Chalcedon (*c.* 300 B.C.), the first human anatomist, was able to make observation and experience the sole basis of his work. He discovered the nervous system, its nature and function; dissected the eye and the liver; recognized the importance of the pulse in diagnosis; discovered the duodenum and investigated the nature and function of reproduction. Erasistratus of Ceos (3d century B.C.), called the father of physiology, was able to distinguish the nerves of sensation from those of motion, to recognize the function of the brain and to give the first accurate description of the heart.

Eratosthenes, Aristarchus, Hipparchus and Ptolemy were the great astronomers of Alexandria. Eratosthenes (*c.* 276–195 B.C.) made a very accurate measurement of the size of the earth, which showed that the world was much larger than men thought and that their own little part of it was less important than they had supposed. Aristarchus of Samos, who lived at Alexandria in 280–264 B.C., measured the distances and sizes of the sun and moon—not very accurately but so differently from his predecessors that he showed that even in the solar system the earth is a rather small planet.

Aristarchus refused to believe that the whole universe revolved around the tiny earth, as Aristotle had said, and he thought that the sun probably was the center of the whole universe. Unfortunately, this idea was lost sight of when the prestige of his successor, Hipparchus (*c.* 160–125 B.C.) overruled it.

At intervals in the history of science a scientist comes to the point where future developments depend on new and better observations of the facts. Then a man appears to meet that need, and shortly thereafter another man who uses these improved data to form a new synthesis, a completely new picture that includes the best of all that has gone before. Hipparchus and Ptolemy were just such a pair of men. Hipparchus improved the astronomical instruments, invented the astrolabe and invented trigonometry. Using all these, he was able to produce more and better data on the motions of the heavenly bodies. Ptolemy in the 2d century A.D. based his system of the world on the observations Hipparchus had made. In order to account for some of the celestial motions, he introduced the epicycle, a combination of several circles each moving around the circumference of the next inner one. His system of the universe remained the accepted astronomical doctrine until Copernicus changed it almost 17 centuries later.



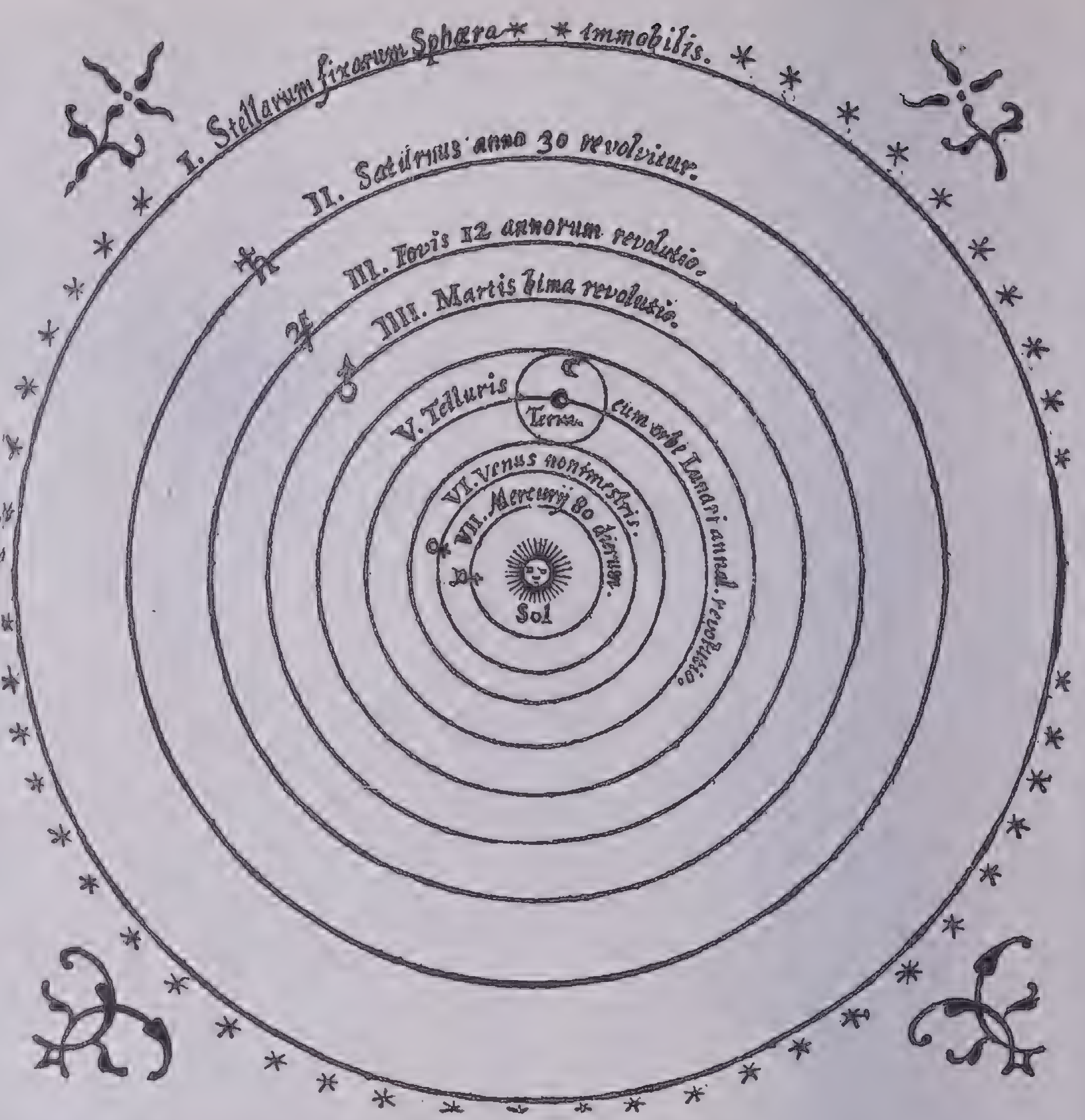
From the Nuremberg Chronicle, 1493

The Universe of Ptolemy

Ptolemy, who lived in the 2d century A.D., placed the earth (*terra*) in the center of the universe. He believed that the earth supported the elements, water, air and fire, and that around the elements revolved a series of epicycles, vast spherical zones or heavens, the smallest enclosing the earth. Each of the heavenly bodies was attached to one of the spheres and caused it to move around the earth at a uniform rate. The moon was attached to the innermost epicycle, and then came Mercury, Venus, the sun, Mars, Jupiter, Saturn and the fixed stars, eight in number. The ninth sphere produced the precession of the equinoxes, and the tenth, the *primum mobile,* supposedly revolved from east to west in 24 hours and carried the hours along with it. Until 1543, when Copernicus published his true system of the universe, people believed in the system of Ptolemy, as pictured here in a woodcut from the *Nuremberg Chronicle.* The artist who designed this old woodcut has added his conception of the heavenly universe: God on His throne surrounded by angels and archangels, seraphim and cherubim, and in the four corners the winds that blow on the earth: *Subsolanus,* the east wind; *Auster,* the south wind; *Aparcias,* the north wind, and *Zephyrus,* the west wind

The Romans and Decline in Science.—The great school at Alexandria declined from Ptolemy's time until about 400 A.D. No more were men interested in finding the secrets of nature or in studying mathematics. What little interest in science remained was confined to studying what the great scientists of the past had said; but fewer and fewer people concerned themselves with science. Why, when science seemed at last to be on the right track, did it wither and die? Because men were no longer interested in studying nature; they no longer sought truth in their reason but in certain books of supreme authority or in emotions that often led to wild orgies. Furthermore Alexandria had long before become part of the great Roman Empire. The Romans were never interested in science. They were a great people in government, in the law and in the construction of buildings, aqueducts and roads; but science and philosophy interested them not at all. What little they had was borrowed from the Greeks or was done by Greek scholars at Rome. From 300 A.D. on, this great empire was gradually collapsing, and Alexandria went down with it. The great names were the Greeks, Strabo (*c.* 63 B.C.–25 A.D.) in geography and Galen of Pergamum (130–200 A.D.) in medicine. For the Middle Ages, Galen became in medicine what Aristotle was in physics, what Ptolemy was in astronomy—the final, absolute truth, not to be questioned, and correct even if the simplest kind of observation showed it to be wrong!

Contributions of India and of the Arabs.—In India Aryabhatta (b. 476 A. D.) wrote a book on astronomy and trigonometry; Brahmagupta (628) discussed quadratic equations; Bhaskara (b. 1114) in his book on astronomy gave the first systematic discussion of the so-called Arabic


I. Stellarum fixarum Sphæra immobilis.
II. Saturnus anno 30 revolvitur.
III. Iovis 12 annorum revolutio.
IIII. Martis bima revolutio.
V. Telluris cum orbe Lunari annua revolutio.
Terra
VI. Venus nonimestris.
VII. Mercurij 80 dierum.
Sol

From Nicolaus Copernicus: Astronomiae Instaurata. Amsterdam, 1617

The Universe of Copernicus

Copernicus in his *De Revolutionibus Orbium Caelestium* (1543) placed the sun in the center of the universe. Thus he was the first to evolve a true system of astronomy

numerals. We call them Arabic because we got them from the Arabs, but the Arabs call them Indian because they got them from India. You will see the importance of the discovery of these numerals at once if you merely try to solve a problem in long division using Roman numerals. The Greek and Egyptian systems were even clumsier than the Roman. The Indian physicians, Charaka (1st century) and Suśruta (5th century) brought Indian surgery to a level that was not surpassed in the West until the 18th century.

What was happening in far-off China? There a very practical-minded people had developed an excellent calendar, some crude medicine, which was better in practice than in theory, and had begun (as early as the 4th century) the study of alchemy.

It was the Arabic world that fell heir to the great traditions of Greek and Alexandrian science. Under the unifying influence of Islam, a great culture grew up that stretched from the Moors in Spain all along the northern coast of Africa and into Persia. Under the great Caliph Harun-al-Rashid (who ruled in Bagdad from 786 to 809) and his successors science was encouraged and flourished. It has been frequently said that all the Arabs did was to preserve Greek science and to pass it on to the western world in the late Middle Ages, that they were not original. Yet they were the founders of chemistry; they developed the whole of trigonometry; they were the first to make a systematic study of drugs; and they made very real contributions to every science then known. Among their great scientists, perhaps the greatest of all was Geber (or Jabir) ibn Hayyan (b. 722), the founder of the theory of alchemy. Geber conceived that all substances are made of two elements: the sulphur principle and the mercury principle. He did not mean actual sulphur and actual mercury but rather two principles that resembled sulphur and mercury more than anything else. All substances are made of these two principles in varying proportions and in different degrees of purity. Metals are made up in the same way. Gold is made of pure sulphur principle and pure mercury principle combined in a perfectly harmonious proportion; silver has the two elements in pure form but not quite in a harmonious proportion; other metals, such as lead, are made of impure sulphur and mercury combined in less harmonious proportions. "Obviously," said Geber, "if I can purify the sulphur and mercury of lead and combine them in just the right proportion, I can make gold." We now know that this theory is quite mistaken and that the process is not quite so easy; but from this beginning the science of chemistry came. How could this be? Because on this theory the alchemists tried every possible combination of every conceivable substance in their search for gold. In this way they discovered for chemistry that mass of facts that is the beginning of science; just as the Babylonian priests with an equally mistaken purpose accumulated the facts on which astronomy could build. Secondly, the alchemists tried to purify everything to make it pure enough for gold.

From that work came the pure chemicals without which every chemical experiment would be so confused that no science of chemistry could ever have developed. The Arabic physician, Al-Razi (866–925), worked out the processes that the alchemists used to purify substances. He also made the first scientific classification of chemical substances. Al-Razi, also Avicenna, Albucasis, Avenzoar and Averroës—other noted Arabic physicians from the 9th through the 12th century—carried on the tradition of Hippocrates of Cos; each contributed his knowledge of how to cure men's ills. The first hospitals were founded by two Arabs, Emir Adad-adaula and Emir Nureddin in 977 and 1160 (or 1154), respectively.

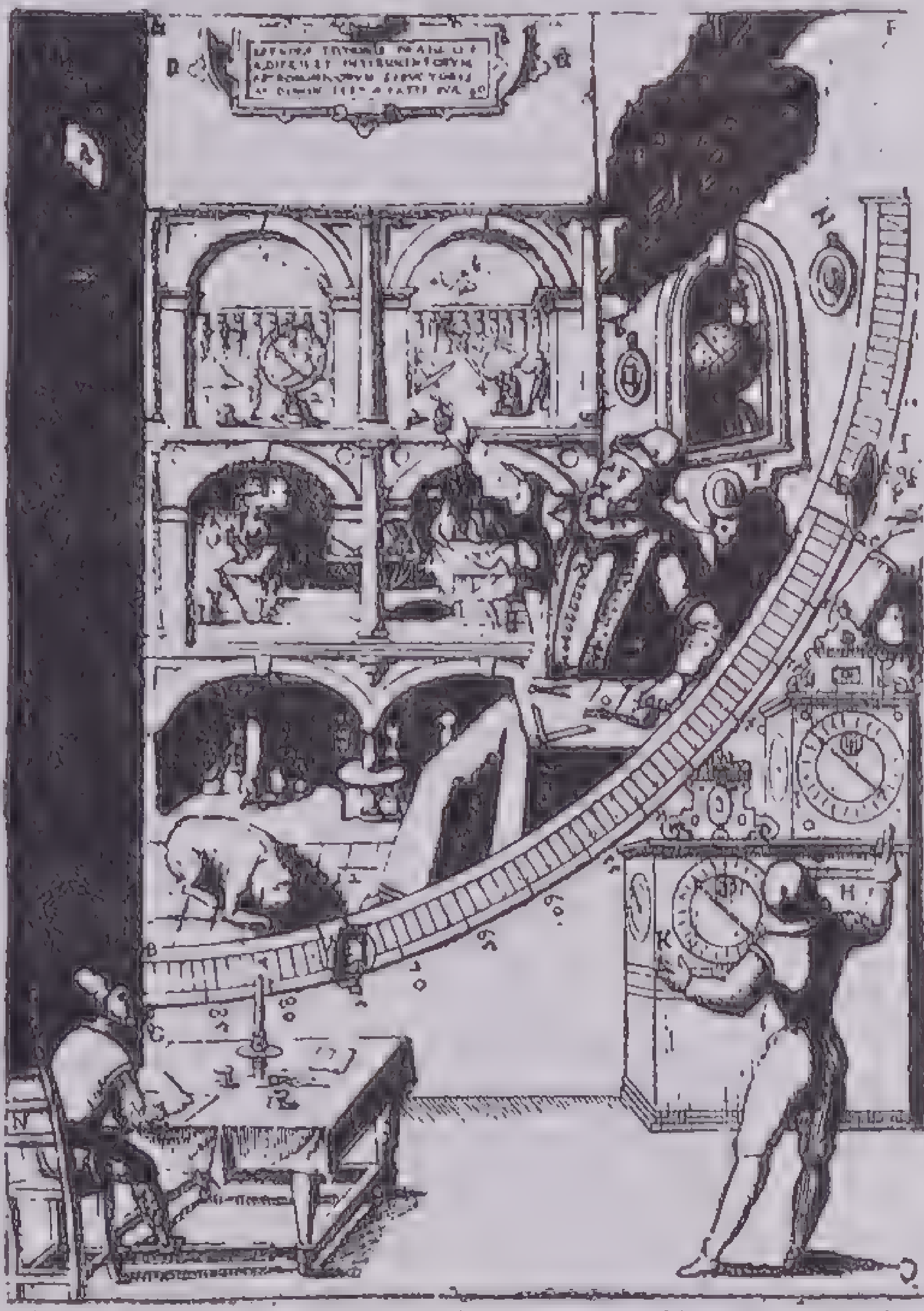
Science and the Renaissance.—What was happening to science in Europe? There men were too bound up in theology and the salvation of souls to take any interest in repairing the bodies that contained those souls, or to study the wonders of the world in which God had put man. Science became the handmaiden of theology, to be studied preferably not at all, but even with Roger Bacon (*c.* 1214–94) only insofar as it would help one to understand the Scriptures. In the Middle Ages men were not stupid—they were interested in something that seemed to them of greater importance than science.

In the period from the 14th to the 16th century all this changed. Why? First and most important of all, because from the 10th century men began to try to *understand* their religion, not simply to *believe* it. This brought a new emphasis on reason as a means of finding truth. Second, about 1250 they recovered the complete works of Aristotle. Shortly after this they came into contact with Arabic science, partly through the Crusades, partly through the Moors in Spain. Also a rebirth of medicine occurred; because the plague swept over Europe and killed one-third to one-half the population; and because the introduction of gunpowder revolutionized warfare. Men began to question the authority of the old systems and to look to nature for the answers to their questions.

Nicholas Copernicus (1473–1543) was one of the first of these questioners. The Ptolemaic system of the universe had by now become so complicated and cumbersome that it seemed to Copernicus that something fundamental had been overlooked. He tried all sorts of new combinations of the old ideas with no success and was finally led to put the sun at the center of the solar system rather than the earth as Ptolemy had done. With this assumption he was able to represent all the observed motions of the heavenly bodies and to answer the objections that previously had been raised against such a system. For over 30 years he worked on this idea until he was finally convinced that it is a more convenient way of looking at astronomical problems and that it represents the actual way in which the heavenly bodies move. He had to retain some of Ptolemy's epicycles, for he was not able to free himself from the old Pythagorean notion that the heavenly motions must be in circles or combinations of circles. In 1543 he published his book *De Revolutionibus Orbium Caelestium,* on the revolutions of heavenly orbs. That began the rebirth of astronomy and with it the renewal of man's efforts to understand nature. What is the great significance of Copernicus's work? It had glaring faults. It retained the old epicycles. But it did lay the foundation for Johannes Kepler's scheme of the universe, which was to permit Isaac Newton (1642–1727) to formulate laws that would tell us why all these motions take place. The Ptolemaic system had merely described the motions of the planets and the stars; Copernicus led the way to a *universal law of gravitation.*

Copernicus himself had pointed out that what was needed for further advance was more data and more nearly accurate data. This need was met by the Danish astronomer, Tycho Brahe (1546–1601), who set up on the island of Hoen near Copenhagen the finest observatory the world had yet seen. There for 20 years with the very finest instruments he could get Tycho made patient observations of the planets, especially of Mars and of the moon. One king of Denmark had paid for all this work. A new king quarreled with the astronomer, and Tycho left Denmark in 1599 and went to Prague. There he met a brilliant young mathematician, Johannes Kepler (1571–1630), who was already convinced of the truth of the Copernican doctrine. Kepler became Tycho's assistant, and on Tycho's death in 1601 he received all the tremendous mass of astronomical data that Tycho had so carefully collected. With the aid of these data it was not long before Kepler's extremely original and fertile mind had created a new conception of the solar universe, the one we have today. In his three laws Kepler gave up forever the circles of Ptolemy and Pythagoras. He proved that the planets move in ellipses with the sun at one focus. So much could now be explained with ease that was not understood before! The old astronomy was dead, the new was born!

Andreas Vesalius (1514–64), a Belgian, went to Paris in 1533 to study medicine. He found the professors reading from a book—usually Galen or perhaps Avicenna—while a demonstrator dissected a body below the lectern. Vesalius soon saw that statements in the book in no way corresponded with what the body showed before his very eyes. He left without a degree and went into the army as a surgeon, where he learned more medicine than was in Galen's book. Later he went to Padua, where the students performed their own dissections. Vesalius soon discovered that men did *not* have fewer ribs than have women, as the theologians had imagined from the story of the creation of Eve out of Adam's rib; that the jawbone was a single bone, and not in two parts as Galen had said; and that other errors had resulted from men's failure to examine the human body. In 1543, the year of Copernicus's great book on astronomy, Vesalius published his book, *De Fabrica Corporis Humani,* on the constitution of the human body; it marked the rebirth of medical science.



From W. T. Sedgwick and H. W. Tyler: A Short History of Science, by permission of The Macmillan Company, publishers

Tycho Brahe and His Instruments

The great arc is the mural quadrant, an instrument for measuring the altitudes of heavenly bodies, consisting of a graduated arc of 90°

In the actual practice of surgery Ambroise Paré (1517–90) was remarkably successful with wounds on the field of battle where he was unable to give the treatment with boiling elder oil that the books prescribed and where he had to use his own good sense. The study of anatomy and the practice of surgery also were reborn!

William Harvey (1578–1657) in his *De Motu Cordis et Sanguinis* (1628), announced his discovery of the circulation of the blood. By a careful examination of the heart in action, by experiments upon it and upon the veins, by calculating the amount of blood pumped through the heart, he showed that the blood follows a regular course throughout the body. The physicians could now be sure that medicine introduced in one part would spread through the whole body—the very basis of all internal medicine thus was established.

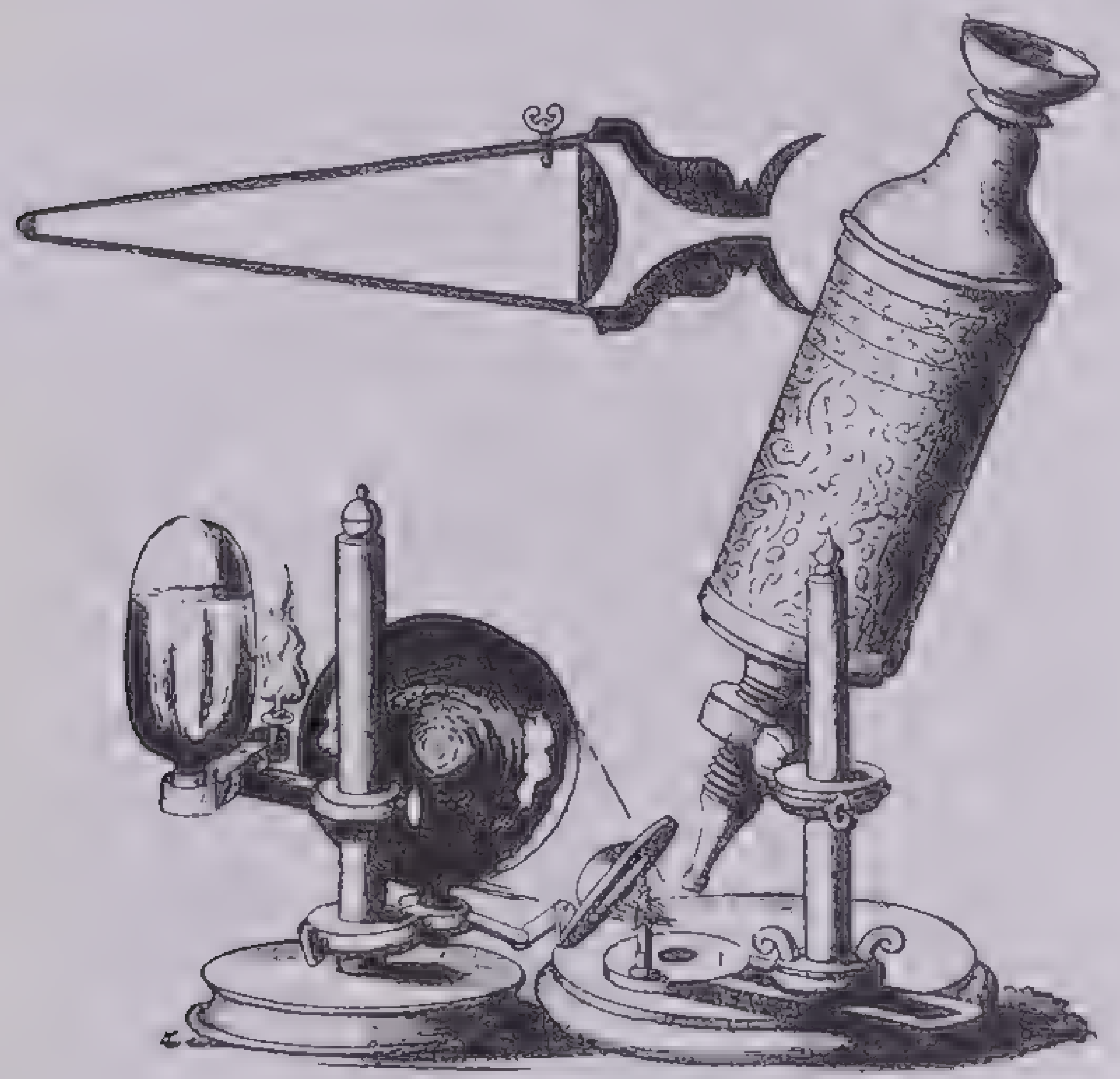
In physics and astronomy this period has the greatest single name in the history of science—Galileo Galilei (1564–1642). Newton's results were greater, but he lived in a day when science was in the saddle, as he himself said: "I stood on the shoulders of giants." Galileo, living in a time hostile to science and with nothing to build on, was the founder of the experimental method that was to make possible all that came after. As a young professor at Pisa he openly denied that certain of Aristotle's statements were true. The Aristotelians had said that a heavy body falls faster than a light body; a 100-pound weight would reach the ground before a 1-pound weight. For 2,000 years no one had thought to test this rule. Galileo tried it, probably from the Leaning Tower of Pisa; the two weights landed at the same time. When his colleagues heard of it there were mutterings and the cry, "Witchcraft!" Some looked up the matter in Aristotle, closed the book, calmly convinced that the weights had *not* landed at the same time. They saw no need to observe! Galileo continued his experiments with falling weights, allowed a ball to roll down an incline, took care to eliminate friction, measured the time it took to roll down, varied the weight and size of the ball and varied the angle of the incline. Soon he had the laws of falling bodies. The new physics had been born! Experiment had been shown to be the way to the discovery of scientific truth.

In 1609 Galileo heard of the invention of a telescope in Holland, but no details were available to him. With his knowledge of optics and of the eye he invented a telescope of a different type. When he turned the instrument to the heavens, astronomical discoveries fell out of the sky to him. He saw the mountains on the surface of the moon. Aristotle and Galileo's colleagues had "proved" the surfaces of all heavenly bodies to be smooth! Galileo turned his telescope to study Jupiter and saw the moons circling around that planet, visible proof of the Copernican theory that he had so long advocated.

Galileo had his troubles with the Church, exaggerated as they have since been; but his troubles with his own so-called scientific colleagues were even greater; certain of them undoubtedly instigated the Inquisition's treatment of him. But what a priceless heritage he left! He had founded the experimental method and had shown the importance of the use of new instruments in scientific discovery and the necessity for basing mathematical laws upon experimental observations—the very essence of science as we know it today.

Progress in the 17th and 18th Centuries.—The interest in astronomy and physics that followed the work of Galileo burst into full flower in the work of Isaac Newton (1642–1727). Newton's work was so great that he has become an almost legendary figure. The stories told about him—such as that he was led to his theory of gravitation by watching an apple fall in his garden—are not only untrue but they obscure Newton's very great reasoning powers. At Cambridge University, Newton very early showed himself to be a mathematical genius, and all his discoveries except in optics were primarily mathematical in their nature. Though he did not publish his *Philosophiae Naturalis Principia Mathematica* (Mathematical Principles of Natural Philosophy) until 1687, Newton himself tells us that more than 20 years earlier, when he was only 23 years old, he had discovered:

> First the binomial theorem, then the method of fluxions (the calculus) and began to think of gravity extending to the moon, and having found out how to estimate the force with which a globe, revolving within a sphere, presses the surface of the sphere, from Kepler's rule I deduced that the forces which keep the planets in their orb must be reciprocally as the squares of their distances from their centres; and thereby compared the force requisite to keep the moon in her orb with the force of gravity at the surface of the earth, and found them to answer pretty nearly. All this was in the two plague years of 1665 and 1666, for in those days I was in the prime of my age for invention and minded Mathematicks and Philosophy more than at any time since.



Robert Hooke's Compound Microscope

At the left is an oil flame fed by the oval reservoir. The large round object is a reflecting bowl which concentrates the light on the object to be examined. The cross-section view shows the two lenses in place. The drawing is from Hooke's *Micrographia* (1665), one of the first books to discuss the use of the microscope

What Newton had done was to find the mathematical method, the calculus, to open the door to modern physics. With it he showed that the laws of falling bodies that Galileo had discovered would apply to the whole universe in such a way as to agree with Kepler's laws.

In 1664 by means of a few glass prisms and a series of simple experiments, Newton showed that white light is really a combination of the colored light of the spectrum and that light travels in straight lines. From these results he invented a new type of reflecting telescope.

What was happening to chemistry? Paracelsus (1493–1541) had added a third element, salt, to the alchemists' sulphur and mercury. The search for transmutation of the elements had given way to the study of chemicals for medical purposes and to the study of chemistry for its own sake. Alchemy had become chemistry!

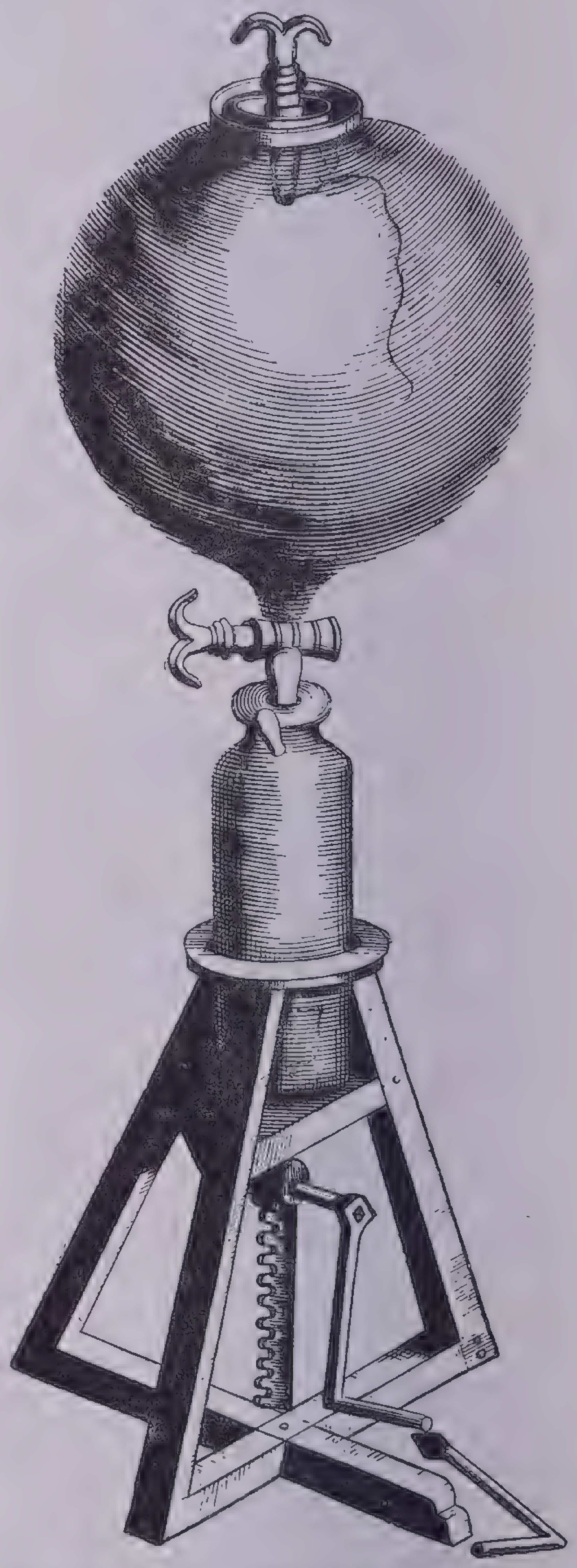
Robert Boyle (1627–91) had shown the value of experiment in studying the physical properties of gases. After the invention of the barometer by Evangelista Toricelli (1608–47), Blaise Pascal (1623–62) and Otto von Guericke (1602–86) experimented on the pressure of the atmosphere. Boyle and his assistant Robert Hooke (1635–1703) built an improved air pump with which they were able to produce a high vacuum. With this, Boyle performed experiments that soon enabled him to find the weight of the atmosphere. Further experiments gave him the relation between the volume and pressure of a gas, and established the rule that bears his name—Boyle's law. Some of his other work, however, had caused a loss of faith in the three-element theory, and it was replaced by the phlogiston theory of Johann Joachim Becher (1635–82) and Georg Stahl (1660–1734). This theory held that all metals are made up of a calx (or ash) plus phlogiston, and that when the metal is heated the phlogiston is driven off and the calx is left. By means of this theory, chemists were able to give a satisfactory explanation of many chemical facts, and it led to two things: a more detailed study of the nature of gases and their reactions with other substances, and renewed efforts to decide just what a chemical element is.

Joseph Black (1728–99) investigated carbon dioxide and the nature of alkalis. Joseph Priestley (1733–1804) discovered oxygen and its properties, which was very important, for what the phlogistonist called a metal's "giving off phlogiston" we now call oxidation, thanks to Priestley's work on oxygen. Karl Scheele (1742–86) discovered chlorine and studied its properties. Henry Cavendish (1731–1810) discovered hydrogen and showed that it burned in oxygen to form water. Most of these men, whose work in studying these gases led to the downfall of the phlogiston theory, themselves still believed in that theory. When Antoine Laurent Lavoisier (1743–94) overthrew the theory singlehanded, Black and Cavendish gave up phlogiston at once, as good scientists should, but some of the others refused to believe what Lavoisier's experiments showed clearly to be the truth.

Lavoisier was thus the founder of modern chemistry. Not only did he overthrow the phlogiston theory but he introduced the use of the balance into chemistry, which led to a chemistry of mathematical laws instead of a collection of chemical facts held together by speculations. He also revised the terminology of chemistry, by eliminating the confusion of five or six different names for each substance and using names that indicate the actual nature of the compound.

Lavoisier's experiments on mercury are classic: In a known volume of air he heated four ounces of pure mercury until it was entirely reduced to a calx. The air had then lost 7 cubic inches of its volume, and Lavoisier had 45 grams of oxide of mercury. The air that was left would not support combustion, but on heating the oxide of mercury he was able to collect 7 cubic inches of a gas that proved to be oxygen. Obviously this gas had been *absorbed* when the mercury was first heated, and if phlogiston was *given off*, it had a *negative weight!*

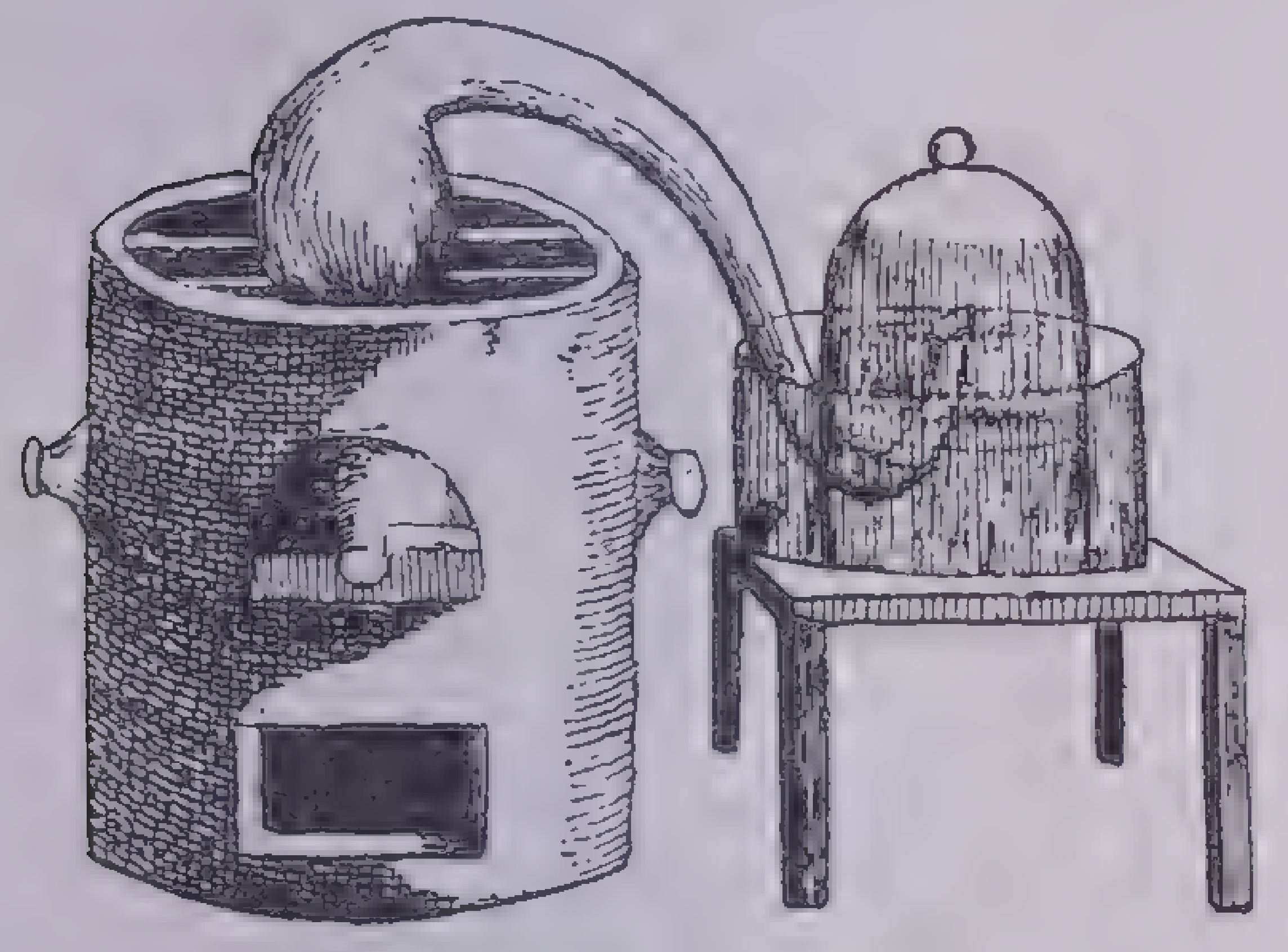
In addition to investigating atmospheric pressure, Otto von Guericke experimented with another force that was to prove of great importance



From the Works of Robert Boyle, London, 1744

Robert Boyle's Air Pump

The spherical chamber is to be exhausted of air. The bottle-shaped device below is a cylinder, open at the bottom, in which a close-fitting plunger works vertically. The plunger, operated by a hand crank, pulls air down from the upper chamber. On the upstroke the air in the cylinder is let out through the down-pointing stem on the upper rim of the cylinder. The exhausted chamber can be sealed off by the stopcocks to mankind—*electricity*. The earliest workers had only static electricity, but with it Francis Hawksbee (d. 1713), Stephen Gray (1696–1736) and Cisternay Dufay (1698–1739) discovered the laws of electrical attraction and repulsion, conduction and induction. These early experimenters were handicapped because they were able to produce only a limited charge of electricity. E. G. Von Kleist invented the Leyden jar (1745), and with a series of these jars Benjamin Franklin (1706–90) explained lightning and discovered the nature of positive and negative charges and the laws of electrical discharge. Luigi Galvani (1737–98) discovered galvanic electricity (named in his honor); Alessandro Volta (1745–1827) invented the voltaic pile (named in his honor), the first electrical battery. This provided a source of electrical current that could be controlled to give a continuous discharge, whereas the static machines could not. From this invention modern electricity began. In 1800 William Nicholson and Sir Anthony Carlisle tried the effect of passing this current through solutions, and electrochemistry was born. Sir Humphry Davy (1778–1829) invented an improved and a more powerful battery that would give him an electric arc; this led to the arc lamp and to more important discoveries. With it Davy was able to discover sodium, potassium, calcium, strontium and magnesium.



Lavoisier's Apparatus

With this equipment, Lavoisier demonstrated the absorption of oxygen in the burning process. His materials were heated in the long-necked flask that rests on the furnace. A measured quantity of air was trapped over mercury in the inverted bell jar

While performing a lecture experiment, Hans Christian Oersted (1777–1857) noticed that an electric current passing through a wire deflected a nearby compass needle. He immediately performed other experiments that showed the connection between electricity and magnetism. André Marie Ampère (1775–1836) heard of these experiments at a meeting of the French Academy on September 11, 1820, repeated all Oersted's experiments and returned a week later with the whole theory of elementary electromagnetic phenomena. Joseph Henry (1797–1878) discovered all this independently, as well as the phenomenon of self-induction. (The ampere and the henry, units in electrical measurement, are named for these scientists.) Henry and Franklin were the first great American scientists.

In series of brilliant experiments, Michael Faraday (1791–1867) discovered the laws of electromagnetic induction upon which all motors, dynamos, transformers and in fact our whole electrical world depend. Georg Simon Ohm (1787–1854) studied the resistance of wires to electrical currents and discovered Ohm's law, upon which all modern electrical computations are based. Charles Coulomb (1736–1806) had already discovered the laws of electric condensers. Enough was known of the character of electrical circuits so that, when Heinrich Hertz (1857–94) discovered electromagnetic waves, Oliver Lodge (1851–   ), Guglielmo Marconi (1874–1937), Sir Ambrose Fleming (1849–   ) and Lee De Forest (1873–   ) could make the radio a part of modern civilization.

Beginning of Modern Biology.—During the 16th century, the age of exploration, a number of explorers took biologists with them to the new lands that were being discovered. Men such as Garcia del Huerto (1490–1570), Nicholas Monardes (1493–1588) and Prospero Alpini (1553–1617) brought back specimens of new and strange plants and animals and a great mass of data concerning them. Some of the plants, such as the potato, the turnip, the agave and tobacco, changed the economic and social life of Europe; all of them aroused interest in biology. Wealthy men collected specimens in museums and supported scientific journals and societies, through which scientists were able to exchange ideas and discoveries. The work of the biologists was further augmented by the invention of the microscope. Biological discoveries multiplied under the microscope as had knowledge of astronomical facts from the use of Galileo's telescope. Marcello Malpighi (1628–94) first saw the capillary vessels that Harvey had shown must exist; and Malpighi studied the anatomy of the silk worm and also discovered the cell structure of plants. Nehemiah Grew (1641–1712) studied the anatomy of plants and discovered their sexual organs and method of reproduction. Jan Swammerdam (1637–80), though mildly insane, in his lucid moments made such minute dissections of insects, especially of the bee, and drew such marvelous pictures of what he saw through his microscope that neither has since been equaled. Anton van Leeuwenhoek (1632–1723) put many specimens under lenses of his own manufacture; he founded histology, discovered parthenogenesis and was the first to see the spermatozoa and probably the first (in 1683) to see bacteria. In about 40 years these few men opened to the biologist an entirely new world, a world whose infinite complexity led to so many discoveries that the biologist was swamped with data.

As might be expected, the men who followed devoted their attention to attempts to put in order and classify all these facts so that something might be done with them. Attempts at this had already been made by Matthias de Lobel (1538–1616), Andreas Cesalpino (1519–1603), Gaspar Bauhin (1560–1624) and Joachim Jung (1587–1657), but none of them was really successful, though each made his contribution. John Ray (1627–1705) and Carolus Linnaeus (1707–78) were the chief founders of systematic biology. In his *Historia Generalis Plantarum,* Ray described all that was then known of the structure, physiology, distribution and habits of 18,600 plants, according to a classification based primarily on the fruit. Much of this classification is still retained. Later he published the first truly systematic classification of animals and explained the true nature of fossils.

Joseph Pitton de Tournefort (1656–1708) gave classic descriptions of the genera and used a method of describing plants that led to binomial nomenclature (system of two names, one for the genus and the other for the species) proposed and used by Linnaeus, who in his *Systema Naturae* (1735) laid the foundation for modern biology. The Linnaeus system of naming plants, animals, minerals and diseases is still in use, and his book is still referred to. The verbose descriptions of plants and animals common before him were replaced by a precise, orderly and concise description that has been followed ever since. Linnaeus established 20 classes of plants mainly according to the arrangement of their stamens and pistils; and he subdivided these classes into orders according to characteristics of the fruit.

Many early biologists collected mineral specimens. Some had speculated in a vague sort of way about the origin of the rock formations, a few had wondered about the fossils frequently found in rock strata, and nearly all of them were puzzled by the question: "Where did all these complicated plants and animals of so many different varieties come from?" Search for the answers to these three questions led to the founding of geology, comparative anatomy and to the theory of evolution.

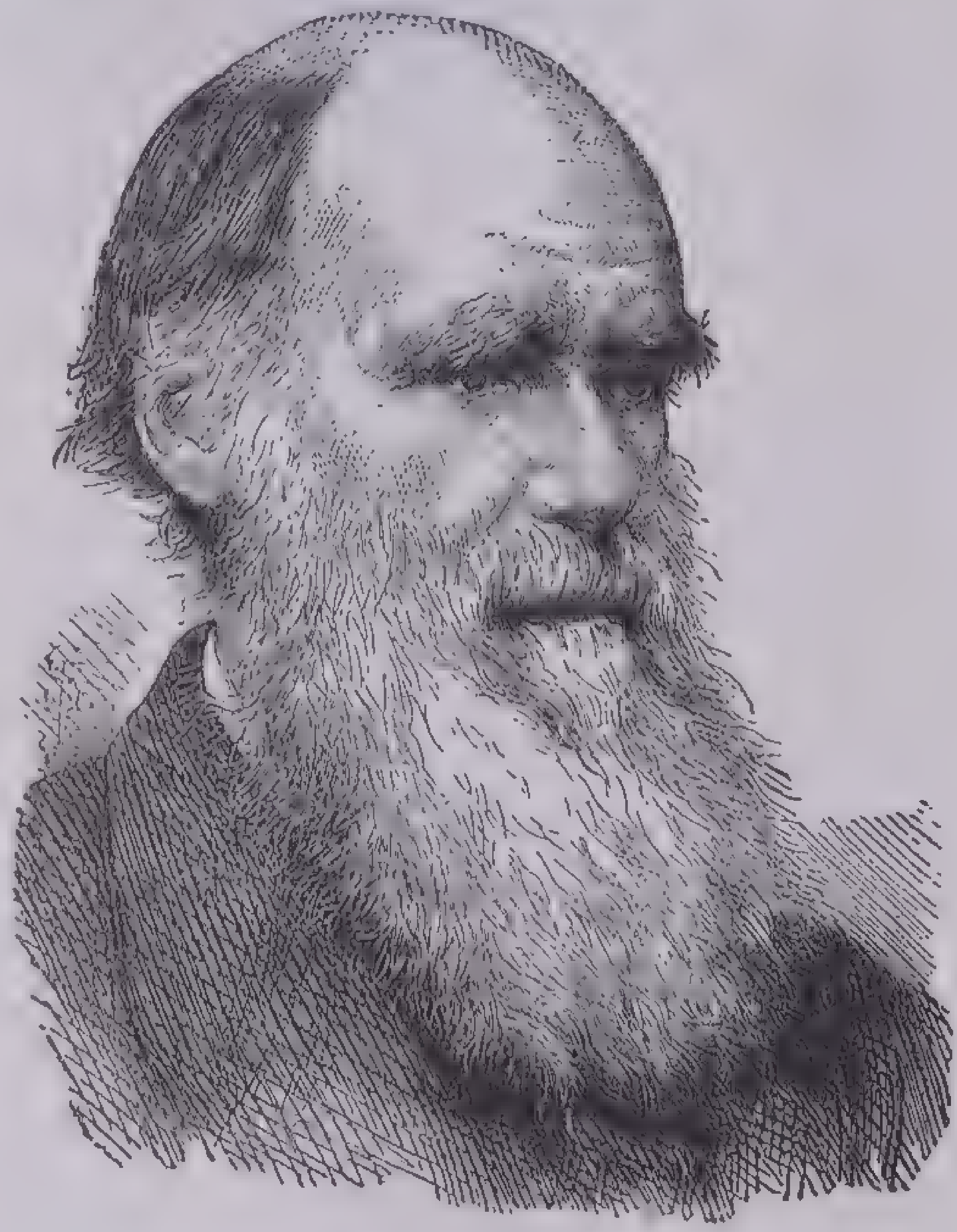
Evolution.—In his *Philosophie Zoologique* (1809), Jean Baptiste Lamarck (1744–1829) introduced a classification of the species according to a "ladder of nature," which ascended from the simplest to the more complex animals in a continuous series. Lamarck thought that changes might be brought about by environment and inheritance of acquired character. James Hutton (1726–97) published his *Theory of the Origin of the Earth* in 1785. At the time it created little stir but showed so conclusively that the earth was *very* much older than had been supposed that thereafter men had to think in terms of eons in considering geology. In this book he also ennunciated the doctrine of uniformitarianism, stating that the present character of rocks and the earth's surface was brought about by forces still in constant operation. Georges Cuvier (1769–1832) studied fossils and was able to date with some accuracy the various geological strata. He also recognized a continuous development from layer to layer of certain fossils. Charles Lyell (1797–1875) by the most careful and patient study, worked out the precise details of Cuvier and Hutton's work.

These men had provided the basis for Charles Darwin (1809–82) to begin his great work on evolution. Hutton had demonstrated the enormously long time that life had been on the earth—and evolution was possible only through a long period. Cuvier's fossils showed a clear relationship among different types that might be explained by evolution. Darwin himself studied the geographic distribution of animals. Richard Owen (1804–92) gave evidence from the study of comparative anatomy; Casper Friedrich Wolff (1733–94) and Karl Ernst von Baer (1792–1876), from embryology. All pointed to evolution. Darwin saw man bring about an artificial evolution in breeding domestic animals, and he asked, "What brings it about in nature?" Thomas Malthus (1766–1934) in his *Essay on Population* provided Darwin with the clue. Malthus says: "Population increases faster than the food supply; eventually there comes a struggle to get the food, in which the fittest will survive." We now know that Malthus was wrong, but his idea of the survival of the fittest was what Darwin needed. In June of 1842 Darwin formulated a short outline of his assumptions and then set patiently to work examining all the evidence, especially that which might tend to show his theory to be incorrect. Sixteen years later he received a letter from his friend A. R. Wallace that contained exactly the same ideas. Darwin was then reluctant to publish his own findings. Finally in 1858 both papers were published simultaneously. Darwin's *Origin of Species* appeared in 1859. It created a furor that has not yet died down.

There were, however, certain problems yet to be considered. Evolution was accepted, but the mechanism by which it takes place—natural selection—had to be reconsidered. Darwin thought that the advantages would be inherited; August Weismann (1834–1914) destroyed Lamarckism by showing that this was impossible as explained by either Lamarck or Darwin and advanced a theory of the mechanism of evolution that helped to shape the modern doctrine. Darwin had said that the variations in the species would be small; they obviously often are not. The Dutchman Hugo De Vries (1848–1935); the Englishman William Bateson (1861–1926) and the Dane W. L. Johannsen (1857–1927) explained these large variations in terms of the mutation theory.

Thirty-five years before, however, working with hybrid peas in his Moravian monastery garden, Gregor Mendel (1822–84) had hit upon the solution, but had published his results in an obscure journal that had been completely overlooked or forgotten. In 1900 De Vries and his associates came upon Mendel's work. At once, Theodor Boveri, T. H. Montgomery and W. E. Castle took up the Mendelian theory to give us the modern theory of heredity.

Physiology and Psychology.—At the dawn of the 19th century the study of the tissues was revived by Marie François Bichat (1771–1802) and led to modern histology. Matthias Schleiden (1804–81) studied the nature and structure of plant cells, and Theodor Schwann (1810–82), with the improved microscope, studied the cells in animal tissues. Their investigations were continued by Rudolf Virchow (1821–1902), Otto Bütschli (1848–1920), Alexis Carrel (1873–) and many others. The study of physiology, especially of the nervous system, also was yielding a rich harvest in the laboratories of Johannes Peter Müller (1810–58), to whom we owe the law of specific nerve energies; of Carl Ludwig (1816–95), who introduced the mechanistic explanations of physics and chemistry into biology; and of Claude Bernard (1813–78), who studied the physiology of the digestive system.


Charles Darwin

The work of the physiologists on the nervous system led to establishing psychology as a real science instead of a mere mass of speculations about the mind and emotions. This began with C. Lloyd Morgan (1852–1936) and was carried on by Jacques Loeb (1859–1924) and Herbert S. Jennings (1868–). All tried to explain psychological phenomena in terms of physics, chemistry and biology. Ivan Pavlov (1849–1936) applied these methods to the study of reflex actions.

Chemistry and Physics.—In chemistry Claude Louis Berthollet (1748–1822) discovered the law of mass action, but poor experimental technique had led him to believe that chemical compounds can unite in almost any proportions. Berthollet's *Essai de Statique Chimique* (1799), stimulated interest in the problem, and the investigations of Louis Joseph Proust (1754–1826), Jeremias Richter (1762–1807) and G. E. Fischer soon established the law of definite proportions. From the study of this law, from the studies on gases made by Henry Cavendish, Joseph Priestley and Antoine Lavoisier and from some evidence for the law of multiple proportions, John Dalton (1766–1844) arrived at his atomic theory that matter is made up of particles, each indestructible, which combine in various ways and under certain restrictions to form all the chemical substances. With this theory Dalton was able to explain the law of definite proportions and many other chemical facts. The new theory gave additional impetus to the study of the weights in chemical reactions, and the law of multiple proportions was fully demonstrated by Jöns Jacob Berzelius (1779–1848). Dalton also invented a system of symbolic representation of atoms and compounds. This rather clumsy system was soon replaced by the Berzelius system.

Dalton's theory was not only important in itself but the ease with which many experimental results could be explained by it led to further investigation of the combining properties of matter. Joseph Gay-Lussac (1778–1850) discovered the law of chemical combination by volume that bears his name; and Amadeo Avogadro (1776–1856) announced his hypothesis that equal volumes of gases contain the same number of molecules.

The inaccuracies in Dalton's values for the atomic and combining weights occasioned demand for further research. Berzelius set himself the task of determining, with the greatest accuracy possible, the combining weights of all the elements. Between 1807 and 1818 he determined this for 43 elements, and in the process created quantitative analysis. Friedrich Wöhler (1800–82), Justus von Liebig (1803–73), Jean Dumas (1800–84) and Berzelius established organic chemistry. The hypothesis (1816) of William Prout (1785–1850) that atomic weights are as whole numbers was the beginning of investigations leading to the periodic table. Jean Servais Stas's (1813–91) improvements in the determinations of the atomic weights, Johann Döbereiner's triads of 1829, the chemical series of Max von Pettenkoffer (1818–1901) and Dumas, the helix (1863) of A. E. B. de Chancourtois, John A. R. Newlands's (1838–98) law of octaves (1865), Lothar Meyer's (1830–95) atomic volume curve—all these pointed to the existence of some series in which the elements might be arranged to give regularly recurring chemical characteristics.

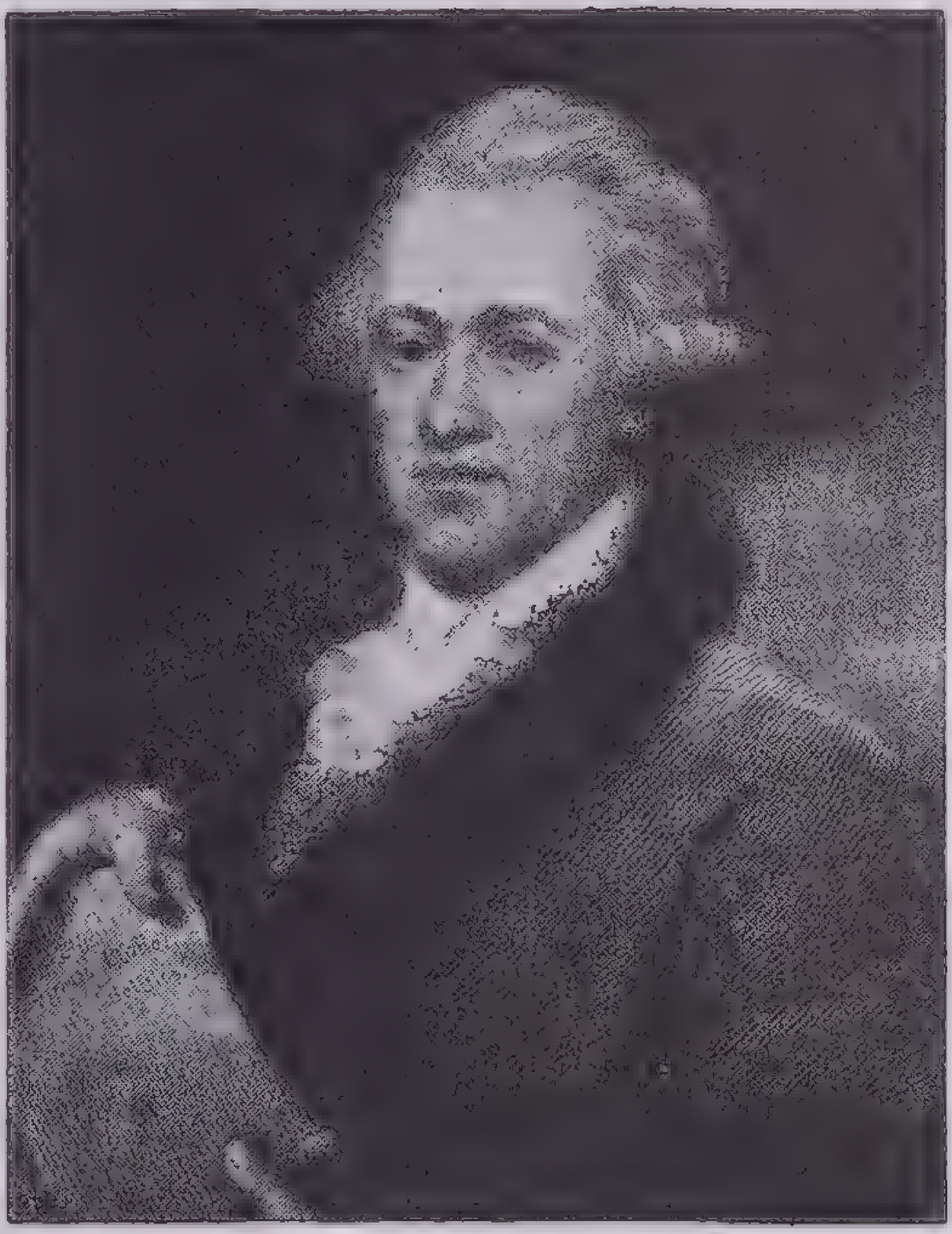
All this work was fulfilled in the periodic table of Dmitri Ivanovich Mendelyeev (1834–1907). After a number of unsuccessful attempts, he succeeded in arranging the elements into the system now familiar to all students of chemistry. It was published in *The Principles of Chemistry* (1869) to which chemists still go for brilliant suggestions and for inspiration. Mendelyeev's work was brilliantly supplemented in 1913 by Henry Moseley (1887–1915) who developed the table of atomic numbers.

The new branch, physical chemistry, began its rise with Rudolf Clausius (1822–88), and was carried forward by Wilhelm Ostwald (1853–1932), Jacobus van't Hoff (1852–1911) and Svante August Arrhenius (1859–1927). Radioactivity and X rays began with the work of Sir William Crookes (1832–1919), Antoine Becquerel (1852–1908), Ernest Rutherford (1871–1937) and the Curies—Pierre (1859–1906) and his wife, Marie (1867–1934).

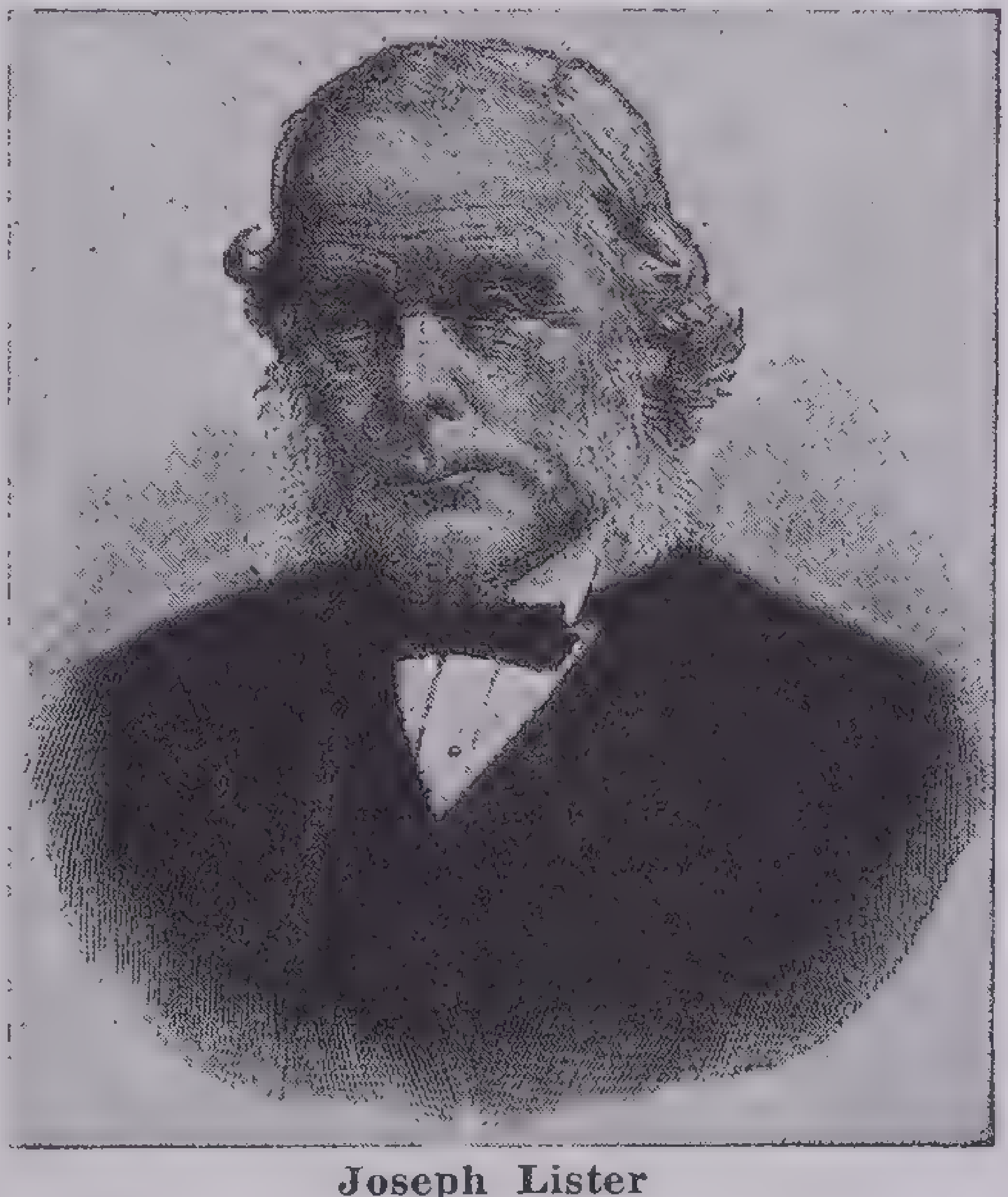
The 18th-century physicists thought of heat as a substance; in Lavoisier's *Traité élémentaire de Chimie* it was listed as an element. Count Rumford (1753–1814), by experiments suggested when he watched the heat given off in boring cannon, showed that heat is not a substance but a mode of motion, a form of energy. Rumford's methods were open to some criticism, but Sir Humphrey Davy rubbed two blocks of ice together in a vacuum; the ice melted; and here was conclusive proof that Rumford was right. This was extended by Nicolas Carnot (1796–1832) in his researches on heat; Julius Robert Mayer (1814–78) announced the law of conservation of energy in 1842; and finally in June, 1847, James Joule (1818–89) published the results of the studies that led him to the determination of the mechanical equivalent of heat. The further study of heat and its properties by William Thomson, Lord Kelvin (1824–1907), gave the world thermodynamics and the absolute temperature scale.

In the same way, the wave theory was to demolish the 18th-century notion that light is a material substance. Newton's corpuscular theory had assumed that light consists of little particles that impinge upon our eyes. With this theory, however, he had a great deal of trouble to explain the interference phenomenon known as Newton's Rings. If a thin lens is placed on a flat reflecting surface, these concentric rings, alternately light and dark, may be easily seen. Thomas Young (1773–1829) showed conclusively that a theory assuming that light is a series of waves in the ether would explain all the facts of optics and even account for the results of Isaac Newton's studies on the composite nature of white light. Young was unable to convince his contemporaries, and the idea lapsed until it was taken up again by Dominique Arago (1786–1853) and Augustin Fresnel (1788–1827). Fresnel repeated Young's experiments and carried the work even further. Through his work the wave theory of light was accepted. From this grew the work of Gustav Kirchhoff (1824–87), William Wollaston (1766–1828) and Joseph von Fraunhofer (1787–1826) on the spectroscope and the spectroscopic analysis of the structure of the atom.

Astronomy and Medicine.—From the time of Newton astronomy had continued to progress. Theoretical mechanics had so far advanced at the hands of Jean d'Alembert (1717–83) and Joseph Lagrange (1736–1813) that Pierre Laplace (1749–1827) was able to apply their results to the computation of the orbits of celestial bodies; and in 1840 John Couch Adams (1819–92) and Urbain Leverrier (1811–77) could compute the orbit of Neptune before the planet had even been observed. The construction of larger and improved telescopes by James Bradley (1693–1762), Sir William Herschel (1738–1822) and many others led to the discovery of the planet Uranus and the notion that our whole solar system is only a small portion of a rather unimportant nebula among a host of other nebulae. The discovery of the enormous distances of the universe began in 1837, when Friedrich Bessel, by sighting on the fixed star 61 Cygni from opposite ends of the earth's orbit, found it to be 657,700 times as far from the sun as the sun is from the earth.



Sir William Herschel



Joseph Lister

Medicine in the 19th century became a science in the true sense of the word, for it then became experimental. Edward Jenner (1749–1823) discovered vaccination and began the investigation of bacterial phenomena in medicine. Louis Pasteur (1822–95) was soon engaged in his great work on the bacteriological causes of disease. Robert Koch (1843–1910) developed the technique by which bacteria could be studied in the laboratory, and explained the immunity that Pasteur had found. These great discoveries were applied to surgery by Joseph Lister (1827–1912). William T. G. Morton (1819–68) had introduced the use of sulphuric ether for anesthesia; the surgeon could then operate without the necessity for haste that previously had retarded the development of surgical technique. Lister's use of antiseptics and the later practice of aseptic surgery went a long way toward eliminating from surgical records the inevitable laconic remark: "The patient died on the —th day."

Twentieth-Century Science.—We are too near the scientific discoveries of our own time to see them in perspective, but they seem revolutionary in their tendencies. Much that the scientist in any special field believed implicitly 40 or 50 years ago has gone into the discard—new methods of investigation have set up new theories and knocked down the old.

In chemistry young H. G. J. Moseley, with his discovery of atomic numbers, supplemented the 19th-century labors of the Russian, Mendelyeev, on atomic weights. The Curies, husband and wife, in 1905 isolated a few grains of radium, bringing to fulfilment the labors of Roentgen and Becquerel. Two Englishmen, Soddy and Aston, established the doctrine of isotopes: that each of many elements is made up of a number of substances, chemically very similar but physically different, each having an integral atomic weight. In America, Urey of Columbia and others isolated heavy hydrogen, heavy nitrogen and other elements in their rare isotopes with unpredictable possibilities for practical benefits, especially in the study of the chemistry of the human body. Modern chemical science has transmuted the elements—more important, has learned that radioactivity is constantly transmuting the elements. The electron theory, the great discovery of J. J. Thomson, relates all chemical reactions to electricity and breaks up the chemical atom into electrical charges.

Astronomy, too, has been made over—not merely by the discovery of a new planet, Pluto, in 1930, as a result of predictions made in 1905 by Percival Lowell, but by Albert Einstein's theory of relativity (1905 and 1915), which modifies Newton's laws of gravitation and questions whether our world really is as simple as Euclid thought. The 20th century has brought equally great changes in biology and in medicine—changes more far-reaching for the ordinary man than we can readily conceive.

The history of science from Galileo's time is the history of the application of the experimental method to all the sciences. Not only has it been applied to physics, chemistry, biology and geology but it has given rise to the new sciences of anthropology, geography and psychology and has become increasingly influential in economics, sociology and political science. The harvest has been rich; this seed is producing more and more fruitful results every day, but much remains to be done, many worlds remain to be explored.

We have not yet found answers to many of the most fundamental questions. Can gravitational and electromagnetic phenomena all be embraced in one great law? What is the nature of the phenomenon called life? What is the relation between mind and body? What is the ultimate nature of matter? We have not yet answered the question first asked by Thales 2,500 years ago, though we have a better idea how to go about finding an answer. Much remains to be done in the details of science and in its application to human problems and human welfare; but the answers to these great fundamental questions await another Galileo, another Lavoisier, another Newton.

PHYSICS

Physics deals with the phenomena of matter and energy and their relations to each other. Physics leaves to astronomy the phenomena of the heavenly bodies; to chemistry the study of particular types of matter and chemical changes; to geology investigating the earth's structure and the transformations of its surface features; and to biology the energy manifestations of living things. All these branches of science, however, as we classify them today, are so interlocked that it is impossible to set up rigid barriers between them.

The scope of physics is more readily seen by an examination of the five major divisions commonly taught in secondary schools and colleges. These are *mechanics, heat* (thermotics), *light* (optics), *sound* (acoustics) and *electricity and magnetism.* A sixth division, *invisible radiations,* includes the production of X rays and the transmission of radio waves.

Mechanics treats of forces and their effects on matter. It is at the foundation of such engineering projects as bridge and tunnel building, boat making, transportation on earth and in the air, power-plant and dam construction and hydroelectric development.

Thermotics deals with temperatures, with changes in size through expansion, changes in the state of matter due to temperature and with the transmission and use of heat. Some knowledge of heat is essential in the use of most mechanical contrivances and is required for the planning of heat engines, heating devices and refrigerating plants.

Light and sound are considered on the basis of their physical properties, the principles governing their production and transmission through the air and other mediums and their actual interpretation through the eye and ear. In the field of optics, this knowledge is applied to the manufacture of powerful lenses for microscopes and telescopes, the specialized lenses of photography and glasses for the correction of faulty vision. Unknown substances may be identified by analyzing the light emitted by them (spectroanalysis); thus astronomers can determine the composition of distant stars. The principles of acoustics are used in the operation of telephones, in designing theaters and concert halls for the best utilization of sound, in making amplifiers and microphones and in soundproofing walls.

As *electricity* and *magnetism* are not apprehended by our senses in the same way as sound, light and heat, they were not studied so early or utilized so soon in human history. Now electricity and magnetism have made possible most of the labor-saving and pleasure-giving devices of the present age. Electromagnetism is the Aladdin's lamp of the modern world. The application of electrical laws to machines of various kinds is one of the great triumphs of physics.

Many of the most recent and important advances in physical science have developed from research on invisible *radiations.* They involve radioactivity, X rays, radio broadcasting, the discovery and implications of cosmic rays, photoelectric effects, television and other related phenomena. It is apparent, then, that physics deals with the utilization of natural forces for man's comfort and enjoyment and for the enrichment of his life; that its study has practical values that none of us can afford to overlook.

BASIC DEFINITIONS AND FACTS

Matter, Energy, the Ether.—Matter and energy are ultimate or fundamental elements in physics; some physicists add a third, the ether. Conventionally, matter is defined as anything that occupies space, but it is better described by its properties. Energy is the capacity possessed by matter for doing work, work being defined as the application of force to a body. A dynamo generates electrical energy, which is used to turn the motor attached to a revolving fan. The energy that activates the whirling fan is mechanical. Here we have a change of electrical energy into mechanical energy, with work accomplished. Heat, light and sound all are forms of energy.

MAGNETISM.—The electrical basis of both matter and energy is discussed below in the section on *Electricity and Magnetism.* The *ether* is assumed to be an elastic medium that fills all space and makes possible the transmission of energy by radiation. (See the sections on *Heat, Light* and *Invisible Radiations*). The existence of the ether has never been proved and the idea is rejected by one school of physicists. The concept is a useful one, however, and helps one to understand radiation.

MOLECULES.—The smallest *physical* unit into which matter can be divided is the molecule. If we further divided a molecule of water, we should have particles of hydrogen and oxygen, neither of which is water. The division of molecules into smaller particles, called *atoms,* is a chemical change. In a physical change there is no alteration of the composition of matter; that is, the molecules are not split. All molecules are much smaller than the tiniest bits of matter visible through a powerful microscope. Each molecule in a drop of water bears the same relation to the size of the whole drop as an orange does to the entire earth. The smallest molecules known are those of hydrogen with a diameter equal to one 125-millionth of an inch. Starch has molecules about one 10-millionth of an inch in diameter, but a particle would have to be 100 times larger than this to be visible under the most powerful microscope ever made.

If a particle of charcoal just large enough to be visible under the microscope is suspended in water, the particle may be seen moving about in an erratic manner. This so-called *Brownian movement* (demonstrated in 1827 by Dr. Robert Brown) is caused by the unequal bombardment of the water molecules on opposite sides of the particle of charcoal. Study of this movement with the motion-picture camera and microscope has convinced the most skeptical scientists of the truth of the molecular hypothesis.

STATES OF MATTER.—Matter exists in three states or forms—the solid, the liquid and the gaseous. A *solid,* for example, a bar of iron, has definite mass (quantity of material), size (dimensions) and shape (oblong, square or cylindrical and so on). A solid resists any effort to change its size or shape. In a solid the molecules are separated by spaces greater than the particles, but these particles, under ordinary conditions, are not wandering about among their neighbors; their only regular motion is a swaying or vibration about a fixed point.

A *liquid,* water, for instance, has definite mass and size, but no shape of its own, for it takes the shape of the containing vessel. In liquids the molecules are closely crowded together, but they are able to wander freely among their neighbors, like people in a crowd. Because they have the tendency to flow, liquids (and sometimes gases) are called *fluids,* from the Latin word meaning to flow.

A *gas* (such as air) has mass but neither size nor shape. It tends to distribute itself uniformly throughout an enclosing vessel. In gases, the molecules are much farther apart than in solids and liquids. One cubic inch of water makes about 1,700 cubic inches of gas (steam), but there are the same number of molecules in the cubic inch of water as in the 1,700 cubic inches of steam. In gases, as in liquids, each molecule has freedom of

PHYSICS COVERS A BROAD FIELD OF PRACTICAL THINGS

PHYSICS

MATTER

STATES OF MATTER	IMPORTANT TYPES	PRACTICAL USES
Solids	Hard Brittle Tenacious Ductile Malleable Conductor Insulator Transparent Opaque Porous Elastic	Building materials Foodstuffs Clothing Furniture Machinery Fuels
Liquids	Mobile Compression-resistant Seek-own-level	Water for all living things Hydraulic elevators Hydraulic brakes Oils Lubrication Oils and gasoline Fuels
Gases	Infinite-expansion Compression to small volume	Air for all living things Air for combustion Compressed-air devices: Tires Air brakes Blast furnaces Tunnel building Fuel Illumination

ETHER

Without weight
Continuous
Capable of carrying wave motion

Transmits radiant energy

Heat
Electricity (Radio)
Light

ENERGY

KINDS OF ENERGY	IMPORTANT SOURCES	IMPORTANT CONDITIONS	PRACTICAL USES
Heat	Natural: The sun Animal Artificial: Friction Combustion	Radiated by matter Radiated as waves Absorbed by matter Conducted through matter Causes convection Changes temperature Causes expansion Changes state of matter: Melts solids Vaporizes liquids Its removal produces cold	House heating Cooking Washing Ironing Operative machinery — steam or gas Preparation of chemicals Reduction of ores Working metals Making castings Glass making Production of illuminating gas Incubation
Light	Natural: The Sun Artificial: Pitch pine Candles Oil lamps Gas Electricity	Radiated by incandescent matter Radiated as waves Transmitted by transparent bodies Absorbed by opaque bodies Reflected by surfaces Refracted Produces colors Causes chemical action: Photographic chemicals In leaves of plants Kills germs	Home and factory lighting Street lighting Lighthouses Searchlights Headlights Aerial beacons Plant growth Photography Motion pictures Photoelectric cell Television Disinfecting Medical application
Mechanical	Gravitational action: Water power Man and animals Steam engines Gas engines Oil engines Electric motors		Sound-wave motion of molecules To produce electricity—water falls To produce electricity—engines To operate factory machines To operate locomotives: Steam Gas Electric To operate: Automobiles Steamships Canal locks Machines for engineering construction
Chemical	Fuels Foods Many chemicals	Produces: Heat Light Electricity	Heat from conbustion Body heat from oxidation of food Gas, oil and candle light Food produced in plants Electric cells Storage batteries
Electrical	Static charges: Friction Contact Induction Electric current: Chemical cells Storage cells Generators	Electrostatic attraction and repulsion Electrodynamic attraction and repulsion Current electricity produces: Heat Light Motion Chemical action	High-pressure discharges: Lightning X rays Violet rays Gas-ignition spark Electric heating: Furnaces Ranges Flatirons Cooking units Electric Lighting: Arc Incandescent Discharge in vacuum Electromagnets: Bells Telegraph Telephone Motors Transformers Generators Chemical action: Electroplating Refining of metals Storage battery Production of chemicals Microphones Sound devices

motion and may circulate, so that it has a new set of neighboring molecules from time to time.

The state of being solid or liquid or gaseous is not an inherent quality of any particular substance. The form of a substance at any particular moment is due to certain conditions of temperature and pressure. Thus water is a liquid; but it can be changed to ice—a solid—by cooling, and to steam—a gas—by heating. Air can be either liquefied or solidified, and the hardest steel can be melted by intense heat. A substance is called solid, liquid or gaseous according to the state it assumes under ordinary conditions.

PROPERTIES OF MATTER.—Any property common to all matter is said to be *general*. A *special* property is a characteristic of certain forms of matter. The important properties of matter (general and special) are discussed below:

Adhesion is the clinging of molecules of one substance to those of an unlike substance when the two substances are in contact; it causes solder to stick to metal, paint to stay on wood, canvas or other vehicle and mucilage to adhere to an envelope flap. Different kinds of matter vary greatly in adhesive power. Glue, paste and mucilage possess this property so strongly that we call them *adhesives*.

Cohesion, the clinging together of molecules of the same substance, is the force that holds molecules together whether those of a drop of water or of a steel bar. Gases have little or no cohesive power.

Ductility is the property some substances have by which they can be drawn into thin wires or threads without being pulled apart. Glass, softened by heat, is the most ductile of all substances, but ductility is especially the property of metals. Gold is the most ductile metal; platinum, however, can be drawn out into finer threads than gold if it is first covered with silver, which can later be dissolved away by nitric acid. Platinum wires only one thirty-thousandth of an inch thick are used in some microscopes.

Elasticity is the ability of matter to recover its original size and shape upon the removal of a distorting or compressing force. In popular language a body is called elastic if it can be stretched over wide limits without breaking or remaining permanently deformed. Live india rubber is one of the best examples of matter having this property. The physicist, however, measures elasticity by the force exerted by the distorted body, not by the extension the body may sustain without breaking. In this sense rubber is very much less elastic than glass, tempered steel or ivory. The *elastic limit* is the maximum force that may be applied to a body without permanently deforming it. This is high for such materials as steel, low for such materials as rubber and practically zero for such materials as wax or lead.

The elastic properties of matter have very important applications in industry. Engineers must plan their bridges so that no load will distort the steel beams beyond the elastic limit. The elastic power of compressed steam must be understood by the man who designs a new steam engine. The elasticity of compressed air is utilized in the air brake and other useful devices. Liquids can be compressed very little, and practical use is made of this property in hydraulic presses and other machines to produce tremendous pressure.

The most important principle in the theory of elasticity is *Hooke's Law:* Strain is proportional to stress. This means that if a spring is stretched 3 inches by a force of 1 pound, it will be stretched 6 inches by a force of 2 pounds, 9 inches by a force of 3 pounds and so on.

Extension is a property common to all matter occupying space. All bodies, large and small, have the three dimensions of length, breadth and thickness, though in some cases these can be measured only by the most refined instruments.

Flexibility is the ability of matter to bend without breaking, the opposite of brittleness. No consideration is paid to whether the bending produces permanent or only temporary distortion. If the substance is *elastic* as well as flexible, it will recover its original form. Lead is flexible without being elastic. Glass is elastic without being flexible to any extent. Rubber is both elastic and flexible.

Hardness is a variable property of solid bodies. Materials are graded as to hardness by their ability to scratch or to be scratched by some other substance. Talc, a substance that one can easily scratch with the fingernail, has the lowest place in the standard scale of hardness. The diamond is the hardest material known. The scale of hardness is as follows:

1. Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Sapphire (corundum)
10. Diamond

Inertia is the tendency of all matter at rest to remain at rest and of bodies of matter in motion to remain in motion in a straight line, until acted upon by some external force. This principle is Newton's first law of motion.

Malleability, a property of certain metals, enables them to be hammered, rolled or pressed into thin sheets. Gold is the most malleable metal. Gold leaf has been made of such thinness that it would take 300,000 sheets to make a pile an inch high. Ordinarily, iron is the least malleable of the common metals; but cast iron that has been subjected to prolonged heating and placed in contact with a substance that removes some of its carbon becomes the malleable iron of industry.

Mass applies to every particle of matter in the universe. The mass of any body is the quantity of matter it contains. We measure the mass of a body by weighing it, but mass and weight are not the same. The ratio of the mass of a body to its volume is its *density*. For example, an object weighing 180 pounds and having a volume of 60 cubic feet has a density of 3 units—pounds per cubic foot. Density is the number of units of mass contained in a unit of volume.

Porosity is a general property of matter, by virtue of which it has pores. In an object like a sponge, this fact is immediately apparent, but even those substances that seem entirely without pores have spaces between their molecules. Many metals have the property of occlusion or absorption because they are porous; platinum in the sponge form or platinum black absorbs 800 times its volume of oxygen, and the metal palladium absorbs 935 times its own volume of hydrogen.

Tenacity or *tensile strength,* the resistance that a substance exerts against being torn or pulled apart, is common to all forms of matter in some degree.

MOLECULAR ACTIVITY.—Examples of molecular action are common facts of everyday life. Such activities as the following can be readily observed or studied experimentally:

Diffusion is the intermingling of the molecules of two or more different substances placed in contact with one another and free to mix. Gases possess in marked degree the capacity of diffusing because their molecules are constantly moving about. It is diffusion that causes us to detect the odor from a leaking gas jet, because the escaping molecules readily mingle with those of the air in the room. For the same reason, the fragrance of perfumes and flowers scents the air. The passage of gas molecules through the pores of a solid is called *effusion*. Liquids also diffuse into one another but somewhat less rapidly than do gases. Even solids, under certain conditions, have been known to diffuse; for example, when gold is overlaid with lead and subjected to high pressure, gold particles may be seen in the other metal after a time.

Osmosis occurs when two liquids of different concentration, such as water and a water solution of sugar, are separated by a porous membrane; the molecules of the two liquids tend to pass through the membrane and mix; but the water molecules will move more rapidly than those of the heavier liquid. Osmosis is important in plant physiology; by osmosis, plant food dissolved in water is taken into the roots from the soil, the surface cells of the roots acting as a permeable membrane.

Surface tension causes the surface layer of a liquid to act like a stretched elastic membrane. A small mass of liquid, if it is free to contract, assumes the form of a sphere, because that has the smallest possible area. Examples are tears and raindrops. Larger masses tend to spread out because the force of gravity is stronger than surface tension.

Capillary action or *capillarity* is the motion of liquids in hairlike tubes (Latin *capilla,* a hair). The rise of oil in a lamp wick, the absorption of ink by a blotter and water by a sponge are examples. Capillary action includes both elevation and depression of liquids in tubes. If we place several fine glass tubes of different diameters in a vessel of water, we can see the water rise in each tube to a higher level than that of the water outside the tube. The smaller the tube, the higher the water will rise. If, however, the tubes are placed in mercury, the mercury will be depressed to a point lower than that of the level outside. The molecules of water tend to adhere to the surface of a glass tube, adhesion being stronger than cohesion; but in the case of mercury, cohesion is stronger than adhesion. The general rule is that a liquid rises in tubes when it wets them and is depressed in tubes that it does not. The surface layer of water in each tube is concave (curved upward). The mercury in each tube is convex (curved downward). In each case the surface tension at the top of the column of liquid causes the surface layer to contract and produces a pressure toward the center of curvature. When the layer is concave, there is a reduced downward pressure of the molecules beneath the surface, and the liquid rises. The opposite takes place when the top of the column is convex.

Solubility is the capacity of certain substances to dissolve in liquids, so that uniform liquid mixtures result. When common salt is added to water, it dissolves, and, after being stirred, the solution is said to be *homogeneous* because all samples, wherever taken, prove to be identical. Water is here the *solvent* and salt the *solute.* If more salt be added by degrees, the temperature remaining constant, a stage is finally reached at which the solution will take up no more salt. The solution is then said to be *saturated* at that temperature with common salt. Solids vary in their capacity to dissolve, because solubility depends on the nature of the solvent as well as of the solute. We cannot dissolve sugar in kerosene, for example, though we dissolve it readily in tea or coffee.

MECHANICS

Mechanics deals with forces and their effects on matter. By *force* is meant any exertion that produces motion or any change of position in a body. It may be a push or a pull. Mechanics is divided into *kinematics* which treats of different kinds of motion without regard to their causes; and *dynamics* which deals with the conditions under which motion is produced and the causes of motion, and is subdivided into *statics* and *kinetics.* Statics considers the action of forces at rest or in equilibrium; kinetics deals with forces producing motion.

Motion.—What is motion? We frequently make such a statement as, "The train remained motionless for an hour." What we really mean is that the train is at rest with respect to some other object considered as a reference frame. In this case, the object is the earth. We know, however, that the earth is both rotating on its axis and revolving around the sun, and that the train is actually being carried along with the earth. Motion and rest, therefore, are relative terms, and motion is not merely change in position but change with respect to something else used as a reference.

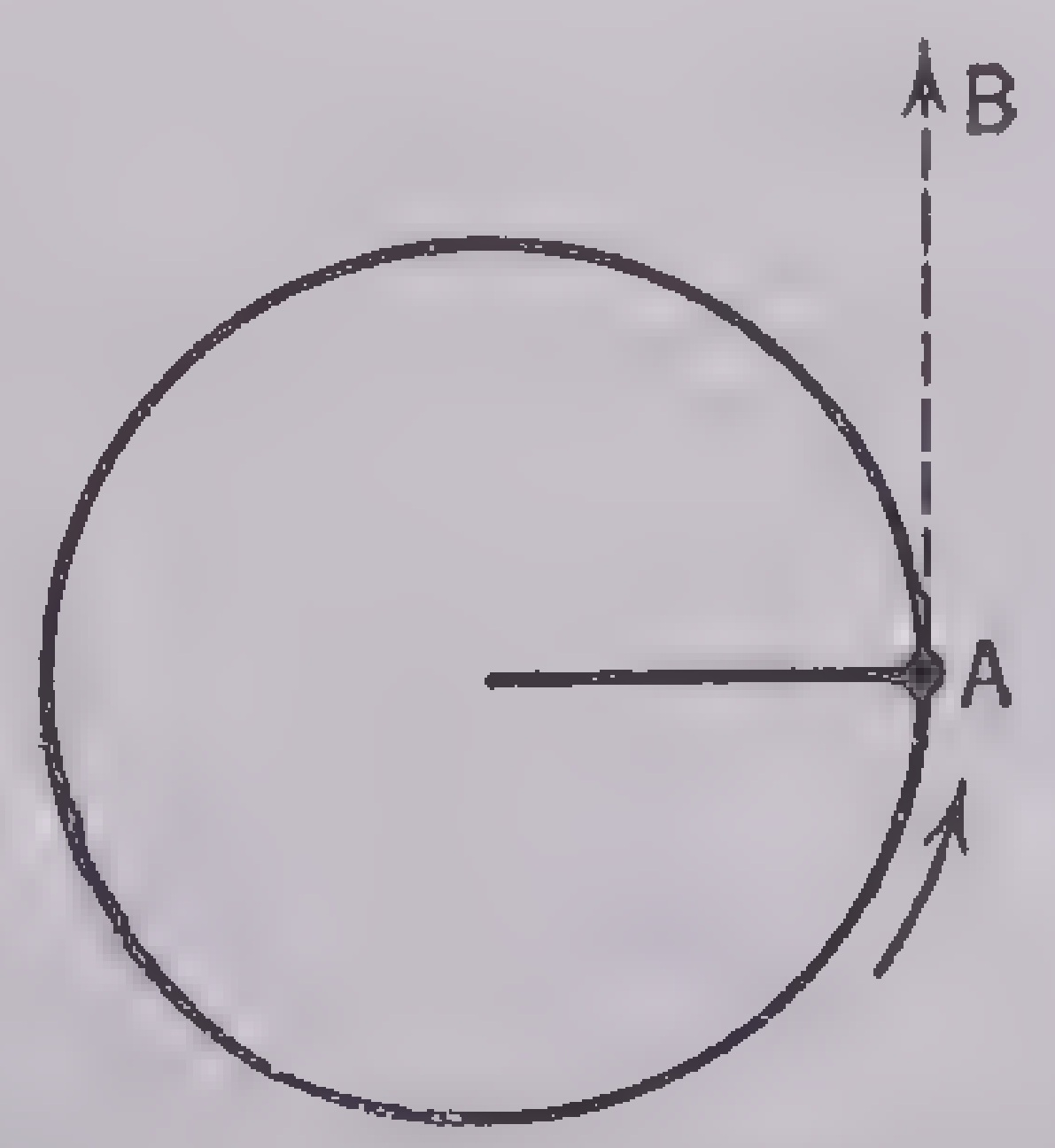
The idea of motion includes both *velocity* and *acceleration.* By velocity we mean the time rate of motion *in a given direction,* as when we say that an airplane is traveling 100 miles per hour eastward. Velocity, then, is speed with direction. By acceleration we mean the time rate of change of velocity; if a moving object increases its velocity (moves faster) through a given portion of space as compared with another portion, the velocity is said to be *positively accelerated.* A decrease in the time rate is *negative acceleration* or *retardation.* A sled loaded with children undergoes a positive acceleration when sliding down a hill; at the bottom, where it begins to slow down, it has retarded motion.

Newton's Laws of Motion.—The foundations of the science of mechanics are the Three Laws of Motion, originally formulated in satisfactory form by Isaac Newton:

1. A body at rest remains at rest (possesses inertia), and a body in motion moves with uniform velocity in a straight line (has inertia of motion), unless it is compelled to change its position by an outside force.
2. The acceleration (change of velocity with time) of a body is in the direction of, and proportional to, the force that produces it, and is inversely proportional to the mass of the body.
3. With every action or force there is an equal reaction in the opposite direction.

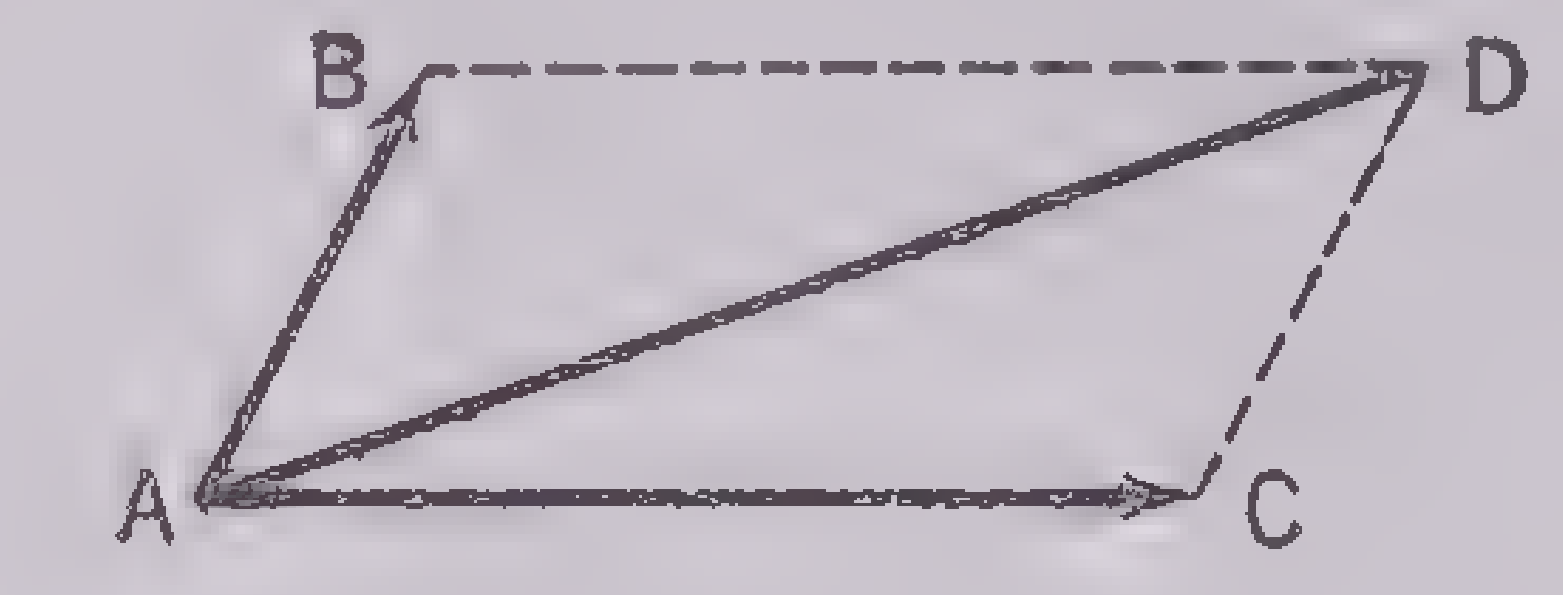
Curvilinear Motion.—The motion of a freely falling body is described as *rectilinear;* that of a pendulum, as *vibratory.* Bodies revolving around a given point are said to have *curvilinear* motion. The force that compels such a body to follow a circular path is called *centripetal.* Because all moving bodies tend to follow a straight line, a body moving in a circular path offers resistance to the impressed force. This resistance is called *centrifugal* force.

If we whirl a stone attached to a string we feel a tension or force in the string, and it seems quite certain that if the string is cut, the stone will fly off in the direction of the string at that instant; but experiment shows that the stone continues in a straight line *tangent* to the circle in which it was moving before the string was cut. Thus, when an athlete throws a hammer, he lets it go *a quarter of a turn before* he is facing the direction in which he wishes to throw.



Whirling Stone Flies Off at a Tangent
If the string is cut when the stone reaches A, it will fly off in the direction AB

Resultants of Forces.—Most forces are not simple, but are combinations of various forces operating in different directions. The total effect of the combination of forces may be treated as a simple force called the *resultant.* If we represent the magnitude and direction of two forces by straight lines, the direction of the forces being the direction of the lines and magnitude of the forces being represented by the length of the lines, the magnitude and direction of the resultant force will be represented by the diagonal of the parallelogram formed from the lines representing the original forces. This is the *Parallelogram Law.*



Parallelogram of Forces
A force proportional to the length AB operates in the direction AB; a second force proportional to length AC operates in the direction AC; the resultant force operates in the direction AD and is proportional to the length AD. This device for calculating the total effect of two forces is called the *parallelogram of forces*

Mass and Weight.—When a force acts on a body it produces a change of motion or acceleration. Newton's second law tells us the fundamental relation between the force acting, the mass of the body and the resulting acceleration. Expressed algebraically the second law may be written:

$$a \text{ varies as } \frac{F}{M},$$

where a stands for acceleration, F for force and M for mass. If suitable units are used, the proportion may be expressed as an equation, and since this is usually more convenient for purposes of calculation, it has become the standard practice to write the second law in the form:

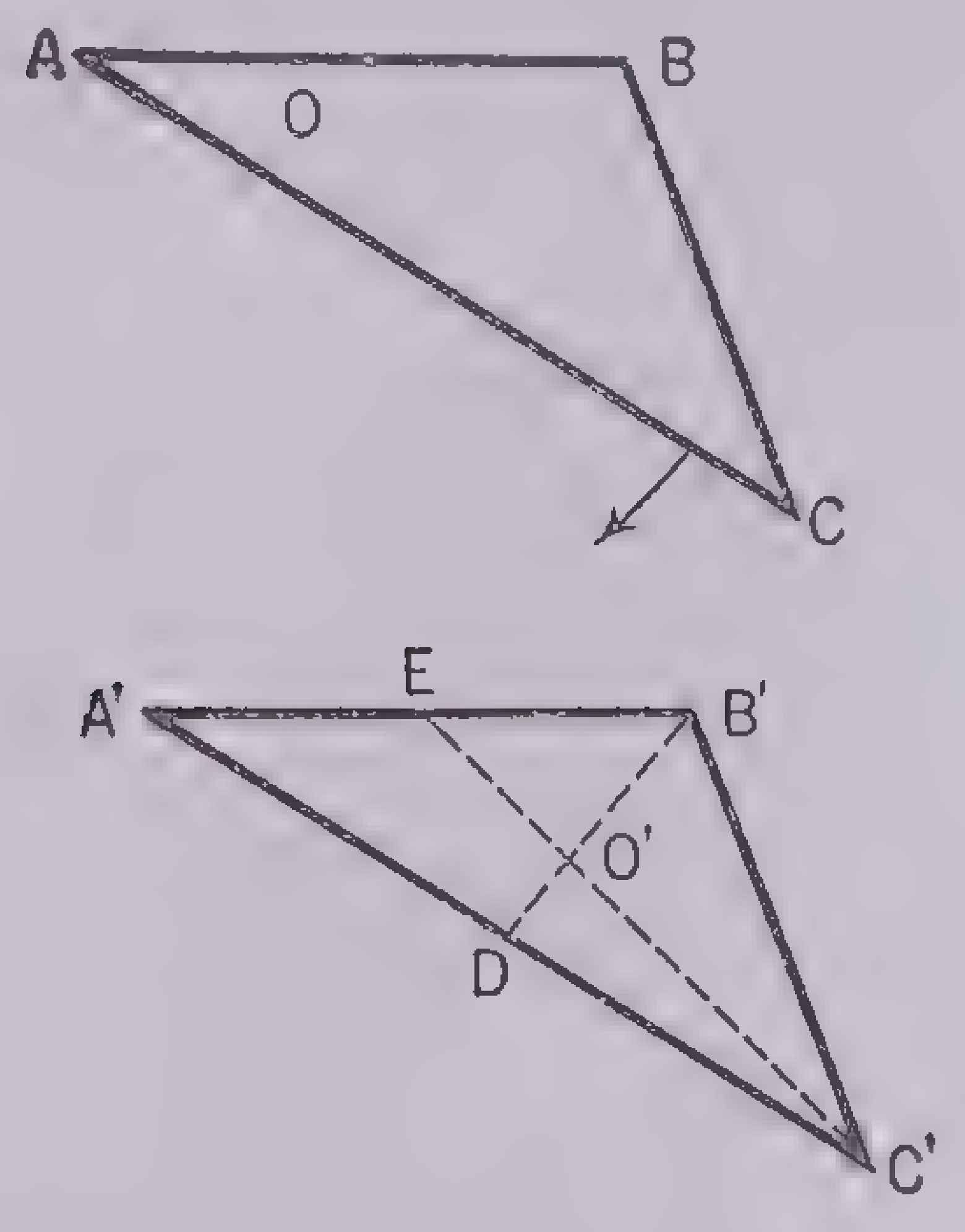
$$a = \frac{F}{M} \quad \text{or } F = Ma,$$

it being understood that the measurements are to be made in the appropriate system of units.

The most familiar force of nature is the force of gravity, the pressure exerted by a heavy body in a downward direction. We shall presently learn that the tendency of bodies to fall toward the earth is merely an example of a universal principle. The force of gravity acts like an attraction directed toward the center of the earth. The amount of this attraction is different for different bodies. We measure it by the weight of a body.

The outstanding fact about gravity is that *weight is proportional to mass;* that is, if the same force produces the same acceleration on two bodies, the weights of the two bodies are equal. Since mass is the measure of *quantity of matter,* a quart of water, for example, must have twice the mass of a pint. By experiment we find that a quart also *weighs* twice as much as a pint. We are so familiar with this fact that we may pass it by as not at all remarkable. Yet it was negligence of this fact that kept the science of mechanics in a hopelessly confused and inaccurate state from the time of Aristotle until Galileo proved experimentally the proportionality of *weight* and *inertia;* that is, of weight and mass. That was the real meaning of his famous experiment at the leaning tower of Pisa, where he showed that bodies of different weights fall toward the earth with the same acceleration.

Center of Mass.—If a piece of sheet metal is cut in an irregular shape it is possible by experiment to find a point through which a pin may be pierced so that the irregular sheet will balance in any position.



Center of Mass in an Irregular Triangle

Suppose for simplicity a sheet of tin is cut in the shape of a scalene triangle ABC. If a point O is selected near one of the corners, and a pin is thrust through, the triangle will tend to turn in the direction indicated by the arrow; but if the pin is thrust through at the point O′ (located geometrically by drawing the triangle's *medians* C′E and B′D), the triangle will have no tendency to turn in any position; and if it is started spinning it will turn as smoothly as if it were circular.

The point O′ is called the *center of mass of the triangle.*

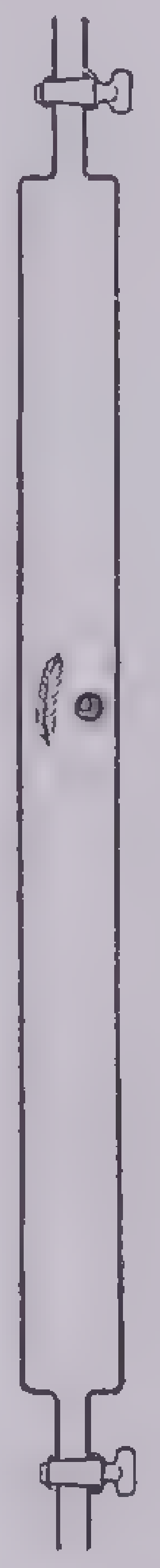
All bodies have such a point, although it may be impossible in an irregularly shaped body to locate it mathematically. A body moving under the action of gravity behaves as if the whole mass were concentrated at this point. Thus, if a hammer is tossed into the air with a whirling motion, a particular point, say on the handle, will describe an extremely complicated irregular curve, but the center of gravity of the hammer will describe a smooth parabola precisely as if the mass were concentrated in the single point.

In the case of certain bodies of unusual shape, the center of gravity may be outside the body.

The position of the center of gravity with respect to the base of support is the determining factor in the three kinds of *equilibrium:*

1. *Stable equilibrium* is that state in which any small displacement of a body raises its center of gravity. When it is released, the body will return to its former position; for example, a cone standing on its base.
2. *Unstable equilibrium* is a state in which displacement of the body lowers its center of gravity. When it is released after such displacement, the body will move until its center of gravity reaches the lowest point possible; for example, a cone balanced on its tip.
3. *Neutral equilibrium* is that state in which any slight movement of a body neither raises nor lowers its center of gravity. When it is released after displacement, no further motion of the body follows; for example, a cone lying on its side.

Laws of Falling Bodies.—That gravity acts on all bodies alike was proved by Galileo in his famous experiment at Pisa. By dropping balls of different weights from the leaning tower of Pisa, he became convinced that all bodies, regardless of their weight, would fall with the same velocity if there were no resistance of air. Later, this theory was proved through an experiment with bodies falling in a vacuum. The laws of falling bodies are based on the fact that their motion is uniformly accelerated; that is, their velocity increases at a uniform rate for every second of fall. These laws have been reduced to mathematical formulas. It has been found that a freely falling body, at approximately 40° North Latitude, travels 16.08 feet the first second. During every second of fall its gain in speed due to gravity (acceleration) is 2 × 16.08 (32.16) feet per second. Since it starts at zero velocity, its total velocity at the beginning of the second second is 0 + 32.16 feet per second. During this second its acceleration is 32.16 feet per second, and its velocity at the end of the second is 32.16 + 32.16 or 64.32 feet per second. At the end of the third second it is 64.32 + 32.16 or 96.48 feet per second. This uniform acceleration cannot continue indefinitely, however, for if the body falls through a sufficient distance, the gravitational force causing its acceleration will be equaled by the increasing friction (resistance) of the air. At this point acceleration ceases, and the body continues the rest of its fall at a uniform, maximum velocity, called *terminal velocity.*



Laws of Falling Bodies

A feather and a metal pellet fall at the same speed in a vacuum. Galileo first proved experimentally that the speed of falling bodies was not dependent upon their weight for large masses. It remained to be shown that this was also true even when the falling masses were very light. After the invention of the air pump, the experiment of Galileo could be repeated without the errors that arise from the resistance of the air, and it was discovered that feathers, bits of paper and even smoke particles fall to the ground like metal weights when the air has been removed from around them

The laws of falling bodies can be concisely expressed algebraically as follows:

Let v = the velocity at the end of t seconds.
d = the distance fallen through in t seconds.
g = acceleration of gravity.
Then $v = gt = 32.16 \times t$ (I)
and $d = 1/2gt^2 = 16.08 \times t.$ (II)

From these two fundamental equations (which apply to all uniformly accelerated motion as well as to falling bodies) other convenient relations can be deduced, for example:

$$t = \frac{\sqrt{2gd}}{g},$$

$$v = \sqrt{2gd}.$$

If we wish to calculate how far a body will fall in any specified second, say the nth, we find the total fall in n seconds by equation II, and subtract the fall in n-1 seconds.

Laws of the Pendulum.—To Galileo, also, we owe the discovery of the laws of the pendulum. A pendulum is defined as an object suspended from a fixed point and free to move under the force of gravity. At sea level, in the latitude of New York, a pendulum about 39.1 inches long (a *seconds pendulum*) will vibrate once in a second. The four *laws of the pendulum* are:

1. The time of vibration is independent of the mass.
2. In the same pendulum, all vibrations of small amplitude are made in the same time.
3. The time of vibration varies directly as the square root of the length.
4. The time of vibration varies inversely as the square root of the acceleration (force of gravity).

These laws apply strictly only to a *simple* pendulum swinging through a small arc. A simple pendulum is one with all its mass concentrated in the bob; the suspension string or wire is supposed to have no inertia. This condition, of course, is never quite fulfilled, but if the suspending string is very fine, its mass can be disregarded in the calculations.

The Nature and Use of Energy

Work and Energy.—When a force is applied to a body with transference of energy from one body to another, work is done. Work implies the overcoming of resistance at the expense of energy. Mechanical energy is of two kinds, *kinetic* and *potential.* Kinetic energy is the energy of motion. Potential energy is the energy stored in matter by its advantageous position. When desired, this potential energy can be released, and an equivalent amount of kinetic energy will result. A moving cannon ball strikes a building; the waves of the ocean beat against the shore; falling water drives a waterwheel. In all of these examples, a moving body does work, and they illustrate the utilization of kinetic energy. Water held at a high elevation, a wound spring in a watch or clock and compressed air illustrate matter in a position of advantage. They have stored energy that can be released at will to do work. The resistance that is overcome in doing work may be one of three types: (1) gravity—lifting a body to a higher elevation; (2) friction—moving a body in contact with another so that surfaces of the two rub together; (3) inertia—starting a body from rest or stopping a moving body.

The measure of work is the product of force and distance.

The fundamental unit of force in the English system is the poundal, which is defined as: the force required to impart to 1 pound of mass an acceleration of 1 foot per second for every second the force acts. The corresponding unit of force in the metric system is the *dyne,* the force required to impart to 1 gram of mass an acceleration of 1 centimeter per second for every second the force acts.

The units of work based upon these force units are the *foot-poundal* and the *erg.* The *foot-poundal* is the work done by a force of 1 poundal acting through a distance of 1 foot; the *erg* is the work done by 1 dyne acting through 1 centimeter. These units are known as *absolute units,* since they are independent of gravity and are directly derived from the laws of motion and the fundamental units of length, mass and time.

Gravitational units are frequently used for practical calculation. Since the force of gravity is nearly constant on the earth's surface and furnishes a convenient means of measuring mass, a system of units has developed in which the fundamental units of force are defined as the force exerted by gravitational attraction on a unit of mass. We have learned that gravity imparts to any mass an acceleration of 32.16 feet a second for every second of fall. Thus 1 pound of mass presses down on the earth with a force of 32.16 poundals. This is 1 pound of force. In metric units the acceleration of gravity is about 981 centimeters per second for every second of fall; therefore 1 gram of force is equal to 981 dynes.

These gravitational units of force supply other units of work, the *foot-pound* (1 pound of force acting through 1 foot), and the *gram-meter* (1 gram of force acting through 1 meter).

Power is the rate of doing work. The practical unit in the English gravitational system is the *horsepower,* which is equal to 550 foot-pounds per second, or 33,000 foot-pounds per minute. The corresponding unit in the metric system is the *gram-meter per second,* but absolute units are more usually used. The *erg* is an inconveniently small unit of work; the *joule* (10,000,000 ergs), is more practical. The practical power unit in the *metric absolute system* (usually called the C.G.S. system because its fundamental units are the centimeter, gram and second) is the *watt,* which is equal to 1 joule per second.

A source of confusion to beginners in the study of mechanics is the failure to distinguish sharply between *force, weight* and *mass.* These three are fundamentally different conceptions, although we often measure them in units of the same name. It is worth while to consider carefully the three separate uses of the term *gram* for example. A *gram of mass* is a certain definite quantity of matter, defined as one-thousandth of the mass of the standard *kilogram,* a platinum-iridium cylinder kept in Paris. A gram of mass is the same amount of matter anywhere in the universe; it does not change with the changing force of gravity on the earth's surface.

Weight is the attraction of the earth for a piece of matter. A *gram of weight* is the weight of a gram of mass at a certain specified point on the earth's surface. Near the poles and in mine shafts the weight of a given mass of matter increases; as one approaches the equator or ascends in altitude, weight decreases. These changes in weight are small in practical observations, but they must be taken into account in scientific work. Weight is thus a variable property of a particular piece of matter; mass is a constant quantity.

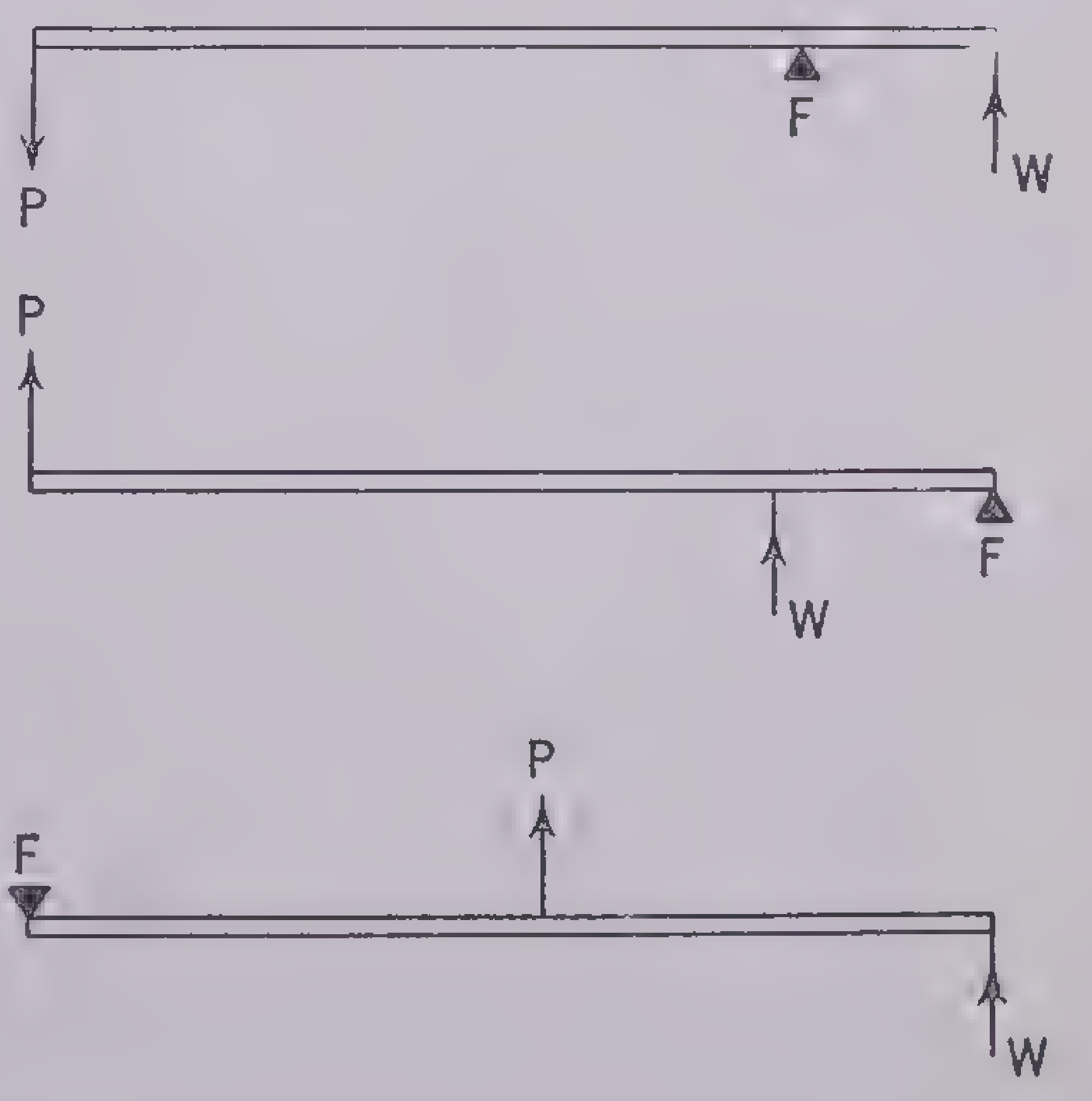
Force has been defined as any exertion, pressure, push or pull that produces motion in a body. The most familiar example of force is gravity. Gravity has thus become a practical reference standard by which forces are measured; we compare them with the force exerted by gravity. A *gram of force* is a force equal to the downward pressure of a gram of weight. It is not identical with a gram of weight, because weight always means the downward pull of gravity, while force may arise in many ways and be exerted in any direction. A gram of force is a convenient unit of force referred to gravity as a standard.

Energy and Machines.—It is a fundamental principle that energy, though it is continually being transformed or changed from one form to another, is never destroyed or diminished. This principle is called the *Law of Conservation of Energy* or the *First Law of Thermodynamics.*

Closely related is the *Second Law of Thermodynamics,* which asserts that the flow of heat between two bodies is always from the hotter to the cooler. An immediate consequence of this law is the dissipation or degradation of energy. This important generalization tells us that every energy change involves dissipation into heat and that this dissipation is irreversible. Heat is a form of energy, but it differs from all other forms in that it cannot be entirely reconverted into the mechanical, electrical or other type in which it originated. Energy cannot be destroyed (First Law), but it can be and inevitably is dissipated in an irrecoverable form (Second Law). Every machine must conform to these two principles. Generally speaking, complicated machines are combinations of six simple machines described below. These are the lever, wheel and axle, pulley, inclined plane, wedge and screw. A study of their operation teaches the basic principles involved in the application of force for the performance of work. When an applied force overcomes a resistance greater than itself, we say that the machine has a *mechanical advantage.* Mathematically this is the ratio of the resistance to the effort or of the resulting force to the applied force. The fact that a machine has a mechanical advantage does not violate the principle of conservation of energy, as we might hastily be inclined to suppose. Force is not energy, and does work only when it moves through a distance.

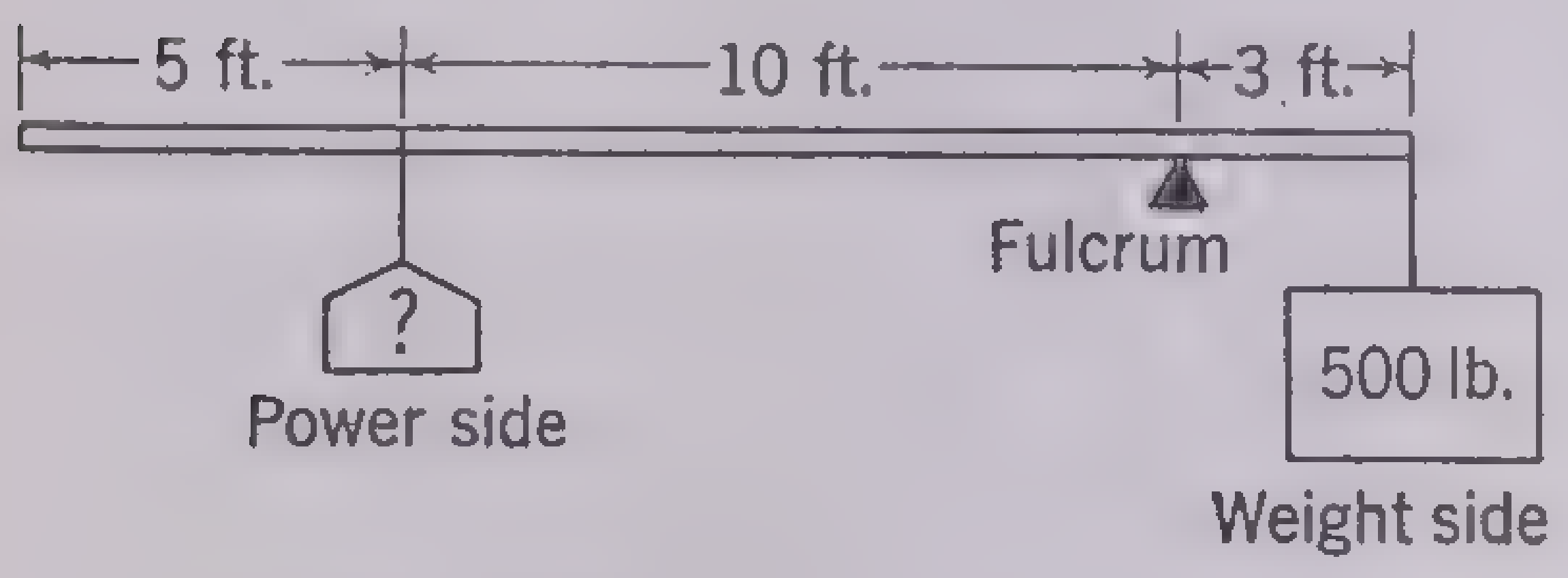
In any machine having a mechanical advantage, the applied force must move through a greater distance than the resistance it overcomes. If the mechanical advantage is 10, a 1-pound applied force will balance a resistance of 10 pounds; but to move the 10-pound resistance through 1 foot, the applied force must be exerted through 10 feet. The work done by the applied force is thus equal to the work done on the resistance. The ratio of mechanical work actually accomplished to the work applied is the *efficiency* of the machine. No machine possesses an efficiency of 100 per cent, because some energy is expended in overcoming friction and is transformed into heat, illustrating the Second Law of Thermodynamics.

The Lever.—A lever consists, theoretically, of a rigid bar pivoted at a fixed point, the *fulcrum.* There are three classes: (1) Levers of the first class have the fulcrum between the weight and the force, as a seesaw, a balance scale or a crowbar. (2) Levers of the second class, represented by a nutcracker or a wheelbarrow, have the weight between the force and the fulcrum. (3) The forearm is a good example of levers of the third class, in which the force is between the weight and the fulcrum. Here the elbow joint is the fulcrum; the force is applied by means of a tendon from the biceps muscle; and the weight is an object in the hand. The distances from fulcrum to force and weight are called, respectively, the *force arm* and the *weight arm.* In all levers (disregarding the weight of the lever itself), the force multiplied by the length of the force arm is equal to the weight multiplied by the length of the weight arm. In a lever of the first class, force and weight are equal when the two arms are equal; if the force is less than the weight, then the force arm must be longer than the weight arm. In a lever of the second class, the force is less than the weight; and in one of the third class, the force is greater than the weight. A lever of the third class sacrifices force to gain speed.



The Three Kinds of Levers

In many cases, especially when there is a large difference between the weight arm and the power arm, it is necessary to take the weight of the lever itself into account in the calculation. This can be done most easily by treating the separate weights of the two sections of the lever as if they were concentrated at the two centers of mass.



Calculating Power for a Heavy Lever

Suppose, for example, we wish to calculate how much weight 10 feet from the fulcrum will balance 500 pounds 3 feet from the fulcrum, if the total length of the lever on the power side is 15 feet, the length on the weight side is 3 feet and the total weight of the lever (of uniform thickness and density) is 72 pounds.

We have:

$$\text{weight} \times \text{weight arm} = 3 \times 500 = 1{,}500.$$

In addition we have 3 feet of the lever weighing $\frac{3 \times 72}{18}$ pounds or 12 pounds on the weight side, and the center of gravity of this section of the lever is 1½ feet from the fulcrum. This acts as an independent weight of 12 pounds at a distance of 1½ feet.

Total weight times weight arm (usually called *moment of force*) equals:

$$3 \times 500 + (12 \times 1\tfrac{1}{2}) = 1{,}518.$$

The weight of the lever on the power side is $\frac{15 \times 72}{18}$ pounds or 60 pounds. The center of gravity of this section is 7½ feet from the fulcrum. If we let x equal the power necessary, we have:

$$10x + 60 \cdot 7\tfrac{1}{2} = 1{,}518$$

$$x = \frac{1518 - 60 \cdot 7\frac{1}{2}}{10} = 106.8 \text{ pounds.}$$

If we had not taken account of the weight of the lever, we should have:

$$10x = 3 \times 500 = 1{,}500$$
$$x = 150 \text{ pounds.}$$

WHEEL AND AXLE.—A modification of the lever—the wheel and axle—consists of a cylindrical axle and a wheel or crank fastened together and revolving in the same axis. Examples include the grindstone, the windlass for raising well buckets and the capstan used in lifting anchors. The center of the axle is the fulcrum, the radius of the wheel is the force arm and the radius of the axle is the weight arm. When a weight is lifted, it is attached to a rope wound about the axle; the force is applied to a rope wound about the grooved rim of the wheel or attached to the crank. When the force is applied by a crank, the force arm is the radius of the circle described in one revolution of the crank. Since the force multiplied by the radius of the wheel (R) equals the weight multiplied by the radius of the axle (r), the mechanical advantage equals R divided by r.

THE PULLEY.—A wheel with a flat or grooved rim, so mounted as to turn on an axle through its center forms a pulley. The form of the rim determines the kind of chain, rope or belt that can be carried by the pulley. Pulleys may be fixed or movable. A *fixed pulley* has its axle fastened to a stationary support. If a weight is attached to a rope and the rope placed around the wheel, one can lift the weight by pulling on the free end of the rope. In this case, the direction of the applied force is changed, but there is no mechanical advantage. If, however, a weight is attached to a *movable pulley,* one carried in the loop of the rope passing over it, the weight can be raised by a force only one-half as great. Such a pulley has a mechanical advantage of two. When several movable pulleys are used in systems, the mechanical advantage is correspondingly greater. A system of pulleys and ropes in which one or more pulleys are encased in frames is called a *block and tackle.*

INCLINED PLANE.—When a workman rolls a cask up a board in an oblique position, he is using an inclined plane. Such a device is advantageous for moving heavy weights into warehouses, boats and trucks, since less force is required than would be exerted in lifting objects vertically. The distance traveled by the weight is, of course, greater. The mechanical advantage is derived from the equation $f \times l = w \times h$, where f is the force, l the length of the plane, w the weight and h the vertical height of the plane (measured downward from the point where it touches the vehicle or place of loading). The mechanical advantage is the length divided by the height. The principle of the inclined plane is applied by an automobilist who drives his car up a long, gentle slope in preference to a shorter but steeper grade.

THE WEDGE.—This is a double inclined plane, which tapers from a rectangular base to a thin, sharp edge. When force, like pressure or percussion, is applied to the back, the cutting edge is driven forward. We apply the principle of the wedge when we split a log with an ax or drive a plow through the soil. Because great frictional resistance is encountered by the sides of the wedge, the mechanical advantage cannot be computed mathematically.

THE SCREW.—In its simplest form, this device consists of a cylinder whose surface has a projecting spiral ridge or thread. It may also be described as a traveling inclined plane wrapped around a cylinder. The application of force at the end of a lever arm or wrench causes the screw to work into a nut having spiral grooves corresponding to the thread; or it turns a movable nut on a fixed screw. The vertical distance traveled by the screw or nut in making a complete turn between two adjacent threads is called the *pitch.* The mechanical advantage of the screw is based on the law that a given force will support a weight as many times as great as itself as the circumference described by the force is times as great as the pitch of the screw. Applications of the screw include the jackscrew, the vise and the letter press.

Friction.—A ball rolled over the floor soon stops. A spinning top soon stops. Why? Frictional force stops them. The friction between any two bodies moving in contact opposes the motion. The wheel of an inverted bicycle once set into motion rotates a long time, because the friction has been reduced at the axle by the use of greased ball bearings. Roller bearings in the automobile wheel axle accomplish the same purpose. If the friction at the axle and the friction of the air against the wheel could be entirely removed, the wheel once set into motion would never stop.

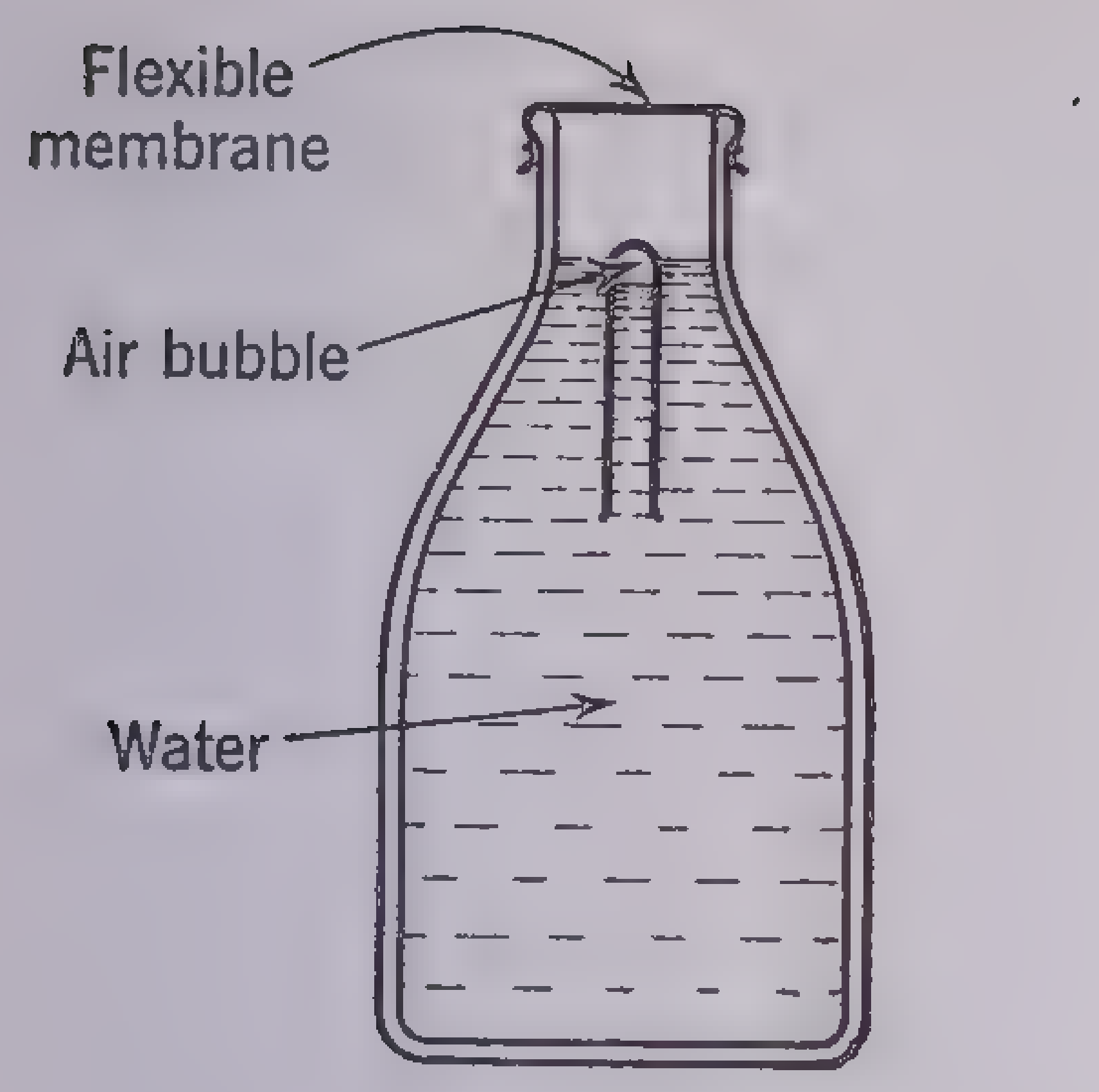
An excellent example of the indefinite continuance of motion in the absence of frictional forces is the motion of the earth in its annual revolution about the sun and its rotation every 24 hours. There are, it is true, frictional forces tending to retard the earth's motion. The chief force of this kind is the friction of shallow sea bottoms to the sliding of the water with the rise and fall of the tides; but these forces are exceedingly small compared with the immense kinetic energy stored up in the spinning earth. The earth may be expected to continue its present rate of motion practically unchanged for millions of years, although there can be no doubt that even this near-perpetual motion is ultimately destined to wear itself out in friction.

Mechanics of Fluids

Pressure of Fluids.—That division of mechanics that deals with liquid and gas pressures is called *hydrostatics.* When a gas or a liquid is confined, there is always a pressure at each point throughout the fluid. *Pressure* is defined as a force per unit area. We speak of a force of 1 pound, but pressure is expressed in pounds per square inch or similar units. No motion is produced by pressure itself, because it is in a state of equilibrium, but a continuous variation of pressure in a given direction will tend to produce motion toward points of less pressure. The following three laws of fluid pressure are of fundamental importance:

1. An external force exerted on a unit of area of a confined liquid or gas is transmitted undiminished to every unit area of the interior of the containing vessel. (This law was formulated by the French mathematician Blaise Pascal, and is known as *Pascal's Principle.* It means that fluids transmit pressure equally in all directions.)
2. The pressure at any point in a liquid is proportional to the vertical depth of the point and is independent of the shape of the containing vessel. (This law does not apply to gases. The pressure at any particular point in a gas cannot vary with the depth of the point, because there can be no stationary location of a point in a fluid that expands indefinitely.)
3. The third law, called *Archimedes's Principle,* is based on the buoyant (upward) pressure of liquids on solids immersed in them. It states: A body immersed in a liquid is buoyed up by a force equal to the weight of the liquid that it displaces.

A body that sinks in water will displace less than its own weight of the



Cartesian Diver

The *Cartesian diver* (named for the French mathematician René Descartes) illustrates Boyle's Law, Archimedes's Principle and Pascal's Principle with great clarity and simplicity. A test tube is inverted in a wide-mouthed bottle (a milk bottle serves very well) nearly full of water, and a bubble of air just large enough to float the tube is imprisoned in the closed end. A flexible rubber membrane is stretched across the mouth of the bottle. If the rubber membrane is pressed inward with the finger, the test tube sinks; when the pressure is removed, the test tube rises. The sinking or rising of the test tube depends upon the total weight of water displaced by the glass walls of the tube and the imprisoned air bubble being less or greater than the weight of the tube (Archimedes's Principle). The volume and hence the weight of the water displaced depend upon the pressure on the bubble of air in the tube (Boyle's Law). The pressure on the bubble of air depends upon the pressure exerted at the surface of the water (Pascal's Principle)

liquid; one that floats displaces its own weight. The apparent loss of weight of a submerged object is always equal to the weight of the displaced liquid, and the volume of liquid displaced is equal to that of the object.

Specific Gravity.—We have learned that the density of a substance is the ratio of its mass to its volume. When we have found the ratio of its density to that of water, we have determined its *specific gravity*. The determination of specific gravity (s.g.) is based on Archimedes's Principle. To find the s.g. of a body heavier than water, we divide its weight in air by the weight of an equal volume of water. To find the s.g. of a body lighter than water, it is necessary to determine also the weight of another object used as a sinker.

Density is commonly expressed in pounds per cubic foot or in similar units; s.g. is an abstract number, showing how many times heavier a body or substance is than another substance taken as a standard or expressing some fraction of the density of the standard. The s.g. of gold is 19.32, and it is, unit for unit, 19.32 times heavier than water. The s. g. of an object lighter than water would be expressed as a fraction. In finding the s.g. of gases, we use air or hydrogen as a standard.

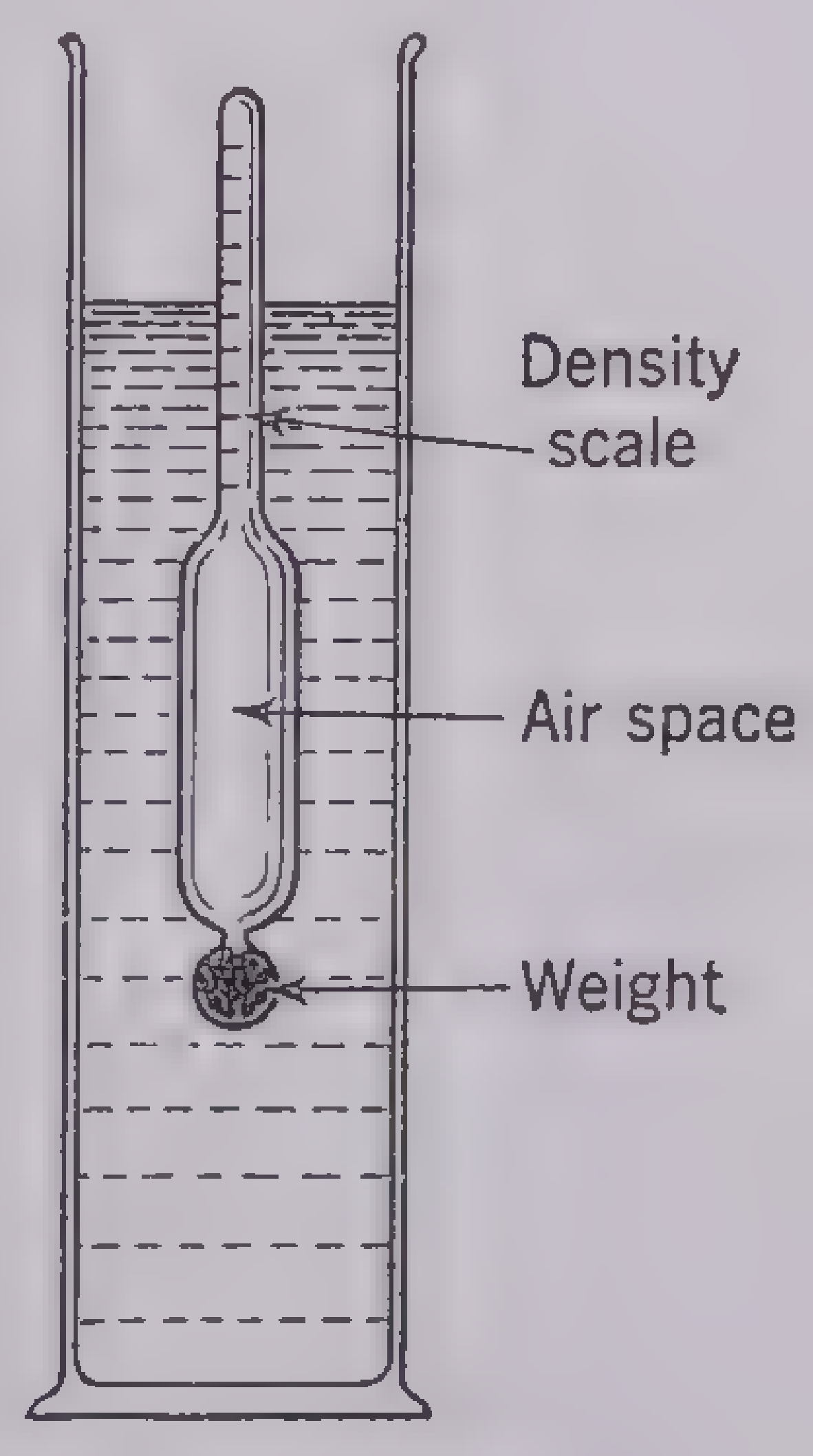
One of the great conveniences in the use of the metric system is the fact that in this system density and specific gravity are numerically equal within the limits of accuracy of ordinary measurement. A cubic centimeter of water has a mass of almost exactly 1 gram, so that the number of grams per cubic centimeter of any substance (density) is equal to the ratio of the mass of any volume of the substance to the mass of any equal volume of water (specific gravity).

Boyle's Law.—This is one of two important laws of pressure that apply to gases: If the temperature of a given quantity of gas remains constant, the volume is inversely proportional to the pressure. That is, each time the volume is halved, the pressure is doubled, and so on. This means, of course, that the molecules collide more frequently in smaller confinement, thus raising the pressure.

Law of Charles and Gay-Lussac.—The pressure of an enclosed volume of gas varies directly as its absolute temperature; that is, its temperature measured from the absolute zero, which is — 273° C. This is due to the fact that the speed of motion of the molecules is increased as the temperature rises and that the impacts of the molecules are therefore stronger.

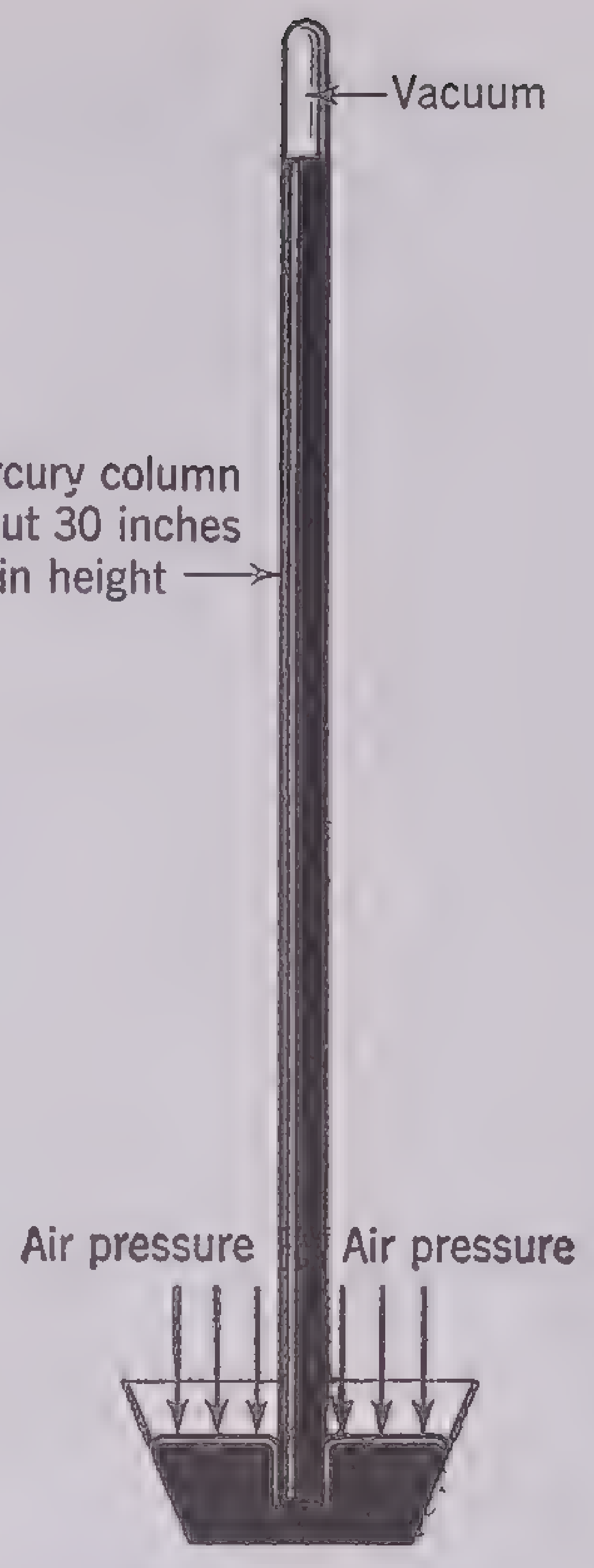
Avogadro's Law.—It is remarkable that all gases should be alike in conforming to these two laws, for in the case of solids and of liquids the behavior toward pressure and toward change of temperature is different for each substance. Gases, therefore, must have something in common that solids and liquids have not. What they all have in common is this: Equal volumes of gases contain, at like temperatures and pressures, the same number of molecules. This is known as *Avogadro's Law*.

Atmospheric Pressure.—In 1643 Torricelli, a pupil of Galileo, proved experimentally that the pressure of the air on 1 square inch of surface is equal to the pressure of a column of mercury 30 inches in height. At sea level, the atmospheric pressure is about 14.7 pounds to the square inch; the pressure diminishes with altitude, because the air grows progressively less dense, being 7,000 times as dense at sea level as it is 33 miles above the earth. Since the pressure of the air is equal in all directions, we do not experience any feeling of weight, although we are in the midst of a great atmospheric sea weighing 60 million billion tons.



Hydrometer

Archimedes's Principle is illustrated in the *hydrometer*, an instrument for measuring the density of a liquid. The hydrometer floats in the liquid and displaces a weight of liquid equal to its own weight. If the liquid is dense, the hydrometer will not sink as far as if the liquid were light. The scale on the stem is graduated so that the density or specific gravity can be read directly. Hydrometers are much used for testing the density of the electrolyte in storage batteries, since the degree of charge in a battery can be learned from this density



The Barometer

How the pressure of the air holds up the mercury

Applications of Pressure.—We owe many useful appliances to the compressibility of air and the force of air pressure. One thousand cubic feet of air compressed to 100 cubic feet will exert a pressure of 147 pounds per square inch. Because of its elasticity, compressed air expands when the pressure on it is removed. The air brake, which utilizes variations of air pressure to operate pistons and levers that set the brake shoes on car wheels, has saved many lives by stopping railroad trains quickly. In tunneling, rock drilling, ventilating, underground mail dispatching and many other operations, compressed air is used to operate tools and machinery. Atmospheric pressure is employed in connection with the siphon to transfer liquids from one elevation to another. The lift or suction pump operates by air pressure, as does the force pump, which delivers water under pressure, as in fire engines. Atmospheric pressure is the force that drives air through the mouthpiece of the tube in the vacuum cleaner.

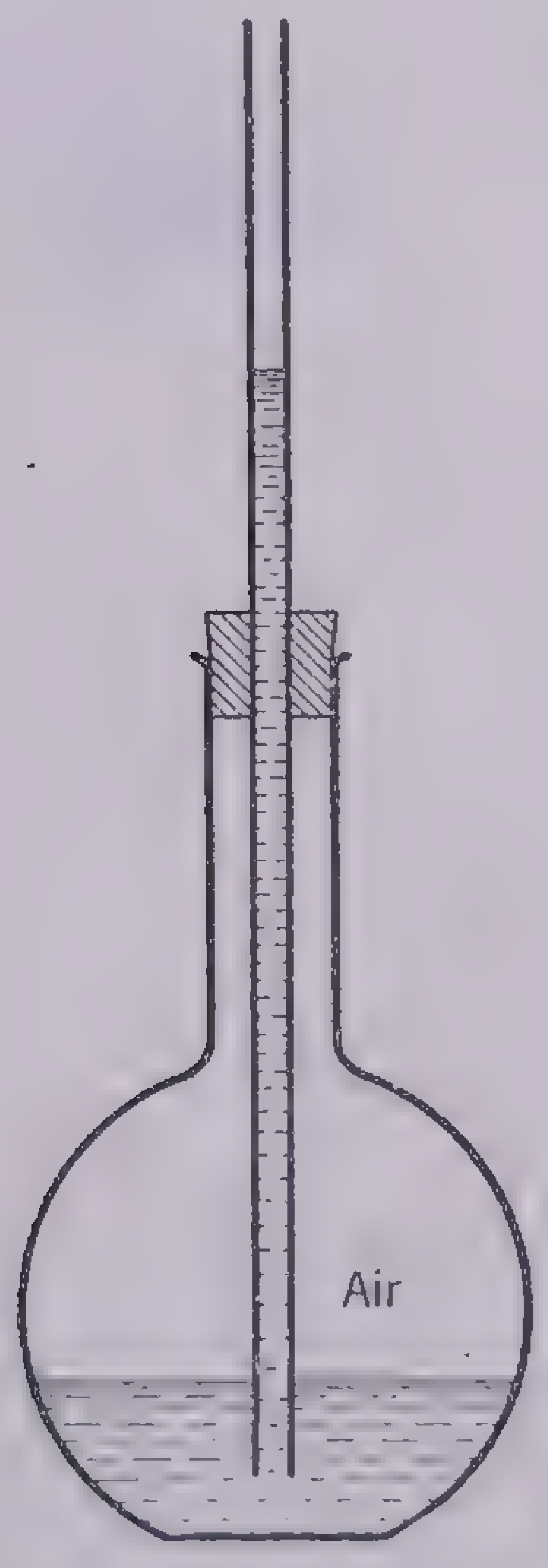
HEAT

Heat is a form of energy resulting from the vibrations of the molecules of matter. As indicated in a preceding section, molecules are incessantly in a state of vibration. Any increase in the energy of this vibrating motion manifests itself in a condition of greater heat; a body with molecular motion speeded up becomes warmer. A decrease of molecular motion cools a body. When this principle was first formulated, it was named the *kinetic theory of heat*. It is a fundamental law of physics, universally accepted and readily capable of proof.

If we place a pan of cold water on a gas flame, in time the heat of the fire will be communicated to the pan and the water will become hot. The fire and the cold pan are said to be at different temperatures; when they are placed in contact, the heat of the flame flows toward the pan in accordance with the law that there is a passage of heat from a body of higher to one of lower temperature when the two are brought together. *Temperature* may be defined as that condition of matter that determines the transfer of heat from one body to another when they are in contact. It is not a measure of *quantity* of heat but of *intensity* of heat. A barrel of cool water will have a greater quantity of heat than a saucer of hot water, but the saucerful will show a higher temperature.

Measurement of Temperature.—Temperature is measured in degrees by a mercurial instrument called the *thermometer*. Very high temperatures beyond the range of mercurial thermometers are measured by an instrument called the *pyrometer*. A scale of temperatures is a system of numbering temperatures, the numbers being larger as the temperatures are higher. A scale is based upon two fixed temperatures; namely, the temperature at which pure ice melts (the *ice point*), and the temperature at which pure water boils (the *steam point*), both under normal atmospheric pressure of 760 millimeters or 29.92 inches of mercury. Three systems or scales are in use—the centigrade or Celsius (C.), the Fahrenheit (F.) and the Réaumur (R.).

CENTIGRADE.—Anders Celsius (1701–44), a Swedish astronomer, introduced the centigrade or 100-degree scale about 1742. This scale is used almost universally in countries that have adopted the metric system of weights and measures as well as in scientific work everywhere. The ice point is at zero (0° C.) and the steam point at 100 degrees (100° C.); the unit of measurement, the centigrade degree (1° C.), is 1/100 of this interval.



Galileo's Air Thermometer

Warming the air in the flask causes it to expand and exert pressure on the liquid; the pressure forces some liquid into the tube. Temperature may be estimated by the height of the liquid in the tube

FAHRENHEIT.—This scale was introduced by Gabriel Daniel Fahrenheit (1686–1736), a German physicist, early in the 18th century. It is generally used in English-speaking countries, except among scientific men. Fahrenheit took as his zero the temperature of a mixture of snow and common salt; and he made 96 degrees between that and the temperature of the human body. This scale made the ice point 32° F. and the steam point 212° F. With the difference of 180°, the Fahrenheit degree (1° F.) is 1/180 of this interval. The Fahrenheit degree is thus 100/180 or 5/9 as large as the centigrade degree. The Fahrenheit zero, at 32° below the ice point, corresponds to 17.8° C. below centigrade 0.

RÉAUMUR.—This scale, which was devised about 1731 by the French naturalist and physicist, René Antoine Ferchault de Réaumur (1683–1757), is used in a few European countries, but is fast being superseded by the centigrade. It has 0° at the ice point and 80° at the steam point, so that the Réaumur degree (1° R.) is 5/4 of the centigrade degree of 9/4 of the Fahrenheit degree.

CONVERSION.—To convert from one scale to another, in accordance with the above definitions, we have the following practical rules:

Centigrade to Fahrenheit; multiply by 9/5 and add 32°.

Centigrade to Réaumur; multiply by 4/5.

Fahrenheit to centigrade; subtract 32° and multiply by 5/9.

Fahrenheit to Réaumur; subtract 32° and multiply by 4/9.

Réaumur to centigrade; multiply by 5/4.

Réaumur to Fahrenheit; multiply by 9/4 and add 32°.

Care should be taken to make the addition or subtraction algebraically; that is, taking account of the negative sign when the temperature in question is below zero.

ABSOLUTE TEMPERATURE.—By absolute temperature is meant the temperature measured in any one of the three kinds of degrees, not from the ice point or from the Fahrenheit zero, but from a point known as the absolute zero, about −273.1° C., −459.6° F. or −218.5° R. This is the temperature that a body would possess if all its molecules ceased to vibrate. It is an imaginary condition so far as actual experiments are concerned, but is used in scientific calculations. Temperatures within a few degrees of it have been achieved in the laboratory with liquid helium.

Effects of Heat.—The importance of heat lies in the different effects produced by it. The most significant of these, in addition to change of temperature, are changes in the size, state and composition of matter.

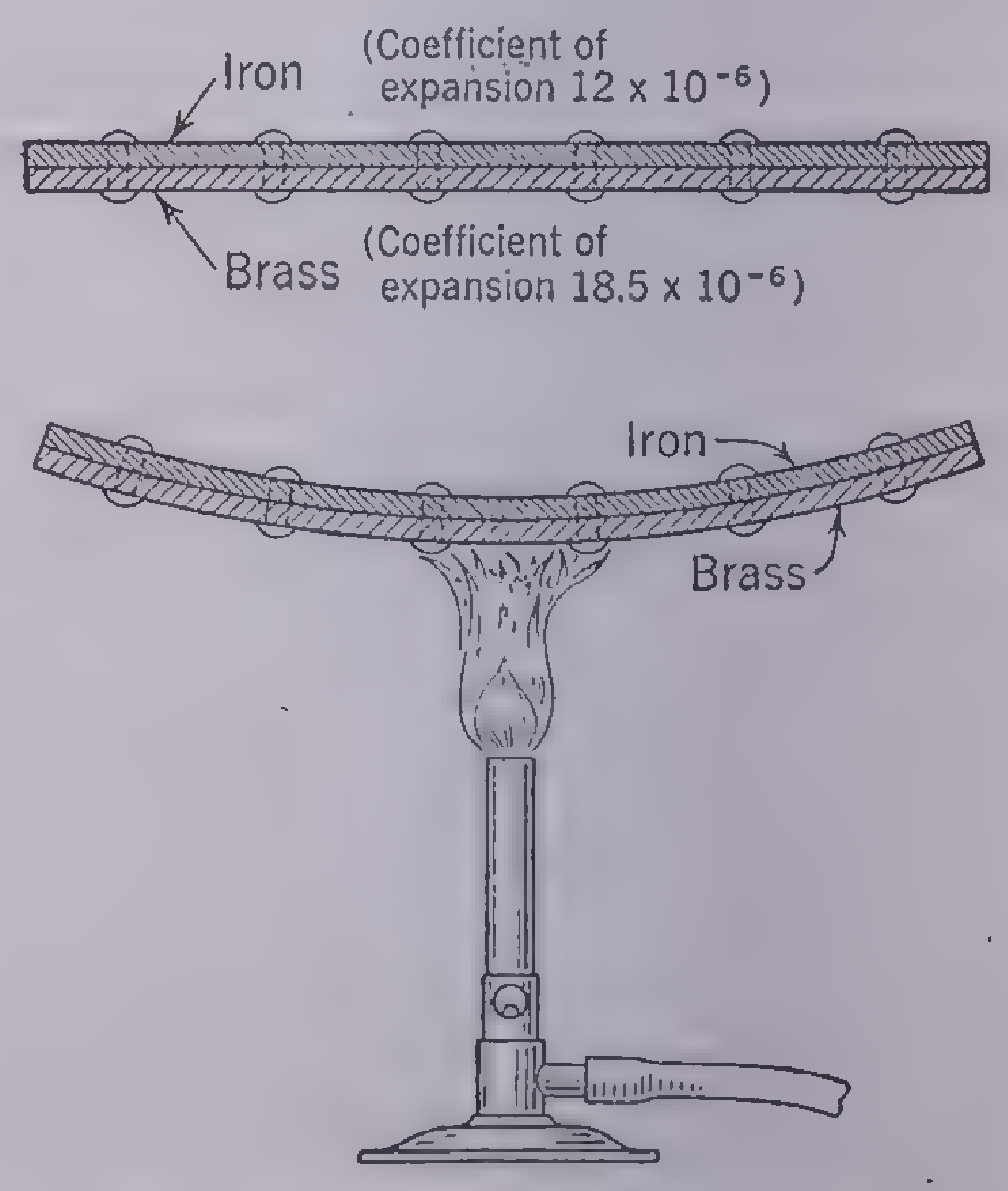
EXPANSION AND CONTRACTION.—The change of size due to heat is called *expansion*. Nearly all solids and liquids expand when their temperatures rise; they contract when cooled. Gases always expand when heated. Expansion of solids explains many familiar facts. A long iron bridge has one end fastened and the other end on rollers with a space for it to move outward in summer, when heat lengthens it, and back in winter. A cold thick glass will sometimes crack when boiling water is poured into it because glass conducts heat slowly, and the inside, which is heated first by the water, expands before the outside and so puts the glass under such strain that it breaks. A thin glass is much less liable to crack. Quartz glass expands so little that when heated red hot it can be plunged into cold water without cracking, whereas ordinary glass, under the same conditions, will be shattered into hundreds of fragments. Nearly everyone has applied a lighted match to the metal cap of a container such as an olive bottle, to loosen it by expansion. A watch will not keep good time from season to season unless some provision is made for the adjustment of parts subject to expansion and contraction. An important application of the expansion of a liquid is the use of mercury in a thermometer. This metal responds very quickly to temperature changes and undergoes a uniform expansion when heated.

The *coefficient of expansion* of a substance is the amount of expansion per unit length per degree rise in temperature. The centigrade temperature scale is practically always used. If a bar or wire of metal has a length l at a given temperature t, it will have length $l + (t_1 - t)\,cl$ at a temperature t_1, where c is the cofficient of expansion. The following table gives the coefficients of expansion for a few common substances:

Aluminum	23.03×10^{-6}
Brass	18.5×10^{-6}
Quartz glass	$.5 \times 10^{-6}$
Iron	11.7×10^{-6}
Platinum	8.9×10^{-6}

(The factor $10^{-6} = 1/1{,}000{,}000$. This is a convenient way to write small numbers.)

The unequal expansion of different metals as their temperature changes is utilized in the *thermostat* for the automatic regulation of temperature. If two strips of metals with different coefficients of expansion are soldered


Iron (Coefficient of expansion 12 x 10⁻⁶)
Brass (Coefficient of expansion 18.5 x 10⁻⁶)
Iron
Brass

The Principle of the Thermostat

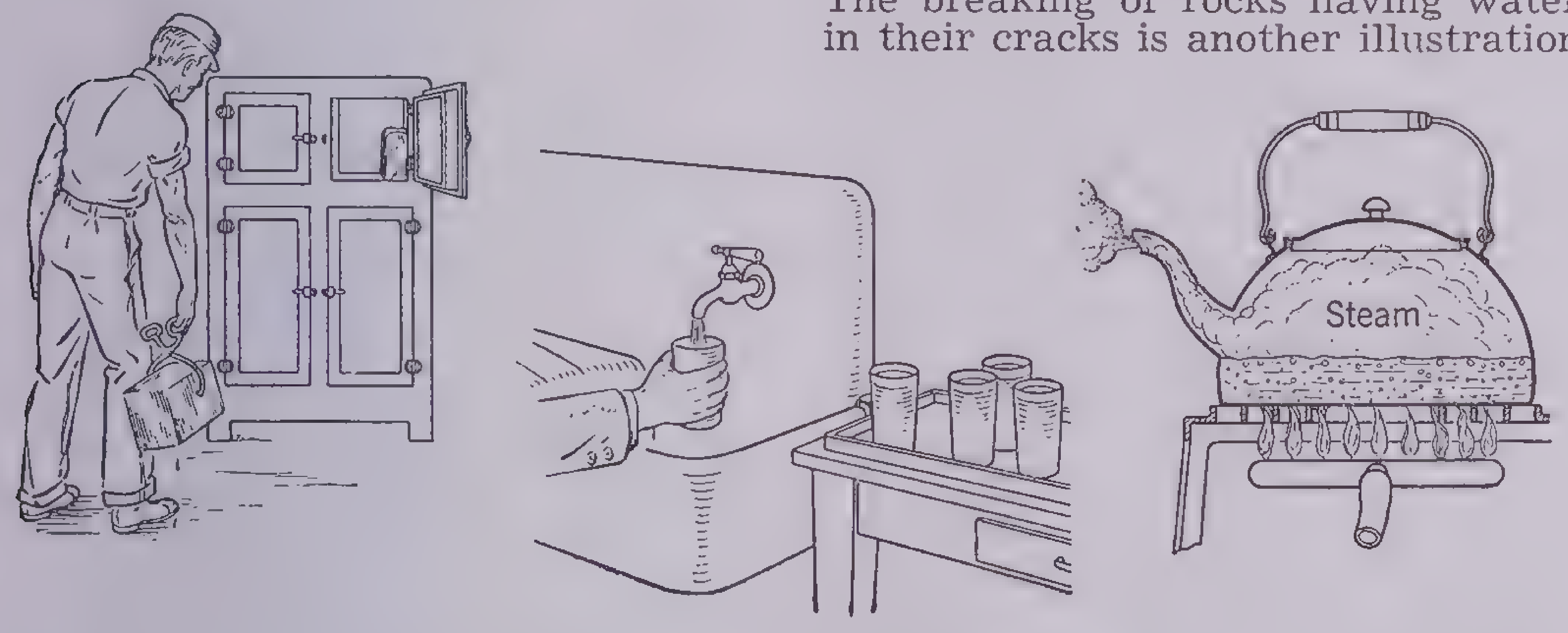
or riveted together as in the diagram, the composite piece will tend to bend in one direction when the temperature rises and in the opposite direction when it falls.

When such a strip of brass and iron is warmed, the brass expands more than the iron, and the strip curls convexly on the brass side. When the strip is cooled, the direction of curl is reversed.

In the thermostat such a strip of metal is connected with a control device (perhaps an electric switch), and an adjustment is arranged so that a given rise of temperature will shut off the heat supply and a fall of temperature will turn on the heat supply. Thermostats are used to maintain constant temperatures in homes, refrigerators, electric irons, automobile engine-cooling systems and in hundreds of industrial processes.

Water has the remarkable property of contracting while being heated from 0° C. to 4° C. Further heating causes it to expand.

In proportion to volume, liquids expand more than solids, and gases expand most of all. For a liquid or a gas, the coefficient of expansion is the fraction of its *volume* that the fluid expands with each degree of rise in temperature.



Water in Three States

The solid (ice), liquid (water) and gaseous (steam) states of water are all shown here

Change of State.—The state of matter—solid, liquid or gaseous—is determined in most cases by its temperature. Under normal conditions, water below 32° F. is *solid* (ice); between 32° and 212° F. It is *liquid* (water); and above 212° F. it is *gas* (steam). Water, however, changes into a gas to some extent at all temperatures. When this change takes place at the surface, it is called *evaporation.* When water at sea level is heated to 212° F. or 100° C., bubbles of gas (steam) form in the bottom of the container where heat is applied. These bubbles rise through the liquid and escape. This process is called *boiling. Vaporization* is a term that includes both evaporation and boiling. Pressure raises the boiling point, a fact utilized in the manufacture of pressure cookers. Conversely, a lowering of pressure lowers the boiling point. Water boils at such low temperatures on high mountains (where atmospheric pressure is low) that foods cannot be cooked there by boiling.

The change of a solid into a liquid is called *melting, fusion* or *liquefaction.* Solids that have a crystalline structure (those whose molecules assume the form of crystals when solidifying in a solution) change to the liquid form at a definite point of temperature when heated. Examples are ice, salt, sugar and alum. Solids that do not crystallize, such as glass, wrought iron and wax, pass gradually into the liquid form when heated. These have no definite melting point. The liquid form is the intermediate condition between the solid and gaseous states of matter, but some solids (arsenic, for example) pass directly into the gaseous form, because their melting and boiling points are the same. This jump from a solid to a gaseous state with no liquid state between is called *sublimation.*

The phenomenon of *freezing* is the opposite of melting or fusion. The withdrawal or reduction of heat causes a liquid to solidify. Usually, a liquid freezes at the same temperature that its solid melts. Ice melts and water freezes at 32° F. Because water expands in freezing, water pipes sometimes break open on a cold night. The breaking of rocks having water in their cracks is another illustration of the same principle. Pressure lowers the melting point of ice and the freezing point of water. That is why ice will form in a snow-covered road where the wheels of vehicles have pressed upon the snow. The pressure causes the snow crystals to melt, and afterwards the water freezes. Such refreezing is called *regelation. Freezing mixtures* illustrate another principle, the absorption of heat in the process of passing from solid to fluid form. When ice and salt are placed in contact with an ice-cream can, the ice melts at a temperature below its normal melting point, because of contact with the salt; the salt dissolves in the water that is formed. The two processes absorb heat from the mixture in the can, and a frozen dessert results.

Measurement of Heat.—The *British thermal unit* (*B.T.U.*) and the *calorie* are the two units of heat measurement in common use. One B.T.U. is the amount of heat required to warm 1 pound of water 1° F. The calorie is a metric unit. One small calorie (a large calorie equals 1,000 small calories) equals the amount of heat required to warm 1 gram of water 1° C. (As the amount of heat required to raise the temperature of a given amount of water through a given temperature interval varies slightly with the initial temperature, the calorie is strictly defined as the amount of heat required to raise 1 gram of water from 15° to 16° C. In most practical calculations this refinement may be neglected.) The large calorie represents the heat required to warm 1 kilogram (1,000 grams) of water 1° C. and is commonly used in measuring the heating value of foods. As this unit is equal to the heat required to warm 1 pound of water 4° F. (approximately), it is equivalent to about 4 (precisely, 3.968) B.T.U. The small calorie is used in scientific calculations.

Specific Heat.—It is an important fact that different substances differ in the amount of heat needed to raise a definite mass a certain number of degrees. The ratio of such an amount of heat to the amount of heat required to warm an equal mass of water an equal number of degrees is the specific heat of the substance. It is the number of calories of heat required to raise the temperature of 1 gram of the substance 1° C. When we say that a metal has a specific heat of 0.1045, we mean that it requires 0.1045 calorie to warm 1 gram of the metal 1° C.; in other words, the amount of heat required to raise 1 gram of the metal through 1° C. will raise 1 gram of water through 0.1045° C.

The specific heat of water is 1; of ice, 0.5; of steam, 0.48; of alcohol, 0.65; of aluminum, 0.217; of iron, 0.11; of zinc, 0.093; of silver, 0.106; of mercury, 0.033. The heavier metals have the lower specific heats. Multiply the atomic weight of any element by its specific heat and the product is always about 6.5.

Of all the common substances, water has the highest specific heat; this fact is utilized in such appliances as the hot-water bottle. A bottle of hot water will supply about 2.3 times as much heat, for example, as the same bottle filled with mercury at the same temperature.

Transmission of Heat.—Heat travels from one body to another by three different modes—conduction, convection and radiation.

Conduction.—Everyone knows that cooking utensils, flatirons and other appliances that have to be handled while they are hot are equipped with wooden handles because wood remains cool while metal becomes very hot. Here we have an example of the conduction of heat, the transfer of heat energy from molecule to molecule. Metals are excellent conductors of heat, and wood is a poor conductor. Other poor conductors are glass, asbestos, leather, wool, fur, cork and sawdust. Gases and most liquids (except molten metals) have low conductivity. It is the low conductive power of air in the meshes of wool and fur that makes them good winter garments. The air prevents the heat of the body from escaping. Substances used as heat nonconductors are called *insulators.*

Convection.—The transference of heated matter from one place to another is called *convection.* This process is limited to fluids, because the molecules of solids are not free to move about. When heat is applied to a liquid or a gas, the molecules nearest the source of heat expand and become less dense. The cooler and heavier molecules are forced down by gravity, the warmer, lighter particles rise and a system of convection currents is set up. Winds and ocean currents are convection currents, as are drafts in chimneys and the flow of water in a hot-water heater. We rely upon convection in heating and ventilating our homes.

RADIATION.—In convection and conduction the substance heated is in contact with the source of heat. Radiation is the transmission of heat from one body to another when the two are separated, and such transference is carried on through the agency of waves. Waves of heat energy from the sun, called *infrared* radiation, are of the same nature as light waves, but are of longer wave-length (*see* LIGHT, *below*). Radiant energy does not heat bodies directly; but when the waves are received by matter, some of the energy is absorbed and an increase of molecular vibration is set up. Dull, rough, black surfaces absorb heat better than bright, smooth, white surfaces. Surfaces that absorb heat best also radiate heat best. If it is desired to have a device give out radiant heat quickly, its surface should be dull and rough. This is the practice in making radiators. If it is desired to hold the heat in, have a polished, bright surface, as is used on the teakettle and teapot. Hot coals in a furnace or a stove radiate intense heat to the walls about. Radiated heat from the walls of the oven supplies most of the heat for baking. Heat radiated from the sun warms the earth and the earth in turn radiates the absorbed heat to the air. The air is warmed more in this way than by the direct heat of the sun.

It is important to know the following laws of heat radiation:

1. Radiation travels in straight lines.
2. The amount of radiant energy received by a body from any small radiant area varies inversely as the square of the distance between them.

THE VACUUM BOTTLE.—The working principle of the vacuum flask involves all three forms of heat transference.

It consists of two glass bottles, one inside the other, with a common mouth. A nearly perfect vacuum between the bottles prevents heat from being conducted into or out of the inner flask and convected away in the surrounding air. The outer surfaces of the bottles are silvered, and any heat radiated from the inner vessel across the vacuum is reflected back. Since there is no air in contact with the inner surface, heat cannot escape by conduction or convection. Hence the contents of the inner bottle remain cool or hot, as the case may be.

Heat and Work.—The application of mechanics to heat phenomena is the science of *thermodynamics*. Heating the brakes as a motorcar proceeds slowly down a long hill and warming one's hands by rubbing them together are illustrations of mechanical methods of producing heat. Conversely, heat may be converted into mechanical work. The steam engine is a machine that does this. There is an exact numerical relation between the mechanical energy used (or the work done) and the amount of heat produced in such transference of energy. This relation, which is called the *mechanical equivalent of heat,* can be expressed in units of both the English and the metric systems:

777.5 foot-pounds are equivalent to 1 B.T.U.

4.18 joules or 427 gram-meters = 1 calorie of heat.

These equivalents of heat mean that if the work done in lifting 778 pounds to a height of 1 foot were converted into heat it would raise the temperature of 1 pound of water 1° F.; and that if the work done in raising 427 kilograms to a height of 1 meter were converted into heat the temperature of 1 kilogram of water would rise 1° C.

We have learned that a definite quantity of heat, the calorie, is required to raise the temperature of 1 gram of water 1° C. It might be supposed that the same amount of heat would suffice to melt 1 gram of ice; to change it from water at 1/2° C. below zero to 1/2° C. above zero. This is by no means the case. A large amount of heat is required merely to melt ice; to change the state of water from solid to liquid requires approximately 80 calories per gram, even though no rise of temperature occurs. This heat required merely to change the state of a substance is called *latent heat.* A similarly large amount of heat is required to change liquid to vapor; in the case of water, 536 calories per gram are required merely to change the state.

Thus melting solids and evaporating liquids absorb much larger quantities of heat than are required for raising temperature without a change of state. This principle is utilized in artificial refrigeration.

ARTIFICIAL REFRIGERATION.—Every pound of ice that melts takes 1444 B.T.U. from surrounding bodies. When ice and foods are enclosed in a box with heat-insulating walls, as in a refrigerator, the foods supply the heat that melts the ice; they are cooled by this loss of heat. If the hand is wet with a volatile liquid, as ether or gasoline, and moved in the air, the liquid quickly evaporates and gives a sensation of coolness. This principle of cooling is employed in home electric refrigerators. Under compression, some gases—for example, sulphur dioxide and methyl chloride—become liquid and give out heat. When such gases are used in refrigeration, this heat is liberated in a condenser outside the refrigerator. The liquid then passes from the condenser to the expansion coils in the refrigerator; here the liquid changes to a gas and expands. Both processes absorb heat. In this way the refrigerator is cooled. The expansion coil is connected with a pump that draws the gas out and compresses it again. The pump is driven by means of an electric motor.

Artificial cold is produced on a much larger scale for cold-storage warehouses, ice making and indoor skating rinks. The principle of cooling is the same as in the home electric refrigerator, but ammonia is used inside the circulating pipes. The gas is compressed to a liquid in the condenser and the heat removed, often by running water. The expansion pipe is sometimes surrounded by brine in which cans of water are frozen for the purpose of producing ice. The cold brine itself may be pumped through pipes that pass around the walls of rooms or show cases that are kept cool. Thermostats automatically control the degree of cold so that a room may be kept at any desired low temperature. The production of liquid air for industrial purposes is based on the same principle of cooling with expansion. Liquid air has as low a temperature as —312° F.

At the end of this treatment of Physics there is a section on applied mechanics with problems on the topics treated so far.

LIGHT

Light, that form of radiant energy that reveals the world to our sight, has given rise to an immense amount of speculation among scientists. Centuries ago, men as intelligent as Plato and Aristotle declared that the eye itself sent out rays that illuminated matter. No definite progress was made in the science of optics until the 17th century, when a great Dutch physicist Christian Huygens first advanced the theory that light is a wave motion in the ether. Because his even greater contemporary, Sir Isaac Newton, formulated a totally different theory, Huygen's wave theory was not accepted for more than a century. Newton conceived of a ray of light as a stream of minute particles or corpuscles emitted from a luminous body at high velocity. It is a most interesting and important fact that scientists today are confronted with phenomena that seem to show that both theories have validity, though the modern corpuscular theory is not identical with Newton's.

Nature and Properties of Light

The Wave Theory.—This theory was originally propounded by Huygens, but its precise mathematical expression was made in 1801 by Thomas Young, a British scientist, and was further elaborated by the French physicist, Augustin Jean Fresnel, who proved that the wave motion is transverse and not longitudinal. In 1865 James Clerk-Maxwell, English mathematical physicist, showed that light is a wave motion of lines of electromagnetic force. This electromagnetic theory of light completed the structure, and made the hypothesis reasonable and understandable. The wave motion of light may be likened to the motion of water particles in a pond that has been stirred by a stone thrown into it. (Light waves, however, are not mechanical waves. It is the motion that we are comparing.) In the pond we see a series of ever-widening circles rippling away on all sides of the center of movement. Each circle consists of water particles oscillating up and down, and their motion is at right angles or transverse to the direction of the wave. We observe in these waves a series of ridges and depressions or crests and troughs; the distance between any two crests is the length of the wave, and its frequency is the number of waves passing a given point in a second. Now think of a luminous body as a center of disturbance in the ether. The vibration of the molecules of the body sets up a wave movement in the ether, which begins to undulate in the same way that the water of the pond does, though the waves of ether are spherical and not spread out in a single plane. It is customary to speak of the line along which a wave travels as a *ray,* and to call a bundle of parallel rays a *beam.* A ray is one of the radii of the spherical wave.

All ether waves are of an electromagnetic nature. Each form of wave has a definite range of wave length and frequency of vibration. The longest waves are those used in the transmission of wireless; those second in length are waves producing heat (infrared); and then come those producing visible light. As stated below, under *Colors,* visible light waves vary in length from about 4 to 8 ten-thousandths of a millimeter. The longest give us the sensation of red light and the shortest produce violet. Of shorter wave length than violet light are ultraviolet rays, X rays, gamma rays and cosmic rays, in this order.

Each kind of wave has its own frequency of vibration; the shorter the wave, the faster the vibration, but all electromagnetic waves travel in space with the same velocity. In this discussion, the ether has been taken for granted. The propagation of light waves through empty space presupposes something to undulate. On the other hand, certain experiments indicate that light and other forms of radiant energy consist of tiny packets or particles that travel at the same high speed. These particles have been termed *quanta* (see *Electricity and Magnetism* and *Quantum Theory.*) Certain phenomena indicate the validity of the wave theory and the ether; others are explained by the particle theory. Hence most physicists believe that each theory is a special case of a broader concept not yet worked out. The reconciliation of the wave and quantum theories is one of the most important problems of modern science.

Velocity of Light.—The velocity of light (and of all other electromagnetic waves) is about 186,300 miles per second. The American physicist, Albert A. Michelson (1852–1931), for many years devoted his great experimental genius to the problem of measuring accurately this fundamental physical constant, and the final results obtained by him are probably correct within a few miles per second.

That the light from the sun does not reach us instantaneously was discovered in 1675 by a young Danish astronomer, Olaus Römer (1644–1710). Römer found that a calculated eclipse of the satellites of Jupiter appeared about 16 minutes late if it was observed at the time when the earth had traveled in its orbit to a point farthest from Jupiter. Reasoning that this interval represented the time taken by light in crossing the earth's orbit, Römer was able to calculate the speed of light.

In modern times it has been found possible to measure the velocity of light directly by experiments with revolving mirrors, and these direct measurements are more accurate than our independent measurements of the diameter of the earth's orbit. Accordingly we do not depend upon a knowledge of the diameter of the earth's orbit to enable us to compute the velocity of light but use the independently determined velocity of light to calculate the diameter of the earth's orbit.

TRANSMISSION THROUGH OBJECTS.—When light falls upon a body, that body reflects some of the light energy and absorbs some of it; if the body is *transparent,* it will also *transmit* light and to such a degree that one can see objects through it, as when one looks through a pane of clear glass. A body that transmits no light is said to be *opaque.* Bodies that allow some light to pass through, so that objects seen through them appear blurred, are said to be *translucent.* Substances like glass and water under different conditions may be transparent or translucent.

DIRECTION OF PROPAGATION.—In a medium that is uniform throughout light travels in straight lines. That is why an opaque object in the path of the sun or other luminous body casts a shadow. The light rays are cut off because they cannot pass around the obstruction. The part from which all the light is cut off is called the *umbra* or shadow; that from which the light is partially excluded is the *penumbra* or almost-shadow.

Diffraction.—Although light waves travel in straight lines, they have a slight tendency to spread out behind an obstacle, when they pass along the sides of a small opening or when they are reflected from ruled surfaces. This phenomenon, which is called *diffraction,* means that light waves do bend a little when they encounter an obstacle. This is a well-known property of sound waves. Because of diffraction we can hear a sound around a corner or from the opposite side of a building. Light waves, however, are so extremely short that diffraction of light can be detected only by the use of specially prepared apparatus.

Intensity of Illumination.—The measurement of the intensity of light is called *photometry.* By intensity is meant the amount of light received by a unit of surface. This intensity varies inversely as the square of the distance from the luminous object. For example, a screen 16 feet from a source of light will receive but one-fourth as much illumination as one 8 feet away ($16^2 \div 8^2 = 4.$). This law, as stated, is valid only when the illuminated surface is at right angles to the direction of the rays. If the rays fall obliquely, the intensity is less.

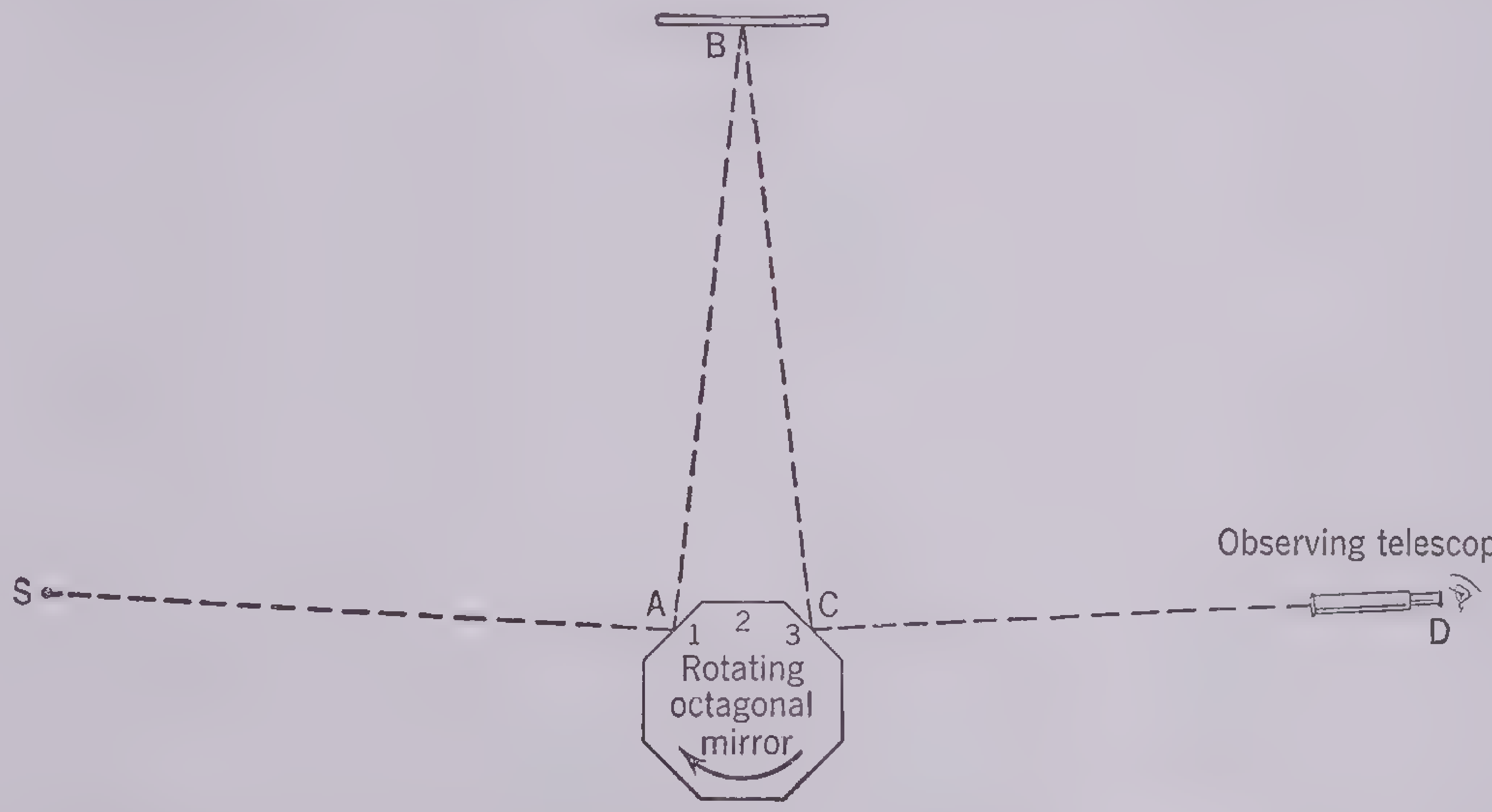


Diagram of Michelson's Apparatus

In measuring the speed of light, a beam from a source S is reflected from one face of an octagonal mirror, which is pivoted so that it may be rotated at high speed. The beam is sent to a distant fixed mirror B, whence it is reflected back to the octagonal mirror at C. An observer looking through the telescope at D sees an image of the source S at the cross hairs of the instrument. When the mirror is made to turn, the image becomes displaced from the telescope's cross hairs, because in the time required for the light to pass from A to B and back to C, the mirror face (No. 3) turns through a small angle. The displacement becomes greater as the speed of the mirror is increased. If the mirror turns fast enough, however, the image will reappear in the telescope field and eventually will again coincide with the cross hairs. This will happen when the speed of the mirror is such that face No. 2 reaches the position C just as the light reaches it; in other words, when the mirror makes one-eighth of a turn while the light travels from A to B and back to C. In actual experiments the fixed mirror was located 22 miles away, yet it was necessary to turn the rotating mirror more than *500 times a second* in order to catch the light as it returned from its 44-mile journey

CANDLE POWER is the unit by which light emission is measured; it is the amount of light produced by a 7/8-inch sperm candle burning at the rate of 120 grains an hour. The *foot-candle* is the intensity of illumination given by a one-candle-power light at a distance of 1 foot. If a course of light of P candle power is placed D feet away, the intensity of illumination in foot candles will be $\frac{P}{D^2}$.

The *lumen* is the amount of light that will fall on 1 square foot illuminated by an intensity of 1 foot-candle. The surface of a sphere of radius r is equal to $4\pi^2$. If a standard candle is thought of as burning at the center of a sphere having a 1-foot radius, the intensity of illumination at all points on the sphere's surface will be 1 foot-candle; the total area illuminated will be 4π or 12.57 square feet. One candle power, therefore, is equivalent to 12.57 lumens.

Reflection of Light.—Luminous bodies, like the sun, electric lights and burning candles, give out light of their own. Nonluminous bodies, such as the earth, buildings and the furnishings of a room, are visible only when they receive light and reflect it (send it back) to the eyes. When light goes from your face to a mirror and comes back to your eyes, you see an image of your face. This cannot happen in a dark room. There must be light that your face can reflect. Then the mirror reflects some of the light it receives from your face.

A smooth surface reflects a beam of light in another beam of parallel rays, but a rough surface scatters or diffuses it so that the rays are no longer parallel. Surfaces that diffuse light are better in our homes and books. A glossy page often makes a glare that is harmful to the eyes. Fewer rays of light are reflected from the surface of glass when they are perpendicular to it than when they are very oblique. After sunset and before sunrise, reflection of sunlight by dust particles and water vapor in the atmosphere is responsible for the periods of mellow light we know as *twilight.*

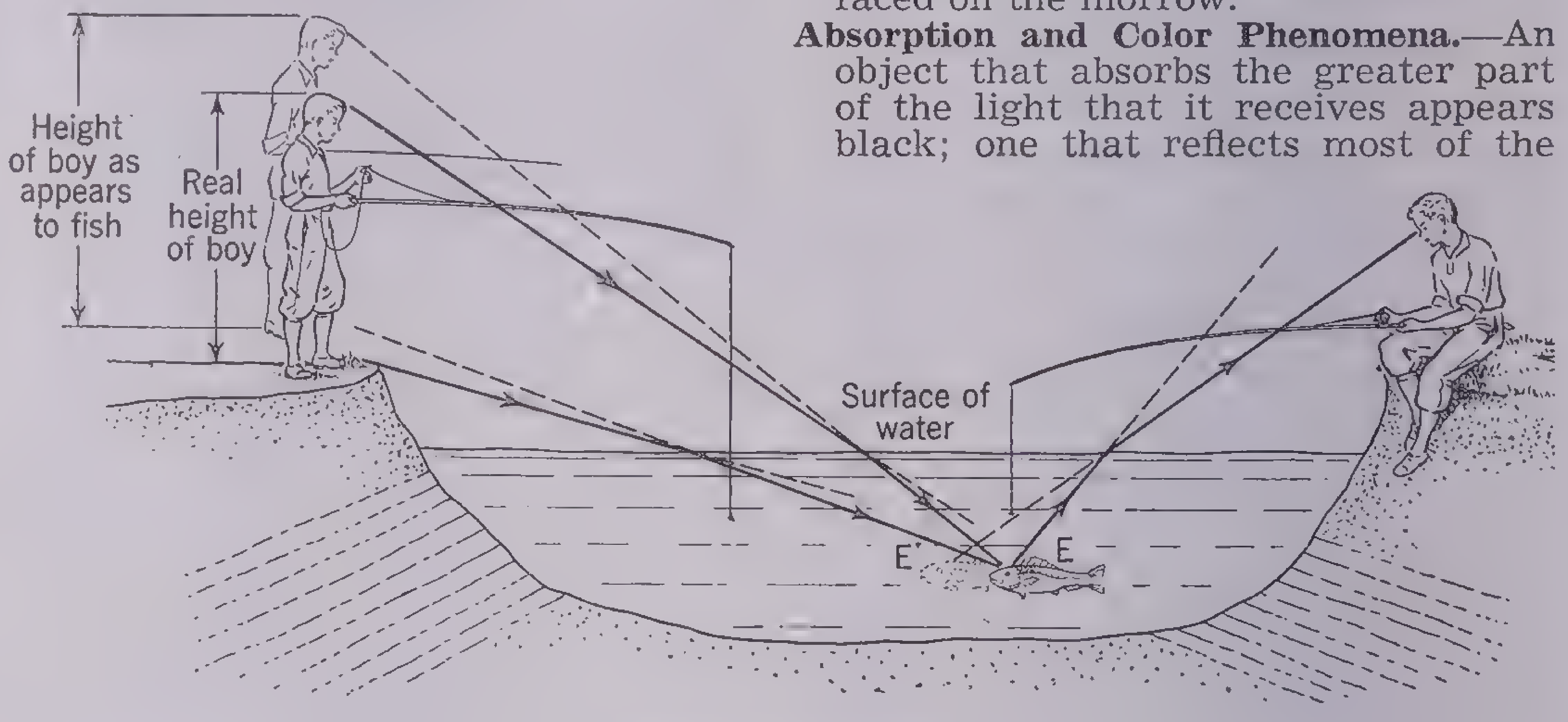
A ray of light that falls on a mirror is an *incident* ray, and a line at right angles to the mirror at the point where such a ray strikes it is called a *perpendicular* or *normal.* The angle between a reflected ray and the normal is known as the *angle of reflection;* that between an incident ray and the normal is the *angle of incidence.* In all cases these two angles are equal.

The object that you see in a plane mirror appears to be in the direction in which light enters your eye, not in the direction of the source of light. That is why the picture in the glass is called an *image.* The image of any object always seems to be as far back of the mirror as the object is distant from the front of it, and is the same size as the object. The image is said to be *virtual,* in distinction to a *real* image, such as would be formed on a screen by light rays themselves.

Refraction of Light.—This is the bending of rays of light upon passing from one transparent medium to another of different density. Rays perpendicular to the surface between the media are not bent, but all others are. The bending is due to the fact that matter slows up the light beam. Light travels more slowly in dense media, and from this fact we derive the following laws:

1. In passing from a rare to a dense medium, light is bent in the direction of a line perpendicular to the surface of the refracting body.

2. In passing from a dense to a rare medium, light is bent away from such a line. Owing to refraction, a stream looks shallower than it really is, and objects partly in and partly out of water may appear bent, though in reality they are straight. The illustration shows how bending of rays of light, in passing from water to air and from air to water, causes deception. To the boy fishing, the ray of light from E seems nearer the surface of the water and to start from E′. To the fish the boy looks taller than he really is.



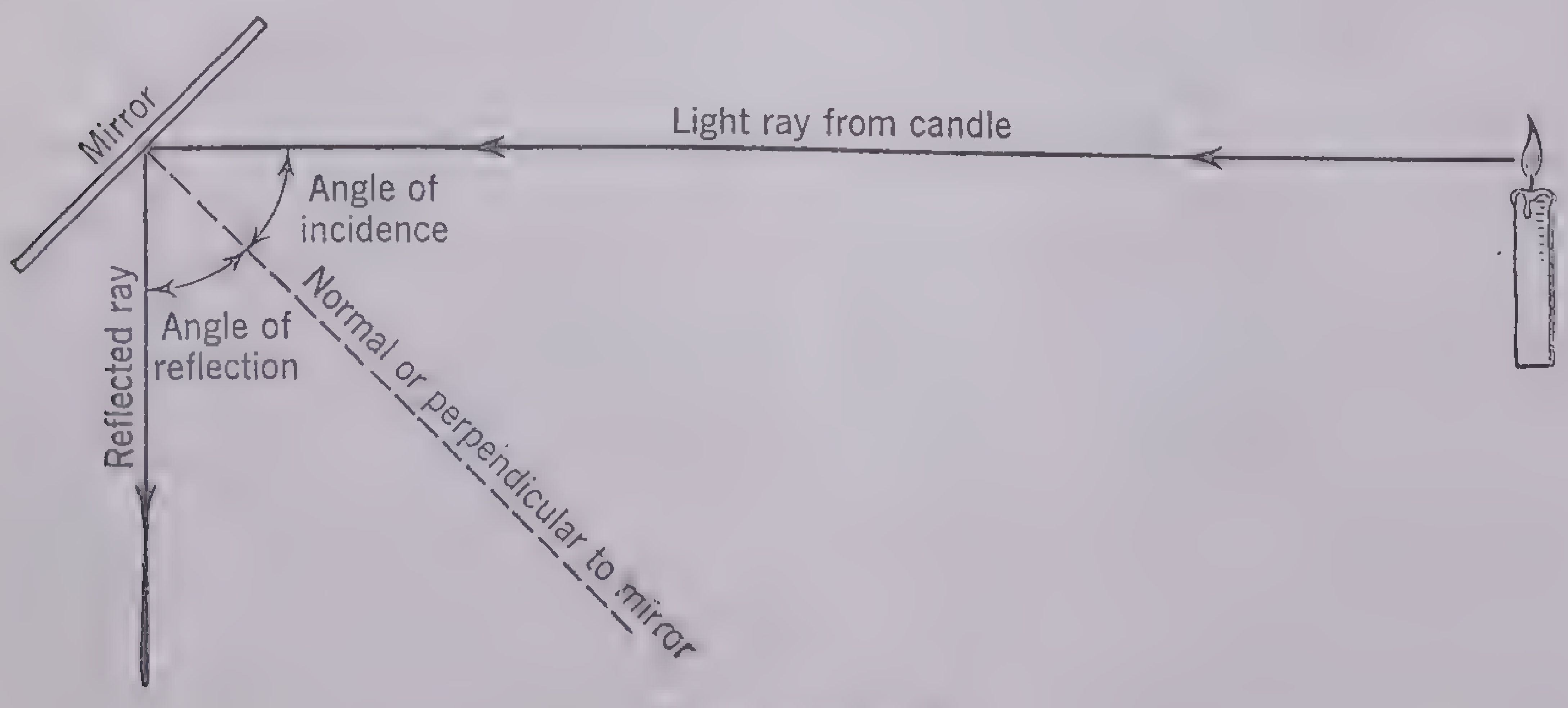
Refraction of Light

THE MIRAGE.—A mirage or looming is an optical illusion sometimes seen at sea, on large lakes, on the icy wastes of the polar regions and on deserts and arid plains. In mirages, images of various distant objects appear usually upside down; the objects themselves may or may not be within sight. Sometimes mirages appear as enlarged images of distant and invisible objects, thrown in relief against the sky. Mirages are caused by the refraction and reflection caused when light, in reaching a person from a distant object, passes through layers of air that are unequally heated, and which therefore are of different densities. When the reflecting layer of air is level and lower than the eye of the observer, the mirage often appears as a sheet of wind-ruffled water, a form of mirage common in the desert. When the reflecting layer of air is higher than the eye, the image appears to be located in the sky. A looming is a form of mirage in which objects appear greatly magnified both vertically and horizontally. The Specter of the Brocken, seen in the Harz Mountains of Germany, is a well-known example of this type of mirage. The exploring parties with Commander Byrd's Antarctic Expedition in 1929 sometimes saw a looming of the district they were to traverse the following day, great crevassed areas to be faced on the morrow.

Absorption and Color Phenomena.—An object that absorbs the greater part of the light that it receives appears black; one that reflects most of the light appears white. Selective absorption therefore results in color.

It should be clearly understood that color is a property of light determined by wave length. When a beam of sunlight is sent through a triangular glass prism at a large angle of incidence, a band of *spectrum* colors can be produced upon a white screen. These colors—red, orange, yellow, green, blue, indigo, violet—all are present in the white light of the sun, for white light is a composite of all colors. On passing through the glass prism, the different colors are separated by refraction. Matter slows up light, and different colors will pass through a prism at different velocities; this variation of speed causes the colors to be refracted at different angles. In an ordinary glass prism the degree of refraction increases as the wave length decreases, being greatest for violet and least for red. The separation of white light into the spectrum colors is called *dispersion.* The reunion of these colors by means of a second prism is called *synthesis.*

The range of visible light is from red waves, 0.00076 millimeter (or 0.000076 centimeter) in length, to the very short violet waves, 0.000397 millimeter long (1 inch = 25.4 millimeters). The wave lengths of all other colors lie between these extremes. When the material in a body absorbs all the light rays except those that have the wave length of red and reflects red, we say that the body is red. Red glass in our windows allows only the red rays to enter. A dress that is blue in daylight will appear



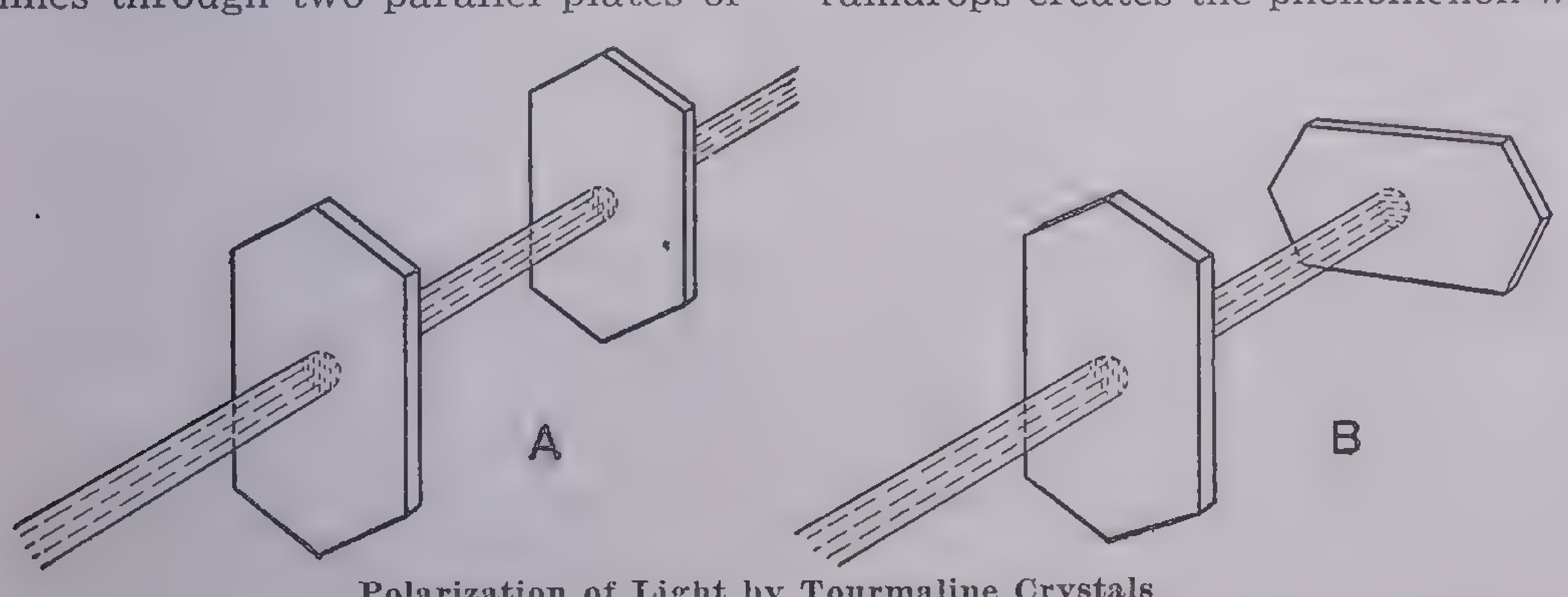
Mirror Reflection
How light is reflected from a mirror. The angle of incidence always equals the angle of reflection

black in a room in which light enters only through red glass. The sky looks blue because the dust particles in the air scatter all light rays except those having the wave length of blue. The dust particles reflect the blue rays.

Colors.—Red, green and violet light can be mixed in proportions to produce white light. By varying their amounts, any other color can be produced. Since the other colors can be produced from these, they are called the three *primary colors.* (More explicitly they are the three *physiological* or *additive* primaries; artists speak of red, yellow and blue as primary colors because other colors can be produced by mixing pigments of red, yellow and blue. Red, yellow and blue are called *psychological* primaries). Certain pairs of colors combine to produce white or a shade of gray; such colors are called *complementary.* Pairs of complementary colors are red and green, yellow and blue, green-yellow and violet, blue-green and orange. To obtain the effect of gray or white the *light* from the complementary colors must be mixed, for example by coloring sectors of a disk and then rapidly whirling the disk. Entirely different results are obtained by mixing *pigments.* Yellow and blue *light* mixed produce white or light gray; yellow and blue pigments mixed produce a green. The differences in results from mixing pigments and mixing colored light have occasioned much confusion in the nomenclature of color. Painters and decorators use the terms primary, complementary and the like in senses quite different from the physicist's meaning.

Mixing Pigments.—When paints or pigments of two colors are mixed, the resulting color is due to the absorption of all light waves except such as can pass through thin layers of the pigments. These are the waves reflected. Since the color of a pigment is due to subtracting colors, the mixture of the three psychological primaries—red, blue and yellow—absorb all light and produce black; but the mixture of two of them will produce another color; for example, the blue pigments reflect some green with the blue, but they absorb all yellow. The yellow pigments reflect some green with the yellow, but absorb all blue; hence, when yellow and blue pigments are mixed, all green, which is reflected by both, is the result. By this principle, different colors are produced by various combinations of pigments of the primary colors.

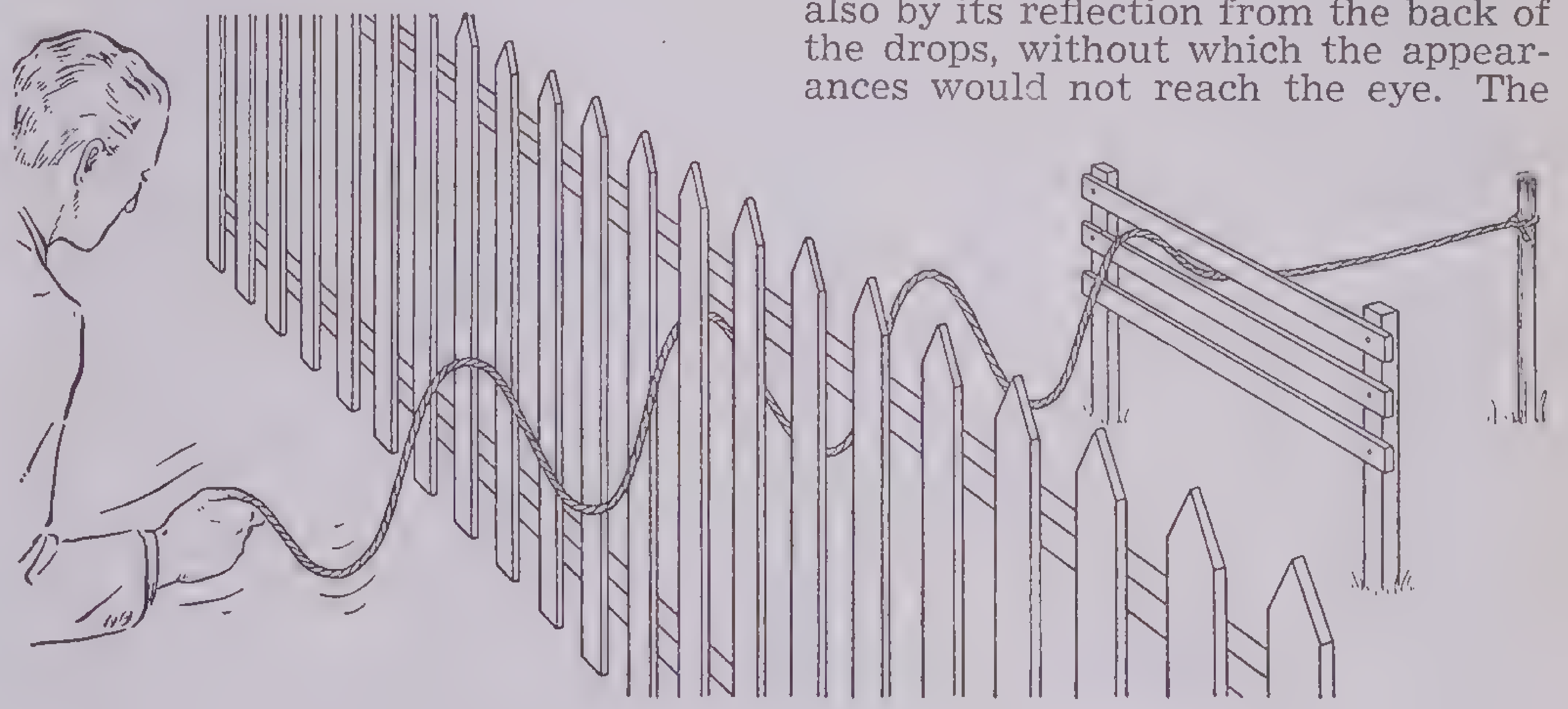
Polarization.—If a source of light shines through two parallel plates of glass, it does not matter how the plates are rotated or oriented so long as they are kept parallel; the light passes through freely; but certain transparent crystals (notably *tourmaline,* a natural mineral containing aluminum, boron, silicon and oxygen) have the property of shutting off light when two crystals are used with their natural lines of cleavage or grain at right angles.



Polarization of Light by Tourmaline Crystals

When the crystals are turned as in diagram A, the light passes through both of them; when one of the crystals is turned 90° around the axis of the incident ray, the ray is cut off. This is an instance of *plane polarization* of light.

In recent years an artificial substance called *polaroid* has been developed; it has the property of polarizing light just as tourmaline crystals do. Polaroid is made in thin transparent sheets that look much like ordinary cellophane. A single thickness of polaroid is fully transparent in any position. A double thickness, however, is transparent only when the two layers are turned in a particular way.



How the Wave Theory of Light Explains Polarization

Polarization is simply explained by the wave theory of light. The polarizer (tourmaline crystal, polaroid) allows the passage of waves vibrating only in one direction, transverse to the line of propagation, just as a fence with vertical bars would allow the passage of vertical rope waves but not of horizontal ones. Two polarizers will cut off all the light if they are turned to the proper angle, just as the two fences in the illustration shut off the vibrations of the rope.

The Rainbow.—The separation of sunlight into its component colors by raindrops creates the phenomenon we call the *rainbow.* It appears in the sky when the sun shines during a rainstorm, and it is seen in that part of the sky opposite the position of the sun. Theoretically, two or more rainbows may coexist; generally, however, there is but one. Occasionally there are two, very rarely three or even four, which is the largest number authentically on record. They may be seen in sea spray or that from a hose in sunshine at the requisite angle. All rainbows exhibit the prismatic colors. When there are two, the lower or primary rainbow is very bright and has the red rays highest and the outer or secondary bow is fainter with its violet rays the highest color. Rainbows are produced chiefly by the refraction and dispersion of the light in passing through the raindrops, partly also by its reflection from the back of the drops, without which the appearances would not reach the eye. The secondary rainbow ceases to be visible when the sun is 54° above the horizon.

Phosphorescence.—Some substances have the property of emitting light or becoming self-luminous after having been exposed to light. This is called *phosphorescence.* The explanation is that when light waves are absorbed by a phosphorescent body, this body uses the energy produced in emitting radiations that are longer than the incident waves but are short enough to affect the eye visually. The energy of a nonphosphorescent body is used in sending out long waves that produce the sensation of heat. When the luminescence of a phosphorescent body is of momentary duration, the phenomenon is called *fluorescence.* The sulphides of barium, strontium and calcium are phosphorescent when they contain traces of copper, bismuth and manganese.

Optical Instruments

Lenses.—When glass is made with rounded surfaces, thicker in the middle than at the edges, it is called a *convex lens.* It has the power through refraction to bring rays of light to a point (as in a burning glass), to make images of objects on screens (as in the camera), to aid vision (as in our spectacles) and to magnify bodies (as in the reading glass and microscope). A *concave lens* is thinner in the middle than at the edge. It gives an unreal image, smaller than the object itself; therefore it is called a *reducing lens.*

ACHROMATIC LENS.—A lens designed to correct *chromatic aberration* or the deviation of different colors of light to different foci is called *achromatic.* All single lenses have the common defect of causing a border of spectrum colors to appear about the image formed by the lens because each color has its own angle of refraction. Chromatic aberration was overcome in early telescopes by the use of flat lenses of extreme focal length. Some of these telescopes were 200 feet long. The achromatic lens consists of two lenses—a convex lens of crown glass and a concave lens of flint glass. These lenses are so constructed that the chromatic aberration produced by one is neutralized by the other, owing to the fact that flint glass has greater dispersive power, for the same refraction, than crown glass.

THE PHOTOGRAPHIC CAMERA.—A device for producing pictures by the action of light on substances that have been sensitized by the proper chemicals has been in use since the middle of the 19th century. Violet and ultraviolet rays are the most important light rays used in photography. A camera usually consists of a tightly closed box containing a lens. A shutter that covers the lens is opened or closed to admit or exclude the light as desired. In order that the lens may be moved nearer or farther from the back, an extensible frame like the bellows of an accordion is used. The distance behind the lens at which the image is formed depends both on the kind of lens used and on the distance of the object from the camera; therefore the front of the camera must be adjusted until the photographer, looking in the finder, can see the desired image clearly; that is, properly focused.

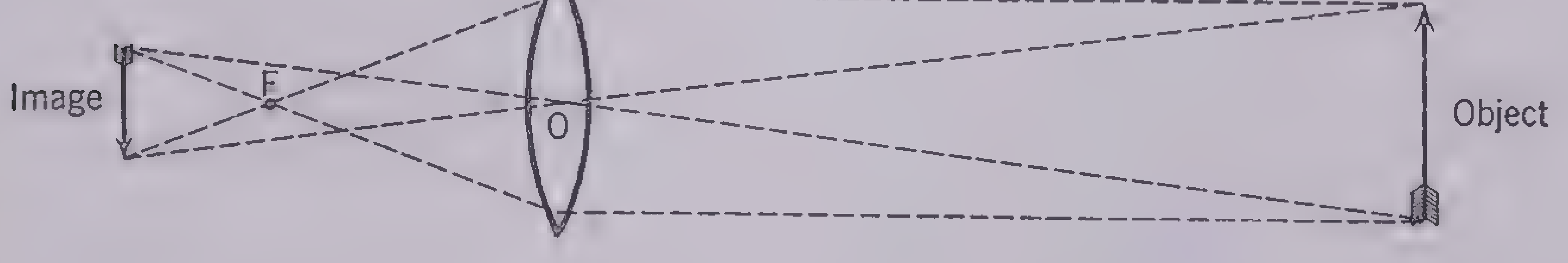
Sensitized glass or film is placed at the back of the camera. The image of the picture to be taken appears upside down on this glass. The farther the object to be photographed is from the camera, the greater the distance must be from the back of the camera to the lens in front. The lens is covered, usually by a closed shutter. When all is ready to photograph, the lens is exposed for a short time and the image registers upon the plate or film, which is then taken into a *dark room* in which there is only orange or red light. The plate is washed in the developer, next in sodium hyposulphite; then, upon looking at the plate in the light, one sees the image in reverse—the *negative.* The *positive* print of the picture is made by placing the plate over sensitized photographic paper and exposing it to the light. The dark parts of the negative produce the light parts of the positive. The print on the photographic paper is washed in a fixing solution, stretched and dried, and the photograph is completed.

FIELD GLASSES.—Portable visual aids with lenses that magnify objects viewed at a distance, field or opera glasses, consist of a pair of telescopes of the type used by Galileo, in which the object glass is a double-convex lens and the eyepiece a double-concave lens that is placed between the object lens and its principal focus. This arrangement causes the rays from the object to diverge, and to enter the eye at such an angle that the image appears erect and enlarged. The use of reflecting prisms within the tubes gives the instrument greater magnifying power without necessitating a longer barrel. Instruments so equipped are called *binoculars.*

INTERFEROMETER.—To understand the principle of the interferometer, it is necessary to understand the phenomenon called *interference of light.* In the section on *Sound,* interference is shown to occur when sound waves meet in such a way that a phase of one coincides with an opposite phase of the other. The result is lack of sound. Now suppose two trains of light waves of the same wave length are emitted from two luminous bodies that are near together. At certain points the effect of the two train waves will be intensified; and at other points the action of one will neutralize that of the other. Or think of two trains of waves rippling away from two stones thrown into a quiet pond. At some points two crests and two troughs will meet, and at others a crest of one and a trough of the other will coincide. The two effects will be opposite. If we should view two such trains of light waves from, let us say, a yellow flame, and if we had the proper apparatus to receive them, we would see alternate bands of yellow and dark, the bright regions representing reinforcement and the dark neutralization. Series of bands of this nature are called *interference fringes.* When light waves from the entire solar spectrum are subjected to interference, we have bands of complementary colors. Interference is responsible for the variegated colors of soap bubbles, mother of pearl, films of petroleum, the colored plumage of some birds and the iridescence of many insects.

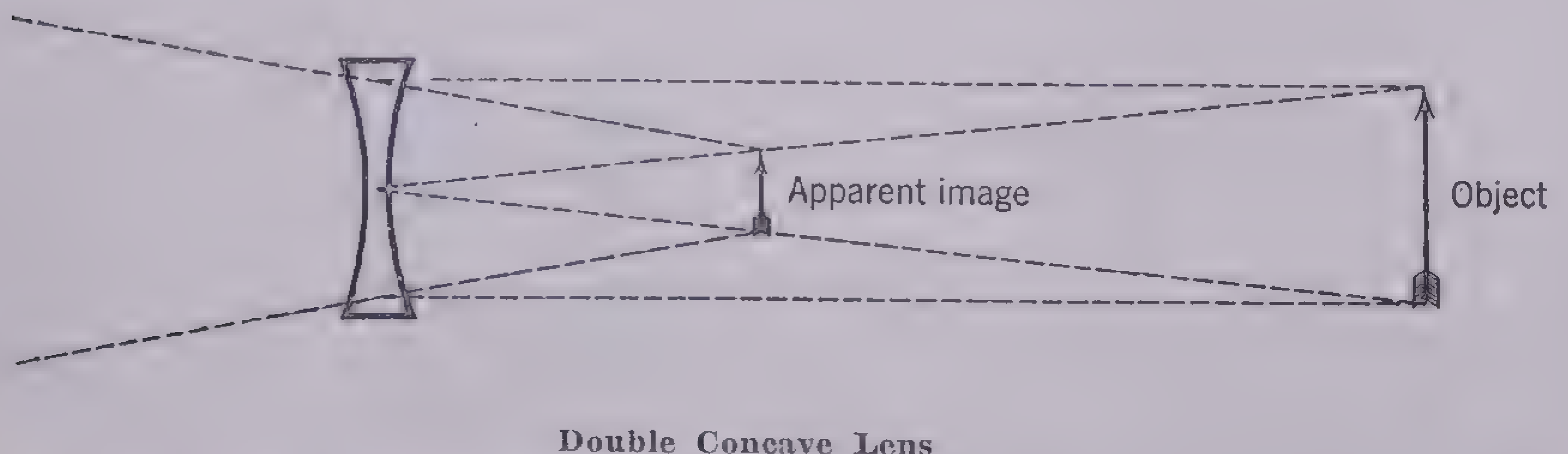
An interferometer is a device for measuring distance, size, wave length, movement and so on of sources of light by means of interference phenomena. There are several forms, but the principle may be understood from a description of the instrument devised by the late Professor Michelson. Each light beam of a train of waves (of one color only) is received by a glass plate that is thinly covered with silver, so that it transmits half a beam and reflects the other half. This glass is at an angle of 45 degrees with the axis of the instrument. Let us call it A and two reflecting mirrors B and C, respectively. B and C are at right angles to each other and on opposite sides of A. The half beam that is reflected from A is received by the mirror B and reflected back to A. The half beam that is transmitted by A passes to the mirror C and is reflected back to A. A piece of plate glass, parallel to A, is placed between A and C, in order to make the optical paths equal. When the two reflecting mirrors are so placed that the two paths are traversed in the same time, the light waves are reinforced at the silvered glass and are so received by the eyepiece of the instrument. When, however, one of the mirrors is moved backward or forward one-fourth a wave length, the paths differ by half a wave length. Then there is a neutralization of the waves at the glass A; consequently, as the interferometer is operated, a series of alternating reinforcements and neutralizations will occur, and by observation and measurement of the interference bands valuable information is obtained. With an interferometer, Michelson made the first measurement of the diameter of a distant star, and he used the device also in the famous experiment to test the movement of the earth through the ether.

THE MICROSCOPE.—An instrument with lenses for magnifying minute objects so as to render them visible for purposes of investigation, the microscope has been of vast importance to science. It has been tremendously valuable in aiding physicians to isolate bacteria and trace the cause of infectious diseases. Surgeons accurately examine new growths of body tissue by means of the microscope. Bacteriologists, biologists and botanists use the microscope in their studies, thus greatly enlarging man's control of nature. The microscope betrays impurities in drugs, food, paint and in the physical structure of copper, iron and steel.



Double Convex Lens

Diagram showing the formation of an inverted real image by a double convex lens



Double Concave Lens

Diagram showing the formation of an upright virtual image by a double concave lens

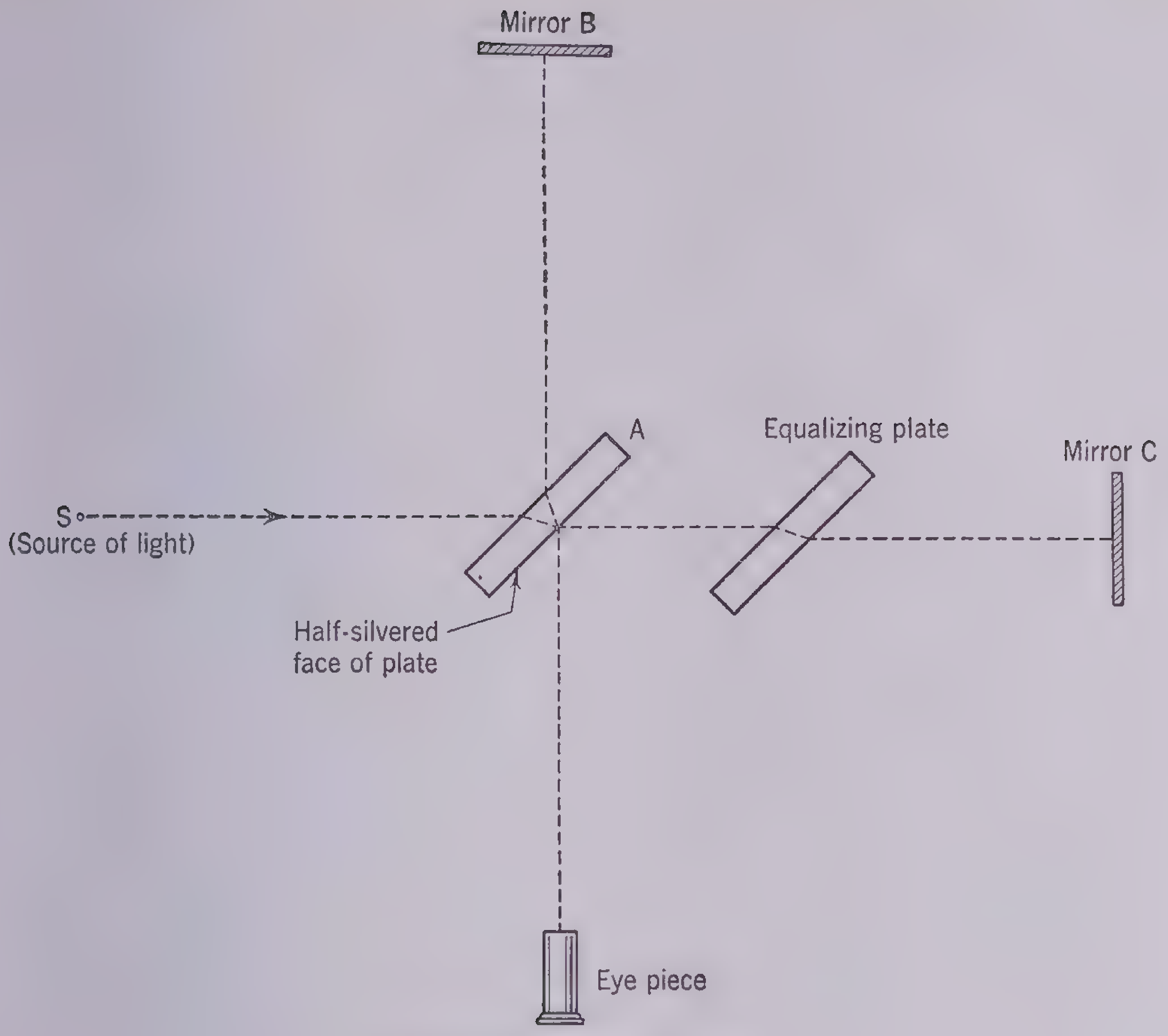


Diagram of Interferometer

A simple microscope, whether of a single lens or of several lenses, gives a view of the object directly and apparently increases its size. A compound microscope furnishes a reversed and magnified view of the object. The objective lens at one end of the metal tube is placed near the object. The ocular glass or eyepiece lens also magnifies the object.

Zacharias Janssen, a Hollander, is believed to have invented the first compound microscope in 1590. Benjamin Martin first made the pocket microscope in London in 1740; but the discovery of the magnifying power of the lens was made long before the Christian era. Reading glasses and rude magnifying glasses have been found in ancient Egyptian ruins. Some historians give the credit of inventing the microscope to Galileo.

The power of a microscope depends upon the focal lengths of the object glass and of the ocular glass. The greater the ratio, the more powerful the microscope. For the human eye enlargement has been made 2,000 times the size of the object; for photographic purposes enlargement has been 5,000 times the actual size. The only limit to the power of the microscope seems to be that no object smaller than one-half the wave length of the light by which it is seen can be shown in its true form.

Sextant.—An instrument used to measure the angular separation between two objects at a distance, the sextant is adapted to taking measurements at sea and is in common use by navigators. By means of a sextant the altitude of a star, planet, the moon or the sun is determined, and when that is known, the latitude of the ship can be reckoned. The angular distance between the heavenly body and the observer's horizon is measured in this case. A navigator's sextant is a curved frame carrying the following: a curved scale, usually an arc of 60 degrees, mounted on the circumference and marked off into degrees and divisions thereof; a fixed glass, called the *horizon glass,* half of which is transparent and the other half silvered to form a mirror; a wholly silvered, movable glass, called the *index mirror;* a sliding arm pivoted at its apex and carrying the index mirror at that point; a telescope for sighting the horizon line; and a vernier for reading the scale.

When the index arm is at zero, the two mirrors are parallel and perpendicular to the plane of the instrument. In operating the sextant, the observer holds it in a vertical plane and sights the horizon with the telescope, pointing it so that he looks through the transparent half of the horizon glass. Then the instrument is turned to bring its plane in a line with the horizon and the heavenly body whose altitude is to be detemined. Next the observer moves the index arm until the image of the body appears in the silvered half of the horizon glass. The sextant is then turned until the image of the heavenly body as reflected by both mirrors coincides with the horizon line. According to the laws of two parallel mirrors and a rotating mirror, the angle between the two mirrors is half the angle between the two objects. Therefore the reading on the scale in degrees is half the altitude of the heavenly body, or its elevation is twice the inclination of the mirrors.

Spectacles.—Glasses worn to remedy defects of vision are the most familiar optical aid. A pair of spectacles usually consists of two lenses (each chosen to correct the defect in the lens of the eye that looks through it) of optical glass. A convex lens is used to correct farsightedness, caused by too great a focal length of the lens and cornea of the eye. Such a defect causes rays from near-by objects to fall on the retina before coming to a focus. When the focal length of the lens of the eye is too short, a concave glass is needed to correct the resulting nearsightedness. There are other lenses to remedy astigmatism, strained eyes and other defects causing faulty vision.

The Spectroscope.—This instrument is used in spectrum analysis, the study of radiations emitted by glowing bodies. When a beam of sunlight passes through a prism, its constituent colors separate and form a spectrum on a screen, with the colors arranged in order of wave length from violet to red. In the ordinary prismatic spectroscope, a telescope and collimator are combined with a prism or series of prisms. The collimator is a tube having a narrow slit in one end and a convex (converging) lens in the other, so that the light beam from a luminous source enters the slit and passes out to the prism through the lens. The spectrum is viewed through the eyepiece of the telescope, at which point the radiations are focused. In the *diffraction spectroscope,* a diffraction grating replaces the prism. This may be a piece of transparent glass on which numerous parallel lines are etched with a diamond; such a grating is a *transmission* grating. (A polished mirror may be used as a grating—the reflecting type.) The lines must be exactly the same distance apart; there are thousands of them to the inch. The diffraction spectra formed by such an instrument obey a definite law, and by their study wave lengths may be accurately measured. When a camera is used instead of a telescopic eyepiece, the instrument is called a *spectrograph.*

Laws of Spectrum Analysis.—For some luminous substances, the band of colors will not be continuous but will present isolated lines. The fundamental laws may be stated as follows:

1. *When it is luminescent, a gas under pressure, a liquid or a solid gives a continuous spectrum, an unbroken sequence of colors from red to violet.* For substances in these physical states, there is no possibility of telling the spectrum of one from that of another.

2. *A gas under low pressure that is excited to luminescence gives a discontinuous or bright-line spectrum;* that is, only lines of certain wave lengths appear in the spectrum, and these lines are characteristic of the gas under examination. Such a luminous source writes its own signature for identification.

3. *If the light from the source giving the continuous spectrum is observed through a layer of cooler gases under low pressure, this layer of gas will absorb from the spectrum just those lines that it would itself emit if it were isolated and luminescent.* The result is a dark-line or absorption spectrum.

Two additional principles of spectroscopy that have a wide application are: The lines of the spectrum of the various elements occupy definite and fixed places in the spectrum under fixed conditions; but if the observer and light source are relatively approaching each other, the lines are shifted toward the violet; if the light source is receding, they are shifted toward the red. The amount of shift is dependent upon the relative velocity. Application of this principle, called the *Doppler Principle,* makes it possible to determine the velocity of the stars toward or from the earth and also to determine the velocity of the earth in its orbit. A further principle states that the location of the most intense part of the spectrum is dependent on the temperature of the light source. If the temperature is low, this maximum intensity of radiation will be in the red. As the temperature increases, the maximum intensity shifts toward the blue. This principle furnishes a direct means of determining the temperatures of the sun and stars.

The Stereopticon.—A device for projecting upon a screen in a darkened room a magnified image from *slides* —usually photographs on glass, which may or may not be colored—was the forerunner of the motion-picture machine. In some stereopticons ordinary photographs or postcards are used. The instrument has two sets of lenses: one set, the *condenser,* for collecting the light rays and transmitting them to the slide; and another set, the *objective,* for magnifying the picture and projecting it upon the screen. The condenser consists of a thick, single-convex lens, or of two plano-convex lenses with the curving surfaces separated a short distance. The objective consists of two double-convex lenses placed in front of the slide and mounted in an adjustable tube, so that the proper focal distance may be secured and a clear picture presented. The source of light may be a kerosene lantern, a gas burner or electricity; the electric arc for large halls and the incandescent light for small rooms are the most satisfactory. The illuminant is always enclosed in a box with suitable openings for ventilation and a door for the use of the operator.

The Stereoscope.—An instrument with two viewing glasses, one for each eye, the stereoscope lends the third dimension to pictures viewed through it; they seem to stand out from the background instead of being flat. The stereoscope utilizes a principle of human vision, namely, that the right eye sees more of the right side of an object than the left eye sees, and vice versa. The combined image interpreted by the visual centers of the brain has an appearance of reality not obtained when one eye alone views the object. In the stereoscope, the eye sees two photographs of the same scene, but these photographs are just different enough to present a lifelike single picture when the two eyes view them simultaneously. The camera used in taking these pictures has two lenses, separated by a little more than the actual distance between the eyes. This slight increase causes the combined picture to stand out in bolder relief. The stereoscope is an old-fashioned device rarely seen in modern homes, for present-day families have that infinitely more fascinating diversion, the motion picture. A stereoscopic camera for motion-picture work has been perfected but has not been adopted to any extent.

The Telescope.—An instrument for magnifying objects seen at distances that may vary from a few yards to millions of miles. Telescopes are of greatest use in astronomical observations; they are of two general types—refractors and reflectors. In a *refractor* the image is formed by a lens, the light actually passing through the glass and being bent or refracted to form the image in the focal plane. The lens requires optical glass of the highest quality, which must be of like density throughout and without mechanical strains. It is very difficult to produce large disks of optical glass of sufficient homogeneity for the demands of astronomical lenses. Inasmuch as it is impossible to unite all the colors into one focal image with a single lens, the modern telescopic object glass consists of two or more lenses in combination. Such a lens system gives a well-defined image of large field, free from spherical and chromatic aberration.

In a *reflector* the light does not pass through the object glass. As the name implies, the light is reflected from a polished surface. With this idea in view, it is seen that it is unnecessary for the material to be optically homogeneous. It is, of course, desirable that it should be free from mechanical strains.

Various materials have been used for telescope mirrors. The early models were made from a copper-tin alloy (usually two parts copper and one of tin) called *speculum metal.* This material was not highly satisfactory, as it absorbs considerable light even when freshly polished and soon tarnishes slightly in ordinary air. A further difficulty arose from the fact that polishing always removed a thin film of metal. A great advance was made by the German chemist Liebig, who invented a process by which a thin surface of metallic silver could be deposited on glass. The silver, when it is burnished and free from tarnish, has a higher reflecting power than the speculum metal has and is therefore to be preferred.

In 1930 a practical technique was developed for depositing aluminum on glass in a thin film, and it was found that this metal is actually a more efficient reflector than silver and preserves longer a high reflecting surface. The great mirror of the Mount Wilson Observatory telescope is now covered with aluminum, and the 200-inch mirror of the California Institute of Technology telescope also uses this metal.

The modern glass industry has developed glasses with very low coefficients of expansion, and mirrors now made for telescopes are much less subject to distortion from temperature change than older mirrors were.

Whether it is a lens or a mirror that forms the image in a telescope, it may be mounted to permit pointing it to any region of the sky. In a fixed observatory, the type of mounting universally adopted is known as the equatorial. Such a mounting has two axes, one parallel to the earth's axis and known as the *polar axis;* the other perpendicular to it, known as the *declination axis.* Rotation about the declination axis produces north-south motion, and rotation about the polar axis produces east-west motion. The advantage of this form of mounting is that, once the telescope is directed toward a star, it may be made to follow it by driving the telescope with clockwork about the polar axis, thereby compensating for the rotation of the earth.

Refractors and reflectors have their relative advantages and disadvantages. The refractor gives finer definition and a much larger field of fine definition. It is, however, more costly because it is necessary to use optical glass and because the four surfaces must be polished; also, the tube must be longer (which necessitates a larger dome) because for a given aperture the *focal length* of reflectors can be made much shorter than for refractors. The refractor, however, has these advantages: once ground and polished, the surfaces are permanent; and the quality of the image is far less affected by changes of temperature. Perhaps in the telescope of the Yerkes Observatory (having an object lens 40 inches in diameter), the limit of size for refractors has been nearly attained. The lens must be supported from the margin, and in different positions, as it is pointed to different parts of the sky—standing on edge when pointed toward the horizon and lying flat in its support when pointed toward the zenith—there may well be deformations that will affect the character of the image.

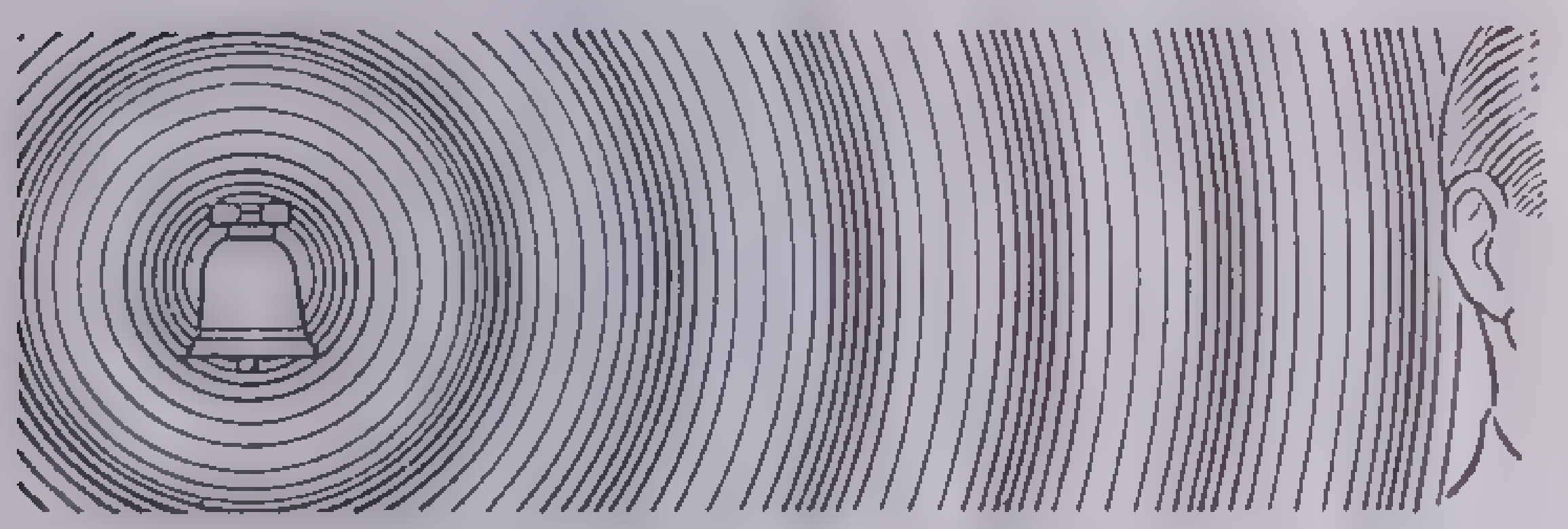
Reflectors have the advantage of perfect achromatism; that is, all colors are united into one focal image; moreover, reflectors are cheaper, and they may be mounted so that there will be no sagging from changing position. They have the disadvantages of: small field, because of spherical aberration; distortion due to change of temperature; and nonpermanence of the silver surface, necessitating frequent resilvering. Nevertheless, recent improvements in mirrors and the possibility of making them very large has raised the reflecting telescope to an outstanding place in astronomical work.

Long the largest telescope in operation, the 100-inch reflector of the Mount Wilson Observatory near Pasadena, Calif., shows a star 250,000 times brighter than to the unaided eye. The California Institute of Technology observatory at Mt. Palomar has a 200-inch reflector, the largest of all, which can photograph stars 300,000,000 light years away.

SOUND

In the production and transmission of sound, as with that of heat and light, we again deal with vibrations and waves. The trembling motion of the prongs of a large tuning fork that has been struck illustrates very well the vibrations that produce sound, because we can see the movement when we hear the sound. These vibrations give rise to waves in the air that strike the ear drum and effect the auditory nerves. The sound impression is carried to the brain by these nerves and there interpreted. Sound is thus used to designate a physical process and a sensation. Sound waves may exist where there is no ear to hear them; the sensation of sound requires a hearing apparatus to be experienced. The human ear hears vibrations having a range of about 30 to 20,000 per second, but a very acute sense of hearing and a finely adjusted ear may be able to interpret a vibration frequency as low as 16. For musical purposes and differentiation of pitch, the extremes are about 40 and 4,000. Middle C on the piano has 256 vibrations per second.

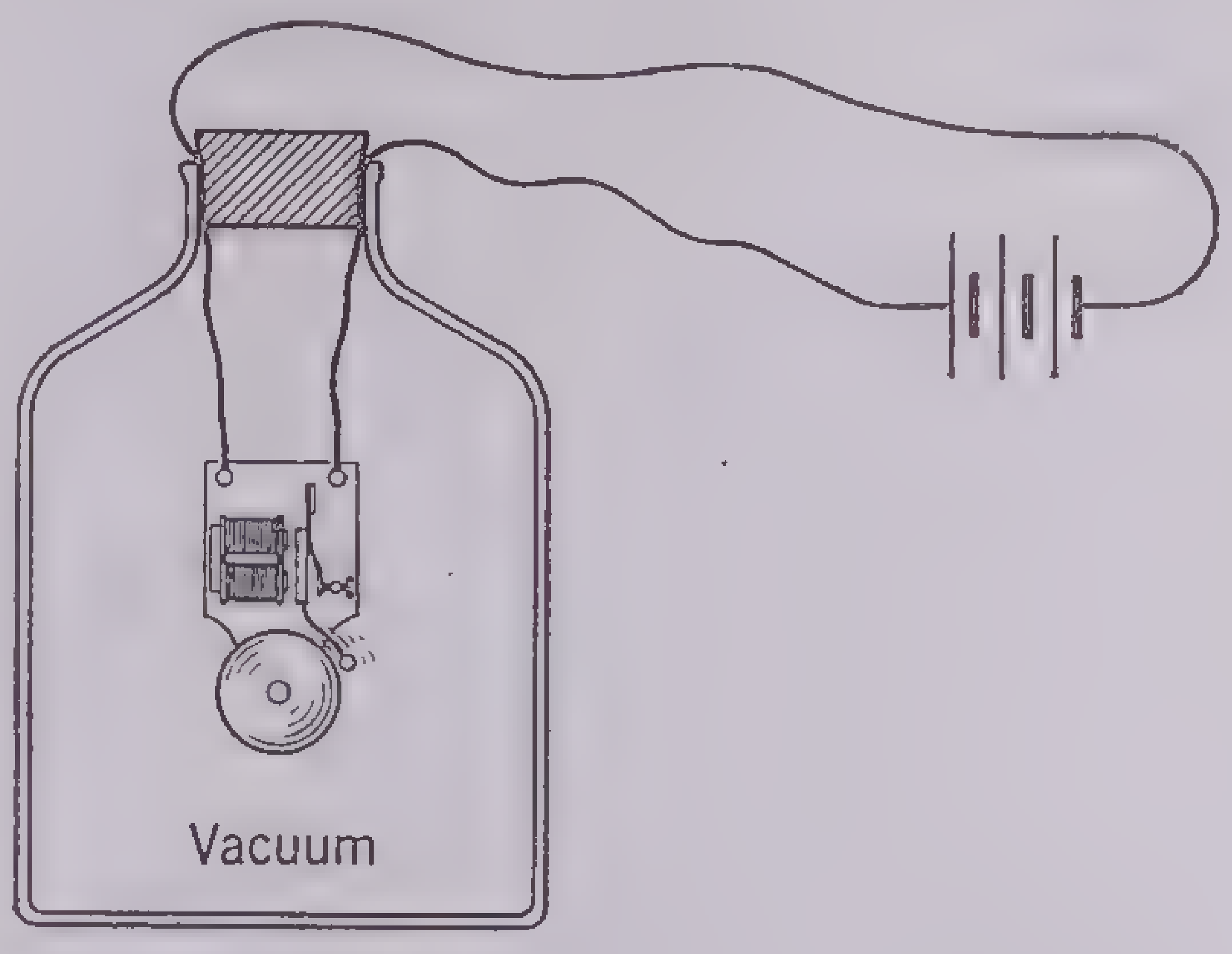
The vibrations that give rise to sound have a to-and-fro movement in the direction that the wave is traveling; hence they are longitudinal (like the alternate stretching and compression of a long coiled spring) rather than transverse (like the oscillations of light). When a sounding body vibrates, the forward motion of its particles compresses or condenses the air in all directions; this motion is followed by a backward movement that causes the air to expand and leaves a space of rarefied air behind the particles. Such an alternate condensation and rarefaction constitutes a sound wave, the motion of which is continuously forward. The forward movement of the particles sets up a movement in the adjacent layer of the air, this layer sets the next in motion, and so there is formed a series of advancing waves that carry the sound. These waves are spherical, for they travel outward in all directions from the vibrating body. Each one consists of the two phases, which advance together.



Sound Waves in Air[1]

Sound waves are spherical in form and consist of alternate bands of condensed and rarefied air

Transmission and Velocity.—Sound cannot travel in a vacuum. Unlike light energy, it requires a material medium for its transmission, and this medium must possess elasticity. At a temperature of 0°C. or 32°F., sound travels in air at the rate of 1090.5 feet per second. For each degree of rise in temperature, its speed increases about 2 feet per second. It travels faster in liquids than in gases, and faster in elastic solids than in liquids. The mediums best adapted to transmit sound are those having high elasticity in proportion to their density. Sound travels more than four times as fast in water, and more than 15 times as fast in steel or glass as in air. We hear thunder after we see the lightning flash because sound is transmitted much more slowly than light.



No Sound is Possible in a Vacuum

A bell ringing in a jar from which the air has been pumped gives out no sound. Unlike light, sound must have a material medium for its transmission

Reflection of Sound.—When sound waves are sent back or reflected after striking a distant surface, we hear the original sound repeated. Such a phenomenon is called an *echo.* The echoing waves travel with the same speed as the incident waves; a sharp, quick sound produced 220 yards from a good reflecting surface will be heard again in about 1.17 seconds, when the air is at average temperature. Because walls of large rooms make good reflecting surfaces, auditoriums have to be constructed so as to offset the tendency of sound waves to be repeated. Otherwise, a confusion of sounds would result. A room in which a speaker's voice is heard clearly is said to have good *acoustics.*

Characteristics of Sound.—Sounds produced by regular vibrations are said to be *musical;* those resulting from irregular vibrations are referred to as noise. Musical sounds may differ as to intensity, pitch and quality.

Intensity.—The terms *intensity* and *loudness* are used interchangeably, though, strictly speaking, intensity refers to the physical condition of a sound, and loudness indicates its intensity as perceived by the ear. Intensity is governed by: the amplitude of the vibrations; the surface area of the vibrating body; the degree of density of the medium; and the distance of the hearer from the source of the sound.

The amplitude of vibration is the distance through which a vibrating body moves. Increasing the amplitude increases the intensity of the sound. Strike a piano key softly, then vigorously. The second sound will be much louder than the first because the wire has been made to vibrate through a wider space. Such increase of amplitude intensifies the energy of the vibrations.

Sound is intensified also by an increase in the size of the vibrating surface. Strike a tuning fork and then let the tip of the handle rest on a table. The sound will immediately increase in loudness because a larger surface, the table top, has been forced into vibration.

Sounds are heard more loudly in elastic solids and liquids than in air, because intensity, like velocity, increases with the density of the medium. Sounds are therefore fainter in media less dense than ordinary air. On a high mountain, where the air is thin, persons who become separated from one another may have difficulty in making themselves heard. It is clear that intensity has a direct relation to velocity. When the speed of the sound waves is slowed up, the energy of the vibrations dies down before the waves can reach the hearer.

When the distance from the source of a sound is increased, the intensity of the sound is decreased. Theoretically, disregarding reflection, friction and wind, the intensity of a sound varies inversely as the square of the distance from its source. Under ordinary conditions, this principle cannot be reduced to a mathematical formula.

Pitch.—Every musical note is produced by a definite number of vibrations in a second. High, shrill notes have many vibrations, and low, bass notes have few. Pitch always depends on the vibration frequency and not on the amplitude. Just as a short pendulum swings faster than a long one, so a short wire vibrates more times a second than a long one of the same diameter and material. Halving the length of the wire doubles the number of vibrations and raises the pitch one octave. The thicker vocal cords of a man give lower tones than the more delicate vocal cords of a woman. By virtue of this, she can produce higher, shriller tones. The piano tuner makes a string give a higher note when he increases its tension. In order to lower its pitch, he loosens it or gives it less tension.

The pitch of a sound is altered by relative motion of the observer and the source of the sound. A familiar example is the abrupt lowering in pitch of the locomotive whistle of a passing train. As the engine approaches, its oncoming motion sends an increased number of vibrations into the ear of an observer standing on the platform, thus raising the pitch of the whistle. At the moment of passing, however, the effect is reversed and the pitch is suddenly lowered, for the receding motion allows fewer vibrations per second to reach the ear. This phenomenon is an illustration of the *Doppler effect,* named for Christian Doppler, who first explained it in 1843. The principle governing this effect has important applications in the transmission of light as well as of sound.

Quality.—One can easily distinguish between three sounds coming, respectively, from a piano, a violin and the human voice, even though they all have the same number of vibrations per second and the same intensity. The reason is that all three sounds differ in quality. Quality depends upon the overtones—tones produced by a body vibrating in parts as well as a whole—and their relative intensities. The mingling of overtones with the fundamental or lowest tone changes the wave form, making it complex without changing its fre-

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[1] From Walter G. Whitman: *Household Physics;* John Wiley & Sons.

quency or pitch. The overtones may be produced in stringed instruments by a wire vibrating in segments at the same time that it vibrates as a whole. In the voice, the resonant air chambers may be changed and thus change the wave form.

Sympathetic Vibrations.—When two vibrating bodies have the same natural period of vibration, a sound from one may start the second body vibrating. Such sympathetic vibrations are produced when a piano wire gives back a note sung into the instrument with the loud pedal pressed down. If two tuning forks (tuned to vibrate in unison) are placed near each other and one is set to vibrating, the second will be heard if the first one is silenced.

INTERFERENCE.—Two sounds may produce also lack of sound. If two waves of the same frequency meet in such a way that the condensation phase of one meets the rarefaction phase of the other, little or no sound will be heard. One can test this phenomenon of interference by turning a vibrating tuning fork around on the handle. In certain positions, the condensation produced by one prong will meet the rarefaction produced by the other prong, and the sound will successively become very faint or inaudible. Conversely, the meeting of two like phases will increase the sound, a process called *reinforcement.* The phenomenon of interference produces *beats,* or regular successions of intensified sounds.

ELECTRICITY AND MAGNETISM

It is easier to describe what electricity does than to explain what it is, even though recent advances in scientific knowledge have dispelled some of its mystery. The modern era has been called the Age of Electricity. Today, this form of energy is utilized for lighting, cooking and heating, for the operation of street railways and railroad locomotives, for carrying on rapid communication, for running a great variety of machines and for many other purposes. Magnetism, the twin sister of electricity, is an indispensable factor in numerous devices that utilize electric energy, and neither subject can be studied independent of the other.

Progress of Electrical Science.—The word *electric,* which came into use a century before the word *electricity,* is derived from *elektron* (Greek for amber), and was coined about 1600 by William Gilbert, Queen Elizabeth's own physician. He was deeply interested in the power possessed by amber (when it is rubbed with wool) of attracting to itself bits of feather and paper. This property was known to the Greeks as early as 600 B. C., but Dr. Gilbert discovered that glass, resin, sealing wax and various other substances also attract light objects when frictionized. He called such substances *electrics.*

Other facts gradually came to light. Early in the 18th century, an experimenter found that some substances conduct electricity and others behaving like Dr. Gilbert's electrics, do not. Friction continued to be employed as an artificial source of electricity until near the end of the century, when Luigi Galvani, an Italian professor of anatomy, generated it by bringing the moist body of a freshly killed frog in contact with two touching metals, iron and copper. A convulsive twitching of the animal's muscles showed that electric energy had been produced. About 1800, Alessandro Volta, another Italian scientist, made a practical application of Galvani's discovery by inventing the galvanic or voltaic battery, which generates a continuous current of electricity. Another discovery of the 18th century was made by Benjamin Franklin; by sending a kite into the air during a thunderstorm, he proved that electricity is the identical form of energy that accumulates at times in clouds and produces lightning.

The 19th century witnessed a remarkable development of the theory and practice of electromagnetism, making possible the invention of the dynamo, the telephone and telegraph and a host of other devices. Indeed, investigation in this field had a triumphant climax in radio—that great conqueror of time and space—for the radio waves that bring us messages instantaneously from all over the world are electromagnetic, and their actual production for the first time was based on the premises of the electromagnetic theory of light.

Another extraordinary result of the study of electrical phenomena has been the 20th-century development of a new concept of the nature of matter. Investigating electrical effects in vacuum tubes, in the decade between 1870 and 1880, Sir William Crookes produced invisible rays to which the name *cathode* was applied, because they came from the cathode (negative terminal) of the tube. In 1895 Wilhelm Konrad Roentgen, German physicist, accidentally discovered X rays while experimenting with Crookes tubes. Inspired by this achievement, Antoine Henri Becquerel, French physicist, discovered radioactivity in 1896. Within the next two years, Sir J. J. Thomson had proved that cathode rays are streams of negative particles of electricity, and two scientists in Paris, Professor and Madame Curie, had isolated an element of intense radioactivity, which was named *radium.* Sir Ernest Rutherford's analysis of radioactivity (1899) was another epoch-making phase of this series of discoveries, the outcome of which was a new concept of electricity, energy and matter.

It is not possible here to state the steps by which scientists arrived at the modern theory indicated above. We may only state their conclusions. It has been found that atoms, the building stones of matter, consist of particles of positive and negative electricity, known, respectively, as *protons* and *electrons.* Though the electron has a greater volume than the proton, the proton is 1,845 times as heavy. Both kinds of particles are of such minute size that for practical calculation they are point charges of energy, though they possess mass. All the protons of an atom are found in a central nucleus. The electrons are in two groups—those within the nucleus and those without. The outer electrons are supposed to revolve in orbits around the nucleus. In the hydrogen atom, the simplest atom known, there is one proton and one revolving electron. The atoms of the other 91 elements vary regularly in complexity until we reach the atom of uranium, which has 238 protons and 92 outside electrons. (See *Chemistry,* for discussion of atoms.)

Since atoms are composed of particles of electricity, it follows that matter itself has an electrical basis. In other words, when we electrify an object, we merely change the condition of the electrons in such a way that the atoms bear a definite charge, instead of being electrically neutral as before. We may therefore think of electricity as inherent in matter, not something extraneous that affects it. It is theoretically possible for a proton and an electron in a star to meet and extinguish each other, for in the excessive temperatures of stellar bodies atoms are stripped of their electrons and electrons and hydrogen protons may exist independently. Such a collision of proton and electron would result in neutralizing the two electric charges and the transformation of their mass into energy. That mass and energy are interchangeable and equivalent is a precept of Einstein's relativity theory, and the change of the one into the other is believed to provide the energy that keeps the stars radiating their light for millions of years. Thus matter, energy and electricity are fundamentally the same in the physics of today.

In spite of the remarkable advance that has been made by modern scientists in the last generation or so after many centuries of research, the true inwardness of electrons and protons and nature of the force that holds them together in the atom are still mysteries. Physicists know a great deal about electricity without really knowing what it is.

STATICAL AND DYNAMICAL ELECTRICITY

Statical electricity (*electrostatics*) treats of stationary electric charges and their measurement; and *dynamical* electricity (*electrokinetics* or *electrodynamics*) deals with electric currents or electricity in motion.

Stationary Electric Charges.—Any neutral (unelectrified) body has the same number of protons as electrons. The number of protons equals the number of nuclear electrons plus the number of outside electrons. When this balance is disturbed, as, for example, by friction between two unlike bodies, an excess of electrons on one gives it a *negative charge,* and an excess of protons on the other gives it a *positive charge.* When glass is rubbed with silk, some electrons pass from the glass to the silk; since the glass is left with more protons than electrons, it becomes positively charged; the silk, which has received electrons from the glass, becomes negatively charged. Glass rubbed with wool or cat's fur becomes negatively charged, because it receives electrons from the wool or fur. Rubbed with silk or fur, rubber becomes negatively charged. The *electrostatic series* is a table of solids so arranged that we know that any substance in the series will have a positive charge if rubbed with the substance that follows it in the table, and that substance will be negative.

ATTRACTION AND REPULSION.—The basic principle of statical electricity—that bodies with like charges repel each other and those with unlike charges attract each other—can easily be tested by experiments. Suspend a glass tube that has been rubbed with silk. Rub a second glass tube with silk and hold it near the first. The suspended tube will be repelled, because both tubes are positively charged. Electrify a rubber comb with a piece of wool and hold the comb near a positively charged glass tube. The tube will swing toward the comb, because the charges are unlike. Precise experiments show that the attraction and repulsion vary inversely as the square of the distance between the charged bodies.

CONDUCTORS AND NONCONDUCTORS.—When a metal rod is held in the hand and rubbed with wool, no electric charge is detected on the metal. If the metal rod is held in a hand that is covered with a heavy rubber glove and then rubbed with wool, it will have an electric charge. In the first case, electric energy was produced, but electrons were conducted away into the hand and body. In the second case, the electricity remained on the metal, because rubber does not conduct electricity.

Depending upon their ability to conduct electricity (a property based on the ease with which atoms lose electrons), materials are classified as conductors, poor conductors, and nonconductors. Nonconductors are also called *insulators*. These are substances in which the electrons are held very firmly in their atoms. The accompanying table shows the relative conducting power of common substances:

Good Conductors	*Poor Conductors*	*Insulators*
Metals	Moist air	Glass
Lead in pencil (graphite)	Pure water	Dry air
Carbon in battery	Kerosene	Rubber
Water solution of acid, base and salt	Wood	Mica
	Paper	Bakelite
	Cotton	Paraffin
	Wool	Porcelain

Examine the crossbars that support electric wires on poles along the streets. Can you find insulators? Heavy insulators must be used in high-tension circuits. In your home you find insulators in connection with switches, light sockets and fuse blocks. Wire for the powerful electric-light current is insulated by successive wrappings of rubber, cotton and waterproof material. For an electric bell, a double cotton cover is sufficient insulation. The production and transmission of the electric current would not be possible were it not for the fact that some materials are conductors and others are insulators.

ELECTROSTATIC INDUCTION.—Electrification of a neutral conducting body by its nearness to another charged body is called electrostatic induction. When a charged body is brought near a neutral body, it causes a rearrangement of the electrons in the neutral body. If the charged body is positively electrified, it attracts electrons to the near side of the second body; but if it has a negative charge, it repels electrons to the distant side of the second body. On the removal of the charged body, the electrons resume their original positions, making the body neutral again. By grounding a body which is under the influence of a negative charge, the earth receives electrons; and by breaking the earth connection before removing the negative body, the return of electrons is prevented. The body thus becomes permanently electrified.

ELECTROSCOPE.—An instrument that indicates the presence of an electric charge and shows whether it is negative or positive is an electroscope. A typical form has two strips of gold leaf suspended vertically from a metal rod within and projecting from a glass jar. The rod is insulated from the jar at the opening, where it passes through, and has a metal knob at the top. It thus serves as a conductor. The electroscope is first charged by contact or by induction. Then the behavior of the leaves will show the kind and amount of charge in the electrified body to be tested. Upon being charged, the leaves spring apart. If negatively charged, they will diverge still more when a negatively charged body is brought near the instrument. A positively charged body will cause them to collapse.

LEYDEN JAR.—A form of condenser or device that increases the capacity of an insulated conductor to hold its charge is called the Leyden jar. In common phrasing, it is used to store electric energy. It consists of a glass jar coated inside and out, more than halfway up, with thin foil; and a brass rod, ending on the outside in a knob, passes through an insulating stopper and is connected with the inner coating by a metallic chain. The glass serves as a dielectric or insulator, the tin-foil coatings are conducting surfaces, and the brass rod is used to conduct electricity from an outside source. When the inner coating has been charged, for instance positively, the outer coating will receive a negative charge if it is connected with the ground, and this charge will be held bound. Equal amounts of positive and negative electricity are thus accumulated on the two surfaces. If several Leyden jars are connected, they will form a battery similar to the condenser used by wireless operators.

LIGHTNING.—Electrostatic induction is the cause of the well-known phenomenon called lightning. Two insulated conductors may be so heavily charged respectively with positive and negative electricity that when they are brought near each other they overcome the high resistance of the air and an electric spark passes between them. Since induction may produce an opposite charge in the side of a body near a charged body, a discharge also may occur between a charged body and a neutral body. This action, which is shown on a small scale in the laboratory, occurs on a huge scale in nature.

Under certain conditions, raindrops falling through a strong ascending current of air are broken into a spray. The fine particles receive a negative, and the larger particles a positive, charge of electricity. The positively charged raindrops, being heavier than the finer, separate and fall to the earth, thus removing the positive electricity from the atmosphere. The negatively charged spray may gather in a cloud. The continued accumulation of electricity produces such heavy charges that the resistance of the air between cloud and earth breaks down, and a lightning flash results. It is possible for the positively charged particles also to form a positively charged cloud, and lightning may then pass from one cloud to another, but this is rare. Most of our lightning is between negatively charged clouds and the earth.

Lightning heats and expands the air. Upon cooling, a partial vacuum results, and the meeting of molecules of air pushed into the vacuum by atmospheric pressure, produces the sound we call *thunder*. Since we know the velocities of light and sound, if we count the seconds between the flash and the thunder coming from it, we can tell how far away the lightning is; allow five seconds to the mile.

Bodies extending above the earth shorten the distance for lightning to travel through the air to reach the earth and so are common targets for the lightning. Lightning rods, extending above our buildings and reaching down deep enough into the earth to be always in moist earth, allow a discharge between clouds and earth without using and damaging the buildings as part of the discharge path. Man-made lightning, produced by discharging electricity at over a million volts, is used in laboratory studies of the nature and control of lightning.

Electricity in Motion—Currents.—The older conception of electricity as a fluid gave rise to the expression, *flow of electric current,* and the actual process is not unlike a flow of water through a pipe. An electric current is a stream of electrons or electrified atoms moving along a conductor in a closed circuit. The electric battery produces a flow of current by means of chemical action. The dynamo generates current electricity by the interactions of electricity and magnetism. For the flow of current to continue, the two ends of a conducting system must be at different *potentials,* that is, have different electrical conditions. Just as water flows from a point of higher pressure to one of lower, so electric current is said to flow from a terminal of higher potential to one of lower.

The pressure that is caused by this difference of potential is known as *electromotive force* (e.m.f.). It is this force that sets the electrons in motion. It is numerically equal to the work that must be done in order to carry a unit quantity of electricity from one end of the circuit to the other.

Measurement of Current.—The units were named for eminent physicists in the electrical and mechanical sciences. The *coulomb* is the amount of electricity that is required to deposite 0.001118 gram of silver from a solution of silver salt. Intensity or rate of flow is measured in *amperes;* a current carrying 1 coulomb per second has a value of 1 ampere. The resistance offered by any conductor to the flow of an electric current is measured in ohms. An *ohm* is equal to the resistance of a circuit in which a potential difference of 1 volt produces a current of 1 ampere; more concretely, the resistance to an unvarying electric current by a column of mercury at 32° F., 14.4521 grams in mass, 106.3 centimeters long and with a constant cross-sectional area.

A *volt* is that electromotive force required to drive a current of 1 ampere through a resistance of 1 ohm. The relation of these three units is expressed in Ohm's Law, as follows:

$$1 \text{ (amperes)} = \frac{\text{E (volts)}}{\text{R (ohms)}}.$$

If you find by test with an ammeter that one dry cell (voltage is 1.5) sends .5 ampere through an electric bell, you find the resistance of the wire in the bell as follows:

$$.5 = \frac{1.5}{x} \text{ ; hence } x = 3 \text{ ohms.}$$

The unit of electric power is the *watt.* It is the amount of power developed by a current of 1 ampere flowing under an electromotive pressure of 1 volt.

volts × amperes = watts.

One horsepower equals 746 watts. A kilowatt-hour equals 1,000 watts for 1 hour. If you pay 10 cents a kilowatt-hour for electricity and burn five 100-watt lamps for 4 hours, the cost of lighting (in cents) will be:

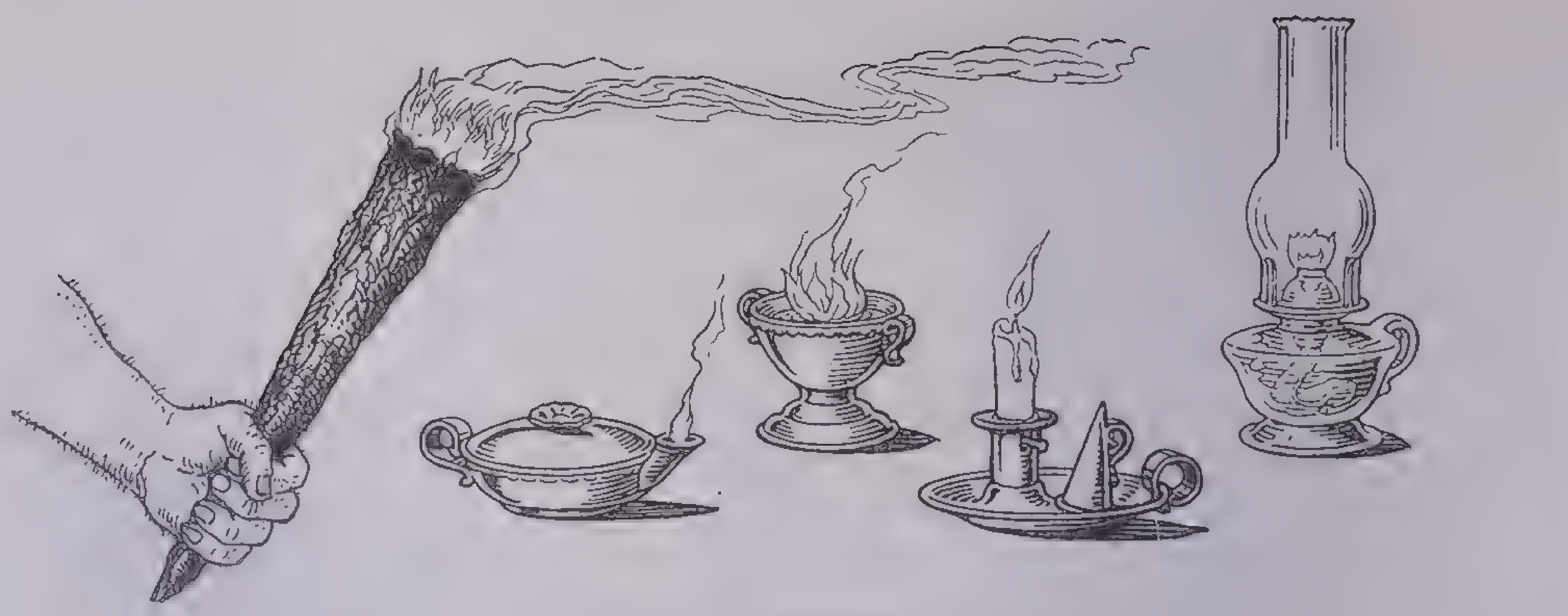
$$\frac{5 \times 100}{1000} \times 4 \times 10 = 20.$$

Effects of Electric Currents.—All the electrical devices by which household work has been made easier, transportation and communication have been revolutionized, industry has been rendered more efficient and life in general made more inviting depend upon the heating, chemical or magnetic effects of electric energy.

Heating.—The rapid heating of the wires of an electric toaster is familiar to everyone. Why is it that the wires of the connecting cord do not get hot? The wires of the toaster are made of some such material as nickel-chromium alloy, which is highly resistant to the passage of electric energy, and the conducting wires are of copper or other low-resistant metal. When electricity in motion encounters resistance in the circuit, it loses energy, which is transformed into heat. The amount of heat produced, in calories, is equivalent to the product of the square of the current strength in amperes, the resistance in ohms, the time in seconds, and 0.24. This figure is the calorie equivalent of 1 joule, a work unit. This is *Joule's Law.* Expressed mathematically it is written:

$$H = 0.24\, I^2Rt \text{ calories.}$$

Tremendous temperatures may be obtained by resistance in a circuit, and these are utilized in electric welding, in metallurgy, blasting, vulcanizing, annealing and many other industrial processes. Electric heating of trains and streetcars is practicable because it is highly efficient relative to the expense, but electric stoves and furnaces in homes are not in common use because the cost of electric power is high compared with other fuels accessible to the householder. The housewife, however, makes extensive use of such devices as electric flatirons, toasters, waffle irons, coffee percolators, curling irons and heating pads.



Early Development of Artificial Lighting

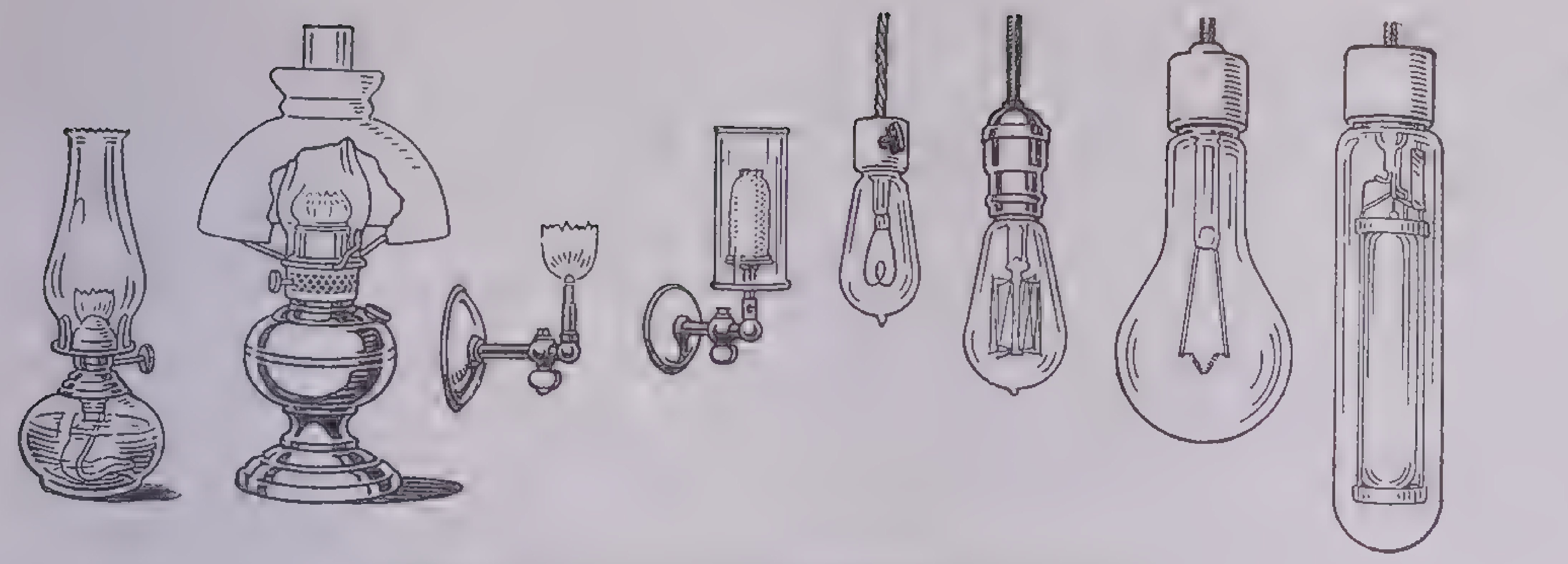
The evolution of artificial lighting from the pitch knot to the kerosene lamp covered a period of 6,000 years

Lighting.—Other forms of illumination have been superseded in many sections of the world by electric lighting which has made its way even into remote regions. The electric lamp with which most of us are familiar is a glass bulb with an enclosed wire or filament. Such a wire is made of material that strongly resists the passage of electric energy, on the principle that a conductor heated to a sufficiently high temperature by resistance gives out light as well as heat. Such a conductor is said to be heated to *incandescence.* The ordinary lamp has a *tungsten filament* enclosed in a glass bulb from which the air has been practically exhausted to prevent oxidation of the wire. Because tungsten has a higher melting point, this type of bulb has displaced the carbon bulb, invented by Edison in 1879 and later improved. In a vacuum it can be safely heated to a temperature of about 2150° C. For large areas like railway stations and city streets, bulbs filled with argon or nitrogen are serviceable, for these inert gases do not burn, and a tungsten filament of large cross section can be heated in them to a temperature of 2500° C. The ordinary bulb has an efficiency of about one candle power for each 1.5 watts; a gas-filled bulb is three times as efficient, requiring only 1/2 watt per candle power. Gas-filled lamps consuming as much as 30,000 watts are used in motion-picture studios and at landing fields for planes. Large numbers of high-powered lamps, concentrated in a small area and used in connection with reflectors, provide the spectacular illumination or floodlighting of skyscrapers now seen in many large cities.

Another standard lighting device is the *arc lamp* used for street lighting. In the ordinary type, two carbon rods that have been made part of an electric circuit are brought together and then slightly separated. The resistance to the current at the points of contact causes those points to become very hot, so that carbon is vaporized and carries the current across the gap between the points. The electrified vapor has the form of a luminous arc; whence the name of this type of lamp. The carbon points, however, are the source of illumination. When continuous current is used, a depression or *crater* is formed on the end of the positive rod, and this becomes brilliantly luminous. *Flaming arcs* are formed when metallic salts are used in the carbons. A luminous arc of orange-yellow color results from the use of calcium. It is serviceable only for outdoor illumination. For indoor lighting, the positive carbon is sometimes placed below the negative, and the brilliant light from the crater is mellowed and scattered by an overhead reflector. Carbons also are enclosed in air-tight bulbs. An enclosed arc lamp burns more slowly because there is a minimum of oxygen in the bulb, but the light is less powerful.

Chemical Effects.—This aspect of the subject may be approached through the study of a *voltaic cell,* the invention of Alessandro Volta. The voltaic cell is a simple form of electric battery. It is a device for generating a current by chemical action, and its operation also illustrates the chemical effect of electric energy. Suppose two metal plates of zinc and copper, respectively, are immersed for about two-thirds their length in a vessel containing sulphuric acid dissolved in water. The metal plates are the *electrodes* of the cell; the acid solution is the *electrolyte.* (Electrolytes form one class of electrical conductors. They are usually water solutions of acids, bases or salts.) If the electrodes are connected by a metal wire outside the liquid, an electric current will be set in motion and will travel around the circuit of terminal plates, wire and liquid as long as the cell provides fuel for the transformation of chemical into electric energy. The fuel in this case is the zinc. The effect of the current may be seen in the wearing away of the zinc plate and the formation of gas bubbles at the copper plate.

When the sulphuric acid is diluted with water, in the process of dissolving some of its molecules split into electrified atoms or groups of atoms called *ions.* Such separation of the



Recent Development of Artificial Lighting
Within a period of 100 years the kerosene lamp has been followed by gas, the gas mantle and the various types of incandescent electric lamps

molecules of an acid in solution is called *dissociation.* All metal ions and the ion of hydrogen are positive. The molecule of sulphuric acid is composed of two hydrogen atoms (H_2) and of a group consisting of one sulphur atom and four oxygen atoms (SO_4). In dissociation the molecule splits into two positive H ions and one negative SO_4 ion (with a double charge). When the zinc plate is dipped into the liquid, positive zinc (Zn) ions enter it, leaving the plate negatively charged. The positive H ions in the electrolyte are repelled by these Zn ions, and they go to the copper plate when the wire connection is made. Here they attract electrons that have traveled over the wire from the zinc plate, and they give that plate a positive charge. At this terminal they rise to the surface as bubbles of hydrogen gas. Zinc sulphate ($Zn\,SO_4$) is formed by the union of Zn ions and the negative SO_4 groups, permitting more zinc to enter the solution and dissociation to continue. When the zinc plate is consumed, the action of the cell ceases. The wearing away of this plate provides the energy required to set up an electromotive force.

The electric current in this cell is a migration of electrons from the negative zinc plate, which has a surplus of electrons; they travel over the wire to the positive copper plate and through the electrolyte back to the zinc. The terminal at which the current enters the solution (the copper plate) is called the positive pole or *anode;* and the terminal at which it leaves (the zinc) is called the negative pole or *cathode.* According to the older theory the current flows from positive to negative, but the electron theory holds that the flow is in the opposite direction, from negative to positive. Electrons travel through a conductor as free particles; protons cannot do so.

The device described above is called a *primary cell,* because it generates electric energy within itself and does not require current from an outside source. The commercial dry cell used for doorbells, in flashlights and as the B battery for the battery-operated radio set has two plates, zinc and carbon, separated by a paste that contains ammonium chloride. (The electrolyte is really moist, rather than dry.)

Each cell has a pressure (e.m.f.) of 1.5 volts, and when new should give 27 or more amperes of current on short circuit. Other forms of commercial cell are the Daniell, gravity and Edison-Lalande.

Properly, the term *cell* refers to a single unit; *battery* refers to an outfit of two or more cells. In practice, however, *cell* and *battery* are used interchangeably.

The *storage cell* or *battery* (also called secondary battery and accumulator) differs from the primary outfit in that it is renewed by having a current sent through it, the current coming from an outside source. Each cell of the storage battery contains positive lead plates having perforations filled with lead peroxide and negative plates filled with gray spongy lead.

The electrolyte is a solution of sulphuric acid in distilled water. When the battery is used, chemical action causes some of the oxygen to be transferred to the spongy lead. When both plates contain about the same amount of oxygen, no more current will flow. It is recharged by passing a current into it in the opposite direction from that produced by the cell. This removes the oxygen from the spongy lead and adds it to the positive plate.

The so-called storage cell does not really store electricity. The electricity put into it causes chemical action that will reverse itself and produce electricity. The ordinary lead cell gives 2 volts. The capacity is indicated as *100 ampere-hours,* which means that a battery of this rating will give 1 ampere of current for 100 hours, 4 amperes for 25 hours or 25 amperes for 4 hours. The battery should not fall below 1.200, hydrometer test, before it is recharged. It reads 1.280 to 1.300 when fully charged, and 1.140 when it needs recharging.

ELECTROLYSIS.—The passage of an electric current through an electrolyte causes certain definite effects at the electrodes. This process is called *electrolysis.* If, for example, two copper plates are immersed in a water solution of copper sulphate and a current is sent through the cell, after a time the anode will appear tarnished and the cathode bright. The cathode in this case has received a deposit of copper that was removed from the anode as fast as it was deposited on the other electrode. Electrolysis has great practical value, being applied in such operations as electrotyping and the plating of tableware, kitchen utensils and various other metallic household articles.

ELECTROMAGNETISM

Magnets and Magnetism.—To understand the interactions between electricity and magnetism, we must know something about the properties of magnets. That pieces of a black ore abundant in Asia Minor could pick up bits of iron was known to the ancients. Columbus kept track of his directions by means of a magnetic compass when he made his first voyage to the New World in 1492; but not until Dr. William Gilbert published his great treatise on magnetism (*De Magnete*) in 1600 was there any scientific discussion of magnetic attraction. Gilbert was the first to establish clearly the magnetic character of the earth and to point out the existence of magnetic poles.

Bits of iron ore (magnetite) that attract iron, steel, nickel, cobalt and a few other substances are called *natural magnets,* and the substances so attracted are said to be *magnetic.* By magnetization they themselves become magnets. Several materials repel magnets. These, which include bismuth, phosphorus and copper, are called *diamagnetic.*

Pure annealed iron, often called *soft* iron, has the property of being strongly attracted by a magnet, but when removed from the magnetic influence it immediately loses all trace of magnetism. Steel, on the other hand, especially certain alloys and hard tempered steel, is magnetized permanently if it comes into a magnetic field. The ordinary horseshoe magnet is made of hard steel and retains its magnetism for years. Such magnets are usually sold with a small piece of soft iron called a *keeper,* which does not retain any magnetism when taken away from the magnet. A sewing needle, however, made of hard steel, may be permanently magnetized merely by bringing it in contact with an ordinary horseshoe magnet.

The magnets in common use for industrial purposes have been magnetized by electrical methods and are called *artificial magnets.* All magnets exhibit *polarity,* by which is meant that the magnetism in each case is concentrated at the two ends or poles. If a magnet is suspended so that it is free to turn in a horizontal plane, it will point north and south when at rest. The end that points north is called the *north* or *positive* pole; the opposite end is the *south* or *negative* pole. Experiments with two freely swinging magnets show that the two north or two south poles always repel each other, and that a north pole of one magnet and a south pole of the other are attracted to each other.

The north-and-south position of a suspended or pivoted magnet is due to the attraction of the earth's magnetic poles. Since like poles repel and unlike poles attract each other, each of the earth's poles has a magnetism opposite in kind to that of the corresponding pole of the magnet. Therefore the positive and negative poles of a magnet may be more accurately designated as *north-seeking* and *south-seeking.*

A simple experiment will make clear what is meant by the concept of a magnetic field surrounding a magnet. Place a piece of glass over a bar magnet and sprinkle iron filings evenly over the glass. Then tap the glass gently and watch the arrangement of the filings. They will line up in curves that diverge from one pole and come together at the other pole. The lines represented by the bits of iron are thought of as lines of force along which magnetic action takes place. The space in which they lie is the *magnetic field.* An object capable of being magnetized can be so affected when not in contact with a magnet, if the object is in the magnetic field. It is then said to be magnetized by *induction.* In the experiment above the iron filings were magnetized by induction.

Magnetic attraction is explained by reference to the molecular theory. Each molecule of a bar of iron or other magnetic substance is itself a magnet; but when the bar is unmagnetized, the molecules have no special arrangement as to direction and lines of force remain within. When the bar is magnetized, many of the molecules will turn about in such a way that the north poles will point in one direction and the south poles in the opposite direction. Thus there will be a concentration of north or of south poles at each end of the bar, while the north poles in the middle of the bar will be facing south poles because of the mutual attraction. These arrangements account for the polarity of a magnetized body, as well as the fact that magnetic force is lacking in the center of a magnet. They also explain why, when a magnet is cut in two, the opposite ends of each section become points of magnetic intensity.

THE COMPASS.—Previous to the invention of the compass, navigators had only the stars to guide them. In the 13th century, there was in use in Europe a crude device that had long been used in China—a magnetized needle attached to a piece of wood and floated on water. A piece of magnetite in a similar position was called the *loadstone* (or *lodestone*), a stone that leads or guides. Columbus used an improved form of compass, but his instrument was a simple affair compared to the mariner's compass of today. This device has several magnetic needles permanently fastened to the lower surface of a round sheet of mica or paper, the compass card. Set into the center of the paper is usually a small piece of agate that rests on a sharp metallic point enabling the card to turn easily. A copper ring or large glass-covered bowl contains the needles and cards. The bowl may be filled with a water-and-alcohol mixture in order to help support the card. Two rings of copper support this compass in such a way that it may shift easily in any direction with the roll of the ship. The compass card has the cardinal points—N, E, S, W—clearly marked on it, as well as the points N.W., N.N.W., and so on.

Inasmuch as the magnetic poles do not coincide exactly with our north and south poles, the magnetic compass is subject to *magnetic declination* or dip and requires adjustment by scientific calculations. The north magnetic pole is located about 70° N. Lat. and 97° W. Long. The south magnetic pole is located about 72° S. Lat. and 155° E. Long. The north and south magnetic poles change their positions slightly because the magnetic intensity of the earth varies with the appearance of sun spots and with a change of season. An imaginary line between these magnetic poles irregularly encircling the earth is called the *magnetic equator* or *aclinic line,* that is, the line with no magnetic dip or declination. At all points along this line the magnetic attraction of the north pole balances that of the south pole.

In addition to the magnetic compass there is the gyroscopic type or gyrocompass, invented in the United States in 1910 by E. A. Sperry (1860–1930). It is valuable in navigating ships made largely of steel, because steel has a disturbing effect upon the magnetic compass. The underlying principle of the gyrocompass is based upon the rotation of the earth and that physical tendency of a rapidly turning body to maintain a definite direction in relation to the earth. This type of compass consists of a heavy wheel that whirls easily and turns vertically or horizontally. The wheel is placed in a vacuum tube and turned by a motor at a rate of about 9,000 revolutions per minute. The gyroscope establishes a north-south direction and continues to do so as long as the wheel is kept turning at an even rate of speed. The compass card indicates the direction. An automatic steering machine or gyropilot, controlled by the gyrocompass, moves the ship's rudder to correct any departure from its charted course.

MAGNETIC EFFECTS OF A CURRENT.—Our knowledge of the relation between electricity and magnetism dates from the year 1820, when a Danish electromagnetist, Hans Christian Oersted (1777–1851), announced his discovery that a wire carrying a current of electricity is surrounded by a magnetic field perpendicular to the direction of the current. The lines of force in such a field are concentric circles. If two parallel wires carrying currents are brought near together, they will be attracted to or repelled by each other according to the direction of the currents. Parallel currents flowing in the same direction attract; those flowing in opposite directions repel. In 1825 William Sturgeon (1783–1850), an English inventor, made the first electromagnet when he sent an electric current through a coil of wire enclosing a bar of soft iron. Only as long as the current flowed did the iron core exhibit magnetism, a fact of great significance in modern industry. An improved electromagnet designed in 1831 by Joseph Henry, American physicist, made possible the telephone and telegraph, electric doorbells and numerous other devices.

Electricity Induced by Magnetism.—That an electric current, in turn, may be produced by means of a magnet was discovered independently by both Joseph Henry and Michael Faraday, his great English contemporary. Faraday published an account of his experiments before Henry's work was known, and therefore he has received chief honor as the discoverer of electromagnetic induction. In 1831 Faraday found that a closed coil of wire, if moved so that it cuts lines of magnetic force, will have a current of electricity generated in it. Such a flow of electric energy is known as an *induced current.* Electromagnetism depends upon *relative motion* between the conductor and the magnetic system.

THE DYNAMO OR GENERATOR.—This device, one of industry's most important machines, transforms mechanical into electrical energy by magneto electric induction; the electric energy that is generated by the dynamo is used to operate an electric motor for turning machinery. Thus the motor is the dynamo reversed—a device for transforming electrical into mechanical energy. Dynamos are set in motion by water wheels, steam engines and other forms of mechanical movers. The heart of the apparatus is a conducting system called the *armature* and a magnetic system called the *field magnet.* The armature usually consists of coils of insulated wire wrapped around an iron core; the field is an electromagnet with two or more poles, alternating north and south. The larger dynamos may have as many as eight pairs of poles. Since an electric current is generated in a conductor when it cuts the lines of force in a magnetic field or when the lines of force are moved across the conducting system, the armature may revolve past the field or the field revolve about the armature. The terms *rotor* and *stator* are applied, respectively, to the rotating and stationary systems.

The rotor is made to revolve by mechanical energy; but direct current carried through brushes to rings connecting with the ends of the wire of the magnetic system produces the magnetic fields. Since each coil of the armature receives lines of force alternately from north and south poles, the current generated in the conductor is always alternating—flowing first in one direction and then in the other. When the electricity is led into the external circuit as alternating current, the dynamo is called an *alternating-current* (A.C.) generator or *alternator.* If the armature revolves, the ends of each loop of wire forming the coils are fastened to a separate *collecting ring,* rotating with the coil, and the current is carried through the brushes to the mains without change. If direct current is required in the external circuit, use is made of a split ring or *commutator,* each segment of which is attached to a terminal of the armature coil. The brushes are so arranged as to slip from one section of the ring to the other coincidently with each reverse movement of the current, and the current flows into the external circuit in one direction. Such an arrangement classifies the dynamo as a *direct-current* (D.C.) generator.

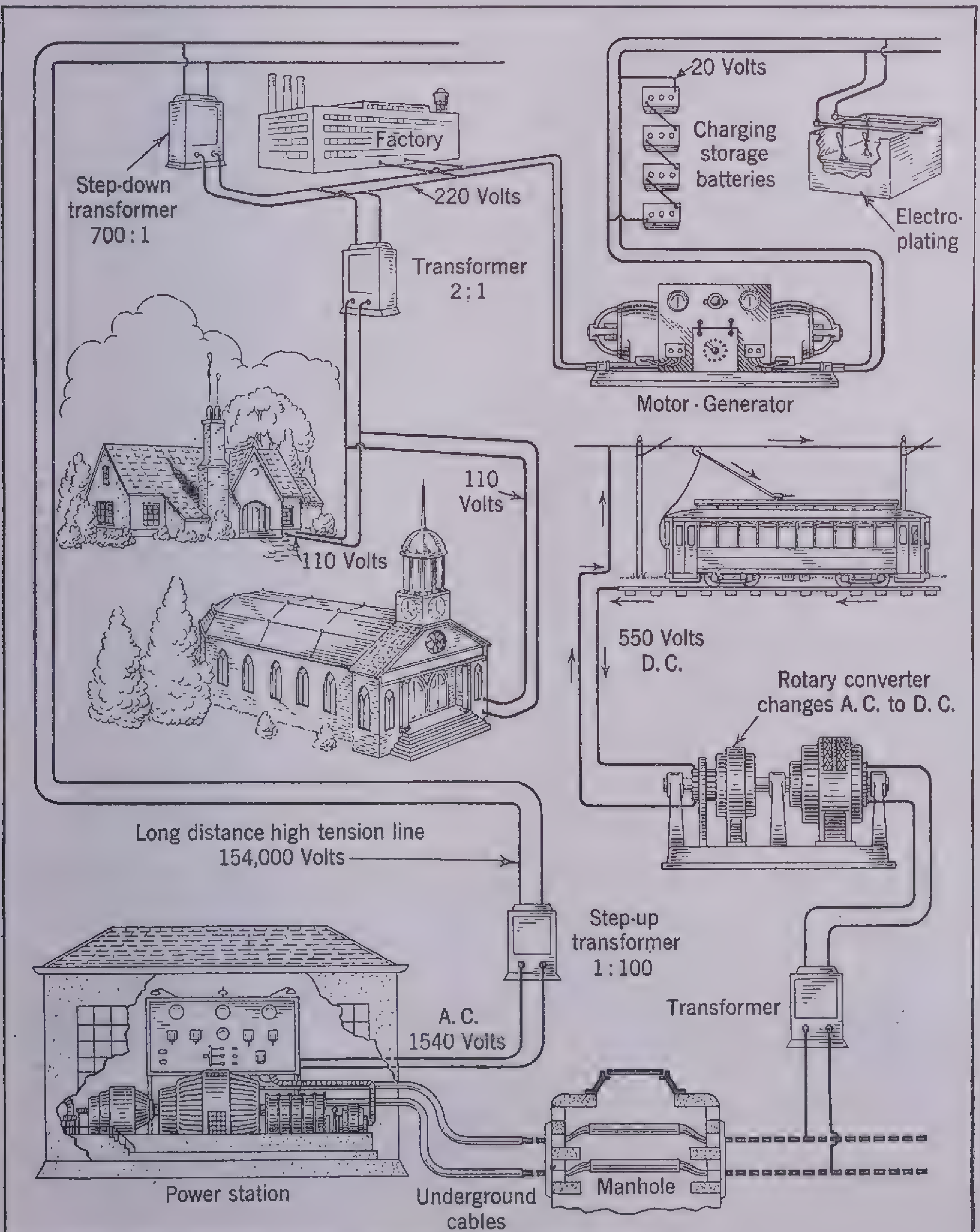
TRANSFORMERS.—When two coils of wire have one iron core in common, and an alternating current is sent into one coil, called the *primary coil,* the lines of force coming to and going from the other, or *secondary coil,* produce a series of currents in it by the principles of induction. The device is called a *transformer.* It is a form of induction coil. The voltage in the two coils varies directly as the number of turns of wire in the two coils; thus the voltage will be raised if the secondary has more turns of wire than the primary, but will be lowered if the secondary has fewer turns than the primary.

The number of amperes will change inversely as the volts, so that the watts in the primary always equal the watts in the secondary. Electricity can be transmitted at high voltage and low amperage with less loss of energy than at low voltage and high amperage. The heat loss in an electrical conductor varies as the square of the current. There is some heating in all conductors; but if the current is doubled, the heat developed is four times as much. To prevent this loss in heat, long-distance transmission is at a high voltage. This can be stepped down to low voltage where it is to be used.

The Magneto.—A device for generating current by means of a *permanent* magnet, a piece of hard steel that has been magnetized by electricity, is called a magneto. Such magnets retain their magnetism for long periods. In this device the armature revolves between the poles of a horseshoe magnet, and the current is generated in the coils of the armature by the cutting of the lines of force. Magnetos are useful where current is used intermittently and in small quantities.

Measuring Devices.—Specially constructed instruments are required for accurate measurement of electric energy. The following devices all make use of electromagnetic laws:

Ammeter, a shortened form of the term *amperemeter,* is the name of an instrument used to measure the number of amperes flowing in a circuit. A common form has a coil of fine wire so mounted as to move freely between the poles of a permanent magnet. A soft-iron core within the coil increases the intensity of the magnetic field of the coil. Current is led into the coil through a pair of spiral springs. As the current flows through the coil, the core is magnetized and tends to deflect the wire so that its magnetism may be parallel to that of the permanent magnet. This motion is resisted by the spiral springs, and the resistance is proportional to the strength of the current. To prevent burning out the coil, only a small part of the current is allowed to enter, the rest being intercepted by a metal strip called a *shunt,* which connects the terminals of the device. The number of amperes is indicated on a graduated scale by a pointer attached to the coil.



Electricity at Work

Showing some of the uses of electricity for light and power and illustrating some of the changes incident to the transmission and varied uses of electricity

The Electric Meter is a device with three or four dials that register in kilowatt-hours the quantity of electric energy consumed. The current is carried by heavy field coils connected in series with the main circuit; the strength of the magnetic field is proportional to the number of amperes passing. A rotating armature, which is wound with fine wire forming a shunt circuit, is activated by electric energy. The mechanism is connected with a clockwork system that moves pointers around the dials. Each dial has ten space divisions. Those of the first dial represent 1 kilowatt-hour each; those of the second dial represent 10 kilowatt-hours each; and those of the third and fourth dials, respectively 100 and 1,000 kilowatt-hours each. When the pointer on the first dial has made 10 complete revolutions, that on the second has moved around the dial once, and so on. To read the meter, note the number of spaces passed by each pointer, beginning with the fourth dial.

The Galvanometer is an instrument useful for detecting and measuring the strength of small currents. The ammeter, described above, is a portable galvanometer that measures larger currents. A common form of galvanometer has a stationary horseshoe magnet and a moving coil of fine wire suspended between the poles. When current is sent through the wire, the magnetic field of the magnet tends to deflect the coil, and the amount of its turning indicates the strength of the current. A small mirror attached to the coil reflects light from an illuminated scale, serving to magnify the deflection of the coil.

The Voltmeter is an instrument that measures difference of potential in volts. For direct current, the voltmeter in common use is a galvanometer in which the moving coil of the instrument is attached at each end to a high-resistant wire spring. When the current is sent through the coil and the coil turns, the springs provide the amount of resistance to be overcome. A pointer attached to the coil indicates by its position on a scale the pressure due to difference in potential.

INVISIBLE RADIATIONS

Electrical and Magnetic Conditions.—A background for this subject is given above in the section on *Light.* As stated there, radiant energy, of which light is one form, consists of electromagnetic disturbances in a supposed ether; or, to put it more scientifically, these disturbances are transverse alterations in the electrical and magnetic conditions of the ether. As early as

1800, the astronomer Sir William Herschel showed that radiations in and beyond the red end of the visible spectrum have a higher temperature than those in the blue. The existence of dark chemical rays (ultraviolet) beyond the violet end of the spectrum was established a year or two later. The wave motion of light radiation was proved by Thomas Young in 1801. By the middle of the 19th century, it was definitely accepted that invisible radiations of longer wave length than light, and others of shorter wave length than light, lie beyond the red and violet ends of the spectrum, respectively, and that these radiations possess such properties of light as reflection, refraction, interference and polarization. Then, in 1865, came Clerk-Maxwell's brilliant theory that light consists of electric and magnetic fields of force vibrating at right angles to each other. James Clerk-Maxwell (1831–79), British physicist, computed the velocity of light mathematically and predicted the discovery of electromagnetic waves moving with the same velocity but having longer wave lengths than any radiations known at that time. His prediction was confirmed about 1888, when the first radio waves were produced experimentally. Then came other discoveries, until scientists have identified about 50 octaves of a great scale of radiations, among which light radiation alone is capable of affecting the sight. (An *octave* is the band of vibrations extending from a given frequency to double that frequency.) Visible light occupies one octave of the scale, the vibration frequency of violet being about double that of red and its wave length being about half that of red.

The very short and penetrating cosmic rays, the gamma rays of radioactive substances, X rays (Roentgen), ultraviolet rays and radio waves are treated below. These forms of radiation, together with infrared (heat) waves and light waves, complete the scale. Included also are discussions of cathode rays; and of alpha and beta rays of radioactive elements, which are streams of electrified particles, not electromagnetic radiations, though it is customary to treat these subjects together, so closely are they associated. The terms *ray* and *radiation* are used interchangeably in practically all texts.

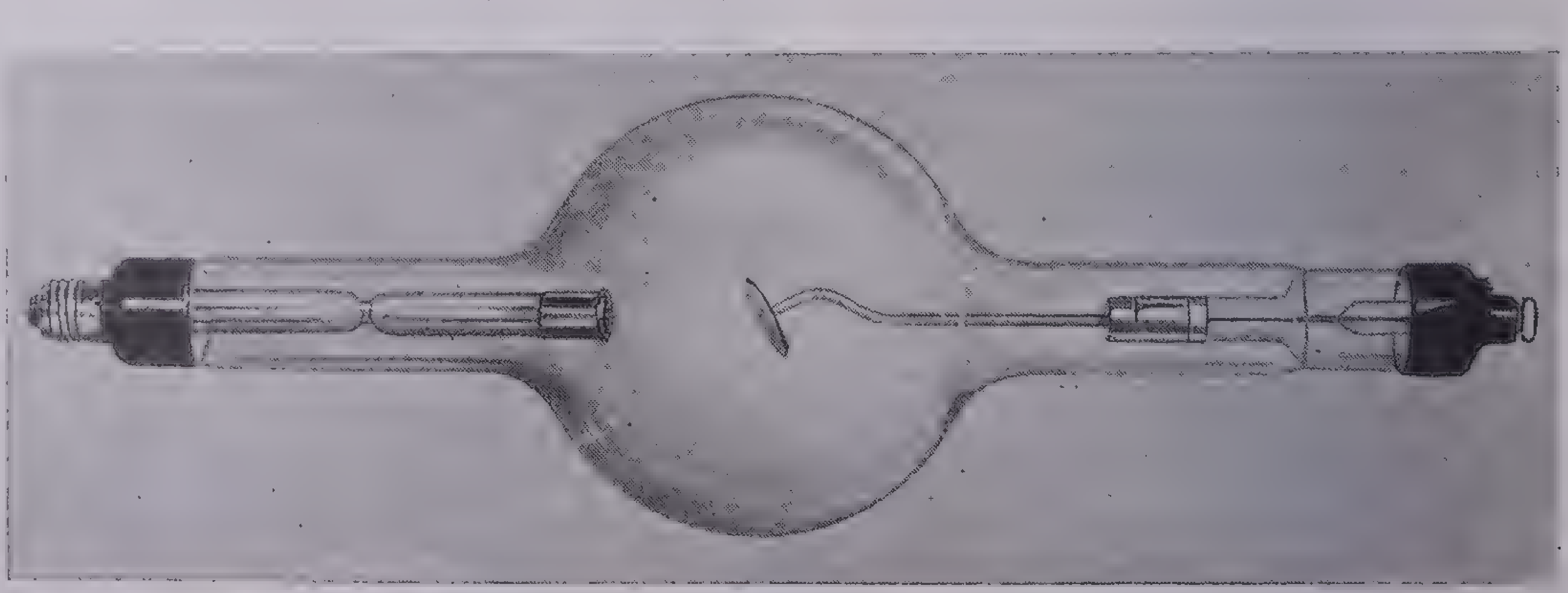
Ultraviolet Rays.—Lying just beyond the violet end of the spectrum, these rays are abundant in sunlight and are responsible for sunburn and tan. They cause the fading of colors exposed to the sun and are important in ordinary photography. Because ultraviolet light is greatly diminished on cloudy days, it is difficult to take an outdoor picture under such conditions. These rays have definite curative properties in cases of tuberculosis and rickets. They do not pass through ordinary glass but are transmitted by glass specially made of fused silica or quartz or fused boric oxide. The rays can be produced artificially and are used in tanning leather and sterilizing water, as well as for the treatment of disease.

Cathode Rays.—These rays originally were produced in glass bulbs from which the air was nearly exhausted. About 1873 Sir William Crookes developed a highly efficient tube for the purpose, and the vacuum bulbs so used became known as *Crookes tubes* in his honor, though experiments similar to his were performed earlier by other investigators. A tube of the type used by Crookes had opposite electrodes sealed into the glass and consisted of wires ending in metal plates. The current entered the tube through the positive terminal or anode and left it through the negative terminal or cathode. When a current of high voltage was led into the tube, a golden-green fluorescent light appeared on the glass opposite the cathode, showing that rays of some character were proceeding from that electrode. A metal screen placed in their path caused a shadow to appear on the fluorescence near the anode, and it was found that a magnet would deflect them in a manner indicating that they were negatively charged. That the cathode rays are streams of electrons detached from the cathode was demonstrated in 1898 by Sir J. J. Thomson. With a sufficiently high voltage, these particles can be made to travel at a velocity of 100,000 miles a second. They are identical with beta rays of radioactive substances.

Roentgen or X Rays were discovered in 1895 by Professor Wilhelm K. Roentgen of Bavaria while he was studying the effects of electrical discharges in Crookes tubes. One day while he was experimenting with a tube wrapped in heavy black paper, he noticed an area of fluorescence on a screen several feet away from the tube. This fluorescence was found to be in a direct line with the area of the tube wall bombarded by the cathode rays. Professor Roentgen placed a disk of platinum in the tube, in the path of the cathode stream, and was then better able to study the new kind of radiation produced by the impact of the cathode rays on this disk, called the *target* and *anti-cathode.* Not understanding their nature, he called the radiations *X rays,* borrowing from algebra the common symbol of an unknown quantity. These rays were later shown to be electromagnetic radiations of wave lengths thousands of times shorter than those of visible light. They lie between ultraviolet light and the gamma rays in the electromagnetic scale and represent radiant energy given out when the swiftly moving electrons from the cathode strike upon the target and dislodge some of its electrons. Part of the energy evolved manifests itself as heat and light.

X rays have very remarkable properties. They penetrate many substances opaque to light, such as aluminum, wood and flesh tissue, but are absorbed by some other substances transparent to light, such as glass (except soda glass). Generally speaking, the greater the density of a substance, the more easily it absorbs the rays. Lead is penetrated only slightly by the rays; hence its use for protective shields in X-ray machines. X rays themselves, however, vary in their penetrating power according to the type of tube in which they are generated. In the highly efficient Coolidge tubes manufactured by the General Electric Company—tubes of extremely high exhaustion and employing high voltage—*hard* X rays are produced of such an intensity that they will penetrate bones and reveal the presence of bullets lodged in them. These hard rays are of very short wave length. Softer rays are stopped by bone. X rays affect a photographic plate in the same way as light affects it, but they can be used to photograph objects not visible to the eye, a fact of great importance in medicine, dentistry and surgery. By revealing the nature of injuries, such as bone fractures and the presence of morbid growths and other pathological conditions, X-ray pictures give the physician or surgeon invaluable information. The rays have curative effects in some cases of skin disease and are helpful in the treatment of superficial cancer. Great care must be taken by X-ray operators, for the rays may cause severe and even fatal burns. In the world of industry, the rays are used to analyze and test materials and to detect flaws.

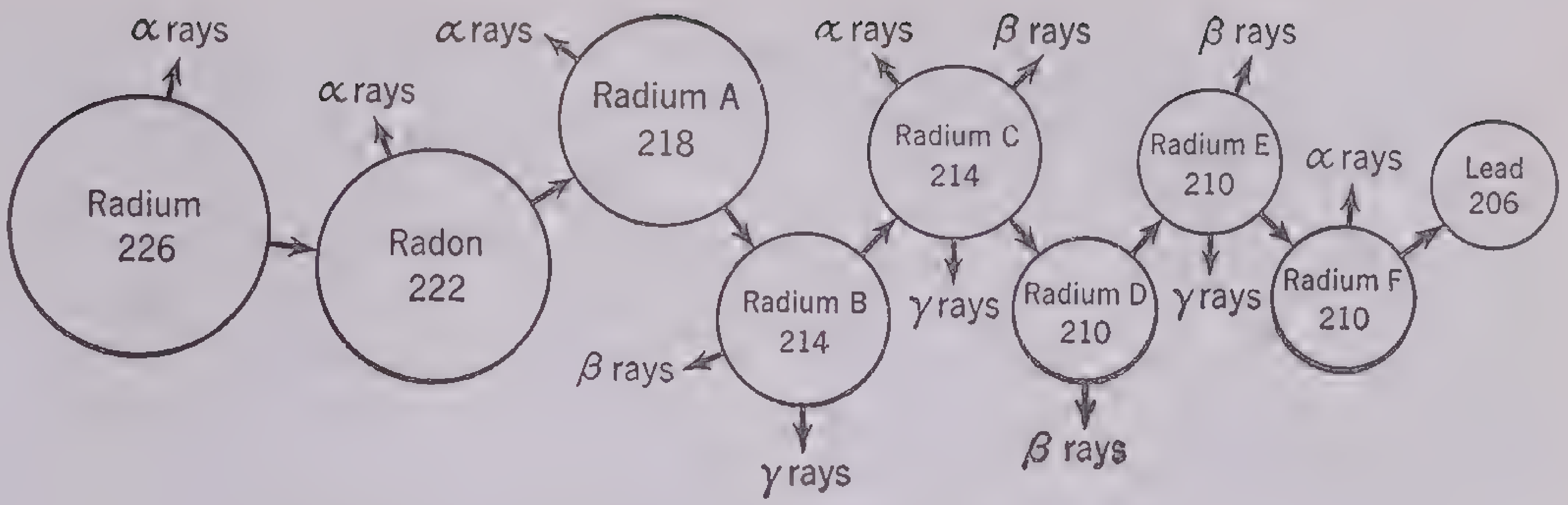
Radioactivity.—The discovery of X rays inspired Professor Becquerel, French scientist, to undertake a search for other sources of radiation; and early in 1896 he found that salts of uranium spontaneously emit rays that, like X rays, affect a photographic plate not exposed to light. The radiations were called *Becquerel rays,* in his honor. His discovery opened the new field of radioactivity, one of the outstanding phenomena of science. The search for other substances emitting



Courtesy Westinghouse X-Ray Company, Inc.

An X-Ray Tube for Medical Use

The electron stream originates at the cathode point at the left. The stream leaps across the space to the target, a slanting tungsten disc. Because of the slant the resulting X rays are deflected out of the tube to do their work



Steps in the Disintegration of Radium into Lead

Becquerel rays not only led to the discovery that a group of some 40 elements possess radioactive properties but gave scientists a new insight into the structure of the atom. In radioactivity the atoms of the radioactive element break up spontaneously and emit radiation. The process is not affected by changes in temperature or other physical or chemical conditions; and no means are known by which it can be hastened, retarded or stopped.

Three kinds of rays are emitted by radioactive elements in this disintegration of atoms.

Alpha Rays.—Positively charged atoms of helium, each atom having lost its two exterior electrons, are alpha rays. (The helium nucleus contains four protons and two electrons.) The alpha particles move with a velocity of 10,000 to 20,000 miles per second, the rays of each radioactive substance having a characteristic speed of emission. Because of their high velocity relative to the normal speed of atoms, the alpha rays ionize molecules of air with which they collide, splitting them into electrically charged atoms or groups of atoms.

Beta Rays.—Streams of negatively charged particles or electrons are beta rays, identical with cathode rays. They can penetrate a few millimeters of lead before being stopped and have a wide range of velocity, their speed varying from one-tenth to nine-tenths that of light. They are responsible for most of the photographic effect of radioactivity. Beta rays are deflected by a magnet in a direction opposite to the deflection of alpha rays. This fact is one proof of the statement that alpha and beta rays are oppositely charged particles of matter. As their mass is small, beta rays are deflected to a much greater degree than alpha rays.

Gamma Rays.—There is no deflection of gamma rays when they are placed in a magnetic field. They are not particles of matter but electromagnetic radiations moving with the velocity of light and lying between cosmic rays and the hardest X rays in the electromagnetic scale. They can be made to pass through 20 centimeters of lead. Gamma rays represent the radiant energy produced by the emission of alpha and beta particles.

Lines of Descent.—There are three parent elements in radioactive disintergration—uranium, actinium and thorium. Half of any one of these elements disappears within a definite period, half of what remains within the next period of the same length, and so on. Since the splitting of the atom and the loss of alpha and beta particles changes the atom as to kind, we have in radioactivity the transformation of one element into another, something that alchemists in medieval times long dreamed of doing. After undergoing five changes, uranium is transformed into radium. Radium disintegrates to half its mass in about 1,700 years, but the second end-product, uranium X_2, has a period of only 1.15 minutes. The final product in this series is a form of lead, and the entire change, from uranium to lead, requires about 8 billion years.

Cosmic Rays.—The existence of cosmic rays has been proved by a series of experiments begun in 1922 by Professor R. A. Millikan of the California Institute of Technology. The cosmic rays are so called because they are believed to have their origin in the remote regions of the cosmos or universe. Professor Millikan has held that they come from a vast field of hydrogen millions of miles beyond the visible stars. Cosmic rays lie at the end of the electromagnetic scale, having the shortest wave lengths and the highest frequency of any form of radiation. According to Millikan, "The energy carried by them [cosmic rays] throughout the universe is as great as, or perhaps greater than, all other radiant energies put together." The source of this radiation may be the birth of atoms through the union of electrons and protons or, as some physicists believe, the destruction of matter by the collision of electrons and protons. Either process would be attended by a release of energy. Cosmic rays are capable of piercing through 18 feet of lead. Their wave length in centimeters is not more than five-trillionths, and their frequency of vibration about 100 billion billions per second. Millikan detected these remarkable rays with refined electroscopes, which responded under 60 feet of water in mountain lakes and when they were fastened to balloons high in air.

Quantum Theory.—At the end of the 19th century most physicists were convinced that the day of fundamental change in physical theory was over. Classical physics, represented in mechanics by Newton's laws of motion and in optics and electricity by Clerk-Maxwell's theory of electromagnetic waves, seemed triumphant on all fronts. Each new refinement of measurement confirmed the predictions of theory, and few scientists dreamed that within 25 years the whole magnificent structure would be undermined. Yet that is precisely what has happened.

Three men have done more than any others to bring about the profound revolution that goes by the name of the New Physics; they are Max Planck with his quantum theory, Albert Einstein with his relativity theory and the late Ernest Rutherford with his theory of atomic structure. Rutherford's ideas of atomic structure have already been discussed briefly; an account of Einstein's theory of relativity appears further on. The *quantum theory* has thrown modern physics into a turmoil that in the fourth decade of the 20th century shows no signs of settling.

The basic idea of the quantum theory is that radiation of energy proceeds by jumps. "Nature makes no jumps" is an old saying inherited from scholastic philosophy.

In 1901 Max Planck, investigating the radiation emitted from the interior of a hot cavity, came to the conclusion that all radiant energy is emitted and absorbed in separate units or *quanta* instead of the continuous stream that the older theory had assumed. The amount of energy in a quantum depended upon the frequency of vibration of the waves in which the energy was radiated. The energy and frequency were related according to the equation

$$E = hv$$

where E represents energy in ergs; v represents frequency (number of waves per second or $\frac{\text{velocity of light}}{\text{wave length}}$) and h represents a fundamental constant of nature known as *Planck's constant,* equal to 6.56×10^{-27}.

This explanation of radiant energy, quite contrary to the classical theory, in many features revived Newton's old idea that light or radiation is a corpuscular phenomenon.

Since the announcement of the quantum theory, experimenters and mathematicians have been busy. They have not produced a new picture of the universe as definite and final as the old classical theory. What they have shown is that nature is excessively complex and that our ordinary everyday concepts simply have no meaning when we attempt to apply them to the world outside the range of our sense perceptions. When we talk about electrons as if they were tiny particles and say that they move in orbits about a nucleus in an atom we are only using figures of speech.

An old story relates that four blind men were brought to an elephant and each was asked his opinion of the animal.

"An elephant is like a wall," said the first man, who had laid his hand on the beast's smooth solid side.

"No, an elephant is like a pillar," said the second, who had grasped the animal's leg.

"I find an elephant much like a sharp smooth stick," said the third, seizing the tusk.

"You are all wrong," said the fourth man, as he felt the trunk. "An elephant is a long curling pipe or hose."

Modern physicists are in a position

something like this when they report their findings on the structure of the atom and the ultimate nature of reality. We have no way of describing what seems to go on in the world except by language drawn from our gross sense experience, and this language does not fit in the subworld of the atom.

In 1937 the Nobel Prize in physics was awarded to C. J. Davisson, an American, and G. P. Thomson, a British scientist, for their work showing experimentally that electrons under certain conditions behave as if they were pure waves of radiant energy. These experimenters directed a stream or beam of electrons against a crystal of nickel, and found that reflection occurred as if the electrons were waves of energy.

THE PHOTOELECTRIC CELL.—This device, sometimes called the *electric eye,* is a means of demonstrating the validity of the quantum theory. The *photoelectric effect* is the emission of electrons from metal surfaces sensitive to light when these *photoactive* metals are electrically charged and subjected to the influence of light. A common type of commercial photoelectric cell consists of a vacuum tube with opaque lining except for a small window to admit the light. On the inside and opposite the opening is a piece of bright potassium metal, which acts as a sensitive surface. A lead-in wire from the negative pole of a battery is connected with the sensitive surface, and a second electrode, consisting of a loop of wire and placed a short distance in front of the surface, is attached to the positive pole of the battery. When a beam of light is sent through the opening and impinges upon the photoactive surface, electrons are liberated by the potassium. These *photoelectrons,* by virtue of the electromotive force between the electrodes, pass from the metal to the second electrode as an electric current.

Now it is very significant that the *number* of electrons liberated for each unit of time is proportional to the intensity of the light, but the *energy* of these electrons is unaffected by the intensity. More electrons will be released by a more intense light, and their velocity will increase as the frequency of vibration of the radiation increases. Each photoelectron, however, receives all the energy (no more and no less) contained in the light dart or *photon* that dislodges it. This energy has the value of one quantum, and it becomes the kinetic energy of the liberated photoelectron. These statements have been proved over and over again by experiments with different kinds of radiation and different metals, and the evidence is convincing that light (and therefore other electromagnetic radiation) is emitted in separate or discrete particles of fixed value under certain conditions. The photoelectric effect cannot be explained by the wave theory. To supply energy sufficient to eject an electron would require days if the light from a source of feeble illumination projected upon a sensitive surface were spread out uniformly in waves. The fact is that electrons are ejected instantaneously in the photoelectric cell, even when a faint light is used; and the electrons, though few in number, leave the surface with an energy as great as if the source of energy were a powerful electric lamp. On the other hand, the wave theory has passed so many tests that physicists know that it has an unassailable place in radiation phenomena. It is believed that the connecting link will some day be found, and then the wave and photon theories will prove to be complementary and not contradictory.

The photoelectric cell has many practical uses, since a small current produced in it may be amplified many times. Such a current may operate a traffic signal when it receives light from an automobile headlight. It may automatically turn the lights on in a room when it is too dark. It may serve as a counter, making a record of each interruption in the beam of light; it will sort out materials according to color or imperfection or give an alarm if smoke from fire is produced in its neighborhood. The photoelectric cell is also an essential part of devices used in radio television, in the transmission of pictures by wire and in talking motion pictures.

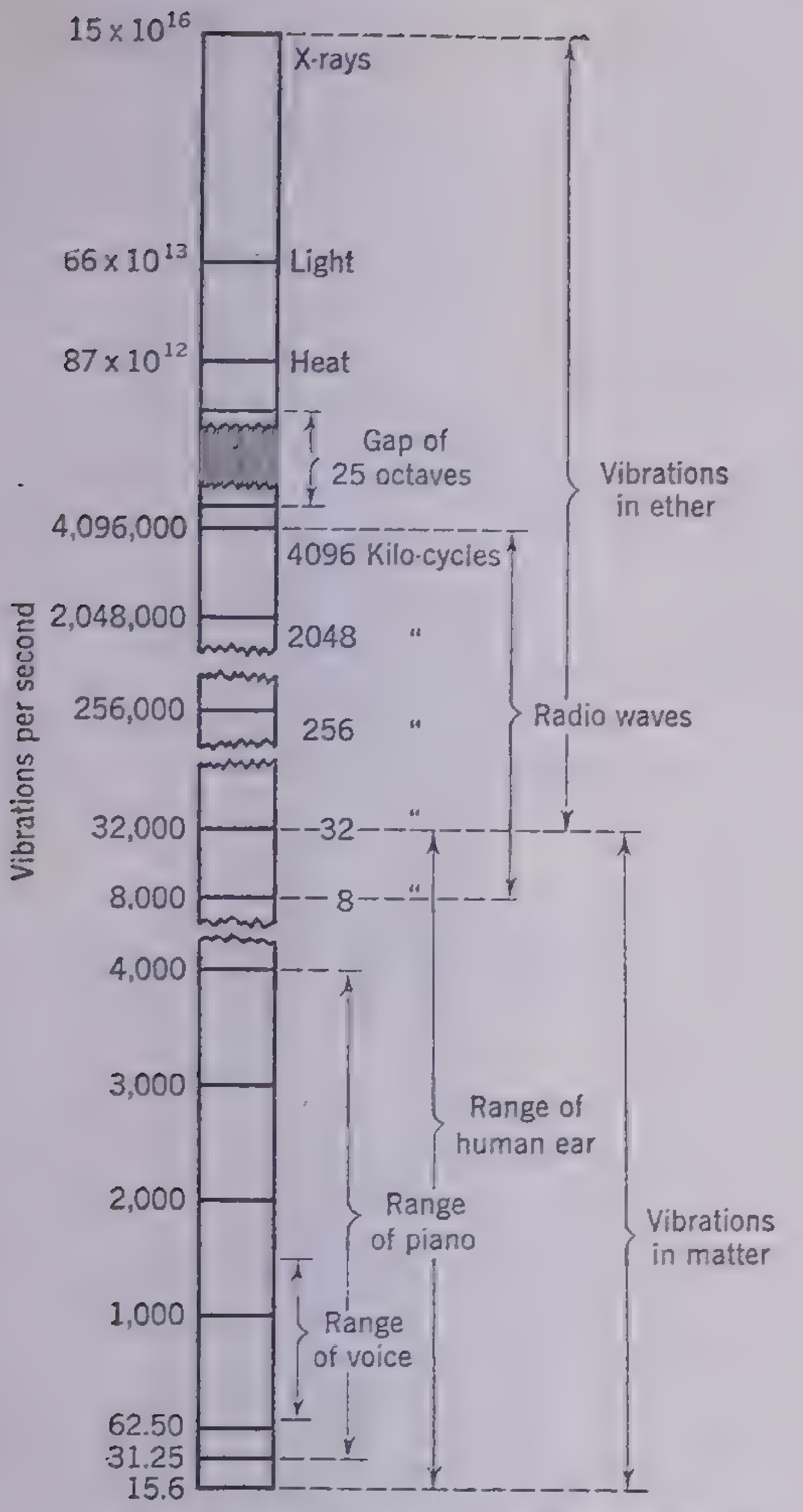
Television.—The steps employed in television are very similar to those used in the telephone. At the sending end there is a photoelectric cell that receives light from the object whose image is to be transmitted. The cell converts the energy of the light received into electric impulses that vary in intensity in proportion to the intensity of the light. At the receiving end, an instrument is employed that is capable of converting these electric impulses back into light in such a way that an image is produced that duplicates the object at the sending end.

Sound Pictures.—Sound pictures, popularly called *talking movies,* combine two of our modern miracles of science—the reproduction of sound that may affect the sense of hearing, and the reproduction of an image that may affect the sense of sight. A scene —words and action—may be produced, and both the picture and the sound recorded on a motion-picture film. In one method of recording sound upon the motion-picture film, a beam of light of constant intensity but of varying width plays upon a narrow strip of the film. The light comes to the film through a narrow opening between two parallel wires that are between two magnets. The wires move to open or close the slit according to the current passing through them, and the current varies according to the sound produced in front of the transmitting microphones. The sound record may be made on the edge of the same film that has the picture, or it may be made upon a separate film. The sound film, when developed, has a series of dark lines alternating with light lines of varying width. The light that can pass through the sound film will vary according to the width of these lines. In projecting from a sound film, use is made of the photoelectric cell. Light that passes through the film is received by the photoelectric cell, which sets in motion an electric current proportional to the light that it receives. This fluctuating current is amplified and taken to the loud speakers that reproduce the original sound. When the sound film is separate from the picture film, the motion of the two must be carefully synchronized.

Radio or Wireless.—The popular term for wireless telegraphy and telephony is radio or wireless, referring to the waves that *radiate* in all directions from the source of electromagnetic disturbance.

About 1888 Heinrich Hertz produced electromagnetic waves for the first time, thus fulfilling Clerk-Maxwell's prediction of relationship between light and electromagnetism—a fine illustration of fact following a theory mathematically worked out. It was Hertz's problem to generate two oscillating fields—one electric and one magnetic—at right angles to each other. One of the oscillators that he used had two metal plates attached to rods ending in knobs very slightly separated. The knobs were connected to the secondary circuit of an induction coil. At each interruption of the primary circuit of the coil, the knobs were charged to such a degree that the electromotive force broke down the insulation of the gap between them and an electric current surged back and forth across the space, at lightning speed. The oscillator having become a conductor, electric and magnetic fields were propagated outward from it as a wave, a series of waves being formed by successive vibrations. To detect these electromagnetic waves, Hertz used a loop of wire with a minute opening to serve as a spark gap. When the loop was placed in the electromagnetic field about the oscillator, which was in continuous operation, tiny sparks passed across the gap. Thus began the era of radio communication. Marconi, a few years later, used an oscillator of the type described above as his first transmitter. Hertzian waves as originally produced had a wave length of not over 100 feet, but by modern wireless apparatus the waves can be extended to a length of several miles.

The length of the wave is always equal to its velocity divided by the frequency of vibration (number of waves per second), and the frequency equals the velocity divided by the wave length. All radio waves, as stated previously, travel with the speed of light, about 186,300 miles or 300,000,000 meters a second; therefore, if a radio station broadcasts on a wave length of 200 meters, its frequency or the number of waves it sends out in a second is $\frac{300,000,000}{200}$ or 1,500,000. This number signifies so many *cycles;* in common practice, the larger unit, *kilocycle* (1,000 cycles), is used. Thus the station with a wave length of 200 meters has a frequency of 1,500 kilocycles. If we know the frequency, we can find the wave length. If a station has a frequency of 500,000 cycles (500 kilocycles), its wave length in meters will be $\frac{300,000,000}{500,000}$ or 600. The frequencies commonly used in radio work vary



Vibrations are Useful in Many Ways[1]
Vibrations in matter give us sound. Vibrations in the ether give us heat, light, ultraviolet rays, the X rays and radio

from 15 to 30,000 kilocycles, and the wave lengths from 20,000 to 10 meters (20,000 meters = 12.4 miles, approximately).

Broadcasting.—What happens when a musical program is sent from a broadcasting studio to those who are receiving the program? The artist stands before a microphone that is similar to that used on a telephone. This instrument changes the sound waves into electric waves that represent the singer's voice. These waves are amplified (made stronger) by being sent through audio frequency amplifiers that make use of vacuum tubes of the type found in every radio receiver. The amplified voice waves are then sent along telephone lines to the transmitting station, usually outside the city in which the studio is located. The transmitter generates waves at some frequency or wave length that has been assigned to it by the government of the country in which it is situated. It generates these waves by means of vacuum tubes that, though often larger and more powerful than those used in radio receivers, operate in much the same manner. These radio frequency waves are often called *carriers,* that is, they serve as a means of carrying the audio waves from the transmitter to the receiver. The audio frequency waves from the studio are combined with the carrier, the electrical combination of the two being called *modulation;* or the carrier is said to be modulated. The modulated waves are then sent out into space from an antenna, usually a network of wires suspended above the surface of the earth by towers.

When such waves pass a receiving antenna they induce in it very small voltage waves—usually no more than a few millionths of a volt—that represent exactly the modulated waves sent out by the transmitter. If the receiver is tuned to the wave length of the transmitting station, that is, if its electrical circuits are adjusted so that it responds to waves from that station only—just as, when a given piano key is struck, a corresponding string in another piano in the same room will start to vibrate—these feeble voltages will be accepted by the receiver, though waves at any other frequencies will have no effect. The receiver amplifies them, using vacuum tubes for this purpose.

Now it was seen that the transmitter sent out a combination of the radio frequency carrier and the audio frequency wave that represented the singer's voice. Before the signal can be heard, the two must be separated in some way. This is done by the rectifier or detector tube in the receiver, which, after separating the two components, allows the radio frequency—which is above the range of audibility—to be eliminated, while the audio-frequency wave is sent through an amplifier that makes it sufficiently strong to operate a loud speaker. The loud speaker is nothing more than a very powerful telephone receiver that changes the audio waves into sound waves and sends them around the room.

Thus the voice of the singer, after a very roundabout trip in which it undergoes many changes, comes from the loud speaker in the same form in which it entered the microphone. In many cases programs sent out from one station have been received and sent out from another station thousands of miles away with very satisfactory results.

Short Waves.—During recent years, it has been found that wave lengths below 100 meters offer tremendous possibilities in long-distance transmission. These are known as *short waves* and many branches of radio service make use of them. For a given amount of power at the transmitter, much greater distances can be covered than by using higher wave lengths, and communication is now being carried on over wave lengths as low as 5 meters. It is probable that within the next few years wave lengths of less than 1 meter will be in fairly common use.

Radio Telegraphy.—Transmitting and receiving apparatus are required for wireless telegraphy as in wireless telephony, and the vacuum tube also is employed for generating electrical waves. In their modulation for transmission, however, a different system is used, for waves must be transmitted that reproduce the dots and dashes used in the telegraphic code. For this purpose, a key is used to stop and start the currents. Wireless telegraphy is still the most important system used for sending commercial messages between widely separated points.

Einstein's Theory of Relativity

The theory of relativity was formulated in two sections by Dr. Albert E. Einstein, a German physicist. His first paper, published in 1905, was a presentation of the restricted or special theory relating only to uniform motion in a straight line. His second paper, on the general theory, appeared in 1915. This extended the relativity concept to gravitation, thus bringing into its scope all forms of motion.

The Special Theory.—To understand this phase of relativity we need to survey its background. The 19th century had witnessed the triumph of what we may call classical physics, based on the work of Newton, Young and Maxwell. According to classical physics, time is an absolute concept, as is space, and the two are independent of each other. Objects in space can be located exactly by reference to three dimensions. Light and other forms of radiation travel in waves through an all-pervading ether. This ether is assumed to be a stagnant fluid through which the earth travels around the sun in a closed orbit at the rate of 18½ miles a second. That the ether is stationary is assumed from astronomical observations showing no relative motion of the parts of the ether between the earth and the stars.

In the last quarter of the 19th century physicists were considering the possibility of measuring the velocity of the earth by using the ether as a reference frame. All measurements of motion were relative. If the earth's speed could be measured with reference to a stationary body, then absolute motion could be determined. In 1887 Michelson and Morley, two physicists, began a series of experiments along this line. They argued that the earth in riding through the ether would set up an "ether drift," much as a vehicle sets up a breeze in traveling through still air. Further, it was argued that light, the speed of which is known, ought to be retarded as it is sent in the earth's direction against the ether drift, just as a boat is retarded when it is rowed against the current. Their experiments were carried out again and again with the most refined instruments obtainable, but no matter how often the test was made, they could find no appreciable difference in the velocity of the light rays, though these were measured in the direction of the earth's motion, against it and at right angles to it. The experimenters made use of revolving apparatus, and tests were made at various times of day and night and on different dates, so that light motion was studied from every conceivable approach.

The negative results of these experiments could be interpreted as indicating the nonexistence of an ether or, as some physicists suggested, the shortening of all measuring devices in the direction of the earth's motion. Such contraction would make it impossible for any observer to analyze the motion of any object by experiments confined to the moving system —the earth. When the discussion was at its height, Einstein announced his theory, which has two basic principles:

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[1] From Walter G. Whitman: *Household Physics;* John Wiley & Sons.

1. All phenomena take place in the same way in two systems moving relatively to each other with uniform rectilinear motion; nothing but relative motion can be detected between two such systems.
2. The velocity of light in free space is invariable and is independent of the velocity of its source or of the observer.

These principles mean that light signals for the interpretation of phenomena come to all observers with the same speed, regardless of the observers' own velocity, and that two observers moving relatively to each other will interpret the phenomena in the same way. It follows, however, that space and time measurements are relative to the movements of the observers, for space and time change with motion. Therefore two observers moving relatively to each other will have different measurements for the time interval between two events; or they will obtain different results from their measurements of length and velocity. Yet both will be right. Such differences can never be detected where the motions are relatively slow, and our earth-bound measurements are satisfactory for all practical purposes. The velocities of the bodies so measured must approach the velocity of light before the new relationships become important.

Relativity asks us to discard the old ideas about space and time, for both have become variable concepts in this theory. We see matter in what we call space, and we witness events that follow one another at intervals in what we call time. We think of each as a distinct reality. Einstein showed that space and time are so bound together that they cannot be separated, for we cannot describe an event without telling where it has taken place, nor can we properly locate an object without telling where it is at a certain time. Time, said Einstein, is the fourth dimension of a manifold that he called *space-time*. Its four dimensions are length, breadth, thickness and time. The history of any person is a world-line, the path he follows through space-time.

Another principle of relativity is that mass and energy are interchangeable; a body loses mass when it releases energy, and it gains mass when it absorbs energy. Einstein also stated that the mass of a body should increase with velocity, reaching infinitude with the velocity of light. It is a remarkable fact that increase of mass is proved by experiments with electrons (negative particles of electricity) produced in vacuum tubes using very high voltage. The swifter electrons actually weigh more than those moving more slowly.

The General Theory.—The extension of the relativity theory to include gravitation opened a new field of discussion as to the nature of gravitation. Einstein rejected Newton's idea of the attraction of one body for another and substituted the idea that gravitational phenomena, such as the movements of the planets in their orbits, are due to the structure of space-time. He said that in the vicinity of matter, space-time has an inherent curvature that compels revolving bodies to follow the paths they do. Gravitation and inertia are identical in this scheme.

Einstein specified that his general theory must be submitted to three tests, and it is generally agreed that it has vindicated itself. He was able to account for a discrepancy in the calculated movement of Mercury in its orbit. His prediction that light rays from distant stars would be deflected in passing through the gravitational field of the sun was verified by observations made during eclipses. Verification was found for his prediction that light waves in a strong gravitational field would be so lengthened that the spectral lines would be shifted toward the red end of the spectrum.

In 1929 Einstein made a further extension of the general theory, bringing electromagnetism into its scope. This *unitary-field* theory places gravitation, electricity and magnetism under the same law.

The reader should not infer that Einstein's equations make Newton's law of universal gravitation invalid. The relativity formulas are more exact, it is claimed, but the differences in the calculations are quite negligible for all ordinary velocities.

The theory of relativity has been hotly debated in scientific circles since the time of Einstein's original publications in 1905. Unfortunately the mathematical difficulties of the theory have to a large extent prevented any adequate critical examination of it. There has unquestionably been a tendency among physicists and astronomers to accept its results on faith rather than subject them to the searching criticism that every scientific hypothesis must face before it can be generally accepted. This has been particularly true of many recent popular scientific books. Some scientists competent to judge are not satisfied of the truth of the theory in its present form.

Professor Charles Lane Poor of Columbia University, one of the ablest students of celestial mechanics in the United States, has made a series of investigations of the astronomical bearings of the theory. He points out that many observed phenomena are inconsistent with the theory and that the various experimental and observational proofs (especially the Michelson-Morley experiment, the advance of the perihelion of Mercury's orbit, and the apparent positions of stars near the sun at the time of total eclipse) are inconsistent with themselves and capable of explanation by the older classical theory. Professor Dayton C. Miller, of the Case School of Applied Science in Cleveland, has repeated the Michelson-Morley experiment with very sensitive appartus and has obtained results inconsistent with the usual interpretation of the original experiment. It must be remembered that the different phenomena observed in the so-called crucial tests are exceedingly minute and require the greatest skill in observations and the soundest critical judgment in interpretation. The layman may well regard the whole matter as an open question.

APPLIED MECHANICS—PROBLEMS IN PHYSICS

This section presents the simpler results of theoretical mechanics and gives a series of examples showing how physical formulas are applied in actual cases.

Gravitation.—Sir Isaac Newton first formulated the great generalization called the *law of universal gravitation*, of which the force causing bodies to fall toward the earth is merely a special case. *Every particle of matter in the universe attracts every other particle with a force that varies directly as the product of the masses and inversely as the square of the distance between them.* In mathematical symbols the law is expressed thus:

$$F = \frac{Gmm'}{d^2}$$

where m and m' are the masses of the attracting particles, d their distance apart, F the force of attraction between them and G the *constant of gravitation* with a numerical value depending upon the units in which we express m, m', d and F.

The law of gravitation asserts that the attractive force between two bodies depends upon their distance apart. If the two bodies in question are of appreciable dimensions compared with the intervening distance, it is obvious that we must define carefully what is meant by distance apart. Are we to take the distance between the centers of the bodies? If that is the rule, where is the center of an irregular shaped body? Consider, as a practical example, the earth-moon system. The earth's diameter is about 8,000 miles; the moon's, about 2,000. These dimensions are by no means negligible compared with the distance from the earth to the moon. If by distance we mean the distance between the *centers*, then the distance to the moon is 239,000 miles; but if we mean the distance between the two nearest points, the distance is only 234,000 miles. A very considerable error in our calculation will be introduced if we use the wrong distance in computing the attractive force of the earth-moon system.

The law of gravitation is stated for *particles* of matter; that is, for bits of matter of supposedly negligible size. To learn the attraction between two large bodies, we must consider the *resultant* of all the forces of the separate particles. For all except a few bodies of regular shape it is a complicated mathematical problem to calculate the direction and magnitude of this resultant.

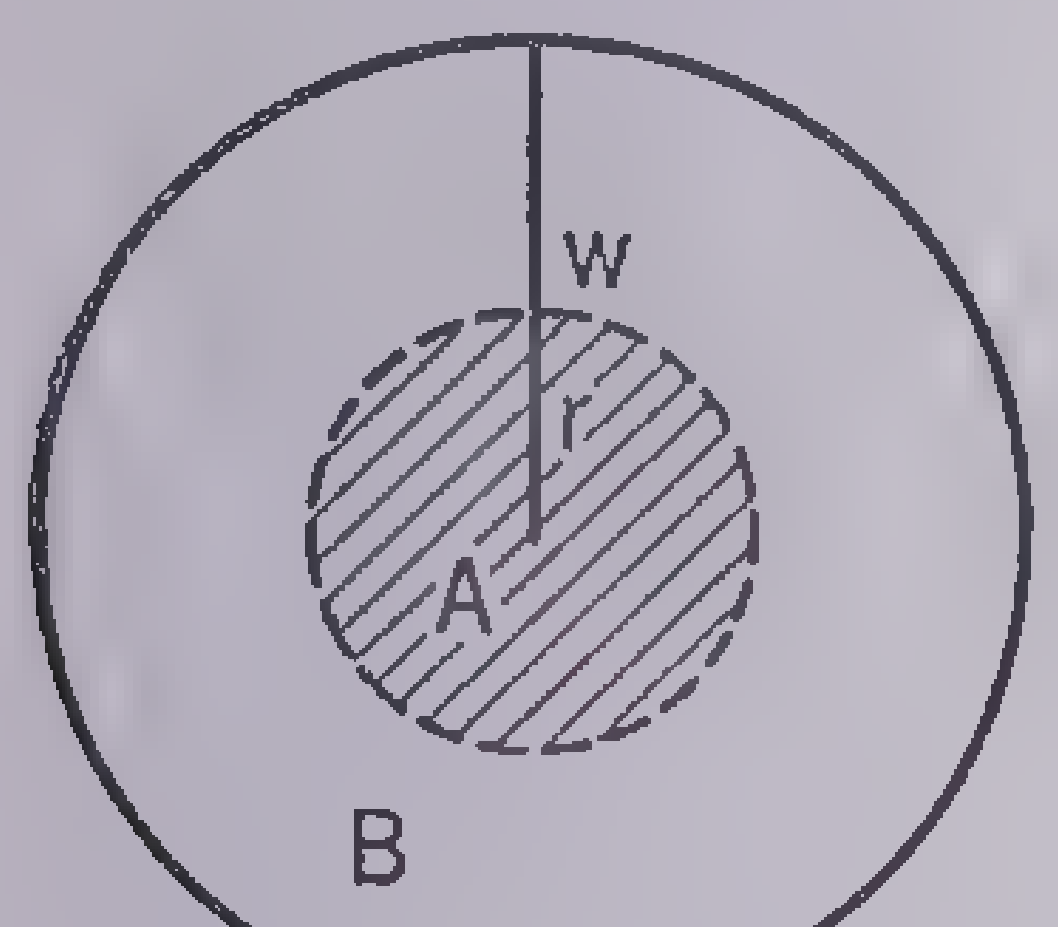
In the most important case, however, the problem is capable of a simple solution. *Two spheres of uniform density attract each other under the law of gravitation as if all their masses were concentrated at their respective centers.* Newton first demonstrated this far-reaching theorem, without which the science of gravitational mechanics would be impossible.

A second important theorem is closely related to this and enables us to calculate the gravitational force exerted by the earth on bodies inside it. *At any point within a uniform* *spherical shell, the resultant of gravitational force is zero.*

As we have learned earlier, the attractive force between two electrically charged particles resembles gravitation in that the force varies inversely as the square of the distance. The two principles just given are equally applicable to the theory of electric attraction.

We can now answer the often posed question, What would happen to the weight of a body if we could take it through a deep mine shaft to the center of the earth?

If the earth were of uniform density throughout, the weight of the body would decrease regularly as we descended in the mine shaft.



Variation of Gravity Below Earth's Surface

According to our first principle there would be an attractive force toward the center depending upon the mass and the square of the radius of the central core A; and by our second principle, this would be the whole attraction to be considered, since the resultant attraction of the external shell B would be zero. The mass of the central core varies as the cube of the radius *r*, and the attraction varies directly as the mass and inversely as the square of the radius; that is:

W (weight at internal point W)

$$\text{varies as } \frac{r^3}{r^2}$$

$$\text{or } \frac{W}{r} = \text{a constant}$$

At a depth of 2,000 miles (half the original radius) a body would weigh half as much as at the surface and so forth.

In actual fact the answer is not so simple as this. The average density of the whole earth is about 5.5 (density of water = 1); and the density of the crust down to a depth of 50 miles or so is only about 2.75. For this reason the weight of a body taken down in a mine shaft would *increase* for something like 400 miles (the exact distance depending upon what assumptions we make regarding the thickness and density of different layers of the earth's crust) and then diminishing as we continue downward. At the center of the earth there would be no observable force in any direction, as the forces in all directions would be exactly balanced and their sum total effect zero.

Irregularities on the surface of the earth—seas, mountains, ore deposits and the like—produce small local variations in the direction and force of gravity. Near a large mountain a plumbline is measurably drawn aside from the vertical, and observations of this deflection formed the basis of the earliest determinations of the *constant of gravitation,* the factor G in the equation:

$$F = \frac{Gmm'}{d^2}$$

where m and m' are the respective masses, d their distance apart, and F is the attractive force between them.

Determinations of G are now made with great accuracy in the laboratory by measuring the attractive force between two massive metal spheres. If absolute metric units are used (m and m' in grams, d in centimeters, F in dynes), the accepted modern value for G is 6.657×10^{-8} or very nearly

$$\frac{1}{15{,}000{,}000.}$$

As an example of the use of the gravitation equation let us calculate the attractive force between two iron spheres each 2 meters in diameter and placed with their centers 3 meters apart.

We have:

$$F = \frac{Gmm'}{d^2}$$

$$G = \frac{1}{15{,}000{,}000}$$

$$m = m' = \frac{4\pi}{3}(100)^3 \cdot 7.8$$

(Density of iron is 7.8)

$d = 300.$

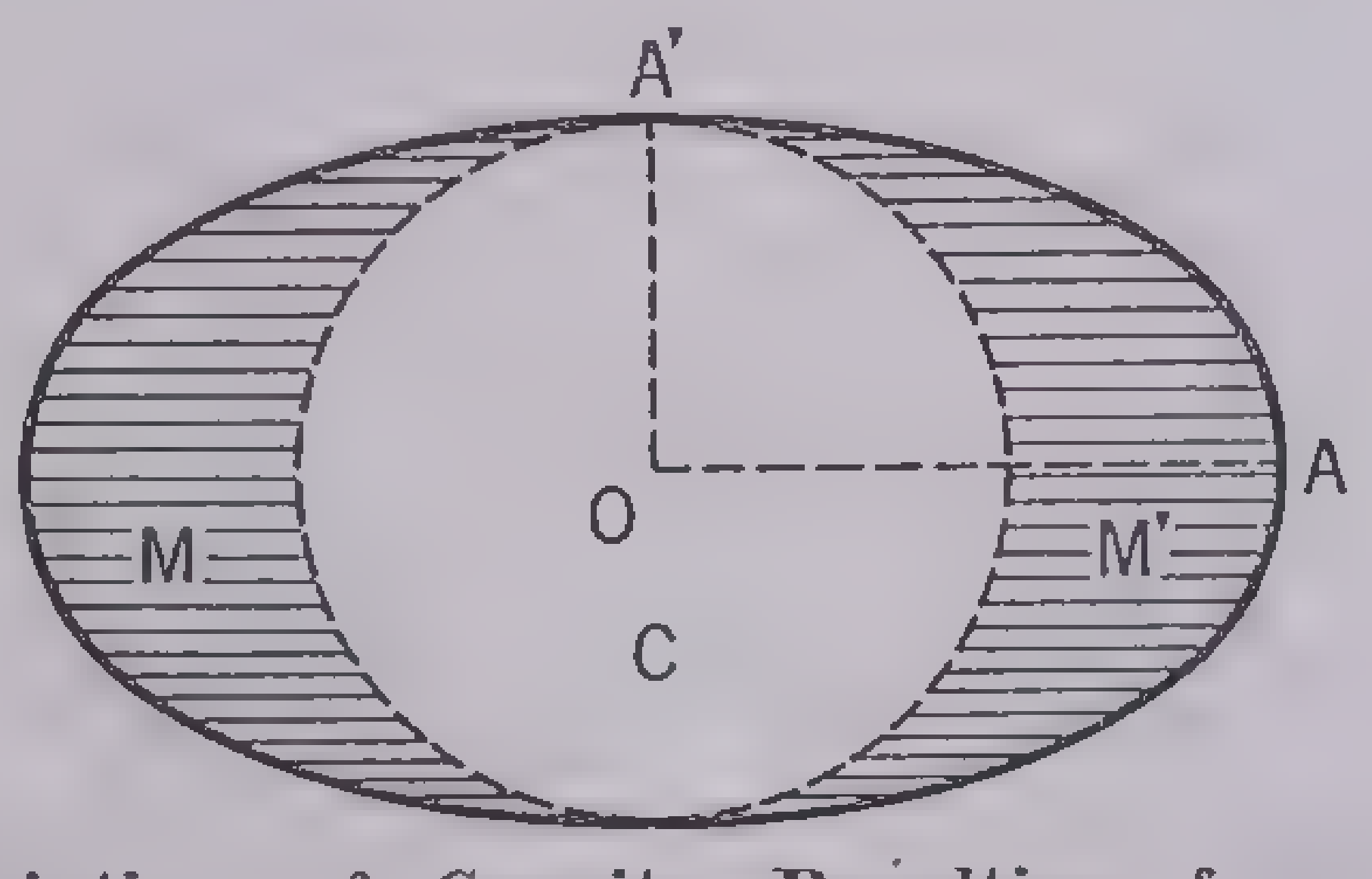
Therefore

$$F = \frac{4^2\pi^2 \cdot 7.8 \cdot 10^{12}}{3^2 \cdot (300)^2 \cdot 15 \cdot 10^6} = \frac{16 \cdot 9.87 \cdot 60.8 \cdot 10^2}{81 \cdot 15}$$

$$= 790 \text{ dynes.}$$

Thus these two spheres weighing 36 tons each and only a few feet apart would be impelled toward each other with a force of only 1/35 of an ounce!

As the earth is not a perfect sphere but is slightly flattened at the poles, there are small variations in the weight of a body at different latitudes. At one of the poles the distance to the center is about 296/297 of the distance to the center at the equator; accordingly the attractive force is greater at the poles. Reasoning hastily we might be led to suppose that the attraction at one of the poles would bear the exact ratio $(297/296)^2$ to the attraction at the equator, but a careful consideration of the problem shows that it is by no means so simple.



Variation of Gravity Resulting from the Shape of the Earth

The distance OA' is 296/297 of the distance OA, and as far as the attraction of the central spherical core C is concerned (neglecting variations of density at different depths), the attractive force at A' is $(297/296)^2$ times the attractive force at A; but bodies at A and A' are attracted also by the shaded portions M and M' of the spheroid, and the exact calculation of the resultants of the attractions of all the separate particles of M and M' is an exceedingly complex mathematical problem. Empirically, that is, by exact comparative measurements, we learn that the ratio of the total attraction at one of the poles to the attraction at the equator is about 1.0019.

There is an additional variation in the weight of a body at different latitudes produced by the centrifugal force arising from the earth's rotation. At the equator the centrifugal force is at a maximum and tends to counteract the force of gravity. The formula for centrifugal force is:

$$F = m\frac{v^2}{r}$$

in which v is the linear velocity relative to the center of rotation; r is the radius of rotation and m the mass of the rotating body. (As is usual with physical formulas, absolute units must be used.) In the case of the earth's equator, $r = 6.4 \times 10^8$ cm, and

$$v = \frac{2\pi \times 6.4 \times 10^8}{86{,}160}$$

(the earth makes one complete rotation in 86,160 seconds).

We thus find

$$\frac{v^2}{r} = 3.4.$$

This indicates centrifugal force due to the earth's rotation in *dynes per gram.* Since the weight of 1 gram of matter is approximately 980 dynes, we find that the ratio of weight at the poles to weight at the equator arising from the earth's rotation is approximately 983.4/980 or 1.0034. Adding the gain due to the earth's flattening or ellipsoidal form, we see that the total gain in weight between the equator and one of the poles is .0034 plus .0019; that is, .0053 or 53 parts in 10,000. A ton of coal, for example, would weigh about 10 pounds more in northern Alaska than in Para, Brazil.

Angular motion is motion of rotation about a fixed axis. We are familiar with the fact that a heavy wheel turning rapidly resists efforts to stop it very much as a heavy body moving in a straight line tends to continue in motion. For a body moving in a straight line, the *kinetic energy* is given by the formula:

$$E = \tfrac{1}{2} mv^2$$

in which E is the energy (in absolute units), m the mass and v the velocity of the moving body. For a rotating body, the kinetic energy is given by the formula:

$$\text{E} = \tfrac{1}{2} I\omega^2$$

where ω is the *angular velocity* in *radians per second,* and I the *moment of inertia* of the body about the axis of rotation. The moment of inertia of a body is found by considering the body as made up of an indefinitely large number of small particles at different distances from the center of rotation and moving at different linear velocities with respect to the center. Each particle has a kinetic energy of $\frac{1}{2} mv^2$ where m is the mass of the particle and v its velocity. As the linear velocity of a particle at a distance r from the center of rotation is $r\omega$, it follows that the kinetic energy associated with a particle having an angular velocity ω is $\frac{1}{2} mr^2\omega^2$. If the whole body is thought of as consisting of a large number of particles at different distances r_1, r_2, r_3 and so on, we might write an expression representing the kinetic energy of the rotating body in the following form:

$$E = \tfrac{1}{2}\,(mr_1^2 + mr_2^2 + mr_3^2 \ldots\ldots)\omega^2.$$

The sum of all the terms of the form mr^2—that is, the total value of the expression in the parentheses—is the moment of inertia of the rotating body. By the methods of integral calculus this sum may be mathematically computed for many bodies of regular form and is of value in answering many interesting mechanical questions.

Summary of Formulas of Mechanics

Physical formulas must be used in connection with absolute units of measurement, and we must not change units during the solution of a problem. In many cases the necessity of retaining the same units throughout gives rise to inconveniently large numbers. Since it is rarely necessary to take account of more than the first three or four figures, it is customary to express large numbers by writing the first few figures and multiplying by the appropriate power of 10. The velocity of light, for example, is often written: 2.998×10^{10} cm./sec. (read "centimeters per second").

The mass of the sun:

$$1.98 \times 10^{33} \text{ grams.}$$

The radius of the earth:

$$6.38 \times 10^{8} \text{ centimeters.}$$

One horsepower:

7.46×10^{9} ergs/sec. (read "ergs per second").

When this scheme of writing large numbers is used, it is just as easy to express large quantities in such units as ergs, dynes or centimeters as it is to express them in foot-pounds, tons or miles.

In the following formulas, all the quantities are to be expressed in absolute units. Certain letters have become conventionally fixed for certain definite physical quantities as follows:

a = acceleration
d = density or distance
E = energy
e = coefficient of restitution, elasticity, etc.
F = force
g = acceleration of gravity
h = height
I = moment of inertia
G = constant of gravitation
l = length or linear distance
m = mass
P = period of vibration or revolution; power
r = radius
s = distance moved (initial letter of "space"
t = time
v = velocity; volume
W = weight
ω = angular velocity

Moments of Inertia for Certain Regular Bodies

1. Cylinder of uniform density about its principle axis, $\frac{1}{2}\, mr^2$.
2. Straight rod of uniform density about a perpendicular axis through its center, $1/12\; ml^2$.
3. Straight rod of uniform density about a perpendicular axis through one end, $1/3\; ml^2$.
4. Thin spherical shell about an axis through its center, $2/3\; mr^2$.
5. Sphere of uniform density about an axis through its center, $2/5\; mr^2$.

Kinetic energy of translation $= E = \frac{1}{2}mv^2$.

Kinetic energy of rotation $= E = \frac{1}{2}I\omega^2$.

Centrifugal force $= F = \dfrac{mv^2}{r} = mr\omega^2$.

In uniformly accelerated motion

$$v = at = \sqrt{2as}$$
$$s = \tfrac{1}{2}at^2$$
$$t = \sqrt{\frac{2s}{a}}.$$

Force of gravitation, $F = \dfrac{Gmm'}{d}$.

For any body moving under the influence of a force, $F = ma$.

Period of simple pendulum, $P = 2\pi\sqrt{\dfrac{l}{g}}$.

Weight in absolute force units, $W = mg$.

Table of Conversion Factors for Physical Units

Units of Length

1 centimeter = .393700 in. .0328083 ft. 6.21370×10^{-6} mi.	1 inch = 2.540005 cm. .0833333 ft. 1.57828×10^{-5} mi.
1 foot = 30.4801 cm. 12 in. 1.89394×10^{-4} mi.	1 mile = 1.60935×10^{5} cm. 6.336×10^{4} in. 5280 ft.

Units of Volume

1 cubic centimeter[1] = .0610234 cu. in. 3.53145×10^{-5} cu. ft. 1.05668×10^{-3} qts.	1 cubic inch = 16.3872 cu. cm. 5.78703×10^{-4} cu. ft. .0173160 qts.
1 cubic foot = 2.83170×10^{4} cu. cm. 1728 cu. in. 29.9221 qts.	1 U. S. liquid quart = 946.359 cu. cm. 57.7500 cu. in. .0334201 cu. ft.

Units of Mass

1 gram = 2.20462×10^{-3} lbs.	1 pound = 453.592 gr.

Units of Force

1 dyne = 1.02×10^{-3} gr. 7.233×10^{-5} pdls. 2.248×10^{-6} lbs.	1 gram = 980.7 dynes .07093 pdls. 2.205×10^{-3} lbs.
1 poundal = 1.383×10^{4} dynes 14.1 gr. .03108 lbs.	1 pound = 4.448×10^{5} dynes 453.6 gr. 32.17 pdls.

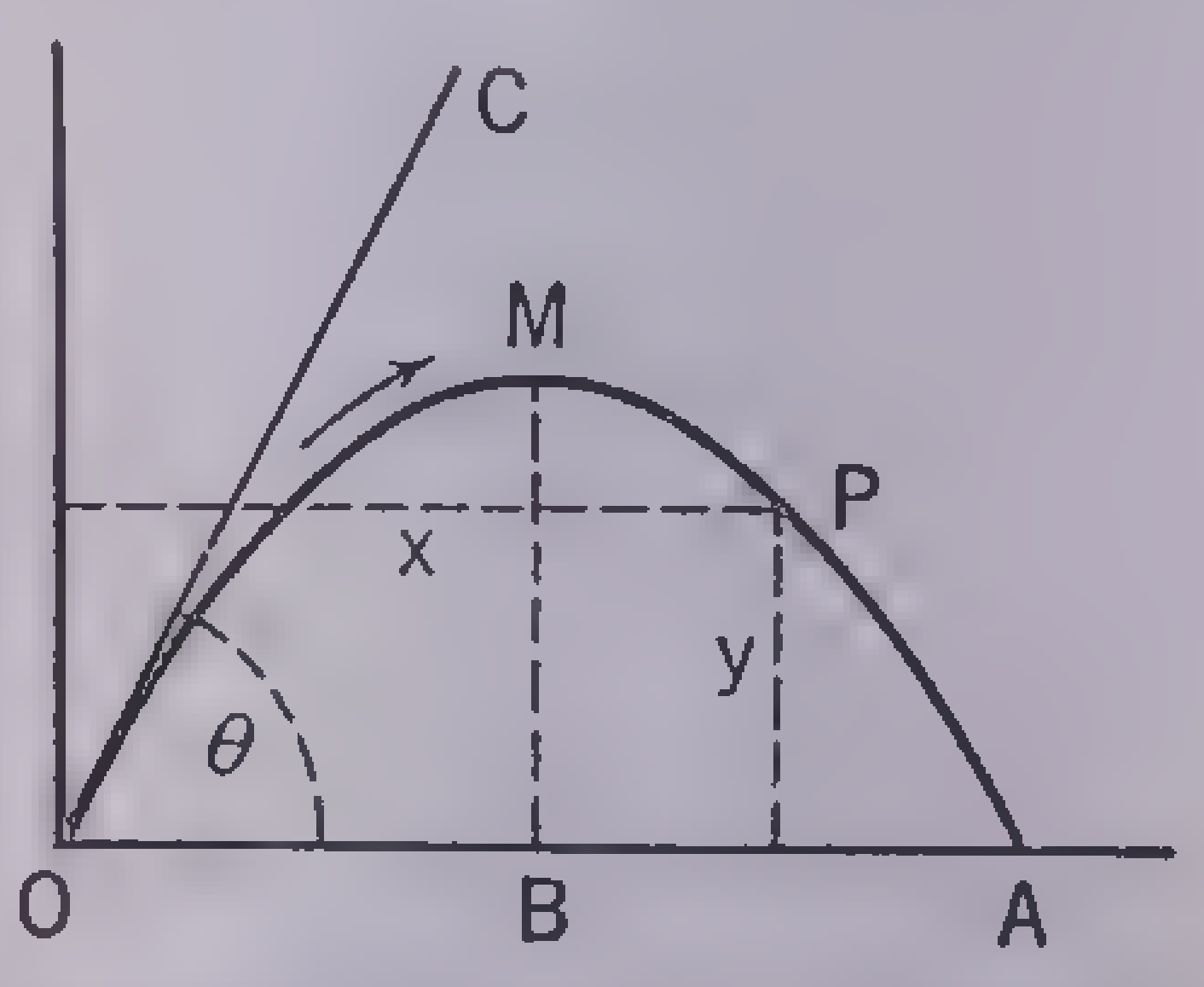
Units of Energy and Work

1 joule (10^7 ergs) = 2.778×10^{-4} watt-hrs. .102 kg.-m. 23.73 ft.-pdls. .7376 ft.-lbs. 3.725×10^{-7} hp.-hrs. .239 gr. cals. 9.486×10^{-4} B.T.U.	1 watt-hour = 3600 J. 367.1 kg.-m. 85430 ft.-pdls. 2655 ft.-lbs. 1.341×10^{-3} hp.-hrs. 860.5 gr. cals. 3.415 B.T.U.
1 kilogram-meter = 9.807 J. 2.724×10^{-3} watt-hrs. 232.7 ft.-pdls. 7.233 ft.-lbs. 3.653×10^{-6} hp.-hrs. 2.344 gr. cals. 9.302×10^{-3} B.T.U.	1 foot-poundal = .04215 J. 1.17×10^{-5} watt-hrs 4.29×10^{-3} kg.-m. .03108 ft.-lbs. 1.58×10^{-8} hp.-hrs. .0101 gr. cals. 4×10^{-5} B.T.U.
1 foot-pound = 1.356 J. 3.766×10^{-4} watt-hrs. .1383 kg.-m. 32.17 ft.-pdls. 5.05×10^{-7} hp.-hrs. .3241 gr. cals. 1.286×10^{-3} B.T.U.	1 horsepower-hour 2.684×10^{6} J. 745.7 watt-hrs. 2.737×10^{5} kg.-m. 6.37×10^{7} ft.-pdls. 1.98×10^{6} ft.-lbs. 6.417×10^{5} gr.-cals. 2547 B.T.U.
1 gram calorie = 4.183 J. 1.162×10^{-3} watt-hrs. .4266 kg.-m. 99.28 ft.-pdls. 3.086 ft.-lbs. 1.558×10^{-6} hp.-hrs. 3.968×10^{-3} B.T.U.	1 British thermal Unit = 1054 J. .2928 watt-hrs. 107.5 kg.-m. 2.501×10^{4} ft.-pdls. 777.5 ft.-lbs. 3.927×10^{-4} hp.-hrs. 252 g. cals.

Units of Power

1 joule per second (1 watt) = 1.341×10^{-3} hp. .102 kg.-m./sec. .7376 ft.-lb./sec.	1 horsepower = 745.7 watts 76.05 kg.-m./sec. 550 ft.-lb./sec.
1 kg. meter per second = 9.807 watts .01315 hp. 7.235 ft.-lb./sec.	1 foot-pound per second = 1.356 watts 1.818×10^{-3} hp. .1383 kg.-m./sec.

Path of a Projectile.—A bullet fired from a gun or a stone thrown from the hand describes a curved path under the influence of gravity. Disregarding the resistance of the air, we can calculate accurately the course of such a projected body if we know the initial velocity v and the angle of elevation θ.



Parabolic Path of a Projectile

If the initial direction of the body is OC, making an angle θ with the horizontal, and the initial velocity is v, the total motion of the body may be treated as the resultant of two components—a horizontal and a vertical. The horizontal component of the velocity is $v \cos \theta$. The vertical component will be subject to a negative acceleration g (acceleration of gravity). At the end of time t, therefore, the body will have reached a horizontal distance (to the right in the diagram) of $vt \cos \theta$ and a vertical distance of $vt \sin \theta - \frac{1}{2}\, gt^2$.

If we represent vertical distance by x and horizontal distance by y (according to the usual practice of analytic or co-ordinate geometry), we have:

① $x = vt \cos \theta$.
② $y = vt \sin \theta - \frac{1}{2}gt^2$.

Since $t = \dfrac{x}{v\cos\theta}$ from ①.

We may write ② as follows:

③ $y = \dfrac{x\sin\theta}{\cos\theta} - \dfrac{gx^2}{2v^2\cos^2\theta}$.

In analytic geometry it is shown that a curve represented by an equation of this form is a *parabola*, one of the three types of *conic sections.* A beautiful physical example is the curve described by a stream of water projected from a jet.

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[1] For all practical purposes, the *liter* may be considered as equal to 1,000 cubic centimeters and the units *milliliter* and *cubic centimeter* may be used interchangeably. As a result of a slight inaccuracy in the construction of the original standard meter, however, the liter (volume occupied by a kilogram of pure water at a temperature of 4° C.) is actually equal to 1000.028 cubic centimeters or 61.0247 cubic inches instead of 61.0234 cubic inches as would be computed from the table.

Equation ③ enables us to calculate the positions of the points M and A in the diagram; that is, the maximum height attained by the projectile and the range or total horizontal distance covered before striking the ground.

To find the distance OA we set $y = 0$ in ③. We have:

$$\frac{gx^2}{2v^2\cos^2\theta} - \frac{x \sin\theta}{\cos\theta} = 0.$$

Whence, $x = 0$

or ④ $x = \dfrac{2v^2\cos^2\theta \sin\theta}{g \cos\theta} = \dfrac{2v^2\sin\theta \cos\theta}{g} = \dfrac{v^2\sin 2\theta}{g}.$

This last equation gives the distance OA, or the range of a projectile having initial velocity v and angle of elevation θ. The numerical value of sin 2θ may be obtained from a table of trigonometric functions.

Inspection of ④ enables us to make at once two significant statements: (1) For a given elevation, the range of a projectile increases as the square of the initial velocity; (2) for a given velocity, the maximum range is attained at an elevation angle of 45°. Since $\sin 2\theta = \sin 2(90° - \theta)$, we see that, except for the maximum range, there are two possible elevation angles for any given velocity and range.

To determine the maximum height BM attained by the projectile, we require to evaluate y when $x = \frac{1}{2} OA = \dfrac{v^2\sin\theta \cos\theta}{g}$.

We have:

③ $y = \dfrac{x \sin\theta}{\cos\theta} - \dfrac{gx^2}{2v^2\cos^2\theta}.$

Substituting $\dfrac{v^2\sin\theta \cos\theta}{g}$ for x,

we have:

⑤ $y = BM = \dfrac{v^2\sin^2\theta \cos\theta}{g \cos\theta} - \dfrac{gv^4\sin^2\theta\cos^2\theta}{2g^2v^2\cos^2\theta} = \dfrac{v^2\sin^2\theta}{g} - \dfrac{v^2\sin^2\theta}{2g} = \dfrac{v^2\sin^2\theta}{2g}.$

Let T = total time in traversing the curve AMO.

The time required to pass from A to M is equal to that required to pass from M to O and is the same as that required for a body to fall in a straight line from M to B, since the uniform motion to the right does not in any way affect the vertical acceleration g. A body falling freely from M to B would fall in a time

$$\sqrt{\frac{2BM}{g}}.$$

Therefore $T = 2\sqrt{\dfrac{2\,BM}{g}}$

Substituting the value of ⑤ for BM, we have:

⑥ $T = 2\sqrt{\dfrac{2v^2\sin^2\theta}{2g^2}} = \dfrac{2v \sin\theta}{g}.$

Equations ③, ④, ⑤, ⑥ are the fundamental equations for projectile motion under constant acceleration g.

It must be remembered that the equations take no account of air resistance, which for rifle bullets and other high-speed projectiles is considerable; nor do they include the fact that the acceleration of gravity varies at different heights. This last correction is insignificant for speeds less than 1 or 2 miles per second, but becomes important when we consider meteors and planets moving at high velocities.

Acceleration and Momentum.—*Acceleration* has been defined as change in velocity with time. Algebraically we may write:

$$a = \frac{v}{t} \text{ or } v = at, \text{ ①}$$

a familiar fundamental equation for uniformly accelerated motion.

Multiplying ① by m, we have:

$$mv = mat.$$

Since $F = ma$ (Newton's second law)

we have $mv = Ft$ or $F = \dfrac{mv}{t}$.

The quantity mv is called the *momentum* of a body of mass m. We see that it is equal to the product of force and time or, what is mathematically the same thing, *force is the time rate of change of momentum.* Regardless of the mass or initial velocity of a body, the same force always produces the same change of momentum in the same time.

If two bodies interact in any way, they impress equal forces for equal times on each other in opposite directions. This is merely a restatement of Newton's third law, but taking it in conjunction with the statement just made regarding force and momentum, we see an important consequence: *In any interaction between two bodies the total momentum remains constant.* The statement can obviously be extended to three or indeed any number of bodies interacting among themselves. This is the principle of *conservation of momentum.*

The principle of conservation of momentum is so important in the study of mechanics, and misunderstanding of it is so common, that it may be well to consider it at more length by means of examples.

Suppose two automobiles of mass 2,000 and 2,500 pounds, respectively, sustain a head-on collision at a relative velocity of 50 miles an hour. To fix our ideas, suppose the 2,000-pound car is traveling 15 miles an hour and the 2,500-pound car is traveling 35 miles an hour. At the instant of collision, an enormous complex of forces operating in all directions comes into play. The steel bodies of the cars are crumpled. Pieces of glass and metal fly in all directions. Tremendous internal stresses are set up in the various parts of both cars. Yet one physical quantity—*momentum*—remains invariant, *conserved,* in all this welter of conflicting forces. Let us see just what we mean here by *conserved.* Since momentum is the product of mass and velocity it is a *directed* or *vector* quantity as the mathematician calls it; that is, it has both *magnitude* and *direction.* Before the impact of the two automobiles we had a momentum of m_1v_1 in the one direction, and a momentum of m_2v_2 in the other (m_1, v_1 m_2, v_2 stands for the mass and velocity of the automobiles). The total momentum of the two cars considered as an isolated system of bodies was $m_1v_1 + m_2v_2$. (Remember that m_1v_1 and m_2v_2 in this case are of *opposite sign* mathematically, so that their albegraic sum is equal to the difference between their absolute values considered without reference to direction.)

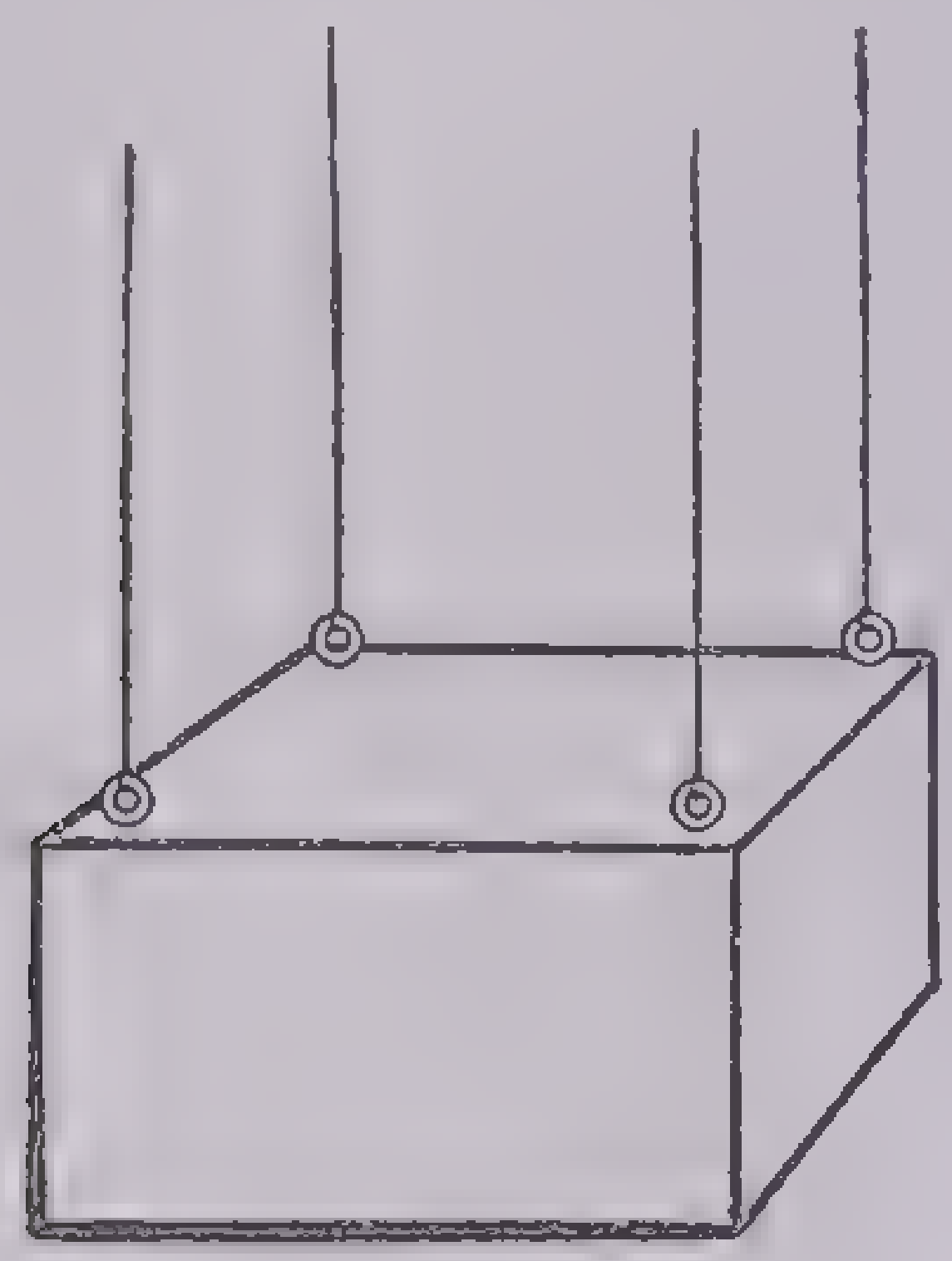
When the crash occurred, every force exerted on every particle of matter in the system was balanced by an equal and opposite force. The same force always produces the same change of momentum in the same time. For every positive change in momentum there was an equal negative change, so that the total remained constant. What does this mean physically?

After the crash the general action might be described as a confused medley of matter flying in many directions. If we could determine the masses and the velocities of all the separate pieces of matter and add all the separate *momenta* (taking account of direction as well as magnitude) the sum would equal $m_1v_1 + m_2v_2$. This leaves the earth out of account. One might argue: Within a very few seconds after the crash, certainly all the separate masses would be at rest; frictional forces would quickly stop them. If all the velocities are zero, the total momentum must be zero. How then can we say that momentum is conserved? The answer is that all the separate momenta would have been communicated to the earth, and the earth is a body of practically infinite mass compared with our automobiles, so that the earth's change in velocity consequent upon its absorption of the momentum $m_1v_1 + m_2v_2$ would be quite inappreciable. Nevertheless, our theories of physical forces convince us that the earth would experience a change of velocity, and that we could not say that the separate masses would come completely to rest.

We might pursue our objections, what about the conservation of energy? If the automobiles do not really come to rest but give up their motion to the earth, whence arose the great amount of energy that unquestionably smashed the cars to twisted metal and distributed their pieces all around the pavement?

To answer this question we are to consider that the energy associated with a moving body is proportional to the *square* of the velocity, it is in fact given by the equation $E = \frac{1}{2}mv^2$. In the case of the two automobiles, the total energy was $\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$, the velocities being measured with respect to the earth. The velocity imparted to the earth by the transfer of momentum was quite negligible, so that for practical purposes the amount of energy dissipated was indeed equal to the whole original amount; namely, $\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$.

In the *ballistic pendulum,* a massive wooden block is suspended by cords in such a way that it may swing freely without turning about a horizontal axis.



The Ballistic Pendulum

A bullet from a rifle may be fired into the block, and by observing the amount of swing, the velocity of the bullet may be determined.

Suppose the block has a mass of 5 kilograms, and a bullet of mass 10 grams is fired into the block. If the block swings so as to rise 10 cm., what was the velocity of the bullet?

Since the block swings under the constant acceleration of gravity, its initial velocity (sufficient for a rise of 10 cm.) must have been

$$\sqrt{2\,gs} = \sqrt{19{,}600} = 140 \text{ cm./sec.}$$

The momentum of the block = mass × velocity = 140(5,000 + 10). (The bullet buried itself in the block, so that its mass must be added to the original mass of the block.)

The momentum of the bullet before striking the block =

$$\text{mass} \times \text{velocity} = 10v$$

where v is the velocity of the bullet. By the principle of conservation of momentum we have:

$$10v = 140(5{,}000 + 10).$$

Whence, $v = 14 \times 5{,}010 = 70{,}140$ cm./sec. = 2,280 feet per second (approximately).

Since the kinetic energy of the block and bullet together after impact equals:

$$\tfrac{1}{2}(5{,}010)140^2 = 4.82 \times 10^7,$$

and the original kinetic energy of the bullet was

$$\tfrac{1}{2}\cdot 10\cdot(70{,}140)^2 = 2.55 \times 10^{10},$$

we see that most of the kinetic energy residing in the bullet, 99.8 per cent in fact, was dissipated in friction.

Consider the kick or recoil of a firearm. When a bullet is fired from a rifle, the rifle reacts against the shoulder of the marksman. The principle of conservation of momentum assures us that the momentum of the recoiling rifle is equal numerically to the momentum of the bullet. (Since the sum of the momenta after the explosion must be the same as before, that is, zero, we have $m_1v_1 + m_2v_2 = 0$ or $m_1v_1 = -m_2v_2$, in which the subscript $_1$ refers to the rifle and $_2$ to the bullet). Yet the marksman is not injured by the rifle. His shoulder stops the recoil in an inch or so, while the bullet striking his shoulder would do great damage. How does this happen?

Suppose a rifle of mass 5 kilograms (about 11 pounds) fires a bullet of mass 5 grams at a velocity of 600 meters (about 2,000 feet) per second. If v represents the velocity of recoil acquired by the rifle, we have:

$$-5{,}000v = 5 \times 60{,}000.$$

(The left-hand side of the equation is negative, since the velocity of recoil is in the opposite direction from the velocity of the bullet.)

$$v = -60 \text{ cm./}sec.$$

The kinetic energy acquired by the bullet is:

$$\tfrac{1}{2} \times 5 \times (60{,}000)^2 = 9 \times 10^9 \text{ ergs,}$$

about 660 foot-pounds.

The kinetic energy of the recoiling rifle on the other hand is only

$$\tfrac{1}{2} \times 5{,}000 \times (-60)^2 = 9 \times 10^6 \text{ ergs,}$$

about ⅔ of a foot-pound.

A projectile's power of inflicting damage depends upon its kinetic energy, not upon its momentum. This is why the bullet is dangerous but the recoiling rifle is comparatively harmless.

Another illustration that enables us to see clearly the difference between momentum and kinetic energy is provided by the ordinary hammer. A 1-pound hammer may easily have as much kinetic energy as a massive sledge, but the sledge will be much more effective in driving a heavy spike. Suppose the head of the 1-pound hammer strikes the spike with a velocity of 30 feet per second. The kinetic energy of the hammer head is $\tfrac{1}{2}mv^2$ or 450 foot-poundals. This is the same kinetic energy as would be associated with a 9-pound sledge striking the spike with a velocity of 10 feet per second (since $\tfrac{1}{2} \times 1 \times 30^2 = \tfrac{1}{2} \times 9 \times 10^2$); but the momentum of the sledge will be three times the momentum of the hammer ($9 \times 10 = 3 \times 1 \times 30$). In driving a spike there are two separate forces to be overcome—the force of friction between the surface of the spike and the wood and the force arising from the inertia of the spike when contact with the moving hammer or sledge tends to set it in motion. The effectiveness of the hammer or sledge blow in overcoming the friction of the wood and spike will depend upon kinetic energy, but the effectiveness in setting the spike in motion will depend upon momentum. Suppose we consider the motion of the spike-hammer-head and spike-sledge-head combinations, independent of the frictional force. For simplicity we shall suppose that the *coefficient of restitution* is zero, that is, that there is no tendency for the spike to bounce when struck by the hammer-head. This would be approximately the case if the hammer-heads were made of lead or some other nonelastic material. Let m represent the mass of the spike. After the blow, the hammer-spike combination will move with a velocity of

$$\frac{30}{m+1},$$

the sledge-spike combination will move with a velocity of

$$\frac{90}{m+9}.$$

The kinetic energy associated with the two combinations will be:

$$\begin{array}{cc} \text{With hammer-spike,} & \text{With sledge-spike,} \\ \tfrac{1}{2}\dfrac{30^2(m+1)}{(m+1)^2} & \tfrac{1}{2}\dfrac{90^2(m+9)}{(m+9)^2} \\[2ex] \dfrac{450}{m+1}. & \dfrac{4{,}050}{m+9}. \end{array}$$

The penetration of the spike will be proportional to the kinetic energy of the respective combinations.

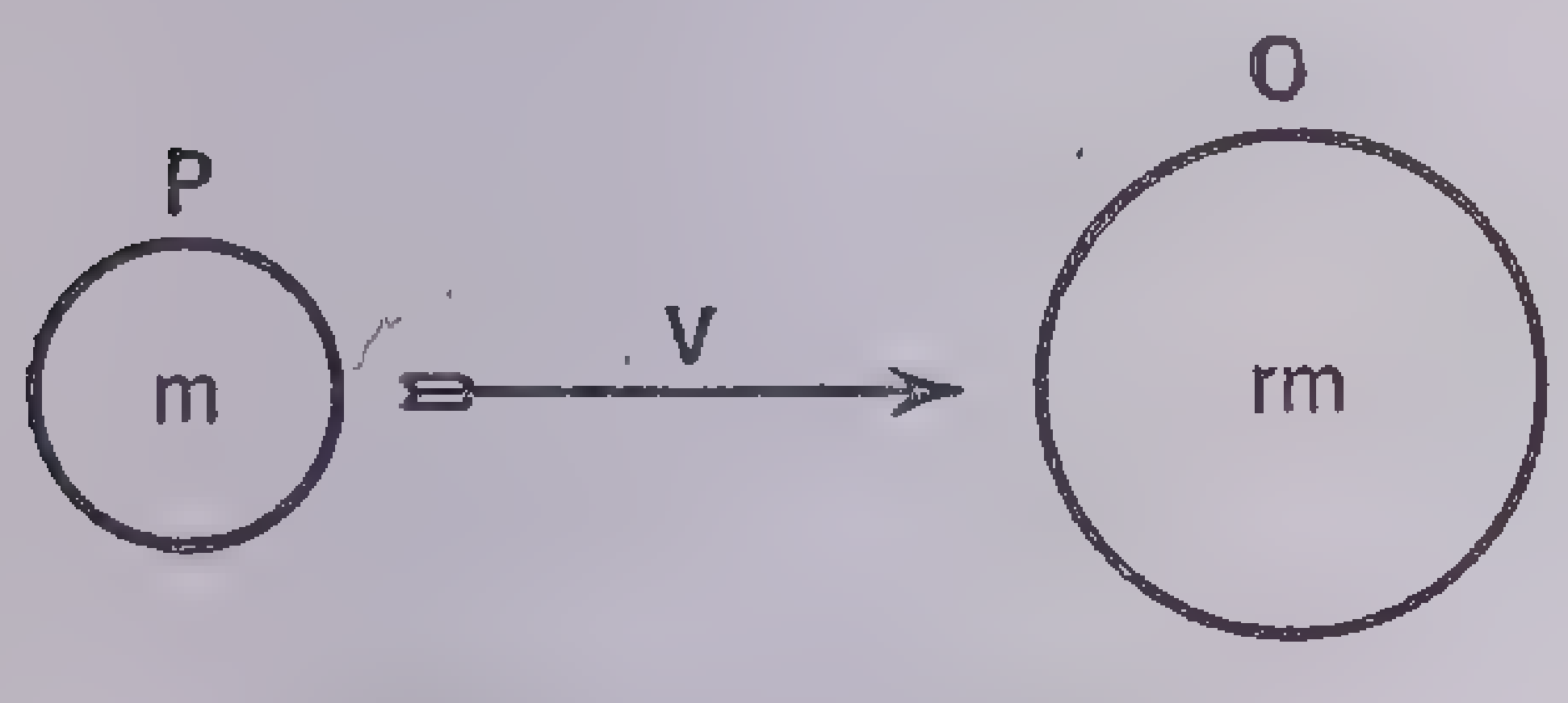
$$\text{Now } \frac{450}{m+1} < \frac{4050}{m+9}$$

for all values of m, and if m is fairly large, say 1 pound (a heavy railroad spike might be as massive as this), we see that the sledge-spike combination would have nearly twice as much penetrative power as the hammer-spike combination. If the mass of the spike is negligible, there is very little difference between the penetrative powers of the combinations. Thus, if we are driving a heavy spike or a wedge, we use a sledge, but for a tack, or small nail, a light hammer is nearly as effective and easier to handle.

How can this difference be reconciled with the fact that both the hammer and the sledge give up 450 foot-poundals of kinetic energy in coming to rest? Energy is the ability to do work, and work is measured by force times distance. If the sledge drives the spike twice as far as the hammer, must it not therefore do twice as much work? How can it do twice as much work if its original kinetic energy was the same as the hammer's?

Forms of Energy.—To answer these questions we consider that there are various forms of energy. In striking the spike, a dissipation of energy in the form of heat takes place. This is not a destruction of energy but merely a transformation. Our equations indicate that the dissipation of kinetic energy is greater in the case of the hammer and spike than in the case of the sledge and spike. The kinetic energy available for driving the spike into the wood is the difference between the original energy of the hammer or sledge head and the energy dissipated in the impact. Ultimately, *all* the original kinetic energy is transformed into heat; the effectiveness of the blow in driving the spike depends on the proportions of the original energy dissipated by the impact of hammer and spike and by fraction between spike and wood.

Suppose two equal masses moving with equal speeds in opposite directions collide directly and do not rebound. Will momentum be conserved in this case? "Surely," someone will say, "the two motions will destroy each other and no momentum will remain; neither will any be communicated to the earth, since the two masses will stop each other without any outside force." This case, however, is not a violation of the principle of conservation of momentum. It is true that the momentum after the impact is zero; *but the momentum before the impact was also zero.* Momentum has *direction* as well as *magnitude.* If the momentum of one mass is *M,* the momentum of the other is $-M$, and $M + (-M) = 0$. This illustration shows clearly that momentum is entirely different from energy which, in the language of mathematics, is a signless quantity. We do not think of mass or energy as positive or negative.



Impact of Two Masses

Direct Impact of Two Masses.—Consider two spheres P and O with masses *m* and *rm,* and suppose P has a velocity *v* in the direction of O, which we consider positive. We wish to determine the motion of P and O after the impact.

At the instant of impact the surfaces of the two spheres become deformed or compressed, and forces are set up tending to cause the bodies to rebound. These forces depend on the elastic properties of the colliding spheres. It is found by experiment that a simple relation holds between relative speed of *approach* of the two bodies and the relative speed of *separation* after the impact. For spheres of a given material:

Relative speed of separation = *e* × *relative speed of approach;* in which *e* is a numerical factor called the *coefficient of restitution,* depending upon the elasticities of the bodies. For highly elastic materials, such as glass, ivory or steel, *e* may be nearly 1; for soft substances, such as putty or wet clay, $e = 0$.

With the help of this relation and the principle of conservation of momentum, we may calculate the velocities of the two spheres after impact.

Let v_1 and v_2 be the velocities of P and O, respectively, after the impact. The relative speed of approach is v; the relative speed of separation is $v_2 - v_1$.

We therefore have: $v_2 - v_1 = ev$.

By the principle of conservation of momentum we have:

$$mv_1 + rmv_2 = mv.$$

This pair of equations may be solved for v_1 and v_2 with the following results:

$$v_1 = \text{velocity of P (projectile)} = \frac{v(1 - re)}{r + 1}; \quad ①$$

$$v_2 = \text{velocity of O (objective)} = \frac{v(1 + e)}{r + 1}. \quad ②$$

If $e = 0$ (that is, if the bodies do not rebound but cling together after the impact), we have:

$$v_1 = v_2 = \frac{v}{r + 1}.$$

If $e = 1$ (that is, if the bodies are "perfectly" elastic), we have:

$$v_1 = v\frac{(1 - r)}{r + 1};$$
$$v_2 = \frac{2v}{r + 1}.$$

If $r = 1$ (that is, if the two masses are equal), we have:

$$v_1 = 0;$$
$$v_2 = v.$$

Thus the projected body P stops completely, while the struck body O moves off with the same velocity that the projectile originally had. This is approximately the case with a straight line shot on a billiard table. The cue ball communicates all its kinetic energy to the object ball.

We also observe that v_1 is positive, zero or negative according as *re* is less than 1, equal to 1 or greater than 1. The value of *re,* therefore, determines whether the projectile will continue in the same direction at reduced speed, stop or have its direction of motion reversed by the impact.

Equations ① and ② enable us to calculate the kinetic energy associated with each mass after the impact. We have:

$$E_1 = \tfrac{1}{2} mv_1^2 = \frac{mv^2(1 - re)^2}{2(r + 1)^2};$$
$$E_2 = \tfrac{1}{2} rmv_2^2 = \frac{rmv^2(1 + e)^2}{2(r + 1)^2}.$$

Total kinetic energy after impact equals:

$$E_1 + E_2 = \frac{mv^2(1 - re)^2}{2(r + 1)^2} + \frac{rmv^2(1 + e)^2}{2(r + 1)^2} = \tfrac{1}{2}mv^2\left[\frac{(1 - re)^2 + r(1 + e)^2}{(r + 1)^2}\right].$$

Since the original kinetic energy was $\frac{1}{2}mv^2$, the value of the factor in brackets will give the fraction of the original kinetic energy *retained* by the system of bodies; if we call this factor *C,* $1-C$ will represent the fraction of the original energy *dissipated* (chiefly as heat) by the impact.

We observe that if $e = 1$, the factor in brackets, *C,* reduces to:

$$\frac{(1 - r)^2 + 4r}{(r + 1)^2} = \frac{1 - 2r + r^2 + 4r}{r^2 + 2r + 1} = 1.$$

That is, *all* the kinetic energy is retained by the impinging bodies.

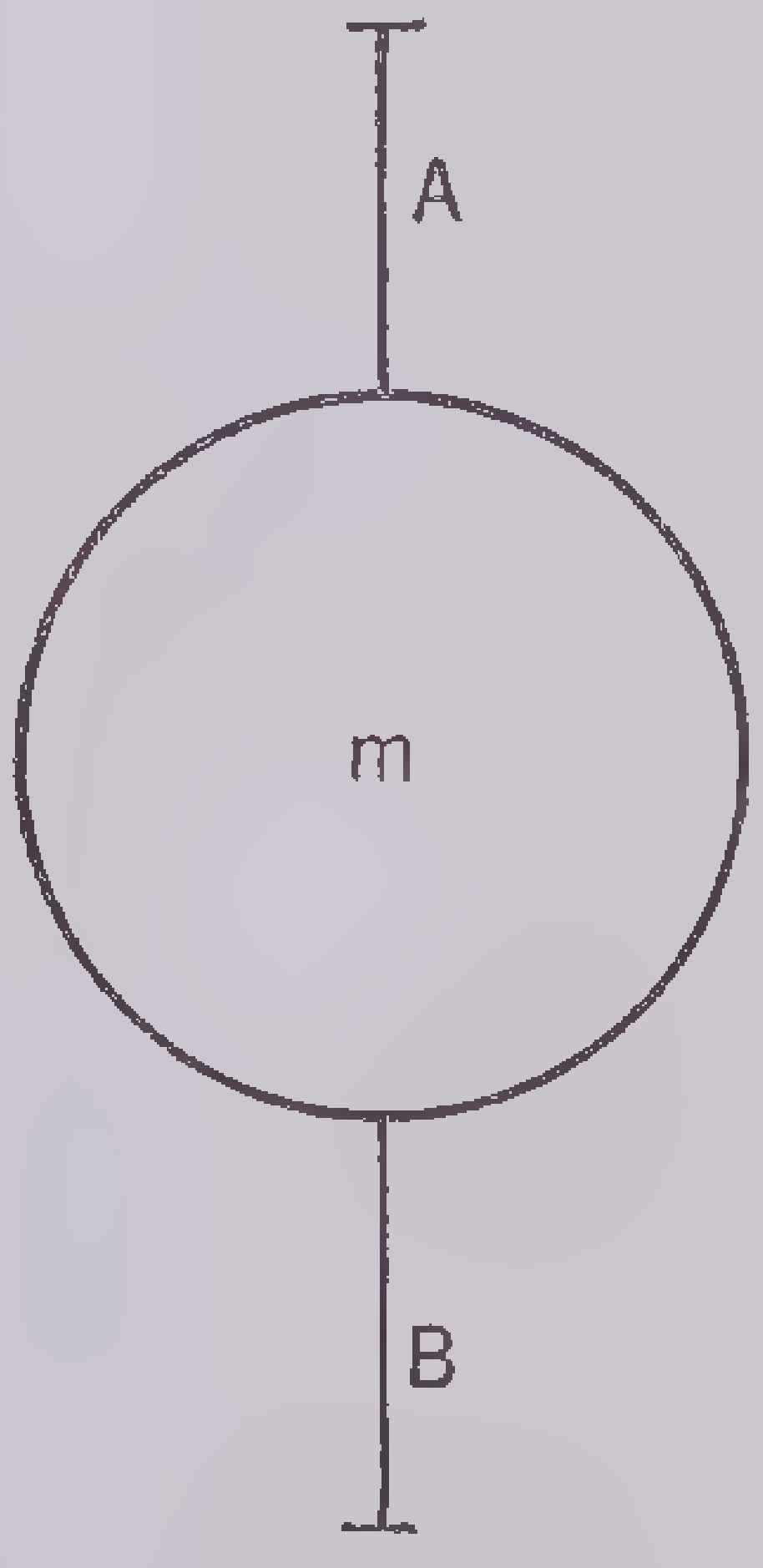
If $e = 0$ we have:

$$C = \frac{1 + r}{(r + 1)^2} = \frac{1}{r + 1}.$$

This means that when *r* is small (projectile, massive; objective, light), most of the kinetic energy is retained; but when *r* is large (projectile, light; objective, massive), most of the kinetic energy is dissipated as heat. This is the more general solution of the cases of the hammer and spike and the ballistic pendulum.

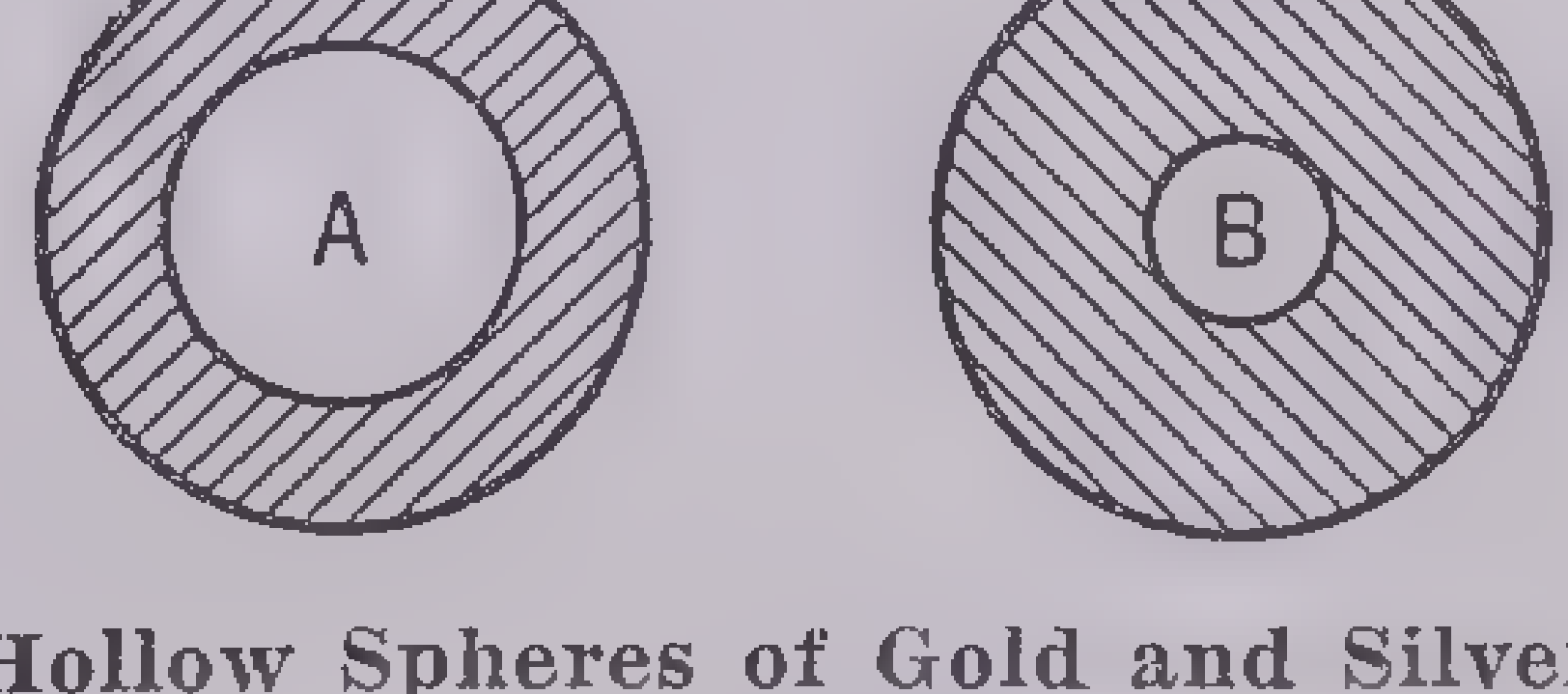
The concepts of momentum and conservation of momentum also are applicable to angular motion. For a body having a moment of inertia *I* and an angular velocity ω about a particular axis, $I\omega$ represents angular momentum, and this quantity is *conserved* or unchanged whatever changes may occur in *I* or ω separately. If *I* is increased (say by the transfer of mass to a greater distance from the axis of rotation), ω will be diminished in the same proportion so that the product $I\omega$ will remain constant. This principle is of great importance in celestial mechanics, where we are dealing with a practically isolated system of bodies in angular rotation. A simple example that can be observed without trouble is the motion of a weight attached to a cord moving in a spiral with the cord slowly winding upon a stick. As the radius of revolution diminishes, the number of revolutions per unit time (angular velocity) increases.

Mechanical Paradoxes.—Suppose a mass *m* is hung from a fixed support by a string A as in the diagram, and a second string B of the same tensile strength is fastened to *m* at the bottom. If a slowly increasing force pulls down on B, the string A will break, because it sustains the whole force pulling on B as well as the weight of *m,* but if a sudden jerk is applied, the string B will break.



Inertia of Mass Breaks String Below

We can easily understand this by recalling that the velocity acquired by a mass acted upon by a force is proportional to the time during which the force acts. If we jerk the string B suddenly enough, we may reduce the time during which the force acts on *m* to a very small interval, and accordingly *m* will acquire only a very small velocity. The force required to stop a moving mass in a given time depends on the momentum of the mass; if this is very small, only a small force over the weight of *m* will need to be exerted by A to arrest the motion.



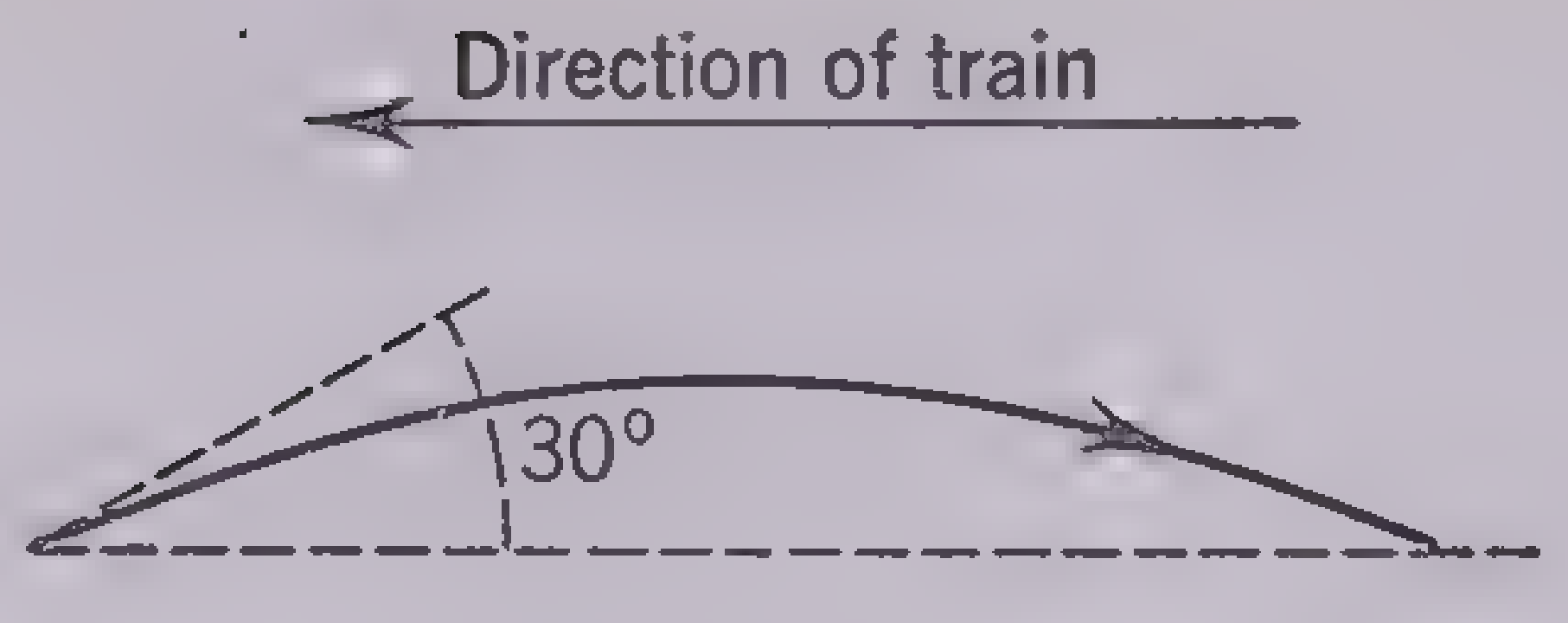
Hollow Spheres of Gold and Silver

An old mechanical problem involves two hollow spheres, one of silver and the other of gold; suppose they have the same diameters and masses, and suppose both spheres are painted so as to be indistinguishable to the eye. How could we tell the difference by a simple mechanical experiment?

Since gold is much more dense than silver, the gold sphere must have a thinner wall than the silver one. In the diagram, A represents the gold sphere and B the silver. Since the mass of A is concentrated nearer the outer surface than the mass of B, it is clear that the *moment of inertia* about the center must be greater for A than for B. If we perform an experiment in which the behavior of the two spheres will depend in some way on their moments of inertia about their centers, we can solve the problem. The simplest experiment would be to release the two spheres simultaneously and let them roll (not slide) down an inclined plane. The silver sphere would reach the bottom first. The work done by gravity on the two spheres would be the same, but in the silver sphere a greater fraction of the total work done would be transformed into *kinetic energy of translation;* the gold sphere would acquire a greater *kinetic energy of rotation.*

Suppose a gun is capable of shooting a bullet that will travel 60 miles an hour; that is, 88 feet per second. If a man armed with such a gun stands on the front car of a train moving 60 miles an hour and shoots at a target on the rear car, will he be able to hit the target? It is often said in answer to this question that since the bullet leaves the muzzle of the gun at a speed of 60 miles an hour, and the gun is moving backward at the same speed, the bullet would fall to the ground in a straight vertical line as if dropped from the hand of a man standing still. Therefore it would be impossible to hit the target. This answer is incorrect, although the reasoning is sound as far as it goes. If the gun were fired *straight backward* without any elevation, the bullet would certainly drop to the ground in a vertical straight line from the viewpoint of a stationary observer. The forward velocity would exactly cancel the backward velocity. If the target were moving on the same horizontal level as the gun, it would not be hit; but this would be true also if the train were standing still. In order to hit the target it is necessary to give the gun a certain angle of elevation. This angle is the same whether the train is in motion or not. The steady motion of the train would make *no difference whatever* as far as hitting the target is concerned. If the target could be hit while the train stood still, it would be hit in exactly the same manner if the train were moving at any uniform speed whatever. It would, indeed, be quite impossible by any mechanical experiment *conducted on the train,* to find out whether the train was moving at all.

The apparent path described by the bullet, however, would be quite different from the point of view of an observer on the ground and an observer on the train. To an observer on the train, the bullet would describe a parabola of the precise size and shape it would have if the train were standing still. On the other hand, an observer on the ground would see the bullet's path as an entirely different parabola. It must be remembered that in order to hit the target, the gun must have a certain angle of elevation. For convenience in calculation, suppose that this angle is 30°. From the point of view of an observer on the train, the bullet's path would be a parabola like that shown in the accompanying illustration.



Path of Bullet Relative to Train

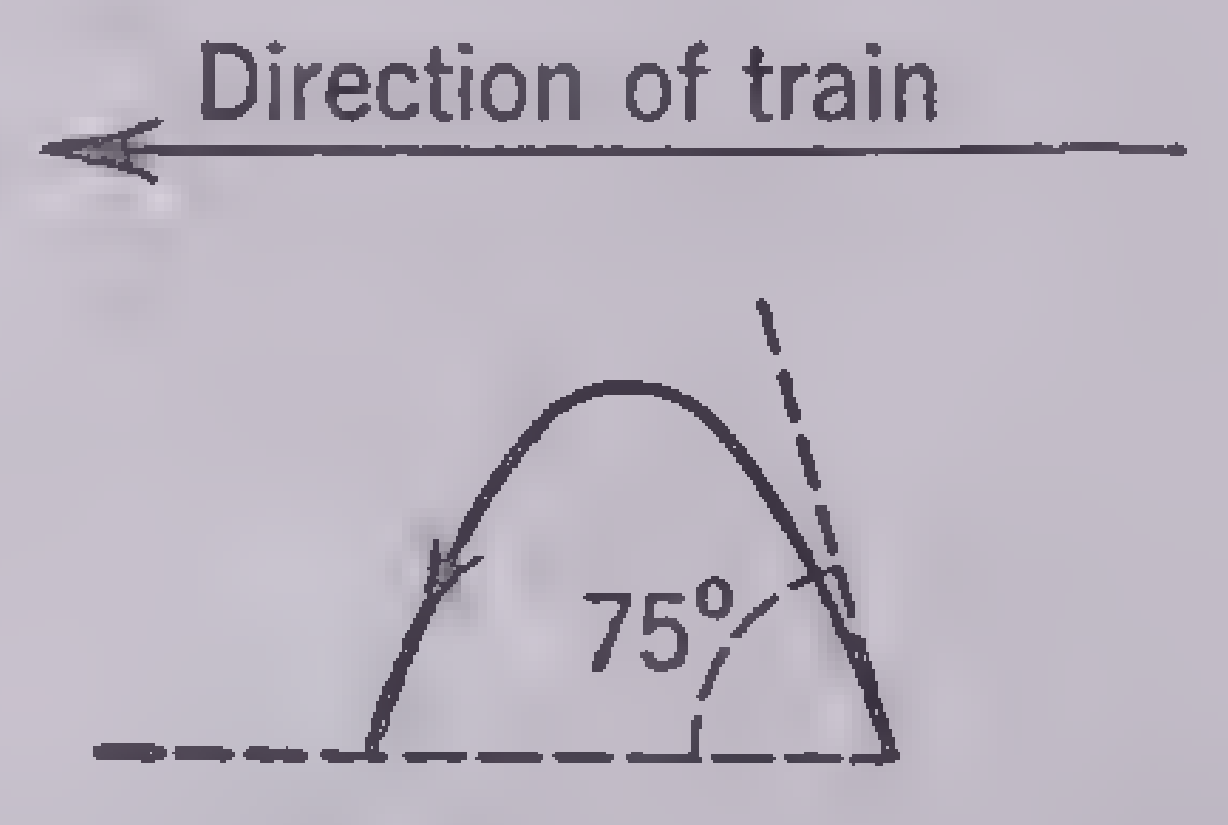
By applying the formula for the range of a projectile,

$$\frac{v^2 \sin 2\theta}{g},$$

we find that the range in this case is 208 feet; that is, the target will be hit if it is 208 feet away.

Consider the matter from the viewpoint of a spectator on the ground. Relative to such an observer, the bullet's velocity would be the *resultant of three components:* a component in the direction of the train (which we shall reckon as negative) of 88 feet per second; a component toward the rear of the train of 88 × cos30°; and an upward component of 88 × sin30°.

Cos 30° = .866, so that the positive horizontal component is 76.2 feet per second. The negative horizontal component is 88 feet per second, so that the net horizontal motion is —11.8 feet per second, that is, 11.8 feet per second *in the direction the train is moving.* The upward component of the bullet's velocity is 88 × sin 30° or 44 feet per second. The bullet will therefore appear to describe a curve like that shown in the accompanying illustration.



Path of Bullet Relative to Stationary Observer

The curve will be precisely that which would be described by a projectile fired from rest at an elevation angle of 75° and a velocity of 45.5 feet per second; but while the bullet is in the air describing this curve, the target moves at 88 feet per second, and the observer on the ground would say that the target catches up with the bullet, and is struck just as it would be if the train were standing still.

The principle that all mechanical experiments have the same result whatever the uniform motion of the experimenter is sometimes called the *Galilean principle of relativity.* By considering the extension of this principle to electrical and optical phenomena, Albert Einstein was led to his theory of relativity.

Perpetual Motion Machines.—The principle of conservation of energy denies the possibility of a *perpetual-motion machine;* that is, a machine that will continuously do work without a corresponding input of work is impossible. An enormous amount of ingenuity has been expended on efforts to find machinery that would *create energy.* All these efforts have been unsuccessful, and if the fundamental concepts of physical science are true, such efforts must always be unsuccessful.

Many machines have been designed in the hope that a series of devices operating on different principles might produce a sum total of energy greater than that required to run them. Such are waterwheels that are supposed to drive pumps to supply themselves with water; electric motors connected with dynamos presumed to supply electrical energy sufficient to operate the motors; and compressed-air motors intended to compress their own air.

When the equivalence of energy and heat was demonstrated in the 19th century, a new field was opened to perpetual-motion seekers. Suppose we have a barrel of water at a temperature of 15° C. Each gram of water in the barrel contains potential energy in the form of heat (so reasons the perpetual-motion inventor), actually about 288 calories per gram. For the whole barrel this would be something like 800,000 × 288 calories or 2.3×10^8 calories—about 9.6×10^8 joules or a little more than 265 kilowatt-hours. If, therefore, we could extract the potential energy of the barrel of water, we need not trouble ourselves about a supply of energy, as there is enough water in the world's lakes and oceans to supply energy beyond our wildest dreams. All that is necessary is a machine that will extract the potential energy.

Unfortunately such a machine is just as impossible as a machine designed to create energy from nothing. The second law of thermodynamics asserts that heat always passes from a warm body to a cool one, never the reverse. A machine whose operation presupposes a flow of heat from a cool body to a warmer one, is called a *perpetual-motion machine of the second kind.*

PROBLEMS IN MECHANICS AND THERMODYNAMICS

Problem 1.—An automobile of mass 2,500 pounds is traveling 50 miles an hour. How much force is necessary to bring it to a stop in 100 feet, assuming that the force is applied uniformly?

First Solution.—By the formula for kinetic energy we have:

$$E = \tfrac{1}{2} mv^2.$$

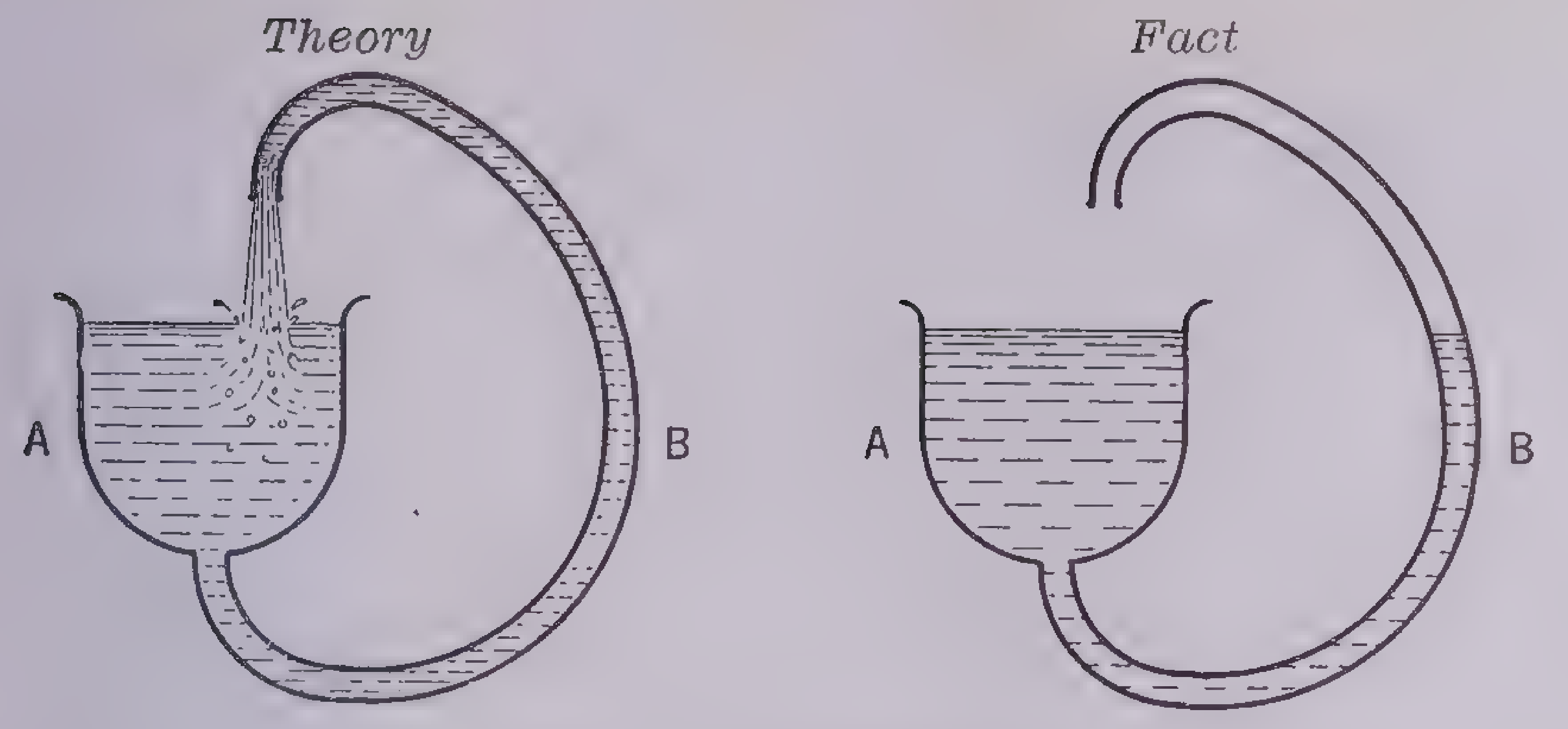
The principle of conservation of energy assures us that the work done in stopping the automobile is equal to E, and we know also that work = force × distance.

We therefore have:

$$Fd = \tfrac{1}{2}mv^2$$

$$F = \frac{mv^2}{2d}. \quad ①$$

To obtain F in poundals, we must express m, d and v in English absolute



Fallacy of Perpetual Motion

A device that the inventor hoped would produce perpetual motion. He reasoned that the large mass of liquid in the goblet A must more than balance the small mass in the tube B; therefore the liquid would continually flow as shown in the diagram. He was confounded when a trial showed that the water reached only the same level in B as in A

units, that is, in pounds, feet and feet per second.

$$50 \text{ miles an hour} = \frac{50 \times 5280}{3600} \text{ ft./sec.}$$

$$= 73.3 \text{ ft./sec.}$$

$$\text{Therefore, } F = \frac{2500 \times (73.3)^2}{200} = 67{,}300$$

(force in poundals).

Since approximately 32.2 poundals = 1 pound, we have:

$F = 2{,}090$ pounds or slightly more than 1 ton.

Second Solution.—

In any case of uniformly accelerated motion we have:

$$v = \sqrt{2as};\ v^2 = 2as;\ a = \frac{v^2}{2s}.$$

Since for any body moving under the influence of a force $F = ma$, we have :

$$F = \frac{v^2m}{2s}.$$

This equation is identical with ① of our first solution.

Problem 2.—A projectile fired from a naval gun, and having a velocity of 2,500 feet per second, strikes the armored side of a battleship. If the mass of the projectile is 1,000 pounds, how much heat would be developed by the impact? (We may assume the battleship to be of such great mass that it is not appreciably set in motion by the projectile.)

The kinetic energy of the projectile is:

$$\tfrac{1}{2}mv^2 = 500 \times (2{,}500)^2 = 3.125 \times 10^9$$

$$\text{Foot-poundals} = \frac{3.125}{32.2} \times 10^9 \text{ foot-pounds.}$$

The heat equivalent of 1 foot-pound is $\frac{1}{778}$ B.T.U.

Therefore the total heat developed is:

$$\frac{3.125 \times 10^9}{32.2 \times 778} = 124{,}500 \text{ B.T.U.}$$

This heat would be sufficient to melt about 500 pounds of iron.

Problem 3.—A flywheel in the form of a solid disk of steel is 120 centimeters (about 4 feet) in diameter and 8 centimeters (about 3 inches) in thickness. It is rotating at 240 revolutions per minute. How many calories of heat would be developed if the wheel were stopped by friction? The density of the wheel is 8.

The kinetic energy of the revolving wheel is:

$$\tfrac{1}{2}I\omega^2$$

Since the wheel is a cylinder of uniform density,

$$I = \tfrac{1}{2}mr^2$$

If v = volume and d = density
$m = dv = 8\pi r^2 d = 64\pi(60)^2$
$I = 32\pi(60)^4$

$$\omega = \frac{2\pi \cdot 240}{60} = 8\pi$$

$$\tfrac{1}{2}I\omega^2 = 32\pi^2 \cdot 32\pi \cdot 60^4 = 32^2 \cdot 60^4 \pi^3.$$

This expresses energy in ergs

Since 1 calorie = 4.18 joules.

$$1 \text{ joule} = \frac{1}{4.18} \text{ calories.}$$

$$1 \text{ erg} = \frac{1}{4.18 \times 10^7} \text{ calories.}$$

Total energy of flywheel is therefore

$$\frac{32^2 \cdot 60^4 \cdot \pi^3}{4.18 \cdot 10^7} \text{ calories} = 9{,}820 \text{ calories.}$$

Problem 4.—If a dirigible shaped approximately like a cylinder is 200 meters (about 650 feet) long and 30 meters (about 100 feet) in diameter, what is its total lifting power when filled (*a*) with hydrogen (density 1/14 that of air) or (*b*) with helium (density about 1/7 that of air)? The weight of a liter of air is approximately 1.25 grams. If the total weight of the dirigible's frame, engines, fuel and other fixed load is 125 tons, what is the percentage of loss in pay load consequent upon the use of helium instead of hydrogen?

By Archimedes's Principle, each liter of hydrogen has a lifting power of $1.25 - \frac{1.25}{14}$ grams or 1.16 grams. Each liter of helium has a lifting power of $1.25 - \frac{1.25}{7}$ grams or 1.07 grams.

The total volume of the dirigible is:
$\pi \times (1500)^2 \times 20{,}000$ cubic centimeters
or $4.5\pi \times 10^7$ liters $= 1.41 \times 10^8$ liters.

Filled with hydrogen the total lifting power is:

$$1.16 \times 1.41 \times 10^8 \text{ grams.}$$

1 English ton = approximately 9×10^5 grams.

Therefore the lifting power in tons is:

$$\frac{1.16 \times 1.41 \times 10^3}{9} = 180 \text{ tons.}$$

Filled with helium the total lifting power is:

$$1.07 \times 1.41 \times 10^8 \text{ grams}$$
$$= \frac{1.07 \times 1.41 \times 10^3}{9} \text{ tons} = 167 \text{ tons.}$$

Pay load with hydrogen = 180 − 125 = 55 tons.

Pay load with helium = 167 − 125 = 42 tons.

Percentage of loss through use of helium

$$= \frac{13}{55} = 23.6 \text{ per cent.}$$

We thus see that although the total lifting power of helium is 93 per cent that of hydrogen, there is a much greater practical loss through the use of the less buoyant gas as a result of the fixed weight of the dirigible. Helium and hydrogen as they are actually used commercially are impure, and their lifting powers accordingly are not as great as the theoretical values used in the example.

Problem 5.—A stream of water flows from a tap at a rate of 6 liters (about 1½ gallons) per minute. The water flows through an electric heater that raises the temperature of the stream 40° C. How much electric power (in watts) is required?

We require:

6,000 × 40 calories per minute or 4,000 calories per second.

1 calorie = 4.18 joules.

1 joule per second = 1 watt.

1 calorie per second = 4.18 watts.

4,000 calories per second = 16,720 watts.

Since the maximum power that may be drawn from the usual home electric circuit is not more than $\frac{1}{10}$ of this amount, we see that the maximum rate at which we could draw *hot* water using a faucet-heating device is about 1 pint per minute.

Problem 6.—A bowling ball having a diameter of 8½ inches and a mass of 16 pounds rolls (without slipping) with a velocity of 20 feet per second down a smooth alley. What is its kinetic energy in foot-pounds?

Let E = kinetic energy of translation and E_1 = kinetic energy of rotation.

We have:
$E = \tfrac{1}{2}mv^2$
$E_1 = \tfrac{1}{2}I\omega^2.$

Total energy $= E + E_1 = \tfrac{1}{2}(mv^2 + I\omega^2).$

Since $\omega = \frac{v}{r};\ \omega^2 = \frac{v^2}{r^2}.$

But $I = \frac{2}{5}mr^2.$

Therefore $I\omega^2 = \frac{2}{5} mv^2$.

Then $E + E_1 = \frac{1}{2}(mv^2 + \frac{2}{5} mv^2) =$

$$\frac{7}{10} mv^2.$$

$$m = 16$$

$$v = 20$$

$$E + E_1 = \frac{7}{10} \cdot 16 \cdot 20^2 =$$

$$7 \times 16 \times 40 = 4{,}480.$$

This result is in foot-poundals; to reduce to foot-pounds we divide by g (32. ft./sec. per second).

$$E + E_1 = \frac{4{,}480}{32.2} = 139.1 \text{ foot-pounds.}$$

Problem 7.—A baseball is thrown at an angle of 30° with the horizontal with a velocity of 100 feet per second. What is the maximum height of its path, and how far away will it strike the ground?

Maximum height is given by the formula:

$$\frac{v^2 \sin^2 \theta}{2g}$$

$$v = 100$$

$$\sin \theta = \sin 30° = \tfrac{1}{2}.$$

If h = the maximum height we have:

$$h = \frac{100^2(\frac{1}{2})^2}{2 \cdot 32.2} = \frac{2{,}500}{64.4} = 38.8 \text{ feet.}$$

Distance is given by the formula:

$$\frac{v^2 \sin 2\theta}{g}$$

$$\sin 2\theta = \sin 60° = \tfrac{1}{2}\sqrt{3}.$$

If d = distance we have:

$$d = \frac{100^2\sqrt{3}}{2 \cdot 32.2} = \frac{17{,}320}{64.4} = 269 \text{ feet.}$$

Problem 8.—An outfielder catches a fly ball at a point 300 feet from the home plate. Immediately after the catch, a runner on third base starts for home. The outfielder throws the ball with a velocity of 115 feet per second, at exactly the right elevation to strike the catcher's glove at the home plate. If the runner can cover the distance in $3\frac{1}{10}$ seconds, will he beat the ball to the plate? Assume that the ball leaves the outfielder's hand at the same height above the ground as it is caught by the catcher.

If d represents the distance and θ the elevation angle, we have:

$$d = \frac{v^2 \sin 2\theta}{g}$$

whence, $\sin 2\theta = \frac{gd}{v^2}$

$$g = 32.2$$

$$d = 300$$

$$v = 115$$

$$\sin 2\theta = \frac{32.2 \times 300}{115^2} = 0.730$$

$$2\theta = 46.8°$$

$$\theta = 23.4°$$

$$\sin \theta = 0.398$$

Total time,

$$T = \frac{2v \sin \theta}{g} = \frac{2 \times 115 \times .398}{32.2} =$$

$$2.84 \text{ seconds.}$$

The ball would thus beat the runner by about ¼ second. It is probable, however, that the outfielder would require more time than this to "wind up" for the throw, and that therefore, in an actual game, the runner would be safe. Only a very fast runner can cover the distance from third base to home in $3\frac{1}{10}$ seconds.

Problem 9.—A circular saw of 8-inch radius turns at 1,200 revolutions per minute. If the resistance encountered by the cutting teeth averages 12 pounds (force of resistance acting tangentially to the saw), what horsepower engine would be required?

Speed of saw equals:

$$\frac{2\pi r \times 1200}{60} = \frac{80\pi}{3} = 83.8 \text{ ft./sec.}$$

Power required, 83.8 × 12 foot-pounds per second = 1,005 ft.-lb./sec.

1 horsepower = 550 ft.-lb./sec.

$$\text{Power required} = \frac{1{,}005}{550} = 1.83 \text{ hp.}$$

Problem 10.—The water at Niagara Falls drops through a height of about 167 feet. What is the rise in temperature of the water as a consequence of the dissipation of energy in the whirlpool at the bottom?

1 pound of water falling through 167 feet yields 167 foot-pounds of energy at the bottom.

Since 778 foot-pounds = 1 B.T.U. we have:

$$167 \text{ foot-pounds} = \frac{167}{778} \text{ B.T.U.}$$

One B.T.U. is required to raise the temperature of 1 pound of water 1° F.; $\frac{167}{778}$ B.T.U. would therefore raise the temperature of 1 pound of water $\frac{167}{778}$ of 1° F. or 0.21° F.

Problem 11.—An automobile of mass 1,000 kilograms (about 2,200 pounds) requires a continuous power of 10 hp. to drive it 30 miles an hour along a straight level road. If the engine is suddenly cut off at the bottom of a hill having a 5 per cent grade and measuring 350 meters (about 1,150 feet) along the slant, will the car coast to the top of the hill if its speed at the bottom is 60 miles an hour? Assume that the average frictional force during the uphill coast is the same as the frictional force at 30 miles an hour on the level.

To solve this problem we must convert all the quantities involved to the absolute system of measurement, and the most convenient will be the absolute metric or C.G.S. system.

We must evaluate separately the two forces tending to retard the car; namely, friction and gravity. Let us consider first the frictional retardation. We have:

$$10 \text{ hp.} = 10 \times 746 \text{ watts} =$$

$$7.46 \times 10^{10} \text{ ergs/sec.}$$

$$30 \text{ miles an hour} = \frac{30 \times 5280 \times 30.5}{3600} =$$

$$1{,}432 \text{ cm./sec.}$$

Force overcome by 10 hp. at 30 miles an hour equals:

$$\frac{\text{work}}{\text{distance}} = \frac{7.46 \times 10^{10}}{1342} =$$

$$5.56 \times 10^7 \text{ dynes.}$$

Let d = the distance climbed.

Work done in overcoming friction alone equals:

force × distance = $5.56 \times 10^7\, d$.

Since the grade is 5 per cent, the vertical rise in distance d is $\frac{d}{20}$.

Work done in overcoming gravity alone equals:

$$\frac{gmd}{20} = \frac{980 \times 10^6 d}{20} = 4.9 \times 10^7 d.$$

Total work done in stopping car equals: $5.56 \times 10^7 d + 4.9 \times 10^7 d = 1.046 \times 10^8 d$.

Kinetic energy at 60 miles an hour = $\frac{1}{2} mv^2$.

60 miles an hour = 2684 cm./sec.

Initial kinetic energy = $5 \times 10^5 \times (2684)^2 = 3.6 \times 10^{12}$.

Since the total work done must be equal to the original kinetic energy, we have:

$$1.046 \times 10^8 d = 3.6 \times 10^{12};$$

whence, $d = \frac{3.6 \times 10^{12}}{1.046 \times 10^8} = 3.44 \times 10^4$ (distance in centimeters climbed by the car).

$$d = 344 \text{ meters.}$$

We thus see that the car would just fail to reach the top of the hill.

Problem 12.—Astronomers have calculated the total radiation output of the sun as 3.8×10^{33} ergs per second. If the sun's diameter is 864,000 miles, how much energy, in horse power, is radiated by each square inch of the sun's surface?

Horse power per square inch

$$= \frac{\text{Total Horsepower}}{\text{Area in square inches}} = \frac{P}{A}$$

Since 1 horsepower = 7.46×10^9 ergs/sec

$$P = \frac{3.8 \times 10^{33}}{7.46 \times 10^9}$$

$$A = 4\pi(4.32 \times 5.28 \times 1.2 \times 10^9)^2$$

$$\frac{P}{A} = \frac{3.8 \times 10^{33}}{7.46 \times 10^9 \times 4\pi(4.32 \times 5.28 \times 1.2 \times 10^9)^2}$$

This fraction is easily reduced with the help of logarithms. We find

$$\frac{P}{A} = 54 \text{ h.p.}$$

Problem 13.—A meteor having a mass of $\frac{1}{100}$ of a gram enters the earth's atmosphere at a speed of 40 kilometers per second. All the kinetic energy is converted into heat and light in 5 seconds. What is the average rate of energy radiation in watts?

Kinetic energy available $= \frac{1}{2} mv^2$

$= \frac{1}{200} \times 1.6 \times 10^{13}$ ergs.

Average energy radiation = 1.6×10^{11} ergs/sec.

1 watt = 10^7 ergs/sec.

Average energy radiation = 1.6×10^4 watts.

Thus the amount of heat and light given out by such a meteor would equal that of 160 100-watt electric lamps.

Problem 14.—A piece of iron weighing 10 grams is heated to a temperature of 600° C. (red-hot) and then quenched in half a liter of water at an initial temperature of 15° C. The specific heat of iron is .11. What would be the rise in temperature of the water?

Let x = final temperature

Heat given up by iron in cooling from 600° to $x°$

$= 10 \times .11(600 - x)$ cal.

Rise of temperature of water $= x - 15 = \frac{10 \times .11(600 - x)}{500}$

Whence $x = \frac{8160}{501.1} = 16.28°\text{C}.$

$x - 15 = 1.28°$ C.

CHEMISTRY

We speak of inanimate nature or the mineral world and of animate nature, the world of plants and animals. The materials and substances that make up these two worlds and the changes that the substances may undergo were long ago assigned for treatment to *inorganic chemistry* and *organic chemistry,* respectively; and this old classification is, broadly speaking, still true today. This time-honored separation is based upon the kind of matter that is being studied.

Many theories about matter and chemical change have been developed and later improved or discarded in favor of better theories. In such theoretical studies, the physical as well as the chemical characteristics of matter must be considered, and thus have grown up the great divisions of chemistry called *theoretical* and *physical* chemistry. Here belong subdivisions dealing with *atomic theory, atomic structure* and *radioactivity,* which will be mentioned later. One far-reaching theory discusses matter in the *colloid* condition, in which the forces at such interfaces as that between a solid and a liquid play an important role (*colloid* and *capillary* chemistry). *Chemical equilibrium,* including as in physics both statics and kinetics, and the rules, such as the *phase rule,* that govern equilibrium, form another branch of physical chemistry. When matter changes, not only does its substance change but also its energy changes. Very often the energy change is the more important of the two. As further divisions of physical chemistry, therefore, we have *thermochemistry, electrochemistry* and *photochemistry,* dealing respectively with the relations of chemistry to heat, electricity and light. As Sir J. J. Thomson has said, there is no longer any clear borderline dividing chemistry and physics. The fact that physics has made more progress in the last three decades than any science ever has in a like period of time is now enabling chemists and physicists to learn the reasons for those fundamental changes of chemistry that have to do with the binding of atom to atom, and that are studied under the name of *valency.*

Analytical chemistry is a division based primarily on the processes used. Broad subdivisions of this are qualitative analysis, which determines what substances are present; and quantitative analysis, which reveals exactly how much. This latter may be done either by measuring weights (gravimetric analysis) or measuring volumes (volumetric analysis). Other subdivisions include: (according to materials) gas analysis, organic analysis, analysis of food and drugs; and (according to method) microanalysis, colorimetric analysis, electrometric analysis, spectroscopic analysis.

In many schools in this country chemistry is divided for convenience of study into inorganic, organic, physical and analytical, as above outlined; but these divisions overlap. Laboratory work is sometimes called practical chemistry. Progress of the greatest practical value in industry is nowadays quite often the result of armchair theorizing. We are at present lacking more in guiding principles than in experimental facts.

Chemistry and the World's Work.—As civilization progresses, chemistry is applied to more and more of the activities with which mankind is busy. The branches of *applied chemistry* grow more numerous every day. Chemistry of drugs is *pharmaceutical chemistry;* of healing, *chemotherapy;* of life processes, *biochemistry* or *physiological chemistry;* of industrial processes, *industrial and engineering chemistry.*

It is of interest to enumerate a few of the industries in which chemistry is a vital factor, and which, therefore, have a chemistry of their own: the chemical industry itself (acids, alkalies and other chemicals); bleaching; fuels; electrochemical industries; metallurgy; lime, cement and plaster; clay, bricks and pottery; glass; paint; lacquer and varnish; fertilizers and insecticides; dyes; drugs; illuminating and heating gas; petroleum; wood distillation; oils, fats and waxes; soap; glycerine; essential oils, perfumes and flavoring materials; turpentine and rosin; gums and resins; rubber; sugar; papermaking; explosives; tanning; glue and gelatin manufacture.

Chemistry is the study of the different kinds of matter, called *substances,* and the changes involved when one substance is transformed into another. By means of various devices and planned experiments in the laboratory, occasionally by chance alone, the composition of substances is determined, their properties are noted, and they are identified and classified accordingly. This experimental evidence is the framework on which scientific laws and theories are built, and if subsequent experiments prove them to be true, they in turn may lead to invaluable practical applications.

Matter and Energy.—Matter constitutes the material of the entire physical universe, but its ultimate nature defies the inquiries of science. Until fairly recently it was believed that atoms were the final indivisible building blocks of nature. Now, however, it is certain that the atoms themselves are composed of still tinier particles —electrons and protons—that bear electrical charges. This has led to the present theory that matter, in its essence, is electricity.

There is no adequate, inclusive definition of matter. We may only describe certain of its properties and speculate on its true nature; however, we can say rather indirectly that *all matter possesses mass* and mass is the quantity of matter in an object.

Matter therefore occupies space and usually may be recognized by touch. The amount of matter in an object is determined by weighing it. The unit of weight is the gram, the weight of 1 cubic centimeter of water at 4° Centigrade.

Matter exists in three different states: solid, liquid and gaseous. Water, for example, may occur as ice, liquid or vapor, depending on the physical conditions of temperature and pressure.

Capacity for Performing Work.—Energy is the ability to do work, that is, to set matter in motion. It is generally classified in two types: *potential* or *static energy,* which exists whenever there is a strain capable of exerting a force through a distance; and *kinetic energy,* which is possessed by bodies in motion. A stretched spring, a piece of iron held at a distance from a magnet, a weight held at a height above the earth are all instances of potential or static energy.

A special form of potential energy is known as *chemical energy.* Chemical energy is possessed by any mixture or compound of substances that can undergo a chemical reaction with liberation of kinetic energy (usually in the form of heat). Explosives and combustibles are the most familiar examples, but every chemical reaction involves some transformation of energy.

Matter and energy are interdependent, for changes in matter always involve energy changes, and we cannot observe energy at all except by its effects on matter. Coal, a form of carbon, is an outstanding source of chemical energy. When it is burned, its substance changes and the potential energy is freed as heat. The coal itself is commonly spoken of as having chemical energy, but strictly speaking it is only the combustible mixture of coal and air that has the chemical energy.

When coal and air are burned, the heat may be applied to a boiler, generating steam, the pressure (energy) of which operates machinery; and this energy may be transformed again into electricity, light, motion or back into heat. Thus we see that energy may be transformed from one type to another, starting with the chemical energy of the coal. During all energy transformations the total amount of energy remains unchanged: energy can be neither created nor destroyed. *The Law of the Conservation of Energy:* In transformations of energy from one form to another, there is no gain or loss of the total amount of energy involved.

Substances and Their Properties.—A substance is a specific kind of matter, every sample of which has the same properties. The most important characteristic of a substance is its uniformity of composition. Pure substances have uniform composition and are said to be *homogeneous.* Sodium chloride (common table salt) is a homogeneous substance. Other forms of material having no definite properties and with variable (nonuniform) composition are called *heterogeneous.* All mixtures are heterogeneous and so is most of the material in the earth's crust. Granite is a mixture of feldspar, mica and quartz particles scattered irregularly throughout its mass. The similar particles in a mixture are called a *phase,* hence granite contains three solid phases.

A third general classification of materials is *solutions.* A solution is generally a solid completely dissolved in a liquid. All solutions are homogeneous, since the particles of the dissolved solid are so finely dispersed that they are invisible under a microscope. They are evenly distributed throughout the liquid, so that every sample of any one solution shows the same properties. A solution is not a pure substance, however, for its composition may be changed at will by altering the concentration of the dissolved material and thus changing the properties of the solution.

Preparation of Pure Substances.—Pure substances are indispensable to the chemist, for on their constant composition and properties he must base his experiments. Since pure substances rarely occur free in nature, the methods of obtaining them are important. They are infiltration, distillation, sublimation and crystallization.

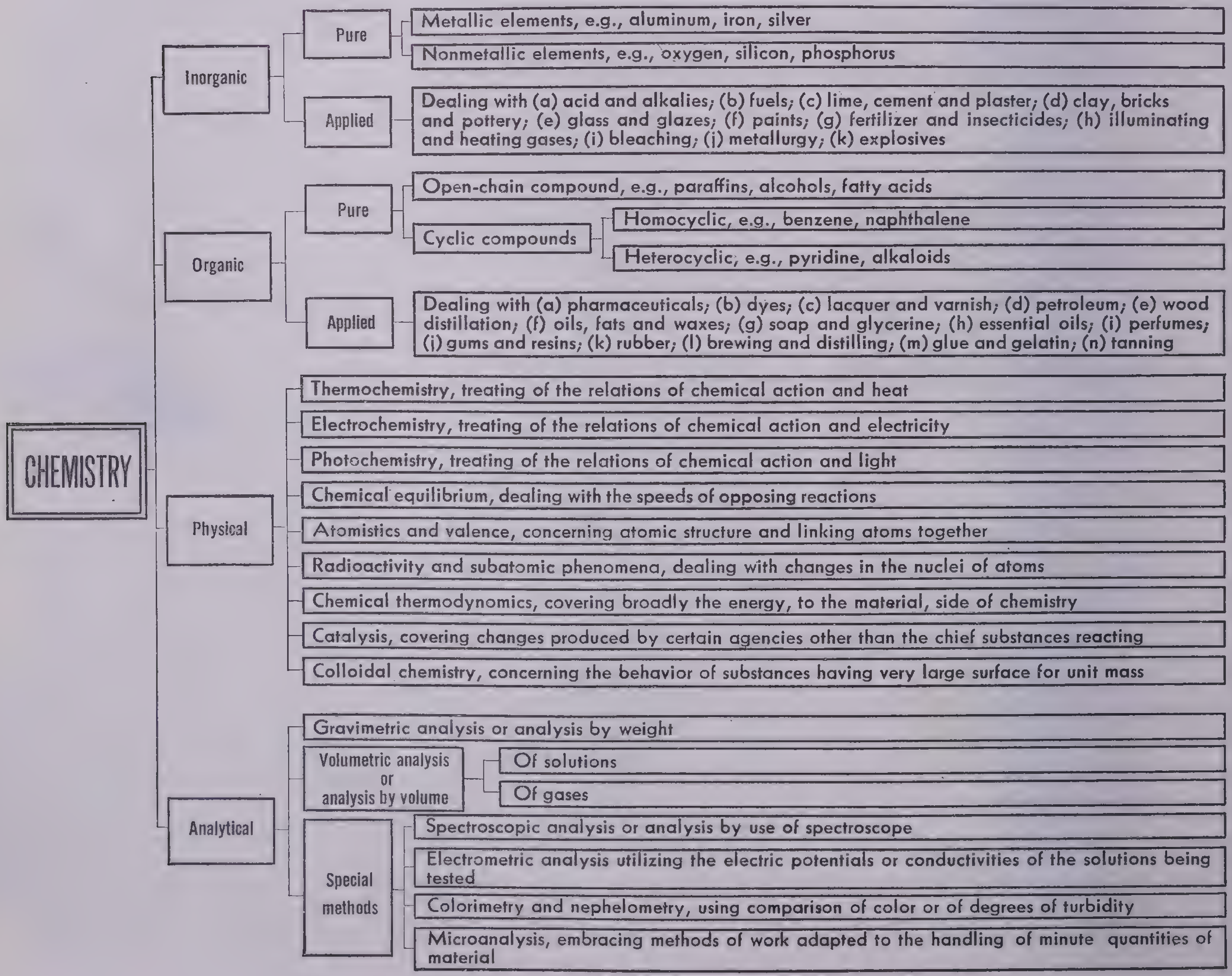
In *filtration* the insoluble solid matter is retained by a piece of unsized filter paper, but the liquid passes through the paper and is collected as the *filtrate.* Instead of filter paper, unglazed earthenware may be used to filter drinking water. In Pasteur filters the pores in the earthenware are so small that some minute microbes cannot pass through them.

In *distillation* a liquid by raising its temperature is converted into gas and is so separated from any accompanying substances that are less *volatile,* that is, less easily converted into gas. Pure drinking water may be obtained on board ship from sea water, which contains less volatile salts, including common salt. The gaseous water (steam) is *condensed* to water again by passage through a cooled tube. The changes from water into steam and vice versa are *physical changes,* because analysis shows that steam and water consist of the same substance differing only in state, steam being in the gaseous, water in the liquid, and ice in the solid state.

Sublimation is the distillation of solids; for example, salammoniac and benzoic acid are purified by sublimation. *Lixiviation* and *leaching* refer to dissolving out a soluble substance from its admixture with an insoluble substance.

Crystallization is the method of recovering a substance in solid form from its solution, usually by raising the temperature of the solution and at the same time increasing its concentration by adding more of the dissolved substance. Since heat increases the solubility of most substances, gradual cooling of the concentrated solution diminishes solubility to the point where the substance can no longer be held in solution and is deposited as crystals. When two or more substances of different solubility are together in solution, they may be recovered separately by repeated *fractional crystallization.* Similar to this in principle is *precipitation,* accomplished by adding a material that reacts with the substance in solution to form an insoluble compound that may be separated out. This compound is then broken down by various chemical means, permitting the recovery of the desired substance in its pure state.

THE DIVISIONS OF CHEMISTRY



- CHEMISTRY
  - Inorganic
    - Pure
      - Metallic elements, e.g., aluminum, iron, silver
      - Nonmetallic elements, e.g., oxygen, silicon, phosphorus
    - Applied
      - Dealing with (a) acid and alkalies; (b) fuels; (c) lime, cement and plaster; (d) clay, bricks and pottery; (e) glass and glazes; (f) paints; (g) fertilizer and insecticides; (h) illuminating and heating gases; (i) bleaching; (j) metallurgy; (k) explosives
  - Organic
    - Pure
      - Open-chain compound, e.g., paraffins, alcohols, fatty acids
      - Cyclic compounds
        - Homocyclic, e.g., benzene, naphthalene
        - Heterocyclic, e.g., pyridine, alkaloids
    - Applied
      - Dealing with (a) pharmaceuticals; (b) dyes; (c) lacquer and varnish; (d) petroleum; (e) wood distillation; (f) oils, fats and waxes; (g) soap and glycerine; (h) essential oils; (i) perfumes; (j) gums and resins; (k) rubber; (l) brewing and distilling; (m) glue and gelatin; (n) tanning
  - Physical
    - Thermochemistry, treating of the relations of chemical action and heat
    - Electrochemistry, treating of the relations of chemical action and electricity
    - Photochemistry, treating of the relations of chemical action and light
    - Chemical equilibrium, dealing with the speeds of opposing reactions
    - Atomistics and valence, concerning atomic structure and linking atoms together
    - Radioactivity and subatomic phenomena, dealing with changes in the nuclei of atoms
    - Chemical thermodynamics, covering broadly the energy, to the material, side of chemistry
    - Catalysis, covering changes produced by certain agencies other than the chief substances reacting
    - Colloidal chemistry, concerning the behavior of substances having very large surface for unit mass
  - Analytical
    - Gravimetric analysis or analysis by weight
    - Volumetric analysis or analysis by volume
      - Of solutions
      - Of gases
    - Special methods
      - Spectroscopic analysis or analysis by use of spectroscope
      - Electrometric analysis utilizing the electric potentials or conductivities of the solutions being tested
      - Colorimetry and nephelometry, using comparison of color or of degrees of turbidity
      - Microanalysis, embracing methods of work adapted to the handling of minute quantities of material

Properties and Changes of Substances.—Since pure substances are homogeneous, they have uniform composition, and all samples of a specific substance will show the same properties. (From this point on, all discussion of substances assumes them to be in the pure state.) These properties or characteristics of a substance are the means by which it is identified and described. There are two kinds of properties, physical and chemical.

Physical properties can be perceived by the senses or measured with instruments. Examples of such properties are: color, taste, odor, touch (slippery, gritty or other characteristic), density, solubility and ability to conduct electricity and heat. Where solids are involved, the shape of their crystals is significant. Other substances take the form of liquids or gases at normal temperature and pressure. Freezing and boiling points also are of concern to the chemist.

Chemical properties or chemical reactions are the changes in composition undergone by a substance when it is subjected to various conditions.

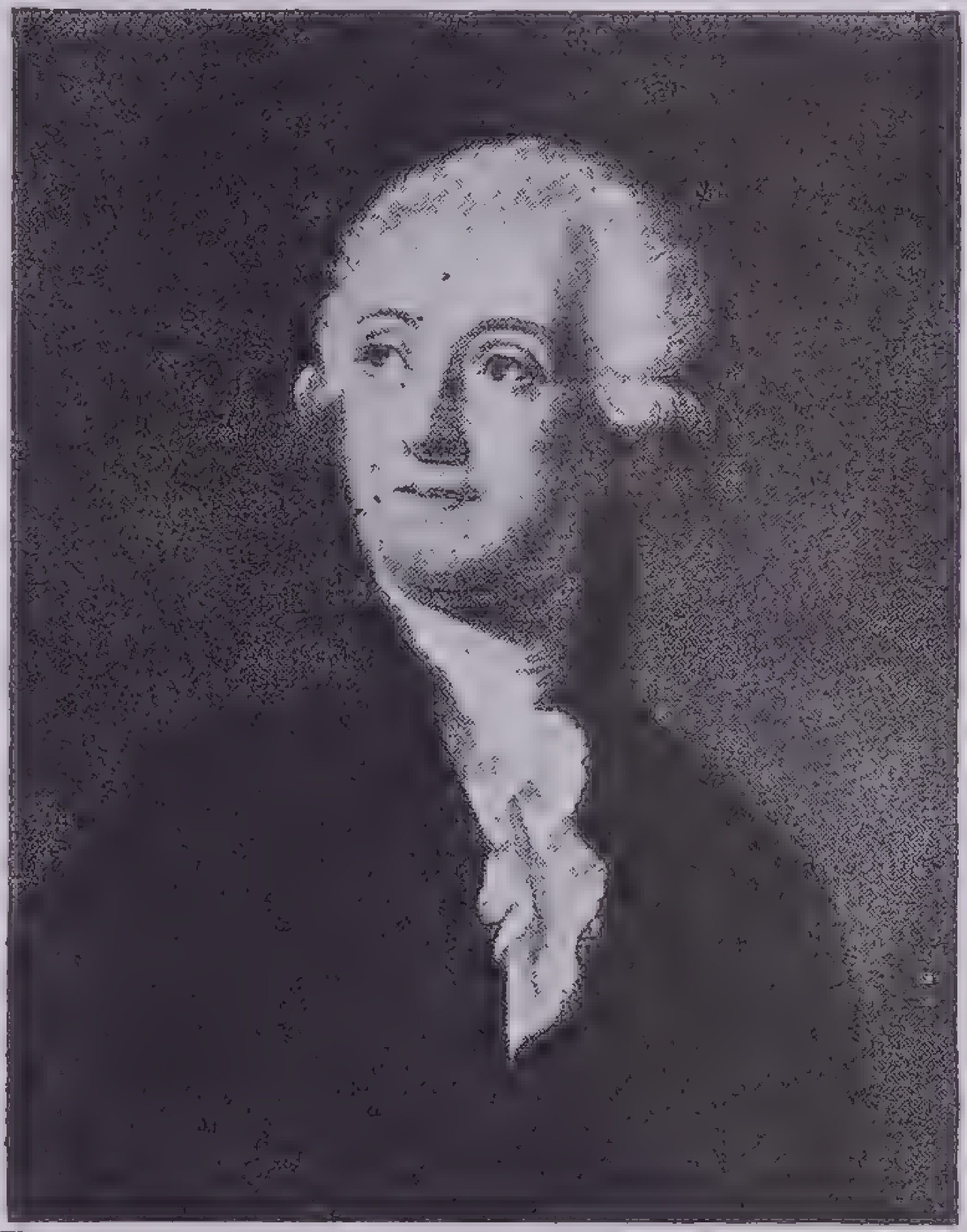
The various changes that different substances may undergo are the same two types, physical and chemical. In a *physical change* there are alterations in the substance but none in its composition. When water is heated until it boils or is cooled until it forms ice, the substance is changed, but its composition remains the same, for steam, ice and water all contain the same proportions by weight of hydrogen and oxygen. Similarly heating an iron bar to redness involves physical change. Note that physical changes tend to be only temporary; in the above examples, when temperature is returned to normal, the steam will condense to water, the ice will melt to water, and the iron bar will cool off to resume its normal state.

In a *chemical change,* the composition of the substance is changed and new products are formed. When an electric current is passed through water, the water is broken down or *decomposed* into two gases, hydrogen and oxygen. Since neither of these gases has the composition of water, it is clear that there has been a chemical change. When iron is exposed to air, it gradually combines with atmospheric oxygen to form iron oxide (rust). This is a chemical change. These changes, unlike physical changes, are permanent. The chemical properties of a substance are a function of its composition and because of them the substance can enter the chemical changes that characterize it.

The French chemist Lavoisier (1743–94) was the first to discover a definite quantitative relationship in chemical changes. By repeating the same change and each time carefully weighing the substances involved, he found that the ratio of the amounts of those substances were constant. This is the *Law of Definite Proportions:* In a specific chemical change the proportions by weight of the substances concerned are fixed and definite. This is easily understood when we consider that pure substances have definite composition.

Having established the law of definite proportions by quantitative measurements, Lavoisier used the same technique in determining the relation between the weights of reacting substances and the weights of their products; and in 1785 he announced one of the most fundamental generalizations of chemical science—the *Law of Conservation of Mass:* The total weight of the substances involved in a chemical reaction is equal to the total weight of the products.

When a candle is burned in a closed vessel of air, part of the candle will be consumed before it goes out, but the total weight of the vessel and its contents is unchanged. The reacting substances are the carbon and hydrogen that compose the candle, and the oxygen from the air in the vessel. The carbon and hydrogen react with the oxygen to form carbon dioxide and water, which remain confined in the vessel.



From a portrait by Jacques Louis David

Antoine Laurent Lavoisier

As still more oxygen is used in the process, the point is reached where it is insufficient to support combustion, and the candle is extinguished. The new substances thus formed (carbon dioxide and water) are exactly equal in weight to the consumed portion of the candle and the oxygen; therefore the total weight of the vessel remains constant.

We have already seen that energy, although it may be changed, can be neither created nor destroyed; now it is evident that the same applies also to matter.

Elements and Compounds.—All pure substances may be divided according to their composition into two main classes—elements and compounds. An element is a simple (elementary) substance that cannot be decomposed into other simpler substances. A compound is a complex substance that can be decomposed into two or more elements. Water was once thought to be a simple substance, but now we know that it can be decomposed into two simpler substances—hydrogen and oxygen. Water, therefore, is a compound composed of these two elements.

Although this definition of an element is valid for most purposes, modern research has shown that several elements may be decomposed in minute quantities by complicated laboratory methods; and radium, itself an element, decomposes spontaneously, forming other elements in the process.

There are 92 known elements. In the free state and in their combinations they constitute all matter as we know it, but only a few of them occur abundantly in nature. The following table shows the estimated relative abundance of the commonest elements in the earth's crust, the sea and the atmosphere:

	Per Cent		*Per Cent*
Oxygen	49.2	Potassium	2.4
Silicon	25.7	Magnesium	1.9
Aluminum	7.4	Hydrogen	0.9
Iron	4.7	Titanium	0.6
Calcium	3.4	Chlorine	0.2
Sodium	2.6	Phosphorus	0.1

These 12 elements comprise more than 99 per cent of the total and are found almost entirely in combined forms.

The elements are classified as metals and nonmetals. Aside from such well-known metals as iron, lead, copper and silver, nearly all the less familiar metals have names ending in *-um* or *-ium* and can be distinguished from the nonmetals in this way. A complete table of the elements and important facts pertaining to them will be found at the end of this article.

The number of different chemical compounds known today is perhaps half a million. Comparatively few occur in nature; the majority are made in the laboratory. In experimental work of this nature, besides discovering new and useful substances, methods are developed for producing familiar substances at less than the cost of extracting them from nature. These synthetic processes are becoming increasingly important in the dye, textile and rubber industries.

Laboratory investigation of compounds follows two general techniques—*analysis* and *synthesis.* Analysis is breaking down or decomposing a compound into its constituent elements. The elements are then identified by *qualitative* analysis, and their relative weight or volume is determined by *quantitative* analysis. Synthesis, the direct opposite of analysis, is building a compound from simpler compounds or elements. Water is analyzed when an electric current is passed through it, decomposing it into hydrogen and oxygen; it is synthesized when hydrogen gas is burned in the presence of oxygen, forming water.

Compounds are homogeneous, and hence *the elements comprising a given compound are always present in the same proportion by weight.* The properties of a compound are different from those of its constituent elements. All samples of water, no matter where taken, contain the same proportions of hydrogen and oxygen when impurities have been removed; but the properties of water have no similarity to those of the hydrogen and oxygen that make it.

Most elements can be made to combine directly with oxygen, and in each compound thus formed there is a definite proportion by weight of the oxygen and the element combining with it. Experiments have determined the weight of each element that combines with a fixed weight of oxygen. For every eight parts of oxygen, the number of reacting parts of the other elements is never less than one. This type of relationship is an *equivalent weight,* which is defined as *the number indicating how many parts by weight of a certain element will combine with eight parts by weight of oxygen.* Thus 8 parts of oxygen will combine with 1.008 parts of hydrogen, 3 of carbon and 12.16 of magnesium; and if other proportions than these are used, the excess remains as a residue.

There are certain pairs of elements that may be combined under different conditions to produce several different compounds. Although these compounds are made up of the same two elements, the elements are present in different proportions by weight, as expressed in the *Law of Multiple Proportions:* In a series of compounds formed by the same two elements, the weights of one element that combine with a fixed weight of the other are in the ratio of small whole numbers. The elements nitrogen and oxygen, for instance, can combine in different proportions to form nitrous oxide, nitric oxide and nitrogen dioxide. When the weights of oxygen that would combine with 1 gram (a fixed weight) of nitrogen are calculated for the three compounds, they are found to be in the simple ratio of 1:2:4, respectively. In other words, per gram of nitrogen, nitrogen dioxide has twice as much oxygen as nitric oxide and four times as much as nitrous oxide. This is typical of all other cases involving two or more compounds composed of the same elements and is one of the principles on which the atomic theory is based.

The Atomic Theory and Molecules.—We have already seen that when two or more elements combine to form a compound, they unite in definite proportions by weight; and that the total weight of the elements involved is exactly equal to that of the resulting product. On the basis of these proved facts it is logical to assume that each element is composed of unit particles having the same mass and that the same number of them enter a specific reaction each time that reaction is carried out.

John Dalton in 1807 was the first to express this idea in concrete form, based on experimental evidence. His atomic theory, unchanged today in its principles, is perhaps the most important concept in modern physical science. In essence it states that: (1) *elements are composed of infinitesimal particles called atoms;* (2) *atoms of the same element have identical properties and mass, but atoms of different elements have different properties and mass;* (3) *atoms of different elements unite to form compounds, and these atoms are the reacting units.* (Note: The word atom means indivisible, not capable of separation. It was long after the name was given that chemists discovered that the atom could be divided.)

For several years after the publication of the atomic theory Dalton made no distinction between the smallest particles of an element, the atoms, and the smallest particles of a compound. From (3) above, however, it is clear that the unit particles of a compound must be composed of the atoms of the constituent elements, and in 1811 the Italian chemist Avogadro bridged the gap with his molecular hypothesis, calling these particles *molecules* (literally, *little masses*) and defining them as *the smallest particles of a substance that can exist in the free state, showing the properties of that substance.* (*Substance* here applies to elements as well as compounds.) Oxygen cannot exist in the free state as separate atoms but only as pairs of atoms, so that one molecule of oxygen consists of two identical atoms joined together. The molecules of other elements are aggregates of three, four or even eight atoms. In still other elements, such as helium and argon, the single atom can exist free and there is no difference between the molecule and the atom. Such elements are called *monatomic* (single atom). To sum up, the molecule of an element is either a single atom or an aggregate of identical atoms, but the molecule of a compound is always a combination of the different atoms of the constituent elements. A molecule is the *physical* unit of a substance and has the properties of that substance; but an atom is the *chemical* unit and generally has not the properties of the substance.

John Dalton

There are many laboratory devices and experiments establishing the existence of molecules and atoms. The evidence is unquestionable but necessarily indirect, for even the largest molecules are too small to be seen under the highest possible magnification, their diameters being much smaller than the shortest light waves visible to the eye. Their *effects,* however, can be easily observed.

So many phenomena are easily and logically explained by the atomic theory that its truth is universally accepted. In a chemical reaction the molecules of the substances involved interact with one another by exchanging their atoms, which recombine to form molecules of different substances with different properties. The weights of the atoms themselves remain unchanged and so the total weight is unaffected throughout, in conformity with the law of conservation of mass. The experimental fact that elements always combine in definite proportions by weight implies that a definite number of the atoms of each element is involved and that the molecule of a compound always contains the same number of atoms of its constituent elements. The law of multiple proportions and the system of equivalent weights can be similarly interpreted in terms of the atomic theory—and it seems impossible to interpret them on any other theory.

Although atoms may be weighed by indirect methods in the laboratory, their actual weights expressed in grams would be too small for practical purposes. A system of relative weights is based on that of oxygen, which is taken arbitrarily as the number 16. On this basis the weight of hydrogen, the lightest element, is 1.008 and that of uranium, the heaviest element, is 238.14. Hydrogen, therefore, is more than one-sixteenth (1.008 ÷ 16) as heavy as oxygen, and uranium is nearly 15 times (238.14 divided by 16) as heavy as oxygen. The relative weight of the atom of an element, measured in this way, is called its *atomic weight.* The comparative weights of molecules or *molecular weights* are similarly determined, for since all molecules are made up of atoms, the molecular weight of a substance is the sum of the atomic weights of all the atoms in a molecule of that substance.

Atomic and molecular weights are expressed in unfamiliar units, for the standard unit of weight in scientific work is the gram; but 1 gram of a compound contains an enormous number of atoms and molecules; moreover, this number would vary with different substances. If, however, we assign a number of grams equal to the number expressing the atomic weights of each element in the compound, that number of grams will always contain the same number of atoms; and the same applies to molecules. In other words, the *gram atomic weight* of a substance is simply the atomic weight expressed in grams; and the *gram molecular weight* or *mole* is the molecular weight expressed in grams.

Atomic Structure.—For many years after Dalton's work, atoms were accepted as the final and indivisible units of matter. Inconceivably tiny as they are, it seemed fantastic to imagine that atoms themselves might be composed of still tinier particles; and yet exactly this was shown to be true. At the close of the 19th century, astonishing discoveries in the field of X rays and radioactivity brought the recognition of atoms as complex systems of particles of electricity (electrons) rapidly revolving in concentric orbits about a nucleus, composed of tightly packed electrons and oppositely charged protons. The development of this concept belongs to the story of electromagnetism and radioactive phenomena in their physical, rather than their chemical manifestations. The steps leading to this discovery of protons and electrons are described in PHYSICS, under *Invisible Radiations,* and the actual structure of atoms with its applications to chemistry is treated below. There can be no definite division between chemistry and physics, and here the two sciences join forces in attacking the same problem from different angles.

Electrons and Protons.—Atoms are composed of two kinds of units—*electrons* and *protons.* Electrons are units of negative electricity, and protons are units of positive electricity; but these simplest units are not yet by any means fully understood, and there is evidence of a smaller particle of positive charge than the proton—the *positron,* which may be the true unit of positive electricity. The charge of an electron is the same as the charge of a proton, but of opposite sign.

The mass of the proton is 1,847 times greater than that of the electron, but its volume is very small because it is highly compressed. The masses of both electron and proton are entirely electromagnetic in origin. This means that matter is composed of electricity and that electricity comes in unit packages of opposite electric signs. Further experimental study of electrons shows that each electron is accompanied and directed by a wave train of its own, and our future knowledge will doubtless grow out of a development of this finding with the aid of the new wave mechanics.

Nucleus and Planetary Electrons.—All the positive charge of any atom is concentrated in a very minute nucleus, which consists (except in the simplest atom, hydrogen) of a certain number of protons and at least half as many electrons. The hydrogen nucleus consists of a single proton; therefore a proton may be accurately defined as the nucleus of a hydrogen atom. Other nuclei contain more than one proton. The aluminum nucleus consists of 27 protons and 14 electrons. The net positive charge on this nucleus is therefore +13. Around this nucleus are 13 extranuclear or planetary electrons, revolving in orbits as the planets revolve round the sun and held in their orbits not by gravity but by electrostatic attraction. The aluminum atom as a whole is therefore electrically neutral. Its mass resides almost entirely in its nucleus, since protons so greatly exceed electrons in mass. Aluminum is said to have the *atomic number* 13, because its nuclear charge is 13, and the number of its planetary electrons is 13. The atomic numbers of the chemical elements run from 1 for hydrogen, 2 for helium, 3 for lithium and so on, up to 92 for uranium. If all the elements are arranged in order of ascending atomic numbers, aluminum is the thirteenth element. The atomic number of an element is: Its number of planetary electrons; the positive electrical charge on the nucleus; and the number of the element in its order from 1 to 92. Only two of the 92 elements from hydrogen to uranium have not yet been discovered; namely, numbers 85 and 87.

Knowledge of the kinds of orbits in which the planetary electrons travel helps us to understand the readiness or reluctance of atoms to combine with one another. For example, certain groupings of the outermost electrons, especially groups of two and of eight, are particularly stable. We may say that two atoms will have an excellent reason to combine if, by doing so, each can attain a group of eight for its outer ring or shell of electrons. Helium is the only atom with but two electrons in its outer shell, each very firmly bound there. Neon, argon, krypton, xenon and radon each have exactly eight. All six of these atoms resemble each other very closely, despite their enormous differences in weight, because each is an inert gas and fails to combine with any other element. Since they already have such stable arangements of electrons in their outer shells as two or eight, they have nothing to gain, as it were, by combining. The interpretation of the chemical properties of elements through their atomic structures is more fully explained below under *The Periodic Law* and *Valence.*

Disintegration of Nuclei.—To chemistry the most significant part of an atom is its outer shell of planetary electrons. Until the year 1896 all chemical reactions then known were caused by changes in these outer electrons, and the nucleus, the essential part of the atom, was assumed to be unaffected. Since that time, however, it has been found that all atoms above number 81, and also a few others, may have unstable nuclei. When an atomic nucleus spontaneously goes to pieces, we have the phenomenon of *radioactivity,* as exhibited by radium, thorium, uranium and so forth. Such a nucleus usually breaks into only two pieces; namely, a residue; and either (α) an alpha particle or (β) an electron. An alpha particle is nothing else than the nucleus of a helium atom or, in other words, a helium atom (atomic number 2) carrying two positive charges because it has lost its two planetary electrons. These alpha particles are expelled with very high speed from the radioactive nucleus out of which they come and are called *alpha rays.* In cases where the radioactive nucleus ejects an electron, there are *beta rays,* which consist of a stream of very swiftly moving electrons. Some of the planetary electrons of the atom are always jerked out by the radioactive cataclysm, and therefore beta rays are not exclusively of nuclear origin. Because in an alpha-ray change the nucleus loses two positive charges, the atomic number of the radioactive atom goes down by two; and the resulting new atom has an atomic number two less. In a beta-ray change, the original nucleus loses one electron, and so gains one unit of positive charge; and the new atom brought into being has an atomic number one higher.

The enormous energy with which alpha particles are expelled from the radioactive nucleus makes them the most energetic entities available in the laboratory. Rutherford used them as missiles to shoot at the nuclei of other atoms to see if he could break them. In this way he succeeded in knocking protons out of a dozen different sorts of atoms, all of low atomic number. What remains after the target nucleus has lost a proton is certainly not the original nucleus but that of a new atom. Artificially changing one atom into another is *transmutation,* and Rutherford succeeded where the alchemists failed. Recent work in this field has revealed another kind of particle in the atom besides protons and electrons. The bombardment of beryllium and boron atoms by alpha rays expels *neutrons,* which are uncharged particles formed by the close combination of a proton and an electron.

Isotopes.—The discovery of radioactivity and refined methods of weighing atoms disclosed the fact that many elements exist in two or more forms having the same atomic number and chemical properties but different atomic weights. Atoms showing these characteristics are called *isotopes,* and their atomic weights are always expressed in whole numbers. The atoms of many elements occur as unvarying mixtures of isotopes that cannot be separated because of their identical chemical properties; hence the weight of such an atom probably will be a fractional figure.

A case in point is the chlorine atom, having the atomic number 17. Its nucleus has a positive charge of +17. This could be made up of 35 protons and 18 electrons or 37 protons and 20 electrons or in other ways. As a matter of fact, it is found by the method called *positive ray analysis* that some chlorine atoms weigh 35 and others 37. When we weigh chlorine atoms by the older methods of analysis, we find 35.46; but this is merely an average value, and it tells us, by arithmetic, the proportions of the two chlorines that are mixed together. Isotopic forms of an element have the same nuclear charge but different masses in typical cases. Since the charge governs the number and arrangement of the planetary electrons of the atom, on which depend all the ordinary chemical properties, it follows that isotopic forms are identical chemically. The isotopes of lead were found by the methods of radioactivity and were among the first discovered.

An English chemist, Frederick Soddy (1877–   ), had propounded the theory of isotopes and suggested the name in 1912. Another English scientist, Francis William Aston (1877–   ), studied the spectrographs of various atoms and in 1919 proved Soddy's theory conclusively, establishing, for instance, that 90 per cent of neon is composed of atoms with a weight of 20; and 10 per cent, of atoms with a weight of 22; hence the atomic weight of neon is 20.2. In rapid succession proof came from English laboratories of the isotopes of boron, silicon, bromine, sulphur, phosphorus and arsenic. In the United States, William Draper Harkins (1873–   ) at the University of Chicago separated the lighter and heavier atoms of chlorine; and Professor Harold Clayton Urey (1893–   ) of Columbia University found that there are two (or even three) different atomic weights of hydrogen and by continuous electrolysis of water removed the lighter or ordinary hydrogen leaving only the heavier hydrogen in a strange compound called *heavy water*. In 1937 Dr. Urey nearly completed the task of isolating the heavy isotopes of nitrogen, potassium and carbon. Heavy nitrogen makes it possible to investigate in a new way the processes of digestion.

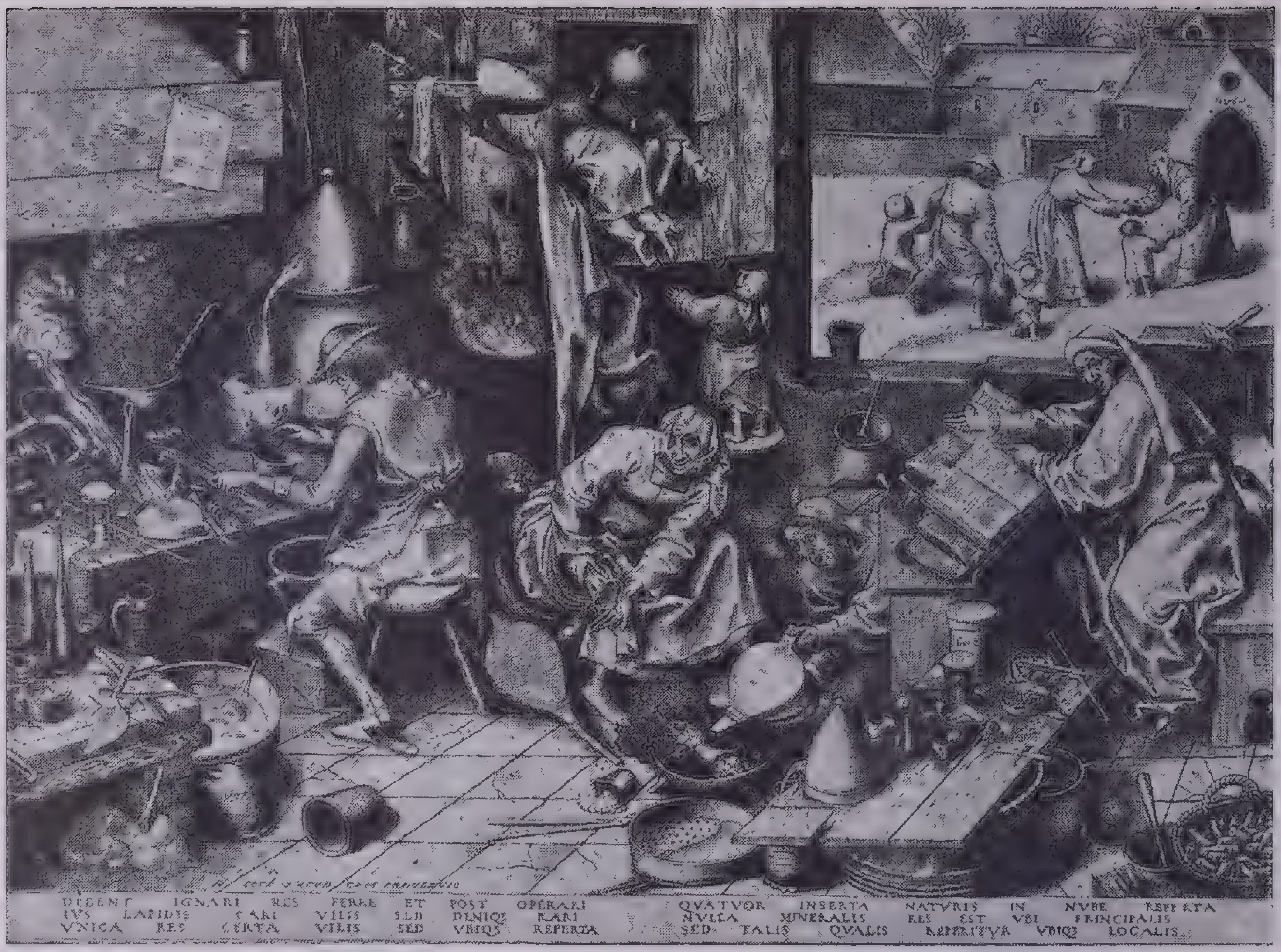
The doctrine of isotopes has completely changed many of our fundamental notions about chemistry. For one thing, in the matter of classification, it has shown that there are few elements (if any) with integer atomic weights; and it has explained why the weights are fractions.

Dalton's atomic theory, though it is perfectly valid in principle, must be modified in certain details, since atoms are not indivisible particles but are comparatively open-spaced systems of still smaller particles. In spite of this the atom remains the reactive unit, entering as an undivided whole into chemical combinations, in accordance with Dalton's postulate. The discovery of isotopes no longer permits us to assume that all the atoms of a certain element have the same mass. Nevertheless atomic weights have lost little of their significance, because isotopes nearly always occur mixed in definite proportions, so that all atoms of these mixed isotopes will weigh the same, and the law of definite proportions still holds for all practical purposes. One exception to this is lead, which may occur in different isotopic mixtures because it is a product of radioactive disintegration.

The Periodic Law.—A much more significant classification of the elements than the division into metals and nonmetals is found by arranging them in the order of their atomic weights.

The confirmation of Dalton's theory and the accurate determination of atomic weights led to the discovery of definite relationships between the atomic weights of certain elements having similar chemical properties. When all the elements are arranged in the ascending order of atomic weights, their properties tend to be duplicated by other elements at certain points in the series. This generalization, although by no means mathematically consistent, embodied an important principle stated by the Russian chemist Mendelyeev in the *Periodic Law:* The properties of the elements are a periodic function of their atomic weights.

Basing their observations on this principle, Mendelyeev and Meyer, working independently, reached a systematic classification of the elements in 1869. It revealed surprising facts but offered no explanation of the fundamental reason for its method of arrangement. The difficulty was solved at the end of the century by the discovery of electrons, which accounted for the similarities between elements in terms of similar atomic structures (*see above*). The repetition of properties, therefore, is now assumed to be a function of atomic numbers rather than of atomic weights as postulated by Mendelyeev.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SED TALIS QVALIS REPERITVR VBIQ LOCALIS

Courtesy Metropolitan Museum of Art

The Alchemists' Attempts At Transmutation Were Unscientific

The Flemish artist Pieter Breughel (*c.* 1525–69) here ridicules those who spend all their money for alchemistic experiments, while their families have to go to the poorhouse. The inscription in medieval Latin deals with the search for the philosopher's stone that would transmute the baser metals into gold

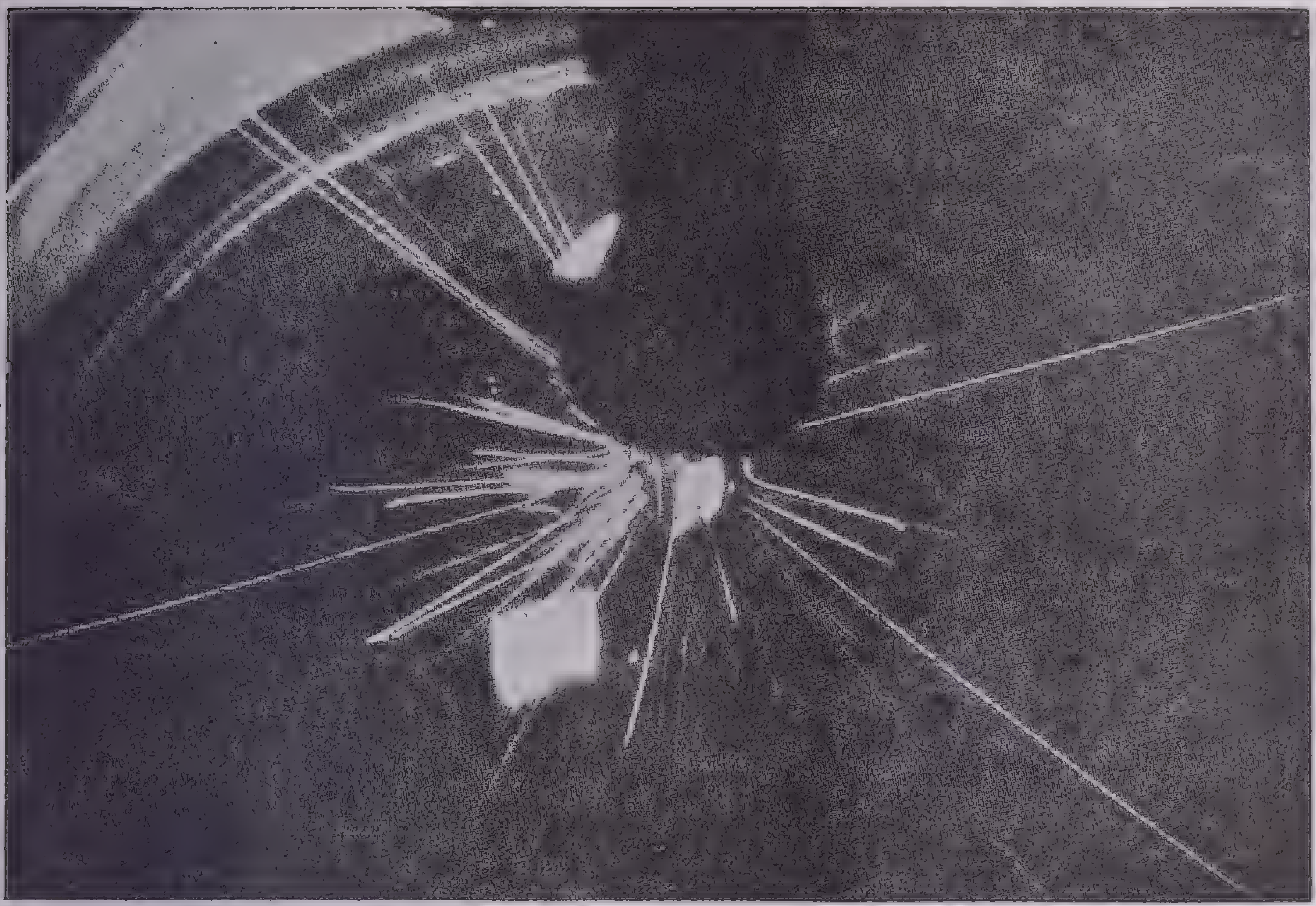
The actual arrangement of the elements, however, remains identically the same as in Mendelyeev's grouping, for the atomic numbers of practically all the elements follow the same order as their atomic weight.

In the accompanying table the elements are represented by their formulas, followed by their atomic numbers. The atomic numbers are in numerical order, reading from left to right by periods. The vertical columns or groups contain families of elements that are markedly similar within each group. Hydrogen and helium, the two lightest elements, are unique in the series, and the first period is assigned to them alone. Group O in the right-hand column is the family of rare inert gases, referred to before as resembling one another because of the stability of their atomic structures. These gases had not been discovered when Mendelyeev first published his table and were added to it later. Fifteen of the elements, atomic numbers 57 to 71, the rare earths, have been entered in the table as a single unit in the classification (Group III, Period 6.)

The arrangement of the elements in the table is not clear at first glance. This is because the periodicity or repetition of properties occurs at a longer interval for the elements of higher atomic number than it does for those of lower atomic number. Omitting hydrogen and Group O, we start at lithium (Li3) in Group I and read across the table through elements of increasing atomic number until we come to sodium (Na11) directly beneath lithium. These two are almost exactly alike in properties, and sodium is the eighth element after lithium. The interval here, then, is 8. Similarly from sodium to potassium (K19), the next related element, is an interval of 8. These intervals are often called *octaves*. After this point, how-

PERIODIC CLASSIFICATION OF THE ELEMENTS
(Based on Atomic Numbers)

GROUP	I	II	III	IV	V	VI	VII	VIII			O
Period 1	H1										He2
2	Li3	Be4	B5	C6	N7	O8	F9				Ne10
3	Na11	Mg12	Al13	Si14	P15	S16	Cl17				A18
4	K19	Ca20	Sc21	Ti22	V23	Cr24	Mn25	Fe26	Co27	Ni28	
	Cu29	Zn30	Ga31	Ge32	As33	Se34	Br35				Kr36
5	Rb37	Sr38	Y39	Zr40	Cb41	Mo42	Ma43	Ru44	Rh45	Pd46	
	Ag47	Cd48	In49	Sn50	Sb51	Te52	I53				Xe54
6	Cs55	Ba56	La57 to Lu71	Hf72	Ta73	W74	Re75	Os76	Ir77	Pt78	
	Au79	Hg80	Tl81	Pb82	Bi83	Po84	—85				Rn86
7	—87	Ra88	Ac89	Th90	Pa91	U92					



Courtesy Bell Telephone Laboratories, Inc.

Artificial Transmutation

In this picture lithium is being bombarded by deutons, the nuclei of hydrogen isotopes. The lithium is transmuted into helium

ever, the heavier elements, such as iron, nickel and copper, with higher atomic numbers intervene. The long period now occurs, and there is an interval of 18 between potassium and rubidium (Rb37), the next similar element. The same interval holds between copper (Cu29) and silver (Ag47) that belong to a subgroup; and rubidium (Rb37) and cesium (Cs55). The rather odd arrangement of the table is necessary to accommodate these long periods with their subgroups.

Note that Groups I–VII consist of main groups on the left of each column and subgroups on the right. Each of the main groups is a closely related family of elements; in the subgroups the relationship, though it is not so marked, is still definite. An outstanding common property of the elements within each group is a similarity of valence or combining power, which is discussed below. In general the metals are found in the low-numbered groups on the left side of the table, and the nonmetals in the high-numbered groups on the right with the intermediate elements in the center groups. Group VIII, an apparent exception to this, represents three sets of transition elements lying between the nonmetals of Group VII, called the *halogens*, and the strongly active metals of Group I, called the *alkali family*. Within any one of the first seven groups metallic properties increase and nonmetallic properties decrease as we go down the column through elements of increasing atomic weight. For example, in Group II beryllium (Be4) is the least active metal and radium (Ra88), the most active. Conversely in Group VII fluorine (F9) is the most active nonmetal and iodine (I53), the least active. There are many other relationships shown in the table that cannot be enumerated here.

The periodic classification is not perfect. There are numerous inconsistencies and arbitrary arrangements of the table that are at variance with the fundamental principle on which it was based. It does not permit the logical distribution of 15 elements, the rare earths (La57 to Lu71). Nevertheless the Periodic System is the most useful and satisfactory correlation of chemical facts that has yet been devised. The discrepancies it revealed in the atomic weights of certain elements have led to their redetermination and correction. Elements have even been discovered by means of it. When Mendelyeev first arranged his table, he had to leave blanks for many unknown elements. By noting the characteristics of the related elements in the groups where these blanks occurred, he was enabled to predict the existence of the undiscovered elements and to state their properties. Before their actual discovery these elements were given the names of the known elements to which they are related, and the prefix *eka*, meaning *one step further* (from Sanskrit *eka*, one), was added to the name. Thus *ekasilicon*, because it immediately followed silicon in the series; *ekaboron*, following boron and so on. Upon their discovery they were rechristened, sometimes in honor of the discoverer or of his native country. Thus ekasilicon is now called *scandium;* and ekaboron, *germanium*. Knowing the general properties of the elements they were seeking, scientists were able to proceed systematically on their search, and nine elements were discovered in this way.

Note in this connection that two blanks still remain in the table as it now stands. They are elements of atomic numbers 85 and 87 at the foot of Groups VII and I, respectively. Although their existence is known and their general properties have been predicted, the actual isolation of these last two elements is in question at the present time. They have not yet been actually discovered. Number 85 may be Alabamine and 87 may be Virginium—but it is not certain.

Valence.—The combining power of the atom of an element is called its *valence*. Examination of a number of different compounds of the same element shows that different numbers of atoms of that element occur in the molecules of the different compounds. This is an index of the combining capacities of the other elements involved, relative to the one element occurring in all the compounds. The one element used as a criterion is hydrogen, for it is the lightest element of all, and no other element (except the rare inert gases) has less combining power. Hydrogen, therefore, has a valence of 1 because one atom of hydrogen never unites with more than one atom of another element.

Consider a series of compounds entered into by hydrogen. In forming a molecule of hydrochloric acid one atom of chlorine joins with one atom of hydrogen; therefore chlorine has a valence of 1. A number of other elements also have the same valence as hydrogen. This is called *univalence*. One atom of oxygen attaches to itself two atoms of hydrogen to form water, so oxygen has a valence of 2 or is *bivalent*. Nitrogen's valence is 3 (*trivalent*) because its atom combines with three atoms of hydrogen to form ammonia. An atom of carbon binds four atoms of hydrogen to itself in a molecule of methane gas, so the valence of carbon in this case is 4.

Many of the elements do not combine with hydrogen, so their valences cannot be determined by direct comparison with it in compounds. In such cases we use an element of known valence that will form compounds with those elements. Though there is no existing compound of sodium and hydrogen, sodium will react readily with chlorine to make sodium chloride. Chlorine, as we have found, combines with hydrogen, showing a valence of 1, and since it reacts similarly, atom for atom, with sodium, it follows that sodium also is univalent. We may say, therefore, that *the valence of an element is equal to the number of atoms of hydrogen or chlorine with which one atom of the element will combine.*

A number of elements have more than one valence, depending on the conditions under which the reaction is carried out. This follows from the facts governing the Law of Multiple Proportions. Nitrogen and oxygen, for example, may combine in different proportions to form a number of compounds, according to the conditions of the experiment, and the valence of carbon in this series may vary from 1 to 5.

Similarity of valence is the most important common property of the related elements listed in the periodic table. The elements in Groups I, II, III and IV have valences of one, two, three and four, respectively. The members of Group O have a valence of zero, since they do not combine with other elements. The rule does not extend to members of the other groups, however, for they have more than one valence in combination with different substances, although there are characteristic valences within each group.

The Electronic Theory of Valence.—The underlying cause of valence is found in atomic structures. An atom, as described above, is composed of a closely packed nucleus surrounded by planetary electrons arranged in concentric orbits or shells. Those in the outermost shell are called *valence electrons,* for their transfer from atom to atom causes chemical reactions, and the electrostatic charges carried by them serve to bind the atoms together.

No atom can have more than eight valence electrons, regardless of the number and distribution of its planetary electrons among the inner shells. The atoms of all the inert gases except helium have eight valence electrons. This very stable configuration explains the inactivity of these gases. The other atoms, each with less than eight valence electrons, may be regarded as trying to attain a more stable structure, and valence then expresses the number of electrons that they must gain or lose in order to form a complete outer shell of 8. Helium has only two electrons, therefore this also is a stable grouping, for helium is an inactive element.

Valence is of two kinds, according to the behavior of the outermost electrons during a reaction. *Covalence* involves the *sharing* of these electrons by the atoms concerned. An example of this is the formation of methane gas by the union of carbon and hydrogen. Carbon has a valence of 4 in this compound, since each of its atoms combines with four hydrogen atoms. Hydrogen (atomic number 1) has only one planetary electron, and carbon (atomic number 6) has six. Of these six, two are in an orbit close to the nucleus and firmly bound to it by electric attraction, but the remaining four are in an outer shell and function as valence electrons. When the two elements combine, four hydrogen atoms lend their single electrons to a carbon atom, getting in return a half share of the four valence electrons of the carbon atom. The latter in this way attains a stable outer shell of 8 electrons, four of its own plus four hydrogen electrons. Each of the four hydrogen atoms, in turn, now has two electrons: its own plus a carbon electron; and a stable group of two is formed. Thus the union of four hydrogen atoms with one carbon atom produces a stable molecule of methane gas.

Valence caused by the *transfer* of electrons from one atom to another is called *electrovalence.* Sodium and chlorine combine to form sodium chloride (common table salt). Sodium (atomic number 11) has eleven planetary electrons arranged in stable inner shells of 2 and 8, with only one outer valence electron. Chlorine (atomic number 17) has seventeen planetary electrons arranged in stable shells of 2 and 8, but with 7 valence electrons in the outermost shell. When a sodium atom combines with a chlorine atom it gives its single valence electron to the chlorine atom. The sodium atom, formerly neutral, now becomes singly charged positively, owing to the loss of its negative electron, and has a *positive* valence of 1. The chlorine atom, formerly neutral, becomes singly charged negatively owing to the gain of an electron, and has a *negative* valence of 1. The attraction of these opposite charges binds the particles together, and in a dry condition they form crystals.

In some cases both covalence and electrovalence may be involved in a chemical reaction; this is typical of elements possessing more than one valence number.

Symbols and Formulas.—Certain devices constitute the shorthand of chemistry. They are more than mere abbreviations in that they have a quantitative, as well as a qualitative, significance.

A *symbol* represents one atom of an element and also one atomic weight of that element. Thus the symbol O indicates not only the name of the element, oxygen, but also one atom of oxygen and 16 parts by weight of oxygen. The symbol of an element is usually the first letter of its name, as H for hydrogen, O for oxygen and C for carbon. Where more than one element has the same initial, two letter symbols are used, as Ca for calcium, Cd for cadmium, Co for cobalt and so on. To make the symbols internationally acceptable, they are based on the Latin names of the elements, such as Fe (*ferrum*) for iron, Au (*aurum*) for gold and Cu (*cuprum*) for copper. A complete list of symbols of the elements is in the table concluding this article.

A *formula* represents one molecule of an element or compound. Oxygen, we know, cannot exist in the free state as a single atom but only as a molecule, consisting of two atoms linked together; therefore the formula for a molecule of oxygen is O_2. The same applies to hydrogen, so its molecular formula is H_2. The formula for a molecule of a compound includes the symbols of the constituent elements, together with subscripts indicating the number of atoms of each element present in the molecule. The formula for water, H_2O, means that in every molecule of water there are two atoms of hydrogen and one atom of oxygen. The formula for ammonia, NH_3, shows one atom of nitrogen and three atoms of hydrogen in the molecule. The molecules of sulphuric acid, H_2SO_4, are composed of two atoms of hydrogen, one atom of sulphur and four atoms of oxygen. The formulas of some common compounds are found at the end of the table of elements concluding this article.

Reactions and Equations.—Chemical reactions involve changes in composition of substances. These changes are most clearly expressed by means of equations. The formulas of the elements or compounds entering reaction are placed on the left side of the equation; and the formulas of the resultant products, on the right. The two members of the equation are separated by an equality sign or by an arrow (→) indicating the direction of the reaction.

Both members of an equation must contain the same elements and the same number of atoms of each element: this is in accordance with the Law of Conservation of Mass. During reaction the atoms, themselves unchanged, are rearranged into different combinations forming the different molecules of the products. The formulas of these products must show their true compositions according to the Law of Definite Proportions. To satisfy these conditions in writing the equation for a reaction, it may not be sufficient merely to enter the formulas of the reacting substances and their products, for in many cases the result would show different numbers of atoms on both sides of the equation. In such cases the equation must be *balanced* by multiplying the formulas or symbols by whole numbers, in such a way that equal numbers of atoms appear on both sides.

We have previously noted the chemical change occurring when an electric current is passed through water, breaking it down into its constituent elements—hydrogen and oxygen. We have also noted that hydrogen and oxygen are diatomic, that is, their molecules consist of two atoms linked together. The equation for the reaction might then be represented:

$$H_2O \rightarrow H_2 + O_2;$$

but we immediately see that this equation does not balance, for although the same number of atoms of hydrogen (two) is on both sides, there is only one atom of oxygen on the left and two are on the right. This is corrected by using numbers:

$$2H_2O \rightarrow 2H + O_2.$$

The equation now balances because there are four atoms of hydrogen and two of oxygen on each side. This is a common type of reaction called a *decomposition.*

Another type of reaction, *direct combination,* is the opposite of decomposition. As implied by the name, it occurs when two or more substances combine to form a more complex substance; therefore we can illustrate it merely by reversing the members of the decomposition equation above:

$$2H_2 + O_2 \rightarrow 2H_2O.$$

In this case water is formed by burning hydrogen in the presence of oxygen, and both the initial substances are elements. Many compounds react together in the same manner, as shown by the union of calcium oxide and carbon dioxide to form calcium carbonate:

$$CaO + CO_2 \rightarrow CaCO_3.$$

Note that this equation does not require balancing.

A third type of reaction is caused by the *displacement* of one atom by another. When sodium bromide and chlorine react together, the chlorine displaces bromine from the sodium bromide, forming sodium chloride and bromine gas:

$$2NaBr + Cl_2 \rightarrow 2NaCl + Br_2.$$

The last type, *double decomposition,* involves the exchange of partners, as in the equation:

$$CaO + 2HCl \rightarrow CaCl_2 + H_2O.$$

Here the oxygen of calcium oxide changes place with the chlorine of hydrochloric acid, forming calcium chloride and water.

The four types of equations above cover all the ordinary reactions of chemistry, and the principles governing them apply directly to many important industrial processes.

Energy and Velocity of Reaction.—All chemical changes are accompanied by energy changes. All substances possess a certain amount of chemical or potential energy owing to their composition. When a reaction occurs, the new products formed also have chemical energy. If the amount of this energy is greater than that of the initial reactants, the excess energy must have been absorbed from external sources. The energy absorbed in this way is usually heat, and the reaction is called *endothermic* (literally, inside heat), that is, absorbing heat; but if the energy of the products is less than that of the reactants, the latter must have given off heat during the reaction, which is then called *exothermic* (outside heat), evolving heat. The products of exothermic reactions are stable, and those of endothermic reactions are unstable, tending to decompose readily.

The underlying cause of chemical reactivity is explained largely on theory. It seems to be associated with the attractive forces of electrified particles (electrons and protons) carried by the atoms. These electrical forces rearrange the atoms composing the molecules of the reacting substances, thus forming the new molecules of the products. Since atoms, with few exceptions, cannot exist singly in the free state but only as united groups of atoms or molecules, it is obvious that the individual molecules of reactive substances must come into actual physical contact before the reaction can start. The molecules of all substances, even solids, are in a state of constant motion.

Therefore chemical reaction occurs when two reactive molecules collide; and when a measurable quantity of substances react together, there is really not one reaction but a multitude of tiny individual reactions between molecules. Although molecules must be in contact to react, every collision does not result in a reaction. Certain kinds of molecules will not react with others.

Although much remains to be learned about the actual process of chemical change, significant evidence is found by observing the speed of reactions under various conditions. Reaction velocities vary widely between such extremes as the explosion of a stick of dynamite and the slow rusting of iron. Certain factors have a definite effect on these reaction velocities.

Effect of Temperature.—A rise in temperature causes a large increase in the velocity of reactions. On the average a rise of only 10° will double or triple the reaction rate. A reaction taking one second for completion at 0° will take about one-thousandth of a second at 100° This is because the application of heat increases the kinetic energy (energy due to motion) of the molecules, their velocity of motion becomes greater and they collide with one another more frequently. When hydrogen and oxygen are placed together at ordinary temperature, no apparent reaction results; but if the temperature is raised sufficiently or if a spark is introduced to the mixture, they will combine with explosive violence, so fast is the reaction.

Effect of Concentration.—It is a common observation that the vigor and speed of a reaction is increased by increasing the concentration of one of or both the reacting substances. Molecular action again is the explanation. Molecules, especially of substances in the gaseous state, move erratically at very great speeds, colliding with one another an enormous number of times a second; but comparatively few of these collisions may produce reactions. When more of a reactive substance is added to a given volume and the number of molecules is increased, they collide more frequently, and the reaction is accelerated. Chemists can assign a relative value to this effect by applying the *Law of Mass Action:* The speed of a chemical reaction is proportional to the product of the molecular concentrations of the reacting substances. Molecular concentration is the number of moles of a substance present in one liter of the solution or gas. *Mole* is molecular weight expressed in grams (*see above,* end of section, *The Atomic Theory and Molecules*).

Reversible Reactions.—Many chemical reactions are reversible, depending on the relative concentration of the reacting substances. This characteristic is shown in equations by the use of two arrows pointing in opposite directions:

$$4H_2O + 3Fe \rightleftarrows Fe_3O_4 + 4H_2.$$

When steam is passed over hot iron, the magnetic oxide of iron and hydrogen are formed. Here the direction of reaction is from left to right. If, on the other hand, hydrogen is passed over hot magnetic oxide of iron, steam and iron are formed, and the direction of reaction is reversed; but if the iron and steam are heated in a closed system, the products cannot escape and will react with each other. After a while the reaction will be proceeding in both directions simultaneously at the same rate, and it is then said to be in *equilibrium.*

Catalysis.—The velocity of many reactions may be greatly increased by the addition of certain substances that remain unchanged during the reaction. This phenomenon is called *catalysis,* and the agents producing it are *catalysts.* A catalyst functions like the lubricating oil in a machine. The oil enables the machine to run more smoothly and rapidly but tends not to be used or altered itself in the process. A catalyst makes a chemical reaction quicker and easier.

In the laboratory preparation of oxygen, potassium chlorate is decomposed by heat into oxygen and potassium chloride:

$$2KClO_3 + \text{heat} \rightarrow 2KCl + 3O_2.$$

If this is done in the presence of even a very small amount of manganese dioxide (MnO_2), the reaction is greatly accelerated and all the manganese dioxide can be recovered afterwards. Thus:

$$2KClO_3 + MnO_2 + \text{heat} \rightarrow 2KCl + 3O_2 + MnO_2.$$

There are many forms and applications of catalysis. Even traces of moisture may have a catalytic effect, as in the union of hydrogen and oxygen. Perhaps the most valuable catalyst is finely divided platinum. It is important to industry in the manufacture of sulphuric acid and in many other processes.

There are also *negative catalysts* that retard the speed of reactions. Certain catalysts may have a positive effect in one kind of reaction and a negative effect in another.

Effect of Increased Surface Area.—When a solid reacts with a liquid, only the molecules in the surface layers of each reactant are in contact, capable of reacting. Any method of increasing the contacting surfaces will bring a faster reaction. Stirring and shaking bring new molecules into contact with one another, and the grinding of a solid into fine separate particles vastly increases the area of the reactive surfaces. Substances in solution react most promptly under these circumstances, for their particles are so finely divided that the maximum reacting surface is attained.

Effect of Radiant Energy and Electricity.—The energy of light has a marked effect on certain reactions. When hydrogen and chlorine combine to form hydrochloric acid,

$$H_2 + Cl_2 \rightarrow 2HCl,$$

in the dark the reaction is very slow; but exposure to bright light causes a reaction that is explosive in its suddenness. The chemical action of light is well known in photography, and a separate subdivision of the science—photochemistry—covers this and other phenomena of radiant energy.

Electrochemistry, as implied by the name, treats of the chemical effects of electricity. Water, for example, is not decomposed by heat but merely undergoes physical change into water vapor or steam. As shown in the first equation illustrating a decomposition, the passage of an electric current through water decomposes it into hydrogen and oxygen. This process, called *electrolysis,* has important applications and will be discussed in more detail later.

THE STATES OF MATTER

Matter exists in three states—the gaseous, the liquid and the solid or crystalline. The state in which a substance occurs under normal conditions of temperature and pressure is a physical property of that substance. Although water is commonly seen in all three states, most other substances require greater changes of temperature for the transition from one state to another. A few solid substances, such as potassium chlorate, decompose before the boiling point is reached and are never obtained as gases. Certain of the gases must be brought to extremely low temperatures before they can be condensed to the liquid state. It is characteristic of substances in general, however, that they may be obtained as gases, liquids and solids.

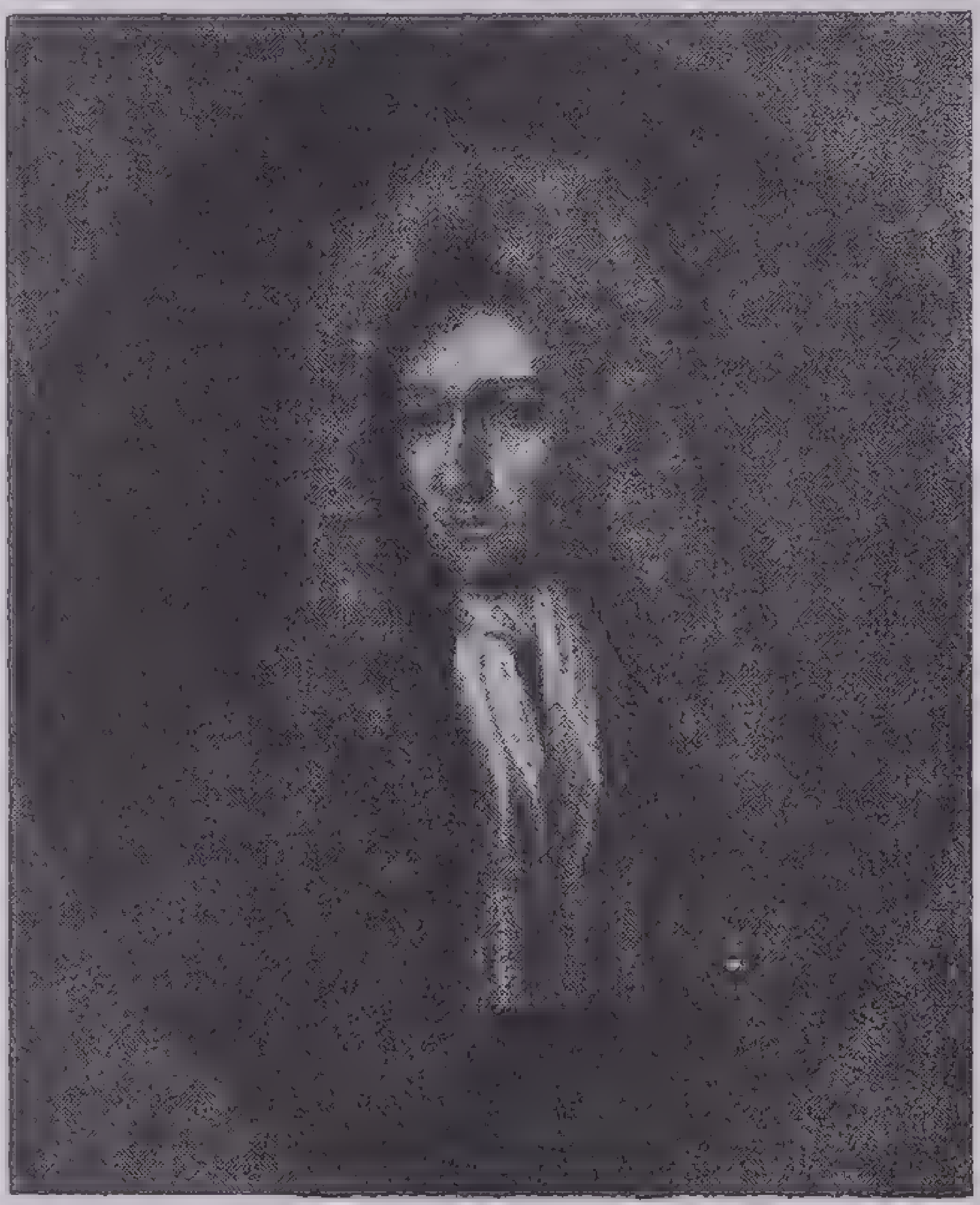
The Gaseous State.—All gases exhibit three general properties in common: (1) *Expansion*—When a small amount of gas is released in a closed room, it immediately distributes itself uniformly throughout the room. In other words, a sample of gas has no definite shape or volume of its own, but conforms in shape and size to the containing vessel. (2) *Compression*—A large volume of gas may be equally compressed into a container of much smaller volume. Common illustrations of this are the inflation of a balloon and of an automobile tire. (3) *Diffusion*—A gas will expand throughout a container in which another gas is already held. In (1) above, we may consider the closed room as already containing air, which is a gas. When the new gas is released, it becomes evenly diffused throughout the room, with regard to the other gas already present. This may be confirmed by releasing a gas with a distinctive odor.

The Gas Laws.—Quantitative experiments based on the facts just stated have revealed important principles governing the relation of temperature and pressure to the volume of a gas and to the diffusion rates of gases.

When the pressure on a gas is increased (the temperature remaining constant), the volume is decreased. It has been found that doubling the pressure on a gas sample halves its volume, and that halving the pressure doubles the volume. This relationship, first announced by Robert Boyle in 1660, is called *Boyle's Law:* If the temperature of a given quantity of gas remains constant, the volume is inversely proportional to the pressure.

Changes in temperature also affect the volume of gas. We know that a hot gas tends to rise; this is because it expands and becomes less dense with the increase in temperature. Experiment has shown that, if the pressure is kept constant, a gas will expand or contract by 1/273 of its volume at 0° C. for each increase or decrease in temperature of 1° C. This means that the volume of a gas would be zero at —273° C., but it is a purely theoretical assumption, for all gases would liquefy before being cooled so intensely. The lowest temperature possible to achieve, therefore, is —273° C., called *absolute zero.* Absolute temperature is measured from this absolute zero; it is figured by adding 273 to the Centigrade reading; thus 10° C. is 283° absolute, and —10° C. is 263° absolute. The effect of temperature on the volume of a gas is stated in *Charles's Law:* If the pressure of a gas is kept constant, its volume will vary directly with the absolute temperature.

By combining Boyle's and Charles's laws, we may state that the pressure of a gas varies directly with the absolute temperature if the volume is kept constant. All these effects are verified mathematically by exact measurements based on *standard pressure* (the average pressure of the atmosphere at sea level) and *standard temperature,* or 0° C. Another pressure effect of gases, stated by Dalton in 1807, is the *Law of Partial Pressures:* When two or more gases are mixed, each gas exerts a part of the total pressure that is proportional to the relative volume of that gas in the mixture. Thus, if a mixture of gases is 4/5 nitrogen and 1/5 oxygen by volume, the nitrogen exerts 4/5, and the oxygen 1/5, of the total pressure.



Robert Boyle

The ability of a gas to diffuse throughout a vessel containing other gases depends on the density of the gas, that is, the mass per unit volume. In accordance with *Graham's Law:* The diffusion rate of a gas is inversely proportional to the square root of its density.

Kinetic Theory of Gases.—Since all gases show such strikingly similar behavior under like conditions of temperature and pressure, it is logical to assume that they are basically similar in structure. A theory explaining this uniform behavior of gases in terms of their structure was developed by Bernoulli in 1738. Subsequent research has broadened the theory and confirmed it beyond reasonable doubt. We have learned from Avogadro's hypothesis that the smallest physical particle of any substance is its molecule, therefore all gases are made up of molecules. Indeed molecules have more significance as particles of a gas than as particles of a liquid or solid; that they are infinitesimal in size has already been stated. The number of molecules in 1 cubic centimeter of a gas at 0° C. is about 2.70×10^{19}, or the number 27 followed by eighteen ciphers. According to Bernoulli's theory, these gas molecules are at great distances apart in proportion to their size; hence the volume of a gas is composed principally of empty space. Thus when a gas is compressed, it merely means that the molecules are crowded closer together.

Again, according to the theory, the molecules are in rapid motion, traveling at a speed of nearly a mile a second. During this second they collide many millions of times with one another and with the walls of the container, so that they follow erratic zigzag courses. Since the molecules never settle to the bottom of the container, we must assume that they are perfectly elastic, rebounding from one another with no loss of energy whatever. If a rubber ball had this property, it would bounce indefinitely once it had been started. Gravity has no appreciable effect on molecules either, owing to the tremendous speeds at which they travel.

On the basis of these postulates the pressure of a gas is caused by the bombardment of its molecules against the walls of the container. When the gas is compressed, there are more molecules in a given space and they strike the confining walls more often, thus raising the pressure. This explains Boyle's Law, above. The uniform expansion of the gas on being released is a result of the high velocity of its molecules. When two or more gases are mixed, their molecules do not interfere with one another (unless of course a chemical reaction occurs) owing to the relatively wide spaces between them. Also each gas exerts a part of the total pressure corresponding to the relative number of its molecules in the mixture. This explains diffusion and the Law of Partial Pressures.

The kinetic energy of molecules is energy due to their motion, and this energy is directly proportional to the absolute temperature. Therefore if the volume of a gas is kept constant and the temperature is raised, the kinetic energy of the molecules also is increased, and they will move with greater velocity, striking the walls of the container harder and more often, and hence raising the pressure. This explains the combined effect of Boyle's and Charles's laws, stated above.

One more important feature of gases is clearly stated in *Avogadro's Law:* Equal volumes of all gases under the same conditions of temperature and pressure contain the same number of molecules. Advanced as a hypothesis in 1811, it is now recognized as a supremely important chemical truth. From it molecular weights are accurately found; and related to it is the experimental fact that the gram-molecular weight of any gas occupies 22.4 liters under standard conditions of temperature and pressure. This volume is called the *molar volume.*

Modern technique has revealed small deviations from the gas laws, for there is no such thing as a "perfect" gas. These deviations, however, are so small and occur under such extreme conditions that they do not affect the basic accuracy of the laws or their interpretation in terms of the kinetic theory.

The Liquid State.—Liquids as well as gases have characteristics in common. It was noted that a gas sample has no definite volume and expands uniformly to occupy the whole of any container. A given quantity of a liquid, on the other hand, occupies its own definite volume and conforms in shape to the part of the container that it fills. This indicates that the molecules of a liquid are very much closer together and more restricted in motion than those of a gas, hence the attractive forces or cohesion of the molecules is effective in holding them to one another, thus giving the liquid its definite volume. The molecules are still able to move freely, however, as shown by the fluidity of a liquid and its adaptability to the shape of the container. This is not so in the case of solids.

Unlike gases, liquids are difficult to compress because there is practically no free space between the molecules. Relatively great pressure may be exerted upon a liquid without appreciably altering its volume. Liquids will diffuse into one another as gases do, but at a much slower rate because the molecules are more crowded and move more slowly.

Evaporation.—All the molecules of a liquid do not move with the same velocity. The more rapidly moving ones may have sufficient kinetic energy to break away from the surface of the liquid and escape into the air as typical gas molecules. This is evaporation. The escape of these molecules uses some of their kinetic energy, lowers the average kinetic energy of the molecules in the liquid and, since kinetic energy is energy caused by heat, lowers the temperature of the liquid. This cooling effect during evaporation is familiar in many forms. If water evaporates in a confined space, some of the escaped (gas) molecules will strike the surface of the liquid and return to that state. Thus there are two opposing changes going on simultaneously—the formation of gas molecules and their return to the liquid state. A condition of equilibrium is reached when the two changes proceed with equal velocity, and the pressure of the gaseous molecules in this equilibrium stage is called the *vapor pressure* of the liquid.

When the temperature of a liquid is increased, the molecules move more rapidly and more of them escape into the gaseous state, increasing the rate of evaporation. This in turn increases the vapor pressure. As the temperature is further raised, gas molecules are produced more and more rapidly, until finally their combined pressure (the vapor pressure) is sufficient to force back the blanket of air resting on the liquid. At this point the liquid begins to boil. *The boiling point,* in other words, *is the temperature at which the vapor pressure is equal to atmospheric pressure.* Water boils at lower temperature on a mountain top than at sea level, for atmospheric pressure is lower at high altitudes. Once a liquid has started to boil, its temperature remains constant, no matter how much more heat is applied; for the additional heat is used to convert the liquid into gas more rapidly.

Liquefaction of Gases.—In order to liquefy a gas it must be cooled to lessen the kinetic energy of the molecules, thus diminishing their activity so that molecular cohesion becomes effective. The temperature at which liquefaction of a gas occurs is the same as the boiling point of the liquid, measured at standard pressure. The usual method is to cool the gas and at the same time increase the pressure, for this raises the boiling point and the gas need not be cooled to such a low temperature. Mere pressure alone will not necessarily succeed, because for each gas there is a temperature above which no amount of pressure can produce liquefaction. This temperature is called the *critical temperature.* The critical temperatures of hydrogen and oxygen are —241° and —118° C., respectively; they must be reduced to these temperatures before pressure can liquefy them.

Solutions.—A solution may be defined as a homogeneous body of matter having variable composition. In other words all samples of a solution have the same properties (homogeneous), but the components of a solution may be combined in different proportions by weight (variable composition), according to the concentration.

Of nine different types of solutions three involve matter in the liquid state. In all solutions the dissolved substance is called the *solute,* and the medium in which it is dissolved is the *solvent.* Only the most important and familiar type of solution, that in which water is the solvent, will be discussed here.

When a lump of sugar is placed in water, molecules of sugar escape from the surface of the lump and move about in the water, gradually becoming uniformly scattered through the solution, and the sugar lump decreases in size and finally disappears. If more sugar is added, its disappearance or dissolution becomes increasingly slow until finally the last part of the sugar does not dissolve. At this point the concentration of dissolved molecules is very high, and as more sugar is added, these molecules strike the undissolved sugar and are deposited on it or *recrystallized.* When the two opposite changes—solution and recrystallization—proceed at equal velocities, equilibrium results, the concentration of the solute cannot be further increased, and the solution is said to be *saturated.* Expressed numerically, the solubility of sugar is the number of grams required to saturate 100 grams of water at a given temperature.

Temperature affects the rate of solution. The application of heat increases the kinetic energy of molecules, thereby increasing the escapement of the molecules on the surface of the dissolving solid; and the rate of solution is increased. This rate varies according to the solute used, and it is shown graphically by plotting the *solubility curves* of various substances on a chart.

Since solubility increases with temperature, it is obvious that a sugar solution saturated at a raised temperature will contain more sugar than if it were saturated at ordinary room temperature. As the solution cools, solubility decreases and the excess sugar crystallizes out. If, however, all the undissolved particles are filtered out of the hot saturated solution, crystallization does not occur on cooling and the solution is said to be *supersaturated.* If one crystal of sugar or even a dust particle is dropped into this supersaturated solution, crystallization of the excess sugar instantly begins. The rate of solution is affected by the total exposed area or interface of a dissolving solid. Granulated sugar dissolves more rapidly than lump sugar because more molecules can escape simultaneously from the exposed surfaces of the sugar grains.

Osmosis.—It has been observed that when a solid is dissolved in a liquid, the particles of the solid tend to disperse evenly throughout the solution. The extent of this dispersion tendency varies with different solutions, and its effect is noted by preventing the normal diffusion of the particles. Thus a sample of concentrated sugar solution is put in a cell of porous clay, which is then immersed in pure water. The clay forms a semipermeable membrane, through which the water molecules can pass freely in both directions, but the passage of sugar molecules through the cell wall is greatly retarded. Because the concentration of water molecules within the cell is lessened by the presence of sugar, more water passes into the cell than emerges from it and the pressure within the cell is increased. The rising pressure forces more water molecules out of the cell until a state of equilibrium is reached and water passes through the walls of the cell in both directions with equal velocity. This passage of substances in solution through a semipermeable membrane is called *osmosis,* and the pressure necessary to produce a state of equilibrium is called *osmotic pressure.* Solutions having the same osmotic pressure are called *isotonic* or *isosmotic.*

Ionization.—In a normal solution, such as sugar and water, the dissolving substance or solute separates into molecules that become evenly dispersed throughout the solvent. There is abundant evidence, however, that three classes of substances—acids, bases and salts—disperse into smaller particles than molecules when they are dissolved in water. The evidence is based on three experimental facts: (1) Solutions of different acids show many of the same properties and reactions, indicating that they have a common component. This component could not be in molecular form, for the molecules of different substances have different properties. The same holds for aqueous solutions of bases and salts. (2) Acids, bases and salts in water solution have an abnormally great effect on the boiling and freezing points of the water. When sugar, for example, is dissolved in water, the boiling point of the water is raised and its freezing point is lowered to a normal extent, according to the molecular concentration of the sugar; but when sodium chloride (common salt) is dissolved in water at the same concentration, the corresponding effects on boiling and freezing points are nearly twice as great. This indicates that the free particles in the sodium-chloride solution must be present in greater numbers than the molecules of the sugar solution and are therefore smaller. (3) Solutions of acids, bases and salts will conduct an electric current and are called *electrolytes;* but solutions of sugars, alcohols and other substances with regular boiling and freezing points will not conduct a current and are *nonelectrolytes.* Therefore the particles contained in electrolytes must be capable of bearing electric charges.

Basing his assumptions on these facts and other experimental data, Svante Arrhenius, a Swedish chemist, advanced his ionic theory in 1887. According to this theory, the molecules of acids, bases and salts in aqueous solution subdivide or *dissociate* into *ions* consisting of electrically charged atoms or groups of atoms; and the dissociation into ions takes place only at the time the solute is dissolved. There are two types of ions—positive and negative—and since the solution of any electrolyte is electrically neutral, the total charges carried by the positive ions are equal to those carried by the negative ions.

In the reaction of sodium and chlorine to form sodium chloride, the sodium atom gives up one electron to the chlorine atom. Before reaction the atoms were electrically neutral; now, however, the loss of this negatively charged electron leaves the sodium atom with an excess positive charge, and the gain of the electron by the chlorine atom gives it an excess negative charge. These charged particles are really ions, but the attraction of their opposite charges holds them in fixed positions relative to one another so that they form solid crystals of sodium chloride. When the crystals are dissolved, the effect of the water separates the ions, which are then free to move about in solution, becoming true ions (from the Greek, meaning going, moving). Thus a solution of sodium chloride contains an equal number of positive sodium ions and negative chloride ions. These free ions bearing opposite charges have a mutual attraction for one another and part of them inevitably come into contact and combine to form molecules of sodium chloride. This part of the solute, consisting of molecules of sodium chloride, is in an inactive condition, as opposed to the active condition of the free-moving ions. We have then a state of equilibrium between the active and inactive parts of the solute, as shown by the ionic equation:

$$NaCl \rightleftarrows Na^{+} + Cl^{-}.$$

The NaCl molecules in solution dissociate into Na^{+} ions and Cl^{-} ions that recombine to form molecules again. It is a reversible reaction. The plus and minus signs denote the type of charge carried, and the number of signs used denotes the valence of the ion. Hence, in the above equation, the sodium and chlorine ions each have a valence of 1. In the equation for the ionization of sulphuric acid in water solution:

$$H_2SO_4 \rightleftarrows H_2^{+} + SO_4^{-},$$

we see that the SO_4 or sulphate ion has a valence of 2.

The extent of ionization, determined by the proportion of the solute that exists as free ions, is characteristic of different substances. Strong electrolytes, like hydrochloric acid, dissociate into ions almost completely; but weak electrolytes, as carbonic acid, scarcely ionize at all. There are many electrolytes between these extremes. The extent of ionization increases with dilution, for there are then fewer ions to wander into one another's paths and combine as molecules. Ionization is always assumed to be incomplete, however, even in cases involving weak solutions of strong electrolytes, for the effect on boiling and freezing points is never so large as calculations show it ought to be for complete ionization.

Electrolysis.—Aqueous (water) solutions of acids, bases and salts are called electrolytes because their dissociation into ions enables them to conduct an electric current. The passing of a current through such a solution is called *electrolysis,* and its effect is to decompose the dissolved substance into its component elements, which may be recovered from the solution. This process has already been mentioned as a means of decomposing water into hydrogen and oxygen. Water itself is only slightly ionized, but the addition of a very small amount of sulphuric acid makes it a good electrolyte that will decompose readily under the passage of a current.

Consider a typical example of electrolysis: When cupric chloride is dissolved in water, it dissociates into positive cupric ions and negative chloride ions in equilibrium with the inactive molecules of cupric chloride:

$$CuCl_2 \rightleftarrows Cu^{+} + 2Cl^{+-}.$$

An electrode is inserted at either end of the container holding the solution, and a current is passed through the solution. The positive cupric ions migrate to the negative electrode or *cathode* and are called *cations;* the negative chloride ions migrate to the positive electrode or *anode* and are called *anions.* The cupric ions on reaching the cathode receive enough electrons to become atoms of copper and are then deposited on the cathode as a shell of metallic copper. The chloride ions, on reaching the anode, lose one electron each and become atoms of chlorine, which pair off into molecules and escape as a gas at the anode. Owing to the escape of these ions from solution, the equilibrium between the ions and the inactive cupric chloride is destroyed, and electrolysis proceeds to completion. In this reaction the products recovered at the electrodes, copper and chlorine, are called *primary products* because they are elements formed directly from ions of the solute. Some substances do not yield primary products in electrolysis. When active metals, such as sodium, potassium or barium, are formed from their salts by electrolysis, they react vigorously with the water and cannot be obtained as elements. In other cases the amount of electricity needed to decompose the solute may be sufficient to decompose some of the water also, forming *secondary products* that are not the products of a simple decomposition of the solute.

Exact calculations can be made on the amount of electricity required to decompose a certain quantity of the solute. An important generalization is summarized in *Faraday's Law:* The same amount of electricity liberates equal amounts of different substances from solutions of their compounds.

The study of electrolysis is part of the science of electrochemistry and has many valuable applications in industry, such as the separation of metals from their ores, electroplating, electrotyping, preparing sodium and chlorine and so on.

Colloidal Dispersion.—The colloidal state of dispersion is an intermediate condition between true solutions, in which the particles are molecules or ions, and ordinary suspensions, in which the suspended particles can be seen by the naked eye. Colloidal particles, although much larger than molecules, are not visible through the ordinary microscope and cannot be separated by filtering, as can the larger particles of a regular suspension. The larger molecules are about one-millionth of a millimeter in diameter, and the smallest suspended particles are about 100 times as large. Dispersions involving particles of a size between these two are called *colloidal suspensions* or *colloidal solutions.* It is important to note that in all colloidal solutions the dispersed particles are insoluble in the dispersing medium. They do not settle to the bottom of the container because the bombardment of rapidly moving molecules in the dispersing medium keeps them in motion The colloidal particles bear electric charges, but unlike ions they all carry the same charge for any specific substance. The effect of the like charges causes the particles to repel one another, preventing them from joining together to form larger particles.

The particles in a colloidal suspension may be precipitated by neutralizing their electric charges; that is, by adding a solution containing a high concentration of ions bearing the opposite charge from that of the colloidal particles. The particles then tend to coalesce, increasing in size and weight until the bombardment of molecules is no longer sufficient to keep them in suspension; they then sink to the bottom of the container.

The numerous types of colloidal solutions may be divided into *suspensoids* and *emulsoids.* A suspensoid is usually a solid in a liquid, such as muddy water, in which the mud does not settle after standing. Other examples are gases in liquids, such as foam, and solids and liquids in gasses, as smoke and fog. An emulsoid is a colloidal dispersion of one liquid in another liquid.

In osmosis the dissolved particles of a solution will pass through a coarse membrane; colloidal particles, however, are stopped by it, and this property makes it possible to separate the two when in solution together, by a process called *dialysis.*

Although the presence of colloidal particles in a liquid has only a negligible effect upon its boiling and freezing points, the properties depending upon surface effects are much stronger than in ordinary suspensions. This is because—weight for weight of dispersed material—the colloidal particles, being much smaller than regular suspended particles, have a much greater total surface area.

A common phenomenon depending mainly on surface area for its effect is *adsorption,* the property of solid substances by which they are able to take up and hold on their surfaces large amounts of gases and dissolved matter. In commercial use, solids exhibiting this property are generally reduced to a fine powder so that they will have a relatively great surface area. Adsorption is a selective process, according to the specific properties of the adsorbent and the substance to be adsorbed. Thus finely divided carbon called *boneblack* is employed in refining sugar, for when the impure syrup is filtered through it, the colored matter and other impurities are adsorbed, but the dissolved sugar is allowed to pass through. A certain form of charcoal is extensively used in gas masks, for it allows most of the oxygen to come through, but adsorbs poisonous gases almost completely.

Some substances, called *gels,* in colloidal solution swell and solidify. A familiar example is the viscous mass formed when gelatin is placed in cold water. Gels have no definite melting point, nor do they set immediately on cooling; both processes take place gradually.

Emulsions.—An emulsion is commonly made by combining liquids that are not capable of mixing, such as kerosene and water, and then stirring or shaking them together. These emulsions are temporary, for the kerosene and water will separate into layers if allowed to stand. A third material called an *emulsifying agent* may be added to give the emulsion a more permanent nature. The composition of the agent to be used depends on the properties of the liquids. In this case if soap solution is added to the kerosene and water, they will not separate into layers after being shaken together. The effect of the soap solution is to form a protective film around the tiny drops of oil, preventing them from joining together to form a layer. Other agents decrease the surface tension of the liquids, thus lessening the tendency for the small drops to unite. Mayonnaise is an emulsion of vinegar and olive oil with egg as the emulsifying agent. Emulsions can be broken down or coagulated by adding a substance that reacts with the emulsifying agent and destroys the protective film formed by it.

The study of colloid chemistry in all its aspects leads into many fields, among them physics, geology, biology, dietetics and metallurgy. Colloidal phenomena are involved in such activities as water purification, dyeing, ore dressing, glass manufacture, tanning leather and making rubber products and artificial silk.

The Solid State.—A solid, as commonly defined, is a body of definite size and mass that resists forces tending to change its shape. In this sense of the word, there are many gradations from the solid to the liquid form, with no sharp distinction between the two; hence such terms as viscous solid, semisolid and viscous liquid. The chemist, however, is more interested in the nature of the particles composing a solid than in its more obvious external features. From this standpoint, *true solids differ from gases and liquids in having a definite crystalline structure.* Changes in pressure do not appreciably affect the volume of a solid, for the particles composing it are very close together and are held in fixed positions by the attractive forces of their electrical charges. The shape of the crystal is useful in identification, for a certain solid always forms the same kind of crystal under the same experimental conditions.

The particles making up a crystal are uniformly spaced in a latticelike arrangement that gives the crystal its typical form. According to the solid designated, these particles may be molecules, atoms or groups of atoms bearing electric charges. A grain of sodium chloride is a cube-shaped crystal. This cube is composed of minute unit cubes having sides about a hundred-millionth of an inch in length.

Each such unit cube contains four positively charged sodium atoms and four negatively charged chlorine atoms, located on opposite corners and forming the lattice effect mentioned above. A multitude of these unit cubes, with their faces aligned, build up the visible salt crystal. The crystals of different solids, of course, occur in many shapes other than cubes. The arrangement of atoms in such a simple crystal as sodium chloride is found, not by direct visual evidence but by studying how the crystal scatters a beam of light having a very short wave length; that is, by the *X-ray reflection method.*

Amorphous Substances.—A number of substances have properties characteristic of solids but are not crystalline in structure. Such substances, lacking definite crystalline form, are called *amorphous* (literally, formless). Glass is another type of substance decidedly different from the true solids in having no symmetrical arrangement of its atoms and molecules. It may really be considered as a solidified liquid or *supercooled liquid* of high viscosity; such substances do not possess a definite melting point, as do solids.

Amorphism applies typically to one of the forms of sulphur made by pouring boiling sulphur into cold water. This sudden cooling produces a plastic noncrystalline, amorphous sulphur. Other varieties of sulphur are the prismatic and rhombic forms. These three types, although the same element, differ in color, hardness and other properties and are called *allotropic forms* of sulphur. Oxygen and ozone are allotropic forms; the diamond and the graphite used in lead pencils are allotropic forms of the same element—carbon.

Melting Point of a Solid.—Every true solid has a definite melting point, a characteristic that aids in identifying it. When a solid is heated until part of it enters the liquid phase, the temperature remains constant and further application of heat merely increases the proportion of the substance in the liquid phase. This temperature at which the solid and liquid are in equilibrium under normal conditions of pressure is the *melting point* of the solid. The change from the solid to the liquid condition has a logical explanation in terms of the atoms and molecules involved. These particles of a solid at normal temperature are held in fixed positions relative to one another. They do not move about freely as in gases or liquids but have only a slight vibratory or oscillatory motion about a fixed point. The application of heat, however, increases their kinetic energy; the vibratory motion increases in vigor until the particles are able to break away from one another, dissolving the crystals and causing the solid substance to become fluid.

ACIDS, SALTS AND BASES

These three great classes of chemical compounds are more readily understood from what we know about ions.

The Nature of Acids.—Acids are compounds containing hydrogen and a nonmetallic element. Nearly all of them contain oxygen as well, but it is the hydrogen that determines their characteristic properties. This hydrogen becomes a free ion in aqueous solution and is replaceable by a metal, that is, a metal may take the place of hydrogen in an acid. Thus in the reaction of zinc and hydrochloric acid,

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow,$$

zinc replaces hydrogen in the acid to form zinc chloride and free hydrogen that escapes as a gas (denoted by arrow pointing upward). In other words each hydrogen ion receives an electron from the zinc atoms and so becomes an atom of hydrogen. The atoms then pair off as molecular hydrogen gas. (It must be noted, however, that every metal cannot replace the hydrogen in every acid.) Water is not shown in the equation, for it is merely the medium in which the reaction takes place. Basing our definition on this typical reaction, we may say: *An acid is a compound whose aqueous solution contains hydrogen ions.* Owing to the effect of the hydrogen ion, acids change blue litmus to red, and their weak solutions have a sour taste.

Common Acids.—The many acids in chemistry may be broadly divided into two classes: (1) *Hydracids,* containing hydrogen and a nonmetal; and (2) *oxyacids,* containing oxygen, in addition to hydrogen and a nonmetal. Typical hydracids are: hydrochloric (HCl), hydrobromic (HBr), hydriotic (HI) and hydrosulphuric (H_2S). The oxyacids include: sulphuric (H_2SO_4), nitric (HNO_3), phosphoric (H_3PO_4) and carbonic (H_2CO_3).

In many cases two or more acids

may contain the same elements but different proportions of oxygen; thus sulphuric acid, H_2SO_4, has more oxygen than has sulphurous acid, H_2SO_3; and nitric acid, HNO_3, has more oxygen than his nitrous acid, HNO_2. This is because sulphur (S) and nitrogen (N) each exhibit two different valences. The *-ic* ending of the acid names indicates higher valence and ability to hold more oxygen in combination than the *-ous* ending.

Of all the acids known to chemists, by far the commonest and most important are hydrochloric, sulphuric and nitric acids.

Hydrochloric Acid.—Hydrochloric or *muriatic* acid is used commercially to make ammonium chloride for the manufacture of dry cells, chemicals, dyes, soap, textiles, glues and many other products. One of its major uses is to clean metals by dissolving metallic oxides; for example, it is widely used to dissolve rust from iron sheets before they are tinned or galvanized.

It is usually prepared by adding concentrated sulphuric acid to sodium chloride (common salt) as shown by the equation:

$$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl\uparrow .$$

The products are sodium hydrogen sulphate and hydrogen chloride, which might be called gaseous hydrochloric acid. This gas is collected and dissolved in water to form the true acid. Its solubility is high, 400 to 500 volumes of the gas dissolving in one volume of water at room temperature and 507 volumes in water at 0° C. Hydrochloric acid, then, is an aqueous solution of hydrogen chloride, the dissolved gas being about 35 per cent by weight of the solution. The dilute acid acts readily on iron, zinc, magnesium and aluminum, releasing hydrogen gas; but it has little effect on copper and lead and scarcely reacts with silver and mercury.

Sulphuric Acid.—One of the most important substances in chemical industry is sulphuric acid; it is called also *oil of vitriol.* Each of its properties has many applications; indeed there are few commonly used materials whose manufacture at some stage does not involve the use of sulphuric acid. In 1930 when the annual production of this acid in the United States reached 7,625,000 tons, about half of it was used for the conversion of phosphate rock into fertilizers and for refining petroleum. Other uses are in preparing many chemicals and coal products, cleaning or pickling iron and steel, manufacturing ammonium sulphate and sulphates of the metals, as a dehydrating (water-removing) agent in the manufacture of explosives, dyes and drugs, and in the rayon, textile and paper industries.

The *contact process* and the *lead-chamber process* are the two methods used in commercial preparation of sulphuric acid. Both of these methods depend on the oxidation of sulphur dioxide.

When sulphur is burned, it combines with the oxygen in the air to form sulphur dioxide:

$$S + O_2 \rightarrow SO_2\uparrow .$$

Roasting sulphide ores gives the same product. In the contact process this gas is produced in a sulphur burner or furnace and passed through a dust remover, washing tower and dryer. The purified gas is then mixed with air, heated and passed through the contact tower over finely divided platinum or some other suitable catalyst. A catalyst, as has already been explained, increases the velocity of a reaction without itself being acted upon. Its effect here is to cause the sulphur dioxide to combine with more oxygen from the air, forming sulphur trioxide. The reaction is reversible and must be conducted at carefully controlled temperatures:

$$2SO_2 + O \rightleftarrows 2SO_3\uparrow .$$

This is an example of *oxidation* in which a substance is combined with oxygen or with more oxygen. (Ordinary burning is oxidation accompanied by light and heat.) The sulphur trioxide is now absorbed by concentrated sulphuric acid, and water is added to form the final product:

$$H_2SO_4 + SO_3 + H_2O \rightarrow 2H_2SO_4.$$

Without the extra sulphuric acid, sulphur trioxide will react with water:

$$SO_3 + H_2O \rightarrow H_2SO_4.$$

For various reasons, however, this method is not satisfactory for commercial production.

The *lead-chamber process* derives its name from a series of lead-lined chambers through which the gases are passed. It involves a series of complex reactions in which the oxidizing action of nitric acid takes part. In this process the expensive catalyst is dispensed with and the acid is more cheaply produced than by the contact process, but it is neither as pure nor as concentrated although it is suitable for many purposes.

Sulphuric acid is a heavy, oily liquid, nearly twice as heavy as water. It has a high boiling point (338° C.) and for this reason is used in preparing other, more volatile acids, displacing them from solution. It combines actively with water, evolving abundant heat. It is an excellent dehydrating agent; that is, it absorbs water from substances. Wood and sugar are charred by sulphuric acid, because it takes up their hydrogen and oxygen as water, leaving a residue of carbon. This explains its corrosiveness. It acts similarly on the skin, causing painful wounds.

At ordinary temperature it may act with metals as hydrochloric acid does, having its hydrogen replaced by metals and forming metallic sulphates. With iron, for example:

$$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2\uparrow .$$

The cold acid does not react with mercury, silver or copper; but hot concentrated sulphuric acid does react with them, according to the equation:

$$Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + SO_2\uparrow .$$

It reacts similarly with most other metals, acting as an oxidizing agent in the hot and concentrated form. It never reacts with gold or platinum.

Nitric Acid.—Formerly called *aqua fortis* (strong water, powerful liquid), nitric acid is next to sulphuric acid in importance. Of the annual American production of approximately 140,000 tons, more than half goes into the manufacture of explosives—dynamite, nitroglycerin, guncotton and trinitrotoluene. It is used also in celluloid and related products, and in drugs and dyes. *Aqua regia* (royal water) is a mixture of nitric and hydrochloric acids, the only liquid that can dissolve gold, the king of metals. Nitric acid alone will dissolve silver but does not act on gold; hence it is often used to separate the two metals when they occur together in ores.

One of the commercial methods of preparation is based on the reaction of sulphuric acid and sodium nitrate to give sodium hydrogen sulphate and gaseous nitric acid:

$$NaNo_3 + H_2SO_4 \rightarrow NaHSO_4 + HNO_3\uparrow .$$

This process is carried out in large cast-iron retorts. They are heated and the acid is distilled off and condensed in special glass containers.

Pure nitric acid is a colorless liquid that boils at 68° C. The aqueous solution used commercially contains 68 per cent acid, boils at 120° C. and is called *concentrated nitric acid.* The colorless acid partially decomposes on exposure to light, becoming yellow. It is a very active acid, ionizing almost completely in water, and is a strong oxidizing agent. Being a fairly unstable compound, it easily gives up its oxygen to metals, thus forming more stable compounds. It differs from other acids in its action with metals, rarely giving off hydrogen in the process.

The Nature of Salts.—Salts are the compounds formed when metals replace the hydrogen in acids. Thus in the equation:

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\uparrow ,$$

zinc replaces the hydrogen in dilute sulphuric acid, forming zinc sulphate, which is a salt. Another salt containing the same metal is zinc chloride ($ZnCl_2$), formed by the action of zinc and hydrochloric acid.

The part of an acid remaining after its replaceable hydrogen has been removed is called an *acid radical.* Thus in the above equation SO_4 is an acid radical. Ions, we have learned, are atoms that have gained or lost electrons and therefore bear an electric charge. A *complex ion* consists of several combined atoms that have gained or lost electrons as a unit group. The SO_4 radical is of this type; it is the sulphate ion, written SO_4^{--}, which means that one sulphur atom and four oxygen atoms in combination have acquired two electrons from other kinds of atoms. All the acid radicals are negatively charged, and the hydrogen ions (H^+) are positively charged, which explains their combining to form the acids previously discussed. Most of the radicals contain oxygen. *A salt, then, is a metal combined with an acid radical.* There is only one exception to this rule in elementary chemistry. Ammonia, although not a metal, has a positively charged radical (NH_4) and is therefore a *metallic radical* able to combine with negative acid radicals. Hence the salts involving ammonia, such as NH_4Cl (*sal ammoniac*), do not contain a metal.

Although all acids and all bases (*see below*) have certain reactions in common, the same is not true of salts because there is no ion common to all salt solutions; these show two series of reactions—one due to the metal ions and one due to the nonmetal ions of the radical.

Common Salts.—The salts are the largest class of compounds in nature, constituting most of the earth's crust. Their number is so large that only the more important and familiar can be discussed here. *Binary salts* are those of the hydro acids; they contain two elements. In naming them the suffix *-ide* is commonly used. Thus sodium chloride (NaCl) is a binary salt, one of the salts of hydrochloric acid. Other examples are: silver bromide (AgBr), potassium iodide (KI) and iron disulphide (FeS_2). *Ternary salts* contain three elements and are named according to the acid from which they are formed. Here the suffix *-ate* is used to denote the salt of an oxy acid with an *-ic* ending; and the suffix *-ite* is used when the acid has an *-ous* ending. Thus sodium sulphate (Na_2SO_4) is a salt of sulphuric acid; but sodium sulphite (Na_2SO_3) is a salt of sulphurous acid. Other ternary salts are: silver nitrate ($AgNO_3$), potassium carbonate (K_2CO_3) and calcium phosphate $Ca_3(PO_4)_2$.

Nitrate.—The most important of the nitrate salts is sodium nitrate ($NaNO_3$), the natural substance called *Chile saltpeter,* after the country where it occurs most extensively. The deposits vary in content from 20 per cent to 50 per cent of sodium nitrate, which is dissolved out with hot water and allowed to crystallize separately on cooling. Sodium nitrate is prepared commercially by the reaction of nitric acid and sodium carbonate, the products being sodium nitrate and unstable carbonic acid, which decomposes into water and carbon dioxide gas:

$$2HNO_3 + Na_2CO_3 \rightarrow 2NaNO_3 + H_2CO_3$$

$$H_2CO_3 \rightarrow H_2O + CO_2 \uparrow .$$

The fixed nitrogen in sodium nitrate renders it important as a fertilizer. Other uses are in the manufacture of nitric acid and its derivatives and of sodium nitrite. It is used also in the manufacture of potassium nitrate or *saltpeter* (KNO_3):

$$NaNO_3 + KCl \rightarrow NaCl + KNO_3.$$

Here sodium nitrate and potassium chloride are heated with a small amount of water; the hot solution is filtered and potassium nitrate crystallizes out when cooled. Its use in making gunpowder and fireworks is well known.

Another familiar member of this family is *silver nitrate* ($AgNO_3$), in stick form called *lunar caustic,* used as a cauterizing agent and in the preparation of germicidal solutions. It is formed by the reaction of silver and nitric acid. Ammonium nitrate (NH_4NO_3) is a high explosive; it was used in shells during the World War. Under gentle heat is decomposes into water and nitrous oxide (N_2O), known as laughing gas and used as an anesthetic. The other nitrates are decomposed by heat into metal oxides, nitrogen dioxide and oxygen.

Chlorides.—Sodium chloride or common table salt (NaCl) is the most abundant and widely distributed chloride occurring in nature. It was the first substance of its kind familiar to man. As other compounds having similar properties became known, they also were called salts. Many compounds now known as salts have few, if any, of the properties of sodium chloride.

Large deposits of this commodity are found in various parts of the world, and there are different methods of recovering and purifying it. Salt in this country is obtained from salt wells in New York, Ohio, Michigan, Kansas and other states. Borings are made and water is forced down, forming brine that is pumped to the surface and afterwards evaporated for the crystalline salt. When salt becomes caked in damp weather, it is not the salt itself but some minor impurity that absorbs moisture from the air. This substance is usually magnesium chloride ($MgCl_2$), and its property of absorbing moisture is called *deliquescence.*

Aside from its consumption as an indispensable article of animal food, many thousands of tons of sodium chloride are used in making sodium carbonate, hydrochloric acid and chlorine, in freezing and preserving foods, glazing pottery and exterminating weeds.

Another important chloride occurring in nature is potassium chloride (KCl), used in fertilizers and as a source for most of the manufactured potassium compounds. Ammonium chloride or *sal ammoniac* (NH_4Cl) is a product of the reaction between sodium chloride and ammonium bicarbonate. It is extensively used in cleaning metals for soldering, in manufacturing dry cells and in producing ammonia. Calcium chloride ($CaCl_2$), another salt, is a by-product of the liberation of ammonia from ammonium chloride. It is highly soluble and very deliquescent; for this reason it is often scattered on dirt roads to absorb moisture and lay dust. In solution it has an extremely low freezing point and is used in certain types of refrigerating systems.

Chlorine belongs to the halogen family of elements (*see* PERIODIC CLASSIFICATION), the other members of which are fluorine, bromine and iodine. These three elements form a series of salts having many properties in common with the chlorides, but they are comparatively unimportant. Taken as a group, the salts of the halogen family are called *halides.*

Sulphides.—The sulphides are abundant in nature and have value as ores from which many of the metals are extracted. These include the sulphides of silver (Ag_2S), copper (CuS), zinc (ZnS), lead (PbS), mercury (HgS), nickel (NiS); also antimony, bismuth and cobalt. Some of them have bright colors and are used in making paints. Sulphides are binary salts of hydrosulphuric acid (H_2S). When they are heated in air, they become oxidized, generally forming the metallic oxide and sulphur dioxide gas. The three general methods of forming metallic sulphides are: (1) By direct union of the metal with sulphur,

$$2Ag + S \rightarrow Ag_2S.$$

(2) By the action of hydrogen sulphide gas (hydrosulphuric acid in solution) on the metal,

$$2Ag + H_2S \rightarrow Ag_2S + H_2 \uparrow .$$

(3) By the reaction of the metallic nitrate with hydrogen sulphide,

$$2AgNO_3 + H_2S \rightarrow Ag_2S \downarrow + 2HNO_3.$$

Here the metallic sulphide is precipitated (arrow pointing down) and nitric acid is formed as the other product. The tarnishing of silver is due to the formation of silver sulphide (Ag_2S) on its surface, when minute quantities of sulphur are present in the air.

Sulphates.—The sulphates are salts of sulphuric acid. The most abundant sulphate in nature is *gypsum,* with the formula $CaSO_4 \cdot 2H_2O$, indicating that it is calcium sulphate with water held in chemical combination (or *hydrous* calcium sulphate). Its principal use is in making plaster of Paris. Great quantities of calcium sulphate are used in the building industry for Portland cement and wallboard, the normal consumption in this country being around six million tons annually.

Copper sulphate ($CuSO_4$) or *blue vitriol* is the commonest and most important salt of copper. It is formed by the action of dilute sulphuric acid on copper, and atmospheric oxygen combines with the displaced hydrogen of the acid to produce water:

$$2Cu + 2H_2SO_4 + O_2 \rightarrow 2CuSO_4 + H_2O.$$

When this salt crystallizes out from water solution, its crystals combine with a definite amount of the water, which is called *water of crystallization.* This is characteristic of many other substances in crystalline form. Upon heating, the water of crystallization is driven off and the substance is said to be *dehydrated.* Copper sulphate is used in copper plating, refining copper and as a mordant in dyeing. Small quantities placed in reservoirs and other places of water supply prevent the growth of algae, the minute organisms that give a disagreeable taste to the water and sometimes form a scum on the surface.

Sodium sulphate (Na_2SO_4) is found in salt deposits in the southwestern part of the United States. It occurs as the *anhydrous* salt; that is, without its water of crystallization. The principal supply is from salt cake formed by the reaction of sodium chloride and sulphuric acid in the preparation of hydrochloric acid. When it is crystallized from solution, it is recovered as a *hydrate* (containing water of crystallization) called *Glauber's salt.* On exposure to air, however, it loses the water of crystallization and becomes the anhydrous salt. This phenomenon is called *efflorescence.*

Ammonium sulphate [$(NH_4)_2SO_4$] is important as a fertilizer, hundreds of thousands of tons being used annually for that purpose. Magnesium sulphate or *Epsom salts* ($MgSO_4 \cdot 7H_2O$) derives its popular name from a mineral spring in England. It is also found in salt deposits and in addition to its medicinal properties is useful in dyeing and in coating cloth.

Sulphuric acid forms with the trivalent metals complicated salts called *alums;* they are double salts. A typical example is potassium alum consisting of potassium sulphate and aluminum sulphate, with the formula $KAl(SO_4)_2 \cdot 12H_2O$. The aluminum alums are used mostly in baking powder.

Carbonates.—The carbonates are salts of carbonic acid (H_2CO_3), a weak and unstable acid that decomposes after its formation into water and carbon dioxide gas. When this gas is passed through water solutions of carbonates, it forms soluble bicarbonates. All the carbonates, except those of sodium and potassium, decompose under strong heat to form carbon dioxide and the metal oxide.

Sodium carbonate or soda (Na_2CO_3) is one of the best-known and most widely used of this group of salts. It occurs as a deposit in certain dry regions where lake water has evaporated; but for commercial purposes it is generally manufactured from common salt by the ammonia or Solvay process (named from the Belgian inventor Ernest Solvay). The operation takes place at a temperature of approximately 35° C. in steel towers about 50 feet high and 6 feet in diameter. Inside these towers are a number of perforated partitions. A concentrated brine or salt solution saturated with ammonia enters the tower and then carbon dioxide is passed through the mixture under pressure, small bubbles of the gas rising through the perforated partitions. Ammonia gas combines with water to form ammonium hydroxide:

$$NH_3 + H_2O \rightarrow NH_4OH.$$

Carbon dioxide combines with water to form carbonic acid:

$$CO_2 + H_2O \rightarrow H_2CO_3.$$

The products of both equations react to form ammonium bicarbonate and water:

$$NH_4OH + H_2CO_3 \rightarrow NH_4HCO_3 + H_2O.$$

Ammonium bicarbonate immediately reacts with sodium chloride of the brine, precipitating sodium bicarbonate:

$$NH_4HCO_3 + NaCl \rightarrow NaHCO_3 \downarrow + NH_4Cl.$$

The bicarbonate is separated from solution and heated or calcined; it then decomposes to form sodium carbonate, water and carbon dioxide:

$$2NaHCO_3 \rightarrow Na_2Co_3 + H_2O \uparrow + Co_2 \uparrow .$$

The Solvay process, sketchily described above, is one of the most important developments in chemical industry. It is economical in operation, salt and limestone being the only raw products consumed, although some of the ammonia is lost and must be supplied from an outside source.

When pure sodium carbonate is dissolved in water and recrystallized from solution, it forms the hydrated salt $Na_2CO_3 \cdot 10H_2O$, called *washing soda* or *sal soda.* This salt is efflorescent, for on exposure to air it loses nearly all its water of crystallization. Solutions of sodium carbonate are decidedly alkaline in nature, turning red litmus to blue; whereas acids turn blue litmus to red. Hence it is used to neutralize acids.

More than a million tons of soda are used annually in the United States. It is important in the manufacture of glass, soap and sodium hydroxide and in softening water.

Sodium bicarbonate ($NaHCO_3$) or baking soda is called an acid carbonate, owing to the presence in its formula of the hydrogen ion. It is one of the first products formed in the Solvay process just described. It is used in baking powders and medicines. Baking powder is a mixture of the bicarbonate and a weak acid, usually cream of tartar. Dough is caused to rise by the liberation of bubbles of carbon dioxide through the reaction of the bicarbonate and acid when water and heat are added.

One of the most abundant compounds found in nature is calcium carbonate ($CaCO_3$) or carbonate of lime, derived chiefly from the shells of crustacean animals that have accumulated in vast deposits over the ages. These shells, in the course of time, have been crushed and cemented together into solid rock, the familiar limestone, which constitutes whole mountain ranges. Marble, a purer form of the carbonate, is less plentiful. An early stage in the gradual formation of limestone is seen in the coquina or loose shell rock so common to Florida. Calcium carbonate in the pure form is a white solid, sometimes transparent. It reacts typically with acids, forming salts and the unstable carbonic acid, which in turn decomposes into water and carbon dioxide. At high temperatures (700° to 1000° C.) the carbonate decomposes to form calcium oxide and carbon dioxide. Limestone is used in great quantities as a flux to assist in the treatment of ores, as building stone, in the manufacture of glass and quicklime and as a source of carbon dioxide. The effect of water and carbon dioxide on limestone is to form calcium bicarbonate ($CaHCO_3$), which is soluble. The limestone is gradually eaten away in the process, and sometimes great caves—Mammoth Cave in Kentucky and Carlsbad Caverns in New Mexico—have been formed in this way.

Another widely distributed mineral is magnesium carbonate ($MgCO_3$) or *magnesite.* It occurs also as a double salt with calcium carbonate, called *dolomite* ($MgCO_3 \cdot CaCO_3$). Both are used as a lining for blast furnaces to remove acidic impurities from pig iron. Firebrick is made from magnesium oxide, a product of the decomposition of magnesium carbonate by heat. When sodium carbonate is added to a solution of magnesium carbonate, a precipitate is formed, which we know as *milk of magnesia.*

Hard Water.—Most natural water,

Courtesy Nevada State Highway Dept.

Limestone Cave, Lehman Caves National Monument, Nevada

Gray and white stalactites hang from the entrance to the formation called the Devil's Bathtub. The caves are on the east flank of Mount Wheeler (13,058 feet) except rain, contains dissolved salts. In limestone regions, for example, calcium bicarbonate is commonly present in the water. It may be precipitated by boiling. Water containing dissolved bicarbonates is said to be in a state of *temporary hardness;* but other salts of calcium and magnesium, especially the sulphates and chlorides, cannot be removed by boiling, and the water containing these salts shows *permanent hardness.* Hard waters are objectionable because their dissolved salts react with soap to form insoluble compounds that make it difficult to form a lather. Temporary hard water, when heated in boilers, forms a crust of insoluble carbonates on the inner surface of the vessel that clogs pipes and is a poor heat conductor. This deposit is called *boiler scale,* and its presence is liable to be costly and destructive.

Hard water may be softened by adding a substance that will precipitate the dissolved salts, allowing them to be filtered or to settle out. Temporary hard water is softened by mere boiling alone, but if this is not desirable, slaked lime, $Ca(OH)_2$, is added. This agent reacts with the bicarbonate, forming a precipitate of calcium carbonate that settles out as a fine powder:

$$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3 \downarrow + 2H_2O.$$

For permanent hard water, caused usually by dissolved calcium sulphate, sodium carbonate (Na_2CO_3) is used:

$$CaSO_4 + Na_2CO_3 \rightarrow CaCO_3 \downarrow + Na_2SO_4.$$

Calcium carbonate is precipitated as in the first equation, and the sodium sulphate (Na_2SO_4) remaining in the water is not harmful in any way.

Other Groups of Salts.—There are many more salts, some of them only slightly less important than those discussed above. Among the phosphates, about four million tons of calcium phosphate [$Ca_3(PO_4)_2$] are mined annually in the United States, chiefly for use as a fertilizer. Of the bromides, silver bromide ($AgBr$) is important in photography because it is acted upon by light; other bromides have medicinal properties. The silicates, in various complex forms, compose most of the earth's crust and are indispensable in the manufacture of glass and cement. Sodium tetraborate ($Na_2B_4O_7$) or borax is one of the borates, a salt of boric acid used in soldering and welding and in making enamels. There are a host of other salts.

The Nature of Bases.—Bases constitute the third great class of compounds. The most important bases in chemistry and their formulas are: sodium hydroxide, $NaOH$; potassium hydroxide, KOH; calcium hydroxide, $Ca(OH)_2$; ammonium hydroxide, NH_4OH. It is seen from the formulas that each base contains OH, that is, one atom of oxygen and one atom of hydrogen held in combination. This OH group, called the *hydroxide radical,* is present in all bases and serves to identify them. Bases also contain a metal, with the exception of ammonium hydroxide (here the NH_4 radical acts like a metal and is called a *metallic radical*). *A base,* therefore, *is the hydroxide of a metal or of a metallic radical.* Bases ionize in solution, forming metal ions and hydroxide (OH^-) ions. A majority of the bases are insoluble; those that are soluble are sometimes called *alkalis* to differentiate them; they include the hydroxides of active metals, such as potassium and sodium.

Bases have several properties in common—their solutions feel slippery to the fingers; they turn red litmus to blue; they are good conductors of electric current; and they react with acids to form water and salts. These common properties are attributed to the hydroxide ion present in solutions of all bases. Each base also has its distinctive reactions, according to the ion of the specific metal involved.

Neutralization.—We have noted that solutions of bases change red litmus to blue, as opposed to acids, which change blue litmus to red. Bases in this respect are said to show a *basic* or an *alkaline* reaction. When equivalent solutions of sodium hydroxide and hydrochloric acid are placed together, heat is evolved and the product has no effect on litmus. Both the base and the acid have lost their characteristic properties, and the resulting solution is called *neutral.* From the equation for the reaction,

$$NaOH + NCl \rightarrow NaCl + H_2O,$$

we see that the products are common salt and water. The neutralization was caused by combining the hydrogen ion (H^+) of the acid with the hydroxide ion (OH^-) of the base to form water, thus removing the ions causing basic and acidic reactions.

Many salts in solution, however, are not neutral to litmus. This depends on the comparative strength of the acids and the bases from which they are derived. A solution of sodium carbonate changes red litmus to blue because it is derived from a weak acid (carbonic acid) and a strong base (sodium hydroxide). Copper sulphate in solution changes blue litmus to red because it is derived from a strong acid and a weak base. Sodium chloride solution (see above equation) is neutral because it involves both a strong acid and a strong base.

Hydrolysis.—When a salt, sodium bicarbonate for example, is dissolved in water, it dissociates almost completely into ions:

$$Na_2CO_3 \rightleftarrows 2Na^+ + CO_3^{--}.$$

Sodium carbonate is not neutral in solution but has the alkaline property of turning red litmus to blue. This is explained by the fact that not only the sodium carbonate but the water itself is ionized:

$$HOH \rightleftarrows H^+ + OH^-.$$

For purposes of clearness, water is here shown as HOH instead of H_2O. The ionization of water is so slight that it ordinarily has no effect on chemical action; but when salts derived from weak acids and strong bases or from strong acids and weak bases are involved, the ionization of water is sufficient to upset the equilibrium of the solution; and when a new equilibrium is reached, the solution is no longer neutral. Thus, in the case of dissolved sodium carbonate, we have four kinds of ions in solution (see above equation), representing the original equilibriums. The hydrogen (H^+) ions from the water now tend to combine with the carbonate (CO_3^{--}) ions of the salt to form undissociated carbonic acid; but the hydroxide (OH^-) ions tend to remain in solution as free ions. Since these free ions are those that cause an alkaline reaction, and since there is now an excess of them over the free H^+ ions, the solution changes red litmus to blue. The effect is to reverse the neutralization action by which the salt is formed. This is called *hydrolysis, a reversal of neutralization caused by the slight ionization of water.* The same explanation applies in the case of salts formed by a strong acid and a weak base, the only difference being that H^+ ions are in excess instead of OH^- ions, and the solution gives an acid reaction. In salts formed by both a strong acid and a strong base equal numbers of H^+ and OH^- ions become undissociated, so that there is no perceptible effect of hydrolysis and the solution is neutral.

Common Bases.—*Sodium* and *potassium hydroxide are strong bases.* They are the hydroxides of very active metals and are highly soluble in water; which accounts in large part for their usefulness. In the dry state they are white solids, usually sold commercially in stick form. They have a corrosive action on organic tissue and are called *caustic alkalis* for this reason. Their solution will promptly dissolve silk and wool. They are deliquescent, so that a stick of the solid on exposure to air becomes coated with moisture and dissolves to a thick liquid in a short time. As bases they have to a marked degree the properties common to the whole group described above.

Sodium hydroxide or *caustic soda* is the cheapest strong base. Great quantities of it are used in soap making. Other uses are in bleaching solutions, making paper and leather and refining petroleum; and an increasing amount of it goes into the rayon industry.

Potassium hydroxide (or *caustic potash*) is not so widely used commercially, being employed principally in the manufacture of soap.

Since potassium and sodium are active metals, their bases are formed by the direct action of the metals on water:

$$2K + 2HOH \rightarrow 2KOH + H_2 \uparrow.$$
$$2Na + 2HOH \rightarrow 2NaOH + H_2 \uparrow.$$

The reaction, however, is so violent and the pure metals are so expensive that this is not a feasible method of production. They are usually prepared by the reaction of their carbonate salts with calcium hydroxide; thus in the case of sodium hydroxide:

$$Na_2CO_3 + Ca(OH)_2 \rightarrow 2NaOH + CaCO_3 \downarrow$$

The operation is carried out by boiling in iron vessels, and when reaction is complete, the solution is evaporated, and the solid sodium hydroxide is recovered.

Another method of preparing these bases is by the electrolysis of solutions of their chlorides. Thus sodium hydroxide is formed by the electrolysis of brine (sodium chloride solution). The reaction, caused by the passing of an electric current through the solution, is:

$$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 \uparrow + H_2 \uparrow .$$

Hydrogen and chlorine are evolved, and, since the latter reacts with sodium hydroxide, the process must be carried out in a special cell that will keep the products separated. The same operation is employed for the commercial preparation of chlorine.

Calcium Hydroxide.—This substance, also called *slaked lime,* is a moderately soluble strong base. It dissolves partly in water, forming *limewater,* used medicinally to counteract acidity. The raw material used in the preparation of the base is calcium carbonate ($CaCO_3$) or limestone, discussed in the section on carbonates. The operation is carried out in a special furnace or *lime kiln,* one type of which is the rotary kiln. Here the crushed limestone passes slowly down a long inclined rotating cylinder under intense heat, which drives off carbon dioxide from the turning pieces of limestone and forms calcium oxide (CaO) or *quicklime:*

$$CaCO_3 + \text{heat} \rightarrow CaO + CO_2 \uparrow .$$

Quicklime is a white solid that melts at 2750° C. When water is added to it a violent reaction occurs, with the liberation of heat and steam. This action is called *slaking,* and the product, of course, is slaked lime:

$$CaO + H_2O \rightarrow Ca(OH)_2.$$

Calcium oxide is the *anhydride* of calcium hydroxide, so called because it needs only the addition of water to convert it to the hydroxide. Ordinary *hydrated lime* is calcium oxide (quicklime) with just enough water added to convert it to calcium hydroxide (slaked lime).

Calcium hydroxide is used chiefly in making mortar by mixing it with sand and water. Its action in softening hard water has already been described. It reacts with chlorine to form bleaching powder:

$$Ca(OH)_2 + Cl_2 \rightarrow CaCl_2O + H_2O.$$

As a cheap base it is extensively used in making paper, in agriculture, in the treatment of sewage and hides and as whitewash.

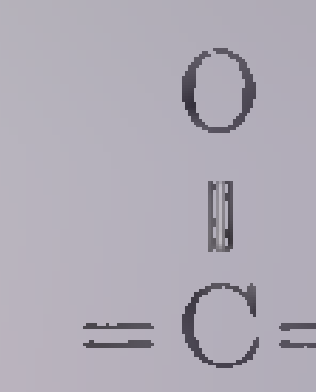
Ammonium Hydroxide.—This is a soluble weak base formed by the union of ammonia and water. It is very unstable, being known only in solution (as ammonia water). Its properties, although they are typically basic in nature, are not so marked as those of the strong bases described above. Household ammonia is a dilute solution of this base with a small amount of soap added.

Other Bases.—The hydroxides of the common metals—iron, copper, zinc and aluminum—are practically insoluble and can be readily precipitated from solution. Although there are many of these bases, their low solubility limits their activity and usefulness. They ionize only slightly and are generally weak in those properties typical of bases. Indeed some of them, as zinc and aluminum hydroxide, react not only with acids but with other bases as well, showing both basic and acidic characteristics. Such hydroxides are called *amphoteric* (both-way) hydroxides.

Organic Chemistry.—A very different branch of chemistry from that presented in the foregoing discussion of the elements and their compounds is organic chemistry, which originally dealt with the substances that are found in the organic vegetable and animal kingdoms. Most of these substances contain carbon, so that organic chemistry nowadays is the chemistry of the carbon compounds. As the number of known organic compounds is well over 200,000, the subject is a large one.

Carbon.—The valence of carbon in most of its compounds is uniformly 4, a regularity that simplifies matters considerably at the outset. Carbon atoms are found to have the faculty of linking themselves together to form chains and rings. In this faculty carbon is exceptional among the elements, and for this reason no other element sufficiently approaches carbon in the multitude of its compounds to merit the treatment of its compounds as a separate branch of chemistry. The attaching of carbon atoms to one another does not utilize all four of the available valences, and the unoccupied valences are therefore able to attach to the molecule such other elements as hydrogen, oxygen, nitrogen and so forth.

It is found that the same grouping of elements recurs as part of a complex molecule; and all substances that possess the same group somewhere in their molecule are fortunately found to show the same reactions in virtue of the presence of that group. Thus all the compounds containing the group CH_2OH are classed as primary alcohols; those with the group CHO are aldehydes; those with COOH are acids; those with the group



$$\overset{\displaystyle O}{\overset{\|}{=C=}}$$

attached to carbon atoms on both sides are ketones; and so on. The fact that all primary alcohols, all aldehydes, acids and so forth, behave chemically more or less alike makes it possible to bring order out of the chaos of organic compounds.

Hydrocarbons.—Many important organic compounds contain only the elements carbon and hydrogen. These are called the hydrocarbons and include marsh gas (CH_4), acetylene (C_2H_2), benzene (C_6H_6) and the components of rock oil, which is a mixture of many hydrocarbons.

Carbohydrates.—Another set of organic compounds contains only the three elements, carbon, hydrogen and oxygen, the latter two in the same proportion as in water, namely, two atoms of hydrogen to one of oxygen. These are the carbohydrates and include: grape and fruit sugars ($C_6H_{12}O_6$); cane, malt and milk sugars ($C_{12}H_{22}O_{11}$); the starches and cellulose [$(C_6H_{10}O_5)_n$], which last is the structural material of the vegetable world. The fats and oils, common alcohol, glycerin and acetic, citric and tartaric acids contain only carbon, hydrogen and oxygen.

When to these elements is added nitrogen as a possible constituent of organic substances, the list becomes a very varied one, including nitroglycerin, nitrocellulose or guncotton, aniline and a horde of dyes, and most of the alkaloids—substances of very powerful physiological action that occur in plants. Adding also sulphur, the vastly important proteins are included, some of which (the nucleoproteins) may contain also phosphorus. Other than water, fats and mineral constituents, proteins constitute the building material of the animal body and are necessary in the diet of animals.

Courtesy American Petroleum Institute

A Great Industry Is Founded on the Study of Hydrocarbons

At the left, workers are shown adding new sections of drill pipe as the oil well becomes deeper. At the right is a gusher, a fountain of oil that must be brought under control quickly to avoid waste

CHEMICAL ELEMENTS

At. wt., atomic weight; At. no., atomic number; S. G., specific gravity; M. P., melting point (°Centigrade); B. P., boiling point (°Centigrade); Co. E., coefficient of expansion (per °C × 10^6. To obtain usual coefficient, multiply by 10^{-6}); E. R., electrical resistivity (resistance per centimeter cube in millionths of ohms); C. S., crystalline system: C = cubic, whether body- or face-centered unknown; C b = Cubic, body-centered; C f = cubic, face-centered; H = hexagonal; T = tetragonal.

Elements	Occurrence and Preparation Date of Discovery, Discoverer	Properties	Chief Compounds and Uses
Actinium, Ac At. wt. 230 (?) At. no. 89	In all uranium minerals and nowhere else; associated mainly with lanthanum. 1899, Debierne and Giesel.	A radioactive element, with half periods from 20 years down to 3.7 seconds.	In chemical properties, it is intermediate between calcium and lanthanum.
Alabamine, Ab At. wt. undetermined At. no. 85	One of the two remaining elements for which discovery has been claimed but disputed. Possibly in monazite sands. 1930, Allison and Murphy.	Not isolated, but may be expected to resemble iodine.	
Aluminum, Al At. wt. 26.97 At. no. 13 Valence 3 S. G. 2.6 M. P. 660° Co. E. 23.03 E. R. 2.62 C. S. C f	Cryolite $AlF \cdot 3NaF$; bauxite, impure $Al(OH)_3$; in feldspars, micas and clay; emery, ruby, sapphire (Al_2O_3). Com'l, by electrolysis of Al_2O_3, from bauxite, dissolved in cryolite, water power usually furnishing the electrical energy. 1827, Wöhler.	Silver-white, ductile, malleable at 120°, tensile strength (wrought) 16 tons per sq. in. A better conductor of electricity, weight for weight, than copper. Molten metal not mobile enough to make castings. Acted upon by dil. hydrochloric acid, slowly by sulphuric, but not by nitric or the acids occurring in foods. Soluble in alkaline hydroxides. The tarnishing action of moist air soon comes to an end as the tarnish acts as an adherent protective coating.	Used for cooking utensils, boatbuilding, airplanes and small articles requiring lightness and strength; for electric leads. The powdered metal is used as a body for paint; and its mixture with ferric oxide, called thermite, is used for producing very high temperatures (up to 2700°C.) for welding rails etc. Many metals are reduced from their oxides by means of Al, hence its use in casting steel. Aluminum bronze (10% Al), rolled, has tensile strength of 40 tons per sq. in. Its sulphate forms alums, e.g., $KAl(SO_4)_2 \cdot 12H_2O$, common alum.
Antimony, Sb At. wt. 121.76 At. no. 51 Valence 3, 5 S. G. 6.62 M. P. 630.7° B. P. Red heat Co. E. 11.4 E. R. 39 C. S. H	Free, and as stibnite (Sb_2S_3). Roasting stibnite gives Sb_2O_4, which is then reduced by heating with carbon. 1450, Valentine.	White, brittle, crystalline metal. Its alloys expand on solidification and therefore give very sharp castings, e.g., for type. It does not tarnish but may be burned in air and unites directly with the halogens.	The metal is a constituent of the alloys type metal, Britannia metal and Babbitt metal (used for bearings). Its oxide (Sb_2O_3) is both basic and acidic. The trichloride, butter of antimony ($SbCl_3$), is easily hydrolyzed. Tartar emetic ($SbOKC_4H_4O_6$) is used in medicine and in dyeing.
Argon, A At. wt. 39.94 At. no. 18 Valence 0 Density 39.9 (oxygen = 32) B. P. —185.7° M. P. —189.2°	Present in the air 0.94% by volume. To isolate, air is freed from CO_2 by soda-lime, water by P_2O_5, oxygen by red-hot copper, nitrogen by magnesium and calcium. From the residual mixture argon is obtained by fractional distillation. 1894, Rayleigh and Ramsay.	Is a monatomic gas and is identified by its characteristic spectrum seen by examining the light emitted when the gas is placed in a vacuum tube at low pressure and sparked. More soluble than nitrogen in water, 100 vols. water dissolving 4 vols. argon under ordinary conditions.	Forms no compounds, hence its name —meaning inactive.
Arsenic, As At. wt. 74.93 At. no. 33 Valence 3, 5 S. G. 5.7 B. P. 450° (sublimes) M. P. 480° (under pressure) Co. E. 4.7 E. R. 35 C. S. HC	Free, as arsenical pyrites (FeSAs), as orpiment (As_2S_3) and as realgar (As_2S_2). By heating arsenical pyrites, $FeSAs \rightarrow FeS + As$.	A steel-gray, dully metallic and crystalline element classed as a metalloid because intermediate between metals and nonmetals. Its vapor has a density corresponding to As_4 at 644°, and to As_2 at 1700°. It burns in air and unites directly with the halogens, sulphur and with many metals.	Used for hardening lead for shot. All its compounds are poisonous. White arsenic (As_2O_3) is partly basic, forming a chloride and partly acidic, forming arsenites. Scheele's green ($CuHAsO_3$) is a pigment dangerous in wallpapers. Traces of arsenic are detected by Marsh's test, in which the intensely poisonous arsine (AsH_3) is formed.
Barium, Ba At. wt. 137.36 At. no. 56 Valence 2 S. G. 3.5 M. P. 850°	As barytes or heavy spar ($BaSO_4$) and as witherite ($BaCO_3$). By electrolysis of the fused chloride. 1808, Davy.	A silver-white, lustrous, malleable metal harder than lead. Like calcium, it acts slowly on water to give barium hydroxide and hydrogen. The vapors of its compounds impart a green color to the Bunsen flame.	The peroxide (BaO_2) is used in the manufacture of oxygen and of hydrogen peroxide; the nitrate and chlorate in pyrotechny to give green fires; the sulphate as the body for a permanent white paint and for filling glazed paper. All its soluble compounds are poisonous.
Beryllium, Be At. wt. 9.02 At. no. 4 Valence 2 S. G. 1.8 M. P. 1350° E. R. 18.5 C. S. H	In beryl [$Al_2Gl_2(SiO_3)_6$]. By electrolysis of the fused double fluoride $GlF_2 \cdot 2KF$. 1828, Vauquelin.	A hard white metal that tarnishes when heated in air and is soluble in dilute acids when powdered.	Its hydroxide [$Gl(OH)_2$] is feebly acidic as well as basic, thus resembling the hydroxide of zinc. Emerald is beryl colored green by chromium oxide.
Bismuth, Bi At. wt. 209.00 At. no. 83 Valence 3, 5 S. G. 9.8 M. P. 271° B. P. *c.* 1200° Co. E. 13.3 E. R. 115 C. S. H	Free and as trioxide (Bi_2O_3) and trisulphide (Bi_2S_3). The ore is roasted and then heated with charcoal and metallic iron (to remove traces of sulphur).	An exceedingly brittle, crystalline, shining metal, white with a tinge of pink. Bismuth expands on solidification. It does not tarnish but can be burnt in air. Dissolves in oxygen acids. The most diamagnetic substance known.	Used for making fusible alloys (e.g., Wood's metal, M.P. 60.5°), which are used in plugs of fire sprinklers and boiler safety valves, and for taking casts. The oxynitrate is used in medicine and as a cosmetic.
Boron, B At. wt. 10.82 At. no. 5 Valence 3 S. G. (amorph.) 2.4; (cryst.) 2.5 B. P. 2200°	As boric acid (H_3BO_3), borax ($Na_2B_4O_7,10H_2O$), colemanite ($Ca_2B_6O_{11},5H_2O$). Amorphous boron by reducing B_2O_3 with Mg. Impure cryst. boron by reducing B_2O_3 with excess of Al. 1808, Gay-Lussac and Thénard.	Amorphous boron is a greenish-black powder that burns in air at 700°, forming B_2O_3 and also BN. It is oxidized by adding hot concentrated sulphuric or nitric acid to boric acid.	The compounds are analogous to those of silicon. Borax is used as a flux and, in solution, as a mild alkali on account of its hydrolysis. Boric acid is used as a weak antiseptic and preservative.
Bromine, Br At. wt. 79.916 At. no. 35 Valence 1 S. G. 3.12 B. P. 58.8° M. P. —7°	In sea water as alkali bromide and in the upper layers of salt deposits as sodium and magnesium bromide. By treatment of the brines with sulphuric acid and manganese dioxide, or else with chlorine. 1826, Balard.	A dark-red liquid, smelling like chlorine; its vapor irritates eyes, throat and nose. Dissolves in 30 parts of water (bromine water). Combines directly with most other elements, but less vigorously than chlorine.	Potassium bromide is used in pharmacy; silver bromide in photography. Bromine is used in the preparation of organic dyes and as a disinfectant.

CHEMICAL ELEMENTS—Continued

Elements	Occurrence and Preparation Date of Discovery, Discoverer	Properties	Chief Compounds and Uses
Cadmium, Cd At. wt. 112.41 At. no. 48 Valence 2 S. G. 8.6 M. P. 321.7 B. P. 767° Co. E. 29.8 E. R. 7.5 C. S. H	In association with the zinc ores, as carbonate and sulphide. In the distillation of impure zinc, the cadmium comes over in the first portions. 1817, Stromeyer.	A silver-white metal, more ductile and malleable than zinc. It burns in air and is attacked by dilute acids.	All the compounds are poisonous and little ionized. The sulphide (CdS) is the basis of cadmium yellow. The iodide is used in pharmacy. The metal is used as a protective plating.
Calcium, Ca At. wt. 40.08 At. no. 20 Valence 2 S. G. 1.55 M. P. 810° Co. E. 25 E. R. 4.6 C. S. C f	As carbonate (Iceland spar, calcite, aragonite, marble, chalk, limestone), sulphate (gypsum), phosphate (apatite), fluoride (fluor spar), and as complex silicates in great variety (feldspars, pyroxenes, amphiboles etc.). By electrolysis of the fused chloride or heating the iodide with sodium. 1808, Davy.	A white crystalline metal, harder than lead, that can be cut, drawn, rolled and turned. It attacks water and burns in the air at a red heat, forming the oxide (CaO) and the nitride (Ca_3N_2). It unites with hydrogen to form CaH_2, whose action on water is a source of hydrogen for balloons. Calcium salts color the test flame yellowish red.	Calcium oxide (quicklime) is used for mortar and to remove hair from hides. The hydroxide $[Ca(OH)_2]$ mixed with sand forms mortar; its solution is limewater. Plaster of Paris, a less hydrated sulphate, takes up water on setting to form $CaSO_4 \cdot 2H_2O$. The phosphates are fertilizers. Bleaching powder is CaClOCl and calcium carbide is CaC_2. Common glass contains silicates of calcium and sodium.
Carbon, C At. wt. 12.00 At. no. 6 Valence 4, 6 S. G. diamond 3.5; graphite 2.3; amorphous 1.9 M. P.—not realized; volatilizes at *c.* 3500°	As diamond and graphite, in the free state; in combination with hydrogen as petroleum; with oxygen as carbon dioxide in the air; with these and other elements as coal and in plant and animal tissues; and as many carbonates. By dry distillation of wood or coal, yielding charcoal and coke, respectively.	Diamond is crystalline and the hardest of minerals, the dark-colored "bort" being used for cutting and grinding. Graphite has a black metallic luster, is crystalline and may be scratched by the finger nail. Charcoal is amorphous and possesses the power of absorbing gases and also coloring matters. All three forms burn in oxygen to produce carbon dioxide.	The carbon compounds form the subject of organic chemistry. Carbon dioxide results from the burning of coal, coke, wood, oil or illuminating gas, from fermentation and decay, which are slow burnings, and is exhaled in the breath. Carbon monoxide, arising from recently stoked fires, is an exceedingly poisonous gas.
Cerium, Ce At. wt. 140.13 At. no. 58 Valence 3, 4, 6 S. G. 7.0 M. P. 640° E. R. 78 C. S. C	As silicate in cerite, along with Nd, Pr and La; also in monazite sand. By electrolysis of the fused chloride. 1803, Berzelius.	A metal with the color and luster of iron, like tin in hardness, and very ductile and malleable. Burns in air more easily and more brightly than magnesium. Emits sparks when scratched with steel.	Welsbach incandescent gas mantles contain 1% of cerium dioxide CeO_2. Alloys are used for gas and cigar lighters.
Cesium, Cs At. wt. 132.81 At. no. 55 Valence 1 S. G. 2.4 M. P. 26.3° B. P. 670°	In certain micas, mineral waters and the ashes of certain plants. By heating the hydroxide (CsOH) with magnesium or by electrolysis. 1860, Bunsen and Kirchoff.	A white silvery metal resembling potassium. It is one of the most active metals, the most electropositive and decomposes water violently. Gives two bright lines in the blue of the spectrum (*caesius*, sky blue).	
Chlorine, Cl At. wt. 35.46 At. no. 17 Valence 1, 7 S. G. (liquid) 1.3 M. P. —101.6° B. P. —33.6°	In sea water as chlorides of the alkalis and alkaline earths, and in salt deposits as like compounds. By electrolysis of alkali chloride, fused or in solution; or by the action of manganese dioxide on hydrochloric acid. 1774, Scheele.	A greenish-yellow gas of characteristic odor, with a violent action on the respiratory tract. Unites directly with all elements save oxygen, nitrogen and the argon family. Displaces bromine and iodine from bromides and iodides, and substitutes hydrogen in organic compounds.	The gas is used in extracting gold and in preparing bleaching and disinfecting agents. In presence of water it bleaches many coloring matters. Forms chlorides (as NaCl, HCl, $CaCl_2$), hypochlorites [as solution of $Ca(OCl)_2$], chlorates (as $KClO_3$, used for matches and in pyrotechny) and perchlorates (as $KClO_4$).
Chromium, Cr At. wt. 52.01 At. no. 24 Valence 2, 3, 6 S. G. 6.9 M. P. 1,515° Co. E. 8.2 E. R. 2.6 C. S. C b	As chromite $[Fe(CrO_2)_2]$. By reducing Cr_2O_3 with aluminum filings. 1797, Vauquelin.	A steel-gray, lustrous, brittle and very hard metal. At high temperatures it burns in air to green Cr_2O_3. It is attacked by dilute sulphuric or hydrochloric acid but not by nitric acid.	Used in alloys of steel and nickel. Chrome green, the pigment, is Cr_2O_3. Chrome yellow is $PbCrO_4$. Bichromates (as $K_2Cr_2O_7$) are used in photo-processes, tanning and dyeing and as oxidizing agents, e.g., in batteries. The metal is used as a protective plating like nickel.
Cobalt, Co At. wt. 58.94 At. no. 27 Valence 2, 3 S. G. 8.9 M. P. 1480° Co. E. 12.3 E. R. 9.7 C. S. H(?)	As smaltite ($CoAs_2$) and cobaltite (CoAsS) found with iron and nickel. By igniting the oxide in hydrogen. 1735, Brandt.	A white magnetic malleable metal, less tenacious than iron. By exposure it turns pinkish. It is less active chemically than iron.	Its intensely blue silicates are used in coloring porcelain and constitute the pigment smalt.
Columbium (Niobium), Cb At. wt. 93.3 At. no. 41 Valence 1, 2, 4, 5 S. G. 12.7 M. P. 1950°	In the mineral columbite. By reduction of CbO_2 by paraffin. 1801, Hatchett.	A light-gray malleable and ductile metal, as hard as wrought iron; not affected by acids, even by aqua regia. The hydride (CbH) burns in air.	The compounds occur with those of tantalum, which they closely resemble.
Copper, Cu At.wt. 63.57 At. no. 29 Valence 1, 2 S. G. 8.92 M. P. 1084.1 B. P. 2100° Co. E. 16.6 E. R. 1.69 C. S. C f	Free, as cuprite (Cu_2O), copperglance (Cu_2S), chalcopyrite ($CuS \cdot FeS$), malachite $[CuCO_3 \cdot Cu(OH)_2]$. After removal of iron and sulphur, the oxide is reduced by heating with carbon. It is refined electrolytically.	A red, lustrous, very ductile and malleable metal of tensile strength 14 tons per sq. in., second only to silver in electrical conductivity. In ordinary air it gradually becomes coated with basic carbonate. In absence of air, nitric acid alone among the dilute acids attacks it, but in presence of air even the acids found in foodstuffs can dissolve it.	The metal is used for coins, electroplating, electric leads, roofing, cooking vessels and for making alloys, such as brass, bell and gun metals, German silver and the bronzes. The soluble compounds are poisonous and are therefore used as germicides in agriculture. Blue vitriol is $CuSO_4 \cdot 5H_2O$; the basic acetate is verdigris.

CHEMICAL ELEMENTS—Continued

Elements	Occurrence and Preparation Date of Discovery, Discoverer	Properties	Chief Compounds and Uses
Dysprosium, Dy At. wt. 162.46 At. no. 66 Valence 3	In monazite, gadolinite, etc. By fractional crystallization of bromates. 1886, Boisbaudran.	A rare earth. The oxide is dysprosia (Dy_2O_3), found with three other rare earths.	The salts are green or yellow in color and show characteristic absorption bands. The salts are the most magnetic of all salts.
Erbium, Er At. wt. 167.64 At. no. 68 Valence 3	In gadolinite, etc. 1843, Mosander.	A rare earth. The oxide erbia (Er_2O_3) is found with holmia, thulia and dysprosia.	The salts are rose-colored and show characteristic absorption spectra.
Europium, Eu At. wt. 152.0 At. no. 63 Valence 3	In monazite and other rare minerals. 1896, Demarçay.	This element so closely resembles samarium that the analytical separation of the two is difficult.	The salts are pinkish and show a faint absorption spectrum.
Fluorine, F At. wt. 19.0 At. no. 9 Valence 1 S. G. (liquid) 1.14 at —187° M. P. —223° B. P. —187°	As cryolite ($AlF_3{:}3NaF$), fluorspar (CaF_2) and very widely elsewhere in small quantities. By electrolysis of dry hydrogen fluoride at —23°. 1886, Moissan.	A pale yellowish-green gas that unites with every element except oxygen and the argon family. It rapidly displaces oxygen from water or chlorine from hydrogen chloride. Attacks glass and cannot be kept in glass vessels.	Hydrogen fluoride is used for etching glass and in silicate analysis. Silver fluoride is soluble and calcium fluoride insoluble, in contrast with the other halides of these metals.
Gadolinium, Gd At. wt. 157.3 At. no. 64 Valence 3	In gadolinite and samarskite. 1886, Marignac.	This element closely resembles terbium in its compounds.	The salts are colorless and show absorption bands only in the ultraviolet.
Gallium, Ga At. wt. 69.72 At. no. 31 Valence 3 S. G. 5.9 M. P. 30.1°	In iron ores, zinc blende and bauxite. By electrolysis of an alkaline solution of its salts secured from zinc. 1875, Boisbaudran.	A bluish-white tough metal that may be cut with a knife. Like aluminum, it is soluble in hydrochloric acid and in caustic alkali, but not in nitric acid.	It forms two chlorides ($GaCl_3$ and $GaCl_2$) that yield spark spectra very characteristic of gallium. Alloys with aluminum and cadmium are used for optical mirrors, cathodes etc.
Germanium, Ge At. wt. 72.60 At. no. 32 Valence 2, 4 S. G. 5.5 M. P. 985.5°	In the rare mineral argyrodite. By the reduction of the dioxide (GeO_2) by carbon. 1886, Winkler.	A grayish-white brittle, lustrous metal, insoluble in hydrochloric acid. It combines directly with the halogens.	The close relation of this element to carbon and silicon is shown in the compound germanium chloroform ($GeHCl_3$). Mendelyeev described it before its discovery, calling it eka-silicon. The oxide is used to treat pernicious anemia.
Gold, Au At. wt. 197.2 At. no. 79 Valence 1, 3 S. G. 19.32 M. P. 1062.4° Co. E. 14.2 E. R. 2.4 C. S. C f	Chiefly free but also as telluride; many specimens of iron pyrites are auriferous. From gold-bearing sands by washing away the lighter material and dissolving the gold from the residue by mercury, which is subsequently separated from the gold by distillation. Quartz ores are pulverized in stamping mills, and the powder is then carried by water over amalgamated copper plates on which the gold collects.	A soft bright-yellow metal, easily scratched by the knife, an excellent conductor of heat and of electricity. The most ductile and the most malleable of all the metals. Chemically, gold is rather inert, and is not attacked by the oxygen of the air, by hydrogen sulphide or by any single one of the common acids. It is attacked by fused alkalis, yielding aurates, and by aqua regia, yielding chlorauric acid ($HAuCl_4$).	Pure gold is called 24-carat gold. Jewelry is made in 18-, 14- and 9-carat gold, the addition of copper increasing the hardness and rigidity. Sodium chloraurate ($NaAuCl_4$) is used for toning in photography, and potassium auricyanide [$KAu(CN)_4$] is used in electrogilding.
Hafnium, Hf At. wt. 178.6 At. no. 72 Valence 4 S. G. 12.1	Associated with zirconium. By decomposing the tetraiodide. 1922, Coster and Hevesy.	Analogous to zirconium.	Similar to zirconium compounds, from which it is separated by fractional crystallization of double fluorides.
Helium, He At. wt. 4.002 At. no. 2 Valence 0 S. G. (liquid) 0.15 B. P. —268.7° M. P. below —272°	In air to the extent of 1 to 2 vols. per million; also occluded in certain minerals. First observed in sun's spectrum. Neon and helium are boiled off crude argon, and the neon is solidified by cooling. 1895, Ramsay.	The lightest gas except hydrogen, transparent, odorless and colorless, inert, forming no compounds with other elements.	It is one of the decomposition products of certain other (radioactive) elements. Used for balloons; is not inflammable.
Holmium, Ho At. wt. 163.5 At. no. 67 Valence 3	A rare-earth metal that occurs with and is separated from the erbium subgroup of the rare earths. 1878, Cleve.		The salts are orange yellow and are similar to those of dysprosium.
Hydrogen, H At. wt. 1.008 At. no. 1 Valence 1 S. G. (liquid) 0.07 M. P. —259.1° B. P. —252.7°	In air to the extent of 1 vol. per 20,000 vols. air; combined, in water (11.19% by wt.) natural gas, petroleum and all animal and vegetable bodies. By treating zinc with hydrochloric or sulphuric acid; by electrolysis of water. 1766, Cavendish.	The lightest gas, transparent, odorless and colorless, soluble in water (2 vols. in 100 vols. water under average conditions), in platinum, in palladium (502 vols. in 1 of Pd). Burns in air and in chlorine and unites with many of the other elements.	Its two oxides are water (H_2O) and hydrogen peroxide (H_2O_2), the latter used in solution as a bleaching agent. Every acid contains hydrogen as an essential constituent: Its compounds with carbon and other elements number over 100,000. Hydrogen gas is used for the oxyhydrogen flame and for filling balloons.
Illinium, Il At. wt. 14.6 (?) At. no. 61 Valence 3	In monazite residues and with the cerium earths, from which its salts are separated. 1926, Hopkins.	This rare-earth metal has not been isolated, but is recognized by its X-ray spectrum and by its optical absorption spectrum.	The compounds are similar to those of neodymium and samarium.
Indium, In At. wt. 114.8 At. no. 49 Valence 3, 1 S. G. 7.3 M. P. 186°	In zinc blende (ZnS) in small quantities. Electrolytically from solutions of its salts. 1863, Reich and Richter.	A white metal, malleable, softer than lead, about as heavy as tin.	Its compounds color the nonluminous gas flame blue and show a characteristic indigo blue line in the spectrum—hence the name.
Iodine, I At. wt. 126.92 At. no. 53 Valence 1, 5, 7 S. G. 4.95 M. P. 113.5° B. P. 184.3°	In the ocean, in certain seaweeds and in Chile saltpeter, always in the combined state. From iodides by displacement of their iodine by chlorine. 1811, Courtois.	A dark-gray brittle solid with a metallic luster. Its vapor is violet, as are its solutions in chloroform and in carbon bisulphide. It requires over 5,000 parts of water for its solution. Combines directly with many elements, but is much less active than chlorine and bromine.	Used in pharmacy as an antiseptic and in prescriptions for the treatment of goiter. Potassium iodide (KI) and iodoform (CHI_3) likewise find application in medicine. The alkyl iodides (e. g., C_2H_5I) are much used in synthetic organic chemistry.

CHEMICAL ELEMENTS—Continued

Elements	Occurrence and Preparation Date of Discovery, Discoverer	Properties	Chief Compounds and Uses
Iridium, Ir At. wt. 193.1 At. no. 77 Valence 3, 4 S. G. 22.42 M. P. 1950° Co. E. 6.5 E. R. 6.0 C. S. C f	Along with platinum. By a complex series of operations from platinum ores. 1804, Tennant.	A white metal, brittle when cold, very hard and one of the heaviest substances known. It is attacked by fused alkalis but not by aqua regia.	It is used for pointing gold pens. Its alloy with 9 parts of platinum is used for standard meter bars on account of its inalterability. Used for a black color in china decoration.
Iron, Fe At. wt. 55.84 At. no. 26 Valence 2, 3 S. G. 7.86; pig, 7.03 to 7.73 M. P. 1535° wrought 1600° steel 1375° gray pig 1275° white pig 1075° Co. E. 11.7 E. R. 10.0 C. S. C f, C b	As magnetic oxide (Fe_3O_4), hematite (Fe_2O_3), limonite ($2Fe_2O_3 \cdot 3H_2O$), siderite (Fe_2CO_3), which are important ores; iron pyrites (FeS_2); in rocks as complex silicates and in plants and animals. Pig iron is prepared in the blast furnace by reduction of the ore by means of carbon monoxide in presence of a suitable flux. From pig iron, wrought iron is obtained by puddling, and steel by the Bessemer, open-hearth or other process.	A white, malleable, ductile, magnetic metal, unchanged in dry air or air-free water but rusting in moist air. Easily attacked by dilute acids but not by fused alkalis. Cast iron contains 2% to 5% of carbon and other impurities, and is hard and brittle. Wrought iron contains less than 0.2% of carbon and is softer and tougher, with a tensile strength of 22 to 25 tons per sq. in. Steel contains from 0.2% to 1.5% of carbon, is permanently magnetic, may be tempered, and possesses tensile strength up to 100 tons per sq. in.	The metal is used as a structural material, for rails, machinery, tools etc. Jeweler's rouge and Venetian red consist of the oxide (Fe_2O_3). Rust is chiefly the hydrated oxide (FeO,OH). Hammer scale and lodestone have the composition Fe_3O_4. Ferric chloride ($FeCl_3$), ferrous iodide (FeI_2) and other iron compounds are used in medicine. Green vitriol ($FeSO_4 \cdot 7H_2O$) is used in making ink and in dyeing. Potassium ferrocyanide [$K_4Fe(CN)_6$] is used for making Prussian blue, potassium cyanide, etc.
Krypton, K At. wt. 83.7 At. no. 36 Valence 0 M. P. —169° B. P. —151.8°	In minute quantity in the air. From crude argon by fractional distillation. 1898, Ramsay and Travers.	An inert, colorless, odorless gas resembling, but denser than, argon.	It forms no compounds and is identified by its characteristic spectrum.
Lanthanum, La At. wt. 138.9 At. no. 57 Valence 3 S. G. 6.15	As lanthanite [$La_2(CO_3)_3,8H_2O$]. By electrolysis of fused $LaCl_3$. 1839, Mosander.	A rare-earth, iron-gray metal tarnishing in air to steel-blue; malleable and ductile. Attacked slowly even by cold water.	When heated in air it forms a strongly basic oxide (La_2O_3) that is diamagnetic and a nitride (LaN).
Lead, Pb At. wt. 207.22 At. no. 82 Valence 2, 4 S. G. 11.34 M. P. 327° Co. E. 29.1 E. R. 21.9 C. S. C f	End product of certain radioactive decompositions. As galena (PbS) and in silver ores. By calcination of partially roasted galena. Purification is effected by Parkes process.	A soft, gray metal, malleable, of low tensile strength, relatively impermeable to X rays. In presence of air, water acts on lead to produce the hydroxide, which, being slightly soluble, may cause lead poisoning if present in water supplies. When heated in air it is oxidized to litharge (PbO) and, under suitable conditions, to minium (Pb_3O_4).	The metal is used for water pipes, roofs and gutters and storage batteries. For shot it is alloyed with 0.4% of arsenic. Typemetal contains 20% of antimony. Babbitt metal, for bearings, contains over 70% of lead. Solder and pewter are alloys of lead and tin. The basic carbonate $2PbCO_3 \cdot Pb(OH)_2$, white lead, is the basis of most oil paints.
Lithium, Li At. wt. 6.94 At. no. 3 Valence 1 S. G. 0.53 M. P. 186° B. P. above 1400° Co. E. 56 E. R. 9.3 C. S. C	As a mixed fluoride with aluminum in amblygonite. By electrolysis of the fused chloride. 1817, Arfvedson.	The lightest-weight metal; silver-white, softer than lead, tarnishes quickly in air and is easily acted upon by water. When heated, it unites vigorously with nitrogen.	The carbonate [$Li_2(CO_3)$] is used in medicine as a solvent for uric acid, lithium urate being soluble. The lithium salts give a carmine flame coloration.
Lutecium, Lu At. wt. 175.0 At. no. 71	In euxenite. 1907, Welsbach and Urbain.	Like ytterbium but has lower magnetic susceptibility.	Its compounds resemble those of ytterbium.
Magnesium, Mg At. wt. 24.32 At. no. 12 Valence 2 S. G. 1.74 M. P. 633° B. P. 1100° Co. E. 25.6 E. R. 4.5 C. S. H	As magnesite ($MgCO_3$), dolomite ($MgCO_3 \cdot CaCO_3$), carnallite ($MgCl_2 \cdot KCl \cdot 6H_2O$) and in very many complex silicates. By electrolysis of dried, fused carnallite. 1830, Liebig and Bussy.	A silver-white, very light-weight metal, ductile when hot, and malleable. It tarnishes in air and acts slowly upon water, rapidly on steam. Burns in air to the oxide MgO, emitting a very bright light. It unites directly with nitrogen.	Used as a reducing agent. The sulphate ($MgSO_4 \cdot 7H_2O$) is known as epsom salts and is used in medicine, as are the oxide (magnesia), the carbonates and citrate. The bright light emitted when the metal is burned in air is used in photography.
Manganese, Mn At. wt. 54.93 At. no. 25 Valence 2, 3, 4, 6, 7 S. G. 7.2 M. P. 1230° Co. E. 23.0 E. R. 5 C. S. CT	As pyrolusite (MnO_2), beaunite (Mn_2O_3), hausmannite (Mn_3O_4) and manganese spar ($MnCO_3$). By heating Mn_3O_4 with aluminum filings. 1774, Gahn.	A steel-gray, hard, brittle metal with a pinkish tinge. It rusts in moist air and is attacked by dilute acids.	Ferromanganese and spiegeleisen are alloys with iron, used in making steel tougher. With copper it forms the hard, tough manganese bronzes, with tensile strength up to 30 tons per sq. in. Impure sodium permanganate ($NaMnO_4$) is used in disinfecting as Condy's fluid. Many uses—medical, oxidizing, coloring, fertilizing.
Masurium, Ma At. wt. (?) At. no. 43	In platinum ores and in columbite. 1925, Noddack and Tacke.	The metal has not been isolated but is recognized by its X-ray spectrum. It was called *ekamanganese* by Mendelyeev.	
Mercury, Hg At. wt. 200.61 At. no. 80 Valence 1, 2 S. G. 13.6 M. P. -38.8° B. P. 356.9° Co. E. 18.2 E. R. 95.8	Free and as cinnabar (HgS). By roasting cinnabar $HgS + O_2 \rightarrow Hg + SO_2$.	A silver-white mobile liquid 20% heavier than lead. It has a vapor pressure at 0° of 0.0002 mm. It tarnishes slowly in air and is attacked only by dilute nitric among the dilute acids. The vapor is monatomic.	It is used in thermometers and barometers. Its alloys are called amalgams, some of which are used in dentistry. Calomel ($HgCl$) is administered internally in medicine; corrosive sublimate ($HgCl_2$) forms a solution with very powerful germicidal properties. The element and its compounds are poisonous. Mercury vapor boilers have many advantages over water boilers.

CHEMICAL ELEMENTS—Continued

Elements	Occurrence and Preparation Date of Discovery, Discoverer	Properties	Chief Compounds and Uses
Molybdenum, Mo At. wt. 96.0 At. no. 42 Valence 3, 4, 5, 6 S. G. 10.2 M. P. 2110° Co. E. 4 E. R. 4.8 C. S. C b	As molybdenite (MoS_2) and wulfenite ($PbMoO_4$). By reducing the oxides with aluminum powder. 1790, Hjelm.	A white metal as malleable as iron; it will not scratch glass. Insoluble in hydrochloric or dilute sulphuric acid.	The ferromolybdenum alloys are used in the manufacture of special steels.
Neodymium, Nd At. wt. 144.27 At. no. 60 Valence 3, 4 S. G. 6.9 M. P. 840°	With cerium and lanthanum. By electrolysis of the fused chloride. 1885, Welsbach.	A rare-earth, yellowish metal, tarnishing in air.	The salts are rose-violet in color, and their solutions show characteristic absorption spectra.
Neon, Ne At. wt. 20.18 At. no. 10 Valence 0 B. B. *c.* —243°	In minute quantity in the atmosphere. Neon and helium are boiled out of crude argon, and the neon separated from helium by cooling with liquid hydrogen. 1898, Ramsay and Travers.	A colorless, transparent, odorless, inert gas resembling argon.	It forms no compounds and is recognized by its characteristic spectrum. Used in glow tubes for display signs.
Nickel, Ni At. wt. 58.69 At. no. 28 Valence 2, 3 S. G. 8.8 M. P. 1452° Co. E. 12.8 E. R. 6.9 C. S. C f	As nicollite (NiAs) and nickel glance (NiAsS). By igniting the oxalate in hydrogen. 1751, Cronstedt.	A white, very hard, lustrous metal, malleable, ductile and tenacious. It rusts slowly in air and is easily attacked only by nitric acid.	The metal furnishes a protective coating when plated on iron. German silver is an alloy of nickel, copper and zinc. Nickel chromium steel is used for armor plates. Manganin, containing nickel, copper and manganese, is used for electrical resistances. It is a catalyst, especially in hydrogenation.
Nitrogen, N At. wt. 14.008 At. no. 7 Valence 3, 5 M. P. —209.8° B. P. —195.8°	Free nitrogen forms about four-fifths of air by volume. As Bengal saltpeter (KNO_3), Chile saltpeter ($NaNO_3$); and as an essential constituent of vegetable and animal protoplasm. By heating ammonium nitrite, by oxidation of ammonia, etc. 1772, Daniel Rutherford.	A colorless, odorless, transparent gas, rather inactive chemically. At ordinary temperature and pressure, 100 vols. of water dissolve 1.5 vols. of nitrogen. It unites directly with strongly heated boron, lithium, calcium and magnesium.	Nitrous oxide (N_2O), or laughing gas, is used by dentists. Nitric acid (HNO_3) has many applications in technical chemistry. Ammonia (NH_3) is a very soluble gas. Ammonium sulphate [$(NH_4)_2SO_4$] and Chile saltpeter are used as nitrogenous fertilizers. Nitrogen is a constituent of the aniline dyes, the proteins and many other important organic substances. Used in electric lamps and mercurial thermometers.
Osmium, Os At. wt. 190.8 At. no. 76 Valence 2, 3, 4, 6, 8 S. G. 22.48 M. P. 2700° Co. E. 6.1 E. R. 9.0 C. S. H	With platinum. By reducing OsO_4. 1802, Tennant.	A gray metal harder than glass; the heaviest of known bodies.	Its alloy with iridium is used in tipping gold pens. Osmium tetroxide (OsO_4) is used as a microscopic stain for fat.
Oxygen, O At. wt. 16.00 At. no. 8 Valence 2 S. G. (liquid at B.P.) 1.13 M. P. —218.4° B. P. —183°	Free oxygen forms about one-fifth of air by volume. Water contains 88.88% of oxygen. The rocks of the earth's crust contain *c.* 45% in combination, chiefly as silicates. In the laboratory, by heating potassium chlorate ($KClO_3$). Commercially from the air. 1774, Priestley and Scheele.	A colorless, odorless, tasteless, transparent gas, slightly heavier than air. At ordinary temperature and pressure, 100 vols. of water dissolve 3 vols. of oxygen. It is very active chemically, combining directly with all but a few of the other elements to form oxides. Sulphur, phosphorus, etc., burn much more vigorously in oxygen than in air. Liquid oxygen is magnetic.	The gas is sold compressed in mild steel cylinders and is used for the oxyhydrogen blowpipe and in medicine, also for chemical purposes. It is necessary to support animal respiration and to sustain ordinary combustion. It enters as a constituent into all oxides, most salts and many organic compounds.
Palladium, Pd At. wt. 106.7 At. no. 46 Valence 2, 4 S. G. 12 M. P. *c.* 1535° Co. E. 11.8 E. R. 10.8 C. S. C f	With platinum and with gold and in nickel ores. By a complex series of processes from platinum ores. 1803, Wollaston.	A silvery, malleable and ductile metal, related to platinum, unlike which, however, it is attacked by nitric acid. Under suitable conditions it can absorb over 900 vols. of hydrogen.	Since it does not tarnish, it is used for coating silver goods, and by dentists as a substitute for gold. Like platinum, it is used as a catalyst.
Phosphorus, P At. wt. 31.02 At. no. 15 Valence 3, 5 S. G. white, 1.82 red, 2.2 M. P. white, 44° B. P. 287°	As phosphates, such as apatite [$Ca_5F(PO_4)_3$]; in bones, teeth, brain and seeds of plants. By reduction of calcium phosphate by carbon in the electric furnace in presence of a suitable flux. 1669, Brandt.	Phosphorus exists in two allotropic modifications: white phosphorus is waxy in consistency, soluble in carbon bisulphide, evil smelling and poisonous; red phosphorus is a solid, insoluble in carbon bisulphide, odorless and not poisonous. White phosphorus has a low ignition temperature, hence its former use in matches.	Red phosphorus is used in the manufacture of matches, as also is the compound P_4S_3. In the form of superphosphate of lime [$CaH_4(PO_4)_2$], phosphorus is an important artificial manure. The chlorides (PCl_3 and PCl_5) are much used in organic chemistry. Compounds are used as nerve tonics, correctives for rickets, skin diseases, etc.
Platinum, Pt At. wt. 195.23 At. no. 78 Valence 2, 4 S. G. 21.45 M. P. 1753° Co. E. 8.9 E. R. 10.5 C. S. C f	Free, alloyed with the platinum metals, as nuggets in alluvial sands in the Urals, California and elsewhere. It is freed from the metals with which it is alloyed by a complex series of processes.	A silvery, tenacious, very heavy, ductile and malleable metal, unaltered in moist air and unattacked by any single common acid. Aqua regia, fused alkalis, alkali nitrates and cyanides, however, attack it. Platinum sponge and platinum black are finely divided forms.	On account of its resistance to acids, platinum is used for chemical vessels and electrodes. Since platinum has a coefficient of expansion very close to that of glass, platinum wires can be fused through glass without danger of breakage on cooling. The salts are used in photography. Used as a catalyst in making sulphuric and nitric acids; the metal costs from three to four times as much as gold, and is much used in jewelry.

CHEMICAL ELEMENTS—Continued

ELEMENTS	OCCURRENCE AND PREPARATION DATE OF DISCOVERY, DISCOVERER	PROPERTIES	CHIEF COMPOUNDS AND USES
Polonium, Po At. wt. 210 (?) At. no. 84	With bismuth in uranium minerals. The metal has been isolated only in minute quantity. 1898, the Curies.	A radioactive element, Radium F, with a half period of 136 days.	The compounds resemble those of tellurium.
Potassium, K At. wt. 39.10 At. no. 19 Valence 1 S. G. 0.86 M. P. 62.5° B. P. 760° Co. E. 83 E. R. 7.0 C. S. C	As sylvite (KCl), carnallite ($KCl \cdot MgCl_2 \cdot 6H_2O$); in plant and animal ashes and in many complex silicates. By reduction or by electrolysis of fused potassium hydroxide (KOH). 1807, Davy.	A silver-white lustrous, very light-weight metal, as soft as wax, tarnishing instantly in moist air. Chemically it is very active, decomposing water in the cold and uniting violently with the halogens, sulphur and oxygen.	An alloy with sodium is used in filling high-temperature thermometers. Bengal saltpeter is the nitrate and is used in pyrotechnics, for gunpowder and as a preservative. The iodide (KI) is used in pharmacy. The chlorate, like the nitrate, is used as a source of oxygen in fireworks and for match heads. Caustic potash (KOH) has many chemical applications. The cyanide (KCN) is used in gold extraction.
Praseodymium, Pr At. wt. 140.92 At. no. 59 Valence 3, 4 S. G. 6.47 M. P. 940°	With cerium and lanthanum. By electrolysis of the fused chloride. 1885, Welsbach.	A rare-earth, yellowish metal, remaining untarnished in air.	The salts are leek-green in color, and their solutions have characteristic absorption spectra.
Protoactinium, Pa At. wt. 230 (?) At. no. 91	In uranium minerals. The metal has been isolated; about 130 milligrams may be secured from 1,000 kilograms of uranium. 1927, Aristid Grosse.	A radioactive element, emitting alpha rays. Its half period is 1.2×10^4 years.	The compounds resemble those of tantalum.
Radium, Ra At. wt. 225.95 At. no. 88 Valence 2	In minute quantity in pitchblende and other uranium minerals. The metal has been isolated; the bromide is separated from the barium bromide prepared from pitchblende by fractional crystallization. 1898, the Curies and Bémont.	In all of its compounds, the metal has the power of emitting certain radiations. These can pass through matter that is opaque to light, render air a conductor, affect a photographic plate and cause a zinc-sulphide screen to fluoresce visibly.	The rays from radium compounds (such as $RaBr_2$, $RaCl_2$, $RaCO_3$) act destructively on living tissues and on bacteria. One gram of radium in any of its compounds gives off about 100 calories of heat per hour.
Radon, Rn At. wt. 222 At. no. 86 Valence 0	Admixed with air, by passing air through solutions of radium salts. 1900, the Curies.	Inert gas of the helium family, radioactive, emitting alpha rays, and the half period is 3.83 days.	Forms no compounds. Radon is used in the treatment of cancer; enclosed in minute glass vessels the size of a small matchhead, it is inserted into the tumor.
Rhenium, Re At. wt. 186.31 At. no. 75 M. P. above 3000°	In molybdenum and platinum ores. 1925, Noddack.	Silver-white hard metal, heavier than gold. Only tungsten is less fusible. Chemical properties are like manganese.	
Rhodium, Rh At. wt. 102.91 At. no. 45 Valence 2, 3, 4 S. G. 12.1 M. P. above 2000° Co. E. 8.4 E. R. 5.1 C. S. C f	In the ores of platinum. By a complex series of processes from platinum ores. 1803, Wollaston.	A silvery, malleable and ductile metal, not tarnishing in air and not attacked by aqua regia.	The red chloride ($RhCl_3$) is formed by the action of chlorine upon the metal. Rhodium-platinum alloy is used for thermocouples to measure high temperatures.
Rubidium, Rb At. wt. 85.44 At. no. 37 Valence 1, 3, 5 S. G. 1.53 M. P. 38.5° B. P. 696°	Found with cesium. The salts are associated with salts of potassium. By heating the hydroxides with magnesium or by electrolysis of the cyanides or hydroxides. 1860, Bunsen and Kirchoff.	A silver-white metal resembling potassium, like which it attacks water vigorously.	The compounds show characteristic flame-spectra with two red lines.
Ruthenium, Ru At. wt. 101.7 At. no. 44 Valence 3, 4, 6, 7, 8 S. G. 12.1 M. P. above 2000°	In the ores of platinum. By a complex series of processes from platinum ores. 1845, Claus.	A hard, white, brittle metal, oxidized when heated in air, scarcely attacked by aqua regia and very infusible. Chemical properties resemble osmium.	The following oxides are known: Ru_2O_3, RuO_2, RuO_4, as well as salts corresponding to RuO_3 and Ru_2O_7. Ruthenium red, an ammoniacal compound, dyes silk a beautiful yellow, but is too costly. No practical use.
Samarium, Sa At. wt. 150.43 At. no. 62 Valence 2, 3 S. G. c. 7.7 M. P. 1300 to 1400°	In monazite and samarskite. By electrolysis of the chloride. 1879, Boisbaudran.	A rare-earth, whitish-gray metal, tarnishing in air.	The salts are topaz-yellow in color and are similar to those of lanthanum.
Scandium, Sc At. wt. 45.1 At. no. 21 Valence 3	In the minerals euxenite and gadolinite. 1879, Nilson.	The existence of this element, whose oxide was discovered in 1879, was predicted by Mendelyeev 1869. He called it *ekaboron.*	The chloride ($ScCl_3$) shows a characteristic spark spectrum.
Selenium, Se At. wt. 79.2 At. no. 34 Valence 2, 4, 6 S. G. amorphous 4.26 monoclinic 4.28 hexagonal 4.8 M. P. amorphous 50° monoclinic 170 to 180° hexagonal 217° B. P. 690° Co. E. 37 E. R. 1.2 C. S. T H C	Free in some specimens of sulphur and in combination with lead, iron and other metals, as in pyrites. (Amorphous) by reducing selenious acid (H_2SiO_3) by sulphur dioxide. With tellurium it is obtained from the anode slime of copper refineries. 1817, Berzelius.	Three varieties are known: (1) red amorphous, soluble in carbon bisulphide, from which it is deposited as (2) red translucent monoclinic crystals, soluble in carbon bisulphide; (3) blue-gray metallic selenium, insoluble in carbon bisulphide. This last form conducts electricity much better when exposed to light, and the brighter the light, the better.	Selenium cells are used as indicators of intensity of illumination. The compounds strongly resemble those of sulphur. Hydrogen selenide is an evil-smelling inflammable gas. Selenic acid (H_2SeO_4) is a more powerful oxidizer than sulphuric acid and dissolves gold. The oxychloride is a valuable solvent for resins, fish oils, etc.

CHEMICAL ELEMENTS—Continued

ELEMENTS	OCCURRENCE AND PREPARATION DATE OF DISCOVERY, DISCOVERER	PROPERTIES	CHIEF COMPOUNDS AND USES
Silicon, Si At. wt. 28.06 At. no. 14 Valence 4 S. G. amorphous 2.35 crystalline 2.4 M. P. 1420° B. P. *c.* 3500°	Silicon dioxide (SiO_2) occurs as flint, quartz, quartz sand etc. The igneous rocks are composed largely of silicates, and this element constitutes more than 25% of the earth's crust—more than any other element except oxygen. By reducing sand with coke in the electric furnace. 1823, Berzelius.	Amorphous silicon is a brown powder that burns when heated in air. Crystalline silicon forms black needles. It is less active than the amorphous variety and is attacked only slowly by a mixture of hydrofluoric and nitric acids. It unites with fluorine, however, at ordinary temperatures.	The pigs of silicon made at Niagara are used in steelmaking. Silicon steel is more magnetic than iron. The ornamental varieties of quartz find uses as gemstones, as do several natural silicates. Silicon carbide, carborundum (SiC), is used as an abrasive. Sodium silicate solution is waterglass, used to protect sandstone and to preserve eggs. Common glass is a mixture of sodium and calcium silicates.
Silver, Ag At. wt. 107.88 At. no. 47 Valence 1 S. G. 10.53 M. P. 961° B. P. 2050° Co. E. 18.9 E. R. 1.62 C. S. C f	Native, as sulphide (Ag_2S) often associated with galena; chloride (AgCl), etc. From lead by the Pattinson or the Parkes process; from the ores by the Mexican and other processes.	A white, highly lustrous, tough, very ductile and malleable metal; the best conductor of heat and electricity known. Liquid silver dissolves oxygen. It is unaffected by the oxygen of moist air, and its tarnishing is due to the action of hydrogen sulphide. It dissolves in dilute nitric and in concentrated hot sulphuric acid.	It is employed for articles of use and of ornament and for coinage. U. S. sterling silver contains 90% silver with 10% copper. Lunar caustic is silver nitrate. This salt and the halides of silver are extensively used in photography. For electroplating a bath of potassium argenticyanide [$KAg(CN)_2$] is used.
Sodium, Na At. wt. 22.997 At. no. 11 Valence 1 S. G. 0.97 M. P. 97.5° B. P. 742° Co. E. 71 E. R. 4.6 C. S. C	In the sea as chloride (NaCl); in salt deposits as chloride, borate, nitrate; in many complex silicates in rocks. By electrolysis of fused sodium hydroxide (NaOH). 1807, Davy.	A silver-white metal, as soft as wax. It immediately tarnishes at ordinary temperature. Like potassium it is very active, uniting directly with many other elements and attacking water vigorously in the cold.	The metal is used in the manufacture of several chemicals. Sodium chloride (NaCl), common salt, is a necessity of life to most animals; and is used in the manufacture of hydrochloric acid, chlorine and sodium compounds. Sodium carbonate ($NaCO_3 \cdot 10H_2O$), or washing soda, and sodium hydroxide (NaOH) are used for cleaning and in the manufacture of soap and chemicals. Sodium bicarbonate ($NaHCO_3$) is baking soda. The sulphate ($Na_2SO_4 \cdot 10H_2O$) is known as Glauber's salt; the thiosulphate, by photographers, as *hypo*.
Strontium, Sr At. wt. 87.63 At. no. 38 Valence 2 S. G. 2.55 M. P. *c.* 800°	As strontianite ($SrCO_3$) and celestine ($SrSO_4$). By electrolysis of the fused chloride. 1808, Davy.	A white metal, softer than calcium and harder than sodium, tarnishing to a yellow tint. Like calcium, it is active enough to attack water vigorously in the cold.	The nitrate and chlorate are used in fireworks for red fire. All volatile compounds color the Bunsen flame red.
Sulphur, S At. wt. 32.06 At. no. 16 Valence 2, 3, 4, 6 S. G. rhombic 2.07 monoclinic 1.96 M. P. rhombic 112.4° monoclinic 119° B. P. 444.6°	Native, in combination with most metals as sulphides and with some metals as sulphates. By melting the free sulphur away from the rocky matrix, and subsequent purification by distillation.	Natural sulphur is rhombic in crystalline form, yellow, brittle, of vitreous luster and a poor conductor of heat and electricity. This and the monoclinic variety are soluble in carbon bisulphide, while amorphous sulphur is not. When heated, sulphur unites directly with most other elements.	Sulphur is used to prepare sulphur dioxide (SO_2), which is used in making sulphuric acid and sulphites and for bleaching; also for vulcanizing rubber and in the manufacture of black gunpowder, fireworks and matches. Sulphuric acid (H_2SO_4) is to chemical industry what iron is to engineering.
Tantalum, Ta At. wt. 181.4 At. no. 73 Valence 2, 4, 5 S. G. 16.6 M. P. 2850° Co. E. 7 E. R. 15 C. S. C b	In tantalite and many other rare minerals. By the action of sodium on sodium tantalofluoride (Na_2TaF_7). 1802, Eckeberg.	A hard silver-white metal, ductile and malleable when hot, of very high tensile strength. The hot metal can absorb 740 volumes of hydrogen. It is not attacked by aqua regia.	The metal was used for filaments for electric lamps, until tungsten took its place; a substitute for platinum in many uses; in surgical instruments and rectifiers.
Tellurium, Te At. wt. 127.5 At. no. 52 Valence 2, 4, 6 S. G. cryst. 6.3 M. P. cryst. 455° B. P. 1400° Co. E. 16.8	Free and as tellurides. By reducing tellurious acid (H_2TeO_3) by means of sulphur dioxide. 1782, Von Reichenstein.	The crystalline variety is white, has metallic luster and conducts heat and electricity. The precipitated variety is black and of lower density. The element is related to sulphur but is more metallic in character.	The compounds find few applications —coloring glass, giving silver a platinum finish. Telluric acid (H_6TeO_6) has basic as well as acid characters, in keeping with the position of the element between metals and nonmetals.
Terbium, Tb At. wt. 159.2 At. no. 65 Valence 3	In gadolinite, samarskite and other rare minerals. 1843, Mosander.	One of the rare-earth group.	The salts are almost colorless. The oxide (Tb_4O) is almost black.
Thallium, Tl At. wt. 204.39 At. no. 81 Valence 1, 3 S. G. 11.86 M. P. 303° Co. E. 28 E. R. 18.1 C. S. T	In crookesite and in small quantities in many samples of iron pyrites. It is precipitated by zinc from a solution obtained by suitable treatment of the flue dust from sulphuric-acid works. 1861, Crookes.	A bluish-white leadlike metal, rather soft, malleable but of low tensile strength. It decomposes water rapidly at red heat and dissolves in dilute acids.	It forms two sets of salts, the thallous (e.g., TlCl), univalent, and the thallic (e.g., $TlCl_3$) trivalent. The salts, used in making optical glass, are poisonous. All the compounds show a characteristic green line in the spectrum.

CHEMICAL ELEMENTS—Concluded

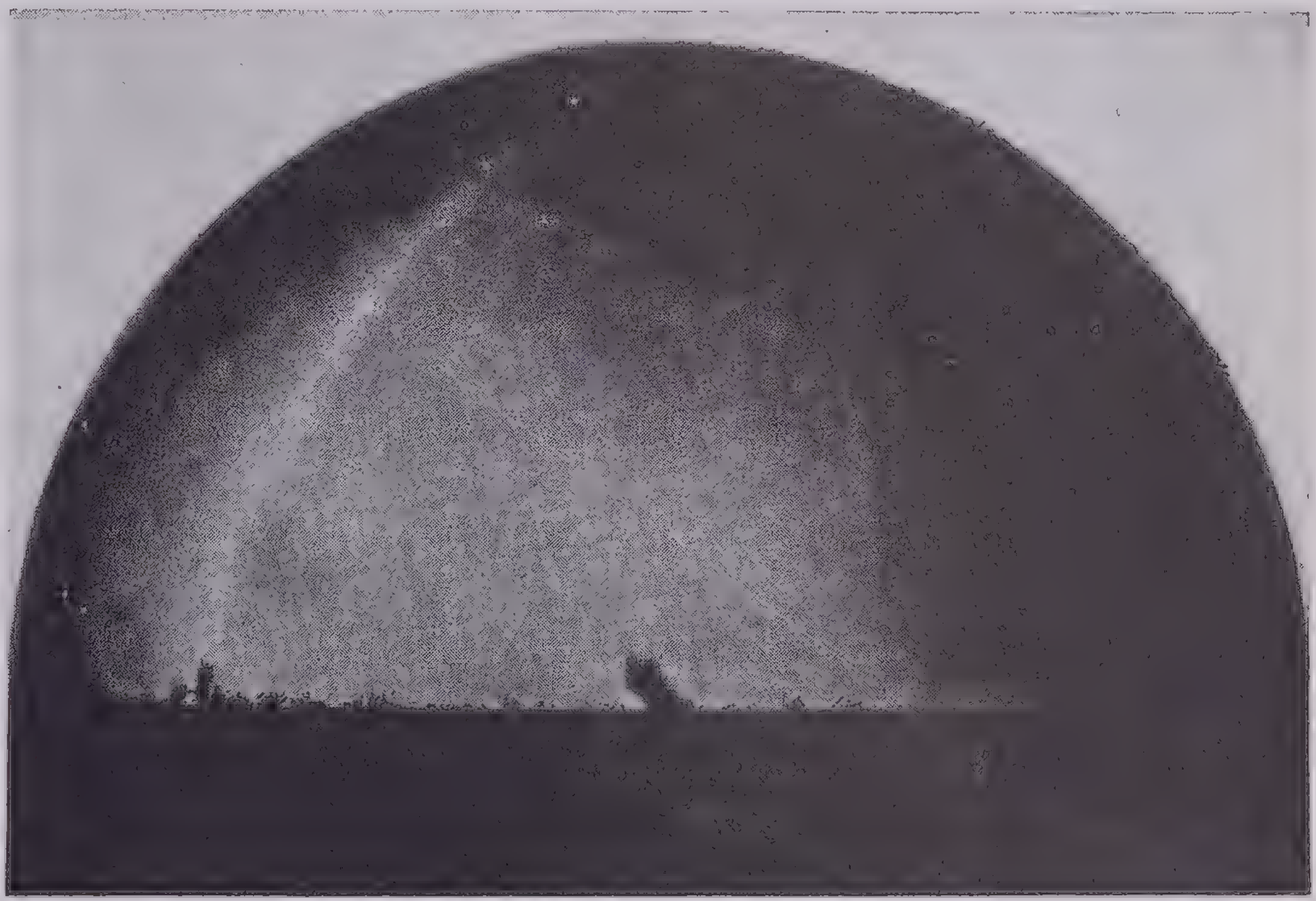
ELEMENTS	OCCURRENCE AND PREPARATION DATE OF DISCOVERY, DISCOVERER	PROPERTIES	CHIEF COMPOUNDS AND USES
Thorium, Th At. wt. 232.12 At. no. 90 Valence 4 S. G. 11.0 E. R. 18 C. S. C	In monazite sand. By reducing potassium thorium chloride with sodium or by electrolysis of the chloride in a mixture of fused potassium and sodium chlorides. 1828, Berzelius.	A metal with the color of nickel, that can be burnt in air. Hydrochloric acid attacks it but slowly.	The nitrate [$Th(NO_3)_4 \cdot 6H_2O$] is used in making Welsbach incandescent mantles, which consist of 99% ThO_2. Thorium is very radioactive.
Thulium, Tm At. wt. 169.4 At. no. 69 Valence 3 M. P. 1700°	In gadolinite and other yttrium minerals. 1879, Cleve.	One of the rare-earth group.	The salts are of a pale-blue color that is destroyed very easily by minute quantities of erbium.
Tin, Sn At. wt. 118.70 At. no. 50 Valence 2, 4 S. G. 7.3 M. P. 232° B. P. *c.* 1600° Co. E. 20 E. R. 11.4 C. S. T C	As cassiterite (SnO_2). After roasting, the ore is reduced by heating with carbon.	A silver-white, rather soft, very malleable and ductile metal, practically unchanged in air. When heated, it may be burned in air. Dilute nitric acid is the only dilute acid that attacks it rapidly. When kept long at temperatures below zero C., ordinary tin changes to a brittle gray powdery modification. This form is the stable one below 20°.	Large quantities of tin are used in coating iron for tinplate. It is a constituent of the alloys Britannia metal, pewter, solder, bronze etc. Tin forms two sets of salts, stannous (e.g., $SnCl_2$) and stannic (e.g., $SnCl_4$). Pink salt [$(NH_4)_2SnCl_6$] is used in dyeing. Mosaic gold is SnS_2.
Titanium, Ti At. wt. 47.90 At. no. 22 Valence 2, 3, 4 S. G. 4.5 M. P. below 1800° E. R. 3 C. S. C	As rutile (TiO_2) and in titanic iron ore ($FeTiO_3$). By reducing the chloride ($TiCl_4$) by means of sodium. 1789, Gregor.	A hard, brittle metal, resembling polished steel in appearance, that may be forged at a low red heat. It dissolves in dilute sulphuric acid and decomposes steam at 800°. It unites easily with nitrogen.	Used in alloys, as a white pigment (paint and paper), coloring for ceramics.
Tungsten, W At. wt. 184.0 At. no. 74 Valence 2, 4, 5, 6 S. G. 19.3 M. P. *c.* 3370° Co. E. 4 E. R. 5.48 C. S. C b	As wolfram ($FeWO_4$) and as scheelite ($CaWO_4$). By reducing tungstic acid (H_2WO_4) by carbon at a high temperature. 1783, d'Elhujart brothers.	A hard, brittle, gray metal, attacked by chlorine only at 250°, although it can be caused to burn in air. It is slowly acted upon by dilute acids and even by water.	The metal is used for the filaments of incandescent electric lamps, giving an efficiency of 1.3 watts per candle power. Tungsten steel has 5% W. Sodium tungstates are used as mordants in dyeing.
Uranium, U At. wt. 238.14 At. no. 92 Valence 2, 3, 4, 5, 6 S. G. 18.7 M. P. *c.* 1500°	As pitchblende, which contains U_3O_8. By reducing the oxides with aluminum. 1789, Klaproth.	A white lustrous metal, tarnishing in air and attacking water slowly in the cold. It combines directly with many of the other elements.	All the compounds of uranium are radio-active in proportion to their uranium content. Glass to which uranium compounds have been added shows a greenish-yellow fluorescence.
Vanadium, V At. wt. 50.95 At. no. 23 Valence 2, 3, 4, 5 S. G. 5.5 C. S. C b	In a few rather rare minerals. By reduction of the dichloride (VCl_2) in hydrogen. 1801, Del Rio.	A silver-white lustrous metal harder than quartz. It does not tarnish nor attack water at ordinary temperatures but can be burnt in oxygen.	Vanadium added to steel even in small quantity (0.2%) increases the tenacity and elastic limit without reducing the ductility.
Virginium, Vi At. wt. undetermined At. no. 87	One of the two remaining elements for which discovery has been claimed, but disputed. Possibly in pollucite and sea water. 1930.	Not isolated but may be expected to resemble cesium.	
Xenon, Xe At. wt. 131.3 At. no. 54. Valence 0 B. P. —109.1° M. P. —140°	In minute quantity in the air, one vol. in 170 million. By fractionation of liquid argon. 1898, Ramsay and Travers.	A transparent, colorless and odorless gas, very inert like argon. It is the densest of the argon family.	It forms no compounds.
Ytterbium (Neoytterbium), Yb At. wt. 173.5 At. no. 70 Valence 3	In gadolinite, euxenite and other rare minerals. 1878, Marignac.	A rare earth, originally from Ytterby, Sweden.	The compounds show a characteristic spark spectrum.
Yttrium, Y At. wt. 88.92 At. no. 39 Valence 3	In gadolinite, euxenite and other rare minerals. By electrolysis of sodium yttrium chloride. 1828, Wöhler.	A gray lustrous metal.	The chloride yields a characteristic, though complex, spectrum.
Zinc, Zn At. wt. 65.38 At. no. 30 Valence 2 S. G. 7.14 M. P. 419.4° B. P. 907° Co. E. 33 E. R. 6 C. S. H	As zinc blende (ZnS), calamine ($ZnCO_3$), zincite (ZnO), etc. After roasting, the ore is reduced by coal, the metal distilling off.	A bluish-white, lustrous, brittle metal, that is malleable and ductile at 120°. It tarnishes in moist air, attacking water slowly in the cold and rapidly when heated in steam. It dissolves in dilute acids and in sodium hydroxide solution.	Sheet zinc is used for roofs and gutters. Iron is galvanized by dipping it in molten zinc, and so protected from rusting. Zinc is used for galvanic batteries and, alloyed with copper, to make brass. For making paint, zinc oxide's being less poisonous affords an advantage over the use of lead oxide. The salts are used in medicine; the chloride and sulphate yield antiseptic solutions.
Zirconium, Zr At. wt. 91.22 At. no. 40 Valence 4 S. G. 6.4 M. P. 1530° to 1700°	As zircon ($ZrSiO_4$). By reducing the oxide (ZrO_2) with carbon in the electric furnace. 1824, Berzelius.	A hard gray metal, remaining bright in air and only slowly oxidized at a white heat. It is dissolved by aqua regia and by caustic-potash solution.	The oxide is contained in some incandescent gas mantles and is used for furnace linings and as a cleansing agent in metallurgy. Increases tensile strength of armor plate. The carbide (ZrC) is an abrasive.

ASTRONOMY

Scope and Importance of Astronomy.—In the dawn of human history, before men knew anything about physics or chemistry or biology, they had begun to study the sky, with its vast array of shining stars—mysterious symbols of a universe of space. Thus astronomy developed as the oldest of the sciences, and one of the noblest. Far afield it leads one, to speculations on the meaning of life and man's own place in a universe so baffling in its dimensions that the mind cannot begin to grasp its implications. We derive the word *astronomy* from two Greek roots—*astro,* a star, and *nomos,* a law. It means, literally, "the science of the stars." Practically, it has come to include the study of all the heavenly bodies—their positions, distances, motions, dimensions, composition and physical condition, and the laws that govern their motions and development. Its scope is the entire visible universe. Other sciences restrict themselves, almost exclusively, to some one phase of nature on the earth, which, from the point of view of size, is an insignificant part of the whole universe. Astronomy, however, unravels secrets of nature not only upon the earth but also throughout all space within reach of the most powerful instruments.

But to suppose that astronomy has no everyday uses is a mistake. Some of the most fundamental phases of our daily life and of modern commerce depend entirely on astronomy. Only by astronomical determinations are the latitudes and longitudes of places on the earth established; and by the same means vessels at sea and caravans on the desert are guided in their courses. The determination of time, land surveys, the establishment of boundaries, map making, prediction of tides, the knowledge of the shape and size of the earth—all rest on observations of the heavenly bodies.

The fundamental unit of time is the rotation of the earth, and the position of any spot on the earth at any time with reference to the heavens determines the time of day at that particular place. Today, with radio to transmit time signals, fewer time determinations are necessary; but the clocks from which the signals are sent give accurate time only because they have been set by means of observations of the stars made with an astronomer's transit instrument. The official time of all civilized countries is obtained from the clocks in the astronomical observatories. The United States Naval Observatory, at Washington, D.C., maintains such a service, as do all the great national observatories.



From a drawing by Hugh Ferris, courtesy American Museum of Natural History

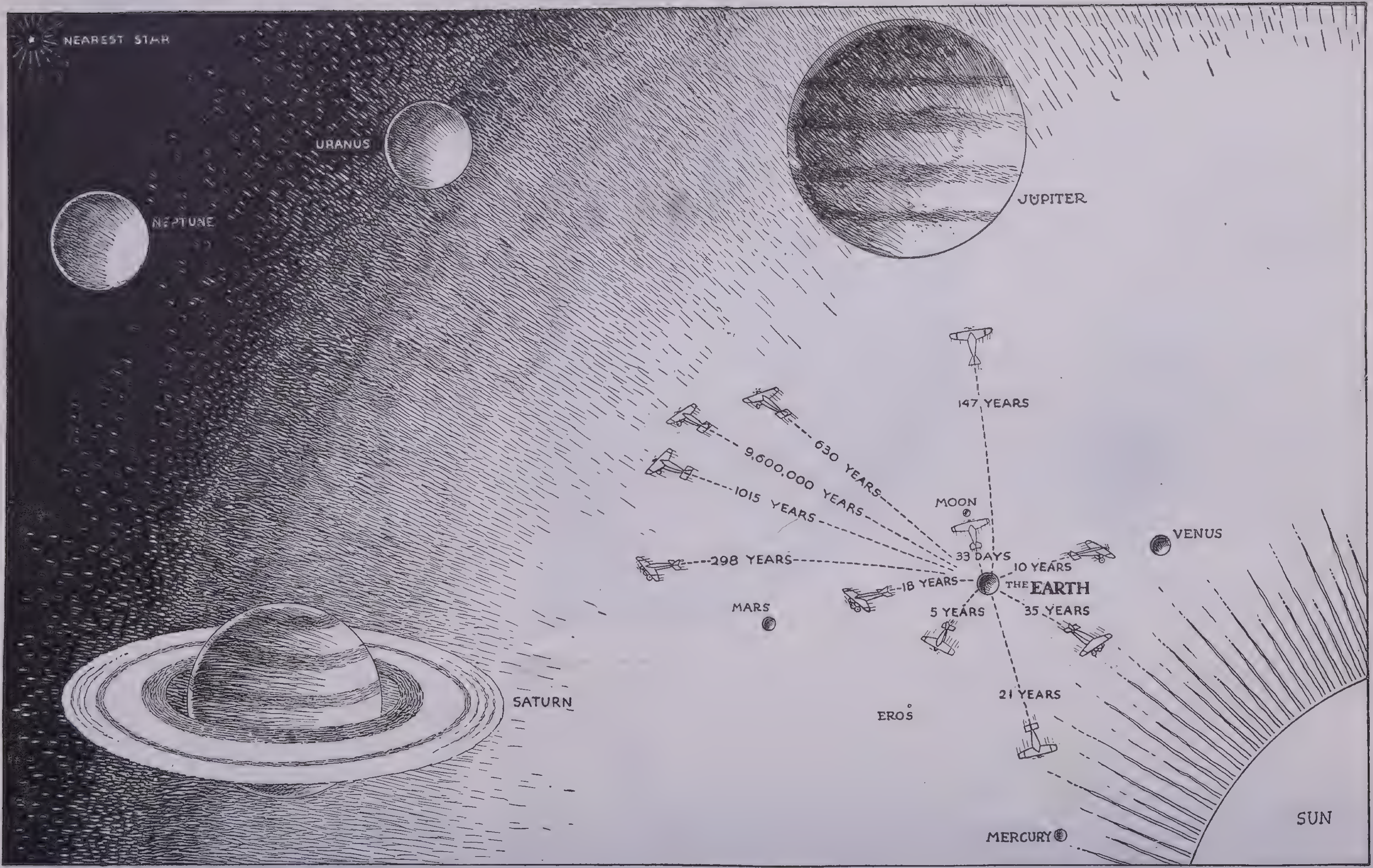
Interior of a Planetarium

Spectators' seats are ranged around the projection machine inside the darkened interior of the planetarium. The lecturer uses an optical pointer not unlike an electric flashlight to point out the stars, sun, moon and planets. (See Astronomical Dictionary: *Planetarium*)

The Celestial Sphere.—Whatever men have learned through observation of the skies, they have learned from a particular vantage point—our earth. Above this we seem to see a great canopy upon which the sun, the moon and the stars are projected like bright lights on a dome. The canopy of the sky forms the reference frame for astronomical work. It is called the *celestial sphere* (only one-half being visible at any one point), and is of the utmost importance in the systematic study of astronomy. It is really a map of the heavenly bodies, without which we should have no clue to the secrets of the world of space. So scientists have marked off on this sphere certain fundamental circles, points and planes, using them as a basis for the measurement and location of the heavenly bodies.

If the plane of the earth's equator could be extended indefinitely, it would meet a great circle of the sky called the *celestial equator.* This is thought of as a circle passing entirely around the celestial sphere, midway between the *celestial poles,* 90° from each. The celestial poles are thought of as those points in space which would meet a prolongation of the earth's axis, or line connecting its own poles. The North Pole of the earth points toward the north pole of the heavens, and the South Pole points toward the south celestial pole. At the earth's north or south pole an observer would find a celestial pole directly above him. In other latitudes, he would look either north or south. Each of us seems to be situated in the center of a hollow sphere, with the horizon line the boundary of the half that is visible. Straight overhead in space is the *zenith;* a point directly opposite, below one's feet, is the *nadir.* It can readily be seen that the zenith and nadir are not fixed points on the celestial sphere, and that every observer carries his own zenith or nadir with him wherever he goes. The celestial poles, on the other hand, are fixed reference points in the heavens, the same for all observers. At the earth's poles they are the observer's zenith and nadir. (The words *zenith* and *nadir* are Arabic meaning upward and opposite. The Arabs were great astronomers.)

Another great circle of the celestial sphere results from one of the two movements of the earth relative to the sun. The earth rotates on its axis once in 24 hours, presenting half of its surface alternately to the sun and away from it; once in a little more than 365 days it makes a complete revolution about the sun. To us, unconscious of the earth's motion by any sensation that we can detect, the sun seems to be the celestial traveler, rising in the morning in the east and making its way westward across the sky. This is the effect of the daily rotation. The earth's yearly revolution in its orbit also gives the sun an apparent path across the sky—a path eastward among the stars. This path is a great circle of the celestial sphere and is called the *ecliptic* (because eclipses of sun and moon take place on this circle). It can be thought of as the extension of the plane of the earth's orbit, and it gives us a picture of how the earth travels in that orbit. Because the earth's axis is not perpendicular to the plane of its orbit, the ecliptic cuts the celestial equator at an angle of about 23½°. This inclination makes the sun seem to rise and set at slightly different points every recurring morning and evening; to march toward a higher point in the sky at noon in summer than in winter, and


NEAREST STAR
URANUS
NEPTUNE
JUPITER
147 YEARS
630 YEARS
9,600,000 YEARS
1015 YEARS
MOON
33 DAYS
10 YEARS
VENUS
298 YEARS
18 YEARS
THE EARTH
MARS
5 YEARS
35 YEARS
SATURN
21 YEARS
EROS
SUN
MERCURY

Distances to the Sun, Moon, Planets and the Nearest Star

The artist has shown diagrammatically the distances to the sun and moon and to the planets (at nearest approach to earth) and the nearest star. The airplanes are traveling at the rate of 300 miles an hour. The planets are shown in approximately relative sizes, but the sun is really much larger than it here appears. Eros is the asteroid that approaches nearest to earth. Pluto, the most distant planet, does not appear here for it could not be shown to scale to rise and set north of due east and west in summer and south of those points in winter.

The Solar System.—Starting with that section of the universe that we inhabit, let us examine first the solar system, the subgroup of heavenly bodies dominated by the sun.

The name *planet* (Greek, wanderer) was applied by the ancients to the sun, the moon and five other heavenly bodies that changed their positions with respect to the general background of stars at small intervals; that appeared, in short, to wander in the sky. The five wanderers besides the sun and moon were named Mercury, Venus, Mars, Jupiter and Saturn. We now know that the wandering characteristic of these bodies arises from their nearness, from the fact that they belong to our local solar system, while the *fixed stars* are enormously distant suns, entirely different in character from the comparatively small and cold planets.

By *planet* we now mean any of the nine principal bodies in the sun's family that shine by reflected light and move about the sun in nearly circular orbits. Six of these nine planets are known to have smaller bodies called moons or satellites revolving about them much as they, in turn, revolve about the sun. These moons, of course, are parts of the solar system, but we do not call them planets. In addition to the nine principal planets, there are more than a thousand small bodies called *planetoids, minor planets* or *asteroids*. These, like the principal planets, revolve about the sun and shine by reflected light; but we do not ordinarily call them planets because they are very small and seem to belong to a special classification. The other chief bodies in the solar system are meteors and comets. (All these bodies are described in detail in the separate articles below.)

The nine planets, in order of their distance from the sun, are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. This list includes: the five wanderers known to the ancients; the earth, which they did not know was a planet, and three more discovered in modern times, Uranus (1781), Neptune (1846) and Pluto (1930).

The planets, as we see them with the naked eye from the earth, look very much like stars, but they usually shine with a steady light, while the stars twinkle. Through a telescope, the planets appear as disks, while the stars, although they are immensely larger, are so much farther away that they appear only as points of light.

The stars all appear to be fixed on the celestial sphere relative to one another; but any observer can see for himself that the planets change positions from night to night. The stars, in fact, are in constant motion, and are moving, in general, at greater speeds than the planets, but they are at such tremendous distances from us and from one another that changes in their relative positions are detected only by refined measurement.

All the planets move about the sun continuously from west to east (that is, counterclockwise as we look down on the system from the north ecliptic pole), the innermost traveling at the highest speed. As we watch their changing positions from the earth, however, we note that they appear to move eastward for a time and then, at regular intervals, loop backward for a short distance before they proceed in the direct motion. This is due to the combination of motions of the earth and the other planets. The orbits are all more or less elliptical, Pluto's the most so. All the orbital planes except Pluto's lie within 7° of the plane of the earth's orbit; Pluto's is inclined 17°. It thus lies outside the limits of the zodiac.

Early in the 17th century, Kepler announced three fundamental laws of planetary motion, as follows:

1. The orbit of every planet is an ellipse with the sun at one focus.
2. The radius vector (the line connecting the sun and the planet) sweeps over equal areas in equal times.
3. The cubes of the mean distances of the planets from the sun are proportional to the squares of their sidereal periods.

To get some conception of the relative distances in the solar system and the size of the planets, we may imagine the sun represented by an ordinary baseball in the middle of a large field. The innermost planet, Mercury, would on this scale (250,000 miles to the inch) be a mustard-seed speck 1/80 of an inch in diameter moving around the central ball in an elliptical orbit at an average distance of about 12 feet; Venus would be a seed more than twice as large (about 1/32 of an inch in diameter) and revolving in a practically circular orbit 22½ feet in radius; our earth would come next, a shade larger than Venus and at an average distance from the baseball sun of 31¼ feet; Mars, larger than Mercury but only half as large as Venus and the earth (diameter to scale, 1/60 of an inch), would be 47½ feet from the center; the giant Jupiter could be represented by a small marble ⅓ of an inch in diameter at a distance of 162 feet; Saturn, a little smaller than Jupiter, would be 297 feet out; Uranus, a ball bearing with a diameter of 1/8 of an inch, would be 598 feet from the baseball; Neptune, practically the same size as Uranus, would be 935 feet out. Pluto, a mustard seed like the earth and Venus (its size is not accurately known), would pursue its elliptical course more than a quarter of a mile from the governing sun at the center. On this same scale the nearest star would be about 1,600 miles away.

In the picture we have represented the relative sizes and distances in the solar system in a somewhat different way. The essential thing to remember is that large as the solar system is (about 8,000 million miles across), it is insignificant when compared with the immensely greater sidereal system, our stellar universe.

Having fixed in our minds this general view of the shape and extent of the solar system, we may examine in more detail the separate objects that it contains.

THE EARTH is a great ball, approximately spherical, with an average diameter of 7,918 miles. It is flattened slightly at the poles, the polar diameter being 7,900 miles and the equatorial 7,927 miles. It is 5.53 times as heavy as the same volume of water would be and weighs six thousand millions of millions of millions of tons: the figure is written six with twenty-one ciphers. This great globe spins on its axis once in twenty-four hours. It makes its journey eastward around the sun in a year at a rate of eighteen and one-half miles a second—about 20 times as fast as the swiftest modern projectiles.

When Magellan's ships actually sailed around the earth in 1519-22, the fact was established that the earth is spherical. Two or three other familiar proofs of approximate sphericity were known even before that time. If an observer, anywhere on the earth, increases his elevation, the visible horizon becomes more and more depressed below the true horizon. Also, as a ship goes out to sea, the highest portions remain longest in view and the tops of the smoke stacks and masts disappear last, showing that the surface is convex. Another proof is observable at times of lunar eclipse. The moon must come into the earth's shadow in order to be eclipsed so if we note the shape of the edge of that shadow on the moon, we will know the shape of the body casting the shadow. It is always seen to be the arc of a circle.

To determine the size and shape of the earth it is necessary to measure the length in miles of one degree at different parts of the earth's surface. Two stations are selected hundreds of miles apart. The latitudes have been determined independently, which gives the distance in degrees. Then, to find the equivalent distance in miles, measurement is necessary. This measurement cannot be done directly by chaining; but a process called *triangulation* is employed. A short base line is measured with very high precision, and a system of triangles is built up on this base line, angles being measured at the two ends of one base in each triangle. The chain of triangles finally connects the two stations whose separation in miles is desired. The accuracy is such that the error is not greater than one inch in twenty miles. From these determinations, one degree of latitude at the equator equals 68.71 miles; at 45 degrees latitude it equals 69.06 miles; at the poles, 69.41 miles. Arcs of longitude at any particular latitude are found to be of uniform length in miles.

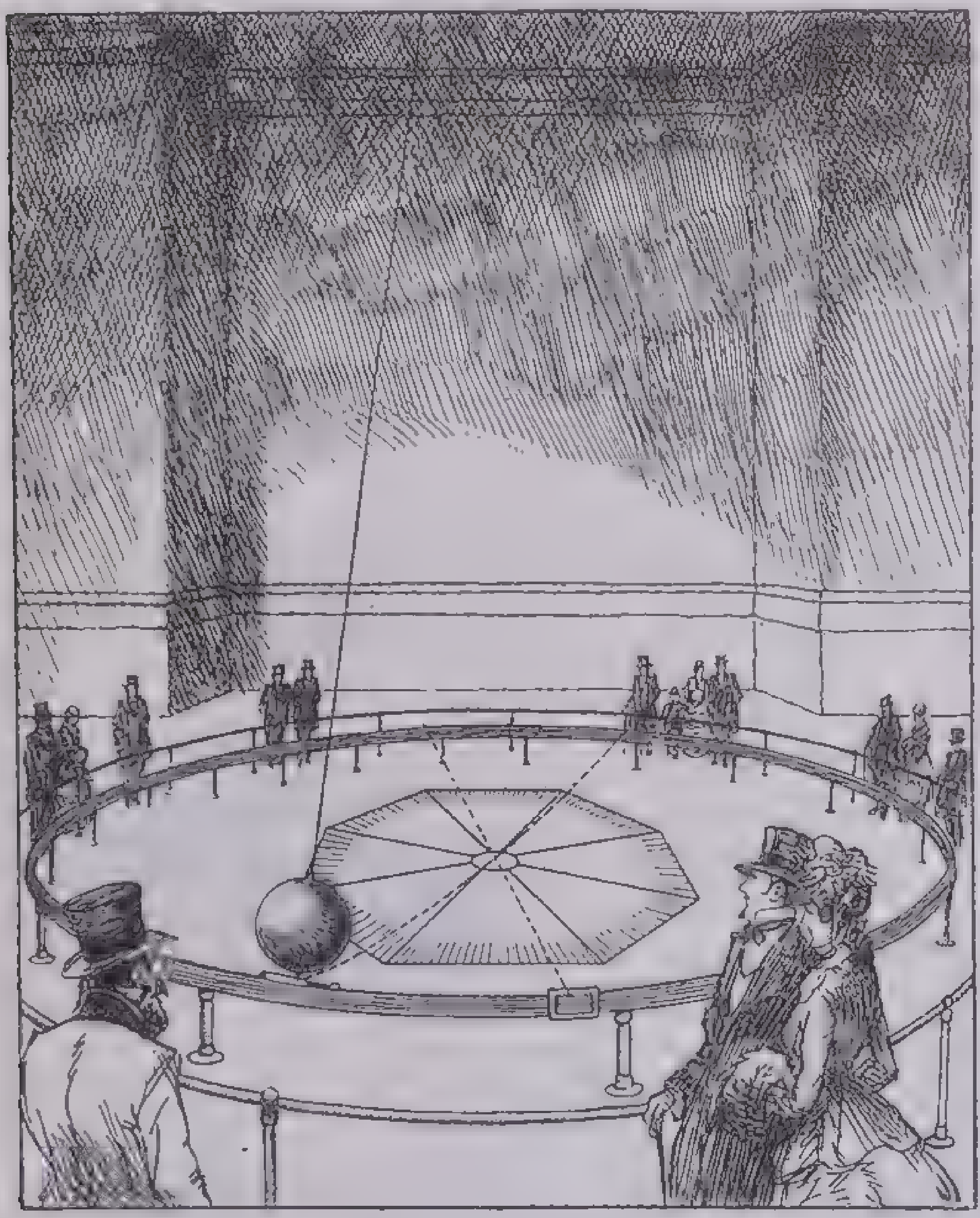
No scale could weigh directly the entire earth. But its mass has been determined by very delicate and accurate experiments which are based upon the Law of Universal Gravitation: *any two particles of matter attract each other with a force proportional to their masses and inversely proportional to the square of the distance between them.* The attraction of the earth for a small body of known mass is compared with the mutual attraction of two such bodies.

Knowing the volume and mass, the

average density of the earth is derived from the relation: density equals mass divided by volume. The density of the earth's surface rocks is found directly to be 2.75 times that of water. Since the mean density is 5.53 times that of water, we deduce that the central core of the earth has a much higher density, 10 or 12 times that of water, and must be made of very heavy elements, probably largely of iron.

If we watch the stars for only a few hours we see that, with relation one to another, they remain unchanged; but their places in the sky are changing, moving slowly westward. The ancients believed the stars to be attached to a material sphere which turned on pivots. Either this is the case, or the earth itself rotates on an axis. After the invention of the telescope it was seen that many of the planets are rotating globes, and it was natural to assume that the earth, also, rotates. But now we have physical proofs that the earth rotates, and these proofs are not dependent upon observations of any other heavenly body.

We shall consider just one of them, the experiment first performed by the French physicist, Foucault, in 1851. He hung a heavy iron ball, about a foot in diameter, by a wire more than 200 feet long from the dome of the Pantheon, in Paris. With great care the pendulum was started, equally free to swing in any plane; and as it swung, a pin fastened in the bottom of the ball cut a path in a ridge of sand. The plane of the swing turned slowly to the right, in the direction of the hands of a watch, at such a rate that it would have been carried completely around in thirty-two hours if it had not first come to rest. The floor was turning under the pendulum; the earth was rotating. It will be seen that at the poles the earth would turn around under such a pendulum once in every 24 hours; with decreasing latitude the time of rotation of the plane would increase, up to infinity at the equator, where there would be no shift at all. At the south pole, the rotation would appear to be reversed. At the pole, the pendulum would deviate 15 degrees an hour. The Foucault pendulum, in the National Academy of Sciences in Washington, D.C., deviates a little less than nine and one-half degrees an hour.



Proof of Rotation of the Earth

Jean Foucault's famous experiment in the Pantheon, Paris, in 1851. The plane of the free swinging pendulum appeared to deviate slowly. A similar Foucault pendulum is exhibited in the National Academy of Sciences, Washington

As the heavens are seen to rotate daily, so the sun is seen to have an annual motion north and south of the equator and eastward among the stars. In spring, certain constellations are left in the sky after sunset; in summer, certain others; and so on throughout the year, winter nine o'clock skies being entirely different from the summer ones at the same hour. As far as the apparent motion goes, it could as well be due to the sun going around the earth as the earth about the sun. When the earth was considered to be fixed at the center of the universe, the sun was supposed to do the moving. Ptolemy (100–170 A.D.) worked out a very complete explanation of the apparent motions of all the members of the solar system on this basis. The Copernican system, announced 14 centuries later, showed that the apparent motions could be explained more reasonably and simply by assuming the earth to be one of the planets going about the sun. By using telescopes and other astronomical instruments and by employing modern methods, exact measurements have been made possible which have led to the discovery of three independent phenomena which demonstrate that it is the earth, and not the sun, that moves in a great orbit.

The first definite proof that the earth revolves about the sun was discovered by the English astronomer, Bradley, in 1726. It depends upon the phenomenon called the *aberration of light*. The velocity of the earth in its orbit is obtained directly when the velocity of light is known. Then, knowing the time it takes to make one complete revolution, the distance around is determined; and from that, the radius of the orbit, or the mean distance of the earth from the sun—92,900,000 miles—is ascertained. This distance is called the *astronomical unit*.

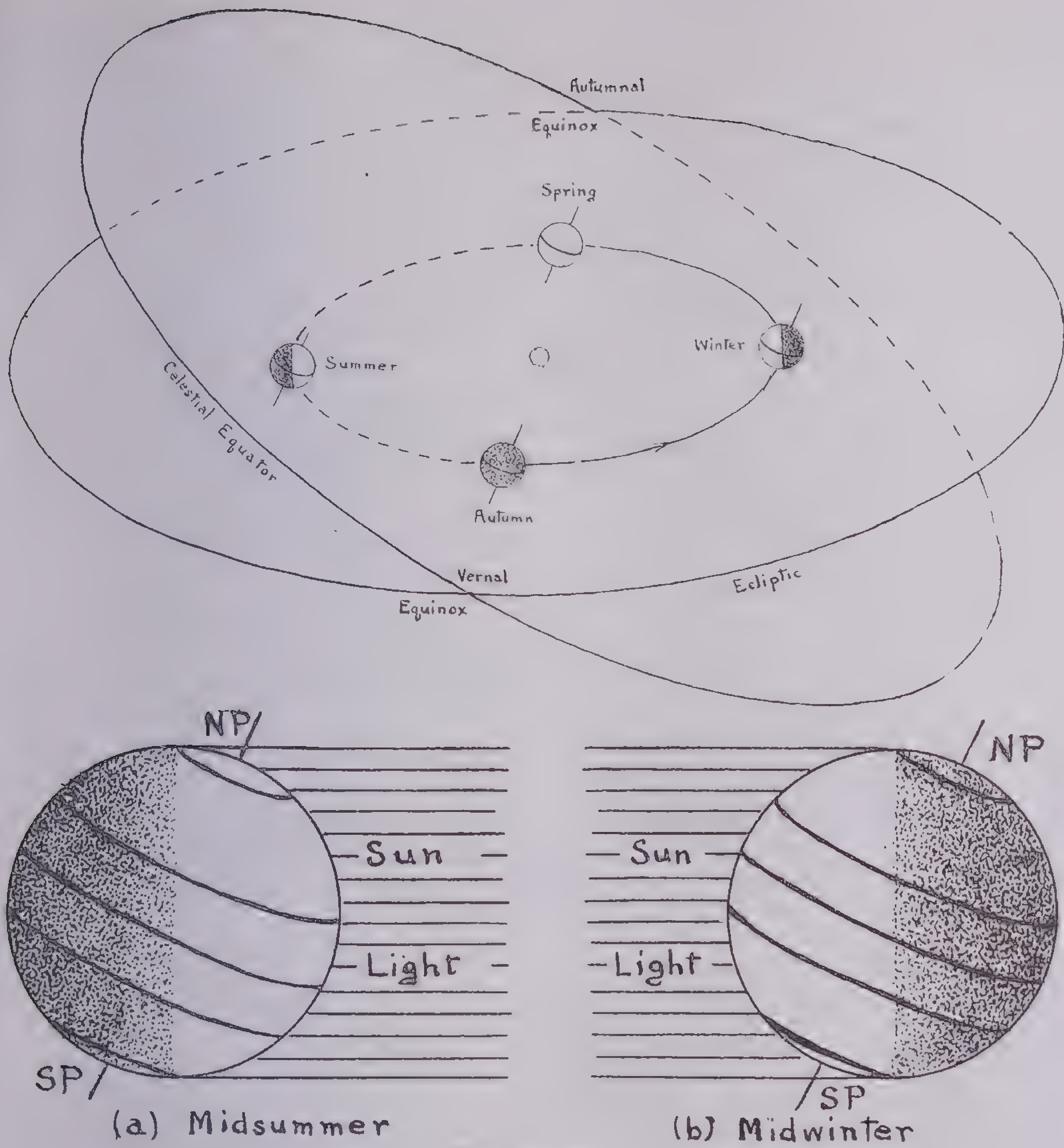
The two other phenomena that constitute direct proofs of the earth's orbital motion are the regular annual *shift of the lines* in the spectra of stars and the annual *parallactic displacement* of the stars. The shift of lines is observed with the spectroscope. Like the aberration of light, it also provides a means of determining the distance to the sun if the velocity of light is known. The second proof is explained under the subject of methods for finding stellar distances.

The force of attraction exerted on the earth by the sun is sufficient to break a cable of steel piano wire 3,000 miles thick, but so great is the inertia of the earth that this tremendous force causes a deviation from a straight line of only one inch in 55 miles as the earth moves in its orbit.

SEASONS. If it happened that the equator were in the plane of the great path of the earth about the sun, there could be no change of seasons such as we have now, and days and nights would always be equal in length. But since the equator makes an angle of 23½ degrees with the *ecliptic,* which is the apparent path of the sun among the stars, and since it faces (except for the slow precessional motion) always in the same direction, there are only two times in the year, March 21 and September 22, when the sun shines perpendicularly on the equator. These are indicated as the spring and autumn positions of the earth, respectively, in the accompanying diagram of the seasons. At the summer solstice, June 21, the sun shines 23½ degrees beyond the north pole and falls short of shining on the south pole by the same amount. Six months later, the opposite circumstance prevails. It is then winter in the Northern Hemisphere; summer in the Southern.

It will be clearly seen from the lower shaded diagrams that any point in the Northern Hemisphere has sunlight for a longer time than it is without sunlight on all the days between March 21 and September 21, the greatest difference coming on June 21, when the sun is highest in the sky at noon. During the other half of the year the reverse condition is true, the duration of sunlight being the shortest on December 21, at which time it is only about seven and one-half hours in the latitude of Chicago and New York. In summer, more heat is received from the sun every 24 hours than is radiated away; as a result, the temperature continues to rise until the amount of heat lost in 24 hours equals that received. In our latitude this occurs about August 1st and not on June 21 as one might suppose from the fact that the most heat is received in 24 hours on that date. For similar reasons the minimum temperature of winter occurs about February 1st and not on December 21, when the daylight is shortest. Of course, elevation, winds and ocean currents affect the local temperature at any one place. The other factor that enters into the higher temperature of summer is the elevation of the sun above the horizon. A beam of sun rays of given cross section falls on a smaller area when it strikes the earth's surface perpendicularly than when it strikes obliquely. Therefore, under high elevation, it will deliver more heat to a unit surface. This is also apparent from Figures *a* and *b* of the diagram of the seasons. A high sun, however, may furnish less heat during a short day than would a low sun shining through a long day. And so, in midsummer a region at the North Pole actually receives 25 per cent more heat from the sun in every 24 hours than does the same area at the equator. Summers at the north pole would be hot if the heat were not used up in melting the great accumulation of ice.

The earth's orbit is not a circle but

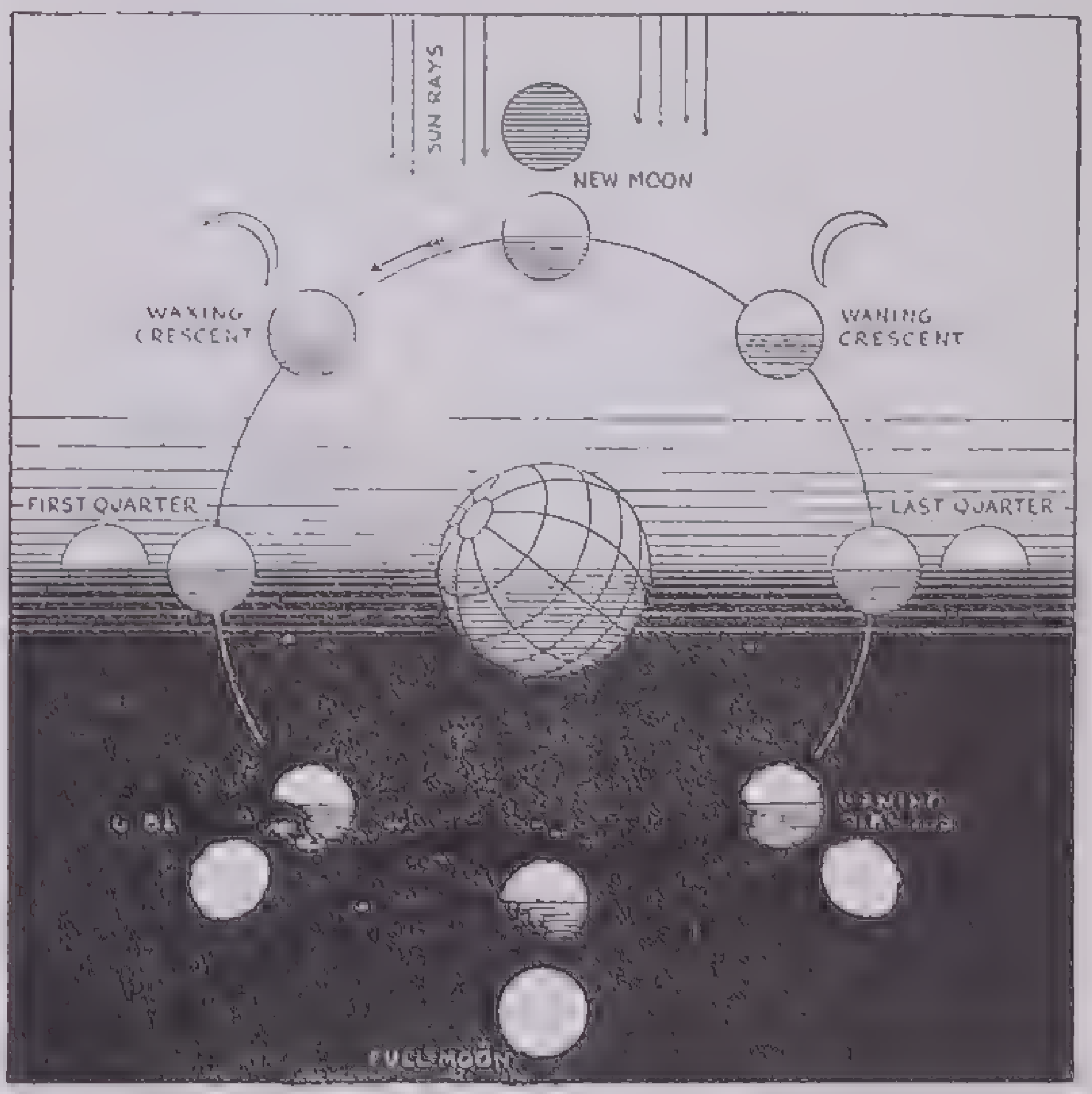


The Seasons
These diagrams are for the Northern Hemisphere

an ellipse, and the sun is not exactly at the center. For this reason the distance between the earth and sun is not the same throughout the year, but varies by about 1,500,000 miles on either side of the average. It might be supposed that the weather would be hottest when the earth is nearest the sun and coolest when the earth is farthest from the sun. The variations of distance do produce some effect, but it is very much smaller than the effect of inclination of the earth's axis, which has just been discussed as the cause of the seasons. The earth actually reaches its closest approach to the sun about January 3, the middle of winter in the Northern Hemisphere. To the extent, therefore, that distance to the sun influences terrestrial weather conditions it tends to moderate the severity of winter in the north and to accentuate it in the south.

The Moon. The earth has one satellite, the moon, which goes with it around the sun. The moon appears to us as large as the sun, and next to the sun its influence on human affairs is greatest of all the heavenly bodies. If the moon were destroyed, maritime interests would be seriously affected, because the tides would be far smaller. The high water, which tides provide for entrance to ports, and the natural dredging effect of the flow of tides, would be lessened. The moon is conspicuous and important only because it is near; it is really small when it is compared with the planets and insignificant when compared with the stars. The planet Mercury is one-half again as big, and Mars has twice the diameter; yet in considering the planets, we shall see that these two are the smallest. However, the phases of the moon (the apparent changes in shape shown in a month); its movement among the stars, change of position with relation to the sun; and its surface markings —all have engaged the attention of man ever since he could think.

Hold a new golf ball between the thumb and forefinger at arm's length, in line between your eyes and a lighted lamp, in an otherwise darkened room. If you are seated in a revolving chair, turn once completely around; or if standing, turn on your heel slowly, all the while watching the golf ball. You will have reproduced the effect of the phases of the moon and demonstrated that they are due to the fact that the moon is spherical in shape, that it shines only by reflected sunlight, and that it travels around the earth in an orbit. In the first position the golf ball showed only its unilluminated side to you, and therefore appeared completely dark. In the corresponding position—earth, moon, sun— we have *new moon,* and the moon is said to be in *conjunction.* The next day, a very thin crescent hangs in the western sky after sunset. Each day the crescent increases in size and in distance east of the sun until it is seen as a *half moon* on the meridian at sunset. This is *first quarter,* and the moon is said to be in *east quadrature.* The phase continues to grow as the moon moves eastward, more and more gibbous, until the illuminated face is turned full toward the earth and we have *full moon,* and the moon is in *opposition.* Then we have a waning gibbous moon until it appears as a semicircle again. This is *third quarter,* or *last quarter,* and the moon is said to be in *west quadrature.* Then it becomes a crescent again, narrowing until it disappears as a new moon. It is this waning crescent which the fewest people see, for it rises later and later each night, from midnight to dawn. Half of the moon's sphere is always illuminated by the sun; it is the portion, varying from none to all, of this illuminated hemisphere turned toward the earth that causes the moon's phases. The line which separates the sunlit portion which we see from the dark portion is called the *terminator.* In the two configurations—conjunction and opposition—the moon is said to be in *syzygy.*

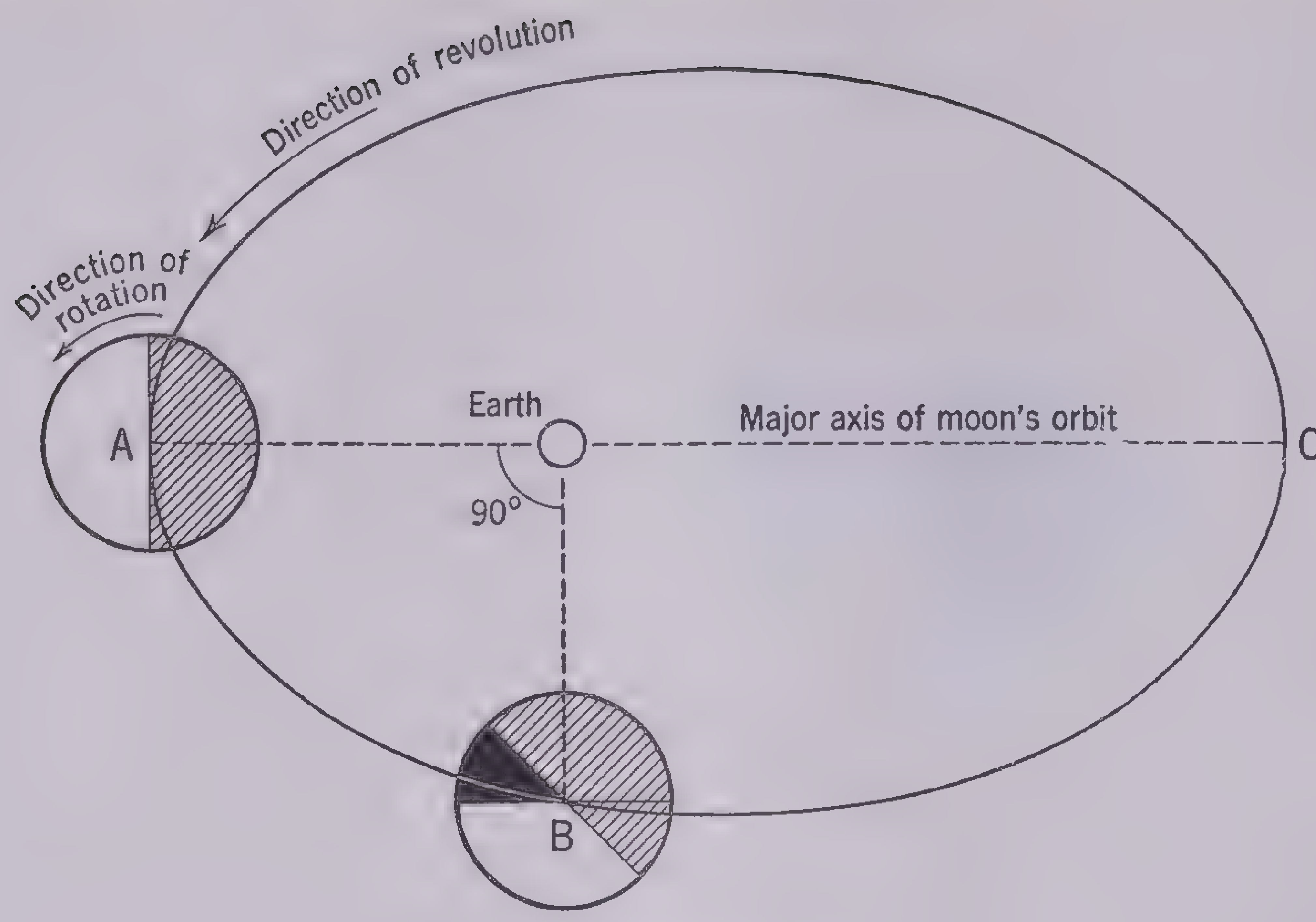


Phases of the Moon
The sunlit side of the moon is presented differently to earth dwellers in different portions of its orbit

To determine the distance to the moon is not a difficult astronomical problem. Two observers at stations situated on the same meridian, but widely separated in latitude, observe the moon and measure its distance from the zenith. Then it is but a matter of the solution of three triangles to determine the distance to the moon, which is found to be 60 times the radius of the earth or 239,000 miles.

The moon's diameter, 2,160 miles, is a little more than a quarter that of the earth. These 2,000 miles across the moon, at its distance of 239,000 miles, appears as great to us (that is, subtend approximately the same angle) as does the 866,000-mile diameter of the sun at 92,900,000 miles.

The moon's mass is 1/81.5 that of the earth, while its volume is about 1/50; and accordingly it is not as



Libration of the Moon

When the moon is at the point A (perigee) of its orbit, the shaded portion of its surface is turned toward the earth. As the moon moves from A around to B, the shaded section turns in the direction indicated by the arrow. The time taken to reach B from A, however, is less than one-fourth the total common period of rotation and revolution, since the moon travels fastest when it is nearest the earth. When the point B is reached, therefore, the moon's rotation (which proceeds at a constant rate independent of the variations of orbital speed) will be less than one-fourth completed, that is, the rotation will not have carried the shaded section one-fourth of the way around, and there will be a new portion of surface (represented by the black section) turned partially toward the earth. As the revolution continues from B to C (apogee) the orbital speed diminishes, and the rotation catches up

dense, being only 3.39 times the density of water. The surface gravity is much smaller than the earth's; objects would weigh only one-sixth as much on the moon as they do on the earth; a man could jump six times as high on the moon.

The moon rotates on its axis once in 27⅓ days, and in exactly the same period of time goes once around the earth, so that we see the same face turned toward the earth at all times, except for small variations in motion, the *librations.* About 41 per cent of the moon's surface is never visible to the earth. The moon's period of revolution is called a *sidereal month.* The time from a given phase to the recurrence of it is 29½ days and is called the *synodic month.* This forms the approximate basis for the unit of time known as our *calendar month.* The moon's orbit is not exactly circular and it is inclined to the ecliptic at an angle of five degrees, roughly. The points where the two orbits cross are called the *nodes—ascending* when going from south to north and *descending* when going from north to south.

When we look at the moon through a telescope and thus magnify its surface features, we see the areas which are dark to the naked eye as smooth plains. Early astronomers thought they were seas and so called them *mare,* a name which persists in spite of the fact that there is no water on the moon. What we see as bright areas are, in general, the rough features—mountains, craters and rills. The moon's surface has been carefully mapped and all the features named. The most prominent *mountain ranges* are the Alps, Apennines and Caucasus.

Heights of mountains on the moon are determined from the length of their shadows and by knowing how high above the lunar horizon the sun would appear at that point; or from the distance of mountain peaks from the terminator, when the sunlight first strikes their summits. The highest lunar mountains are 25,000 feet or more.

Many thousands of *craters* are visible on photographs of the moon which have been made with modern telescopes. These craters range in size from a few hundred feet across, to dimensions greater than some of our smaller states. The curvature of the moon is such that to a person standing in the center of the giant craters the rim, unless exceptionally high, would be quite invisible. In the large craters, numerous smaller ones as well as mountains are seen.

Over a thousand *rills* have been mapped. These are narrow crevices (ditches or furrows) less than two miles wide and inconspicuous because they are so narrow. In length they are from ten to a hundred or more miles.

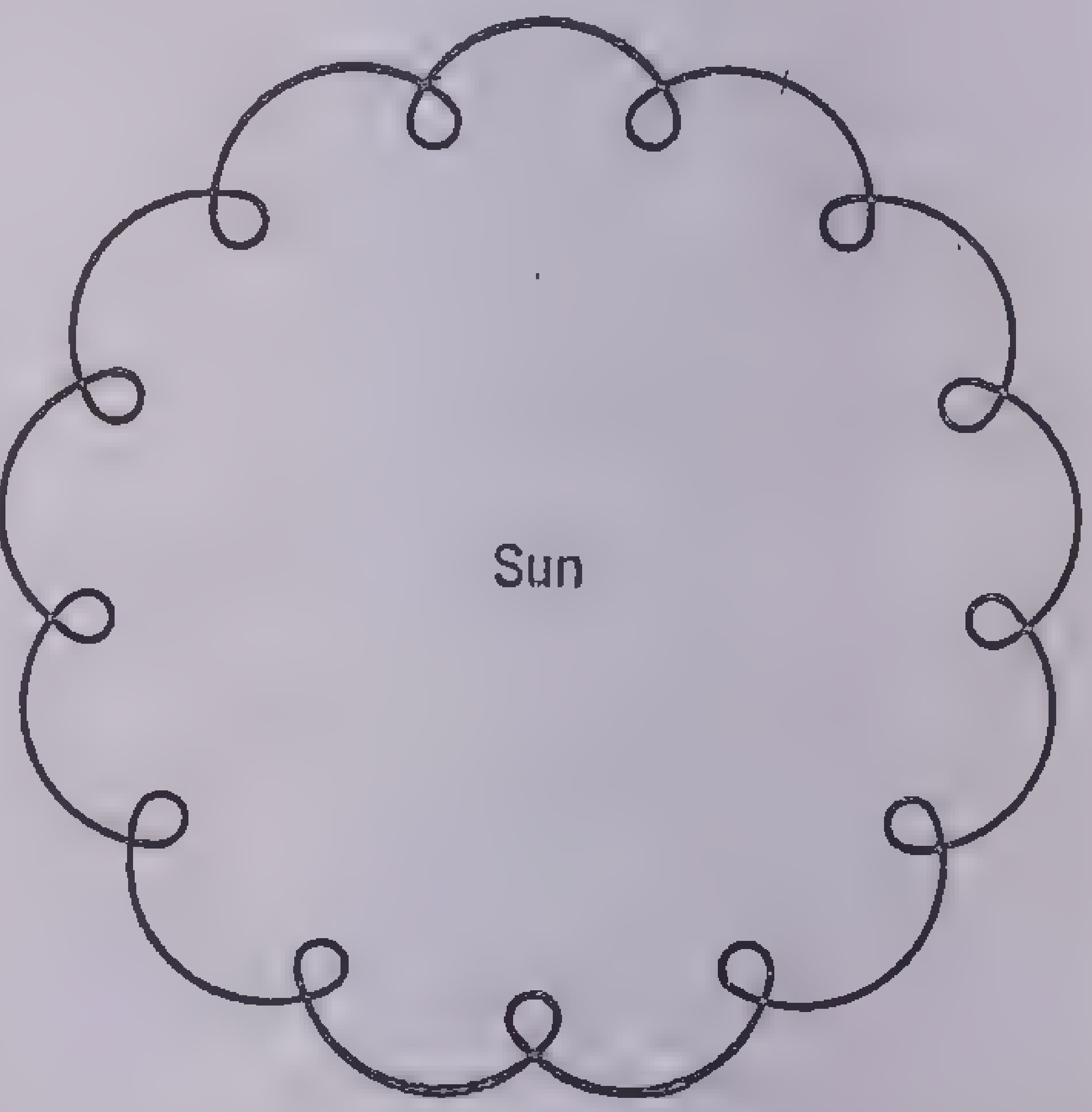
When the mountains, craters or rills on the moon's surface are near the terminator, they are in the best position for observing.

From some of the prominent craters, especially Tycho, Kepler and Copernicus, narrow streaks are seen to radiate outward; these are called *rays.* When the moon is full, these ray systems can be seen best.

The moon is known to be without air and water; neither animal nor vegetable life can exist on it.

The moon's surface is subjected to long periods of glaring sunlight, alternating with long nights. There is no atmosphere to temper the fierceness of the sun's rays or hold in the heat after the sun has set. Accordingly there are severe extremes of temperature. The surface rocks are probably hot enough to melt lead during the early afternoon of a lunar day, but at night the temperature falls to 200 to 300 degrees below zero. An earth dweller who managed to get to the surface of the moon would find other disadvantages as serious as deprivation of air and water and the alternate baking and freezing temperature. Like the earth, the moon is being continually showered with meteors; unlike the earth, the moon receives these meteors like high-speed rifle bullets directly on its solid surface. The earth's atmosphere is a 100-mile thick blanket through which only the largest meteorites can pierce; the moon has no atmosphere. Its surface must resemble a battlefield with soundless machine guns firing from all directions.

The earth moves round the sun in a path which may be visualized as a large circle; it carries with it the moon, traveling around the earth in a much smaller near-circle and making 13 trips around the earth while the earth makes one trip around the sun. Leaving the earth out of the picture and considering only the path of the moon relative to the sun, there is a tendency to think of it as a series of loops roughly like the diagram.



Common False Notion of the Path of the Moon

Actually the path of the moon is at all times concave to the sun and never crosses itself. If drawn accurately to scale it would be practically indistinguishable from a circle. The false conception arises from failure to visualize the great distance of the earth from the sun as compared with the distance from the earth to the moon. If a circle of six-inch diameter represents the earth's orbit, the moon's position would never be more than 1/130 of an inch inside or outside the circle. This is less than the width of an ordinary pencil line upon paper, so that it would not be possible on such a scale to show the moon's orbit at all.

The angular diameter (the angle subtended by the moon at the earth) is about half a degree. This is the same angle as that subtended by a ten-cent piece at a distance of six feet. It is curious that most people greatly overestimate the apparent diameter of the moon and will say as an uncalculated guess that the moon looks about as large as a ten-cent piece at a distance of ten to twenty inches.

Everyone has noticed that the full moon looks very much larger when it is near the horizon than when it is high in the sky. This is an illusion that is not thoroughly understood, but actual measurement shows that the moon's angular diameter is slightly *less* when it is near the horizon. At that time the moon is about 2,000 miles more distant than when it is near the zenith.

THE SUN. To most persons the sun is just a large orb that appears to cross our sky from east to west, giving light when it is visible, and regarded as responsible for the varying temperatures at any one place on the earth and for the difference in climate at various places on the earth.

Actually, the sun is a star, so near to us that its brightness obscures the other stars except when we are on the side of the earth turned away from it, which condition we call "night." The sun appears to cross our sky because the earth turns on its axis, now presenting one half of its spherical surface to the sun's rays and 12 hours later presenting the opposite half.

The sun's attraction keeps the earth, the eight other planets and the comets and meteors in their orbits about it; it also influences the motions of the satellites. It is not impossible that other stars have systems of planets revolving about them, like our own, but we have nothing to prove this.

Our sun is but an average star, medium in size and temperature. Yet, compared with the earth and the other planets which circle about it, it is enormous and exceedingly hot. At the sun's surface a shell of ice 39 feet thick would melt in one minute. The earth could not endure the sun's great heat except for the distance which separates it from us—92,900,000 miles.

Knowing the distance to the sun, we can readily determine how large it must be to appear the size it does. Its diameter is found to be 866,000 miles. If the earth were placed at the center of the sun, our moon, at its present distance, would be only a little over half the distance to the surface of the sun. And when we come to consider the volume of this huge ball, we find that more than a million earths could be contained within its dimensions.

Its mass is 333,000 times the mass of the earth, and from this we can see that a unit volume of it is only about one-fourth as heavy as the same volume of the earth; or, it is only about one and one-half times as dense as water. But the entire mass is so great that an average man would weigh more than two tons at the surface of the sun. Ninety-nine and six-sevenths per cent of all the mass in the solar system is contained in the sun.

We cannot turn a telescope toward the sun and proceed to examine its surface as we did in the case of the moon, for the intense heat would destroy the observer's eye. An image of the sun may be projected upon a white cardboard, and thus several persons can see it at one time and observe the rotation by the motion of the spots. They are seen to move faster at the equator than in higher latitudes, once around in 25 days at the sun's equator; and in solar latitude 45 degrees, once in 27½ days. So, because its parts move past one another, we know that the sun cannot be solid; it is gaseous throughout, extremely hot at the center, with temperature about 10,000 degrees Fahrenheit at the surface.

One can look at the sun through a smoked glass or by putting a dark glass on a telescope. Also, a helioscope may be attached to the telescope for visual observations of the sun. This latter device diverts most of the light to one side.

Photographs may be taken with a special camera and focal-plane shutter attached to a telescope, and the details of the surface then studied at leisure. A very minute fraction of a second is required for a photograph, because the sun is so bright.

A view of the sun by any of the means above mentioned or a photograph of it presents a brilliant circular disk, brighter at the center and darkening toward the edges, with a mottled, granular surface which we call the *photosphere.* On the photosphere are the dark sun spots. These vary greatly in size and shape, the larger ones stretching over more than 100,000 miles of the sun's surface. Each spot has a dark center, called the *umbra,* and a less dark region about it, called the *penumbra.* Sun spots start as small points, develop rapidly, last for a few hours, a few weeks or a few months and then break up and disappear. But the sun seems not to become immune to spottedness: it passes through one cycle, lasting about 11 years, and even before that is over another begins. The spots of the new cycle are first seen in latitudes 30 to 40 degrees north and south. As the period progresses, others break out at lesser and lesser latitudes until the solar equator is approached. The greatest number are present when the spot regions are at latitudes 16 degrees. This is called a *sun-spot maximum.* The most recent maximum was spread over the years 1927 and 1928. The time from a maximum to a minimum is longer than from a minimum to a maximum, 6.5 years and 4.6 years, respectively.

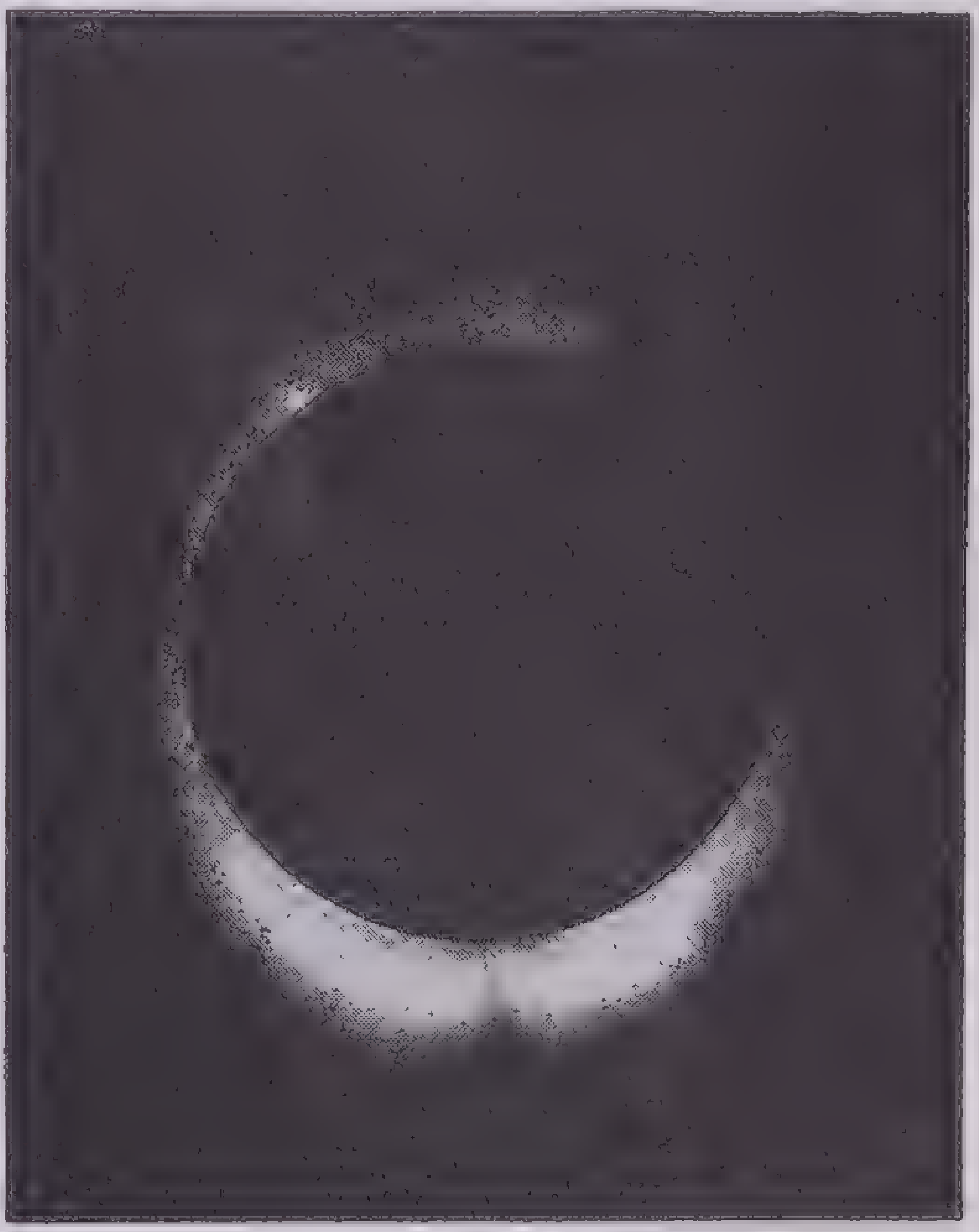
Besides the dark spots, there are bright areas visible on a direct photograph of the sun. These are called *faculae* and are usually seen only near the outer edge because the background is darker there. When pictures of the sun are taken in a single element, such as hydrogen or calcium, they are called *spectroheliograms;* and on such pictures the bright areas are called *flocculi.*

Above the sun's surface, the photosphere, is a layer of permanent gases, called the *chromosphere.* The lower part of it is sometimes called the *reversing layer.* The origin of this name will be understood after the discussion of the solar spectrum below.

From the chromosphere rise vast, flamelike eruptions, called *prominences.* These vary in height, some having been known to rise 500,000 miles. They sometimes take on rapidly changing fantastic shapes, and at other times lie quiescent like clouds in the atmosphere.

The outermost layer of the sun's atmosphere, the *corona,* can be seen only at times of total eclipse of the sun, as a vast halo extending 300,000 miles all about it. Its shape varies with a period of approximately 11 years, corresponding to the sun-spot cycle. It is controlled by the magnetic field of the sun.

When the solar spectrum is observed with a suitable spectroscope, it is seen to have hundreds of dark lines. According to the third law of spectrum analysis, stated above, these are interpreted as being due to the absorption of an atmosphere of cooler gases overlying the photosphere. That this is the case has been amply demonstrated by observations made at time of solar eclipse. At the moment when the moon has completely covered the photosphere and the atmosphere of permanent gases on the sun is alone exposed to view, there suddenly appears a complex, bright-line spectrum, and these bright lines are the exact counterparts of the dark lines of the ordinary solar spectrum. For obvious reasons it is called the *flash spectrum.*



Solar Corona in a Total Eclipse

The sun's corona is invisible at ordinary times because it is blotted out by the sun's glare. This photograph, taken at Goldendale, Washington, during the total eclipse of June 8, 1918, gives a fine view of the corona. The bright patches on the edge of the disk are *prominences,* great eruptions of incandescent material thrown thousands of miles up from the sun's surface

Fifty-seven of the 90 terrestrial chemical elements have been detected in the sun from a comparison of the lines of the solar spectrum with those of the various elements. It is reasonable to suppose that others may also be there but that we do not see their lines in the solar spectrum because of peculiar conditions of radiation due to temperature, pressure and so forth.

We have considered the dependence of our modern world upon astronomy for supplying it with time, directions, positions on the earth and all resulting conditions; but when we come to consider the most important to us of all the heavenly bodies, our sun, we readily recognize that except for it there would be no form of activity on our earth. We depend upon the sun for all power and warmth and life on the earth. Our food, in all its forms, has had its origin in the same source. Our light and heat is one or another form of "canned sunlight." We have our very existence because of conditions for which the sun is responsible. It is not difficult to understand why some races have worshiped the sun.

The Planets. We have already given a general view of the arrangement of the planets in the solar system. *Mercury* is the innermost planet. It is also, except for the asteroids, the smallest and least massive. One of the consequences of Kepler's third law is that the speed of a planet in its orbit is inversely proportional to the *square root* of the planet's mean distance from the sun; accordingly, Mercury swings round its course faster than any other planet, at an average speed of nearly 30 miles a second, making a complete revolution in 88 days. Because its orbit is well inside the earth's, the planet is never seen far from the sun, which makes it a difficult object to observe. Consequently few people, comparatively speaking, have ever seen Mercury. At the most favorable periods, the planet is about 28° from the sun and may be seen low in the western sky just after sunset.

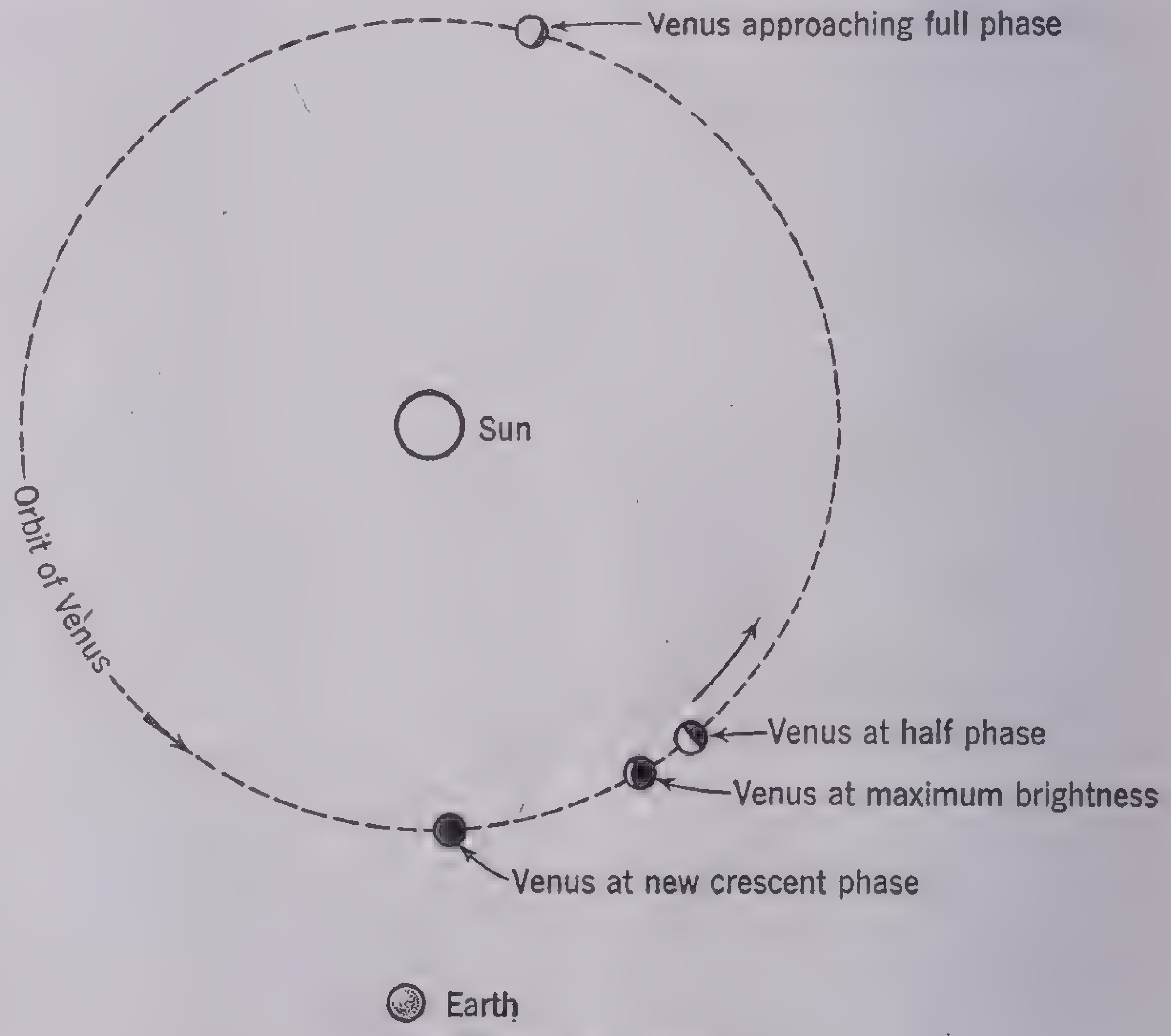
If a planet has one or more satellites it is possible to determine its mass with great accuracy by observing the satellites' distances and periods of revolution. Mercury has no satellite, and we are forced to depend upon indirect and complicated calculations to get an estimate of its mass and density. The figures given in the table are the best available, but they may well be in error by as much as 20 per cent.

Little is known about conditions on the surface of Mercury. Most astronomers believe that its rotation period is the same as its revolution period, which means that it keeps the same face always turned toward the sun. If this is the case, the illuminated half must be exceedingly hot, while the dark side must be close to the absolute zero—about 450° below zero F. At times of transit across the sun's disk, the planet appears as a black dot without a surrounding bright ring, a fact that proves that there can be no appreciable atmosphere. Hazy and ill-defined markings have been observed, but they are too faint to furnish much information about the surface.

Because their orbits are inside that of the earth, Mercury and Venus show phases such as that of our moon, from new to crescent, through half to full. Also, they are the only ones that can be seen to transit, that is, to cross the face of the sun.

Venus is the second planet in order of distance from the sun. Of all the bodies in the solar system it most resembles the earth. It has a diameter of about 7,700 miles, a mass about 4/5 that of the earth and a density of 4.86 as compared with the earth's 5.53. It has an abundant atmosphere, believed to contain large amounts of water vapor and carbon dioxide. The thick blanket of foggy atmosphere prevents us from seeing the solid surface of the planet, and we accordingly know nothing of its topography. It is also impossible to observe directly the planet's rotation, and the rotation period is not known. Spectroscopic measurements show that the rotation must be slow—a period of less than 20 days would produce measurable shifts in the lines of its spectrum which have not been observed—but it is unlikely that Venus keeps the same face always towards the sun. It has been demonstrated that the dark part of the planet has a temperature not much colder than 0° F, which would seem impossible unless there is rotation relative to the sun.

The brightness of Venus depends upon the relative positions of the planet, the sun and the earth. As previously mentioned, the planet's disk exhibits phases, like the moon's, but unlike the moon, Venus is not brightest when at full phase. The phases and variations of brightness of Venus may be understood by considering the diagram.


Venus approaching full phase
Sun
Orbit of Venus
Venus at half phase
Venus at maximum brightness
Venus at new crescent phase
Earth

Phases of Venus

When Venus is nearest the earth, it appears as a thin crescent close to the sun; when the whole illuminated half is turned toward the earth, the planet is again seen close to the sun, but on the opposite side of its orbit, about 160,000,000 miles away from the earth. The apparent brightness depends upon both the fraction of the illuminated surface that is turned toward the earth and the distance. Maximum brightness occurs at a point between new crescent and half phase, when the planet is about 39° from the sun. At such times Venus is, with the exception of the sun and the moon, the brightest object in the sky, surpassing the brightest star Sirius nearly ten times. It can often be seen in broad daylight, and on moonless nights casts a distinct shadow. The diagram shows the planet as it appears to the earth. Of course one-half of its surface (that turned toward the sun) is always illuminated

The many resemblances between the earth and Venus have raised speculation as to the possibility of the planet's supporting life. The strongest and indeed nearly conclusive argument against life on Venus is the fact that spectroscopic examination has failed to reveal the presence of oxygen in the planet's atmosphere, although the tests made were delicate enough to detect the gas in the amount of 1 per cent of its abundance in the earth's atmosphere.

Mars is the fourth planet in order of distance from the sun, the mean radius of its orbit being 141,000,000 miles. At favorable times it approaches within 40,000,000 miles of the earth and is a conspicuous object, looking to the naked eye like a very bright star of reddish tinge. It resembles the first magnitude star Antares, which was so named because of its similarity to Mars (Ares).

The planet's diameter is 4,200 miles, only half that of the earth; its density is 3.96, and the force of gravity at its surface is 0.38 that of the earth's. That it has an atmosphere is demonstrated by floating clouds that have often been seen in telescopes; that its atmosphere is much less dense than that which surrounds the earth is indicated by the clearness with which surface detail can be seen and is inferred from the low surface gravity.

Mars rotates on its axis in 24 hours and 37 minutes, and its equator is inclined to the plane of its orbit in an angle of 23½°. Day and night on Mars and the alternations of season are therefore strikingly similar to the earth's. Speculation concerning the possibility of life on Mars has produced great popular interest in the planet. Telescopes certainly reveal that Mars has polar caps that increase and diminish with the seasons, and that certain fine markings and even extensive regions on the planet undergo seasonal changes in color and conspicuousness. This phenomenon favors the idea of advance and decline of vegetation. It seems quite probable from this evidence that there is plant life on Mars. The presence of water vapor in the atmosphere of Mars and temperatures on the planet, recently determined, increase the possibility. Where plant life exists, there is likely to be some form of animal life. The principal argument for intelligent life rests on the artificial appearance of the so-called canals, but most contemporary astronomers think that these canals are natural vegetation areas, and that conditions on Mars are not favorable to the existence of human life as we know it.

The Martian year is 687 days; so the seasons are almost twice as long as ours. The light and heat received from the sun is less than half as intense and for this reason there is probably less difference between summer and winter than on earth. On the other hand, the eccentricity of Mars' orbit brings the planet 25,000,000 miles nearer the sun at perihelion than at aphelion; this variation is perhaps as important as the inclination of the planet's equator in producing seasonal changes.

Although only a little more than half as large as the earth, Mars has two moons—Deimos and Phobos. But they are tiny moons, probably less than twenty miles in diameter, whereas our moon is 2,160 miles in diameter. They can be seen only in a large telescope. The little satellite Phobos is especially remarkable because it revolves faster than the planet rotates (its revolution period is 7 hours and 40 minutes) and thus must appear, to a Martian observer, to rise in the west and set in the east.

ASTEROIDS. Between the orbit of Mars and that of the next major planet, Jupiter, is a gap in space in which are found more than a thousand little planets, called asteroids. Most of them are tiny objects when seen in the telescope and can be distinguished from faint stars only by their motions. The brightest one, Vesta, when nearest the earth is sometimes visible to the naked eye. Two are larger than Vesta, though not so bright—Ceres, 488 miles in diameter; and Pallas, 304 miles in diameter.

The asteroid named *Eros* approaches the earth as near as 13,000,000 miles, nearer than any heavenly body except the moon. Observations made on this little planet at such times of close approach furnish the basis for the most accurate determinations we have of the distance of the sun from the earth.

None of the asteroids has enough surface gravity to hold an atmosphere, and they are undoubtedly arid and airless chunks of material. There is no reason to suppose that the smaller ones are even approximately spherical in shape; indeed there is strong evidence that they are irregular, for the light received from them is quite variable. There may well be thousands undiscovered, ranging in size down to mere rocks.

The total mass of all the asteroids is small, not more than 1,000th of the mass of the earth, and they produce practically no effect in perturbing the larger planets.

One of the most remarkable of the asteroids (from the point of view of earth dwellers) was discovered in February, 1936, when the Belgian astronomer Delporte observed an unfamiliar object in the heavens that may best be characterized as an enormous rock, perhaps half a mile in diameter and weighing about a billion tons. This rock was at the time of its discovery only about 3,000,000 miles from the earth, and calculations of its orbit showed that on February 7th it had approached the earth within 2,000,000 miles. Its orbit about the sun is an ellipse of high eccentricity, and its distance from the sun varies between 41,000,000 and 300,000,000 miles. As the orbit apparently nearly intersects the earth's, and the period of revolution is about 2½ years, there is some chance of a collision actually taking place. Large perturbations in its orbit from the action of Venus, the earth and Mars make it impossible to calculate the future of this asteroid.

Late in 1937 another asteroid was discovered that came even closer to the earth than the *Delporte Object* just mentioned. This was discovered on photographic plates made by Dr. Karl Reinmuth of Heidelberg. Calculation showed that between October 25 and October 30, 1937, this asteroid had passed within 400,000 miles of the earth, traveling at a speed of 20 miles or more a second. We do not know exactly what would happen if such a heavenly body should actually collide with the earth, but it would probably produce a catastrophe greater than any in recorded history. If the planetoid landed in one of the oceans, a tremendous wave disturbance would be set up that would perhaps inundate large areas of seacoast.

Jupiter is the greatest planet in dimensions and in mass. Its mean diameter is 87,600 miles, 11 times that of the earth; and in volume it is greater than all the other planets combined. It weighs 317 times as much as the earth. At a distance of 5.2 astronomical units, it revolves about the sun once in a little less than 12 years. It travels slowly and majestically through about 30 degrees or one sign of the Zodiac each year. Jupiter's day, however, is short—only about ten hours. To the naked eye Jupiter appears as a star five or six times as bright as Sirius, though not so bright as Venus. Its light is yellowish, whereas that of Venus is white. In any telescope an equatorial bulge on Jupiter is noticeable; and light and dark belts, parallel to its equator, are conspicuous. The oblateness is caused by the planet's rapid spinning on its axis. With a large telescope and with good visual conditions the bands reveal delicate, beautiful structure with colors in red and brown. The most prominent persistent marking is the great red spot. Jupiter has nine satellites, five of which are very small. The four large ones—Io, Europa, Ganymede and Callisto—are known as the *Galilean satellites* (discovered by Galileo in 1610). They were the first heavenly bodies discovered by means of the telescope, and their discovery furnished a strong argument from analogy that the earth was not the center of the solar system. They are so bright as to be visible in the smallest telescope. These four satellites of Jupiter present a beautiful sight and afford interesting phenomena for astronomical observation as they revolve about the planet, when the moons themselves and their shadows can be seen to cross the disk of Jupiter, and when the moons are occulted by the planet or eclipsed by its shadow. Observations of the eclipses of the Galilean satellites led to the first determination of the velocity of light.

Saturn to the unaided eye is most nearly like Mars of any of the planets, though not so ruddy nor so brilliant. It resembles the star Spica. Viewed in a telescope, Saturn is perhaps the most beautiful sight in the heavens. It presents a picture different from all other bodies in the universe—a globe encircled by a shining ring. The ball is striped with delicate bands, much fainter than those on Jupiter, and at times polar caps blue as a robin's egg are seen. The ring system is composed of two bright rings separated by *Cassini's Division* and of one dusky, semitransparent ring within them, nearest the ball, called the *crape ring.* Saturn makes its trip around the sun in nearly 30 years.

Essential Facts about the Planets

Name of Planet	Symbol	Mean Distance from Sun (A. U.)	Mean Distance from Sun (Miles)	Period of Revolution	Mean Orbital Velocity (Miles per Second)	Period of Rotation	Mean Diameter (Miles)	Mass (Earth = 1)	Density (Water = 1)	Acceleration of Surface Gravity (Earth's = 1)	Velocity of Escape at Surface (Miles per Sec.)	Number of Satellites
Mercury	☿	.387	36,000,000	88 days	29.8	88 days	3,100	.04	3.8	.27	2.24	0
Venus	♀	.723	67,200,000	224.7 days	21.8	?	7,700	.81	4.86	.85	6.3	0
Earth	⊕	1.000	92,900,000	1 year	18.5	23 hr. 56 m.	7,920	1.00	5.53	1.00	6.95	1
Mars	♂	1.524	141,500,000	1.88 years	15.0	24 hr. 37 m.	4,200	.11	3.96	.38	3.1	2
Jupiter	♃	5.203	483,000,000	11.86 years	8.1	9 hr. 50 m.	87,600	316.9	1.34	2.64	37.3	9
Saturn	♄	9.539	886,000,000	29.46 years	6.0	10 hr. 25 m.	71,500	94.9	.71	1.17	22.4	9
Uranus	⛢	19.191	1,782,000,000	84.01 years	4.2	10 hr. 40 m.	31,800	14.7	1.27	.92	13.1	4
Neptune	♆	30.071	2,793,000,000	164.8 years	3.4	15 hr. (?)	31,000	17.2	1.58	1.12	14.3	1
Pluto	♇	41.0	3,800,000,000	247.7 years	2.9	?	5,000–10,000(?)	?	?	?	?	?

Twice during this period the rings are presented edgewise to the sun. At those times, when the earth is approximately in the plane of the rings, they can be seen only with difficulty or else they entirely disappear. Seven and one-half years later, the earth and sun look down on the rings from an elevation of about 26 degrees, and then they appear as an ellipse nearly half as wide as it is long. At this time the rings cast a shadow on the ball, and the ball casts a shadow on the rings. The rings are made up of small bodies, giving the appearance of a solid ring. The demonstration of the meteoric constitution of the rings is one of the triumphs of the application of the spectroscope to astronomy. Saturn is next largest to Jupiter, having a mean diameter of 71,500 miles. The distance between the outer limits of the ring system is more than twice this distance. Saturn's day is very short—about 20 minutes longer than that of Jupiter. The ball being less dense than Jupiter, this rapid spinning makes for even greater flattening at its poles. The bulging at its equator is easily visible in a telescopic view of the planet and on photographs of it. Saturn's density is less than that of water. The planet has nine moons, as has Jupiter; but only one of them, Titan, is as large as the Galilean satellites.

Uranus was discovered in 1781 by Sir William Herschel. The first six planets had been known since prehistoric times; so that the discovery of a planet was a thing unheard of and the occasion of great excitement. Uranus can be seen with the naked eye on a moonless night if one knows just where to look for it. In a telescope it presents a light greenish disk, too small and too faint to reveal surface markings clearly, if there are any. Consequently it has not been possible to determine its rotation period by the usual method. Other determinations, spectroscopic and radiometric, indicate a period of between 10 and 18 hours. Uranus has four tiny moons, Ariel, Umbriel, Titania and Oberon. These encircle it in periods varying from 2½ days to 13 days. Their orbits, and the equator of Uranus as well, are nearly perpendicular to the ecliptic. The planet itself goes around the sun at a distance of 19 astronomical units once in 84 years.

Neptune was discovered because Uranus was seen to deviate from the orbit computed for it from observations of its position made in the years immediately following its discovery, even though allowance had been made for the disturbing effect of all known planets. It was thought that some unknown body, near enough and of great mass, must be perturbing Uranus. In 1846 search for such a disturbing body in a position indicated by computations by Urbain J. Leverrier (1811–77) and John Couch Adams (1819–92) revealed a planet beyond Uranus. This was a magnificent triumph for mathematical astronomy. The planet was named Neptune. It is not visible to the naked eye. In the telescope its appearance is not unlike that of Uranus—a pale greenish disk with markings, vague at best. Although its one satellite has a diameter almost equal to that of our moon, its great distance from us makes it difficult to see. Neptune's period of rotation is unknown. It goes about the sun once in 165 years at a distance of 30 astronomical units. In size, it almost equals Uranus.

Early in 1930 a still more distant planet was discovered by the astronomers at the Lowell Observatory, Flagstaff, Arizona. The circumstances leading to this discovery are not unlike those which led to the discovery of Neptune. A keen analysis (*Lowell Observatory Memoirs,* Vol. I, No. 1, "A Trans-Neptunian Planet" [1914]) by the late Professor Percival Lowell of the unexplained discrepancies in the motion of Uranus pointed the way to an unknown planet at a distance about 44 astronomical units, with mass 1/50,000 that of the sun, in longitude which would put it, in July, 1914, if it were near the ecliptic, in one of two alternative positions, either in the eastern edge of the constellation of Taurus or about 180 degrees from this. The Flagstaff observers had begun the search for this planet before the publication mentioned above and carried it on until the discovery in January 1930. Great credit is due to Percival Lowell for his masterful mathematical treatment and to the staff of astronomers at the Lowell Observatory. The new planet was named *Pluto.*

Following the announcement of the discovery, a search of older photographic plates showed Pluto's position on several past dates and made possible a fairly accurate computation of its orbit. Its period of revolution is nearly 248 years. The orbit is highly eccentric, and its perihelion approach is actually inside the orbit of Neptune. There is no danger of the planet's colliding with Neptune, however, as the orbit is inclined 17° to the ecliptic and thus passes well over and under Neptune's orbit. The closest possible approach to Neptune is about 140,000,000 miles. The mass and size of Pluto are not known, but the planet can hardly be larger than the earth.

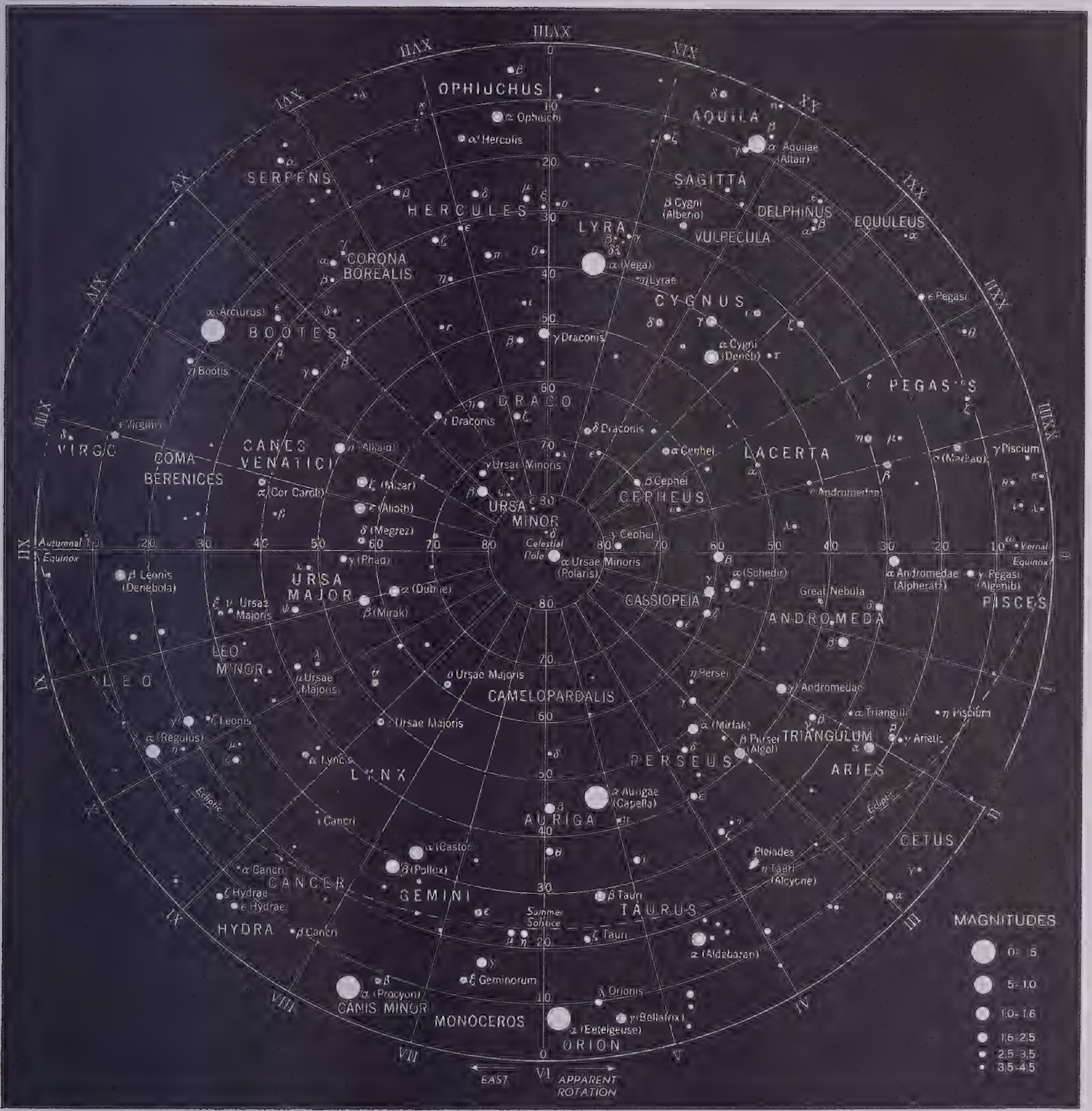
The Sidereal System (Stars).—If it were physically possible for an airplane to travel indefinitely into space, it would take one going at a speed of 300 miles per hour 35 years to reach the sun, our star. At the same speed, nearly 10,000,000 years would be required to reach the next nearest star. Seen from that star, our sun would look like one of the brighter stars; but no telescope yet constructed would be able to show the earth nor even the giant planet Jupiter. More than half the stars which we see are 100 times as far away as this nearest one, and the farther ones which telescopes reveal are thousands of times as remote. Only comets and meteors occupy the vast space which surrounds our planetary system.

It is only when we consider the enormous distances of the stars that we can think of these glittering points of light as bodies of the same nature as our sun, globular masses of enormously hot gas, with temperatures of millions of degrees at their centers. Many of them are larger and hotter than our sun; some are smaller and cooler. Within the last 100 years, by use of the spectroscope, a great deal has been learned about the constitution of the stars, their temperatures and the speeds at which they are moving toward or from us. Indeed, as early as the 17th century, Newton had established this fact by another means. From the theory of gravitation he showed that the stars must be hundreds of times as far away as Saturn, for otherwise they would either fall into the sun or describe orbits about it. At such great distances they could not shine by reflected sunlight, as do the planets.

The stars vary in color, according to their spectra. They are red, yellow, blue or white. The red stars are either young giants or old dwarfs. Yellow stars are either youthful or middle-aged. The blue and white stars are the hottest, and average twice the size of our sun, which is a middle-aged yellow star, past its prime. It will be smaller when it becomes a dwarf red star, and after that it will perhaps cease to shine at all. But this will be countless ages hence. Giant red stars, such as Betelgeuse, Antares and Aldebaran, are 200 to 300 times as large as our sun. It will be seen that astronomers regard the stars as in a process of evolution and place them in sequence according to their special characteristics. The various steps in the sequence correspond with stages of development. Of course the process is too slow to permit any view of the transitions; but, as one may judge of the development of human beings from studying the characteristics of children, young people and elderly ones, so from the detailed study of stellar spectra arises the idea of the evolution of stars.

When we look up at the stars they seem to be fixed at random on the inside of a large hemisphere. Although their distances have very great range, yet in describing the position of one star with respect to another, we say they are near together if they appear in about the same direction, and far apart if their directions are quite divergent. Therefore, since their separation is only a matter of direction, it must be given in angular measure, by degrees, minutes and seconds. A ten-cent piece held at arm's length is a rough measure for one degree. The sun and the moon are each about a half degree in angular diameter. It is well, also, to know angular distances between certain bright stars, to use as yardsticks in the sky; thus, the distance between Alpha and Beta Ursae Majoris, the Pointers, is five degrees.

If we give thought to the arrangement of the stars, the brighter ones naturally fall into outlines and groupings that make up star pictures. We do not all see the same pictures, just as we do not see the same pictures in cloud formations. In olden times the shepherds, while guarding their flocks at night, traced out star pictures of animals and monsters, giants and heroes. They gave names to them and made up tales about them. Most of these names are drawn from Greek


XXIII
0
XXII
XIX
OPHIUCHUS
α Ophiuchi
α¹ Herculis
AQUILA
α Aquilae (Altair)
SERPENS
HERCULES
SAGITTA
β Cygni (Albeiro)
DELPHINUS
EQUULEUS
LYRA
VULPECULA
CORONA BOREALIS
α (Vega)
η Lyrae
CYGNUS
ε Pegasi
α (Arcturus)
BOOTES
γ Draconis
α Cygni (Deneb)
η Bootis
PEGASUS
DRACO
ι Draconis
δ Draconis
ε Virginis
VIRGO
COMA BERENICES
CANES VENATICI
η (Alkaid)
α Cephei
LACERTA
γ Piscium
ζ (Mizar)
ε (Alioth)
δ (Megrez)
γ Ursae Minoris
URSA MINOR
β Cephei
CEPHEUS
α Andromedae
α (Cor Caroli)
Autumnal Equinox
γ Cephei
Celestial Pole
α Ursae Minoris (Polaris)
Vernal Equinox
γ (Phad)
β Leonis (Denebola)
URSA MAJOR
α (Dubhe)
β (Merak)
α (Schedir)
CASSIOPEIA
Great Nebula
ANDROMEDA
α Andromedae (Alpheratz)
γ Pegasi (Algenib)
PISCES
ν Ursae Majoris
LEO MINOR
LEO
μ Ursae Majoris
ο Ursae Majoris
CAMELOPARDALIS
η Persei
γ Andromedae
α Trianguli
η Piscium
γ Leonis
α (Regulus)
ι Ursae Majoris
α (Mirfak)
β Persei (Algol)
TRIANGULUM
γ Arietis
α Lyncis
LYNX
PERSEUS
ARIES
Ecliptic
α Aurigae (Capella)
AURIGA
ι Cancri
CETUS
α (Castor)
Pleiades
η Tauri (Alcyone)
α Cancri
CANCER
β (Pollux)
GEMINI
β Tauri
ζ Hydrae
ε Hydrae
Summer Solstice
TAURUS
HYDRA
β Cancri
ζ Tauri
α (Aldebaran)
MAGNITUDES
0-.5
.5-1.0
1.0-1.6
1.6-2.5
2.5-3.5
3.5-4.5
ζ Geminorum
α (Procyon)
CANIS MINOR
λ Orionis
MONOCEROS
γ (Bellatrix)
α (Betelgeuse)
ORION
VIII
VII
VI
V
IV
III
IX
X
XI
XII
XIII
XIV
XV
XVI
XVII
XX
XXI
I
II
10
20
30
40
50
60
70
80
EAST
APPARENT ROTATION

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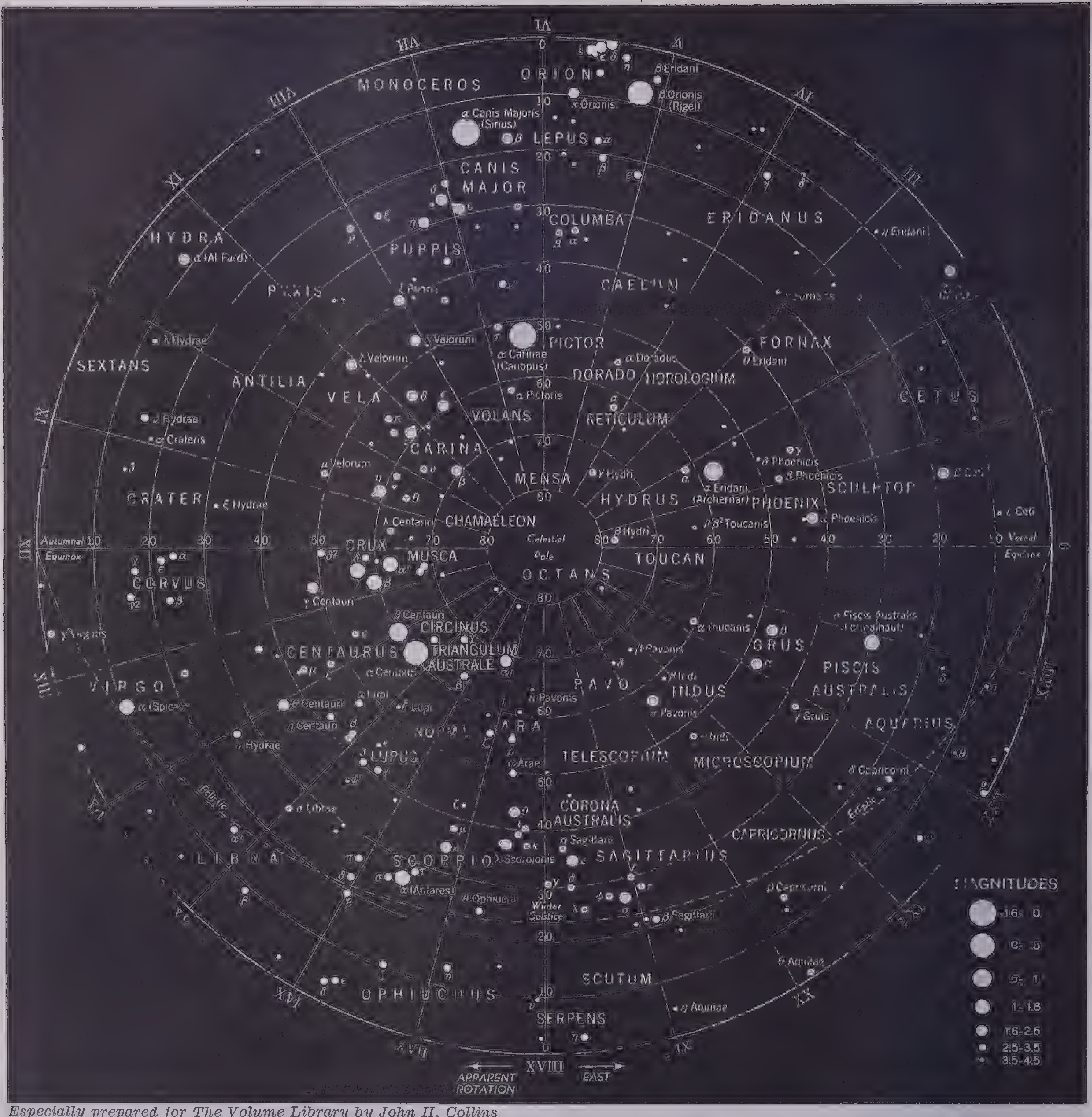
Stars and Constellations of the Northern Hemisphere

These maps show all the constellations and all the stars brighter than magnitude 4.0 as well as a few fainter stars. The approximate position of any star at any time can be learned from the map. The lines running radially on the map are the *right ascension hour circles* numbered from 0 to XXIII around the circumference, clockwise on the North map and counterclockwise on the South map. These lines represent great circles on the celestial sphere passing through the poles. The concentric circles centered at the poles represent *parallels of declination* at 10° intervals north and south of the celestial equator. The position of a star on the celestial sphere is specified by giving its *right ascension* (measured in hours, minutes and seconds of sidereal time eastward from the equinoctial colure or circle of right ascension passing through the equinoxes) and its *declination* (measured in degrees, minutes and seconds of arc north or south of the equator). The bright star Vega or α Lyrae (near the center in the upper half of the North map) has the position (1940) R.A. (right ascension) 18^h 34^m 53^s, Decl. (declination) 38° 43′. This means that Vega transits the meridian 18 hours 34 minutes and 53 seconds of sidereal time (see *Time and Time Measurement*) after the Vernal Equinox. This is strictly true only in 1940, but it is nearly true for many years before or after that date. To find what time by an ordinary watch Vega or any other star of given right ascension crosses the observer's meridian on a given date, it is necessary to convert the sidereal time to mean solar time. Rather elaborate tables are constructed for doing this exactly, but a rough approximation adequate for locating stars and constellations in the sky is given by the following rule: Add to the right ascension of any star (reading from the map) 2 hours for each month and 4 minutes for each day

[*Concluded on following page.*]


ORION
MONOCEROS
α Canis Majoris (Sirius)
κ Orionis
β Orionis (Rigel)
β Eridani
LEPUS
CANIS MAJOR
COLUMBA
ERIDANUS
HYDRA
α (Al Fard)
PUPPIS
PYXIS
CAELUM
FORNAX
PICTOR
α Carinae (Canopus)
α Doradus
DORADO
HOROLOGIUM
θ Eridani
SEXTANS
ANTILIA
VELA
γ Velorum
λ Velorum
α Pictoris
VOLANS
RETICULUM
CETUS
λ Hydrae
α Hydrae
α Crateris
CARINA
MENSA
γ Hydri
α Eridani (Achernar)
δ Phoenicis
β Phoenicis
SCULPTOR
CRATER
ε Hydrae
HYDRUS
PHOENIX
α Phoenicis
μ Velorum
λ Centauri
CHAMAELEON
β Hydri
β Toucanis
ι Ceti
Autumnal Equinox
Vernal Equinox
CRUX
MUSCA
Celestial Pole
OCTANS
TOUCAN
CORVUS
γ Centauri
β Centauri
CIRCINUS
α Toucanis
GRUS
α Piscis Australis (Fomalhaut)
γ Virginis
CENTAURUS
TRIANGULUM AUSTRALE
α Centauri
β Pavonis
PAVO
INDUS
PISCIS AUSTRALIS
VIRGO
α (Spica)
θ Centauri
η Centauri
α Lupi
NORMA
ARA
α Pavonis
γ Gruis
AQUARIUS
γ Hydrae
LUPUS
α Arae
TELESCOPIUM
MICROSCOPIUM
δ Capricorni
α Librae
Ecliptic
CORONA AUSTRALIS
η Sagittarii
CAPRICORNUS
LIBRA
SCORPIO
λ Scorpionis
SAGITTARIUS
α (Antares)
θ Ophiuchi
Winter Solstice
β Sagittarii
β Capricorni
MAGNITUDES
-1.6- 0
0-.5
.5-1
1-1.6
1.6-2.5
2.5-3.5
3.5-4.5
θ Aquilae
SCUTUM
OPHIUCHUS
η Aquilae
SERPENS
XVIII
APPARENT ROTATION
EAST
VI
VII
VIII
IX
X
XI
XII
XIII
XIV
XV
XVI
XVII
XIX
XX
XXI
XXII
XXIII
0
I
II
III
IV
V
10
20
30
40
50
60
70
80

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Stars and Constellations of the Southern Hemisphere

[*Concluded from preceding page.*]

between the date of observation and the next March 21; let this result be T.

If T is less than 12, the star will be near the observer's meridian on the date selected at T P.M. standard time.

If T is between 12 and 24, the star will be near the meridian at T — 12 A.M. standard time.

If T is between 24 and 36, the star will be near the meridian at T — 24 P.M. standard time.

If T is between 36 and 48, the star will be near the meridian at T — 36 A.M. standard time.

Example 1: When will Altair (upper right of North map) be near the meridian on June 15?

Answer: June 15–March 21 = 9 months, 6 days. Counting 2 hours a month and 4 minutes a day we have $18^h\ 24^m$.

Right ascension of Altair estimated from map $19^h\ 48^m$

$$18^h\ 24^m + 19^h\ 48^m = T = 38^h\ 12^m.$$

T is between 36 and 48; therefore Altair will be near the meridian at

$$38^h\ 12^m - 36^h = 2{:}12 \text{ A. M.}$$

Example 2: On September 5, what hour circle will be near the meridian at 9:30 P.M.?

Answer: Let x be the required hour circle.

Sept. 5–March 21 = 6 months, 16 days

Counting 2 hours a month and 4 minutes a day we have $13^h\ 4^m$.

$$x + 13^h\ 4^m = T$$

Since T is more than 12 it must lie between 24 and 36 to give a P.M. standard time for the meridian passage of the x hour circle.

$$T - 24^h = 9^h\ 30^m \text{ P.M.}$$

$$\text{or } x + 13^h\ 4^m - 24^h = 9^h\ 30^m \text{ P.M.}$$

$$x = 24^h - 13^h\ 4^m + 9^h\ 30^m = 20^h\ 26^m$$

This is the hour circle passing on the map through the constellations Cepheus, Cygnus, Vulpecula, Delphinus, Aquila and Capricornus.

or Roman mythology. Some go back even farther. Forty-eight such star groups or *constellations* were included in Ptolemy's *Almagest* of the second century. These include practically all that can be seen in north latitude about 40 degrees. Since 1600 A.D., 40 more constellations have been named; most of these are seen only in the southern skies or are made up of the less conspicuous stars. So now 88 constellations map out the entire sky that can be seen in any latitude at any time on any night. The boundaries between them are imaginary lines, just as are some of the boundaries of countries. The early constellation names and the legends connected with them have come down to us through the centuries. Realization of their antiquity adds to the interest in learning them. The naked-eye stars are designated by the letters of the Greek alphabet coupled with the constellation name, usually in order of brightness, though there are some exceptions. If there are more stars in a constellation than there are letters in the Greek alphabet, Roman letters are used; numbers afford an alternative method. About 60 of the brighter stars have proper names, too. For example, the brightest star in the constellation Taurus is Aldebaran, and it is Alpha of Taurus, written α (Alpha) Tauri (the genitive case of the constellation name is always used).

To one living at the north pole, the pole star (Polaris or Alpha Ursae Minoris) would always be directly overhead. His horizon would coincide with the equator, and as the earth rotates on its axis from west to east, the stars would appear to travel from east to west in paths parallel to the horizon. Half of the stars would always be above the horizon for him; half of them he would never see. At the South Pole the same conditions would prevail, except that the two hemispheres would be reversed. To one living on the equator the stars rise and set at right angles to the horizon, and all stars are visible in the evening at some time of the year. For those living in latitudes between 0° and 90° north or south, some stars are never seen, others are always above the horizon, and the rest rise in the east and set in the west obliquely to the horizon. Since the earth travels once around the sun in a year, the sun appears to us to have made the complete circuit of the heavens with relation to the stars. It moves eastward about 1° a day or 30° a month, that is, through one sign of the zodiac. For this reason we do not see the same constellations in the same part of the sky at the same hour the whole year around. There is a gradual shifting, so that one set of constellations is left in the sky at sunset at one time of the year, and six months later those of the opposite part will have replaced them. It will be clear that by the earth's rotation on its axis once in 24 hours our position with relation to the stars is changed as much in two hours on any one night as it is changed for the same hour of night by a month's revolution about the sun. So the star pictures that one sees depend upon the latitude in which he is viewing the heavens, the time of year and the time of night.

At a glance we will be able to pick out a dozen or more stars that are outstandingly brighter than the others, and we will note that there are fainter ones all the way down the scale to those which we can barely see. The brightness of a star is called its *magnitude* and depends upon three things—its size, distance and temperature. Stars just visible to the naked eye are of the sixth magnitude. Fifth magnitude stars are two and one-half times as bright (exactly 2.512 or $\sqrt[5]{100}$); fourth magnitude stars, six times as bright; third magnitude, sixteen times; second magnitude, forty times; first magnitude, one hundred times. This magnitude scale is continued upward to zero and minus magnitudes and downward to the faintest stars visible in the largest telescope. The greater magnitude numerically thus indicates the fainter star; and any two stars which differ by five magnitudes differ a hundredfold in brightness.

The magnitudes just described are *visual*—that is, they are judged by the eye with the aid of a telescope. This method has its disadvantages because the eye does not respond to radiation of infra-red or of ultraviolet. In other words, by the visual method two stars of different colors will be rated the same magnitude if they appear equally bright to the eye, though the eye misses different proportions of radiation owing to the color. So *photographic magnitudes* are figured for stars, based on impressions on photographic plates rather than human eyes. Red stars affect the eye more strongly than blue; blue stars affect the photographic plate more strongly than red stars. The difference between photographic magnitude and visual magnitude of the same star may be as much as 1½ magnitudes. This difference, photographic minus visual magnitude, is called the *color-index* of the star and furnishes a numerical measure of the degree of redness.

A good idea of the conception of stellar magnitude may be gained by considering the light given out by an ordinary candle. At a distance of 300 feet a candle would have a visual magnitude of —4.0; at 475 feet the magnitude would be —3.0; at 750 feet —2; at 1,200 feet —1; at 1,750 feet, 0; at 3,000 feet, 1. As the candle is moved from 300 to 3,000 feet the light diminishes to 1/100 of its original intensity; this corresponds to 5 units of the magnitude scale.

Neither of these magnitudes (visual or photographic) gives us any idea of the absolute magnitude, that is, the real intrinsic brightness of the stars independent of the distance at which they are seen.

Absolute magnitude or true brightness can be calculated from the two factors, apparent brightness and distance. The seven most conspicuous (apparently brightest) stars have very different absolute magnitude. Sirius gives 28 times as much light as the sun; Canopus, perhaps 50,000 times; Vega, 50 times; Arcturus, 100 times; Capella's two stars, 110 and 70 times; Rigel, more than 10,000. In technical astronomical work a scale of absolute magnitude modeled on the visual magnitude scale is frequently used. Absolute magnitude is defined for this scale as the visual magnitude a star would have if it were seen at a standard distance of 10 parsecs (about 2,060,000 A.U. or *astronomical units.* One A.U. is the mean radius of the earth's orbit; about 92.9 million miles). For most purposes, however, it is more convenient to speak of a star's *luminosity,* by which we mean its real visual brightness compared with the sun as a standard.

There are only twelve first magnitude stars in the whole sky; there are 20 of magnitude 1.5 or brighter; 40 of the second magnitude; about 200 of the third magnitude; 500 of the fourth; 1,600 of the fifth, and 5,000 of the sixth or brighter.

So the stars are by no means numberless, as we are likely to think. Subtracting from the 5,000 naked-eye stars those that are below the horizon and those that are invisible because of the haze near the horizon, only about 2,000 to 2,500 are visible at any one time at any place. With a field glass, 50,000 can be seen; with a two-inch telescope, about 300,000; with the 18½-inch refractor of the Dearborn Observatory, 40,000,000; with the 40-inch refractor of the Yerkes Observatory, 140,000,000; and with the 100-inch reflector of the Mount Wilson Observatory, about 1,000,000,000. The total number of stars in our sidereal system may be from 30,000,000,000 to 40,000,000,000. This limit is derived by determining the number of stars of successively fainter magnitudes visible on photographs of long exposure. The great 200-inch reflecting telescope for the observatory on Mt. Palomar in California will have approximately four times the light-gathering power of the 100-inch reflector at Mount Wilson and should enable us to see many more stars. Perhaps it will enable us to settle definitely such questions as the total number of stars, and it may turn out in the light of future information that our present guesses are far below the facts.

A casual view of the sky shows that the stars are not uniformly distributed, that there are regions with few stars and others with many. More careful examination shows that the number of stars in any unit of area in the sky increases as approach is made to that broad hazy belt of misty light around the sky known as the *Milky Way.* If the Milky Way is examined with the telescope, or better, photographed with a portrait lens, it is shown to be made up of myriads of stars. We conceive our sidereal system to be roughly the shape of a grindstone or a thin watch, with the solar system somewhere near the center. If we look toward the edge of the system we see many stars and this produces in the sky the appearance which we call the Milky Way. If we look toward the faces we see comparatively few stars. Research indicates a diameter for our galaxy of between 200,000 and 300,000 light years, while the thickness is about one-tenth of this figure.

It is possible to gain an idea of the shape of our sidereal system and of the distribution of the stars within it from counts of the stars in the different regions, without having any knowledge of the dimensions of the system. In order to know the scale of it, it is necessary that we be able to solve the fundamental problem of the determination of stellar distances. Only the direct, trigonometric method is explained here. There are other indirect and perhaps less restricted methods.

If one sways back and forth from right to left, looking at some nearby object the while, it will be seen that, as the body sways to the right, the nearby object will appear to move to the left when compared with distant objects in the background; and when the body sways to the left, the opposite will be the case. This apparent displacement of the nearby object is called *parallax,* and the principle is employed in determining the distances of the nearer stars. Instead of the body moving back and forth, we have the earth moving about its yearly orbit. When the earth is on one side of the orbit, a star will appear in a certain direction with respect to the more distant stars in the background. Six months later the nearer star will appear slightly displaced from the original position. The nearer the star the greater will be its parallax. For the nearest star, Alpha Centauri, the parallax is 0."75. The angular value of this displacement, coupled with the known diameter of the earth's orbit, furnishes the means for determining the distance to the star in much the same way that one determines the distance to an inaccessible object on the earth by laying down a carefully measured base line and measuring the angular position of the distant object from the two ends of it.

The parallax of a star may be thought of as the angle subtended by the radius of the earth's orbit at the distance of the star. How very small this angle is and how refined must be the techniques used to measure it are made vivid when we consider that the radius of a one-cent piece subtends an angle of about 0."75 at a distance of 1½ miles. If the earth's orbit is represented by a cent, the nearest star would be 1½ miles away. The presence of this parallactic displacement has been cited as a proof of the earth's orbital motion. The problem of determination of stellar parallax (although simple enough in conception), on account of the minuteness of the displacement, is one of the most difficult problems of practical astronomy.

The remoteness of the stars makes it necessary to use a unit of distance larger even than the astronomical unit in order to avoid extremely large figures. The *light year* is the distance light travels in a year, at a speed of 186,000 miles a second. The star nearest to our solar system (Alpha Centauri) is 4.3 light years away. It should be noted that our sun is eight light minutes distant. Of the bright stars in the northern sky, it happens that the brightest, Sirius, is also the nearest; we see the light which left it a little less than nine years ago. Altair is 16 light years away; Vega, 27. The giant star Antares is 250 light years away. To be as bright as it is, it must, of course, be very large: the orbit of Mars could be put inside of it.

The stars appear to us to be fixed, but this is only because they are so far away. Through the centuries there have been slight changes in the apparent arrangement, but actually they are moving through space in all directions at speeds much greater than cannon shot. From observations of the motions of the stars it is found that our star, the sun, is moving through space toward a point in the constellation of Hercules at a speed of about 12 miles a second.

Some stars change in brightness from time to time. These are called *variable stars.* The outstanding naked-eye variables are Mira or Omicron Ceti; Algol or Beta Persei; Delta Cephei and Betelgeuse or Alpha Orionis. Over 5,000 variables are known at the present time, and more are being discovered each year. They are classified according to the cause or character of the variation in light and according to the length of period. The observation of variable stars is one field in which amateur astronomers may profitably work, co-operating with the great observatories.

If one with a keen eye looks closely at some of the stars, he will see that there are two stars instead of one. Many thousands of close pairs may be seen in a telescope. Some of them appear double only because two stars are nearly in the same line, though they are really far apart in space, while others are actually close together and held by their mutual gravitation. Many of them show that they are moving along together or that they are in orbital motion about their center of mass. Stars which show orbital motion are known as *binary stars.* Only for binaries is it possible to find the mass.

The density of various stars has been figured by elaborate calculations. It varies from very low, only 1,000th as dense as our ordinary atmosphere in the mass of Antares and of other giant red stars, to very high, say 2,000 times as dense as platinum or osmium (densest of our metallic elements) in the mass of Sirius's famous companion star and of other dwarf white stars. Midway between these extremes is the sun with a density 1.4 times that of water. The very diffuse red giant stars may belong to a young group of stars, comparatively little advanced in the process of star evolution. The sun is then to be classed as middle aged or in a mid-stage of evolution; the white dwarfs with their density so much greater than anything we know on earth are old stars, far along in evolution.

Table of the Brightest Stars

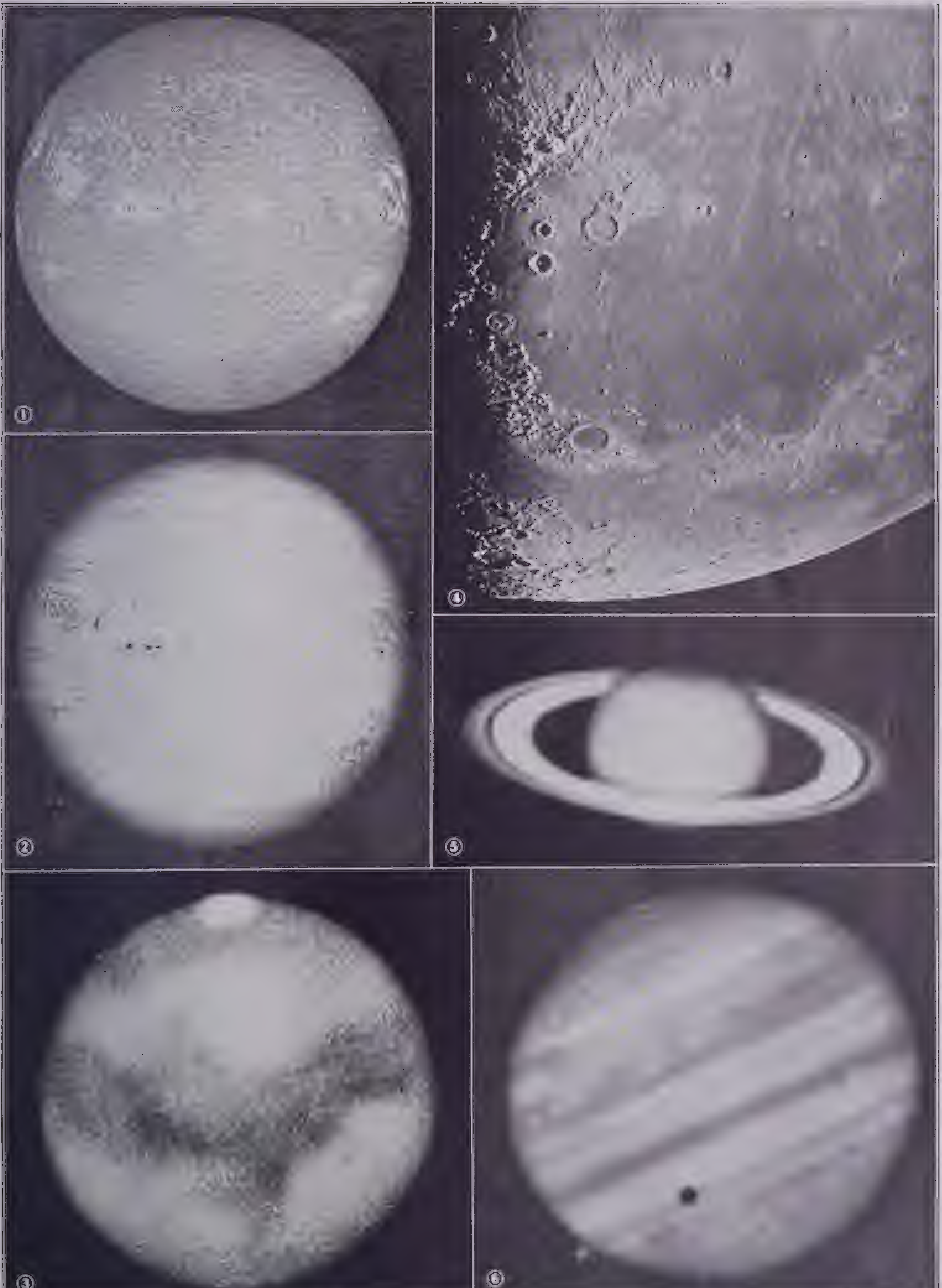
Name	*Constellation Name*	*Mag.*	*Estimated Surface Temperature (°F.)*	*Distance (Light Years)*	*Luminosity (Sun = 1)*
Sirius	α (Alpha) Canis Majoris	−1.58	20,000	8.8	26[1] .003
Canopus	α Carinae	−.86	13,000	650?	70,000?
	α Centauri	.06	10,000	4.3	1.1[1] .3
Vega	α Lyrae	.14	20,000	26	50
Capella	α Aurigae	.21	10,000	47	110[1] 70
Arcturus	α Boötis	.24	7,500	41	100
Rigel	β (Beta) Orionis	.34	27,000	540 ?	18,000?
Procyon	α Canis Minoris	.48	14,000	10.4	5.4[1] .00005
Achernar	α Eridani	.60	27,000	66	200
	β Centauri	.86	40,000	300 ?	3000?
Altair	α Aquilae	.89	15,000	16	9.2
Betelgeuse	α Orionis	1.–1.4	5,400	190 ?	1000–2000?[2]
	α Crucis	1.05	40,000	230?	1000?[1] 650?
Aldebaran	α Tauri	1.06	6,000	57	90[1] .001
Pollux	β Geminorum	1.21	7,500	32	28
Spica	α Virginis	1.21	36,000	230 ?	1500?
Antares	α Scorpii	1.22	5,400	360 ?	3400?
Formal haut	α Piscis Australis	1.29	18,000	24	13.5
Deneb	α Cygni	1.33	20,000	650 ?	10,000 ?
Regulus	α Leonis	1.34	27,000	56	70
	β Crucis	1.50	40,000	200 ?	850
Castor	α Geminorum	1.58	20,000	43	23.[1] 11. .04

(The following fainter stars are also commonly called by name rather than by their constellation letters.)

Name	*Constellation Name*	*Visual Magnitude*
Alcor	γ (Gamma) Ursae Majoris	4.0
Alcyone	η (Eta) Tauri	3.0
Algol	β (Beta) Persei	2.3-3.5 [2]
Alioth	ε (Epsilon) Ursae Majoris	1.7
Alkaid	η (Eta) Ursae Majoris	1.9
Alpheratz	α (Alpha) Andromedae	2.2
Bellatrix	γ (Gamma) Orionis	1.7
Cor Caroli	α (Alpha) Canum Venaticorum	2.9
Denebola	β (Beta) Leonis	2.2
Markab	α (Alpha) Pegasi	2.6
Mira	ο (Omicron) Ceti	2.0-9.6 [2]
Mizar	ζ (Zeta) Ursae Majoris	2.4
Polaris	α (Alpha) Ursae Minoris	2.1

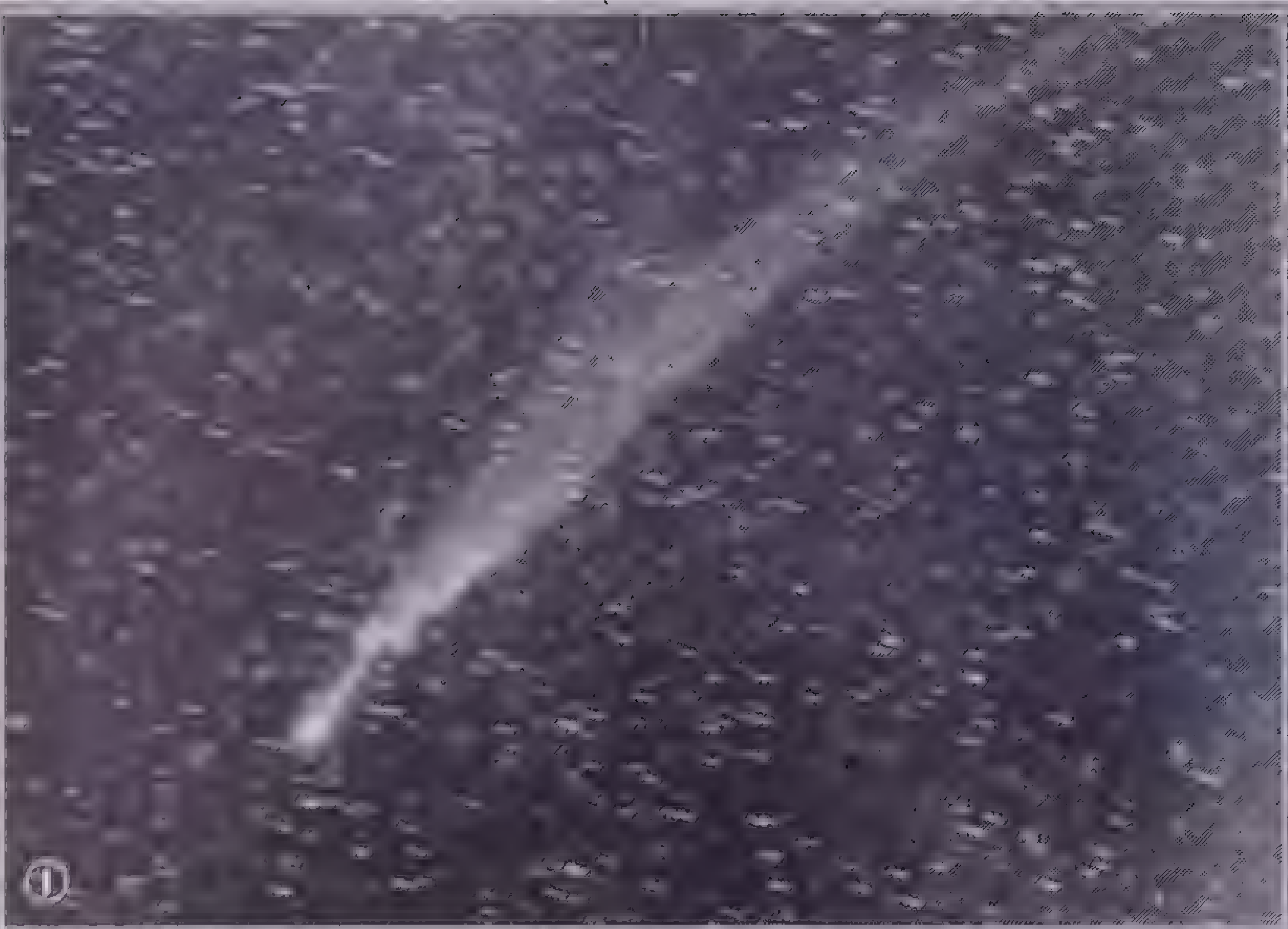
[1] Double or triple stars; the luminosity of the components is listed separately.

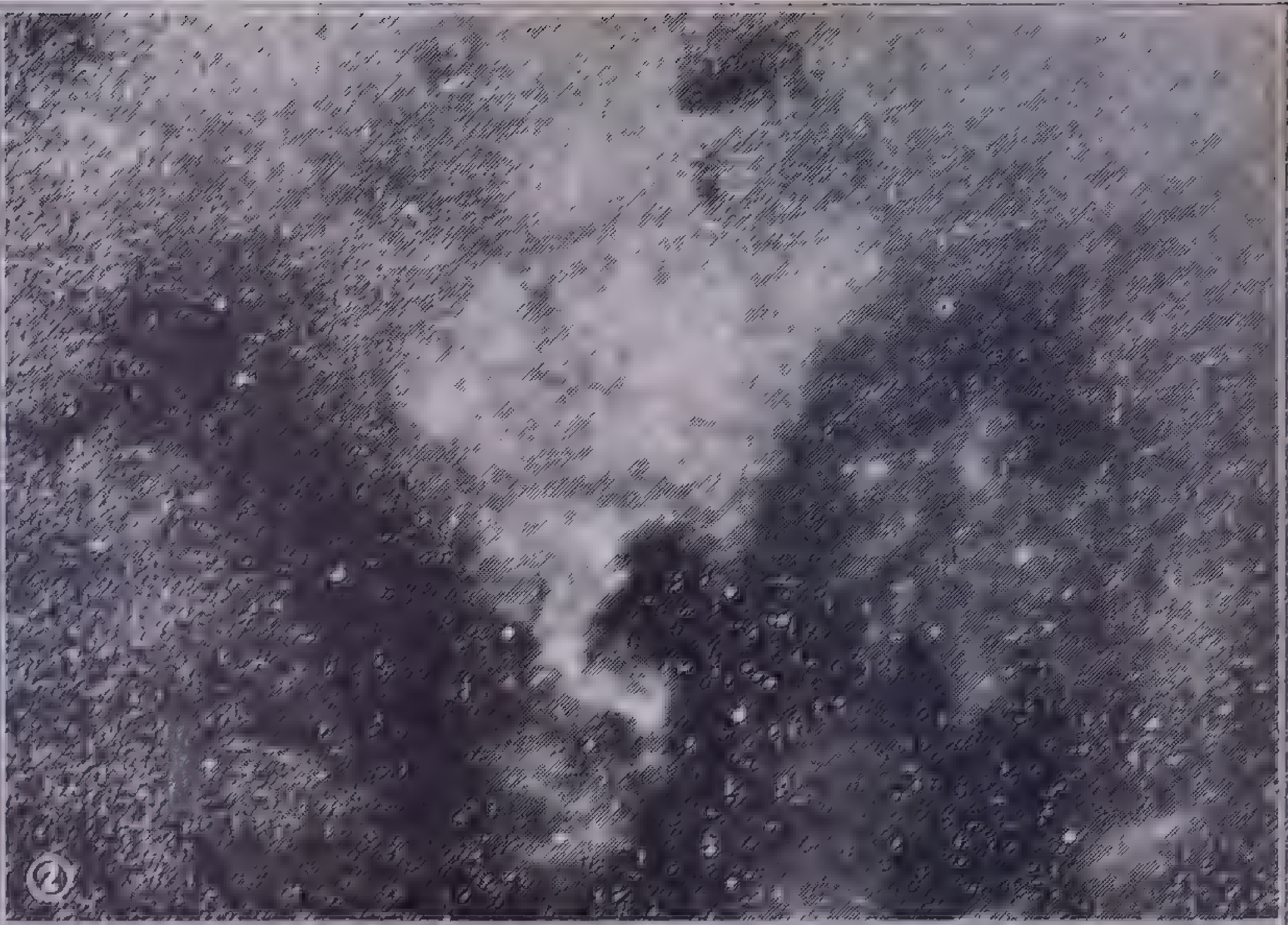
[2] Variable

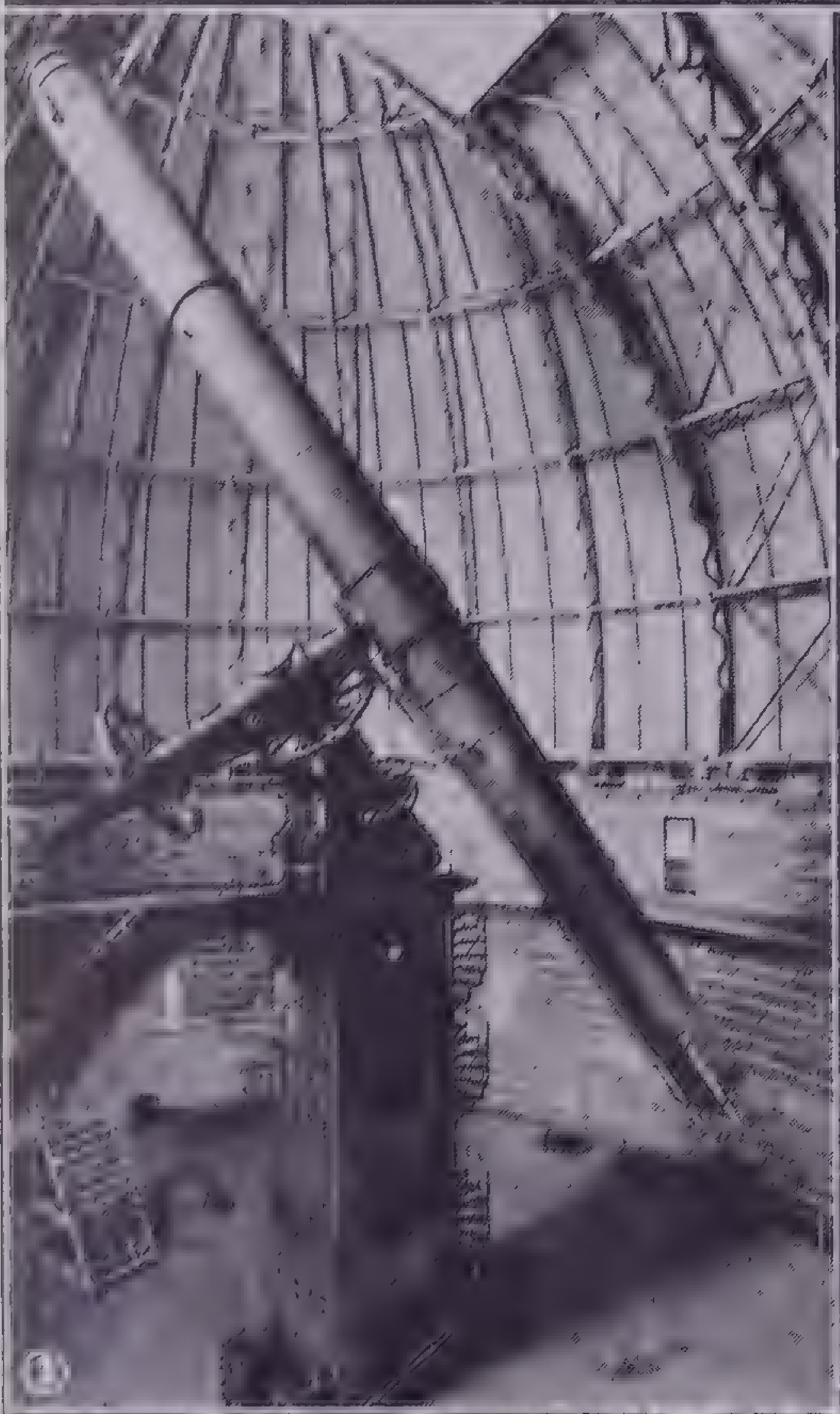


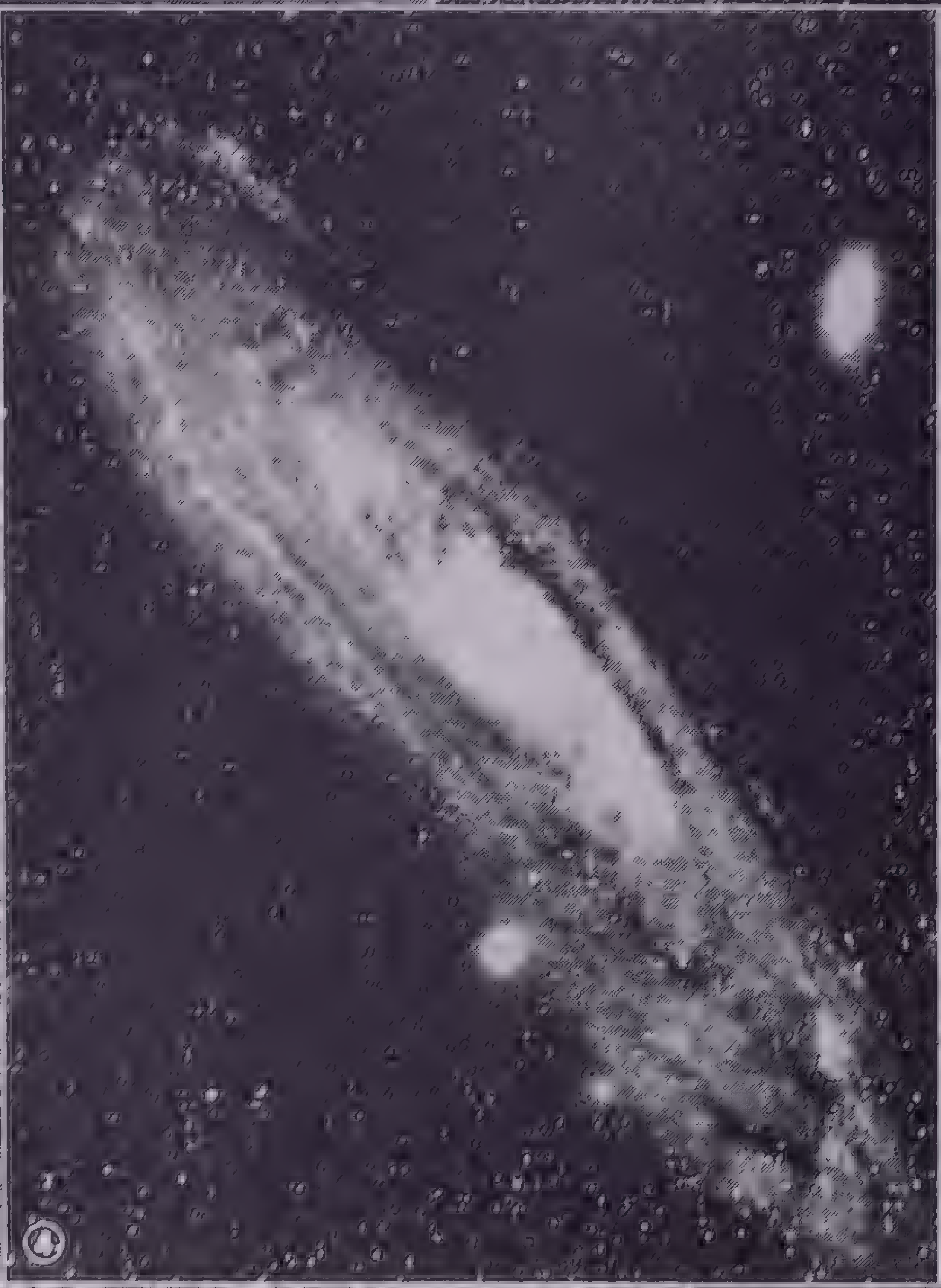
Sun, Moon and Planets

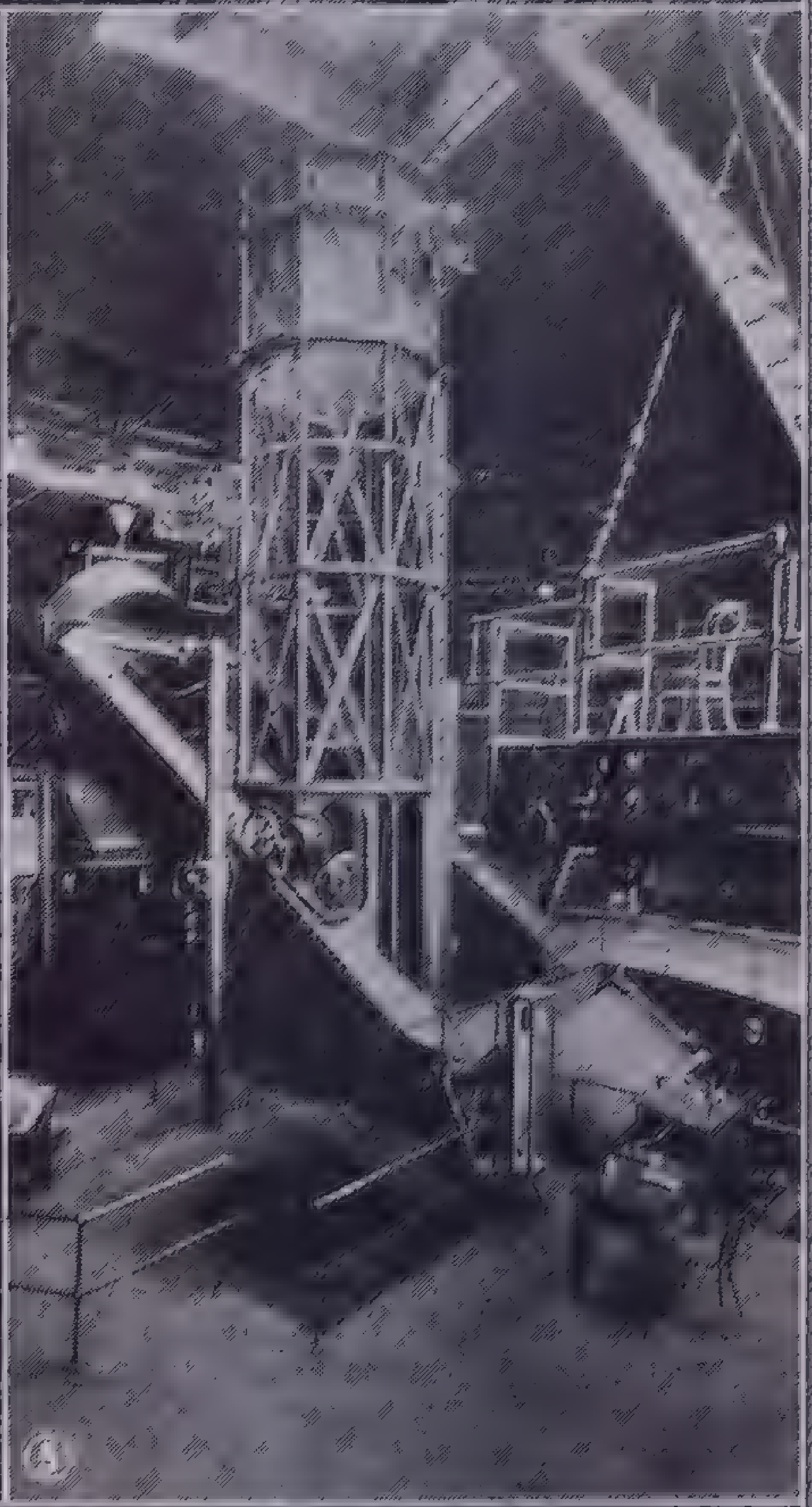
1. Sun, showing distribution of calcium in solar atmosphere. *2.* Sun, showing hydrogen. Both *1* and *2* photographed at Mount Wilson Observatory, July 22, 1906. *3.* Mars, photographed at Yerkes Observatory. *4.* The moon, northern portion at last quarter, photographed at Mount Wilson with the 100-inch reflector, September 15, 1919. *5.* Saturn, photographed at Mount Wilson with 60-inch reflector. *6.* Jupiter, photographed at Mount Wilson with the 100-inch reflector; Ganymede, a satellite, is seen at lower left of planet, and its shadow is seen on the disk

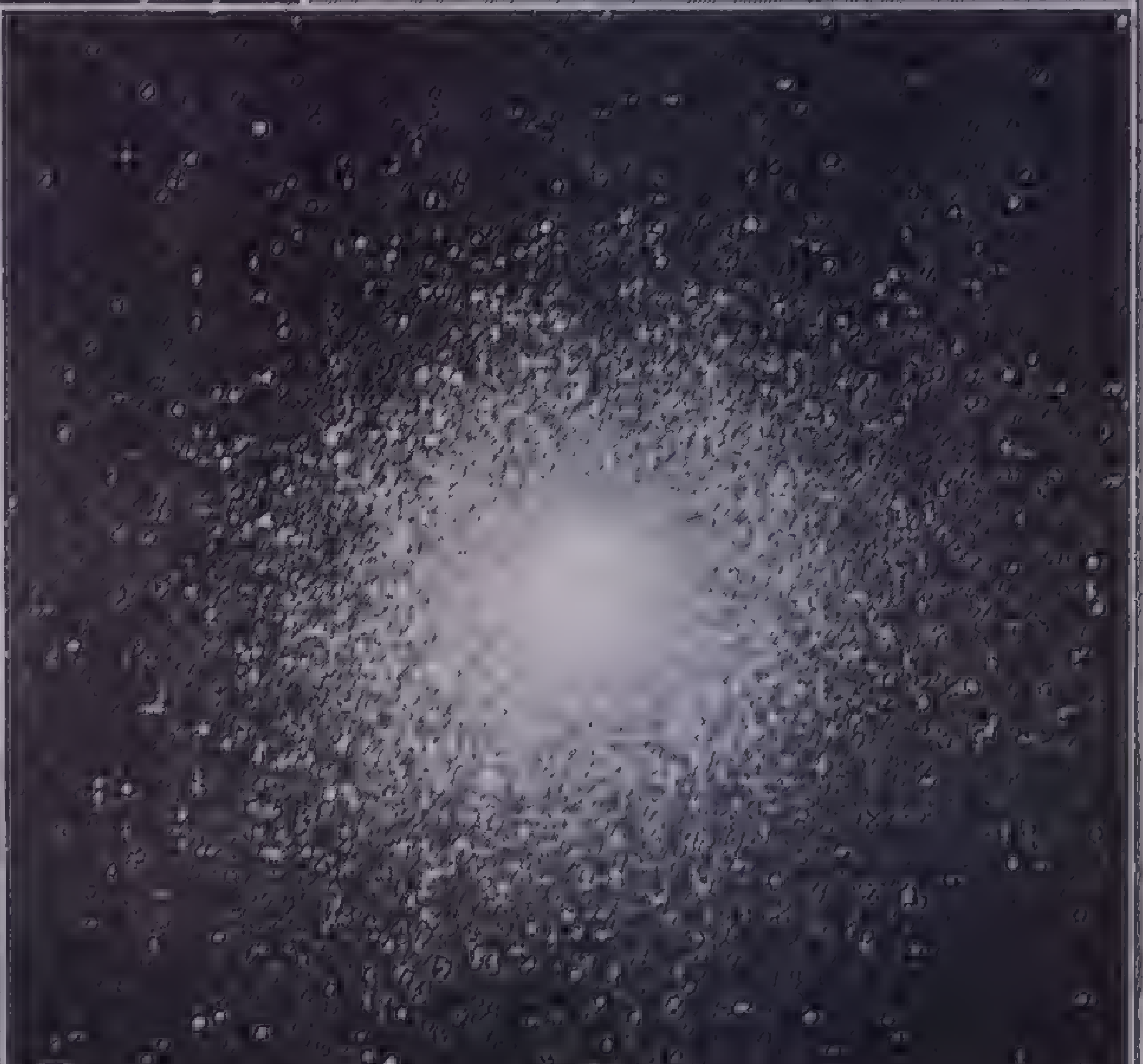












Into the Depths of Space

1. Morehouse Comet, photographed at Yerkes Observatory, Williams Bay, Wisconsin, October 15, 1909. During the long exposure the telescope is guided to follow the comet, and the star images appear as *trails*. *2.* North American Nebula in the Milky Way. *3.* Yerkes 40-inch refracting telescope. *4.* Great Nebula in Andromeda, an island universe. *5.* The 100-inch reflecting telescope, Mount Wilson Observatory, southern California. *6.* Yerkes Observatory. 7. Great Star Cluster in Hercules, photographed at Mount Wilson with the 60-inch reflector

Star Clusters. Searching the sky with a field glass or telescope, one sees here and there hazy patches of light. Higher optical power in some cases resolves these hazy patches into thousands of stars grouped more or less compactly into a spherical shape. They are called *globular clusters*. About a hundred such are known, the diameters of which are all approximately the same, about 500 light years. They are at enormous distances, ranging from 20,000 to 200,000 light years, on the outskirts of our star system.

Nebulae. The hazy diffuse patches in the sky that cannot be resolved into stars by large telescopes are called *nebulae*. Many of them are very beautiful objects when viewed with the telescope or as shown on photographs. Nebulae are classified according to form, constitution or distribution. Under the first heading, nebulae are either irregular or chaotic, planetary, ring form or spirals. According to distribution with reference to our sidereal system or galaxy they are either *galactic* or *extragalactic.*

These different classifications are not mutually exclusive, for the terms *spiral nebulae* and *extragalactic* are well nigh synonymous. The nongalactic or the spiral nebulae are by far the most numerous, running into the tens of thousands. The region of the North American Nebula (illustrated) shows not only the star clouds of the Milky Way but also the diffuse galactic nebulous matter involved. The Andromeda Nebula, shown here, is one of the most remarkable of the extragalactic spiral nebulae. Studies of this vast system and of others like it have led to a new conception of our cosmos. From a study of their spectra, they appear to be stellar in character; indeed, they may be partially resolved into stars, and their distances are found to be such that they are beyond the limit of our sidereal system and therefore must be regarded as distinct stellar systems, which have come to be called *Island Universes.* We must therefore think of our galaxy, enormous as it is, as but one—though perhaps the most magnificent—of a great supergalaxy.

In the table on page 1094 the 20 apparently brightest stars are listed in order of brightness. All but three of them are commonly referred to by their proper names, although astronomers often use the constellation name in technical writing. In looking at the table it should be remembered that the distances of stars more than 100 light years away are very uncertain, and the uncertainty increases with distance. Canopus, for example, is listed as 650 light years distant; this distance is calculated from several parallax measurements, but the inevitable instrumental errors are probably greater than the entire quantity measured. About all that can be said with assurance is that Canopus is very remote, at least 300 and possibly 1,000 light years away. Obviously uncertainty as to distance means uncertainty as to luminosity as well.

The temperature column of the table enables us to tell roughly the color of a star. The bluish stars are extremely hot (20,000° F. and higher). Stars ranging in temperature from 10,000° to 20,000° F. are yellowish to white. Those cooler than 10,000° F. are distinctly red.

ASTRONOMICAL DICTIONARY

Aberration of light, the apparent change in the direction of incident light from the stars that results from the earth's motion in its orbit around the sun. If one stands in a shower of rain and there is no wind, the raindrops will come down upon him vertically, and he will hold an umbrella directly overhead to keep dry. If, however, he is running through the shower, he will hold the umbrella at an angle directed ahead and away from the vertical; the drops of rain will seem to be coming at a slant. The faster he moves, the greater will be the apparent deviation from the vertical of the down-coming raindrops.

The earth is moving in its orbit at an average speed of 18½ miles a second, which is very nearly 1/10,000 of the speed of light. In order to see a star, we must direct the telescope slightly ahead of the true direction, just as we direct the umbrella ahead in walking through a shower.

If the earth were traveling in a straight line, we would have no way of measuring the true direction of a star and would not be able to detect aberration observationally; but since the earth is traveling in a particular direction at one time of the year and in the opposite direction six months later, we find that all the stars appear to shift slightly in position. The *constant of aberration* is the angular displacement thus observed. It is equal to 20.47 seconds of arc and it is the same for all stars. In calculating the true position of a star it is necessary to take account of this apparent aberrational displacement.

Though all stars show the same total displacement in the course of a year, the amount of displacement on a given observation is not constant except for a star situated precisely at the ecliptic pole. For the actual aberration to be equal to 20.47 seconds of arc, it is necessary that the earth's direction of motion be exactly perpendicular to the direction of the star. This in general happens only twice a year for a given star. Consider, for example, a star in the plane of the ecliptic. Twice a year the earth will cross the imaginary line passing through the star and the center of the earth's orbit; at each of these crossings the star's aberration will be the maximum, 20.47″. At two other points on its orbit the earth will be moving directly toward or directly away from the star; at these times the aberration will be zero.

Albedo (Latin, whiteness), the ratio of light reflected to total light received, a measure of the reflecting power of planets, satellites and other bodies in the solar system. The ratio of reflection depends on the atmosphere and the surface of the body. The moon with no atmosphere and a very rough and broken surface of dark colored rock has a low albedo. The presence of much water vapor in the atmosphere of a planet gives it a high albedo—Venus, for example, has an atmosphere so loaded with vapor that the actual surface is always hidden from our view by dense clouds or fog and has an albedo of .60; Mercury, with no atmosphere at all, has an albedo of only .07; Mars, with a tenuous atmosphere, probably holding a little vapor, has an albedo of 0.15.

Apex of the sun's way, a term denoting the point in the heavens toward which the solar system is at present moving at a speed of about 12 miles a second. The existence and amount of this motion is determined by studies of the average velocities of approach and recession of groups of stars in different parts of the sky. The velocity of approach or recession for any particular star is called the *radial* velocity, and is determined by observations with the spectroscope. It is found that, on the whole, the stars in the constellations Lyra and Hercules, of which the most conspicuous is the bright blue star Vega, are approaching the solar system, but those in the opposite part of the sky are receding. This is interpreted to mean that the sun and planets are moving through space toward these constellations.

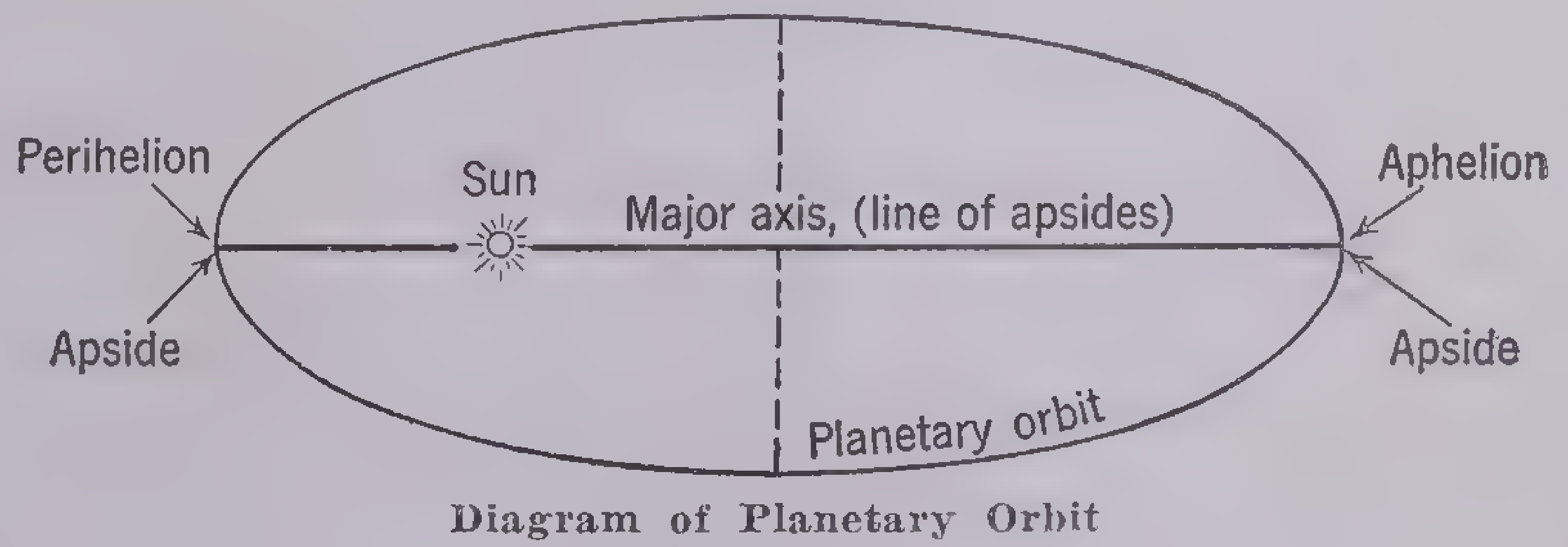


Diagram of Planetary Orbit

Aphelion, the point on the orbit of a planet farthest from the sun (see *Apsides*).

Apogee, the point of the moon's orbit farthest away from the earth (see *Apsides*).

Apsides, the two points in the orbit of a heavenly body marking the greatest and least distance from the attracting *primary.* The orbits of the planets, comets and the satellites of the planets are *ellipses* with the attracting body located not at the center but at an off-center point called the *focus.* The focus is on the long diameter or *major axis* of the ellipse, and its distance from the center depends upon the *eccentricity.* One particular point on the orbit is nearest the focus; a second is farthest away. When the orbit in question is that of a planet, the two apsides are called *perihelion* and *aphelion* (from Greek words *peri* around, *apo,* away from, and *helios,* sun). The major axis of the orbit is sometimes called the *line of apsides.* In the diagram an orbit is pictured with various points named. The actual planetary orbits are much more nearly circular than the diagram indicates; the flattening or *eccentricity* is exaggerated for purposes of illustration.

As a consequence of perturbations and other irregularities the line of apsides of a particular orbit does not remain in a fixed direction in space but revolves slowly in the plane of the orbit. This motion of the perihelion point on the orbit of the planet Mercury and the difficulty of explaining all of it by the usual laws of celestial mechanics is one of the principal pieces of evidence for the theory of Relativity. According to the theory of Relativity, the law of universal gravitation is only approximately true; the hitherto unexplained residue in the advance of Mercury's perihelion is accounted for by a new law of gravitation introduced by Einstein. The discrepancy between the Newtonian and the Einsteinian laws is very slight and for all ordinary calculations may be disregarded.

Astronomical Unit (abbreviated A.U.), the mean distance from the earth to the sun, equal to half the long diameter or *major axis* of the earth's orbit. The distance is of fundamental importance in astronomy, as it is the basic unit in terms of which all the distances in the heavens are determined. There are several quite independent methods of measuring it. The most probable value deduced from modern observations is 92,887,000 miles. This is almost certainly correct within 20,000 miles.

Azimuth, the direction angle of a heavenly body measured in the plane of the horizon. The zero point is generally taken as due south, and azimuth is reckoned positively to the right. The point on the horizon cut by the great circle of the celestial sphere passing through the zenith and the heavenly body concerned locates the azimuth direction. The north celestial pole thus has an azimuth of 180°; an object just east of due south would have an azimuth of nearly 360°. As a consequence of the rotation of the earth, all the points on the celestial sphere except the poles are continually changing azimuth.

Bode's Law—In 1776 the German astronomer Johann Elert Bode (1747–1826), reviving an idea put forth by Johann Daniel Titius (1729–96) in 1772, pointed out a remarkable relation apparently holding for the distances of the planets from the sun. If we write down a simple geometric progression beginning with 3, with each term double the preceding term, and add 4 to each term, the resulting series will represent approximately the relative distances of the planets from the sun. We have

0	3	6	12	24	48	96	192	384	768
4	4	4	4	4	4	4	4	4	4
4	7	10	16	28	52	100	196	388	772

The first term of the upper series (0) is not formed strictly according to the mathematical law, as it should be 1½. Passing over this irregularity, we find the series 4, 7, 10, etc., rather accurately represents the facts of planetary distance.

Taking the earth's distance as 10, the actual distances of the planets known in Bode's time were as follows:

	Mercury	Venus	Earth	Mars	——	Jupiter	Saturn
True distances	3.9	7.2	10	15.2	28	52	95.4
Bode's series	4	7	10	16	28	52	100

Bode suggested that there might be an unknown planet with a distance approximately 28 on this scale. Thirty years later the first asteroid was discovered, and since that time a large number of these small planets, having an average distance from the sun about 27, have been found. In the meantime Herschel had discovered Uranus in 1781, and when its distance was computed as 192 on the Bode scale, it seemed to furnish an extraordinary proof of the accuracy of this law, which is sometimes called the *Titius-Bode* law.

When Adams and Leverrier were working on the mathematical problem that led to the discovery of Neptune, they assumed that the hypothetical planet they sought would be at approximately the distance indicated by Bode's Law. When Neptune was actually discovered, it turned out to be much nearer the sun than the "law" predicted, only 300 instead of 388. A further and worse failure appeared on the discovery of Pluto in 1930, Pluto's actual distance being only 395 while Bode's law would require 772.

The failure of the "law" in these two cases, and the necessity for introducing an artificial first term, as well as our inability to give any physical reason for such a relation has led most scientists to believe that the law is no more than a remarkable coincidence. It is of considerable historical interest, however, as it well illustrates how science may be advanced by investigation guided by false hypotheses.

Comet (from the Greek word meaning long-haired, alluding to the comet's tail), a body of immense size but small mass that revolves about the sun in an elongated ellipse, almost a parabola, not at all like the almost circular orbit of a planet. Comets consist of matter in very tenuous form and are subjected to the gravitational forces of denser bodies. They shine partly by reflected light and partly by their own light. Some of them appear only as faint patches of light, but a typical comet includes a head, consisting of a starlike nucleus surrounded by a ring of hazy light, or coma; and a tail, which may extend into space for millions of miles in a straight or curved path. This appendage is always repulsed by the sun, presumably by the pressure of the sun's light, and the tail of a comet therefore precedes the nucleus when the body is receding from the sun, and follows the nucleus at the time when the comet is approaching it.

The heads of comets seem to consist of swarms of meteoric particles, and the tails largely of gaseous matter. Some comets revolve in such well-defined elliptical orbits that astronomers are able to preduct the time of their return with great accuracy. Halley did this first (in 1705) after calculating the orbits of 24 comets and finding that the comets of 1531, 1607 and 1682 had identical orbits. He decided they were the same comet and that it would return after 76 years on March 13, 1759. It returned within a month of that date. It was observed with great care in 1835, and its next appearance was expected in July 1912. Instead it came in April 1910—the two years difference being due to planetary action. Comets of this character are said to be periodic; their orbits have been shortened by the attraction of Jupiter, Neptune, or some other planet. We know that one comet, 1889 V, called Brooks's comet) was reduced from a 27-year orbit to one of seven years by the attraction of Jupiter in 1886. As Jupiter's mass is greater than that of any other planet, it has attracted more comets. They are called Jupiter's comets, and the attraction by a planet is called the planet's capture of comets. The fact that some comets are outside the orbits of the known planets suggests the possibility that unknown planets are related to these comets. The terrestrial planets (Mercury, Venus, the earth, Mars) do not capture comets—their mass is probably too small.

The comets that are not periodic have orbits that are extremely elongated; they do not return to perihelion (nearest position to the sun) for thousands of years.

Few comets are seen by the naked eye, and only those of short period may be observed with any great frequency. Photography has greatly helped the study of comets as their light is highly actinic, leaving a record on the photographic plate that would not be seen through the telescope.

The following comets are worth a brief description:

HALLEY'S COMET, already mentioned, belongs to Neptune's family. Its history has been traced back to 240 B.C. and for every return since that time (except possibly in 163 B.C.) there is some record of a comet observed at the time that modern astronomers' calculations set for it—so it has had 29 observed passages. The comet's appearance in 1066 A.D. is pictured on the famous Bayeux tapestry (Panel 34).

ENCKE'S COMET, named from J. F. Encke (1791–1865), a German who studied its orbit, was first discovered in 1786 and has been seen and studied 40 times from that date to its appearance from September to December 1937. It has a very short period, 3.3 years, and it passes very close to the sun. It belongs to Jupiter's family. Its period shortened by about 2½ hours from 1818 until 1868 and after that by about 1¼ hours. Its volume has varied enormously at different observations—sometimes a million times as much as at other times.

BIELA'S COMET, another of the Jupiter family, was named for the German astronomer Baron Wilhelm von Biela (1782–1856) who discovered it in 1826. It has a period of 6.6 years. In 1846 while it was visible it separated into two parts that moved in parallel lines about 160,000 miles apart. In 1852 the two parts were observed with a distance of 1,500,000 miles between them. They have not been seen since but showers of meteors occurred in the path of the comet at the time it should have been seen in 1872, 1885, 1892 and 1898.

THE PONS-WINNECKE COMET, another of the Jupiter family, was discovered in 1819 by Jean Louis Pons (1761–1931), a French astronomer who was a great comet-finder, and rediscovered in 1858 by a German, Winnecke. In 1927 this comet came within 3½ million miles of the earth. Its perihelion distance from the sun strangely increased after 1915 and its period also increased from 5.6 years to 6—all apparently due to Jupiter.

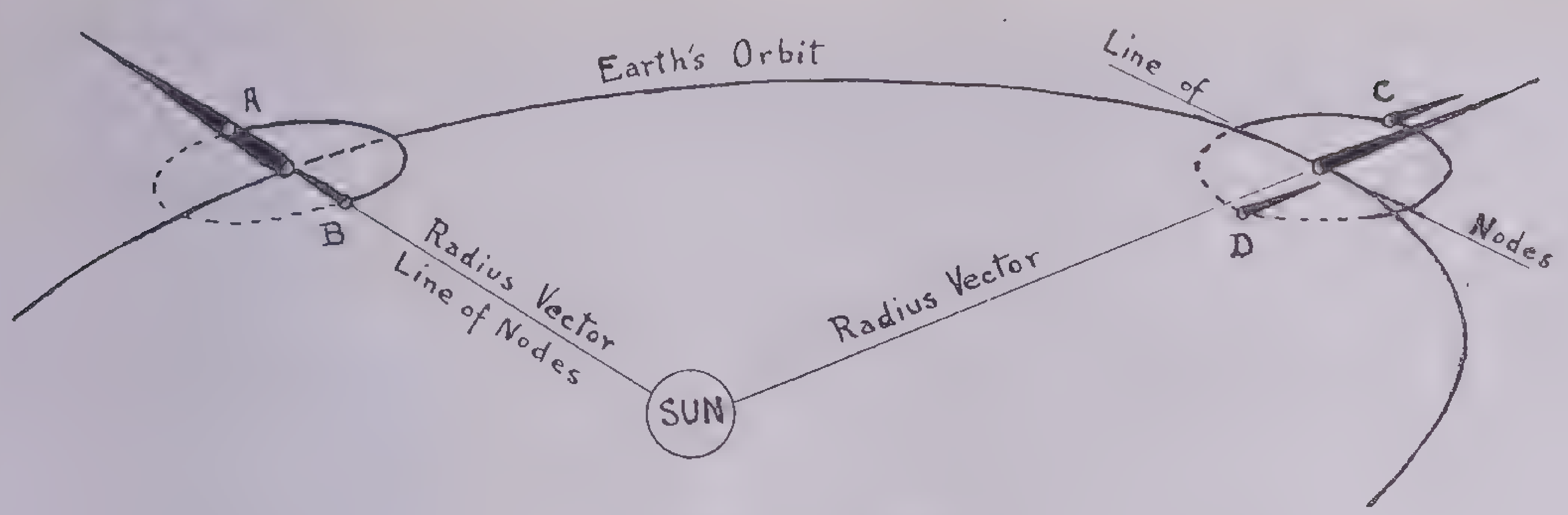
Some of the long-period comets come very close to the sun, and move at very high speeds. The great comets of 1880, 1882 and 1887 all came so close to the sun as actually to pass through the corona, the diffuse solar envelope that we see at times of total eclipse. Such comets as these have very elongated elliptical orbits and periods of many hundreds of years. At the time of aphelion (greatest distance from the sun) the comet is far out beyond the orbits of Neptune and Pluto and moving slowly through the vast dark emptiness of space. It has no tail and receives very little light from the sun. It seems to pursue its path almost aimlessly, and one would hardly suspect that it was moving according to the invisible gravitational influence of the distant sun.

After rounding aphelion, the comet slowly picks up speed on its long trip inward. To reach the orbit of Mars, 150,000,000 miles from the sun, may take more than 1,000 years, but the comet has now acquired considerable speed, and is rapidly gaining more. It crosses the earth's orbit at 25 miles a second, and as it approaches the sun its tail fans out into a spectacular beam millions of miles long. Faster and faster moves the comet, and it seems that it cannot avoid falling right into the sun; 100, 200, 300 miles a second it moves, and then it disappears in the sun's glare. It swings around the sun only a few hundred thousand miles from the glowing surface, passing in a few hours all the way around and starting off again on its long lonely journey.

Cosmogony.—Various ideas have been advanced from age to age in the endeavor to account for the origin of the solar system. An acceptable theory must account for such facts as these: that the planets all revolve about the sun in the same direction, in orbits that are nearly circular and in nearly the same plane; and that the sun and the planets, so far as is definitely indicated, rotate on their axes in the same direction. The satellites, for the most part, revolve about their primaries in the same direction as the planets revolve about the sun. In this explanation, the *nebular hypothesis* of Laplace held the field for a full century, but now it has been greatly modified or wholly abandoned. It assumed that at one time a large, slowly rotating, nebulous mass, in cooling, gradually contracted. A law of mechanics requires that if a rotating body contracts, it must spin faster. The process of contraction and more rapid spinning continued until the centrifugal force equalled the gravitational attraction, and a ring of material was left behind. This process was repeated until there were several revolving rings. The material comprising each ring somehow collected into a single body, a planet; and the central mass condensed to form the sun. Modern theories assume the approach of another star to our sun, with resulting partial disruption and the strewing of debris in the plane of the star's motion as it and the sun swung about each other. Some of this material fell back into the parent body. The remainder took up orbital motion in the direction of the motion of the other star. Naturally, there would be condensations in this material and these formed the nuclei about which the aggregations took place which ultimately became the planets. A somewhat similar process, secondary in character, would account for the satellites. This explanation, first enunciated by the University of Chicago scientists T. C. Chamberlin and Forest Ray Moulton, and called the *planetesimal hypothesis*, accounts in a satisfactory way for the items of regularity which demand orderly development of the planetary system according to law.

The English scientist Sir James Jeans has devoted much study and great mathematical skill to the problem of the origin of the solar system. His theory resembles the planetesimal hypothesis in postulating a close approach of two stars, and he has worked out the various configurations of rotating masses of gas under the influence of tidal strains so as to give a plausible account of the origin of the planets. Jeans's theory offers an explanation for the fact that the middle planets, Jupiter and Saturn, are the largest; it does not fully account for the great concentration of angular momentum in Jupiter. In 1936 R. A. Lyttleton proposed a variation of the dynamic encounter theory of Jeans. Lyttleton's theory postulates that the sun was originally a double star. Certain technical difficulties are overcome in Lyttleton's theory that had previously been stumbling blocks.

All the modern theories assume a very close approach of two stars. What we know of the average distances between the stars in space demonstrates that such close approaches must be extremely rare. If solar systems are in fact formed only in this way, we can be sure that very few stars, comparatively speaking, can be surrounded by planets. This would further mean that life, as we know it, is a freak phenomenon: for every inhabited planet there may well be millions of stars without a trace of life about them. That ours is the *only* solar system in existence we cannot infer; that it is one of few may be held to be probable,



Conditions for Eclipses
This diagram illustrates the conditions for lunar and solar eclipses

Eclipses, both of the sun and moon, occur when certain geometrical conditions of relative positions of sun, earth and moon are fulfilled. In the eclipse diagram it will be seen that, on the side of the earth opposite to the sun, there is a cone of shadow. When the moon in its revolution about the earth comes into that shadow it is darkened, and we say it is eclipsed (Position A). When it is on the side of the earth toward the sun and comes into such a position as will cut off all or part of the sun's light, we say the sun is eclipsed (Position B).

It would appear at first glance that there would be an eclipse of the moon at every full moon and an eclipse of the sun at every new moon. But this is not the case because the moon's orbit is inclined to the orbit of the earth. If the full moon is not near the ascending or descending node of its orbit, it will be so far from the plane of the ecliptic that it will pass above or below the earth's shadow and will not be eclipsed (Position C). If the new moon is not near one of the nodes, its shadow will pass above or below the earth and the sun will not be eclipsed (Position D).

If the shadow of the earth and the full moon are near enough to one of the nodes so that the moon passes entirely into the shadow, a *total lunar eclipse* results. If only part of the moon enters the shadow, a *partial eclipse* occurs. Most persons have witnessed a lunar eclipse, for the phenomenon can be seen by all the people on the night side of the earth at the same instant. In fact, an eclipse of the moon is visible to considerably more than a hemisphere because in the four hours that may pass from the time the moon first touches the earth's shadow until it completely leaves it the earth has turned on its axis 60 degrees. There are between 15 and 16 lunar eclipses in 10 years. The eastern side of the moon becomes darker some time before it actually reaches the shadow; then a bite is taken out of the moon's disk and this increases in size until the whole moon is darkened. Presently, a small bright arc is seen to emerge on the opposite side, which grows until the whole lunar surface is again in sunlight. Very successful motion pictures of eclipses of the moon have been secured.

If the new moon's cone-shaped shadow does not pass above or below the earth and is long enough to reach it, *a total eclipse of the sun* occurs. The sun is totally obscured for those parts of the earth which the moon's shadow touches. But if the new moon's shadow is in line but falls short of reaching the earth, as it often does, a ring of sunlight shows around the disk of the moon, and this is called an *annular eclipse.* A solar eclipse is visible as total only within the narrow shadow path. For some hundreds of miles on either side of the shadow path, the sun may be observed in partial eclipse. The shadow travels with high speed, and for any one place on the earth the average duration is three minutes. At any one station a total eclipse of the sun will be visible only once in 300 or 400 years, on an average. And even if one travels far to the places where total solar eclipses are to be visible, he may be disappointed by clouds obscuring them. Many astronomers, even, have never witnessed the phenomenon.

In ancient times the sudden rush of darkness in a midday cloudless sky was attended by scenes of terror. It is surprising how early the ancient astronomers developed methods of prediction. Among the earliest records are found such predictions. In prehistoric times the Chaldeans had discovered that eclipses follow an orderly sequence with recurrence at intervals of eighteen years, eleven and one-third days. They named this period the *saros.* Astronomers paid severe penalties for failure to foretell, for it is recorded in ancient Chinese annals that the astronomers Ho and Hsi were beheaded upon the occurrence of the unannounced eclipse of 2137 B.C.

The moon gradually encroaches on the solar disk and for a brief time—at most, seven minutes and forty seconds—completely covers it, then passes off to the other side. The phenomenon presents no especially interesting features until the stage of totality approaches. The exposed crescent of the sun becomes narrower and narrower. At this time, because the light of the sun's edge differs from that of the center of the disk, the landscape is seen in unusual hues. Images of the sun formed through interstices in the foliage are crescent shaped. The unnatural light causes all animals to show uneasiness; fowls go to roost. Just before the beginning of totality, the crescent becomes broken and there appears along the edge of the moon a series of bright points, called *Bailey's beads,* due to the sun shining between the mountains on the edge of the moon. If one stands on an elevation he may see the moon's shadow rushing at a terrific speed over the landscape. On bright surfaces may be seen the rippling shadow bands, due to the uneven refraction of light from the narrow source through the earth's atmosphere. Then comes totality, and with it the most beautiful phenomenon visible to human eyes—the solar corona—stretching out its tenuous filaments about the sun. The degree of darkness depends upon the clearness of the atmosphere and the size of the shadow. In some cases, it is easily possible to read a watch; in other, lanterns are necessary if one would move about. There is generally a marked drop in temperature; dew is sometimes deposited. The end of totality comes with the same abruptness as does the beginning. The corona fades, and suddenly the edge of the sun appears from behind the lunar disk, and the sequence of events at the beginning of eclipse is repeated in reverse. It is noticeable that human beings show the same release from tension that the animals have exhibited. In our day, the terror is gone; but the sense of awe remains. Foretold though it is, the very fulfillment of the prediction is tremendously impressive. The observer views the most beautiful of natural wonders, with the inexorable march of the shadow, the unnatural light, the strange actions of animals, the swift descent of darkness, the beauty of the prominences and corona, the view of the stars, and the realization that they are always in the heavens, invisible only because of the brilliance of the sunlight-flooded air.

Total solar eclipses visible in North America between 1937 and 2000 A.D.:

Date	*Where Visible*
February 1943	Alaska, China
June 1954	Canada, Scandinavia, Russia, Persia
July 1963	Alaska, Canada
March 1970	Mexico, Georgia
July 1972	N.E. America, Atlantic Ocean
February 1979	United States, Canada

The following are some of the famous eclipses of history:

2137 B.C. The first eclipse ever to be recorded. It occurred in China, and cost the lives of two astronomers, who failed to predict its coming.

763 B.C. This eclipse is probably referred to in the Old Testament (Amos, VIII, 9). It was total near Nineveh, and is recorded in Assyrian chronicles.

585 B.C. An eclipse in the afternoon stopped the Medes and the Persians in the midst of a battle and frightened them into ending a five years' war with peace.

1780 A.D. At Penobscot, Maine, during the American Revolution. Despite the war, the American government fitted out a scientific expedition to observe it.

1842 A.D. An eclipse in Italy of such extraordinary beauty that vast crowds of spectators burst into cheers. Bailey's beads were named at this eclipse.

1937. The eclipse of June 8 was the long-

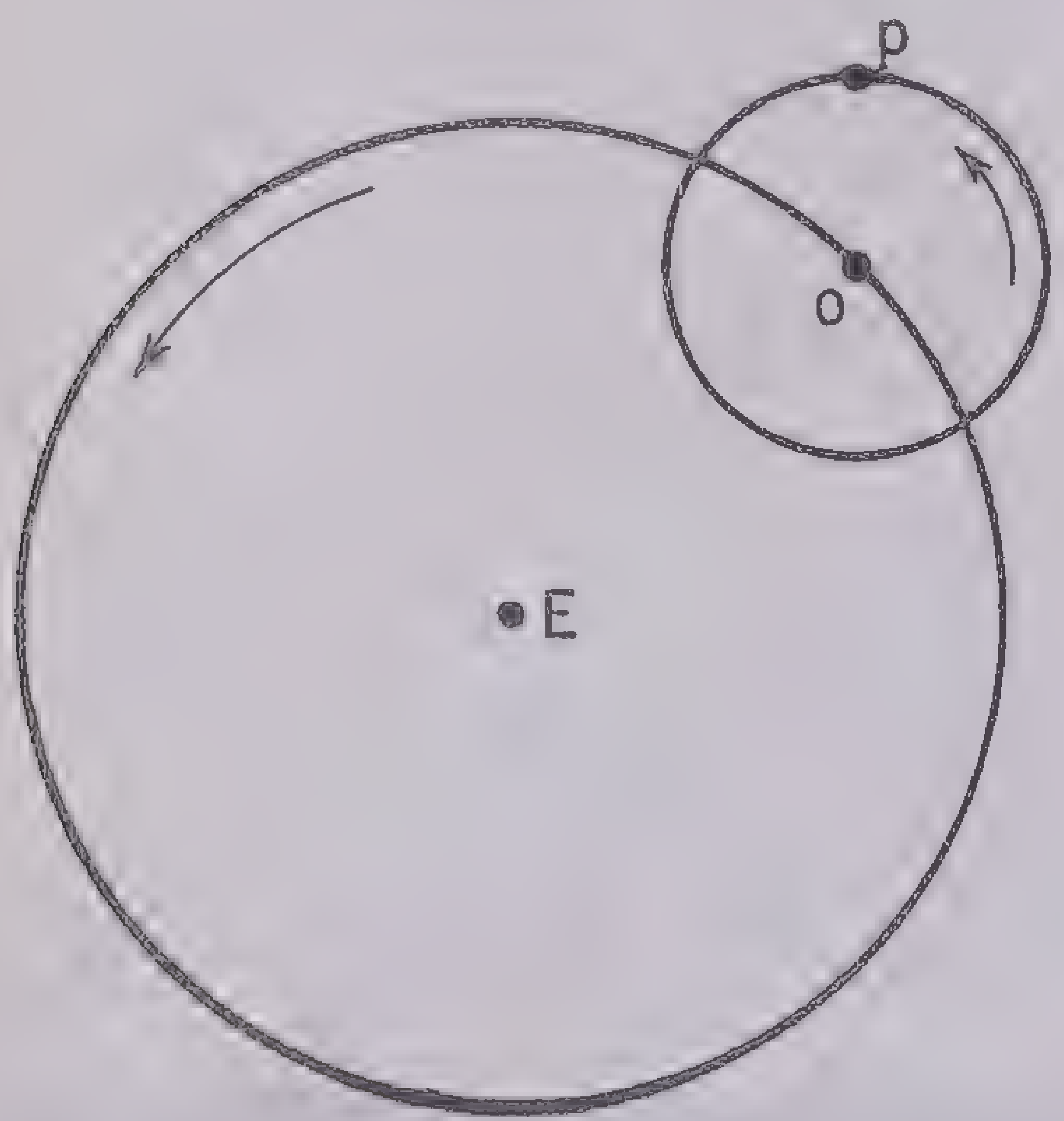
Photo by U. S. Weather Bureau

Three Stages in a Partial Eclipse of the Sun

The disk of the moon slowly encroaches on the disk of the sun, biting deeper and deeper as the eclipse progresses. This eclipse occurred April 28, 1930. It was an annular eclipse over a narrow path extending from the mid-Pacific northeastward to near the British Isles; and was visible as a partial eclipse over the entire North American continent, parts of Siberia and large parts of the Atlantic and Pacific oceans est in 1200 years and was of unusual interest because it began at sunrise Wednesday morning east of the Solomon Islands in the South Pacific and then crossed the international date line and ended in Peru the day before it began.

Epicycle.—The Greeks, who founded the science of mathematical astronomy, supposed that the only possible path of a heavenly body was a circle. To the Greek mind the circle was the one perfect curve, and of course any imperfection in the heavenly motions was unthinkable. Nevertheless, the Greeks were accurate observers, and they clearly saw that the motions of the planets were more complicated than the simple circular motions on which imagination insisted. To preserve the idea of pure circular motion while at the same time accounting for the facts as observed, the Greeks conceived the notion of *epicycles*, which may be described as circular motions superimposed one upon another.

The fundamental idea of the epicycle is clearly seen in the diagram. A planet P was thought of as revolving uniformly in the small circle whose center O in turn revolved uniformly in the large circle. It is clear that, as observed from the center of the large circle E, the point P would appear to have a periodic or looping motion, and that by assigning suitable speeds and angles of inclination between the planes of the circles and by using several circles almost any kind of motion might be represented as compounded from circular motions.



Epicycles

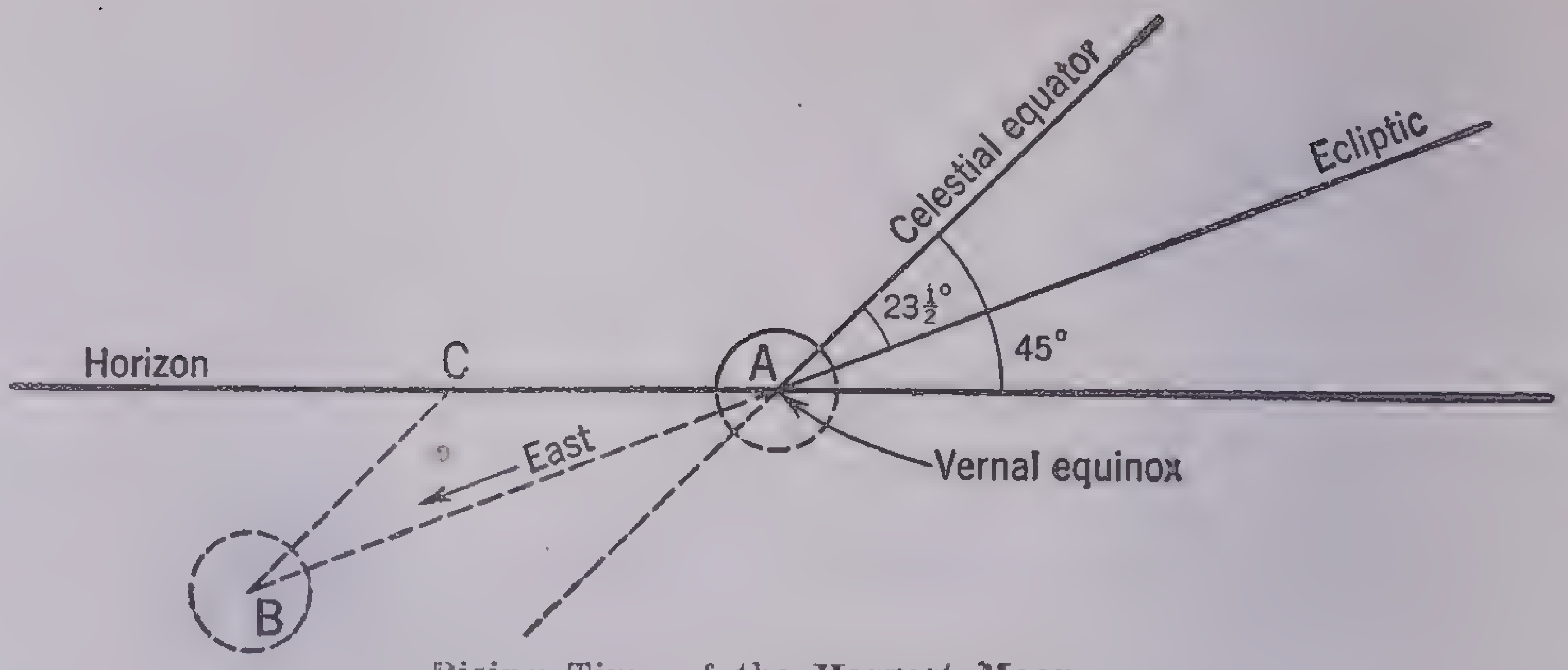
As a matter of fact, the central problem of astronomy before the time of Copernicus and Kepler was to find by calculation the combination of epicycles that would best represent the observed motions of the heavenly bodies. By the end of the Middle Ages this problem, as a result of increasing accuracy of observation, had become excessively complex. King Alphonso X of Spain, who lived in the 13th century, illustrated the difficulties that were felt in trying to make theory conform with observation by saying "If I had been present at the creation I could have given some useful hints in the direction of simplicity."

The first great blow to the epicycle system was dealt by Copernicus, who saw that most of the complexities could be removed by the simple assumption that the sun, and not the earth, was the center of the planetary system. Copernicus, however, unconventional and fearless thinker though he was, could not shake off the ancient Greek tradition that the fundamental orbit of any heavenly body must be a circle, so that even in his system epicycles were still called in to explain some of the motions.

Johannes Kepler destroyed the last vestiges of the old system. By substituting an ellipse for a series of epicycles he showed that the motions could be adequately accounted for. The work of Copernicus and Kepler ushered in the modern era in astronomy.

Equinoxes, the points of intersection of the celestial equator with the ecliptic (see *Celestial Sphere* and diagram of *Seasons* in the main article).

Harvest moon, the full moon that occurs each year nearest the date of the autumnal equinox, September 23. Its remarkable feature is the fact that for several successive nights it rises at much more nearly the same hour by the clock than at other times of the year. The phenomenon may be understood by considering that the path of the moon through the stars, roughly the same as the ecliptic, is inclined to the celestial equator, and on the date of the autumnal equinox, the full moon is in the vernal equinox directly opposite the sun.



Rising Time of the Harvest Moon

The diagram is drawn for a latitude of 45°. If the full moon occurs precisely when the sun is in the autumnal equinox, the moon will rise just at sunset in the position A of the diagram. By the same hour on the following night the moon will have moved approximately along the ecliptic to the position B. The difference in time of rising will be measured by the time required for the moon to rise through the distance BC. It is easily seen that this distance is less than the distance BA through which the moon would have to move to rise if its path were parallel to the celestial equator, as it is when the full moon occurs at the time of one of the solstices. When the ascending node of the moon's orbit happens to be near the vernal equinox at the time of the harvest moon, the effect is even more pronounced

Inferior Planet, see *Planetary Configurations.*

Libration (from the Latin *libra,* a balance), an oscillation in the motion of a heavenly body suggesting that of a balance before it comes to rest. The term is most commonly used of the motion of the moon. Libration causes slightly different portions of the moon's surface to be visible from the earth at different times of the month, although on the average the moon keeps the same face always turned toward the earth. Libration arises from the fact that the axial rotation of the moon is uniform while the speed of revolution (orbital motion) is variable. The compounding or resultant of the two motions gives the moon a small oscillating rotation relative to the earth. The diagram under the general discussion of the moon should make clear just how libration occurs.

The moon's libration makes about 41 per cent of its surface always visible (leaving phase out of account); 41 per cent never visible, and 18 per cent alternately visible and invisible.

Magellanic Clouds, two masses of nebulae of clouds in the far southern heavens, named after Magellan, the circumnavigator. The larger group occupies an area of more than 30 square degrees; the smaller about 10 square degrees. These clouds look to the naked eye much like the Milky Way, but the telescope shows that there are many more star clusters. Just southeast of the Southern Cross is the Black Magellanic Cloud, popularly called the Coalsack, apparently dark nebulae of fine dust obscuring the stars.

Meridian, the great circle of the celestial sphere passing through the celestial poles and the observer's zenith. If a vertical plane is imagined cutting the earth's surface in a due north and south line, it will cut the celestial sphere along the meridian. As the earth rotates on its axis from west to east, all the heavenly bodies appear to rise in the east, pass across the sky in parallel circles, and set in the west. As a star crosses the meridian it reaches its greatest distance above the horizon. Hence the meridian point is sometimes called *culmination.*

Meteors, a class of heavenly bodies that are seen on a clear evening as moving points or streaks of light, visible only for a second or two. We call them *shooting stars,* but they are not stars at all. They are tiny bodies of stone or metal. They move through space with extremely high velocities, and when they strike our atmosphere, the energy of their rapid motion is converted into heat by friction, and they shine until consumed. One can see several meteors on any clear night by merely watching some part of the sky. They are of different colors—white, bluish, green, yellow and reddish—and sometimes are as bright as the full moon. Most meteors are very small in size and mass, but occasionally one is large enough and massive enough to reach the ground before it is consumed. Those that get through the atmosphere to the earth's surface are called *meteorites.* There are two general types: stone meteorites, composed of various mineral silicates and sulphides, and iron meteorites, which are essentially iron, usually alloyed with nickel. Collections of them may be seen in museums. The largest meteorite known, weighing 36½ tons, was brought from Greenland by Captain Peary, and is now on exhibition in the Museum of Natural History in New York City. Another one, discovered in Africa and partly excavated where it fell, is estimated to be even larger.

The famous meteor crater, in the desert of northwestern Arizona, is evidence of a huge meteorite that struck the earth probably many ages ago. It is so large that aerial photographs of it resemble the craters on the moon as seen through a telescope. The circular depression is 4,200 feet across and 570 feet deep. The rim of the crater, rising 150 feet above the surrounding plain, is composed of debris thrown out of the pit, ranging from fine rock dust to blocks of stone weighing many tons. Being so massive, the meteor was only slightly retarded by the air, and struck the earth a terrific blow. The enormous heat produced when it landed reduced the solid metal partly (or perhaps wholly) to gas, for efforts to reach it by drilling have thus far proved unsuccessful.

The most catastrophic fall of a meteorite in recent times was the great fall of 1908, which occurred in a remote region of north central Siberia. This one, much smaller than the Arizona meteorite, completely devastated an area over a radius of 40 miles. There were stories of a sudden, blinding light, a roar and a concussion heard 600 miles away, of searing heat at a distance of 50 miles, of the destruction of 1,500 reindeer in a nearby region, and of forests blown down for miles around by the enormous shock to earth and air. Fortunately, such occurrences are extremely rare, owing to the protecting envelope of our atmosphere.

Some meteors are thought to be the remains of disintegrated comets; for many of them are known to travel about the sun in orbits previously followed by a comet. The showers we see on August 10th and 11th, the Perseids, seem to be remnants of a comet that disappeared after it was observed in 1862. The Leonids that we see each November 14th or 15th are in the path of a comet that disappeared in 1866. If the meteors are well scattered along the orbit, we see a meteor shower each year when the earth crosses their orbit. If, however, the meteors are crowded together in the orbit, showers will occur only in those years when the earth and the clustered meteors arrive at the orbital intersections together. It is estimated that 10,000,000 to 20,000,000 meteors strike the earth's atmosphere every day, amounting to perhaps 50,000 tons of material in a year. These figures, however, are only rough guesses. Most meteorites fall into the seas that cover three quarters of the earth's surface. Perhaps 100 strike the earth every year but not more than three or four are seen.

Nodes, the intersections on the celestial sphere of the path of a body of the solar system with the ecliptic. Most commonly the term is used of the orbit of the moon. As any two great circles on the surface of a sphere always intersect at two points on opposite sides, there are two nodes for every planetary orbit. The node is called *ascending* when the moon or planet crosses the ecliptic from the south side to the north side; *descending* when the motion is from north to south. The nodes of an orbit do not, over long periods, remain at the same point; they all slide slowly around the ecliptic in the *retrograde* direction, that is, from east to west. This is a consequence of the mutual gravitational perturbations of the planets.

The position of an inferior planet with respect to the node of its orbit at the time of inferior conjunction with the sun determines whether a *transit* may be observed. Similarly, the moon's position relative to one of its nodes at the time of new or full moon determines the occurrence of an *eclipse*, solar in the case of new moon and lunar in the case of full moon.

Nutation (from a Latin word meaning nodding), a term used in astronomy to describe a movement in the earth's axis like the nodding of a top, which causes the celestial pole to follow a wavy path in its revolution among the stars. The unequal attraction of the sun and moon on the equatorial ring of the earth causes the precession of the equinoxes (see *Precession of the Equinoxes*), and a variation in the attraction itself, due to the changing positions of the sun and moon, causes the oscillation or nutation of the axis.

Occultation, the eclipse of a star or planet by the moon.

Parsec, a unit of distance much used by astronomers, equal to 206,265 A.U. or 3.26 light years. It is the distance at which the radius of the earth's orbit subtends an angle of 1 second. If, therefore, a star were exactly one parsec away it would have a parallax of 1 second of arc. No star is, in fact, as close as this; Alpha Centauri, the nearest, is about 1⅓ parsecs away.

The convenience of the parsec unit depends upon the fact that a star's distance in parsecs is equal to the reciprocal of its parallax in seconds of arc.

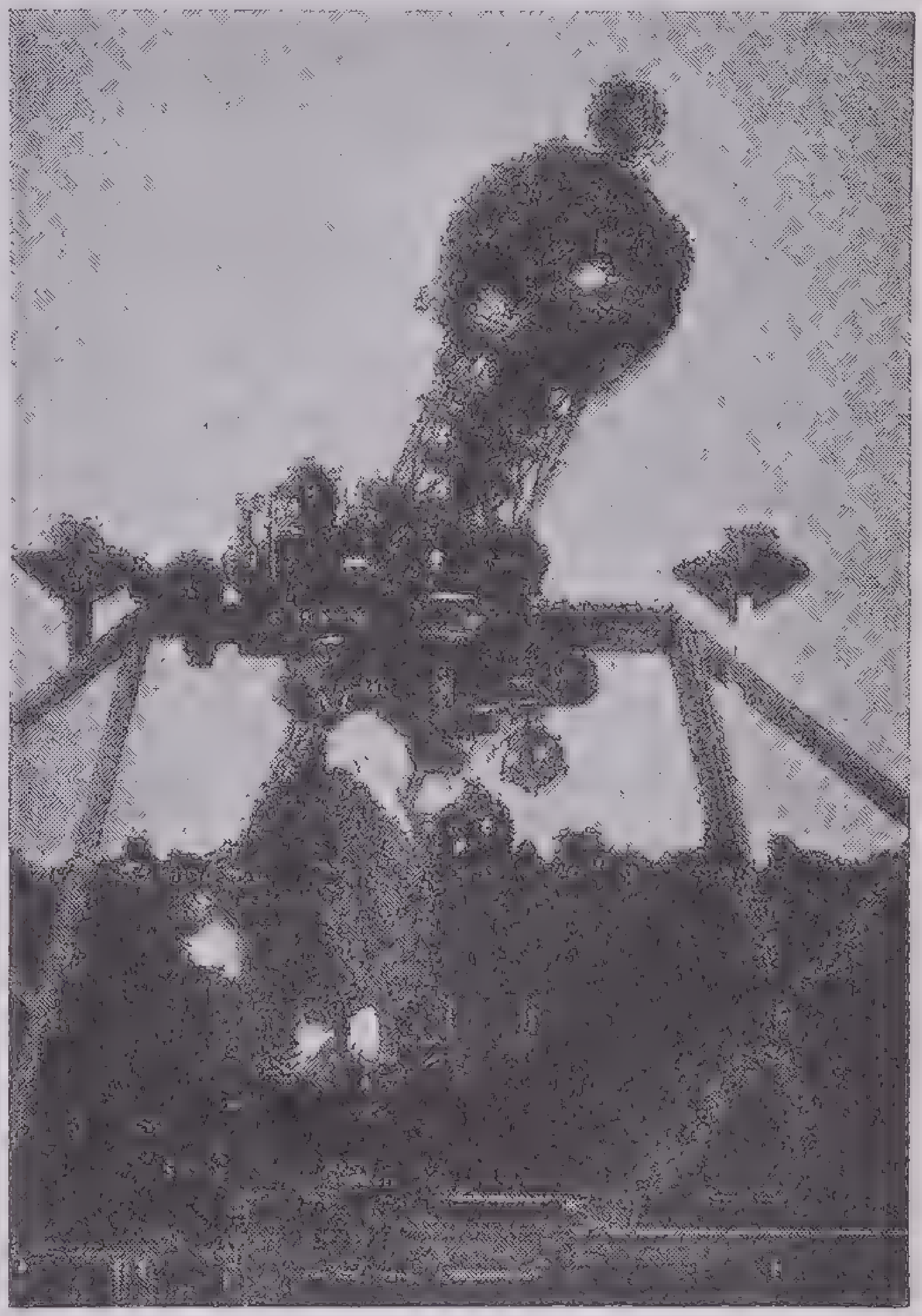
Perigee, the point on the moon's orbit nearest the earth. (See *Apsides.*)

Perihelion, the point on a planet's orbit nearest the sun.

Perturbations.—According to Kepler's first law, the orbit of every planet is an ellipse with the sun at one focus. This was originally a statement of observed fact without any explanation from mathematical theory. After the laws of general mechanics and in particular the law of gravitation were worked out by Newton, it became evident that Kepler's laws were only approximations to the truth. They hold rigorously only for the case of two bodies where the mass of one is negligibly small compared with the mass of the other. If a third body is introduced, the problem of tracing the subsequent motion by mathematics becomes exceedingly complicated and has not yet been solved for any except special cases.

Fortunately, in the case of the solar system, the mass of the sun is immensely greater than that of all the planets put together, so that a good approximation is obtained if we assume, in computing the orbit of any planet, that it moves only under the influence of the sun's attraction. This theoretically elliptical orbit is then considered as modified slightly by the gravitational influence of the other planets and satellites. These secondary attractions and the deviations they produce from the original accurately elliptical orbit are called *perturbations.* They are of great importance in practical astronomy, as they enable us to calculate the masses of many bodies in the solar system.

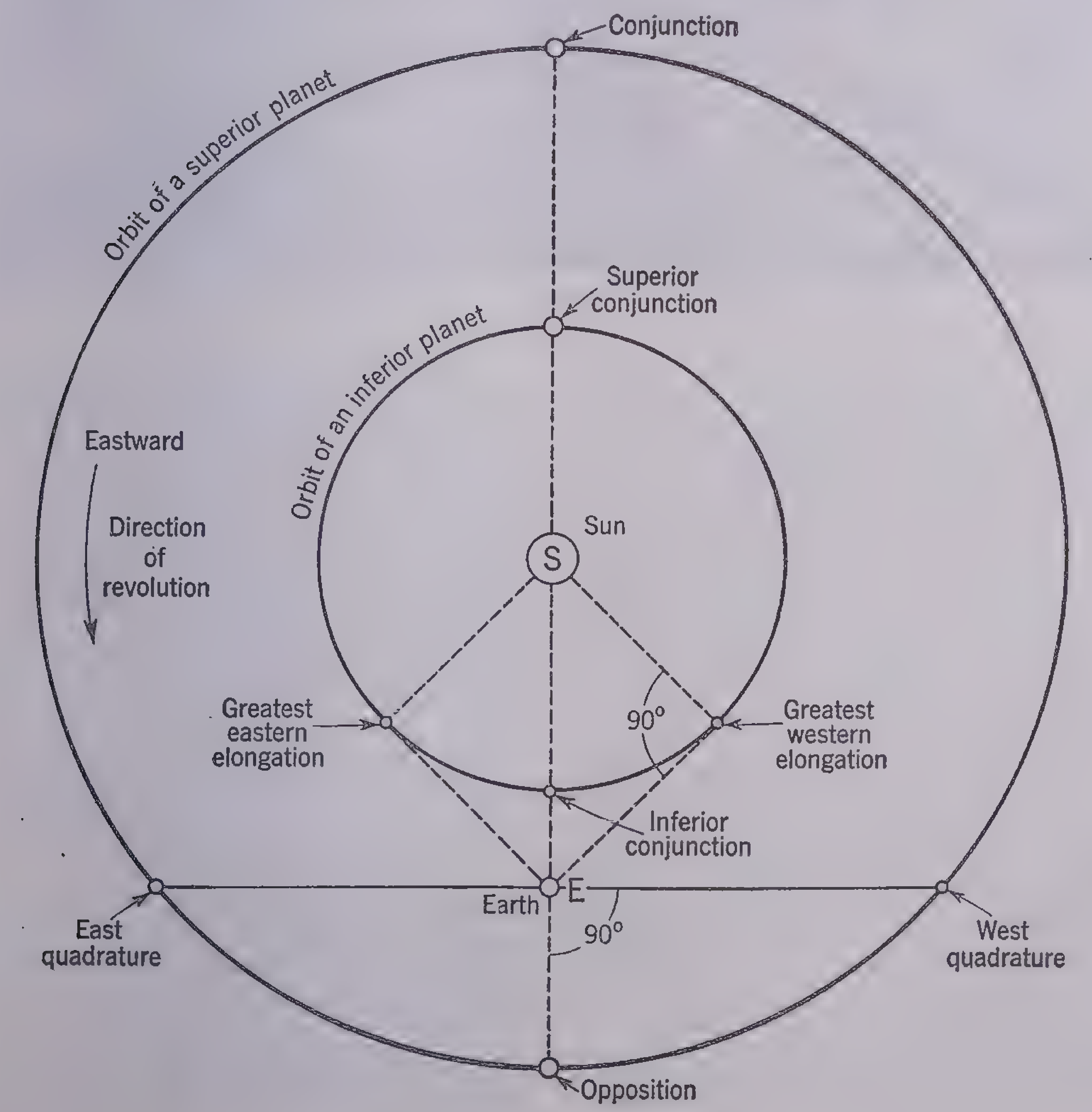
Planetarium, an instrument for artificially duplicating in a large, specially constructed lecture-hall the appearance of the heavens to assist instruction in astronomy. Several have been erected in Germany, where the instrument was devised, and outside of Germany they have been erected in Vienna, Moscow, Rome, Milan, Stockholm and Japan. In America Chicago, New York, Philadelphia, Pittsburgh and Los Angeles have planetaria. By means of a complex projector, the representation of the entire heavens may be thrown on the interior of a large concave hemispherical dome. This artificially produced sky is startlingly real. The instrument may be set to depict the heavens of any terrestrial latitude and for any time; it may be driven to show the apparent celestial motions, such as the diurnal motion, and even the changes due to precession. The moon, sun and planets are shown by means of special projectors, and their apparently complex motions are faithfully reproduced. Various speeds may be used, so that the diurnal motions of the heavens, and even the annual motions, may be compressed into a few seconds. This acceleration gives a realization of the annual course of the sun among the stars, the planetary orbits, and the intricate apparent motions of the planets in them. In no other manner can these phenomena be so interestingly seen and so easily understood.



Courtesy American Museum of Natural History

Planetarium Projector

The great dumbbell-shaped projector is studded with numerous lenses. Through these lenses, illuminated by powerful lights, the images of the stars, sun, moon and planets are thrown on the dome, which serves as a screen. Standing before the projector is Dr. Clyde Fisher, Curator of the Hayden Planetarium, New York



Planetary Configurations

In the buildings that house the American planetaria there are also astronomical museums. In these are shown instruments and models to demonstrate the modern practice of observing; instruments to show laws of optics, spectroscopy, and dynamics; a series of astronomical photographs in the form of transparencies; and a superb collection of antique astronomical instruments.

Planetary Configurations.—It is often convenient to refer to the position of a planet relative to the earth and some other body, usually the sun.

For a superior planet, that is, one whose orbit is outside the earth's, there are four critical positions relative to the sun. They are named *conjunction, opposition, east quadrature* and *west quadrature.* The positions are shown in the diagram. For an inferior planet (orbit inside the earth's) there is no position of opposition or quadrature; there are, however, two conjunctions: *superior conjunction* when the sun is between the earth and the planet; and *inferior conjunction,* when the planet is between the earth and the sun. There is a third critical position when the planet's angular distance from the sun as observed from the earth is a maximum. This is the point of *greatest elongation,* and it obviously occurs when the line joining the earth and the planet is tangent to the planet's orbit.

The term conjunction is also used to indicate the time when two superior planets have the same celestial longitude, that is, when they are closest together in the sky. Jupiter and Mars, for example, are said to be in conjunction when the plane passing through the earth, Jupiter and Mars is perpendicular to the ecliptic, or when the three planets are most nearly in the same straight line.

Precession of Equinoxes, the slow retrograde (westward) motion of the equinoxes or points of intersection of the celestial equator and the ecliptic. The motion is caused by the unequal attraction of the sun and moon on the equatorial bulge of the earth. This attraction causes the earth's axis to trace out an approximately circular cone instead of keeping a fixed direction in space. The celestial poles therefore trace out circular paths on the celestial sphere.

The rate of precession is so slow that during any person's lifetime the celestial poles and the equinoxes remain approximately in the same places with reference to the stars. Over long periods, however, substantial changes occur. In the year 15,000 A.D. the north celestial pole will no longer be closely marked by the Pole Star, but will be near the boundary line between the constellations Lyra and Hercules about half way between the bright stars Vega and Gamma Draconis. The equinoxes move all the way around the ecliptic in about 26,000 years. The annual angular rate of precession is 50.3″.

For the effect of precession on the signs of the zodiac, see *Zodiac*.

Refraction, the bending of light rays in passing obliquely through mediums of varying density. The refraction of starlight by the earth's atmosphere is of great importance in practical astronomy, since all stars appear slightly higher in the sky than their true positions. The amount of displacement by refraction depends upon the barometric pressure, the temperature, the humidity and the distance of the star above the horizon. Since it is necessary in many astronomical observations to measure the angular positions of stars to within 1/10 of a second of arc, and the refraction correction may be as high as 100 seconds, it is easily seen that much care must be used to determine accurately the amount of the error.

When a star is in the zenith, there is no refraction, as the light rays from the star strike the earth's atmosphere at right angles.

Right Ascension and Declination, the positions of stars or points on the celestial sphere with reference to the celestial equator and the equinoxes. The terms correspond to longitude and latitude in specifying points on the surface of the earth. Right ascension is the angular distance east from the vernal equinox; declination is angular distance north or south from the equator. As we specify the position of, say, Chicago, by saying that it has a longitude of 87° 40′ East and a latitude of 41° 55′ North, so we may indicate the position of Sirius, the brightest star, by saying that it has a right ascension of 6 hours 32 minutes and a declination of 17° South.

Saros, see *Eclipse*.

Solstices, the two points on the ecliptic where the sun reaches its maximum distance north or south of the celestial equator. The point of maximum north distance which the sun reaches on June 21–22 is called the summer solstice; the point of maximum south distance (reached by the sun about December 21) is the winter solstice. The solstices are half way between the two equinoxes.

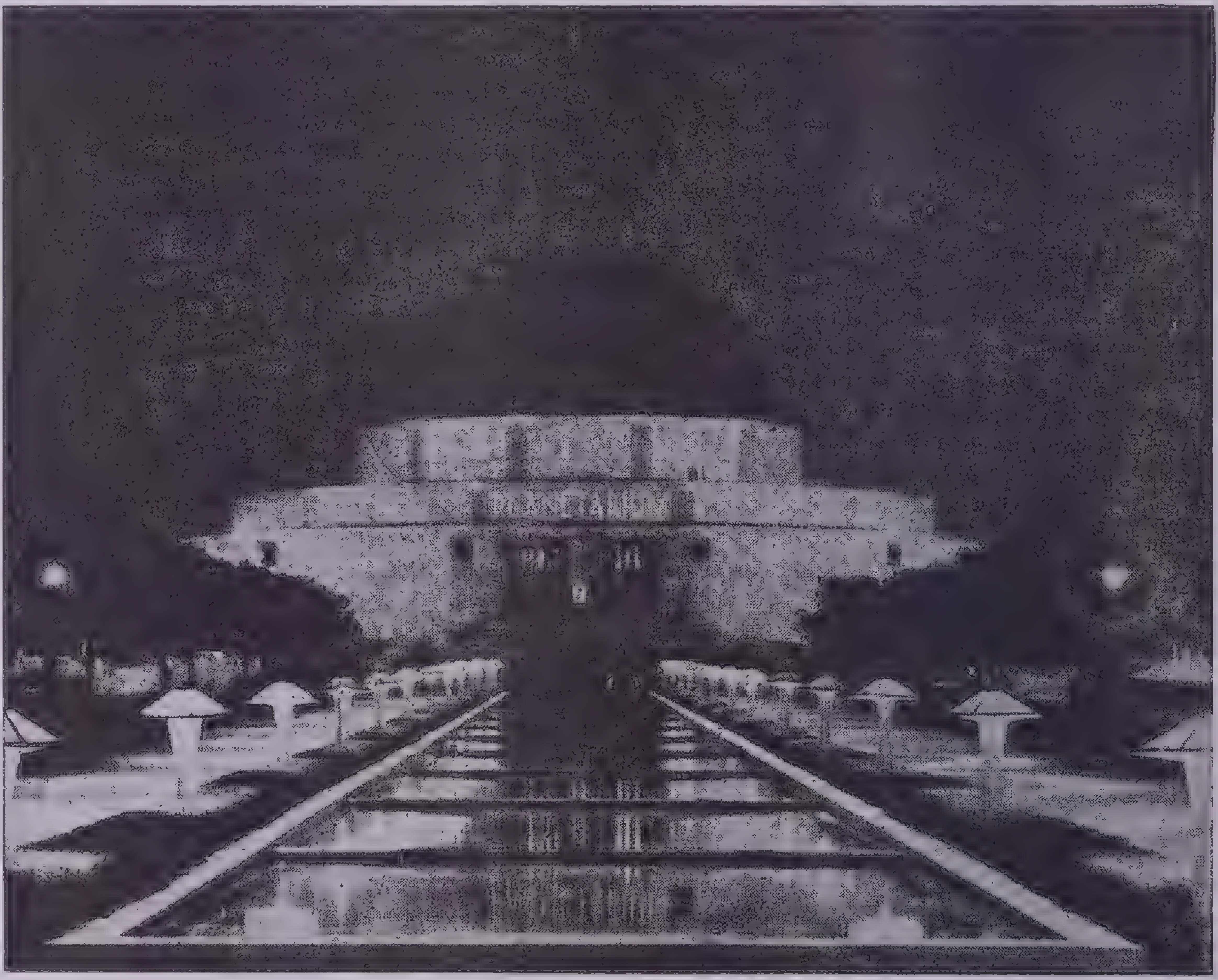
Superior Planet, see *Planetary Configurations*.

Time Measurement.—We are in the habit of saying that the earth rotates on its axis once in 24 hours. When we inquire in detail precisely what we mean by this statement, we find that the answer is by no means simple. The only practical means of determining the time of the earth's rotation is by observations of the heavenly bodies, and since all of these are in independent motion, it becomes a very complicated problem to reduce the actual observations to theoretical correctness. This problem has given rise to the whole science of time measurement, one of the most important branches of astronomy.

The stars are at such immense distances from the earth that their relative positions among themselves remain nearly the same over long periods. If we consider a large number of stars in different parts of the sky, we find that their individual motions with respect to each other are at random, so that we can form a conception of an absolutely fixed celestial sphere determined by the *mean* or average positions of all the stars. The rotation of the earth relative to this ideal celestial sphere or to the mean of the stars may be thought of as the true period of the earth's rotation. It is sometimes called the *absolute day*.

The absolute day is an abstraction which cannot be directly observed. The motions of individual stars are so small, however, that the interval between two successive passages of a particular star across the meridian is equal to the absolute day within very close limits. The stars mark out practically fixed points of reference on the ideal celestial sphere, and by comparing their observed motions among themselves over long periods of time, we can even allow for the particular or proper motion of an individual star.

The equinoxes are the points of intersection on the celestial sphere of the great circles of the celestial equator and the ecliptic. For many reasons, astronomers find it convenient to give a special meaning to the period of rotation of the earth relative to the equinoxes. This period is called the *sidereal day*. It is not quite the same as the absolute day, because the equinoxes are slowly moving westward around the ecliptic. The time between successive meridian transits of one of the equinoxes is therefore slightly less than the time between transits of a fixed star. The actual difference is, however, less than 1/100 of a second, and it is seldom necessary to draw any distinction between the sidereal day and the absolute period of the earth's rotation.



The Adler Planetarium, Chicago, Illinois

Sidereal noon is thus defined as the instant of transit of the meridian by the vernal equinox. Since the affairs of ordinary life depend chiefly on the alternations of night and day, it is desirable to adopt a system of time-keeping depending upon the rotation of the earth relative to the sun.

As the earth moves around the sun, the apparent position of the sun with reference to the fixed stars changes from day to day. The sun appears to move slowly eastward among the stars along the ecliptic, making a complete circuit once a year. On March 21, the sun's position on the celestial sphere coincides with the vernal equinox, so that at sidereal noon of March 21 the sun is on the meridian. By the time the vernal equinox reaches the meridian on March 22, however, the sun will have fallen a short distance behind, and will not reach the meridian until some minutes after sidereal noon. The discrepancy between sun time and sidereal time continues to pile up as the days go by, so that by September 23 sidereal noon occurs at midnight. The *apparent solar day* is the observed period of rotation of the earth relative to the sun; the time, that is, between two successive transits of the sun across the meridian.

Because the apparent sun moves along the ecliptic instead of the celestial equator, and because its rate of motion along the ecliptic is different at different times of the year as a consequence of the eccentricity of the earth's orbit, the apparent solar day is not an unvarying interval of time. For the practical purposes of time-keeping we must have a day of constant length, so astronomers have invented the concept of the *mean sun*.

The *mean sun* is a fictitious point moving at a perfectly constant rate along the celestial equator (not the ecliptic) and completing its journey around the celestial sphere in the same time as the real sun, that is, in one year. The mean sun crosses the meridian sometimes ahead and sometimes behind the apparent sun, but it makes the same number of transits in a year as the apparent sun, and coincides with the apparent sun at the beginning and the end of its annual journey. It may conveniently be thought of as the sun with its irregularities of motion ironed out.

The *mean solar day* is the interval between two successive transits of the meridian by the mean sun. It is a practically unvarying unit of time and is the standard of all our ordinary watches and clocks. On any given date it differs somewhat from the apparent solar day, but the differences average out in a year's time.

The mean solar day is divided into 24 hours, 1,440 minutes, or 86,400 seconds. To be perfectly exact we should speak of these ordinary hours, minutes and seconds as *mean solar* hours, minutes and seconds to distinguish them from the sidereal units of the same names. Under ordinary circumstances, however, there is no risk of misunderstanding, and by hours, minutes and seconds we always refer to the mean solar units unless the contrary is specified.

The sidereal day, that is, the actual time of the earth's rotation, is equal to 23 hours 56 minutes 4 seconds (mean solar units). We should keep this in mind when we speak of the earth's rotating in 24 hours. The statement is really true only when we refer to the earth's rotation relative to the mean sun.

The difference between apparent and mean solar time is called the *equation of time*. The difference, as explained above, arises from the variations in the rate of eastward motion of the sun along the ecliptic. Astronomers have arbitrarily selected the date December 24 as defining the beginning and end of the annual motion of the mean sun. On that date the mean sun crosses the meridian with the apparent sun; the *equation of time* is zero. Between December 24 and February 11, the mean sun precedes the apparent sun across the meridian by an amount increasing slightly each day and reaching on February 11, 14 minutes and 25 seconds. From February 11 to April 15, the difference decreases to zero. From April 15 to May 14 the apparent sun precedes the mean sun until it is 3 minutes and 48 seconds ahead on that date. The apparent sun then begins to lose again, falling behind on June 14 and lagging by 6 minutes and 20 seconds on July 26. Speeding up from July 26 to November 2 the apparent sun overtakes the mean sun on September 1 and reaches a maximum of 16 minutes and 21 seconds ahead on November 21. Between November 21 and December 24 the apparent sun slows down once more, reaching equality with the mean sun on December 24, when the cycle begins to repeat. By speeding up and slowing down we refer, of course, to the apparent westward motion relative to a point on the earth's surface.

Most globes of the earth have a figure-eight-shaped diagram in the Pacific Ocean southwest of Mexico; this diagram is a graphic representation of the equation of time.

Mean solar noon has been defined as the instant of passage of the mean sun across the meridian at any given point on the earth's surface. Mean solar noon is the same instant of time, however, only for observers on the same meridian of longitude. A degree of longitude in the United States is about 55 miles. The earth turns through 15° an hour, so that an observer whose watch is quite correct by the mean sun at a given place, will find that the watch is 4 minutes slow by the mean sun after a trip of 55 miles eastward. Because it is inconvenient for each person to have to reset his watch whenever he moves a short distance east or west, a system of *standard time* has been adopted. *Standard time* is the time determined by the mean sun on one of the earth's meridians of longitude which is east or west of the meridian of Greenwich, England, by an exact multiple of 15°. A properly regulated clock will therefore differ from a sundial by (1) the *equation of time* and (2) a correction for longitude of four minutes per degree for any difference in longitude between the sundial and a standard meridian.

The *year* is measured by the period of revolution of the earth around the sun, which is obviously the same as the period of the sun's apparent motion around the ecliptic. The time between two successive passages of the sun across a fixed point in the ecliptic is the *sidereal year;* it is the earth's period of revolution relative to the whole heavens, and in a special sense is the true period of revolution. The sun's position with respect to the equinoxes, however, determines the seasons, and it is convenient to adopt for calendar purposes a year that will keep pace with the seasons. The *tropical year* is the time between two successive passages of the sun through the same equinox. Because the equinoxes are slowly sliding westward along the ecliptic (see *Precession*), the tropical year is slightly shorter than the sidereal year. The actual difference is 20 minutes and 14 seconds. The tropical or calendar year is equal to 365 days, 5 hours, 48 minutes and 45.9 seconds (mean solar time).

Secular Variation in Length of Day. In the preceding account we have assumed that the earth's period of rotation is constant, and that therefore it may be used as a standard for the measurement of time. The laws of physics, however, and in particular the principle of *conservation of energy* assure us that this assumption cannot be quite the truth. The earth may be compared with an enormous flywheel storing kinetic energy of rotation. If there were no frictional or other forces tending to influence its motion, it would actually continue at a fixed rate forever. But we know that in the case of the earth there are frictional forces tending to retard its motion. Chief among these is the friction of the tides. The rise and fall of tides is caused by the earth's rotation in the gravitational fields of the sun and moon. The water of the oceans slides back and forth over the sea bottom, and friction results accompanied by dissipation of mechanical energy in the form of heat. It has been found by calculation and measurement that this energy dissipation from tidal friction goes on at a rate of about 2,000,000,000 horsepower. This seems a very large amount, but the total kinetic energy of the spinning earth is so great that the braking or slowing effect of this 2,000,000,000 horsepower is insignificant. It is sufficient to cause a lengthening of the day of about 1 second in 100,000 years. Each day, that is, is on the average about one-thirty-six-millionth of a second longer than the day before it. Even the very accurate time measures of modern astronomy can neglect so tiny an amount.

A slight change—only a few feet—in the radius of the earth may also cause minute variations in the length of the day. Certain small irregularities in the observed motion of the moon can be explained on the assumption that the earth's rotation is not quite constant, and Mr. E. W. Brown, whose studies of the moon's motion are the most exhaustive and careful ever made, has offered the suggestion that small changes of this sort may occur. There is evidence that changes in the length of the day of perhaps 3/1000 of a second have occurred rather suddenly on two occasions since 1895; but these two changes practically canceled each other.

From the principle of conservation of angular momentum it is inferred that the day is slightly lengthened whenever a mass is transferred on the surface of the earth from a higher to a lower latitude, and when we consider the great seasonal shifts of ice and water associated with the periodic melting and freezing of the polar ice fields, we see that there must be some changes in the length of the day from this cause. Such changes are not progressive, however, like the braking effects of the tides. In the long run their influences cancel out.

None of these variations is of practical importance in timekeeping. The spinning earth is very much more constant than the most accurate clock ever made.

Transit, the apparent passage of a planet across the disk of the sun. Two planets, Mercury and Venus, both nearer the sun than the earth, on certain rare occasions pass directly between the earth and the sun, so that the observer sees them as black dots moving across the sun's disk. If the orbits of these two planets were exactly in the plane of the earth's orbit, a transit would be observed at every *inferior conjunction.* Since the planes of both orbits are inclined to the plane of the earth's orbit, however, a transit occurs only when *inferior conjunction* happens to coincide with the planet's passage of one of the nodes of its orbit (points of intersection with the ecliptic). The conditions necessary for a transit are thus similar to those necessary for an eclipse of the sun by the moon.

Twinkling of stars is caused by changing variations in the density of different layers of the earth's atmosphere. In passing through the air a ray of light is bent or *refracted.* The amount of this refraction depends upon the density of the air. Because the air at different levels is at different temperatures, and the successive layers of air are being continuously shifted by winds, the slight distortions of a ray of light are different from instant to instant.

Twinkling of stars makes accurate observation impossible for the astronomer. In selecting the place for building an observatory, much study is given to local weather conditions. The ideal site for an observatory is one where the air is exceedingly calm, undisturbed by unequal heating.

Velocity of escape.—The gravitational attraction of any body falls off with the square of the distance from the body. If a projectile is shot directly upward from the surface of the earth, the earth's gravitational pull on it diminishes as the body ascends. The greater the initial velocity, the higher the body will go, and the weaker will be the force of gravity tending to arrest its motion. In the usual formulas for the behavior of falling bodies this diminution of gravity with distance is neglected, as it is insignificant in the small distances of fall ordinarily considered. By calculation, however, it can be shown that at a certain critical velocity a projected body would leave the earth and never return. This critical velocity is called the *velocity of escape, the velocity from infinity* or the *parabolic velocity.* For simplicity we have visualized the imaginary projectile as being fired directly upward, and we have neglected the effects of air resistance (which, at the velocity of escape, would actually be very great). It can be shown mathematically, however, that it makes no difference in what direction we imagine the projectile to be fired; at all velocities less than the critical velocity of escape the path described would be a closed curve, a more or less elongated ellipse, and thus the body would return ultimately to the point from which it was projected. At the velocity of escape, however, the orbit would be a *parabola* which is an open curve; the projectile would never return. Projected with a still higher velocity, the orbit would be a *hyperbola,* another type of open curve.

The velocity of escape is called the *velocity from infinity* because it is the limiting velocity with which a body would strike the attracting mass if it had fallen freely from an infinitely great distance. The velocity of escape at the surface of the earth is about 6.95 miles per second, several times the speed of the swiftest modern projectiles. At any given distance d from any body of mass m, the velocity of escape may be calculated by the formula: V *equals* $\sqrt{\frac{2\,G\,m}{d}}$ where G is the constant of *gravitation* equal to 1/15,000,000. For this formula to hold, m must be expressed in *grams,* d in *centimeters* and V in *centimeters per second.*

The importance of the velocity of escape in astronomy lies in the fact that it enables us to calculate whether the gravitational attraction of a planet is sufficient to retain an atmosphere. All gases consist of swarms of rapidly moving molecules. Physicists have calculated the average velocities of the molecules of a gas of given density and temperature. If this velocity is near to or greater than the velocity of escape at the surface of a planet, we can be sure that such a planet could not long retain an atmosphere of the given temperature and density. The molecules in the outer layers of any atmosphere around such a planet would fly off into space. This is the theoretical explanation of the observed fact that the moon has no atmosphere.

Zodiac.—Since the earliest times it has been noticed that the sun, the moon and all the planets moved in the sky in a certain band or narrow strip within a few degrees of the ecliptic. This belt was called by the Greeks *zōdiakos* (the zodiac), relating to animals, because the names of the constellations that marked it out were mostly names of animals. The width of the belt became traditionally fixed at 16°, 8° on either side of the ecliptic, and it was found that the five planets known in early times, as well as the sun and the moon, were always to be found within these limits. The zodiac was divided by the Greeks into 12 equal divisions of 30° each called the *signs* of the zodiac, and these signs were named for the principal constellation each contained.

There are two points on the ecliptic with a special significance. They are the equinoxes or equinoctial points, where the ecliptic intersects the celestial equator. The *vernal equinox,* which the sun crosses each year about March 21, seemed a convenient point of reference for measuring distances around the zodiac. In the time of the great Greek astronomer Hipparchus (*c.* 300 B.C.) the vernal equinox was located just west of the constellation Aries, or the Ram. Hipparchus, therefore, who first named the signs of the zodiac systematically, laid off 12 30° segments counting eastward from the vernal equinox and found that the segments corresponded with the following 12 constellations:

♈ Aries (Ram)
♉ Taurus (Bull)
♊ Gemini (Twins)
♋ Cancer (Crab)
♌ Leo (Lion)
♍ Virgo (Virgin)
♎ Libra (Balance)
♏ Scorpio (Scorpion)
♐ Sagittarius (Archer)
♑ Capricornus (Goat)
♒ Aquarius (Water Bearer)
♓ Pisces (Fishes)

These 12 constellations gave their names to the 12 signs of the zodiac.

The vernal equinox, as the starting point in laying out the zodiac, came to be called the "first point of Aries." The slow motion of the earth's axis known as *precession* causes the equinoxes to move slowly westward around the ecliptic, completing the circuit in about 26,000 years. Thus, in the time that has elapsed since Hipparchus, slightly over 2000 years, the equinoxes have moved about 1/12 of the whole distance around, or somewhat over 30°. Instead of being in Aries, therefore, the equinox is now in the constellation Pisces, and of course all the signs of the zodiac, being measured from the equinox, are similarly "out of step," so to speak, with the constellations whose names they bear. When we speak of the sun, the moon or one of the planets being "in Taurus" or "in Cancer," we almost always mean the zodiacal sign, not the constellation. In each case the body concerned will be in the constellation just east of the one for which the zodiacal sign was named.

All the planets known to the ancients move in orbits the planes of which intersect the ecliptic plane at angles of 7° or less. This is the reason they are all to be found at all times within 7° north or south of the ecliptic, in the belt of the zodiac. In modern times, however, many minor planets or asteroids have been discovered with orbits inclined to the plane of the ecliptic by more than 8°, and such bodies may appear north or south of the limits of the zodiac. The planet Pluto, discovered in 1930, has also an orbit much inclined to the ecliptic (17°), and for that reason does not remain confined to the traditional zone.

Zodiacal light, a triangular zone of nebulous light seen along the ecliptic after sunset or before sunrise. It extends outward from both sides of the sun to varying heights and is observed to best advantage in the tropics. Its name refers to an old belief that the glow could be seen only in or near the zodiac. The most commonly accepted explanation of this light is that it represents the reflection of sunlight from myriads of meteoric particles revolving about the sun.

GEOLOGY

Geology is the history of the earth and its life. It is ancient history rather than modern; and the record of its events are written in the rocks of the earth's surface, not in ancient volumes.

Geology is one of the new sciences. Most of what has been important in the thought and writings of scholars on this subject is later than the beginning of the 19th century. There could be no real science of any sort before a few scholars at least had adopted the general principles of careful observation, analysis, forming theories that agree with the data observed, checking these things in every possible way. There could be no real science of the earth's beginning and its development before the notion of evolution had taken hold in the minds of scientists.

History of Geology.—Long ago the ancient Greeks wondered when they found sea shells on mountain tops and in rocks far under the earth miles from an ocean or sea. "There must once have been seas that covered these mountain tops," said the more sensible Greeks who tried to give an answer. A less scientific explanation was: "These are sports of nature. They just *happen* to look like sea shells. No sea animals could ever have lived here."

The story of Noah's flood was used as an explanation by many good people. The Bible told of one universal deluge: "All the high hills that were under the whole heaven were covered" (Genesis 8:10). This theory of geology is called *catastrophism*: that changes in the earth's surface and all the other strange things in geology resulted from sudden calamities and disasters. The catastrophists said that each stratum or group of strata was the product of a period of quiet and that it was ended by a disaster that destroyed all life and upset the whole earth. It is always easy to explain what is strange by a catastrophe or something supernatural—and it is hard to find the natural explanation.

The natural explanation of the facts of geology, especially the fossil sea shells, is called *uniformitarianism*, which means that the same sort of causes that are at work now and acting in the same way, regularly and naturally, caused all the changes in the earth's surface and explain all the data of geology. Our wisest geologists today try to find natural explanations.

The natural explanations began in the 17th and 18th centuries. The great mathematicians René Descartes (1596–1650) and Wilhelm Gottfried Leibnitz (1646–1716) imagined that the earth and the other planets were originally incandescent masses and that the earth's crust was due to gradual cooling. James Hutton (1726–97), a Scotch physician and farmer, wrote *Theory of the Earth, with Proofs and Illustrations* (1795), full of important new ideas that were more clearly expressed 7 years later in *Illustrations of the Huttonian Theory* by John Playfair (1748–1819), Scottish mathematician. The Huttonian theory was uniformitarian—and geology still is uniformitarian, though nowadays geologists believe that geologic change in earlier times may have been somewhat different from what it is today. They agree with Hutton in giving only natural causes for changes and in believing that these changes took a long time. There may have been catastrophes, but they did not wipe out all living things, and they were like the catastrophes we know.

Hutton's explanation combined fire and water—present rocks on the earth's surface are largely waste of older rocks; materials deposited undersea were consolidated by terrific pressure and then broken and tossed up by expansion from internal heat; masses of molten rock were then packed into breaks between strata; land under atmosphere decays and is carried to the sea floor; the sea floor, subject to upheavals from volcanic action, builds new land from freshly consolidated sediment.

This brief account (condensed from Sir Archibald Geikie's summary of Hutton's work) introduces to us several important ideas and terms commonly used in geology. Hutton did not make the mistake of trying to find a single cause for all geological changes. That was the great mistake made by the father of German geology, Abraham Gottlob Werner (1750–1817), who classified the strata of Saxony as accurately as William Smith mapped the strata of England. But Werner wanted to make water the great geological influence. He taught that all rocks were precipitates of a universal primeval ocean and that volcanoes were due to combustion of beds of coal under the ocean floor.

Werner's theory was called *Neptunism*—from Neptune, god of the sea. On the other side were Hutton's followers, the *Vulcanists* or *Plutonists*, who considered subterranean fire the main factor in geological change and took their name from Vulcan, god of fire and of volcanoes, and Pluto, god of the underworld.

The great French biologist Lamarck (1744–1829), who studied fossils more carefully than had anybody before him, laid some of the foundations of evolutionary theory and opposed the ideas of the catastrophists. The last and greatest of the old catastrophe school was the great anatomist Baron Cuvier (1769–1832), who did not believe in evolution or in uniformitarianism.

In the 19th century geology became a real science—with so many names of great thinkers that all cannot be mentioned here. First was the self-educated English engineer and canal builder William Smith (1769–1839), nicknamed Strata Smith for his study of strata as he observed them in his canal digging and for identification of different strata by the fossils found in them. He was the first maker of geological maps (1815) and he gave the formations in the Jurassic period that he studied English place names—names that are still used—like Oxfordian and Purbeckian. Then came the scholar and traveler Sir Charles Lyell (1797–1875), who wrote *Principles and Elements of Geology,* made up the names *Eocene, Miocene, Pliocene* (meaning, respectively, early new, less new, more new) and was specially interested in the relations of biology and geology, finally agreeing with Darwin's theory of evolution.

Both Longfellow and Whittier wrote poems about the first great American geologist Louis Agassiz (1807–73), born in Switzerland and for 25 years professor at Harvard. His main contribution to geology, *The Glacial Theory* (1840), was based on his study of Swiss glaciers. Drift, the deposits on the earth's surface of gravel, brickearth, sand and huge scored rocks that seem not to belong with their surroundings, had formerly been explained as *diluvium,* from the Latin word for flood. It was supposed that Noah's flood or some smaller overflow had carried this drift far from its original home. But Agassiz showed that the drift was the result of ice movements at some period of geological time. The scratched or scored rocks have markings like those made by glaciers, and in all parts of the earth where there are now no other signs of ice there are the moraines (accumulations of dirt and stones), the scooped out lake beds, the polished hummocky rocks called *roches moutonées* (sheep's-back or wooly-wig rocks) that are so common in glacier regions today. Agassiz, like Cuvier, could not agree with the notion of evolution.

Two Scotch brothers were famous geologists—Sir Archibald Geikie (1835–1924), who traveled in the United States and wrote the valuable *Text-Book of Geology* (1882, often republished) and *The Founders of Geology* (1905); and James Geikie (1839–1915), author of *The Great Ice Age and Its Relation to the Antiquity of Man* (1874) and *Prehistoric Europe* (1881), which described several interglacial periods between ice coverings, when conditions were absolutely different from the glacial periods.

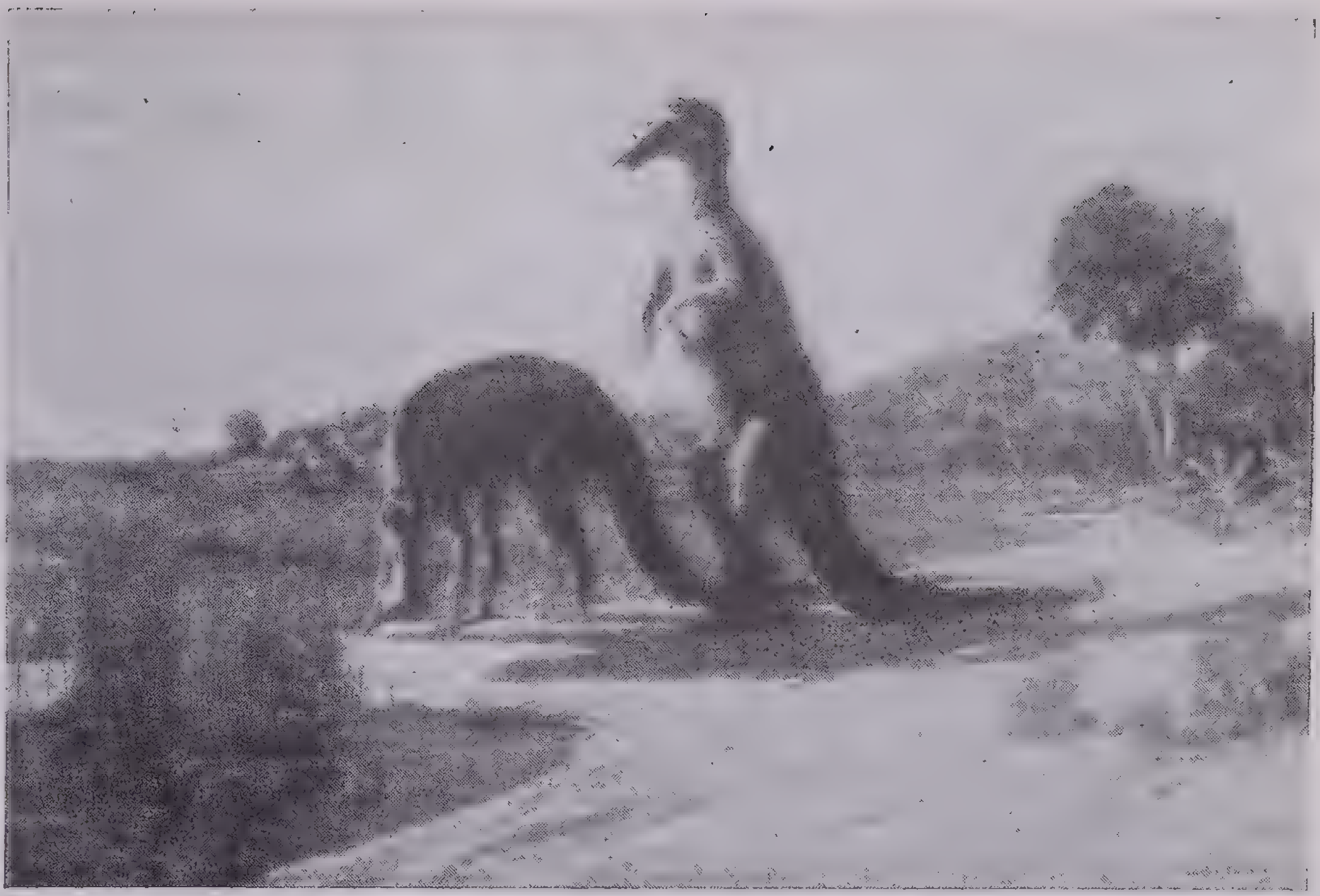
Geology is one of the sciences that has received government recognition. The U.S. Geological Survey, formed in 1879 by a union of the different government surveys in the West, has made valuable geological maps of the United States. The separate geological surveys of individual states have done similar local work. One great American geologist, James Hall (1811–98), headed in succession the state surveys of New York, Iowa and Wisconsin; another, Thomas Chrowder Chamberlin (1843–1928), was head of the Wisconsin survey and then taught at the University of Chicago. Chamberlin was an astronomer as well as a geologist; the planetesimal theory of the solar system is due to him. With Harvard's Agassiz, Yale might rank her Professor James Dwight Dana (1813–95), author of *Manual of Geology* and an authority on coral islands and volcanoes; and Princeton may boast of William Berryman Scott (1858–1937), who led geological expeditions in the Far West and in Patagonia and wrote *An Introduction to Geology.*

Henry Fairfield Osborn (1857–1935) was a professor at Columbia University, long connected with the U.S. Geological Survey and president of the American Museum of Natural History in New York. He wrote on evolution in general and specifically on the mammals (particularly horses) of America in geological times.

Today geology is newly linked to other sciences. The chemistry of the rocks is important. The lighter acid rocks that we see on the earth's surface are called *sial* (short for silicon and aluminum); under them are basic igneous rocks called *sima* (short for silicon and magnesium); and at the central core is a dense material called *nife* (short for nickel and iron —*Fe* being the chemical symbol for iron). The German geologist Alfred Wegener explains the shape of the continents by the relation of these three kinds of rocks.

The new science of radioactivity contributes to geology in a surprising way. A hundred years ago geologists were finding in the fossils evidence that the earth is much older than anyone had ever supposed. Now the radium experts have evidence that the earth is far older than the scientists of the 1830s estimated, or than Lord Kelvin (1824–1907) figured it when he set the age at about 27 million years. This was based on the rate of the cooling of the earth's crust by conduction. Now that we know that different radioactive elements in rocks give off heat, we know that the cooling of the earth's crust must have taken much longer than Kelvin thought, for there was so much more heat to cool off—not only the heat from the molten mass of the earth's center but a much greater amount from radioactivity.

Radioactivity gives another clue to the age of the earth. Some of the lead in rocks near the earth's surface has not always been lead—at some time it was uranium. We know that is so because uranium now becomes lead (with an atomic weight a little less than "original" lead—206 instead of 207.2). One atom of this sort of lead is produced in one year by 6,400 million atoms of uranium—or by weight one unit of lead is produced each year from 7,400 million units of uranium. So, the radium experts say, here is a formula: Any rock with x parts of uranium-derived lead to 1 part of uranium must be 7,400x million years old. That many years ago there was no lead in the rock. Figured on the basis of this radioactive formula it is not less than 1,500 million years and not more than 3,000 million years since the earth became solid.



From a painting by Charles R. Knight, courtesy American Museum of Natural History

Field of the Paleontologist: Dinosaurs of Sixty Million Years Ago

The artist's idea of the appearance of Trachodont dinosaurs is based on fossil skeletons (of the Cretaceous Period) found in Converse County, Wyoming. Trachodonts are closely related to the Iguanodont dinosaurs that left the huge footprints pictured on page 806. The Iguanodonts had a single toe pad on each digit; Trachodonts, three toe pads on each digit. Trachodonts used their ducklike bills to pull up vegetation along the rivers and seashores. Their webbed front feet, partly webbed hind feet and long tails assisted in swimming. Unlike most living reptiles, they had no scales but were covered with a tessellated surface of mosaiclike plates an inch or more across

A definition of some of the main branches of geology will be useful. *Paleontology* (literally the science of beings of the remote past) is the study of fossils. Originally the word *fossil* meant anything dug up, including rocks and minerals; but now it means any trace, impression or remains of a plant or animal in rocks—the imprint of a fern or leaf, the footprint of a reptile, the shell of a mollusk, the skeleton of an animal. Cuvier and Osborn were paleontologists.

Cosmogony or *cosmic geology* deals with the origin of the universe and the relations of the earth to the universe. (Cosmos is Greek for universe). James Geikie was a cosmogonist.

Economic geology is the study of minerals and other factors of geology that have a use in commerce—such as indicating where petroleum can be found and the nature of strata in which anthracite coal occurs; the men in Federal and State geological surveys are primarily interested in economic geology. *Mining geology* is a special branch of economic geology.

Petrology is the study of rocks, their composition, structure and history. Microscopic study and the use of chemical analysis play a large part in petrology.

Stratigraphy or *stratigraphical geology* is the study of the succession and relation of the layers (strata) of sedimentary rocks. William Smith and Lyell in England and Werner in Germany are good examples of stratigraphers. Paleontology is closely related to stratigraphy since fossils are found only in the sedimentary rocks.

Physical geology studies the forms of the earth's surface and the character of the processes that have produced those various forms. It is interested in many changes that do not come under the head of metamorphism, such as the effects of weather and atmosphere. Agassiz's glacial theory was one of the great contributions to physical geology. The whole subject of physical geology is closely related to physical geography and to meteorology (the science of weather) and it is dependent on the sciences of physics, chemistry and biology.

Historical geology (in contrast to physical) is setting in order of time the animals and plants found in fossils and the strata or layers of the earth's crust that contain these remains of prehistoric life. A few remnants of these prehistoric times are found elsewhere than the sedimentary strata: in the tar pits of the southern California oil fields there are great masses of bones, the remains of beasts that were mired; and in the frozen gravels of northern Siberia complete carcasses, hide and all, of the wooly rhinoceros and the hairy elephant or mammoth supplement the information pieced out by comparing one fossil with another.

PHYSICAL GEOLOGY

Earth Relations.—The earth does not exist by itself. A number of the most important geological processes and indeed life itself are dependent on the earth's relations to other parts of the solar system. The treatment of that relation belongs in astronomy rather than in geology. It is interesting to notice that several great scientists have been both astronomers and geologists. The field where the two sciences especially overlap—the origin of the earth as a part of the solar system—is called cosmogony.

Major Divisions of the Earth.—The materials of the earth may be separated naturally into three major divisions: (1) the atmosphere, (2) the hydrosphere and (3) the lithosphere.

Atmosphere.—Although extending far above the earth, the atmosphere nevertheless revolves and rotates as a fundamental part of it. Except when the wind is strong, we are unconscious of its weight; yet the atmosphere is estimated to comprise one part in 1,200,000 of the earth's great mass, and it exerts a pressure of about 15 pounds a square inch at sea level. The density of the air diminishes rapidly upward, but it seems possible that the rarest parts of the earth's atmosphere extend out beyond the orbit of the moon.

The atmosphere is the most active of the major divisions of the earth, and its effects upon the other divisions are so great that it may be regarded as one of the most important agents of change in the geologic history of the earth.

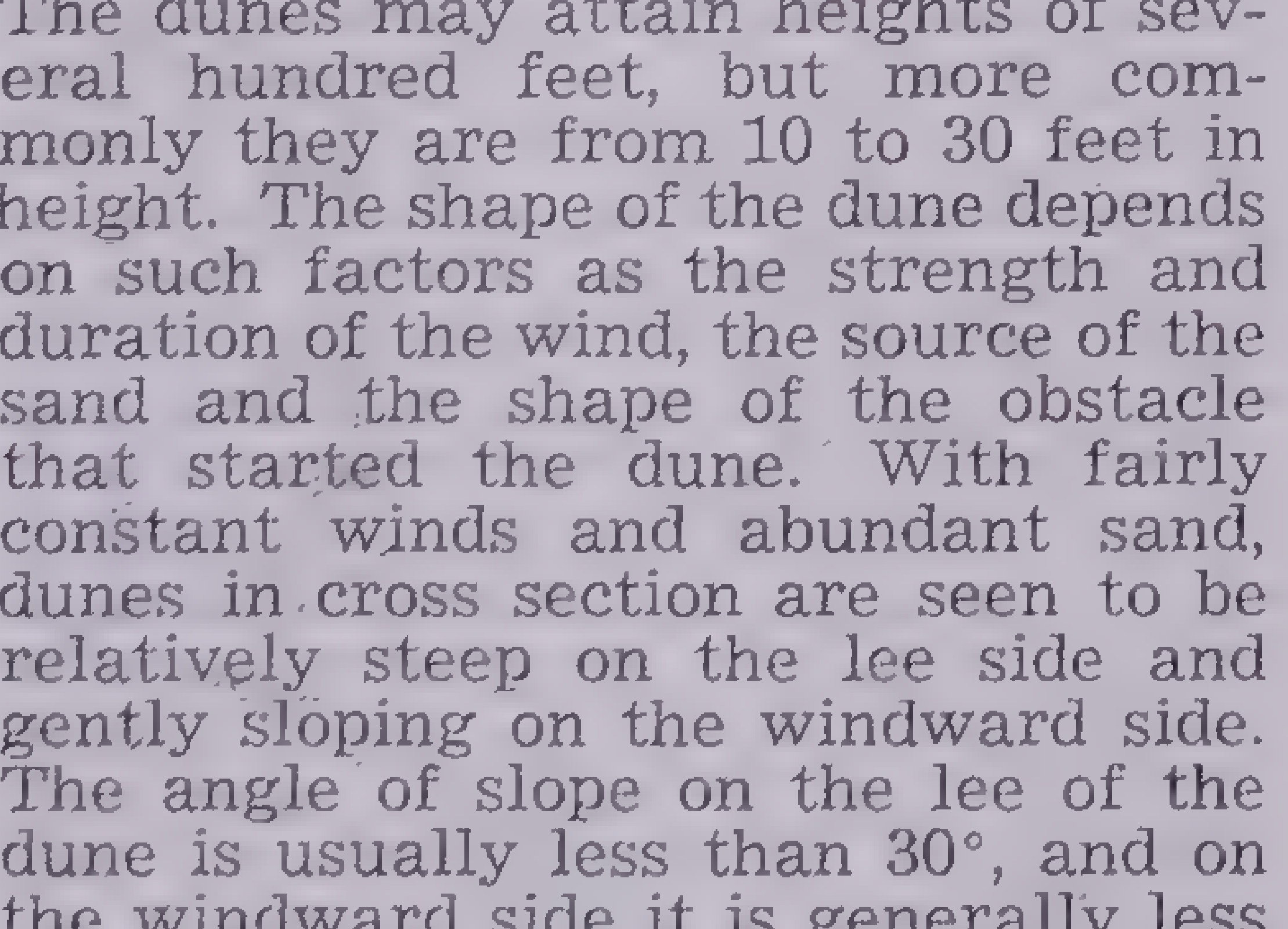
Hydrosphere.—The hydrosphere comprises all the waters of the earth's surface and makes up about one part in 5,000 of the earth's mass. Compared with the oceans, all other bodies of water are small, yet of all the geologic agencies shaping the earth's surface, running water is the one we see at work most constantly and the one that seems to be most active. In the form of rainfall, surface streams, underground waters, currents and waves, the hydrosphere is continually altering the earth's facial expression. It is eternally carrying sediment from the higher land to the basins where it is deposited.

Lithosphere.—The lithosphere (rock sphere) is the only one of the three major divisions of the earth that is truly a sphere, for both the atmosphere and the hydrosphere are shells. The greater part of the lithosphere is composed of solid rock, but at most places it is covered by a surface veneer of loose material, such as soil, clay, gravel, sand and fragmentary rock, which is collectively known as *mantle rock.*

The solid rock is nowhere very far beneath this mantle, and at many places it appears directly at the surface. This solid rock is made up of many diverse varieties, all of which may be grouped into three main classes. The *stratified* rocks are layered and are similar in composition and bedding to those sediments that are forming on the sea floor today. The *igneous* rocks are hardened lavas or other products of volcanic processes. *Metamorphic* or altered rocks have undergone physical and chemical alteration since their formation; these rocks have been derived from either the igneous or the sedimentary type chiefly through the agencies of heat, pressure and underground water.

Work of the Atmosphere.—*Mechanical Work*: The mechanical work of the wind depends upon its movements. The transportation of dust by the wind is essentially universal; the particles find their way to the interior of tightly closed drawers and even fall upon the decks of steamers in mid-ocean. During the eruption of Krakatoa in Malaysia in 1883 large quantities of dust were shot up to great heights by the force of the explosion. This dust, carried by upper air currents, completely encircled the earth and made red sunsets for several months. In some parts of China there are very thick deposits of a fine-grained, wind-blown dust known as *loess,* out of which the Chinese have carved walls, homes and even entire villages.

Winds do not commonly lift sand far above the surface of the earth and therefore surface obstacles interfere with the movement and cause it to drift. It thus is aggregated into mounds and ridges known as *dunes.* The dunes may attain heights of several hundred feet, but more commonly they are from 10 to 30 feet in height. The shape of the dune depends on such factors as the strength and duration of the wind, the source of the sand and the shape of the obstacle that started the dune. With fairly constant winds and abundant sand, dunes in cross section are seen to be relatively steep on the lee side and gently sloping on the windward side. The angle of slope on the lee of the dune is usually less than 30°, and on the windward side it is generally less than 15°. The continual transference of material from the windward to the leeward side causes dunes to march steadily in the direction of the prevailing winds. Thus entire forests are overwhelmed, covered, killed and finally again exposed by the shifting sands; for example, on the south side of Lake Michigan. The church at the village of Kungen on the east shore of the Baltic Sea was covered by a dune in 1809 and revealed again 60 years later by the migration of the sands.



Dunes

A. and B. Sand-dune shapes known as *barchanes.* C. Section through dune. Arrows show direction of wind

There were dunes in remote geological times—so wind action is nothing new. It has two distinct actions—filling in and uncovering (denudation or erosion). Recent dust storms in the United States have ruined thousands of farms—giving a striking illustration of the way the atmosphere has affected the earth's surface. The deserts of central Asia were fertile soil before the blown sands choked them.

Wind is one of the few geological agents that can work against gravity, for it carries material uphill. The abrasive effect of the wind depends on the materials that it can carry. In semiarid regions the solid rock is sometimes carved into fantastic spires and pinnacles by the sand constantly being blown against its surface. In desert sand the wind often makes well-defined ripple-marks. These are found on desert rock surfaces and even on desert pebbles, which have a sharp ridge or a triangular marking on the exposed side.

The atmosphere works with other geological factors. An extreme example is volcanic dust carried by the wind so far that it produces marked variations of climate. The American meteorologist W. J. Humphreys (1862-) considers that icecaps may have been due to such a chain of fire, dust and wind.

Chemical Work.—The atmosphere is an efficient chemical agent only in connection with water, for dry air has little effect on rocks or soil. The important atmospheric processes of a chemical nature are oxidation, carbonation and hydration. *Oxidation* is the union of oxygen with some constituent of the rock to form an oxide. *Carbonation* is the union of carbon dioxide with rock constituents to form carbonates, and *hydration* is the union of water with constituents of the rock. These processes operate efficiently in hot, damp regions, but they are of importance in all climates.

A Conditioning Agency.—In addition to its chemical and mechanical work, the atmosphere is also a conditioning agent. Changes of temperature tend to break up rock. The alternation of heating and cooling rock by day and night causes its disintegration. Atmospheric temperature is the chief factor governing evaporation; it is important in the circulation of the water vapor; and it controls its precipitation in the form of rain or snow. The water vapor of the air with its carbon dioxide acts as a thermal blanket that permits the passage of the sun's radiant energy through it but does not readily permit the heat generated at the earth's surface to spread out into space.

Work of Running Water.—*Destructive Work:* It has been estimated that 30,000 cubic miles of water in the form of rain or snow fall upon the surface of the earth every year; and more than one-fifth of this great total is carried to the sea by rivers. Since many of these streams descend from great heights, their total energy is tremendous and the amount of sediment that they carry during a year is almost incalculable. The destructive work of some sluggish streams is not readily apparent, but it is evident that swift-flowing rivers wear away their banks from year to year and that streams in flood excavate new channels in the course of a few hours.

Streams that flow the year round are called *permanent streams;* whereas those that flow only after rains or seasonally are known as *temporary* or *intermittent.* All permanent and most temporary streams flow in depressions known as *valleys.* Very small depressions in which water runs only after showers are called *gullies,* and somewhat larger temporary stream courses usually are referred to as *ravines.* The smallest gullies unite to form larger ones, which in turn join others to form ravines that lead finally into valleys.

After heavy rainfall the run-off becomes concentrated in natural depressions that are enlarged into gullies by the erosive effect of running water. The lengthening of these drainage depressions takes place chiefly at their upper ends and is known as *headward erosion.* While the depression is being lengthened by this process, it is also being widened by *lateral erosion.* It appears, therefore, that many valleys are developed by the run-off of a series of showers; but if the source of the water were run-off only, all surface streams would cease to flow shortly after rainfall. As the valley of an intermittent stream is cut deeper, however, the periods when it is dry are shorter; and, when it has at last sunk below the permanent ground-water table, it becomes a permanent stream that is no longer dependent directly upon rainfall. Since a valley ordinarily works headward, its lower and older course is likely to have a permanent stream, while the younger and upper parts are occupied by a temporary stream.

Other types of valleys are those that develop from the outflow of lakes; still others, which are formed as a result of the downfolding of rocks into structural depressions, are known as *structural valleys.* No matter how the valley has been formed, its size is somewhat limited by that of adjacent valleys. Some streams, however, are able to grow more rapidly than others, and thus they enlarge their drainage system by *capturing* parts of other rivers. Such streams are known as *pirates.*

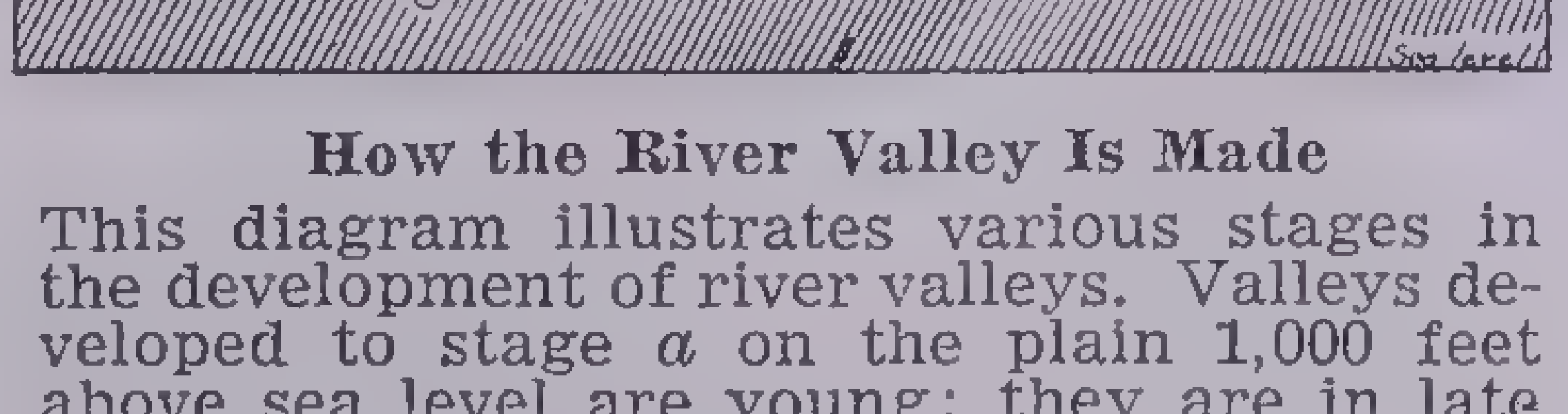
The topography of an area being eroded is constantly changing. At first the running water roughens the surface by cutting out valleys, leaving ridges and hills between; but later the hills and ridges are reduced by erosion to the level of the valley bottoms. The plain that begins to be before the hills are completely eroded is called a *peneplain* (almost plain), and the elevations that rise above its general surface are known as *monadnocks,* a name derived from Mt. Monadnock in New Hampshire, which rises from this sort of plain. When these rounded hills have been completely subdued, the resulting plain is called a *base level.* The time necessary to produce this condition is called a *cycle of erosion.*

Courtesy U. S. Soil Conservation Service

A Few Years Ago Crops Grew Here

Through carelessness erosion gullies were allowed to form; now the land is worthless

Just as the face of a man shows different and characteristic expressions in youth, maturity and old age, so river valleys have diverse but easily recognizable physiographic expressions at different stages of their development. The cycle has its inception at the beginning of valley development, when drainage is in its infancy, and the infant valley is a ravine or gully. The valley becomes deeper, longer and somewhat widened and passes into the *youthful* stage. In this stage of development the valleys are relatively deep, the divides between them are relatively broad, and the streams are swift; they erode their bottoms rather than their sides, and their courses are marked by rapids and falls. As the valleys are deepened toward base level, the streams' power to cut vertically is greatly diminished, and they begin to widen their valleys and increase their number of tributaries. The country is reduced largely to slopes and only a little of the original upland surface remains. In this condition both the drainage and the topography are said to be *mature.* As the erosion processes are continued, the gradient (slope) of all the valleys becomes less, the valleys grow wider, the hills and ridges are lowered, the divides become low and indistinct and the streams wind back and forth across swampy flood plains—a course called *meandering* (from the river Meander in Phrygia, famous for its winding course). Such valleys are described as *old,* and the country adjacent to their courses is also in topographic old age.



How the River Valley Is Made

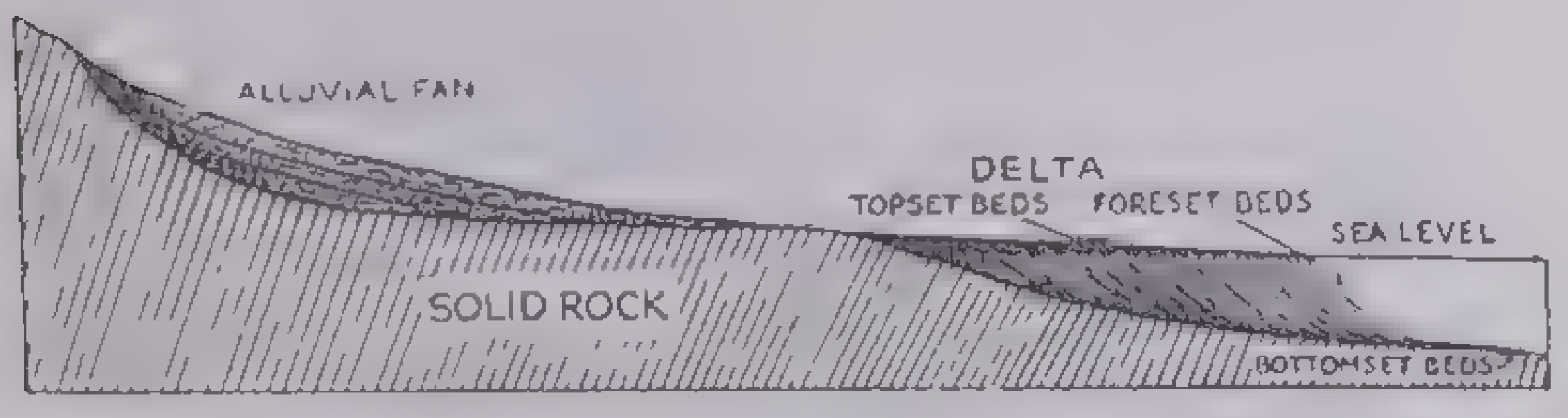
This diagram illustrates various stages in the development of river valleys. Valleys developed to stage *a* on the plain 1,000 feet above sea level are young; they are in late youth at stage *b*; early maturity at *c*; maturity at stage *d*; late maturity at *e*; early old age at stage *f*, and old age at stage *g*. They cannot cut much lower than *g* because the grade from *g* to sea level is needed to keep them flowing seaward

Erosion is a group term applied to all processes by which soil and rock are loosened or carried from one place to another. The important subprocesses are weathering, transportation, corrasion and corrosion. *Weathering* is the term applied to all processes that loosen or change the exposed surface of rocks. *Transportation* is that process by which the products of weathering are moved—wind, water or ice. *Corrasion* is the mechanical wear effected by the weathered material while it is being transported: scraping of stream bed or banks by sand or stones; wear of rock by wind-blown sand or scooping out a channel by rocks carried in a glacier. *Corrosion* is the chemical effect of streams in dissolving soluble materials. These various processes are affected by the climate, by the gradient of the streams, by the physical and chemical character of the rocks over which the streams flow and by the structure or attitude of the rocks.

Because of the various conditions affecting erosion many diverse surface forms result from stream action. Badland topography is developed in the early stages of maturity in highlands where the rocks are slightly and unequally resistant, and where the rainfall is limited to a few heavy showers during the year. Deep, narrow valleys most commonly result during the youthful stages of erosion of high, arid lands and are called *canyons.* Small, narrow canyons or their straight-walled, deeper portions are sometimes called *gorges.* Inequalities of hardness in the rocks of a stream valley result in *rapids* where the water flows very swiftly, or in *falls* where the water actually plunges over rock ledges. Similarly *rock* *terraces* occur along the side of a valley where hard layers of rock alternate with softer ones. In such cases the valley walls are steep at and below the hard rocks but gently sloping where the softer beds occur. *Narrows* or *water gaps* are notable constrictions of a stream's valley wall that occur where the stream crosses highly inclined beds of unequal hardness.

Many other topographic features result from the erosion of rocks of unequal hardness some distance from the stream course itself. *Plateaus* are relatively high-standing regions of considerable summit area. *Buttes* and *mesas* are smaller features of the same type, and *hogbacks* are linear ridges that result from the weathering of tilted layers of unequal hardness.

As stream courses develop from gullies to valleys they tend to become *adjusted* to the underlying rock structure. The processes of adjustment continue until the streams flow as much as possible on the weaker rocks, and consequently the more resistant strata tend to become *divides.* At base level, however, even the divides have been reduced. The old-age streams meandering across base-leveled plains may be *rejuvenated* by the general uplift of the land. Because of the uplift, the stream's gradient is increased, it again assumes youthful features, and a new cycle of erosion is begun. If the stream is able to maintain its course in spite of the uplift the meanders become *incised* and the stream is said to be *antecedent.* New streams originating as a consequence of the uplift are defined as *consequent.* In some instances the river system may be depressed in relation to sea level and the lower course become *drowned,* as in the case of the Chesapeake Bay area. A stream may also be checked by an upwarping of strata across its course, in which case the river is said to be *ponded* above the point of uplift.



Deposits Made by Running Water

Diagram showing deposits made by running water upon the land and in the water. Note that the material of the fan is coarsest toward the source of supply. Note also that as the delta is built out to sea the landward portion becomes elevated

Constructive Work.—Rivers, in carrying mud, sand and gravel to the sea in their constant attempt to degrade the land surface to base level, are often forced to drop their sediment upon the land, perhaps to carry it on again when conditions are more favorable to transportation. Water drops its load generally because its current has lost velocity. The deposition is sudden when the stream passes from a steep slope to a gentle one, or when it flows into a body of standing water; it is slow when a stream gradient decreases gradually.

Deposition by running water takes place chiefly at bases of steep slopes, in valley bottoms and at river mouths. At the bases of steep slopes temporary streams are suddenly checked, and they deposit their heavy loads of debris in the form of partial cones, known as *alluvial cones. Alluvial fans* are similar deposits with lower angles of slope. The fans built by adjacent streams may spread laterally until they merge to form a *compound* alluvial fan or *piedmont* alluvial plain. Such plains parallel the bases of most great mountain ranges.

As a stream descends its valley its gradient gradually is reduced, so that with diminished velocity it abandons part of its load. The sediment so deposited is left in the channel of the stream at low water, but it is spread over the flood plains at high water, building them into alluvial plains. As streams grow older, they tend to develop larger and larger alluvial plains. In times of flood the water, overflowing the normal channel, has its current checked as it moves out on the flood plain. For this reason sediment is deposited along the banks of the stream in the form of raised banks or *natural levees.* A stream in flood builds up its alluvial plain while eroding its channel, but when the water is low it again fills in its bed. This alternation of erosion and deposition in the stream bed is known as *scour-and-fill.* A stream with an alluvial plain generally meanders, that is, it has a very crooked, winding course. This is the result of low velocity, which permits the stream to be turned aside easily. The stream tends to cut its banks where they are least resistant; and once a curve of the bank is started it is increased by the current directed into it. As the current issues from this curve it is deflected so that it impinges against the opposite bank a little farther downstream. In this fashion a series of sinuous curves are developed so that the stream wriggles in snakelike fashion across its alluvial plain. In many cases the meanders become so pronounced that *U-shaped bends* are formed. During flood stage the stream may cut off a meander and temporarily straighten its course. In such cases the abandoned channel becomes a crescentlike lake known as an *oxbow lake.* Lakes of this type are common along such old streams as the Mississippi and its larger tributaries.

At the point where a stream empties into a lake or sea the velocity is promptly checked and its load is dropped. At such places, if strong waves or currents do not sweep the sediment away, *deltas* are formed, so called from their triangular shape, like the Greek letter delta (Δ). A delta has many features in common with an alluvial fan, but in the delta formation the current is checked more completely than in building a fan, and the initial deposition is beneath water rather than on the land. As the delta grows, it is built up to or even above the water level. Many large streams have built deltas of great size, of which those of the Mississippi, the Nile and the Hwang Ho rivers are perhaps best known. The united delta of the Ganges and the Brahmaputra has an area of 32,000 square miles above water; that of the relatively small river Po has been extended 14 miles from Adria, which was formerly a seaport; and the Rhone River is adding about 50 feet a year to its delta front.

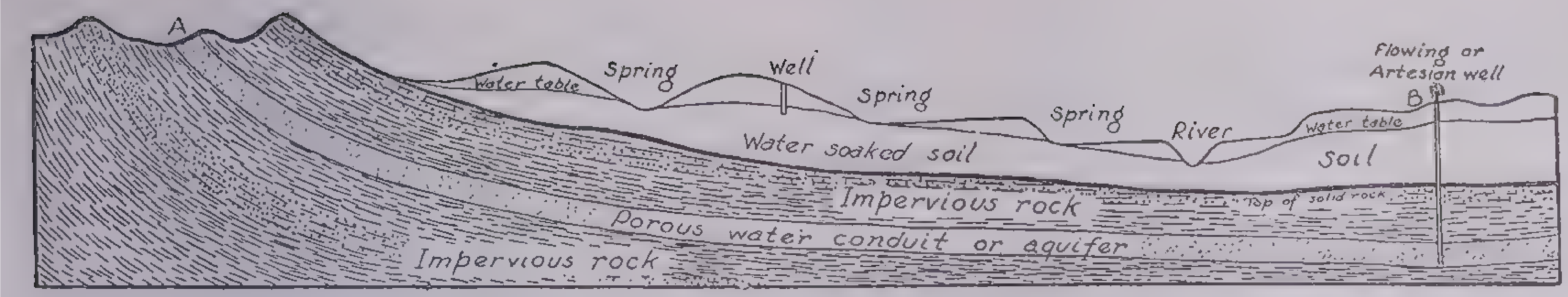
Work of Underground Water.—Of the water that falls as rain or snow, one portion is carried to the sea by rivers, another portion is evaporated and goes back into the air, but a third portion sinks into the soil and the fractured bedrock beneath and is known as *ground water.* This water fills the fissures in the rock and the pores of the soil up to a certain level whose surface is described as the *ground-water table.* This table is lowered in dry weather and raised during the rainy season; it is near the surface in humid areas and far beneath it in deserts. The surface of the ground-water table in general conforms to the topographic irregularities of the land but does not rise so high under hills nor fall so low under the valleys. Where the water table and the land surface intersect, springs, swamps, lakes or rivers occur. Wells also yield water because they have been dug deep enough to penetrate the water table. When they go dry the water table has been lowered below the bottom of the well.

Where water enters an inclined porous layer of rock that is enclosed between impervious layers, it may move down the slope, as in a conduit, until a considerable column of water is behind it, and great hydrostatic pressure is generated. Consequently wells drilled in such a position as to tap the porous layer give release to the pressure; and the water so obtained may be forced high in the air. Such flowing wells are called *artesian wells.*

Ground water takes substances into solution, transports them and frequently deposits them; and thus it is an important geologic agent. Chemical denudation or the wearing away of land by solution is most effective in limestone areas, but is important in all humid regions. It is estimated that, as a result of this type of erosion or corrosion, North America supplies to the sea yearly 474,000,000 tons of material in solution.

In limestone areas the ground water enlarges natural fissures by solution until they become distinct underground channels. The latter further enlarge to form *caves* or *caverns.* The openings leading downward into these caves are termed *sink holes.* The underground waters may deposit some of the materials carried in solution on the roofs or floors of caves. Those iciclelike pendants that hang from the roof are known as *stalactites,* whereas those that grow upward from the floor are termed *stalagmites.* Deposition in caves commonly results in formations of grotesque form and bizarre beauty.

Work of Ice and Snow.—*Nonglacial Ice.* The freezing of water in crevices of rock tends to disrupt the rock by ice-wedge work, and the expansion of water in soil as it freezes also produces a variety of effects. On slopes it causes a slow downward *creep* of rocks and soil, and, together with the



Conditions Necessary for an Artesian Well

Cross section to show conditions required for artesian wells. Water enters the porous sandstone stratum at A, is held between the two impervious layers and develops hydrostatic pressure that is released by the well drilled at B. The water table is shown in the soil above the bedrock

work of ground water, it is instrumental in moving masses of broken rocks in *landslides* and *rock glaciers.* In streams that freeze, the ice becomes cemented together with gravel and soil that are transported when the ice breaks up in the spring. The ice of lakes modifies their shores by the thrust that it exerts upon expansion. The ice that fits the lake perfectly when first frozen contracts under very low temperatures, and cracks form. Water welling upward into the cracks is frozen and the ice again fits the lake. With the return of warmer weather, however, the ice expands and exerts an enormous pressure. By this means loose material along the shore is pushed up into walls known as *ice ramparts.*

Glacial Ice.—There are places on all continents except Australia where the annual fall of snow is not completely dispersed each year by evaporation and melting. These perpetual snow fields occur only on the tops of lofty mountains in the Tropical Zone; they occur on much lower mountains in the Temperate Zone, and in the Arctic Region they approach sea level. Thus from equator to poles there is a descending line above which snow lies all the year, and consequently this line is called the *snow line.* In the snow fields the snow becomes compacted by the weight of the various annual layers and in its lower layers is altered from its original loose, feathery condition to a coarse granular material known as *nevé,* which is partly the result of alternate freezing and thawing at the surface.

On a slope, particularly in warmer weather, the nevé begins to move—this is the beginning of the *glacier.* The ice slowly flows down the valley. At the place where this forward motion of the glacier is balanced by its melting there issues a river that carries off the water.

The ice fields of the world are divided into three great classes: (1) valley or Alpine glaciers, (2) piedmont glaciers and (3) continental glaciers or icecaps. Valley glaciers are typical of all mountain regions that rise above the snow line. Like rivers they may have tributaries; all have catchment basins for gathering the snow; all are confined to valleys and all move down slope; and usually they are replaced by rivers at their lower ends. Valley glaciers are so common in the Alps that they sometimes are termed the *Alpine* type of glacier.

When a number of valley glaciers descend out of the mountains to nearly flat land, they may give rise to a large body of nearly stagnant ice. Such ice fields or piedmont glaciers are confined to high latitudes and are uncommon. Continental glaciers are icecaps of vast extent. They may be regarded as oceans of ice compared to the rivers and lakes of ice in the valley and piedmont glaciers, respectively. The present Greenland icecap covers an area of about 720,000 square miles, and the Antarctic icecap is nearly 5,000,000 square miles in extent. That even greater ice sheets existed in the geologic past is indicated by the record of the geologic work that they performed over much of northern North America and Europe.

A number of theories have been advanced to account for glacial motion, but the most probable explanation seems to be that by melting and refreezing under pressure and by movement along gliding planes in the ice itself the granules change position, and thus the ice undergoes a slow flowage that is like the motion of a viscous body. The surface of a glacier is traversed by wide, deep cracks known as *marginal, longitudinal* and *tranverse crevasses.* It is also covered in places by heaps of earth and stone called *moraines,* which are classified as: *ground* moraines, if they are under the ice and away from its edges; *lateral,* if they are at the sides of the glacier; *medial,* when they are at the center, especially when two glaciers meet; and *terminal,* at the end of a glacier.

The glacier in its movement acts as a monstrous rasp, for frozen into its base are many boulders and sharp angular fragments of rock. These are its cutting tools, and they constantly grind away the bedrock on which it moves. This bedrock soon becomes smoothed and polished but marked also by grooves called *glacial striae,* which run in the direction of glacial movement. These and other characteristic erosional features may remain after the glacier has melted away, and they attest to the fact that the area in which they are found has been *glaciated.*

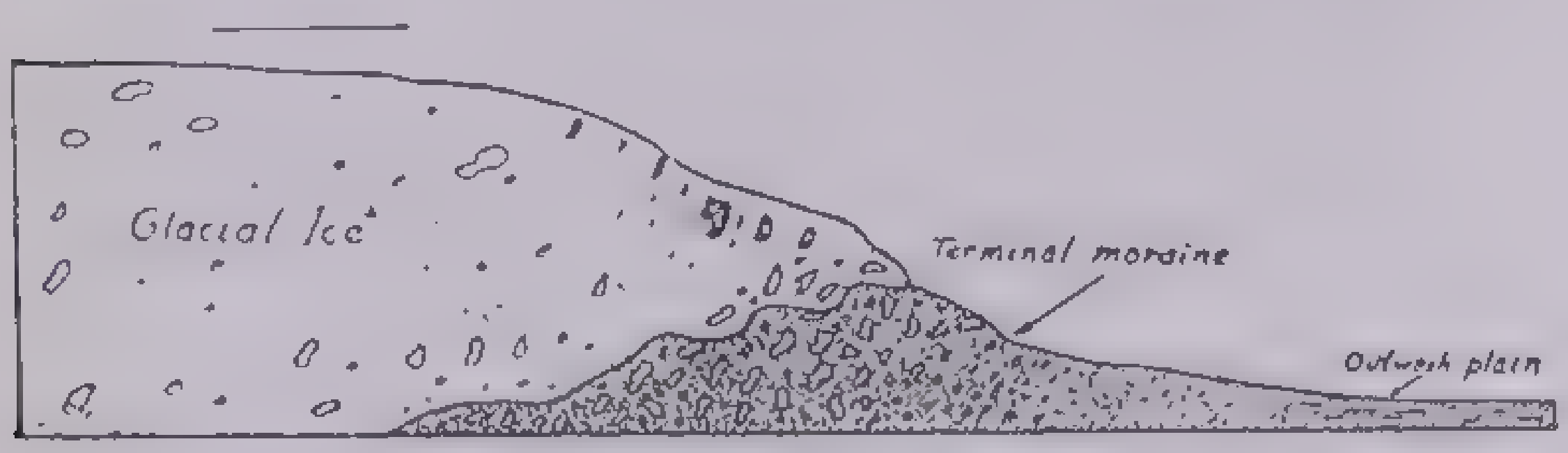
Glaciers erode in their upper courses, and the material incorporated into the ice there is finally deposited at the point of their melting. Unlike water-laid sediments these deposits are unstratified. They are composed of a heterogeneous mixture of the smoothed, striated and faceted boulders that have taken part in the erosion work of the glacier, and of those that, having ridden on the surface of the glacier, are still rough and angular. This morainic material, which is not only heterogeneous as to size of material and degree of rounding or of faceting but as to type of rock as well, is called *glacial till* or *boulder clay.* Great blocks of rock that differ markedly in composition from the bedrock on which they rest have evidently been transported by ice and are known as *glacial boulders* or *erratics.* In many cases they are as large as a small house.

The deposits of a continental glacier are more extended than those of valley glaciers. They form well-defined terminal and ground moraines, but no well-marked lateral or medial deposits. The materials left behind after the melting of continental sheets are called *glacial drift.* The drift may characterized by *drumlins,* which are

Oblique aerial photo by U. S. Navy Department

Taku Glacier, Tongass National Forest, Alaska

narrow, rounded hills of unstratified material whose longer axes point in the direction of the ice movement; by *kames,* which are hills, knobs or short ridges made of stratified material lying athwart the direction of ice movement; by *eskers,* which are long sinuous ridges of stratified sands and gravels trending in the general direction of the ice flow; or by *outwash plains* that represent the materials carried away from the ice front by streams generated by the melting ice.



At the Glacier's Edge

Diagram showing the deposition of material at the melting edge of a glacier. The ice front remains stationary when melting just balances the rate at which ice particles advance. Thus as the ice moves toward the right in the diagram, material frozen into the ice is brought to the melting edge and dropped there to form a terminal moraine. The water flowing away from the ice builds up an outwash plain

Oceans.—The oceans cover nearly three-fourths of the globe, and their average depth is about 2½ miles. In spite of their great depth and tremendous extent, however, they are in reality a mere film on the face of the earth. If a sphere 3 feet in diameter representing the earth were dipped in water and withdrawn, the wet film adhering to its surface would correctly depict the oceanic depth. The oceans have overflowed the oceanic basins and have inundated the *continental shelves.* The parts of the ocean resting on these continental platforms are called *epicontinental* seas, and they have a total extent of about 10,000,000 square miles.

The ocean is not only an important regulator of climate, but it is also a geologic agent of the first rank. Its geologic work depends upon its movements that may be divided into three classes: *ocean currents, tides* and *waves.*

The unequal heating of the ocean by the sun in tropical and polar regions establishes a slow general circulation of water by convection *currents.* This circulation is increased and modified by prevailing winds and by the configuration of land and sea. The best-known current is the Gulf Stream.

The *tide* is a huge uplift or wave of the ocean caused by the attraction of the moon, and, to a lesser degree, of the sun. Were there no continents it would pass around the earth in about 24 hours, but the interval between tides is actually 12 hours and 26 minutes. This is the reason why the time of high and low tides progressively changes from day to day. The tide rises highest in narrow bays and estuaries, where the difference between high and low tides may be as much as 50 feet. On exposed headlands the difference is commonly only a few feet, and the tides are not noticed on the open ocean.

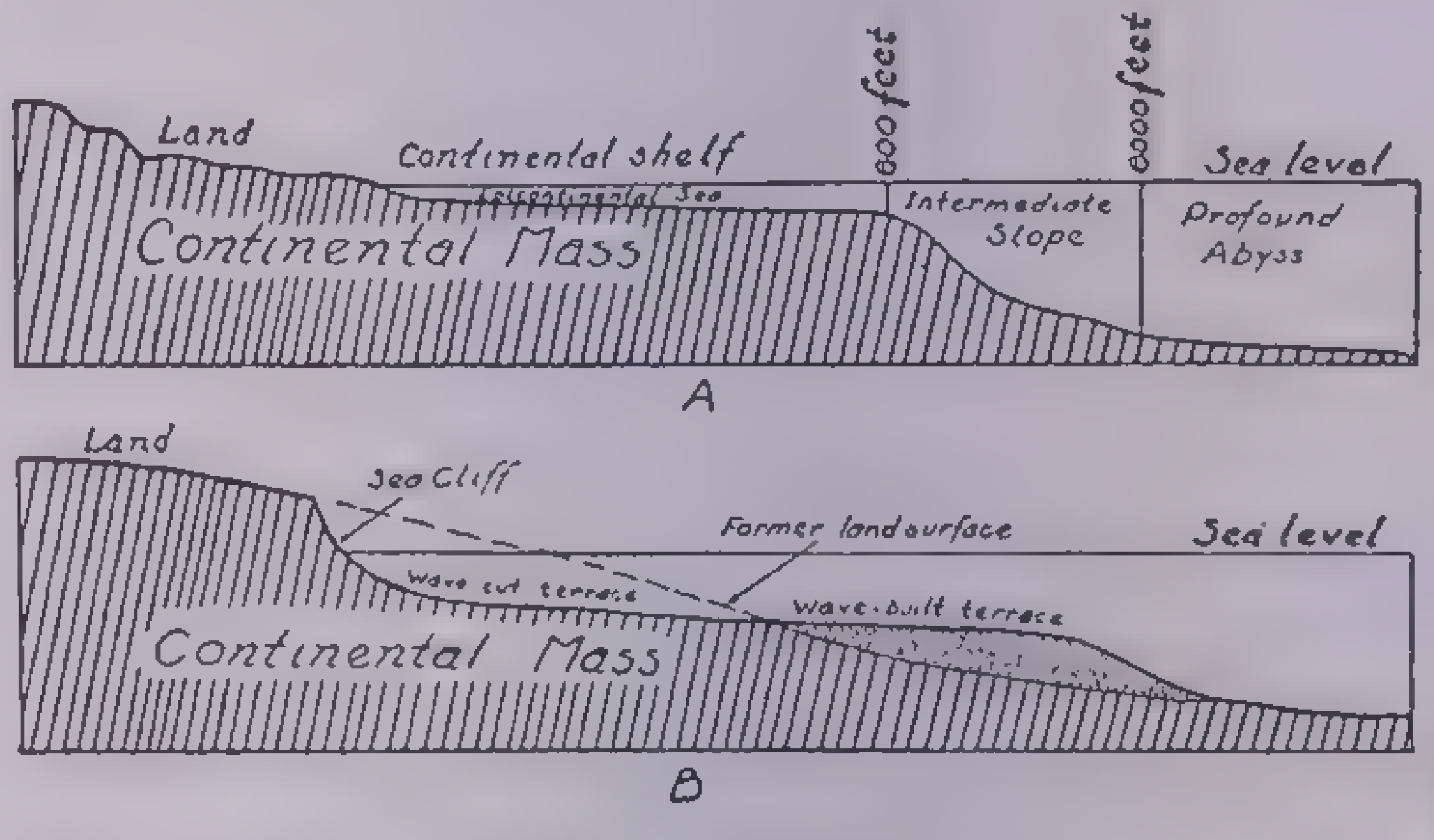
Waves are due to the force of the wind, which makes the water particles move in circles and thus generate the wave form that advances, though the water itself ordinarily does not. Near shores, however, there is insufficient water to complete the wave form and as a result the tops of waves collapse with a strong forward motion. This results in *breakers* or *surf.*

The surface of the ocean is an ever-moving, horizontal saw that is eternally cutting all shores. Sea water has a solvent action on most rocks, thus aiding the more important work of currents, tides and waves, which is largely mechanical. The chief eroding action results from grinding effected by dislodged sand, gravel and boulders that act as the tools of the moving water. In the erosive process the tools themselves become rounded and reduced in size. The resulting material is carried away from the shore line by *undertow* and by tidal and shore currents; and thus it is prevented from serving as a buffer of loose material that would protect the shore. The effective erosion by waves is confined to a narrow zone. Where the sea is cutting its shore back into higher land, the seashore is marked by a cliff. Beneath the cliff is an area of shallow water that marks the lower limit of wave action, and is known as the *shore platform* or *wave-cut terrace.* The terrace is slowly lowered seaward to a point where the depth prevents further erosion. Here the materials eroded from the shoreward edge of the platform accumulate and form deposits known as *wave-built terraces.*

Shallow water deposits are confined to the continental shelves. The *beach* is the familiar edge zone of seas that consists of material being worked over and ground up by the waves. The sediments of a beach commonly are coarsest at the landward edge and become finer toward the sea. If the continental shelf slopes very gradually breakers may form relatively far out to sea, and the waves in such cases pick up sediment from the bottom and move it shoreward. The undertow, however, tends to move the material back again, and hence there is built up a long, narrow bar parallel to the general trend of the coast. Such bars may grow until they are above sea level and are known as *barriers.* Between the barrier and the mainland lies a body of water that is called a *lagoon* if small or a *sound* if large. Shore currents commonly sweep materials across the mouths of indentations of the coast and build the sediment up in the form of an embankment that may eventually become land. Such embankments with free ends are called *spits,* whereas those that close or nearly close the indentation are known as *bars.* Tidal currents sweeping in and out of the *bay* behind the bar generally prevent complete closure by maintaining an *inlet.*

The rivers bringing sediment to the sea deposit it near their mouths where part of it is reworked and mixed with the material obtained by the erosion of the shore. It thus happens that the continental shelf is continually receiving sediments that are deposited in definite layers or *stratified.* These sediments may have mixed with them the remains of plants and animals that lived in the shallow waters or were swept out to sea by the rivers. In general the coarse-grained sediments are found near the coast, and finer and finer deposits farther out to sea. Thus sands and gravels commonly are being deposited near the shore, fine-grained muds farther out in quieter waters, and still farther seaward limy oozes are being laid down.

The ocean bottom beyond the edge of the continental shelf and down to a depth of 6,000 feet is called the *intermediate slope.* It may be considered as the side or wall of the true ocean basin. The deposits are chiefly the very finest of the land sediments or *blue* and *green* muds. The *profound abyss* comprises all the ocean bottom below the 6,000-foot line. Over most of this floor, land-derived sediments are wanting, but deep-sea sounding has determined that it is covered with peculiar fine, soft deposits called *oozes.* These oozes are volcanic, organic or cosmic in origin.



Shore Processes

A. diagram showing relation of continental mass to oceanic basin and epicontinental sea. B. diagram representing the cliff resulting from the sea advancing on a greatly sloping coast. The material eroded from the cliff base is moved seaward and deposited on the outer edge of the wave-built terrace

Lakes and Interior Drainage.—Lakes are enclosed bodies of water with little or no current. They are generally fresh but a few are salt. They have their origin in structural depressions, in rock basins that have been formed by glacial or volcanic action or behind natural dams that have been formed across drainage channels. Glaciers are perhaps responsible for most lakes, as is indicated by the fact that lakes are far more numerous in glaciated than in unglaciated areas. From the geologic standpoint all lakes are only temporary. This is true because all rivers that feed lakes tend to fill them with sediment; whereas all streams flowing out of lakes tend to deepen their channels upstream and thus in time completely drain the lakes.

Rivers that end not in the sea but through evaporation in interior basins are called *interior drainages.* In such drainages the salts carried by the streams constantly accumulate at the point where drainage ends. This place may be called a *salina* or salt marsh if it is swampy, or a *salt lake* if it is a permanent body of water. Salinas are common in desert areas, and many examples of salt lakes, such as the Dead Sea and Great Salt Lake, are known. Salinas and salt lakes are important economically, for many valuable alkaline salts may be concentrated in them.

The erosive and depositional work of lakes is essentially similar to that of the ocean previously described.

Deserts.—The importance of water as a geological factor is made specially evident by a study of the parts of the earth where there is little or no precipitation of rain or snow, practically no lakes, rivers or streams and no influence of oceans. These arid or abnormally dry spots are *deserts,* the parts of the earth's surface that cannot produce enough vegetation to support a human population or even a varied animal population. In their geologic past they were well watered: the Sahara was in great part an inland sea or epicontinental ocean.

Deserts are sometimes sand, sometimes rock. Even the Sahara is largely rock in certain parts. The absence of the stabilizing influence of moisture creates differences of 60° to 80° F. between day and night temperatures. Glaring sun in the day and the sudden drop in temperature at night produce rock disintegration. Granite mountains in the deserts of Turkestan are crumbling to something like soft sandstone and actually to sand itself. Bits of granite from the pyramids of Egypt are often so affected by desert climate that they can be crumbled by hand into small crystals.

The wind is the desert's great geological factor. It can work there as nowhere else since the soil is not bound by moisture or by vegetation and since the direction of the wind is almost always the same. Winds cut rock surfaces in the desert more than in damper climate.

The economic geology of deserts is definitely due to the fact that they once had water and now have it no longer. Salt deposits are always evidence of aridity and desert conditions at the time the salt was deposited. Salt lakes are found only in arid, almost desert regions. Some of these saline lakes were originally fresh water; for example, the Great Salt Lake is a small part of a prehistoric fresh lake that shrank when rainfall grew less and evaporation increased; then the lake became first brackish and later very bitter. Salton Sea in southern California was originally the head of the Gulf of California; now it is a sink hole occasionally flooded by the Colorado River.

Gypsum, soda and borax are other valuable deposits from saline lakes in desert regions. The main supply of borax is the prehistoric Borax Lake in Death Valley, California. Desert floors that were once the beds of inland seas are often rich in the tiny skeletons or silicified cell walls of diatoms, little fresh-water one-celled seaweeds called infusoria; this infusorial earth is useful in cleansing powders, abrasives and the manufacture of dynamite.

Geologic Work of Organisms.—Traces and remains of organic matter are found in these infusorial earths. Limestone and chalk owe their calcium carbonate to organic remains from the seas of geologic time—shells, corals, seaweeds. Shell marl is a soft rock formed from fresh-water shells. Fossils—shells, body cases, skeletons and imprints of animals—in sedimentary rocks give a clue to the history, chronology and evolution of the earth. Besides, animal and vegetable life continue to play an important part in geology today, for they are now present over much of the surface of the land and throughout much of the sea. In many cases these organisms tend to destroy existing structures; in others they build new ones; and in still others they protect existing structures from the action of other agencies. The most important protective effect is that of vegetation in hindering erosion of the soil either by wind or running water.

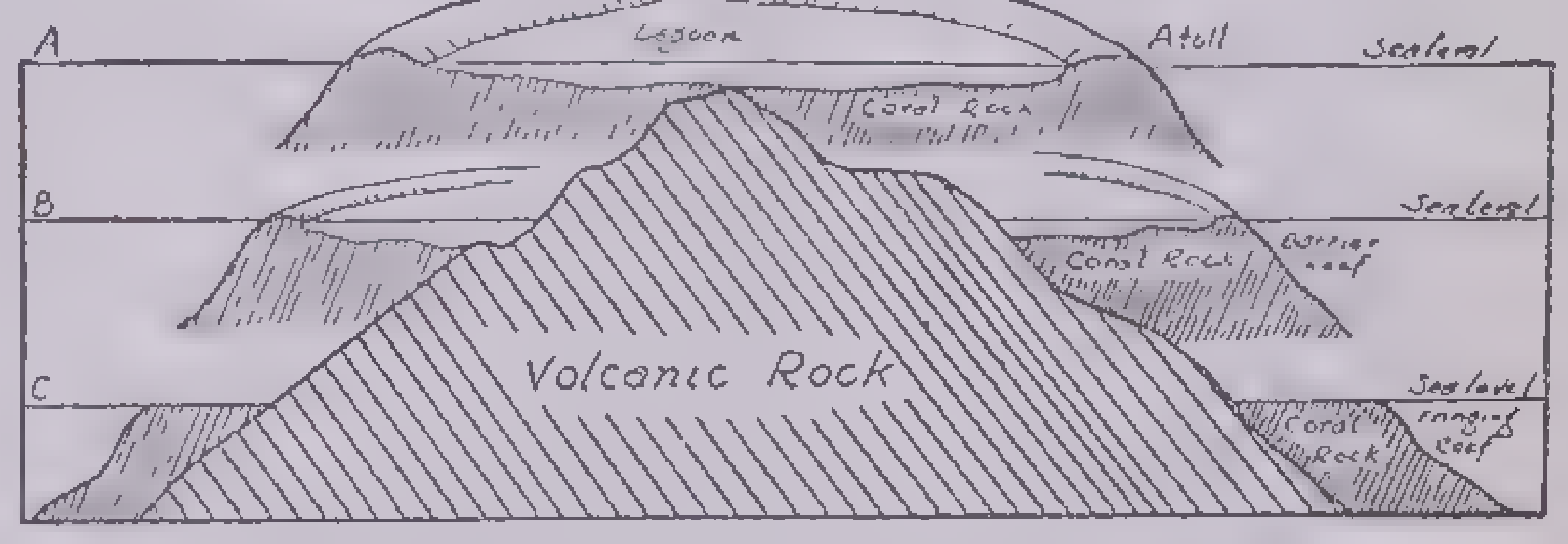
Vegetation acts in a mechanical way to destroy existing structures, as is seen in the splitting and disintegration of rocks by the roots of trees and other plants. The plants also play an important role in chemical weathering, for they aid in the formation of the carbonic acid and acids of the humus that tend to reduce rocks to soil. Animals are less destructive than plants, but even such insignificant creatures as earthworms and ants aid the process of weathering by making holes and burrows and by bringing fresh material to the surface. The animal that has most effected geological changes probably is man, who by cutting down forests has greatly increased the rate of erosion over large areas and by his great engineering projects has reversed entire drainage systems; for example, the Chicago River.

The constructive work of plants is best exemplified in the formation of peat bogs. *Peat* is brown to black carbonaceous material formed by the partial decay of vegetable material under a protective covering of water. In the growth of a plant the carbon dioxide of the air is decomposed, the carbon is utilized by the plant, and the oxygen is largely returned to the atmosphere. In addition plants use the oxygen and hydrogen of water and certain mineral compounds of the soil. The framework of plants is largely cellulose, $C_6H_{10}O_5$; and for simplicity we may regard cellulose as forming the organic matter of plants. If cellulose is burned in air, complete oxidation takes place with the formation of carbon dioxide and water vapor. If the air supply is limited, as it is in burning wood in kilns, the oxidation is incomplete, and a greater part of the carbon remains behind as *charcoal.* Similar though much slower processes take place in nature. The woody material of dead plants slowly oxidizes or decays and the component parts are returned to the air and soil. If the decay takes place under water, however, as it does when plants grow in water or fall into it after death, the oxidation is incomplete. In this case the partly decayed material is rich in carbon and forms the carbonaceous substance that is called *peat.*

Peat is forming today, just as it has formed through the long geologic past, in small lakes, ponds, lagoons and marine marshes. Peat is the first stage in the formation of coal, which results from the slow compacting of the peat, as a result not only of the weight of sediment put down over the organic material but also of slow chemical processes. They cause the further oxidization or escape of gases from the organic material and leave the residue richer and richer in carbon.

The constructive work of animals has resulted in enormous deposits. Most of these have been built by marine organisms that extract calcium carbonate from the water in which they live, build their skeletons of it and leave the skeletons in these deposits.

Of all these animals the most interesting, perhaps, are the corals, lowly marine animals that secrete a stony base of calcium carbonate to support their filmy bodies. Although very small, they live together in colonies made up of countless individuals. The most important of the corals, geologically speaking, are the *reef-builders.* This type is common today in warm, clear, shallow seas, and they were abundant in the past apparently in a similar habitat.



Formation of Reefs and Atolls

Sections showing the successive formation of a fringing reef, a barrier reef and an atoll during the relative elevation of sea level from C through B to A

Corals grow upward and spread laterally as one generation builds upon the bases of their dead ancestors. Many other animals living among the corals also have their skeletons incorporated into the constantly accumulating material. Calcium carbonate, deposited out of the warm sea water, cements the fragments together and eventually the deposit becomes a solid white limestone upon whose upper surface the corals flourish. This surface rises until it is just below the level of low tide and forms the *coral reef.* These reefs include the fringing reefs, barrier reefs and atolls.

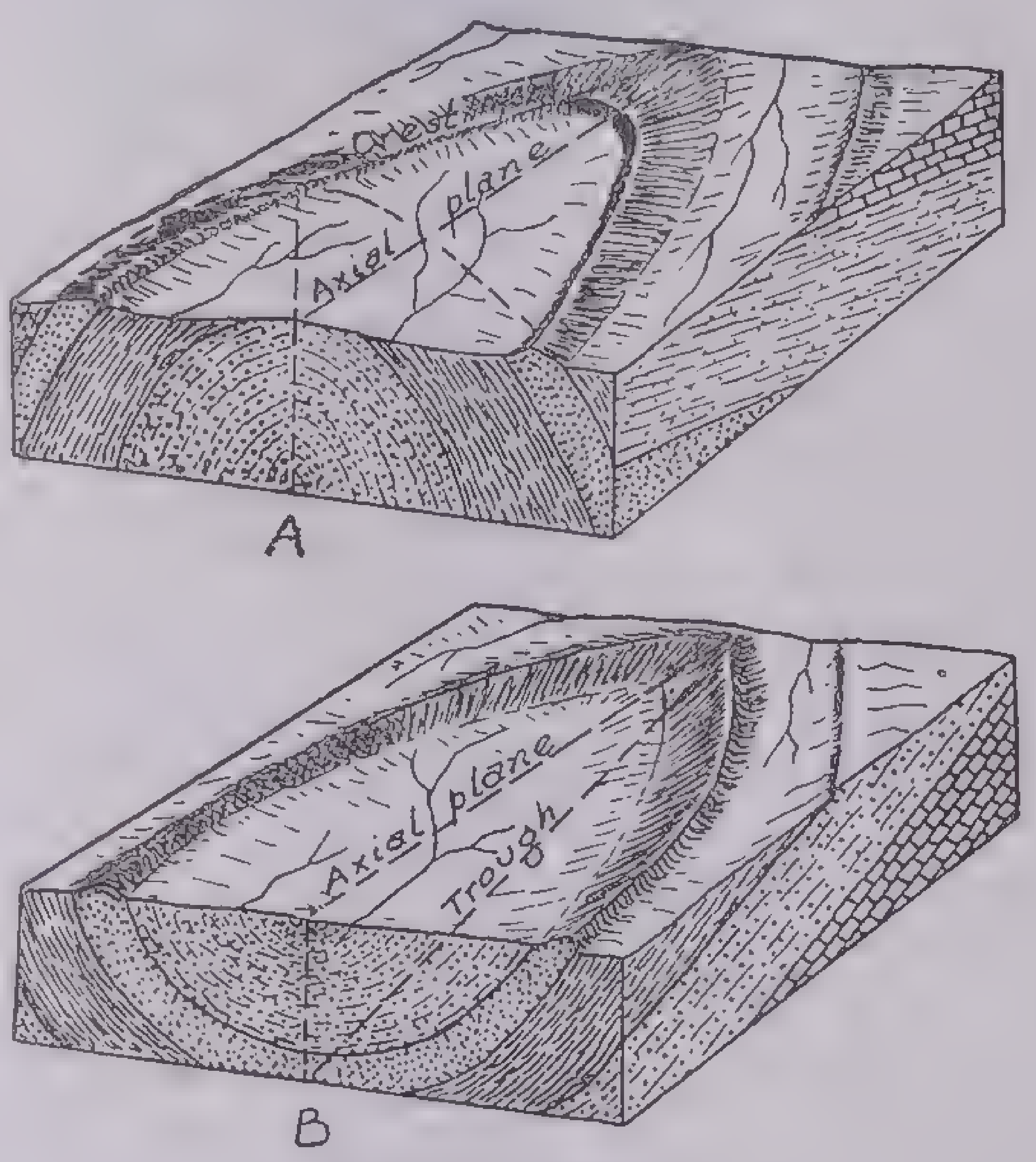
Corals growing in shallow water at the edge of existing land gradually build up a platform to sea level, which, since it fringes the older land, is called a *fringing reef. Barrier reefs* are similar to the fringing type but are located some distance from the land and are separated from it by a lagoon of varying width. These lagoons commonly serve as good harbors, though in many cases they are too shallow for large ships. *Atolls,* like many barriers, are more or less circular, ringlike reefs, but they are without any central land mass, and they inclose a shallow lagoon. Many reefs of the atoll type apparently have been formed by the subsidence of the volcanic island around whose shore they originated. Chalk, limestone, coquina and phosphate rock also are in large part of organic origin.

Materials of the Earth's Crust.—When rock waste is carried by any transporting agent, it becomes *sediment.* Most of the transporting agents, except ice, have the power of *sorting* this sediment because changes in the velocity of the agent are directly reflected in its ability to move various types of material. It thus happens that two layers of material may be separated by a distinct junction plane, known as the *bedding plane,* on either side of which they differ in texture or composition. Such bedding is called *stratification;* the rocks so bedded are said to be *stratified,* and stratified rocks are of the *sedimentary* type.

The most common sediments are gravel, sand and mud. These may be deposited upon the land, in which case they are *continental;* they may be deposited on the beach and are then called *littoral;* or they may fall to the ocean floor beyond the strand line and are said to be *marine.* After the sediment is laid down, it generally is cemented into solid rock by the deposition of mineral matter held in solution in water. The cemented gravel is called *conglomerate* or *puddingstone* if the fragments are rounded and large; *grit* if they are very rounded and very small; and *breccia* if they are angular. Cemented sand is called *sandstone.* Cemented mud is known as *shale.* These are common sedimentary rocks, and they are said to be *clastic* (fragmentary) since they are made of particles derived from other rocks. Limestone that is broken up, redeposited and recemented also is clastic. Many sedimentary rocks are not clastic. Some, including most limestones, are formed by chemical precipitation or more commonly by the cementation of organic remains. Some, such as salt and gypsum, are entirely the result of precipitation from saturated solutions. The principal classes of sedimentary rocks are:

Clastic	Mechanically formed	Gravel, conglomerates, breccia Arenaceous rocks—sand, sandstone, arkose Argillaceous rocks—clay, shale Some limestones
Non-clastic	Chemically formed	Some carbonate rocks—some limestones, travertine, siderite Chlorite rocks—rock salt Sulphate rocks—gypsum Some siliceous rocks—some flint, some chert
	Organically formed	Calcareous rock—many limestones Carbonaceous rocks—coal, peat Siliceous rocks—siliceous oozes

Most sedimentary rocks are stratified, but glacial till and some conglomerates are not. The term *stratum* is commonly applied to a single layer; and *formation,* to a set of layers or strata of similar nature and considerable extent. Sedimentary rocks, especially shales, are in many cases very thinly bedded and are said to be *laminated.* Many of these sedimentary rocks are marked by cross-bedding, mud cracks, ripple marks and raindrop impressions, as sediments deposited today are marked. Many of the rocks of the earth have had their original positions altered by crustal movements, but these alterations are recorded best in sedimentary rocks since they are definitely layered. The *dip* of a rock stratum is its inclination when referred to a horizontal plane, and its *strike* is the trend or direction of its horizontal edge at right angles to the dip. Where beds dip in a single direction they form a *monocline.* Where they are arched upward into a fold, they form an *anticline,* and where they are downfolded, they form a *syncline.* As they are found in nature, many folds are rather completely eroded, but their character may still be determined by a study of their dips and strikes.



Results of Erosion

A. Block diagram showing features resulting from erosion of a symmetrical anticline. B. Block diagram to show features resulting from the erosion of a symmetrical syncline

Sedimentary rocks are spread over a large part of the earth's surface, but their thickness, though locally measurable in thousands of feet, is relatively slight; and they may be thought of as constituting a veneer over the igneous or metamorphic rocks on which they rest.

Igneous rocks are the products of vulcanism; they are older than the sedimentary rocks and are usually the source of the material from which the sedimentary rocks have been made. The fiery mass of the igneous rocks before they consolidated and while they were still molten and fused is called *magma* from a Greek word meaning dough or paste. Because the various types tend to mingle and run into each other, they are difficult to classify; but on the basis of chemical composition they may be divided into acid and basic rocks. The *acid* rocks are rich in silica and poor in iron, lime and magnesia; they are generally light in color, fuse only at high temperatures and have a relatively low specific gravity. The *basic* rocks are relatively poor in silica and rich in lime, iron and magnesia; they are dark in color, fuse at relatively low temperatures and are heavier than the acid types.

The rate of cooling also influences the character of igneous rocks. Those that cool slowly so that crystals have a chance to form are coarse-grained; those that cool more rapidly are fine-grained or, in extreme cases, glassy; and some are fragmental. The coarse-grained rocks are all intrusive in character, that is, they cooled deep within the earth; where they are now exposed erosion has removed the rocks into which they were intruded. *Granite* is one of the most abundant rocks of this type. It is made up of the minerals *quartz* and *feldspar,* usually with minor amounts of *mica* and *hornblende. Syenite* is a rock similar in every respect to granite except that it contains no quartz. *Diorite* is a coarse-grained rock composed largely of hornblende and feldspar. *Gabbro* is superficially similar to diorite, but in it the hornblende is replaced by *augite. Peridotite* is composed entirely of ferromagnesian minerals, such as hornblende, augite and *olivine,* and it lacks feldspar. Peridotites are of special interest as they are the only rocks in which diamonds are formed.

The fine-grained igneous rocks were extruded onto the surface so that they congealed before any considerable crystal growth. *Felsites* are the light-colored, fine-grained chemical equivalents of the coarse-grained granites and syenites. *Andesites* are rocks transitional in character between the felsites and the *basalts.* Basalts or *traps* are dark-colored, fine-grained, basic, extrusive rocks similar in mineral composition to the diorites and gabbros. The glassy rocks are *obsidian* and *pitchstone.* Obsidian is a natural glass that breaks with the same shelly fracture as artificial glass. It has a high luster and is usually jet black, but it may be brown, red, green or gray. Pitchstone is similar to obsidian but has a duller, more pitchlike luster.

The fragmental rocks are products of eruptions of explosive violence. *Tuff* is a light-colored, highly porous rock made up of volcanic dust and ash. Volcanic *breccia* is a coarser igneous rock composed of angular fragments cemented together in a tufflike matrix of ash and dust. Fragmental and fine-grained igneous rocks may have a rude to fairly perfect stratification, but in the main igneous rocks are homogeneous in character. For this reason their deformation is not so readily deciphered as that of the sedimentary rocks.

Metamorphic rocks are the products formed when igneous or sedimentary rocks are subjected to great heat and pressure. Metamorphic rocks that are massive and homogeneous in size and arrangement of parts are said to be *nonfoliate;* those which have the mineral particles arranged so that the rocks readily split along definite cleavage planes are said to be *foliate. Marble* and *quartzite* are the chief nonfoliate metamorphic rocks. Marble is metamorphosed limestone. It is more coarsely crystalline than lime-

Courtesy Czechoslovak Consulate General, New York

Organlike Basalt Formation near Kamenický Šanov, Czechoslovakia

stone and takes a high polish. For this reason it is widely used as an ornamental stone. Quartzite is metamorphosed sandstone in which the individual sand grains are so thoroughly cemented by silica that the rock breaks through the grains rather than around them.

Slate is one of the most common of the foliate rocks; it is metamorphosed shale. *Gneiss* is a coarsely foliated or laminated rock that resembles granite in composition and is usually marked by bands of segregated light and dark minerals. *Schists* grade into gneisses but are typically more finely foliated. The results of the metamorphism of various rocks are shown in the following tables:

Metamorphism of Sedimentary Rocks

Original Rock	*Metamorphic Equivalents*
Conglomerate	Gneiss and schist
Sandstone	Quartzite and schist
Shale	Slate and schist
Limestone	Marble

Metamorphism of Igneous Rocks

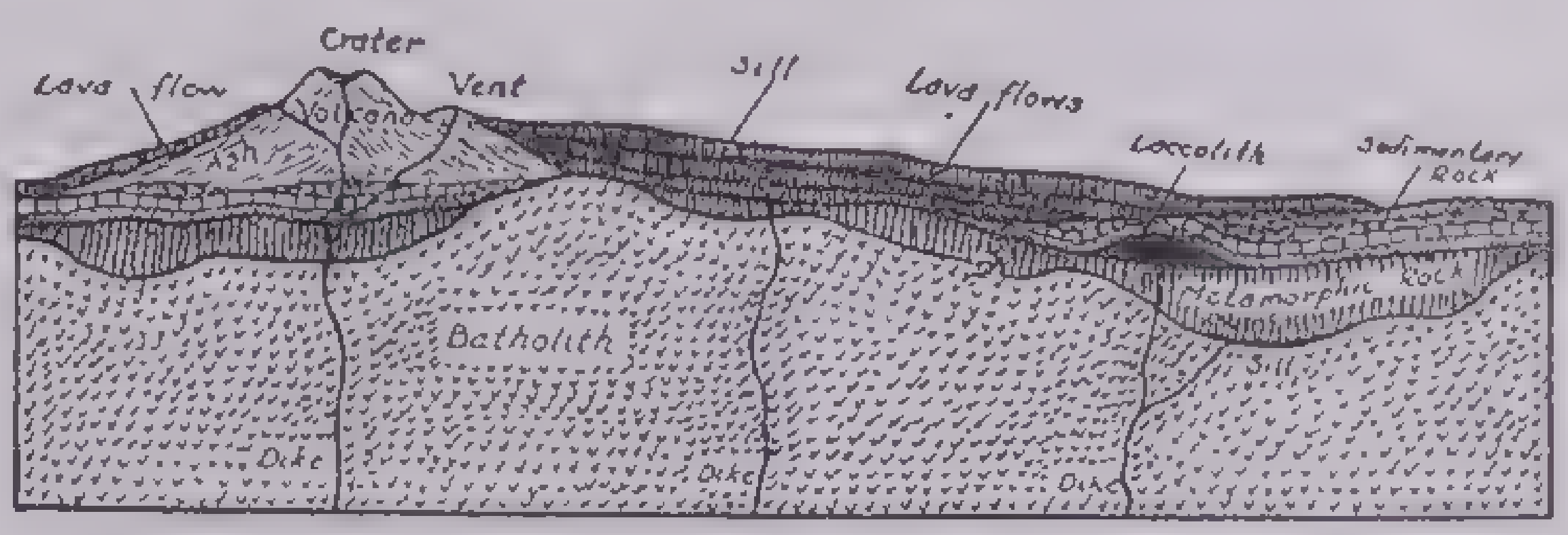
Original Rock	*Metamorphic Equivalents*
Coarse-grained acid rocks (Granite and syenite)	Gneiss and (rarely) schist
Fine-grained acid rocks (Felsite, tuff and others)	Gneiss, schist, slate
Basic rocks (Diorite, gabbro, basalt and others)	Schist

Vulcanism.—The term applied to all movements of molten rock toward the surface of the earth, as well as to certain related phenomena, is *vulcanism.* The molten rock that reaches the surface is known as *volcanic,* and is said to be *extrusive;* that which congeals before reaching the surface is known as *plutonic,* and is said to be *intrusive.*

Molten rock that solidifies in fissures forms *dikes;* in chimneylike openings it forms *pipes* or *plugs;* inserted between layers of rock it forms *sills,* and where it arches the strata above it forms *laccoliths.* Still more massive intrusions are known as *batholiths.* All of these intrusive bodies bake or *metamorphose* the rock into which they are intruded, but thin dikes and sills produce no great effect.

The extrusive processes are the most impressive of geologic phenomena. Volcanoes are elevations built of the igneous material thrown out of a central vent. In its most typical form a volcano is a steep, conical mountain with a pitlike depression or *crater* at its top, from which there issue at times of *eruption* gases, ashes, steam, bombs and flows of molten rock called *lava.* Many volcanoes, however, are low, some are irregular in shape, and in others the crater may be located far from the center; some are not more than 100 feet in height, and yet others attain an elevation of more than 20,000 feet. We may classify volcanic eruptions as those that are *explosive* in character, those that are *quiet,* and those that are of the *intermediate* type.

Volcanoes of the explosive type give rise to sudden, violent explosions during which great quantities of gas, dust and ashes are shot high in the air. During the eruption of Krakatoa more than 4 cubic miles of material were blown into the air; the vast cloud so formed completely hid the sun over many thousands of square miles; the terrific detonation was heard for more than 150 miles, and more than 40,000 natives of Java and Sumatra were drowned by the great waves generated by the explosion. The volcanoes of Mt. Pelée and Soufrière in the West Indies and Mt. Katmai in Alaska are of the same type. Many explosive eruptions apparently are so violent that they destroy the volcanic cone. When this happens or when the volcano collapses, there is left a *caldera* or huge bowl-shaped cavity. Crater Lake, Oregon, occupies such a depression. The largest crater is on the Japanese island of Kyushu, the volcano of Asosan, with an area of 100 square miles.



Types of Igneous Formations

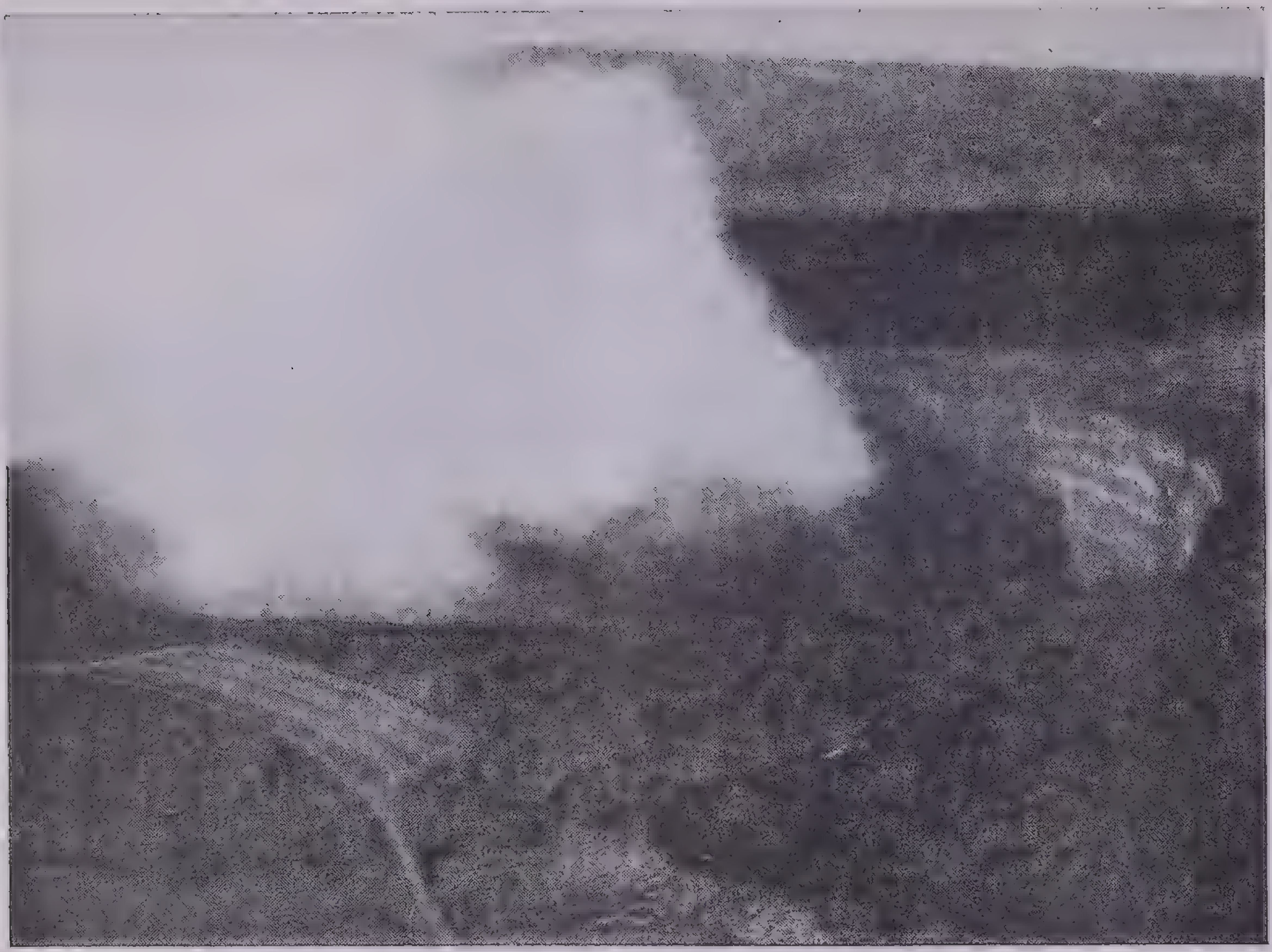
This diagram shows various types of extrusive and intrusive igneous bodies

Quiet volcanoes give rise to outflows of liquid lava without the issuance of ashes or the violent expulsion of gases. The Hawaiian volcanoes are the best examples of this type, and the Hawaiian Islands have been built up 30,000 feet above the sea floor as a result of the long-continued eruptions of this type.

In the intermediate type of volcano the eruption begins with explosive violence; but in its later stages it produces great lava flows of a more or less quiet nature. Vesuvius, the recently extinct cones of the Pacific Northwest, such as Mt. Rainier and Mt. Shasta, those of the Aleutian Islands and most other volcanoes are of this character.

Long after an eruption has taken place, vapor and gas may escape from minor vents in the crater or on flanks of the volcano in emanations known as *fumaroles.* Where these vapors move through layers of sediment they may form small cones of mud with miniature craters termed *mud volcanoes.* Hot springs are caused by ground water coming in contact with hot rocks deep beneath the surface. *Geysers* are gushing hot springs whose eruptions are caused by the accumulation of water under pressure that is heated above the boiling point. Steam forming at the bottom of the ground-water conduit forces water out at the top or crater of the geyser. This relieves the pressure throughout the conduit, with a result that a great deal of the water immediately turns to steam and is ejected violently.

Diastrophism.—The outer shell of the earth is not fixed and rigid but it is constantly oscillating, as can be shown by comparing the land elevation with that of the sea. Along certain coasts it is common to see features made by the work of the waves now elevated far above their reach. Along other shores the physiographic features, such as drowned valleys, submerged forests and the seaward extension of river channels, indicate clearly that the land has been depressed in relation to sea level. All such movements of the outer shell, whether of continental masses or of the mountain-making type, folding or fracturing, thrusting or stretching, are included under the group term, *diastrophism.* The immediate cause of the movements of the earth's crust is the unequal contraction or shrinkage of the earth as a whole.

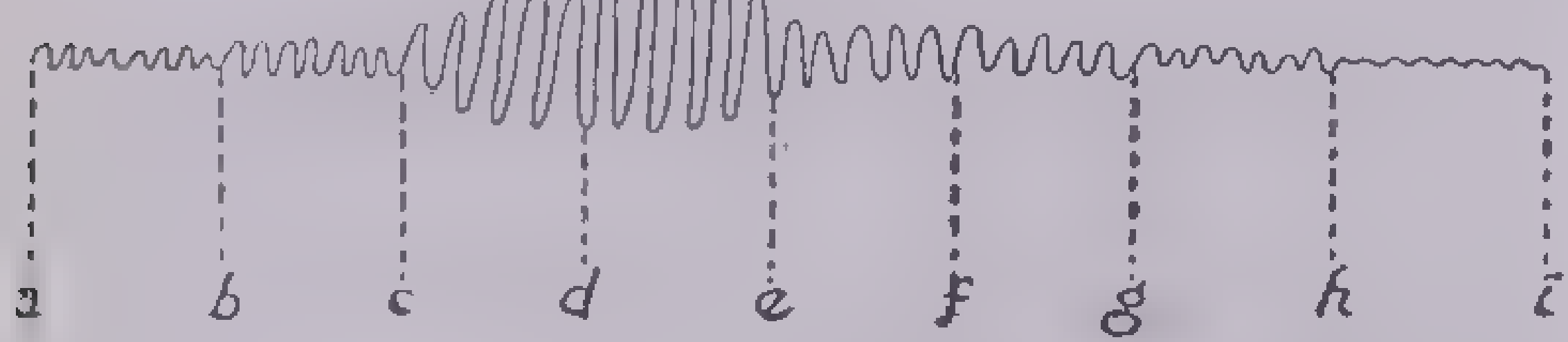


Courtesy U. S. Army Air Corps

Kilauea—Largest Active Volcanic Crater

Kilauea is on volcanic Mt. Mauna Loa, Hawaii National Park, Hawaii

The earth's shell is constantly undergoing movements, some of which act through long periods of time, others of which take place rather suddenly. Those of the latter type sometimes occur as recognizable tremors that are called *earthquakes.* The study of earthquakes is known as *seismology,* the instrument that records them is called a *seismograph,* and the record written by the stylus of such a machine is a *seismogram.* The principle upon which a seismograph is constructed is that a heavy pendulum, owing to its inertia, will remain at rest when an earthquake shock vibrates the earth beneath it. A stylus is attached to the suspended weight or pendulum, and a strip of paper revolving on a drum operated by clockwork is fixed to a pile driven to the solid rock. The stylus draws a straight line on the paper while it is at rest, but a vibration of the pile causes the line to oscillate sinuously from one side to another. The study of seismograms has shown that the main shock of distant earthquakes is preceded by smaller quick vibrations. These tremors represent the shock that has come through the earth, that is, along a chord; whereas the large vibrations represent the waves that have traveled the longer route along the surface of the earth. As the time between the arrival of the preliminary tremors and the main shock is proportional to the distance to the earthquake center, the distance to that place may be calculated at any seismograph station as soon as the record is received. If the distances from three recording stations are known the exact place of disturbance also can be calculated geometrically.

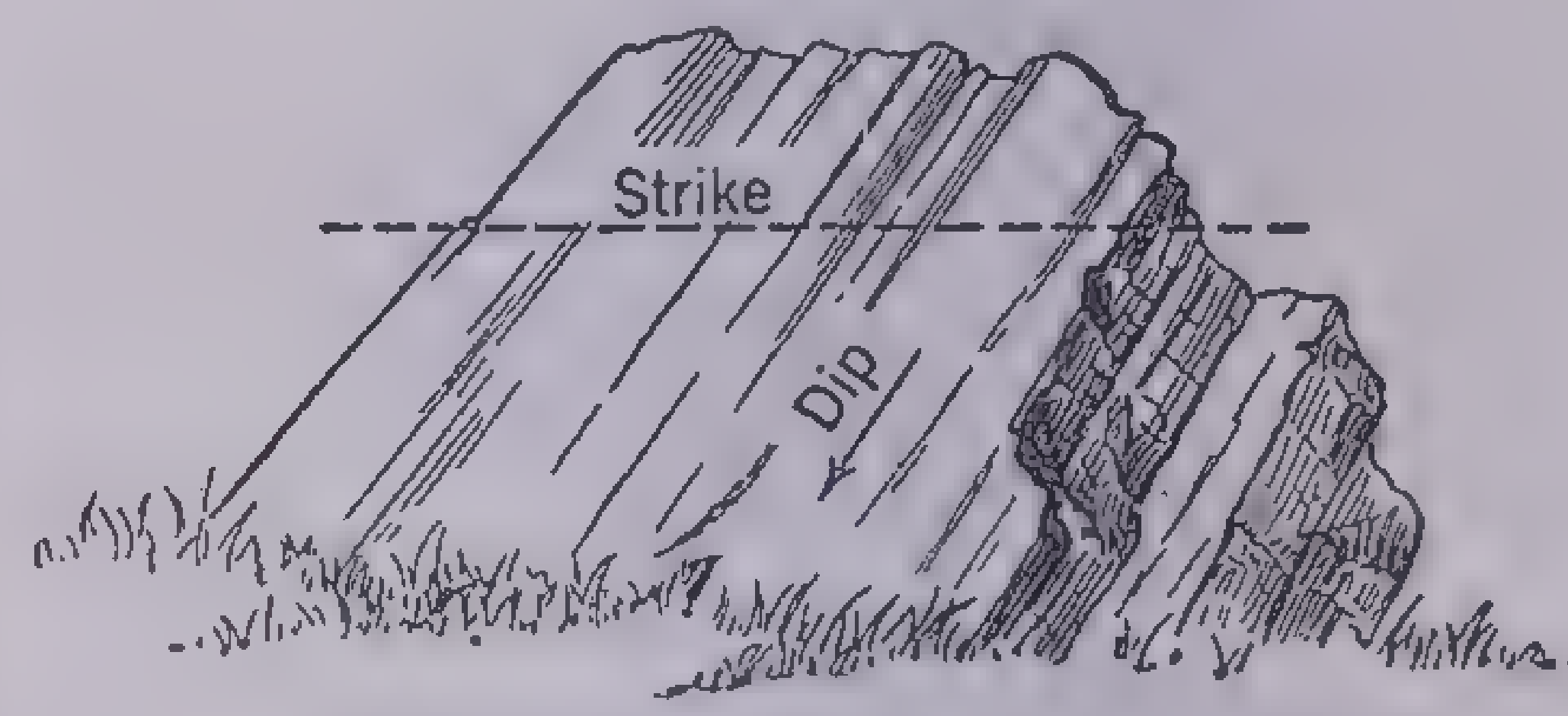


Seismogram

A distant earthquake seismogram: *ab,* first preliminary tremors; *bc,* second tremors; *ce,* main tremors; *eh,* later phases; *hi,* tail

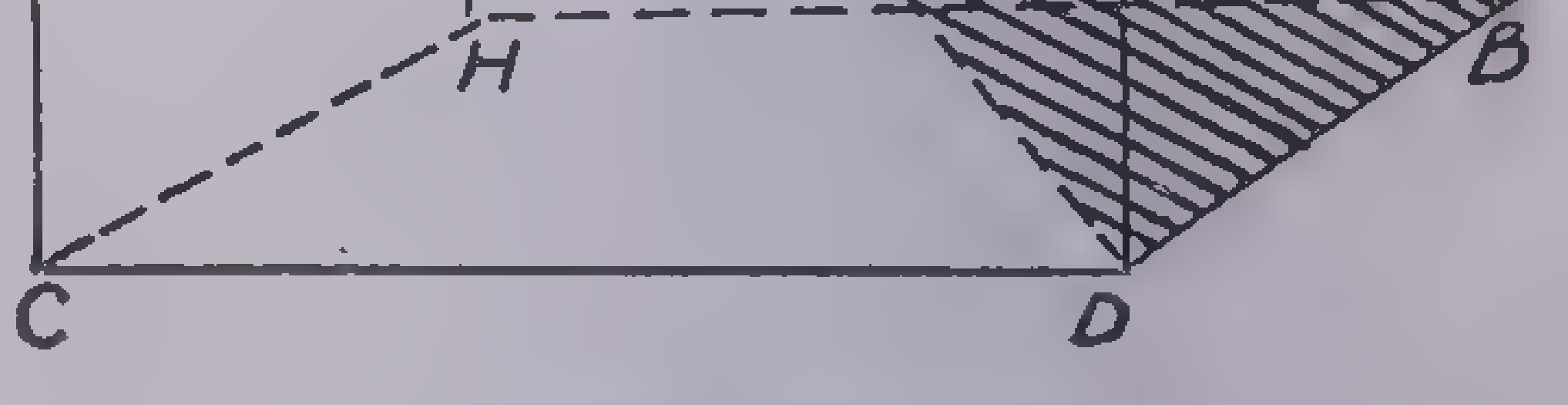
The rocks of the outer shell of the earth are traversed in all directions by fractures that vary from minute crevices to large fissures. Those fractures that develop in single rock masses are commonly known as *joints;* whereas those that traverse many adjoining rock masses are termed *rifts.* There are many kinds of joints and fractures and they occur in all types of rock. Movements along rifts either at the time of their formation or later may displace rocks with reference to their former position. Such displacements are called *faults,* and earthquakes commonly result from their formation. The fracture along which movement takes place is called the *fault plane,* or better, the *fault surface,* for it is rarely a plane surface. The movement in faulting may involve a series of blocks, in which case a fault *zone* is formed, and the process is called *step faulting.* The rock masses involved in faulting exert great pressure on the faulting surface, and the rock faces, therefore, commonly exhibit polishings and groovings known as *slickensides.* The line of intersection of the fault with the horizon is known as its *strike* (trend), whereas the angle of the fault surface with the plane of the horizon is known as its *dip,* and the angle formed with the vertical plane is termed the *hade.* In the case of an inclined fault the upper side is known as the *hanging wall;* the lower, as the *foot wall.*

Faults in which the movement has been such that the hanging wall has moved down with respect to the foot wall are known as *normal;* those in which the hanging wall has been shoved up over the foot wall are described as *reverse.* With reference to their supposed mode of origin reverse faults are sometimes termed *compression* faults; and normal faults, *tension* faults. Faults are among the most common of geologic phenomena, and in many cases they are of great economic importance, for they serve as the place of deposition of many great ore bodies. As a result of their formation many topographic features, such as *fault scarps* and *block mountains* arise. Many normal faults have *displacements* or movements along the fault surface that are to be measured in thousands of feet, and in some reverse or thrust faults the hanging wall has ridden over the foot wall for distances of several miles.



Strike and Dip

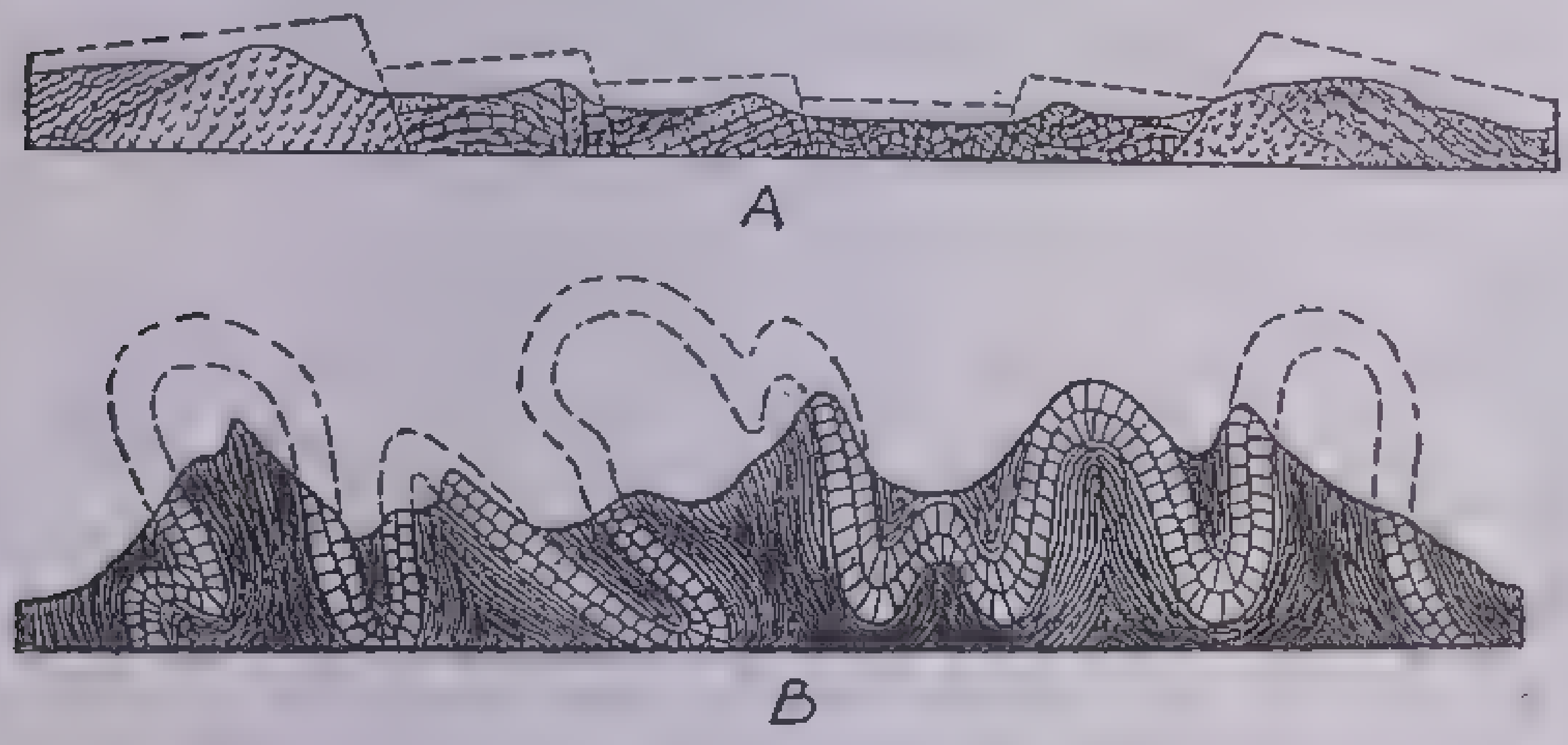
A *mountain* is a conspicuous elevation with a limited summit area. There is a great local variation in the usage of the term mountain, for many small hills are given the distinction of that name, whereas the Black Hills of South Dakota are truly great mountains, though not designated as such. Mountains may be irregularly disposed in *groups,* such as the Catsskills, or aligned as *ranges,* such as is the case of the Sierra Nevadas. Ranges may consist of a single ridge, but in most cases they are compound, that is, composed of many ridges whose general direction is parallel. A range is regarded as a *geologic unit* because it was formed at a definite time by a definite set of processes. A group of ranges having a common general trend and formed at about the same time is known as a *mountain system,* whereas a complex combination of systems, such as those of the Andes, constitutes a *cordillera.*



Fault Diagram

Diagram illustrating the various components of normal faults. The fault surface is shaded, the bars indicating the direction of movement. AB is the displacement if a point formerly at A has moved to B

Many mountains are formed by igneous agencies. These are mountains produced by the extrusion of igneous materials to form volcanic peaks, and elevations formed by the intrusion of igneous material into sedimentary rocks that are domed and elevated by the process. Some mountains are formed by the erosion of elevated tracts of land leaving isolated remnants of the former plateau surface. Many of the western buttes are mountains of this type, as are the Catskills in New York. The above mountain types, however, are of small importance when compared with those that have been formed by movements of the earth's crust. Such mountains may be made chiefly or entirely by faulting or they may be produced by wrinkling or folding. In the former case the ranges are the exposed edges of great tilted blocks of the earth's crust, consequently they are called *block mountains.* The Great Basin ranges of Nevada are of this type. In the second case the ranges result from the wrinkling of the crust into anticlines and synclines and are called *folded* ranges. Most great mountain ranges are of the latter type, although most of them are also rather complexly faulted as well as folded.



Mountain Structures

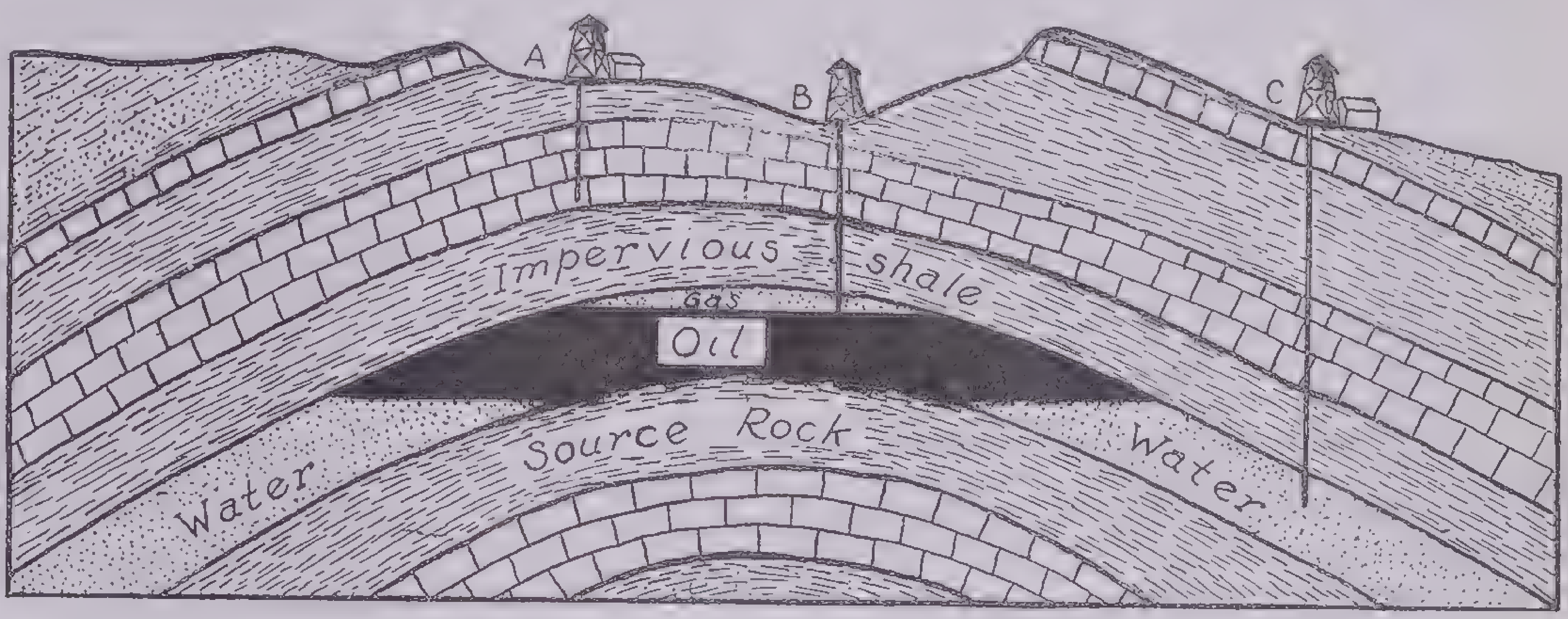
A. Faulted mountain structure, Great Basin type. Dotted lines indicate the position of the blocks unmodified by erosion. B. Folded-mountain structure, Alpine type. Dotted lines represent the shape of the uneroded folds

Detailed examination of folded mountain ranges has shown that they are invariably composed of masses of very thick sedimentary beds. These were deposited in a long basin of deposition or trough known as a *geosyncline.* As sediments were added to the basin, it slowly sank, so that great thicknesses of sedimentary rocks resulted. After this long quiet pre-mountain-forming period, the sediments of the geosyncline were thrown into complex folds by lateral pressures generated by the contraction of the earth's shell. Since the rocks are complexly folded, the areas in which they are located have suffered crustal shortening. In the Appalachians this crustal contraction amounts to at least 50 miles. That mountains have been formed after the manner described above is clearly indicated not only by field evidence but by experiments in which perfect replicas of existing mountain ranges have been made experimentally.

Some folded mountain ranges are particularly complex because igneous episodes occurred in the late stages of their folding; and the study of all ranges is complicated by the effect of erosion on the folds.

Economic Geology.—Compared with the great bulk of rock in the earth's crust, deposits of economic value are extremely rare, and where they occur they have been concentrated under unusual geologic conditions. It is the business of the economic geologist to search out such deposits and to aid in their exploitation. The materials of the earth that man utilizes may be divided conveniently into *nonmetallic* and *metallic* substances.

The most important nonmetallic mineral deposits are coal and petroleum. *Coal* is a sedimentary rock that is not difficult to locate but whose profitable mining in many places is impossible. The geologist, by his knowledge of sedimentary processes, is able to increase the efficiency of mining in areas of normally profitable mines and to introduce mining methods that make possible the recovery of coal in areas where ordinarily it would not be exploited.



Accumulation of Oil, Gas and Water

Diagram showing the accumulation of oil, gas and water on the crest of an anticline. Well A has not been drilled deep enough to strike oil; Well B obtained both oil and gas, and Well C has encountered only water. The water moves upward in the porous sandstone and the gas is placed under great pressure, which, when released, causes flowing wells or "gushers"

Petroleum is quite as valuable as coal to our present industrial development, and its discovery falls particularly within the sphere of the geologist. Petroleum is a liquid hydrocarbon that is found in porous rocks, such as sandstones. It apparently is entrapped during the deposition of marine shales, migrates from them into porous reservoir rocks and finally is concentrated on or near the crests of anticlines. It is the business of the petroleum geologist to locate such structures, for although not all anticlines produce oil, nearly all oil is produced from anticlinal or similar upfolded structures.

Other valuable nonmetallic products are *salt, gypsum, graphite, barite, mica* and *phosphates.* In addition to these, building stones, clays, limestones for the manufacture of cement, slate for roofing and other similar products of the earth's more common constituents are, in the aggregate, of great economic importance.

Most of the valuable minerals are metallic; where they occur in quantities great enough to be mined profitably they are called *ores.* The study of these ores and their occurrence is one of the largest divisions of the subject of geology, but it can only be mentioned here. *Iron* is the most widely used of our metals. With petroleum and coal it forms the very basis of modern industrialism. Most of the great iron-ore deposits are of sedimentary origin, and in most places they are mined by steam shovels. Most of the other ores are thought to have been deposited from hot solutions ascending through fissures of the earth's crust from some deep-seated igneous source. In this category are most of the ores of *copper, gold, silver, lead, zinc, cobalt, nickel, antimony, arsenic, tin, aluminum* and *mercury,* though some of these also have had a sedimentary origin.

HISTORICAL GEOLOGY

Origin of the Earth.—The stratified rocks of the earth's crust record its relatively recent geologic history with great fidelity, but the older events are in some cases indistinct, and the geologist has been unable to decipher all the very earliest records. The complexly altered igneous and metamorphic rocks below the sedimentary veneer and the inaccessible interior of the earth itself undoubtedly hold the secret of the earth's origin, but their study is difficult and has so far yielded only hints as to the final solution of the question. For this reason the relationship of the earth to other heavenly bodies also has been carefully studied in this connection, and as a result other suggestions as to the earliest stages of earth history have been obtained. Consequently a number of theories for the origin of the earth have been proposed of which the planetesimal theory of T. C. Chamberlin and F. R. Moulton of the University of Chicago perhaps is the most widely accepted.

The planetesimal theory states that the sun, while in an early gaseous condition, was approached by another and probably greater star. The mutual gravitational attraction resulting partially disrupted the sun. The matter ejected from it took on the shape of long spiral arms connected with the central sun, whose mass was many times that of all the material in the arms. In this stage of the development of the *nebula,* our ancestral solar system resembled closely the *spiral nebulae* that may be seen in the heavens at present. The ejected material was mainly dustlike, small particles that have been called *planetesimals;* hence the name of the theory. Included in the cold dustlike material were a number of relatively large, possibly hot, masses called *knots.* These knots, in revolving in their orbits, were able because of their superior size, to gather the planetesimals to them to build up at last the nine planets, their satellites and the asteroids.

Changes of the Earth's Facial Expression.—Whatever the origin of the earth, the keynote of all its physical and organic history is change. The lands have altered slowly but continually. Mountains have been elevated to alpine grandeur only to be eroded to sea level. The ocean has flooded the land, not once, but scores of times, and each inundation has left the record of its existence in the sedimentary deposits that it left behind when it receded.

> There rolls the deep where grew the tree,
> O earth, what changes hast thou seen!
> There where the long street roars hath been
> The stillness of the central sea.

This is not only poetry but sound geology. The areas of Riverside Drive in New York city, Michigan Avenue in Chicago, the Strand in London and the Champs Élysées in Paris all have been beneath "the central sea" at repeated intervals. Even the continents themselves have changed remarkably in outline during the geologic past. Old Mother Earth has indeed suffered many vicissitudes; her facial expression changes daily, and, though the changes are ordinarily too slight to be noted by the casual observer, the geologist knows that during the long geologic past her face has been wrinkled where now it is smooth, and unmarked where now it is deeply furrowed.

Fossils and Their Significance.—A fossil is any record of prehistoric life. The rocks that contain them are the graveyards of the animals and plants that link the past with the present. Fossils are of many different types and vary greatly in their perfection. Insects are so perfectly preserved in amber that their soft parts may be dissected, and the extinct mammoths of the frozen Siberian tundras are so well preserved that even the contents of their stomachs ordinarily may be examined. Most fossils, however, are only the harder parts of once-living things.

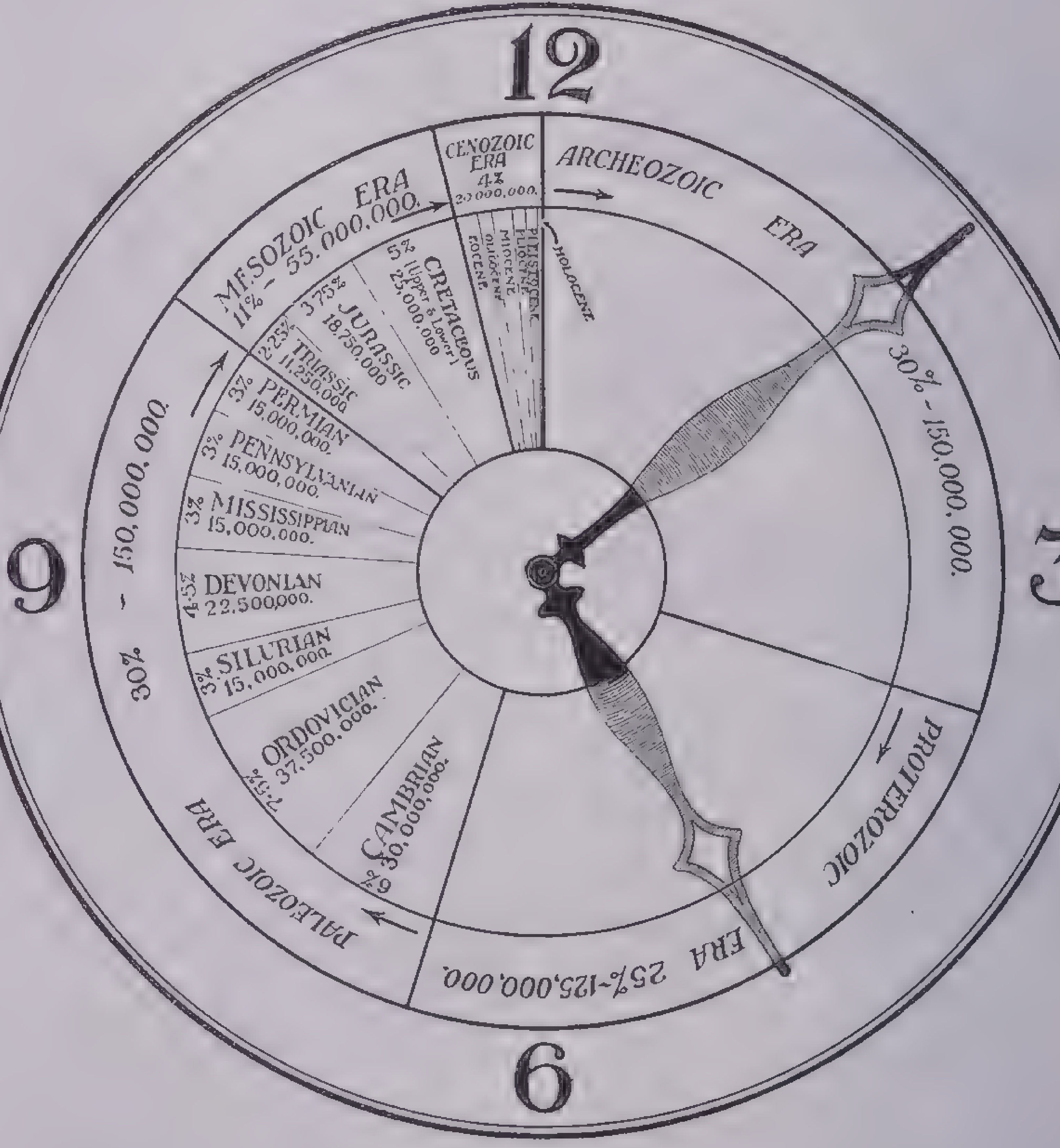
Most dead organisms are at once attacked by microscopic fungi and bacteria and by scavenging animals, so that they leave no trace of their former existence. If, however, the organism is covered by sediment immediately after death, a complete or partial record of its presence may be preserved. Organisms with hard parts have the best chance of writing their record into the rocks, but even most of these are not preserved. In rare cases the soft parts are preserved, but generally only the hard structures, such as bone or shells, remain and may be preserved as the original material; but much more commonly these hard parts have been altered or *mineralized.* In still other types of fossils the original substance is entirely missing, but the former presence of the organism is indicated by shapes known as *molds, imprints* or *natural casts.*

Fossils are not freaks of nature nor chance records of extinct organisms but are the very important documents upon which the timetable of the geologic past has been established. They also indicate the path of organic evolution, the ancient distributions and migrations of plants and animals, the habitats of these organisms, and they even give important information as to the changes that have occurred in climate throughout geologic time.

The fact that sedimentary rocks occur in layers or strata and that fossils are found in these strata is the simple basis for historical geology. It is obvious that the oldest stratum is at the bottom and the newest at the top and that the order of superposition is the order of time. It is equally obvious that the fossils of a certain stratum belong to that layer and that the order of superposition of the strata reveals the order of succession in time of the fossils.

Geological Timetable and Age of the Earth.—Geologic history, like human history, falls into certain major divisions, and these in turn into minor ones. The sequence of events is determined by the order of the superposed sequence of stratified rocks, by the degree of evolution attained by the fossils found in the rocks, by the breaks or *unconformities* in the sequence of rock formations, and through the order in which igneous rocks intersect one another and sedimentary beds. The *era* is the longest division of geologic time; it is one volume of historical geology. The eras are divided into *periods,* which are chapters in the geologic volumes. Periods are sometimes further divided into *epochs.*

Man has long been interested in determining the age of the earth. Hutton, in 1795, after studying the geology of Scotland, said that he could find "no vestige of a beginning—no prospect of an end." Since that time the age of the earth has been variously estimated as from 20,000,000 to 1,600,000,000 years. The great differences in these estimates result from the different bases used in making them. The physicist's study of radioactivity results in the larger figure given above, whereas geologic evidence obtained through calculations of the time involved in the accumulation of salt in the sea, or in the deposition of the combined column of sedimentary rocks, gives a figure nearer 500,000,000 years. If the latter figure is taken as representing approximately the age of the earth since the beginning of the *Archeozoic,* or first era, and if all subsequent geologic time be shown as taking place during the course of an hour, the proper time relationships of the various eras and periods may be shown on the face of a sort of clock of the ages, as is done in the accompanying figure.



Geologic Time Clock

If all geologic time since the beginning of the Archeozoic era is taken as 500,000,000 years and is represented on the clock as 1 hour, then 33 minutes of that hour elapse before the rocks begin to yield abundant evidence of life. The beginning of the Mesozoic era and the dominance of reptiles occur only 9 minutes before the end of the hour. The Cenozoic era or the age of mammals lasted only 2 minutes and 24 seconds; and man, commonly stated to have been present for about 1,000,000 years, has occupied the center of the stage in the pageantry of changing life for only 7 seconds of that hour

The various geologic events, both physical and organic, are so well known that their complete discussion requires many volumes. The outstanding events, however, may be presented briefly in the following tables:

SYNOPTIC CHART OF MAJOR EVENTS OF HISTORICAL GEOLOGY

(This chart is arranged like geological strata—most recent at the top, most ancient at the bottom. To get the story of development, read up from the bottom of the page.)

Era	Period	Important Physical Events	Important Organic Events
Quaternary or Cenozoic	*Holocene (Recent)*	Completion of oceanic depression to present level. Climate as today. Gradual rise of depressed lands and depression of marginal bulge. Ocean waters flooding depressed lands.	Man makes iron implements 1350 to 900 B.C. Man makes bronze implements 3500 to 2000 B.C. Man makes polished (Neolithic) implements 18,000 to 7500 B.C.
	Pleistocene	Champlain period, glacial lake building. Wisconsin, two glacial advances with an unnamed interglacial interval. Third interglacial period (Sangamon). Illinoian glacial advance. Second interglacial period (Yarmouth and Buchanan). Kansan glacial advance. First interglacial period (Aftonian). Nebraskan or Jerseyan glacial advance.	Cro-Magnon Man—first of present species. Neanderthal man—Paleolithic culture. Heidelberg man—Paleolithic culture.
Tertiary or Cenozoic	*Pliocene*	Continued world-wide elevation. Epicontinental seas restricted.	Intermigration of North American and South American mammals. Horses and elephants become essentially modern in appearance.
	Miocene	World-wide uplift and mountain building. Birth of Alps, Himalayas and other systems. Vulcanism in western North America. Marginal seas and cool climate.	Notable advances in the horse and elephant families. Apes appear in the Old World.
	Oligocene	Extensive erosion. Marginal seas. Warm climate.	Carnivores and ungulates become well established. First ancestral elephants.
	Eocene	Uplift in western North America. Marginal seas. Enlargement of Mediterranean basin.	Dawn of mammalian dominance. Reptiles in subordinate position. Coming of modern types of marine invertebrates.
Secondary or Mesozoic	*Upper Cretaceous*	World-wide continental uplift. Birth of Rockies and Andes. Widespread interior seas. Formation of chalk and coal deposits.	Extinction of all Mesozoic types of reptiles and birds. Climax of cephalopods. Armored and horned dinosaurs reach climax just before extinction.
	Lower Cretaceous, Comanchean or Shastan	Great swamp deposits in North America. Some marine flooding in form of interior seas.	Introduction of modern flowering plants. Toothed birds and flying reptiles known. Marine pelecypods very abundant.
	Jurassic	Widespread emergence and erosion of North America. Small interior seas in northwestern North America. Birth of Sierra Nevadas.	First birds appear. Crustaceans take on modern aspect. Cephalopods very numerous. Gigantic reptiles common. Marine and flying reptiles abundant.
	Triassic or Newark	Continental and marine deposits in Europe. Mostly continental in North America. Widespread deserts with salt, gypsum and red beds.	Appearance of mammals. Reptiles dominate. Cycads prominent. Marine invertebrates reduced in number.
Primary or Paleozoic	*Permian*	World-wide uplift and mountain building, glacial episodes and aridity. Birth of the Appalachian system.	Extinction of most Paleozoic types of invertebrates and many Paleozoic plants. Reduction in all types of life. Primitive reptiles fairly numerous locally.
	Pennsylvanian, Upper Carboniferous	Crustal instability. Much land oscillating near sea level. Formation of world's greatest coal deposits.	Great coal-forming forests. Earliest known reptiles. Trilobites become rare. Brachiopods, pelecypods and gastropods common.
	Mississippian, Lower Carboniferous	Coal swamps in Europe. Low lands and warm, mostly clear interior seas in North America.	Great abundance of crinoids. Sharks numerous. Amphibians become well established.
	Devonian	Progressive widespread submergence of continents. Terrestrial deposits in Europe and North America. Local diastrophism and vulcanism at close.	First amphibian record. Armored fish numerous. Brachiopods reach climax. First forests known. Coral reefs important.
	Silurian	Important marine transgression. Salt and gypsum deposits and aridity. Crustal disturbances in many parts of the world at close.	First air breathers in the form of scorpions. First great abundance of corals and coral reefs. Eurypterids reach climax. Trilobites diversified. Land floras appear.
	Ordovician	Three cycles of marine inundation in North America. Greatest known submergence. Vulcanism in British Isles. Local diastrophism in North America.	First vertebrate record in ostrocoderins. Climax of invertebrate dominance. Brachiopods, trilobites and cephalopods most numerous and characteristic.
	Cambrian	First abundantly fossiliferous rocks. Low lands, mild climate and crustal stability.	Most invertebrates present. Trilobites most abundant and characteristic. Brachiopods and gastropods fairly numerous.
Algonkian or Proterozoic	*Upper Huronian*	Great vulcanism in central and eastern North America with formation of great copper, silver, gold and nickel deposits.	Sponges and foraminifera probably present. Some higher invertebrates possibly present.
	Middle Huronian	Sedimentary processes dominant. Formation of great iron deposits.	Bacteria and seaweeds present. Sponges and protozoa probably present.
	Lower Huronian	Normal sedimentary processes dominant. Earliest known glacial episode.	Bacteria and seaweeds present. Sponges and protozoa possibly present.
Archean or Archeozoic	*Laurentian*	World-wide igneous intrusive activity. Granites.	Blue-green algae present.
	Keewatin	World-wide igneous extrusion and some sedimentation. Schists.	Primitive one-celled plants and animals possibly present.

GEOLOGIC DEVELOPMENT OF THE ANIMAL KINGDOM

(Simple forms below—complex types above)

Phylum		Class	Known Geologic Range	Common Name or Living Example
Chordata	Vertebrata	Mammalia	Triassic to present	Mammals
		Aves	Jurassic to present	Birds
		Reptilia	Pennsylvanian to present	Reptiles
		Amphibia	Devonian to present	Amphibians
		Pisces	Silurian to present	Fish
		Ostracodermi	Ordovician through Devonian	Bony-plated fish
		Cyclostomata	Devonian to present	Lamprey eels
		Acrania	No fossil record	Amphioxus
		Urochorda	No fossil record	Ascidians
		Adelochorda	No fossil record	Balanoglossus
Arthropoda	Invertebrata	Insecta	Mississippian to present	Insects
		Arachnida	Cambrian to present	Spiders
		Myriopoda	Devonian to present	Centipedes
		Onychophora	Cambrian to present	Peripatus
		Crustacea	Cambrian to present	Crayfish
Mollusca		Cephalopoda	Cambrian to present	Squid
		Scaphopoda	Ordovician to present	Tooth shells
		Gastropoda	Cambrian to present	Snails
		Pelecypoda	Ordovician to present	Clams and oysters
		Amphineura	Ordovician to present	Chitons
Molluscoidea		Brachiopoda	Cambrian to present	Lamp shells
		Bryozoa	Ordovician to present	Moss animals
Echinodermata		Holothurioidea	Cambrian to present	Sea cucumbers
		Echinodea	Ordovician to present	Sea urchins
		Ophiuroidea	Ordovician to present	Brittle stars
		Asteroidea	Ordovician to present	Starfish
		Crinoidea	Cambrian to present	Sea lilies
		Blastoidea	Ordovician through Pennsylvanian	Sea buds
		Cystoidea	Ordovician through Mississippian	Sea bladders
Vermes *Annulata*		Classes omitted	Cambrian to present	Segmented worms
Trochelminthes			No fossil record	Wheel worms
Nemathelminthes			Cambrian to present	Threadworms
Platyhelminthes			Pennsylvanian to present	Flatworms
Coelenterata		Ctenophora	No fossil record	Comb jellies
		Anthozoa	Cambrian to present	Corals
		Scyphozoa	Cambrian to present	Jellyfish
		Hydrozoa	Cambrian to present	Hydrozoans
Porifera		Porifera	Proterozoic to present	Sponges
Protozoa		Infusoria	No fossil record	Infusorians
		Sporozoa	No fossil record	Gregarina
		Mastigophora	Cretaceous to present	Euglena
		Sarcodina	Cambrian to present	Ameba

GEOLOGIC DEVELOPMENT OF THE PLANT KINGDOM

(Simple forms below—complex types above)

Phylum	Class		Known Geologic Range	Common Name or Living Example
Spermatophyta (seed plants)	Angiospermae (covered seeds)	Dicotyledones	Early Cretaceous to present	Oaks, maples, elms
		Monocotyledones	Early Cretaceous to present	Grasses
	Gymnosperms (naked seeds)	Gnetales	No fossil record	Ephedra
		Coniferales	Permian to present	Pines
		Ginkgoales	Permian to present	Ginkgo
		Cycadales	Triassic to present	Cycads
		Cycadeoidea	Permian to Cretaceous	Cycadeoids
		Cordaitales	Devonian to Permian	Cordaites
		Cycadofilicales	Devonian to Jurassic	Neuropteris
Pteridophyta (fern plants)		Lycopodiales	Devonian to present	Club mosses
		Sphenophyllales	Devonian to Permian	Sphenophyllum
		Equisitales	Devonian to present	Horsetails
		Filicales	Devonian to present	Ferns
Bryophyta (moss plants)		Musci	Mississippian to present	Mosses
		Hepaticae	Silurian to present	Liverworts
Thallophyta (thallus plants)		Fungi	Silurian to present	Fungi
		Diatomeae	Jurassic to present	Diatoms
		Algae	Proterozoic to present	Seaweeds
		Myxomycetae	No fossil record	Slime molds
		Schizophyta		
		Blue-green algae	Archeozoic to present	Blue-green algae
		Bacteria	Proterozoic to present	Bacteria

MINERALOGY

Mineralogy is the science that treats of the properties of minerals and teaches us to characterize, distinguish and classify them according to their properties. The science of mineralogy is not confined to the study of the external characters of mineral substances; their chemical composition is equally important.

Classification.—Minerals may be described and classified by their chemical composition, their crystallographic forms or their physical properties—hardness, fracture, color, luster—or a combination of all. So various systems of classification have been adopted.

Most minerals crystallize in definite forms, though some are not distinctly crystalline but are earthy or occur in masses. The noncrystalline minerals have important varieties of structure, as *laminated, fibrous, granular, reniform, botryoidal* and others.

Other distinctive characteristics are *color,* which, however, varies even in the same mineral; *luster,* the character of the light reflected from the surface and described as *adamantine, vitreous, nacreous, greasy, silky* and so forth; *fracture,* the character of the freshly broken surface; *streak,* the color of the powder. *Diaphaneity, refraction, polarization* and *electric* properties are other bases for classification.

Of special importance is *hardness,* which is now expressed in terms of the Mohs' scale. In this scale type the hardnesses are given from 1 to 10. Diamonds are known to be from 90 to 150 times as hard as corundum, ordinarily regarded as the next hardest substance. The type minerals of Mohs' scale are:

1. *Talc,* common laminated light-green variety.
2. *Gypsum,* a crystallized variety.
2.5 *Mica.*
3. *Calcite,* transparent variety.
4. *Fluorite,* crystalline variety.
5. *Apatite,* transparent variety.
5.5 *Wernerite,* crystalline variety.
6. *Potash feldspar,* white cleavable variety.
7. *Quartz,* transparent.
8. *Topaz,* transparent.
9. *Corundum.*
10. *Diamond.*

To determine the hardness of a mineral, ascertain by experiment which of the minerals it will scratch and which will scratch it; thus, if a mineral will scratch fluorite but not apatite, and apatite will scratch it, its hardness is between 4 and 5.

Precious and Semiprecious Stones.—Minerals of unusual beauty, hardness and rarity that are prized for use in ornamentation, especially in jewelry, are classified as *precious stones.* The diamond, ruby, sapphire and emerald are the only stones entitled to be called precious in this sense. But the opal is often included with the precious stones, and so is the pearl, which is not really a stone but a secretion of a shellfish.

The brief dictionary list that follows presents distinguishing points on the better known stones and related subjects.

Agate, a semitransparent, uncrystallized variety of quartz, presenting various tints in the same specimen. Its colors are delicately arranged in stripes or bands, or blended in clouds.

Alexandrite, a variety of chrysoberyl found in the mica slate of the Ural Mountains. It is a rich garnet color by artificial light, by daylight a dark moss green. It is the only stone that so changes. The finest specimens of alexandrite are nearly as valuable as diamonds.

Almandine, a common maroon-red variety of garnet.

Amethyst, a variety of crystallized quartz of a purple or bluish-violet color of different shades. It is much used as a jeweler's stone. The lighter colored amethysts come from Brazil, the deep purple ones from Siberia. In value the amethyst is about equal to garnet.

Aquamarine, a transparent, light-blue variety of beryl, used as a gem.

Aventurine, a variety of translucent, reddish quartz, spangled throughout with scales of yellow mica or hematite.

Beryl, a very hard mineral of much beauty when it is transparent. It occurs in hexagonal prisms, commonly of a green or bluish-green color, but also blue, light-blue, yellow, pink and white. It is a silicate of aluminum and beryllium. Beryls are usually very delicate in color. The emerald is the most valuable variety.

Bloodstone, a dark green, uncrystallized quartz sprinkled with red jasper, from which it takes its name. It is sometimes called *heliotrope.*

Cabochon, a gem cut without facets or that method of cutting. The French phrase *en cabochon* means cut in this style.

Cameo, a figure cut in relief in stone or shell that often is composed of different colored layers. The value depends upon the artistic merit of the engraved figure.

Carat, a measure of weight for precious stones equal to 200 milligrams or about 3.086 grains troy. One-fourth of a carat is called a *carat grain.*

Carbuncle, a term used by the ancients to designate any deep red, transparent stone, but especially applied to garnets. Today the carbuncle is a deep red garnet cut *en cabochon* (not faceted). The word originally meant little coal.

Carnelian, a variety of chalcedony of a brownish-red color. It is moderately hard and capable of taking a good polish. It is sometimes used for seals. It is not extensively used today.

Cat's-eye, a variety of quartz or chalcedony exhibiting shifting reflections from within like the eye of a cat. The name is given to other gems affording similar effects, especially to the chrysoberyl. A fine specimen of the latter about three-eights of an inch across might be worth $100 or more.

Chalcedony, an indistinctly crystalline translucent variety of quartz, whitish or grayish in color and with a luster nearly like wax.

Chrysolite, a transparent gem, composed of silica, magnesia and iron, yellow to green in color. It is also known as *peridot* or *olivine.*

Chrysoprase, an apple-green variety of chalcedony. Its color is due to nickel.

Citrine, a semiprecious stone that closely resembles topaz but owes its yellow color to the action of heat on black quartz.

Dendrite, a stone in which are branching figures, resembling shrubs of trees, produced by a foreign mineral, usually by an oxide of manganese, as in moss agate.

Demantoid, a green garnet, sometimes called *olivine,* found in the Urals.

Diamond, a precious stone or gem excelling in brilliancy and beautiful play of prismatic colors and remarkable for extreme hardness. It occurs in many hues—green, rose, straw, yellow and others—but the straw-colored diamonds are the most common.

The diamond is a native carbon occurring in isometric crystals, often octahedrons, with rounded edges. It is the hardest substance known. Diamonds are said to be of the *first* water when very transparent and of the *second* and *third* water as the transparency decreases.

Diopside, a crystallized variety of pyroxene (a silicate of lime and magnesia), clear light-green in color.

Emerald, a precious stone of a rich green color, the most valuable variety of beryl. The finest emeralds are more valuable than diamonds.

Epidote, a mineral, commonly of a yellowish-green to greenish-brown color, occurring granular, massive, columnar and in crystals. It is a silicate of alumina, lime and oxide of iron or manganese.

Essonite, cinnamon stone. A variety of garnet, yellow to brown in color.

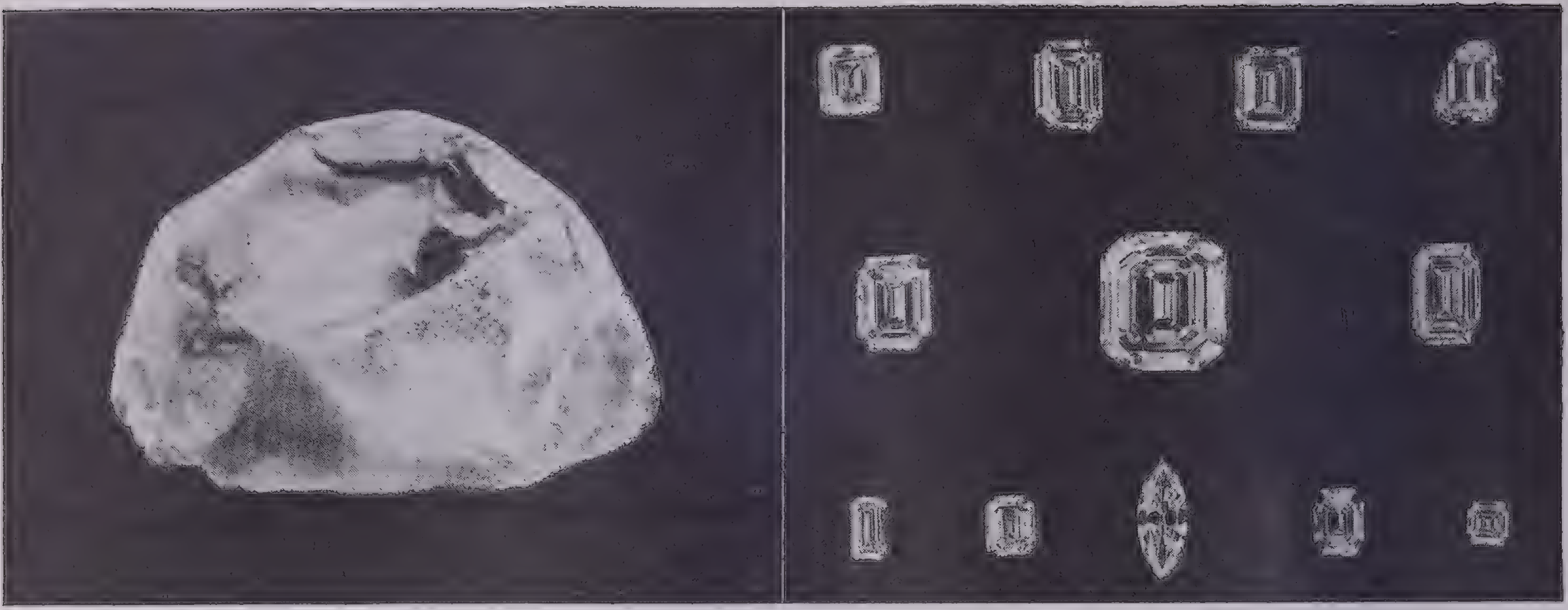
Fire opal, see *Opal.*

Fluorite, calcium fluoride, a mineral of many different colors—white, yellow, purple, red, green and others—often very beautiful. When it is crystallized, it is commonly in cubes with perfect octahedral cleavage. Some varieties are used for ornamental vessels. Also called *fluor spar* or *fluor.* The colored varieties are known as *false ruby, false emerald, false topaz, false sapphire* and *false amethyst.* It is too soft for use in jewelry; the hardness is only 4.

Fluor spar, see *Fluorite.*

Garnet, a mineral having many varieties, differing in color and in their constituents, but with the same general chemical formula. The commonest color is red.

The luster of garnet is vitreous or glassy. The hardness is greater than that of quartz. The common crystal forms are the dodecahedron and trapezohedron. Besides the red varieties there are white, green, yellow, brown and black garnets.



Courtesy American Museum of Natural History

726 Carats of Frosted Crystal— **And the Twelve Stones Cut from the Jonker Diamond**

On January 16, 1934, a dirt-encrusted stone about the size of a hen's egg was found on the farm of Jacobus Jonker in South Africa—the largest diamond that has turned up in modern times. Uncut, it weighed nearly half a pound and was approximately 2¾ inches long and 1½ inches high. Jonker sold the stone to a London diamond corporation for a reputed $350,000–$375,000. A New York diamond cutter, Lazare Kaplan, was commissioned to cut the stone. This was a delicate and highly important operation, as the least error in estimating the lines of cleavage would have been disastrous. After months of study, Kaplan, with one light tap of a mallet, sundered the stone correctly. Cleaving in the direction of the grain is the first step in cutting up a stone; the second is sawing across the grain, and after sawing the separate pieces are cut and polished—or *faceted*. The Jonker made 12 stones as shown in the picture at the right. Eleven of them are emerald-cut diamonds, and the twelfth (center, bottom row) is a marquise-cut diamond

The garnet is a silicate with various bases, such as alumina-lime (grossularite, essonite), alumina-magnesia (pyrope), alumina-manganese (spessartite) and chromium-lime (uvarovite—color emerald green). The transparent red varieties are used as gems. The garnet was the carbuncle of the ancients. Garnet is a very common mineral in gneiss and mica schist.

The finest specimens of red garnets come from Arizona. A green variety comes from Russia.

Heliotrope, see *Bloodstone.*

Hematite, an important ore of iron, the sesquioxide, so called because of its red color when in the form of powder. It occurs in splendid rhombohedral crystals and in massive and earthy forms, the last being called *red ocher.* It is now seldom used in jewelry.

Hyacinth, a reddish-brown variety of zircon, sometimes used as a gem. It resembles closely a dark Spanish topaz.

Idocrase or **Vesuvianite,** a mineral occurring in tetragonal crystals, also massive; brown to green in color, rarely sulphur yellow or blue. It is a silicate of alumina and lime, with some iron and magnesia. It is found at Mt. Vesuvius. Hardness, 6.5.

Indicolite, a variety of tourmaline of an indigo-blue color.

Intaglio, a figure cut in a stone or shell so as to be depressed below the general surface, which may be the same as, or a different color from, the material exposed by the cutting.

Iolite, a silicate of alumina, iron and magnesia showing bright blue and yellow colors when viewed from different directions and with a vitreous or glassy luster. It is remarkable for its dichroism, that is, the property of presenting different colors when it is seen from different directions. Also called *dichroite.*

Jacinth, same as hyacinth, but sometimes distinguished from the hyacinth by a more orange color.

Jade, a stone commonly of pale to dark green color but sometimes whitish or showing light tints of other colors. It is moderately hard and very tough, capable of a high polish. It is used for ornamental purposes and for implements, especially in the Orient and among many primitive peoples.

Jasper, an opaque, impure variety of quartz, of red, yellow and other dull colors, breaking with a smooth surface.

Jet, a very hard form of coal that takes a high polish and is used for mourning jewelry.

Labradorite, a kind of feldspar with green, blue, yellow and copper colors, used for ornamental purposes. The best specimens come from Labrador.

Lapis Lazuli, a mineral of fine dark blue color, usually occurring in small rounded masses. It is usually a silicate of alumina, lime and soda, with some sodium sulphide. It is often marked by golden yellow metallic spots or veins of sulphide of iron. It is much valued for ornamental work. *Lapis* is Latin for stone; *lazuli* is the same word as *azure.*

Moonstone, a nearly pellucid variety of feldspar, showing bluish pearly or opaline reflections from within. The best specimens come from Ceylon. Moonstone is worth a few dollars a carat.

Nephrite, a hard, compact mineral, of dark green color, formerly worn as a remedy for diseases of the kidneys, whence its name, *kidney stone,* and the name *nephrite* from the Greek word for kidney. It is a variety of jade.

Obsidian, a kind of glass produced by volcanoes. It is usually black in color and opaque, except in thin splinters. It is sometimes used as a gem. The Indians made arrowheads of obsidian, and in Central America the natives used it for knives and ornaments.

Olivine, a common name of the yellowish-green mineral chrysolite, especially of the variety occurring in eruptive rocks. The name is sometimes applied to demantoid, a green garnet.

Onyx, chalcedony in parallel layers of different shades of color. It is used for making cameos, the figure being cut in one layer with the next layer as a background. Sometimes it is stained black and used to make mourning jewelry as it is cheaper than jet.

Opal, a mineral consisting, like quartz, of silica but inferior to quartz in hardness and specific gravity. The precious opal shows a peculiar play of colors of delicate brilliant tints, and it is highly esteemed as a gem. One kind, with a varied play of colors in a reddish ground, is called *harlequin opal.* The *fire opal* of Mexico has colors like the red and yellow of flame. The *black opal* is dark gray or black with flecks of color.

Pearl, a shelly concretion, usually rounded, having a brilliant luster, with varying tints, formed in the mantle or between the mantle and shell of certain bivalve mollusks (especially in pearly oysters and river mussels) and sometimes in certain univalves. Its substance is the same as nacre or mother-of-pearl. Pearls that are round or nearly round and of fine luster are highly prized as jewels. They are sold by grain (quarter carats) instead of by carats.

Pebble or **Brazilian pebble,** see *Rock crystal.*

Peridot, see *Chrysolite.*

Pyrope, a red variety of garnet, used as a gem.

Rock crystal or **Mountain crystal,** any transparent crystal of quartz, particularly of limpid or colorless quartz. Rock crystal is often called pebble, especially by opticians who make very fine lenses from the Brazilian crystal.

Rose quartz, a pinkish or red, usually badly flawed, variety of quartz.

Rubellite, a variety of tourmaline varying in color from a pale rose to a deep ruby and containing lithium. It is a little more valuable than garnet.

Ruby, a precious stone of a carmine-red color, sometimes verging to violet or intermediate between carmine and hyacinth red. It is a crystallized variety of corundum. The ruby from Siam is of a dark color and is called *oxblood ruby.* It has about the same value as the diamond. The ruby from Burma, called the *pigeon-blood ruby,* is of a lighter color and several times more valuable than the oxblood. A fine pigeon-blood ruby is much more expensive than a diamond of the same weight.

Rutile, a mineral, usually of a reddish-brown color and of brilliant, adamantine luster, occurring in tetragonal crystals. It is a dioxide of titarium and in its darker shades, deep red or black, is cut and used for jewelry.

Sapphire, gem corundum or aluminum sesquioxide. Gem miners and dealers use the term for material of any color, as pink, white and other sapphires (but red corundum is *ruby*). The name sapphire, alone, is applied by jewelers only to the blue stone. The best specimens of the blue variety are nearly as valuable as the diamond.

Sard, same as *Carnelian.*

Sardonyx, a variety of onyx consisting of sard and white chalcedony in alternate layers. See *Onyx.*

Spinel, a mineral occurring in octahedrons of great hardness and various colors, as red, green, blue, brown and black. The red variety is the gem *spinel ruby.* It consists essentially of alumina and magnesia but commonly contains iron and sometimes also chromium. Fine specimens of spinel ruby are worth rather more than one-fourth as much as diamond.

Sunstone, aventurine feldspar; aventurine.

Topaz, a mineral occurring in rhombic prisms, generally yellow and pellucid, also colorless, and of greenish, bluish or brownish shades. It sometimes occurs massive and opaque. It is aluminum fluosilicate and is occasionally used as a gem. It is little more valuable than garnet, except in the case of unusually fine specimens. Yellow varieties when heated sometimes turn pink. The yellow sapphire is sometimes called *Oriental topaz.*

Tourmaline, a mineral occurring in three-sided prisms. Black tourmaline is the most common, but there are other varieties, as the blue (*indicolite*), red (*rubellite*), green, brown and white. The red and green varieties, when they are transparent, are valued as jewels. The finest ones come from California and Brazil.

Turquoise, a hydrous phosphate of aluminum containing a little copper. It is blue or bluish-green in color, is nearly opaque and usually occurs in kidney-shaped masses with a nodular surface like that of a bunch of grapes.

Unio-pearl, a pearl secreted by a fresh-water mollusk, in distinction to those secreted by salt-water pearl oysters.

Verd antique, a mottled-green, serpentine marble. A green porphyry is called *Oriental verd antique.*

Zircon, a mineral occurring in tetragonal crystals, usually of a brown or gray color. It consists of silicon and zirconium. It is harder than garnet. The transparent varieties are used as gems. The reddish-brown variety is called *hyacinth.* The dark-brown zircon heated with potassium cyanide turns to a blue color and this recolored stone is called *starlite.* The *jargon* is a colorless, pale-yellow or smoky-brown variety from Ceylon.

METEOROLOGY

The state of the weather interests practically everyone, and to certain groups, such as farmers, air-mail pilots and navigators, it is of fundamental importance. This widespread interest in the weather is responsible for numerous and varied proverbs, all belonging to a picturesque weather lore. Though some bits of weather wisdom are based on fact, much of the weather lore one hears is superstition and tradition.

The scientific study of weather facts is called *meteorology,* from Greek words meaning midair and science. It is one of the most useful sciences.

The Weather Bureau.—Forecasting the weather is a regular function of government weather bureaus. The United States Bureau, one of the best in the world, has been a division of the Department of Agriculture since 1891, when it was transferred from the United States Signal Corps. Its weather and crop service for the agricultural interests, its flood, frost and storm warnings, its special air and marine forecasts and its advisory service for shippers of perishable goods, street-cleaning departments, concrete-construction and water-power companies and other groups help to protect lives, serve industry and conserve property.

The Weather Bureau is organized and equipped to make country-wide surveys. At more than 200 observation stations that are scattered over the entire United States, trained observers make records of weather data twice daily—at 7 A.M. and 7 P.M., Central Standard Time. They read the maximum and minimum temperature records of the thermometer; record the movement and velocity of the winds; observe the clouds; measure rainfall or snowfall; take barometer readings; and note any special weather phenomena. The reports are telegraphed in code to concentration offices in Chicago and New York, from which cities, by a specially devised system, they are redistributed to certain stations throughout the country, all in less than 45 minutes.

Expert meteorologists tabulate the data and put it in such form that other experts at five district centers may quickly issue their forecasts. These forecasting centers are Washington, D.C., Chicago, New Orleans, Denver and San Francisco. There are in addition over 4,000 co-operative meteorological stations engaged in compiling permanent data. Specialized forecasts are issued from widely scattered local stations as needed.

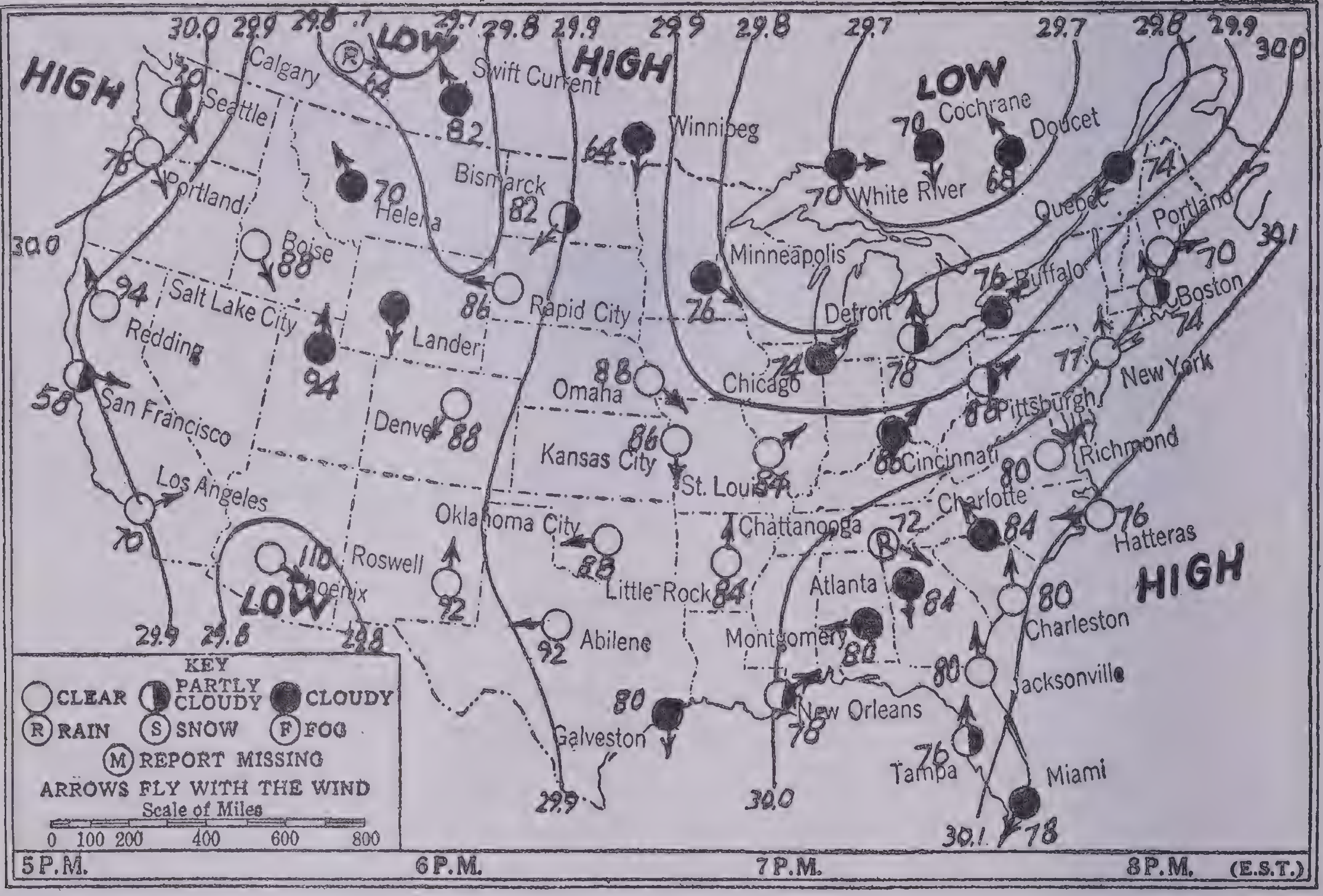
Another activity of the Weather Bureau is the preparation of summaries, records and interpretations that provide valuable information for engineers, medical institutions, builders, merchants, insurance companies, invalids, agricultural specialists and any others who require special data on climate.

The weather predictions show a high average of correctness, but every forecaster must expect some failures, for the reason that he can indicate probabilities but not certainties. A variation of pressure may point to rain, but unforeseen factors may intervene, and the skies remain clear. Nevertheless the forecasts examined over a long period show many more successes than failures.

Weather maps showing country-wide conditions are made twice a day at the larger offices. A weather map seems complicated at first sight, but it is not difficult to understand. The most prominent feature is the system of solid black lines that run irregularly across it. These are called *isobars* or *isobaric lines.* They connect places of equal air pressure, pressure being a fundamental element in weather phenomena. The words *high* and *low* indicate centers of barometric pressure higher or lower than 30 inches, respectively. In the barometer, a column of mercury 30 inches high balances the normal air pressure at sea level, and a rising barometer shows that the mercury is being pushed upward by descent of heavy air and that an area of high pressure is developing. A falling barometer shows decreasing pressure and a "low."

Dotted lines on the map are *isotherms* or *isothermal lines.* They connect places of equal temperature. Each map is furnished with a key that interprets other markings. A circle means clear; if half shaded, it means partly cloudy; if entirely black, it indicates cloudy weather. There are symbols to indicate rain and snow; and arrows show wind direction.

Weather and Climate.—There is an old saying to the effect that there is nothing certain about the weather except that it changes. This suggests the chief distinction between the climate of a locality and its weather. *Climate* is the average result of variations in weather over a long period. *Weather* includes the daily changes in temperature, density of the air, wind and so on. A locality with a climate characterized as dry may have several rainy days throughout the year; but dryness is a dominant feature in the general average of its atmospheric conditions. Climates are said to be variable within the year when there


HIGH
LOW
HIGH
LOW
LOW
HIGH
Calgary
Seattle
Swift Current
Portland
Helena
Bismarck
Winnipeg
White River
Cochrane
Doucet
Quebec
Portland
Boston
Buffalo
Minneapolis
Detroit
Boise
Salt Lake City
Redding
Lander
Rapid City
Chicago
New York
Pittsburgh
San Francisco
Omaha
Denver
Kansas City
St. Louis
Cincinnati
Richmond
Charlotte
Los Angeles
Oklahoma City
Chattanooga
Hatteras
Roswell
Phoenix
Little Rock
Atlanta
Charleston
Abilene
Montgomery
Jacksonville
Galveston
New Orleans
Tampa
Miami
KEY
CLEAR
PARTLY CLOUDY
CLOUDY
RAIN
SNOW
FOG
REPORT MISSING
ARROWS FLY WITH THE WIND
Scale of Miles
0 100 200 400 600 800
5 P.M.
6 P.M.
7 P.M.
8 P.M.
(E.S.T.)

United States Weather Bureau Map

This chart, printed in a morning newspaper, was made from data assembled the previous evening. The forecast for New York city, based on this chart, is "Local thunder showers today, cooling at night. Tomorrow generally fair, moderate temperatures." Normally, highs that follow lows bring clearing weather, while lows that follow highs cause unsettled weather. Although highs and lows sometimes remain stationary or even retrograde, they usually move across the country from a westerly quarter, passing off to the northeast. The average speed of lows ranges from 477 to 718 miles a day; of highs from 485 to 594 miles a day, the higher speeds governing in winter, the lower, in summer. Winds about a low are deflected slightly toward the center and shift to a counterclockwise direction; but from highs they diverge and shift in a clockwise direction

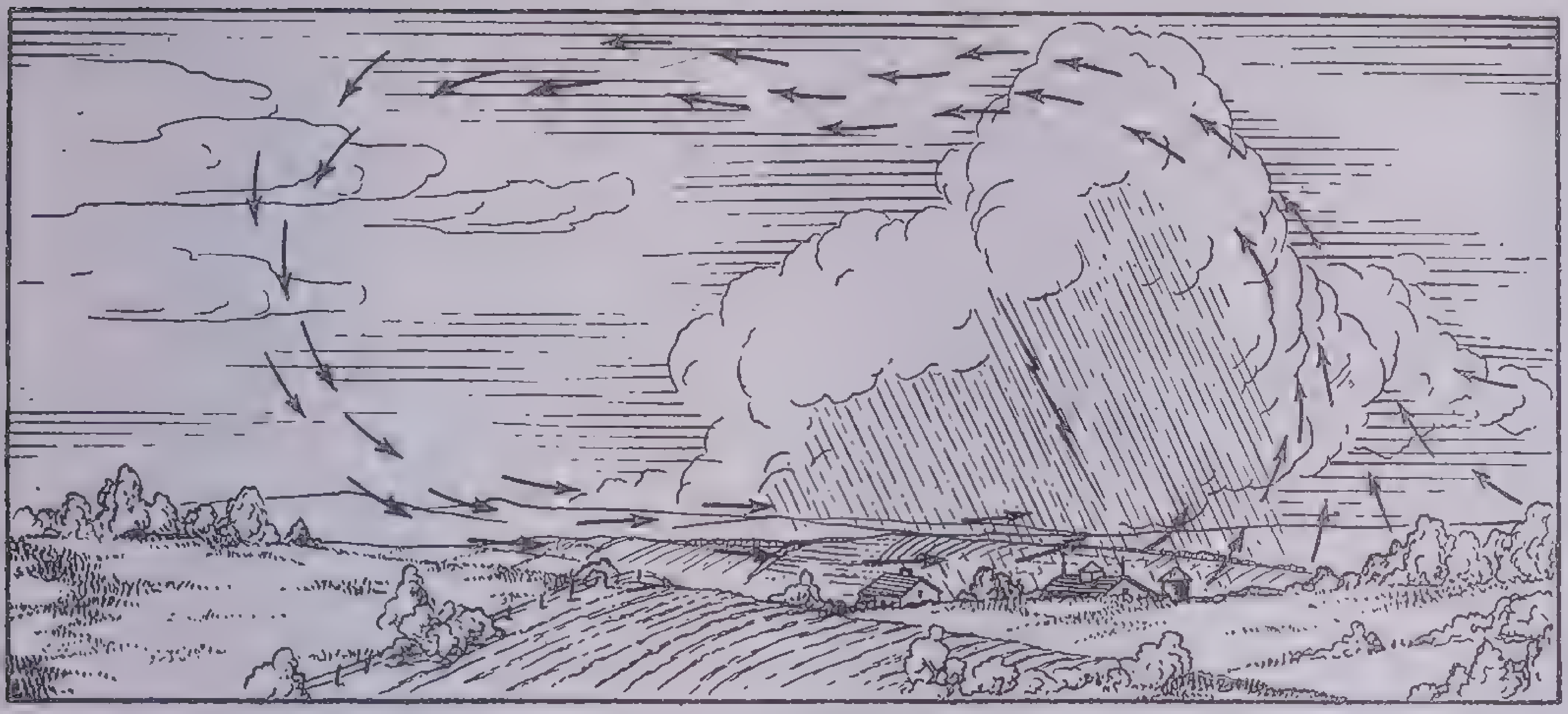
are marked changes from season to season, as in the Middle West. Temperatures there may range from below zero in winter to 100° or more in summer. Yet the general average from year to year, over a considerable period, remains about the same.

Considering the earth as a whole, we find that variation in the amount of sunshine received is the most widespread cause of variations in climate. On this broad basis, the earth is divided into five zones. The two Frigid Zones about the poles are perpetually cold, because the sun's rays strike them very obliquely. The nearly vertical direction of the rays in the Torrid Zone, which extends 23½° on each side of the equator, gives that zone a high average temperature. In the North and South Temperate Zones, between the torrid and frigid areas, we find a medium average temperature, but there is a wide range between the margins of these zones. These are the general conditions responsible for the five mathematical divisions of the earth's surface.

If we divide the earth into climatic belts based on equal temperatures, substituting isotherms for parallels of latitude, we would find the boundaries very irregular. Several factors offset the basic effect of latitude. One of the most important of these is altitude. Elevated lands are cooler than lowlands. A freezing temperature may be registered on a mountain slope at the very moment that intense heat prevails in the valley. Large bodies of water tend to modify the climates of adjacent coasts, making them cooler in summer and warmer in winter. Winds, ocean currents and variations of land topography are other elements that help to determine climatic conditions by affecting temperature.

Winds and Storms.—Winds are currents of air moving in the atmosphere in various directions and at velocities that may range from that of a light breeze to that of a tornado. Ordinary winds blow strongest in the upper air, a fact of great significance to aviators. Surface winds tend to be slowed up by friction with buildings and elevated land. Storms are atmospheric disturbances of which winds are usually a feature. Not all winds are storms but winds are vitally important in the formation of storms.

Cause of Winds.—The direct cause of winds is the flow of air from regions of high pressure to those of low pressure. If the atmospheric pressure were everywhere the same and unchanging, there would be no air movements. Variation in pressure is thus the cause of winds; and variation in pressure, in turn, is brought about by unequal temperatures. With this in mind let us consider the general circulation of the atmosphere. Over the equatorial regions, where the rays of the sun are most nearly vertical, the air near the warm earth is constantly being heated. Expanded upward by the heat, it is pushed into the upper atmosphere by cooler air crowding in from surrounding areas. When the ascending air reaches a stratum of equal density in the upper atmosphere, it flows away horizontally, being parallel with the earth, and poleward movements north and south are set up. In higher latitudes there is a descending movement, north and south of the equator, at points of high pressure, causing a return movement of surface currents toward the equatorial belt. These currents are the *trade winds*. Some of the upper current continues as a horizontal movement and on settling to the surface forms another belt of winds blowing toward the pole in each hemisphere. These are the *prevailing westerlies*. Difference in pressure is known as the *barometric gradient* because the flow of air from areas of high to areas of low pressure suggests



High- and Low-Pressure Areas

This diagram shows in a general way the chief surface directions in related high- and low-pressure areas, provided there are no modifying factors at the earth's surface. Note that the wind in the high area, as it comes down from higher regions, blows in broad currents toward the center of the low, where it must rise to repeat the same round

the flow of water down grade. Winds are named according to the direction from which they blow. A north wind blows *from* the north not toward it. Winds are also designated as regular, periodical and variable.

WATER VAPOR AND ITS CONDENSATION

No portion of the earth's atmosphere, not even the air over deserts, is absolutely devoid of water vapor. Though we cannot see or feel the tiny particles of moisture that make up the vapor content of the air, we are made aware of this moisture whenever condensation takes place. A person wearing spectacles finds that the lenses become cloudy when he comes out of the cold into a warm room. On a warm summer day drops of water will form on the outside of a pitcher of ice water. The moisture thus made visible is water vapor of the air condensed into liquid particles. Cold air cannot hold as much vapor as warm air. Water vapor in the air of the warm room condenses on the glass of the spectacles and the pitcher because the temperature at those points is lowered.

Air is said to be *saturated* when it contains all the moisture possible at a given temperature. The actual amount that it contains is called its *absolute humidity.* The amount that it contains compared with the quantity that it might contain is its *relative humidity,* a property expressed in percentages. Saturated air, for example, has a relative humidity of 100. When air contains three-fourths the moisture that it might contain, its relative humidity is 75. Whenever the temperature of saturated air is lowered, condensation of moisture begins, and the temperature at which this process starts is called the *dew point.* When air contains a large amount of vapor, its dew point is higher than when the moisture content is small.

The reverse process—the formation of vapor from matter in a liquid state—is called *evaporation.* This process is constantly going on from all damp surfaces, but the oceans are by far the most important evaporating bodies. We see, then, that water vapor is constantly being supplied to the air and is constantly being condensed, returning to the earth as liquid and making possible an endless replenishment of the earth's water supply. The rate of evaporation varies with different conditions. It is checked by an addition of water vapor; every housewife knows that clothes hung out to dry in damp air are longer in drying than those exposed to dry, clear air. We all suffer more from the heat on a humid day because the perspiration evaporates too slowly to permit the skin to cool. Water vapor is derived more quickly from a warm surface than from a cold one. Evaporation takes place more rapidly in a wind than in still air—a fact utilized in machines for drying the skin and hair. On the other hand, evaporation is diminished by an increase of pressure.

TERMS IN METEOROLOGY

Anemometer, an instrument for measuring the velocity of winds. The form used at most observing stations consists of four metal cups mounted on the ends of rods that cross each other at right angles at the top of a vertical bar. As the winds strike the hollow sides of the cups, the instrument revolves, and the speed of revolution is recorded by a clockwork system at the bottom of the bar. Another type of anemometer resembles a miniature windmill.

Atmosphere.—Changes constantly taking place in the earth's atmosphere—its *air sphere*—produce the varied phenomena of weather. A knowledge of the air envelope is therefore essential to an understanding of meteorology. Although we cannot see it, air is a real substance, capable of being weighed, analyzed and compressed. It is a mixture of nitrogen, oxygen, argon, water vapor, carbon dioxide and a number of other gases in very small amounts. An average sample of country air freed from water vapor would contain, by volume, the following (in percentages): nitrogen, 77.94; oxygen, 20.95; argon, 0.94; carbon dioxide, 0.03; other gases, 0.14. By weight, the average composition of dry air is nitrogen, 75.30; oxygen, 23.15; argon, 1.30; carbon dioxide, 0.05; other gases, 0.20. The amount of water vapor in the air varies greatly from place to place and may also vary considerably in the same locality from season to season or even from day to day. This is also true of carbon dioxide, which is produced in large quantities by the burning of coal and the respiration of men and animals. Changes in temperature affect the moisture content of the air to a very great degree, as explained below in the section on *Water Vapor.*

Air contains innumerable solid particles known collectively as *dust.* These particles consist of mineral matter, smoke, meteoric dust, plant spores, pollen, bacteria and so on. The hazy atmosphere of cities is due to dust particles. In the country haze is characteristic of the warm, mellow days in autumn called Indian summer. The haze in the atmosphere at that time is caused chiefly by lack of rain to wash dust out of the air, by lack of wind to blow dust away and by the presence of smoke from burning brush or forest fires. Dust particles provide solid surfaces for condensing water vapor.

As a physical substance air is classed as a fluid. From experiments it has been found that 1 cubic foot of air at sea level weighs approximately 1.2 ounces. The lower layers are weighed down by the masses above, and at sea level the average weight of the air column or the air pressure is about 14.7 pounds to the square inch. The column of air resting upon 1 square foot of surface at sea level will therefore weigh more than 1 ton. The total weight of the air is equal approximately to a layer of water

Photo by U. S. Weather Bureau

Sounding Balloon

The public sometimes helps to gather weather data. A meteorograph—the instrument recording temperature, pressure and humidity—is in a wicker basket attached to the sounding balloon. The balloon rises until it bursts, and the instrument's fall is retarded by means of a small parachute. An attached card requests the finder to pack and return the instrument by express (collect), for which a payment of from $1 to $5 is usually made. Sounding-balloon observations are taken each year during the International Month when meteorological services around the world make simultaneous observations of air conditions

Photo by U. S. Weather Bureau

Recording the Wind Indicated by Pilot Balloons Aloft

Weather Bureau employees record the direction and compute the velocity of the wind for each minute or for each 180 meters in altitude while the sounding is being made. Upper air observations by means of pilot (unmanned) ballons are made by the Weather Bureau and by the Army and Navy at stations throughout the United States

covering the whole earth to a depth of 33 feet. The higher the altitude, the rarer the air becomes, because it is less compressed by the weight of the air above it. At 50 miles above the earth's surface the air exerts no pressure that can be measured. It is estimated that half the atmosphere by weight lies below an altitude of 3.6 miles above sea level and approximately three-fourths of it lies below our highest mountain peaks. The density of the air and the pressure that it exerts are changed by variations in temperature. When it is heated, air expands and becomes less dense, that is, lighter per unit of volume. This principle accounts for the formation of winds.

Our knowledge of the atmosphere has been greatly increased in recent years by balloon flights into the stratosphere (the name given to the tenuous shell of atmosphere surrounding the dense layer near the surface, roughly the atmosphere at a height exceeding 5 miles.)

Sounding balloons equipped with self-recording instruments have been sent to heights of 25 miles. Russian investigators have been especially prominent in this field of science.

Scientists of the Massachusetts Institute of Technology have developed a tiny radio that can be carried as part of the equipment of a sounding balloon. During the flight this radio automatically broadcasts the data recorded by meteorological instruments and afterwards descends safely to the earth by parachute.

Barometer, a device for measuring the pressure of the atmosphere. It is provided with a scale that shows the pressure in inches and fractions thereof. The first barometer was made in 1643 by Torricelli, a pupil of Galileo. He filled a glass tube about 1 yard long with mercury. He then placed his finger over the open end of the tube to keep the liquid from spilling and inserted this end in a vessel of mercury. On removing his finger, he found that the fall of mercury from the inverted tube continued until the top of the mercury column was 30 inches above the surface of the mercury in the vessel. The vacuum above the top of the column showed that the mercury was held up by the pressure of the air; in other words, the pressure at sea level (14.7 pounds to the square inch) is balanced by the weight of a column of mercury 30 inches high. Increased air pressure causes the mercury to rise in the tube; a reading, say, of 30.1 inches, shows a rising barometer and indicates fair weather. Since lighter pressure usually precedes a storm, a falling barometer indicates stormy weather.

The Torricelli barometer is called the *cup* or *cistern* type. An *aneroid* barometer, so called (from Greek meaning not wet) because it has no fluid in it, is found in several patterns. One type consists of a cylindrical metal box, highly exhausted of air and having a thin, elastic, corrugated lid that responds to every change of pressure. The device is equipped with transmission levers and a graduated scale (usually with 30 as a base) on which the pressure changes are recorded. Such a barometer is easily carried about and is of the type used in measuring altitude.

The accompanying table shows how pressure of the atmosphere varies at different elevations:

Elev. Feet	Barom. Inches	Elev. Feet	Barom. Inches	Elev. Feet	Barom. Inches
0	29.9	600	29.25	4000	25.81
50	29.845	700	29.14	5000	24.88
100	29.79	800	29.03	6000	23.98
200	29.68	900	28.92	7000	23.11
300	29.57	1000	28.82	8000	22.28
400	29.46	2000	27.78	9000	21.48
500	29.35	3000	26.78	10000	20.70

A self-recording barometer, in which an automatic pen point records daily changes in pressure on a revolving cylinder, is called a *barograph.*

The actual variations in pressure from month to month, maximum and minimum for each month, for about 60 years are shown for New York city in the accompanying table:

Monthly Highest and Lowest Barometric Readings

(Pressure in inches at sea level, New York, N. Y.)

MONTH	HIGHEST	DATE	LOWEST	DATE
January....	31.01	27, 1927	28.61	3, 1913
February...	31.00	1, 1920	28.70	6, 1896
March......	30.95	30, 1934	28.83	1, 1914
April.......	30.71	1, 1934	29.03	17, 1929
May........	30.57	11, 1929	29.02	3, 1929
June.......	30.56	2, 1883	29.34	26, 1902
July........	30.51	7, 1892	29.35	2, 1932
August.....	30.45	31, 1934	29.28	24, 1893
September..	30.61	7, 1888	29.19	30, 1920
October.....	30.72	10, 1929	29.06	25, 1925
November ..	30.82	28, 1932	28.70	13, 1904
December...	30.93	28, 1896	28.97	26, 1909

The schedule below (from material prepared by the U. S. Weather Bureau) shows how to use a barometer to foretell the weather.

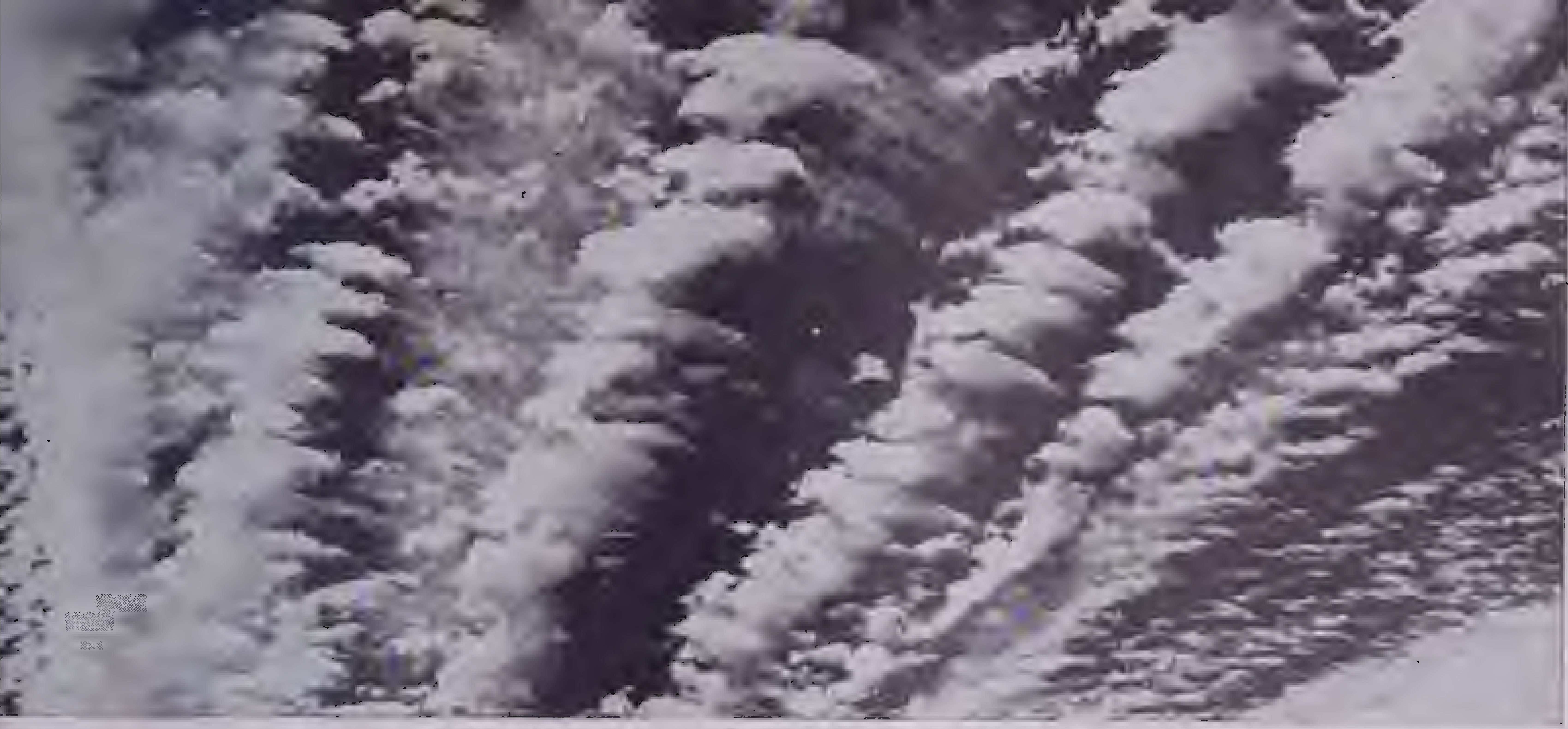
Rules for Foretelling the Weather

(For use with aneroid barometers, prepared by U. S. Weather Bureau.)

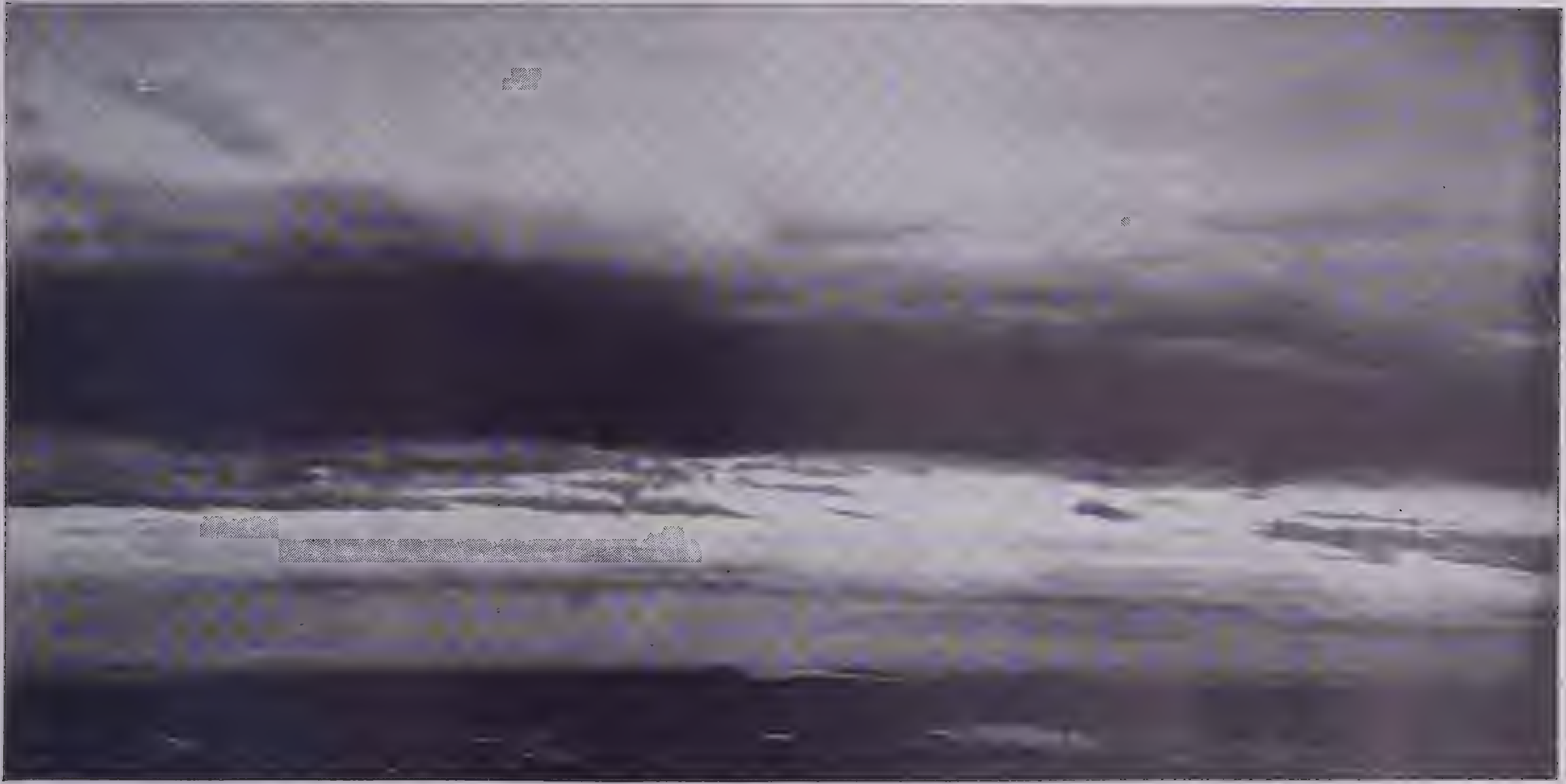
BAROMETER	WIND FROM	WEATHER INDICATED
High and steady	SW to NW	Fair and little temperature change for 1 or 2 days.
High and rising rapidly	SW to NW	Fair followed by rising temperature and rain within 2 days.
High and falling slowly	SW to NW	Rain in 24 to 36 hours.
Very high, falling slowly	SW to NW	Fair and slowly rising temperature for 2 days.
High and falling slowly	S to SE	Rain within 24 hours.
High and falling rapidly	S to SE	Increasing wind with rain in 12 to 24 hours.
High and falling slowly	SE to NE	Rain in 12 to 18 hours.
High and falling rapidly	SE to NE	Increasing wind with rain in 12 hours.
High and falling slowly	E to NE	Summer, light winds, fair; winter, rain in 24 hours.
High and falling rapidly	E to NE	Summer, rain in 12 to 24 hours; winter, rain or snow and increasing winds.
Low and falling slowly	SE to NE	Rain will continue 1 or 2 days.
Low and falling rapidly	SE to NE	Rain and high wind; clearing and cooler in 24 hours.
Low and rising slowly	S to SW	Clearing soon and fair several days.
Low and falling rapidly	S to E	Severe storm soon, clearing and cooler in 24 hours.
Low and falling rapidly	E to N	Northeast gales with heavy rain or snow, followed in winter by cold wave.
Low and rising rapidly	Going to W	Clearing and colder

Beaufort's scale, see *Wind scale.*

Blizzard, any heavy snowstorm accompanied by winds and excessive cold. Robert De C. Ward, in his *Climates of the United States,* defines a blizzard as: "A sharp, biting, irresisti-

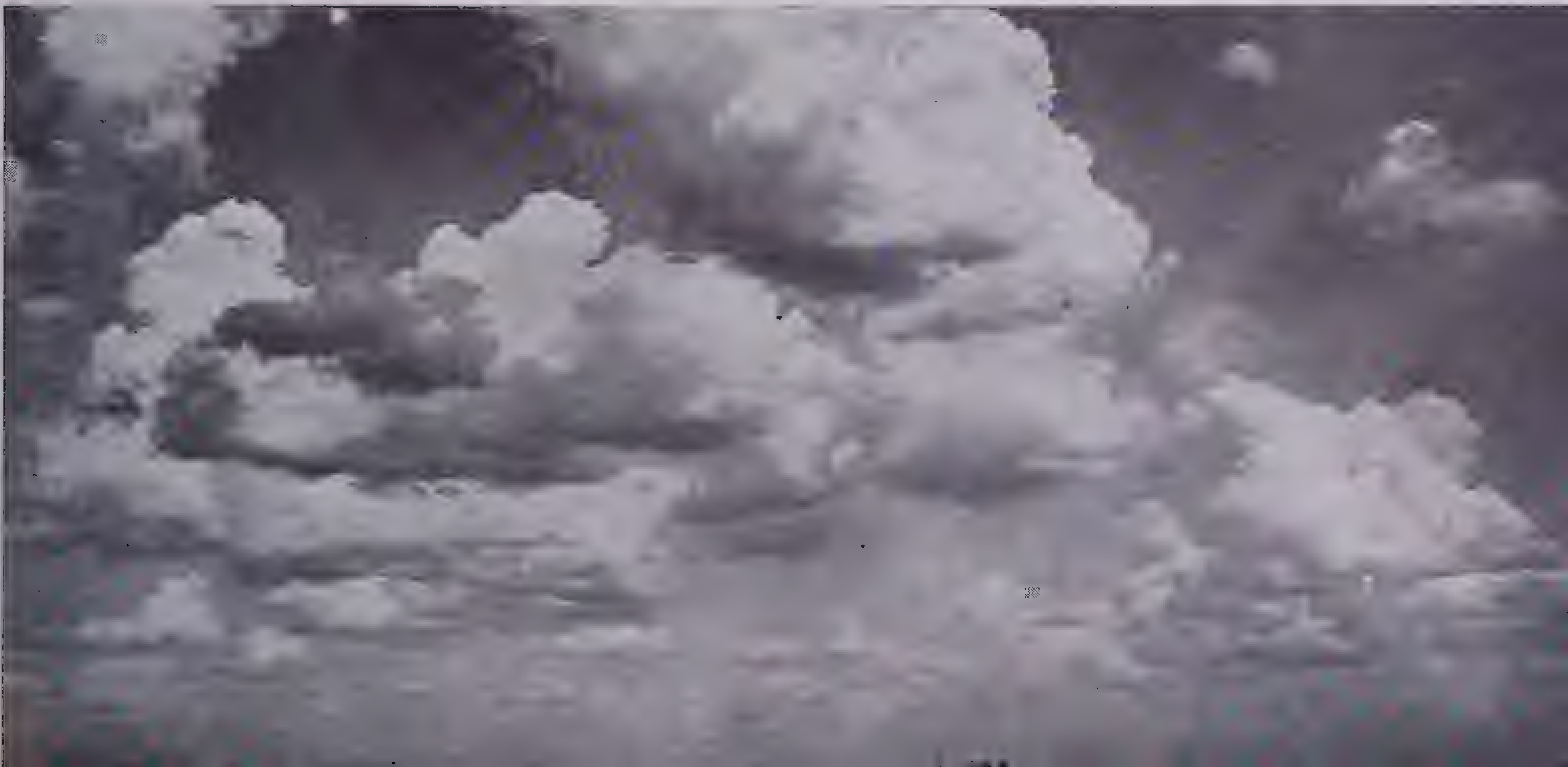


Bands of Alto-Cumuli Clouds with Cirrus Filaments

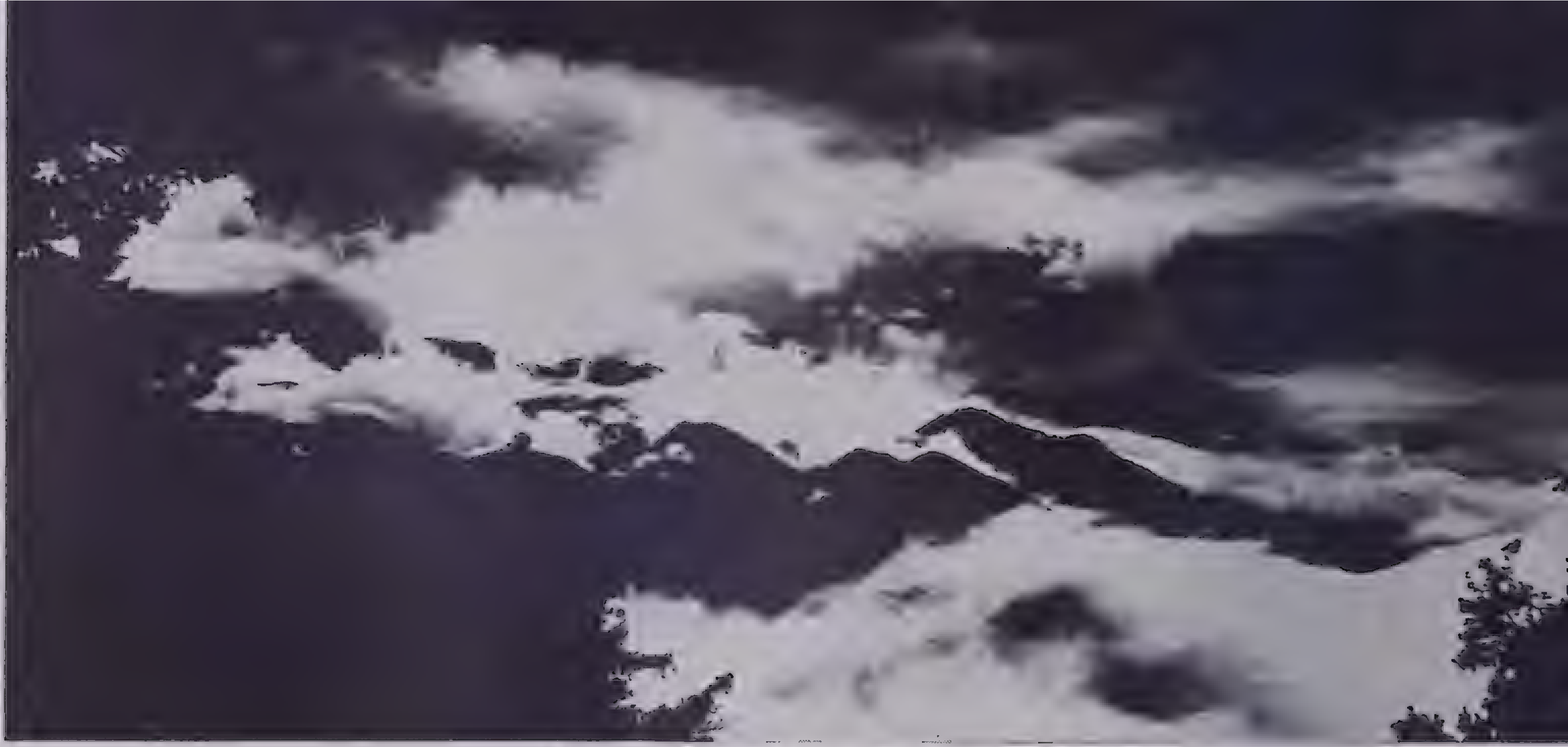


Stratus Clouds at Two Levels

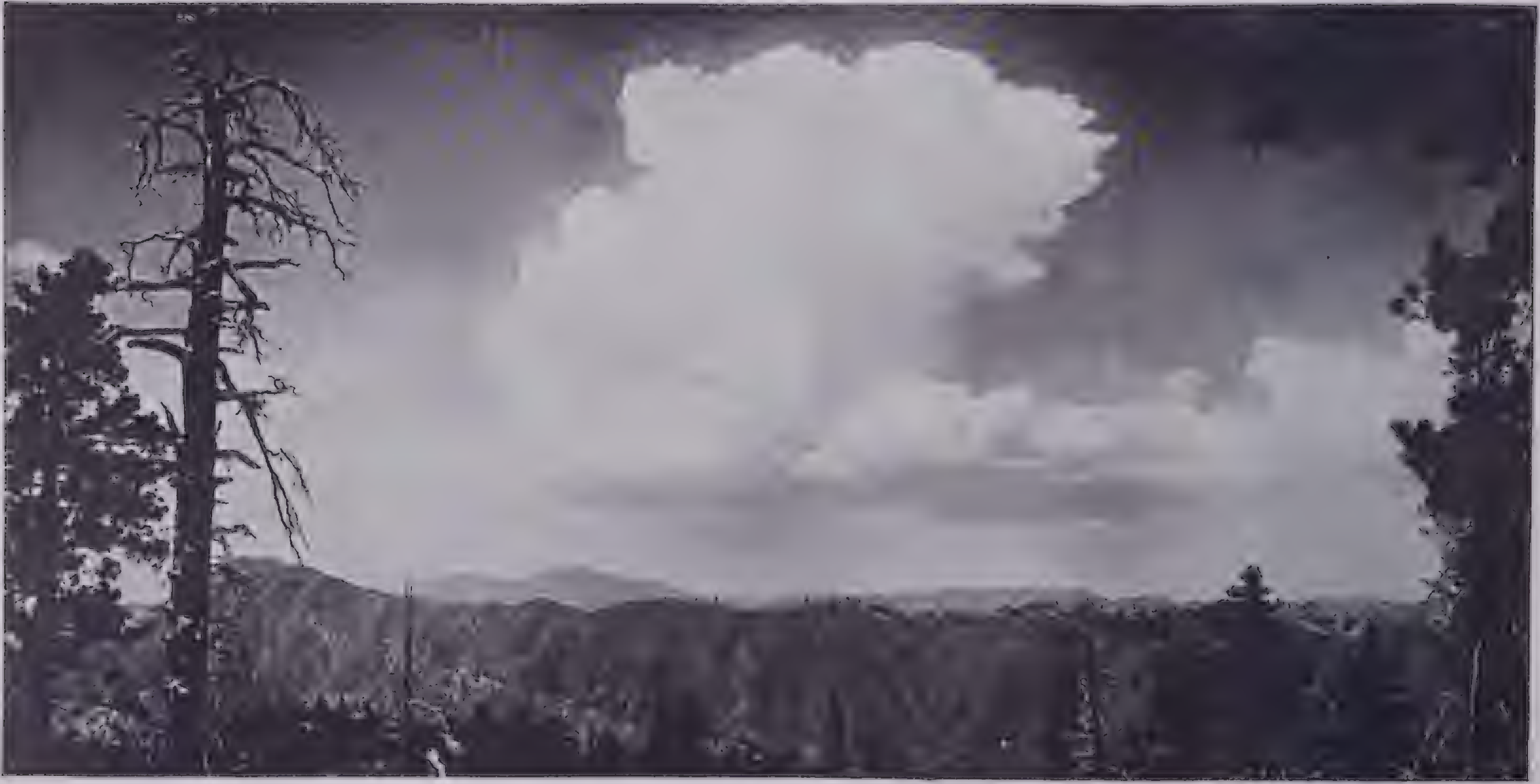
Cumulus Clouds



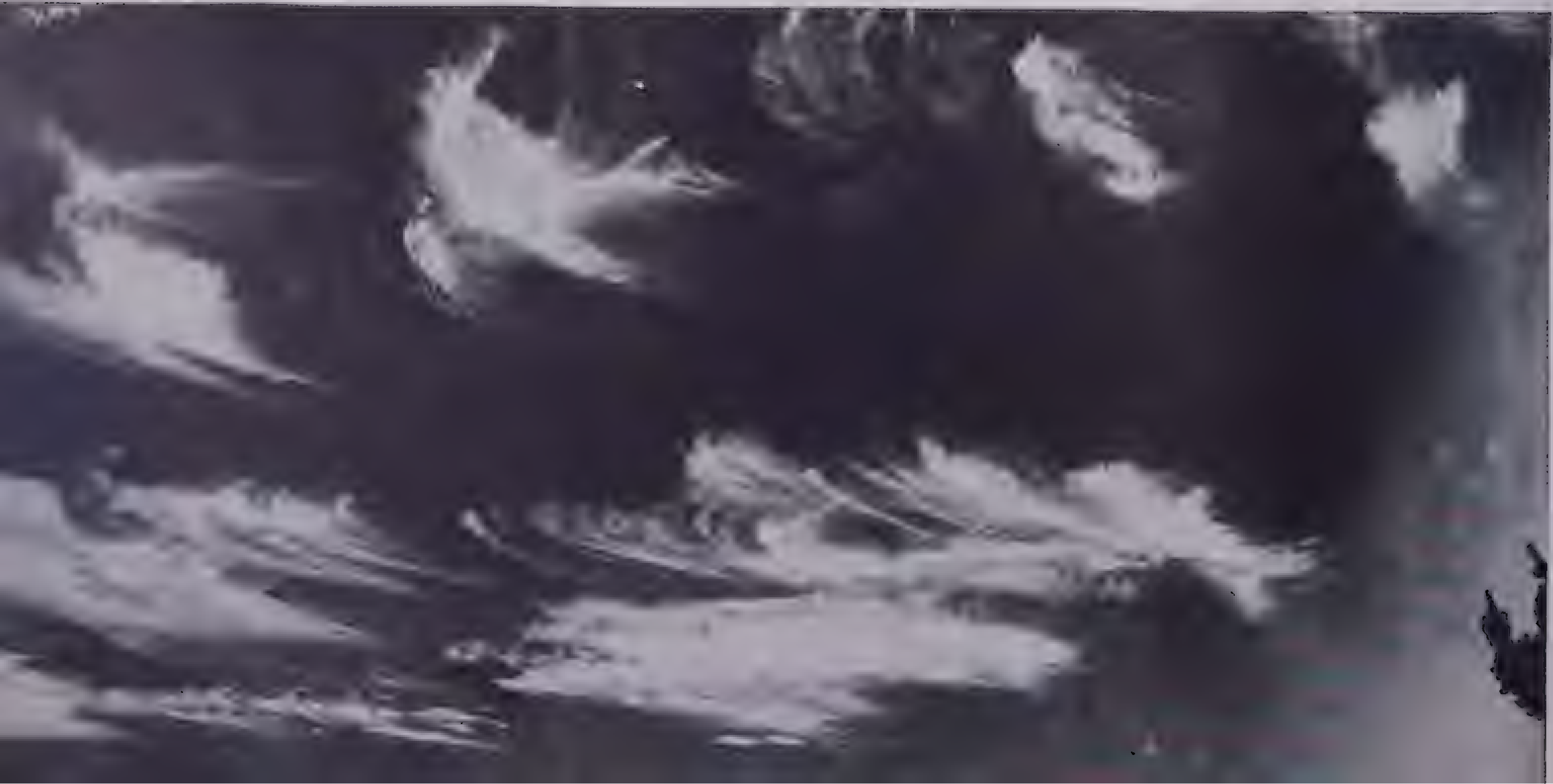
Photos by
United States
Weather Bureau



Nimbus Clouds above Fog or Stratus



Cumulo-Nimbus just grown from Cumulus



Tufted Cirrus Clouds

Photos by Ferdinand Ellerman, Mt. Wilson Observatory ble cold-wave gale, with rapidly falling temperature, with fine, dry, driven snow and with cutting needlelike ice crystals." This type of storm occurs most frequently and with greatest severity on the northern plains of the United States, on the Canadian prairies and on the plains of Russia and Siberia. Severe blizzards may cause great losses to stockmen. Because of the blinding snow, many a person has lost his way and perished a few yards from his own home. The cause of a blizzard is the rapid pushing forward of a mass of cold air from a region of high pressure formed far north.

Calms, regions in which little or no wind blows for protracted periods. The vertical direction of the ascending air currents in the region of the equator is the cause of the *equatorial belt of calms,* also called *doldrums.* Here there are pronounced air movements perpendicular to the earth; the result is an area of quiet that was always dreaded by masters of sailing vessels in the earlier days of navigation.

Because the rising air is cooled at higher altitudes, frequent rains occur in this belt. The calms move north and south a few degrees each year, in accordance with the apparent movement of the sun, the extreme limits of advance being 15° N. and S. Lat. Farther north and south, at about 30° Lat., are similar belts of tranquillity, where the cooler air is descending and creating a vertical movement that brings little or no rain.

Chinook (named from an Indian tribe of the Columbia River region), a warm, dry wind prevalent in winter on the plains east of the Rocky Mountains in Canada and the United States. As the chinook ascends the western slopes of the mountains, it loses so much of its moisture that on the downward course it is very dry; and it becomes relatively dryer because, in its rapid descent, the increase of air pressure warms it by compression and so gives it a greater capacity for holding its vapor. There are on record cases of a rise in temperature of 80° F. in 6 to 8 hours on the Montana plains, after the chinook had begun to blow. Freezing and starving cattle find comfort and food, for the wind warms them and melts the snow quickly, exposing the grazing areas. The cattle ranges, in fact, could not be maintained were it not for the chinook. If the wind blows in summer, its drying action is a calamity, for crops cannot withstand its heat. This type of wind is called a *foehn* in the Swiss Alps, especially on their northern side; and that word is often used by meteorologists.

The name chinook is also applied locally to a warm, moist wind that blows along the Pacific coast of Oregon and Washington.

Cloud, a collection of minute but visible water particles condensed from the water vapor of the air under conditions that are unfavorable to *precipitation;* that is, the particles are too fine and light to fall as rain or snow and are held suspended in the air. There is no real distinction between a cloud and a fog except that of position. The statement that a cloud is a fog in the sky or a fog is a cloud on the earth is essentially true. A traveler on a mountain thinks of himself as surrounded by fog, while an observer in the valley, seeing the same formation, calls it a cloud. Clouds are sometimes due to the rising of warm, vapor-laden air that cools when it reaches a higher altitude. Some clouds are formed when moist air comes in contact with a cool surface, such as a mountain. Again two air currents of different temperature may cause clouds to form when such currents meet each other. There are four general cloud types to which the names *cirrus, stratus, cumulus* and *nimbus* have been given. Aside from these standard types there are innumerable variations and combinations. Many words are compounded to express these forms, as fracto-cumulus, fracto-stratus, alto-cirrus, alto-stratus, cirro-cumulus and cumulo-nimbus. Besides these, there are others, such as scarf, riffle and billow.

Flying Above the Clouds
Cirro-stratus clouds above a thick layer of strato-cumulus.

Cirrus Clouds.—The cirrus is a detached cloud of delicate appearance, threadlike or hairlike in structure and feathery or plumelike in form. They may resemble isolated tufts or curls of hair or may be in long straight or curved filaments ending in tufts, not uncommonly arranged in bands converging more or less at a point on the horizon. "Cats' whiskers" and "mares' tails" are cirrus clouds. They are usually in the upper regions and are our highest clouds, 5 to 10 miles high and in regions of extreme cold. Naturally, at this height they must be made up of snow or ice particles.

The altitude, however, is not vital provided conditions for their formation are favorable. The extreme cold in which they are found necessitates a limited amount of moisture; consequently they are never heavy and do not obscure the form of sun or moon. When these bands thicken and become solid sheets, they are the forerunners of storm and the sailor prepares for high seas. If, however, they become thinner and die out, clear weather for several days may be expected.

Stratus Clouds.—The strati are the lowest-lying clouds, generally less than ½ mile above the earth's surface. "A uniform layer of cloudlike fog not lying on the ground" is the international definition given to this form. The lack of observable structure differentiates it from all other forms. It is the cloud that produces our drab, chilly, cheerless days, for it shuts off the sun completely. The so-called "high fogs" of California, where a deep-sea fog drifts over a relatively warm land, evaporating the lower part, is one of this type. At times such a cloud sheet becomes broken by winds and then the term fracto-stratus is applied to it. There are many other variants.

Cumulus Clouds.—The cumulus is a thick cloud of which the upper surface is dome-shaped and exhibits protuberances while the base is generally horizontal. These clouds are the great billowy heaps or "wool packs" that one is likely to see in mid-latitudes (the intermediate area between the tropics and the Polar Region) on a summer afternoon. They are formed by the warmed air in the lower regions being pushed up into colder regions. They increase with the heat of the afternoon, usually growing smaller as evening approaches. Because they indicate rising air currents, they are more commonly seen over bodies of water at night.

Forest fires frequently produce cumulus clouds that, when high and well broken up, give the sky a flaky appearance designated as a cirro-cumulus or mackerel sky.

Nimbus Clouds.—The fourth general type, the nimbus, is the dense, dark, shapeless rain cloud. The average altitude of its under surface is little more than ½ mile. Nimbus clouds are usually too heavy for the sun to penetrate; consequently their under parts are dark gray or even black. When they are broken up by strong winds, they are known as fracto-nimbus clouds.

Cyclone (from the Greek word for wheel or whirl), a storm area of low pressure toward which winds blow from all directions. Cyclonic disturbances are the most important type of storm in middle latitudes. The low-pressure areas move eastward because they are eddies in the prevailing westerly winds and are followed by high-pressure areas called *anticyclones.* From the anticyclonic areas, the winds blow outward in all directions. One may trace on weather maps the paths taken by successive highs and lows across the United States. The alternation of these areas causes regular variations of the weather.

The inflowing air in the cyclonic area gives rise to an upward spiral current, and as the air rises and is cooled, its vapor is condensed. Hence cloudiness and rain are characteristic of the cyclonic storm. Then, too, some of the winds blow from warmer to cooler regions, and in some sections they are forced into higher altitudes by mountain ranges. These conditions are favorable to precipitation. On the other hand the approach of the anticyclone heralds clear skies and a lower temperature. In summer anticyclones bring cool weather. The hurricanes of the tropics and the tornadoes of the Middle West are concentrated cyclonic storms.

Dew, moisture in the air condensed on the surface of certain bodies. We commonly speak of dew falling, but the drops of water seen on grass early in the morning do not fall like rain. They form on surfaces that are colder than the adjacent atmosphere. Dew forms in precisely the same way as the drops on the outside of a cold pitcher in a warm room. It condenses more readily on clear nights because clouds tend to check the radiation of heat from the earth, and condensation cannot take place unless the ground becomes colder than the air in contact with it. Winds that keep the air in motion and so prevent its reaching the dew point also interfere with the formation of dew.

Doldrums, see *Calms.*

Fog or **Mist,** a cloud in the bottom atmosphere as indicated above under *Cloud.* When warm, damp air blows over cold water, or cool air settles over a warm, damp lowland, fogs occur. Heavy fogs that enshroud places like London and Chicago are intensified by the dust particles that are always hovering over such cities.

Frost, moisture condensed on objects when the temperature of the dew point is below freezing (32° F.). Frost is not frozen dew, not moisture that forms as dew and freezes afterward; it is moisture deposited in the form of ice crystals. Frost is less likely to form on cloudy than on clear nights because the ground cools more slowly if there are clouds to check radiation. In the autumn when the cold night air tends to settle in the warmer valleys and lowlands, frosts are a menace to late crops. Similar conditions may prevail in early spring.

Hail, balls of ice resulting from the meeting of two currents of air, one very warm and the other cold. Hailstones form in warm weather during violent thunderstorms when the particles of condensed moisture are carried back and forth between two adjacent layers of air. In the cold layer, ice or snow is formed. The particles then fall into the warm layer and are partly melted, only to be changed again into ice as they are whirled back into the cold stratum. This alternation of freezing and melting continues until hailstones are built up of such size that they fall of their own weight. The ice particles that cold weather sometimes brings mixed with snow or in the form of sleet (frozen rain) are not true hail.

Hurricane (from a Central American Indian word meaning evil spirit), a violent tropical storm accompanied by torrential rain and heavy gales. Hurricanes originate on the ocean in the Torrid Zone as upward currents of warm, moist air. The vapor rapidly condenses, liberating heat in the process and thus hastening the upward movement. There is always a center of low pressure, toward which blow winds of violent destructive force. Because of the rotation of the earth, the winds are turned to one side and start a spiral motion around the center of the storm, producing its whirlwind feature. The rotary winds may reach a velocity of 100 or 150 miles an hour, but the storm itself advances at a rate of only 10 to 15 miles an hour. Hurricanes of the Northern Hemisphere originate off the west coast of Africa and travel westward, being regular visitants of the West Indies. They usually continue westerly to Florida, causing havoc along the east coast, and then, recurring easterly, pass out across the Atlantic. Sometimes, however, they travel inland by way of the Gulf of Mexico. Such a course was taken by the Galveston hurricane of 1900, which caused terrible losses of life and property by a tidal wave that engulfed the city. The season for these hurricanes is August to November. In 1926, 1928 and 1935 Florida was visited by disastrous storms, all three in September. Hurricanes are the only storms of the Northern Hemisphere that travel from east to west.

Hygrometer, an instrument for determining the humidity of the air. There are several types, of which the *sling psychrometer* is in most common use. It consists of two thermometers attached to a support. One, called the *wet* thermometer, has a piece of wet muslin around the bulb; the other or *dry* thermometer indicates the temperature of the air at the time of measurement. The hygrometer is first rotated rapidly, to increase the rate of evaporation from the wet muslin. If the relative humidity of the air is 100 (that is, if the air contains all the moisture that it can hold or is saturated), there will be no evaporation. If the relative humidity is less than 100, evaporation will take place and will be indicated by a fall of temperature in the air adjacent to the wet thermometer. Comparison of the lower reading with that of the dry thermometer will show the amount of decrease. By reference to prepared tables, the relative humidity can be calculated.

Another type of hygrometer depends for its action on a curious property of human hair. If the natural oils are removed from a human hair by soaking it in a solution of caustic soda or alcohol, the length of the hair will change as the amount of moisture in the air changes, and these length changes are nearly proportional to relative changes in humidity. In the hair hygrometer the changes in length of such a piece of hair are used to move a needle across a dial, and the dial is calibrated so that the humidity can be read directly.

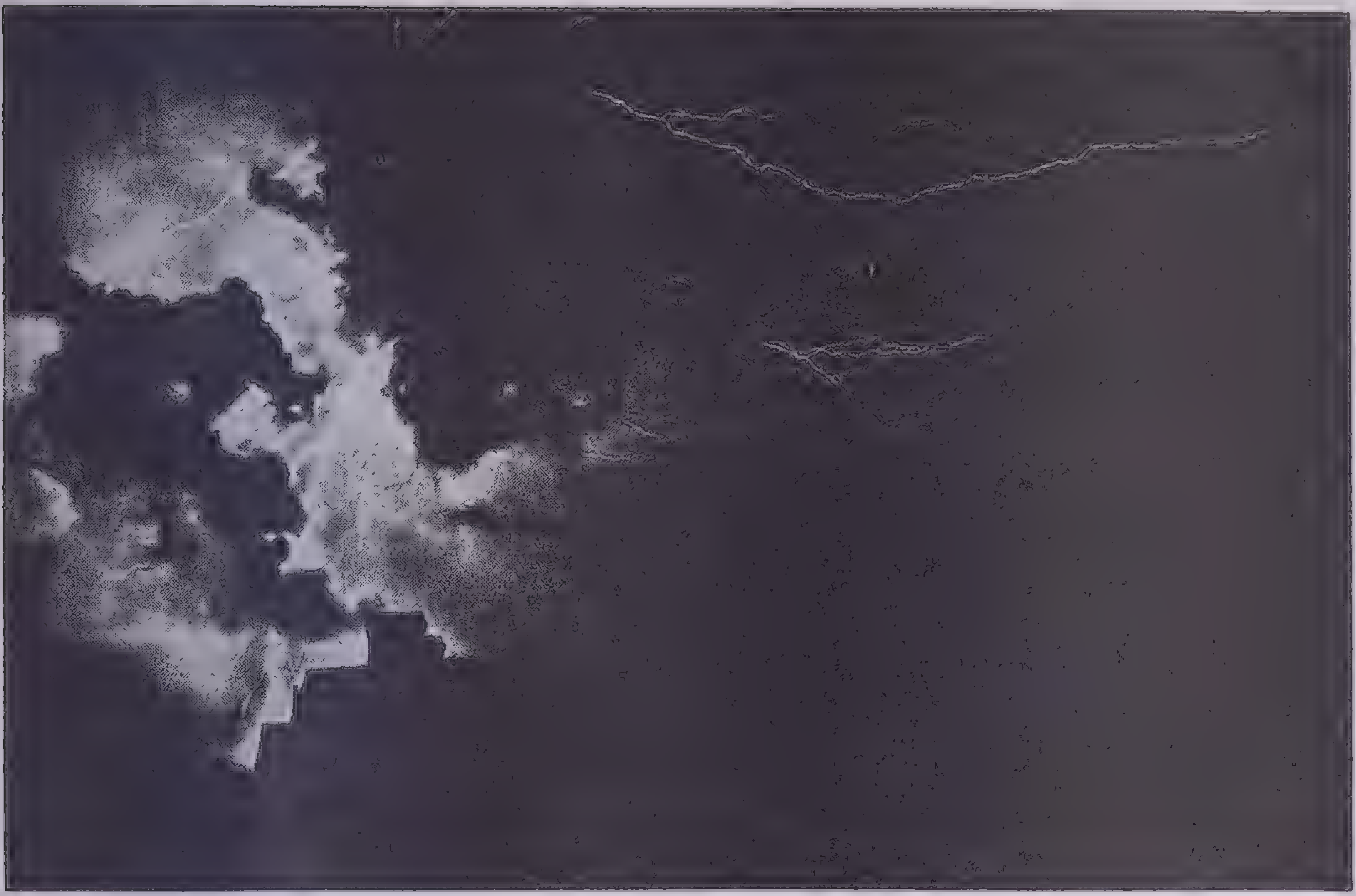
Khamsin (from the Arabic word for 50), a hot south or southeast wind that blows about 50 days over Egypt from the Sahara Desert and is dreaded for the heat and sand it brings with it.

Land and sea breezes, periodical winds that blow from land to sea and in the reverse direction, respectively. They are a phenomenon of warm weather or of warm climates. In the tropics the heat of the vertical (or nearly vertical) sun rarefies the atmosphere over both land and water but not to the same extent. Land is easily heated during the day and cooled during the night, especially if radiation is favored by the absence of clouds. Water is cooler than the land during the day and changes little in temperature at night. Hence during the day the cooler air moves in from the sea toward the area of low pressure, pushing up the heated, expanding air over the land, then there is a sea breeze. At night, when conditions are reversed, cool air from the land flows out to the warmer ocean, and there is a land breeze over the water.

Lightning, an enormous electric spark discharged between two clouds in the sky or between a cloud and the earth. Whenever friction occurs between isolated nonconducting bodies, charges of static electricity are built up; and, when these charges become sufficiently intense, they may rupture the intervening layer of air thus producing a visible spark or lightning flash.

An average flash of lightning has great energy—as much as a 200-ton express train traveling at 60 miles an hour—and we need not be surprised at the damage that occasionally results when a bolt or discharge of lightning strikes the earth. In passing through the air, the lightning raises the temperature to an extremely high point in a fraction of a second, and the sudden expansion of air thus produced gives rise to the familiar noise of thunder.

Though the danger of lightning to human life has been much exaggerated—statistics indicate that automobiles are about 1,000 times more dangerous—it is best to take no un-



Forked and Sheet Lightning Behind a Cloud

necessary risks while a thunderstorm is in progress. The safest place is the inside of a metal-framed building, such as a city skyscraper. Lightning frequently strikes such buildings, but is conducted harmlessly to the earth. The most dangerous locations during electrical storms are near isolated trees or prominences in open fields. The line of least resistance that lightning follows from a charged cloud to the earth usually causes it to strike any outstanding elevated point, and this is particularly true if there is a metallic connection between the point and the earth. For this reason it is not safe to walk across an open field carrying an umbrella; the iron ferrule provides a fine point for the build-up of a strong electric charge. There are cases on record of death from lightning apparently attracted by a steel-handled golf club held up in the air by a player.

A flash of lightning is practically instantaneous. If a moving electric fan in a dark room is suddenly lighted up by a lightning flash, the blades are seen with perfect distinctness exactly as if they were motionless. If the flash lasted for more than $\frac{1}{1000}$ of a second, the blades would be blurred by the wheel turning. This conclusion certainly contradicts our ordinary impressions, for a lightning flash seems to last for a very appreciable time; perhaps a second would be a normal guess for a large bright flash. The illusion of duration arises from the slowness with which the brain responds to sense impressions.

Mistral (from a French word meaning master or dominant), the local name for the strong, cold, dry wind that blows from the northwest over the Mediterranean coastal region, especially in winter. It brings dry, extremely cold weather, clear blue skies and brilliant sunshine.

Monsoon (from an Arabic word meaning season), a continental wind that changes its direction from season to season. Monsoons are so well developed in Asia that the term commonly refers to the Asiatic continental winds. The summer monsoon blows as a southwest wind from the Pacific and Indian oceans toward the extremely hot interior. In winter the monsoon is a northeast wind blowing toward the warmer oceans from the cooler Asiatic highlands. India depends upon the monsoons for its seasonal rains, and when the southwest monsoon does not blow, severe famines often result. In Australia the monsoon is a sea breeze in summer (January) and a land breeze in winter (July).

Prevailing westerlies, regular westerly winds that prevail in the Northern and Southern hemispheres. In the general circulation of the atmosphere, part of the upper air flowing away from the Torrid Zone continues toward each of the poles, giving rise to regular wind belts. These winds become surface currents, and the rotation of the earth deflects them toward the right in the Northern Hemisphere and toward the left in the Southern; consequently the winds become westerly currents. They blow over most of the Temperate zones; in the Frigid zones they are called the *circumpolar whirls.* Sailing vessels from England to Australia used to go round Cape Horn on the outward voyage and round the Cape of Good Hope on the return—getting the benefit of the westerly winds both ways.

The great land masses of the Northern Hemisphere, with their varying temperatures, cause many variations in the movement and velocity of these prevailing westerly winds at the surface; but high in the air they blow with great steadiness. That is why the west-to-east airplane passage between America and Europe is much less dangerous than flight in the reverse direction. In the Southern Hemisphere, where water predominates, the prevailing westerlies are much more regular. Their strength in 40° S. Lat., off the west coast of southern Chile, has given rise to the expression, *roaring forties.* Local conditions, including the succession of cyclonic and anticyclonic storms, often change the westerlies into easterlies in limited areas. The westerlies are separated from the trade winds by the horse latitudes.

Rain, condensed moisture in the form of drops of water heavy enough to fall. It represents a continuation of the process that forms clouds. We commonly think of rain as drops of water that fall from clouds to the ground; but rain may evaporate before it reaches the ground if it passes through a layer of warm dry air, or it may freeze on the way down and

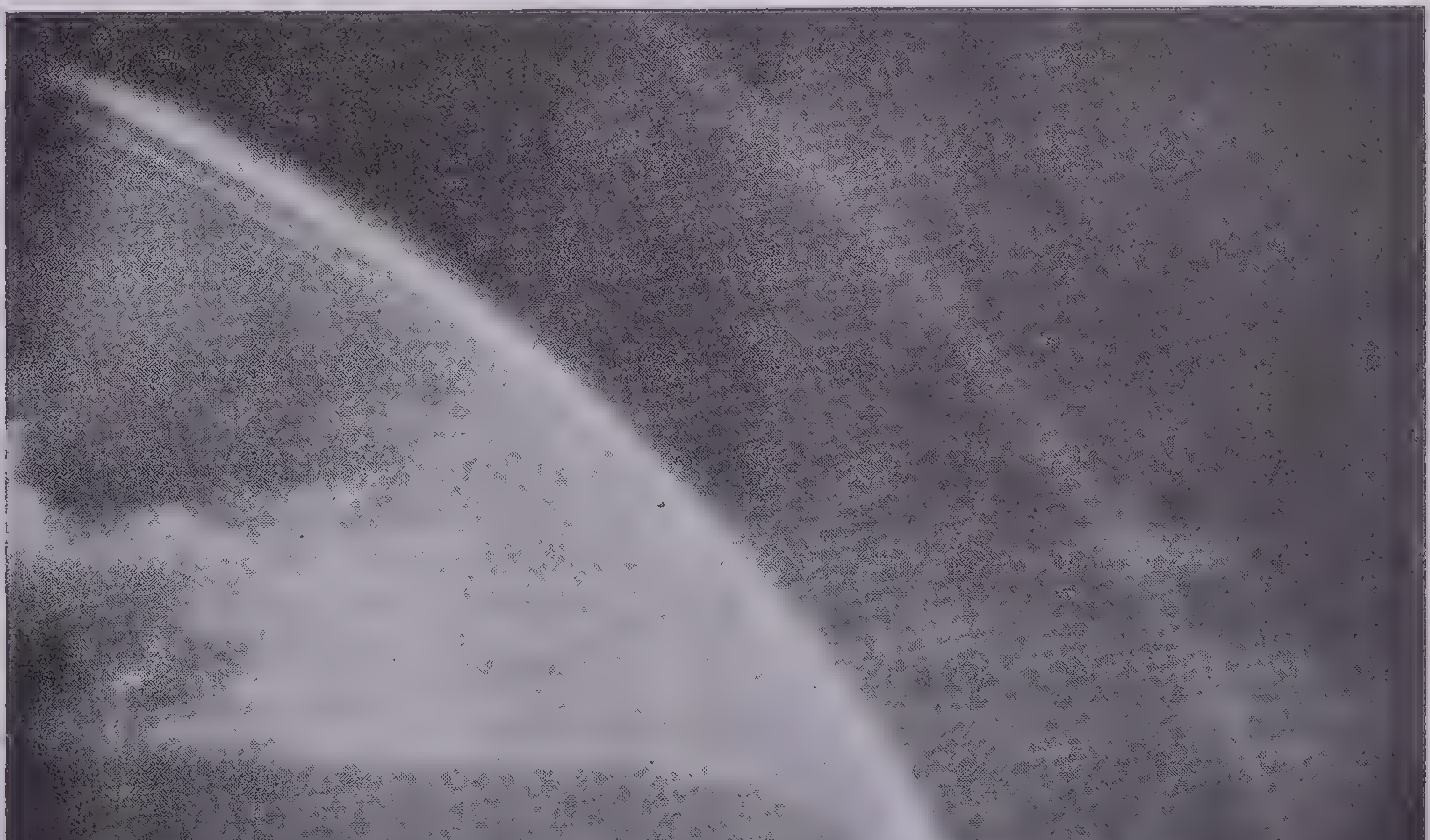


Photo by U. S. Weather Bureau

Rainbows

This evening sky at Aberdeen, Scotland, shows the strong primary bow and the paler secondary bow; fainter supernumerary bows appear inside the primary rainbow reach us as sleet. Precipitation that begins as snow high in the air sometimes becomes rain by the time it reaches the earth. The necessary condition is a lower stratum of air warm enough to melt the snow. In an ice storm, the objects on which rain falls, as trees and telephone wires, are colder than the air above them.

Rain may occur when vapor-laden air comes in contact with a cold mountain side, when a moist current blows from a warmer to a cooler region and when a warm air current rises into a cooler part of the atmosphere. The greater rainfall is therefore on the windward slope of mountains, and the lesser, on the leeward side. Generally, areas with rising air will have rain; areas with falling air currents will have little or no rain; air blowing from a colder to a warmer region will be a drying wind and the sky will be cloudless; air blowing from a warmer to a colder region will be a moisture-bearing wind and the skies will be overcast.

There are a number of areas that have more or less permanent low pressures (ascending air) or permanent high pressures (descending air). In some cases they are seasonal. Thus over Asia in summer, because the land gets warmer than the bordering waters, a low pressure develops, pulling in the air from all sides to take the place of the rising air. In winter the reverse process takes place because the land becomes colder than the water, and a high pressure is developed. During the high-pressure period, there are descending currents of air becoming somewhat warmer as they approach the earth, and therefore this is the dry season of the year. In the South Pacific, west of central Chile, there is a permanent high continuing throughout the entire year. As a result, that part of South America is one of the great desert regions of the world.

Rain gauge, an instrument for measuring rainfall. The kind used by the United States Weather Bureau consists of two cylindrical tubes, one inside the other. The inner tube widens into a funnel at the top, and this has an opening that permits rain to collect in the small tube. The dimensions are such that rain falling on the funnel collects in the inner cylinder to a depth that is 10 times the amount of the actual rainfall. By measuring the amount of water collected and dividing by 10, one determines the rainfall in inches or fractions thereof. Self-recording gauges also are in use.

A fall of 1 inch of rain is equivalent to about 113 tons of water to the acre or a little more than 5 pounds to the square inch. Snowfall also is measured by inches, but it takes 10 inches of snow to equal the water content of 1 inch of rain.

The accompanying table shows local variations in amount of rainfall in different states of the United States with mean, maximum and minimum temperatures for the same stations.

Simoom (named from an Arabic word meaning poisonous or deadly), a hot wind common to the deserts of North Africa and Arabia, and also occurring in other regions subject to abnormally high temperatures. When the ground and lower air strata become overheated, there occurs a rising of expanding air toward which cooler currents flow. Whirlwinds of sand result, suffocating to man and beast and causing a haze to overspread the sky. The sand is sometimes blown long distances, even across seas, and in heaps like snowdrifts.

Sirocco (an Italian form of the Arabic word meaning east), usually a hot wind, especially one that brings a period of unseasonably warm weather. In the countries along the north shore of the Mediterranean, the term is applied to a hot, dry wind that is like the simoom though not so violent, and to a moist rain-bearing wind.

Snow, moisture in the air condensed at a temperature below freezing, that is, at less than 32° F. Snowflakes are ice crystals that sometimes are beautifully regular. Snow bears the same relation to rain that frost does to dew. It is not frozen rain but is water vapor condensed at a temperature too low for the vapor particles to assume the liquid form. Snow sometimes melts as it falls and turns into rain; and that rain that freezes on the way down becomes sleet—not snow. Accumulations of snow on mountains and plateaus are important sources of water supply for regions that have deficient rainfall.

Thermometer, an instrument for registering temperature. The ordinary

From a photomicrograph by W. A. Bentley, Jericho, Vermont

Snow Crystals (Greatly Enlarged)

NORMAL TEMPERATURE AND RAINFALL

(From U. S. Weather Bureau)

States	Stations	Temperature (Degrees Fahrenheit)				Rainfall (Inches)
		Mean		Highest	Lowest	Mean Annual
		Jan.	July			
Alabama	Mobile	52	81	103	− 1	61.6
Arizona	Phoenix	51	90	119	12	7.8
Arkansas	Little Rock	41	81	108	−12	48.4
California	San Francisco	50	58	101	27	22.0
Colorado	Denver	30	72	105	−29	14.0
Connecticut	New Haven	28	72	101	−15	45.5
District of Columbia	Washington	33	77	106	−15	42.2
Florida	Key West	70	84	100	41	38.1
Georgia	Atlanta	43	78	103	− 8	48.3
Idaho	Boise	30	73	121	−28	13.1
Illinois	Chicago	24	72	105	−23	32.9
Indiana	Indianapolis	28	76	106	−25	39.9
Iowa	Dubuque	19	74	106	−32	32.9
Kansas	Wichita	31	79	109	−22	30.1
Kentucky	Louisville	34	79	107	−20	43.3
Louisiana	New Orleans	54	82	102	7	57.5
Maine	Portland	22	68	103	−21	41.9
Maryland	Baltimore	34	77	105	− 7	42.6
Massachusetts	Boston	28	72	104	−18	40.1
Michigan	Detroit	24	72	105	−24	32.0
Minnesota	St. Paul	13	72	104	−41	27.2
Mississippi	Vicksburg	48	81	104	− 1	51.9
Missouri	St. Louis	31	79	108	−22	37.4
Montana	Helena	20	66	103	−42	13.6
Nebraska	Omaha	22	77	111	−32	27.8
Nevada	Winnemucca	29	71	108	−28	8.5
North Carolina	Charlotte	41	78	103	− 5	46.0
North Dakota	Bismarck	8	70	108	−45	16.3
New Hampshire	Concord	22	68	102	−35	37.5
New Jersey	Atlantic City	32	72	104	− 9	40.6
New Mexico	Santa Fe	29	69	97	−13	14.3
New York	New York City	31	74	102	−13	43.0
Ohio	Cincinnati	30	75	108	−17	38.6
Oklahoma	Oklahoma City	36	81	108	−17	31.2
Oregon	Portland	39	67	104	− 2	41.6
Pennsylvania	Philadelphia	33	76	106	−11	40.4
Rhode Island	Block Island	31	68	92	−10	41.3
South Carolina	Charleston	50	81	104	7	45.2
South Dakota	Pierre	16	75	112	−40	16.7
Tennessee	Nashville	39	79	106	−13	47.2
Texas	Galveston	54	83	101	8	44.8
Utah	Salt Lake City	29	76	105	−20	16.1
Vermont	Burlington	19	70	100	−29	31.6
Virginia	Norfolk	41	79	105	2	44.1
Washington	Seattle	40	63	98	3	34.0
West Virginia	Parkersburg	32	75	106	−27	39.4
Wisconsin	Milwaukee	21	70	105	−25	30.1
Wyoming	Cheyenne	26	67	100	−38	15.0

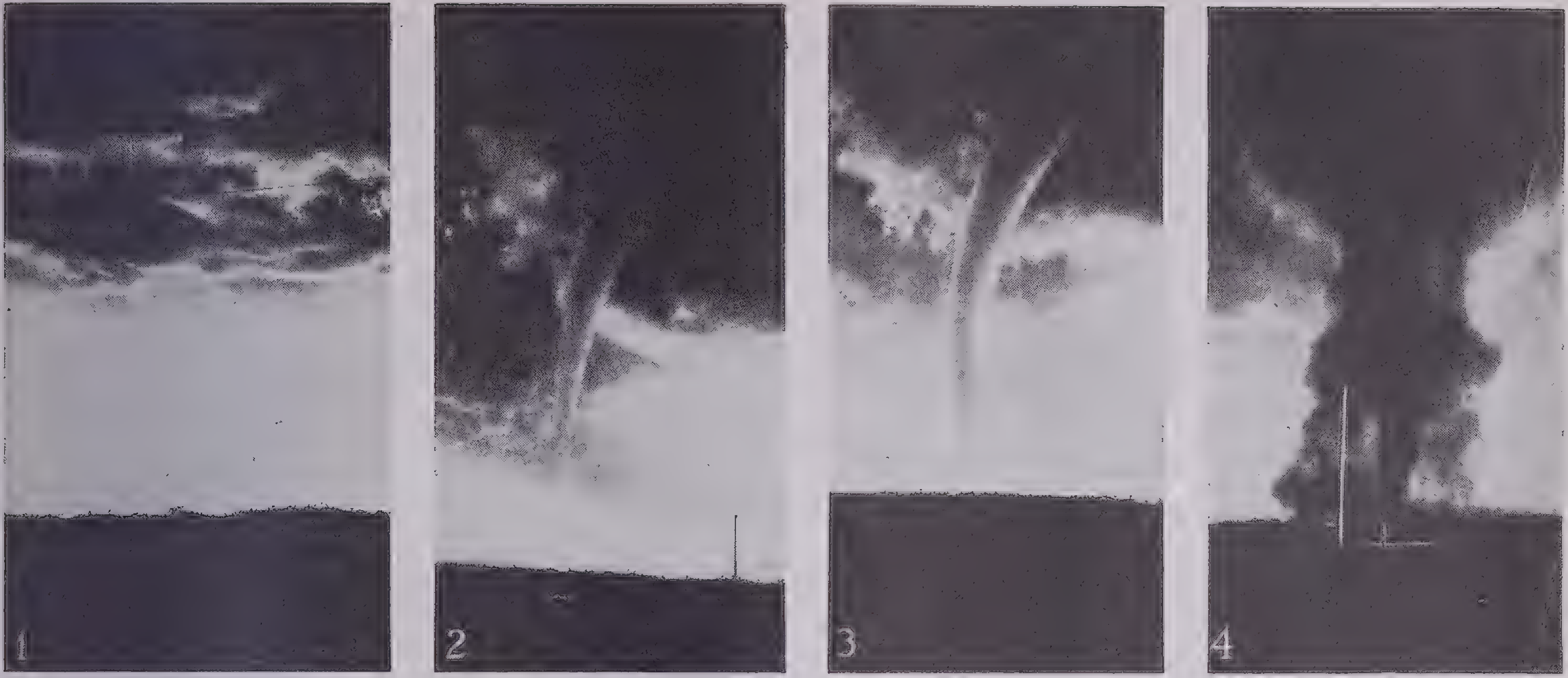


Photo by U. S. Weather Bureau

The Tornado—A Swirling Funnel Descends from the Skies

1. The cone forms. 2, 3. It moves toward the earth. 4. It meets a farmhouse. This tornado occurred June 24, 1930, and swept through Lincoln, Dawson and Phelps counties, Nebraska. The path of destruction was 70 miles long and varied in width from a quarter of a mile to 2 miles. It moved slowly, about 20 miles an hour, making it easy for people to get out of danger

mercury thermometer consists of a sealed glass tube of small diameter with a bulb at the lower end containing mercury. Since mercury, like most other substances, expands when heated and contracts when cooled, it will rise in the tube when the temperature rises, and fall when the temperature falls. A graduated scale shows the degree of temperature at any one time. In the United States the Fahrenheit scale is in common use. This is divided into 180 degrees between freezing and boiling points (from 212°, the boiling point of water, to 32°, the freezing point of water) and continued on the same scale for lower temperatures. The centigrade scale, which is preferred in Europe, has the boiling and freezing points at 100° and 0°, respectively. Since mercury freezes at about —40°, alcohol is used in thermometers that are required to register extremely low temperatures.

Tornado (from a Spanish word meaning thunderstorm), the most violent and destructive kind of storm. The tornado cloud, a writhing, funnel-shaped mass hanging from dark thunder clouds in violent upheaval, is a herald of death and destruction. Alternately ascending and descending, it sweeps forward at a speed of 30 or 40 miles an hour, with a bellowing roar like the sound of "ten thousand freight trains." It may have a path less than 400 feet wide; within that path everything is doomed. Railroad trains may be lifted from their tracks, houses torn from their foundations, chickens denuded of their feathers, massive trees uprooted like weeds and human beings and animals lifted like toys, carried a few yards and dropped.

The condition favorable for the formation of a tornado is the meeting of warm, humid air, blowing from the south, with cool, westerly winds. As the lower air rises, pushing the cooler layer up, a whirl develops around the center of disturbance; spirally ascending winds whirl counter-clockwise about this center of low pressure, with velocities estimated at 400 to 500 miles an hour. The destructive force of the storm is felt at points where the funnel is at or near the ground. High in the air, it does no damage. The cloud is formed by condensation of moisture, and its funnel shape is due to the expansion and spreading out of the ascending air.

The air pressure within the center is so low that when the cloud passes over a house, the inequality between the normal pressure within the building and that outside causes windows or even walls to blow out (not in), as if there were an explosion.

Tornadoes come from the west or southwest, and they occur early in the warm season. The lowlands of the Mississippi Valley are especially favorable areas of tornado development. The funnel of a tornado at sea is called a *waterspout.* The word *tornado* is applied also to smaller disturbances akin to whirlwinds on land.

Trade winds, regular air currents that blow toward the equatorial regions from the north and the south. They are called trade winds because they blow steadily in the same course—trade formerly meant course. Rotation of the earth deflects them, so that there are northeast and southeast trades. The trade-wind belts, like the belt of calms, move north and south with the sun. The trade winds are a part of the general circulation of the atmosphere and represent the cool surface currents that flow into the equatorial regions to take the place of the warm, ascending air. They are between the equatorial belts of calms and the horse latitudes, and blow from about 30° N. and S. Lat.

The trade winds bring rain to the windward (eastfacing) coasts in their range, for they receive quantities of vapor from the oceans by evaporation and give this up when they rise over the cooler land. The outflowing air in the upper atmosphere, moving above the trades, constitutes the *anti-trades,* the prevailing westerly winds of the middle latitudes.

Typhoon (a name from Chinese words meaning great wind), a tropical cyclone of the North Pacific Ocean. Typhoons have their origin in the South China Sea and are a scourge of the East Asiatic coast in July, August, September and October. They are the counterpart of the tropical hurricanes that regularly visit the West Indies.

Waterspout, a whirling, funnel-shaped cloud that extends from the underside of a cumulus cloud to the sur-

Waterspout from the Lake of Zug, Switzerland, June 19, 1905

face of an ocean, sea or lake. It is formed by the meeting of cool and warm winds and the creation of a central area of low atmospheric pressure; the waterspout consists of a column of condensed humid air or fresh-water vapor, which, like a whirlwind, rotates rapidly. It moves counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. Some waterspouts are vertical, and others are inclined. They are often from 20 to 30 feet in diameter, from 300 to 400 feet high and are observed especially in the doldrums and the China Sea.

Whirlwind, an ascending spiral air current, often formed in a hot, desert area where the movement is made visible by rising sand and dust. A whirlwind is caused by overheating of the ground and adjacent air, which gives rise to an upward rotary movement into the cooler layers of air. In deserts, whirling dust columns sometimes rise to a height of 1,000 feet. The warm air is cooled in the upper part of the column, and the sudden condensation of vapor may cause heavy downpours or even cloudbursts. The whirlwind may be described as a miniature tornado. Waterspouts at sea are of the same character.

Wind scale, a scale devised to indicate the velocity of the wind. The Beaufort scale, drawn by Admiral Sir Francis Beaufort in 1805 and later adopted by the British Admiralty, did not give the actual velocity of the wind but merely described a series of wind forces from 0 to 12. Various scales attempting to show wind velocity have since been drawn up. The United States Weather Bureau scale, giving wind velocity in miles per hour, is now used for all official broadcasts of weather reports. The accompanying table shows the correlation between the Weather Bureau scale, the Beaufort scale for ships at sea, the old Continental or Mannheim scale (the 4-scale), the new Continental or land scale used by European observers on land (the 6-scale) and the scale drawn up by the Smithsonian Institution (the 10-scale) before the adoption of the Weather Bureau scale. The velocity of the wind is measured by an anemometer.

WIND SCALE

No.	Beaufort	Four	Six	Ten	Weather Bureau		No.
	Miles Per Hour	Miles Per Hour	Miles Per Hour	Miles Per Hour	Miles Per Hour		
0	0	0	0	0	Light	Less than 1	0
1	1–3	7	2	2		1–3	1
2	4–7	18	11	7		4–7	2
3	8–12	36	18	11	Gentle	8–12	3
4	13–18	58	36	18	Moderate	13–18	4
5	19–24		58	27	Fresh	19–24	5
6	25–31		90	36	Strong	25–31	6
7	32–38			45		32–38	7
8	39–46			58	Gale	39–46	8
9	47–54			76		47–54	9
10	55–63			90	Whole Gale	55–63	10
11	64–75					64–75	11
12	above 75				Hurricane	above 75	12

WIND VELOCITY IN THE UNITED STATES

Stations	Average	High
	Miles per hour	*Miles per hour*
Albany, N. Y.	7	59
Atlanta, Ga.	10	51
Bismarck, N. Dak.	10	60
Boston, Mass.	10	56
Buffalo, N. Y.	13	73
Cape Hatteras, N. C.	14	80
Cape Lookout, N. C.	..	104
Chattanooga, Tenn.	7	50
Chicago, Ill.	12	65
Cincinnati, Ohio	7	43
Cleveland, Ohio	12	59
Denver, Colo.	7	58
Detroit, Mich.	11	67
Ft. Smith, Ark.	7	57
Galveston, Tex.	11	71
Helena, Mont.	7	54
Jacksonville, Fla.	8	57
Key West, Fla.	10	84
Knoxville, Tenn.	6	54
Louisville, Ky.	8	58
Memphis, Tenn.	8	58
Miami, Fla.	9	70
Mobile, Ala.	10	87
Montgomery, Ala.	6	43
Mt. Washington, N. H.	27	188
Nashville, Tenn.	9	58
New Orleans, La.	8	66
New York, N. Y.	15	73
North Head, Wash.	15	113
Omaha, Nebr.	9	51
Pensacola, Fla.	12	91
Philadelphia, Pa.	10	68
Pittsburgh, Pa.	11	56
Point Keyes, Calif.	18	91
Portland, Me.	8	48
Rochester, N. Y.	9	60
St. Louis, Mo.	11	62
St. Paul, Minn.	9	78
Salt Lake City, Utah	7	53
San Diego, Calif.	6	43
Sand Key, Fla.	14	87
San Francisco, Calif.	10	50
Santa Fe, N. Mex.	7	42
Savannah, Ga.	8	68
Spokane, Wash.	6	41
Tatoosh Island, Wash.	15	84
Toledo, Ohio	11	65
Washington, D. C.	6	53

BIOLOGY

GENERAL BIOLOGY[1]

The Scope and Importance of Biology.—Biology is the study of living things. Among the biological sciences, botany is the study of plant life; zoology, of animal life; bacteriology, of bacteria, and so on. Of other subdivisions of biology, each deals with one aspect of living things: morphology is the study of structure; physiology, of activities or functions; embryology, of the development of individuals; genetics, of inheritance; ecology, the relation of the organism to its environment.

The special problems with which biology deals are: the nature of protoplasm and of the cell; the structure and functions of organisms, their development as individuals and the evolution of the race; the methods of inheritance; the effect of environment on the individual; relationships between organisms and modes of life; biological equilibrium.

Biology, like all other sciences, employs the inductive method. Therefore understanding the laws governing life depends on conclusions drawn from observations and controlled experiments. The method of observation is as old as man. Biology has developed from natural history (the observation of living things) to natural science (the conclusions drawn from those observations), and now biology is an experimental science. By controlling the conditions of experiments and the subjects observed biologists try to secure particular information. The nature of protoplasm is so complex, however, that it is difficult to devise conclusive experiments.

Biology is closely related to other sciences and depends upon them both for the tools with which to work and for concepts that aid in clarifying biological ideas. The significance of fossils cannot be appreciated without a knowledge of earth history or geology. The laws of physics, applied in the microscope, the camera, the centrifuge and the spectroscope are of the utmost importance to biology. Similarly, a knowledge of the properties of chemical substances gives the biologist opportunity to apply the laws of chemistry to living organisms, and chemistry aids him materially in his understanding of the structure and functions of living things. Mathematics also is being applied to the complex problems of biology, notably in genetics, biostatistics (or vital statistics) and studies of population and growth.

Good health is the result of normal functioning of a normal body in a good environment. Part of the foundation of medicine is a knowledge of body structure and function in health and disease. Psychology deals with mental activities, which are functional aspects of the nervous system and are profoundly affected by changes in bodily activity. Hygiene, concerned with the preservation of health, includes knowledge of the body functions, the effects of exercise, cleanliness and good habits. Sanitation deals with the control of public health, water, food supplies and the disposal of sewage.

The foundation of wealth is agriculture. Scientific agriculture uses biological knowledge in seed selection, plant and animal breeding, soil conservation and treating plant and animal diseases and insect pests.

The conservation of wild life—song and game birds, fishes, fur-bearing animals—and the conservation of forests are the important biological phases of economics.

Biology and Everyday Life.—Modern thought and modern living are affected by biological knowledge. The nature of life has always been of general interest. Newspapers and magazines reflect popular interest in such biological topics as reports on influenza epidemics, avoidance of industrial accidents when fatigue is lessened, dangers of unsanitary public drinking fountains, explanations of haemophilia, necessary precautions in blood transfusions, use of artificial respiration and suggestions for varied and adequate diets.

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[1] Terms not explained in the text are defined in Biological Terms, alphabetically arranged at the end of this article.

Air conditioning, so widely applied to theaters, trains, office and other buildings, adjusts the environment to the conditions of temperature, moisture and cleanliness most favorable for men. Streamlining in automobiles, trains and airplanes shows the principles exemplified in the body shape of fish and birds. The flight mechanisms of birds have been studied as an aid to airplane construction.

First aid is more intelligently applied if one has a general knowledge of biological principles. For instance, the fact that arteries carry blood away from the heart shows that a tourniquet should be applied to an injured artery between the injury and the heart. Artificial respiration properly applied saves many lives.

Not only are current events, public health, hygiene, agriculture and many phases of economics made clearer by biological information, but community civics also shows applications of biology. The problems of overcrowding, poverty, crime and war have biological implications. Although improved environment offers a better chance for individual welfare, feeblemindedness and criminal tendencies are inherited and can be eliminated only by the application of biological principles. A knowledge of the laws of inheritance and other laws governing life gives a citizen a better understanding of man's biological and social environment.

Biology as Natural History.—From the earliest times man has observed the working of his own body, the bodies of other animals and the plants about him. Men of the Old Stone Age made crude pictures of hunted or domesticated animals. Records of early civilizations in Assyria, Egypt, China and India show a knowledge of crude surgery and medicine.

Aristotle (384–322 B.C.), the Greek philosopher, was also a famous naturalist. His accuracy and the fact that he made use of personal observation and experiment entitle him to be considered the first scientific anatomist. He described the organs of higher animals and made observations upon their functions. He studied the development of the chick and also the metamorphosis of insects. Many of the observations that he made are still considered accurate.

Pliny the Elder (23–79 A.D.), a Roman, compiled an extensive work on natural history. The work of Galen (*c.* 130–200 A.D.), the great Greek physician, remained the authority on descriptive anatomy for about a thousand years.

Although natural phenomena were observed in the Middle Ages, queer mystical explanations were invented to explain them. Reliance was placed on books rather than upon observations of nature. Scientific books were scarce until the 13th century when knowledge books or encyclopedias made Aristotle's work acceptable to the Church and revived interest in natural history.

Complex causes led to the Renaissance or revival of learning in the 14th and 15th centuries. This was important because the appeal to authority in natural science was discarded and the fundamental practice of observation was renewed. Andreas Vesalius (1514–64), a Belgian teaching in Italy overthrew the authority of Galen and established anatomy on a scientific basis with a book written in 1543. He demonstrated on a cadaver while lecturing and published in 1538 the best anatomical drawings up to that time. Botanical description, as well, became more exact. During the 16th century, many herbals describing animals as well as plants were printed and illustrated with woodcuts.

Biology as Natural Science.—Growing precision characterized the scientific work of the 16th and 17th centuries. Dr. William Harvey (1578–1657) introduced experimental observation and physiological measurements. By careful observations he discovered the circulation of the blood. Early in the 17th century the microscope was introduced. With this optical aid, a host of microscopic organisms were discovered and minute structures of plants and animals were investigated. In 1665 an English botanist Robert Hooke (1635–1703) observed the walls of dead cells in cork. Marcello Malpighi (1628–94) discovered capillaries, made embryological observations and studied insect anatomy. Jan Swammerdam (1637–80) discovered blood corpuscles and, like Francesco Redi (*c.* 1626–97), attempted to disprove the theory of spontaneous generation. Anton van Leeuwenhoek (1632–1723) demonstrated capillaries and described spermatozoa, ciliated protozoans and (in 1687) bacteria.

By the opening of the 18th century the study of external features was giving way to the study of internal structures, development and functions. At this time, however, the cellular structure of plants and animals was not comprehended, although Hooke had observed cell walls. The theory of spontaneous generation of life was still widely accepted. Because plant structure was not so apparent as that of animals, botanical discoveries lagged. There was no understanding of seed formation and development or of photosynthesis (the action of light and radiant energy in producing chemical compounds). The relation of bacteria to disease was only suspected. Details of anatomy were known, but the functions of organs were just claiming attention. The current theory of development assumed that eggs contained a preformed embryo that needed only to expand to attain maturity. Species had been defined but the real relationships among organisms were misunderstood. No standard method was used in plant or animal descriptions.

Progress in the 18th Century.—Natural history, especially classification, was advanced by a Swedish naturalist, Carolus Linnaeus (1707–78). He proposed binomial nomenclature, a two-name way of classifying organisms still in use today. Linnaeus worked out short descriptions and a classification scheme published first in 1735 and later revised. Because he believed in fixity of species, his classification was modified as ideas of evolution developed.

Anatomists began to adopt the comparative viewpoint. John Hunter (1728–93) established an anatomical museum that became famous for its specimens. Geoffrey Saint-Hilaire (1772–1844) was an anatomist second only to Georges Cuvier (1769–1832). Cuvier's great contribution was his thorough research on the whole animal kingdom. Though he discovered vertebrate fossils near Paris in 1796, he opposed the evolutionary theories of Saint-Hilaire and of Jean Lamarck (1744–1829), a comparative anatomist who studied invertebrate fossils and who saw a natural order or relationship between all living things, both plants and animals. Lamarck gave currency to the word *biology*.

Physiology developed at the same time. Albrecht von Haller (1708–77) studied the irritability of muscles. The chemistry of the digestive fluids and regeneration of nerves were among the investigations of Lazaro Spallanzani (1729–99), who showed in 1775 that spontaneous generation does not occur. In botany Stephen Hales (1677–1761) investigated transpiration, and Jan Ingenhousz (1730–99) showed that plants require oxygen. In embryology Caspar Friedrich Wolff's theory of epigenesis in 1759 held that the germ or embryo is created entirely new and has not been preformed. Albrecht von Haller's opposition to this theory retarded the progress of embryology until the time of Karl Ernst von Baer (1792–1876). The science of histology, dealing with the anatomy of tissues, was founded by François Bichat (1771–1802) and others. In 1796 Edward Jenner (1749–1823), an English physician, proved that vaccination with cowpox prevents smallpox.

Biology in the 19th Century.—In 1838–39 Matthias Schleiden (1804–81) and Theodor Schwann (1810–82) each announced independently a fundamental theory that cells are the units of living things, but they emphasized the importance of the cell wall. Jellylike material in animal cells was noticed by Schleiden and others. A similar material in plant cells was called *protoplasm* by Hugo von Mohl in 1846. The protoplasm doctrine of Max Schultze (1822–74) in 1861 established the conception that a living cell, plant or animal is a mass of protoplasm containing a nucleus. Thomas Huxley (1825–95) called this "the physical basis of life." Evidence of cell division in algae obtained in 1835 and Theodor Boveri's discovery of chromosomes in 1883 also contributed to the cell theory that formed a background for the science of genetics.

Research in plant embryology by the inductive method was emphasized by Schleiden and by Wilhelm Hofmeister (1824–77). Hofmeister's greatest discovery, the alternation of generations, published in 1851, encouraged a theory of the common descent of plants. In 1855 came proof that plant eggs are fertilized by a gamete from the pollen tube. Joseph Koelreuter (1733–1806) had pointed out the relation of insects to cross-pollination, and experiments on cross-pollination and hybridization were continued by Karl von Gärtner, Karl von Nägeli, Charles Darwin and Gregor Mendel. More recently hybridization on an immense commercial scale was carried on by Luther Burbank (1849–1926) in California.

By his classic treatise on the development of the chick, Karl Ernst von Baer definitely established the germ layer theory of development in 1832. The foundations of comparative embryology were laid by Francis Balfour (1851–82), and the statement of recapitulation by Fritz Muller (1822–97) was widely applied by Ernst Haeckel (1834–1919). Other embryologists and cytologists of the late 19th and early 20th centuries—Theodor Boveri, Wilhelm His, Oskar Hertwig, Rudolf von Kölliker, Edmund B. Wilson, Edwin Grant Conklin and Frank R. Lillie—made experimental studies of egg structure and developmental stages.

Organic Evolution.—Although John Ray (1627–1705) clearly defined species in the 17th century, organic evolution was first suggested by Georges Buffon (1707–88) in the 18th century but retracted under pressure by the Church. Somewhat later Erasmus Darwin (1731–1802) arrived at a theory of evolution based on deductions. At the turn of the 19th century Lamarck's study of invertebrate fossils indicated that evolution had occurred. He believed that species changes had occurred by the inheritance of acquired characters. Cuvier and his American student Louis Agassiz (1807–73) opposed Lamarck, although Cuvier's own work gave evidence for evolution, and Agassiz had unknowingly worked out the principle. In 1830 Charles Lyell in *Principles of Geology* presented new evidence of the long time required to form fossil-bearing rocks.

After reading Thomas Malthus's *Principle of Population* (first published in 1798) and Lyell's *Geology,* Charles Darwin (1809–82) became interested in evolution. For years he studied the facts he had collected on a voyage around the world during 1831–36 on the *Beagle.* In 1859 he published *The Origin of Species,* which attracted such attention that the simultaneous theory of Alfred Russel Wallace was overshadowed. Darwin's conclusions that species have arisen through natural selection and the survival of the fittest were opposed by the Church. Through his writings and lectures, the biologist Thomas Henry Huxley did much to overcome popular objection to this concept. The evolutionary principle if not the means of evolution suggested by Darwin was generally recognized. Attempts to explain the method of evolution led to more study and controversy. Darwin himself realized that the theory was not yet perfect. August Weismann (1834–1914) maintained that germinal selection also was important. On the other hand, E. D. Cope (1840–97), an American paleontologist, reverted to Lamarck's view of the inheritance of acquired characters. Since then further evidence from embryology, comparative anatomy, paleontology and genetics has modified Darwin's theory.

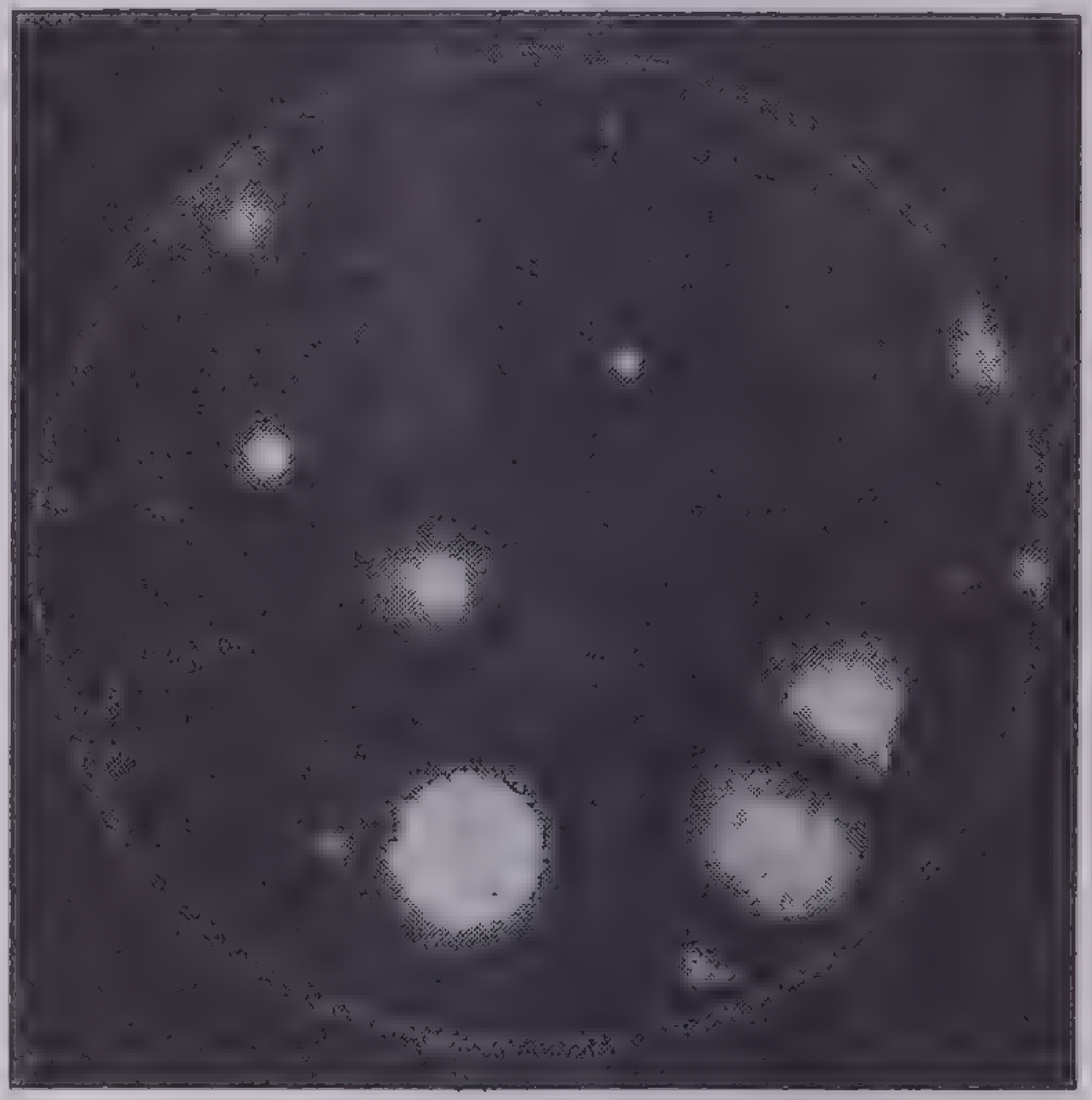
Plant and Animal Physiology.—Julius von Sachs (1832–97) established plant physiology as a separate field. He showed that starch is formed within chloroplasts, and studied reactions to light, conditions of growth and development and sexuality of plants. Wilhelm Hofmeister (1824–77), who explained alternation of generations, maintained that internal and environmental conditions affect plants.

Early in the 19th century animal physiology continued to center around the chemistry of the digestive system and the functions of the nervous system. Charles Bell (1774–1842) and François Magendie (1783–1855) established experimentally that spinal nerves have sensory and motor roots. Johannes Müller (1801–58) introduced comparative physiology and Magendie established the modern type of research in nutrition. The actual secretion of gastric juice was observed by William Beaumont (1785–1853), an army surgeon in Wisconsin who in 1822 treated Alexis St. Martin for a bullet wound that left an opening or fistula to the interior of his stomach. Artificial fistulas in dogs have since been used by the great Russian Ivan Pavlov (1849–1936) to study secretions and conditioned reflexes. Ether, the first general anesthetic, was used by Dr. Crawford W. Long in Georgia in 1842 and by William Thomas Green, a Massachusetts dentist, in 1846. Other general anesthetics and local anesthetics have been introduced.

About the middle of the 19th century physiology was separated into physical and chemical aspects. Men concerned with physical measurements invented mechanical devices and instruments in use today. Carl Ludwig (1816–95), Emil Du Bois-Reymond (1818–96) and Hermann von Helmholtz (1821–94) studied diffusion, animal electricity, the law of conservation of energy and optics and acoustics. In contrast to these physical studies were the chemical investigations of Claude Bernard (1813–78), who made three fundamental discoveries: first, that glycogen is formed by the liver, the initial example of constructive power in animal tissues; second, that the blood vessels are regulated by the sympathetic nervous system; third, the triple action of pancreatic juice on foods. Bernard also studied the actions of poisons including carbon monoxide.

Pasteur and the Germ Theory of Disease.—The relation of bacteria to fermentation and disease was established by Louis Pasteur (1822–95). He discovered in 1857 that the souring of wine and beer as well as their fermentation was not chemical in nature but was caused by the growth of organisms. In 1860 he found that lactic and alcoholic fermentations were caused by bacteria and yeasts, respectively. During 1860 Pasteur also showed that errors in Félix Pouchet's experiments the year before accounted for results that seemed to demonstrate spontaneous generation. No serious defense of the theory of spontaneous origin of life has been made since that time.

After 1860 Pasteur's greatest discoveries concerned the causes and treatment of disease. He solved the mystery of the silkworm plague in 1865–68. That discovery and his studies of wine diseases and of anthrax were invaluable to French industry. Pasteur and Koch found that anthrax was caused by characteristic bacteria, and in 1881 Pasteur demonstrated vaccination against anthrax in cattle. Inoculation against rabies or hydrophobia was tried in 1885. Robert Koch (1843–1910) discovered the tuberculosis germ in 1881 and the germ of Asiatic cholera in 1883; he established that a particular germ is responsible for a specific disease when the following two conditions are found to exist: (1) Large numbers of the particular germ are present in the blood and tissues of the sick animal. (2) If a pure culture of the particular germ is made and introduced into a healthy animal, the animal becomes sick with the specific disease and its blood and tissues are found to contain quantities of the particular germ. At the Pasteur Institute, erected in 1888 by popular subscription, Pierre Paul Émile Roux (1853–1933) discovered the antitoxin for diphtheria. The fight against disease continues and other types of disease besides those caused by bacteria are being studied.



From E. C. Cole: An Introduction to Biology, John Wiley & Sons, Inc., publishers

Growth of Molds and Bacteria

A Petri dish was plated with a nutrient substance and then sterilized. It was exposed to the air of a schoolroom for five minutes, just after the class had been dismissed. Then the dish, securely covered, was placed in a warm place for 48 hours. This picture shows small colonies of bacteria and large colonies of mold that grew on the nutrient substance during that time. The schoolroom was a modern one, cleaned regularly by means of a vacuum system; yet molds and bacteria were present

Antisepsis.—Joseph Lister, a Scottish physician, in 1866 published his discovery that germs infecting injured or operated parts can be killed by an agent like carbolic acid and thereby established the principle of antisepsis, which was not generally recognized in hospitals until 20 years later. Pasteur adopted the practice of antisepsis.

Modern methods include asepsis, the prevention of infection.

Heredity and Genetics.—During the 19th-century controversy over evolution, the method of inheritance was repeatedly questioned. Gregor Mendel (1822–84), an Austrian monk, experimented with garden peas. From observing inherited characteristics he worked out the Mendelian laws of dominance, independent assortment and segregation. The publication of his theories in an obscure journal in 1866–67 delayed recognition of this significant work. Now it is known that inheritance is not always so simple as Mendel's cases suggest.

Meanwhile came August Weismann's theory that the germ plasm is the important factor in inheritance and that acquired characters are not inherited. Francis Galton (1822–1911), who agreed with Weismann, introduced statistical methods in studying breeding experiments and population figures. The importance of Weismann's theory of the continuity of the germ plasm was emphasized later by the work of Hugo de Vries and others.

Hugo de Vries and two other botanists (William Bateson and W. L. Johannsen) rediscovered Mendel's work in 1900, and the importance of his laws was demonstrated. De Vries supported the theory of evolution but offered a new idea as to the method. He insisted that species have arisen not by gradual change but by the accumulation of sudden though small changes in the germ cells that he called *mutations*.

Genes.—Many branches of genetics have developed in the last 30 years. Data are gathered on human inheritance, and a great deal of the experimental plant and animal breeding being done is of commercial value. The research on the fruit fly, *Drosophila,* has been very important. This fly is ideal for laboratory purposes because it has a short life cycle and only four pairs of chromosomes. Thomas Hunt Morgan (1866–), who received the Nobel Prize in 1933, and others have found in *Drosophila* that definite locations of genes in particular chromosomes are responsible for inherited characters. Mutations are evidently changes in the genes. Natural and experimental mutations are being studied.

Infectious Diseases.—Other discoveries since Pasteur include the work of Élie Metchnikoff (1845–1916) on phagocytosis or the ability of white blood corpuscles to engulf foreign substances such as germs; and the discovery by Paul Ehrlich (1854–1915) in 1910 of a specific remedy for syphilis. Ehrlich is credited with the modern conception of immunity and of a specific treatment for each infectious disease. The cause and treatment have been found for such parasitic diseases as malaria and syphilis, hookworm and tapeworm infections and fungus diseases such as athlete's foot.

Influenza, common colds and plant mosaic diseases are caused by viruses too small to be seen with the microscope yet exhibiting properties of living things. Wendell M. Stanley (1904–) in 1936 proved that the virus of the tobacco mosaic disease is actually a crystalline protein with some properties like those of genes carrying hereditary traits. This work opens the way to mastery of virus diseases and also tends to erase the boundary between the living and the nonliving. Serums and antitoxins are being developed to treat more diseases, and other medical work of similar biological interest is being carried on.

Active Fields.—That animals and plants are essentially alike in their living substance (protoplasm), in their cell structure and in their methods of reproduction, nutrition, respiration and growth; that all life is interconnected in the present and down through the centuries; that life must come from life and not from inanimate matter—these concepts have made biology a definite science. Today active biological research is being done in many fields including: endocrinology, genetics, nutrition, physiology, protozoology, experimental embryology, neurology, tissue and organ culture, animal behavior, ecology, economic entomology, paleontology, histology and cytology.

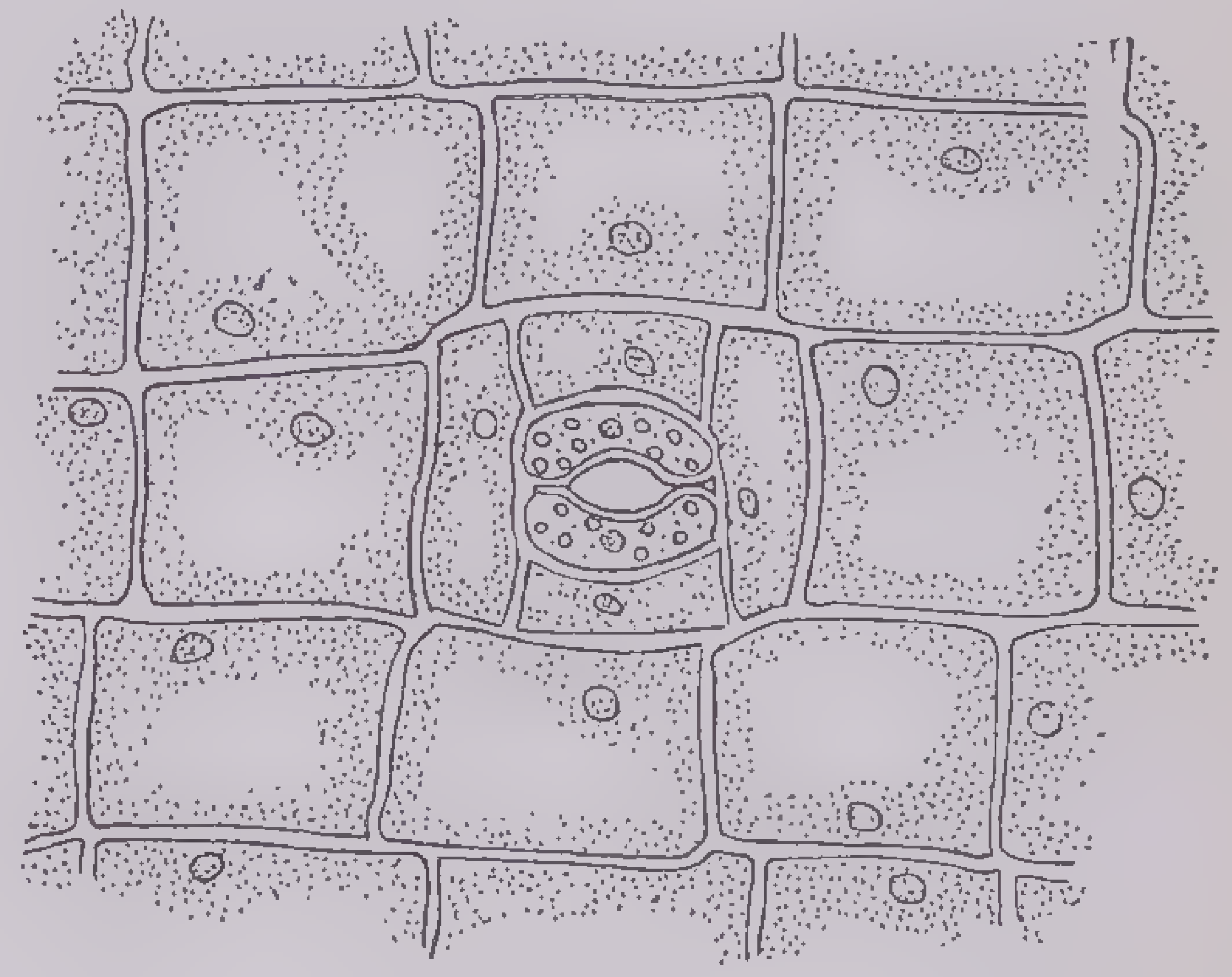
A great deal of this work is carried on in university and college laboratories, and those of medical schools and hospitals; considerable investigation is done also at Marine Stations, the Rockefeller and Carnegie Foundations and at laboratories maintained by commercial firms. Modern tools include the ultramicroscope, high-speed centrifuges, X-ray and other radiations, photography, microdissection apparatus as well as the tools of biochemistry and biophysics.

STRUCTURE AND FUNCTION OF LIVING THINGS

Protoplasm.—Life is always associated with a colorless jellylike material called *protoplasm,* which is found only in living things. The bodies of plants and animals are largely protoplasm and the nonliving substances that protoplasm produces. This living substance has certain characteristics: (1) Protoplasm is always found in unit masses called cells. (2) It is constantly undergoing changes, some of which are constructive or anabolic and others that are destructive or catabolic. Collectively all these activities are called *metabolism.* (3) Protoplasm has the ability to grow whenever anabolism exceeds catabolism. (4) It has irritability, the capacity to respond to both internal and external changes. (5) Protoplasm exhibits spontaneous motion—a movement brought about by the living material itself. (6) Protoplasm has the capacity for forming new individuals, the power of reproduction.

Protoplasm is a mixture of complex chemical compounds, inorganic salts and water. Its composition varies with the organism and the parts of organisms. Twelve chemical elements, usually as compounds, are found in nearly all protoplasm: oxygen, hydrogen, carbon, nitrogen, sulphur, phosphorous, potassium, iron, magnesium, calcium, sodium and chlorine. The first four make up nearly 99 per cent by weight, and hydrogen combined with oxygen as water makes up 70 to 90 per cent by weight. Protoplasm consists of a more or less liquid medium with particles or droplets scattered through it; such a liquid is said to be colloidal (as distinct from crystalloidal). Protoplasm constantly changes phases, that is, changes back and forth from jellylike to fluid consistency. This ability to change its physical state is the basis of the irritability of protoplasm.

The Cell.—Cells range in size from bacteria that can barely be seen with the microscope to eggs of the ostrich. Cells differ widely in form: they may be spherical, star-, brick- or spindle-shaped, flat or irregular. In man, the muscle, nerve, skin and other cells are of different shapes. In plants, the pith and woody cells are unlike.



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Cell Layers

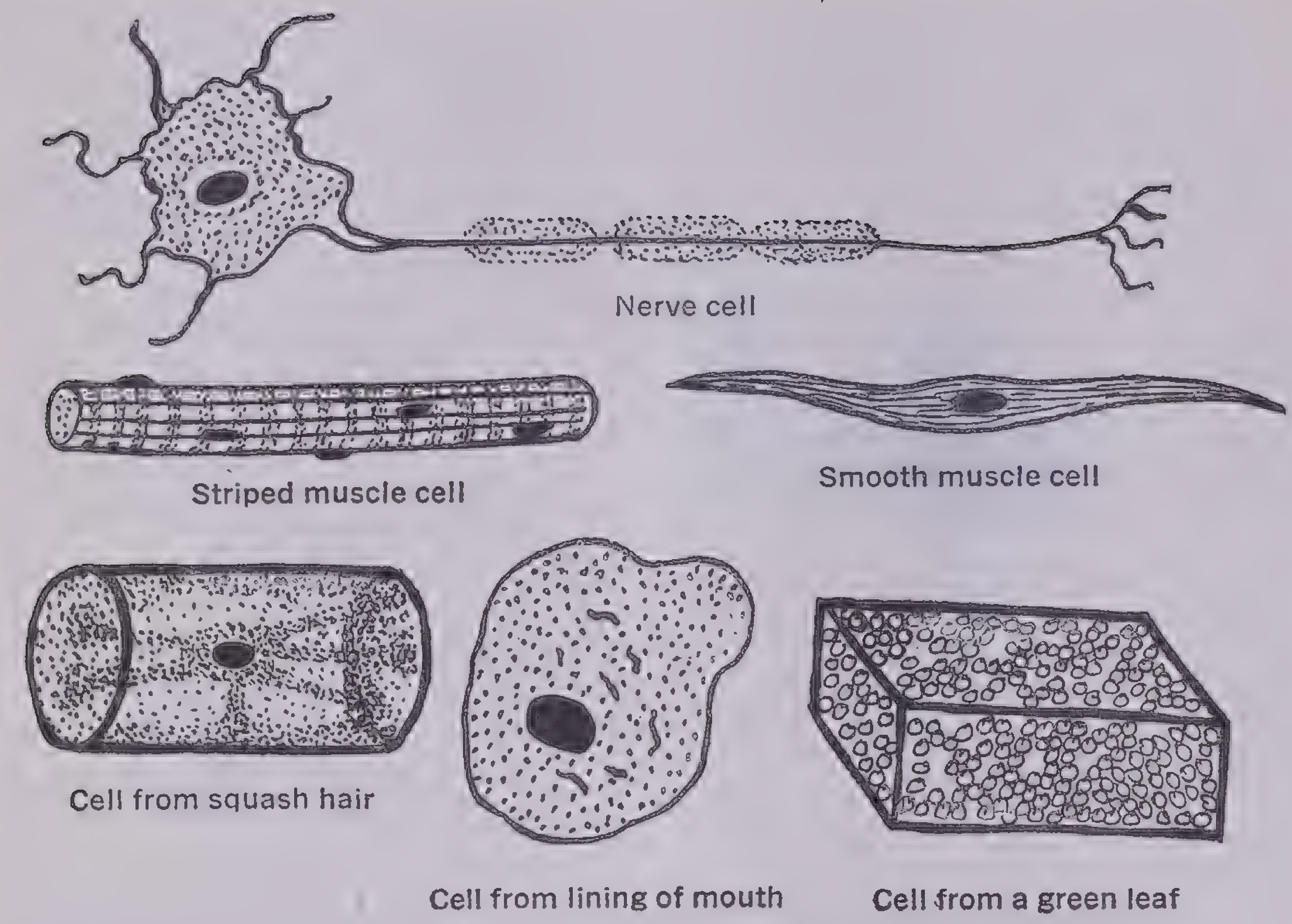
A section of the epidermis of the inch plant (*Tradescantia*). This layer consists of cells that cover the leaf and reduce evaporation. In the center are two guard cells that surround a stoma or breathing pore. Note that these cells contain chloroplastids, in addition to nuclei, cytoplasm and vacuoles that are found in all the cells

A typical cell consists of a dense body, the nucleus, surrounded by a more fluid cytoplasm that is bounded by a delicate cell membrane. These parts are all living, but the cytoplasm may contain both living and nonliving matter. Among the structures conspicuous in many plant cells are plastids.

Chloroplastids contain the green pigment, chlorophyll, in the presence of which photosynthesis occurs. Chondriosomes and Golgi bodies are other types of structures visible when cells are stained with special dyes. Their functions are not fully known. Vacuoles, small cavities in the cytoplasm, contain cell sap. In some animal cells vacuoles are contractile, that is, have the power of folding up or shrinking.

The nucleus is bounded by a thin nuclear membrane in the resting stage and fine chromatin granules are scattered through it; but when the cell is about to undergo mitosis or division, dense bodies called *chromosomes* appear. The number of chromosomes is constant in the body cells of particular organisms; for example, 48 is the characteristic number of chromosomes in human body cells, 8 in the fruit fly *Drosophila* and 16 in the onion.

Many cells possess a nonliving cell wall outside the living cell membrane. Trees and other woody plants consist largely of cellulose and related substances secreted by their cells. The



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Types of Cells

This figure shows a few of the many forms which various cells assume. The cell from a squash hair and the cell from a green leaf possess woody or cellulose walls; the others pictured lack thick cell walls

bones of animals consist of materials formed by bone cells.

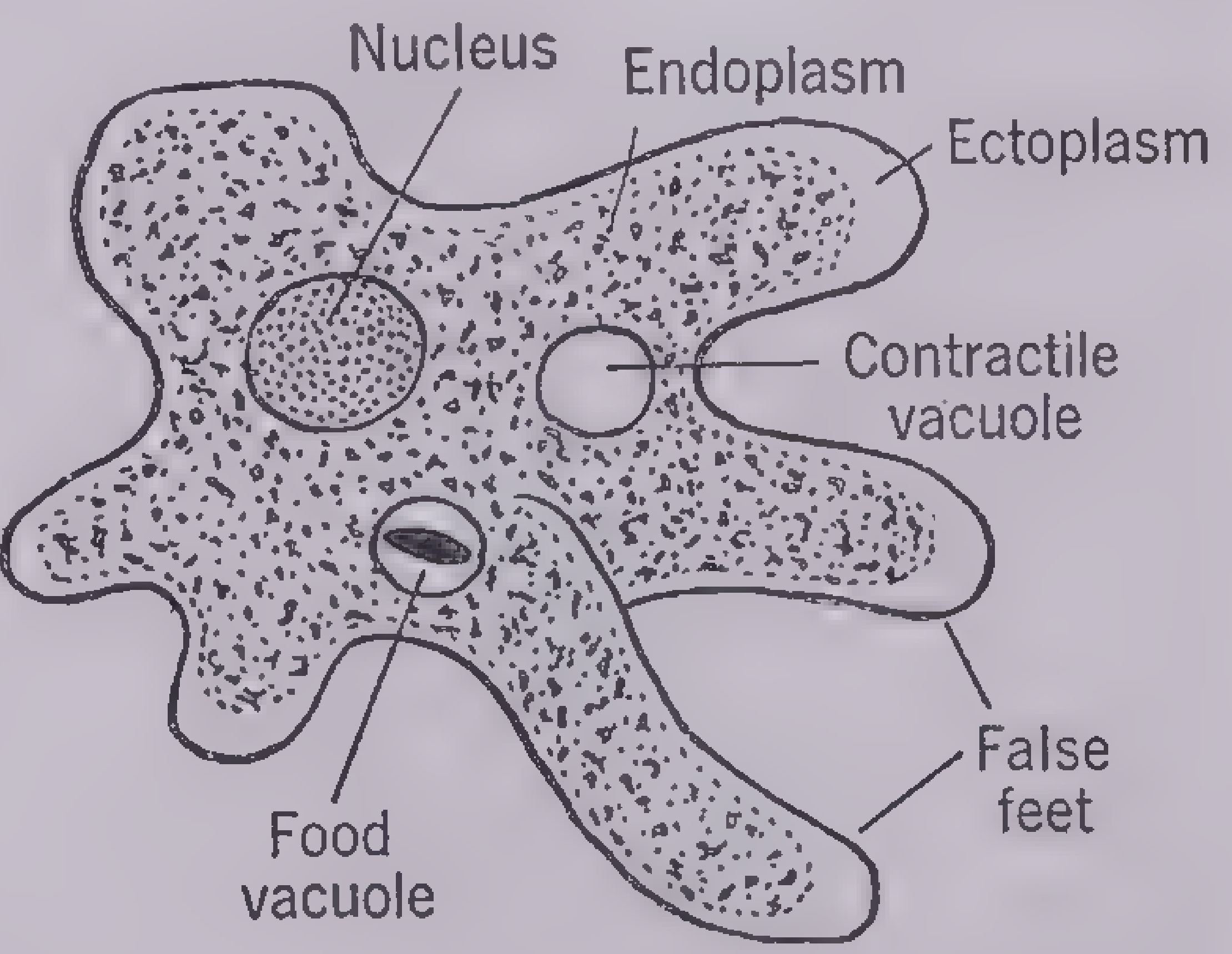
Both living cell membranes and cell walls may permit liquids and gases to pass through them. This property is called *permeability*. All living membranes permit some substances to pass through but bar the passage of others. Such a membrane is selectively permeable or semipermeable. The process by which liquids and gases pass or diffuse through a membrane is called *osmosis*. This is of the utmost importance to all living things, for by osmosis food and oxygen enter body cells and waste materials pass off.

Organisms.—Typical cells have been considered above as parts of living things. A cell, however, may be independent and carry on all the functions of living things. Bacteria and other simple plants are single-celled organisms, and so are the protozoa, the unicellular animals. Some of these live in clusters or colonies but each cell is more or less independent. A cell or a collection of cells that carries on life functions as an individual is called an organism.

The multicellular forms in ferns, trees, flowering plants, insects, fish, frogs, birds and man are more familiar than minute unicellular organisms. Multicellular organisms exhibit a division of labor inasmuch as the cells are grouped, each kind with a special structure for a particular function. Their combined functions enable the organism to behave as an individual.

Groups of similar cells make up tissues that in turn are combined to form organs with particular functions. Organs performing related functions constitute an organ system; for example, the animal digestive system usually includes the stomach, intestine, liver and other organs which may have muscular, secretory, vascular, connective and nervous tissues.

Many organs co-operate in securing food. In man the eyes, nose and hands assist in locating food and transferring it to the mouth. In the protozoan *Paramecium,* the food is secured by the vigorous beating of hairlike cilia lining its oral groove. Organ systems are specialized for these basic processes: (1) the digestion, absorption and assimilation of foods; (2) respiration and the oxidation of food materials and protoplasm; (3) the excretion of wastes; (4) the elimination of food residues (feces); (5) the conduction of nervous impulses—these processes maintain the life of the individual; (6) reproduction, necessary to maintain the race.



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The Ameba, a Single-Celled Organism
Greatly enlarged

Symmetry.—The characteristic appearance of most plants and animals is due to the size, form and distribution of the organs and to modifications by the environment. *Symmetrical* organisms are those presenting a balanced appearance; *asymmetrical* organisms lack a balanced form. Many straggling plants are truly asymmetrical, but most organisms show either bilateral symmetry, in which the right and left halves are mirror images as in man, or radial symmetry typical of such organisms as the starfish and the jellyfish. The radial symmetry of most plants is altered by wind, sunlight and crowding.

Segmentation.—The bodies of many animals are arranged lengthwise into parts or segments called *metameres.* Sometimes these are all alike, as in the earthworm, and sometimes unlike, as in the grasshopper. Man is a metameric animal, as shown internally by the vertebral column.

Metameres frequently carry paired arms, legs or other appendages. Organs or appendages of like origin and structure are called *homologous.* The wing of a bird, the foreleg of a horse and the arm of man are homologous. Organs or appendages having the same function, but different origins and structures are called *analogous.* The wings of a fly and those of a bird are therefore analogous because they are structurally different, although both are used for flight.

The Food of Organisms.—Broadly speaking, food is any substance that furnishes energy or by which metabolism is maintained. Organisms secure food by manufacture from simpler substances or by appropriation of ready-made materials. Manufacture is practically limited to plants that contain chlorophyll. Organisms lacking chlorophyll are usually obliged to take food from other plants or animals. Flesh-eating animals often prey upon other animals that eat green plants. Directly or indirectly, therefore, animals rely upon plants, and with few exceptions both plants and animals depend primarily on the activity of chlorophyll for a food supply.

Carbohydrates.—Starch manufacture is called *photosynthesis* and takes place in green plants only when certain materials are present. Chlorophyll, carbon dioxide from the air and water from plant tissues must be present. Sunlight falling on the chloroplasts furnishes the energy necessary to bring about the formation of carbohydrates and the liberation of free oxygen. This chemical reaction is expressed:

$$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2\uparrow$$

As a result of photosynthesis, plants obtain carbohydrate food for use or storage, and free oxygen is liberated into the air. This constructive process is the opposite of respiration, by which oxygen is used and carbon dioxide is liberated.

Fats and Oils.—Fatty substances called *lipins* are found abundantly in nuts, castor beans, corn, flaxseed and other plant sources. Animals obtain lipins in two ways: by eating such plant foods and by reducing carbohydrates to this form of food substance. When lipins are oxidized, large amounts of energy are released. Those found in protective layers under the skin insulate warm-blooded animals and serve as storage tissues for future energy needs.

Proteins.—Proteins are the most complex of chemical compounds; they sometimes have millions of atoms. The protein molecules are combinations of about 20 amino acids containing carbon, oxygen, hydrogen, nitrogen and sometimes such other elements as sulphur, phosphorus and iron. Protoplasm, except its water content, is mostly protein in nature. The cells of plants or animals may synthesize amino acids from ammonia and fragments of carbohydrates. Protein manufacture, unlike photosynthesis, requires neither chlorophyll nor light; but as animal cells cannot synthesize all amino acids, they must obtain some of them from plant sources. Proteins yield energy when they are combined with oxygen; or they may be transformed by cell activity into either lipins or carbohydrates.

Vitamins.—Physiologists attempting to determine adequate diets found that food contains minute quantities of substances called *vitamins,* which are necessary for normal growth and development. The diseases caused by vitamin deficiencies had long been known, but the discovery of the first vitamins, A and B, was made in 1915 by the American chemists Elmer V. McCollum and Marguerite Davis. Since then five others have been announced. Vitamins are essential parts of food, although they are present in minute quantities and do not furnish energy. Some are produced by animals, others by plants. The lack of adequate amounts of vitamins in the diet gives rise to characteristic disturbances in animals. Vitamin A, for example, abundant in cod-liver oil, milk and eggs, promotes growth; but when a deficiency occurs, body growth is stunted, resistance to infection is lowered and other symptoms appear. Vitamin D, also abundant in fish-liver oils, affects bone formation; adequate amounts prevent rickets. This vitamin is formed by animal cells and also by the direct action of sunlight or ultraviolet light on the human skin. Other vitamins, B_1, B_2 or G, C and E, have definite effects that also are being studied by physiological and medical research.

Metabolism.—Metabolism is the building-up and the tearing-down processes that take place in every organism. Different phases of metabolism are: growth by assimilation, cell division, digestion, respiration, secretion, excretion, muscular contraction, nervous activity, reproduction. External factors such as sunlight, heat, water supply and altitude are influential, especially in plant metabolism. In young organisms the building-up processes are foremost, but growth may cease in mature organisms.

Secretion is a metabolic activity by which glands or gland cells manufacture materials of use to the organism. The secretions are usually watery but may be mucous, waxy or oily. Tears, saliva and mucous secretions of the nasal membranes are familiar. Some glands in the digestive system secrete enzymes or ferments that aid chemical reactions. Other ductless or endocrine glands produce hormones that control the oxidation rate and the heart rate and stimulate other glands. Plant secretions also are familiar as perfumes, resins, oils or poisons (as in poison ivy).

The *digestive system* prepares food for use in the body. First, food is eaten or ingested by animals, then follows digestion, which has both mechanical and chemical aspects. The action of the jaws and muscular movements of stomach and intestine are examples of *mechanical* digestion by which food is softened and divided into smaller particles. *Chemical* digestion occurs when enzymes contained in secretions of digestive glands break down the complex food materials into simpler chemical compounds. Carbohydrates are broken down into simple sugars, proteins into amino acids, lipins are emulsified and converted into fatty acids and glycerin.

A variety of glands produce digestive enzymes. In man the salivary glands produce saliva, and the gullet and intestinal glands secrete enzymes and mucus that aid the passage of substances. Glands in the stomach produce gastric juice. The pancreas secretes pancreatic juice and produces a hormone called *insulin.* Bile from the liver is poured into the intestine through the bile duct, and the liver also forms and stores glycogen.

Absorption is the process by which digested food materials pass through the walls of the digestive tract into the lymph and blood streams. Osmosis plays an important part in this absorption as it does in respiration and in water absorption by plant roots. In simple organisms, absorption of food materials takes place directly through the cell or body wall, but in higher plants and animals other organs are involved.

Circulation.—Protoplasm circulates in all cells. Besides this circulation, higher plants and animals need special organs for the distribution of water, food and respiratory gases and to excrete waste products and other materials. Circulation in higher plants takes place through conducting tubes extending throughout the organism and by movement from cell to cell. Water from the soil enters plant roots by osmosis and passes upward in the vessels of the wood (that part between the pith or center and the outer covering); food and other products pass downward through the phloem tubes of the inner bark. Horizontal movements of liquids take place by osmosis in the cells of the wood rays or lines of cells that radiate from the pith through the wood to the outer region of the stem or root.

In the higher animals the circulatory system consists of a muscular pumping organ, the heart and three kinds of tubes: (1) the veins that bring blood to the heart; (2) arteries that carry blood away from it; and (3) minute capillaries that connect the smallest arteries to the smallest veins. The heart varies in shape in different groups of animals. It is a long pulsating tube in insects; it is an efficient four-chambered organ in mammals, whose oxygenated and unoxygenated blood streams are more completely separated than in any other type.

Within the circulatory system, the blood performs several functions. The fluid carries white blood corpuscles that attack bacteria and help repair injuries, and in higher animals the red blood corpuscles, containing hemoglobin, carry oxygen. Carbon dioxide is transported chiefly by the plasma or fluid part of the blood. Plasma contains substances that have the power of producing *fibrin,* a sticky substance that brings about clotting of the blood following injury. This property is of extreme importance in preventing death from loss of blood. Persons with hemophilia (inherited lack of the blood-clotting property) are in danger of bleeding to death from minute injuries. Blood serves as a transportation and co-ordinating system in animals, carrying digested food materials and secretions to be used by the body and usually collecting carbon dioxide and other wastes. Circulation in insects is of interest because the blood does not transport oxygen or carbon dioxide. It does, however, transport digested food and secretions to all parts of the insect body.

Digested food materials pass by osmosis through the capillary walls into a watery fluid or lymph, and from the lymph individual cells absorb food materials. All exchange of gases and other substances occurs through this medium. The lymphatic system of higher animals is not so easily observed as the blood system, but it is a collecting and circulatory system supplementing the blood and is intimately associated with all cells of the body. By complex processes the food absorbed through the lymph is converted or assimilated by cells to form new protoplasm.

Cellular Oxidations.—Oxidation is a metabolic process, one of many going on within the cells. Combinations of oxygen with food substances and protoplasm itself occur and yield large amounts of energy. In plants energy from cellular oxidations is expressed chiefly as growth by increase in cell number. In warm-blooded animals cellular oxidations are expressed also as heat and motion.

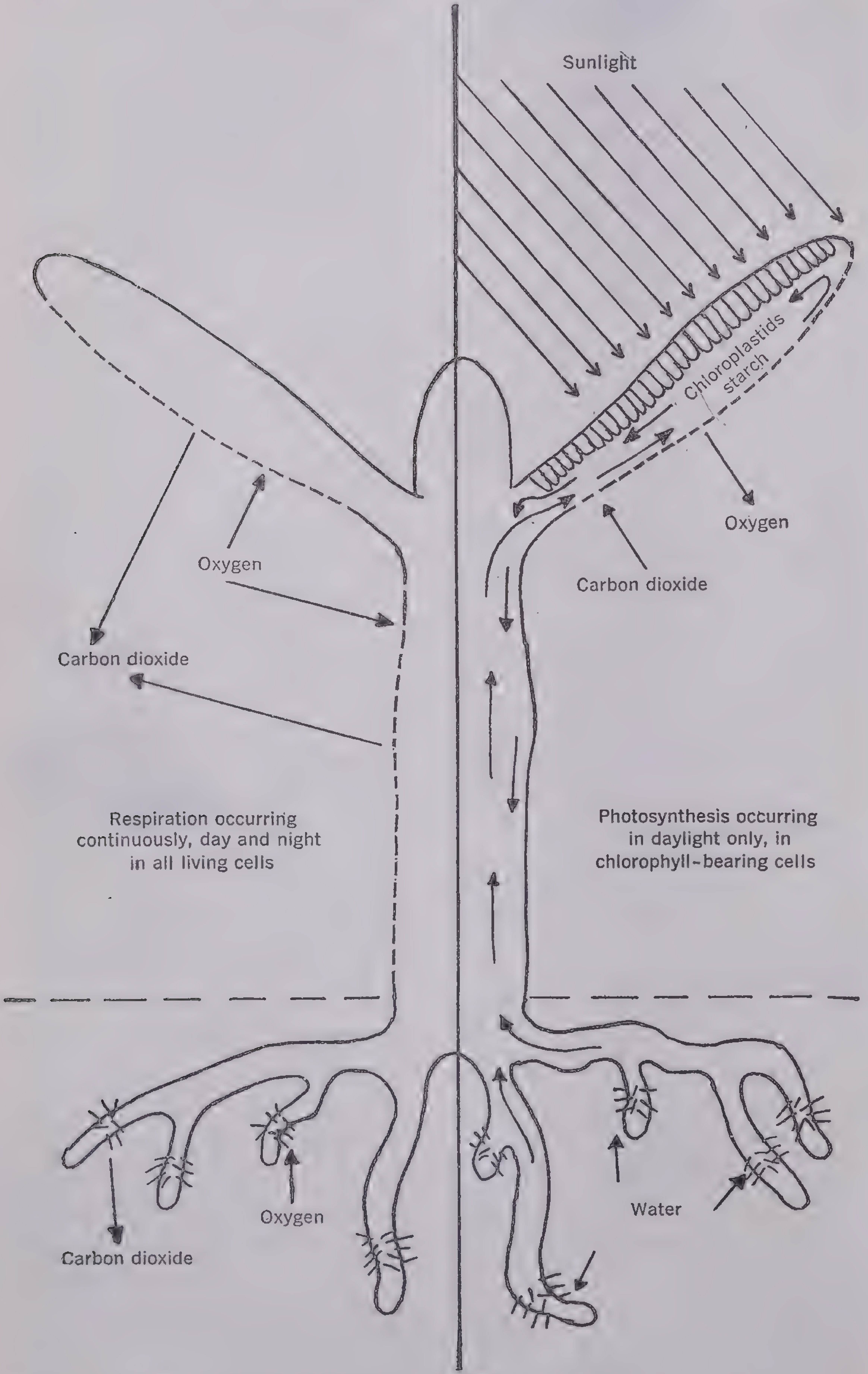
In all cells a steady intake of oxygen and a steady outgo of carbon dioxide occur. This exchange of gases within the body is *internal* respiration. *External* respiration is the exchange of respiratory gases between an organism and its environment. In simple plants and animals oxygen is absorbed and carbon dioxide is given off by osmosis through the entire body surface; but higher organisms have special organs for external respiration. Plant leaves and bark have small openings that serve as ports for gaseous exchange. Most animals have adaptations, such as gills or lungs, with greatly infolded surfaces that are ventilated by breathing movements and are closely associated with the blood system. Insects have an efficient respiratory system of air tubes that conduct gases directly to and from the tissues.

As a result of metabolic activity, numerous waste products called *excretions* are formed. These include carbon dioxide, urea and other substances. The nitrogenous secretions, including urea, are passed off chiefly by the kidneys of vertebrates and similar organs of invertebrates. The sweat glands and the lungs also excrete small amounts of nitrogenous wastes. Excretion is by no means limited to animals. All plants exhale carbon dioxide as part of respiration, and many plants deposit waste products as insoluble crystals in certain cells. Trees get rid of waste materials by deposits in bark and leaves.

True excretions (breakdown products) of metabolism must be distinguished from mere food residues that never become part of the protoplasm. In animals these residues consist of insoluble portions of food plus fluids added in the digestive tract. Residues (feces) are usually eliminated through the anus (vent).

Growth.—Growth is the process by which organisms increase in size whenever the anabolic phases of metabolism exceed catabolism. The first step is the increase in size of individual cells by assimilation (conversion of food into protoplasm). Since the size of any cell seems limited, the second stage of growth follows.

The second phase of growth is *mitosis,* the process by which a cell divides into two daughter cells. A fully mature cell in the resting stage has a distinct nucleus with fairly uniform distribution of chromatin granules and one or more nucleoli. When mitosis begins, definite chromatin bodies, the chromosomes, appear as the nucleoli and the nuclear membrane disappears. In animals and some unicellular plants, a centrosome may divide and pass to opposite sides of the cell. Between these poles a series of fibers makes a spindle as the cell elongates. The chromosomes line up at an equator, a plane halfway between the two poles. This marks the end of the prophase. Secondly, the chromosomes split into halves. This brief process is the metaphase. Thirdly, as the spindle fibers appear to shorten, one-half of each chromosome goes toward each pole, where a cluster forms. At this stage plant cells deposit a layer of cellulose in the equatorial region; this woody cell plate finally forms part of the daughter cell walls. In animal cells no cell plate forms but the cell membrane and cytoplasm begin to constrict. This ends the anaphase. Fourthly, the spindle and chromosomes disappear, and scattered chromatin granules, nucleoli and the nuclear membrane reappear. The daughter cells of plants are separated by completion of the cell wall; those of animals are completely separated by constriction. By the end of this final stage (telophase) both cells are in the typical resting stage. Mitosis, therefore, increases the number of cells.


Sunlight
Chloroplastids
starch
Oxygen
Carbon dioxide
Oxygen
Carbon dioxide
Respiration occurring continuously, day and night in all living cells
Photosynthesis occurring in daylight only, in chlorophyll-bearing cells
Oxygen
Carbon dioxide
Water

From E. C. Cole: An Introduction to Biology, John Wiley & Sons, Inc., publishers

Diagram Showing Respiration and Photosynthesis

The daughter cells are only about half the size of the parent cell, but they grow rapidly by assimilation and reach full size. The nucleus remains in the resting stage until the next mitotic division, but the whole cell carries on metabolism. The third stage of growth begins when the cells differentiate and produce special substances that enable them to perform special functions; for example, some cells develop contractile fibers in the cytoplasm and become muscle cells; others develop a capacity for secreting fluids and become gland cells. In this way division of labor is maintained and the co-ordination of the growing organism is secured.

Regeneration of Tissues.—When an organism is injured, the cells usually respond by regenerating the lost parts. If the original injury is small, regeneration may be so perfect that no scar remains. A cut in the skin ordinarily heals promptly and leaves no trace of the injury. In wounds of larger size the replacement tissue often consists of connective fibers that, although they make a scar, actually serve to strengthen the wounded area. Skin grafting and transplantation of skin now widely used on burned or scarred areas must be used when normal regeneration does not supply enough new tissue. Generally speaking, the more highly specialized the tissues or an organism, the less regenerative power they have. Embryonic tissues have more power to replace lost parts than older tissues.

The power of replacement or regeneration of lost parts varies in

From E. C. Cole: An Introduction to Biology (John Wiley & Sons, Inc.)

A Regenerating Starfish

A complete starfish of this species has a central disk and five arms. This specimen has lost four arms, and new ones are being formed

different organisms. In plants, this capacity makes it possible to produce new individuals from cuttings. If the small fresh-water hydra is cut into halves each piece will regenerate the lost parts to form a complete hydra. An earthworm injured by a spade will regenerate to some extent, although two individuals seldom are completed. If one or more arms of a starfish are removed by injury, others develop to replace them. The injured appendages of lobsters and crabs usually are regenerated, and a small piece of the flatworm *Planaria* will usually form a complete individual. Though these examples show unusually high regenerative capacity, most organisms exhibit this phenomenon to a more limited degree. The process enables an individual to meet the hazards of environment and continue existence.

Energy Transformations.—*Energy* is the ability to perform work. It may be stored as potential energy in food, and when the food is oxidized kinetic energy, which expresses itself in motion, heat, chemical changes or other forms, is released. The whole story of metabolism is a tale of energy transformations.

When organisms move without the aid of external forces, they exhibit *spontaneous motion.* Motion from place to place is *locomotion.* The simplest type of motion is the streaming activity of protoplasm within cells. Such protoplasmic movement can be demonstrated in *Ameba, Paramecium,* the green-plant *Elodea* and the stamen hairs of the inch plant. Some cells have hairlike cilia that lash about like tiny whips. This type of motion is shown in many protozoans, the roof of the frog's mouth and the human trachea. The best-known movements, however, are caused by the contraction of muscle cells in the body or appendages of organisms.

Some organisms express energy as light. Certain bacteria, fungi in rotting wood, marine protozoans, jellyfish and fireflies are examples of luminous organisms. In their production of light, little heat is given off.

The activities of organisms are accompanied by the production of minute amounts of electricity. The torpedo, a fish of the ray type, and the electric eel, however, are able to give a powerful shock.

Although the form that energy takes may change, no energy is actually lost. This law of conservation of energy applies to organisms; for example, as the sun's energy acts upon chlorophyll, the energy disappears, but carbohydrates are formed by photosynthesis. The disappearance of energy with the simultaneous appearance of matter or vice versa leads to the conception that matter and energy are two forms of the same thing, and that also the law of conservation of matter applies to organisms.

Co-ordination.—Regardless of the size or complexity of an organism, it acts as an individual. This unity is maintained in animals chiefly by the co-ordinating activities of the nervous, endocrine and vascular systems. (A discussion of the co-ordinating functions of the blood has been given above.) Recently evidence has shown that plants have hormones with co-ordinating functions, although no special gland systems are present. Plant vascular tissues serve as transportation avenues for food materials, secretions and water, facilitating co-ordination.

The vertebrate nervous system consists of a central portion, the brain and spinal cord, and a peripheral system of nerves that extends to all parts of the body and carries impulses to or from the spinal cord and brain. Sense organs are receptive to certain types of stimuli in the environment, such as temperature, light, sound, touch and chemical changes. The eye is sensitive to light stimuli; the ear, to sound stimuli; and some other sensory organs are stimulated by muscular activity. From the sense organs impulses pass to the central system where adjustments are made. The impulse is continued by other nerves that reach responding organs such as muscles or glands. An accessory system, the sympathetic nervous system, is associated with the central system, but is entirely involuntary.

A nervous system, no matter how complex, consists of nerve cells called *neurons.* The cell body of a neuron consists of a nucleus and cytoplasm with a long process, the axon, and one or more dendritic processes. Impulses enter a neuron by the dendrites (cell bodies) and leave by the axon, which is usually in contact with the dendrites of other neurons. Neurons are classified as: receptors that receive stimuli; adjustors that direct the impulse, usually in the central system; and effectors that cause some organ to respond. Theoretically a receptor might act directly upon an effector, but actually more than two neurons are involved in a reflex arc. A familiar reflex action is involved when the finger touches a too-hot object. An impulse from receptors in the skin passes to adjustors and then to effectors controlling muscles of the arm or hand, and the finger is withdrawn involuntarily. A reflex action does not involve control by the brain, although in many cases adjustors carry impulses to the brain, and there is consciousness of the reflex action after it is completed.

An adjustor neuron may pass a

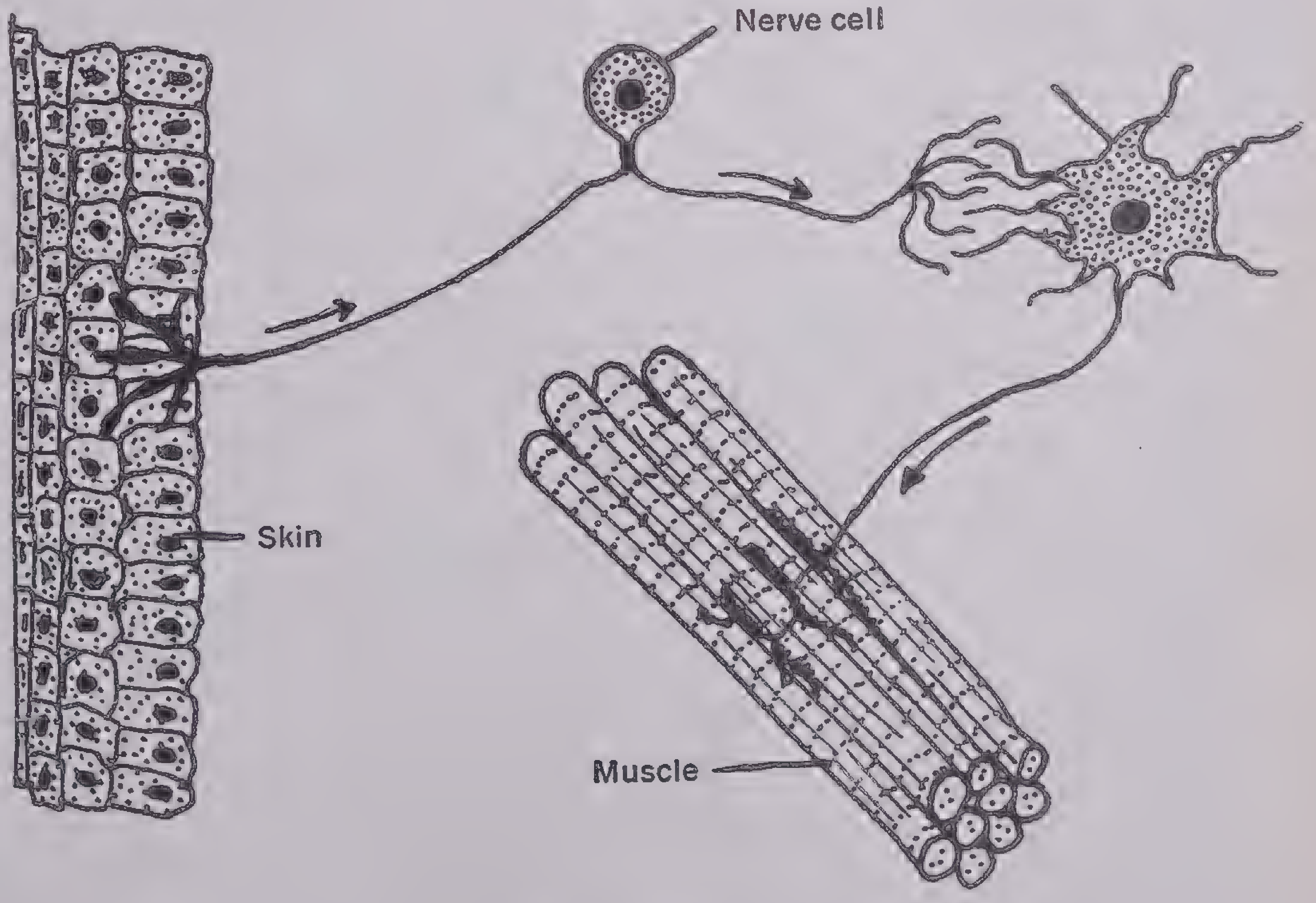


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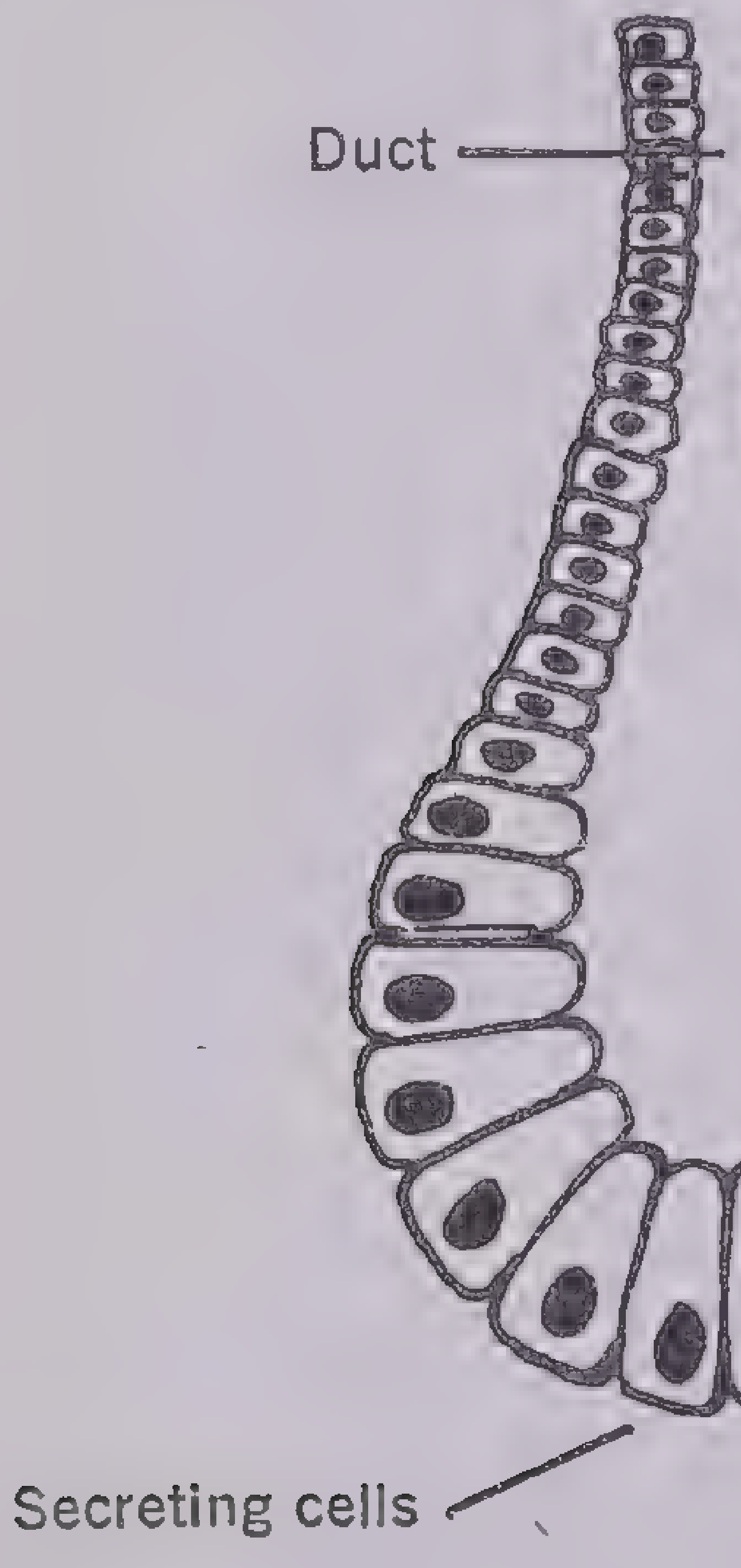
Diagram of a Reflex Arc

When a stimulus acts upon a nerve ending in the skin, an impulse passes inward along the fibers of a sensory nerve. The impulse is then transferred to a motor nerve and passes to muscle tissue, where contraction occurs. The contraction of muscle tissue produces movements that tend to adapt the body to the change in the environment that produced the stimulus

stimulus to several effectors, making possible different responses. Usually one pathway seems to be the preferred one. This is the structural basis of habit formation. By practice it is often possible to attach a desired response to a given stimulus in place of an undesirable one.

Endocrine System.—The endocrine glands located in various parts of the body produce hormones that affect the metabolism of the body. Ordinarily they have no ducts, and the secreted hormones pass directly into the blood stream by osmosis. The pancreas and sex glands are examples that, in addition to hormones, produce other products and secrete them through ducts. The thyroid gland at the front base of the neck secretes the hormone *thyroxin* that controls oxidation and was the first hormone to be synthesized. Several hormones with different functions are produced by the pituitary gland at the base of the brain; some of them affect the sex glands. The adrenal glands produce two hormones—adrenalin, which affects the heart and other muscles through the sympathetic nervous system, and cortin, which controls potassium in the body and is necessary for life. The pancreas secretes insulin, the hormone controlling sugar metabolism. It can be readily understood from these examples that the control of metabolic activity by the hormones is a means of co-ordinating various body functions.



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Simple Gland (Diagram)

Although simple glands may vary in shape and size, they consist essentially of a cluster of secreting cells and a tube or duct through which the secretion passes outward. Compound glands are composed of great numbers of simple glands, similar to the one shown here, bound together by connective tissues. A compound gland possesses a special nerve and blood supply

Hormones.—Hormone action was discovered in 1894–95 when the effect of a suprarenal-gland extract on blood pressure was observed. That hormone is adrenalin. Since then, many others have been discovered and isolated: secretin, in 1902 by Sir William Bayliss (1860–1924) and Ernest Starling (1866–1927); thyroxin, in 1915 by Edward C. Kendall (1886–); several sex-gland hormones; three hormones from the pituitary; insulin; cortin from the adrenal cortex. Plant hormones were announced in 1936. The medical aspects of these discoveries are increasingly important. Since Charles Harington first synthesized thyroxin in 1927, several other synthetic hormones have been made.

Adjustment to Environment.—Since an organism depends upon its environment for food and other materials, the successful organism makes adjustments to changes in its surroundings. Immediate responses to environmental changes are functional, as for instance when plant roots respond to water by growing toward it, or when an animal moves away from a place that is too hot. As cold weather approaches, birds fly south and many animals seek shelter for hibernation or winter sleep. This type of response permits the individual to carry on life in spite of changes in the environment.

Plants and animals seem to have structures adapted to their environments. The streamlined shape of the fish enables it to move through water with the least resistance. A fish has a swim bladder so adaptable that it changes in size and adjusts the fish to the water pressures at different levels. This enables the fish to rise or sink with little effort, since the weight of the body about equals that of the water displaced. Fins are adapted for steering, and the tail serves as a powerful sculling device. The breathing movements of a fish send water over the gills and out through openings behind them.

The fitness of an organism for its own environment is not appreciated until that organism is pictured in strange surroundings. The expression "like a fish out of water" illustrates this point. On land, the body shape of the fish might be useful, but the fins and tail would be unfit for locomotion, the moist skin would soon harden, the swim bladder would be of no value, the gills would dry out, and respiration would cease.

Protective coloration is a remarkable kind of adaptation. The weasel, brown in summer, turns white during the winter when snow usually covers the ground. This enables the animal to escape from its enemies and renders it more or less invisible when stalking its own prey. Many cases of protective coloration are seen among animals. Another adaptation is mimicry, in which the organism resembles another organism or something in the environment. A familiar example of this is the walkingstick, an insect that not only resembles the brown color of its surroundings but also looks like a dead twig.

Adaptation or structural adjustment has been going on for long, long periods of time. It has not been brought about by direct action of the environment upon organisms but by the survival and propagation of those individuals best suited to conditions. The survival of the fittest, with other factors of inheritance, has been an important means of evolution.

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Protective Adaptation: The Walking Stick

Walking sticks may be green or brown in color. In any case, they so closely resemble the twigs among which they live that they are hard to see

Modes of Living.—The majority of familiar plants and animals are free living. Trees obtain water and mineral salts from the soil, carbon dioxide from the air, energy from sunlight. Some animals, the carnivorous, feed upon flesh; others, the herbivorous, upon vegetation; still others, the omnivorous, feed upon both flesh and vegetable foods.

Certain bacteria, fungi and other plants do not manufacture their own food but exist as *saprophytes;* that is, they obtain complex food substances from the dead organisms on which they live.

Parasites are organisms that associate themselves with other organisms, usually injuriously, living in or on them and securing food by direct attack on their hosts. The dodder and mistletoe are well-known plant parasites. Animal parasites include ticks, lice, tapeworms and hookworms. Parasites have adaptations of structure and function that permit them to carry on their parasitic mode of life.

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Shelf Fungus on Trees

Injuries to the bark of these trees permitted the entrance of spores of this fungus. The spores germinated and developed into mature plants, whose fruiting bodies may be seen in the picture. The threads or mycelia of the fungus spread throughout the tree trunk. Note that the fungus has killed the tree at the right. The tree at the left is doomed also. Such organisms are called *parasites;* those that feed upon the remains of organisms are called *saprophytes*

Close relationships between organisms need not be injurious. In symbiotic associations, both individuals living together are benefited. The common lichen consists of green algae and fungi living co-operatively; the algae create food materials; the fungi cannot do this but they protect and support the delicate algal cells.

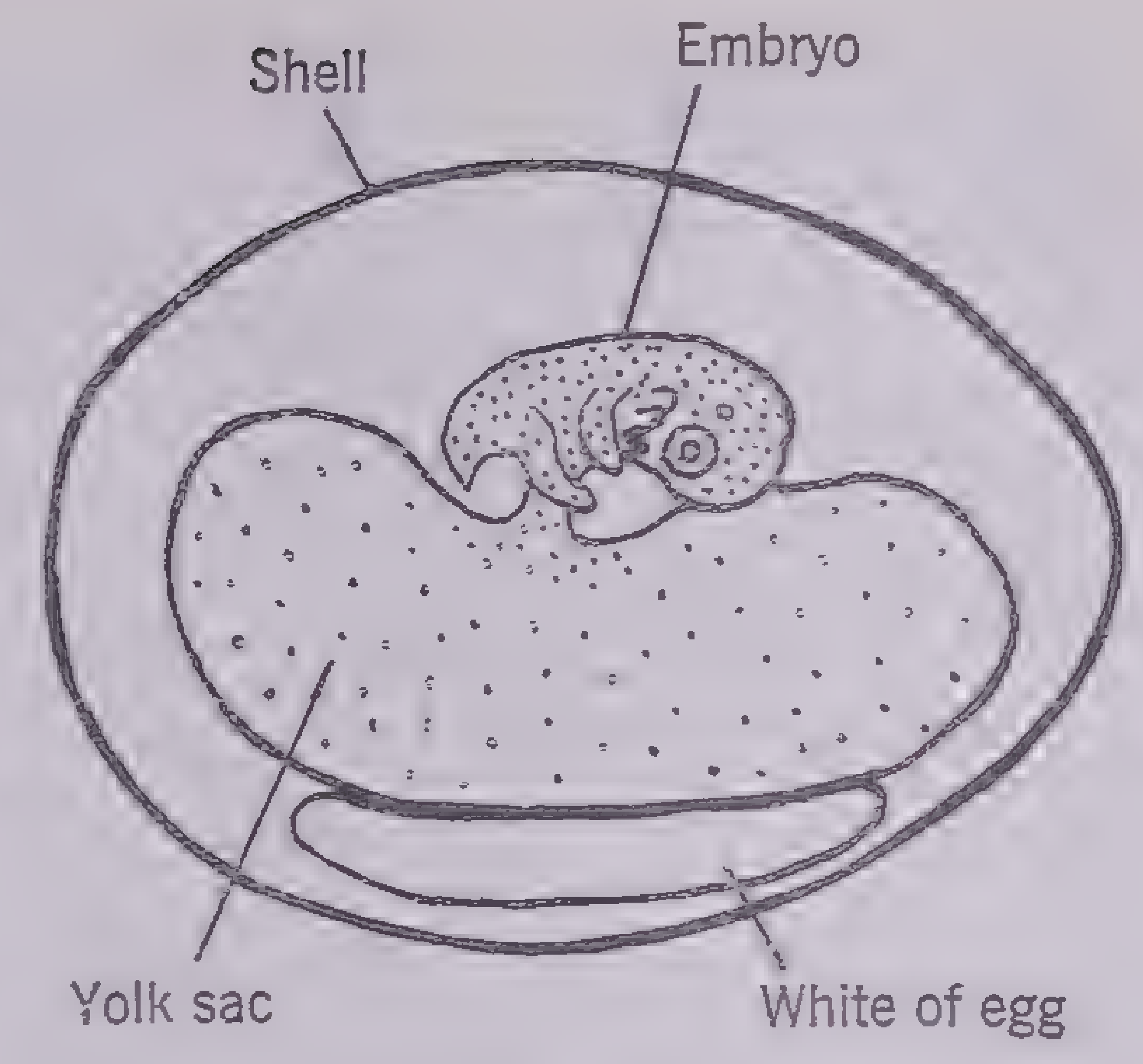
Communities of plants and of animals sometimes show division of labor. In the beehive, the queen's sole function is the production of eggs; the male bees (drones) supply her with sperm cells for fertilization of the eggs; and the workers gather nectar and pollen and perform other duties. In human affairs, a well-organized town has a police department to maintain order; a health department to control private and public health; a school department to care for the education of the young; and other special departments.

Reproduction.—Many organisms reproduce by asexual methods that require only one parent and never involve the union or fusion of cells. The simplest asexual method is fission, by which a parent divides into two new individuals. Sporulation occurs when the parent breaks up into a large number of spores, each of which becomes an individual. Another type is budding, by which a small part grows to full size and may separate from the parent. Another method is fragmentation, by which the parent breaks up into pieces that become new organisms. Asexual methods of propagation are used in agriculture, as in planting pieces of potato that grow into complete plants. Buds from valuable fruit and nut trees are grafted into sturdy but less valuable trees and continue to bear desirable fruit and nuts.

Sexual reproduction involves the fusion of two *gametes* (germ cells) from one parent or one gamete from each of different parents. In simple plants and animals, the gametes may be alike, but in higher organisms they are differentiated into eggs and sperms. Like body cells, the gametes contain chromosomes in the nuclei. but the chromosomes are reduced to one-half the original number by a division during maturation, called *meiosis*. This reduction division is distinguished from mitosis, in which the daughter cells have the same chromosome number as the original cell. When the egg unites with a sperm, the resultant *zygote* (fused cell) has the full number of chromosomes. The new individual has therefore the same chromosome number as its parents. The body cells of man have 48 chromosomes, but mature human eggs and sperms contain 24.

The eggs of some animals develop into new individuals without being fertilized. Certain plant lice deposit unfertilized eggs that develop into parthenogenetic plant lice. Unfertilized eggs of the queen bee develop into male bees, but the fertilized eggs grow into either queen or worker bees depending upon the way in which they are reared.

In all the higher plants and in some animals, sexual and asexual generations alternate. The ordinary pigeon-wheat moss develops a spore that grows into a sexual plant. This first plant produces eggs and sperms that unite, forming an asexual plant that grows out of the first. The asexual plant produces spores that develop into sexual plants. In many organisms with alternating generations, one is conspicuous and one is less so. The jellyfishes are a familiar form in the sexual stage, but the asexual stage is seldom noticed.



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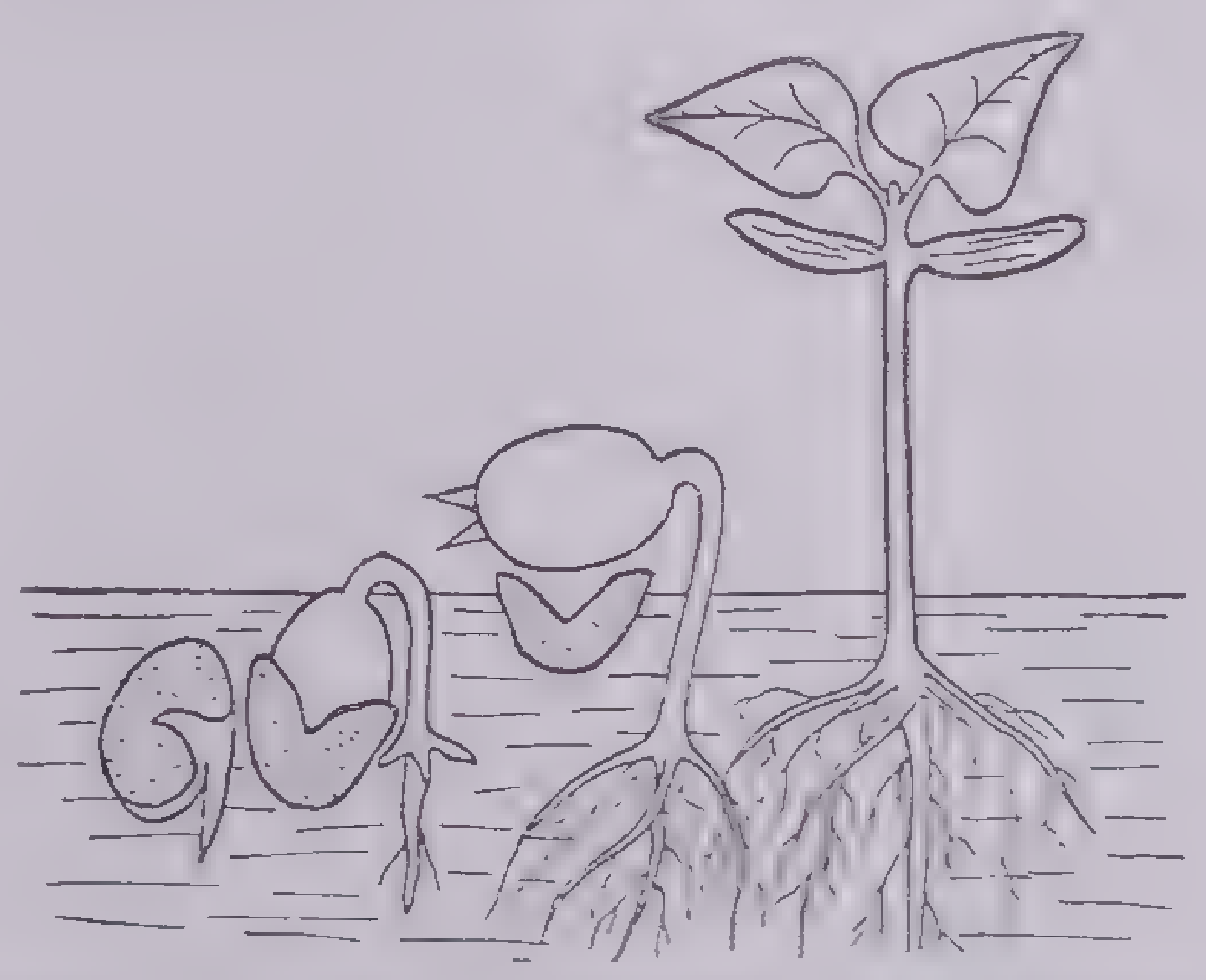
Developing Embryo in a Bird's Egg
Simplified diagram

Development of the Individual.—Seed-producing plants show clearly the development of a new individual. After fertilization of the egg cell within the ovule, there is a period of growth. A young embryo is developed containing reserve food material or surrounded by food in the endosperm. As the fruit ripens, the embryo, with its reserve food and membranes, becomes a mature seed. The seed may remain in a resting state, but under suitable conditions, it sprouts and the rootlike hypocotyl, the budlike epicotyl and the cotyledons (seed leaves) contribute to the formation of new structures. By growth the roots and stem and leaves assume mature form. Flowers appear, fertilization occurs, and the development of a new seed begins.



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Germination of a Bean Seed (Diagram)
At the left, the tearing of the seed coats and the emergence of the hypocotyl may be seen. The next step shows the curve formed in the hypocotyl. As the latter continues to grow, the seed coats are left in the ground, and the cotyledons appear above the surface. At the right is seen the young seedling, erect and ready for rapid growth

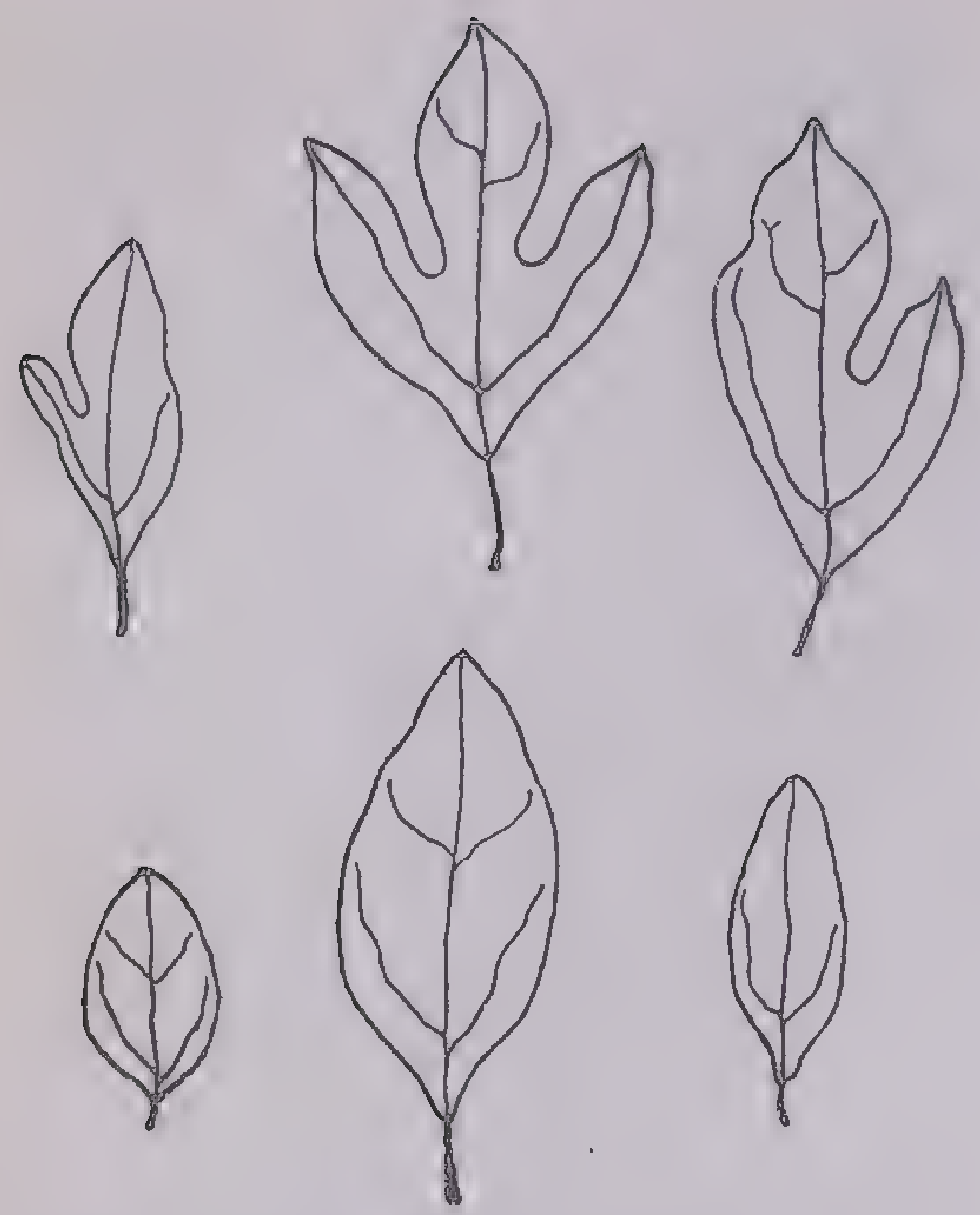
The frog is an example of animals that produce eggs that are fertilized and develop externally. Development begins after fertilization, mitosis occurs, then three germ layers differentiate, and from these all the tissues arise. At first the tadpole grows rapidly; then external and internal changes occur, and it metamorphoses into a frog. The young frog grows until mature size is reached, when the discharge of eggs and sperms occurs. Fertilization of the eggs marks the beginning of a new generation.

Mammals show a higher development than that of the frog. In the mouse, fertilization takes place within the body of the mother. The fertilized egg undergoes mitosis, becomes attached to the uterine wall and there the embryo grows. Protective and nutritive membranes form, and the developing mammal is efficiently protected by the uterus. At birth, the surrounding membranes rupture, and the young animal is expelled from the mother's body. There is a period of maternal care, but growth is rapid until the adult size is reached. At maturity mating takes place, and a new generation develops.

Inheritance.—Individuals of one generation bear striking resemblances to their parents. Closer examination, however, shows that offspring differ from their parents and from one another. Many of these differences are slight, but they occur in man and all other organisms. Some are inherited, others are not.

The laws of inheritance were discovered by Mendel and rediscovered in 1900 by de Vries and others. Parents transmit to offspring those characters represented in the germ cells by genes located in the chromosomes. Each offspring receives one-half its genes from the father and one-half from the mother. Individuals inheriting qualities from unlike parents show only the dominant character. For instance, tall garden peas crossed with short ones will yield hybrid offspring appearing tall, for tallness is dominant and shortness is recessive. If the members of the first (F_1) hybrid generation are crossed with one another, the second (F_2) generation appears three-fourths dominant and one-fourth recessive; however, only one-fourth are of the pure dominant type, the others appearing dominant are hybrids like the F_1 generation; but since the recessive character appears in the F_2 generation and since it breeds true, inherited characters are transmitted as units and are not blended or mixed. Besides this, and the fact that some are dominant over others, genes assort independently during maturation of germ cells. For instance, a hybrid pea plant showing tallness and yellow seed color but with genes for the recessive factors, shortness and green seed color, develops gametes of at least four groups: tallness and yellow seed color in one group, tallness and green, shortness and yellow, shortness and green groups. Not all characters are inherited independently; that is, as the simple Mendelian characters illustrated above. There are more complicated types of inheritance, in which genes do not assort independently during maturation of the germ cells or in which other complications occur.

When mutations appear, the nature



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Variations in Sassafras Leaves

All of these variations were found on a single branch

of the gene for that character is changed. The offspring of the mutant receives the mutant gene. It is probable that mutations have been important in the evolution of species, although natural selection has acted on mutant organisms as on all others.

Hybridization is of value in producing useful plants and animals. The plumcot (a cross between the plum and apricot) has the features of both fruits. Wheat strains have been developed with resistance to wheat rust. The cross between a female horse and a male donkey produces a mule that possesses the size of the mother and the endurance of the father.

Human beings are subject to the same laws of inheritance as are other organisms. The inheritance of eye color, height and other physical traits is complex and that of mental traits is probably even more so. Some qualities, however, such as musical talent, are known to be recessive. Brown or dark hair is probably dominant to light hair. Hemophilia is transmitted through the mother, who does not have the disease, to her male offspring.

Eugenics.—The science of improving the human offspring by the methods of genetics is called *eugenics*. (Euthenics is the science of improving the human race by betterment of environment.) Family records illustrate the handicap of poor inheritance and the advantage of good inheritance. The notorious so-called Juke family through several generations showed a long line of descendants with the degenerate tendencies of the original parents. On the other hand, the Edwards family that originally received good traits has a long line of good citizens among whom are college presidents, ministers and other professional men. A convincing contrast is illustrated by the Kallikak families. About the time of the American Revolution, Martin Kallikak and a feebleminded girl became the parents of a son whose numerous decendants have shown feeblemindedness and social unfitness. Later, Kallikak married a girl of good stock and normal mentality, and from their children have descended another group, all satisfactory citizens. The weight of evidence shows that good environment may help to improve individuals, but that there is no substitute for a good inheritance. Overcrowding in the slums, for instance, places a handicap on any inheritance. Attempts to better the human race probably will profit by use of both euthenics, better environment, and eugenics, better inheritance.

Organic Evolution.—After Darwin's theory of the origin of species by natural selection had been generally accepted by scientists, biological thought was profoundly altered. When mutations and, later, genes were discovered, new interpretations of evolution arose. The modern concept briefly stated is this: the organisms living today have arisen, by means of mutations and natural selection through long periods of time, from the simpler to the more and more complex forms of life.

No informed person today questions that evolution has occurred. The evidence from comparative anatomy, embryology, genetics, paleontology and other sciences is overwhelming. Among the many fields of knowledge with facts that can best be explained by evolution is comparative anatomy. Certain structures are vestigial or rudimentary in higher organisms but are still functional in related lower forms. The human appendix is a useless structure, a focus of infection; but the appendix of apes and other mammals is a functional part of the digestive system.

Embryology shows that certain early stages in the development of higher animals represent later stages of simpler animals. This suggests that such animals have descended from common ancestors. Also the developmental stages of higher forms recapitulate the history of their race, or "Ontogeny repeats phylogeny."

Fossils (petrified remains or traces of plants and animals) can best be interpreted by evolution. In many regions, layers of rock lie as they formed ages ago. In the upper layers, the fossils resemble living plants and animals, but in the next lower layers, some familiar and some simpler forms are found, and the lowest layers contain fossils of extinct organisms even simpler than those above. These fossils represent only a few of the multitude of organisms that have existed but they indicate the changes in species over vast periods of time. The fossil record is the strongest evidence of evolution.

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Fossil Trilobite

Trilobites, related to lobsters and crabs and once very abundant, are now wholly extinct. Their fossil remains are to be found in certain ancient rock layers

Genetics supplements other types of evidence by illustrating the natural processes of inheritance through the germ cells. Theoretical aspects of evolution are often explained through scientific breeding. Domestication of plants and animals illustrates how artificial selection and breeding work in developing desirable species.

The present geographical distribution of organisms can be satisfactorily explained only on the basis of evolution. For instance, where peculiar species are found on an island near the mainland, as in Australia, geological evidence shows that the island has been separate long enough for the divergence of species. On the other hand, tapirs found in South America and in Asia are alike. Their ancestors roamed Asia and North America when Asia and Alaska were connected by a land bridge. North American tapirs then migrated to South America when conditions were more favorable there.

The succession of life for millions of years has been maintained by the repeated use of the same raw materials. Oxygen liberated during photosynthesis is used by animals and the carbon dioxide respired by the latter is used by plants. Carbon dioxide made into carbohydrates by photosynthesis is made available again when the carbohydrates are oxidized as an energy source. Bacteria and fungi, causing the decay of dead organisms, release nitrogen and other substances for the use of future organisms. Hard rocks are weathered by erosion, producing soil for plant growth. Eventually soil carried by streams to the sea bottom becomes pressed into rock, and when the ocean floor rises, the exposed rock again produces soil by erosion.

Biological Equilibrium.—All types of organisms produce more offspring than can survive. Because organisms compete for space, food and other supplies from the environment, only those that secure adequate supplies can survive. One example of the balance between competing organisms concerns: (1) rodents, (2) the seed plants upon which rodents feed, and (3) those predatory animals that feed upon rodents. With abundant food materials rodents increase so fast that predators such as owls and hawks become more numerous; but as the rodents consume their available food supply, their numbers decline. This reduction limits the number of predators that can survive. Gradually a balance is developed between rodents, their food and the predators, each kept in check by the others. If climatic or other factors change one group, the effects show in the others, and a new balance is reached. Plants and animals show many balancing relationships of this sort. Recent events in the dust-bowl area have shown important relations between the welfare of man and overgrazing, overcultivation, loss of grassland, soil erosion and lack of rainfall.

With a suitable climate and abundant food, the human race tends to increase. That increase puts a strain upon food supplies and other needs of modern civilization. Commerce expands to meet the needs of growing populations, commercial rivalries increase, and the threat of war appears. Crowded populations can no longer find relief in the expansion of geographical frontiers. Instead, modern frontiers are the new markets created by science, which develops new products and finds new uses for old commodities.

BIOLOGICAL TERMS

Alternation of generations, a phenomenon first shown by Hofmeister in 1851 to be typical of plants. Asexual parents give rise to a generation of sexual individuals, which, in turn, produce asexual offspring. This occurs also in some invertebrates, but here a series of asexual generations may come between two sexual generations.

Analogy, the superficial resemblance of body parts that have the same function but are unlike in origin and structure. The foot of a clam and the foot of an insect are analogous parts.

Antisepsis, the destruction of disease germs by disinfectants or germicides such as carbolic acid, bichloride of mercury and iodine. These are useful in cleansing wounds and injuries but are such strong poisons that they must be used with great care. The principle of antisepsis was discovered by Joseph Lister in 1866.

Antitoxin, a substance produced by the body that counteracts the effects of bacterial poisons. For example, the toxin (poison) of diphtheria is injected into horses; there the blood forms antitoxins. The blood serum containing antitoxins can be withdrawn from the horse and used to prevent diphtheria in human beings. The diphtheria antitoxin was discovered by Pierre Roux at the Pasteur Institute.

Asepsis, the method of preventing infection by germs, involving the sterilization of instruments, gauze, dressings and everything else that might carry germs during an operation.

Assimilation, the process by which new protoplasm is made within cells from digested food materials absorbed by osmosis.

Binomial nomenclature, a method of naming organisms devised by Linnaeus in 1735. Each plant or animal is given two names, the first a generic, and the second a specific, name. Thus *Rana clamitans, Rana pipiens, Rana palustris* are three closely related frogs of different species but all in the genus *Rana*.

Cell, the unit of structure and function in living things. A typical cell has a dense nucleus and a more fluid cytoplasm bounded by a cell membrane. By differentiation, cells become specialized to perform a particular function, such as contraction, secretion or transmission of nervous impulses. A cell reproduces by division; when exact division of the nucleus occurs, the process is called *mitosis*.

Chlorophyll, the green pigment found in chloroplasts of plant cells, with power to synthesize carbohydrates from water and carbon dioxide in the presence of sunlight.

Chloroplasts, plastids containing the pigment chlorophyll; they are centers of photosynthesis (starch manufacture).

Chondriosomes, rod-shaped bodies found in the cytoplasm of cells and believed to be concerned with cell metabolism.

Chromosome, a dense body in the nucleus of a cell especially noticeable during mitosis. The number of chromosomes in both germinal and body cells is characteristic of each kind of organism. In the chromosomes the genes responsible for inheritance of traits are located.

Co-ordination, the condition in which all parts of an organism operate harmoniously so that the organism behaves as an individual. The nervous, circulatory and endocrine systems have important co-ordinating functions.

Cyto, a prefix meaning cell.

Cytoplasm, the protoplasm of a cell surrounding, but not including, the nucleus.

Differentiation, a complex series of modifications by which young cells or tissues become fitted for special functions. Nerve cells, at first generalized cells, develop long processes and extraordinary irritability, enabling them to carry nervous impulses.

Division of labor, the condition in which the various life functions of a multicellular organism are carried on by various organs specialized for the performance of a particular function. Division of labor not only occurs in the organs of one individual but may occur among different individuals of a community, such as those of bees, wasps and ants.

Energy, the ability to perform work. Energy is expressed by organisms as heat, light, motion, electricity, chemical changes or other phenomena. Energy is not lost when it changes from one form to another; furthermore it may be transformed into matter with potential or stored energy. When matter disappears, kinetic (active) energy appears. These facts show that the laws of conservation of matter and energy apply to living things.

Excretion, a product formed by the breakdown (oxidation) of protoplasm, the process of getting rid of metabolic products. To be distinguished from feces, which are merely food residue, passed off by intestinal elimination.

Experimental method, a way of studying scientific problems by which only one factor of a planned problem is varied at a time, and by which a control is always subjected to the same conditions as the experimental material without changing that factor. By this method a result in the experimental material may be correlated with one particular factor of the problem.

Gamete, one of two sexual cells that by fusion produce a zygote. Gametes of the simpler plants and animals may be alike, but gametes of higher forms are differentiated into eggs and sperms. A gamete contains one-half as many chromosomes (haploid number) as a body cell.

Genes, entities located in the chromosomes and responsible for the transmission of specific characters to offspring. Changes in the genes are called *mutations*.

Germ layers, the three layers of cells formed by the developing zygote of multicellular animals. The outer layer is the *ectoderm*, the inner layer the *endoderm*, and an intermediate layer is the *mesoderm*. All of the specialized organs of the mature organism arise from these three layers.

Homology, the fundamental similarity of organs or parts that may serve the same or different functions but are alike in origin and structure. The wing of a bird, the foreleg of a dog and the arm of a man are homologous. To be distinguished from analogous parts that have different origins and structures, although quite similar in function.

Hormones, substances manufactured by glands that secrete their products directly into the blood. Hormones profoundly affect bodily activities and aid in co-ordination and adjustment.

Lamarckism, the evolutionary theory proposed by Lamarck (before Darwin) that changes in the environment produce new characteristics and that these acquired characters may be inherited.

Life cycle, the term applied to the stages through which an organism passes. In animals usually an embryonic period is followed by infancy, youth, maturity, old age and death. Analogous stages occur in plants. Reproductive capacity develops at maturity and then the life cycle of the next generation is begun.

Mendelian laws, the fundamental principles of dominance, independent assortment and segregation, operating in inheritance. They were first published by Gregor Mendel in 1866–67.

Matter, a term applied to anything that occupies space. Living or *animate* matter refers to organisms; *inanimate* matter, to the nonliving. *Organic* matter is any material produced in nature by organisms and always contains the element carbon; *inorganic* matter refers to substances not produced by living things, such as water, iron, phosphorus, granite and cement.

Meiosis, a type of cell division limited to one stage in the development of germ cells. In meiosis, each of the daughter cells receives half the number of whole chromosomes that the original cell contained, instead of half of each chromosome as in mitosis. This maturation division reduces the chromosome number from the diploid to the haploid number; in man, from 48 to 24. The diploid number is restored when the egg is fertilized by a sperm and a zygote is formed.

Metabolism, the sum of all of the activities of the organism; the anabolic phases are concerned with building up, and the catabolic phases with the breakdown of protoplasm.

Mitosis, a method of forming new cells in which the parent cell nucleus divides exactly so that the two daughter cells contain one-half of each parental chromosome. During growth of the daughter cells, each half chromosome grows to full size.

Motion, Spontaneous, a change of form or position due to the action of protoplasm itself. Motion may be protoplasmic, ciliary or muscular. *Locomotion* is a change of position from one place to another.

Mutation, a change in a hereditary trait due to alteration of a gene in the germ cells. Mutations appear in the offspring that develop from sex cells having an altered gene.

Nutrition, the series of processes by which organisms prepare food substances and utilize them within their bodies.

Ontogeny, the development of an individual organism.

Osmosis, the diffusion of liquids or gases through a semipermeable membrane, occurring in all cells of plants and animals through the cell membrane.

Parasite, an organism that lives on or in another, securing food through direct injury of its host. Parasites may be external or internal, temporary or permanent.

Photosynthesis, the process by which the chlorophyll in green plants synthesizes carbohydrates from water and carbon dioxide in the presence of sunlight. Upon this fundamental process all organisms, plant and animal, depend for their supply of carbohydrate food.

Phylogeny, race or group development or evolution as distinguished from ontogeny or individual evolution.

Plastids, specialized bodies in the cytoplasm of plant cells and concerned with cell metabolism.

Protoplasm, a very complex semifluid mixture found exclusively in living cells. It lives, grows, responds to stimuli and reproduces itself. The fundamental identity of protoplasm in plants and animals was not realized until 1861.

Recapitulation theory, the hypothesis of Fritz Müller (1822–97), popularized and promoted by Ernst Haeckel (1834–1919), Herbert Spencer (1820–1903) and John Fiske (1842–1901), that the development, especially in the embryo, of an organism repeats the stages through which the ancestral types have passed: "Ontogeny repeats phylogeny."

Reflex arc, the path over which a nerve impulse is transferred from a sensory ending or sense organ to another neuron terminating upon an effector organ such as muscle or gland cells.

Respiration, External, the exchange of oxygen and carbon dioxide between an organism and its environment; it is aided in many animals by breathing movements.

Respiration, Internal, the internal exchange of gases. Cells take in oxygen and give off carbon dioxide by osmosis through the cell membrane. Respiration makes possible cellular oxidations.

Saprophyte, a plant that is unable to manufacture carbohydrates through photosynthesis and therefore lives upon the complex substances found in dead organic matter. The Indian pipe is a waxy white saprophytic plant, living on decaying logs in swamplands.

Secretion, the process by which a gland manufactures a useful substance; also the product of such a gland. Secretions may be watery, oily, waxy or mucous.

Sense organs, specialized parts of the body that react to particular types of stimuli. The eye is adapted to respond to changes in the nature and intensity of light; the ear reacts to sound vibrations; organs of smell, to chemical substances in the air, organs of taste, to substances in solution.

Vitamins, components of foods, present in minute quantities, not used for energy sources but essential to health.

Weismannism (Neo-Darwinism), a modified evolutionary theory advanced by August Weismann, arguing that germ plasm is the basis of heredity and that acquired characteristics cannot be transmitted.

Zygote, the cell formed by the union of two sex cells. There may be two like gametes or an egg and sperm. By repeated division, the zygote gives rise to all the cells composing a new individual.

ZOOLOGY

Zoology is the science that treats of animal life. It has a framework of philosophy but is founded on physics and chemistry. Students of zoology have as their aim the analysis and explanation of life, particularly animal life.

An understanding of the general foundations of zoology is necessary for the study of medicine, sanitation, agriculture, sociology, psychology and eugenics.

Characteristics and Tests of Living Objects.—Anyone can tell merely by looking at them, which of two given objects, for instance, is a dog and which is a clod of earth; but it is not always so easy to find the exact differences that distinguish living from nonliving objects. The usual tests applied to discover these differences are the following: chemical composition, metabolism, reproduction, irritability and organization.

We know that the bodies of animals are made up of relatively few and relatively simple chemical substances, of which the most generally found are: carbon, hydrogen, oxygen, phosphorus, potassium, iodine, nitrogen, sulphur, calcium, iron, magnesium, sodium and chlorine. The most important of these are carbon, hydrogen, oxygen, nitrogen and sulphur, which together make up 99 per cent of the weight of the average animal. When these substances combine to form living matter, the result is called *protoplasm.*

Chemical Composition.—Protoplasm is not a definite chemical compound. Further it is constantly changing; yet it has a degree of constancy like that of a village from which people are always coming and going, but in spite of this shifting the village keeps the same name and the same general characteristics.

Frequently the combinations making up protoplasm are very complex, even though they are composed of relatively simple and common chemical elements. Thus muscle tissue is characterized by a very complex chemical structure; but in muscle structure, as well as in the bulk of all other animal tissues, the larger part is nothing but ordinary water. It is astonishing to know that animals, with all their wonderful possibilities of growth, movement, memory, intelligence, devotion, suffering and happiness, should have 70 to 90 per cent of their weight composed of nothing more complex than water. Even this brief survey is sufficient to show that we cannot in any certain way distinguish living from nonliving matter by mere chemical analyses.

Metabolism is also found in nonliving as well as in living substances. Both types undergo growth and repair—a nonliving salt crystal as well as a living animal; and both suffer partial or complete destruction, as when iron rusts or living tissues waste away.

Reproduction, which always occurs in living substances, also occurs in many nonliving substances. They reproduce by dividing when they become too large, as do clouds under pressure of the wind.

Irritability, too, is a characteristic of both kinds of substances: it is found in dynamite as well as in animals.

Organization.—Though we commonly call living things organisms (because of their organized structure), organization is just as definitely seen in the nonliving crystals and their like.

We must therefore conclude that there is no one test that will distinguish living substances from all nonliving substances. The touchstone that comes nearest to success in doing this is the automatic (self-moving) nature of these several processes that, once begun in living things, may continue to operate automatically for years in the individual animal or in many races of animals for centuries or geologic ages.

If it is difficult to draw precise distinctions between living and nonliving matter it is still less possible always to distinguish between plants and animals. Anyone can tell a cow from an oak tree; but there are some very simple organisms that are claimed both by botanists and by zoologists, because they show characteristics both of plants and of animals. Such organisms are called, by way of compromise, *primitive plant-animals.* Some of them the zoologists call *Mycetozoa* (slime molds), but the botanists speak of the same organisms as *Myxomycetes.* In our chart, which shows the relationships of the animal kingdom, they are placed at the bottom as an indication of their relatively simple organization.

When one makes even a hasty survey of all animal life, he finds that there are different degrees of complexity that can be readily recognized. It is convenient for our study to arrange animals according to the degree of complexity shown in their organization and to summarize what is known concerning the relationships of the different groups. The evidence for these relationships comes from the study of fossil remains of the animal races; from the study of embryology, which considers the development of the individual animal; and the study of the origin, nature and relations of different body structures. Many facts discovered by these studies have been further confirmed by delicate chemical blood tests of the different animals.

The results of all these studies are summarized in the animal-relationships chart. The simplest animals are placed at the bottom. Distance from the bottom shows the relative degree of complexity of any group.

This chart represents a somewhat simplified picture of modern opinion concerning the animal kingdom. For example, there are facts that seem to indicate that the *Chordata* are directly related to the worms (represented by the earthworm), but the arrangement of this chart disregards those facts. Moreover there are certain small groups that have been omitted. One group, the lamp shells or *Brachiopoda,* has characteristics that seem to link it to both main branches; and it may in fact represent another stalk arising from the coelenterates (represented by the hydra), independent of the other and more important branches. Again the great group of worms, *Vermes,* is now frequently split into several smaller subdivisions.

The two main branches of the animal kingdom are distinguished from each other (1) by differences in body development and (2) in the type of *larvae,* as the young stages are called. Some of these differences will appear later in the discussion.

CLASSIFICATION AND NATURAL HISTORY

The following brief review of the different sorts of animals, together with the chart, will give a general idea of the diversity and variety of animal life.

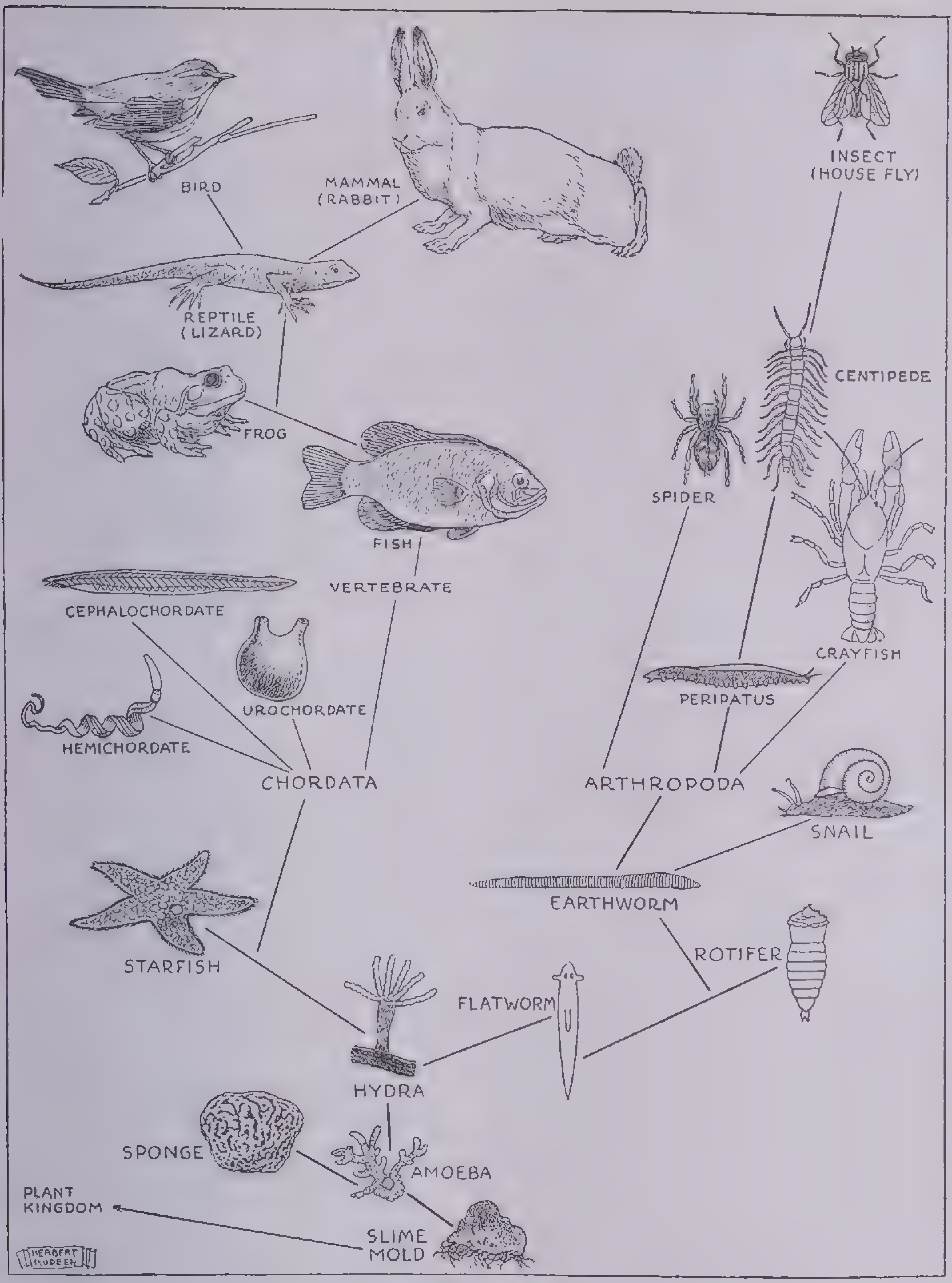
Phylum Protozoa (primitive animals).—There are 8,500 known species of protozoans. These are usually single-celled animals, always lacking tissues. Most of them are microscopic in size, though some are visible to the unaided eye. Four distinct types are recognized.

Subphylum 1. *Sarcodina* (fleshy) move by means of pseudopodia or false feet that project from the body and can be extended or retracted as needed. The Rhizopoda have rootlike false feet; the Actinopoda are characterized by raylike feet (radiolaria and Heliozoa). *Ameba,* one of the simplest and most-studied animals, belongs here. Some amebae are parasitic in man, and one variety produces amebic dysentery.

Subphylum 2. *Mastigophora* (whip-bearers) or flagellates move by the vibration of long whiplike flagella. Some have chlorophyll, which is the green coloring matter in plants; others are colorless. Many are disease-producing parasites and cause African sleeping sickness, syphilis and other diseases.

Subphylum 3. *Sporozoa* (spore animals) are exclusively parasitic. As adults they lack all organs of locomotion. They produce many diseases. The most widely known human parasite of this group causes malaria. It lives for a part of its lifetime in a certain mosquito called *Anopheles* and is transferred to its human host when he is bitten by this mosquito. The best method of controlling the parasite is to destroy the breeding places of the mosquito by draining off all standing water or treating it with oil.

Subphylum 4. *Infusoria* (found in infusions after exposure to air) swim by short bristlelike projections called *cilia.* Some, such as the *Paramecium,* are large enough to be seen with the unaided eye. They are found abundantly in infusions made by steeping common hay in water. After cool-



Animal Relationships

Beginning at the bottom, the Slime Mold is a representative of the primitive plant-animals. The Amoeba represents the *Protozoa,* which are animals without tissues. The Hydra is a type of the *Coelenterata;* the Flatworm (*Platyhelminthes*), Rotifer (*Trochelminthes*) and Earthworm (*Annelida*) are representatives of the *Vermes.* The Snail is a type of the *Mollusca.* The *Chordata* and the *Arthropoda* are the other two phyla represented in this chart. Important classes of the present day *Arthropoda* are indicated: the Crayfish (*Crustacea*), Peripatus (*Onychophora*), Centipede (*Myriapoda*), Spider (*Arachnida*) and Housefly (*Insecta*). In the *Chordata,* the subphyla, *Hemichorda, Urochorda, Cephalochorda* and *Vertebrata* are shown, the latter by the classes Fish (*Pisces*), Frog (*Amphibia*), Lizard (*Reptilia*), Bird (*Aves*) and Rabbit (*Mammalia*). In more technical accounts many of the lower groups are similarly divided into subphyla and all are subdivided into class, order, family, genus and species

ing, such an infusion should be seeded with a small amount of pond water containing plant debris, covered and allowed to stand for some days.

The Protozoa have been in existence for an unknown length of time, probably over twice the length of known fossil history. During all this time some have never developed beyond the protozoan stage. Certain Protozoa are highly specialized with little nerve fibrils and small contractile fibrils like tiny nerves and muscles. Other Protozoa have only generalized protoplasm. They are found everywhere: in the air, in soil, and in both salt and fresh waters.

Phylum Porifera (pore bearers).—These are the sponges. Of the 2,500 species, only a few (one family) are found in fresh water; the others all live in the sea. They are classified according to their skeletons, some of which are made of glass, others of limestone, and still others of a silklike substance. The well-cleaned skeletons of the last-named are the commercial sponges that grow along tropical coasts. They can be grown from cuttings, like plants.

Phylum Coelenterata.—These have body cavity and digestive tract combined. There are 4,200 species, mainly marine, although *Hydra* is widespread in fresh waters. These animals are radially symmetrical, arranged on a cylindrical plan. The alimentary canal has only one opening which is surrounded by one or more rows of food-gathering tentacles. The body wall is composed of two layers, an outer ectoderm and an inner endoderm. In all the remaining phyla there is a third layer, lying between these two, which is called the *mesoderm.* Hydroids, the jellyfishes, corals and sea anemones belong in the group of coelenterates. They are of little economic importance, with the exception of the corals, which have added thousands of square miles to the earth's surface. It is generally known that the coral islands of the tropical seas were built up from the skeletons of these little animals; in the United States, the southernmost part of Florida is coral-built.

Phylum Ctenophora (comb bearers).—This marine group has about 100 species, which resemble jellyfishes and are closely related to them. They possess two openings to the alimentary canal. They are of no economic importance and of little general interest.

Phylum Vermes (worms).—This is a mixed assemblage of wormlike animals in which we may recognize the following clearly defined groups that many zoologists regard as separate phyla:

1. *Platyhelminthes* (flatworms) are a group of 4,600 known species that typically have but one opening to the digestive canal located on the lower side and near the center of their flat, ribbonlike bodies. The Nemertinea (about 400 species) have two openings to the digestive tract but are classed with the Platyhelminthes. There are marine, fresh-water and parasitic forms. The parasites include the flukes and the tapeworms. The latter are degenerate parasites that have lost their entire digestive system and, attached to the digestive tract of their host, float there, absorbing the host's food. They sometimes are found parasitic in man but are much more common in the other vertebrate animals.

2. *Nemathelminthes* (round worms) are known mainly from their parasitic species. Only 1,500 species are known, including such forms as *Ascaris,* the common round worm found in swine and in man; the hookworm, parasitic in man; and *Trichina,* which is most common in rats but which may reach man also through underdone pork infested with the *Trichina.* It is estimated that there are 80,000 species parasitic in vertebrates alone, while the number parasitic in invertebrate animals, together with the free-living forms, greatly exceed those found in vertebrates. They seem to be everywhere.

3. *Trochelminthes* (wheel worms) are called *rotifers* from their most important class. There are 900 species known, limited to fresh water. They are microscopic in size but have many cells. Their name comes from the wheellike appearance of a crown of cilia that encircles the mouth. The current made by the motion of these cilia brings them food and, if the animals are free-swimming rather than attached to something stationary, carries them also from place to place. They closely resemble the larvae of most worms and many mollusks and are thought to resemble roughly the ancestral form of these animals. They may be frozen or thoroughly dried and still become active again when conditions become favorable.

Phylum Molluscoida.—A small intermediate division of uncertain classification, except that all members are characterized by a *lophophore* (literally crest-bearer), which is a circular or horseshoe-shaped organ around the mouth that carries the tentacles, this phylum includes the Bryozoa or moss animals, colonies that look like seaweed; and the Brachiopoda (arm-footed), the lamp shells with waving arms that draw food into a current that carries them to the organism. There are only 120 living species of the brachiopods, although about 2,500 fossil species are known. These fossil shells are common at various points in the Mississippi Valley, where they stand as relics of the time when this whole central valley of North America was a vast shallow sea. The brachiopods have a larva like that of the worms, but the body cavity develops in the same way as in the young forms of the starfishes and sea urchins.

Phylum Echinodermata (spiny skin).—The starfishes, sea urchins and sea cucumbers are a marine group with about 4,000 living species divided into five living classes. Two other classes have become extinct and now are known only in fossil form. The echinoderms appear to belong to an entirely distinct series from that which we have been discussing. Their eggs are relatively smaller and develop according to a less fixed pattern. Their larvae, which are free-swimming, are built upon an entirely different system from the free-swimming marine larvae of the worms and mollusks; and, as will be explained later, the mesoderm, the layer arising between the outer ectoderm and the inner endoderm of the developing larvae, arises in a different fashion, as does the body cavity. The echinoderms are built with a radial or wheellike symmetry, like the coelenterates. The nervous system is very poorly organized. They have developed a water-vascular system that is characteristic of them. This water-vascular system consists of a series of connected tubes or canals, containing slightly modified sea water. Projections from these canals extend outside the animal as tube feet; among their many uses may be mentioned locomotion, collection of food, respiration and perception of light, contacts and chemicals.

Phylum Annelida.—These segmented worms include the earthworm. There are about 4,500 known species of annelid worms, divided into four classes that include the marine clamworm and its relatives, the earthworms that burrow in the soil and the leeches, which are chiefly limited to fresh water. All these are distinguished from the other worms by having bodies divided into numerous segments. The embryology and early larval life of the annelid worms and the molluscoids are similar. Typically there is a well-developed body cavity surrounding the digesting tract. The blood flows through well-developed blood vessels, a system not found in any of the simpler animals. Earthworms are of marked economic importance in opening up the subsoil by their burrowing.

Phylum Arthropoda (joint-footed).—This phylum includes the crayfishes, crabs, lobsters, spiders, the so-called hundred-legged and thousand-legged worms and the insects. These are divided into five classes of living animals. This assemblage includes also the trilobites, a commonly found fossil that somewhat resembles some modern crustaceans or the young stages of the horseshoe crab; it became extinct near the close of the Paleozoic era. All the modern classes are important enough for separate consideration.

Class 1. *Crustacea* (crustlike shell), including crayfish, lobsters, crabs and similar animals, are mainly marine and fresh-water animals; 16,000 species are known. They breathe by means of gills and have two pairs of antennae or feelers on the head. Many of the *Crustacea* are used for food by man, and myriads more make food for aquatic animals, ranging from tiny minnows to whales.

Class 2. *Arachnida* (the spinners) is a class containing the scorpions, ticks, mites and spiders. Almost all the known species live on land. They lack antennae and breathe by special devices known as *book lungs* and by piping the air directly to the tissues as insects do. The young stages of the king crab, a marine member of this group, resemble the old fossil trilobites. Ticks and mites do great damage by sucking the blood of man and of domestic animals, and by carrying disease-producing parasites. Texas fever is scattered by one tick, and Rocky Mountain spotted fever by another.

Class 3. *Onychophora* (nailbearers) is a reduced class of about 75 species now found only in moist tropical countries. They are of great interest, because the group forms an almost perfect connecting link between the annelid worms and the insects. The Peripatus is typical. It has an unsegmented body with several pairs of unsegmented legs.

Class 4. *Myriapoda* (many-footed) are frequently further subdivided into separate classes for the centipedes or hundred-legged worms, and the diplopods or thousand-legged worms. There are only about 1,000 species, all living on land, and none is of great importance.

Class 5. *Insecta* (cut into segments) are also called *Hexapoda* (six-legged). These are the insects; the study of them is the science of entomology. The insects may be described as six-legged arthropods that frequently have wings and that have one pair of antennae on their heads and breathe by means of trachea that carry the air directly to their tissues. The half million or more species are commonly divided into two subclasses and 25 orders.

Something of the importance of this one class of animals can be seen if we remember that the insects include three-fourths of all the known species of animals. The importance of insects to man is indicated by the fact that in the United States alone they annually destroy property valued at more than $2,000,000,000. In other words, it takes the work of over a million men each year to offset the damage done by insects in this country. This property damage occurs in a region relatively unfavorable to insects. In tropical countries, insects and insect-borne diseases keep men from living in and using the most fertile districts. When this is carefully considered it becomes apparent that by ordinary objective standards the insects, rather than men, are the dominant or controlling animals on the earth today in everything but the size of individuals. Only in a few tropical regions, the Panama Canal Zone, for example, has man been able to hold them in check sufficiently to go about his work unharmed. Man is only beginning to dispute the ascendancy of the highly specialized insects.

Important orders of insects are:

Orthoptera (straight-winged). Grasshoppers and locusts; they destroy grasses and growing plants.

Isoptera (similar-winged). Termites, called white ants; they tunnel in solid wood, which they destroy. They are particularly abundant in the tropics, but do damage as far north as Chicago.

Ephemerida (ephemeral, short-lived). The May flies; they are an important natural food for fishes.

Odonata (toothed.) The dragonflies; they destroy other insects.

Hemiptera (half-winged). True bugs; they suck plant juices.

Homoptera (wings alike). Aphids (plant lice) and scale insects; they suck plant juices and are garden and orchard pests.

Coleoptera (sheathed wings). Beetles. Some, like potato beetles, destroy vegetation; others, like ladybird beetles, destroy other insects.

Lepidoptera (scaled wings). The butterflies and moths. The gipsy moth, the brown-tail moth and others destroy vegetation. The larvae of some, like the silkworm, produce silk cocoons.

Diptera (two wings). Flies and mosquitoes; they suck blood, carry disease germs and parasites and sometimes act as scavengers.

Hymenoptera (membranous wings). The bees, wasps and ants; when they have wings they have two pairs, both like a membrane. The Hymenoptera are especially remarkable for their high development of social life. In the ants may be recognized types of social organization corresponding to the hunting, the pastoral and the agricultural stages of human society. Ants join in common hunts for their prey; they keep and carefully attend aphids (plantlice) and obtain honeydew from them; in the winter they carry the aphids into protected underground burrows to spend the cold weather, and in the spring transfer them to appropriate food plants. Certain species of ants, called the leaf-cutting ants, prepare suitable beds on which to grow a mushroomlike fungus that they use for food. When the queen ant starts a new colony, she carries some of this fungus with her for a new mushroom bed.

William M. Wheeler of Harvard has found that the social habit has arisen at least 24 times in as many different groups of insects that were at first of solitary habit. He says that social organization reaches its highest development among the wasps, bees and ants of the highly specialized *Hy-*

menoptera; and among the termites, *Isoptera,* which for insects have a relatively simple body structure.

Phylum Mollusca.—This division contains the snails, clams, oysters, mussels, squids and octopuses, arranged in five classes and containing 60,000 known species living on land as well as in both fresh and salt waters. Usually these animals have a soft body (*mollics* and *molluscus* mean soft) surrounded by a membranous mantle that secretes a shell. One of the most characteristic structures of this highly varied group is the presence of a flexible filelike device called the *radula,* which is used in obtaining food and in burrowing into wood and even into stone or the shells of other animals. This structure is absent in the great group of bivalved mollusks, which includes the clams and mussels. Eyes that are remarkably like our own in general principle are commonly developed.

The adult structure varies greatly. Snails are fairly representative, except for their large coiled body. The mussels and their relatives, the clams and oysters, have lost almost all their heads; the octopuses and the squids have lost almost all of their shells but have a well-developed head from which spring eight or ten arms, bearing strong sucking disks, which are used to catch the animals they eat. Some mussels can move only about 6 feet a day; others are permanently attached to one spot; but squids swim rapidly enough to catch fish for their food. Many representatives of this phylum, like the clams and oysters, are used for food. The shells of others furnish buttons, mother-of-pearl and pearls. The shipworm *Teredo* is so destructive that in 1920–21, $20,000,000 had to be spent in replacing the wharf pilings of San Francisco Bay that had been weakened by its burrows.

Phylum Chordata (having a notochord).—This is the last of these great divisions of the animal kingdom to be considered. It is divided into 37,000 species and includes the vertebrates. The chordates are characterized by having (as adults or in some of their larval stages) the following three body structures that all other animals lack:

1. A notochord, a rather stiff rodlike structure, lying between the digestive tract and the nervous system, replaced in the vertebrate animals by the vertebral column or backbone.

2. Gill slits, openings in the neck region from the digestive tract to the exterior, used for breathing by the lower chordates, fishes and tadpoles, and occurring in the embryo of the higher chordates.

3. A dorsal hollow nervous system. All members of the entire worm and arthropod system have most of their nervous system to the side of, or below, the alimentary canal, with only the first nerve mass or brain lying above or dorsal to it. In the chordates, on the other hand, the entire central nervous system lies dorsal to both the alimentary canal and the notochord.

The Echinoderms have three nervous systems, two on the lower or ventral side, and one in the upper or dorsal region. The connection between the chordates and the echinoderms is made by the simplest of the three subphyla grouped in the chart as forming the lower chordates. This subphylum is known as *Hemichordata.* The adults are marine, wormlike animals (*Balanoglossus* is one) that burrow in the sandy mud of shallow bays along with annelid worms. They have an outgrowth from the digestive tract that appears to be a start toward a notochord; hence the name *Hemichordata* or half-chordates. They have distinct gill slits and possess both a dorsal and a ventral nervous system. Thus they appear to satisfy the chordate requirements fairly well, but they have larvae so much like those of the starfishes and sea urchins that these larvae were considered a kind of echinoderm until finally it was proved that they develop as adults into these wormlike *Hemichordata.*

The other subphyla that make up the lower chordate group include the ascidians or sea squirts and the lancelike animal called *Amphioxus.* All these lower chordates are marine.

Subphylum *Vertebrata* (having vertebrae or backbones). Fishes, frogs, reptiles, birds and mammals make a group of about 36,000 known species, compared with the half million known species of insects; but the average individual of the vertebrates is much larger in size than the insects. Representatives of this group are found in fresh or salt water or on land.

The least specialized vertebrate animals are the fishes, *Pisces.* The most primitive of these lack both jaws and paired fins, which were apparently the forerunners of the legs of higher vertebrates. The brook lamprey of our streams is an example of such primitive fishes. The lampreys belong to a group called *Cyclostoma* (circle-mouths) and are usually regarded as belonging to a distinct class of vertebrates.

The true fishes had developed jaws and paired fins back in the Devonian period of the Paleozoic era, in what is now known as the age of fishes. The early fishes had skeletons of cartilage, as the modern group of sharks have today, but they early developed bony structures, both as an internal skeleton and also as an external covering.

It is interesting to note that if we were to take only one animal to be an example of the whole animal kingdom, a median representative of the whole lot, we should have to choose an annelid worm, perhaps an earthworm; and if we were to choose similarly a median representative of the chordate phylum we should have to take a sharklike fish. This is a low type of vertebrate, but it is about halfway up the chordate scale.

Some of the fishes developed lungs, but apparently the amphibians, Class *Amphibia* (double lives), the first land vertebrates, are more closely related to the ancestors of the lungfishes than to the lungfishes themselves. Amphibians began to live on land about the time coal beds were being laid down in the carboniferous period of the Paleozoic era, just before the first insect fossils are found.

The amphibia have not been remarkably successful as a class. Modern frogs and toads are common, but relatively unimportant. The amphibians gave rise to the great class of reptiles; this is shown in the fossil beds of the Permian rocks of Texas, where very close gradations between the two types are found, so that it is hard to distinguish them. The reptiles introduced among vertebrates eggs that have power to develop out of water. The Mesozoic era became the age of reptiles. They were at that time the most successful vertebrates of water, air or land. The majority of these old reptiles, of which the dinosaurs are the most widely known, have been extinct for a long time, and the group is now represented by a relatively sparse collection of crocodiles, turtles, lizards and snakes. Not all these ancient beasts were large, but some reached the gigantic length of 80 feet, much of which was neck and tail, and others probably weighed as much as 50 tons.

The amphibia left two distinct types of successors: the birds, Class *Aves;* and the mammals, Class *Mammalia.*

These two classes rose independent of each other, and independently arrived at a warm-blooded condition, which makes surrounding temperatures less important to them than to other animals. The birds are connected with the reptiles by many fossil records—and in living species by similarities in the development of the embryos and in many details of adult body structures.

The oldest bird known is the fossil *Archeopteryx,* which was found in the Jurassic rocks of Germany. It was about the size of a crow. It had toothed jaws, as do modern bird embryos, though modern adult birds never have teeth. *Archeopteryx* had a long, dinosaurlike tail, with fringing feathers. The wings also were feathered but otherwise were like dinosaur arms with fingers that ended in claws. Bird feathers seem to have been developed from reptilian scales. So close is the relationship between birds and reptiles that birds are often spoken of as glorified warm-blooded reptiles, close relatives of the old dinosaurs.

Modern birds are divided into two main groups: the running birds, *Ratitae* (raftlike), which are represented by the ostrich, and the flying birds, *Carinatae* (peel-shaped), which include all our common birds. The structure of flying birds can best be understood when we think of them as living flying machines. The essentials of a successful heavier-than-air, all-the-year-round flying machine are: (1) supporting planes; (2) great power adequate for long flights; (3) light weight; (4) rigidity; (5) stability; (6) steering and balancing devices; and (7) protection from cold.

These essential characteristics the bird possesses as follows: (1) planes —wings and tail with their strong flight feathers; (2) power—high body temperature of 104° F. as compared with 98° F. for many mammals, allowing more rapid digestion and greater activity of muscles; powerful breast muscles well supplied with blood by a relatively large heart, and with oxygen by a system of breathing that is more efficient than that of mammals; (3) light weight—made possible by hollow bones (since hollow structures are stronger, weight for weight, than are solids) and by extensive air sacs distributed through the body that not only aid breathing but give added buoyancy; (4) rigidity—obtained by the fusion of the bones of the back; (5) stability in flight—obtained by the location of all the heavy muscles below the wings, so that even the muscles that lift the wings are located below them and are attached to the wing bones by a long cordlike tendon that operates through a ring of bone, acting on the principle of a pulley; (6) steering—accomplished by the use of tail and wings; (7) balancing—by means of a flexible neck and the proper adjustment between load and point of support in the air; and (8) protection from cold—by feathers with their enclosed air spaces.

Mammals (Class *Mammalia*) solved the problem of the conservation of body heat by the development of hair. They can be adequately defined as *hairy vertebrates,* just as birds can be distinguished as *feathered vertebrates.* Mammals are further characterized by the mammary glands (from which the name mammals is derived) with which they suckle their young. They, too, arose from the reptiles, but from small, lightly built, running types of reptiles. They appear to have arisen in the geological period that immediately preceded that of the birds and near the beginning of the great age of reptiles.

Three subclasses of mammals are recognized. The first is the *Prototheria* (primitive mammals) that retain the reptilian habit of egg laying, along with certain reptilelike structures. The monotremes, the duckbill platypus of Australia and Tasmania and the Echidna or spiny anteater of the same region, are examples. Both have primitive milk glands; the young, after hatching from the egg, lick off the milk as it drips from the hairs covering the glands.

Marsupalia (pouched animals) are a second class sometimes called *Metatheria* or mid-mammals. They are represented by the American opossum, the kangaroo and many related forms of the Australian region. The young are born in a very immature condition. The young of a large kangaroo that would reach to man's shoulder is, at birth, about the size of a man's little finger. These tiny animals as they are born move along the abdomen of their mother to a pouch where the mammary glands open; within this pouch they attach themselves and complete their development. In Australia, where they have had no competition from higher mammals, marsupials have become adapted to most of the different environments where mammals can live. They burrow, climb trees and run over the earth's surface. Both carnivorous (flesh-eating) and herbivorous (plant-eating) forms of marsupials occur.

The third mammalian subclass is that of the *Eutheria.* The name means true animals and these are the common hairy mammals with which we are most familiar. They are characterized by a placenta, an organ attaching the developing embryo to its mother. The young animal develops as a parasite within the mother, and birth takes place at a relatively late stage in development. In many mammals of this class as, for example, the deer, the young can run about, following the mother, within a few hours after birth. Other vertebrates, as well as some invertebrates, bring forth their young alive, but only among the *Eutheria* is there a true placental attachment between the mother and the young. Usually, among other animals, the eggs are merely kept within the mother's body and hatched out there, instead of being laid and incubated outside the body.

By degrees of specialization of structure there are four main types of these highest mammals. The first is the *clawed* mammals, the least specialized of all. They include the shrews, moles, hedgehogs, bats and carnivores. The last is a large flesh-eating order with two suborders: the land carnivores, such as cats, dogs, hyenas and bears; and the marine carnivores, such as seals, sea lions and walruses. The great order of rodents or gnawing mammals and the so-called *Edentates* also belong to the division of clawed animals.

The second type of mammal in degree of specialization includes those with flattened horny growths called *nails* at the end of their fingers and toes. This group contains only one order, the *Primates,* which include lemurs, monkeys, apes and man. In mental power, man far outdistances any other animal; but in structure and even in many aspects of behavior he is similar to the great apes. Some generalized features of this group are: five fingers or toes on each limb, a clavicle or collarbone and bones of the arm and leg less specialized than in the next group.

The third type, the hoofed mammals, includes the even-toed animals (*Artiodactyla*), like swine, hippopotamuses, camels, deer, elk, giraffes, cattle, buffaloes, antelopes, gazelles, sheep and goats, and the odd-toed animals (*Perissodactyla*), such as horses, zebras, tapirs and rhinoceroses. The elephants and conys also are placed here; and manatees or sea cows are aquatic forms related to this general assemblage. Here the greater specialization is shown by the great elongation of the finger bones. The knee of the horse is the equivalent of the human wrist or ankle joint, while the joint corresponding to the human elbow or knee occurs up next the body. There is a loss of one or more of the fingers or toes, culminating in the horses that walk on the tips of their middle toes, having lost two toes of each foot completely, and almost all of two more. Many of this group have lost the collarbone entirely, and have more highly specialized teeth than the preceding groups.

The fourth type, the most highly specialized mammals, includes the whales and dolphins. This estimate that the whales are most specialized is supported by the following facts: (1) They have lost almost all hair, which is a most distinctive mammalian character. Some have no teeth as adults; and the hind limbs and almost the entire pelvic girdle are lacking. (2) The skeleton of the fore limbs (flippers) is specialized by the addition of several digits or fingers. (3) They have reached a bulk unrivaled in animal history, far surpassing the great reptiles of the past. (4) The stomach is the most complex among mammals, more complex even than that of the camel or cow. (5) The skull also is the most specialized to be found among mammals.

EMBRYOLOGY

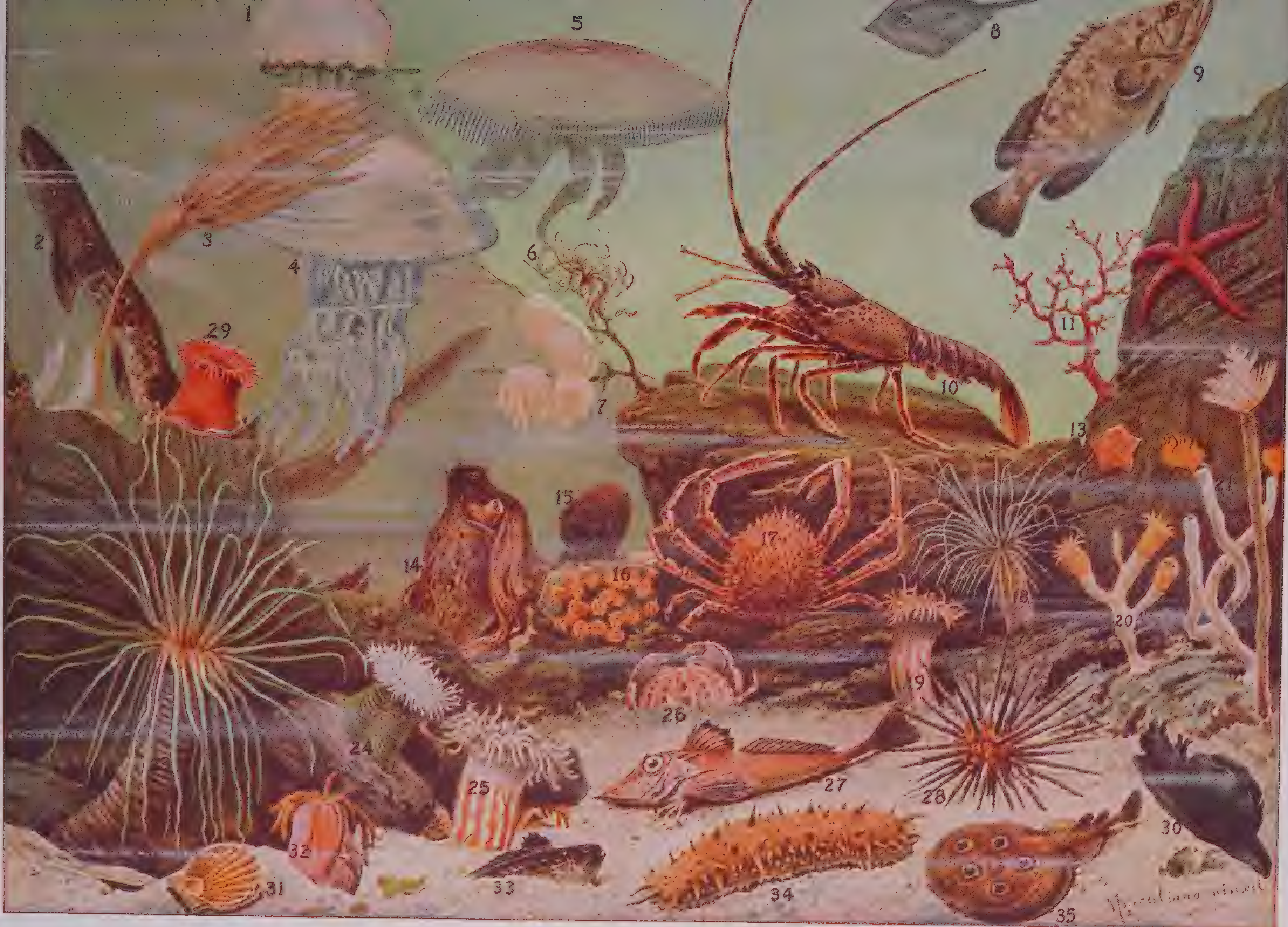
There are two main types of reproduction among animals, sexual and nonsexual or asexual. Sexual reproduction involves the union of two germ cells or their equivalents, which usually arise from two separate animals. Nonsexual reproduction is the simpler process. The simplest form of nonsexual reproduction, as in the protozoans, consists of a nearly even division of the entire animal body, which here consists of one cell, into two daughter cells, each of which then grows to adult size.

Variations of this process occur, such as budding, which resembles budding in plants, and in which an offshoot grows from the main animal, finally breaking off from the parent to form a separate individual. When these budded individuals do not separate entirely from the original animal, colonies of connected individuals occur, as in the hydroids. Some animals reproduce nonsexually by forming spores or gemmules (small bits of protoplasm surrounded by protective material) and thereby are enabled to withstand severe conditions, such as extreme cold, heat or drought. Some protozoans and some sponges reproduce in this manner.

Many of the simpler animals, including even tadpoles and lizards, can regrow lost parts of their bodies. Others can regenerate a whole animal from a fragment. Sponges, hydroids, flatworms and echinoderms have this power to a marked degree. Breaking off parts of the body often occurs in nature, either by accident or as a result of the activity of the animal itself, and these pieces may develop new whole animals. The lack of this power of regeneration is one of the penalties of specialization.

Sexual reproduction is the usual method among most animals. In the simplest form as, for example, in fishes, the sperm and the eggs are shed into the water. A sperm fuses with an egg and thus starts the development of a new animal. The fertilized egg consists of one cell, whether this is microscopic, as it usually is, or the entire large yolk of a hen's egg.

Shortly after fertilization the egg divides into two cells, then successively into four cells, eight, sixteen,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Undersea Life

1. Jellyfish
2. Cat Shark
3. Tube Worm
4. Tentacles of Jellyfish
5. Umbrella of Jellyfish
6. Crinoid
7. Squid Eggs
8. Sting Ray
9. Giant Perch
10. Prawn
11. Red Coral
12. 13. Starfish
14. Mollusk
15. Sponge
16. Coral
17. Spider Crab
18. 19. 23. Sea Anemones
20. Yellow Coral
21. 22. Tube Worms
24. 25. Sea Roses
26. Crab
27. Gurnard
28. Sea Urchin
29. Horse Sea Rose
30. Sea Hare
31. Scallop
32. Nail Sea Rose
33. Weever
34. Sea Cucumber
35. Skate

thirty-two and so on, forming gradually and typically into the shape of a hollow ball, whose surface is made up of a single layer of cells. This ball of cells is called a *blastula*. Among water-living animals it is supplied with cilia and swims actively through the water, much as a *Volvox,* an adult colonial fresh-water protozoan, does, except that the *Volvox* has flagella rather than cilia. All sexually produced animals, except protozoans and sponges, go though a blastula stage in their development, although in animals like chickens the blastula is represented by a flat sheet of cells rather than by a hollow ball.

After the blastula is fully formed, the cells in the different parts begin to behave differently. At the so-called *animal pole* the cells divide rapidly and are relatively small. At the opposite or *vegetative pole* they are slower to divide and contain more yolk or food material. Eventually the more rapidly growing cells tend to enclose the others, forming a structure like a hollow rubber ball, one end of which has been pushed in until it forms a sort of lining for the other half.

The inside cells are called the *endoderm;* the enclosed cavity, which opens to the outside at the posterior end, is called the *primitive gut,* and develops into the alimentary canal; the outside cells are called the *ectoderm.* These are the first two layers of the developing embryo. This level of development is called the *gastrula* stage, and all animals that reproduce sexually, protozoans and sponges excepted, pass through a recognizable gastrula stage. Some animals never develop farther. The whole group of hydroids, jellyfishes and sea anemones is built upon this plan.

In the higher animals, the ectoderm gives rise to the skin and the lining of the ends of the alimentary canal, as well as to the nervous system and the sensory part of the sense organs. The endoderm forms the lining of the alimentary canal and the lining of the organs that arise from it—the lungs, liver and pancreas, for example.

Between the ectoderm and the endoderm, after the gastrula stage, a new germ layer develops. It is called the *mesoderm* and gives rise to the rest of the body, including such parts as the bones, muscles, blood, connective tissues, cartilage and reproductive organs.

The mesoderm arises differently in the two main branches of the animal kingdom as shown in the chart of animal relationships. In the right-hand branch, among the worms and mollusks, it grows from two cells that lie at the connecting point between the ectoderm and endoderm and are called *pole cells.* In the echinoderms and lower chordates it arises as an outpocketing of the primitive gut wall, and, therefore, from the endoderm. The hollow ball of mesoderm thus formed develops into the body cavity of the adult echinoderms and *Amphioxus;* but in the other branch of the animal kingdom, the worms, the body cavity develops as a result of a splitting of the developing mesoderm bands.

The development of the definite organs of the body may be illustrated by remarks on a few organs in the common frog.

In the frog, the first opening of the primitive gut of the gastrula does not form the mouth. This organ arises, rather, from an ingrowth of the ectoderm that forms the mouth opening by fusing with the gut ectoderm. Gill pouches grow out from the endoderm in the neck region and form contacts with the ectoderm. Openings break through, forming gill slits. An outgrowth at the base of the second gill slit becomes the thyroid, an important gland of internal secretion. The first gill pouch is transformed into the middle ear and the tube that connects it with the back of the mouth, even in adult life. The sensitive part of the ear, the inner ear, develops as a pouch of ectoderm that cuts loose from the surface and comes to lie deeper than the middle ear.

The lungs develop as an outgrowth from the lower side of the alimentary canal behind the gill slits. Farther back the canal enlarges to form the stomach, and behind this arise outgrowths that will form the liver and the pancreas.

Above the developing alimentary canal, a cylindrical rod of cells is pinched off and forms the notochord or forerunner of the backbone. The bones themselves, however, come from the mesoderm. Above this, on the dorsal or upper side of the growing animal, a parallel pair of ridges appeared very early. These grew until they finally formed a hollow tube, broad at the front end, from which the brain develops, and narrower behind, where the spinal cord arises. The eye begins as an outgrowth from the side of the brain. This first outgrowth folds on itself to form the retina or sensitive part of the eye. The lens and outer surface of the eye develops from the surface ectoderm. The other structures of the eye are formed from the surrounding mesoderm.

The olfactory or smelling organs arise as a patch of thickened surface ectoderm. This lies just above the future mouth. It deepens to form a pocket that never closes but remains open as a nostril. It gradually deepens and finally opens into the back part of the mouth. The ear arises similarly but farther from the front end of the animal. Unlike the nostrils, the auditory sac becomes entirely closed off from direct connection with the surface or with other internal cavities.

The heart develops from a pair of blood tubes that arise in the mesoderm and which fuse to form a simple tubular heart, such as the fishes possess. Later this develops the more complex structures characteristic of the frog's heart.

There are some animals widely scattered through the animal kingdom that have eggs that develop without fertilization. This is called *parthenogenesis.* It occurs in rotifers, plant lice, bees and other animals. Some animals whose eggs normally require fertilization by a sperm can be started in their development by special treatment, such as shaking the egg, treating it with chemicals or by mechanical injury. Echinoderm eggs are particularly easy to start toward artificial development. Even the egg of a frog can be artificially stimulated to develop without the presence of a sperm, and an adult frog can be reared from an egg whose development was started by pricking it with a hot needle.

HISTOLOGY

Histology is the study of the structure of animal tissues seen under the microscope. A tissue may be defined as a group of cells or of cells plus their products grouped together to form a definite structure and to perform common functions. The same sorts of tissues are widespread in the animal kingdom. We can recognize the following kinds:

Epithelial Tissues.—Epithelial cells are usually flattened but may be of various shapes. They are united to form a membrane that protects exposed surfaces just as the skin covers the surface of the body or the epithelium lines the mouth. It also makes up the lining membranes of glands and of the body cavity. Epithelial tissue, then, is a layer of closely compacted cells covering an internal or external surface of the body, one surface being free and the other resting on underlying tissue. It serves to protect the more sensitive tissues and allows the passage of waste or food substances to or from the blood. It also serves as an organ of secretion or excretion. The sensitive parts of sense organs are the epithelial layers. Epithelial cells of the reproductive organs may retain the power of individual growth and thus become germ cells. Outgrowths from epithelial cells become hair, nails, hoofs, cilia, flagella and so on. In structure the epithelium may be thick or thin. It may arise from ectoderm, endoderm or mesoderm.

Connective Tissue.—In the different sorts of connective tissue the intercellular substance determines the character of the tissue. The cells are not conspicuous. All connective tissues arise from the mesoderm. The following kinds are recognized:

Fibrous.—Fibrous connective tissue has fibers so well developed that the cells are hard to discover among them. This tissue is used as sheathes over muscles or bones, as tendons to connect muscles with bones and as ligaments to fasten bones together. It also serves as mesenteries (connecting membranes) in supporting internal organs and forms the main part of the walls of blood vessels. The fibers are not cells but are the product of cells. There are two sorts of fibers: those of the white inelastic and the yellow elastic connective tissues.

Adipose or Fatty Tissue.—Composed of connective-tissue cells that have the power to store fat, fatty tissue is usually laid down within the cells until the cell protoplasm is crowded off to one side. If many fat cells are present, they gather into groups or clusters, which may form layers. Fat is a chemical compound of glycerine and fatty acids and is used within the animal body as a reserve supply of food, for protection of underlying organs, and to conserve body heat. In starvation, the fatty cells are the first to become shrunken.

Cartilage may be either elastic or inelastic; it covers the joints of bones and fills in places as a substitute for bone. In some animals (the shark, for example) the entire skeleton is of cartilage; and embryos of higher vertebrates usually pass through a cartilaginous stage. Cartilage frequently hardens with age.

Bone.—Bone may develop either from a cartilage or from a fibrous connective-tissue basis. As in cartilage, the bone cells are much separated by intercellular bony material, the main part of which is phosphate of lime. Each cell lies in a space or lacuna, which communicates with other lacunae by means of tiny canals running through the bony substance. These, in turn, connect with a large canal that contains blood vessels that carry food and oxygen to the bone-locked cells. The bone cells are arranged in concentric circles around the large canals. The surface of a living bone is covered by a layer of fibrous connective tissue. Bones serve for support, as levers and for protection. Bone is most common in vertebrates but is also present in the king crab, a sea animal related to spiders.

Muscles or Contractile Tissues.—There are two types of muscle cells, the smooth and the striated or striped cells. Each smooth muscle cell has a nucleus. The *cytoplasm,* as the protoplasm around the nucleus is called, contains longitudinal fibrils. In higher animals these smooth muscle cells occur in organs in which rapid contraction is unnecessary, such as the digestive tract, the gall bladder, the walls of arteries and veins and some glands. They are not subject to direct mental control and on that account are usually called the involuntary muscles. They arise from primitive mesoderm cells or from embryonic connective-tissue cells.

Striated muscle differs from smooth muscle in having the fibrils striated or striped. Ordinarily they have long, straight, unbranched fibers, although the fibers of vertebrate heart muscle are branched. Muscle fibers arose from cells in the embryo, each of which had a single nucleus; but after a time the division of the nucleus was not followed by a division of the cell, so the cells became very large and possessed many nuclei. The contractile fibrils are not present in young cells but develop as secretions within the cell. There is good reason for thinking that they are nonliving cell products that are made and kept working by the surrounding living protoplasm. The fibrils are merely contracting machines.

Exactly how muscles work is not known. The best theory is that on stimulation the material in the dark stripes of the fibrils absorbs material from the light stripes. Since each dark stripe was originally long and narrow, it tends to become spherical with the material taken in. This thickening of the dark stripes causes the thickening of the muscle that accompanies contraction. By absorption from the light stripes, the dark stripes are brought close together. This constitutes contraction and accounts for the shortening.

According to this theory, stimulation to contraction results first in stimulation of the protoplasm and only indirectly acts on the fibrils. During contraction the protoplasm produces a lactic acid called here sarcolactic (fleshy lactic) acid. Oxygen is not used by the fibrils in the contraction process but is used by the protoplasm to restore the fibrils to a condition of high potential energy. The sarcolactic acid is consumed during this process and carbon dioxide is given off.

In addition to contracting, striped muscles give contour to the body and protect underlying organs.

Blood, the Circulating Tissue.—The blood is a liquid tissue occupying a set of tubes in the higher animals, but circulating in spaces between the other tissues in less specialized forms. The tubes are not a part of the blood tissue, although their lining membrane must be so considered, because one cannot be changed without affecting the other very directly. Blood is composed of two main parts: the liquid plasma and the solid corpuscles. Of these the plasma is commonly regarded as the intercellular, lifeless part of the blood corresponding to the lifeless part of bone. It acts as passive carrier of food and waste products.

The two kinds of blood corpuscles in vertebrates are red and white. The red blood corpuscles of fishes, amphibians, reptiles and birds have nuclei like other cells. Those of mammals also have nuclei in the embryonic stages, and pass successively though stages resembling those found in fishes, amphibians and reptiles, and then entirely lose their nuclei, becoming degenerate cells.

The red blood corpuscles have an unusually large surface for their bulk. Thus a man weighing 150 pounds would have about 4 quarts of them, which would contain approximately 16 trillion red blood corpuscles with a surface of almost 17,000 square feet. This vast surface expanse is related to the oxygen-carrying power of the blood.

The red blood corpuscles of vertebrates contain a pigment called *hemoglobin,* which is related chemically to the green chlorophyll of plants. This is the material that combines with oxygen inhaled at the gills or into the lungs and conveys it to the tissues. It also occurs in other animals, as in certain mollusks and in earthworms. In these cases, it is found in the blood plasma rather than in the corpuscles. Hemoglobin contains iron. Many invertebrates have in their blood, in place of hemoglobin, a compound called *hemocyanin.* This contains copper instead of iron, and is far less efficient as an oxygen carrier than hemoglobin. It turns distinctly blue when it is well aerated, whereas hemoglobin becomes scarlet under this condition.

The white blood corpuscles occur widely in the animal kingdom. They are amebalike cells that have the power to leave the regular blood tubes and wander freely through the tissues where they destroy old tissues or bacterial invaders. They thus act to check disease invasions and to destroy the old structures including those of larvae at the time the latter metamorphose into adults.

Nerve Tissue.—This master tissue is composed of cells that possess from one to many outgrowths, some of which in a large animal may be several feet in length. Those of the cells in the lower part of the spinal cord reach to the feet. The principle properties of the nerve cells are their irritability and conductibility. In the coelenterate hydroids, the simplest animals to have separate nerve cells, these are scattered about singly, connected with each other by a network of nerve fibers. Even here they tend to be more numerous about the mouth region. In most other animals they are collected into smaller or larger masses, which are usually called *ganglia.* Great collections of nerve cells occur in the gray matter of the brain and of the spinal cord of the vertebrates; but ganglia are found even in this group, lying outside the central nervous system.

The nerve fibers of the invertebrates are naked; those of the vertebrates are surrounded with an insulating sheath called a *medulla.* In the former the different nerve cells may be directly joined with one another. In the latter the nerve processes end in a brushlike arrangement that interlocks with another similar end-brush of another nerve cell without coming into direct contact with it. These individual nerve cells, with all their connecting outgrowths, are called *neurons.* The interlocking arrangement between the different neurons is called a *synapse.* The brushlike synapse allows a nerve impulse to jump from one neuron to another.

The simplest nerve mechanism in the higher animals consists of a reflex arc. If we examine a sense organ in the skin, for example, we find a sensory brush of fibrils that connects with a main nerve process called a *sensory process.* This, then, connects with a nerve cell in the dorsal part of the spinal cord. By a synapse or a series of synapses, this sensory cell is in connection with a motor cell in the ventral part of the cord that, in turn, is connected by one of its processes with a muscle or gland. If the sensory element (receptor) is stimulated, an impulse is sent along to the nerve cells in the spinal cord, which act as adjustors, and which in turn relay a stimulus to some appropriate effector. If the sensation is of sufficient importance—which may mean merely if it is of sufficient strength—it may be sent along another system of neurons to the brain and may eventually come to the conscious attention of the individual.

In the hydroids the nervous system arises in both the ectoderm and the endoderm; but in the higher animals its origin is restricted to the ectoderm.

PHYSIOLOGY

Physiology deals with the functions of plants and animals, either as a whole in general physiology or of their different parts in special physiology. Physiologists try to discover what the living processes are and to determine their exact causes. Physiology is sometimes divided into plant physiology and animal physiology, but there is no real difference between the general physiology of the two. Plant physiology is much concerned with the manufacture of sugar by the green plants under the influence of light, commonly called *photosynthesis;* and with the loss of water from exposed plant surfaces, both of which are subjects of indirect or minor importance to animals. On the other hand, general physiology of animals must consider the problem of locomotion and problems centering about the well-developed organ systems, such as the nervous system. These are the chief differences, but the similarities are many.

Underlying Laws.—The study of physiology has brought out the importance of certain laws of physics and chemistry as applied also to living matter and has led many persons to think that living and nonliving processes are probably parts of the same general system.

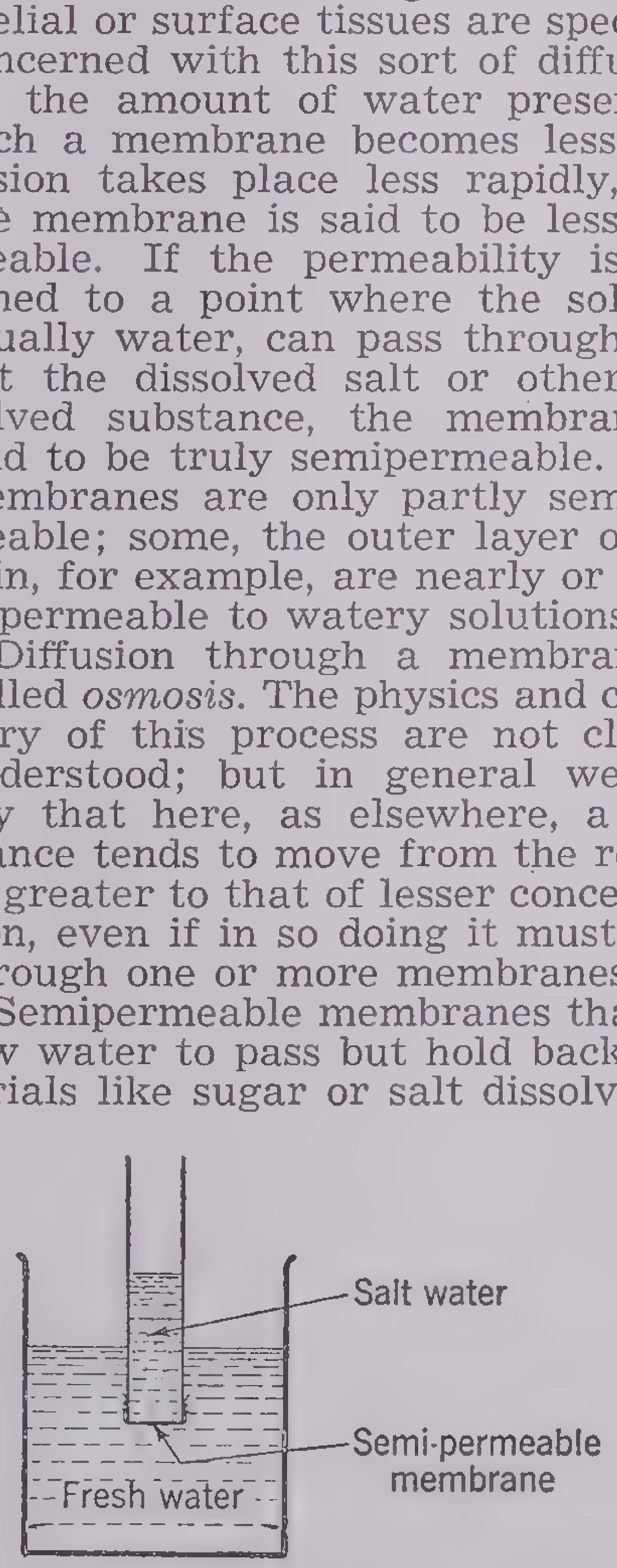
From these laws we may select the following: (1) The law of continuity, which states that there is no break in nature or in natural processes. (2) The law of the conservation of energy. Careful tests on the total energy intake and outgo in men placed in specially constructed rooms that allow the measurement of the energy value of all food consumed and all heat, work and wastes produced have shown that energy outgo can be no greater than the energy intake. Living things can transform but cannot manufacture energy. (3) The law of the conservation of matter, which states that matter cannot be created or destroyed by living or nonliving substances, no matter how its form is changed. (4) Laws dealing with chemical proportions worked out for inorganic chemical compounds hold also for chemical compounds found in living things. (5) The laws of thermodynamics. The first of these laws states that in any change involving heat and work, a definite amount of heat is expended or goes out of existence for every unit of mechanical work done. The opposite also holds. The second law of thermodynamics states that it is impossible for a self-acting machine, working independent of any assisting set of forces, to convey heat from one body to another that is already at a higher temperature. (6) The common gas laws of physics including the laws growing out of the process of diffusion, apply particularly to breathing.

It is well known that gas enclosed in a vessel distributes itself equally through the container regardless of other gases present. When two containers holding different gases, for example, oxygen and hydrogen, are connected with each other, each gas diffuses into the other container, moving from the region of highest to that of lowest concentration of each gas. Diffusion applies also to the mutual distribution of gases and liquids, as air into water; liquids with other liquids; gases and solids, liquids and solids; and the slow diffusion of one solid into another. At least a part of the process of dissolving or going into solution represents the diffusion of a solid into a liquid, as of sugar into water.

In physiology the diffusion of gases or liquids through membranes is of the greatest importance. A membrane in this sense means any thin, soft, pliable sheet of animal or vegetable tissue, which may be a cell wall or a tissue composed of many cells or even a membrane inside a given cell. Epithelial or surface tissues are specially concerned with this sort of diffusion. As the amount of water present in such a membrane becomes less, diffusion takes place less rapidly, and the membrane is said to be less permeable. If the permeability is lessened to a point where the solvent, usually water, can pass through, but not the dissolved salt or other dissolved substance, the membrane is said to be truly semipermeable. Most membranes are only partly semipermeable; some, the outer layer of the skin, for example, are nearly or quite impermeable to watery solutions.

Diffusion through a membrane is called *osmosis.* The physics and chemistry of this process are not clearly understood; but in general we can say that here, as elsewhere, a substance tends to move from the region of greater to that of lesser concentration, even if in so doing it must pass through one or more membranes.

Semipermeable membranes that allow water to pass but hold back materials like sugar or salt dissolved in the water allow what is called *osmotic pressure* to develop. Osmotic pressure may be defined as the amount of pressure necessary to keep the solvent (water in the above case) from diffusing through a semipermeable membrane. Among the physiological effects of osmotic pressure, we may mention the fact that cells are usually under an internal pressure that causes their contents to flow out if the limiting membrane is broken. This pressure is called *turgor* and makes the outstanding difference between an active and a dried plant or animal. Wilting is loss of turgor.



Simple Demonstration of Osmosis
The difference in height between the salt water and the fresh water indicates osmotic pressure produced by diffusion

Osmotic pressure is easily shown in the laboratory by putting a membrane, as from the bladder of a hog, over the end of a tube that contains sugar or salt, and then immersing the covered end in water. The water will rise within the tube much above the level outside.

Osmosis is also concerned with such necessary processes as the movement of food or waste material or oxygen into and out of the blood. Some physiological processes, such as secretion and excretion, may be carried on in direct opposition to the laws of osmosis as now understood. In other words, it appears that in such processes the living cells are able to exert some sort of force that overcomes the normal working of osmosis. The nature of this force is not yet understood. Its existence is one of the main facts leading us to question the theory that all physiological processes can be fully explained in terms of physics and chemistry.

Physiology of Systems.—The physiology of different organ systems has been suggested in dealing with tissues. Additional facts are given below. This subject is discussed at length in any text on human physiology.

The Transport System.—This system consists of the heart, lymph and blood, blood and lymph vessels or their equivalent on the one hand, and the respiratory passages on the other. The general function of the blood has been suggested in the section on histology. The uses of the blood as a transport system are: (1) to carry food and oxygen to every part of the body; (2) to carry away waste products; (3) to carry internal secretions that serve as chemical regulators of the body; (4) to protect the body from the invasion of protozoa and bacteria; and (5) to furnish the tissues a balanced salt solution of the composition and strength most favorable for their best work.

The degree of development of the blood transport system depends on: (1) The size of the animal. Some small crustaceans lack hearts, although their larger relatives, such as crayfish, have hearts and many blood vessels as well. In the small animals, the blood moves about as a result of the movement of the entire animal. (2) The relative degree of specialization of tissues. Nervous tissue requires a better blood supply than does fatty or bony tissue. (3) The general activity of the animal, though there are exceptions, as seen below. (4) The method of respiration.

It is one of the inconsistencies of animal physiology that those animals capable of the greatest activity in proportion to their size, the insects, have a poorly developed circulatory system. The reason is that their air tubes or trachea carry air directly to the tissues that use it, so that the blood need carry only food and remove wastes.

The Digestive System.—The work of the digestive system is to dissolve food so that it will pass through the semipermeable membrane of the wall of the digestive tract. This is accomplished rapidly and at ordinary temperatures without harming the delicate lining walls of the digestive tract. In the chemical laboratory great heat and strong chemicals are required to do such work at a similar speed. In animals and plants digestive ferments called *enzymes* act to promote digestion.

There are three main classes of animal food: (1) the proteins, of which lean meat is chiefly composed; (2) the fats; and (3) the carbohydrates, such as starch and sugar.

The food of the majority of lower animals consists largely of protein, and their digestive systems contain mainly protein-splitting enzymes. In more complex animals, fats and carbohydrates form important foods, and there is an increasing number of fat- and carbohydrate-splitting enzymes.

Pepsin is a protein-splitting enzyme found in the stomach of higher animals. It works in an acid medium to split insoluble protein with a molecular weight of about 5,000 into peptones with a molecular weight of from 250 to 400. Peptones are soluble and can pass through the walls of the stomach into the blood; but it appears that only about half the protein present undergoes even this splitting.

Trypsin continues the splitting of protein. It acts in an alkaline medium, breaking the protein molecules into their constituent amino acids with a molecular weight as low as 75. These can pass through the intestinal walls. Trypsin can attack complex proteins; it is found in the intestines of the higher animals and is widely distributed among animals, occurring in all the important phyla. It is supplemented by *erepsin,* which acts upon simpler proteins. Erepsin is mainly limited to the vertebrates.

Lipase is the enzyme that attacks fats, converting them into fatty acids and glycerin. If there is a great deal of fatty acid and glycerin, and only a small amount of fat present, it acts in the reverse fashion—to build up fats—and thus serves to store fat in the body as well as to digest it in the alimentary canal. Lipase has not been found in *Protozoa* but does occur in the other important phyla.

Carbohydrates are acted upon by a large number of enzymes, none of which has been found with certainty in the protozoans. Thus *cellulase* changes the pithy part of plants (cellulose) into a sugar called *maltose. Amylase* (or *diastase*) changes starch into maltose. *Invertase* splits cane sugar into the simpler sugars, *dextrose* and *levulose. Lactase* splits milk sugar into dextrose and *galactose.* In man, starch-splitting enzymes are found in the saliva of the mouth and in the intestines.

The integrating system is composed of two parts—the glands of internal secretion and the nervous system.

The glands of internal secretion are also called the *endocrine* organs. Each secretes some substance of distinct value to the animal directly into the blood stream, rather than into a well-recognized duct, as the salivary glands do. We do not know exactly how many structures in the body are organs of internal secretion.

Among those known to have such a function are: the pineal body and the pituitary body of the brain; the thyroid and parathyroids of the neck and the thymus of the upper chest; the pancreas of the digestive system and, possibly, the inner wall of the stomach, the lining of the small intestine and of the vermiform appendix; the ovary, placenta and testes of the reproductive system; and the adrenal glands near the kidneys. Muscles also give off such regulatory substances. The materials given off by these glands of internal secretion are called *hormones* from a Greek word meaning impel or excite. They are chemical regulators of the growth and activity of the body.

The *pineal gland* is a small extension of the roof of the brain just back of the cerebral hemispheres. It is most active in young animals, and its secretion acts somewhat like that of the thymus.

The *pituitary gland* is located at the base of the brain, back of the nose. It is about the size of a pea. Two kinds of hormones are secreted by the two lobes of this gland. The secretion of the front gland together with thyroid secretion influences growth and development. Too little of these secretions causes dwarfs; too much produces giants. It also markedly influences brain activity. The other hormone from the posterior lobe of the pituitary body helps control the tension of the blood vessels and affects emotional control.

The *thyroid gland* of the neck puts a definite hormone called *thyroxin* into the blood. This substance controls the rate of metabolism (assimilation and energy conversion of food) within the body; affects the development of organs; neutralizes bacterial poisons; affects the condition of the skin and other body membranes, as well as the general tone of sense organs and nerves.

The *parathyroid glands* are closely associated with the thyroid. Their removal is usually fatal within a few days and is accompanied with nervous disturbances such as lockjaw. The glands secrete *parathormone,* which controls the concentration of calcium in the blood and the body. The amount of calcium affects the irritability of the different cells.

The *thymus gland* of the upper chest region is active in almost all young vertebrates. Its secretion, together with that of the pineal body, acts as a check upon the other glands of internal secretion. During its period of activity the individual remains sexually immature and keeps its juvenile characteristics. Its hormone has not been isolated.

The *pancreas* is an important gland in the digestive system, producing protein-, fat- and carbohydrate-splitting enzymes, which are delivered by the pancreatic duct into the small intestine near the stomach. In addition, it pours into the blood stream an internal secretion called *insulin,* which serves, in co-operation with adrenalin to promote the use of sugar in the body. Too little insulin in the body leads to the disturbance known as diabetes.

The *adrenal glands* lie near the kidneys. Their secretion, *adrenalin,* is well known and can be made in the chemical laboratory. Adrenalin acts to regulate blood pressure and the distribution of the blood to different parts of the body. A slight increase in adrenalin causes the blood to flow to muscles and brain and away from the digestive organs. The reverse occurs when the supply is decreased.

The action of these hormones and of the nervous system, the activities of which were suggested above, tends to bring the tissues, organs and systems of any animal into a unified whole, which behaves as an individual, rather than as a collection of independent parts.

The whole story of the relationship between the work of these glands and the structure and behavior of the vertebrates, including man, is an interesting chapter in physiology that cannot be told in detail here.

ANIMAL BEHAVIOR

The activities of animals are studied as *animal behavior.* Four grades of behavior are recognized: (1) The simple reflexes, such as winking or swallowing. (2) Reflex actions of the entire animal, commonly called *tropisms,* which may be direct and machinelike, as when a moth orients and moves directly toward a light, or more at random, as when an earthworm moves about uneasily until it finds, apparently by accident, the most comfortable soil in which to come to rest. (3) When tropisms are complex they are called *instincts.* All these are the expression of inherited, unlearned behavior. (4) Finally there is the conditioned or learned behavior that has been modified by the experience of the individual animal. This is sometimes called *intelligent* behavior and is best developed in man. The tropisms and instincts find their highest development among the insects.

ECOLOGY

Ecology is the part of biology that deals with the relation between living organisms and their environment. There are two parts to the environment: the inorganic or *physical,* and the living or *biological.* The life of plants and animals is most affected by the following elements in the physical environment: heat, light and water (as ice, liquid or vapor); chemicals, including oxygen, carbon dioxide, concentration of acid or alkali; general soil effects; air pressure; and wind, wave or current action. The action of winds, waves and currents are most important in distributing or limiting the distribution of animals and plants than in limiting their growth.

Among the biological or living elements we must mention:

1. Food chains, that is, groups of animals no one of which can be disturbed without upsetting the food relationships of the whole series. These are based principally on plants but are organized about key-industry animals that make plant food available to a large number of other animals. Plant aphids are an example of key-industry animals; they convert

plant foods into such a form that they can be used by many animals. The aphids change plant juices into a secretion called honeydew, much used by ants and bees. They themselves are fed upon by many insects and by birds. Food chains include the whole range of food relations among animals—from the parasites that live upon the food or tissues of their hosts to the hawks or foxes that prey upon defenseless mice, which in turn feed upon defenseless plants.

2. Competition for space among animals is another element in environment.

3. Co-operation among animals, as between the different members of an ant colony.

4. The *web of life* is an expression covering all the biotic relations. Its far-reaching effects are illustrated by the well-known example used by Darwin to show that in the country districts of England the more old maids, the more clover seed. The relationships are: the more old maids, the more cats; the more cats, the fewer mice; the fewer mice, the more bumble bees; the more bumble bees, the more clover. Therefore the more old maids, the more clover seed.

Biological factors, acting together, tend to bind the animals and plants in any place into a more or less organized community that contains certain important plants or animals and also may contain many more or less incidental forms. These communities undergo changes with increasing age of the environment, and these changes are called *succession.* Ecological succession may be illustrated in streams where certain fish, usually minnows, are found only in brooks at head waters; others are limited to the medium-sized creeks or rivers, and still others live only in large rivers. As the brook becomes deeper the larger fish move up in it, and the smaller fish move on to new headwaters.

In nature animals and plants are usually in a rough balance. When for any reason one kind of animal becomes unduly abundant, its enemies also tend to increase in numbers until the overabundant animal is killed off sufficiently to restore a new balance. Man greatly disturbs this natural balance by clearing off forests and planting large holdings of food plants that attract insects and other enemies. The problems arising from the depredations of these animals form the basis of economic zoology, which is one aspect of ecology.

Ecology emphasizes the following generalizations:

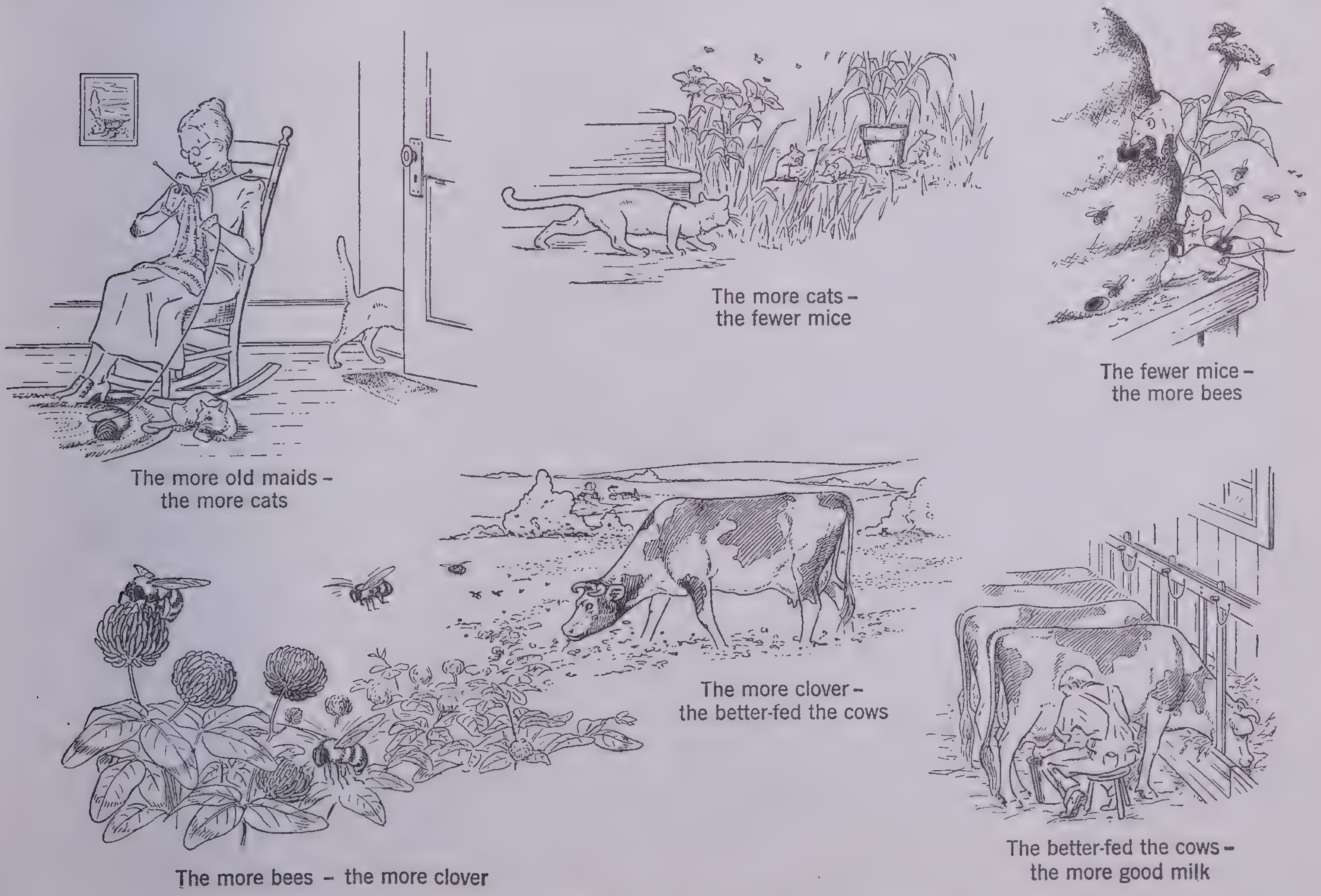
1. An animal or plant will tend to occupy all situations where it can tolerate the physical and biological conditions, unless it is kept out by such impassable barriers as deserts, high mountain ranges or broad expanses of water.

2. Toleration is lowest at the time of the breeding season and when animals are young; so that the range at breeding time is more restricted and becomes the most important part of the entire range of the animal. Thus, gulls retire to secluded islands to lay their eggs. Destruction of these nesting sites or of the eggs or of young birds will rapidly reduce the total number of gulls. This is one of the most important causes of the reduced numbers of wild animals in closely settled regions. It acts more rapidly than killing off the adults by hunting, fishing or trapping.

There are many other important aspects of zoology, among which are *parasitology,* which deals with animal parasites; *genetics,* which treats of heredity and in which great progress has been made, particularly since the rediscovery of Mendelian heredity in 1900; *animal geography,* which is concerned with the distribution of animal life over the face of the earth; and *philosophical zoology,* which deals with the explanation of the zoological facts that have been accumulated.

ZOOLOGICAL THEORIES

Organic Evolution.—Modern zoology is organized around three great theories. The oldest of these is that of organic evolution, which dates back to Aristotle and the other Greek philosophers who flourished as early as the 4th century B. C. It holds that all species of animals and plants living today are descended from other species. According to Professor Lull of



The more old maids – the more cats

The more cats – the fewer mice

The fewer mice – the more bees

The more bees – the more clover

The more clover – the better-fed the cows

The better-fed the cows – the more good milk

All Living Things Are Related

The pictures show the steps in Charles Darwin's famous example of the ecological relations of old maids, cats, mice, bees, clover and cows

Yale, "Evolution is the gradual development from the simple unorganized condition of primal matter to the complex structure of the physical universe; and in like manner, from the beginning of organic life on the habitable planet, a gradual unfolding and branching out into all the varied forms of beings that constitute the animal and plant kingdoms. The first is called inorganic, the last organic evolution." There are numerous theories as to how organic evolution came about, the most famous of which is the Darwinian theory of evolution by natural selection, which was first set forth in detail and clarity in his famous book *On the Origin of Species,* published in 1859.

Darwin's theory starts with the observed fact that different individuals of the same species show variations; no two are quite alike. Thus, among men, some are tall, some short; some are blue-eyed, some brown-eyed; some are intelligent, some stupid. The next step in the theory is the assumption, backed by a certain amount of observation and experiment, that, upon the whole, these variations are *inherited;* the offspring of tall parents are likely to be tall. Now life under primitive conditions is a *struggle for existence;* the law is, Eat or be eaten. In this struggle certain individuals will survive and reproduce; others will be destroyed.

Upon the whole, over a long stretch of time, those animals will survive and reproduce that are best adapted to the conditions with which they are surrounded. If a certain variation, for example, unusual sharpness of vision, is advantageous to the animal in the struggle for existence, that variation will tend to be reproduced and to become normal in subsequent generations of the species, since individuals without the advantageous characteristic will be killed off in the natural course of things. We thus have a gradual change in the species brought about through the survival of the fittest—fittest, that is, to cope with natural surroundings.

If the environment changes, the characteristics that formerly were conductive to survival may no longer serve the animal's turn; they may indeed now be disadvantageous. Thus it may happen that a species becomes extinct after a long and successful course of evolution. Changes in the species brought about by natural selection may have various results; they may temporarily enable the animal to survive but in the long run may destroy him. We must remember also that fitness in the biological sense is a very different thing from fitness in the human ethical sense. The cockroach, for example, which has survived for perhaps 200,000,000 years without noticeable change, is far more fit in the biological sense than a delicately adjusted organism like man that has successfully stood the test of changing environment for only a million years or so.

The theory of natural selection does not attempt to account for the origin of the variations with which it starts; it merely shows how these small, occasional, individual differences may pile up into big differences and may become normal characteristics of a continuing species.

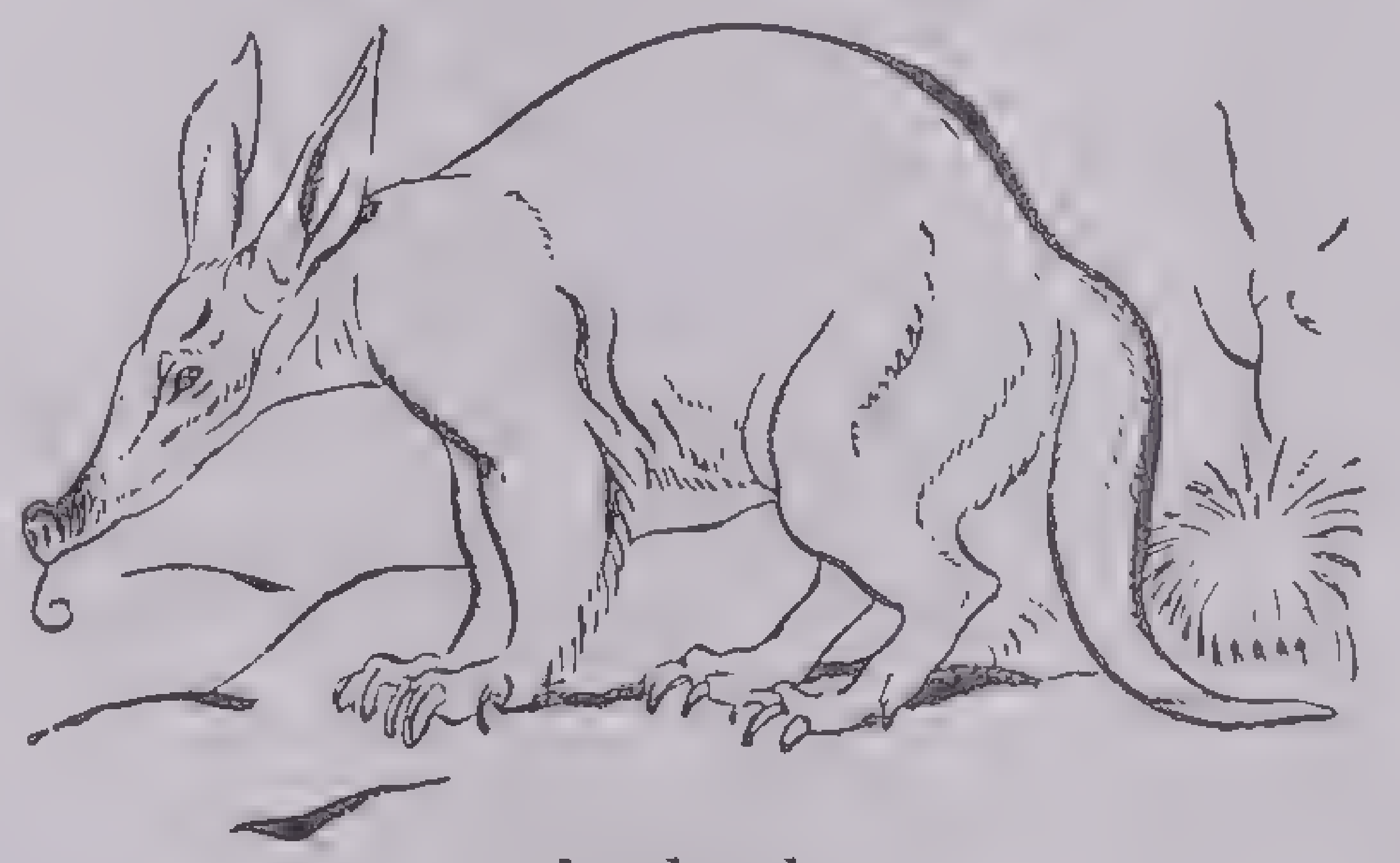
The chief attempt to account for the variations themselves is to be found in Lamarckian evolution, which is the theory that acquired characteristics may be inherited. Most modern biologists are exceedingly skeptical of this idea, yet it explains so many observed facts that it is constantly used, especially in popular books, to account for the course of evolution.

All Life from Previous Life.—The next great theory of zoology first proposed by William Harvey near the beginning of the 17th century holds that for higher animals all life comes from the egg. This has been broadened by three centuries of study to state that, so far as we know, all life now comes from previous life.

Cell Theory.—The third is the cell theory, first fully stated in 1839 by two German workers, Matthias Jakob Schleiden (1804–81) and Theodor Schwann (1810–82). It holds that all animals and plants are composed of cells. At present this generalization is regarded as fundamental both for structure and for physiology of living matter.

ZOOLOGICAL DICTIONARY

Aardvark (Dutch for earth pig), an African genus of anteating mammals, scientifically called *Orycteropus* or digger foot from the strong claws with which it digs its burrows and tears down the nests of the termites or white ants on which it lives. Like the other anteaters, the aardvark licks up the ants with its long slimy tongue. Its small eyes and long snout are the only features that make it look like a pig, but it is called ant boar and earth pig. It is about 5 feet long including the tail.



Aardvark

Adder, the common viper (*Vipera berus*), widely distributed throughout Europe, the only British venomous snake. It attains a length of more than 2 feet, is brown, with a black zigzag line down the back, feeds chiefly upon mice and is viviparous (bears young alive—not from eggs). Its bite rarely proves fatal. In the United States the term is applied to some poisonous snakes without rattles, as the moccasin or water adder and the copperhead or red adder; and also to the harmless hognose, which resembles in appearance and assumes the defensive attitude of a viper when it is disturbed.

Agouti, a species of rodent (*Dasyprocta*), like a guinea pig, native of the West Indies, of South America and Central America and found as far north as Mexico. The agoutis live for the most part upon the surface of the ground, not climbing or digging to any great depth. They commonly sit upon their haunches when at rest, holding their food between their forepaws in the manner of squirrels. By eating the roots of sugar cane they often cause great damage to the crop. They are good to eat and are sometimes domesticated.

Albatross, a petrellike bird, genus *Diomedea,* the largest of all aquatic birds, the spread of wings when extended measuring sometimes 15 feet. Specimens often exceed 20 pounds in weight. Its plumage is white with black bands on the wings and back. It has a strong, hard, long beak, of a pale-yellow color; the flesh-colored feet are short and webbed, and the wings are long, strong and narrow. Many are continually met with in the Southern Ocean. They have great nesting grounds on Laysan Island northwest of Hawaii. Another variety is seen in immense flocks about Bering Strait in the early part of the summer, attracted by vast schools of migrating fish. Their powers of flight are prodigious. They have been known to glide in the wake of a ship for days at a time, without any apparent motion of the wings.

Alligator, a genus of reptiles closely resembling the crocodiles. Alligators are found only in the southeastern portions of the United States and China. They differ from crocodiles in having a shorter and flatter head, in having cavities or pits in the upper jaw into which the long canine teeth of the lower jaw fit and the feet are much less webbed. Although they live for the most part in the water, alligators are much less restricted to it than crocodiles. The eggs are laid in small groups in the sand and hatched by the heat of the sun. Alligators occasionally reach a length of 17 to 20 feet.

Alpaca, the domesticated guanaco (*Lama huanaco*), a representative of the camel group in the New World. It is about 2 feet high at the shoulder. Its range is wholly South American and is restricted to the higher portions of the Andes Mountains. The Peruvians keep vast flocks of alpacas and esteem the silky luster and fineness of their wool, which furnishes material for excellent fabrics.

Ameba (a Greek word meaning change), a microscopic animal consisting of a single cell and belonging to the lowest group of the animal kingdom. The mode of locomotion is by flowing, which it does slowly and in any direction, the animal having no head or tail. A related species (*Entamoeba histolytica*) causes severe inflammations of the intestine, where it is sometimes found living parasitically.

Amphibia, the cold-blooded vertebrates between fishes and reptiles, a class comprising such forms as the frog, toad, salamander and newt. The name means double life; these animals spend part of their lives in the water and part on land. Breathing is done through gills (larval form), lungs (adult land form) and occasionally through the skin. The amphibia, although air breathers, are very rarely found away from the water where their eggs are laid and hatched. The tadpolelike young, after swimming around for some time, change their habits and become terrestrial for the rest of their lives. The amphibia are called *Batrachia* (froglike) by some authorities.

Anaconda, one of the largest tropical nonvenomous serpents (*Eunectes murinus*). It is a native of tropical America and is allied to the boa constrictor. The anaconda, like the boa, kills its prey by wrapping its body around the victim and squeezing it to death. It lives in swamps and rivers or in trees along river banks and is an excellent swimmer—its scientific name (*Eunectes*) is Greek for good swimmer. The anaconda sometimes reaches a length of 30 feet.

Anchovy, a well-known small fish (*Engraulis encrasicholus*) of the herring family, abounding in many parts of the Mediterranean, particularly on the coasts of Italy, Greece, Spain and France. It is about 4 inches long, bluish-brown on the back and silvery-white on the belly. It was known to the ancients and was used by both the Greeks and Romans for a pickle or sauce. Norwegian anchovies are pickled sprat.

Ant, the common name of various genera of hymenopterous (membranous-winged) insects of the family *Formicidae,* found in most temperate and tropical regions. They are small but powerful insects and have long been noted for their remarkable activities and interesting habits. They are social insects, that is, live in communities regulated by definite laws, each caste of the society bearing a well-defined and separate part in the work of the colony. Each community consists of males, breeding females (much larger than the males) and sterile females called neuters, workers or nurses. The workers are wingless, and the males and females acquire wings only for their nuptial flight, after which the males and many females perish, and the few remaining females divest themselves of their wings and either return to established nests or become the founders of new colonies. The workers perform all the labor of the anthill or abode of the community; they excavate the galleries, procure food and feed the larvae or young ants, which are without organs of locomotion. In fine weather they carefully convey them to the surface for the benefit of the sun's heat. Just as attentively they carry them to a place of safety either when bad weather threatens or the anthill is disturbed. In like manner they watch over the safety of the nymphs or pupae about to acquire their mature growth. Some communities possess a special type of workers, known as *soldiers* because of the duties that fall upon them.

There is a very considerable variety in the materials, size and form of anthills or nests according to the peculiar nature or instinct of the species. Some ants live on animal food, very quickly picking quite clean the skeleton of any dead animal they may find. Others live on saccharine matter, being very fond of the sweet substance called *honeydew,* which exudes from the bodies of aphids or plant lice. These the ants keep in their nests or tend on the plants where the aphids feed; sometimes they even superintend their breeding. By stroking the aphids with their antennae they cause them to emit the sweet fluid, which the ants then greedily imbibe. Various other insects are found living with ants in different types of association. It has been observed that some species, like the red ant (*Formica sanguinea*), resort to violence to obtain working ants of other species for their own use, plundering the nests of suitable kinds of their larvae and pupae, which they carry off to their own nests to be carefully reared and kept as slaves.

In temperate countries most of the male and female ants survive until cold weather. The next brood of ants appears in the spring from eggs laid the preceding summer. In the colder climates the workers pass the winter in a state of torpor and require no food. They require food only during the season of activity, when they have a vast number of young to feed. Some species have stings as weapons, others only their powerful mandibles or an acrid and pungent fluid (formic acid) that they can emit.

Anteater, any of several South and Central American animals with long hair and very slender heads. They walk on the sides of their feet with the claws incurved. They have no grinding teeth and so are called *Edentata* (toothless). Their insect food is captured by the long tongues that the animals are able to extend a considerable distance.

The great anteater (*Myrmecophaga jubata*) is a native of Brazil and Guiana and is much the largest of all the anteaters. It is covered with long, coarse, shaggy hair and has a remarkably large tail with which it can wrap itself up and be effectually protected from heat or rain. It is a powerful animal, and specimens often occur that measure more than 8 feet from the extremity of the nose to the end of the tail. It lives exclusively on ants and procures these insects in abundance by tearing open their hills with its hooked claws and then drawing its long tongue, which is covered with glutinous saliva, over the swarms that flock from all quarters to defend their dwelling.

Antelope, the common term for several Old World species (*Antilopinae*) of graceful deerlike animals. They have a timid and restless disposition and are among the swiftest runners in the animal kingdom. Externally they very much resemble deer, from which they are to be distinguished by various points of structure, such as the horns, which in the deer are solid and branched, and by the absence of front teeth in the upper jaw. They are intermediate between goats and oxen, have hollow horns and chew the cud. Generally speaking antelopes are gregarious and unite in large herds. Africa may be considered the headquarters of the antelope. The species are numerous and include the springbok, wildebeest, hartebeest, gnu, eland and gazelle. There are two European antelopes—the chamois, which inhabits the Alps; and the saiga, in eastern Russia. The American pronghorn and the Rocky Mountain goat are incorrectly called antelopes.

Ant lion, the larva of a North American neuropterous insect (*Myrmeleon*) or doodle bug, the adult of which resembles a dragon fly. The larva catches its food by digging a funnel-shaped hole in the driest and finest sand

Photo by Charles J. Belden, Pitchfork, Wyoming

Pronghorn Antelope Speed across Wyoming Ranchland

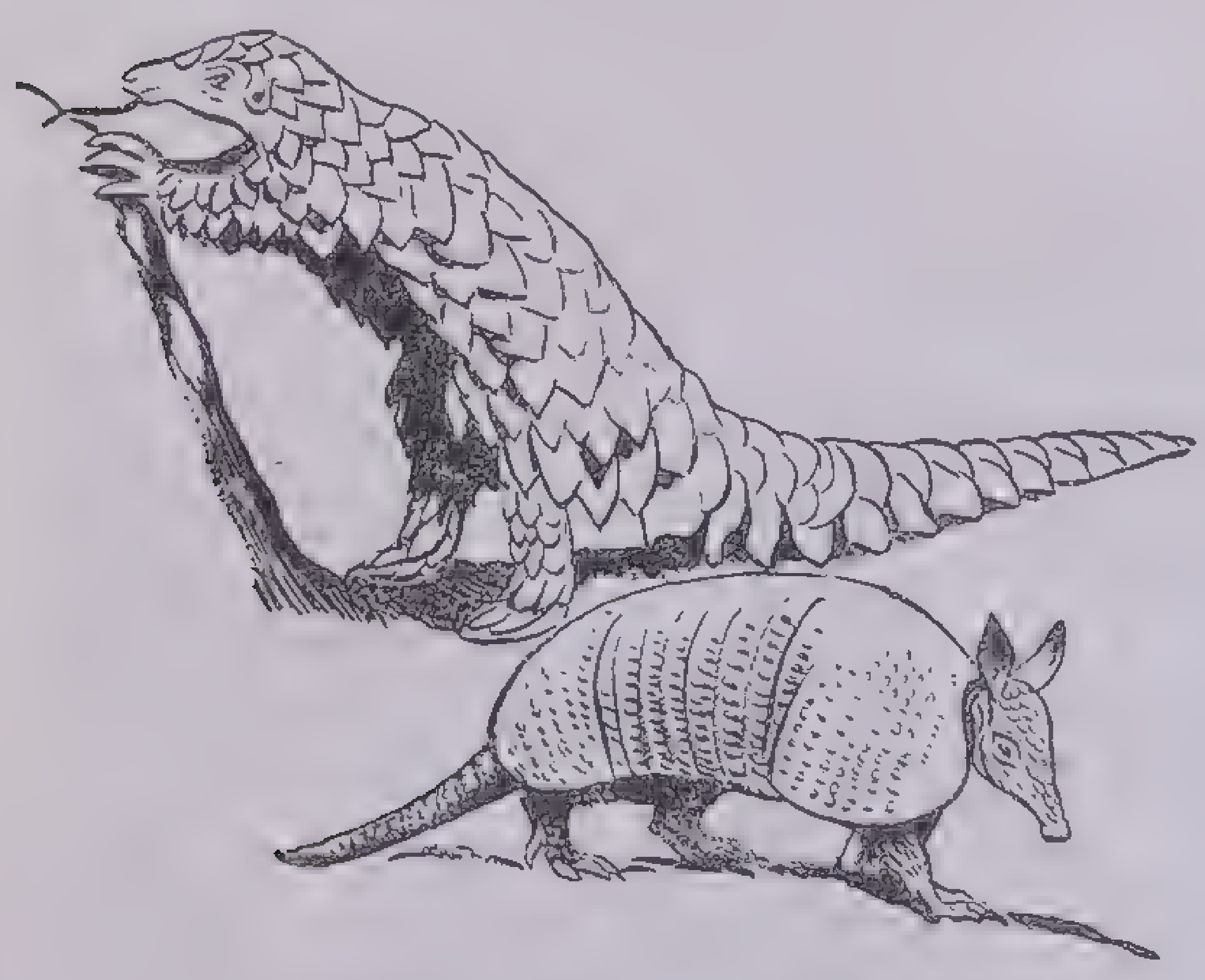
This herd was photographed from a plane flying within 30 feet of the ground. The pronghorn—not a true antelope—is one of the fastest land animals in the world and can attain a speed of 60 miles an hour. Only the cheetah, at 70 miles an hour, has outrun the pronghorn it can find, and when the pit is deep enough and the sides are quite smooth and sloping, it buries itself at the bottom with only its formidable mandibles projecting. Then it waits until some luckless insect stumbles over the edge, immediately seizes it, sucks its juices and throws out the dead body. With its big head the ant lion tosses sand on any ant that tries to escape, almost burying it.

Ape, a name given to the most highly developed monkeys, all inhabitants of the Old World. The nostrils of the ape are divided by a narrow septum; both fore and hind feet have opposing thumbs; the callosities on the rump are generally naked. Some species have cheek pouches. The tailless or true apes comprise the chimpanzee, gorilla and orangutan.

Aphids, small insects known as plant lice that feed on the juices of plants. Many species excrete from the alimentary canal a substance called *honeydew,* which is food for ants. Some ants keep aphids in their nests and care for them so as to use the honeydew. These aphids in ant nests are known as ant cows. The phylloxera, an aphid that destroys vineyards, is one of the most injurious of these insects. Unlike most aphids the phylloxera has no honey tubes.

Apteryx, see *Kiwi.*

Armadillo, a mammal, found in South America and in North America as far north as Texas, belonging to a family intermediate between the sloths and anteaters. It is covered with a hard bony shell divided into belts composed of small separate plates like a coat of mail, flexible everywhere except on the forehead, shoulders and haunches, where it is not movable. The belts are connected by a membrane that enables the animal to roll itself up like a hedgehog. Armadillos burrow in the earth, where they lie during the daytime, seldom going abroad except at night. They are of different sizes—the largest (*Dasypus gigas*) is 3 feet in length excluding the tail; and the smallest, only 10 inches. They subsist chiefly on fruits and roots, sometimes on insects and flesh. They are inoffensive, and their flesh is considered good food.



Pangolin **Armadillo**

Arthropods, an enormous group of the animal kingdom, including the crayfishes, crabs, spiders, insects, centipedes and many other animals with jointed legs and segmented bodies. There are more species of arthropods —many being of great economic importance —than of all the other groups combined.

Asp, a venomous snake (*Vipera aspis*), widely distributed through southern Europe and the Alps region. The name has been applied to several species of poisonous snakes. The kind of asp whose bite caused Cleopatra's death was probably the horned viper (*Vipera hasselquistii*) of Africa, a small, very poisonous snake about 15 inches long. In another species, the *Naja haje* of Egypt, the dilatable loose skin at the neck gives it a hooded appearance much like the *cobra de capello.* This Egyptian cobra is from 3 to 5 feet long, and its bite is usually fatal.

Ass, a species (*Equus asinus*) of the horse genus supposed by Darwin to have sprung from a wild variety found in Abyssinia. Some writers consider it a descendant of the onager or wild ass inhabiting the mountainous desert of Tartary. Others believe that it descended from the kiang of southwestern Asia. The ass ranges from dark gray and reddish brown to white, and from the size of a Newfoundland dog, as in northern India, to that of a good-sized horse. In the southwestern countries of Asia and in Egypt, in some districts of southern Europe, as in Spain, and in Kentucky and Peru, great attention has been paid to selection and interbreeding, with a result no less remarkable than in the case of the horse. Thus in Syria there appear to be four distinct breeds—a light and graceful saddle animal used by ladies, an Arab breed reserved for the saddle, an ass of heavier build in use for plowing and draft purposes and the large Damascus breed. In everyday English speech the word *donkey* is much more common than *ass*; it is probably derived from *dun,* the color.

Auk, a swimming bird of the family *Alcidae,* including the great auk, the little auk and the puffin. The great auk (*Plautus impennis*), a bird about 3 feet in length, is now extinct, the last survivors having been killed about 1845. The great auk could not fly but its wings were an aid to swimming. Several smaller species are still alive: the razor-billed auk (*Alca torda*), about 16 inches high, and the various auklets of the genus *Aethia.* Auks are almost wholly water birds, coming to land only in times of great danger and in the breeding season. The food is mainly fishes, crustaceans and worms. Auks are northern birds, ranging from Newfoundland to Iceland in the Atlantic and from California to the Bering Straits in the Pacific.

Avocet, a wading bird (genus *Recurvirostra,* back-turned bill). There are four species, one of them common to the western United States. The avocet is about 18 inches in length, has long, slender legs and a peculiar, upcurved bill that it swings from side to side in shallow water with a scythelike motion, capturing aquatic insects and small mollusks. The American variety (*R. Americana*) is the most striking shore bird of North America, with a white body, black-and-white striped wings and the bluish legs that give it the popular name, blue shanks. Its nest is concealed on the ground in marshes, and the eggs, three or four in number, are olive or buff mottled with brown spots.

Axolotl, a curious Mexican salamander (*Amblystoma tigrinum*), not unlike a newt and from 8 to 10 inches in length, with gills formed of three long ramified or branchlike processes floating on each side of the neck. The axolotl is esteemed as food by the Mexicans. There are a number of species in North America.

Babirusa (a native name meaning hog deer), a wild hog inhabiting some of the islands of the East Indies, and occasionally domesticated. The body is almost without hair, and the male is equipped with long tusks that extend through the lips.

Baboon, any ape of the genus *Papio* or *Cynocephalus* (dog-faced) with an elongated, abrupt muzzle like a dog's, strong tusks or canine teeth, usually a short tail, cheek pouches, small deep set eyes with large eyebrows and naked callosities on the buttocks. The hind and fore feet are well proportioned, and the baboon runs easily on all fours but cannot maintain an upright posture with ease. Baboons are generally the size of a moderately large dog; but the largest, the mandrill, is nearly as tall as a man. They are almost all African, ugly, sullen, fierce and gregarious, defending themselves by throwing stones and dirt. They live on fruits, roots, eggs and insects.

They include the chacma, drill, common baboon and mandrill. The chacma or pig-tailed baboon (*P. porcárius*) is found in considerable numbers in parts of South Africa. The common baboon (*P. babouin*) inhabits a large part of Africa farther to the north. It is a brownish-yellow color; the chacma is grayish-black or partly black. The mandrill (*P. mormon*) has blue ridges on the sides of the nose, which has a red bridge. The hamadryad (*P. hamadryas*) of Abyssinia is characterized by long hair, which forms a sort of shoulder cape. The black baboon (*P. niger*) is found in Celebes.

Badger, a burrowing mammal of the Northern Hemisphere belonging to the family *Mustelidae.* The American badger (*Taxidea taxus*) is generally regarded as a solitary, stupid animal. Its length averages about 2½ feet. The forepaws are provided with immense claws. The badger is unique in having the hind and fore limbs the same length. The head is broad and has a sharp nose; the tail is short and thick; the color is sandy gray. Badger bristles are used for fine shaving brushes, and the best ones come from the European badger, which has stiffer hair. The American badger lives chiefly on roots, fruits, insects, squirrels and frogs. Some consider the flesh of the badger a delicacy.

Barbet, any climbing bird of the subfamily *Capitoninae* with thick, conical beaks and tufts of bristles at the base. Their wings are short and their flight somewhat heavy. They have been divided into three subgenera: the barbicans, inhabiting India and Africa that feed chiefly on fruit; the barbets proper, found in Africa and North America and closely related to woodpeckers; and the puffbirds that inhabit South America and Central America and feed on insects.

Barnacle, a salt-water shellfish of the order *Cirripedia* commonly found in great numbers on rocks, timber, ships' bottoms and in similar places in all parts of the world. The body is enclosed in a shell of five valves, which may be closed when the animal is out of the water. Some barnacles are provided with a long stalk or peduncle by which they attach themselves to the rocks. When the shell is open, long arms or tentacles rise and pick food out of the water. Barnacles begin their lives as free swimmers but soon degenerate and settle down in one place for life. The barnacle goose (*Branta leucopsis*) gets its name from the old belief that this big bird grew from the stalk barnacle, which looks a little like a goose's neck and head.

Bass, many salt- and fresh-water fishes throughout the world, most of them valued as food. One of the best-known varieties is the American striped bass (*Moronetineata*) common along the entire Atlantic coast and often reaching a weight of 60 to 70 pounds. This fish is taken by nets, by trolling with artificial lures and by casting bait into the surf from shore by means of a long fishing rod. It is highly edible and greatly prized by sportsmen because it puts up a lively battle when hooked. Both the small-mouthed and the large-mouthed black bass (*Micropterus*) are prominent among the fresh-water game fishes. These forms, related to the sunfish, are good food and good fighters. The small-mouthed bass is sturdily built and dark in color; it weighs up to about 7 pounds. It frequents rivers and clear, cold water and for this reason is more active than the much heavier large-mouthed bass, which prefers quiet water and attains its greatest weight (about 20 pounds) in semitropical regions.

Bat, a wing-handed, flying mammal of the order *Chiroptera* (hand wings), having the fore limb peculiarly modified to serve for flight. Bats are animals of the twilight and darkness. They are common in temperate and warm regions, but are most numerous and largest in the tropics. All European bats are small and have a mouselike skin. The body of the largest British species (*Vespertilio noctuula*) is smaller than that of a mouse, but its wings stretch to 15 inches. During the day it remains in caverns, the crevices of ruins, hollow trees and similar lurking places; at evening it flits out in search of food, which consists of insects. Several species of the same genus are common in North America. Many bats are remarkable for having a singular noselike appendage, bearing in some cases a fancied resemblance to a horseshoe. Two types of these horseshoe bats are found in Britain.

Bats may be conveniently divided into three classes: most of them eat insects; some eat fruits; a few are bloodsuckers. The insectivorous comprise all European and most African and American species. The fruit-eating bats include the tropical Asian, Australian and several African forms. An Australian fruit-eating bat (the kalong or flying fox) is the largest of all bats; it does much mischief in orchards. At least two species of South American bats are known to suck the blood of other mammals. They are called *vampire* bats. The best known is the *Desmodus rufus* of Brazil, about 3 inches long. Its bite is not dangerous.

In cold climates as winter approaches, bats seek shelter in caverns, vaults and ruined and deserted buildings, where they cling together in large clusters, hang by the feet with head downward and remain in a torpid condition until spring.

Batrachia, see *Amphibia.*

Bear, a large carnivorous mammal of the family *Ursidae.* The true bears include about 10 varieties, natives chiefly of Europe, Asia and North America. They generally lie dormant in their dens during the winter months. They feed on fruits, roots, honey, ants and, in case of need, on mammals. The American brown or black bear (*Ursus americanus*) has shining hair and is rarely more than 5 feet long. It is a great climber, is less dangerous than the grizzly bear and is hunted for its fur and flesh.

The grizzly bear (*U. horribilis*) is an inhabitant of the Rocky Mountains; it is a ferocious animal, attains 9 feet in length and has a bulky, unwieldy form, but is nevertheless capable of great rapidity of motion. It is usually brownish yellow in color. Silvertip grizzlies have some hairs tipped with white or gray. The Kadiak bear (*U. middendorffi*) is a brown bear larger than the grizzly and is found on Kadiak Island, Alaska.

The brown or black bear of Europe is the *U. arctos*. It is a native of almost all the northern parts of Europe and Asia and was at one time common in Britain. It sometimes reaches the length of 7 feet, the largest specimens being found farthest north. It lives solitarily.

The extinct cave bear (*U. spelaeus*) seems to have been closely akin to the grizzly. The polar or white bear (*U. maritimus*) is characterized by a flat head and comparatively long neck.

Beaver, a rodent (gnawer) of the genus *Castor* that lives both on land and in water. It has a broad, flat, naked tail and webbed hind feet; it uses the tail as a rudder and the hind feet in swimming. When it swims, it folds its front paws. The beaver is about 2 feet long, not counting the tail, and weighs 40 to 50 pounds. It is very widely distributed, being found in the northern parts of Europe, Asia and America, most abundantly in the northern and thinly peopled parts of North America, dwelling in communities on the banks of rivers and lakes. The beaver dam is one of the most famous of all animal enterprises. At one time immense numbers of these animals were killed for their fur, which was largely used in making hats. Beaver pelts were a main article of trade with American Indians in colonial times, especially in New York, and later in the Far West. Oregon is called the *Beaver State;* there is a beaver on the official seal of New York State. Within recent years, beaver fur has had wide use in the making and trimming of women's coats.

Courtesy Frontiers: A Magazine of Natural History

Beaver

Bee, any insect of the superfamily *Apoidea* of the Hymenoptera. The bees are related to the wasps but differ from them in having heavier bodies and sucking mouths and in feeding on pollen and nectar. Many bees are honey producers, and the typical bee is the honeybee (*Apis mellifera*) which also typifies the social, swarming and hiving habits of many bees.

From the very earliest ages man appears to have known the value of bees and to have taken advantage of their products. The Bible makes mention of honeybees, and the Latin poet Vergil has celebrated them in the fourth book of his *Georgics*, where he has summed up all that the ancients knew about them.

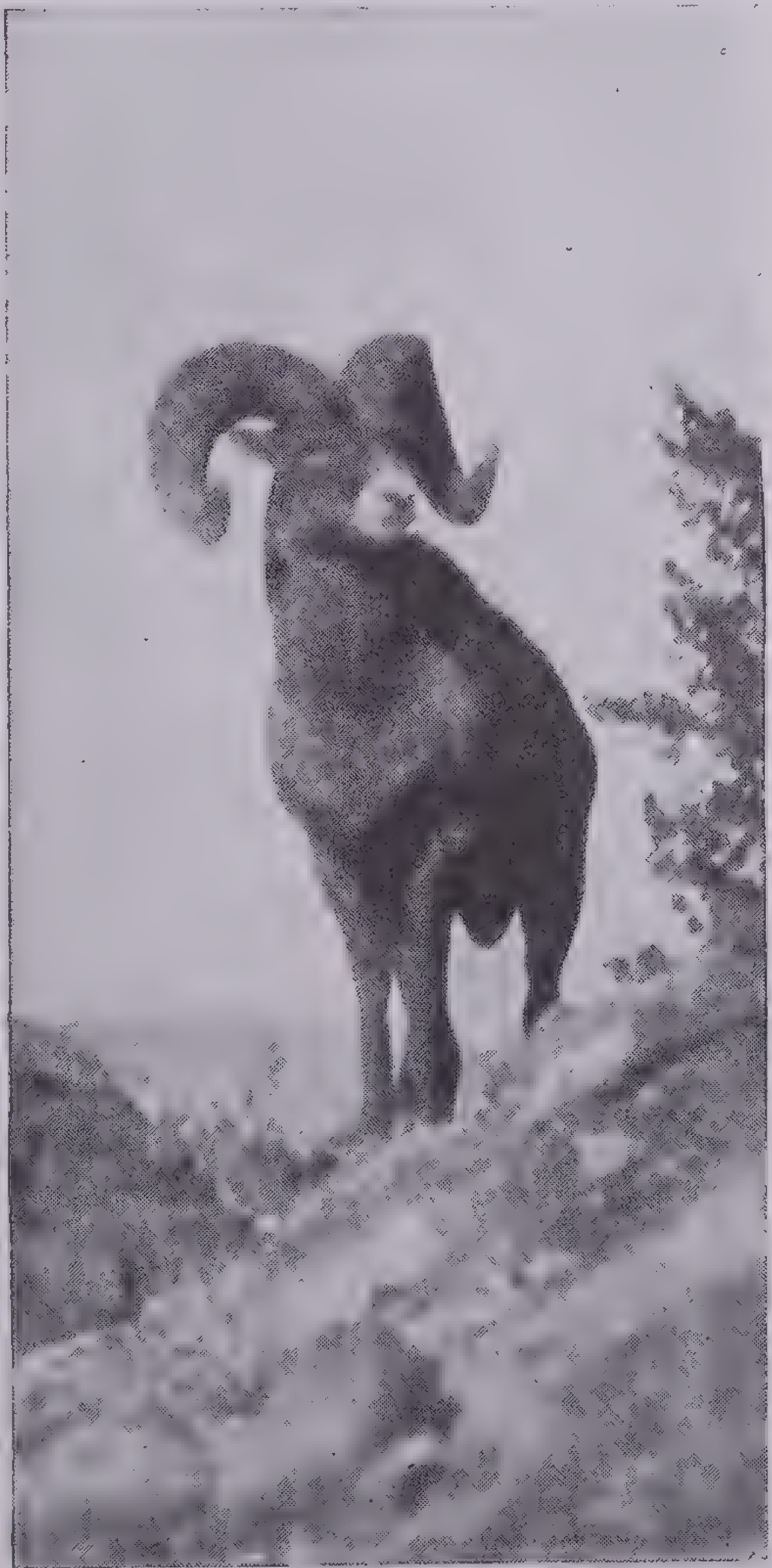
During the greater part of the year the population of bee hives is composed exclusively of two sorts of individuals—the mother or queen bee and the working or neuter bees, which are sterile females. A third kind of individuals, the males or drones, generally live only from May to July.

The working bees constitute essentially the bee community; they are recognized by their small size, reddish-brown color and, above all, by the palette and brush with which each hind leg is furnished. The three pairs of legs, which are inserted in the thorax or chest of the bee, are its tools. The two hind legs are longer than the other pairs, and each presents on the exterior a triangular depression, resembling and called a *palette,* which is surrounded by stiff hairs, forming the borders of a sort of basket in which the insect deposits the pollen of flowers. To each of these hind legs is jointed a square expanded piece, which may be termed the ankle, smooth on the exterior but on its interior surface having hairs that have caused it to be named the *brush* and that are employed in collecting the pollen. The other tools of the working bee consist of a pair of movable mandibles that close the mouth on its two sides and a trunk or proboscis, which may be considered as a sort of tongue. This latter organ has a hairy surface, to which the honey of flowers adheres, whence it is conveyed to the mouth and the stomach, to be subsequently disgorged.

The males or drones are larger and hairier than the working bees; they emit a buzzing sound, have no palettes and do not sting. The queen has a longer body than the workers, and her wings are shorter in proportion. The chief part she plays is laying eggs, and so she has no palettes or brushes. Only one queen lives in each hive, of which she is perfect sovereign. The number of males is scarcely one-tenth that of the working bees, and they live only about 3 months.

The wax of which the cells of the honeycomb are constructed is secreted by special glands in the bee's abdomen. Another substance called *propolis,* resembling but not identical with wax, is made from the juices of certain plants and is used to line the inner surface of the hive. The comb cells are six-sided and of two kinds: store cells, to be filled with honey as a reserve of food; and cradle cells, in which the eggs are laid.

In the spring the queen leaves the hive, accompanied by the drones, to take what is called her *nuptial flight* through the air. About 48 hours after her return to the hive she begins to lay her eggs at the rate of about 200 a day. First the eggs that are destined to develop into workers are laid, then those that are to produce males, and lastly those that develop as fertile females or queen bees. The eggs hatch early; the larvae (or brood) that emerge from them are tended by the workers and are fed by them on a peculiar paste, apparently a preparation of pollen. In five or six days each larva becomes a pupa or chrysalis, and 7 or 8 days later the insect is hatched.



Courtesy State Department of Commerce and Industry, Wyoming

Bighorn

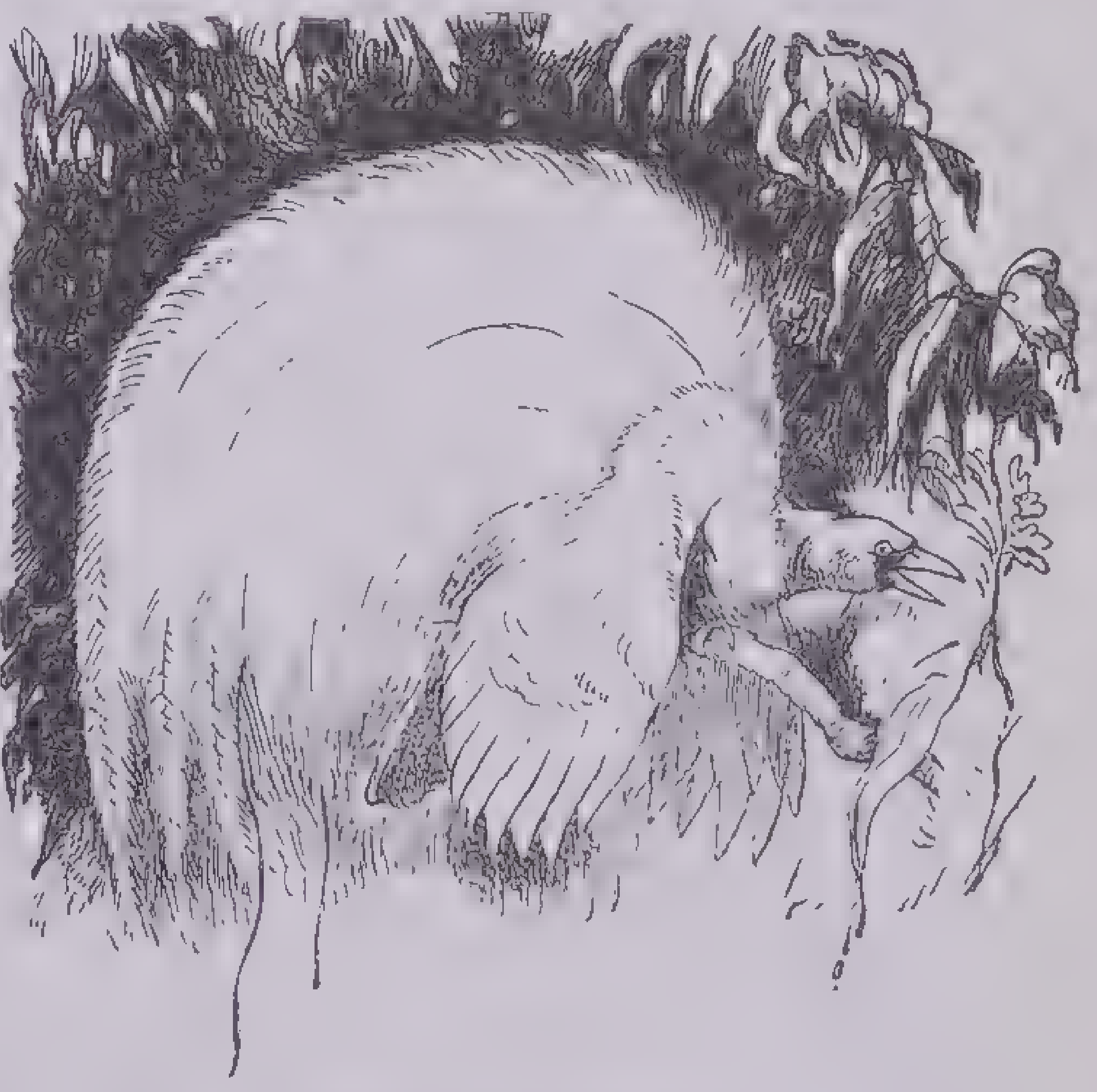
Aside from making honey and wax, honeybees (and other bees) are of great economic importance in aiding cross-pollination of flowers by carrying pollen from one flower to another.

Some bees do not live in communities. Interesting solitary bees are: the very large carpenter bee (*Xylocopa virginica*), as big as a bumble bee, which cuts tunnels in timber, builds partitions in the gallery and lays an egg in each cell; the mason bee (*Chalicodoma muroria*), which builds similar cells for nests in mud or sand; the leaf-cutter bees (*Megachila*), which build nests of chopped leaves; and the cuckoo bees (*Nomada*) that use the nests of other kinds of bees.

Beetle, an insect (commonly but wrongly called a bug) with wings covered by hard, tough covers that fit tightly together along the back and protect the wings when they are not in use. Beetles and weevils form the order *Coleoptera,* a word from the Greek meaning sheath-wing. Beetles are found in all types of places from forests to deserts. Many bore in wood and live in tunnels under the bark of trees; others are found only on flowers or plants; still other species are found only in the remains of dead animals. Many pests, such as grain weevils, belong to the beetle group.

Bighorn or **mountain sheep,** a species of wild sheep (*Ovis canadensis*) that inhabits the western mountain ranges of North America from New Mexico and California northward to British Columbia. The sheep is about 3 feet high at the shoulder; the horns are curved and measure from 32 to 40 inches in length. The color of the Rocky Mountain sheep varies from white and khaki to black.

Bird of paradise, any of several very beautiful birds forming the family *Paradiseidae,* found in New Guinea and the surrounding islands. The adult males have remarkably developed tail feathers and plumes of brilliant color. The young birds and females are plain. The great emerald bird of paradise (*Paradisea apoda*) was called *apoda* or footless because there was a story that it never lighted or perched and because the skins sent from New Guinea to scientists were not accompanied by skeletons and feet. It has long orange-and-yellow plumes, but is not so brilliantly colored as the red paradise bird (*Uranornis rubra*) or the king variety (*Cincinnurus regius*) which has huge epaulet plumes and two long tail feathers.



Bird of Paradise

Bison, two species of ungulates (hoofed animals). One species (*B. europaeus*) is found only in the forests of Lithuania and in the Caucasus. The other or American species (*B. americanus*) was formerly found in great numbers on the western plains of North America but is now present only in a few herds that are protected by law. The American bison is wrongly called *buffalo.*

The two species closely resemble each other. The American bison is for the most part smaller with shorter and weaker hind quarters. The bison is remarkable for the great hump or projection over its fore shoulders, at which point the adult male is almost 6 feet in height, and for the long, shaggy rust-colored hair over the head, neck and forepart of the body. In summer, from the shoulders backward, the surface is covered with very short, fine hair that is as smooth and soft as velvet. The tail is short and tufted at the end.

The American bison was hunted for the sake of mere sport as well as for its flesh and skin; and tons of the meat were consumed by the workmen on transcontinental railway construction. Its flesh is rather coarser grained than that of the domestic ox, but is considered by hunters and travelers as superior to it in tenderness and flavor. The hump is highly celebrated for its richness and delicacy. Bison skins, especially those of the cow, dressed in the Indian fashion with the hair on, make admirable defenses against the cold and are known as buffalo robes. The wool has been manufactured into hats and also a coarse cloth. The American bison breeds readily with domestic cattle, and their issue are fertile among themselves.

Bittern, a water bird that inhabits marshy places. The two British species are becoming rare as the marshy grounds that form their favorite haunt are reclaimed. The common bittern is about 28 inches in length, and about 44 in wing spread. Its general color is a dull yellowish brown, with spots and bars of black or dark brown. It has long and loose feathers on the breast, a short tail and a bill about 4 inches long. It is remarkable for its curious booming or bellowing cry, from which come the provincial names, *miredrum, butterbump* and *stake driver*. The eggs are four or five in number. The little bittern is not more than 15 inches in length. The American bittern (*Botaurus lentiginosus*) resembles the common European bittern but is smaller.

Blackbird, any of several quite different varieties of American birds (family *Icteridae*) related to the orioles. A well-known species of thrush, the blackbird is common in England and throughout Europe. The red-winged blackbird (*Agelaius phoeniceus*) is a familiar American bird that congregates in great flocks; the genus name *Agelaius* means gregarious. The related grackle is often called crow blackbird. The European blackbird (*Tardus merula*) is a song bird of the thrush group, larger than the common thrush, its length being about 11 inches. The male is a uniform deep black with an orange-yellow bill; the female is brown with a blackish-brown bill.

Black duck, a common bird (*Anas rubripes*) of eastern North America, and a favorite with gunners. It is about 2 feet long and has dark-brown plumage with an iridescent bluish patch on the wings, and bright-orange feet. It breeds from the Middle States north to Labrador. This species and the closely related mallard are the two most abundant ducks in the United States. The nest is a large structure made of weeds and grass; the 6 to 12 eggs are a pale-greenish color.

Blackfish, a name used for several varieties of dark-colored fishes common to America and Europe, particularly the tautog (*Tautoga onitis*), an important food fish abundant along the Atlantic coast, especially from Maine to New Jersey. It may reach a weight of more than 20 pounds, but is generally sold at 2 to 3 pounds. Tautogs are caught from early spring through the summer on rock ledges near the bottom in fairly deep water.

The name blackfish also designates any of several species of killer whales of the genus *Globicephala*. These small whales attain a length of 30 to 40 feet and feed in large herds. They are sometimes killed for their edible flesh and for their oil, which is used as a lubricant in fine watches.

Bluebird, a small warbler (*Sialia sialis*), larger than a sparrow and smaller than a robin. It is very common in the United States. The upper part of the body is blue, and the throat and breast are an earthy red. It makes its nest in the hole of a tree or in the box that is so commonly provided for its use by the friendly farmer. The bluebird is the harbinger of spring; its song is cheerful, continuing with little interruption from March to October, but is most frequently heard in the serene days of the spring. The bluebirds raise several broods in a season, starting a second nest before the first brood is ready to fly.

Bluefish, one of the best-known and most popular food and game fishes (*Pomatomus saltatrix*), widely distributed and abundant along the eastern coast of the United States. Related to the mackerel, it is steely blue in color and beautifully shaped for speed and strength. Although individuals up to 20 pounds have been taken, the average weight of the school fish is from 3 to 8 pounds, and the length 20 to 30 inches. Aside from its value as a food, this fish is noted for the tremendous schools in which it congregates, and for the capacity of its feeding habits. Millions of pounds of bluefish are caught annually by commercial fishermen, great quantities being taken in pound and gill nets; also by trolling with hand lines and artificial lures. Sportsmen catch them on rod and reel by casting heavy block-tin squids into the surf from shore and rapidly reeling them back in imitation of live bait. Another method, chumming from a boat, involves the spreading of fragments of menhaden or squid on the water to form an oily slick that attracts the feeding bluefish. A line rigged with the same bait is then put overside, and the fisherman may expect a lively tussle from any bluefish that strikes his hook. Young bluefish, called *snappers*, weigh about half a pound and are generally caught with long bamboo poles, cork floats and minnow bait.

Blue jay, see *Jay*.

Boa, a nonvenomous South American snake with its jaws so constructed that it can dilate the mouth sufficiently to swallow bodies thicker than the jaws themselves are wide. The boa has a hook on each side of the vent; the tail is prehensile and the body compressed and largest in the middle, with small scales, at least on the posterior part of the head. The genus includes some of the largest species of serpents with immense muscular power. They seize sheep and deer, crush them in their coils and then swallow the animal whole. The boas are peculiar to the hot parts of South America. The boa constrictor is not one of the largest members of the genus; it rarely exceeds 20 feet in length. The name *boa* or *boa constrictor* often is given to any large serpent of similar habits, including the pythons of the Old World and the anaconda and other large serpents of South America.

Boar, see *Swine*.

Bobolink, an American songbird (*Dolichonyx orizovorus*) called *reedbird* or *ricebird* in the Southern States (*orizovorus* means rice eater). It belongs to the family *Icteridae*, which has about 150 species, most of them found only in South America. North American representatives of this group include the Baltimore and orchard orioles, the blackbird, grackle and meadowlark. The male bobolink is almost 7½ inches long. In spring and summer it is black and white on top and solid black underneath. In the fall and winter its plumage undergoes a complete transformation, becoming buffy olive streaked with black, and the underparts olive or yellowish. The smaller female throughout the year resembles the male in autumn plumage. In size both sexes are between that of the sparrow and that of the robin.

The name bobolink (short for Robert of Lincoln) was applied by early English settlers who thought the three syllables sounded like the bird's call. The bobolink is noted for the spontaneity of its song. Its energetic notes that ring from the fields and meadows in June have been compared to the tune of a hysterical music box. Summer is scarcely half over before the bobolink starts its long migration southward to the central part of South America below the equator.

Boll weevil, a beetle (*Anthonomus grandis*) about ¼ inch long that lays its eggs in cotton bolls. When the larva hatches, it destroys the boll and causes great damage. This pest was formerly restricted to Central America, but its range has been greatly extended. It entered Texas about 1890 and spread over the cotton-growing states of the United States.

Bony pike, see *Gar*.

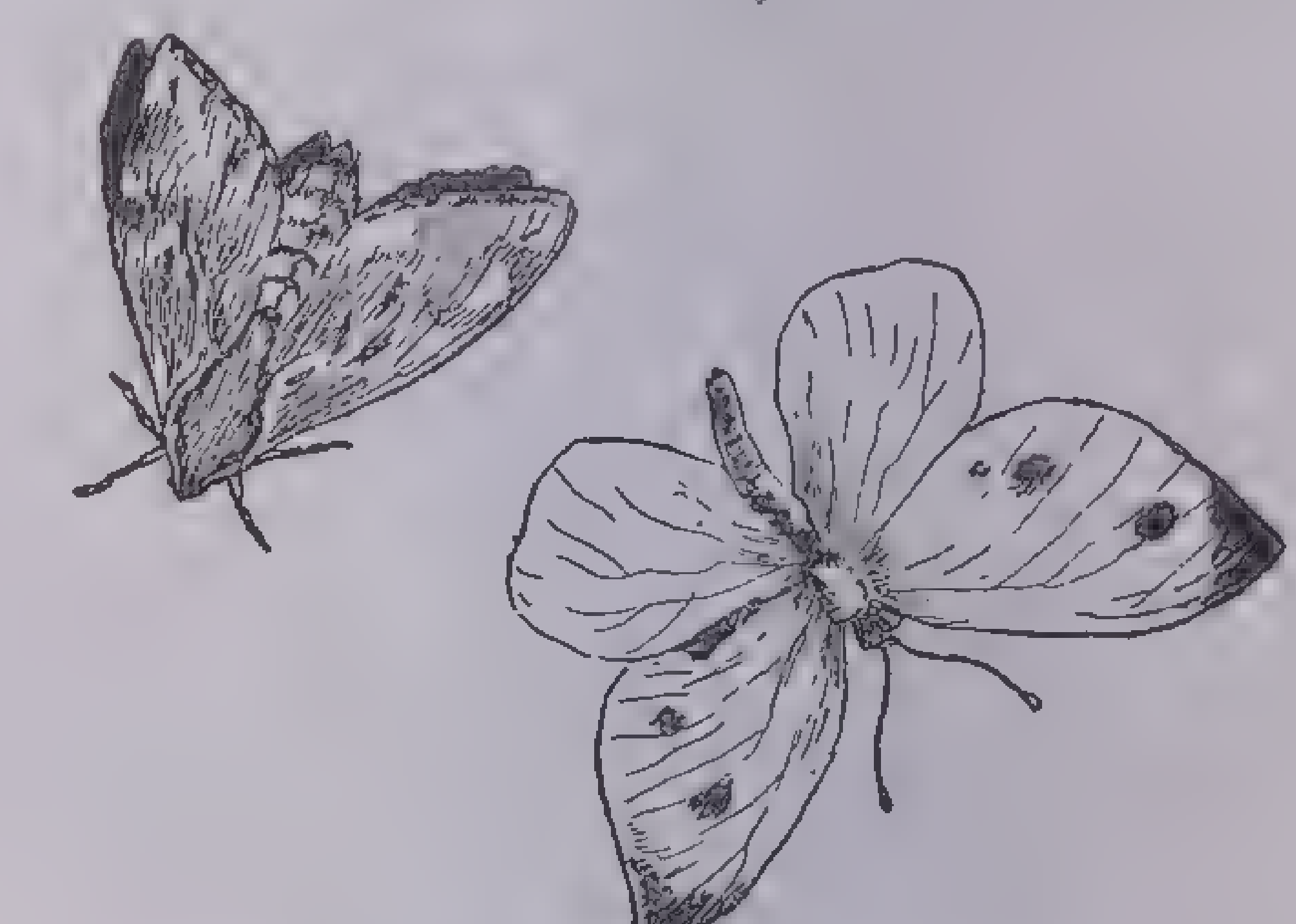
Brant, the smallest of the wild geese in the United States, where it is only a winter visitant. It is about 2 feet in length; the upper parts are brownish gray, under parts ashy gray fading to white; the neck is long and slender, the bill and feet are black. Like all geese, the brant covers tremendous distances in migration, breeding within the Arctic Circle and traveling in winter generally as far south as North Carolina or occasionally even to Florida. The common or eastern brant is found only on the Atlantic coast; a nearly identical species, the black brant, is represented on the Pacific coast. The barnacle goose of Europe was named *Branta leucopsis* for its whitish face. Sometimes it flies to America. White brant and blue brant are popular names for the snow goose and blue goose, which belong to a different genus, *Chen*.

Buffalo, wild cattle of the warmer parts of the Old World, living in marshy places. They are about 5 feet high at the shoulder. Some of them have been domesticated and are used as beasts of burden. The name was transferred by the early explorers to the bison of North America, a very different kind of animal. The Indian or water buffalo (*Bos bubalus*) has been domesticated throughout Asia and the East Indies. The Cape of Kaffir buffalo (*B. caffer*) of Africa when it is wounded is more dangerous than any other African beast.

Bullhead, a common name for any of several species of fish with large heads. In the United States the name is given to a species of catfish or horned pout (*Ameiurus nebulosus*); it is usually less than 1 foot in length.

Bumblebee (called also *humblebee*), any species of wild bee pertaining to the genus *Bombus* (order *Hymenoptera*), which includes about 50 varieties found in North America. Members of this genus occur only rarely in tropical regions and are the only bees known in Arctic climates. This bee is identified by its large, furry black-and-yellow body and loud, droning hum. It is about 1 inch long, much larger and heavier than the honeybee and not nearly so prolific. The communities rarely number more than 200 or 300; and the females of one colony never try (as do honeybees) to destroy one another. Bumblebees do not swarm, and the honey cells do not exhibit the symmetry and craftsmanship typical of the comb of the honeybee.

Butterfly, the popular name of any of a group of insects with broad wings (*Rhopalocera*, club horn), easily distinguished from the moths (*Heterocera*) by the habit of flying in the daytime and by having the antennae or feelers at the end of the head ending in a club, never tapered or feathered. The wings are never folded when the butterfly is at rest, but are held erect or extended. The butterflies and moths form the order of *Lepidoptera* (scaled wings). Like many another insect, the butterfly hatches from the egg in the shape of a worm or larva, a caterpillar that eats mostly vegetable matter, grows rapidly, molts its skin several times, and for a resting stage, then changes into the pupa or chrysalis, in which it usually passes the winter. Then the pupa case splits down the back and from the opening the butterfly comes out to lead a short life, during which the female lays eggs that are to go through the same history. Several thousand species of butterflies are known, the majority being inhabitants of the tropics.



Moth **Butterfly**

Buzzard, any of several daytime birds of prey resembling the hawks. They feed on mice, moles, small birds and insects and on the whole are therefore a benefit to the agriculturist. The common buzzard is found over the whole of Europe and America. The carrion buzzards feed on decaying animal matter; the bee buzzards or honey buzzards of the Old World feed on honey and on the larvae of bees and wasps.

Caddisfly, any of several small insects with rather delicate wings, found in great numbers near lakes and streams. They belong to various families of the *Neuroptera*, and some authorities make them a separate order, *Trichoptera* (hairy wings), named from one of their main characteristics. They are easily attracted to artificial light. The larvae of caddis worms, less than 1 inch long, are important food for fish and are used as bait by anglers. The worms enclose themselves in netlike cases. These cases are usually placed in swift streams and turned so that food may wash into openings in them.

Camel, a large ruminant (cud chewer) used as a beast of burden in the desert. There are two species—the Asiatic camel (*Camelus bactrianus*), which is about 9 feet tall and has two humps; and the African camel or dromedary (*C. dromedarius*), which has only one hump. Camels can go for a long time without drinking as they store water in stomach cavities, and as the fatty hump is absorbed by the body when their food is insufficient. Fossil camels have been found in North America. The alpaca and llama of South America are closely related to the camels of the Old World.

Canary, a small finch (*Serinus canarius*) native to the Canary, Azores and Madeira islands but domesticated in many countries for 300 years. As they have a sweet and powerful song, canaries are sold as household pets.

The best singers, notably those raised in the Harz Mountains, bring high prices. The usual color in cage birds is yellow (canary color is a brilliant reddish yellow, named from the bird), but wild birds are a dull green with brown streaks.

Canvasback, a wild duck (*Marila valisneria*), named from its grayish back and sides. The king of waterfowl, it is a favorite with epicures and sportsmen alike. It is distributed throughout North America, breeds in the marshes of the Northwest and migrates principally to the Atlantic coast around Chesapeake Bay, where it is sometimes found in rafts numbering thousands upon thousands. This duck is 2 feet in length and has a reddish head, with a wide black collar around the lower neck; the rest of its body is grayish white. In Chesapeake Bay its food, which gives a distinctive flavor to its flesh, is wild celery or tape grass (*Valisneria*), hence the second word in the Latin name. The canvasback is a near relative of the redhead duck, whose plumage is a lighter color and the head more distinctly red.

Cardinal or **redbird**, one of the most beautiful of American song birds (*Richmondena cardinalis*), a member of the finch and bunting family (*Fringillidae*). It is about 8½ inches long. The color is brilliant red like a cardinal's hat, and a sharp crest of vermilion gives the bird a striking contrast to the green foliage of the trees. The cardinal nests in bushes and thickets and constructs its nest of bark and twigs. Its beautiful song has given it the name, Virginia nightingale.

Caribou, see *Reindeer.*

Carnivora or **flesheaters,** a group of mammals in which the canine teeth are well developed and the food is mainly or entirely flesh. The carnivores feed mostly on other animals. Dogs, cats, lions, seals, bears, hyenas, coyotes and badgers are members of this group, which is the most ferocious in the animal kingdom.

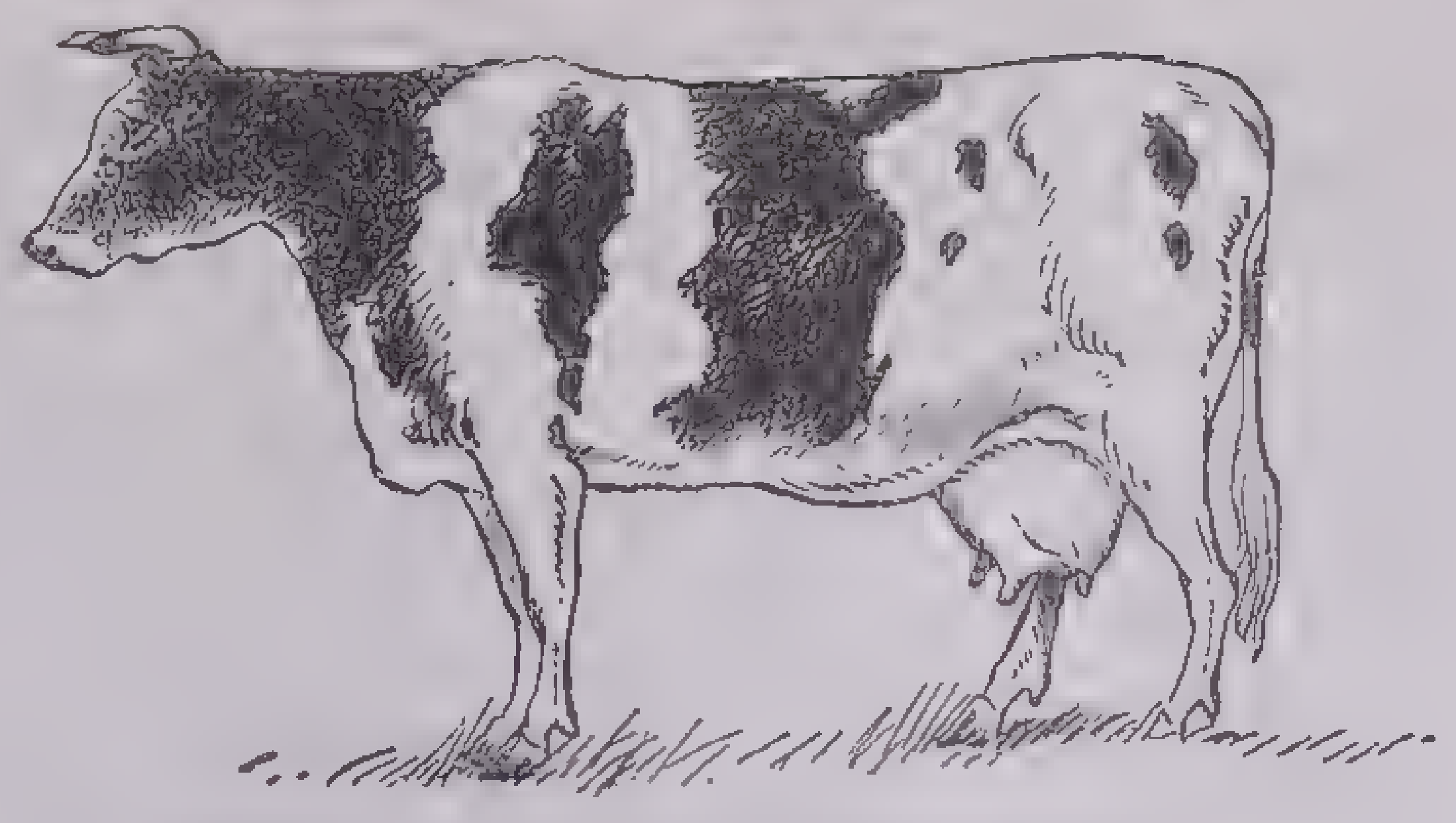
Cassowary, a large Australasian bird, related to the African ostrich and the South American emu. It is about 5 feet high and has a heavy body and dark plumage of a hairy character. Its brightly colored head is topped by a hornlike growth. The cassowary cannot fly but is a speedy runner.

Cat, a large family of animals (*Felidae*), including the lion, tiger, panther, leopard, lynx, puma and a number of other forms, among them our domestic cat. All have retractile claws, teeth specially adapted for cutting and elongate pupils of the eyes. The common cat is probably a native of Egypt. It is certain that it was domesticated there and that it was an object of worship and was frequently mummified. It was not known to the ancient Greeks and Romans who used domesticated martens to destroy rats and mice.

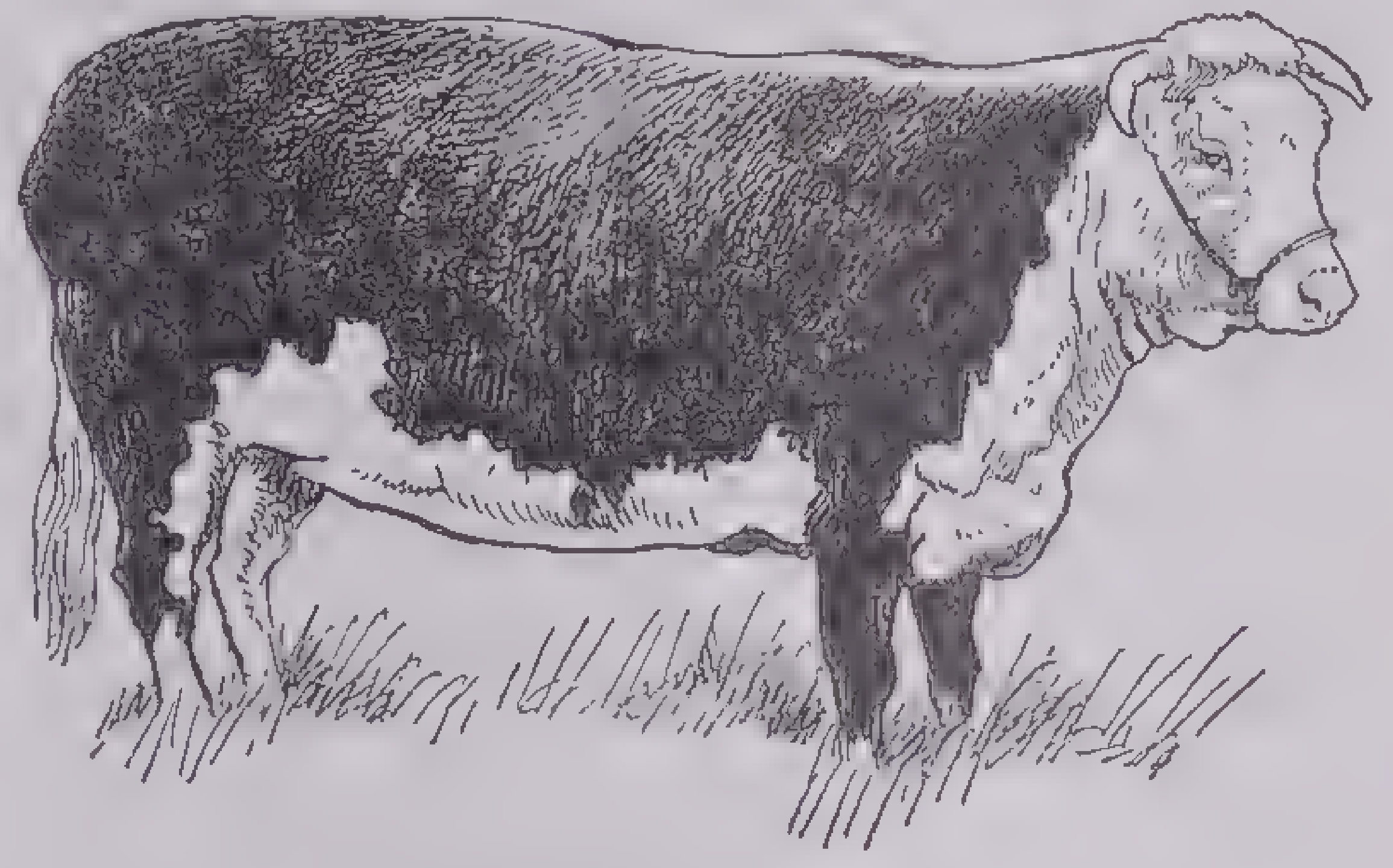
Domestic cats are cleanly animals, always washing their fur and paws. Different breeds vary widely in color, markings, size, shape, length of tail. Notable are the tailless Japanese and Manx cats (coming from the Crimea as well as from the Isle of Man), the Angora or Persian cats with long silky fur and the Siamese variety, a semialbino with blue eyes, a long pointed head, slender legs and a long thin tail. The nose, ears, paws and tail are darker than the body. The original of the domestic cat was probably marked with black bars on a ground of tawny and white, these colors rendering it inconspicuous among the grasses and shrubbery where it ranged.

Catbird, a well-known American songbird (*Dumetella carolinensis*) of the thrush family (*Turdidae*). During the summer it is found throughout the Middle and New England States. The plumage is a deep-slate color above, and lighter below. The catbird is about 9 inches long. In habit it is lively, familiar and unsuspicious; the song is largely imitative of those of other birds—the catbird is related to the mockingbird—but it also has the catlike call that occasions its common name. During the winter it inhabits the extreme South of the United States, and is found also in Mexico and Central America.

Caterpillar, the wormlike larva of the moth or the butterfly. Caterpillars are often mistaken for true worms, which have the same general shape and mode of locomotion. Some are smooth like the real worms but there are many that have a hairy or furry coat, and the name caterpillar is from two Latin words *catta pilosa* (hairy cat). Caterpillars often do great damage to crops and other vegetation by eating leaves. The silkworm, which is about 1 inch long, is an economically valuable caterpillar that spins a cocoon from which silk is made.



Milch Cow (Holstein-Friesian)



Beef Cattle (Hereford)

Cattle, originally all live animals held as property—the word *cattle* being a variant of *capital;* but now confined to bovine animals—cows, bulls and steers—of the genus *Bos,* ruminants or cud chewers. There are many breeds of domestic cattle. In India and other southern Asiatic countries, the zebu is used in much the same way as domestic cattle are used in the United States. Zebus are humped cattle and are not of the same quality as American or European breeds. The European cattle, which have been introduced into America, are of two general types—beef and dairy. Of the beef cattle, the English Shorthorns are a very sturdy breed. These vary from red to almost pure white. Shorthorns originated in England, but later spread to North America, South America and to Australia. Another valuable beef variety is the Hereford. This has a red body and white head. Herefords are not so widely distributed as Shorthorns. Among the dairy cattle, the Holstein breed (black and white) is perhaps the most important. Holstein cattle are great milk producers, but the percentage of its butter fat is somewhat less than in milk from other cattle. This variety originated in Holland, but has been imported to a considerable extent to the United States and now forms an important part of the milk industry. Jersey cattle also are good dairy animals. These are of various shades of yellow and red. Jersey milk is rich in butter fat. This breed originated on the Isle of Jersey, off the coast of France. Guernsey cattle are reddish, with white markings. They also originated on one of the Channel Islands. Their milk is probably the richest in fat, but the quantity is not so great as in other breeds. Among the wild cattle, the American bison is native to the United States.

Cavy, see *Guinea pig.*

Centipede, any segmented animal of the family *Myriapoda,* closely related to the insects but having legs on every segment. With the millipedes (literally, thousand feet), the centipedes (literally, hundred feet) form the family of *Myriapoda*—a name that means ten-thousand feet. The centipedes differ from insects in having all segments essentially the same—except the first and last few. Centipedes can move forward and backward with equal ease. Most of the North American species are small and inconspicuous, living under stones and in and under decaying logs. In the tropical regions they attain greater sizes, sometimes reaching 10 inches in length. Some centipedes have the first pair of legs modified into poison claws, the contents of which cause considerable pain to a person bitten, although known cases of death are rare.

Chameleon (a Greek word meaning lion-on-the-ground), an Old World lizard famous for changing its color either in accordance with its environment or with its temper when disturbed. The change is due to the presence of clear or pigment-bearing contractile cells placed at various depths in the skin, their contractions and dilations being under the influence of the nervous system. The species that has this proverbial power of matching its surrounding has a naked body 6 or 7 inches long with a prehensile tail of about 5 inches, and feet suitable for grasping branches.

Their power of fasting and habit of inflating themselves gave rise to the fable that they lived on air; but they are in reality insectivorous, taking their prey by rapid movements of a long, viscid tongue. In general habit they are dull and torpid.

The family of chameleons is sometimes called *Rhiptoglossae,* literally dart-tongues.

Other lizards have the same power of changing color and the name has been applied also to them, especially the anolis of the iguana family, the American chameleon of the southeastern states.

Chamois, a goatlike antelope (*Rupricapra*) inhabiting high, inaccessible mountains in Europe and western Asia. It is 25 to 30 inches high at the shoulder. The horns, which are about 6 or 7 inches long, are round, almost smooth, perpendicular and straight until near the tip, where they suddenly terminate in a hook directed backward and downward. The hair is brown in winter, brown-fawn color in summer and grayish in spring. The head is pale yellow with a black band from the nose to the ears and surrounding the eyes; the tail is black. Its agility, the nature of its haunts and its powers of smell render the pursuit of the chamois an exceedingly difficult and hazardous occupation. It can jump 20 feet and is proverbially sure-footed. A very soft yellow leather for linings and cleaning cloths is made from chamois skin—and from inferior and less expensive hides.

Chimpanzee, the native name in Guinea of a large ape (*Anthropopithecus*) of west and central Africa belonging to the anthropoid or manlike monkeys, and a close relative of the gorilla. The scientific name of the chimpanzee (*A. troglodytes*) means man-ape cave-dweller. The full-grown chimpanzee is sometimes about 5 feet high and is not so large and powerful as the gorilla. The chimpanzee walks erect better than most of the apes, but not so well as the gorilla; walking on all fours it rests on the knuckles. It is much more a tree-dweller than the gorilla and much less violent and fierce. It feeds on fruits, often robs the gardens of the natives and constructs a sort of nest among the branches of the trees. It is common in menageries, where it shows much intelligence and docility.

Chinch bug, an insect pest (*Blissus leucopterus*) that feeds on the roots of plants, especially grain, and destroys annually thousands of dollars' worth of grain in wheatfields and cornfields. The adults seek protection near the roots and spend the winter under the soil. They emerge in the spring and lay eggs, which hatch in about 2 weeks. When the young hatch, they immediately start to feed. After about 3 months the adult stage is reached, and the insects lay eggs for a second brood. The larvae are red; the grown bugs are black and white. They are killed by heavy rains but survive from one year to the next in dry places.

Chinchilla, a small South American rodent of the numerous family *Chinchillidae* related to the cavies and strongly resembling ground squirrels. The chinchillas inhabit the Andes of Chile and Bolivia, where they live gregariously in deep burrows, feeding on roots. They are more than 10 inches long and are highly prized for their lustrous gray pelts, especially the Andean species (*C. laniger*), whose fur is made up into costly garments. For this reason they are steadily decreasing in number. An attempt has been made to domesticate them in the United States on fur farms.

Chipmunk, a small ground squirrel (*Tamias*) of North America and Siberia. It has a body about 6 inches long and a thin furry tail. It is reddish brown or grayish in color with black-and-white stripes along the back. The eastern United States species has two white stripes, and the western species four. This frisky little creature is a familiar sight in the country. It generally lives in burrows, enlarged at intervals into supply rooms for the nuts and acorns it stores for a winter food supply. The young are four to six in number.

Civet cat, a small carnivorous animal (family *Viverridae*) of the Old World (especially Africa), related to both the cats and the hyenas. The civet is about 3 feet long, has a slender body and head, a sharp muzzle, short, rounded ears and a long tail. On the back is an erectile mane, resembling that of the hyena. It feeds on birds' eggs, small mammals and reptiles. Civets are valued for their musky substance secreted in a sac near the sexual organs. This substance, called civet, is used in making perfume and sells for about $10 an ounce in the pure form.

Clam, a bivalve mollusk, usually with equal shells and mostly found in salt water, though the fresh-water mussel is sometimes called a clam. In the United States an important industry has grown up around the fresh-water clams, from whose shells are manufactured such articles as knife handles and buttons. Most clams live under the surface of the ground and send two long tubes to the surface, through which fresh water is taken in, and used water is eliminated. Others attach themselves to wharf piles or other places by means of tough threads that they secrete. As a group, the clams are of considerable importance. The shipworm (*Teredo navalis*), which is really a clam, causes a great amount of damage by boring into ships and docks. There are three main types of clams in the United States, all used for food; the hard clam, little neck or quahog (*Venus mercenaria*), round in shape and thick-shelled (the shell was used by the Indians in making wampum); the soft clam (*Mya arenaria*), oval in shape, about 2½ inches long and with shells that are almost paper-thin; and a Pacific variety, the razor clam (*Ensis directus*), long, narrow and shaped like an old-style razor.

Cobra, an Asiatic snake (*Naja tripudians*) usually less than 5 feet long, much used by snake charmers, who remove the fangs to make it harmless and pipe to make it dance —*tripudians* in its scientific name means dancing. When it is irritated, the cobra has the habit of raising its head above the ground, puffing the region about the neck and swaying back and forth. The puffed neck gives the cobra its name, *cobra de capello,* hooded cobra. It is exceedingly poisonous; 5,000 deaths a year in India are from cobra bites.

Cochineal, a scale insect of Central America (*Coccus cacti*) that feeds on the cactus. From the dried bodies of the females a famous red dye, also called cochineal, is made. In recent years a similar dye has been obtained from coal tar. A related scale insect in Asia, the lac bug (*Tachardia lacca*), secretes a substance from which shellac and several dyes are prepared.

Cockroach, an insect that feeds on decaying vegetable matter. Several species (family *Blottidae*) have become household pests. Many methods have been advocated for their extermination, but none is very satisfactory.

Cod, a salt-water food fish (*Gadus*); and the family (*Gadidae*) that includes the common cod, hake, haddock, ling and whiting.

The cod (*G. morrhua*) is found in great numbers off the coast of Newfoundland, and the fisheries there were of commercial importance before there were any European settlements in North America. The cod has a projecting lower jaw with a barbel on the chin. The back is olive green with darker spots, and the belly is white. A 4-year-old fish is about 2 feet long. Three feet is an average length for a grown fish—occasionally one is caught that is more than 5 feet. The cod lives in 10- to 100-fathom depths. Most of the catch is dried and salted and goes to the Catholic countries of Europe for fast-day meals.

From the liver of the cod (now also from the livers of haddock, hake and halibut) an oil is pressed that is very rich in vitamins A and D. Isinglass is made from the air bladder of the cod and the sturgeon.

Coelenterata (literally, hollow-intestined), a large group of water animals containing such forms as the jellyfish, coral and sea anemone. They are mostly sea animals, but a few are found in fresh water. The group is characterized by an internal digestive cavity, the coelenteron, and by the presence of stinging cells, small structures that explode when the animal is irritated and cause severe irritation to the region of the body of an animal that they strike.

Colugo or **flying lemur,** a flying mammal (*Galeopithecus volans*) of the East Indies, unlike the true lemurs. Its head is doglike, and a flap of skin extends from the neck to the tail, extending between the legs, much like the skin flaps of the flying squirrel. Colugos are about 18 inches long. They feed on seeds, fruits and leaves. They are quite helpless on the ground, but are active in the trees where they leap from branch to branch with remarkable agility. A related flyer (*G. philippensis*) is found in the Philippines.

Condor, a South American vulture (*Sarcorhamphus gryphus*), one of the largest flying birds. It resembles the common vulture, differing from it mainly in the large cartilaginous outgrowth that surmounts its beak and in the large size of its oval and longitudinal nostrils. The wing spread sometimes is as much as 10 or 12 feet. Condors are found in the Andes Mountains, frequenting regions from 10,000 to 15,000 feet above sea level. They descend to the plains only under stress of hunger, and then they attack sheep, goats, deer and bullocks. They prefer dead animals. A closely related bird of North America is the California condor, now nearly extinct.

Cony, a rabbit, especially the European *Lepus cuniculus.*

Coot, a wading bird (*Fulica*) of the rail family (*Rallidae*), widely distributed. It is a little more than 1 foot long. Its nest is built in the water by piling up masses of vegetation. Coots fly slowly and do not leave the water unless disturbed. They have some difficulty in rising from the surface because their wings are small, so the coots would rather dive than fly. Slow and stupid, this bird has become a synonym for simpleton—"queer coot" or "silly coot" is applied to a human being none too bright. The common European coot is *F. atra;* the American representative is *F. americana.*

Copperhead, a poisonous snake (*Agkistrodon contortrix* or *mokasen*), widely distributed in the eastern United States, often called *moccasin.* It is 3 to 4 feet in length with a triangular, reddish-bronze head (some classifiers have named it *Trigonocephalus,* triangle-head) and light-brown body with dark blotches on the sides and belly. It is related to the rattlesnake, from which it may be readily distinguished by the absence of any rattle. Its food consists mainly of rats and mice, with an occasional bird. In the thickly settled northern parts of its range this snake has been fairly well exterminated, but in certain regions of the South it is still abundant. Another name for the copperhead, especially the fish-eating water moccasin, is *cotton-mouth,* from the white inside of its mouth. Although sluggish by nature and timid of man, the copperhead is as poisonous as any other of its size, and its bite is occasionally fatal.

Coral, a small marine animal (*Anthozoon*), sometimes called an insect but actually a polyp, that secretes a limy skeleton that also is called coral. The skeleton is secreted by the outer surface of the animal and may show a number of little cups in which the animals live. When the animals die, the skeletons remain, and so abundant are they in the tropics that coral reefs and islands are formed by them. The precious coral of the Mediterranean and of Japan is very solid and takes a high polish. The price is dependent upon the color and size of the pieces, the pale pink commanding the highest price. Red coral is the internal skeleton of madrepores, and some of the tree corals also are formed of internal skeletons.

Cormorant, a large sea bird of the genus *Phalacrocorax,* found in eastern North America and western Europe, along the seashore and sometimes in inland lakes. Cormorants dive and swim easily. They usually nest in cliffs. Their food consists mostly of fish. In China and Japan trained cormorants are used for fishing, a brass ring being placed around their necks to prevent them from swallowing the fish.

Cornborer, the larva of a moth (*Pyrausta nubilalis*), native to Europe and now a pest in America. It bores into the corn plant and does great damage. Many efforts are being made to check its spread. It is important to destroy all infected material. Fermentation of the cornstalks in silos kills the insect; otherwise it lives through the winter in the plant, and attacks new plants the next summer.

Cougar, see *Puma.*

Cow, see *Cattle.*

Cowbird or **cow blackbird,** an American blackbird (*Molothrus*), about 8 inches long, often seen around cows, on whose backs it frequently perches. The cowbird lays its eggs in the nests of other birds (more than 90 species) and leaves them there to be hatched and raised with the other birds' broods.

Coyote, a wolflike animal (*Canis latrans*) of nocturnal habits found on the western plains of North America. It is smaller than the wolf and more cowardly. Its food consists of rabbits, ground squirrels and other small mammals.

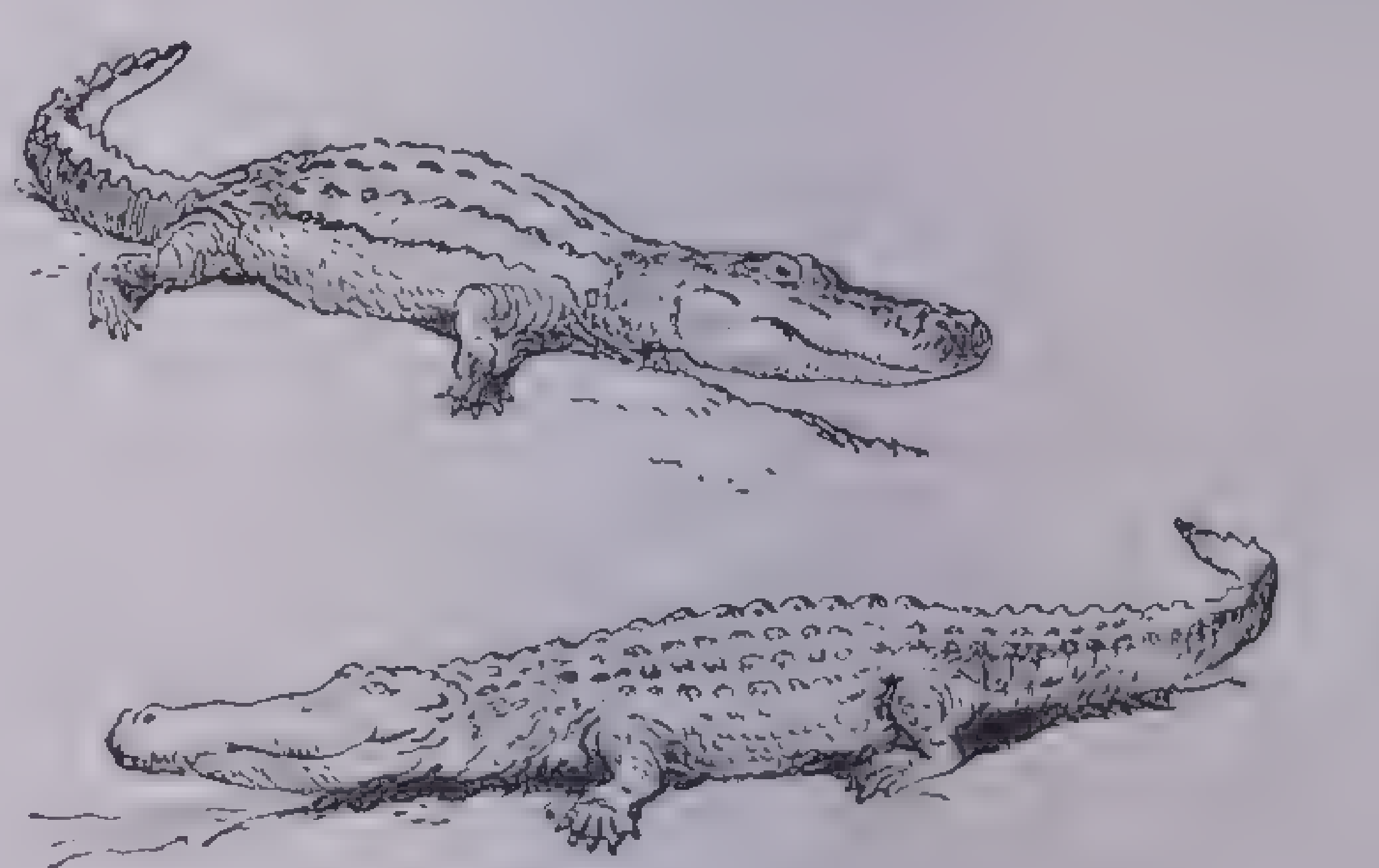
Crab, a marine animal (class *Crustacea*) with 10 legs or arms (order *Decapoda*) and a small abdomen folded under the anterior part of the body, the cephalothorax (suborder *Brachyura*). More than 2,000 species are known, differing greatly in size, shape and in other respects. The largest is the great *spider crab* of Japan, whose legs may stretch to 12 feet. Like all crustaceans the crabs molt their shell at intervals, and after the molt their skins are soft. One species on the Atlantic coast is taken at this time in great numbers and is cooked as *soft-shelled crab. Hermit crabs* have soft abdomens, and to protect themselves live in the shell of a dead snail. The great majority of crabs are marine, but a few, the *land crabs,* spend their entire lives on land, going to the water only once a year to lay their eggs. One type, the *purse crab* (*Birgus latro*) of tropical islands, climbs trees and feeds on fruit, especially coconuts. This tree crab sometimes weighs 20 pounds.

Crane, any of several long-legged birds (family *Gruidae*), somewhat resembling the herons. Cranes are remarkable for their long migrations, in which they usually fly in large flocks led by a single leader, the whole assemblage assuming a V form in flight. The leadership is continually changed. The European crane (*Grus grus*) breeds in the north of Europe and in Siberia and migrates southward at the approach of winter. It attains nearly 5 feet in height. With the exception of the neck, which is black, the body is of a uniform ashy gray; it has a graceful carriage. It frequents large plains and marshes and feeds on fish, reptiles, frogs, mollusks, worms, insects and even small mammals. At the breeding season the birds pair for reproduction and rearing the young. They often nest on the chimneys of houses in Germany and the Netherlands. Two species occur in America. The whooping crane (*G. americana*) is distinguished by the convolutions of the trachea within the breast bone; it is famous for its noisy call. The commoner variety is the sandhill crane (*G. canadensis*). Both are becoming rare. The great blue heron (*Ardea herodias*) is incorrectly called the *blue crane.*

Crayfish or **crawfish,** a fresh-water crustacean (family *Astacidae*) closely related to and resembling the lobster but smaller, 3 to 6 inches in length, and with claws proportionately smaller. The second syllable of the name was not originally *fish,* as the word is derived from French *écrevisse* and is like our word *crevice*—possibly from the burrows it digs. Originally applied to only one species in Europe (*Astacus fluviatilis*), the name now covers all fresh-water species of the family *Astacidae* and several closely similar species in America. Crayfishes are considered a table delicacy and are readily caught in traps and nets baited with decaying fish or animal matter. Their extensive burrowing causes considerable damage to levees and dams. Blind crayfish are found in the river of Mammoth Cave, in Kentucky.

Cricket, any member of a large and widely distributed family (*Gryllidae*) of jumping insects, generally black in color, nocturnal in habit and about 1 inch long, not counting the long antennae. The cricket is a familiar and cheerful member of almost any rural community in the summertime. Only the males chirp. The sound is produced by scraping the serrated edges of the wings together, and the rapidity of chirping increases or decreases with a rise or fall in temperature. Crickets scrape holes in the ground and lie there during the day, venturing out only at night. The American black cricket (*Gryllus assimilis*) occasionally enters houses; but the European variety (*G. domesticus*) prefers houses, especially little chinks in the masonry of fireplaces. In the Mediterranean countries crickets are kept in cages, as are song birds. In China they are caged and matched for cricket fights, a sport on which there are heavy wagers.

Crocodile, the largest of living reptiles. The characters of the order *Crocodilia* are: the skin is covered with square, bony plates; the tail is long and compressed; the feet are short, and there are five toes on each forefoot and four on each hindfoot, which is more or less webbed; the jaws are long and their gape is enormous; the nostrils are at the extremity of the snout and capable of being closed to prevent ingress of water; the heart is four-chambered.



Alligator
Crocodile

The families now existing are the alligators, crocodiles and gavials. The alligators are confined to the southeastern parts of the United States and of China. The gavial proper (*Gavialis gangeticus*) is confined to India and the East Indies and is distinguished by a very long snout with a soft tip that can be puffed. The crocodile of the Nile (*Crocodilus niloticus*) is the best-known member of the order. It was worshiped and embalmed by the ancient Egyptians. Another species the mugger (*C. palustris*) lives in India and the East Indies; and a third (*C. acutus*), in tropical America, from the southern part of Florida to Central America. The crocodile is formidable in its great size and strength. It is exclusively carnivorous and prefers its food in a state of putrefaction. It is no longer found in Egypt except in the upper and more southern parts. It grows sometimes to a length of 30 feet and lives to a very old age.

Crow, any of a family (*Corvidae*) of birds, about 20 inches long, mostly black; widely distributed over the world. The family includes the common crow, the raven, the fish crow, the rook, the jay and the magpie. The common crow (*Corvus brachyrhynchos*) of North America is remarkable for its gregarious and predatory habits, as well as for its intelligence and cunning. Crows pair in March; the old repair their nests, the young frame new ones; but they are such thieves that while the one is fetching materials the other must keep watch to prevent the rising fabric from being plundered by crow neighbors. As soon as the nest is finished and five bluish-green eggs with dark blotches are laid, the male takes upon himself the care of providing for his mate, which he continues during the whole period of incubation. They frequent the same rookeries for years, but allow no intruders into their community. They feed chiefly on worms and the larvae of insects, consequently during outbreaks of certain insects the crows are beneficial; but they also eat grain and seeds and are thus injurious to the farmer. Chiefly because they destroy beneficial wild birds and their eggs, crows must be classed as enemies. The fish crow (*C. ossifragus*) frequents the Atlantic coast. The carrion crow (*C. corone*) and the hooded crow (*C. cornix*) are closely related European varieties. In Australia a black-and-white piping crow (*Gymnorhina tibicen*), a good mimic, is a favorite pet. Other crows are sometimes tamed and taught to talk. In Tokyo and other Japanese cities crows are scavengers on the streets.

Crustacea, one of the great groups of animals, characterized by external skeletons and jointed feet. It includes the lobster, crab, barnacle and shrimp. They have two pairs of feelers (antennae) in front of the mouth, breathe by gills attached to some of the legs and have a ladderlike nervous system. As they have a hard, unyielding external skeleton, they can increase in size only by shedding the external skin at irregular intervals. Several thousand species are known.

Cuckoo, a member of large family (*Cuculidae*) of long-tailed, insectivorous birds, distributed nearly all over the world. This group includes about 200 species, more than 40 being native to America. The most familiar varieties in this country are the black-billed (*Coccyzus erythrophthalmus*) and yellow-billed (*C. americanus*) cuckoos, nearly identical in appearance, save for the color of the bill. They are shy, inconspicuous birds, about 1 foot long and grayish brown above and white below. Few birds are more universally known than the cuckoo, but most references in literature are to the European birds, which lay their eggs in other birds' nests and thus avoiding family responsibilities. The American cuckoo is different; its call in no way resembles that of the cuckoo clock, being merely a guttural, unmusical cry. Farmers call it the rain crow, for its cry is supposed to predict rain. The food habits of the cuckoo are extremely beneficial to farmers, for it consumes large numbers of harmful caterpillars and larvae that few other birds would attempt to eat.

Cuttlefish, a mollusk (*Sepia*) with 10 arms around the mouth and the internal shell calcified. This shell, called *cuttle bone,* is used as a supply of lime for cage birds. Cuttlefish have an ink bag, the secretion of which furnishes the pigment sepia (named from the genus name). Cuttlefish are usually less than 18 inches long; they are an important article of food in southern Europe.

Daddy longlegs, see *Harvestman.*

Deer, any cud-chewing mammal of the family *Cervidae,* distinguished from other ruminants by their branching antlers, which in most species are on the male only. They are solid, fall off annually and are renewed with increase of size and number of branches, according to the kind, until the animal has reached old age. Deer are animals of graceful form, combining much compactness and strength with slenderness of limb and fleetness. They use their antlers as weapons of defense and offense; but in general they trust to flight for safety. They have a long neck, a small head carried high, large ears and large, full eyes. Many have scent glands, usually beneath the eyes, which serve to attract a mate.

Deer are found in almost all parts of the globe except Australia and South America, their place in the latter region being supplied by antelopes. The greater number inhabit the warmer temperate countries, and they are chiefly found in wide plains and hills of moderate height. The flesh (venison) of most kinds of deer is highly esteemed for the table, and they have long been regarded as among the noblest objects of the chase. The principal New World varieties are: the Virginia or white-tailed deer (*Odocoileus virginianus*); the mule deer (*O. hemionus*) with very large ears; the blacktail (*O. columbianus*) of Oregon and the far Northwest, sharing the characters of the Virginia and the mule deer; the wapiti (*Cervus canadensis*) or American stag or elk; the caribou (*Rangifer caribou*), an American reindeer; and the moose (*Alces americanus*), the largest of existing deer.

In the Old World are: the red deer (*Cervus elaphus*); the fallow deer (*Dama dama*); the roe (*Capreolus capreolus*); the elk (*Alces alces*), the Old World's largest deer, smaller than the American moose; and the reindeer (*Rangifer tarandus*), the only deer that man has domesticated.

Dingo, the wild dog (*Canis dingo*) of Australia, probably descended from a domesticated breed introduced by early settlers. It is the only dog known to live successfully in both wild and domesticated states. The dingo is about 2½ feet long and 2 feet high, has sharp ears and a long bushy tail. Its general contour is somewhat like that of a fox. The color varies from a light tawny to nearly black. It is a crafty, elusive animal and hunts in large packs, worrying its larger adversaries to death by sheer force of numbers.

Dodo, an extinct large flightless bird related to the pigeons. These birds were formerly quite abundant on the island of Mauritius, but after 1681 there are no records of them. Their size, judged from skeletal remains and a few records, exceeded that of the turkey. The dodo had white underparts and tail and a darker back. The bill was large and ended in a curved hook.

Dog, a carnivorous mammal of the family *Canidae* remarkable for the almost infinite varieties as to size, form, color and quality of the hair that domestication has brought about. The family *Canidae* includes also the jackal and wolf. The parent stock of the dog is uncertain. Some authorities are of the opinion that the breed is derived from the wolf; others, that it is a domesticated jackal. All agree that no trace of it is to be found in a primitive state of nature. That there are wild dogs, we know. The dhole of India and the dingo of Australia are examples that exist in a state of complete independence and throw no light upon the question. A dog will live on cooked vegetable matter but prefers animal food. To drink, it laps with the tongue. It never perspires, but the nose is naked and moist and in hot weather a dog's tongue hangs out. The female goes with young 63 days and usually has about six or eight puppies in a litter. They are blind at birth and do not acquire sight until the tenth day. The dog attains full growth at the expiration of the second year, is old at 15 and seldom lives beyond 20 years. The main classes of dogs are: Eskimo, sheep dogs, greyhounds, mastiffs, terriers, hounds, spaniels and poodles.

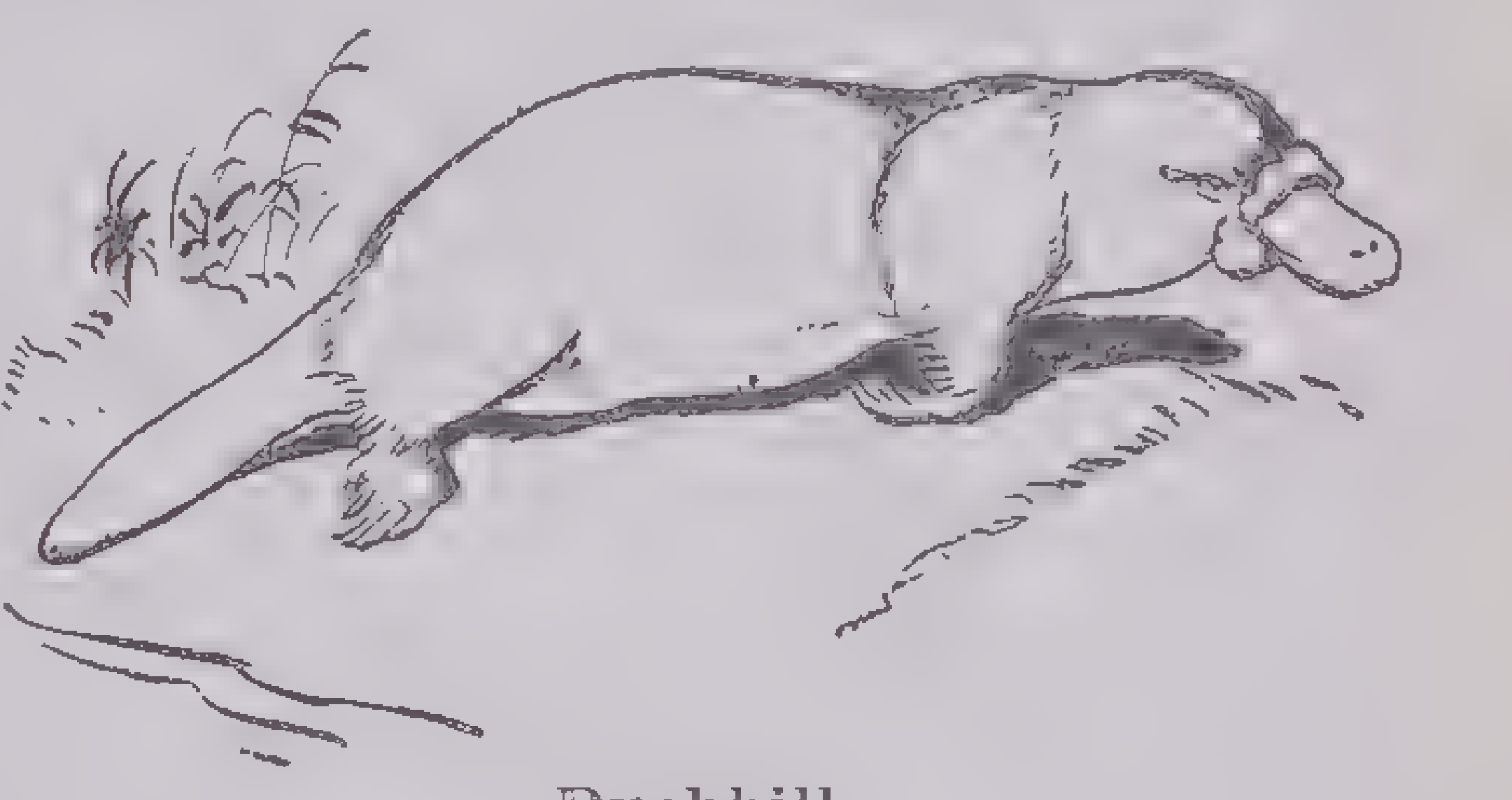
Dolphin, a whalelike marine animal usually with a beaklike snout. Dolphins are found in all seas. They swim in schools and have the habit of leaping far out of the water. The common form is about 7 feet long.

Donkey, see *Ass.*

Dragon fly, an insect (order *Odonata*) with a very long body (2 inches or more) and long, slender, lacelike wings. Though these insects are called *devil's darning needles* and there are various popular notions that they are dangerous, dragon flies can do no harm. The eggs are laid in the water, where the young hatch and live. After a long period of time the larva crawls up the stem of some aquatic plant and transforms into the adult dragon fly. The adults are of value in destroying mosquitoes. They fly at a tremendous speed—perhaps 60 miles an hour.

Duck, any swimming bird of the family *Anatidae.* Most of the species are migratory and some, like the mallard and the shoveler duck, are found in both the Old World and the New. Among the interesting forms are the eiders, found in cold regions and well known from their soft down. The Labrador duck was formerly very abundant but is now probably extinct. Museum specimens of it are far rarer than those of the great auk. The wood or summer duck, common in North America, is possibly the most beautiful species. It is about 20 inches long.

Duckbill, an Australian mammal (*Ornithorhynchus anatinus*), living in streams and feeding like a duck on the organic matter contained in the ooze at the bottom. In accordance with these habits, the toothless jaws are lengthened into a ducklike beak, and the feet are webbed—which gives the animal the variant name, *platypus* (broadfoot). The duckbill does not bring forth its young alive as do most other mammals, but lays eggs. It averages about 1 foot in length. A horny spur on the male's heel is connected with a poison gland.



Duckbill

Dugong, see *Manatee.*

Eagle, any large bird of prey of the genus *Aquila,* belonging to the same family as the falcons and the hawks. Eagles are found in all parts of the globe. The size varies according to the species, but all attain imposing dimensions. The bald eagle (*Haliaeetus leucocephalus,* that is, white head), really a sea eagle, the emblem of the United States, is so called from the white head feathers. The golden eagle (*Aquila chrysaetus*) measures about 3 feet 9 inches in height, and the spread of its wings is nearly 10 feet. It was trained (like a falcon) by the Kirghiz Tatars and used to hunt antelope. The eagle soars at great heights, and its sense of vision is very acute. It builds its nests in the clefts of inaccessible rocks, and generally lays two or three eggs; the period of incubation is 30 days. Besides the bald and the golden eagles, there are other species, such as: the tawny eagle (*A. rapax*) of the Old World; the erne or European sea eagle (*H. albicilla*); and the harpy eagle of the Philippines (*Pithecophagus jefferyi*), which eats monkeys.

Earthworm, any burrowing worm of the family *Lumbricidae,* found in the earth in almost all parts of the world. Earthworms are without eyes or appendages; they live on the organic matter of the soil, to obtain which they swallow earth itself and cast the refuse on the surface. This makes them of great value to the agriculturist, for they work through and loosen the soil. In winter they burrow beneath the frost line. The large numbers frequently seen after a storm do not descend with the rain, as was once believed, but have been drowned out of their holes. Because they are used as bait by fishermen, earthworms are sometimes called *angleworms.* The common earthworm is 3 to 5 inches long; in some tropical countries giant earthworms are 5 feet or more long.

Echidna, an Australasian pouched monotreme, resembling the duckbill in being an egg-laying mammal. It is sometimes called the *porcupine anteater* as its back is covered with spines; it feeds mostly on ants, which it digs out with its strong claws. The echidna is about 15 inches long, lives in a burrow and comes out seldom except at night. The genus *Echidna* is called also *Tachyglossus* (swift tongue), from the long darting tongue with which it licks up ants. The name echidna originally meant adder, and probably it was given to this Australian anteater because its tongue looks dangerous.

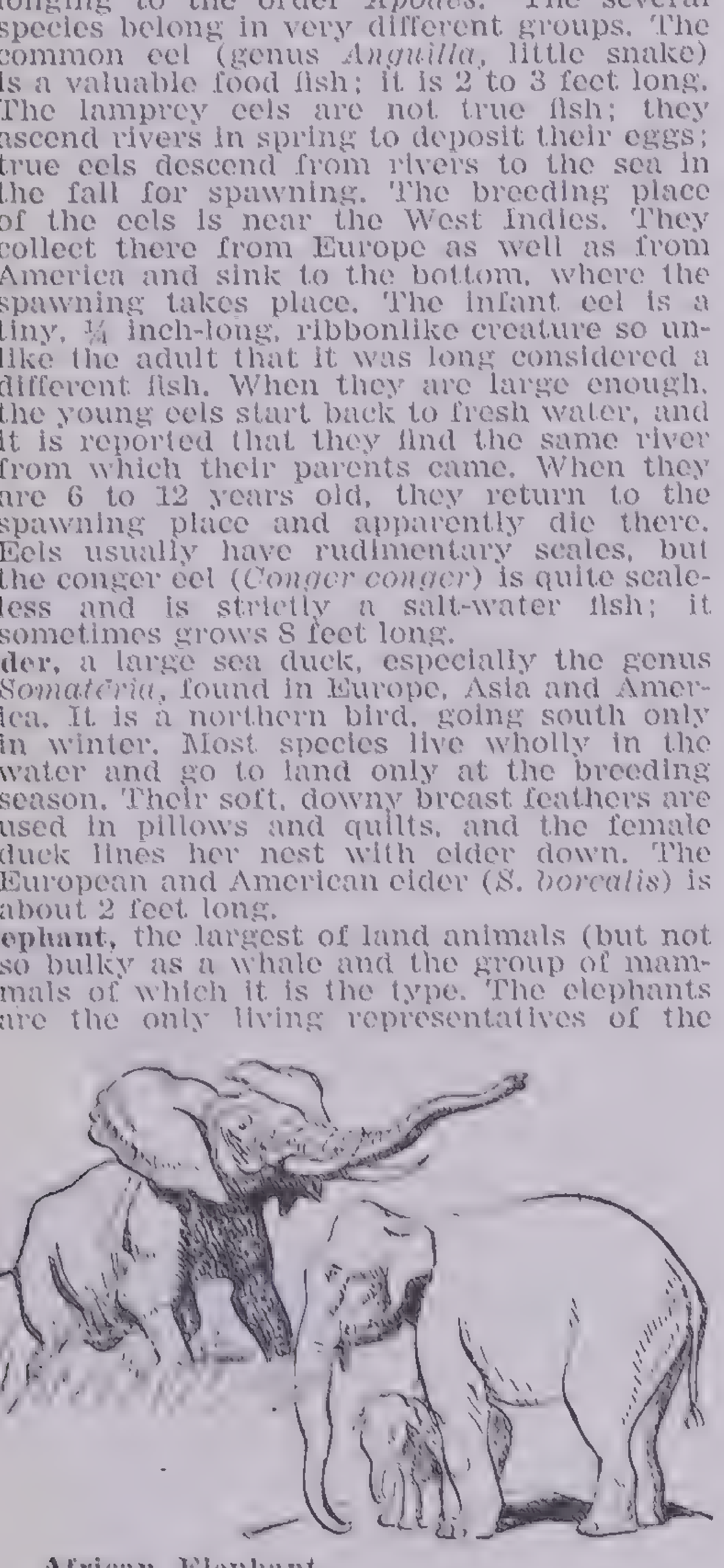
Echinoderms or **Echinodermata** (spiny skinned), a phylum of sea animals in which the body is usually arranged in parts of five around a central disk; there is a chalky spiny skin. The group is world-wide in distribution and contains the starfishes, sea urchins, sea cucumbers, sand dollars and sea lilies. The group as a whole is characterized by having small structures known as *tube feet,* by which they move and obtain food. The feet are controlled by water pressure and act by suction. Hundreds of these feet extend around the animals. The sea urchin is almost spherical; its spines growing from almost all parts of the body. It moves by means of these spines and the tube feet. Sea cucumbers are found buried in the ooze at the bottom of the sea. They are soft bodied, with very rudimentary skeletal parts. When they are violently irritated, they have the curious habit of throwing out the intestine and growing a new one. In some places sea cucumbers grow as long as 3 feet, but ordinarily are much smaller. Sea lilies are among the most beautiful sea animals. They remain attached by a stalk to the sea bottom throughout adult life.

Edentata, a group of mammals in which the teeth are not always lacking (as the name, meaning toothless, would imply) but are imperfectly developed. The Edentata include the armadillos, sloths and anteaters of the New World, the pangolin and aardvark of the Eastern Hemisphere and some fossils, like the glyptodon and megatherium.

Eel, a fish of very elongate snakelike form, belonging to the order *Apodes*. The several species belong in very different groups. The common eel (genus *Anguilla*, little snake) is a valuable food fish; it is 2 to 3 feet long. The lamprey eels are not true fish; they ascend rivers in spring to deposit their eggs; true eels descend from rivers to the sea in the fall for spawning. The breeding place of the eels is near the West Indies. They collect there from Europe as well as from America and sink to the bottom, where the spawning takes place. The infant eel is a tiny, ¼ inch-long, ribbonlike creature so unlike the adult that it was long considered a different fish. When they are large enough, the young eels start back to fresh water, and it is reported that they find the same river from which their parents came. When they are 6 to 12 years old, they return to the spawning place and apparently die there. Eels usually have rudimentary scales, but the conger eel (*Conger conger*) is quite scaleless and is strictly a salt-water fish; it sometimes grows 8 feet long.

Eider, a large sea duck, especially the genus *Somatéria*, found in Europe, Asia and America. It is a northern bird, going south only in winter. Most species live wholly in the water and go to land only at the breeding season. Their soft, downy breast feathers are used in pillows and quilts, and the female duck lines her nest with eider down. The European and American eider (*S. borealis*) is about 2 feet long.

Elephant, the largest of land animals (but not so bulky as a whale and the group of mammals of which it is the type. The elephants are the only living representatives of the *Proboscidea* (animals with a trunk or proboscis). They are confined to the tropical regions of the Old World—India, Burma, the Malay Peninsula and adjoining islands and Africa south of the Sahara. They live in herds in the forests. Only two existing species are known—the Asiatic and the African. In both species the two upper incisors or front teeth are enormously developed, constituting long tusks. The lower incisors are lacking, and there are no other teeth in the jaws except the molars or grinders of which two are usually in use at one time on each side of each jaw. The molars are very large and are composed of a number of transverse plates of enamel united by dentine. As one pair of molars is worn out another pair succeeds it from the bony process at the rear. The nose is prolonged into a cylindrical trunk, movable in every direction, highly sensitive, and ending in a fingerlike lobe. The nostrils are at the extremity of the trunk. The feet are furnished with five toes, but these are but slightly indicated externally; the sole of the foot is formed of a thick pad of skin.



African Elephant **Indian Elephant**

The Indian elephant is the only species that is domesticated. As it scarcely ever breeds in captivity, the demand for it is supplied entirely by the capture of adult wild individuals. The Indian elephant has a concave forehead and small ears; the African elephant has a convex forehead and large ears and is chiefly hunted for the sake of its ivory. There is reason to believe that this pursuit will ultimately end in extinction of this species. A pygmy race of elephants—4 or 5 feet high—half the size of the regular African elephant—is found in the Congo.

Elephants are vegetable feeders, living almost entirely on the foliage of shrubs and trees, which they strip off by means of the prehensile trunk. As the tusks prevent the animal from drinking in the ordinary manner, the water is sucked up by the trunk, which is then inserted in the mouth, into which it empties its contents. Many species of fossil elephants are known, the most familiar of which are the mammoth and the mastodons. The young of the Indian elephants have a hairy covering that sometimes lasts for several years—a remainder from its remote ancestors that lived in colder climates.

Elk, the largest of Old World deer (*Alces alces*), like the American moose but smaller. It is found in the northern parts of Europe and Asia.

Emu, a peculiar Australian bird, similar in habits and appearance to the ostrich. Of all birds only the ostrich is bigger than the emu, which is sometimes 7 feet high. Emus are strong runners and depend upon legs to escape danger; they are native to the level plains of Australia, where they collect in small groups although they are often seen alone. There are two species of the genus *Dromiceius*, one found in eastern Australia and the other, the spotted emu, in western Australia.

Ermine, a member of the weasel group (*Mustela erminea*), the stoat, native to Asia and America, which changes its dark summer coat to white in the winter. Only the white fur is called ermine; it is used to line the robes of royalty and judges. The white fur is usually trimmed with the black tips of the tails for contrast.

Falcon, a bird of prey related to the hawks and eagles. Falcons are often trained to pursue and capture wild game and fowl—the sport called *falconry* in the Middle Ages. They were domesticated by the Persians in 1700 B.C. and by the Chinese even earlier. The falcons proper, for strength, symmetry and powers of flight, are the most perfectly developed of the feathered race. They are distinguished by having: the beak curved from the base, hooked at the point; the upper mandible with a notch or tooth on its cutting edge on either side; long and powerful wings, the second feather rather the longest; and short, strong legs. Most prominent of these birds are the peregrine falcon (*Falco peregrinus*), of which the North American duck hawk is a variety, and the gyrfalcon (*F. rusticolus*), an arctic bird that is more powerful but less speedy than the peregrine.

Finch, any of the singing birds forming the family *Fringillidae*, including buntings, crossbills, grosbeaks, linnets, sparrows and other small birds with stout bills. The sexes may or may not be differently colored. They are to be found in all types of places, but especially in forests and open meadows. Seeds, insects and fruits form the greater part of their food.

Firefly, a nocturnal beetle with light-producing organs on the lower side of the abdomen. Fireflies belong to two families—*Lampyridae*, mostly in temperate climates, and *Elateridae*, large tropical fire beetles. It is thought by some that this lighting power is used by fireflies to attract mates. The nature of the light is interesting, as apparently little or no heat is produced. The light is caused by the oxidation of a secretion called *luciferin*. The luminous larvae are called *glowworms*. In some species the eggs are luminous.

Fisher, see *Marten*.

Fishes (*Pisces*), one of the lowest classes of vertebrate or backboned animals, adapted for an aquatic life, their shape being such as to permit easy and rapid progress through water. They breathe by gills placed on the walls of slits in the sides of the neck, and their appendages (fins) make efficient paddles. There are usually one or more fins in the middle line of the back and one or two in a corresponding position beneath the tail (anal fins); the tip of the tail is terminated by a caudal fin, the chief organ of swimming. The caudal fin presents three different types: In the *diphycercal* fin the backbone is straight at the tip, and the lobes of the caudal fin are equally disposed on its two sides. In the *heterocercal* tail the backbone is turned upward at the tip, this making one lobe, and a smaller second lobe is developed on its under side; this is the type of tail in the sharks. The *homocercal* tail has the same bent backbone as the heterocercal, but the two lobes are equal. Most fishes have the homocercal type. All of the fins are supported by a skeleton of rays, either horny or spinous in character.

There are several great groups of fishes, distinguished by the presence of a cartilage or a bony skeleton, by having the gill slits free or under a gill cover, by characters of the skull, by the presence or absence of an air bladder and by peculiarities of the digestive tract and nervous system.

Several aquatic animals that are not fish have the word fish in their common names; for example, cuttlefish, starfish, jellyfish.

Flamingo, a member of the family *Phoenicopteridae*, beautifully plumaged birds with seven species, one of which occurs rarely in the United States, usually around the southern tip of Florida. The scarlet flamingo, as the American species is called, is bright red with black wings, in adult plumage, and has long black legs and a slender, snakelike neck. The down-turned bill is oddly shaped, with the upper mandible fitting into the lower like an inverted box. The bill is thrust into the mud with the upper mandible underneath, as if the bird were trying to stand on its head, and thus it feeds on the small shellfish and mollusks that constitute most of its diet. Flamingoes nest in colonies often numbering 4,000 or 5,000 on small, isolated islands. The nest is about 1 foot high, made of mud patted into shape by the feet and bill. The eggs are one or two in number.

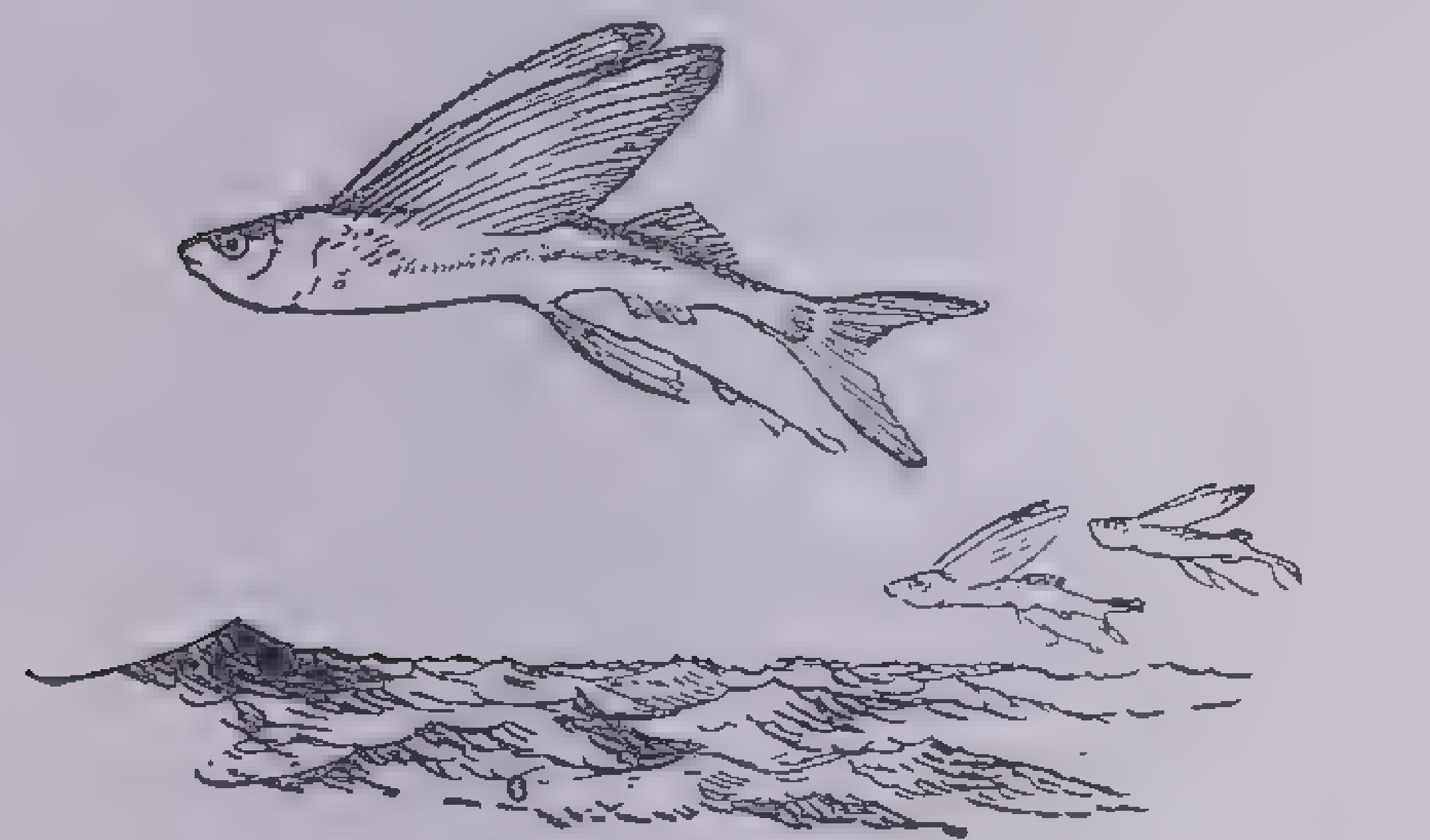
Flatfish, any fish of the order *Heterosomata*, including the halibut and the sole, in which the much-flattened body represents an extreme modification—*Heterosomata* means other or different body. Both eyes are found on the same side of the head. The belly of the flatfish is usually white, and the back often possesses remarkable powers of color change enabling the fish to conform to the color of its surroundings. The young flatfishes swim in the normal position and have an eye on either side of the head. When they are about ½ inch long, they turn on the side and swim flat; at the same time one eye begins to migrate to the other side, and the twisting involved in this change distorts and flattens the bones of the skull.

Flea, a wingless insect of the order *Siphonaptera*. The fleas are bloodsuckers, remarkable jumpers and usually parasites on other animals. They have: a hard skin covered with spines arranged so they can easily work themselves through the hair of the host; legs admirably adapted for jumping; and mouthparts fitted for piercing and sucking. Fleas breed in the cracks in a floor or in some similar place where there is dirt, and when they are mature they attack animals. The irritation and annoyance of their bites make them a nuisance; also it is now known that they are an important agency in the transmission of certain diseases. Bubonic plague is communicated to man by fleas that have bitten infected rats. The fleas that infest cats and dogs belong to the genus *Ctenocephalus*; the *Pulex*, commoner in Europe than in North America, seeks a human host; the chigoe or jigger (*Tunga penetrans*) is a tropical flea, and the female of the species burrows under the skin of its host—man or another animal—and lays eggs there that cause serious irritation.

Fly, a term applied to various insects of different groups, but strictly belonging only to a small family (*Muscidae*) of the two-winged insects (*Diptera*). Besides being known by the number of wings, the group is distinguished by having a metamorphosis, and by its sucking mouthparts. There are from 30,000 to 40,000 species of *Diptera*, but only a few species of true flies, all related to the common housefly (*Musca domestica*). The horsefly (*Tabanus lineola*) and the stable fly (*Stomoxys calcitrans*) are larger and bite severely. So does the much smaller black fly (*Simulium hirtipes*) that lives in the woods. This pest lays its eggs in manure or other refuse; the eggs hatch, pass through various stages and emerge as perfect insects within a few days. Their uncleanly habits make houseflies dreaded agents in the carriage of different diseases, especially typhoid and other fevers that attack the digestive tract. Houseflies are thus not merely to be combatted as a nuisance but as a positive menace to health.

Flycatcher, a small bird with a short, broad bill and long tail, whose food consists mainly of insects caught on the wing. The European flycatchers are songsters and the family name, *Muscapidae,* means flycatchers. Some American warblers are called *flycatching warblers,* especially the Wilson's warbler (*Wilsonia pusilla*) and the redstart (*Setophaga ruticilla:* the first name means moth-eater); but the American flycatchers are not songbirds and they belong to the family *Tyrannidae,* including the least flycatcher, the phoebes and the kingbird. They are grouped as tyrant flycatchers. The group as a whole is found in forest regions; a number of species are native to North America.

Flying fish, any of the various fishes that have the power of sustaining themselves for some time in the air by means of long front fins that act as wings. The name usually refers to the genus *Exocoetus,* which includes perhaps the best-known examples that can maintain their flight as far as 200 yards. Flying fishes leave the water apparently to escape from larger sea animals that feed on them. A few fresh-water fish in western Africa and northern South America fly short distances.



Flying Fish

Fox, a carnivorous animal of which there are several species belonging to the same family as the dog and characterized by a sharp muzzle, long bushy tail and the cunning that has passed into a proverb. The pupil of the eye is elongated, not circular as in the dog, and the ears are triangular and pointed. A very powerful scent is emitted from glands near the root of the tail; this odor is so fetid that even other animals avoid it.

The common fox (*Vulpes vulpes*) is an inhabitant of most parts of Europe and America and extends also into northern Asia. Its senses are extremely acute. It usually remains concealed in a burrow during the day and ventures abroad chiefly at night in search of food. Birds, rabbits or hares constitute its usual prey, but, when pressed by necessity, it will have recourse to other food, especially chickens, so is destructive to poultry. It likes certain kinds of fruit, such as grapes. Though slightly made, the fox has great muscular vigor and bites with much severity. Even when it is taken at a very early age, it is never completely domesticated. Adults placed in confinement show great ferocity and soon die.

Numerous other species of foxes exist, of which the most important are the arctic or white fox (*Alopex lagopus*) and the American red and gray foxes. The arctic fox is remarkable for changing its color with the season, being brown or bluish in summer and white in winter; the soles of its feet are hairy. The red fox (*Vulpes fulva*) found in the northern and middle states is very variable in color and marking, and varieties of it are known by different names. The gray fox (*Urocyon cinereoargenteus*) is common in the Southern States. The furs of all the species are valuable, especially the silver variety of the red fox, a glossy black with some white-tipped hairs. The silver foxes are now raised for the market on fox farms.

Frigate bird, see *Man-of-war bird.*

Frog, the common name for many genera of amphibians, all characterized by smooth skin and webbed hind feet. Frogs are quite widely distributed over the world. They differ from toads in being water animals and better jumpers. The adults lay their eggs in long strings in the water, and from them are hatched out larvae that develop as tadpoles or polliwogs. These are fishlike in having a broad, swimming tail and gills on the sides of the neck. The tadpoles feed upon small aquatic plants that they scrape from sticks and stones with their horny jaws. As they increase in size, the legs grow out and the tail is absorbed. In the growth of the legs, the anterior pair is first formed, but as this pair is at first under the skin, the hind pair seem to be the first to form. With the growth of legs and the loss of tail the gills disappear and the lungs come into use, but most species always remain in close proximity to water throughout life. The adults live on animal food—such as insects, mollusks and small fishes—and do not hesitate to eat their own species. They do much good in keeping down certain species of insects. They are bred for their hind legs, which furnish an article of diet. Frogs are important for physiological investigations, because their tissues have so much vitality.

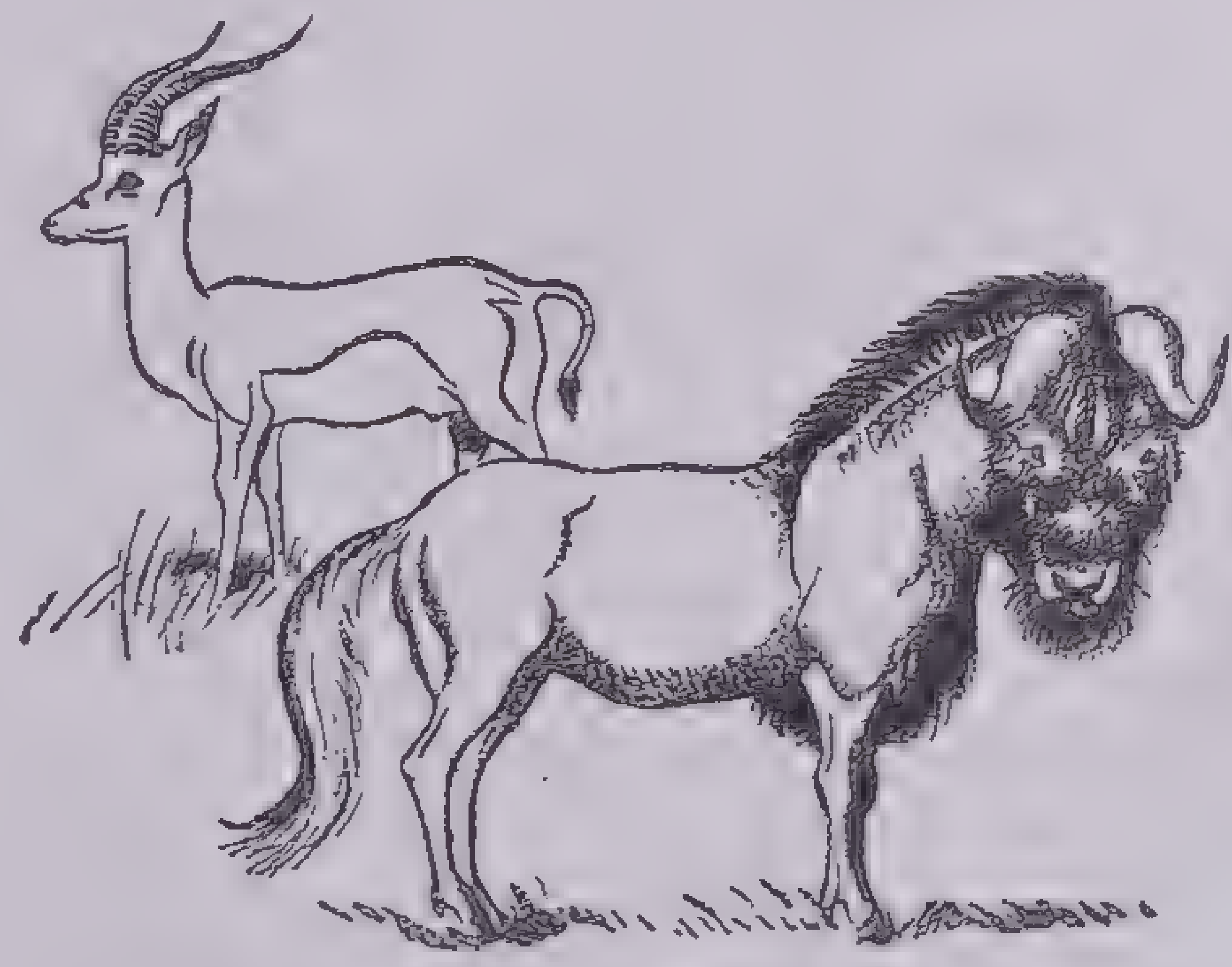
The largest North American variety is the bullfrog (*Rana catesbiana*), 5 to 8 inches long, found almost everywhere east of the Rocky Mountains. The pickerel frog (*R. palustris*) is brown with green spots; and the leopard frog (*R. pipiens*) is brilliantly marked with black spots outlined in white on its bright-green skin.

Fruit fly, a very small insect commonly found around bananas and other fruits in which its larva develops. The Mediterranean fruit fly (*Ceratitis capitata*) is a destructive pest, especially on citrus fruits. Much of what we know today concerning heredity has been learned from a study of fruit flies, especially the genus *Drosophila.*

Gar (from an Old English word meaning pike or spear), a remarkable genus (*Lepisosteus*) of fishes inhabiting the rivers and lakes of North America, and one of the few living forms that now represent the ganoid fishes that were so largely developed in past geological ages. The body is covered with thick, smooth, rhomboid scales, so hard that it is almost impossible to penetrate them. The common gar (*L. osseus*) or *bony pike,* frequent in inland waters of eastern North America, sometimes attains a length of 5 feet and is easily distinguished by the long extension of the mouth region to form a beaklike structure. The alligator gar of the lower Mississippi and of Mexico (*L. spatula*) is larger than the common gar.

Gavial, see *Crocodile.*

Gazelle, any of a genus (*Gazella*) of the antelope family, graceful in shape and remarkable for speed and for large beautiful eyes. It is smaller than the chamois. The color is fawn or dun on the back, separated from the white belly by a brown or blackish band. The horns, stronger in the male than in the female, form the shape of a lyre and were used for lyre frames in early days. It inhabits the large plains and the Saharan region of northern Africa, as well as Arabia and Syria, and lives in herds. The common gazelle (*G. dorcas*) is native to northern Africa; the springbok (*Antidorcas euchore*) of southern Africa is famous for leaping. Other species are: the Indian (*G. bennetti*) and the Persian or goitered gazelle (*G. subgutturosa.*)



Gazelle White-Tailed Gnu

Gibbon, any member of 10 or 12 species of tailless anthropoid apes (especially *Hylobates* and *Symphalangus*) native to southeastern Asia and the East Indies. The gibbon is not so large as its more advanced relatives, the chimpanzees, orangs and gorillas, being rarely more than 3 feet high when standing erect. It has remarkably long arms; the hands nearly reach the ground from an upright position. Living in the forest, the gibbon uses these long arms to great advantage in climbing and swinging from tree to tree, sometimes covering a distance of 40 feet or more in one swing. Although they walk erect gibbons cannot travel with any ease or speed on the ground. They usually stretch their arms overhead to maintain balance. At night they make a loud outcry as they wander in large bands.

Giraffe, the tallest mammal; formerly called *camelopard,* because the neck resembles that of a camel, and the skin is spotted like a leopard. It inhabits various parts of Africa. The height ranges from 15 to 20 feet, the greater part of which is in the exceptional length of the neck. Nevertheless, the giraffe has only seven neck bones, the same as all other mammals. It has an unusually long cylindrical tongue, which is prehensile and is used for stripping the leaves off the trees on which it feeds. When the giraffe grazes on the ground, it must spread its front legs wide apart to reach the surface.

Glutton, see *Wolverine.*

Gnu, see *Wildebeest.*

Goat, any of a genus (*Capra*) of animals closely allied to the sheep, although they do not look alike. Goats have a hairy hide, and both sexes have hollow horns; only the male is bearded. Goats are found in wild mountainous countries where they scramble among the high rocks. The tahr (*Hemitragus jemlaicus*) is a wild goat of the Himalayas that has no beard. The Rocky Mountain goat is really a goat antelope, intermediate between the antelopes and the tahr goats. It is about as big as an ordinary sheep, and it looks like a sheep of the Merino breed with long straight hair. The hair of the Angora goat is woven into a fabric called *mohair;* and the under wool of the Kashmir (or Cashmere) goat makes the fine cashmere for India shawls. The flesh, especially that of the kid or young goat, is much used as food, though rather poor in quality. The milk is very rich and nutritious, more easily digested than cow's milk and often fed to tubercular and other patients as it is free from tuberculosis germs. Many cheeses are made from goats' milk. Some goats yield as much as 4 quarts of milk daily, although the average quantity is only about 2 quarts. The skin is dressed as leather for many uses, particularly for gloves and the finer kinds of shoes. The horns are used to make knife handles, and the fat to make candles.

Goose, any of the web-footed birds forming the subfamily *Anserinae* between the ducks and the swans in the family *Anatidae.* The bill of a goose is not longer than the head, and the upper mandible is slightly hooked at the tip; the legs are farther forward than in a duck, and so better adapted for walking; the neck is moderately long with 16 vertebrae—a character which distinguishes the goose from a swan. In general, geese spend much of their time on land and feed on grass and other herbage, berries, seeds and various kinds of vegetable food. Although they are large and bulky, they have great powers of flight. They strike with their wings in fighting, and there is a hard callous knob or tubercle at the bend of the wing, which in some species becomes a spur. The domestic goose probably originated from the common wild goose, but all the species seem capable of domestication. The graylag goose is almost 3 feet in length from the tip of the bill to the extremity of the short tail; the wing spread is about 5 feet. The weight of the largest bird is about 10 pounds.

Geese are kept for their eggs, for their flesh (a favorite Christmas dish) and for their feathers, which are used for pillows and beds. Quill pens were made from goose feathers.

Wild geese include: the Canada goose or brant; the blue goose (*Chen caerulescens*) and the related snow goose (*C. hyperborea*), both Arctic varieties.

Gopher, a squirrellike animal of the family *Geomyidae* that lives in burrows on the open plains. The name is from the French *gaufre* (honeycomb), alluding to the burrow. Gophers are rarely seen in daylight. Their principal diet is seeds and grain, and their onslaught on seeds and roots makes them a troublesome pest in some localities.

The prairie ground squirrels of Europe and North America, called *spermophiles* (seed lovers) by scientists, are popularly known as gophers, and so are the burrowing land turtles (*Gopherus polyphemus*) of the southern coast of the United States.

Gorilla, the largest of the manlike apes (*Gorilla gorilla*) living in the forests of tropical West Africa. Gorillas reach a height of 5½ feet and a weight of 400 pounds. The arms are shorter in relation to the body than in any other ape. Gorillas are very strong, but they usually retreat before man. They can climb but are far less arboreal than their relatives, the chimpanzees. Usually they make beds of leaves and boughs. Little was known of them until 1859 when Paul du Chaillu, a French explorer, brought skins and skeletons to Europe. They do not thrive in captivity.

Grackle, the common name for certain birds of the family *Icteridae,* common in the United States. The most familiar representative is the bronzed grackle, sometimes called *crow blackbird.* The purple grackle (*Quiscalus quiscala*) is noted for the lustrous nature of its plumage.

Grasshopper, a popular name used in North America for any member of two families of orthopterous insects (*Acridiidae* and *Locustidae*). The *Acridiidae* or short-horned grasshoppers are important economically because they occasionally inflict heavy damage on farm lands and crops in the western United States and in many other parts of the world. The ancient locust plagues of the Old World were probably grasshopper plagues. The most destructive species in the United States is the Rocky Mountain grasshopper (*Melanoplus spretus*). It is almost 1 inch long. Modern methods of combating it include: burning over the land or late fall plowing to kill the eggs; catching the grasshoppers in traps pushed by tractors; and poisoning them with a bait of bran and arsenic.

The *Locustidae* or long-horned grasshoppers include such familiar species as the katydids and tree crickets. The eggs are laid in bunches beneath the ground in autumn and covered with a secretion that hardens into a shell and protects them until hatching time the following spring.

Grebe, a water bird of the family *Colymbidae,* related to the loons and found on all continents as inhabitants of slow streams and ponds. When they are disturbed, grebes usually dive below the surface, where they swim long distances. They are good flyers, however, but have some difficulty in leaving the surface of the water because of their small-sized wings. They feed mainly on small fish, frogs and insects. They build nests near the water and sometimes actually afloat. Some of the species are: the horned grebe (*C. auritus*) of the Northern Hemisphere; the crested grebe (*C. cristatus*) of the Old World; and the western grebe (*Aechmophorus occidentalis*) of western North America.

Grouse, any of a family (*Tetraonidae*) of fowl-like game birds including about 25 species, widely distributed in the Northern Hemisphere and especially well represented in North America. The grouse are rounded, compactly built birds, 13 to 22 inches in length. The plumage is thick and soft, usually brown and reddish in inconspicuous patterns. The short wings are wielded very rapidly in flight with a whirring sound, the birds being capable of great speed and agility over distances up to a few hundred yards. In general grouse prefer the deep woods and spend most of their lives on the ground where their chief food is obtained.

The ruffed grouse (*Bonasa umbellus*), sometimes called partridge in the northern states, is one of the most typical and finest of all upland game birds. The startling roar of its wings as it rises swiftly from nearly underfoot and flies to safety around trees and bushes is known to many sportsmen. The male of this species is well known for its habit, during the mating season, of drumming its wings at some open spot on or near the ground, the sound sometimes carrying a mile or more, and serving as a call to the female or as a challenge to combat for other males. Other members of the family are: the western dusty grouse (*Dendragopus obscurus*); the heath hen (*Tympanuchus cupido*), a smaller form rapidly nearing extinction; the prairie chicken (*T. americanus*), also sadly decreased in numbers; and the ptarmigans (*Lagopus*) of the North, whose brownish plumage becomes pure white in winter and whose feet are feathered. The red grouse, famous game bird of Scotland, is a ptarmigan but does not change its color in the winter.

Guinea fowl, game birds native to Africa and Madagascar, related to the pheasants and forming a subfamily, of the *Numidinae.* There are two main genera—*Numida,* notably the common guinea (*N. meleagris*), ancestor of the domesticated bird; and the helmeted guinea (*N. pucherami*) with a bony head covering; and *Guttera edouardi,* the crested guinea of West Africa. Most of the species of guinea fowl inhabit grassy areas through which they can run easily. They are also raised as domesticated fowls and are excellent eating, much like quail. They are mainly vegetarian, digging and scratching for seeds and roots, and are almost too noisy to be raised on a small farm.

Guinea pig or **cavy,** a small rodent (*Cavia*) native to South America. It has been introduced into Europe and America, where it is domesticated as a pet as it was by the Incas before white men came to America. It possesses a very low degree of intelligence. In its natural home it is gregarious, and is usually found living on dry land covered with low brushwood. The color is variegated; the tail, rudimentary. The wild cavy has small litters, but in captivity the guinea pig is extremely prolific and begins to breed at the age of 10 months, producing several broods in a year; each litter consists of about 8. The popular name is very inappropriate; the animal does not come from Guinea and is not a pig.

Gull, any of the genus *Larus* of large web-footed birds, common about large bodies of water in the Northern Hemisphere. Its color is usually white below with the upper parts varying from a light gray to black. All gulls are much alike in their habits, noisy and quarrelsome, searching the water for any possible scrap of food and often following ships for days. They breed on uninhabited islands. The closely allied terns (genus *Sterna*) are usually smaller and have a forked tail; the gulls' tails are square or pointed. Both are strong fliers but the terns are the more graceful.

Common species are: the herring gull (*L. argentatus*) of Europe and North America; the two black-backed gulls (*L. marinus* and *L. atricilla*); and the kittiwakes of the genus *Rissa.*

Haddock, one of the most important of the food fishes (*Gadus aeglefinus*) closely related to the cod but distinguished by the notched tail and a white line along the side. In habits the two are much alike, both being greedy and both eating anything edible, especially mollusks and crabs.

Hagfish, see *Lamprey.*

Halibut, a large flatfish, usually found with cod and, like the cod, a favorite food for fast days of the Church. The name means holy fish—hali for holy. Halibut usually weigh about 50 to 120 pounds; the largest known weighed 720 pounds. The flesh is white and most excellent.

Hare, any of the genus *Lepus* of rodents, very common in most parts of the world. American hares are usually called rabbits, but the hares do not burrow, and rabbits are found only in Europe and North Africa. The Belgian hare is a true rabbit. Hares feed mostly on herbage, although grain, roots and bark are sometimes eaten. The common American cottontail (*L. sylvaticus*) is a familiar animal all over the country. In the North, the varying hare (*L. americanus*) is a brownish color in summer and a snow white in the winter. In the West and Southwest the jack rabbits, a large variety, hide in the bushes by day and feed on herbage by night. Hares breed very rapidly. Imported into Australia recently they have become a real menace there on account of their vast numbers. Australia exports huge quantities of hares frozen for food; and the fur (like that of the cony or rabbit) is used for felt in the manufacture of hats.

Harvestman, a curious animal (group *Phalangiida*) closely related to the spiders, and commonly called *daddy longlegs.* It differs from the spider in having very long legs and small, often hard, bodies and in its inability to spin webs. A pair of eyes are present on an elevated turret on the back of the animal. Harvestmen are abundant in fields and forests in all parts of the world from May to October. Eggs are laid in the fall and hatch the following spring. A few species sleep through the winter, but the majority of the adults die each fall after the breeding season. Their food consists mainly of small insects and other animals.

Hawk, any of the family *Falconidae* of day-time birds of prey (except eagles and vultures) including falcons, buzzards, harriers, kites and the South American caracaras. Hawks are common in all parts of the world. They are almost wholly carnivorous and rarely take food that has not been recently killed. The plumage is usually brown or white, although gray is not uncommon. The nests are built in trees and on rocky cliffs; occasional ground nests are found. Hawks are both beneficial and injurious. The sharp-shinned hawk (*Accipiter velox*) is a menace to poultry keepers. It is small, measuring only 11 to 13 inches in length. The back is a grayish color with bars of brown; the under parts are whitish; and the feet are yellow. Another species equally destructive to poultry and game is the Cooper's hawk (*A. cooperi*) similar in plumage to the sharp-shinned, but larger. The American sparrow hawk (*Falco sparverius*) is a falcon, resembling the European kestrel. The goshawks (originally *goosehawks*) form the genus *Astur* and are found in the northern United States and in Canada. The marsh hawk (*Circus hudsonius*), one of the harriers, is a highly beneficial bird, as it kills such pests as rats, mice and grasshoppers. It rarely feeds on birds.

Heath hen, see *Grouse.*

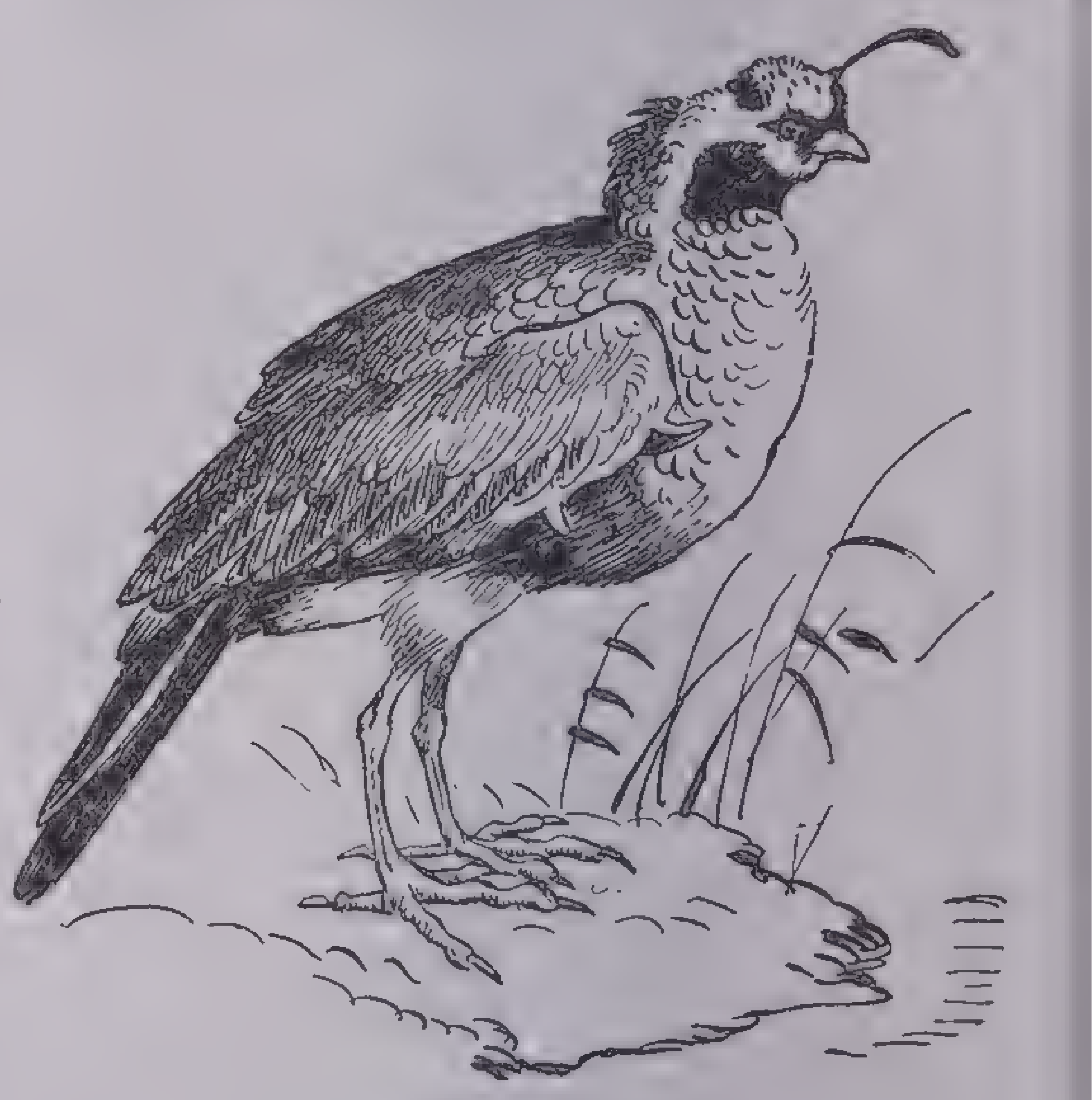
Hedgehog, one of the genus *Erinaceus* of small, insect-eating spiny animals, native to the Old World and sometimes called *urchins.* It can roll itself into a ball and extend the spines outward. Hedgehogs measure from 10 to 12 inches in length; the legs are short, and the snout is long. The spines are usually about 1 inch long. The food of hedgehogs consists mainly of small reptiles, birds and mammals. They are nocturnal in habits, hiding during the day in logs and stumps. During the winter hedgehogs hibernate in protected places. Their flesh is sometimes eaten in Europe. The North American porcupine is sometimes called a hedgehog.

Heron, any of the family *Ardeidae* of long-legged wading birds that are usually found near bodies of water. They are commonly seen standing on one leg in shallow water, although they fly when disturbed. Herons are smaller than cranes but look something like those birds though they are not related to them. They are widely distributed. The egrets are herons with snowy plumes, the aigrettes of the milliner. The snowy, the white and the reddish egrets live in the Southern States. There are two American blue herons—the great blue (*Ardea herodias*), sometimes called blue crane, about 50 inches high, with a black crest; and the little blue heron (*Florida caerulea*), only about 24 inches high. The European heron (*A. cinerea*) is so swift and strong that it was the favorite prey of trained falcons. Herons nest high in trees in structures built of grass and twigs, sometimes in communities called heronries.

Herring, any small soft-finned fish of the genus *Clupea,* found in the North Atlantic and of great economic importance. These fishes occur in large schools, swimming through the sea with open mouths, scooping up the minute life for food. Immense numbers are taken both here and abroad, the annual catch for Europe and America being estimated at 1,500,000,000 pounds. The young also are taken in vast quantities and are preserved as American sardines. In America most of the adults are smoked and dried.

Hippopotamus (Greek for river horse), an animal related to the hogs and peccaries, and belonging to the order *Artiodactyla.* The *Hippopotamus amphibius* of Africa is enormously bulky and unwieldy, attaining a height of 4 feet at the shoulder, a length of 14 feet and a weight of 3 or 4 tons. The feet are massive and are terminated by four toes; the skin is very thick. The hippopotamus feeds upon vegetable substances, such as grasses and shrubs; it dives and swims with great facility. A dwarf hippo is found in the rivers of West Africa. It is called *H. liberiensis* or put in a subgenus *Choeropsis* by itself.

Hoatzin, a strange pheasantlike bird (*Opisthocomus cristatus*) of the American tropics, apparently a link between reptiles and birds. The young birds have a pair of claws or toes on the first two fingers of the wing, so that they can climb easily. The adult bird has a foul smell and is sometimes called *stink bird.*



Hoatzin

Hog, see *Swine.*

Hookworm, any small parasitic worm of several genera (*Necator* and *Ancylostoma,* especially), characterized by spines about the mouth. These worms are found commonly in the soil in warm climates. They bore through the human skin and make their way finally into the intestine. There they cause severe bleeding, which results in marked weakness. The lungs also are subject to attack from larvae in the bloodstream and the victims often contract tuberculosis. Millions of people are affected by this parasite, which greatly reduces the efficiency of dwellers in warm countries with poor sanitation.

Hornet, a large stinging insect of the wasp family (*Vespidae*), gray or brown in color, about 1 inch long with conspicuous white or yellow markings. Members of this family are noted for their irritability and for the virulence of their sting. The commonest species in the United States, *Vespa maculata*, suspends from the limbs of trees its large, papery nest made from wood fibers. The manufacture of wood-pulp paper is based on a study of the process of making these nests. Inside the nest are cells like those of a honeycomb. Hornets eat sweets of all kinds and steal honey from bees; they also feed on other insects. The true hornet of Europe (*V. crabro*) occurs here only in a restricted area near New York city, but the term is loosely applied to a number of stinging wasps.

Horse, a hoofed, herbivorous, nonruminant mammal (genus *Equus*), characterized by a tail with long hair from base to tip, a long, flowing mane, a small bare callosity on the inner surface of the hind leg, a smaller head and ears and longer limbs than have the ass and other related species. It is mentioned throughout the Bible. The native country of the modern horse is central Asia, where the wild horse discovered by the Russian explorer Nikolai Przhevalski and called the *Przhevalski wild horse* had characteristics midway between those of the true horse and the ass.

More fossil horses have been found in the New World than in the Old, and the original form (*Eohippus*, dawn horse) was no larger than a fox. The zebra and the ass belong to the *Equidae* or horse family; all are related to the tapirs and rhinoceroses, forming the order *Perissodactyla*, that is, having an odd number of toes. The horse may have descended from a striped ancestor, for stripes sometimes still remain, especially in duns and mouse-duns.

When the horse was first introduced into the Western Hemisphere by the Spaniards in 1537 at Buenos Aires, no wild horses were in America; but individuals escaping ran wild, and by 1580 their descendants had spread over the continent as far as the Strait of Magellan. The age of a horse is ascertained by examination to see what teeth are developed and to what extent they have been worn away by use. Like other domestic animals the horse has been developed into various breeds, the most celebrated of which is the Arab horse. Great attention is given in the United States, especially in Kentucky, to breeding race horses.

Hummingbird, any of the tiny birds related to the swifts and forming the family *Trochilidae*. It has great delicacy of body and wonderfully brilliant plumage; it is found only in the Americas and in the greatest profusion (both of individuals and of varieties) on the slopes of the Andes just below the snowline. About 18 species are found in the United States, many of them only on the borders of the country. Only one species, the ruby-throated (*Trochilus colubris*), 3¼ inches long and beautifully colored, is found east of Nebraska. The common name is due to the humming noise made by rapid vibration of the wings when the bird flies. The beak is long and curved, allowing the bird to reach into flowers to get the nectar upon which it lives.

Hyena, any carnivorous, doglike animal of the family *Hyaenidae*, inhabiting the semiarid portions of Africa and Asia. The hyena is covered with coarse, bristly hair, short over the greater portion of the body, but forming a mane along the ridge of the neck. The hindlegs are shorter than the fore, giving the body a slope from the withers to the haunches. The hyena is somewhat larger than a shepherd dog. The cheek muscles are greatly developed, and the large grinding teeth have great conical crowns that give them the power to smash the thighbones of animals the size of a horse. All hyenas are nocturnal in their habits. They are useful scavengers.

Hyrax, a small African ungulate that resembles a guinea pig. It is difficult to trap and so has become a proverb of wisdom. Two distinctive species are the klipdas (*Procavia capensis*) of South Africa and the daman (*P. syriaca*) of Syria.

Ibis, any long-legged wading bird of the family *Ibididae*, which comprises about 30 known species of nearly world-wide distribution, four of them occurring in the United States. Within this family a wide variation in color and size is exhibited. The ibis was celebrated in ancient times as the sacred bird of Egypt (hence the family is sometimes called *Threskiornithidae* (birds of worship); and many legendary powers were ascribed to it, among them that of killing snakes. The bird does eat small reptiles.

Perhaps the most striking member of this group, on account of its size, is the wood ibis (*Mycteria americana*), also called *American wood stork*. This majestic bird stands 4 feet high, is white with black tail and wing tips and has long bluish legs and a long probing bill; the head and neck of the adult are entirely bald. It belongs to one of only two species of storks that occur in North America. The birds breed principally in Florida.

The glossy ibis (*Plegadis autumnalis*) is now so rare that only a few pairs breed annually in Florida; but the white ibis (*Guara alba*) is one of the common birds of that state, thousands of them forming rookeries during the nesting season. The white ibis is over 2 feet long with pure white plumage and a few black wing feathers. The face is bare; the legs and the very long down-curved bill are orange. The scarlet ibis (*G. rubra*) of South America and Central America has bright-scarlet wings tipped with black.

Ichneumon, see *Mongoose*.

Ichneumon fly, a parasitic insect of the family *Ichneumonidae* allied to the wasps and bees. Its long, slender abdomen has at the end a long extension by which holes are bored in the body of another insect and eggs deposited there to hatch. Most of the many species are beneficial in killing off injurious insects.

Iguana, a tropical lizard of the family *Iguanidae* found in America and the West Indies. It has a laterally compressed body and tail, and a number of soft spines extend from the head to the tip of the tail and give a crested appearance. The iguanas live mainly in trees, but a Galapagos variety (*Amblyrhynchus cristatus*) lives on the seashore and is partly aquatic. This marine iguana grows to be 4 feet long. Even larger is the common iguana (*Iguana tuberculata*) of Central and South America, which is sometimes 6 feet long. The iguanas look more like the legendary Chinese dragon than real animals. The flesh is delicate and the eggs, almost all yolk, are eaten in Latin America.

Insects, the largest class (*Insecta* or *Hexapoda*) of the animal kingdom both in species (625,000—or two-thirds of all animal species) and in individuals. The *Insecta* are a class of the phylum *Arthropoda*. They are found in all parts of the world and are characterized by having three pairs of legs, hence are called *Hexapoda*, having six legs. Although they are largely terrestrial, some insects have taken to the water; some have become parasitic on other animals. The word *insect* means cut into and so do the first three syllables of the word *entomology*, the science of insects. Both names were given because the body of an insect is sharply divided into three general regions: (1) head, (2) thorax and (3) abdomen. The head contains the mouthparts that are differently constructed in different insects. Some insects, as the beetles, have mouthparts that are constructed for biting; others, as the mosquitoes, possess a sucking apparatus. Insects have three pairs of thoracic legs, and one or two pairs of outgrowths from the top of the back to form wings. The fly group (*Diptera*) has only one pair of wings, but most other groups of insects are provided with two pairs, although some of the simpler forms (*Thysanura*) are wingless. Insects breathe by means of small tubes that extend throughout the body and take air to all parts of the insect. The sense organs of insects are usually in the head. The large eyes are composed of hundreds of units, each complete in itself. There is usually a pair of feelers or antennae that act as tactile organs.

Most insects pass through several stages of development. Upon hatching from the egg the form is known as a *larva*, and in this stage the insect is most destructive, as much eating is done at this time. After it matures the larva spins a cocoon around itself and becomes a *pupa*, which is a quiet stage in which metamorphosis or reorganization of the body takes place, and the pupa transforms into the adult insect or imago.

Insects show a great variety of forms. The fish moths (*Thysanura*), often seen in damp cellars, have an almost white body and no wings. The locusts, grasshoppers, crickets and cockroaches (*Orthoptera*) typically have two pairs of wings, but may be wingless. The beetles (*Coleoptera*) have an outer pair of wings that are modified into hard covers to protect the second thin pair. The bees, ants and wasps (*Hymenoptera*) are famous for the social life that exists in their colonies. The true bugs (*Hemiptera*) may be recognized by wings that are folded across the backs and by sucking mouthparts. The dragon flies (*Odonata*) are ferocious-looking creatures with two pairs of long membranous wings that are held outright, even when not flying. Butterflies and moths (*Lepidoptera*) are familiar everywhere. Fleas (*Siphonaptera*) are parasitic, wingless insects that are often present in the hair on various mammals.

Many insects are harmful and injurious, but many are beneficial. Insect products of commercial importance are silk, wax, honey, shellac and cochineal. Modern paper and rayon manufacture developed from adaptations and imitations of the methods of wasps and silkworms.

Jackal, any of several doglike wild animals native to the Old World, especially the common jackal (*Canis aureus*) of southeastern Europe. In appearance jackals somewhat resemble foxes they are small in size and have erect ears, bushy tails and pointed muzzles. The common jackal has muddy-brown fur fading to yellowish underneath. It is nocturnal in habits, coming forth at night from holes and burrows to hunt in packs. Eight or ten jackals are able to run down and slaughter a deer, antelope or other large animal. The jackal also feeds on carrion, mice, lizards and some forms of vegetable matter. It intermingles with domestic dogs, and certain breeds of the latter seem to reflect this influence in their traits and appearance. The jackals differ from dogs in tooth structure.

Jaguar, a carnivorous mammal (*Felis onca*) of the cat family, somewhat larger than a leopard, with a tan or brown skin beautifully marked with large dark rosettes. The jaguar is one of the most formidable beasts of prey found on the American continent. It is typically South American but is found as far north as Texas. The banks of rivers are its favorite haunts, where it preys on such animals as the tapir and water hog or capybara. It kills its victim by leaping on the back and breaking the neck by twisting it with heavy powerful paws. The jaguar is a noisy animal and roams abroad at night, especially before the approach of bad weather. It is an expert climber and swimmer and sometimes catches fish for food.

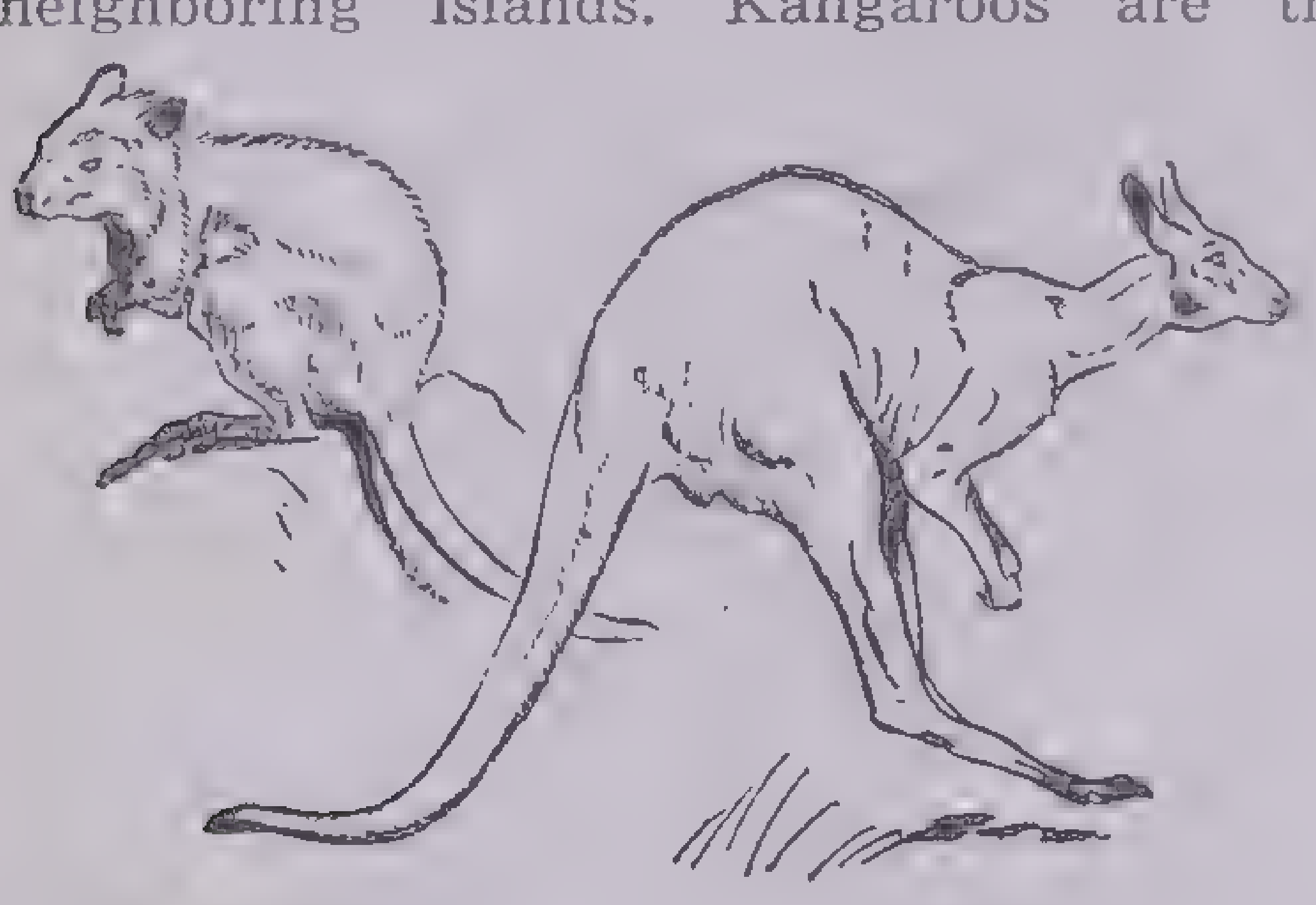
Jay, any bird of the crow subfamily *Garrulinae*, noted for its harsh voice. Jays are smaller and more brightly colored than the crows and are found throughout the temperate and tropical zones. The common blue jay (*Cyanocitta cristata*) of the East has beautiful bright-blue plumage and a very harsh cry. Besides the blue jay's ordinary call, a raucous yell, he has (rarely) a sweet note and the gift of mimicry; sometimes he frightens small birds with a cry something like that of the sparrow-hawk. The Canada jay (*Perisoreus canadensis*) has sooty plumage and no crest. It is an accomplished thief from hunters' and prospectors' camps; it is called *moosebird* or *whisky-jack*. The California jay (*Aphelecoma californica*) has no crest, is bluish and brownish gray and robs fruit and nut trees. Nearly all jays destroy smaller birds and their eggs.

Jellyfish, marine animals, not fish but free-swimming coelenterates of a jellylike transparent substance. They belong to two classes —*Scyphozoa* and *Hydrozoa*—of the *Coelenterata*. They all have a more or less bell- or umbrella-shaped body with a proboscis that hangs down in the place of the handle of an umbrella or tongue of a bell. The mouth is at the end of this handle and leads into a stomach that divides and sends out branches like the ribs of the umbrella to the margin. Most of the species start in life as buds from animals in the fixed stage. These buds later separate and lead a free existence, swimming by opening and closing the bell. Jellyfish produce eggs from which the fixed stages arise. They have nettling organs that are used for defense and to kill their prey and in some species strong enough to cause severe irritation to man. These long hairlike filaments that hang round them have given one group the name *Medusae* from Medusa in Greek myth whose hair became writhing snakes.

Some Oriental jellyfish are used for food, but they are so largely composed of water that little is left of them when they are dried.

June bug or **May beetle,** any of a group of clumsy brown beetles a little less than 1 inch long, sometimes called *bumping bugs*. They are familiar throughout the United States in late spring. The adults swarm in the evening, often inflicting considerable damage on shrubs and young foliage. The larvae are white grubs that pass a year or more in the ground, feeding upon grass roots and shoots. The commonest genera known by these names are *Phyllophaga* and *Cotinis*. They are attracted to light and may often be seen on spring nights, buzzing around lamps and occasionally tumbling to the floor.

Kangaroo, any of a genus (*Macropus,* literally, long leg) of pouch-bearing (marsupial) mammals peculiar to Australia and the neighboring islands. Kangaroos are the most highly developed members of the order, *Marsupialia*. The family *Macropodidae* includes many relatives of the kangaroos, over 50 species—wallabies, tree kangaroos and others. The great kangaroo (*M. giganteus*) is typical of the genus. It was formerly plentiful over the plains but it is now retiring before the colonists.



Kangaroo Rat **Giant Kangaroo**

The forelegs of the kangaroo are small; the hindlegs very large and thick; the head is small, with rather long ears and a long, dusky-brown muzzle; the body long, with the fur shortish but thick, and of a gray-brown tint. It is sometimes 8 ft. tall. The female carries her young in a pouch (the marsupium) on the underside of the belly. When the kangaroo moves quickly, the hind limbs alone are brought into action, and by means of these the animal bounds along in great leaps of from 10 to 15 feet, the body being carried in a nearly horizontal position, and the tail extended to balance it. The forepaws are chiefly used for handling, and with these the females lift their young and place them in the pouch. The kangaroos are vegetable feeders. Leather made of kangaroo skin is very soft and pliable and is used in making shoes and gloves.

Katydid, the popular name for several varieties of large grasshoppers, native to North America. In many parts of the country their loud, rasping "ka-ty-did" notes are the most familiar sounds of a summer evening, being audible for ¼ mile or more on quiet nights. The sound is produced by rubbing together the wing covers, and is noticeably different in the daytime from the ordinary song heard at night. The katydids resemble common field grasshoppers in structure but are larger—almost 1½ inches long—with bright-green bodies and long antennae.

Killdeer, an American plover (*Aegialitis vociferus*) common in the Mississippi Valley.

Kingbird, an American flycatching bird of the tyrant (*Tyrannus*) group, common almost everywhere in the United States east of the Rockies. The common kingbird (*Tyrannus tyrannus*) is about 8 inches long, crested, dark gray with white underparts and a white-tipped tail. It is famous for defending any attack on its nest. Rather larger is the gray kingbird (*T. dominicensis*) that visits only the Southern States. Yellow underparts are distinctive of the Arkansas kingbird (*T. verticalis*) and Cassin's kingbird (*T. vociferans*), both western birds. It ranges over the greater portion of temperate North America. It is commonly found in trees, from which it ventures to catch flying insects that form most of its foods. Its note is rather harsh and shrill.

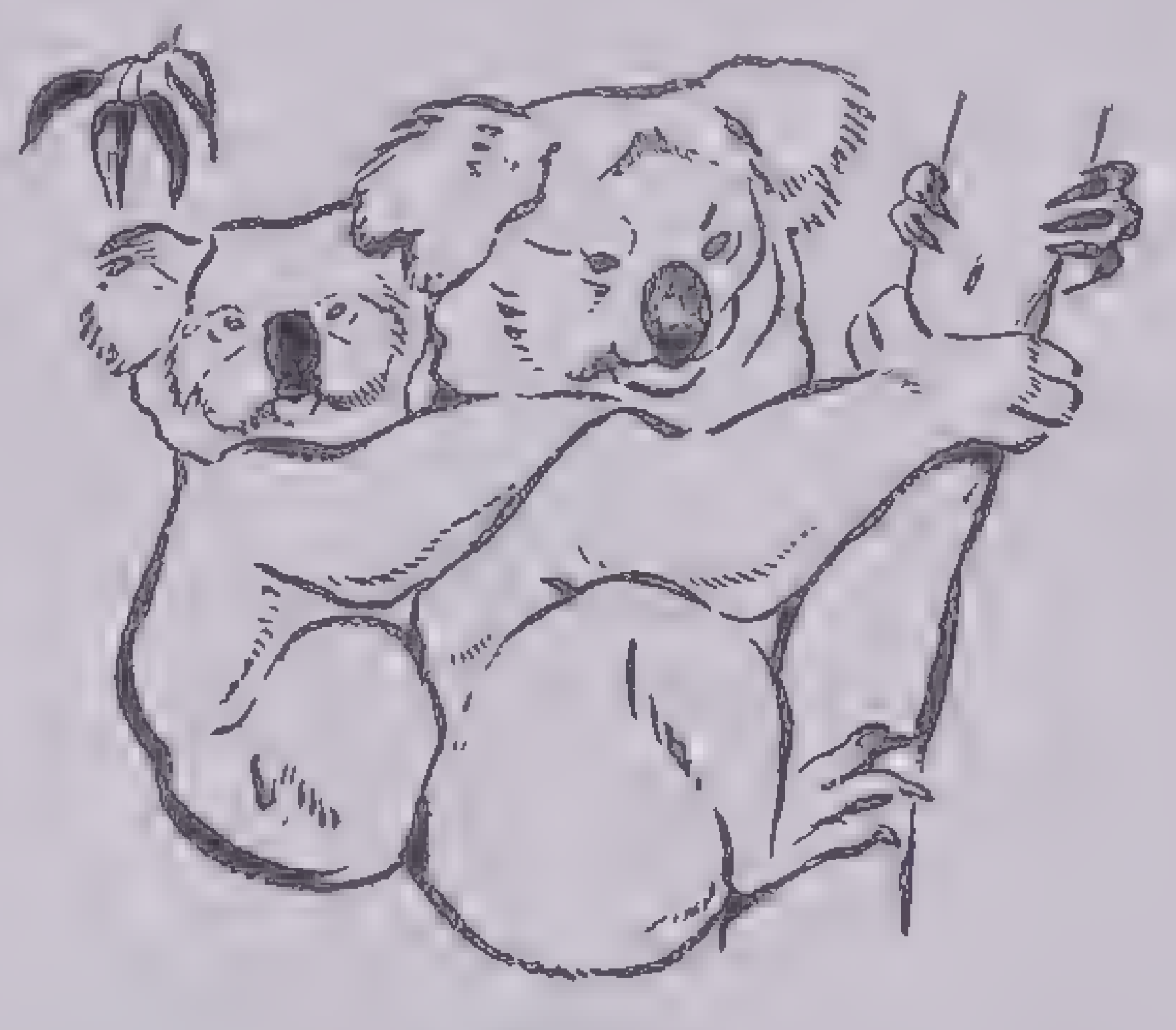
Kingfisher, a crested, large-billed bird feeding on fish, reptiles and insects and belonging to the family *Alcedinidae*. The belted kingfisher (*Megaceryle alcyon*) is about 1 foot long with a rather topheavy look as the tail is short and the large head is crested. Its food is mainly small fish, which the bird gets by diving. Insects also are sometimes eaten. Kingfisher nests are usually built in tree trunks or in the banks of streams. The Australian laughing jackass is a kingfisher.

Kinkajou, a member of the genus *Cercoleptes* of flesh-eating mammals of tropical America, related to the raccoons. It lives in trees, hunts by night, eats eggs and honey as well as flesh and is sometimes called *honey bear*. The kinkajou is about as big as the house cat, has soft wooly fur and is easily tamed.

Kite, a bird of prey of the hawk or falcon family (*Buteonidae* or *Falconidae*). There are four species of kites common to the United States, varying in length from 14 to 24 inches, all of them strong and graceful in flight; they have long wings, curved beaks and powerful talons. The longest species, the swallow-tailed kite (*Elanoides forficatus*) about 25 inches long, spends most of its life on the wing, often in flocks of 20 or so. It feeds upon snakes, lizards, frogs and other small reptiles, also grasshoppers, caterpillars and grubs. This bird is solid black on top, with head and under parts pure white. The wings are very long, and the tail is deeply forked. In flight it is as graceful as a swallow, and few birds equal its speed. The other species, differing in plumage but generally similar in form and habits, are: the white-tailed kite (*Elanus leucurus*), Mississippi kite (*Ictinia mississippiensis*) and Everglade kite (*Rostrhamus sociabilis*).

Kiwi (from its cry), a strange New Zealand bird of the Ratitae division, related to the ostrich, emu and cassowary but much smaller, about the size of a domestic hen. The kiwi cannot fly and has practically no wing development. The wing stubs are only 3 inches long (hence the genus name *Apteryx*, wingless); and the feathers are hairy and have no aftershaft or accessory plume. The kiwi has a long sharp beak and is the only bird with nostrils opening at the tip of the bill. It taps with its bill to test the ground before him—like a blind man with a cane. The kiwis are nocturnal. They feed on earthworms. The female lays two eggs for a setting, and the eggs are larger in proportion to the bird's size than those of any other bird.

Koala, an Australian marsupial (*Phascolarctos*, meaning pouched bear) that looks like the toy called a *teddy bear*. It is 1 foot high at the shoulder and about 2 feet long; has soft, wooly grayish fur, remarkable hands with thumb and forefinger both opposable to the other three fingers; lives in eucalyptus or blue-gum trees and feeds on their leaves. It is prized for its flesh and as a pet. The young koala is carried in the mother's pouch or on her back.



Koala

Kudu, a large African antelope (*Strepsiceros kudu*) found in the deep forests from Abyssinia to Cape Colony, although now nearly extinct in the latter region. Unlike most other antelopes, it is heavy and rather ungainly in appearance. It is almost 5 feet high at the shoulder and 8 feet long, excluding the long, tufted tail. The male has massive, beautifully curved horns nearly 4 feet long and spirally twisted—*Strepsiceros* is Greek for twist horn. The thick coat is grayish brown with a white stripe down the middle of the back and a number of vertical stripes down the sides. The kudu ranges in small groups and its elusiveness makes the trophy of its magnificent horns very difficult to secure. A smaller kudu (*S. imberbis*), about 3½ feet high at the shoulder, lives in East Africa only.

Lac bug, see *Cochineal*.

Ladybird, ladybug or **ladybird beetle,** a small, brightly colored round-backed beetle (family *Coccinellidae*) found in temperate and tropical climates. Most ladybirds eat smaller insects and larvae and are of great value in destroying plant lice and scale insects. A few ladybirds eat plants. The commonest American species is *Coccinella novemnotata*, black-spotted on orange. An Australian ladybird *Vedalia cardinalis* was brought to California to fight the cottony cushion scale (also from Australia) that threatened the orange orchards. Five hundred ladybirds and their descendants in a few years checked the ravages of the scale insects.

Lamprey, an eel-shaped animal (order *Petromyzontes*) that lives in the sea but goes to fresh water to lay its eggs. The large sea lamprey (*Petromyzon marinus*) is nearly 3 feet long. It has no lower jaw; its mouth is permanently open and is lined with horny teeth by which the animal fastens itself to other fishes, on the blood and mucus of which it lives. It has a single nostril and seven gill openings on the side of the neck. A fresh-water variety the mud lamprey (*P. wilderi*) is found in the northeastern states. The Romans prized lampreys as a luxurious food, kept them in large private pools and occasionally fed disobedient slaves to them.

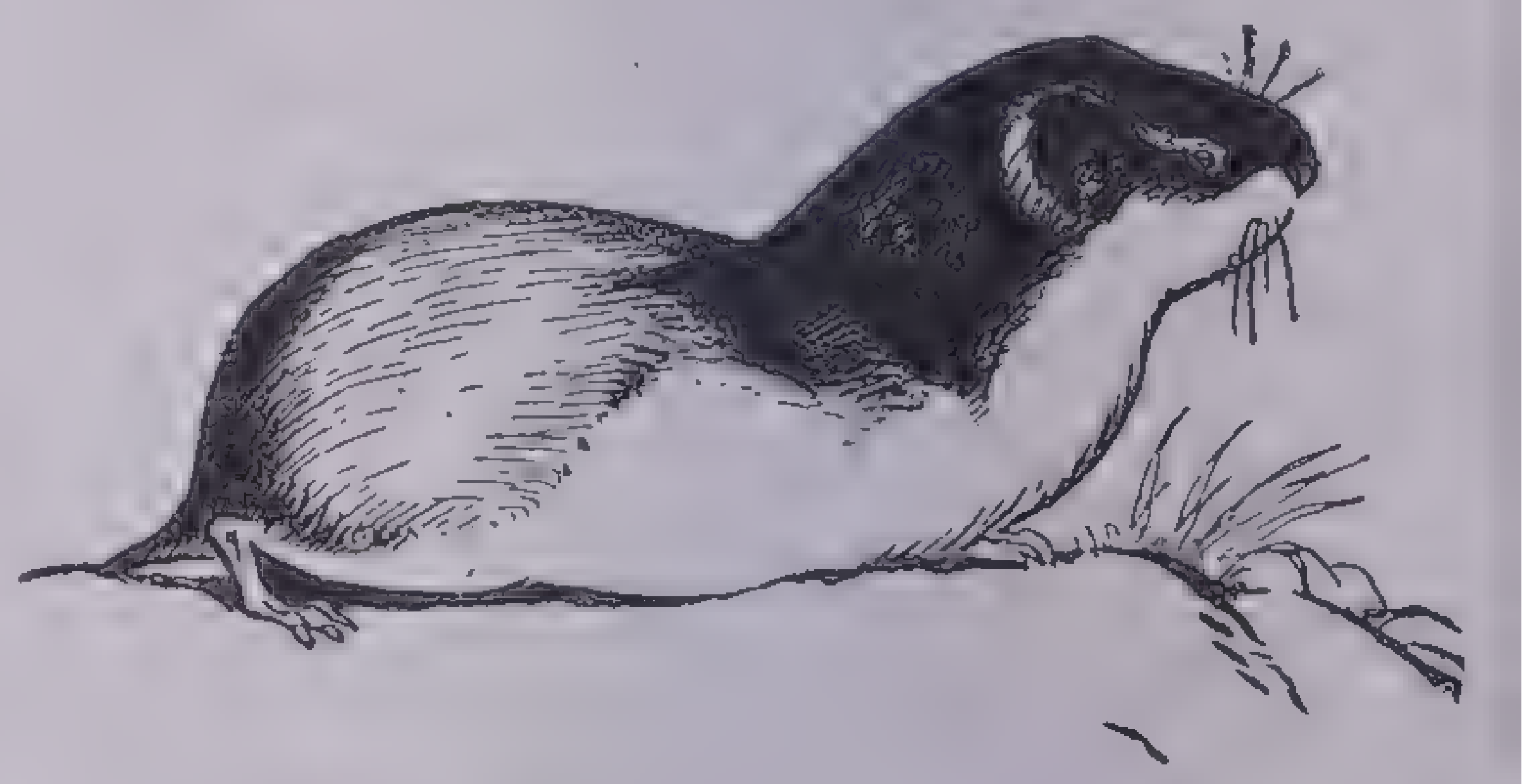
Allied to the lampreys are the hagfishes (genus *Myxine*), which become true parasites, entering the body of a fish through the gills and completely devouring the flesh in a single night. The hagfishes are not common on our east coast; they are more abundant in Europe and in California.

Lark, a name applied to two genera of singing birds: the *Alauda*, European, of which the skylark is typical; and the American meadow lark, *Sturnella*. The skylark of Europe, the most harmonious of this musical group, begins its song early in the spring and continues to sing the whole summer; it is one of the few birds that sing on the wing. When it first rises from the earth, its notes are feeble and interrupted; as it ascends, however, the song gradually swells to a full tone, and long after the bird is lost to the sight, the notes continue to charm the ear with their melody. The lark mounts almost straight up, but descends in a glide. If there is danger, it falls suddenly. It is about the size of a sparrow, quietly colored in brown, buff and creamy white and is prized as food. The eastern meadow lark of North America (*S. magna*), about the size of a robin, is streaky brown with a yellow breast and a black V on its throat. It somewhat resembles the skylark in its habits, but the song is a little sharp and not so sweet. The western meadow lark (*S. neglecta*) is smaller and a sweeter singer with a flutelike note. The horned lark (*Otocoris alpestris*), found both in Europe and North America is only a little smaller than the meadow lark and is a true lark of the *Alaudidae*.

Laughing Jackass, a large Australian bird (*Dacelo gigas*) as big as a crow and related to the kingfishers. Its Latin name *Dacelo* is an anagram of *Alcedo*, the Latin name for the kingfisher. The popular name comes from the bird's loud braying cry, which is like a noisy laugh. It utters this call at nightfall and at daybreak.

Leech, a flattened worm (class *Hirudinia*) found almost entirely in fresh water, though in Asia there are species that live on the land or in trees. The leech has a sucker at either end of its body. The anterior sucker surrounds the mouth and in some species has radiating from it three jaws, each like half a buzz saw. With these the leech cuts the skin of animals of a higher order, sucking their blood through the wound. Half a century ago fresh-water leeches 2 or 3 inches long were extensively used by physicians to relieve certain diseases by bloodletting, but since it was found that the human system needs strengthening not weakening, the use of leeches has ceased.

Lemming, a mouselike animal found in northern Europe and Asia. The Norway lemmings (*Lemmus lemmus*), about 6 inches long with a heavy, rounded body, short legs and a large head, are famous for their great migrations that occur periodically every 8 to 10 years. In these migrations huge numbers of lemmings start for the coast, do not stop even for the waters of the ocean but plunge in and are drowned. These hordes destroy much grain and other crops. Another genus (*Dicrostonyx*, meaning forked claw) is the pied lemming that turns white in winter.



Lemming

Lemur, a monkeylike animal native to Madagascar. Little is known of the lemurs' habits. They are mostly arboreal and nocturnal. The tail is long in proportion to the body. The eyes are very large and present a staring appearance that gives them their name—Latin for ghost. Lemurs are both vegetable and animal feeders. For the flying lemur, see *Colugo.*

Leopard, a catlike animal (*Felis pardus*) that differs from the jaguar in having small spots thickly set, the jaguar's spots being large and open. The species is a native of both Africa and Asia. The body of this fierce and rapacious animal is about 4 feet long. It can take surprising leaps and can swim and climb trees. The larger leopards are often called *panthers,* and this name is applied also to the American puma and jaguar. The word panther originally meant all-wild, as if a combination of the wildest qualities.

Lion, a large carnivorous mammal (*Felis leo*), the largest and most majestic of the cat family. It is nearly a uniform tawny or yellowish, paler on the under parts; but the immature lions show stripes like a tiger's and some spots like a leopard's. The male usually has a great shaggy, flowing mane and a long tufted tail. The whole frame is extremely muscular, and the foreparts, in particular, are remarkably powerful. The heavy shoulders, large head, bright eye and copious mane give the animal a noble appearance that has led to its being called the *king of beasts.* A lion of the largest size is not so big as a tiger. It measures about 8 feet from the nose to the tail, and the tail measures about 4 feet more. The lioness is smaller, has no mane and is of a lighter color on the under parts.

The strength of the lion is such that it can carry off a heifer as a cat carries a rat. It is chiefly an inhabitant of Africa, although it is found also in Asia, particularly in certain parts of Arabia, Persia and India. It was anciently much more common in Asia and was found in some parts of Europe (Macedonia and Thrace), according to Herodotus and other authors. The lion is an inhabitant of open plains in which the shelter of occasional bushes and thickets may be found. It hunts mostly at night and has a terrifying roar. It is easily tamed if it is taken young and abundantly supplied with food.

Lizard, a four-footed reptile (group *Lacertilia*) found in warm climates and especially abundant in the tropics. The body is covered with scales on both back and belly, and the head is covered with larger plates, called *scutes.* Some legless lizards are often mistaken for snakes. Most lizards are insect eaters and thus do much good.

Only a single one, the Gila monster (*Heloderma*), is poisonous. Some of the larger tropical species are used as food. Some species can change color to correspond to their surroundings. This is most marked in the chameleons of Africa and exists to a less extent in some American species that are popularly called by the same name. The change of color is due to the enlargement or contraction of small colored bodies in the skin. Among the interesting lizards are the horned toads of the Southwest; the glass snakes, footless lizards whose tails are very brittle and break off at slight provocation but grow again; the frilled lizard of the East, which has a wondrous collar that it raises when it is alarmed; and the geckos of southern Europe, which have adhesive, suckerlike disks on their feet and crawl about on the ceilings of the rooms, uttering the cry that gives them their name.

Llama, a cud-chewing animal of Peru, allied to the camels but without a hump. It is about the size of the common deer but has a longer neck; it serves as the native beast of burden and is capable of carrying 150 pounds.

Fine cloth is made from the long hair of the coat of the llama, which is allied to the alpaca. Both defend themselves by spitting and biting.

Lobster, a salt-water shellfish (genus *Homarus*), Old World and New, used for food and distinguished by the exaggerated size of the front pair of claws or legs, one of which is larger than the other. The other four pairs are small and are used in walking. At the front of the head are two pairs of feelers, which are sensory, and a pair of eyes on the ends of short stalks. Lobsters are fond of decaying fish, and are among the scavengers of the sea. They are caught in large traps, called *lobster pots,* made of lath and baited with decaying fish. The number of lobsters taken is enormous, but overfishing has greatly reduced the numbers in the sea, so that almost everywhere laws have been passed to protect them. The annual catch on the New England coast is estimated at about 30,000,000 pounds, the average weight of a lobster being between 2 and 3 pounds. The American variety is *H. americanus;* the European, *H. vulgaris.*

The spiny lobster or sea crayfish has 10 legs that are much the same size. Several varieties of this genus *Palinurus* are: in the Mediterranean *P. vulgaris,* the langouste of French menus; the Bermuda lobster *P. argus;* and the Cape lobster *P. lalandii* of South Africa.

Locust, a loosely used term, correctly applied only to orthopterous insects of the family *Acridiidae* or short-horned grasshoppers. Locusts were eaten in the East. John the Baptist ate locusts and wild honey, and locusts were allowed as food among the early Hebrews (Leviticus 11:22).

Loon, any of three or four species of large, ducklike water birds (genus *Gavia*) found in northern North America. The loons are a primitive group, closely resembling in structure the fossil remains of birds of past geologic ages. They are noted for their speed and agility in swimming and diving; some gunners think the loon can see a bullet coming and dive in time to avoid it. Loons spend nearly their whole lives on the water. They are clumsy and awkward on land. They cannot take flight from land at all, and even from water they must run along the surface with frantic flapping of their short wings. They are rather solitary birds, and their favorite haunts are in wild places unfrequented by man.

The common loon or great northern diver or embergoose (*G. immer*) is 28 to 36 inches long and weighs from 8 to 12 pounds. The general color is grayish above and whitish underneath, although there is some seasonal variation. The general contour of the loon resembles a duck, but the bill is longer and somewhat pointed. The cry of the loon is an uncanny sound, sometimes likened to laughter of the insane. Its principal food is fish, which it captures by diving and swimming under water with the aid of the wings. While it is swimming, the loon can submerge gradually until only the head is above water.

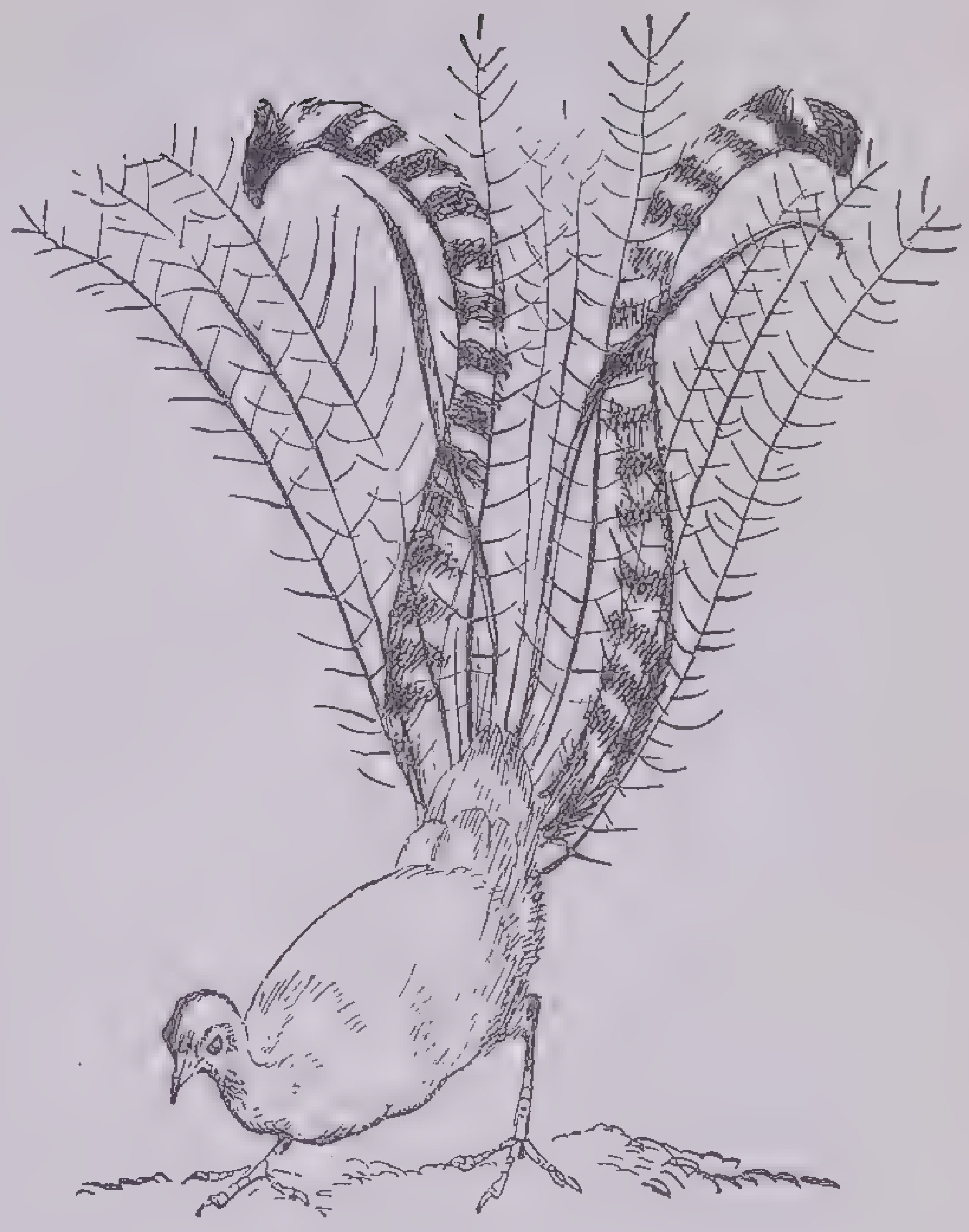
Lungfish, a fish that can withstand considerable drought; a subclass called *Dipnoi* or double breathers because they have a lung or pair of lungs as well as gills. They live in rivers and ponds that dry up for part of the year. When the dry period comes, the fish burrow into the damp earth and breathe by means of air bladders that are similar to lungs. When water again appears in the river, the fish leave the burrow, and the gills function as in other fish. Other lungfish are: the barramunda (*Neoceratodus*) of Australia, a large food fish 6 feet long with red flesh something like salmon; the *Lepidosiren* of South American river swamps; and the *Protopterus* of central and western Africa. None of the lungfishes has a well-developed system of fins.

Lynx, any of a genus of wildcats, represented by several species in the United States, distinct from other members of the cat family (*Felidae*) in having sturdy bodies higher in the back than in front, thick, strong legs, long, bushy fur and very short tails. An upright tuft of hair projects from each ear tip. The American lynx, now nearly exterminated in all thickly populated sections, formerly ranged over the whole of North America. There are two principal species, each showing wide variations in structure and coloration—the Canada lynx (*Lynx canadensis*) or catamount and the southern lynx, bay lynx or bobcat (*L. rufus*). The length varies from about 30 to 40 inches. The lynx is mostly nocturnal in habits; is notorious for raids on poultry and is a terror to most denizens of the woods. The northern variety, larger and darker in color than its southern relative, is trapped in large numbers for its fur.

Lyre bird, an Australian bird (genus *Menura*), the mature male being remarkable for the brilliant and showy tail feathers that grow in the shape of a graceful lyre. The tail measures 25 inches, about two-thirds the length of the bird. The female has a long straight tail. The lyre birds are forest dwellers and live on the ground. They dig their food, which consists of insects, centipedes and other burrowing forms.

Macaw, see *Parrot.*

Mackerel, an important food fish (*Scomber*) found in the North Atlantic and characterized by the slender shape, the series of little finlets on the tail and the deeply notched caudal or tail fin. It is taken both by hooks and by seines. A mackerel fleet from Gloucester, Mass., follows the fish up the coast in their spring migration to the St. Lawrence River, which they reach in May. Besides the common mackerel (*S. scombrus*), other fish called mackerel are: the Spanish mackerel (*Scomberomerus maculatus*) 6 to 10 pounds, common in Southern waters on the Atlantic coast; and two tunas—the horse mackerel and the smaller frigate mackerel. Some are eaten as fresh fish and some are salted.



Australian Lyre Bird

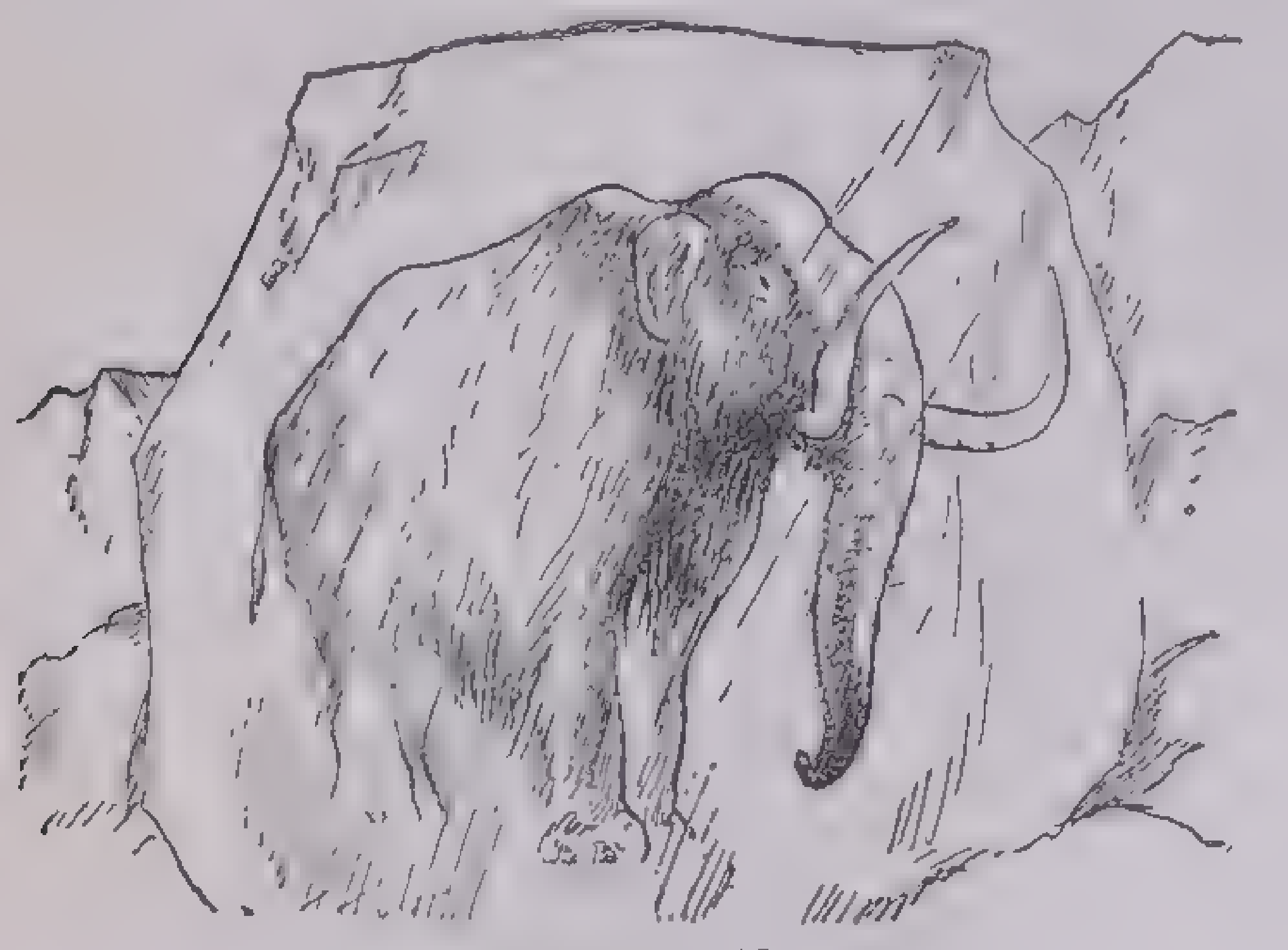
Magpie or **pie,** any of a genus (*Pica*) of birds belonging to the crow family and related to the jays. They are mostly black and white, and the name of the bird gives us the words *pied* and *piebald,* meaning varicolored. There are several species, two of which belong to America: *P. hudsonica,* much like the European pie, and *P. nuttalli,* the yellow-billed magpie of California. The common European magpie (*P. caudata*) is about 18 inches long; the plumage is black and white, the black glossed with green and purple; the bill is stout, and the tail is very long. The magpies continue in pairs throughout the year and prey on a variety of food, chiefly animal. They are determined robbers of other birds' nests, destroying the eggs and young birds. In captivity they are celebrated for their crafty instincts and for their power of imitating words. They were household pets in England for a long time, and it seems that they were usually called Mag or Margaret (just as a parrot is called Polly), and that syllable was prefixed to pie, which is from the Latin *pica.*

Mallard, a duck (*Anas platyrhynchos*) that flocks in numbers in the Northern Hemisphere and one of the most important ducks to man. The mallard and the black ducks are the common wild ducks of North America. A majority of the domestic breeds raised for food are descended from mallards, which are hardy and prolific, interbreeding freely with other species. The true mallard is a large, handsome duck, about 2 feet long and sturdy in structure. It is readily identified by its glossy green head, which in some lights has a purplish tinge. The bill is yellowish green and broad (*platyrhynchos* means broad bill). The neck is ringed with white, the back is brown and the tail is whitish. The speculum, a patch at the center of the wing, is an iridescent violet; the underparts are mottled gray, and the feet, orange-red. This duck is practically omnivorous, feeding on small fish, frogs, snails, mussels, mice, seeds, plant rootlets, grain, acorns and fruits. It is especially fond of wild rice. The nest is well concealed on the ground, usually in marshland or conveniently near water. The eggs, 6 to 10 in number, are a pale-greenish or olive color.

Mammals (*Mammalia*), one of the great groups of vertebrates, distinguished by the fact that the young are fed with milk from the mother's breast—*mamma* is Latin for breast. Other marks of mammals are: the hair (which occurs in no other animals, the warm blood and the birth of the young alive, though the last is true of some nonmammals. The only mammals that lay eggs are the Australasian monotremes, the lowest class of mammals. Next above them are the marsupials, the young of which are very immature when born, and therefore are taken into a pouch on the ventral side of the mother, where they remain until able to shift for themselves. To this group belong the American opossum and the Australian wallabies and their relatives.

The divisions of the mammalia are given in the text before this alphabetical list.

Mammoth, an extinct elephantlike animal (*Elephas primigenius*) formerly having a range over much of North America, Europe and Siberia. In Siberia whole carcasses of the mammoth have been found preserved in the ice. Unlike elephants of today, the mammoth had long, thick wool, the tusks grew to be 15 feet long and are known to have weighed 250 pounds. There has been considerable trade in the fossil ivory found in Siberia.



Mammoth

Manatee or **sea cow,** a large water mammal (genus *Manatus* or *Trichecus,* meaning hairy) found on the coasts of Florida and tropical America. Manatees generally frequent the mouths of rivers and estuaries and feed on algae and such seashore vegetation as they can reach at high tide. Their front limbs or swimming paws are furnished with nails by means of which they drag themselves along the shore. They are large, awkward, whalelike animals, attaining a length of 8 to 10 feet and sometimes even 20 feet. The skin is grayish-brown, sparsely covered with hair. Their flesh is excellent, and they furnish a soft, clear oil that does not become rancid.

A closely related form with similar habits is the dugong of Australia, which has a tail more like a whale's. The manatee's tail is rounded and broad. The dugong and the manatee form the order *Sirenia,* named from the beautiful mermaids of Greek mythology. These animals nurse their young and hold them with their flippers so that from a distance the ugly dugong or manatee might be mistaken by an imaginative sailor for a beautiful mermaid.

Mandrill, an African baboon (*Papio*) distinguished by a short tail. The cheeks are striped with red and blue, and the bridge of the nose is bright red. Mandrills live in herds. They are ferocious animals and eat any kind of food.

Man-of-war bird or **frigate bird,** any of a family (*Fregatidae*) comprising two species of large tropical birds, with remarkable powers of flight. The larger of the two species (*Fregata aquila*) is a tropical or subtropical bird, more than 3 feet in length, much of this size being accounted for by long tail feathers. The plumage is brownish black, the bill long and hooked at the end; the legs are short, the feet rather small and weak. A wing spread of 7½ feet enables it to sail for hours without apparent effort. A strange feature of the male bird is the pouch beneath its neck; when the pouch is inflated with air, it resembles a large red balloon. This device, normally invisible beneath the feathers, is used as part of the courtship display during the mating season. The man-of-war bird is parasitic in its habits, securing most of its food by chasing gulls and forcing them to drop their fish, which it then catches in mid-air. A smaller species (*F. minor*) is found only in the South Pacific and the Indian Ocean.

Marlin, any of the genus (*Makaira*) of salt-water game fishes resembling the swordfish, sailfish and spearfish and named from a fancied resemblance to a marlinspike. The Atlantic variety, found off Block Island and Montauk Point is *M. ampla.* On the West coast, especially round Catalina Island, the black (*M. marlina*), the striped (*M. holei*) and the spotted (*M. nutsukurii*) marlins are good fishing with rod and reel.

Marmoset, any of a family (*Hapalidae* or *Callitrichidae*) of New World monkeys noted for their diminutive size. In structure it is among the primitive monkeys, having claws instead of nails (except on the great toe), nonopposable thumbs, only 32 teeth without wisdom molars and a tail that is not prehensile. These tiny monkeys have long, silky fur, elongated hindlegs and penciled ears. The smallest and one of the most abundant species is no more than 7 inches long. Several varieties are familiar pets in South and Central America, notably the oustiti (*Hapale jacchus*) of Brazil. Specimens of this species are often brought to the United States, but only with great difficulty can they survive the winters of temperate climates. In their natural haunts marmosets climb around trees in groups and feed on fruits and insects.

Marmot, any of the genus *Marmota* (sometimes *Arctomys,* which means bear mouse) of rodents with short legs and heavy bodies. The American example is the woodchuck. The name *marmot* means mountain mouse.

Marsupials (*Marsupialia*), primitive mammals, the young of which are born in an immature condition and carried in a pouch or marsupium on the body of the mother; they include the wallaby, kangaroo, phalanger and wombat. The American opossum is a marsupial but the group as a whole is largely restricted to Australia and nearby islands.

Marten, any of the genus (*Martes*) of small carnivorous animals, widely distributed throughout North America and Europe. Most species have slender bodies, small ears, long tails, and gray or brown fur. The most familiar American species is the fisher or pekan (*M. pennanti*), which is sometimes more than 3 feet long and which has darker fur than the other martens. The pine marten or American sable (*M. americana*) is about 18 inches long including the 10-inch tail. It lives in hollow trees and hunts at night. In Europe there is a very similar pine marten. The beech or stone marten of Europe (*M. foina*) has a white patch on the throat.

Mastodon, an extinct elephant of both North and South America. It was the only elephant that extended its range into South America. Some mastodons had a small pair of tusks on the lower jaw in addition to the large pair on the upper jaw. The name *mastodon,* which has come to mean huge, originally meant bulgy tooth and was applied because this prehistoric elephant had projections on his molars.

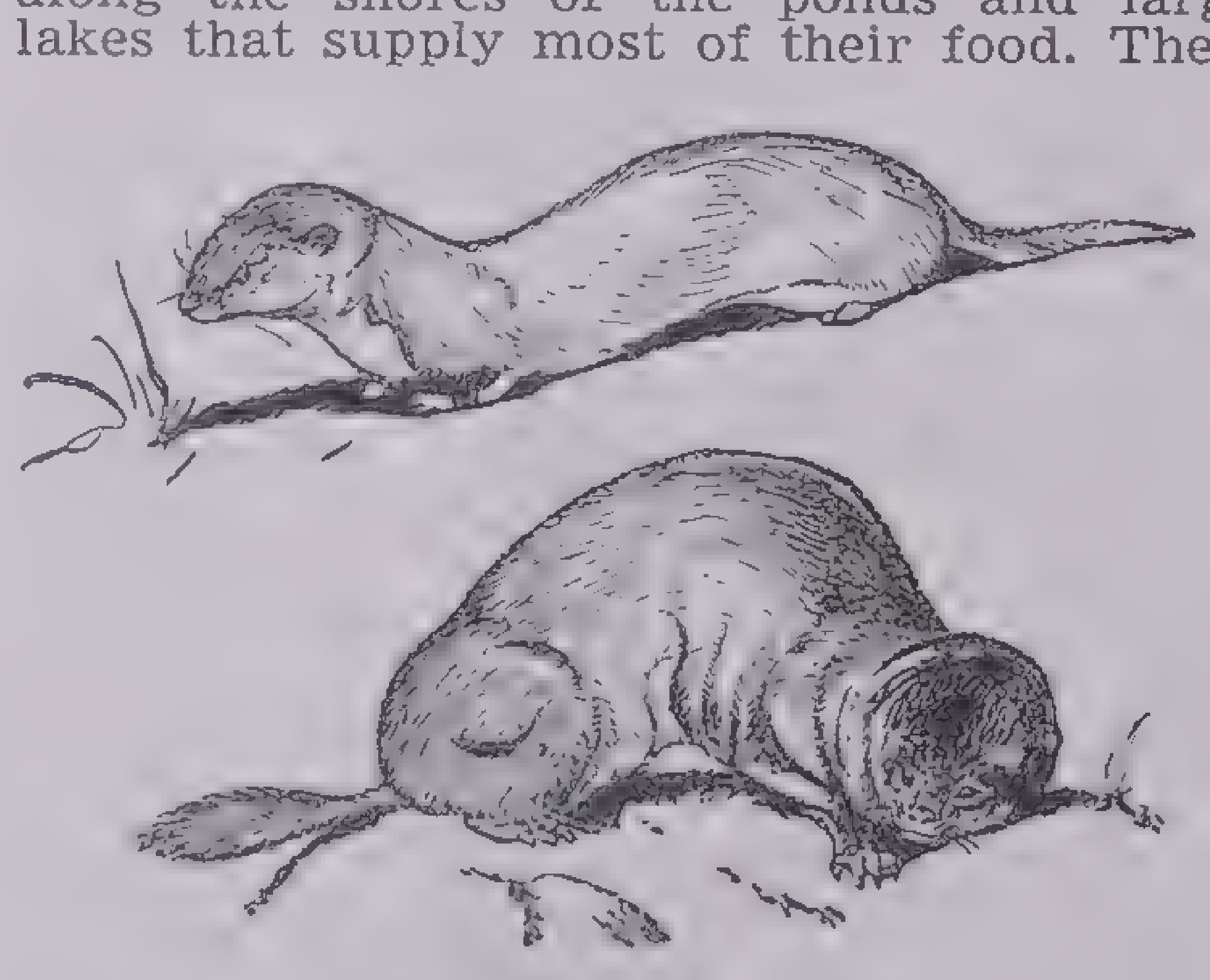
May beetle, see *June bug.*

Meadow lark, see *Lark.*

Millipede, see *Centipede.*

Mink, any one of several species of semiaquatic animals, genus *Mustela,* to which the weasels and European polecats also belong. They inhabit both North America and the Old World, the European variety being found in Scandinavia, Finland, Poland and Russia. The American mink (*M. vison*) occurs throughout this continent, but is most plentiful in the northern regions, even where civilization has encroached upon its natural haunts. Larger than the weasel, it is about 1½ feet long in the body with a 9-inch tail. The male is much larger than the female. In color it is usually a very dark brown, and its lustrous fur, especially that of the northern mink, commands a high price in commercial markets.

Minks always live near water, digging their burrows on the banks of streams or along the shores of the ponds and large lakes that supply most of their food. Their feet are partially webbed, which gives them speed enough in the water to overtake and capture large fish. They have a musky secretion that is second only to that of the skunk in power and unpleasantness, but fortunately it is rarely employed, its main purpose probably being the attraction of the other sex in breeding season. The litter of five or six young is born in early spring and defended, on occasion, with great courage and ferocity by the parents. Young mink are sometimes kept as pets and used like ferrets for hunting.

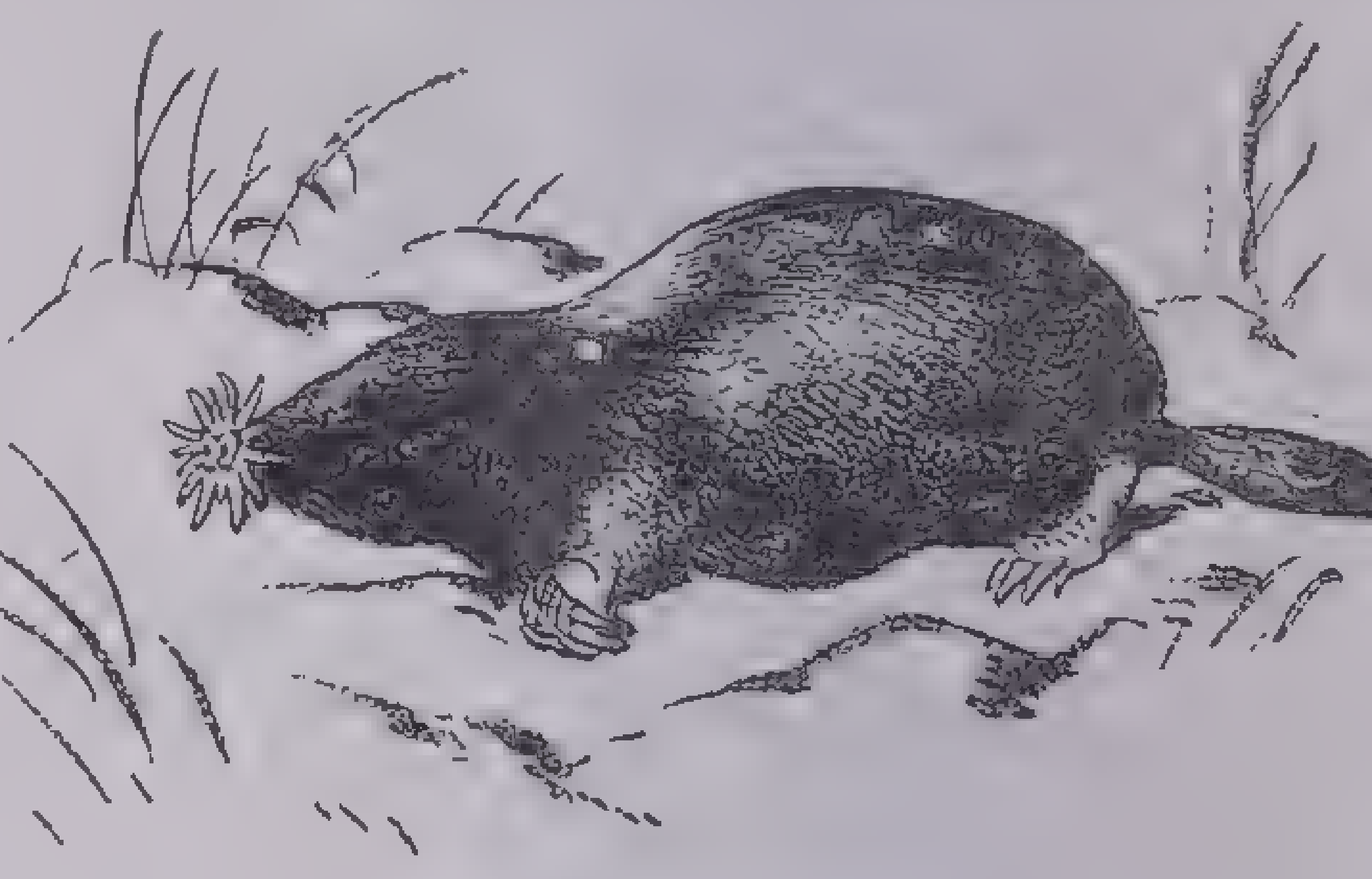


Weasel
Mink

Minnow, a popular name for many small fishes, especially those that swim in schools, sought as food by larger fish. Minnows rarely grow longer than 4 inches. Members of the genus *Notropis* are frequently called *shiners,* owing to the bright-silver color of their scales. Another type, belonging to the genus *Gambusia* are surface feeders, called *killifish.* The common minnow of fresh and brackish waters is the mummy or mummichog. Nearly all minnows are of value as live bait for fishing.

Mockingbird, an American thrush (*Mimus polyglotta*) found in the southern United States and famous for its ability to imitate almost any sound. Its own song is loud, full and exceedingly varied. In plumage it is decidedly somber, being of a general ashy-gray hue, paler beneath; its sweet, varied notes and faculty of imitation render it a prime favorite. The related catbird is sometimes called the northern mockingbird.

Mole, a small, rodentlike animal (family *Talpidae*) that burrows tunnels and is often the despair of gardeners. It is about 7 inches in length and compactly built with short, powerful limbs well adapted for digging. The fur is soft, velvety and grayish black with iridescent lights. The eyes are small and of practically no use in daylight, in some cases even being covered over by a membrane. Moles are nocturnal in habit; most of their feeding is by night, and the main diet is of earthworms, although many insects are greedily eaten. Moles build amazing subterranean fortresses or nests, consisting of an intricate system of chambers connected by tunnels at varying depths. The European mole belongs to the genus *Talpa.* The American moles belong to different genera: the most common is *Scalopus* with partly webbed feet; the star-nosed mole or *Condylurus,* remarkable for the branching fleshy processes around the nose used as feelers and roughly star-shaped.



Star-Nosed Mole

Mongoose, a member of either of two species of weasellike animals belonging to the civet family (*Viverridae*). The Indian mongoose (*Herpestes griseus*), famous from Kipling's story of Rikki, is 15 to 18 inches long, excluding the tail, which is nearly as long as the body and very thick at the base but tapering at the end. The thick fur is a reddish-gray color. In India this mongoose is known for its quickness and ferocity in killing snakes, including even the deadly cobra. It is a blood-thirsty little animal, however, killing off many valuable birds and other mammals, and efforts to introduce it as a rodent killer have usually met with failure for that reason. In 1902 a law was passed that forbids bringing any live mongoose into the United States.

The Egyptian mongoose (*Herpestes ichneumon*) is often called ichneumon in English—a word derived from the Greek and meaning tracker or tracer. The ichneumons find and devour rats and mice and crocodile eggs, and the ancient Egyptians kept ichneumons much as they kept cats. They are found in southern Spain as well as in Africa, are larger than the Indian mongoose and have a darker-colored head.

Monkey, a term loosely used for any of those *Primates* (highest order of mammals) that have longer tails and smaller bodies than the apes and the lemurs. All American primates are true monkeys and most of them have prehensile tails. None of the Old World monkeys can swing by their tails. The Old World monkeys have, and the American kinds have not, cheek pouches and calloused hindquarters. The American monkeys have widely separated nostrils opening sidewise; but in the Old World group the nostrils open in front and downward, as in man. The only big-nosed monkeys are natives of the Eastern Hemisphere. Some monkeys make most entertaining pets. Others are disagreeable in looks, temper and habits. The majority of them are vegetarians for most of their diet, but they are fond of eggs, young birds and insects.

Monotremata, the most primitive mammals known, found only in Australia and named from having a single outlet for genital and excretory organs—monotreme is Greek for one perforation. Unlike other mammals, the monotremes lay eggs and hatch their young outside the body. After birth the young are transferred to a temporary pouch on the mother, into which milk ducts open.

Moose, the largest member of the deer family (*Alces americanus*), related to the European elk. It is found in the northern part of North America, where it roams through the forests. The massive antlers are used for defense. The legs are longer and heavier than are those of other deer. The Alaskan variety (*A. gigas*) is even larger than the moose of the North woods.

Mosquito, any of the family *Culicidae,* two-winged insects related to the flies. They usually lay their eggs in water, where they hatch into larvae called *wigglers* because of their motion in the water. When they are fully grown, the wigglers come to the surface, their skins split down the back, and the insect emerges. The adult males live on plant juices; the females, on blood, which they suck from punctures that they make by the proboscis. In order to stimulate the flow of blood they inject a little of their poisonous saliva into the wound. This causes the itching that was formerly thought to be the worst effect of their bite. The male does not have a stinging proboscis.

It was found that mosquitoes are the means of inoculating man with malaria and yellow fevers. They get the germs from some one affected with the disease and, after a few days, are able to transmit them with their saliva. Mosquitoes of the genus *Anopheles,* which raise the hind end of the body when they bite, convey the germs of malaria. Yellow fever is carried by mosquitoes of the genus *Aedes,* sometimes called *Stegomyia.* This discovery led to warfare against the mosquito and to preventing the attacks by means of screens. The best way to eradicate these pests is by emptying all possible breeding places; when that is not possible, covering the top of the water with kerosene is effective.

The common mosquitoes of temperate climates, species of *Culex,* are not known to convey any disease; but a tropical variety of *Culex* (*C. fatigans*) transmits larvae of filaria, a worm that causes a dangerous skin and tissue disease—elephantiasis.

Moth, the common name of certain insects belonging to the *Lepidoptera* and distinguished from the butterflies (also *Lepidoptera*) by having more solid, chunky bodies; smaller wings that are not held erect but are horizontal when the insect is resting; and antennae that taper to a point instead of being club-shaped as in the butterflies. The moths almost all fly at night; the butterflies, by day. Like all *Lepidoptera* moths have scaly wings, the fore wings larger than the hind and a sucking tube on the lower side of the head. Only a very few moths feed on anything except vegetable matter. The larvae of the clothes moth eat woolens, silk and other animal matter. In the larval or caterpillar state, many moths do great damage to plants. Among the worst pests in America are the gypsy moth, the brown-tail moth and the leopard moth—all imported species. Our older forms, like the codling moth, the army worm and the various measuring worms, are of far less importance. The only moth of great economic value is the *Bombyx mori.* Its larva, the silkworm, spins silk from spineret glands near the mouth.

Mouse, any of the genus (*Mus*) of small rodents related to the larger rats. The common house mouse (*M. musculus*) is an immigrant from Europe; its habits are well known. There are some interesting varieties, among them the white or albino mice, which are kept as pets. The field mice or voles, are a different species (*Microtus*), including the American meadow mouse (*M. pennsylvanicus*) and the English field mouse (*M. agrestis*). The white-footed mouse of the United States is *Peromyscus leucopus.* The pocket or kangaroo mouse of the western states (*Perognathus*) has external cheek pouches. The jumping mouse (*Zapus hudsonius*) has large hindlegs but no cheek pouches; sometimes it is called a kangaroo mouse from its jumping ability.

Mule, a hybrid bred from the horse and the ass, differing in size, strength and beauty, according to the predominance of its parental species. Hybrids between a male ass and a mare are far superior to the progeny of a she-ass and a horse, which are sometimes called *hinnies* to distinguish them from the other mules. In mountainous countries mules are highly serviceable, for no beast of burden is more sure-footed or more capable of enduring fatigue. In beauty of form they fall far short of the horse. The mule has a large, clumsy head, long erect ears, a short mane and a thin tail.

Mullet, a food fish belonging to either of two families: the *Mugilidae* or gray mullets; living in shore and brackish water, and the sea fishes *Mullidae,* surmullets (meaning sorrel mullets) or red mullets. The gray mullets are usually fairly small, running not more than 2 or 3 pounds in weight, with large, silvery scales and small mouths. The striped mullet (*Mugil cephalus*), common to both Europe and America, is considerably larger, reaching a weight of 12 pounds. A common species off Florida is the fan-tailed mullet (*Mugil trichodon*), which often runs in vast schools and may be netted in great numbers by skilful fishermen.

The red mullets have two barbels, organs of touch, under the chin, like a beard; sometimes they are called *goatfish.* The scales are brilliant red or gold. The bearded red mullet (*Mullus barbatus*) was highly valued by the ancient Romans, who kept them in ponds and trained them to come to the sound of a voice or a bell at feeding time. In the western and southern United States the term mullet is applied to various suckers which belong to the genus *Moxostoma.*

Musk ox, an animal (*Ovibos moschatus*) somewhat resembling a small bison, allied in structure to both sheep and oxen (hence the name *Ovibos,* literally sheep-ox). Its range in glacial times was over the whole of Europe and in the United States as far south as Kentucky but is now confined to the Arctic regions of Greenland and North America, where the steadily decreasing herds are hunted by Eskimos.

The musk ox is about the size of a small domestic ox but has shorter, sturdier legs. The shaggy, brownish coat has very long hair, hanging almost to the ground; it is matted over the shoulders and gives the appearance of a hump. The bisonlike horns are very thick at the base, curving down and forward below the eyes. The animal is named for its musky odor, which apparently is not emitted by scent glands and is noticeable at a considerable distance from a herd and also in the flesh, which the Eskimos eat. The musk ox has gregarious habits, runs in herds of 30 to 40 and feeds on grass plant shoots, moss and lichens.

Muskrat, a familiar and abundant aquatic animal of North America, also called by an Indian name, *musquash.* The scientific name is *Fiber zibethicus.* It belongs to the rat family (*Muridae*) and is much in demand for its fur, which is called *Hudson seal.* Its compact body is about 1 foot long and the tail is 8 inches. The head is small and rounded with close-set ears; the feet are partially webbed; and the soft dense fur is dark brown on the back and gray underneath.

Muskrats eat aquatic roots, fish, worms, mollusks, vegetables, insects and fruits. They are especially fond of apples and mussels, often traveling some distance to procure them. Mostly nocturnal in habits, muskrats are not often seen, but their abundance is proved by the millions that are annually trapped for their skins. They do not seem to be on the decrease despite constant persecution by man and natural enemies. The muskrat's home is built near water, usually burrowed into the bank of a stream with the entrance under the surface of the water.

Mussel, a name loosely applied to any of various forms of bivalved mollusks, either salt-water (*Mytilidae*) or fresh-water (*Unionidae*). The best-known of the salt-water kind is the common mussel (*Mytilus edulis*), used for food in parts of Europe and America and important in the United States as fishing bait and fertilizer. It averages about 3 inches in length and half that in width. The exterior of the shell is black; the inside, an iridescent blue. Great masses of these bivalves are often found in solid beds, sometimes by low tides.

The fresh-water mollusks constitute a family with almost 1,000 species. They are abundant and very widely distributed, many of them occurring in the United States. They sometimes reach a length of 8 inches but generally are much smaller. They are not as palatable as the marine mussels but are important in the production of pearls, some of which command very high prices, and in the manufacture of pearl buttons.

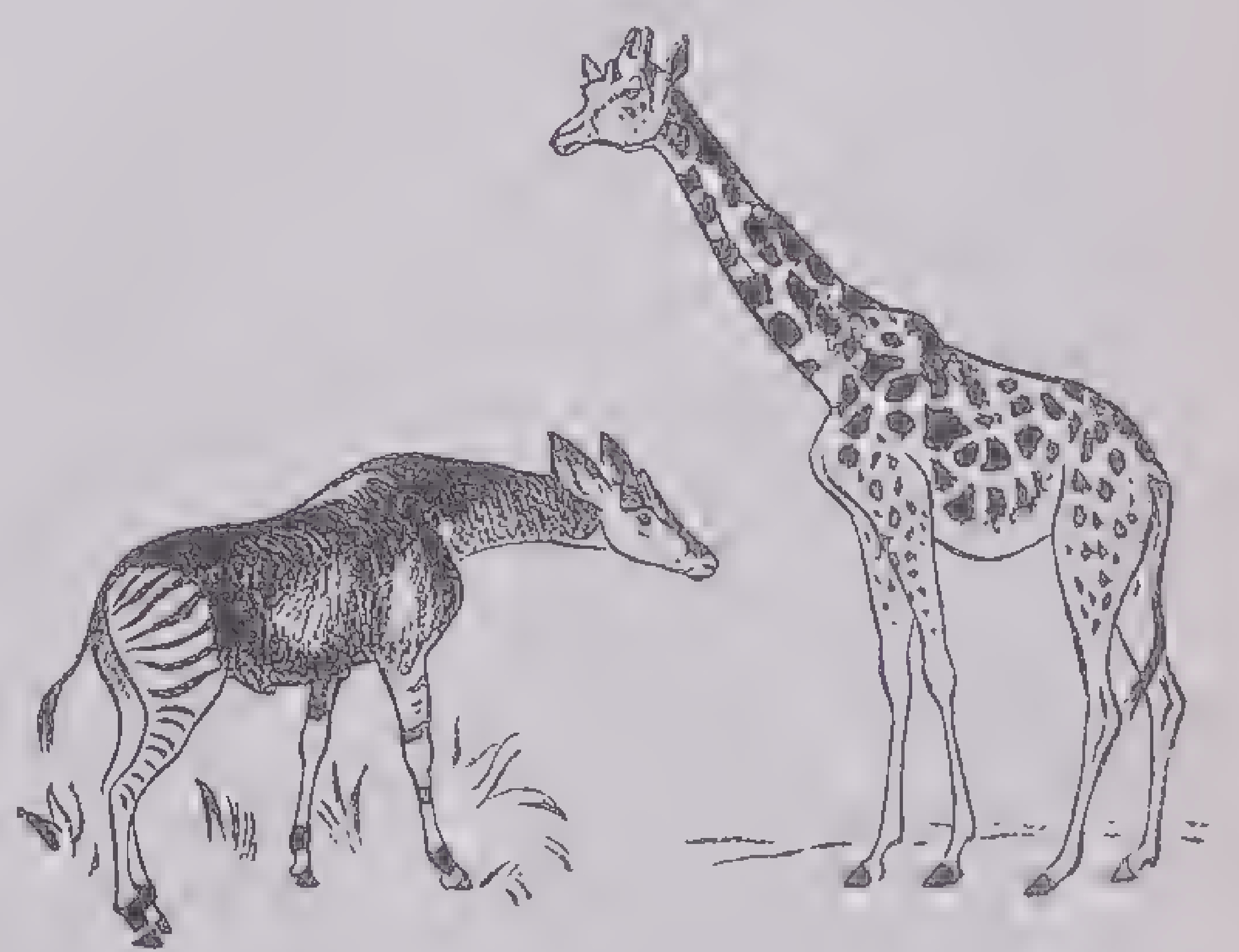
Newt or **eft,** a genus (*Triton* or *Triturus*) of small aquatic salamanders with narrow compressed tails. The giant newt (*T. torosus*) of North America is about 6 inches long with red or orange underparts. The red eft is a brick-colored American variety. Eft and newt are the same word. "An eft" was misdivided to "a neft" and "a newt."

Nightingale, an Old World thrush (genus *Luscinia*) famous for singing at night. (Nightingale means night singer.) There are two species: *L. megarhyncha* is a summer resident of the southern and eastern counties of England, arriving about the middle of April. It is about 6 inches long. The plumage of this delightful songster is a dull reddish brown on the upper surface and grayish white on the lower side. It is commonly found on hedgerows, from which it picks insects. The nest is composed of dry leaves, lined with grass, roots and hair. The eggs are four or five in number, and of a uniform olive-brown color, tinged with grayish blue. The common European nightingale (*L. luscinia*) is a little larger than the English bird.

Ocelot, a wild cat (*Felis pardalis*), native to tropical America and having a limited range in the southern United States (Texas and Arkansas). Large specimens are about 3 feet long, excluding the tail, which is over 1 foot in length. The color is generally a tawny gray, barred or spotted with brown or black, with chin and underparts almost white. Like all its family, the ocelot is extremely agile and preys mostly on birds in the deep forests. Individuals have been partly domesticated and trained for hunting like the Asiatic cheetah.

Octopus, a mollusk of the class *Cephalopoda,* with a rounded body and a small head bearing a pair of well-developed eyes, the mouth surrounded by eight long arms, each arm bearing numbers of suckers by which the animals hold their prey. Inside the mouth is a pair of jaws, shaped much like those of a parrot. Most of the species are small, averaging 5 pounds, but along the coast of Alaska some can spread nearly 28 feet. The octopus is eaten extensively in the Mediterranean countries. The stories of large octopuses attacking man are very doubtful.

Okapi, a ruminant (cud-chewing) animal (*Okapia johnstoni*) related to the giraffe and found in the forested regions of the Congo valley. It stands over 4 feet at the withers, has a head and ears like those of a giraffe but a much shorter neck. The body is a strange mixture of deep reddish and black; the cheeks are yellow-white; and the legs are cream-colored below and striped black and white where they enter the body. Scientists have known about the okapi only since 1900, when Sir Harry Johnston discovered and described it.



Okapi Giraffe

Opossum, any of the family of pouched mammals or marsupials found in America from the tropics to the middle Temperate Zones. One species is found from Florida north to the Hudson River, and west to the Missouri River. The opossums are related to the Australian kangaroos. The scientific name for the genus is *Didelphis,* which means double uterus. Opossums are ratlike in form, the largest species about the size of the common cat. They have a long tail that is almost destitute of hair and is very useful from its prehensile nature, enabling the animal to hang by it, to climb and descend trees and to carry its young on its back with their tails holding on to its tail—like straphangers in a crowded car. Each of the opossum's paws has five fingers and is used as a hand, and even on the hindfeet the thumbs are opposable. The opossum "plays dead" when surprised—hence the phrase, "play 'possum." It is sly, lives chiefly in trees, lying up in the daytime, and at night roaming in search of its food—insects, small reptiles, birds' eggs and the like. The meat

Courtesy North Carolina Department of Conservation

Opossum

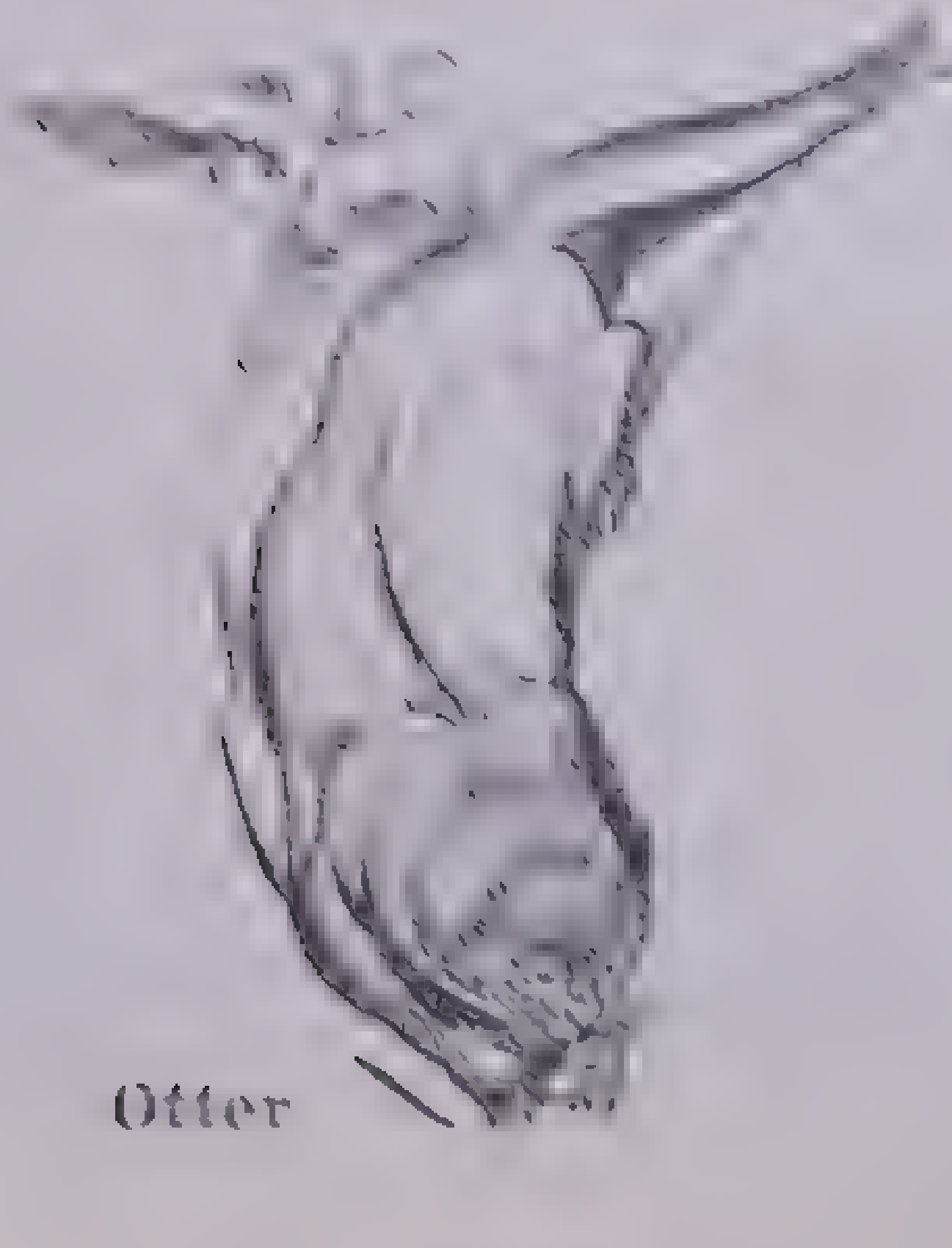
of the opossum is a favorite dish among Negroes and Indians.

Orangutan, the Malay name (meaning man-of the-woods) for a large manlike ape (*Simia satyrus*) found in Borneo and Sumatra. It never reaches a height much over 4 feet, but the arms of one specimen, 4 feet 2 inches tall, spread 7 feet 9 inches, and when this orang stood erect, the hands nearly touched the ground. A large orang may weigh 250 or 300 pounds. The orang lives almost entirely in trees where it builds a nest of leaves and boughs. It never jumps, but progresses through the forest by swinging itself from limb to limb. The skin is dark brown and the scanty hair is reddish brown.

Oriole, any bird of the Old World family *Oriolidae* or a somewhat similar bird of North America. The name means golden, a shorter spelling of aureole. One species, the golden oriole, is a summer visitor in central Europe. The male of this species has a brilliant-yellow body and black wings and tail. The female is greenish, streaked with dusky lines. It is about the size of the common thrush. The American orioles are an entirely different family. The Baltimore oriole (*Icterus galbula*) ranges from Canada to Mexico. The head, throat and wings are black; but the lower back and all the under parts are orange, deepening into vermilion on the breast. It is called Baltimore because its colors are those of the coat of arms of the Calverts, Lords Baltimore. It builds a hanging nest and is often called *hangbird*. The orchard oriole (*I. spurius*) resembles the Baltimore oriole in habits but is found mostly around orchards. The male is black and reddish, and the female is olive and yellow.

Ostrich, a large flightless bird (*Struthio camelus*) inhabiting the southern parts of Africa. The ostrich is related to the emus and rheas of South America. The wing muscles are reduced, and there is no keel on the breastbone as there is on most other birds. The African ostriches formerly furnished most of the well-known plumes that were used in decorating hats, but the use of them has been reduced in recent years. Ostrich farms have been developed in South America and in California. The eggs, which are the largest of any living bird, are laid in the sand. In Africa they are incubated by the heat of the sun, but in California the male and female birds both sit on the eggs to hatch them.

Otter, a genus (*Lutra*) of fish-eating mammals related to the weasel. Some live in fresh water, some in salt. They furnish valuable furs. Even more valuable is the skin of the sea otter (*Enhydra lutris*) of the Pacific coast, which is more heavily built than the true otter (*Lutra*). Both kinds are playful. The Canadian fresh-water otters enjoy sliding down snowy banks head first into streams. The mother sea otter plays with her pup for hours and sometimes is seen asleep on a tangle of seaweed in the water, lying on her back with the little otter in her front paws.



Otter

Owl, any bird of prey of the order *Strigiformes*, mostly nocturnal, with well-marked characteristics. The head is extremely large; the eyes are huge and directed forward; the bill is short and stout; the apertures of the ears are very large. The legs are feathered; the toes are four in number, and the outer one is capable of being directed backward. The plumage is remarkably soft, the feathers of the face forming disks around the eyes. Owls are found over the whole globe. Different species vary in size from 5 inches to 2 feet in length. They feed on small mammals, birds, fishes and insects, swallowing the hair, bones, feathers and scales. This they afterward disgorge in the shape of pellets. They nest on the ground, among rocks, in hollow trees and in buildings; some resort to the old nests of other birds. They lay from two to five roundish, white eggs.

Several species have feathered tufts on either side of the top of the head and are called *horned owls* or *cat-owls*—notably the eagle owl (*Bubo bubo*) of Europe and Asia and the North American great horned owl (*B. virginianus*), both very large. The snow owl or snowy owl (*Nyctea nyctea*), though its scientific name means nocturnal, is a bird that hunts in the daylight; it is arctic but occasionally enters the northern part of the United States. It has no horns and is almost snow-white. A typical small owl is the pygmy or gnome owl (*Glaucidium gnoma*) of California and the Southwest. Quite different in its habits from other owls is the burrowing owl (*Speotyto hypogaea*) of the American plains, which lives in the deserted holes of prairie dogs and viscachas. It is 9 or 10 inches long, and its legs are much longer and barer than are those of other owls.

Oyster, a salt-water bivalve with rough irregularly shaped shells. There are several genera: *Ostrea*, famous for food; *Avicula* and *Pinctada*, pearl oysters; and the Bermuda oyster (*Margaritophora radiata*), a pearl producer, good to eat.

Of the true oyster or *Ostrea* there are various species in all parts of the world; but the best is the American species (*O. virginica*) that now is found from Cape Cod to the Gulf of Mexico. Formerly it extended to the coast of Maine, and even now there are scattered beds in the Gulf of St. Lawrence. The oyster grows in shallow water, fastening its shell to some rock or shell. In this way large beds are formed. They are also planted; that is, the young are taken and placed in favorable situations for rapid growth. The great enemies of the beds are the drill, a small snail that bores holes through the shell in order to obtain the flesh, and the starfish, which destroys large numbers. The oyster yields comparatively little nourishment, yet it is eaten extensively. A Pacific coast variety is *O. lurida*. The European oyster (*O. edulis*) is smaller than the Virginian and has a coppery taste. In the American species the sexes are separate; in the European species they are united in the same individual.

Allied to the true oysters are the pearl oysters, which are especially abundant around Ceylon. These have the interior of the shell lined with mother-of-pearl; when foreign particles get between body and shell, they are covered with the same substance, thus forming the pearls used for adornment. These oysters are obtained by diving. The animal matter is allowed to perish, leaving the pearls behind. The shell also is of value, furnishing material for knife-handles and buttons, though most pearl buttons are now made from the shells of fresh-water mussels from the Mississippi Valley.

Pangolin (from a Malay word meaning roll up), a group (*Manis* and other genera) of African and Asian scaly anteaters that protect themselves (like the armadillo) by rolling up in a ball. When they do this, all the exposed parts are protected by the horny scales that cover the back and tail. This hard surface is not bone but cemented hairs. The different species of pangolins vary in length from 1 to 3 feet. Some have tails twice as long as their bodies. They have short legs, strong claws for tearing their way into termite hills and long tongues for licking up the ants. They have no teeth and belong to the *Edentata*.

Panther, see *Leopard* and *Puma*.

Parrot, any bird of the group *Psittaciformes* with yoke toes, two in front and two in back. The group includes the parrots proper, the cockatoos, parrakeets, macaws, lories and nestors. The name parrot seems to be a variation of Pierrot, a French diminutive for Peter. In English the pet name for parrots is Polly, a girl's name used for pets, like Mag for the talking pies now called magpies. In true parrots the upper mandible of the bill is toothed, is longer than it is high and is hinged to the skull so that it can be moved. Parrots have a short, rounded tail. These birds have beautiful plumage and are quick to learn. They have the faculty of imitating the human voice in a degree not possessed by other birds. They are found chiefly in Africa, whence we get the gray parrot (*Psittacus erithacus*), which has a red tail and is the best talker. South America, which is particularly rich in species, furnishes the well-known green parrot. North America is the home of a single species, the Carolina parrot, actually a parrakeet (*Conurus carolinensis*).

The parrakeets are smaller than the true parrots and have a more slender body and a longer tail. The grass parrakeet (*Melopsittacus*) of Australia has pleasanter notes than the others. The cockatoos of Australia and the East Indies are mostly white with a helmetlike crest; but there are several black cockatoos, notably the palm variety (*Probosciger aterrima*), the largest of all parrots. Several cockatoos are rose or yellowish.

The macaws live in Central and South America, are large (sometimes 3 feet long) with long tails and very brilliantly colored plumage—blue and yellow, red and blue, red and green. The nestors are large New Zealand parrots. The parrots are forest birds and are adepts at climbing, using both the feet and the bill. Their food consists of seeds and fruits.

Partridge, the name of several European game birds of different genera, originating in Africa and Asia and related to the pheasant. The gray partridge of Great Britain (*Perdix cinerea*) and the red partridge (*Alectoris rufus*) are good shooting and good eating. In America the name has been transferred to the quail in the Southern States, and to the ruffed grouse farther north.

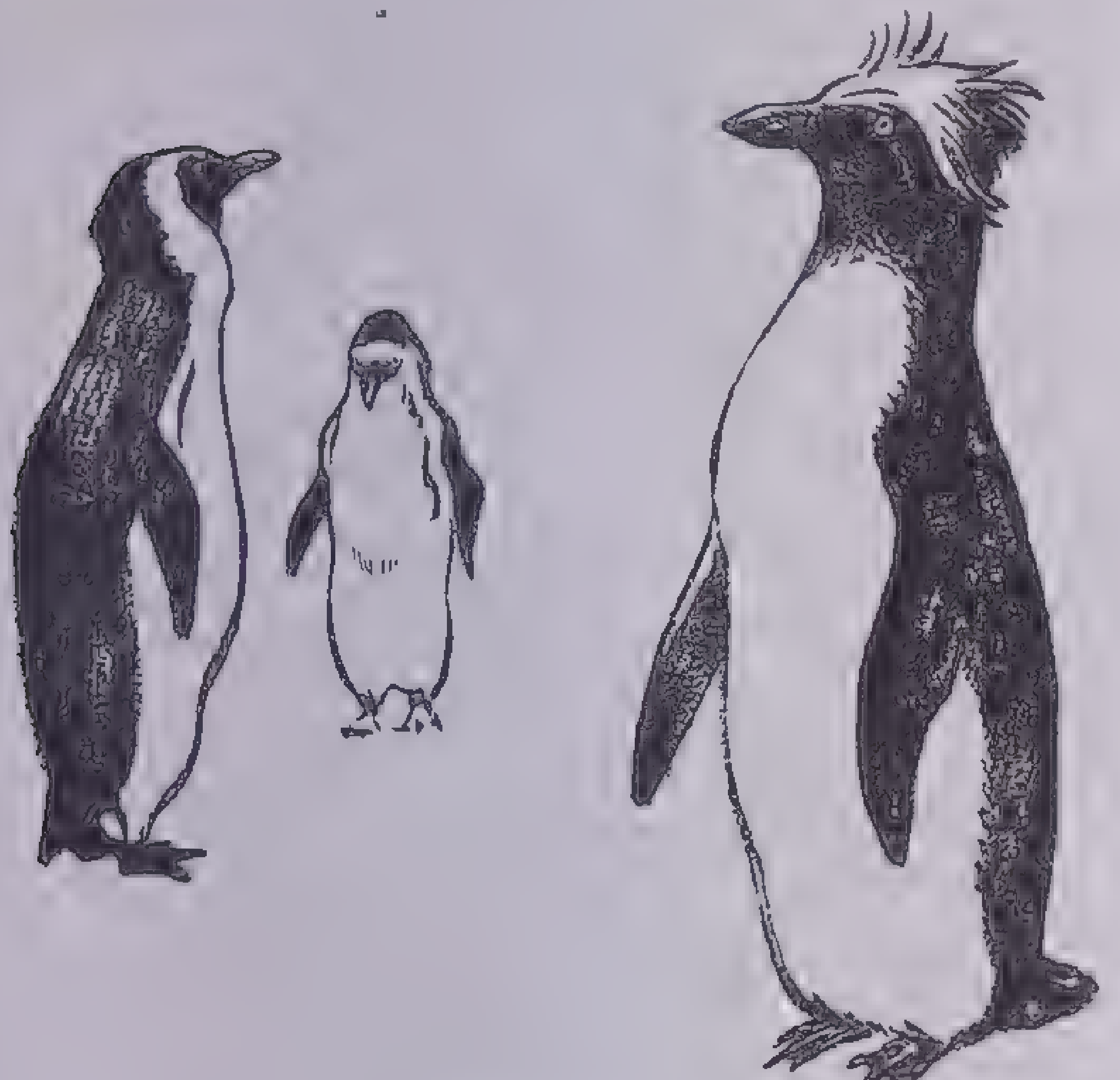
Peacock, the male of a brilliantly plumaged, pheasantlike bird (*Phasianidae*), native to Asia and the East Indies. The common peacock (*Pavo cristatus*) readily adapts itself to captivity and is a familiar ornamental bird in zoological parks and gardens throughout most of the world. It is rather large, about 7 feet long including the train, with a slightly curved bill, brilliantly crested head, long stout legs and short wings. The metallic beauty of its plumage and the erectile train characterizing the bird have been famous since the time of King Solomon. In Greek myth the bird was a favorite of Hera (Juno). The peacock is sacred in parts of India.

The outspread train is not composed of the tail feathers, as is commonly supposed, but of highly developed tail coverts, which in other birds are small feathers overlying the base of the tail. The tail feathers themselves are used merely to support the train, which may be erected and folded back at will. The female or peahen has no train, is smaller than the male and drab in appearance by comparison. Peacocks were a table delicacy of the Greeks and Romans and in medieval times. White peacocks are a cultivated variety.

Peccary, a hoglike animal found in the tropical regions of the New World, differing from swine in having tusks directed downward and in other respects. The tusks are dangerous weapons. The peccary is sometimes called *musk hog* because it secretes a strong smelling substance. Peccaries range from Texas to Paraguay. The two kinds are: the large white-lipped peccary (*Tayassus*) and the collared peccary (*Pecari*), about 3 feet long. Peccaries frequent forests and are usually seen in groups. At night they feed on corn, inflicting considerable damage on the crop. They are also fond of reptiles and other small animals. Jaguars and pumas prey upon the peccaries. Pigskin gloves are sometimes made of peccary hide.

Pelican, a fish-eating, swimming bird (*Pelecanus*) with a large pouch of skin between the halves of the lower jaw. Pelicans have huge awkward bodies and short legs but are very active in the water. When they fish, they strike the surface of the water with the wings, scoop the fish into the pouch and then retire to the shore to devour them. Sometimes they fish in groups. Pelicans are found in many parts of the world. The white pelican (*P. erythrorhynchos*) winters on the Gulf of Mexico and nests on islands in Rocky Mountain lakes. Its body is 5 feet long and its wing spread is 10 feet. There are brown pelicans in Florida and on the Pacific coast.

Penguin, an antarctic bird (family *Spheniscidae*) with wings very small, hard and covered with small stiff feathers of a bristly nature, useless for flight. The name *penguin* is Welsh for whitehead and was originally applied to the great auk. The penguin's short chunky body gives the scientific name—from a Greek word meaning wedge. The birds swim well, using both their webbed feet and their wings. There are about 18 species, entirely confined to the southern ocean and the Antarctic Region and ranging from 1 to 3 feet in height. The tallest are the emperor and king varieties. Of medium size is the jackass penguin (*Spheniscus demersus*) of South America and South Africa that has a call like a donkey's bray. An Australian variety (*Eudyptula minor*) is the smallest. During the breeding season they resort to rocky islands in immense numbers, and stand erect with their eggs under them. The newly hatched penguins are covered with down, but the grown birds have stiff scalelike feathers. Their food consists chiefly of fish.



Penguins

Perch, a popular name applied to numerous varieties of spiny-rayed fish. The true perches (*Percidae*), numbering about 125 species, are all fresh-water food fishes, the best-known of which is the yellow perch (*Perca flavescens*) of America, identified by its orange-yellow sides crossed by six to eight dark stripes, and by its reddish lower fins. It reaches about 1 foot in length, and 2 pounds in weight, but generally averages half that size. This fish is particularly abundant in the Great Lakes and the St. Lawrence, and is important for its edible qualities. The pike and the log perches are other members of the same fish family. Two closely allied species are common in Europe and Asia. Several unrelated forms are the so-called blue, sea, white and Sacramento perches.

Petrel, a sea bird (order *Procelliformes*) related to the albatrosses and varying in size from 6 inches to 3 feet in length. Petrel means little Peter and alludes to the bird's motion over the waves as if walking on the water like St. Peter in Matthew 14:29. The scientific name comes from Latin *procella,* a storm, as the petrels are supposed to appear when a storm is coming. The stormy petrel (*Hydrobates pelagicus*), smallest of these birds, is known as Mother Carey's chickens—as if the birds were sent to protect sailors by *Mater cara,* the Virgin Mary. These chickens are small with dark plumage and white rumps. The giant petrel or fulmar (*Macronectes giganteus*), more like an albatross, is nearly as large as that big bird but has not as great a wing spread. All petrels live on the high seas, and many of them will follow a ship for days for the scraps thrown overboard. At night they follow close behind the stern of the vessel.

Phalanger, one of a group of Australian pouched animals (marsupials), related to the koala and wombat and marked by the presence in some species of a parachutelike membrane between the front and hind legs. The phalangers get their name from the fact that the second and third phalanges or joints of the finger bones are united by a web. They range in size from that of a mouse to that of a cat. The smallest (*Acrobates pygmaeus*) is called *flying mouse.* Most of them have long prehensile tails, live in trees and hunt by night, eating insects and fruit. A relative, the long-snouted phalanger (*Tarsipes rostratus*) seems to live on honey and insects that he gets out of deep flowers.

Pheasant, a genus (*Phasianus*) of bright-colored birds with long tails, originally native to the Old World and related to the ancestors of the common domestic fowl. The pheasant of Europe (*P. colchicus*) is a game bird long bred for shooting. In India, China and Japan many beautifully colored varieties have been developed by fanciers: the golden, the silver and the argus, which is related to the peacock. The females are dull and plain compared with the males. The name pheasant is loosely used for grouse and quail in some parts of the United States.

Pickerel, a name meaning small pike and applied to the smaller members of the pike family and genus (*Esox*), as well as to the young of the large species. Pickerel are common in the fresh waters of the United States, and in winter many of them are caught through the ice. The banded pickerel (*E. americanus*) is 1 foot long and a dark-greenish color, with a number of dark vertical bars on the sides. In structure it is typical of the family, with an elongated, tapering body, long, flattened head and protruding lower jaw plentifully supplied with sharp teeth. The little pickerel (*E. vermiculatus*) is found in the Mississippi Valley. A large form is the pond or grass pickerel, also called green pike (*E. reticulatus*), which is about 2 feet long. One of the most abundant species of its group, it is found everywhere east of the Alleghanies.

Pig, any swine, young or mature, domesticated or wild.

Pigeon, the common name of any of the group of birds *Columbae* including about 300 species, distributed in nearly all parts of the world. They are so much alike that the membership of any member in the group is obvious. Most domesticated varieties with their great differences in form, which in other groups would be considered as distinct species or even genera, are derived from the rock dove. Among the interesting species are the passenger pigeon, which 80 years ago formed immense flocks over the whole of the eastern part of America but is now extinct. The mountain witch of Jamaica is one of the most beautiful of birds. The largest member of the group was the dodo of islands in the Indian Ocean, which became extinct before 1681.

No sharp distinction can be drawn between pigeons and doves. In general, however, the term *dove* is applied to the smaller members of the group. At present the mourning dove (*Zenaidura macroura carolinensis*) probably is the most widely distributed of its family in North America. It is about 1 foot in length with a long, white-bordered tail, bluish-gray color above, and reddish-brown underparts. This bird is extremely swift and strong in flight, its wings making a whistling sound as they cut the air. A familiar characteristic is its doleful call, a low-pitched, repeated whistle that carries a surprising distance.

Photo by Harold E. Edgerton

Homing Pigeon Rising in Flight

Picture taken on the downstroke of the wings showing the feathers tightly closed. Exposure time for the photograph was approximately 1/100,000 of a second

Pigeon, Carrier or **Homing,** a pigeon in which the homing instinct is well developed. These pigeons may be taken miles from home, but manage to fly back, even under the most trying conditions. They were formerly used by travelers to send messages home, to carry news from incoming ships to newspapers and to communicate between parts of an army.

Pike, a fresh-water fish with a long slender spear-shaped body (hence the name) and long flattish head with a protruding snout and a large mouth equipped with formidable teeth. The single genus (*Esox,* formerly *Lucius*) forms the family. There are six species, all but one of them occurring only in North America. Pikes are notorious for their rapacity, doing great damage to the smaller game fish in restricted waters. They eat frogs and water rats also and have been known to destroy entire broods of ducklings, dragging them down by the feet as they swim.

A fully grown pike is usually about 4 feet in length. It may attain a great age and continues its growth, for there are records of much larger specimens being taken. The muskellonge, although not a true pike, resembles one in nearly every respect save that of size; it is larger still, 5 to 8 feet in length with a weight of more than 100 pounds. The so-called wall-eyed pike is actually a perch, but is shaped more like the pike.

Pintail, a duck (*Dafila acuta*) found throughout the Northern Hemisphere, abundant in the United States west of the Mississippi, and a hardy, fast-flying species. The name originated because the male has two long middle tail feathers 5 to 9 inches long. The adult male is about 28 inches long, has a reddish-brown head, gray back and white throat and underparts. The female is somewhat smaller, is streaked brown and without a long tail. Pintails breed in the northern parts of the continent. The nest is built on the ground and concealed in bunches of grass or weeds, usually near water. Seven to ten greenish eggs are laid in March or April.

Platypus, see *Duckbill.*

Plover, a family of shore birds (*Charadriidae*) including about 75 species, eight of which occur in North America. It is a smallish bird, most commonly seen on the seashore, where many run along the beach at the water's edge feeding on small marine life deposited by the waves. In this environment they are often found with snipes and sandpipers, from which they may be distinguished by their shorter, pigeonlike bills, thicker legs and heavier bodies. In England and on the Continent plovers' eggs are a great delicacy. As a group, the plovers are noted for covering enormous distances on their migratory flights. The golden plover (*Pluvius dominicus*), about 10 inches long, a beautiful but fast-diminishing species, breeds on the Arctic coast but winters in southeastern Brazil and Argentina, and makes an annual southern flight that takes it many hundreds of miles out to sea though it takes an overland route flying north.

One of the most familiar species is the killdeer, so called because the word somewhat resembles its loud, reiterated cry. Its Latin name is *Aegialitis vociferus,* the adjective meaning loud or noisy. Although a true shorebird, the killdeer is often found in the uplands many miles from water. It is 10 inches long, brownish above and pure white below, with two black bands on the breast and two on the head. The piping plover (*Charadrius meloda*) is nearly always found on the beach, where it is often difficult to distinguish from the sand that it so closely resembles in color. This little bird, only 7 inches long, has a plaintive, melodious whistle, as indicated by its name. Other species are the black-bellied plover (*Squatarola squatarola*), semipalmated plover (*Charadrius semipalmata*) and ring plover (*C. hiaticula*).

Polecat, the European species of the genus *Mustela* or *Putorius,* to which the weasels and mink also belong. Polecat means poultry cat, for the animal destroys poultry, rabbits and game; and the ferret is a domesticated polecat used for hunting rabbits and rats. The common polecat is found in Europe. It is about 17 inches long; the tail, 6 inches. The color is dark brown. The animal is nocturnal, sleeps during the day and searches for its prey at night. It has glands secreting a fetid fluid somewhat like that of the American skunk, and the skunk is sometimes called polecat. The fur is known as *fitch* from the name fitchet or fitchew sometimes applied to the polecat. Its hairs are used for superior artists' brushes.

Porcupine (spiny pig), a large rodent characterized by having some of the coat in the form of large spines or quills. Usually the quills lie flat on the animal's back, but when it is disturbed, the porcupine rolls itself into a ball and all the quills stand outward, forming a very good defense. The quills come out very easily, but it is not true that the animal has the power to shoot them. There are two families: in the Old World, living on the ground, the *Hystricidae;* and in the New World, tree dwellers, the *Erethizontidae.* The common North American porcupine (*Erethizon dorsatum*) has quills about 3 inches long. It feeds upon the bark of trees and does much damage to vegetation. *Hystrix cristata* of southern Europe and North Africa has spines more than 1 foot long.

Porpoise (from French for hog fish), a sea mammal (*Phocaena*) related to the whales and dolphins. The porpoise is 5 to 8 feet long, black or dark gray above and almost white below. The greater part of its diet is composed of small fish, and porpoises are commonly seen following large schools of fish. Like all whales, porpoises must come to the surface of the water to breathe. The oil of the porpoise makes an excellent lubricant. From the hide a water-resistant leather is made.

Prairie chicken, see *Grouse.*

Prairie dog, a small rodent (*Cynomys,* literally, dog mouse) of the squirrel family, found on the plains east of the Rocky Mountains. The prairie dogs resemble their allies, the marmots, in appearance, having well-developed claws on all the toes of the forefeet and shallow cheek pouches. The best-known species is about 1 foot long with a 4-inch tail. On the upper surface it is reddish-brown variegated with gray. These animals live together in great societies in burrows on the prairies where the buffalo grass grows luxuriantly. Their burrows make riding over the plains very dangerous. The name was given them because their cry sounds something like the bark of a small dog.

On the plains of South America the viscacha (*Lagostomus maximus*) lives in colonies of burrows much like those of the North American prairie dog. The viscacha is related to the chinchilla but is larger. It has soft fur with strangely variegated bands across the face.

Primates (pronounced in three syllables, prī-mā′tēs), the highest order of mammals, containing the apes, lemurs and man. The forefeet are usually grasping members, and the hindfeet are for walking and, in some cases, grasping. The development of the brain in this group is the greatest of any in the animal kingdom.

Ptarmigan, a grouselike bird (genus *Lagopus,* rabbit foot, from the feathered feet) found in the Arctic Region and on high mountains. The birds are desirable game and are hunted. They nest in thickets on the ground. Their food is buds, insects, berries and roots. The ptarmigan is reddish brown in the summer, but turns snow-white in winter—a remarkable example of protective coloration. The British red grouse is the only ptarmigan that does not change color in winter. A distinctive Rocky Mountain species living above the snow line is the white-tailed ptarmigan (*L. leucorus*).

Puma, a large member (*Felis concolor*) of the cat family (*Felidae*) native to America. It is more than 3 feet long, exclusive of the tail, which measures about 2 feet. Slender and with long legs and small head, the puma is a fairly uniform tawny brown. This species is known as the mountain lion in the western states, where it is notorious as a marauder on young cattle and sheep, and elsewhere as panther, painter, catamount or cat-o'-mountain and cougar, but the correct name is puma, from its native name in Peru.

Python, a large nonpoisonous snake of the subfamily *Pythonidae* inhabiting the Old World; distinguished from the boa of the New World by the presence of teeth in the premaxillary bone and two rows of subcaudal scales. The python is a very large serpent, the rock snake of India and Ceylon attaining a length of 30 feet. Although it is not venomous, it is feared for its tremendous strength. Once properly coiled about a victim, it can crush the life out of an animal as formidable as a buffalo or tiger. An arrangement of elastic tendons linking the two jaws renders them enormously distensible and makes it possible for a python to swallow a whole sheep.

Quail, a game bird (*Colinus virginianus*), also called *bobwhite* from the sharp whistle of the male, which accents the last syllable. In the Southern States it is called *partridge.* It inhabits the greater part of central North America, preferring the open fields. The bobwhite is about 10 inches long with a rounded body, mottled feathers, black head and white throat. Its nest is usually placed on the ground and is made of grasses and other vegetation. The eggs number about 12, and two broods are produced each season.

The Old World quail (genus *Coturnix*) is smaller, about 7 inches long, back brown, black and buff; the under parts are whitish.

Quetzal, see *Trogon.*

Rabbit, a member of the hare family; strictly only the *Lepus cuniculus* of Europe; but by extension the varieties of this species include the Belgian hare. What are commonly called rabbits in the United States are actually hares.

Raccoon (apparently from an Indian phrase meaning "he scratches with his hands"), a nocturnal carnivorous animal (genus *Procyon*) of both North and South America. The fingers and toes are exceptionally long, and they help the raccoon to catch its favorite food—fish. The North American species is a very dainty eater, washing his food and hands before meals; hence he is *P. lotor,* the washer. During the day the raccoon curls up in a tree to sleep. A South American raccoon (*P. cancrivorus*) is a crabeater. The fur makes warm winter coats. The early American pioneers wore coonskin caps with the tail as an ornament.

Courtesy North Carolina Department of Conservation

Raccoon

Rail, a member of the bird family *Rallidae,* comprising 180 species and related to the gallinules (*Gallinulinae*) and coots (*Fulicinae*). Six species of rails occur regularly in North America. They are shy and secretive, living almost exclusively in marshland and using their wings only as a last resort, when they fly feebly for a short distance, immediately settling into the swamp grass from which they were flushed. The king rail (*Rallus elegans*), now rare, is the largest species; it is 19 inches long and a dusky-brown color and has a long bill, large feet and a body shaped somewhat like that of a chicken. A smaller species, the Virginia rail (*R. virginianus*), resembles the king rail in everything but size, being only 11 inches in length. The clapper rail (*R. crepitans*) is much sought by hunters as a game bird. It is 16 inches long, of an indistinct brownish color and frequents salt marshes. Perhaps the commonest species in America is the sora (*Porzana carolina*), 9 inches long, brown above and gray below, with a short bill, differing in this respect from the other rails. This also is a popular bird with gunners, who pole through marshes in a flat-bottomed skiff and shoot their quarry as it flutters over the salt grass. Rails are nocturnal in habits; comparatively little is known about them as a group.

Rat, a large rodent (*Mus*) of the mouse family (*Muridae*). Of the several species, two—the black and brown rats—are distributed almost everywhere in the world. Their wide occurrence is due mostly to ships, which have transported them as stowaways to many parts of the world. Both species probably came originally from Asian regions.

The black rat (*Mus rattus*) is about 7½ inches in length, excluding its long tail. The white rat is an albino form of the black species. The Norway or brown rat (*M. decumanus*) is more than 10 inches long, with smaller ears, shorter tail and less pointed muzzle. In places where the two occur together, as in North America, the brown rat quickly subdues the black rat and becomes the common rat of that region.

From earliest times the rat has been a plague to civilization. It is very prolific, breeding several times a year, with 10 to 14 young at a birth; is extremely adaptable to almost any environment; is omnivorous, eating all kinds of animal and vegetable matter, garbage and refuse, grain, eggs, poultry and many other things; is amazingly intelligent and difficult to trap; and is a prominent agent in the spread of disease, notably bubonic plague and trichinosis.

Rattlesnake, a venomous reptile of America, identified by a horny appendage on the end of the tail that emits a rattling noise when vibrated. It belongs to the pit vipers, a family called *Crotalidae* but sometimes classed as a subfamily of the *Viperidae.* There are two genera, *Crotalus* (from a Greek word meaning castanet or rattle) and *Sistrurus,* from two Greek words meaning rattle tail). Some 16 species are found in the United States, the largest of which is the diamond rattlesnake (*C. adamanteus*—the adjective means diamond) of the South. It sometimes reaches a length of more than 8 feet and a circumference of 15 inches. It swims freely and prefers the vicinity of water, being most commonly found in the Florida Keys.

The common banded or amber rattler (*C. horridus*), once abundant in the eastern states, may reach a length of 5 feet and diameter of 4 inches. The smaller or pygmy rattlesnake, sometimes called by the North American Indian name, *massasauga,* belongs to the genus *Sistrurus.*

Most species are sluggish in habit, nonaggressive by nature and entertain as much respect for man as he does for them. They rarely pursue an enemy and cannot strike a distance more than two-thirds their length. Although the bite of a rattlesnake is extremely poisonous, it is by no means inevitably fatal, especially when measures are promptly taken to prevent the spread of the poison. Rattlers perform good service in destroying rats, mice and other small rodents.

Raven, a large bird (*Corvus corax*) resembling the crow. Ravens were formerly found over most of the United States but have been driven out of all but the western region. They are destructive birds, eating almost anything. They are remarkable for their long life; some live to be 70 years old. They are among the few birds that can imitate human speech.

Ray, any fish of the order *Batoidei,* all elasmobranch (that is, having platelike gills). The order of rays includes the skates, sting rays, whip rays, sawfish and devilfish. The sharks also are elasmobranchs, and Dr. Hornaday describes the rays as "flat-bottomed, side-wheel sharks, built to navigate in shallow water." Rays vary widely in size and contour, but all have flat bodies and long tails that are usually armed with horny spikes or other stinging devices. They are bottom fishes, feeding on crustaceans or other small fish and swimming with an odd undulating motion of the edges of the body, somewhat like the wings of a bird in flight. Game species are very large. The common sting ray (*Dasyatis centrura*), abundant along the east coast, is known to reach a length of more than 10 feet. In Florida and the Mediterranean some specimens of devilfish or manta weighing 1,000 pounds have been captured.

The sawfish is a skate having the head armed with a long snout that is provided with teeth on the sides. Another species, the torpedo, is provided with sets of muscles capable of giving a powerful electric shock. In Europe some of the smaller species are used as articles of food.

Reindeer, a deer (*Rangifer tarandus*) of the Arctic Region, domesticated long ago in Northern Siberia, Kamchatka and Lapland, where it is used as a beast of burden and draft animal. The name does not mean deer that is driven by reins; for *rein* seems to be a Lapp word meaning pasture. The Laplanders depend on the reindeer for their very existence; besides being their beast of burden, the reindeer gives them meat and milk for food, hides for tents and clothing and horns and hoofs for various purposes.

Its usefulness led to the introduction of the reindeer into Alaska in 1889, where it has since proved of inestimable value to the Eskimos.

The caribou of Canada and Greenland is considered by some to be merely a subspecies of the reindeer, but apparently several distinct species are recognized. All the varieties are larger than deer and have long, wide-spreading antlers; they are also different from ordinary deer in that the female as well as the male possesses antlers.

Reptiles or **Reptilia,** a large group of vertebrates, including lizards, snakes, turtles and crocodiles and a large number of extinct forms, such as the dinosaur. Reptiles have a scaly skin, breathe by lungs and have blood that maintains the same temperature as their surroundings. All reptiles produce eggs, but some of the snakes retain them in the body until they are hatched. Reptiles and birds resemble each other in several points, so that the English biologist Huxley united them in a group of *Sauropsida* (reptilelike). The turtle's body is inclosed in a bony case, the upper half being formed of the ribs united to the skin, the lower of plates developed in the skin. In the crocodiles the scales are strengthened by the formation of bone beneath the horny portions. Most reptiles have teeth, but in turtles the jaws are toothless and covered with horny sheaths. Some snakes and a single lizard (the Gila monster) are poisonous, the poison glands being developed in the mouth.

Rhea, any of a genus of large flightless birds, closely related to the ostrich and inhabiting the grassy plains of South America. It is smaller than the ostrich, has more feathers on the head and neck, no tail and three-toed feet with claws. The rhea runs very fast, using the wings as an aid in covering ground—somewhat like a sail; and it is a good swimmer. Although its plumes are inferior to those of the ostrich, they find a market when made up into feather dusters. The skins are used for making rugs. There are three species: *R. americana,* the largest, occasionally seen in zoological gardens; a smaller bird, *R. pennata,* confined to eastern Patagonia; and Rothschilds' rhea, with a longer bill, found farther north, in Brazil.

Rhinoceros (from Greek words meaning nose horn), a large thick-skinned mammal with one or two horns on the snout. The rhinoceros has a large, unwieldy body, short, thick legs, terminating in large pads, with hooflike nails on the three toes; a large, elongated head; small eyes and ears; and a short tail. Two species, each with two horns, belong to Africa: the black (*Diceros bicornis*—both names mean two-horned), for which the native name is *borele;* and the huge white or slate-colored *Ceratotherium simus,* now almost extinct. It is sometimes more than 12 feet long and 6 feet high. The Asiatic species, all smaller, are: the Indian and Malayan with one horn; the Sumatran with two. These Asiatic rhinoceroses have a hide that looks like armor plates. The Indian rhinoceros, a one-horned species, is the one usually seen in American menageries. It leads a tranquil, indolent life, wallowing on the marshy borders of lakes and rivers. Its sense of smell and its hearing are so keen that the rhinoceros cannot be easily attacked. When it is brought to bay, it charges with great fury and impetuosity and is one of the most dangerous animals to hunt.

Robin, a familiar American bird (*Turdus migratorius*) found in all parts of the country. It is about 10 inches long with a dull brownish-gray color above and a breast of rusty red. It is one of the earliest birds to appear in the spring. John Burroughs called it, of all our birds, "the most native and democratic." Although it is usually thought that the robin winters in the South, probably very few that nest in temperate climates migrate any great distance, and most of the species spend the winter within a few miles of their nesting site. The English robin or robin redbreast (*Erithacus rubecula*) is a smaller bird, more like a warbler and a better singer than the American robin, which it resembles only in general coloring.

Rodents or **Rodentia,** the large group of gnawing mammals containing such forms as rats, mice, squirrels, rabbits, marmots and beavers. The most characteristic thing about the group is the nature of the teeth. There are no canine teeth, and the incisors are used for gnawing, continue to grow throughout life and are kept a moderate length only by gnawing. Although the rodents are mostly burrowers, some forms, as the vole and muskrat, have become partly aquatic; others, such as squirrels, are tree dwellers. Rodents have caused much economic damage in Europe and America.

Sable, a carnivorous mammal (*Martes zibellina*), about 18 inches long exclusive of the tail. It is allied to the common and pine martens, found chiefly in Siberia and Kamchatka and hunted for its fur, the darker shades being most valuable—so that sable as an adjective has come to mean black. The lustrous fur is generally brown, grayish yellow on the throat, with small grayish-yellow spots scattered on the sides of the neck. It is densest during winter, and owing to the mode of attachment of the hairs to the skin, it may be pressed or smoothed in any direction. A North American species (*M. pennanti*) is called *fisher* or *pekan.* The furs of all these varieties are frequently dyed and otherwise manipulated to imitate the true Russian sable. Sable hair is used also in the manufacture of artists' paint brushes.

Salamander, a small, lizardlike amphibian, nocturnal in habits and spending most of its life in or near water. Its skin is always moist and cold, a fact that gave rise to the superstition it could live in fire and that gave the name to salamander furnaces for heating buildings in course of construction. The common species of Europe is the spotted salamander (*Salamandra maculosa*), 6 to 8 inches long and black with yellow or orange patches. It is sluggish in habits, very shy and perfectly harmless.

The Mexican axolotl (*Amblystoma tigrinum*) is a salamander that usually breeds in the larvae stage and develops beyond that only in dry climates where it cannot live in water all the time. Another species, *Cryptobranchus,* is represented by the giant salamander (*C. maximus*) of Japan, sometimes 5 feet long, and the hellbender (*C. alleganiensis*) of streams in the Ohio valley, about 18 inches long.

Salmon, a game and food fish (genus *Salmo*) that inhabits both fresh and salt water. It generally reaches a length of 3 to 4 feet and weighs 12 to 30 pounds; but these limits are frequently exceeded. The adult is bluish white on the back and head and lighter on the sides and belly. It is found in the North Atlantic and in Canadian waters.

The eggs hatch in the headwaters of some fresh-water stream, and the young usually remain in the shallow portions of this stream for a year or more and then they migrate to the sea. When the season of migration approaches, the fins become darker and the fish assumes a silvery hue. It is now known as a *smolt* or salmon fry. The smolts congregate into shoals and proceed seaward. On reaching the estuary they remain in its brackish water for a short time, and then make for the open sea. The smolt, leaving its native river as a fish weighing perhaps not more than 2 ounces, after 3 months' absence may return to fresh water as a *grilse,* weighing 4 or 5 pounds. In the grilse stage, the fish is capable of depositing eggs. After spawning in the fresh water the grilse again seeks the sea in the autumn, and when its second stay in the ocean is over, it returns after a few months' absence as an adult salmon, weighing from 8 to 10 pounds. For the purpose of breeding, the salmon returns to the same river in which it passed its early life and fights its way upstream in spite of obstacles. Its climbing and leaping ability give the best-known species its name *S. salar,* the second word meaning leaper. A few landlocked salmon remain all their lives in lakes and fresh-water streams.

A related genus *Oncorhynchus,* represented by six species in the Northwest, is the main source of supply for the great salmon-canning industry. These fish, unlike the true salmon of genus *Salmo,* die after they spawn and do not return to the ocean. Salmon fishing is one of the great food industries. There are large fisheries both in Europe and in western America between the latitudes of 45° and 75°.

Sand dollar, see *Echinoderms.*

Sandpiper, any of about 100 species of shore birds (family *Scolopacidae*) including snipes and related species. Although there is wide variation in size, most birds of this group are rather small, with long, usually straight bills and fairly long wading legs. Sandpipers are distributed throughout the world; they breed in the northern regions and often cover vast distances in migration but are seldom found far from water.

The spotted sandpiper (*Actitis macularia*) is the most widely known of the family. This little bird is 7 inches long, olive-brown above and white mottled with black spots underneath, but in winter the spots disappear and the underparts are pure white. It is generally seen running along the shore of a pond or stream, stopping occasionally to bob its head and body up and down, a habit that has given it the name of *teeter.* The solitary sandpiper (*Tringa solitaria*), unlike its American relatives but like the European sandpiper, is an inland bird never seen on the sea beach where other sandpipers are found. In size and coloration it strongly resembles the spotted sandpiper, from which it is distinguished by the conspicuous white in the tail feathers. The least sandpiper or stint (*Pisobia minutilla*) is the smallest of the group, 6 inches in length, a pale brownish gray on top and white underneath. Scarcely larger than a sparrow, it is a familiar sight on marshes and along the open beach.

Sandpipers nest on the ground, usually in clumps of grass near the water's edge, and lay 4 eggs. The solitary sandpiper and the green sandpiper (*T. ochrapus*) of the Old World lay their eggs in old nests of other birds. The food of the seashore sandpipers consists principally of tiny larvae and marine organisms.

Sardine, see *Herring.*

Sawfish, see *Ray.*

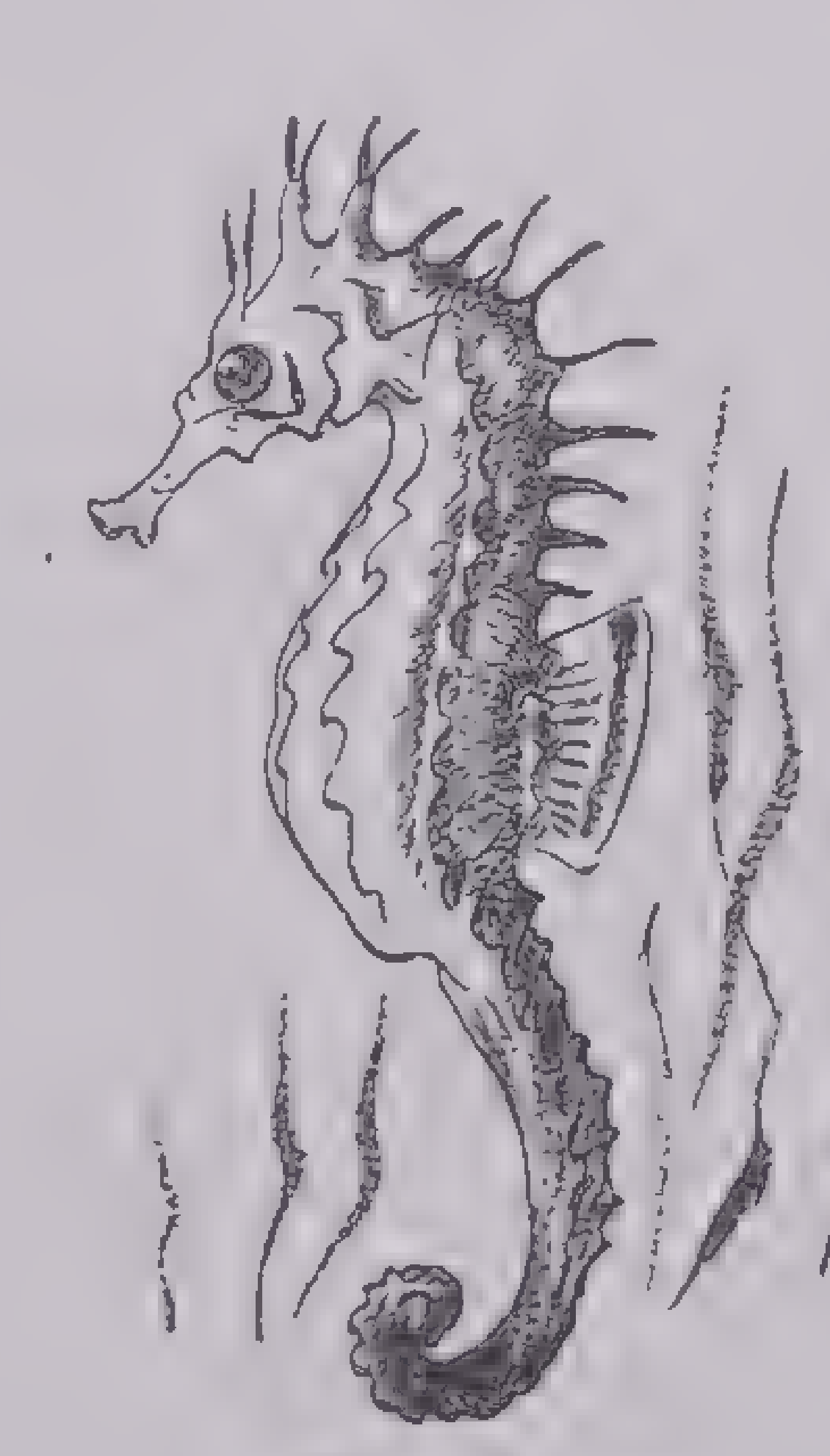
Scallop, a salt-water bivalve mollusk (family *Pectinidae*) well known as a food, the muscle that pulls the shells together being the edible part. The fan-shaped shell is regular in contour, with ridges radiating to the outer edge, which is waved in a form named scallop from the mollusk. (Scallop seems to be a variant of the root in the word *shell.*) Scallops vary in size from 2 to 10 inches long. About 40 species occur in North America, usually in the warmer climates and in fairly deep water. They are taken by means of heavy dredges dragged along the bottom by a motorboat. Most of the catch is made in July and August, but the season during which they may be legally taken varies in different parts of the country.

Scaup, the European duck (*Nyroca marila*), more popularly known in this country as broadbill, bluebill or widgeon and is related to the canvasback. Scaups are abundant and fly in large flocks; they are often seen sitting on the water in so-called *rafts* that number several thousand, and many are shot each year during the hunting season, for their flesh is very tasty, especially after feeding on the wild celery that is their favorite food.

The scaup is 20 inches in length. The male has a metallic black head, neck and chest; the rest of the body is white streaked with fine black lines. The female is brown where the male is black. The lesser scaup (*N. affinis*) is a smaller bird but differs little from *N. marila.*

Sea anemone, any of the flowerlike animals (*Anthozoa*) belonging to the group *Coelenterata.* All are sea forms and are found attached to piles and floating timber. From their attached positions they extend arms or tentacles in all directions to find food, which consists of microscopic organisms. When it is irritated, the sea anemone contracts violently and at the same time sends out from small holes in the body long threads that bear stinging cells capable of killing small animals.

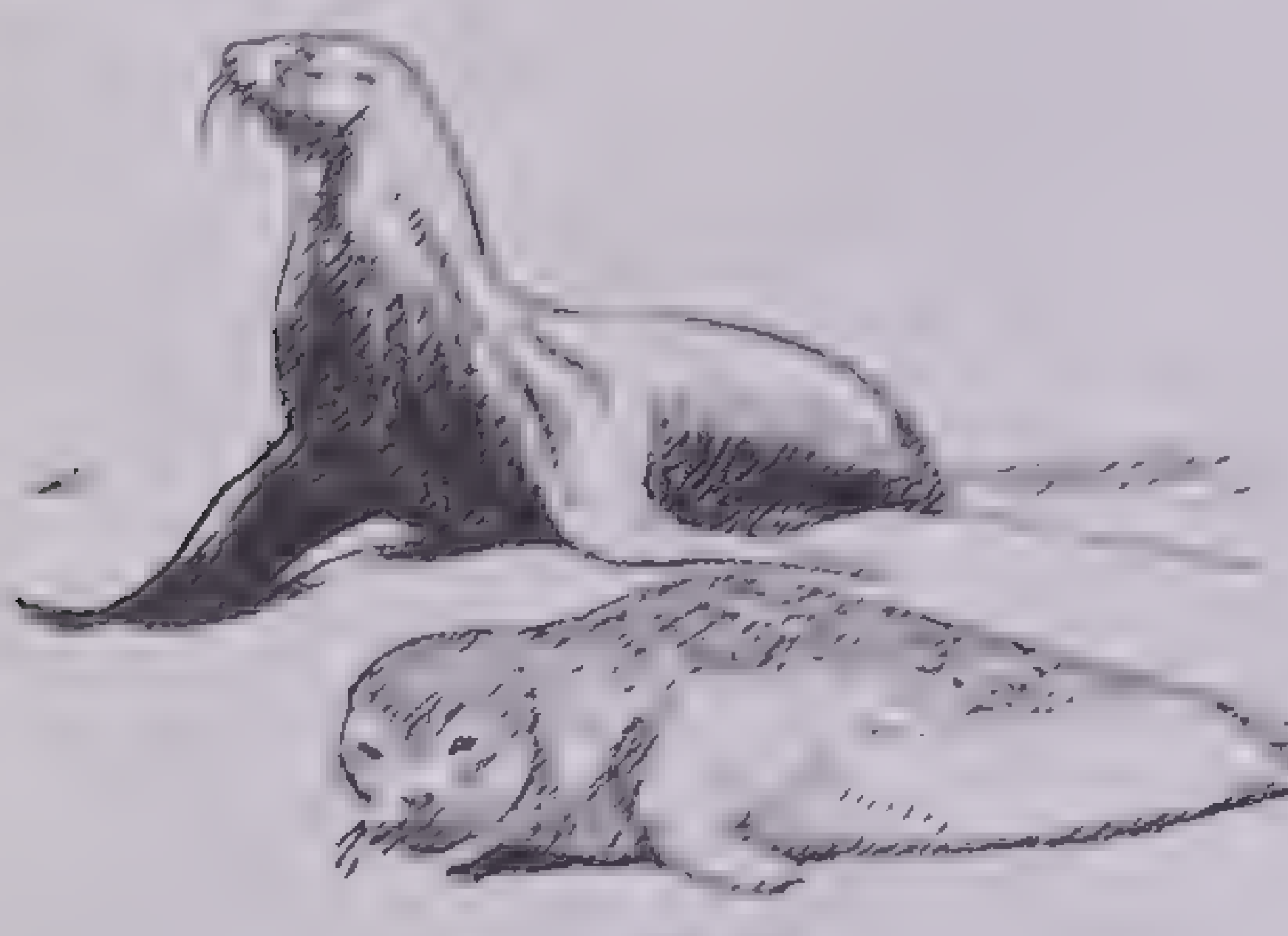
Sea cucumber, see *Echinoderms.*



Sea horse

Sea horse, a small, odd-looking fish (*Hippocampus*) with a head strongly resembling that of a horse or the knight chessman. The whole body is covered with bony plates. It has a long, prehensile tail and swims in an almost vertical position. It prefers quiet brackish waters and coils its tail around marine grasses to keep from being swept away by the tide. The eggs of the sea horse are hatched by the male in a pouch of his body where the female lays them. About 50 species exist. The common variety in eastern North America (*H. hudsonius*) is 3 inches or a little longer; on the Pacific coast there is a variety twice that size.

Sea lion, an aquatic mammal, any of the eared seals (*Otariidae*), which differ from the true seals in having the hind limbs less modified into a taillike structure and in having an external ear; they are better adapted for land than are the true seals. Although the group *Otariidae* has a wide distribution, sea lions are mainly Antarctic. The fur seals are strictly eared seals and belong to the sea lions. The fur seals are of most importance in the Pacific Ocean, where they are found from southern California to the Aleutian Islands. At one time the population of Commander and Pribilof Islands was estimated at 3,500,000 seals, but at present the sealing industries have reduced the number greatly.



Seal

Sea Lion

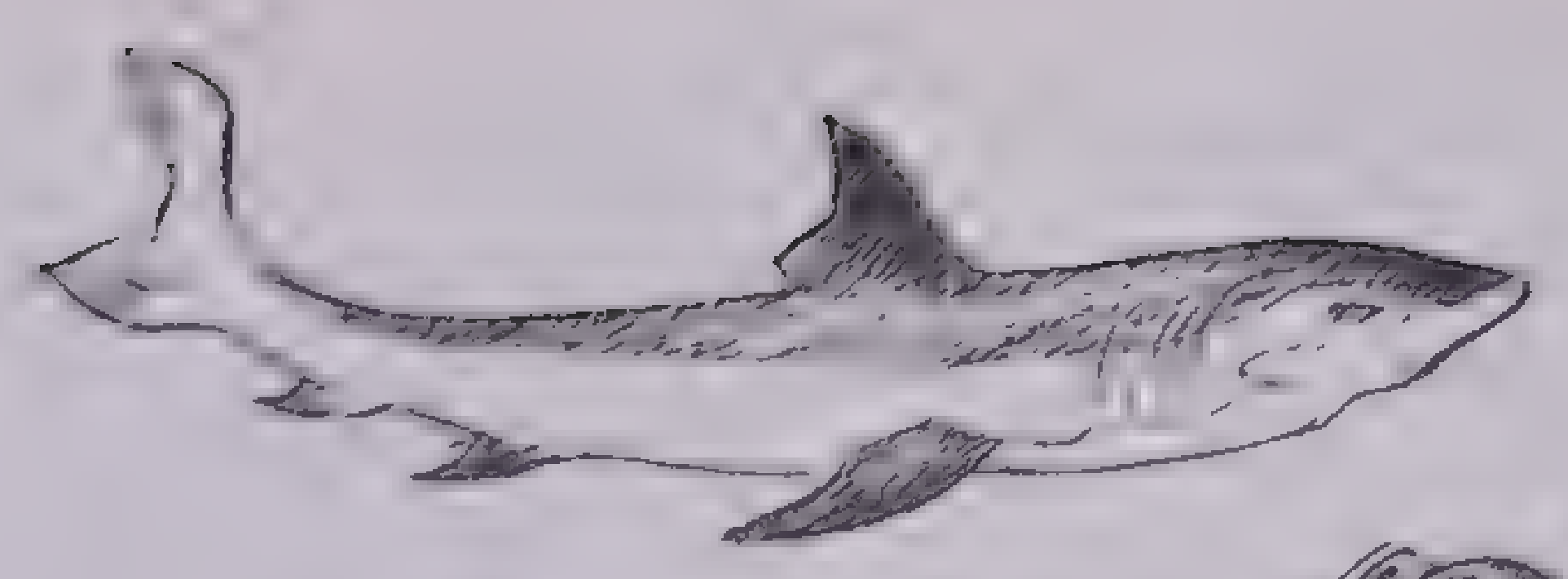
Seal, an aquatic carnivorous mammal belonging to either of two families: the true seals (*Phocidae*) with legs modified into flippers, which are of little use in progressing on land but which are well adapted for life in the water; or the eared seals (*Otariidae*) with two well-defined rear flippers. Another classification is: hair seals, those with short coarse hair; and fur seals, which have a thick soft under fur that is commercially valuable. All species of seals are flesh eaters and make great havoc in schools of fishes and eat also sea birds, mollusks and crustaceans. The seals are prized as food by the Eskimos.

Sea urchin, see *Echinoderms.*

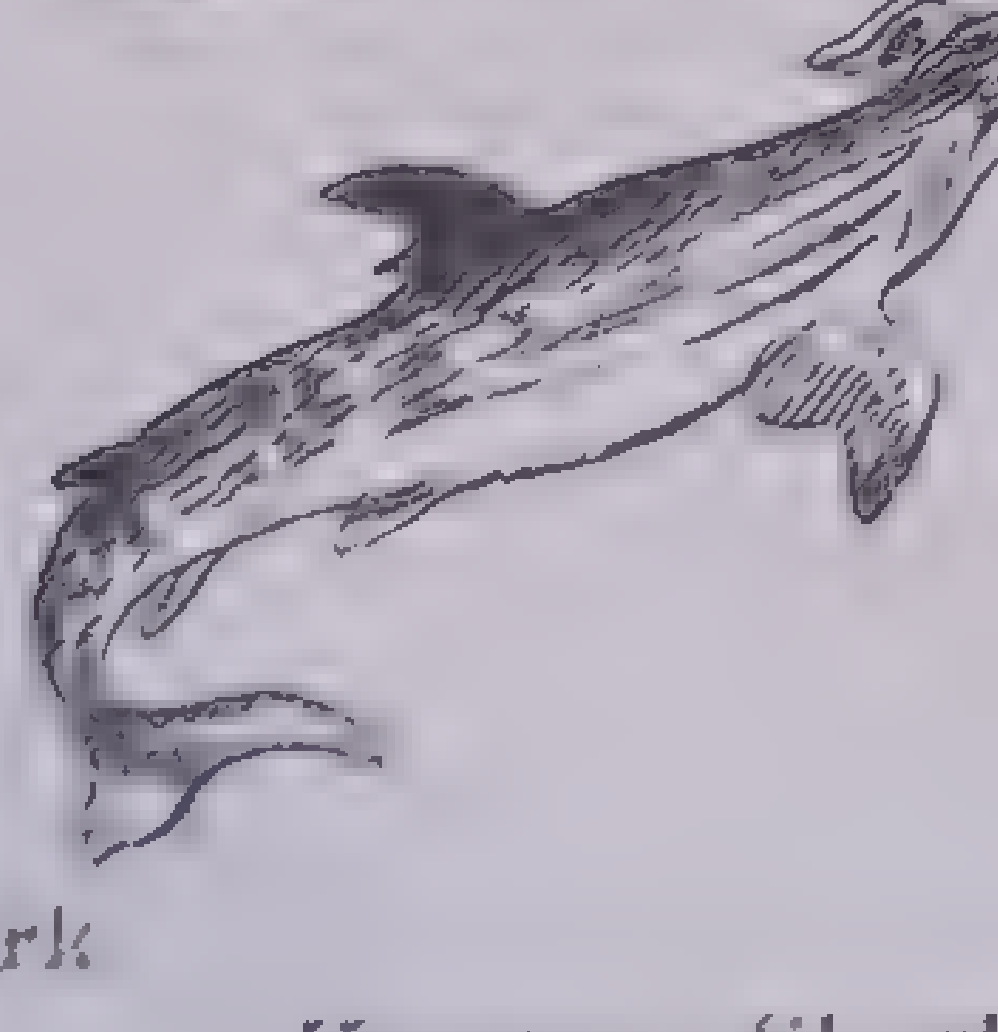
Secretary bird, a South African bird of prey (*Serpentarius* or *Sagittarius secretarius*) resembling the turkey vulture or buzzard. It stands about 4 feet high and has long, naked legs and a crested head that gives the bird its popular name—as if a plumed pen were carried over its ear. It is bluish gray, with black underparts and tail quills, which are tipped with white. This bird is known and valued for its fearless attacks on snakes, even large and poisonous varieties, which it kills with its talons. It is sometimes domesticated as a protection against snakes.

Shad, a herringlike fish of considerable food value. There are several species of the genus *Alosa.* The body is deeper than in the herring. In the spring the shad ascend the rivers of-our eastern coast to lay their eggs. The roe is prized as a table delicacy and the grown fish, caught in the rivers in the spring, are delicious. The Atlantic coast species is *A. sapidissima,* and that adjective is Latin for very tasty. The meat is very full of extra sharp small bones.

Shark, any of a group of very simple fishes, usually classed with the rays as *Selachii.* The skeleton is entirely of cartilage, no bone being developed. The gill openings have no covering (*operculum*) as in other fish, and open separately by five slits on each side of the neck. The mouth is on the bottom of the head, not at the extreme front. The tail has two lobes, of which the top is much longer. The skin of most species is composed of a number of small plates, each of which bears a small spine. Formerly under the name *shagreen,* sharkskin was used commercially in place of sandpaper. The skins of certain sharks are used in the manufacture of pocketbooks and shoes. The sizes of sharks vary from that of the small dogfish forms, which average perhaps 2 feet, to that of the great whale shark (*Rhineodon typicus*), sometimes 45 feet long. The whale shark and the basking shark (*Cetorhinus maximus*), which is nearly as big, eat only tiny sea animals. The blue shark (*Prionace glauca*), 20 to 25 feet long, and the *Carcharodon* (named from Greek words meaning sharp tooth because his teeth are shaped like arrowhead flints) are real man-eaters. The small sharks called dogfish (some spiny—genus *Squalus,* some smooth—genus *Cynias*) wreck fishermen's nets and eat the fish. Two sharks with strange heads are: the porbeagle (*Lamna nasus*), 18 feet long, viviparous and sharp-snouted; and the hammerhead (*Sphyrna zygaena*) with a head like the top of a T. Most of the species are voracious, but the tales of man-eating sharks are exaggerated and overdrawn. The flesh of some of the smaller sharks is edible and is sold under the name of grayfish; but the use of it in the United States is limited.



Blue Shark



Hammer Shark

Sheep, a genus (*Ovis*) of hollow-horned ruminants or cud-chewing mammals of great economic importance. Wild sheep are common in Asia, where the argali (*O. ammon*), the largest of the genus with huge horns, is often found in large herds in the mountainous regions of the Northeast. In America the bighorn or mountain sheep (*O. canadensis*) is found in the Rocky Mountains from Mexico to northern Canada. Marco Polo's sheep (*O. poli*), one of the finest species of wild sheep known, is found in Turkestan and has been known since the 13th century. It reaches a length of more than 6 feet and the horns are sometimes 5 feet long.

Sheep were probably first domesticated in Asia and introduced into other parts of the Old World before history was written. The American breeds of domesticated sheep come chiefly from British and Spanish races. The Shropshire is a popular breed in the Middle States and is a good mutton sheep. The most important wool sheep is the Merino breed, Spanish in origin but found today largely in America and Australia, where its fine wool is a product of great importance. In addition to their furnishing wool and meat products sheep are of considerable importance to farming because of the manure that they produce.

Shrew, the smallest of mammals, mouselike in appearance but actually related to the mole and forming the family *Soricidae.* Shrews are found in fields, meadows, gardens, woods and marshes, where they feed on worms and insects. They usually live under logs and stumps. The most common shrew in the United States is the mole shrew (*Blarina brevicauda*), a type of the short-tailed genus. The long-tailed genus is *Sorex.* The water shrews have fringed feet. In the East Indies and Asia there are squirrel shrews that live in trees (genus *Tupaia*). The African elephant shrew (*Macroscelus,* long legs) has a big proboscis and is a great jumper.

Shrike, a bird of prey with the peculiar habit of impaling its victims on thorns or barbed wire fences. The genus is named *Lanius,* butcher. Shrikes are found in both hemispheres. Two species are common in the United States, the northern shrike or butcherbird (*L. borealis*), about 10 inches long, and the slightly smaller loggerhead shrike (*L. ludovicianus*) of the southeastern states. They are quite similar in plumage, gray on top and white beneath, with black-and-white wings and tail. The bill is sharply hooked, the wings short and rounded and the tail long.

Shrikes feed on large insects, frogs, small reptiles, mice and birds. They are usually seen perched on the tops of trees, telegraph poles or fence posts, from which they swoop upon their prey. At times they work destruction on sparrows and other small birds, wilfully slaughtering without eating them. Apparently the shrike impales its victim because the shrike's feet are not strong enough to hold the prey while the powerful beak tears it apart.

Shrimp, any of a group (*Caridea*) of small, slender crustaceans allied to the lobster and crab; mostly sea dwellers. Louisiana is the principal source of shrimps in the United States, where they are widely used. In many other countries they are an important article of food. Usually they are 1½ to 3 inches long, of a delicate gray-green color spotted with brown. When shrimps are cooked, the color changes to pink and white.

Silkworm, a term applied to the larva or caterpillar of several species of moths (*Bombycidae*). The common silkworm moth (*Bombyx mori*), the most important, is a native of China, where it has been cultivated from a remote period. It feeds on mulberry leaves. The caterpillar (silkworm) is yellowish gray, and when it is fully grown is about 3 inches in length, with a hornlike projection on the last joint of the body. The silk is produced from a pair of glands (on the floor of the body) that contain a gelatinous substance and become much enlarged at the time when the animal is about to spin. These silk glands unite at the mouth to form a common duct termed the *spinneret.* Through this tube the semifluid substance is ejected; on coming in contact with the air, it hardens into the silk fiber, which the caterpillar employs in constructing the cocoon in which it assumes the pupa stage.

In the silk industry the pupa is usually killed by plunging the cocoon into hot water, because the natural exit of the moth is injurious to the silk. After the pupa is killed the silk is reeled from the cocoon and sent to the market as raw silk. The cocoon is 1 to 1½ inches long. The color of the silk varies from a bright orange to almost white. In Europe some moths produce one generation annually; others, two generations. A valued variety is the *novi* race of Italy, which spins a large, white, oval cocoon. The Japanese have several varieties, including an oak-feeding silk moth, producing a green cocoon, the silk of which is much used for embroidery. There are also different kinds in China and India.

Skate, see *Ray.*

Skink, a small lizard, 7 or 8 inches long, that lives in sandy places. Most skinks have short legs, some only one pair and others none at all. The head is narrow and pointed; the body and tail are round and chunky. The Egyptian skink or adda (*S. officinalis*—officinalis means used as a drug) was supposed to be a cure for leprosy. A brilliantly colored North American skink is the blue-tailed lizard (*Eumeces fasciatus*) with a black-and-yellow striped body and azure-blue tail; when this lizard is 4 or 5 years old, the colors fade, the head becomes coppery red and the body olive-brown.

Skunk, any of the genus (*Mephitis*) of carnivorous mammals, usually marked with black and white in a striking manner. The skunk is nocturnal, feeding on whatever it may find, and is especially fond of poultry. It defends itself by ejecting at will an offensive fluid secreted by a gland near the vent. Besides the striped skunks there are the spotted skunks (genus *Spilogale*) and the large white-backed skunks (*Conepate*) of Central and South America. Sometimes skunks eat birds and poultry, but their usual food is frogs, mice and insects.

Sloth (meaning slowness, laziness), a large mammal belonging to the edentates, or animals with imperfect teeth. It is a tree dweller and lives hanging (back downward) by its strong claws from the limbs of trees. The sloth feeds upon the leaves, and its slow motion gives it its common name. It occurs in the forests of tropical America. There are two genera: *Bradypus* (which means slow-foot), having three claws on the front feet; and *Choloepus* (lame foot), having two claws on the front feet. The sloths are practically helpless on the ground. They are usually 1½ to 2 feet long. The young, only one at a birth, holds tight to the mother's back and is almost hidden by her long hairy fur.

Smelt, an important food fish that occurs along the coasts of North America and Europe and occasionally moves up rivers to spawn. In form and structure it closely resembles the salmon but is smaller. The color is greenish on the back, silvery and white on the sides and bottom. The American species (*Osmerus mordax*), sometimes called *frostfish,* is about 1 foot long and occurs abundantly on the northern Atlantic coast. The common European smelt or sparling (*O. eperlanus*) is smaller, reaching a length of about 8 inches. A third species (*O. thaleichthys*) is found along the Pacific coast north to Alaska.

Snail, a common name for a mollusk that has the body enclosed in a spiral shell that gives the name *Helix* (coiled, spiral) to the typical Old World genus. Some snails live on land and others in water. The land-dwelling forms have a slight shell, into which the whole body can be retracted. They feed exclusively on vegetation, which they rasp with a long ribbon just inside the mouth, the surface of which is covered with thousands of minute teeth, so that the whole is a flexible file. The animal creeps about on a broad sole (which gives the class name *Gastropoda,* ventral foot), and has four tentacles on the head, one pair of which bear the simple eyes at the tip. Snails do considerable damage if they are numerous. One species is eaten by many people in Europe, especially in France and Italy. Over 10,000 species are known.

Snake, any of the group (*Serpentes* or *Ophidia*) of limbless reptiles found in almost all parts of the world except the Polar Regions. The snake has a cylindrical body, scaled above but with broader plates or scutes on the lower surface. The mouth can be opened very wide, and the jaws are armed with teeth pointing backward, which are of great assistance in forcing large animals down the throat. Most of the species are so colored that they are inconspicuous in their natural surroundings, but the poisonous species usually have no such protection. The largest snakes are the pythons of India and Africa. The most poisonous species are the fer-de-lance of the West Indies and the krait of India. One group is entirely aquatic, living in the middle of the Indian and the tropical Pacific oceans and bringing forth its young alive.

Snipe, a shore bird closely related to the sandpiper but with a longer bill; it is related also to the woodcock but has a slenderer body. Several species have been so popular with gunners and as a table delicacy that they are now protected during a closed season. Foremost among the protected birds are the greater and lesser yellowlegs or tattler (*Totanus melanoleucas* and *T. flavipes*). The former is one of the largest snipes, 15 inches in length, with long yellow wading legs, a long straight bill for probing in sand and mud, a streaked blackish-brown color above, and white below, mottled with brown on chest and neck. Its range at different seasons is over most of North and some of South America. The lesser yellowlegs is identical in every way except for its smaller size—it is about 11 inches high.

The Wilson's snipe, jacksnipe or English snipe (*Capella delicata*) and the red-breasted snipe or dowitcher (*Limnodromus griseus*) are other American snipes, the latter more like the sandpipers.

The snipes, like other shore birds, cover immense distances on their migratory flights, which range from Alaska to Brazil. They occur usually in small flocks along the edge of water, and the note of most varieties is a loud, mellow whistle, repeated many times.

Sole, see *Flatfish.*

Sparrow, a genus (*Passer*) of birds, including the common English or house sparrow (*P. domesticus*). The name is loosely used for other small birds especially members of the finch family (*Fringillidae*). Most sparrows are small, inconspicuous birds of a dark-brown color. The English sparrow is a common resident of northern Europe and Asia, and was introduced into North America. Since 1850, when the first English sparrows were brought to the United States to protect the trees against insect pests, these birds have spread to all parts of the country and have themselves become pests by eating grain and other food crops. They are very destructive in gardens and drive away more desirable birds.

The lark sparrow or lark finch (*Chondestes grammacus*) has a head marked with black-and-white stripes. Its song is very pleasant and can be recognized by the low purr. The fox sparrow (*Passerella iliaca*) is a larger bird and has red plumage. Its song, which is quite pleasant, is heard only in the spring and fall, as the bird is only a migrant in the United States. The vesper sparrow (*Pooecetes gramineus*), often called the *grass finch,* is recognized by the outer tail feathers, which are exceptionally white. It received its name because it sings late in the afternoon. The song sparrow (*Melospiza melodia*) is moderately large—6 inches long. The white underparts have black or brown markings that fuse in the center to form a large blotch. Its song is very sweet and melodious. Closely related are: the chipping sparrow or chippy (*Spizella passerina*), 5 inches long, which nests near houses; the lighter colored field sparrow (*S. pusilla*); and the larger tree sparrow (*S. arborea*), which winters in the United States. Of the crown sparrows the best-known is the white-throated sparrow (*Zenotrichia albicollis*). Native sparrows do little damage to grain crops as compared with the English sparrow. They do eat many seeds and fruits, but these are usually the seeds and fruits of weeds.

Spider (a word related to spinner), an order (*Araneida*) of animals with jointed bodies and legs, the bodies divided into two regions, the front part bearing four pairs of legs. The most anterior of these are the poison claws (with a poison gland in the base, and the end of the claw tapered to a point) to serve as a hypodermic syringe. The front of the head has from 6 to 8 simple eyes. The posterior half of the body, the abdomen, is without appendages, save for two or three pairs of very small projections, the spinnerets. Each of these has numbers of openings at the tip through which a fluid is forced at will. This hardens immediately after it comes in contact with the air, and furnishes the silk of which the web is woven. Fine as it is, this silk is really a cable, being made of numbers of finer threads, one for each opening in the spinnerets. Spiders use the silk for making webs, for cocoons for the eggs, nests and in some cases for parachutes for flying.

Different species make different kinds of webs. The silk nest of the trap-door spiders (*Cteniza*) is cylindrical with perfectly fitted circular doors on the surface of the ground. The common house spider of America is the same as that of Europe. The largest species we see is the one found occasionally in banana bunches. The tarantula (*Lycosa tarentula*) has the greatest reputation because of the unfounded belief that its bite causes a mad desire to dance, which can be cured only by dancing the tarantella to appropriate music. So far as is known there is only one species that can cause serious effects by biting man. This is the black widow (*Latrodectes mactans*), which is ½ inch long.

Spiders are not insects; their bodies have two (not three) parts, and there are four (not three) pairs of legs. They breathe by means of sacs (called lungs) on the lower side of the abdomen. They are related to the scorpions and with the scorpions and other allies form the class *Arachnida.*

Sponge, any of the low organisms (*Porifera*) that live attached to stones and other submerged objects and depend on the currents of water to bring them food. Although most sponges are found in the ocean, there are a few fresh-water forms. The body is perforated with many holes through which the water flows, bringing food. A large opening at one end allows the water to leave the body. Thus there is a continuous stream of water flowing through the body at all times. Sponges have skeletons of lime and of a horny substance called spongin. The spongin skeletons are used commercially as bath sponges and for other purposes.

Squid, a marine mollusk (*Tenthoidea*) closely related to the cuttlefish. The body is barrel- or cigar-shaped and has 10 long arms equipped with suckers projecting in front and two fins at the tail. The head has two well-developed eyes that are quite similar to those of higher animals. When they are disturbed, squids give off a quantity of an inky substance that acts as a screen and aids them to escape. Most squids are less than 2 feet long, but giants have been reported from time to time with bodies 20 feet long.

Squirrel (a name that comes from Greek words meaning shadow tail), any of the family *Sciuridae,* rodents, mostly tree dwellers, with bushy tails and hind legs much more developed than the front pair. Squirrels are abundant in the Northern Hemisphere, living in trees and feeding largely on nuts. There are several species in the United States. The red squirrels are common in evergreen conifers, and the gray or fox squirrels in hardwood forests. The gray squirrels are larger and drive the red ones away when the two meet. Black squirrels are variants of the fox squirrels. The fur of the larger kinds has considerable value. Closely related are the ground squirrels or chipmunks and the flying squirrels, which really do not fly but glide by means of a parachute of skin extending between the legs of each side.

Starfish, see *Echinoderms.*

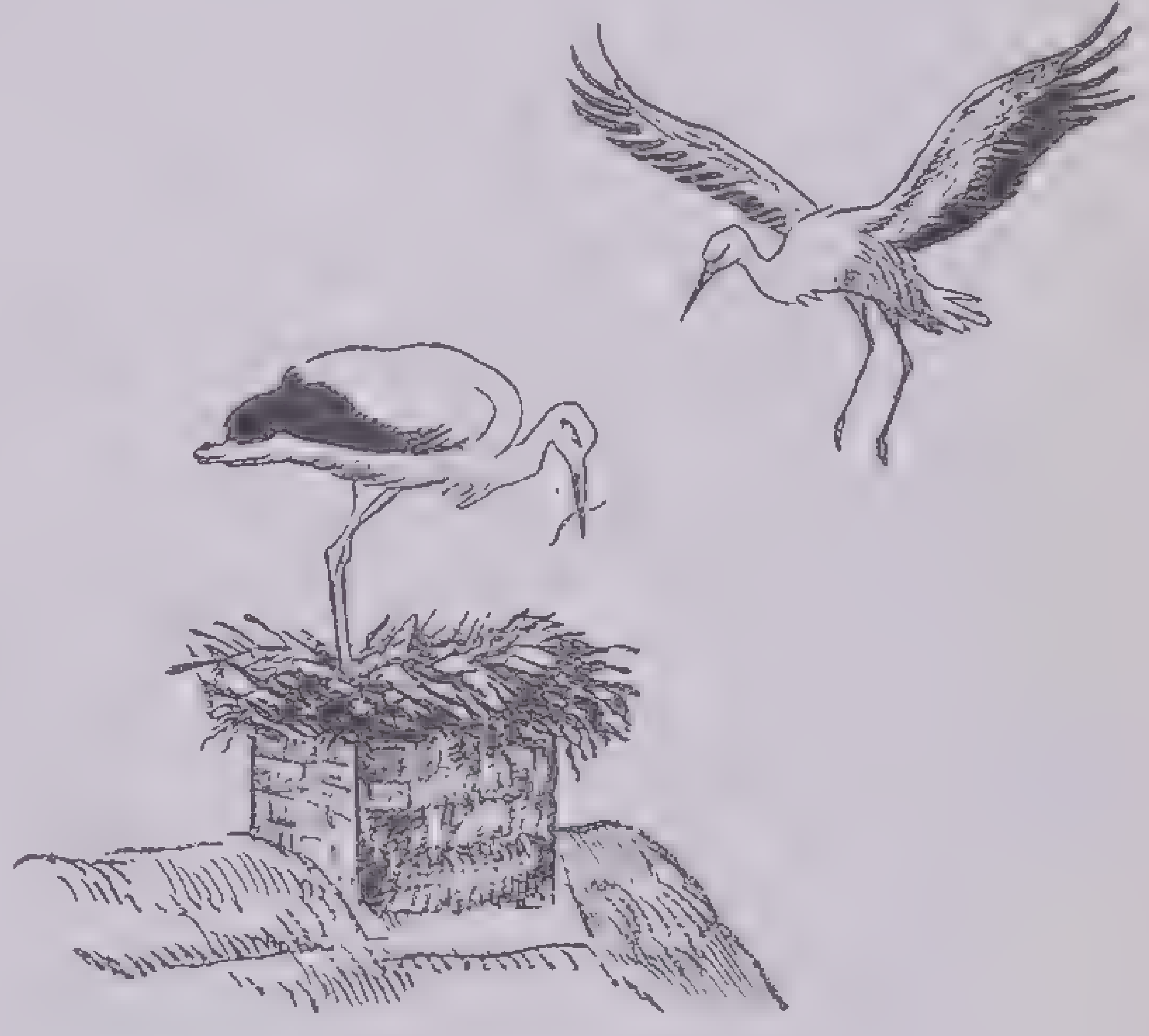
Starling, any of a large family (*Sturnidae*) of Old World birds, numbering about 150 species, one of which was introduced into America. This species (*Sturnus vulgaris*) is 8 inches long and has a metallic black plumage, shot with purple reflections. There are conspicuous light-colored dots sprinkled over the body. The bill is yellow, and the wings are very pointed, distinguishing it from the blackbird in flight. Its ordinary call is a shrill whistle, but the starling imitates sweeter bird songs.

In 1890, 80 of these birds were released in New York city, and 40 more the following year. Now its numbers reach into millions, and it has spread over the entire eastern United States.

In certain sections it is a distinct menace, wreaking great havoc on cereal crops, fruits and berries upon which it descends in enormous flocks. By its competition for food and dwelling places and its ever-increasing numbers it may threaten the actual existence of such native species as the robin, bluebird, flicker, martin, tree swallow, crested flycatcher and sparrow hawk, nearly all of them much more beneficial economically than the starling at its best. The starling and the English sparrow are conspicuous examples of the fact that a beneficial species in one country is by no means always beneficial in another country, into which it has been artificially introduced.

Stoat, see *Weasel.*

Stork, a large wading bird of the family *Ciconiidae,* related to herons and ibis. The true storks number six species, ranging over Europe, Asia and Africa, and found also in South America. They resemble the herons but are more robust and have larger bills and shorter toes, with a nonserrated claw on the middle toe. They inhabit the vicinity of marshes and rivers, where they find food consisting of frogs, lizards, fishes and even young birds. They are migratory, arriving at their breeding haunts in the early spring and departing again in the autumn. The white stork (*Ciconia alba*) is common in Europe, constructing a large nest, most frequently on the chimney of a cottage where a cartwheel is often put for it to build on. It is supposed to bring good luck—and babies. The black stork is a swamp bird of Europe and Asia. The adjutant bird (*Leptoptilus dubius*) is an Indian stork, 6 or 7 feet high, feeding on carrion and snakes and protected by the law of India. The African marabou (*L. crumeniferus*), famous for its plumes, is a smaller adjutant. One South American stork is the varicolored maguari (*Euxenura maguari*).



European Storks

Sturgeon, any large fresh-water fish of the family *Acipenseridae* numbering about 25 species. The sturgeons are notable for their peculiar structure and for the roe of several species, which is treated with salt and marketed as the delicacy called caviar. Smoked sturgeon is a famous food. Isinglass is made from the sturgeon's air bladder.

As a group the sturgeons are primitive fishes, fossil remains showing little or no structural difference from the modern species. The elongated body is armored with fine rows of body plates, each having a raised ridge down the center. The upper half of the tail is longer than the lower and the snout is usually elongated, with four barbels, somewhat resembling whiskers, at the sides of the mouth. All sturgeons occur in fresh waters of the northern regions, most of them migrating upstream to spawn. The lake sturgeon (*Acipenser rubicundus*) once plentiful in the Great Lakes, may reach a weight of 200 pounds; it has blotched, reddish sides. The common sturgeon (*A. sturio*) has been taken at 500 pounds. The largest form occurring in North America is the white sturgeon (*A. transmontanus*) weighing from 300 to 600 pounds. It is found off the Pacific coast. Most famous for the caviar furnished by its roe is the huge beluga (*A. huso*), a white sturgeon of Russia (*beluga* means white). This species attains a great age and its maximum size is not known, but specimens have been taken with a length of about 25 feet and a weight of over 3,000 pounds. The best caviar comes from a small Russian sturgeon, the sterlat (*A. ruthenus*), usually 2 or 3 feet long.

Sucker, a fresh-water fish of the large family *Catastomidae* related to the carps and nearly all native to the United States. They are small and generally rather thickset in structure, with small heads and prominent dorsal fins. The thick-lipped mouth is set low in the head and is toothless. The fish was named from its habit of sucking mud and organic matter from the bottom. The commonest species is the white sucker (*Catastomus commersonii*), about 18 inches long.

Sunfish, a name applied to two very different varieties of fish: one very small, the other very large; both have round flat bodies.

The small sunfish is found in fresh-water ponds. It belongs to the bass family but looks more like perch, being brightly colored and small in size (usually about 7 inches). From their oval-shaped bodies they are called pumpkin seeds. All the fresh-water sunfishes in this group are highly palatable.

The large salt-water sunfish (*Mola mola*) sometimes weighs as much as 1,500 pounds. This fish looks like a large head with fins on it. It is sluggish and clumsy, usually being found well out at sea on calm days, sunning itself on the surface. Its flesh is inedible. It is a drab color and has no scales.

Swallow, any of the family *Hirundinidae,* small, long-winged birds with broad bills that open very wide. All are noted for their graceful flight and for their regular migrations in great flocks. They feed almost exclusively on insects. The name swallow is often applied to the swifts.

Among the best-known American swallows are: the barn swallow (*Hirundo erythrogaster*), which builds a nest of mud and grass stuck to the rafters of barns; the bank swallow or bank martin (*Riparia riparia*), a small bird, less than 5 inches in length, nests in gravel or sandbanks; the cliff swallow (*Petrochelidon albifrons*), noted for the bottle-shaped nest of mud that it builds under eaves or cliffs; and two brightly colored swallows, the white-bellied (*Iridiprocne bicolor*), greenish black with white beneath, and the violet-green swallow (*Tachycineta thalassina*) of the West, violet green above and white below.

Courtesy U. S. Bureau of Biological Survey

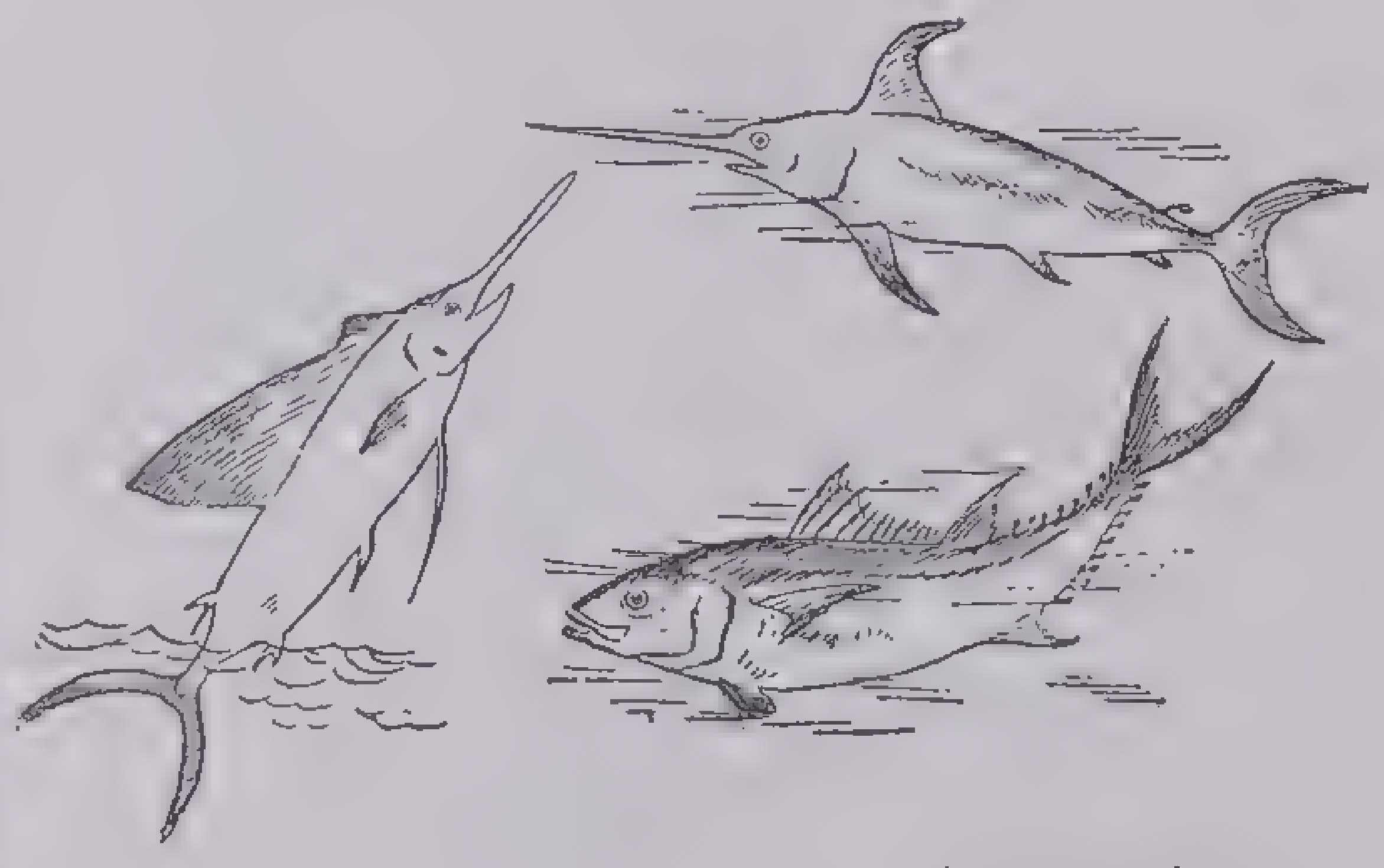
Trumpeter Swan

One of the few remaining trumpeter swans that now find sanctuary on the Red Rock Lakes Migratory Waterfowl Refuge, Montana. The bugle-like call of these birds used to be heard in many parts of the western United States before hunting and the development of the country almost wiped them out. Recently, however, the swans at the Red Rock Refuge have begun to increase in number

Swan, a swimming bird of the subfamily *Cygninae* closely related to the ducks and geese. It has a long, slender neck, a bill about as long as the head, and a swelling at the base of the bill. The swans are uniformly white with the exception of two: the black swan (*Chenopis atrata*) of Australia, which has a little white on the wings, and the black-necked swan (*Cygnus melancorynchus*) of South America. The others come from the Northern Hemisphere. In the United States there are two wild species: the whistling swan (*C. columbianus*) and the trumpeter (*C. buccinator*), but all the tame species are of European origin. The swan (*C. olor*) of the Thames and other English rivers is mute. The legend that it sings just before it dies—a swan song that is a farewell—is not a fact. Formerly swans were bred for the table, but now they are bred solely as ornamental birds for lakes and pools.

Swift, any aerial bird of the family *Apodidae* that seldom comes to the ground except at night. They look like swallows with their long wings, broad bills, wide mouths and the weak inconspicuous feet that give the family name meaning no-feet. They are tireless flyers usually in pursuit of insects that they continually hunt. The coloration is almost always dull, either black or brown. The swifts are usually seen in groups. Nests are placed in inaccessible places, such as the sides of rocks, chimneys and caves and are fastened in place by the birds' saliva. The edible birds' nests of Asia, especially China, are built by small swifts, particularly *Collocalia fuciphaga;* and these nests are almost entirely composed of a salivary secretion. The American chimney swallow is really a swift (*Chaetura pelagica*).

Swine, any thick-skinned omnivorous mammal of the family *Suidae,* including the domestic hog, the wild boar of Europe, the peccaries of America and the wart hog of Africa. Of the wild type, the wild boar (*Sus scrofa*) is the most common and was formerly present in large numbers over Europe, but has been scarce since the 17th century. In this species the tusks are well developed. The young are marked with brown stripes that remain for several months after birth. The African wart hog (*Phacochoerus aethiopicus*) received its name from the large facial growths that resemble warts. In this species there is a growth of long hair down the middle of the back, and the tusks are well developed in both jaws. The hippopotamus is closely related to the swine.



Swordfish, a very large fish of the open sea, widely distributed in both the Atlantic and the Pacific oceans. It is notable for the extreme prolongation of the upper jaw—actually a consolidation of teeth—forming a flattened and tapering sword that in the adult may be over 3 feet long and that gives both the popular name and the scientific name (*Xiphias gladius*), in which the first word is Greek for sword and the second, Latin for sword. True swordfish, often called broadbills, are the only species of its family, although several unrelated varieties, the marlins, the sailfish and the spearfish bear more than a superficial resemblance to it. The body is cylindrical in form, tapering toward the strongly notched tail. There are no scales, the sides being naked and grayish in color. This fish has no teeth and no ventral fins, and the dorsal fin is very long, often projecting above the surface of the water when the fish is sunning itself. The maximum weight of specimens captured is about 800 pounds, but the average is about half that size. The bill of the swordfish can be a dangerous weapon and there are instances on record of its having been thrust through the planking of ships crippling the boats so that they were forced to turn home for repairs. Sometimes the fish breaks off the sword because it hits a boat so hard. In feeding, the swordfish, capable of great speed, swims in among school fishes, lashing out from side to side with its bill and crippling or killing its food. The broadbill is eagerly sought by both commercial fishermen and sportsmen with harpoons and rod and reel. Swordfish steak, a very solid meat, is considered a great delicacy by many, and the angler who brings one of these savage fighters to gaff has achieved something.

Tanager, a brightly colored bird of the New World. Of the three or four species commonly occurring in the United States the best-known is the scarlet tanager (*Piranga erythromelas*—the second word means red black). In summer the adult male, 7 inches long, has a flaming scarlet body with jet-black wings and tail. In fall and winter the wings and tail are still black, but the body plumage is an olive green shading to yellow beneath. The female is rather nondescript in appearance, with brownish-gray wings and tail, otherwise resembling the male in its winter plumage. The scarlet tanager winters in northwestern South America.

The summer tanager (*P. rubra*) is slightly larger and a uniform, duller red all over. The female is yellowish green above and dull yellow below. Its range is from New Jersey to central Florida. The male of the Louisiana or western tanager (*P. ludoviciana*) is variegated yellow, black and red, and the female is generally similar to that of the two other species mentioned above. This bird is confined to the West where, like the robin, its feeding habits sometimes make it a nuisance in orchards. The hepatic or yellow tanager (*P. flava*) is found in the Southwest and south to Guatemala. The tropical tanagers belong to the genus *Tanagra* and the name comes from the language of the Tupi, Amazon River Indians.

Tapir, a genus of hoofed animals with 4 toes on the forefeet and 3 on the hind. Most tapirs are natives of Central and South America, but one species is found in the Malay Peninsula. The malayan tapir (*T. indicus*) is 7 or 8 feet long, bigger than the New World tapirs and has a broad white patch. All are bulky beasts, somewhat resembling swine in appearance but with longer legs. They live in the forests, usually near rivers or swamps, and are good swimmers. The snout is prolonged into a flexible proboscis with the nostrils at the tip. The flesh is said to be good to eat.

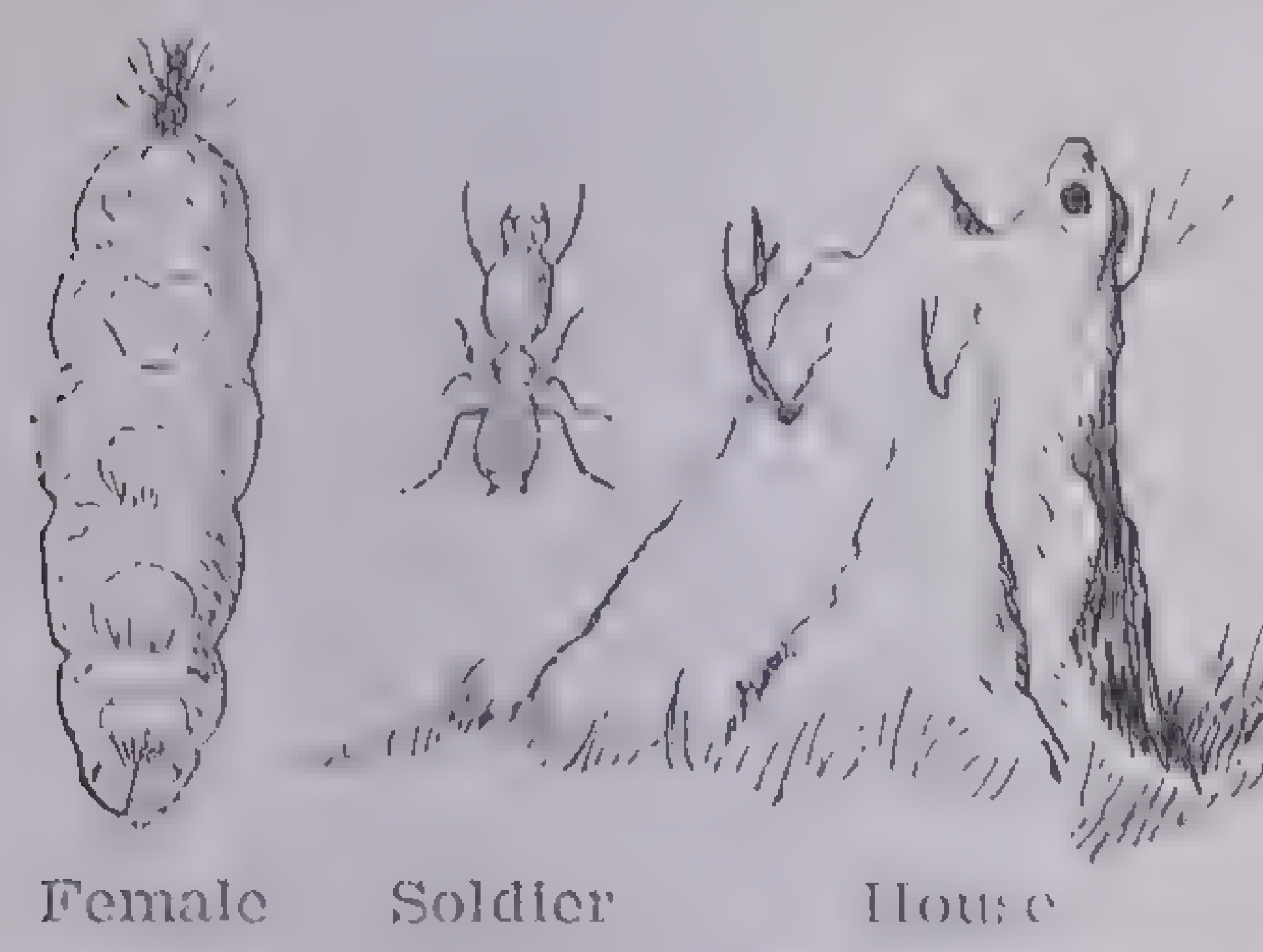
Tarantula, any hairy spider of tropical and subtropical countries, especially the wolf spider (*Lycosa tarantela*), named from the Italian city of Taranto. Central American tarantulas are often brought into the United States on fruit. The tarantula eats insects and other small animals. The seriousness of the bite of the tarantula is overestimated; it is painful but seldom proves fatal. This spider is nocturnal in habits. During the day it remains in a silken tube in the ground.

Tarpon, a large game fish (*Tarpon atlanticus*) of the New World, often called silver king. It is widely distributed in the warmer waters, being especially common in Florida and along the Texas coast but ranging from Long Island to Brazil. The tarpon is slender in structure with a deeply forked tail and a streamlined body built for great speed and strength. The mouth is very large, with a prominent lower jaw and minute teeth. The eyes are large and staring. The most remarkable feature, however, is the overlapping silver scales. The larger of the scales measure more than 3 inches in length. The upper back is greenish blue, and the rest of the body a shining silver. Tarpons weighing over 250 pounds have been taken on rod and reel. It is probable that they reach a weight of more than 350 pounds. A fish this size would be about 8 feet long. There is no harder fighting game fish than the tarpon. When it is hooked, it frequently jumps 15 to 20 times, clearing the water by as much as 8 feet in a single leap.

Teal, a small river duck with short neck, found both in Europe and America. Teals are the midgets of the duck family, and one genus is named *Nettion,* which means little duck. It is believed by many that there is no swifter bird in the world. The male green-winged teal (*N. carolinense*) is 14 inches long, with head and neck rich brown and a large green patch behind the eye. The back is a light streaked gray, and underparts are whitish. It was named from the glossy green speculum or wing patch. Females are streaked brown above and whitish below. This duck nests mostly in the Northwest, but is found throughout the continent. The blue-winged teal (*Querquedula discors*) is 16 inches long. Males are brownish with gray head and a conspicuous crescent-shaped white patch before the eye. The speculum is light blue. Females are brown all over except for the blue speculum. The cinnamon teal (*Q. cyanoptera*) is 17 inches long, both sexes being a mottled chestnut color.

Teredo, the shipworm. See *Clam.*

Termite, a woodworm of the family *Termitidae.* The termites are often called *white* *ants.* Like the ants they live in social communities with an elaborate system of castes and functional varieties. They do not have the constriction between abdomen and thorax that marks the ants. In structure the termites are more like cockroaches. They are pale in color and have soft bodies. The castes that have wings have two pairs, but these are easily shed. The termites are wood eaters and cause enormous losses in tropical countries and recently in many temperate regions of the United States.


Female Soldier House

Termites

The workers, about ⅜ inch long, are both male and female—another difference from the ants, whose workers are all females. The queen termite, about 1½ inches long, lays millions of eggs, sometimes 4,000 in a day.

There are more than 1,000 species of termites. Many of them, especially in Africa and Australia, build huge nests or termitaries, 20 to 40 feet high, piled up a grain of earth at a time and cemented by the saliva of the termites. An Australian termite, called the *compass ant* (*Hamitermes meridionalis*) builds an 8-foot nest with narrow ends always facing north and south. In one African genus the queen controls all activities in the nest: if she is taken away, all work stops and the soldiers run wildly about accomplishing nothing.

Tern, any seabird of the subfamily *Sterninae*, often called the sea swallow, smaller and lighter built than the gulls. They are found throughout the Northern Hemisphere and breed in sandy, isolated regions. Terns usually are gray above and white below, with black markings on the head, but some species are pure white.

Terrapin, see *Turtle.*

Thrush, any of the large family *Turdidae,* attractive birds of moderate size found all over the United States. The group contains many of the best songsters. The wood thrush (*Hylocichla mustelina*) of the eastern United States is olive green above and almost white below, with brown spots on the belly. This is the best singer and one of the largest of the American thrushes. The hermit thrush (*H. guttata*) is second in song. The so-called brown thrush or thrasher (*Toxostoma rufum*) is not a thrush; the thrashers are relatives of the mockingbirds.

Tiger (*Felis tigris*), the largest and most dangerous of the cats, slightly exceeding the lion in size and far surpassing him in destructiveness. In habitat it is purely Asiatic and reaches its highest development both in size and color on the hot plains of India. The full-grown male Indian tiger measures from 9 to 12 feet, and the tigress from 8 to 10 feet, from the nose to the tip of the tail, which has no tuft. The ground color is rufous or tawny yellow, white on the ventral surface, with vertical black stripes or elongated ovals and brindlings. Though possessed of immense strength and ferocity, the tiger rarely attacks armed men, unless it is provoked, but often carries off women and children. When it is pressed by hunger or enfeebled by age and incapable of dealing with larger prey like buffaloes, the tiger prowls around villages and, if it once tastes human flesh, becomes a habitual man-eater. Two varieties are: the Bengal or southern type with short hair; and a northern variety, ranging as far north as Siberia, which has longer, softer hair.

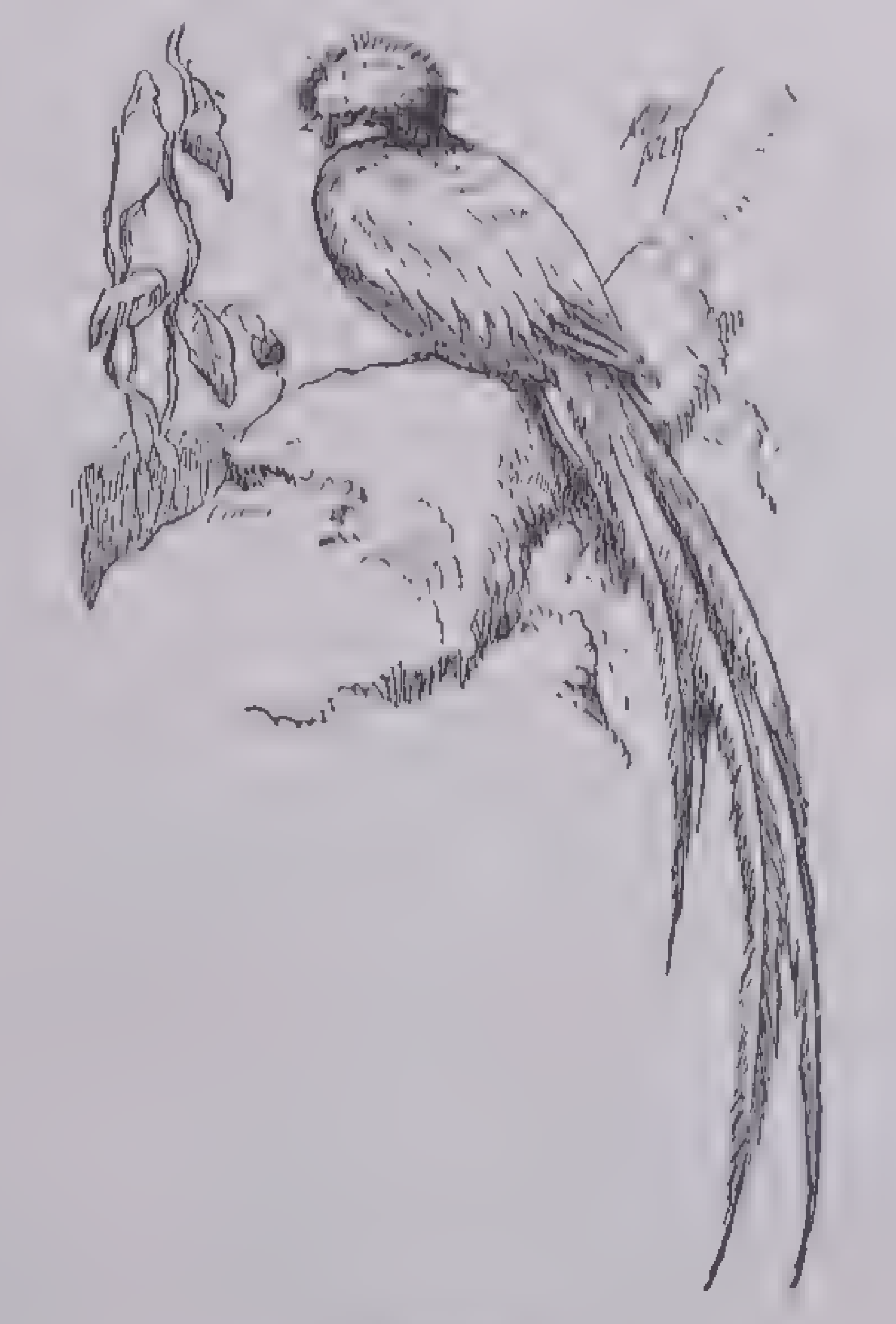
Toad, one of the genus *Bufo* or any of the related genera of amphibians without a tail or teeth and with a warty skin. Toads differ from frogs in their rough skin, their unwebbed feet and their preference for land instead of water. They are common in most parts of the world; but there are few in the Australian region. They are mostly nocturnal and, as they feed on insects, they are among the best friends of man. They have glands in the skin that secrete an acrid fluid (irritating to tender surfaces) that protects them from many enemies. They are perfectly harmless to man, and they cannot cause warts.

Tortoise, a slow-moving reptile of the order *Chelonia* with a heavy armor of horny plates. Some authorities distinguish between turtles as sea animals and tortoises as land animals; but there is no real distinction. The American box tortoise (*Cistudo carolina*) draws the body completely within the hard covering and closes the ends by hinged portions of the shell. Tortoises sometimes attain great sizes. Among the largest are the giant tortoises (*Testudo gigantea*) of the Galápagos Islands and the western Indian Ocean. Specimens attain a length of 4 feet and a weight of 400 pounds.

Toucan, a tropical American fruit-eating bird of the family *Ramphastidae* (literally, curve-beaked), characterized by a beak nearly as long as the body and by brilliant coloring. The bill is very strong but it is spongy and light and does not make the bird awkward. When a toucan roosts he usually rests the long bill on his back. The name is an imitation of the bird's cry. Toucans nest in holes in trees. In the Andes they are found at an elevation of 2 miles above sea level. The toco (*Ramphastos toco*) is a very large species about 2 feet long with an 8-inch beak; its black plumage is relieved by white patches, scarlet tail feathers and an orange-red, black-tipped bill. The araçari belongs to another genus (*Pteroglossus*). One variety is found in Trinidad; the others occur only on the mainland.

Towhee, one of the American finches (*Fringillidae*), either of the genus *Pipilo* or of *Oberholseria.* The common towhee or chewink (*P. erythrophthalmus*) of the eastern United States is so-called because its typical call note is a rather nasal "tow-hee" or "chewink" accented on the last syllable. Another name for this bird is ground robin, and it does somewhat resemble a robin, although smaller in size and rather different in contour. The male towhee is 8 inches long with glossy black head, neck and upper parts. The sides are washed with reddish brown, about the color of a robin's breast; but the towhee's breast and underparts are pure white. The eyes are bright red (hence the name *erythrophthalmus*, meaning red eye). The adult female resembles the male, but is brown where the male is black. The green-tailed towhee (*O. chlorura*) is a Rocky Mountain bird with a chestnut head. Towhees are essentially birds of the ground; their sturdy legs and feet are well adapted to the industrious scratching among leaves, so characteristic of them.

Trogon, a brilliantly colored bird of the family *Trogonidae,* found in the mountainous regions of tropical America. Most famous is the quetzal (*Pharomacrus macinno*) with tail feathers 2 feet long. The under parts are crimson; the upper parts, an iridescent green. It is the national symbol of Guatemala. In former times the native chiefs used the long tail feathers for decorations. The bird was worshipped by the Aztecs and Mayas in the cult of Quetzalcoatl, the mythical king. Quetzal seems to mean tail feathers.

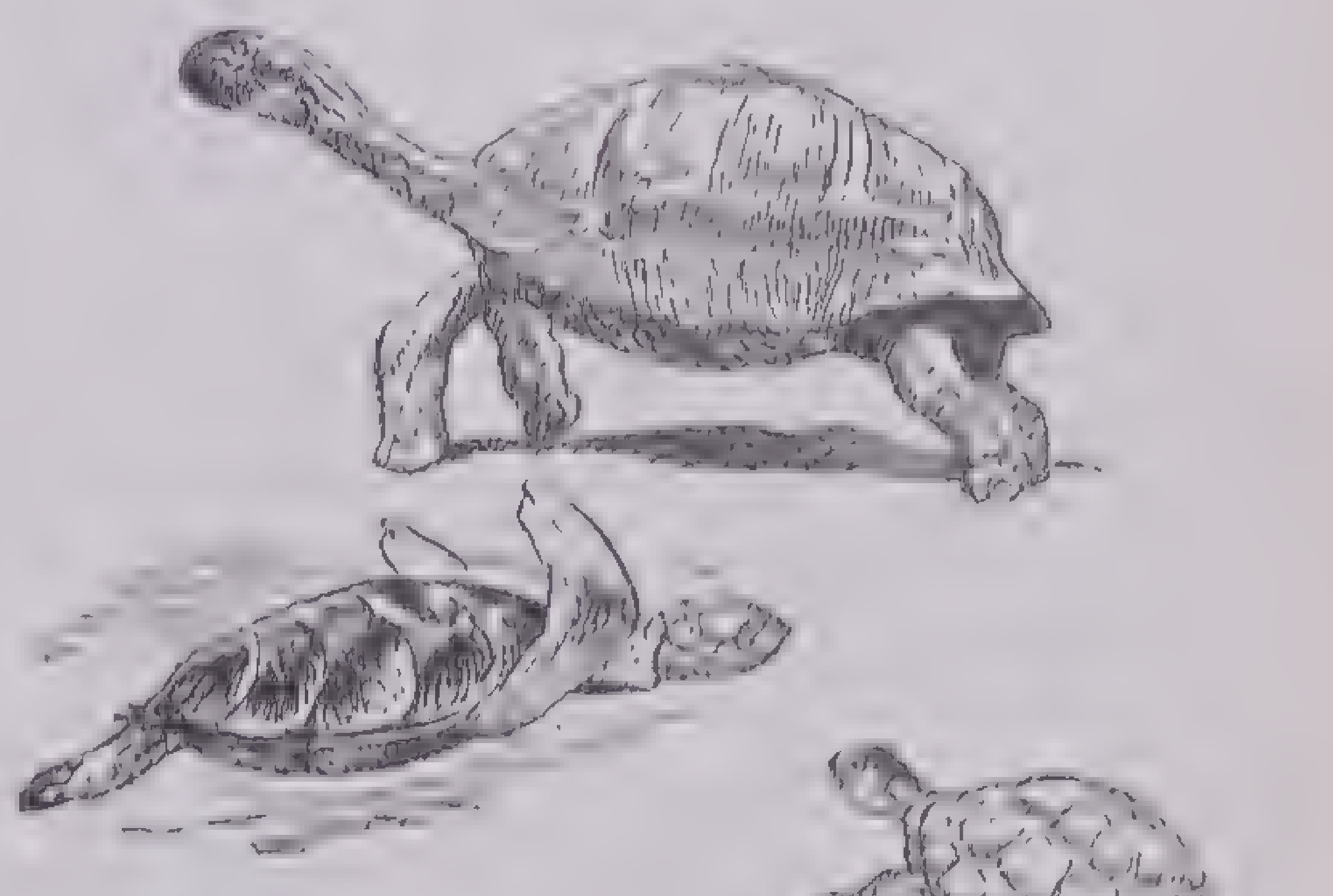

Quetzal

Trout, a common name for several fishes with soft, rayed fins and a small fin without rays on the back behind the large fin; the smaller members of the salmon family. They have very small scales. All are excellent eating, and all are regarded as game fish. The North American brook trout is typical. This thrives in the coldest and clearest streams, laying its eggs in December or January. Other species in North America are the lake and the salmon trout in the East and the rainbow and the Dolly Varden trout in the West. Sea trout is a general term for any salt-water trout that go into fresh water to spawn. All species belong to the Northern Hemisphere, but they have been introduced into Australia and New Zealand.

Tuna, the largest of the mackerels (*Thunnus thynnus*), called horse mackerel and tunny on the Atlantic coast and tuna on the Pacific. In structure it strongly resembles the common mackerel, except that the body is proportionately thicker, and the tail more deeply notched. The color is dark bluish above and grayish mottled with silver below. Some specimens have been taken 10 feet long and weighing about 1,500 pounds. These monsters are usually caught either by harpoon or by entangling themselves in trap nets set for smaller fish.

Although the tuna is a fish of the open sea, it is frequently found within a few miles of shore off the northern Atlantic coast. It is abundant in all warm seas, and the tuna fishing and canning industry of California and of Italy is important. The fish taken for this purpose usually average around 50 pounds. They feed in great schools and are netted or caught with a short line on heavy poles. Of recent years this fish has become recognized by sportsmen for its strength and fighting ability, and specimens weighing around 800 pounds have been landed by rod and reel. One of the favorite grounds for this fishing is off Nova Scotia.

Turkey, a large scratching bird (genus *Meleagris*), native to America from Canada to Central America, known now chiefly in domestication but still found wild in some parts of the United States. They were domesticated by the Southwestern Indians at least 500 years before Columbus discovered America. The tame birds differ some in appearance from the birds in a wild state. The English name was given under the misapprehension that they came from Turkey; and the French name *dinde* is equally inaccurate, as it means of India, *d'Inde.*


Galapagos Turtle

Tortoise **Box Turtle**

Turtle, the common name for the tortoises. They are remarkable for having the body enclosed in a hard case, composed above of the enlarged ribs, and below of several large, bony plates. In some the head and legs can be retracted inside this shell. Over the outside of the case are horny plates that in the hawksbill turtle (*Eretmochelys imbricata*) are of value, as they afford the tortoise shell used for combs. Turtles never have teeth, the edges of the jaws being covered with horny material. Most of the species are carnivorous. Some are terrestrial, others occur in fresh water, and still others in the sea. The largest species are the marine leatherbacks (*Dermochelys coriacea*) of the tropics, which occasionally drift north to New England, and the giant species occurring on the Galápagos Islands, off the west coast of South America, and off some islands in the Indian Ocean. The marine green turtles (*Chelonia mydas*) are favorites with epicures, as are the terrapin (*malaclemys*) of the American eastern coast. Most species are inoffensive, but the soft-shelled turtles and snapping turtles of the United States are savage animals.

Vampire, a blood-sucking bat of the tropical parts of North and South America. The front incisor teeth are much elongated into a sharp structure that can easily penetrate the skin of other animals. Vampire bats attack mammals such as horses, cattle and even man. The bat's teeth are so sharp that often the danger is not sensed until considerable blood has been lost and the bat has departed.

Vertebrates, one of the great groups of the animal kingdom. The vertebrates have a backbone or vertebral column that protects the spinal cord and terminates in the skull containing the brain. Some vertebrates lack legs or their equivalent fins, but most of them have two pairs of these structures, and the aquatic species have also fins in the middle lines of the back and belly. All reproduce exclusively by eggs, developed internally or externally, and there are no cases of the division or budding that is so common in the lower orders of the animal kingdom.

Viper, generally any venomous snake; more accurately the European adder, the only poisonous snake of England, and the rattlesnakes of North America, which are pit vipers.

Viscacha, see *Prairie dog*.

Vulture, a large bird of prey native to the New World. There are nine species of vultures, and three of them occur in the United States. The family name, *Cathartidae,* is from a Greek word meaning scavenger or purifier, because vultures feed almost exclusively upon carrion, practically never attacking living creatures, and then doing so only when the latter are dying or badly injured. Vultures are famous for their remarkable powers of flight, wheeling aloft for hours with no apparent motion of the wings. Their eyesight is incredibly keen and it is this faculty, rather than the sense of smell, that brings them down to their food from great altitudes in the sky.

One of the largest flying birds in the world is the California condor (*Gymnogyps californianus*), now nearly extinct. This great black bird is 4 to 4½ feet long and weighs from 20 to 25 pounds. Its wingspread, exceeded only by that of the albatross, is from 9 to 11 feet. It lives only in the more inaccessible mountain regions of California and is closely related to the South American condor.

The turkey vulture or buzzard (*Cathartes aura*) is the commonest of this group. On the ground it is repulsive, but in the air it is graceful and beautiful. Two and one-half feet in length, with a wingspread of 6 feet, it has a naked head and upper neck reddish in color, like the turkey's. The body plumage is a drab gray-brown; the bill is stout and hooked at the end; the wings are broad and long; the feet are flesh-colored. This bird is common through most of the United States. Its invaluable service as a scavenger has earned it rigorous protection by law.

The black vulture or urubu (*Coragyps atratus*) is a resident of the South. It is more compact in structure than the turkey vulture, has shorter wings and tail and weighs more.

The Old World vultures belong to another family, the *Vulturidae.* The Egyptian vulture, a white bird, was frequently pictured in ancient monuments. The lammergeier, literally lamb vulture (so called because it was supposed to steal lambs), is the largest of European birds of prey and is sometimes called the bearded vulture from the tuft of bristles on the chin.

Wallaby, any of several relatives of the kangaroo, some of the same genus (*Macropus*), and some of the *Petrogala* and *Onychogale.* In the last-named group is the nail-tailed wallaby that has a tail ending in a horny spur. The red-necked wallaby (*M. ruficollis*) is smaller than most kangaroos, and the hare wallaby is only as big as a rabbit. The rock wallaby (*Petrogale*), medium in size, leaps with great agility in rocky places, using its tail to balance. Wallabies are found only in Australia and a few adjacent islands.

Walrus, a marine carnivorous mammal (genus *Odobenus*), closely related to seals and sea lions, and having enormous down-turned tusks or canine teeth projecting from the upper jaw, which sometimes reach a length of 16 inches beyond the sockets. The generic name *Odobenus* means tooth walking, for it is supposed that the walrus helps himself along on land or ice by digging in his tusks. The female has smaller tusks. There are bristly whiskers on each side of the broad muzzle. Walruses have a thick, clumsy body, deepest at the shoulders, and limbs that are adapted for swimming. They reach a length of 12 feet or more, and a weight of 2,200 pounds. There are two species, one in the Atlantic (*O. rosmarus*) and a larger one (*O. obesus*) of the Pacific and the Bering Sea region. The Atlantic form is found on the coast of Labrador and in Hudson Bay, but formerly extended farther south. They feed largely on clams and other mollusks, which they dig from the sea bottom with their tusks. They are hunted for their hides, their tusks and their blubber, which produces 25 to 30 gallons of oil from each walrus.

Warbler, one of the large family *Compsothlypidae* including over 150 species of small birds native to the Americas, about 50 of them more or less common in the United States. Warblers in general are among the smallest birds, smaller than sparrows as a rule, and otherwise distinguished from them by their brighter plumage, in which different shades of yellow and olive green are prevailing colors. They are extremely active birds, rarely descending to the ground, but resting and feeding among trees. They are insectivorous in habit, and their pursuit of this food through the seasons takes them on long migratory flights, unlike the seed-eating sparrows, many of which are permanent residents of the locality they inhabit. The name warbler is deceptive, in that very few of them are singers of any ability. In spite of this, the warblers are among the most charming and useful citizens of our wildlife. Their insect- and larvae-destroying activities are worth many millions of dollars annually.

More familiar members of this family are: the yellow warbler or yellowbird (*Dendroica aestiva*), yellowish green above and bright yellow beneath; the black-and-white warbler (*Mniotilta varia*), which creeps around tree trunks searching for insect food in crevices; the myrtle warbler (*D. coronata*), slaty gray, with conspicuous yellow patches at the base of the tail, the crown and on either side of the breast; the cerulean warbler (*D. cerulea*), light blue on the back and white beneath; the redstart (*Setophaga ruticilla*), a flycatcher with brilliant red wing and tail marks contrasting with its jet-black plumage; and the Maryland yellowthroat (*Geothlypis trichas*), olive above and bright yellow below, with a black mask over its face.

All the American warblers are called wood warblers to distinguish them from the European family, the *Sylviidae,* which are famous songbirds.

Wasps, several families of insects with two pairs of wings and (in the females and workers) a well-developed sting and poison gland at the hinder end of the body. They differ from bees in having slenderer bodies and no honey-collecting apparatus on the hind legs. Some are solitary; others form colonies in which the individuals work together for the common good. Among the first are the digger wasps (*Fossores*), which excavate holes in the soil or in wood and there store insects that they have paralyzed with their sting; then they lay their eggs in the mass so that the young on hatching will have abundant food. Other solitary forms are the mud daubers (genus *Sceliphron*), which build nests for the eggs by sticking mud to beams in barns or similar places. The social wasps make a nest in common, sometimes in the earth; but the well-known yellow jackets or hornets make paper nests from bits of decaying wood that they chew into a real paper pulp. In the colonies the males die when winter approaches; but the females live to form a new colony in the spring.

Waxwing, any member of the small-bird family *Bombycillidae* of the Northern Hemisphere. There are three species: one found in Japan and nearby Asia; one in North America; and the third in northern North America. Waxwings are about the size of a robin, with crested heads and soft, fawn-colored plumage. Their secondary wing feathers are tipped with red, as though dipped in sealing wax; hence the bird's name. The Japanese waxwing (*Bombycilla japonica*) has red-tipped wings but not the flaked effect found at the wing tip of the New World waxwings.

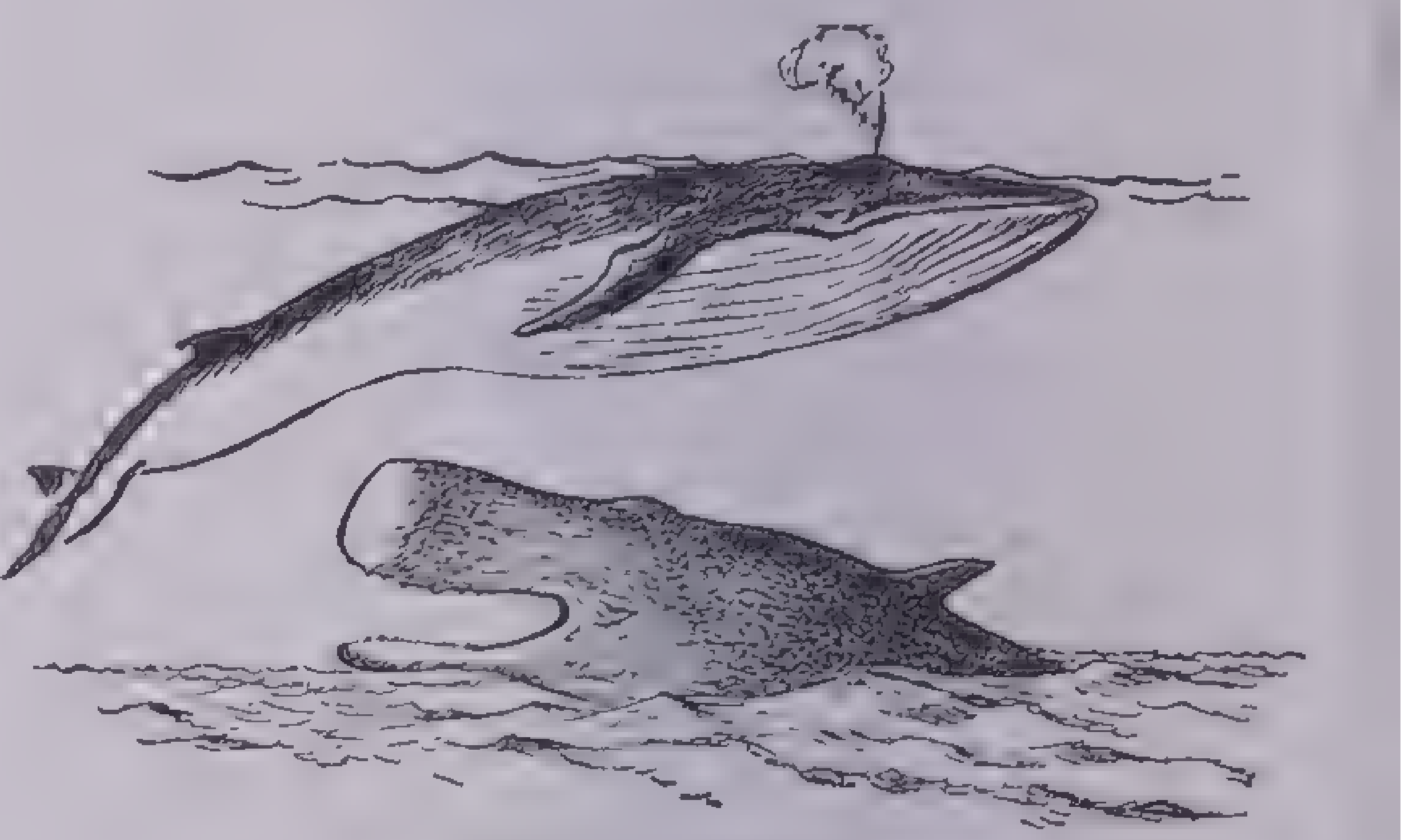
The American variety is the cedar waxwing or cedar bird (*B. cedrorum*) or cherry bird, a handsome, crested bird with a black patch rimmed with white on the face, smooth brown plumage blending into a slate color on wings and tail, the tip of the tail edged with bright yellow. This species, in the adult male, has red-tipped secondaries. The circumpolar Bohemian waxwing (*B. garrula*) or northern waxwing is slightly larger, with grayer plumage and streaks of white or yellow in the wings; otherwise it strongly resembles the commoner cedar waxwing.

These birds are berry and fruit eaters and also take their toll of insects. They have a great deal of dignity and are most often seen in the colder latitudes, where they frequent evergreen trees.

Weakfish, a well-known and important food fish (*Cynoscion regalis*) common along the entire Atlantic coast. It is a silvery color, often tinged with pink. In weight it may run as high as 30 pounds, but individuals half that size are considered large, and the average is from 5 to 10 pounds. The weakfish is not weak by any means; it is ranked with the best game fish in fighting ability. It is named for the large, flabby mouth, which is easily torn by a hook, requiring some care on the part of the angler to avoid losing his prize. Other names for the common weakfish are squeteague and sea trout. A closely allied species, the spotted weakfish (*C. nebulosus*), is abundant along the coast from North Carolina to Georgia. It is readily distinguished from its more northern relative by the numerous black spots on the rear half of the body.

Weasel, a genus (*Mustela*) of small, slender flesh eaters found both in Europe and in America. In Europe they are called also polecats and stoats. In the eastern states the common weasel (*Putoris noveboracensis*) is of a brownish hue above, and white below. In the winter the color changes to pure white. It is noted for its ferociousness, eating voles, mice, rats, poultry and other small animals. In turn it is preyed upon by hawks and other birds of prey. It is most active at night.

Whale, a sea mammal of the order *Cetacea* including the largest of present-day animals. They are warm-blooded and air-breathing. The young are suckled by the mother. The structure in many respects differs from that of fishes. There are two classes of whales—those with whalebone or baleen (*Mysticeti*) and those with teeth (*Odontoceti*), and usually called by other names, like porpoise, dolphin, killer, beluga.



Blue Whale

Sperm Whale

The head of baleen whales is of enormous size, but is entirely destitute of teeth, instead of which the palate is furnished with an apparatus of baleen or whalebone for the purpose of straining from the water the small crustaceans that form their food. The elasticity and heaviness of whalebone are well known. The plates of it in the mouth of the whale are very numerous, several hundreds on each side of the mouth, and they are so close together that the mouth is filled with them. The head of whales usually occupies from a third to a fourth of the whole length. The lower surface of the true skin extends into a thick layer of blubber, an open network of fibers, in which fat is held. The blubber is from 1 foot to 2 feet in thickness, the whole mass in a large whale sometimes weighing more than 30 tons. The smooth, shining skin is immediately underlaid by a thick coating of blubber, the great objective of the whalers. This is at once dense and elastic, and while it preserves the animal heat it also serves to reduce the mighty bulk of the whale and to bring it nearer to the specific gravity of the sea.

The most important species is that known as the right or Greenland whale (*Balaena mysticetus*). It inhabits the seas of the northern parts of the world and abounds chiefly in the Arctic Region. It attains a length of 50 feet. It was formerly supposed that the Greenland whale was an inhabitant of the southern as well as the northern parts of the world; but the southern or Cape whale is now regarded as a distinct species (*Eubalaena glacialis*) the head being smaller in proportion than that of its northern relative, and the color a uniform black. The largest of the whales is the blue or sulphurbottom (*Sibbaldus musculus*), a whalebone whale that sometimes reaches a length of 90 feet. The main physical characteristics of the whale are its distorted jaws with upward directed nostrils, its great bulk and rudimentary limbs. The huge bulk of the creature is driven forward by the flexible caudal fin, and though the body is rigid in front, it exhibits great mobility behind. The blowholes are on top of the head, and the animal can respire only when these are above water. The larger whales travel at the rate of about 4 miles an hour, but when pursuing their prey or goaded by pain, they rush through the water at a much greater pace. They are aided in this by the broad and powerful tail, which is the chief organ of locomotion. Instead of being vertical, as in fishes, it is horizontal, and the larger species command immense driving power. The tail is used also as an offensive and defensive weapon. The chief food of the baleen whale consists of minute mollusks, and with these its immense pasture grounds in the northern seas abound.

The best-known of the toothed whales is the sperm whale or cachalot (*Physeter catodon*), which has teeth on the upper jaw, no baleen and a wide throat. It is hunted for its blubber and for spermacetti, a white wax used in making candles and ointments and derived from sperm-whale oil. Another waxy material produced by the sperm whale is ambergris, a secretion of the alimentary canal that is very valuable in making perfumes.

Whippoorwill, an American night bird (*Antrostomus vociferus*) named from its loud cry that sounds like "whip poor Will" with the last syllable heavily accented. The bird is not often seen, although it is abundant in damp woods of the eastern United States. It usually rests on the ground during the day and is active at early nightfall, sending forth its cry and also coursing low over the grass in search of insects. It is about 10 inches long and of plain colors, being grayish, much variegated with black and buff. Its bill is very broad, its mouth large (hence the genus name meaning cave mouth) and provided with a tuft of long bristles. It builds no nest but deposits its eggs on leaves or in a slight depression in the ground. To the same family belong the chuck-will's-widow (*A. carolinensis*), a larger Southern species, also named for its long, loud jerky cry, and the nighthawk or nightjar, popularly called *goatsucker*.

Wildcat, in America the name applied to almost any cat (other than the domestic house cat); the lynx and puma are most commonly so called. The true wildcat (*Felis catus*) is found only in northern Europe and Asia. It is a striped animal, similar to other members of the cat family.

Wildebeest, an antelope (*Connochaetes*) native to Africa, called gnu by the Hottentots. The white-tailed gnu (*C. gnu*) is about the size of a horse and has structural features of both the buffalo and the deer. It has an erect mane, the forehead is tufted with hair and there is a shaggy beard beneath the lower jaw. The horns taper to points, curving forward from the skull and turning up sharply at the ends. The long slender legs, the long tail and the hindquarters resemble those of a horse. The flesh of the wildebeest is good to eat; and this animal, formerly numerous, is now nearing extinction.

Wolf, any of several species of carnivorous animals belonging to the genus *Canis*, which includes domesticated dogs. Wolves will breed with some dogs, especially the Eskimo dog. The common wolf is about 5 feet in length, including the tail, and about 32 inches in height at the shoulders. The muzzle resembles that of a sheep dog; the ears are upright and pointed, and the eyes are set obliquely. The color of the hair is variable, depending upon the country the animal inhabits; the usual color is light gray. The American timber or grey wolf (*C. occidentalis*) is becoming extinct, having been hunted systematically to prevent its depredations; but the smaller European wolf (*C. lupus*) is still found in considerable numbers in many parts of Sweden, Russia and Poland. The wolf of India is reddish. Arctic and timber wolves are sometimes white.

Wolverine or **glutton,** a large, bearlike animal (*Gulo luscus*) of the family *Mustelidae*, occurring through the forested regions of Canada north to the Arctic. It is more than 3 feet in length, with short legs, a bushy tail and a squarish head. The color is a very dark brown, with a lighter patch on the back and light spots on chest. The wolverine is notorious among trappers for its cunning in robbing their traps and in avoiding the most ingenious devices for capturing it. It lives in dens or burrows, cannot climb trees and does not hibernate. Its prey consists mostly of animals much smaller than itself, and it feeds on the carcasses of larger animals when it finds them. The fur is coarse but as it is almost waterproof and does not gather moisture from the breath, it is prized as a lining for Arctic hoods.

Wombat, an Australian and Tasmanian marsupial, genus *Phascolomys* (Greek for pouched mouse). The wombat is 2 or 3 feet long, yellow, brown or black in color, with a chunky body and short legs. It looks like a little bear and is sometimes called an ursine (bearlike) opossum. Like the American opossum and the Australian kangaroo the wombat carries her young in a pouch for some time after their birth. Wombats live in burrows and come out at night.

Woodchuck or **groundhog,** a familiar animal (*Marmota monax*) of the marmot group, distributed in North America from the Hudson Bay region to South Carolina and westward to Nebraska. The name is probably a corruption of an Indian name and has nothing to do with wood. The woodchuck is about 1½ feet long, blackish or grayish on the back, and reddish underneath. The body is thickset and the legs are short and strong, built for burrowing. The head is wide and flat with long whiskers, and the fur is dense and soft. Woodchucks, when numerous in any locality, are the bane of the farmer. They devour many garden crops and are very fond of alfalfa and red clover. The burrow is deep and has several compartments in which the woodchuck hibernates from September to March. February 2, Candlemas, is known as Groundhog or Woodchuck Day from the popular belief that the animal comes out of his burrow and if he sees his shadow runs back again—considered a sign of continued cold weather.

Woodcock, a small game bird (*Philohela minor*) related to the snipes and sandpipers. It is 11 inches long, and a soft, mottled brown above, fading to pale orange-brown beneath, a triumph in protective coloration—matching to perfection the color and effect of autumn leaves. The head is rather large and the bill very long, for probing into the ground for the bird's favorite food, angleworms. The bill is peculiar in having the upper mandible hinged, so that it may be flexed back like a finger. The large eyes are set high in the head, a further adaptation to allow free vision while the bird is probing. The wing primaries are notched in such a way that they make a peculiar sound in rapid flight.

The woodcock is chiefly nocturnal in its habits. Most of its life is spent on the ground in thick cover, a trait that has earned it the nickname briar snipe from disgusted hunters. Many gunners will swear that it can fly sideways; at any rate its wavering corkscrew flight is highly deceptive. The mother woodcock, when she is disturbed on the nest, has been known to return later and move the eggs to a safer place. Sometimes the chicks are borne off one by one between her feet, to safety. The female is larger than the male. The flesh of the woodcock is fine eating.

Woodpecker, a bird of the family *Picidae* that drills holes in trees to make a nesting place or to get insects to eat. The tongue is elongated to enable the bird to remove insects from the holes bored. The woodpecker has stiff tail feathers that help it to climb tree trunks. The ivory-billed woodpecker (*Campephilus principalis*) of Florida, almost extinct, has a white bill and black-and-white plumage. The imperial woodpecker of Mexico (*C. imperialis*), the largest of the family, is closely related; it is 2 feet long, with a white beak, red head and red neck. Common species in the United States are the small downy woodpecker (*Dryobates pubescens*) and the larger hairy woodpecker (*D. villosus*). The California woodpecker (*Balanosphyra formicivora*) digs holes to store acorns. An arctic woodpecker (*Picus arcticus*) has only three toes. The woodpecker generally has contrasted colors: green and yellow or black and white. Its head is usually tinted red. The woodpecker is found over almost every part of the globe.

Wren, a small dull-colored bird of the family *Troglodytidae*; it has a slender, slightly curved, pointed bill. The wings are short and rounded, and the tail is short and carried erect. Most wrens live on or near the ground, feeding on insects and worms that they find among the low brushes. The North American species are numerous. The common house wren (*Troglodytes aedon*) is abundant over the eastern part of the United States, often living in houses that have been built for them. The song of the wren is very melodious. The male is a bold creature, often attacking birds much larger than itself, such as the bluebird and swallow. The European wren (*Nannus troglodytes*) is abundant in northern Europe, where it frequents gardens, hedges and thickets.

Yak, an oxlike animal (*Bos grunniens*) native to the high regions of Tibet. Its neck is longer in proportion to the body than in other oxlike animals; its body, especially on the lower parts, is covered with long hair. Sometimes an old male will stand 6 feet high and weigh 1,200 pounds. The yaks are domesticated as beasts of burden, and their flesh and milk are used for the table. The hair is woven into fabrics and rope, and the tails are used for fly brushes.

Yellowbird, see *Warbler*.

Zebra, an African wild ass with dark-brown or black stripes on a buff or whitish ground. There are several varieties with different markings. Zebras are light and graceful, with slender limbs. They are almost untamable, but have been driven in harness.

Courtesy New York Zoological Society

Yaks

BOTANY

Botany is one of the natural sciences, dealing with plants as zoology deals with animals. In its widest sense it includes all kinds of inquiries regarding plants: their structure, activities, distribution, origin, classification and uses—anything about plants themselves and their relations to man and other living things. But for convenience applied botany dealing with the practical and commercial uses of plants is now commonly regarded as a part of agronomy, horticulture, forestry and pharmacy. Today the more scientific problems are retained in botany.

Historical Background.—The history of botany, from ancient to comparatively modern times, is concerned chiefly with the development of taxonomy, the branch of the science that classifies the myriad plant forms and shows their relationships. Without some common scientific language, without a logical method of grouping and identifying plants, progress in the science would be impossible; therefore taxonomy was the first and by far most important problem to be undertaken.

The systematic study of plant life probably first began among the ancient Egyptians and Greeks. In those early times, people were much more interested in the practical uses of plants than in the less obvious but equally important studies of structure and development. In its beginnings botany involved much speculation and superstition and very little actual observation. Magical powers were attributed to certain plants, and there were myths accounting for the human origins of others.

Hippocrates and Aristotle described plants in their writings, but the first systematic treatise on the subject was by Aristotle's pupil Theophrastus, the Father of Botany, who lived in the 3d century B.C. He described and arranged into groups about 500 species of plants, concerning himself mostly with their medicinal properties. He divided plants arbitrarily into *trees, bushes* and *herbs*. In the 1st century A.D. Dioscorides and Pliny the Elder described a great number of plants, stressing their uses as medicines.

It was not until the 16th century that botany and especially the classification of plants was really organized. This period saw the first herbals or books describing wild and cultivated plants, illustrated with woodcuts. One of the best of these herbals was written by Otto Brunfels (1488–1534), a German botanist. Contemporary with him were Hieronymus Bock and his *Materia Medica;* Leonhard Fuchs (1501–66), who wrote a glossary of technical terms, the first terminology of botany; Matthias de Lobel (1538–1616), a Flemish botanist, whose classification of plants, although based on no formal system, was amazingly like the one in use today, and William Turner, the Father of English Botany, who began his *New Herbal* in 1551. Up to this point, attempts at systematic classification were crude at best, and the main concern of botanists was still with the medicinal virtues of plants and random speculations. Some students devoted themselves entirely to identifying the medicinal plants of the Greeks.

The Italian botanist Andrea Cesalpino (1519–1603) made the first formal attempt at a methodical classification of plants. In his work, *De plantis* (1583), he divided the 1,520 plants then known into 15 classes, basing his divisions on the character of the fruit. This system made a deep impression, but it lacked a consistent basis and could not survive. John Ray (1627–1705), an English naturalist, developed a system of natural affinities. He separated the flowering from the flowerless plants, calling them *Dicotyledons* (having two seed leaves) and *Monocotyledons* (having one seed leaf), respectively, the same names that are used today. But Ray erroneously divided plants according to woody and herbaceous stems as the Greeks had done.

Robert Morison (1620–83), a Scotsman, went back to the lines laid down by Cesalpino for his study of systemic botany. Joseph de Tournefort (1656–1708) published a classification in 1700 that covered about 8,000 species of plants arranged into 22 classes. He established the system of grouping plants into genera that we now use, and his entire system of classification was used in Europe for many years, finally to be supplanted by the method of Linnaeus.

Karl von Linné (1707–78), the Swedish botanist, is generally known by his Latin name, Carolus Linnaeus. He founded a system of nomenclature that was based on the characteristics of stamens and pistils. These are the reproductive organs of the flower, hence the system is often called the sexual system. It was essentially an artificial arrangement as Linnaeus himself knew; he stated that he considered it only a temporary method, to be used until enough was known to permit the adoption of a natural system of classification.

A notable advance was made by Antoine de Jussieu (1748–1836), who was professor of botany at the Jardin des Plantes in Paris. The necessity for logical arrangement of the plants caused him to devote considerable time to the problem, and in his *Genera Plantarum* (1789) he outlined a plan that included the best features of Ray's and Linnaeus's systems. It was based on a close study of plant organs, made use of Linnaeus's simple definitions and showed in general the natural relationships of plants, thus forming the basis for the natural classification predicted by Linnaeus.

Augustin de Candolle (1778–1841) was an enthusiastic supporter of de Jussieu; he showed that the natural affinities of plants must be found by a study of morphology (the form and development of organs) and not by physiology (plant functions). In this connection the invention and subsequent development of the microscope advanced the science immeasurably in the last century.

Some of the early botanists were interested in the functions of plants and devised experiments to learn something about their activities. Stephen Hales (1677–1761) studied transpiration (loss of water from leaves) and the pressure developed by roots. Joseph Priestley (1733–1804) demonstrated in 1779 that his newly discovered gas, oxygen, was given off by green plants in the light, and Jan Ingenhousz (1730–99), in the same year, published his paper entitled "Experiments on vegetables, discovering their great power of purifying the common air in the sunshine and of injuring it in the shade and at night." It is clear that Ingenhousz discovered that all plants give out carbon dioxide in respiration throughout life and that only the green parts of plants give off oxygen in sunlight.

Then Rudolph Jacob Camerarius (1665–1721) in 1694 demonstrated the sexuality of plants, experimenting with hemp, hops and maize. It was nearly 200 years after maize was introduced into Europe that he discovered that pollen from the tassels must fall upon the silk in order to produce seeds. The date growers of Mesopotamia, centuries earlier, were familiar with the necessity of carrying pollen-bearing branches from the male trees to the female trees in order to secure a crop of dates.

It was in 1761 that Joseph Gottlieb Kölreuter (1733–1806) produced the first plant hybrids, crossing two species of tobacco and then experimenting with other plants. Konrad Christian Sprengel (1750–1816) in 1793 published his book *The Newly Revealed Secret of Nature in the Structure and Fertilization of Flowers,* in which he showed that flowers are commonly pollinated by insects, and that cross pollination is of very wide occurrence.

In the 19th century the study of plant life tremendously developed. Some explorers visited India, China and Japan, bringing to light the wealth of their flora. Other explorers went to South Africa, Australia, North America and South America. Many men were engaged in the description of the new material collected. Asa Gray (1810–1888), professor of botany in Harvard University, was the most noted contributor to the knowledge of North American plants and their classification.

In the field of mycology, Christian Hendrik Persoon (1761–1836) in central Europe, Elias Magnus Fries (1794–1878) in Sweden and Miles Joseph Berkeley (1803–1889) in England made extensive taxonomic studies of the higher fungi.

Anton de Bary (1831–1888) is regarded as the founder of plant pathology; his discovery of the relation between the barberry and wheat rust was of special significance. Oscar

Brefeld (1839–1925) made extensive studies on various groups of fungi, particularly the smuts. Jakob Eriksson (1848–1931) discovered the existence of physiologic races of certain cereal rusts, a phenomenon that has been found to be of wide occurrence among the parasitic fungi.

In physiology and cytology progress was made. Thomas Andrew Knight (1759–1838) studied the action of gravity on growing plants on a specially devised wheel driven by water power. Julius Sachs (1832–1897) devised experimental methods for the study of photosynthesis, respiration, water relations and growth. Eduard Strasburger (1844–1912) was largely the founder of cytology (the study of structure and functions of living plant cells), and the early development of cytological methods was due to him.

The development of both botany and zoology was profoundly influenced by the investigations and conclusions of a few men. In 1838 Matthias Jakob Schleiden (1804–1881) and Theodor Schwann (1810–1882) enunciated the cell theory that all animals and plants are composed of units or cells; by the discoveries of several men, the significance of the cell contents or protoplasm was recognized as of the greatest importance.

Charles Darwin (1809–1882) revolutionized the thought of the biological world by his publication in 1859 of *The Origin of Species,* setting forth the theory that new species arise by descent from existing ones.

Hugo de Vries (1848–1935) in 1900 proposed his Mutation Theory, based upon his extensive studies of the evening primrose.

Gregor Mendel (1822–1884) published his paper in 1866, "Experiments in Plant-hybridization," which remained practically unknown until 1900. His experimental results, however, are the foundation of all the modern work on genetics of both plants and animals.

Modern Investigation.—Plant research today is carried on chiefly in the universities, botanical gardens and arboretums (gardens of living trees and shrubs). Their work includes public education and plant research. There are many botanic gardens and arboretums established in different parts of the world. Among the most famous are:

Royal Botanic Gardens, Kew, England.
Botanischer Garten und Museum, Berlin, Germany.
Jardin des Plantes, Paris, France, which is a part of the Muséum National d'Histoire Naturelle.
Hortus Bergianus, Stockholm, Sweden.
National Botanic Gardens of South Africa, Kirstenbosch, C. P.
Government Botanic Gardens, Buitenzorg, Netherland India.
Royal Botanic Gardens, Peradeniya, Ceylon.

The Arnold Arboretum of Harvard University at Boston, Mass., is widely known for its collection of trees and shrubs. The Missouri Botanical Garden of St. Louis, Mo., the gift to the city of Henry Shaw; the New York Botanical Garden; and the Brooklyn Botanic Garden have extensive collections of plants in their herbaria, as well as living plants on their grounds, and research in various phases of botany is carried on. The William Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y., conducts extensive researches in plant physiology, particularly along the lines of seed germination, dormancy and the influence of growth-promoting substances. The new Rockefeller Institute for Plant Pathology at Princeton, N. J., is devoted to fundamental investigations on the virus diseases of plants.

The United States Department of Agriculture, in its association with the State Experiment Stations, has enrolled a large number of workers who are engaged in all phases of botanical investigation.

Characteristics of Plants.—Our shade trees, lawn grasses, the flowers and shrubs of our gardens and the crops and vegetation of the fields are recognized as plants without the exercise of imagination. But when it is pointed out that a bottle of souring milk, a batch of yeast-risen bread or even a handful of rich garden earth each represents a vast population of microscopic plants, the problem of knowing the plants about us by name, form or activity begins to assume large proportions.

Plants are not all flowers, not all visible to the unaided eye, not all green. We must remember that plants grade from the huge to the microscopic, from the complex to the very simple. We must be warned that diversity of form is perhaps no less marked than the variety exhibited in their structure and living processes or products. Then we may be better prepared to understand how vast is the field of science that includes all phases of knowledge respecting plants. As our knowledge of form and activity increases, it becomes more difficult to frame briefly a definition of a plant. Some of the lower plants are not readily distinguished from lower animals. Many facts point to certain generalized types as primitive organisms—not necessarily either plant or animal—yet *organisms.*

It is not possible to give a definition of a plant that is concise and at the same time inclusive of all kinds of plants, without having to make many exceptions. Consequently the following is merely a practical or proximate form of a definition: A plant is a living organism that is:

(*a*) Either simple or complex in structure.

(*b*) Generally possessing green pigment (*chlorophyll*).

(*c*) Absorbing its nutrients in solution.

(*d*) Commonly nonmotile or permanently fixed in position.

It will be seen that, in general, characters (*b*), (*c*) and (*d*) distinguish the plant from the animal, because the animal ordinarily contains no chlorophyll, ingests its food and is characteristically motile. Other distinguishing features might be considered in a more detailed treatment of differences.

The Cell.—The simpler or lower plants, such as the pond scums, differ very greatly in appearance and size from the higher or seed plants; but all plants are composed of units called *cells.* The simplest green water plant (an *alga*) consists of a single cell; a maple tree is an enormous complex of cells. Every cell consists of a unit mass of living substance (*protoplasm*) surrounded by a boxlike cell wall. This may seem very simple, but living protoplasm is almost inconceivably complex if we think of it in terms of what it can do, that is, in terms of its activities. Protoplasm is definitely organized into parts readily visible under the microscope. Most conspicuous and important are:

(*a*) The *cytoplasm,* constituting the major part of the viscid contents.

(*b*) The *nucleus,* the denser spherical mass of protoplasm, always surrounded by cytoplasm and commonly exhibiting a smaller refractive mass known as the *nucleole.*

In nuclei stained with special dyes the chromatin material is visible. In mature plant cells the cytoplasm occupies primarily a layer just within the cell wall, and there is usually a large central *vacuole* of cell sap. However, strands of protoplasm may extend from one side of the cell to the other across the vacuole. In the green cell there are differentiated in the layer of cytoplasm special protoplasmic bodies called *plastids,* and these contain the green pigment, chlorophyll. Food materials are also frequently stored in the protoplasm or in the vacuoles. Very young cells are usually richer in protoplasm, and the vacuole is of less extent.

Throughout this discussion it will be necessary to refer to the work of cells, whether in dealing with one-celled organisms or with complex organisms, whether in thinking of them as acting individually (as in the solution-absorbing root-hair cells) or as components of a mass of cells (tissue) or of an organ (a root tip, for example, boring its way through the soil).

Divisions of Botanical Science.—In modern times when the vastness of the field of botany or plant sciences has come to be more generally but often still rather vaguely understood, one frequently hears this question asked: What does botany include? Departing from a formal definition, the various recognized subdivisions of the science may be noted. As a matter of fact these are provisional divisions of knowledge and are clearly recognized as overlapping; yet each one is suggestive of a more or less distinctive point of view in the presentation of material for academic purposes or for general information.

The following divisions are generally emphasized:

Classification (*taxonomy*), the grouping of related forms of organisms for purposes of systematization.

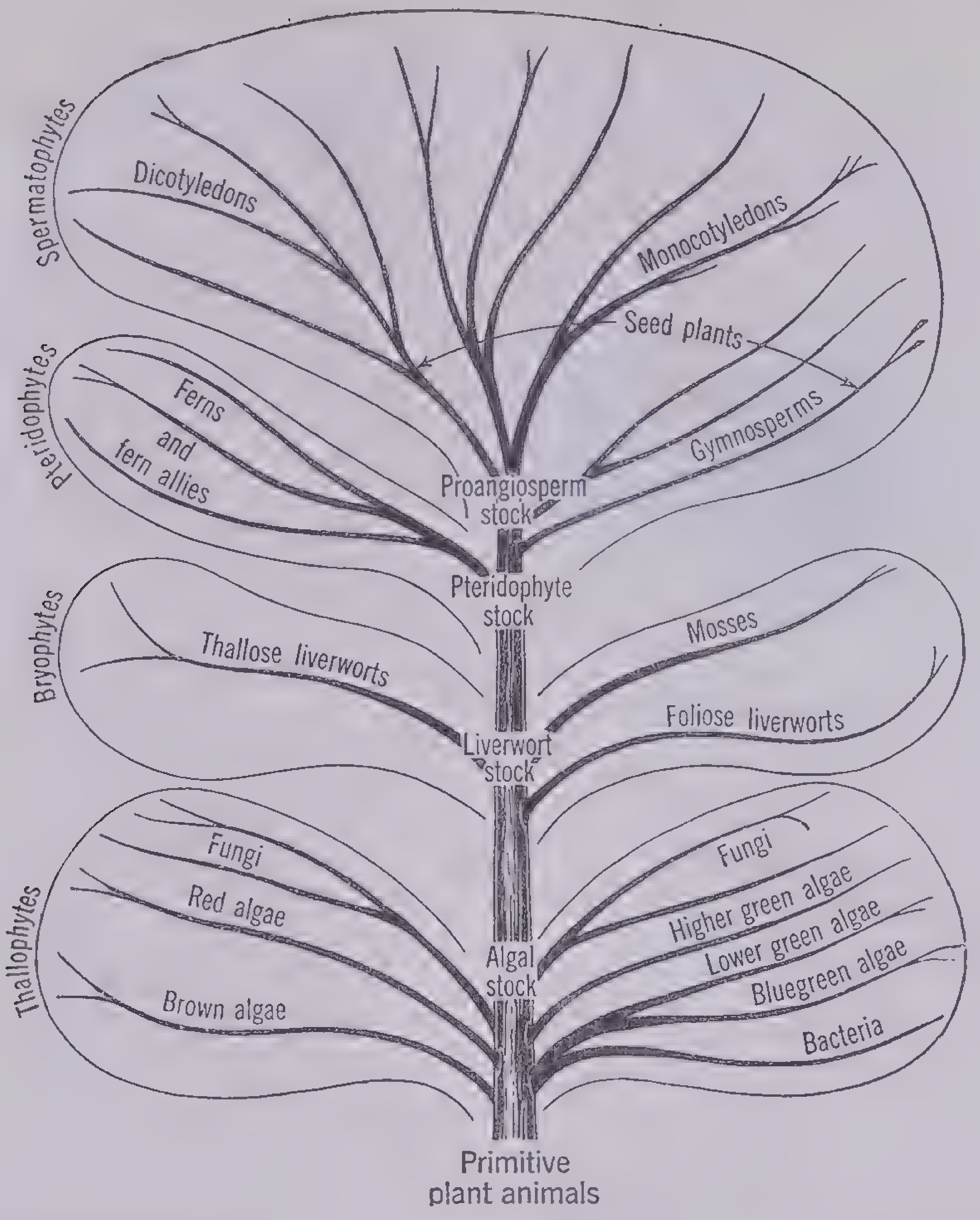
Description of form (*morphology*).

Structure, especially in the development of relationship (*anatomy*).

An intimate study of tissues (*histology*).

Special characteristics of cells (*cytology*).

The study of plant remains and relationships as shown by fossils in the



The Botany Tree

This diagram shows relationships and development in the plant kingdom. It will be helpful to study this diagram in connection with the accompanying text

rocks and by preserved material in soil strata (*paleobotany*); functions, behavior and the physics and chemistry of life processes (*physiology*).

Relationship and behavior of vegetation in respect to habitat and environment (*ecology*).

The basis and facts of heredity (*genetics*).

Relationships of plants as to origin in point of time (*phylogeny*).

The special forms and activities of bacteria (*bacteriology*).

Of algae (*algology*).

Of fungi (*mycology*).

Of lichens (*lichenology*).

Of mosslike plants (*bryology*).

The treatment of microscopic life (*microbiology*).

Special fermentative processes (*zymology*).

The relation of plants to disease (*pathology*).

The study of plants and plant products as therapeutic agents (*pharmacognosy* and *pharmaceutical botany*).

Further applications in respect to such phases of general agriculture as field crops (*agronomy*), fruits, vegetables and ornamental plants (*horticulture*), tree culture and wood uses (*forestry*).

It is practicable to give further and more detailed attention to only a few of these subdivisions.

TAXONOMY

The classification of plants and animals into groups of related organisms is *taxonomy* (from the Greek words meaning law and arrangement). It was by far the first branch of the science to be developed, and its importance may be realized from the fact that there are roughly 233,000 different kinds of plants in the world, all of them to be named and classified in some logical manner to avoid hopeless confusion in their identification.

Of the tremendous variety of plants in existence, those that seem to be related because of similarities in form and structure are assigned to a definite group, and smaller groups are associated in larger divisions based on some common characteristics. Group names are given in the efforts of scientists to systematize our knowledge. Some organisms do not fit well into any group, or perhaps they fit indifferently into several groups. In nature all types and degrees of diversity have developed. Nature is not concerned with the maintenance of groups. Classification, then, is not fixed; men's opinions may differ about the value of the characters used in classification, or organisms may be shifted from one group to another as our knowledge of structure and life history increases. Nevertheless the purpose of classification is to present a natural system of relationship. To paraphrase Asa Gray, the great American botanist of the 19th century: The whole should form, as it were, a great map in which the larger divisions or classes might answer to countries, the families and orders to states or provinces, and the individual species to towns, villages and hamlets.

The Thallophytes.—The thallophytes (or class *Thallophyta*) are plants possessing neither stems nor leaves. They may consist of a single cell of various forms, or they may be multicellular and of most diverse appearance. The plant body is a *thallus*. Two divisions are recognized, algae and fungi. Algae are usually "independent," possessing chlorophyll (leaf green) and are accordingly able to make the organic food material required. Fungi possess no chlorophyll and are dependent upon an outside source of carbon-furnishing food, such as the carbohydrates.

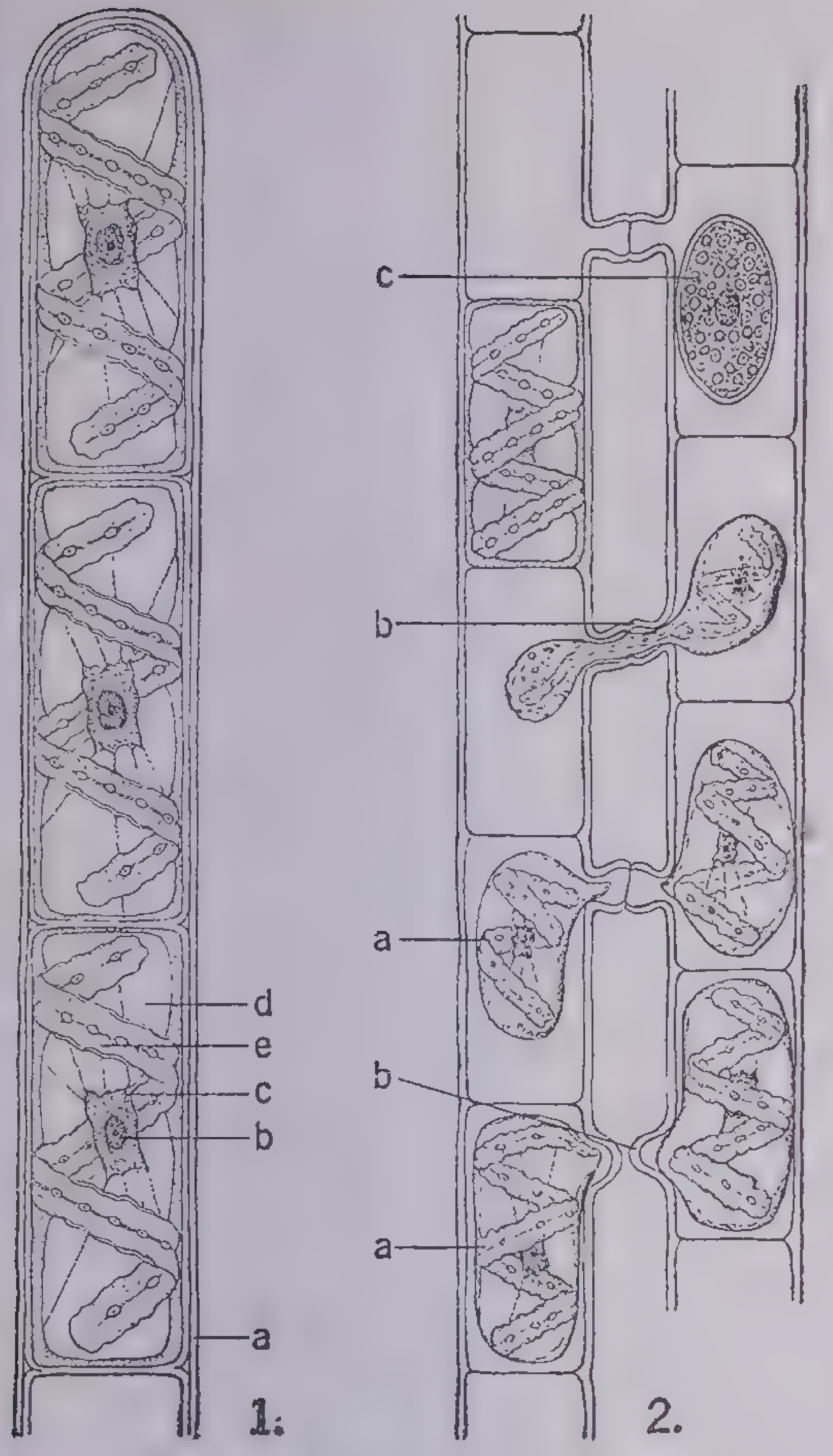
ALGAE. Algae are primarily water plants. Many of the fresh-water forms are called *pond scums*. Among the marine population are red sea weeds, kelps and others. Some species are attached, and others constitute much of the floating life of aquatic habitats. The smaller forms especially may constitute an important factor in the food of the animal life of waters, even of the fish. Reproduction may be effected by simple fission (splitting off) or by nonsexual spores that may be motile or nonmotile. Various types of fusion cells or *gametes* may occur. Four main classes require consideration:

Green Algae. Algae in which the pigment chlorophyll is conspicuous are more numerous than all others combined; about 10,000 species are recognized. The pigment is contained in an organized cell structure known as the *chromatophore* or *chloroplast.* There are several families or major divisions of the green algae, differing one from another in the form and complexity of the thallus and in their sequence of development or life history. The more primitive forms are unicellular, and certain of these (for example, *Chlamydomonas*) possess whiplike motile organs (*cilia*) when in the active vegetative state.

Reproduction is primarily by simple fission—a parent cell becoming quiescent and dividing into two. In this organism, therefore, as also in such nonmotile algae as *Protococcus,* death of the parent cell does not occur, so that any cell may be immortal. Sexual reproduction also occurs when two motile cells (or gametes) fuse together to form a new cell. *Protococcus* may occur in temperate climates, on shaded sides of trees and in other moist places. Colony forms of ciliated algae are particularly interesting, as in the free-floating *Volvox.*

Diatoms, peculiar unicellular algae with their cell walls impregnated with silica, may grow in such quantity that, upon the decay of the cells, a diatomaceous deposit occurs. Geologically such deposits are of practical value, for they constitute the well-known abrasive material, diatomaceous earth.

Filamentous forms of the green algae are numerous; these are the typical pond scums. Among these the methods of reproduction are diverse. Green algae of various types also occur in the sea. Of special interest as to form is *Ulva,* the sea lettuce, consisting of colonies of cells forming



Alga: Spirogyra or Pond Scum

1. Spirogyra consists of a filament of cylindrical cells, although the end cell may be rounded out. The filament increases in length by the division of cells, and new filaments are formed asexually by the chance breaking apart of a filament. *a,* cell wall; *b,* nucleus, surrounded by *c,* cytoplasm, which radiates as strands to a layer inside the cell wall; *d,* vacuole, containing the cell sap; *e,* chloroplast, spiral in shape, with pyrenoids or starch-storing structures. The number of chloroplasts varies from one to several in different species.
2. Sexual reproduction. Sexual reproduction occurs by the fusion of two cells; adjacent filaments push out projections that unite to form tubes, and the contents of one cell pass over and fuse with the contents of the other. *a,* gametes; *b,* conjugation tubes; *c,* zygospore, thick-walled resting spore, which on germination gives rise to a new filament

broad ribbons or leaflike structures.

Blue-green Algae. These algae, the *Myxophyceae,* owe their common name to the occurrence of a blue pigment along with the chlorophyll of the cell. They may occur as single cells, but colony-forming species are more commonly observed. Colonial characteristics are diverse—filaments, chains and other forms. A gelatinous sheath or extensive jelly may inclose the colony. In stagnant water the decay of blue-green algae may give disagreeable odors. These are simple algae, apparently with less organization of the cell than any other algal group. Reproduction is by simple fission of the cell.

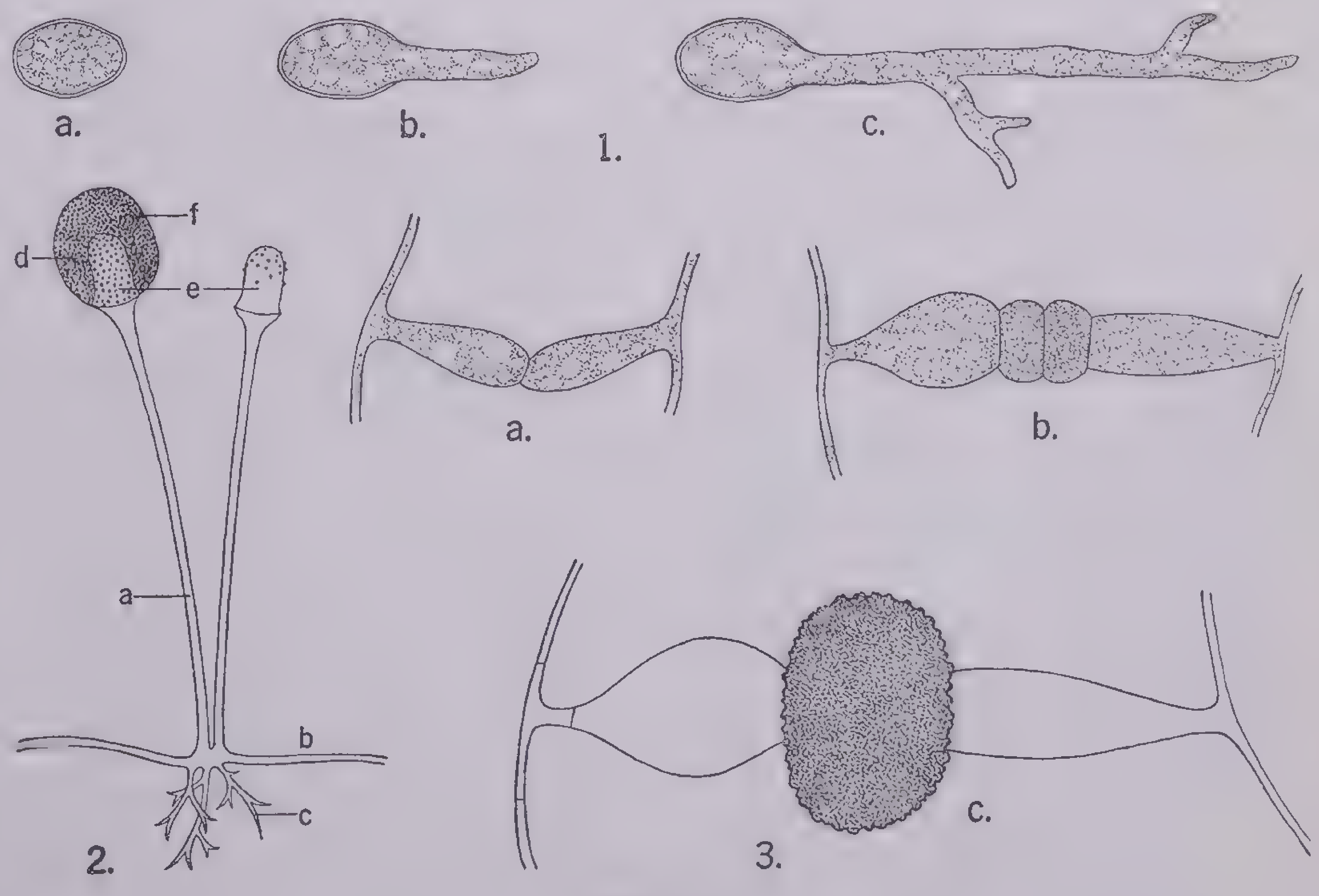
Brown Algae. A high degree of complexity and differentiation of structure is exhibited by many of the brown algae. They are almost exclusively marine. The rockweed is a common type. This alga grows upon rocks between high and low tide. Species of *Laminaria* or kelp (also called *devil's apron*) occur in deeper, colder waters; and on the Pacific coast a giant kelp, *Nereocystis,* often grows to exceed 100 feet in a season. The sea palm (*Postelsia*), properly named from its growth habit, occupies rocks within the tidal levels. Chlorophyll is present in these algae but is masked by the occurrence of another pigment, golden brown in color, as seen in the plastid. Reproduction in the brown algae is characterized by gamete production. In *Fucus* the gametes are strongly differentiated; relatively large egg cells are liberated from one sex organ (*oögonium*) and minute *antherozoids* from the *antherids* are set free in large numbers.

Red Algae. Members of the group *Rhodophyceae* are generally red in color and typically marine. Although not the largest in size, they are the most attractive algae in color and in variety of form. They may be filamentous, more massive and highly differentiated; or they may be membranous. Here, also, the chlorophyll is masked by a plastid pigment. The reds often frequent deep waters, and in regions of extended sunshine they have been found at depths exceeding 300 feet. The red algae are not closely related to the preceding groups. Although characterized by the production of gametes, their cells are nonmotile, and the mechanism effecting fusion as well as the development of spores is peculiar to this group.

FUNGI. The second great division of the thallophytes, the fungi, are commonly filamentous in the vegetative condition and are distinguishable from the algae primarily by the absence of chlorophyll. Practically speaking, they occur wherever organic matter exists, since some one or more species may inhabit any dead or nonliving material, and many species attack living tissues, especially those of seed plants. The chief classes of fungi are the *Phycomycetes, Ascomycetes* and *Basidiomycetes;* but broadly limited they may be said to include also the bacteria and the slime molds.

Phycomycetes. These are the algalike fungi, and they were once supposed to be degenerate forms of algae. The vegetative plant body is a *mycelium* and consists of a greatly branched system of threads or *hyphae.* The hyphae of these fungi are ordinarily without cross walls (*siphonaceous*) and with many nuclei (*coenocytic*). Hyphae specialized for reproduction develop later in the life history. There are two large groups: (1) The *zygomycetes* include the common bread mold. The mold reproduces in two ways: nonsexual spores are produced in structures known as *sporangia,* borne at the end of specialized filaments; in sexual reproduction hyphae cut off at their ends form cells that act as gametes. These fuse together and form a thick walled resting spore known as the *zygospore.* (2) The *Oömycetes* include the water molds and downy mildews. Some species of water molds are parasitic; one form causes a disease of fish. The downy mildews are parasitic on seed plants, the destructive downy mildew of the grape being one of the better known. The water molds and downy mildews produce asexual spores. Sexual reproduction takes place between gametes, which are differentiated into small male gametes and large female gametes or eggs.

Ascomycetes. The chief character distinguishing this class is the production, during reproduction, of a spore-sac (*ascus*) typically containing eight spores. The ascus stage is called the *perfect* stage. It is commonly a se-



Bread Mold

1. *a,* mature spore; *b* and *c,* spores germinating to form the mycelium, a branched system of threads or hyphae.
2. Asexual reproduction: *a,* sporangiophores, which arise in groups that are connected by *b,* stolons, and supported by *c,* rhizoids; *d,* sporangium, formed at the upper end of the sporangiophore, in which the spores are produced; *e,* columella; *f,* spores.
3. Sexual reproduction: *a,* sexual branches; *b* gametes cut off; *c* zygospore, thick-walled resting stage

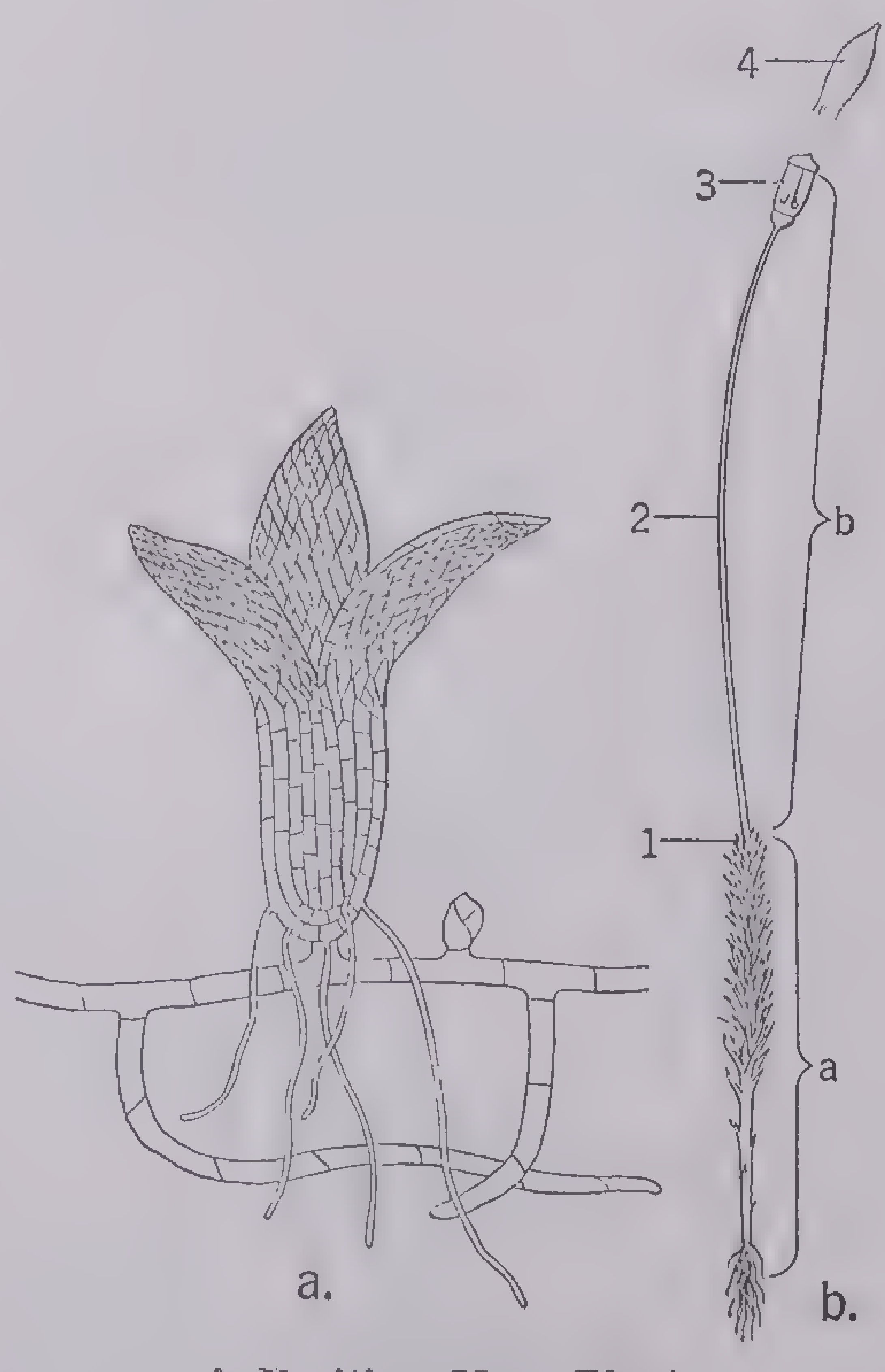
quel to a fusion process. There may be various types of subsidiary or nonsexual spore forms. In the major divisions of this group the asci are produced within a fruit body, the *ascocarp* (*apothecium, perithecium*). The mycelium possesses cross walls, and the cells have usually but one nucleus. More than 10,000 species are known. They occur in the most diverse situations. The *saprophytic* species (those inhabiting dead material) are found abundantly upon decaying vegetation and in or on the soil. The blue and green molds of food products belong to this group, as do also a few families of fungi with large and fleshy fruit bodies, such as the edible morels or sponge mushrooms. Parasitic species are likewise numerous. Such well-known plant diseases as apple scab and rose mildew are examples of the effects produced. The fruiting bodies of the powdery mildews are very interesting structures to examine under the microscope.

Basidiomycetes. This class of fungi comprises orders and families very diverse both in structure and in habitat, but the different subclasses are related through the possession of a *basidium* (a club-shaped cell or cells) that typically bears four spores. *Rusts* and *smuts* constitute the main parasitic groups; other divisions include the vast majority of the fleshy or woody fungi, such as the mushrooms of field and forest. Smut fungi are known to the casual observer chiefly through the spore stage. Thus the smut of corn is little more than a mass of spores, yet a mycelium within the tissues produced those spores. Some rust fungi exhibit an exceedingly interesting and complicated life history. The black stem rust of wheat has one stage on the wheat and related plants and another on the barberry. The apple rust passes from the apple to the red cedar and from the red cedar back to the apple. In the same way the white-pine blister rust is associated with a stage on the gooseberry.

On the host plant the fungi are characterized ordinarily by the occurrence of rusty spots; actually these are *sori* or beds of the spores of the fungus. The woods and fields of almost any forested locality will yield hundreds of fungi variously known as mushrooms, fairy wands, brackets, punks, puff balls and so forth. They grow on the soil or on decaying logs and vegetation, and a considerable number cause heartwood or sapwood decays of trees and decay of timber. Among fleshy forms there are edible species and poisonous species (a few of these only); there are those soft in texture and those hard and woody; they vary in size from those that are microscopic to brackets two feet across.

Bacteria. Among the fungi there are usually included the smallest plants known, the *bacteria*. These are sometimes designated *fission fungi* because of their method of division. They seem, however, to constitute an independent group, perhaps related to some of the lower algae. They are so small that they are visible to the unaided eye only when growing in colonies of many hundreds or thousands together. If arranged end to end it would require about 500 of these bacteria of average size to reach across the head of a pin. A study of the bacteria requires a special technique, since for careful examination they must be grown in pure cultures. They are universal in occurrence and are popularly called *germs*. In human and animal diseases they play a chief role. Many very important plant diseases, such as pear blight and soft rot, are caused by bacteria. But they also make up much of the life of soil and of open waters. They are the agents of many useful fermentation processes, as in the dairy industry, in vinegar production and in the retting of flax.

Lichens. These plants constitute another group which does not fit closely into the scheme of classification given. A lichen consists of a fungus and an alga growing together, probably mutually helpful, to form a dual colony so closely associated that the colonial composite acts as an individual. To a degree the fungus is parasitic upon the alga and holds it captive, but the alga is thus enabled to grow in many places where it could not otherwise exist. Within the lichen the alga multiplies vegetatively, whereas the fungus, in addition, has its characteristic spore reproduction. Lichens grow commonly upon trunks and branches of trees, rocks and soil. Some are thalluslike or flattened, some are mosslike in appearance. The reindeer moss, really lichens, are typical of the latter group. They are often gray-green in color, very resistant to extreme conditions, and some species form a considerable element in most northern or arctic climates.



A Fruiting Moss Plant

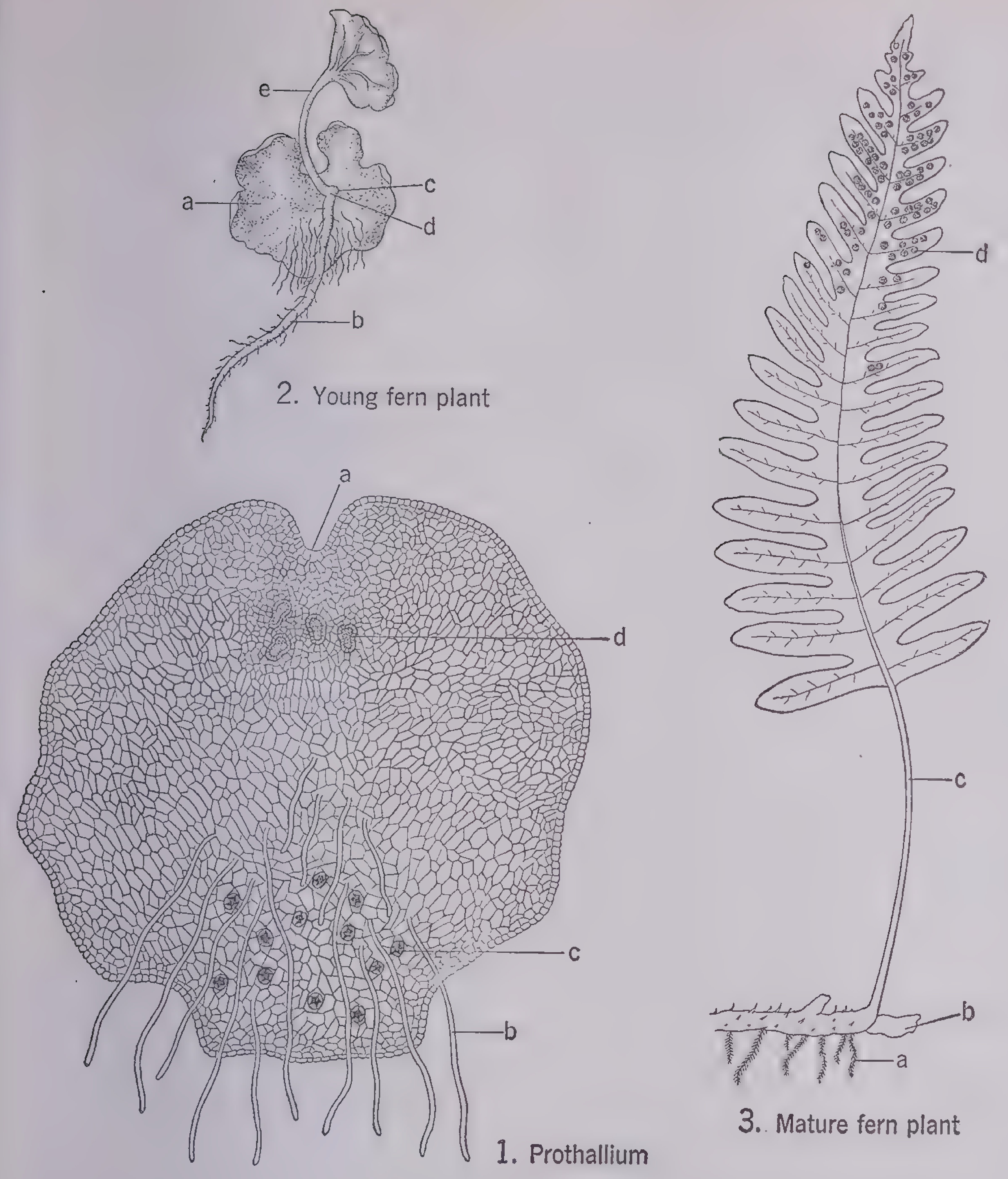
a. Protonema with young moss plants developing; the protonema arises from a spore.
b. Fruiting moss plant: a, gametophyte with stem, rhizoids and leaves; the gametophyte arises from buds on the protonema; b, sporophyte; this arises from a fertilized egg at the upper end of the gametophyte and consists of the following parts: 1, foot, embedded in the tissues of the gametophyte, serves as an absorbing organ; 2, stalk or seta; 3, capsule with operculum or lid; 4, calyptra, which remains as a cover to the capsule. It is a remnant of the female sex organ and belongs with the gametophyte stage

The Mosslike Plants.—The mosses and mosslike plants (class *Bryophyta*) constitute a considerable group of green plants higher in the scale of development than the algae. As a class, however, they are much smaller and less complex than seeds plants. In general they are most familiar to us as miniature velvety or feathery growths occupying all sorts of situations—carpeting the ground in many moist or dry places, growing upon rocks, the trunks of trees, and some even in ponds or running water. The parts of the mosses usually visible look like higher plants; that is, they have a stemlike axis with numerous leaves. But there is no true stem and root such as characterize seed plants. The bryophytes include the true mosses and liverworts, the latter being often flattened or thalluslike.

The conspicuous moss plant grows from a bud formed on another stage, which is filamentous, known as the *protonema* (first thread). The protonema develops directly from the germination of the spore. On the apical end of the moss plant, in time, special sex structures are developed, one producing male gametes and another female gametes. Fusion takes place, and the fertilized egg grows into what is commonly known as the *moss fruit*. This consists of a food-absorbing organ imbedded in the upper end of the moss plant, a stalk (*seta*) and a capsule that is differentiated into several parts. In this capsule small asexual spores are produced and each of these in turn gives rise to a protonema. Thus there are a very definite sexual generation and a nonsexual generation in mosses.

Ferns and Fern Allies.—Among the better-known groups of the class *Pteridophyta* are the true ferns, quillworts, horsetails or scouring rushes and the club mosses. Ferns are usually unrestricted as to habitat, though we think of them more particularly as growing in moist woods and along shaded streams; but the bracken, for example, is a common fern of more exposed slopes and roadsides as well as of the borders of the woods. Several species of ferns occur on the sides of rocky cliffs. Scouring rushes are equally diverse in their home requirements: some occur on dry railroad embankments, others on moist banks and in the shade. The American club mosses are chiefly shade-loving plants of the forest floor. Those familiar with the decorative ferns of the home and with the ground pine (a club moss) of many northern evergreen forests will regard this class as a rather diverse one. That is true from the standpoint of grosser form (morphology), yet all these groups have much in common.

Ferns are characterized by the possession of stems, roots and leaves. Those of temperate climates have stems restricted to underground growth, known as *rhizomes*. The leaves arise from this stem, and



2. Young fern plant

1. Prothallium

3. Mature fern plant

The Life History of the Fern

1. Prothallium, the gametophyte stage, a heart-shaped structure composed of green cells that carry on the process of photosynthesis; *a,* notch or growing point; *b,* rhizoids or absorbing organs; *c,* male sex organs; *d,* female sex organs. The fusion of the male gamete with the egg is the beginning of the sporophyte generation.
2. Young fern plant: The young sporophyte has arisen from the fertilized egg; *a,* prothallium with rhizoids; *b,* root; *c,* stem; *d,* foot, embedded in the prothallial tissues; *e,* first leaf.
3. Mature fern plant or sporophyte: *a,* roots; *b,* stem; *c,* leaf, pinnately divided, with *d,* sori, consisting of spore sacs on the under side. In the spore sacs spores are produced, which grow into the prothallia.

growth of the leaf (*frond*) is primarily from the tip. The mature leaf is usually large and complex. The unfolding of this incurved (circinate) tip is engagingly clear and rapid. Moreover the fern has much in common with the seed plants in the differentiation of special supporting and woody or conducting (vascular) tissues.

Though they are mosslike in appearance, the club mosses are also comparable with ferns in that they possess stems, leaves and roots; but the stems are largely above ground, and the leaves are small and scalelike. Vascular tissue occurs in this group also.

The ferns have a distinct alternation of spore-bearing and gamete-bearing stages. The small, flat, green heart-shaped prothallia produce male and female sex organs in which gametes are developed. A male gamete fuses with an egg, and from the fertilized egg develops the fern plant with its roots, stem and leaves, as we know it. On the under side of the leaves there are small spore cases or *sporangia,* often distributed as dots, rows or larger masses. In these spore cases large numbers of spores are produced, usually all the same size and each consisting of a single cell; and, when they germinate, they give rise to the prothallia. So the prothallia are gametophytes producing gametes, and the ordinary leafy fern plant is a sporophyte producing spores.

In the quillworts the spores are of two sizes, and they are produced in sporangia at the bases of the leaves. In the ground pines and club mosses the sporangia occur on leaves (sporophylls) toward the tips of branches, often forming a loose cone. In the ground pine (*Lycopodium*) these spores are alike in appearance (homosporous), but in the small club mosses (*Selaginella*) the spores in the two kinds of sporangia are different in size (heterosporous). These two spore sizes are significant, for the larger one (megaspore) produces the female prothallus (gametophyte), and the small spore gives rise to the male gametophyte.

Seed Plants.—The complexities of the great groups of seed plants (*Spermatophyta*), the highest division in the plant kingdom, are too many to lend themselves readily to brief treatment. Consequently it will be necessary to consider only a few generalized characteristics of this climax group. Spores such as occur in the club mosses are no longer so conspicuous to the casual student; but they occur none the less, and the generation that bears them (sporophyte) is practically the entire plant. Another structure has arisen. This is the *seed,* and it contains an embryo plant.

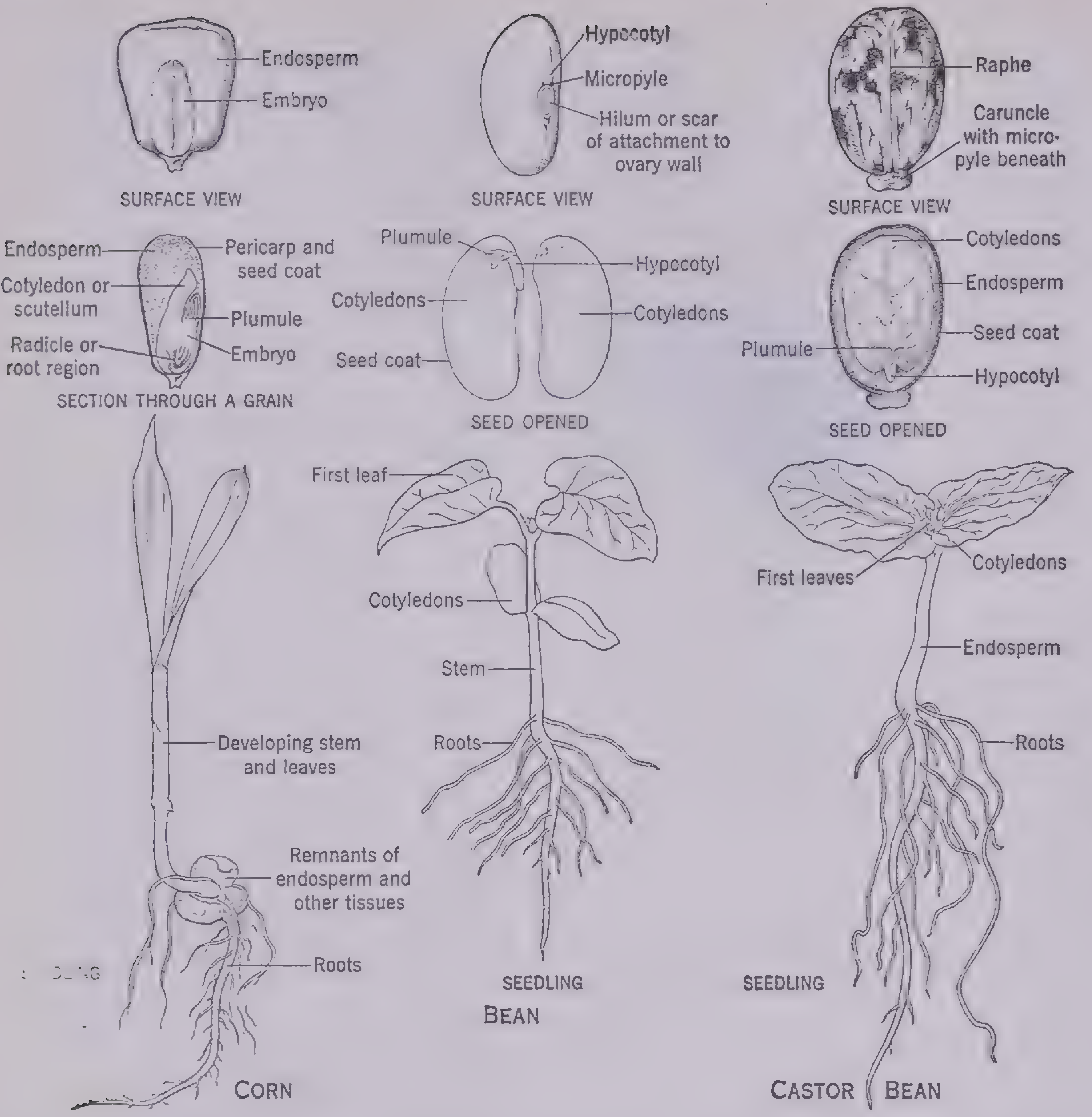
The development of the seed is preceded by the process of pollination. Pollen is produced on certain specialized structures and carried by the wind or insects to the female structures. There the pollen germinates, giving rise in a short time to male gametes that fuse with the female gamete. The latter develops into the young embryo plant that, surrounded with protective structures, becomes the seed. The gymnosperms differ from the angiosperms in which the seeds are borne within a special structure known as the ovary.

Seed plants embrace two major divisions, the gymnosperms (with seeds not enclosed) and the angiosperms (with enclosed seeds).

GYMNOSPERMS. Familiar examples of gymnosperms are the pines, spruces and other evergreen trees or shrubs with conelike fruits, known as the *Coniferae.* In these the spore-bearing leaves or scales (sporophylls) do not constitute a flower. As the scales of the seed-bearing cones separate, the winged seeds may be seen, a pair under each scale.

The vast forests of the northern United States were formerly largely conifers (trees that produce seed-bearing cones), but they were so valuable as lumber that the more accessible ones have been cut down, and the larger part of the present lumber supply comes from the Pacific states and from the South. Vascular or woody tissues reach a high state of development in the stems and roots of conifers. The foliage leaves of mature pines are called *needles.* They are highly specialized in structure and are adapted to resist extremes of conditions. Morphologically they are grouped in fascicles of two, three or five needles, depending upon the species.

It has been indicated that the seed contains an embryo plant. In the pine, this embryo plant is surrounded by a considerable food-storage layer called the *endosperm,* and the whole is enclosed by the seed coat or *integument.* Maturity of the seed is accompanied by a certain amount of drying out and by a period of inactivity or dormancy. A renewal of

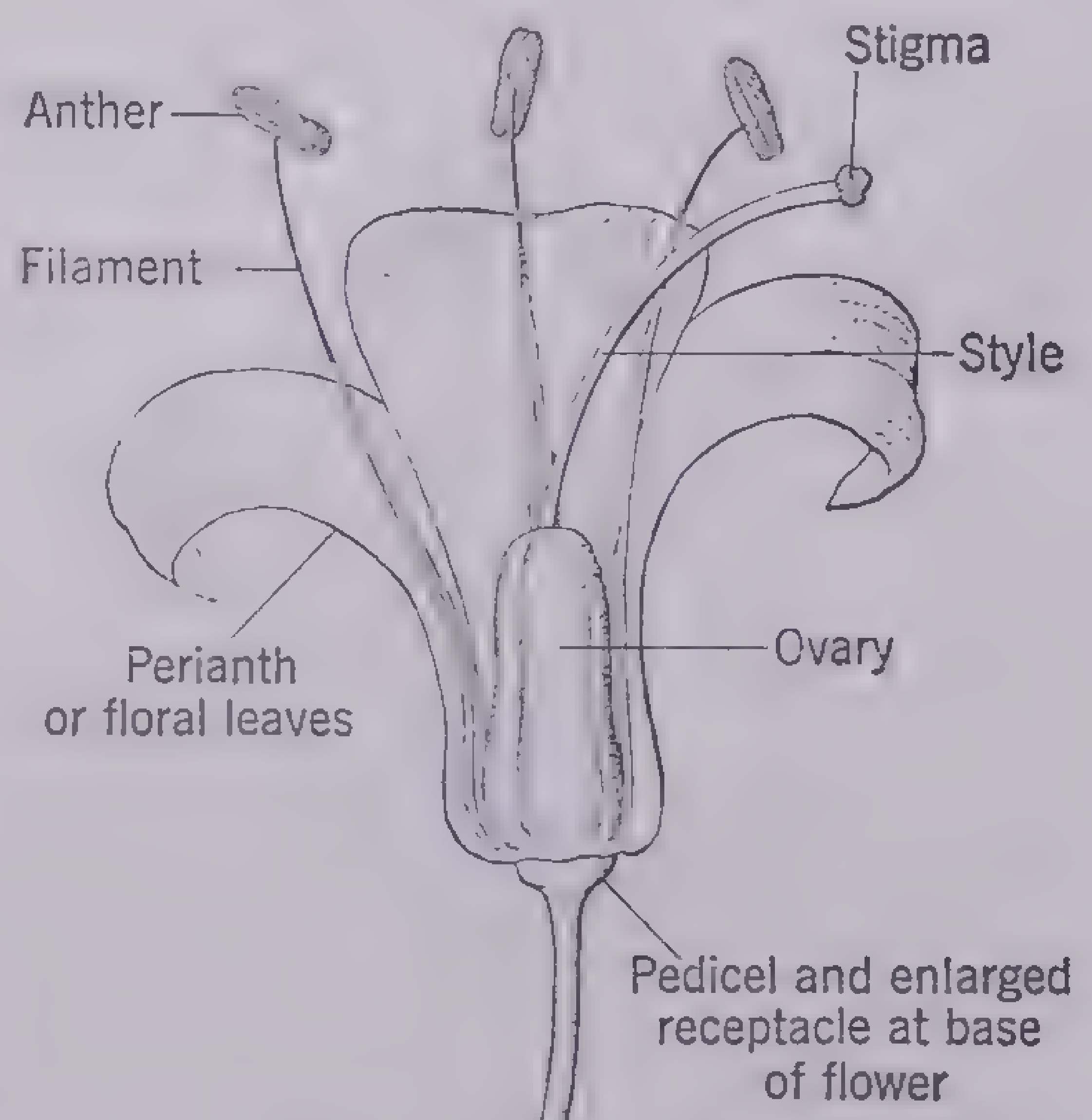

Endosperm
Embryo
SURFACE VIEW
Hypocotyl
Micropyle
Hilum or scar of attachment to ovary wall
SURFACE VIEW
Raphe
Caruncle with micropyle beneath
SURFACE VIEW
Endosperm
Pericarp and seed coat
Cotyledon or scutellum
Plumule
Radicle or root region
Embryo
SECTION THROUGH A GRAIN
Plumule
Hypocotyl
Cotyledons
Cotyledons
Seed coat
SEED OPENED
Cotyledons
Endosperm
Seed coat
Plumule
Hypocotyl
SEED OPENED
First leaf
Cotyledons
Stem
Roots
First leaves
Cotyledons
Endosperm
Roots
Developing stem and leaves
Remnants of endosperm and other tissues
Roots
SEEDLING
BEAN
SEEDLING
CORN
CASTOR BEAN

Seeds and Seedlings

In the corn grain or caryopsis the embryo consists of the plumule and cotyledon (scutellum) and the radicle (root region). In the bean seed, the hypocotyl is barely visible beneath the seed coat

growth is shown by the embryo when under favorable conditions the seed absorbs water, and thus germination or sprouting ensues. The young seedling, free of the seed coat, consists of root portion, bud or *plumule* and a whorl of long, green seed leaves or *cotyledons.*

ANGIOSPERMS. The angiosperms or true flowering plants include the great majority of the familiar flowers and weeds of field and garden, as well as all the trees and shrubs except the gymnosperms, referred to above. The angiosperms have seeds and a complex tissue system in which vascular or woody elements attain a further advanced state of differentiation, and they exhibit the highest evolutionary development through the production of flowers. A *flower* may be regarded as a shortened branch with highly modified sporophylls and commonly with other floral leaves, often conspicuously colored. Our esthetic interest is awakened by the beauty of many flowers, but the importance of the flower to the life of the species of plant lies primarily in the possession of sporophylls, for these are concerned with the reproduction and perpetuation of the species. Color and fragrance are likewise useful, and both are factors in attracting insect visitors, so necessary for the pollination of certain species.


Anther
Stigma
Filament
Style
Ovary
Perianth or floral leaves
Pedicel and enlarged receptacle at base of flower

Lily Flower (Longitudinal Section)

The stamen consists of the filament and anther. The pistil consists of the ovary, style and stigma

Parts of the Flower. It is important to know all parts of the flower, and as a representative type the apple or the wild rose may serve. In such flowers as these there are at least four sets of structures that attract particular interest. The outer set of parts (green in these plants) is the *calyx,* the individual leaves of which are the *sepals.* Next there is a set of showy leaves known as the *corolla,* the individual parts of which are *petals.* Within the petals are a group of relatively small sporophylls (microsporophylls), and these are the *stamens.* The central and last structure constitutes a united set, termed a *pistil,* made up, however, of several parts or *carpels.* More immediately concerned with reproduction are the stamens and pistils. In the case of the flower under consideration each group of carpels has an enlarged basal *ovule sac,* a terminal *stigma* and a connecting shank known as a *style.*

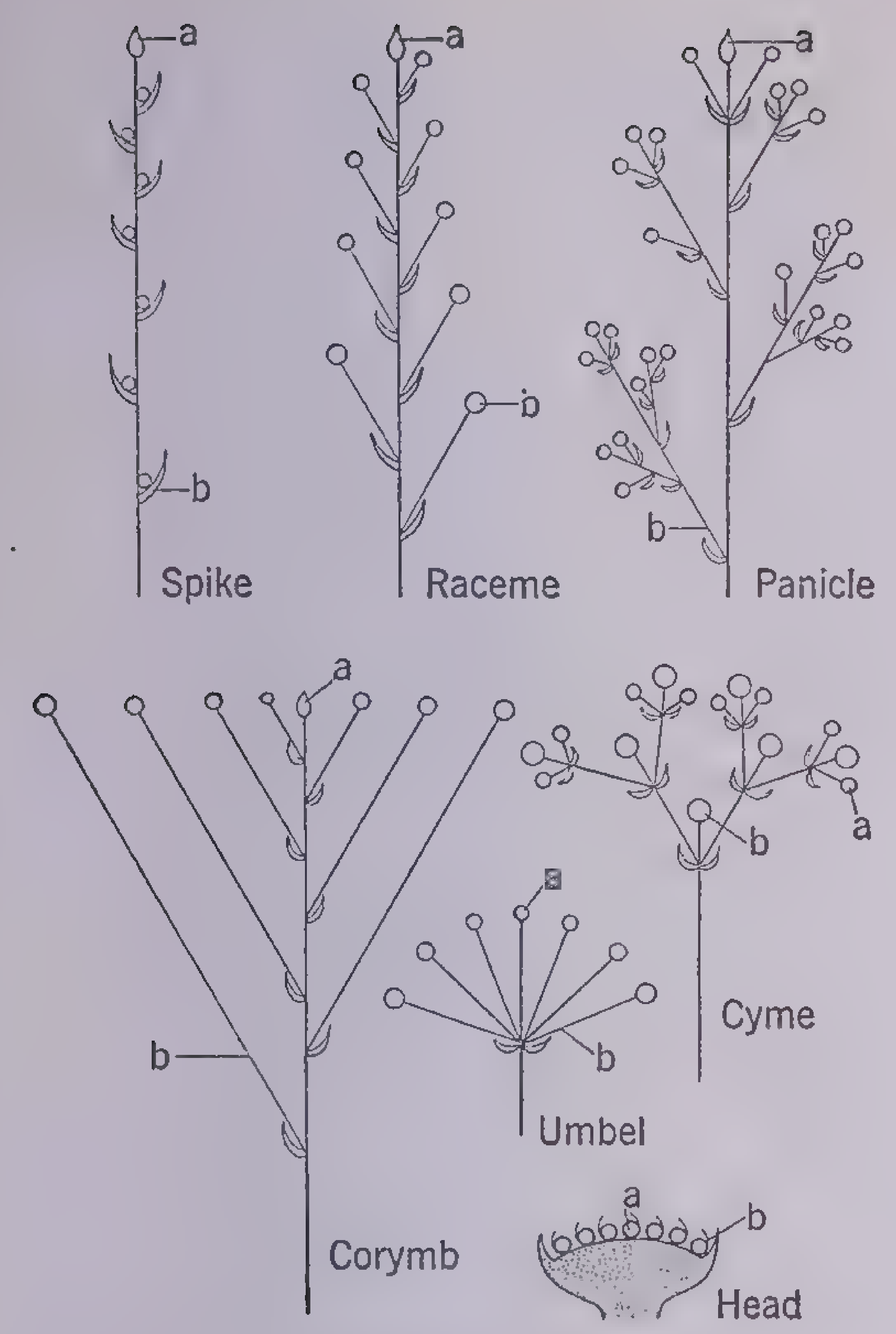
The terminal enlarged part of the stamen is an *anther,* and in this the dustlike *pollen* is produced. In the ovule sac there are differentiated the ovules within which the egg gametes are produced. Pollen grains distributed by insects, wind or other agencies lodge on the stigma and germinate (becoming the male gametophytes), and the germ tubes grow down the style and into the ovules, where gametic union occurs. Following this, embryonic development and seed formation proceed until the seed ripens or matures.

Inflorescences.—Flowers may occur solitary on the stem, as in the tulip. In the fuchsia they occur in the axils of the green leaves on the upper part of the stems. In other plants these green leaves are reduced to bracts, and there are fully developed inflorescences.

RACEMOSE INFLORESCENCES. Such forms are characterized by the main stem continuing to grow, forming new bracts and buds, thus providing a succession of flowers, the oldest being at the base. The types of racemose inflorescences are as follows:

1. *Raceme.* Flowers on short stalks or pedicels distributed along the main axis as the hyacinth and snapdragon. The panicle is a compound raceme, secondary branches arising from the main axis and these, in turn, bearing the flowers. Oats and the yucca are examples.
2. *Spike.* The pedicels of the flowers are greatly shortened, as in the mullein and plantain. In wheat there is a compound spike.
3. *Catkin.* Essentially similar to the spike, except that the whole flower cluster falls as a unit; for example, the poplar.
4. *Corymb.* The pedicels of the lower flowers are much longer, so that the entire flower cluster is more or less flat; for example, hawthorns.
5. *Umbel.* All the flower pedicels seem to arise from about the same point and are about the same length, as in the cherry and onion. In the compound umbel secondary branching occurs, as in the wild carrot.
6. *Head.* The pedicels of the individual flowers are greatly shortened, forming a compact, rounded or flat arrangement of many flowers. The clover and sunflower are examples. Thus the *flower* of the composites, to which the sunflower belongs, is really a flower cluster or inflorescence.

In contrast to the racemose inflorescences is the *cymose* type, in which the main stalk soon ceases to grow, and the first or oldest flower is pro-



Inflorescences

In each diagram *a* represents the youngest flower and *b* the oldest

duced at the apex. The younger flowers develop on lateral branches below, and the youngest flowers are farthest from the tip of the stem. Crabapple and some of the dogwoods are illustrations.

The grouping of flowers into inflorescences is doubtless an adaptation for pollination.

Fruit and Seed.—The seed develops from the ovule and consists of the young embryo plant with its surrounding nutritive and protective tissues. The seeds are enclosed within the ovary during their development and the fully developed ovary with its adjacent parts constitutes botanically the *fruit.*

Fruits are of several different kinds:

1. Fleshy: *Berry* (grape, tomato, orange, squash); *drupe* (cherry, peach, olive); *pome* (pear, apple).
2. Dry: Fruits splitting open—*follicle* (milkweed); *legume* (pea); *capsule* (iris, lily). Fruits not splitting open—*achene* (buckwheat, sunflower); *caryopsis* or grain (cereals); *samara* or winged (maple, ash, elm); *nut* (oak).

Fruits are called *simple* when they develop from a single or a compound ovary within the flower. If there are several separate carpels in the flower, an *aggregate* fruit is formed; in the raspberry there is an aggregation of many drupes. A *multiple* fruit arises when the fruits developed from separate flowers remain united, as in the mulberry and pineapple.

Leaves.—Since the primary function of a leaf is to carry on the process of photosynthesis, provision must be made for a large surface for the absorption of light energy. Usually leaves consist of a slender stalk or *petiole* and a broad expanded blade or *lamina.* *Stipules* are sometimes present at the base of the stalk; but in the black locust these are modified into spines, and in garden peas they are quite large and adapted for carrying on photosynthesis.

From the apex of the petiole, *veins* extend into the blade. These are composed of various kinds of tissue, which serve for mechanical support, for the transport of raw materials through the leaf and for carrying away the products elaborated by the green cells. The *venation* (arrangement of the veins) is characteristic for different kinds of plants: *Net* venation, as in dicotyledons, and *parallel* venation, as in the monocotyledons. In *pinnate* net venation of leaves, the petiole extends as a main vein or midrib through the center of the leaf, lateral veins extending off it on each side, giving a featherlike appearance; for example, apple and elm. In *palmate* net venation, several larger veins radiate from the apex of the petiole like the fingers on the hand; for example, the maple.

The leaf blade may be *simple,* as in the apple, or *compound,* consisting of *leaflets.* The leaflets may have the pinnate arrangement, being distributed on each side of the main axis, as in the pea, potato and tree of heaven; or the leaf may be palmately compound, the individual leaflets being arranged at the end of the petiole like the fingers on the hand.

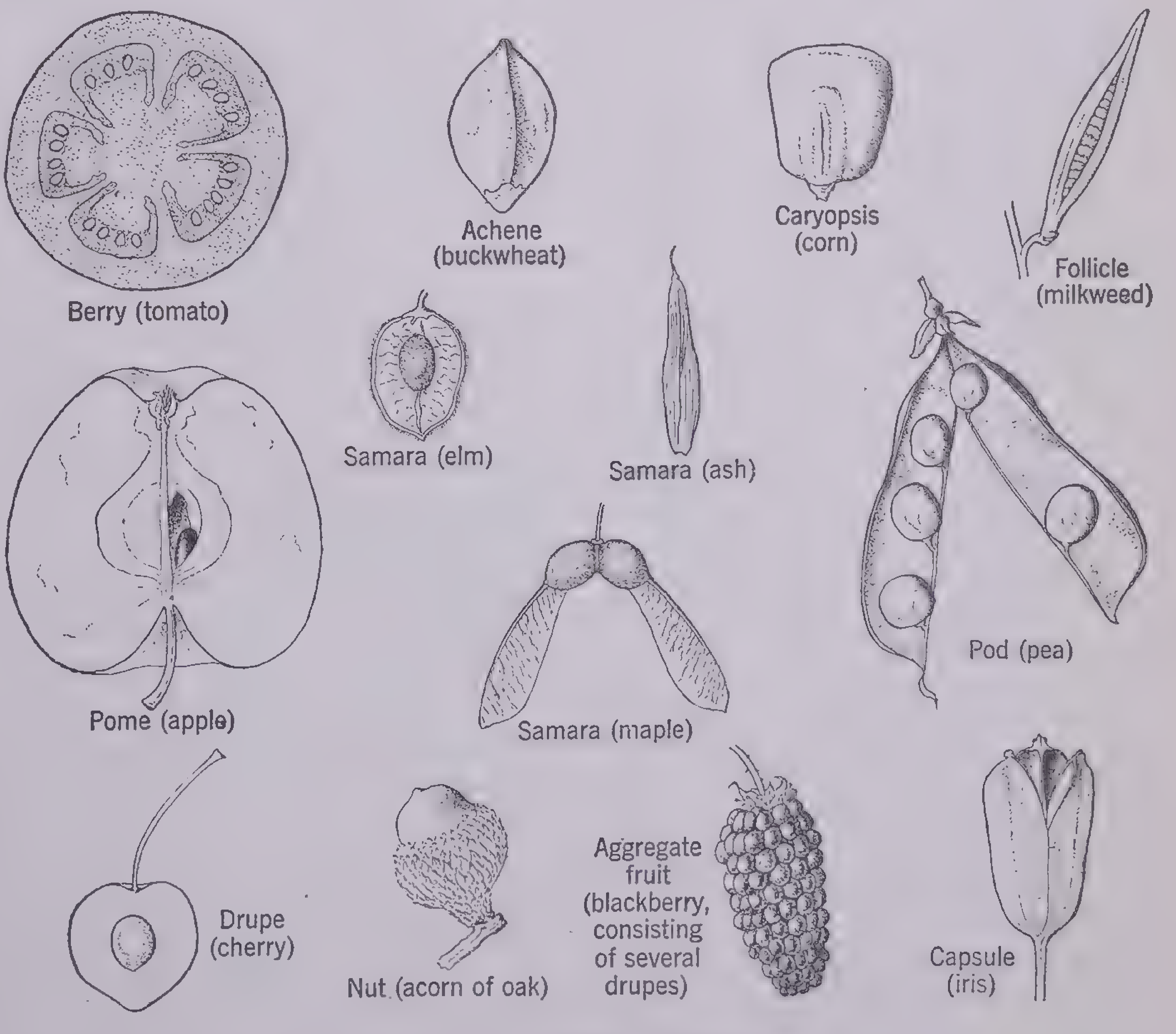
The leaves of grasses are interesting in that, instead of a distinct petiole, the basal part is a sheath that closely surrounds the stem. At the junction of the sheath and blade there is the ligule. At the base of the blade there is a special growing zone, so that grass leaves continue to increase in length for long periods of time. Advantage of this is taken in cattle grazing and in utilizing grasses for lawns.

Arrangement of Leaves on the Stems. Leaves are arranged on the stem, usually, in one of three ways: *Alternate,* one leaf at a place or notch, as in the apple or elm; *opposite,* leaves on opposite sides at the same point or node, as in the maple; *whorled,* three or more leaves at the same level, as in the lily. Buds are regularly found in the axils of the leaves and, under favorable conditions, will grow into branches, bearing additional leaves or flowers.

Modifications of Leaves. Leaves may undergo many modifications. *Bud scales* are greatly reduced leaves, primarily for the protection of the delicate tissues during adverse seasons. In *bulbs,* the bases of the leaves are enlarged and serve for storage of food. The thick, fleshy leaves of sedum and similar plants store quantities of water. Some barberry leaves are modified into *spines.* In the pea, some of the leaflets are modified into *tendrils,* which assist the plant in climbing. Very curious modifications occur in the insectivorous plants, as the sundew and the pitcher plants.

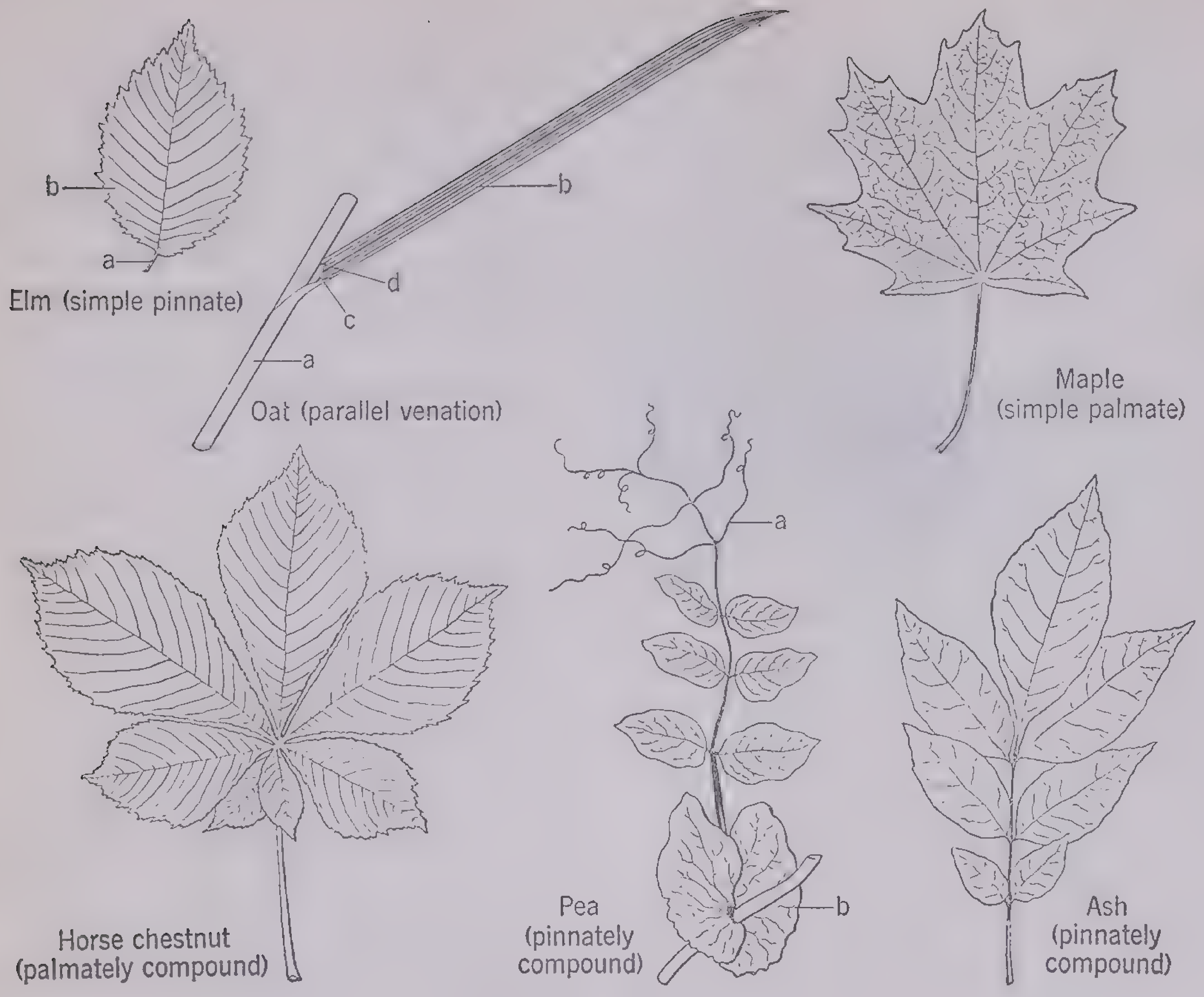
Structure of the Leaf. In a cross section of a leaf blade, different types of tissues and cells are observed.

1. *Epidermis.* The upper and lower epidermis covers the entire leaf surface, protecting the tissues within



Various Types of Fruits

The tomato, apple and cherry are fleshy fruits; the buckwheat, corn, milkweed, elm, ash, pea, maple, iris and the acorn of the oak are dry fruits; the blackberry is an example of aggregate fruit, as are the strawberry, raspberry and magnolia



Types of Leaves

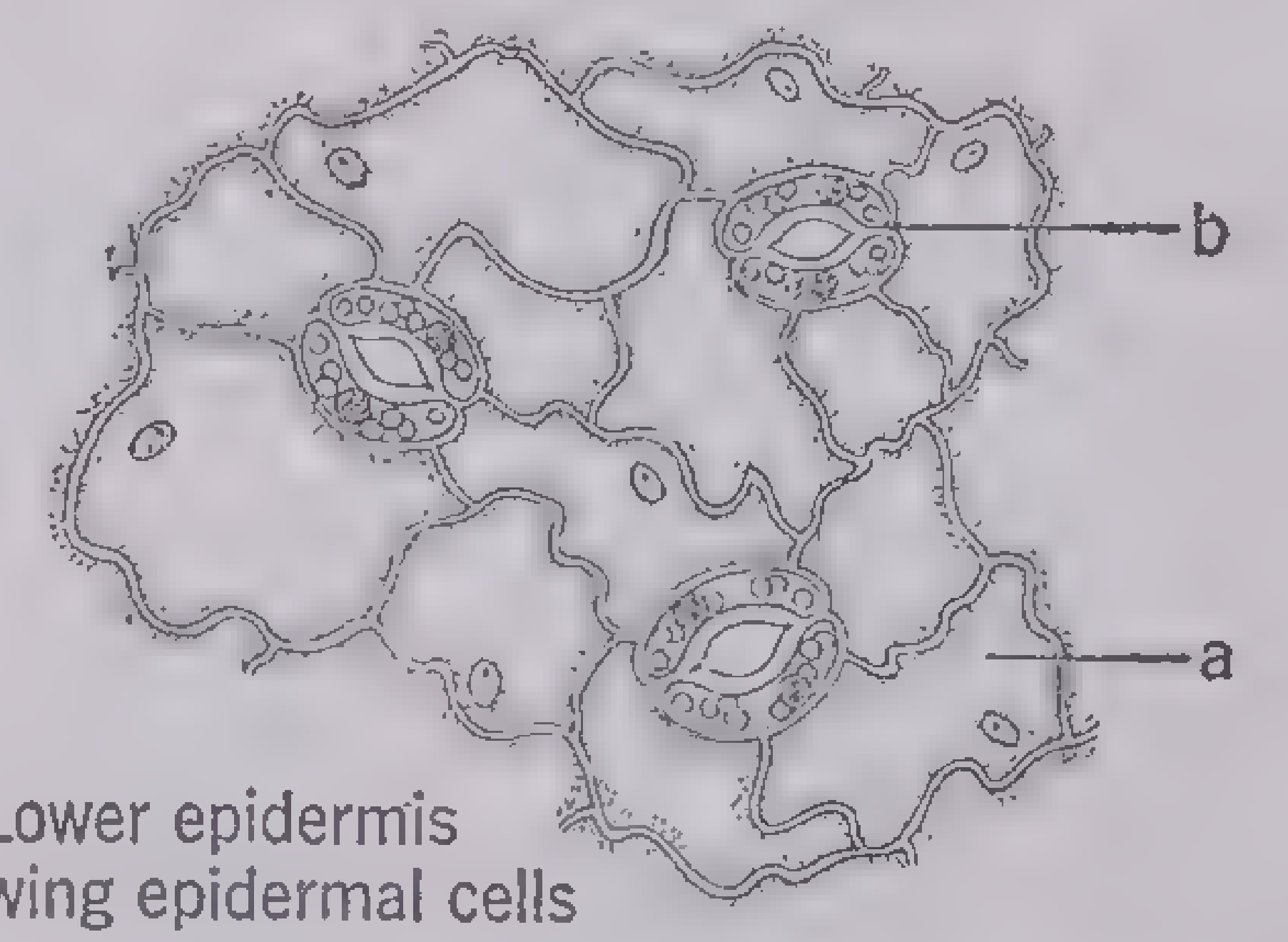
Elm: *a*, petiole; *b*, blade. Oat: *a*, sheath; *b*, blade; *c*, ligule; *d*, growing zone at base of blade. Pea: pinnately compound, with some of the leaflets modified into *a*, tendrils; *b*, greatly enlarged stipules clasping the stem that serve as photosynthetic organs

from mechanical injury and drying out. The epidermis, particularly the upper one, is usually covered with a waxy cuticle, which further prevents loss of water. The epidermal cells are longer and wider than they are deep and, as viewed from the surface, have wavy cell outlines. Among the epidermal cells, sometimes on both sides of the leaf, sometimes only on the lower, are found special kidney-shaped *guard cells,* which contain chloroplasts. Between the guard cells is a pore called a *stoma* (plural *stomata*). The size of these openings is regulated by the movements of the guard cells. It is through these pores or stomata that the gaseous exchange takes place between the interior of the leaf and the outside air, water vapor escaping, carbon dioxide entering for the process of photosynthesis, oxygen escaping as a waste product or entering in connection with respiration.

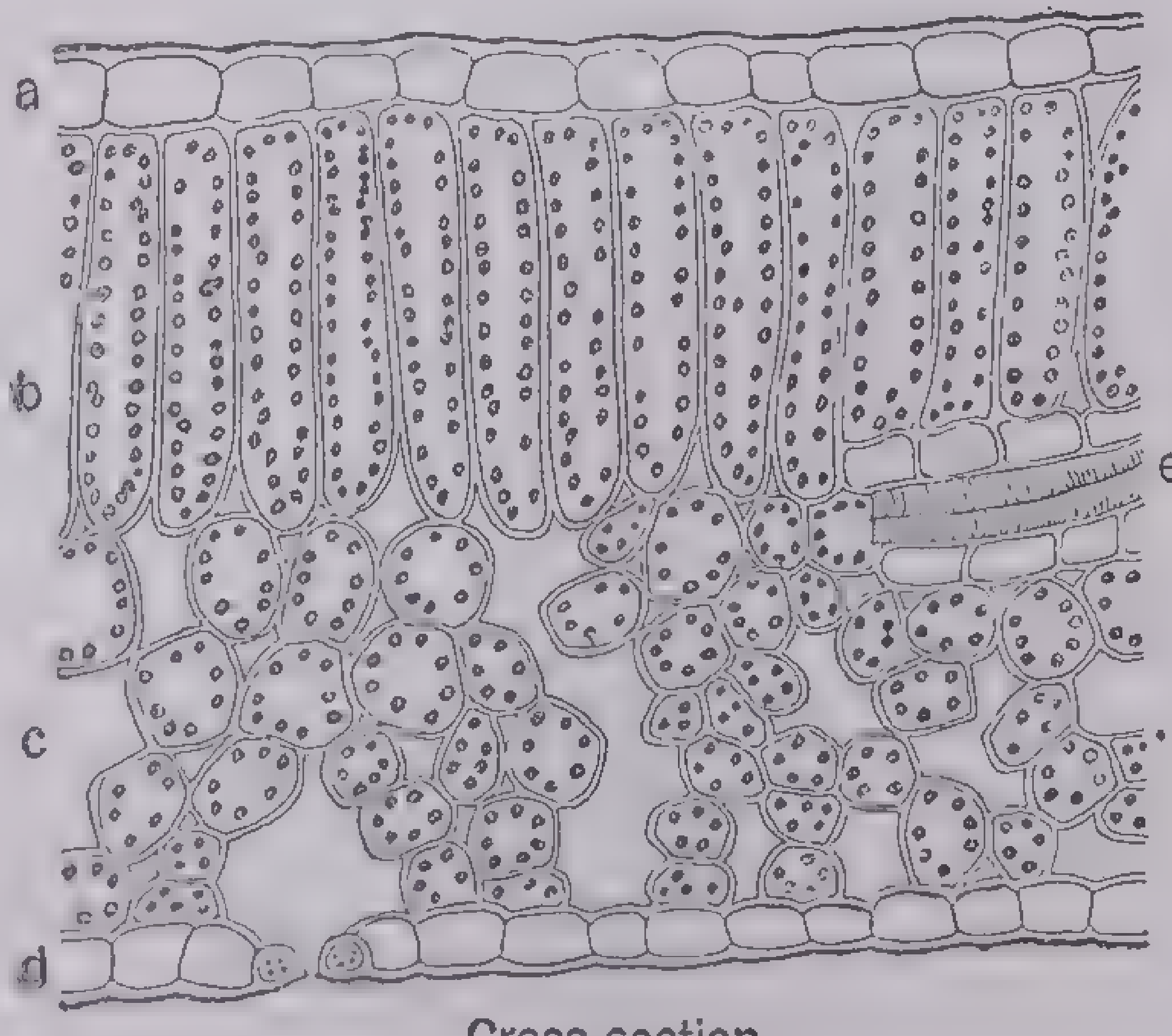
2. *Mesophyll.* Between the upper and lower epidermis there are specialized chlorophyll-bearing cells. Beneath the upper epidermis, long, narrow cells are arranged in a palisade fashion, and between these and the lower epidermis are more or less rounded or irregularly shaped cells, arranged to form a loose, spongy tissue, with abundant air chambers between. These cells are largely concerned with the manufacture of carbohydrates.

3. *Vascular bundles.* These are the veins of the leaves, as seen from the surface; the larger ones branch into smaller bundles, the latter finally ending in perhaps a single type of cell.

The structure of the leaf is adapted to prevent excessive loss of water vapor in transpiration and provide for adequate exchange of carbon dioxide and oxygen.



Lower epidermis showing epidermal cells



Cross section

The Leaf

Enlarged view of the lower epidermis or surface layer of cells and a cross section

Cross section: *a*, upper epidermis and cuticle; *b*, palisade layer; *c*. spongy parenchyma; *d*, lower epidermis with stoma and guard cells; *e*, fibrovascular bundle or vein.
Lower epidermis showing epidermal cells: *a*, with wavy outline, in contrast to the guard cells, *b*, surrounding the stomata

Significance of Scientific Names

In speaking of the lower classes of plants, including the algae, mosses and ferns, there have been used as scientific names only the class names (for example, *Bryophyta*) and certain common or popular names. But in discussing the higher plants it is extremely useful to become better acquainted with scientific names and to learn how these are employed. It is not difficult to do so when we make the effort, and it is never necessary to make the use of scientific names a burden. It is more particularly necessary if an effort is made to get more intimate knowledge of plant relationships, or if one attempts to use the manuals or floras prepared for the identification of either wild or cultivated plants. All those interested in knowing plants will want to use these manuals sooner or later, for they can add greatly to out-of-doors enjoyment.

There are various subdivisions of the classes of organisms that have been referred to, but for the sake of simplicity we need consider only three categories—families, genera and species. As an example of a plant family we may consider the rose family. There are perhaps 2,500 different kinds (species) of plants in this family. It includes such groups as roses and brambles, plums and cherries, the pear and the apple, spirea and mountain ash. All such plants are included in the family *Rosaceae* (roselike). Why are these grouped into one family? The answer is that all possess a wild *rose* type of flower. It is, then, the type of flower that determines relationship. The strawberry and the apple are plants of different extremes in size, but this is of little significance.

All kinds of brambles, including many sorts of blackberries, dewberries and raspberries, are placed together in a smaller group, a *genus;* in this case it is the genus *Rubus.* Members of this genus are more closely related one to another than are members of different genera. They may be related through more detailed floral characters or through other characters. Each kind of bramble, such as the high bush blackberry or the trailing blackberry, constitutes a distinct *species,* the former is *Rubus frondosus,* the latter *Rubus trivialis.* Each of these is the true scientific name of a kind of plant. This name does not vary with locality or with language, as common names often do. The name is a binomial (two terms), and generally the specific name suggests some characteristic of the particular kind of plant; thus *Rubus rosaefolius* is the rose-leaved blackberry.

In the next few paragraphs it will be helpful to mention under the greater divisions of the flowering plants a number of the important families.

Major Divisions of Angiosperms.—The angiosperms are subdivided into two groups. In one of these the venation (vein system) of the leaves is parallel, as in the corn, and on germination of the seed the young plantlet exhibits a single seed leaf or cotyledon; such plants are *monocotyledons.*

The second group is characterized by netted (reticulate) venation of the leaves, as in the bean plant or in the rose. In all these there are two seed leaves in the young seedling, and in the bean these are thickened, representing reserves of organic food. Plants with two seed leaves are called *dicotyledons*. There are other characters—both of floral parts and of inner structure—that are generally distinctive of the two groups, as further study will reveal.

Among the several hundred families of flowering plants known, about 165 furnish our cultivated crops, together with other useful and ornamental trees, shrubs and annuals that are actually planted and cared for by man.

The Monocotyledons. Among the monocotyledons there come such families as those of the grasses (*Gramineae*), furnishing the cereal grains, pasture and ornamental grasses; tropical palms (*Palmaceae*), including the date and coconut palms, besides many that are cultivated in greenhouses; lilies and related plants (*Liliaceae*), affording many attractive flowers; bananas and plantains (*Musaceae*); and the highly prized orchids (*Orchidaceae*), famous alike for the delicacy and variety of their waxlike flowers and for the remarkable modifications in floral parts, the latter having come about in adjustment to insect pollination. The grasses and the orchids show extreme differences in floral anatomy. The grass flower consists of a pistil, with ovary, style and two feathery stigmas, and three stamens enclosed in scalelike leaves or bracts. The silk of an ear of corn is made up of hundreds of long, flexible styles that grow out beyond the husks and catch the pollen distributed by the wind. On the other hand, the beauty of form and color in the petals of floral leaves of lilies, irises and orchids enlist the admiration of all.

The Dicotyledons. The dicotyledons are nearly five times as numerous as monocotyledons, and at the same time the former group is regarded as geologically the older; it has attained far greater diversity in form and has advanced to higher types of development. Among families exhibiting the less complex types of floral structure there are the willows and the poplars (*Salicaceae*), with simple flowers in spikelike branches called *catkins*. Related to the willows are other families without showy floral parts such as the walnut-hickory nut family (*Juglandaceae*), the birch-alder (*Betulaceae*), the beech-oak family (*Fagaceae*) and the elms (*Ulmaceae*). These families of trees and shrubs are often classified as *primitive* from their simple floral parts, but there is much to suggest that this simplicity is merely one line of development that is made prominent by the emphasis on floral features.

In a varied group of families, including the pinks, sweet Williams, carnation (*Caryophyllaceae*), water lilies (*Nympheaceae*), buttercups, columbines, peonies and clematis (*Ranunculaceae*), there are included many attractive wild and garden plants of much interest. In all these the petals are distinct (polypetalous) and the carpels either separate or united. The various kinds of magnolia, as well as the sweet bay and the tulip tree constitute an impressive though small family (*Magnoliaceae*), considered by some to qualify as a present-day representative of a primitive flower. The petals of magnolia are often very showy and they vary in number; and the carpels are usually aggregated into a conelike structure.

In the manuals the rose family (*Rosaceae*) and the pulse family (*Leguminosae*) are neighbors, and together they constitute a very considerable part of the separate-petal series of families. As a whole the rose family is rather heterogeneous (as indicated in a previous paragraph); but we cannot fail to note among the wild and cultivated blackberries, roses, cherries and the like several common features:

(*a*) The corolla and stamens are inserted on the calyx tube, the latter being often united with the wall of the ovule case, so that the calyx tube forms a part of the developing fruit.

(*b*) The stamens are rather numerous and in cycles.

In the pulse family there are several thousand species, among which are the lupines, clovers, beans, peas and acacias. Generally the corolla is papilionaceous (butterflylike) with petals more or less like those of the sweet pea, and the fruit is characteristically a pod or legume.

Among the families of dicotyledons in which the petals are united (*gamopetalous*), a few only may be mentioned here. The mints (*Labiatae*), typified by the garden salvia, are fragrant herbs and shrubs with flowers commonly two-lipped. The nightshade family (*Solanaceae*) includes the potato, tomato, egg plant, tobacco and petunia, with prevailingly rotate flowers and fruit that is a *berry* (as in tomato) or a capsule (as in Jimson weed). Our table melons of various sorts are the fruit of certain members of the gourd family (*Cucurbitaceae*).

Botanists generally agree in placing at the pinnacle of development in the plant kingdom the composite family (*Compositae*). This is the family of sunflowers and goldenrods, asters and thistles, chrysanthemums and dahlias. It has also given us lettuce, bur artichoke and salsify. It is a huge family with perhaps 12,000 species nearly all of them annuals or perennial herbs, and the woody ones are not trees. The outstanding characteristic is the compact head of many flowers—some with ray flowers (as in sunflowers) and some without (as in thistles). The fruits are hard and one-seeded (*akenes*), and these are often provided with a feathery appendage or pappus (as in dandelion) that helps wind distribution of the seeds.

HISTOLOGY

Sometimes regarded as a division of microscopical anatomy, histology deals with *tissues;* that is, cells more or less similar in form, constituting a specialized area of the cell body.

Tissues.—Tissues may be of as many kinds as there are kinds of cells. A convenient classification of tissues is as follows:

Meristem or young tissue consists of thin-walled cells rich in protoplasm (living substance). They are able to divide and thus continue the growth of the organ. All other tissues are derived from meristem by differentiation or modification. *Cambium,* the layer of active growth and cell formation in stems and roots of dicotyledons, is a form of meristem.

Parenchyma or soft tissue consists of mature, thin-walled, usually short cells that have attained their growth, as the tissue of ripened fruits and the green tissue of leaves. The cells contain less protoplasm than meristem.

Collenchyma or thick-angled tissue consists of long prismatic cells with thin walls, but with the longitudinal angles much thickened. In many stems it occurs as a strengthening tissue just beneath the epidermis.

Sclerenchyma or stone tissue consists of thick-walled, usually short cells, so tightly packed together that they form a hard mass, as in the shells of nuts, for example, in hickory nuts, walnuts and filberts, and in the "stones" of many fruits, as in plums and cherries.

Fibrous and bast tissue consists of thick-walled, elongated cells so tightly packed together that they make up the fibrous part of the wood (wood fibers) and of bark (bark or bast fibers) of the stems of most higher plants. Bast fibers are used in rope making and linen manufacture.

Sieve tissue consists of elongated, usually large cells, more or less united into tubes and having only slightly thickened walls. The name is given because the transverse partitions between the cells are perforated in a sievelike pattern, and through these perforations the protoplasm connects from cell to cell. Sieve tissue occurs primarily in the young bark. It is important in conveying organic food material.

Tracheary tissue is another tubular tissue, but the continuity of the cavity is usually more complete than in sieve tissue. The walls are somewhat thickened—in rings, spirals or in more complicated ridge systems. When they are young, these tubes contain protoplasm; but eventually they contain water or air. Tracheary tissue occurs in the woody parts of stems and leaves. It is a greatly differentiated tissue, losing protoplasm and dying with complete development. Its true function, that of water conduction, then begins.

Laticiferous tissue consists of milk cells and tubes that occur singly or in masses in many plants and are easily recognized by their milky contents, as in the many kinds of milkweeds. The milk (*latex*) is often very poisonous; rarely is it wholesome. In some cases it contains caoutchouc, from which India rubber is manufactured.

Epidermal tissue is usually a single layer of cubical cells, constituting the outer layer of leaves, young stems and roots.

PHYSIOLOGY

Physiology is concerned with the activities of plants, their methods of getting water and nutrient materials for the manufacture of food, their responses to environment, their growth and reproduction.

Absorption of Water and Chemical Nutrients.—Active living plants contain a high percentage of water, and every growing plant must in some way be in contact with a water supply. The familiar plant of the garden has its roots fixed in the moist soil, and the water weeds and the immersed or floating algae are surrounded by free water. In a complex plant the cell walls are in close contact, and even though cells of the leaves may be many feet from the absorbing roots, the distribution of water is so perfect that there is indirect water contact with the soil through long chains of tissue cells, each cell in turn taking its water from some other cell or conducting vessel nearer the constant supply. Unless a plant contains a quantity of dead tissue, as in trees or shrubs, the water content is usually four-fifths or more of the fresh weight.

No living thing can grow and develop without an adequate supply of water. The water plant is in direct contact with water through much or all of its surface. The roots of the soil plant are well distributed and thus a large surface of contact with soil moisture is established. A few plants, like the Florida moss (which hangs from the limbs of trees), obtain their moisture by condensing the water vapor (humidity factor) of the air.

Water is constantly being absorbed by the active root, that is, the plant is exerting a pull on the soil for water. This pull could be adequately described only after a long and elaborate consideration of the nature of diffusion and of the movements of water and of substances in solution through membranes (a process called *osmosis*).

Plants contain the chemical elements carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, potassium, calcium, magnesium and iron. Carbon, hydrogen and oxygen enter into the composition of the carbohydrates as starch, cellulose, dextrins and fats. Proteins contain these same three elements with the addition of nitrogen, phosphorus and sulphur. In addition to these ten elements, minute traces of copper, manganese, boron and zinc have been found to be necessary for plant growth. Carbon in the form of carbon dioxide and oxygen are obtained for the most part from the air; the other elements, usually in the form of nitrates, phosphates and sulphates, are obtained from solutions in the soil.

Physiologists long ago studied the mineral nutrient requirements of plants by means of water cultures. Plants were grown in water to which various combinations of mineral salts were applied. Very recently growing plants in water cultures has been developed on a commercial basis. Tanks are built, to which are added the necessary chemicals in solution. Roses, carnations, tomatoes and other plants are successfully grown. It is necessary to change the solution frequently in order to provide proper aeration for the roots. Clean sand may be used as a substratum, to which the mineral substances in solution are applied. It has been found that calcium nitrate, potassium phosphate and magnesium sulphate are usually sufficient for successful growth. Unless highly purified grades are used, these salts contain the necessary traces of the other elements.

Conduction and Transpiration.—The water and mineral nutrients absorbed by the roots are conducted through special tissues to other parts of the plant. Most of the water absorbed is transpired through the leaves. A well-grown corn plant in the course of a season may transpire as much as 54 gallons of water, and this is 90 times as much water as is actually needed for the production of the organic materials composing the plant. A well-grown apple tree may transpire 250 pounds of water a day or 36,000 pounds during the growing season. Transpiration is influenced by several external factors, notably the humidity of the atmosphere, the intensity of light, the movements of the air and the temperature of the air.

The question may be raised why such large quantities of water are transpired. As a matter of fact there are many adaptations in plants to avoid excessive water losses. It must be remembered that the primary function of the green leaf is the manufacture of organic substances, and its principal adaptations are for carrying out this very important function.

Photosynthesis.—This is the unique process carried out by green plants. By means of it they manufacture not only their own food but also the food for all other organisms. This process may briefly be summarized as follows:

(1) The raw materials are carbon dioxide from the air and water from the soil.

(2) The energy for the process is obtained from sunlight.

(3) The place of manufacture is in the chlorophyll-bearing part of the living cells. Since most green cells are found in the leaf, the latter is the principal location for photosynthesis.

(4) The chief product synthesized is sugar, and oxygen is given off as a waste product.

Leaves are thin, broad, expanded structures and thus expose a large surface for the absorption of sunlight. The carbon dioxide necessary for photosynthesis enters the leaf through the minute pores of *stomata* (mouths). The number of stomata varies greatly in different plants. Sometimes they are confined to one surface of the leaf, in other cases they are found on both. The average number of stomata per square millimeter (1/60 square inch) on the surfaces of the leaves of some plants are: apple, upper surface 0, under surface 250; pea, upper surface 101, under surface 216; corn, upper surface 94, under surface 158.

Photosynthesis is also influenced by such external factors as temperature, intensity of illumination, carbon dioxide content of the atmosphere and water supply.

Food Storage and Digestion.—The sugar manufactured in the leaves and other green portions of the plant may be stored temporarily in the form of starch. Most of it is soon transported to other parts of the plant, where it is utilized for building up the plant tissues. Some of it is used in the synthesis of proteins, which are manufactured in any living plant cell; the nitrogen for the proteins is derived from salts absorbed through the roots. The legumes, such as peas and clover, are able to utilize the free nitrogen of the air by the presence of certain bacteria that develop the characteristic nodules on the roots of these plants.

Much of the organic material manufactured during the growing season is stored for later use in the form of carbohydrates, fats and proteins, and large quantities are found in the seeds and fruits, rhizomes, tubers and roots. Upon the return of growing conditions the plant utilizes this stored material, but, before it can do this, it must change it from an insoluble to a soluble form for transportation. This is the process of digestion and is carried out by means of enzymes, of which there are many kinds acting upon the different materials.

Respiration.—The plant must have a supply of energy in order to carry on the various life processes. This energy comes from the breaking down of the complex organic compounds within the cell, and most of these changes are associated with the process of respiration. It is a common mistake to confuse photosynthesis and respiration. Respiration is the same in green plants, nongreen plants and animals. The chief end product of respiration is carbon dioxide, but one of the end products of photosynthesis is the oxygen that is liberated. The two processes may be contrasted as follows:

Photosynthesis	*Respiration*
1. The raw materials are carbon dioxide and water.	1. The raw materials are sugar or other foods and oxygen.
2. The process goes on only in chlorophyll-bearing cells.	2. The process takes place in all living plant or animal cells.
3. It takes place only during the day.	3. It goes on at all times, day and night.
4. The energy of light is stored.	4. It is an energy-releasing process.
5. The final products are sugar and oxygen.	5. The final products are carbon dioxide and water.

Assimilation.—The final conversion of carbohydrates, fats and proteins into the living material (protoplasm) is called *assimilation.* Very little is known about the details of this process.

Stimulus and Response.—It is very easy to demonstrate that plants react to changes in their environment. If a sunflower seedling is illuminated from one side, the stem will bend and the plant grow toward the source of the light. If a sunflower seedling is laid horizontally in the dark, the root will bend and grow downward, but the stem will bend and grow upward; both growths are in response to the influence of gravity. Oxalis, mimosa and other legumes close their leaves when they are placed in darkness and expand them when removed to the light. The tendrils of the squash are very sensitive to touch. These are only a very few of the evidences of irritability or capacity of response to stimuli in plants.

One of the most recent developments in physiology is the discovery of *photoperiodism,* the fact that some plants are short-day plants, and others are long-day plants. Some plants, such as ragweed and soybeans, flower and fruit much earlier when they are exposed for *less* than 12 hours a day to the light; but others flower and fruit earlier when they are exposed daily to more than 12 hours of light. The tomato, radish and lettuce are examples of long-day plants. Practical use of this response is made in various ways. Chrysanthemums ordinarily bloom late in October. They can be brought into bloom in August or September by cutting off the daylight in the early morning and late afternoon.

Growth and Reproduction.—Growth is a familiar and obvious characteristic of the living organism. The bean seed germinates and grows into a bean plant; a potato tuber sprouts, and as the new shoots grow the old tuber is gradually exhausted of food, as a result of which it decays or shrinks as the tissues disintegrate. Rapid growth usually presupposes a reserve of stored food material.

Several types of growth may be noted as the leaf bud of the elm, for example, unfolds in the spring. The bud swells, and with the increasing size the bud scales drop away, revealing an elongating shoot axis with miniature leaves. As shoot elongation continues, the leaves expand and differentiate, and soon a full-fledged elm shoot is the perfected product. This development and differentiation are always associated with extensive growth in a complex plant.

Growth of a tissue or organ may consist of an increase in the number of cells or in the size of cells or both, and generally there is considerable differentiation or change in the nature of the cells. Growth rate of any plant is a function of the specific inheritance of the plant and of the favorableness of the environment. The bamboo grows with great rapidity, the oak with extreme slowness; the maximum relative-growth rate of each is highest with adequate sunlight and warmth, moisture and soil nutrients. Every structure, organ or individual has growth characteristics peculiar to itself and different requirements as to growth conditions. So some plants grow primarily in the spring or primarily in midsummer, and some grow in all seasons.

As the root of the sprouting bean emerges, cell formation is active in the region of the tip. Back of the tip, cells rapidly elongate, continually increasing the length of the root. As soon as the cells in any zone cease elongating, root-hair development occurs; and since these hairs greatly increase the root surface, they are efficient agents of water absorption.

Growth in plants is primarily an increase in the size of the cells and in their differentiation for the performance of various functions. This increase is due in part to the manufacture of protoplasm and in part to the absorption of water. The amount of growth is limited, unless cells increase in number. The increase in number of cells is *reproduction.* In cell division the nucleus first divides by means of a very complicated process involving the exact distribution of the *chromosomes.* These are bodies that aniline dyes stain deeply, that usually are more or less rod-shaped and are conspicuous during the stages of nuclear division. Each kind of plant has a definite number of chromosomes. The chromosomes are particularly important because they appear to be the bearers of the hereditary qualities from one cell generation to another. Following nuclear division the cell usually divides. In the higher plants, cell division results in an increase in the number of cells and a consequent increase in the size of the plant through the process of growth. The process, however, may lead to reproduction of the plant. Many plants are propagated by the so-called asexual or vegetative method—potatoes by tubers, iris by rhizomes, tulips by bulbs; many plants, by cuttings; and some plants, such as apples and other fruits, by grafting.

Plants differ greatly with reference to the ease in which they may be propagated by cuttings. Roots develop very readily on the willows but with the greatest difficulty on apple cuttings. Recently, certain substances known as hormones (growth-promoting substances) have been found to stimulate the production of roots in the stem cuttings of many plants.

Sexual reproduction also occurs in practically all groups of plants. This process involves the fusion of specialized cells called *gametes.* In some of the lower plants the gametes are alike; but in most plants, particularly the higher ones, the gametes are highly differentiated. The male gametes are usually produced in large numbers and are quite small and motile. The female gametes (eggs) are produced in small numbers, are rather large in size, are filled with stored food material and are nonmotile. The seed production of the higher plants is traced back to a fusion of specialized gametes.

Genetics.—One of the most familiar facts about plants is that the offspring in most respects resemble their parents. A variety or species is essentially a true breeding type; the characters possessed by parents reappear in generations of their descendants. Variation between individuals, however, is of wide occurrence. Most variations are fluctuating, no two individuals being exactly alike on account of differences in water and food supplies, illumination and other external factors; but some variations between individuals are due to hereditary differences.

Genetics is a very modern branch of biology, having arisen largely since 1900, and it is concerned with the results of inheritance and its mechanism. The stimulus for modern genetics dates to the rediscovery in 1900 of Mendel's paper (published in 1866) recounting his experiments with peas.

Hybridization of plants involves the crossing of individuals that differ in one or more characters; and one of the important contributions of Mendel is his discovery that the characters of plants appear to behave independently in inheritance. If there are no differences between the plants, they evidently belong to a true breeding variety or strain.

In connection with hybridization it is necessary to know something about the types of plants from the standpoint of pollination. Many plants, such as wheat, oats, barley, rice, peas, beans, tobacco and tomatoes, are naturally self-pollinated. Other plants are naturally cross-pollinated; for example, maize, rye, clovers and apples. A third group includes plants that may be either self-pollinated or cross-pollinated, such as the grain sorghums, cotton and alfalfa. There is a final group of plants that produce two kinds of flowers, borne on different individuals—one kind produces only stamens and the other only carpels; hops, hemp, the date palm and asparagus are illustrations. Self-pollination naturally leads to self-fertilization; and cross-pollination, to cross-fertilization.

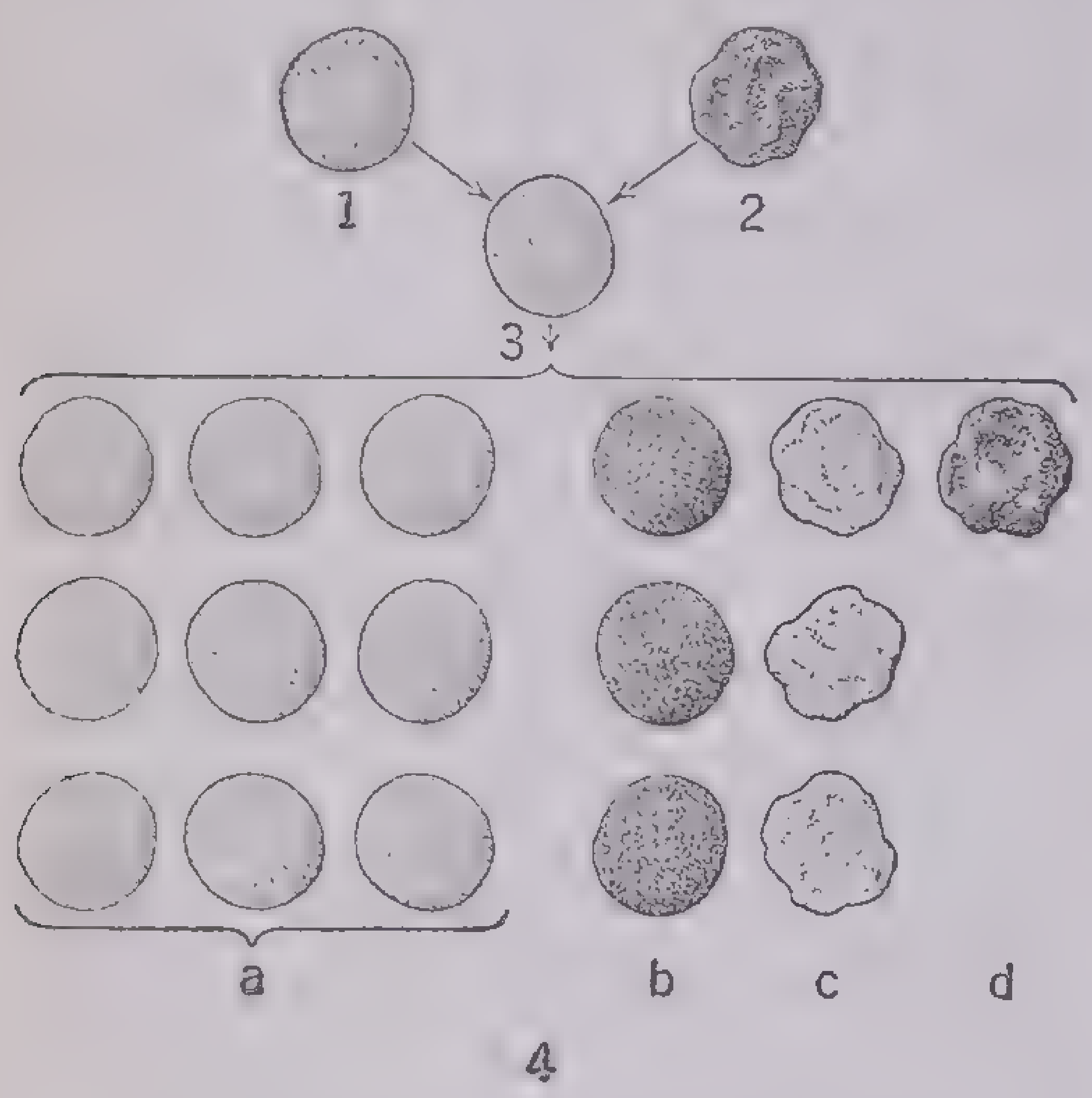
Mendel, in his classic work, studied varieties of garden peas, making crosses between different kinds. He particularly stressed the importance of studying the individual characters and, by doing this, arrived at his laws of inheritance. The varieties that he utilized in his experiments had the following contrasting characters:

1. Tall stems	—Dwarf stems
2. Yellow seed leaves	—Green seed leaves
3. Colored seed coats	—White seed coats
4. Inflated pods	—Constricted pods
5. Green pods	—Yellow pods
6. Axillary flowers	—Terminal flowers
7. Smooth or round seeds	—Wrinkled or angular seeds

In all of Mendel's crosses, he found that the first generation plant had the appearance of the parent as given in the first column. Thus a cross between the tall and dwarf variety gave tall offspring, and a cross between a variety with yellow seed leaves and one with green seed leaves had offspring with yellow seed leaves. Mendel referred to this discovery as the *dominance* of one character over another. It was when the second generation was grown, however, that the most interesting feature was discovered; for example, tall plants crossed with dwarf plants gave tall offspring in the first generation. If these tall first-generation plants were self-pollinated and the individuals grown from the seed, some were tall and others were dwarf, and they occurred in approximately the ratio of three tall to one dwarf. Crosses involving varieties with the other six sets of characters behaved in exactly the same way. Thus, Mendel arrived at a second generalization, namely, that in the second generation a segregation of the parental characters takes place.

If the experiments are carried on to the third generation, other interesting facts are discovered. It is found, for example, that some of the tall second-generation plants produce only tall offspring, and other tall second-generation plants produce both tall and dwarf offspring and, again, in a ratio of three tall to one dwarf. The dwarf second-generation plants produce only dwarf offspring.

Mendel then studied hybrids between varieties differing in two pairs of characters (such a cross is a *dihybrid*). For example he crossed a variety that had yellow wrinkled seeds with one that produced green smooth seeds. The first-generation plant produced yellow smooth seeds, a combination of characters not found in either parent. When these plants were self-pollinated and the second-generation offspring grown, four kinds of plants were obtained—yellow smooth seeds, yellow wrinkled seeds, green smooth seeds and green wrinkled seeds—and these different types appeared in definite ratios. One of these groups of offsprings resembled one of the original parents and another group the other parent. The other two groups, however, combine new characters, and thus, out of such a cross as this, two new varieties of peas were obtained.



Inheritance of Color and Shape in Pea Cotyledons

1, female parent—yellow and round cotyledons; *2,* male parent—green and wrinkled or angular cotyledons; *3,* first hybrid generation—yellow and round cotyledons; *4,* second hybrid generation, showing four groups that occur in a definite ratio: (a) 9 yellow round, (b) 3 green round, (c) 3 yellow wrinkled, (d) 1 green wrinkled. Mendel's data for this experiment were as follows: 315 yellow round, 108 green round, 101 yellow wrinkled, 32 green wrinkled

Hybridization is the principal basis of plant breeding. Crosses have been made between varieties and species of all sorts of plants, and the inheritance of the various characters has been worked out. In most cases the results have not been as simple as Mendel found in the garden peas. One of the important discoveries is the fact that dominance does not always occur; for example, red-flowered varieties of snapdragons crossed with the white-flowered kind give pink-flowered instead of red-flowered first-generation plants. In the second generation three color types appear—red, pink and white. The red-flowered and the white-flowered individuals both breed true in the following generations, but the pink-flowered type gives rise to the three groups of offspring as regards flower color.

Another important discovery is the fact that certain characters are linked together; in fact Mendel himself had a case of this sort, because he found that colored seed coats were always associated with colored flowers. It was impossible to obtain a pea with white seed coats and colored flowers.

The plant breeder is concerned with getting new and different varieties of plants adapted to particular conditions, and he can do this only if he has strains that differ in two or more characters. The practical breeders are working for increased yield, improved quality, winter hardiness, better adaptation to particular localities and, more particularly, resistance to disease. Stress is laid upon resistant varieties, since this is one of the most effective methods of combating disastrous plant diseases.

In order to secure material for hybridization, botanists send out expeditions to all parts of the world to bring back plants that may serve in the improvement of varieties already grown. Thus potatoes grown in Peru and Ecuador are introduced for hybridization with the commonly grown varieties as a method of combating some serious diseases. Varieties of various cereals, grasses, fruits, vegetables and ornamental plants are introduced for the same purpose.

BOTANICAL DICTIONARY

Abacá, an important fiber plant (*Musa textilis*), native to the Philippine Islands. It belongs to the banana family, but its fruit is not good to eat. Its leaf fiber, called Manila hemp, grows 6 to 12 feet long and is used in the best grades of rope and cables, where it wears well and does not easily jam or kink in pulleys. The plant has 12 to 20 clusters of leaf stalks, each 15 to 25 feet high, spreading into large undivided leaves. The abacá requires a damp warm climate and deep rich soil. Many attempts to introduce its culture into other tropical islands and into America have failed. Abacá is the Tagalog word for hemp.

Acacia, woody shrubs and trees of the mimosa family, though the name is sometimes applied to trees of the pulse family. The acacia has a pinnate or featherlike leaf, clusters of small yellow or white flowers and usually thorns. Most acacias are found in warm climates throughout the world. An African species yields gum arabic, another is the source of khaki dye, the seeds of a South American variety are used for snuff and hard lumber is obtained from some forms. Acacia is used to describe a brilliant yellow. The North American locust is sometimes called acacia, but the acacia has a finer leaf than the locust. The name is derived from the Greek *akakia,* a thorny tree.

Acanthus, a handsome, thorny shrub with broad, shiny, deeply notched leaves and spikes of white, purple or red flowers. It is commonly found in southern Europe and the warm parts of Asia and Africa. The genus has about 20 species and the acanthus family has 175 genera. The ancient Greeks and Romans used the acanthus leaf as a decorative design in architectural columns (especially the Corinthian). In Christian painting and sculpture it symbolizes heaven. The name is derived from the Greek *akanthos* for thorn.

Aconite, a genus (*Aconitum*) of poisonous herbs of the buttercup family, comprising about 80 hardy perennials found in the mountainous regions of the North Temperate Zone. The leaves are palmate and the ornamental flowers are purplish blue or yellow. The helmetlike shape of one of the five sepals gives the plant its common name *monkshood.* Aconite is also known as *wolfsbane* and is grown for ornamental and medicinal purposes. The drug derived from it is a sedative in certain respiratory and cardiac ailments but is a dangerous poison in large doses. The roots of the common monkshood frequently are mistaken for horseradish though they are much smaller and more tapering than the edible root.

Agave, a desert plant of the amaryllis family found in tropical America. The best-known representative is the fleshy-leaved *century plant* or American aloe. All the members of the family bloom at long intervals; blossoms appear on the century plant many years apart. Despite a noxious odor, the juices of Mexican varieties are made into *mescal,* an alcoholic drink. Some agaves have cleansing properties and are called soap plants.

Ageratum, an easily grown garden flower of the thistle family. There are about 30 forms, most of them native to tropical America, in the genus. Though usually blue, the small heads of flowers are occasionally white or rose colored. The fuzz over the flower heads gives the plant its common name of floss-flower. Ageratum is the name of a brilliant blue-red color.

Agrimony, a wild plant (*Agrimonia eupatoria*) of the rose family, with coarsely pointed compound leaves, small yellow flowers growing in stiff spikes at the top of leafy stems and seeds enclosed in a spiny bur.

Ailanthus, a large-leaved tree native to the East Indies and China and introduced into America where it is commonly used as a street tree. The leaves are pinnate or featherlike, and there are clusters of green flowers. The staminate flowers have a disagreeable odor. The fruits of the ailanthus resemble twisted sheets of paper about 2 inches long and bear a seed in the center. The ailanthus is commonly known as the tree of heaven and belongs to the ailanthus family.

Alder, a genus (*Alnus*) of small trees with toothed leaves and conelike fruit, closely related to the birches and hornbeams. The black, seaside and Oregon alders are representative species. All are water-loving, grow rapidly and usually form thickets. The soft wood is not valuable as lumber, although the black alder is sometimes used for underwater construction. Yellow, red and brown dyes are obtained from the same form. The wood of the alders is used in turning and in making charcoal; the bark is sometimes used for tanning.

Alfalfa, a valuable legume (*Medicago sativa*) of the pea family, probably native to southwestern Asia or southeastern Europe but grown extensively in the United States where it is sometimes called *lucerne.* It has a small purple flower and seeds are produced in a twisted pod resembling a snail shell. Its long roots make it a valuable drought-resisting crop. Properly cured alfalfa hay is relished more than any other forage plant by farm animals. It is an excellent pasture crop and has high feeding value when the dry hay is ground to make alfalfa meal. The name is from the Arabic and means best fodder.

Algae, a plant subphylum (division of the *Thallophyta*), ranking lowest in the scale of plant life and including pond scums and seaweeds. The four general classes of the algae are the blue-green (*Cyanophyceae*), green (*Chlorophyceae*), red (*Zygophyceae*) and brown (*Phaeophyceae*). Most of the green forms are found in fresh water and include *Protococcus* (a single-celled form), *Spirogyra* and *Cladophora.* The seaweeds that grow in vast masses in the Sargasso Sea, called Sargasso weed, are brown algae. The marine kelps, some of which attain a length of 600 feet from their attached portions in the ocean bottom to the floating bodies, are the most important species of brown algae. The primitive structure of the plants rather than their size is the basis for their classification as the lowest form in the plant kingdom. Most red algae are found in very deep salt water, although a microscopic form is often found in snow, coloring the precipitation. Irish moss is a red alga. Desmids and diatoms are interesting forms. Some seaweeds have medicinal value, and one of them yields agar-agar, used as a laxative and a bacterial culture medium.

Alligator pear, see *Avocado.*

Allspice, the berry of the pimento (*Pimenta officinalis*), an evergreen tree of the myrtle family found in the West Indies. Its pungent, aromatic flavor seems to unite the flavors of the cinnamon, clove and nutmeg. The tree has tough, leatherlike leaves and flowers that grow in simple clusters. The fruits are picked unripe and cured by artificial heat. Jamaica is the principal source of supply; this spice is sometimes called Jamaica pepper.

Almond, a small tree (*Amygdalus communis*) belonging to the peach family. It has beautiful blossoms resembling those of the peach and is grown for its nut. The almond is native to Asia and the Mediterranean countries but is now extensively cultivated in California. It requires warmth. There are two kinds of almonds, bitter and sweet. The bitter almonds are used for flavoring extracts and were at one time the chief source of the dangerous poison, prussic acid, now made chemically. Sweet almonds are eaten and are used in candy and desserts; they are of three types—hard-shelled, soft-shelled and paper-shelled. A related plant is the flowering almond, a small, pink-flowered shrub native to Japan.

Aloe, a genus of large plants of the lily family, found chiefly in South Africa and less frequently in the tropic and subtropic regions of the Western Hemisphere. Aloes vary from small plants to 30-foot trees. Their succulent leaves are basal, and the plants bear large, attractive flowers. The juice of some aloes has medicinal value and is used as a tonic and purgative.

Alyssum, a genus of Old World herbs of the mustard family with fragrant yellow or white flowers growing in clusters. The sweet alyssum is used commonly as a border plant in gardens; the golden alyssum is a prolific early spring flower.

Amaranth, a genus and a family of widely distributed plants, including flowering shrubs, herbs and weeds, characterized by alternate leaves and small flowers. One species is a tumbleweed that is broken away from its roots in the autumn to roll across plains and prairies as a light mass wafted by the wind. The common amaranth occurs in gardens and is known as *redroot* or *pigweed*. Some of the amaranths, such as *love-lies-bleeding* and *prince's-feather*, are grown as garden flowers. A blue-red color is called *amaranth*.

Amaryllis, a genus of bulbous plants of tropical and temperate regions belonging to the amaryllis family. The only true member of the genus is the *belladonna lily*, grown for its rose-colored lilylike flowers. Other plants commonly called amaryllis but more properly known as Hippeastrums are usually cultivated in pots. Leaves of these plants appear after the flowers. The narcissus and the agave belong to this family.

Anemone, a genus of the buttercup family with divided leaves and showy flowers that have sepals but no petals. They are common in forests in temperate and subarctic regions. The wood anemone or *windflower* is a delicate starlike flower of the early spring. Many varieties, including the Japanese anemone, are cultivated as garden flowers. The *pasque flower*, state flower of South Dakota, is an anemone. The name anemone is derived from the Greek word for wind and is applied to the flowers because they are so light that they sway at the slightest touch of the breeze.

Anise, an aromatic herb (*Pimpinella anisum*) of the carrot family, native to Egypt but cultivated in many countries for its seeds, leaves and the oil obtained from the seeds. The seeds are used for seasoning and flavoring condiments, cheese and candy, and a cordial is made from them. The oil is used in medicine as a flavor and to reduce flatulence. The oil and seeds are used in making soap and perfume, and the leaves for garnishing and seasoning.

Apple, a tree of the genus *Malus* native to the Temperate Zone, extensively grown for its fruit, commonly round and reddish or yellow, but produced in a variety of sizes and colors and shapes. The tree belongs to the rose family, is large, with spreading branches. It has beautiful five-petalled blossoms that are white tinged with pink. The greenish-gray, oval leaves grow thickly, making the apple a shade tree. The edible fruit is grown in many varieties, ranging in taste from sweet to sour, eaten raw, cooked or preserved and frequently used in baking. They ripen from early June to late in the fall. The apple originated in the Old World and is derived from the wild apple of southwestern Asia. The *crab apple* is a small form, nearly as well known as the common apple. Japan has produced apple trees with fruit the size of cherries, cultivated entirely for their flowers.

Apricot, a garden fruit (*Prunus armeniaca*) of the peach family, native to the Orient but now grown in mild temperate climates throughout the world. The oval, orange-colored fruit has a flavor resembling both the peach and plum. Apricots require careful handling as they bruise easily. They are used fresh, canned and evaporated. The name is a variation of *precox*, meaning precocious or early ripe.

Aquilegia, see *Columbine*.

Arbor vitae, a North American tree of the genus *Thuja*. It is a cone-bearing evergreen that attains a height of 20 to 65 feet. The arbor vitae has small, flat leaves, pressed close to the stem and supplied with a fragrant oil. The name means tree of life.

Arbutus or **Trailing arbutus,** a trailing plant (*Epigaea repens*), blooming in the early spring, that has fragrant waxy-white or pink blossoms and oblong hairy evergreen leaves. It is found in light sandy loam in forest areas. Although it is difficult to coax this dainty flower to live in cultivated areas, government botanists have successfully propagated it. It is sometimes called *ground laurel*. It is also known as *mayflower*, because it was found in profusion in the vicinity of Plymouth by the colonists who came over in the "Mayflower."

Arbutus (accented on the first syllable) is the botanical name of a genus of evergreen trees or shrubs of the heath family, including the madroña tree.

Areca or **Betel palm,** see *Palm*.

Arnica, a perennial plant of cool mountainous regions. It has large, yellow flowerheads and belongs to the daisy family. An extract of its roots and leaves is used as a liniment for sprains and bruises. Arnica is also known as *mountain tobacco*.

Arrowhead, a tall plant (*Sagittaria latifolia*) of the water-plantain family that has arrow-shaped leaves, whorls of white flowers on a leafless stalk, fruits (achenes) with beak-like appendages and roots growing out of fleshy tubers. The plant is common in wild marshy regions of both hemispheres. The Chinese and Indians eat the fleshy roots.

Arrowroot, a fleshy, tropical American herb (*Maranta arundinacea*) with rootstocks 4 to 12 inches long that are the source of true arrowroot. This starch is obtained by washing the ground root pulp of *Maranta* or of other similar plants that contain a large amount of starch in their roots. Two of these are the *tacca* of the East Indies and the *coontie* of Florida. Arrowroot received its name because Indians formerly used it as a remedy for wounds inflicted by poisoned arrows.

Artichoke, a plant (*Cynara scolymus*) resembling the thistle, that grows from 2 to 3 feet high and has long, prickly leaves and white or violet-colored flowers. The base of the unopened flower bud and the thick scales around it are eaten as a vegetable. Native to the Mediterranean countries, the artichoke has been produced in the southern United States for many years. The so-called Jerusalem artichoke (*Helianthus tuberosus*) is really a sunflower with edible tubers.

Arum, one of a genus of plants of tropical and temperate regions belonging to the family of the same name. They have thickened root tubers, petalless flowers growing on a club-shaped spadix (stalk) wrapped in a large green or white leaf. The black calla is a member of the genus arum, and related aroids are Jack-in-the-pulpit and the Asiatic dasheen or taro.

Ash, a tall stately tree (genus *Fraxinus*), related to the olives, grown as a shade and lumber tree. The different species vary in height from 50 to 125 feet. The ash has smooth bark, checked into small plates, and small, inconspicuous flowers that bloom before the delicate, compound leaf (composed of from 7 to 11 leaflets) appears. The tree bears a winged seed called the *samara* or *ash-key*. The wood of various species of the ash is used for tool handles, oars, baseball bats and other articles requiring lightness and strength. The inner bark of the blue ash contains a dark blue dye, easily extracted when the bark is immersed in water. Other species are the green, black, white, red and Oregon ash.

Asparagus, a shrub (*Asparagus officinalis*) belonging to an Old World genus of the lily-of-the-valley family that has many-branched stems and scalelike leaves. It is grown extensively in the United States. In the spring the asparagus plant produces tender shoots eaten as a green vegetable. Some of the feathery plants that develop if the shoots are permitted to grow produce yellow-green bell-shaped flowers bearing pollen, and others carry smaller, seed-bearing flowers followed by red berries. Some varieties of asparagus, such as *smilax*, are grown for ornamental purposes. The plant was known to the ancient Greeks and Romans. The name is derived from the Greek word meaning a shoot and has been colloquially corrupted into sparrowgrass.

Aspen, see *Poplar*.

Asphodel, a genus (*Asphodelus*) of hardy plants belonging to the lily family. The asphodel is a stemless plant with fleshy roots, long, grey-green leaves and tall clusters of yellow or white flowers. Indigenous to India and the Mediterranean countries, it figures prominently in Greek mythology and legend, where it was considered a flower of the dead. Several species have been introduced into this country, including one known commonly as the *king's spear*. The name asphodel is used to describe a yellow-green color.

Aster, a genus of plants of the thistle family containing about 200 species. They are tall, hardy perennials, natives of the temperate zones, that bloom in the fall. They bear flowers varying in color from white to pink, violet and purple. In England the wild aster has been improved and called the Michaelmas daisy. The China aster, a garden flower, belongs to another genus (*Callistephus*) of the same family (*Carduaceae*). Although asters become troublesome weeds in meadows, they are attractive in gardens. The name is Greek for star and was applied to these plants because the shaggy flower heads resemble stars.

Avocado, a tropical laurel (*Persea gratissima*), whose fruit is sometimes called the *alligator pear*. Although it is native to the West Indies and tropical America, the avocado has been cultivated in the United States and Hawaii. The tree grows to a height of 50 feet and has thick, oval, evergreen leaves that make it a shade tree and clusters of small, greenish flowers. The fruit is about the size of a large pear and has a green or purple skin and a soft, oily pulp surrounding a single, central seed. When cut open, the fruit is eaten like a melon or used in salads. The seeds are the source of a black dye, and oil extracted from the fruit is used in soaps and lighting fuels. The name is probably derived from the Spanish word *bocado*, meaning tidbit or delicacy. It is prized as a delicacy in temperate regions but is extremely common in Central and South America.

Azalea, a genus of deciduous-leafed shrubs of the heath family native to the swamps and forests of North America and Asia. They have smooth-edged, small, oval leaves and fragrant funnel-shaped flowers that may be white, yellow, pink or flame colored. Azaleas bloom in the late spring and summer. They are closely related to the evergreen rhododendrons. The pink azalea, a beautiful example of the genus, has flowers resembling the honeysuckle. It does not respond to cultivation and needs protection to prevent its extinction at the hands of careless collectors.

Baby's breath, see *Gypsophila*.

Bachelor's button, see *Cornflower*.

Balloon flower or **Japanese bellflower,** a bushy Oriental perennial, closely related to the bellflower, with blue or white bell-shaped flowers, narrow, irregularly toothed leaves and leafy stalks that bear the buds, which are balloon-shaped before they open into the 3-inch flowers.

Balm, a perennial mint (*Melissa officinalis*) that grows 1 to 2 feet high and is a common garden plant. It has clusters of white flowers with a lemonlike odor that grow from a branching leafy stem.

Balm of Gilead, see *Poplar*.

Balsam or **Garden balsam,** an erect, branched shrub (*Impatiens balsamina*) of the geranium family, native to India but common in the gardens of the temperate zones. It grows from 1 to 2½ feet high, has light green branches, narrow finely toothed stems and short-stalked flowers in clusters that shade in color from white to deep crimson. The double-flowered varieties are most popular. Its scientific name *Impatiens* was given because the seed pod irritably bursts open when touched. It is related to the *jewelweed* or *touch-me-not* and is sometimes called *lady's slipper*. The balsam is an annual that blooms throughout the summer but is readily killed by frost. The name balsam is also applied to many trees that produce a spicy, fragrant resin, notably the balsam fir that produces Canada balsam, one of the best-known resins.

Balsam fir, see *Fir*.

Bamboo, a tribe (*Bambuseae*) of tropical and subtropical plants of Asia, Africa and South America, related to the grasses and composed of several genera. About 200 varieties are known, many of which attain a height of more than 100 feet. Bamboos have hollow stems with well-marked joints and numerous branches. Short narrow leaves growing high above the ground give a treelike appearance to the plant. Some have blossoms growing on spikes. The plants usually die after the seeds appear. Bamboos grow rapidly—in Ceylon as much as 16 inches a day. They grow wild in thickets that become impenetrable; some are cultivated in many parts of the East and two varieties grow in canebrakes and swamps in the southern United States. The stems are made into furniture, floats, buckets, baskets, walking sticks, palanquin poles, flutes and even houses. Paper is made from one type of bamboo. Bamboo seeds are eaten by the Chinese, and the tender young shoots are used in salads.

Banana, a very large, tropical, treelike herbaceous plant (*Musa sapientum*), with stems 10 to 30 feet high and leaves from 5 to 20 feet long and spreading into a crownlike cluster at the top of the stem. When the plant blossoms, a long stalk grows through the hollow stem, bending downward when it emerges and bearing a cluster of small tubular flowers protected by bright bracts. The long narrow fruit is produced by the flowers furthest from the stem and grows in large bunches. Each plant produces one bunch and dies. Bananas are cultivated successfully in hot, damp climates and are second only to coconuts in commercial importance throughout the tropics. Pictures of banana plants are found in ancient Assyrian sculpture. Bananas were introduced into the West Indies from the Canary Islands. The banana is used for its fruit, for its fiber, which is woven into cloth, and for its leaves, which are cut and braided to form mats and bags. Related to the banana is the *plantain*, edible after cooking, and the *abacá* or Manila hemp. A red banana, thicker and sweeter than the yellow variety, is common in the East.

Baneberry, a perennial American herb of the genus *Actaea*, growing 1½ to 2 feet tall, with coarsely toothed compound leaves, clusters of small, fuzzy white flowers that lose their sepals as soon as the blossoms open, thick red stalks and waxy poisonous berries. The white and red baneberries are sometimes called *herb Christopher*.

Banyan tree, see *Fig*.

Barberry, Common, a spiny shrub (*Berberis vulgaris*) with handsome clusters of oval, toothed, dark-green leaves and brilliant red berries that remain throughout the winter. The barberry grows from 3 to 12 feet high. It bears brilliant yellow flowers and has clusters of thorns beneath the leaves. Though ornamental, it is now outlawed in many states because it is the host of the black stem rust that destroys wheat crops. A preserve is made of the berries, and at one time they were used as medication for fevers. Closely related to this form and similar in appearance are the purple-leaved and Japanese barberries. The Japanese barberry has smoother leaves than the common barberry, has single spines and is harmless as it does not harbor black rust.

Barley, a cereal grain (*Hordeum vulgare*) resembling wheat, native to Asia and cultivated throughout the world, notably in the United States north and west of the corn belt. Barley grains are small and grow on slender heads with a number of stiff hairs. The beard, as these hairs are called, is being eliminated by experimental farmers. Barley is grown chiefly as a feed for animals but is also used as a breakfast cereal, a baby food and in the manufacture of malt beverages. It has no gluten and cannot be made into raised bread.

Basswood or **Linden,** a popular rapidly growing shade tree of the genus *Tilia* that has a straight trunk, heart-shaped leaves appearing late in the spring and clusters of fragrant cream-white flowers from the nectar of which bees make excellent honey. This drought-resisting tree grows 60 to 125 feet high. In droughts cattle have been known to eat its leaves. The wood of the bass, also called the *American linden*, is used for furniture, woodenware, cooperage, paper pulp and charcoal.

Bayberry, a name applied to the *American wax myrtle* (*Myrica cerifera* and *M. carolinensis*), a shrub 3 to 8 feet tall found in the Atlantic Coast states. It has aromatic leathery foliage, fragrant bark and small hard berries that yield wax when they are boiled in water. Candles are made from this wax, and the plant is sometimes called the *candleberry* or *tallow tree*. A similar species is found in Scotland and Japan. Bayberry bark is used in astringents and tonics. Bayberry is also the name of a West Indian myrtle (*Pimenta acris*), related to the allspice tree, that yields an essential oil (oil of myrica) used in making bay rum and other cosmetics. For this reason it is commonly called the *bay-rum tree*.

Bay-rum tree, see *Bayberry*.

Bay tree, see *Basswood*.

Bean, one of many varieties of erect or climbing legumes. There are field and garden beans; some are low bushy plants, and others are tall vines. All have small white, purplish, scarlet or yellow flowers and leaves composed of three leaflets. A variety now known as the broad bean was known to the ancient Egyptians. Lima beans and the common garden beans, such as the string, snap and kidney bean, are native to the United States. The soy bean of China and Japan is now cultivated extensively in the United States for food, oil, stock food and various industrial uses. Beans require warm soil and are easily killed by frost. They are palatable green and dried.

Bear grass, one of a genus (*Xerophyllum*) of striking American plants of the lily family, abundant in Mt. Rainier and Glacier National Parks, where they grow in tufts, 2 to 3 feet long, of wiry leaves. Once every five or six years, this plant blooms, bearing clusters of fragrant creamy flowers covering about 18 inches of a long flower stalk. Bears eat its rhizomes (underground stems). It is often called *squaw grass* because Indian squaws use the leaves for their basket work. The name beargrass is also applied to yuccas and other grasslike flowers of the southwestern United States.

Bedstraw, one of a genus (*Galium*) of plants of the madder family found in warm and temperate regions. They vary greatly in height, have square prickly stems, leaves arranged in whorls around the stem and clusters of small white, yellow or purple flowers. They are weeds and often grow in pastures and along fences. The roots of lady's bedstraw yield a red dye. Bedstraw gets its name from the fact that the dried strawlike stems and leaves were frequently used to fill mattresses.

Beech, a symmetrical, silvery-gray tree (*Fagus grandifolia*) widely distributed throughout the United States. The beech grows 70 to 100 feet high, has oval silky leaves that are coarsely pointed and small flowers, both staminate and pistillate on the same tree. Its bark is marked with pale blotches. Beechnuts are small, triangular nuts with a rich delicate flavor. The water-resistant wood of this tree is useful for furniture, flooring and tool handles. Beeches propagate rapidly from sapling growths around the trunks and therefore form large forests entirely of their own kind.

The common European beech (*F. silvatica*) closely resembles the American variety. Copper or purple beeches (a variety of the European) are handsome trees with unusually colored leaves. On fine-grained boards of beechwood the ancient Germans carved runes and charms. The bark of the beech has always been carved with initials and entwined hearts. Perhaps our word *book* is related to the word *beech* because the tree was thus used for writing.

Beet, a biennial herb (*Beta vulgaris*), native of Europe but cultivated in this country as an important root crop. It is closely related to spinach. The beet produces a red, white or yellow bulbous root one year and seed the second. When it is raised as a garden crop, it is usually planted from bought seed and raised as an annual. Some forms, such as *Swiss chard*, are grown for their edible foliage, others for their edible root. The root of the sugar beet is a valuable source of sugar, supplying about half the world's sugar. Beet red is the name of a rich, deep-red color.

Begonia, a large genus of flowering plants, varying from a few inches to several feet in height, native to the moist regions of the South American tropics and India but raised extensively in hothouses all over the world. They have strikingly uneven leaves, some waxy and some with a thick fuzz of fine hairs. In some species the leaves are very large and brilliantly marked with metallic colors. The *elephant's ear* of northern gardens is a variety of begonia. The showy flowers, borne in hanging clusters containing staminate and pistillate flowers, range from white to pink or red. There are various types of begonias—the fibrous-rooted, used mainly as house plants, the tuberous-rooted, the bulbous-rooted and the rhizomed. The fruit of the begonia is a winged capsule. This succulent herb was named after Michel Begon, a 17th-century governor of Santo Domingo. Begonia is the name of a medium shade of red.

Belladonna or **Deadly nightshade,** a bushy herb (*Atropa belladonna*) of the same family as the potato, tomato and tobacco plant. It has reddish, ball-shaped flowers and shiny purple to black poisonous berries. It is a native of Europe but has been cultivated in the United States. The roots and leaves yield the poisonous alkaloid atropin used to stop spasms, relieve pain and dilate the eyes. Actresses formerly used a cruder extract of the plant, containing atropin, to dilate their eyes before they appeared on the stage. This gave the plant the name *belladonna*, Italian for beautiful lady. *Atropa* seems to come from Atropos, the name of that one of the Three Fates who cut the thread of life.

Belladonna lily, see *Amaryllis*.

Bellflower, any one of a family of plants of 300 species having bell-shaped flowers. It includes many garden varieties, 20 of which are native to the United States. The family is also called *Campanula* and contains the *Canterbury bell* and *harebell*. Closely related is the *balloon flower*.

Bellwort, a genus (*Uvularia*) of American perennials with yellow bell-shaped flowers, a tall forked stem, oval leaves with hairy undersurfaces and fleshy roots. They are a woodland flower blooming in the spring.

Bergamot, a small citrous Old World tree (*Citrus bergamia*) grown in Italy and recently in the United States. It has leaves and flowers resembling the orange tree and bears a small lemon-yellow fruit very much like an orange, from which a strong but fragrant oil used in the manufacture of perfumes, cosmetics and liquors is extracted. The name bergamot is derived from the town of Bergamo, Italy. The word is also used to describe a small pear. The name of the *bergamot pear* is supposed to have come from the Turkish *beg-armudi*, prince's pear. The name bergamot is also given to a common variety of the mint family that has red or pink blossoms.

Betel palm, see *Palm*.

Bindweed or **Wild morning glory,** a trailing perennial vine (*Convolvulus sepium* and *C. arvensis*) growing along walls and hedges and in fields, native to Europe but now found throughout the United States. The vine has deep-running rootstocks, spear-shaped leaves and pink to white bell-shaped flowers resembling those of the cultivated morning glory. As a weed it is one of the farmer's worst enemies, and care must be taken to see that it is not present when such crops as wheat are sown. The name bindweed is derived from the vine's habit of winding around other plants. The black bindweed belongs to the buckwheat family.

Birch, a graceful, medium-sized tree, 60 to 70 feet high, of the genus *Betula*, related to the alders and found in northern regions. It has soft layers of bark, round slender branches, serrate leaves, long catkins of pollen-bearing flowers and shorter clusters of pistillate flowers. The bark, conspicuously marked with narrow slits or breathing pores, is white, red, gray, brown or black in the various species. Birchwood is valuable for carriages and boxes and as a source of charcoal. The bark of the canoe birch was used by the Indians for their wigwams and canoes. The *fasces*, or bundle of rods used by the *lictors* of ancient Rome to clear the way for the Roman magistrates, were made of birch. A Russian variety is the source of an oil, that gives the characteristic smell to Russian leather. The sugary sap of the birches is fermented to make a beverage and a kind of vinegar. White birch is grown as an ornamental park tree.

Bitternut, see *Hickory*.

Bittersweet, Climbing or **False,** a woody vine, the only North American species (*Celastrus scandens*) of the staff-tree family, common in rich land in the eastern United States. It has shiny oval leaves arranged alternately and clusters of small greenish flowers succeeded by yellow capsules that burst when they are ripe and expose scarlet-covered seeds in orange-yellow envelopes. They last all winter and are commonly planted to cover trellises and walls. The bittersweet is sometimes known as the *waxwork*.

Bitterroot, a small New World perennial (*Lewisia rediviva*) that bears pink or rose-colored flowers growing close to the ground, small succulent leaves and roots rich in starch and eaten by the Indians and early white settlers. It is the state flower of Montana.

Blackberry, a thorny, fruit-bearing perennial of the genus *Rubus* that grows 5 to 6 feet high and belongs to the rose family. With the dewberry, a low-growing trailing member of the genus, and the raspberry, this plant is classified as a bramble. Native of North America, it has been introduced into Europe. The blackberry has stalked leaflets, white or pink terminal flower clusters and berries eaten fresh or canned. The blackberry propagates rapidly from suckers growing from the root, and cultivation and pruning are necessary in commercial growing of this plant.

Black-eyed Susan, a handsome North American wildflower (*Rudbeckia hirta*), that blooms from June to September. It is 1 to 2 feet tall and has gay yellow petals surrounding a dark-brown center. The center is composed of many tiny flowerlets closely packed, and the yellow rays are themselves flowers that have lost seed-bearing parts. The black-eyed Susan, sometimes called the yellow daisy, is widely distributed and will thrive in dry hot places in which other flowers die. It is the state flower of Maryland.

Black haw, one of a genus (*Viburnum*) of American shrubs used as decorative trees. These plants grow from 15 to 40 feet high and have spreading branches, oval leaves that become bright red in the autumn and clusters of white flowers blossoming in the early spring.

Bladderwort, a genus (*Utricularia*) of carnivorous water plants found throughout the world in sluggish streams and ponds. The plants have blue or yellow flowers that stand above the water and feathery-leaved stems floating under water. Tiny bladders on the leaves help support it. Around the valved door of each hollow bladder are sticky hairs that attract insects and small pond animals. These become entangled in the hairs, are trapped in the bladders and are then digested by the plant.

Bleeding heart, a dainty perennial herb (*Dicentra spectabilis*) 1 to 2 feet tall, native of Japan, but common in American and European gardens. The plant has rosy red and pink heart-shaped flowers growing in sprays on light-green, graceful stems that hang from the main stalk. A near relation is the Dutchman's Breeches, so-called because their small-lobed blossoms resemble Dutch pantaloons.

Bloodroot, a perennial woodland flower (*Sanguinaria canadensis*) of the poppy family that blooms in the early spring. Its fragile white blossom, bearing 8 to 12 petals, develops from a bud arising from a paper-thin sheath before the leaf opens. The flower lasts only for a day or two. The plant has a single bluish-green leaf, round and deeply notched, tightly rolled around the flower bud. Its thick rootstock, like other parts of the plant, contains an orange-red juice formerly used by the Indians as warpaint and a basket dye. The juice of the root contains the alkaloid *sanguinaria,* used in medicine. Bloodroot juice was an old-fashioned cough remedy.

Bluebell or **Harebell,** a bell-shaped blue flower (*Campanula rotundifolia*) that droops from hairlike stems. It is found in moist rocky uplands of Europe and the United States and has been made famous in poetry as the bluebell of Scotland. The name bluebell is also applied to American plants of the genus *Mertensia,* a perennial 1 to 2 feet high growing in large clumps in the damp portions of the eastern United States. It blooms in the early spring and has a smooth, thick, branched stalk, trumpet-shaped flowers about an inch long that may be pink or purple and large oblong leaves. It is closely related to the *forget-me-not.*

Blueberry, see *Huckleberry.*

Bluebonnet, see *Lupine.*

Bluegrass, a perennial grass of the genus *Poa* introduced into the United States about 250 years ago and flourishing in humid regions of Kentucky and neighboring states. Bluegrass is a valuable pasture crop in many parts of the world. It has short hairy stems, many lower leaves and blue flowers that give the grass its name. It grows in clumps and makes good hay.

Boneset, a genus (*Eupatorium*) of American herbs of the composite family with a stout hairy stem growing 2 to 5 feet tall, wrinkled serrate leaves and clusters of rayed flower heads of minute greenish-white flowers. The flowers and leaves have some medicinal value as a tonic and to produce and increase perspiration. The Indians used the plant as a treatment for ague and fevers.

Borage, one of a genus (*Borago*) of European perennial herbs of the borage family that are typified by hairy leaves and blue flowers producing small fruits marked by a large scar at their base. The name comes from the Latin *borra* or hair of beasts and refers to the downy leaves.

Bougainvillea, a genus of attractive shrubs and shrubby vines of tropical and subtropical America, related to the garden four-o'clocks. The profuse red or purple bottle-shaped flowers grow in groups of three nearly entirely enclosed by three brilliant bracts; the dark leaves are glossy. Though native to Brazil, where seven or eight species are found, it is common in other parts of tropical America and a trailing form grows in the southern United States, covering porches and walls. The plant was named after the French explorer Louis de Bougainville (1729-1811), who voyaged through the Caribbean.

Bouncing Bet, Bouncing Bess or **Soapwort,** an attractive perennial flower (*Saponaria officinalis*) native to Europe but now found growing wild in the United States. It has a thick smooth stem, smooth oval leaves and clusters of pink or snowy-white flowers. The plant received the name soapwort because the juice of the broken leaves lathers in water and was used for soap by colonial housewives. From the cell sap of the leaves comes a white powder, *saponarin,* used in making a blue dye.

Box, an evergreen shrub (*Buxus sempervirens*) about 16 feet high, used commonly as a hedge plant. It is a native of Europe but grows in the eastern United States. Some members of the genus are found in Asia. The boxes have small, oval, leathery leaves that grow densely and inconspicuous flowers. They are slow-growing bushes difficult to keep in good health. The pale yellow wood is very hard and used for wood engraving and making wind instruments.

Box elder, see *Maple.*

Bracken or **Brake,** a genus (*Pteridium*) of tall ferns growing from 2 to 14 feet high, found throughout the world. Ferns of this genus have large fronds divided into three branches and spore cases found underneath the edge of the frond. The roots of various species are used for making a beverage and for tanning. In New Zealand, the rhizomes of one species, the *aruke,* are eaten.

Brazil nut, a tree (*Bertholletia excelsa*) related to the myrtles, growing from 100 to 150 feet high, found along the shores of the Orinoco and Amazon rivers in Brazil. It has huge oval, leathery leaves, creamy white flowers and oily edible nuts. The nuts, contained in groups of 18 to 24 in a large globular pod, yield an oil that is used by watchmakers and artists as well as for lighting fuel.

Breadfruit, a tropical tree (*Artocarpus incisa*), native to the Polynesian Islands, that yields a globular fruit edible when cooked. This handsome tree is related to the mulberry, osage orange and elm trees. It rarely grows taller than 40 feet and has thick oval leaves about a foot long. The green melon-like fruit tastes like bread and eggs when it has been baked; this fact gave rise to the English name of the tree. First described by Captain Cook, the breadfruit was introduced into the West Indies by other British naval men. Captain Bligh of the *Bounty* was sent to Tahiti to carry breadfruit trees to America. The tree is now found in Florida. A bird lime is extracted from the sap of the tree, a fine tapa cloth is woven from its strong bast fibers, the wood is used by the Polynesians for their houses and canoes, and a sticky substance exuding from wounds in the bark of the tree is used to seal the seams of boats.

Bridal wreath, see *Spirea.*

Broccoli, see *Cauliflower.*

Broom, a genus (*Cytisus*) of European and Asiatic shrubs of the pea family that have long slender branches, small leaves and white, yellow or purple flowers. Some brooms are evergreens, others are deciduous. The plant has been introduced into the temperate regions of North America. The nauseous tasting twigs and seeds are used as a diuretic.

Broom corn, a tall sorghum (*Andropogon sorghum*) native of the warm countries of the Old World but cultivated in America since early colonial days. It has a jointed stem varying from 4 to 6 feet tall in the dwarf variety and from 10 to 14 feet in height in the standard variety. The stem produces many long slender branches that grow in brushlike formations at the top. This straw is gathered soon after the seeds have ripened and is used for making brooms and brushes.

Brussels sprouts, a small plant (*Brassica oleracea*), a variety of cabbage. Growing close together on a thick stalk are buds 1 to 2 inches in diameter that resemble miniature cabbage heads. These grow in the axils of the shrub's many green leaves. Brussels sprouts, so named because they were first seen in Brussels in medieval days, require a long, cool growing season. They are cultivated in the United States and cooked and eaten as vegetables.

Buckeye, one of a group of American trees that, with the showy horse chestnut tree originating in Europe and Asia, comprises the genus *Aesculus.* The buckeyes vary, according to species, from 30 to 90 feet in height and have delicate compound leaves composed of from 3 to 9 elliptical leaflets. These trees produce nuts, brown marked with a lighter spot, that resemble the half-closed eyes of a buck. Among the species are the Ohio buckeye (so prominent in that state that Ohio is known as the buckeye state), the sweet and California buckeyes. The light wood of these trees is used for artificial limbs and paper pulp.

Buckthorn, a genus (*Rhamnus*) of shrubs, sometimes attaining a height of 12 feet, with black bark, small scalloped leaves, tiny 4-petalled yellowish-green flowers and blue-back berries yielding a purgative juice and a pigment used by painters. Most of them have thorny branches. Different varieties grow in Europe and the United States. A European species that has been introduced into this country is the waythorn. The California buckthorn has medicinal bark called, when dried, *cascara sagrada* (sacred bark) and used as a mild laxative. A yellow dye is obtained from the bark of some species of buckthorns, and the powder obtained from the berries of an Oriental and French form has long been used by peasants to dye wool.

Buckwheat, a native grain of Asia (*Fagopyrum esculentum*) cultivated for many centuries by the Chinese and introduced into the United States by way of Europe. The plant is not a cereal but is related to the dock and sorrel. Buckwheat is an annual with a slender jointed stem from 2 to 3 feet tall, heart-shaped leaves and clusters of small white, pink or purplish-red flowers. The stems are occasionally tinted with purplish red. Fertilization is insured by the fact that some flowers have long stamens and short pistils and others have the pistils long and the stamens short. The grain of this plant, grown in the northeastern part of the United States, is made into a flour used for griddlecakes and as a food for cattle and poultry.

Bulrush, see *Cattail.*

Bunchberry, a small American herbaceous plant (*Cornus canadensis*) related to the flowering dogwood. It grows in cool, damp, northern woods, and produces four to six oval leaves above which appears a slender flower stalk bearing four to six white bracts surrounding clusters of green flowers. The bracts and flower clusters give the appearance of a single blossom. The clustered red berries are edible.

Burdock, a genus (*Arctium*) of coarse biennial weeds that produce large, broad wavy-edged leaves one year and branched leafy stem; flowering from July to the first frost in their second year. The clusters of pink or purplish flowers grow in green burs covered by sticky hooked bristles that are effective in spreading the seed as they catch into the clothing of passersby and the fur of animals. Burdock is seen along fences and walls. Japanese in California use the root of one species for food. An extract of the leaves and roots has some medicinal value and is used in certain skin and blood ailments.

Burning bush, see *Evonymus.*

Buttercup or **Crowfoot,** a large genus (*Ranunculus*) of wild flowers found in cold and temperate regions. They have five-petalled cup-shaped flowers of a bright golden yellow, branching stems from a few inches to 2 feet high, small deeply cut leaves and acrid, caustic juices. Most buttercups are found in marshy places, which fact accounts for the scientific name of *ranunculus* or little frog. A fine golden powder rubs off if the flower bells are touched, and children commonly rub buttercups under their chin to determine, by the yellow stain, whether or not they like butter.

Butterfly flower, a delicately cut flower of many hues (*Schizanthus pinnatus*), related to the tomato, that resembles small butterflies. Though native to Chile and frequently grown in hothouses, they are hardy and flourish in temperate regions. The plants grow from 1 to 4 feet high. The scientific name is derived from a Greek word meaning split flower because of the winglike shape of the small blossom surrounded by delicate fern-like leaves. It is sometimes called poor man's orchid.

Butterfly weed, a North American milkweed (*Asclepias tuberosa*) found in dry fields. It has an erect stem 1 to 3 feet high and clusters of fragrant orange blossoms usually surrounded by butterflies and other nectar-seeking insects. This gave rise to the plant's common name. The butterfly weed has a stout and hairy stem, long leaves that are smooth and narrow and pods, growing on kinky stalks, that burst open to release winged seeds.

Butternut, see *Walnut.*

Butterwort, a small insectivorous herb (*Pinguicula vulgaris*) native to the marshy regions of northern America and Europe. It has a rosette of thick, oblong leaves that grow close to the ground and are covered with hairs and a gummy secretion attractive to insects. Four-inch stalks grow out of the leaf rosette, bearing violetlike flowers of blue or purple. Insects alight on the leaves, each of which has two pairs of glands for secreting the viscid substance. When an insect is caught in the sticky web of leaf hairs, it is held captive, the leaves close around it, and the secretion becomes acid and kills and absorbs the insect, thereby supplying the plant with the nitrogenous substances most plants procure from the soil. It has been called butterwort because Lapland and Alpine peasants use its secretion to curdle milk.

Buttonwood, see *Sycamore.*

Cabbage, an important green vegetable (*Brassica oleracea*) cultivated throughout the world. It grows close to the ground and has edible leaves, green, red or purple, that form a compact head in cultivated varieties. The fleshy leaves form a loose cluster in wild forms. In some varieties the leaves are smooth, in others, such as the savoy, the leaves are wrinkled. Cultivated cabbage, like the wild cabbage, will send up a long flower stem bearing a yellow blossom if the heads are left in the ground. Cabbage is rich in mineral salts and vitamins A, B and C, and is eaten raw, cooked or as sauerkraut, a salted, slightly fermented form. Sauerkraut juice is a mild tonic. Kale, cauliflower and Brussels sprouts are related vegetables. The word cabbage is derived from the old Norman French *caboche* or head.

Cacao, small South American tree (*Theobroma cacao*) now found also in parts of Africa and Trinidad, grown for its brown-skinned oily seeds that are the source of the world's chocolate and cocoa supply. Clusters of small pink flowers grow on the trunk and heavier branches of the cacao tree. Since cacao trees must be protected from the sun, shade trees are usually planted around them. The seeds (cocoa beans), about as large as an almond are contained in large yellow-orange or purple fruits. When the fruit is ripe it is harvested, the seeds are extracted and roasted preparatory to being marketed. A rich oil found in the seeds is used in making candy and cosmetics. The name comes from a Nahuatl Indian word *cacahuatl* meaning the seed.

Cactus, one of a family (*Cactaceae*) containing 125 genera of stubby succulent desert plants of the western hemisphere. They have no leaves or only small ones that die quickly; and moisture is stored in the stout, hollow, spiny-coated stems that grow in limitless variety of shapes and sizes. Some are intricately branched, others barrel-shaped, many are cylindrical. Some forms have beautifully colored spines; many—such as the night-blooming Cereus—flower and bear showy blossoms ranging from white and yellow to scarlet and purple. Cacti have been known to attain a height of 60 feet. The lives of many desert wanderers have been saved by drinking the fluids in the bodies of these strange plants. The cactus was introduced to the Old World by early explorers and is now quite common throughout the Mediterranean region.

Calabash tree, a small tree (*Crescentia cujete*) of the American tropics that has hard-shelled globular fruits, the dried husks of which are used for drinking utensils and other vessels by the Indians.

Calceolaria, a genus of plants of the figwort family that are natives of the American tropics but are grown in greenhouses in northern countries. They are 1 to 2 feet tall, have oval leaves, and flowers with one large saclike part and a smaller erect part above it. The flowers are usually yellow with reddish markings.

Calendula or **Pot marigold,** an annual herb of the thistle family that has large heads of bright yellow or orange flowers and alternate leaves. It grows rapidly in temperate regions. The dried flowers have medicinal value as a laxative, a diuretic and a healing lotion for wounds. It has been called pot marigold because the flowers were at one time used to flavor soup. The name calendula comes from the Latin word *calendae,* first of the month, the day on which the plant was supposed to bloom. It blooms from late spring to the first frost.

California poppy, a poppylike plant of the genus *scholtzia* that has delicate silver-hued foliage and cup-shaped flowers growing on top of stems 1 to 2 feet tall. It produces a 3-inch pod that stands erect. Most of the flowers are orange or yellow, but there are some white-blossomed varieties.

Calla lily, an Old World shrub (*Zantedeschia aethiopica*) of the arum family with dark green foliage, a white flowerlike spathe and bright yellow spadix. It has been cultivated as a house plant and as a garden plant in warm parts of the United States. The golden calla (*Z. elliottiana*) has a yellow spathe and white-spotted leaves. It is related to the skunk cabbage and Jack-in-the-pulpit and is not a true lily. The water arum or bog herb is a similar wild plant with Calla in its scientific name (*C. palustris*). The name may be derived from the Greek *kallaia,* cock's wattles, which the flower somewhat resembles.

Calliopsis, see *Coreopsis.*

Caltrop or **Bean caper,** a plant of an Old World genus (*Zygophyllum.*) A Levantine variety (*Z. fabago*) has malodorous leaves and flower buds that are used for flavoring sauces and other dishes. The seeds of another variety (*Z. coccineum*) are used by the Arabs for peppers. The name caltrop is sometimes extended to other genera of the same family, especially *Tribulus, Guaiacum* and *Kallstroemia.* They all have spiny flower heads. A caltrop was originally a four-pointed instrument used in battle to injure horses or men who stepped on one of its sharp prongs.

Camellia, an Asiatic shrub (*Camellia japonica*), grown in the United States. It belongs to the tea family and has waxy roselike flowers, 3 to 7 inches in diameter, ranging from red to white, and glossy evergreen leaves that are pointed and slightly toothed. The plant was named after Georg Kamel or Camelli, the Jesuit who brought it from the East.

Camomile, aromatic medicinal plants of two genera (*Anthemis* and *Matricaria*) that resemble daisies by having small white florets surrounding a yellow center on top of a downy branched stem with finely cut leaves. It is grown as a decorative plant and as a source of the drug camomile, or chamomile, extracted from the powdered flower heads. The name *camomile* has been derived from the Greek word *chamaimelon* or earth apple; the plant and flowers smell something like apples.

Campanula, see *Bellflower.*

Camphor, a tree (*Cinnamonum camphora*) of the laurel family, with slender glossy leaves that are pink when they are young, green when they mature and yellow or red just before they fall in the late winter. Native to the Orient, this relative of the cinnamon tree has been cultivated in California, Texas and Florida, where it is used as a shade tree, a windbreak and a source of gum camphor. It bears small flowers followed by fragrant black berries. Most commercial camphor is obtained from Formosa, where it is distilled from the twigs, roots and trunk of the tree, and the production and shipment is controlled by the Japanese Government.

Canada thistle, a troublesome weed (*Cirsium arvense*), 1 to 3 feet tall, that spreads rapidly by underground rootstocks and winged seeds. It is native to Europe but has been introduced into Canada and the northern United States, where it propagates rapidly, growing in clumps. This plant, with its ruffled narrow leaves, rose-purple flower heads and sharp spines, may be destroyed by planting alfalfa in fields infested with it.

Candytuft, a genus (*Iberis*) of Mediterranean garden flowers of the mustard family that grow 6 to 8 inches high, have numerous dark green leaves with notched ends and round-topped heads of small white, lavender, purple or crimson flowers. Some varieties are perennial evergreens, others are annuals. The name was derived from the fact that this tufted shrub was first described in Candia, Crete, though it is now grown in both hemispheres. The genus name *Iberis* is derived from another country in which candytuft is common, Spain, once called Iberia.

Canna, a genus containing 50 species of tropical plants with large sheathing leaves of green or bronze and red, white or yellow irregularly-shaped flowers that grow terminally on simple stems. The canna has been introduced into the United States from its native South America and the West Indies. The dwarf canna, growing from 3 to 5 feet tall is seen more frequently than the regular variety that reaches a height of 10 to 16 feet. Experiments are continually producing new forms of this plant. It was once called Indian shot from its hard seeds.

Cantaloupe, see *Muskmelon.*

Canterbury bell, see *Bellflower.*

Cape jasmine, see *Gardenia.*

Caper, see *Caltrop.*

Caraway, an aromatic biennial herb (*Carum carvi*) of the parsley family that has yellow, white or pink flower clusters and delicate leaves. It grows from 1½ to 2 feet tall and in its second year produces seeds used for flavoring bread, cheese, cake, sauces, soups and candy. An oil extracted from caraway seeds is distilled for use in perfumes and soaps.

Cardamom or **Cardamon,** a genus (*Elettaria*) of Indian plants of the ginger family that produce aromatic brown, white-lined seeds in three-cornered pods. The seeds are used as a condiment and as a source of certain medicines that have stimulant and purgative value.

Cardinal flower or **Indian pink,** a brilliant vermilion wildflower (*Lobelia cardinalis*) that grows in inch-long spikes at the end of tall leafy stems 2 to 4 feet tall. The tubelike flowers appear in the late summer and early fall. It is now comparatively rare because it has been picked in such large numbers. Cardinal flowers are sometimes called *lobelias* after the botanist de Lobel who classified them. The leaves of another member of this genus, called Indian tobacco, are used as an expectorant. Related genera in the South less often grow as trees and some exude poisonous juices.

Carnation or **Clove pink,** a handsome, perennial florist's flower (*Dianthus caryophyllus*) with a double spicy-scented blossom of white, yellow, rose, pink or red borne on a tall, gray-green stem. Originating in Europe, it was cultivated there for over 2,000 years and is now grown in the United States. The name carnation was derived from the Latin *caro, carnis,* flesh, because originally carnations were grown only in a flesh-pink color.

Carob, a dense, evergreen shade tree (*Ceratonia siliqua*), 40 to 50 feet tall, that is native to the Mediterranean region, but has been cultivated in the warmer parts of the United States. It has shining evergreen compound leaves and bears flowers of different sexes on separate trees. They grow in red spikes or racemes. The pods produced by the female tree have a pulp that is used as fodder and food in many Mediterranean countries. This plant is sometimes called St. John's bread.

Carrot, a biennial garden vegetable (*Daucus carota*) of the parsley family, developed from the wild carrot or *Queen Anne's Lace.* It is grown for the edible yellowish or red orange root valued as a food for its high vitamin and mineral content.

Cascara sagrada, see *Buckthorn.*

Cashew nut tree, a tree (*Anacardium occidentale*) originating in the American tropics but cultivated in other tropical countries. It is tall, related to the sumacs and has pink flowers and nuts borne in a receptacle sometimes called the cashew apple. Both the apple and the nut are edible. The bark yields medicinal substances and a gum used for making varnish.

Cassaba, see *Muskmelon.*

Cassava, a tropical plant of the genus *Manihot,* belonging to the spurge family, that grows 5 to 10 feet tall and has long-stemmed, spreading leaves. Native to Central America and the West Indies, it is cultivated in South America. Tapioca is derived from the flour (manioc) produced from the starch-bearing rootstock. A bread made of this, called cassava bread, is a staple in the tropics. The name is a Spanish derivation of the Taino (aboriginal Bahaman Indian) word *cazavi* for manioc flour.

Castor-oil plant, a genus (*Ricinus*) of the spurge family, native to the Asiatic and African tropics where it is recognized by its palmate bronze-green leaves, its small flowers and spiny capsules. In the tropics the castor-oil plant grows perennially and reaches a height of 30 to 40 feet. It has been cultivated in temperate regions, where it grows as an annual and rarely gets taller than 15 feet. Its mottled seeds, from which medicinal and lubricating oils are extracted, contain a poisonous substance called *ricin.* The name of this plant, which is sometimes known as *palma Christi,* was derived from the Latin word *castor* or beaver because the oil has an unpleasant odor very much like the scent secreted by beavers.

Catalpa, an American genus of ornamental trees, related to the trumpet creepers and found in warm and temperate regions. The catalpas have coarse branches, large heart-shaped leaves and long clusters of frilled bell-like flowers. They produce the drooping pods, 6 to 20 inches long, that have given these trees the common name of cigar trees. Catalpa wood is used for fences. The name is derived from the Creek Indian word *kutuhlpa* meaning head with wings, an image suggested by the flowers.

Catnip or **Catmint,** an Old World herb (*Nepata cataria*) of the mint family growing 2 feet high with pointed, velvety, serrate leaves and whorls of white, purplish or blue-tinged flowers. The plant was introduced into the United States by early settlers, and now it grows in America as a weed along roadways and in gardens. It was once used as a tea, a tonic and a remedy for colds and colic. Cats are fond of the leaves of this plant.

Cattail, a tall plant (*Typha latifolia*), common in swamps and marshes, that has swordlike leaves and brown cylinders of pistillate flowers with a furry appearance above which appears a spike of staminate flowers. The cylinders suggest a cat's tail. The rootstock and pollen yield a flour used for bread. The Indians ate the roots and leaves as a vegetable. This plant is sometimes known as *reed mace* or *royal mace* from its resemblance to the sign of royal power. In England it is commonly called the *bulrush*.

Cauliflower, a delicately flavored variety of cabbage (*Brassica oleracea botrytis*) with an edible head of misformed white flower stems and buds. The name comes from the Latin *caulis* and *flor*, meaning cabbage and flower. The plant is difficult to cultivate. It thrives in cool moist places and is grown in both hemispheres. It was derived from cabbage heads with thick stems. *Broccoli* is a cabbage form that Italian gardeners developed before the cauliflower with its flowering head was finally produced.

Cedar, a tall fragrant-barked evergreen tree of the genus *Cedrus*. True cedars are Old World trees. The name is given to many American junipers and cypresses, such as the giant arborvitae or red cedar, which has overlapping scalelike leaves arranged in a flat spray and light strong bark. The *deodar* of India is a true cedar now cultivated in California. It is pyramid-shaped with clusters of blue-green needles. The name deodar means god-tree and the tree is planted around Hindu temples. The cedar of Lebanon, mentioned in the Bible, is another true cedar, a tall stately tree, 50 to 80 feet high, with a dense flat head and needles arranged in tufts. So-called cedar apples are the fruiting bodies of the fungus cedar rust. Cedar is the name of a reddish yellow color.

Celandine, a European biennial herb (*Chelidonium majus*) that now grows wild in the eastern United States, where it is common along roadsides. The celandine, which is a member of the poppy family, bears odorless yellow flowers and notched leaves growing on a sprawling brittle stem. The juice of this plant was once considered valuable in treating warts and jaundice.

Celery, a European biennial garden vegetable (*Apium graveolens*) of the parsley family, cultivated in both hemispheres for many years. It has a fibrous root, short stems, clusters of long blanched leaves and (when it is permitted to blossom) small white flowers. The stalks are used raw or cooked as a salad or relish. Dried celery seeds are used as a condiment and have some medicinal value as a sedative.

Celery cabbage, see *Pe-tsai*.

Century plant, a species (*Agave americana*) of desert aloe that has showy fragrant white or yellow tubular flowers borne on 20 to 40 stalks growing out of a large rosette of blue, spine-tipped leaves. The plant dies after blooming and developing seeds, and suckers arise from the base of the plant. This agave blooms rarely—about once in 20 years. The name century plant was given to it because it was supposed to bloom only once in a century.

Cereal, in the botanical sense, any grain used for food. The most important cereal grains are barley, corn, oats, rice, rye and wheat. The name cereal is derived from Ceres, the Roman goddess of growing vegetation.

Chard, see *Beet*.

Chaulmoogra, the Oriental tree (*Taraktogenus kurzii*) whose seeds yield an oil that has become important in the treatment of leprosy.

Cherimoya, a tropical tree (*Annona cherimolia*) of the western hemisphere, belonging to the custard apple family, that has oblong leaves, drooping branches and fragrant flowers producing edible, sweet fruits that vary in color from yellow to brown and range in size from the size of an orange to that of a melon. The name comes from the Quichua (Peruvian Indian) word *chiri-moya* meaning round cold fruit.

Cherry, a tree of the genus *Prunus* native to the Old World, where it was cultivated for over 2,000 years, and extensively grown in the United States for its edible fruit. Cultivated cherry trees are rather small, but wild forms like the wild black cherry tree of North America attain a height of 100 feet. Cherries have small, smooth oval leaves and beautiful clusters of fragrant white or pinkish blossoms. The edible fruit is of two varieties—light red sour cherries and deeper red sweet ones. In Japan the tree is cultivated for its flowers and the Japanese cherry tree bears no fruit or small tasteless berries that appear after the luxuriant pink blossoms have fallen.

Chess or **Cheat,** a weed (*Bromus secalinus*) of the grass family that grows 1 to 4 feet high and somewhat resembles wheat or rye. It is a plant pest in most parts of North America, where it was introduced by early European settlers. In some northern districts it is grown as a hay crop and called *arctic grass*. European peasants call it cheat because they believed it was degenerate wheat.

Chestnut, a tree of the genus *Castanea* that grows in warm and temperate regions of eastern North America, northern Africa, Europe and Asia. The American chestnuts are showy shade trees that have oval coarse-toothed leaves, seed-producing flowers growing in clusters of three enclosed in a prickly burr and staminate flowers growing on long catkins. The wood is a useful lumber and the nuts, brown with thin shells, are eaten cooked or raw. The *chinquapin* is a small chestnut, resembling a shrub, that grows in the southeastern United States. The nuts are edible but smaller than other chestnuts.

Chickweed, a weed of the genus *Stellaria*, related to the sweet William, found in North America, Europe and Asia. Though it is delicate looking and rarely more than 8 inches tall, it is very hardy. It produces starlike flowers in loose clusters, small oval leaves arranged in pairs on weak stems that have swollen joints. The seeds are produced throughout the spring and summer. The weeds are occasionally fed to chickens, and the seeds are fed to caged birds. Stellaria is a troublesome pest to farmers.

Chicory, a sprawling perennial weed (*Cichorium intybus*) of the dandelion family with a long heavy taproot, a rosette of leaves resembling the dandelion's and flat blue flowers. In Europe large amounts of chicory are raised for a coffee substitute, made from the pulverized root. The blanched leaves are used by the French for salads. *Endive* is a variety of chicory, and *succory* is another name for the common chicory.

China aster, see *Aster*.

Chinese cabbage, see *Pe-tsai*.

Chinquapin, see *Chestnut*.

Chocolate, see *Cacao*.

Christmas rose, see *Hellebore*.

Chrysanthemum, a genus of large perennial flowers cultivated in both hemispheres from two Asiatic forms now rarely found wild. Some forms are found as weeds in the United States, others are medicinal plants and the majority are garden or florist's plants. Though the name means golden flower, the rayed flower heads of these tall hardy plants may be red, yellow or white. The garden forms are from 1 to 2½ inches in diameter and come in many varieties such as the small pompom, the Japanese anemone, the decorative and large-flowered. The florist's chrysanthemums are usually about 6 inches in diameter. The chrysanthemum, which figures a great deal in Oriental art, is the national flower of Japan.

Cinchona, a small evergreen tree (*Cinchona officinalis*), native to the slopes of the Andes mountains, that produces pink bowl-shaped flowers, smooth oval leaves and a bark, known as Peruvian bark, that is the source of quinine, a specific for malaria and other fevers. The Spanish colonists learned of this tree, originally called *calisaya*, from the Incas. The tree is now cultivated in the East Indies, and the world's supply of quinine comes largely from the East rather than from Peru, where the tree is permitted to grow wild. Quinine is obtained by stripping a small amount of bark from each tree every year, permitting the wounds to heal and then stripping the bark again. The name cinchona was given to this plant when the wife of Count Cinchon, a viceroy of Peru, was cured of a malignant fever by using quinine.

Cineraria, a genus (*Senecio*) of ornamental plants of the thistle family that have daisylike white or purple flower clusters and large coarse heart-shaped leaves with an ash-colored down on their under surfaces. True cinerarias are native to South Africa, where about 25 species are found, but they have been cultivated in many countries. The name comes from the Latin *cinerarius*, ashy, referring to the downy leaves.

Cinnamon, a spice tree (*Cinnamomum zeylanicum*) of the laurel family, native to Ceylon but raised in China, South America, Florida and California. It is a small evergreen with large ovate leaves, malodorous greenish flowers arranged in panicles and aromatic bark, usually a light yellowish-brown, which has a sweet warm taste caused by the presence of an aromatic oil. The bark is used as a spice, as a cordial and as a stimulant and carminative. Oil of cinnamon is extracted from the leaves and fruit as well as from the bark. Cinnamon of commerce is obtained from the dried inner bark of young shoots and branches. The word is also the name of a golden brown color.

Citron, a small evergreen tree (*Citrus medica*) related to the orange, lemon, lime and grapefruit. A native of Asia cultivated in the Mediterranean countries of Europe, it is about 10 feet high with irregular branches, large leaves and bluish blossoms. The citron fruit is lemon-shaped, 5 to 6 inches long, with a rough surface and greenish-yellow outer skin. Its juice is used as a beverage or syrup and the rind is candied. Citron leaves yield an oil used for perfumes. The name is derived from the Greek word *kedros*, for cedar, which the citron tree was thought to resemble.

Clematis, a widely distributed genus of vines or erect herbs of the crowfoot family, consisting of more than 200 species. The plants are shrubby, with compound leaves on tendrillike stems that wind around trellises or other supports, and clusters of small white or colored flowers. *Virgin's-bower* (sometimes called *old-man's-beard* because of the feathery plumes attached to its seeds), Japanese white and the native American purple are some popular garden varieties of clematis. The name is derived from a Greek word meaning brushwood, applied to this flower because of its long lithe branches. Clematis is also the name of a bluish-red color.

Clove, a tropical evergreen tree (*Eugenia aromatica*) of the myrtle family, about 40 feet tall, with large oval leaves and clusters of crimson flowers that are dried to form the spice cloves. Though it is native to Molucca, the tree is cultivated in South America, the West Indies and parts of Africa. The buds are picked by hand from the trees, each of which yields from 5 to 75 pounds of cloves a season. Cloves are used in cooking, in making candy and for a liqueur. Oil of cloves, extracted from the brownish fragrant flowers, is used in medicine and in the manufacture of soaps and perfumes.

Clover, a small herb of the genus *Trifolium* found throughout the temperate zones. Though the name of the genus means three-leafed, there are four- and five-leafed varieties. Clovers produce spikes of tiny, closely packed white, pink or purplish flowers. Clover is valuable as a forage crop and for the nectar that makes clover honey. The herbs require cool, moist soil and are frequently grown by farmers as a rotating crop for soil improvement. Some American species are the red, crimson, alsike and white. The shamrock is a white clover.

Club moss, see *Ground pine*.

Coca, a tropical shrub (*Erythroxylon coca*) found in Peru and Bolivia. Its tealike leaves are chewed by the Indians to give them strength and endurance on long journeys. The leaves are a source of cocaine, used as an anaesthetic in surgery and as a drug.

Cockle, a noxious annual weed (*Agrostemma githago*) of the pink family that grows 1 to 3 feet tall, has fine hairs covering the stem, grasslike leaves and purplish red flowers that appear from July to September. It infests wheat fields and its poisonous seeds get mixed with wheat. Modern milling methods have made it possible to extract the cockle seeds before flour is damaged. At one time many cases of poisoning were traced to flour contaminated by cockle seeds.

Cockscomb, a genus (*Celosia*) of small, tropical moisture-loving plants cultivated as annual garden flowers in the temperate regions. They have long pointed leaves and showy flower heads of crimson, orange or creamy-white that grow in great clumps resembling a rooster's comb. The blooms are sometimes as wide as the plant is tall.

Cocoa, see *Cacao*.

Coconut palm, see *Palm*.

Coffee, one of a genus (*Coffea*) of small trees of the madder family native to Arabia and northern Africa but cultivated in South America. The seeds are the coffee bean of commerce, from which the popular beverage is made. The coffee plant has small, shining, evergreen leaves and clusters of fragrant, white flowers that ripen, after about 7 months, into the crimson, cherrylike fruits containing the seed or coffee bean. Wild coffee plants were observed in Arabia in the 13th century and in Abyssinia at about the same time. An alkaloid, caffeine, found in coffee, is a mild stimulant and is used in intravenous injections for certain cardiac conditions. The word coffee is derived from an Arabic word, *gahwah*, meaning a decoction of berries.

Columbine, a genus (*Aquilegia*) of graceful perennials, belonging to the buttercup family, found in Europe and in North America, where there are more than 25 species. They have long-stalked divided leaves and tubular flowers composed of five sepals and five spurred petals. The common wild columbine of the United States is a red flower that blooms in woods and rocky regions from April to July. Other species are blue, white, yellow or varicolored. The name columbine is derived from the Latin *columbinus* or dovelike, suggested by the birdlike shape of the flowers. The appearance of the honey sacs at the end of the petals suggested an eagle's talon to Linnaeus, and he named the plant *Aquilegia* or eaglelike.

Conifers, trees or shrubs of the order *Coniferales* producing cones that contain seeds, hence the name meaning conebearers. These plants are the main living group of the gymnosperms and the only group native to North America. One great group of conifers, in addition to the yew family, is the pine family, including the pines, firs, spruces, hemlocks, cedars, larches, junipers, cypresses and the redwoods, the oldest of all living things.

Convolvulus, see *Bindweed.*

Coreopsis or **Tickseed,** a long-stemmed perennial (*Coreopsis lanceolata*) of the temperate zone that produces a few narrow leaves and many yellow, daisylike flowers that bloom throughout the summer. The seeds have tiny hooks that make them stick to the clothing of passersby. The flat naked seeds (or achenes) account for the name coreopsis, from a Greek word meaning buglike. A similar species of the same genus is *calliopsis,* an annual, whose flowers are red and maroon as well as yellow.

Cork oak, see *Oak.*

Corn, a genus (*Zea*) of tall, American grains of the grass family, raised by Mexican Indians for centuries before the coming of the white man and more properly called *maize* or *Indian corn.* Corn grows 2 to 30 feet high, has a stout stalk, ribbonlike leaves, ears of pistillate flowers and a tassel of staminate flowers growing at the top of the stalk. Several hundred varieties of corn are grown, but the chief food types are dent, flint, flour, sweet, pod and pop corn.

Cornel, see *Dogwood.*

Cornflower, a slender annual (*Centaurea cyanus*) of the daisy family, common in gardens throughout the temperate zone. It grows 1 to 2 feet tall, has small grayish leaves and produces fringed trumpetlike flower heads of many blue, pink or white flowerets. It is sometimes called bachelor's button or ragged robin. Cornflower blue is the name of a rich shade of blue.

Cosmos, a genus of late-blooming American herbs of the thistle family, native to the tropics but cultivated in temperate regions. Cosmos grow 5 to 10 feet high, have feathery leaves and rayed red, pink or white flowers. They are related to the Spanish needle.

Cotton, a genus (*Gossypium*) of erect, freely branching tropical Old World plants of the mallow family extensively cultivated in the southern United States. The plant has alternate lobed leaves and large showy creamy flowers that turn red on the second day after blossoming. The seeds are borne in a pod or boll, filled with a fluffy fiber from which cotton is made. Wild cotton grows more than 15 feet tall, but cultivated cotton is kept lower because it is picked by hand. Cotton is divided into two groups—American (upland, sea-island and Peruvian) and Asiatic (Bengal, Indian, Chinese and Egyptian). An oil derived from the seeds has many commercial uses.

Cottonwood, see *Poplar.*

Cowpea, a sprawling tropical legume (*Vigna sinensis*) of the bean family, native of Africa but grown in warm parts of Europe and the United States. It is grown as a forage plant, a green-manure crop and for food. The seeds of the white-seeded and black-eyed varieties are eaten fresh and dried.

Cowslip, see *Marsh marigold.*

Crab apple, see *Apple.*

Crab grass, a coarse, annual European grass (*Digitaria sanguinalis*) that has spread to the United States. It has a creeping stem, rough hairy leaves 2 to 10 inches long and red or purple seeds borne on spikes that spread in a fingerlike cluster from the top of the stalk. Crab grass is occasionally raised for forage.

Cranberry, one of a genus (*Oxycoccus*) of small, trailing shrubs of the heath family, native to America, that produce small red acid fruits on curved stalks. The cranberry bush, which grows in acid peaty soil and demands much moisture, bears tiny oval leaves. The flowers growing at the end of the small curved stalks suggested a crane's head to early settlers who named the bush *craneberry,* later corrupted to cranberry. The fruits are used for canning, preserving and baking. There are two common varieties, the large-seeded and small-seeded.

Crape myrtle, see *Myrtle.*

Creosote bush, a shrub (*Covillea mexicana*) found in desert regions of the southwestern United States and Mexico. This plant, commonly 3 to 4 feet tall, has gray stems marked with black, yellow flowers and small green leaves that smell like tar. A tea used by Mexicans as a liniment in treating colds is brewed from its leaves. The resin produced from the stems is called sonora gum.

Cress, one of a variety of small, perennial herbs belonging to the mustard family and common in temperate zones. Its pungent leaves are used for salads and sandwich fillings. Watercress is grown in running water or in tubs for home use; upland cress and garden cress are grown in gardens.

Crocus, a genus of bulbous spring flowers of the iris family, found in both hemispheres. Crocuses have fibrous corms (solid bulbs) and stiff bladelike leaves that bloom after the purple, lavender, white or yellow blossoms. In Spain a variety of fall-blooming crocus (whose cup-shaped blossoms do not appear until fall although the bulbs are planted early in the year) produces stigmas that give the yellow dye saffron. The word crocus is Greek for saffron.

Croton, a genus of tropical shrubs of the spurge family, related to the castor oil plant and found in both hemispheres. An Asiatic species (*C. tiglium*), from which croton oil, a powerful cathartic, is obtained, has metallic leaves of green or orange. Western members of the genus produce aromatic resins and cascarilla bark, which is used in making incense and some tonics.

Cubeb, see *Pepper.*

Cucumber, a trailing, annual plant (*Cucumis sativus*) of the gourd family, native to Asia and Africa but cultivated in Europe and America. It has a hairy stem, three-lobed leaves and bell-shaped yellow flowers growing on short stalks. The green, fleshy, oblong fruit is eaten fresh and pickled. Certain small pickled cucumbers are called *gherkins.*

Currant, one of a genus (*Ribes*) of shrubs producing a small, acid, edible berry that is native to both hemispheres. Currant bushes have smooth stems, round, scalloped leaves; clusters of many small, yellowish or purple flowers and, eventually, drooping clusters of red, black, striped or white berries. One species, the flowering currant, a native of the western United States, is a showy bush with many tubular, fragrant blossoms.

Cyclamen, a genus of Old World plants of the primrose family that has long-stalked, leathery, kidney-shaped, basal leaves and nodding, fringed, white, rose, purple or pink flowers. It is raised as a greenhouse plant in the United States. The English cowslip belongs to the same family.

Cypress, a genus (*Cupressus*) of tall, straight conifers of the pine family, found in both hemispheres, that have graceful evergreen leaf sprays and ornamental cones. They are used as hedges, windbreaks and street trees and are often used in cemeteries. A tree of a related genus, the bald cypress (*Taxodium distichum*), is the only deciduous cypress. It grows in wet places in warm regions, may be 150 to 170 feet tall and gets air by means of spongy stumps (cypress knees) that grow around its base. Its hard wood is an invaluable timber, especially good for shingles.

Daffodil, see *Narcissus.*

Dahlia, a genus of perennial Mexican and Central American plants of the thistle family grown widely as a garden flower. The wild plant grows from 2 to 6 feet tall and has composite red flower heads, made of many flowers packed together, with yellow centers. The cultivated varieties are grown in every color except blue and scarlet. The plant may be grown from seeds or from tuberous roots with eyes at their stem ends. Many varieties have been developed from seed. The Aztecs cultivated this plant, which they called *Acocotli,* but it was not introduced into Europe until two centuries after the *conquistadores* saw and admired it. The name is in honor of a Swedish botanist A. Dahl.

Daisy or **Oxeye daisy,** a common hardy perennial (*Chrysanthemum leucanthemum*) native to Europe but found as a weed in the United States. The stem grows from 1 to 3 feet tall, is marked by many dark, notched leaves both stamens and pistils and are surrounded and has a terminal flower head, made of a golden cluster of tiny flowerets that have by a fringe of white flower rays bearing only pistils. Closely related to this form is the large Shasta daisy. The pink English daisy, belonging to another genus, is a member of the same family. The name is Old English in origin, day's eye.

Dandelion, a common lawn weed (*Taraxacum officinale*) widely distributed over the northern United States and Canada. Bright yellow flowers are borne on stalks that rise from a flat rosette of leaves. The tender young leaves are sometimes used as a salad or cooked as greens, a wine is made from the flowers, and the roots are used as a coffee substitute and in certain medicines. Bees are fond of dandelion nectar. The name, meaning tooth of the lion, comes from the French *dent du lion* and has been applied to the flower because of the jagged edges of the leaves, suggesting an animal's tooth.

Dasheen, see *Taro.*

Date palm, see *Palm.*

Delphinium, see *Larkspur.*

Deutzia, one of a genus of small, hardy, ornamental shrubs, comprising about 50 species, mostly native to Asia but grown extensively in the United States. It has rough, oval serrate leaves, slender arching branches that give it a bushy appearance and clusters of small, spreading, rose-colored flowers. The dwarf variety grows from 2 to 3 feet high and the larger form reaches a height of about 8 feet. The plant was named after the Dutch botanist Jan Deutz.

Devil's paint brush, see *Hawkweed.*

Dewberry, see *Blackberry.*

Dianthus, see *Carnation, Pink.*

Dill, a fragrant-leaved biennial herb (*Anethum graveolens*) of the parsley family, that grows 2 to 3 feet high. A native of southern Europe and northern Africa, the dill is cultivated in many parts of Europe and some regions of the United States. It is the *anise* mentioned in the Bible. Dill is grown for its seeds used in soups and sauces, and in flavoring pickles. The oil is used in cooking and as a carminative and stimulant.

Dock, one of a genus (*Rumex*) of troublesome perennial weeds, growing from 1½ to 3 feet tall, with a long, stout taproot, broad ruffled leaves and small green clustered flowers. Most of the 30 species are found in Europe, some in North and South America. They grow in meadows, pastures and alfalfa fields. In Colombia the dock is used for grazing. The *canaigre,* a Mexican variety, is used in tanning. A narrow-leaved form (*R. crispus*) is eaten as a green.

Dodder, one of a genus (*Cuscuta*) of annual, leafless, rootless parasitic vines that twine around such agricultural crops as clover and alfalfa and extract food from them by means of *haustoria* (sharp suckers). The threadlike stem of this strange plant is yellow, red or white, and the pink flowers are borne from July to September in small clusters.

Dogbane, a perennial herbaceous plant of the genus *Apocynum* found throughout North America, where it grows in fields. Dogbane has branching stems 1 to 4 feet tall, oval paired leaves and clusters of pink bell-shaped flowers. A close relative of Indian hemp, it has been called dogbane because the milky juice of its stems is quite poisonous.

Dogtooth violet or **Adder's tongue,** one of a genus (*Erythronium*) of small, bulbous early spring flowers of the lily family. Of 15 species, all but one European form are native to North America. The common yellow dogtooth violet grows in clumps in moist regions and has russet-yellow flowers and two mottled oval leaves sheathing a stalk from 6 to 8 inches high. The flower is forked and tonguelike as it shows between the leaves. This accounts for the name adder's tongue. Other forms have white or lavender blossoms.

Dogwood or **Cornel,** one of two genera (*Cornus* and *Cynoxylon*) of hardy shrubs and small trees including about 40 species found in the north temperate zone. Dogwoods have showy flowers, oval leaves, smooth bark and tough wood. The American flowering dogwood (*Cynoxylon florida*) is one of the most beautiful varieties, having large white or pink blossoms. Dogwood leaves turn bright colors in the fall and many have colored bark. Several useful products are derived from the bark of this tree; sometimes it has been used as a substitute for Peruvian bark, the source of quinine. One of the dogweeds is the *bunchberry.*

Douglas fir, a giant North American conifer (*Pseudotsuga taxifolia*) that is not a true fir but is classified botanically between the firs and the hemlocks. It is a tall, straight tree found along the Pacific Coast. In the northwest regions it grows from 200 to 300 feet high, with a trunk unbroken by branches for two-thirds of its length. In the southern states, the tree is smaller, averaging about 100 feet in height. The Douglas fir has flat blunt needles growing on long drooping cones, thick red or yellow bark and pitchy wood. It was named after the

Scottish-American botanist David Douglas (1798–1834). A valuable lumber tree, it is sometimes called Douglas spruce, red pine or Oregon pine.

Dutchman's breeches, an American woodland wild flower (*Dicentra cucullaria*) belonging to the fumitory family. It has slender stalks 5 to 10 inches high bearing delicate green leaves and trembling small, heart-shaped spurred, pink or white flowers whose shape suggests the ballooning breeches worn by Holland peasants. This plant is closely related to the bleeding-heart.

Easter lily, see *Lily.*

Ebony, a tree of the genus *Diospryos,* native to India and the East Indies, whose heartwood is the valuable hard wood of the same name. The species (*D. ebenum*) from which most valuable ebony used in making furniture and ornaments is derived has a charred-looking bark covering wood that is white until the heart is reached. The heartwood is black. This species grows in the Indian jungles and is 60 to 80 feet tall, with oblong leaves and fragrant yellow blossoms. Other species are smaller. Ancient Egyptian records speak of ebony being used in cabinetwork and as ornaments. Various other hard tropical woods that take the same high polish that true ebony does are spoken of as ebony. West Indian ebony is obtained from a shrub of the pea family. The word ebony is derived from the Hebrew word *hobnim* meaning stone, referring to the unusual hardness of this wood.

Edelweiss, a small Alpine plant (*Leontopodium alpinum*) of the composite family with narrow woolly white leaves and flowers. It grows from 2 to 6 feet tall and is frequently found in inaccessible peaks of the Alps. In Switzerland, where it is becoming rare because zealous collectors prize it for its silvery flowers, it is protected by law. It is cultivated in gardens in the United States. The name comes from two German words: *edel,* noble, and *weiss,* white.

Eggplant, a tropical annual (*Solanum melongena*) of the nightshade family, grown for its large, oval edible fruit. Though a native of Asia Minor and India, this plant is cultivated extensively in the warmer parts of Europe and North America. This plant, which is related to the potato, has a bushy spiny stem, large lobed leaves and violet flowers. The oblong fruit is pendant and may be purple, white or yellow.

Elder, a genus (*Sambucus*) of ornamental shrubs or trees of the honeysuckle family that have compound dark green leaves with a smooth upper surface and a hairy lower surface, large clusters of small cream colored or pink flowers and red or purplish-black berries. The elders grow in clumps in damp soil and are usually found along streams or next to fences. They thrive in poor soil. A Mexican variety (*S. mexicana*), one of the largest, is a tree more than 10 feet tall. The red-berried elder of the United States is an ornamental shrub. Elderberries are used for making wine, in preparing certain laxatives and in preserves and cooking. The flowers are used in the manufacture of perfumes. The name is a derivative of the word *alder.* In England, certain members of the genus *Alnus* are called elders.

Elecampane or **Horseheal,** a tall coarse herb (*Inula helenium*) that is native to Europe and has been introduced into the United States. It has a thick, stiff stem 3 to 5 feet tall and produces yellow flowers with notched rays and large toothed leaves. An extract made of the plant juices was formerly used in the treatment of pulmonary diseases. It is still used by veterinarians in treating horses. A candy is made from the roots. The name is a shortened form of *Inula compana,* field inula; and *horseheal* seems to come from *horse helene,* in which *helene* is a shorter form of elecampane.

Elephant's ear, see *Begonia.*

Elm, a tall tree of the genus *Ulmus* found in both the old world and the new, commonly planted as a shade tree and used as a valuable source of lumber. Elms have showy foliage, oval leaves and tufts of purplish or brown flowers. The common European elm, native to England, Europe and Asia, grows 60 to 150 feet tall and has a very rugged bark. It has been introduced into the eastern United States. The American or white elm is a stately tree growing from 100 to 120 feet tall and frequently having a trunk that grows for 60 feet before it divides into branches. The hard wood of many species is used in making furniture, the keels of boats and wheels. The red elm or slippery elm of the United States has red wood and produces a resinous substance beneath its young shoots that boys used to chew and that is an ingredient in certain medicines. Other species found in the United States are the cork elm and the wing or rock elm or wahoo.

Endive, see *Chicory.*

Eucalyptus, a genus of large Australian trees of the myrtle family comprising over 250 species that are characterized by leathery alternating leaves in older plants, small paired ones in young trees, buds covered by a caplike structure that is lifted when the bud opens and resins or gummy secretions. In Australia the eucalyptus trees are valuable timber trees. Oil of eucalyptus, used for colds and bronchial troubles and, when emulsified, as an anaesthetic in certain operations, is obtained from the twigs and leaves of several varieties. The blue gum (*E. globulus*) is one of the many species of eucalyptus successfully introduced into California and other warm regions of the United States. It has silvery leaves with a blue sheen and cream colored flowers and is considered one of the fastest growing trees in the world, attaining a height of 50 feet in about 5 years. It is used as a windbreak in fruit groves. One of the Australian varieties grows to be 360 feet tall, rivalling the sequoias of California in height. The name is used to describe a yellowish green color. The name comes from the Greek *eu,* well, and *kalyptos,* covered, referring to the covering of the bud.

Euphorbia, a genus of herbaceous plants of the spurge family found in both hemispheres. They have simple leaves, succulent spiny stems, *latex* (a milky juice) in their cells and simple tiny flowers contained in a large structure (*cyathium*) that has large brilliantly colored glandlike parts frequently mistaken for tropical species, such as the related poinsettias that have conspicuous bracts of scarlet or other bright colors. In South Africa there are several varieties resembling the American cacti. The juices of many of these are poisonous. A brownish gum resin (euphorbium) extracted from a Moroccan variety was once used medicinally as a purgative but is now used only in veterinary practice.

Evening primrose, a genus (*Oenothera*) of nocturnally blooming fragrant flowers found throughout the United States where they grow as pasture weeds. Plants of this genus vary in height from 6 inches to 5 feet, have narrow leaves arranged alternately and bear white, yellow or rose flowers. The root and upper leaves of many varieties are edible and delicate in flavor.

Everlasting flower, any one of several genera of annuals whose strawlike dried blossoms are kept as decorations throughout the winter. They are cut before the blossoms are fully opened and then dried hanging upside down. The name is applied specifically to immortelle (*Helichrysum orientale*), a composite with yellow scalelike bracts found wild in Asia and Africa and grown in southern Europe. The flower heads are dyed many colors after they have been dried. Other genera known as everlastings are the Australian *Waitzia,* the American *Antennaria, Gnaphalium* and *Anaphalis,* and such European plants as teasel and honesty.

Evonymus, a genus of shrubs or vines of the spurge family containing about 120 species found throughout the north temperate zone. Many of them are evergreens. Typical of the genus is the *burning bush* (*E. atropurpureus*), also known as the *spindle tree.* It has spreading branches growing 6 to 14 feet high and produces pointed, serrate leaves, clusters of drooping purple flowers and seeds covered by bright red arils. Attractive foliage and brightly covered seeds are characteristic of all the members of this genus, making them popular as ornamental shrubs. The name burning bush is sometimes given to the Japanese quince.

Fennel, a perennial herb (*Foeniculum officinale*) of the parsley family, originating in the old world but introduced into the United States where it frequently becomes a troublesome weed in pastures. The young leaves of this plant are deeply notched. They are often eaten as salad greens. The aromatic seeds, borne in flat yellow flower heads are used as a condiment and a medicinal ingredient; the oil derived from them is used in making perfumes and soaps.

Fern, an order (*Filicales*) of the phylum *Pteridophyta* representing one step of advancement in the evolutionary scale above the mosses. Ferns are the highest type of plants that do not produce flowers or seeds. Like seed-bearing plants, they are differentiated into different types of tissues, having fronds (corresponding to leaves), stipes (stemlike organs) and rhizomes (underground root-like stems). There are over 6,000 known varieties, ranging in size from small climbing plants to huge treelike bodies 50 feet high. Ferns are found throughout the world but grow in greatest variety and profusion in the tropics. The fern is an asexual organism that produces spores. These, in turn, give rise to differentiated bodies (gametophytes) that produce sexual organisms (gametes). The gametes give rise to the large asexual plant again. This is known as alteration of generations. Among the wild ferns commonly seen are the maidenhair, Christmas, cinnamon, ostrich, royal and walking ferns. Some popular cultivated varieties are the Boston, dagger and holly ferns.

Fig, one of a large genus (*Ficus*), comprising 800 species, of Asiatic trees of the mulberry family successfully cultivated in warm regions of the United States. Some are small trailing shrubs, others are huge trees. All have a palatable milky juice in their alternately arranged leaves and produce a unique, pear-shaped inverted receptacle enclosing tiny flowers that produce small fruits. The portion of the edible fig usually considered a fruit is the receptacle itself, containing inside it myriads of tiny fruits. They are eaten fresh, dried, canned or preserved, are used to make wine and other alcoholic beverages and medicinally as a mild laxative. The fig of commerce is the product of *F. carica,* a 20-foot tree cultivated in all of the Mediterranean countries and the United States. Its fruit varies in color from white to yellow, purple and black. Wild figs are never as delectable as cultivated ones. The fig tree was cultivated in Biblical days and by the early Greeks, who got it from Caria, accounting for the species name of the commonest form. The sacred *peepul* tree of India is a fig (*F. religiosa*), a tall tree with heart-shaped leaves used in tanning and as a source of lac. The *india-rubber* tree, a common house plant with oblong glossy leaves and pink flowers is a fig. So is the strange *banyan* of India. This tree, which grows to a height of 100 feet, has one main trunk producing root branches that remain above ground, grow as thick as the parent and produce other aerial roots till the tree spreads over an acre or more of ground.

Figwort, a large genus (*Scrophularia*) of plants found throughout the temperate regions and the family to which this genus belongs. They are coarse herbs with knotted roots that were once believed to be a cure for scrofula. They bear clusters of small flowers that have one extended petal swollen into a liplike structure.

Filaree, a plant of the genus *Erodium* grown as a forage plant in the southwestern United States. It has a rosette of reddish leaves, out of which grows a stalk producing clusters of purple or pink flowers. The seeds have wiry tails that twist with every turn of the wind, so that when the plants fall the twisting tails are able to bore into the ground and plant themselves. The name filaree is derived from the Spanish *alfilier,* little pin, referring to the tailed seed.

Filbert, see *Hazel.*

Fir, one of a genus (*Abies*) of fragrant pyramid-shaped evergreen trees with needle leaves and erect cones that are purple, yellow or green. They are usually tall trees and all have a blistered bark, marked with spots of light-colored resin that has some medicinal value. Fir trees are found in the mountains of both hemispheres. The soft, light wood of the firs is used for lining cabinets, making wooden utensils and as a firewood. One group of the firs, known as balsam firs, produces a fragrant resin used in medicine. Most popular of the balsam firs is the commonly known Christmas tree. Another is the Fraser's balsam fir, used as an ornamental tree. The giant red firs of California frequently grow from 200 to 300 feet tall. The noble fir of Washington and Oregon, which produces a harder wood than any of its relatives, frequently equals the California red in size.

Fireweed, an Asiatic plant transplanted to America (*Epilobium angustofolium*) that has a stout leafy stem 5 to 7 feet high, narrow leaves and clusters of purple or red flowers growing on spikes. The resemblance of the leaves to willow leaves has given the fireweed the name of *willow herb.* It is a relative of the evening primrose and it gets its name because it commonly grows in land that has been devastated by fire.

Flax, one of a genus (*Linum*) of fibrous plants that is native to Egypt and China but has been cultivated extensively in Europe. The species commonly raised for linen fiber is an erect annual, from 1 to 2 feet tall, with delicate gray-green leaves and blue blossoms that soon fall off and are replaced by a ball of seeds. An African species has bright red flowers. Linen fiber is obtained from the roots of the flax plant by rotting (retting) them in water. The flat brown seeds of some species are the source of linseed oil, used in paint, varnish, linoleum and printer's ink.

Fleur-de-lis, see *Iris.*

Forget-me-not, one of a genus (*Myosotis*) of Eurasian wildflowers of the borage family that grow near water in rocky soil. It is usually 6 to 18 inches high with a hairy stem, pale, glossy oblong leaves and scorpion-shaped clusters of tiny blue flowers developing from pale pink buds. Some forms have flowers that are yellow in the bud; one species has flowers that are always white. A close relative is the heliotrope. The forget-me-not is an emblem of friendship and fidelity. It is the official flower of Alaska. The name is applied to a shade of light blue.

Forsythia or **Golden bell,** a genus of spring garden shrubs of the olive family, native to China but common in gardens in Europe and the United States. It is 3 to 8 feet tall, has brilliant yellow bell-shaped flowers that blossom profusely before the alternately arranged oval serrate leaves appear. It was named after William Forsyth, who first introduced the plant into America from China. It is widely cultivated as a garden flower in Japan.

Four-o'clock, a South American flower of the genus *Mirabilis.* One species (*M. jalapa*), with trumpet-shaped flowers of red, yellow, white or varicolored stripes, is commonly grown in North American gardens. It is sometimes called the marvel-of-Peru. Its flowers open about four o'clock every afternoon and stay open through the night, closing around sunrise. Though it is a perennial in its native Peru and in warm parts of the United States, the plant is grown as an annual in temperate regions.

Foxglove, one of a genus (*Digitalis*) of tall poisonous biennials common in England and the United States. They grow to a height of about 5 feet, have ovoid leaves and long spikes of yellow, white, purple or pink spotted tubular flowers that hang like inverted bells. *Digitalis,* the powerful drug used in the treatment of heart diseases, is obtained from this plant, all parts of which are poisonous to eat. It is closely related to the mullein and snapdragon. The name was originally folksglove, meaning a fairy glove, for the tubular flowers look like tiny fingers. The scientific name *Digitalis* comes from the Latin word for finger.

Foxtail grass, one of various genera (*Alopecurus* and *Setaria*) of brushlike grasses that grow in marshy regions in both hemispheres. They are injurious to grain crops.

Freesia, a genus of ornamental herbs of the iris family that are native to South Africa but are raised as house plants in many countries. They grow from bulbs, have many bladelike leaves, a stem bearing smaller leaves and lineal clusters of trumpet-shaped sweet-smelling flowers varying in color from white to cream, yellow, rose and lavender. They were named after the Swedish botanist Elias Magnus Fries (1794–1878).

Fritillary, one of a genus (*Fritillaria*) of bulbous herbs of the lily family found throughout the north temperate zone. They have stout stems with leaves growing close to the ground and bell-shaped flowers of white, scarlet, brown or purple. The *California mission bell* is a variety of fritillary. The many species vary in height from a few inches to 2 or 3 feet. The name comes from the Latin *fritillus,* dice-box, and was given to the plant because the mottled flowers suggest the markings of dice.

Fuchsia, a genus of decorative treelike South American shrubs of the evening primrose family, cultivated in greenhouses in temperate regions. The plants of this group have deep green, oval leaves growing in pairs surrounding the funnel-shaped flowers that hang from thin stalks. The blossoms are usually bicolored, the sepals a different color from the petals. Blue and red are the most common colors, though some forms are cream and red, and a Mexican species has green and scarlet flowers. Fuchsias produce plumlike fruits with many seeds that are usually some shade of red. A dye is obtained from certain forms. The plant was named for the 16th-century German botanist Leonhard Fuchs. The name fuchsia is given to a deep bluish-red color.

Fumitory, one of a genus (*Fumaria*) of plants of the fumitory family that have spurred, irregular purplish flowers, growing in delicate plumes, and capsules containing a single seed. They are natives of the Mediterranean countries but have been cultivated in Europe and the United States. Some forms are erect and others climbing. They are related to the poppies.

Fungi, a group of plants of the phylum *Thallophyta* ranging in size from microscopic unicellular organisms, many of which are parasitic, to the large, highly-developed toadstools and mushrooms. There are over 100,000 varieties, many of them of great economic importance. Because none have any green coloring matter (*chlorophyll*), they cannot manufacture their own food and must get their sustenance from other forms. Those that grow and feed on living plants or animal are termed parasites. Examples are the wood-destroying fungi, the molds that destroy grain crops and food, the rusts and smuts attacking various plants, the organism causing ringworm infections in man and many others. Some are saprophytes, that is, they grow and live on dead vegetable matter. Saprophytic fungi are the mushrooms and toadstools. Some fungi live in a symbiotic arrangement with higher plants. A symbiotic arrangement is one in which each organism is necessary for the life of the other. The fungi found in the roots of orchids and in many conifers of the north temperate regions are examples of this type. The yeasts valuable in baking are fungi. The mildews that produce spots on fruits and on damp cloths are fungi. Fungi all reproduce by means of hard-celled spores that are resistant to great degrees of heat and cold, making them very difficult to destroy. Foods are protected against fungi by canning and preserving.

Furze, see *Gorse.*

Gaillardia, a genus of wild flowers of the western United States with stiff stems 2 to 3 feet high, a few oval notched leaves and flower heads whose red or yellow flowerets are rays surrounding a golden center in a daisylike arrangement. They are popular garden flowers and bloom until late fall. Some species are annual, others perennial. Another name for gaillardia is the *blanket flower.* The generic name is in honor of Gaillard de Marentonneau, a French botanist.

Galax, a genus of small evergreen plants that grow wild in many portions of the United States but are cultivated by florists for their heart-shaped glossy leaves. These become red or bronze late in the summer. The plants produce delicate spikes of white flowers and are sometimes called *wandflowers* because of the rodlike shape of the spikes. The leaves exude a heavy sap, and the name is Greek for milk.

Gardenia, a genus of decorative shrubs of the coffee family, 6 to 8 feet high, that have beautiful yellow or white camellialike fragrant flowers with a waxy texture and broad succulent evergreen leaves. From China it has been introduced into Europe and the United States, where it is a popular greenhouse flower. In warm places, as the southern United States, it blooms outdoors and makes a decorative hedge. The flowers are used in the manufacture of perfume and scents for other cosmetics. The fruits of some species yield a yellow dye. One species (*G. florida*) is called the Cape jasmine because it was brought to England from the Cape of Good Hope.

Garland flower, one of a genus (*Daphne*) of small shrubs, less than 1 foot high, that have pink clustered flowers and small evergreen leaves growing on trailing branches. This fragrant flower is a native of Europe. It is cultivated in greenhouses throughout the world and grows in gardens in many parts of America and Europe. One species grows wild in North America.

Garlic, a strong-smelling small onion (*Allium sativum*) belonging to the lily family and native to southern Europe. It has erect, spearlike leaves. It has been introduced into the United States where it grows wild. This wild garlic is a troublesome weed in wheat fields and when it is eaten by cattle, it spoils the taste of milk. The odorous bulbs, composed of many cloves (small bulbs) held in a strong skin, are used as a condiment and flavoring for cooking; and the oil is used as a household remedy for children's diseases. The name is derived from two Anglo-Saxon words, *gâr,* spear, and *lēc,* leek.

Gentian, a genus (*Gentiana*) of blue or yellow American wild flowers that grow 1 to 2 feet high in moist soil. The closed or bottle gentian (*G. andrewsii*) is a perennial that has clusters of deep purplish blue flowers with white lines marking the valved tips that open when insects alight on them. The fringed gentian (*G. crinita*) is an annual, close to extermination, that has small leaves and lovely azure urn-shaped blossoms with fringed edges that turn down. It spreads by means of winged seeds. Some gentians have yellow blossoms. From the roots of the yellow gentian is made a drug used as a tonic or cordial. Gentian purple is a dye recently found to be effective in the treatment of various skin and respiratory infections. The plant was named after Gentius, an Illyrian king who discovered the plant's tonic benefits.

Geranium, a genus of perennial wildflowers that have slender branched stems 1 to 2 feet tall, underground stems, wedge-shaped compound leaves, spotted with white, and pale purplish-pink swaying flower clusters. The pistil, 1 or 2 inches long, splits open when it is ripe and looks like a cranesbill. *Cranesbill* is another name of the wild geranium, and the word *geranium* is from the Greek meaning cranelike. The rhizome of one form (*G. maculatum*) is called *astringent root* and is used medicinally. A very different plant is the cultivated house plant known as geranium. This is a member of another genus (*Pelargonium*), native to South America and Africa, with stiff stems, luxuriant round or nearly heart-shaped leaves that have a pleasant pungent odor and large flower heads of red, rose, pink, yellow or white irregular blossoms and narrow, pointed seed pods. It is a hardy plant, surviving in poor soil, though it needs a lot of sun and warmth. The essential oil of the Pelargonium is called *geranium oil* and is used in perfumery. As a color geranium is a yellowish red.

Gillyflower or **Stock,** a genus (*Matthiola*) of fragrant Mediterranean annuals and perennials of the mustard family. They have thin stems 1 to 3 feet tall, white, purple, rose, blue or orange flowers growing in clusters of various shapes and slender leaves. They are grown in greenhouses in many countries. The name gillyflower in Elizabethan days referred to the *carnation.* Today it is sometimes used for the *wallflower,* a perennial (*Cheiranthus*) also belonging to the mustard family, grown in temperate regions throughout the world. It is about the same size as the true gillyflower and has large erect spikes of purple, brown or yellow flowers.

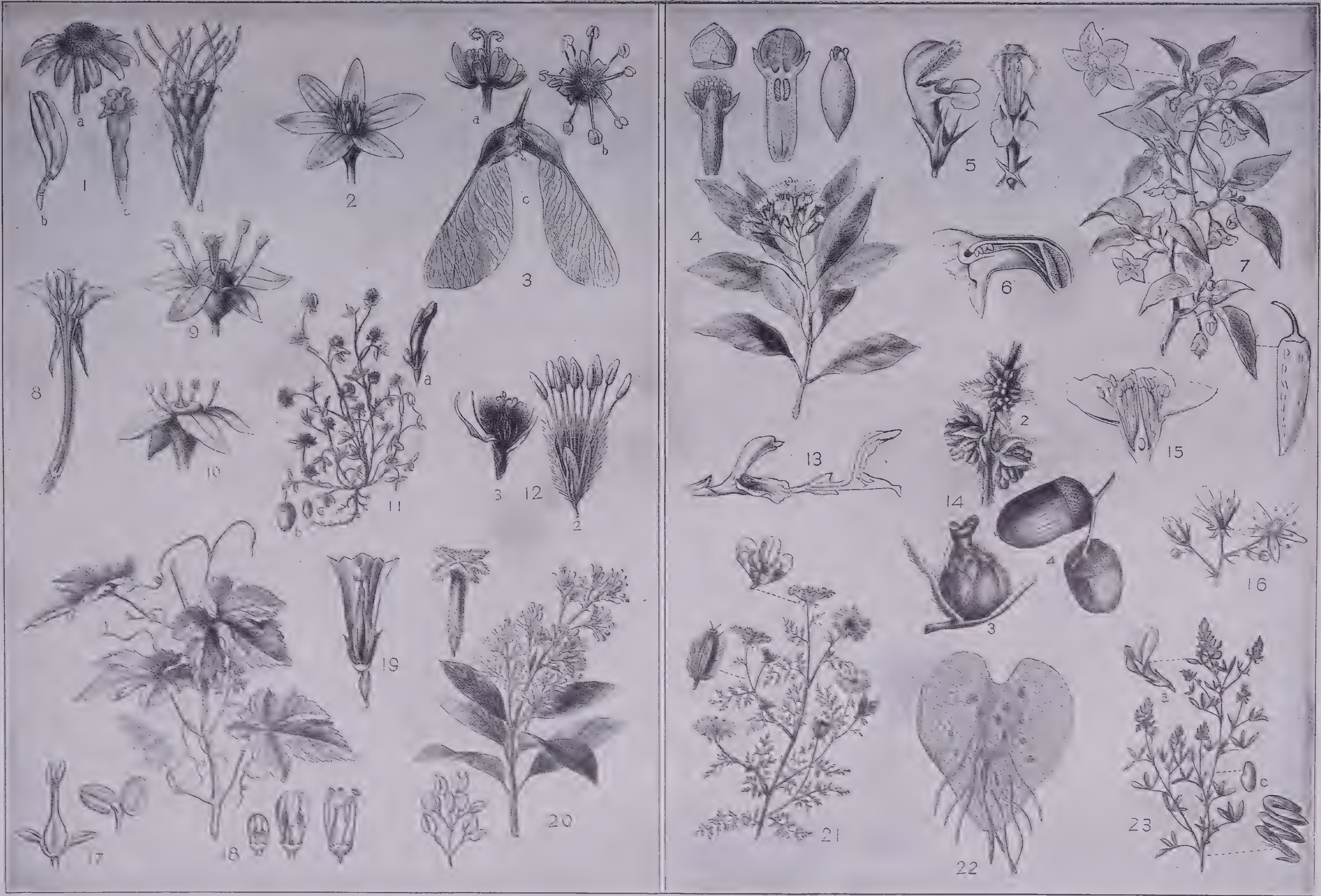
Ginger, one of a genus (*Zingiber*) of herbaceous, reedy, spice plants that are native to Asia but have been cultivated throughout the eastern and western tropics for many centuries. The leaves and flowers grow on separate stems growing out of a fleshy rhizome (underground stem). The spice ginger is made from the pungent aromatic rootstocks, which are dug up and ground after the stalks wither. Preserved ginger is a candy made from the young and tender rhizomes; *Canton* ginger is a well-known variety of the candied root. The dried rootstock is used medicinally as a carminative. The unscraped roots are called *black* ginger, and the scraped roots are known as *white* ginger. The finest grade is *Jamaica* ginger. *Wild ginger* is a perennial herb of another genus (*Asarum*) found in North America, a member of the birthwort family. It has an aromatic rootstock that produces two kidney-shaped furry leaves and a bell-shaped petalless flower, purple on the inside and green on the outside.

Ginkgo or **Maidenhair tree,** a genus of slender, erect Chinese and Japanese shade trees that grow 60 to 80 feet tall and bear, on a few branches, clusters of fan-shaped leaves resembling maidenhair fern. The female trees produce paired flowers that develop into malodorous plumlike fruits and oily nuts eaten in the Orient. The male trees, which have sprays of flowers, are grown as shade trees. Fossil ginkgos have been found in Europe, Asia and America, and the tree, which is one of the oldest of living forms, is often called a living fossil. It has been cultivated in the United States.

Ginseng, a genus (*Panax*) of plants, found in Asia and North America, that have fleshy, aromatic forked roots, a cluster of compound leaves at the top of a 12-inch stem and yellow flowers that produce scarlet berries. The Chinese consider ginseng root a valuable medicine with supernatural powers, but occidental doctors consider it almost worthless. Korean ginseng is the best, but the Chinese import much of the cheaper American ginseng. Sometimes the forked roots bear a crude resemblance to the human form.

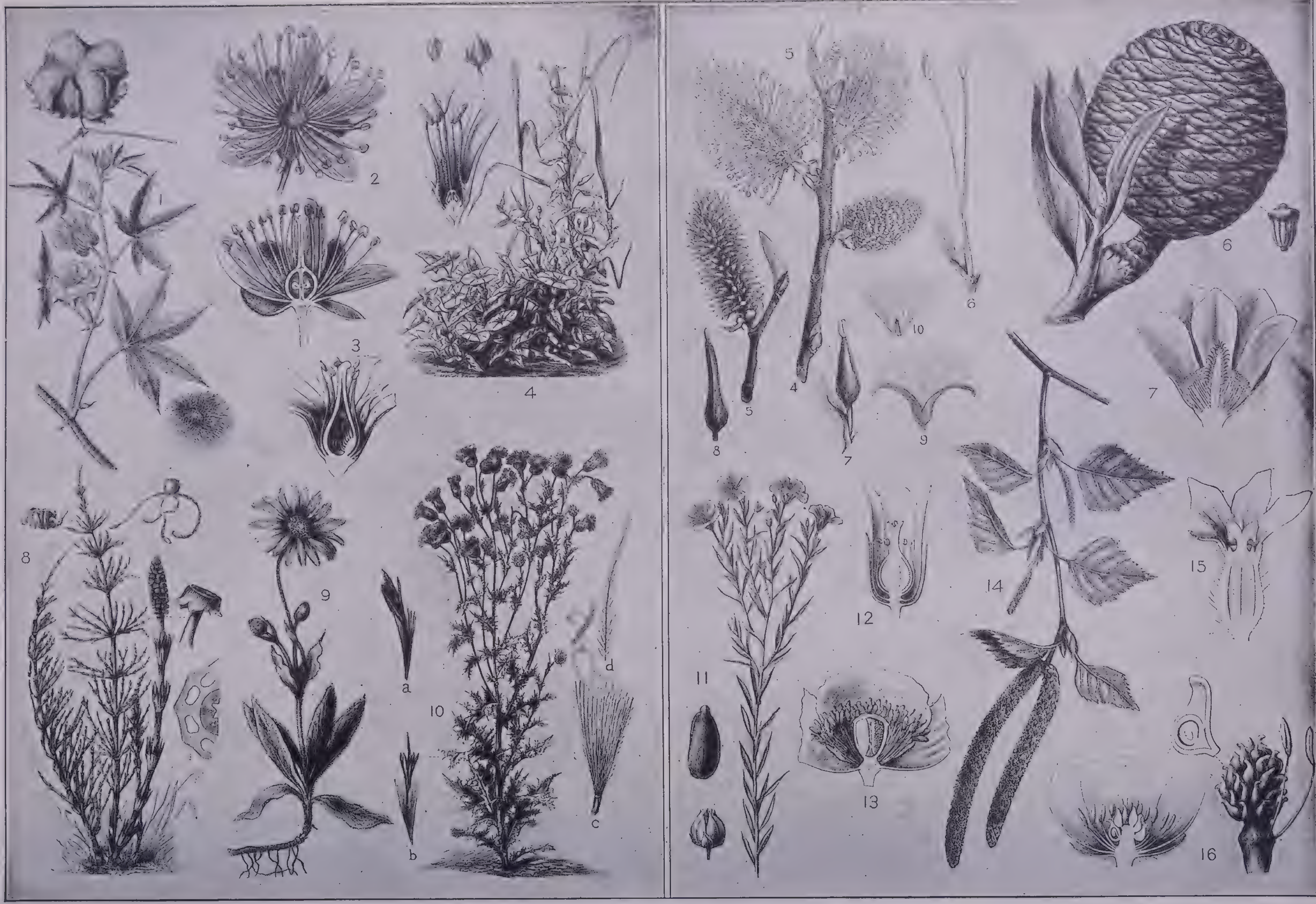
Gladiolus, one of a genus of handsome, bulbous African plants of the iris family cultivated in gardens in both hemispheres. The plants grow several feet high with bladed leaves and spikes of large, stemless, irregularly trumpet-shaped flowers of white, yellow, pink, rose, purple or combinations of more than one color. They are propagated from corms planted in the spring. The name *gladiolus* is Latin for little sword and refers to the shape of the leaves.

Gloxinia, a small tuberous, Brazilian plant that has large, deeply veined spreading leaves growing close to the main stalk and a cluster of large bell-shaped violet flowers.



Botany—Selected Types of Floral Structure, Flowering Shoots and Fern Prothallium

1. Composites: (a) head with rays, (b) ray flower, (c) disk flower, (d) head of tubular flowers.
2. Star of Bethlehem: flower.
3. Maple: (a) pistillate, (b) staminate flower, (c) fruit
4. Clove: shoot, flower section, fruit.
5. Lamium: two-lipped flower, side and front.
6. Orobanche: flower section.
7. Pepper: flower, fruit.
8. Oenothera: flower section.
9. Aralia: flower.
10. Cornus: flower.
11. Clover: habit, (a) flower, (b) fruit, (c) seed.
12. Beech: (2) staminate, (3) pistillate flowers.
13. Sage: flower and section.
14. Oak: (2) staminate, (3) pistillate flower, (4) acorn.
15. Peach: flower section.
16. Saxifrage: flowers.
17. Ash: apetalous flowers.
18. Grape: shoot, opening of flower.
19. Gentian: flower section.
20. Cinchona: flower, fruit.
21. Carrot: shoot, flower, fruit.
22. Fern prothallium.
23. Alfalfa: shoot, (a) flower, (c) seed.



Botany—Habit Sketches and Floral Arrangements

Showing selected seed plants, also the field horsetail.

1. Cotton shoot, boll, seed.
2. Linden: flower section.
3. Tamarix: flower section.
4. Morning-glory: habit, flower section, fruit, seed.
5. Willow: (4, 5, 6, 7, 8, 9, 10) flowers, seed.
6. Evergreen (Dammar): leaves, cone, scale.
7. Magnolia: flower section.
8. Field horsetail: plant form.
9. Arnica: flowering shoot.
10. Thistle: (a, b, c, d) habit, flowers, pappus.
11. Flax: habit, fruit, seed.
12. Monotropa: flower section.
13. Poppy: flower section.
14. Birch: flowers in catkins.
15. Melon: flower section.
16. Buttercup: flower section, pistils, stamens, ovules.

It rarely grows more than 6 inches high and is seldom seen in cultivation. The name *gloxinia* is frequently used for a closely related South American plant (*Sinningia speciosa*) that is raised in greenhouses in the temperate regions, where it demands a warm, damp environment. The *Sinningia* has been produced in many varieties, with white, pink, rose, red or violet flowers. Gloxinia was named after B. P. Gloxin, a German botanist.

Godetia, a genus of garden flowers of the evening primrose family that have large satiny petals ranging from white to deep red. A popular form is the one called *farewell-to-spring.* The genus was named after the Swiss botanist Charles H. Godet.

Golden bell, see *Forsythia.*

Golden chain, see *Laburnum.*

Golden glow, an American garden plant (*Rudbeckia lacinata*) that belongs to the cone flowers and is a relative of the black-eyed Susan. It has a few narrow leaves and stems 3 to 6 feet high that bear clusters of large, showy double flowers that bloom throughout the summer.

Goldenrod, one of a genus (*Solidago*) of perennial American wild flowers, embracing 60 species, belonging to the composite family. The small flowers, usually yellow but sometimes white or greenish, are fuzzy and grow in featherlike sprays. They appear in autumn, when they brighten forests, fields and roadsides. The plant, which has many leaves on a rough hairy stem that may be 7 feet tall, makes a good garden border plant, although many hayfever sufferers are allergic to it.

Goldenseal, a small American herb (*Hydrastis canadensis*) of the crowfoot family, related to the common buttercup and larkspur. It has yellow rootstocks, a stem 6 to 12 inches tall, one basal leaf, two small terminal leaves, a single short-lived, greenish, petalless flower blooming in April and a large fruit resembling a raspberry. The root has medicinal value. The Indians made a yellow war paint from the juice of this plant. It gets its common name from the seals (scars) left on the roots by the withered stems.

Goober, see *Peanut.*

Gooseberry, a thorny bush of the genus *Ribes,* to which the currant belongs. It is a member of the saxifrage family and is found in Europe and the United States. Old World and New World varieties are cultivated in cool regions of America for their edible, oval, green or purple fruits. This hardy plant has three-lobed leaves that are deeply notched and small whitish blossoms. The berries are eaten raw or used in cooking and preserving.

Gorse, one of a genus (*Ulex*) of spiny, ornamental woody shrubs with few leaves, fragrant yellow flowers and seeds borne in conspicuous brown pods. There are about 20 European and African varieties, used mostly for hedges, sheep pasturage, fodder for horses and cattle and as a binding plant in sand to prevent dunes from shifting. It is also called *furze* or *whin.*

Gourd, a vine of the genus *Cucurbita,* related to the pumpkin and the melon and native to Asia and Africa, or of the genus *Lageneria,* found in warm regions of America. They are grown for their fruits, which range in size from those the size of a lemon to huge, drooping forms. Some are round, others oval, some strangely curved, others (especially *Lageneria*) bottle-shaped. They may be white, orange or brown. When they are cleaned of their pulp and dried, they are used as dishes, drinking utensils and ornaments.

Grain, a collective term used to describe the cereal plants and grasses and their edible seeds that are used, whole or ground into meal or flour, for the most important food of men and many other animals. The cultivation of grain has played a great part in the development of the human races. In ancient times as well as among primitive races today it was the chief factor causing men to live in permanent communities, which they did in order to harvest and store what grains they had sown. On every continent primitive men cultivated grain. Many religious ceremonies and festivals are associated with harvesting grain.

Grape, a genus (*Vitis*) of woody vines of the old and new worlds that climb over trees and fences by means of tendrils, produce broad divided leaves, hairy, small, green flowers and valuable fruits. Cultivated grapes produce larger and better fruits than wild ones, although wild grapes are used for cooking and preserving. Grapes have been cultivated for wines, raisins, preserves and table fruits for centuries, chiefly in Mediterranean countries (from which the best wine grapes come) and the United States. There are white, red, blue and black grapes that may be large or small, sweet or tart, seeded or seedless. *Vinifera* grapes with a high sugar content and easily detached seeds come from the Mediterranean countries and the Pacific coast of the United States. Large *muscadine* grapes, with big seeds difficult to remove, come from the Atlantic and Gulf states. Blue *Concord* grapes come from New England and were developed from *Labrusca* or northern *fox grapes. Delawares,* a small variety, are also natives of North America. Cultivated grapes are mentioned in the Bible, and the ancient Greeks and Romans used the grape figure in their art work. There are records of grapes in Bronze Age remains.

Grapefruit, a small Oriental tree (*Citrus grandis*) related to the orange and lemon, producing clusters of 3 to 15 large edible fruits properly called *pomelos.* This tree, which is extensively cultivated in Florida, California, Texas and the West Indies, has large egg-shaped leaves and white blossoms. Thin-skinned and seedless varieties of grapefruit have been developed in the United States. The fruit is eaten fresh or canned. It has been cultivated in the Orient for at least 2,000 years. It is a variant of the *shaddock* (named after the 17th century sea captain who introduced grapefruit into the West), a coarse unpalatable fruit from an Oriental tree. The grapefruit received its name from the grapelike shape of the fruit clusters.

Grape hyacinth, a bulbous shrub of a genus (*Muscari*) comprising about 50 species of flowering plants that have tall bladelike leaves and clusters of bell-shaped flowers of blue, yellow or white growing on top of long stems in an arrangement similar to a bunch of grapes. These flowers are natives of Europe but now grow wild in the United States where they are also cultivated as border and rock-garden plants.

Grass, any member of the *Gramineae* family with hollow stems, fibrous roots, long alternate leaves, tiny red, purple or green panicled flowers and small fruits called grains. Grasses are found in all parts of the world. Some varieties are timothy, millet, sugarcane, wheat, rye, oats, corn, barley, bluegrass, bent grass and redtop. Bent grass, bluegrass and redtop in mixtures make good lawn and sod and are frequently used on golf courses. Kentucky bluegrass is a valuable pasture grass. Redtop and timothy are grown for hay.

Greasewood, a shrub (*Sarcobatus vermiculatus*), 4 to 8 feet tall, found throughout the western United States, where it is used as a forage plant. It has white stems, stiff branches and slender, succulent leaves eaten by sheep and cattle.

Ground burnut, a weed (*Tribulus terrestris*) native to the Mediterranean countries and now a pest along the Pacific coast of the United States, where it grows in a dense formation close to the ground. It has branching stems, compound leaves and fruits borne in spiny burs that often injure animals' feet and become entangled in their coats. It is one of the caltrops.

Ground ivy, a European perennial vine (*Glecoma hederacea*) that grows as a weed in the United States. It is a member of the mint family and has a square stem, kidney-shaped leaves and blue or yellow flowers that grow in small clusters.

Ground pine or **Club moss,** a genus (*Lycopodium*) of ferns that grow in North America and Japan as trailing evergreens with underground stems sprouting tiny, tree-shaped plants whose stems are thickly covered with fine leaves. Spores are found in the club-like structures at the end of the stem. The appearance of these sporiferous bodies gives the fern its name. Ground pine is popular as a decorative plant, and some varieties are made into Christmas wreaths.

Guaiacum, a genus of tropical shrubs and trees of the bean-caper or caltrop family that have plumelike leaves, blue flowers and fruit growing in capsules. *Lignum vitae* (wood of life), a hard oily wood that sinks in water, is obtained from one species, *G. officinale,* which usually grows about 20 to 30 feet tall. The name is sometimes applied to the tree itself. A drug used medicinally as a treatment for rheumatic and skin diseases is obtained from guaiacum resin.

Guava, a small tropical American tree (*Psidium guajava*) of the myrtle family that grows 10 to 20 feet high, with fragrant white flowers and yellow, mildly acid fruit about the size of a hen's egg. It is native to Mexico and the northern half of South America but is cultivated in the southern United States, China, the Malay Archipelago and northern Africa. The white or pink fruit is made into jellies and jams and shipped to various parts of the world. It is eaten raw in countries where it is grown but is too perishable a fruit to withstand transportation. The name is a Spanish variation of Indian names for this plant.

Guayule, a rubber-producing shrub (*Parthenium argentatum*) of the daisy family found wild in Mexico and Texas and cultivated in the southwestern United States. It has many branches and luxuriant silvery leaves. Rubber is mostly gained from cultivated plants. When the plants are about 4 years old, they are pulled up, dried, crushed and immersed in water. The rubber appears as spongy particles that are taken out and made into sheets. From 150 to 200 million pounds of rubber are extracted annually. The name comes from Nahuatl Indian words meaning plant ball; the Indians made a bouncing football from the gum.

Gum, any of various tasteless, viscid substances that are exuded by plants and that will soften or dissolve entirely in water. Gum arabic, a red or straw colored gum from either of two varieties of acacia, used in the arts and medicine, is an example. Cherry and fruit trees secrete a gum that is used for stiffening straw. Chicle, the sap of the *sapodilla,* is used for chewing gum, and so in early New England was spruce gum, which is still used by some natives.

Gutta-percha, a tree, one of a genus (*Palaquium*) of large trees found in Malaysia. Gutta-percha is the dried form of the gray, milky juice found between the wood and bark. It is extracted by cutting and stripping the tree or by boring a hole and letting the juice run out. Gutta-percha is used to waterproof shoes, pipes and telegraph wires; to make surgeon's splints, acid-resisting chemical utensils, inkwells, trays and many objects of every day use. The name comes from two Malay words, *gatah,* gum, and *perca,* the tree.

Gypsophila or **Baby's breath,** a genus of Old World garden plants, 1 to 3 feet tall, belonging to the pink family. Most of them are perennials. They all have fine stems, narrow leaves and feathery stalks of tiny pink or white flowers used in decorative bouquets.

Hackberry, one of a genus (*Celtis*) of moderately tall trees of the elm family that are found throughout temperate and subtropical regions. It shows great variation in height, ranging from 60 to 130 feet, and is recognized by the ridges and elevations (hacks) marking its bark. The leaves of this drought-resisting tree are oval and short-stemmed, arranged alternately on stems growing from the many branches that make the tree a good shade tree. The fruits are edible and are produced by inconspicuous greenish flowers. The bark of the common American hackberry is silvery, its wood is soft, and the tree is frequently damaged by wind-storms. A variety found in the southern United States is sometimes called *sugarberry* tree.

Harebell, see *Bluebell.*

Hawkweed, a plant of the genus *Hieracium,* many species of which are objectionable weeds in the United States and Europe. It belongs to the composite family and is closely related to the chicory and dandelion. There are about 450 species, found in South Africa, the heights of the Andes, Europe and North America. The orange hawkweed or *devil's paint brush,* a common pest throughout the United States, has a hairy flower stalk that grows from 1 to 2 feet tall, a rosette of oval, hairy leaves growing close to the ground and clusters of orange flowerheads made of many tiny flowerets. It reproduces from seeds and runners. The plant was named hawkweed (and the generic name is from a Greek word meaning hawk) because it was believed that hawks sharpened their eyesight by using the leaves of this plant.

Hawthorn, one of a genus (*Crataegus*) of shrubs and trees of the rose family, found throughout the North Temperate Zone. They have spiny stems, clusters of rose or pink flowers, simple, lobed serrate leaves and small red, yellow, blue or black applelike fruits. These fruits (haws) are decorative, pulpy structures that frequently stay on the bushes throughout the winter. Many are edible and are eaten raw or preserved. Scarlet, black and red hawthorns are the most common American species. The English hawthorn, an attractive hedge tree, is used traditionally in May Day celebrations. The name is derived from two Anglo-Saxon words meaning hedge and thorn.

Hay, the dried, cut, stock food made from various kinds of grasses grown throughout the world. It is fed to cattle when there is no green pasturage.

Hazel, a small genus (*Corylus*) of American and Old World shrubs and small trees of the birch family. The common American hazel is a tree 3 to 8 feet high that has oval leaves, drooping catkins of yellow staminate flowers and tiny buds of female flowers with conspicuous red stigmas. Like those of several other American varieties, the nuts are edible. The beaked hazel is so named because the nut is enclosed in a shell with a beaklike appendage. Both forms are widely distributed through the eastern and middlewestern states and parts of Canada. There is a Pacific coast variety that may grow as tall as 30 feet. The common Old World hazel, found in Europe, Asia and Africa, is 12 to 30 feet tall and has edible nuts called filberts (full beard) because they are covered by a hairy husk. Filberts are larger than the American hazel nuts. Hazel as a color is a red-yellow brown.

Heath, a genus (*Erica*) of European and African perennial shrubs related to the heathers and resembling them. They have white, pink or purple cuplike flowers known as heather bells. They are grown in greenhouses in the United States and are cultivated in many of the warmer states.

Heather, a small perennial evergreen shrub (*Calluna vulgaris*) that has stems 6 inches to 3 feet high, tiny scalelike leaves and clusters of abundant purplish pink or white flowers. Although it is a native of Europe and Asia Minor, this plant has been introduced into the United States where it grows as a border plant and a wild flower. It blooms in late summer. It is particularly abundant on the Scottish moors where its purplish blossoms have been celebrated in song and story. In England heather is used for fuel and fodder, and the stems are made into brooms, baskets and thatching. The heather is sometimes called *ling*.

Heliotrope, one of a genus (*Heliotropum*) of herbaceous shrubs of the borage family. These fragrant relatives of the forget-me-not have hairy stems, alternating leaves that are oval and slightly toothed and simple spikes of tiny purple, lilac, blue or white flowers. The heliotrope is a common garden and houseplant in Europe and the United States. The name heliotrope, derived from Greek words meaning turning to the sun, was given to this plant to describe its growth: the leaves and flowers are always turned to face the sun. *Turnsole* is another name for heliotrope and other plants that follow the sun.

Hellebore, one of a genus (*Helleborus*) of European perennials of the buttercup family with glossy evergreen leaves and showy petalless cup-shaped flowers of white, pink or purple. One of the commonest forms is the *Christmas rose* or black hellebore (*H. niger*) whose white flowers, growing on top of a stem 9 to 15 inches tall, bloom in late winter or early spring. It is commonly cultivated in the United States. The powdered roots are used in medicine as a sedative and an insecticide.

Hellebore, American, see *Indian Poke*.

Hemlock, one of a genus (*Tsuga*) of evergreen trees represented by four species in America and by several species in Europe and Asia. This graceful pyramid-shaped conifer often grows in damp places as an ornamental tree, has blunt silvery-green needles that grow from tiny stems in sprays on drooping branches. Its tan cones, growing on the under surfaces of the branches, produce winged seeds. The common hemlock (*T. canadensis*), which grows from Nova Scotia south to Alabama and west to Montana, has splintery wood, occasionally used as lumber, and bark valuable for its tannic acid, used in tanning leather. The western hemlock (*T. heterophylla*) is a large tree with valuable lumber and bark that is useful in tanning. The *poison hemlock* is an unrelated shrub, *Conium*, of the carrot family.

Hemp, an annual fiber plant (*Cannabis sativa*) of the mulberry family, native to Asia, but cultivated in parts of Europe and the United States. Wild hemp grows in erect stalks 3 to 18 feet high, but cultivated hemp is usually kept down to a height of about 8 feet. Male and female flowers grow on separate plants: the staminate plants bear loose clusters of yellow flowers and die shortly after flowering, the pistillate flowers are borne on longer-lived plants and are arranged in short green spikes. Hemp fiber is taken from the inner bark, cut while the plant is in bloom, and retted. It is used for twine, canvas (canvas is a short form of cannabis), sailcloth, ropes and (when ravelings are tarred to make oakum) for calking boats. In many parts of the United States, Central America and the Orient hemp is cultivated for the resin of the leaves and fruits, which are smoked for the drug *cannabin* contained in the sap. This drug is called *hashish, marijuana* or *charas*. The seeds of hemp produce an oil, used commercially, that resembles linseed oil. Hemp has some medicinal value and was described as a medicine by the ancient Chinese, Indians and Persians. Its cultivation dates back at least 4,000 years.

Henequen, a Yucatan agave (*Agave fourcroydes*), belonging to the amaryllis family, cultivated in Mexico and the West Indies for its fiber, second only to Manila hemp in durability and strength. The fiber used in making binding twine is obtained from the long gray-green leaves. A similar and closely related form is *sisal*, a member of the same genus found in the eastern tropics. Henequén is the Taino Indian name for the plant.

Hepatica, a genus of plants of the buttercup family native to Asia, Europe and the United States. They have thick, trilobed leaves, shaped very much like the human liver, and pale blue, pink or white flowers that grow on slender stalks rarely more than 3 inches above the ground. As the plants get older, the green leaves become tinged with purple. A common name for this genus is *liver-leaf*, from the shape of the leaves, and *hepatica* is Greek for liverlike. Hepaticas bloom very early in the year, often while snow is still on the ground.

Hibiscus or **Rose mallow**, a genus of large-flowered plants of the mallow family found in the temperate and tropical regions. They are most profuse in the tropics, where some grow as trees 30 to 40 feet high. In temperate countries they are usually shrubs a few feet tall. The heavily veined leaves are deeply lobed. The blossoms, which resemble hollyhocks, are cup-shaped, 6 to 8 inches in diameter and may be white, pink, yellow, rose or scarlet. The rose mallow is a hardy perennial all along the Atlantic seaboard in the United States. Another species seen commonly in American gardens is the rose of China, a plant that has a scarlet blossom whose juice leaves a black stain. It is used by Chinese women as an eyebrow pencil and by West Indians as a shoeblack. A Hawaiian variety is the territorial flower of those Islands and is common as a tall hedge covered with luxuriant blooms of many colors.

Hickory, a genus (*Carya* or *Hicoria*) of trees native to the eastern region of North America. They have tough, close-grained wood valuable in making tools and as a fuel; large, shining pinnate leaves that grow in profusion on a trunk 60 to 160 feet tall and usually edible nuts produced by small flowers grown in stiff spikes on the same trees that produce the yellow-tasseled staminate flowers. The nuts have reddish husks, thin shells and, in edible varieties, sweet kernels. The *shagbark hickory* is a common tree in the East, so named because the silver bark peels off in large strips that hang on to the trunk of the tree for many months before they drop. The *pecan* is a species of hickory, growing over 150 feet tall, that produces the best nuts of any members of this genus. The *bitternut* is a tree of this genus belonging to a group called *disappointing hickories*, because bitternuts are too bitter for any animal to eat. *Pignuts* and *mockernuts* are the inedible fruits of other hickories.

High-bush cranberry, see *Viburnum*.

Holly, one of a large genus (*Ilex*) of shrubs and trees found throughout the world. Most of the 120 species are found in Central and South America, and there are many Asiatic varieties. The common American holly (*I. opaca*) is typical of the evergreen forms of this genus. It is a tree 40 to 50 feet high with spiny, leathery, glossy evergreen leaves, male and female flowers on separate trees, shining red berries on the female trees and hard even-grained wood much sought by wood engravers. Very similar is the European holly (*I. aquifolium*). Both species are commonly used for Christmas decorations. The use of the European holly as a festive flower goes back to the days of the Druids in England, when it was used as wreaths for Druid festivals. Holly is a corruption of the Anglo-Saxon word for holy. A few hollies are deciduous. A form that loses its leaves in the winter is the *black alder* or *winterberry*. The interesting Paraguayan evergreen shrub (*I. paraguayensis*) known as *maté* is a holly. Its prickly leaves, containing caffeine, are brewed into a popular South American beverage called Paraguay tea or *yerba maté*. Another American species, an erect branching bush, 2 to 8 feet tall, with black fruits and white flowers, is the *inkberry*.

Hollyhock, a perennial shrub (*Althaea rosea*), native of China and now cultivated in Europe and America as a stately garden flower. It has wrinkled, large leaves growing on an erect stem 5 or 6 feet tall and large cup-shaped flowers of pink, white, yellow, violet and a purple so dark it seems black. Wild hollyhocks are single-blossomed; florists' varieties are double-blossomed and frequently grown as annuals. The leaves of this member of the mallow family are cooked as a vegetable by the Egyptians.

Honesty, a European plant (*Lunaria annua*) of the mustard family with a stem about 2 feet tall, large leaves, purple flowers growing in erect spikes and clusters of flat pods used in winter bouquets.

Honeydew melon, see *Muskmelon*.

Honey locust, see *Locust*.

Honeysuckle, a genus (*Lonicera*) of climbing shrubs with fragrant flowers, native to Asia, Europe and the United States. Many Asiatic varieties are cultivated in the United States, including the large Tartarian honeysuckle (*L. tartaria*) that has pink flowers and bright red berries. Honeysuckle blossoms are trumpet-shaped with fringed lips, an exceptionally sweet fragrance and nectar much sought by bees and butterflies. One of the most common American forms, the climbing trumpet honeysuckle (*L. sempervirens*), has yellow and scarlet flowers and red berries. Other varieties have white, purple or scarlet flowers and yellow, black or blue berries. The Latin name is in honor of a 16th-century German botanist Adam Lonicer.

Hop, a perennial vine (*Humulus lupulus*) of the nettle family that has rough stems 15 to 20 feet long, coarse lobed leaves, bract-enclosed female flower clusters (the hops of brewers) and staminate flowers growing on separate plants. The hops, used in making yeast and malt beverages, get their bitter taste from resinous grains inside the yellow flowers enclosed in the scalelike bracts. A Japanese species of the same genus is raised purely as an ornamental tree.

Horehound, a genus (*Marrubium*) of perennial herbs of the mint family native to the Mediterranean countries but introduced into every continent. They have clusters of small white flowers in the axils of the toothed, hairy, silvery leaves. The name *horehound* or *hoarhound* was given to the plant because of the silvery or hoary effect of the leaves. An extract of the plant is used in candies and syrups used to treat colds and coughs.

Hornbeam, a genus (*Carpinus*) of trees of the oak family, found in both hemispheres. They have drooping branches, hard wood, gray bark, serrate oval leaves that turn red and orange in the fall, clusters of staminate and pistillate flowers that grow on one tree and tiny winged fruits.

Horse chestnut, a tree (*Aesculus hippocastanum*) of the same genus to which the buckeye belongs, a native of Greece but found throughout the world. It is a showy deciduous tree, about 60 feet tall, with toothed, wedge-shaped leaflets and pyramidal clusters of creamy flowers. It produces a nut that looks like a large chestnut but is inedible. It has been named horse chestnut because the nuts were once used as food for horses—or possibly just because it is large.

Horse nettle, an American weed (*Solanum carolinense*) of the potato family that has underground stems, thorny aerial stems and leaves, blue flowers and orange berries. The entire plant, which grows about 1 or 2 feet tall, is covered with stiff hairs in addition to the little spines that give it the name of nettle.

Horse-radish, a perennial (*Armoracia rusticana*) of the mustard family that has a stem about 2 feet tall, narrow leaves, edible white fleshy roots used as a condiment and clusters of white flowers. Though a European plant, it has been widely cultivated in the United States. The cultivated plant is propagated by root cuttings.

Horsetail, a genus (*Equisetum*) of primitive, flowerless sporiferous plants related to the ferns. They have tall, hollow stems and branches and clusters of scales instead of leaves. There is a great deal of silica in the stems, which were once used for cleaning, giving these plants the common name of *scouring rush*. Many species are found all over the world and vary greatly in height. In South America there are some forms over 25 feet tall. In this country many varieties are less than 1 foot tall. At the top of some of these erect branches are club-shaped masses of spores, giving the plant a resemblance to a stiffened tufted horse tail. There is indication that ancient *Equiseta*, much larger than the modern variety, form part of the material carbonized into coal.

Horseweed, an annual (*Leptilon canadense*) that grows throughout North America as a weed. It is a member of the composite family ranging in size from a few inches to over 6 feet. It produces small yellow flower heads composed of many tiny flowerets.

Huckleberry, one of a genus (*Gaylussacia*) of small, branched bushes, 1 to 3 feet high, that bear smooth, leathery oval leaves, nodding reddish flowers and clusters of glossy black berries. The generic name commemorates the French scientist Gay-Lussac. Huckleberries belong to the heath family and are closely related to the rhododendron, mountain laurel, cranberry and blueberry. The blueberry is a member of a related genus and looks very much like the huckleberry. Colloquially, in the United States, the term blueberry is applied to the huckleberry, although properly it should only be used for the slightly less acid berries of the genus *Vaccinium.*

Hyacinth, a member of the genus *Hyacinthum,* a group of Old World garden plants of the lily family cultivated in both hemispheres. It produces stiff, bladelike leaves and spikes of bell-shaped flowers of white, pink, blue or violet. The plant was named after Hyacinthus, a Greek youth mentioned in classical mythology as a favorite of Apollo. When Hyacinthus was accidentally killed by the god, the plant now bearing his name sprang from his blood.

Hydrangea, a genus of ornamental shrubs of the saxifrage family. Some are indigenous to the New World and many that are natives of the Orient have been cultivated throughout the world. They are large woody bushes, growing from 8 to 20 feet tall, with large paired leaves and round flower heads composed of globular flowers. Dwarf varieties with pink, blue or white flowers are cultivated in gardens and greenhouses. The blossoms of the common American hydrangea are greenish-white when they first appear, later pink and blue. The name, which comes from the Greek words meaning water and vessel, was given to the plant because of the cuplike shape of the light fruits.

Iceland moss, an edible mosslike lichen (*Cetraria islandica*) that is found in Arctic countries. It grows 3 to 4 inches tall, has light tan tubular branches that end in fringed lobes and is eaten by the natives because of its high carbohydrate content. When it is dried, it is made into bread. It is also used for making paper and cloth.

Ice plant, a hardy annual plant (*Mesembryanthemum crystallinum*) that has thick, glistening foliage and small white or pink flowers. It is a native of southern Europe but grows extensively in Africa and southern California. The juice of this plant is used as a diuretic and demulcent. In Spain the ashes of the leaves and stems are used in making glass.

Indian hemp, an American plant (*Apocynum cannabinum*) that has a milky juice, tough stems 2 to 4 feet high, oval leaves and bell-shaped white flowers in terminal clusters. Because the Indians used the fibers of the stems for making rope, the plant has been named Indian hemp. It is closely related to the dogbane.

Indian pipe, a colorless plant (*Monotropa uniflora*) that lives as a parasite or saprophyte in rich, moist forests. The white nodding flower is borne on a colorless, clammy stem 4 to 10 inches high. There are no leaves, but the stem is covered with waxy white scales. Because of the pallor and clamminess that characterize this plant, it is sometimes called *ghost-flower* or *corpse plant.* When it is picked, it turns black. Because it has no chlorophyll, it can not manufacture its own food and must live as a parasite on the living roots of other plants or as a saprophyte on dead vegetable matter.

Indian poke, a poisonous American herb (*Veratrum viride*) of the lily family with a thick rootstock, thick stem 2 to 7 feet tall, large, shining plaited leaves and yellow or white flowers in spikelike panicles. The roots have some medicinal value. It is a serious pest, because its poisonous roots and leaves attract cattle. Other names for this plant are *cow poison* and *American hellebore* or *white hellebore.*

Indian tobacco, see *Lobelia.*

Indigo, one of a genus (*Indigofera*) of Asiatic plants of the pea family that have clusters of pink or purple flowers in the axils of the pinnate leaves. These plants are cultivated throughout the tropics. The leaves are the source of the dye indigo, which is extracted by steeping cut plants in water and evaporating the solution. Crystals of the dye then appear. Indigo is one of Newton's seven primary colors, an intense blue; and is used as the name of a bird with blue plumage, a color of the spectrum and any other object that is the same color as the dye secreted by the indigoferous plants. The word indigo is Spanish and means Indian, referring to the Asiatic origin of the dye plant.

Inkberry, see *Holly.*

Ipecac or **Ipecacuanha,** a tropical creeping plant (*Cephaëlis ipecacuanha*) found in Brazil, Bolivia and Colombia. It has annulated roots made of many small pieces held together in a chainlike formation, short stems and clusters of large ovoid leaves surrounding inconspicuous flowers. The roots contain an alkaloid *emetine* and an acid resembling tannic acid that make it an important medicinal plant. The powdered root is used as an emetic, expectorant and skin irritant. As Dover's powder, in which it is combined with opium, the extract of ipecac is used as a soothing, perspiration-inducing agent. In small doses it acts as a digestive tonic because it increases the flow of gastric juices and other digestive enzymes. In large doses it is poisonous, producing bronchial symptoms resembling those in lobar pneumonia, severe inflammation of the stomach and intestines and heart failure. Because of its emetic activity it is important in the treatment of dysentery. For this reason the English have tried, unsuccessfully, to cultivate it in India. The name comes from the descriptive Brazilian Indian words *ipe-kaa-goëna,* meaning a small roadside plant that causes vomiting.

Iris, one of a genus of beautiful garden plants of the lily family whose large showy flowers appear in a variety of shades accounting for the name iris or rainbow. There are about 200 species, native to the Old World and the New. The large plants known as *flags* in the United States are native to the West, but most of the garden varieties cultivated here are Oriental species. Some are bulbous and others have thick underground stems (rhizomes). All are tall plants, even dwarf varieties grow 2 to 3 feet high. The flowers, usually orchid, yellow or bluish-purple in wild forms, though they may be white, brown, russet, pale blue or dark blue, have large petals forming a platform surrounding the two coiled inner petals forming a hoodlike structure. Some are bearded, that is they have feathery outer petals, and some are plain. Orris root is an extraction of the powdered rhizome of one iris (*I. florentinus*) and is used in making imitation violet perfumes, shampoos, tooth pastes and other cosmetics. The word orris is a corruption of the word iris. The most common species are the large, hardy common American blue flag (*I. versicolor*), the western blue flag (*I. missouriensis*), the English iris (*I. xiphioides*), the Japanese iris (*I. laevigata*) and the dwarf bearded iris (*I. pumila*). Iris is also known as *fleur-de-lis* (flower of the lily) and was the emblem of medieval France.

Irish moss or **Carrageen,** a soft seaweed (*Chondrus crispus*) found along the Irish and American Atlantic coasts, where it thrives on rocks. It is usually green, yellow, brown or purplish. This moss is gathered, washed and dried in the sun, and a mucilaginous substance contained in it is extracted. From it such foods as blanc mange are made. Extracts of Irish moss are also used in making cough mixtures. Carrageen is the name of an Irish town near which great quantities of the moss are found.

Ironweed, one of a genus (*Vernonia*) of wild flowers of the daisy family found throughout the western and northeastern United States. It is a troublesome pasture weed, producing clusters of flat purplish-red flowers that resemble asters. It has a prodigious seed-producing ability and rapidly takes possession of acres of land if it is not checked immediately.

Ivy, the name correctly applied to an English and Asiatic climbing evergreen (*Hedera helix*), cultivated in many countries, with dark green oval or five-lobed leaves that have a high gloss, yellowish flowers, black berries and rootlets by means of which it covers walls, stones and trellises. It has been extensively cultivated in the southern regions of the United States but is not hardy enough for the northern states. This ivy was sacred to Bacchus and an ivy garland was used as the symbol of a tavern. In the United States the name ivy is frequently applied to another climbing vine with shiny three-lobed leaves, the Boston ivy, a hardy woody Oriental vine (*Parthenocissus tricuspidata*). Its leaves turn bronze or scarlet in the autumn and it bears bluish purple berries. It is sometimes known as the Japanese ivy. It grows in great profusion over houses and walls in most parts of the United States, climbing by means of suckerlike discs at the end of its slender tendrils. It thrives even in the sooty atmosphere of cities. A member of the same genus, commonly seen in the United States, is the native *woodbine* or *Virginia creeper,* which has inedible berries and leaves with 5 or 7 lobes. *Poison ivy* is not an ivy but a climbing member of the sumac family.

Jack-in-the-pulpit, a wild flower (*Arisaema triphyllum*) of the arum family, found as an early spring flower throughout the eastern woodlands of North America. It has one or two large leaves made of three leaflets and a stem 1 to 3 feet tall that rises from a spicy corm or turniplike tuber eaten by the Indians. Small greenish flowers are borne at the base of a tall clublike spadix surrounded by a hooded spathe, curving over the spadix at the top. The spathe is usually green, striped with purple, and when it withers it reveals clusters of red berries, which the Indians cooked and ate. The spadix is the "Jack" in the "pulpit" or spathe. The plant is sometimes called *Indian turnip.* Closely related to Jack-in-the-pulpit is the calla lily.

Japonica or **Flowering quince,** the popular name for an Oriental shrub (*Cydonia japonica*) related to the common quince. It is a native of Japan, has spreading spiny branches 3 to 6 feet high, glossy leaves, scarlet flowers and small yellow berries occasionally preserved and eaten. A species of camellia is sometimes called japonica. The true japonica is also known as *flame-bush.*

Jasmine or **Jessamine,** one of a genus (*Jasminium*) of small East Indian erect or climbing shrubs of the olive family that are cultivated as garden plants in many parts of Asia, the southern United States and tropical America and grow in greenhouses in temperate regions. True jasmines have delicate compound pinnate leaves, slender stems and extremely fragrant small yellow or white flowers, which are used in the manufacture of perfumes. Dried jasmine flowers are often included in Japanese and Chinese teas to give the beverages a pleasant fragrance. In the United States a fragrant vine of another unrelated genus (*Gelsemium*), an evergreen, is often called Carolina or yellow jasmine. The name comes from the Persian word for this flower, *yāsmīn.*

Jerusalem artichoke, see *Artichoke.*

Jewelweed or **Touch-me-not,** two American species (*Impatiens biflora* and *I. aurea*) found throughout moist regions in this country. They have hollow stems 2 to 5 feet tall, oval leaves with white undersurfaces, spurred brown and orange flowers that hang pendant, like earrings, and pods of seeds that pop open at the faintest touch, scattering their seed contents over a radius of several feet. The jewellike arrangement of the flowers gives them one common name; and the delicacy of the seed pods, the other. (The genus name *Impatiens* means impatient, irritable or sensitive.) They are members of the same genus as the garden balsam. Frequently any members of the genus *Impatiens* are referred to as jewelweeds.

Jimson weed, a poisonous plant (*Datura stramonium*) of the nightshade family found throughout Europe, Asia and North America. It has a tall, coarse stem, growing as high as 5 feet, white trumpet-shaped flowers that are followed by a prickly ovoid seed pod. An alkaloid contained in the seeds has been considered of high medicinal value in Europe and Asia for many centuries. Small amounts of atropin are extracted from it. (This drug is found in greatest quantities in belladonna, a close relative of the Jimson weed.) Sometimes the leaf is smoked as a remedy for asthma. *Stramonium,* an important drug, is extracted from the leaf. The plant was called *Jamestown weed,* apparently because it was found near the first English settlement in Virginia; the prickly fruit has given it the common name of thorn apple.

Joe-pye weed (*Eupatorium*), one of a genus of wildflowers of eastern North America that have thick leafy stems 3 to 10 feet tall, oval, whorled, serrate leaves and pink or purple clusters of flowers arranged in flat-topped heads. The plant belongs to the composite family, resembles the aster and is closely related to the boneset. It was named after Joe Pye, an Indian medicine man of the New England states who once traveled around the country advertising a tonic made of this plant as a cure for typhus.

Jonquil, see *Narcissus.*

Judas tree, see *Redbud.*

Jujube, one of a genus (*Zizyphus*) of small shrubs or trees of the buckthorn family native to the area east of the Mediterranean Sea. The different species vary from 20 to 50 feet in height. All have alternate leaves and hooked spines and are cultivated for their fruits, about the size of olives, that are dried and eaten as candy. The fruit is sometimes known as the Chinese date. This tree has been introduced into parts of the southern United States, where it is grown as an ornamental garden tree.

Juniper, one of a genus (*Juniperus*) of evergreen trees of the pine family with narrow leaves and fruitlike cones borne on the female trees. The common juniper (*J. communis*) varies from a shrub a few feet tall to a tree 30 feet high. Its blue berrylike fruits are used in making gin. The red cedar (a true juniper, *J. virginiana*) is a tall tree, valued for its wood, used in making lead pencils, posts and railroad ties. The western juniper of the Pacific coast (*J. occidentalis*) grows high in the mountains at altitudes of from 7,000 to 10,000 feet and specimens 2,000 years old are known. The red juniper has drooping leaf-sprays resembling ferns and silvery berries, making it a strikingly handsome tree. The fruits of many varieties yield oil of juniper, used medicinally as a diuretic and commercially in the manufacture of varnish.

Jute, one of a genus (*Corchorus*) of East Indian shrubs of the linden family. Two species (*C. capsularius* and *C. olitorius*) are cultivated for the bast fibers they produce, which are used for making cheap twines, cords, burlap, bagging, oakum and wrapping paper. Jute is not water-resistant and cannot be used for expensive fibrous materials. The plants grown for fiber are 6 to 12 feet tall and raised as annuals. They are planted very close together, so they grow erect with almost no branching. About 3,000,000 acres in the northeastern portion of British India are devoted to the cultivation of the two common species of jute. The word jute is derived from the Sanskrit *juta,* matted hair, descriptive of the appearance of the newly retted fibers.

Kaffir, a variety of sorghum, an East India grain cultivated extensively in the United States. Kaffir, sometimes called *Kaffir corn,* is a drought-resisting grain that is found in South Africa and grown throughout the arid regions of the United States. It is valuable as a pasture crop, fodder and silage and is as nutritious as corn. The seeds are fed to poultry, and the stalks to cattle and other grazing animals.

Kale, a headless variety of curly-leaved cabbage (*Brassica oleracea*), probably the original from which the cultivated headed cabbages were developed. It is grown for winter greens and food for stock. It is sometimes called *borecole,* husbandman's cabbage.

Kalmia, see *Laurel.*

Kapok or **Silk-cotton tree,** a tropical American tree (*Ceiba pentandra*) of the Bombax family cultivated principally in Java, Ceylon, Malaysia and the Philippine Islands for the fluffy silk fiber contained in its seed pods. The tree, which produces fiber for about 50 years, starting when it is 5 to 7 years old, has a ridged, heavy trunk, bell-shaped flowers and five-lobed leaves succeeded by the fiber-yielding pods. The fiber cannot be used for spinning. It is water resistant, elastic and buoyant and is used for stuffing mattresses, pillows and life-preservers, for making bathing suits and water wings and for insulating walls and ceilings. Kapok oil from the seeds is used in manufacturing foods and soap.

Kelp, see *Algae.*

Kentucky coffee tree, a tall tree (*Gymnocladus dioica*) of the eastern and central portions of the United States that has double, plume-like leaves, terminal clusters of white flowers and black seeds, used by the early settlers as a coffee substitute, contained in woody brown pods. It has rough, scaly reddish-gray bark and grows 50 to 100 feet tall. The tree is grown as an ornamental tree, and its hard wood is used for fence posts and other structures.

Kohlrabi, a species of cabbage (*Brassica caulorapa*) that has an edible stem growing into a strange turniplike enlargement appearing just above the ground and bearing several leaf stalks.

Kudzu, a leguminous vine (*Pueraria thunbergiana*) of China and Japan, grown in the United States as a forage plant. It produces luxuriant foliage and clusters of purple flowers on fibrous stems that are the source of the fiber called *kohemp.*

Kumquat, one of several shrubs of the genus *Fortunella* belonging to the citrus family and formerly considered a member of the genus *Citrus.* The kumquat is a small bushy tree, native of the Orient, growing from 6 to 8 feet tall and producing glossy green leaves, small fragrant white flowers and a fruit about the size of an olive but resembling a miniature orange. These fruits are eaten raw or preserved. To some extent they are now grown in some of the southern states of the United States and in greenhouses. The name comes from the Cantonese pronunciation of the Chinese words *kin kü* or gold orange.

Laburnum, a small genus of ornamental poisonous small trees of the pea family, natives of Europe but widely cultivated in the United States. These plants have dark green leaves and pendant sprays of bright yellow flowers. The wood is prized for cabinet and inlay work. The common laburnum (*L. vulgare*) is frequently called *golden chain.* Another variety is generally cultivated in greenhouses for Easter decorations.

Lacquer tree or **Varnish tree,** a Japanese tree (*Rhus verniciflua*) of the sumac family cultivated in the United States as an ornamental tree. In Japan this tree, which grows to a height of 20 or 30 feet, is cultivated for its poisonous milky sap, the chief source of the lacquer used in the Orient for the lacquered trays, cabinets, boxes and shrines made there.

Lady's-slipper, one of a genus (*Cypripedium*) of wild orchids found in north temperate and subtropical regions. There are about 30 species, each with a pouchlike labellum (lip) to the corolla that resembles a shoe and gives the plant its name of lady's-slipper or *moccasin flower.* This plant has a slender stalk rising from less than 1 foot to more than 2 feet above the ground and large oval deeply veined leaves wrapped around the stem. The few blossoms are large and showy and come in many colors: pink, white, yellow, purple, green, brown, red or orange. The stemless lady's-slipper (*C. acaule*), the state flower of Minnesota, has white or pink blossoms. The showy lady's-slipper (*C. spectabile*), one of the handsomest varieties, has hairy leaves and large red and white flowers that are very beautifully mottled. One form very easily grown in gardens is the large yellow lady's-slipper (*C. pubescens*).

Lamb's-quarters, a weed (*Chenopodium album*) of the goosefoot family found throughout most of North America and Europe. It is an annual, with a straight stem 1 to 9 feet tall, narrow serrate leaves and sprays of greenish-white flowers. This plant, sometimes called *white goosefoot,* is related to the beet and spinach; the green portions of young plants are sometimes cooked and eaten as a vegetable. *Chenopodium* means goosefoot.

Larch, one of a genus (*Larix*) of deciduous conifers of the pine family that have drooping clusters of needles arranged in spurs on graceful branches. Small rounded cones develop from rose-colored pistillate flowers. These trees, which grow from 30 to 200 feet tall, are found throughout the North Temperate Zone. The *tamarack* or American larch (*L. laricina*), sometimes called the *hackmatack,* is a resinous tree, frequently over 100 feet tall, found in the cold swampy regions of this continent. Its wood is valuable for ship's keels, telegraph poles, railroad ties and fuel. It is sometimes planted as an ornamental tree, as is the European larch. The western larch (*L. occidentalis*) is the tallest of the larches, occasionally attaining a height of 200 feet.

Larkspur, one of a genus (*Delphinium*) of wild flowers of the buttercup family that have tall sturdy stems 2 to 7 feet high, large deeply notched leaves at the base of the stalk and long rods of handsome flowers with spurred sepals of blue, purple, pink, cream, white or blended colors. There are five sepals and four petals to each flower. The appearance of the spurred sepal has given the blossom the name of larkspur. The name delphinium is derived from the Latin word for dolphin and has been applied to this plant because the gland that secretes nectar resembles a dolphin. In common usage the name larkspur is reserved for the annual varieties, and the name delphinium for the perennial forms. Many of the wild larkspurs are poisonous to cattle.

Laurel, a name applied to several genera of the laurel family (*Laurus, Umbellularia* and *Persea*) and some heaths, including the genus *Kalmia.* The Old World tree most frequently spoken of as laurel or *sweet bay* is *L. nobilis,* a handsome, tall tree with lustrous leaves (used in seasoning foods), yellow flowers and purple fruits that resemble cherries. Very similar in appearance to this tree is an American tree, the *red bay* (*P. borbonia*) found throughout the southern states. A member of the same genus is the *avocado,* a small wild laurel of Central America whose fruit is a favorite dessert and salad fruit. The *California laurel* (*U. californica*) is another tree commonly designated by this name. It is tall and luxuriant in foliage, with hard wood much used in cabinet making and shining evergreen leaves. The *heaths* commonly called laurel include the *mountain laurel* (*K. latifolia*) of the eastern United States, a small evergreen shrub with beautiful clusters of rose-pink flowers. It is the state emblem of Connecticut. Closely related is the sheep laurel or *lambkill* (*K. angustifolia*) so-called because like most of the kalmias, it is poisonous to sheep, although only the young animals seem to eat it.

Lavender, one of a genus (*Lavandula*) of small woody, perennial shrubs of the mint family native to the old world but cultivated extensively in America. These shrubs have tall spikes of delicately scented pale lilac flowers and narrow leaves. Both leaves and flowers are dried for use as sachet and to scent perfumes and other cosmetics. Because bags of this fragrant herb have been traditionally used to scent newly washed linens, it may have received its name from the Latin verb *lavare,* to wash.

Leek, a member of the lily family and a variety of onion (*Allium porrum*) that has a cylindrical bulb smaller than the onion, a broadened stem and succulent leaves eaten commonly in Europe as a relish and used as a condiment. The taste is milder than that of the onion. This plant is common in the Old World and the New. It is the floral emblem of Wales.

Legume, a general term for such plants as peas, beans and clovers that have alternate leaves and roots with warty growths (nodules) containing nitrogen-fixing bacteria. These bacteria are responsible for the plants' growth; they convert the nitrogen of the air into compounds usable for food by the plants. Legumes are planted to improve soil. Most of them are edible, either as vegetables for humans or fodder for pasture animals. They usually have spurred blossoms resembling sweet peas that come in a variety of pale colors and seeds growing in pods, a one-celled fruit breaking into two valves with the seeds attached by tiny stalks to each side of the shell. Some are erect plants; many are vines.

Lemon, an evergreen tree (*Citrus limonia*), native of Asia, that has been cultivated for its light yellow acid fruit. It is a relative of the orange and grapefruit. The lemon tree, which was cultivated in India thousands of years ago and has been grown in subtropical America, Europe and Asia for many years, grows 10 to 12 feet tall, has oval leaves and fragrant white flowers. The fruit is valuable for its juice and for the oil of lemon and citric acid extracted from it. The rind is frequently candied or preserved.

Lentil, an annual herb (*Ervum lens*) of the pea family that grows 6 to 18 inches tall and produces many branches, leaves ending in tendriled leaflets, blue or white flowers and two gray or red seeds enclosed in each pod. A native of the Old World, this plant has been grown widely in Europe, Asia and Egypt and to a very small extent in the United States. The red pottage of lentils mentioned in the story of Esau (Gen. 25:30, 34) was probably a dish of red lentil seeds. It is one of the oldest foods cultivated by man and is used in soups, stews or ground into meal. The name is derived from the Latin word *lens,* and because a typical double magnifying glass looks like a lentil seed the glass is called a lens.

Lettuce, an important salad plant (*Lactuca sativa*), a member of the composite family. Many types have been cultivated throughout the world for table use. These forms have all been developed from the wild lettuce, a native of central Asia now found in Europe and the United States. The wild lettuce has tall narrow leaves that contain a milky juice reputed to have given the plant its name. (The word lettuce was derived from *lactuca,* a Latin adjective that comes from *lac* or milk.) If cultivated lettuce is permitted to grow to seed, it will produce small daisylike flower clusters resembling those ordinarily produced by the wild lettuce. Three of the most common varieties of table lettuce are *leaf, head* and *cos* (or *romaine*) lettuce. Lettuce is grown in warm and temperate regions throughout the world and is an important greenhouse crop in the fall and autumn. It is very high in vitamin content, although it does not contain many nutritive elements. Lettuce was cultivated by the Persians more than 2,000 years ago.

Lichens, a group of composite plants of the lowest plant phylum (*Thallophyta*) found on rocks, the bark of trees, logs and similar objects throughout the world. They are common in polar regions, where such varieties as Iceland moss and reindeer moss are eaten by polar explorers, natives and grazing animals. The lichen is a symbiotic arrangement of multitudes of two different plant forms—algae and mold fungi. Each plant is essential to the life of the other and each is equally helpful, which is what is meant by symbiosis. The alga supplies the food, the fungus absorbs water and protects the alga. A variety of lichen, the *archil* or *orchella weed* of the Mediterranean coast, yields *litmus,* a blue coloring matter that turns red when in an acid medium and retains its own color in alkaline media. It is used by scientists to determine acidity or alkalinity of any substance.

Licorice, a European plant (*Glycyrrhiza glabra*) of the pea family that has pale green leaves and purplish flowers growing on a stem about 3 feet tall. It has sweet fibrous roots from which is extracted the licorice used in candies, soft drinks and flavors for medicines and tobacco. The plant is a native of southern Europe and is cultivated largely in the Mediterranean countries. Some is grown in the United States, but most of the commercial licorice used in this country is imported. Wild licorice, a related species (*G. lepidota*), is found in the United States, where children hunt it to chew its root, although it is not as sweet as the root of the cultivated species. The English word licorice is a corruption of the scientific name, which is Greek for sweet root.

Lignum vitae, see *Guaiacum.*

Lilac, one of a genus (*Syringa*) of garden shrubs of the olive family, natives of temperate regions of Europe and Asia but cultivated extensively in the United States. The lilac has thick, dark oval leaves and clusters (usually fragrant) of white or lilac four-petalled flowers. They are hardy bushes, occasionally growing to a height of 25 feet. In 16th century writings, they are described as blue pipe privets. The common lilac (*S. vulgaris*) has lilac or purple fragrant flowers and the white lilac (*S. vulgaris alba*) has white blossoms of unusual sweetness. A Japanese variety grows very tall but produces odorless flowers. The common name syringa is applied to flowers of another unrelated genus. The name is a Spanish form of the Arabic word *laylak,* and Persian *nilak,* bluish.

Lily, one of a genus (*Lilium*) of bulbous plants, indigenous to the United States, tropical America, Europe, Asia and Africa, with trumpet-shaped flowers that have three sepals and three petals and perianth tips rolled back. The leaves are narrow and pointed and scattered over the stem. The blossoms may be white, yellow, pink, red or orange, plain or mottled. The white Madonna lily (*L. candidum*) is a fragrant white variety. The Easter lily, a Bermudan variety (*L. longiflorum*), is a white species seen in greenhouses in this country. Many Oriental varieties are cultivated here. The regal lily (*L. regale*) is a showy Chinese flower that is grown in the United States; and so are the scarlet Turk's cap (*L. chalcedonicum*), the gold-banded lily (*L. auratum*) and the tiger lily (*L. tigrinum*) another Chinese form. The calla lily and the water lily are not true lilies; the calla is an arum and the water lily a member of the genus *Nymphaea.*

Lily-of-the-valley, a low perennial (*Convallaria majalis*) of Europe and America that has rhizomes that send up numerous shoots that produce a pair of large oval leaves surrounding a delicate curved spray, about 6 inches tall, of fragrant white nodding bell-like flowers. It grows wild in shaded areas.

Lima bean, see *Bean.*

Lime, an evergreen tree (*Citrus aurantifolia*) related to the orange and lemon trees, that produces a small, acid, greenish-yellow fruit whose juice is used in beverages and flavorings. Although this tree is Asiatic in origin, it is cultivated throughout Mexico, the West Indies, some of the Florida Keys and southern Europe. Lime trees are small and delicate with fragrant white flowers. Citric acid is extracted from the fruit.

Linden, see *Basswood.*

Litchi, a long-lived tree (*Litchi chinensis*) of China belonging to the soapberry family. It reaches an average height of 30 feet and produces large compound leaves, small flowers and many leathery-skinned, rose, oval juicy fruits, about 2 inches in diameter. These are dried and sold as litchi nuts. Upon drying, the skin becomes brown, brittle and wrinkled and the pulp shrinks and resembles raisins. The tree is cultivated extensively in India and the Philippine Islands.

Live-forever or **Orpine,** one of a genus (*Sedum*) of small perennials of the stonecrop family, a native of Asia and Europe but now naturalized in the United States. Originally a garden plant it now grows as a field weed. Some are erect and some are trailing. They usually have fleshy stems and leaves and tufted heads of white, purple, pink or yellow flowers. The common live-forever produces purple flowers at the tops of tall stalks. It received its name because root cuttings preserve their vitality a long time and will take root and grow easily. The name *orpine* is French, short for Latin *auripigmentum,* gold paint. In the Middle Ages orpine was used to heal wounds.

Live oak, see *Oak.*

Liverworts, a group (*Hepaticae*) of the phylum *Bryophyta* that are characterized by flat leaflike bodies (thalli) at the ends of long stalks usually attached to rocks or logs or found floating on the water. They are moss-like in structure and appearance and reproduce by means of spores produced in tiny organs at the end of erect stalks contained on the thallus. Like the mosses, to which they are closely related, they produce no seeds. They have received their name from a fancied resemblance to a human liver in the shape of the thallus.

Lobelia, a genus containing about 200 species of decorative plants, annuals and perennials, of wide distribution. Some South African species are trailing plants, growing about 6 to 12 inches above the ground, bearing blue, white or rose flowers with white centers. Many, such as the *American cardinal flower,* are tall erect plants. The cardinal flower grows on a stem 2 to 4 feet tall in low swampy regions. It has narrow serrate leaves and scarlet blossoms, borne in clusters, that are trumpet-shaped, divided into five petals, two of which are erect and three spreading. *Indian tobacco,* another lobelia, has small blue flowers with inflated capsules. The leaves, which the Indians used for smoking, and flowers have a tobaccolike odor. The juices of the fruit yield a drug used medicinally as an antispasmodic. The name was given in honor of Matthias de Lobel, a Flemish botanist.

Locoweed, any plant of two genera *Oxytropis* and *Astragalus* of bushy herbs of the American southwest and western plains. These members of the pea family are dangerous weeds because horses and cattle that eat them become crazed (*loco* in Spanish) and eventually die as a result of the plants' slow poisoning. The animals stop eating and drinking, lose weight and starve themselves to death. A common variety of this weed is the purple loco (*A. mollissimus*) found principally in Texas. It has compound bluish leaves and clusters of purple or pinkish flowers. The seeds are borne in dry brittle pods that rattle in the breeze, giving the plant the name of *rattleweed.* The white loco or rattleweed (*O. lamberti*) and the blue loco (*A. diphysus*) resemble the purple in structure and poisonous effect.

Locust, one of a genus (*Robinia*) of thorny American forest trees of the pea family that have showy pealike flowers and leaves that droop and close at night or at the approach of rain. It is a slender tree growing 40 to 80 feet tall with wood that is very durable and valuable in ship-building and for use as railroad ties, fence posts and other structures exposed to weathering. Locusts produce orange seeds in small, flat, reddish-brown pods. The common locust (*R. pseudo-cacia*) has two varieties, the yellow and the black locusts, named for the color of their wood. A related species is the clammy locusts (*R. viscosa*), with pink flowers and sticky hairs covering its branches. The tree called the *honey locust* (*Gleditsia triacanthos*) is not a member of this genus but belongs to another group of the pea family. It is a thorny tree growing from 80 to 140 feet tall, with green flowers and pods about a foot long that contain seeds imbedded in a gummy substance children like to chew. This pulp is sweet, resembling honey. In the southwest the *mesquite* is sometimes called honey locust, and in Europe the *carob* is sometimes called a locust, because the bean looks like the insect. The name was later transferred to the other trees.

Loganberry, one of the brambles, a variety of blackberry, sometimes considered a cross between the blackberry (*Rubus ursinus*) and a wild raspberry. This theory is disputable. The bush appeared for the first time in 1881 on the estate of Judge J. H. Logan, Santa Cruz, California. A hardy, prickly bush, it resembles the blackberry in appearance and habit but produces a purplish berry that tastes like the raspberry. It thrives in the northwestern states and has been cultivated in many other parts of the United States, although it is not very sturdy on the Atlantic coast.

Logwood, a Central American tree (*Haematoxylon campechianum*) of the locust family with peculiarly ribbed bark, thorny branches and dark red heartwood that is one of the most valuable dyewoods known because it contains a coloring matter, *haematoxylin,* from which red, blue, black and purple dyes are made for silks and woolens. The freshly cut wood is ground up, soaked in water and then evaporated, producing the dye. Different materials are included in the water in which the wood is soaked to produce the different colors desired. An astringent extract derived from the wood is an important medical principle.

Lombardy poplar, see *Poplar.*

Loofah, see *Vegetable sponge.*

Loquat, a small evergreen tree (*Eriobotyra japonica*) of the rose family that produces large oblong leaves with rusty undersurfaces, fragrant white flowers and a yellow, acid fruit, the loquat, resembling a miniature pear. It is a native of Japan but has been cultivated in the United States in California and in those states bordering on the Gulf of Mexico. The tree, which grows from 10 to 12 feet high, blossoms in the fall and produces its fruit in the spring. The fruit is eaten raw, cooked or preserved. It is sometimes incorrectly called the *medlar.* Loquat is the Cantonese pronounciation of the Chinese name for this tree, *lo kwat.*

Lotus, a name given to many plants, particularly those of the genera *Nelumbo, Castalia, Zizyphus* and others. One of the plants frequently referred to as a lotus is the Indian or sacred lotus (*Nelumbo nelumbo*), an aquatic plant with large cuplike flowers of white or pink with four or five sepals and many petals surrounding a fleshy fruit receptacle suggesting a water nozzle. This plant is frequently represented in Hindu art. The scientific name comes from the Singhalese word for this flower, *nelumbu.* The yellow water lily of America (*Nelumbo lutea*) is a close relative commonly called a lotus. The Egyptian lotus or water lilies (*Castalia lotus* and *C. coerula*) are blue flowers, sacred to the ancient Egyptians and prominent in their paintings and carvings. In legendary Greek history, the lotus was the fruit of a tree eaten by the lotus-eaters, Lotophagi, an African tribe. When it was eaten the legendary lotus caused complete forgetfulness of the past. This plant is identified with the jujube tree (*Zizyphus lotus*). The water lilies that we commonly call lotus flowers today all float on the surface of ponds and are attached to the bottom by means of long stalks growing from the underground roots.

Luffa, see *Vegetable sponge.*

Lupine, one of a genus (*Lupinus*) of plants of the pea family that are native to the Old World and the New. The lupines grow about 1 or 2 feet tall and are fond of sandy soil. In the United States they are very numerous in the west. The *bluebonnet* (*L. subcarnosus*), state flower of Texas, is a lupine that has silky compound leaves with narrow leaflets and clusters of bright blue bonnet-shaped flowers with white or scarlet centers. The ancients cultivated lupines and ate their seeds; but American varieties produce inedible seeds that are frequently poisonous, causing the death of much livestock. Most lupines have blue or purple flowers, although there are white and yellow varieties. The name is an adjective from the Latin word *lupus,* wolf, because it was once believed that the lupine destroyed soil in which it grew, much as a wolf destroys animals.

Madder, one of a genus (*Rubia*) of Asiatic and European herbs grown in the warmer parts of India, Europe and America. For centuries important red, purple and orange dyes have been extracted from its roots. Madder has whorls of leaves, small yellowish flowers and fleshy fruit. Its dye was known to the ancient Egyptians, and many mummy cloths in old tombs were dyed with madder. Doctors of the Middle Ages and ancient times used it as a medicine. It stains the bones, beaks and claws of animals and birds fed with it, making it useful in studying bone growth and disease. *Alizarin,* the dye that produces the color called Turkey red, was formerly made from madder; now it is produced from coal tar.

Madroña, a small evergreen tree or shrub (*Arbutus menziesii*) of the heath family, native to the Pacific coast of North America. It produces white flowers, large glossy leaves that are white on their undersurfaces, edible orange-red fruits called madroña apples and a smooth bark varying in color from red to brown. The wood is used for charcoal and in the manufacture of gunpowder.

Magnolia Gardens of South Carolina

This famous English landscape garden, 12 miles from Charleston, South Carolina, was designed by the Reverend John Grimke Drayton about 1830 and is still owned by his descendants. The garden itself comprises 25 acres, and in front of the house is a lawn of 16 acres. Besides the magnificent magnolia trees, azaleas, camellias, cypresses and live oaks grow in profusion

Magnolia, a genus of ornamental American and Asiatic trees with aromatic bark, fragrant waxy white, yellow or rose flowers, cone-shaped fruits and glossy leaves. Magnolia blossoms are the largest flowers produced by any cultivated tree, often measuring a foot in diameter. The large-leaved *umbrella tree* (*M. tripetala*) is one of the best known American magnolias. Its leaves are arranged like the ribs of an umbrella at the end of the stems, and the flowers resemble water lilies. The *sweet bay* of the southwestern United States (*M. virginiana*) is an evergreen magnolia, about 15 feet high, with leaves that are bluish green above and silver below. The wood is used in making bowls and other utensils. The *large flowered magnolia* (*M. grandiflora*), state flower of Louisiana and Mississippi, grows 70 feet tall and produces beautiful creamy flowers with a lemonlike scent. One of the Indian varieties grows over 100 feet tall and has flowers varying from rose to purple. The plant was named after Pierre Magnol, a 17th-century French botany professor.

Mahogany, a tree (*Swietenia mahogani*) of Central America and the West Indies that has been cultivated in Florida and Bengal. It has compound leaves resembling those of the ash, clusters of small flowers, a pearlike fruit and valuable wood, brown to reddish brown, of uniform grain and texture that takes a high polish and is much used in cabinet work and for veneers. Such trees as the related khaya of West Africa and certain Australian myrtles and eucalyptus trees are incorrectly called mahogany. Some unrelated American shrubs (*Cercocarpus*) of the rose family are called *mountain mahogany* because they have hard reddish wood suggesting the true mahogany.

Maidenhair tree, see *Ginkgo*.

Maize, see *Corn*.

Mallow, a genus (*Malva*) of weeds and a family native to Europe but growing wild in the United States. Some species are annual, others perennial. Most of them bear pink, blue or white flowers, lobed leaves with scalloped edges and flattened fruits commonly called cheeses. The fruits contain a pleasant tasting mucilaginous substance, in which the seeds are imbedded; it has been used as a home remedy for coughs and colds. The common mallow (*M. sylvestris*) is an erect biennial with purplish flowers, called *mauve* in French. This name is used to describe a color resembling that of the flowers. They are shaped like small hollyhocks. The round-leafed dwarf mallow (*M. rotundifolia*) is another common form, a creeping perennial that grows in sandy soil and produces toothed leaves and pink flowers. Related genera of the same family are those containing the hibiscus, hollyhock and marsh mallow. The name mallow is derived from the Greek *malakos*, soft, because the plant's juices have demulcent properties and because the mallow has downy soft leaves.

Mandrake, a European shrub (*Mandragora officinarum*) of the potato family indigenous to the Mediterranean countries. It has a short stem, ovate leaves, a single purplish blossom and forked roots to which supernatural powers are attributed. It was once believed that the roots shrieked when the plant was picked, and Shakespeare referred to the shrieking mandrake roots in several places. It was considered a favorite charm of witches and was formerly used as an emetic, purgative and narcotic through Europe and the Orient. It is still used medicinally and as a love philter in Africa and the Orient. The name mandrake is frequently applied to the American May apple.

Mangel-wurzel or **Mangold**, a variety of long-rooted beet (*Beta vulgaris macrorhiza*) that produces a short stem with a rosette of leaves in its first year and a tall branching stem that produces flower clusters in its second year. The plant has a long rootstock containing sugar and is cultivated, particularly in Europe, for cattle food. It is also grown in Canada and the northern United States. Although it grows best in cool climates, it is easily destroyed by frost. *Mangoldwurzel* is German for beetroot.

Mango, an evergreen tree (*Mangifera indica*) of southern Asia that grows 40 to 50 feet tall and has glossy foliage, slender smooth oval leaves, sprays of yellow flowers and large pear-shaped greenish yellow fruits. Sometimes these delicious fruits weigh as much as 4 pounds. This tree belongs to the sumac family. It has been cultivated in Hawaii, the East and West Indies and parts of Florida and California. The fruit is eaten raw or preserved. Unripe fruits are frequently pickled. In India, where the tree has been under cultivation for centuries, the roasted seeds are occasionally eaten. The fruit of the wild mango is much more sour and less palatable than that of the cultivated varieties. The name comes from the native name of the tree in India.

Mangrove, a genus (*Rhizophora*) of tropical and subtropical trees with aerial prop roots. The trees thrive in muddy flats and form dense, forests around estuaries and tidal flats in warm countries throughout the world. They produce arched adventitious roots from which new trunks arise, causing the mangrove to spread in a manner similar to that of the banyan. The trees are often 75 feet tall and the individual trunks have a diameter of about 3 feet. The bark is astringent, yielding a substance used in tanning. The aerial roots breathe by means of pores (*lenticles*). The seeds of the edible fruit sprout before they drop and are able to propagate new plants as soon as they touch the ground. Some of the best known varieties are the red, white and black mangroves, named for the color of their bark. The West Indian name was *mangle*, and *manglegrove* or *mangrove* originally meant a group of these trees.

Manila hemp, see *Abacá*.

Manzanita, one of a genus (*Arctostaphylos*) of 40 species of evergreen shrubs of the heath family. They produce white or pink flowers, smooth leaves, gnarled branches and brown fruits resembling little apples; *manzanita* is Spanish for little apple. They are native to the Pacific coast of North America and are conspicuous for their reddish or chocolate brown bark.

Maple, a genus (*Acer*) of trees (with 150 species) found throughout the Northern Hemisphere. They are tall trees with slender branches, long-stalked palmate leaves and clusters of small yellow, green or red flowers that produce fruits—seeds with flat wings—growing in pairs on a stem. In some species—such as the *Norway maple*—the flowers appear before the leaves, in other species—such as the *sycamore maple*—the flowers follow the leaves. The *sugar maple* (*A. saccharum*) is a hardwood tree of the northeastern United States growing about 120 feet high and producing 3 types of wood prized in cabinet work: curly, wavy or bird's-eye maple. Most maple sugar is produced from the sap of this tree. Very similar is the black maple (*A. nigrum*). The *box elders* (*A. negundo*) are small, water loving maples of Canada and the United States with compound leaves. The sycamore or great maple (*A. pseudo-platanus*) is a maple of Europe and western Asia, about 70 feet tall, producing a valuable hard wood. The Norway maple (*A. platanoides*) of Europe and Asia is a similar tree, about 100 feet tall. There are two common American softwood maples, the *silver maple* (*A. saccharinum*) that has leaves with white undersurfaces and the *red maple* (*A. rubrum*), a tree producing red flowers in the early spring before the leaves appear. These are commonly planted as ornamental trees.

Marguerite or **Paris daisy**, a perennial shrub (*Chrysanthemum frutescens*) of the daisy family that has a branching stem about 3 feet high, delicate leaves and many flower heads or white raylike flowers surrounding a center of tiny pale yellow flowers. This native of the Canary Islands has been in cultivation by florists and gardeners in Europe and the United States for more than 200 years.

Marigold, a genus (*Tagetes*) of old-fashioned pungent-leaved garden flowers with yellow, red or brownish blossoms belonging to the composite or daisy family. The two most common species, the tall straight-stemmed African marigold (*T. erecta*) and French marigold (*T. patula*), a dwarf with velvety russet flowers, are natives of Mexico cultivated extensively in both hemispheres. The name marigold is also applied to a variety of calendula (*C. officinalis*), the pot marigold, a tall composite with flower heads of golden rays. The marigold was sacred to the Virgin Mary.

Mariposa lily, a genus (*Calochortus*) of perennial American plants of the lily family with long narrow leaves, bulbous roots and tuliplike blossoms of white, red, yellow or lilac frequently marked with spots of color resembling those on a butterfly's wing. Mariposa is the Spanish word for butterfly. This tall-stemmed plant is the state flower of Utah. Western Indians ate the bulbs of these plants.

Marjoram, one of a genus (*Origanum*) of aromatic herbs of the mint family, natives of Asia and Mediterranean Europe. Their leaves and flower buds are dried for use as a condiment. The wild marjoram (*O. vulgare*) is a hardy plant widely distributed in the United States. It has a thick stem about 3 feet tall, oval leaves and purple flowers. The sweet marjoram (*O. marjorana*) is raised as an annual. It produces grayish leaves and white flowers. The plant is usually grown for its aromatic leaves, which are cut when the plant begins to flower then allowed to dry thoroughly in the shade.

Marsh mallow, a perennial plant (*Althaea officinalis*) of the mallow family that grows 2 to 4 feet high and produces delicate pink flowers and oval leaves. It abounds in the coastal marshes of Europe and the United States. The roots produce a sweet gummy substance formerly used in making the candy of the same name, which is now made artificially.

Marsh marigold, a genus (*Caltha*) with 20 species of flowers that grow in damp places in temperate regions of America and Europe. They have hollow stems, glossy kidney-shaped leaves and usually yellow flowers. The leaves and stems of young plants are eaten as greens. One variety (*C. palustris*) is known in the United States as the *cowslip.* In the Rocky Mountains, from Alaska to Mexico, there is another variety (*C. leptosala*) with blue-white blossoms. This genus is not related to the true marigold.

Maté, see *Holly.*

May apple, an American herb (*Podophyllum peltatum*) of the barberry family with a long branched root, umbrella-shaped leaves growing on tall stout stems and nodding white flowers borne on separate stems. A fleshy, oval, yellow fruit is produced. All parts of the plant except the fruit are poisonous. Even the fruit may cause illness. The rootstock produces podophyllin, a drug used in a powerful cathartic and liver medicine. This plant is sometimes known as *swamp apple* or *mandrake.*

Mayflower, see *Arbutus.*

Mayweed, a genus (*Anthemis*) of weeds of the composite family native to Europe but found in sandy places throughout North America. The *common mayweed* or *dog fennel* (*A. cotula*) is a strong-smelling plant that grows about 2 feet high and has yellow-centered, white-rayed flower heads resembling daisies. The finely serrate leaves were once used for a tea given in treating colic. The *garden camomile* (*A. nobilis*) is a similar plant whose leaves were made into a beverage formerly believed to be a blood purifier.

Medlar, a small Asiatic and European tree (*Mespilus germanica*) that has many branches and produces a flattened, globular fruit resembling a crab apple used in making preserves. It belongs to the same family as the apple and the pear tree. When it is partially decayed, the unpreserved fruit has a pleasant taste, but if eaten when it has just ripened, it has a gritty, acid taste. This name medlar is sometimes incorrectly applied to the loquat.

Melon, a popular name for two groups of plants, the *muskmelon* and its many varieties (cantaloupe, cassaba, honeydew, Persian and rock melon) and the *watermelon.*

Mesquite, one of a genus (*Prosopis*) of thorny trees and shrubs of the mimosa and acacia family that grow throughout the arid regions of the southwestern United States, Mexico and South America. Mesquite has a strong, reddish, hard wood used for posts, fuel, charcoal and cabinet work. These plants produce pinnate leaves, spikes of odorous greenish flowers and seeds in yellow beanlike pods. The taproot is a long unbranched organ, penetrating deep into the earth in search of water. The root frequently grows down deeper than 60 feet, making it possible for the mesquite to thrive in arid regions that will support no other vegetation. When a mesquite grows into an unstunted tree 40 or 50 feet high, it is an indication that there is water within 40 feet of the earth's surface. The common mesquite (*P. juliflora*) has long seed pods; closely related is the screwpod mesquite (*P. pubescens*) whose seeds are produced in a twisted pod. The seeds are eaten by Mexicans and Indians and form a valuable fodder for livestock. The name is a Spanish variation of the Mexican Indian name for this plant, *mizquitl.*

Mignonette, a genus (*Reseda*) of small flowers native to Europe, Asia and Africa but grown in gardens of both hemispheres for their fragrant spikes of greenish flowers that have tufts of brownish anthers on the upper petals. The wild flower is a small plant that grows very close to the earth sending out many branches with tiny flowers and broad leaves that form a dense blanket over the soil. It has been bred for larger flowers at the cost of the strong, sweet aroma. Beekeepers plant mignonette for their bees. The Romans used it to treat bruises. The name is French and means little darling.

Milkweed, one of a large genus (*Asclepias*) of plants of North and South America that exude a milky substance (*latex*) when injured and have pods containing a silky down. Milkweeds usually have wavy-edged oblong leaves and large clusters of small white, pink, red, purple, lavender or orange blossoms. The petals are so shaped that insects coming for nectar can not help but carry pollen from one blossom to another. These plants must be cross-pollinated and depend entirely on insects because the pollen is too sticky to be wafted by the wind. The seeds are winged with a silk down that makes it possible for them to be distributed by the wind. The common milkweed (*A. syriaca*) has purple-pink or brownish-pink blossoms. The butterfly weed (*A. tuberosa*) has bright orange flowers. A large group with whorled leaves are called *whorled* milkweeds, and still others have poisonous juices, making them troublesome weeds.

Millet, any of several genera (*Chaetochloa, Panicum, Pennisetum* and *Eleusine*) of small-seeded cereal grasses cultivated for grain and grass. They have been cultivated in the Orient for more than 5,000 years. *Common millet* (*Panicum miliaceum*) has been cultivated in Europe, Asia and Egypt since prehistoric days. The grain is mixed with wheat for bread flours and is also fed to poultry. *Foxtail millet* (*C. italica*) is a smaller grain grown considerably in the United States where it is fed to poultry. *Pearl millet* (*Pennisetum glaucum*) is an African variety grown throughout the Orient. Some species over 8 feet tall come from tropical Africa and the Amazon valley. *Sorghum, Deccan grass, broomcorn millet* (a brushy variety cultivated largely in the United States as poultry feed), *barnyard millet* (a variety of Deccan grass found in the United States) and *raggee millet* (an Indian variety used as food by the peasants) are some of the most important of the many types of grasses known as millets. In the United States, millet is grown chiefly for fodder, but in many parts of Europe and the Orient the various varieties form important parts of human diet.

Mimosa, a genus of tropical South American trees, shrubs and herbs comprising about 400 species. They have delicate feathery leaves, small white or pink flowers in round clusters and seeds in bivalved pods. Chief among the varieties cultivated in northern greenhouses is the common *sensitive plant* (*M. pudica*) of Brazil. As in the case of many others of this genus, the slightest stimulus will cause the plant to droop and close. If one of the compound leaves is touched, its leaflets will fold over one another, the stalk will droop, and the movement will spread to other leaves of the tree. Many varieties have been transplanted to Asia and tropical Africa. The roots of some Brazilian species, such as the common sensitive plant, are poisonous. The name is derived from the Greek *mimos,* imitator, and was given to this plant because it "plays dead" when it is touched.

Mint, one of a genus (*Mentha*) of about 25 species of herbs found throughout the world. They have square stems, aromatic leaves, creeping roots and clusters of blue, pink or white flowers. Included are the *peppermint* (*M. piperita*) and the *spearmint* (*M. spicata*) commonly raised in gardens for their leaves. Peppermint grows in damp places and produces small reddish-blue flowers. It is propagated by means of rootstocks. Large amounts are produced commercially in Michigan, Indiana and Oregon. The volatile oil used in making soaps and perfumes and in flavoring candies and medicine is extracted from resinous dots in the leaves. A similarly used volatile oil is extracted from the leaves of spearmint. A variety of spearmint (*M. sylvestris*) that has hairy leaves and denser flower spikes is believed to be the mint mentioned in the Bible. *Pennyroyal* (*M. pulegium*) is another member of this genus. It is known by its whorled flowers. Closely related is the *American pennyroyal* (*Hedeoma pulegioides*), similar in appearance and fragrance and also used as a flavoring, a salad and tea. Closely related to this genus are other genera, members of the same mint family, including lavender, sage, marjoram, thyme, basil, rosemary and horehound.

Mistletoe, either of two parasitic plants (*Phoradendron flavescens* and *Viscum album*) of the family *Loranthaceae.* The American forms, *Phoradendron,* have thick smooth yellowish-green leaves on forked stems, small greenish flowers, male and female on separate plants and suckerlike roots growing into trees to draw water and mineral food. White waxy berries are produced; these are eaten by birds who, in wiping their bills on tree trunks, deposit some of the fleshy pulp there, thus implanting the mistletoe into a new host. In the United States there are many varieties of mistletoe, living on cypresses, willows, oaks, maples and poplars. They are named according to the tree upon which they are found. The European mistletoe, *Viscum album,* is a similar plant, usually parasitic on apple trees. Mistletoe is generally seen growing in joints of tree limbs. It is used principally as a decoration for Christmas festivities and was held sacred by the ancient Druids. The name is sometimes given to other parasites of the same family, as the dwarf mistletoe (*Arceuthobium pusillum*), a parasite of evergreens. The state flower of Oklahoma is the mistletoe.

Mockernut, see *Hickory.*

Mock orange, see *Syringa.*

Mold, a fungus growing in microscopic threadlike structures on animal or vegetable substances. Fungi reproduce by means of microscopic spores, found in multitudes in the air, produced by tiny sporiferous stalks that form the white, cream, yellow, brown, green, blue or black stains found on moldy food and mildewed paper or material. Molds will ruin canned or preserved foods unless the cans or jars are thoroughly sterilized. Mold spores are very difficult to kill and are very numerous, so that molds continuously multiply in tremendously large numbers.

Moneywort, a handsome, trailing, perennial European wildflower (*Lysimachia nummularia*) of the primrose family with golden-yellow flowers. It frequently grows as a troublesome weed in gardens and pastures in the United States where it was introduced by the early settlers.

Monkshood, see *Aconite.*

Moonflower, a vine (*Calonyction aculeatum*) related to the morning glories and often called *evening glory.* It has purple-throated, white flowers, flatter than morning-glories, that bloom at night. It is grown as a shading vine for porches but often escapes from cultivation and becomes a troublesome weed.

Morning-glory, several tropical American species of the convolvulus family belonging to the genus *Ipomoea.* Morning-glories are annual, slender vines that have hairy stems, heart-shaped leaves and trumpetlike flowers that open wide in the morning. The blossoms are sometimes 3 inches long and may be pink, rose, purple or blue—one solid color or multicolored. These plants are related to the potato. They have been cultivated in northern gardens, where they climb on walls, gates and trellises, and are often found as wild flowers. Most garden varieties have been developed from the common morning-glory (*I. purpurea*).

Moss, one of a class (*Musci*) of plants of the phylum *Bryophyta,* classified just below the ferns in the plant kingdom. They have small leafy or tufted stems bearing sex organs (*antheridia* and *archegonia*) that give rise to oöspores, which in turn produce capsules containing asexual spores; the asexual spores produce the protonema, an embryonic form from which the gametophytic generation arises by budding. Mosses grow throughout the world and thrive best in cool regions. They cover rocks and bare places, as do lichens. They grow in profusion in bogs, where *Sphagna* or peat mosses are generally found.

True mosses, *Bryales,* cover tree trunks, ruins and shady brook banks. By covering roots, they act as a winter protection to other plants. *Andreaea* or *rock mosses* cover rocks and boulders. In Arctic regions moss is used as a winter food for animals and as the material for a coarse bread. Trees and plants are packed with moss, animals' beds are made of moss, and in some countries pillows and mattresses are stuffed with these soft plants.

Mountain ash, a genus (*Sorbus*) of small ornamental trees of the rose family found in the temperate regions. They have delicate fernlike foliage resembling the leaves of the ash and clusters of creamy flowers that produce bunches of orange-scarlet berries. The blossoms resemble those of the apple, to which the tree is related. The European mountain ash or *rowan* (*S. aucuparia*) is frequently planted in American parks and gardens. The American mountain ash (*S. americana*) is rarely taller than 30 feet.

Mulberry, a genus (*Morus*) of trees of the mulberry family, native to the Old World and the New. Leaves of different shapes—lobed, smooth and partially notched—grow on one tree. Separate clusters of tiny male and female flowers are borne, occasionally on separate trees. They produce very sweet fruits that are eaten raw, cooked or preserved. The *white mulberry* (*M. alba*), a Chinese tree cultivated in New England and parts of Europe, is the species whose leaves are favored by silkworms producing the best silk. Its blackberrylike fruits are pale yellow. The *black mulberry* (*M. nigra*) of Persia, cultivated in many countries, produces black fruits that are the best for eating purposes and are grown for that purpose in many European countries. The *red mulberry* (*M. rubra*) is a native of North America.

Mullein, a biennial wildflower (*Verbascum thapsus*) of the figwort family with coarse wooly white leaves, a stiff stem 2 to 7 feet tall produced in the second year and bearing a spike of white, yellow or purple flowers that bloom for one day. It is a native of Europe and America, where it grows as a weed along rocky hills and dry fields and pastures. The ancient Greeks burned mullein leaves for lampwicks, and the Roman funeral torches were suet-coated mullein stalks. From the felty texture of the leaves mullein is sometimes called *feltweed* or *flannel leaf.* From its tall flowering stem it is called *Aaron's rod.*

Mushroom, a type of fungus including many edible varieties, mostly of the genus *Agaricus,* and many highly poisonous forms commonly called *toadstools.* Mushrooms generally have numerous underground rootlike filaments (*mycelia*) nourishing very thick short stalks that bear umbrellalike spore-carrying heads (*pilei* or caps) composed of numerous radiating folds. Like all fungi mushrooms have no chlorophyll, cannot manufacture their own food and live on decaying plant or animal matter in dark, damp regions. Most edible mushrooms are raised in greenhouses. The name may be related to the French *mousse,* moss.

Muskmelon, one of a genus (*Cucumis*) of annual vines of the gourd family native to Asia but grown in other warm countries including the southern United States. The delicious fruits (melons) of this vine are borne on a hairy prickly stem with round leaves and yellow starlike flowers, male and female. A green knob on the female blossoms develops into the melon, which occur in many varieties: round or oblong; smooth or ridged; gray, orange, yellow or white, with flesh that is smooth, firm and hard or soft and watery. *Cantaloupes* are hard-rind ridged muskmelons grown in Europe, but the name is sometimes applied to a small American variety with netted pulp. The *cassaba* is a large round smoothskinned melon with rich creamy pulp. It grows late and is sometimes called winter muskmelon. *Honeydew melon* or *Persian melon* is a white, oval muskmelon, introduced into the United States from Persia, that has a thick, green, sweet flesh and a white, smooth rind. Melons seem to have been cultivated in Asia ever since food crops were raised. A variety of melon was raised by the ancient Egyptians.

Mustard, certain species of the genus *Brassica,* to which the turnip and cabbage also belong. The mustards have stiff branching stems 1 to 6 feet tall, yellow heads of tiny flowers and round seeds producing a pungent oil. The black mustard (*B. nigra*) is the common form supplying the common condiment, made by grinding the seeds into a fine powder. White mustard (*B. alba*) produces seeds used in pickling and making medicinal preparations. Both grow in Europe and America wild and under cultivation. In some places the greens are used as a vegetable. There are certain wild *mustards* that belong to different genera: tumbling mustard (*Sisymbrium altissimum*), hedge mustard (*S. officinale*) and garlic mustard (*Alliaria officinalis*).

Myrtle, a fragrant member of a Mediterranean genus (*Myrtus*) of shrubs and trees that grow 3 to 10 feet tall and produce small glistening leaves and white or faintly pink flowers followed by black berries. The plant is now grown as a hedge in Florida and California and as a potted plant in the northern states. The wood has a fine grain and is used in turning fine gunstocks. An oil extracted from the leaves is used medicinally. Various parts of the plant, all strong-smelling, are used for perfumes and other cosmetics and once were used as a condiment. From ancient times myrtle flowers have had significance in the Hebrew religion. The Romans considered myrtle sacred to Venus. The Greeks crowned winners of Olympic games with myrtle wreaths. The plant known as *crape myrtle* is an unrelated Oriental flowering shrub (*Lagerstroemia indica*) about 20 feet high grown in the United States as a decorative hedge. It produces dark pointed leaves resembling those of the myrtle and small pink or red blossoms. It thrives in the South but is grown as a pot plant in the North, remaining outdoors only during the summer.

Nannyberry or **Sheepberry,** a large American shrub (*Viburnum lentago*) of the honeysuckle family that grows 20 to 30 feet tall with delicate branches, glossy oval leaves and white flowers growing in clusters, which produce fruits that turn from green and pink to deep blue and black. The fruits last all winter.

Narcissus, a genus of bulbous Old World plants of the amaryllis family, native to Asia and central and southern Europe. They have slender leaves and white or yellow flowers with a six-divisioned perianth revealing a ruffled corona that is trumpet-shaped or disclike. There are several groups. The true narcissus is a white flower with an orange line edging the corona. The *daffodil* (*N. pseudo-narcissus*) is a yellow scented blossom growing singly on a stem about 18 inches tall with a prominent corona. The *jonquil* (*N. jonquilla*) is a paler yellow fragrant blossom growing in clusters at the top of a slender stalk. The corona is small and flatter than the perianth. Belonging to this same small-corona group is the *Chinese sacred lily* (*N. tazetta*). Another division of this genus includes the *poet's narcissus* (*N. poeticus*), a delicate blossom having the perianth much more conspicuous than the small corolla. The genus name comes from Narcissus, a youth mentioned in Greek mythology who was changed into a flower when he died.

Nasturtium, one of a genus (*Tropaeolum*) of South American annual flowering plants with a pleasant pungent aroma, cultivated in gardens in Europe and North America. They have large umbrella-shaped leaves and handsome spurred yellow, scarlet and maroon flowers. Dwarf nasturtiums (*T. minus*) grow only a few feet high, but a tall species (*T. majus*) may attain a height of 20 feet or more. The leaves are sometimes eaten in salads, and the seed pods are edible when pickled. The generic name is derived from the Greek *tropaion,* trophy, because the flowers and leaves resemble helmets and shields (classic war trophies). The name nasturtium (also the generic name of cresses), meaning nose-twisting, applies to the pungent flavor.

Nectarine, see *Peach.*

Nettle, one of a genus (*Urtica*) of coarse herbs of the Old and New Worlds with small greenish leaves, sharp stinging hairs on the serrate leaves, and watery juices. The *stinging nettle* (*U. gracilis*) is found in the eastern and middle regions of North America, and a close relative (*U. dioica*) is cultivated in Europe. This form produces a coarse fiber that was used for cloth in the World War. Nettle roots yield a yellow dye, and the young plants of some species are eaten as greens. The pointed nettle needles break off when they come in contact with anything, and an irritating liquid in the hair's base runs into the wound, causing a temporary irritation. A strong white glossy silklike fiber (*ramie*) made into tablecloths and other so-called linens is produced by *China grass,* an Oriental nettle (*Boehmeria nivea*) of a different genus but the same family. The plant itself is also called *ramie.* It produces small white flowers and the fiber is obtained from the young and tender shoots. Another name for the material made of these fibers is grass cloth.

New Jersey tea, a small American shrub (*Ceanothus americanus*) of the buckthorn family that grows 1 to 3 feet tall and produces oval serrate leaves, branches covered with fine hairs, many dainty white flowers and a deep red root formerly used in dyeing and in the preparation of certain medicines. The greens of this plant were used by the early settlers as a tea.

Night-blooming cereus, a variety of cactus (*Cereus grandiflorus*) found, with several variants, throughout the southwestern United States, Central America and the West Indies. It has a climbing stem that attaches itself to supports by means of aerial roots and huge creamy fragrant flowers, about a foot in diameter, that bloom very rarely and open only at night. This plant has been cultivated in northern greenhouses, and many hybrids of it are known. Cereus is Latin for waxy; the plant resembles the column of a wax candle.

Nightshade, one of a genus (*Solanum*) of American annuals and perennials of the potato family that have smoothly branching stems, wavy oval leaves and clusters of white flowers producing juicy berries that are usually black, red or yellow and reputedly poisonous. The black nightshade (*S. nigrum*), producing black berries, and the bittersweet nightshade (*S. dulcamara*) are representative species.

Norfolk Island pine, a plant (*Araucaria excelsa*) of the pine family that in its native South Seas grows over 200 feet high and has luxuriant needlelike green leaves. It is grown in greenhouses in the United States as a small potted plant suitable for house decoration, particularly at Christmas time. This plant was first seen by Captain Cook when he touched at Norfolk Island in the South Pacific during one of his voyages of exploration.

Nutmeg, an evergreen spice tree (*Myristica fragrans*) of the myrtle family, native to the Molucca Islands, that grows 50 to 60 feet tall, producing simple oval leaves, tiny sprays of bell-like flowers and a peachlike fruit containing a brown-shelled seed (nutmeg) in a red waxy membrane. The dried membrane, which turns yellow, is the spice *mace.* The fruit is preserved and eaten as a candy or jelly. The nutmeg is ground and eaten as a spice; at one time it was pickled and eaten as a food. Nutmeg trees are now cultivated in South America and the West Indies.

Nux vomica, a medium-sized East Indian tree (*Strychnos nux-vomica*) with oval shining leaves and greenish flowers, growing in clusters, that produce globular fruits about the size of oranges. The drug nux vomica is obtained from the green seeds imbedded in the bitter white fruit. The most bitter of all drugs, it is highly toxic. The seeds are one of the sources of strychnine. In small doses nux vomica is a tonic and stimulant.

Oak, a large genus (*Quercus*) of hardwood trees often referred to as cupbearers because their fruits (acorns) are borne in a cup. The cupped acorn identifies oak trees, which are distributed throughout the world, thriving in many different climates and soils. Most oaks are tall, ranging from 100 to 150 feet, although a dwarf variety, the scrub oak, rarely grows taller than 10 feet. Oak leaves are simple, five-ranked and usually oval. There are two groups of oaks, the white-oak group, with round-lobed leaves, including the *white,* the *bur, chestnut* and other oaks; and the black-oak group, with sharp-lobed leaves, including the *red, pin, black* and other oaks. The leaves change color in the fall but hang on to the tree until the spring. The leaves of the *live oak* (*Q. virginiana*), an evergreen variety, last for several years. Some oaks fruit annually, others biennially. Flowers of both kinds, staminate and pistillate, are borne on the one tree, the male flowers growing in loose tassels and the female flowers growing singly or in tiny clusters. They all make good shade trees and are valuable for their lumber, which is used in making furniture, houses and ships. The live oak is a striking tree, about 75 feet tall, generally found in the southern United States and Mexico, where it grows covered with festoons of Spanish moss. It has leathery leaves and the lumber is among the most valued of oak woods. Ranking with it as lumber trees are the *English oak* (*Q. robur*) and the white oak (*Q. alba*). The *cork oak* (*Q. suber*) is a small evergreen, about 40 feet high, native to the Mediterranean countries; it has a light spongy bark that is made into the cork of commerce. The bark is stripped about once every 9 years without damaging the tree, which lives to be about 150 years old. Some cork oaks are grown in the United States, but the world's supply of cork comes principally from Spain and Portugal.

Oats, an important cereal grass (*Avena sativa*) cultivated throughout the north temperate regions. It is an annual grass derived from two wild species (*A. fatua* and *A. sterilis*). It is grown as a food for stock and as the source of the breakfast food oatmeal. Oats have been cultivated in Asia and Europe for thousands of years, but only since the advent of modern milling methods have they been raised as a food for human beings. Today oats rank high among the important crops of the United States. Wild oats are sometimes sowed as a forage plant, but this practice introduces a pest difficult to eradicate into wheat fields. Oats are frequently planted with clover as a rotating crop.

Oil palm, see *Palm.*

Okra or **Gumbo,** a tropical African annual (*Abelmoschus esculentus*) of the mallow family that produces seeds in mucilaginous pyramidal pods. The pods are cooked as a vegetable, used pickled or green for thickening soups and other dishes. It is now cultivated in many parts of the United

States, particularly in the South. The name okra comes from the West African native name *nkruman,* and gumbo also is an African name.

Oleander, a small evergreen tree or shrub (*Nerium oleander*) of the periwinkle family, growing 7 to 15 feet tall, with slender waxy leaves and sprays of flowers varying in color from white to rose. This shrub is a native of the Orient and southern Europe but has been cultivated in warm countries of both hemispheres. Every part of it is poisonous. Oleanders are grown as street and hedge trees in California and Bermuda and as potted plants in the North, thriving outdoors during the summer.

Oleaster, one of a genus (*Elaeagnus*) of showy shrubs 10 to 20 feet tall producing silvery leaves, fragrant yellow flowers and olive-like fruits that are usually bright red. Some species of oleaster are deciduous; others are evergreen. All are natives of the Orient and Mediterranean Europe but have been cultivated in the warm regions of the United States. This plant is sometimes called *wild olive* because of the shape of the fruit, but it is not related to the true olive. The name is derived from the Latin *olea,* olive.

Olive, an evergreen tree (*Olea europaea*) of the olive family that grows 25 to 35 feet tall and has dull, willowlike gray-green leaves, shining white flower clusters and small fruits that become black when they are ripe. The tree is native to Mediterranean Europe, Asia and Africa. Olives are very bitter and can not be eaten until they have been soaked in lye, which removes the bitterness. Both green and black olives are thus treated before marketing. The olive has been cultivated in the Near East and southern Europe since time immemorable. The Franciscan fathers introduced the plant into California in the 18th century. It is also cultivated in Mexico, South America and Australia. An important commercial oil used in foods and cosmetics is obtained from pressed ripe olives. The olive branch has long been considered a symbol of peace.

Onion, a biennial bulbous plant (*Allium cepa*) of the lily family with hollow leaves and a strong flavored edible root that may be white, red or yellow and either round or flat. It has been cultivated for thousands of years. A native of southwestern Asia, it now has almost universal distribution. Bermuda and Spanish onions and onions planted from seed imported from the Canary Islands are all grown in the United States. *Chive* is a related plant of the same genus, to which the *leek* also belongs. *Shallot,* a Syrian plant with pointed bulbs used widely as a flavoring for meats and stews, is another species (*A. ascalonicum*) of the same genus. The name is from the Latin *unio,* union, oneness; the onion is a unit of layers—the pearl, built the same way, is called *oignon* in French and *unio* in Latin.

Orange, one of several species of citrous fruits grown in warm regions throughout the world, although they are natives of southern Asia. The Chinese or *sweet orange* of ordinary use (*C. sinensis*) is raised wherever oranges are grown. The orange groves of the southern United States have been developed since the Spanish settlers brought the fruit to Florida in the 17th century and the mission fathers brought it to California in the 18th. It is eaten fresh and its juice makes a healthful, refreshing drink especially rich in Vitamin C. The peel is dried and candied. Orange oil and paste are other products. The principal varieties are the seedless navel (introduced from Brazil), the Washington and Valencia. The Temple orange is believed to be a hybrid of the sweet orange and the *mandarin orange* or *tangerine* (*C. nobilis*). Mandarin oranges are a smaller group called kid glove oranges, because their skin is easily removed. They are raised to a great extent in the Gulf states. Tangerine is the name of a brilliant reddish orange color. The *sour* or *Seville orange* (*C. aurantium*) is bitter and unfit for eating but is used in making marmalade. Bergamot oranges (*C. bergamia*) are a variety sometimes considered a separate fruit. The word orange is derived from the Sanskrit word *nāraṅga,* orange tree. The initial syllable (*or-* instead of *nar-*) results from confusion with the French word *or,* gold, because the fruit is golden in color.

Orchard grass, a tenacious perennial forage grass (*Dactylis glomerata*) of Europe that is grown in the United States. This plant, which is known as *cocksfoot* in England, has tufts of tall stout stems and crowded clusters of flowers.

Orchid, one of a family (*Orchidaceae*) of more than 5,000 strange plants found all over the world except in very cold or arid regions. There are two main groups: plants with roots in the soil and those with aerial roots. Included in the first group are the common *lady's slipper* and the fringed *orchis,* which produces flower clusters of pink, yellow or white spurred blossoms. The second type of orchids are all tropical and are much prized as greenhouse flowers. Some are found only in inaccessible jungles. All must be raised slowly from seed found by difficult tropic exploration, making orchids very expensive. The tropical orchids have leaves varying greatly in size and shape and magnificently colored flowers of fantastic shapes. Frequently one of the petals is enlarged into a hollow sac or into a long spur; the petals and sepals are often fringed or scalloped. The plants are not parasitic. The spongy aerial roots draw moisture and food from the air, not from the other plants around which they grow as clinging vines. *Vanilla,* a common flavoring extract in candies, cakes, cosmetics and tobacco is obtained from the dried seed pods of any one of a genus (*Vanilla*) of orchids native to the hot jungles of eastern Mexico but cultivated in the West Indies, Ceylon and Java. They climb to great heights and have oval leaves and pale green flowers. The flat-leaved vanilla (*V. planifolia*) of Mexico supplies most of the vanilla of orchid origin. Much vanilla is now manufactured artificially from oil of cloves, asafoetida and substances extracted from various fir trees. The name *vanilla* is the Spanish diminutive of *vaina,* sheath, referring to the pod in which the seeds are found. The words *orchid* and *orchis* come from a Greek word meaning testicle, referring to the winding roots of these plants.

Oregon grape, a small shrub (*Mahonia aquifolia*) of the barberry family that grows about 5 feet tall, producing spinous compound leaves, clusters of yellow flowers and dark blue berries that resemble grapes. It is a native of the Pacific coast of North America and is the state flower of Oregon.

Orris root, see *Iris.*

Osage orange, a sprawling thorny American tree (*Maclura pomifera*) of the mulberry family native to the region between Texas and Missouri, the home of the Osage Indians. This plant, frequently grown as a hedge, has strong heavy wood useful for ties, posts, tool handles and woodenware; glossy dark green leaves, staminate and pistillate flowers on separate trees and hard round yellow fruits, resembling warty oranges, that are unfit to eat. This tree grows from 30 to 60 feet high. Early French settlers called it *bois d'arc,* bow wood, because the Osage Indians used the wood for their thin bows. This name has been corrupted to *bodark* and *bodock,* names frequently applied to the tree locally. Yellow, orange, tan, gold and olive dyes are extracted from the bark.

Osier, see *Willow.*

Oswego tea, a North American perennial plant (*Monarda didyma*) of the mint family that grows about 3 feet high and has fragrant pointed leaves, square hairy stems, shaggy clusters of showy red flowers and a creeping rootstock. Sometimes this plant is called *wild bergamot* or *bee balm.* The genus name *Monarda* is in honor of a Spanish physician Niccolo Monardés (d. 1578).

Oxalis, a genus of small plants of the tropics and temperate zones, with delicate stems, small trifoliate leaves and clusters of delicate pink, lavender, yellow or white flowers that close in dull weather. The *wood sorrel* (*O. acetosella*) is an oxalis found in Canada and the United States, where it was introduced from Europe. It has bell-like white flowers and, as in all the members of this genus, a pleasantly acid juice in the leaves and seed pods. Violet sorrel and yellow wood sorrel are found in the southern states. In addition to the colored blossoms, they bear seed-producing buds close to the ground. Although the wood sorrels are natives of temperate regions, some varieties of oxalis are tropical and can only be grown in this country in greenhouses. Oxalis is derived from the Greek word for acid, and sorrel is a corruption of the German *sauer,* sour. Both names refer to the pleasantly acid taste of the green portions of this plant. Children often call sorrel *sourgrass.*

Oyster plant, see *Salsify.*

Palm, any one of many genera of striking, tall tropical trees of the family *Arecaceae,* distributed throughout the hot countries of the world. There are about 1,200 species, including some of the most valuable plants grown. Every part of palm trees is useful. The fan-shaped, featherlike leaves thatch the roofs of native houses, provide fans, mats and other articles and occasionally, as in the case of young coconut palm (*cocos nucifera*) leaves, they are eaten as greens. Flowers and fruits, many of which are edible, are borne in large clusters. Most palms are tall, a few are undershrubs, and some, as the *rattan palm* (a species of *Calamus*), climb by means of hooks and prickles.

Courtesy Nassau, Bahamas Information Bureau

Cluster of Coconuts

Besides their direct use as food, coconuts produce medicinal and cosmetic oils, fiber for cordage and matting and coconut milk, a beverage drunk fresh or fermented in the tropics. Shredded coconut and coconut oil is made from copra or dried coconut meat. The coconut palm is invaluable in the Pacific and Indian Ocean islands, the West Indies and tropical America. From its leaves are made thatched roofs; from its wood, furniture; and from the nut husks, eating utensils

Oils used in wax and cosmetics are derived from the seeds; sugar and wine come from the sap of some palms; the trunks are used for building materials and fuel; the timber, of such forms as the coconut palm, is used in cabinetry; and the stems, as of the rattan, may be made into canes and wickerwork chairs.

Among the most valuable is the coconut palm, native to the islands of the Pacific and Indian Oceans, the West Indies and tropical America. Atop a slender trunk 60 to 100 feet tall, 15 or 20 long feathery leaves grow in a cluster. Hanging beneath them are large round fruits covered by a thick husked shell, inches deep. They contain a layer of meat surrounding a cavity filled with a juice, coconut milk. The dried coconut, *copra,* is the chief product of the South Sea island trade, supplying cargoes for thousands of tramp freighters. Copra supplies edible dried or shredded coconut and the coconut oil of cosmetics and medicines. Coconut shells are made into cups and ladles. The husks yield a fiber, *coir,* that is made into cordage, matting and other fibrous materials. The trunk is used for canes and posts, and the wood (*porcupine wood*) is used in cabinetwork.

The *areca* or *betel nut palm* (*Areca catechu*) is a native of Asia, Malaysia and the Philippine Islands. It yields a nut about the size of a hen's egg that is boiled and dried, then placed between the leaves of a pepper, the *betel-vine,* and chewed by the natives of many countries. It stains the lips and teeth a dark red.

The *oil palm* (*Elaeis guineensis*) is a palm of Africa and the East Indies, 20 to 30 feet tall, with a deeply ringed trunk. In the center of the cluster of its many-divisioned leaves is a bunch of reddish-orange fruits, resembling plums, that yield the palm oil used in soaps, medicines and industry. The nuts yield a cosmetic oil, too.

The *date palm* (*Phoenix dactylifera*) is a tall straight tree requiring hot dry weather. It thrives in Arabia and the desert regions of Africa. From beneath its crown of glossy feathery leaves the fruit, the chief source of Arabia's wealth, hangs in large bunches.

Dates were introduced into California by the Spanish missionaries for the sake of the leaves, used in Palm Sunday services. It now grows in California and Arizona.

The *palmetto*, a species of *Sabal*, is a smaller palmlike plant found in the southern United States and the West Indies. It has frayed leaves, black fruits and tender flower buds eaten like cabbage head.

The *royal palm* (*Roystonea regia*) is a popular shade tree in all tropical and semi-tropical cities. It grows to a height of about 100 feet, has a crown of plumelike leaves and bears huge clusters of bright yellow berries.

Cabbage palm is a name applied to any palm with a big bud that is eaten as a vegetable, especially *Roystonea oleracea*.

The *raffia palm* (*Raphia ruffia*) of Madagascar supplies the valuable fiber, *raffia*, used commercially in basketry, weaving and millinery. It is the peeled and dried skin of the leaves of the raffia palm. Another raffia palm (*R. vinifera*) is the principal source of palm wine, the fermented beverage made from the juice of the tree.

The *sago palm* is a small East Indian tree, rarely over 30 feet high, that grows in marshy places. It dies soon after producing its fruits. When it blooms, the pith of its trunk fills with starch that later passes into the fruits, leaving the trunk a hollow shell. From this starch is extracted sago, used in making custards similar to tapioca and made into a bread that is the chief food of millions of Oriental people. To get the starch, the tree is cut down when the flower appears, and the starch is scraped from the trunk pith.

Palmetto, see *Palm.*

Paloverde, either of two small spiny desert trees (*Cercidium torreyanum* and *C. floridum*) of the southwestern United States and Mexico. They have stiff alternating branches, green bark, delicate pinnate leaves and clusters of small bright yellow five-petaled flowers. The leaves and flowers fall after a short time, and the tree is then bare and sticklike, which accounts for its name, the Spanish equivalent of green stake.

Pampas grass, a forage plant (*Cortaderia argentea*) found in South America where it covers great areas of the *pampas* or plains. It is tall and reedlike with basal coarse leaves and beautiful fluffy plumes, 6 to 12 feet high, of white silky flowers. Several varieties were cultivated in California for those plumes that gives the specific name *argentea*, silvery, to the plant.

Pansy, a cultivated perennial believed by some to be a variant and by others a hybrid of the wild pansy (*Viola tricolor*) related to the violet. It is native to cool regions of Europe but is grown in both hemispheres. Pansies bear varicolored flowers of wonderful velvety texture on stalks a few inches tall. Cultivated pansies have been developed in combinations of blue, yellow, brown and violet, forming countless variations in the color scheme of the large-petalled blossoms that look like nodding faces. Wild varieties have small purple and yellow flowers. Because pansies have been under cultivation for hundreds of years in England and the United States, they have many common names; for example, the wild pansy is called *heartsease* and *love-in-idleness*, and the dwarf varieties are called *Johnny-jump-up*. The name pansy comes from the French *pensée*, thought, because of the *pensive* appearance of the hanging heads.

Papaw or **Pawpaw,** a small tree or shrub (*Asimina triloba*) of the custard apple family found in southern and central United States. It is frequently 35 feet tall, produces broad leaves that narrow at the base and skirted cuplike red or purple malodorous flowers that give rise to the fruits. These fruits, sometimes called *custard apples*, resemble small bananas. The rind becomes black when the fruit ripens, and the pulp, which resembles custard, bears a double row of seeds. All other members of this family are tropical. The name is a corruption of the Spanish word *papaya*, and it is sometimes applied to the papaya.

Papaya, a tall herbaceous tropical American plant (*Carica papaya*) somewhat resembling a palm tree. It has a cluster of large palmate leaves and yellow flowers crowning a stem that may be 25 feet tall. It bears huge ovoid melonlike fruits, weighing from 15 to 20 pounds, that have an orange pulp tasting like a very rich muskmelon. The milky juice in the stem, leaves and fruits of this plant contains a pepsinlike digestive enzyme, *papain*, sold commercially in a powder form as an aid to digestion. The papaya has been introduced into tropical countries throughout the world. The fruit is popular in hot countries, where it is eaten as a melon or in salads. Cooks in warm countries frequently wrap papaya leaves around cooking meats, as the enzyme in the leaves helps render the meat tender. This plant is sometimes called *papaw.*

Paper mulberry, an ornamental tree (*Broussonetia papyrifera*) related to the true mulberries. It is a native of Eastern Asia and the Pacific Islands but is cultivated in warm parts of the United States. Its leaves and flowers resemble those of the mulberry, but its fibrous bark is used to make *tapa*, the bark cloth of the South Seas used by the Islanders as dress and decorative material. The bark is cut into thin strips, retted and beaten into sheets of cottonlike material and stained with many colors into the intricate designs native to the various groups of islands. Different island groups have different characteristic designs. It is commonly made through most of Melanesia and Polynesia. A thin silky paper in which tea is often wrapped is made by the Chinese and Japanese from the bark of young shoots of this tree.

Paprika, see *Pepper, Red.*

Papyrus or **Egyptian paper plant,** a tall plant (*Cyperus papyrus*) of the sedge family native to Egypt. It has a long triangular reedlike stalk growing about 15 feet tall and bearing at its top an umbrella-shaped cluster (*umbel*) of thin, long leaves and flower sprays. The ancient Egyptians cut the pith of this plant into long strips, arranged them into layers, soaked and pressed them to form long sheets and rolls of writing material. The Romans and Greeks also used papyrus as we use paper. In Egypt papyrus was used as late as the 9th century. The plant is grown as a decorative plant in the United States and Europe, but it is not hardy in cool regions. The wind blowing through the feathery strands of the plant's umbel gives it a graceful attractive appearance. The genus name *Cyperus* is Greek for sedge.

Parsley, a European biennial herb (*Petroselinum hortense*) of the parsley family with tightly curled leaves and an umbrellalike cluster of small flowers. Its finely serrate leaves are used as a garnish and seasoning for various foods, and the root of one variety, Hamburg parsley, is eaten as a vegetable. Oil of parsley, made from the seeds of this plant, is used medicinally. It has been cultivated in European and American gardens for centuries.

Parsnip, a biennial vegetable (*Pastinaca sativa*) of the parsley family with edible roots and stems 2 to 5 feet high bearing many compound leaves and clusters of small yellow flowers. The white conical root was reported by Pliny to have been brought to Rome every year from the provinces across the Rhine to please the palate of the emperor. It has been cultivated as a common garden plant in Europe since the Middle Ages. It is now grown as food for man and as fodder for cattle. The wild parsnip, from which the edible variety was cultivated, grows as an injurious pest. The name comes from the Latin *pastinare*, to dig up.

Pasque flower, see *Anemone.*

Passion flower, one of a large genus (*Passiflora*) of tropical climbing vines that produce strikingly handsome flowers and melonlike fruits. The plants received their name from the early Spanish missionaries who saw in the plant the story of Christ's crucifixion. The corona, a double fringe of slender colored threads that makes the flowers unusual, represented to them the crown of thorns; the colored stamens and pistils suggested the nails of the cross and the marks of the wounds; and the five white petals and sepals stood for ten apostles, omitting Peter and Judas. The common passion flower (*P. cerulea*) is a native of Brazil that is frequently cultivated in warm parts of the United States. Its flowers are blue, white and purple. The *maypop* (*P. incarnata*) is a purple and white passion flower native to the southern states. The *granadillas* (*P. quadrangularis*) are Brazilian and West Indian varieties that have fruits nearly a foot long. These melons are popular as edible fruits, and the juices are used for cooling drinks. The name *granadilla* is Spanish for little pomegranate.

Pea, one of a genus (*Pisum*) of hardy perennial legumes that climb by means of tendrils. This plant has compound featherlike leaves and blossoms of white or purple, resembling sweet peas, that produce straight pods containing the seeds. Many edible varieties have been developed, all of them very nutritious. Garden peas (*P. sativum*), which have been cultivated for at least 1,000 years in Europe and Asia, were probably developed from the field pea (*P. arvense*). The different varieties of garden peas are all sweeter and more tender than the field peas, which are usually raised for stock food and green manure but are eaten in many parts of the Old World. *Pease*, the old form for the singular (from the Latin *pisum* and French *pois*), is now occasionally used to represent peas of many kinds collectively.

Peach, a tree (*Amygdalus persica*) of the rose family, closely related to the plum, almond and apricot, that has many branches, narrow leaves, pink five-petaled flowers and edible fruits occurring in many varieties. It is a delicate tree, easily injured by frost. A native of the Orient, this tree was cultivated in China for several thousands of years and introduced into Persia and Europe, and thence the Spanish conquerors brought it to the United States. Many varieties of fruit have been developed from this one species. There are freestone and clingstone peaches, double and single flowered trees, round and oval fruits and fruits with white or yellow flesh. Most peaches have a downy velvety skin, but a smooth skinned variety, *nectarines*, has been developed.

Peanut, an annual tropical American hairy-stemmed vine (*Arachis hypogaea*) of the pea family. It grows about a foot high, producing many double leaves and bright yellow flowers. The flowers give rise to pods that bend downward, enter the earth and ripen underground, where the seeds are produced. The peanut commonly eaten is not a nut, but the dried pod of this plant. It has been known in South America since prehistoric times, has been cultivated in Africa for more than 400 years, is an important crop in Asia and India and has been known in the southern United States since the 18th century. The nutritious pods are eaten as food, raw or roasted, and used in candies and cakes. The green portions are made into hay for stock. Peanut oil and peanut butter are made from the seeds and pods. The oil is nutritious and digestible. In the southern part of this country peanuts are frequently called *goobers* (from an African word). They are also known as earthnuts, groundnuts, monkeynuts and ground peas.

Pear, a European and Asiatic tree (*Pyrus communis*) of the rose family, closely related to the apple, that has glossy pointed oval leaves, white flowers and sweet, gritty ovoid fruits. The trees frequently grow 75 feet tall, though dwarf varieties are usually produced in cultivation. The hard wood of this tree is used for wooden ware and cabinetmaking. When dyed black it is used as imitation ebony. Many varieties of trees have been cultivated, in Europe and America, with fruit differing greatly from the small, hard, bitter fruits produced by the wild pear. The Bartlett pear, named after the man who introduced it into the United States, is a large sweet fruit; the Seckel or sugar pear is a small, hard, sweet variety, and the Kieffer is a coarse winter pear much less tasty than the others. Closely related to these varieties of the common pear is the sand pear (*P. sinensis*) of China and Japan, often used as a stock for grafting.

Pecan, see *Hickory.*

Peepul or **Pipal tree,** see *Fig.*

Pelargonium, see *Geranium.*

Pennyroyal, see *Mint.*

Pentstemon or **Beardtongue,** one of a genus (*Pentstemon*) of American herbs related to the figwort and snapdragon that grow wild in the western states but have been cultivated in many other places. They grow from 2 to 4 feet tall and have clusters of long, tubular white-throated blossoms of blue, purple or shades of red. The presence of four perfect stamens and one sterile stamen gives the plants their name of pentstemon, Greek for five stamens.

Peony, one of a genus (*Paeonia*) of bushlike European and Asiatic perennials of the buttercup family that have thickened rootstocks growing deep into the ground, thick stems about 3 feet tall, glossy notched leaves and large globular double red, rose, pink, white or mottled flowers. This flower has been cultivated by gardeners and florists in both hemispheres. The Chinese peony (*P. albiflora*) of Siberia is a common garden variety with double or single white and magenta flowers. The common peony (*P. officinalis*) of Europe is a plant with white, pink or red flowers and is extensively grown in the United States. The tree peony (*P. suffruticosa*) or mountain peony is a native of the Far East that has stems from 3 to 6 feet long and rose, magenta and white flowers of a gorgeous satiny texture, often measuring a foot across. The wild peony (*P. brownii*) is a reddish-brown variety found wild in the mountains of the Pacific states. The root of the common peony is used as a nerve tonic, and the name peony originally meant the flower of Paeon, the Greek god of healing.

Pepper, a clinging vine (*Piper nigrum*) of the pepper family that grows 20 to 30 feet tall and is customarily supported against trees. It has ovate leaves and spikes of flowers that produce red berries, turning yellow when they are old. From these berries the black and white pepper used as a condiment is obtained. Black pepper is derived from the unripened berries, which are dried and ground. Ripe berries, dried, peeled and soaked in water, produce the white pepper. Pepper has been cultivated in the Orient since ancient times, and the spice trade stimulated the traders of the 15th century to find a shorter route to the Orient. The Dutch East Indies and India are still the greatest pepper growing countries in the world, although pepper vines are now cultivated in other tropical countries. Singapore is the leading pepper port. A volatile oil is extracted from this vine and a related species (*P. longum*). Pepper is used medicinally as a carminative. Another member of this genus is the *cubeb* (*P. cubeba*), a woody, climbing shrub found in Malaysia. The aromatic bitter berries or cubebs are dried and used in remedies for asthma and respiratory diseases, sometimes in the form of cigarettes.

Peppergrass, one of a genus (*Lepidium*) of annuals of the mustard family that have branching bushlike stems 2 feet high, curly notched leaves and clusters of small white flowers. It is a cool weather annual cultivated as *garden cress.* When it is allowed to grow wild, it frequently becomes a weed pest in pastures.

Pepperidge, see *Tupelo.*

Peppermint, see *Mint.*

Pepper, Red, one of a genus (*Capsicum*) of tropical American shrubs of the nightshade family, closely related to the tomato. They have small, round flowers and dry pungent berries with many seeds that are used as a relish, flavor and condiment. The pods are eaten green or ripe, when they turn red. *Paprika* is made by grinding mild red peppers. Strong paprika is ground with the seeds, their absence making the paprika milder. Another variety, the *Spanish sweet pepper,* is called *pimento* and is used in salads and for stuffing olives. *Cayenne pepper* is made from the dried, ground fruits of the *Guinea pepper* (*C. annuum*) and the *spur pepper* (*C. frutescens*). *Sweet peppers,* sometimes called mangoes, are eaten stuffed and in salads. Small red peppers are used for pickling and for flavoring catsup, chili con carne, chowchow and other relishes. The genus name comes from the Latin *capsa,* box, referring to the boxlike shape of the pods. Medicinally, peppers are used in treating neuralgia, rheumatism, tonsilitis and delirium tremens.

Pepper tree, an evergreen tree (*Schinus molle*) of the sumac family native to South America but grown in California as an ornamental and shade tree. It grows 20 to 50 feet tall and has drooping branches, compound pinnate leaves, clusters of small whitish male and female flowers, borne on separate trees, and rose or red spicy berries. The Franciscan fathers brought it into Mexico and California from Peru. Its growth in the United States is being discouraged because it is a host to the black scale, a serious pest in orange orchards. The berries are sometimes eaten as peppers in South America.

Periwinkle, a trailing perennial garden plant (*Vinca minor*) with glossy evergreen leaves and solitary purplish blue flowers borne in the axils of the stems. This variety, the blue periwinkle, is the most common of these plants and is native to Europe but naturalized as border and window box plants in the United States. There are other varieties with purple or white flowers. The Madagascar periwinkle (*V. rosea*) is a tropical variety. Periwinkle thrives in shady spots, covering the ground. It is sometimes called *blue myrtle, running myrtle* or *vinca.* The name is applied to a lilac-blue color resembling the shade of the flowers of the common periwinkle. The genus name means binder, twiner from Latin *vincere,* bind; and the English name comes from *pervinca,* from Latin *pervincere,* bind thoroughly.

Persimmon, one of a genus (*Diospyros*) of trees and shrubs of the ebony family with hard elastic wood, long, thick, oval leaves and yellow bell-like flowers. When the trees, which grow 30 to 50 feet tall, are old, the bark is marked into squares. The pistillate flowers, borne on separate trees from the male flowers, produce round orange-brown fruits that are very delicious when they have been touched by frost but are extremely sour and puckery before they are entirely ripe. The Japanese persimmon (*D. kaki*) is a larger sweeter fruit, resembling a tomato, and it comes in seeded and seedless varieties. It is cultivated in the Orient and the Pacific states. The common persimmon (*D. virginiana*) grows wild in the southern United States. Another persimmon (*P. lotus*) is known as the date-plum. The name is derived from a Virginian Indian word, *pasiminan* meaning dried fruit.

Pe-tsai or **Chinese cabbage,** a variety of cabbage (*Brassica pekinensis*) that has a lettucelike head of tightly wrapped edible leaves. The inner leaves, used for coleslaw, salads and cooked dishes, are crisp, white and tasty. Pe-tsai is a relative of the cabbage and mustard and has been raised in China since the 1st century, A.D., although just recently introduced into the United States. It is sometimes called *celery cabbage.*

Petunia, a genus of South American annuals of the potato or nightshade family that have weak hairy stems 6 to 24 inches tall, smooth oval leaves and fragrant, trumpet-shaped, ruffled flowers of white, purple, violet or mingled colors. It has been cultivated as a garden and florists' flower in the United States, where many new varieties have been developed. The usual species seen in cultivation are the Argentinian purple petunia (*P. violacea*) and white petunia (*P. axillaris*) and the hybrid (*P. hybrida*) forms developed from them. The name comes from the Tupi Indian word *petum,* tobacco or smoke. Petunia is the name of a reddish-purple color.

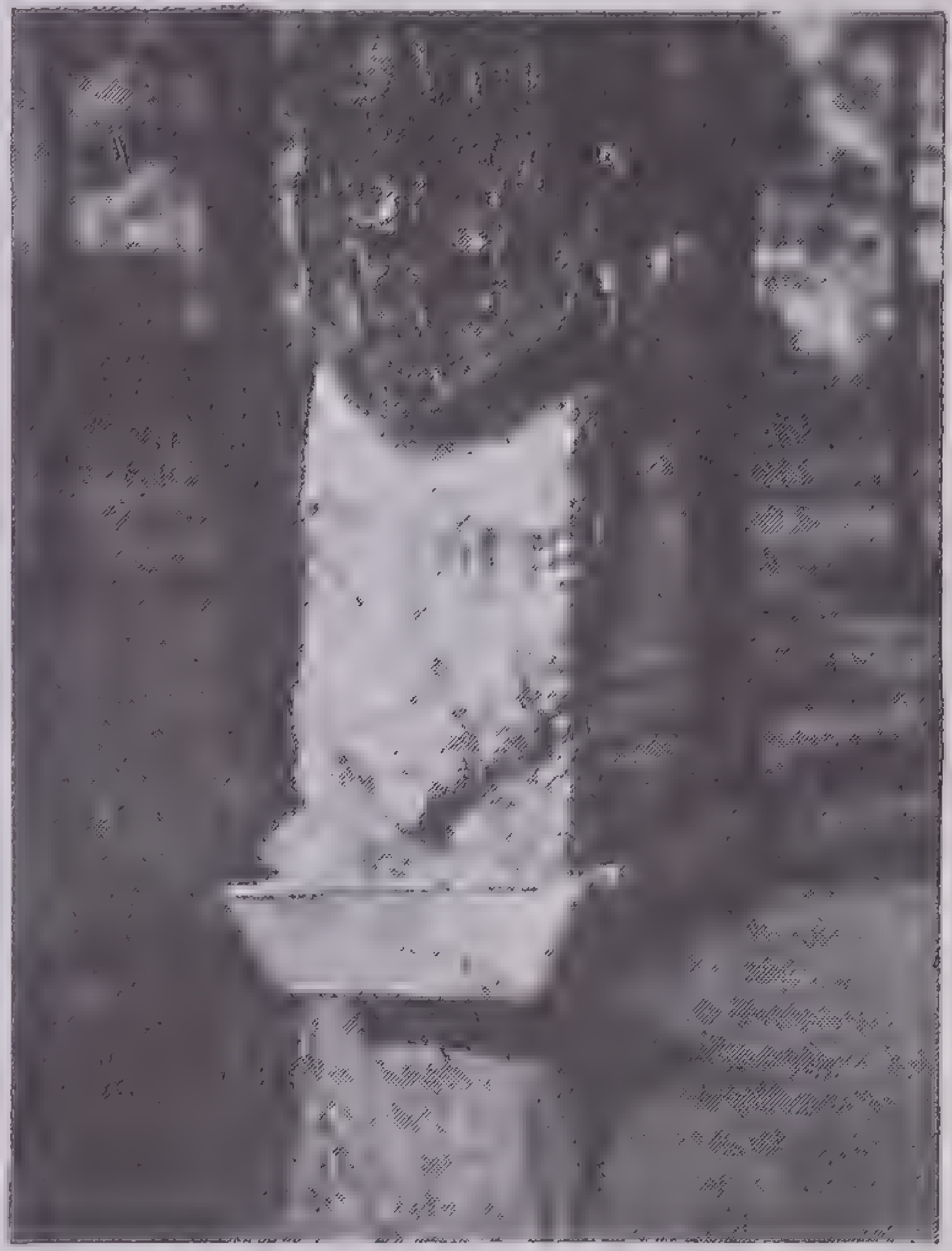
Phlox, a genus of annual and perennial American flowering plants that have stiff stems, narrow stalkless leaves and luxuriant clusters of tray-shaped red, purple, white or mottled flowers whose corollas are divided into five sections. The annual varieties grown in gardens are usually variants of *Drummond's phlox* (*P. drummondi*), a dwarf variety found wild in Texas and producing red or purple blossoms. The *wild sweet William* is a phlox (*P. maculata*) growing about 2½ feet tall with pink or purple flower clusters. It is found along streams and in rich soil in the woods of the New England and central states. It is not to be confused with the true sweet William, which is a pink. *Ground pink* or *moss pink* is another dwarf phlox (*P. subulata*), a creeping evergreen plant that grows close to the ground in rock and sandy soil, covering entire acres. It has tiny tufted leaves and clusters of magenta, pink or lilac blossoms that bloom early in the spring. The name phlox is the Greek word for flame and refers to the shape of the rolled buds, which resemble flame tips before they open.

Pignut, see *Hickory.*

Pimento or **Pimiento,** see *Pepper, Red.*

Pimpernel, a small European herb (*Anagallis arvensis*) of the primrose family that has branching stems, delicate leaves with black dots on their undersurfaces and scarlet or white flowers with dark centers that open only in bright sunlight. Popular in England, the pimpernel has been introduced into the United States. The scarlet pimpernel, also called *poor-man's-weather-glass,* closes at the slightest increase of atmospheric humidity; it is common in Canada, the United States and Mexico. The sea pimpernel and brookweed are other forms found in this country. The fruit of the pimpernel looks something like peppercorns, and the name comes from the French *pipernelle,* pepperlike.

Pine, one of a large genus (*Pinus*) of cone-bearing evergreen trees that produce male and female flowers on the same tree and have needles, typically arranged in bundles, enclosed at their base in a papery sheath. The needles vary from 1 inch to about 2 feet. Pines are found at altitudes varying from sea level to mountain heights. Some pines are valuable timber trees. Soft pines have soft wood and lose the sheath before the leaves fall. The needles may live from 2 to 8 years before falling. Hard pines have hard resinous wood and retain the sheath until after the leaves drop. The winged seeds of some species are released from the cones as soon as they ripen; the seeds of others remain for years. Among the most important pines are the *white pine* (*P. strobus*), a soft lumber tree of the northeastern United States; the *Georgia yellow* or *longleaf* (*P. palustris*), important as a source of lumber and of pitch, resin, turpentine and oil, products derived from pine resin. The shortleaf yellow pine (*P. echinata*) is a southern tree. The *western yellow pine* (*P. ponderosa*) is another major lumber tree; *the sugar pine* (*P. lambertiana*), the giant pine of the Pacific coast mountains, has cones about 2 feet long; the *scrub pine* (*P. virginiana*) is a dwarf variety; the *lodgepole pine* (*P. contorta*) is a straight slender tree, once used by the Indians for lodge poles; it grows in dense formations like wheat on a prairie. The piñon pine (*P. edulis*) of the Southwest is a stunted, crooked tree that produces edible seeds or nuts, *piñons,* sold in markets in the West where they are much sought by Indians.



Courtesy Florida Forest and Park Service

A Turpentine Face

This pine tree has been tapped for turpentine. The wound cut into the bark to allow the turpentine to exude is known as the face. Pine gum is congealed on the face, forming a thick, sticky surface. Below the face is the pan in which the exuding turpentine resin collects. Most American turpentine is obtained from the Georgia pine and the loblolly, a flaky-barked southern pine

Pineapple, a tropical plant (*Ananas sativus*) of the bromelia family, resembling the agaves, that is native to South America but is cultivated throughout the tropics, particularly in the Hawaiian Islands. The plant produces a stalk 3 to 6 feet tall rising from amid long, spiny leaves. At the top of the stalk the delectable fruit appears. This so-called fruit or pineapple is really a cluster of fleshy ripened flowers and the bracts protecting them, and it resembles a huge pine cone weighing 3 to 20 pounds and is tufted with a cluster of shorter leaves. About three-quarters of the world's supply is raised in the Hawaiian Islands, and large acreages in Puerto Rico are devoted to pineapple cultivation. The West Indies, Malaysia and warm parts of the continental United States also raise some. The fruit is eaten raw or canned.

Pinguin or **Bromelia,** a tropical plant (*Bromelia pinguin*) typifying the bromelia family, a relative of the pineapple. It has spiny leaves resembling those of the aloes, sprays of reddish flowers and edible fruits resembling plums. It yields a valuable fiber. It is grown extensively as an ornamental and fruitbearing plant in the tropics. The genus is named in honor of Olaf Bromel, a 17th-century Swedish botanist.

Pink, one of several members of a genus (*Dianthus*) of Mediterranean flowers including the carnation, sweet William and about 250 others. Pinks are low garden perennials with small, showy fragrant blossoms of red, white, pink or purple and narrow, paired grasslike leaves. Most of them have a spicy fragrance. Sweet William (*D. barbatus*) is an Asiatic form that has bright rose, pink or white ruffled flowers with deeper centers. The blossoms grow in dense clusters on stems about a foot tall. The clove pink (*D. caryophyllus*) is a European variety from which the carnation was de-

Courtesy Hawaiian Pineapple Company, Ltd.

Pineapple Field, Island of Oahu, Hawaii

veloped. The China pink (*D. chinensis*) is an annual; and the grass pink (*D. plumarius*), a perennial; both developed from a central European variety. All pinks are grown in gardens throughout the temperate regions. The English name seems to have been applied to the flower because its edges are cut or pinked; from the flower the word was transferred to the color.

Pink, Ground, see *Phlox.*

Pipsissewa, a small plant (*Chimaphila corymbosa*) of the heath family, thriving in sandy woods. It has a long creeping rhizome giving rise to short stems, thick glossy evergreen leaves and terminal clusters of flowers. The leaves have an astringent quality and are used as a tonic and diuretic. Another name for this plant is the *prince's pine* or *princess pine*. The common name is an American Indian word. The genus name is Greek and means winter-loving.

Pistachio, a small tree (*Pistacia vera*) of the cashew family that is native to Asia Minor, but is cultivated in southern Europe and to some extent in the southwestern United States. It is about 25 feet tall and produces trilobed compound leaves and olivelike fruits containing an edible green seed, prized for its delicate flavor. The pistachio nut is eaten salted or sugared and is used in flavoring ice cream and confections. The name is derived from *pistah*, the Persian word for the nut of this tree. The sap of the pistachio tree yields a substance called *Chian turpentine*. It is the only variety of this oily resin not obtained from coniferous trees. Pistachio is also the name of a pale yellow-green color.

Pitcher plant, one of several genera (*Sarracenia, Nepenthes, Cephalotus*) of strange insectivorous plants that have pitcherlike leaves lined with sticky hairs. Insects are attracted to the plant and crawl into the pitcher. They cannot retrace their steps (because the cells are down-pointed) and eventually end up in a liquid contained at the bottom of the pitcherlike structure and secreted by gland cells near the bottom. Here they drown and are decomposed. Their nitrogenous substances are used by the plant for food. The common pitcher plant or sidesaddle plant, (*Sarracenia purpurea*) of the northeastern United States has a cluster of sheathed leaves with a short stalk bearing the pitcherlike structure, which varies from light green to crimson and is made glossy by a nectar secreted by several glands on its surface. The liquid in which insects drown also acts as a breeding ground for some diatoms and the larvae of certain insects. About 60 tropical shrubby, climbing pitcher plants of the genus *Nepenthes* are found in Asia, Madagascar, Australia and Borneo. These have tubular winged tendrils developed into pitchers with jagged rims. A small Australian herb (*Cephalotus follicularis*) resembles the other pitcher plants, but it has ordinary leaves growing close to the ground in addition to its bright pitchershaped insect-catching leaves.

Plane tree, see *Sycamore.*

Plantain, one of a genus (*Plantago*) of weedy plants of the temperate regions that have rosettes of thick long leaves, fibrous roots, short stems and spikes of tiny greenish flowers. The *narrow-leaf plantain* or *buckhorn* (*P. lanceolata*) kills off valuable grasses in the meadows and pastures it infests. The common *broad-leafed plantain* (*P. major*) is found on lawns where it chokes out attractive grasses. The word plantain is derived from the Latin *plantago*, sole of the foot, and refers to the shape of the broad leaf characterizing most varieties. The name is also used for a variety of large, greenish tropical banana (*Musa paradisiaca*) commonly cooked and eaten in warm countries.

Plum, one of several species of the genus *Prunus* of the rose family, related to the peach. They are small trees with a close-grained wood frequently used as timber, a bitter sap, containing hydrocyanic acid, and clusters of white flowers that occasionally appear before the smooth, oval, serrate leaves. They produce red, yellow, purple, blue or green smooth-skinned and smooth-stoned fruits varying in size from very small plums to large round ones. Many are sweet enough to eat raw, but some have a very low sugar content and can only be eaten preserved or jellied. Damsons, greengages and prune plums are variants of the common European plum (*P. domestica*) grown extensively in Europe and the United States. The native American wild plum (*P. americana*), the Japanese plum (*P. salicina*) and the hardy Canadian variety (*P. nigra*) are also cultivated in the United States, although the European plum is the most important commercially. *Prunes* are dried plums and the name is often used for the large sweet plums of the West Indian tree (*P. occidentalis*) and for certain California varieties that produce the best fruits for drying.

Poinsettia, a showy flower (*Euphorbia pulcherrima*) of the spurge family that has scarlet bracts more than a foot long growing beneath the small, true flowers, which are borne in a cuplike cluster consisting of one female and several male flowers. Although it is a native of Central America and Mexico, it is grown in greenhouses in the north as a Christmas flower because of its scarlet bracts and dark green foliage. A milky juice exudes from the cut stems, which are dipped in boiling water to stop the flow of the liquid. A smaller species (*P. heterophylla*) is found throughout the West Indies and southern United States. Some variants have white or pink bracts. The plant was named after Joel R. Poinsett, (1779-1851), who introduced it into the United States when he was United States minister to Mexico.

Poison hemlock, a European plant (*Conium maculatum*) of the parsley family that grows 2 to 6 feet tall, has thick red-spotted stems, compound leaves and clusters of small white flowers. The poisonous yamlike root of this biennial is sometimes mistaken for wild parsnip, which it resembles. It grows wild in many damp places of the United States. All parts of the plant are poisonous. The juice of poison hemlock root was used by the ancients as a means of suicide and execution.

Poison ivy, a shrub or vine (*Rhus toxicodendron*), one of the sumacs that has compound leaves of three oval toothed leaflets, the middle larger than the lateral ones. It produces small greenish flowers and pale, hard, globular berries. This plant is highly poisonous. Its sap usually causes a severe skin irritation and makes the exposed skin surfaces swell and blister painfully. Some people contract this poisoning by handling objects that have been touched by the ivy leaves or their juice. Some people seem immune. The poison oaks (*R. quercifolia* and *R. diversiloba*) are believed by many scientists to be a variety of poison ivy rather than a distinct plant. They are sumacs, closely resembling poison ivy, and their sap is highly irritating.

Pokeweed, a native American perennial weed (*Phytolacca americana*) that has a stem 4 to 10 feet high; long, tapering leaves; small, bracted, odorous, greenish flowers growing in racemes 2 to 8 inches long and clusters of purplish berries filled with red juice that are eaten in the fall by birds. The root is very poisonous and the berries also are sometimes poisonous. It is common in waste places and along roadsides.

Pomegranate, a small tree (*Punica granatum*) of the myrtle family with glossy lanceolate leaves and short-stalked bell-like scarlet flowers growing out of the leaf axils. The flowers produce a fruit about the size of an orange with a thick leathery reddish-yellow rind surrounding a juicy, acid pulp containing many large seeds. The tree grows wild in Afghanistan and parts of India but is cultivated throughout the Orient and parts of Europe and the United States. It has been cultivated since ancient days and is referred to in the Old Testament and the Odyssey. Ancient Assyrian and Egyptian sculptures frequently show designs of this fruit, which had religious significance to many Oriental cults. Pliny says it came to Rome from Carthage, and some botanists consider it a native of Palestine. The genus name means Phoenician or Carthaginian. It yields a substance used in tanning and has medicinal values known to the ancient Greeks and Romans. The drink grenadine is made from its pulp. The name comes from the Latin *pomum*, fruit, and *granatum*, grained.

Pomelo, see *Grapefruit.*

Pond lily, see *Water lily.*

Poplar, one of a genus (*Populus*) of tall hardy, quick-growing trees of the Old World and the New, related to the willows. They have broad, leathery leaves with long petioles and slender drooping catkins of male and female flowers, borne on separate trees, that appear before the leaves. The leaves turn yellow in the autumn. The soft splintery wood is used for pulpwood, crates and woodenware. They are among the first trees to appear after a fire but disappear before longer-lived trees mature. The *Lombardy poplar* (*P. nigra italica*), a slender tree 30 to 100 feet tall with many upright branches and red stems, is popular in America as an ornamental tree. It is named after the region of Italy in which it is most numerous but it originated in Persia. The *trembling aspen* (*P. tremuloides*) grows about 100 feet tall and has flat petioled leaves that tremble at the slightest wind disturbances. It is a native of America and resembles the *European aspen* (*P. tremula*). The balsam poplar or *balm of Gilead* (*P. tacamahaca*) is a tree popular in western America. The *cottonwood* or necklace-bearing poplar (*P. balsamifera*), largest of the American poplars, is another Western tree, frequently the only tree growing in large sub-arid areas throughout the west. The seeds have a cottonlike wing by means of which they are spread that has given the popular name, cottonwood, to this tree. Its wood is prized by toy makers.

Poppy, one of a genus (*Papaver*) of annuals and perennials that are natives of Asia but are cultivated as garden flowers in the United States. They have long stalks containing a milky juice, hairy notched leaves and showy flowers of brilliant red or orange, pale pink, yellow and other delicate tints. There are many varieties, all of which are cultivated as garden plants in the United States. The corn poppy (*P. rhoeas*) and the opium poppy (*P. somniferum*) are the sources of most florist's annual varieties; and the Oriental poppy (*P. orientale*) and the Iceland poppy (*P. nudicaule*) are the source of most perennial varieties. The Iceland poppy is a dwarf perennial native of Arctic Regions, with delicate crapy flowers that have an attractive fragrance. The Oriental poppy produces large scarlet or orange blossoms, frequently 6 or 10 inches in diameter. The opium poppy is raised throughout the Orient for the sake of the drug opium, obtained from the milky juice that oozes out of the cut, green pods. Although a dangerous drug when it is smoked, it is also a valuable medicine used in such forms as laudanum, morphine, paregoric and codein, which are all pain killers and sedatives. It is a habit-forming drug deadly in large doses.

Portulaca, see *Purslane.*

Potato, a South American plant (*Solanum tuberosum*) of the nightshade family that has a stem 1 to 2 feet high, many branches, compound oval leaves and round white or purplish flowers that produce bitter, yellow seed-bearing berries. The fibrous roots are supplemented by underground stems with fleshy swollen tips that are the edible portions. Under cultivation, seeds are rarely produced. The plants may be propagated from shoots growing out of the buds or eyes found on the tubers. Over 600 varieties have been developed in the United States. The potato was introduced into North America from Ireland, to which it had been brought in the 16th century by early English explorers who found it in South America. A related species was found growing wild in the southwestern United States and Central America.

Prickly pear or **Indian fig,** any one of a genus (*Opuntia*) of flat-jointed cacti found through Mexico and the southwestern United States. It has yellow or red flowers and pearlike edible fruits. The thickened stem is frequently mistaken for the leaves, which are tiny scales found on the young branches. The prickly pear was brought to Spain by the conquistadores. The Moors introduced it into Africa, where it is now an important food. Together with the *nopal,* this cactus is cultivated as the food and the home for the *cochineal insect,* a small insect whose dried body produces cochineal, a valuable red dye used in preparing cosmetics and scarlet and crimson color-fast dyes.

Primrose, one of a genus (*Primula*) of herbs with tufted leaves and large showy cuplike flowers native to Europe, Asia and North America. The leaves grow close to the ground and the flower clusters have fringed blossoms of red, rose, lavender, white or yellow. Wild varieties are usually yellow, but the garden and florist's varieties have been developed in many colors. The common English primrose or cowslip (*P. veris*) has a short main stem and long stalks to the clustered flowers, while in many other varieties the flowers are produced on short stalks growing from a longer main stem. The name is derived from the Latin *primula,* first, because it blooms quite early in the spring.

Privet, a genus (*Ligustrum*) of ornamental Oriental shrubs of the olive family commonly grown as hedges. They have dark oval leaves, clusters of fragrant white flowers borne at the ends of the branches and black berries. The common privet (*L. vulgare*) is a hardy evergreen variety. The California privet (*L. ovalifolium*) is used widely for hedges because it can be trimmed and trained into attractive shapes. There are several other varieties, some of them deciduous.

Prune, see *Plum.*

Pumpkin, an American vine (*Curcurbita pepo*) of the gourd family that has tendrils, a prickly trailing stem, dark green three or five-lobed leaves, large yellow flowers and huge globular dull orange fruits. This plant, which probably originated in Mexico and the southwestern United States, was cultivated by the Indians. The fruits are eaten boiled, baked or canned, are made into pies and used for stock food. The carved and hollowed shells are popular as jack-o'-lanterns on Hallowe'en. The common name is a corruption of the French word *pompion* which goes back to a Greek word *pepon* (like *pepo,* the species name), which meant cooked by the sun, a name applied to this fruit because it is never eaten until fully ripe.

Purslane, a trailing troublesome garden weed (*Portulaca oleracea*) with fleshy oblong leaves, succulent stems and small yellow flowers. Although a native of the tropics, the plant is found throughout the world. Upright varieties have been developed in France, where the leaves are cooked and eaten as a vegetable. The stems are fed to swine.

A close relative to this plant is the portulaca, also called *garden purslane* or *rose moss* (*P. grandiflora*). It is an annual growing in hot dry places. It is a South American plant cultivated in gardens in the temperate regions. The portulaca produces trailing stems, stemlike leaves forming a thick mat several inches thick that looks like a dense blanket of moss and cup-shaped rose, red or orange sun-loving flowers. *Pursley* or *pusley* is a colloquial variant of the word, and "mean as pusley" is a farmer's phrase from the trouble the thick growth makes him especially in sandy soils.

Pussy willow, see *Willow.*

Queen Anne's lace, see *Wild carrot.*

Quince, an Asiatic tree or shrub (*Cydonia oblonga*) of the rose order, closely allied to the apple and pear. The small trees are often used as dwarf stock for pear trees. The flowers produced by this tree, introduced into Europe and America centuries ago, are white or pink and they produce a hard, fragrant, acid, yellow fruit that cannot be eaten raw but is esteemed for marmalades and jellies. The seeds have a gluey covering that is used in making cosmetics and a vegetable mucilage. The tree is small, about 15 feet high, with crooked branches bearing oval downy leaves. Japonica, a related bush found in Japan, is sometimes called Japanese or flowering quince. The name *quince* is derived from the Latin name of the genus *Cydonia,* which is an adjective from the name of an ancient city in Crete or Asia Minor.

Quitch or **Quick grass,** a troublesome perennial weed (*Agropyron repens*) native to Europe but naturalized throughout North America. It propagates from tough underground stems; the new plants spring from the joints of these rhizomes. The fruiting spikes resemble wheat, although they are thinner than those of the grain. This plant is sometimes called *couch grass.* The name *quitch* seems to mean quick in the sense of lively, hard to kill.

Radish, a garden vegetable (*Raphanus sativus*) of the mustard family that has lobed leaves, erect clusters of pink flowers, short pods and edible roots of red, white, gray or black that are cultivated for their pungent flavor. The radish, which is of uncertain origin but is believed to have come from Asia, has been cultivated by the Chinese for over 3,000 years. Closely related to the edible radish is a weed (*R. raphanistrum*), the wild radish, found throughout the northeastern part of North America. Its root does not enlarge like that of the edible radish and its blossoms are yellow. The name radish comes from the Latin *radix,* root.

Raffia, see *Palm.*

Ragweed, one of a genus (*Ambrosia*) of annual and perennial weeds of the composite family that have a coarse stem 1 to 5 feet tall, deeply-notched ragged leaves and greenish staminate and pistillate flower clusters borne on the same plant. The pollen produced by these plants is one of the causes of hay fever. Ragweed is common in grain fields and produces hardy seeds that may live for several years before germinating.

Ramie, see *Nettle.*

Ranunculus, see *Buttercup.*

Rape, an annual or biennial forage plant (*Brassica napus*) of the cabbage family that has a stem 1 to 2 feet tall, blue-green fleshy leaves growing in a loose cluster and seeds producing an oil used commercially and sometimes called *colza* oil. Rape is grown in Europe and the United States as a forage crop. The seeds are eaten by birds. It is closely related to the turnip, although turnips have hairy stems in contrast to the smooth stems of the rape.

Raspberry, one of a genus (*Rubus*) of bushes with thorny branches, toothed compound leaves, white flowers and edible red, black, purple, white or yellow berries. Black and red raspberries are natives of North America and Europe; many varieties have been developed from them. The berries of this genus are not single fruits, but clusters of fruits formed by one flower, distinguished from blackberries because the raspberries are easily separated from their receptacle. They are eaten raw, cooked and preserved. The commonest varieties are the black raspberry or black cap (*R. occidentalis*) a large-seeded American variety; the American red (*R. strigosus*), widely used for jams, as is the European red (*R. idaeus*). Purple-cane raspberries are crosses between red and black. Wild raspberries are commonly called *thimble berries.* The name comes from an old English word *raspis,* a kind of wine that the berries resemble in taste.

Rattan, see *Palm.*

Redbud, one of a genus (*Cercis*) of small trees or shrubs of the pea family that have heart-shaped leaves and clusters of red flowers. These trees are used as ornamentals. Some varieties are found in the Old World. Three American species are the Texas redbud, the California redbud and the common redbud or *Judas tree,* found from Arkansas to Ontario. The name Judas tree is sometimes given to all redbuds because it was believed that Judas Iscariot hung himself on a redbud.

Redtop, a perennial European grass (*Agrostis stolonifera major*) with sprays of tiny red flowers. It is grown in wet acid lands in the United States as a pasture crop. In New England it is used for hay.

Redwood, a huge American evergreen (*Sequoia sempervirens*) related to the sequoia and found only in the Pacific Coastal Range. It has light, durable, reddish wood and a straight trunk 200 to 340 feet tall, covered with furrowed red bark. It has a small head, flat double sprays of green cypress-like needles, sprays of small flowers and drooping cones less than 1 inch long. It is an important timber tree and is one of the tallest and oldest trees known. Some redwoods are believed to be 2,000 years old. They form the magnificent forests in California. The name redwood is frequently applied to unrelated tropical trees, such as the red sandalwood (*Lingoum santalinum*) of the East Indies and Brazilian trees yielding red dyewood of the genus *Caesalpinia.*

Reed, a stout, hollow-stemmed grass (*Phragmites communis*) 10 to 15 feet tall, resembling the bamboo. It has rose, lavender or silver flower sprays and grows in swampy lands, where its 25-foot rootstocks form dense mats that catch decaying vegetable matter and sediment washed in by the tide and help to make new land. In Europe, roofs are thatched with reeds. The related *giant reed* (*Arundo donax*) of southern Europe is used for making musical reed instruments.

Rhododendron, a genus of ornamental shrubs and trees of the heath family with thick evergreen leaves and clusters of handsome lobed funnel-shaped flowers of white and many shades of purple, pink and rose. They are natives of the mountains of the Orient, Europe and North America but have been cultivated wherever there is acid soil and are a favorite with British and American landscape artists. Many florists' varieties have been developed. The great or laurel rhododendron (*R. maximum*) is the state flower of West Virginia. The western rhododendron (*R. californicum*), state flower of Washington, is a resplendent rose-colored flower with glossy leathery leaves. This plant is classified by botanists with the azaleas, although horticulturists separate the deciduous azaleas from the rhododendrons, whose name is derived from the Greek *rhodos,* meaning rose, and *dendron,* tree.

Rhubarb or **Pie plant,** an Asiatic perennial (*Rheum rhaponticum*) of the buckwheat family that has rhizomes, coarse leaves and leaf stalks with swollen joints. The plant is cultivated in the United States for its edible leaf stalks, cooked and eaten in sauces and pies. The drug, rhubarb, used medicinally for diarrhea and indigestion, is the dried root of a related species of the same genus, cultivated in China for over 4,000 years. The name rhubarb seems to be short for *rha barbarorum;* the river Volga was called *Rha* by the Greeks and the plant grew along its banks; *barbarorum* means "of the savages."

Rice, an annual cereal (*Oryza sativa*) of the grass family that grows in flooded fields in the Orient and warm parts of the United States. It is 2 to 6 feet tall and has panicles of flowers that produce seeds on top of the stalks. About 90 per cent of the world's rice is grown in China, but Hawaii, the Philippine Islands, Egypt, Japan, the East Indies and the United States also grow rice. When rice is ready for harvesting, the water in which it grew is drawn off, the grain cut, threshed and polished. Starch, flour and stock foods are made from the husks, and the polished rice is eaten. Because vitamins are removed with the husks, polished rice is a vitamin-deficient food, and its continued use as a staple causes *beri beri* or polyneuritis, the crippling nerve atrophy caused by lack of vitamin B. *Wild rice* (*Zizania aquatica*) grows in North American swamps where it furnishes food for water birds. Formerly the Indians ate it, gathering it and beating out the kernels in their canoes as they paddled through the wild rice swamps. It is a delicacy highly prized by epicures in modern cooking. The name is derived from the Sanskrit *vrihi* and the Greek *oryzon.*

Rockfoil, see *Saxifrage.*

Rose, one of a genus (*Rosa*) of Asiatic, European and American flowers that grow wild and have been cultivated for thousands of years. The rose is an erect or climbing shrub with thorny stems and single or double blossoms that range from white to yellow, pink and various shades of red. It produces round red berries, many species of which are edible when preserved. The common *wild rose* of America has five-petalled pink flowers with glossy foliage and is found along fence rows and embankments. The *Cherokee rose,* found wild in the south, was introduced from China. About 15 other varieties of American wild roses, including the *sweetbrier,* are European plants escaped from cultivation. The *prairie rose* is a variety that produces pink flowers late in the season. China, rambler, hybrid tea, damask, yellowbrier and others bloom throughout the summer. The rose has been cultivated since ancient days. Rose culture has been described in books for centuries, and roses have been referred to in literature and history since the beginning of written records. Closely related to the roses are most American fruits and berries. Although roses are usually grown for ornamental purposes, attar of roses, an important perfume and cosmetic base, is distilled from roses in the Orient, and there is a considerable business of rose growing for perfumery in Bulgaria. Frequently rose petals are candied and eaten.

Rosemary, a sea-loving fragrant Mediterranean shrub (*Rosemarinus officinalis*) of the mint family. It has a pungent, warm taste and is used as a spice in perfumes and medicines. This plant has become a symbol of fidelity. The name comes from the Latin *ros,* dew, and *marinus,* marine.

Rose of Sharon or **Shrubby althea,** a common Chinese ornamental shrub or small tree (*Hibiscus syriacus*) of the mallow family. It is 10 to 20 feet tall and has sharp leaves and bell-shaped white, purple or rose flowers resembling hollyhocks. It is cultivated in American gardens. The Biblical reference to the rose of Sharon is probably a reference to a variety of crocus or narcissus.

Rowan, see *Mountain ash.*

Rubber plant or **India rubber tree,** see *Fig.*

Rubber tree or **Para rubber tree,** an Amazonian latex-producing tree (*Hevea brasiliensis*), 60 to 100 feet tall, of the poinsettia and castor-oil plant family. It has compound, long-stalked leaves, green flowers and tubes filled with milky juice (latex) that are found throughout the bark. This latex is the world's chief source of rubber. Rubber is also made from the small fig tree called *rubber plant* (formerly the main supply until the rubber tree was discovered), from the guayule and certain members of the genera *Manihot, Castilla* and *Landolpha.* Today the Para rubber tree is the only commercially important rubber tree. Amazon Indians made rubber of its latex centuries ago, but only recently have white people learned the secret of making rubber from the tapped latex. The Para rubber tree is now cultivated in the East Indies, where most of the world's rubber is produced. Small trees are grown as ornamental plants in hot houses.

Rue, a European shrub (*Ruta graveolens*) with a stem 1 or 2 feet high, notched, bitter leaves and yellow flowers. It is now found wild in this country. At one time the strong-smelling leaves were thought to have medicinal value. Rue is sometimes called *herb of grace*—probably from a popular notion that this noun *rue* had something to do with the verb *rue* meaning regret. The *meadow rue* is a member of an unrelated genus (*Thalictrum*) with stems 1 to 7 feet tall, fernlike leaves and plumelike flower clusters of blossoms with yellow, white or rose-colored sepals.

Rush, one of the genus *Juncus* of Old and New World coarse grasslike plants related to the lilies. They have hollow unbranched stems varying in height from a few inches to 4 feet, creeping rootstocks and green or brown flowers in clusters. In Japan braided mats are made of some varieties. Chair seats, baskets and rope were once made from the stems, and the tallow-soaked pith formerly was used in England as lampwicks.

Rutabaga, a winter turnip (*Brassica napobrassica*) that has a longer, thinner root, denser, redder flesh and more nutriment than the ordinary turnip. It has smooth, succulent blue-green leaves and yellow or orange flowers. It is raised as a stock food and vegetable. *Swedish turnip* or *Russian turnip* are other names.

Rye, a hardy annual cereal grass (*Secale cereale*), related to wheat. It has ribbonlike leaves and long, bearded spikes of flowers growing on stalks 7 to 10 feet tall. It was under cultivation in southeastern Europe for 2,000 years and is an important crop in Europe and the United States. The straw is useful for hats, paper, mattresses and packings. It is made into a flour used for black bread in Europe and mixed with wheat for rye bread in the United States. It is used as a cover crop and green manure and is also made into whisky. Some varieties are sowed in the spring, others in the fall. It is valuable for soil improvement. *Wild rye* or lyme grass is a member of the genus *Elymus,* used in the United States as a pasturage and meadow grass.

Safflower, an East Indian annual (*Carthamus tinctorius*) of the thistle family with a stem 1 to 3 feet tall, prickly leaves and heads of bright orange flowers. A dye used in rouge and for coloring silks a light red is obtained from the flowers, and the seeds of this plant yield an important drying oil used in paints and varnishes. The plant is under cultivation in Egypt, India and warm regions of Europe, and efforts are being made to grow it in the United States. A drug made from the dried flowers is used medicinally like saffron. This plant is sometimes called *bastard saffron* or *false saffron.*

Saffron, see *Crocus.*

Sage, a genus (*Salvia*) of herbs of the mint family that are widely distributed in both hemispheres. They usually have stems from 1 to 2 feet tall, blue, purple, scarlet, pink or white flowers borne in clusters and grayish leaves. The common garden sage (*S. officinale*) is a European perennial with aromatic leaves that are dried and used to season sausages, cheese and dressings. At one time a tea, used as a tonic, was brewed from the leaves. Sage, which is widely cultivated in the United States, received its name because of this quality attributed to the leaves. The showy scarlet sage (*S. splendens*), a tropical annual, is one of the most brilliant varieties. Its spikes of flowers have vivid scarlet, irregular, two-lipped blossoms. The plant has pointed leaves and square stems. It is common in gardens. The genus name and the common English name are both from the Latin *salvus,* safe, healthy, because medieval doctors believed great healing powers were possessed by these plants.

Sagebrush, one of several varieties of the genus *Artemisia.* They are shrubby plants of the thistle family that cover thousands of acres of arid land in the western United States. The plants, which have a pungent odor resembling sage and a bitter juice, have stiff low branches 1 to 12 feet tall, silvery notched leaves and sprays of yellow flowers resembling small daisies. They are eaten to a limited extent by cattle and sheep and occasionally are used for fuel. The common sagebrush (*A. tridentata*) is the state flower of Nevada. The odor of sagebrush is like that of the herb sage, which explains the name.

Sago, see *Palm.*

Saguaro, the huge tree cactus (*Carneyiea gigantea*), largest of all the cacti. It is the state flower of Arizona. It is found in desert regions of Mexico and the southwestern United States. It is about 60 feet high, with a spiny, fluted columnar trunk that occasionally has one or two candelabrumlike branches, striking, waxy yellow night-blooming flowers and pear-shaped edible fruits used raw and preserved by the Indians of the southwest.

Salpiglossis or **Painted tongue,** one of a genus of attractive petunialike flowers of the nightshade family. They are natives of Chile but are cultivated in gardens in the temperate zones. They have branching stems about 2 feet tall and trumpet-shaped velvety flowers of white, yellow or crimson, deeply marked with brilliant veins. They bloom at night. A tonguelike stamen protrudes from the trumpet of the blossom, accounting for the name, which is derived from the Greek *salpinx,* trumpet, and *glossa,* tongue. This flower is sometimes described as the orchid of hardy annuals.

Salsify, a biennial (*Tragopogon porrifolius*) related to the chicory that has a tapering edible root, bladelike leaves and purple flower heads resembling those of the dandelion. The creamy root has an oysterlike taste when it is boiled, and salsify is sometimes called *oyster plant.*

Saltbush, any one of a genus (*Atriplex*) of native Australian and American forage plants of the beet family found throughout the arid regions of the western United States. They are woody or herbaceous bushes, varying considerably in height but usually under 10 feet tall. They have small gray-green leaves with a salty taste and clusters of staminate and pistillate flowers that in some varieties are borne on the same tree and in others are borne on separate trees. As they can be raised in land too dry for any other forage plants, they make it possible to utilize the vast semi-arid acres of the west as grazing grounds. The term saltbush is also applied to related genera that resemble these plants in habit, use and appearance.

Salvia, see *Sage.*

Sandalwood, one of the genus *Santalum* of oriental trees that have close-grained fragrant wood used for making incense, boxes, fans and many fine pieces of cabinetwork. Most of the sandalwood used is from the white sandalwood tree (*S. album*), which has a fine yellow wood. An oil distilled from the fragrant wood chips is used in making perfumes and is powdered to form incense, used in religious rites in the Orient. The wood is used like cedar for chests to protect fabrics from insects and moths. In the East Indies, wood engravings are made on sandalwood, and a great deal of the fine carving of China utilizes sandalwood. The name is derived from the Sanskrit word *candana,* the name applied to this tree. The *red sandalwood* is an unrelated tree yielding a dyewood. The name has nothing to do with sandals for the feet. The genus name *Santalum* comes from a Sanskrit word meaning shining.

Sapodilla, a tree (*Sapota achras*) of tropical America that grows 30 to 60 feet tall and has a durable wood, latex-producing bark, stiff evergreen leaves, white flowers and edible reddish-brown fruits about the size of oranges, with a juicy, dark yellow pulp. From the milky latex of these trees, *chicle,* the substance used in making chewing gum, is obtained by tapping the trees just as rubber is obtained from the Para rubber trees. Most chicle is produced in Yucatan, but the tree is cultivated in many tropical countries. In the British West Indies it is called the *naseberry;* in the Spanish West Indies, *nispero,* and in the Philippines, *chico.* Other genera of this family produce various gums and gutta-percha. The name sapodilla is a Spanish diminutive of *sapote,* the name of another New World plant.

Sapote, a West Indian tree (*Lucuma mammosa*) related to the sapodilla that produces a large, sweet fruit, also known as the *marmalade plum,* widely used in making jams. The fruit resembles a ripe pear in taste. It produces a single large seed that yields a rich oil used in the tropics for confectionery purposes. The name is an Indian word.

Sarsaparilla, one of several prickly vines, varieties of smilax (*Smilax officinalis, S. papyracea, S. medica*), native to Mexico, Central America and South America, with cordlike roots that are dried for a medicinal drug. An oil distilled from the juices of other parts of the plant is used as a flavor for the beverage called *sarsaparilla.* The name comes from the Spanish *zarza,* bramble, and *parrilla,* little vine.

Sassafras, one of a genus of American trees of the laurel family, related to the cinnamon and camphor trees. They grow 40 to 100 feet tall and have oval or lobed leaves, soft yellow wood, corky roots, greenish-yellow flowers, male and female sprays borne on separate trees, and purplish-blue berries in red bracts. The aromatic red bark of the roots is used in making sassafras tea and as the flavoring extract for root beer and confections. Oil of sassafras, also obtained from the roots, has medicinal and cosmetic uses. In the south the leaves are used with okra to flavor soups. Fence posts and small boats are frequently made of the wood.

Saxifrage or **Rockfoil,** one of a genus (*Saxifraga*) of annual or perennial low-growing plants, including about 250 species, natives of temperate regions and high altitudes. The flowers and leaves vary considerably, but there are usually tufted basal leaves and clusters of stemmed flowers growing above the leaves. Wild varieties are among the first spring flowers to bloom. Because they often grow on tops of rocks or in crevices of rocks, they have been called *saxifraga* or *rock breakers,* from the Latin *saxum,* rock, and *frangere,* to break.

Scabious, one of a genus (*Scabiosa*) of about 70 Old World garden plants of the teasel family. They have whole or divided leaves and flat lacy heads of blue, rose, yellow, purple and white flowers.

Schizanthus, see *Butterfly flower.*

Screw pine, one of the genus *Pandanus* of shrubs or small trees native to the Malay Archipelago and the islands of the Indian and south Pacific oceans. They have a main stem bearing branches with tufts of shiny, spiralled, stiff leaves. The stem produces roots that appear above ground and penetrate into the earth. Frequently the plant is left growing on stiltlike prop roots because the lower portion of the stem has decayed. The sword-shaped leaves grow in a spiral arrangement that has given its common name to the plant. Dwarf varieties are common hothouse and pot plants in temperate climates.

Sea kale, a perennial (*Crambe maritima*) of the mustard family cultivated in vegetable gardens. It is found along the coast of Great Britain and along the shores of the Baltic Sea. It produces edible succulent shoots and blue-green leaves. A variety of seaweed called *dulse,* a red alga found along the Atlantic coast of the United States and eaten as a relish, is sometimes called *sea kale.*

Seaweed, see *Algae.*

Sedge, one of the genus *Carex* of grasslike plants related to the papyrus and found in woods, meadows and swamps of both hemispheres. They vary in height from a few inches to a few feet and usually have three-cornered stems that, unlike grass stems, are solid. The stems and narrow leaves are roughly serrate and can injure a person handling them carelessly. The green or brown flowers are borne in spikes that are bristled. The name is derived from the Latin *secare,* saw, and refers to the cutting edges of these plants.

Sedum, a genus of widely distributed plants of the orpine family, including about 250 species that have small fleshy leaves, tiny clustered flowers of many colors and, in some cases, creeping stems. The stonecrop, a yellow-flowered creeping variety, is representative of the genus. The live-forever, European sedum, is now found growing wild in the United States.

Self-heal, a perennial weed (*Prunella vulgaris*) of the mint family that has a creeping rootstock, short stems and thick clusters of purple or blue two-lipped flowers. It is a European plant but grows wild in this country. At one time it was used as a salve for cuts and wounds.

Senega, an American herb (*Polygala alba*) that has tufted leafy stems and small white flowers growing in spikes. The root is used medicinally. The drug *senegin* derived from it is used as a diuretic and expectorant. The plant is sometimes called *snakeroot.*

Sensitive plant, see *Mimosa.*

Sequoia, a genus of mammoth pinelike evergreen trees of the Pacific slopes of the United States including the *redwood* (*S. sempervirens*) and the *big tree* (*S. gigantea*) of California. Mature sequoias attain a height of over 275 feet. A sequoia still standing is 325 feet tall, and a fallen tree is 400 feet tall. The lumber is very valuable. These trees are the oldest living organisms known and are believed to be from 1,000 to 4,000 years old in some instances. The big trees have ridged cinnamon-colored bark, short branches, sharp scalelike needles, separate clusters of male and female flowers and small thick cones. The light strong wood is used for building roofs, fences and posts. Fossil remains of these trees lead scientists to believe that they were once widespread throughout North America, and an effort is being made to transplant seedlings in different parts of this country. The trees were named in honor of Sequoya or George Guess, the Indian who invented an alphabet for the Cherokee language.

Serviceberry or **Shadbush,** one of an American genus (*Amelanchier*) of small trees of the rose family closely related to the apple. They have slender branches on a trunk 6 to 30 feet tall, reddish leaves and small white blossoms. They produce sweet, edible purplish berries called *Juneberries.* The name serviceberry is also applied to the fruit of trees of a related genus (*Sorbus*) of the same family found throughout the Old World. They resemble the mountain ash but produce gritty edible fruits. The name *service* is derived from the Latin word for the genus *Sorbus.*

Sesame, one of a genus (*Sesamum*) of woody herbs 2 to 4 feet tall with lobed leaves and pink or yellow trumpetlike flowers borne in the leaf axils. The most important is the Indian sesame (*S. indicum*), whose seeds produce an oil used for food, soap making and lighting. The seeds and leaves of this plant, originating in India but now only known under cultivation, are extensively used by Orientals as a demulcent. The soot of the burned oil is a substance used in India ink. The oil of these seeds, more important commercially than olive oil, is used in soap making and is sometimes called *benne oil* or *til oil.* It is cultivated throughout the East.

Shallot, see *Onion.*

Shamrock, the three-leaved floral emblem of Ireland and the name of several plants including the clovers, the wood sorrel, water cress and nonesuch. The shamrock has long been connected with St. Patrick who is said to have used a trefoil plant called the *shamrock* to explain the doctrine of the Trinity. The three-leafed white clover is commonly connected with the celebration of St. Patrick's Day, and is believed by many to be the original of St. Patrick's shamrock. The word shamrock is derived from the Irish *seamrog,* trefoil.

Sheep sorrel, a small plant (*Rumex acetosella*) of the buckwheat family that has a smooth stem less than a foot high, arrowlike leaves and clusters of tiny petalless crimson or yellowish flowers. The green portions of the plant have a pleasant acid taste. The plant propagates itself by means of rhizomes and seeds. It originated in the Old World but grows wild in the United States. The name sorrel is related to our word, sour, and the species name is derived from the Latin *acetum,* vinegar, both referring to the taste of the juices of this plant. It is sometimes called *red sorrel* or *field sorrel* but is not related to the *wood sorrel* or *oxalis.*

Shepherd's purse, a common annual weed (*Capsella bursa-pastoris*) of the mustard family that has a basal rosette of notched leaves, small white flowers about a foot above the ground and three-cornered pouchlike pods with a mustardy flavor that have given the plant its scientific name, translated literally into its common name. This plant originated in Europe but now grows wild in the United States, where it was introduced by the early settlers.

Shooting star, one of a genus (*Dodecatheon*) of wild flowers of the primrose family that have basal stemless leaves and pink or white umbrellalike clusters of flowers resembling cyclamen blossoms, with stamens protruding from the folded corollas. Most species are found in the western part of North America, though a few are native to Asia.

Shrubby althea, see *Rose of Sharon.*

Sisal, a perennial tropical American plant (*Agave sisalina*), related to the century plant. Its leaves produce sturdy fibers frequently confused with henequen. The white fibers are second only to those of the abacá in strength. The fiber is used for ropes, binder twine and cord. The plant has been cultivated in Africa, the East Indies, the West Indies and Florida as well as its native South America, Central America and Mexico.

Skunk cabbage, an early spring flower (*Symplocarpus foetidus*) of the arum family growing in marshy places in both hemispheres. It has a disagreeable odor and produces its spathe-covered greenish yellow flowers before the leaves appear. It is related to jack-in-the-pulpit.

Smilax, see *Asparagus.*

Smoke tree, either of two members of a genus (*Cotinus*) of small spreading shrubs of the cashew family. The European variety (*C. coggygria*) is found in southern Europe and Asia. It grows about 15 feet tall and produces feathery clusters of purple flowers, leathery leaves and purple hairs on the stems and branches that give a smoky appearance to the tree. The American species (*C. americanus*) is a taller tree, approaching 35 feet in height, with clusters of yellowish flowers and gray or reddish hairs covering the stems and branches. The male and female flowers are borne in clusters on

Courtesy United Fruit Company

Cutting Sisal in Jamaica

An important industry in the West Indies and other tropical regions is the growing of sisal, a valuable fiber plant related to the century plants. The strong fibers, shown drying in the sun next to the plants, make good rope, twine and cord separate trees. The few fruits are small round berries. Another name is *chittamwood*.

Snapdragon, one of a genus (*Antirrhinum*) of annuals or perennials of the figwort family cultivated in both hemispheres as garden flowers. They vary in height from 8 inches to 3 feet and have spikes of odd, two-lipped white, red, orange, yellow, rose or purple flowers that open if touched and snap shut when released. The shape of these snapping blossoms give the plant its common name.

Snowball, see *Viburnum.*

Snowdrop, one of a genus (*Galanthus*) of low-growing bulbous plants of the amaryllis family. They have small bell-shaped white flowers that appear early in the spring and long, narrow grasslike leaves. Many hybrid types have been produced under cultivation. The snowdrop is also called *snowbell, white violet* and *virgin flower.*

Snowdrop tree, a genus of shrubs or small trees (*Halesia*) of the same family to which the spicebush belongs. The common variety is the silver bell (*H. carolina*). It is a hardy North American tree with oval serrate bronze leaves, bunches of white flowers resembling snowdrops an inch long and four-winged fruits that ripen in the late fall.

Snow plant, a short, stocky plant (*Sarcodes sanguinea*) of the U. S. Pacific coast. The stem, 3 to 12 inches high, the leaflike bracts and the bell-like flower are deep crimson. The plant has no chlorophyll and derives its food entirely from the vegetable decay upon which it grows. It is a relative of the Indian pipe. Because it blooms while snow is still on the ground, it has been called the *snow plant.*

Soapwort, see *Bouncing Bet.*

Solomon's seal, one of a genus (*Polygonatum*) of about 30 varieties of plants of the lily family found in the Old World and the New. They grow from creeping rootstocks that bear seallike marks left by the dying stems. The erect stem grows to a height of 1 to 8 feet and bears pointed leaves in whose axils are found the nodding, short-stalked pink flowers later producing purplish berries. Members of an allied American genus (*Smilacina*) are known as *false Solomon's seal;* their roots also bear seallike scars, but the flowers grow in a spike.

Sorghum, a genus (*Andropogon* or *Sorghum*) of tall Oriental cereal grasses cultivated for centuries in the Old World for its stalk and grain. It was introduced into the United States by the early settlers. Some varieties (such as the Kafir and milo sorghums, grown for their grain) have dry pithy stalks; others have sugarless juicy stalks and some (the *sweet sorghums*) have a very sweet sap made into a dark or honey-colored syrup. Sweet sorghum, sometimes called *sorgo,* is drought-resisting and well-liked by cattle, making it a valuable arid-region fodder plant.

Sorrel, see *Sheep sorrel.*

Soursop, see *Sweetsop.*

Spanish moss or **Southern moss,** a hoary festooning plant (*Dendropogon usneoides*) that is neither a moss nor a native of Spain. It is a member of the pineapple family and is found in the southern United States, the West Indies and tropical America. Spanish moss is usually seen hanging from the limbs of live oaks and other trees in dense southern forests. Its slender threadlike stems, several feet long, give an eerie appearance to the thickets. The plant produces tiny scalelike leaves and small yellow flowers. Like the orchid it is epiphytic, that is, it produces no roots but lives on the air rather than on the plants on which it is found growing. Spanish moss absorbs moisture from the air by means of tiny hairs that cover it. When it is dried, its fibrous stems are used for upholstery packing. It is occasionally grown in northern greenhouses. It is frequently known as *long moss.*

Speedwell, see *Veronica.*

Spicebush or **Feverbush,** an American shrub (*Benzoin aestivale*) of the laurel family that grows from 4 to 15 feet high and produces bright green leaves, turning yellow in the autumn, small yellow flowers and spicy crimson berries much sought by the birds. A valuable medicinal oil is obtained from a related Japanese species (*B. praecox*). These trees are not to be confused with the source of the drug *benzoin,* which is any of several members of the Oriental genus *Styrax,* usually *S. benzoin.*

Spikenard, one of a genus (*Aralia*) of American woodland plants of the ginseng family with spicy creeping rootstocks, compound leaves, stems 3 to 6 feet tall, clusters of greenish flowers and purple-black berries. The roots of the American spikenard (*A. racemosa*) and small spikenard (*A. nudicaulis*) were used as medicines by the Indians. The small spikenard is sometimes known as wild *sarsaparilla.* The spikenard mentioned in the Bible as a costly ointment is probably an East Indian perfume produced by an Oriental valerian (*Nardostachys jatamansi*).

Spinach, a hardy annual (*Spinacia oleracea*) of the goosefoot family that is one of the most important vegetable plants grown. It is a cool weather crop, producing a cluster of oval or arrowlike dark green leaves growing from the root and, in hot weather, a branching stalk 2 or 3 feet tall that produces seed-bearing flowers. The leaves are a valuable food, containing vitamins A. B, C and G and important minerals, including iron. The plant is a native of Asia that was introduced into Europe in the 15th century and brought to the United States by the early settlers. The name was derived from a Persian word *isfānāj.*

Spindle tree, see *Evonymus.*

Spirea, a genus of shrubs of the rose family found throughout the temperate regions. They are usually medium sized, with slender branches, small leaves and sprays of pink, white or red flowers with five small petals. Bridal wreath (*S. prunifolia*) is an Oriental variety widely cultivated in gardens in this country. It has a delicate white flower with sprays of little wreathlike clusters growing close together on a dense shrub about 10 feet high. Several other native and exotic varieties are cultivated by gardeners. Included are Van Houtte's spirea (*S. vanhouttei*), which has foliage attractive throughout the summer, and Thunberg's spirea (*S. thunbergii*), a variety with very delicate leaves and flowers that appear early in the spring.

Spirogyra, a genus of multicellular threadlike green algae composing most of the green scum found floating on water. Varieties are often grown in aquaria.

Spring beauty, an early spring flower (*Claytonia virginica*) of the purslane family found in the eastern United States. It has a tuberous underground root about 6 inches long, a stem less than a foot tall, a pair of smooth oblong leaves and sprays of fragile pink or white blossoms veined in rose. Very similar is the Carolina spring beauty (*C. caroliniana*).

Spruce, one of a genus (*Picea*) of conebearing evergreen trees found in temperate and subarctic regions of the Old World and the New. About a dozen species are natives of Canada and the United States. Spruces are tall, slender, erect trees, growing from 100 to 200 feet high, depending upon the species. Their stiff needles are arranged in spirals on the branches, and they last about 10 years. The cones, which vary according to species from 1 to 10 inches in size, are always pendant. Spruces yield valuable resinous timber woods. The *Norway spruce* (*P. abies*) has been imported into the United States, and is widely grown as an ornamental tree in the eastern states. The *Sitka spruce* (*P. sitchensis*) is found from Alaska to California. It grows more than 200 feet tall. During the World War Sitka spruce was much in demand for airplane construction and was known as airplane stock. Today with the eastern American varieties, *red spruce* (*P. rubra*) and *black spruce* (*P. nigra*), it is used chiefly as a source of paper pulp. The name spruce, the ancient name for Prussia, was given to this tree because it was first described in Prussia.

Spurge, see *Euphorbia.*

Squash, one of a genus (*Cucurbita*) of bushes and trailing vines of the gourd family that are native to America. They have large rough leaves borne on hollow stems and large yellow flowers that produce the fruits. These are edible and come in a variety of shapes, sizes and colors. Some are shaped like large, rough cucumbers, others are round, and some are oval. They may be green, yellow or orange. There are winter and summer varieties. The summer squash are bushy plants with short stems, and the winter squash are long trailing vines. The name is derived from the Massachusetts Indian word *askutasquash,* meaning vine-raw fruit. Squashes were cultivated by the Indians of every section of the country long before the white man came. The squash blossoms figure in the cultural and religious rites of many Indians. The squash blossom is a symbol of virginity among the Hopi Indian groups, and all unmarried women must wear their hair turned up in two side coils resembling squash blossoms. Southwestern Indians use the symbol, usually in conventionalized form, in much of their metalwork.

Squill, one of a genus (*Scilla*) of small bulbous plants of the lily family with grasslike leaves and a few drooping pink, blue and white starlike flowers on slender stalks. Two common varieties in rock gardens are (*S. bifolia*) and (*S. siberica*). The name squill is also applied to the bulbs of another lilylike plant, the *sea onion* (*Urginea scilla*), a Mediterranean plant 1 to 3 feet high with a large scaly bulb, clusters of multitudes of white flowers and shining succulent leaves. A powerful drug, used as a heart stimulant and to promote kidney action, is made from the bulbs of this plant.

Staff tree, one of a genus (*Celastrus*) of trees, shrubs and woody vines of Asia, Australia and North America. The only American variety is the *bittersweet* or *waxwork* (*C. scandens*) used in medicine as a tonic and emetic. From an East Indian staff tree (*C. paniculatus*) seeds containing *oleum nigrum,* a valuable medicinal oil, are obtained.

Stock, see *Gilliflower.*

Strawberry, one of a genus (*Fragaria*) of fruits of the rose family that have been cultivated in America and Europe as a small fruit crop for centuries. They are low-growing plants propagating from strawlike runners that are responsible for the name strawberry. These plants are stemless and produce coarse, serrate, trilobed leaves, pretty white blossoms and compound fruits. The so-called berries are the enlarged juicy ends of the flower stalks, the receptacles for the true fruits that survive as *achenes* or seedlike structures on the outside of the receptacle. The strawberry grows wild in Europe and the United States, but the first commercially important berry was produced in 1712 in Europe by crossing a form grown by the Chilean Indians (*F. chilensis*) with a form found wild in North America (*F. virginiana*). The Hovey strawberry, produced in Boston in 1834 by Charles Hovey, was the next important market fruit. The cultivated berries are larger, sweeter and more succulent than the wild forms.

Sudan grass, a variety (*Sorghum vulgare*) of African sorghum introduced into the Great Plains and corn belt of the United States in 1909. It is a valuable drought-resisting hay and pasture plant growing 5 to 9 feet tall and having long panicles of tiny blossoms surrounded by bladelike leaves.

Sugar beet, see *Beet.*

Sugarberry, see *Hackberry.*

Sugar cane, a tropical grass (*Saccharum officinarum*) with many-jointed stems. It is a native of Asia and the East Indies but is cultivated throughout the tropics for the sweet juice in its tall stalks, the principal source of the world's sugar supply. The Portuguese introduced this plant into Europe about 1400, and it was brought to the West Indies about 150 years later. Sugar grows from 6 to 16 feet high, flourishing only in hot, moist places. The thin rind of the stem (½ to 3 inches across) is yellow, green or purple. The colorless fibrous tissue contains the juice that is made into sugar, molasses and syrups. The grasslike leaves spring from nodules at each joint in the stem. The plant is usually propagated by stem cuttings, although it produces seed-bearing microscopic flowers in huge sprays called *arrows.* Cuba, India and Java lead in the production of sugar cane, but large amounts are grown in Hawaii, the southern United States and many parts of tropical America. The stalk refuse, *bagasse,* left after the sap has been extracted, is utilized for fuel, or is processed into paper and wallboards.

Sumac or **Sumach,** one of the genus *Rhus,* trees and shrubs of the sumac family distributed throughout North America and Europe, particularly in warm regions. They are usually stiff, angular plants with fernlike foliage, a milky juice, four- or six-lobed flowers and clusters of bright, hairy berries. The *staghorn sumac* (*R. typhina*) is frequently planted as a decorative plant. This tree grows about 30 feet high and has velvety hairs covering its branches. The leaves turn scarlet in the fall, and its berries are born in pyramidal crimson clusters. The *aromatic sumac* (*R. aromatica*), a variety with handsome foliage, and the *smooth sumac* (*R. glubra*), an attractive form growing about 15 feet tall, are commonly planted in gardens and along roadsides as decorative forms. Three varieties, the swamp-loving *poison sumac* (*R. vernix*), which bears drooping gray berries, *poison ivy* (*R. toxicodendron*) and *poison oak* (*R. quercifolia*) are serious pests as their juices are highly poisonous to most people upon contact with any part of the plant, even the unbroken leaves.

Sundew, one of a genus (*Drosera*) of low, slender, insectivorous, marsh-loving plants of the sundew family. They have a rosette of club-shaped leaves growing close to the ground, covered with fine glandular hairs that secrete an oily substance. Drops of this shining on the plant look like dew, explaining the common name for these forms. Sundews bear a few white or purple flowers. Insects are attracted by the glistening leaves; when they alight, they are enmeshed in the hairs on the leaves, killed and digested by the juice secreted by the leaf glands. So insects form the source of the plant's nitrogenous food.

Sunflower, one of the genus *Helianthus* of annual or perennial members of the composite family that are native to Europe, Asia, North America and South America. The common variety (*H. annuus*), the state flower of Kansas, is a tall plant with a hairy stem 3 to 20 feet high; coarse, serrate leaves and a flat, large flower head composed of many rays of golden yellow blossoms. This was a sacred plant to the Incas of Peru, who built images in its shape, and to the North American Huron Indians. A mammoth Canadian form is grown as an ensilage crop. In Europe and Asia varieties are grown for their seed and seed-oil, used as a human food. The residue left after the oil has been removed from the seeds is fed to cattle. Sunflower stalks are used as fuel by peasants in many parts of eastern Europe and Asia. The Jerusalem artichoke is a sunflower (*H. tuberosus*) grown for its edible roots, fed to stock. The name sunflower was given to this plant because the rayed flower heads bear a resemblance to crude symbolic drawings of a rayed sun. The scientific name is derived from the Greek *helios*, sun, and *anthos*, flower. Double and frilled varieties have been cultivated by gardeners.

Sweet bay, see *Laurel.*

Sweet gum or **Liquidambar,** a North American and Central American tree (*Liquidambar styraciflua*) of the witch-hazel family that grows from 40 to 140 feet high and is often cultivated as an ornamental shade tree. An aromatic gum exudes from wounds in the gray bark that, in old trees, is deeply furrowed. Its corky branches bear many large, stellate, lobed leaves that turn scarlet, yellow and orange in the fall. The clusters of greenish male and female flowers are borne on the same tree. The pistillate flowers produce the fruits, globular structures composed of many spiny seeds fused into one prickly ball, contained in winged seeds, that lasts after the leaves have dropped. The reddish-brown hard wood is used for furniture, floors and veneers, especially to imitate mahogany and Circassian walnut. It is sometimes called the *red gum, star-leaved gum* or *alligator tree.* A related genus in the Orient, *Styrax,* and Oriental species of *Liquidambar* produce resin and balsam called *storax.*

Sweet pea, a handsome garden annual (*Lathyrus odoratus*) of the pea family that grows 3 or 4 feet high with slender, climbing stems, pinnate leaves and butterfly-shaped flowers of white, apricot, red, pink, peach, blue or lavender. The flowers, which may be variegated or of a solid color, grow in clusters of three or four and bloom throughout the summer. Dwarf varieties and double varieties have been developed. The plant, a native of Sicily, was introduced into England in the 18th century and from there into the United States.

Sweet potato, a perennial low-trailing vine (*Ipomoea batatas*) of the morning-glory family raised for its edible roots in South America, the southern United States and other warm countries. It is a native of South America first introduced into Europe by Columbus. The plant produces heart-shaped leaves, purple flowers, if left to grow to seed, and tuberous roots varying from round to long, slender structures with a greenish-yellow, orange or reddish edible pulp. A sweet variety is incorrectly known in the United States as *yam.* It is the original plant known as potato. The Irish or white potato was named after it.

Sweetsop or **Sugar apple,** a small tree (*Annona squamosa*) of the custard-apple family, native to the American tropics but raised in the southern part of the United States. The tree is usually under 25 feet high and produces oval leaves, single green blossoms and a fruit with a green scaly rind resembling a pine cone and a sweet, melting white pulp. Another member of this genus is the *soursop* (*A. muricata*) of the West Indies, Mexico and tropical parts of South America. The fruits are larger than those of the sweetsop and are more acid. They are used in making cooling drinks, ices, jellies and preserves.

Sweet William, see *Pink.*

Swiss chard, see *Beet.*

Sycamore or **Plane tree,** any species of the genus *Platanus,* trees native to both hemispheres that are used commonly as shade trees. Sycamores have thin brittle bark, which scales off leaving chalky white patches; tough wood; spreading branches on a massive trunk 140 to 170 feet tall; broad lobed leaves with a hollow leafstalk that drops off to reveal the winter bud; and brown fruits composed of a dense mass of small nuts tightly packed together. The common American sycamore or *buttonwood* (*P. occidentalis*) is found throughout the United States; smaller native varieties grow in the southern States, and the European sycamore (*P. orientalis*), resembling the American, is common in large cities throughout this country, where it is planted as a shade tree. The name sycamore comes from Greek words meaning fig mulberry and is frequently applied to certain Oriental figs. The name plane is short for *Platanus,* which comes from the Greek word *platus,* broad, and refers to the broad head of the tree.

Syringa or **Mock orange,** one of a genus (*Philadelphus*) of ornamental European shrubs of the saxifrage family, extensively cultivated in the United States. The syringa is a hardy plant, 6 to 12 feet tall, with brown bark, oval leaves about 4 inches long and large, sweet-scented white or cream flowers blossoming late in the spring. The state flower of Idaho is a syringa, *P. lewisii.* Closely related is the *hydrangea.* The lilac, whose generic name is *Syringa,* is entirely unrelated. The mock orange is known as syringa because at one time its stems were used for pipestems—*syrinx* is Greek for pipestem.

Tallow tree, a Chinese tree (*Sapium sebiferum*) grown in the United States as an ornamental tree and in China and India for the white grease covering its seeds, used in making candle tallow, soap and a dressing for cloth. Candles made of this tallow give a very clear light. The tree produces glossy oval leaves and long clusters of flowers that are very small. Its hard wood is often used for engraving. The name tallow tree is sometimes applied to an African tree (*Pentadesma butyracea*) also called the *butter tree* of Sierra Leone, which produces an ovoid fruit that has a fleshy rind containing a yellow grease used as a butter by the natives.

Tamarack, see *Larch.*

Tamarind, an evergreen fruit tree (*Tamarindus indica*) of the pea family, found in India. This tree, which is related to the acacias, grows about 80 feet tall and produces many branches, making it an important shade tree. It has compound leaves composed of many leaflets, unusual white, yellow or pink flowers and fruits in the form of long, narrow, knotty brown pods containing many seeds imbedded in a juicy brown pulp used for making jellies, preserves and a cooling drink popular in the tropics. In India the fruits and leaves are eaten and are used as a mordant in making dyestuffs. The wood is hard and durable and is important in cabinetmaking. The fruit is also used in medicines for throat ailments. The tamarind is grown in other tropical countries and has been cultivated to some extent in Florida. It resembles the native locusts. The name comes from the Arabic *tamr,* date, and *Hind,* India.

Tamarisk, one of a genus (*Tamarix*) of shrubs and small trees found in salt deserts and sandy regions of the tropical and subtropical regions of the Old World. They are drought-resisting trees producing small leaves, many sprays of minute pink flowers and capsules containing tufted seeds. One variety has been introduced into California. It is a valuable windbreak and shelter tree in desert areas.

Tangerine, see *Orange.*

Tapioca, see *Cassava.*

Taro, a perennial (*Colocasia esculenta*) of the arum family native to the South Sea Islands. It has been cultivated in the Orient and the Pacific Islands for its edible starchy root since ancient days. It has been introduced into the West Indies and the southern United States. It has spherical tuberous roots eaten cooked throughout the tropics. In some places the stalks and leaves also are eaten as a cooked vegetable. In the Hawaiian Islands a meal, *poi,* is made from the fermented paste of the root. A variety of taro is known to florists as *elephant's ear,* a name botanists generally reserve for a large-leafed mottled variety of begonia. The leaves of the taro are very similar to those of the elephant's ear begonia, being large and spreading. A variety of taro, *dasheen,* is raised in the United States and the West Indies. The name originated in Trinidad, where it was known as *taro de la Chine,* to distinguish it from varieties already growing there. That name degenerated into *dasheen.* The dasheen has longer, sweeter roots than other taros. Taro is an important food staple throughout the Old and New World tropics, and it may become as important in America as the potato. Taro is the Tahitian and Maori name for this plant.

Tarragon, a European herb (*Artemisia dracunculus*) of the composite family that belongs to the same genus as the sagebrush. It has smooth branches, aromatic foliage with a bitter taste and globular clusters of flowers. Tarragon is usually propagated by rootstocks. The foliage is used to flavor vinegar, pickles and salads. Tarragon oil is sometimes known as *estragon oil.* The specific name *dracunculus* means little dragon, and *tarragon* is an altered form of the same word.

Tea, a bush or small tree (*Camellia thea* or *Thea sinensis*) related to the camellia, native to China but cultivated in India, Ceylon, Japan and Formosa as well as its native country. It is an evergreen shrub 30 feet tall in the wild stage but 3 to 5 feet tall when cultivated. It has many leathery, oval, serrate leaves with thick veins and fine hairs on the undersurface and faintly odorous ivory or pink flowers in axillary clusters. The fruit is a woody structure containing several seeds resembling hazelnuts. The two chief varieties, black and green tea, come from the same variety, but green tea is made from leaves that are dried quickly and black tea from leaves that have been fermented first. Two varieties, *C. thea viridis* and *C. thea bohea,* and their hybrids give rise to the chief races of Assam, Lushei, Chinese, Burma, Yunan, Shan, Formosa, Ceylon, Japanese, Indian and Sumatra teas. Tea leaves are picked from the same bushes 20 or 30 times a year. The first picking yields buds and very young leaves, giving the best grades of tea, the next pickings take the new buds and leaf shoots induced to grow by the first plucking. The last pickings are of the old leaves and completely strip the bushes, giving a coarser grade of tea. After tea is withered, rolled, fermented and dried (the processes used in preparing black tea for market) it is graded. According to quality, black tea is classified as orange pekoe, pekoe, pekoe souchong and souchong. The characteristic color of black tea is caused by the fact that the drug in tea, *tannin,* becomes converted by oxidation into a reddish brown substance that colors the liquid brewed from the leaves. Tea was known as a beverage in China for nearly 3,000 years before Christ. There is a legend in the Orient as to how tea was produced: When a priest of India, Bodhidharma, went to China in 543 A.D. to teach the Chinese, he accidentally fell asleep at a time he wished to stay awake. In order to insure eternal wakefulness he tore off his eyelids and threw them into the ground, whence sprang a bush with leaves that keep the eater awake. Another story is that tea was discovered by Emperor Shên-nung in 2737 B.C. Tea was first brought into Europe by the Portuguese in the 16th century and probably into England a century later. Samuel Pepys wrote of it in 1660 as a new Chinese drink. Tea became such a popular drink in England in the 18th century that its cultivation was begun in British India. In Japan almost religious rites are connected with the drinking of tea and elaborate tea ceremonies, whose rituals are dated in antiquity, are followed on certain occasions, with traditional articles used in the preparation of the beverage and traditional acts observed by the drinkers.

Teak, a tall Asiatic tree (*Tectona grandis*) of the verbena family that ranks with the mahogany as the source of the world's most valuable timber. Teak has been known and used in India for at least 2,000 years. It is a native of India, Burma and Siam and is grown in Java, Malaysia and the Philippine Islands. Teak survives only in a rainy climate but must have dry subsoil with perfect drainage. It grows about 200 feet tall with a straight trunk, spreading crown, leaves 1 or 2 feet long that drop off in the dry season and small white flowers borne in sprays. The timber is fragrant; the heartwood a golden yellow that seasons into darker mottled colors. Expensive furniture and wood carvings are made of it, and in the Orient teak is used for temples, homes and ships, although it is subject to attack by the *teredo* or shipworm. In Burma an oil extracted from teak is used medicinally and commercially. The tree is cultivated on huge plantations throughout India, Burma, Bengal and the islands on which it is found. It is a wood of great durability; there are teak carvings more than 2,000 years old in Indian temples.

Teasel, either of two members of a genus (*Dipsacus*) of prickly-stemmed biennials native to Asia and Europe but naturalized in the United States. It has large spreading leaves with prickly main veins and purple flowers borne in clusters that produce stiff, spiny bracts. The burrs of one variety, fuller's teasel (*D. fullonum*), have hooked spines. They are cut and fastened to wooden rollers, then used to raise a nap on woolen cloth. Teasel burrs are used almost exclusively for this work. The wild teasel (*D. sylvestris*), from which this other species was developed, is a straight-spined variety useless in the woolen industry.

Teosinte, an annual grass (*Euchlaena mexicana*) that is a native of Mexico and Central America and is cultivated to a limited extent as a fodder crop in the southern part of the United States. It is closely related to Indian corn or maize and will cross with it. Many botanists believe that it is a descendant of Indian corn. The branched stems produce maizelike tassels, and the pistillate flowers have a silky covering, also resembling maize.

Thistle, any of several genera (*Carduus, Cirsium, Cnicus* and *Onopordon*) of the thistle family (*Carduaceae*) that have prickly stems about 3 feet tall, narrow spiny leaves and tufts of purple, yellow or white flowers producing winged seedlike fruits. The Scotch thistle, a purple variety, is the national emblem of Scotland. The Canada thistle (*Cirsium arvense*) is a widely distributed variety found throughout North America, where it was introduced from Europe. It grows as a weed, spreads rapidly and is considered a serious pest by farmers.

Thorn apple, see *Jimson weed.*

Thyme, one of a genus (*Thymus*) of perennial shrubs of the mint family that are native to Mediterranean Europe but are cultivated in the temperate regions of both hemispheres for their aromatic leaves used in cookery. It has a woody stem 1 or 2 feet tall, narrow leaves and clusters of lilac-colored two-lipped flowers. The leaves, which taste something like sage, yield the essential oil of thyme, used medicinally. The common garden thyme (*T. vulgaris*), usually used as a condiment- and drug-producing plant, is closely related to the wild creeping thyme (*T. serpyllum*). The name is related to the Greek word for sacrifice, alluding to the aroma of the shrub.

Timothy, a perennial European grass (*Phleum pratense*) used for fodder, bushy, with flowers borne in a closely packed spike resembling a miniature cattail, is the leading hay grass grown in America today. It easily withstands drought and cold because its bulbous root stores up food. When it is in bloom, timothy grass seems covered by a purple mist because the long stamens are purple. It is well liked by stock. The grass was named for Timothy Hanson who introduced the seed in the Carolinas in 1720.

Toadstool, see *Mushroom.*

Tobacco, one of the genus *Nicotiana* of broad-leafed annuals of the nightshade family first discovered by the Spanish in Mexico and the Caribbean Islands but native to Central America and South America. It has handsome leaves, a straight stem about 6 feet high and pretty pink or white tubular flowers. The leaves are stripped from the stems either before or after the stalks have been cut. The leaves are then dried and processed for manufacture into cigars, cigarettes, smoking tobacco, chewing tobacco or snuff. Many grades, varieties and qualities of tobacco are developed in the different countries in which it is grown: the United States, Cuba, other parts of tropical America, Africa, Persia, central Europe, India, the East Indies, the Philippines, Turkey and Egypt. Some are adapted for cigarettes, others for cigars. The genus name and the name of the drug, *nicotine,* found in tobacco leaves, was given to the plant in honor of the Frenchman Jean Nicot (1530-1600) who introduced tobacco into France. The Indians of both North America and South America had been smoking tobacco leaves for centuries before the white man came to the New World. The smoking of a pipe was part of the peace ritual of most North American Indians. Sir Francis Drake brought tobacco into England towards the end of the 16th century, and Sir Walter Raleigh, by smoking, set the fashion for tobacco use in England. At one time smoking was considered a means of preventing the black plague, and pipesmoking was a widespread habit among men and women. The United States leads in tobacco production today, producing tobacco used for cigarettes, cigars, pipes and chewing. In Brazil and Sumatra tobacco is raised that is most adaptable for cigar wrappers. In Havana choice cigar tobaccos are raised. Particularly fine cigarette tobaccos are grown in Turkey and Egypt.

Most tobaccos are varieties of *N. tabacum,* the Virginia tobacco native to North America and grown in Cuba, the Philippines, Canada, Africa and Turkey. *N. persica,* a Persian variety producing the famous Shiraz tobacco of Persia, is probably a variant of the common American genus. At one time divine healing powers were attributed to it, and it was known in 17th century Europe as *herba santa,* holy herb.

There are other members of this same genus known as *flowering tobaccos,* because they are grown not for their leaves but for their fragrant pink, white, yellow, violet or red blossoms that grow in luxuriant sprays. These flowering plants are usually about 3 feet tall. Some varieties are night-blooming, and some are day-blooming, so that flowering tobacco plants are ornamental day and night. Their heavy fragrance is more pronounced at night.

Tomato, an annual tropical plant (*Lycopersicon esculentum*) of the nightshade family that is one of the newest food plants of the temperate regions. Only about 100 years ago was it realized that the bright fruits (or *love apples*) of this plant, long cultivated as an ornament, are not poisonous and are very good to eat. The plant is usually rather small, with notched leaves, yellow flowers and round red or yellow fruits rich in vitamins. They are eaten raw, cooked, pickled, canned and crushed into tomato juice. The Spaniards introduced it into other countries from its native South America. It is closely related to the potato.

Tonka bean, a South American tree (*Dipteryx odorata*) of the bean family, known in Latin America as the *cumaru.* The tree grows about 80 feet high and produces fleshy fruits containing a black, fragrant seed, the tonka bean, used in flavoring tobacco and in making imitation vanilla extract. The beans, containing *coumarin,* a sweet-smelling carbohydrate, are also used in making perfumes. The plant is sometimes called the *tonqua bean tree* or the *coumarou.* The name is adopted from Dutch *Tonquin boontjes,* in which *boontjes* means berries, and Tonquin is the name of a province in Indo-China, though the tree is American and not Asiatic.

Toyon or **Tollon,** a small tree or shrub (*Heteromeles arbutifolia*) of California that belongs to the rose family. It varies in height from 5 to 25 feet, has light aromatic bark and produces glossy, serrate evergreen leaves, loose clusters of white stellate flowers and red berries resembling those of the holly. It is sometimes called *Christmas berry* or *California holly.* The fruits, which are edible and pleasant, ripen through the coldest part of the winter. The tree is protected by law from unwarranted picking.

Trillium or **Wake-robin,** one of a genus of American woodland wild flowers of the lily family. They have white or purplish red three-petaled flowers, short thick rootstocks and three whorled leaves at the flower base. The name trillium, from *tri,* three, is applied to this plant because all its parts are in groups of three. The *white trillium* is one of America's showiest native flowers; the *painted trillium* has red stripes on its white flowers, and the *red trillium* has small purplish red blossoms and an unpleasant odor. The rootstocks of one variety (*T. erectum*) are dried and used as a tonic and astringent.

Truffle, a European mushroomlike fungus, any of several varieties of the genus *Tuber,* 1 or 2 inches wide with a warty black surface around a firm pulp of brown and white. Truffles frequently grow underground and are hunted by means of dogs or pigs trained to recognize their distinctive scent. France leads in their production.

Trumpet vine or **Trumpet creeper,** a hardy, decorative, American woody vine (*Campsis radicans*) related to the catalpa tree that has clusters of orange or scarlet trumpet-like flowers, stout stems, bright green, oval, compound leaves and tendrils by which it climbs over trellises, walls and rocks. It grows rapidly—sometimes to a height of 80 feet.

Tuberose, a fragrant Mexican flower (*Polyanthes tuberosa*) of the amaryllis family grown in greenhouses and gardens in temperate regions of both hemispheres. It produces a long spike of heavily perfumed, waxy white, tubular flowers and narrow leaves growing on a stem about 3 feet tall. The name tuberose means tuberous, its roots are tuberous in contrast to the bulbous root of its relatives.

Tulip, one of a genus (*Tulipa*) of Near Eastern plants of the lily family that have been cultivated in Holland since the 16th century. They have sheathed bulbs, broad, tapering leaves and large, showy cuplike flowers. Some have long stems; others are dwarfed. There is much variety in size, shape and color, but tulips are usually vivid, either in one solid color or variegated shades. Clusius brought the first bulbs to Holland at the close of the 16th century. The flowers became so popular they commanded fabulous prices. Today they are cultivated in many places, including the United States, but Holland is the center of commercial production. Many varieties have been developed, differing considerably from the first wild forms. The *cottage tulip* (*T. gesneriana*) is the original form from which the *bizarre* (bright, yellow-centered blossoms), the *roses* (variegated pink, rose or scarlet blossoms) and the *bybloemens* (white blossoms with colored stripes) have been cultivated. A wild tulip of the Caspian sea (*T. suaveolens*) is the forerunner of the early-blooming yellow-tipped red Van Thol tulips. Many other pure and hybrid strains have been grown. The name comes from the Turkish *tulband,* turban; the shape of the blossoms is something like a Mohammedan turban.

Tulip tree, a handsome North American tree (*Liriodendron tulipifera*) of the magnolia family that has a straight trunk frequently growing 200 feet tall, a cone-shaped head of branches bearing broad, simple lobed leaves and striking tuliplike greenish-yellow flowers. The soft wood, sometimes known as *whitewood* or *canoewood,* was used by the Indians for canoes and is still used in making wooden ware and interior finishes. The only nearly related tree is a Chinese variety with similar blossoms. Some members of unrelated genera are known in the West Indies and in the Orient as tulip trees because they have showy flowers somewhat like those of the true tulip tree.

Tumbleweed, one of several plants that break loose from their roots when they are dry and are rolled by the wind across plains or prairies as light balls, thereby scattering their seeds. The Russian thistle (*Salsola pestiva*), pigweed (*Cycloloma atriplicifolium*) and tumbling mustard (*Sisymbrium altissimum*) are some examples.

Tung tree, an Asiatic tree (*Aleurites fordii*) of the spurge family that has a milky sap and bears small white blossoms that produce drupes containing oily seeds. The oil pressed from these seeds, mixed with soy bean oil, forms one of the most effective drying oils used in the paint industry. The cultivation of these trees has become an important industry in the United States—they are raised in the Gulf region, where they blossom in the early spring.

Tupelo or **Pepperidge,** one of a genus (*Nyssa*) of waterloving trees of the dogwood family that are found in Asia and the United States. They grow 40 to 60 feet tall with drooping lower limbs, leathery leaves and clusters of separate male and female flowers growing on one tree. The pistillate flowers produce a red, blue or purple cherrylike fruit that ripens in the fall, when the leaves are scarlet. A common name for the tupelo is *gum.* The *black gum* (*N. sylvatica*) is an Eastern tree often grown in parks. The *cotton gum* (*N. aquatica*) is a swamp tree of the Gulf coast. The *sour tupelo* (*N. ogeche*) is a tree of the coastal swamps producing sour berries used for preserves. *Tupelo* is a Creek Indian name meaning swamp tree. The generic name Nyssa is the name of a water nymph of classic mythology.

Turkey beard, an American herb (*Xerophyllum asphodeloides*) of the bear grass family that is found in the southeastern United States. It has a thick rootstock, a stem 1 to 4 feet tall, rough-edged stiff leaves and clusters of fragrant white spring-blooming flowers.

Turnip, a biennial vegetable (*Brassica rapa*) of the mustard family that has a root eaten by human beings and livestock, a rosette of bright hairy leaves, yellow flowers and

Courtesy Mississippi Advertising Commission

Tung-Tree Grove in Mississippi

The seeds in the nuts of these trees produce the valuable tung oil used as a drying oil in the paint industry. This picture was taken in Pearl River County, Mississippi, center of tung cultivation in the Gulf States, where the trees have been introduced from their native China

cylindrical, pointed seedpods. Some turnips have white and some yellow roots. There are early blooming and late varieties. The closely related *rutabaga* is a member of the same genus and is often called *Swedish* or *Russian turnip*.

Umbrella plant, a variety of sedge (*Cyperus alternifolius*) that is native to Madagascar but is raised as a house plant in many places. It produces clumps of 3 to 10 stems growing from 1 to 3 feet high and bearing whorls of rough bladelike leaves arranged like the ribs of an umbrella. In January and February clusters of greenish flowers appear at the tops of the stems. This plant is related to the papyrus.

Umbrella tree, see *Magnolia*.

Valerian, a genus of European and Asiatic sunloving hardy perennials with stems 2 to 5 feet high, root suckers by which they are propagated, delicately pinnate leaves and tiny sweet-smelling pink, lavender or white flowers in luxuriant clusters. Valerian is grown in the New World and Old as a border flower. The roots yield a drug with valuable medicinal qualities. The *common valerian* (*V. officinalis*) is sometimes called *garden heliotrope*. An unrelated genus (*Polemonium*) of perennials with blue cuplike flowers and showy foliage is sometimes called *Greek valerian* or *Jacob's ladder*.

Vanilla, see *Orchid*.

Varnish tree or **Golden rain tree**, a small Oriental tree (*Koelreuteria paniculata*) grown in gardens in the United States and England. It has a trunk 25 to 30 feet high that frequently branches close to the ground into two main trunks. It bears large oval leaves and long spikes of tiny yellow flowers that drop in great numbers when they dry, suggesting a fall of golden rain. From these flowers are produced swollen three-cornered red pods that turn brown as they ripen. The Chinese use the flowers for a deep yellow dye. Another varnish tree is the sumac used for Japanese lacquer. See *Lacquer tree*.

Vegetable sponge, Luffa or **Loofah**, an eastern tropical vine (*Luffa aegyptica*) of the gourd family that has large coarse leaves and a long slender fruit, 10 to 40 inches long, with a fibrous skeleton running through the pulp. The name vegetable sponge is frequently applied only to the framework of fibrous tissue from which the pulp has been removed. The entire fruit is sometimes eaten, and the fibers are used in various Oriental countries as a sponge, in the preparation of cloth and in making hats. This plant is also called the *rag gourd* or *towel gourd*.

Velvet bean, one of a genus (*Mucuna*) of tropical annual legumes grown in the United States as a forage and fodder crop. It is a large vine, often 50 feet long, with large trilobed leaves borne on long stems, clusters of pink, blue, white or violet flowers, hairy pods and noduled roots 10 to 20 feet long.

Venus's-flytrap, an insectivorous plant (*Dionaea muscipula*) of the sundew family found in marshy regions of North and South Carolina. It has a rosette of bright leaves that have winged stalks and bilobed blades edged with sharp teeth resembling a rat trap. Each lobe of the blade is armed with three bristles. When an insect alights on any of these bristles, the plant [illegible] the two lobes of the leaf close, and the insect is crushed to death inside the leaf whose glands pour a digestive fluid over their prey.

Verbena, several South American species of a genus of small prairie flowers. Because they bloom through the summer until the first frost, producing flat, attractive clusters of pink, rose, white, blue or purple flowers, they are cultivated in gardens in both hemispheres. The *sweet-scented verbena* (*V. hybrida*) is a garden favorite in the United States because of its gayly-colored blossoms. *Moss Verbena* (*V. erinoides*) is commonly grown in hanging baskets. Another related plant, *vervain* (*Verbena officinalis*) is an Asiatic variety with smooth branching stems and purple flower sprays. Some varieties of vervain are native to North America; all are cultivated here. *Lemon verbena* is a plant of a related genus (*Lippia citriodora*), also native to South America and cultivated in the North. It has pyramidal clusters of [illegible] with a juice that has a lemon fragrance. The words *verbena* and *vervain* are the same in their origin.

Veronica or **Speedwell**, one of a genus of herbs, shrubs and trees of the figwort family found throughout the world. They generally have simple leaves on erect or creeping stems and long spikes of small-sized blue flowers. Most of the [illegible] are natives of North America; [illegible] will grow only under cultivation. A New Zealand variety is a shrub with a [illegible] stem. The flowers resemble small [illegible] and they are named from the legend of St. Veronica who wiped the face of Jesus on His way to the cross with her veil and found the imprint of His face on the veil.

Vervain, see *Verbena*.

Vetch, one of the genus *Vicia* of annual forage vines of the pea family that are natives of Europe and Asia but have been cultivated in North America. They have slender trailing stems, 2 to 5 feet long, compound tendrilled leaves and purple, pink, white or purple blossoms producing seed-pods. The common vetch (*V. sativa*) is a native of Great Britain; the hairy vetch (*V. villosa*), of eastern Europe.

Viburnum, a large genus of shrubs of the honeysuckle family, some of which are native to America, others to Europe and China. They have large showy leaves and globular clusters of white or pink flowers. Some large flowers in each cluster are sterile. They produce dark red or black berries. The *snowball* is a sterile species (*V. opulus sterile*) propagated by cuttings. Its white clusters of flowers have neither pistils or stamens. It is a variety of high-bush cranberry (*V. opulus*), a group growing 12 feet high with coarse leaves and white flower clusters containing a few small, fruiting flowers in the center surrounded by large white sterile flowers.

Viola, the common name of any one of several cultivated members of the genus *Viola*, to which the pansies and violets also belong. Violas have hardy pansylike foliage. The *Jersey gem*, one of the commonest varieties, is a long-stemmed plant with velvety purple flowers resembling those of the common violet. The *apricot viola* is a variety with pansylike apricot-colored blossoms.

Violet, several small wild species of the genus *Viola* that are found wild in moist places throughout the world. They are low-growing herbs with short stocky stems, broad oval or heart-shaped coarse leaves and small long-stalked nodding blossoms of white, yellow or violet borne singly. The blossoms are irregular with one long spurred petal containing the nectar. These blossoms produce seeds, but violets are usually propagated by the seeds borne by different [illegible] cleistogamous (self-pollinating) petalless buds that grow on short inconspicuous stalks at the base of the leaf cluster late in the season. The violet, which occurs in many varieties, is the state flower of Illinois, New Jersey, Rhode Island and Wisconsin. Most varieties are very fragrant.

Virginia creeper, a trailing vine (*Parthenocissus quinquefolia*) of the grape family with five-lobed ivylike leaves and dark blue berries. It is native to the eastern part of the United States but is extensively cultivated as an ornamental vine. It covers houses and fences climbing by means of disklike tendrils. Closely related is the *Boston ivy* (*P. tricuspidata*).

Wahoo, see *Elm*.

Wake-robin, see *Trillium*.

Walking leaf, a small North American fern (*Camptosorus rhizophyllus*) with slender, tapering evergreen fronds that bend down to the ground and take root there, forming new plants. The reproductive spores are scattered over the under surface of the frond which is heart-shaped at the base of the plant. It is named from this habit of creeping along.

Wallflower, see *Gillyflower*.

Walnut, one of a genus (*Juglans*) of valuable timber trees of the Old World and the New. They are round-topped trees, 70 to 150 feet tall, with large compound leaves, tiny male and female green flowers borne on one tree and round light-brown edible nuts. The *black walnut* (*J. nigra*) is an American variety 150 feet tall growing east of the Rocky Mountains that has a hard wood prized for furniture, ships and gunstocks and an edible oily nut. Equalling it in timber value is the *Persian walnut* (*J. regia*), sometimes called *English walnut*, that has [illegible] the same way as the purplish-brown wood of the black walnut. The Persian walnut originated in Persia and India but was introduced [illegible] several centuries ago and has [illegible]. The wood of this tree is sometimes called *Circassian walnut*.

The *butternut* is the fruit of the *white walnut* (*J. cinerea*) common in Canada and the eastern United States. A stain obtained from the husks of butternuts was used in colonial days for dyeing homespun woolens. It is a smaller tree than the black walnut. Butternuts are oblong, although most walnuts are round. Their husks have one pointed end, and the nuts are much oilier than other walnuts. The *southwestern walnut* (*J. rupestris*) is a small nut-producing tree of Mexico and the southwestern United States. The *California walnut* (*J. californica*), is used for grafting the Persian walnut, extensively cultivated in this country. The name *walnut* comes from the Anglo-Saxon [illegible] genus name is derived from the Latin *Jupiter* and *glans*, acorn of Jove.

Water chestnut, a [illegible] aquatic plant (*Trapa natans*) of the Orient grown in aquaria in the United States. It has [illegible] notched leaves that float on the surface of the water, spongy stalks, feathery underwater leaves and small white flowers appearing above the water that give rise to the fruits, which are spiny, thin-shelled structures containing a sweet, edible seed eaten raw or roasted in the Orient. In Mediterranean countries the nuts are ground into a flour. The Chinese *ling* and the Indian *singhara nut* are varieties of water chestnut with larger fruits.

Watercress, see *Cress.*

Water lily, one of several genera of attractive aquatic plants of the *Nymphaceae* found in shallow slow-moving streams and ponds in many parts of the world. Their fleshy rhizomes grow in the stream bed and produce flat padlike leaves floating on the water's surface a few inches below the handsome large flowers that are borne on thick stalks. They vary in color from white to bright red. Some bloom by day, some by night. Many are fragrant. An Amazon water lily (*Victoria regia*) has flowers 12 to 16 inches in diameter and leaves 6 to 12 feet wide. Native American water lilies are not so attractive as tropical varieties, many of which are grown in the United States. Various Oriental water lilies are called *lotus.* The *yellow pond lily* of the United States is a flower with yellow sepals and tiny petals. The *white water lily* is an American form with white sepals and many petals changing into stamens at the flower's yellow center.

Watermelon, an annual vine (*Citrullus vulgaris*) of the gourd family, native to Africa but grown extensively in the United States. This vine produces huge berries or melons weighing 50 pounds or more, with a sweet red pulp covered by a thick green or green and white rind. Watermelons are known to have been cultivated in Egypt in Biblical times and were introduced into Europe before the time of Christ. The fruit has great cooling qualities and is eaten raw or pickled. In the Orient the seeds are a popular food.

Water plantain, one of a genus (*Alisma*) of aquatic plants of temperate regions that have long-stemmed floating leaves and large round white flowers. The acrid leaves resemble those of the plantain.

Wattle tree, one of several species of acacia indigenous to Australia and cultivated in the southwestern United States. They have twigs that, in young saplings, are easily bent and are used in Australia for making primitive dwellings and fences. The yellow flowers are borne in long sprays. The *common wattle* (*Acacia longifolia*) is the national flower of Australia.

Wax plant, an Asiatic climbing shrub (*Hoya carnosa*) of the milkweed family that grows 5 to 7 feet tall, has leathery, shining oval leaves and fragrant pink stellate flowers. It is grown as a pot-plant and a trellis plant in many parts of the world. It requires a great deal of water to flourish and is usually propagated by root cuttings. It received its common name from the shining waxy appearance of the leaves.

Waythorn, see *Buckthorn.*

Wheat, one of a genus (*Triticum*) of annual grasses. It has been cultivated in its native Asia since prehistoric times and comprises the world's chief cereal crop. It has tall stems, ribbonlike leaves and bearded heads or spikelets of starchy grains that are prized as food throughout the world. Pictures of cultivated wheat are found in ancient Egyptian carvings and paintings, and it was raised in China about 3,000 years before Christ. Many varieties have been developed. Wheat is one of the main crops of the United States, Canada, China and Russia. *Spring wheat,* a variety planted in the spring and harvested in the early summer, is planted in the northern United States and in most cold countries. *Winter wheat,* planted in the fall and harvested the following spring, is planted in the middle regions of the United States and in warmer countries. *Durum wheat* is a hard wheat and produces *semolina,* the source of most macaroni products. *Einkorn, Polish wheat, spelt emmer, poulard wheat* and *club wheat* are other varieties used in making breads and wheat cereals. The name comes from the Gothic *hwaiteis,* white.

Wild carrot or **Queen Anne's lace,** a weed pest (*Daucus carota*) of Europe and America from which edible carrots can be produced in a few generations. It has a hairy stem about 3 feet tall, pinnate leaves and a cluster of white blossoms as delicate as lace.

Wild ginger, see *Ginger.*

Willow, any species of the genus *Salix,* shrubs and trees found throughout the world in warm, temperate and arctic regions. In cold regions they appear as plants a few inches high, in warm countries they grow as trees over 100 feet tall. They have slender flexible branches of unusual grace, narrow smooth leaves and long clusters of male and female flowers, borne on separate trees, that appear before the leaves. The largest American species is the *black willow* (*S. nigra*) of the eastern states. The *weeping willow* (*S. babylonica*) is a Chinese variety whose graceful branches droop in cascades nearly touching the ground. They are generally found, as are most willows, along stream banks. The *pussy willow* (*S. discolor*) is a shrub with small, gray, furry catkins that appear very early in the spring. The *almond-leaved willow* (*S. amygdaloides*) has leaves as broad as those of almond or peach trees. The European *white willow* (*S. alba*) is frequently grown as an ornamental tree. The American *shining willow* (*S. lucida*) has green leaves so glossy they gleam in the sun like silver. Willow wood is too soft to be of much value in cabinetry. But the bark yields *tannin,* used in tanning, and *salucrin,* used in medicines. The young branches of many varieties are used in making baskets and wicker furniture. They are called *osiers,* a name sometimes applied to the tree itself, particularly to the tough, flexible *basket willow* (*S. viminalis*).

Winterberry, see *Holly.*

Wintergreen, a creeping evergreen (*Gaultheria procumbens*) of the heath family that has glossy foliage, wax white flowers and fragrant red berries that are a favorite food of birds. Oil of wintergreen, used medicinally and as a flavoring extract, is obtained from the leaves. The berries of this plant, related to the mountain laurel, are often called *checkerberries.* The name wintergreen is applied, in England, to another evergreen (*Pyrola minor*), called *false wintergreen* in the United States.

Wistaria, one of a genus of Oriental and American climbing shrubs of the pea family that have woody stems, compound leaves and handsome long clusters of lilac-purple flowers, with some white or pink varieties. The clusters are frequently 1 to 5 feet long in Chinese and Japanese varieties grown in Europe and the United States as a decorative plant. An American variety (*W. frutescens*) has smaller flower clusters and is not grown as frequently as the Chinese (*W. chinensis*) and the Japanese (*W. floribunda*). Every formal Japanese garden contains wistaria, which is symbolic of one of the many phases of man's life in respect to the universe. The name is derived from that of the American anatomist Caspar Wistar (1761–1818). The name is sometimes spelled *wisteria.*

Witch hazel, a shrub (*Hamamelis virginiana*) of the eastern United States that has leaves that turn yellow in the fall and resemble those of the hazelnut. Its fragrant yellow flowers appear in the fall after the leaves have fallen. Its bark is scaly and its branches are arranged alternately on the main trunk. The fertilized ovary, covered by a hairy sheath, remains on the tree all winter and does not produce its fruits until the spring. Then the brown seeds are shot out of the opening pods and scattered for quite a distance. The wood is hard and closegrained. The astringent bark and leaves are the sources of lotions, extracts and other medicinal substances. There is a related species in Japan that blooms in the early spring and is occasionally cultivated as an ornamental plant in the United States.

Woodbine, see *Ivy.*

Wormwood, an aromatic European herb (*Artemisia absinthium*) of the composite family that is 1 to 3 feet high and has hairy branches, small serrate leaves and yellow round flower clusters. Wormwood is cultivated in Europe and the United States for the dark green bitter oil of wormwood, used in making absinthe and in various tonics.

Yam, any species of the genus *Dioscorea* of tropical climbing or trailing vines related to the lily and amaryllis that have edible roots 6 to 8 feet long weighing from 30 to 100 pounds, glossy heart-shaped leaves and white flower clusters. Throughout the tropics the boiled or roasted roots of this plant are eaten. The name yam is incorrectly applied in the United States to the unrelated sweet potato.

Yarrow or **Milfoil,** a common perennial weed (*Achillea millefolium*) of the North Temperate Zone that has a stiff stem 1 or 2 feet tall, curled notched leaves and clusters of brown or yellow flowers surrounded by rayed white blossoms. The leaves are alleged to have medicinal qualities first discovered by the Greek hero Achilles, for whom the plant was given its genus name. Because of the many parts into which the leaf is divided it is called *milfoil,* thousand-leaf. It frequently is cut with hay, and its seed occurs as an impurity in clover and timothy seed.

Yeast, one of an order (*Saccharomycetes*) of unicellular microscopic colorless fungi of the class *Ascomycetes* (sac fungi) that secrete enzymes causing alcoholic fermentation by breaking up sugar into alcohol and carbon dioxide. The principal enzyme secreted by these plants, which thrive and reproduce rapidly under proper conditions of food, moisture and temperature, is known as *zymase.* Yeasts are of universal distribution and, like bacteria, always present in the air. Yeasts reproduce by budding. A small projection of the plant substance pushes its way out of the parent cell and enlarges until it is the size of an entire cell, a wall forms between the two, and two complete organisms are formed. Each continues to reproduce in the same way, forming a large colony. If conditions are unfavorable for growth, a hard wall is formed around the yeast, which becomes globular and is then known as a spore. The spore withstands an unfavorable environment for a long time. Yeasts are invaluable in the making of bread and alcoholic liquors, such as beer. In leavening bread the carbon dioxide they release in their life processes penetrates the dough, forcing it up into a porous instead of a solid mass. Yeast makes alcohol of sugars and thus ferments beverages. Yeasts have been used experimentally in curing certain parasitic diseases. The commercial cake of yeast is a compressed mass of multitudes of these little organisms contained in a medium of starch. When they are immersed in warm water, they begin to reproduce, giving off gas and alcohol.

Yellow wood, a North American flowering tree (*Cladrastis lutea*) found in the mountains of the South and Southwest. It is a wide-topped tree, 40 to 60 feet tall, with brittle branches, bright compound leaves that turn yellow in the autumn and long sprays of sweet-smelling pealike white flowers. It has a hard, close-grained wood that yields a yellow dye. The genus name is from the Greek words meaning brittle-branch. Other common names for this tree are *yellow locust* and *gopher wood.* The name yellow wood is sometimes applied to West Indian and Australian trees that have yellow, dye-producing wood or bark.

Yerba mansa, a small plant (*Anemopsis californica*) native to Mexico and California that produces a peppery rootstock, a stem less than 2 feet high, astringent, spicy leaves and clusters of tiny white flowers surrounded by large white ornamental bracts resembling those of the dogwood or the poinsettia. The rootstock is used by the Mexicans and Indians as a cure for throat and lung troubles. The name is Spanish for soft herb.

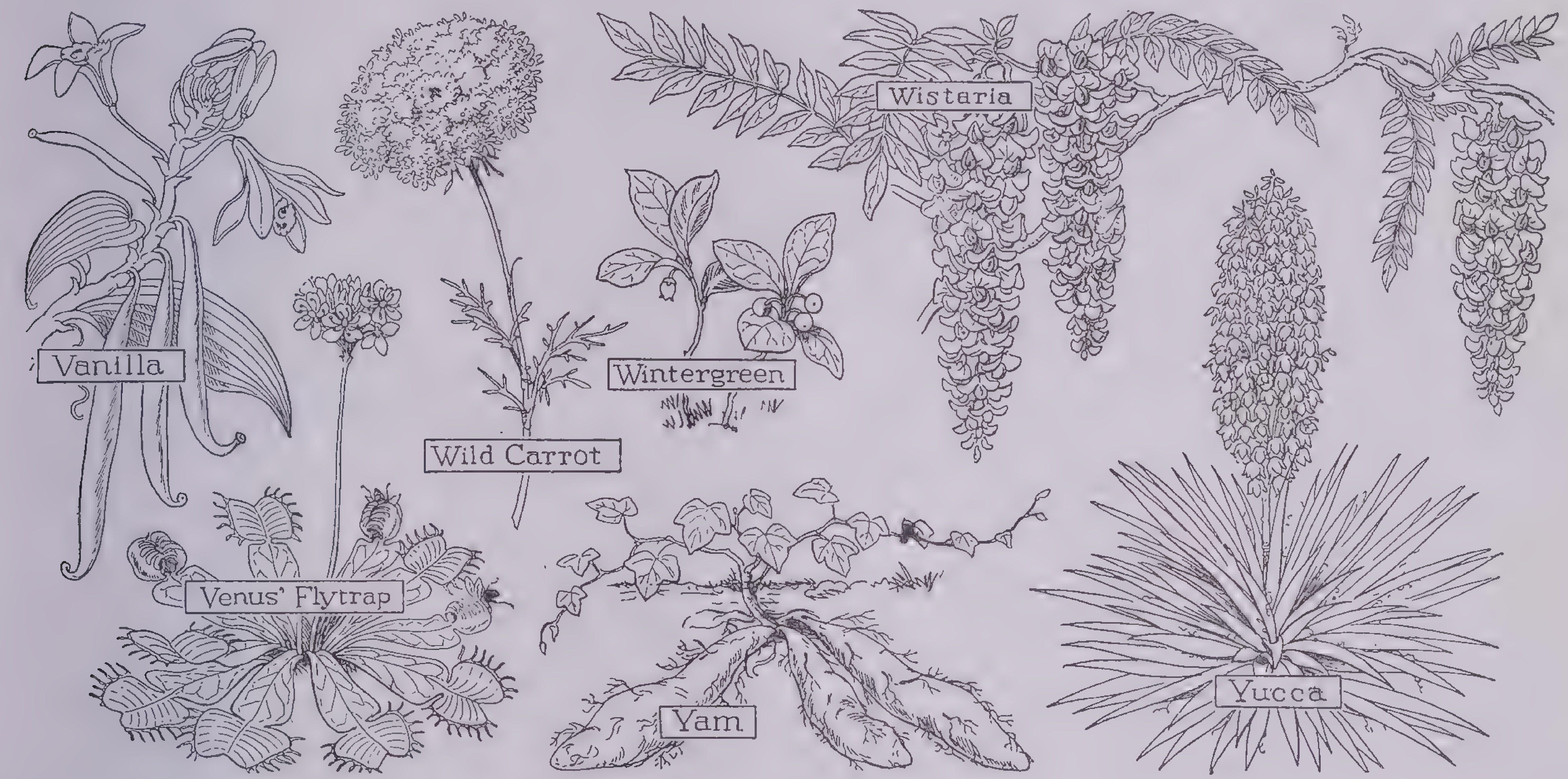
Yerba santa, a California shrub (*Eriodictyon californicum*) that grows 6 to 8 feet tall, producing glossy, oval serrate leaves that have a sticky, bitter resin and delicate white or lilac spring-blooming tubular flowers. The leaves were once smoked as tobacco and brewed for tea. The Indians and early Spanish settlers used them medicinally, believing the leaves a cure for all ailments. The healing powers attributed to this shrub gave it its common name, which, in Spanish, means holy herb. An expectorant used in bronchial ailments is still made of the yerba santa leaves.

Yew, one of a genus (*Taxus*) of European, Asiatic and American evergreen shrubs or trees of the yew family that have flat needles, dark green above and light green on their undersurfaces, male and female flowers borne on separate trees and scarlet cuplike berries partially enclosing a bony seed. The American yew (*T. canadensis*) is a low shrub, sometimes called *ground hemlock,* that is used for making decorative wreaths. It grows in moist places, resembling a woody vine, beneath other evergreens. The western yew (*T. brevifolia*) is a much taller plant with a finegrained wood used in making bows, canoe paddles and cabinet pieces. The European yew (*T. baccata*) is indigenous to Europe and Asia and is frequently mentioned by classical Latin writers as a poisonous plant. The leaves, if eaten by stock, cause serious injury. The Japanese yew (*T. cuspidata*), commonly grown for ornamental purposes, attains a height of 50 feet. Forms are found in Mexico and the southern part of the United States.

Yucca, a genus of plants of the lily family that are native to the southern portion of the United States and Central America. They have long pointed leaves on a woody stem bearing terminal clusters of white flowers. The swordlike appearance of the leaves has given two common names, *Spanish bayonet* and *Spanish dagger,* to one variety (*Y. aloifolia*). The Mexican Indians call some of the varieties that have huge branching clusters of flowers extending into the air *candlestick-*

of-the-Lord. A spirelike yucca (*Y. filamentosa*) is known by the common name of *Adam's needle* and, according to the local Indians, was the plant with which Adam and Eve sewed in the Garden of Eden. This species produces an edible fruit, the *datil.* The Mormons named one branching variety (*Y. brevifolia*) that they found in the Utah deserts the *Joshua tree.* Some species of yucca are called *bear grass.* The yucca is the state flower of New Mexico.

Zinnia, one of a genus of showy annual bushy garden plants of the composite family. Most zinnias grow about 2 feet tall, have thick stems, thick oval leaves and large round compact heads of innumerable white, red, gold or purple blossoms. There are some dwarf forms, such as the *Mexican zinnia* (*Z. haageana*), an orange flower a few inches tall. The *common zinnia* (*Z. elegans*) has been developed into many varieties. The flower was named in honor of J. G. Zinn, a German professor of medicine in the 18th century.



FLOWER-PLANTING TABLE

May is almost the sole flower-planting month; the Adonis, Cornflower, Pink, Primrose and Sweet Pea may also be planted in April. The months listed in this table cover the blooming season in the middle latitudes of the United States. A longer season prevails in the South and a shorter in the North.

Name of Flower	Life of Plant	Blooms	Plants Inches Apart	Seeds Inches Deep	Colors
Achillea	Perennial	May-June	6	....	Yellow
Adonis	Annual	June-October	6	¼	Blue-White
Ageratum	Annual	August-October	10	....	White-Rose
Anemone	Perennial	July-September	14	¼	Various
Aster	Annual-Perennial	July-October	8	⅛	Blue-White-Pink
Bachelor's Button	Annual	June-September	14	¼	Various
Balsam (Lady's Slipper)	Perennial-Annual	July-October	10	¼	Blue-White-Pink
Bellflower (*Campanula*)	Perennial	May-August	26	....	Crimson
Bleeding Heart (*Dicentra*)	Perennial	June	12	⅛	Rose
Calendula	Annual	August	10	⅛	Orange
California Poppy	Annual	June-September	8	⅛	Orange
Candytuft	Annual	August	9	¾	White-Crimson
Castor Bean	Perennial-Annual	August-October	30	⅛	Various
Chrysanthemum	Annual-Perennial	June-October	10	¼	White-Purple-Rose
Clarkia	Annual	June-October	10	¼	Red-Purple-Yellow-White
Cockscomb	Annual	June-September	12	....	Various
Columbine (Aquilegia)	Annual	July-August	12	....	Coral-Yellow
Coral Bell	Annual	June-August	12	⅛	Yellow-Brown-Crimson
Coreopsis	Annual	June	15	⅛	Blue-White-Yellow
Cornflower	Annual	August-September	12	¼	Blue-White-Pink
Cosmos	Annual	July-September	15	....	Various
Dahlia	Perennial	August-September	10	....	White-Pink-Rose
Daisy	Perennial	July-August	10	....	Yellow
Evening Primrose	Perennial-Biennial	April-July	6	¼	Blue-Yellow
Forget-Me-Not	Perennial	July	10	....	Blue-White
Four-o'Clock	Perennial-Annual	July-October	12	¼	Red-White-Yellow
Foxglove	Perennial-Biennial	June	12	⅛	White-Pink
Gaillardia	Perennial	July-October	12	⅛	Yellow-Red
Globe Amaranth	Annual	July	12	¼	Pink
Godetia	Annual	July-October	12	⅛	White-Red
Gourds	Annual	July-October	14	⅛	Various
Helianthus	Perennial	July-September	18	¼	Yellow
Heliopsis	Perennial	August-September	18	....	Yellow
Hollyhock	Biennial	August	16	½ drills	Red-Pink-Purple-White-Yellow
Iceland Poppy	Perennial-Annual	June-September	6	⅛	White to Orange
Iris	Perennial	May-July	12	....	White-Blue-Yellow
Larkspur	Perennial-Annual	June-July	18	⅛	Blue-White-Pink
Lavatera	Annual	July	12	¼	Rose
Lobelia	Annual	June-September	4	⅛	Blue-Red
Love-in-a-Mist	Annual	June-September	10	¼	Scarlet-Blue
Love-Lies-Bleeding	Annual	June-September	8	¼	Scarlet-Yellow
Lupine	Perennial-Annual	June	5	....	Blue-White-Pink
Mallow	Perennial	July-September	10	....	White-Rose
Marigold	Annual	August-October	6	¼	Lemon to Orange
Mignonette	Annual	July-October	12	⅛	Whitish Green-Yellow
Monkshood	Perennial	July-August	8	....	White-Blue
Moonflower	Annual	August-September	5	¼	White
Morning Glory	Annual	July-August	12	¼	Various
Nasturtium	Annual	July-October	10	½	Various
Nicotiana	Annual	July-October	8	¼	Red-White

FLOWER-PLANTING TABLE—Concluded

Name of Flower	Life of Plant	Blooms	Plants Inches Apart	Seeds Inches Deep	Colors
Pansy	Perennial-Annual	May-October	12	⅛	Various
Peony	Perennial	May-June	48	....	Red-White-Pink
Petunia	Annual	July-September	8	Scatter	White-Pink-Blue-Wine
Phlox	Perennial-Annual	July-October	8	⅛	Various
Pink	Perennial-Annual	August	6	⅛	White to Rose
Poppy	Annual	July-August	5	⅛	Various
Portulaca	Annual	July-October	5	⅛	White-Red-Yellow
Primrose	Perennial	April-May	6	....	Yellow-Pink
Pyrethrum	Perennial	August-October	12	....	Various
Rudbeckia	Perennial	August-September	12	....	Yellow
Salpiglossis	Annual	June-August	8	⅛	Various
Salvia	Perennial-Annual	August-October	6	⅛	Scarlet
Scabiosa	Annual-Perennial	June-August	8	....	Blue-Yellow-White
Schizanthus	Annual	July-August	10	¼	Yellow-Lilac
Silene	Perennial	June-August	6	....	White to Rose
Snapdragon	Perennial-Annual	July-August	8	¼	Various
Stock	Annual	June-September	6	¼	White to Red
Sunflower	Perennial-Annual	August	36	¼	Yellow
Sweet Alyssum	Annual	May-September	5	⅛	White
Sweet Pea	Annual	June-October	8	3 trench	Various
Sweet William	Perennial-Biennial	July-August	10	¼	Red-White-Pink
Verbena	Annual-Perennial	June-August	8	....	Various
Veronica	Perennial	August	6	....	Purple
Violet	Perennial	March	6	....	Violet
Wallflower	Perennial-Biennial	July-August	8	½	Yellow-Brown
Zinnia	Annual	July-October	10	½	Various

TABLE OF SHRUBS AND HEDGES

Name of Shrub	Height in Feet	Time of Flowering	Color of Flowers	Distance Apart in Feet	Uses	Remarks
Althea or Rose of Sharon (*Hibiscus*)	8 to 10	August September	Red, pk., wht.	3	Screen	Single kinds better; makes good screen; stands pruning well
Common Barberry (*Berberis vulgaris*)	6	June	Yellow	2	Defensive screen	Foliage dense, very dark green
Japanese Barberry (*Berberis Thunbergii*)	4	June	Yellow	1½	Boundary, drive, terrace	Bears red berries; fall color striking
Single Bridal Wreath (*Spiraea Van Houttei*)	5 to 6	June	White	2 to 3	Boundary	Widely planted, showy and economical
Sea Buckhorn (*Hippophae rhamnoids*)	6 to 30	April	Yellow	3	Screen	Gray foliage makes it distinctive
Dogwood (*Cornus florida*)	8 to 30	May	White	2½	Screen or background for lower growths	Bark reddish and showy in winter
Slender Deutzia (*Deutzia gracilis*)	2½	June	White	2	Edging	Showiest of dwarf-flowering hedges
English Privet or Prim (*Ligustrum vulgare*)	2 to 15	June	....	1	Best clipped hedge; edging, terrace, etc.	Better than California, because hardier
English Wayfaring Tree (*Viburnum lantana*)	10 to 15	June	White, large	5	Screen	Grows rapidly, has attractive, dark foliage and purple fruit
Golden Bell (*Forsythia intermedia*)	5 to 8	Early May	Yellow	3	Boundary	Best of yellow shrubs; blooms before Cydonia; too striking for wide use
Tartarian Honeysuckle (*Lonicera Tatarica*)	10	June	Pink	3	Screen	Dense foliage, showy flowers and berries
Large-flowered Hydrangea (*Hydrangea paniculata, var. grandiflora*)	3 to 15	July, August	White, pink	2 to 3	Screen, boundary	Blooms when flowers are scarce; showy
Japanese Briar (*Rosa rugosa*)	5 to 8	All summer	Wht., pk., red	2	Boundary	The only rose suitable for a hedge
Japanese Snowball (*Viburnum plicatum*)	6 to 8	June	White	4	Screen, boundary	More showy than Common Snowball
Japan Quince (*Cydonia Japonica*)	4 to 10	May	Red	1½	Defensive boundary	Blooms among first of all the shrubs; thorny, subject to scale
Lilac (*Syringa vulgaris*)	8 to 15	June	Purple, white	2	Screen	Spreads quickly, if not controlled, but is an excellent screen
Honey Locust (*Gleditsia triacanthos*)	10 to 100	May	Greenish	1½	Defensive	Requires close attention to pruning; apt to become bare near bottom. Being supplanted by better kinds
Garland's Mock Orange (*Philadelphus coronarius*)	8 to 15	Early June	White	3	Screen	Flowers highly scented; grows rapidly
Osage Orange (*Maclura pomifera*)	3 to 50	May	White	2 to 3	Defensive screen	Bears yellow fruit 3 to 4 inches in diameter, when not clipped
Spirea (*Spiraea arguta*)	2 to 3	Early May	White	2	Edging, terrace	Two weeks earlier than *Spiraea;* showy, but not a sure bloomer
Native Thorn (*Crataegus coccinea*)	3 to 12	May	White	2½	Screen; defensive boundary	One of the best native shrubs, or small trees. Bears showy scarlet fruit; improves with shearing, making very dense hedge. Can be kept at any height
Cockspur Thorn (*Crataegus Crus-galli*)	3 to 25	Late May	White	2½	Defensive screen; boundary	Native plant, with very long thorns. Fruit showy. Good windbreak
Wistaria or Wisteria (*W. Frutescens*)	8 to 15	All summer	Lilac	2	Screen; trellis	Handsome, hardy, slow-growing, climbing shrub. Flowers in elegant racemes, slightly scented

NUMBER OF YEARS SEEDS RETAIN THEIR VITALITY

Vegetables	Years	Vegetables	Years	Vegetables	Years	Vegetables	Years
Cucumber	8 to 10	Asparagus	2 to 3	Radish	4 to 5	Pepper	2 to 3
Melon	8 to 10	Beans	2 to 3	Beets	3 to 4	Tomato	2 to 3
Pumpkin	8 to 10	Carrots	2 to 3	Cress	3 to 4	Egg Plant	1 to 2
Squash	8 to 10	Celery	2 to 3	Lettuce	3 to 4		
Broccoli	5 to 6	Corn (on cob)	2 to 3	Mustard	3 to 4	HERBS	
Cauliflower	5 to 6	Leek	2 to 3	Okra	3 to 4	Anise	3 to 4
Artichoke	5 to 6	Onion	2 to 3	Rhubarb	3 to 4	Caraway	2
Endive	5 to 6	Parsley	2 to 3	Spinach	3 to 4	Summer Savory	1 to 2
Pea	5 to 6	Parsnip	2 to 3	Turnip	3 to 6	Sage	2 to 3

COMPARATIVE YIELD OF VARIOUS GRAINS VEGETABLES AND FRUITS

	Lbs. per acre		Lbs. per acre
Hops	442	Parsnips	11,200
Wheat	1,260	Grass	7,000
Barley	1,600	Carrots	6,800
Oats	1,840	Potatoes	7,500
Peas	1,920	Apples	8,000
Beans	2,000	Turnips	8,420
Plums	2,000	Cinquefoil grass	9,600
Cherries	2,000	Vetches, green	9,800
Onions	2,800	Cabbage	10,900
Hay	4,000	Mangel-Wurzel	22,000
Pears	5,000		

THE ROSE GARDEN

There are over 4,000 varieties of roses, and their care occupies an important province in flora culture. The best results are obtained from setting out the plants or roots in the spring—from the middle of April to the middle of May. For practical purposes they may be divided into the following classes, with some examples of each:

Classes	Characteristics
The Hybrid Perpetuals	Hardiest of the garden roses
Frau Karl Druschki	An ideal white rose
Jacqueminot ("Jack Rose")	Brilliant scarlet
Paul Neyron	Dark rose—largest of all
Magna Charta	Bright pink—a favorite
George Arends	Splendid soft pink
The Hybrid Teas	The most satisfactory for the general garden
Robert Huey	One of the largest bright reds
The Lyon	Deep coral pink verging on yellow
White Killarney	One of the best pure whites
La France	Clear satiny pink
Burbank	Rich pink
Richmond	Brilliant crimson
Radiance	Grown sucessfully in Florida
The Teas	Much tenderer than the Hybrid Teas; sweet scented
The Bride	Pure white
Perle des Jardins	Beautiful rich yellow
Papa Goutier	Dark crimson
Hardy Climbers	Popular and showy
American Pillar	Large, single, pink flowers
Excelsa	Finest of crimson ramblers; mildew-proof
Hiawatha	Single, brilliant crimson
Dorothy Perkins	Soft shell-pink, fragrant
Lady Gay	Delicate cerise-pink changing to creamy white
Wichmoss	A "Moss" rose, light blush-pink, fragrant
Hybrid Briers	Hardy semiclimbing roses
Lord Penzance	Beautiful contrasting shades
Refulgence	Dazzling scarlet, in clusters
Juliet	Rosy red with reverse petals of old gold
The "Baby Ramblers"	Dwarf, "perpetual bloomers"
Phyllis	Beautiful pink
Jessie	Bright cherry-red, white center
Orleans	Brilliant red, white center
Snowball	White, free flowering
Noisette	Excellent climber for walls
William Allen Richardson	Deep orange-yellow flowers
Garland	Semidouble, blush and white
Longworth Rambler	Splendid autumn climber; flowers, semidouble and crimson
Japanese and Chinese	
Blairii (China)	Vigorous climber for sunny walls; flowers, blush and rose
Rugosa (Japanese)	No pruning is needed; flowers, white, rose and violet

ANTHROPOLOGY

Definition.—The term *anthropology* (formed of two Greek words, *anthropos* meaning man, and *logos,* theory) means the science of man in a limited sense—the study of *primitive* man; the physical characteristics and customs of the forerunners of man as we know him today; the lives and habits of men who existed before the beginning of history, people of whom we have no written records. Since the forerunners of *Homo sapiens* long ago ceased to exist and the early civilizations have vanished from the earth, anthropologists are forced to rely upon skeletal remains for information about early types of humanity and upon stone or bone implements and other more or less indestructible objects for their knowledge of the customs and achievements of prehistoric peoples. Besides these men of the past, anthropology studies the present aboriginal peoples of the world who can still be observed alive and in the midst of their economic, social and religious institutions.

Beginnings of Anthropology.—Anthropology is a relatively new science. The early Greeks speculated upon the nature of man and recognized his relationship to other animals; but it was many centuries before scientists again began to consider man as an animal. Carolus Linnaeus, the Swedish naturalist who lived in the 18th century, established the biological connections between man and apes, and divided existing peoples according to biological types. Sometime later the German scientist Johann Blumenbach (1752–1840) developed a way of classifying races according to measurements of the head and face.

Shortly after the middle of the 19th century, excavations in western Europe brought to light a number of human remains, bones from various parts of the body, which indicated that man as we know him today was preceded by creatures whose bodies showed some characteristics of modern man and some characteristics of the apes. A skull found in a cave in Germany was first pronounced to be that of an ape. One scholar expressed the opinion that it had acquired its peculiar characteristics through disease; but the famous Huxley recognized that it belonged to a healthy human being who was of a type of humanity no longer existing on the earth. From that time on, the search for the ancestors of the present human races has continued. Although interest in such matters is as strong as ever, anthropologists of the 20th century pay more attention to similarities and differences found among living people and the influence of living conditions on bodily form than to the relation of man to his possible animal ancestors.

Even before the beginnings of this sort of anthropology, travelers and missionaries brought back from the far-away corners of the globe news of the savage creatures who lived there, their strange customs and odd habits. The Jesuit missionaries from the 16th to the 18th century contributed information on the North American Indians; Captain Cook (1728–79), famous navigator, and William Ellis (1794–1872) supplied facts concerning the primitive peoples inhabiting the islands of the Pacific; and David Livingstone (1813–73) wrote about Africa. The great number of facts made known to the world in this way were studied and used by scholars of the time. One of the earliest of these was James Cowles Prichard, an Englishman who published *The Natural History of Man* (1843), describing all the races known to him and giving an account of their customs.

One group of early anthropologists were struck with the notion that our own civilization is the last and highest of a series of stages through which man has passed in his upward climb from the lowest conditions of savagery. These anthropologists set out to trace the steps of the journey and to study the customs of primitive peoples in order to discover the path of progress. Other anthropologists, unwilling to assume that a study of primitive customs would enable us to discover any path leading directly from the lowest stages to the highest, were interested in the history and customs of primitive peoples of whom we have no written records. By selecting certain customs and observing their distribution throughout the world, these anthropologists thought they could discover where the customs originated and trace historical connections between various peoples. Comparatively speaking, it is only recently that anthropologists by personally investigating primitive people and communities have come to see that seemingly odd and curious customs are actually sensible and easily understandable against the proper background and in the proper setting. Scholars now recognize that a study of primitive communities will help us to interpret our own customs and to solve our own problems.

This study of primitive man may be considered under four main headings: *Physical anthropology,* dealing with the past and present races of men: *Prehistory,* which concerns the habits and customs of prehistoric peoples; *Ethnology,* which deals with the customs of modern primitive peoples; and *Primitive languages.*

PHYSICAL ANTHROPOLOGY

Man's nearest relatives in the animal kingdom are the apes. Man is distinguished from them chiefly by the size and organization of his brain, but there is less difference between men and apes than between apes and

Courtesy American Museum of Natural History

Conceptions of the Earliest Men

Restorations by Dr. J. Howard McGregor based on fossil remains of prehistoric men. Left to right: *Pithecanthropus erectus* (ape man who walked erect); Piltdown man; Neanderthal man; Cro-Magnon man

monkeys. Nevertheless, of all the apes known at the present day none can be said to be the direct ancestor of man. It is believed that apes and men have descended from a common ancestor, regarding which, however, nothing is known. So far, the search for man's ancestors has been unsuccessful. Because the close relationship with apes enables us to know that man evolved from some creature with apelike characteristics, we can limit the search to the regions inhabited by the anthropoid apes: Africa, the home of the gorilla and chimpanzee; and Asia, where the gibbons and the orangutan are found. Furthermore we suspect that man first appeared about 100,000 years ago in the early Quaternary age of geological time (sometimes called the Age of Man) and in a locality favored with a warm climate. We can guess, too, that the earliest man lived on the ground rather than in trees, and that he walked more or less upright and used pieces of wood and stone as tools.

The Earliest Men.—Though anthropologists have not discovered a type of ape that can be pointed out as the father of humanity, several fossil finds of prehuman beings combine human with apelike characteristics. One of the most famous of these is the Java man, *Pithecanthropus erectus* (ape man who walked erect). Our knowledge of this creature is based on the study of part of a skull, two teeth and a leg bone that were found in Java about 1890. It is difficult to know just when Pithecanthropus lived, but it probably was in the early Pleistocene period of the Quaternary age. Judged from the skull his brain seems to have been simple in structure but more like the brain of man than that of the apes. His teeth are very apelike, but the leg bone suggests that he walked upright. Between 1921 and 1930 remains of another type of ancient man were found in China: numerous teeth, two jaws and a skull, which belonged to what has been called the *Peking man* (*Sinanthropus Pekinensis*). These finds have been dated as early Pleistocene, and he therefore did not live much after the time of Pithecanthropus. He represents, however, a more primitive type but is also similar in some respects to man of a much later date. He seems to be very close to the main line of descent of modern *Homo sapiens*.

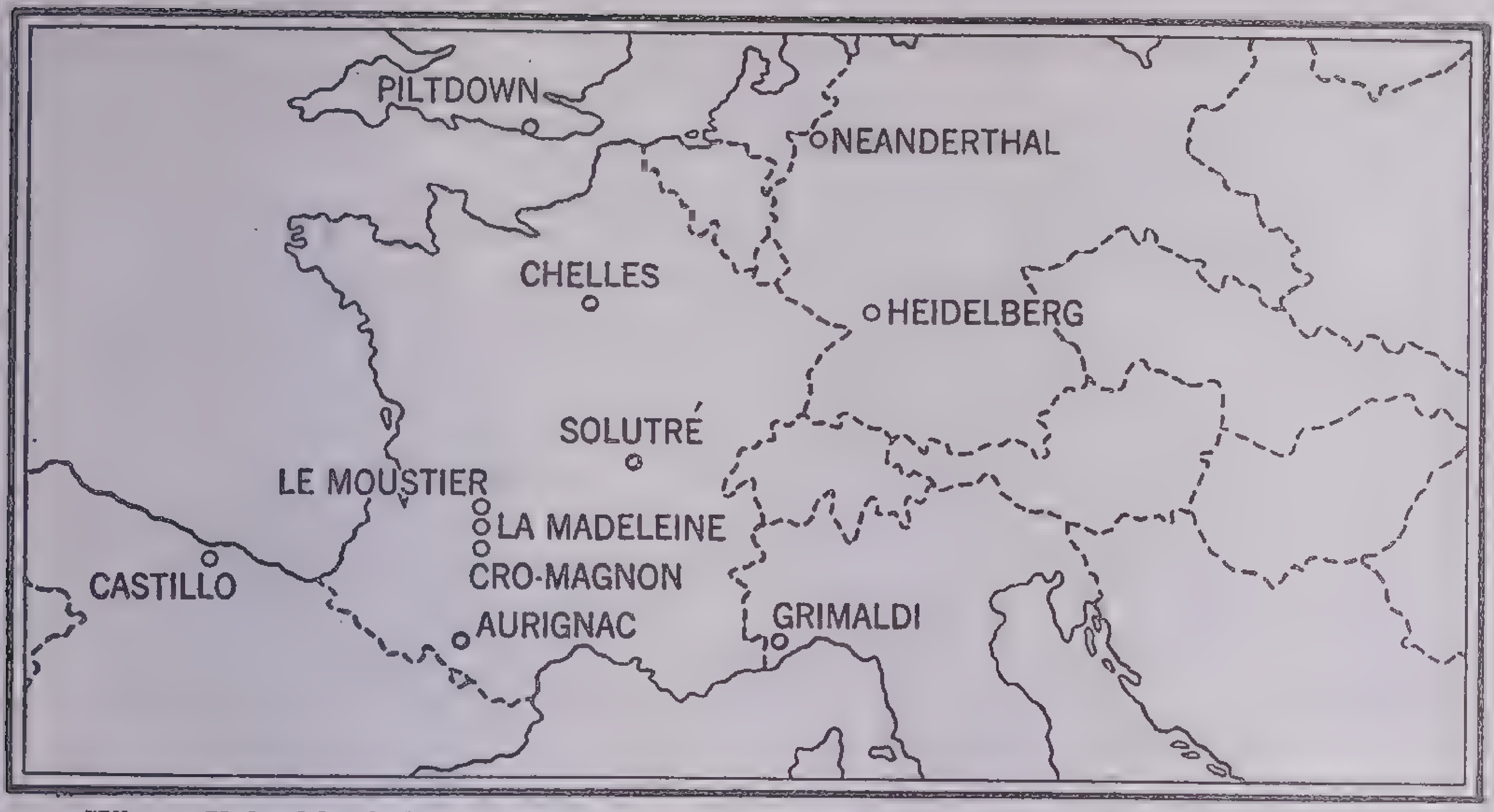
Another very early and primitive type is the Piltdown man (*Eoanthropus dawsoni*—Dawson's dawn man) whose fossil remains were found near Piltdown, England. Our knowledge of him is based on part of a skull, a fragment of a lower jawbone and a tooth. The skull is definitely human, but the jawbone has equally definite apelike characteristics, and some scholars have doubted that they belonged together. Piltdown man has been difficult to date accurately, but he may be placed with fairness in the early Pleistocene. Another early man, the Heidelberg man (*Homo heidelbergensis*) is known to us by a jawbone that was found in a sand pit at Mauer near Heidelberg.

From the end of the third interglacial period (which immediately preceded the last great ice advance), fossil remains, at least in Europe where a great deal of excavating has been done, are sufficiently numerous to enable anthropologists to speak with some certainty of early types. Neanderthal man (*Homo neanderthalensis*) is known from a great number of fossil remains found at Neanderthal in the Rhineland, so that a fairly accurate description of him can be given: He averaged about 5 feet 3 inches tall and walked not quite upright. His head, supported by heavy neck muscles, was set a little forward. His face was large and broad, with a strong and chinless jaw. He appeared in Europe at the close of the third interglacial period, and the beginning of the fourth glacial period. Although he had many characteristics in common with modern *Homo sapiens,* he cannot be said to be the direct ancestor of any present-day race.

Neanderthal man occupied Europe for a long time and probably was wiped out by the newcomers who appeared at the beginning of postglacial times. These newcomers are the first examples of *Homo sapiens* and already a division into races had taken place.

Two of these may be discussed in some detail: (1) *The Grimaldi race,* named from the caves of Grimaldi, near Mentone, Italy. These people had many characteristics, especially body proportions, in common with the present-day Negro, and they may have entered Europe from Africa by way of Spain. In Europe they lived around the Mediterranean Sea. (2) *Cro-Magnon man,* so named from remains found in the Cro-Magnon cave in Dordogne, France. Physically these people were very fine, averaging 6 feet tall. Their outstanding characteristic was a broad face combined with a long and narrow head. The type can be recognized today in this part of France and in the inhabitants of the Canary Islands.

We know very little about early man outside of Europe. In Africa some fossil finds have been made but they are difficult to date accurately. One, the *Oldoway man,* found in Oldoway, a town in Tanganyika Territory, East Africa, seems to have lived in the Early and Middle Pleistocene periods. The jawbone and parts of two skulls are Negroid in some characteristics, and Oldoway man is considered by several authorities to belong to the species of *Homo sapiens*. The Talgai skull from Talgai in Queensland, Australia, shows that people ancestral to the present Australian aborigines were living in Pleistocene times in Australia.



Where Valuable Cultural and Skeletal Remains of Early Man Have Been Found

The most productive region is the department of Dordogne in France, including Le Moustier, La Madeleine and the Cro-Magnon Cave

The Races.—Present-day members of the species of *Homo sapiens* may be divided into three main races: the Caucasian, Negroid and Mongoloid. By the term *race* we mean a group of people who have certain physical characteristics in common. One or two common characteristics will not be sufficient; for example we cannot classify people according to skin color alone since the white race includes people with very dark, almost black skins. By selecting a number of physical characteristics, scientists have made a rough classification. The most important physical characteristics are: stature; color of skin, hair and eyes; hair texture; shapes of head, nose and lips; form of the eye, straight or oblique; degree of prognathism or projection of the lower part of the face.

Stature.—The average of stature of adult males is used as the stature of race or people; it is obtained by measuring representative groups. For all mankind it is about 1.65 meters or about 65 inches. Among all races there is a sex difference in stature and in general the female averages one-sixteenth less than the male.

People are divided on the basis of stature into tall tribes (1,700 millimeters, about 67 inches, and up), medium tribes (1,600 to 1,699 millimeters, about 63 to 67 inches) and short tribes (below 1,600 millimeters, about 63 inches). The term *pygmy* is ordinarily applied to the races whose stature does not exceed 5 feet.

Skin Color.—The color of the skin varies with race, with differences so striking that they have attracted universal attention, and in various classifications the color basis is fundamental. It is difficult to suggest a serviceable series of color terms. There are no really black skins and no truly white skins. For a careful discrimination color scales are necessary, and investigators generally use a series of fixed color samples matched with the skins of the subjects studied. In one chromatic scale for use in racial studies today there are as many as 34 shades. In ordinary practice, however, only half a dozen terms are used.

Hair.—One of the most distinctive marks of race is the hair. Huxley made it fundamental in his classification and recognized two main divisions of mankind—the straight-haired and the wooly-haired. In general appearance hair is classified as straight, wavy, curly, crinkly or wooly; in cross section it is circular, elliptical or flattened. White peoples generally have hair elliptical in cross section; yellow peoples have hair with circular cross section; and Negroes have distinctly flattened hair.

Hair differs racially in abundance, distribution, texture, diameter and angle of emergence. There are marked differences among the races in baldness and in graying; also in the quantity, distribution and development of facial hair. In color hair is black, brown, medium, light or blond. Red hair is found exceptionally among all races.

Head Form.—The two most important head measures are length and breadth, but the principal value of these measurements lies in their comparison. The ratio between them is known as an *index.* Two head indices are employed: the *cranial* index, which expresses the relation between the length and breadth of the skull, and the *cephalic* index, which expresses the relation of length and breadth on the living subject. These indices are found by dividing the breadth by the length and multiplying the result by 100. Thus if a skull measures 6 inches in breadth and 8 inches in length, the cranial index is 75. If, on a living head, the breadth is 5 inches and the length 7½ inches, the cephalic index is 66⅔. No normal skull has an index as low as 50 (that is, twice as long as it is broad) or an index as high as 100 (that is, as broad as it is long).

These indices are constantly employed in defining human races. The actual range is 69.4 to 88.7. Special terms are used to indicate the head form: *dolichocephalic* or long-headed (index of 80 or above); and *brachycephalic* or broad-headed (index below 80).

Nose.—The form of the nose is one of the best distinguishing characters of race. Here again an index is calculated from two measurements—height and breadth. The nasal index is found by dividing the breadth of the nose by its height or length and multiplying the result by 100. Three terms are used in connection with the nasal index—*platyrrhinian,* with a short, broad nose; *mesorrhinian,* with a medium nose; and *leptorrhinian,* with a long, narrow nose.

Using these criteria, anthropologists distinguish and describe three main races:

(1) *Caucasian.*—Members of this race have high thin noses, moderately full lips and straight eyes. The degree of prognathism is slight. The hair ranges from straight to kinky; there is also considerable body hair and beard. Members of this race vary greatly in stature, skin color and head form. The Caucasian type is found throughout Europe except in the extreme north and northeast. It extends around the Mediterranean Sea as far as the Sahara Desert and eastward to The Steppes. It is prominent in India and may be distinguished among the Ainus of Japan. Caucasian characteristics appear strongly in some of the peoples of the eastern Pacific islands. In modern times people belonging to this race have spread out and settled in America, Australia, New Zealand and South Africa.

(2) *Negroid.*—Negroid peoples are characterized by broad, flat noses, thick lips and straight eyes. There is considerable prognathism. The hair is kinky, and the amount of body hair and beard varies in different people. The skin is dark, but the degree of brownness is not uniform throughout all peoples belonging to this race. They are generally long-headed. Both extremes in stature are found among Negroid peoples, from the pygmies to the very tall Negroes of Africa. Negroids are found in Africa south of the Sahara Desert and are strongly represented in Madagascar. The peoples inhabiting Melanesia (Tasmania, south of Australia, and the large islands northeast of Australia) are Negroid in physical type.

(3) *Mongoloid.*—This race may be divided into the Old World and the New World Mongoloids, called also Americanoids. Those members of the Mongoloid race which inhabit the Old World have small, narrow noses, thin lips and oblique eyes. The hair is straight, lank and coarse; the body hair and beard are sparse. The skin is yellow or yellowish brown. The head form and stature show great variation. All eastern Asia is occupied by these people. In northern Europe the Mongoloid race is represented by the Lapps, and there are Mongoloid peoples in the great plains of Europe. Peoples inhabiting Indonesia (large islands off the southeastern coast of Asia) and Micronesia (small islands to the east) are largely Mongoloid.

The New World Mongoloids are characterized by high, thin noses, thick varying to thin lips and usually straight eyes. The hair is straight and that on the body is sparse. The skin is reddish brown. Head shapes and statures vary. This second Mongoloid type is represented by the Indian in-

Courtesy Minnesota Tourist Bureau

Chippewa Chief

This Indian warrior of the Cass Lake Reservation in Minnesota has dressed up for a historical pageant in full panoply of wartime

habitants of the Western Hemisphere.

A few peoples do not fit readily into a positive classification. Authorities do not agree on the exact position of the Australian aborigines. By some they have been grouped with the Caucasian; by others, with the Negroid race. They are moderately tall in stature, have dark-brown skin, full lips and broad noses. The hair is wavy rather than kinky, and the beard is heavy. The head is usually narrow.

Anthropologists find another problem classifying the Ainus of northern Japan. These people are short in stature, have light-brown skin, straight eyes and rather thick lips. The hair is straight with a tendency to wave; the body hair so thick and plentiful that the people are known as the Hairy Ainus. Authorities are inclined to believe that they belong to the Caucasian race.

The Polynesians, who inhabit the islands of the eastern Pacific (from New Zealand to Hawaii and from Samoa to Easter Island) appear to be the result of a mixture of races and cannot be placed in any of the three main groups, at least on the basis of our present knowledge. They are a handsome, athletic people, with an average stature of 5 feet, 8 inches. They are characterized by light-brown skin, straight varying to wavy hair and broad heads.

Considerable variation in physical types is thus seen among the peoples of the earth. As to mental differences, anthropologists believe that on the basis of our present knowledge there is no reason to assume that one race is mentally inferior or superior to any of the others.

PREHISTORY

For the study of the past and the customs of early man we are dependent upon objects that have been brought to light by many excavations. Scholars early recognized that these objects can be roughly divided into stone implements and metal implements. People who made use of stone implements were spoken of as living in the Stone Age, and those who understood the use of metal were said to belong to the Age of Metals. It is important to remember that people all over the world did not learn to substitute metal for stone at the same time: in Europe metal came into use several thousand years ago; but the New World, at the time of its discovery less than 500 years ago, was inhabited by peoples still in the Stone Age. The only exception was Peru.

Succession of Cultures in Europe

	Geological Periods		*Cultural Periods*	*Approximate Dates*
Quaternary Age	Pleistocene	Stone Age	Lower Paleolithic Middle Paleolithic Upper Paleolithic	100,000 – 10,000 B.C.
			Mesolithic Age Neolithic Age	10,000 – 4000 B.C.
	Holocene	Metal Age	Copper Age	4000 – 3000 B.C.
			Bronze Age	3000 – 2000 B.C.
			Iron Age	2000 – present

Our knowledge of the prehistory of Europe is more complete than for any other part of the world. There the Stone Age may be divided into three periods: (1) Paleolithic—Old Stone Age, (2) Mesolithic—Middle Stone Age, (3) Neolithic—New Stone Age.

The Paleolithic Period.—The study of this period may be further subdivided into: (1) Lower Paleolithic, (2) Middle Paleolithic, (3) Upper Paleolithic. The Lower Paleolithic period occupied the first two-thirds of Quaternary times (that is, the most modern of geological periods). The first tools belonging to this period were found in Chelles, on the river Marne, and the *Lower Paleolithic* culture, therefore, has been called Chellean. The characteristic feature of Chellean culture is the coup de poing or cleaver, a large piece of flint or other stone shaped somewhat like an axe and chipped all around. The people who made these tools certainly knew the use of fire and probably they knew how to produce it. Beyond these few facts very little can be said about Chellean culture, and it is impossible to assign it to any known type of primitive man.

Underwood & Underwood

Aborigines of the Japanese Islands

The aboriginal Ainus once lived throughout the islands of Japan, but with the passing of the centuries have been driven north to the district of Hokkaido and Sakhalin and Kuril islands. Because of their light skins and regular features, they are believed to be descendants of a Caucasian people that once inhabited northern Asia

The *Middle Paleolithic* lasted until the end of the fourth glacial period. The typical culture has been called Mousterian, after a cave at Le Moustier in south-central France. The characteristic tool is a flake implement. Instead of chipping a piece of stone to obtain a sharp edge, Mousterian man knocked off a flake from the piece of stone and had a superior tool. The Neanderthal man made tools of this kind. The people who used these tools lived in rock shelters and hunted and ate large animals. This culture extended west from the great plains of central Europe as far as Spain, and a culture somewhat similar to Mousterian has been found in North Africa.

From *Upper Paleolithic* times on, *Homo sapiens* occupied Europe. This period comprises three cultures, the earliest of which is called *Aurignacian* (from the ancient caves in Aurignac, southern France). The Aurignacian implements are flaked tools of flint and some of bone. This culture extended from central Asia through central Europe to Spain, and is found in North Africa also. The second of the three Upper Paleolithic cultures is called the *Solutrean* (from Solutré in central France) and apparently was confined to a small area in France and central Europe. It is chiefly recognized by the so-called laurel-leaf spear head, which was very beautifully chipped. The last culture is known as the *Magdalenian,* which is found only in northern Spain and central France, notably at La Madeleine in the same region as Le Moustier. The people who developed this culture used the bow and arrow, and made superior implements of bone; but, above all, the Magdalenian culture is famous for its art works, carvings on stone, bone and ivory and engravings and paintings on cave walls. Some of the Aurignacians were fair artists, but the peak of Paleolithic art was reached in early Magdalenian times and a decline set in at the end of this period.

The Mesolithic Period.—Between the Old and New Stone periods is the Mesolithic. The earlier part of this period is characterized by the occurrence of pigmy flints, very small flakes in various geometrical shapes; and small painted pebbles the use of which is not known. In the latter half of Mesolithic times the Kitchen Midden culture is found, especially in Scandinavia. Shell fish was one of the main foods of the people of this culture. The middens are shell heaps that have become cemented together and look like low hillocks. Among the shells are found bone and stone tools and some very crude pottery. It is possible that the dog had been domesticated by this time.

The Neolithic Period.—Neolithic culture shows a very great advance over that of the Old Stone Age. Instead of chipping sharp edges on his implements, Neolithic man sharpened them by grinding. Many Neolithic peoples cultivated barley and wheat, and made plough tools and sickles. Domestic animals, sheep, goats, cattle, pigs and dogs were kept, and pottery was made. Clothing was made from animal skins, and a few remains of woven stuff suggest that flax was used for clothing and fishing nets. Some Neolithic people still lived in rock shelters, but others built rude huts; still others were lake dwellers, especially peoples living around the lower slopes of the Alps. In building these lake dwellings, wooden piles were driven into the marshy ground on the edge of the water to support the platform on which the houses were built. Such dwellings offered protection from hostile men and animals.

In Neolithic times there were several types of burial: some graves were dug in the ground, some had a mound heaped over the grave, and some were marked by a single large stone. Another type of Neolithic tomb, called a *dolmen* (Breton word meaning stone table) was built of three or four upright stones, covered with a horizontal stone. The use of large stone structures began at the end of Neolithic times. Most scholars are of the opinion that the Neolithic culture originated in central Asia and spread westward into Europe.

Although here and there people of the Stone Age used metals—the Eskimo, for instance, used iron from meteoric showers—the Metal Age did not begin until men learned how to extract metals from ore by smelting. This process probably was first discovered somewhere in the Near East, and the first metal to be thus obtained probably was copper. Pure copper is not suitable for manufacturing many objects, but by mixing copper with tin a much more useful material, bronze, was obtained. The Bronze Age began in Babylonia around 3000 B.C. Iron, a still more satisfactory metal, was discovered in Asia Minor, probably some time during the 14th century B.C. In the early days of the age of metals, many important inventions were made. Perhaps most important of all, the Egyptians and Babylonians evolved a system of writing, and from then on we have written records upon which to rely for our knowledge of their customs.

Some of the areas of the globe were peopled only fairly recently—long after Europe and Asia. Although scholars have not settled when man first entered the continent of North America it is generally agreed that he came by way of the Asiatic-American isthmus, perhaps 10,000 years ago. We know very little about the culture he brought with him. The earliest tools found in North America are nicely worked flakes, quite distinct from anything that so far has come to light in the Old World. Because of their isolated position the islands of the Pacific are not likely to have been inhabited by early man.

Though our information on other peoples of the world is not nearly so extensive as on those of Europe, we know that most primitive peoples at the time they were discovered were still living in a Stone Age culture. The chief exceptions to this are the Peruvians of South America, who made considerable use of bronze, and many African Negroes, who were skilful workers in iron.

ETHNOLOGY

The study of the cultures of living primitive peoples is termed ethnology. By *culture* anthropologists mean the sum total of man's achievements in both the material and nonmaterial spheres; that is, his use and manufacture of various tools, weapons and dwellings, his economic and social practices and his religious beliefs. Though no other living creatures possess such an elaborate form of culture as man, certain insects, for instance the ant, exhibit a highly organized social system with a division of labor; and apes use tools on occasion and have a social life that may be compared with that of man at several points.

Human cultures may be considered as the solutions various peoples have made to three fundamental problems: (1) The problem of making a living, primarily of obtaining food and shelter; (2) the problem of getting along with other people by some sort of organization of society; (3) the problem of dealing with the supernatural forces (spirits and gods) that require special methods of approach. The solution of this third problem is usually termed *religion*.

This three-fold division is convenient, though in fact obtaining food and shelter is everywhere tied up with social organization, and religious practices often have as their aim something to do with the food supply. Hence we often find ceremonial dances or other activities, sometimes called *increase rites*, performed as magical means for maintaining the food supply.

Food Gathering.– For the problem of obtaining food, the simplest and undoubtedly the earliest solution was food gathering. Among the food gatherers of the world are hunters, fishermen and gatherers of vegetable foods. Australia was inhabited entirely by food gatherers; their diet included practically everything edible they could find—roots and grass seeds, berries and fruits, rats, snakes, beetles and grubs, gathered by women; and birds and other animals hunted by men with spears. Other food gatherers in the Old World are several groups in southeastern Asia, the very primitive Ainus in Japan and a few of the inhabitants of northeastern Asia.

The primitive people of what is now California lived chiefly by gathering acorns, which were first pounded and soaked in water and then made into a sort of mush. Among the people of Africa the Bushmen were food collectors. They inhabited an extremely poor country in the south of Africa and ate everything that their territory afforded. Like the food-gathering Australians, they spent most of their time on the move, and an average

Hewitt's Photo Shop, Anchorage

Eskimo Woman Fishing through the Ice

family covered 25 or 30 miles a day.

Far to the north, the Eskimos obtain almost all their food by hunting. The walrus and the seal are the most important animals used by them for food, and occasionally land animals, the polar bear, hare and musk ox, are eaten. When the Eskimo hunts seals, he waits quietly near the seal's breathing hole and when it comes up for air, he harpoons it and then kills it with a lance. The meat is sometimes boiled, but great quantities are eaten raw.

In eastern North America, the culture of another hunting people centered around the moose and caribou that they killed with bow and arrow. Tribes inhabiting the western plains relied mainly on the bison or buffalo for their food supply. Since the 16th century, when the Indians acquired the horse from the early Spanish explorers, hunting has been on horseback. Usually a number of men joined together and hunted by driving the animals over a cliff or into an enclosure, where they were shot with bow and arrow. The meat was boiled or roasted, and the surplus from a kill was dried in the sun, then pounded and mixed with berries and preserved in skin bags. In South American jungle regions hunting and gathering vegetable foods were the main methods. On the great plains of southern South America the guanaco was hunted on horseback like the bison in North America.

People on the southern tip of South America subsisted mainly on fish and shell fish. Also on the northwestern coast of North America the main food was fish, principally salmon and halibut, caught by trapping, netting and spearing.

Agriculture.—Many primitive peoples, like those living in more advanced civilizations, obtain their food by raising it. Among the Indians of the New World there were two centers of agriculture, one in Mexico and one in South America. In Mexico the staple crop was maize (Indian corn), which was domesticated from a wild grass called *teosinte.* In cultivating this plant a hoe or digging stick was used. These primitive farmers practiced irrigation but had no knowledge of fertilizers or rotation of crops. Squashes, pumpkins, beans and tomatoes were cultivated with maize. The maize was prepared for eating by grinding it between two stones, and the coarse meal or flour thus obtained was mixed with water and made into a mush or cooked in a thin cake on a flat slab. From Mexico the cultivation of maize spread northward, and at the time of the discovery of America by Europeans, the Indians in the eastern half of what became the United States and the pueblo dwellers of the Southwest were food raisers with maize as the staple crop.

In the Andean region of South America, potatoes, beans, peanuts and tomatoes were the staple foods, and only a little maize was grown. Especially in Peru agriculture was highly developed, and, as the country was rather arid, irrigation was practiced on a large scale, and fertilizers were used. In the lowland districts of the Amazon basin manioc (or tapioca) was grown. Manioc in its natural state contains a strong poison, but the natives developed a means of extracting the poison: the root was first grated and then pressed in an ingenious basketry press, and the poison was thus squeezed out.

On the islands of the Pacific, inhabited entirely by food raisers, the chief crops are the yam, taro, banana, breadfruit and coconut. Most of these were first cultivated in the peninsula of southeastern Asia and carried thence by the first emigrants to the islands. Yams and taro both require considerable care in planting. In some of the low islands in Polynesia the coconut is the staff of life, since it will grow on poor sandy soil unfit for the yam and taro, but everywhere it is highly prized both as food and drink.

Many primitive peoples of southern Asia, Indonesia and Madagascar live largely on rice. There are two main methods of cultivating it. One method is to cut and burn the jungle growth and plant the rice in the ashes; the other is to plant in terraces that are then irrigated.

Most of Africa was inhabited by food raisers. Millet seems to have been cultivated first south of the Sahara Desert; but most of the other staple crops of Africa did not originate there. The banana, now an important food throughout Africa, was brought from southern Asia, and maize and manioc, which are cultivated extensively today, are of American origin.

Use of Domestic Animals.—In addition to the food gatherers and food raisers, we may distinguish another broad group of peoples—those whose lives center around domesticated animals. Even the most primitive food gatherers have at least one domestic animal, the dog; and among some of them, for instance the Eskimos, the dog is very important for transport purposes. To many of the food raisers domestic animals are economically important for agriculture, especially ploughing; but as food domestic animals are of little importance to primitive food raisers. The peoples of the Pacific islands value their pigs above almost everything, but they eat pork only on rare occasions. Among many of the African tribes who live by food raising, domestic cattle are a form of wealth but are rarely used for food.

In Asia some pastoral nomadic groups are almost entirely dependent on their domestic animals. On The Steppes of central Asia a number of tribes lead a pastoral life centering around their herds of horses, sheep, goats, cattle and camels. Vegetable foods are of very little importance to them. In winter, especially, great quantities of meat are consumed; and in summer milk from ewes, goats, mares and camels is the principal part of their diet. Cheese and butter are made, and the favorite beverage is the fermented milk of mares and camels. Other very primitive groups living far to the north have domesticated the reindeer. In northeastern Siberia some of the tribes possess large herds, and reindeer meat is their most important food. A group of people in southern India, the Todas, are buffalo herders. Although they use some vegetable products that they obtain from their neighbors, their dairy foods are of prime importance.

Shelter and Clothing.—Next in importance to his need for food comes man's need for shelter, some sort of protection aganst the weather. The Tasmanians, the most primitive peo-

Courtesy U. S. Office of Indian Affairs

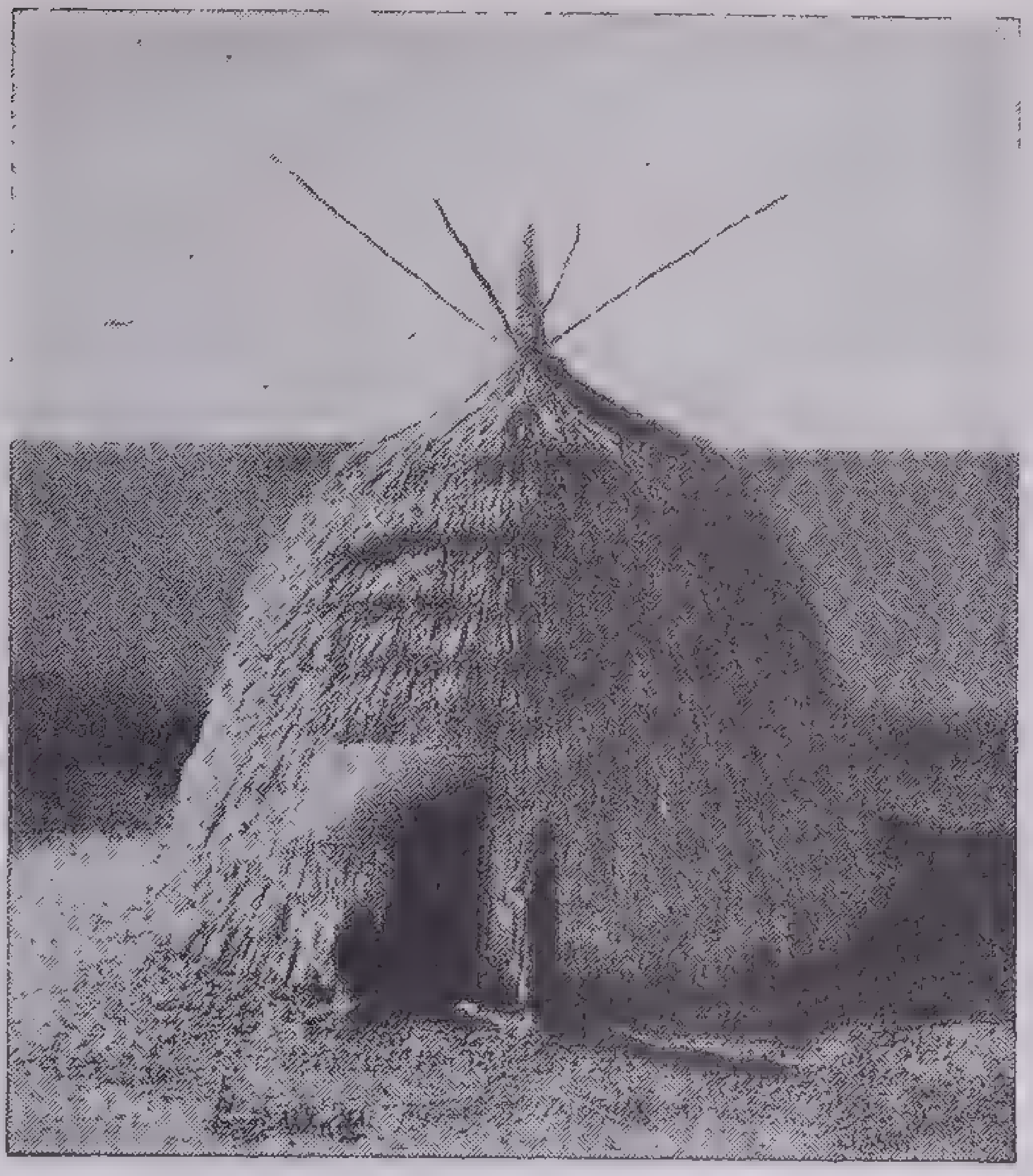
Pueblo Indian Dwellings at Taos, New Mexico ple known to us, who inhabited an island south of Australia, erected a simple screen of boughs or strips of bark to protect them from the wind. Many tropical peoples protect themselves from the heat and drenching rains by building houses with thickly thatched roofs. Some Eskimo tribes build houses of blocks of snow and line them with skins. Weather and natural surroundings frequently determine the building material, and the mode of life often plays a part in determining the structure of the house. Wandering tribes have no use for stationary homes: buffalo hunters of the plains live in conical-shaped tepees, which can be easily moved from place to place and set up quickly, as they are only a framework of poles covered with skins. The Hottentots of South Africa, who lead a more or less nomadic existence, have dome-shaped huts composed of a framework of poles covered with rush mats, all light in weight and portable. Primitive dwellings are very often designed for more than one family: the long bark-covered house built by the Iroquois of eastern North America was inhabited by a number of families; and the large buildings made of stone plastered with adobe, in which the Hopi of Arizona live, are like apartment houses with one room for each family. Not infrequently houses are built to be a protection against hostile neighbors as well as against the weather; the tree houses found in some parts of New Guinea are excellent examples.

Hewitt's Photo Shop, Anchorage

Eskimo Girl

Wearing apparel is still homemade among the Eskimos. This girl is shaping the foot of a *mukluk,* a hip-length boot of sealskin, by crimping it with her teeth

As protection of another sort against the weather, some peoples have made use of clothing. The Eskimos, for example, wear a well-made suit of furs in winter and of skins in summer. On the other hand, peoples such as the Ona of Tierra del Fuego manage to survive in a very cold climate with practically no clothing at all. The only garment is a stiff skin cloak that is little better than nothing, except that it may be shifted to protect the side of the body that is exposed to the cold wind. Articles of apparel may be protection of another sort, especially in tropical countries, where cloth is valued as a protection against insects. Among the primitive Semang of the Malay Peninsula women wear a girdle for a magical protection against disease. Modesty or shame is seldom the reason for primitive people's wearing clothes. Very generally primitive children run about naked until they are 13 or 14 years of age, and even adults of many primitive groups are not ashamed to go about with the body either entirely or almost entirely exposed. Among the Tasmanians, both men and women ordinarily wore no clothing.



Wichita Indian House in Arkansas

The Wichitas' most distinctive tribal feature were their large conical grass houses built over frameworks of poles. (From a model in the American Museum of Natural History)

Tools and Pottery.—We have seen that man is able to live in most environments before he has discovered more than a very primitive means of obtaining his food and before he has learned to erect more than a very simple sort of shelter; but many primitive peoples have succeeded in doing considerably more than manage a bare existence. Before great progress could be made, however, satisfactory tools and weapons were needed, and primitive man invented or acquired them. In addition to various stone implements, he devised the spear thrower (a device that enables the spear to be thrown with greater force) and the bow and arrow. The South American Indians and some other primitive peoples shot their game with arrows dipped in poison. Poisoning the water is a lazy method of obtaining fish in many parts of the world.

All primitive peoples used fire, and most of them were able to produce it. Fire is useful for warmth, for shaping wood by steaming it and especially for cooking. With few exceptions the manufacture and use of pottery was limited to food-raising peoples; but even the most primitive peoples made some sort of baskets, and very fine basketry was woven by the acorn gatherers of the California area. In the more advanced cultures cloth was made. In Africa, Oceania and South America, for instance, cloth is produced by beating the inner bark of certain trees. The art of weaving, though not known to many primitive peoples, is practiced by some groups of American Indians, especially those living in our Southwest.

Transportation and Trade.—Devices for transportation vary considerably. The Eskimos and other Arctic peoples use a dog sledge, but elaborate facilities for travel and transportation by land are not prominent among primitive people. Transportation by water has various vehicles. Types of water craft include: the Tasmanian raft, bundles of rushes tied together; the simple bark canoe of the Australians; the complex skin boat or kayak of the Eskimo; and the well-built sailing vessels in which the Polynesians made long ocean voyages.

Primitive man frequently needed or desired articles not to be obtained in his own territory, and systems of barter and trade were developed. It is common for coastal tribes to exchange sea food for the garden produce of the inland people. Money is fairly common among many primitive peoples; in Melanesia shell money is a widespread medium of exchange.

The Instinct for Art.—Aside from attending to practical matters, primitive man has devoted much time to artistic effort. He ornaments objects of daily use and lavishes all his skill on ceremonial objects. He does not devote all his time to making a livelihood and so he has leisure to develop myths and stories that are the beginning of literature. Though his musical instruments may be crude, even the most primitive man has something in the way of songs and dances.

Social Organization.—In surveying the organization of primitive society, we may first consider the primitive *family,* since that is the smallest and most fundamental social group. Marriage customs of primitive peoples vary considerably. Adults in primitive society usually marry shortly after they reach maturity. In some communities a young man is allowed to select his wife according to his own preferences, but in many others a small boy and girl are betrothed in infancy and expected to marry when they become mature. Very often, especially in some Australian tribes, a man may marry no one but the daughter of his mother's brother or of his father's sister. Marriage by capture, the man seizing and carrying off a girl from a neighboring group, is very rare, but it is occasionally practiced by some of the Tasmanians. Among most primitive groups the young man must pay a price to the family of his bride. It is very often arranged by custom whether a married couple shall live with the bride's family or with the husband's. Among the Hopi Indians of Arizona, women own the houses and a bride brings her husband home to her mother's house. In many primitive cultures man may have more than one wife —often two or three. More rarely a woman has more than one husband.

Among the Todas of southern India a woman married a group of brothers; in this case the custom was connected with the practice of killing female infants so that there were not as many women as men. Divorce among primitive peoples is not infrequent. The wife, if she is living with her husband's people, merely returns to her own home.

The inability to bear children is often considered sufficient reason why a man should divorce his wife. Primitive parents generally treat their children with indulgence. Many would be shocked at the idea of slapping a child, however gently. Education is usually informal, coming through more or less active participation in the daily tasks beginning at a rather early age. Many primitive peoples mark the beginning of adolescence with elaborate rites and ceremonies. Two features are especially characteristic of these ceremonies in many parts of the world: tests of fortitude and ability and instruction in tribal knowledge and matters of sex. Among the Aranda of central Australia, ceremonies of initiation to manhood are very elaborate and last over a period of years. In the first rite the boy is tossed in the air by the men of the tribe and beaten as he falls by those whom he has offended in any way. Later he is circumcised and then taught tribal secrets. The Haida Indians of British Columbia disregard the boys but pay special attention to the girls at this period. The girl is considered to be unclean and is kept inside the house for about a month, with her face smeared with hemlock gum and wearing a special hat. She eats very little food and drinks no water. Her father's sisters care for her during this time, and at the end of it a feast is made in her honor.

Primitive Groups and Leaders.—Beyond the family another and larger social grouping typical of some primitive peoples is the *band,* usually a small group of people living together in one locality. For example, the Semang of the Malay Peninsula live in bands composed of about six families who may or may not be related. There is no real chief of the band, and within each family the father is the highest authority.

Many other primitive societies are characterized by *clan* organization. A clan is a group of people who consider themselves to be descended from a common ancestor. The clan members in many primitive societies believe that they are descended from a certain animal or plant or have it associated with them in some special way. Members of the clan are forbidden to kill or eat this particular animal or plant. The animal or plant is a totem—in a sense, a sacred thing; and the rule that it must not be killed (sometimes not even touched) is a taboo.

Among some peoples an individual belongs to the clan of his father; among others he belongs to the clan of his mother. Often a man is not allowed to marry a woman from his own clan. The clan as a group in many instances owns the land and recognizes one individual with authority over all members.

Among most primitive peoples the largest social group was the *tribe,* a body of people inhabiting a limited territory and having a common culture and a common language. Among primitive groups, tribes very rarely join together to form a federation or *nation.* The League of the Iroquois, composed of five tribes inhabiting what is now the northeastern part of the United States, is a famous exception. The large African kingdoms, such as the Dahoman of West Africa, with absolute monarchs at the head, are not typical of primitive people as a whole.

Among many of the most primitive peoples there is nothing that can be called real chieftainship. Age and a strong personality give some men authority of a very informal nature. The Tasmanians were inclined to follow the leadership of certain men who had acquired fame by virtue of their courage and ability in war; but in times of peace these men had very little power. In some societies with clan organization the office of chieftainship is inherited so that a chief has a title if nothing else; but his actual power depends largely on his personal characteristics. In some societies with class divisions and an aristocracy the chief's power is derived from his rank. Among the Polynesians noblemen were considered to be the descendants of the gods, and the highest chief was the man who could show the most direct descent. In some of the islands his person was regarded as so sacred that it was dangerous to have him around—if common people came in contact with him it was thought they would injure themselves! For public protection, therefore, the movements of the chief were much restricted, and he had to remain in his house most of the time. Chieftainship among primitive peoples reached its highest development in Africa, where powerful monarchs surrounded with their courts presented unique political structures in primitive society.

Primitive Law.—No matter what its form of government, no primitive community is lawless. In every primitive society custom prescribes certain acts and forbids the performance of others. The acts prescribed and those prohibited vary greatly from culture to culture; and there is equal variation in the methods used to enforce law and to punish its nonobservance. Among many of the most primitive peoples customs are obeyed because of a fear of ridicule. A Tasmanian who failed to obey tribal custom was made to sit on the limb of a tree while the rest of the tribe gathered below and mocked and jeered him. The Yurok Indians of California are forced to pay a certain amount of shell money for breaking tribal laws. Among the Yuroks it is forbidden to mention the name of a dead person, and a man who does this has to pay the relatives of the dead person two or three strings of shell money. To discover whether a man accused of crime was guilty, many African peoples practiced the method of trial by ordeal. Primitive courts with the chief frequently acting as judge were held among some African tribes.

The methods used to enforce law often include magic, and the punishment for crime is supposed to follow automatically. For example, in Samoa a man protects his coconut trees against theft by making of coconut leaves the figure of a shark and tying it to the tree; then anyone who steals those coconuts will be devoured by a shark the next time he goes to sea. In many primitive societies certain acts are classed as sins, for which atonement must be made to avoid or avert evil consequences. Among the Semang of the Malay Peninsula it is considered a sin to kill a certain black wasp, to mock a helpless animal, to act familiarly with one's

Courtesy Swedish Travel Information Bureau

In Swedish Lapland: Basking in the 24-Hour Summer Sunshine of the Arctic

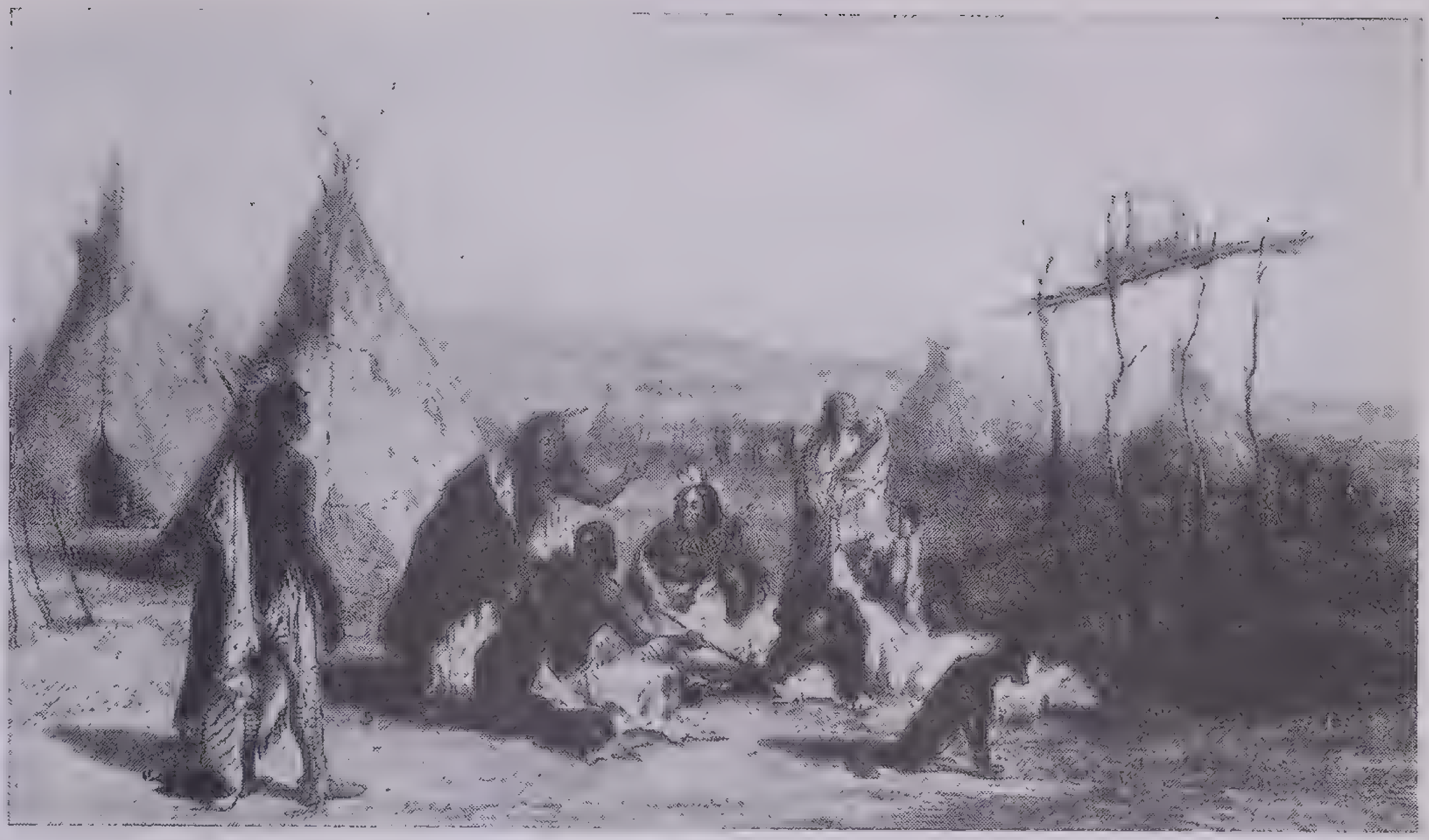
mother-in-law or to comb one's hair during a thunder storm. A sacrifice of blood has to be made by anyone who commits these sins.

Warfare.—With the exception of minor quarrels, relations existing among members of a clan or even a tribe are usually friendly; but an attitude of hostility breaking out frequently in warfare is very characteristic of relations between tribes. War does not seem to be a universal custom, however, and some extremely primitive peoples never engage in warfare. War is said to be absolutely unknown among the Semang of the Malay Peninsula. Motives for going to war vary among different peoples. The Hopi Indians of the Southwest, generally a peace-loving people, were surrounded by more warlike neighbors and forced to go to war in self-defense. The Chaco Indians of South America made war for economic reasons; a tribe would perhaps dam a stream so that the group of people who lived lower down the stream would be cut off from the supply of fish and would then go to war to destroy the dam. Among the Crow Indians of the Great Plains men set forth on the warpath to acquire a glorious reputation for bravery. If some of the tribes inhabiting the Melanesian Islands wanted a human head for rites in certain ceremonies, they went to war to secure it.

Weapons and methods of defense show considerable variation. Polynesians fought with wooden clubs and spears and made effective use of sling stones. Tribes in South America used the blowgun and a poisoned dart. Use of the bow and arrow was widespread. Plains Indians defended themselves with a shield made of buffalo hide. Suits of armor made of woven coconut fiber were worn by warriors of the Gilbert Islands in Micronesia. Villages often were fortified with stone walls or wooden fences.

Methods of fighting are usually primitive. Surprise attacks, especially at dawn, are favored by many primitive warriors. Pitched battles are rather rare. The head-hunters are satisfied if they secure one head; and among many tribes warfare is not aimed to kill as many as possible or to wipe out the enemy entirely.

Religious Beliefs and Practices.—In the same way that primitive peoples show wide variation in their manner of making a living and in their relations with other men, the ideas of the universe held by one primitive group may differ from those of another group. To people living on a small island the world would naturally appear a very different place from what it seems to the inhabitants of the interior of a great continent. A natural phenomenon like rain is accepted by natives of the Pacific Islands as a matter of fact, because it is an almost daily occurrence; but it is regarded as a precious gift from the sky-god by the Hopis of the Arizona desert region. The ideas of the universe held by various primitive peoples show many differences that cannot be attributed to environment, but certain broad concepts are to be found very generally among primitive groups.


Courtesy American Museum of Natural History

Funeral Scaffold of the Sioux Indians

From Prince Maximilian of Wied's *Travels in the Interior of North America, 1832–34*

The notion that each individual possesses a soul is almost without exception typical of primitive beliefs. The soul is sometimes thought to be the same as the shadow. The Semang of the Malay Peninsula believe that the soul is a smaller, red copy of its owner. These people and many others believe that all other living things as well as men have souls; and according to some peoples plants and even inanimate objects possess a soul.

The notion that the soul leaves the body at death but continues to survive, independent of the body, is also common to many peoples. The Aranda of central Australia believe that the soul flies away in the form of a whistling bird. Among other peoples the belief exists that after death the soul haunts the grave of its former owner or continues to hang around the village as a ghost. The Iroquois Indians attribute strange noises and whistling after dark to these ghosts who remain near the grave during the period of mourning for the dead. The Iroquois feared ghosts and set out bits of food to satisfy their hunger and keep them from causing illness and other misfortunes. Among many peoples it is forbidden to speak the name of the dead person for fear of attracting his ghost. Other primitive groups love and reverence the dead, have no fear of ghosts and wear bones or hair belonging to their dead relatives as a protection against evil.

Primitive notions of the afterworld vary, but frequently it is considered to be very like the present world—usually with all unpleasant features eliminated. To reach it, according to the beliefs of many peoples, the soul has to go on a long journey overcoming numerous obstacles along the way. Some peoples have the idea that there are several afterworlds; but whether a man has led a good or a sinful life makes no difference in his final destination. Among the Aztecs men killed in battle went to one afterworld, men struck by lightning to another. Belief in reincarnation is rather rare among primitive peoples. The Ganda peoples of East Africa believe that the soul of an ancestor enters into a newborn child. When they name a baby, the names of deceased ancestors of the clan are recited, and if the child laughs, that is considered a sign that the soul of the ancestor last named has entered the child.

Primitive Deities.—Among many peoples the relations between the living and the souls of the dead constitute religion. Among other groups spiritual beings who have never been human are more important. Although one of these may be in a higher position than the rest of his fellow spirits, the idea of a supreme deity as the creator of mankind is not by any means universal; and even when such a belief exists, the supreme creator is often of comparatively little significance. The Polynesians, for instance, recognized such a being but paid very little attention to him. Religions, both of those peoples who worship ancestors and those who worship spirits that have never been human, have certain things in common. There may be said to be almost universally a recognition of the fact that the gods may withhold or bestow certain things that the living desire; furthermore, that the gods can inflict on the living disease or misfortune either out of pure malice or because they are angry with mortals. Religious practices consist, then, of methods designed to obtain benefits from the gods and to appease them when their anger has been aroused.

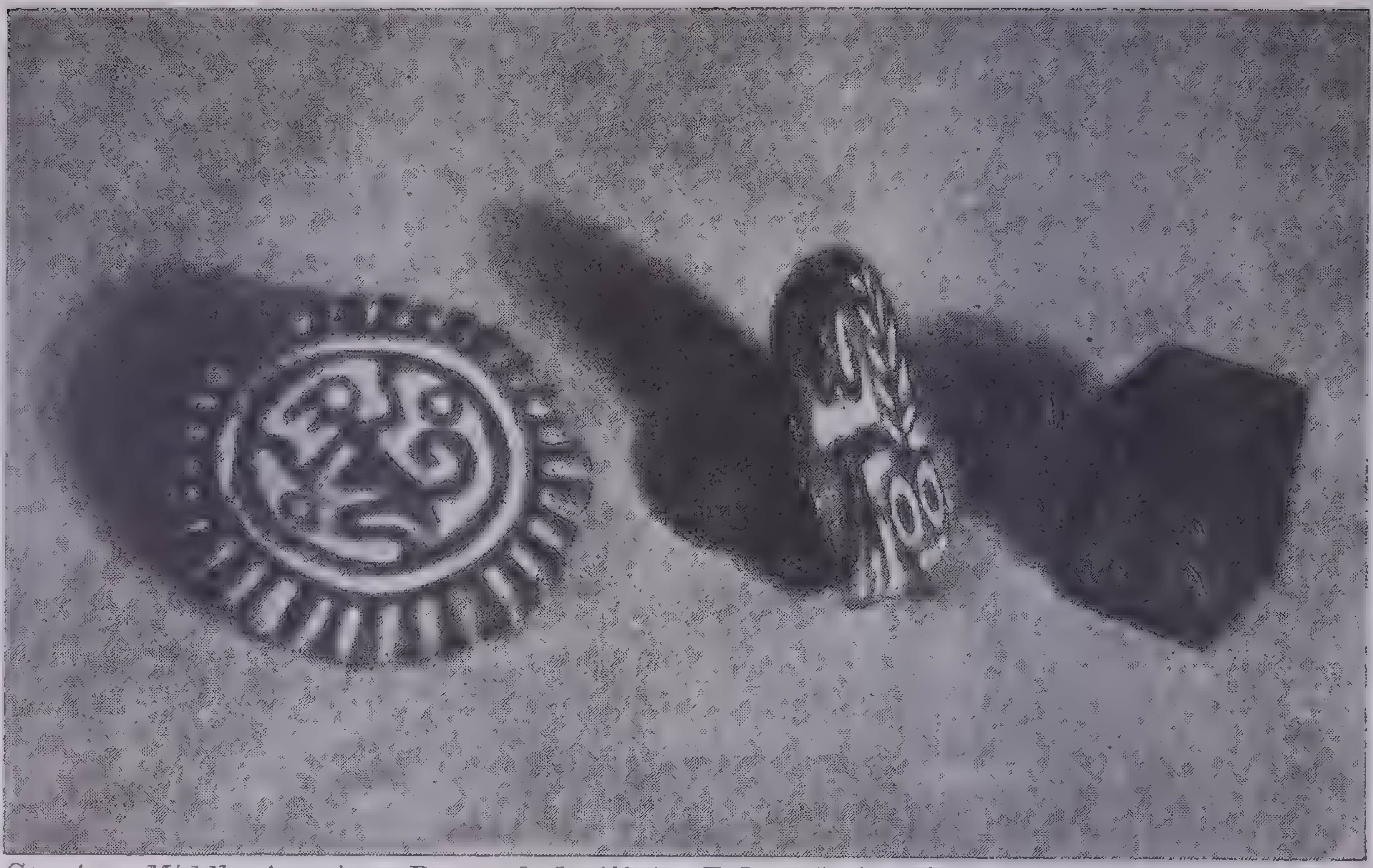
Many Indian tribes of North America are said to obtain powers and benefits from their deities in visions induced by fasting and prayer. Among the most prominent and widespread methods of soliciting the gods is prayer. Among the Hottentots of South Africa it is customary to visit the graves of ancestors to pray for health or success in hunting. The Hopi Indians hold an annual ceremony in honor of their ancestral spirits, at which time they pray for rain. Sacrifice is an important means among many primitive peoples of appeasing the anger of the gods. Samoans, believing that the gods frequently inflict disease on the living, sacrifice to the deity when there is illness. The Semang of the Malay Peninsula fear thunder, believing that it is a sign that their god is angry; at the sound of thunder they gash their bodies to obtain blood, which they offer as atonement for their sins.

Among almost all primitive peoples certain individuals are considered for one reason or another especially skilled in the work of approaching the gods. In some parts of the world an individual is supposed to be able to enter into a personal relationship with a deity and on occasion to become temporarily possessed by it; or to acquire the favor of a deity as a familiar spirit and thus become a very powerful person in the community. Among the Eskimos, such a person is regarded as able to influence the weather and the movements of seals and to cure sickness; also to perform magical acts such as walking on the water. Other people specialize in learning the rites and ceremonies necessary in the religion. In Polynesia, where long and complicated ceremonies were extremely important and one slight mistake would be ruinous, priests were of very great influence in the community.

In addition to a belief in beings more or less personified who are in possession of supernatural powers, a belief exists among many primitive peoples that an intangible, impersonal power pervades the universe and may be acquired by people for themselves. Among the peoples of the islands of the Pacific this power was called *mana* and was of great importance.

Magic.—Primitive man often turns to his gods for help, but nearly all primitive peoples have another source of aid, a knowledge of magic upon which they rely when their own physical efforts are not sufficient to accomplish the task. The Semang of the Malay Peninsula decorate their blowguns with certain designs thought to make the users successful in hunting. Many hunting peoples know magic that they think enables them to influence the supply of animals. Food-raising peoples practice magic to hasten the growth of their crops. To win the affections of his loved one by magical means a Haida Indian performs certain acts over a piece of hemlock gum that is used as a cosmetic and leaves it where the girl will see it.

Among many peoples the use of spells—a set of words to be recited—is important in performing magic. Some tribes of northeastern Asia have spells for curing disease or producing good weather. Another widespread notion is that wished-for results can be brought about by performing acts imitating the effects desired. Associated with this idea very often is the belief that by using some object that has been in contact with a person, the sorcerer can affect the person himself. Thus, among the Ona Indians of South America, a sorcerer obtains a lock of his intended victim's hair or a piece of his clothing and puts them into a little bag; he stamps on this or puts it close to the fire or under water, acting in the firm belief that his victim will die shortly. Many primitive peoples believe that magic is a means of revealing the past or foretelling the future. The Ganda peoples of East Africa are sure that by throwing coffee beans and observing how they fall they can foretell the future.



Courtesy Middle American Research Institute, Tulane University

Movable Type of the Maya Indians

Many hundreds of years before printing from movable type was discovered by Johann Gutenberg in the 15th century, the Maya Indians of Central America and Yucatan and the Chinese had invented type that operated on exactly the same principle. Above are shown two Maya clay stamps and a piece of modern metal type

Among many peoples spells contain references and invocations to spiritual beings and are frequently difficult to distinguish from prayers. If acts of imitative magic are accompanied by a prayer to a spirit, it would be impossible to say whether magic or prayer was the more important.

PRIMITIVE LANGUAGE AND WRITING

Primitive languages, another main division of anthropological studies, show enormous variation; the Indians of North America speak languages belonging to more than fifty different linguistic families or stocks. Many peoples of the world use, in addition to speech, elaborate sign languages. The Aranda of central Australia, for instance, use signs in communicating with speakers of other languages as well as among themselves.

Most primitive people have no form of writing; the nearest approach to it is a sort of picture writing, such as that used by the Iroquois Indians to record military exploits. In the New World, the Aztecs, a people with a developed culture that can hardly be termed primitive, had a system of writing composed partly of pictographs (pictorial writing) and partly of hieroglyphs (writing in symbols, as on Egyptian tombs).

Value of Anthropology.—Anthropology has considerable practical value for at least one large section of mankind—the primitive peoples of today in various parts of the world. Europeans and to a lesser extent some Asiatics, such as the Japanese, as they have spread out to the farthest ends of the earth, have imposed their customs and especially their laws and religions upon the aborigines with whom they came in contact. The effect on the aborigines has been disastrous. Anthropologists have shown that our own point of view is not the only one; that our habits are not necessarily of benefit to primitive peoples; and that primitive customs and beliefs are often quite efficient for primitive life. Administrators and officials controlling native peoples have learned to govern and direct more successfully by taking into account the customs and beliefs of the people they govern.

The facts of anthropology are not without some bearing on our own modern life. If nothing else, the wide range and diversity of customs practiced and beliefs held by peoples of the world suggest that it is necessary to go beyond the limits of our own culture in order to understand human nature; and that the evils of present-day civilization may not be inherent in human nature and may therefore be remedied.

PEOPLES AND SUBRACES

(Those named from their countries, like English, Chinese, are not included.)

Achaeans, a tall blond people, racially a mixture of Nordic and Alpine, probably emigrants from the Danube region, who occupied the mainland of Greece during the Bronze Age.

Aëtas, Negrito or Pygmy people of low culture living in the interior of Luzon, chief island of the Philippines.

Akka, Pygmies of the Belgian Congo, Africa.

Akkadians, Semitic peoples who entered Syria and Palestine early in the 4th millenium B.C. From their civilization the ancient culture of Babylonia and Assyria probably arose.

Alpines, subgroup of Caucasians, found principally in France and Switzerland.

Apaches, nomadic Indian tribes living in Arizona and New Mexico.

Araucanians, primitive American Indians of northern Chile.

Armenians, subgroup of Caucasians living in Anatolia (Asia Minor) and Armenia. The ancient Hittites were Armenians.

Avars, a people of Asiatic origin who invaded Hungary in the 6th century.

Aztecs, the dominant people in Mexico before the Spaniards under Cortez destroyed them in 1519; theirs was one of the most important civilizations of the New World Indians, centering around what is now Mexico City.

Baganda, one of the Bantu-speaking tribes of Uganda, Africa.

Basques, racially and linguistically a puzzling people inhabiting the French-Spanish border, probably a mixture of several racial types; physically of medium stature with black hair and rather dusky complexions. It is impossible to show a relationship between their language and that of any other people.

Bedouins, Semitic nomads of Arabia and North Africa.

Berbers, peoples of the eastern Sahara Desert. Their origins remain a mystery, but they are thought to have descended from an early Hamitic type; they usually have fair skin, black hair and dark eyes but occasional individuals are blond.

Bororos, primitive American Indians in the interior of Brazil.

Bushmen, Negroid people of South Africa.

Cantabri, an ancient people of northern Spain.

Caribs, primitive American Indian tribes inhabiting the West Indies and the northern coast of South America. The Red Caribs are pure blooded; the Black Caribs have negro blood.

Celts, a mixture of the Nordic and Alpine types that formerly inhabited the western part of Europe and the British Isles; a linguistic rather than racial group, including the Bretons, Welsh, Irish and Scotch.

Chukchi, primitive Mongoloid inhabitants of extreme northeastern Siberia.

Cossacks, a pastoral but very warlike people of Russia, who are skilful in horsemanship.

Crows, a tribe of American Indians who inhabited the Great Plains of North America. Their buffalo-hunting culture was typical of most of the Plains Indian tribes.

Dinarics, Caucasian subgroup found in the Illyrian and Carpathian mountains in south central Europe.

Dorians, a people of inferior culture who entered Greece from the north and northwest and destroyed the Achaean civilization about 1050 B.C.

Dravidians, a large group inhabiting southern India; their exact racial connection is unknown; they show both Caucasian and Mongoloid physical traits.

Dyaks, primitive inhabitants of the interior of Borneo; physically they resemble other Indonesians.

Eskimos, the New World Mongoloids who inhabit the northernmost regions of North America from the Aleutian Islands to the eastern coast and eastern Greenland. Among them the Aleuts bear the closest resemblance to the American Indian.

Fellahin (singular, Fellah), an agricultural people, descendants of ancient Egyptians, living in the rural districts of Lower Egypt.

Flemings, a Teutonic people of northern Belgium (originally Flanders) who speak Flemish, a Low German dialect something like Dutch.

Franks, a confederation of German tribes in the 3d century. In the 5th century one group under Clovis, their king, invaded central Gaul and gave their name to what is now France.

Gauchos, a group of nomadic cattle breeders and cowboys of mixed Spanish and Indian descent in Latin America.

Giliaks, primitive Mongoloid peoples living near the mouth of the Amur River in eastern Siberia.

Goths, a barbaric Teutonic people who appeared in the 3d century in the Danube region and later invaded the Roman Empire.

Guanche, native tribes, now extinct, who lived in the Canary Islands off the northwest coast of Africa and resembled the Cro-Magnon man.

Hamites, dark-skinned but non-Negroid population of northeast Africa.

Hausa, inhabitants of northern Nigeria, predominantly Negroid but with some Hamitic traits.

Hottentots, subgroup of Negroid people living in South-West Africa.

Huns, (1) a group of barbarous Eastern people who invaded the Eastern Roman Empire in the 4th and 5th centuries A.D.; (2) invaders of Hungary from the east in the 9th century A.D.; (3) the White Huns, who intermittently harassed the Persians during the 5th and 6th centuries; (4) during the same period, invaders of India. The exact relationship of these groups to one another is uncertain; physically and linguistically they are not a unit.

Ibo, negro tribes of West Africa.

Incas, the American Indians who developed the high civilization that flourished in Peru before and at the time of the Spanish conquest.

Indonesians (sometimes called *Nesiot*), predominantly Mongoloid people inhabiting the Malay Archipelago before the Malays.

Ionians, ancient inhabitants of Greece and Asia Minor.

Iroquois, a powerful, warlike group of Indians who inhabited what is now the state of New York. Five tribes, the Cayuga, Mohawk, Oneida, Onandaga and Seneca, formed the League of the Iroquois.

Kaffirs, Bantu-speaking people occupying the eastern half of Cape Colony, Africa. The word is Arab for infidel.

Kalmucks, a Mongoloid people found chiefly in the country between the Don and Volga rivers in Russia.

Karelians, inhabitants of eastern Finland.

Karens, Mongoloid people living in lower Burma and western Siam.

Kirghiz, Mongoloid inhabitants of northwestern Chinese Turkestan.

Kurds, inhabitants of Kurdistan and neighboring regions in southeastern Turkey, possibly descendants of early Aryan-speaking peoples.

Kwaens, inhabitants of northern Finland.

Magyars, a Mongoloid people now inhabiting Hungary, whose original home was in central Asia.

Malays, a mixed group containing Mongoloid and Caucasian elements, found in southeast Asia and islands to the east.

Manchus, a Mongoloid group of the Tungus division, modified by mixture with the Chinese; they inhabit Manchuria and have from time to time invaded and ruled China.

Maoris, civilized Polynesians who inhabit New Zealand; they are skilled in the art of wood carving.

Masai, a pastoral people of East Africa who combine Hamitic and Negroid physical characteristics.

Mayas, pre-Columbian inhabitants of Yucatan, Mexico, who developed a high civilization that reached its peak about 1000 A.D. They were superseded by the Aztecs.

Medes, early Aryan-speaking people who entered Persia from the Eurasian steppes.

Mediterraneans, a subgroup of Caucasions living in the Iberian Peninsula, southern France southern Italy and Greece.

Melanesians, Negroid peoples inhabiting Melanesia, northeast of Australia.

Micronesians, a group predominantly Mongoloid living in Micronesia, a group of islands in the Pacific east of the Philippines.

Montagnais-Naskapis or **Nascapees,** primitive hunting American Indian tribes who occupy a large territory in eastern Canada and Labrador.

Moors, Arabic-speaking inhabitants of the Mediterranean coast of Africa; physically Berbers with some Negro blood; once powerful in Spain.

Nagas, various tribes in the hills of Assam, India, difficult to classify, but apparently an intermixture between aboriginal types and later groups; Indonesian characteristics are prominent.

Nairs or **Nayars,** a group inhabiting Malabar, in Madras, India; predominantly Dravidian in physical type.

Navahos, members of an American Indian tribe living in Utah, Arizona and New Mexico; they are expert weavers of blankets.

Negrillos, a Negroid people, distinguished chiefly by short stature and yellowish skin, found in the Congo region of Africa.

Negritos, Negroid peoples, similar to the Negrillo in stature, living in the Andaman Islands in the Bay of Bengal, the interior of the Malay Peninsula, the interior of the Philippine Islands and the interior of New Guinea.

Nordics, subgroup of Caucasians, confined largely to Scandinavia and northern Germany.

Onas, primitive Indian hunters of Tierra del Fuego, at the tip of South America.

Papuans, a Negroid group in New Guinea and scattered in Melanesia.

News of Hawaii photo

Hawaiian Throwing-Net Fisher

The Polynesians of the South Seas are expert fishermen with nets, spears or torches—or even with their bare hands

Pelasgi, in prehistoric times a people who occupied Greece and the coastal region of the Aegean Sea.

Phrygians, ancient inhabitants of Asia Minor who apparently entered this territory sometime before 1200 B.C. The expansion of the Phrygians in this area resulted in the decline of Hittite culture.

Picts, a Celtic people who inhabited Britain during the Stone Age and who were later pushed back into the Highlands.

Polynesians, a mixed group of people inhabiting the islands of the eastern Pacific.

Pueblo Indians (from the Spanish *pueblo,* people, village), the village dwellers of the southwestern part of the United States, including the Hopi, Zuni and other tribes.

Pygmies, dwarfs, mostly less than 5 feet in height, living in central Africa; dark-skinned but lighter than true Negroes; they resemble the Negrillos and Negritos.

Sakais, Negrito people living in the interior of the Malay Peninsula.

Samoyeds, Mongoloid people of northwestern Siberia.

Saracens, desert nomads who once lived between Syria and Arabia. The name was used of all the Moslem invaders of Europe and enemies of the crusaders.

Sarawakese, natives of northwestern Borneo.

Saxons, a people living originally in north Germany who invaded England in the 5th and 6th centuries.

Scythians, nomadic people who in ancient times occupied southeastern Europe and western Asia.

Semites, a group of Caucasian peoples probably originating in Arabia and southwestern Asia; they included the ancient Assyrians, Babylonians and Phoenicians and are now mainly represented by the Jews and Arabs.

Shans, people predominantly Mongoloid, inhabiting Siam and parts of Burma.

Slavs, a collective term to denote the Caucasian peoples inhabiting Russia, Poland, Czechoslovakia, parts of Hungary, Jugoslavia and Albania. Their likeness is one of language rather than race.

Sumerians, an ancient people of lower Babylonia who probably entered Mesopotamia sometime before 5000 B.C.

Tajik, early (perhaps original) inhabitants of Iran (Persia). They belong to a subgroup of the Caucasian race.

Tatars, a term usually referring to various Turkish peoples of the Mongoloid race. One group of Volga Tatars is found in eastern Russia; another, south in Crimea.

Tavastians, inhabitants of southern Finland.

Tehuelche, primitive inhabitants of eastern Patagonia in southern Argentina.

Teutons, a collective term including the Danes, Dutch, English, Flemings, Frisians, Germans, Norwegians, Swedes and others.

Tuaregs, Berbers who inhabit the central Sahara Desert.

Tubas, a mixed group, predominantly Mongoloid but with great variations, inhabiting remote districts of the Yenesei region in central and western Siberia.

Tungus, Mongoloid peoples occupying a vast territory in central Asia.

Tupi, a primitive Indian tribe of eastern Brazil.

Turks, subgroup of Mongoloid peoples originally located in central Asia and since spread east to the Lena River and west to European Turkey.

Ugrians, a subgroup of Mongoloids found mainly in northern Asia.

Vandals, barbaric Teutonic people who first appeared in Germany and later invaded Gaul, Spain, Italy and North Africa.

Veddas, a very primitive group of people living in Ceylon. They are short in stature and have dark skin and curly or wavy hair. People very similar to the Veddas are thought once to have occupied the greater part of India; today numerous groups of a similar physical type are to be found scattered throughout India.

Walloons, people of southern Belgium and neighboring France who speak archaic French.

Yakuts, a Mongoloid people who occupy territory around the upper Lena basin in eastern Siberia.

Zulus, Negroid people inhabiting part of southeastern Africa.

SOCIOLOGY

The Nature of Sociology.—Man is a social animal; he is born into a social heritage and he lives in social relations. Sociology is the study of social relations as they affect behavior, as they cohere into institutions and organizations and as they are forever changing in response to all the conditions of existence. Then the question is, what are social relations?

If we consider the way in which the term *social* is used by journalists, novelists and authors of books on history, economics and government, when they speak of social relations, social changes, social problems, we realize that the term is applied widely enough to include almost all human activities and phenomena.

A number of important sociologists, including the French philosopher Auguste Comte, who coined the term *sociology* in 1838, use the word in this broad sense. Sociology is for them a comprehensive study of the whole of human activity and of almost everything that influences human activity—the arts, inventions, government or science. The word *anthropology* might be used in this sense, since it means literally the study of man; but anthropology has a more limited reference to the study of primitive man.

The inclusive study of man, embracing civilized as well as primitive man, is so complicated and so enormous a task that it is scarcely possible for any single science to deal with it. In fact many sciences divide the task among them. Some sciences concern man's physiological make-up, his arts and techniques, his languages, religions, philosophies, forms of government and ways of making a living. Each of these focuses attention on some selected aspect of man.

Many sociologists therefore accept the view that sociology also has for its subject matter a special aspect of human life. They distinguish between human activities and social activities, between human relations and social relations. For these sociologists a relation is social when it is based on the recognition of something shared in common, on some consciousness of kind, or when it involves for the parties to the relationship some sense of belonging together. There are some variations in usage between these sociologists as to what is involved in naming a relationship social; but the differences are mainly matters of emphasis.

Social Relations.—The definition that emphasizes the sense of belonging together as the basis of social relationships will be used here. This definition enables us to distinguish sociology not only from the other sciences about man but also from those among them that are called *social,* such as economics and political science. Though the other sciences are concerned with social relations, that is not their primary or main concern. Economics concerns the production and distribution of wealth, not primarily the social relationships of producers, distributors and consumers. It considers social relations only for a particular purpose and from a particular point of view; so does political science; whereas sociology, as above defined, treats of social relations themselves, social relations as such.

The distinction becomes clearer when we consider the many types of social relations and the variations of the sense of belonging together. Thus the emotional quality of a social relation varies from a casual attitude toward an acquaintance to romantic love or frenzied patriotism. The number of persons included varies from a pair of friends to the millions of citizens in a country. The amount of everyday living that this sense of belonging directly influences varies from the all-absorbing membership in a rural family and village to the highly specialized and temporary participation in a class in sociology. The amount of altruism extends from the pious loyalty of religious disciples to the self-interest of political party leaders. Regularity and constancy vary from the occasional, sporadic curiosity of crowds to the more permanent family and national loyalties. The extent to which members hold aloof from nonmembers varies from

From a drawing by W. K. Oltar-Jevsky, courtesy Architect Book Publishing Co.

Community Life: The City

the rigid caste distinctions of India to the democratic congeniality of a pioneer community. All these differences and many more are included under the term *social relations.*

The Work of the Sociologist.—In pursuing his special subject the sociologist does not and cannot ignore the other aspects of human life that are bound up with man's social relations. He does not ignore physiological, geographical, technological, economic and other factors; but he is concerned with these factors only as they influence social relations or as social relations influence them. Thus he takes account of geography insofar as geographical factors, like soil fertility or climate, influence social changes such as the growth or decline of urban life, or insofar as human cooperation actively changes geographical conditions. The sciences of man do not divide human affairs among themselves as a cake is divided; what distinguishes one from another is its selective influence or focus. The subject as here marked out for sociology is still very large and has many subdivisions.

Nonsocial Factors.—The tasks of the physicist are greatly simplified by the fact that he can disregard so much of the world. The speed of light is not altered at all by the opinions of human beings and very little by other factors. All the planets and stars in the heavens exert a pull on a pendulum, but these pulls are so slight that they may be disregarded, leaving only the pull of the earth to be considered.

Unlike the speed of light and the swing of a pendulum, however, the properties of social relations are not so uniform and free from sources of change. Human beings are set upon by an enormous number of significant influences, many of which have either a direct or an indirect effect on social relations. The size of the earth, the presence of huge icecaps at the poles, variations in temperature, oceans, fertility of soil, facilities for transportation and communication, factories, religious creeds, philosophies of life, music, art—all these and many more help to shape man's social relations with his fellows. The sociologist must therefore be familiar with many different kinds of influences. The necessary scope of this knowledge can only be indicated here.

Despite man's increasing control over nature by his invention of means to elude, control or utilize its forces, geographical factors such as climate and mountain ranges still set important limits to human behavior and social relations. Thus mineral resources and fertility of soil set limits to the population of the earth. Modern inventions exert the most pervasive influences that the sociologist must study. Modern means of transportation and communication, for example, have made possible new types of social groups. It is now possible to have a circle of friends scattered over a whole continent. In a period of six weeks the President of the United States can appear personally before five million people; and in a single evening eighty million persons may hear him speak. With the coming of the modern large-scale factory, people have clustered more and more into compact cities. Women and children have left the home to work in these factories. Scarcely a single social relation remains uninfluenced by modern inventions.

Sociology, as a science of social relations in the sense here defined, is a youthful science and has only begun the preliminary analysis of its varied subject matter. It will be sufficient to indicate some of the beginnings in this direction.

Significance of Social Groups.—Whenever two or more people are bound together by social relationships, they are a *social group.* Such groups range in size from a circle of friends to a whole nation. Social groups whose members frequently come together in face-to-face relations, as in the family or neighborhood, are called *primary* groups. Secondary groups are those whose members are so numerous or so widely scattered that face-to-face communication is infrequent or impossible. Thus the members of a state cannot enter together into personal relations in the way that members of a club or lodge do.

A number of people who live together on a given territorial area and have a sense of belonging together built around enough interests to include most of their everyday living may be called a *community.* Examples of communities are numerous and familiar: a rural village, an immigrant group within a city, a city, a region such as New England, a nation-community. A club is not a community; it is organized for a specific purpose and comprises relatively little of the everyday living of its members. Modern methods of transportation and communication have made it possible for greater numbers of people over increasingly larger territories to experience the sense of community; yet the smaller communities do not disappear within the larger but remain communities within communities.

Other social groups are built around specialized pursuits. Unlike communities, into which people are born, these specialized groups or *associations* are organized for the cooperative pursuit of some particular end or ends, such as recreation, edu-

Courtesy Connecticut Publicity Commission

Community Life: The Small Town

cation, companionship, wealth, sanitation or prison reform. The characteristic mark of an association that enables us to distinguish it from other social groups is *definite establishment* for the pursuit of *special ends*. Examples are a business partnership, an economic corporation, a trade-union, a church, a college, a school, a family, a discussion group, a football team. It is characteristic of modern society that it finds expression in a great number and variety of associations that may be classified as either *primary* groups or *secondary* (large-scale) organizations.

The basic unit for all other associations is the small group whose members meet face to face for recreation, to decide questions of policy for a larger association, for companionship, for mutual aid. This face-to-face type of association includes the circle of friends, the play group, the study group, the family. Almost every pursuit known to man is a focus for face-to-face groups. For most people, membership in these groups is the most powerful influence in their lives.

The Family.—Perhaps the most influential of all face-to-face groups is the family. Sometimes the word *family* is used very broadly to include childless marriages. Usually, however, it is defined as a union of parents with each other and with their children that is sufficiently continuous and enduring to provide for the upbringing of the children. Other general characteristics of the family are: (1) initiating ceremonies, (2) certain obligations of family members toward one another, which are set forth in laws or in customs, (3) sharing the family income and (4) sharing a common habitation, the home. A considerable sociological literature is devoted to the subject of the family, dealing with its changes, social and economic functions, relation to the state and the numerous problems of marital relations and personal adjustments that occur within it.

The State.—An essential large-scale organization of modern society is the state, which is frequently confused with the nation-community. The important distinction between the two appears in the contrast between being an American by birth or tradition and being merely an American citizen—a part of the state. In the role as an American citizen, one lives under the Federal Constitution, belongs to a political party, votes and abides by the decisions of the majority. In the larger role as an American, one not only lives under the Constitution and the particular government thereby established but speaks the English language with American slang, dresses in a distinctively American way, follows American methods and manners and shares American culture. There is a distinctively American way of doing a great many things. Only a small part of one's life is occupied with the role as citizen, but membership in the nation can include almost all everyday living. In other words, the state is an association; the nation is a large community.

The large-scale associations built around the pursuit of wealth have certain very specific and detached objectives that give them their peculiar character. When economic groups, such as the corporation and holding company, reach the form in which members are interested solely in private gain, the sense of belonging together that they express is very limited; but co-operation between persons interested only in private gain is so precarious that nearly every economic group strives to hold up something as a common possession—if only a symbol such as a trade mark. Economic associations depend in very important ways upon the political system, and the relation between them and the state is one of the greatest and most controversial of modern social problems.

In addition to political groups, such as the state and political parties, and economic groups, such as the corporation and the trade-union, there are secondary cultural associations, such as federations of churches and national and international institutes of art, music and scientific research. These larger cultural organizations supplement the indispensable face-to-face units by making possible a wider selection of intimate contacts, by setting and maintaining higher and more uniform standards, by facilitating exchange of information and by undertaking large-scale enterprises of many kinds.

The Classes.—A *social class* is any social group whose sense of belonging is built around the belief that its members occupy a recognized position of superiority or inferiority and must therefore hold themselves in some degree aloof from nonmembers. The extreme form of class, in which membership is unalterably determined by birth, is called a *caste*.

India furnishes the outstanding example of a caste system. The highest caste includes the sacred priests (Brahmans), who are regarded by all Hindus with reverence and awe. The lowest caste comprises the untouchables, whose mere presence is believed to be polluting. Every Hindu is automatically a member of the caste to which his parents belong and must observe the intricate rules of conduct that distinguish each caste from the others. If he marries outside his caste he suffers ostracism; he cannot voluntarily leave one caste to enter another without social punishment, nor through superior talent, bravery, wealth, or public service rise from a lower to a higher status or rank.

Class systems range from this extremely rigid caste system of India, based on religious belief, to the very mobile class system of America, based largely, though not exclusively, on the possession of money. The class system in this country may be likened to a continuous slope on which one slides up or down according to the amount of wealth he acquires. On the other hand rigid class systems are like a series of disconnected levels or plateaus, on one of which a person is placed by the accident of birth, and where he must always stay.

Class systems are sometimes described by contrasting them with functional systems. In a functional system the gradation of classes from lower to higher would be replaced by groups based mainly on vocation: farmers, scientists, musicians, domestic servants, and so on. In a strictly functional system distinctions of higher and lower would be based on personal qualities such as skill, inventiveness and efficiency rather than on the mere possession of wealth or an honored family name. In such a system opportunities would be made available to the talented and ambitious regardless of parentage or privilege or vested interest.

Class consciousness or the sense of belonging to a superior or an inferior group is a powerful factor in any community. In its superficial forms it leads the lower classes to imitate the upper classes, as is frequently seen in the phenomena of fashion. In its deeper forms it leads to class struggle or to social revolution, as in the French Revolution of the 18th century and in the Bolshevik Revolution of the 20th century that put forward as its goal the abolition of classes. This goal is still far from being attained, since class distinctions are based upon differences of power as well as upon differences of wealth.

In all human history few chapters are more amazing than those on the social classes. They are filled with stories of unbelievable degradation of human beings by their alleged superiors. Throughout human history there have been groups of human beings who regarded themselves as superior and groups who accepted a position of inferiority. The three most extreme forms of class distinction, slavery, caste and divine-right aristocracy have been disappearing under modern conditions. When human beings are regarded as property to be bought and sold or held captive for their services they are called *slaves*. Slavery is rare among the most primitive tribes, but until recently was very common among civilized peoples. When a group of people hold a position of authority on the ground of birth or privilege, it is called an aristocracy. In between the extremes of slavery and aristocracy are many other groups whose members look up to or down on outsiders. These include many social, income, nationality and occupational groups holding a higher or a lower position in the social scale.

Slavery has had a long and varied history. In early times people became slaves mainly through military conquest by an enemy. Later, with the introduction of money, many people fell into debt and were sold into slavery by their creditors. Slaves were acquired by purchase, often from slave traders who raided primitive peoples and sold them. Slavery is no longer a recognized institution. Status dependent on birth has been undermined by new modes of acquiring wealth and by the breakup of dynastic systems of government.

Modern classes are generally of two kinds: (1) Those with a definite economic basis, such as distinguishes a wage-earning class from an employ-

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The Crowd: A Lynch Mob Batters Down the Doors of a California Jail

A mob is blind, uncritical and primitive in its emotions. It thinks and acts together as a unit, not as its individuals. The mob pictured here is bent on getting at the quarry on whom it later carried out its own idea of justice. As individuals, these men might believe in leaving justice to the state, but as a crowd they have reverted to the level of a savage community

ing class; (2) those that depend on minor differences of prestige, however acquired. The latter does not create what is known as class struggle but manifests itself in the competitive striving to maintain a social position or to rise to a new one.

Crowds.—All the groups so far considered are usually enduring and well-organized. The *crowd,* on the contrary, is sporadic, temporary, highly changeable and without formal organization. The crowd may be defined as any considerable number of people who mass together without definite order or division of responsibilities and functions. Examples of crowds are groups of rioters, strikers, lynch mobs and the groups that gather to watch a fire or an excavation. An audience in a theater conforms to a definite seating plan and has traditional relationship with the entertainers. Therefore it is not a crowd.

Such an audience, however, may exhibit a herd or mob spirit, which may be defined briefly as the impulse to do what is being done by others. It is a blind, uncritical following of the group one happens to be in. In certain instances it may become an unquestioning acceptance by a group of previously approved beliefs and practices simply because they have been approved; it is an unintelligent rejection of all divergent beliefs and practices simply because they diverge. On a national scale the herd spirit can be recognized in the exaggerated patriotism that sometimes causes various nationals to look down on the rest of the world simply because it is not of their traditional mold. On the smaller scale of the family the herd spirit is manifested in that extreme family pride that prompts people to revere their ancestors above more worthy fellow men. The herd spirit may thus be present in any group, large or small, but it takes most complete possession of crowds.

We may distinguish between two types of crowds. One type is represented by a group of people who are rushing to secure a limited number of seats or who are craning their necks to see some street spectacle. Here the objective is something that each is striving to get for himself individually or separately. In this type of crowd the interests of each person are merely similar or *like;* there is no sharing, no interest in common; so it may be called a *like-interest* crowd.

Of greater sociological significance is the type of crowd that is inspired by a *common interest.* Formed to make demands that are not satisfied by the existing orderly groups, crowds of this type include such groups as workingmen who engage in demonstrations for higher wages, the lynching crowd that wants the quick revenge that the courts refuse to give or college rooters who swarm on the football field to express elation that overflows the bounds of regimented cheering. In such crowds there is a purpose involving co-operative effort, a purpose common to all members of the group, and around it there forms a sense of belonging together. The commuter speaks of "my" train; the college rooter refers to "our" victory.

The common-interest crowd is a very important unit for the sociologist to study. It reveals the primitive sense of belonging together that in orderly social groups has become so refined, patterned and specialized as no longer to attract attention. Thus the study of the crowd helps us to understand other social groups. It reveals the presence and power of ambitions, emotions, desires and appetites that are repressed in everyday living. Thirdly, knowledge of the conditions favorable to the formation of common-interest crowds, and knowledge of the effects of the herd spirit can furnish a foundation for deliberate prevention of dangerous crowds and herd thinking.

The Invisible Attitudes.—A closer view of social groups discloses within them a variety of social relations that might easily be overlooked. In fact sweeping statements about social relations in general are one of the prevalent weaknesses of sociology.

Sympathy is very different from reverence, friendliness from love, tolerance from trust; yet all these very different attitudes or ways of feeling toward people are varieties of social relations. It is very difficult to describe these attitudes. They are invisible. They do not always evoke the same facial expressions and gestures. They are far more numerous than the words available to label them. They enter into subtle combinations with one another: it is possible, at the same moment, both to love and to hate the same person.

A list of the more familiar attitudes that determine social relations would include the intimate attitudes of sympathy, kindliness, tenderness, affection and love; and the more distant attitudes of reverence, adoration, hero worship, tolerance and humility. In addition to these social attitudes there are various nonsocial attitudes, such as disgust, repugnance, horror, terror and hate. The importance of these nonsocial attitudes comes from the fact that they hinder or bar the formation of social relations.

The scientific study of attitudes presents a difficult problem, since they are so complex, elusive and variable. Some sociologists have attempted to develop techniques for measuring attitudes, but generally without fully recognizing the nature of the problem with which they are faced.

Leadership.—The process of entering into social relationships differs greatly in face-to-face groups and secondary groups. In small face-to-face groups there is generally some indication, through gestures or words, of each person's attitudes toward the others. Here the problems of relationship are personal. If, for example, one member of the group wishes to be a leader, there is the problem of establishing complementary attitudes between leader and followers. Mere friendliness between the leader and his group is not sufficient. There must be also attitudes toward him of deference or even of subservience. The leader on his part must have the complementary attitudes of protectiveness and dominance. If the would-be leader's attitude of dominance is met by indifference, hostility or ridicule, the process of attitude adjustment has failed and no effective social relationship is established. Some of the difficulty in attitude adjustment may be a result of inadequate means of communication; for example, an attitude of kindliness and helpfulness may be mistaken for the attitude of pity.

In large secondary groups such as the nation, the process of attitude adjustment is simplified by the fact that each member does not communicate directly with every other member. Instead, there is a vague notion or image of the group as a whole that greatly simplifies the actual differences between members. It is thus possible for a large group to have intense attitudes of devotion and helpfulness toward distant leaders and fellow members with whom face-to-face relations would be unpleasant or difficult.

Symbols frequently play a large part in creating and sustaining the emotional loyalty found in most large groups. People may grumble at paying income taxes but cheer when the national flag passes by, and others who grumble because they believe income taxes are too low will probably join in the cheering. The symbolic flag arouses attitudes of devotion without making people conscious of their differences.

Social Patterns.—Each social group has a unique set of approved beliefs, symbols and modes of conduct. Between friends there are the handshake and inquiries about health. Each school has its own colors and songs, each church its distinctive rituals and creed, each nation its own flag, manner of dress, national holidays and songs. The best-known description of social patterns is W. G. Sumner's book, *Folkways.*

These various social patterns derive their strength mainly from the fact that they are a condition for good membership. To be a member of any group, to enter into social relations with other members, it is necessary to enter into at least part of the social pattern of that group. The variety of these social patterns is so great that it is important to make some distinctions. Customs and institutions may be distinguished from each other. Marriage, controlled by a definitely established set of required procedures, is an institution; but the honeymoon, less definitely established and not required, is only a custom. The family is the group of parents and children that is regulated by various family customs and institutions. The term *custom* may thus be used to stand for those approved modes of conduct that are less definitely established. The term *institution* covers approved modes of conduct, such as baptism, that are more definitely set up than customs. It also includes those social patterns, such as property ownership, which are not behavior but instrumental to it.

Social patterns have often been called the *habits* of groups. Habits are those acquired grooves that direct the actions of body and mind without the direct aid of conscious effort. When customs and institutions are called group habits, emphasis is put on the grooves and the influence of social relations is overlooked. Constant repetition of certain customary modes of behavior, such as table etiquette, will produce habits. These habits then *co-operate* with social relations to sustain the social pattern. When the social sanction requires the frequent performance of an act, such as the salute in the army and navy, the act itself becomes a habitual response performed almost automatically. On the other hand habit plays almost no part in the making of some social patterns.

So complicated is the business of living that without the restrictions imposed by social patterns the individual would break down under the burden of choices thrust upon him. Most customs and institutions are such convenient limitations that they are seldom questioned; but individual preferences sometimes conflict with a social pattern, as when an American wishes to marry an Oriental.

Social Change.—From the point of view of everyday living, the most important characteristic of social relations is their constant change. Not only do the individual's social relations change from day to day but the various types of social groups that he may enter are constantly changing. In place of the slow-moving small town with its one or two schools and simple neighborhood groups, today most individuals face the city with its endless array of specialized groups.

An important series of social changes is receiving increased attention. It includes the social changes throughout the life span of the individual from early childhood through adolescence and adulthood until death. There are great individual differences in this respect, yet certain generalizations may be helpful. For example, it is very important to know at what age infants usually begin to be aware of themselves and others as persons, and to experience a sense of belonging with others. It is important also to observe the changes in social relations that usually take place during adolescence. Such descriptions of social changes in the lives of individuals are preliminary to the problem of how far and in what ways the biological changes from infancy to death influence the individual's social relations.

Social change has a different meaning when we are studying the processes through which different types of social groups, such as the family, church and state, are constantly passing. Among the most significant recent social changes in types of groups are: (1) The rise of large nation-communities for the members of which the sense of belonging usually stops at national boundaries. There have always been exclusive groups whose members are antagonistic toward outsiders; but now their greater size, associated with the intensely emotional patriotism of their members, which may include the obligation to give one's life if need be, makes the modern exclusive nation a new and distinct social group. (2) The tentative beginnings of an international sense of belonging. (3) A decline in the size of families and in the number of activities centering in the home. (4) A decline in the control held by churches over their members. (5) An increase in the number, variety and size of groups devoted to economic interests. (6) The rise of associations of workingmen or trade-unions. (7) The multiplication of specialized cultural groups for the pursuit of such activities as music, art or recreation, which formerly centered either in the home or the neighborhood. (8) The increase of the activities of the state, especially through the establishment of new controls over economic behavior and through the provision of various forms of social legislation and social insurance.

These changes follow or accompany the nonsocial changes—discoveries, inventions, scientific applications, changes in opinions, religious beliefs, cultural activities and so forth.

Changes Affecting the Family.—Although many social changes run counter to one another and give the general appearance of a meaningless chaos, others have co-operated and moved in definite directions. Social changes in respect of the family and its relation to other groups illustrate one of these trends. Prior to the 19th century the good housewife and mother usually performed many economic functions, such as bread baking and canning, spinning and weaving. She also gave her children a large part of their meager education. The father as head of the family exercised great power over the wife and children, who occupied a subordinate position. In early times this power sometimes gave the parent the right of life and death over the child. In 18th- and 19th-century New England and provincial England the father often supplemented the church by directing various formal religious activities, such as Bible reading and hymn singing. The family was usually the main center for recreation and cultural pursuits, such as games and music. The dominant note in the family sense of belonging was subordination to the authority of the father. Membership in the family was often enforced by economic dependence and the threat of punishment by the father.

Most of these functions are now performed by specialized agencies outside the family. With the development of highly efficient machinery, most of the economic functions such as bread baking are done in special factories. The highly specialized vocational training and the wider general education demanded by the modern world cannot be acquired at home. The home has been forced to allow specialized schools to provide the additional educational training that is now necessary. Formal religious worship is now cared for by the churches. The powers of the husband and father have been greatly curtailed: his power of economic coercion has been modified by the entrance of women into industry and the professions, and most of his power to punish family members has been taken over by government. The family itself has become a highly specialized group in a world of highly specialized groups. There remain for parents three basic and closely related functions: (1) The perpetuation of the human race, (2) intimate relations in an atmosphere of companionship and protection, (3) the provision of a relatively permanent and intimate abode for themselves and children. The family's claim to a place in modern society rests on the ground that these three functions should enrich one another, and that only in the family can such mutual enrichment occur.

It is important to observe the effects of specialization on what the family can now mean to its members and on the functions that remain to the family: Despite wide differences between families it is possible to say that the family sense of belonging has in most cases lost the ingredient of reverence for authority and now rests more often on companionship between husband and wife. Romantic love receives more emphasis; accordingly few marriages are arranged by parents. A home that is not a workshop, bakery and school as well, has a better chance to develop into a stable and congenial environment for the family's main function: the upbringing of children.

The family is only one of many social groups that have become specialized in structure and function. In many places citizenship was once synonymous with membership in an established church. Gradually a distinction arose and finally two social groups emerged, each with specialized duties and privileges. This differentiation of social groups, each with its own institutions and special functions, is called *social evolution.*

The Evolution of the Family Group.—The wide range of present-day sociology becomes more apparent in reviewing the chief evolutionary changes that have occurred in some of the main areas of sociological investigation. There have been many efforts to construct a picture of a single original type of family and to show that the present monogamous family (one husband and one wife) evolved from this original type by a series of inevitable changes. It is now generally agreed that there was no single original type of family, neither polygynous (one man with more than one wife) nor polyandrous (one woman with more than one husband). Human society at all stages probably has presented variations of the mating relationship, of the nature and residence of authority within the family and of the ease or difficulty of divorce. Among primitive tribes of today polygyny is very common but usually is practiced only by a small minority in each tribe. Polyandry is very rare and strict monogamy is not infrequent. In many primitive tribes divorce is at the will of the husband; in others, the mutual consent of husband and wife is required; but almost never is divorce granted at the will of a wife alone. In some tribes, divorce is allowed only under certain conditions, such as desertion and cruelty. It may be supposed that variations such as these are as old as the human race.

In ancient Eygpt and in Babylon (3000–1000 B. C.), the husband exerted much less power over his wife and children than in the Roman family a thousand years later. The history of the family is therefore not a record of the gradual decline of the power of the husband.

The families of Greece, Rome and Israel (1000 B. C. to 400 A. D.) were patriarchal. The patriarch or father had even the right to put his wife and children to death for disobedience, though in both Greece and Rome this right was eventually abolished. Polygyny was widely practiced in Greece. Women were regarded as inferiors and their education was so neglected that often they developed a crude language of their own. The small ancient Greek cities were essentially men's clubs. In one of these cities (Sparta) the children of the upper class were taken from the home and brought up by the men. In the most famous and cultured of these cities (Athens) women lived a life of seclusion and were supposed not to venture into the public streets without the husband's permission.

In early Rome, polygyny was rare, but rarely in human history has the power of the father over wife and children been so great. He could sell his children into slavery or kill them at will and could punish his wife with torture or death without a trial. Divorce was almost unknown. In later Rome, the power of the father declined, the position of women in society became more nearly equal to that of men and many varieties of freer family relations sprang up. Divorce became at times almost as frequent as marriage.

During the Middle Ages family life fell under the influence and the power of the Church. Celibacy was thought holier than marriage. The unmarried life of the monks who devoted themselves to the service of God was held up as an example of the highest human achievement. The position of the wife was somewhat degraded by the Church doctrine that woman was the principal source of sin; furthermore, there was no place for women outside the household or the farm, which demanded her attention to an incessant round of tasks, in addition to child-bearing.

Effects of the Renaissance on Social Relations.—The Renaissance developed greater emphasis on worldy pleasures and romantic love. Slowly the family was liberated from the strict control of either church or state. Within the family the sons and daughters gained greater liberty of choice in marriage. The wife gained some legal protection against ill treatment. Divorce was permitted somewhat more freely. The patriarchal system long retained considerable strength, though it varied with the religious and economic situation.

It was only in the 19th century and largely as a consequence of industrial developments, that revolutionary changes in the family took place throughout the Western world. The differences between the patriarchal family and the family of modern civilization are marked. Women have gained a far higher degree of independence—legally, economically, and socially. Their work has become more specialized, like that of men, and in the process has been largely taken out of the home. For large groups marriage has become an essentially civil institution rather than a religious one. At the same time the frequency of divorce has very considerably increased, the size of the family has diminished and its functions have become more limited though not less necessary than before. The increased use of machinery in the 19th century was a major factor in bringing about the recent evolutionary changes already described.

Political Institutions.—Government in the sense of a specialized organization of officials who are distinct from priests and family heads and who enact and carry out laws for the people of a given territory is a recent development in the long history of the race. Government in the sense of leadership and exercise of authority of one or more men over others probably is as old as man. The earliest governments may have consisted in sporadic meetings of the old men or perhaps the strong men for the purpose of settling troublesome disputes. Since each party to a dispute had generally the backing of his whole family, a quarrel often resulted in a bloody feud between the families. It is not surprising that early man should have been driven to find some way of stopping this disruptive practice of vengeance. At first there was probably no thought of lawmakers and permanent officials; but only the desire for a leader or leaders to keep the peace, to conduct certain religious ceremonies connected with war and the harvest and to punish offenders.

Early government usually was merged with religion. The functions of priest and ruler were often combined in one man; sometimes the ruler was supposed to be guided by supernatural beings. Early government usually was identified with the maintenance of custom and usage, and the rulers were thought of as mere keepers of existing customs. Only later did rulers enact laws. Lastly, early government usually was combined with family authority. As members of a tribe supposed themselves to be blood relatives, the ruler was a supreme family head, and the scope of his rule was limited to a small group. Only later was the idea of government based on blood relationship replaced by the modern idea of a group of loyal citizens living on common territory.

The story of political institutions deals mainly with gradual distinction of government from other forms of authority and the appearance of the specialized set of machinery and officials that we call government. The confusion of family and state which identified the two authorities was probably the first to break down. In ancient Athens (600–500 B. C.) government by ruling families was changed to government on the basis of citizenship.

The ancient Greek cities (600–300 B. C.) were laboratories in which many modern political institutions were first developed. At one time in Athens nearly all the 30,000 citizens served successively as government officials; but these Greek city-states were so quarrelsome and exclusive that they failed to achieve any lasting co-operation and fell a prey to conquering peoples. The leagues they formed, however, resulted in techniques of arbitration that are still used by modern nations.

Rome is noted for the elaboration of codes of law and for the development of agencies for the enactment of new laws. The majority of primitive peoples have looked upon their customs as laws, eternal and unchangeable. Greece broke through this notion, but it was the Romans who developed a consistent body of written laws and legal principles. After the fall of Rome the power of central governments declined until the various kings of Europe did little more than collect taxes and conduct military campaigns. The unit of government was the warrior or noble who owned a tract of land on condition of service to the king and ruled over the serfs and others who lived on his estates. This system, called *feudalism,* disappeared with the growth of commerce and of cities. In its place arose the modern national state, of which the outstanding characteristic is the intense loyalty of its members for their country and its ruler or its form of government. In all earlier large-scale states or empires government was almost as remote as the stars from the individual.

The monarchs consolidated their power against the feudal lords. Then began a series of changes in which the people acquired more and more power until, in countries such as England, the monarch is barely more than a symbol. Since modern nations had become too large for the direct democracy of the Greek city, a new set of political institutions was developed—representative government. At first government represented owners of property. Now, after a long struggle, universal suffrage for all sane adults of both sexes has been achieved in many nations. The claims of the mass of people have also taken the form of bills of rights such as the first ten amendments in the Constitution of the United States.

Governmental Developments.—Government has undergone great changes in the last century. These changes are partly a response to changes in ideas of what government should do. The old notion of government as a policeman who keeps the peace and punishes offenders against people and property is giving way to the idea that government is a service agency that can be entrusted with a number of public-service functions such as sanitation, maintenance of parks, reforestation, food inspection and provision for a water supply, electricity and social security. To carry out these new functions an enormous number of new agencies have been established.

Among distinctive institutions of modern governments are: (1) the federal system, in which a number of states are united into a single state but still retain each its own sphere of sovereignty, as in the United States, (2) the separation of power among courts, legislature and administrative officers, (3) political parties, (4) representative legislatures, (5) civil service.

Until the time of the World War the trend was nearly everywhere toward a higher degree of democracy. The war and its immediate consequences seemed to accelerate this tendency, but it brought in its train so many crises and grave disturbances that soon a very different trend appeared—toward dictatorship. The two chief types of modern dictatorship are the Fascist (Italian, with German National Socialism as a variety) and the Communist, represented by Soviet Russia. From the sociological point of view the distinctive feature of dictatorship is its attempted unification of the whole national life, economic and cultural, under the control of the state, which is styled totalitarian (all inclusive). To this end it employs an intensive system of propaganda, establishing one party and abolishing all others, stimulating in every possible way unquestioning loyalty.

The greatest political task facing the modern world is the creation of a government of the world that will destroy war as an instrument of national governments.

Religious Organization.—Man has always been challenged to attempt some kind of explanation of the facts of life and death, of the seasons, of the world around him, of the universe. His explanations have nearly always included some superhuman power; either an impersonal superhuman force or, more frequently, some super-person or group of spirits.

The earliest religions of man probably took the form of a belief that spirits, both good and evil, inhabited and controlled various natural objects. Sun and moon have often been chosen by primitive peoples as the habitation of powerful spirits. Religion was very closely bound up with magic. That is, attempts were made to use these unknown powers to provide abundant harvest, to kill enemies, to bring good luck. This magical element in religion has declined, but prayers still take the form of a plea to God for material gifts.

Religion is one of the permanent interests around which men have formed groups. It is this aspect of religion that is of special sociological interest. The Jehovah of the ancient Hebrews was the protector of all their groups: of the whole Hebrew nation and of every tribe and family within it. In very early Greece (800 B.C.) there were separate gods for each locality and tribe, as well as gods who sponsored particular aspects of living. Religion in Rome was centered mainly in the households, each with its own gods.

Some of the Semitic peoples worshiped one god, but the Greeks and Romans were polytheistic. With the coming of Christianity the worship of many gods (polytheism) practically ceased in the civilized western world. Solemn services in honor of one God took the place of the numerous religious festivals for the gods of Greece and Rome, of the Teutons and the vikings.

Christianity was for a thousand years the special care of one fairly unified hierarchy of religious authorities. During this time the Roman Catholic Church exercised its temporal power in the greatest degree, dividing the New World and even deposing kings for heresy or disobedience.

The greatest change in the religious organizations of the western world came shortly after the year 1500, when many of the peoples of northern Europe broke away from the Catholic Church and formed a number of separate religious groups. This religious revolt is called the Protestant Reformation. The close relation between church and state continued, because the Protestant rulers generally established their own church and suppressed the Roman Catholics.

The most important religious change since the Protestant Reformation has been the gradual separation of Church and State. The Puritans disliked the extravagance and elaborate rituals of the established Church of England, and came to America seeking religious freedom; but they wished freedom of religious worship only within the limits of their own principles. The idea of religious freedom for all sects did not become prevalent until much later, but is now accepted by most governments of the world. In the United States alone there are now over 500 religious sects. It has been found that differences in religious belief and worship do not necessarily divide a nation, but that attempts to enforce religious uniformity are almost certain to result in dissension or revolution.

Educational Institutions.—From a sociological viewpoint, the most important change in formal education is the recent appearance of mass education. Prior to the late 19th century, formal education was the privilege of the few who could afford it. The great mass of the people were usually ignorant and even illiterate. Now, through taxation and state supervision, education is made available to all children and to many adults.

An important sociological aspect of this change in education is its effect on the sense of belonging. For the illiterate French peasant of the early 19th century, the small village was both the center and the circumference of life. He had no patriotic feelings for a united France, for he did not even know the meaning of the word *France.* It was not until the government enforced a program of education that France became national rather than provincial. Especially in European countries and in Japan education is used to create national loyalty and, unfortunately, to cultivate hatreds for other nations. The next change to be hoped for in education is the universal promotion and establishment of instruction that will form the basis for permanent, world-wide co-operation.

Another important change in education is the relaxation of a rigid program of classics in favor of more freedom of choice. Education has become a much more elaborate system, with a multitude of specialized institutions corresponding to the complex civilization in which we live. Vocational education also has, to a large extent, replaced the old institution of apprenticeship.

Relation of Culture to Technology.—As one writer has put is: "Man came into the world naked. He had no tools nor weapons. For shelter he had to use caves or, if these were not available, trees; and when pressed by danger, he would climb these. His only means of transport on land were his two legs, and to cross streams he had to wade or swim. . . . He knew no arts and his food he had to take where he found it." But man had hands with great possibilities, he had the power of speech, and he developed a superior brain.

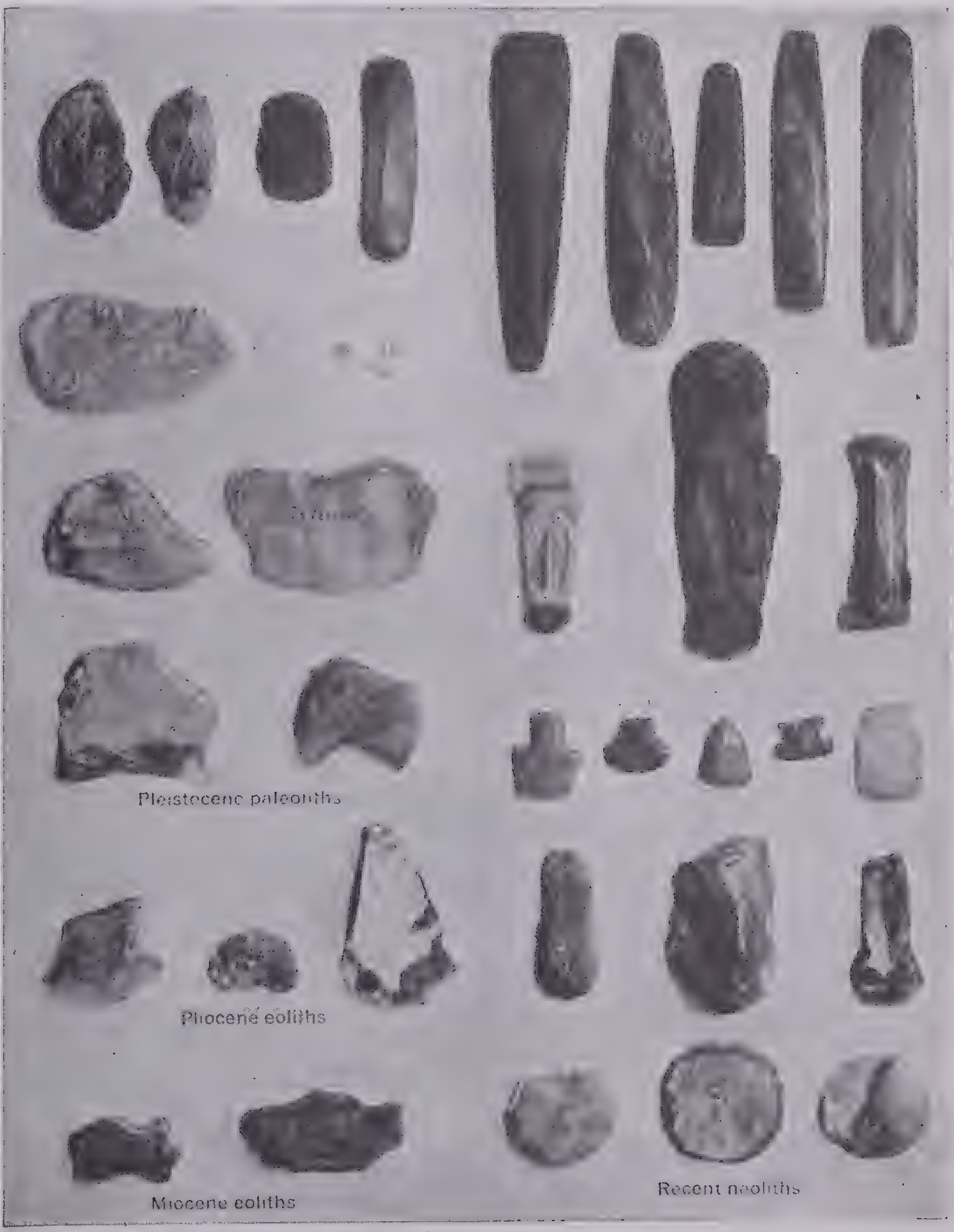
At first men must have been occupied mainly with the technological problem of struggling for existence against weather, wild animals and food shortage; but through basic inventions, such as the axe, the spear, the bow, the plow, the wheel and the canoe, the problem of bare existence was gradually solved. More attention could then be given to expression of the human spirit in the form of art, ceremonials, songs, fashion, sport and secret societies. The earliest aspect of such cultural expression probably took the form of decorating basic tools, weapons and pottery. Such embellishment is practically universal among human beings.

Culture is in many ways dependent on technology. Not only is technology needed to free at least part of the population to devote themselves to art, music, the drama and social clubs but every item of culture has a technological base. The technique of stone cutting is necessary for beautiful buildings, the inventions of paper and printing were necessary for the widespread enjoyment of writing. With the 12th century there began that astonishing series of inventions that provided the foundation for modern machine production. Among these discoveries were lenses, accurate clocks, printing of books, roller bearings, the decimal system, calculating machines, the steam engine, thermometer, cement, the cotton gin, electric motor, gas engine, airplane and radio. The division of labor for speeding the production of goods was early made use of but its almost universal adoption came in the last few generations with machine production in which each individual may do little more than twist screws or feed a machine.

These changes in technology have been exceedingly rapid and have had a momentous effect on social relations. Here we can see a contrast between technological change and cultural change. Though great changes in art, literature, philosophies, theories of government and forms of recreation have taken place, the plays of Shakespeare and the paintings of Rembrandt are still treasured. The forms of transportation of the times of Shakespeare and Rembrandt, however, have been discarded in favor of the railway, automobile and airplane. Often part of the culture will hinder the adoption of some new technique; for example, a theory that government should not interfere with business has, until recently, prevented the enforcement of safety measures in factories. In such cases culture is sometimes said to lag behind technology.

The relation of culture to technology is significant to the student of society. Culture embodies itself in characteristic institutions and organizations, of which historically the most important is the church. Others are the play group, the social club, the theater and the organizations devoted to the pursuit of the fine arts and to the advancement of the sciences. Observe that to derive the benefits of cultural organization people must personally participate in them, whereas without such direct participation they may receive the benefits of economic, political and technological organizations that are concerned with practical devices or applications derived from science.

Modes of Sociological Investigation.—Sociology has been defined as the scientific study of social relations and the term *social relations* has been explained; but what is a *scientific study* of social relations? Briefly, the study of any kind of social relation (such as friendship, hero worship or loyalty to one's fellow countrymen) consists in (1) defining it, (2) describing some examples of it, (3) describing its changes, (4) discovering the forces or influences that direct these changes, (5) tracing the influences that sustain it and lastly (6) determining the influence that the social



Courtesy American Museum of Natural History

Technology: Man's First Tools

These cutting, scraping, chipping and grinding instruments of stone were used by prehistoric men. The *eoliths* are the unpolished, unshaped tools of the earliest men known, who lived in the Miocene and Pliocene periods of the Tertiary era. In the Pleistocene period man used *paleoliths:* less crude, chipped instruments. Neolithic man, about 18,000 B.C., developed much more advanced tools. He gave them cutting edges and definite shapes by grinding and polishing and thus had increasingly efficient and specialized implements relations exert on the human beings whose attitudes of belonging together have created them. Definition and description alone are not a study of social relationships; they are merely preliminary to the more important and more difficult task of causal explanation.

Social relations are created and sustained by human beings. They exist only by reason of the attitudes (such as sympathy, reverence or tolerance) of human beings toward other human beings. This fact distinguishes social relations from natural objects and from every other kind of reality. Social relations are unique. Therefore the methods of studying them are unique.

The uniqueness of the methods of sociology results mainly from the fact that the sociologist is himself a social being. Unlike the chemist or biologist, he can often participate in the very reality he is studying. The chemist will never know how it feels to be a member of a molecule of water. Likewise the biologist will never know the point of view of a cell or a gland. The sociologist, however, who wishes to study the factors that disrupt labor unions need not observe them only from the outside. He can participate in such groups and learn at firsthand why congenial social relations in large groups of workingmen are often difficult to maintain. The sociologist thus has an inside track that gives him a unique place among scientists. Even the psychologist can seldom use his own experiences to the same extent as the sociologist. This is some compensation for the fact that the subject matter of the sociologist does not admit of the controlled experimentation and the exactitude of measurement attainable in the physical sciences.

Courtesy Los Angeles City School Report, 1937

Technology: The Tools of Modern Man

Although modern man must still use tools, he relies more and more on power-driven adaptations of hand tools. The advancement of civilization is largely coincidental with this advanced development of tools. In the simple lathe illustrated here the work rotates against a fixed cutting tool. Through the use of mechanical power and specially developed materials, the cutting tool, less than an inch long in the picture, can remove a thick, continuous ribbon of metal from the work. That could not be done by the stone tools of prehistoric man nor even by modern hand tools

Even if the sociologist cannot participate directly in the group he is studying, he can always do so indirectly; for, by using either observations or the written descriptions of others, he can *imagine* himself into a group. This indirect way of entering into social relations is called *vicarious* social experience. It cannot be as complete or as accurate as direct participation. In modern times social groups have so increased in number and variety that the sociologist must rely heavily on vicarious experience. He cannot expect to study gangs by being a gangster, or to enter into more than a few of the thousands of types of cultural and vocational groups. The information on which to base vicarious experience, however, can be obtained in many ways: through interviews, questionnaires, autobiographies of actual participants and even newspaper reports.

The combination of actual and vicarious social experience is the unique and most important tool of the sociologist. Without it he could only describe *how* human beings act. Without it he never could answer the question, *Why?* To answer this question it is necessary to know the emotional and other reactions of human beings to their changing environment; and emotions can be known only through actual or vicarious experience. Why is the divorce rate increasing? Not merely because of the external fact that divorces are easier to get than formerly. The problem is to discover why married people choose to separate. Immediately the sociologist is transported to the realm of motives, which he can reconstruct only with the aid of his own actual and vicarious experience.

Importance of Statistics.—When used in conjunction with actual or vicarious social experience, statistics have an important place as one of the methods of sociology. Problems are often solved through statistics for they immediately reveal any change in such figures as the divorce rate, the number of desertions or the suicide rate. It is not scientific to guess at facts that may be subjected to measurement. Likewise it is not scientific to be content with measurement alone and to neglect the less precise task of discovering motives behind the external actions that are summarized in statistical tables.

Statistics are useful for discovering the size of a given problem: How many people are in prisons? How many immigrants enter the country each year? How many Negroes in the United States? Only statistics can answer important preliminary questions such as these.

Causal Explanation and Laws.—All scientists are searching for what they call *causes*. The same word, *cause*, is used by the natural scientist and by the sociologist; but there are important differences in the operation of causes on physical and on social relations. The differences may be illustrated by contrasting the relation of iron filings to a magnet with the relations of a group of human beings to their leader. In both cases the units are attracted toward something, but here the resemblance ceases. Every magnet exerts on the bits of iron only one kind of attractive force, that called *magnetic attraction.* Each leader on the other hand, has a different technique from every other; and each leader makes not one uniform appeal but a variety of appeals to his followers. Every bit of iron, no matter what its past history has been, would be attracted by the same kind of pull from every magnet. Iron filings from Siberia act just the same as those from Minnesota. People, however, are greatly influenced by their unique past experiences; and as a result leadership in China is very different from leadership in America. It is obvious that the explanation of a successful leader in terms of a magnetic personality is only a figure of speech. What is magnetic for most Chinese might repel most Americans.

Magnetic attraction is the only active influence that holds iron filings to a magnet. Therefore we may say that magnetism is *the cause* of this behavior of iron filings. When human beings obey a leader many different causes may be at work—varying external factors, such as transportation, food supply, weather, communication and the leader's control of these; also numerous mental-emotional factors, such as desire for food and companionship, hurt feelings, repressed emotions, fear of ridicule, a sense of humor, a feeling of outrage. The sociologist cannot say that leadership is the cause of obedience to the leader. Instead he must examine each instance of leadership that he wishes to explain and discover what causes are at work.

The attraction of a magnet for iron filings will continue uniformly as long as the filings are within the range of the magnet. The power of a leader will exist only so long as he is trusted or feared or both. Magnetism is so uniform and single in its operation that it is possible to say: If a magnet of a certain power is a certain distance from a bit of iron the pull will *always* be a certain amount. This statement of an invariable relationship is called a *law.* The power of a leader is influenced by so many variable factors that it cannot be stated in the form of a law.

It follows that the explanation of a social phenomena is a task of great difficulty since it is necessary to set it in relation to the many variable factors involved in it and somewhat bound up with its existence. In fact the explanation is never complete. Suppose, for example, that we are attempting to explain an increase or decrease in the amount of crime. A great many other things have been changing at the same time. There have been changes in education, family life and religion, in the nature of authority, in economic conditions, in political organization and in the means and opportunities for committing crimes. All these changes probably have something to do with the increase or decrease of crime; but to discover how to deal with them so as to show their relation to the volume of crime (and beyond that to the attitude that leads men to commit acts of crime) is a problem that sociology is only slowly learning to explore and is still far from having solved.

The History of Sociology.—From the earliest times men have reflected about society and expressed their ideas about social relations, but no science of sociology developed before the 19th century. There was social philosophy but not social science. The reason for this is that men thought of social life as something to be regulated, not something to be investigated. They were so preoccupied with what was good and right for men to do or with what they assumed was approved as good or right by supernatural powers that they did not attempt to explain why social relations are what they are or why they change as they do. Some of the greater thinkers, like Plato and Confucius, described ideal societies or ideal social relationships but seemed to think it unnecessary to describe existing societies.

The ancient Greeks thought and wrote much about social relations. They were not restrained by ideas about the divine ordinance of human life; but they did not create a systematic sociology, because in their discussions about friendship, love, group loyalty, forms of government and so on they were mainly interested in ethical questions. Not actual life but the good life was their theme. Even when Aristotle studied the constitutions of a great many cities, he was chiefly interested in the manner and degree in which they promoted the ideal of a good life that he upheld. Social relations were not singled out for factual investigation; hence there could be only a fragmentary sociology. The absorption of Roman thinkers in the study of law and writing law codes likewise prevented their systematic study of social relations, though some, such as the dominance of the Roman father, were considered mainly from the viewpoint of possible regulation by law; otherwise social relations were taken for granted.

Conditions were still less favorable through the greater part of the Middle Ages. The lower place accorded to secular life as compared with spiritual life and to the natural and therefore sinful relations of everyday conduct as compared with the perfect society conceived by the Church effectually prevented the systematic exploration of social phenomena themselves. Toward the close of the Middle Ages there were thinkers like Machiavelli (1469–1527) and Jean Bodin (1530–96), who sought to investigate "what men do, not what they ought to do," but even for such men sociology was only a subordinate element in the study of political regulation. Moreover, the desire to see human beings and human relationships as they actually were was not of itself sufficient to create a science of society. For that, the development of scientific methods of investigation was necessary and also that broad scientific spirit that in the 19th century finally established the principle of organic evolution. This achievement gave a great impetus to the development of sociology.

The history of sociology from the end of the Middle Ages is mainly the story of how men came to regard society as an object of study distinct from the state. Various writers on government raised and answered questions about its proper sphere, about the reasons why men formed and lived in states, about the nature of political obligation and the grounds of political obedience. Of course they reflected on the social nature of man. For centuries, however, this appeared only as an aspect of politics. Not until the end of the 18th century did the distinction between the state and society begin to be clearly realized. When this happened the way was prepared for the development of sociology as a distinctive science.

Modern Investigators.—Various 19th-century French investigators, among them Frédéric Le Play (1806–82), who studied family budgets and the relation between social life and working conditions, were in reality sociologists, and one of them, Auguste Comte (1798–1857), gave sociology its name. From that time it began to undergo continuous development. Comte himself furnished no example, no model, for later sociologists to follow. He inspired more than he instructed, and his theory that human groups always passed through certain definite stages was unfounded. Nevertheless his influence was powerful, and an important group of sociologists arose in France with such leaders as Émile Durkheim (1858–1917) and Lucien Lévy-Bruhl (1857–). In England, Herbert Spencer (1820–1903) in his elaborate *Principles of Sociology* (1877–96) opposed all efforts to improve man's conditions by legislation. That improvement, he thought, could be attained only by the slow process of evolution, competition and struggle for existence. In Germany, systematic sociology was developed by Georg Simmel (1858–1918), Alfred Vierkandt (1867–) and the outstanding thinker, Max Weber (1864–1920). Among the pioneers in America were Lester F. Ward (1841–1913) and Franklin H. Giddings (1855–1931). Ward took issue with Spencer's ideas and contended that man, through advancement of knowledge and education, could and should direct social progress toward a predetermined goal. Giddings applied afresh the evolutionary ideas of Spencer; he traced the relations between causes and effects of social phenomena and followed Ward in stressing education as a means of directing society on its way to a more satisfactory world. In America sociology now entered upon a stage of intensive development that has been largely responsible for its definite establishment as a science.

The conditions necessary for the creation and growth of sociology may be summed up as: (1) Social relations must be singled out for special attention, instead of being subordinated to some other subject, such as government or religion. If, for example, community and custom are not distinguished from the state and its laws, there will be a political theory but only random and subordinate remarks about social relations. (2) The desire to improve the social relations of man must not be a substitute for a description and explanation of man's social relations as they have been and are. Both have their place. (3) There must be a scientific method, as distinguished from random observations and hunches. (4) There must be an approach and method appropriate to the subject matter of sociology.

Recent and Contemporary Developments.—Sociology has passed beyond the stage where it sought to explain all social relations and their changes in terms of some dominant single factor, such as geography, race or inventions. There is now a fairly general recognition that social relations are always influenced by a large number of interacting factors. What these factors are and how they combine must be determined by special researches. For instance, to say that the increase in the divorce rate is caused by the increased economic independence of women is both insufficient and incorrect. This would not explain why the rate increases as we go from the Atlantic coast toward the Pacific. Other factors are involved, and special studies are necessary to determine how they interact. Investigations into such social phenomena as divorce, suicide, social maladjustment, crime and social disorganization represent one direction to which research has been turning in recent years.

There has been a tendency to substitute for broad social surveys more specific studies of the phenomena of community life and more intensive studies of well-defined social areas, such as rural neighborhoods or urban districts. Considerable progress has been made in the study of population changes and in the social phenomena that accompany these changes, such as mobility, accommodation (for example, of immigrant groups) and dominance. Various social groups and organizations also are receiving attention, though probably the family is attracting more research than any other social group. The numerous problems of interpersonal adjustment and the many varieties of situation that different families reveal make this a particularly fertile field.

Certain subjects have received too little attention from sociologists. Social classes are only beginning to be studied scientifically, and modern nations and the national movements that play so large a part in the world today have not yet been analyzed as they deserve. Earlier sociologists were content to say that nations were the result of favorable geographical environment or inborn racial traits or certain inventions. Modern sociologists emphasize not only the complexity of the factors that produce nations but also the great differences between nations, such as Japan, Argentina and France, each of which presents a special problem of causal explanation. There are certain general factors—common language, traditions, territory and the like—but they combine differently in each nation. Researches into the relation of heredity and environment have been advancing and are beginning to prove valuable in the study of nations.

There is a French proverb, "To understand all is to forgive all." It is certainly true that the more we understand how conditions under which people live affect their behavior and their attitudes, the more futile and foolish appears mere blame or denunciation of those who differ from us or whom we disapprove. Sociological studies make it very clear that opinions, beliefs, attitudes and manners are to a very large extent socially determined.

Investigations into the relation of heredity and environment show that many traits that we are apt to regard as inborn are in reality social responses. Although such purely physical characters as the color of the eye or the length of the nose seem to be hereditary and biologically determined, our customs and our habits, our skills and our creeds, even our hopes and our fears are socially conditioned. Even certain physical traits, such as stature and the shape of the head, once considered independent of social conditions, are now known to be in some measure directly or indirectly influenced by them. Thus stature is influenced by diet and diet in turn by social factors. No longer can we think of races and peoples as purely hereditary groups, and the more we realize these facts, the more we gain in tolerance. Furthermore when we understand how responsive men's actions and attitudes are to social training, to indoctrination and to habituation, we gain a more scientific approach to social problems.

Social Aspect of Crime.—For many centuries people thought of crime as the expression of a will to evil, and treated it by cruel punishment of the criminal. The criminal was certainly made worse by the treatment and the conditions that led to the crime were not improved. Modern studies of crime show that most frequently the criminal is not a special kind of depraved human being but an ordinary person who has adjusted himself to criminal behavior because his training, social conditioning and lack of social opportunities have led him in this direction. The amount and the character of crime in any community is one index of the community itself. Knowledge of this fact enables us to attack the problem in a new and better way.

Application of Sociology to Everyday Problems.—One of the problems of a complex modern society arises from the fact that it is composed of many diverse groups with different mores (customs), different cultures, different faiths and different habits. Nowhere is this more noticeable than in the United States of America, where groups of many different racial and national origins mingle and merge. For every group to think its own ways best is natural, but one consequence is that each is apt to condemn or dislike the ways of other groups. Hence there arise prejudices and intolerances that are destructive to social unity. In a larger way these attitudes divide nation from nation and thus, because they may end in war, imperil civilization. Sociological knowledge brings the tolerance of understanding. We learn that other people are as human as ourselves and that one reason they differ from us and we from them is that they and we have been subject to different conditions. We learn that it takes all kinds to make a world. Not only does this knowledge make for greater social harmony but it also removes the barriers that stand in the way of assimilating these diverse elements into the unity of a great people. In this connection remember that all the great peoples of the world have arisen out of the intermixture of diverse elements.

Sociological studies reveal further that the formation of our attitudes, ideas and social prejudices takes place mainly in our earliest social environment and within the circle of the first primary groups to which we belong, especially the family. As one sociologist, C. H. Cooley, has said, primary groups are "the nursery of human nature." In them, in the family, the play group, the group of friends, the neighborhood group, we find our chief social satisfactions. In them our social impulses are directed and molded. This knowledge opens up very important educational possibilities.

Sociology has many applications to the field of education, for the modern world presents to individuals a constantly increasing array of choices, vocations, creeds, moral codes, manners. In simpler times or in an isolated rural neighborhood, these alternatives were not present and society on the whole determined for the individual his lot in life. The modern trend calls for greater ability on the part of each individual to make choices between social alternatives and to weave them into a design for living. He has not one loyalty only, he has several loyalties to reconcile; he belongs not to one organization only but to several, and they sometimes make conflicting claims. To meet this challenge of alternatives the individual needs greater self-reliance; he has to adjust himself to a world that is both complex and changeful. These socially determined conditions make new educational demands and suggest new educational orientations.

Regarding the application of sociology to the problems of everyday life, we realize that all these problems have a social aspect, but they have other aspects as well—economic, political, technological, cultural, psychological, medical. Sociology reveals one aspect of the situation; it contributes one element toward the solution of many problems. Often what we call social maladjustment involves economic or psychological difficulties combined with those of social relationships. That the various sciences of man cannot be separated, cannot be applied in detachment from one another is becoming increasingly clear; also that sociology offers its own particular contribution to all for the betterment of human living.

Some notable studies (especially those by the outstanding French sociologist, Émile Durkheim) show that a powerful factor in the causation of suicide is the sense of being socially isolated, of being cut off in some way, mentally or physically, from the sustaining companionship of one's fellows or from active participation in common life. Though many other factors are involved, Durkheim and his followers have shown that in many instances these would not be enough to explain the result were it not for the presence of this social factor as well.

Many investigations have shown that people who migrate from one social environment to another often have difficulties of adjustment to the habits, customs and beliefs of the group into which they enter, and that it is among these that crime is most frequent. Wherever people pass from one set of social standards to another, there is a risk of personal disorganization. If this conflict of standards appears within the home itself, as often is the case with second-generation immigrants, there is a greater problem of juvenile delinquency. There is also much evidence that such phenomena as gangs and rackets develop particularly among groups and in areas in which there is much social disorganization or conflict of social standards. While crime is associated with poverty, it is clear from many studies that poverty alone would not explain its frequency, and that we must look particularly to the social attitudes of those concerned and the social situations in which these attitudes are bred.

In this connection let us consider poverty itself. Broadly speaking, the extent of poverty may be attributed to the combination of two factors: the resources available to the community and the social and economic arrangements in accordance with which those resources are utilized and distributed. While the extent of poverty cannot be regarded as merely or perhaps even mainly due to the social order, it is affected by that order in several important ways: by the rate at which the population increases (which depends directly on social attitudes and social relationships); by the handicaps and opportunities that social institutions create for individuals, groups and classes; and by the provision for social and economic security made by society. On the other hand poverty is a potent factor in promoting the conditions under which social adjustments became acute.

As we advance in the understanding of these social problems we also make some progress toward their solution. If, for example, we discover that much juvenile delinquency occurs where youth is exposed to a conflict between the codes of the home and that of the larger community, we thereby recognize the need for different methods of treating and preventing delinquency. This recognition is taking form in the work of juvenile courts, family-consultation services, case-work agencies, modern reformatories and other correctional institutions.

SOCIOLOGICAL TERMS

Accommodation, the process in which individuals or groups attain a sense of harmony with their social environment.

Adaptation, the process in which individuals or groups fit themselves into any situation, so as to be able to deal with it efficiently for their own purpose of living.

Adjustment, the process in which individuals or groups remove difficulties or overcome obstacles so as to fit themselves into a situation.

Assimilation, the process in which individuals or groups entering into a new situation (like the immigrant in a new country) come to resemble the society they enter.

(NOTE. The four terms defined above are used almost interchangeably. As the definitions show, their differences are those of emphasis.)

Association, any group organized for the pursuit of particular interests, such as a business, a college, a church.

Attitude, a state of mind or predisposition leading a person to respond or act in a characteristic way whenever any object or occasion that stimulates it is presented. Examples: pride, friendliness, humility, pity, love, dislike.

Caste, a social class so rigidly determined by birth that those who belong to it cannot change their status and cannot intermarry into other social classes. Examples: the four great Hindu castes.

Causal Explanation, explanation of a phenomenon by showing the conditions on which its existence directly depends, and the manner in which these conditions create the phenomenon.

Ceremony, any socially established formal or dignified procedure intended to signalize an occasion or event. Examples: marriage, proclamations, initiations.

Church, an association established in the name of a religious interest.

Civilization, the whole system of means, techniques and apparatus that man has developed to serve his purpose; its elements are systems of production and exchange, means of communication and of transportation, the division of labor, tools and mechanical devices and the various systems of government.

Class, in the broad sense any category or grouping into which individuals fall, based on any resemblances between them; a portion of a community occupying a different status from other portions, whether determined by wealth, birth, opportunity, power, cultural level or any combination of these factors.

Code, a unified set of regulations laid down for the guidance or control of a social group.

Common Interest, see *Interest.*

Community, any group occupying a distinctive area and of such a character that its members can live their whole lives within it. Examples: tribe, pioneer settlement, village, city, nation.

Crime, an act in violation of the legal code, regarded as a definite offense against the state or the social well-being and punishable accordingly; a wrong against the public as distinct from a private wrong which is legally called a *tort.*

Crowd, a transitory aggregation of people who mass together without formal organization. A mob is a crowd in motion.

Culture, the whole system of ends (values) that characterizes a group or community, including their beliefs, recreations, fine arts, philosophies, modes of living, fashions and everyday satisfactions. Our culture is what we *are,* the ends for which we live; our civilization is what we *use,* the means whereby we seek those ends. In anthropology the term *culture* is employed in a much more inclusive sense.

Custom, any procedure or usage characteristic of a group and followed because it is socially accepted, not because it is prescribed by authority. Examples: courtship, everyday greetings, handshaking.

Delinquency, Juvenile, violation of the code of law by nonadults (the age limit being usually sixteen or eighteen) and not treated as a crime but usually disposed of under the procedure of special courts, called *juvenile courts.*

Economic Association, any association of which the particular interest is the pursuit of wealth, making a livelihood or the establishment of conditions favorable to these ends.

Environment, the whole set of conditions external to an individual or a group, to which either must become adapted in order to maintain life or some mode of life.

Family, a union of man and woman sufficiently permanent and well-defined to provide for bearing and rearing offspring. A family is *monogamous* if the union is between one man and one woman; *polygamous* if between one man and more than one woman; and *polyandrous* if between one woman and more than one man. If the offspring are attached to and controlled by the mother's kin, the family is *matriarchal;* if the father determines the name and status of the children and exercises authority over them, the family is *patriarchal.*

Fashion, a short-lived socially accepted variation of a cultural type (in turn superseded by another variation). Examples: in dress, the arts, manners, modes of speech.

Folkways, the whole system of socially accepted modes of behavior, including both institutions and customs.

Group, Social, two or more persons entering into any kind of social relationships with one another. In *primary* groups the members meet together in personal relationships, as in the family; in *secondary* or *large-scale* associations, such as the state, little or no personal relationship exists.

Habit, a mode of behavior that, through repetition, creates an organic and psychical readiness to act again in the same manner. It need not be socially determined.

Heredity, the organic or biological characters transmitted from parents to offspring and determining the continuity of the successive generations.

Individuality, the qualities that distinguish one unit or one person from others belonging to the same type or the same group.

Institution, a definitely established *mode* of social procedure, such as marriage; or a definitely established *condition* of social behavior, such as property.

Interest, any object to which an attitude is directed or to which attention is devoted; as here understood it may be a material thing such as money or a nonmaterial thing such as science. A *like* interest is one that is pursued by different individuals each for himself, such as a livelihood; a *common* interest is one that is pursued by individuals not for themselves alone but as an indivisible good for others as well as themselves. Thus the social group, such as family or nation or the cultural object such as an art or a science is a common interest.

Marriage, the ceremony or contractual procedure initiating or establishing a legally admitted or socially recognized mating union between a man and a woman; also the status resulting from such ceremony or contract.

Matriarchate, see *Family.*

Mobility, when people tend to migrate from place to place, they are said to exhibit *physical mobility;* when they shift from job to job, from occupation to occupation, from one social class or condition to another, they are said to exhibit *social mobility.*

Mores, the set of rules and procedures and standards upheld by a group as right and proper.

Nation, a group occupying a definite territorial area and sufficiently large and sufficiently conscious of common interests to possess or to claim a separate political government. A nation differs from a *people* in that the latter is a less definite term, signifying any group of considerable size, and particularly one that has its own historical background.

Patriarchate, see *Family.*

People, see *Nation.*

Primary Group, a group the members of which maintain frequent personal relationships with one another. Examples: family, neighborhood, play group.

Race, a people distinguished from others by physical characteristics common to its members or prevalent among them. The term *race* generally implies a common origin and a common heredity, but the attribution of race in this sense is precarious and usually misleading.

Religion, a system of beliefs propounding a relationship between man and some higher being and the practices and observances by which such relationship is fostered.

Social Change, any change in the relations of the members of a group or in the organizations through which these relations are established or maintained.

Social Control, the process in which social relations are directed or regulated, whether through leadership, authority, indoctrination or other device.

Social Evolution, the process in which the institutions and organizations of society become more specifically adapted to specific functions, so as to exhibit, without loss of unity, greater variety and generally greater complexity.

Social Process, any continuous series of changes occurring in the social relations of a group.

Social Relation, any relation involving two or more people in such a way that in establishing and maintaining the relation they are conscious of belonging together.

Society, the whole system of social relations.

State, a political association; that is, an organization maintaining a general system of order over a territorial area by means of a government vested with ultimate coercive power.

Status, any recognized position of rank, privilege or social esteem enjoyed by one group or portion of a community by contrast with others.

Technics, technology, the system of specific devices or instruments developed to serve any human purposes, in which sense it is a major part of civilization.

BIBLIOGRAPHY

General Science

John W. Hammond, *A Magician of Science—Boys' Life of Steinmetz,* Appleton-Century, N.Y., 1926, $1.75

Marion F. Lansing, *Great Moments in Science,* Doubleday, Doran, Garden City, N.Y., 1926, $2.50

Jean Henri Fabre, *Story Book of Science,* Appleton-Century, N.Y., 1917, $2.50

C. E. Rush and Amy Winslow, *The Science of Things About Us,* Little, Brown, Boston, 1926, 90¢

A. Williams-Ellis, *Men Who Found Out,* Coward-McCann, N.Y., 1930, $2.00

Mary H. Wade, *The Boy Who Found Out* (Fabre), Appleton-Century, N.Y., 1928, $1.75

F. E. Benz, *Pasteur: Knight of the Laboratory,* Dodd, Mead, N.Y., 1938, $2.50

Jean Henri Fabre, *This Earth of Ours,* Appleton-Century, N.Y., 1923, $2.50

R. F. Yates, *Exploring with the Microscope,* Appleton-Century, N.Y., 1934, $2.00

Paul de Kruif, *Microbe Hunters,* Harcourt, Brace, N.Y., 1932, $2.75

Michael Pupin, *From Immigrant to Inventor,* Scribners, N.Y., 1930, $1.00

Tobias Dantzig, *Aspects of Science,* Macmillan, N.Y., 1937, $3.00

George W. Gray, *The Advancing Front of Science,* Mc-Graw-Hill, N.Y., 1937, $3.00

C. G. Abbott, *Everyday Mysteries,* Macmillan, N.Y., 1923, $2.00

Sir James Jeans, *The Universe Around Us,* Macmillan, N.Y., 1931, $4.50

Grove Wilson, *Great Men of Science, their Lives and Discoveries,* Garden City Pub. Co., Garden City, N.Y., 1932, $1.00

Geoffrey West, *Charles Darwin,* Yale Univ., New Haven, 1938, $3.00

James D. Olmsted, *Claude Bernard: Physiologist,* Harpers, N.Y., 1938, $4.00

Eve Curie, *Madame Curie,* Doubleday, Doran, Garden City, N.Y., 1937, $3.50

B. K. Ashford, *A Soldier in Science* (autobiography), Morrow, N.Y., 1934, $3.50

Julian Huxley and E. N. da C. Andrade, *Simple Science,* Harpers, N.Y., 1935, $3.50

F. Sherwood Taylor, *The World of Science,* Reynal & Hitchcock, N.Y., 1937, $3.75

J. W. Caldwell and E. E. Slosson, *Science Remaking the World,* Doubleday, Doran, Garden City, N.Y., 1924, $2.50

J. W. Hammond, *Stories of Scientific Discovery,* Macmillan, N.Y., 1931, $1.50

R. J. Harvey-Gibson, *Two Thousand Years of Science,* Macmillan, N.Y., 1931, $3.50

Sir James Jeans, *Mysterious Universe,* Macmillan, N.Y., 1932, $2.25

Gerald Beavis, *The Book of the Microscope,* Lippincott, Phila., 1931, $2.50

O. J. Lodge, *Pioneers of Science,* Macmillan, N.Y., 1904, $2.50

H. G. Garbedian, *March of Science,* Halcyon House, N.Y., 1937, $1.29

Ernest R. Trattner, *Architects of Ideas,* Carrick & Evans, N.Y., 1938, $3.75

Animal Biology

Edward C. Huey, *A Child's Story of the Animal World,* Reynal & Hitchcock, N. Y., 1935, $3.50

E. F. Deglish, *How to See Beasts,* Morrow, N.Y., 1933, $1.50

Julius King, *Peter and the Frog's Eye,* Grosset & Dunlap, N.Y., 1936, $2.00

Dhan Gopal Mukerji, *Jungle Beasts and Men,* E. P. Dutton, N.Y., 1923, $2.00

W. W. Robinson, *Elephants,* Harpers, N.Y., 1935, $1.75

W. W. Robinson, *Lions,* Harpers, N.Y., 1936, $1.75

T. W. Burgess, *The Burgess Animal Book for Children,* Little, Brown, Boston, 1927, $3.00

John Burroughs, *Squirrels and Other Fur Bearers,* Houghton Mifflin, Boston, 1904, $1.75

T. Stowell and T. W. Burgess, *The Book of Animal Life,* Little, Brown, Boston, 1937, $2.50

I. S. Cobb, *Azam: the Story of an Arabian Colt,* Rand McNally, Chicago, 1937, $1.50

Agnes A. Atkinson, *Blinky, the Biography of a Ringtail,* Viking, N.Y., 1935, $1.50

A. C. Gall and F. H. Crew, *Ringtail,* Oxford, N.Y., 1933, $1.50

Rudyard Kipling, *The Two Jungle Books,* Doubleday, Doran, Garden City, N.Y., 1925, $3.50

Dhan Gopal Mukerji, *Gay-Neck, the Story of a Pigeon,* E. P. Dutton, N.Y., 1927, $2.00

E. F. Daglish, *How to See Birds,* Morrow, N.Y., 1932, $1.50

O. T. Miller, *The Children's Book of Birds,* Houghton Mifflin, Boston, 1927, $3.00

W. S. Bronson, *Paddlewing, the Penguin of the Galapagos,* Macmillan, N. Y., 1931, $2.00

T. W. Burgess, *Burgess Bird Book for Children,* Little, Brown, Boston, 1919, $3.00

E. F. Daglish, *The Life Story of Birds,* Morrow, N.Y., 1930, $3.00

N. B. Doubleday, *The Bird Book*, Doubleday, Doran, Garden City, N.Y., 1932, $2.95

E. W. Teale, *Grassroot Jungles* (insect stories), Dodd, Mead, N.Y., 1937, $3.75

Eleanor King and Wellmer Pessels, *Insect People*, Harpers, N.Y., 1937, $1.25

Eleanor Doorly, *Insect Man* (Fabre) Appleton-Century, N.Y., 1937, $1.50

Maurice Maeterlinck, *Children's Life of the Bee*, Dodd, Mead, N.Y., 1919, $2.00

William Reed and W. S. Bronson, *The Sea for Sam*, Harcourt, Brace, N.Y., 1935, $3.00

E. L. Butler, *Along the Shore*, Reynal & Hitchcock, N.Y., 1930, $1.25

William Crowder, *Dwellers of the Sea and Shore*, Macmillan, N.Y., 1923, $2.25

P. W. Kearney, *Strange Fishes and their Strange Neighbors*, Doubleday, Doran, Garden City, N.Y., 1933, $1.25

Edith M. Patch, *Holiday Meadow*, Macmillan, N.Y., 1930, $2.00

Jean Henri Fabre, *The Book of Insects*, Dodd, Mead, N.Y., 1921, $2.00

Edith M. Patch and C. L. Fenton, *Desert Neighbors*, Macmillan, N.Y., 1937, $1.75

W. S. Bronson, *Polliwiggle's Progress*, Macmillan, N.Y., 1932, $2.00

Alfred Morgan, *An Aquarium Book for Boys and Girls*, Scribners, N.Y., 1936, $2.00

Helen O. Watson, *Chanco, a U. S. Army Homing Pigeon*, Harpers, N.Y., 1938, $2.00

Edith M. Patch and C. L. Fenton, *Holiday Shore*, Macmillan, N.Y., 1935, $2.00

Ida Mellen, *The Young Folk's Book of Fishes*, Dodd, Mead, N.Y., 1927, $2.00

A. E. Emerson and E. Fish, *Termite City*, Rand McNally, Chicago, 1937, $1.50

Alice Gall and Fleming Crew, *Each in His Own Way* (historic animals), Oxford, N.Y., 1937, $2.00

E. G. Boulenger, *A Natural History of the Seas*, Appleton-Century, N.Y., 1936, $3.00

Clifford B. Moore, *Book of Wild Animal Pets*, Purnam, N.Y., 1937, $5.00

R. and F. DeSola, *Strange Animals*, Scribners, N.Y., 1933, $1.50

William T. Hornaday, *Tales from Nature's Wonderlands*, Scribners, N.Y., 1924, $2.50

Francesca La Monte and Micaela Welsh, *Vanishing Wilderness*, Liveright, N.Y., 1934, $3.50

Raymond L. Ditmars and William Bridges, *Wild Animal World*, Appleton-Century, N.Y., 1937, $3.00

Ernest T. Seton, *Wild Animals I Have Known*, Scribners, N.Y., 1910, $2.50

I. T. Sanderson, *Animal Treasure*, Viking, N.Y., 1937, $3.00

Harold C. Whitnall, *A Parade of Ancient Animals*, T. Y. Crowell, N.Y., 1936, $2.00

C. R. Knight, *Before the Dawn of History*, Whittlesey House, N.Y., 1935, $2.75

M. E. Price, *Down Comes the Wilderness*, Harpers, N.Y., 1937, $1.75

W. Reid Blair, *In the Zoo*, Scribners, N.Y., 1929, $2.50

W. M. Reed and Jannette M. Lucas, *Animals on the March*, Harcourt, Brace, N.Y., 1937, $3.00

Raymond L. Ditmars, *The Book of Prehistoric Animals*, Lippincott, Phila., 1935, $2.00

Raymond L. Ditmars, *Thrills of a Naturalist's Quest*, Macmillan, N.Y., 1932, $3.50

W. W. Robinson, *Ancient Animals*, Macmillan, N. Y., 1934, $2.00

Carroll Lane Fenton, *Life Long Ago: the Story of Fossils*, Reynal & Hitchcock, N.Y., 1937, $3.50

John Burroughs, *Bird Stories from Burroughs*, Houghton Mifflin, Boston, 1911, $1.75

E. H. Baynes, *Wild Bird Guests*, E. P. Dutton, N.Y., 1937, $2.00

L. L. Butler, *Birds Around the Year*, Appleton-Century, N.Y., 1937, $2.00

Lee S. Crandall, *Paradise Quest*, Scribners, N.Y., 1931, $3.50

Gordon C. Aymar, *Bird Flight*, Dodd, Mead, N.Y., 1935, $4.00

R. Boulton, *Traveling with the Birds*, Donohue, N.Y., 1933, $1.50

A. H. Verrill, *Strange Birds and their Stories*, Page, N.Y., 1938, $2.50

Constance Rourke, *Audubon*, Harcourt, Brace, N.Y., 1936, $3.00

Audubon, *Birds of America*, Macmillan, N.Y., 1937, $12.00

H. E. Anthony, *Field Book of American Mammals*, Putnam, N.Y., 1928, $5.00

Ellen Robertson-Miller, *Butterfly and Moth Book*, Scribners, N.Y., 1926, $2.50

Raymond L. Ditmars, *Book of Living Reptiles*, Lippincott, Phila., 1936, $2.00

Clifford H. Pope, *Snakes Alive and how they Live*, Viking, N.Y., 1937, $2.50

Raymond L. Ditmars, *Snakes of the World*, Macmillan, N.Y., 1932, $5.00

C. W. Coates, *Tropical Fishes as Pets*, Garden City Pub. Co., Garden City, N.Y., $1.29

Gardine, *Coral Reefs and Atolls*, Macmillan, N.Y., 1931, $4.25

R. W. Hegner, *Parade of the Animal Kingdom*, Macmillan, N.Y., 1935, $5.00

Brian Curtis, *The Life Story of the Fish*, Appleton-Century, N.Y., 1938, $3.00

J. R. Norman and F. C. Fraser, *Giant Fishes, Whales and Dolphins*, Norton, N.Y., 1938, $4.00

W. H. Hudson, *Birds and Man*, Knopf, N.Y., 1929, $2.00

Thomas Huxley, *Man's Place in Nature*, Appleton-Century, N.Y., 1929, $1.00

Julian Huxley, *Essays of a Biologist*, Knopf, N.Y., 1929, $1.00

Julian Huxley, *The Individual in the Animal Kingdom*, Macmillan, N.Y., 1912, $1.00

Charles Darwin, *The Origin of Species*, Burt, N.Y., 1924, 95¢

William H. Carr, *The Stir of Nature*, Oxford, N.Y., 1930, $1.75

Raymond L. Ditmars, *The Making of a Scientist*, Macmillan, N.Y., 1937, $2.75

R. G. Hoskins, *The Tides of Life*, Norton N.Y., 1933, $3.00

E. L. G. Watson, *Mysteries of Natural History*, Stokes, N.Y., 1937, $1.75

Richard Goldschmidt, *Ascaris, The Biologist's Story of Life*, Prentice-Hall, N.Y., 1937, $3.25

Raymond L. Ditmars, *Confessions of a Scientist*, Macmillan, N.Y., 1934, $3.50

E. M. East, *Biology in Human Affairs*, Whittlesey House, 1931, $3.50

William T. Hornaday, *American Natural History*, Scribners, N.Y., 1927, $5.00

A. F. Shull, *Principles of Animal Biology*, McGraw-Hill, N.Y., 1934. (4th edit.) $3.50

Anthropology

Muriel Fellows, *Little Magic Pictures*, Winston, Phila., 1938, $2.00

M. and C. H. B. Quennell, *Every Day Life in the Old Stone Age*, Putnam, N.Y., 1922, $2.50

M. and C. H. B. Quennell, *The New Stone, Bronze and Early Iron Ages*, Putnam, N.Y., 1923, $2.50

D. C. Peattie, *Story of Ancient Civilization*, Grossett & Dunlap, N.Y., 1938, 50¢

Isis L. Harrington, *Nah-le Kah-de, The Story of a Navajo Boy*, E. P. Dutton, N.Y., 1937, $1.50

Elizabeth K. Steen, *Red Jungle Boy*, Harcourt, Brace, N.Y., 1937, $2.00

T. O. Deming, *Indian Child Life*, Stokes, N.Y., 1899, $3.00

A. H. Verrill, *Our Indians*, Putnam, N.Y., 1935, $2.50

Jesse Cornplanter, *Legends of the Longhouse*, Lippincott, Phila., 1938, $2.00

Eva Taylor, *Men are Brothers*, Viking, N.Y., 1937, $1.00

Ramon Coffman, *Child's Story of the Human Race*, Dodd, Mead, N.Y., 1927, $2.00

Gregory Trent, *Hunters Long Ago*, Harcourt, Brace, N.Y., 1937, $2.00

Gregory Trent, *In the Stone Age*, Harcourt, Brace, N.Y., 1936, $2.00

Katherine E. Dopp, *The Early Cave Men*, Rand McNally, Chicago, 1936, 88¢

F. A. Kummer, *The First Days of Man*, Doubleday, Doran, Garden City, N.Y., 1922, $2.00

H. W. van Loon, *Ancient Man*, Liveright, N.Y., 1920, 95¢

E. A. Hooton, *Apes, Men and Morons*, Putnam, N.Y., 1937, $3.00

Margaret Mead, *Coming of Age in Samoa*, Morrow, N.Y., 1928, $3.00

Margaret Mead, *Growing Up in New Guinea*, Morrow, N.Y., 1930, $3.50

Charles Darwin, *Descent of Man*, Burt, N.Y., 1909, $1.00

E. E. Burriss, *Taboo, Magic and Spirits*, Macmillan, N.Y., 1931, $2.50

Hamlin Garland, *Book of the American Indian*, Harpers, N.Y., 1923, $6.00

Mary E. Boyle, *Man Before History*, Little, Brown, Boston, 1924, $2.50

Alexander Goldenweiser, *Anthropology: an Introduction to Primitive Culture*, Crofts, N.Y., 1937, $5.00

V. F. Calverton (Editor), *The Making of Man; an Outline of Anthropology*, Modern Library, N.Y., 1931, 95¢

B. J. Gruenberg, *The Story of Evolution*, Garden City Pub. Co., Garden City, N.Y., 1935, $1.00

Louis Adamic, *The House in Antigua*, Harpers, N.Y., 1937, $3.00

Margaret Mead, *Cooperation and Competition among Primitive Peoples,* McGraw-Hill, N.Y., 1937, $4.00
T. O. Deming, *Indians of the Pueblos,* Whitmans, N.Y., 1935, $1.50
Frank C. Lockwood, *The Apache Indians,* Macmillan, N.Y., 1938, $3.50
R. O. Marsh, *White Indians of Darien,* Putnam, N.Y., 1934, $3.00
Franz Boas, *The Mind of Primitive Man,* Macmillan, N.Y., 1911, $2.00
Franz Boas, *Anthropology and Modern Life,* Norton, N.Y., 1928, $3.00
E. Hooton, *Up from the Ape,* Macmillan, N.Y., 1931, $5.00
J. G. Frazer, *The Golden Bough,* Macmillan, N.Y., 1928, $5.00
Henry F. Osborne, *Men of the Old Stone Age,* Scribners, N.Y., 1925, $5.00
Robert Lowie, *Are We Civilized,* Harcourt, Brace, N.Y., 1929, $3.00
Paul Radin, *The Story of the American Indians,* Garden City Pub. Co., Garden City, N.Y., 1937, $1.39
Clark Wissler, *American Indian,* Oxford, N.Y., 1922, $5.00
Margaret Mead, *Changing Culture of an American Indian Tribe,* Columbia Univ., N.Y., 1932, $4.50
R. R. Moton, *What the Negro Thinks,* Doubleday, Doran, Garden City, N.Y., 1929, $2.00
Gladys Reichard, *Spider Woman,* Macmillan, N.Y., 1933, $3.50
Gregory Mason, *Columbus Came Too Late,* Appleton-Century, N.Y., 1931
H. Shetrone, *Mound Builders,* Appleton-Century, N.Y., 1930, $7.50
Robert Lowie, *Primitive Religion,* Liveright, N.Y., 1924, $3.00
Clark Wissler, *Man and Culture,* T. Y. Crowell, N.Y., 1923, $2.75

Astronomy

Gaylord Johnson, *The Stars for Children,* Macmillan, N.Y., 1934, $1.50
Mary Proctor, *The Young Folks' Book of the Heavens,* Little, Brown, Boston, 1925, $2.00
E. B. Frost, *Let's Look at the Stars,* Houghton Mifflin, Boston, 1935, $2.00
E. C. Clarke, *Astronomy from a Dipper,* Houghton Mifflin, Boston, 1933, $1.25
William Reed, *The Stars for Sam,* Harcourt, Brace, N.Y., 1931, $3.00
Simon Newcomb, *Astronomy for Everybody,* Garden City Pub. Co., Garden City, N.Y., 1932 (rev. edit.), $1.00
James Baikie, *Peeps at the Heavens,* Macmillan, N.Y., 1911, $1.00
Calvin Macready, *Beginner's Book of the Stars,* Putnam, N.Y., 1937, $3.50
Robert H. Baker, *When the Stars Come Out,* Viking, 1934, $2.50
E. A. Fath, *Elements of Astronomy,* McGraw-Hill, N.Y., 1934, $3.00
E. A. Fath, *Through the Telescope,* Whittlesey House, 1936, $2.75
H. H. Bernhard, D. A. Bennett and H. S. Rice, *Handbook of the Heavens,* Whittlesey House, N.Y., 1935, $1.00
Harlan T. Stetson, *Man and the Stars,* Whittlesey House, 1930, $2.50
F. A. Grondal, *The Romance of Astronomy,* Macmillan, N.Y., 1937, $1.79
Clyde Fisher, *Exploring the Heavens,* T. Y. Crowell, N.Y., 1938, $2.50
F. W. Grover, *Pageant of the Heavens,* Longmans, Green, N.Y., 1937, $3.00
Henshaw Ward, *Exploring the Universe,* Grosset & Dunlap, N.Y., 1927, $1.00
James Stokley, *Stars and Telescopes,* Harpers, N.Y., 1937, $3.00

Botany

C. J. Hylander, *The Year Round,* Putnam, N.Y., 1932, $2.00
F. W. Burgess, *Burgess Flower Book,* Little, Brown, Boston, 1923, $3.00
F. B. Atkinson, *A Year in the Wonderland of Trees,* Scribners, N.Y., 1922, $1.20
Julie Kenly, *Green Magic,* Appleton-Century, N.Y., 1930, $2.50
E. F. Daglish, *How to See Plants,* Morrow, N.Y., 1932, $1.50
Enos A. Mills, *A Thousand Year Pine,* Houghton Mifflin, Boston, 1914, $1.25
Nellie B. Doubleday, *Wild Flowers,* Doubleday, Doran, Garden City, N.Y., 1926, $2.50
F. S. Mathews, *The Book of Wild Flowers for Young People,* Putnam, N.Y., 1922, $3.00
Louis C. C. Krieger, *The Mushroom Handbook,* Macmillan, N.Y., 1936, $3.50
Norman Taylor, *A Guide to the Wild Flowers,* Garden City Pub. Co., Garden City, N.Y., 1937, $1.59
E. J. Salisbury, *The Living Garden,* Macmillan, N.Y., 1936, $3.00
A. D. Taylor and G. D. Cooper, *The Complete Garden,* Garden City Pub. Co., Garden City, N.Y., 1937, $1.98
W. F. Ganong, *The Living Plant,* Holt, N.Y., 1913, $2.50
Douglas H. Campbell, *An Outline of Plant Geography,* Macmillan, N.Y., 1926, $4.00
H. K. Hayes and R. J. Garber, *Breeding Crop Plants,* McGraw-Hill, N.Y., 1937, (2d edit.) $4.00
Wilfred W. Robbins, *The Botany of Crop Plants,* Blakiston, Phila., 1931, (3d edit.) $4.00
Wilfred W. Robbins and Ramaley, *Plants Useful to Man,* Blakiston, Phila., 1933, $3.00
Reginald C. Punnett, *Mendelism,* Macmillan, N.Y., 1927 (7th edit.) $3.00

Chemistry

Charles R. Clark, *The Boys' Book of Chemistry,* E. P. Dutton, N.Y., 1922 $2.00
A. F. Collins, *How to Understand Chemistry,* Appleton-Century, N.Y., $2.00
F. L. Darrow, *Story of Chemistry,* Blue Ribbon, N.Y., 1932, $1.00
William Foster, *Romance of Chemistry,* Appleton-Century, N.Y., $3.00
Bernard Jaffe, *Crucibles,* Tudor, N.Y., 1936, $1.49
Edwin Slosson, *Creative Chemistry,* Appleton-Century, N.Y., 1930, $3.50
Tilden, *Chemical Discovery and Invention in the Twentieth Century,* E. P. Dutton, N.Y., 1936, $4.00

Geology

Carroll Lane Fenton, *Along the Hill,* Reynal & Hitchcock, N.Y., 1935, $1.25
William Reed, *The Earth for Sam,* Harcourt, Brace, N.Y., 1930, $3.50
Edith Heal, *How the World Began,* Follett, Chicago, 1930, $1.00
Carroll Lane Fenton, *The World of Fossils,* Appleton-Century, N.Y., 1933, $2.00
Hallam Hawksworth, *The Adventures of a Grain of Dust,* Scribners, N.Y., 1922, $1.60
Lillian Rifkin, *Our Planet the Earth, Then and Now,* Lothrop, N.Y., 1934, $1.75
J. H. Bradley, *Autobiography of Earth,* Coward-McCann, N.Y., 1935, $3.00
Paul B. Sears, *This is Our World,* Univ. of Oklahoma, Norman, 1937, $2.50
S. J. Shand, *Earthlore,* E. P. Dutton, N.Y., 1938, $1.00
Russell Lord, *Behold our Land,* Houghton Mifflin, Boston, 1938, $3.00
Frederic B. Loomis, *The Field Book of Common Rocks and Minerals,* Putnam, N.Y., 1923, $3.50
C. F. Brooks, *Why the Weather,* Harcourt, Brace, N.Y., 1924, $2.00
Charles F. Talman, *Realm of the Air,* Blue Ribbon, N.Y., 1931, 98¢

Physics

C. R. Clark and S. Small, *The Boy's Book of Physics,* E. P. Dutton, N.Y., 1922, $2.00
O. W. Gail, *Romping Through Physics,* Knopf, N.Y., 1934, $1.50
Arthur Haas, *Elementary Physics: A Non-Mathematical Presentation,* E. P. Dutton, N.Y., 1938, $1.90
A. F. Collins, *Fun with Electricity,* Appleton-Century, N.Y., 1936, $2.00
K. L. Keeler, *Working with Electricity,* Macmillan, N.Y., 1935, $1.25
R. F. Yates, *These Amazing Electrons,* Macmillan, N.Y., 1937, $3.75
John Langdon-Davies, *Inside the Atom,* Harpers, N.Y., 1933, $2.00
A. F. Collins, *Radio Amateur's Handbook,* T. Y. Crowell, N.Y., 1938, $2.00
A. S. Eddington, *Nature of the Physical World,* Macmillan, N.Y., 1929, $3.75
A. S. Eddington, *New Pathways in Science,* Macmillan, N.Y., 1935, $3.00
Albert Einstein and Leopold Infeld, *The Evolution of Physics,* Simon & Schuster, N.Y., 1938, $2.50
Lemon, *From Galileo to Cosmic Rays,* Univ. of Chicago, Chicago, 1934, $5.00
Paul Karlson, *The World Around Us,* Simon & Schuster, N.Y., 1936, $3.00
F. A. Osborn, *Physics of the Home,* McGraw-Hill, N.Y., 1935, $3.00
O. E. Dunlap, *Marconi, the Man and His Wireless,* Macmillan, N.Y., 1937, $3.50
L. M. Heil, *The Physical World,* Blakiston, Phila., 1936, $2.75
W. H. Bragg, *Universe of Light,* Macmillan, N.Y., 1933, $3.50

Sociology

M. D. C. Crawford, *The Conquest of Culture,* Greenberg, N.Y., 1938, $3.50
Robert S. Lynd and Helen M. Lynd, *Middletown in Transition,* Harcourt, Brace, N.Y., 1937, $6.00
Charles R. Walker, *The American City,* Farrar & Rinehart, N.Y., 1937, $2.50
Oswald Spengler, *Decline of the West,* Knopf, N.Y., 1932, $7.50
V. F. Calverton, *The Making of Society: An Outline of Sociology,* Modern Library, N.Y., 1937, 95¢

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PHYSIOLOGY *and* HYGIENE

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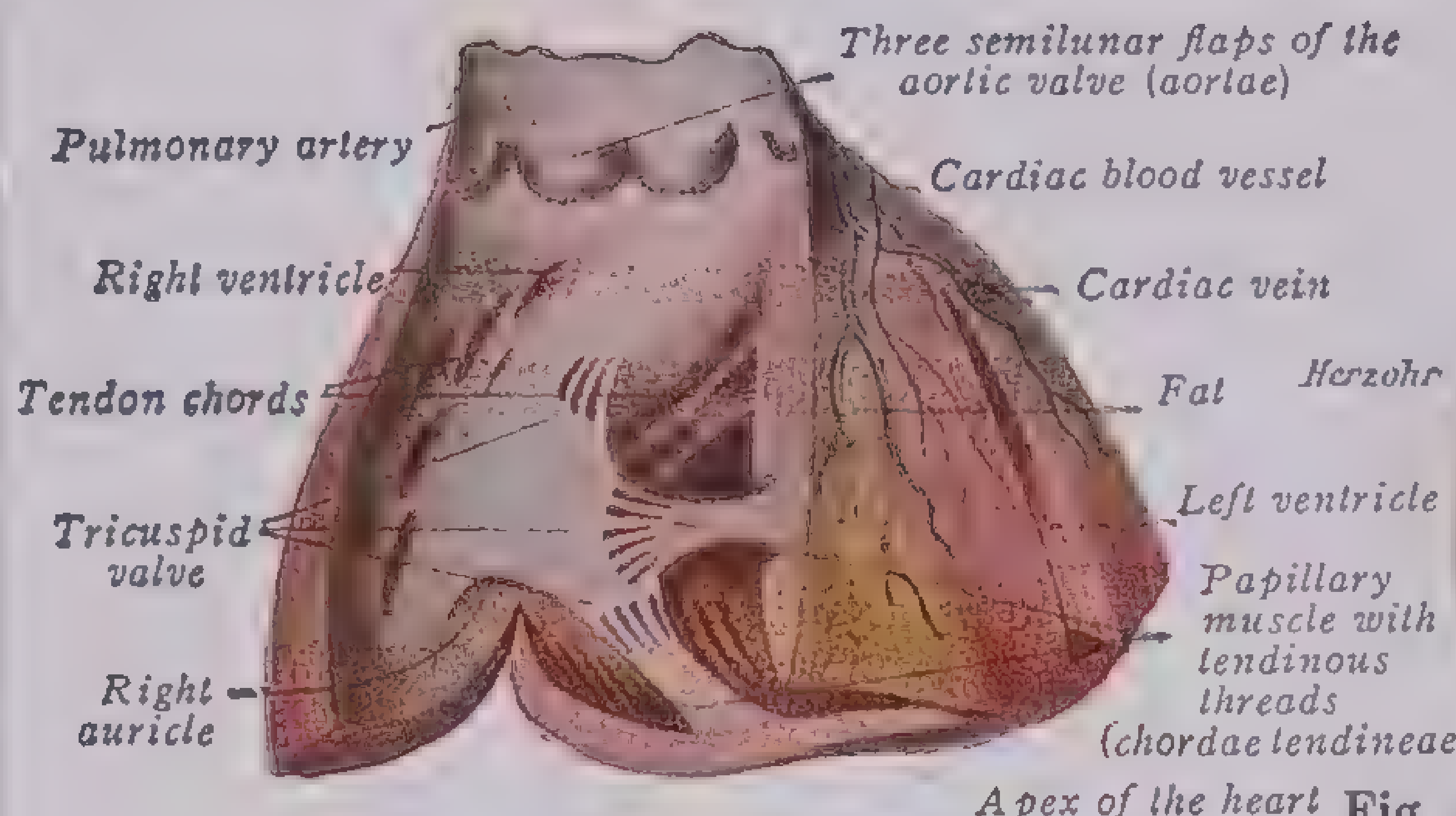
Three semilunar flaps of the aortic valve (aortae)
Pulmonary artery
Cardiac blood vessel
Right ventricle
Cardiac vein
Tendon chords
Fat
Left ventricle
Tricuspid valve
Papillary muscle with tendinous threads (chordae tendineae)
Right auricle
Apex of the heart

Fig. 1. Heart

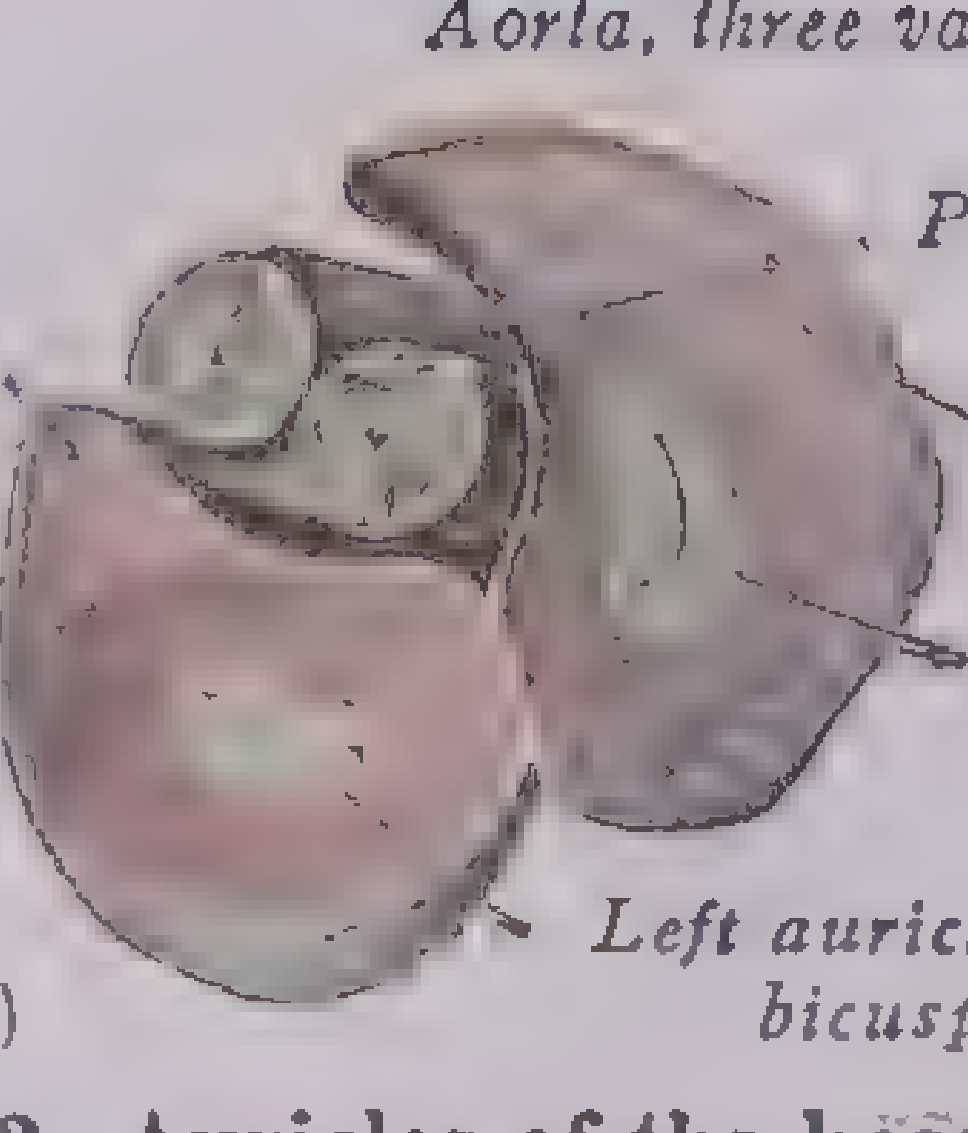
Aorta, three valves closed
Herzohr
Pulmonary artery
Right auricle
Tricuspid valve (closed)
Left auricle with closed bicuspid valve

Fig. 2. Auricles of the heart

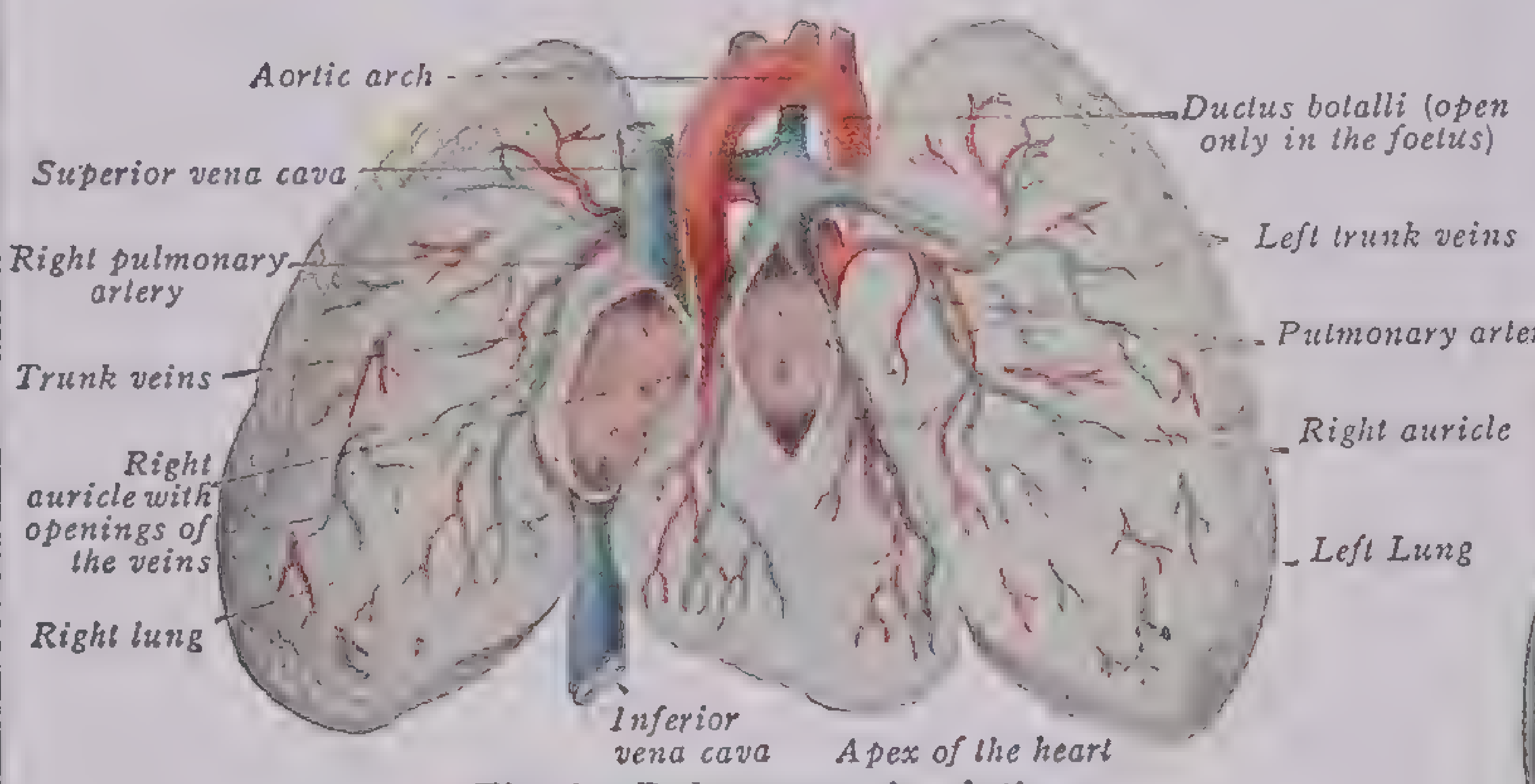
Aortic arch
Ductus botalli (open only in the foetus)
Superior vena cava
Left trunk veins
Right pulmonary artery
Pulmonary artery
Trunk veins
Right auricle
Right auricle with openings of the veins
Left Lung
Right lung
Inferior vena cava
Apex of the heart

Fig. 3. Pulmonary circulation

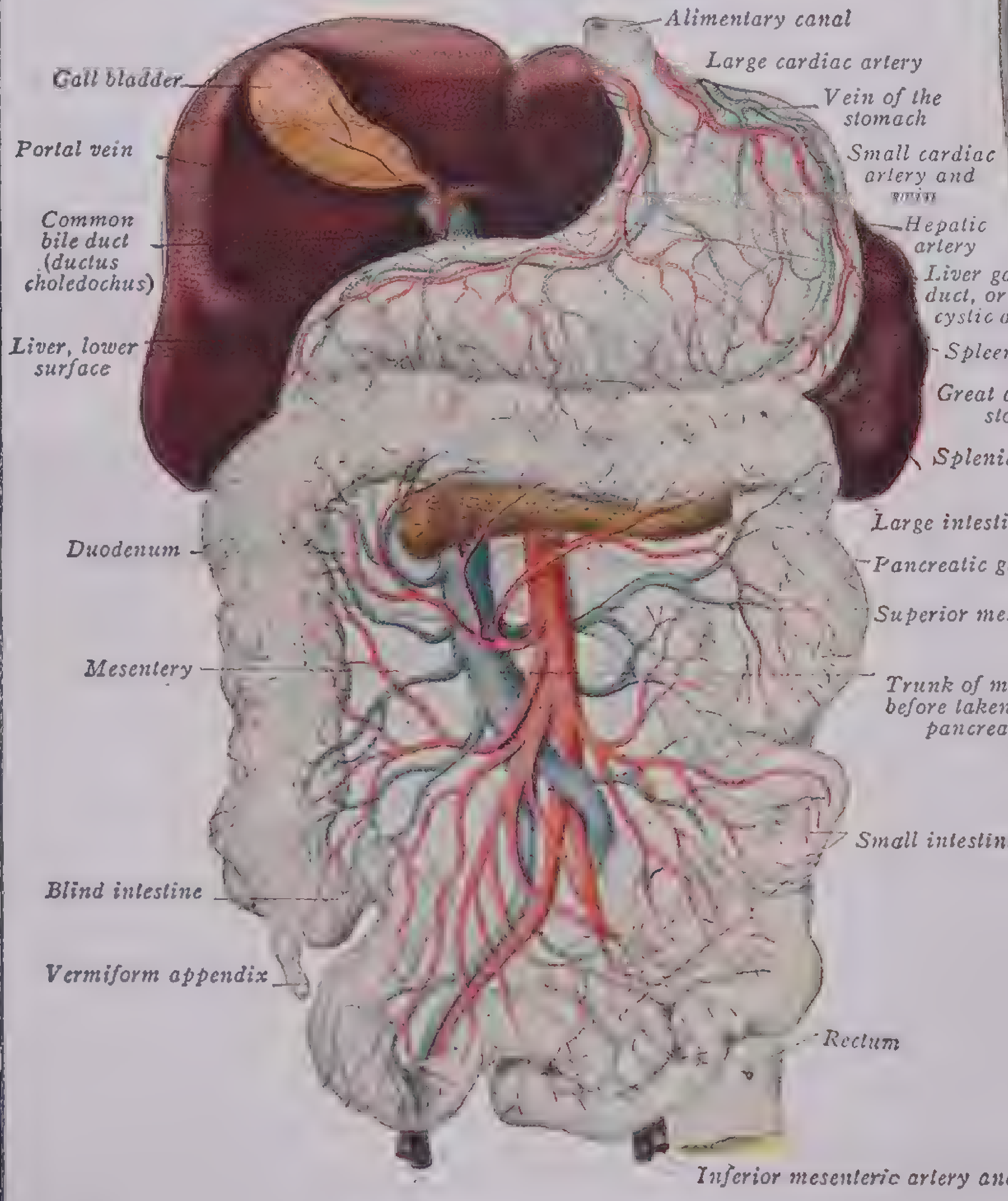
Alimentary canal
Large cardiac artery
Gall bladder
Vein of the stomach
Portal vein
Small cardiac artery and vein
Common bile duct (ductus choledochus)
Hepatic artery
Liver gall duct, or cystic duct
Liver, lower surface
Spleen
Great arch of the stomach
Splenic vein
Large intestine
Duodenum
Pancreatic gland
Superior mesenteric artery
Mesentery
Trunk of mesenteric vein before taken up by spleen, pancreas, stomach
Small intestine
Blind intestine
Vermiform appendix
Rectum
Inferior mesenteric artery and vein

Fig. 4. Portal vein circulation

(The union of veins of the stomach, intestine, spleen and pancreas into trunk of portal vein is hidden by the stomach)

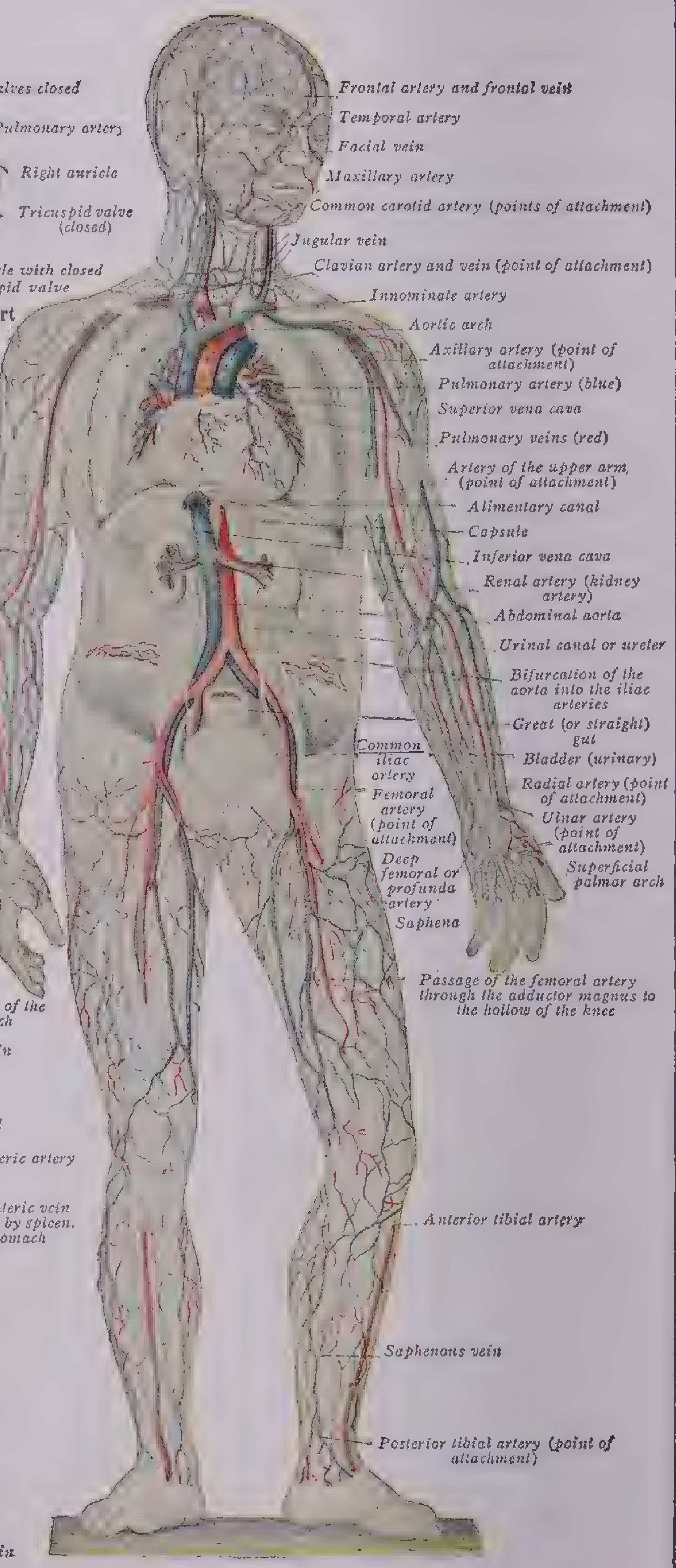
Frontal artery and frontal vein
Temporal artery
Facial vein
Maxillary artery
Common carotid artery (points of attachment)
Jugular vein
Clavian artery and vein (point of attachment)
Innominate artery
Aortic arch
Axillary artery (point of attachment)
Pulmonary artery (blue)
Superior vena cava
Pulmonary veins (red)
Artery of the upper arm, (point of attachment)
Alimentary canal
Capsule
Inferior vena cava
Renal artery (kidney artery)
Abdominal aorta
Urinal canal or ureter
Bifurcation of the aorta into the iliac arteries
Great (or straight) gut
Common iliac artery
Bladder (urinary)
Femoral artery (point of attachment)
Radial artery (point of attachment)
Ulnar artery (point of attachment)
Deep femoral or profunda artery
Superficial palmar arch
Saphena
Passage of the femoral artery through the adductor magnus to the hollow of the knee
Anterior tibial artery
Saphenous vein
Posterior tibial artery (point of attachment)

Fig. 5. Circulation of the blood in the body

In fig. 5 the intestines of the portal vein circulation have been removed from the abdominal cavity

The red lines indicate the arteries, the blue lines the veins

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The Circulatory System

BOOK IX: PHYSIOLOGY AND HYGIENE

THE HUMAN BODY

Through the centuries men have labored to understand the mysteries of the human body. Now they understand its structure, how the parts are related and how they function. *Anatomy* (the study of structure) and *physiology* (the study of function) are great sciences. Other men have studied disease, learned how it is caused and how some diseases can be cured.

In modern times scientists have sought to understand how disease can be prevented, and *hygiene* (the study of health and its preservation) has become a medical science. Especially in the last 50 years many insanitary practices and conditions have been eliminated. Better health and longer life are the results.

The Span of Life.—When we ask, "What is the span of life?" we may mean, "How long is this newborn baby going to live?" or we may mean, "How long am I going to live?" or "What is the average duration of human life?" or "What is the extreme limit of the duration of human life?"

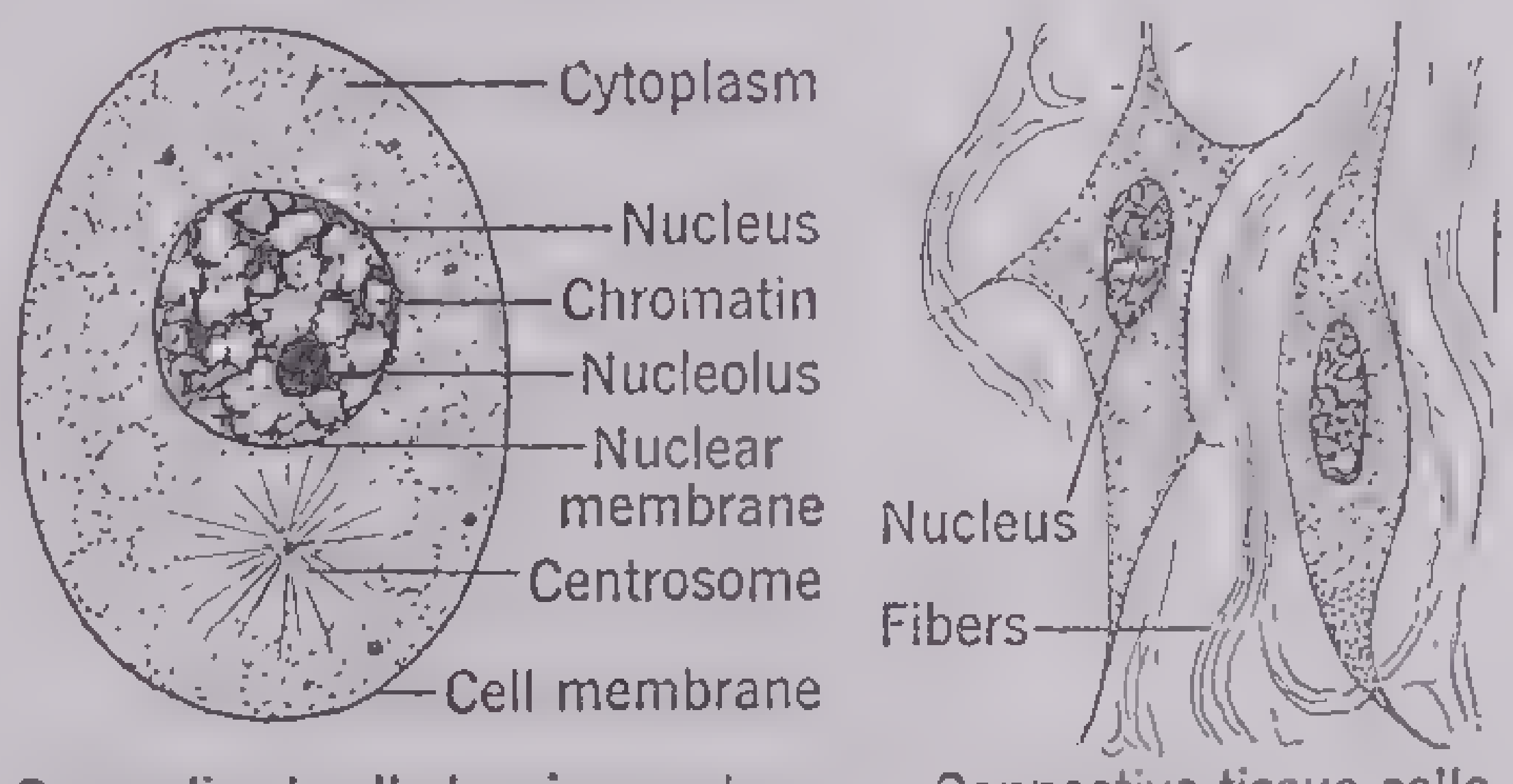
No one can answer the first two questions; that is, no one can predict the length of an individual life. Accident, infection and disease may terminate the individual life at any time. By considering many thousands of lives, however, we can level off the accidental and answer the question, "What is the average length of human life?"

The average span of human life is increasing. More people reach the age of 50 now than 100 years ago. Consequently more people are reaching later ages. This is almost entirely due to the decline in the infant death rate. In 1850 a newborn human being had a life expectancy of 38 years. Now a newborn human being has a life expectancy of 59 years.

Every once in a while the newspapers carry a story of someone who has lived over 100 years, but careful check seldom reveals an authentic record. In the experience of life insurance companies, some of whose records go back to 1706, there is only one case of a centenarian. We may say, then, that the extreme limit of the length of human life is 100 years; the average about 60 years.

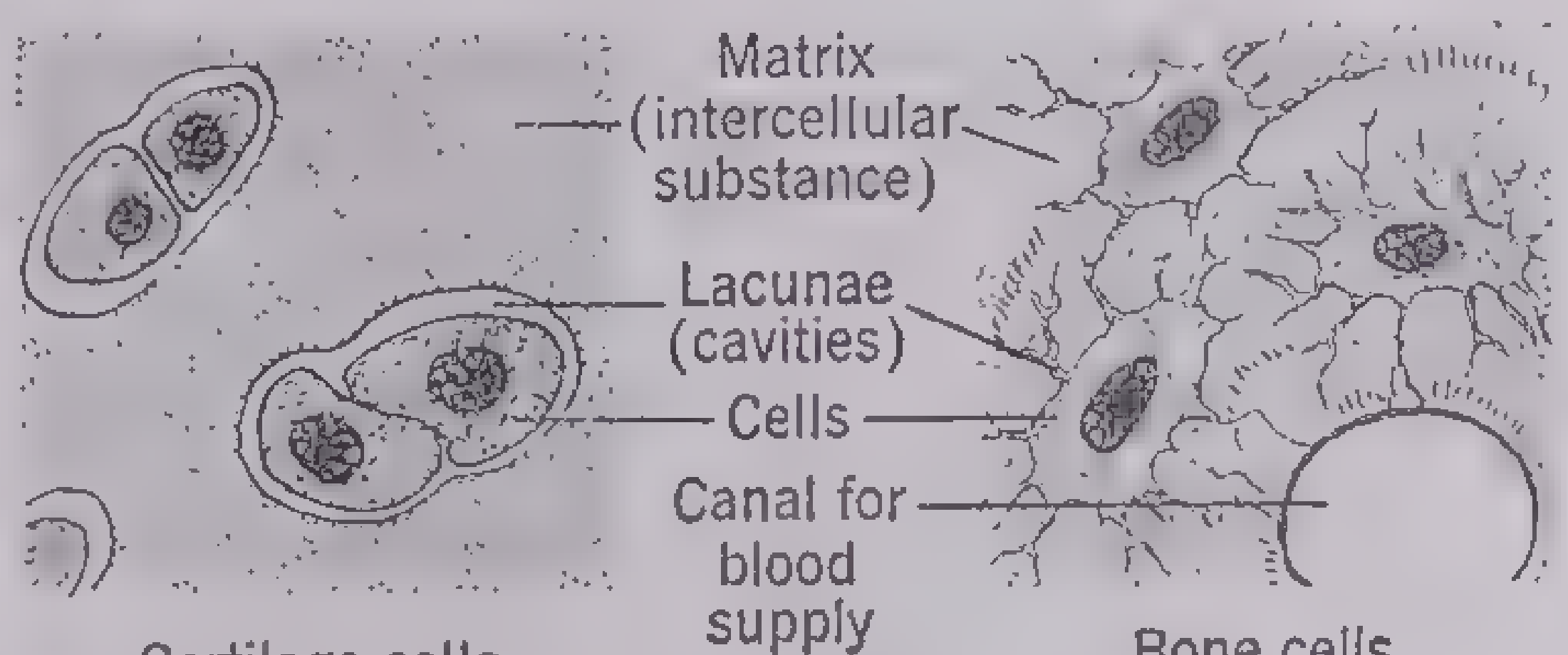
It is not enough that we live long. It is far more important that we should be healthy while we live. The laws of hygiene should be used as guiding principles for the routine of living. To use them effectively, it is essential to know the fundamental facts about the structure of the human body and how it works.

The body is made of smaller parts just as a house is made of bricks, boards, beams, nails and other things. Its smallest living unit is the *cell,* of which there are many kinds. Cells of the same kind usually occur in masses called *tissue.* Tissue is combined to form an *organ,* a part of the body adapted to perform a specific function. For example the eye is the organ of sight. Organs working together to perform a complex bodily function are called a *system.* The digestive system comprises all the organs that help to digest food. The body, then, is an organization of systems whose operations are co-ordinated for growth, maintenance and reproduction.



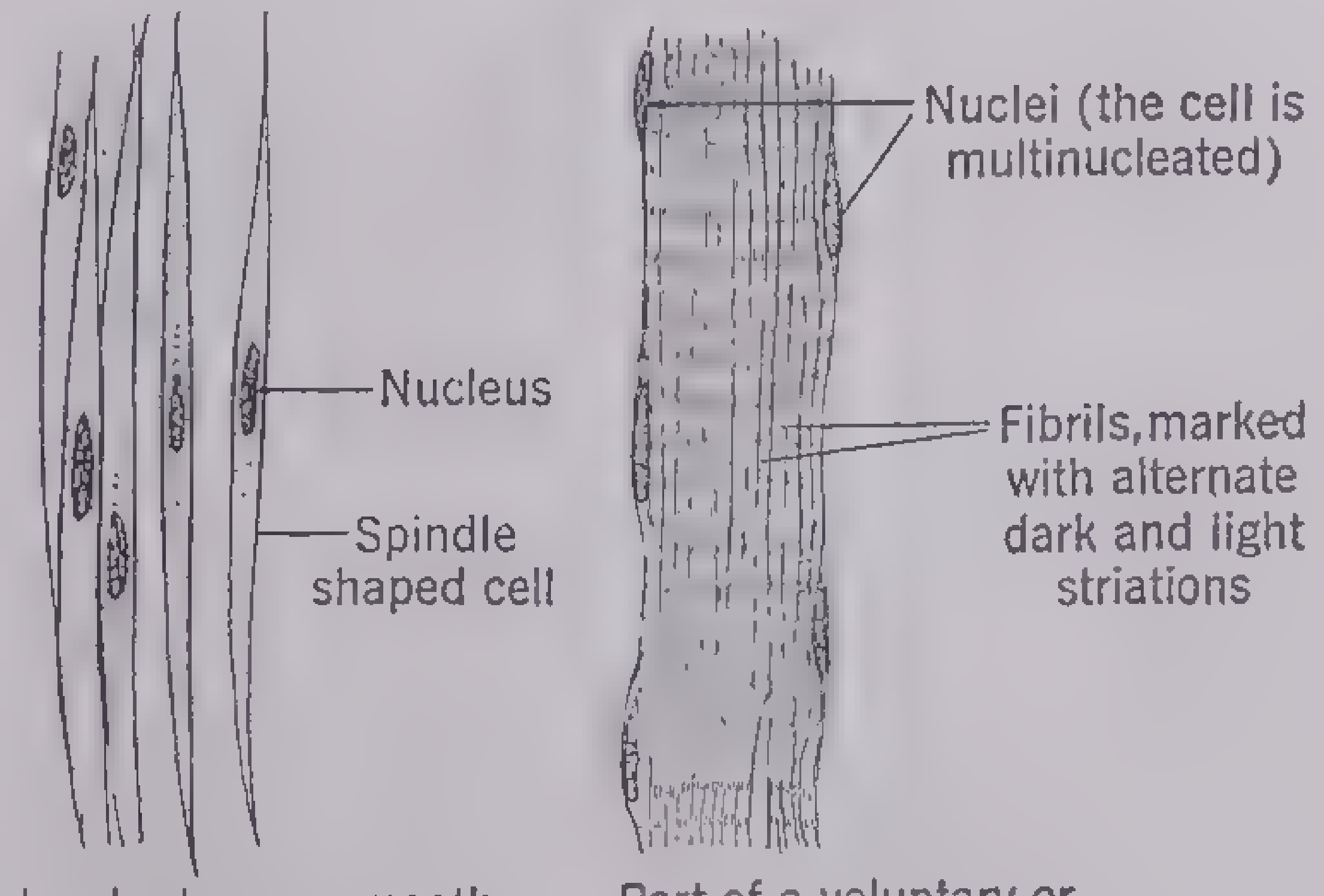
Generalized cell showing parts common to most cells

Connective tissue cells with intercellular fibers



Cartilage cells

Bone cells


Nucleus
Spindle shaped cell
Nuclei (the cell is multinucleated)
Fibrils, marked with alternate dark and light striations

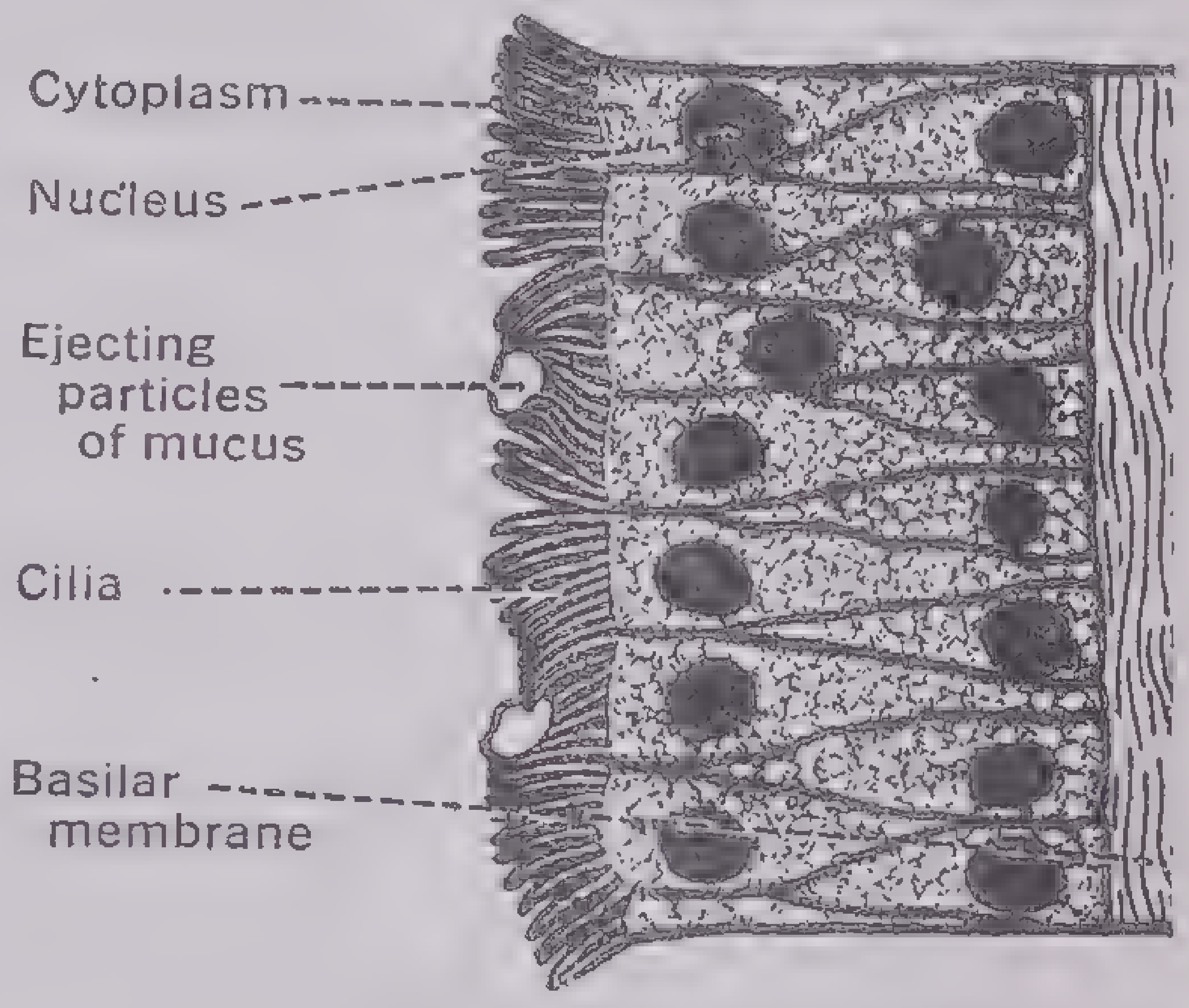
Involuntary or smooth muscle fiber cells

Part of a voluntary or striated muscle fiber

Typical Cells of the Human Body

Cells.—The billions of cells that make up the body differ from one another in function or purpose, but they all have certain general characteristics. A typical or generalized cell is a minute bit of jellylike substance, *protoplasm,* containing a denser, rounded body, the *nucleus.* Within the nucleus is a small structure called the *nucleolus.* Some cells have a limiting outer membrane. In others this membrane is indefinite, and a group of such cells is more or less continuous.

The following are the most important kinds of cells in the body:



Epithelial Cells of Air Passages

Diagram of the epithelial cells lining the air passages of the lungs. Particles of mucus, dust, bacteria and other foreign bodies are moved outward by the to-and-fro motion of cilia

Epithelial cells, subdivided into: (*a*) Mucous membrane cells, making up the surface membranes of the body—the skin, the inside of the nose and mouth, the digestive tract and the trachea. (*b*) Glandular cells, typified by the cells of the salivary glands, liver, pancreas, thyroid, sweat glands and so forth. (*c*) Excretory cells, found in the kidneys.

Connective-tissue cells, making up bone, cartilage, tendons and the fibers that hold organs and tissues together.

Muscle cells, of which there are three types: (*a*) Striated (striped) cells, which make up the voluntary muscles, that is, those moved at will, like the muscles in the arm. These cells are made up of bands of material that give a striped appearance to the cell under the microscope. (*b*) Smooth (nonstriated) cells, such as those in the intestine and arteries. These are involuntary muscles, not under the individual's control. (*c*) Heart muscle cells, which are striated in two directions. The heart muscles are not ordinarily under control of the will.

Nerve cells, which make up the entire nervous system. They have a cell body and long tentacles, *dendrites,* that go out from it.

Fat cells.

Blood cells, which consist of the red-blood cells, nonnucleated, and the white cells, which are nucleated.

Reproductive cells, which are the

ova (female) and the spermatozoa (male).

All these cells have different functions—the muscle cells to move, the bone cells to support, the fat cells to store energy. The specialized gland cells produce body fluids and secretions, such as the lachrymal fluid that bathes the eye, the gastric juice of the stomach, the saliva and the sweat. The nerve cells have various functions. One is to receive sensations—of touch (skin), of taste (tongue), of smell (nose), of light (eyes) and of sound (ears). Second, there are the nerve cells that send their dendrites out to muscles and produce motion when they are stimulated. Third, in some way nerve cells produce thought.

A Tissue (The Skin).—The skin is an example of cells aggregated into tissue. The innermost layer (*Malpighian layer* or *stratum mucosum*) is made up of active, living cells nearly cylindrical in shape. These grow outward to the surface, becoming flatter and less active until the outermost layer (*stratum corneum*) is reached. At this level the cells are flat, horny, dead and without nuclei. They scale off the surface continually and are replaced by cells from below.

The color of the skin is due principally to the pigment produced by the innermost layer.

An Organ (The Stomach).—The stomach is a pouchlike organ, part of the digestive system. It lies in the upper part of the abdominal cavity. After food is chewed and mixed with saliva in the mouth (the first phases of digestion), it is passed (by swallowing) to the stomach. There a specific phase of digestion takes place. The proteins in the food are acted on by pepsin and hydrochloric acid secreted by the stomach, the mass is churned and softened by the stomach muscles and is passed on to the small intestine for the next digestive action.

The Systems of the Body and Their Hygiene

The Skeletal System.—The body is built around a bony framework or *skeleton,* consisting of 206 bones. Some are fused or joined firmly together; others are connected by joints that permit free or limited motions.

The general scheme of the skeletal system is a main, upright, supporting series of bones, the *spinal column* or *spine,* composed of 33 *vertebrae* or bony sections. The spinal column has an S shape that gives it the springlike, shock-absorbing power necessary to protect the head and its contents when the body is in motion.

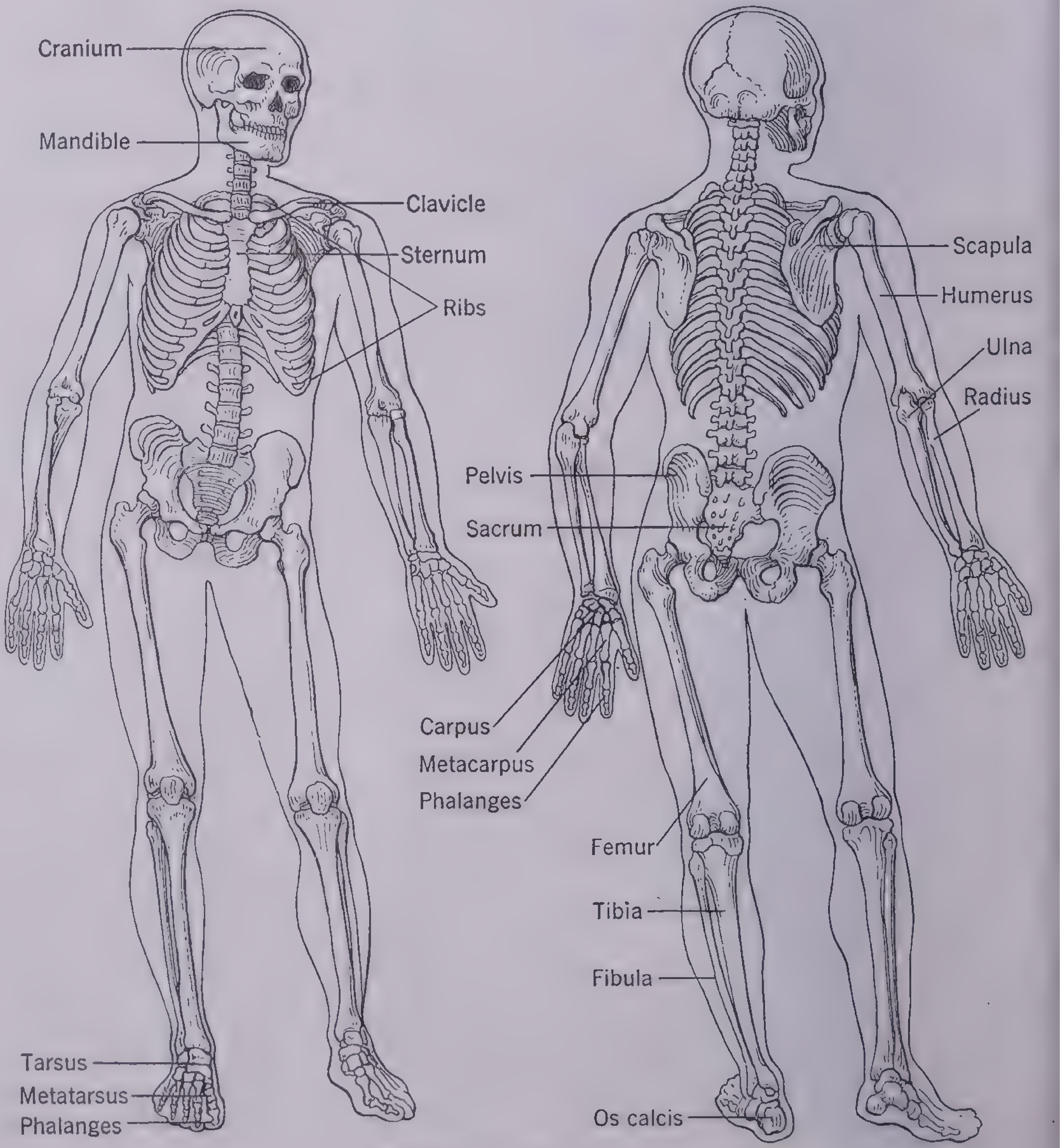
The *skull* or bony framework of the head is fastened to the top of the spinal column; a little below are fastened the shoulder bones and, at the bottom, the girdle of pelvic bones. From the center front of the shoulder bones there extends downward a series of three bones that make up the *sternum* or *breastbone,* parallel to the spinal column. On each side, between the back of the spinal column and the front of the sternum, curve seven *costae* or *ribs,* the true ribs. The lower five pairs of ribs are attached to the spinal column but do not connect directly with the sternum; they are called the *false* ribs. The last two pairs of these ribs are sometimes called the *floating* ribs.

These bones (spinal column, sternum and ribs) make a basketlike structure that contains and protects many of the most delicate and vital organs of the body. The upper arm bones are joined to the shoulder bones and the upper leg bones to the pelvic girdle.

Joints. Joints between the bones permit bodily movement. There are several types of joints. The elbow is a hinge joint, like the hinge on a door. The hip is a ball-and-socket joint—the ball-like projection of the *femur* or *thigh bone* fits into a socket in the pelvis and permits free, swinging movement of the leg. The vertebrae are separated by pads of soft cartilaginous material. By contraction and relaxation of the opposing muscles between the transverse processes (bony projections from the sides of the vertebrae), the spine may be tilted to the side. Another kind of joint, the pivot joint, is illustrated in the *atlas* (top vertebrae), which rotates on a projection, the *odontoid process* or *peg,* of the second vertebra, the *axis.* This joint permits movement of the head. A dislocated joint requires prompt attention by a physician or surgeon.

Bone Structure. Bones are, with the exception of the teeth, the hardest materials in the body, and this is due to the fact that they are made up largely of calcium (lime). A typical bone is hollow: a study of mechanics reveals that a hollow tube has the maximum amount of strength for its weight. The hollow part of the bone is filled with bone marrow. Surrounding the bones is a membrane, the *periosteum,* from which in young life the bony cells develop. The ends of a typical bone are spongy in structure, and the spongy network is made up of bony tissue (that is to say, it is mostly calcium). In the early stages of development the ends of the bone (the *epiphyses*) are not united to the shaft (the *diaphysis*). It is in this area that growth takes place during the period before the spongy part becomes ossified. Sometimes the epiphysis does not ankylose or unite with the shaft until the 20th year.

Posture. The functions of the skeleton are to serve as a framework for the body, to protect many of the soft parts from injury, to provide the necessary cavities for the lungs and other organs, to provide strength and opportunities for motion and to maintain the necessary shock-absorbing systems. It is clear that good posture, which means the proper management and arrangement of the skeleton,



The Bones of the Body

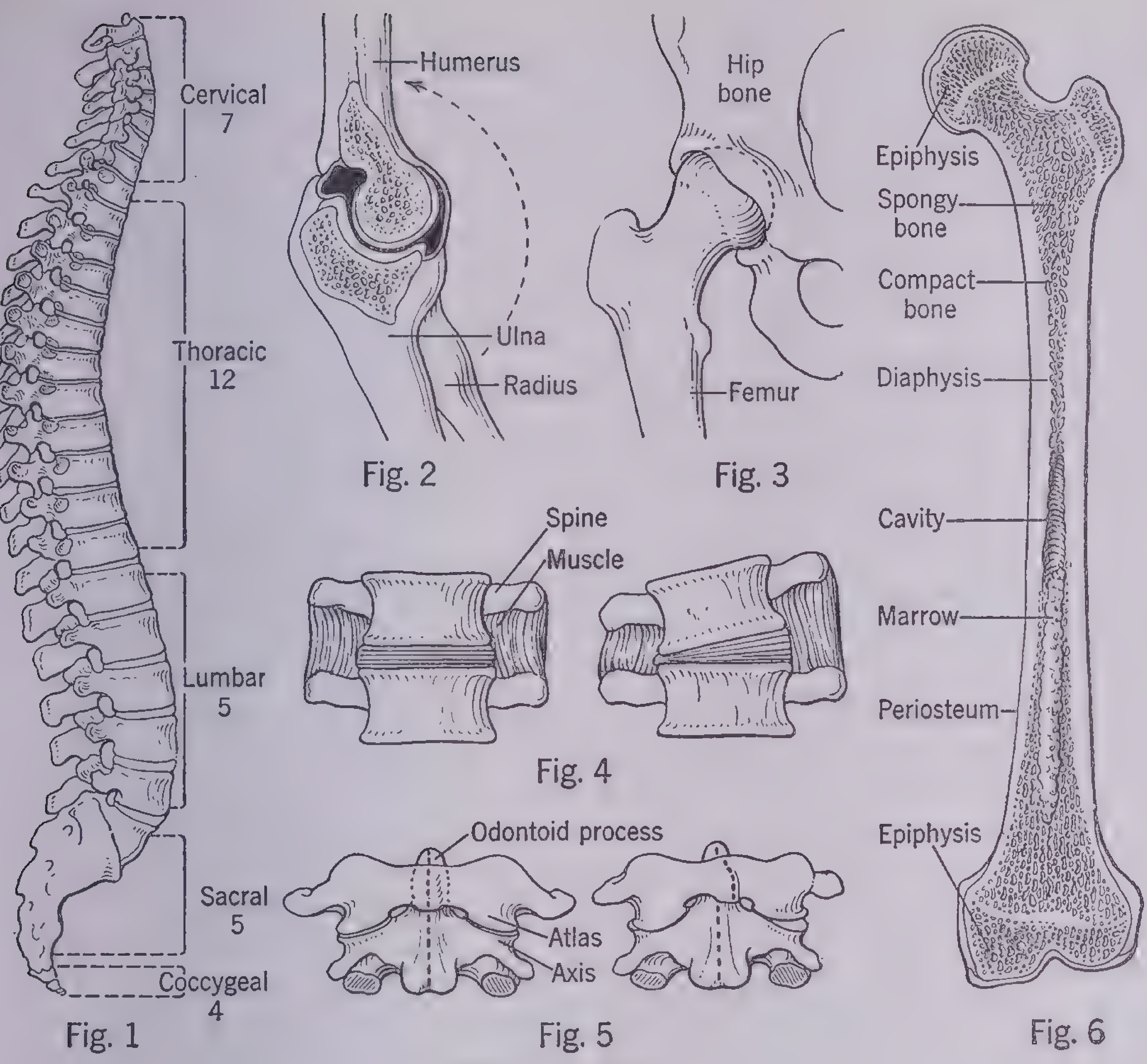

Cervical 7
Thoracic 12
Lumbar 5
Sacral 5
Coccygeal 4
Humerus
Ulna
Radius
Hip bone
Femur
Spine
Muscle
Odontoid process
Atlas
Axis
Epiphysis
Spongy bone
Compact bone
Diaphysis
Cavity
Marrow
Periosteum
Epiphysis

Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

Bones and Joints

1. Spinal column (left side)
2. Hinge joint of left elbow
3. Right hip joint
4. Joint between two vertebrae:
 Left, with body upright
 Right, with body bending to left
5. Pivot joint of atlas and axis:
 Left, with head straight ahead
 Right, with head turned to left
6. Structure of a long bone (left femur)

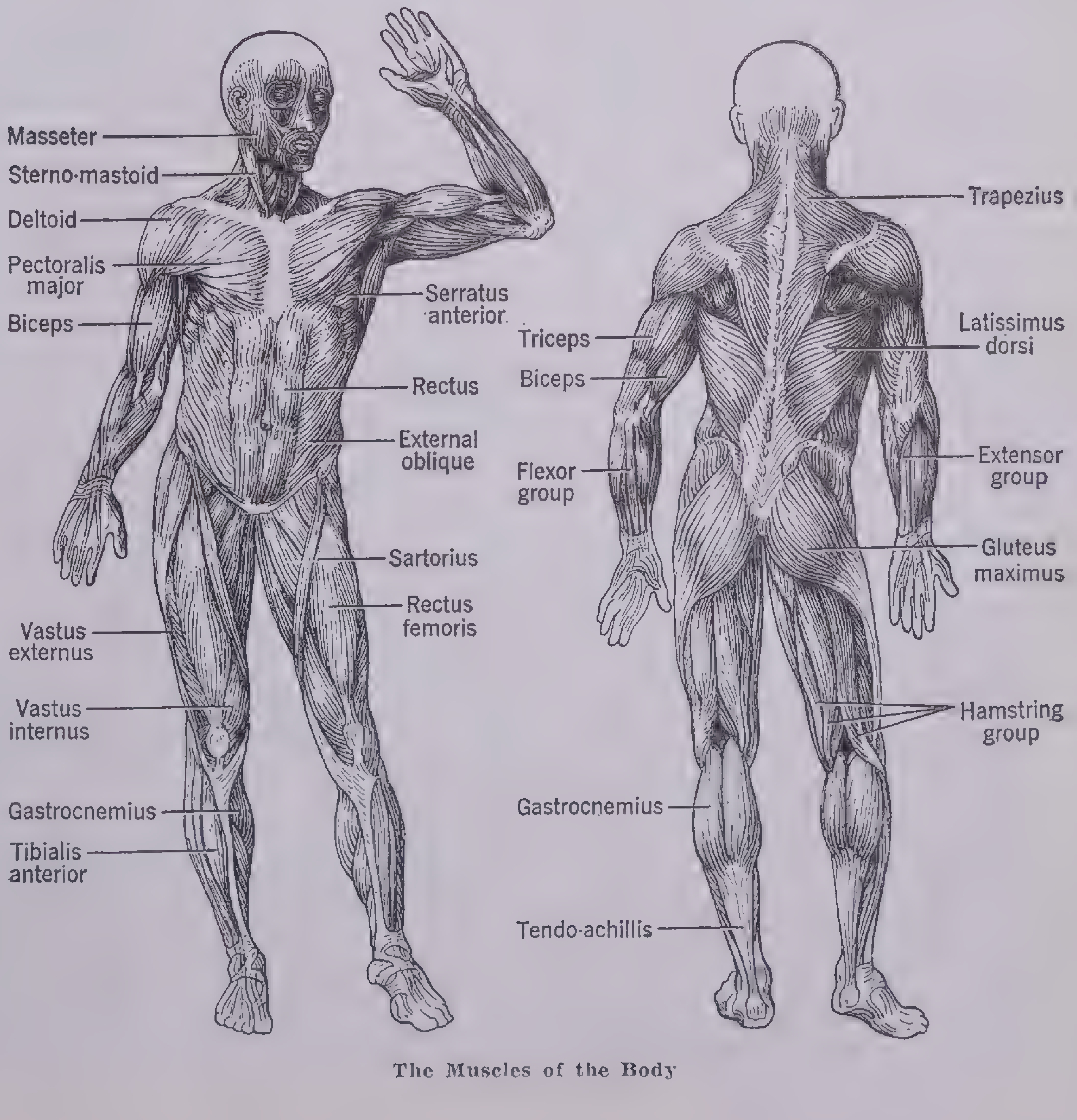
is essential for the proper functioning of the body. Bad posture interferes with circulation and sometimes cramps the inner organs. Good sitting and standing postures are very important, particularly for children.

Good posture in the standing position is that attitude in which there is the least strain so that the body is well balanced on the feet and as nearly in an erect position as is consistent with ease and lack of strain on the muscles. The shoulders are straight, and the head is erect on the neck. The abdomen is flat, and the spinal curves are slightly convex backward in the dorsal region and convex forward in the lumbar region. The body in this position should be under the least possible expenditure of energy required for the maintenance of the posture, and it is from this position that the body may be set in motion most easily.

Good posture depends a great deal on properly fitted shoes. The bones of the foot are arranged in a strong, shock-absorbing, springy arch. A broken arch (flat foot) is a serious handicap. Sensible, correctly fitted shoes are a good safeguard for the feet. A shoe with a narrow, pointed toe and high heel can do much damage. Flat foot and other unhealthful foot conditions can often be cured by toe and foot exercises and by wearing shoes that do not cramp the toes or throw the bones of the foot off their true arch. These exercises are recommended for partly or completely correcting fallen arches and strengthening the muscles of the feet: repeatedly rise on the toes when standing; place the soles of the feet together when sitting; stand on a towel with bare feet and tuck the towel under the feet by gripping it with the toes.

Muscular System.—The large masses of muscles that lie under the skin make up approximately half the body's weight and perform all our voluntary movements. A voluntary muscle makes movements by shortening itself or lengthening itself. A muscle is one of the most efficient energy machines known. It is nearly three times as efficient as a steam engine and about a third more efficient than a gas engine. A human muscle is able to lift many times its own weight, although it does not compare with the muscles of insects, which are able to lift several thousand times their own weight.

Any combustion machine must have fuel and oxygen in order to operate. The oxygen unites with the fuel to spark the engine. The fuel of the human muscle is derived from food and is utilized by the muscle in the form of glucose, a simple sugar. The oxygen comes from the air absorbed by the lungs. When glucose and oxygen are present in the blood that bathes the muscle, it responds by contractions within a fraction of a second


Masseter
Sterno-mastoid
Deltoid
Pectoralis major
Biceps
Serratus anterior
Rectus
External oblique
Sartorius
Rectus femoris
Vastus externus
Vastus internus
Gastrocnemius
Tibialis anterior
Trapezius
Triceps
Biceps
Latissimus dorsi
Flexor group
Extensor group
Gluteus maximus
Hamstring group
Gastrocnemius
Tendo-achillis

The Muscles of the Body

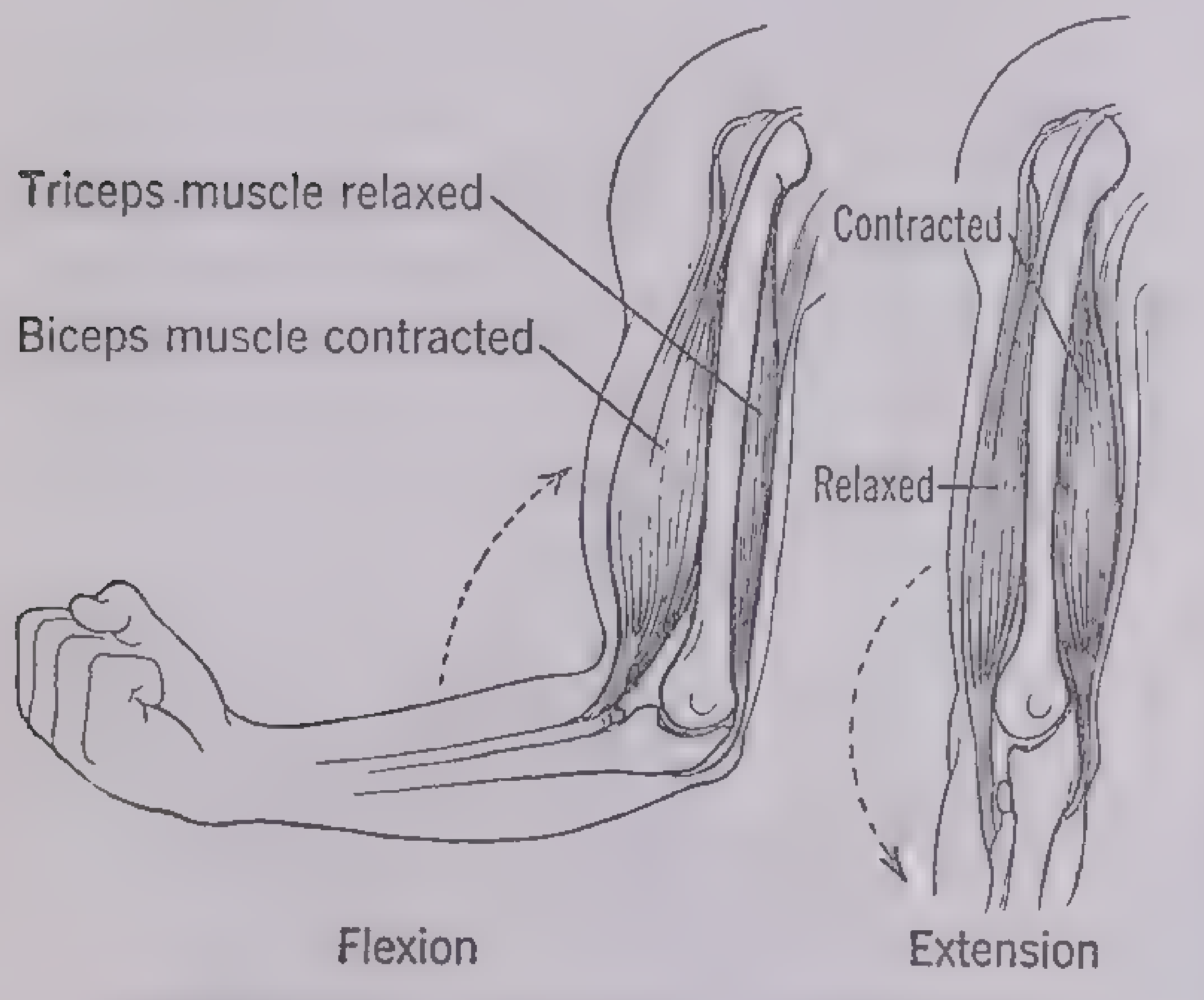
after the nervous impulse sets it off. In the combustion of glucose in the muscle, lactic acid is produced.

Any human muscle can contract indefinitely if it has a sufficient oxygen supply. But in the more vigorous exercises this is impossible. To run a hundred-yard sprint a man needs 6 liters of oxygen, but his lungs and the blood cannot possibly supply his body with this amount. He therefore goes into debt for oxygen and makes it up by the forced breathing he is compelled to do at the end of the race. This forced breathing sends oxygen to the muscles and drives out the lactic acid. The accumulation of lactic acid tends to fatigue the muscle.

In light exercise the body pays as it goes, and no oxygen debt is incurred. The lactic acid is removed during the work. Practice, that is, athletic training, will increase the ability of the body to supply oxygen to the muscles during exercise.

The mechanical arrangement of the muscles and bones is very efficient, and a great many household devices are modeled upon the joints of the human body. Thus the hinge of a door is like the elbow, and the hip is like a ball-and-socket joint.

The forearm is raised by a simple application of the mechanical law of the lever. The biceps muscle arises in the shoulder blade above the joint of the arm and is inserted into the bones of the forearm. When it contracts, the hand moves upwards towards the shoulder simply because of the leverage that the muscle exercises.



Co-ordinated Movement of Muscles

Besides increasing the ability to absorb oxygen—what is generally called by athletes *wind*—exercise, of course, increases the size and strength of the muscles. When muscles are exercised, they hypertrophy or enlarge; and when exercise is stopped, they atrophy or shrink.

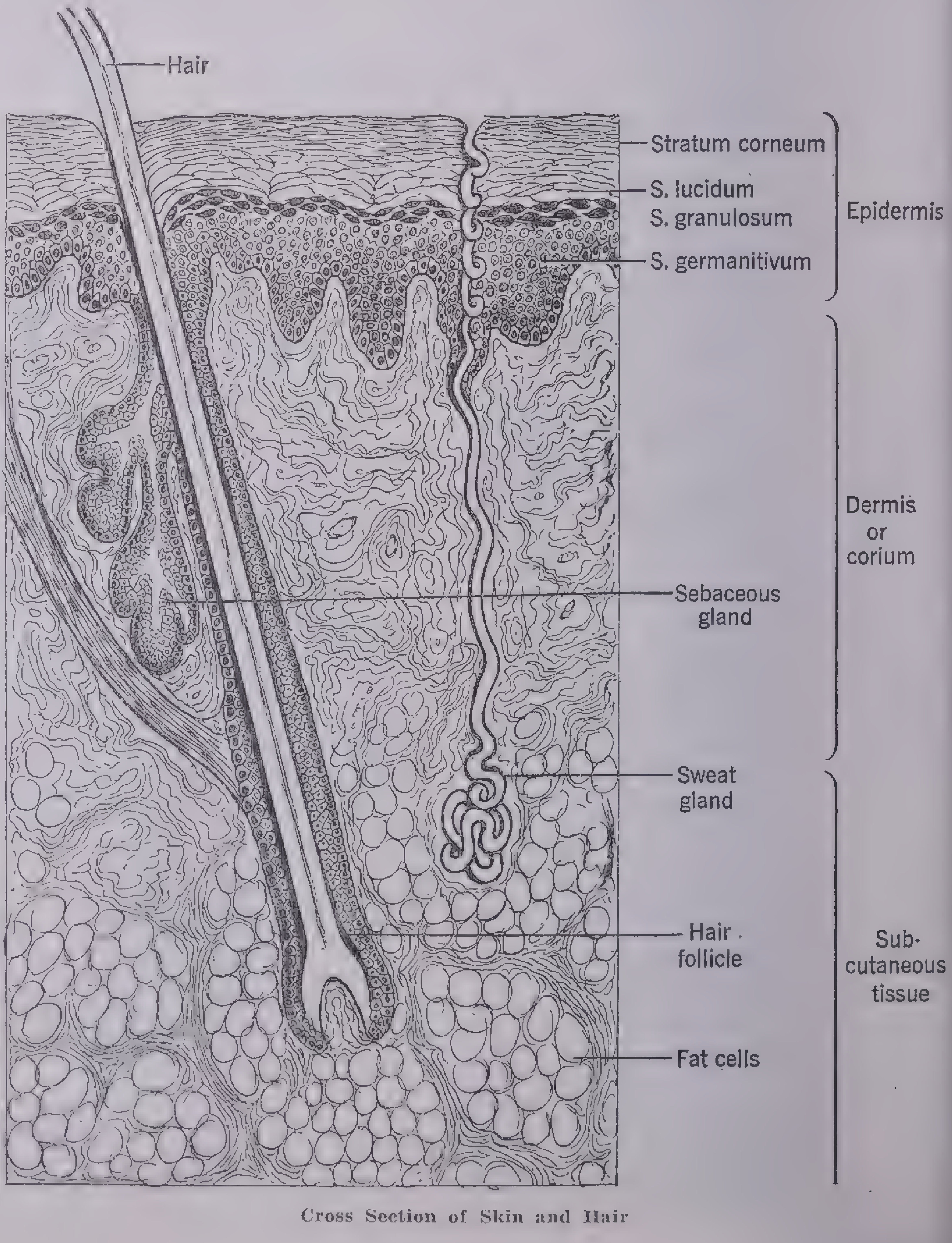
The striated red muscles underneath the skin are not the only kind of muscles in the body. We have mentioned nonstriated muscles, such as those in the intestine, which are not under control of the will, and also the heart muscle, a particularly efficient muscle that originates its own contractions. The muscle of the heart keeps contracting and relaxing in a rhythmical fashion. The principles of muscular action, however, are the same in voluntary, involuntary and heart muscles. Involuntary and the voluntary muscles are always in a state of greater or lesser *tonus* or contraction, complete relaxation being apparently incompatible with the living state. The tonus of the involuntary muscle is controlled by nervous and chemical stimuli; the tonus of the voluntary muscles is, in addition, controlled by the will.

The smooth involuntary muscles in the walls of the stomach, intestines and blood vessels control their movements. They contract and relax alternately to churn the contents of the stomach and at suitable times cause the food to move on through the gastrointestinal tract. Many muscles combine to cause the motions that result in inspiration and expiration. Expiration is normally a passive process. Corsets and tight clothes interfere with breathing and tend to make for shallow respiration.

Exercise in moderation serves to keep the muscles in a healthy state and usually aids other organs and tissues. The flow of blood in the veins is considerably accelerated by the contraction of muscles, so that muscular exercise aids the blood supply of many tissues. On the other hand it is not ordinarily advantageous to exercise vigorously directly after a meal, probably because blood that is needed in the digestive organs is directed to other parts.

Regular, moderate exercise every day will help keep the body in a healthy state. Vigorous exercise should not be prolonged and should be followed by rest.

Skin.—This organ or group of organs serves three important functions: protection of delicate tissues, excretion of waste products and regulation of body temperature. Each of these is important. As a protective organ the skin is remarkably efficient though it is, in general, only from one one-hundredth to one-tenth of an inch thick. It guards the sensitive tissues against mechanical injury, evaporation, heat, cold, excessive sunlight, effects of water or other fluids. It is unusually thickened over certain parts of the body where it is exposed to frequent pressure or friction (callouses, corns). Ordinary bacteria cannot penetrate through the unbroken



Cross Section of Skin and Hair

skin. The sebaceous glands in the skin secrete an oily substance to keep the hair in good condition so that it may serve protective functions. The same protective function may be mentioned for the nerve endings in the skin that give the sense of touch and also heat and cold.

The excretory function of the skin is primarily associated with the numerous sweat glands that it contains. They draw waste products and water from the blood vessels to make the sweat. This is passed on through their ducts to the pores. The sweat is then discharged upon the surface of the skin.

The third function of the skin is concerned with the maintenance of the body temperature within a narrow range of fluctuation (average 98.6° Fahrenheit or 37° Centigrade).

The healthy body maintains its temperature at an even level by various mechanisms. If exposed to low temperatures the blood vessels of the skin contract. When excessive heat is produced in the body by muscular exercise or in hot weather, these blood vessels dilate, carrying the heat to the surface where it is conveyed into the air. Another heat-regulating mechanism is the sweat glands. When the outside temperature is high or when heat is formed in the body by exercise, these glands are stimulated to throw out moisture on the surface of the skin, which is cooled by evaporation. About 2 quarts of perspiration are passed off daily in this way.

The skin should be assisted in these functions by frequent washing and bathing to remove not only the dirt that accumulates but also the products of perspiration and of the sweat glands of the skin. Cold bathing is considered a stimulus to the heat-regulating machinery of the skin.

Digestive System.—The body is an organism that is able to convert food and air into energy and into tissue. In order to utilize food for energy it must be converted into a form that the body can use. We have just seen that the muscles use glucose for fuel. There is very little glucose in our ordinary food. For this and for other reasons the food goes through a complicated process called *digestion.* This is partly chemical and partly mechanical change.

The digestive system consists of the lips, mouth, teeth, tongue, esophagus, stomach, small and large intestine, the salivary glands, the liver and the pancreas. We may conceive of it as a tube of variable size that extends from the mouth to the rectum. It is largely lined with strong smooth muscle fibers, and these keep churning the food and forcing it onward so that digestion and absorption may be facilitated at different points in the digestive canal.

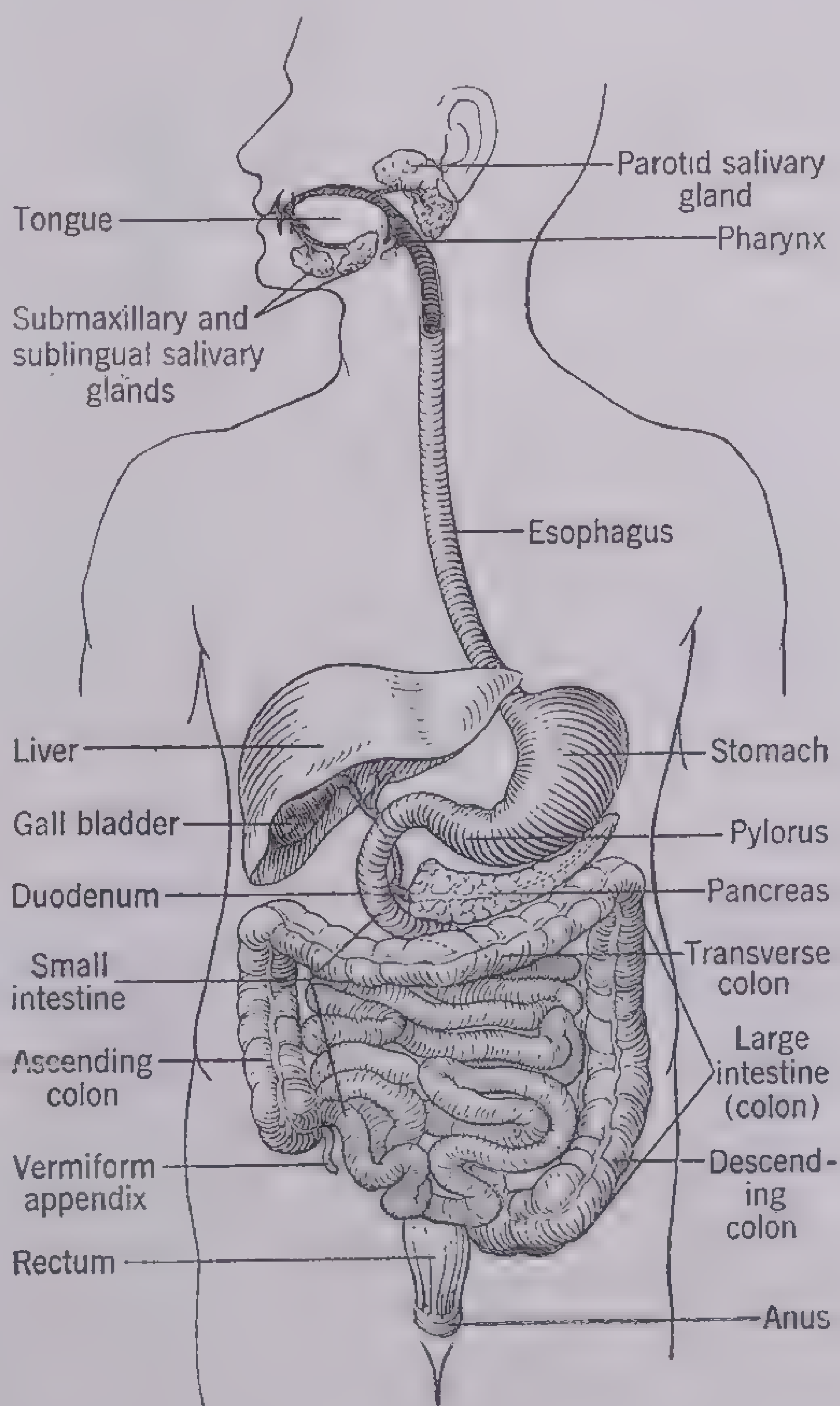
The mouth and teeth especially perform the mechanical functions of digestion by breaking the food masses up into small particles so that the digestive juices can get to all parts. The stomach and intestines continue this process by churning the food mass and further reducing it to a pulp.

The chemical functions of digestion are carried on by a number of glands that secrete the digestive enzymes. These enzymes are extremely powerful in their chemical action, and most of them are extremely rapid. You realize this when you eat a piece of bread or soda cracker. Almost immediately you get a sweet taste in your mouth, which is due to the action of the secretion of the salivary glands on starch, converting it into sugar.

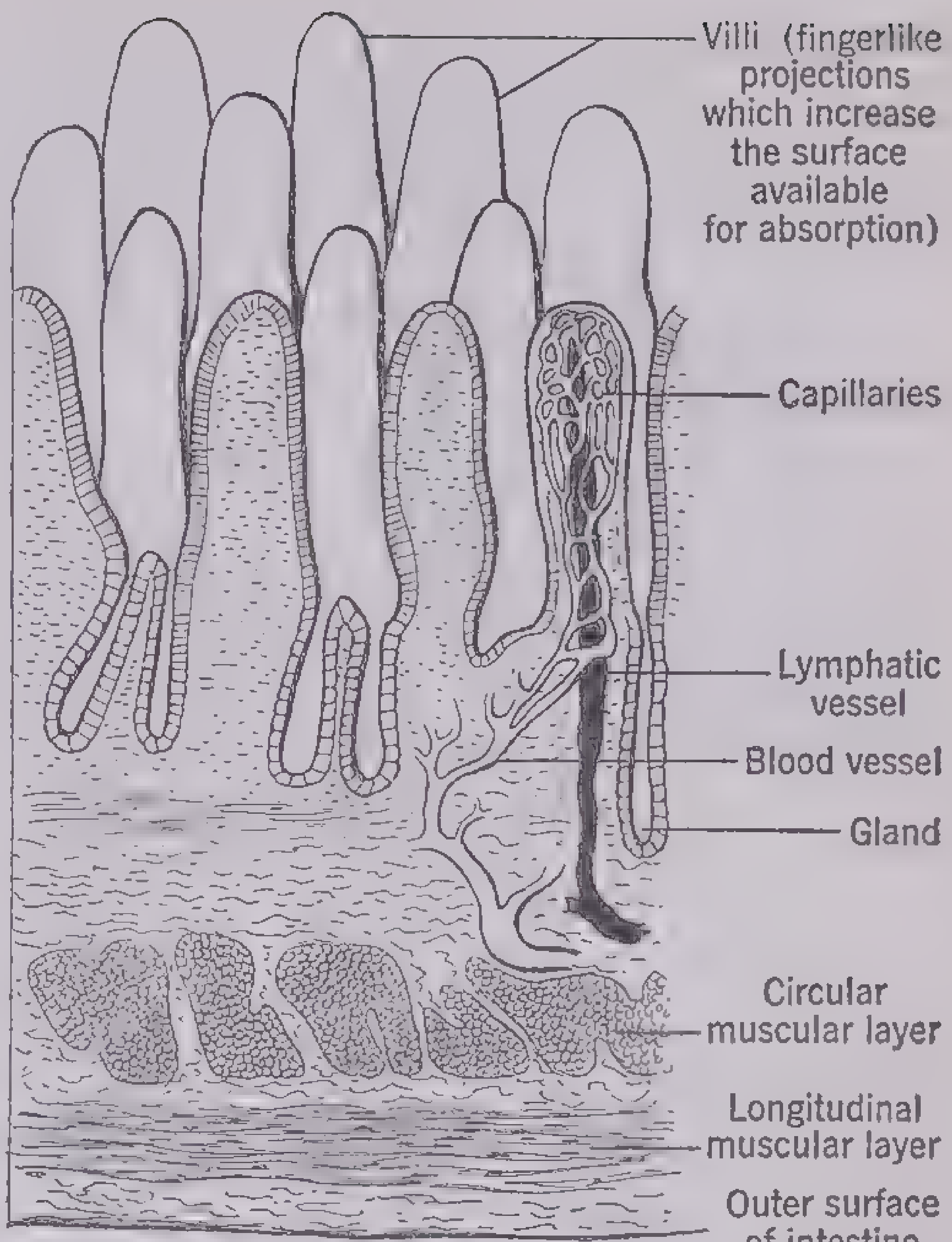
In the stomach the pepsin of the gastric juice in conjunction with the hydrochloric acid secreted by the stomach wall converts protein, the meaty or albuminous part of food, into simpler compounds. Rennin in the gastric juice clots milk and is especially important in a baby's digestion.

The bile of the liver helps to convert fat, and the three digestive juices of the pancreas have these functions: the trypsin of the pancreas converts protein food (albuminous food), carrying on the work that the gastric pepsin has left incomplete; the amylopsin converts the starches into sugars, and the steapsin converts fats.

Food, then, passes from the mouth by way of the esophagus into the stomach and is there reduced to a pulpy mass called *chyme.* Passing into the small intestine, it is further acted on by the liver and pancreatic juices and in the small intestine begins to be absorbed in the blood and carried to the liver, where it is absorbed and given out to the tissues of the body when needed. Some of it is taken into the lymphatic channels, the lacteals of the small intestine, and carried to the large lymph duct, where eventually it is discharged into the blood. After a fatty meal or a meal of milk these lacteal vessels can be seen on the surface of the small intestine as fine white threads.



Digestive System
Shown with the organs spread apart


Villi (fingerlike projections which increase the surface available for absorption)
Capillaries
Lymphatic vessel
Blood vessel
Gland
Circular muscular layer
Longitudinal muscular layer
Outer surface of intestine

Section of the Wall of the Small Intestine

The movements of the stomach and the intestines are rhythmical waves or contractions that pass over them regularly and constantly. They are called *peristaltic waves.* The process is called *peristalsis.*

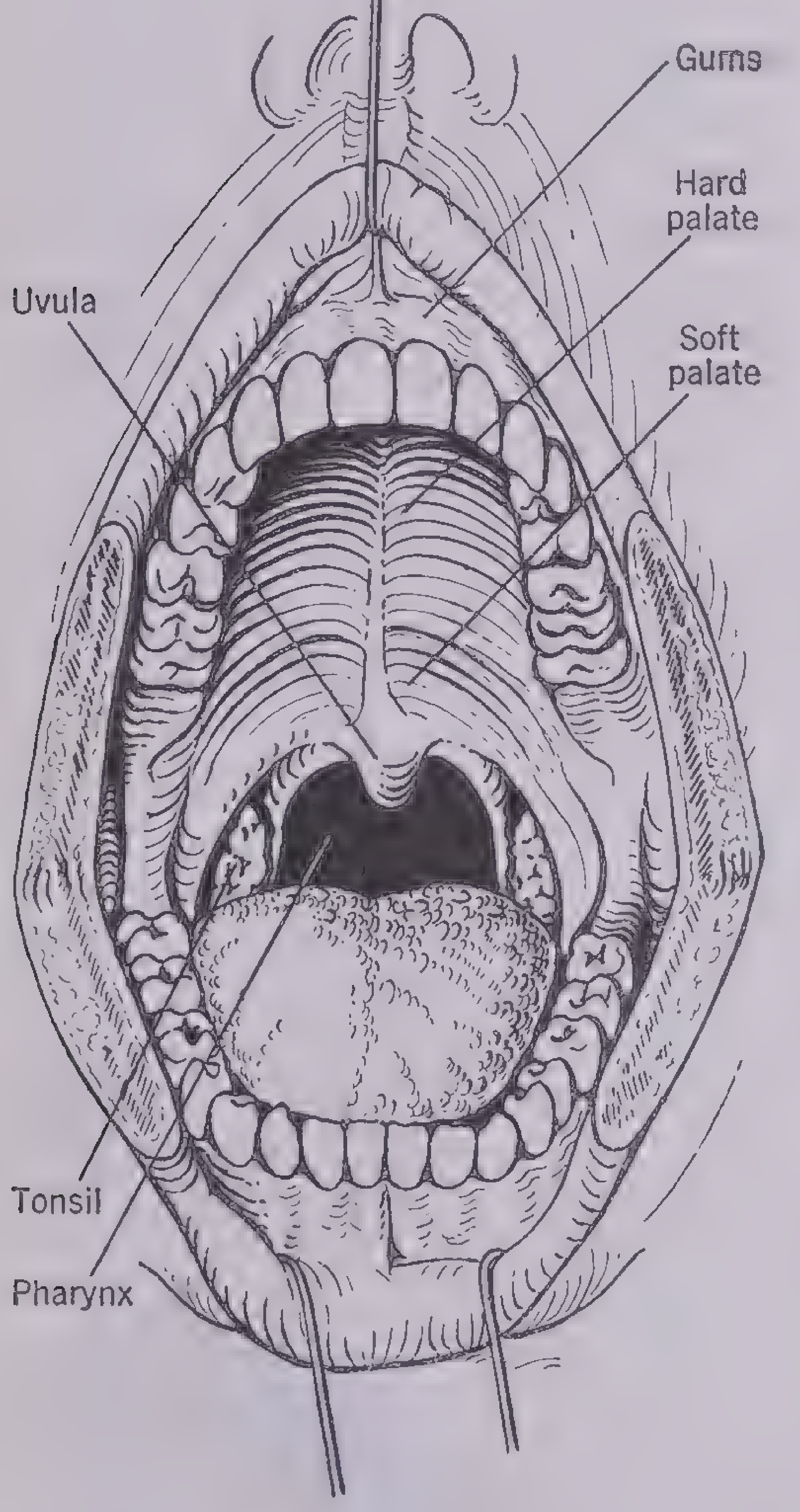
The small intestine is a coiled tube about 20 feet long, narrower in diameter than the stomach, and narrower and shorter than the large intestine into which it empties at the *ileocecal valve.* At the junction of the large and small intestine near the ileocecal valve is the *vermiform appendix,* which is a vestigial organ in man but is a large projection of the large intestine in such herbivorous animals as rabbits and cows.

Little absorption occurs in the large intestine, and here the food residue is passed on until it reaches the rectum, where it is ejected daily in the form of the stool. A daily stool after breakfast is a hygienic standard.

When the appendix becomes infected and inflamed (appendicitis), it must usually be removed surgically.

The liver is the largest organ inside the body, and since it pours bile into the intestine, it is usually classified as part of the digestive system. It has, however, many other functions, principally associated with nutrition. It stores glucose, the energizer of the body. It also plays a part in the storage of fat and conversion of uric acid. It stores vitamin D and many other substances necessary to bodily functions. Without the liver the body lives only about 4 hours.

BACTERIA IN THE DIGESTIVE TRACT. Food for man is also quite commonly food for *bacteria.* There are bacteria in and upon practically everything. Bacterial growth will go on in the foods that are ingested (taken into the body), especially because mixing with water and the warmth of the body stimulate the activities of the microorganisms. There is no significant bacterial action on foods in the upper parts of the alimentary tract because the ingested food material is in the mouth and esophagus for only a few minutes. In the stomach many bacteria are killed, and others are inhibited by the hydrochloric acid of the gastric juice. In the small and large intestines, particularly the latter, the restraints on bacteria are lost, and extensive multiplication occurs, so that the contents of the colon come to contain many thousands of millions of bacteria. These are primarily harmless; but if the contents of the colon are not evacuated regularly (that is, if constipation occurs), the products of microbic action may be absorbed and give rise to *autointoxication* (self-poisoning), because of the injurious effects of these products on the tissues of the body. Some of the effects of constipation are probably due to the "lazy" and "full" condition of the intestines. It must be emphasized that individuals vary with respect to the frequency of bowel movements. One daily is normal for most people; two daily or one in two days may be normal for others. Cathartics should not be used except on rare occasions unless prescribed by a physician. The chief aim of drinking acidophilus milk is to implant in the colon types of bacteria that are aciduric and that will hold in check putrefactive kinds. Overeating, lack of exercise and insufficient roughage in the diet are the commonest causes of simple constipation.



The Mouth

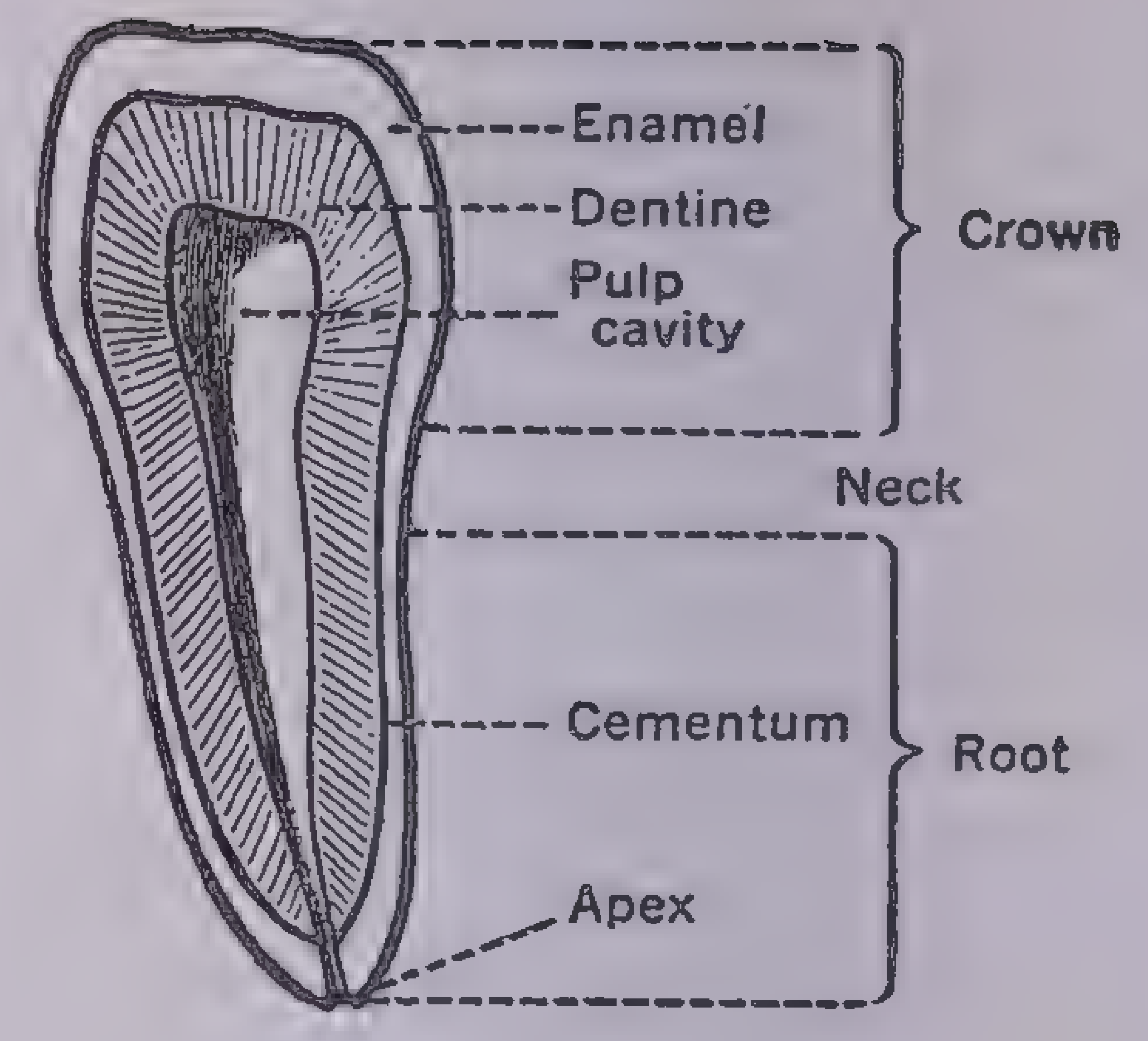
Special Problems of the Mouth and Its Hygiene. Digestion begins in the mouth with the process of chewing food, because chewing prepares food so that the digestive juices may act upon a pulp instead of upon large solid or semisolid masses.

Teeth and Dental Hygiene. The newborn baby does not have visible teeth although they have already been partly formed and are in the gums preparing to complete their development and erupt. For the proper formation of a baby's teeth good, fresh milk is necessary, mother's milk in preference to cows' milk. About 6 months after birth the teeth begin to come through the gums. These first teeth will last between 6 and 12 years and then fall out. They are the *milk* teeth or *deciduous* teeth. They are replaced by the permanent teeth, which form beneath them and force them out. When the milk teeth become loose, they should be pulled out to permit the permanent teeth to erupt straight.

Many of the lower animals subsist on meat and have sharp, pointed teeth for tearing it; others live on grains and have flat grinding teeth. Man lives on a mixed diet and has both types of teeth. The permanent set of teeth has four of each of the following (two in each jaw): (1) Central incisors, (2) Lateral incisors, (3) Canines or cuspids, (4) First premolars or bicuspids, (5) Second premolars or bicuspids, (6) First molars, (7) Second molars, (8) Third molars or wisdom teeth. These grade from the first, which are sharp and chisel-edged, to the last, which are flat.

The first of the permanent teeth to appear are the first molars, usually in the 6th year. These are the largest of the teeth and are very important because they must serve as the chief teeth while the temporary teeth are being replaced. Their health and position therefore largely determine the position of the permanent teeth that follow them. Soon after the 7th year the central incisors appear, and at approximately yearly intervals the lateral incisors, the first and second premolars, the canines and the second molars (after the 12th year) and finally the third molars (after the 17th year).

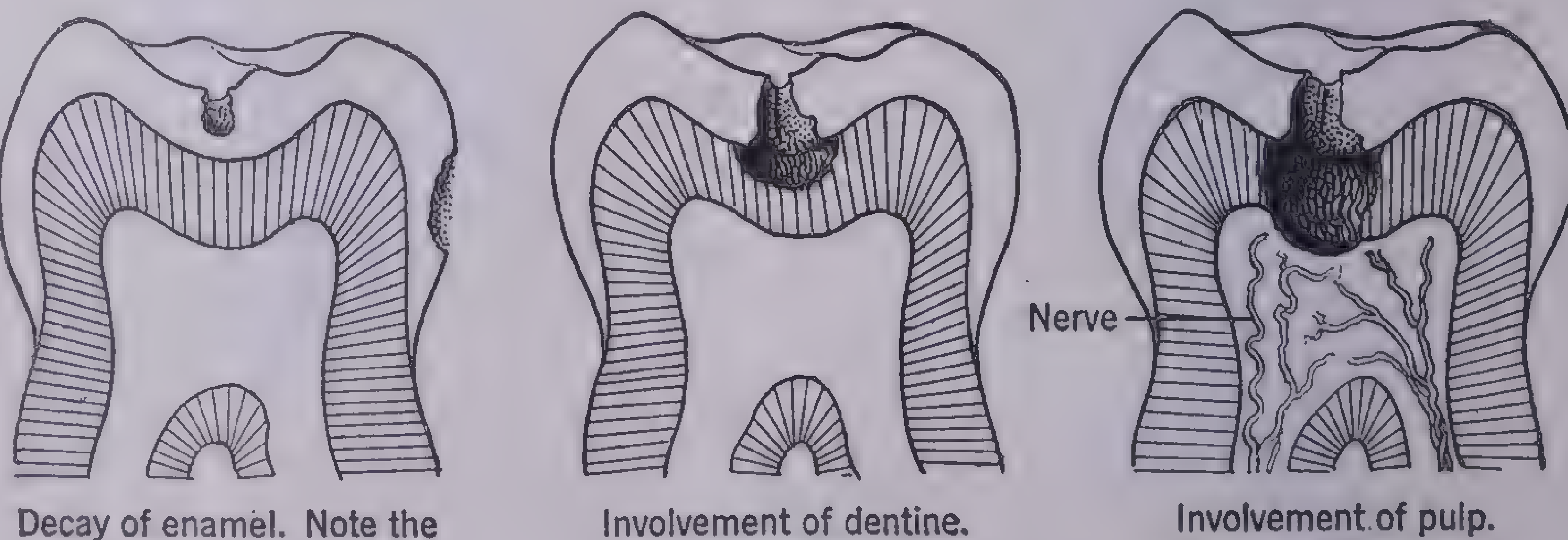
Tooth Structure. Each tooth has three parts: the *crown,* which is visible above the gums, the *neck,* surrounded by the gum, and the *root* (or roots), lodged in the jawbone. The outer layer of the crown is *enamel,* an extremely hard substance. The neck and root are covered with *cement* or *cementum,* a bony substance. Beneath the hard outer layer is a thicker layer of *dentine,* a softer material that surrounds the central or pulp cavity in which the nerve and blood vessels are contained.



Tooth Structure
Section of an incisor to show the structure of a tooth

Tooth Decay. Dental *caries* or tooth decay is the greatest danger to teeth. Decay usually starts in some tiny flaw or injury in the enamel. A little food and some bacteria collect; the bacteria develop and form acids that attack the enamel. The decay continues, reaches the dentine and eventually the pulp cavity. Here the bacteria and the products of decay may reach the nerve and set up excruciating pain. They may reach the blood vessels, enter them and be carried in the blood to other parts of the body. A decayed tooth is frequently the focus of infection for many parts of the body, and often it results in serious disease.

The statement that a clean tooth never decays is not entirely true. It is true that brushing the teeth once, twice or three times a day may help to control infection of the teeth, but this alone will not insure their health. The mechanical action of brushing is of more importance than the kind of dentifrice used. The evidence available at this time indicates that diet is, if anything, more important than cleanliness in care of the teeth. An adequate diet, in which plentiful use of milk and orange juice is most important, is the best insurance for sound teeth. A well-balanced diet for the mother before the baby is born and for the child as it grows provides the basis for good dentition. In addition proper cleaning of the teeth and periodic examination by the dentist—preferably more than once a year—



Decay of enamel. Note the two most likely points of decay.

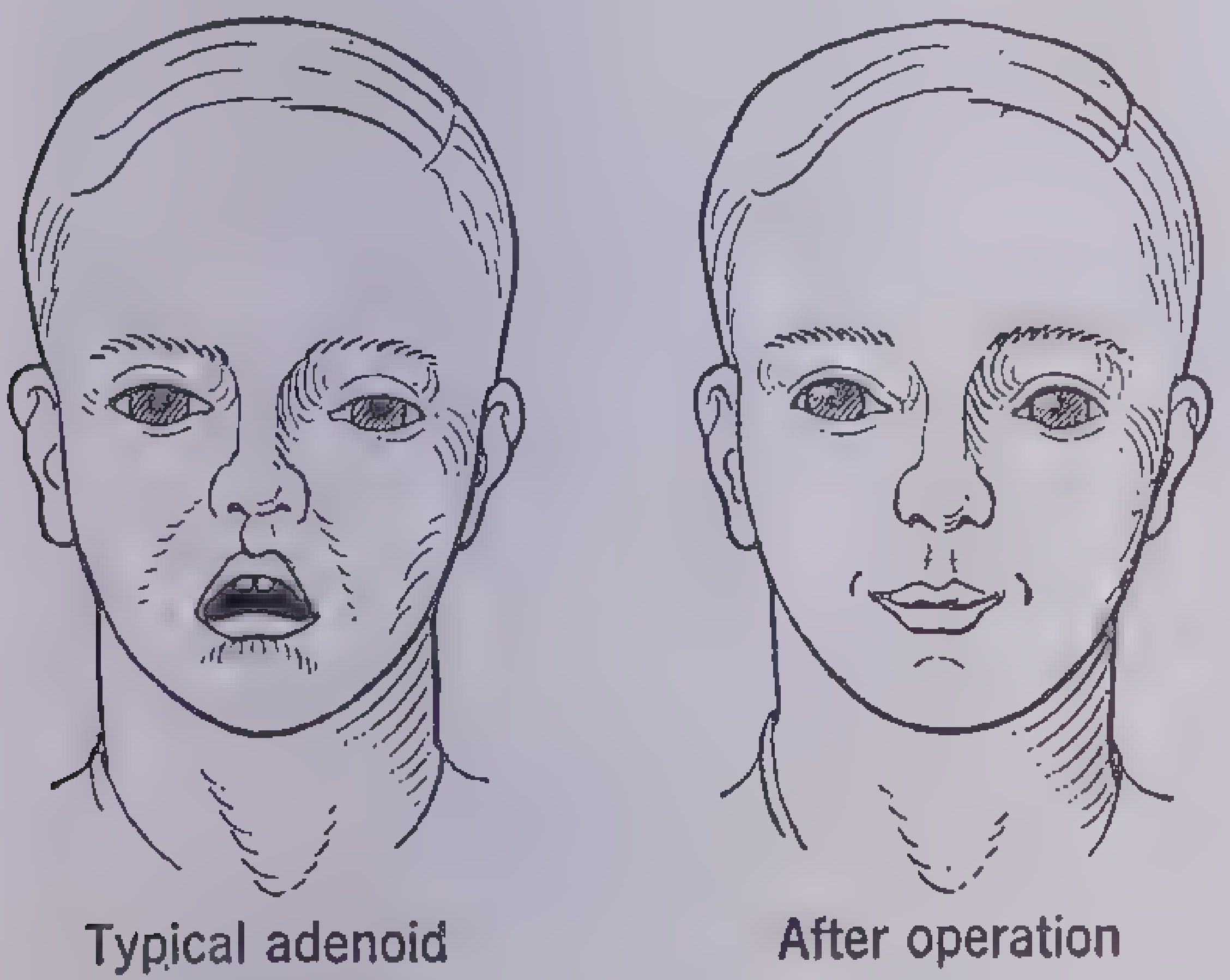
Involvement of dentine. Decay advances more rapidly now.

Involvement of pulp. The tooth becomes very painful.

Section of a Molar Tooth Showing Stages of Decay

should insure healthy teeth. The dentist can detect early flaws in the teeth. These can be repaired by simple and often painless treatment so that more serious damage is not likely to occur. Decayed and abscessed teeth, if they are beyond repair, should be removed without delay.

Tonsils. On each side of the back of the throat is a structure of lymphoid tissue called the *tonsil* or *palatine tonsil.* It is a complex structure with deep crypts that open into the throat. Bacteria frequenty gain entrance into these crypts and infect them. Infected tonsils serve as a reservoir of bacteria that may repeatedly infect the adjacent tissues or gain entrance to the blood vessels, be carried by the blood to other parts of the body and set up secondary infections. Diseased tonsils can and should be removed by a simple surgical operation, tonsillectomy.



Typical adenoid facial expression

After operation

Effect of Adenoids

Adenoids. On each side between the two folds of the soft palate are the pharyngeal tonsils. Behind the soft palate, attached to the posterior wall of the pharynx, one on each side, are the adenoids. All these tissues are lymphatic in structure. They are large in childhood and tend to atrophy in adult life unless they become infected.

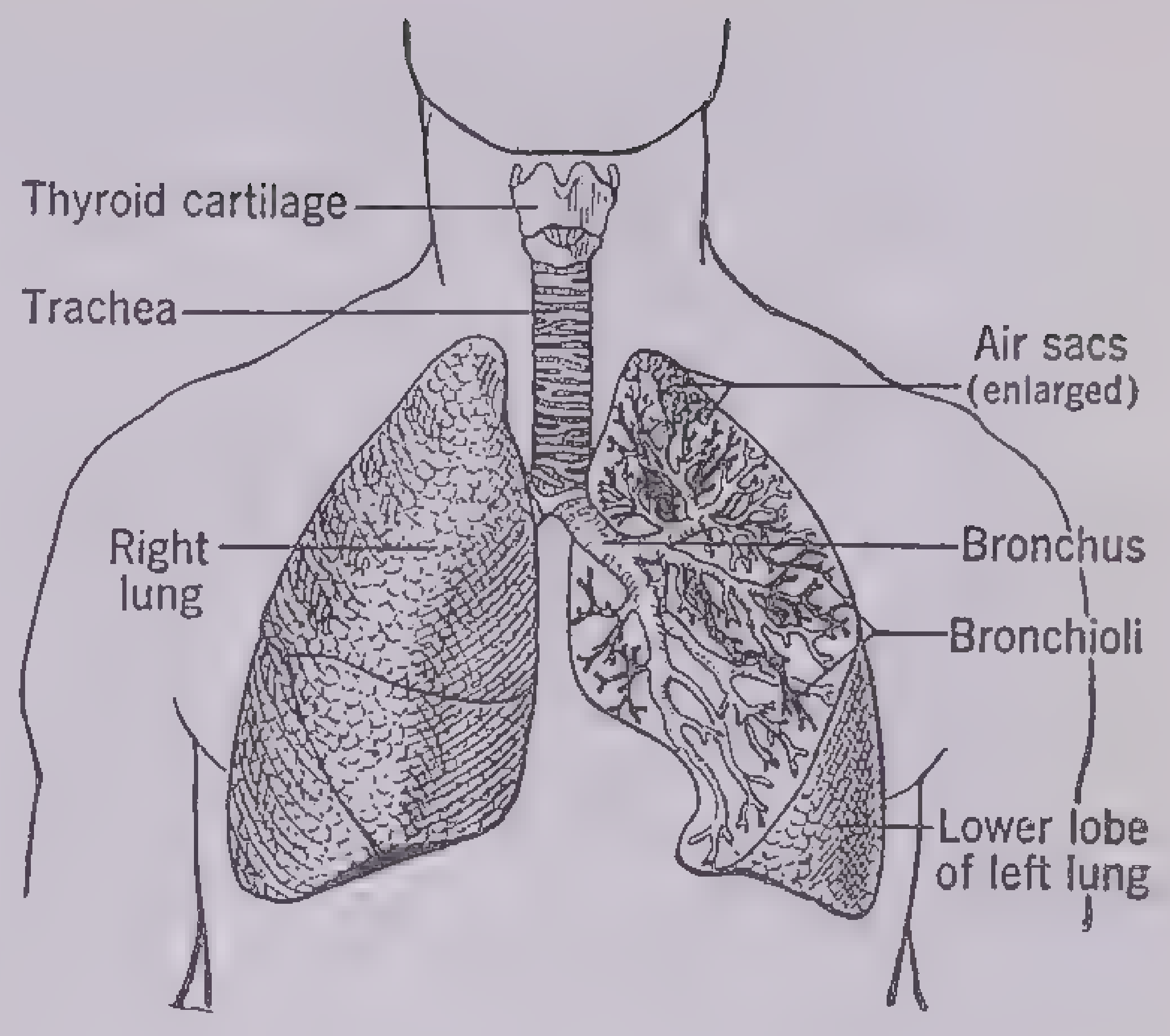
Their function is, so far as we know, to drain infection from the mouth and nose. In performing this function both the tonsils and the adenoids are likely to become infected and inflamed; when this happens, they should be removed by surgical operation.

The adenoids lie over the Eustachian tube that goes from the back of the throat to the ear. If they are enlarged or infected, they may cause difficulties in hearing. Enlarged adenoids may also obstruct the air passage between the nasal cavities and the mouth so that the child is compelled to breathe through the mouth instead of the nose. This condition is unhygienic, because in cold weather the air taken into the lungs is not warmed, moistened and filtered as it should be by passage through the nose. Repeated and chronic colds and other ailments frequently result. Continued mouth breathing places an unusual strain on the muscles of the face and jaws and tends to cause the young bones to develop abnormally. The roof of the mouth tends to develop a high arch, and the teeth occupy irregular positions and are crowded out of their natural sites. The face shows a stupid and strained expression.

Respiratory System.—In discussing the digestive system it was said that the body needs food and oxygen to operate as a combustion engine. The food is prepared by the digestive system; the oxygen is obtained from the air by the intermediation of the lungs.

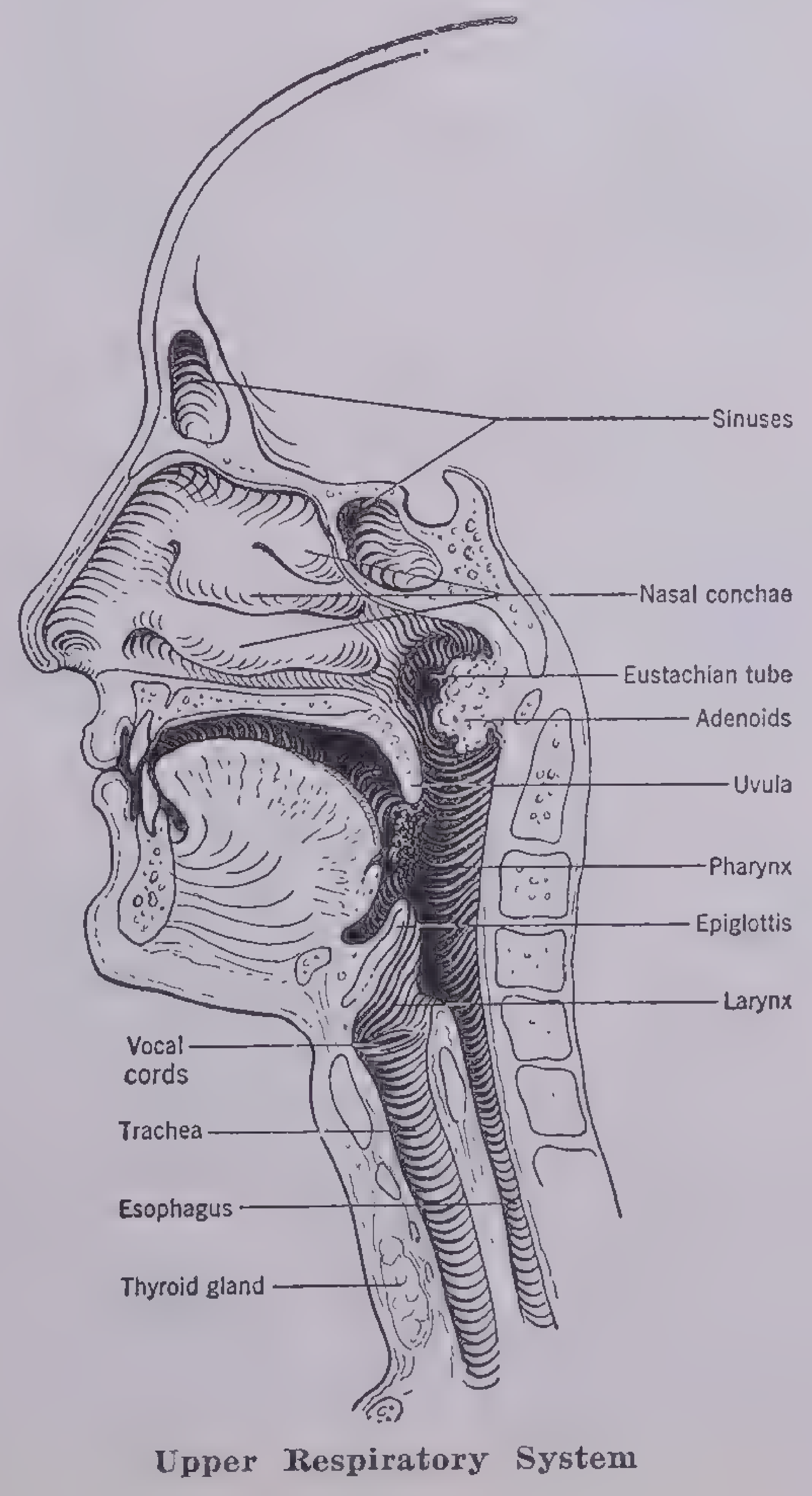
A supply of fresh air is drawn into the lungs about 20 times a minute, an average rate of respiration. When one's body is resting quietly or sleeping, the respiratory rate may be as low as 16 or 12 a minute. When the individual is exercising, it may rise to 30 or 40. In each condition the amount of oxygen supplied is adjusted to the needs of the body.

Respiration. Air, which is about one-fifth oxygen, enters through the nose or mouth, passes through the *pharynx* and *larynx* into the *trachea* and thence into the *bronchi* and *lungs.* The motions of the air, when it is drawn in (*inspiration*) and expelled (*expiration*), are due to enlargement and reduction in volume of the chest. The lungs are normally passive. In respiration the chest is raised and lowered, and its internal capacity is altered by movements of the ribs and the *diaphragm* (the muscle sheet that makes the floor of the chest cavity). As the chest or *thoracic cavity* changes in size, the lungs change similarly. As the thoracic cavity is enlarged, the lungs tend to follow the chest wall, they bellow out and air is drawn into them; as the cavity is reduced, the lungs are compressed and air is expired.



The Lungs and Air Tubes

Lungs. The lungs are merely extremely convoluted and pouched membranous sacs made up of many minute sacs whose surfaces are in intimate contact with the air they enclose. In the membranous walls of the lungs down to the finest pouches and sacs (*infundibula* and *alveoli*), there is a rich supply of blood vessels. The oxygen from the air in the sacs is diffused through the lining membranes to the blood; and carbon dioxide, a waste product, is given back by the blood and is expelled with each expiration of air.



Upper Respiratory System

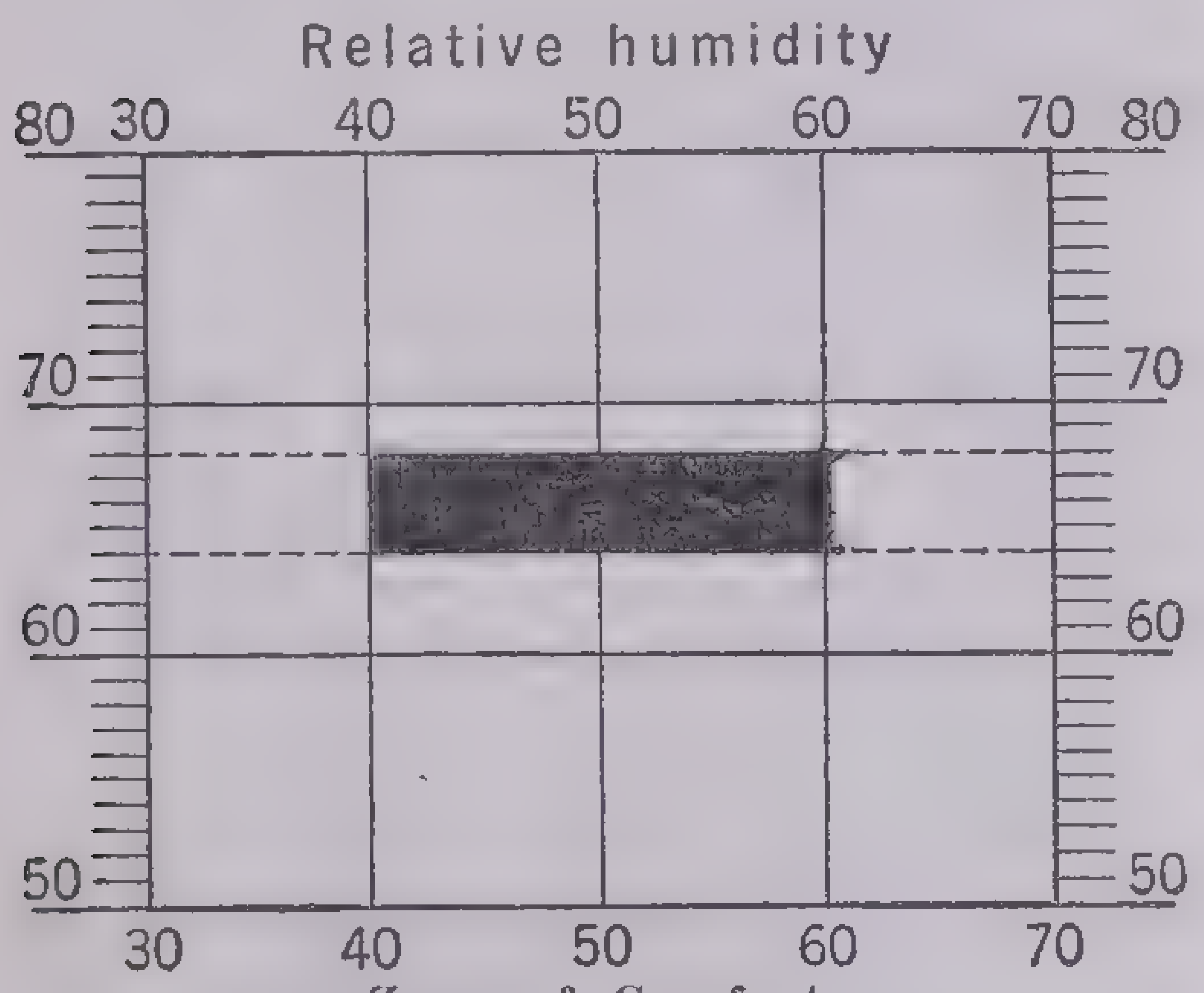
Rate of Respiration. The rate of respiration is partly under voluntary control. It is also under involuntary control. When there is need for respiration to supply oxygen and remove carbon dioxide, the accumulated carbon dioxide causes a slightly acid condition of the blood. This seems to activate a region of the brain (the respiratory center in the *medullar oblongata*), which causes nervous stimulation to the lungs and intercostal muscles (between the ribs), and, finally, acceleration of the respiratory rate. The nervous control of respiration is also observed in the effects of a sudden dash of cold water on the skin, of emotions and certain drugs.

Products of Respiration. The essential results of respiration are the consumption of oxygen and the excretion of carbon dioxide. In addition the air that is drawn into the lungs comes into intimate contact with the moist surfaces of the membranes of the nose, mouth, larynx, trachea, bronchi and lungs. The expired air becomes saturated with moisture and warmed to body heat. Water is also being continuously given off by the skin. The end result is that the body loses to the atmosphere around it about 3 pints of water a day and about as much heat as is given off by a candle burning continuously. The body is also excreting via the lungs and skin volatile, ill-smelling substances of uncertain composition.

Ventilation. The net effect upon the atmosphere of the presence of an individual is the consumption of oxygen and the excretion of carbon dioxide. water vapor, heat and ill-smelling products. If one or more human beings remain in an enclosed space, the air is subjected to chemical and physical changes, and it is necessary to provide for the maintenance of proper air conditions. Except under very extreme circumstances the consumption of oxygen by human beings in a room is inconsiderable, and actual oxygen deficiency rarely occurs. Extensive experiments have demonstrated that the depressing effects of bad air are due to excessive heat and moisture rather than to increased carbon dioxide or reduced oxygen content. The odorous substances given off by human bodies may become perceptible in a close, crowded room or auditorium and may have unfavorable effects upon the appetite.

The aim of ventilation is to provide proper air conditions. For most human beings the best temperature is between 64° and 68° Fahrenheit. The humidity of air is expressed in terms of relative humidity (the percentage of moisture contained in the air by comparison to the maximum which air can hold at the same temperature). The most desirable relative humidity at favorable temperatures and with moderate air movement is about 50 per cent.

As the body loses heat, it tends to warm the air about it. If there is little or no motion of the air, a blanket of warm air tends to form about the body and give a sensation of warmth. If the air is in motion, the warmth from the body is dissipated. Air in motion therefore tends to have greater cooling and evaporating power than quiet air.



Zone of Comfort

Physical comfort does not depend on temperature alone. We are most comfortable when the temperature is between 64° and 68° F., provided that relative humidity is between 40 and 60. If the relative humidity were less than 40 at that temperature, we would feel cold because of excessive evaporation of body moisture. If relative humidity should rise above 60 the air would seem "stuffy"

The aim of ventilation is to provide clean air at proper temperature and humidity, in moderate motion and free from odors and noxious impurities. In a house or office where there are few people there may be sufficient ventilation through cracks around windows and doors. A window open a few inches will ordinarily suffice for air change if there is appreciable difference between the indoor and outdoor temperatures or if there is a wind blowing. In very cold weather windows may be closed. In a schoolroom good air conditions may be attained by window ventilation, with or without ducts by which the warmed air in the room may escape as it rises. In cold climates or in winter the heating system should be so arranged that the cool air is tempered as it comes in.

In a large auditorium or theater it may be necessary to use an elaborate system of fans and ducts to bring fresh air in and to remove vitiated air through many openings judiciously distributed to avoid drafts.

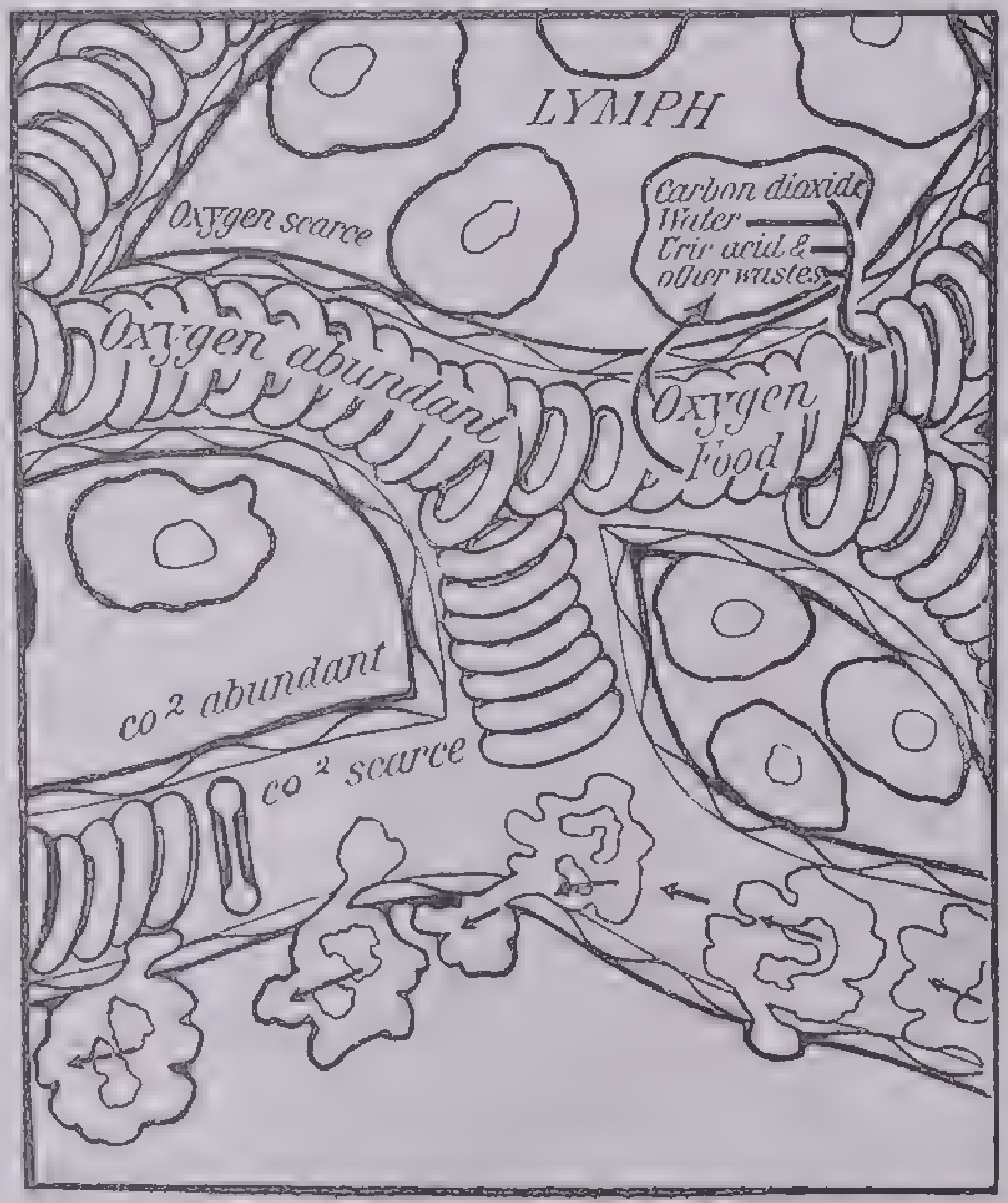
Artificial Respiration. Death ensues if respiration is stopped by drowning, electrical shock, gas poisoning or choking. It is often possible to save the individual's life by inducing and for a time maintaining artificial respiration. The important thing is to start the artificial motions as soon as possible, because seconds are valuable. Even if the patient does not appear to respond, the artificial motion should be continued until a physician has pronounced the individual dead.

The Blood.—The digestive system prepares the food for the body's use, the lungs filter out the oxygen from the air, and both the food and the oxygen enter the blood and are carried by them to the tissues.

The blood consists of a thick liquid called the *serum* in which there float several kinds of cells:

1. The red cells, which give the blood its color and are the most numerous. In health they number 5,000,000 per cubic millimeter.
2. The white cells, which number about 5,000 per cubic millimeter.
3. The platelets, which number about 5,000 per cubic millimeter.

Clotting of Blood. The circulation of the blood is absolutely essential to life because a continuous supply of oxygen is essential. There are about 6 quarts of blood in the body, and if through *hemorrhage* (bleeding) more than 2 quarts are lost, the danger of death is very great.



Red Corpuscles at Work

Showing the interchange of food and waste materials between the red corpuscles and the tissue cells. At the bottom is shown the migration of white corpuscles from the blood stream

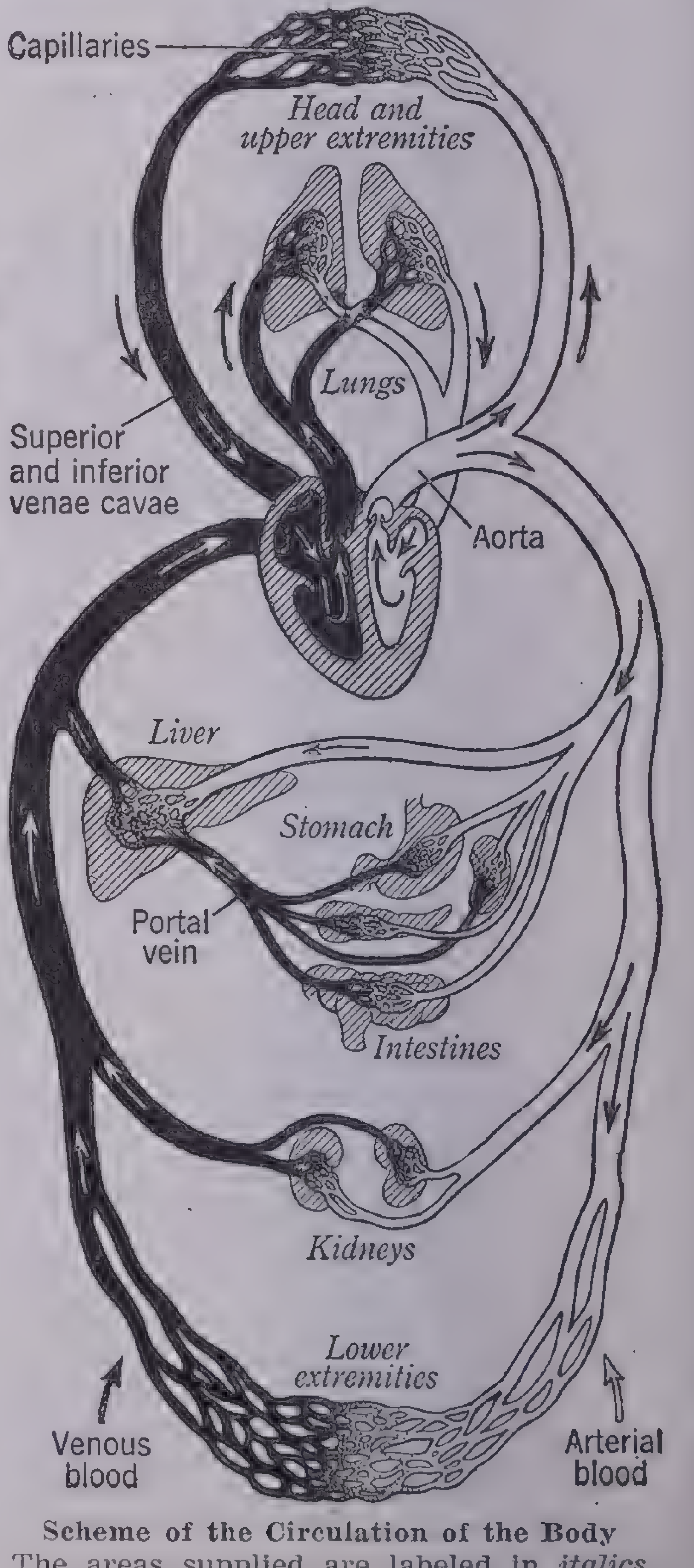
Blood is easily lost through a cut in the skin that severs a blood vessel, and unless some provision had been made for preventing the blood from oozing out of the body, any cut would be fatal. Nature has provided a means to control this by the clotting of blood.

If you remove a small amount of blood from the body and put it in a test tube, in a very short time it will cease to be liquid and will become a jellylike solid. This is due to the formation of *fibrin* from the liquid serum.

When a cut is made in the skin, the blood that comes to the surface forms a clot and plugs up the opening of the cut blood vessel, thus preventing death from hemorrhage. Some unfortunate individuals have a disease known as *hemophilia* in which the blood clots only after a very long time. Those who have it usually die of hemorrhage at an early age. Surgeons are always careful to ascertain whether a patient is hemophiliac or not before they perform an operation.

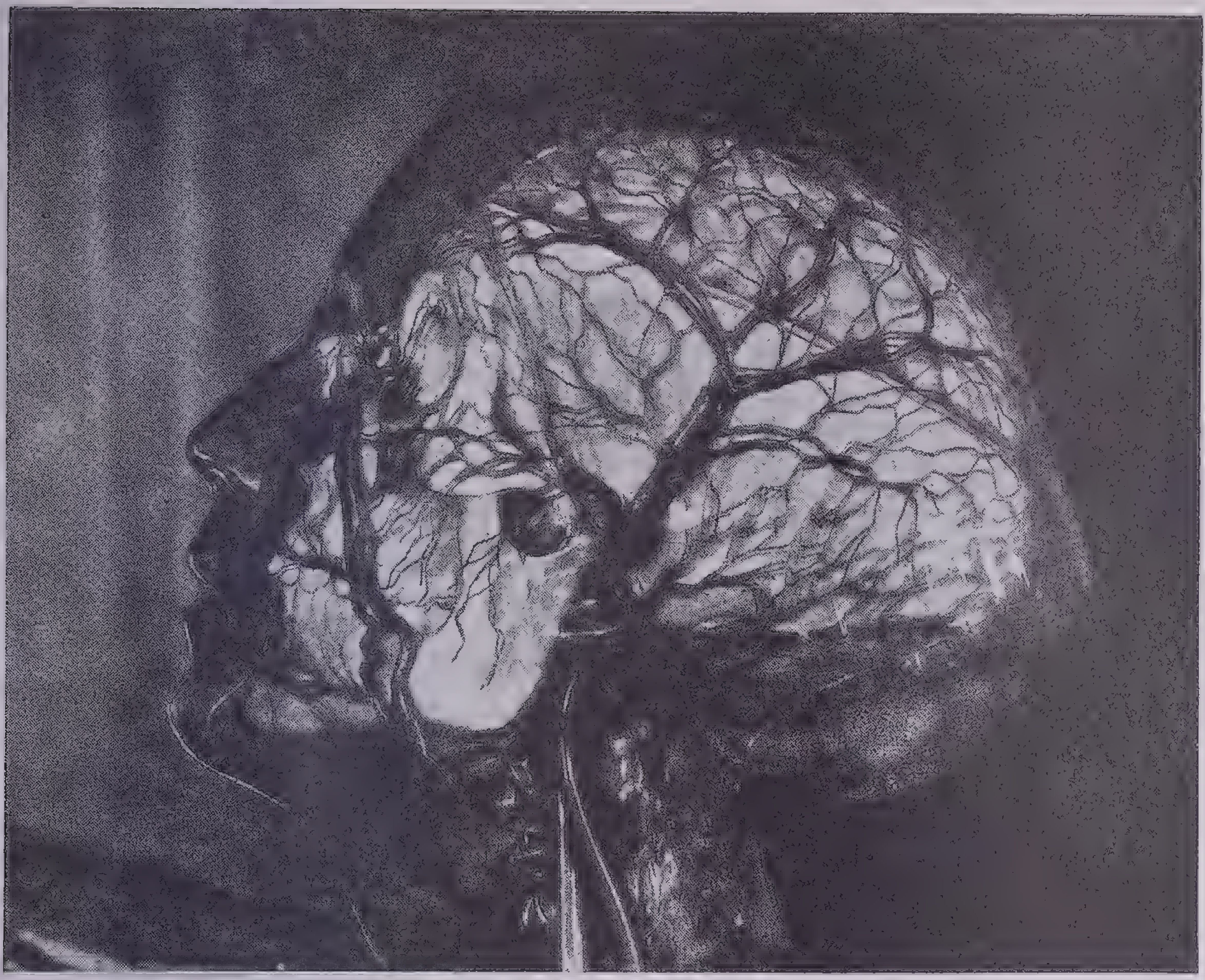
Food, largely dissolved in the serum, is carried from the digestive system to the tissues; and any sample of blood will contain a certain amount of protein, sugar and fat, which are available for tissue use. After a meal high in fats, the blood often turns white on account of the fat particles dissolved in it (lipemia).

Oxygen is carried from the lungs to the tissues in the red blood cells. The hemoglobin of the red blood cell contains iron, which has an affinity for oxygen, so that when the blood reaches the thin membrane of the lungs, the oxygen is diffused through the walls and combines with the hemoglobin. When this same blood is



Scheme of the Circulation of the Body

The areas supplied are labeled in *italics*



Courtesy S. H. Camp and Company

Head of the Transparent Woman

The Transparent Woman and the Transparent Man, created by the Hygiene Museum of Dresden, have been exhibited throughout the United States. Through the transparent skin of these two perfectly modeled forms can be seen in their natural colors the skeleton, organs and circulatory system of the human body. The picture shows the network of blood vessels and the relationship of the skull to the features and to the brain. The top of the skull has been removed to expose the brain

in close contact with the tissues, the oxygen is given up to them.

The white blood cells have various functions, perhaps the most important of which is to defend the body against bacterial invasion. The white cells always rush to a wound, such as a cut in the skin, and begin the process of healing, part of which is to destroy all the germs that have been brought under the surface of the skin at the time of the cut. If the white cells are not able to destroy all the germs, infection results. The engulfment of germs by the white cells is called *phagocytosis,* and they are known as *phagocytes.*

The platelets are concerned with the clotting of blood. As soon as blood strikes the air, the platelets dissolve and help to form fibrin.

The blood is contained in vessels and does not actually come in contact with the tissue cells. A fluid, called *lymph,* that oozes out of the blood vessels and that is much like the blood actually bathes the cells. The transfer of food substances and oxygen from the blood to the cells and of waste products and carbon dioxide from the cells to the blood is actually accomplished by diffusion through the lymph. The lymph is continually being formed from the blood and collecting into vessels called *lymphatics.* Eventually it returns to the blood through the main lymph vessel called the *thoracic duct.*

Circulatory System.—Not only is it necessary for the blood to absorb food from the digestive tract and oxygen from the lungs, but it must also be driven around the body. This is the function of the circulatory system. The parts of this system consist of the heart, which is a muscular pump to drive the blood; the blood vessels or arteries, which carry the blood from the heart; the veins, which return the blood to the heart, and the capillaries, very small, thin-walled vessels that spread out in all the tissues and allow food and oxygen to be diffused through their walls as the tissues need them.

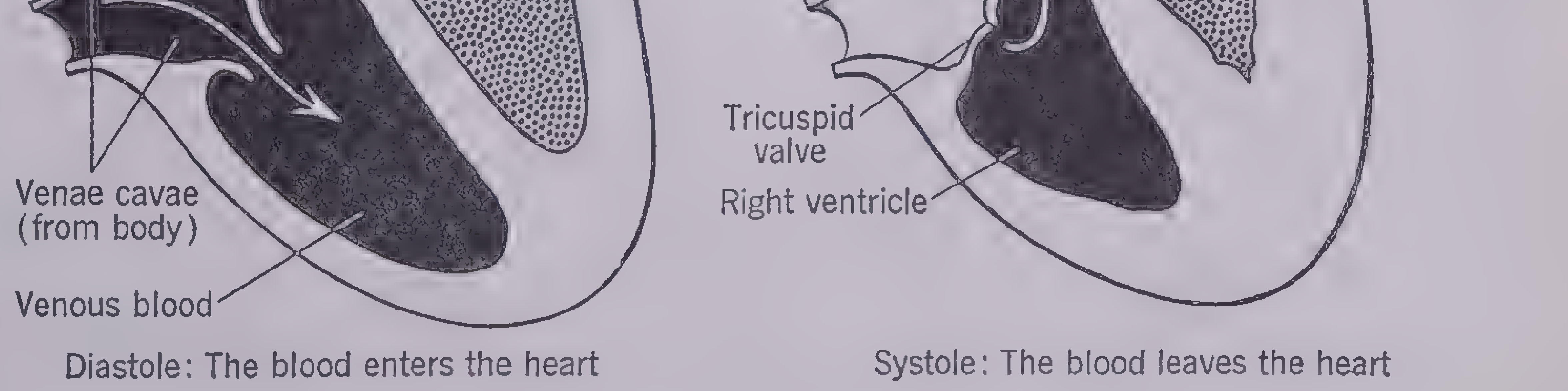
The mechanism of the circulation is one of the most wonderful arrangements made by nature. The blood is kept moving in a continuous circle and prevented from moving backwards by valves in the heart and in the veins.

The heart is a thick-walled muscular organ consisting of four chambers, two on each side. The smaller, upper chambers are called *auricles;* the lower larger chambers, *ventricles.*

The heartbeat consists of a contraction called *systole* and a period of relaxation called *diastole,* in the following series of changes. The blood enters the auricles from the great veins. The blood from the lungs enters the left auricle from the pulmonary vein, and the blood from the rest of the body enters the right auricle from the vena cava. As soon as the auricles are full, they contract simultaneously, forcing the blood past the auriculo-ventricular valves, which open only one way, into the ventricle. (The valve on the left side is called the *mitral valve;* on the right side, the *tricuspid valve.*) This contraction is known as *auricular systole.* When the ventricles have been filled as a result of auricular systole, they begin to contract, and this contraction creates such pressure on the contained blood that it closes the mitral and tricuspid valves, forcing the blood out into the great arteries, the aorta on the left side and the pulmonary artery on the other. This is known as *ventricular systole.*

As soon as systole is over, diastole begins. The heart muscle begins to relax or dilate, the aortic and pulmonary valves close and prevent the blood in the great arteries from returning to the ventricle; the relaxation of the ventricle then opens the auriculo-ventricular valves, and the ventricles begin once more to fill with blood from the auricle, and the whole process is repeated. As the heart beats oftener than once a second, the whole process takes place in much faster time than it can be described.

In order to understand the circulation let us follow a drop of blood around. It comes from the lungs, where it has been laden with oxygen. The pulmonary vein carries it to the left auricle, whence it passes to the ventricle and is then shot out into the aorta, the largest artery in the body.

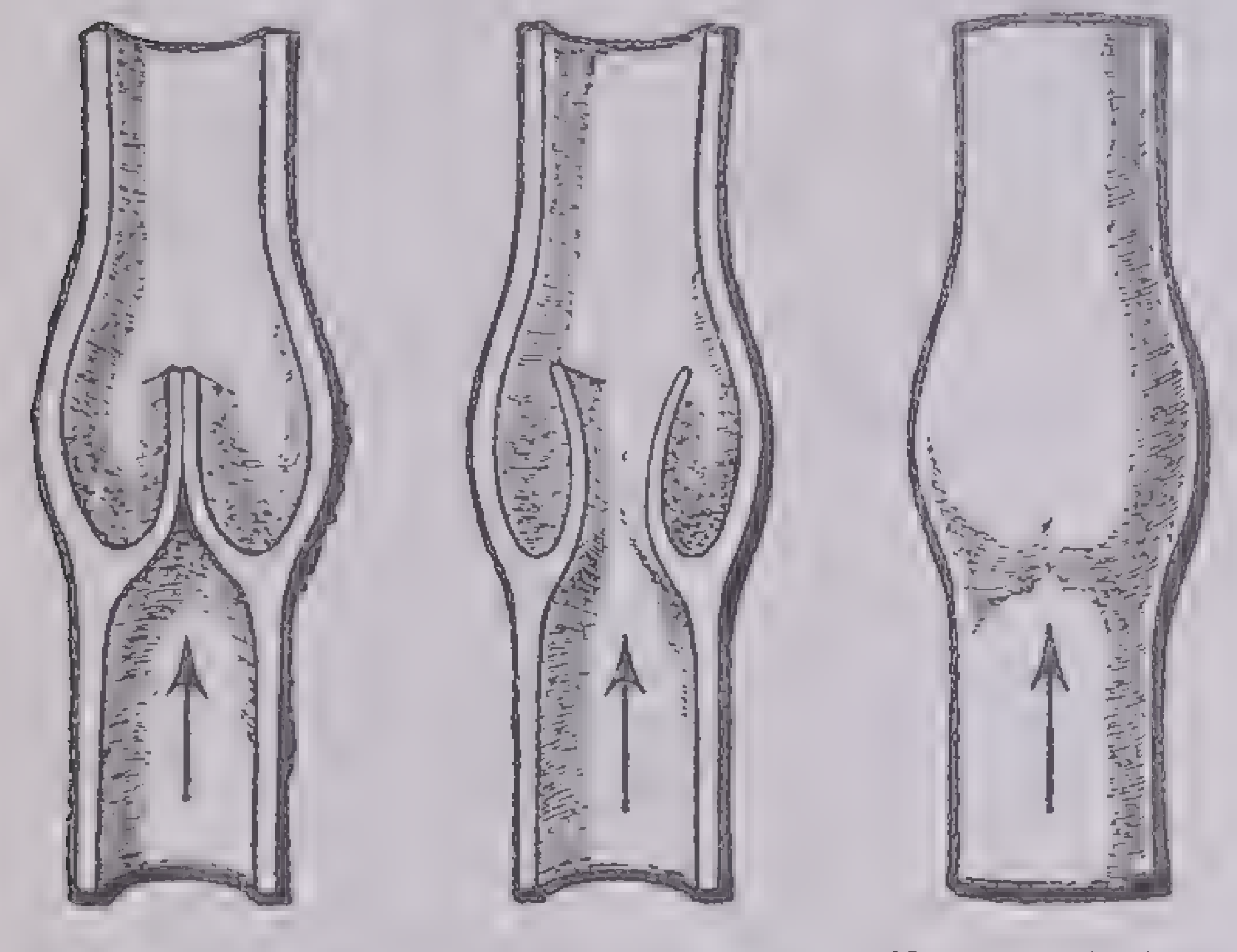


Diastole: The blood enters the heart

Systole: The blood leaves the heart

Action of the Heart

It travels through ever smaller arteries until it reaches the very small thin-walled capillaries in the muscle of the calf of the leg. Here it gives up its oxygen and is loaded with the waste product of the muscle, carbon dioxide. It moves on—the blood vessels are getting larger—until finally it reaches the veins. Here it begins to move upward rather slowly, held at various points by the valves in the veins, until finally it enters the great canal of the large veins just outside the heart, the vena cava. From there it is sucked into the right auricle, goes to the right ventricle and is forced into the pulmonary artery, in which it goes to the lungs. The arteries get smaller and smaller until at last the fine network of capillaries spread out over the lung wall is reached, and through this thin wall air diffuses so that the blood gives up its carbon dioxide and is loaded again with oxygen. Then it enters the pulmonary vein, returns to the left auricle, and the entire process is repeated.



Cross Section of the Valves in the Veins
Arrows indicate the path of the blood

This same drop of blood on another occasion might find its way to the wall of the intestine, in which case it gets loaded with food material, then enters the portal vein and is carried to the liver. There it gives up its food materials and going through the capillaries of the liver enters a vein that carries it immediately to the vena cava. This is the third or portal circulation. The first is the general or systemic; the second, through the lungs, the pulmonary.

Normally the heart beats about 70 or 75 times each minute in adults, somewhat faster in children and slower in older persons. The beat of the heart can be felt as the *pulse* by placing a finger over the artery in the wrist or over the apex of the heart; and it can be heard by listening to a person's chest. The heart ordinarily pumps about 4 quarts of blood each minute. During a day the work done by the heart in an average adult is equivalent to raising a mass of 200 tons through a distance of 1 foot. In a lifetime the work done by the heart is equal to the energy that would be required to lift it to the moon.

Correlation of Pulse and Temperature. As a general rule the correlation of pulse and temperature may be stated as follows:

An increase of temperature of one degree above 98 degrees Fahrenheit corresponds with an increase of 10 beats of the pulse per minute, as in the following table:

Temperature of 98° corresponds with a pulse of 60.
Temperature of 99° corresponds with a pulse of 70.
Temperature of 100° corresponds with a pulse of 80.
Temperature of 101° corresponds with a pulse of 90.
Temperature of 102° corresponds with a pulse of 100.
Temperature of 103° corresponds with a pulse of 110.
Temperature of 104° corresponds with a pulse of 120.
Temperature of 105° corresponds with a pulse of 130.
Temperature of 106° corresponds with a pulse of 140.

To put it another way, the daily work the heart does is sufficient to raise a man of 150 pounds twice the height of the Woolworth Tower. The 24-hour stint is done second by second.

Fainting. This is commonly the result of defective circulation in the brain (cerebral anemia) and not of disease of the heart. The proper treatment for fainting is to lay the person on his back with the feet higher than the head.

First Aid for Bleeding. Injury to an artery can be recognized by the intermittent spurting of the bright-red blood. Treatment for any form of bleeding is compression. If arterial bleeding occurs in an extremity a tourniquet or tight bandage should be wound around the extremity between the heart and the point of bleeding, that is around the lower arm if the bleeding is at the wrist and the upper arm if the bleeding is at the elbow; around the leg if the bleeding is at the ankle and around the thigh if the bleeding is at the knee. The bandage should be compressed tight enough so that the bleeding stops. Treatment of venous bleeding is by pressure over the site of the hemorrhage. Bleeding from a vein is slower and more regular, and the blood is darker.

Heart Disease. More people die from diseases of the heart and blood vessels than from any other single cause. Usually these diseases come late in adult life. Proper hygienic living is the best way to avoid premature disease of these parts. It is also important to avoid poisoning from alcohol, infected teeth, tonsils and adenoids and from infectious diseases in general. Work, rest, sleep and diet in moderation and balance are the best-known rules for the care of the heart and blood vessels.

Metabolism or Nutrition.—The processes by which food and air are converted into energy and tissue are known as *metabolism.* They are discussed at more length in the article on *Nutrition,* but it should be pointed out here that metabolism is a natural step in the process we have been describing: first, the preparation of food and the preparation of air in order to furnish combustion and oxygen to the body tissues; the conveyance of those substances in the blood and by means of the circulatory system.

Excretory System.—Like every engine the body forms some waste products. As glucose is oxygenated in the muscles, certain substances form. Among them is water. As protein material is metabolized, certain other waste products form. In the case of protein it is urea and uric acid. These are like the cinders formed in a furnace or the exhaust gas from an automobile. These waste products must be removed from the body; this is the function of the excretory system.

Organs of Excretion. The principal excretory organs are the *lungs, kidneys* and the *perspiration glands* of the skin.

The kidneys are the chief organs of excretion in the body. They are paired organs, lying in the abdominal cavity on either side of the spinal column. The blood brings waste products from the body, and as it circulates through the kidneys, the kidney cells remove these waste products. The principal substances excreted by the kidneys are water, urea and salt. These are removed from the circulating blood in the kidney and form the watery excretion called *urine.* The tubules and glomeruli of the kidneys collect the urine from the blood, and it is passed from the kidneys down the ureters to the urinary bladder and stays there until expelled from the body. The ordinary, healthy person should drink each day about six glasses of water (in addition to the water that occurs in solid foods) to provide sufficient fluid for the proper excretion of body wastes. The excretory functions of the skin have already been described. They operate through the sweat glands.

Endocrine Glands.—All the processes of the body except voluntary movement and mental effort are carried out automatically. The very finest adjustment exists between all the body's needs. We do not breathe more than we have to; the heart pumps blood to different organs exactly as they need it. When we need food, we get hungry; and our tissues absorb just those substances that are necessary.

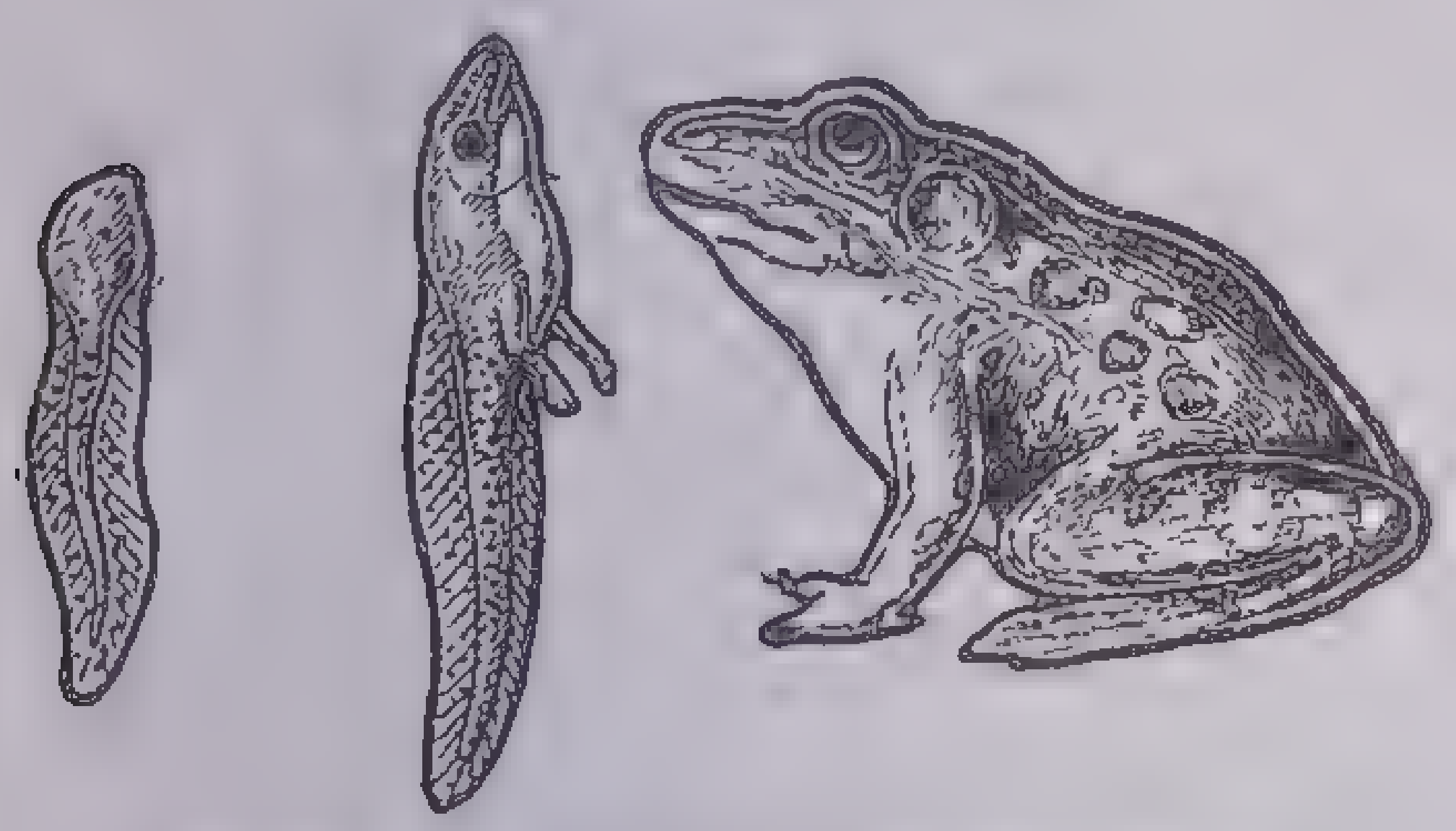
All these processes have to be regulated, and the regulation is largely under control of the *ductless glands,* sometimes called the *endocrine glands.* These glands are 12 in number, and in general they influence the functions of nutrition, growth and reproduction. To a certain extent they affect the mental state. They are widely scattered in the body and are different from all other glands in that they do not pour their secretion through a duct into a cavity, but their secretion is absorbed directly into the blood stream.

A description of these glands follows:

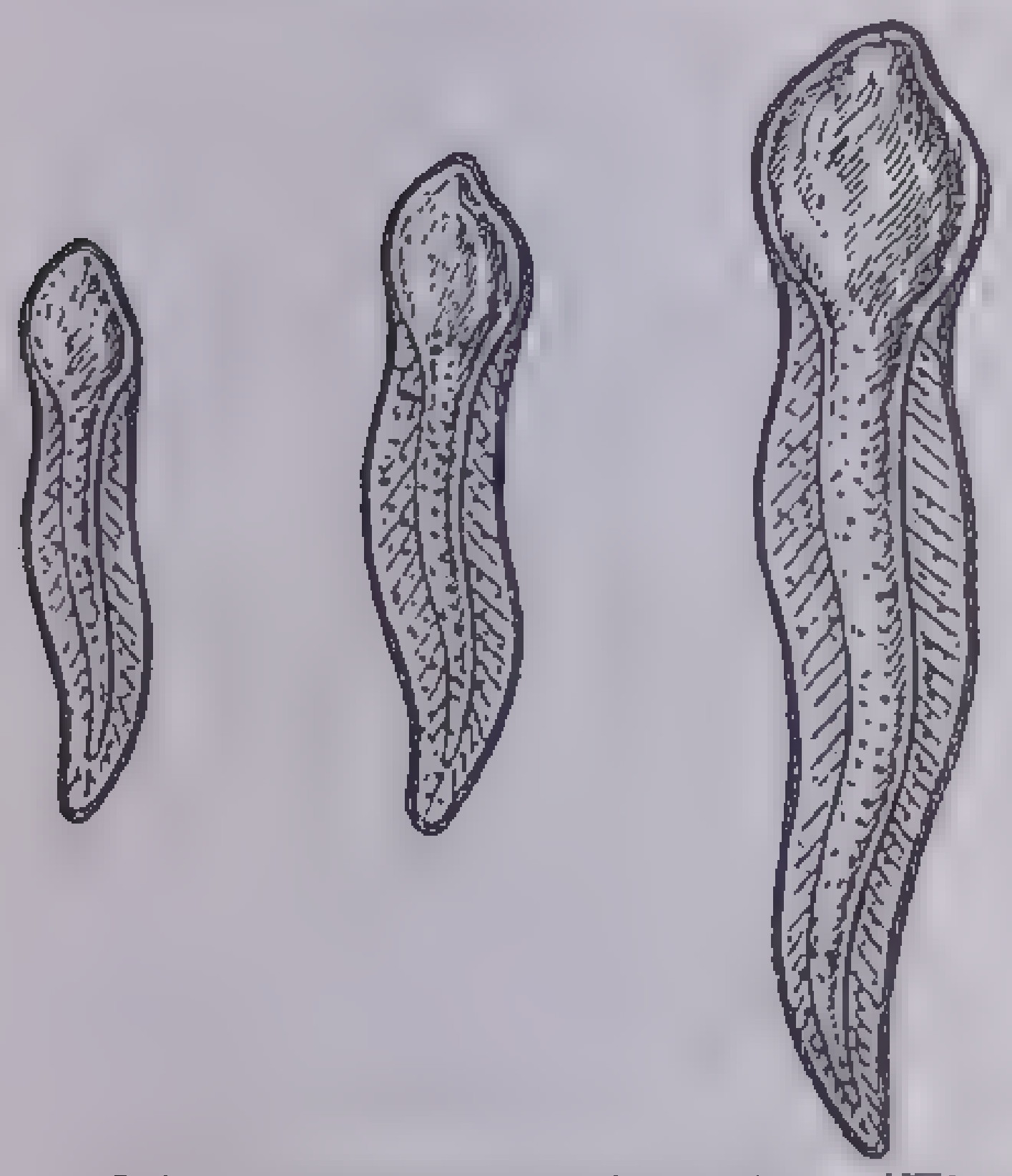
The *pituitary gland* lies inside the skull at the base of the brain. It consists of anterior, middle and posterior parts; the parts differ somewhat in function and structure. The anterior pituitary has a secretion that influences many bodily functions. One of its secretions regulates growth, and derangement of this secretion produces the condition known as *giantism,* in which young people grow rapidly to heights of 7 or 8 feet or more, and *acromegaly,* in which there is great enlargement of the hands and feet and lower jaw and bones of the face. Another function of the anterior pituitary is to exert a regulatory action on the thyroid secretion and the secretions of the glands of reproduction.

The middle and posterior portions of the pituitary gland influence water metabolism. When they are deranged, a disease known as *diabetes insipidus* appears—the patient consumes and passes out by way of the kidneys large quantities of water.

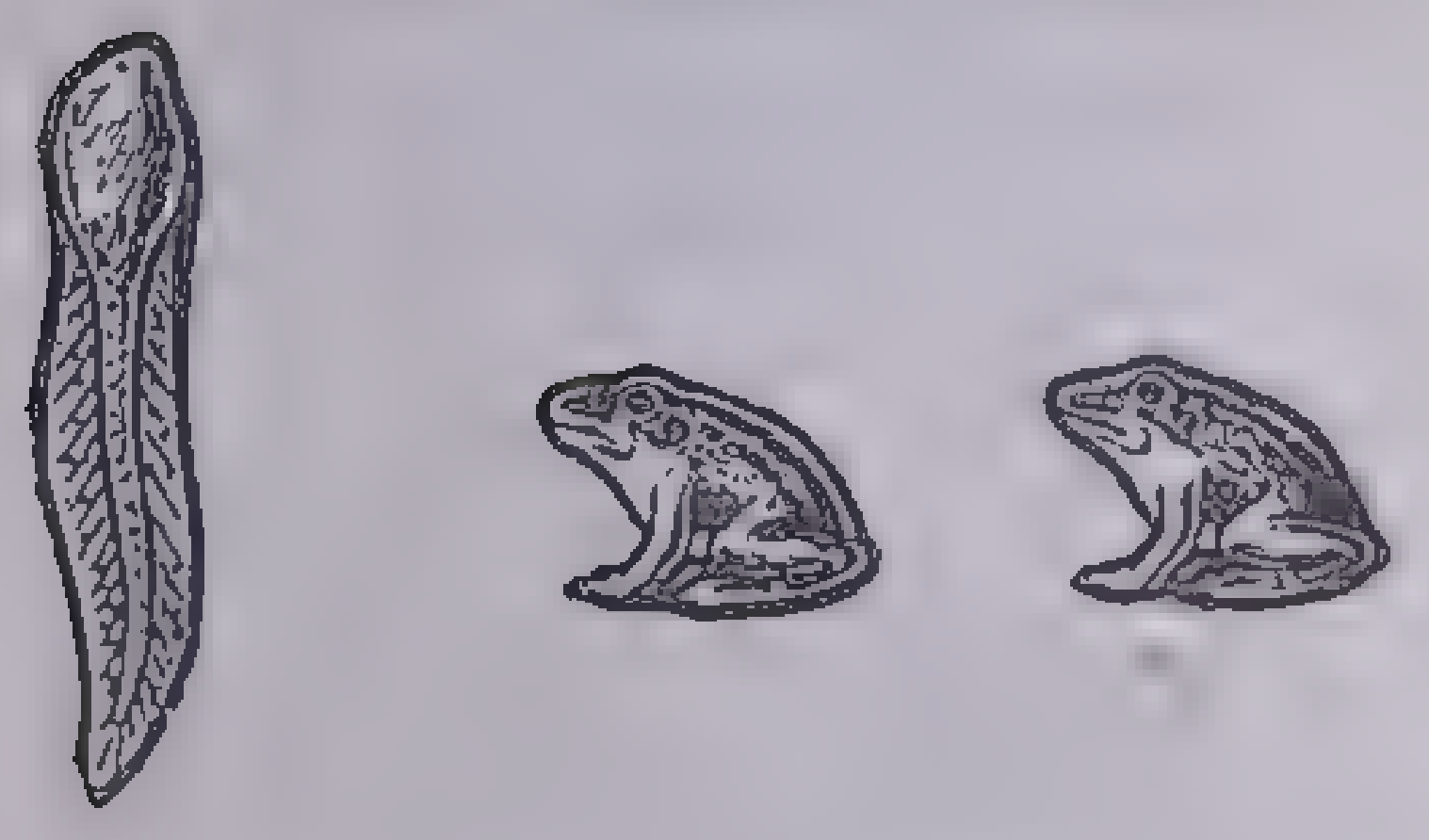
The *thyroid gland* consists of two lobes connected by a narrow band of tissue, the isthmus, which lie in front of the trachea. Its hormone (active principle or active ingredient of the secretion) is important in the regulation of the rate at which the body tissues live, the activity of the nervous system and the growth of the body. Perhaps it has other functions not yet clearly understood. Its effect on growth and normal development is illustrated in experiments with tadpoles. A tadpole whose thyroid has been removed continues to grow without metamorphosis into the adult form, the frog. But a tadpole that has been fed an excess of thyroid extract develops prematurely into a frog which is normal except that it does not attain normal size.



Normal growth and development



Thyroid gland has been removed. Growth without development



Thyroid fed in excess. Premature development and insufficient growth

What Happened to the Tadpoles

An experiment illustrating the effect of the thyroid gland upon the growth and development of the frog

The human beings who live in parts of the world where iodine is scarce in water and foods are subject to a disease of the thyroid, because the hormone of this gland contains iodine. If iodine is lacking, the gland undergoes enlargement (hypertrophy). When the gland becomes enlarged, there is a swelling in the front of the neck. This condition is called *goiter*. The thyroid may become enlarged from other causes, and it is important to consult a physician as soon as even a slight enlargement or swelling is noticed. Goiter is far more common in girls and women than in boys and men. If the physician finds that the enlargement is due to a shortage of iodine and too little thyroid secretion (hypothyroidism), and if he discovers it in the early stages, he can prescribe iodine in the diet and quickly effect a cure. Delay makes his problem far more difficult. Iodine should not be taken except upon a physician's recommendation.

The *parathyroid glands* are four small glands placed behind the thyroid. Their secretion influences calcium metabolism, which conditions the tone of the muscles and the growth of bone and teeth.

The *thymus gland* is a large gland in the chest, just under the breastbone. It probably influences growth, since it disappears about the time of the beginning of growth at adolescence (the age of 12 to 15 years).

The *Islets of Langerhans* are in the pancreas. These cells do not contribute to the external secretion of the pancreas into the intestine, but their secretion is absorbed into the blood and influences glucose metabolism. Atrophy of these cells causes the disease known as *diabetes mellitus,* in which sugar is not burned in the muscles but passes out of the body intact in the urine.

The *adrenal glands* are the two glands that sit on top of each kidney. Each adrenal gland consists of two parts—an outer part, the *cortex,* the secretion of which influences hair growth (the bearded woman in the circus probably has a diseased adrenal cortex) and other secondary sexual characteristics. The middle part of the adrenal gland is known as the *medulla,* and it excretes a substance known as *adrenalin.* This has many important functions in regulating the distribution of the blood supply, toning the muscles and regulating the discharge of glucose from the liver.

In times of fear, anger or other emotional stress the body is capable of unusual physical efforts because of increased secretion from the adrenal and other glands.

The *gonads* are two reproductive glands that have also an internal secretion.

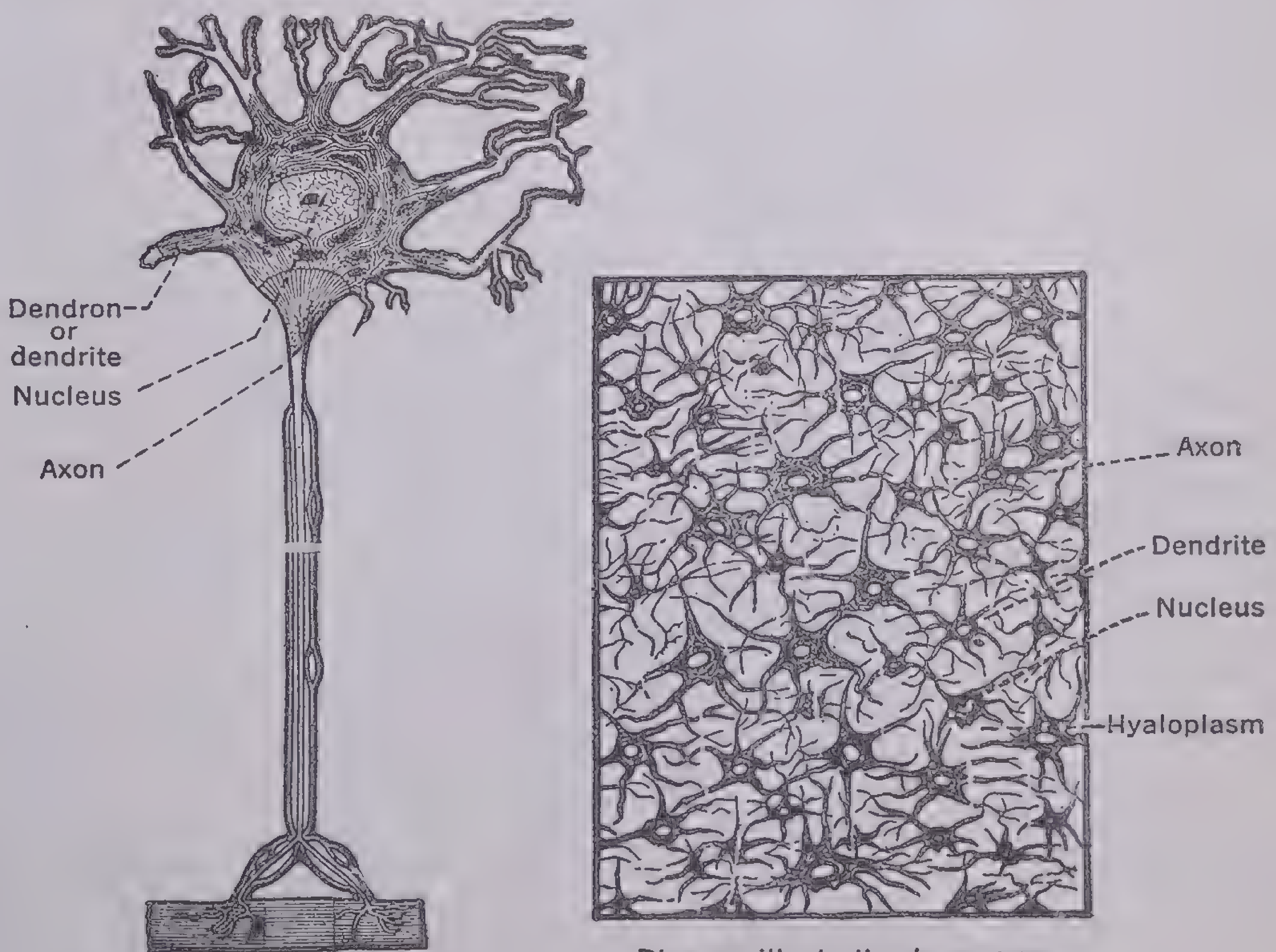
Nervous System.—The principal control, direction and harmony of action in the body is due to the integrating (co-ordinating) action of the nervous system. The chief parts are the *brain, spinal cord,* the *ganglia* (groups of nerve cells) and the *nerves.*

The Brain. The principal parts of the brain are the *cerebrum,* the *cerebellum,* the *pons* and the *medulla oblongata.* Twelve pairs of nerves (the cranial nerves) are offshoots from the brain. These nerves are associated with the special senses—sight, taste and the like.

The Spinal Cord. Continuous with the medulla is the long spinal cord that runs down from the head along the length of the back and is enclosed within the spinal column. From the cord 31 pairs of nerves (the spinal nerves) branch off. There are also two rows of ganglia (the spinal ganglia) in front and on either side of the cord; these are connected with it by nerve fibers.

The Nerves. From a functional point of view, the nerves are divided into two classes: the *afferent* nerves carry sensations to the central system (brain and cord) where the nerve cell is located; the *efferent* nerves carry impulses from the central system or nerve cell to the muscle, organ, blood vessel and so forth with which the nerve is related and whose activity it affects or controls.

The Reflex Arc. The simplest kind



Nerve cell connected by axon to a muscle fiber

Diagram illustrating how nerve cells are interrelated in the brain

Nerve Cells

THE HUMAN FACTORY

BREATHING

The breathing system is shown as a bucket chain picking up oxygen from the air at the nasal openings and emptying it into the blood within the lungs. On leaving the lungs the buckets carry away carbonic acid gas from the blood pumped there by the heart. Thus, the blood is purified

FOOD

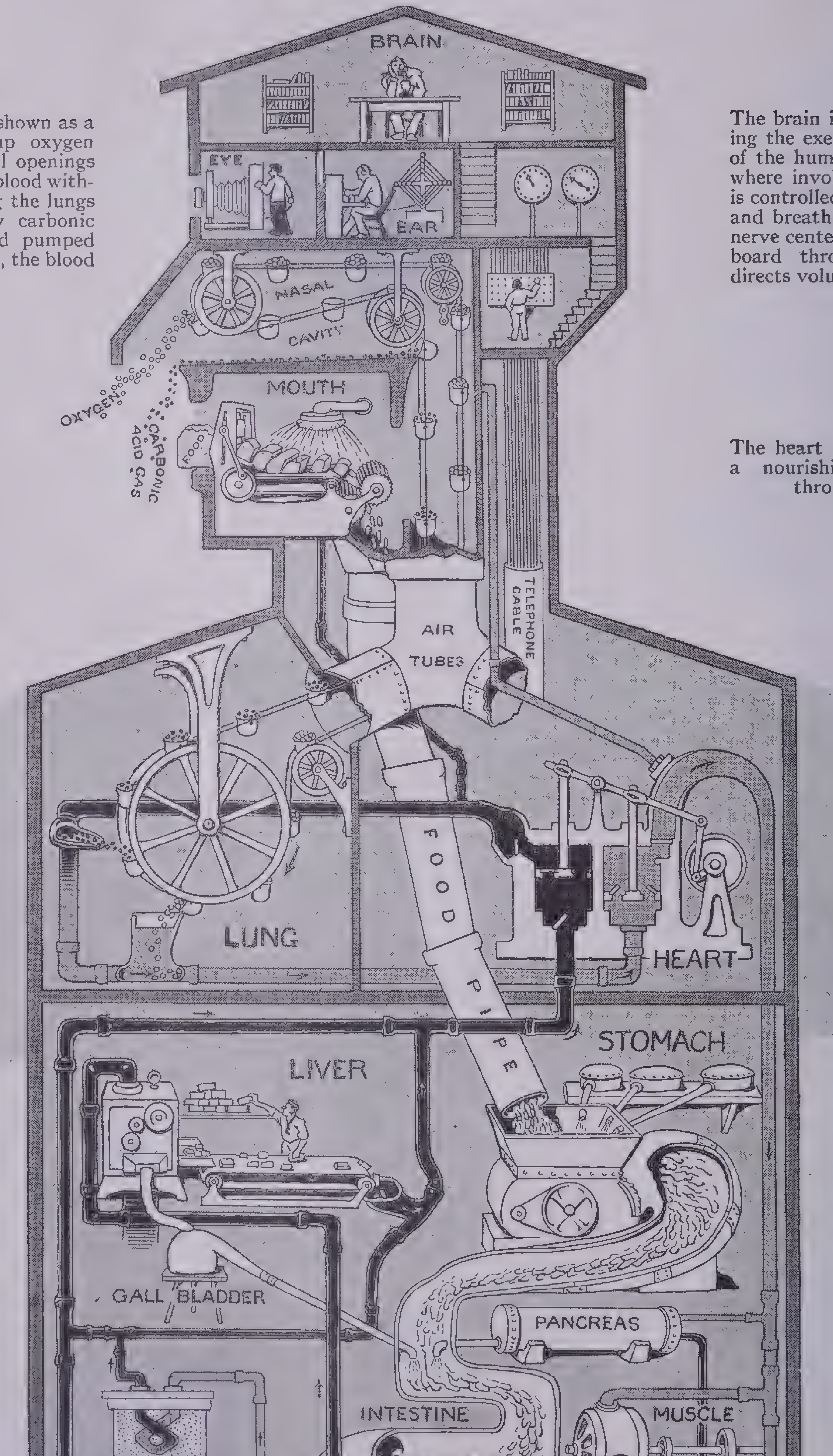
Food entering the mouth is shown being cut by a slicer (the front teeth) and then carried on a conveyor (the tongue) to the crusher (the back teeth). During this process of cutting and mashing, the salivary secretions from the mouth are mixed with the food.

LIVER

In the liver, sugar is stored in the form of animal starch (glycogen); wastes and poisons are removed from the blood, and bile is manufactured. The bile is stored in the gall bladder until it is needed in the intestines.

KIDNEYS

The kidneys are filters for the blood; they filter water and many waste products out of the blood, thus producing the urine.


BRAIN
EYE
EAR
NASAL
CAVITY
OXYGEN
CARBONIC ACID GAS
MOUTH
FOOD
AIR
TUBES
TELEPHONE CABLE
FOOD PIPE
LUNG
HEART
STOMACH
LIVER
GALL BLADDER
PANCREAS
INTESTINE
MUSCLE
KIDNEY
URINARY BLADDER
Shepard

BRAIN

The brain is represented by picturing the executive or directing head of the human factory; a dial room where involuntary muscular action is controlled, such as the heart beat and breathing. The motor (action) nerve center is pictured as a switchboard through which the brain directs voluntary movements of the body.

HEART

The heart is a pump which forces a nourishing stream of blood throughout the body.

STOMACH

The stomach is a mixer and kneader It is here that pepsin and other ferments are mixed with the food.

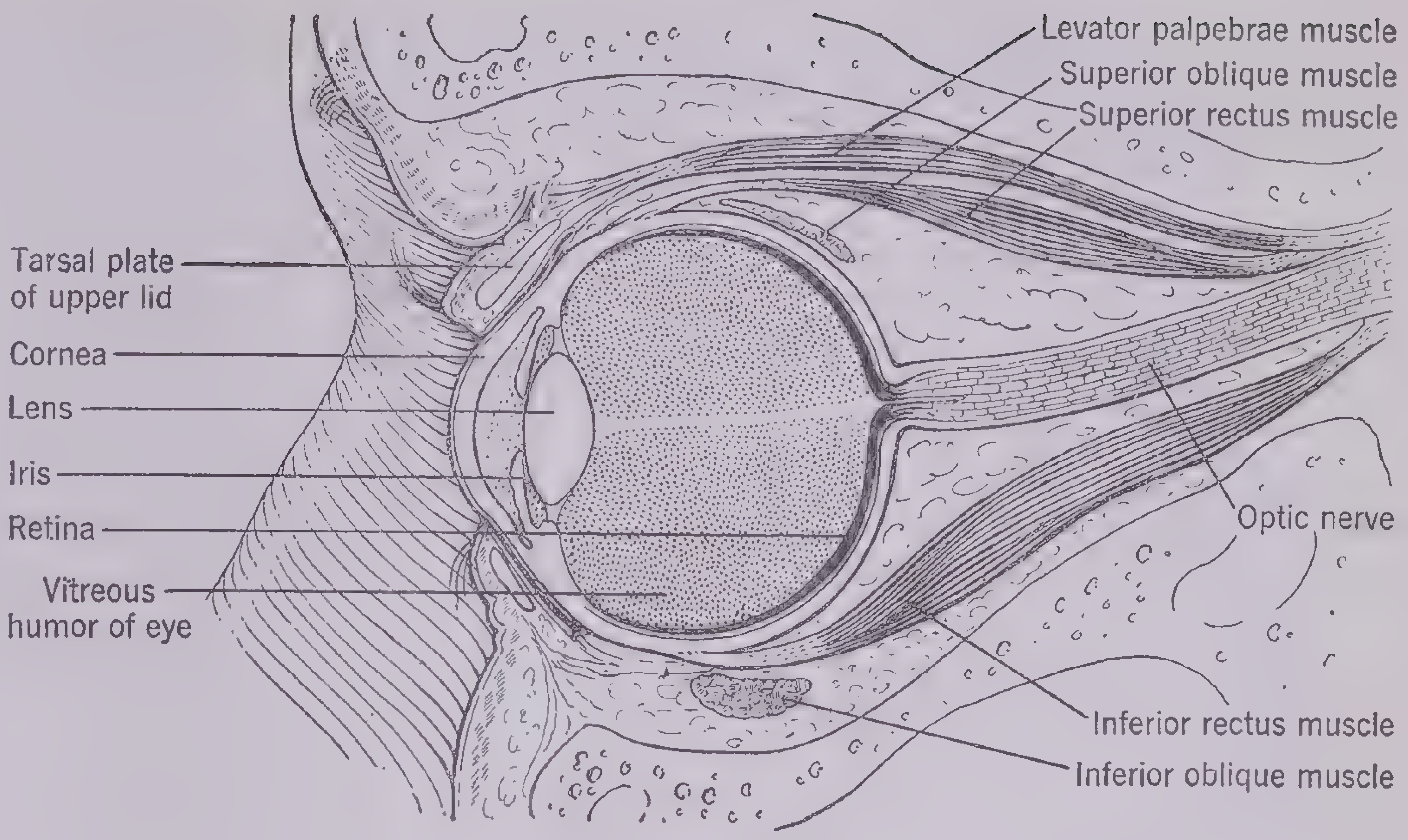
INTESTINES

From the intestines the blood takes sugar and other digested foods.

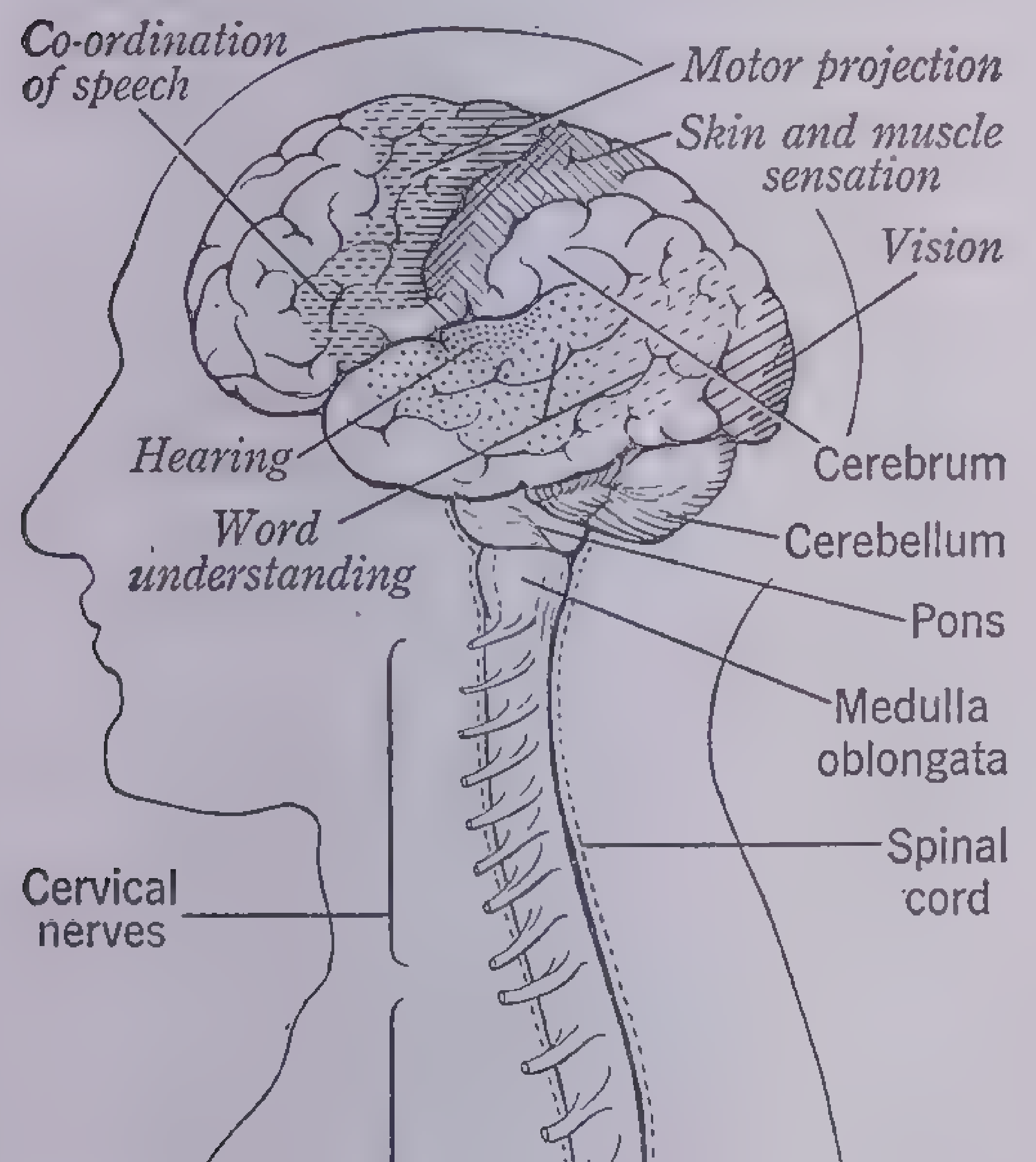
MUSCLES

A picture of a motor is shown to indicate the muscles — energy and power. The blood brings to the muscles the fuel and removes the wastes.

of nervous control of organs or tissues takes place in the *reflex.* A stimulus is given the nerve ending, for instance, by a prick of the skin, a burn or shock. This stimulus passes along an afferent nerve to a ganglion in the cord. There this *sensory* stimulus is transformed into a *motor* stimulus, which is directed back along an efferent nerve and causes muscles to contract and draw away the part of the body that was stimulated. This cycle is called the *reflex arc* because it may happen without any consciousness or voluntary interference. Even if a message is relayed from the spinal ganglion up the spinal cord to the brain, many reflexes may be completed before the brain has been made aware of the primary stimulation. Automatic or reflex behavior in the nervous system is often likened to an automatic or dial telephone system with its extensive wires, cross connections, switchboards, automatic controls and so forth. The brain is then analogous to the central station that controls the switchboard. In complexity, however, the nervous system far exceeds any known mechanical system. Man has only scratched the surface of the problem of understanding the workings of the nervous system.



The Eye and Associated Structures



The Central Nervous System

The functional areas of the cerebrum are labeled in *italics*

Nervous Fatigue and Rest. Like all other living cells the neurons carry on active metabolism (chemical changes of life processes) in which repair must keep pace with use and injury. Rest is just as essential to nerves as to muscles. The chief rest of the nervous system is sleep. It is important that the nervous system be protected from drugs or poisons that speed it up or injure its organs. Chief among the common substances injurious to the nervous system is alcohol. Even small doses reduce the efficiency of this system; larger doses may be actually poisonous. Coffee, tea and tobacco are harmful to the nervous system when they are used in excessive quantities.

The Special Senses.—All normal persons are equipped with organs for the *special senses—seeing, hearing, smelling, tasting* and *touching.* These senses are made possible by highly specialized types of organs (as eye, ear, nose) at the ends of special sensory nerves. These organs provide us with the means of relating ourselves to the environment. With their aid we recognize what is going on about us.

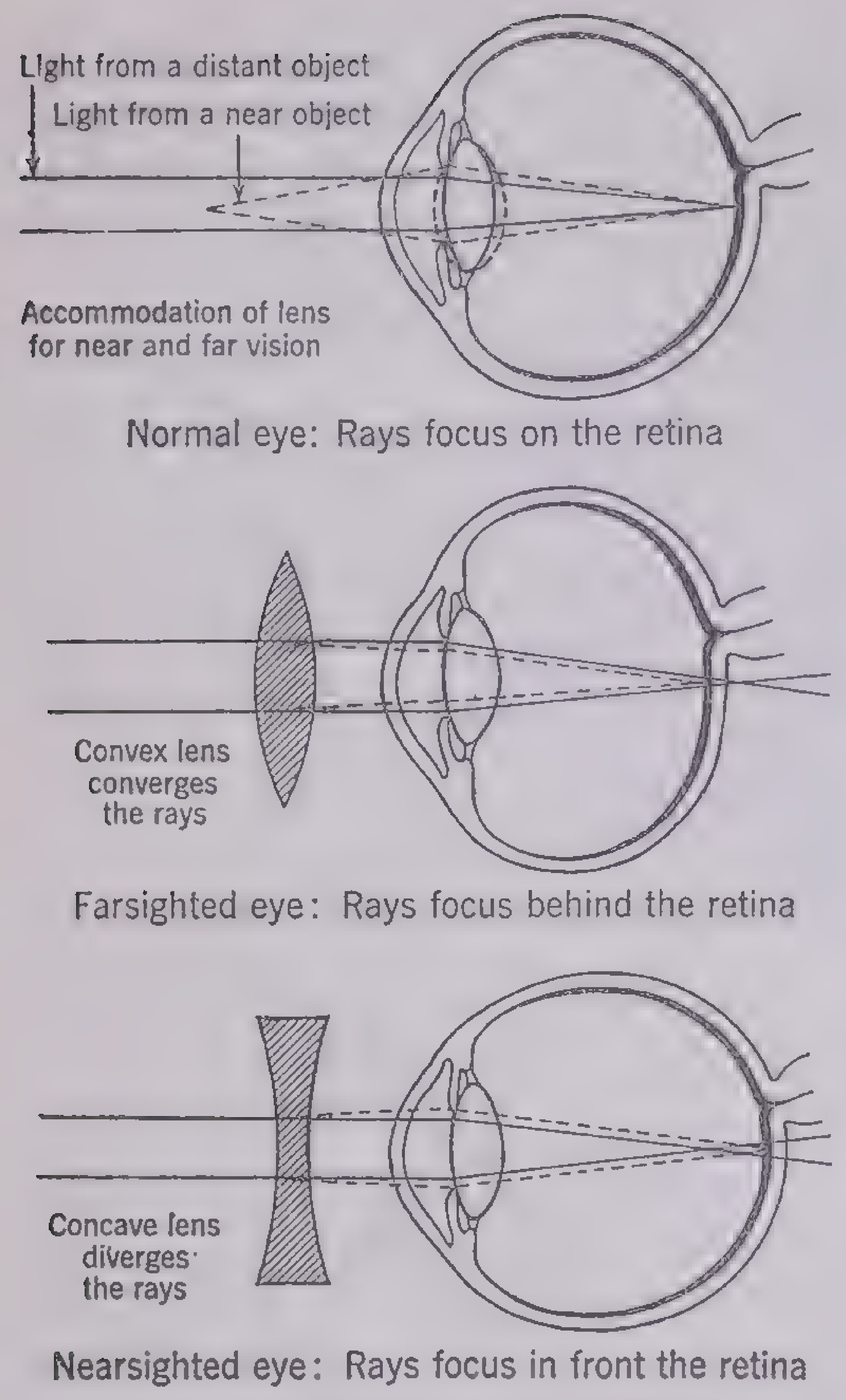
THE EYE. Perhaps most important among the organs of special sense are the eyes. These are very delicate and very complex structures that lie in protecting cavities of bone. The eye is often likened to a camera, because it has a lens in front to focus an image upon a sensitive screen behind. To understand the proper care of the eye it is essential to know something about its construction and functions.

The eye is a ball-like structure with three coats; the outer one is the *sclerotic,* the middle one, the *choroid,* and the inner one, the *retina.* The ball is divided by the lens into two chambers, both filled with fluids called *humors.* The anterior chamber, filled with *aqueous humor,* has the jellylike crystalline lens at its back; the posterior chamber, filled with *vitreous humor,* is lined by the retina, which is made up of blood vessels and the extremely complex, specialized endings of the optic nerve that runs to the brain. The sclerotic coat, the white of the eye, has a round area in front, the *cornea,* which is transparent to light. The choroid coat below it has a round opening in front, the *pupil,* and around it a pigmented region, the *iris.* From the iris the eye gets its color—black, brown, blue, gray or hazel. The iris is under the control of muscles that can expand or contract it so that light enters the eye. This change is easily observed when a light is flashed into an eye that has been covered for a few moments. As an excess of light strikes it, the iris contracts.

The crystalline lens is attached to the choroid coat by special ligaments, the *zonule of Zinn.* The ciliary muscle that is circular around the eye controls the tension of the ligaments. The action of the ciliary muscle of the lens is involuntary. The lens changes shape because the eye attempts to focus. When the eye is directed on a nearby object, the tension on the lens is increased, and the lens is flattened. When the eye sees a distant object, the tension on the lens is relaxed, and the lens becomes thicker and its surfaces more highly curved. By these means light from more or less distant sources is brought to a focus on the retina. With advancing age the lens tends to become hard and less easily variable in shape, and the choroid and the muscles become less responsive to stimuli and less accurate in functioning.

The *retina* is an extremely complex structure in which light produces various chemical and physical changes that send suitable stimuli along the fibers of the optic nerve to the brain. There the stimuli are interpreted to give the impressions of light, color and so forth. The two eyes act together so that vision is single and stereoscopic, giving effects of distance and depth.

The eye is bathed continually by the secretion of the *lachrymal gland.* This fluid normally flows over the eye and is drained off through the *lachrymal duct* at the nasal corner of the eye.


Light from a distant object
Light from a near object
Accommodation of lens for near and far vision
Convex lens converges the rays
Concave lens diverges the rays

Normal eye: Rays focus on the retina

Farsighted eye: Rays focus behind the retina

Nearsighted eye: Rays focus in front the retina

Normal Vision and Correction of Abnormal Vision

When under the influence of nervous or emotional stress or a local irritant, this gland is unusually active, the excessive quantity of fluid it secretes may overflow the eyelids as *tears*. The eye is also protected against injury and foreign bodies by the eyelids and eyelashes. The lids are controlled by muscles which are under voluntary control but which also operate involuntarily.

Defects of Vision. The eyes are very frequently handicapped by abnormalities of structure and function.

If the eyeball is too short from front to back, the focus is *behind* the retina. To correct this the lens of the eye must be made thicker (more convex), and the ciliary muscles that effect this change are called into use so often that serious strain results. The situation (*hyperopia* or long-sightedness) is corrected by means of a suitable convex lens or eyeglass.

But if the eyeball is too long (from front to back), the focus is in *front* of the retina and the correction of this condition (*myopia* or near-sightedness) is made with a suitable biconcave lens.

When the surface of the cornea becomes irregular, the image is indistinct on the retina (*astigmatism*). This can be corrected by suitably prepared eyeglasses.

Everyone should have his eyes tested at least every year or two to detect defective conditions in their early states. Parents can often discover that a child's eyes need attention by the fact that he holds a book too close or too far away when reading. Some common eye defects can be corrected if they get prompt attention. If the child's eyes tend to be *crossed,* they should be examined by an eye specialist without delay.

Color Blindness. This condition is rather widespread, but many persons are unaware for years that their eyes are defective in discriminating colors. Complete color blindness is rare. Failure to distinguish red and green is the commonest fault. Color blindness occurs far more often in men than in women.

Eye Strain. The commonest cause of eye strain is using the eyes under too strong or too weak illumination. Particularly for reading the light should be shaded so that the eyes are not exposed to glare, and light in moderate intensity should fall on the object not upon the eyes. A flickering light should be avoided. The correct distance for reading is from 12 to 14 inches for the normal adult eye and somewhat less for children. When the eyes are being used for close work like reading, they should be rested frequently by closing the eyelids or by looking off at the sky or some distant object. When the eyes have been irritated by dust, wind, excessive sunshine or glare, they can be quickly soothed by being bathed with boric-acid solution.

Foreign Bodies in the Eye. When a foreign body such as a dust particle gets into the eye, the eye should never be rubbed. If the body cannot be removed by gently drawing one lid over the other, it should be removed as soon as possible by a physician or other competent person who knows how to turn the lids back and remove the irritating object with the corner of a clean handkerchief or other suitable object.

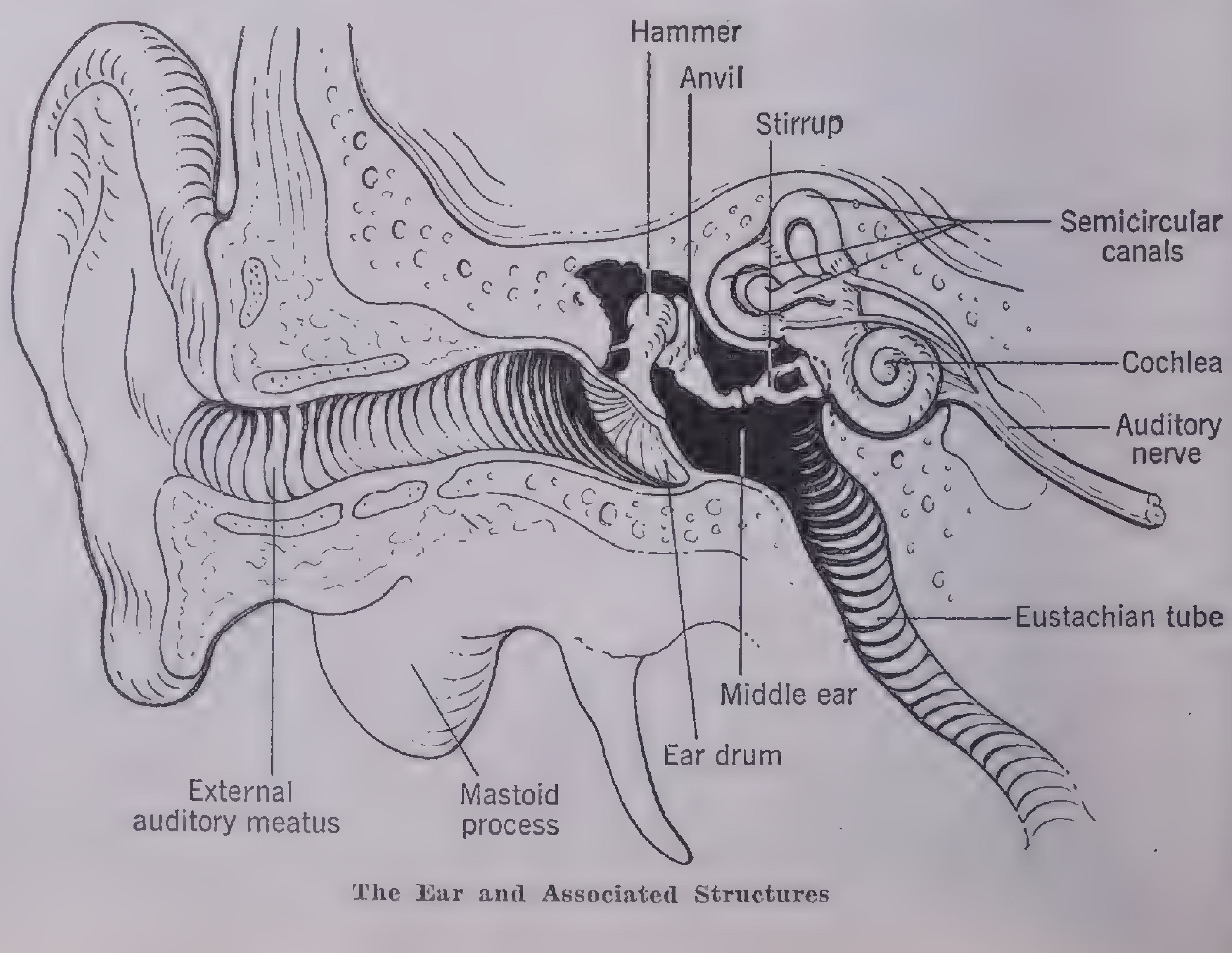
The Ear. The ear is probably next to the eye in complexity and importance as an organ of special sense. It consists of three parts—the *external, middle* and *internal.*

The External Ear. This consists of the trumpetlike part of flesh and cartilage that is ordinarily called the *ear.* Its function is to catch sound waves and reflect them through the opening (external auditory meatus) into the auditory canal). The auditory canal is guarded by cartilage and at its beginning is lined with *cerumen* or *ceruminous* glands that secrete a sticky material called *ear wax* that catches dust and dirt particles. Beyond this region is a bony canal terminated by a thin membrane, the eardrum or tympanic membrane, that is stretched across it.

The Middle Ear. Just beyond the eardrum is another cavity, *tympanic cavity,* which connects with the upper part of the throat by the Eustachian tube. In the tympanic cavity lie three bones called the *hammer* (*malleus*), *anvil* (*incus*) and *stirrup* (*stapes*) because they resemble these things in function or shape. The hammer is fastened to the eardrum and vibrates when sound waves entering the ear make the drum vibrate. The vibrating hammer strikes upon the anvil, and the anvil vibrations are in turn transmitted to the stirrup, which transmits them to the inner ear. The net effect of this ingenious arrangement is that when the vibrations of the eardrum reach the inner ear they have been magnified about 30 times. The Eustachian tube, normally open to the throat and mouth, permits equalization of pressure on both sides of the eardrum. When the nose is blown, it is extremely important to keep the mouth open, especially when one is suffering with a cold. Otherwise mucus and bacteria may be driven into the Eustachian tube and into the sinuses (cavities in the bony structures in the nose) and lead to painful and serious disease.

The Internal Ear or Labyrinth. This consists of two functional and structural parts, one concerned with hearing and the other with balancing and sense of position and direction.

Hearing is accomplished by transmission of vibrations from the stirrup bone to the fluid in the cochlea, a part of the internal ear. It is called *cochlea* because it is spiral-shaped like a conch or snail shell. The mo-



The Ear and Associated Structures

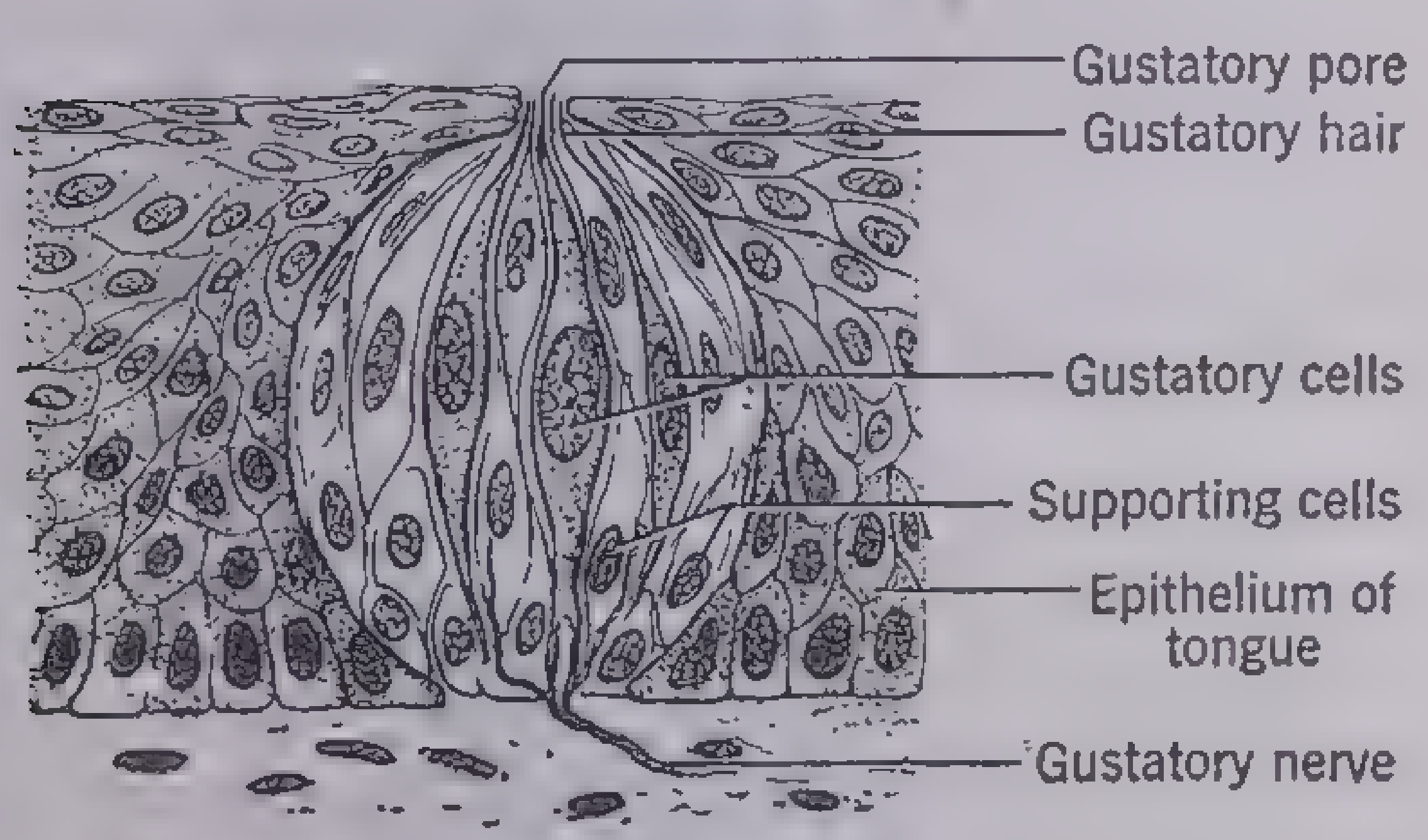
tion of the fluid in the cochlea causes vibration of hairlike endings of the auditory nerves. Stimuli pass along the nerve to the brain and there set up sensations that are interpreted as sound.

The other function of the inner ear is accomplished by the semicircular canals. They are the organ of equilibrium or balance. There are three of these structures at right angles to each other. They contain a fluid, *endolymph,* and nerve endings. Any motion or change in position of the head results in motion of the fluid, and this stimulates the nerve endings. The stimuli that pass along a branch of the auditory nerve to the brain set up sensations there. Early in life the individual learns how to interpret these sensations so that they enable him to balance the body or walk in a straight line even when blindfolded.

Care of the Ears. To clean the ears and remove wax, use a damp cloth. Under no circumstances should the ears be cleaned, probed or poked with a hard or pointed object. Serious injury can be done to the eardrum in this way. When water has entered the external ear, it should be removed by inclining the head.

If earache occurs, consult a physician at once. Do not delay even a single day because serious complications can develop rapidly.

THE NOSE. This is the organ of smell. The nasal cavity lies behind the nose and nostrils and above the roof of the mouth. Communicating with it by minute openings are a number of pocketlike cavities, *sinuses,* in the adjacent bony structures; the mouth of the Eustachian tube and the end of the tear duct also open into the nasal cavity. The olfactory nerves have endings on the turbinate bones (or nasal conchae) in the nose. These nerve endings are stimulated by particles in the air brought to them by inhalation. The stimulations are transmitted to the brain by the olfactory nerve, and there set up reactions that are interpreted by the individual as sensations of smell. When the nose is diseased or affected by a cold, inflammation may render the olfactory nerve endings incapable of detecting many odors. Many agencies other than bacteria can irritate the nose and cause an increased secretion of mucus by the nasal mucous glands. This condition, which is called *catarrh,* can be brought about by dust, fumes, dry hot air or some similar cause. Irritation of the nose by pollens of plants is called *hay fever.*



Taste Bud

Matter suspended in air that is inhaled tends to adhere to the moist mucous membranes. This material may be of no consequence, or it may be injurious if it contains irritating particles or disease-producing microbes. Dust, fumes and the spray from coughing or sneezing persons should be avoided.

THE TONGUE. Most of the tastes we detect in eating and drinking are really smells of aromatic or volatile particles that reach the nose from the mouth. Sweetness, sourness, saltiness and a few others are true tastes detected by certain special sense organs, *taste buds,* located in the tongue. The buds that detect sweetness are located on the front surface of the tongue, those that detect sourness are along the sides of the tongue, and those concerned with bitterness are on the back of the tongue. The taste buds have nerve endings that receive special taste stimuli and transmit them to the brain.

ORGANS OF TOUCH. The sense of touch is associated with special types of nerve endings that are widely distributed in the skin. They occur particularly in the form of the *tactile corpuscles.* They are especially numerous in the skin of the finger tips and palms of the hands.

DISEASE

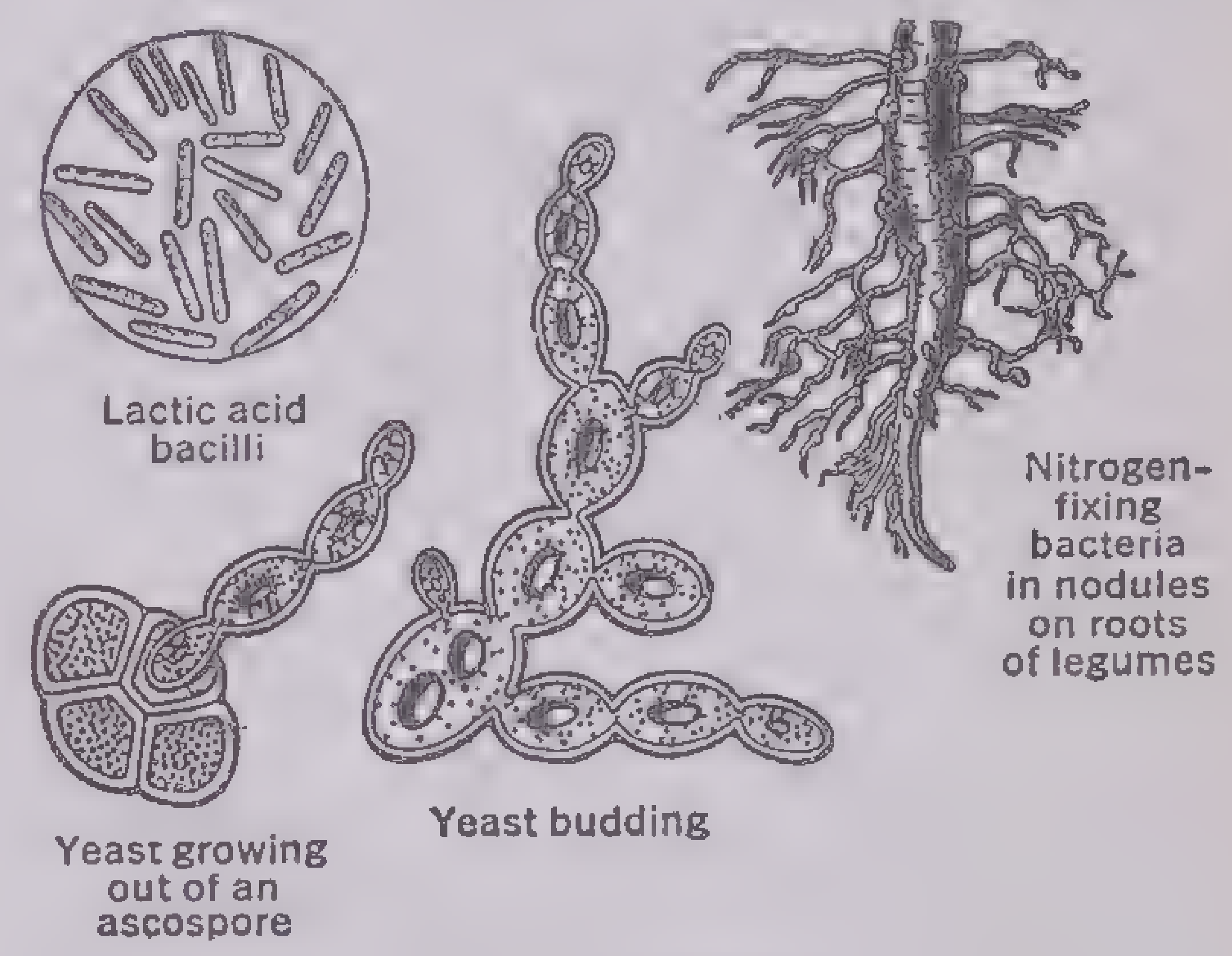
Health and Disease.—The body passes through many changes during its span of life. This is true of all living things—plant, animal or human. Each goes through a cycle: conception, growth, differentiation of various parts and specialization of their functions, maturity, reproduction, old age and decline and finally death. All these are normal processes through which complex organisms pass. Health is the normal working of the living body. Disease is the failure of one or more parts of the body to function or to function normally. The breakdown of a part may be local and restricted, or it may involve other parts until the work and repair of the body cannot continue.

Origin of Disease.—The beginning of disease is due to external or to internal causes. An example of an internal cause is the rupture of the appendix, the bursting of a blood vessel that has lost its elasticity or the failure of some part to function because it is not receiving its necessary fuel (food) or is not disposing of its wastes. Diseases that follow injuries of this kind are commonly called *nutritional.* Of the diseases of external origin the simplest to consider are those that follow *mechanical* injury, as by crushing, cutting, tearing, burning, shooting; or upon *chemical* injury, as from corrosive acids, alkalies, drugs or similar substances. Injury by mechanical or chemical means is usually called *trauma* and is spoken of as *traumatism.* Among the diseases of external origin the commonest, most widespread and most important are those resulting from *biological* causes or *parasitism.*

Microbes and Disease Carriers

Parasitism.—The word *parasite* has an interesting origin. It is from the Greek words *para* and *sitos,* meaning eat beside, and it was first applied to a person who sat at the table of another and ate at his expense. Now it is applied, in one sense, to a plant or animal that lives on another living thing (the *host*) and is wholly or partly incapable of supporting itself without a host.

Parasitism is extremely common throughout the organic world. In an indirect way the dependency of one group of organisms upon other groups is part of the whole scheme of the living world. Many living things are adapted to obtain part or all of their food, warmth or other requirements from other living things. The mistletoe that lives as a sucking vine on a larger tree, the mold on a leaf, the insect piercing the skin of an animal for a meal of blood—these things indicate parasitism. Even as the human parasite—minstrel, jester or other—came to be dependent upon his host in many instances, so also has the plant or animal parasite become incapable of supporting itself without a living host. The fact that we still speak not only of a parasite but also of its host is reminiscent of the origin of the term.


Lactic acid bacilli
Nitrogen-fixing bacteria in nodules on roots of legumes
Yeast budding
Yeast growing out of an ascospore

Helpful Bacteria

Lactic acid bacilli, yeast growing out of an ascospore and the budding yeast are shown as seen through the microscope

Some parasites live on their hosts and do comparatively little damage; they do not greatly shorten the host's life span. In the case of microbes that live in the nodules that may be seen on the root hairs of a pea, bean or clover plant, is the parasite not only harmless to the host, it is even beneficial because the microbes change certain substances in the soil so that the plant is enabled to use them as foods. One might with equal force say that the leguminous plant is the parasite on the microbes that it harbors in its root-hair nodules. But not all parasites are so harmless. Most of them deprive the host of food needed for its own purposes or interfere with its nutrition. If they live inside the host, they can injure or interfere with the function of tissues or organs and so cause the host's death. Injury caused by the presence, growth and multiplication of parasites and by the action of poisonous substances they produce is called *infectious disease.* The parasitic causes of most but not all infectious diseases can be transferred from one host to another, that is, infectious disease may be *communicable.* If the communication from one host to another is usually accomplished by more or less direct contact between the infected host and the potential host, the communicable disease is said to be *contagious.*

Communicable diseases are responsible for a large proportion of all sickness, and they are the cause of at least two-thirds of all premature deaths. It is easy to understand how tremendously important the discoveries about parasitism are. From them have flowed humanitarian accomplishments exceeded by those of no other branch of natural science. Their beneficial effects on man's health and well-being are invaluable. They have enabled man to control disease to such an extent that human beings can congregate in cities without being wiped out by epidemics of communicable disease.

Parasites Important to Man. There are so many different kinds of parasites that we must restrict our attention to those that live on human beings and to only the most important of these.

Practically all the important communicable diseases are caused by parasites so small that they cannot be seen by the unaided human eye. For this reason they are called *microbes* (from the Greek words *mikro*, small, and *bios*, life). All but a few of them can be seen through a microscope magnifying them 1,000 or 2,000 times.

The most important microbic parasites of man are single living cells. When one grows to mature size, it divides into two or more cells that usually separate from one another, and each new cell lives an independent life. Certain of the unicellular microbes have chemical composition, food requirements and methods of growing and dividing that place them in the plant kingdom. These are called *bacteria.* Others are more closely allied to the animal kingdom and are known as *protozoa.* Most of the diseases caused by protozoan parasites are restricted to tropical areas. Malaria and amebic dysentery are the only protozoan diseases that are world-wide in occurrence and commonly found in the United States. There are many multicellular parasites, some plant, like the *molds*, others animal, like the *worms.* Some of these parasites spread from person to person by contact. Others gain access to the human body in dirt, dust, saliva or sputum, through the skin in cuts, abrasions or wounds or by way of the mouth or nose.

Bacteria. An average-sized bacterium is so small that it would take 50 million to make a mass the size of a grain of sugar, and a raindrop could hold about 1,000 million. Bacteria are so small that, for the sake of convenience, a special unit of length is used to describe their size. This is the *micron* commonly expressed by the Greek letter μ, (*mu*). There are a million of these in a meter and about 25,000 in an inch. Average-sized bacteria are from 1 to 10 μ long or wide or thick.

Each bacterium, despite its small dimensions, is an extremely complex living thing. What bacteria lack in size, they make up in activity. The reason for this is that the speed at which organisms live, other things being equal, depends upon the ratio of their surface to their volume or bulk. The smaller a thing is, the larger is its surface per unit volume. For example a sphere with a radius of 1 inch has a surface (in square inches) that is only three times its volume (in cubic inches); but a sphere with a radius of one-tenth of an inch has a surface 30 times its volume, and for still smaller spheres the ratio of surface to volume is proportionately greater. A man of average size may have half a square inch of body surface for every cubic inch of volume. A bacterium of average size may have 50,000 times as large a surface per unit volume. Each living cell, whether bacterium or tissue cell, must obtain its food from the fluid in which it is bathed and must excrete its waste products into this fluid. The more surface it has, the more rapidly and the more efficiently it can take in foods and give off its wastes. Under proper conditions of temperature and food supply, each bacterium may grow into two every 20 minutes. From a single bacterium a billion could be produced in 10 hours; and in a few days, enough to fill the ocean. But such rapid multiplication of bacteria never actually occurs except for brief periods of time because food gives out, products of digestion stop activities and enemies destroy them. It is important to remember how rapidly bacteria can and do live and multiply to understand how they can do so much damage in a short time when they get into the body.

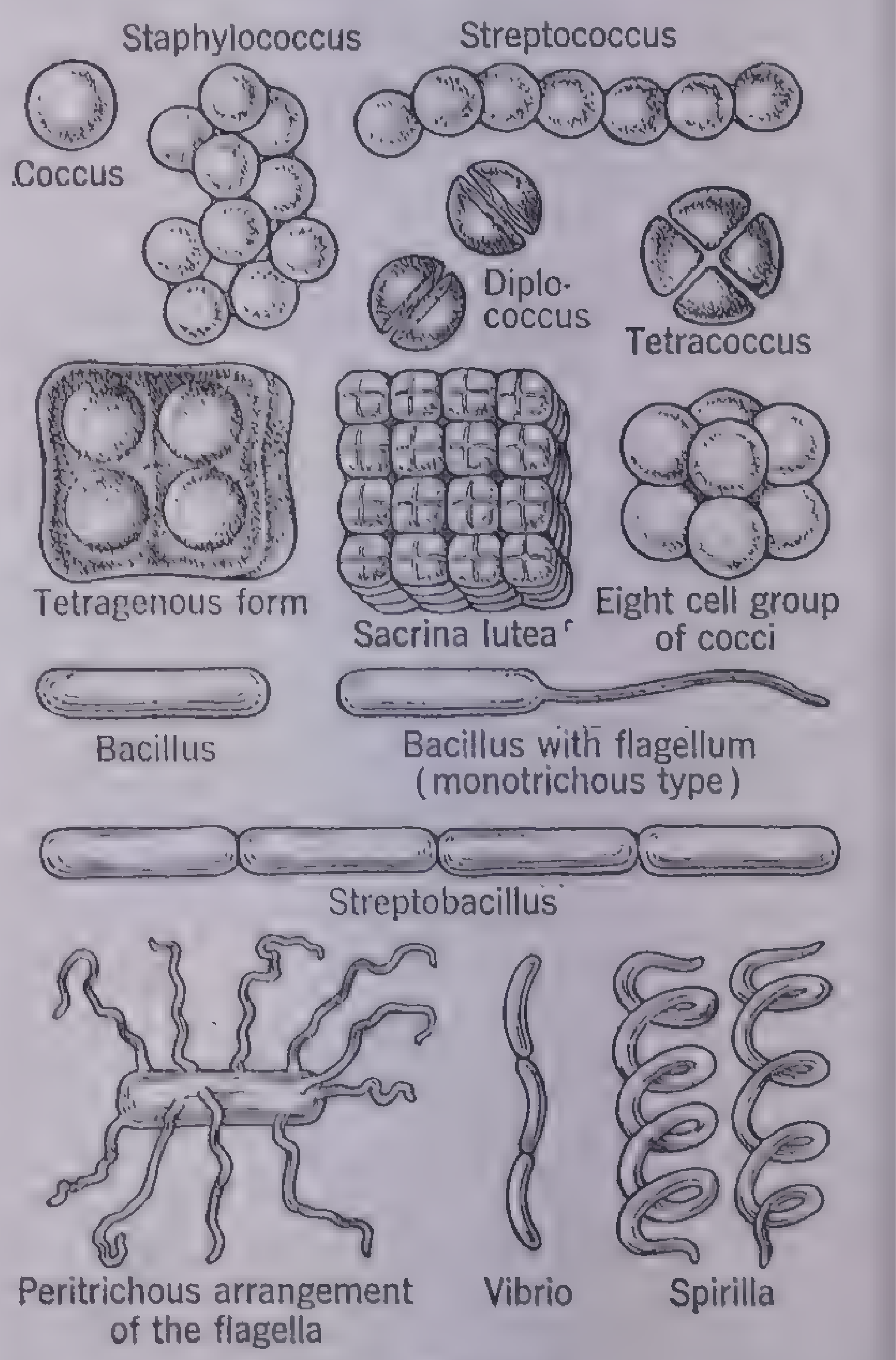
Distribution of Bacteria. Bacteria are present practically everywhere in nature. There are a few in every breath of air we draw. They are in the water we drink and the food we eat. There may be thousands in a speck of dust or dirt. They are in the soil and on the leaves, stems, fruits, flowers and seeds of plants. There are millions of them on the skin and in the mouth and intestines.

Good and Bad Bacteria. Not all bacteria are parasites. Most kinds are entirely unable to live in or on man, animals or plants. Not only are these harmless, but many are actually very useful to man. Several thousand kinds of bacteria are known, but only 40 or 50 kinds are parasites that cause disease. It is important to know how to tell the good from the bad.

Kinds of Bacteria. Bacteria show limited structural differentiation. When bacteria are examined with a suitable microscope, three general shapes are seen: sphere, rod and spiral. These are called *coccus, bacillus* and *spirillum* (plurals, *cocci, bacilli* and *spirilla*), respectively. Each is a single cell with no particular differentiation of parts within it. It is still uncertain whether the bacterial cell has a true cell wall or a separate nucleus. There is no doubt, however, that the surface has the properties that are usually associated with a cell wall, and that there is nuclear material scattered more or less throughout the cell. Special kinds of pigment particles, food and other kinds of granules and vacuoles (cavities) are usually present. In many bacteria the presence of pigment or granules occurs regularly and is useful in identifying them as belonging to some particular genus or species. Bacteria are also divided according to the groups in which they tend to stay.

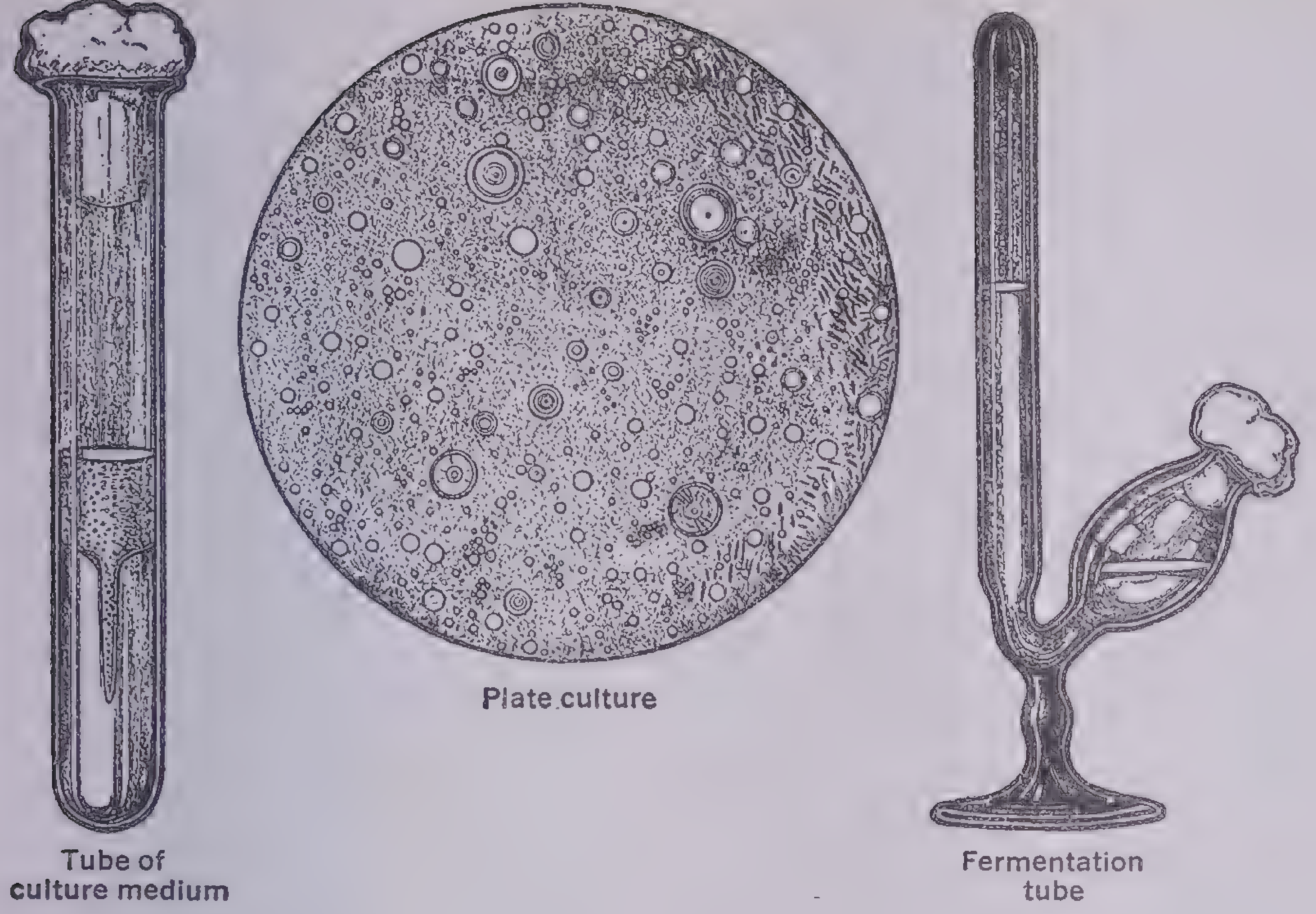
Motion of Bacteria. Some bacteria have whiplike appendages called *flagella.* By lashing these to and fro in water or other fluid the cell can move at a considerable speed. An actively motile bacterium can move 25 times its own length in a second. This speed is five times greater than that of a champion human runner. Flagella cannot be seen on the bacterium but are made visible by staining with a dye. Up to this time there have been no authentic discoveries of cocci with flagella; these organs of motility have been demonstrated only for bacilli and spirilla. Only about half the bacilli and spirilla have flagella, and some species have one, some two or more. Some have them at one end, some at both ends and some all around the cell.

Spores. Some species of bacilli have the ability to change their normal rodlike shape (called the *vegetative* state) to a more condensed, spherical body called a *spore.* This change usually occurs when conditions are not favorable, as when the temperature is too high or too low, when food gives out or when acids, alkalies or other products of digestion accumulate. In the spore stage the cell is not easily penetrated by injurious substances and is very resistant to heat. Most



Common Bacteria

Structure of the common kinds of bacteria as seen under the microscope



Growth of Bacteria

Many methods are used to cultivate bacteria and other microbes. A plate culture is a shallow dish containing a culture medium—a jelly which contains foods for microbes. Each microbe that grows in or upon the jelly may multiply into so many that a visible colony develops. A plate culture contains many such colonies of molds, yeasts and bacteria. In the tube is a jellied culture medium into which was stabbed a platinum needle that was first sterilized and then touched to a colony of bacteria. The closed arm of the fermentation tube has been filled with a sugar medium and then inoculated with microbes. They have fermented the sugar and produced gas. As the gas bubbles rise through the fluid they are trapped in the closed arm and provide direct evidence that the sugar has been fermented

bacteria in the vegetative state are killed in a few seconds in boiling water and in a few minutes in hot water. But spores can survive boiling for half an hour, and some have been known to survive it as long as 16 hours. It is fortunate that there are extremely few disease bacteria that can form spores. Otherwise it would be very difficult for man to protect himself against these microbes. Botulism, which is one kind of food poisoning, tetanus, which is lockjaw from infection of a wound, and anthrax are the only important diseases caused by spore-forming bacteria.

Chemical Tests for Bacteria. Many bacteria that look very similar even through the microscope are different. Simple or complicated chemical tests must be used to tell one from another. For example the *Bacillus coli,* which is present in large numbers in the intestines of man and other animals and is harmless there, looks just like the dangerous microbe of typhoid fever, *Bacillus typhosus.* They can be distinguished by placing them in separate tubes of broth (a special kind of soup in which bacteria grow and multiply) to which glucose or grape sugar has been added. In glucose broth, both species use the sugar as a food and will produce acid, but *B. coli* will also produce gas, whereas *B. typhosus* will not. If they are placed in separate tubes of broth containing lactose or milk sugar instead of glucose, *B. coli* will use this sugar, too, and will produce acid and gas; but *B. typhosus* will not use the sugar at all, and neither acid nor gas will be formed. By using many kinds of sugars and other substances, chemical differences are detected among bacteria that are alike or similar in form, size and motility. When it is necessary to identify bacteria, as in the diagnosis of infectious disease, material taken from the patient is examined, or the bacteria in it are grown on broth or other food and then studied with the microscope or by various chemical tests according to the disease that is suspected. The invention of methods for making these tests quickly is one of the great contributions of bacteriology. For many diseases the diagnosis can be made speedily and accurately, the patient treated promptly, and the disease prevented from spreading.

Bacteria in Air. The air near the surface of the earth usually contains bacteria, yeasts, molds and other microbes. These are usually present on dust particles, and the more dust, the more microbes in the air. Country air usually contains fewer microbes than city air, and the air on a mountain may be practically free from dust and microbes.

The important thing is not how many bacteria there are in the air, but what kinds there are. Those ordinarily present in the air we breathe are harmless and unimportant. But when a careless person sneezes or coughs, there may be dangerous disease germs in the droplets sprayed from his nose or mouth. When air containing these droplets is breathed, disease may follow. It is well known that colds, pneumonia, scarlet fever, measles, tuberculosis of the lungs (consumption) and many other diseases are spread in this way. Human beings, not things around them, are the usual and common source of infectious disease.

Bacteria in Water. The water in brooks, streams, rivers, wells, ponds and lakes may contain the same kinds of bacteria that occur in air, soil or dust. When the rain falls, it washes bacteria with it wherever it drains. These bacteria are not ordinarily dangerous or harmful. They are called the *normal* bacteria of water.

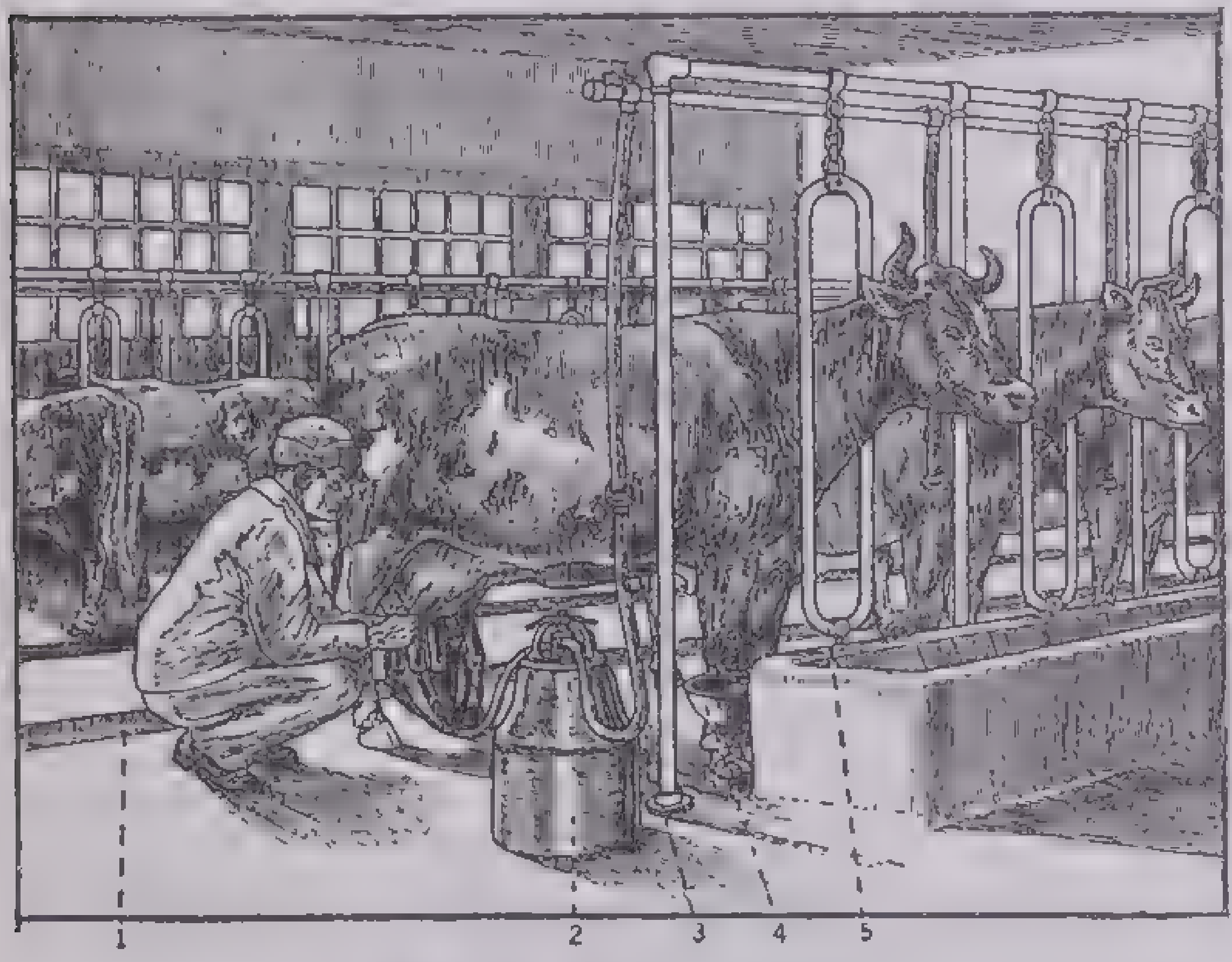
The importance of pure water for drinking and cooking purposes was known to man in ancient times, and he knew that filthy, dirty or smelly water was not safe to drink. It was not until about 100 years ago, however, that it was clearly understood that even water that looks pure and wholesome may contain disease-causing substances. Even long before bacteria were known as the specific causes of certain infections, it was proved that typhoid fever, cholera and dysentery were usually contracted from water that contained excreta of persons sick with these diseases. Private and public water supplies should be protected against contamination by sewage or other human wastes.

Bacteria in Soil. The surface of the earth is rich in bacteria and other microorganisms. This is particularly true of fertilized soil. There may be many millions of microorganisms in an ounce of soil within an inch or two of the surface. The deeper one goes the fewer there are, and 2 or 3 feet below the surface the soil may be sterile, particularly if it has not been recently turned or disturbed.

Soil, like air and water, contains its own normal kinds of molds, yeasts, protozoa and other microbes. These are usually nonparasitic kinds. In many places, however, the soil contains bacilli capable of causing infections. Two are especially dangerous. Both are *anaerobic,* that is, they can live without air or oxygen. The first, *Bacillus tetani,* is a spore-forming, rod-shaped bacterium. When dirt containing this organism or its spore gains entrance to a deep cut, scratch or wound, it grows and produces a substance (a toxin) that is extremely poisonous to nerve tissues and causes the disease called *tetanus* or *lockjaw.* To prevent this disease, wounds into which soil or dirt has entered must be thoroughly cleaned and disinfected. If the injury is serious, and dirt has entered the wound, it must be treated by a physician, and the patient must be injected with tetanus antitoxin.

The second dangerous bacterium that may be present in soil is *Bacillus botulinus.* This is also a spore-forming organism. It is not known to be infectious in wounds or if it is swallowed. If it gains entrance to food that is left in a warm place, the bacillus may grow and produce a toxin that is extremely deadly to anyone who eats the food. The spore of this organism is quite resistant to heat and may survive all but the most thorough cooking. It is particularly dangerous in any improperly canned food. The fact that *B. botulinus* is an anaerobe provides the first factor of safety, because the bacillus cannot grow or produce toxin if it is exposed to air. The second factor of safety is that the toxin is easily destroyed by boiling the food. Any food that might have been contaminated with garden soil and that has been kept for some time in a closed container in a warm place should be thoroughly cooked before it is eaten. As far as it is now known, cooking must be sufficient to destroy the toxin. It is apparently less important whether the organism or its spores have been killed.

Very little more needs to be said about the nonparasitic bacteria in soil or about the specific disease germs that might be there. There are other groups of bacteria and other microbes whose regular presence in soil has a great significance. These are the bacteria that act on organic matter—like the dead bodies of animals and plants—and bring about their rotting and decay. They convert organic matter into simpler and more soluble substances that dissolve into the earth and can be used again by plants as foodstuffs. Plants, in turn, are eaten by animals and man; animals are eaten by man; and plants, animals and man (when they are dead) are, in turn, decayed by microbes and returned to the soil. In this cycle bacteria play an essential role. Without their aid the earth's surface would soon become cluttered with dead plant and animal life. Growing plants would soon exhaust the soil of food materials, and plant and animal life would come to an end. Man cannot live without certain kinds of microbes, but he must beware of how he lives with others.



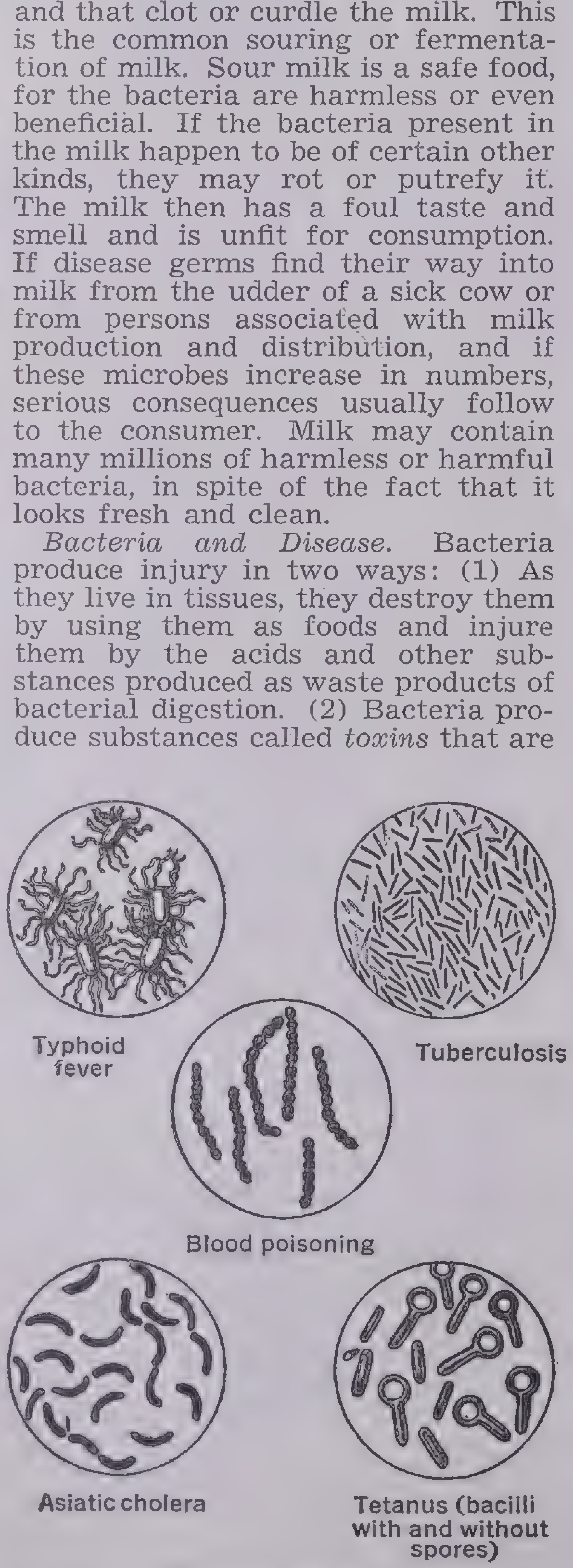
Model Dairy Barn

Healthy cattle and a sanitary dairy barn are the starting points in the production of clean milk: *1*, cleaning trough; *2*, milking machine; *3*, compressed-air pipe; *4*, individual drinking cup for cows; *5*, movable stanchion

Bacteria in Milk. Practically all common species of bacteria will thrive in the milk of cows or other animals. The rate at which they grow and multiply in milk depends almost entirely on the temperature. They grow slowly or not at all in very cold milk; more rapidly in temperatures up to body heat, 98.6° Fahrenheit or 37.5° Centigrade, and at higher temperatures they are killed quicker than they multiply. No matter how carefully it is obtained, milk always contains some bacteria. Most of the bacteria present in fresh milk come from dust and dirt on the cow, on the hands of the milker, in the utensils or from other sources. The number present in a sample of milk depends on the number present when it was drawn, its age and the temperature at which it has been kept. Milk carefully collected into clean vessels with precautions against dirt may contain a few hundred to a few thousand bacteria in a cubic centimeter. If it is promptly chilled and kept cold, the number may remain for many hours or days under 10,000 or 50,000 in a cubic centimeter. If the milk is not cooled, there may be millions, hundreds of millions or even billions in a cubic centimeter after from 12 to 24 hours.

When bacteria grow in milk they use the proteins, fats and sugars of the milk as foods, and they produce waste products. From the lactose (milk sugar) the common milk bacteria produce lactic acid and other substances that result in an acid taste and that clot or curdle the milk. This is the common souring or fermentation of milk. Sour milk is a safe food, for the bacteria are harmless or even beneficial. If the bacteria present in the milk happen to be of certain other kinds, they may rot or putrefy it. The milk then has a foul taste and smell and is unfit for consumption. If disease germs find their way into milk from the udder of a sick cow or from persons associated with milk production and distribution, and if these microbes increase in numbers, serious consequences usually follow to the consumer. Milk may contain many millions of harmless or harmful bacteria, in spite of the fact that it looks fresh and clean.

Bacteria and Disease. Bacteria produce injury in two ways: (1) As they live in tissues, they destroy them by using them as foods and injure them by the acids and other substances produced as waste products of bacterial digestion. (2) Bacteria produce substances called *toxins* that are extremely poisonous to the tissues and organs of the host. Injury of the first type is usually local in character; it may become generalized in the body as the bacteria are carried from part to part by blood or lymph. Injury of the second type is also usually local, not because the bacteria are localized, but because each particular toxin has its own special damaging powers. For example the toxin of the bacillus of botulism acts chiefly on certain nerves; that of the tetanus bacillus, on other nerves; the toxin of the dysentery bacillus, on the intestines, of the diphtheria bacillus, on the heart and other organs. As far as is now known, only a few species of bacteria that are *pathogenic* (disease-producing) for man produce true toxins. In most cases injury is of the first type described, although science is now showing that an increasing number of disease bacteria can produce toxins. Many disease bacteria are like the diphtheria bacillus—they may not have great powers to penetrate tissues but do their damage locally or at a distance through the action of the soluble poisons (toxins) they secrete. It is not yet understood why germs and their poisons have specific affinities for particular tissues, but these affinities are very high. It is this property that results in the special characteristics of each disease; the signs and symptoms depending on which tissue is injured and the way the injury is produced.



Harmful Bacteria

Five pathogenic or disease-producing types of bacteria as seen under the microscope

Infection and Resistance

Natural Defense Against Bacteria.—The body has many natural defenses against invasion by harmful bacteria. One is the skin and the mechanisms by which it maintains its integrity. The unbroken skin is a protective layer or shell around the outer parts of the body. It regenerates itself continuously unless it is too extensively injured. Although there are a few unusual exceptions, bacteria do not ordinarily penetrate the unbroken skin. Another defense is the effective protection provided by the intact and healthy mucous membranes of the mouth, throat, nose, lungs, stomach, intestines, bladder and other organs. The secretion of the stomach glands is strongly acid and undoubtedly destroys enormous numbers of microbes that are ingested with food and drink. Many fluids in the body have mild or strong antiseptic or germicidal properties. This is especially true of the blood, and as the blood reaches all parts of the body, it affords considerable protection to all tissues. The flowing lymph, the fluids between cells and the secretions of mucous glands have mild antiseptic or germicidal properties. The lachrymal gland secretion that bathes the eye has a distinct antiseptic property. This is one reason why injuries of the eye infrequently lead to infection, and why operations on the eye can usually be performed without an antiseptic or disinfectant.

The white cells or *leucocytes* in the circulating blood have the power to engulf bacteria and many other foreign particles. In many cases they

Leucocyte at Work
Leucocyte (phagocyte) taking up and digesting a pair of bacilli

destroy the engulfed material. When cells take up foreign particles, the process is called *phagocytosis,* and the cell that performs it is a *phagocyte.* In addition to the wandering phagocytes, exemplified in the leucocytes of the blood, there are fixed tissue phagocytes in the spleen, liver, lymph glands and numerous other organs. In general in the diseases where injury is done by the microbe rather than by a toxin, the phagocytes provide the principal internal defense of the body. Anything that increases the powers of the phagocytes makes for increased immunity, and anything that weakens their powers makes for increased susceptibility to disease.

The body frequently utilizes its power to wall off a parasite by laying down an impermeable layer around the affected area. This is one of its most important methods of defense against the germ of tuberculosis.

The natural defenses vary in efficiency in animals of different kinds, among animals of a particular kind and among humans. Some are more important against one parasite, others against another. Their combined effectiveness goes to make up the *natural immunity* of the living thing against parasites. It is determined by inheritance. Babies are immune to many of the contagious diseases that the mother had because the antibodies passed from her blood into the baby's blood during the period of gestation.

Acquired Immunity.—Each individual can acquire increased immunity as a result of a variety of processes. The commonest form is the increased resistance against infectious disease that results from an attack of the disease itself. This is called *naturally acquired immunity.* It is rare or unusual for an individual to have measles, scarlet fever, diphtheria or smallpox a second time. One attack of the disease leaves the body with a new and increased capacity to resist the infection.

Antitoxins.—How does an attack of infection protect the body against the disease, and why is the protection specific for the particular disease? The answer is partly known. Diphtheria is due to the toxin secreted by the diphtheria bacillus. It is now established that the toxin stimulates the tissues of the body to produce a new property in the blood, the property of neutralizing the poisonous qualities of the diphtheria toxin. This new property is said to be *antitoxic* and is supposed to come from the presence of an *antitoxin* in the blood, although scientists have not yet succeeded in discovering just what antitoxin is. This antitoxin will neutralize only diphtheria toxin. Antitoxin is specific for the toxin that caused its production in the body. Just as the toxin of the diphtheria bacillus stimulates the body to produce diphtheria antitoxin, the toxin of the tetanus bacillus arouses the production of tetanus antitoxin, and so on down the list of the toxin diseases.

Antibodies.—There is reason to believe at this time that most infectious diseases do not result from toxins. If there are no toxins, there can be no antitoxins. How, then, does the body become immune after an attack of such disease? The answer is that the microbe and its products arouse the body to produce in the blood and tissues certain new properties of defense against the microbe itself. These are said to result from various kinds of antibodies, each being named according to the way in which it acts. Thus, a person who has had an attack of typhoid fever is usually immune against this disease during the remainder of his life. There is no sound evidence that the typhoid bacillus produces a toxin, nor that the immunity acquired naturally by an attack of the disease results from the appearance of an antitoxin in the blood. It is not difficult to show, however, that the blood of the immune person will cause the clumping or *agglutination* of typhoid bacilli much more effectively than will the blood of a person who has not had the disease and who is not immune against it. The blood of the immune person is said to contain specific *agglutinin* for the typhoid bacillus. There is reason to believe that the clumping of the bacilli leads to their more effective removal from the blood and more rapid destruction in various tissues of the body. That is the reason why agglutinin is considered an antibody or immune body. Similarly, it is known that the blood of the immune person has an increased property of causing the precipitation of products of the typhoid bacillus. This property is ascribed to another antibody, the *precipitin.* Furthermore the blood of the immune person may have powerful action in preparing the typhoid bacillus for ingestion by phagocytes. This property is called *opsonic* and is supposedly due to another antibody, the *opsonin.* In addition to the agglutinins, precipitins and opsonins, there are other antibodies that need not be discussed here. It is not certain whether these antibodies are distinct or whether they are really identical, the differences being due to what they act upon rather than to what they are and how they act. Suffice it to say that they provide an understanding of the nature of the acquired immunity against certain microbes. The example cited was the case in typhoid fever. The statements would be equally true if the name of that disease were replaced by the name of any one of a long list of infections. In each case the antibodies are specific against the microbe (or its products) by which the body was aroused to produce them. That is why we speak of typhoid agglutinins, dysentery agglutinins and so forth. In the roles played by antitoxins and by antibacterial antibodies, we have the modern understanding of acquired immunity.

Artificially Acquired Immunity.—The immunity discussed above is called *naturally acquired* because it depends upon the fact that the individual contracts a disease in the natural course of events. One of the most beneficial discoveries ever made is due principally to Edward Jenner (1749–1823). He showed that when a human being has an infection with the germ of cowpox, which is an extremely mild disease in man, the body becomes immune against smallpox, which is an extremely dangerous disease. Jenner then showed that if an individual is given a mild, local cowpox infection (on the arm or leg), the body acquires a general immunity against smallpox. This is the process of arousing *artificially acquired immunity,* so called because the infection that brings it about is produced artificially instead of naturally. It is now understood that the germs of cowpox and smallpox are probably the same and differ only in the fact that life in the cow has made the cowpox germ less capable of producing a severe infection in man. The germ of cowpox is said to be less "virulent" for man than the germ of smallpox.

About 75 years after Jenner's discovery, Louis Pasteur (1822–95) discovered the same principle. In addition he actually invented methods of making pathogenic bacteria less virulent so that when they are introduced into an animal body they cause only a very mild infection but arouse immunity against highly virulent bacteria of the same kind.

It might now be asked: If acquired immunity can be aroused in the body following a mild as well as a virulent infection, can it also be aroused by dead bacteria or by the products of the living or dead bacteria? The demonstration that this can be done was first made by a great American scientist, Dr. Theobald Smith (1859–1934). This discovery opened the way to the most important method of preventing disease: Immunity may be acquired without disease by introducing into the body the products of bacteria or the killed bacteria. In the case of diseases that come from a toxin produced by the bacteria, artificially acquired immunity may be produced by injecting an extremely small quantity of the toxin. More often a mixture of toxin and antitoxin, called *t.-a.,* is used. Thus the poisonous power of the toxin is neutralized and counteracted by the antitoxin. This treatment results in the appearance of antitoxin in the blood. For diseases caused by bacteria themselves a suspension of dead bacteria, called a *vaccine,* is injected. This treatment results in the appearance of antibacterial antibodies in the blood.

The production of immunity by the injection of a toxin-antitoxin mixture or a vaccine, when properly carried out by a physician, is a safe, harmless and reliable way of producing immunity agamst the particular disease concerned.

Active and Passive Immunity.—When an individual contracts a disease, recovers and becomes immune, he has manufactured substances upon which his immunity depends. This is an active immunity. The immunity following the injection of a toxin-antitoxin mixture, a toxoid or a vaccine is similarly an active immunity. If the blood of an actively immunized person is injected into a nonimmune individual, the latter is made immune. The latter did not manufacture his own immunity; he received it passively from the former. For this reason his immunity is said to be a *passive* one.

The antitoxins or other antibodies that occur in the blood are found to be present in the blood serum—the fluid that separates after blood is shed and is permitted to clot. About 50 years ago when antitoxins were first being discovered by Doctors von Behring and Kitasato in Germany and Doctors Roux and Yersin in France, the following facts were proved by experiments on guinea pigs. (1) The animal that recovers from infection with diphtheria bacilli can later survive a still stronger infection. (2) The animal that is injected with small doses of diphtheria toxin in a few weeks can survive the injection of doses of toxin that would kill normal, untreated guinea pigs. (3) If a little blood or blood serum from such an immunized guinea pig is mixed with a large dose of toxin before the toxin is injected into a normal guinea pig, the animal will survive. (4) If a little of this blood or serum is injected into a normal animal, it will survive the injection of large doses of toxin. These facts can be summarized by saying that where the antitoxin produced actively in the body of one animal is mixed with toxin, or when it is injected into another animal, it will protect a guinea pig, horse, rabbit or human being against the toxin of the diphtheria bacillus. It does not matter in what species of animal the antitoxin is made; the serum that contains it is effective. Hence, when a child has diphtheria or needs to be protected because it has been exposed to infection, the physician injects a suitable dose of diphtheria antitoxin. Because this must be continuously kept on hand in large quantities, antitoxin is made in horses by injecting them with small doses of toxin, taking small quantities of blood from them at various intervals, separating the serum from the clot and carefully purifying the serum so that it contains a maximum of antitoxin and a minimum of everything else.

Serum containing antibacterial antibodies is also usually prepared in horses by injecting them with suitable vaccines and preparing the serum as described for antitoxin.

There is one fundamental, practical difference between active and passive immunity that must not be overlooked. In an actively immunized animal, whether by natural or artificial means, the body has made its own immunity and keeps it. The individual tends to remain immune for years or tens of years or an entire lifetime. In the passively immunized animal, the antitoxin or other antibodies were made in another animal. They are excreted fairly rapidly from the body into which they were injected. For example the child that becomes actively immune against diphtheria either by an attack of the disease or from treatment with toxin-antitoxin mixture usually remains immune for life; but the child that is made immune by an injection of horse serum containing diphtheria antitoxin usually loses his immunity in a few weeks or months and again becomes susceptible to the infection.

The facts described in these paragraphs have been illustrated principally by examples from diphtheria and typhoid fever. They apply in general to all diseases, such as scarlet fever, tetanus, dysentery and meningitis, in which immunity depends upon antibodies in the blood. There are a few diseases in which immunity appears to depend chiefly upon the activity of the fixed-tissue phagocytes. In these cases the passive transfer of immunity cannot yet be accomplished by any well-established methods.

Antiseptics and Disinfectants

If an object contains pathogenic (disease producing) microorganisms it is said to be *infected*. If these microorganisms are destroyed, the object is said to be *disinfected*. Many agencies are used to disinfect objects, but such agencies, known as *disinfectants* or *germicides* are effecive only under specified conditions. If an object is raised to a sufficiently high temperature, all the microbes, including the pathogenic ones, will be destroyed. At such a temperature heat is a disinfectant. Suppose a lower temperature is used. It may be too low to destroy all pathogens but high enough to keep them from growing or increasing in numbers. In this case heat is not a disinfectant but is an *antiseptic*. At a still lower temperature heat may have no restricting effects. Similarly a chemical substance may be destructive (disinfectant) when used in a suitably high strength or concentration, only inhibitive (antiseptic) in lower concentration and without significant effect in still lower concentration.

Sunlight.—Many kinds of microbes are destroyed by direct sunlight. It is principally the ultraviolet rays in sunlight that do this work, and as these rays cannot pass through ordinary glass, they must be direct to be effective. Microorganisms in or upon anything not in direct sunlight are not easily killed by it. Many microbes are not very sensitive even to direct light. For these reasons sunlight is not a reliable disinfectant. Its principal value in this connection is that people are likely to use soap and water and other cleaning agents when sunlight reveals dust, dirt or filth.

Heat.—Germs and parasites of all kinds cannot live at high temperatures, and heat is, therefore, the most reliable disinfectant or sterilizing agent that we have. Most of the food that we eat is free from germs because it is cooked. Boiled water is always harmless, and in the presence of an epidemic where the water supply may become infected it should always be boiled. In a strange country, as with soldiers on the march or a hunting expedition, it is always safer to insist on the use of boiled water.

For surgical operations the instruments are all boiled, and the dressings are subjected to dry heat at a temperature of 340° Fahrenheit. Surgical dressings as purchased at a drug store have all been treated in this way.

Objects in the sick room that may be infectious, such as sputum and sputum cups and toys handled by a child with scarlet fever, should all be burned.

Heat has some limitations as a household disinfectant because certain objects that should be disinfected, such as mattresses, fragile materials, and so forth, obviously cannot be boiled in water. These, however, can be subjected to dry heat in a sterilizer.

Chemical Disinfectants.—For many purposes chemicals (solids, liquids and gases) serve as the most useful disinfectants. Chemists are continually discovering and inventing new ones—some effective for one purpose, others for another. On many occasions it matters little which one of many common disinfectants is used. At other times it is important to choose the disinfectant with discrimination—one, for example, that will destroy microorganisms but not tissues or clothing, furniture, books or bed linen. Some disinfectants are more effective than others in penetrating dirt; some act better than others in the presence or absence of water, and some are so much cheaper than others that cost will determine the choice.

Scientists are always searching for the ideal disinfectant: a substance deadly to germs yet harmless and nonpoisonous to man; something that could be made cheaply; that would be active even if dirt or other things were present; that would not change by being kept for long periods and that would act quickly. The ideal disinfectant has not yet been found, but there are substances that have some of the properties of the ideal. If a substance is deadly to the protoplasm of microbes, it may also be deadly to the protoplasm of man. It is always safest, then, to assume that a disinfectant is a poison, especially if it is taken internally. All poisonous substances kept in the home should be carefully labeled and marked POISON. They should be kept out of the reach of children.

The following are some common disinfectants and antiseptics:

Alcohol. Wood (methyl) alcohol and grain (ethyl) alcohol are good disinfectants. They are specially useful for the skin of the hands. But the use of wood alcohol as a household disinfectant should not be encouraged because it may easily be swallowed by accident, causing degeneration of the optic nerves of the eyes. Denatured alcohol is just as good a disinfectant as pure alcohol. Denatured grain alcohol (in 50 or 75 per cent solution), specially prepared for external use, is a safe disinfectant. If it is kept in the home, it should be labeled POISON, because the substances used in denaturing it are poisonous taken internally.

Common Salt. Common table salt is more an antiseptic than a disinfectant. Food to which it is added in large quantities will usually be preserved because the salt interferes with the growth of bacteria, yeasts and molds.

Hydrogen Peroxide. Hydrogen peroxide, in the form commonly kept in the household, is useless because it decomposes rapidly. In the 3 per cent solution in which it is usually sold, it is a mild antiseptic, but it is usually too weak to kill bacteria in a cut or wound. If it is kept in strong solution and tightly stoppered, it is one of the most powerful of the nonpoisonous disinfectants.

Copper Sulphate. Copper sulphate is a very important disinfectant for certain water supplies because it has strong action against certain small plants, algae, that give bad tastes and odors to drinking water. It is not a valuable disinfectant for household use.

Silver Nitrate. Silver nitrate is a very powerful disinfectant; it is nearly as powerful as bichloride of mercury. It is especially useful to prevent blindness in babies. A few drops of a one per cent solution should be placed in each eye of every baby directly after birth to prevent infections.

Argyrol and protargol are two among many chemicals that contain silver and are very good disinfectants. Argyrol is specially useful because it is not so injurious to tissues as silver nitrate. It can be used even in 25 per cent solution in disinfecting such delicate tissue as the eye. It is used in the throat, nose and other parts of the body to combat local infections.

Tincture of Iodine. Tincture of iodine is a solution of iodine in alcohol. It is very useful as a disinfectant because it has the germicidal power of alcohol and of iodine combined. As long as it is not taken internally it is a safe and reliable disinfectant. It is probably the most useful disinfectant for household first aid. Although it is poisonous, its color and odor make it difficult to mistake for anything else. It can be applied safely to cuts, wounds, bruises or injuries for the purpose of killing microorganisms that may be introduced into the tissues.

Lime. Lime is one of the cheapest reliable disinfectants. It is useful in two forms: (1) Quicklime and slaked lime are strong disinfectants. Whitewash is slaked lime and water. It is specially useful on walls of barns, cellars, stables and outbuildings. Lime is very valuable in the disinfection of excreta if thoroughly stirred up with the material that is to be disinfected. (2) Chlorinated lime or chloride of lime, also known as *calcium hypochlorite,* is particularly powerful because it gves off the powerful disinfectant chlorine. Formerly it was used even in disinfecting drinking water. In modern days it is cheaper and more convenient to use compressed chlorine gas or *liquid chlorine* for the disinfection of large quantities of water, as in the case of a city water supply. For small water supplies, as for a village or farm, chlorinated lime is still very convenient and useful.

Coal Tar Disinfectants. There are a great many good disinfectants that are made from coal tar. Perhaps the best known of these is carbolic acid or phenol. Cresol, tricresol and many other similar preparations are good disinfectants and are only moderately expensive. There are hundreds of similar disinfectants, sold under trade names, most of which are efficient but expensive.

Soap. Soaps have been used for many thousands of years as cleansing agents. By cleansing things soap helps to get rid of germs. Some soaps are disinfectants as well as cleansers. Soap is most effective when used with hot water.

Gas Disinfectants.—There are some occasions when it is desirable to fumigate a room or house, for example, to disinfect mattresses, curtains and carpets after a patient with scarlet fever has been sick in a room. Formaldehyde (formalin) is one of the most effective fumigants when properly used. Because it is a somewhat dangerous substance, it should be used only by an expert. Burning sulphur and exposing a room to chlorine or cyanide gas, although still used for disinfection, are much more useful for killing insects, bugs and rats than for killing microbes. Fumigation is no longer widely practiced because it is not usually efficient. We know now that most disease germs die quickly when they leave the body, and it is no longer considered so important to fumigate.

It is a great deal more important to avoid close contact with the sick or infected person and to disinfect the patient's excreta and the clothes, linens, dishes and other things that he has used than to attempt to disinfect the room in which he has been confined.

Test for Disinfectants.—The standard test for the strength of a disinfectant is the carbolic-acid or phenol-coefficient test. It consists of comparing the efficiency of a substance with that of a 5 per cent solution of carbolic acid, both acting under the same conditions on suspensions of typhoid bacilli. The coefficient expresses how the substance tested compares with phenol. A phenol coefficient of 10 means that the substance was as effective as phenol when used in one-tenth as strong a solution; a coefficient of one-tenth means that the substance tested had to be in 10 times as strong a solution to be as efficient as the phenol.

The phenol coefficient is a useful index to the strength of a disinfectant, but it is not altogether reliable because it does not indicate with certainty how the presence of substances like sputum, dirt or excreta will affect the disinfectant's efficiency.

Communicable Diseases and Their Prevention

The communicable diseases are those caused by germs, bacteria or animal parasites. Inasmuch as they constitute an extremely large and important group, every intelligent person should know something about their cause and prevention. It is plain, of course, that diagnosis and treatment should be left to the physician.

The germs that cause these diseases may enter the body in the food, in the air, through the skin. A frequent form of spread is by *carrier.* The carrier is a human being who has had a communicable disease and recovered from it but still harbors the germs on his person and may transmit them to others. Thus there are typhoid carriers and diphtheria carriers and meningitis carriers.

It is difficult to arrange diseases in a logical way. Classification is made according to various characteristics: (1) the type of microbe that is responsible; (2) the parts of the body principally affected; (3) the type of body discharges by means of which the disease is commonly spread; (4) the methods of prevention or treatment; and so forth. For the purposes of this book, however, the diseases that are discussed are listed alphabetically. They are discussed largely after the plan and the form used by the Committee on Standard Regulations (U.S. Public Health Reports, Dec. 17, 1926), from whose report we have borrowed freely.

Colds.—The common cold (*coryza*) is a catarrhal inflammation of the upper respiratory tract. A cold is sometimes called by other names if the inflammation is principally in one spot—acute rhinitis (nose), acute laryngitis (larynx) or acute pharyngitis (pharynx). It is not certain whether it is a simple disease or a group of diseases. There is good reason to believe that it is caused by microorganisms and is infectious and contagious, but it is not certain whether a particular microbe or a variety of microbes is responsible. Fatigue, chilling, wet feet, wet clothing, drafts and irritants in the air sometimes appear to cause colds. How these factors operate is not clear. The cold itself is not a dangerous disease, but it frequently leads to more serious affections. Prevention of the spread of colds depends upon avoiding contact with the infected individual and all objects he has recently touched or contaminated with discharges from mouth or nose. The affected person should avoid close contact with others, stay away from crowds and public places, cover mouth and nose when sneezing or coughing and use soap and hot water or a disinfectant for hands and handkerchiefs.

Chickenpox.—This is a mild disease that attacks a large percentage of children. Those who escape it in childhood may contract it in adult life. It is marked by an eruption on the body, face and scalp and is usually accompanied by mild, general symptoms of illness. The infectious agent, which is still not known, is present in the eruptions and on the mucous membranes. The disease is usually spread from person to person by contact or through articles freshly soiled by discharges from the infected individual. The infected person may be able to infect others until the primary scabs have disappeared from the mucous membranes and skin. Chickenpox is not very dangerous in itself. When an eruption occurs that is thought to be chickenpox, particularly in a person over 15 years of age (or in a person of any age during an epidemic of smallpox), the patient should be carefully examined by a physician, because chickenpox may be confused with the more serious smallpox. The child suffering with chickenpox should be kept away from others who have not had the disease. One attack of the disease usually confers upon the individual a permanent immunity. The disease is not known to occur in any of the lower animals.

Diphtheria.—This is the most deadly disease of childhood. Although enormous strides have been made in its prevention, it still is very common. It is safe to say that enough is known about diphtheria to control and wipe it out altogether. Its persistence is due to the failure of people to utilize available scientific knowledge and facilities. The disease is caused by *Bacillus diphtheriae,* which is present in the discharges from lesions in the nose, throat, eyes and other organs, and which may be present in the nose and throat of a healthy person. It is well established that many persons who are in apparently good health are carriers of the microbe. There is no convenient way of detecting all carriers and no reliable method of freeing the carrier of microbes after he has been detected, so the sources of the infection cannot be entirely controlled. The principal symptoms of the disease are due to the toxin produced by the bacilli. In addition to contact from person to person, diphtheria bacilli may be spread in a community through infected milk or milk products.

The control of diphtheria depends on:

(1) Early diagnosis of the disease by the doctor. If antitoxin is injected on the first day of the disease, the patient is almost certain to get well; the longer the delay in injecting the antitoxin, the greater the danger. It is extremely important to call the physician promptly when, because of general illness or sore throat, diphtheria is suspected.

(2) Isolation and quarantine of all persons until they have recovered and until suitable bacteriological tests show that they are free of virulent diphtheria bacilli.

(3) Producing temporary passive immunity in the susceptible persons who have been exposed to the disease. This is done by the injection of an ordinary dose of antitoxin, which confers immediate passive immunity lasting about 2 weeks. The *Schick test* is used to determine which persons are susceptible. This test consists of injecting a very small quantity of toxin into the skin. If the individual is immune, that is, if he has antitoxin in his blood, the injected toxin is neutralized, and no reaction follows. He is then said to be *Schick negative.* If the individual is not immune, he lacks antitoxin, and the toxin in the skin causes an area of reddening and inflammation that develops at the site of the injection. Such a person is said to be *Schick positive.* The Schick test is named for Dr. Bela Schick (1877–   ), who first developed it into a practical method of discovering which persons have antitoxin in the blood and which have not.

(4) Disinfection of all articles that have been in contact with the patient and all articles soiled by discharges from the patient.

(5) Pasteurization of the milk supply.

(6) Active immunization of every susceptible individual in a community, especially school children. The procedure is as follows: In any large group of school children, a Schick test is made on each one. Those who are positive, therefore susceptible and liable to get diphtheria, are given injections of *toxoid.* Toxoid is diphtheria toxin that has been rendered less toxic by keeping it at low temperatures.

The technique of toxoid immunization is simple. The age at which it should be administered is 12 months. It is not generally advised before that time, but any time after it is proper. The toxoid is given in the dose of 1/2 cc. under the skin. It is not dangerous. Immunization is complete in from 96 to 99 per cent of children 2 to 4 months after the injection.

A preparation known as toxin-antitoxin mixture, much used formerly, is now generally supplanted by toxoid.

From experience with hundreds of thousands of children it is well established that practically all children can be made immune against diphtheria with one or two injections of toxoid. It is the duty and obligation of every parent to arrange to have a physician give this treatment to every child after the 12th month of life. If this were done, there would be no diphtheria in the family or community. There are now many cities in the United States with populations over 50,000 that have gone from 1 to 3 years without a single case of diphtheria. This gratifying condition exists because all children were made immune, and all new babies are first immunized near the end of the first year, because about this time they become susceptible by the gradual loss of the antitoxin that they had obtained from their mothers before birth. Diphtheria is an easily preventable disease and should not occur among intelligent people. It cannot occur in a child who has been made immune.

Dysentery.—Dysentery is a diarrheal disease that usually occurs only in warm or tropical parts of the world. There are two important kinds of dysentery.

Amebic or tropical dysentery is caused by a protozoan organism belonging to the ameba; the particular parasite is *Endameba histolytica.* The source of infection is usually the bowel discharges of infected persons. The disease is transmitted by drinking water that has been contaminated by the sewage of infected persons, by eating infected foods and by hand-to-mouth transfer of infected material, by handling objects soiled with the discharges of an infected individual or of a carrier and by flies going from infected excreta to foods. The control of amebic dysentery depends on the early diagnosis of the disease, including the recognition of the ameba in the stool, the disinfection of all bowel discharges and supervision of the water and food supplies to insure that they are free from contamination by excreta.

The other kind of dysentery is bacillary dysentery, caused by *Bacillus dysenteriae.* It is spread in the same way as the amebic form. Its prevention depends on the same procedures and also on immunizing individuals exposed to infection. This is done by a vaccine. The rules for avoiding contamination of food should be rigidly observed. No person who has bacillary dysentery or who is a carrier of the bacillus or who is in contact with a patient should have any contact with milk production or food preparation. When dysentery is prevalent in a community, all water and milk should be boiled, and all foods should be cooked. Milk and foods should be protected against contamination by flies and human handling.

German Measles.—This disease (also known as *rubella*), is an acute, highly contagious disease of childhood and is very much like measles and scarlet fever. The infectious agent is unknown but is probably present in the secretions of the mouth and perhaps in the nose. The disease is almost always mild. One attack usually confers immunity for life. Control depends entirely on separating the patient from nonimmune children and on excluding the patient from school and public places for about 8 days after the onset of the disease.

Gonorrhea.—This is an acute, infectious disease of the sex organs and is usually spread by sexual contact. It is a very common disease in all parts of the world, recent figures indicating that in many civilized countries as many as from 20 to 30 persons in every thousand contract the disease each year. It may be spread by personal contact (other than sexual) with infected persons and indirectly by contact with articles freshly soiled with the discharge of such persons. In the newborn baby of an infected mother gonorrheal infection is likely to occur in the eyes. The disease is sometimes looked upon as of little consequence. This is not the correct point of view, because it is very frequently a serious and dangerous disease that may lead to bad affections of the joints, heart and other parts of the body.

The prevention and control of gonorrhea depends chiefly upon: (1) recognition of the disease; (2) isolation of infected persons and exclusion from sexual contact; (3) exclusion from school or contact with children of persons who have contracted gonorrheal infection of the eyes; (4) disinfection of discharges from lesions; (5) elimination of common towels and common toilet articles from public places; (6) exclusion of persons in the active stages of the disease from participating in the preparation of food; (7) education of the public in matters of sex hygiene to insure understanding that continence is not dangerous to health, and that gonorrhea or other venereal disease is commonly the consequence of association with sexually delinquent or promiscuous persons.

Hookworm Disease.—This disease is due to the presence of certain parasitic worms in the intestines. It is a disease of warm countries and is widely prevalent in tropical and subtropical climates. In many countries (India, China, Malay States, northern and central Africa, Puerto Rico, southern United States, Central America, South America, the West Indies and other places), from 60 to 100 per cent of the people are afflicted with chronic hookworm disease. There are two specific parasites, called *Ancylostoma duodenale* and *Necator americanus.* Hookworms are minute, almost microscopic parasites (nematodes) and are characterized by hooklike structures about the mouth. The adult worm is about one-half to three-quarters of an inch long and about as thick as an ordinary hairpin.

To understand how to prevent and control hookworm disease it is essential to understand the peculiar life history of the parasite. The adult worms in the intestine gain their nourishment by biting into the intestinal wall and sucking blood. There may be hundreds or thousands in a single person, so it is not surprising that the individual is anemic and weak and seems lazy. There is also some evidence that the worms produce a toxin. The mature female worm produces eggs (ova), which are excreted in the stools of the infected individual. When the excreta are deposited on the ground, the eggs grow into larvae that hatch out in from 24 to 72 hours. After about 5 days they become encysted and are then capable of infecting people—usually through the skin of the feet. Hookworm infection is a disease of poor people (who go about without shoes) living in warm climates, where proper facilities for sewage disposal are lacking. (The ova develop more rapidly where it is warm.) The larvae penetrate through the skin between the toes or elsewhere on the feet, causing a condition called *ground itch.* After they have once gained entrance to the body, they pass by a roundabout path to the intestines. Six to eight weeks after the infection they are laying eggs, and the cycle is repeated. Infection may also occur by drinking water containing larvae, by eating contaminated food and by hand-to-mouth transfer of ova or larvae from contaminated objects. Contaminated soil is the principal source of infection.

As long as an individual is discharging ova he is infective. Soil may be infective for as long as from 4 to 6 months if it has not frozen over in the interim. The control of hookworm disease depends upon the following:

(1) Diagnosis of the disease by general symptoms and by finding the ova in the excreta;

(2) Proper disposal of sewage to prevent contamination of the soil, of water and foods;

(3) Suitable treatment of infected persons to free them of worms and ova;

(4) Education of the public concerning the nature of the disease and the dangers of soil pollution;

(5) Economic improvements or philanthropic action, specifically in the form of distribution of shoes in places where the poor and the ignorant can be persuaded to wear them.

Influenza.—This is an acute infectious disease of the upper respiratory tract, usually occurring in epidemics in the cold season of the year.

"During epidemics efforts should be made to reduce opportunities for direct contact infection, as in crowded halls, stores and street cars. Kissing, the use of common towels, glasses, eating utensils or toilet articles should be avoided. The hands should be washed carefully before eating. In isolated towns and institutions infection has been delayed and sometimes avoided by strict exclusion of visitors from already infected communities. The closing of schools has not been effective in checking the spread of infection. The use of masks by nurses and other attendants has proved of value in preventing infection in hospitals. Scrupulous cleanliness of dishes and utensils used in preparing and serving food in public eating places should be required, including the subjection of all such articles to disinfection in hot soapsuds. In groups which can be brought under daily professional inspection, the isolation of early and suspicious cases of respiratory tract inflammation, particularly when accompanied with a rise in temperature, may be relied upon to delay the spread of the disease. To minimize the severity of the disease and to reduce mortality, patients should go to bed at the beginning of an attack and not return to work without the approval of their physician." (United States Public Health Service, Reprint No. 1129 from the Public Health Reports.)

The disease itself is almost never fatal, but it is extremely dangerous because it so often leads to pneumonia. In the world-wide influenza epidemic in 1918–19 it is estimated that from 25 to 75 per cent of all persons contracted the disease, and that tens of millions of persons died from pneumonia and other diseases that followed influenza.

Intestinal Worms.—In temperate climates three kinds of intestinal worms are liable to affect mankind. All these worms enter the body through uncooked food.

Tapeworms are long segmented worms that may be several yards in length. The head is usually buried high up in the small intestine but the body may lengthen out along the course of the intestine until finally it is broken off in the rectum and appears in the stool. Contrary to popular opinions these worms apparently do little harm. They do not cause weakness, loss of weight or anemia.

Treatment consists of the use of a vermifuge after preparation for it. The preparation is designed to expose the worm. It should be as follows:

First day: Eat only soft food, milk, eggs, soups, gruels and so forth.

Second day: Castor oil, 2 ounces in the morning. Food as on first day.

Third day: Castor oil, 2 ounces in the morning. Food as on first day. Epsom salts, half an ounce in water at night.

Fourth day: Enema in the morning. The vermifuge is given on this day.

The best vermifuge for tapeworm is aspidium or male fern, which is given in the form of the oleoresin—1 dram in capsule at 7 A.M. and repeated 2 hours later in plenty of water. If the bowels have not moved, an hour later a second dose of epsom salts is given.

Roundworms are about the size of ordinary fishing worms; they are smooth, hard and white. They are especially likely to occur in children and may cause serious symptoms, such as intestinal obstruction. They may also work upwards and get in the nose and even in the lungs.

Preparation for treatment is the same as for tapeworm. The usual vermifuge is santonin, which should be given in a dose of 1 grain for a child and up to 5 grains for an adult.

Pinworms are small worms that particularly infect children. They live mostly in the rectum and are liable to wiggle out at night, causing extreme itching and irritation of the skin. They should be treated with santonin and rectal douches of infusion of quassia.

Malaria.—The manifestations of malaria in the body are chills and fever, enlarged spleen, emaciation and jaundice. The chills and fever occur either daily or every other day or every fourth day, depending on the particular variety of the plasmodium that enters the body.

Malaria is due to three species of a protozoan microbe, *Plasmodium vivax, P. malariae* and *P. falciparum.* It is spread by the bite of an *Anopheles* mosquito. The mosquito becomes infected by biting (sucking blood from) an individual whose blood contains the parasites. These develop in the body of the mosquito for from 10 to 14 days. After that period numerous mature parasites are present in the salivary glands of the insect and may be injected into the person the mosquito bites. The individual who is actually sick with malaria and is having repeated chills and fevers is the most important source of infection. Many persons who appear to be well or cured harbor the parasites in their bodies for many years. The disease is communicable as long as the parasites are present in the blood.

This disease cannot be spread by

the common *Culex* mosquitoes. Malaria is transmitted only by mosquitoes and usually occurs in warm and tropical climates where there are moisture, marshes and swamps, and where mosquitoes breed in large numbers and for many months of the year or all the year round. There can be no spread of malaria without mosquitoes.

The control of malaria is a problem of education, medical practice and, in part, a financial and economic problem for the whole population. The sources of infection (infected persons) are controlled (1) by making it difficult or impossible for mosquitoes to reach those who harbor the parasites; (2) by keeping houses screened so that normal persons are not easily reached by infected mosquitoes; (3) by the destruction of mosquitoes everywhere and elimination of all swampy places and large or small collections of water where mosquitoes may breed; and (4) by the use of quinine (which is a specific drug against the malaria parasite) to kill the parasite in infected persons and to prevent infection in healthy individuals who are exposed to mosquitoes in communities where malaria prevails.

Measles.—This is an acute, highly contagious disease that occurs most commonly in the cold months of the year but that may occur in any season. It usually starts with catarrhal inflammation, fever and a rash that is followed by an eruption. If no complications occur, it is usually a very mild disease. Pneumonia is the most serious complication that frequently follows measles. It is primarily a disease of childhood, but it may attack adults of any age who have not had the disease before. Exposure of susceptible persons by contact with one who has measles almost invariably leads to infection. One attack usually confers immunity for life.

The specific infectious agent that causes measles is not yet certainly known. It is well established by infection experiments that the agent is present in the secretions from the eyes, nose and respiratory tract. The patient is most infective before the eruption has appeared. It is usually considered that the patient is infective from 4 days before to 5 days after the appearance of the rash.

The control of measles depends upon:

(1) Early recognition of the disease.

(2) Isolation of the patient while he is infective.

(3) Protection of persons who have been exposed to infection by an injection of convalescent serum. After an individual becomes infected, 10 days usually elapse before the onset of symptoms. If the blood or serum from some one who is recovering from measles or from a healthy adult who has had the disease is injected within 5 days after infection, the disease may be prevented. The serum from a convalescent or an immune adult appears to contain protective antibodies.

(4) Exclusion from school and other public places of all susceptible persons (children or teachers) who have been exposed to infection for 14 days from the last exposure.

(5) Disinfection of all articles soiled with discharges from the nose and throat.

Mumps.—This is an acute, infectious and contagious disease especially characterized by painful swelling of the parotid gland, the large salivary gland in front of the ear. Other salivary glands and the genitourinary and other organs may also be affected. There is fever. The symptoms usually disappear in a week. Mumps occurs most commonly between the ages of 5 and 15 years, but is not uncommon among young adults under 30 or 35. It usually prevails in the cold months of the year.

The infectious agent of mumps is unknown. The secretions of the mouth and possibly of the nose are infective. The disease is spread from person to person by direct contact or by articles freshly soiled with saliva, mucus or other discharges from the throat or nose of the infected person. The chief methods of preventing the spread of the disease are: (1) early recognition of the disease, particularly by the fever and the swelling or pain in the region of the affected glands; (2) separation of the patient from all children who have not already had the disease and exclusion of the patient from school and public places until the glands have healed; (3) disinfection of all articles soiled with the discharges from the patient's nose and throat.

Meningitis.—This is a general name for an inflammation of the meninges, the membranes that surround the brain and spinal cord. Many kinds of bacteria may cause meningitis, and all such infections are serious. They are not generally communicable because the microbes that have invaded the central nervous system do not easily escape from it to infect other hosts. There is one kind of meningitis that does occasionally break out in epidemics, though it is not a common disease. This is meningitis caused by a coccus called *meningococcus* or *Micrococcus meningitidis.*

Meningococcus meningitis is also known as *cerebrospinal fever.* It is primarily a disease of children and soldiers—soldiers apparently being affected in epidemics because overcrowding permits easy spread of the infection. Healthy carriers of the microbes of this disease are probably common and widespread. The infection is transferred from person to person principally through the discharges from the mouth and nose of infected persons. Direct contact and hand-to-hand or droplet infection (that is, infection through contact with tiny drops of sputum coughed or sneezed into the air) appear to be essential to infection; hence the significance of overcrowding. Control and prevention of the disease depend upon:

(1) Early diagnosis of the disease;

(2) Isolation of infected individuals for at least fourteen days;

(3) Disinfection of discharges from the mouth and nose;

(4) Discovery of carriers by bacteriological examination and, if possible, their isolation;

(5) Education of the public in the importance of personal cleanliness and the avoidance of contact and droplet infection;

(6) Prevention of overcrowding in private and public places.

Pneumonia.—The term pneumonia is applied to various diseases that result from a number of causes. The common characteristic of each is an inflammation of the lung. Various pathogenic bacteria, many of them commonly found in the nose, throat or mouth, can cause the inflammation when conditions are suitable. Just what these conditions are is not clearly known at this time. If the disease involves whole lobes of the lung, it is called *lobar pneumonia;* if it is distributed in the scattered small lobules of the lungs, it is called *lobular* or *bronchial pneumonia.* The pneumococcus (*Diplococcus pneumoniae*) is the commonest cause of all pneumonias.

Although accurate figures cannot yet be obtained, it is quite certain that pneumonia is one of the leading causes of death and should perhaps stand at the head as "the captain of the hosts of death." In recent years at least 10 per cent of all deaths in the United States have been due to pneumonia, and the disease is approximately of equal importance in all countries of the world and in all climates. It is more prevalent in the cold than in the warm seasons of the year. It is well known that colds, catarrhs, chilling, exposure, fatigue and many comparatively mild diseases (influenza, measles, sore throat and so forth) predispose to pneumonia. Diet also appears to play an important role; persons suffering from scurvy or rickets are prone to attacks of pneumonia. All ages of life are susceptible, especially the young and the old.

It is a matter of strong controversy whether pneumonia is a contagious disease. There is no doubt about its infectious nature and about the identity of the microbes that are commonly responsible. There is also no doubt that close and intimate contact with infected individuals frequently results in the transmission of infection. There are, however, many who doubt that most cases of pneumonia are contracted by contagion from an actual case of the disease. They believe that the pneumococcus and other microbes that are potentially capable of causing pneumonia frequently inhabit the nose or throat of normal, healthy persons and cause disease when the resistance of the tissues is lowered by some predisposing cause.

It may be said that the control of pneumonia depends upon avoiding contact with persons suffering with an acute attack of the disease and with articles freshly soiled with discharges from the nose and throat of a patient. It is also commonly recommended that people should avoid congestion in public places in the cold seasons of the year. It is highly important to avoid fatigue, chilling and exposure, not to neglect colds and catarrhs, and, by proper regard to diet, exercise, fresh air and temperance in the use of alcoholic beverages, to maintain the body's resistance at the highest level.

Poliomyelitis (Infantile Paralysis).—This is an acute, infectious disease that occurs most commonly in children and that may result in extensive paralysis. The disease ordinarily begins abruptly with fever, nausea, vomiting, pain and perhaps stiffness of the neck. These may be followed by paralysis and death. The disease occurs in the form of occasional and isolated cases or in a sharp epidemic. It is a warm-weather disease and occurs in all countries. Its prevalence usually increases during the warm months of the year and then declines with the coming of cold weather.

The causative organism of the disease is not certainly known. There is reason to believe that the infection is probably spread through the agency of healthy carriers and through the nose and throat discharges of infected persons or objects contaminated by them. Some investigators are of the opinion that bowel discharges or objects contaminated with excreta of infected persons may also contain the infectious agent in a virulent form. There is little doubt that persons in the active stages of the disease have contaminated milk supplies and that consumption of the milk has led to epidemics of infantile paralysis.

The control of the disease is extremely difficult because there may be many healthy carriers in a community, and because infected persons may be capable of spreading the infection for several days before the symptoms of disease appear in them. Nevertheless there is reason to believe that the spread of the disease may be controlled to a certain extent by:

(1) Early recognition of the disease;

(2) Isolation of all recognized cases for 3 weeks from the beginning of fever;

(3) Quarantine for 2 weeks of children who have been exposed to infection and of adults who may have contacts with children or who are food handlers;

(4) Disinfection of discharges from the nose, throat and bowel of all patients;

(5) Isolation of all children who have fever during an epidemic of infantile paralysis until a diagnosis is made.

Enormous advances have been made in the treatment of infantile paralysis to prevent the development of permanent paralysis of arms, legs or other parts of the body and to treat the paralyzed child by skilful physiotherapy (the use of special exercises, massage, water, heat and so forth, to treat disease) to recover the use of parts that have been affected.

Rabies (Hydrophobia).—Rabies is a wound infection. It is due to an unknown virus that causes disease in lower animals as well as in man. All mammals are susceptible; dogs, wolves, jackals and foxes are most commonly infected. Rabies exists in all parts of the world, except in countries where rigid laws control and exclude it. Few diseases are more generally feared than rabies. Yet it is a disease against which a community can protect itself if it will only take the necessary steps. The microbes of this disease attack the central nervous system, and they may be present in high concentration in the saliva of the affected animal. The microbe probably cannot penetrate the unbroken skin or uninjured mucous membranes. Hence contact and ingestion are harmless. The infectious agent is capable of setting up disease when it gains entrance to the tissues through a bite, scratch or abrasion.

Not every animal that is angry or mad is rabid (affected with rabies); nor does the bite of every rabid animal necessarily lead to rabies. But it is essential, however, to suspect the possibility of rabies in every case.

The control and prevention of rabies depends on:

(1) Treatment of the wound. Every bite, scratch or abrasion caused by a dog or other animal that seems mad, acts queerly or gives any other signs of being rabid should be treated promptly (preferably by a physician) with strong nitric acid. Disinfectants or germicides like carbolic acid, silver nitrate, alcohol, bichloride of mercury and so forth, which may be used for other purposes cannot be relied upon to kill the virus of rabies. It is important that the treatment of the local wound be thorough and be done as promptly as possible.

(2) Killing the mad animal, if possible without injuring or destroying the head, because the diagnosis of the disease in the dog depends upon examination of the brain. If the animal is not certainly mad, it should be tied up where it cannot bite persons or other animals and be kept under observation by a physician or veterinarian.

(3) Prevention of disease by vaccination in the person who has been bitten. It is a fortunate thing about rabies that the disease ordinarily has a long incubation period. In man there is usually a lapse of 30 days to several months after infection before the symptoms appear. This period may be shorter if the bites were very severe or were on the face, head or near large nerves. Usually the incubation period is sufficiently long so that it is possible to keep under observation the animal that has done the biting to determine whether or not it will develop the disease, if it was not certainly mad at the time of the biting. This "time out" is of no consequence to the victim who is bitten because the incubation period is so long. Furthermore the length of the incubation period makes it possible actively to immunize the patient before the disease develops. One of the greatest inventions of Louis Pasteur was the method of vaccinating human beings against this terrible disease. Hence the vaccination is called the *Pasteur treatment.* It consists in injecting into the patient a carefully prepared vaccine to stimulate immunity against the microbes that may have been introduced by the bite of a rabid animal. Persons properly given the Pasteur treatment practically never develop rabies. If they are bitten again, months later, the treatment should be repeated.

(4) Muzzling of all dogs on public streets or in public places.

(5) Detention and examination of all dogs suspected of having rabies.

(6) Immunization of all dogs each year in communities where rabies occur.

(7) Effective quarantine of all dogs coming into a community or the entire country, to ascertain whether they are rabid. England enforces most of these rules and as a result is almost free of rabies.

Rheumatic Fever.—This is a generalized infection that involves the joints and the heart. It is sometimes called *acute inflammatory rheumatism.* The particular germ that causes it is as yet unidentified.

Rheumatic fever occurs mostly in children. Its onset is sudden, with high fever, sweating, pain, swelling and redness of different joints. In the usual course of the disease one or two joints will be involved one day, then the inflammation in these joints will subside, and the next day other joints will be involved. Thus on one day both knees, on the next day both elbows and on the third day the wrists and ankles may be swollen. It runs a course of about 10 days or 2 weeks. It is usually preceded by a sore throat or tonsillitis.

The most important feature of acute inflammatory rheumatism is the fact that it is liable to involve the heart, either the heart muscle or the valves of the heart, and lead to valvular heart disease. This complication may not be manifest for several months or even several years. The possibility of heart involvement is much lessened if the patient is kept in bed for a long enough period of time.

Treatment of the disease is by heat and oil of wintergreen dressings on the joint and the use of the salicylates, either salicylic acid or sodium salicylate by mouth.

Except for preventing exposure to cold weather, there is no effective method of controlling acute rheumatic fever.

Scarlet Fever.—This is an acute, infectious disease caused by bacteria (*Streptococcus scarlatinae*). It usually begins with sore throat, nausea, vomiting, fever and headache. A rash on the skin and roof of the mouth usually develops a day or two later, and this is followed by *peeling.* Although the disease may occur in persons of any age, it is uncommon in children in the 1st year of life and occurs most commonly between the 2d and the 12th years. The disease is most deadly to children in the 2d, 3d and 4th years of life. Therefore it is especially important to guard the very young against this infection.

Scarlet fever may be spread by healthy carriers of the streptococci or by diseased persons. The common sources of infection are discharges from the nose, throat, ears, abscesses—or from articles contaminated with the discharges—from scarlet-fever patients. Transmission of the infecting organisms is usually by direct, personal contact; but it may be accomplished indirectly through contaminated objects or milk or milk products. Epidemics of the disease have been definitely traced to infected milk. The affected person is usually infective for 2 to 3 weeks after the onset of the disease and until abnormal discharges have ceased and open sores and wounds have healed.

The control of scarlet fever depends on:

(1) Early recognition of the disease.

(2) Isolation of the patient in the home or in a hospital until the end of the infective period.

(3) Testing for immunity to the disease of such persons as have been exposed to infection. The *Dick test* used for this purpose is similar to the Schick test for immunity against diphtheria. Those who give a positive Dick reaction should be actively immunized by the physician with a suitable preparation of scarlet-fever toxin.

(4) Exclusion from school of children, teachers and others who have been exposed to infection and of food handlers from their work until 7 days have elapsed since the last exposure to a recognized case.

(5) Disinfection of all articles that have been in contact with a patient or soiled by his discharges.

(6) Daily examination by a physician, if possible, of all persons who have been exposed to infection.

(7) Pasteurization of the milk supply.

Smallpox.—This is a widespread disease that starts with general symptoms of infection—chills, fever, nausea, vomiting and so forth—and is definitely recognized by a characteristic eruption of separate pustules with crater tops that develops about the 3d, 4th or 5th day. It was once one of the most prevalent diseases in the world, killing or pockmarking old and young. Sometimes great epidemic waves would sweep through a land, sometimes it made its way slowly but certainly through a population.

Although smallpox is no longer such a terrible scourge, it is still widely prevalent. In 1923 there were reported about 50,000 cases in Europe and about 30,000 cases in the United States. There is no doubt that these are only fractions of the numbers that actually occurred. As it is intensely contagious, smallpox is not controlled by sanitation. Active immunization by vaccination is the only reliable preventive measure against smallpox.

The microbe that causes smallpox is unknown at this time. It is known to be present in the lesions of the mucous membranes and skin of infected persons. It is usually transferred from person to person by contact, but transfer may be accomplished through objects soiled with discharges from lesions or with feces or urine of the patient.

The control of smallpox depends upon:

(1) Accurate diagnosis of the disease.

(2) Hospital isolation of the patient in screened wards, free from vermin, until the disappearance of all scabs and crusts on the skin and membranes of the patient.

(3) Prompt vaccination of all persons who have been exposed to infection.

(4) Disinfection of all discharges from the patient. No article should leave the surroundings of the patient until it has been thoroughly boiled or subjected to equally effective treatment.

(5) Vaccination of all persons in infancy, revaccination of children on entering school (5th to 7th year) and revaccination of everybody, old and young, when the disease appears in a severe form in a community. The reason for these recommendations is that the immunity against smallpox that follows an attack of the disease or vaccination is not absolute, nor is its persistence certain. Persons who have been successfully vaccinated within 3 to 7 years are probably immune, but complete reliance should never be placed upon a former vaccination in the face of exposure to infection or existence of the disease in the community.

Syphilis.—This is the most dangerous and deadly of the diseases commonly spread by sexual contacts. It affects from 6 to 10 per cent of all persons; it occurs among old and young and in all classes of society. It is the principal cause of insanity, childlessness, abortions and miscarriages. It is caused by a spirillumlike microbe, called *Spirocheta pallida* or *Treponema pallidum.* The sources of infection are discharges from lesions of the skin and mucous membranes, the blood of infected persons and articles freshly soiled with such discharges or blood in which the spirochetes are present. The spread of the disease occurs most commonly by sexual contact, but it may be occasioned by kissing, by more casual contact or indirectly through infected objects.

It must be emphasized that syphilis is an extremely dangerous disease, but it is both preventable and curable. Control of the disease depends upon the following:

(1) Early recognition and diagnosis of the disease by clinical symptoms and examination of the discharges and of the blood. The effectiveness of treatment depends on how early it begins and how long it is continued. It is therefore very important that all persons who have been exposed to infection should promptly seek the advice of a reputable physician. Early preventive or curative treatment may make the difference between a lifetime of healthy living or one of broken health, disease and insanity.

(2) Exclusion of infected persons from sexual contacts and from preparation of foods during the early active stages of disease and avoidance of kissing and other close contacts.

(3) Avoidance of common towels, drinking cups, toilet articles and eating utensils.

(4) Proper personal prophylaxis, prescribed by a reputable physician, for those who expose themselves to infection, especially in illicit sexual intercourse.

(5) Education of all persons to insure understanding that continence in both sexes and of all ages is compatible with health and normal development.

Tetanus (Lockjaw).—This is a wound-infection disease caused by *Bacillus tetani.* This microbe is apparently harmless if it is swallowed and becomes dangerous only when it gains entrance to injured tissue. (The probable reason for this is that *B. tetani* is an anaerobic microbe, requiring the absence of oxygen to grow and produce its poison.) It is frequently present in animal manure, soil and in street dust. Infection ordinarily occurs through wound infection with dirt that contains the bacillus. The patient affected with the disease is not ordinarily infectious to others. It is a very painful disease, characterized by tonic spasms of certain muscles. It is sometimes called *lockjaw* because the jaw muscles are first affected; the jaw is set or locked and cannot be opened. Prevention of tetanus depends upon:

(1) Removal of all foreign matter as quickly as possible from all wounds.

(2) Through the disinfection of all wounds.

(3) Use of tetanus antitoxin in all persons who have been seriously wounded or injured in regions where tetanus bacilli are known to occur in the soil and in all cases where wounds are ragged or penetrating. Tetanus was an unfortunately common cause of death among wounded soldiers in the early days of the World War. Then the practice was instituted in all the armies of giving every seriously wounded soldier a suitable dose of tetanus antitoxin as a preventive measure. Thus the disease was brought under control.

Occasional cases occur the year round, but tetanus is most prevalent in the United States directly after the Fourth of July. Many cases follow injuries due to celebration accidents. Tetanus is sometimes the terrible price paid by those who do not observe a safe and sane Fourth.

Tuberculosis.—There are many kinds of *tuberculosis* that are caused by the *Mycobacterium tuberculosis.* Lung infection is the commonest form. This is *pulmonary tuberculosis* or *consumption.* Until recently the disease was responsible for from 10 to 20 per cent of all deaths, but effective control methods were found and there has been a remarkable decline in its occurrence (death rate in 1868—350 per 100,000 population; in 1910, 180 per 100,000; in 1934, 56 per 100,000). Man's conquest over tuberculosis as we see it occurring today marks one of the greatest triumphs of hygiene and preventive medicine. Serums and vaccines for tuberculosis are announced from time to time, but none is yet established.

The control of tuberculosis is extremely difficult because the microbe is widespread. In civilized communities nearly everyone becomes infected at some time or other in the first 20 years of life. Ordinarily the infection is conquered by the infected tissues, and the individual is unaware of the battle that was waged between the microbe and the body defenses.

The bacillus of tuberculosis may attack almost any part of the body, giving rise to lesions of the skin, glands, bones, intestines, kidneys and other organs.

Pulmonary Tuberculosis (*Consumption*). This is caused by the tubercle bacillus of the so-called *human* variety. It is present in the discharges of any open tuberculous lesions, the most important being the sputum. Infection is usually spread by direct or indirect contact by coughing, sneezing or other droplet infection, kissing, common use of unsterilized food utensils, pipes, toys, drinking cups and other articles and possibly by contaminated flies and dust. The danger of infection exists as long as the infected person is discharging the microbes.

The methods of control are:

(1) Recognition of the disease through examination by a physician using X ray, skin tests and bacteriological examinations when necessary.

(2) Education of the affected person in how to avoid spreading infection.

(3) Careful disinfection of sputum or articles soiled with it—handkerchiefs, cloths, papers, eating utensils and so forth.

(4) Education of the public in the hygiene of the body to avoid and control infection.

(5) Provision of dispensaries and other facilities for the recognition of early cases and of facilities for their care, open-air schools for pre-tuberculous children (children who have been exposed to tuberculosis, although they may not actually have it in active form).

(6) Ventilation and elimination of dust in factories, workshops and places of public assembly.

(7) Separation of babies from tuberculous mothers at birth.

Other Forms of Tuberculosis (*Nonpulmonary*). The human or the bovine variety of the tubercle bacillus may cause affections of the skin, glands, bones and internal organs. The sources of infection are discharges from the mouth, nose, bowels, genitourinary tract of infected humans; articles freshly soiled with such discharges; milk from tuberculous cattle. Infection may be transmitted by direct contact with infected persons, by contact with objects contaminated with their discharges and by eating or drinking contaminated meat, milk or other foods. Control of these infections is by:

(1) Early recognition of the disease.

(2) Disinfection of discharges and articles soiled with them.

(3) Pasteurization of all milk and inspection of meats.

(4) Elimination of tuberculous cattle from milch herds.

(5) Prohibiting all persons who have open tuberculous lesions from handling foods that are consumed raw.

Tularemia.—This is an acute disease, acquired almost exclusively from dressing wild animals, particularly rabbits. The causative germ is a bacterium. The disease has been reported only in the United States.

The usual form of the disease is for a sore to develop on the skin of the hand, followed by the enlargement of several glands in the arm, which are painful, usually break down and ulcerate through the skin. This form is particularly likely to occur in hunters or marketmen who skin and dress wild rabbits. Rabbits are particularly prone to the disease, and the germ can invade the skin, especially when there is a cut in the skin, during the process of dressing.

Treatment is by hot applications to the sores and surgical drainage when the sores begin to fluctuate, that is, when they become soft, showing that they contain pus.

Prevention is by the use of rubber gloves when dressing rabbits or any other wild game.

Typhoid Fever.—This is one of a group of infections of the intestinal tract caused by bacteria. It is caused by *Bacillus typhosus.* There are a number of bacterial species or varieties that are different but closely related and that are capable of causing infections that are similar as to symptoms with typhoid fever. The paratyphoid bacilli cause paratyphoid fever; others cause milder or more severe diarrheal infections. In all these diseases there is fever, malaise, headache, acute gastrointestinal upset with mucus or bloody diarrhea, complications in the liver or gallbladder function and so forth. In each of the diseases in this group the sources of infection are the bowel discharges and urine of infected individuals or of healthy carriers of the microbes. The microorganisms are ordinarily spread by direct contact or indirectly through contaminated water, milk and shellfish. Contaminated flies are common means of transmission in epidemics.

The control of typhoid fever and related diseases depends on:

(1) Recognition of the disease from the clinical symptoms and confirmation by the agglutination test and by bacteriological examination of blood, bowel discharges or urine.

(2) Isolation of the patient in a flyproof room, preferably under hospital conditions.

(3) Immunization by vaccination of all persons, so far as is practicable, in communities where the disease is prevalent and especially of all susceptible persons in the family or household of the patient who have been or may be exposed during the course of the disease.

(4) Adequate protection and purification of public and private water supplies.

(5) Pasteurization of public milk supplies.

(6) Supervision of other food supplies and of food handlers.

(7) Prevention of fly breeding.

(8) Sanitary disposal of human excreta.

As recently as 2 or 3 decades ago epidemics of typhoid fever were common—one of the regular prices man paid for the privilege of living in cities. The disease was significantly reduced as soon as people in urban communities learned how to dispose of their sewage and keep it out of their water supplies and how to disinfect the water they drank. When pasteurization of milk became more general, the incidence of typhoid fell still further. Now, as communities are learning how to discover carriers, eliminate them from food-handling occupations and educate them in hygienic living, typhoid fever is tending to become a rare disease. Occasionally one or the other of these defenses breaks down, and an epidemic sweeps through a community. Typhoid fever is controllable, but eternal vigilance is the price.

Whooping Cough.—This disease, also called *pertussis,* is acute and contagious and is caused by a bacillus (*B. pertussis*). In its first stage it usually appears as a mild catarrhal infection of the upper respiratory tract. In the second stage the principal sign is the frequent coughing spells that usually end in a characteristic inspiratory whoop. The disease is unlike most respiratory infections in that in the United States it is most common in spring and summer rather than in the winter months. It is principally an affection of early childhood, about one-fifth of all cases occurring in babies in the first year of life and another fifth in the second year. It is relatively uncommon in persons over 15.

Whooping cough is one of the most dangerous of the common infectious diseases, not because it is itself mortal but because it may lead to pneumonia or other serious complications. Nearly every one suffers an attack of the disease at some time or other. The disease is far more deadly to young than to older children. One attack of the disease usually confers a lasting immunity, so that a second attack is rare.

The pertussis bacilli are usually present in very large numbers in the discharges from the lungs. These provide the common means of spreading the disease. It is known that cats and dogs are susceptible to pertussis, and it is thought by some that these animals may occasionally become infected and serve to spread the bacilli. The usual mode of transmission is contact with an infected person or with articles freshly soiled with discharges from a patient. The disease is especially communicable in the first 7 to 14 days when only the catarrhal signs usually exist and before the coughing and whooping spells have begun. After the whoop has appeared, the patient may still be infective for 3 or more weeks.

The control of whooping cough depends on:

(1) Recognition of the disease.

(2) Separation of the patient from susceptible children and exclusion of the patient from all public places for a period of from 1 week after exposure to infection until 3 weeks after the appearance of the whoop.

(3) Disinfection (by boiling) of all articles soiled by nose or throat discharges of the infected child.

Summary

(1) These diseases are caused by the activities or poisons of microbes —bacteria, protozoa and so forth.

(2) Human beings, not lower animals or the environment, are most commonly the reservoirs of infection, principally because most disease germs die out quite rapidly after they leave the body.

(3) The transmission of disease is most commonly accomplished by more or less direct transfer of the infecting agent from person to person (contact); less often through the intermediate infection of foods and fomites (substances—cloth for instance—in man's surroundings that may retain and transmit disease); and in a few diseases (malaria, plague, yellow fever and others) through the intermediate agency of insects.

CANCER

Cancer belongs to the group of diseases known as *tumors*. There are two types of tumors—malignant and benign. Cancer is classified as a malignant type. A common type of benign tumor is a wart on the skin. This is a growth or tumor (swelling) that is due to a growth of skin cells.

Cancer has the same characteristics. It is a condition in which the cells are undergoing excessive growth and multiplication. Benign tumors stay in one place and usually stop growing after a certain time. The reason cancer is called *malignant* is that once started the cells never stop growing, and instead of remaining localized they may get out into the blood stream, appear in some distant part and begin growth there. This is called *metastasis*.

Great advance has been made in the exact diagnosis and treatment of cancer. Treatment is by surgery, the X rays and radium. All these agencies destroy or remove the cells. Treatment should be instituted in the early stages while the growth is still localized. Cancer usually attacks people after they are 40 years old. With early diagnosis and prompt treatment cancer can be cured in 90 per cent of the cases of skin cancer and approximately 20 per cent of internal cancers.

The cause of cancer is not known. Some pathologists believe it is due to a germ infection of some kind, but there is little evidence to support this. The best thought at the present time is that it is due to heredity, being a hereditary predisposition of the cell to increase and run wild.

COMMUNITY HYGIENE AND SANITATION

Water Supply.—The purity of the water supply must be carefully guarded. The conditions under which water is found in nature leave it open to contamination. Because it is generally consumed raw, its pollution is unusually dangerous.

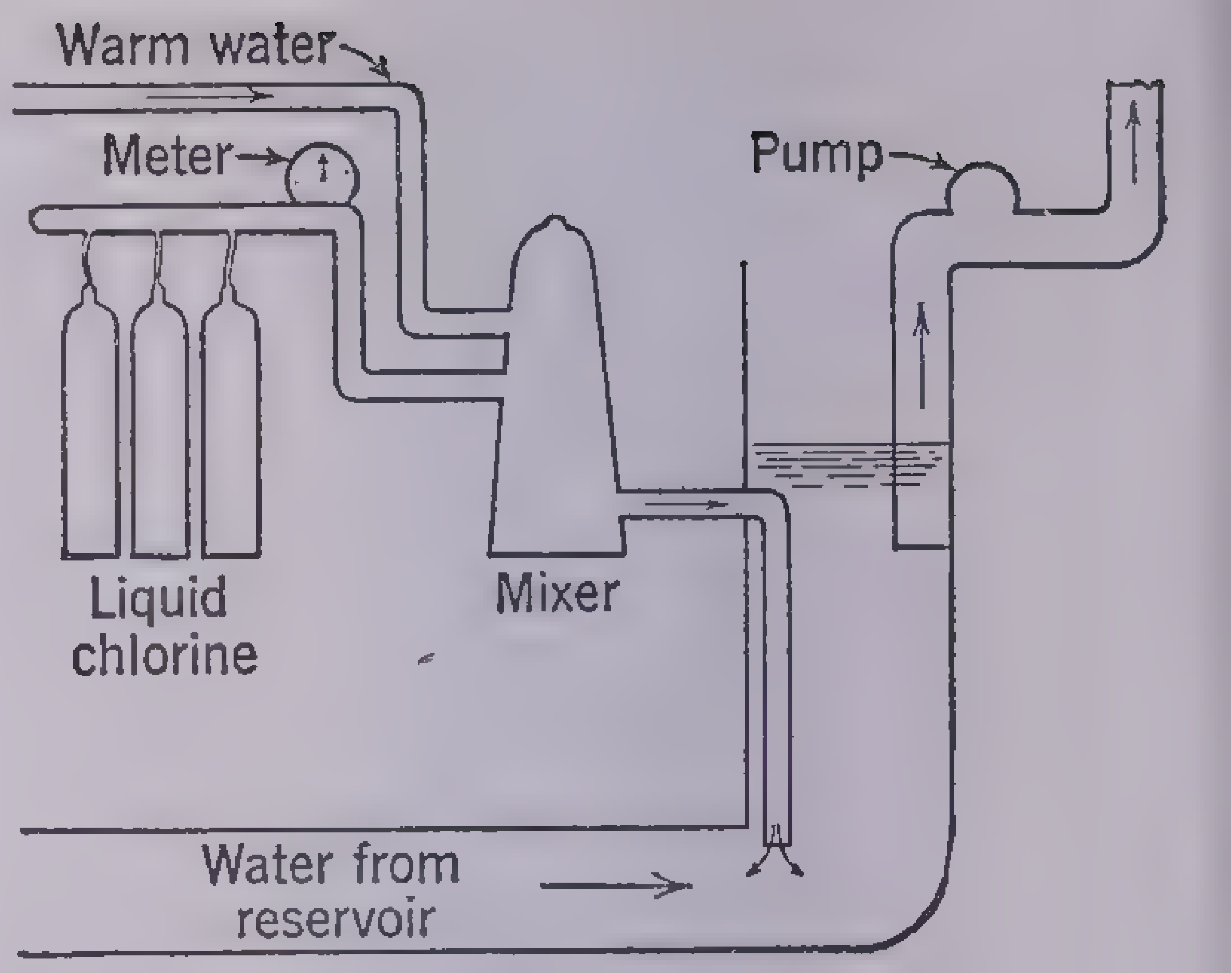
Purification of water should eliminate water-borne diseases. Drinking water should contain no typhoid and no colon bacilli. The latter are indicative of sewage contamination, and since they are easy to detect, their presence is a standard criterion of contamination. The recommendations of boards of health state that water purification should eliminate "all but a few" bacteria.

Protecting the Well. On the farm and in small communities water for drinking, cooking, washing and other purposes is usually drawn from a well. The well is usually in proximity to the house. Precautions must be taken to locate and construct the well so that polluted material will not readily be flushed or drained into it. This applies especially to the excreta of human beings, because they may contain the microbes of disease even though they come from apparently healthy persons. The well should be located as far as is convenient from the privy or cesspool so that the natural drainage, if it can be determined, is away from and not toward the well. The sides of the well should be of tight construction so that no water can enter it except from the inlet at the bottom. The top should be watertight so that no surface wash or drainage can seep in. If the soil is sandy and free from cracks or fissures, surface or ground water will be effectively filtered and rendered safe before it reaches the water level at the bottom of the well.

Protecting Large Water Supplies. The existence of large communities is impossible without a sufficient supply of good water. Therefore artificial reservoirs are essential for towns and cities if a natural supply, such as a river or lake, is not available. Man is always careless about the disposal of his wastes. No large body of water can be considered safe for consumption in its natural state even if the population near or in the area it drains is small. Sewage pollution may enter it regularly or occasionally, and large epidemics follow. There are three general methods of safeguarding a water supply: (1) storage, (2) filtration and (3) disinfection.

Purification of Water by Storage. If water is stored for a considerable period of time (2, 3 or more weeks), disease bacteria in it will usually die out for lack of food. Water is stored in large reservoirs by impounding a natural drainage or by pumping it into a specially constructed, large tank. The water need not be actually stored for a long time. The reservoir should be large enough so that the regular draughts made upon it result in so slow a flow that each portion of water is several weeks in passing through from the inlet to the outlet.

Purification by Filtration. Sometimes storage is impractical because the locale makes the building and protecting of a reservoir inconvenient or expensive. Filtration through sand is then resorted to. This is usually accomplished by building large underdrained beds of carefully chosen sand. In passing through these beds (slow sand filters) practically all the bacteria adhere to the sand grains. The water flowing off through the drains below may be nearly sterile. Where the appropriate kind of sand is not available, where the water contains finely suspended clay or where so much water is needed that an ample area of sand beds is impractical, engineers frequently add a coagulant (usually sulphate of ammonium or sulphates of iron) to the water and then remove this and adherent bacteria from the water by rapid filtration through mechanically washed filters (rapid or mechanical filters.)



How Water is Chlorinated

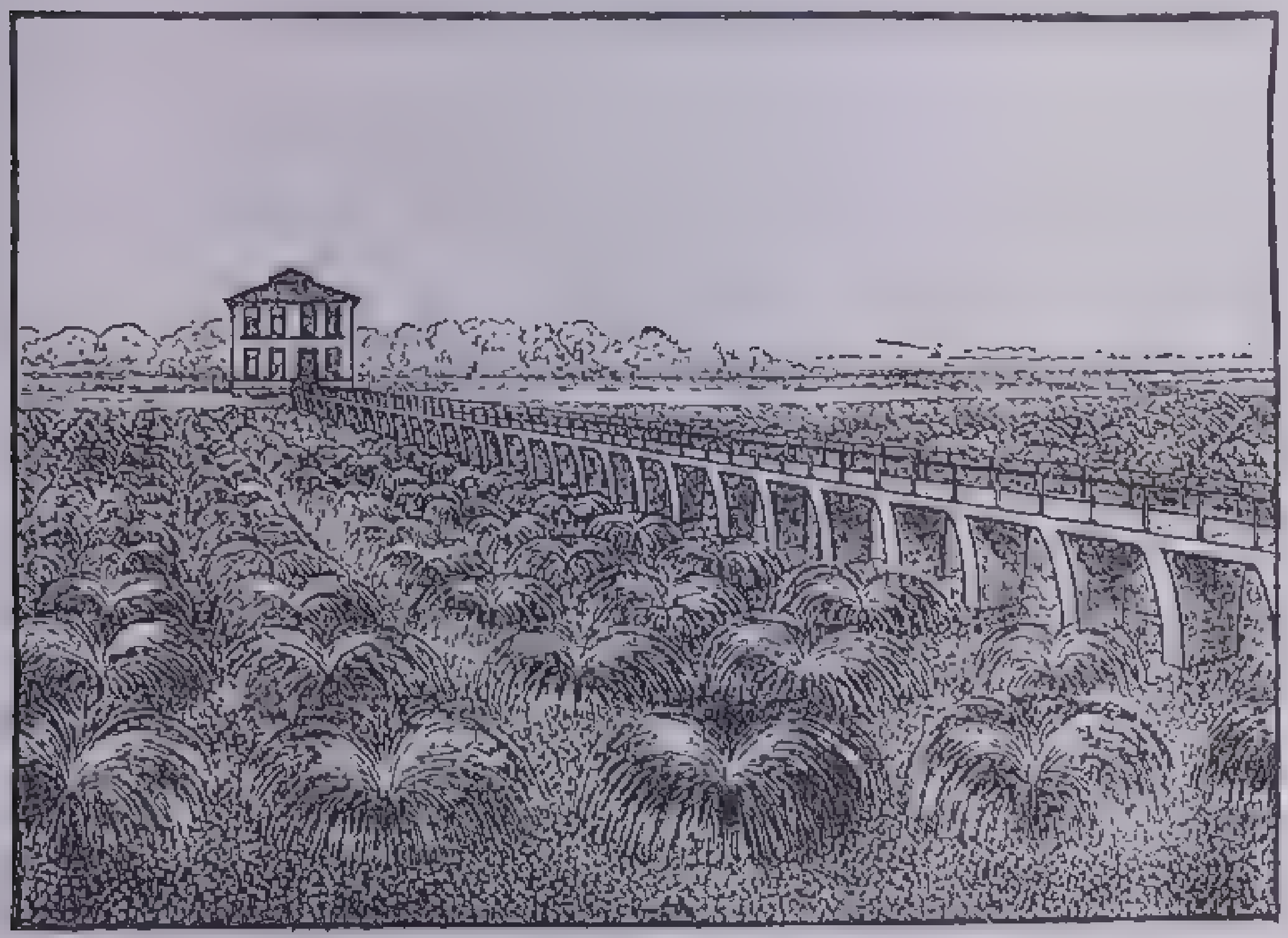
Carefully measured amounts of liquid chlorine from steel bottles are mixed with warm water in a special machine. The mixture flows into the incoming water from the reservoir and is pumped into the city mains

Purification by Disinfection. As a final protection of the water supply, practically all progressive communities use disinfection in addition to storage or filtration. The cheapest and most reliable methods depend upon the use of chlorine or a chlorine-yielding substance like calcium hypochlorite. In quantities of a few tenths of a part to a million parts of water, chlorine will destroy all the important disease germs that gain access to water. The bacteria of tuberculosis, typhoid fever, dysentery, cholera and others are destroyed by chlorine. It will not destroy the spores of certain pathogenic bacteria, but these are not commonly present in water and are not ordinarily dangerous when ingested.

Milk Supply.—Milk is an item of diet that requires special sanitary precautions in its production and distribution. Milk is a nearly perfect food for microbes as well as for man. Disease germs can multiply in it and infect the user. Epidemics of typhoid fever, scarlet fever, diphtheria, septic sore throat, Malta fever (also known as undulant fever) and other diseases have frequently been caused by infected milk. To safeguard the milk supply sanitary precautions are essential at many stages in its marketing.

The first requisite is that milk should come from cattle that are free from disease. In progressive communities inspectors examine the cattle at frequent intervals to detect those that have tuberculosis or disease of the udders. The farmer and milker must also watch the cattle closely for infections that may develop between inspections. Diseased cattle must be separated from the healthy ones and eliminated from the dairy herd. Strict ordinances concerning the health of the milker, the cleanliness of the dairy barn and the thorough cleansing and disinfection of all the milking and storage utensils must be observed. In a modern dairy milking is done by sterilized milking machines and the milk is promptly cooled to prevent the development of bacteria that may be present in the milk.

Pasteurization of Milk. No matter how carefully precautions are taken to obtain milk from healthy cattle and to reduce the opportunities for contamination and the development of bacteria, raw milk cannot be considered safe for consumption. (Certified raw milk, if the inspection is reliable, can be used.) Infection will occasionally get in and may cause disease. Pasteurization, named after Louis Pasteur, is the only effective safeguard. It consists in heating the milk at a temperature of 140° to 145° Fahrenheit for from 20 to 30 minutes. All disease germs of the kinds that may be present in milk are destroyed. The milk should then be cooled promptly to approximately 40° F. and kept cold until consumed. Pasteurization does not destroy all bacteria, and if pasteurized milk is not kept cold, it will turn sour and spoil. Properly pasteurized milk is pasteurized in the bottle or is bottled by automatic machinery as it flows from the pasteurizing chamber through the cooler to the bottler.



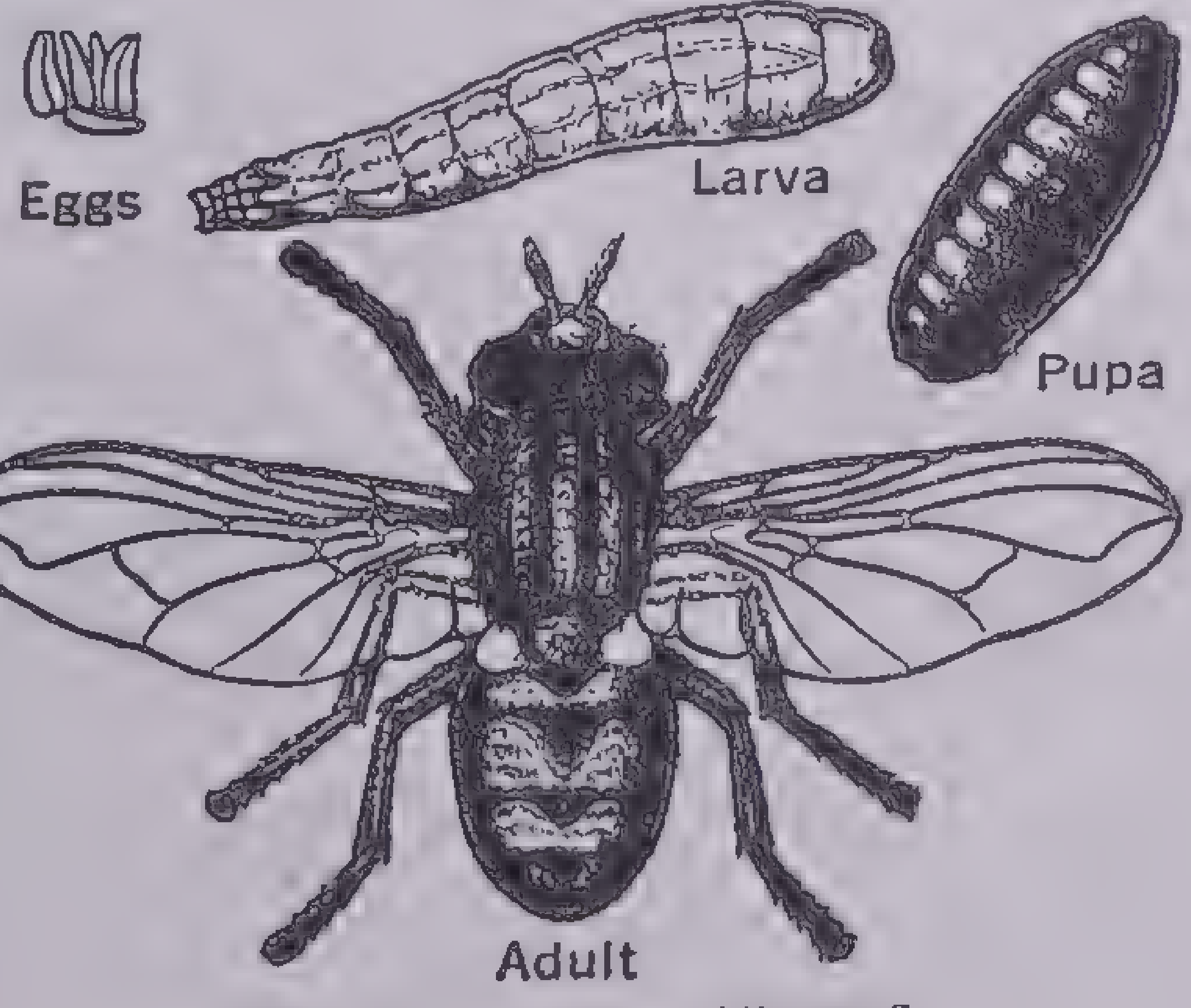
Sewage Disposal
A sprinkling filter for sewage disposal

Sewage Disposal.—In sewage disposal it is important to avoid offensive sights and smells and to avoid the contamination of the community's water and food supplies and those of its neighbors.

Disposal by Dilution. The simplest method of sewage disposal is by dilution; that is, the sewage is discharged into a large body of water, usually the sea. The natural processes of oxidation and bacterial action render the offensive matter harmless. It is essential that the discharge be into an adequately large body of water and sufficiently distant from water-supply intakes, bathing beaches and oyster beds.

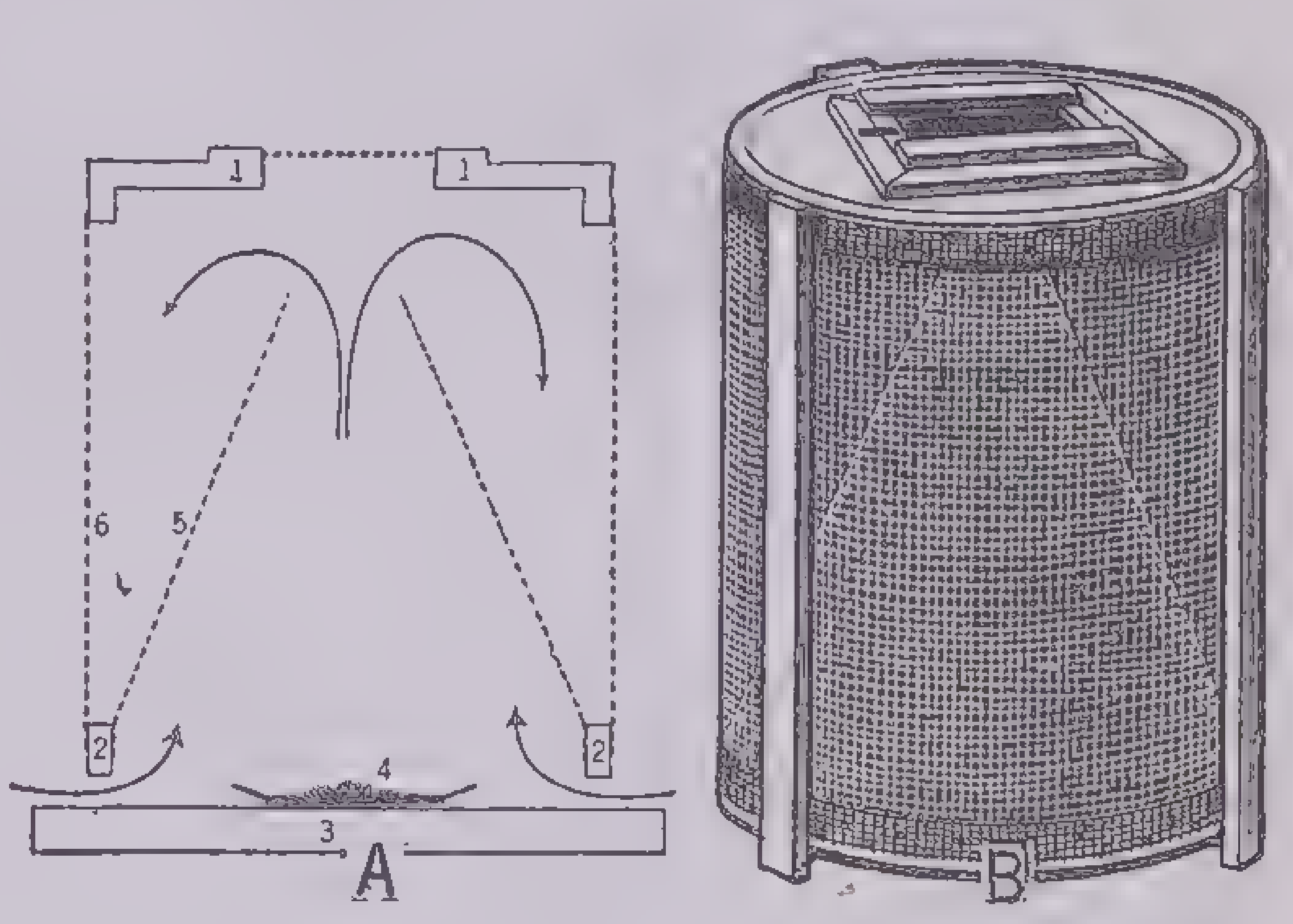
Disposal by Filtration. It is frequently impractical to dump sewage into a nearby body of water. For a rural household or a small community it is sometimes sufficient to treat the sewage in a septic tank and permit the outflowing fluid (effluent) to drain away through the soil. Bacterial action in the tank stabilizes the offensive and unstable organic matter. For large communities there are many devices available for sewage treatment. Sewage can be converted into clear water, but the process is usually very expensive. Each community must adapt its sewage-treatment program to its own problem. In some places treatment in large septic tanks of suitable design (Imhoff tanks) with or without preliminary screening to remove coarse detritus and suspended matter is sufficient. In others it is necessary to filter sewage through properly constructed filter beds. These are usually beds of stone and gravel, several feet thick and from one-quarter of an acre to several acres in area, over which the sewage is sprayed. The spray absorbs oxygen, and on the surfaces of the gravel and stones oxidizing bacteria grow, form jellylike coatings and work on the organic matter in the sewage so that a highly purified effluent is all that flows from the bed. The whole process takes from 4 to 6 hours. This may be emptied into a stream or other body of water without causing serious harm or nuisance.

Garbage and Waste Disposal.—Towns and cities must also make adequate provision for the proper disposal of their solid wastes, garbage, ashes and rubbish. This is done to prevent accumulations of offensive and unsanitary material—breeding grounds for insects and disease-producing bacteria. In up-to-date communities closed or carefully covered watertight wagons or carts are used to haul the material away at frequent intervals. At the place of disposal the modern cart can be dumped and washed automatically. Dumping in open places frequently leads to the establishment of serious nuisances. Garbage can be safely and profitably fed to hogs. Large cities must usually use other methods. In some places incineration is used, and the ash and clinker that is left is used to fill in vacant land or water fronts. In others, devices are used by which the water, grease and solids are separated. The grease is often valuable for commercial purposes and other portions for fertilizer. This process is called *garbage reduction.*



Life Cycle of the Housefly

Smoke Control.—Smoke is a product of combustion and consists of a mixture of gases and solid particles. There are two main causes of smoke: insufficient boiler capacity and improper stoking. The use of powdered coal with adequate collectors for fly ash has helped. In Pittsburgh forced draught combustion has reduced the visible smoke by 40 per cent.

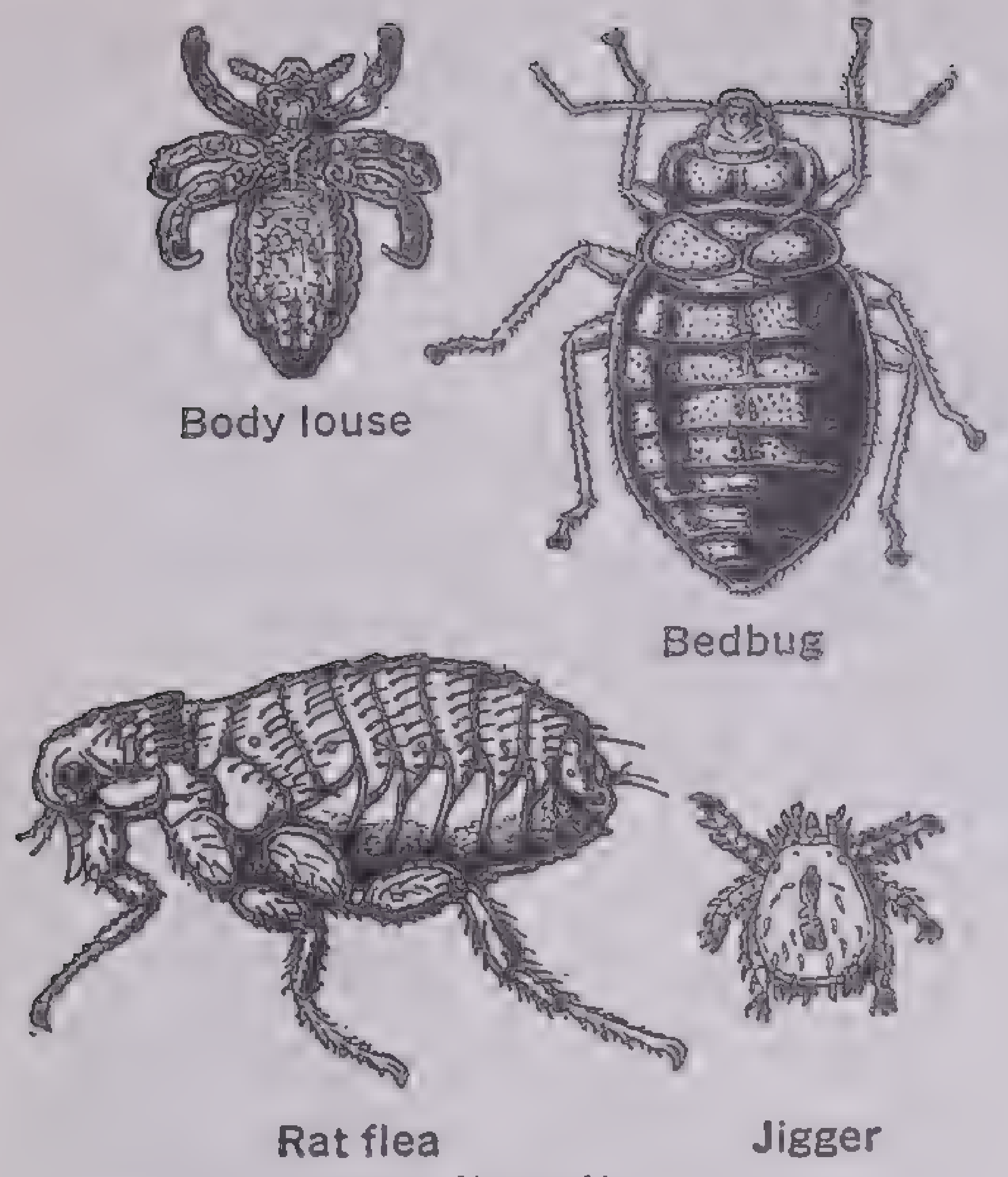


Simple Flytrap
At left is a section of a flytrap to show construction. At right is an external view of the flytrap: *1*, wooden top; *2*, wooden hoop to which screenwire is attached; *3*, table top; *4*, saucer of sugar or other bait; *5*, inverted cone with apex left open; *6*, cylinder of screenwire

Insects and Other Disease-Carriers.—Insects should be controlled by domestic and municipal sanitation. It is important that each household play its part in combating these enemies of man, but concerted action of the community is also essential. Some insects are only accidental, adventitious or mechanical carriers of disease germs, for instance, the housefly, which may carry typhoid; others are specific carriers of particular diseases, the spread of the disease being unusual or impossible without them. An example is the mosquito that carries malaria.

Houseflies. The housefly, *Musca domestica,* is found in practically all parts of the world. It multiplies rapidly in warm weather. The mother fly lays her tiny white eggs on manure, garbage or other refuse or filth. From each egg hatches out a small white maggot (larva). This grows for 4 or 5 days and then changes into a brown, motionless, resting body (pupa). After 4 or 5 days the adult fly hatches out and takes to the air. The fly breeds in filth and feeds on filth. It comes to the kitchen and the table; it alights on food or the body. It carries germs from filth to food and the body and leaves them where it alights and rests. It frequently carries typhoid bacilli and other disease germs from excreta to food and drink.

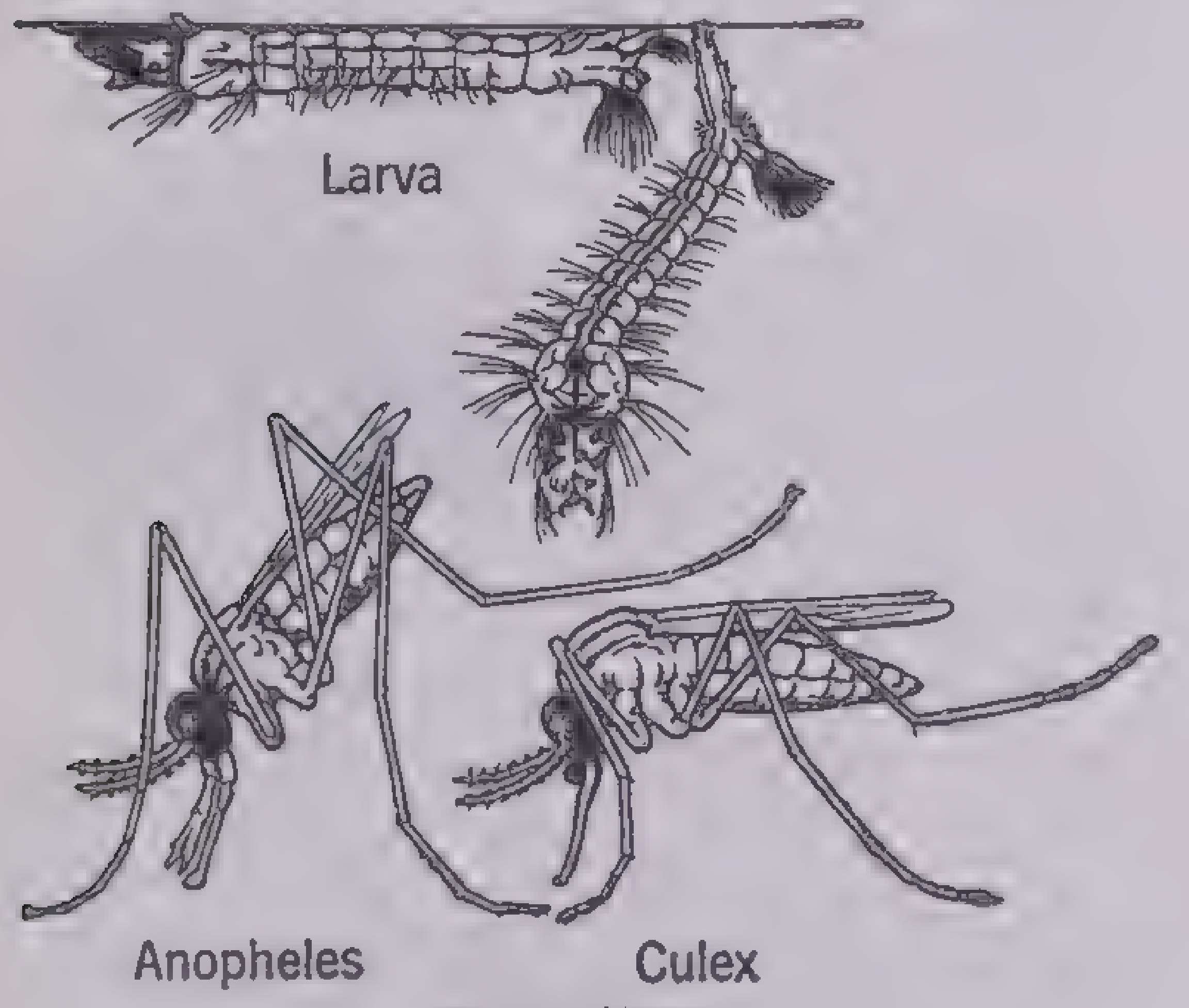
An understanding of these facts is essential in attempting to control flies. Their breeding must be prevented by keeping manure, garbage, refuse and all kinds of decaying matter in tightly covered containers so that flies cannot gain access to deposit their eggs. Flies must be trapped where they are present in large numbers, particularly if it is near the home. Suitable and effective



Insect Parasites

Body louse, *Pediculus vestimenti*
Bedbug, *Cimex lectularius*
Rat flea, *Ceratophyllus fasciatus*
Jigger, *Trombicula irritans*

flytraps can be built easily and cheaply. It is essential to keep the house and privy carefully screened so that the flies that are about cannot enter the house.



Mosquitoes

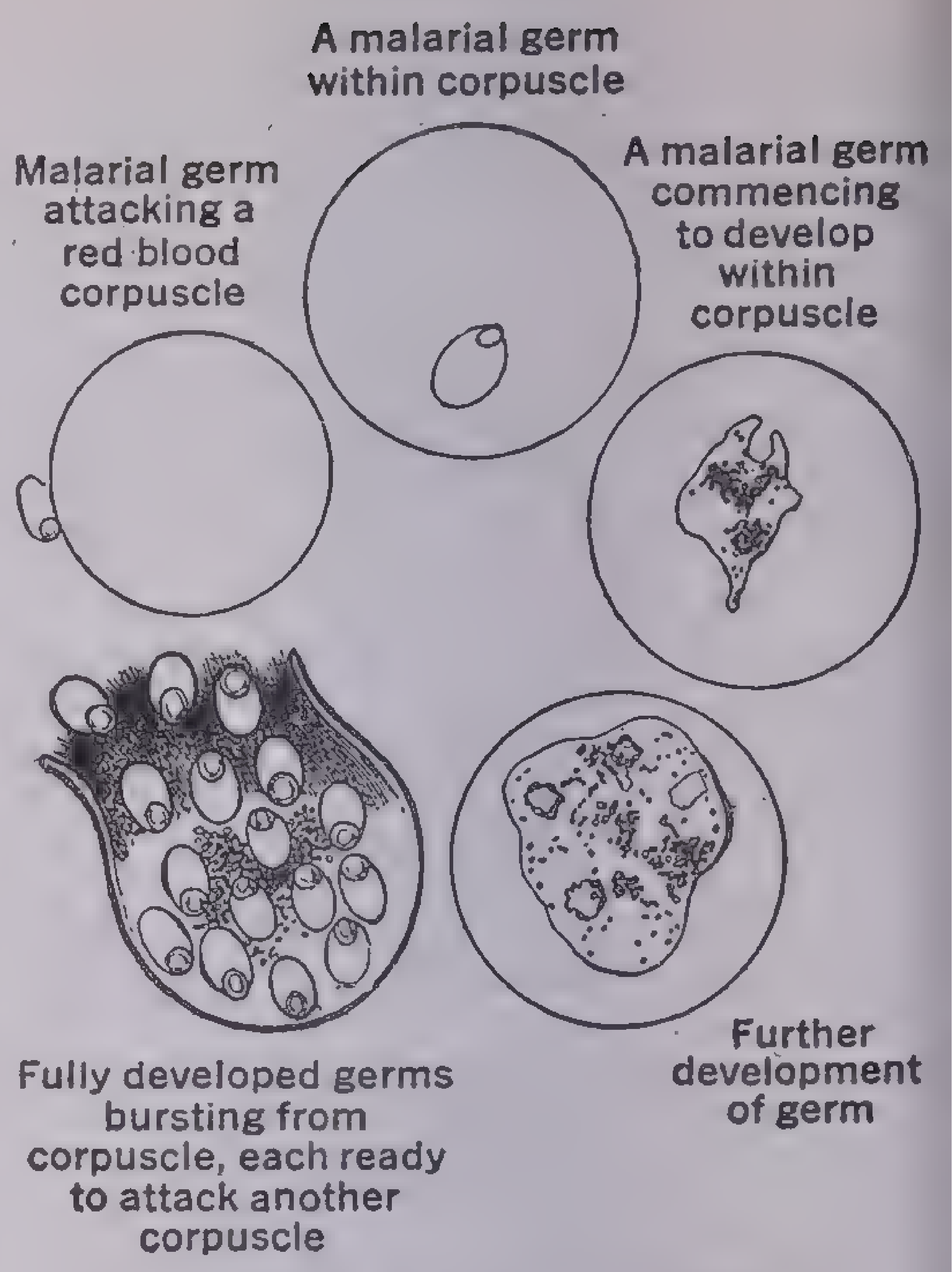
The larval stages (above) and adult stages (below) of the Anopheles and Culex mosquitoes

Mosquitoes. These insects are very dangerous to man, especially in warm places, because they are the specific carriers of malaria. Like other insects the mosquito goes through four phases in its life history: egg, larva, pupa and adult. The eggs are laid in stagnant or slow-moving water, small pools or ponds, ditches, sluggish streams clogged by plant growth, marshes, tin cans, roof gutters—almost any collection of exposed water. The larva or wriggler, so called because it moves about by jerks, hatches out from the egg. It obtains its air by frequently coming to the surface to breathe. To do this it sticks the breathing tube in its tail up through the surface. A few days later the larva changes to the pupa, and from this the winged adult hatches out. The common mosquito (*Culex*), which is a nuisance but which is not ordinarily capable of carrying malaria, can be distinguished from the dangerous malaria mosquito (*Anopheles*) particularly in the larval and adult stages. When the larva comes to the surface to breathe, it hangs down from the surface if it is *Culex* and lies flat against the surface if it is *Anopheles.* (The *Culex* has a longer breathing tube than the *Anopheles.*) The adult *Culex* has shorter legs than the adult *Anopheles,* so that when it is standing quietly the *Culex* is in a hunchbacked position (head, thorax and abdomen not in a straight line) whereas the *Anopheles* is at an angle to the surface on which it is resting, and the body is straight (head, abdomen and thorax in a straight line).

The control of mosquitoes is based upon the same principles that apply to the control of flies. First in importance is elimination of breeding places wherever this is feasible and practical. This necessitates draining swamps, pools and other collections of stagnant water in the vicinity of habitation. Second is the destruction of the larvae by covering with a thin film of kerosene or other oily material the surface of all stagnant water that may serve as a breeding place. As the material spreads over the surface of the water, it forms a film through which the larva cannot thrust its breathing tube when it comes up to breathe air. Third is the careful and thorough screening of all windows, doors and vents of the house with a fine-mesh wire or cloth net.

Rats and Fleas. These pests spread plague (sometimes called *bubonic* or *Oriental plague*). This is the Black Death that in earlier centuries used to sweep through countries like a terrific scourge. In one epidemic it killed between a quarter and a half of the population of Europe.

Plague is primarily a disease of rats and other rodents. It is spread from rat to rat and from rat to man by the rat flea, which, as it bites and sucks the blood of a diseased animal, receives a supply of the germs (*Bacillus pestis*) and then passes them on to the healthy animal or man that it bites later. The effective control of this disease depends on destroying and eradicating rats and on preventing them from breeding in and about human habitations. Houses and barns should be built or made rat-proof by screening all openings near the ground, by building tight foundations and pouring cement between the joists to sufficient depth so that the rats cannot gnaw their way through. Collections of garbage and refuse should be kept in closed containers. It is especially important that granaries be kept in rat-proof condition. To prevent the importation of infected rats and their fleas from other countries of the world, especially from countries where plague is prevalent, incoming ships are fumigated to destroy rats, and the mooring lines are protected with large, metal collars so that rats that attempt to come ashore on the lines cannot pass.


A malarial germ within corpuscle
Malarial germ attacking a red blood corpuscle
A malarial germ commencing to develop within corpuscle
Fully developed germs bursting from corpuscle, each ready to attack another corpuscle
Further development of germ

Life Cycle of the Protozoan Parasite Causing Malaria

Other Diseases Spread by Insects. Typhus fever (ship, jail, camp fever)

TABLE OF HEIGHTS AND WEIGHTS BASED UPON THE REPORT OF THE MEDICO-ACTUARIAL INVESTIGATION COVERING AN ANALYSIS OF 221,819 MEN AND 136,504 WOMEN

TABLE OF AVERAGE HEIGHTS AND WEIGHTS—MEN

Age	5 ft. 0 in.	5 ft. 1 in.	5 ft. 2 in.	5 ft. 3 in.	5 ft. 4 in.	5 ft. 5 in.	5 ft. 6 in.	5 ft. 7 in.	5 ft. 8 in.	5 ft. 9 in.	5 ft. 10 in.	5 ft. 11 in.	6 ft. 0 in.	6 ft. 1 in.	6 ft. 2 in.	6 ft. 3 in.	6 ft. 4 in.	6 ft. 5 in.
15	107	109	112	115	118	122	126	130	134	138	142	147	152	157	162	167	172	177
20	117	119	122	125	128	132	136	140	144	148	152	156	161	166	171	176	181	186
25	122	124	126	129	133	137	141	145	149	153	157	162	167	173	179	184	189	194
30	126	128	130	133	136	140	144	148	152	156	161	166	172	178	184	190	196	201
35	128	130	132	135	138	142	146	150	155	160	165	170	176	182	189	195	201	207
40	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	206	212
45	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
50	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
55	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219

TABLE OF AVERAGE HEIGHTS AND WEIGHTS—WOMEN

Age	4 ft. 8 in.	4 ft. 9 in.	4 ft. 10 in.	4 ft. 11 in.	5 ft. 0 in.	5 ft. 1 in.	5 ft. 2 in.	5 ft. 3 in.	5 ft. 4 in.	5 ft. 5 in.	5 ft. 6 in.	5 ft. 7 in.	5 ft. 8 in.	5 ft. 9 in.	5 ft. 10 in.	5 ft. 11 in.	6 ft. 0 in.
15	101	103	105	106	107	109	112	115	118	122	126	130	134	138	142	147	152
20	106	108	110	112	114	116	119	122	125	128	132	136	140	143	147	151	156
25	109	111	113	115	117	119	121	124	128	131	135	139	143	147	151	154	158
30	112	114	116	118	120	122	124	127	131	134	138	142	146	150	154	157	161
35	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
40	119	121	123	125	127	129	132	135	138	142	146	150	154	158	161	164	167
45	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
50	125	127	129	131	133	135	138	141	144	148	152	156	161	165	169	173	176
55	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177

Copied from *The Chemistry of Food and Nutrition* by H. C. Sherman, Macmillan, 1927.

WEIGHT - HEIGHT - AGE TABLE

For Boys and Girls 2 to 15 Years Old

BOYS—HEIGHT IN INCHES—BOYS

BOYS

WEIGHT IN POUNDS

Height in Inches	2 Years Old	3 Years Old	4 Years Old	5 Years Old	6 Years Old	7 Years Old	8 Years Old	9 Years Old	10 Years Old	11 Years Old	12 Years Old	13 Years Old	14 Years Old	15 Years Old	Height in Inches
30	22														30
31	23														31
32	25														32
33	26	26													33
34	27	27													34
35	29	29	29												35
36	30	31	31												36
37	31	32	32												37
38		33	33	34	34										38
39		35	35	35	35										39
40		36	36	36	36										40
41			38	38	38	38									41
42			39	39	39	39	39								42
43			41	41	41	41	41								43
44				44	44	44	44								44
45				46	46	46	46	46							45
46				47	48	48	48	48							46
47				49	50	50	50	50	50						47
48					52	53	53	53	53						48
49					55	55	55	55	55						49
50					57	58	58	58	58	58	58				50
51						61	61	61	61	61	61				51
52						63	64	64	64	64	64	64			52
53						66	67	67	67	67	68	68			53
54							70	70	70	70	71	71	72		54
55							72	72	73	73	74	74	74		55
56							75	76	77	77	78	78	78	80	56
57								79	80	81	81	82	83	83	57
58								83	84	84	85	85	86	87	58
59									87	88	89	89	90	90	59
60									91	92	92	93	94	95	60
61										95	96	97	99	100	61
62										100	101	102	103	104	62
63										105	106	107	108	110	63
64											109	111	113	115	64
65											114	117	118	120	65
66												119	122	125	66
67												124	128	130	67
68													134	134	68
69													137	139	69
70													143	144	70
71													148	150	71
72														153	72
73														157	73
74														160	74

GIRLS—HEIGHT IN INCHES—GIRLS

GIRLS

WEIGHT IN POUNDS

Height in Inches	2 Years Old	3 Years Old	4 Years Old	5 Years Old	6 Years Old	7 Years Old	8 Years Old	9 Years Old	10 Years Old	11 Years Old	12 Years Old	13 Years Old	14 Years Old	15 Years Old	Height in Inches
30	21														30
31	23														31
32	24	25													32
33	25	26													33
34	26	27													34
35	29	29	29												35
36	30	30	30												36
37	31	31	31												37
38		33	33	33	33										38
39		34	34	34	34										39
40		35	36	36	36	36									40
41			37	37	37	37									41
42			39	39	39	39									42
43			40	41	41	41	41								43
44				42	42	42	42								44
45				45	45	45	45	45							45
46				47	47	47	48	48							46
47				49	50	50	50	50	50						47
48					52	52	52	52	53	53					48
49					54	54	55	55	56	56					49
50					56	56	56	58	59	61	62				50
51						59	60	61	61	63	65				51
52						63	64	64	64	65	67				52
53						66	67	67	68	68	69	71			53
54							69	70	70	71	71	73			54
55							72	74	74	74	75	77	78		55
56								76	78	78	79	81	83		56
57								80	82	82	82	84	88	92	57
58									84	86	86	88	93	96	58
59									87	90	90	92	96	100	59
60									91	95	95	97	101	105	60
61										99	100	101	105	108	61
62										104	105	106	109	113	62
63											110	110	112	116	63
64											114	115	117	119	64
65											118	120	121	122	65
66												124	124	125	66
67												128	130	131	67
68												131	133	135	68
69													135	137	69
70													136	138	70
71													138	140	71
72															72
73															73
74															74

ABOUT WHAT YOUR CHILD SHOULD WEIGH AND MEASURE

Reproduced from *The Growing Child* by Dr. Herman N. Bundesen, Chicago, 1927.

is spread by the bite of the body louse. Personal cleanliness has resulted in the practical control of this disease by the elimination of lice. When habits of cleanliness break down, as in time of war, typhus fever usually takes its toll of health and life.

Certain kinds of mosquitoes spread yellow fever, filariasis and dengue fever in parts of the world where these diseases occur. Tsetse flies are chiefly responsible for the spread of sleeping sickness in Africa. A particular kind of blood-sucking fly (*Chrysops*) spreads the germs of tularemia, a disease that occurs in the United States in wild rabbits and other animals and that is occasionally contracted by hunters and by persons who handle infected rabbits. Some kinds of ticks carry the germs of Texas fever of cattle and Rocky Mountain spotted fever in the United States and of relapsing fever of Africa.

It is not entirely certain, but it is suspected, that various bedbugs are partly responsible for the spread of tularemia in the United States, European relapsing fever, Indian kala-azar and South American trypanosome disease (sleeping sickness). Lice also spread trench fever and Asiatic, European and Algerian relapsing fevers.

Health Departments and Public Hygiene.—The practice of personal hygiene is the individual's task, but the individual cannot entirely safeguard his personal health without concerted and co-operative action with other individuals. Many problems of sanitation, like those associated with water supplies, sewage disposal and the control of insects, are clearly community problems. There are many others with which the individual cannot cope single handed. The proper care, treatment and prevention of disease require hospitals, clinics, sanatoriums and related organizations; laboratories to aid in the diagnosis of disease; the supervision of food supplies and of food-handling establishments; statutes concerning disease prevention and means for their enforcement; maintenance of staffs of experts on sanitary-building design, ventilation, industrial hygiene, school hygiene; the provision of physicians and nurses for the examination of school children and many other community organizations. Finally experience has demonstrated that common welfare requires that there be available experts in the public teaching of hygiene so that the fruits of discovery and invention in medical and related subjects shall be carried to the public and made available for effective utilization. To accomplish all these ends modern urban and rural communities arm and equip themselves with health departments.

The organization of a health department depends upon the size and nature of the community. In American cities the department is usually under the direction of a commissioner of health appointed by the mayor or other chief executive. The commissioner of health usually operates with the advice and approval of a board of health.

A typical health department has bureaus of:

(1) Communicable diseases,
(2) Sanitation (water supply, sewage disposal),
(3) Laboratories (diagnosis of disease, distribution of antitoxins, vaccines),
(4) Child, maternity and school welfare,
(5) Food and drug inspection,
(6) Public-health nursing,
(7) Public-health education,
(8) Vital statistics.

In some places these functions are divided among more bureaus, and in others some of the bureaus are combined.

City departments of health are to a certain extent supervised by state departments of health and their activities co-ordinated. The health problems that concern the mutual relations of the state and interstate traffics, such as transportation of foods and quarantine against contagious diseases, are supervised by various departments of the Federal Government, chiefly the United States Public Health Service of the Treasury Department, although the departments of Agriculture, Commerce, Labor, Interior and other departments all perform important public-health functions.

The Trend of the Public Health.—There is no doubt that the general trend of public health is decidedly toward improvement. There are still great epidemics of disease that sweep through the population, but many diseases have been so effectively controlled that some that were common a century ago are now rare, and a few are rapidly approaching extinction.

The saving has been particularly noticeable in the diseases of infancy and was brought about by creating and controlling a clean milk supply. The trend at present is to attempt to control the death rate in the degenerative diseases of the heart and kidneys and blood vessels, and much progress is being made in this direction. The present efficient treatment of pernicious anemia and diabetes is an indication of how these degenerative diseases of middle age can be attacked. It cannot be said that the ultimate span of life has been changed: man still does not often exceed 100 years of life. But the average length of life has been increased from something like 35 to approximately 55 years in communities that are progressive in the practice of sanitation and hygiene. These accomplishments have been due particularly to the revolution effected in medical science by the germ theory of disease, improvements in standards of living and by mechanical and industrial applications of chemical and physical science. One of America's greatest leaders in public health (the late Dr. Herman M. Biggs) said: "Public health is purchasable. Within natural limitations a community can determine its own death rate." And the Department of Health of the State of New York adopted these as its watchwords.

In the following tables and paragraphs appear some vital statistics for the United States to indicate more precisely some facts about births, infant and adult mortality.

Vital Statistics.—In 1934, the last year for which full official figures are available, there were 1103.2 deaths for each 100,000 persons in the registration area for deaths. The registration area for deaths includes all those portions of the United States for which accurate figures are available and make up about 90 per cent of the population.

Contrasting this with the figures for 1926 we find that in that year there were over 1,200 deaths per 100,000 persons, so the recent figures show an improvement.

The cause of death is classified under 18 headings and the number of deaths per 100,000 population in each heading is as follows:

Diseases of the Circulatory System	263.2
Infectious Diseases	117.0
Cancers and Other Tumors	111.2
Diseases of the Nervous System	106.1
Violent and Accidental Deaths	104.3
Genitourinary Diseases	98.9
Respiratory Diseases[1]	90.7
Digestive Diseases	75.8
Deaths in Early Infancy	42.9
Rheumatic and General Diseases	33.6
Deaths from Ill-Defined Causes	16.4
Deaths Incidental to Pregnancy and Childbirth	10.2
Congenital Malformations	10.0
Deaths Due to Senility	8.7
Diseases of the Blood and Blood-making Organs	8.1
Chronic Poisonings	3.1
Diseases of the Skin	1.7
Bones, etc.	1.3

Approximately 80 per cent of all deaths were caused by the following diseases:

Diseases of the Heart and Circulatory System	263.2
Cancer	111.2
Brain and Nervous System	106.1
Violent and Accidental, all forms	104.3
Diseases of the Kidneys	98.9
Digestive Diseases	75.8
Tuberculosis, all forms	56.6
Pneumonia—Lobar	43.3
Early Infancy	42.9
Rheumatic and Other Diseases	33.6
Bronchopneumonia	33.1
Automobile Accidents	26.8
Diabetes	22.1
Influenza	17.3

It is illuminating to study the data in this brief compilation. The striking fact is that diseases of the heart are, by a considerable margin, the principal cause of death. Figures of this sort are sometimes analyzed by considering groups of causes of death. Thus, items 1, 2, 3, 5 and 13—representing causes of death that are called the *degenerative* diseases, principally because they usually occur late in life and are concerned with the breakdown of tissues or organs—were responsible for a combined death rate of approximately 600 deaths per 100,000 persons (over 40 per cent of the total mortality); items 7, 8, 11, 14 and part of 6—fatal infectious diseases—accounted for about 200 deaths in each 100,000 (about 17 per cent of the total); and items 4, 6, 9, 10 and 12—the remaining principal causes in this list—caused over 250 deaths per 100,000 persons (something over 20 per cent of the total).

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[1] In these mortality statistics respiratory diseases include some infections, such as pneumonia, and respiratory diseases, such as asthma.

This type of analysis is somewhat fallacious because it presumes that the degenerative diseases can be set apart from the infectious diseases. It may be that cancer is not caused by parasites and is not infectious. It is conceivable that certain diseases of the brain, heart, arteries, kidneys and so forth are not infectious. But there is not the slightest doubt that a large fraction, perhaps most, of the fatalities caused by these "Hosts of Death" are definitely bacterial infections.

It is of interest to comment on the fact that many of the diseases that were listed earlier among the principal communicable diseases are not among the principal causes of death. This is in part a reflection of the fact that many of the commonest diseases are mild and nonfatal; that when they are severe they are most dangerous not because they themselves kill but because they lead to secondary diseases (like bronchopneumonia and nephritis) that are deadly; and that many of them (like typhoid fever and diphtheria) have been extensively controlled and reduced.

In 1934 for the first time statistics were sufficiently reliable that the recording of births was made from every state, the District of Columbia, Hawaii, Puerto Rico and the Virgin Islands. In that year the population was estimated at 126,626,000 people. In 1934 in the U. S. registration area there were 2,167,636 live births (17.1 per 1,000 population). There were 1,396,903 deaths. There were 78,503 stillbirths (babies born dead), which was 3.6 per 100 live births. There were 130,185 infant deaths (under one year of age)—an infant mortality rate of 60.2 per 1,000 live births.[1]

The infant-mortality rate has been declining very rapidly in recent years and is the most certain sign of the application of medical, educational and public-health knowledge to the conservation of human life. From 1910 to 1915 rates of infant mortality of from 125 to 175 (infant deaths per 1,000 births) were not uncommon. Infant mortality has been cut in half, but much work still remains to be done.

The principal causes of infant deaths are (1) infectious diseases of the respiratory tract, (2) disorders of the intestinal tract (largely infectious) and (3) conditions concerned with defects in the development of the child's body, accidents and injuries at birth and so forth. From 1915 to 1920 approximately one-third of all infant mortality was caused by each of these groups of causes. The reductions in infant mortality that have been effected have, however, been almost entirely in the first and second groups. Consequently group (3) is now responsible for a relatively increased proportion of infant deaths. Thus in 1926 diseases of group (1) respiratory, were responsible for 25 per cent, group (2) intestinal, for 18 per cent and group (3) congenital, for 57 per cent of all infant deaths. Though the proportion of congenital deaths has gone up, the actual number of such deaths has decreased.

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[1] From *Birth, Stillbirth and Infant Mortality Statistics*, 1934, U. S. Department of Commerce, Department of the Census.

NUTRITION

The science of nutrition is the total knowledge gained by study and experiment about the effect of food on the body. Usually we eat because we are hungry or because we enjoy the taste of certain kinds of foods; but we know that unless we eat at regular times we become tired and feel weak and irritable. Why is it that food satisfies hunger, often relieves fatigue and makes us more cheerful? We could not know the answer to this question if men had not been curious to learn what happens to food when it is eaten and what it does to the body.

he First Food Scientists.—One of the first persons to experiment with the effect of food on the body was Sanctorius, an Italian who performed an experiment on himself about 1614. He sat in a chair hung from a steelyard or balance scale and weighed himself before and after each meal. Before he ate he counterbalanced the steelyard to the weight of food he intended to eat. Then sitting in the chair he weighed himself as he ate and found his weight increased by exactly the weight of the food he ate; but several hours *after* the meal he weighed himself again and found his weight the same as it was before he had eaten. Why was it that he had lost the weight of the food eaten? This question he could not answer. He thought it might be "insensible perspiration."

More than a century later Antoine Laurent Lavoisier (1743–94), a Frenchman who lived during the French Revolution, found the true answer and is now called the "father of the science of nutrition." A drawing made by Mme Lavoisier of her husband's laboratory and equipment shows one of his assistants breathing into a glass flask; by his experiments Lavoisier was able to measure both the oxygen that the man inhaled and the carbon dioxide that he exhaled. Lavoisier was the first to understand that the oxygen is used to burn food in the body (that is, to release the energy of the food) and that carbon dioxide is the waste product resulting from the combustion. This was the answer to the question asked by Sanctorius.

For more than 100 years not much more was learned about the fate of food taken into the body. Finally Wilbur Olin Atwater (1844–1907), chemist at Wesleyan University, Middletown, Conn., tried to determine the amounts of oxygen used and of carbon dioxide given off when food is burned in the body and also the amount of heat produced by this reaction. He built a chamber so insulated that it was possible to measure the heat given off by the body of a person in the chamber, the amount of oxygen he breathed in and the amount of carbon dioxide he breathed out. This apparatus, still used, is called a respiration calorimeter, and with it we have been able to learn how much food a man needs to lie quietly, to sit, to walk or to participate in almost any kind of activity.

The Body as a Machine.—The body is very often compared to an engine. It burns food in order to play or work, just as an engine burns gasoline to make it run. In addition, food must furnish the body with substances for keeping it in health and for growth.

Imagine buying a gasoline that would furnish fuel to make an automobile engine run and also repair it as the car moved along! Suppose, too, that it would gradually convert the car into a new model! Truly, that would be miraculous. Yet that which is impossible for gasoline to do for the automobile, the right kind of food really does for the human body—gives it power, repairs and renews it throughout life!

Food, then, may be expected to keep the body active, in repair and in good running order and enable boys and girls to grow to maturity. Is it fair, however, to expect the body to accomplish all of these things with just any sort of food as fuel?

Engineers provide the best possible fuel to make machines operate effectively. A poor grade of fuel always causes trouble in an engine. The engineer of the human machine must be able to do as much as the engineer of an industrial machine if he wishes quality performance. It is well, then, first to learn something about your machine—the human body—and next to find out how much and what kind of food is best to keep it in good working order, fuel that will be suitable in quantity and quality.

When we look at people we see many types of individuals—short and tall, fat and thin, vigorous and weak. Food has played a great part in making them what they are. If we could see through the layers of muscle and skin we would discern the framework, or bony structure, of the body, which supports and protects the laboratory stations—the stomach and intestines—where food is changed into a form suitable for the distributing lines that we call blood vessels. Through these lines, the heart pumps the blood, carrying its supply of water, oxygen and food to all parts of the body and carrying away from them the waste products. The lungs, acting as ventilators, bring air into the body—for oxygen to purify the blood stream—and remove the carbon dioxide that is discharged in them by the blood.

Measuring Food Values in Calories.—Fuels for man-made machines are measured in several ways: gasoline by gallons, coal by tons, gas by cubic feet. When we use fuels to run machines, we really wish to know how much work they will do, what *horsepower* the engine can deliver. In the same manner the work value of the food we eat is measured by *calories*. In physics a large or great calorie is the amount of heat required to raise the temperature of 1 kilogram of water 1° Centigrade. Just as the horsepower rating of an engine tells the engineer how much the engine can lift, the calorie tells how much energy there is in our food. One calorie represents energy enough to lift a boy or girl weighing 100 pounds about 31 feet into the air. The food is burned by the body to produce this energy and as in other machines heat is given off in proportion to the work done. Since it is possible to measure the ability to do work either as heat or as work, if we burn a food and measure the amount of heat given off, we can estimate the work that the calories in that amount of food will enable one to do.

Any apparatus for measuring calories is called a calorimeter. Dr. Atwater's device described above was a respiration calorimeter. The bomb calorimeter is the special apparatus used to determine the number of calories yielded by different kinds of food. It is a gas-tight steel vessel shaped like a bomb. It is placed in another vessel containing water of known amount and temperature, in which food, ignited by an electric spark, is burned in pure oxygen. As the food burns, the heat given off raises the temperature of the water surrounding the bomb. The difference between the temperatures of the water before and after the food was burned determines the number of calories such food will yield. Thus an ordinary hen's egg yields 70 calories; a half cube of sugar, 13 calories; a half slice of baker's bread, 25 calories. Fortunately for us, scientists have burned many foods in the calorimeter and have listed their results in tables so that we can study the calorie value of our meals.

Chemistry of the Food Mixture.—Food as it is eaten is not usually in a form that the body can absorb and use for fuel, for building material or to help in maintaining health in other ways. It is converted into usable forms by digestion, in which process certain substances called *enzymes*, secreted by the digestive tract, are essential. There are in foods a few materials not needing digestion, such as water, common salt and other minerals that can be absorbed without chemical change.

Among the most widely used fuel foods in grain-growing countries are those containing starches and sugars. Because of their chemical relationship they are called carbohydrates, though they are not actually hydrates of carbon. Chemists tell us that they all are composed of the elements carbon, hydrogen and oxygen. Plants absorb water from the ground and carbon dioxide from the air; and by the aid of sunlight they manufacture starch, sugar and another related product, called vegetable fiber, or cellulose. There are many kinds of sugar, the best-known two in the market being obtained from sugar cane and the sugar beet. The chemist calls these sucrose. Other sugars that we have every day but whose names are not so common, include: lactose, the sugar in milk; maltose, or malt sugar formed from the action of enzymes on starch; fructose, a common sugar in fruits; and glucose, prepared in large quantities by the chemical digestion of corn starch and sold in crude form as corn syrup.

When cane sugar (sucrose) is eaten, it must be changed by enzymes in the small intestine to glucose and fructose before it is possible for the body to use it. Starch, also, must be changed, first into maltose and then into glucose. There are no enzymes to digest cellulose, so it is not utilized by the body for power but serves as roughage to help keep the muscles of the intestinal tract in good condition and prevent constipation.

Another fuel food used all over the world is fat. It is composed of carbon, hydrogen and oxygen in different proportions from those in starches and sugars. Fats are a concentrated form of fuel abundantly supplied by nature in both plant and animal food. Some fats are in a liquid form—olive, corn and cottonseed oils—and some fats are congealed as a solid; for example, butter, lard and other cooking fats.

Like carbohydrates (except simple sugars, such as glucose and fructose), fats are not available for use in the form in which they enter the body but must be acted upon by special enzymes that change them to fatty acids and glycerin. One type of these enzymes is found in the stomach secretion, called gastric juice, and another in the secretion of the pancreas, called pancreatic juice.

Another form in which fuel food occurs is protein. It is found in both plant and animal foods, but in larger proportion in meat, eggs, milk and cheese, though such vegetable foods as cereals, legumes and many nuts are fairly rich in protein. Although protein is only 8 to 10 per cent of the weight of most dry cereals, it contributes a considerable amount to the diet when these are eaten regularly in large quantities.

Proteins differ and are made up of a number of complicated substances that chemists call amino acids. So far 22 different amino acids have been found in foods containing protein. Like the starches, sugars and fats, proteins contain carbon, hydrogen and oxygen; but unlike them the proteins furnish in addition nitrogen, sulphur and sometimes phosphorus and iron. When these proteins, which are really groups of amino acids combined, are eaten, special enzymes convert them into simple amino acids so that the body can use them.

Thus the food eaten usually contains three different kinds of fuel that the human machine can burn. When it burns carbohydrates or proteins, it gets 4 calories for every gram of such fuel eaten, but each gram of fat gives 9 calories. For example one glass of milk contains 8.5 grams of protein, 9.8 grams of fat and 12 grams of carbohydrate, or sugar. The caloric value of the milk is estimated thus:

Fuel	*Grams*		*Calories per gram*	*Calories*
Protein	8.5	×	4	34.
Fat	9.8	×	4	39.2
Carbohydrates	12.	×	4	48.
	One Glass of Milk			121.2

Measuring the Body's Fuel Needs.—If we know how many calories can be expected from each type of fuel material, the next question is how much fuel the body needs. This also can be measured by means of the Atwater respiration calorimeter.

Since the construction and operation of such a chamber is complicated and expensive, another kind of apparatus that has proved equally reliable in its measurements is more commonly used. It, too, is a respiration apparatus and resembles in some ways the device used by Lavoisier. Because it is known that burning food in the body means combination with oxygen in the process of combustion, the respiration apparatus measures calories spent by measuring the amount of oxygen used by a person. The amount of oxygen used in breathing during any state of activity can be used to determine how many calories are being burned. A table that shows the number of calories needed by boys and girls at different ages for each pound of body weight follows.

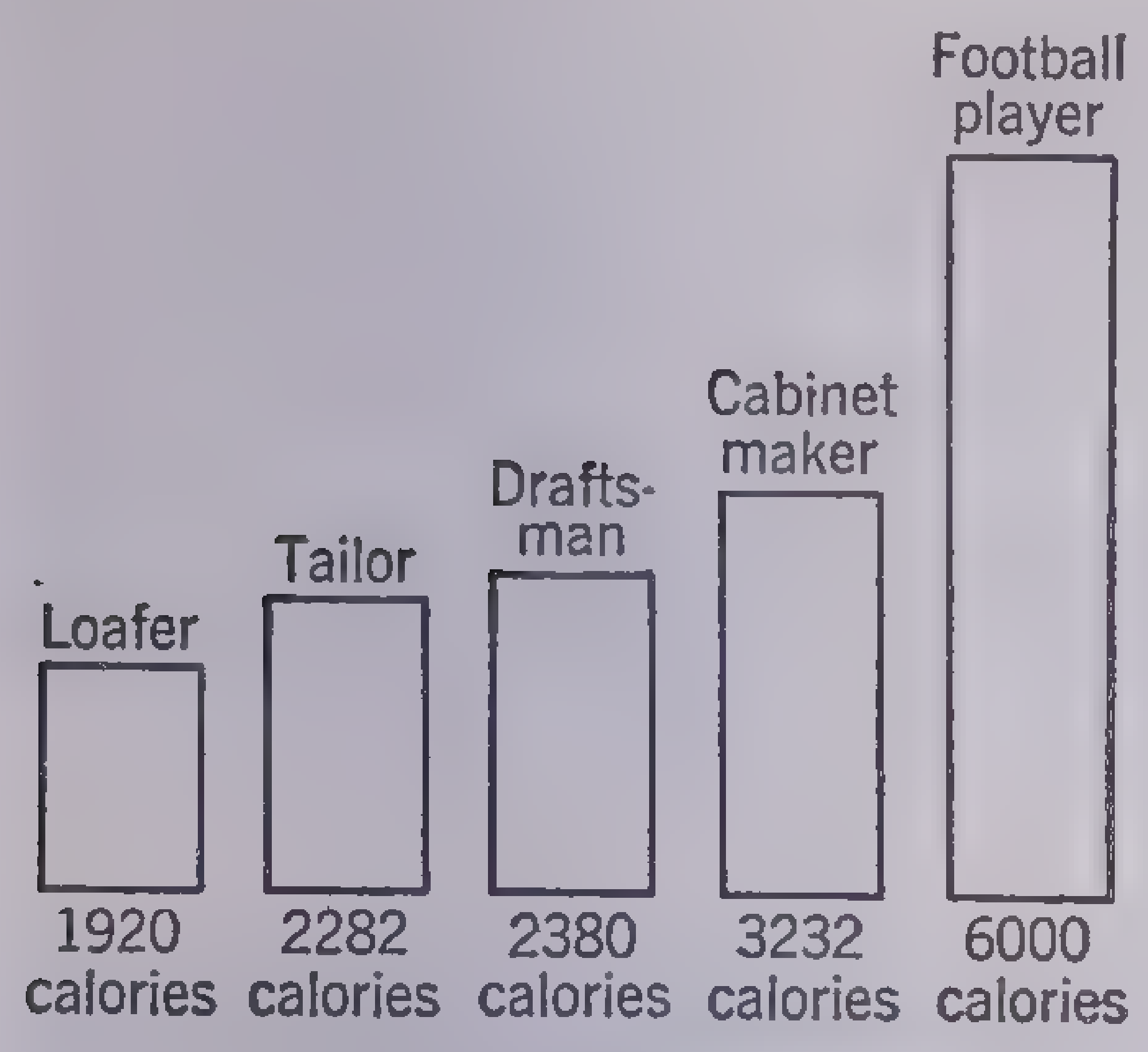
TOTAL CALORIES REQUIRED PER POUND OF BODY WEIGHT

Age in Years	*Calories*	
1-2	45-40	
3-5	40-36	
6-9	36-32	
10-13	32-27	
	For Boys	*For Girls*
14-15	27-25	23-20
16-17	27-25	20-18
18-19	25-23	18-16

The number of calories men and women need to make them go depends upon their weights and heights and forms of activity. The accompanying table shows the number of calories a person weighing 154 pounds spends each hour during which he is doing any of the things listed.

Form of Activity	*Calories per Person per Hour*
Sleeping	65
Awake, lying still	77
Sitting at rest	100
Standing relaxed	105
Singing	122
Dishwashing	144
Walking slowly	200
Walking moderately fast	300
Swimming	500
Running	570
Walking very fast	650

Perhaps the diagram will show more clearly the effect different types of exercise have upon the amount of fuel needed by the body. It shows how five men, all weighing the same, 141 pounds, needed different amounts of fuel daily because of the difference in their work.



Daily Calorie Requirements in Different Activities

Building and Regulating the Body.—It should not be forgotten that food must meet other needs as well as for fuel; namely, material to keep the body in proper running order and material enough to make it grow or, as we might say, to keep its model up to date. Machines may be made of the finest materials the world can produce but they will not function properly unless they are carefully regulated. The body has a large number of special regulators, among them hormones, enzymes and minerals, to keep it running in a healthy fashion.

Perhaps it is well to consider first the production of the model, for the body struggles to follow its own particular style and uses whatever material it has just as well as it can. To put it another way, we all know that a dressmaker cannot be expected to make a dress unless she has enough material. In the same way, we cannot expect our bodies to grow as they should unless we give them enough material.

One of the first essential materials is water, for about two-thirds of the body weight is water. It is necessary for the structure of all parts of the body, even the bones, and it forms 90 per cent of the blood. It lubricates the joints, keeps the growing tissues in a moist and healthy condition and makes it possible for food to digest.

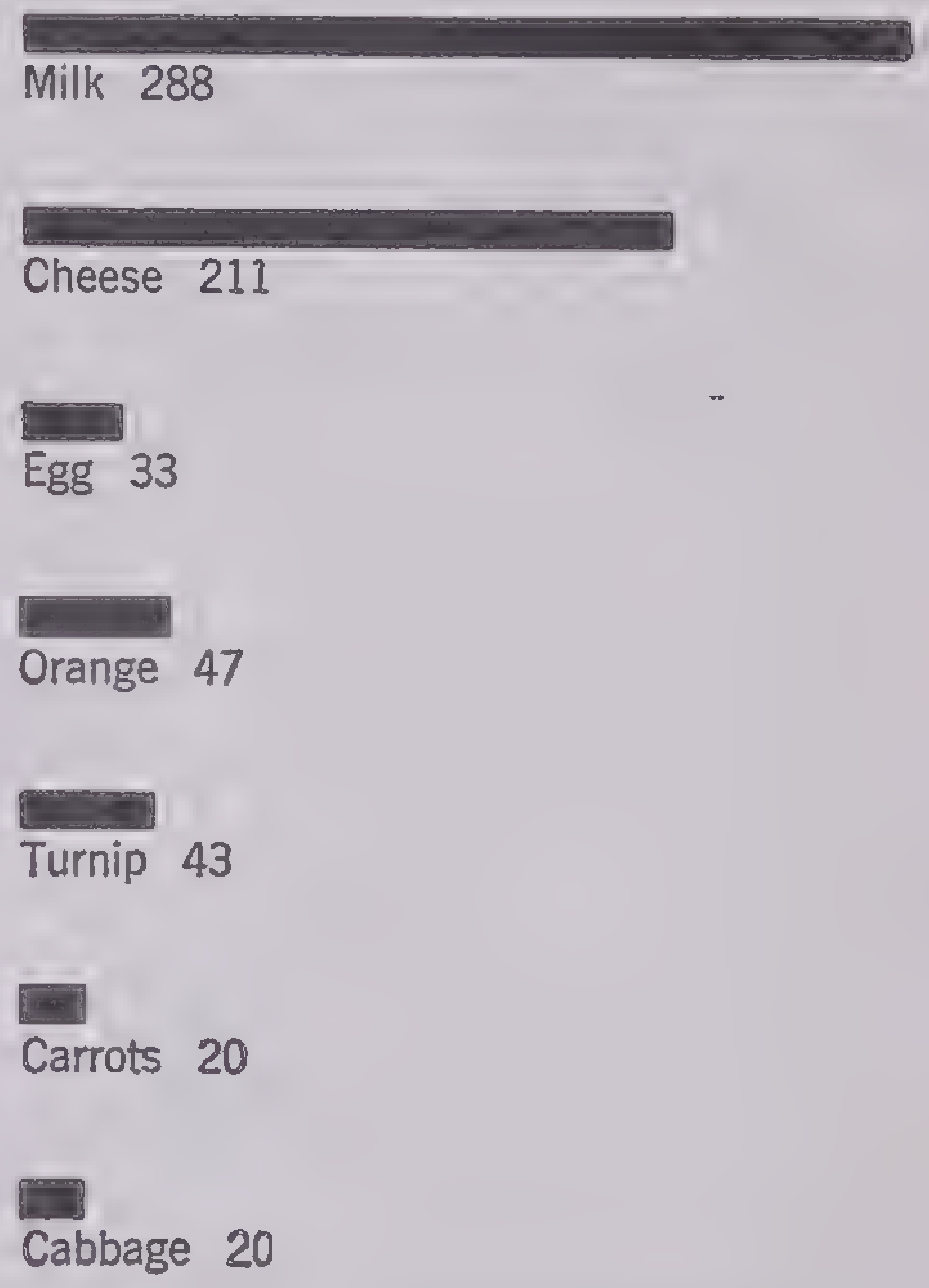
Water is as important as a regulator as it is as a building material. The temperature of industrial machines that are being used must be regulated in some manner, either by human hand or by thermostatic control. If they are not thus regulated, they will get so hot they cannot run or they will explode. You remember that the food burned in the body to enable it to do its work gives off heat as the work is done. If that heat were to remain in the body, the body would literally burn up; but the water of the body takes and distributes it and finally helps to get rid of it. When a person becomes too hot from exercise or overheated rooms, the body begins to perspire—water escapes through the pores of the skin where it evaporates and cools the body. On the other hand, in cold weather water tends to stay within the tissues of the body so that less reaches the outside surfaces, and there is very little loss of water by evaporation. Thus the body is kept sufficiently warm.

Water not only regulates the temperature of the body but at the same time removes the waste products. We remember that the body pours some of its waste products into the blood stream. If the blood is to perform its functions normally, it must maintain a certain composition, and to do this these waste products must be removed. This removal takes place by means of water. When the blood passes through the kidneys, they collect the waste products to be excreted.

It has been found by experimentation that persons kept on a low water supply for several days have headaches, lose their appetites and become nervous and irritable. They lose all these symptoms immediately when their water intake is increased. All natural foods except pure fat, starch and sugar contain water, but there is not enough water in natural foods to carry on the processes of heat regulation and elimination of body wastes, so it is usually advisable to furnish the body at least one glass of water at each meal and more if the food is very dry.

Minerals are not burned and therefore cannot serve as fuel. If we should put some fat in the fire it would burn without leaving ashes as a clue to its having been there; but if we should put a potato or a piece of meat in the fire it would leave a residue, just as coal and wood leave ashes. This residue of burned food is composed of mineral elements—calcium, phosphorus, iron and iodine—not singly in the pure form as they are seen in laboratories but combined with one another as might be expected from association in the foods from which the ash has been obtained. If we do not get enough minerals, unfortunate things happen. Some of these things we may know about soon, for we may begin to feel tired and irritable or we may not want to do anything except sit still. On the other hand some of the effects of too small an amount of minerals may not be noticed for a long time. Since minerals have this power it is important for mothers and fathers to know how to supply them to children and for older boys and girls to get them for themselves. Then the framework of our bodies grows straight and strong rather than weak and crooked. Whenever minerals are neglected in infancy we see as a result knock knees, bow legs, flat feet and poor teeth.

Important Minerals.—Two minerals that are very important are phosphorus and calcium. They help build strong bones and good teeth. Each boy and girl needs 1 gram of phosphorus daily. This is not very difficult to get because many common foods are good sources of phosphorus—milk, cheese, eggs, meats, fish, oatmeal and other whole-grain cereals and dried beans and peas. Calcium is harder to get. Consequently it behooves the engineer of the human machine to take special care to provide this mineral. For growing boys and girls it is known that a regular supply of 1 gram of calcium each day will build a firm structure. Milk is the richest known food source of calcium and an excellent source of phosphorus. The growing boy or girl who drinks 1 quart of milk a day will receive enough calcium and phosphorus to build a sturdy framework. The comparative amount of calcium supplied by common foods is shown in the accompanying table.



Calcium Content in Milligrams in Average Servings of Certain Foods

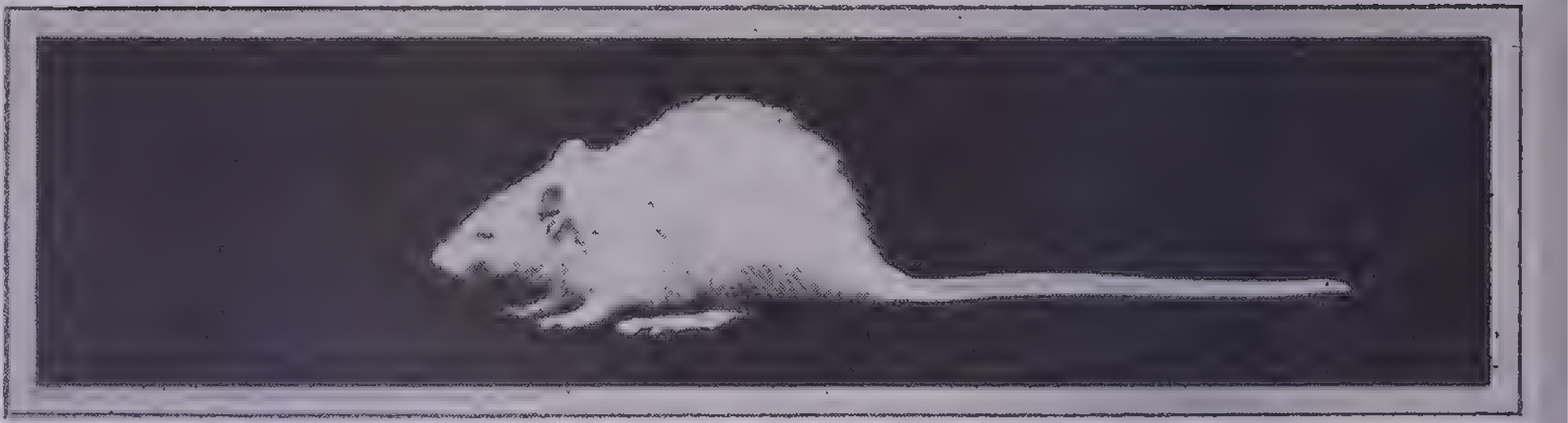
Milk, 1 glass (160 calories)
Cheese, 1 1/8-in. cube (100 calories)
Egg, 1 (75 calories)
Orange, 1 medium-sized (90 calories)
Turnip, ½ cup of ½-inch cubes (25 calories)
Carrot, 1/3 cup of ½-inch cubes (20 calories)
Cabbage, ½ cup chopped (14 calories)

Iron is a mineral so commonly used in the world that its importance is quite familiar. It is as necessary to the structure of the body as to the structure of industrial machines, yet the body machine is often forced to operate with less iron than it could profitably use. We need iron to make the hemoglobin or red coloring matter of the blood cells that gives them the power to carry oxygen. The amount of iron needed by the body is small in comparison with the required amounts of calcium and phosphorus, but the available supply of iron is also limited. Every boy or girl who receives 0.005 gram of iron for each 1,000 calories of food eaten will probably have enough, but those who get more will be better engineers. Egg yolk, dried beans and peas, whole-grain cereals and liver are the best sources with other meats and green vegetables as additional sources.

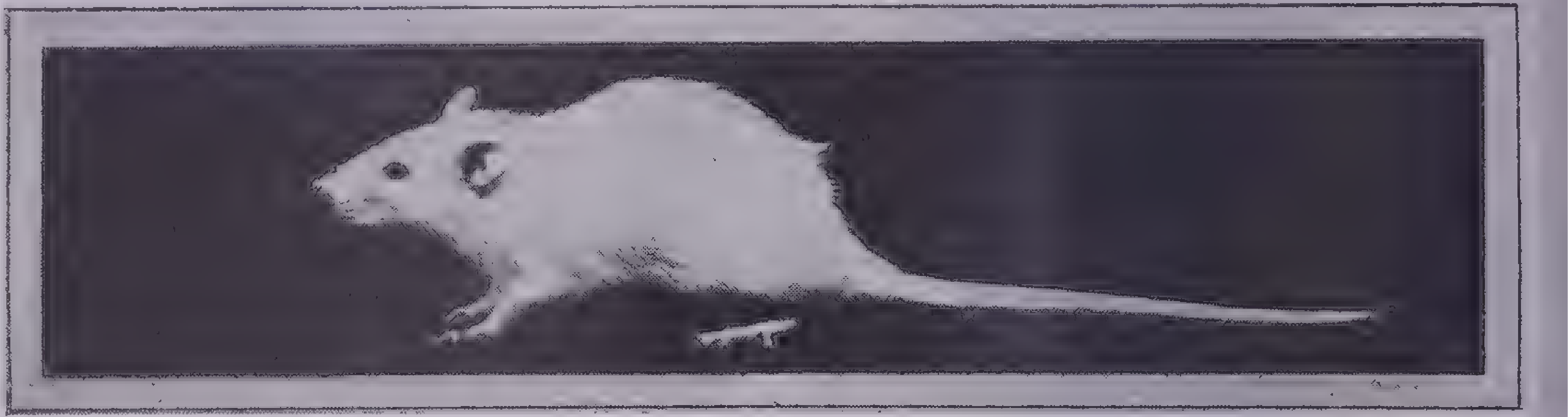
Still another mineral, iodine, is important for body building because it is needed for the proper functioning of the thyroid glands. The body needs only a very small amount of iodine, and those who live near the sea have a generous supply from sea food and from water and foods grown in that section. In some parts of the country, however, the supply of iodine is very low in soil and water, and in those sections there is usually a prevalence of simple goiter or enlargement of the thyroid glands. This can be avoided by an addition of a minute amount of iodine salt to the ordinary table salt. Commercially this is known as

Vitamin A For Growth

Rats from the same litter, 11 weeks old



This rat had no vitamin A. It weighed only 56 grams. Note the infected eye, rough fur and lack of vigor



Courtesy U. S. Bureau of Home Economics

This one had plenty of vitamin A and weighed 123 grams. It has bright eyes and sleek fur and is vigorous.

iodized salt. In nongoitrous districts, milk, water and green vegetables provide an adequate supply of iodine for normal growth.

Of other minerals essential for growth (potassium, magnesium, manganese and sulphur), little need be said except to mention their names, for if the body receives the needed amount of calcium, phosphorus and iron in natural foods, these minerals will be supplied. Sodium chloride or common salt is abundantly provided by the salt added to food as a condiment.

Protein as a Body Builder.—The most important use of protein is as material to build muscles and to keep them in good condition. Other substances, such as fats and carbohydrates, can take its place as body fuel, but they cannot furnish the amino acids needed for body building. There is some protein in all foods except pure fat, pure starch, sugar and their combinations; but the amounts of protein are not the same in all foods. Some foods contain a combination of proteins that supplies all needed amino acids for making boys and girls grow and for keeping their tissues well repaired. Certain proteins are unable to support growth by themselves but they usually occur in foods that have the better proteins also that do support growth. Our most important protein-bearing foods all have excellent proteins. Such foods are milk, cheese, eggs, meat and fish. Cereals and dried beans are good sources if combined with these other foods, and at the same time are economical. The supply of protein and the supply of minerals in milk make it one of the most important foods in the life of the human race and particularly in the life of the growing boy or girl. When 10 to 15 per cent of the day's food calories are contributed by protein, adequate amino acids will be available for the growth of new tissues and their upkeep.

We have seen that food does two things: first, it provides the body with fuel for its activities; and, second, properly selected food yields material for building and health. There is a third function: food must supply the vitamins that, as important catalysts, encourage and accelerate certain body processes that are necessary to health. The vitamins that we now know are definitely needed in human nutrition are vitamins A, B, C, D and G. That there are others seems quite certain.

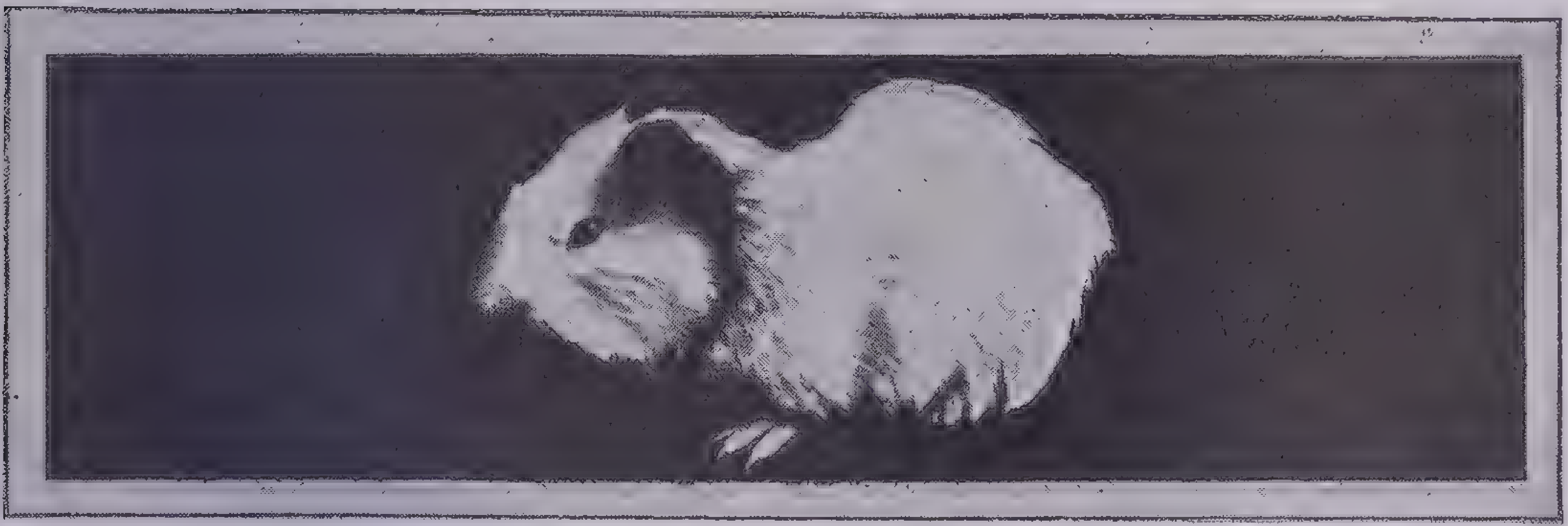
The Discovery of Vitamins.—The discovery that gave new understanding of the different kinds of food needed took place in 1897 in the Dutch East Indies. Christian Eijkman, official medical representative of the Dutch colonial office, was watching some chickens in his yard. They staggered as though their feet and legs hurt. Suddenly he realized that the chickens were behaving much like the prisoners who had been in the Java jail for three months or longer, and whose legs and feet had become weak and stiff from a disease called beriberi. No one knew what caused the disease nor how to cure it. Eijkman knew that these chickens got the food left from prisoners' meals, mostly white (polished) rice. He immediately began an experiment with the chickens and found that if he gave them brown (unpolished) rice their condition improved. Then he tried giving the prisoners brown rice instead of white and found that it cured them of beriberi. Thus he knew there was something in the rice husks or polishings that was necessary to health because the rice with the husks was health-giving and the rice without the husks or polishings produced the disease. (In 1929 Eijkman received the Nobel Prize for this discovery.) In Japan, where beriberi had been steadily increasing, scientists soon began working to discover just what was in the rice polishings that had so marvelous an effect. Today the pure substance made from rice polishings, called vitamin B, may be bought at a drug store.

Once men began to analyze food they became much interested in developing diets of pure substances, but for a long time no investigator succeeded in keeping animals alive on such diets. Then Professor Lafayette Benedict Mendel (1872–1935) of Yale University and his friend Dr. T. B. Osborne, director of the Connecticut Agricultural Experiment Station, sought to discover what it is in food that makes animals grow. They obtained from the Wistar Institute in Philadelphia a large number of white rats and fed them on chemically pure materials; but the rats did not grow until protein-free milk (the part of the milk that remains after the butterfat and curd are removed) was added to the pure materials fed to them. As soon as this was added, the animals began to grow, and continued experiments proved that growth was promoted by the minerals and vitamins in the milk.

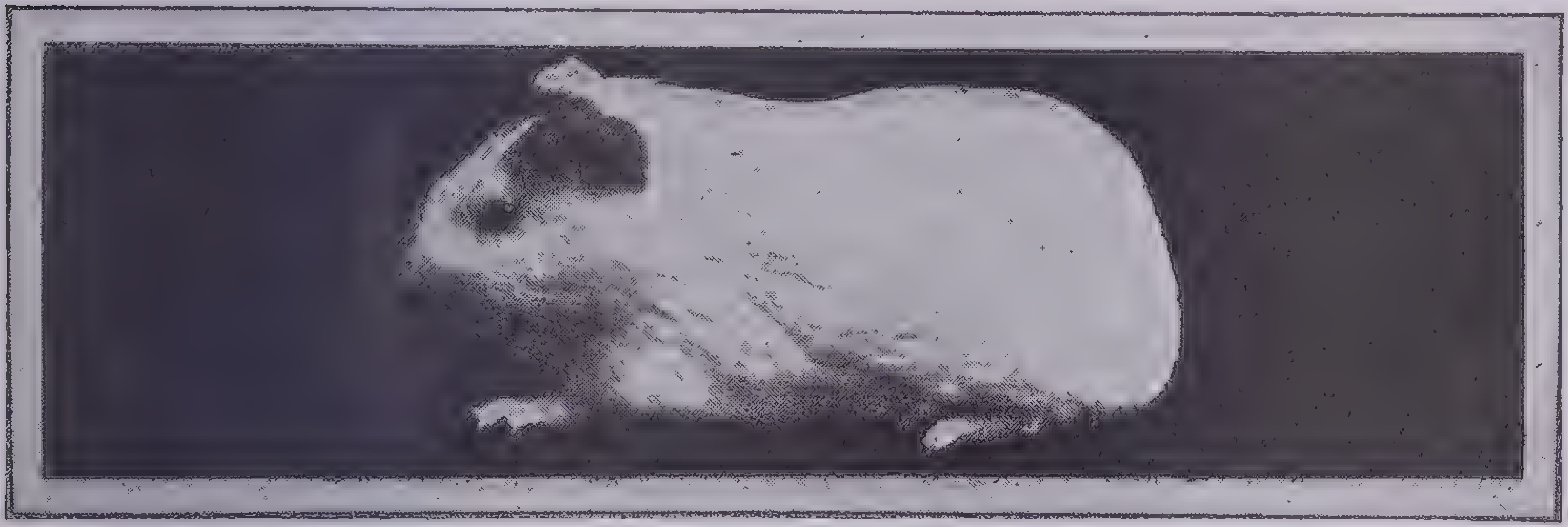
From such studies it was learned that food furnishes the body with material to burn or convert into energy and with vitamins, minerals and some other elements necessary for growth and health. The discovery of vitamin B came through Eijkman's studies of white and brown rice. Vitamin A was found when chemists noticed that green and yellow vegetables, butter, cod-liver oil and egg yolk all contained some special substance necessary to keep animals healthy and make them grow well. Vitamin A is essential for the health of everyone and also for growth. Experiments with white rats and other animals show that life cannot long continue if this vitamin is entirely lacking in the diet. Although we know where to find this vitamin, the problem is how to persuade everybody to get enough for health and growth. If the diet is low in vitamin A, we may be harmed by bacteria that would not do us much damage if we had enough vitamin A. For example, we need such protection for the respiratory tract to help us ward off the damage wrought by severe colds. Almost every organ of the body demands vitamin A to keep all parts in the best condition, especially skin, hair, nails, respiratory tract, digestive tract, urinary tract, glands, eyes and teeth. Because the body stores much of this vitamin, a lack of it in the diet is not always noticed until some damage has been done. Among the best common sources of vitamin A are the fat of milk (in whole milk, cream or butter), green beans, other green and yellow vegetables and cod-liver oil or other fish-liver oils.

Vitamins and Their Sources.—Vitamin B has a very striking effect on appetite. When it is not present in the diet there is no desire for food. When an animal that has lost its appetite through lack of vitamin B again receives a proper amount, appetite returns in a few hours. Since the lack of vitamin B very quickly disturbs the nervous system and interferes with digestion, it

Vitamin C For Healthy Gums and Teeth
Guinea pigs of the same age



This one had no vitamin C and developed scurvy. Note the rough fur and crouched position due to sore joints



Courtesy U. S. Bureau of Home Economics
This one had plenty of vitamin C. It has sleek fur and is healthy and alert

is very important that we have generous amounts of this vitamin daily.

Cereals that have been highly refined in milling, so that both bran and germ are removed, are poor sources of vitamin B, for the germ is especially rich in this vitamin. Milk, eggs, whole-grain cereals, yeast, fruits and vegetables, all are sources of vitamin B. Some vegetables lose much of the vitamin in cooking, and if the water in which they are cooked is discarded, still more of the vitamin is lost. The dry toasting of cereals, often practiced to improve their flavor, also destroys some of the vitamin. Since this vitamin is not stored in the body, a deficiency of it is more quickly noticed than a vitamin A deficiency.

Vitamin C is ascorbic acid, and some of the foods that furnish it have received wide advertising. The effects of the lack of this vitamin in a diet were noted long before anyone knew that vitamins are necessary in the diet or how to obtain them in pure form. Scurvy, a disease resulting from vitamin-C deficiency, has been very common in Europe for centuries. Sailors at sea often became so ill with it they could not work and many of them died. It affects all parts of the body. The joints swell and become very sore. The gums also become sore and bleed because the walls of the blood vessels lose their strength and those of the capillaries break easily causing hemorrhages. The bones and teeth cannot hold calcium and become soft; the gums become sore and the teeth sometimes drop out. No wonder that a child with scurvy cannot grow well; his teeth and gums get too sore to allow him to eat properly, his joints are too sore for him to exercise, and other symptoms of illness may be present.

Dr. James Lind (1716–94), a British naval physician, in 1747 experimented with different foods to determine whether any of them would cure scurvy. He found (what had been known in 1593 to Sir Richard Hawkins, an English admiral) that eating oranges and lemons produced the most rapid and best curative results. After 1795 British ships were legally required to take lemon and lime juice with them to be given to the men regularly for the prevention of scurvy. From this, the British sailors received the nickname of "limeys" and British merchant ships were called "lime-juicers."

Everyone needs vitamin C, but children especially need an extra large supply to assure strong teeth and bones and excellent growth. Vitamin C is found in many fresh fruits and vegetables but, except in lemons, oranges and tomatoes, is easily destroyed by heat or by aging. In vegetables it is quickly destroyed by adding soda or by too long cooking. Like vitamin B, any vitamin C not destroyed by the heat will be lost if the water in which the vegetables were cooked is thrown away. Hence it is safest to depend on oranges, lemons and grapefruit, tomatoes or tomato juice and raw vegetables such as spinach, carrots, cabbage and green peppers and to have a liberal portion of at least one of these every day.

Vitamin D is called the antirachitic vitamin because it prevents rickets. It enables the bones and teeth to use the calcium and phosphorus in foods. Without a sufficient amount of vitamin D these minerals are not utilized properly, so that despite growth the bones remain soft and incapable of holding up the body in normal position. Young children lacking vitamin D are likely to have bow legs, small sunken chests, beaded ribs and soft teeth that quickly decay.

Calories, Protein and Vitamins in Common Measures of Food Materials*

Food Material	*Measure*	*Total Calories*	*Protein Calories*	*Vitamin Units*			
				A	*B*	*C*	*G*
Apple	1 medium	80	2	95	32	13	26
Applesauce	1 cup	260	3	106	35	4	46
Bacon	2 small slices	50	7	1	—	—	3
Banana	1 medium	100	5	238	29	17	30
Beans, string	½ cup	20	4	482	16	16 (R) 4 (CK)	12
Beef, lean	1 slice 1½″x2¾″x¾″	100	55	40	32	—	64
Bread, whole-wheat	1 slice 2⅓″x3¾″x½″	50	7	+	61	—	+
Butter	1 tablespoon	100	0	512	—	—	—
Carrots	½ cup	30	3	2,055	33	4 (R)	33
Celery	½ cup	13	3	9	++	6 (R)	
Cheese, American	1″ cube	88	23	510	+	—	41
Cheese, cottage, skim	1 tablespoon	20	15	15	+	—	+
Egg	1	70	25	983	28	—	68
Figs, dried	1 large	63	3	14	7	—	8
Grapefruit	½ medium	100	7	+	43	138	85
Lemons	1 medium	30	3	—	+	44	+
Lettuce	2 leaves	6	1	60	18	3	12
Milk, whole	1 cup	170	34	515	27	8 (R)	78
Oats, rolled cooked	½ cup	100	17	—	30	—	+
Onions	1 medium	25	3	—	5	8 (R) 5 (CK)	7
Orange	1 medium	80	6	90	111	92	48
Peas, fresh	½ cup	66	19	666	198 (R) 149 (CK)	26 (R) 20 (CK)	66
Pepper, green	1 medium	20	3	554	8	138 (R)	+
Potatoes, sweet	1 medium	200	12	4,164	114	20	56
Potatoes, white	1 medium	100	11	34	48	13 (CK)	30
Prunes, dried	1 medium	25	0	167	6	1	22
Raisins, seedless	¼ cup	100	3	29	17	—	14
Rice, steamed	½ cup	66	6	—	—	—	—
Spinach, cooked	½ cup	20	2	12,373	65	10 (CK) 74 (R)	85
Tomatoes, fresh	1 medium	35	5	1,270	59	59	34
Tomatoes, canned	½ cup	25	5	950	43	43	24
Turnips	½ cup	25	3	—	22	29	29

* Vitamins have been stated in units wherever possible. Otherwise signs have been used as follows:
+ = the vitamin is present
++ = the food is a good source of the vitamin
— = the food contains no appreciable amount of the vitamin
A blank indicates that no quantitative tests have been made, but in all probability the vitamin is present only in traces or is lacking altogether
In columns B and C, (R) = raw; (CK) = cooked

Vitamin D may be made in the body by the action of ultraviolet sun rays upon a substance present in the skin. In summer these ultraviolet rays are intense and if they play on the bare skin they readily form vitamin D. In winter, especially in northern climates, the sun's rays are shorter and contain less ultraviolet light, and in cold weather less bare skin can be directly exposed to the rays, so that the bodies of boys and girls are not able to make a sufficient supply of this vitamin from sunshine. It is necessary to seek it elswhere. Common foods are not to be depended upon, though if chickens and cows have good supplies of Vitamin D some will be transferred to eggs and milk. One of the best and cheapest sources is cod-liver oil. (Many other fish-liver oils are very rich in this vitamin.) The vitamin is extracted from cod-liver oil and used in other foods, the best one being milk. Vitamin D milk is also made by irradiating the milk with ultraviolet light or by feeding irradiated yeast to the cows.

Another vitamin was discovered in 1925 by Joseph Goldberger (1874–1929) and was given the letter G for his name (though it is also known as B_2). It is now known chemically as flavin. Animals fed on a diet containing this vitamin in the pure state grow better in their youth and when they mature do not age as quickly as animals not receiving this vitamin, or as Dr. E. V. McCollum (1879–) of Johns Hopkins says, they tend longer to "preserve the characteristics of youth." Lack of vitamin G in the diet can be recognized not only by poor growth but also by a lack of vitality and by general signs of senility. This vitamin is found in cheese, meat, fish, and in green, growing tips and leaves of vegetables as well as in milk and eggs.

Food Selection.—A machine that is as complicated as the human body and needing so many things for its various parts and for its normal functioning requires that the engineer be very intelligent about what he is doing and constantly on guard lest failure to provide the necessary materials result. This sounds difficult but it really is not hard when we know what we need and which foods are good sources of it. In selecting food for the individual or family it is well to have a definite idea of the needs of each person before trying to plan a dietary.

Every growing boy and girl needs fuel to sustain body activities according to age and size. Remember that 10 to 15 per cent of the calories should come from protein and that the rest of the calories should be chosen so that the day's food will provide 1 gram of phosphorus, 1 gram of calcium and for each 1,000 calories 0.005 gram of iron; then, too, not less than 200 units of vitamin A per 100 calories, 20 units of vitamin B, 4 units of vitamin C and 40 units of vitamin G for each 100 calories throughout all the years of rapid growth.

The units used in this book are Sherman units, measured in terms of rat growth for vitamins A, B and G and in terms of scurvy prevention in guinea pigs for vitamin C.

Boys and girls can get all these necessary substances each day from a diet that contains 1 quart of milk, one egg, one serving of meat or fish and besides potatoes two portions of vegetables—one of which must be a green or yellow vegetable, such as spinach, peas, string beans or carrots. There should be an orange, a tomato or the juice of either each day and one other kind of fruit—an apple, prunes, raisins or the like. Each child should have at least one teaspoon of cod-liver oil daily. In order to get enough calories for the day, cereals, bread and butter, meat and potatoes and other plain wholesome foods may be added. Whole-grain cereals are among the cheapest good sources of calories, vitamin B and iron.

Adults would do well to follow the same plan, but frequently family incomes do not allow adult members to have the same kind of food as growing children who must receive the right food for growth and the right amount of it to let them build strong, healthy bodies. Adults, having already finished growing, need food that will supply fuel enough for the work they do and a sufficient amount of each of the necessary materials for keeping their body machinery in good repair. It is possible for them to do this if their daily diet includes at least 1 pint of milk a day, fruit and vegetables as mentioned for children, one serving of meat, fish, eggs or cheese, whole-grain cereals, potatoes, butter or other fat reinforced with vitamin A and other foods available to make enough calories for fuel. The accompanying table shows the mineral needs of adults as well as those of children.

Daily Mineral Needs

Minerals	*Adults*	*Children*
Calcium	0.68 gram	1 gram
Phosphorus	1.32 gram	1 gram
Iron	0.015 gram	0.0005 gram per 100 calories

Adulteration of Food.—Foreign matter is sometimes added to food so that it can be produced at a lower price and sold with more profit. Obviously this weakens its nutritive value and defrauds the consumer. Adulteration of food is practiced in various ways, the most common of which are enumerated below:

(*a*) *The abstraction of some valuable ingredient,* for example, skimming milk and selling the product as whole milk.

(*b*) *The addition of some agent that dilutes or weakens the product*—water in milk, chicory in coffee, ground shells in pepper and other spices.

(*c*) *Concealing the inferiority of a product,* chiefly by coloring or bleaching, as for instance, the use of color in a distilled vinegar to make it look like cider vinegar; adding an artificial flavor to an extract to make it resemble the genuine article; bleaching flour to make it look like high-grade patent flour.

(*d*) *The addition of a substance to a food product that may render it injurious to health.* Some coloring matters are undoubtedly injurious to health, such as sulphate of copper and many coal-tar dyes. Food preservatives are worse than coloring matters. Many authorities on hygiene are of the opinion that any kind of preservative drug added to a food product is injurious, because the preservative acts by destroying or paralyzing germ life and is effective only when enough of it is added to secure this effect. But some experts maintain that the use of preservatives is not deleterious. All nations that have food laws either forbid or restrict the use of these preservative materials, and popular feeling is decidedly opposed to them. When it is further considered that every kind of food that is suitable for human consumption may be perfectly preserved in some unobjectionable way without the use of preservatives, it is evident that their employment is unnecessary.

MENTAL HEALTH

Characteristics of Mental Health.—Mental health involves, first of all, keeping in sound working condition the nervous system, the mechanism upon which mental processes depend, and using this mechanism in such a manner as to maintain harmony between the component parts of the system to insure efficiency of operation and to obtain freedom from excessive strain.

To keep the nervous system in excellent working condition, it is necessary to observe the rules for hygienic living: eating foods that contain the essential vitamins; the proper elimination of waste products; alternate muscular exercise and rest; sufficient sunlight, air and moisture; cleanliness; guarding against disease; avoiding intemperance; and shunning the habitual use of chemical substances (alcohol, morphine, cocaine) that have an injurious effect upon the body.

A defective machine cannot function efficiently. Before searching for other causes of any mental disturbance, it is wise to investigate the condition of the body. A person suffering from a deep emotional depression might fear that there was something seriously wrong with his mind, when, in reality, he was suffering from the effects of an improper diet, constipation or lack of exercise.

The mentally healthy person is able to adjust himself to his environment. Such an adjustment depends upon (1) seeing clearly all those factors in the environment that have a bearing upon his adjustment, (2) judging impartially the significance of every situation and (3) acting wisely.

To maintain mental health, a person must see his environment as it actually is, instead of distorting it in an attempt to make it conform with his desires. Suppose that he wishes the day to be warm; but, if it is actually cold, he will be making a poor adjustment if he does not recognize that it is cold and decides to spend the day sitting on a bathing beach in a swimming suit. To react properly to a situation we must observe it accurately, interpret it correctly and see it in relation to other aspects of life.

When a normal man finds that circumstances are not to his liking, he will try to modify them or, if he cannot change them, to deal with them as best he can. If he makes a mistake, he will acknowledge his error, rectify it if he can and learn from it how to do better next time. He spends relatively little time regretting past failures or gloating over past successes.

Meeting Various Crises.—Everyone is disposed to use the same methods in meeting present difficulties that he found successful in past crises. If he has learned many different ways of solving problems, he has a better chance of success than if he has only one device at hand. If he has intelligence enough to select from many methods the best one for each special need, he is even more likely to win. For example, if a child finds that his mother yields once to his demands when he smiles, he is almost sure to try this method again. If smiling repeatedly helps him gain his ends with his mother, father, sisters, nurse, teachers and playmates, he never tries any other method. Such a habit might be the only device that a person would need to get through life if every individual could be influenced in the same manner. Success is more likely if a child is taught that he should fit his behavior to the situation he confronts; he should study other persons in his attempts to influence them and suit his behavior to their personalities instead of adhering to some pattern that he happened to learn in his childhood. Undesirable forms of reaction are learned in exactly this same manner and consequently there are specialists in temper tantrums, crying and pouting, also chronic complainers, liars and thieves.

If we are not limited to a single method of adjusting, it may be because those who had us in charge when we were very young saw to it that our one method did not succeed too frequently. Instead, we had to learn to discriminate and to vary our activities. In other words, we have acquired the habit of thinking when a problem is encountered instead of acting impulsively according to some infantile habit that does not fit into the present emergency. It may take a difficulty to make us think, but not all of us think when we do encounter a difficulty.

Confidence.—The mentally healthy person thinks and has the habit of success. Because he has learned a great variety of adjustment methods, he is confident of finding one to apply in any emergency. He is stimulated to search for every factor that will help him think out the best way to act and then applies himself to solving the problem in that way.

Though specialization in some form of behavior, especially if the behavior is socially undesirable, is unwholesome, it is still more dangerous for an individual to learn to evade his difficulties instead of making an active attempt to adjust. If an individual fails on one occasion, he would do well to admit that he has failed, to endeavor to discover why he failed and to plan to overcome his error on the next occasion. He is merely paving the way for further failures if he distorts the facts by blaming his failure upon others, by attempting to convince himself that he does not care, by excusing himself on the grounds of imagined illness, by railing against society in general, by trying to convince himself that he did not try or by similar evasions and distortions of the facts. It is normal to encounter conflicts; it is normal to be readjusting continually; but it is unwholesome to evade factors that should be faced squarely. We cannot adjust successfully when we are deceiving ourselves about the real nature of our difficulties.

Adjustment Habits.—Let us now consider a number of adjustment habits and study the degree to which each is desirable or dangerous.

DAYDREAMING.—A child who has no associates invents imaginary playmates. When life becomes unkind, satisfaction is obtained by imagining a more desirable state of affairs. This use of imagination is wholesome as long as it is a temporary expedient to make existence tolerable. When it becomes so alluring that it is chosen in place of actual life, it is discarding reality and living in a world of daydreams—a very hazardous procedure. Imagination should stimulate a person to make a more valiant fight to become adjusted to reality; it should never be a prolonged substitute for reality. When daydreaming gets too strong a grip upon a person, it is a sign of evasion not of adjustment.

In the extreme form, a daydreamer may distort what he sees and hears into visions and phantom voices; he has let the world of imagination become more real than the objective world. The way to correct excessive use of the imagination is to make objective living so satisfactory that you will not want to forsake it for the hollow satisfactions of phantasy.

ARGUING AND EXCUSE MAKING.—Argument is often just a contest, a game indulged in for the sheer pleasure derived from competing with others in a verbal encounter. It becomes more serious when its purpose is to gain some very important personal end. The debater knows that an argument is a device to outwit an opponent and that it is possible to find arguments for both sides of any issue. When a cherished belief is involved, arguments tend to become overvalued.

A child quickly learns that he can extricate himself from painful predicaments by arguing. Using this device with repeated success makes it a fixed habit. Finally a child may even deceive himself into thinking that the excuses he trumps up are real and that they justify his acts.

This process of excuse making has many degrees—from mild distortions of emphasis to extreme cases in which a person develops delusions. Most of our convictions result from the desire to believe and not from the operation of correct reasoning. Hence, when a person develops a false belief it is better to find the cause for his wanting to believe as he does and to deal with this emotional bias than it is to argue him out of his beliefs. It may be a game to distort reasoning in order to win a debate, but to deceive oneself in order to maintain a belief is a dangerous procedure. The mentally healthy man must learn to face facts instead of distorting them to suit his fancy or to avoid accepting a painful conclusion.

LIVING IN THE PAST.—It is unwholesome, especially for young persons, to spend too much time ruminating upon the past. The memory of the past has value in consoling us or in guiding us to better living; but the dangers of the present or the uncertainties of the future should not tempt one to spend too much time in imaginary reliving of what has gone.

Every child should be convinced that the future holds better things in store than the past has given him. This can be accomplished if the objectives that he is urged to seek are not too remote. Each person should have a continuous series of aims. He should concentrate upon the nearest one until it is reached; and upon gaining one victory he should immediately set another goal toward which to strive. Having only one goal—and that so remote as to appear almost unattainable—is not encouraging. Have a distant goal, but see to it that the main emphasis is given to an intermediate goal that is more accessible. This is the best way to guard against the temptation to exist upon memories.

FORGETTING.—Forgetting may be caused by the kind of nervous system that does not retain well, or it may be due to not having learned adequately; and the habit of forgetting is sometimes formed because one has found it is to his advantage to forget. It is a simple procedure, if one has an unpleasant appointment, to forget to keep it. This avoids the unpleasantness that would follow if the appointment were kept, and is an excuse acceptable to others and to oneself.

Once it is started in simple situations, the habit of forgetting grows rapidly. Its victim finds himself forgetting important facts. A habit that was begun because it seemed to offer an easy escape from unpleasant situations now becomes a great handicap. In extreme cases, the individual may forget great portions of his life; he may even forget his identity and wander aimlessly from place to place not knowing where he belongs. When an individual shirks the direct solution of a problem by forgetting that there is a problem at hand, he pays for his evasion the big price of starting the habit of forgetting, which is very dangerous in critical situations.

BECOMING ILL.—When we are ill, we discover that our friends are more kindly to us, more forgiving, less demanding. It is no wonder that children soon discover that they can evade their duties by complaining of illness of one sort or another. Unless they lose more than they gain by being ill, they may continue to use this device throughout their lives. Men and women who have developed in this way come to regard the slightest discomfort as the symptom of some pernicious disease. They infest physicians' offices, read medical books, take all sorts of nostrums and torment their friends with their endless discussion of their physical ills.

The mentally healthy person is so engrossed in some vital occupation in life that he has no time to waste on exaggerating a physical discomfort or inventing symptoms of disease when he is in normal health. The best prevention for this type of evasion is to treat illness with prompt and efficient medical care and nursing but not to manifest undue consideration at such times. Manifestations of affection, however, can help those whose complaints are slight but whose sufferings are severe.

BLAMING OTHERS.—We are never completely to blame for the mistakes we make, so that it becomes an easy matter to stress the part that other factors or other persons play in any unfortunate situation. This emphasis may begin as a minor distortion and develop into a chronic habit of evasion. As is the case in most types of evasion, this method at first is adopted to mislead others but soon leads to self-deceit. Once in the habit of blaming anything or anybody but himself, one may come to feel that he is the only blameless person and that everybody is hounding him and is bent upon accomplishing his downfall. His mind is filled with the notion that he is persecuted. In his own thinking he successfully evades all responsibility for his own acts, develops false ideas of his own importance and even thinks that he is a great person.

It is well for every child to learn to take the responsibility for his own actions and not to evade that responsibility by making it appear that he is always innocent and others are always to blame.

BACKBITING.—A frequent form of evading the full significance of a poor performance is for a person to compare himself with an individual who has done still worse. On the other hand, even though a person does pretty well, his success may be marred by the knowledge that there are others who have done much better. In either case, one's status may seem to be raised if others can be degraded a bit. The wholesome desire to excel may be distorted into the desire to degrade others. This leads to backbiting, scandalmongering, talebearing, spying on others, hate and jealousy.

This unhealthy mental attitude is fostered by an excessive emphasis upon personal comparisons. The child who sees his brother receiving more love and attention than himself may easily blame his brother and not his own unlovable character for this neglect. Instead of trying to improve himself, he spends his time nursing his jealousy and hatred. He looks for opportunities to do his brother bodily harm or, what seems still more effective, to degrade him by spying on him, tattling or making malicious insinuations as to his moral character.

Everyone should learn that his success is not enhanced by the failure of others and that his failure is not softened by gloating over the greater failure of someone still more unfortunate.

INGROWN EMOTIONS.—Emotions have a definite and valuable function. They arise in us whenever we encounter a difficulty. Through certain bodily mechanisms they incite us to vigorous and changeable behavior until we respond in some satisfactory manner or the cause of the emotion is removed. The healthful way to adjust to an emotional situation is to do something about the cause of the emotion. The unhealthful procedure is to enjoy the emotions or to suffer from them, to nurse them for their own sake and to refrain from doing anything about their cause.

When a violent emotional stimulus is experienced, it is a poor policy to attempt to refrain from any action. Some particular actions must be restrained, but this can best be accomplished by substituting desirable responses for impulsive acts. Even though there is some danger of doing the wrong thing under the stress of emotional excitement, the danger of refraining from all activity is much greater.

Fear, for example, comes when we meet a situation that is too much for us. We must retreat temporarily. When we remove ourselves from the danger our feeling of fear subsides and then we can decide what to do next. To remain in the presence of danger and attempt to control or remove the feeling of fear is foolish.

In anger, the important thing is to exercise enough control to do the correct thing instead of some unintelligent act that will bring more trouble in its wake.

Joy and sorrow are emotions that are more likely to be cultivated for the sake of the emotions themselves. Having experienced some thrill of pleasure, one attempts to prolong the emotion after the cause for joy has disappeared. This leads to a sham that terminates in boredom. True enjoyment adds to one's life and growth without having to be prolonged artificially.

The tendency to nurse a sorrow is perhaps even more common. Grief finds its place in one's life. A deep sorrow becomes a tender, precious memory; but the continual manifestation of the external signs of sorrow over a very long period may come from a desire for the sympathy that this invokes in others.

Emotions are valuable only so long as they lead to some sort of adjustment to the situations that cause them. They become dangerous when they are cultivated for themselves.

FEELINGS OF INSECURITY.—Normally an individual should progress from the helplessness of infancy to the independence of maturity without developing any profound sense of insecurity. If he learns to depend too much upon adults and then finds himself without their support, he is filled with a feeling of insecurity. He has not learned to act independently and is lost when the customary support is removed.

We should look upon such a feeling as a signal that we must learn to do things for ourselves. This necessity is evaded by some individuals who constantly prate about their inferiority feelings, act in a babyish manner or search for someone who will treat them with the same consideration as their mothers did. They should grasp an opportunity to achieve success for themselves. Once having tasted the joy of doing something independently and successfully, they will soon forego their desire to remain permanently dependent.

COMPENSATION.—When a person is lacking in some particular, it is often a wholesome procedure to make up for that lack by cultivating some other characteristic. For example, if one has a weak physique, he may achieve excellence in his studies. If he is not very efficient in learning a language, he may achieve excellence in some mechanical occupation. If he is not physically attractive, he may develop a personal charm that wins him more social acceptance than would physical beauty. Life is full of such compensations, and they are valuable as long as the person who utilizes them does so with full awareness of what he is doing.

The danger in compensation lies in the tendency to carry it to excess. We merely make ourselves ludicrous when we greatly exaggerate one trait in an attempt to hide something that we consider a handicap.

MISCONDUCT.—Misconduct may be a symptom of some underlying attitude of hate, jealousy or fear. In such cases it is more worth while to attempt to change the attitude of the delinquent person than it is to punish him for what he has already done. Change his attitude and he will be less likely to perform similar acts of misconduct in the future. Punish him and the way may be opened for worse offenses. The person who has the highest type of morality and who is least likely to become delinquent is the one who has advanced in his social development to the place where he does not want to injure others.

SOCIAL ADJUSTMENT.—The keenest happiness that a person can experience is usually intertwined with his harmonious associations with other persons; and, conversely, most mental ill-health is associated with social disharmony. For this reason, a clear conception of social adjustments is essential to an understanding of mental health.

Social adjustment changes with age. It is not a static affair; and what is normal for a child may be abnormal for an adult. Normal social progress involves a gradual widening of social contacts, beginning with the mother, father, nurse and members of the immediate household and going on to a few playmates outside the home circle, to classmates, to club mates, to members of the other sex and to those met casually in formal social circles and routine business affairs.

Social development should involve also a gradual change from supreme interest in oneself to a greater interest in other persons. The feeling that we are essential to the happiness of others is usually the driving force behind learning to be interested in others. Once a person feels that others need his services, his interest or his affections, he usually makes normal progress in social adjustment.

The greatest hazard to social adjustment comes when the child fails to gain the satisfaction that comes from services to others. It is highly essential for the mental health of children that parents and teachers provide opportunities for such service, without, at the same time, making the child feel that he is being imposed upon. The important element is to permit him to feel pleasure in his usefulness. Anyone who comes to mature years without having learned this important lesson in mental health can still organize his own life so as to acquire this learning. He can create situations in which he can be of service to others without their knowing who helped them.

Achieving a Unified Life.—Each activity in which a person engages from early infancy to old age plays a part in the development of attitudes. These attitudes may not be expressed by the individual; he may not know what they are; but they are to become the guides of his future conduct and really determine his mental health or instability. In early life such guiding principles are vague and ill-formed, but as one grows older he becomes more stable. It is essential, therefore, that the growing child be protected from developing the attitudes that tend to lead to unhappiness—hate, jealousy, suspicion, greed, shiftlessness, cowardice and the like. He should be taught to develop attitudes of optimism, self-assurance, industry, loyalty to others, progressiveness, a zest for overcoming obstacles.

With maturity, the child is likely to find that some of the viewpoints he has learned conflict with some of his other attitudes. He may find that his loyalty to his mother clashes with his loyalty to his playmates. He must learn to face such conflicts among attitudes without evasion and to make the best adjustment that seems possible at the time.

From these attitudes gradually emerges his sense of values, and it is his formulation of value that eventually determines his mental health or his mental disruption. It is a wholesome exercise to attempt to state the values that one has at any particular time, compare these values with those entertained previously, note the direction of change, attempt to discover why this trend is taking place and, finally, attempt to predict what those values will be in the future. Such an exercise, repeated from time to time —but not too frequently—will help one to remain free from the many evasions and the rigid crystallization of prejudices and fixed ideas that often are the forerunners of mental illness. These inventories will make it possible for one to achieve a well-balanced and unified life.

HOME MANAGEMENT

In its broadest sense home management involves all phases of home economics and homemaking. It has to do with the housing of the family adequately, the selection, use and care of household equipment and furnishings, planned spending of the time, effort and money of the family, buying of food and household supplies and cleaning and care of the house and clothing. When the children are small, child care and home nursing may take a good part of the home manager's time. Child study is now rightly an important phase of home-economics education. The Children's Bureau, Washington, D. C., publishes many bulletins on child care and training.

Housing or Shelter.—Our standards of a house or a home may depend on where we live and what we are accustomed to. The family living in a houseboat on the Mississippi River will not have the same standard as the family in a New York tenement or the family on a Nebraska farm. Since the ideal in the United States is the separate house for each family, most of the standards set up for good housing in this country are based on this thesis; but many modern two-family houses and apartments satisfy modern housing-standard requirements. The price of land always has direct effect on the size and variety of houses. In densely populated cities it has produced apartments and row houses, and in the country the expensive detached suburban house and the country house. More general use should be made of modern methods of grouping small suburban houses so as to concentrate open spaces and make them more useful and enjoyable. Town and village planning before the houses are built insures the best use of land.

Cost of Shelter.—It is agreed by those studying the problem that the family can safely pay two to two-and-one-half times the yearly income for a house and lot. This will depend somewhat on the age of the family provider and the permanency of his job. If the house is rented, from 19 to 25 per cent of the income may go for rent. The desire of the American people for modern housing and conveniences is almost unlimited. A *minimum standard* that should be obtainable by every self-supporting family, American or foreign-born, was drawn up by the National Conference of Charities and Correction in Cleveland in 1912, as follows:

> Social welfare demands for every family a safe and sanitary home; healthful surroundings, ample and pure running water inside the house; modern and sanitary toilet conveniences for its exclusive use, located inside the building; adequate sunlight and ventilation; reasonable fire protection; privacy; rooms of sufficient size and number to decently house the members of the family; freedom from dampness; prompt, adequate collection of all waste materials. These fundamental requirements for normal living should be obtainable by every family, reasonably accessible from place of employment, at a rental not exceeding 20 per cent of the family income.

Although this was written many years ago, many homes on farms, in villages and in large cities do not yet measure up to these requirements. Modern requirements in a minimum of housing include these items and in addition improvements due to modern inventions. New materials are available for house structure, and extraordinary developments have taken place in heating, lighting, sewage disposal and refrigeration for the home.

Conditions Injurious to Health.—Some bad housing conditions injurious to health are lack of light (especially sunlight), lack of ventilation, dampness (as in underground dwellings), overcrowding, impure or inadequate water supply, lack of bathing facilities, insanitary or insufficient toilets, lack of sewer connection, uncleanliness, dilapidation, lack of screens against flies and mosquitoes and inadequate disposal of garbage. Housing authorities give these conditions as causes or contributing causes of disease. Doctors and psychiatrists are agreed that serious nerve strain is often caused by overcrowding and noise. Mental depressions are aggravated by squalor and poor surroundings.

From the landlords' point of view bad houses make careless tenants and careless tenants make bad houses worse.

Housing Requirements.—Housing requirements are more fundamental than being able to "keep up with the Joneses" or live in a fashionable neighborhood. The basic requirements may be classified as (1) decency, (2) health, (3) amenity, (4) comfort and convenience and (5) safety. Under each of these are certain requirements and minimum standards.

1. *Requirements for decency:* A shelter, house or an apartment in keeping with family income and manner of living; a subdivision of this house or apartment into rooms for ordinary living; possibilities of privacy for individuals in the family. An adequate number of bedrooms includes one for the parents, one for the boys and one for the girls. An infant or small child may share the parents' room. At the age of adolescence and beyond, separate rooms are desirable. With a limited number of bedrooms, a couch in the living room may serve for guests. Relatively sound-proof walls make for privacy. No windows should look directly into windows of other dwellings.

2. *Health:* Facilities for cleanliness and sanitation; air adequate and pure; cross ventilation; light and adequate sun in rooms and public corridors; facilities for outdoor recreation. To meet this requirement all toilets must be ventilated. In an apartment house each family requires a separate water closet and bathroom within the apartment. In a separate house at least one bathroom reached from a hall is needed. In a two-story

house the provision of a washbowl and water closet on the first floor is desirable. A free movement of air throughout the house and every room with adequate natural ventilation is desirable. Limiting the depth of the house to two rooms makes for better ventilation. Rooms in apartments to meet the standard of gracious living should open on the street, yard or garden; and the ideal condition is to have no opposite wall nearer than the height of the home building. Sunshine is essential for its sanitary, germ-destroying quality and is needed in every room. Rooms with only north windows are to be avoided. Noxious industrial or other fumes are a menace to health. Play space for children and outdoor seats and a garden for adults are needed. Dead-end streets and public parks may furnish these facilities in a large city.

3. *Requirements for amenity:* Attractive outlook; simple but good architecture; quiet. Lawns and gardens visible from windows are a great improvement over paved inner courts, ash heaps and tin-can alleys. Attractive houses are made from all the building materials. Simple and direct designs are best. All walls should be insulated against noise, dampness, heat and cold. Traffic streets are to be avoided in selecting a house. Noisy inner courts are violations of the minimum standard.

4. *Requirements for comfort and convenience:* A satisfactory house has space for the family and guests, for both domestic and communal activities. The rooms are designed to accommodate furniture, the living habits of the family and facilities for the circulation of air and ease of cleaning. Living rooms and kitchens or a living-room-kitchen, bedrooms and bath are essentials. Living rooms need to be at least 180 square feet in area to be adequate for family use. Kitchens less than 100 square feet are likely to be too small except in an efficiency apartment. The dining room may be omitted if the family is small, but a nook or area for eating in or near the kitchen saves steps and wear on the living room. Some provision for laundry work done at home is necessary. A separate laundry, preferably on the ground floor if all the laundry is done at home, or built-in tubs in the kitchen for light work are suggested. Closets, though they are expensive to build, are included in a minimum standard. The minimum number is one closet per room and one per hall. In a small house or an apartment this number has to be increased to two.

The standard for electricity is safe wiring for lights and electrical equipment. This means wall outlets in each room in addition to the outlet for overhead light. Fireplaces for cool days, to add cheer and a center of interest, are desirable but not always in the minimum standard except in the South, where there is no other way of heating the house.

Another requirement of the minimum standard is accessibility—to schools, shops, social centers and work. Except in large cities the home should not be more than 30 minutes from work.

5. *Requirements for safety:* These have to do with soundness of construction; safe play spaces for children; passably fireproof buildings and permanent immunity from partial or total neighborhood blight.

Blighted areas and slums found in city, town and country are often the dwelling place of an element of the population that by its habits of living, low earning capacity and place in the industrial and social scale has helped create these slums. Special provisions have to be made for housing adapted to their needs and limitations, and help must be given in adjusting their mode of life to improved surroundings. In this area there may be records of delinquency and crime, suspicious fires and diseases commonly attributed to bad housing or associated with it. A program for the treatment of blighted areas and slums is protection against such neighborhood blight of obsolescent and deteriorated structures. This program should include the legal power to clear areas because they are unsanitary or because public interest requires it, with authority to demolish old structures hazardous to health, safety or morals.

Adequate and workable building codes are necessary to insure sound construction for the householder. State building codes, covering fundamentals of construction that promote the public health, morals, safety and welfare, were recommended by the President's Conference on Home Building and Ownership in 1931. Fireproof materials should be used for all except isolated houses. Wide stairs in an apartment house are advisable.

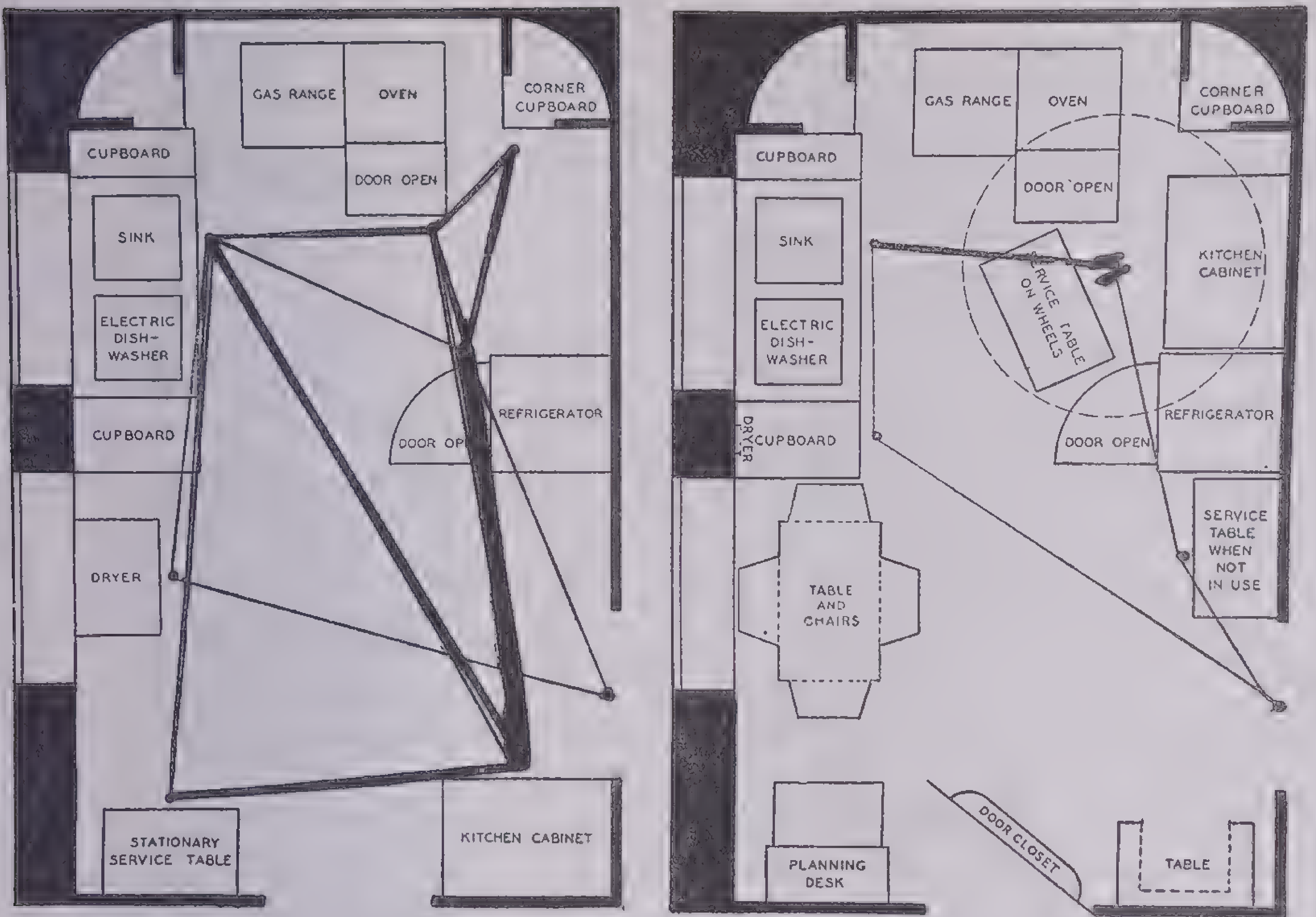
The best insurance against neighborhood blight is community planning with designated areas for recreation before the houses are built. Dead-end streets and large open-block interiors provide safe playgrounds. Hazardous street crossings are eliminated in the super-block plan. In the super-block, the essential idea is that traffic streets pass around, not through the block. Driveways for private cars are blind alleys at the rear of the houses. This leaves the center of the block in front of the houses free for playgrounds, parks or gardens. Underpasses are built connecting super-block with super-block. Dust, noise and especially danger to children and adults in street crossings is minimized. Radburn, N. J., embodies in its planning the first attempt to carry out the super-block or residential-unit (based on elementary school population) idea evolved for the Russell Sage Foundation by Clarence A. Perry.

Cost.—In calculating the cost of a house homeowners think in terms of finished-product costs that include the cost of the land, improvements on the land and the cost of financing. To calculate the cost of a modest house the cost per cubic foot is usually given as 45 to 85 cents. The more reliable method is to assign a cost to each room, taking into consideration size, finish and complexities of construction. The sum of the units gives an approximately accurate figure for the house. Bathrooms with an area one-fifth of an average room cost nearly double what a room costs. Mortgages may be given on the property for money borrowed. A second mortgage, when the first is inadequate, is sometimes necessary. The owner transfers part of his equity in this case to the lender.

Household Furnishings and Equipment.—Household equipment for the elimination of unnecessary work has had its greatest popularity in the United States. The movement began about 1910, but the general adoption of improved working equipment for the home has been relatively slow dependent on social and economic factors. The greatest development has taken place since 1918 in the adoption of electric appliances and modern gas and oil equipment. Inventors and manufacturers have been so busy developing new articles and styles that the modern housewife is often bewildered in making a choice and in separating essentials from luxuries.

The general rule is that the cost of furnishing should not exceed 25 per cent of the cost of the house or one-half the yearly income. The tastes, desires and activities of the family are important considerations in the development of a plan for furnishings, which should be chosen with the idea of its comfort and usefulness to the family and contribution to the design of the room. The furnishings already on hand may influence the choice of articles to be bought. The style and type of house must be considered. Repair and replacement are important parts of the cost, especially when furnishings are no longer new. Setting aside a sum each month for replacement is a good plan. Cash purchases at mid-season and other sales can be made advantageously by the homemaker who knows values. In the budget the 12 to 15 per cent allotted to operating expenses covers care and replacements.

In furnishing the various rooms of the house the relative importance of each room is to be considered. The smaller the allowance, the more care must be taken in purchasing. The mistakes of the small income will have to be lived with, but with a more generous income they can be replaced. The living room or room where the family sits and where guests are entertained is the most important room of the house and usually will require the most generous allowance of money for furnishings. In more pretentious homes several rooms may be set aside as parlors, drawing rooms, libraries and so forth, but all serve the same purposes. The essential furniture includes chairs enough for the family and a few extra ones for guests; adequate lights for reading, writing and conversation; a desk or table for writing; some musical instrument or a radio; and a dining table if the room is used as a dining room. The articles that may be added to this room for comfort are numerous—draperies, rugs, occasional tables, footstools, bookcases and mag-



Courtesy New York Herald Tribune Home Institute

A Well-Arranged Kitchen Saves Steps

Two hundred and eighty-four steps were required in making a strawberry shortcake in the kitchen shown at the left. At the right, the same kitchen has been rearranged so that the operation required only 48 steps, a saving of 236 steps. The service table where the cake-making is done has been put on wheels, and when not in use, it can be kept behind the door

azine stands. A few good pieces of furniture at a time is a wiser spending plan than a suite of cheap furniture. Solid wood or a high quality of veneer gives its money's worth in appearance and livability. A few well-chosen pictures, books and decorative objects enrich home life and are reflections of the family's taste.

Bedroom furnishings are chosen for comfort and to express the personality of the user. Springs and a good mattress make any kind of bed frame or stand comfortable. The effectiveness of the mirror and the dressing table are not based on cost. Chests of drawers supplemented by clothes closets are needed to take care of clothes. A small bedroom requires simple furnishings to avoid a cluttered appearance.

Most of the bathroom equipment is classed as part of the house. The expense of such items as a new shower or a modern lavatory have to be anticipated in the budget. Colored bathroom equipment and novelties are more costly than the usual white. Unless tiled walls and floor are used, the upkeep of paper and paint is an important budget item.

In the kitchen the modern housewife would like to let herself go in spending for the many labor-saving devices now available. An ironclad budget and a strong will are needed to resist the sales appeals of the dealers and manufacturers of modern equipment. New models with modern improvements are being constantly introduced. The trade-in value on out-of-date models is small. Instalment buying by salaried families of expensive kitchen equipment (or automobiles) is not always an economical practice. Instalment buying is of value insofar as it makes possible things that the family can afford; it is detrimental to family wellbeing if it makes something seem desirable and procurable that really cannot be afforded. The rate of interest charged on the balance due is exorbitant. If the income stops and the article is returned, the down payments are lost. The family's future may be jeopardized by paying out all the money earned each month for necessities and instalment buying. Instalment buying may be justified if a large piece of equipment, as a washing or sewing machine, means the reduction of an operating expense. If there is doubt as to permanency of employment, only cash purchases should be made. Charge accounts also can be abused, although they are a convenience in ordering goods, making exchanges and in monthly settlement of bills. Women are the chief abusers of the practice as they do from 75 to 85 per cent of all household buying. Style wears out more articles than use. Styles in equipment and furnishings change frequently. A simple article of honest construction bought from a reliable dealer will outlast many of the latest fads sold by nonreputable dealers.

The sale of mechanical home devices follows the increase of the family income in the wage and salaried class. The housewife who does her own work is usually most interested. The apartment house with its necessity for utilizing space to the greatest advantage has created an interest in these devices and in small-sized and dual-purpose equipment. The virtual standardization of electric service has been important in the sale and use of modern electrical equipment. Education in the use of equipment has contributed to its public acceptance. Gas and electric companies, manufacturers, schools, colleges and government departments have given place on their programs to instruction and demonstration.

Motor Driven Appliances.—Electric washing machines came into use about 1905; electric vacuum sweepers, in 1909. Other motor appliances are ironing machines, refrigerators, sewing machines and general utility motors for such jobs as freezing ice cream, sharpening knives, operating coffee mills, beating, mixing and grinding. The motor-driven appliances cost very little to operate and are easily cared for. Lubrication is taken care of by grease cups or oil wells of large capacity that require little replenishing.

The washing machine, refrigerator and vacuum cleaner are perhaps the most important appliances to the housewife. Since 1917 great improvements have been made in refrigerators, particularly in the replacement of wood by metal in cabinets. Electric refrigerators may not fit the housewife's needs, purse and condition as well as other types of mechanical or ice refrigerators. The vacuum cleaner with attachments is an example of an appliance that can be used for several jobs—draperies, upholstered furniture, mattresses and so forth can be cleaned with it. Some vacuum cleaners clean by suction of air movement only and others by motor-driven brush and suction. The cost of these items is interpreted as the purchase price but quite as important are maintenance and upkeep costs. Before buying a large and expensive appliance, data on yearly costs of operation and repairs should be made. The choice is determined by original cost and operation costs measured against amount of use the family can secure from it.

Small Electric Appliances.—The ease in using and the safety of electric heating has made many appliances popular. The development about 1910 of resistance wires of a nickel-and-chromium alloy that could be heated to redness in the air without oxidation made it no longer necessary to have heating units sealed or enclosed. Electric irons were among the first of home devices in popular use and still lead the list; the toaster comes second; and percolators, waffle irons, grills, coffee makers and portable heaters are becoming increasingly popular. These small appliances have been streamlined and fitted with automatic heat regulators and thermostatic control. Sizes to suit individual or family needs are available. Ventilating fans can be had in a variety of sizes from the small vent fan to fit over a kitchen flue opening to the larger sizes for a window, transom or attic. Some are reversible and bring in fresh air from outside or take out fumes and cooking odors.

In choosing small electric appliances, the need, original cost, storage facilities and the cost of operation, upkeep and service required are important considerations. Heating equipment uses more electricity than motor-driven appliances. Electric appliances need separate storage space and convenient outlets. Wiring in most old houses is inadequate, for the majority are wired for the single purpose of providing light from permanently installed fixtures. Additional wall outlets for portable lamps and appliances are the safest arrangement. Long extension cords are dangerous and unsightly.

Other less-used electric equipment includes stoves and various types of cooking units. Some ranges have automatic temperature and time controls. Cooking with electricity is clean and comfortable. The dishwasher and the garbage-disposal unit are two sink accessories that are growing in popularity. Electric water heaters are often used where electric rates are low. Floor polishers and waxers usually are not owned but are rented from a local dealer, since their use is limited to general house-cleaning days. Heavy revolving or rotating brushes or a revolving drum equipped with sandpaper or other abrasive does the scraping. Polishing materials are used for waxing.

Gas and Oil Appliances.—Gas is the most-used fuel; coal and wood are next; oil is third and electricity fourth. Gas ranks first as a cooking medium because it is easily accessible, heats quickly and is easy to use. Modern gas ranges have insulated ovens with temperature control, built-in removable broilers, sliding shelves and utensil drawers. In the same sizes they cost somewhat less than electric ranges. The cost of operation depends on the amont of gas used and local rates. Oil stoves have been modernized in design. The improved burner gives good combustion. The ovens are not insulated in most types. The cost is about the same as a gas stove, sometimes less. Stoves for using stored gas are in demand for country houses and camps.

Both gas and oil refrigerators are cheap to operate. The modern gas refrigerator does not use water. The oil refrigerator requires the care and cleanliness necessary with any oil-burning appliance. Both types of refrigerators are relatively expensive. Modern ice refrigerators are built on the same lines as mechanical refrigerators, but the initial cost is less.

Courtesy New York Herald Tribune Home Institute

When Storage Space Is at a Minimum

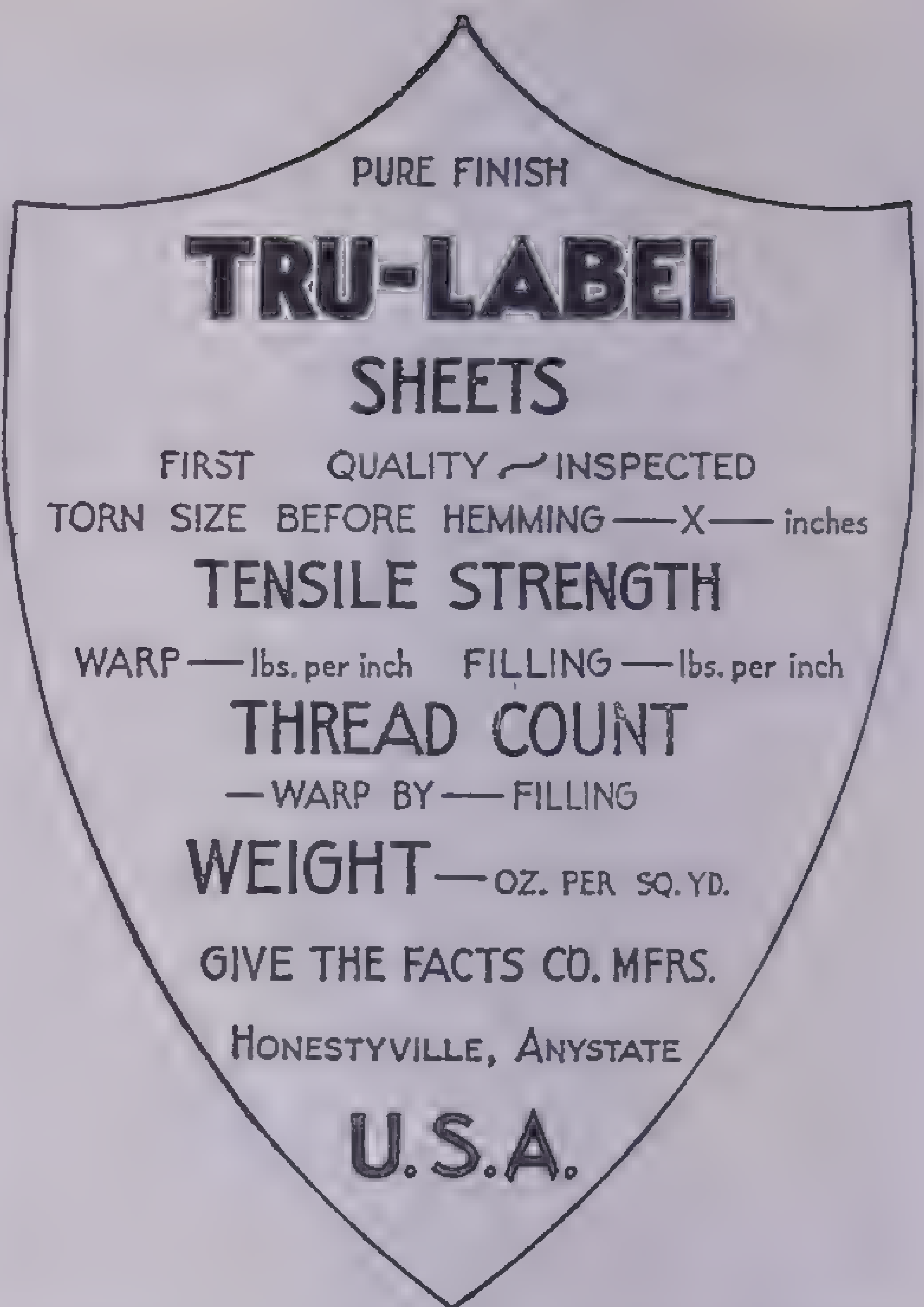
A cabinet on a door materially increases cupboard space

Water Heaters.—Hot water, once a luxury but now a necessity in the modern home, is more often heated by gas than by any other fuel. Water is also heated by coils or pipes in the furnace or firebox of a coal or wood range or by an oil burner. Older types of gas heaters had a gas burner below a coiled pipe or water container fed by two pipes that provided circulation through either the container or coil. The modern instantaneous gas heater provides hot water by turning on any hot-water tap on the pipe line attached to the heating unit. The temperature is thermostatically controlled.

Small Appliances.—An equipment list for small utensils and appliances to be used in food preparation and serving, cleaning and laundry, including tools that the housewife must have to do her work with, helpful tools and perhaps some that are rarely used, is valuable as a check on the equipment in the home. It gives a basis for replenishings and additions. Such a list tends to prevent useless and thoughtless buying. All equipment should be chosen on the basis of efficiency. The ideal is an article doing effective work with a minimum expenditure of energy and a reasonable operating cost. Cheap equipment requires frequent replacing and is expensive in the end. Choice also should be influenced by the care required to keep the appliance. An article that increases labor without adequate return is a questionable investment.

Storage.—Facilities for storage of equipment and supplies are important in house planning and remodeling. Modern storage units in wood or metal come in various sizes and types ready to install in kitchen, laundry, hall or pantry. Storage units bought ready-made or made at request should be planned to store definite articles. The most convenient storage is near the working surface or area where the articles are used—dish cupboards in the butlers' pantry or kitchen; pot closet near the stove; table linen in the butlers' pantry or dining room; and cleaning closet convenient to the kitchen.

The housekeeper as purchasing agent has been handicapped by lack of standards and specifications by which to judge her goods and must rely often on her own knowledge and judgment. Many goods cannot be adequately judged by personal observation, however skilled one is. Various agencies are now making tests and setting up standards and specifications to guide individual consumers. The Bureau of Home Economics (Department of Agriculture, Washington, D. C.) publishes bulletins for the homemaker and gives personal advice to inquirers. Agents from the Extension Service of state agricultural colleges and of the United States Department of Agriculture give information to women in rural districts and small communities. The U. S. Bureau of Standards (Department of Commerce) has done some testing for the housewife. Its publications are available from the Department at Washington, D. C. Some women's magazines and consumer leagues also do testing.



PURE FINISH
TRU-LABEL
SHEETS
FIRST QUALITY ✓ INSPECTED
TORN SIZE BEFORE HEMMING —X— inches
TENSILE STRENGTH
WARP — lbs. per inch FILLING — lbs. per inch
THREAD COUNT
— WARP BY — FILLING
WEIGHT — OZ. PER SQ. YD.
GIVE THE FACTS CO. MFRS.
HONESTYVILLE, ANYSTATE
U.S.A.

Courtesy U. S. Bureau of Home Economics

Informative Labels Help the Buyer

An ideal label gives all the facts. But the careful buyer is informed about the article she purchases and does not have to depend entirely on the often inadequate information provided by the manufacturer

Household Accounts and Budgets.—Keeping household records and making a budget as a guide for family spending are parts of good management in the home. The home manager has the problem of the best utilization of all available resources: of money, equipment, time, energy and personnel. Perfect management of an income of any size is an achievement. It is in fact the expression of a highly disciplined life. A study of costs does not lead to materialism but is a needed help in recognizing and comparing values. Spending is always a question of *which* rather than *what.*

The family expenses to be met regularly include necessities, comforts and luxuries. These vary according to the size, age, sex, interests and training of the members of the family. Necessities are hard to define because of the different standards of living of families. Each family establishes its own standard of living commonly determined by the home life of the homemakers in their youth, by the interests and tastes of family members and by the standards set by neighbors and acquaintances. Satisfactions vary with families and individuals; some gain most from good food or fine clothing, some from a large house; others, from education or travel, and still others, from display and ritual. If the satisfactions sought require fairly large outlays of money or of time and effort and represent permanent values, the person is said to have a high standard of living. To be satisfactory the standard of living is kept within the income. Good planning will mean a budget or plan of proposed expenditures.

Budget.—The family budget is a detailed schedule of anticipated household income and its allotment into proposed expenditures, drawn up as a guide. The usual divisions are for food, housing or shelter, clothing, operation or housekeeping expense and advancement. Under advancement such items as savings, health, education, church and charities, personal and miscellaneous expenses are provided for. Food, shelter, clothing and operating expenses are the essentials and are taken care of first with any income. In the small incomes there may not be much left for advancement after the necessities are provided for.

The family expenses are met by the money received for work by one or more members of the family, usually the husband and father. Other members of the family may contribute earnings; however, unless the contribution is regular it cannot be depended on as a part of available income. Other types of incomes are from saved or invested money. These earnings brought in from outside are supplemented by goods produced in the home. The wife, mother or homemaker who conserves the income and contributes labor and management is adding to the family finances.

Incomes may be classified as: mere existence or minimum, comfort, moderate and well-to-do. Food, shelter and clothing are immediate needs to be provided for by the income. Government agencies (such as the Bureau of Home Economics in the Department of Agriculture) working with relief agencies have prepared budgets giving the minimum food requirement for health and growth. Some improvements in housing for the lowest-income group are being made with government subsidies. Without aid, at this income level very little planning for the future and advancement can be made. The pressing elementary needs have to be provided for first. The minimum standard income for a family of five, to give some choices of expenditures, is not less than $1,000 a year. The farm cash income may be much less than this, but goods furnished by the farm can supply from ¼ to ½ the income. In keeping records and accounts the goods used are given the market value. The range of percentages given in Standard Budgets for a family of five with an income of $1,100 to $1,800 is:

33% to 42%, food
19% to 25%, housing
12% to 15%, clothing
9% to 17%, house operation
3% to 4%, savings and investment
10% to 17%, personal, doctor, church, etc.

The percentage spent for food decreases as the income increases because only a certain amount of food can be consumed. Increased costs of entertaining and serving are shown in operation cost. In the case of a large income, the percentage for food may be as low as 10 to 20 percent. If the income is low, 45 to 50 per cent is sometimes used for food.

The percentage spent for shelter also tends to decrease with larger incomes. From 1/10 to 1/4 of the larger annual income goes for housing. The best proportion in a minimum budget is less than 20 per cent, from 13.4 to 17.3 per cent. Actually a greater percentage often has to be spent for housing, by working families in large cities and in thickly populated areas, to be near the wage earner's work. The family standard of living influences the expenditure for housing. The location should never be such that the family is depressed or humiliated by surrounding conditions. The cost of clothing may advance from almost nothing in a bare subsistence budget to 15 per cent of a liberal budget. The percentage varies very little in comfort, moderate and well-to-do budgets. The clothing cost listed is only the initial cost and does not include such items as laundry and dry cleaning, as these are included in operation expense, which also covers such items as light, fuel, heat, telephone, water, ice, hired help, cleaning supplies and other running expenses.

Savings invested in Government bonds, savings banks and life insurance increase from almost nothing in the low-income group to 14 per cent for the well-to-do.

In the minimum and comfort standard budgets there is little or no money for an automobile without sacrificing other more important items. The automobile may, however, be a necessary part of the wage earner's business or a means of recreation that justifies the expense. The percentage spent for automobile expenses varies very little with different incomes. Under advancement are included items of a cultural nature, recreation, education, travel, health, music, church and charities and hobbies. The percentage increases from 5 per cent in the minimum budget to 20 per cent or more in the well-to-do.

The factors controlling the distribution of the income are: the amount (first and most important); size of the family; age and sex of children; occupation of the father; housekeeping skill of the mother; education of the parents and standards of living in the homes from which they came; life in the country or town and size of the community; housing in an apartment or detached house; social and religious customs that affect expenditures; and finally personal choice in emphasizing one expenditure rather than another. Normally the best location is among families of similar financial status and social standards rather than a house on the fringe of a group that spends on a larger scale.

The income tax is deducted before the money is budgeted for house expenses. To deduct the savings at the same time is a good practice. Savings may be thought of as *deferred* spending. Rules for saving are:

1. Never live up to your income and never borrow.
2. Set aside regularly what will be needed to build up the sum agreed on for larger aims and live on the rest.
3. Never dribble your spending; have respect for the penny and nickel.

Savings may be invested in:

(a). Government bonds, safe securities and deposits in savings banks.

(b). Life, health and accident insurance.

(c). House, lot and furniture—which bring income through the use of goods it would require money to hire.

(d). Education.

(e). Rest and recreation for the money earners.

(f). Old-age endowments.

Savings may expand with increase in income, but not at the expense of the spiritual, mental and social life of the family.

Items to consider under advancement are the cost and education of children. The cost of rearing a child to 18 years has been estimated at $7,425. The cost to society for his education, public-health service and so on is more than this. The cost of education varies in college and professional schools.

In 1933–34 the average minimum 9-month expense for a freshman in college in 468 institutions was $540. In state-supported institutions the average was $376. In privately controlled institutions, the minimum expense was $901 in women's colleges; $818 in men's colleges; and $600 in co-educational institutions. The freshman student in an independent medical school in 1933–34 had a minimum expense of $1,023.[1] Insurance policies taken out when the children are young, to take care of college educations, are good investments.

The family health is uncertain. Normal provisions in the budget should take care of visits to the dentist and health examinations. A savings account is protection in case of long illness or operations. An available sum of $83 for a doctor's care and $44 for a dentist has been recommended. Recreation, travel and needed vacations may well be considered investments in health.

Donations for church and charity, based on national philanthropic needs in 1921 are 1/10 of 1 per cent of the $1,250 income; 1 per cent of the $2,100 income; 2 per cent of $2,750; 3 per cent of $4,500; 4 per cent of $7,000; and 5 per cent of $12,500 annually.

Household Accounts.—A record of the family's spending for several months or a year gives a good basis for setting up a budget. Ready-made budgets are based on average expenditures of families of varying incomes. A tentative budget can be set up for the year with the important items provided for. This budget is then modified by actual family-spending practices. The household account may serve the same purpose as a record of sales and purchases in a business house, that is, provide ready information concerning the status of family finances. Household accounts provide: (1) means of comparing expenditures for various items; (2) a method of detecting waste and needless expenditures; and (3) a basis for better planning of expenditures.

Household account books are sold at bookstores, department stores, stationery departments of 10-cent stores and by the Bureau of Home Economics, (U. S. Department of Agriculture). All such books have pages for the months of the year and spaces for daily notations of expenditures for food, clothing, rent, house operation and advancement. The subdivisions under these main topics differ somewhat.

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[1] Figures are from *The Cost of Going to College*, by Walter J. Greenleaf, Office of Education, U. S. Dept. of the Interior.

Daily expenses for household goods can be kept in a small book and transferred weekly to the larger book or written directly into the account book each day. If children are given allowances, these are recorded, but each child needs a plan of spending for his money no matter how small the amount. At the end of the month or even week, the expenses are totaled and the results compared with the tentative budget. Accounts kept for a three-month period may be used as a picture of the yearly spending when multiplied by four. The three-month period should include seasonal buying of clothing.

Keeping an account of household expenses is a good practice if these records are studied and used as a check on thoughtless purchasing and as a basis of planning expenses to give greater satisfaction. Undue spending for food and clothing may leave little for the development of personal life and social satisfaction. The personal expenses of the adults in the family are provided for in a lump sum and need not be itemized except by the individuals under personal care.

Checking and comparing actual figures of money spent in the family with national averages are helpful. Clothing costs for a family of five, for instance, may be divided with 27 per cent of the income for the father, 31 per cent for the mother and 42 per cent for the three children, 17 per cent for the 12-year-old, 15 per cent for the 10-year-old and 10 per cent for the 8-year-old. Clothing is bought and planned for a 2- or 3-year period. Winter coats and spring coats need not be bought the same year. The mother's time and ability in sewing will make some difference in clothing costs. From the record of clothing expense it is easy to see whether one member is getting more than his share. The weekly amount spent on food can be compared with that budgeted for food by dividing the 25 per cent of the income by 52; this will give the weekly allowance. The weekly allowance times 4 1/3 will give the monthly allowance. The monthly allowance divided by 30 gives the amount per day. The cost of adequate food varies. Minimum cost is estimated at 25 to 60 cents per day per person. The division of the food money needs watching in the household account. Nutritionists recommend that 1/5 of the money, more or less, go for fruit and vegetables; 1/5 for milk and cheese; 1/5 for meat and fish; 1/5 for bread and cereals; and 1/5 or less for sugar, fats and other foods.

The methods of purchasing are cash, charge and instalment buying, sometimes referred to as "weekly payments for weakly minded." Available cash permits one to shop at cash-and-carry stores and special sales. Charge accounts are convenient but can be abused by telephone orders and careless buying. Instalment buying should be limited to large household equipment that will pay for itself in savings of time, labor and material. Large-quantity buying is economical if there is storage space.

Allowances for the children may begin with a few cents a week when they are very small and be gradually increased to cover certain specified expenses as they grow older. One-fourth the allowance should be saved and some of it be spent for gifts for others. The spending of money is as valuable as making it and this should be taught. Some home duties required of the children do not need compensation, these are their contributions to the family life. If there is no money available in the family for allowances the children can be permitted to use outside opportunities for making pin money for recreation and other uses.

Suggested Apportionment of Expenditures for Different Incomes for a Family of Four[1]

Income	FOOD		HOUSING		CLOTHING		HOUSE OPERATION		LIFE INS., SAVINGS		AUTO. EXPENSE		ALL OTHER EXPENDITURES	
	%	Amt. $	%	Amt. $	%	Amt. $	%	Amt. $	%	Amt. $	%	Amt. $	%	Amt. $
	Minimum Standard													
$1,000	38	380	18	180	17.5	175	8	80	2	20	0	0	16.5	165
$1,500	30	450	16	240	15	225	8	120	5	75	0	0	26	390
	Comfort Standard													
$2,000 (No car)	21	580	17	340	15	300	9	180	7	140	0	0	23	460
$2,000 (With car)	28	560	15	300	13	260	8	160	5	100	6	120	20	400
	Moderate Standard													
$3,000	21	630	17	510	15	450	10	300	9	270	8	240	20	600
$4,500	20	900	15	675	15	675	10	450	12	540	6	270	22	990
	Well-to-do Standard													
$6,000	19	1140	15	900	15	900	10	600	14	840	7	420	20	1200

Budgeting time is also important for the home manager if she is to enjoy rest, recreation and leisure with the family. A 42- to 48-hour week as in industry has been recommended. Housework requires various skills. The wise housewife spends her energies on the things she does best if there is any choice, and has assistance with the less-liked jobs. As the children grow up, they can be trained to take over certain household tasks, boys as well as girls.

The housewife has the problem of dividing her day between managerial and physical problems. Housekeeping is the productive work of the household in making ready food, clothing and shelter for the members. Homemaking is the direction of the personal life, of the family group. A daily schedule of work with a time limit to each job is good training.

In the fullest family life each member participates in the interests, ambitions and experiences of the others. The creation, continuance and development of the family mind is the most characteristic process, if not the most obvious one in household experience.

BIBLIOGRAPHY

D. Baruch and O. Reiss, *My Body and How It Works*, Harpers, N. Y., 1934, $1.50

M. S. Haviland, *The Most Wonderful House in the World*, Lippincott, Phila., 1921, $1.00

Florence Meredith, *Twelve Hours of Hygiene*, Blakiston, Phila., 1935, $1.90

Hope Holway, *The Story of Health*, Harpers, N. Y., 1931, $1.25

Logan Clendening, *The Human Body*, Knopf, N. Y., 1937, $3.75

Harold S. Diehl, *Healthful Living*, Whittlesey House, N. Y., 1935, $2.75

L. E. Richards, *Florence Nightingale*, Appleton-Century, N. Y., 1931, $1.00

Paul de Kruif, *Microbe Hunters*, Blue Ribbon, N. Y., 1935, $1.00

H. W. Haggard, *Devils, Drugs and Doctors*, Blue Ribbon, N. Y., 1929, 98¢

H. W. Haggard, *The Lame, the Halt and the Blind*, Harpers, N. Y., 1932, $4.00

Hans Zinsser, *Rats, Lice and History*, Little, Brown, Boston, 1935, $3.75

David Dietz, *Medical Magic*, Dodd, Mead, N. Y., 1937, $3.50

Richard Harrison Shryock, *The Development of Modern Medicine*, Univ. of Pennsylvania, Phila., 1936, $4.00

R. G. Hoskins, *The Tides of Life*, Norton, N. Y., 1933, $3.50

H. S. Jennings, *The Biological Basis of Human Nature*, Norton, N. Y., 1930, $4.00

Nicholas Kopeloff, *Man Versus Microbes*, Knopf, N. Y., 1936, $4.00

Victor Heiser, *An American Doctor's Odyssey*, Norton, N. Y., 1936, $3.75

William N. Macartney, *Fifty Years a Country Doctor*, E. P. Dutton, N. Y., 1938, $3.50

Logan Clendening, *The Balanced Diet*, Appleton-Century, N. Y., 1936, $1.50

J. Jastrow, *Keeping Mentally Fit*, Garden City Pub. Co., Garden City, N. Y., 1930, $1.00

John J. B. Morgan, *Keeping a Sound Mind*, Macmillan, N. Y., 1934, $2.25

M. B. and M. R. Jensen and M. L. Ziller, *Fundamentals of Home Economics*, Macmillan, N. Y., 1935, $1.80

H. M. Jordan, M. L. Ziller and J. F. Brown, *Home and Family*, Macmillan, N. Y., 1935, $1.80

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[1] *Home Living* by Justin & Rust, Lippincott, 1935

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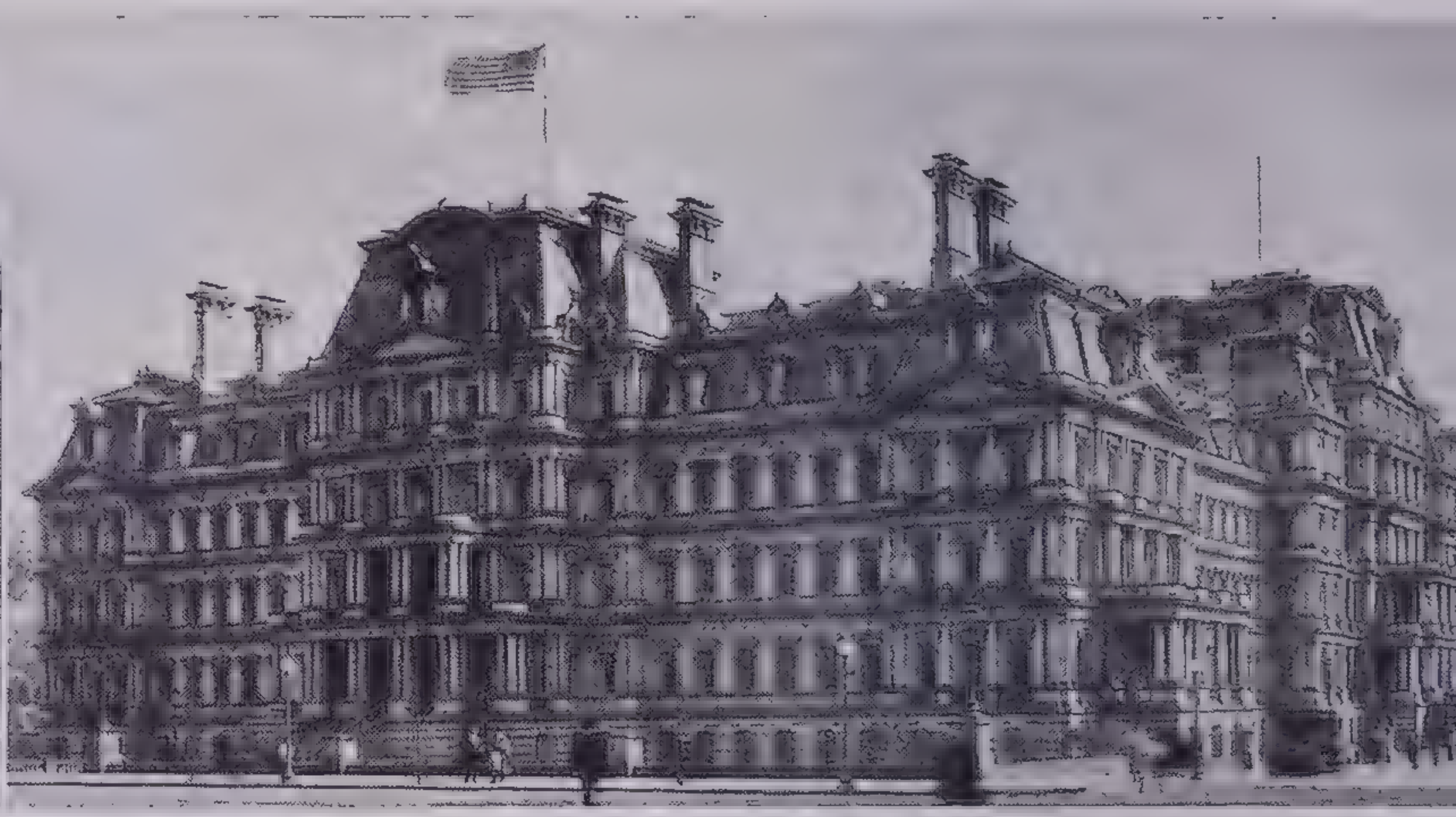
Department of the Navy, Constructed at the Time of the World War. The Building to the Right Is Used by the War Department

Washington, D.C.—Buildings of the Ten Departments of the Federal Government

(Photos by Harris & Ewing)

Treasury Department (1845)



Department of State (1871)

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BOOK X: GOVERNMENT AND LAW

THE THEORY OF GOVERNMENT

What is Government?—Government is control. "Learn to govern your temper"—that means control. Trace the word back and you find that the Latin word to govern, *gubernare,* means to steer, to be pilot. The governor, *gubernator,* was the helmsman, responsible for the safety of all on board.

In a small boat with nearly everyone on board rowing there is no special need for a helmsman. In the small size ship of state everyone can help steer—the entire small community can meet and decide what is to be done. That would be a pure democracy. But it does not happen very often. Communities and nations are too big for a town meeting government. People are too busy, too indifferent, to spend the time and effort to be their own government. So most government is not direct self-government. A working definition is: government is public control by a few presumably for the benefit of the many.

Woodrow Wilson was a student of government before he became a statesman and in his great book *The State* he lists the eight essential functions of government:

(1) To keep order and provide for the protection of persons and property from violence and robbery.

(2) To fix the legal relations between man and wife and between parents and children.

(3) To regulate the holding, transmission and interchange of property, and the determination of its liabilities for debt or for crime.

(4) To fix the contract rights between individuals.

(5) To define crime and provide for the punishment of criminals.

(6) To provide for the administration of justice in civil causes.

(7) To determine the political duties, privileges and relations of citizens.

(8) To regulate the dealings of the state with foreign powers, to preserve the state from external danger and to advance its international interests.

In addition to these eight essentials, all modern governments have undertaken a whole series of service functions of the sort that might conceivably be carried on by private enterprise. This service field of government activity cannot be strictly defined, but we all recognize as familiar examples of government functions such things as the following:

Mail service
Fire protection
Health protection
Education
Road-building and maintenance
Conservation of natural resources
Information bureaus (e.g. census, weather reports, agricultural experimentation, geological and geodetic surveys).

One of the conspicuous trends of government at the present day is the expansion of these general service functions, and one of the main issues of modern political discussion is the degree to which this field ought to expand. Few people would hold, for example, that government operation of the postal system is an encroachment on the field of private enterprise, but many people object strenuously to proposals that the government operate the railroad system or the telephone and telegraph systems.

A second leading issue in the discussion of the proper field of government action arises from different interpretations of Wilson's function (3): "to regulate the holding, transmission and interchange of property, and the determination of its liabilities for debt and for crime." The extreme individualistic theory (the famous *laissez-faire* of the classical economists) limits government regulation of the holding and interchange of property to the government's guarantee of every man's right to do exactly as he pleases with everything he can get. The extreme totalitarian theory holds that the government can confiscate or abolish private property or specify in detail the use to which it is put.

Theory of government and the facts of government are quite different. Many statesmen have found that when they run a government it is necessary to do many things they would not approve in theory. Thomas Jefferson, for example, took advantage of the opportunity to buy Louisiana though his whole political philosophy assured him that the Constitution gave him no power to do anything of the sort. Lincoln boldly arrogated to the executive the right to proclaim Negro emancipation—as flagrant a case as any in American history of confiscating property without due process of law—justifying his action on the ground that it was a necessary war measure. Woodrow Wilson himself, though his political faith was that of the old Democratic party stemming from the ideas of Jefferson with its strong tradition favoring State rights and non-interference by government in the activities of business, sponsored the Clayton Anti-Trust Act, the Federal Reserve Law, the Federal Trade Commission Act and other pieces of legislation that strengthened the control of the national government and interfered, his opponents said, with business.

Almost any government you examine closely will vary considerably from the eight essential functions laid down by Woodrow Wilson. In the history of the world there have been many forms of government, and today there are many variations in the character and nature of governments in different countries. We can understand these variations best by answering with actual examples certain questions suggested by our definition of government: public control by a few for the benefit of the many.

How complete is the control? Almost without exception the control exercised by governments today is more far-reaching than ever before. "The least government is the best government" was the maxim of Thomas Jefferson a hundred and fifty years ago. But about seventy years ago the young German Empire under Bismarck's iron rule introduced compulsory insurance for factory workers, tariff barriers to protect German industry and subsidies to steamship lines to improve German commerce. Germany had state socialism long before Hitler's National Socialism.

During the World War the governments of all combatant Powers commandeered industry; rationed the inhabitants' food, fuel and lights and set standards of pay and hours for workers. Public utilities (postal and telephone systems, railways, electricity, gas and water) are today regulated by many nations and completely controlled and owned by others. Since the War, in the emergency of the economic depression, Sweden, Britain and the United States (to name only a few nations) have extended the operations of government into control of price levels and money and many fields new to government. In Italy, Germany and Russia today the government is all-embracing, so that we have a new concept: the totalitarian state that controls education, business, religion—everything.

How are those in control *chosen* for the task of government? The few are chosen by the many—that is the ideal. But even when and where that is true, there are great variations in the meaning of "chosen by the many." Sometimes it is a direct choice—as we in the United States now vote for U. S. senators instead of having them chosen by state legislatures as was originally provided by the Federal Constitution. Even this is a direct choice only in a qualified and modified fashion—for the party candidates for the Senate are chosen by party organizations, and the two or three names are then submitted to the many for their direct choice.

Candidates for President and Vice-President of the United States are chosen by party conventions, and from these candidates the President and Vice-President are actually elected by a plurality of the presidential electors. So it may happen that the choice of the electoral college is not the people's choice. In 1888 Benjamin Harrison was made President by 233 electoral votes to 168 for Grover Cleveland who received 100,000 more votes of the many than Harrison (5,540,329 to 5,439,853).

Though the king of England has not much practical control, he is the head of the government in theory. He is chosen by the accident of being the previous king's eldest son. Nevertheless, on several occasions in the past this regular succession has been set aside by Parliament, and it is really Parliament that fixes the qualifications of the king. In 1936 King Edward VIII was forced to give up the crown by the political pressure of his ministers acting with the support of Parliament.

Occasionally in the last generation the choice of a governing head of a country has been by the oldest and most primitive of all methods—force of arms. Mussolini was not elected Duce of Italy by popular vote. He led his Fascist Black Shirts—an organized force of a few thousands—in their march on Rome and made himself ruler. But Mussolini insists that he rules by consent of those whom he governs.

To whom are those who govern responsible? When Edward VIII was forced to abdicate it was made plain that the Crown of England is responsible to the Ministry and to public opinion.

To whom is Mussolini responsible? Or Hitler? Or Stalin? Only in a very vague way to anyone!

In our democratic government every official is responsible to the people who elect him to office or to the authority that appoints him. He is an agent with delegated powers. He is liable to removal from office, to defeat when he comes up for re-election, to trial upon impeachment. His continuance in office depends upon his good behavior.

Are there any rules that control those who govern? In countries (the United States, for example) with a written constitution that can be altered only by a long, elaborate process of amendment the rules are strict, rigid, difficult to change. In England the unwritten constitution may be altered much more easily and quickly—by an Act of Parliament that goes into effect immediately, as in 1911 when the veto power of the House of Lords was practically abolished. In France a National Assembly, composed of the members of the two houses, has power to amend the Constitution merely by majority vote.

In some countries the rules can be changed at a minute's notice just by the say so of the ruler. In Italy Mussolini announces the dissolution of the lower house—and the form of government is immediately changed. In Germany the upper house (Reichsrat) and the lower house (Reichstag) voted early in 1934 to transfer to the Reich the powers of each of the states that had made up the Reich—and within two weeks the Reichsrat was abolished by executive decree. But in Italy and Germany and Russia the dictator is always in fact controlled by economic and political necessity—and to a degree by the public favor he tries so hard to win.

What is meant by *benefit* when we speak of control for the benefit of the many? The preamble to our Federal Constitution proposes to "establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare and secure the blessings of liberty to ourselves and our posterity." Liberty and freedom of the individual are benefits of government that we take for granted, though we recognize at the same time that individual liberty must necessarily be somewhat restricted for the public good—for example by forbidding adulteration of food or punishing fast driving. But the Italian and German governments now in power consider that individual liberty is non-essential and that the object of government is the welfare of the State that is composed of the party—and not of the individuals in the state.

Japan has a constitution and a cabinet government patterned on western models, but the government is not for the benefit of the many: the many are important only as subjects of the emperor, so government exists for his glory rather than for their benefit.

What do we mean by *many* when we say government is for the benefit of the many? Government for the good of all the people is the ideal objective. How can this be secured? By a government that represents all the people! But in our own representative government the congressional district's representative at Washington is elected by the majority not by all the people in his district. Will he work for the benefit of the minority, those who did not vote for him? This question he must decide for himself. Certain types of government entirely disregard the benefit of the minority or even of a large class or of many large classes. Hitler's Nazi regime in Germany has the definite governmental policy of an Aryan state; Jews have no rights—the government is not for their benefit. Indeed this government is not for the benefit of any of the many except members of the relatively small National Socialist party. Hitler's blood purge in January, 1934, wiping out many prominent members of the Nazi party showed that the rule in Germany is not even for the benefit of all the members of the party.

In Russia there have been similar "liquidations" of outstanding associates of Stalin. The benefit of the *many* in Germany and Russia, if it is the object of government, is interpreted as benefit to the members of the party—a small minority in the nation who are loyal to a plan or policy. In these countries and in Italy the many are no longer important as individuals but only as members of a nation—a political philosophy more Oriental than western.

The wide extent of our definition of government shows us that old-fashioned classifications no longer really fit. The old classes are terms still in use. You should know them and their definitions. But as you read the definitions, note how many modern governments will come under more than one of these headings.

Types of Government

DESPOTISM, government by an absolute ruler. The term enlightened despot is often used, meaning an absolute ruler who rules for the benefit of his people.

TYRANNY, absolute rule of an autocratic and violent sort, often resulting from a forcible seizure of the government. This type of rule, by a tyrant or usurper, was common in ancient Greece where from time to time democracies were seized by ambitious men. Some Greek tyrants gave their subjects a very good government; but tyranny now implies cruelty and arbitrary use of power.

DICTATORSHIP, rule of a single person beginning in an emergency and sometimes chosen by legal methods, as in ancient Rome, to take complete command for public safety. In modern use dictator means one who exercises absolute authority in government or in any other sphere.

AUTOCRACY, the sole and undisputed government of a single ruler.

MONARCHY, government headed by a hereditary ruler, a king or emperor; *absolute,* if the monarch has complete power—or *limited,* if a constitution (or its equivalent) controls his actions (constitutional monarchy).

ARISTOCRACY, literally "rule by the best," is government by a small privileged class, noble or wealthy.

OLIGARCHY, government by a few and the sort of government in which only a small class have political rights.

DEMOCRACY, government by the people—*pure* or *absolute,* when the people govern directly and immediately as in a town meeting where every detail of government comes before all the people; or *indirect, representative* democracy, when the people delegate their authority to elected officials.

REPUBLIC, government by the people through their elected representatives; a representative democracy or a government by a select electorate (not necessarily all the people) which delegates power to its representatives.

These classifications do not really describe types of government. The ancient Roman republic was an aristocracy and an oligarchy. Modern Italy is a limited monarchy with a king—and a dictatorship under its ruler, the Duce, who came to power in a crisis and, because he usurped power, might be called a tyrant in the original meaning of the word. Britain is a limited monarchy; but the king's ministers have more power than the king. That does not make England an oligarchy—for the Cabinet and the king's ministers are responsible to the House of Commons, and the House of Commons is elected by the people. So England, a limited, constitutional monarchy in form, is in fact a representative democracy.

Party Rule.—There were parties in ancient Athens—named Hillmen, Plainsmen and Shoredwellers, evidently regional classes of farmers. Our modern political parties originated primarily in economic classes with different views of the state and its relation to their business and other businesses. But there are two important facts to bear in mind about parties in government today: first, that the origin and original purpose of any political party are soon lost in modern politics; and that party organization plays an ever increasing part in government.

The change in party purpose and meaning is repeatedly illustrated in American government. Jefferson and the other leaders of the Democratic party defended State rights against centralization of power in the Federal government. During the 1936 presidential campaign the political descendants of Alexander Hamilton, who was for Federal aggrandizement at the expense of the states, were using the arguments that Jefferson used against Hamilton—and used them against the leaders of the Democratic party, in which Jeffersonian policies are traditional.

A generation ago in the United States it was a political maxim that there could be no healthy government without two parties of nearly equal strength—a minority, an opposition party, was as important as a majority, a party in power. Today in Italy, Germany and Russia party government means something it never meant before: the party *is* the State, no party but the party in power can exist at all. Party government is entirely unimportant in Japan with its strange admixture of emperor's and army's authority and the superficial forms and organization of a constitutional government.

Need for Studying Government.—This changing concept of government, the wide variations between leaders of opposing parties, new practices in government here and abroad—all these are special reasons now for studying government. Never was it a subject of such varied interest.

It has always deserved more attention than it received. Government has not been as good as it should be, the representatives of the people have not been as wise as they should be. Why? One reason certainly is that the people have not cared enough or known enough or thought enough about their government.

GOVERNMENT OF THE UNITED STATES

About 115 years after the first voyage of Columbus to the New World the first English colony (Virginia, 1607) was founded in America; expansion was quite rapid, and ultimately the English nation planted thirteen colonies along the fringe of the Atlantic Ocean. American government had its origin in the actual experience of the hardy colonists in these Western outposts of civilization; for several generations they had been able to view the governmental policies of the mother country, take lessons from its triumphs and its mistakes and little by little transfer control of their destinies to their own hands.

The Colonial Period.—In origin, each of the English colonies was either a grant of privilege to an individual—like Pennsylvania to William Penn—or to a corporation, like Virginia or Massachusetts Bay. However, since those who settled in the colonies were brave, venturesome individuals, not desirous of asking favors of royalty, and since they were three thousand miles from the seat of a central government more or less indifferent to their interests, self-government quickly found roots in the soil of America.

When the American Revolution occurred, there was very little fundamentally new in political institutions in any of the colonies. Radically new governments were not set up—the old machines were used. The revolutionists of Rhode Island and Connecticut, where the governors, councilors and judges were not appointed by the Crown but created solely by the colony, found their colonial systems of government so well suited to their needs and ideals that they made no alterations in them other than casting off their allegiance to the king of Great Britain. The royal charter granted to Connecticut by Charles II in 1662 remained the constitution of that state until 1818, and the charter of Rhode Island, granted in 1663, remained in force until 1842. In all the states the distribution of representation, the suffrage, the qualifications for holding office and the legislative, executive and judicial institutions were continued after the Revolution without many radical alterations.

On the eve of the Revolution, the thirteen colonies had forms of government which presented striking similarity. Each had a governor, an assembly and a judicial system, and the common law of England, as far as it was applicable and had not been changed by legislation, was binding in all of them.

In eight of the colonies—Massachusetts, New Hampshire, New York, New Jersey, Virginia, North Carolina, South Carolina and Georgia—the governor was appointed by the king, recognized as the king's personal deputy and known as a *royal governor*. He was the highest executive official in the colony, charged with the preservation of peace and the advancement of the welfare of the colonists.

The governor, as the chief executive, supervised the enforcement of the laws and appointed, usually with the advice of his council, the important civil officers. He could, except in Massachusetts, remove any of the council and other officials for cause and direct them in their work. By virtue of his position as chancellor, he was head of the highest court in the colony, which handled appeals from lower courts and exercised important original jurisdiction in many matters. He also granted pardons and reprieves. He was commander in chief of the colonial forces, appointed the military officers of high rank, levied troops for defense of the colony and enforced martial law when this was necessitated by invasion or rebellion.

He had important legislative powers, including the right of veto. He appointed (except in Massachusetts) the members of the upper house of the colonial legislature and summoned, adjourned and dissolved the assembly.

But the royal governor was by no means an unlimited sovereign in his province, for he was bound by his instructions from the British government and by restraints which the assembly imposed through its power of controlling grants of money. Furthermore, complaints against his actions often were taken to the king in council across the sea. In Massachusetts the royal governor was somewhat limited by the colonial charter. He did not appoint the council or upper house and his appointments of civil officers required the consent of the council.

In Rhode Island and Connecticut the governor was elected annually by a general assembly composed of the governor, assistants and representatives chosen by the voters in each "city, town or place." In these colonies the governor did not stand out as a separate and distinct official. His duties were performed only in co-operation with both the assembly and council.

The executive authority in the proprietary colonies of Maryland, Pennsylvania and Delaware differed vastly from that of the other colonies. The proprietary colony was a vast estate, carved out of the royal domain and granted by the Crown to a proprietor. When the proprietor was in the colony he had the right to assume control of the executive authority there and when he was absent he vested it in a lieutenant-governor, who served in the capacity of agent for the real owner of the estate. The power of the governor in these colonies was less limited than in any of the others; but toward the end of the colonial era there was a gradual decline in his power, because the Assembly was winning control over measures appropriating money.

All the colonies had two branches in their legislatures except Pennsylvania, which had only one. In Massachusetts, Connecticut and Rhode Island the upper house was elected by the assembly; in the proprietary colonies the proprietor or his representative selected the councilors; in the other colonies the upper house or council was chosen by the king acting through the royal governor.

The council enjoyed the right to discuss and vote on all laws, and with the governor enjoyed executive and judicial functions. It advised the governor on important matters, and in conjunction with him formed the highest judicial tribunal in the colony.

In every colony there was an assembly of representatives chosen by popular vote; but, contrary to common impressions, there was nothing like universal manhood suffrage. In every colony there were restrictions on the suffrage, which were usually educational, property or religious qualifications.

The colonial assemblies from an early period of colonial history maintained that they possessed entire and exclusive authority to regulate their domestic affairs. In the matter of taxation they stoutly asserted their exclusive rights not only in formal declarations but also in actual resistance to the royal and proprietary governors. In addition to general legislative power, the assemblies usually exercised a large control over the executive department through their power to withhold the salaries of the officials.

The lowest colonial courts were those of justices of the peace who were generally appointed by the governor or in some instances elected by local freeholders, that is, owners of real estate. In civil cases these justices had jurisdiction over cases involving small amounts; in criminal matters they were allowed to try only the pettiest offenses against the law. In Massachusetts and a few other colonies the practice of uniting all of the justices of the country in a general court was followed; this court not only exercised criminal jurisdiction but supervised roads, bridges and similar affairs.

Above the justices of the peace there usually were the county courts whose judges were appointed by the governor, except in New Jersey where they were elected. In most colonies the county court had criminal jurisdiction over all except capital cases, but in Massachusetts, criminal matters were taken care of by the regular sessions of the justices of the peace. The county courts also had civil jurisdiction in cases involving less than certain amounts specified by law in each colony.

A high court was set up in each colony to decide weighty matters and appeals from the lower courts. In the royal colonies the governor, acting as chancellor, and his council generally composed this tribunal. In Massachusetts it consisted of a chief justice and four associates, appointed by the governor and council. In Pennsylvania the supreme court was composed of a chief justice and three associates, all chosen by the governor.

Of course, appeals always lay from the highest court in the colony to the king in council, and this power was frequently exercised just as certain cases are appealed to the Supreme Court of the United States at the present time.

Important Steps Toward Union.—(a) From 1643 to 1684 the Massachusetts Bay, New Plymouth, Connecticut and New Haven colonies formed the New England Confederation to strengthen their defense against the Indians, Dutch and French.

(b) In 1754 twenty-five members from seven colonies met at Albany to arrange a treaty with the Iroquois Indians and to consider other common interests. This Albany Convention adopted Franklin's plan for a permanent federation, but the members could not bind the colonies and the plan was rejected.

(c) In 1765, in consequence of the passage of the Stamp Act in Great Britain, at the instance of the Massachusetts house of representatives nine colonies sent representatives to the Stamp Act Congress at New York, which issued a declaration that the rights of natural-born English subjects belonged to the colonists, and framed petitions to the English government for relief.

(d) Further acts of England, especially the Townshend Acts (imposing additional duties on certain goods including tea), led to the formation of Committees of Correspondence among the colonists, who thus fostered unity of sentiment against England and for their common interests.

(e) The First Continental Congress was called by Massachusetts in 1774, after the English government had passed acts providing for the coercion of that colony. All the colonies except Georgia sent delegates to Philadelphia; they drafted the Declaration of Rights of the colonies, adopted articles of association, advised resistance, and provided in case of need for the meeting, May, 1775, of the Second Continental Congress.

(f) The Second Continental Congress met, delegates from all the colonies being present. In the meantime England had passed other measures of coercion and in attempting to seize the war supplies of the colonists, had brought on the battle of Lexington. It therefore became necessary for the Congress to make provisions for continuing resistance. In fact it became a governing body; and, with adjournments from time to time, until May 1, 1781, it directed the Revolutionary War and really organized and managed a new state. It issued the Declaration of Independence, recommended that the colonies provide for state governments and instituted relations with foreign countries.

(g) When the colonies declared their independence of Great Britain they also appointed a Congressional committee, composed of one delegate from each state, to draw up a form of union for all the new states. The Articles of Confederation thus drawn up were discussed for more than a year and were adopted by Congress in 1777.

Development of the Constitution of the United States

Failure of the Articles of Confederation.—When the Articles had been ratified by all the thirteen states (1781), it was confidently believed that the new nation had been satisfactorily launched upon its career. However, almost at once defects in administration became apparent. What had seemed admirable in theory to its framers failed when applied in practice to the many problems that had to be met. Because each state wished to maintain its "sovereignty, freedom and independence," Congress was hampered in all these ways:

(1) No important law could be put into operation until it had been ratified by nine of the states;

(2) Even when a law had been ratified by a state, Congress had no power to enforce its provisions there;

(3) Congress could pass laws for raising revenue, but could not force payment from objecting states;

(4) The states maintained their right to regulate interstate commerce among themselves and insisted upon independent action with respect to the regulation of foreign commerce;

(5) Amendment of the Articles to remedy defects was difficult: any proposed change had to be accepted by all the states;

(6) Taxation was a right reserved to the states; Congress could not legislate on the subject. Even expenses of war were to be met from a common treasury supplied by the several states.

Maryland and Virginia came into conflict upon the subject of the navigation of the Potomac River and Chesapeake Bay. Delegates from the two states met in the Mount Vernon Conference in 1785 and could not reach an agreement but decided to call a meeting of delegates of all the states for 1786 at Annapolis to discuss the commercial relations of the colonies.

At this Annapolis Convention only five states were represented—New York, New Jersey, Pennsylvania, Delaware and Maryland. They accomplished little but at the suggestion of Alexander Hamilton decided to ask the Congress to call a convention of delegates from all the states. The call was—

" . . . for the sole and express purpose of revising the Articles of Confederation and reporting to Congress and the several Legislatures such alterations and provisions therein as should, when agreed to in Congress and confirmed by the States, render the Federal Constitution adequate to the exigencies of Government and the preservation of the Union."

The Constitutional Convention.—This famous assembly met in Philadelphia beginning May 25, 1787, and George Washington was elected to preside. During the convention all the states except Rhode Island were represented and fifty-five of the sixty-five delegates named were present. The ablest and most notable men in the new republic were members. Months of discussion throughout the states had firmly convinced the nation that the Articles of Confederation could not be amended, so the convention began the consideration of an entirely new basic law.

It took four months of discussion and compromise to frame the new Constitution of the United States. There were conflicting views—between large states and small, between strong central government and State rights, between men who wanted a king in all but name and those with more democratic ideas.

The Constitution was adopted by the convention and signed on September 17, 1787. Of those who were present on the final day, only thirty-nine gave it the approval of their signatures and sixteen refused approval or absented themselves at the hour of signing. The document was submitted to the Congress and by it sent to the states for ratification, which occurred in the following chronological order:

Delaware, Dec. 7, 1787; unanimously.
Pennsylvania, Dec. 12, 1787; vote, 46 to 23.
New Jersey, Dec. 18, 1787; unanimously.
Georgia, Jan. 2, 1788; unanimously.
Connecticut, Jan. 9, 1788; vote, 128 to 40.
Massachusetts, Feb. 6, 1788; vote, 187 to 168.
Maryland, April 28, 1788; vote, 63 to 12.
South Carolina, May 23, 1788; vote, 149 to 73.
New Hampshire, June 21, 1788; vote, 57 to 46.
Virginia, June 25, 1788; vote, 89 to 79.
New York, July 26, 1788; vote, 30 to 28.
North Carolina, Nov. 21, 1789; vote, 193 to 75.
Rhode Island, May 29, 1790; vote, 34 to 32.

Divisions of the Constitution.—There are seven main sections, called Articles, as outlined below; each Article is subdivided into Sections and Clauses:

Article I. The legislative (law-making) department; qualification and election of members, the powers of Congress; powers prohibited to the states.

Article II. The executive department; election of the President of the United States; his powers and duties.

Article III. The judicial department; its organization and its powers.

Article IV. Relation of the states to one another and of the states to the United States.

Article V. Method of amending the Constitution.

Article VI. Declaration of the supremacy of the Constitution, affirmation of validity of contracts made prior to its adoption, and statement of oath or affirmation required of officials of the United States.

Article VII. Ratification of nine states to put the Constitution into effect.

Amendments. Some of the members of the Constitutional Convention believed that the new Constitution did not sufficiently safeguard the rights of the people, and they signed it only on the promise of the convention that the first Congress should present amendments covering such rights. Accordingly, twelve amendments were thus proposed (September 1789) and ten were ratified by the end of 1790. These ten are frequently referred to as the American Bill of Rights.

Eleven other amendments have since been adopted:

XI. Declared that a state shall not be sued in United States courts by citizens of another state or of a foreign country (1798).

XII. Provided for electing the President and Vice-President on separate ballots by members of the electoral college (1804).

XIII. Abolished slavery (1865).

XIV. Defined citizenship in the United States, defining the status of the newly-freed Negro race (1868).

XV. Decreed equal voting rights for white and colored citizens (1870).

XVI. Authorized Federal taxation of income (1913).

XVII. Provided for election of United States Senators by direct vote of the people (1913).

XVIII. Prohibited in the United States and its outlying possessions the manufacture, sale or transportation of intoxicating liquors (1919).

XIX. Granted the privilege of the voting to women (1920).

XX. Made the term of President and Vice-President begin on January 20 and of Congressmen on January 3 (1933).

XXI. Repealed the Eighteenth (Prohibition) amendment (1933).

The Three Departments of the United States Government

Legislative Department.—In the organization of the United States government there must be a department whose business is the making of laws; it is called the legislative department. There is another which is charged with enforcing or executing the laws or statutes that the law-makers have enacted; this is the executive department.

Each of the above acts as a check upon the other. Every law passed by the legislative department must go to the Chief Executive for the purpose of approval before it can become operative. If in his judgment a measure that has been enacted is ill-advised, he may refuse to sign it, and this action is known as a *veto;* if it is vetoed, a proposed law is killed, unless the legislative department in each house can muster two-thirds of all its members to pass it again over the veto. This is not often possible.

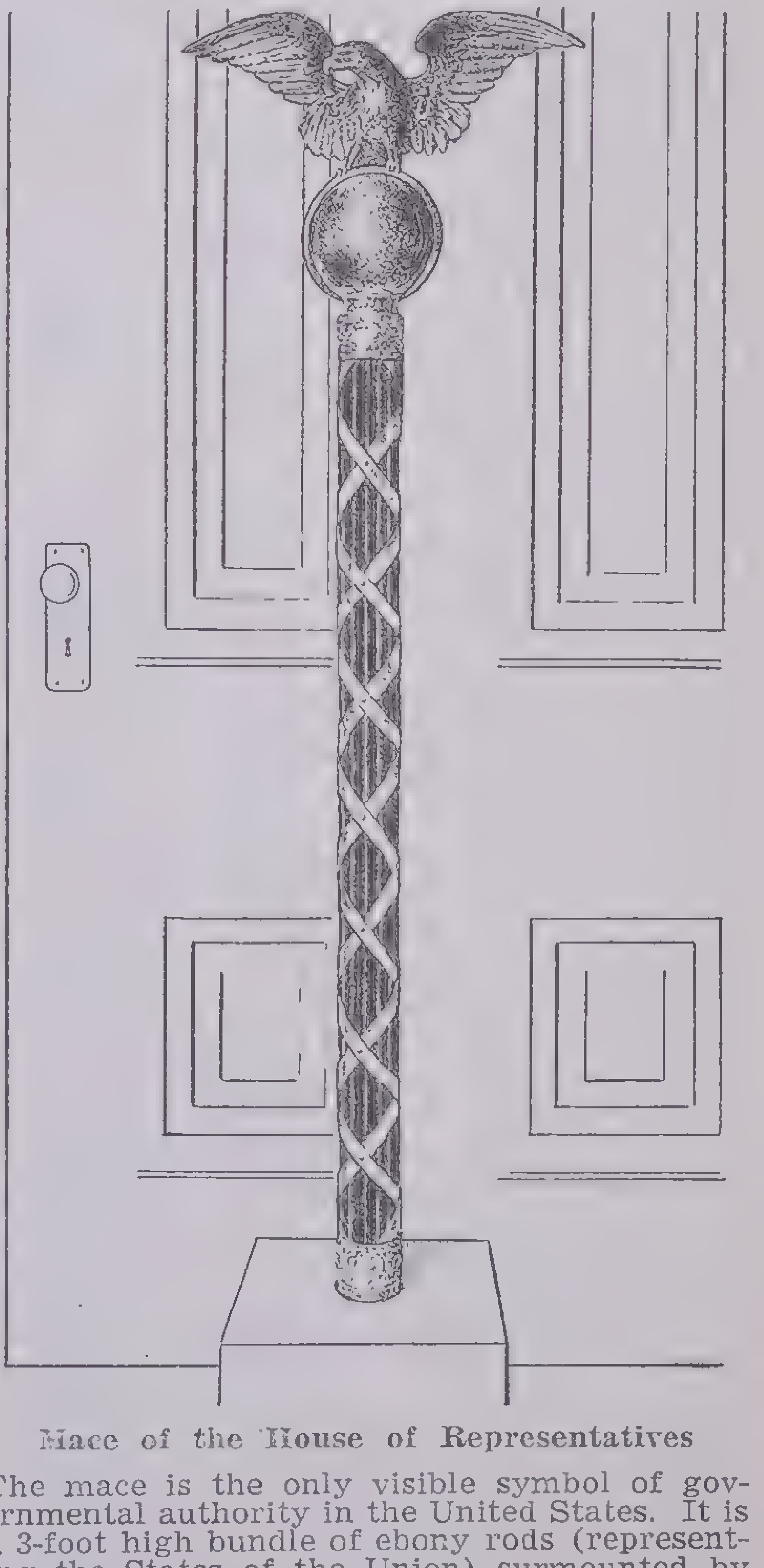
The legislative department, in its upper house, the Senate, holds a check upon all important appointments to office made by the Executive. Each appointee to an important post must be approved by the Senate before entering upon his duties; if approval is withheld, he cannot serve.

The third branch of the government is the judicial department, which holds a check on the legislative, executive and administrative branches of the government through its ability to declare laws unconstitutional.

The Constitution declares (Art. I, Sec. 1) that "all legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and a House of Representatives." The Congress, therefore, is the sole law-making power of the Federal government. Its two branches act as a check upon each other, for a bill, in order to become a law, must be approved by both in exactly the same phraseology; either house may withhold approval of a proposed act of the other.

The founders of the republic considered the Senators to be representative of the sovereign states of the union, and the Representatives the spokesmen of the masses of the people. The Senators have the longer terms—six years—and it was decreed (Art. I, Sec. 3) that they should be chosen by the state legislatures, and not by the people (this provision was altered by the 17th amendment in 1913); the Representatives, it was thought, would better reflect the wishes of the people if chosen directly by them and at frequent intervals, so their term of office was set at two years.

The Senate is a continuous body; its membership is so spaced that the terms of only one-third expire every two years (with the end of each Congress); there are always experienced



Mace of the House of Representatives

The mace is the only visible symbol of governmental authority in the United States. It is a 3-foot high bundle of ebony rods (representing the States of the Union) surmounted by a silver globe above which is poised a silver eagle. Since 1789 the mace has rested on a pedestal at the right of the Speaker's desk when the House is in session. When the House resolves into Committee of the Whole, the mace is removed to a lower pedestal near the desk of the Sergeant at Arms. Whenever a member of the House seems beyond the Speaker's control—as seldom happens, however—the Sergeant at Arms, on order of the Speaker, lifts the mace from its pedestal and "presents" it before the offending member, and order is restored.

men held over to each new Congress. The terms of all members of the House of Representatives expire at one time; election of all Representatives is for the term of one Congress only. It would therefore be possible that with every new Congress there might be a House membership entirely new and inexperienced; this never has happened for a majority of the members are usually re-elected, and they return with the advantage of previous service.

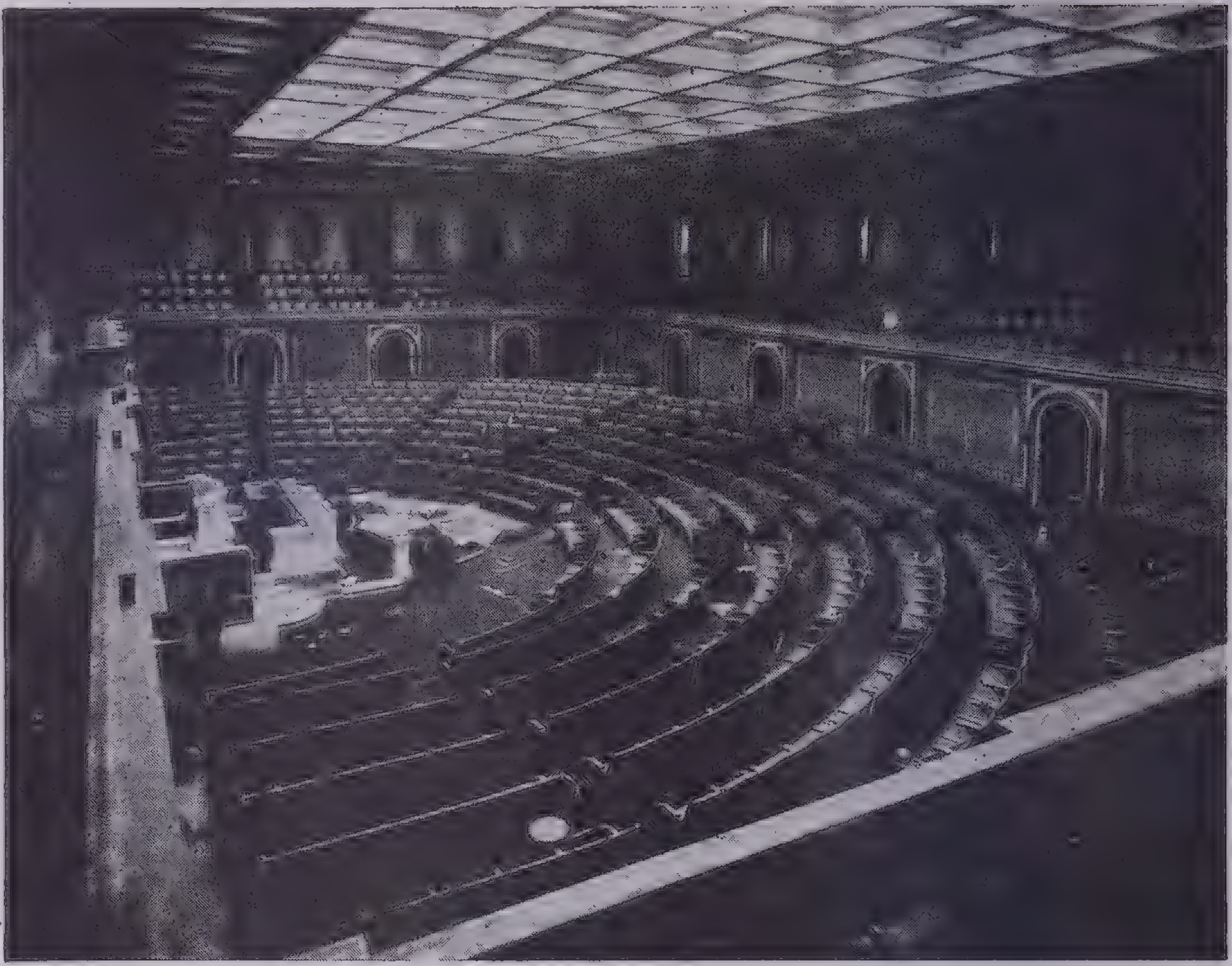
The salary of both Senators and Representatives is $10,000 per year.

The Senate. Each state has two Senators, regardless of its area or population. The mandate of the fathers of the Constitution as to the manner of their election was changed in 1913 and now, like the Representatives, they are chosen by direct vote of the people, but to represent the whole state and not a separate part or district.

The Senate holds three powers that are denied to the House of Representatives: it has the power to approve or reject important appointments of the President to office; with the President it makes treaties with foreign powers and it has the sole power to sit as a court to try officials of the government impeached by the House of Representatives for misconduct. The Senate cannot originate a bill raising revenue; that power is reserved to the House of Representatives, because it more fully than the Senate reflects the will of the people. However, when a revenue bill reaches the Senate after passing the House, the Senate may amend it at will.

Qualifications of a Senator. To be eligible to election to the Senate, a person must have reached the age of thirty years, been at least nine years a citizen of the United States and live in the state from which he is chosen.

The House of Representatives. This is called the lower house of the Congress, but it possesses powers coordinate with those of the Senate, with the exceptions above noted. Though the Constitution limits the number of Senators to two from each state, no such limitation is placed upon the number of Representatives. The number of members of the House is determined in relation to the population and distributed among the states according to the population of the state, excluding Indians not taxed. The House is authorized to determine for itself after each Federal census what its number shall be for the next ten years. The population of the country is divided by the number of members of the House, to determine the number of people entitled to one Representative. For the ten-year period 1931–1941 the ratio was one Representative for 280,674 inhabitants and the number of members 435. Each state determines its number of Representatives by dividing this unit of representation into its population; but each state has at least one Representative no matter how small its population—Nevada with about 110,000, Wyoming with 250,000 and Delaware with 266,500 in 1940 each has one representative though its population is below the 280,674 unit.



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Legislative Department: Chamber of the House of Representatives in the Capitol

Members of the Lower House meet here when Congress convenes in regular session every January 3, or in special session whenever called by the President according to the provisions of the 20th Amendment. The marble dais is occupied by the Speaker of the House, officials and stenographers

If a state does not make new congressional districts after a reapportionment that increases its representation, each additional Congressman to which the state is entitled is chosen *at large,* that is, he is elected by the voters of the whole state. Or if the representation is reduced and there is no redistricting the Representatives may be chosen at large—as in North Dakota which had three districts under the 1910 Census but only two representatives under the 1930 Census.

The House holds two powers that are denied the Senate: all bills for raising revenue (tariff and tax bills) must originate in the House, and the House has the sole power of impeaching government officials for misconduct. (The Senate tries impeachment cases.)

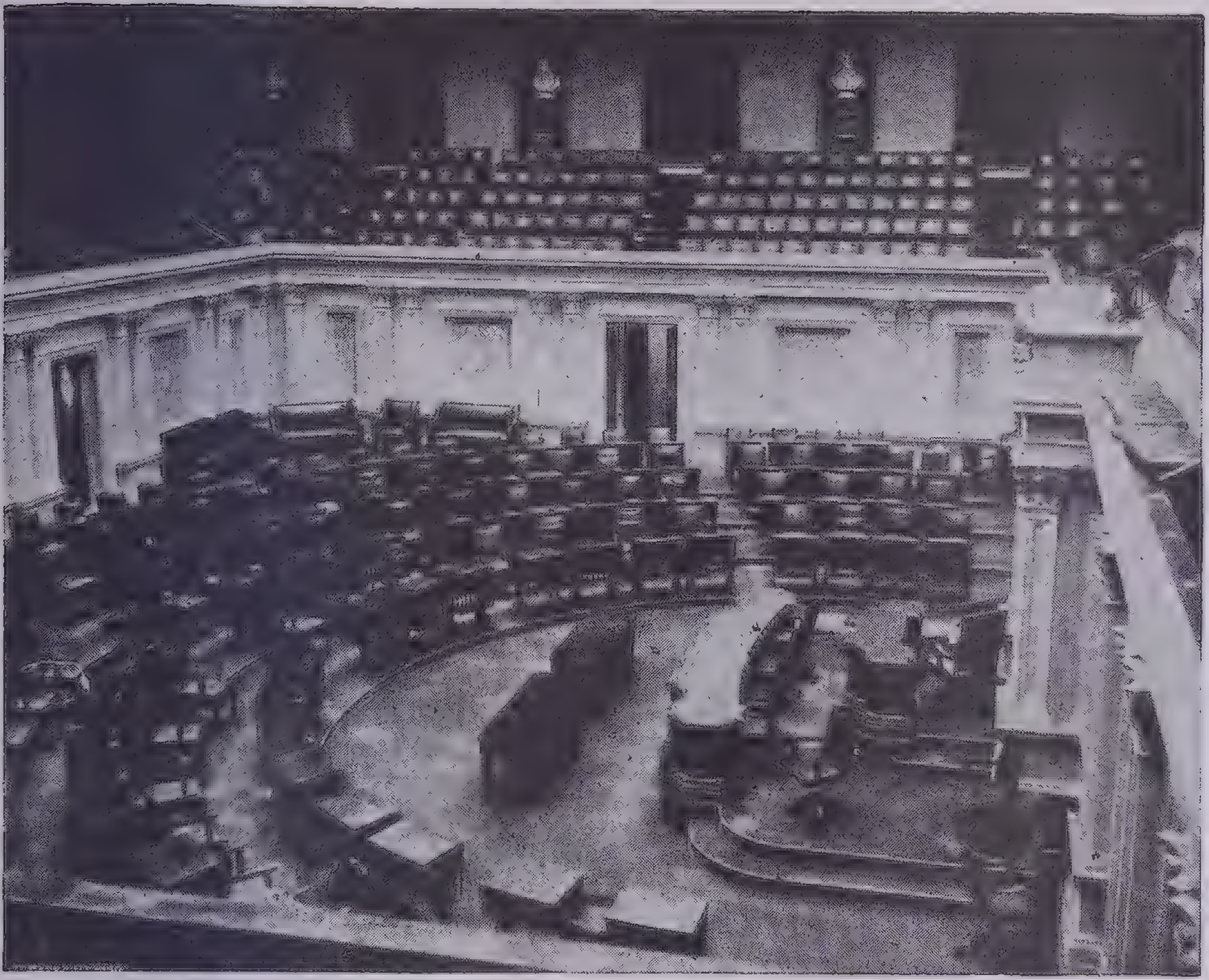
Qualifications of a Representative. He must be at least twenty-five years of age, must have been a citizen of the United States for at least seven years and must be an inhabitant of the state from which he is chosen. By custom each is selected from the congressional district he represents, unless he is a Congressman at large.

Officers of Senate and House. The presiding officer in the Senate is the Vice-President of the United States. The Constitution calls him president of the Senate. If he succeeds to the Presidency of the United States the Senate chooses a president *pro tempore.* Not being a member of the Senate he has no vote "unless they be equally divided."

The presiding officer in the House is the speaker, invariably chosen by the members from their number, though it would be legal to choose a nonmember. As a member of the House, he is entitled to vote on all occasions. The speaker is elected every two years, at the beginning of each new Congress. His salary is $12,000 a year, $2,000 more than other members of the lower House. He is leader of his party in the House. Each House has a sergeant-at-arms, who preserves order, a postmaster, doorkeepers and reporters of proceedings.

Powers of Congress. The general powers of Congress are:

To pass laws, to judge the elections and qualifications of its own members, to determine its own rules of procedure, to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare, to borrow money on the credit of the United States, to regulate commerce with foreign nations and among the several states and with the Indian tribes, to coin money and provide for certain substitutes for coin, and make provisions for controlling the value and purity of both, to fix standards of weights and measures, to establish uniform rules of naturalization, and uniform laws of bankruptcy, to establish and maintain a postal system with all needed equipment for efficient service, to make provision for the encouragement of inventors and authors by patent and copyright laws, to define and punish piracies and felonies committed on the high seas and offenses against the law of nations, to declare war and make full provision for carrying on war by land and sea, by regular



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Legislative Department: The Senate Chamber in the Capitol

The Vice-President, as presiding officer of the Senate, sits in a chair on the central dais. The 96 members, elected for terms of 6 years, are seated in a semicircle around him. Opposite the presiding officer's chair is a gallery for the senators' families and members of the diplomatic corps

army and navy or by militia, and to exercise exclusive jurisdiction over all districts that are acquired for the use of the Federal government in its civil or military capacities. Besides these special powers, the Constitution grants to Congress the right to make all regulations necessary to carry these into effect.

Every Act of Congress before it becomes a law must be submitted to the President for his veto or approval, as explained below under the heading *Duties of the President*. Any Act of Congress may come before the Supreme Court (see below) for a ruling on its constitutionality in connection with a suit on some matter under the law appealed from lower courts. There is no legal or judicial machinery for testing the constitutionality of an Act of Congress in itself—only as it affects an actual case in the courts between two parties and only on appeal. The particular clauses in the Constitution about the powers of Congress that have been most variously interpreted by the Supreme Court are: general welfare (Art.I, Sec. 8, Cl. 1), regulation of commerce between the States (Art. I, Sec. 8, Cl. 3) and the due process of law (5th and 14th amendments).

Scarcely less important than the powers granted to Congress are the restrictions placed upon it. It shall not suspend the writ of *habeas corpus* except in cases of rebellion or invasion if the public safety requires it; shall not pass bills of attainder or *ex post-facto* laws. No money shall be drawn from the treasury but in consequence of appropriations made by law, and regular accounts thereof shall be published; no titles of nobility shall be granted by the United States, and presents and titles from foreign governments or rulers are forbidden to officeholders without the consent of Congress.

These prohibitions are all in the interest of the states and people against possible encroachments by the Federal government.

The several states are forbidden to enter into any relations with foreign states and are restricted closely in their actions regarding money, the law of contracts and some other important matters. Especially rigid are the provisions forbidding state interference with interstate or international commerce and relations with foreign powers.

Sessions of Congress. The Congress meets every year, formerly (under the original Constitutional provision) on the first Monday in December, but since 1934 (by the 20th amendment, adopted in 1933) on January 3rd. The life of each Congress is two years. Members are elected in November of even-numbered years. Unless they were called into special session they formerly did not take their seats for thirteen months after election, for each new Congress began in December of odd-numbered years. Now each Congress is organized two months following the election in November. There are two sessions of each Congress. Each begins on January 3 and each session may be a year in length.

The Executive Department.—The Constitution gives the executive power of the government to one man, the President of the United States. The Vice-President, who is elected with the President for a term of four years, has no executive authority.

The President is the only official of the government who must be a natural-born citizen of the United States.

The clause that no person shall be eligible to the Presidency "who shall not have been fourteen years a resident within the United States" excludes a natural-born American citizen who lives abroad; unless he is an ambassador or minister to a foreign country, since a public servant abroad is considered never to leave the soil of his country; wherever he may be, that spot is home territory. John W. Davis, Democratic candidate for the Presidency in 1924 had been U. S. Ambassador to Great Britain in 1918–21, but that did not disqualify him.

The President must be at least thirty-five years of age, the highest age requirement for any office in the government service.

The youngest man who has taken the oath of office as President was Theodore Roosevelt, in his 43d year; the oldest, William Henry Harrison, in his 69th.

From the founding of the nation to the year 1873 the salary of the President was $25,000 per year; from that date to 1909 it was $50,000; since 1909 it has been $75,000. An additional $25,000 is granted yearly for traveling expenses; an official residence (the White House or Executive Mansion) is provided in Washington and there is an annual appropriation for its maintenance.

There is an election for President every four years. During the summer of this year each political party in its national convention nominates candidates for President and Vice-President. In each state the party names electors for these two candidates—as many electors as the state has representatives in both houses of Congress (Senators plus Representatives—so each state always has at least three electors). On presidential-election day in November the voters in each state vote for the state group of presidential electors. The entire number of electors chosen from all the states forms the electoral college, and this body elects the President and Vice-President.

The Electoral College. The total number of electors is the same as the number of Senators and Representatives in Congress. Since 1910 the number has been 531 (Senators, 96; Representatives, 435). These 531 electors do not all meet in one place to cast their ballots. The process through which the President is elected (and with him, the Vice-President) is as follows:

On the first Tuesday after the first Monday in November the voters in each state choose their electors. When the result of that election in all the states is reported, nearly always it is known who is to be the new President and who the new Vice-President; for if a majority of the entire 531 electors chosen are Republicans, the Republican candidates are certain of eventual choice; if the majority is Demo-

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Executive Department: The White House

A shaded drive leads to the entrance of the 18th-century colonial style, freestone mansion that houses the Presidents of the United States. The Executive Mansion is called the White House because it has been painted white ever since 1814 to cover the scars left by the fire set to it by British troops. It was originally designed by James Hoban in 1792, built on the site chosen by Major Pierre L'Enfant (who planned the city of Washington), completed in 1799 and remodeled in 1902–03

cratic, the Democratic candidates will be ultimately successful.

The electors chosen in each state meet in their respective capitals on the first Wednesday in January and cast their votes for the two officials to whom they are pledged. They send the report of their ballots to the Congress, and the two houses, meeting together, canvass the returns and announce the result. This formality completes the election, provided any candidates for President and Vice-President have received a majority (266) of the votes cast. If no one has the required number of electoral votes the procedure to be followed is that outlined in the 12th Amendment—the House of Representatives selects the President and Vice-President.

The President- and Vice-President-elect, beginning in 1937, have taken office on the 20th of January under the 20th Amendment, which changed the date from March 4.

The Constitution originally provided that each elector vote for two candidates and that the person receiving the highest number of votes (if a majority) should be President and the next highest be Vice-President. In case of a tie or of no majority vote, the House of Representatives was to choose, voting one vote from each state, and choosing from the tie candidates or (if no tie) from the five highest on the list. The 12th Amendment to the Constitution changed this in 1804.

Duties of the President. The office of Chief Executive of the United States is one of the most powerful posts of authority in the world. Upon the President rest vast and ever increasing responsibilities.

He is commander in chief of the army and navy of the United States and of the militia of the states when called into military service of the nation.

He has the power to grant reprieves in cases involving Federal law and pardons for offenses against the United States except in cases of impeachment.

He makes treaties with foreign nations through the office of his secretary of state, but before a treaty may become effective it must be ratified by a two-thirds vote of Senators present in the Senate of the United States.

He appoints ambassadors, ministers and consuls to foreign countries, justices of the Supreme Court, all other Federal judges, members of his Cabinet, United States district attorneys and marshals, the three highest classes of postmaster and many other officers of the government, all with the consent of the Senate. Many minor appointments are made by Department heads, but the responsibility is his. Any appointments he makes during a recess of the Senate are valid without confirmation until the end of the next session of the Congress.

He makes reports to the Congress on the state of the nation, with recommendations as to needed legislature.

He calls special sessions of the Congress when emergency legislature cannot be postponed to a regular session; and he may adjourn both Houses if they disagree on the time of adjournment.

He receives ambassadors and ministers of foreign countries. An ambassador, representing the person of his ruler, is entitled to audience directly with the President at all convenient times.

He "shall take care that the laws be faithfully executed."

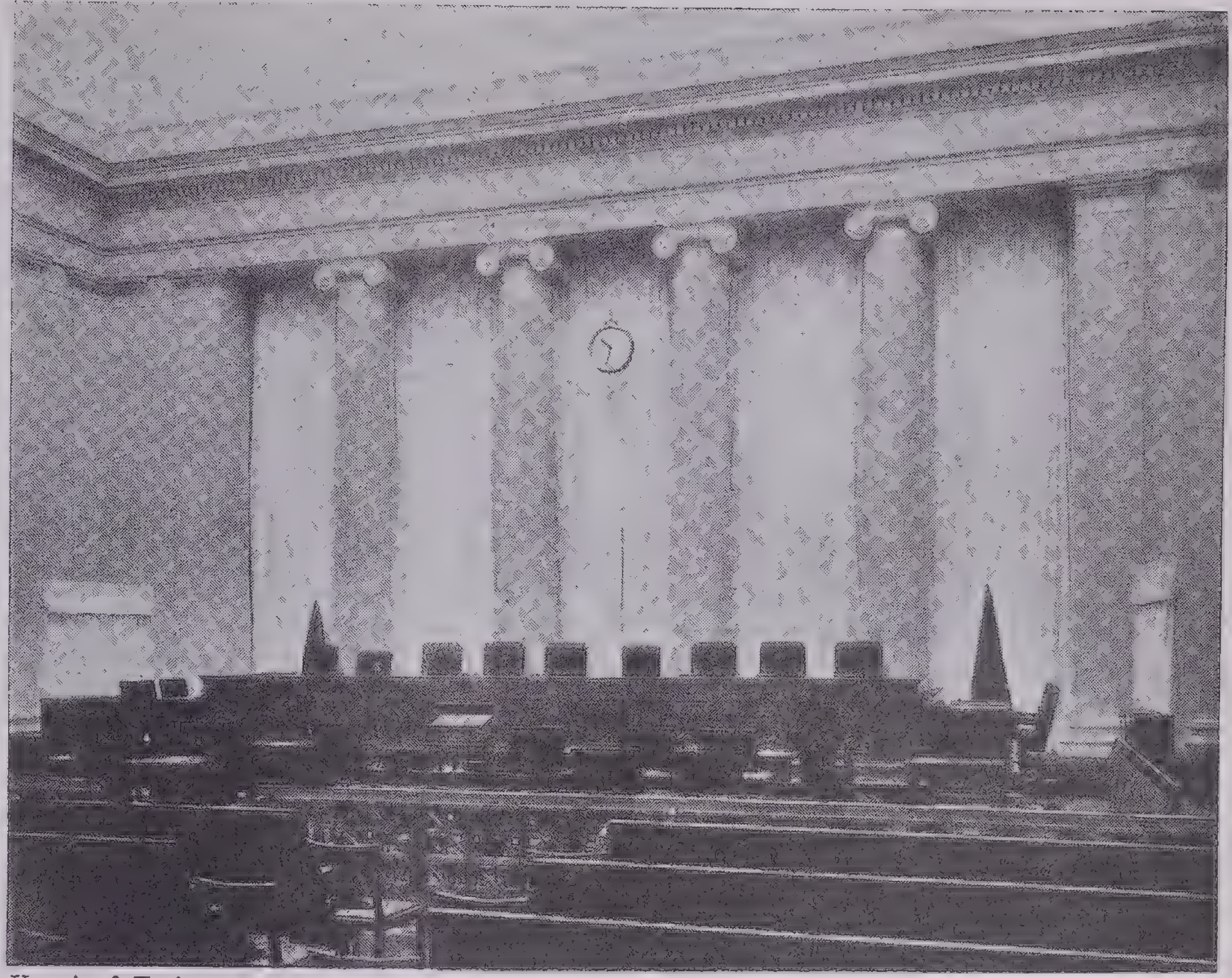
His power of appointing justices to the Supreme Court and other Federal courts with the consent of the Senate gives him a sort of control of the judiciary. His veto power gives him considerable legislative power. In these two respects his executive functions are not kept entirely separated from the judicial and legislative branches of the government.

The Constitution provides that every Act of Congress before it becomes a law must be presented to the President for his approval and signature. If he does not approve, he returns the measure with his objections to the House in which it originated for reconsideration. Then it can become a law only by a two-thirds vote in each House. If the bill is not returned within ten days, it becomes a law without the President's signature—unless Congress adjourns before the ten days are up, "in which case it shall not be a law." (The word *veto* is not used in the Constitution.)

The Vice-President has the same qualifications and is chosen for the same term and in like manner as the President. Unless the President dies or is removed or becomes incapacitated, the Vice-President's sole duty is to preside over the Senate. He may sit in the Cabinet by invitation of the President. He succeeds to the presidency if the President dies; and the members of the Cabinet succeed in the order of the establishment of their departments, beginning with the secretaries of state and of the treasury. The salary of the Vice-President is $15,000 a year. In political practice a candidate for the Vice-Presidency is usually chosen from a different part of the country and a different wing of the party than those of the candidate for the Presidency.

The Cabinet is not mentioned in the Constitution. The nearest it comes is (Art. II, Sec. 2, Cl. 1): "He (the President) may require the opinion in writing of the principal officer in each of the executive departments upon any subject relating to the duties of their respective offices." The executive departments were organized by law and not by the Constitution and the President's power of appointment is subject to approval by the Senate. It is a custom and not a law that has made the heads of departments a group of official advisers to the President. The Cabinet consists of secretaries of state, treasury, war, attorney-general, postmaster general, secretary of the navy, secretary of the interior, secretary of agriculture, secretary of commerce and secretary of labor. They are (a) appointed by the President, confirmed by the Senate and

(b) serve really at the pleasure of the President, usually for his term unless their resignation is sooner brought about. (c) The salary of each member of the cabinet is $15,000 a year. In addition, an allowance is made for office expenses. (d) The members of the cabinet are the official advisers of the President in both administrative work and political policy. In administrative matters each member exercises much discretion in the management of his department and usually really controls the selection of those of his subordinates who are not under civil service regulations. In matters of policy and when making important decisions, his personal judgment is of prime importance, although, of course, he must accept the decision of the President or be removed from office. Routine business is frequently managed by subordinates whose tenure of office is practically during good behavior and efficiency.



Harris & Ewing

Judicial Department: Interior of the United States Supreme Court

When the Court meets, the center chair behind the Bench is occupied by the Chief Justice; to his right and left sit the eight Associate Justices. The last-appointed member of the Court is seated at the Chief Justice's extreme left, and at the death or resignation of a senior justice he then moves to the Chief Justice's extreme right. The space immediately in front of the Bench and inside the bronze railing is for members of the Court's bar, and the lighted reading stand is used by the counselor addressing the Court. Inside the bronze railing to the left is a desk for the Attorney General. The public is seated between the bronze railing and the front door. Sessions of the Court are from the first Monday in October to approximately the first week in June

Commissions or Boards. Not all the administrative work of the national government is carried on by the ten regular cabinet departments. From time to time Congress has established commissions or boards, the members of which are appointed by the President with the advice and consent of the Senate. The most widely known among these bodies are:

(1) The Interstate Commerce Commission, consisting of eleven members, established in 1887 to supervise the execution of federal laws relating to foreign and interstate trade, particularly those laws relating to railroads.

(2) The Federal Trade Commission, consisting of five members, established in 1914 to investigate and prevent all unfair competition in commerce and industry and to enforce the laws against trusts or any combinations which unreasonably restrain interstate trade.

(3) The Tariff Commission, consisting of six members, was established in 1916 to study the tariff needs of the country from every point of view and to report annually, with recommendations, to Congress. Its functions are of an advisory nature only.

(4) The Civil Service Commission, consisting of three members (not more than two from the same political party), created in 1883, is charged with the duty of examining all candidates for positions in what is known as "the classified service." Examinations are held regularly twice a year at various places throughout the country designated by the Commission. The appointees are apportioned among the states in proportion to population as far as possible, and the positions are permanent during efficiency.

(5) The Federal Reserve Board, consisting of the Secretary of the Treasury, the Comptroller of the Currency, and six other members. This board was provided for by the Federal Reserve Bank Act passed by Congress in 1913. It controls the Federal Reserve system, which consists of twelve Federal Reserve districts with a Federal Reserve bank in each. These banks are reserve depositaries for the Federal Government and for member banks, which must subscribe to the capital stock of the Federal Reserve Bank of their district an amount equal to 6 per cent of their own paid up capital stock and surplus. They also lend funds (by rediscounting) to these member banks upon approved security; and they have the right to issue paper money.

Director of the Budget. Another important administrative official acting under the President's direction is the director of the budget, also appointed by the President, but in this case without confirmation by the Senate and without any fixed term of office. In 1921 Congress passed the Budget and Accounting Act, providing for the preparation, by the director of the budget, of an estimate of the income and expenditures of the Federal Government for the coming year. This budget is transmitted to Congress for adoption, amendment or rejection; but Congress may also make appropriations outside of this budget. It should be noted in this connection that the President cannot veto any particular items in an appropriation bill and leave the rest standing. He must either accept or veto it as a whole. The result is that the veto power, as far as the spending of public money goes, is reduced almost to a nullity.

Independent Establishments. The Federal government also has various independent establishments, such as the government printing office, the Library of Congress and the Smithsonian Institution—an educational organization.

The Judicial Department.—This is the department of courts provided under the Constitution to adjudicate both civil and criminal cases arising from the execution of the laws of the United States. These courts have no connection with those established under authority of the various states.

The Constitution established the Supreme Court of the United States as the highest judicial power, and authorized "such inferior courts as the Congress may from time to time ordain and establish." All Federal judges are appointed by the President with the consent of the Senate and hold office during good behavior. Their salaries cannot be reduced during their term of office.

Supreme Court of the United States. This is now composed of one chief justice and eight associate justices. The Court had five justices until 1807, then six until 1837, then eight until 1863. A law of 1866 to reduce the number to six was repealed in 1869 before the date on which it was to have gone into effect.

To become a member of the Supreme Court might well be the ambition of the greatest lawyers. William H. Taft declared that he would rather be Chief Justice of the Supreme Court than President of the United States. He achieved both posts. Upon the organization of the court in 1789 the Chief Justice received $4,000 a year, the Associate Justices $3,500. These sums have been increased from time to time; to-day they are $20,500 and $20,000, respectively.

The Supreme Court is usually in session from October to May. It is housed in its own splendid building completed in 1936.

Powers of the Court. The Constitution declares the powers of the Supreme Court. Its jurisdiction includes:

All cases affecting ambassadors, other public ministers and consuls.

All cases of admiralty and maritime jurisdiction.

All controversies over which the United States shall be a party.

All controversies between two or more states.

All controversies between one state and citizens of another state or between different states, and controversies between the citizens of the same state claiming lands under grants of different states. But the Eleventh Amendment declares that this shall not extend to suits by a citizen of one state or a foreign state against another state.

All controversies between a state or the citizens thereof and foreign states, citizens or subjects.

In many countries the legislative body is free to enact whatever laws its members desire without any check. The whole American system is one of check and balance. The President may veto any act of Congress and it becomes law over his disapproval only by a two-thirds vote of each House of Congress. Besides, the Supreme Court has the power to declare an Act of Congress (or a statute of a state legislature) unconstitutional and therefore inoperative.

The Supreme Court has authority of two different kinds: *original jurisdiction* (over cases affecting ambassadors, other public ministers and consuls and cases in which a state of the Union is a party) or the power to hear these cases in first instance and finally; and *appellate jurisdiction* in other cases as determined by Congress, that is, power to give final decisions both as to law and fact in these cases after they have been tried in other courts.

The right of appellate jurisdiction is the source of the Supreme Court's power to declare an Act of Congress or a state statute unconstitutional. Only by implication and by custom it has this right—it is not definitely mentioned or given the Court by the Constitution. It is important to bear in mind that this power comes under the head of appellate jurisdiction and that the Constitution gives the Supreme Court "appellate jurisdiction . . . with such exceptions and under such regulations as the Congress shall make."

There have always been two schools of political theory on Constitutional interpretation in the United States. The strict construction or State-rights view minimizes the national government, gives it no more than the Constitution unquestionably grants it and puts particular stress on the 10th Amendment which reserves to the states respectively or the people powers "not delegated to the United States by the Constitution, nor prohibited by it to the States." The nationalist or loose-construction interpretation adjusts the phrases of the late 18th century to 20th century conditions; considers that "general welfare" (Art. 1, Sec. 8, Cl. 1) includes modern legislation for social betterment; and makes the congressional power "to regulate commerce . . . among the several States" apply to almost all types of business.

The Supreme Court has from time to time seemed to interpret these and other phrases in the Constitution (especially "due process of law" in the 5th Amendment) now very strictly, now very loosely. The famous constitutional cases decided when John Marshall was Chief Justice, between 1801 and 1835, were definitely nationalist, construing the Constitution broadly and rousing the bitter opposition of Jefferson and others of the State-rights school. The famous Dred Scott decision in 1857 written by Chief Justice Taney was strict construction of the Constitution. During the last generation the Court has repeatedly curbed the efforts of Congress and state legislatures to pass laws for social betterment and the improvement and regulation of conditions of employment—the "due process" clause was interpreted to mean that there could be no legislation interfering with the liberty of contract. In the depression period of the 1930s the Court quashed New Deal legislation on the ground that it interfered with commerce that was inside a state and not interstate and that Congress had unconstitutionally delegated power to the President. Some decisions of this strict constructionist character were handed down by a divided court with the decision of a single justice making a law unconstitutional by 5 to 4 votes. The Court (which had been bitterly assailed in Marshall's day and in Taney's) was now criticized as reactionary and as assuming legislative powers. In 1937 President Roosevelt sponsored a measure to put new blood in the Court and increase its personnel with the hope of winning the Court's approval for his New Deal legislation. His own party split, many members refused to follow him and the measure was defeated.

Inferior Courts. The Constitution does not name these, but provides for —"such inferior courts as the Congress may from time to time ordain and establish."

United States District Courts number more than 100 with each judicial district an entire state or part of a state. They have original jurisdiction over offenses against the laws of the United States, and over certain classes of controversies between citizens of different states. Among the offenses of which the District Courts take cognizance are violations of the Federal laws connected with the revenue and postal laws, smuggling, counterfeiting and bankruptcy.

There are more than 150 district judges. The salary of a district judge is $10,000; he is appointed for life or during good behavior by the President of the United States with the consent of the Senate. Each of the District Courts has its district attorney, marshal and other officers who prepare cases for presentation to the bench and who execute the mandates of the judges.

The Circuit Courts of Appeals hear appeals from decisions in the District Courts; this function relieves the Supreme Court of the United States of much of its labor as the decision of the Circuit Court is usually final, only cases of high economic and constitutional significance going to the Supreme Court from the Circuit Courts. There are about forty-five circuit judges in the ten circuits into which the country is divided. The salary of a United States circuit judge is $12,500; his appointment follows the same course as that of a district judge. Originally the Justices of the Supreme Court rode the circuit as circuit judges.

Amending the Constitution is provided for in Article V. Two-thirds of both Houses of Congress may propose an amendment to the states. Or if legislatures of two-thirds of the states ask Congress to do so, it may call a convention for proposing amendments—this has never been done. An amendment proposed in either way becomes a part of the Constitution (a) when it is ratified by legislatures of three-fourths of the states or (b) by conventions in three-fourths of the states. When Congress proposes an amendment or calls a convention to propose amendments, Congress signifies which method—(a) legislature, (b) convention—shall be used by the states for ratification. But the method of ratification by legislatures has always been used.

Some amendments have been adopted to make it possible to enact laws that the Supreme Court had declared unconstitutional. The 16th Amendment authorizing Congress to tax incomes became a part of the Constitution in 1913, eighteen years after the Supreme Court of the United States had decided that an income tax law of 1894 was unconstitutional because it was a direct tax not "in proportion to the census" (Art. I, Sec. 9, Cl. 4). In 1924 Congress sent to the state legislatures a proposed amendment giving Congress power to "limit, regulate and prohibit the labor of persons under 18 years of age." This amendment was an attempt to secure legislation that the Supreme Court in 1918 and 1924 had declared unconstitutional. Up to 1937 when President Roosevelt tried in vain to rouse public interest in the amendment it had been ratified by only 24 states.

The Government of the States

The original thirteen states, at the suggestion of the Continental Congress, each in its own way and time adopted a state constitution. Under the Constitution (Art. 4, Sec. 4) the United States guarantees to each state a republican form of government. It is customary for Congress to pass an act permitting a territory to become a state under prescribed conditions of boundaries, population and so forth, with provision that it frame and adopt a constitution satisfactory to the Congress. These state constitutions are all modeled in part after the Constitution of the United States and of the older states. Of late years there has been a tendency to make them longer and to include subjects that were formerly left for action by the legislature. The process of amending state constitutions is almost continuous. Sometimes as many as two-thirds of the states in a single year are voting on proposed amendments. Each state government, like the Federal government, has three main departments—the legislative, executive and judicial.

Legislative Department.—The law-making department of the state is variously called legislature, assembly or general assembly. In Massachusetts and New Hampshire it is called the General Court. In most states it meets every other year, but every year in Arizona, Massachusetts, New Jersey, New York, Rhode Island and South Carolina. In Alabama the legislature meets every four years. The two houses, corresponding to the organization of the Federal Congress, are usually termed the Senate and House of Representatives. In Nebraska a constitutional amendment of 1934 established a single chamber legislature which first met in 1937; but there are few innovations in state government.

The upper house usually has fewer members than the lower and sometimes they are elected for longer terms. The total number of state legislators varies considerably in different states. New Hampshire has a senate with 24 members and a House with more than 400; New York has 51 Senators and 150 Assemblymen. Usually there is at least one representative for each county (in New England, each town) in the lower house of the state, and it is quite common for the rural parts of a state to be overrepresented and the cities to be underrepresented. The amount of state legislation is enormous—one authority estimates that in the 20 years from 1906 to 1926 over 850,000 measures were introduced in the legislatures of the 48 states and that 220,000 of these were enacted! But only a small part of this huge amount affects the political structure, for many legislative acts are appropriations or private, special and unimportant acts. Legislative councils in Michigan and Kansas since 1933 are specially organized committees to study the drafting of bills and furnish necessary information to legislators.

Executive Department.—The chief executive of the state is the governor, elected for a term of two years in 24 states, for four years in 23 states and for three years in New Jersey. Salaries range from $3,000 in South Dakota to $25,000 in New York; $20,000 in New Jersey and the average is $7,500. In every state except North Carolina the governor has the veto power. He makes comparatively few appointments to important offices. The lower executives of each state are elected for the same term as the governor. They may include a lieutenant governor, secretary of state, treasurer, auditor, superintendent of public instruction, attorney-general and in some states a comptroller.

Judicial Department.—The supreme court is the head of the state system in most instances, and it has the power to declare statutes unconstitutional. They have been even more conservative in this respect than the United States Supreme Court. In a few states (Colorado, Florida, Maine, Massachusetts, New Hampshire and South Dakota) the Supreme Court is required to give opinions on questions submitted by the governor or legislature. In the organization of lower courts the state is divided into circuits (and at least one circuit court, known also as a county court, is provided for each county); the presiding officer is the circuit judge or county judge. The name of such courts is varied in a few states and in some there are additional courts to meet local needs, such as appellate courts, municipal courts, courts of general sessions, juvenile courts, etc. There are usually justices of the peace in each township.

Suffrage.—In general each state makes its own rules concerning who shall be allowed to vote in state and national elections. Three amendments to the Federal Constitution control this power of the states: the 14th (1868) which threatens with reduced representation in the lower House of the Congress any state that denies the right to vote for President to any of the male inhabitants of the state; the 15th (1870), forbidding denial or abridgment of the right of citizens of the United States to vote on account of race, color or previous condition of servitude; and the 19th (1920), that the right to vote shall not be denied or abridged on account of sex.

The states agree in setting the voting age at 21. They all require a certain period of residence in the state —usually one year—and often a shorter period in the county or election district. Some states require the payment of a poll tax. About half the states have a literacy test and the others require that a voter must be able to understand and explain what is read to him. Louisiana and other southern states in an attempt to bar Negroes from voting and to keep the voting rolls under the control of election officers, exempted from the literacy test or alternative property ownership requirement "males entitled to vote on January 1, 1867, their sons and grandsons 21 years of age or over at the time of the adoption of the state constitution and citizens naturalized before 1898." Negroes could not enjoy these exemptions and might be excluded by the election officials as illiterates. The grandfather clause was declared unconstitutional by the Supreme Court. Other legislation by southern states tending to debar the Negro apparently is within the letter of the Federal Constitution. In New York the literacy test is conducted by school authorities and not by the election officers. Paupers, persons of unsound mind and criminals are excluded from suffrage by varying state constitutional requirements.

State Administration.—For a score of years there has been an active movement to simplify and make more effective the elaborate and confused administration of the states. In 1917 Illinois adopted a scientifically planned organization of nine (later eleven) departments each headed by a director appointed by the governor with the approval of the senate. About twenty states have followed this general idea, mostly with less care and thoroughness than went into the Illinois plan.

The Political Divisions.—If a state were quite small, it would be possible to govern it with satisfaction from one central point. However, most states are large, and to attempt such an expedient would result in too much government near the focal point and too little control and attention at distant points. Therefore, each state is politically divided for the purposes of local self-government into counties (parishes in Louisiana), and the counties are divided into towns or townships.

The affairs of a county are entrusted to a sheriff, county clerk, county treasurer, state's attorney (or prosecuting attorney), assessor, register of deeds, superintendent of schools, coroner and surveyor; sometimes there is a comptroller, rather than treasurer. The sheriff and coroner are usually limited to two consecutive terms in office; others may be elected indefinitely. The legislative body is a board of supervisors, one member from each township, or a board of county commissioners of three or more members.

A township's affairs are in the control of a supervisor, treasurer, clerk, school inspector, assessor, justices of the peace and constables who are police officers with limited powers.

Municipal and local government has so many variations that it cannot be described in a few sentences. The old style of city government was in form something like the state government with an executive and two houses of a legislative body; and in fact it was usually controlled by the state government. The major changes in municipal government were: to simplify the legislative body; and to make the city independent of the state—to give the city home rule. A third objective has been to get away from party government in the cities, to keep elections there as free as possible from being swayed by presidential or congressional campaign issues —in short to give cities a businesslike rather than a partisan government. In Cincinnati and in a few other American cities municipal elections are nonpartisan and the chief executive of the municipality is a city manager.

Government of Territories.—The nonadjacent parts of the United States include: (1) Alaska, Hawaii and Puerto Rico, each with a territorial government practically the same as those of the frontier parts of the continental United States before they were admitted to the Union as states —and each on the way possibly to becoming a state; (2) the Philippine Islands which are now passing from the territorial stage to a complete independence *via* a ten-year commonwealth under self-rule; (3) and the dependencies, American Samoa, the Virgin Islands, the Canal Zone and Guam, all under the executive government of Federal officers and with little or no popular government.

Alaska was acquired by purchase (in 1867). Hawaii was annexed in 1898 after a revolution, led by business men of American descent, had overthrown the native kingdom. Puerto Rico, the Philippines and Guam were prizes of the Spanish-American War of 1898, as a result of which for a time the United States exercised a practical protectorate over Cuba. The Panama Canal Zone, now a military reservation, came to the United States as the outcome of the revolution that set up Panama as a distinct republic separate from Colombia and that made possible our building the Panama Canal. The Virgin Islands of the United States were purchased from Denmark in 1914. Almost all these outlying lands came during the period of imperialism and have not been assimilated to the distinctly American scheme of government.

The President appoints a governor for Hawaii, for Alaska and for Puerto Rico, and these territories have two-chamber legislatures elected by the people of the territory and each has a delegate in Congress at Washington who represents their interest but has no vote. The Virgin Islands have a governor, chosen by the President and Senate. He has wider appointive powers than the territorial governors, and he appoints some members of the two municipal councils that form a colonial council or legislature. The Virgin Islands send no delegate to Washington. The Virgin Islands, like Alaska, Hawaii and Puerto Rico, are supervised by a Division of Territories and Island Possessions created in 1934 under the jurisdiction of the Secretary of the Interior. Guam and Samoa are ruled by naval officers and so come under the Navy Department.

TABLE OF STATE GOVERNMENTS

STATE	CAPITAL	GOVERNOR		LEGISLATURES									
		LENGTH OF TERM (Years)	SALARY (Per year)	YEARS IN WHICH SESSIONS ARE HELD	LIMIT OF TERM (DAYS)		LENGTH OF MEMBERS' TERMS		NUMBER OF MEMBERS		SALARIES OF MEMBERS		
					Regular Session	Special Session	Sen.	Rep.	Sen.	Rep.	Regular Session	Special Session	Transportation Allowance
Alabama	Montgomery	4	$6,000	Odd[1]	50	30	4	4	35	107	$4 per day	$4 per day	10¢ a mile
Arizona	Phoenix	2	7,500	Odd	60	20	2	2	19	51	$8 per day	$8 per day	20¢ a mile
Arkansas	Little Rock	2	6,000	Odd	60	15	4	2	35	100	$1,000—2 years	$6 per day	10¢ a mile one way
California	Sacramento	4	10,000	Odd			4	2	40	80	$2,400—2 years	Mileage only	5¢ a mile one round trip
Colorado	Denver	2	5,000	Odd			4	2	35	65	$1,000—2 years	None	15¢ a mile
Connecticut	Hartford	2	5,000	Odd	150		2	2	35	267	$300—2 years	None	10¢ a mile
Delaware	Dover	4	7,500	Odd	60	30	4	2	17	35	$10 per day	$10 per day	10¢ a mile
Florida	Tallahassee	4	7,500	Odd	60	20	4	2	38	95	$6 per day	$6 per day	10¢ a mile
Georgia	Atlanta	2	7,500	Odd	60		2	2	51	205	$7 per day	$7 per day	10¢ a mile one round trip
Idaho	Boise	2	5,000	Odd	60	20	2	2	44	59	$5 per day	$5 per day	10¢ a mile one round trip
Illinois	Springfield	4	12,000	Odd			4	2	51	153	$3,500—2 years	None	Actual mileage
Indiana	Indianapolis	4	8,000	Odd	61	40	4	2	50	100	$10 per day	$10 per day	20¢ a mile one round trip
Iowa	Des Moines	2	7,500	Odd			4	2	50	108	$1,000—2 years	Not over $10 per day	5¢ a mile
Kansas	Topeka	2	5,000	Odd	50		4	2	40	125	$3 per day	$3 per day	15¢ a mile one round trip
Kentucky	Frankfort	4	6,500	Even	60		4	2	38	100	$10 per day	$10 per day	15¢ a mile
Louisiana	Baton Rouge	4	7,500	Even	60	30	4	4	39	100	$10 per day	$10 per day	10¢ a mile
Maine	Augusta	2	5,000	Odd			2	2	33	151	$600—2 years	$5 per day	$2 for 10 miles one way
Maryland	Annapolis	4	4,500	Odd	90		4	4	29	120	$5 per day	$5 per day	20¢ a mile (once)
Massachusetts	Boston	2	10,000	Annual			2	2	40	240	$2,000 per year	Determined at session	$4.20 a mile (once)
Michigan	Lansing	2	5,000	Odd			2	2	32	100	$3 per day	None	10¢ a mile one round trip
Minnesota	St. Paul	2	7,000	Odd	90		4	2	67	131	$1,000—2 years	$10 per day	15¢ a mile one round trip
Mississippi	Jackson	4	7,500	Even			4	4	49	140	$1,000—2 years	$7.50 per day	10¢ a mile one round trip
Missouri	Jefferson City	4	5,000	Odd			4	2	34	150	$5 per day	$5 per day	10¢ a mile
Montana	Helena	4	7,500	Odd	60		4	2	56	102	$10 per day	$10 per day	7¢ a mile
Nebraska	Lincoln	2	7,500	Odd			2	Unicameral	43	Unicameral	$1,744.18—2 years	None	Actual traveling expenses
Nevada	Carson City	4	7,000	Odd	60	20	4	2	17	40	$10 per day	$10 per day	10¢ a mile (shortest route)
New Hampshire	Concord	2	5,000	Odd			2	2	24	418	$200 per year	$3 per day (15-day limit)	10¢ a mile (round trip once a week)
New Jersey	Trenton	3	20,000	Annual			3	1	21	60	$500 per year	None	Transportation
New Mexico	Santa Fe	2	5,000	Odd	60		4	2	24	49	$5 per day	$5 per day	10¢ a mile
New York	Albany	2	25,000	Annual			2	1	51	150	$2,500 per year	None	10¢ a mile one round trip
North Carolina	Raleigh	4	10,500	Odd		20	2	2	50	120	$600 per year	$8 per day (20-day limit)	
North Dakota	Bismarck	2	4,000	Odd	60		4	2	49	113	$5 per day	$5 per day	10¢ a mile one round trip
Ohio	Columbus	2	10,000	Odd			2	2	36	138	$2,000 per year	None	3¢ a mile
Oklahoma	Oklahoma City	4	6,500	Odd			4	2	44	117	$6 per day	$6 per day	10¢ a mile one round trip
Oregon	Salem	4	7,500	Odd	40	20	4	2	30	60	$3 per day	$3 per day	$3 for 20 miles
Pennsylvania	Harrisburg	4	18,000	Odd			4	2	50	208	$2,500—2 years	$500 per session	5¢ a mile (round trip once a week)
Rhode Island	Providence	2	8,000	Annual	60		2	2	42	100	$5 per day	None	8¢ a mile
South Carolina	Columbia	4	7,500	Annual			4	2	46	124	$400 per year	$10 per day	5¢ a mile one round trip
South Dakota	Pierre	2	3,000	Odd	60	60	2	2	45	103	$5 per day	$5 per day	10¢ a mile
Tennessee	Nashville	2	4,000	Odd	75		2	2	33	99	$4 per day	$4 per day	Actual mileage
Texas	Austin	2	12,000	Odd		30	4	2	31	150	$10 per day	$10 per day	$2.50 for 25 miles
Utah	Salt Lake City	4	6,000	Odd	60	30	4	2	23	60	$4 per day	$4 per day	10¢ a mile
Vermont	Montpelier	2	4,000	Odd			2	2	30	248	$400—2 years	$4 per day	20¢ a mile
Virginia	Richmond	4	10,000	Even	60	30	4	2	40	100	$720 per session	$360 per session	10¢ a mile
Washington	Olympia	4	6,000	Odd	60		4	2	46	99	$5 per day	$5 per day	10¢ a mile one round trip
West Virginia	Charleston	4	10,000	Odd	60		4	2	30	94	$500 per year	None	Mileage
Wisconsin	Madison	2	6,000	Odd			4	2	33	100	$2,400—2 years	None	10¢ a mile
Wyoming	Cheyenne	4	6,500	Odd	40		4	2	27	56	$10 per day	$10 per day	Mileage only

[1] Every other odd year, 1939, 1943, etc.

UNITED STATES CABINET OFFICERS

Department	Administration		
	Washington (1)	**Washington (2)**	**J. Adams**
State	John Jay Thomas Jefferson	Thomas Jefferson Edmund Randolph Timothy Pickering	Timothy Pickering John Marshall
Treasury	Alexander Hamilton	Alexander Hamilton Oliver Wolcott	Oliver Wolcott Samuel Dexter
War	Henry Knox	Henry Knox Timothy Pickering James McHenry	James McHenry Samuel Dexter R. Griswold
Justice	Edmund Randolph	Edmund Randolph William Bradford Charles Lee	Charles Lee
Post office	Samuel Osgood	Joseph Habersham	Joseph Habersham
Navy	Timothy Pickering		Benjamin Stoddert

	Jefferson (1)	**Jefferson (2)**	**Madison (1)**
State	James Madison	James Madison	Robert Smith James Monroe
Treasury	Samuel Dexter Albert Gallatin	Albert Gallatin	Albert Gallatin
War	Henry Dearborn	Henry Dearborn	William Eustis
Justice	Levi Lincoln	J. Breckenridge Caesar Rodney	Caesar Rodney William Pinkney
Post office	Joseph Habersham Gideon Granger	Gideon Granger	Gideon Granger
Navy	Benjamin Stoddert Robert Smith	Robert Smith	Paul Hamilton

	Madison (2)	**Monroe (1)**	**Monroe (2)**
State	James Monroe	J. Quincy Adams	J. Quincy Adams
Treasury	Albert Gallatin George Campbell Alexander Dallas Wm. H. Crawford	Wm. H. Crawford	Wm. H. Crawford
War	John Armstrong James Monroe Wm. H. Crawford	John C. Calhoun	John C. Calhoun
Justice	William Pinkney Richard Rush	Richard Rush William Wirt	William Wirt
Post office	Gideon Granger Return J. Meigs	Return J. Meigs	Return J. Meigs John McLean
Navy	William Jones B. W. Crowninshield	B. W. Crowninshield Smith Thompson	Smith Thompson Samuel Southard

	J. Q. Adams	**Jackson (1)**	**Jackson (2)**
State	Henry Clay	Martin Van Buren Edward Livingston	Edward Livingston Louis McLane John Forsyth
Treasury	Richard Rush	Samuel Ingham Louis McLane	Louis McLane William Duane Roger B. Taney Levi Woodbury
War	James Barbour Peter Porter	John H. Eaton Lewis Cass	Lewis Cass Benjamin Butler
Justice	William Wirt	John Berrien Roger B. Taney	Roger B. Taney Benjamin Butler
Post office	John McLean	William Barry	William Barry Amos Kendall
Navy	Samuel Southard	John Branch Levi Woodbury	Levi Woodbury M. Dickerson

	Van Buren	**Harrison-Tyler**	**Polk**
State	John Forsyth	Daniel Webster Hugh S. Legare Abel P. Upshur John C. Calhoun	James Buchanan
Treasury	Levi Woodbury	Thomas Ewing Walter Forward John C. Spencer George M. Bibb	Robert Walker
War	Joel Poinsett	John Bell John C. Spencer James M. Porter William Wilkins	William Marcy
Justice	Benjamin Butler Felix Grundy Henry Gilpin	John Crittenden Hugh S. Legare John Nelson	John Y. Mason Nathan Clifford Isaac Toucey
Post office	Amos Kendall John M. Niles	Francis Granger Charles Wickliff	Cave Johnson
Navy	M. Dickerson James Paulding	George Badger Abel P. Upshur David Henshaw Thomas Gilmer John Y. Mason	George Bancroft John Y. Mason

UNITED STATES CABINET OFFICERS—Continued

Department	Administration		
	Taylor	**Fillmore**	**Pierce**
State	John M. Clayton	Daniel Webster Edward Everett	William Marcy
Treasury	William Meredith	Thomas Corwin	James Guthrie
War	George Crawford	Charles Conrad	Jefferson Davis
Justice	Reverdy Johnson	John Crittenden	Caleb Cushing
Post office	Jacob Collamer	Nathan K. Hall Samuel Hubbard	James Campbell
Navy	William Preston	William Graham John Kennedy	James Donnin
Interior	Thomas Ewing	Alexander Stuart	Robert McClelland
	Buchanan	**Lincoln (1)**	**Lincoln (2)**
State	Lewis Cass Jeremiah Black	William H. Seward	William H. Seward
Treasury	Howell Cobb Philip Thomas John A. Dix	Salmon P. Chase William Fessenden	Hugh McCulloch
War	John B. Floyd Joseph Holt	Simon Cameron Edwin Stanton	Edwin Stanton
Justice	Jeremiah Black Edwin Stanton	Edward Bates James Speed	James Speed
Post office	Aaron Brown Joseph Holt Horatio King	Montgomery Blair William Dennison	William Dennison
Navy	Isaac Toucey	Gideon Welles	Gideon Welles
Interior	Jacob Thompson	Caleb B. Smith John P. Usher	John P. Usher
	Johnson	**Grant (1)**	**Grant (2)**
State	William H. Seward	Elihu Washburn Hamilton Fish	Hamilton Fish
Treasury	Hugh McCulloch	George Boutwell	Wm. Richardson Benjamin Bristow Lot Morrill
War	Edwin Stanton U. S. Grant John Schofield	John Rawlins Wm. T. Sherman William Belknap	William Belknap Alphonso Taft James Cameron
Justice	James Speed Henry Stanbury	Ebenezer Hoar Amos Akerman George Williams	George Williams Edward Pierrepont Alphonso Taft
Post office	William Dennison Alexander Randall	John Creswell	John Creswell James Marshall Marshall Jewell James N. Tyner
Navy	Gideon Welles	Adolph Borie George Robeson	George Robeson
Interior	John P. Usher James Harlan O. H. Browning	Jacob Cox Columbus Delano	Columbus Delano Z. Chandler
	Hayes	**Garfield-Arthur**	**Cleveland (1)**
State	William Evarts	James G. Blaine F. T. Frelinghuysen	Thomas Bayard
Treasury	John Sherman	William Windon Charles Folger Walter Gresham Hugh McCulloch	Daniel Manning Charles Fairchild
War	George McCarry Alexander Ramsey	Robert T. Lincoln	William Endicott
Justice	Charles Devens	Wayne McVeagh Benjamin Brewster	August Garland
Post office	David Key Horace Maynard	Thomas James Timothy Howe Walter Gresham Frank Hatton	William Vilas Don Dickinson
Navy	Richard Thompson Nathan Goff	William H. Hunt William Chandler	William Whitney
Interior	Carl Schurz	Samuel Kirkwood Henry Teller	Lucius Lamar William Vilas
Agriculture			Norman Colman
	B. Harrison	**Cleveland (2)**	**McKinley (1)**
State	James G. Blaine John Foster	Walter Gresham Richard Olney	John Sherman William R. Day John Hay
Treasury	William Windon Charles Foster	John G. Carlisle	Lyman J. Gage
War	Redfield Proctor Stephen Elkins	Daniel Lamont	Russell A. Alger Elihu Root
Justice	W. H. H. Miller	Richard Olney Judson Harmon	Joseph McKenna John W. Griggs
Post office	John Wanamaker	Wilson Bissell William Wilson	James A. Gary Charles E. Smith
Navy	Benjamin Tracy	Hilary Herbert	John D. Long
Interior	John W. Noble	Hoke Smith David R. Francis	Cornelius Bliss Ethan Hitchcock
Agriculture	Jeremiah Rusk	J. Sterling Morton	James Wilson

UNITED STATES CABINET OFFICERS—Concluded

Department	Administration		
	McKinley (2)	**T. Roosevelt (1)**	**T. Roosevelt (2)**
State	John Hay	John Hay	Elihu Root Robert Bacon
Treasury	Lyman J. Gage	Lyman J. Gage Leslie M. Shaw	Leslie M. Shaw George Cortelyou
War	Elihu Root	Elihu Root Wm. H. Taft	Wm. H. Taft Luke Wright
Justice	Philander Knox	Philander Knox William Moody	William Moody C. J. Bonaparte
Post office	Charles E. Smith	Charles E. Smith Henry Payne Robert J. Wynne	George Cortelyou George Meyer
Navy	John D. Long	John D. Long William Moody Paul Morton	Charles Bonaparte Victor Metcalf Truman Newberry
Interior	Ethan Hitchcock	Ethan Hitchcock	Ethan Hitchcock James R. Garfield
Agriculture	James Wilson	James Wilson	James Wilson
Commerce and Labor		George Cortelyou Victor Metcalf	Victor Metcalf Oscar S. Straus
	Taft	**Wilson (1)**	**Wilson (2)**
State	Philander Knox	Wm. J. Bryan Robert Lansing	Robert Lansing Bainbridge Colby
Treasury	Franklin MacVeagh	W. G. McAdoo	W. G. McAdoo Carter Glass David Houston
War	Jacob Dickinson Henry Stimson	Lindley Garrison Newton D. Baker	Newton D. Baker
Justice	George Wickersham	J. C. McReynolds Thomas Gregory	Thomas Gregory Mitchell Palmer
Post office	F. H. Hitchcock	A. S. Burleson	A. S. Burleson
Navy	George Meyer	Josephus Daniels	Josephus Daniels
Interior	Richard Ballinger Walter Fisher	Franklin K. Lane	Franklin K. Lane John Barton Payne
Agriculture	James Wilson	David Houston	David Houston E. T. Meredith
Commerce and Labor	Charles Nagel		
Commerce		Wm. C. Redfield	Wm. C. Redfield J. W. Alexander
Labor		Wm. B. Wilson	Wm. B. Wilson
	Harding-Coolidge	**Coolidge (2)**	**Hoover**
State	Charles E. Hughes	Frank B. Kellogg	Henry Stimson
Treasury	Andrew W. Mellon	Andrew W. Mellon	Andrew W. Mellon Ogden L. Mills
War	John W. Weeks	Dwight F. Davis	James W. Good Patrick Hurley
Justice	H. M. Dougherty Harlan F. Stone	John G. Sargent	Wm. D. Mitchell
Post office	Will H. Hays Hubert Work Harry S. New	Harry S. New	Walter F. Brown
Navy	Edwin Denby Curtis Wilbur	Curtis Wilbur	C. Francis Adams
Interior	Albert Fall Hubert Work	Hubert Work Roy O. West	R. L. Wilbur
Agriculture	Henry C. Wallace Howard M. Gore	W. M. Jardine	Arthur M. Hyde
Commerce	Herbert Hoover	Herbert Hoover Wm. F. Whiting	Robert Lamont Roy D. Chapin
Labor	James J. Davis	James J. Davis	James J. Davis Wm. N. Doak
	F. D. Roosevelt (1)	**F. D. Roosevelt (2)**	**F. D. Roosevelt (3)**
State	Cordell Hull	Cordell Hull	Cordell Hull
Treasury	Wm. H. Woodin Henry Morgenthau	Henry Morgenthau	Henry Morgenthau
War	George H. Dern	George H. Dern Harry Woodring Henry L. Stimson	Henry L. Stimson
Justice	Homer Cummings	Homer Cummings Frank Murphy Robert H. Jackson	Robert H. Jackson
Post Office	James A. Farley	James A. Farley Frank C. Walker	Frank C. Walker
Navy	Claude Swanson	Claude Swanson Charles Edison Frank Knox	Frank Knox
Interior	Harold L. Ickes	Harold L. Ickes	Harold L. Ickes
Agriculture	Henry A. Wallace	Henry A. Wallace Claude R. Wickard	Claude R. Wickard
Commerce	Daniel Roper	Daniel Roper Harry Hopkins Jesse Jones	Jesse Jones
Labor	Frances Perkins	Frances Perkins	Frances Perkins

TABLE I. FACTS RELATING TO

No.	President's Name and Number of Administration	Born		Parents		Paternal Ancestry	Father's Occupation
		Date	Birthplace	Father	Mother		
1	**George Washington,** 1–2	Fri., Feb. 22, 1732	Bridges Creek, Va.	Augustine	Mary Ball	English	Planter
2	**John Adams,** 3	Wed., Oct. 30, 1735	Quincy, Mass.	John	Susanna Boylston	English	Farmer
3	**Thomas Jefferson,** 4–5	Tues., April 13, 1743	Shadwell, Va.	Peter	Jane Randolph	Welsh	Planter
4	**James Madison,** 6–7	Fri., Mar. 16, 1751	Port Conway, Va.	James	Nellie Conway	English	Planter
5	**James Monroe,** 8–9	Fri., April 28, 1758	Westmoreland Co., Va.	Spence	Elizabeth Jones	Scotch	Planter
6	**John Quincy Adams,** 10	Sat., July 11, 1767	Quincy, Mass.	John	Abigail Smith	English	Lawyer
7	**Andrew Jackson,** 11–12	Sun., Mar. 15, 1767	Near Monroe, N. C.	Andrew	Elizabeth Hutchinson	Scotch-Irish	Farmer
8	**Martin Van Buren,** 13	Thurs., Dec. 5, 1782	Kinderhook, N. Y.	Abraham	Mary Hoes (Goes)	Dutch	Farmer
9	**William Henry Harrison,** 14	Tues., Feb. 9, 1773	Berkeley, Va.	Benjamin	Elizabeth Bassett	English	Statesman
10	**John Tyler,** 14	Mon., Mar. 29, 1790	Greenway, Va.	John	Mary Armistead	English	Jurist
11	**James Knox Polk,** 15	Mon., Nov. 2, 1795	Mecklenburg Co., N. C.	Samuel	Jane Knox	Scotch-Irish	Farmer
12	**Zachary Taylor,** 16	Tues., Nov. 24, 1784	Orange Co., Va.	Richard	Mary Strother	English	Planter
13	**Millard Fillmore,** 16	Tues., Jan. 7, 1800	Summer Hill, N. Y.	Nathaniel	Phebe Millard	English	Farmer
14	**Franklin Pierce,** 17	Fri., Nov. 23, 1804	Hillsborough, N. H.	Benjamin	Anna Kendrick	English	Farmer
15	**James Buchanan,** 18	Sat., April 23, 1791	Near Mercersburg, Pa.	James	Elizabeth Speer	Scotch	Merchant
16	**Abraham Lincoln,** 19–20	Sun., Feb. 12, 1809	Hardin Co., Ky.	Thomas	Nancy Hanks	English	Farmer
17	**Andrew Johnson,** 20	Thurs., Dec. 29, 1808	Raleigh, N. C.	Jacob	Mary McDonough	English	Sexton
18	**Ulysses Simpson Grant,** 21–22	Sat., April 27, 1822	Point Pleasant, Ohio	Jesse Root	Hannah Simpson	English	Tanner
19	**Rutherford Birchard Hayes,** 23	Fri., Oct. 4, 1822	Delaware, Ohio	Rutherford	Sophia Birchard	Scotch	Merchant
20	**James Abram Garfield,** 24	Sat., Nov. 19, 1831	Orange, Ohio	Abram	Eliza Ballou	English	Farmer
21	**Chester Allan Arthur,** 24	Tues., Oct. 5, 1830	Fairfield, Vt.	William	Malvina Stone	Scotch-Irish	Clergyman
22	**Grover Cleveland,** 25	Sat., Mar. 18, 1837	Caldwell, N. J.	Richard Falley	Anne Neal	English	Clergyman
23	**Benjamin Harrison,** 26	Tues., Aug. 20, 1833	North Bend, Ohio	John Scott	Elizabeth F. Irwin	English	Farmer
24	**Grover Cleveland,** 27	Sat., Mar. 18, 1837	Caldwell, N. J.	Richard Falley	Anne Neal	English	Clergyman
25	**William McKinley,** 28–29	Sun., Jan. 29, 1843	Niles, Ohio	William	Nancy Allison	Scotch-Irish	Iron Mnfr.
26	**Theodore Roosevelt,** 29–30	Wed., Oct. 27, 1858	New York city	Theodore	Martha Bulloch	Dutch	Merchant
27	**William Howard Taft,** 31	Tues., Sept. 15, 1857	Cincinnati, Ohio	Alphonso	Louise M. Torrey	English	Lawyer
28	**Woodrow Wilson,** 32–33	Sun., Dec. 28, 1856	Staunton, Va.	Joseph Ruggles	Janet Woodrow	Scotch-Irish	Clergyman
29	**Warren Gamaliel Harding,** 34	Thurs., Nov. 2, 1865	Corsica, Ohio	George Tryon	Phoebe E. Dickerson	English	Doctor
30	**Calvin Coolidge,** 34–35	Thurs., July 4, 1872	Plymouth, Vt.	John Calvin	Victoria J. Moor	English	Farmer
31	**Herbert Clark Hoover,** 36	Mon., Aug. 10, 1874	West Branch, Iowa	Jesse Clark	Huldah R. Minthorn	Swiss	Blacksmith
32	**Franklin Delano Roosevelt,** 37	Mon., Jan. 30, 1882	Hyde Park, N. Y.	James	Sara Delano	Dutch	R. R. President

TABLE II. FACTS RELATING TO

Name	Residence when Elected	Term of Office		Subsequent Career	Died	Cause of Death
		From	To			
Washington	Mt. Vernon, Va.	Apr. 30, 1789	Mar. 4, 1797	Agricultural pursuits; appointed commander-in-chief (1798) because of threatened war with France.	1799	Acute laryngitis
Adams, J.	Quincy, Mass.	Mar. 4, 1797	Mar. 4, 1801	Member of Massachusetts Constitutional Convention of 1820.	1826	Natural decline
Jefferson	Monticello, Va.	Mar. 4, 1801	Mar. 4, 1809	Retired to his plantation at Monticello, Va.; devoted much time to the University of Virginia.	1826	Chronic diarrhœa
Madison	Montpelier, Va.	Mar. 4, 1809	Mar. 4, 1817	Retired to Montpelier, Va.; maintained active interest in education and politics.	1836	Natural decline
Monroe	Oakhill, Va.	Mar. 4, 1817	Mar. 4, 1825	Retired to private life in Virginia; served in Virginia Constitutional Convention in 1830.	1831	Natural decline
Adams, J. Q.	Quincy, Mass.	Mar. 4, 1825	Mar. 4, 1829	Member House of Representatives from 1830 to his death.	1848	Paralysis
Jackson	Hermitage, near Nashville, Tenn.	Mar. 4, 1829	Mar. 4, 1837	Retired to the Hermitage; maintained great interest in politics.	1845	Dropsy
Van Buren	Kinderhook, N. Y.	Mar. 4, 1837	Mar. 4, 1841	Renominated, 1840 and 1848, for the presidency.	1862	Asthma
Harrison, W. H.	North Bend, Ohio	Mar. 4, 1841	Apr. 4, 1841	Died in office.	1841	Pneumonia
Tyler	Williamsburg, Va.	Apr. 6, 1841	Mar. 4, 1845	Retired to his estate in Virginia; presided at the peace convention held in Washington in 1861.	1862	Liver trouble
Polk	Nashville, Tenn.	Mar. 4, 1845	Mar. 4, 1849	Died within 3 months.	1849	Chronic diarrhœa
Taylor	Baton Rouge, La.	Mar. 4, 1849	July 10, 1850	Died in office.	1850	Indigestion
Fillmore	Buffalo, N. Y.	July 10, 1850	Mar. 4, 1853	Chancellor, University of Buffalo.	1874	Natural decline
Pierce	Concord, N. H.	Mar. 4, 1853	Mar. 4, 1857	Traveled in Europe; retired to Concord, N. H.	1869	Stomach trouble
Buchanan	Wheatland, Pa.	Mar. 4, 1857	Mar. 4, 1861	Wrote defense of his administration.	1868	Rheumatic gout
Lincoln	Springfield, Ill.	Mar. 4, 1861	Apr. 15, 1865	Died in office.	1865	Assassinated by Booth
Johnson	Greeneville, Tenn.	Apr. 15, 1865	Mar. 4, 1869	Chosen United States senator in 1875.	1875	Paralysis
Grant	Washington, D. C.	Mar. 4, 1869	Mar. 4, 1877	Made tour of the world and retired to write his memoirs.	1885	Cancer
Hayes	Fremont, Ohio	Mar. 4, 1877	Mar. 4, 1881	Devoted his time to education, reforms and charity.	1893	Heart disease
Garfield	Mentor, Ohio	Mar. 4, 1881	Sep. 20, 1881	Died in office.	1881	Assassinated by Guiteau
Arthur	New York city	Sep. 20, 1881	Mar. 4, 1885	Died the year following his retirement.	1886	Apoplexy
Cleveland	Buffalo, N. Y.	Mar. 4, 1885 Mar. 4, 1893	Mar. 4, 1889 Mar. 4, 1897	Retired to New York to practice law; at the end of second term, retired to Princeton, N. J.	1908	Debility
Harrison, B.	Indianapolis, Ind.	Mar. 4, 1889	Mar. 4, 1893	Actively practiced law.	1901	Pneumonia
McKinley	Canton, Ohio	Mar. 4, 1897	Sep. 14, 1901	Died in office.	1901	Assassinated by Czolgosz
Roosevelt, T.	Oyster Bay, N. Y.	Sep. 14, 1901	Mar. 4, 1909	Headed scientific expeditions; wrote; active in politics.	1919	Heart trouble
Taft	Cincinnati, Ohio	Mar. 4, 1909	Mar. 4, 1913	Chief justice of U. S. Supreme Court.	1930	General breakdown
Wilson	Princeton, N. J.	Mar. 4, 1913	Mar. 4, 1921	Lawyer and writer.	1924	Heart trouble
Harding	Marion, Ohio	Mar. 4, 1921	Aug. 2, 1923	Died in office.	1923	Apoplexy
Coolidge	Northampton, Mass.	Aug. 2, 1923	Mar. 4, 1929	Writer.	1933	Heart trouble
Hoover	Stanford Univ., Cal.	Mar. 4, 1929	Mar. 4, 1933	Retired to private life.		
Roosevelt, F. D.	Hyde Park, N. Y.	Mar. 4, 1933				

THE PRESIDENTS OF THE UNITED STATES

Educational Advantage	Early Vocation	Later Vocation	Religious Faith	Married	Wife's Name	Children		Name
						Boys	Girls	
Common School	Surveyor	Planter	Episcopalian	1759	Mrs. Martha (Dandridge) Custis (1732–1802)	0	0	**Washington**
Harvard College, 1755*	Teacher	Lawyer	Unitarian	1764	Abigail Smith (1744–1818)	3	2	**Adams, J.**
William and Mary College, 1762	Lawyer	Lawyer	Liberal	1772	Mrs. Martha (Wayles) Skelton (1748–1782)	0	6	**Jefferson**
Princeton College, 1771	Lawyer	Lawyer	Episcopalian	1794	Mrs. Dolly (Payne) Todd (1772–1849)	0	0	**Madison**
William and Mary College	Lawyer	Lawyer	Episcopalian	1786	Eliza Kortwright (1768–1830)	0	2	**Monroe**
Harvard College, 1787	Lawyer	Lawyer	Unitarian	1797	Louisa Catherine Johnson (1775–1852)	3	1	**Adams, J. Q.**
Self Taught	Lawyer	Lawyer	Presbyterian	1791	Mrs. Rachel (Donelson) Robards (1767–1828)	0	0	**Jackson**
Kinderhook Academy	Lawyer	Lawyer	Reformed Dutch	1807	Hannah Hoes (1783–1819)	4	0	**Van Buren**
Hampden-Sidney College, 1790	Doctor	Soldier	Episcopalian	1795	Anna Symmes (1775–1864)	6	4	**Harrison, W. H.**
William and Mary College, 1807	Lawyer	Lawyer	Episcopalian	1813 1844	First, Letitia Christian (1790–1842); second, Julia Gardiner (1820–1889)	3 4	4 3	**Tyler**
University of North Carolina, 1818	Lawyer	Lawyer	Presbyterian	1824	Sarah Childress (1803–1891)	0	0	**Polk**
Common School	Soldier	Planter	Episcopalian	1810	Margaret Smith (1788–1852)	1	5	**Taylor**
Common School	Wool carder	Lawyer	Unitarian	1826 1858	First, Abigail Powers (1798–1853); second, Mrs. Caroline (Carmichael) McIntosh (1813–1881)	1 0	1 0	**Fillmore**
Bowdoin College, 1824	Lawyer	Lawyer	Episcopalian	1834	Jane Means Appleton (1806–1863)	3	0	**Pierce**
Dickinson College, 1809	Lawyer	Lawyer	Presbyterian	....	Unmarried	...	...	**Buchanan**
Self Taught	Farmer	Lawyer	Liberal	1842	Mary Todd (1818–1882)	4	0	**Lincoln**
Self Taught	Tailor	Politician	Liberal	1827	Eliza McCardle (1810–1876)	3	2	**Johnson**
West Point Military Academy, 1843	Tanner	Soldier	Methodist	1848	Julia Dent (1826–1902)	3	1	**Grant**
Kenyon College, 1842	Lawyer	Lawyer	Methodist	1852	Lucy Ware Webb (1831–1889)	7	1	**Hayes**
Williams College, 1856	Teacher	Lawyer	Disciples	1858	Lucretia Rudolph (1832–1918)	4	1	**Garfield**
Union College, 1848	Teacher	Lawyer	Episcopalian	1859	Ellen Lewis Herndon (1837–1880)	2	1	**Arthur**
Academy	Teacher	Lawyer	Presbyterian	1886	Frances Folsom (1864–)	2	3	**Cleveland**
Miami University, 1852	Lawyer	Lawyer	Presbyterian	1853 1896	First, Caroline Scott (1832–1892); second, Mrs. Mary (Lord) Dimmick (1858–)	1 0	1 1	**Harrison, B.**
Academy	Teacher	Lawyer	Presbyterian	1886	Frances Folsom (1864–)	2	3	**Cleveland**
Allegheny College	Teacher	Lawyer	Methodist	1871	Ida Saxton (1844–1907)	0	2	**McKinley**
Harvard University, 1880	Writer	In politics	Reformed Dutch	1880 1886	First, Alice Lee (1861–1884); second, Edith Kermit Carow (1861–)	0 4	1 1	**Roosevelt**
Yale University, 1878	Lawyer	Lawyer	Unitarian	1886	Helen Herron (1861–)	2	1	**Taft**
Princeton University, 1879	Lawyer	Educator	Presbyterian	1885 1915	First, Ellen Louise Axson (1860–1914); second, Mrs. Edith (Bolling) Galt (1872–)	0 0	3 0	**Wilson**
Ohio Central College	Editor	Publisher	Baptist	1891	Florence Kling (1860–1924)	0	0	**Harding**
Amherst College, 1895	Lawyer	In politics	Congregationalist	1905	Grace A. Goodhue (1879–)	2	0	**Coolidge**
Stanford University, 1895	Engineer	Engineer	Quaker	1899	Lou Henry (1875–)	2	0	**Hoover**
Harvard University, 1904	Lawyer	In politics	Episcopalian	1905	Anna Eleanor Roosevelt (1884–)	4	1	**Roosevelt**

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* Date indicates graduation.

THE PRESIDENTS OF THE UNITED STATES

Age at Death	Place of Death	Place of Burial	Writings of the Presidents	Presidential Sobriquets	Name
67	Mt. Vernon, Va.	Mt. Vernon, Va.	*Maxims; Transcripts of Revolutionary Correspondence.*	*Father of his Country; American Fabius.*	**Washington**
90	Quincy, Mass.	Quincy, Mass.	*Essay on Canon and Feudal Law; Defense of the American Constitution.*	*Colossus of Independence; Son of Liberty.*	**Adams, J.**
83	Monticello, Va.	Monticello, Va.	*A Summary View of the Rights of America; The Declaration of Independence; Act for Freedom of Religion.*	*Sage of Monticello; Long Tom.*	**Jefferson**
85	Montpelier, Va.	Montpelier, Va.	*Reports of Debates During the Congress of the Confederation and Federal Congress; Essays.*	*Father of the Constitution.*	**Madison**
73	New York city.	Hollywood, Richmond, Va.	*A View of the Conduct of the Executive; The People; The Sovereign.*	*Last Cocked Hat.*	**Monroe**
80	Washington, D. C.	Quincy, Mass.	*Poems of Religion and Society; Defense of Washington's Policy of Neutrality.*	*Old Man Eloquent.*	**Adams, J. Q.**
78	Hermitage, near Nashville, Tenn.	Hermitage, near Nashville, Tenn.		*Old Hickory; Caesar of the White House.*	**Jackson**
79	Kinderhook, N. Y.	Kinderhook, N. Y.	*Inquiry Into the Origin and Causes of Political Parties in the United States.*	*Little Magician; Wizard of Kinderhook.*	**Van Buren**
68	Washington, D. C.	North Bend, Ohio	*A Discourse on the Aborigines of the Valley of the Ohio.*	*Tippecanoe.*	**Harrison, W. H.**
72	Richmond, Va.	Hollywood, Richmond, Va.		*Young Hickory.*	**Tyler**
53	Nashville, Tenn.	Nashville, Tenn.	*Diary of James K. Polk.*	*Young Hickory.*	**Polk**
65	Washington, D. C.	Near Louisville, Ky.		*Rough and Ready.*	**Taylor**
74	Buffalo, N. Y.	Buffalo, N. Y.		*American Louis Philippe.*	**Fillmore**
64	Concord, N. H.	Concord, N. H.	*Some Papers of Franklin Pierce.*	*Purse.*	**Pierce**
77	Lancaster, Pa.	Lancaster, Pa.	*Résumé of My Administration.*	*Bachelor President.*	**Buchanan**
56	Washington, D. C.	Springfield, Ill.	*Orations.*	*Honest Abe; Great Emancipator.*	**Lincoln**
66	Carter's Station, Tenn.	Greenville, Tenn.	*Speeches.*	*Sir Veto.*	**Johnson**
63	Mount McGregor, N. Y.	New York city	*The Personal Memoirs of U. S. Grant.*	*Unconditional Surrender.*	**Grant**
71	Fremont, Ohio	Fremont, Ohio		*President de Facto.*	**Hayes**
49	Elberon, N. J.	Cleveland, Ohio	*Discovery and Ownership of the Northwestern Territory; Garfield's Words.*	*The Martyr President; The Dark Horse.*	**Garfield**
56	New York, N. Y.	Near Albany, N. Y.		*America's First Gentleman.*	**Arthur**
71	Princeton, N. J.	Princeton, N. J.	*Writings and Speeches.*	*Man of Destiny.*	**Cleveland**
67	Indianapolis, Ind.	Indianapolis, Ind.	*This Country of Ours; Views of an Ex-President.*	*Hoosier President; Son of His Grandfather.*	**Harrison, B.**
58	Buffalo, N. Y.	Canton, Ohio	*Speeches.*	*Prosperity's Advance Agent.*	**McKinley**
60	Oyster Bay, N. Y.	Oyster Bay, N. Y.	*The Winning of the West; The Rough Riders; The Strenuous Life; African Game Trails; The Great Adventure, etc.*	*Teddy; T. R.; The Rough Rider; Our Strenuous President.*	**Roosevelt**
72	Washington, D. C.	Arlington, Va.	*Four Aspects of Civic Duty; The United States and Peace; Ethics in Service, etc.*	*The Globe Trotter; The Judicial President.*	**Taft**
67	Washington, D. C.	Washington, D. C.	*Congressional Government; The State; A History of the American People; The New Freedom, etc.*	*The Scholar in Politics.*	**Wilson**
57	San Francisco, Calif.	Marion, Ohio			**Harding**
60	Northampton, Mass.	Plymouth, Vt.	*Have Faith in Massachusetts; The Price of Freedom.*	*Silent Cal.*	**Coolidge**
			Principles of Mining; American Individualism.		**Hoover**
					Roosevelt

PRESIDENTIAL ELECTIONS AND INAUGURATIONS

Year	Presidential Candidates	State	Party	Vote			Vice-Pres. Candidates		Facts Concerning Inauguration	Age at Inaug.
				Total	Electoral	Popular	Name	State		
1789	**George Washington**	Va.	....	73	69[1]	....	*John Adams*	Mass.	I. **George Washington** was inaugurated President of the United States on a portico in front of the Senate chamber, Thursday, April 30, 1789, in the Federal building, facing Broad Street, in New York. The oath of office was administered by Robt. R. Livingston, chancellor of the state of New York, who exclaimed when the oath was taken, "Long live George Washington, President of the United States."	57
	John Adams	Mass.	....	...	34	....				
	John Jay	N. Y.	....	...	9	....				
	R. H. Harrison	Md.	....	...	6	....				
	John Rutledge	S. C.	....	...	6	....				
	John Hancock	Mass.	....	...	4	....				
	George Clinton	N. Y.	....	...	3	....				
	Samuel Huntington	Conn.	....	...	2	....				
	John Milton	Ga.	....	...	2	....				
	James Armstrong	Ga.	....	...	1	....				
	Benjamin Lincoln	Mass.	....	...	1	....				
	Edward Telfair	Ga.	....	...	1	....				
	Electoral votes not cast	.....	....	...	4	....				
1792	**George Washington**	Va.	Fed.	135	132[1]	....	*John Adams*	Mass.	II. **George Washington,** for a second term, in the Senate chamber, Monday, March 4, 1793, in the Old Federal hall, in Philadelphia. Oath of office administered by William Cushing of Massachusetts.	
	John Adams	Mass.	Fed.	...	77	....				
	George Clinton	N. Y.	Rep.	...	50	....				
	Thomas Jefferson	Va.	....	...	4	....				
	Aaron Burr	N. Y.	....	...	1	....				
	Electoral votes not cast	.....	....	...	3	....				
1796	**John Adams**	Mass.	Fed.	138	71[1]	....	*Thomas Jefferson*	Va.	III. **John Adams,** in the chamber of the House of Representatives, Congress hall, Saturday, March 4, 1797, in Philadelphia. Oath of office administered by Oliver Ellsworth, Chief Justice of the United States.	61
	Thomas Jefferson	Va.	Rep.	...	68	....				
	Thomas Pinckney	S. C.	Fed.	...	59	....				
	Aaron Burr	N. Y.	Rep.	...	30	....				
	Samuel Adams	Mass.	Rep.	...	15	....				
	Oliver Ellsworth	Conn.	Ind.	...	11	....				
	George Clinton	N. Y.	Rep.	...	7	....				
	John Jay	N. Y.	Fed.	...	5	....				
	James Iredell	N. C.	Fed.	...	3	....				
	George Washington	Va.	Fed.	...	2	....				
	John Henry	Md.	Fed.	...	2	....				
	S. Johnson	N. C.	Fed.	...	2	....				
	C. C. Pinckney	S. C.	Fed.	...	1	....				
1800	**Thomas Jefferson**	Va.	Rep.	138	73[1]	....	*Aaron Burr*	N. Y.	IV. **Thomas Jefferson,** in the Senate chamber of the Capitol, Wednesday, March 4, 1801, in the city of Washington. Oath of office administered by John Marshall, Chief Justice of the United States.	57
	Aaron Burr	N. Y.	Rep.	...	73	....				
	John Adams	Mass.	Fed.	...	65	....				
	C. C. Pinckney	S. C.	Fed.	...	64	....				
	John Jay	N. Y.	Fed.	...	1	....				
1804	**Thomas Jefferson**	Va.	Rep.	176	162	....	*George Clinton*	N. Y.	V. **Thomas Jefferson,** for a second term, in Senate chamber, Washington, Monday, March 4, 1805, by Chief Justice John Marshall.	
	C. C. Pinckney	S. C.	Fed.	...	14	....	Rufus King	N. Y.		
1808	**James Madison**	Va.	Rep.	176	122	....	*George Clinton*	N. Y.	VI. **James Madison,** in the chamber of the House of Representatives, Washington, Saturday, March 4, 1809. Oath of office administered by Chief Justice John Marshall.	57
	C. C. Pinckney	S. C.	Fed.	...	47	....	Rufus King	N. Y.		
	George Clinton	N. Y.	Rep.	...	6	....	John Langdon	N. H.		
							James Madison	Va.		
	Electoral votes not cast	.....	....	...	1	....	James Monroe	Va.		
1812	**James Madison**	Va.	Rep.	218	128	....	*Elbridge Gerry*	Mass.	VII. **James Madison,** for a second term, Thursday, March 4, 1813. Oath was administered by Chief Justice Marshall.	
	De Witt Clinton	N. Y.	Fed.	...	89	....	Jared Ingersoll	Pa.		
1816	**James Monroe**	Va.	Rep.	221	183	....	*D. D. Tompkins*	N. Y.	VIII. **James Monroe,** Tuesday, March 4, 1817. Oath administered by Chief Justice John Marshall, on a platform erected for the purpose, in front of the eastern portico of the Capitol at Washington.	58
	Rufus King	N. Y.	Fed.	...	34	....	John E. Howard	Md.		
							James Ross	Pa.		
	Electoral votes not cast	.....	....	...	4	....	John Marshall	Va.		
							Robert G. Harper	Md.		
1820	**James Monroe**	Va.	Rep.	235	231	....	*D. D. Tompkins*	N. Y.	IX. **James Monroe,** for a second term, in the House of Representatives, Monday, March 5, 1821. As March 4 came on Sunday he took the oath, administered by Chief Justice Marshall, at noon on Monday, March 5, 1821.	
	John Q. Adams	Mass.	Rep.	...	1	....	Richard Stockton	N. J.		
							Daniel Rodney	Del.		
							Robert G. Harper	Md.		
							Richard Rush	Pa.		
1824	**John Q. Adams**	Mass.	Rep.	261	84[2]	108,740	*John C. Calhoun*	S. C.	X. **John Quincy Adams,** in the hall of the House of Representatives, Friday, March 4, 1825. Oath of office administered by Chief Justice Marshall.	57
	Andrew Jackson	Tenn.	Dem.	...	99[2]	153,544	Nathan Sanford	N. Y.		
	Henry Clay	Ky.	Rep.	...	37	47,136	Nathaniel Macon	N. C.		
	W. H. Crawford	Ga.	Rep.	...	46	46,618	Andrew Jackson	Tenn.		
							Martin Van Buren	N. Y.		
							Henry Clay	Ky.		
1828	**Andrew Jackson**	Tenn.	Dem.	261	178	647,286	*John C. Calhoun*	S. C.	XI. **Andrew Jackson,** on the eastern portico of the Capitol, Wednesday, March 4, 1829. Oath administered by Chief Justice Marshall.	61
	John Q. Adams	Mass.	Nat. Rep.	...	83	508,064	Richard Rush	Pa.		
							William Smith	S. C.		
1832	**Andrew Jackson**	Tenn.	Dem.	288	219	687,502	*Martin Van Buren*	N. Y.	XII. **Andrew Jackson,** for a second term, in the hall of the House of Representatives, Monday, March 4, 1833. Oath administered by Chief Justice Marshall.	
	Henry Clay	Ky.	Nat. Rep.	...	49	530,189	John Sergeant	Pa.		
	John Floyd	Ga.	Ind.	...	11	....	Henry Lee	Mass.		
	William Wirt	Md.	Anti-M.	...	7	....	Amos Ellmaker	Pa.		
	Electoral votes not cast	.....	....	...	2	....	William Wilkins	Pa.		
1836	**Martin Van Buren**	N. Y.	Dem.	294	170	762,678	*R. M. Johnson*	Ky.	XIII. **Martin Van Buren,** on the eastern portico of the Capitol, Saturday, March 4, 1837. Oath administered by Chief Justice Taney.	54
	Wm. H. Harrison	Ohio	Whig	...	73	735,651	Francis Granger	N. Y.		
	Hugh L. White	Tenn.	Whig	...	26		John Tyler	Va.		
	Daniel Webster	Mass.	Whig	...	14		William Smith	Ala.		
	W. P. Mangum	N. C.	Whig	...	11	....				
1840	**Wm. H. Harrison**	Ohio	Whig	294	234	1,275,016	*John Tyler*	Va.	XIV. **William Henry Harrison,** on the eastern portico of the Capitol, Thursday, March 4, 1841. Oath administered by Chief Justice Taney.	68
	Martin Van Buren	N. Y.	Dem.	...	60	1,129,102	R. M. Johnson	Ky.		
							L. W. Tazewell	Va.		
							James K. Polk	Tenn.		
							Thomas Earle	Pa.	**John Tyler,** inaugurated 12 M., Tuesday, April 6, 1841, at Brown's Indian Queen hotel, Washington. Oath administered by Judge William Cranch.	51
1844	**James K. Polk**	Tenn.	Dem.	275	170	1,337,243	*George M. Dallas*	Pa.	XV. **James Knox Polk,** on the eastern portico of the Capitol, Tuesday, March 4, 1845. Oath administered by Chief Justice Taney.	49
	Henry Clay	Ky.	Whig	...	105	1,299,062	T. Frelinghuysen	N. J.		
	James G. Birney	N. Y.	Lib.	...	...	62,300	Thomas Morris	Ohio		
1848	**Zachary Taylor**	La.	Whig	290	163	1,360,099	*Millard Fillmore*	N. Y.	XVI. **Zachary Taylor,** on the eastern portico of the Capitol, Monday, March 5, 1849. March 4 came on Sunday. Oath administered by Chief Justice Taney.	64
	Lewis Cass	Mich.	Dem.	...	127	1,220,544	Wm. O. Butler	Ky.		
	Martin Van Buren	N. Y.	F. S.	...	...	291,263	Chas. F. Adams	Mass.		
									Millard Fillmore, in the House of Representatives, 12 noon, Wednesday, July 10, 1850. Oath administered by Judge William Cranch.	50
1852	**Franklin Pierce**	N. H.	Dem.	296	254	1,601,274	*William R. King*	Ala.	XVII. **Franklin Pierce,** on the eastern portico of the Capitol, Friday, March 4, 1853. Oath administered by Chief Justice Taney.	48
	Winfield Scott	N. J.	Whig	...	42	1,386,580	Wm. A. Graham	N. C.		
	John P. Hale	N. H.	Fed. D.	...	...	155,825	George W. Julian	Ind.		
1856	**James Buchanan**	Pa.	Dem.	296	174	1,838,169	*J. C. Breckenridge*	Ky.	XVIII. **James Buchanan,** on the eastern portico of the Capitol, Wednesday, March 4, 1857. Oath administered by Chief Justice Taney.	65
	John C. Fremont	Calif.	Rep.	...	114	1,341,264	Wm. L. Dayton	N. J.		
	Millard Fillmore	N. Y.	Amer.	...	8	874,534	A. J. Donelson	Tenn.		

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[1] Prior to 1804 each elector was entitled to vote for two candidates for President. The candidate with the greatest number of votes was declared elected President; the candidate with the next highest vote was declared elected Vice-President. [2] As there was no election the choice was decided by the House of Representatives.

PRESIDENTIAL ELECTIONS AND INAUGURATIONS—Concluded

Year	Presidential Candidates	State	Party	Vote			Vice-Pres. Candidates		Facts Concerning Inauguration	Age at Inaug.
				Total	Electoral	Popular	Name	State		
1860	**Abraham Lincoln**	Ill.	Rep.	303	180	1,866,452	*Hannibal Hamlin*	Me.	XIX. **Abraham Lincoln,** on the eastern portico of the Capitol, Monday, March 4, 1861. Oath administered by Chief Justice Taney.	52
	J. C. Breckenridge	Ky.	Dem.	...	72	847,953	Joseph Lane	Ind.		
	Stephen A. Douglas	Ill.	Union D.	...	39	1,375,157	H. V. Johnson	Ga.		
	John Bell	Tenn.	Amer.	...	12	590,631	Edward Everett	Mass.		
1864	**Abraham Lincoln**	Ill.	Rep.	314	212	2,213,665	*Andrew Johnson*	Tenn.	XX. **Abraham Lincoln,** for a second term, on the eastern portico of the Capitol, Saturday, March 4, 1865. Oath administered by Chief Justice Chase.	
	Geo. B. McClellan	N. J.	Dem.	...	21	1,802,237	G. H. Pendleton	Ohio		
1868	**Ulysses S. Grant**	Ill.	Rep.	317	214	3,012,833	*Schuyler Colfax*	Ind.		
	Horatio Seymour	N. Y.	Dem.	...	80	2,703,249	F. P. Blair, Jr.	Mo.		
1872	**Ulysses S. Grant**	Ill.	Rep.	366	286	3,597,132	*Henry Wilson*	Mass.		
	Horace Greeley	N. Y.	D. & L.	...	...	2,834,125	B. Gratz Brown	Mo.	**Andrew Johnson,** in his rooms at the Kirkwood House, Washington, D. C., 10 A. M., Saturday, April 15, 1865. Oath administered by Chief Justice Chase.	56
	Charles O'Conor	N. Y.	Dem.	...	...	29,489	John Q. Adams	Mass.		
	James Black	Pa.	Temp.	...	...	5,608	John Russell	Mich.		
	Thos. A. Hendricks	Ind.	Dem.	...	42[1]	....	Geo. W. Julian	Ind.		
	B. Gratz Brown	Mo.	Dem.	...	18	....	A. H. Colquitt	Ga.		
	Charles J. Jenkins	Ga.	Dem.	...	2	....	J. M. Palmer	Ill.	XXI. **Ulysses Simpson Grant,** on the eastern portico of the Capitol, Thursday, March 4, 1869. Oath of office administered by Chief Justice Chase.	46
	David Davis	Ill.	Ind.	...	1	....	T. E. Bramlette	Ky.		
	Electoral votes not counted	.....	....	...	17	....	W. S. Grosbeck W. B. Machen	Ohio Ky.		
							N. P. Banks	Mass.	XXII. **Ulysses Simpson Grant,** for a second term, on the eastern portico of the Capitol, Tuesday, March 4, 1873. Oath administered by Chief Justice Chase.	
1876	**Ruth'd B. Hayes**	Ohio	Rep.	369	185	4,036,298	*Wm. A. Wheeler*	N. Y.		
	Samuel J. Tilden	N. Y.	Dem.	...	184	4,300,590	T. A. Hendricks	Ind.		
	Peter Cooper	N. Y.	Grb.	...	...	81,737	Samuel F. Cary	Ohio		
	Green Clay Smith	Ky.	Pro.	...	...	9,522	G. T. Stewart	Ohio		
	James B. Walker	Ill.	Amer.	...	...	2,636	D. Kirkpatrick	N. Y.	XXIII. **Rutherford Birchard Hayes,** privately in the White House, at 7:05 P. M., Saturday, March 3, 1877. Oath administered by Chief Justice Waite. The oath of office was publicly taken March 5, 1877.	54
1880	**James A. Garfield**	Ohio	Rep.	369	214	4,454,416	*Chester A. Arthur*	N. Y.		
	Win'd S. Hancock	Pa.	Dem.	...	155	4,444,952	Wm. H. English	Ind.		
	James B. Weaver	Iowa	Grb.	...	...	308,578	B. J. Chambers	Tex.		
	Neal Dow	Me.	Pro.	...	...	10,305	H. A. Thompson	Ohio		
1884	**Grover Cleveland**	N. Y.	Dem.	401	219	4,874,986	*T. A. Hendricks*	Ind.	XXIV. **James Abram Garfield,** on eastern portico of the Capitol, Friday, March 4, 1881. Oath administered by Chief Justice Waite.	49
	James G. Blaine	Me.	Rep.	...	182	4,851,981	John A. Logan	Ill.		
	John P. St. John	Kan.	Pro.	...	...	150,369	William Daniel	Md.		
	Benjamin F. Butler	Mass.	People's	...	...	175,370	A. M. West	Miss.		
1888	**Benjamin Harrison**	Ind.	Rep.	401	233	5,439,853	*Levi P. Morton*	N. Y.	**Chester Alan Arthur,** at his residence, N. Y., 2 A. M., Tuesday, Sept. 20, 1881, oath administered by Jno. R. Brady, justice of the N. Y. supreme court. Oath repeated at the Capitol, September 22, 1881; administered by Chief Justice Waite.	50
	Grover Cleveland	N. Y.	Dem.	...	168	5,549,309	A. G. Thurman	Ohio		
	Clinton B. Fisk	N. J.	Pro.	...	...	249,506	John A. Brooks	Mo.		
	Alson J. Streeter	Ill.	U. L.	...	...	146,935	C. E. Cunningham	Ark.		
1892	**Grover Cleveland**	N. Y.	Dem.	444	277	5,554,437	*A. E. Stevenson*	Ill.	XXV. **Grover Cleveland,** on the eastern portico of the Capitol, Wednesday, March 4, 1885. Oath administered by Chief Justice Waite.	47
	Benjamin Harrison	Ind.	Rep.	...	145	5,175,287	Whitelaw Reid	N. Y.		
	James B. Weaver	Iowa	People's	...	22	1,041,028	James G. Field	Va.		
	John Bidwell	Calif.	Pro.	...	...	264,133	James R. Cranfill	Texas		
	Simon Wing	Mass.	S. L.	...	...	21,164	C. H. Matchett	N. Y.		
1896	**William McKinley**	Ohio	Rep.	447	271	7,104,779	*Garret A. Hobart*	N. J.	XXVI. **Benjamin Harrison,** on eastern portico of the Capitol, Monday, March 4, 1889. Oath administered by Chief Justice Fuller.	55
	William J. Bryan	Neb.	Dem.	...	176	6,502,925	Arthur Sewall	Me.		
	William J. Bryan	Neb.	People's				Th. E. Watson	Ga.		
	John M. Palmer	Ill.	Nat. Dem.	...	...	133,148	Sim. B. Buckner	Ky.		
	Joshua Levering	Md.	Pro.	...	...	132,007	Hale Johnson	Ill.	XXVII. **Grover Cleveland,** on eastern portico of the Capitol, Saturday, March 4, 1893. Oath administered by Chief Justice Fuller.	55
	Chas. H. Matchett	N. Y.	So. L.	...	...	36,274	Matthew McGuire	N. J.		
	Chas. E. Bentley	Neb.	Nat.	...	...	13,969	J. H. Southgate	N. C.		
1900	**William McKinley**	Ohio	Rep.	447	292	7,219,101	*Theo. Roosevelt*	N. Y.	XXVIII. **William McKinley,** on the eastern portico of the Capitol, Thursday, March 4, 1897. Oath administered by Chief Justice Fuller.	54
	William J. Bryan	Neb.	Dem. & P.	...	155	6,357,054	A. E. Stevenson	Ill.		
	James G. Woolley	Ill.	Pro.	...	...	208,187	Henry B. Metcalf	R. I.		
	Eugene V. Debs	Ind.	S. D.	...	...	87,814	Job Harriman	Calif.		
	Wharton Barker	Pa.	M. R. P.	...	...	51,585	Ignatius Donnelly	Minn.	XXIX. **William McKinley,** for a second term, on the eastern portico of the Capitol, Monday, March 4, 1901. Oath administered by Chief Justice Fuller.	
	Jos. F. Malloney	Mass.	S. L.	...	...	99,613	Val. Remmel	Pa.		
1904	**Theodore Roosevelt**	N. Y.	Rep.	476	336	7,623,486	*Chas. W. Fairbanks*	Ind.		
	Alton B. Parker	N. Y.	Dem.	...	140	5,077,971	Henry G. Davis	W. Va.	**Theodore Roosevelt,** at residence of Ansley Wilcox, Buffalo, N. Y., September 14, 1901, at 3:32 P. M. Oath administered by Judge John R. Hazel, of the United States district court.	42
	Eugene V. Debs	Ind.	Soc.	...	...	402,283	Benjamin Hanford	N. Y.		
	Silas C. Swallow	Pa.	Pro.	...	...	258,536	George W. Carroll	Texas		
	Thomas E. Watson	Ga.	People's	...	...	117,183	Thomas H. Tibbles	Neb.		
1908	**William H. Taft**	Ohio	Rep.	483	321	7,637,676	*James S. Sherman*	N. Y.	XXX. **Theodore Roosevelt,** on the eastern portico of the Capitol, Saturday, March 4, 1905. Oath administered by Chief Justice Melville W. Fuller.	
	William J. Bryan	Neb.	Dem.	...	162	6,393,182	John W. Kern	Ind.		
	Eugene V. Debs	Ind.	Soc.	...	...	420,393	Benjamin Hanford	N. Y.		
	Eugene W. Chafin	Ill.	Pro.	...	...	241,252	Aaron S. Watkins	.....		
	Thomas L. Hisgen	Mass.	Ind. L.	...	...	83,183	Jno. Tem. Graves	Ga.		
1912	**Woodrow Wilson**	N. J.	Dem.	531	435	6,282,542	*Thos. R. Marshall*	Ind.	XXXI. **William Howard Taft,** in the chamber of the House of Representatives, Washington, March 4, 1909. Oath administered by Chief Justice Fuller.	51
	Theodore Roosevelt	N. Y.	Prog.	...	88	4,114,585	Hiram Johnson	Calif.		
	William H. Taft	Ohio	Rep.	...	8	3,480,479	James S. Sherman[2]	N. Y.		
							Nicholas M. Butler	N. Y.		
	Eugene V. Debs	Ind.	Soc.	...	...	820,606	Emil Seidel	Wis.	XXXII. **Woodrow Wilson,** on eastern portico of the Capitol, March 4, 1913. Oath administered by Chief Justice Edward D. White.	56
	Eugene W. Chafin	Ill.	Pro.	...	...	181,762	Aaron S. Watkins	Ky.		
1916	**Woodrow Wilson**	N. J.	Dem.	531	277	9,129,606	*Thos. R. Marshall*	Ind.		
	Chas. E. Hughes	N. Y.	Rep.	...	254	8,538,221	Chas. W. Fairbanks	Ind.	XXXIII. **Woodrow Wilson,** on eastern portico of the Capitol, March 4, 1917. Oath administered by Chief Justice Edward D. White.	
	Allan L. Benson	N. Y.	Soc.	...	...	585,113	Geo. R. Kirkpatrick	N. J.		
	J. Frank Hanley	Ind.	Pro.	...	...	220,506	Dr. Ira Landrith	Tenn.		
1920	**Warren G. Harding**	Ohio	Rep.	531	404	16,152,200	*Calvin Coolidge*	Mass.	XXXIV. **Warren Gamaliel Harding,** on the eastern portico of the Capitol, March 4, 1921. Oath administered by Chief Justice Edward D. White.	55
	James M. Cox	Ohio	Dem.	...	127	9,147,353	Franklin D. Roosevelt	N. Y.		
	P. P. Christensen	Ohio	F. L.	...	...	265,411	Max S. Hayes	Ohio		
	Aaron B. Watkins	N. Y.	Pro.	...	...	189,408	D. Leigh Calvin	N. Y.		
	Eugene V. Debs	Ind.	Soc.	...	...	919,799	Seymour Stedman	Ill.	**Calvin Coolidge,** at home of his father, John C. Coolidge, Plymouth, Vt., August 2, 1923. Oath administered by his father.	
1924	**Calvin Coolidge**	Mass.	Rep.	531	382	15,718,789	*Chas. G. Dawes*	Ill.	XXXV. **Calvin Coolidge,** on plaza of the Capitol, March 4, 1925. Oath administered by Chief Justice, Ex-President, Wm. H. Taft.	53
	John W. Davis	W. Va.	Dem.	...	136	8,378,962	Chas. W. Bryan	Neb.		
	Robt. M. LaFollette	Wis.	Prog. & F. L.	...	13	4,822,319	Burton K. Wheeler	Mont.		
1928	**Herbert C. Hoover**	Calif.	Rep.	531	444	21,943,328	*Chas. Curtis*	Kan.	XXXVI. **Herbert C. Hoover,** on eastern portico of the Capitol, March 4, 1929. Oath administered by Chief Justice Wm. H. Taft.	54
	Alfred E. Smith......	N. Y.	Dem.	...	87	15,430,718	Joseph T. Robinson	Ark.		
	Norman Thomas	N. Y.	Soc.	...	...	267,420	Jas. A. Maurer	Pa.		
1932	**Franklin D. Roosevelt**	N. Y.	Dem.	531	472	22,815,785	*John N. Garner*	Tex.	XXXVII. **Franklin D. Roosevelt,** on rostrum in front of Capitol, March 4, 1933. Broadcast over radio. Chief Justice Hughes administered oath.	51
	Herbert Hoover	Calif.	Rep.	...	59	15,759,266	Chas. Curtis	Kan.		
	Norman Thomas	N. Y.	Soc.	...	...	881,951	Jas. A. Maurer	Pa.		
	William Z. Foster	Ill.	Workers	...	...	102,785	James W. Ford	Ala.		
1936	**Franklin D. Roosevelt**	N. Y.	Dem.	531	523	24,476,673	*John N. Garner*	Tex.	XXXVIII. **Franklin D. Roosevelt,** on east portico of the Capitol, January 20, 1937. Chief Justice Hughes administered the oath.	54
	Alfred M. Landon	Kan.	Rep.	...	8	16,679,583	Frank Knox	Ill.		
	William Lemke	N. D.	Union	...	...	882,479	T. C. O'Brien	Mass.		
	Norman Thomas	N. Y.	Soc.	...	...	187,720	George Nelson	Wis.		
1940	**Franklin D. Roosevelt**	N. Y.	Dem.	531	449	27,243,466	*Henry A. Wallace*	Iowa	XXXIX. **Franklin D. Roosevelt,** on the steps of the Capitol, January 20, 1941. Oath administered by Chief Justice Hughes.	58
	Wendell L. Willkie	Ind.	Rep.	...	82	22,304,755	Charles L. McNary	Ore.		
	Norman Thomas	N. Y.	Soc.	...	...	99,557	Maynard C. Krueger	Ill.		
	Roger Babson	Mass.	Pro.	...	...	57,812	Edgar V. Moorman	Ill.		

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[1] Owing to the death of Horace Greeley the Democratic electors scattered their vote. [2] Died Oct. 30, 1912, just prior to the election Nov. 5.

JUSTICES OF THE U. S. SUPREME COURT

Name	Service		Born	Died
	Term	Years		
John Jay, N. Y.	1789–1795	6	1745	1829
John Rutledge, S. C.	1789–1791	2	1739	1800
William Cushing, Mass.	1789–1810	21	1733	1810
James Wilson, Pa.	1789–1798	9	1742	1798
John Blair, Va.	1789–1796	7	1732	1800
Robert H. Harrison, Md.	1789–1790	1	1745	1790
James Iredell, N. C.	1790–1799	9	1751	1799
Thomas Johnson, Md.	1791–1793	2	1732	1819
William Paterson, N. J.	1793–1806	13	1745	1806
John Rutledge, S. C.	1795–1795	..	1739	1800
Samuel Chase, Md.	1796–1811	15	1741	1811
Oliver Ellsworth, Conn.	1796–1800	4	1745	1807
Bushrod Washington, Va.	1798–1829	31	1762	1829
Alfred Moore, N. C.	1799–1804	5	1755	1810
John Marshall, Va.	1801–1835	34	1755	1835
William Johnson, S. C.	1804–1834	30	1771	1834
Brock Livingston, N. Y.	1806–1823	17	1757	1823
Thomas Todd, Ky.	1807–1826	19	1765	1826
Joseph Story, Mass.	1811–1845	34	1779	1845
Gabriel Duval, Md.	1811–1836	25	1752	1844
Smith Thompson, N. Y.	1823–1843	20	1767	1843
Robert Trimble, Ky.	1826–1828	2	1777	1828
John McLean, Ohio	1829–1861	32	1785	1861
Henry Baldwin, Pa.	1830–1844	14	1779	1844
James M. Wayne, Ga.	1835–1867	32	1790	1867
Roger B. Taney, Md.	1836–1864	28	1777	1864
Philip P. Barbour, Va.	1836–1841	5	1783	1841
John Catron, Tenn.	1837–1865	28	1786	1865
John McKinley, Ala.	1837–1852	15	1780	1852
Peter V. Daniel, Va.	1841–1860	19	1785	1860
Samuel Nelson, N. Y.	1845–1872	27	1792	1873
Levi Woodbury, N. H.	1845–1851	6	1789	1851
Robert C. Grier, Pa.	1846–1870	24	1794	1870
Benjamin R. Curtis, Mass.	1851–1857	6	1809	1874
John A. Campbell, Ala.	1853–1861	8	1811	1889
Nathan Clifford, Me.	1858–1881	23	1803	1881
Noah H. Swayne, Ohio	1862–1881	19	1804	1884
Samuel F. Miller, Iowa	1862–1890	28	1816	1890
David Davis, Ill.	1862–1877	15	1815	1886
Stephen J. Field, Calif.	1863–1897	34	1816	1899
Salmon P. Chase, Ohio	1864–1873	9	1808	1873
William Strong, Pa.	1870–1880	10	1808	1895
Joseph B. Bradley, N. J.	1870–1892	22	1813	1892
Ward Hunt, N. Y.	1872–1882	10	1811	1886
Morrison R. Waite, Ohio	1874–1888	14	1816	1888
John M. Harlan, Ky.	1877–1911	34	1833	1911
William B. Woods, Ga.	1880–1887	7	1824	1887
Stanley Matthews, Ohio	1881–1889	8	1824	1889
Horace Gray, Mass.	1881–1902	21	1828	1902
Samuel Blatchford, N. Y.	1882–1893	11	1820	1893
Lucius Q. C. Lamar, Miss.	1888–1893	5	1825	1893
Melville W. Fuller, Ill.	1888–1910	22	1833	1910
David J. Brewer, Kan.	1889–1910	21	1837	1910
Henry B. Brown, Mich.	1890–1906	16	1836	1913
George Shiras, Jr., Pa.	1892–1903	11	1832	1924
Howell E. Jackson, Tenn.	1893–1895	2	1832	1895
Edward D. White, La.	1894–1910	16	1845	1921
Rufus W. Peckham, N. Y.	1896–1909	14	1838	1909
Joseph McKenna, Calif.	1898–1925	27	1843	1926
Oliver W. Holmes, Mass.	1902–1932	29	1841	1935
William R. Day, Ohio	1903–1923	19	1849	1923
William H. Moody, Mass.	1906–1910	4	1853	1917
Horace H. Lurton, Tenn.	1909–1914	5	1844	1914
Charles E. Hughes, N. Y.	1910–1916	6	1862	....
Edward D. White, La.	1910–1921	11	1845	1921
Willis Van Devanter, Wyo.	1911–1937	26	1859	1941
Jos. R. Lamar, Ga.	1911–1916	5	1857	1916
Mahlon Pitney, N. J.	1912–1922	10	1858	1924
James C. McReynolds, Tenn.	1914–1941	27	1862	....
Louis D. Brandeis, Mass.	1916–1939	23	1856	1941
John H. Clarke, Ohio	1916–1922	6	1857	....
William H. Taft, Conn.	1921–1930	9	1857	1930
George Sutherland, Utah	1922–1938	16	1862	....
Pierce Butler, Minn.	1922–1939	17	1866	1939
Edward T. Sanford, Tenn.	1923–1930	7	1865	1930
Harlan F. Stone, N. Y.	1925–1941	16	1872	....
Charles E. Hughes, N. Y.	1930–1941	11	1862	....
Owen J. Roberts, Pa.	1930–....	..	1875	...
Benjamin N. Cardozo, N. Y.	1932–1938	6	1870	1938
Hugo L. Black, Ala.	1937–....	..	1886	...
Stanley Reed, Ky.	1938–....	..	1884	..
Felix Frankfurter, Mass.	1939–....	..	1882	..
William O. Douglas, Conn.	1939–....	..	1898	.
Frank Murphy, Mich.	1940–....	..	1893	
James F. Byrnes, S. C.	1941–....	..	1879	...
Robert H. Jackson, Pa.	1941–....	..	1892	...
Harlan F. Stone, N. Y.	1941–....	..	1872	...

Bold-face type denotes Chief Justices.

CONTINENTAL CONGRESS, PRESIDENTS OF

Peyton Randolph, Virginia	1774
Henry Middleton, South Carolina	1774
Peyton Randolph, Virginia	1775
John Hancock, Massachusetts	1776
Henry Laurens, South Carolina	1778
John Jay, New York	1779
Samuel Huntington, Connecticut	1779
Thomas McKean, Delaware	1781
John Hanson, Maryland	1782
Elias Boudinot, New Jersey	1782
Thomas Mifflin, Pennsylvania	1783
Richard Henry Lee, Virginia	1784
John Hancock, Massachusetts	1786
Nathaniel Gorham, Massachusetts	1786
Arthur St. Clair, Pennsylvania	1787
Cyrus Griffin, Virginia	1788

SPEAKERS OF THE HOUSE OF REPRESENTATIVES

Congress	Years	Name	State	Born	Died
1	1789–91	F. A. Muhlenburg	Pa.	1750	1801
2	1791–93	J. Trumbull	Conn.	1740	1809
3	1793–95	F. A. Muhlenburg	Pa.	1750	1801
4–5	1795–99	J. Dayton	N. J.	1760	1824
6	1799–1801	Theo. Sedgwick	Mass.	1746	1813
7–9	1801–07	Nathaniel Macon	N. C.	1757	1837
10–11	1807–11	J. B. Varnum	Mass.	1750	1821
12–13	1811–14	Henry Clay	Ky.	1777	1852
13	1814–15	Langdon Cheves	S. C.	1776	1857
14–16	1815–20	Henry Clay	Ky.	1777	1852
16	1820–21	John W. Taylor	N. Y.	1784	1854
17	1821–23	P. P. Barbour	Va.	1783	1841
18	1823–25	Henry Clay	Ky.	1777	1852
19	1825–27	John W. Taylor	N. Y.	1784	1854
20–23	1827–34	A. Stevenson	Va.	1784	1857
23	1834–35	John Bell	Tenn.	1797	1869
24–25	1835–39	James K. Polk	Tenn.	1795	1849
26	1839–41	R. M. T. Hunter	Va.	1809	1887
27	1841–43	John White	Ky.	1805	1845
28	1843–45	John W. Jones	Va.	1791	1848
29	1845–47	John W. Davis	Ind.	1799	1859
30	1847–49	R. C. Winthrop	Mass.	1809	1894
31	1849–51	Howell Cobb	Ga.	1815	1868
32–33	1851–55	Lynn Boyd	Ky.	1800	1859
34	1855–57	N. P. Banks	Mass.	1816	1894
35	1857–59	James L. Orr	S. C.	1822	1873
36	1859–61	Wm. Pennington	N. J.	1796	1862
37	1861–63	Galusha A. Grow	Pa.	1822	1907
38–40	1863–69	Schuyler Colfax	Ind.	1823	1885
41–43	1869–75	James G. Blaine	Me.	1830	1893
44	1875–76	Michael C. Kerr	Ind.	1827	1876
44–46	1876–81	S. J. Randall	Pa.	1828	1890
47	1881–83	Joseph W. Keifer	Ohio	1836	1932
48–50	1883–89	John G. Carlisle	Ky.	1835	1910
51	1889–95	Thomas B. Reed	Me.	1839	1902
52–53	1891–91	Charles F. Crisp	Ga.	1845	1896
54–55	1895–99	Thomas B. Reed	Me.	1839	1902
56–57	1899–1903	D. B. Henderson	Iowa	1840	1906
58–61	1903–1911	J. G. Cannon	Ill.	1836	1926
62–65	1911–1919	Champ Clark	Mo.	1850	1921
66–68	1919–1925	F. H. Gillett	Mass.	1851	1935
69–71	1925–1931	N. Longworth	Ohio	1869	1931
72	1931–1933	John N. Garner	Tex.	1869	....
73	1933–1934	Henry T. Rainey	Ill.	1860	1934
74	1935–1936	Joseph W. Byrns	Tenn.	1869	1936
74–76	1936–1940	Wm. B. Bankhead	Ala.	1874	1940
76–	1940–	Sam Rayburn	Tex.	1882	....

THE DECLARATION OF INDEPENDENCE

[Note. The text of the Declaration printed here reproduces the original document in spelling and punctuation.]

In CONGRESS, July 4, 1776

The unanimous Declaration of the thirteen united States of America,

When in the Course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.—We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.—That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed,—That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.—Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.—He has refused his Assent to Laws, the most wholesome and necessary for the public good.—He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.—He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.—He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.—He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.—He has refused for a long time after such dissolutions to cause others to be elected; whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within.—He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new Appropriations of Lands.—He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary powers.—He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.—He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people, and eat out their substance.—He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.—He has effected to render the Military independent of and superior to the Civil power.—He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:—For quartering large bodies of armed troops among us: —For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:—For cutting off our Trade with all parts of the world:—For imposing Taxes on us without our Consent:—For depriving us in many cases of the benefits of Trial by Jury:—For transporting us beyond Seas to be tried for pretended offences:—For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:—For taking away our Charters, abolishing our most valuable Laws, and altering fundamentally the Forms of our Governments:—For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.—He has abdicated Government here, by declaring us out of his Protection and waging War against us.—He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.—He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.—He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.—He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers; the merciless Indian Savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes and conditions. In every stage of these Oppressions We have Petitioned for Redress in the most humble terms Our repeated Petitions have been answered by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people. Nor have We been wanting in attentions to our Brittish brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which would inevitably interrupt our connections and correspondence They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

We, therefore, the Representatives of the united States of America, in General Congress, Assembled, appealing to the Supreme Judge of the World for the rectitude of our intentions, do, in the Name, and by authority of the good People of these Colonies solemnly publish and declare, That these United Colonies are and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do.—And for the support of the Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.

SIGNERS OF THE DECLARATION OF INDEPENDENCE

Name	Order[1]	Colony	Occupation	Born	Birthplace	Died	Age[2]
Adams, John	6	Massachusetts Bay	Lawyer	Oct. 30, 1735	Quincy...Mass.	July 4, 1826	90
Adams, Samuel	2	Massachusetts Bay	Brewer	Sept. 27, 1722	Boston...Mass.	Oct. 2, 1803	81
Bartlett, Josiah	9	New Hampshire	Physician	Nov. 21, 1729	Amesbury...Mass.	May 19, 1795	66
Braxton, Carter	51	Virginia	Planter	Sept. 10, 1736	Newington...Va.	Oct. 10, 1797	61
Carroll, Charles	31	Maryland	Lawyer	Sept. 20, 1737	Annapolis...Md.	Nov. 14, 1832	95
Chase, Samuel	44	Maryland	Lawyer	April 17, 1741	Somerset Co...Md.	June 19, 1811	70
Clark, Abraham	14	New Jersey	Lawyer	Feb. 15, 1726	Elizabethtown...N. J.	Sept. 15, 1794	68
Clymer, George	38	Pennsylvania	Merchant	Mar. 16, 1739	Philadelphia...Pa.	Jan. 23, 1813	73
Ellery, William	22	R. I. and Prov. Plan.	Lawyer	Dec. 22, 1727	Newport...R. I.	Feb. 15, 1820	92
Floyd, William	5	New York	Farmer	Dec. 17, 1734	Brookhaven...N. Y.	Aug. 4, 1821	86
Franklin, Benjamin	46	Pennsylvania	Printer	Jan. 17, 1706	Boston...Mass.	April 17, 1790	84
Gerry, Elbridge	8	Massachusetts Bay	Merchant	July 17, 1744	Marblehead...Mass.	Nov. 23, 1814	70
Gwinnett, Button	40	Georgia	Merchant	1735	Down Hatherly...England	May 16, 1777	42
Hancock, John	1	Massachusetts Bay	Merchant	Jan. 12, 1737	Braintree...Mass.	Oct. 8, 1793	58
Hall, Lyman	47	Georgia	Physician	April 12, 1724	Wallingford...Conn.	Oct. 19, 1790	66
Harrison, Benjamin	54	Virginia	Farmer	April 5, 1726	Berkeley...Va.	April 24, 1791	65
Hart, John	13	New Jersey	Farmer	1711	Stonington...Conn.	May 11, 1779	68
Hewes, Joseph	35	North Carolina	Merchant	Jan. 23, 1730	Kingston...N. J.	Nov. 10, 1779	49
Heyward, Thomas, Jr.	56	South Carolina	Lawyer	July 28, 1746	St. Luke's...S. C.	Mar. 6, 1809	62
Hooper, William	23	North Carolina	Lawyer	June 17, 1742	Boston...Mass.	Oct. 14, 1790	48
Hopkins, Stephen	12	R. I. and Prov. Plan.	Merchant	Mar. 7, 1707	Providence...R. I.	July 13, 1785	78
Hopkinson, Francis	29	New Jersey	Lawyer	Oct. 2, 1737	Philadelphia...Pa.	May 9, 1791	53
Huntington, Samuel	11	Connecticut	Lawyer	July 3, 1731	Windham...Conn.	Jan. 5, 1796	64
Jefferson, Thomas	32	Virginia	Lawyer	April 13, 1743	Shadwell...Va.	July 4, 1826	83
Lee, Richard Henry	48	Virginia	Soldier	Jan. 20, 1732	Stratford...Va.	June 19, 1794	62
Lee, Francis Lightfoot	55	Virginia	Farmer	Oct. 14, 1734	Stratford...Va.	Jan. 11, 1797	62
Lewis, Francis	7	New York	Merchant	Mar. 21, 1713	Llandaff...Wales	Dec. 30, 1803	90
Livingston, Philip	3	New York	Merchant	Jan. 15, 1716	Albany...N. Y.	June 12, 1778	62
Lynch, Thomas, Jr.	43	South Carolina	Planter	Aug. 5, 1749	Winyah...S. C.	At sea ...1779	30
McKean, Thomas	39	Delaware	Lawyer	Mar. 19, 1734	New London...Pa.	June 24, 1817	83
Middleton, Arthur	50	South Carolina	Planter	June 26, 1742	Middleton Pl...S. C.	Jan. 1, 1787	45
Morris, Lewis	15	New York	Farmer	April 8, 1726	Morrisania...N. Y.	Jan. 22, 1798	71
Morris, Robert	24	Pennsylvania	Merchant	Jan. 31, 1734	Liverpool...England	May 8, 1806	72
Morton, John	16	Pennsylvania	Surveyor	1724	Ridley...Pa.	April 1777	53
Nelson, Thomas, Jr.	49	Virginia	Statesman	Dec. 26, 1738	York...Va.	Jan. 4, 1789	50
Paca, William	28	Maryland	Lawyer	Oct. 31, 1740	Wye Hall...Md.	Oct. 13, 1799	59
Paine, Robert Treat	4	Massachusetts Bay	Lawyer	Mar. 11, 1731	Boston...Mass.	May 11, 1814	83
Penn, John	18	North Carolina	Lawyer	May 17, 1741	Caroline Co...Va.	Sept. 14, 1788	47
Read, George	41	Delaware	Lawyer	Sept. 18, 1733	Cecil Co...Md.	Sept. 21, 1798	65
Rodney, Caesar	52	Delaware	General	Oct. 7, 1728	Dover...Del.	June 29, 1784	55
Ross, George	37	Pennsylvania	Lawyer	May 10, 1730	Newcastle...Del.	July 14, 1779	49
Rush, Benjamin	27	Pennsylvania	Physician	Dec. 24, 1745	Berberry...Pa.	April 19, 1813	67
Rutledge, Edward	34	South Carolina	Lawyer	Nov. 23, 1749	Charleston...S. C.	Jan. 23, 1800	50
Sherman, Roger	19	Connecticut	Shoemaker	April 19, 1721	Newton...Mass.	July 23, 1793	72
Smith, James	36	Pennsylvania	Lawyer	1719	Ireland	July 11, 1806	87
Stockton, Richard	10	New Jersey	Lawyer	Oct. 1, 1730	Princeton...N. J.	Feb. 28, 1781	50
Stone, Thomas	30	Maryland	Lawyer	1743	Poynton Manor...Md.	Oct. 5, 1787	44
Taylor, George	33	Pennsylvania	Iron Maker	1716	Ireland	Feb. 23, 1781	65
Thornton, Matthew	17	New Hampshire	Physician	1714	Ireland	June 24, 1803	89
Walton, George	53	Georgia	Lawyer	1741	Prince Edward Co...Va.	Feb. 2, 1804	63
Whipple, William	20	New Hampshire	Merchant	Jan. 14, 1730	Kittery...Me.	Nov. 28, 1785	55
Williams, William	26	Connecticut	Statesman	April 8, 1731	Lebanon...Conn.	Aug. 2, 1811	80
Wilson, James	42	Pennsylvania	Lawyer	Sept. 14, 1742	Carskerdo...Scotland	Aug. 28, 1798	56
Witherspoon, John	21	New Jersey	Minister	Feb. 5, 1723	Yester...Scotland	Nov. 15, 1794	71
Wolcott, Oliver	25	Connecticut	Jurist	Nov. 20, 1726	Windsor...Conn.	Dec. 1, 1797	71
Wythe, George	45	Virginia	Lawyer	1726	Elizabeth Co...Va.	June 8, 1806	80

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[1] Order in which they signed. [2] Age at death.

THE ARTICLES OF CONFEDERATION

[NOTE. The text of the Articles reproduces the original in spelling and punctuation.]

To all to whom these Presents shall come, we the undersigned Delegates of the States affixed to our Names, send greeting.

Whereas the Delegates of the United States of America in Congress assembled did on the fifteenth day of November in the Year of Our Lord One thousand seven Hundred and Seventy-seven, and in the second Year of the Independence of America agree to certain Articles of Confederation and perpetual Union between the States of Newhampshire, Massachusetts-bay, Rhodeisland and Providence Plantations, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North-Carolina, South-Carolina and Georgia, in the Words following, viz. Articles of Confederation and perpetual Union between the states of Newhampshire, Massachusetts-bay, Rhodeisland and Providence Plantations, Connecticut, New-York, New-Jersey, Pennsylvania, Delaware, Maryland, Virginia, North-Carolina, South-Carolina and Georgia.

ARTICLE I. The stile of this confederacy shall be "The United States of America."

ARTICLE II. Each State retains its sovereignty, freedom and independence, and every power, Jurisdiction and right, which is not by this confederation expressly delegated to the United States, in Congress assembled.

ARTICLE III. The said states hereby severally enter into a firm league of friendship with each other, for their common defence, the security of their Liberties, and their mutual and general welfare, binding themselves to assist each other, against all force offered to, or attacks made upon them, or any of them, on account of religion, sovereignty, trade, or any other pretence whatever.

ARTICLE IV. The better to secure and perpetuate mutual friendship and intercourse among the people of the different states in this union, the free inhabitants of each of these states, paupers, vagabonds and fugitives from justice excepted, shall be entitled to all privileges and immunities of free citizens in the several states; and the people of each state shall have free ingress and regress to and from any other state, and shall enjoy therein all the privileges of trade and commerce, subject to the same duties, impositions and restrictions as the inhabitants thereof respectively, provided that such restriction shall not extend so far as to prevent the removal of property imported into any state, to any other state of which the Owner is an inhabitant; provided also that no imposition, duties or restriction shall be laid by any state, on the property of the united states, or either of them.

If any Person guilty of, or charged with treason, felony, or other high misdemeanor in any state, shall flee from Justice, and be found in any of the united states, he shall upon demand of the Governor or executive power, of the state from which he fled, be delivered up and removed to the state having jurisdiction of his offence.

Full faith and credit shall be given in each of these states to the records, acts and judicial proceedings of the courts and magistrates of every other state.

ARTICLE V. For the more convenient management of the general interests of the united states, delegates shall be annually appointed in such manner as the legislature of each state shall direct, to meet in Congress on the first Monday in November, in every year, with a power reserved to each state, to recal its delegates, or any of them, at any time within the year, and to send others in their stead, for the remainder of the Year.

No state shall be represented in Congress by less than two, nor by more than seven members; and no person shall be capable of being a delegate for more than three years in any term of six years; nor shall any person, being a delegate, be capable of holding any office under the united states, for which he, or another for his benefit receives any salary, fees or emolument of any kind.

Each state shall maintain its own delegates in a meeting of the states, and while they act as members of the committee of the states.

In determining questions in the united states, in Congress assembled, each state shall have one vote.

Freedom of speech and debate in Congress shall not be impeached or questioned in any court, or place out of Congress, and the members of congress shall be protected in their persons from arrests and imprisonments, during the time of their going to and from, and attendance on congress, except for treason, felony, or breach of the peace.

ARTICLE VI. No State without the consent of the united states in congress assembled, shall send any embassy to, or receive any embassy from, or enter into any conference, agreement, alliance or treaty with any King prince or state; nor shall any person holding any office of profit or trust under the united states, or any of them, accept of any present, emolument, office or title of any kind whatever from any king, prince or foreign state; nor shall the united states in congress assembled, or any of them, grant any title of nobility.

No two or more states shall enter into any treaty, confederation or alliance whatever between them, without the consent of the united states in congress assembled, specifying accurately the purposes for which the same is to be entered into, and how long it shall continue.

No state shall lay any imposts or duties, which may interfere with any stipulations in treaties, entered into by the united states in congress assembled, with any king, prince or state, in pursuance of any treaties already proposed by congress, to the courts of France and Spain.

No vessels of war shall be kept up in time of peace by any state, except such number only, as shall be deemed necessary by the united states in congress assembled, for the defence of such state, or its trade; nor shall any body of forces be kept up by any state, in time of peace, except such number only, as in the judgment of the united states, in congress assembled, shall be deemed requisite to garrison the forts necessary for the defence of such state; but every state shall always keep up a well regulated and disciplined militia, sufficiently armed and accoutred, and shall provide and constantly have ready for use, in public stores, a due number of field pieces and tents, and a proper quantity of arms, ammunition and camp equipage.

No state shall engage in any war without the consent of the united states in congress assembled, unless such state be actually invaded by enemies, or shall have received certain advice of a resolution being formed by some nation of Indians to invade such state, and the danger is so imminent as not to admit of a delay, till the united states in congress assembled can be consulted: nor shall any state grant commissions to any ships or vessels of war, nor letters of marque or reprisal, except it be after a declaration of war by the united states in congress assembled, and then only against the kingdom or state and the subjects thereof, against which war has been so declared, and under such regulations as shall be established by the united states in congress assembled, unless such state be infested by pirates, in which case vessels of war may be fitted out for that occasion, and kept so long as the danger shall continue, or until the united states in congress assembled shall determine otherwise.

ARTICLE VII. When land-forces are raised by any state for the common defence, all officers of or under the rank of colonel, shall be appointed by the legislature of each state respectively by whom such forces shall be raised, or in such manner as such state shall direct, and all vacancies shall be filled up by the state which first made the appointment.

ARTICLE VIII. All charges of war, and all other expences that shall be incurred for the common defence or general welfare, and allowed by the united states in congress assembled, shall be defrayed out of a common treasury, which shall be supplied by the several states, in proportion to the value of all land within each state, granted to or surveyed for any Person, as such land and the buildings and improvements thereon shall be estimated according to such mode as the united states in congress assembled, shall from time to time direct and appoint. The taxes for paying that proportion shall be laid and levied by the authority and direction of the legislatures of the several states within the time agreed upon by the united states in congress assembled.

ARTICLE IX. The united states in congress assembled, shall have the sole and exclusive right and power of determining on peace and war, except in the cases mentioned in the sixth article—of sending and receiving ambassadors—entering into treaties and alliances, provided that no treaty of commerce shall be made whereby the legislative power of the respective states shall be re-

Courtesy Colonial Williamsburg, Inc.

Where Justice Was Meted Out by Early Virginia Judges

The Courthouse that was first erected in 1770 has been rebuilt as a part of the reconstruction of Virginia's colonial capital at Williamsburg. The building was jointly owned by the City of Williamsburg and the County of James City, and here courts were held monthly to try those guilty of petty offenses

strained from imposing such imposts and duties on foreigners, as their own people are subjected to, or from prohibiting the exportation or importation of any species of goods or commodities whatsoever—of establishing rules for deciding in all cases, what captures on land or water shall be legal, and in what manner prizes taken by land or naval forces in the service of the united states shall be divided or appropriated—of granting letters of marque and reprisal in times of peace—appointing courts for the trial of piracies and felonies committed on the high seas and establishing courts for receiving and determining finally appeals in all cases of captures, provided that no member of congress shall be appointed a judge of any of the said courts.

The united states in congress assembled shall also be the last resort on appeal in all disputes and differences now subsisting or that hereafter may arise between two or more states concerning boundary, jurisdiction or any other cause whatever; which authority shall always be exercised in the manner following. Whenever the legislative or executive authority or lawful agent of any state in controversy with another shall present a petition to congress, stating the matter in question and praying for a hearing, notice thereof shall be given by order of congress to the legislative or executive authority of the other state in controversy, and a day assigned for the appearance of the parties by their lawful agents, who shall then be directed to appoint by joint consent, commissioners or judges to constitute a court for hearing and determining the matter in question: but if they cannot agree, congress shall name three persons out of each of the united states, and from the list of such persons each party shall alternately strike out one, the petitioners beginning, until the number shal be reduced to thirteen; and from that number not less than seven, nor more than nine names as congress shall direct, shall in the presence of congress be drawn out by lot, and the persons whose names shall be so drawn or any five of them, shall be commissioners or judges, to hear and finally determine the controversy, so always as a major part of the judges who shall hear the cause shall agree in the determination: and if either party shall neglect to attend at the day appointed, without showing reasons, which congress shall judge sufficient, or being present shall refuse to strike, the congress shall proceed to nominate three persons out of each state, and the secretary of congress shall strike in behalf of such party absent or refusing; and the judgment and sentence of the court to be appointed, in the manner before prescribed, shall be final and conclusive; and if any of the parties shall refuse to submit to the authority of such court, or to appear or defend their claim or cause, the court shall nevertheless proceed to pronounce sentence, or judgment, which shall in like manner be final and decisive, the judgment or sentence and other proceedings being in either case transmitted to congress and lodged among the acts of congress for the security of the parties concerned: provided that every commissioner, before he sits in judgment, shall take an oath to be administered by one of the judges of the supreme or superior court of the state, where the cause shall be tried, "well and truly to hear and determine the matter in question, according to the best of his judgment, without favour, affection or hope of reward:" provided also that no state shall be deprived of territory for the benefit of the united states.

All controversies concerning the private right of soil claimed under different grants of two or more states, whose jurisdictions as they may respect such lands, and the states which passed such grants are adjusted, the said grants or either of them being at the same time claimed to have originated antecedent to such settlement of jurisdiction, shall on the petition of either party to the congress of the united states, be finally determined as near as may be in the same manner as is before prescribed for deciding disputes respecting territorial jurisdiction between different states.

The united states in congress assembled shall also have the sole and exclusive right and power of regulating the alloy and value of coin struck by their own authority, or by that of the respective states—fixing the standard of weights and measures throughout the united states—regulating the trade and managing all affairs with the Indians, not members of any of the states, provided that the legislative right of any state within its own limits be not infringed or violated—establishing or regulating post-offices from one state to another, throughout all the united states, and exacting such postage on the papers passing thro' the same as may be requisite to defray the expences of the said office—appointing all officers of the land forces, in the service of the united states, excepting regimental officers—appointing all the officers of the naval forces, and commissioning all officers whatever in the service of the united states—making rules for the government and regulation of the said land and naval forces, and directing their operations.

The united states in congress assembled shall have authority to appoint a committee, to sit in the recess of congress, to be denominated "A Committee of the States," and to consist of one delegate from each state; and to appoint such other committees and civil officers as may be necessary for managing the general affairs of the united states under their direction—to appoint one of their number to preside, provided that no person be allowed to serve in the office of president more than one year in any term of three years; to ascertain the necessary sums of Money to be raised for the service of the united states, and to appropriate and apply the same for defraying the public expenses—to borrow money, or emit bills on the credit of the united states, transmitting every half year to the respective states an account of the sums of money so borrowed or emitted,—to build and equip a navy—to agree upon the number of land forces, and to make requisitions from each state for its quota, in proportion to the number of white inhabitants in such state; which requisition shall be binding, and thereupon the legislature of each state shall appoint the regimental officers, raise the men and cloath, arm and equip them in a soldier like manner, at the expence of the united states; and the officers and men so cloathed, armed and equipped shall march to the place appointed, and within the time agreed on by the united states in congress assembled: But if the united states in congress assembled shall, on consideration of circumstances judge proper that any state should not raise men, or should raise a smaller number than its quota, and that any other state should raise a greater number of men than the quota thereof, such extra number shall be raised, officered, cloathed, armed and equipped in the same manner as the quota of such state, unless the legislature of such state shall judge that such extra number cannot be safely spared out of the same, in which case they shall raise officer, cloath, arm and equip as many of such extra number as they judge can be safely spared. And the officers and men so cloathed, armed and equipped, shall march to the place appointed, and within the time agreed on by the united states in congress assembled.

The united states in congress assembled shall never engage in a war, nor grant letters of marque and reprisal in time of peace, nor enter into any treaties or alliances, nor coin money, nor regulate the value thereof, nor ascertain the sums and expences necessary for the defence and welfare of the united states, or any of them, nor emit bills, nor borrow money on the credit of the united states, nor appropriate money, nor agree upon the number of vessels of war, to be built or purchased, or the number of land or sea forces to be raised, nor appoint a commander in chief of the army or navy, unless nine states assent to the same: nor shall a question on any other point, except for adjourning from day to day be determined, unless by the votes of a majority of the united states in congress assembled.

The congress of the united states shall have power to adjourn to any time within the year, and to any place within the united states, so that no period of adjournment be for a longer duration than the space of six Months, and shall publish the Journal of their proceedings monthly, except such parts thereof relating to treaties, alliances or military operations, as in their judgment require secrecy; and the yeas and nays of the delegates of each state on any question shall be entered on the Journal, when it is desired by any delegate; and the delegates of a state or any of them, at his or their request shall be furnished with a transcript of the said Journal, except such parts as are above excepted, to lay before the legislatures of the several states.

ARTICLE X. The committee of the states, or any nine of them, shall be authorized to execute, in the recess of congress, such of the powers of congress as the united states in congress assembled, by the consent of nine states, shall from time to time think expedient to vest them with; provided that no power be delegated to said committee, for the exercise of which, by the articles of confederation, the voice of nine states in the congress of the united states assembled is requisite.

ARTICLE XI. Canada acceding to this confederation, and joining in the measures of the united states, shall be admitted into, and entitled to all the advantages of this union: but no other colony shall be admitted into the same, unless such admission be agreed to by nine states.

ARTICLE XII. All bills of credit emitted, moneys borrowed and debts contracted by, or under the authority of congress, before the assembling of the united states, in pursuance of the present confederation, shall be deemed and considered as a charge against the united states, for payment and satisfaction whereof the said united states, and the public faith are hereby solemnly pledged.

ARTICLE XIII. Every state shall abide by the determinations of the united states in congress assembled, on all questions which by this confederation are submitted to them. And the Articles of this confederation shall be inviolably observed by every state, and the union shall be perpetual; nor shall any alteration at any time hereafter be made in any of them; unless such alteration be agreed to in a congress of the united states and be afterwards confirmed by the legislatures of every state.

And Whereas it hath pleased the Great Governor of the World to incline the hearts of the legislatures we respectively represent in congress, to approve of, and to authorize us to ratify the said articles of confederation and perpetual union. *Know Ye* that we the undersigned delegates, by virtue of the power and authority to us given for that purpose, do by these presents, in the name and in behalf of our respective constituents, fully and entirely ratify and confirm each and every of the said articles of confederation and perpetual union, and all and singular the matters and things therein contained: And we do further solemnly plight and engage the faith of our respective constituents, that they shall abide by the determinations of the united states in congress assembled, on all questions, which by the said confederation are submitted to them. And that the articles thereof shall be inviolably observed by the states we respectively represent, and that the union shall be perpetual. In Witness whereof we have hereunto set our hands in Congress. Done at Philadelphia in the state of Pennsylvania the ninth Day of July in the Year of our Lord, one Thousand seven Hundred and Seventy-eight, and in the third year of the independence of America.

State of New Hampshire—Josiah Bartlett, John Wentworth, jun^{r}, August 8th, 1778; State of Massachusetts Bay—John Hancock, Samuel Adams, Elbridge Gerry, Francis Dana, James Lovell, Samuel Holten; State of Rhode-Island and Providence Plantations—William Ellery, Henry Marchant, John Collins; State of Connecticut—Roger Sherman, Samuel Huntington, Oliver Wolcott, Titus Hosmer, Andrew Adams; State of New York—Ja^{s} Duane, Fra: Lewis, Wm Duer, Gouv^{r} Morris; State of New Jersey—Jn° Witherspoon, Nathl Scudder, November 26, 1778; State of Pennsylvania—Robert Morris, Daniel Roberdeau, Jon. Bayard Smith, William Clingar, Joseph Reed, 22d July, 1778; State of Delaware—Thos McKean, Feby 22d, 1779, John Dickinson, May 5th, 1779, Nicholas Van Dyke; State of Maryland—John Hanson, March 1, 1781, Daniel Carroll, ditto; State of Virginia—Richard Henry Lee, John Banister, Thomas Adams, Jn° Harvie, Francis Lightfoot Lee; State of North Carolina—John Penn, July 21st, 1778; Corn^{s} Harnett, Jn° Williams; State of South Carolina—Henry Laurens, William Henry Drayton, Jn° Mathews, Rich Hutson, Thos Heyward, jun^{r}.; State of Georgia—Jn° Walton, 24th July, 1778, Edwd Telfair, Edwd Langworthy.

THE CONSTITUTION OF THE UNITED STATES

[Note. The text of the Constitution printed here precisely reproduces the original document in spelling and punctuation. Comments and explanations are in smaller type.]

PREAMBLE

We the People of the United States, in order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

Article. I.

Section. 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section. 2. The House of Representatives shall be composed of Members chosen every second Year by the People of the several States, and the Electors in each State shall have the Qualifications requisite for Electors of the most numerous Branch of the State Legislature.

No Person shall be a Representative who shall not have attained to the Age of twenty five Years, and been seven years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State in which he shall be chosen.

Representatives and direct Taxes[1] shall be apportioned among the several States which may be included within this Union, according to their respective Numbers, which shall be determined by adding to the whole Number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three fifths of all other Persons. The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct. The Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to chuse three, Massachusetts eight, Rhode Island and Providence Plantations one, Connecticut five, New York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

When vacancies happen in the Representation from any State, the Executive Authority thereof shall issue Writs of Election to fill such Vacancies.

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[1] Partly superseded by Article XIV, Amendments.

The House of Representatives shall chuse their Speaker and other Officers; and shall have the sole Power of Impeachment.

Section. 3. The Senate of the United States shall be composed of two Senators from each State, chosen by the Legislature thereof, for six Years; and each Senator shall have one Vote.

Immediately after they shall be assembled in Consequence of the first Election, they shall be divided as equally as may be into three Classes. The Seats of the Senators of the first Class shall be vacated at the Expiration of the second Year, of the second Class at the Expiration of the fourth Year, and of the third Class at the Expiration of the sixth Year, so that one third may be chosen every second Year; and if Vacancies happen by Resignation, or otherwise, during the Recess of the Legislature of any State, the Executive thereof may make temporary Appointments until the next Meeting of the Legislature, which shall then fill such Vacancies.[1]

No Person shall be a Senator who shall not have attained to the Age of thirty Years, and been nine Years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State for which he shall be chosen.

The Vice President of the United States shall be President of the Senate, but shall have no Vote, unless they be equally divided.

The Senate shall chuse their other Officers, and also a President pro tempore, in the Absence of the Vice President, or when he shall exercise the Office of President of the United States.

The Senate shall have the sole Power to try all Impeachment. When sitting for that Purpose, they shall be on Oath or Affirmation. When the President of the United States is tried, the Chief Justice shall preside: And no Person shall be convicted without the Concurrence of two thirds of the Members present.

Judgment in Cases of Impeachment shall not extend further than to removal from Office, and disqualification to hold and enjoy any Office of honor, Trust, or Profit under the United States: but the Party convicted shall nevertheless be liable and subject to Indictment, Trial, Judgment, and Punishment, according to Law.

Section. 4. The Times, Places and Manner of holding Elections for Senators and Representatives, shall be prescribed in each State by the Legislature thereof, but the Congress may at any time by Law make or alter such Regulations, except as to the places of chusing Senators.

The Congress shall assemble at least once in every Year, and such Meeting shall be on the first Monday in December, unless they shall by Law appoint a different Day.

Section. 5. Each House shall be the Judge of the Elections, Returns and Qualifications of its own Members, and a Majority of each shall constitute a Quorum to do Business; but a smaller Number may adjourn from day to day, and may be authorized to compel the Attendance of absent Members, in such Manner, and under such Penalties as each House may provide.

Each House may determine the Rules of its Proceedings, punish its Members for disorderly Behaviour, and with the Concurrence of two thirds, expel a Member.

Each House shall keep a Journal of its Proceedings, and from time to time publish the same, excepting such Parts as may in their Judgment require Secrecy; and the Yeas and Nays of the Members of either House on any question shall, at the Desire of one fifth of those Present, be entered on the Journal.

Neither House, during the Session of Congress, shall, without the Consent of the other, adjourn for more than three days, nor to any other Place than that in which the two Houses shall be sitting.

Section. 6. The Senators and Representatives shall receive a Compensation for their Services, to be ascertained by Law, and paid out of the Treasury of the United States. They shall in all Cases, except Treason, Felony and Breach of the Peace, be privileged from Arrest during their Attendance at the Session of their respective Houses, and in going to and returning from the same; and for any Speech or Debate in either House, they shall not be questioned in any other Place.

No Senator, or Representative shall, during the Time for which he was elected, be appointed to any civil Office under the Authority of the United States which shall have been created, or the Emoluments whereof shall have been encreased during such time; and no Person holding any Office under the United States, shall be a Member of either House during his Continuance in Office.

Section. 7. All Bills for raising Revenue shall originate in the House of Representatives; but the Senate may propose or concur with Amendments as on other Bills.

Every Bill which shall have passed the House of Representatives and the Senate shall, before it become a Law, be presented to the President of the United States; If he approve, he shall sign it, but if not he shall return it, with his Objections to that House in which it shall have originated, who shall enter the Objections at large on their Journal, and proceed to reconsider it. If after such Reconsideration two thirds of that House shall agree to pass the Bill, it shall be sent, together with the Objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a Law. But in all such Cases the Votes of both Houses shall be determined by Yeas and Nays, and the Names of the Persons voting for and against the Bill shall be entered on the Journal of each House respectively. If any Bill shall not be returned by the President within ten Days (Sundays excepted) after it shall have been presented to him, the Same shall be a Law, in like Manner as if he had signed it, unless the Congress by their Adjournment prevent its Return, in which Case it shall not be a Law.

Every Order, Resolution, or Vote to which the Concurrence of the Senate and House of Representatives may be necessary (except on a Question of Adjournment) shall be presented to the President of the United States; and before the Same shall take Effect, shall be approved by him, or being disapproved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the Rules and Limitations prescribed in the Case of a Bill.

Section. 8. The Congress shall have Power To, lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States; but all Duties, Imposts and Excises shall be uniform throughout the United States;

To borrow Money on the credit of the United States;

To regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes;

To establish an uniform Rule of Naturalization, and uniform Laws on the subject of Bankruptcies throughout the United States;

To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures;

To provide for the Punishment of counterfeiting the Securities and current Coin of the United States;

To establish Post Offices and post Roads;

To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;

To constitute Tribunals inferior to the supreme Court;

To define and punish Piracies and Felonies committed on the high Seas, and Offences against the Law of Nations;

To declare War, grant Letters of Marque and Reprisal, and make Rules concerning Captures on Land and Water;

To raise and support Armies, but no Appropriation of Money to that Use shall be for a longer Term than two Years;

To provide and maintain a Navy;

To make Rules for the Government and Regulation of the land and naval Forces;

To provide for calling forth the Militia to execute the Laws of the Union, suppress Insurrections and repel Invasions;

To provide for organizing, arming, and disciplining, the Militia, and for governing such Part of them as may be employed in the Service of the United States, reserving to the States respectively, the Appointment of the Officers, and the Authority of training the Militia according to the discipline prescribed by Congress;

To exercise exclusive Legislation in all Cases whatsoever, over such District (not exceeding ten Miles square) as may, by Cession of particular States, and the Acceptance of Congress, become the Seat of the Government of the United States, and to exercise like Authority over all Places purchased by the Consent of the Legislature of the State in which the same shall be, for the Erection of Forts, Magazines, Arsenals, dock-Yards, and other needful Buildings;—And

To make all Laws which shall

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[1] See Article XVII, Amendments.

be necessary and proper for carrying into Execution the foregoing Powers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.

Section. 9. The Migration or Importation of such Persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the Year one thousand eight hundred and eight, but a Tax or duty may be imposed on such Importation, not exceeding ten dollars for each Person.

The Privilege of the Writ of Habeas Corpus shall not be suspended, unless when in Cases of Rebellion or Invasion the public Safety may require it.

No Bill of Attainder or ex post facto Law shall be passed.

No Capitation, or other direct, Tax shall be laid, unless in Proportion to the Census or Enumeration herein before directed to be taken.

No Tax or Duty shall be laid on Articles exported from any State.

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law, and a regular Statement and Account of the Receipts and Expenditures of all public Money shall be published from time to time.

No Title of Nobility shall be granted by the United States: And no Person holding any Office of Profit or Trust under them, shall, without the Consent of the Congress, accept of any present, Emolument, Office, or Title, of any kind whatever, from any King, Prince, or foreign State.

Section. 10. No State shall enter into any Treaty, Alliance, or Confederation; grant Letters of Marque and Reprisal; coin Money; emit Bills of Credit; make any Thing but gold and silver Coin a Tender in Payment of Debts; pass any Bill of Attainder, ex post facto Law, or Law impairing the Obligation of Contracts, or grant any Title of Nobility.

No State shall, without the Consent of the Congress, lay any Imposts or Duties on Imports or Exports, except what may be absolutely necessary for executing it's inspection Laws: and the net produce of all Duties and Imposts, laid by any State on Imports or Exports, shall be for the Use of the Treasury of the United States; and all such Laws shall be subject to the Revision and Controul of the Congress.

No State shall, without the Consent of Congress, lay any Duty of Tonnage, keep Troops, or Ships of War in time of Peace, enter into any Agreement or Compact with another State, or with a foreign Power, or engage in War, unless actually invaded, or in such imminent Danger as will not admit of delay.

Article. II.

Section. 1. The executive Power shall be vested in a President of the United States of America. He shall hold his Office during the Term of four Years, and, together with the Vice President, chosen for the same Term, be elected, as follows

Each State shall appoint, in such Manner as the Legislature thereof may direct, a Number of Electors, equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress: but no Senator or Representative, or Person holding an Office of Trust or Profit under the United States, shall be appointed an Elector.

The Electors shall meet in their respective States, and vote by Ballot for two Persons, of whom one at least shall not be an Inhabitant of the same State with themselves. And they shall make a List of all the Persons voted for, and of the Number of Votes for each; which List they shall sign and certify, and transmit sealed to the Seat of the Government of the United States, directed to the President of the Senate. The President of the Senate shall, in the Presence of the Senate and House of Representatives, open all the Certificates, and the Votes shall then be counted. The Person having the greatest Number of Votes shall be the President, if such Number be a Majority of the whole Number of Electors appointed; and if there be more than one who have such Majority, and have an equal Number of Votes, then the House of Representatives shall immediately chuse by Ballot one of them for President; and if no Person have Majority, then from the five highest on the List the said House shall in like Manner chuse the President. But in chusing the President, the Votes shall be taken by States, the Representation from each State having one Vote; A quorum for this Purpose shall consist of a Member or Members from two thirds of the States, and a Majority of all the States shall be necessary to a Choice. In every Case, after the Choice of the President, the Person having the greatest Number of Votes of the Electors shall be the Vice President. But if there should remain two or more who have equal Votes, the Senate shall chuse from them by Ballot the Vice President.[1]

The Congress may determine the Time of chusing the Electors, and the Day on which they shall give their Votes; which Day shall be the same throughout the United States.

No Person except a natural born Citizen, or a Citizen of the United States, at the time of the Adoption of this Constitution, shall be eligible to the Office of President, neither shall any Person be eligible to that Office who shall not have attained to the Age of thirty-five Years, and been fourteen Years a Resident within the United States.

In Case of the Removal of the President from Office, or of his Death, Resignation, or Inability to discharge the Powers and Duties of the said Office, the Same shall devolve on the Vice President, and the Congress may by Law provide for the Case of Removal, Death, Resignation or Inability, both of the President and Vice President, declaring what Officer shall then act as President, and such Officer shall act accordingly, until the Disability be removed, or a President shall be elected.

The President shall, at stated Times, receive for his Services, a compensation, which shall neither be Increased nor diminished during the Period for which he shall have been elected, and he shall not receive within that Period any other Emolument from the United States, or any of them.

Before he enter on the Execution of his Office, he shall take the following Oath or Affirmation:—

"I do solemnly swear (or affirm) that I will faithfully execute the Office of President of the United States, and will to the best of my Ability, preserve, protect and defend the Constitution of the United States."

Section. 2. The President shall be Commander in Chief of the Army and Navy of the United States, and the Militia of the several States, when called into the actual Service of the United States; he may require the Opinion, in writing, of the principal Officer in each of the executive Departments, upon any Subject relating to the Duties of their respective Offices, and he shall have Power to grant Reprieves and Pardons for Offences against the United States, except in Cases of Impeachment.

He shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur; and he shall nominate, and by and with the Advice and Consent of the Senate, shall appoint Ambassadors, other public Ministers and Consuls, Judges of the supreme Court, and all other Officers of the United States, whose Appointments are not herein otherwise provided for, and which shall be established by Law; but the Congress may by Law vest the Appointment of such inferior Officers, as they think proper, in the President alone, in the Courts of Law, or in the Heads of Departments.

The President shall have Power to fill up all Vacancies that may happen during the Recess of the Senate, by granting Commissions, which shall expire at the End of their next Session.

Section. 3. He shall from time to time give to the Congress Information of the State of the Union, and recommend to their Consideration such Measures as he shall judge necessary and expedient; he may, on extraordinary Occasions, convene both Houses, or either of them, and in Case of Disagreement between them, with Respect to the Time of Adjournment, he may adjourn them to such Time as he shall think proper; he shall receive Ambassadors and other public Ministers; he shall take care that the Laws be faithfully executed, and shall Commission all the Officers of the United States.

Section. 4. The President, Vice President and all civil Officers of the United States, shall be removed from Office on Impeachment for, and Conviction of, Treason, Bribery, or other high Crimes and Misdemeanors.

Article. III.

Section. 1. The Judicial Power of the United States, shall be vested in one Supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish. The Judges, both of the supreme and inferior Courts, shall hold their offices during good Behaviour, and shall, at stated Times, receive for their Services, a Compensation, which shall not be diminished during their Continuance in Office.

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[1] This paragraph in force only from 1788 to 1803; superseded by Article XII, Amendments.

Section. 2. The judicial Power shall extend to all Cases, in Law and Equity, arising under this Constitution, the Laws of the United States, and Treaties made, or which shall be made, under their Authority;—to all Cases affecting Ambassadors, other public Ministers and Consuls;—to all Cases of admiralty and maritime Jurisdiction;—to Controversies to which the United States shall be a Party;—to Controversies between two or more States; between a State[1] and Citizens of another State;—between Citizens of different States;—between Citizens of the same State claiming Lands under Grants of different States, and between a State, or the Citizens thereof, and foreign States, Citizens or Subjects.

In all Cases affecting Ambassadors, other public Ministers and Consuls, and those in which a State shall be Party, the supreme Court shall have original Jurisdiction. In all the other Cases before mentional, the supreme Court shall have appellate Jurisdiction, both as to Law and Fact, with such Exceptions, and under such Regulations as the Congress shall make.

The Trial of all Crimes, except in Cases of Impeachment, shall be by Jury; and such trial shall be held in the State where the said Crimes shall have been committed; but when not committed within any State, the Trial shall be at such Place or Places as the Congress may by law have directed.

Section. 3. Treason against the United States, shall consist only in levying War against them, or in adhering to their Enemies, giving them Aid and Comfort. No Person shall be convicted of Treason unless on the Testimony of two Witnesses to the same overt Act, or on Confession in open Court.

The Congress shall have Power to declare the Punishment of Treason, but no Attainder of Treason shall work corruption of Blood, or Forfeiture except during the Life of the Person attainted.

Article. IV.

Section. 1. Full Faith and Credit shall be given in each State to the public Acts, Records, and judicial Proceedings of every other State. And the Congress may by general Laws prescribe the Manner in which such Acts, Records and Proceedings shall be proved, and the Effect thereof.

Section. 2. The Citizens of each State shall be entitled to all Privileges and Immunities of Citizens in the several States.

A Person charged in any State with Treason, Felony, or other Crime, who shall flee from Justice, and be found in another State, shall on Demand of the executive Authority of the State from which he fled, be delivered up, to be removed to the State having Jurisdiction of the Crime.

No Person held to Service or Labour in one State, under the Laws thereof, escaping into another, shall, in Consequence of any Law or Regulation therein, be discharged from such Service or Labour, but shall be delivered up on Claim of the Party to whom such Service or Labour may be due.

Section. 3. New States may be admitted by the Congress into this Union; But no new State shall be formed or erected within the Jurisdiction of any other State, nor any State be formed by the Junction of two or more States, or Parts of States, without the consent of the Legislatures of the States concerned as well as of the Congress.

The Congress shall have power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States; and nothing in this Constitution shall be so construed as to Prejudice any Claims of the United States, or of any particular State.

Section. 4. The United States shall guarantee to every State in this Union a Republican Form of Government, and shall protect each of them against Invasion; and on Application of the Legislature, or of the Executive (when the Legislature cannot be convened) against domestic Violence.

Article. V.

The Congress, whenever two-thirds of both Houses shall deem it necessary, shall propose Amendments to this Constitution, or, on the Application of the Legislatures of two thirds of the several States, shall call a Convention for proposing Amendments, which, in either Case, shall be valid to all Intents and Purposes, as Part of this Constitution, when ratified by the Legislatures of three fourths of the several States, or by Conventions in three fourths thereof, as the one or the other Mode of Ratification may be proposed by the Congress; Provided that no Amendment which may be made prior to the Year One thousand eight hundred and eight shall in any Manner affect the first and fourth Clauses in the Ninth Section of the first Article; and that no State, without its Consent, shall be deprived of it's equal Suffrage in the Senate.

Article. VI.

All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

The Senators and Representatives before mentioned, and the Members of the several State Legislatures, and all executive and judicial Officers, both of the United States and of the several States, shall be bound by Oath or Affirmation, to support this Constitution; but no religious Test shall ever be required as a Qualification to any Office or public Trust under the United States.

Article. VII.

The Ratification of the Conventions of nine States, shall be sufficient for the Establishment of this Constitution between the States so ratifying the Same.

Done in Convention by the Unanimous Consent of the States present the Seventeenth Day of September in the Year of our Lord one thousand seven hundred and Eighty seven and of the Independance of the United States of America the Twelfth. In Witness whereof We have hereunto subscribed our Names,

Attest: William Jackson, Secretary; George Washington, President and deputy from Virginia; New Hampshire—John Langdon, Nicholas Gilman; Massachusetts—Nathaniel Gorham, Rufus King; Connecticut—William Samuel Johnson, Roger Sherman; New York—Alexander Hamilton; New Jersey—William Livingston, David Brearley, William Paterson, Jonathan Dayton; Pennsylvania—B. Franklin, Thomas Mifflin, Robert Morris, George Clymer, Thomas Fitzsimons, Jared Ingersoll, James Wilson, Gouverneur Morris; Delaware—George Read; Gunning Bedford, Jr., John Dickinson, Richard Bassett, Jacob Broom; Maryland—James McHenry, Dan of St. Thomas Jenifer, Daniel Carroll; Virginia—John Blair, James Madison, Jr.; North Carolina—William Blount, Richard Dobbs Spaight, Hugh Williamson; South Carolina—J. Rutledge, Charles Cotesworth Pinckney, Charles Pinckney, Pierce Butler; Georgia—William Few, Abraham Baldwin.

The Constitution was ratified by the thirteen original States in the following order: Delaware, December 7, 1787, unanimously; Pennsylvania, December 12, 1787, vote 46 to 23; New Jersey, December 18, 1787, unanimously; Georgia, January 2, 1788, unanimously; Connecticut, January 9, 1788, vote 128 to 40; Massachusetts, February 6, 1788, vote 187 to 168; Maryland, April 28, 1788, vote 63 to 12; South Carolina, May 23, 1788, vote 149 to 73; New Hampshire, June 21, 1788, vote 57 to 46; Virginia, June 25, 1788, vote 89 to 79; New York, July 26, 1788, vote 30 to 28; North Carolina, November 21, 1789, vote 193 to 75; Rhode Island, May 29, 1790, vote 34 to 32.

Twelve amendments to the Constitution were proposed at the First Session of Congress, begun and held at the City of New York, on Wednesday, March 4, 1789. The first two were not adopted. The following ten were adopted by the necessary number of States and now stand as the first ten amendments to the Constitution. The original proposal of these amendments were preceded by the following preamble and resolution:

The conventions of a number of the States having, at the time of their adopting the Constitution, expressed a desire, in order to prevent misconstruction or abuse of its powers, that further declaratory and restrictive clauses should be added, and as extending the ground of public confidence in the Government will best insure the beneficent ends of its institution.

Resolved,

By the Senate and House of Representatives of the United States of America, in Congress assembled, two-thirds of both Houses concurring, that the following articles be proposed to the Legislatures of the several States, as amendments to the Constitution of the United States; all or any of which articles, when ratified by three-fourths of the said Legislatures, to be valid to all intents and purposes as part of the said Constitution, namely:

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[1] See Article XI, Amendments.

The following ten original amendments were declared in force December 15, 1791.

Article I.

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Article II.

A well-regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Article III.

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Article IV.

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Article V.

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Article VI.

In all criminal prosecutions, the Accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which districts shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have Assistance of Counsel for his defence.

Article VII.

In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any court of the United States, than according to the rules of the common law.

Article VIII.

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Article IX.

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Article X.

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

The following amendment was propsed to the Legislatures of the several States by the Third Congress on the 5th of March, 1794, and was declared to have been ratified in a message from the President to Congress, dated January 8, 1798.

Article XI.

The Judicial power of the United States shall not be construed to extend to any suit in law or equity commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign state.

The following amendment, in lieu of the third paragraph of the first section of the second article of the Constitution, was proposed to the Legislatures of the several States by the Eighth Congress on the 12th of December, 1803, and was declared to have been ratified in a proclamation by the Secretary of State, dated September 25, 1804. It was ratified by all the States except Connecticut, Delaware, Massachusetts and New Hampshire.

Article XII.

The Electors shall meet in their respective states, and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same state with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President, and of all persons voted for as Vice-President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of the Government of the United States directed to the president of the Senate;—The president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;—The person having the greatest number of votes for President, shall be the President, if such number be a majority of the whole number of Electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by states, the representation from each state having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice-President shall act as President, as in the case of the death or other constitutional disability of the President.—The person having the greatest number of votes as Vice-President, shall be the Vice-President, if such number be a majority of the whole number of Electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice-President; a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

The following amendment was proposed to the Legislatures of the several States by the Thirty-eighth Congress on the 1st of February, 1865, and was declared to have been ratified in a proclamation by the Secretary of State dated December 18, 1865. It was rejected by Delaware and Kentucky; was conditionally ratified by Alabama and Mississippi; and Texas took no action.

Article XIII.

Section. 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

Section 2. Congress shall have power to enforce this article by appropriate legislation.

The following, popularly known as the Reconstruction Amendment, was proposed to the Legislatures of the several States by the Thirty-ninth Congress on the 16th of June, 1866, and was declared to have been ratified in a proclamation by the Secretary of State dated July 28, 1868. The amendment received the support of twenty-three Northern States; it was rejected by Delaware, Kentucky, Maryland, and ten Southern States. California took no action. Subsequently it was ratified by the ten Southern States.

Article XIV.

Section 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Section 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of Electors for President and Vice-President of the United States, Representatives in Congress, the Executive and Judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

Section 3. No person shall be a Senator or Representative in Congress, or Elector of President and Vice-President, or hold any office, civil or military, under the United States, or under any

State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State Legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

Section 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss of emancipation of any slave; but all such debts, obligations, and claims shall be held illegal and void.

Section 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

The following amendment was proposed to the Legislatures of the several States by the Fortieth Congress on the 27th of February, 1869, and was declared to have been ratified in a proclamation by the Secretary of State, dated March 30, 1870. It was not acted on by Tennessee; it was rejected by California, Delaware, Kentucky, Maryland and Oregon; ratified by the remaining thirty States. New York rescinded its ratification January 5, 1870. New Jersey rejected it in 1870, but ratified it in 1871.

Article XV.

Section 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

Section 2. The Congress shall have power to enforce this article by appropriate legislation.

The following amendment was proposed to the Legislatures of the several States, by the Sixty-first Congress on the 12th day of July, 1909, and was declared to have been ratified in a proclamation by the Secretary of State, dated February 25, 1913. The income tax amendment was ratified by all the States except Connecticut, Florida, Pennsylvania, Rhode Island, Utah and Virginia.

Article XVI.

The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several States, and without regard to any census or enumeration.

The following amendment was proposed to the Legislatures of the several States by the Sixty-second Congress on the 16th day of May, 1912, and was declared to have been ratified in a proclamation by the Secretary of State, dated May 31, 1913. It received the vote of all the States except Alabama, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Rhode Island, South Carolina, Utah and Virginia.

Article XVII.

Section 1. The Senate of the United States shall be composed of two Senators from each State, elected by the people thereof, for six years; and each Senator shall have one vote. The electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State Legislatures.

Section 2. When vacancies happen in the representation of any State in the Senate, the executive authority of such State shall issue writs of election to fill such vacancies: Provided, That the legislature of any State may empower the executive thereof to make temporary appointments until the people fill the vacancies by election as the Legislature may direct.

Section 3. This amendment shall not be so construed as to affect the election or term of any Senator chosen before it becomes valid as part of the Constitution.

The following amendment was proposed to the Legislatures of the several States by the Sixty-fifth Congress, December 7, 1917; and on January 29, 1919, the Acting Secretary of State proclaimed its adoption by 36 States, and declared it in effect on January 16, 1920.

Early in 1920, the validity of the Eighteenth Amendment was upheld by the Supreme Court of the United States, in suits to void, brought by the States of Rhode Island and New Jersey, and by various brewers and distillers.

Article XVIII.

Section 1. After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.

Section 2. The Congress and the several States shall have concurrent power to enforce this article by appropriate legislation.

Section 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the Legislatures of the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

The following amendment was proposed to the Legislatures of the several States by the Sixty-fifth Congress, having been adopted by the House of Representatives, May 21, 1919, and by the Senate, June 5, 1919. On August 26, 1920, the Secretary of State proclaimed it in effect, having been adopted (June 10, 1919–August 18, 1920), by three-quarters of the States. The Tennessee House, August 31, rescinded its ratification, 47 to 24.

Article XIX.

Section 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex.

Section 2. Congress shall have power to enforce this article by appropriate legislation.

Article XX.

The following amendment was proposed to the Legislatures of the several States by the Seventy-second Congress, in March, 1932, a joint resolution to that effect having been adopted, first by the House, and then, on March 2, by the Senate. On Feb. 6, 1933, the Secretary of State proclaimed it in effect, 39 of the 48 States having ratified. By Oct. 15, 1933, it had been ratified by all of the 48 States.

Section 1. The terms of the President and Vice-President shall end at noon on the 20th day of January, and the terms of Senators and Representatives at noon on the 3d day of January, of the years in which such terms would have ended if this article had not been ratified; and the terms of their successors shall then begin.

Section 2. The Congress shall assemble at least once in every year, and such meeting shall begin at noon on the 3d day of January, unless they shall by law appoint a different day.

Section 3. If, at the time fixed for the beginning of the term of the President, the President elect shall have died, the Vice-President elect shall become President. If a President shall not have been chosen before the time fixed for the beginning of his term, or if the President elect shall have failed to qualify, then the Vice-President elect shall act as President until a President shall have qualified; and the Congress may by law provide for the case wherein neither a President elect nor a Vice-President elect shall have qualified, declaring who shall then act as President, or the manner in which one who is to act shall be selected, and such person shall act accordingly until a President or Vice-President shall have qualified.

Section 4. The Congress may by law provide for the case of the death of any of the persons from whom the House of Representatives may choose a President whenever the right of choice shall have devolved upon them, and for the case of the death of any of the persons from whom the Senate may choose a Vice-President whenever the right of choice shall have devolved upon them.

Section 5. Sections 1 and 2 shall take effect on the 15th day of October following the ratification of this article.

Section 6. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three-fourths of the several States within seven years from the date of its submission.

Article XXI.

The following proposed amendment to the Constitution, embodied in a joint resolution of the 72nd Congress (Senate, Feb. 16, 1933, by 63 to 23; House, Feb. 20, 1933, by 289 to 121), was transmitted to the Secretary of State on Feb. 21 and he at once sent to the governors of the States copies of the resolution. The amendment went into effect on Dec. 5, 1933, having been adopted by 36 of the 48 States—three-quarters of the entire number. The amendment is:

Section 1. The eighteenth article of amendment to the Constitution of the United States is hereby repealed.

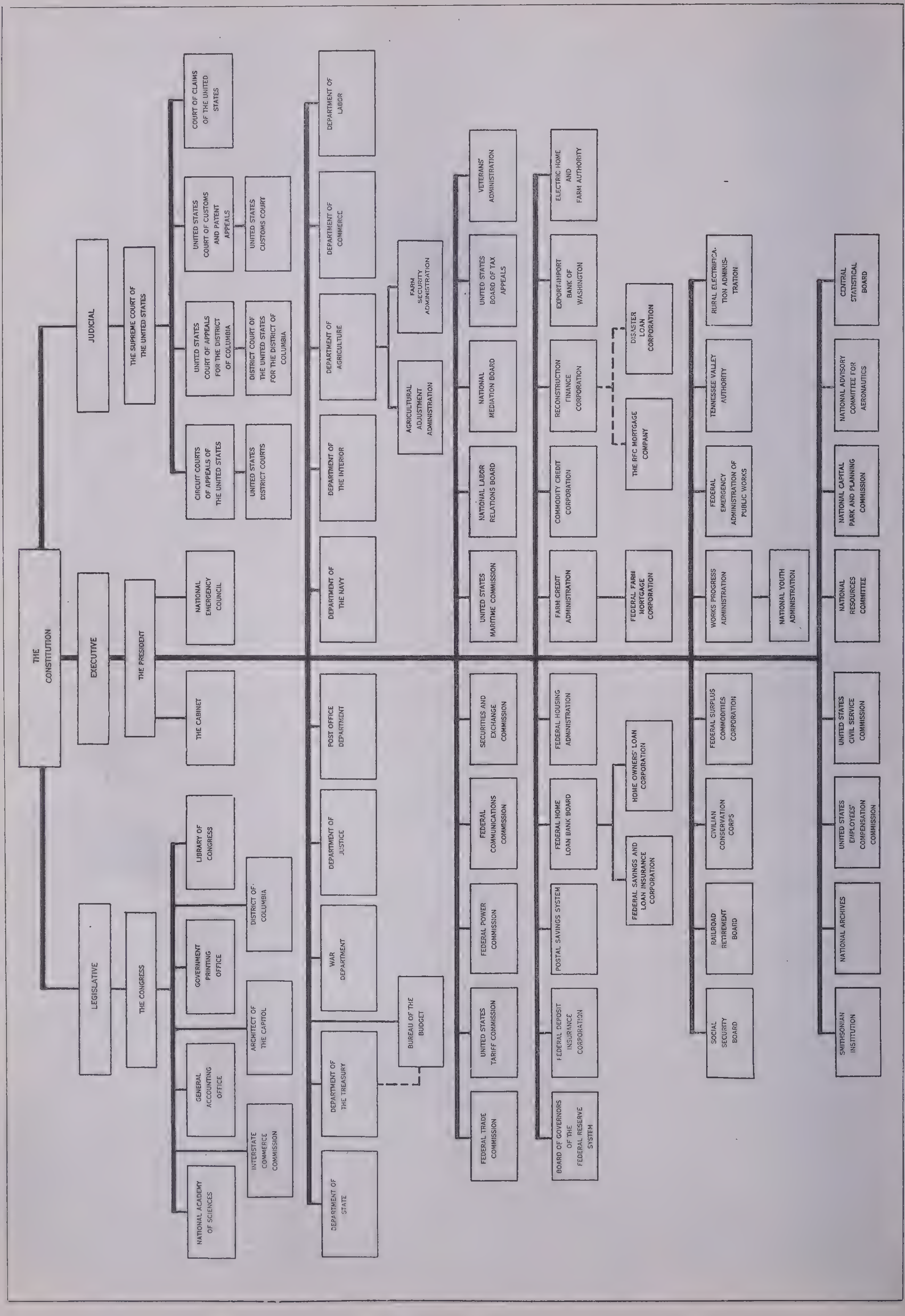
Section 2. The transportation or importation into any State, Territory, or Possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited.

Section 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by conventions in the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

Since the Child Labor Amendment, passed by Congress in 1924, has been ratified by only 28 states, there is some doubt as to its status. The text of the proposed amendment follows:

Section 1—The Congress shall have power to limit, regulate, and prohibit the labor of persons under eighteen years of age.

Section 2—The power of the several states is unimpaired by this article except that the operation of state laws shall be suspended to the extent necessary to give effect to legislation enacted by the Congress.


THE CONSTITUTION
JUDICIAL
THE SUPREME COURT OF THE UNITED STATES
CIRCUIT COURTS OF APPEALS OF THE UNITED STATES
UNITED STATES DISTRICT COURTS
UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA
DISTRICT COURT OF THE UNITED STATES FOR THE DISTRICT OF COLUMBIA
UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS
UNITED STATES CUSTOMS COURT
COURT OF CLAIMS OF THE UNITED STATES
EXECUTIVE
THE PRESIDENT
NATIONAL EMERGENCY COUNCIL
THE CABINET
LEGISLATIVE
THE CONGRESS
LIBRARY OF CONGRESS
DISTRICT OF COLUMBIA
GOVERNMENT PRINTING OFFICE
ARCHITECT OF THE CAPITOL
GENERAL ACCOUNTING OFFICE
INTERSTATE COMMERCE COMMISSION
NATIONAL ACADEMY OF SCIENCES
DEPARTMENT OF LABOR
DEPARTMENT OF COMMERCE
DEPARTMENT OF AGRICULTURE
FARM SECURITY ADMINISTRATION
AGRICULTURAL ADJUSTMENT ADMINISTRATION
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF THE NAVY
POST OFFICE DEPARTMENT
DEPARTMENT OF JUSTICE
WAR DEPARTMENT
BUREAU OF THE BUDGET
DEPARTMENT OF THE TREASURY
DEPARTMENT OF STATE
VETERANS' ADMINISTRATION
UNITED STATES BOARD OF TAX APPEALS
NATIONAL MEDIATION BOARD
NATIONAL LABOR RELATIONS BOARD
UNITED STATES MARITIME COMMISSION
SECURITIES AND EXCHANGE COMMISSION
FEDERAL COMMUNICATIONS COMMISSION
FEDERAL POWER COMMISSION
UNITED STATES TARIFF COMMISSION
FEDERAL TRADE COMMISSION
ELECTRIC HOME AND FARM AUTHORITY
EXPORT-IMPORT BANK OF WASHINGTON
RECONSTRUCTION FINANCE CORPORATION
DISASTER LOAN CORPORATION
THE RFC MORTGAGE COMPANY
COMMODITY CREDIT CORPORATION
FARM CREDIT ADMINISTRATION
FEDERAL FARM MORTGAGE CORPORATION
FEDERAL HOUSING ADMINISTRATION
FEDERAL HOME LOAN BANK BOARD
HOME OWNERS' LOAN CORPORATION
FEDERAL SAVINGS AND LOAN INSURANCE CORPORATION
POSTAL SAVINGS SYSTEM
FEDERAL DEPOSIT INSURANCE CORPORATION
BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM
RURAL ELECTRIFICATION ADMINISTRATION
TENNESSEE VALLEY AUTHORITY
FEDERAL EMERGENCY ADMINISTRATION OF PUBLIC WORKS
WORKS PROGRESS ADMINISTRATION
NATIONAL YOUTH ADMINISTRATION
FEDERAL SURPLUS COMMODITIES CORPORATION
CIVILIAN CONSERVATION CORPS
RAILROAD RETIREMENT BOARD
SOCIAL SECURITY BOARD
CENTRAL STATISTICAL BOARD
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
NATIONAL CAPITAL PARK AND PLANNING COMMISSION
NATIONAL RESOURCES COMMITTEE
UNITED STATES CIVIL SERVICE COMMISSION
UNITED STATES EMPLOYEES' COMPENSATION COMMISSION
NATIONAL ARCHIVES
SMITHSONIAN INSTITUTION

The Federal Government

Courtesy United States Information Service

THE FEDERAL GOVERNMENT AND THE INDIANS

The administration of Indian affairs means, in part, managing an estate of approximately $2,000,000,000 and caring for the health and educational needs of 367,000 Indians. It is the duty of the Secretary of the Interior, acting through the Commissioner of Indian Affairs. These two officers are appointed by the President of the United States. The commissioner is represented among the Indians by a superintendent and his staff in each of about 80 agencies and 20 independent schools and sanatoriums set up in the Indian country. There are about 7,200 regular employees in the Indian Service, of whom almost 7,000 work in the field and about 250 in the Washington headquarters. There are Federal Indian reservations in 26 states, most of them in the West, but three eastern states—New York, North Carolina and Florida—have reservations under Federal care. In other eastern states—Maine, Virginia and South Carolina, for example—the state maintains land reserves for its Indians.

When the United States Government was organized under its Constitution in 1788, supervision of the Indians was in the hands of the Secretary of War. At that time the business between the Government and the Indian tribes was mostly regulating trade and making treaties. In 1832 while the Indians were still under the War Department, the Bureau of Indian Affairs was established with a commissioner as its chief officer. Two years later the duties and powers of the Indian Bureau were enlarged and made the subject of a statute, the Act of June 30, 1834, which became the basic law for the administration of Indian affairs in later years.

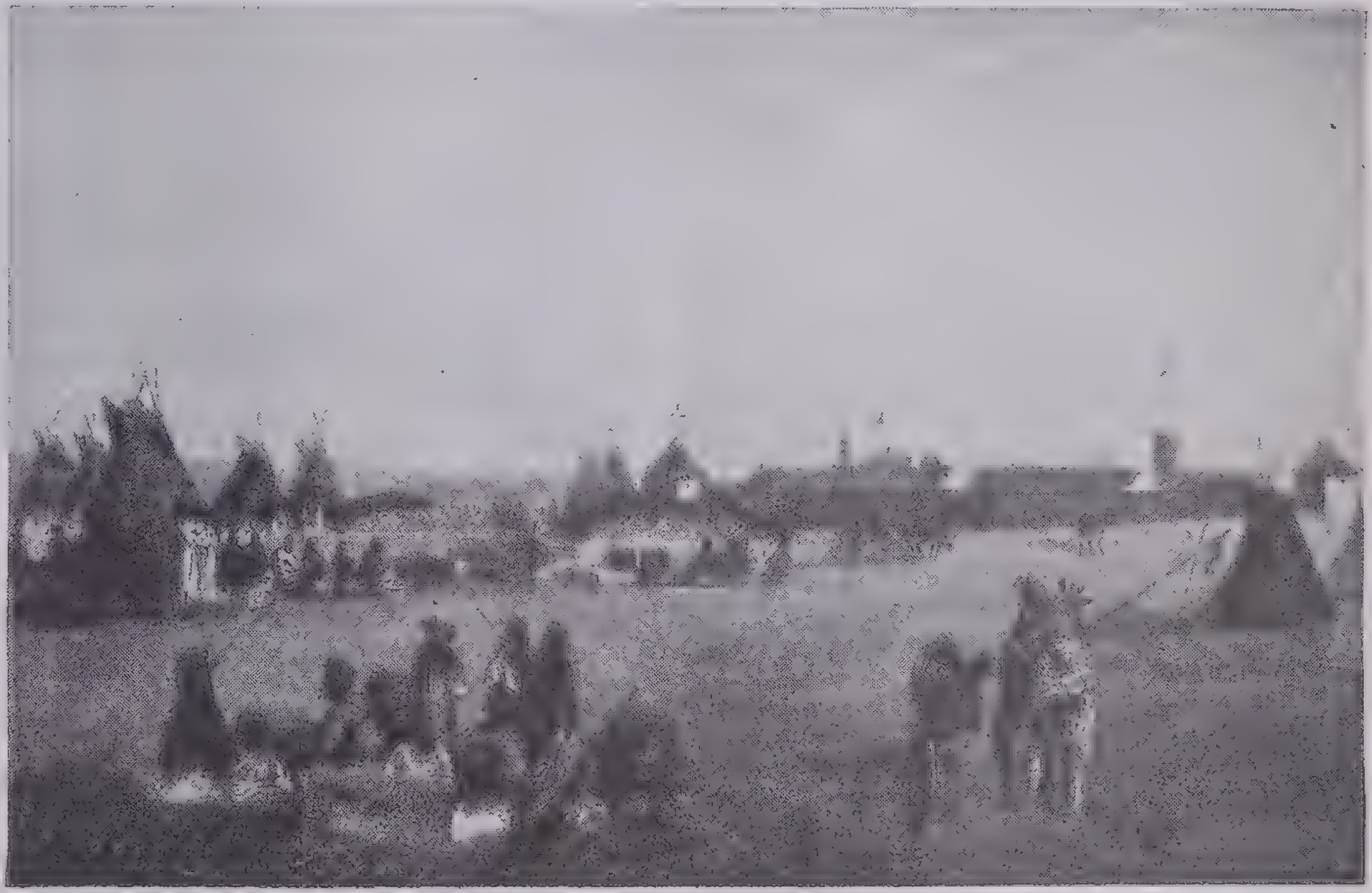
The history of the Office of Indian Affairs until a few years ago was a story of increasing supervision and control over the property and the lives of the Indians. In time they came to occupy a position of complete dependence. Just as in a court of law a person under 21 cannot speak for himself, so Indians had a legal status of incompetency. By an Act of March 3, 1847, Congress declared null and void any contract that an Indian might enter into. Congress alone, acting through the Commissioner of Indian Affairs, had the right to say how the funds or property owned by the various tribes could be used.

The Agency System.—Transferring the care of Indian affairs from the War Department to the newly created Department of the Interior and making the Secretary of the Interior the responsible officer (Act of March 3, 1849) did not make the attitude of the Government more considerate. A spirit of military discipline in dealing with Indians had resulted from appointing army officers as agents among the Indian tribes. The appointment of army officers (authorized in the Act of 1834) increased the power of the agents since disobedience or resistance usually resulted in prompt and severe punishment by the United States Army. The time came, indeed, when an Indian agent ruled with all the power of a petty autocrat. He was the sole judge of the guilt of an Indian charged with an offense committed on the reservation. He could prevent an Indian leaving the reservation without permission; he could prohibit visiting by Indians from other reservations. He had complete authority to transact business for them without consulting their wishes in any way.

Still another factor accounting for the breakdown of Indian morale was the destruction of the food supply—wild game in most instances; native berries, nuts and roots, in others. The great plains tribes, notably the Sioux, Cheyenne, Crow and Blackfeet, depended entirely on bison herds for food, clothing, weapons and shelter, and when the last of the great herds was slaughtered in 1883 these Indians were left at the point of starvation. Wild fruits disappeared as the original prairies were plowed up and as forests were felled by exploiting lumbermen. The Government that had adopted the policy of wild-life extermination as a means of bringing the tribes to terms now found it necessary to feed the Indians and set up a system of rationing out beef, flour and other foodstuffs. A few years of such meager living was enough to destroy any lingering spirit of enterprise or rebelliousness in the Indian. Today, long after rations have ceased to be given except to the old and disabled, there is still found among the Indians a feeling that the Government should provide for the able-bodied. It is easy to understand the origin of this feeling.

Taking Indian Lands.—Having depleted the Indian in spirit, the Government's policies beggared him in resources also. The story of the Indian's exploitation is told most plainly in describing his land losses. At first we recognized the Indian's right in his own soil and made formal treaties with the tribal leaders, maintaining a semblance of paying for what we got. This attitude changed as our numbers increased, and in course of time our strength became such that we could ignore the Indian's complaints and do with him about as we pleased.

Even before the creation of our national Government, several of the colonies—Massachusetts, New York and South Carolina, for example—began to set aside for their Indian tribes definite land reserves in exchange for the larger areas that they had inhabited or hunted on before settlement began. An exchange of this sort was usually accomplished by means of a formal treaty between the colony and the tribes concerned. Later the Federal Government made the same sort of treaties. By 1840 all but a small portion of Indian-owned land east of the Mississippi River had been surrendered, and the tribes concerned had been moved to western reserves. The pace was accelerated as a result of the passage of the Homestead Law in 1862. After the Civil War occupation of the western plains was further aided by the building of the transcontinental railroads. Most of the 213 reserves that exist today were established during the years 1851-80. This was partly a safety measure, since Indians confined on limited areas seemed less likely to come into hostile contact with invading whites; and the tribes that had received specified reserves in exchange for territorial rights ceded by them



Assiniboin Indians Receive Government Supplies

This reproduction of an old lithograph printed in 1855 shows Indians and soldiers at Fort Union near the mouth of the Yellowstone River, Montana. Descendants of this tribe are now located at Fort Belknap near Harlem, Montana were less likely to resist encroachment by white settlers. Actually it did not turn out that way. Between 1846 and 1890 there were 78 battles and skirmishes with the Indians. By 1871 the Indian power of resistance had been so nearly crushed that the Federal Government abandoned the pretense of making formal treaties and called any settlement between the Government and a tribe an agreement. In 1887 (when they numbered fewer than they do now) Indians owned 138,000,000 acres of land—an area larger than the whole state of California. Fifty years later 86,000,000 acres had been lost to the Indians. Of about 52,000,000 acres left, 20,000,000 acres are barren and semidesert. Two-thirds of the Indians now have no land at all or too little to support them.

Splitting the Reservations.—All this loss resulted from the operation of the Dawes General Allotment Act of 1887. The purpose of this law was to permit the division of Indian reservations into small, individually owned pieces—not an Indian idea. The Indians in their native state did not conceive of an individual laying claim to a piece of ground. To them, land was something intended for the use of all, just like air and water. When the Government set up reservations for the tribes, the land was left undivided, and each Indian used as much land for a homesite as he chose. On the remaining area he was learning to run stock in a common herding ground, and if the land was mountainous it usually offered a game refuge where he could hunt and fish. The allotment law, however, intended that each reservation should be divided into tracts of 40 to 320 acres—depending on the amount of land in each reservation and the fertility of the soil. Any surplus land that was left after members of a tribe had been provided for was purchased by the Government at the low rate of $1.25 per acre, and this land was then taken up by white homesteaders. It has been estimated that approximately 60,000,000 acres were lost to the Indians in this manner. Of the land in individual allotments the Indian owners have sold to white men about 26,000,000 acres, usually the most desirable land.

Attempts at Education.—This recital of injuries that the Indians suffered at the hands of the Government, their legal guardian, does not imply that government officials were necessarily indifferent to the Indians' welfare or that they wilfully inflicted injury upon them. Generally the intention was good, and very often the injustice resulted from ignorance of Indian ways or from policies laid down without sufficient study of the effects that might result. As early as 1802 an Act of Congress was passed appropriating money "to promote civilization among the friendly Indian tribes" by purchasing domestic animals and farm implements for distribution among them. In 1819 government farmers and schoolteachers were engaged to work among the friendly tribes. These were the beginnings of an extensive system of education, health, farm aid and similar social services for the Indians' benefit.

Interest in Indians outside the Government has always been an important factor in shaping the Government's policies toward its wards. It was this outside interest and pressure that led President Grant in 1869 to establish the Board of Indian Commissioners, a body of 10 men "eminent for intelligence and philanthropy." The President's action resulted from uncovering gross frauds in handling contracts for Indian supplies, and the men first appointed, who served without pay and were independent of governmental control, were chosen for their business ability. In later years, the Board came to concern itself more exclusively with Indian education and consequently its members were chosen from among clergymen and educators. This Board was discontinued by executive order of President Roosevelt in 1933.

Courtesy U. S. Office of Indian Affairs

Modern Shoshones

The new and the old go side by side. The window has been screened against flies, while the mother still carries her child in the traditional cradleboard

The General Allotment of 1887 or Dawes Act, which was responsible for the loss of so much Indian land in recent years, was intended to advance civilization among the Indians by teaching them the value of industry and ownership of property. It was assumed that once the Indians learned to farm and to work at trades, they would no longer care to maintain their tribal identity or to live upon the reservations. The 1887 Act bestowed citizenship rights on all Indians who received a land allotment. This citizenship involved no responsibilities, since the allotted land was held under a trust patent and was exempt from taxation and from seizure for debt. Since some reservations were unallotted, this grant of citizenship was not universal. A later law, the Act of June 2, 1924, extended citizenship to all Indians born in the United States.

Boarding Schools.—Another way that the Congress and the Indian Service sought to accomplish the purposes of the Allotment Act was by developing large boarding schools away from the reservations—an idea that originated with Captain R. H. Pratt. Working with Indians first at Hampton Institute, Hampton, Va., and then at the Carlisle Indian School, Carlisle, Pa., Pratt believed it possible to make Indian children over by taking them far enough away from home, teaching them useful trades and putting them in a white home on an outing during vacation time. Indian languages and native dress were forbidden in these schools.

Several such schools followed after the organization of Carlisle in 1879, notably Haskell Institute at Lawrence, Kan. (1882), and Sherman Institute at Riverside, Calif. (1901); but they never successfully performed the tasks set for them. Carlisle was discontinued during the World War, and none of these schools is now important.

The theory behind the schools never worked—Indian tradition and Indian ways of life were too deeply rooted. The reservation, instead of disappearing, became the only friendly haven for the thousands of Indian children leaving the boarding schools. Relatively few made the transition from Indian to white life. Meantime the reservations had been severely reduced in acreage and economic opportunities, a generation of entirely landless Indians grew up and the Government had made no provision for assisting them. On some reservations living conditions became so bad that it was hard to conceive how human beings continued to exist there. Yet there was surprisingly little complaint.

The New Policy.—In 1934 the Congress, realizing that the program had failed, undertook a fundamental revision of its Indian policy. The new policy of the Indian Reorganization Act of June 18, 1934, can be summarized as follows:

1. It prohibits the alienation by sale or foreclosure of land still owned by Indian tribes.
2. It provides for the purchase of new land for subsistence farming and grazing for tribes that are seriously land-poor.
3. It sets up a system of credit by which Indians may finance farming and business enterprises.
4. It permits consolidation of Indian-owned lands that have become split into fragments through the operation of inheritance laws.
5. It encourages and assists in the organization and incorporation of Indian tribes for political self-rule and businesslike management of tribal resources.
6. It provides a loan fund out of which deserving Indian students seeking higher education may be assisted.
7. It gives preference to Indians for employment in the Indian Service.

The Act was entirely permissive, not mandatory; that is, the tribes were asked to vote on the question of accepting or rejecting the law. Out of 266 tribes voting, 189 with a popu-

Courtesy U. S. Office of Indian Affairs

Papago Basket Maker in Arizona

Basketwork is an art that the Indian Arts and Crafts Board is seeking to preserve

lation of 130,000 accepted the Act. When the Indians of Oklahoma and Alaska were brought under the Act by amendments passed by the Congress in 1936, there were 252,211 Indians (out of a total of 367,349) under its jurisdiction. Those who rejected it continue to receive from the Government the same care as formerly but are excluded from the benefits of the Act of 1934. The tribes that placed themselves under the Act began at once to organize tribal governments and adopt charters of incorporation. Credit, which Indians have never had before, enables them to engage in stock raising, timber cutting, fishing and similar enterprises. The Arts-and-Crafts Act of August 27, 1935, provided for the creation of a Board of five commissioners (1) to develop markets for Indian arts and crafts; (2) to carry out research and give technical advice; (3) to co-ordinate the activities of various agencies working in the same field; (4) to secure loans when needed to carry on craft projects; and (5) to create and register trade-marks of genuineness and establish standards of quality.

More and more the Indians of today are demonstrating that they have not lost the capacity for self-management and self-improvement. They have only needed the opportunity, something to work with. Their condition will not be bettered overnight, but at least they can be hopeful once more.

STATISTICS OF INDIANS IN UNITED STATES

Population, exclusive of Alaska	337,366	Jan. 1, 1937
Population, including Alaska	367,349	
Number of tribes	266	
Children of school age	103,641	(June 30, 1936)
Number of Federal agencies	79 agencies and 19 independent schools and sanatoriums	
Unallotted tribal land	33,104,050 acres	
Tribal trust funds	$4,500,000	
Appropriations—for education	$9,608,525	(1938)
Appropriations—for health	$4,965,690	(1938)
Appropriations—for administration	$2,604,600	(1938)

GOVERNMENT OF CANADA

The government of the Dominion of Canada (which comprises all of British North America north of the United States except Newfoundland), is carried on by means of a Federal government and a Federal Parliament, which deals with all affairs of the Dominion as distinguished from the provinces and territories which make up the Federation (much as the States make up the Union of the United States).

In Canada provincial and territorial governments in each of the nine provinces, the Yukon Territory and the Northwest Territories roughly correspond to the state governments in the United States. The Constitution of the United States (10th Amendment) reserves to the states respectively or to the people all powers not delegated to the Federal Government by the Constitution. In Canada the situation is just the opposite: the residual powers—those not described in the Constitution—belong to the Dominion and not to the provincial governments.

In June 1936 the Canadian counterpart of the New Deal in the United States was declared unconstitutional by the Canadian Supreme Court on the ground that this legislation was not within the powers of the Federal Parliament of the Dominion but actually came within the powers of the various provinces and their legislatures.

Status of the Dominion.—The relations of the Dominion Government to the British Government were changed by the Statute of Westminster in 1931, which gave equality of status to the self-governing British Dominions—Canada, Australia, New Zealand, Newfoundland (since 1934 no longer a dominion), South Africa and the Irish Free State. Canada had been the first Dominion, formed in 1867 by the Federal union of the four provinces. Upper Canada (Ontario), Lower Canada (Quebec), Nova Scotia and New Brunswick. The plan of federation had been drafted by the Canadians themselves in conference at Quebec and it was little changed by the British North America Act passed by the British Parliament in London. Under the Westminster Statute of 1931 the Parliament in London no longer makes laws for Canada unless the Dominion requests and consents to the law; and the Dominion Parliament has power to repeal or amend any British act. Other signs of the Dominion's independence and equality with the United Kingdom are that Canada now sends a minister to the United States; that the Dominion is a member of the League of Nations and has had a seat in the League Council; and that there can be no change in the succession to the English throne without the assent of the parliaments of Canada and the other Dominions.

EXECUTIVE DEPARTMENT

The Governor General of Canada.—By the Statute of Westminster (1931) the governor general is the sovereign's representative in Canada and is appointed by him upon the advice of the Canadian Government. (Formerly he had been appointed on the advice of the British Cabinet in London.) He is appointed for five years. The person to be chosen must be a British subject and is usually selected from the ranks of the statesmen of Great Britain. The salary of the governor general is fixed by a statute of the Dominion Parliament at £10,000 and is paid out of the Dominion exchequer.

The governor general, according to mandate of the Imperial Conference of 1926 (one of the preliminaries to the Statute of Westminster), is "a representative of the Crown, holding in all essential respects the same position in relation to the administration of public affairs in the Dominion as is held by His Majesty in Great Britain, and is not a representative or agent of His Majesty's government." He is therefore Canada's executive head as the king is the executive head in Great Britain, but he cannot dictate in the affairs of the Dominion and his theoretical right of approving or vetoing legislation is only a theory —like the king's in England.

The Cabinet.—This constitutes a kind of executive committee of Parliament. Its powers and duties are not defined by any statute or written law, but rest on conventions that have become part of the constitutional law of England and of the various parts of the Empire to which powers of self-government have been delegated. It differs from the Cabinet of the President of the United States in that all its members are also members of one or other of the Houses of Parliament of Canada, where they can explain and defend all their acts and proceedings. The Cabinet of the Dominion originates all legislation that it thinks necessary or expedient, and the defeat of any government measure of importance in the House of Commons generally necessitates the resignation of the Ministry, as no longer able to command the confidence of Parliament.

Privy Council of Canada.—The statute law provides for the establishment of a Privy Council of the sovereign in Canada, to aid and advise in the government of the Dominion. In practice the Privy Council as such does not govern, as it embraces men of different political parties who have been members of former cabinets.

The Executive Departments.—The various executive departments of the Dominion Government are under the control of ministers who are members of the Cabinet. The following are the Cabinet portfolios, each corresponding to an executive Department, though every department is not necessarily represented in the Cabinet. In some cases a Cabinet Minister has charge of several departments.

The Prime Minister usually fills the offices of President of the Privy Council of Canada and Secretary of State for External Affairs.

The other Cabinet members are

Courtesy Canadian National Railways

Parliament Building of the Dominion of Canada

Above the Ottawa River at Ottawa, Ontario, towers the Canadian Parliament Building housing the Senate (96 members) and the House of Commons (245 members). These bodies enact all Dominion legislation. The building is in modern Gothic architecture; its central tower has a 53-bell carillon and a chamber containing *The Book of Remembrance* in which are inscribed the names of all Canadian men and women who died in the World War

the following, though sometimes two or more portfolios are combined:

- Minister of Finance
- Minister of National Revenue
- Minister of Fisheries
- Minister of Labour
- Minister of Justice and Attorney-General of Canada
- Minister of Trade and Commerce
- Minister of Transport
- Postmaster General
- Minister of Public Works
- Secretary of State of Canada
- Minister of National Defence
- Minister of Agriculture
- Minister of Mines and Resources
- Minister of Pensions and National Health

LEGISLATIVE DEPARTMENT

Parliament of Canada.—The Parliament of Canada is composed of the Senate and the House of Commons. It is the prerogative of the sovereign (represented by the governor general) to summon meetings of Parliament and to prorogue (or dissolve) it; also to approve or disapprove of all bills which have been agreed to by both houses. In each case he acts only on the advice of his responsible ministers. The governor general takes no part in the debates. There must be a session of Parliament at least once in every year.

The Senate.

Number of Members, 96.

How Appointed. By the governor general on the advice of his ministers.

Term of Office. Life, but office may be forfeited.

Eligibility. Thirty years of age or upward; British subject; owner of $4,000 realty; resident of the province he represents, and in the Province of Quebec his property qualification must be in the electoral district he represents.

Salary. Fixed by statute at $4,000 and traveling expenses; Speaker of Senate, $6,000.

Powers. (a) Appoints its officers other than the speaker, who is appointed and removed by the governor general in Council. (b) Has power to approve, reject or amend bills passed by the House of Commons, except that it cannot originate, or alter bills passed by the House of Commons for raising revenue.

House of Commons.

Number of Members, 245.

How Elected. By popular vote for electoral districts, readjusted decennially.

Speaker. Elected by the House.

Salary. Fixed at $4,000 and traveling expenses; Speaker, $6,000.

Term of Office. Duration of Parliament, but may resign or be expelled for crime.

Duration. Until dissolved by the governor general, but not to exceed five years.

Powers. (a) Originates all bills for raising revenue, and may originate bills of any other nature. (b) Approves, rejects or amends bills passed by the Senate.

Legislation.—All laws must receive the assent of the governor general, the Senate and the House of Commons.

JUDICIAL DEPARTMENT

Judges of Dominion Courts.

Supreme Court. Consists of a Chief Justice and six other justices.

How Appointed. By the governor general on advice of Canadian Cabinet.

Term of Office. Life and good behavior, but must retire on reaching the age of 75.

Jurisdiction. Appellate court to hear appeals from courts of last resort in the various provinces of the Dominion. Has original jurisdiction in certain constitutional matters. The only appeal from its decisions is to the Judicial Committee of the Imperial Privy Council.

GOVERNORS GENERAL OF CANADA

GOVERNOR GENERAL	LINEAGE	TERM OF OFFICE	BIRTH	DEATH
The Right Hon. Viscount Monck, G.C.M.G.	Charles Monck, British statesman, made a peer of the United Kingdom in 1866.	1867–1869	1819	1894
The Right Hon. Baron Lisgar, G.C.M.G.	Baron Lisgar, a British politician (Sir John Young)	1869–1872	1807	1876
The Right Hon. the Earl of Dufferin, K.P., K.C.B., G.C.M.G.	Was created Marquis of Dufferin in 1888 (Frederick Temple Hamilton Blackwood)	1872–1878	1826	1902
The Most Hon. the Marquis of Lorne, K.T., G.C.M.G., P.C.	Eldest son of the eighth Duke of Argyll (John George Henry Douglas Sutherland Campbell)	1878–1883	1845	1914
The Most Hon. the Marquis of Lansdowne, G.C.M.G.	Fifth Marquis of Landsdowne (Petty-Fitz Maurice Henry Charles Keith)	1883–1888	1845	1927
The Right Hon. Lord Stanley of Preston, G.C.B.	Sixteenth Earl of Derby (Frederick Arthur Stanley)	1888–1893	1841	1908
The Right Hon. the Earl of Aberdeen, K.T., G.C.M.G.	Seventh Earl of Aberdeen (John Campbell Hamilton Gordon)	1893–1898	1847	1934
The Right Hon. the Earl of Minto, G.C.M.G.	Fourth Earl of Minto (Gilbert John Elliot-Murray Kynynmound)	1898–1904	1845	1914
The Right Hon. the Earl Grey, G.C.M.G.	Fourth Earl Grey (Albert Henry George)	1904–1911	1851	1917
Field Marshal H.R.H. the Duke of Connaught, K.G.	Third son of Queen Victoria	1911–1916	1850	1938
The Duke of Devonshire, K.G., G.C.M.G.	Ninth Duke of Devonshire (Victor Christian William Cavendish).	1916–1921	1868	1938
Baron Byng of Vimy, G.C.B., G.C.M.G.	Seventh son of Earl of Stafford (Julian Hedworth George)	1921–1926	1862	1935
The Right Hon. the Marquis of Willingdon, G.C.S.I., G.C.M.G.	First Marquis of Willingdon (Freeman Freeman-Thomas)	1926–1931	1866	
The Right Hon. the Earl of Bessborough, G.C.M.G.	Ninth Earl of Bessborough (Vere Brabazon Ponsonby)	1931–1935	1880	
The Right Hon. Baron Tweedsmuir, G.C.M.G., C.H.	First Baron Tweedsmuir (John Buchan)	1935–1940	1875	1940
The Right Hon. the Earl of Athlone, K.G., G.C.M.G., P.C.	First Earl of Athlone (Alexander Cambridge)	1940–	1874	

Salary. Chief Justice, $15,000; other judges, $12,000.

Exchequer Court. Consists of two judges.

How Appointed. By the governor general upon the advice of the Canadian Cabinet.

Term of Office. Life and good behavior, but must retire on reaching the age of 75.

Jurisdiction. Claims against the Crown; Federal railways; patents, trade-marks; copyright; admiralty cases.

Salary. President of Court, $10,000; other Judge, $9,000.

Provincial Governments.—Only Quebec and Nova Scotia have two houses in the provincial Parliament; the other provinces have a single chamber legislature. In the Dominion the provinces have much less power than the central Government.

PRIME MINISTERS OF CANADA

Name	Service		Born	Died
	Term	Years		
Right Hon. Sir John Alexander Macdonald, G.C.B., P.C.	1867–1873	6	1815	1891
Hon. Alexander Mackenzie	1873–1878	5	1822	1892
Right Hon. Sir John A. Macdonald, G.C.B., P.C.	1878–1891	13	1815	1891
Right Hon. Sir John Joseph Caldwell Abbott, K.C.M.G.	1891–1892	1	1821	1893
Right Hon. Sir John Sparrow David Thompson, K.C.M.G.	1892–1894	2	1844	1894
Hon. Sir Mackenzie Bowell, K.C.M.G.	1894–1896	2	1823	1917
Hon. Sir Charles Tupper, Bart.	1896–1896	6 mos.	1821	1915
Right Hon. Sir Wilfrid Laurier, G.C.M.G.	1896–1911	13	1841	1919
Right Hon. Sir Robert Laird Borden, G.C.M.G.	1911–1920	9	1854	1937
Right Hon. Arthur Meighen	1920–1921	1	1874	
Right Hon. William Lyon Mackenzie King	1921–1926	5	1874	
Right Hon. Arthur Meighen	1926–1926	2 mos.	1874	
Right Hon. William Lyon Mackenzie King	1926–1930	4	1874	
Right Hon. Richard B. Bennett	1930–1935	5	1870	
Right Hon. William Lyon Mackenzie King	1935–		1874	

LAW

Law is like life or matter or electricity—hard to define. Though we use it and benefit by it, we may not know its exact nature or be able to say just what it is. Some light on its meaning comes from the common phrase, "laying down the law." The words *law* and *lay* have the same root: law is something laid down. A statute is something laid down or established. Law is a system of rules or principles with authority.

Who lays down the law? What is the authority? The government is the obvious answer. Law is the rules laid down by the government.

Law and Right.—If we look at other languages, we find that *droit* is French for law—and that it also means right, straight, upright; the German word for law is *Recht*—and that it also means right, proper; and the Italian word is *diritto*—and that it also means direct, straight.

Etiquette tells us what is right. So does morality. So does law. Each is prescribed or established rules of conduct. They are alike because they all express the usages of some community at a particular time and place. In different communities, at different times, in different places there are all sorts of differences in the rules for politeness or righteousness or being a law-abiding citizen. The origin of all these social controls is custom. It is the custom of a dominant social class, especially in the matter of etiquette. Etiquette, standards of morals and law are all the rules of this class that sets the standards and lays down the law. Law is more formally and definitely set. Like etiquette and morality it changes from time to time and is not the same in different places at the same time; but at any one time or place law seems more hard and fast and less open to question or difference of opinion than etiquette or morality. In politeness and goodness we are governed considerably by the example of certain leaders; but, though it is true that our obedience to the law and our observance of it may depend on how others obey and observe it, the law has a force behind it that is different from any power that makes us polite or moral.

Law and morality and etiquette are all enforced partly by our desire to win the approval and avoid the disapproval of other members of the community. Law and morality unite to control much of the whole field of human conduct. For example, most modern societies consider it both immoral and unlawful to kill a human being (except in war, in self-defense or by police officers), to commit adultery or to steal. More and more the law is coming to coincide with the rules of good conduct. This is seen in every field of law. In defining crimes and noncriminal wrongs, the law is becoming more interested in the intent, that is, in the spirit of the act and its purpose, which are the things that count in morality. In trade, law is becoming more and more severe on fraud and unfair practices. What used to be considered excusable business shrewdness is now discouraged by law. The old maxim of the law, *caveat emptor*, let the buyer beware, has almost disappeared, so heavy are the obligations of fair dealing that modern law puts on the seller, so powerful are the laws' efforts to protect the buyer who used to be told that he must look out for himself.

With all these similarities between law and morality and etiquette, there are essential differences between these three methods of social control. Law refers to external action whereas morality refers to the mind. Law imposes a norm to which all must conform, morality imposes an ideal standard toward which all should strive. The sanctions of law and morality are different—that is, the force that deals with violations of the controlling rules. Fear of disapproval may be the only reason for observing rules of etiquette or even certain moral rules, but it is seldom the only reason for obeying the law of the land. For a breach of etiquette one is likely to suffer exclusion from certain social contacts. Immorality provokes vigorous and widespread criticism and a more complete social ostracism. For unlawful acts the offender is tried by a court, pays retribution to an individual whom he has wronged and may be fined, imprisoned or even put to death. It is true that you can imagine instances of immorality where the punishment that the community informally imposes is more painful than the penalty for certain unlawful acts—like paying damages for trespassing or a fine for violating the ordinance against parking. However the penalties of law are more uniformly and impersonally administered; they are administered by public authorities and they are administered more publicly and the purpose of the law and the conduct it demands are generally approved.

Law and Public Opinion.—It is plain that law depends on custom. It is plain that the purpose of law is approved in general by the public. It follows that nothing seems to be law (effective law, anyway) that lacks popular support. The law against homicide is not much of a law in a primitive community where many murders are no more shocking to the frontiersman than bad table manners would be to us today. The 18th Amendment to the Constitution of the United States, prohibiting the sale, manufacture and transportation of intoxicating liquors was openly disobeyed by some citizens (including lawyers) because they thought the regulation of anyone's drinking habits was not a proper function of government. Other citizens disobeyed the same law because they believed that only a small minority had favored the Amendment. The repeal of the Amendment was certainly the result of public opinion. In a sense, public opinion makes laws, breaks laws and repeals them or renders them inoperative. Our statute books contain many laws that are dead letters. Some have gone out of date just because so long a time has passed since they were enacted. Some laws are on the statute books but have never been in force, because they were never intended to be enforced; they were passed as gestures, concessions to loudly expressed moral sentiment or attempts to pacify political opponents.

When a statute is repealed during the prosecution of a person accused of violating that statute, the prisoner is usually dismissed. The reason seems to be that as public opinion has changed enough to repeal the law now, the law could not have been really supported by public opinion when the accused violated the law. It often happens that a jury acts on the assumption that a law without popular approval is not a law to be enforced. Under the old English law a man who stole a loaf of bread was condemned to death; when the public revolted from this extreme punishment juries would often declare a guilty man innocent rather than have him punished by death. And the one who mercifully enables a dying person to end his suffering is guilty of murder, but the jury will usually decide that the "mercy killer" did not do the alleged act, in order to prevent what is thought to be an unjust punishment.

Changes in Law.—What sort of conduct must be regulated by law? The answer is constantly changing, and so the content of the law constantly changes. For example, the criminal law of England formerly protected a man's interest in an animal only if the animal was edible. Old crimes have ceased to be crimes under new modes of thought, and penalties are very different now from what they were in England two centuries ago when 160 crimes were punishable with death. Within a much shorter period some old forms of property have disappeared and new forms have become important—such as promissory notes, bills of exchange, corporate stock.

There has also been a great change in the authority back of the law—a change that corresponds roughly with alterations in the organization of society.

In primitive society, just because it is organized so differently from our own, it is hard to say what is law or even whether there is anything that can be called law—except criminal law. Conduct of all kinds is regulated by taboo. Judged by the apparent purpose of the taboos, many of them seem to be for the public good and in this respect they have one of the essential qualities of law—for example, taboos respecting foods may guard the public health and taboos about personal relations such as marriage may preserve good order inside one group or peace between different groups. But we cannot be sure that the taboos had the purpose we read into them. Besides, the punishment under taboo was merely predicted and there was nothing to make it come true but the frightened apprehension of the wrong-doer. No penalty was demanded and enforced by society.

In a theocracy, the priests who governed as the representatives of the tribal god learned the will of the god and told it to the tribe as a message from the god. Moses received the ten commandments from Jehovah on Mount Sinai in a thick cloud with thunders and lightning and "the whole mount quaked greatly." The penalties under the Mosaic law had an extra terror because the law came from the terrible mountain. How different are the authority and the source of law today in democratic states! The people's elected representatives enact the statutory law in national Congress and in state legislatures; and judges (many of them elected by the people) declare the rules of law that are not enacted and fix the actual meaning of the laws that are enacted. From day to day in this year a century and a half after the adoption of the Constitution the judges of certain courts have the power to decide the meaning of our Constitution.

Crime and Punishment.—In primitive society punishment was private vengeance. By custom of the community, with the approval but without the participation of the community, a man who was injured (or his group) took revenge on the wrong-doer (or on his group). The penalty was retaliation in the strict sense of that word, a punishment to fit the crime. Like injury, like penalty was the principle of *lex talionis,* the law of retaliation. In the Mosaic law the penalty is: "Eye for eye, tooth for tooth, hand for hand, foot for foot." Gradually private retribution was superseded by punishment set and administered by government.

In the Babylonian Code of Hammurabi, 1900 or 2000 years before Christ, there was no recognition of private vengeance: the state set penalties for different crimes—death by burning, drowning or gibbeting for different crimes—and the state exacted these penalties. There are two extreme opinions of scholars about this and other early codes that are full and minute in their list of punishments. One opinion says that from the earliest time it was recognized that certain wrongs were offenses against the state or community and that this is the reason for the many penalties in these codes. The other interpretation is that the community was interested not so much in punishing an offense against the public order (the wrong or crime) as in preventing the person or family that had been wronged from pursuing a private vengeance that would again disturb the public peace.

Whether it is a concept of long standing or merely a development in the gradual growth of civilization, the principal that a crime is an offense against the state is an essential of law as we know it. The act of the wrong-doer is usually one that directly injures another individual—stealing, homicide or fraudulent representations. It is also an injury and an offense to the state, prosecuted in the name of the people. Many offenses against an individual plainly threaten the public peace—larceny, robbery and the other wrongs just mentioned. Minor offenses, if they were left unpunished, would endanger the public peace by encouraging many further offenses. A thousand car drivers may ignore traffic lights if one who disregards a light goes unchallenged. Often in sentencing a prisoner the judge says: "I must make an example of you"; and many penalties are inflicted mainly as examples.

Comparative Law

In the 19th century, after Darwin had roused interest in evolution of animal and plant life and scholars began to study the relations of different languages, in England and Germany there sprang up the investigation of early law and an attempt to compare different legal systems, primitive and recent. Before this time the legal scholars had directed their attention toward finding natural law and perfect justice. Legal study had been deductive and in the 19th century it became inductive. The Grimm brothers to whom we owe the famous fairy tales studied early Teutonic law as well as myth. Sir Henry Maine (1822–88) wrote *Ancient Law* in 1861 and *Early Law and Custom* in 1883, drawing on his knowledge of primitive law in the village communities of India.

But neither ancient nor primitive legal systems have had any great influence upon our modern law. Finding the same ideas, the same methods, the same solutions or even similar punishments does not prove any relation or connection between the legal systems in which the similarities occur. No matter where or when the problem arises of protecting a loan to a debtor whose mere promise to pay is not enough, it is almost certain that the lender will say: "Give me your cattle or land for security." No matter where or when a creditor wants payment made at a point far distant from the debtor, the creditor is sure to say: "Give me an order on your friend who lives where the payment is to be made. Command him to pay it there." The chief value of comparative jurisprudence is that it discovers variations rather than likenesses, for the likenesses are so easy to explain.

Law of Babylon and Egypt.—Our knowledge of ancient law is steadily growing. Archeologists are unearthing legal records on Babylonian bricks, Assyrian tablets and Egyptian papyri. Two thousand years before Christ Hammurabi, king of Babylon, compiled a code that combined two earlier legal systems. It was discovered in 1901 and it proves that there was a complete system of commercial law (contracts, sales, pledges, suretyship), land law, wills, criminal law and some material on judgments and procedure. About early Egyptian law we know less, for we have no copies of codes; but there is abundant evidence in documents with legal allusions and legal meanings to make it plain that there was an elaborate system of commercial law in that land at an early date.

The legal material that is being uncovered by archeologists is valuable because it helps us reconstruct the early law of Babylon and Egypt—and because it helps to appraise the social conditions and ideals of the ancient world, for law deals with the fundamental interests of a nation.

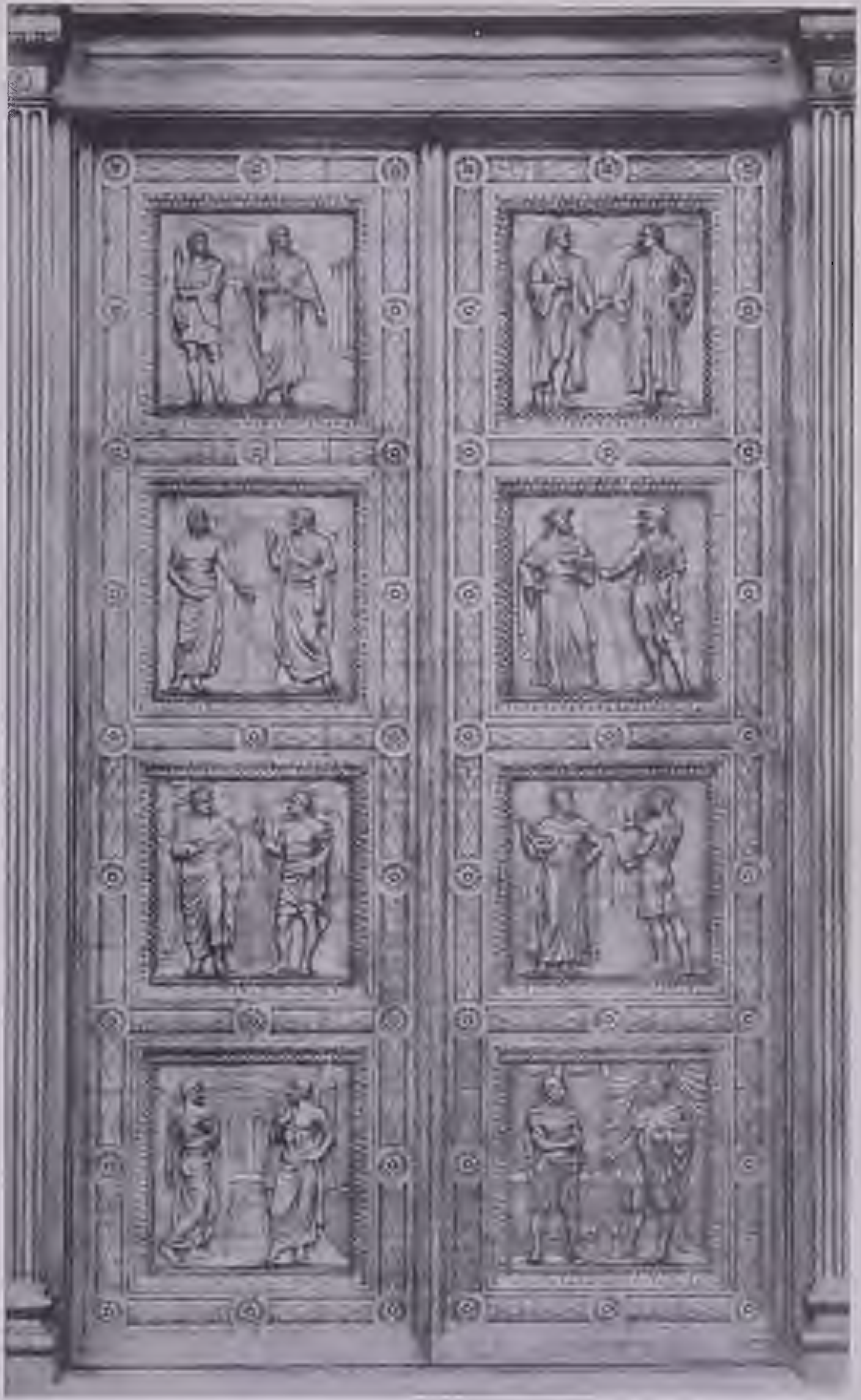
The Jewish Law.—The Old Testament contains half a dozen codifications, usually dated in this order: the Decalogue (*Exodus* 20: 1–17; *Deuteronomy* 5: 6–21), the Covenant code (*Exodus* 20: 23; 23: 19; 24: 17–26), the curses of Mount Ebal (*Deuteronomy* 27: 15–26), the Deuteronomic Code (*Deuteronomy* 21–26), the Holiness Code (*Leviticus* 17–26), and the Priestly Code (most of the book of *Leviticus*). The Bible contains in its narrative portions very many scattered provisions of popular law or customs relating to family relations, landed property, inheritance, debtors, slaves and crime. This customary law manifestly comes from different periods in the development of Jewish culture. Some is from the stage of nomad life; some from that of settled tribal agricultural communities; some from that of urban civilization. Conflicts are observable between the living popular law and some of the high religio-ethical principles enunciated as ideals, rather than realities, in the codes.

Altogether the Jewish law of the Old Testament furnished admirable material for the historical study of law and other social institutions. It illustrates the relation between law and the dominant interests of society, which in this case are those of religion in a theocratic state.

Archeological discoveries are constantly revealing new connections between the Bible and the culture of the ancient Orient, and this is true of the law. Two qualities, however, characterize the Jewish law and set it apart from other Oriental systems. Particularly in its codes it has high religious and ethical principles, and is more humane (however deficient it may seem to us) than other ancient systems in its emphasis upon family purity, freedom of the person and relative protection of animals, slaves, aliens, debtors and the poor. Its second characteristic is that it has been almost wholly confined to the Jewish people; though it was never a world-law, it has remained a living law for a people scattered world-wide, in which respect it is unique.

Roman Law. The legal system of Rome began as the law of the City of Rome and so was called *jus civile* or city law. This early city law was primitive and crude, a body of rigid detailed rules that applied to citizens. After the expulsion of the kings in 509 B.C., the prolonged contest between the patricians and the plebeians led to a codification of the law in 451 B.C. Probably investigations were made into the laws of Athens and Sparta, and even a few enactments of Solon and other famous lawgivers may have been incorporated, but the main body of the law that was codified in *The Twelve Tables* was of Roman derivation. These tables related to judicial procedure, ownership, inheritance, torts and the sacred law.

Foreigners (*peregrini*) living in Rome, subjects but not citizens, were numerous and economically and socially important in the city even when it had barely begun its conquests. As early as 242 B.C. a special magistrate (*praetor peregrinus*) was appointed to try cases in which these foreigners were involved. As the foreigners at Rome came from all parts of the



Harris & Ewing

The Bronze Doors of the Supreme Court Building Tell the Story of Law

Eight panels in high relief on the great bronze doors of the Supreme Court Building at Washington depict the peaks in man's progress toward democratic government and legal equality. They are by John Donnelly, Jr. In chronological order, the eight panels are:

Left, reading from the bottom up:

1. Shield of Achilles, representing the origin of law and custom.
2. The Praetor publishing his Edict, signifying the importance of the Judge's work.
3. Julian and a pupil, representing the development of law by scholar and advocate.
4. Justinian publishing the *Corpus Juris Civilis*.

Right, reading from the bottom up:

5. King John signing the Magna Charta, confirming the legal rights of the people.
6. The Chancellor publishing the first Statute of Westminster in the presence of King Edward I, one of the great legal reforms in English law.
7. Sir Edward Coke barring King James I from sitting as a Judge in the King's Court, thereby declaring the court independent of the executive.
8. Chief Justice Marshall and Mr. Justice Story, who made enduring contributions to the American legal system.

world, the magistrates who tried their cases had to apply rules suggested by considerations of fairness and common sense and rules taken over from a commercial law that was current in the Mediterranean at that time. Thus the law applied to the *peregrini* was a general law of natural justice, based on considerations of equity and utility (*ex bono et aequo*). Because it applied to different nationalities (*gentes* in Latin) it was called the *jus gentium.*[1]

These two systems side by side at Rome, affected each other. The citizens' law became less formal, more businesslike and more equitable. The aliens' law became more precise and more sternly just. Soon citizens and subjects had practically the same private rights under the law—first in a general sort of way and finally in 212 A.D. by the Edict of Caracalla, which gave citizenship to all freeborn subjects and so made the same law for all Romans.

After another three centuries in 528–34 A.D., the Emperor Justinian had the Roman law summarized in three parts: a student's textbook, called the Institutes; a compendium of the jurist-made law, the Digest or Pandects (literally, all-embracing); and a Code of imperial rescripts (that is, special decisions by the Emperor). This compilation, the *Corpus Juris Civilis* or body of civil law, is by far the most famous and most influential law-book of the world's history. Scholars and statesman of the Middle Ages studied it with consequences of immense extent and immeasurable importance. More or less altered, everywhere more or less combined with local native custom and statute, it is the civil law that now rules most of the world that is not ruled by our own English common law.

The Roman law, quite apart from what it did in form, in code and in the actual content that passed into the civil law of modern times, contributed the idea of fair trial, proof of guilt, opportunity for the accused to meet his accusers and know their accusations. In the New Testament (Acts 25:16) a Roman provincial governor, Porcius Festus, states this principle: "It is not the manner of the Romans to deliver any man to die before that he which is accused have the accusers face to face and have license to answer for himself concerning the crime laid against him."

Roman law in its form and content greatly influenced the law of almost all nations of Europe. In the early 16th century Germany and most of the rest of Europe (but not England) took over the Roman civil law and discarded their own customary law, the folk law or common law that expressed their own native and local ideas. This adoption of Roman law was called the *Reception.* Of it a great English jurist, Frederick W. Maitland says: "The modern historian of Germany will speak of the Reception as no less important than the Renaissance and the Reformation with which it is intimately connected."

The Roman law is especially interesting to us because today it governs most of the world. The great legal systems of the world are usually divided into: civil law (the legal systems based upon the Roman law); the common law; and the Mohammedan law. The civil law rules in the nations of Europe (except England), Egypt, the Union of South Africa and the African colonies of civil-law nations, Central and South America and our own state of Louisiana, Quebec, Japan and China (through their borrowing from the German law) and to some extent in the Asian colonies of civil-law nations.

In English law—and so in American law—Roman law has had considerable influence. The church or canon law was largely Roman and this canon law was the branch in which most of the Lord Chancellors of England were trained because they were churchmen. These chancellors in the Court of Chancery built up a system (called *equity* as distinct from English common law), which changed the English and American administration of justice quite as much as the rulings of the *praetor peregrinus* in Rome altered Roman law.

Anglo-American Law.—The law of the United States and of England is fundamentally Germanic rather than Roman. In the fields of equity and admiralty law and in the details of many other portions of English and American law there are Roman influences, but they are not basic and have frequently been exaggerated. When Roman law in the 16th century was more or less adopted and fused with native local law in most countries of Europe—what is known as the Reception—nothing of the sort happened in England. So English law is related to the native legal systems of continental Western Europe through the common Germanic elements of the continental nations' laws and the English law. All the absolutely fundamental doctrines of our property law, for example, are pure Germanic doctrines of the early medieval period; indeed, they are decidedly more so than the principles of the present property law of Germany, because that has so many elements of Roman law from the time of the Reception.

The phrase *common law* is likely to be misunderstood, because it is used in several different senses. It means Anglo-American law as contrasted with the Roman law and its present descendants, the civil law and canon law. It also means that portion of our legal system that is not equity. Sometimes Common law means our traditional or customary law as contrasted with our statutory law which is made by legislatures. The phrase *common law* refers to the origin of English (and so American) law in general customs common to the whole kingdom of England as distinguished from peculiar local and class customs which differed widely among themselves. This common legal custom was gradually formulated in the King's courts as distinct from local courts. It came about mainly as a process of genuine discovery, but in part by deliberate suppression of local customs which the Crown was not for some reason bound to respect. The royal courts gave the Crown revenue and power. Royal justices traveled on circuit through the country, bringing the king's justice to every subject, expediting justice, making it cheaper than it would have been if litigants had been compelled to travel to the court at Westminster. They offered suitors the great advantages of jury trial, and gradually the king's justice displaced almost all local and feudal jurisdictions of a general nature. Statutory law also became of great importance in the medieval period. In the reign (1154–89) of Henry II the circuit system was established—judges taking the king's court to different parts of the realm—and the power of ecclesiastical courts began to be limited and lessened. In the reign of Edward I (1272–1307) there were many important statutes, especially about inheritance and transfer of real estate, with further limitations of the power of the Church and increase in the power of the Crown. Under Henry VIII the Act of Supremacy made the King head of the English Church and again reduced the importance of the ecclesiastical courts and increased that of the king's courts.

Colonial Law.

The English law has not always been so supreme in America as it is today. The Englishmen who settled our thirteen colonies wanted and found in America freedom from tradition. As Sir Guy Carleton said, it was "impossible for the dignity of the throne or peerage to be represented in the American forest." The colonists judged many English institutions to be unnecessary or unsuitable. They did not transplant bodily and immediately to American soil the legal system of the mother country. They lacked, at first, the books and the knowledge that would have made it possible; but they also lacked, at first, the desire to do so. Many of them had fled from England to find freedom from political or ecclesiastical constraints, and they may well have included in their distrust or enmity the courts as a part of the English governmental system and the law as the bulwark of the economic and social order of that country. Only three of the thirteen colonies *formally* recognized English law as governing, in fact, their administration of justice. Several explicitly denied its binding character and for a long time acted upon this denial. In Massachusetts, for example, there was for a time a sort of Bible Commonwealth under the Mosaic Code. Each of the colonies at some time used some sort of code, fundamental law or body of statutes chosen as meeting its particular needs. All passed their own laws and quarreled with the home government and its local representatives over lawmaking. Sometimes they violated English law and even their own charters. In early Massachusetts the government actually imprisoned men who wanted to appeal to English courts. Many important innovations in the law were thus made. It was all an aspect of the growing away from England which culminated in the Revolution. Positive and general distrust of English institutions was largely confined to New England in the period of its early settlement.

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[1] Later *jus gentium* came to mean international law.

English Law Paramount.

In the 18th century there was a constant development of local governmental institutions; there were clashing policies regarding trade and taxes, and bickerings with royal agents over the mother country's rights of political control; and these factors were sweeping the colonies toward the Revolution. But that began with a Declaration of Independence, which was from end to end an argument that the colonists here had been denied the rights of Englishmen at home. In the 18th century English lawbooks became more abundant. Scores of colonists were trained for the legal profession in England, especially after 1750. It became clear that for the regulation of the mutual rights and duties of citizens the common law had served our needs and could continue to serve them. Thus it happened that after Independence, all the original states at varying dates adopted the English Law, statutory and nonstatutory, as the basis of their own legal systems.

English and American law have countless differences in detail. Examine a particular technical point and often you can see no agreement, no relationship. You must remember that there are also countless agreements on other details. What is more important, there is a common mass of fundamental concepts, of general or basic principles; there is the same general classification of materials and the same technique of dealing with them.

American law does not entirely agree with itself. Aside from a few fields in which exclusive Federal jurisdiction creates uniformity, there is, speaking strictly, no American Law. Each state of our country has its own law, slightly affected by provisions of the Federal Constitution. But of course the resemblances between the state systems are very great, and we use the term *American law* to designate this vast mass of common concepts, rules and principles.

Documents of the Law.

English law differs from continental European law in having much more complete historical material for students of the law. The Anglo-Saxon records from the 6th century onward are numerous and inclusive and make it much easier to understand the essentially Germanic thought and institutions of early English law because they are written in the native tongue instead of Latin. And the *Year Books,* which are informal reports and colloquial discussions of actual cases in the king's courts from the late 13th century to the early 16th, are a unique record of medieval law and of a medieval language. No other country has anything like them. In modern times, too, the English and American "reports" of decided cases (almost wholly those decided in the courts of last resort alone) are unique for their fullness and vast bulk. At the present time they total between fifteen and twenty thousand volumes.

Codification.

Our law has such a huge bulk because it is uncodified—that is, it has not been boiled down and digested as Roman law was by Justinian; and the whole common-law system is based on the principle of *stare decisis, et non quieta movere,* which means, stand by decisions and do not reopen matters that are settled. Reports must be bulky to preserve the countless decisions that serve as precedents. The Romans were not excellent codifiers, but their modern followers have, in following their example of codification, improved its quality. All the civil-law countries have codified the principles of their law. Only a few states of our country have enacted their substantive law in general codes. But rules of legal procedure have been codified in nearly two-thirds of the states. By the adoption of Uniform Acts (prepared by the American Bar Association and State Commissioners on Uniform Laws) complete or nearly complete uniformity has been reached throughout the country in state legislation in certain fields of law, chiefly commercial, for example, the law of negotiable paper, sales, warehouse receipts, etc. In this indirect way some parts of American commercial law have become as well defined and as uniform as if the states had adopted a uniform commercial code. In England statutory statement of portions of the law has proceeded much farther than in the United States, and of course an Act of Parliament sets the law for all England, but the statutes of one state of our Union make law only for one state of the 48.

American statutory law, as well as the reporting of American court decisions, is immensely bulky. Just as thousands of decisions are handed down by our courts of last resort, so thousands of laws are passed by our state legislatures at every session. The decisions present a vast amount of duplication in the application of common principles to legal problems that constantly recur. In the immense output of legislation, too, there is a constant recurrence of similar problems. The significance of our legislation lies in the novel social problems with which it deals, and the opportunity presented for trying out variant public policies in different states. Novel problems of recent decades include regulating public utilities (railroads, gas and electric companies, etc.) and sales of corporate stock and bonds (*blue-sky* laws), workmen's compensation and social insurance (against old age, sickness or unemployment), formulating state labor policies, curbing fraud and unfair practices in trade, regulating automobile, truck and trailer traffic. Thus, much of our current legislation embodies the popular will of the day on issues of reform. During the last half century its quality has been greatly improved because the legislatures are employing experts to draft legislation and because nearly all our states now have legislative reference bureaus to aid legislators in the study of their problems and give aid in drafting bills. This lessens litigation, avoids invalidation of statutes by the courts on the ground that they are unconstitutional and insures more complete attainment of desired ends.

Equity.—In both England and the United States the legal system still consists of two distinct parts—the common law and equity. Equity was developed in England from the 14th century onward by the king's chancellor in his Court of Chancery, sitting as the king's representative to deal with petitions from his subjects. The early chancellors were all churchmen (no layman was chancellor until 1529), and these chancellors were all trained in the civil and canon laws that ruled in all church courts. The chancellor's court gave justice where it was not to be procured in the courts of common law because their rules were incomplete or rigid, because the principle of precedent was out of touch with the problems of the moment, because juries might be intimidated or for other reasons. Equity as a complement to our common law was like the benefit in Roman law from the *praetor peregrinus* who transformed the *jus civile* into the *jus gentium.* In both the English and the Roman system the older law was too formal, too inelastic and too narrow in its spirit. The reforming process both in Rome and in England was an emphasis upon essential fairness. The gradual absorption into our common law of the law merchant developed in international commerce and fairs by medieval merchants is another instance of the liberalization of our law and it is even more closely parallel to what the foreign praetor did at Rome.

In almost all of our states the same courts administer both legal and equitable relief. In all the code states—those with a code of civil procedure—there is only one form of civil (noncriminal) *action;* the distinction between actions at law and suits in equity has been abolished. But the distinction between law and equity is not abolished: those that originated in common law remain *legal* and those that were developed in chancery remain *equitable.* There is still some conflict between the principles of these two portions of our law; but in the long run the equitable principles generally prevail.

Equity looks through form to substance. It acts consistently on a plane of morality higher than that of the nonequity law. It is still a growing jurisdiction supplementing and humanizing the nonequity law. An English statute of 1783 and similar statutes in at least two of our states provide that, when the rules of law and equity conflict, equity shall prevail. It may be an actual advantage that the two systems of law and equity have not been fused, with equity in the predominant position; if equity is still far from perfect its doctrines should not be fixed for good and all. Many lawyers feel that equity is itself becoming too much a matter of rules and precedents. The substantive principles of the two systems have fused by a slow infiltration of equitable doctrines into all parts of the common law.

What's Wrong with the Law?—Popular criticism of the law and its administrators has for centuries been abundant (not more in our own than in other countries), and not at all confined to disappointed litigants. In our country it is directed today against the law, the judges, the bar and the administrative officials who enforce the judgments of the courts and provisions of the statutes.

The law is considered by many to be unduly conservative. Undeniably it lags behind social changes. Law is the embodiment of what purport, at least, to be society's pondered judgments on its fundamental interests. Our constitutions and statute-books record our theories of government, our standards of governmental organization. If our legislators truly represent us the laws they make must reflect our general attitudes toward agriculture, trade, industry and transportation. They embody our conception of men's basic mutual rights and duties, our measurement of the individual against society, our ideals regarding religion, education, personal freedom, personal security, the protection of youth and age and the succor of the physically and mentally infirm, our attitudes toward the problems of poverty and of labor—in short, the estimates of every kind which we make of our own day and forecast of our children's day. Nobody will deny that all these estimates need persistent scrutiny and occasional revision—that the law should constantly be criticized. This is true both of public law and of the substantive rules of the private law that reflect our conceptions of individualism and express the mutual rights and duties of individuals. It must be admitted, however, that our criticism cannot be very scientific or accurate. We may all agree that a law or institution works well or ill, but we cannot state mathematically how well or how badly. There is no established method of scientific measurement for that. On fundamentals the law is conservative—for it is the designed conservator of fundamentals. Courts in their opinions occasionally suggest desirable changes in procedure or in the substance of the law; our state attorneys general sometimes do the same. In twenty states Judicial Councils exist for improvement of the procedural law alone. All the states occasionally, in revising their statutes, have introduced improvements. Not one state has yet provided a permanent instrumentality that will continuously scrutinize the statutory law and the nonstatutory law (both substantive and procedural) with the duty of suggesting amendments. This should be done. The creation of such reformative agencies is probably near. Far less is wrong with the law, however, than with its administrators.

The judges, many critics of our law consider, should make more and better law. The judge's power to make law is based on his adapting rules and precedents of the past to the changing needs of today, and so the opportunity of a judge to make law is limited. The network of precedents covers the field of law. It has been well said that only within the interstices of this net can the courts make law, and that even then they make it by analogy. A judge's decision that is contrary to a prior and clear decision of a higher court or that disregards such a decision will be reversed on appeal, unless the higher court reverses its previous decision, which seldom happens. In another sense, however, every judge has daily opportunities to make law; for he may lessen the infinite obscurities in the opinions supporting earlier decision. Unintelligent opinions have literally filled the law with obscurities. There are some problems in property law, for instance, that have been recognized literally for centuries, but the treatment of them by the courts has not improved in all that time. A statement about such a problem by a court in 1900 or 1938 is no more modern than one from Coke on Littleton in 1629 or even one from Perkins's *Profitable Book* printed in 1530. The rule of *stare decisis,* the judge's compulsory habit of looking to the past for the rules which govern problems of the present—that is what makes of most judges somewhat stodgy conservatives. Another reason is that almost all judges, before they attain judicial office, are successful practitioners who serve important business interests, so that from these associations judges naturally acquire a conservative attitude on social and economic questions. It may fairly be said that too few judges have any considerable knowledge of economic problems or social conditions; that too few have the ability to make desirable adjustments of the law, that too many harbor a professional aversion to change. But all criticisms of judges are really criticisms of those who elect or appoint them. The bar generally ignores its duty to lead the people or the appointing officer to a proper choice; and politics and indifference are the causes for this state of affairs.

The same is true of all our public prosecutors and others who represent the state in the administration of the law. Surveys of crime conditions have been made in various cities and states. They have all shown in varying degree the powerful and baneful influence of politics at every step—in determining whether or not to arrest a suspect, whether to hold an inquiry before the grand jury, whether to indict him, whether to *nolle prosequi* (do not prosecute) the action, whether to parole him from prison, whether to pardon him. With rare exceptions the office of public prosecutor is given not to career men who know the law but to political neophytes who want to make that office a springboard to some other political position.

The educational and moral standards for admission to the bar are not sufficiently high, and disbarment proceedings after admission are much too infrequent. Law has come a long way in its thousands of years of slow development. The slow advance has been considerably accelerated in the last three centuries, maybe even more in the last century. There is hope for the future—especially if there is a more general interest in law and government with a growing sense of the responsibility each citizen has for making law more just and government more free.

LEGAL PROCEDURE

The more important principles of the law as they apply to our everyday lives may be summed up under the general head—rights under private law. And these may be classed as they are based on (1) status; (2) contract, including (a) negotiable instruments, (b) agency, (c) corporations, (d) partnership and (e) sale of personal property; (3) obligations imposed by law irrespective of agreement, which involve besides other rights a special consideration of real property, its ownership and transfer by deed, lease or will; (4) remedial rights and legal remedies, including court procedure.

(1) STATUS

Certain rights and duties exist between parties who bear a certain relationship to one another. The most striking illustration is family relationship. Rights and duties of husband and wife and of parent and child are created by the existence of those family relations and are confined to persons bearing that relation to each other. The relation of master and servant involves at common law certain consequences, and other consequences are often added by statute.

(2) CONTRACTS

Most of the ordinary transactions of business life involve applications of the law of contracts. The greater part of the law of agency, partnership, insurance, sales, negotiable paper and banking consists of specialized contractual law.

The simplest and also most accurate conception of a contract is a promise or a number of promises forming part of a single transaction to which the law attaches legal obligation. Promises of competent parties may be binding because of their form or because of their essential character. Contracts of the first kind are called formal, of the second kind, informal or simple contracts.

Requisites of Contracts.—Both formal and informal contracts may consist wholly of a promise or promises by one party only or of mutual promises by the parties. In the former case the contract is called unilateral, in the latter case it is called bilateral. Both formal and informal contracts require that the parties undertaking to contract shall have capacity for that purpose. Both types also may be invalidated by being opposed to statute or public policy; or by being induced by fraud, duress or essential mistake.

A contract is voidable when it may be avoided at the option of one of the parties. The term *void contract,* sometimes used for an agreement or promise having no legal effect, is a contradiction in terms. Being void, such an agreement is not a contract.

Incompetent Parties.—In order to protect certain classes of persons, their capacity to make a binding contract has been limited by law. They may be divided into the following classes: (1) infants; (2) insane persons; (3) drunkards; (4) married women; (5) corporations.

Infants. At common law, all persons under twenty-one years of age are infants. In a few states, however, by statute females are of age at eighteen.

An infant's contract for necessities is legally binding, but his other contracts are voidable by him. Necessaries consist of whatever, in view of his station in life, and his supplies from other sources, is essential for his welfare. An infant may avoid his contracts within a reasonable time after he becomes of age, and if he has not received property which he still retains, his power of avoidance is generally not limited in time, but in some states an infant who has received property can never avoid obligations without returning what he has received. Even for necessaries an infant is liable only for their fair value. He is liable for his torts or wrongdoings of a civil nature.

Insane Persons. Agreements of a person so insane as to be totally incapable of understanding what he is doing are generally void. If not insane to that degree, his contracts are generally voidable in the same way as the contracts of an infant. In some states, however, if an insane person not wholly devoid of reason has received fair consideration for his promise and the person with whom he dealt had no knowledge of the insanity, the contract is held valid.

Drunkards are under no positive disability unless their intoxication is so great as to deprive them wholly of the use of their mental faculties. In that event they are dealt with like insane persons. The fact, however, that a person is slightly intoxicated may render him more easily a prey to fraudulent persons; thus drunkenness is often a relevant fact in determining whether a transaction was induced by fraud.

Married Women. At common law a married woman could not contract or acquire a contract right or other personal property or retain the ownership of such rights or personal property that she had at the time of her marriage. Courts of equity, however, from an early day, have protected her separate estate and recognized her contracts relative thereto. This estate included all property both real and personal, which was settled upon her to her sole and separate use. The legal title to it had to be in some other person (who might be her husband), who held it in trust for her. The Married Women's Acts, which are in force in every state of the Union, have so far enlarged the rights and powers of married women that they are generally under no disability or only unable to contract with their husbands or to become surety.

Corporations are created by the state and have only the powers given them by their charters. They may make contracts, provided they act within the scope of their charters. Contracts attempted beyond that scope are *ultra vires* (exceeding legal power or authority).

Formal Contracts are of two kinds: (1) promises made as part of proceedings in court and (2) promises under seal. At common law the seal consisted of an impression on wax or a wafer attached to a written instrument. By statute, however, a mere scroll generally has the same effect as a common-law seal. By more comprehensive statutes, in some states seals are now wholly abolished, and in many other states if it is proved that there was not such consideration as is necessary for informal contracts, a promise under seal is not binding.

Informal or Simple Contracts depend for their validity upon a manifestation of mutual assent and sufficient consideration to support the promises of the parties. Informal contracts are at the present time of much the greatest importance everywhere, and in many states owing to the abolition of seals or a diminution of their legal effect all contracts are informal.

Mutual Assent.—Expression of assent to a contract, as a practical matter, can be secured only by an offer by one person and acceptance by the person to whom the offer is made. An offer to contract is a promise, in terms conditional on there being given in exchange for it another promise or some specified performance. Giving such other promise or performance is itself a manifestation of acceptance. Before such acceptance takes place, however, and making any subsequent acceptance ineffective, an offer may be terminated: (1) by revocation by the offeror; (2) by rejection by the offeree; (3) by death or insanity of either party; (4) by lapse of an unreasonable time for acceptance. An offer may be made not simply by spoken or written words but by acts manifesting the offeree's intention or by both words and acts. Thus an order given to a shopkeeper implies a promise to pay for the goods requested, if they are furnished.

An offer can be accepted only by the person to whom it is addressed. The method of accepting an offer for a unilateral contract is by doing the act requested in the offer. An offer for a bilateral contract is accepted by giving the promise that the offeror requested. The offeror may impose any conditions in his offer that he sees fit, and in order to form a contract the offeree must always comply with these conditions. When an offer is made by mail, an acceptance by mail, if properly addressed and stamped, takes effect when it is posted. The fact that it is lost in the mail is immaterial. The offeror, however, may make actual receipt of the letter of acceptance a condition of his offer. The rule in regard to acceptance by telegraph is the same as in the case of acceptance by post. Use of the mail or telegraph must have been expressly or impliedly authorized by the offeror in order to make the mere despatch of a letter or telegram a valid acceptance. Use of that means in communicating the offer or general custom may give the requisite authority by implication.

Like an offer, acceptance may be indicated by acts as well as by words. A contract is called an express contract where the assent of the parties is manifested by oral or written words. An implied contract is one where assent is inferred from the acts of the parties. Obligations to pay for benefits received, though not created by any manifestation of assent, are also sometimes called implied contracts, but are better called quasi contracts.

Consideration.—Consideration means an exchange given for a promise. In order to support a promise there must be something given in exchange for it, and the exchange must be such as the law requires. Therefore, a promise to make a gift is not enforceable, though an actual gift accompanied with delivery of chattel property is effectual, since the donee then relies on possession of the chattel not on a promise. Consideration for a unilateral contract is legally sufficient if it is anything which the promisee was not previously under a legal obligation to do or give, and a *promise* of any such thing is sufficient consideration for a bilateral contract. Payment of all or part of an admitted debt or a promise of such payment is, therefore, insufficient consideration for a promise by the creditor. A promise, though conditional on the happening of an event which may never occur (such as a promise to pay money if a house burns) is, however, sufficient consideration for another promise. It is also immaterial that consideration for a promise is of little or no pecuniary value so long as the offeror requested it and the offeree was not bound to give it. It is a common error to suppose that inserting in a contract the clause "in consideration of one dollar" automatically makes a contract binding; but it must be borne in mind that the courts are always ready to find any additional promissory advantage beside the small consideration which will establish the intent.

Promises Binding Without Assent or Consideration.—There are very few promises which are binding without any acceptance by the promisee and without any consideration. Such are promises to pay a debt of the promisor, recovery of which has been barred by the Statute of Limitations or by discharge in bankruptcy.

Necessity of Writing.—An early English statute, called the Statute of Frauds, required certain contracts to be in writing, or a written memorandum to be made signed by the party to be charged, stating the terms of the contract, in order that such contracts should be enforceable. This statute has been substantially re-enacted in all the United States. The contracts that are thus required to be in writing are the following: (1) contracts by an executor or an administrator to pay damages out of his own estate; (2) contracts to answer for the debt or default of another;

(3) contracts in consideration of marriage, that is, contracts for marriage settlements; (4) contracts for the sale of any interest in land; (5) contracts which cannot be performed within a year from their formation; (6) promises to pay an antecedent debt that otherwise would be barred by the Statute of Limitations; (7) promises to accept a bill of exchange; and certain other contracts under the statutes of most American states, require a writing.

In some states also a writing is necessary to make enforceable promises: (1) to revive a debt barred by a discharge in bankruptcy; (2) to make a will or leave a legacy; (3) to authorize an agent for some purposes; (4) to pay commissions to real estate brokers.

Under the English statute, a written memorandum signed by the party to be charged was also required to make enforceable sales and contracts to sell chattels exceeding £10 in value, if no part of the goods were accepted and actually received by the buyer, and no earnest money or part of the price paid by him. There were thus alternative methods besides a written memorandum for making such transactions enforceable. About three-fourths of the United States have enacted a similar statute, but in these states the minimum amount necessary to bring the transaction within the statute varies greatly. In Ohio it is $2,500. In no other state is it higher than $500, the figure adopted in a number of States. In others it is $50.

Illegal Contracts.—An agreement to do an act which is prohibited by positive law or which is against public policy is illegal and cannot be enforced by a party who knew the facts making the agreement illegal. A party who has no reason to know such facts may, however, recover damages for breach of an illegal contract. Thus if a married man engages himself to an unmarried woman who does not know he is already married, she can maintain an action for breach of promise.

Wagering Contracts. In this country wagering contracts are not enforceable. They include not only ordinary bets but speculative transactions where the parties do not contemplate a delivery of goods or shares of stock bought or sold but merely payment of the difference between the contract price and a subsequent market price.

Sunday Contracts. Sunday contracts, as a rule, are prohibited by statute. At common law, however, they were enforceable. The statutes of the various states vary considerably, but all exempt from their operation contracts founded upon works of charity or necessity. Under these statutes, contracts not within this exemption are illegal. Formal contracts and negotiable instruments take effect on delivery. Therefore, bills of exchange, promissory notes, bonds, deeds and mortgages delivered on Sunday are illegal although signed on a secular day. But those delivered on a secular day are enforceable although signed on Sunday. An informal contract takes effect on acceptance of an offer. Therefore if an offer is made on Saturday and the acceptance is given on Sunday, the transaction is invalid; but an acceptance on Monday of an offer made on Sunday creates a valid contract.

Usury Statutes. Usury statutes obtain in nearly all of the states. Usury is interest contracted for or paid in excess of the legal rate. The purpose of the usury statutes is to protect debtors from overreaching creditors. They vary in the different states. A few make the entire contract void. Others make the interest void. Still others merely make the excess above the legal rate void. They apply to loans but not to sales. Hence they are not applicable where bills or notes are discounted by a third party. Nor, by the Law Merchant, do they apply where a banker in loaning money, deducts in advance the highest rate of interest allowable. Devices to cover an intent to obtain usury by commissions or bonuses are carefully scrutinized by the courts.

Contracts in Restraint of Marriage. Contracts which unduly restrain a person from marrying are against policy and void. Thus, a contract never to marry or not to marry any one but a certain person to whom the promisor is not already engaged is void. But a contract not to marry until of age is valid. And ordinarily a contract not to marry without the consent of the promisor's parents is valid.

Contracts facilitating divorce or separation of married couples are illegal, though after actual separation a contract fixing the amount of settlement is valid.

Contracts in Restraint of Trade. From early times contracts unreasonably restraining employees whose employment had terminated from exercising their skill were held to be illegal. A restraint was unreasonable which exceeded what was necessary for the protection of the promisee, as where it would prohibit exercise of the promisor's occupation in territory beyond the scope of the promisee's business. This is still law both in England and in the United States; and a similar rule invalidates contracts prohibiting competitors in a business or profession from exercising that business or profession beyond the extent necessary for the protection of the business purchased. The prohibition of contracts in restraint of trade has been extended, especially in the United States, to all contracts the tendency of which is to obtain a substantial monopoly, and statutes have been passed both by the Federal Government (the Sherman Law) and by many states making any transaction, whether by contract or by actual combination, illegal and in many cases criminal.

Contracts Obstructing Justice. Contracts by which a lawyer or other person undertakes to pay the expense of litigation and to receive in return a share of the proceeds of the litigation are generally, though not universally, held illegal. Contracts to refrain from prosecuting or disclosing a criminal offense are also illegal. An injured person may refrain from prosecuting but he may not bargain for consideration for so doing.

Contracts Tending to Political or Business Corruption. Lobbying contracts are illegal though contracts to argue in favor of legislation before legislative committees are valid. Contracts for procuring public contracts, for the appointment or compensation of officials, for procuring pardons or for the location of public buildings are also illegal, as are contracts to secure the election to office in a private corporation and contracts of agents or other fiduciaries for secret commissions or for any purpose which tends to impair fidelity.

Miscellaneous Illegal Contracts. Contracts with alien enemies are forbidden. Contracts already existing with them are suspended if they involve merely unilateral obligations to pay money or transfer property; but existing contracts which would require continued exchange of performance during war are wholly voided. Contracts to promote illegal acts or to indemnify one who performs them are prohibited. However, mere knowledge by a seller that the buyer intends to use goods purchased for an illegal purpose does not generally preclude recovery of the price. Revenue statutes and licensing statutes also may make contracts illegal.

Rules of Interpretation.—The ultimate purpose of rules for interpreting contracts is to ascertain their meaning, which often is not clearly expressed. To accomplish this the following rules are applied by the courts:

When the contract is in writing, its purport cannot be contradicted or varied by proof of oral agreements or conversations. This rule does not apply, however, where the writing is a mere memorandum of the contract or where the purpose in introducing oral testimony is to show fraud, illegality, mistake of expression, usage or custom or a condition precedent to the writing becoming effective. Nor does it apply to subsequent oral agreements. Nor to oral testimony whose purpose is to explain not contradict the meaning of terms.

When the instrument is partly written and partly printed and the written and the printed parts conflict, the writing controls.

In both oral and written contracts words must be interpreted in their plain, common meaning. If, however, the context or surrounding circumstances show that the parties intended to use them in a peculiar or technical sense, the words then take that special meaning.

When doubt exists as to the meaning of a word or clause, it is construed most strongly against the party using it.

When words or clauses are repugnant, those which are opposed to the manifest intention of the parties are rejected.

Subsequent acts of the parties may have a controlling influence in determining the meaning of their agreement. In no case, however, will they be allowed to defeat the plain import of their words.

The various parts of the instrument must be construed together. When there are several contemporaneous agreements relating to the same transaction, they must be construed in the light of one another. And when one or more other papers are directly referred to in the instrument as constituting an inducement to the contract, they are entitled to consideration.

Mistake. Where parties to a contract bargain on the assumption that an essential fact exists and it does not, the contract is voidable. The mistake must be mutual and relate to a vital fact that was assumed as a basis of the bargain.

Misrepresentation, as distinguished from fraud, is an innocent misstatement or nondisclosure of a fact. Though formerly this had no effect on a contract, the prevailing tendency is now to treat it as ground for voiding a contract. Mere nondisclosure, however, does not ordinarily have this consequence. There are, however, some exceptions to this rule. Where one party justifiably relies upon the other party for knowledge of certain facts, that other party in consequence is bound to exercise the utmost good faith. Such contracts are insurance contracts, and those made between parties occupying a fiduciary relation, such as guardian and ward, trustee and *cestui que trust,* attorney and client, principal and agent.

Fraud is a misrepresentation of a material fact, present or past, made with knowledge of its falsity or in reckless disregard whether it is true or false, which deceives the other party, to his injury.

Ordinarily, to constitute fraud, there must be the intentional use of deception or artifice to cheat another. There are, however, some exceptions to this rule. Where the deceiving party is duty bound to make a disclosure, where he takes steps to prevent a disclosure or where the concealment renders that which is stated false, the nondisclosure amounts to fraud. The effect of fraud upon a contract is to make it voidable at the option of the injured party.

Duress is actual or threatened violence or imprisonment which reasonably causes another to enter into a contract. It may be by one of the parties to the contract or by his agent. And it may be directed against either the other party to the contract, or his or her spouse or other near relative. It may consist of the threatened destruction of property, or, under oppressive circumstances, of the illegal detention of property. Its effect is to render the contract voidable.

Undue Influence. Undue influence is akin to duress. It consists in one of the parties to the contract taking an unfair advantage over the other party, who reposes confidence in him, possesses a weak intellect or is in distress. Like fraud, its effect upon a contract is to render it legally voidable.

Modes of Discharging a Contract.—Contracts are discharged: (1) by agreement; (2) by performance; (3) by impossibility of performance; (4) by breach; (5) by operation of law in a few less common ways.

Discharge by Agreement. The parties may agree that their contract shall no longer bind them. Such an agreement is called a *waiver, cancellation* or *rescission.* Express words of rescission are not essential. When the parties make a new contract which is inconsistent with the old one, the old contract is discharged. In such case if a third party is substituted for one of the original parties with the consent of all three, the new agreement is called a *novation.* A unilateral obligation, however, cannot be discharged by mere agreement. The same requirement of sufficient consideration for creating an unsealed contract exists for discharging contractual rights as for creating them. Where both parties are under an obligation, the mere agreement of each to surrender his rights is enough.

Discharge by Performance. Strict and full performance of a contract discharges it.

Performance may consist in payment of money or negotiable paper. In the latter case the performance may be absolute or conditional. Ordinarily, a presumption arises that the payee is entitled to sue on the original contract if the paper is not paid when due.

Rejection of tender or of an offer to perform may constitute a release. Thus, when a party offers to render services, deliver goods or do some other act which he is bound to perform and the tender is definitely refused, he is released if the contract is bilateral.

If, however, there is merely a unilateral obligation to pay money or render some other performance capable of subsequent fulfilment, a tender of what is due does not discharge the debt. Usually, however, it stops the accrual of interest, and also puts the burden of costs on the creditor in case he sues to recover the debt. Moreover, if any security for the debt exists, it discharges it.

Discharge by Impossibility of Performance. When impossibility of performance arises subsequently to the formation of the contract, it does not discharge it in every case. It does, however: (1) when the contract is one for personal services, and death or incapacitating illness supervenes; (2) when the continued existence of some specific thing or means of performance is essential to the performance and it ceases to exist through no fault of either party; (3) when the impossibility is created by domestic law; (4) in a few recent cases it has been held that a change in facts that were understood to be a basic assumption in the formation of the contract, entirely frustrating the object or value of performance of the contract, discharges it.

Discharge by Breach. Breach of the contract by one of the parties always gives the other party a right of action for damages, and if it is a material breach and the injured party so elects, it discharges the contract.

Other Methods of Discharge by Operation of Law. Contracts are discharged by operation of law: (1) by merger; (2) by cancellation or destruction of a formal contract; (3) by alteration. Remedies under a contract may also be barred by a discharge in bankruptcy or by the Statute of Limitations.

Merger is the absorption or extinguishing of a lesser security by a greater, whereby the lesser ceases to exist but the greater is not increased. A contract under seal will merge a simple contract, and a judgment will merge a contract under seal. But a written contract not under seal will not merge an oral one because they are of equal grade. Each is merely a simple contract.

Cancellation or Destruction of a formal unilateral contract if done intentionally by the promisee discharges it.

Alteration of a written contract discharges it provided the alteration is material and is made fraudulently and intentionally by one of the parties to it or by his agent without the consent of the other party.

(a) NEGOTIABLE INSTRUMENTS

The law of negotiable instruments differs from the general law of contracts in that it is practically uniform throughout the United States. The Uniform Negotiable Instruments Law has been adopted, with only minor changes, in all of the states, the District of Columbia and American possessions.

Assignment of an ordinary contract does not fully substitute a new contract with the assignor for the original one. Negotiability gives substantially this effect.

An instrument to be negotiable must conform to the following requirements: (1) it must be in writing and signed by the maker or drawer; (2) it must contain an unconditional promise to pay a sum certain in money; (3) it must be payable on demand or at a fixed or determinable future time; (4) it must be payable to order or to the bearer; and (5) where an instrument is addressed to a drawee, he must be named or otherwise indicated therein with reasonable certainty.

Bills of Exchange.—A bill of exchange is an unconditional order in writing addressed by one person to another, signed by the person giving it, requiring the person to whom it is addressed to pay on demand or at a fixed or determinable future time a certain sum in money to order or to the bearer.

Bills of exchange are of two kinds: (1) foreign and (2) domestic. A foreign bill of exchange is a bill drawn in one state or country and payable in another state or country. A domestic or inland bill of exchange is a bill which is payable in the state or country in which it is drawn.

The necessary parties to a bill of exchange are the drawer, the drawee and the payee. There may be, in addition, indorsers and indorsees. After the drawee accepts the bill he is called the acceptor. By accepting the bill he becomes the party primarily liable.

Unless the drawer has directed that presentment be made for acceptance it is not essential in the case of bills payable on demand or on a certain date to present them for acceptance. It is customary to do so, however, with those payable at a specified time. Those payable a certain number of days after sight or demand must be presented for acceptance within a reasonable time.

The drawee is entitled to inspect the bill and to refrain from acting for twenty-four hours. This is to enable him to investigate the drawer's account before deciding whether he will accept the bill or not.

An acceptance which differs from the tenor of the bill may be refused by the holder; but if he consents to receive it, he can have no greater right.

Promissory Notes.—A promissory note is an unconditional promise in writing made by one person to another signed by the maker engaging to pay on demand or at a fixed or determinable future time a certain sum in money to order or bearer. If a note is drawn to the maker's own order, it is not complete until endorsed by him. The liability of the maker, unlike that of the drawer of a bill of exchange, is primary and unconditional.

Negotiation. A bill or note payable to bearer or payable to order and indorsed in blank is transferable thereafter by mere delivery. The transferor in such case impliedly warrants the genuineness of the signatures and the body of the instrument. He also impliedly warrants the capacity of the parties to make a contract and his title to the instrument.

When the instrument is payable to order and has not been indorsed or when it has been specially indorsed by naming the indorsee, any further transfer will require the indorsement of the indorsee. Without such indorsement the equitable title will pass but not the legal title.

Indorser. An indorser of a bill or note not only impliedly warrants all that a transferor by mere delivery impliedly warrants, but also, in the case of an unaccepted bill payable at a certain future time, that it will be accepted unconditionally by the drawee when duly presented for acceptance; and in the case of a promissory note or an accepted bill payable at a certain future time, that it will be paid at maturity if duly presented for payment or, if payable on demand, that it will be paid when demand of payment is made, if that demand is made within a reasonable time. And furthermore, that in case of dishonor, either by nonacceptance or nonpayment after due demand, he will pay the obligation if due notice of the dishonor is sent to him.

Where there are two or more indorsers they are liable *prima facie* in the order in which their names appear on the instrument.

A drawer of a bill or indorser of a bill or note is not liable unless the instrument is on presentment to the drawee or maker at maturity dishonored by him and prompt notice of the dishonor sent. Notice of dishonor may be oral. Ordinarily, however, it is in writing. It should contain statements showing: (1) a sufficient description of the instrument dishonored; (2) that it was presented for acceptance or payment; (3) that acceptance or payment was refused; (4) that it has been protested, if protest is necessary; (5) that the holder looks for payment to the party notified.

Protesting a bill or note consists in taking the necessary formal steps, usually by a notary public although it may be done by any respectable resident with two or more creditable witnesses, to establish and certify to its dishonor. It is essential that the same notary take all the steps required and that the certificate of protest be based upon his acts.

Protest is necessary only in case of bills or notes made in one state or country and payable in another. Presentment, notice and protest may be waived. Sometimes the waiver is written with an indorsement. Even after failure of the holder to exercise the required diligence to charge a drawer or indorser, a promise by him to waive the deficiency is effective.

A restrictive indorsement is one which restrains further indorsement of the bill or note. Title is vested in the indorsee as a trustee or agent. Thus, "Pay to John Brown for my use" or "Pay to John Doe for my account" are restrictive indorsements.

Checks.—A check is a bill of exchange drawn on a bank, payable on demand.

A checkholder, as a rule, may not sue the bank. The bank's duty is to the depositor, and it will be liable to him for failing to pay a properly drawn check when there are funds. When the check has been previously certified by an authorized officer of the bank, that operates as an acceptance and the bank becomes liable to the holder. When the holder of the check procures the certification, the drawer and the indorsers are released.

A check should be presented within a reasonable time. What constitutes a reasonable time depends upon the circumstances of the particular case. If through neglect to present within a reasonable time the drawer should suffer, as where the bank fails, the drawer is discharged to the extent of the injury suffered. One who takes an overdue check, like one who takes any overdue bill or note, is subject to equitable defenses of the maker.

When the fund of a depositor is attached, the bank, as a rule, may not pay his checks unless they have been certified before the attachment.

When a bank pays to a holder in due course a check whose signature is forged, it must bear the loss. And when it pays a raised check to such a holder, it also must bear the loss, unless the drawer's negligence in making out the check facilitated the forgery.

Holders in Due Course of negotiable paper are persons who take it in good faith, without notice of equities in the usual course of business, for a valuable consideration and before maturity.

As a rule, such a holder of negotiable paper takes it free from all equities. Negotiable paper is endowed with the capacity for transfer, and it is not the purpose of the law that, when it passes from hand to hand, its origin shall be scrutinized at the peril of nonpayment. In that way its valuable quality is not impaired or lost. The requirement is that the transfer shall be made with honest intent and belief by the purchaser that the paper is the evidence of an honest indebtedness. To constitute notice of an infirmity in the instrument or defect in the title of the person negotiating the instrument, the person to whom it is negotiated must have had actual knowledge of the infirmity or defect or knowledge of such facts that his action in taking the instrument amounted to bad faith.

(b) AGENCY

An agent is one who represents and acts for another who is called his principal. Agency is the relation which exists between such persons. The relation of agency may be created by agreement or by operation of law.

Creation by Agreement may be by appointment or by ratification. Appointment is a manifestation by the principal to the agent that the agent may act on his account and consent by the agent so to act. Ratification is the principal's adoption of an act by an unauthorized agent. To create the agency relation by ratification the following conditions must exist: (1) the doer of the act must profess to do it on behalf of an existing principal; (2) the approval of the act must be given with full knowledge of all the facts; (3) the act must be approved as a whole. It may not be approved in part and repudiated in part.

Creation by Operation of Law.—As a rule, the agency relation is created by agreement of the parties. There are, however, two important exceptions to this rule: (1) agency by estoppel or apparent authority; (2) agency by necessity. In these cases there is no assent of the parties. The relation is created by operation of law.

In the case of agency by estoppel (automatic bar) the principal by his act estops (or bars) himself from disputing the agency. As said by an eminent judge, "Where one has so acted as from his conduct to lead another to believe he has appointed some one to act on that belief, then, unless he interposes, he will, in general, be estopped from disputing the agency, though in fact no agency really existed."

An example of agency by necessity is that which arises where a husband improperly fails to furnish his wife with necessaries. In this case, as Chief Justice Holmes said, "it [the law] creates a compulsory agency."

Agents.—Agents are classified by the scope of their authority and also by the nature of their duties.

By scope of authority agents are either general or special. A general agent is an agent authorized to conduct a series of transactions involving a continuity of service, and a special agent is one authorized to conduct a single transaction or a series of transactions not involving a continuity of service.

By the nature of their duties, agents are either professional or nonprofessional. The former include brokers, factors, commission merchants, auctioneers and attorneys at law.

Capacity of the Parties. Any person who has legal capacity to act in his own right may act through an agent. And any person who has sufficient natural capacity to perform the act delegated to him may be an agent. Thus an infant or married woman may appoint an agent who will have the same powers as the principal, and an infant or other person incompetent to bind himself may act as an agent and legally bind his principal.

Appointment of Agents. Ordinarily, an agent may be appointed orally. In some cases, however, by statute, a writing is essential. At common law, to empower an agent to bind his principal by an instrument under seal, the agent's authority must be under seal. At present, however, as has been previously said, seals have been abolished in many states and even where they still have force the rule is subject to the following exceptions: (1) where the instrument is sealed in the presence of the principal by his authority; (2) where the instrument does not require a seal for its validity.

Duties and Liabilities of Agents. An agent must be loyal to his trust and obey instructions. He must not engage in enterprises antagonistic to the interest of his principal nor reap secret benefits at the expense of his principal. He must exercise due care and skill and keep regular accounts of his transactions connected with the agency. If he exceeds his authority as agent, he is liable to a third party with whom he deals as well as to his principal. And in all cases he is liable to third parties injured by his torts just as if he were not an agent.

Rights of Agents. An agent is entitled to the compensation agreed upon or to reasonable compensation where no sum is fixed by agreement. If the term is fixed and he is wrongfully discharged, he has the option of treating the contract as rescinded and recovering the actual value of the services rendered or of treating the contract as subsisting and recovering damages for the breach. If he should decide to do the latter, it is wiser to wait until the end of the term, since the damages are otherwise uncertain.

Liabilities of Principal. Besides the duties to the agent involved in the preceding statement of the agent's rights, it is the duty of the principal to give instructions to his agent what duties he is to perform, to furnish him with proper appliances and so forth. The acts of the agent within the scope of the agency are the acts of the principal, and the principal is liable to third persons for them.

Termination of the Agency Relation. The agency relation may be terminated as follows: (1) by act of the parties; (2) by expiration of the term; (3) by operation of law.

(1) The parties may terminate the relation at any time by mutual agreement. Moreover, as a rule, either party has the actual power to renounce the agency at any time. In doing so, however, he is liable in damages for breach of his contract. The only exception to this rule is where the agent's authority is coupled with a proprietary interest in the subject matter of the agency. In such case the principal cannot renounce the agency.

(2) When the agency is created for a definite period, it expires at the end of the term; if no time is specified it terminates at the end of a reasonable time.

(3) The chief causes by which the agency relation may be terminated by operation of law are: death, loss of capacity of principal or agent, impossibility, war, bankruptcy and accomplishment of the authorized act. There are certain types of agency, such as a power coupled with an interest, which are not terminated even by the death of the agent so interested.

(c) Corporations

A business corporation from a strictly legal point of view is an artificial person created by law and distinct from its members. Practically, however, it is an association of natural persons endowed with power by the legislature to carry on business enterprises in many respects as an individual.

How Corporations are Created.—In this country they are created by the legislature and as a rule under general statutes. Under these statutes the charter of the corporation consists of the certificate of incorporation, the articles of association and the statutory provisions.

Corporate Attributes and Powers.—As a legal entity, a business corporation has capacity within the limits fixed by its charter and by law to exercise the legal functions of a natural person.

Corporate Management.—The ultimate power in a corporation rests in its members. In a business corporation they are the stockholders. They choose a board of directors, and this board is entrusted with the direct management of the business. For carrying out this work a president, secretary and treasurer are usually chosen by the board. By-laws established by the corporation on its formation with subsequent amendments fix the duties of officers and other details.

Each stockholder is usually entitled to one vote for each share of stock owned and by statute may be permitted to cumulate them as he chooses. He may also vote by proxy. But voting power is often restricted in the charter to a special class or classes of stockholders.

The board of directors usually has a wide discretion in the management of the business. It has sole power to declare dividends and to fix the time and place of payment. As a rule, the majority of the directors constitute a quorum. The board has authority to select agents of the corporation but not to decide upon important changes in the company's business nor to determine whether the business shall be wound up or not.

Liability of Shareholders.—As a rule, the shareholders whose subscriptions are fully paid are not liable to the creditors of the corporation. But by statute in various cases where they participate in the wrongful diversion of the capital of the corporation to the injury of its creditors, they are liable to them. Shareholders in national banks are liable on insolvency of the bank to pay toward its indebtedness an additional amount equal to the par value of their stock.

Modes of Dissolving a Corporation.—A corporation may be dissolved in any one of the following ways: (1) by expiration of its charter; (2) by surrender of its charter with the consent of the state; (3) by legislative enactment, provided it is constitutional; (4) by judicial proceedings for the purpose of forfeiture owing to misuser or nonuser of its franchises.

(d) Partnerships

A partnership is an unincorporated association of two or more competent persons who have agreed to unite their property, labor and skill (entire or in part) in carrying on a lawful business as principals for their joint profit.

The requisites of a partnership are: An agreement by two or more competent persons to carry on a lawful business as principals for pecuniary gain. The contract need not be in writing unless its terms bring it within the Statute of Frauds.

Classification of Partnerships.—Partnerships are sometimes classified as ordinary partnerships, limited partnerships and joint-stock companies.

Ordinary partnerships are divided into general and special partnerships.

A general partnership is one for carrying on a general kind of business or several kinds of business. A special partnership is one created to accomplish a single adventure.

A *limited partnership,* allowed by statute in a few states, is one having one or more general partners whose liability for the firm debts is not limited, and one or more special partners whose liability is limited. In organizing this kind of partnership the provisions of the statute must be carefully followed.

Joint-stock companies are partnerships with a capital stock divided into transferable shares. In the absence of statutory provisions they are governed by the articles of association, the by-laws, and the general principles of partnership.

Classification of Partners.—Partners are designated according to the relation that exists between them and the firm or between them and third persons. Thus, depending upon such relation, they are called ostensible, active, secret, dormant, nominal, general, special, incoming, retiring or liquidating.

Powers of Partners.—As a general rule, each partner for the purposes of the partnership business is an agent of the firm and of his copartners. The extent of the agency depends upon the nature of the business. In a trading firm a partner has implied power to buy and sell goods, execute commercial paper, borrow money, pledge or mortgage firm personalty, collect debts due the firm, lease premises, hire property, appoint agents, etc. He has no implied power, however, to submit controverted partnership matters to arbitration or make a general assignment for the benefit of creditors.

In the case of a non-trading firm the implied powers of a partner are more limited. Thus, he has no implied power to bind the firm by making, accepting or indorsing commercial paper. Such paper, therefore, is not enforceable even in the hands of a *bona fide* purchaser.

Rights and Duties of Partners to One Another.—Each partner, in the absence of an agreement to the contrary, has an equal right to share in the management of the business of the firm. And each has the right to have firm property applied to the payment of firm debts.

The partnership relation is one of great confidence and trust. For this reason the law requires that partners exercise toward one another the highest integrity and good faith. In the absence of agreement, a partner must not engage in transactions antagonistic to the firm's business or take secret profits at the expense of the firm. He must conform to the partnership agreement, keep accounts, exercise care and skill and consult with his copartners upon all proper occasions.

Liability of Partners.—Partnership obligations arising from contract are joint, while those arising from tort are joint and several. Each member of the firm is personally and unlimitedly liable, however, for all the firm debts. But a partner who is compelled to pay firm debts out of his separate estate is entitled to credit for the payment in an accounting with his copartners.

Partnership Property.—The property of the firm may be both real and personal. The legal title to the firm personalty may be held in the firm name. This is sometimes allowed by statute also as to the firm realty; but apart from statute it is not possible, and even though permitted it is not wise. This is owing to the fact that the firm is not a separate legal entity. The deed should run to all of the partners in trust for the firm. It may be held by any one, however, for the use of the firm. The interest of a partner in the firm property is a peculiar one. It is simply his share in the surplus after the debts are paid. And this is all the buyer gets where a partner's interest is sold by a separate creditor under a writ of execution.

Actions in Law and Equity.—Since the firm is not a separate legal entity, a partner cannot sue his firm at law. Nor can the firm sue him. Moreover, a partner cannot sue his copartner at law except as to transactions wholly distinct from the partnership business; and also as to matters which arise prior or subsequent to the partnership and which, though connected with it, are not partnership transactions. Thus, a partner may sue his copartner at law for breach of his agreement to enter into the partnership relation, to furnish capital, pay debts, indemnify him for expenses paid or reimburse him for capital advanced.

Dissolution of the Firm.—The partnership relation may be terminated either (1) by act of the parties or (2) by operation of law.

By act of the parties it may be by original agreement or by subsequent act; and by original agreement it may be by lapse of time or by the accomplishment of the object of the partnership.

By operation of law it may be by death, insanity, marriage of a female partner unless regulated by statute, bankruptcy, illegality or war between the countries of the partners. The circumstances under which each of these causes will effect a dissolution of the partnership relation are similar to those under which each of them will terminate the agency relation.

A court of equity may decree the dissolution of a partnership for (1) fraud in creating the partnership, (2) insanity of a partner, (3) gross misconduct of a partner or (4) hopelessness of success.

Notice of Dissolution Required. When the partnership is dissolved by act of parties, notice of the dissolution must be given not only to those who have had dealings with the firm but also to the public generally. The former must have actual notice transmitted to them, but for the latter a general notice in a newspaper of general circulation in the neighborhood, for a reasonable period, is sufficient.

Effect of Dissolution. When the partnership is dissolved by the death of a partner, the legal title to all the the firm personalty and to all realty the title to which was in all the partners jointly vests at once in the surviving partners, who hold it in trust for the firm. Moreover, the right of disposing of all the partnership assets, real as well as personal, vests in them. Firm creditors may proceed at law against the surviving partners. In case of their insolvency or in any case if by statute the liability of partners is joint and several, the creditors may proceed in equity against the estate of the deceased partner.

After dissolution, the partners may perform acts essential for closing up the business, but not with the view of creating new ventures.

SALE OF PERSONAL PROPERTY

The Uniform Sales Act has been adopted, with only minor modifications, in 29 states, Alaska and Hawaii, and thus the sale of personal property in the major part of the United States is governed by this uniform law.

The Act defines a sale of goods as an agreement whereby the seller transfers the property in goods to the buyer for a consideration called the *price.*

Formalities of a Sale.—A sale or contract to sell may be oral or in writing; the price may be paid at once or promised on a future day; possession of the goods may be given the buyer immediately or retained for a time by the seller. But a contract to sell or a sale of goods of the value of $500 or upwards is not enforceable unless the buyer accepts part of the goods and actually receives them or makes a part payment, unless some note or memorandum in writing of the contract or sale be signed by the party to be charged. There is an acceptance of the goods when the buyer, either before or after delivery of the goods, expresses by word or conduct his assent to becoming owner of the specific goods.

When Title Passes.—When the title passes is governed by the intention of the parties. Unless a different intent appears the following are the rules for ascertaining the intent of the parties: If the goods are ready for immediate delivery, the law presumes that title passes at once. If they are not, the law presumes that title is not to pass until they are put in a deliverable condition. If the sale is on approval, the law presumes that title does not pass until the buyer has tried and approved them or has kept the goods and failed to give notice of rejection to the seller by the end of a fixed or reasonable time. In the case of a "sale or return," it passes to the buyer at once with the right to pass it back to the seller within the time agreed or within a reasonable time when no time is fixed, if he chooses to do so. Where the goods are shipped C.O.D. (Collect on Delivery) in accordance with an order or contract, the title passes to the buyer upon delivery to the carrier, but the buyer is not entitled to possession of them until he pays the price.

In many situations such as bankruptcy of one of the parties or a destruction of the goods by fire, the question whether title has passed to the buyer is very important. For example, goods in the possession of the seller may be destroyed by fire. If the title to the goods has passed to the buyer, the buyer must bear the loss, but if the title has not passed, the seller must bear the loss.

Duties of the Parties.—The duties of the seller are three-fold. He must furnish the thing agreed upon, transfer title to the buyer and give him possession of it. The duties of the buyer are to take delivery and pay the price.

Warranties.—An express warranty is any affirmation of fact of any promise by the seller relating to the goods, if the natural tendency of the affirmation or promise is to induce the buyer to purchase the goods, and if the buyer purchases the goods relying thereon. But no affirmation of the value of the goods, nor any statement purporting to be a statement of the seller's opinion shall be construed as a warranty. Unless there is a contrary intention, the law states that there is an implied warranty by the seller that he is the owner of the subject matter of the sale and that it is free from incumbrance. When the goods are sold by sample, he impliedly warrants that they shall conform to the sample; and when they are sold by description, that they shall conform to the description. When goods are sold by a manufacturer or dealer, he is generally held to warrant impliedly that they are free from latent defects. And when goods are selected by the seller to fulfill a particular purpose, the manufacturer impliedly warrants their fitness for that purpose.

Remedies of the Buyer.—When the buyer has paid for the goods and the seller refuses to deliver them, the buyer is entitled to recover the market value of the goods at the time and place of delivery together with interest. If he has not paid for the goods, he is entitled to recover the difference between the contract price and the market price at the time and place of delivery, provided the latter price is greater than the former together with interest.

Any breach of warranty gives the buyer a right of action for damages amounting to the difference between the value of the goods as they are and what it would have been had the goods been as warranted. As an alternative, in most states the buyer may rescind a sale if he can return the goods uninjured within a reasonable time.

Remedies of the Seller.—If the buyer fails to fulfill his duty, the seller may sue for the breach. If title to the goods has passed, he recovers the price. Also, if the goods are specific and not readily salable, he is allowed to notify the buyer that the goods are held for him; he can then, too, recover the full price. If title has not passed and the goods are readily salable, the seller recovers as damages the difference between the contract price and the market price. The seller is further protected by rights against the goods. Though title has passed, the seller, so long as the goods remain in his possession, has a lien on them unless he has agreed to give credit. A lien may be enforced by rescission of the transaction or by resale of the goods. Even if the goods have already been shipped to the buyer, the seller may, if the buyer proves to be insolvent, give notice to the carrier to stop them in transit. The carrier must comply if the goods have not been delivered, unless they have been shipped under an order bill of lading. In that event the carrier need not deliver to anyone without surrender of the document.

(3) OBLIGATIONS IRRESPECTIVE OF AGREEMENT

Obligations of this sort are customarily classified either: (1) as quasi contracts or (2) as duties to make compensation for torts.

Quasi Contracts.—These are so called because the remedy for their enforcement in English and American law has been similar to that granted for contracts.

Quasi contractual obligations include: (1) judgments, taxes, official and statutory obligations of various sorts, and (2) obligations arising from unjust enrichment; that is, the receipt of property or services that the recipient ought to pay for, though he has not contracted to do so.

Torts.—Torts are wrongs or injuries that give rise to a duty to make compensation to the injured party. A tort is a civil wrong and the remedy for a tort is a civil action brought by the party injured as distinguished from a crime where a criminal action is brought by the state. The same act may be both a tort and a crime; for example, if a man assaults and beats another, he may be punished by the state for his crime, but the person injured may also bring a civil action against the one who did the tortious act for damages.

Torts may be divided into two main classes: (1) intentional harm to persons, land and chattels, (2) negligence; but torts also include invasions of economic relations and transactions, defamation, interference with domestic relations and the invasions of other miscellaneous interests.

Intentional Harm to Persons, Land and Chattels. This class of torts includes intentional harmful bodily contact (battery), intentionally putting another in apprehension of harmful or offensive contact (assault), false imprisonment and intentionally causing emotional distress—except when such action is privileged as when the act was done in self-defense or when an arrest was being made. A trespass on land and the interference with the possession of chattels is a tort, except when such action is privileged as when consent is given.

Negligence. In determining what constitutes negligence the standard of a "reasonable man" is used. Negligent conduct is action that a reasonable man should realize involves an unreasonable risk of causing injury to another. Or negligence may be the failure to act when it is necessary for the protection or assistance of another and there is a duty to give this protection or assistance. If the injured person is also negligent (contributory negligence), this may prevent his recovering damages from the person who did the act causing the injury.

REAL PROPERTY

Land and whatever is permanently attached thereto, together with certain incorporeal rights relating to land, are called *real property.*

Definition of Estates.—An estate is an interest in land. These interests in land are of various types and durations and are expressed as different estates.

In Fee-Simple. This is the highest estate known to the law. It is an estate of inheritance, free from any condition and of indefinite duration.

In Fee-Tail. This is an estate of inheritance which is descendable only to particular heirs of the grantee and not to his heirs in general. It had its origin in the desire of owners of great estates to keep them intact to particular families by restricting the power of alienation. In this country it is looked upon with such disfavor that, where it is recognized at all, the restraint upon free alienation is limited by statute so that the immediate grantee gets a life estate and the second taker gets the remainder in fee.

For Life. An estate for life may be created by the parties themselves or, as in the case of dower, by operation of law.

For Years. An estate for years is an estate for a certain number of years and is a mere chattel interest, even if created for a thousand years. It may be limited to commence presently or at some future time. It does not descend to a deceased lessee's heir, but vests in his executor or administrator of the deceased in the same manner as other personal property.

At Will. This is an estate which the tenant holds at the pleasure of the lessor. Statutes almost invariably require a notice to quit, and the practical effect of these statutes is to convert estates at will into tenancies from year to year or from month to month.

By Sufferance. A tenant by sufferance is one who holds over after his term expires and is allowed by the owner to continue in possession. At common law he was not liable for rent beyond the term agreed unless the lease expressly so provided; but modern statutes frequently make him liable for double rent.

In Remainder. This is an estate which is limited to commence at a future time on the termination of a precedent estate created at the same time. It is either vested or contingent. A vested remainder is one in which there is an immediate fixed right of future enjoyment. A contingent remainder is one where no right of enjoyment accrues until the happening of some uncertain event which may never happen.

In Reversion. This is the residue of an estate left in the grantor or his heirs commencing in possession upon the determination of a particular estate granted. It is subject to the same incidents as an estate in remainder. Practically the only difference between these two estates is that a remainder is always created by act of the parties and a reversion always by operation of law.

In Severalty. This is an estate held by one person in his own right. Most legal estates in real property belong to this class.

In Joint Tenancy. A joint tenancy is an estate in which the grantees have the same interest, created at the same time, by the same conveyance and held by them by the same undivided possession. The most important incident of this estate is the right of survivorship, that is, on the death of one joint tenant, the survivors have the entire estate. This tenancy is chiefly used for partnership and trust property.

In Common. An estate in land held by two or more persons with interests accruing under different titles. They may acquire their title from different sources at different times, and acquire different shares.

By Entirety. This estate is created when a conveyance is made to husband and wife and the conveyance either states that they shall hold by entireties or is silent as to the manner in which they shall hold. They are not joint tenants, nor are they tenants in common. Neither party can dispose of his or her interest without the assent of the other; and upon the death of either, the estate survives to the other. This kind of estate is abolished by statute in some states.

Equitable Estate. An equitable estate is a right or interest in real property not recognized at common law but recognized and made available by courts of chancery. In general the holder of an equitable estate is entitled to the income or beneficial enjoyment of his equitable estate (which, like a legal estate, may be an estate in fee, for years or for life, joint or several, in remainder or reversion) while another person, typically a trustee, has the legal title to the property.

Modes of Acquiring Title.—Original title to property is acquired in the following four ways: (1) occupancy, (2) discovery, (3) conquest and (4) cession.

Derivative title is acquired in three ways: (1) by descent through consanguinity, affinity or adoption. (2) by act of the parties and (3) by operation of law. It is acquired by act of the parties either by public or private grant or by devise. Public grant is by patent or legislative grant. Private grant is by deed or by dedication.

Deed.—In its widest signification a deed is an instrument under seal written or printed; but the word is commonly used in the narrower meaning of a deed of conveyance of realty.

The two parties to a deed are the grantor and the grantee. If the grantor is married, his wife also should sign the deed. This is essential to convey her dower interest. Where the land conveyed is a homestead, it is essential in order to transfer her homestead right.

The premises should be accurately and minutely described. Reference should be made to prior deeds by which title was acquired by the grantor. If the land is described by metes and bounds and by specifying the number of acres and the two descriptions differ, the former will govern.

A quit-claim deed merely transfers all the right, title and interest in the land that the grantor has. A warranty deed, in addition to this, contains some or all of the following covenants of warranty: that the grantor is lawfully seized of the premises in fee-simple; that the premises are free from all incumbrances; that the grantor has good right to sell the same to the grantee and that he will; and that his heirs, executors and administrators shall warrant and defend the same to the grantee, his heirs and assigns forever against the claims of all persons whatsoever.

A deed is executed by the grantor signing it and annexing his seal. If the grantor is a corporation, the deed should be signed by its president or by some other officer authorized so to do. At common law the sealing of the deed was the most important act in its execution. In some states, by statute, sealing is not essential. In some states two witnesses are essential; in some, one; and in others, none. In order that the deed may be recorded, it must also be acknowledged.

To pass the title to the property, the deed must be delivered by the grantor or his agent to the grantee or to some one on his behalf.

A delivery of the deed by the grantor to a third party to hold until the grantee has performed certain conditions or until a certain time has elapsed does not pass the title until the condition has happened or the time elapsed. Such a delivery is called a delivery *in escrow.*

Recording a deed is not essential to pass title to the grantee, but if the grantor should make a second conveyance to an innocent purchaser, or in some states if the grantor's creditors without notice of the conveyance should attach the land, the latter purchaser or the creditors could defeat the original conveyance. To protect himself, the grantee should have the deed recorded at once. To do so gives constructive notice to the world that the title to the land is in him.

Wills Concerning Real Property.—Title to real estate as well as to personalty may be acquired by devise or will in all the states of the Union. To render a person competent to transfer title by this means he must be of full age and of sound mind and must act voluntarily.

In most of the states a will must be in writing, signed by the testator or by some person in his presence and by his direction, and attested by witnesses, who must subscribe their names in the presence of the testator. The form of wording a will is immaterial as long as its intent is clear.

Witnesses. Most of the states require two witnesses, but three are required in Connecticut, Maine, Massachusetts, New Hampshire, South Carolina and Vermont.

At 18 years males and females are competent to make wills in California, Connecticut, Hawaiian Islands, Idaho, Montana, Nevada, North Dakota, Oklahoma, South Dakota and Utah. At 18 years females (but not males) are competent to make wills in Colorado, District of Columbia, Illinois, Maryland, Missouri, Washington and Wisconsin.

In the following states persons of 18 years may dispose of personal property only: Alabama, Arkansas, Missouri, Oregon, Rhode Island, Virginia and West Virginia. In Georgia anyone over 14 years and in Louisiana anyone over 16 years is competent to make a will. In Colorado persons of 17 years, and in New York males of 18 and females of 16 years may dispose of personalty.

(4) REMEDIAL RIGHTS AND LEGAL REMEDIES

The law does not undertake to enforce specifically most legal duties created by status, contract, quasi contract, ownership of property or the law of torts. Instead, a right to recover appropriate pecuniary damages is given. The right of action allowed by law for breach of any legal duty may be called a remedial right. When a right *in rem* (in or against the thing) is violated by a particular individual the owner of the right *in rem* then acquires, besides his original right against all the world, a special right *in personam* (against the person) against the wrongdoer.

Thus an owner of land acquires a right *in personam* against a trespasser for the recovery of damages suffered by the trespass. So a right *in personam* may change its character when the right has been violated. The right of a servant to employment under a contract becomes a right of action for damages if the employer wrongfully discharges the servant. Both rights against the master are rights *in personam,* but the right of action arising on breach of the contract is different from the right to employment which existed under the contract when it was still unbroken.

Closely connected with the subject of legal rights and duties is the subject of legal remedies for their enforcement. The rules defining the rights and duties of persons has been called the substantive law and that defining the remedies and the procedure and proof, the adjective law. Adjective law may be divided into the law of procedure and of proof or evidence. Procedure in turn may be divided into civil procedure and criminal procedure; and civil procedure into procedure of law and in equity.

Civil Procedure.—The fundamental steps of civil procedure at law are the beginning of the action by a writ or notice to the defendant, pleading, trial, judgment and execution.

Pleading consists first of a statement of the plaintiff's case variously styled a *declaration* or *complaint.* This is followed by a *plea* or *answer* of the defendant denying some or all of the facts alleged in the plaintiff's statement, or alleging further facts or both. The answer is sometimes followed by other pleadings. The ultimate result of the pleading is that each party has set forth the facts on which he relies, and these facts have either been admitted or denied by the other party, thus clarifying and defining the issue that is to be tried before the court. If essential facts are denied, it is necessary to try the disputed question by means of proof.

Not only questions of fact but also questions of law may be involved in a dispute. The parties may agree as to the facts and dispute only whether on those facts the plaintiff has a right of action. Or the defendant may dispute the truth of the facts alleged by the plaintiff and assert that, even though the facts are as the plaintiff alleges, still the plaintiff has no cause of action. Questions of law are decided by a judge, and questions of fact are decided by the jury. In accordance with the judge's decision on questions of law and a jury's verdict on questions of fact final judgment is given by the court for the plaintiff or defendant. In the United States at the present day many questions of fact are decided by judges without the aid of juries, but owing to the provisions of state constitutions, this is generally impossible unless the parties waive their right to be tried by a jury.

Procedure in equity differs from procedure at law in various respects. The plaintiff's pleading is called a *bill* or *petition* and is fuller than is usual in a declaration at law. The defendant's answer also is fuller as to facts charged in the bill. There is no jury; questions of fact as well as of law are determined by the judge.

The most fundamental difference between *equity* and *law,* however, is in regard to the character of the final order of the court. When judgment is rendered at law in favor of the plaintiff, an execution for the amount of the judgment is put in the hands of a sheriff, who endeavors to satisfy the execution by seizure of the defendant's goods. The decree of the court of equity, however, is directed to the person of the defendant, ordering him on pain of imprisonment to do what the court directs. A court of law can give only a money judgment, a court of equity can effectively order a defendent to do many things besides the payment of money; and not only affirmative orders but negative orders or injunctions are possible and constitute one of the most important branches of equity jurisdiction.

In many states of America the procedure at law and in equity is now made substantially identical, and even in states where this is not so, the same court generally has jurisdiction of both actions at law and suits in equity, but the general constitutional requirement of jury trial in an action at law, involves the persistence of a difference between matters originally within equitable jurisdiction and other matters. Moreover, the distinction between equitable relief and legal relief is still necessarily observed.

Criminal Procedure.—This is, in the main, like civil procedure at law; the chief difference relates to the beginning of the proceedings. A person may be charged with crime by complaint made by any citizen to a magistrate, who, if he is satisfied that there is reasonable cause for the complaint and if he has jurisdiction to try cases of the sort, may proceed with the trial of the accused; otherwise, he may hold the accused for trial in the proper court.

Another method of beginning a criminal prosecution is by information filed by a prosecuting officer, but the commonest method for serious crimes is by indictment found by grand jury on a case presented to it by the prosecuting officer. The accused may then be arrested and held for trial either by confining him or by admitting him to bail. Those who give bail are regarded as private keepers of a prisoner and are bound to produce him when called upon to do so.

Greater particularity is required in the criminal pleading of the indictment than is necessary in civil actions. The defendant makes no answer or plea other than guilty or not guilty. The latter plea compels the government to prove everything essential to

COMMERCIAL LAW IN THE VARIOUS STATES

States and Territories	Legal Rate Per Cent	Allowed by Contract Per Cent	Interest Laws	Statutes of Limitation		
			Penalty for Usury	Judgments Years	Notes Years	Open Accounts Years
Alabama	8	8	Forfeit interest if not paid	20	6	3
Alaska	8	12	Double excess already paid recoverable; forfeit all interest not paid	10	6	6
Arizona	6	10	Forfeit excess if not paid	5	4	3
Arkansas	6	10	Forfeit principal and interest if not paid	10	5	3
California	7	12	Forfeit excess of interest if not paid	5	4	4
Colorado	8	12	Forfeit excess of interest if not paid	20	6	6
Connecticut	6	12	Fine or imprisonment or both, excess forfeited	None	6	6
Delaware	6	6	Forfeit excess whether or not paid	10	6	3
District of Columbia	6	8	Forfeit interest, whether or not paid	12	3	3
Florida	8	10	Forfeit interest if not paid; double excess recoverable if paid	20	5	2
Georgia	7	8	Forfeit excess, if not paid	7	6	4
Hawaii	8	12		20	6	6
Idaho	7	10	Forfeit interest whether or not paid	6	5	4
Illinois	5	7	Forfeit interest unless borrower is corporation	20	10	5
Indiana	6	8	Forfeit excess if not paid	20	10	6
Iowa	6	8	Forfeit interest if not paid	20	10	5
Kansas	6	6	Forfeit double excess whether or not paid	5	5	3
Kentucky	6	6	Forfeit excess if unpaid	15	15	5
Louisiana	5	8	Forfeit excess whether paid or unpaid	10	5	3
Maine	6	Any	No provision except for small loans	20	6	6
Maryland	6	6	[1] Forfeit excess if unpaid	12	3	3
Massachusetts	6	Any	No provision except for small loans	20	6	6
Michigan	5	7	Forfeit interest if unpaid	10	6	6
Minnesota	6	8	Forfeit interest if unpaid; forfeit excess if paid	10	6	6
Mississippi	6	8	Forfeit interest if unpaid; if more than 20%, both principal and interest	7	6	3
Missouri	6	8	Forfeit excess	10	10	5
Montana	8	10	Forfeit double amount of interest whether paid or unpaid	10	8	5
Nebraska	7	10	Forfeit interest	5	5	4
Nevada	7	12	Forfeit excess	6	4	4
New Hampshire	6	Any	No provision	20	6	6
New Jersey	6	6	[1] Forfeit interest	20	6	6
New Mexico	10	12	Forfeit double amount of interest whether paid of unpaid	7	6	4
New York	6	6 except call loans	[1] Forfeit of principal and interest if unpaid, excess if paid; misdemeanor; any rate allowed on collateral call loans of over $5,000	20	6	6
North Carolina	6	6	Forfeit interest if unpaid, and double interest if paid	10	3	3
North Dakota	6	10	Forfeit interest if unpaid, and double interest if paid	10	6	6
Ohio	6	8	Forfeit interest if unpaid	15	15	6
Oklahoma	6	10	Forfeit double interest whether paid or unpaid	5	5	3
Oregon	6	10	Forfeit principal and interest if unpaid	10	6	6
Pennsylvania	6	6	Forfeit excess whether paid or unpaid	5–20	6	6
Puerto Rico	6	12		5	3	3
Rhode Island	6	Any	Forfeit excess if unpaid	20	6	6
South Carolina	7	8	Forfeit interest if unpaid and double interest if paid	10	6	6
South Dakota	7	12	Forfeit all interest whether paid or unpaid; misdemeanor	10	6	6
Tennessee	6	6	Forfeit of excess whether paid or unpaid; misdemeanor	10	6	6
Texas	6	10	Forfeit all interest if unpaid; double interest if paid	10	4	2
Utah	8	12	Forfeit excess if unpaid	8	6	4
Vermont	6	6	Forfeit excess whether paid or unpaid	8	6	6
Virginia	6	6	Forfeit all interest whether paid or unpaid	20	5	3
Washington	6	12	Forfeit double interest if unpaid	6	6	3
West Virginia	6	6	Forfeit excess if unpaid	10	10	5
Wisconsin	6	10	Forfeit all interest if unpaid, and treble excess interest if paid	20	6	6
Wyoming	8	12	Forfeit interest if unpaid	21	5	8

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[1] In Maryland, New Jersey and New York a corporation cannot set up usury as a defense.

make out the guilt of the accused of the crime charged.

In civil cases it is sufficient for one alleging facts in his pleading to prove them by a mere preponderance of evidence; but in criminal trials the government must prove the prisoner's guilt beyond a reasonable doubt in order to convict him.

Appellate Procedure.—Trials, both civil and criminal, are ordinarily conducted by a single judge, but appellate courts are established to revise the rulings of law made by trial judges if these rulings are questioned. When the trial judge makes a ruling of law, the party aggrieved by his decision may reserve the right to question the correctness of the ruling in an appellate court, which generally consists of from three to seven judges sitting together. If the ruling at the trial is held to be incorrect by the appellate court, a new trial is ordered.

Evidence.—A very important branch of the adjective law is that relating to evidence. Evidence includes all the means by which any alleged matter of fact, the truth of which is submitted to investigation, is established or disproved. It is an obvious rule of logic as well as of law that no testimony is admissible which is not relevant to the facts in dispute; but not all evidence which is relevant is admissible.

Indeed the law regarding evidence has been defined as consisting of rules excluding various kinds of logically relevant testimony; the most important of these rules is that which excludes hearsay evidence. Hearsay evidence is evidence given by one person regarding facts told to him by another person. Since the truth of hearsay evidence depends upon the veracity of the person who originally made the statement and not the veracity of the person in court, such evidence is generally excluded. Because the original person making the statement was not sworn and is not before the court to be cross-examined, it is held that hearsay reports cannot be accepted as evidence.

Of vital importance also is that which excludes oral evidence of the contents of a written document when the written document is obtainable and which makes a written contract between parties a conclusive statement of the particular agreement. The rules of evidence grew up as an accompaniment of the jury system and, to a large extent, are designed to avoid the misleading of a tribunal composed of twelve men unlearned in the law and perhaps of no great education. A very common kind of legal errors carried from trial courts to appellate courts consists of erroneous rulings admitting or excluding proffered testimony.

LABOR LEGISLATION

Labor legislation is now customarily defined as the laws that are intended to improve the working and living conditions of wage earners and low-salaried employees. Most of the early laws concerned with labor had an entirely opposite purpose; namely, to restrict the freedom and activities of the workers.

Early English Attitude.—This restrictive legislation was a reflection in part of the mercantilist theory that dominated the economic thinking of the western world from the beginning of the wage system in the 14th century to the time of Adam Smith in the later part of the 18th century. The mercantilists viewed labor as the primary source of national wealth but deduced from this idea that the poorer the laborer and the lower his wages, the larger was his contribution to the national wealth. Low wages, substantially at the level of subsistence, were considered essential to national welfare. Such an atmosphere of thinking made it almost impossible that legislation should favor the worker.

The famous English Statute of Apprentices or Artificers, passed in 1563 in the reign of Elizabeth, authorized the justices of the peace to fix the wages, hours and terms of contracts of workers according to the scarcity of labor and the cost of living.

This law imposed severe penalties for nonobservance. In practice this meant fixing labor conditions primarily in the interest of the employer, although the statute did place a certain responsibility on the Government for the maintenance of a subsistence wage and for public relief for persons unable to obtain work. Broadly speaking, the attitude of mind expressed in the Statute of Apprentices in 1563 prevailed in England for more than 200 years and was carried into the American colonies as they were settled.

In the American Colonies

Even in the early years of these colonies a considerable body of law was concerned with labor, and with almost no exceptions this legislation was directed to control labor not to protect it. In New England this control took the form chiefly of restrictions upon the wages of skilled workers; in the middle colonies it took the form chiefly of a system of indentured servants, often referred to as white servitude, and farther south the effort was to solve the labor problem by the introduction of Negro slavery.

Restricting Wages.—Plymouth Colony and Massachusetts Bay Colony passed similar laws in 1630 fixing a maximum rate of pay. In Massachusetts Bay Colony:

> It was ordered that Carpenters, Joyners, Brickelayers, Sawers and Thatchers shal not take above 2s. [approximately 48 cents at present exchange rates] a day, and 16d. [32 cents] a day if they have meate and drinke, nor any man shall give more, under paine of 10s. to taker and giver; and that sawers shal not take above 4s. 6d. ye hundred for boards, att six score to the hundred, if they have their wood felled and squared for them, and not above 5s. 6d. if they fell and square their wood themselves.
>
> It was ordered that labourers shal not take above 12d. a day for their worke, and not above 6d. and meat and drink, under paine of 10s. (Massachusetts Bay Colony Records, Vol. I, p. 109.)

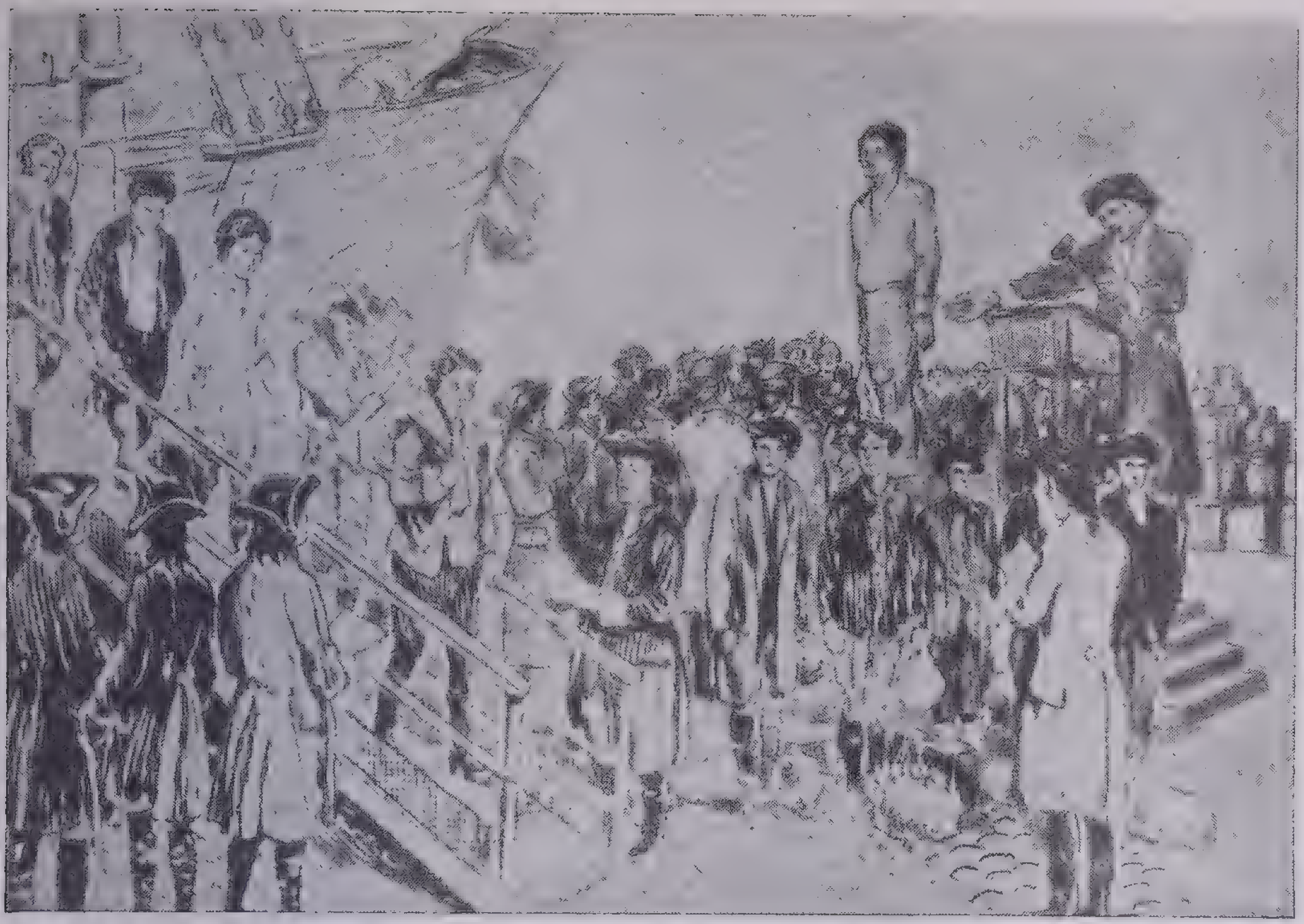
This law was not successful and later the General Court appointed a commission of 29 men, including Endicott, Winthrop, Bradstreet and Mather, "to bring into the next General Court their thoughts for the remediing of the same." (Massachusetts Bay Colony Records, Vol. I, p.223).

This communion of the best minds of Massachusetts Bay produced a policy of local option by which each town was advised and requested to control its own wage rate.

> The Court, having taken into consideration the scarsity of money and the great abatement in the prices of corne, cattle and other commodities of the countrey, whereby it is impossible that men shall bee able to give such wages to servants and other labourers and workmen as formerly, so as many think better to lay aside their busines and impliments (which would tende to the ruin of the Churches and the Commonwealth) than to spend the small remainder of their estates for the maintenance of others in such a way as will not afford them some equall recompence—it is therefore hereby declared that it is thought equall that all servants, labourers and workmen shall bee content to abate their wages according to the fall of the commodities wherein their labour is bestowed, and that they shall bee satisfied with payment in such things as are raised by their labour or other commodities which the countrey affoards, and that they are to be content to partake now in the present scarsity as well as they have had their advantage by the plenty of former times, and this Court shall account it great oppression in any that shall transgress the intention of this Order, and will have them proceeded with accordingly. (Massachusetts Bay Colony Records, Vol. I, p. 326.)

Although the General Court of the Bay Colony thus changed its policy from one of dictating a limit to what a workman might have for his work to one of thinking about what should content him, the court of Plymouth Colony retained its old legal rate of 2s. but had no greater success in enforcement. When the towns of the Bay Colony undertook to carry out what the colonial authorities had passed on to them to handle, the wage rates fixed by the towns were lower than those in the colonial statutes, but that was because a general depression and hard times followed the crop failure of 1640. Carpenters in Hingham were reduced from 2s. to 1s.10d., and wheelwrights from 2s.3d. to 2s. a day; but mowers kept the old rate of 2s. and common labor rose to 1s.6d. As late as 1651 Thomas Trusler of Salem was presented before the Essex County Court for "taking excessive wages from John Alderman, "10s.6d. for a day's work of 6 oxen and one man," but no fine is recorded.

Later in the 17th century and about 20 years after the New England colonies had given up the futile effort to control a commodity so urgently



From a drawing by Louis Bromberg, courtesy U. S. Bureau of Labor Statistics

Auction of Redemptioners on Arrival from Europe

in demand as labor, Virginia attempted both impressment and wage fixing in its program of town building and succeeded only in driving mechanics out of the colony.

The many, constantly repeated efforts to control and regulate labor by legislative action were made inoperative by the continued scarcity of workers, especially in the skilled crafts, and by the abundance of land and the common desire to plant settlers upon it.

The tendency of craftsmen to become farmers was frowned upon in New England, since it was "more to the public welfare and the Glory of God to hold them to their trade;" and it was specifically legislated against in Virginia. Agents of the Virginia Company were instructed to establish tradesmen in towns in order "to remove them from temptation to plant on their own account."

Indentured Servants.—The old system known as *indentured labor* grew out of the demand for land and for laborers in the colonies and out of the overpopulation and extreme poverty of Europe. It was most prevalent in the middle colonies, although it was probably practiced to some extent in all the colonies.

White servitude took two different forms—labor under a specific contract called an indenture and under a less definite agreement embodied in legislation or in the *custom of the country*. An indentured servant was one who came to the New World under a contract with the planter who imported him into the colony or with the shipowner or merchant who transported him for the purpose of disposing of his services upon his arrival. British law required that all British subjects emigrating as servants, before they sailed, should execute indentures stipulating the number of years of service entered into and whether the labor to be performed was a definite trade or any kind of work required by the other party to the contract. In consideration of his right to the servant's labor the master agreed to provide food, clothing and lodging for the stated period of time and generally to allow additional compensation in provisions, clothing and equipment upon the expiration of the term. This allowance came to be known as *freedom dues* and sometimes, particularly in the beginning, included land. These indentures were similar in form; in fact a printed form came into use as the system developed. They were officially recorded at the port of embarkation and had the full force of law in both England and the colonies.

Though the business thus created was in large part a legitimate form of assisted immigration, it led to evils both in procuring and in transporting that discredited the entire traffic. Systematic kidnaping of children and adults was carried on openly and flagrantly in English seaports. The alarming proportions assumed by this outrage at last compelled legislative action that influenced the indenture system as a whole but did not materially affect the kidnaping evil itself. The law requiring that indentures be executed and recorded before sailing was a direct result of the practice of kidnaping. This law probably checked the operations of the organized kidnapers to some extent, but a few years later merchants in the colonial trade appealed to Parliament for measures to protect their legitimate business of supplying the colonies with laborers. Parliament granted the request with an act making the stealing and transporting of children and adults a crime punishable by death without benefit of clergy.

The first laborers sent into the early settlements as indentured servants came chiefly from the great class of unemployed and unemployable unskilled workers and landless agricultural laborers—the unassimilable surplus population of Great Britain. Undoubtedly throughout the history of the indenture system in all the colonies the majority of the servant class that came from the British Isles and the Continent belonged to this unemployable group, and there were not as many ex-convicts as some historians have supposed.

The colonists opposed the introduction of convicts by every means within their power, but their efforts were not successful. Pennsylvania and Virginia controlled the matter to a considerable extent, but the other settlements were unable to do so. Maryland especially became the dumping ground for English jails and received more convicts than any other plantation in the colonies. An authority states that between 1717 and 1775 the number sent from Old Bailey alone was thought to be 10,000, and the whole number from various places in Great Britain and Ireland was estimated as at least 50,000.

The attitude of the American settlers toward the practice is shown in the many regulative and restrictive laws passed by the provincial legislatures and by the bitter attacks upon it in the early newspapers. Franklin fought it vigorously in his paper and in England.

After the emigrating servant, whether indentured or kidnaped, a free-willer or a convict, had survived the hardships and perils of the voyage, he became merely merchandise when the ship reached its American port. Prices varied according to age, skill, length of service and other considerations, but the average price for adults seems to have been about £15 to £20 ($72.90 to $97.20), though convicts were regularly sold by the contractors at £8 to £20 ($38.88 to $97.20) each. The price for which redemptioners were sold in Pennsylvania was gradually advanced during the 18th century, and as the price increased charges of passage were increased, so that the shippers put in a claim for a man's transportation that was substantially the market value of his services.

As settlement moved back from the seaboard, a new business grew up analogous to that of servant shipping. Dealers would buy up servants in blocks at the port of entry and take them inland for sale in the new settlements. The trade practices of these dealers seem to have earned for them their suggestive name of *soul drivers* and were in fact not unlike the better-known tactics of their contemporaries, the slave traders. The back country was depended upon largely to furnish the market for the criminal class that the more experienced buyers in the old settlements refused.

A servant became the property of his employer or master as soon as the sale of his services was effected. He could at any time during his servitude be resold for the remainder of his term without his own consent. In Pennsylvania, however, the law did not permit his removal from the colony after resale without his consent.

The legal character of the institution of white servitude was definitely fixed in all the colonies and was practically identical in all those where it was the predominating labor system. An indenture executed in England covering the term and kind of service, the obligations of both master and servants and the remuneration to be paid was regarded as a legal contract enforceable by the colonial courts.

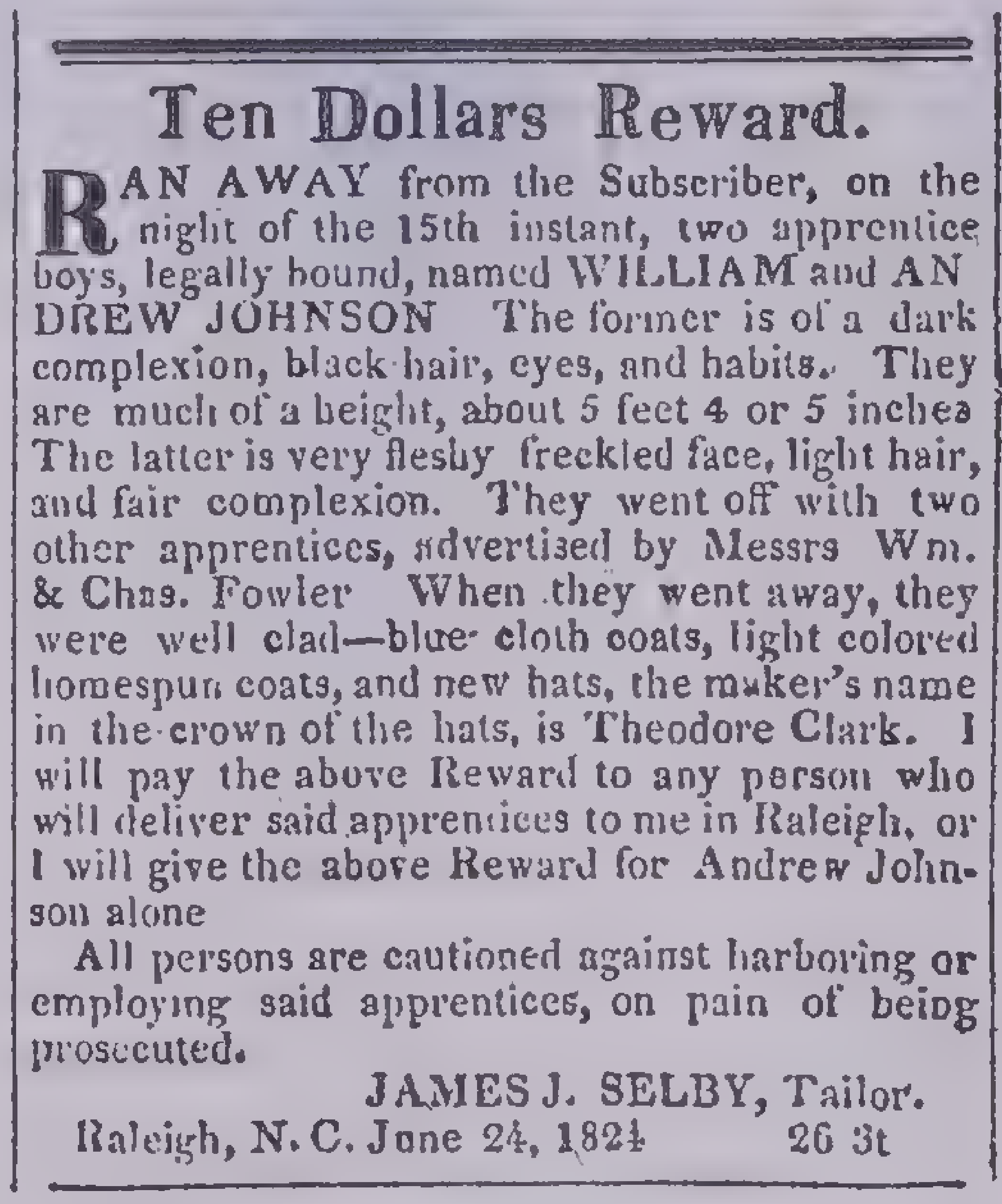
Whether the servant was bound by an indenture specific in its terms or merely by the custom of the country, he had, as one writer puts it, "a legal as well as moral right to expect that provision would be made for his comfortable existence"; and, according to a contemporary, "the laws of Virginia take great care for the good usage of servants as to necessities, Diet and Clothes." Virginia law provided that a sick or disabled servant "could claim support and medical attention at his master's charge during servitude without any reciprocal right on the part of the master therefor."

Legally servants could always bring charges against their masters for mistreatment, violation of contract and the like; but they were themselves subject to punishment if they failed to prove their case. The laws themselves afforded almost unlimited opportunities for injustice and exploitation by providing for additional time in servitude as a penalty for countless infractions and misdemeanors. In its practical application, extension of time as a legal theory worked two ways: It was granted to the employer as compensation for damages in his claim against a servant who broke laws dealing solely with the master-and-servant relationship; and it was also granted even in criminal cases where the employer paid in money a fine assessed against a servant for violation of general laws having no connection with his status as servant.

Numerous laws were designed merely to protect the master in his right to his servant's time and labor. Chief among these were those prohibiting trading with a servant without his master's consent; prohibiting marriage of servants even to free persons without such consent, and relating to runaway servants. Offenses against all these laws were punished by extension of the period of servitude, the amount of added time in some instances was fixed by statute, in others, determined by the court.

Apprenticing children to trades followed in practically all particulars the indenture system, but there were two marked differences—the length of service and the fact that an apprentice could not be assigned or transferred to a master other than the original contracting party, except in case of the death of the master. Studies of the old colonial labor system make almost no distinction between actual apprenticeship and indenturing children, so that it is difficult now to draw the line. The record is clearer in New England than in other colonies, probably because bound servitude was less general among workers other than apprentices, and more trades were practiced.

As a general rule an apprenticeship lasted for seven years, unless the child was very young when bound. In that case the term expired when the boy became 21. The custom developed during the 18th century of giving both apprentices and indentured children six weeks' schooling throughout the year. Pennsylvania law made that compulsory in 1810.



Ten Dollars Reward.

RAN AWAY from the Subscriber, on the night of the 15th instant, two apprentice boys, legally bound, named WILLIAM and ANDREW JOHNSON The former is of a dark complexion, black hair, eyes, and habits. They are much of a height, about 5 feet 4 or 5 inches The latter is very fleshy freckled face, light hair, and fair complexion. They went off with two other apprentices, advertised by Messrs Wm. & Chas. Fowler When they went away, they were well clad—blue cloth coats, light colored homespun coats, and new hats, the maker's name in the crown of the hats, is Theodore Clark. I will pay the above Reward to any person who will deliver said apprentices to me in Raleigh, or I will give the above Reward for Andrew Johnson alone

All persons are cautioned against harboring or employing said apprentices, on pain of being prosecuted.

JAMES J. SELBY, Tailor.
Raleigh, N. C. June 24, 1824 26 3t

President Johnson Was an Apprentice

This advertisement appeared in the Raleigh, N. C., *Register*, when Andrew Johnson, who was to become the 17th President of the United States, ran away from his master

The indentured system was widely used as a means of emptying European orphan asylums and almshouses. The vice-director of a Dutch colony on the Delaware River wrote thus to his commissioners in Holland in 1658:

> The children sent over from the almshouse have safely arrived and were in sufficient request so that all are bound out with one and the other; the eldest for 2 years, the others, and the major portion, for 3 years, and the youngest for 4 years, earning 40, 60 and 80 guilders [$16, $24, and $32] during the above period, and at the end of the term will be fitted out in the same manner as they are at present. Please continue to send others from time to time but if possible none ought to come less than 15 years of age, and somewhat strong.

The bulk of indentured-servant traffic flowed into Virginia, Maryland and Pennsylvania, and the system was economically more vital to those colonies than to the others. The economic value of the indenture system became markedly different in the tobacco-growing South and in industrial Pennsylvania. In the first half of the 18th century the system declined in the plantation colonies almost as rapidly as it grew in Pennsylvania, and it lasted in the latter colony nearly a century after it was outgrown in Maryland and Virginia.

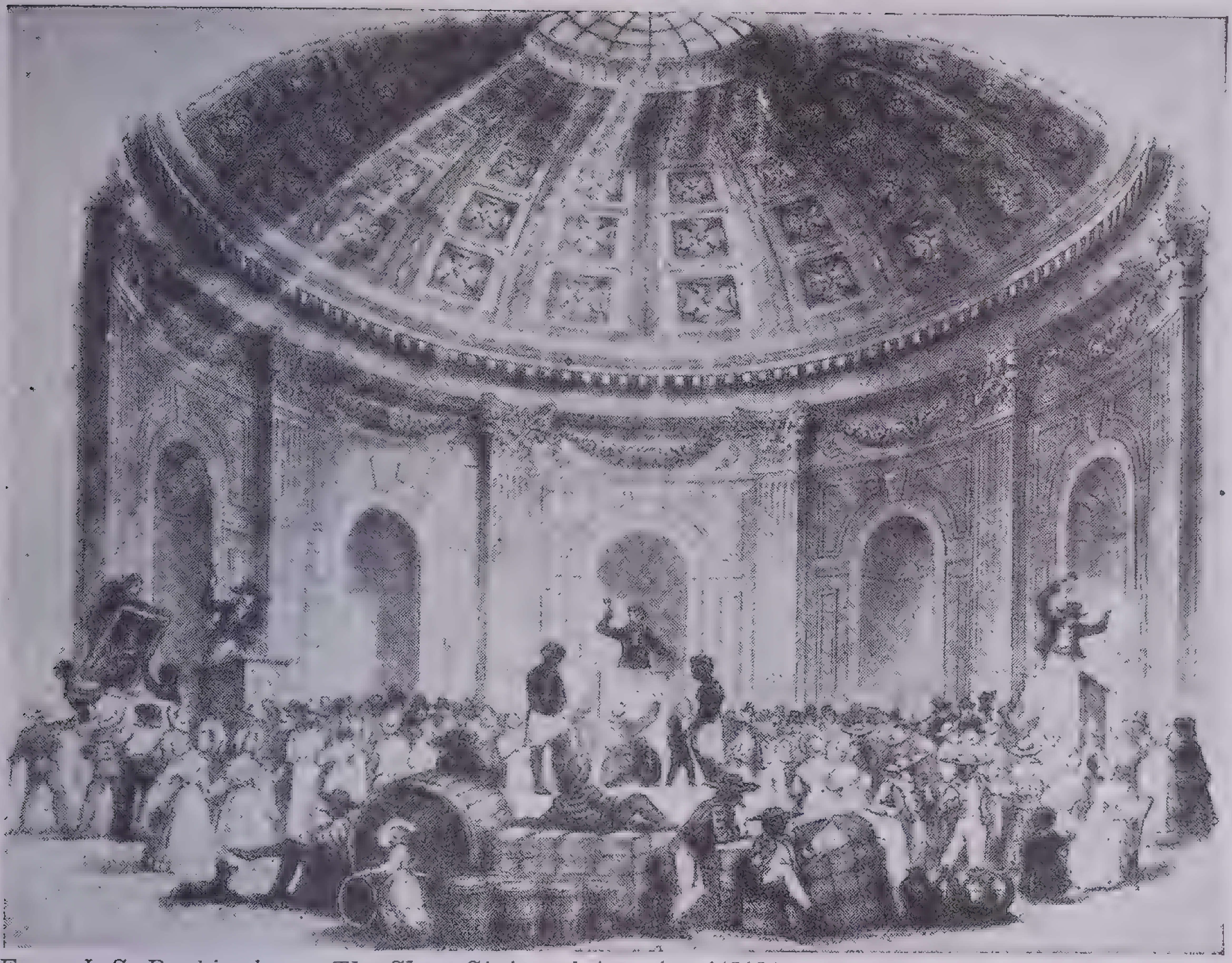
As a labor policy white servitude continued in Pennsylvania for a quarter century after the establishment of the Republic. It took on renewed vigor after the Revolution, and indentured servants figure largely in the heavy immigration at the close of the 18th century. The last officially recorded registry of a redemptioner in Pennsylvania is dated December 1, 1831.

The system was never legally abolished. It died gradually as the economic conditions that had created it changed. As population increased, indentured immigrants were no longer necessary to an adequate labor supply, and with the introduction of machinery and the factory system employers found it cheaper to hire free labor by the day or as needed than to maintain servants by the year. One law, however, did affect the system materially. When imprisonment for debt was outlawed, and the master could no longer compel the servant to discharge his debt, the institution of indentured service received its legal death blow and necessarily died out without any special enactment.

Negro Slavery.—The stronghold of Negro slavery in the United States was in the southern states, where it was favored by the particular agricultural conditions existing there. Slavery thus became identified with a particular form of unskilled agricultural labor. As the prosperity of these sections depended so greatly on the efficiency of the labor supply, it would have seemed logical for the colonial and state governments affected to have enacted legislation protecting the slaves from exploitation and abuse. Actually this did not happen. The conception of the slave as a chattel without any legal or civil status was so dominant that practically no legislative measures for his welfare were anywhere taken. Such legislation as was enacted was directed to protect the slaveholder in his rights in his slave property.

Modern Protective Legislation

Origins.—As in all social movements it is difficult to set a precise date for the beginning of modern protective labor legislation. Its origins may be traced to the Industrial Revolution, which brought forth the factory system, and the French Revolution with its philosophy of humanitarianism. James Watt was perfecting his steam engine in the 1770s and '80s and his work, probably more than any other one thing, inaugurated the present power-machine age with its concentration of production in large units. It meant, among other things, the transfer of workers from the home and small workshop to communities built upon large-scale production, in which the working and living conditions of the employees were subject to many hazards and vicissitudes not previously experienced. Thus although power machinery brought a vast cheapening in production costs, it created employment conditions under which the worker was easily subject to exploitation and under which there was no form of collective action by the workers (indeed such collective action was for a long time forbidden by law) and the individual employee was practically helpless to protect himself. Thus arose the need for state protective measures to minimize, if not actually



From J. S. Buckingham: The Slave States of America (1842)

Auction Sale of Slaves, Pictures and Estates

When large estates were being sold, slaves were often the most valuable property to come under the auctioneer's hammer. Here in the rotunda of the old St. Louis Hotel, New Orleans, slaves are being disposed of at the central auction block

to prevent, some of the worst abuses of the new system. Unfortunately the economic philosophy of the time, carried over from the more primitive social organization of premachine days, was slow to recognize the altered conditions. In effecting a change in this philosophy the liberal, humanitarian ideas released by the French Revolution played a vitally important part. Their influence was slow in making itself felt in England and the United States, but gradually these new ideas of the human value of the common man spread sufficiently to influence the electorates and the legislators. The American Revolution was essentially political, and the Constitution of the United States that resulted therefrom was a political document. In it there is not even a reference to labor or to labor conditions. The French Revolution, on the other hand, was concerned with such topics as the rights of man with greater emphasis than ever before upon the rights of men in the lowly stations of life. Just as the American Revolution had profound aftereffects on the political thinking of the whole world, the French Revolution left an indelible impress on its social thinking.

Developments in Foreign Countries.—England was the first country to make use of power machinery on a large scale. From the standpoint of national wealth and prestige, the results were marvelous, and England became the workshop of the world. But for the workers themselves the immediate results were disastrous. Men, women and children toiled incredibly long hours under dangerous and unhealthy surroundings. In the mines women and men were used often in place of animals to drag the coal wagons, and sweatshop conditions of the worst kind developed in the textile industries. Intoxicated by the material benefits of low-cost production and its widening world markets, the country was for a long time heedless of the vicious conditions imposed upon the workers under the new factory system.

Just how bad conditions in the cotton mills were, especially as regards the child employees, is evident from the testimony before a parliamentary committee in 1816, as summarized in the recently published *Economic History of Europe since 1750* by Witt Bowden of the United States Bureau of Labor Statistics and Professors Karpovich and Usher of Harvard University. A cotton manufacturer stated that children as young as 5 years of age were employed; that the usual hours of work were 14, some mills requiring 15; and that some mills allowed no intermission for meals. A magistrate testified that the warm, humid, unventilated mills with cotton lint or *flew* polluting the air induced a condition that required the frequent administration of emetics. A physician whose father-in-law owned a large mill testified "with the greatest reluctance" that when the children first came to the mills, with the close, humid atmosphere and high temperature, they were seized with a mild fever and were subject to a subsequent debility. There was no protection from the machinery, and he had "too often" seen workers crushed to death, and the mangling of the hands of the children was "a very common thing." He stated further that children, so far as he knew, were never allowed to sit down during working hours; that they frequently walked 2 miles from their homes to the mills; and that the factories in his community usually operated from 6 o'clock in the morning until 7 o'clock at night in summer, and from 7 until 8 in the winter. Among the workers he said, "scrofula is common indeed, and consumption extremely common."

In 1819 an act was passed (but never enforced) forbidding the employment of children under 9 years of age in the mills and limiting the hours of those from 9 to 16 years to 12 hours per day. The first effective child-labor law was enacted in 1833. It was applicable to children in textile mills, excluded children under 9 years of age and provided for the gradual introduction of a 9-hour day for minors. Equally important was the fact that this law provided for paid inspectors and machinery of enforcement.

Slowly there was a broadening of national sympathy and understanding. The hours of labor of children were still further reduced, women were similarly protected against excessively long working hours, factory acts provided for safer and more healthful working conditions in industrial plants, workmen's compensation laws were enacted, and these, with other similar laws, gave England before the end of the 19th century a comprehensive labor code. This was rounded out early in the 20th century by a series of social-insurance laws setting up a system of public social insurance for workers against the hazards of unemployment, sickness and old age.

Other European countries, as they became more and more industrialized, experienced substantially the same evil human effects as had England and undertook with varying degrees of rapidity and thoroughness to control the evils by public legislation. Germany was the first to adopt a broad program of social insurance, the program starting in the 1880s and being enlarged in the subsequent decades. This movement in Germany was the result in part of humanitarian impulses; but a dominating motive was the policy of Bismarck to fight the growing labor and socialist movement of his day by having the state take the lead in improving the conditions of the workers.

By the time of the World War practically all the industrial countries had more or less comprehensive labor codes, and it is interesting to note that, in general, certain of the smaller countries, such as Sweden, Denmark and the Netherlands, were rather more advanced than most of the larger countries. In this movement toward liberal labor legislation, a prominent place was taken by the British dominions of Australia and New Zealand, especially in the fields of shortened working hours and minimum wages.

Following the World War the political upheavals in Italy, Germany, Russia and certain other countries resulted in the establishment of non-democratic governments and a complete change in the character of their labor legislation. In Russia, where the private employing class was abolished and the Government was frankly in control of the working class, practically all legislation was directed to the welfare of labor; but individual workers and groups of workers had to surrender much of their freedom of action in the interest of the collective state. This was not particularly significant in Russia, however, as under the former Czarist government they had had very little freedom of action.

In Germany and Italy, on the other hand, private enterprise continued, and the effort of the governments was to weld employers and employees into a single entity working toward a common aim. This meant suppressing former free trade-unions, the denying labor the right to strike or even to protest (except within rather narrow and formal channels) and the supremacy of the Government in determining wages and working condition. Theoretically there was no labor legislation in the old sense but simply legislation for the benefit of the state as a whole. In all cases, however, the various social-insurance systems for the special benefit of the workers were continued, wherever they existed.

Legislation in the United States

In the United States protective labor legislation developed more slowly than in England and many other western European countries. There were several reasons for this slow progress. In the first place, although mechanized industry developed early in the United States (the textile industry was well established in New England as early as the 1830s), the country as a whole remained predominantly agricultural until well after the Civil War. Secondly, as long as our western lands were open to settlement there was always an outlet for the more energetic and ambitious eastern workers who were dissatisfied with their industrial life. Again the Constitution of the United States made it impossible for Congress and the legislatures to enact laws of which the courts disapproved, and for a long period the courts tended to frown upon protective labor laws as an infringement on the "freedom of contract" and "due process" clauses of the Constitution. This meant not that the judges were personally unsympathetic to the needs of labor but that, construing the Constitution as they understood it, their conclusions were usually to the effect that the state had no constitutional power to interfere with the freedom of the adult worker to contract to work under any arrangements he might agree to.

Besides in the United States the philosophy of individualism was perhaps more strongly entrenched than in any other country in the world. There were many reasons for this—the hard life of the early settlers and of the later western pioneers, the vast resources of the country, the fairly even distribution of wealth in the early years of the Republic, the more or less spontaneous generosity of the average person toward those in need. All these factors led to building up the idea that any man who wanted to could make a comfortable living if he was really willing to work, and that there was no need for the state to intervene in such matters. In the early days of the country, there was, of course, much merit to this point of view, but its strength weakened as the free lands of the West were exhausted and the country became more and more industrialized. A vast wage-earning class was created, for the most part propertyless and detached from the soil. Even though it was moderately well paid, it could not hope, except in rare instances, to earn or save enough to be protected against the hazards of industrial life—such as accidents, sickness, unemployment and old age.

Until very recently Federal legislation in the field of labor was almost entirely concerned with interstate matters, such as railroad labor, over which Congress has full authority. All other matters concerning labor were left to the control of the states. Since 1933, however, the Federal Government has enacted a series of very important laws applicable to labor generally.

In attempting to review the labor legislation of the United States as it now exists, the situation is complicated by the fact that for legislative purposes the United States, in addition to the Federal Government consists of 48 separate state governments, as well as Puerto Rico, Alaska and Hawaii (and until recently the Philippine Islands), which are all separate legislative entities. In addition the District of Columbia is governed by laws of Congress especially applicable thereto, so that in total there are 52 jurisdictions in the United States, each with its own set of laws, including labor laws, with an almost complete absence of uniformity in their terms. As a result of this diversity of jurisdictions any review of labor legislation in the United States, unless it is to be extremely bulky, can touch only upon the more significant subjects.

Child Labor Regulation.—In the United States as in most other countries the first important labor protective laws dealt with the regulation of the employment of children. The exploitation of children in factories was probably never as bad as it was in the British textile mills in the early 19th century as described above; but that conditions were often deplorable is illustrated in the following quotation from a document published in 1830 and quoted in the *Documentary History of the United States* by J. R. Commons and others:

> It is a well-known fact that the principal part of the help in cotton factories consists of boys and girls, we may safely say from six to seventeen years of age, and are confined to steady employment during the longest days in the year, from daylight until dark, allowing, at the outside, one hour and a half per day [for meals]. In consequence of this close confinement, it renders it entirely impossible for the parents of such children to obtain for them any education or knowledge, save that of working that machine, which they are compelled to work, and that too with a small sum, that is hardly sufficient to support nature . . . we are confident that not more than one-sixth of the boys and girls employed in such factories are capable of reading or writing their own names.

This quotation referred to conditions in Philadelphia in 1830, but is no doubt indicative of general conditions existing in industry in the early days of the factory system in the United States.

Courtesy National Child Labor Committee

Eight-Year-Old Fieldworker

The Census of 1930 listed 667,118 child workers 10-15 years old, and agriculture employs twice as many of these as all other occupations together

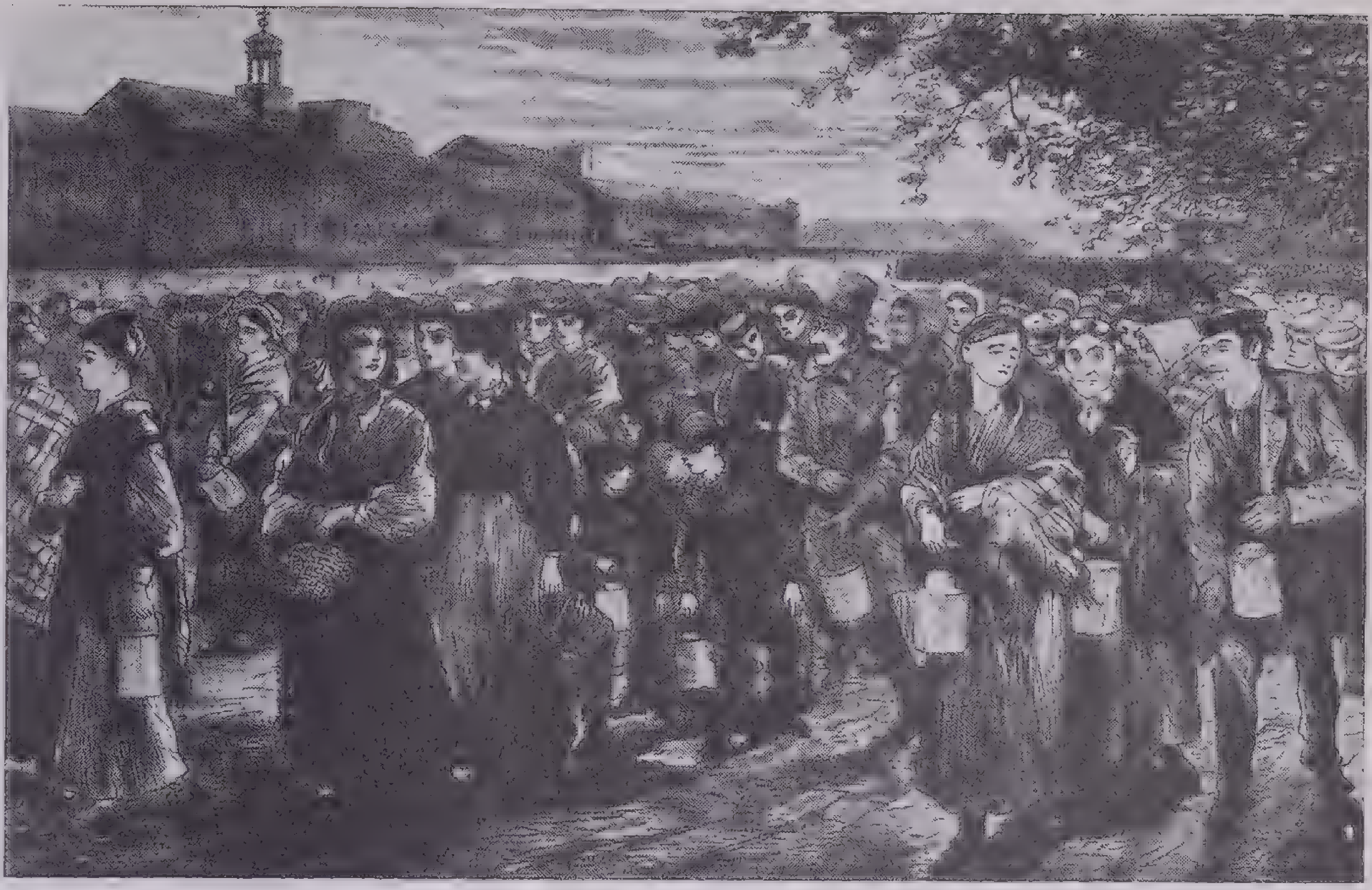
As early as 1848 Pennsylvania passed a law forbidding the employment of children under 12 in textile establishments; but no provisions for special enforcement was made and the law was not effective. This was equally true of similar laws passed by Rhode Island and New Jersey during the next decade. Experience soon demonstrated that such regulations were ineffective unless some form of special machinery was provided for enforcement. This was first done in Massachusetts in 1866 when a 10-year limit for child labor in certain employments was enacted; in the following year a special officer was provided to see that the law was obeyed.

Other states followed Massachusetts' example, but many of the laws were extremely weak and not well enforced. In time the idea of a 14-year limit on the industrial employment of children became fairly general, with the more liberal-minded states favoring a 16-year age limit. At present eight states—Connecticut, Montana, New York, Ohio, Pennsylvania, Rhode Island, Utah and

Wisconsin—have adopted the 16-year limit although several of these permit employment at 14 years outside school hours, and not all the laws apply to all forms of industrial employment.

During the life of the National Industrial Recovery Act, from 1933 to 1935, almost all the codes in effect under NRA prohibited the employment of children under 16 and in hazardous occupations under 18. With the discontinuance of the codes following the Supreme Court decision of May 1935, the employment of children, which had almost ceased under the NRA codes, was returned to the control of the individual states.

Comparatively early in the movement to restrict child labor, the idea was advanced that this was a fit subject for Federal control, and on two occasions Congress passed acts directed to this end, one based on the interstate power of the Federal Government and the other based on its taxing power. Both laws were declared unconstitutional by the United States Supreme Court. In 1923 Congress passed the Federal Child Labor Amendment to the Constitution. To be effective this must be ratified by the legislatures of three-fourths of the states. At the end of 1937 ratification had been made by 24 states, with 36 necessary to make it part of the Constitution. This proposed amendment does not prescribe any particular regulations regarding child employment; it simply gives Congress the power to enact legislation in this field.



From a drawing by Winslow Homer in Harper's Weekly, July 25, 1868

Lunchtime at a New England Textile Mill in the 1860s

Regulation of Women's Employment.—Protective legislation for women has been concerned largely with limiting hours of work and fixing minimum wages. In addition, however, there has been other special legislation regarding women's labor, such as provisions regarding employment at the period of childbirth.

Of recent years especially there have been two schools of thought among women's groups regarding the desirability of special protective legislation for women. Those who favor this type of legislation hold that women are more susceptible to injury from long hours, overstrain and industrial poisons than men are, and that injuries to them have a more serious social effect than in the case of men. Therefore, for the sake both of the individual woman and of society, the law should step in and protect women from undesirable conditions, especially since they are later entrants into industry than men, are less used to organization and are less able to protect themselves. The opponents of such legislation claim that it may easily become a handicap to the women it is intended to aid, making it impossible for them to enter the better-paid occupations and forcing them to crowd into already overcrowded, badly paid fields. Moreover, they point out that at present we have very little reliable information about the effect of given occupations or conditions upon women's health, and that much of our special legislation for them is based upon general impressions rather than upon accurate knowledge. Where the advocates of protective legislation for women would forbid their employment in an occupation patently hazardous or carried on under evidently unhealthful conditions, the opponents of such legislation would devote themselves to prohibiting employment under such terms for any worker and would legislate specially for women only where it can be definitely proved that some condition harmless to men is injurious to women.

Hours of Labor. The movement for limiting the hours of labor for women followed closely upon the agitation for the regulation of working hours for children. In the 1830s and '40s protests against the long working hours for women as well as men, particularly in textile mills, where the daily hours of work were normally 12 or more, were made frequently by labor groups and efforts increased to secure appropriate legislation. Acts were actually passed in a few states, such as New Hampshire and Pennsylvania, which provided that 10 hours should be the normal working day for all workers in the absence of an express contract requiring longer hours. The employers, in general, immediately drew up contracts to that effect and in spite of a certain amount of resistance by the workers and a few strikes, were successful in their efforts and these laws therefore proved entirely futile.

The movement for shorter hours, like other social-reform movements, languished in the violent antislavery agitation for some time prior to the Civil War and was not seriously revived until the 1870s. The first effective law limiting the hours of women was that of Massachusetts in 1879. This law provided for a maximum 10-hour day and 60-hour week. The movement spread gradually to other states and was greatly strengthened when the United States Supreme Court in 1908 upheld the constitutionality of the Oregon 10-hour law for women. By the end of 1937 only four states—Alabama, Florida, Iowa and West Virginia—had no law of any sort regulating the working hours of women. Indiana has but one limitation of hours—that prohibiting the employment of women at night in manufacturing.

All other states, the District of Columbia and Puerto Rico have definitely forbidden the employment of women for more than a certain number of hours a day or week or have penalized all employment beyond certain specified hours by providing that it must be paid for at an increased rate. But in many states the number of industries or occupations coming under the law is so small as to affect only a small proportion of all wage-earning women in the state. No state has regulated each industry or occupation by the passage of all types of hour laws. California has the most inclusive hour legislation. Oregon can point to the shortest week ever put into effect by a state law, a 44-hour week for women in two industries.

Only seven states—Arizona, California, Kansas, New Mexico, New York, Utah and Wyoming—and the District of Columbia and Puerto Rico have written upon their statute books the 8-hour day combined with the 48-hour week for women in some industries or occupations. Though for the most part these are not industrial states, the fact that New York, the largest industrial state in the country, has established the 8-hour day and 48-hour week stresses the possibility and feasibility of all states having similar legislation in the near future. Four other states and one of the seven just listed have an 8-hour daily limit but permit weekly hours in excess of 48 in certain industries or occupations, and four have a 48-hour weekly limit but permit 9 hours a day.

At the other end of the scale of

Courtesy U. S. Bureau of Labor Statistics

Sweated Labor in the Garment Industry

The sweatshop proprietor employs unorganized labor and by various devices evades state laws stipulating maximum hours, minimum wages and sanitary working conditions. He may, for instance, locate his factory just over the border of a state with good labor laws in a state with less stringent requirements. Sweatshops also operate unchecked because of the lack of sufficient inspectors to enforce the labor laws

hour legislation are the 19 states in which women may work 10 hours or more daily in some industries or occupations, and the 16 states that permit a working week in excess of 54 hours.

In regard to nightwork legislation 16 states and Puerto Rico prohibit nightwork for women in certain industries or occupations. The laws of three of these states cover manufacturing only, the law in one applies only to mercantile establishments and in two others only a small occupational group in each is covered. The period during which nightwork is prohibited most commonly is from 10 P.M. to 6 A.M.

Minimum Wages for Women. The first minimum-wage law for women was adopted by Massachusetts in 1912, and this was the effective beginning of a movement that spread very rapidly up to 1923, when the United States Supreme Court held unconstitutional the minimum-wage law of the District of Columbia, reversing an earlier decision and several favorable decisions by state supreme courts. As a result of this adverse action by the United States Supreme Court in 1923, many of the existing laws were repealed or became inoperative, and although efforts were made to redraft certain of the laws along lines that might be acceptable to the courts, little was accomplished in this field until after the decision of the Supreme Court in May 1937 in the so-called *Washington Case*. Here the United States Supreme Court, by a 5 to 4 decision, again reversed itself and declared the principle of a minimum-wage law for women did not violate the Constitution. Chief Justice Hughes, in handing down the decision of the Court, gave a very interesting statement of the social philosophy back of such legislation in the present age:

> The principle which must control our decision is not in doubt. The constitutional provision invoked is the due-process clause of the fourteenth amendment governing the States, as the due-process clause invoked in the *Adkins* case governed Congress. In each case the violation alleged by those attacking minimum-wage regulation for women is deprivation of freedom of contract. What is this freedom? The Constitution does not speak of freedom of contract. It speaks of liberty and prohibits the deprivation of liberty without due process of law. In prohibiting that deprivation the Constitution does not recognize an absolute and uncontrollable liberty. Liberty in each of its phases has its history and connotation. But the liberty safeguarded is liberty in a social organization which requires the protection of law against the evils which menace the health, safety, morals, and welfare of the people. Liberty under the Constitution is thus necessarily subject to the restraints of due process, and regulation which is reasonable in relation to its subject and is adopted in the interests of the community is due process.

Following this decision many states became active again in passing new legislation and in reviving earlier laws. As a result of this action there were at the end of 1937 minimum-wage laws in effect in 24 jurisdictions. Most of the laws apply to women and minors only and do not attempt to afford any protection to men. But the wage statute of Oklahoma approved on April 22, 1937, applies to men as well as to women and children. The Nevada law protects women only.

With the exception of Arkansas, Nevada, South Dakota and Puerto Rico, where the minimum wages are fixed by the law, the laws generally provide for the establishment of wage boards to investigate and recommend to the commission or other organization authorized to administer the law, the minimum wage to be fixed for certain industries. Such agency may accept or reject the recommendation.

During the life of the National Recovery Administration (1933–35) minimum wages were established for women as well as for men in all of the codes adopted.

Homework.—Some 50 years ago the bad working conditions in the so-called sweatshop industries all over the world aroused a considerable wave of public feeling that culminated in two types of protective legislation for homeworkers. In Australia and later in Great Britain minimum-wage laws applying to homeworkers as well as factory workers were established. As a result, the number of homeworkers was decreased and their wages increased so that they more closely approximated factory standards. This principle of regulating industrial homework through minimum-wage legislation has prevailed in the majority of countries outside the United States.

Homework legislation in the United States has been of a different type. Investigations of sweated industries in New York, Pennsylvania, Massachusetts, New Jersey, Indiana, Maryland and Ohio in the 1890s revealed the same deplorable conditions among homeworkers that had been found in Australia and England. The result of these investigations was the passage of the so-called antisweating laws in a number of states. The aim of these laws, however, was primarily the protection of the consuming public from unclean products, and focused on an improvement of physical surroundings rather than on an improvement of actual working conditions.

Another factor influencing the trend of legislation was the fact that a New York law passed in 1883 prohibiting the manufacture of cigars in city tenements was declared unconstitutional on the ground that it was an economic and not a health measure. Up to the present time, though approximately one-third of the states have enacted minimum-wage laws, they have not been used extensively to control industrial homework. California and Wisconsin specifically refer to homeworkers in wage orders and Connecticut sets a minimum wage for homeworkers in the lace industry; but there is little mention of homework in the regulations of the other minimum-wage states.

At the present time about one-third of the states have statutes or official regulations governing industrial homework. Three laws (Connecticut, New York and Rhode Island) passed in 1935 and 1936 institute a stringent regulatory system attempting to raise labor standards as well as to compel sanitation and are aimed at the

Courtesy U. S. Women's Bureau

Good Working Conditions in a Modern Factory

The humane and farsighted employer upholds state laws regulating working conditions. This view of a hosiery mill illustrates some minimum standards that make for healthier employees and better work: windows with middle section adjustable for ventilation; excellent lighting; wide aisles; adjustable back-supporting chairs; sanitary bubble fountain; wood floors (not so hard as concrete)

eventual elimination of homework. The laws and regulations in the other states, with the exception of California where homework regulations are a part of several minimum-wage orders, are the outgrowth of the anti-sweating laws mentioned above and, for the most part, are intended for the protection of the consumer.

The absence of legislation in two-thirds of the states is particularly significant in the case of industrial homework because of its mobility. It is a relatively simple matter for an employer of homeworkers through the use of contractors and subcontractors or the direct use of the mails to withdraw homework from a state in which there are prohibitions or strict regulations and send it to a state where no legislation exists.

Hours and Wages of Men.—Maximum-hour and minimum-wage legislation for women has been fairly frequent in the United States and still more frequent in the case of minors. But in the case of adult males little effort was made until comparatively recently to impose legislative restrictions of wages or hours except in public employment and in employments involving special hazards to the workers concerned or to the public. This was due partly to the fact that the courts almost invariably frowned upon such legislation in the case of adult males in private employments as violation of the principle of freedom of contract, and partly to the fact that the organized men workers were in general opposed to legislative fixing of minimum standards for themselves for fear that this minimum might become a maximum.

onstitutionality of Hours Legislation.—The first important decision of the United States Supreme Court on the constitutional question of the power of a legislature to fix a maximum number of hours of labor that persons may work in private employment was that of Holden *v.* Hardy, decided by the United States Supreme Court in 1898. In this opinion the court held that a legislature had such power in the case of employments that were particularly dangerous or unhealthful. In 1905, however, the United States Supreme Court was asked to pass on the constitutionality of the New York statute providing that no employees should be required or permitted to work in bakeries more than 60 hours a week or more than 10 hours a day. The court held: "The limitation of the hours of labor as provided for in this section of the statute, * * * has no such direct relation to and no such substantial effect upon the health of the employee, as to justify us in regarding the section as really a health law"; and "under such circumstances the freedom of master and employee to contract with each other in relation to their employment, and in defining the same, cannot be prohibited or interfered with, without violating the Federal Constitution." (Lochner *v.* New York.)

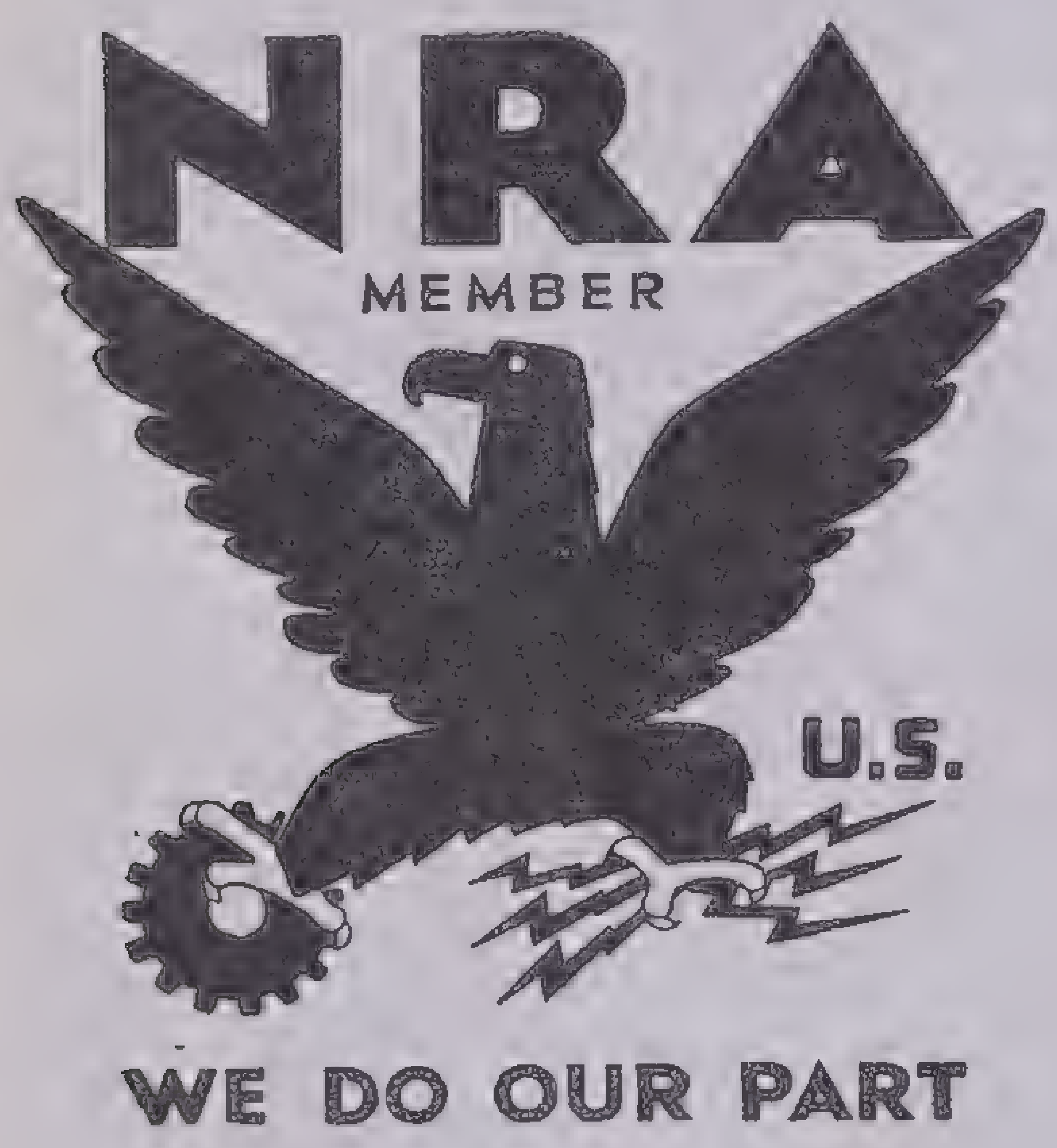
A change of attitude took place in 1917, when a statute of Oregon limiting the hours of labor of any person, whether man or woman, working in any mill, factory or manufacturing establishment for 10 hours a day and providing for overtime was upheld as constitutional by the United States Supreme Court. (Bunting *v.* Oregon.) In view of this decision it is generally considered that state legislatures have the power to fix the maximum number of hours for men at less than 10, particularly in view of the language of the court in a case upholding the validity of a California statute fixing the maximum number of hours for women at 8 hours. (Miller *v.* Wilson, 1915.) The court then said: "It is manifestly impossible to say that the mere fact that the statute of California provides for an 8-hour day, or a maximum of 48 hours a week, instead of 10 hours a day or 54 hours a week, takes the case out of the domain of legislative discretion."

Before the National Industrial Recovery Act of 1933 there had been no Federal legislation attempting to fix minimum wages for men in private employment; so the constitutionality of such action had never come before the courts.

NRA Codes.—The National Industrial Recovery Act of 1933 represented a sharp break with American tradition as regards Federal legislative intervention in the matters of wages and hours of adult men. This Act provided, among other things, for the establishment for each industry or group of related industries of a "code of fair competition." Each code, to be worked out in consultation by the employers and employees in the industry and by the National Recovery Administration, was to provide for fixing minimum wages and maximum hours for all employees in the industry, men as well as women.

Prior to its being declared unconstitutional in 1935, the NRA had approved several hundred separate industrial codes covering the major part of American industry. There were wide differences between these codes in their labor provisions, but the great majority provided for a work week of not over 40 hours and for minimum hourly wage rates of between 32½ and 40 cents, inclusive.

The National Industrial Recovery Act covered only workers engaged in employments concerned with interstate commerce, for it was felt that this limitation would make the law constitutional. But in modern economic life it is very difficult at times to decide what industries or employments are interstate in character, and the Supreme Court has discussed various aspects of this question in a long series of cases without ever developing any precise distinction of universal applicability.



NRA Blue Eagle

From June 1933 to May 1935 the blue eagle was prominently displayed by the majority of employers throughout the United States as a symbol of their acceptance of industrial codes drawn up by the National Recovery Administration but subsequently declared unconstitutional by the Supreme Court

The decision of the Supreme Court that overthrew the NRA in 1935 involved so many constitutional questions that it still was not quite clear just how far Congress could go in this matter; therefore, the advocates of wages-and-hours legislation were not deterred from carrying their efforts to secure Federal legislation on the subject. At the 1937 session of the Federal Congress, new bills providing for the establishment of legal standards of hours and wages for all employees in all industries vested with an interstate character were under discussion and had wide support.

The character of the support for this type of legislation, however, had changed as time went on. In the earlier days the arguments for limitation of hours and for minimum wages had been based solely on the idea that too long hours and too low wages were detrimental to the health of workers. With the advent of the great depression of the early 1930s attention turned to the possible desirability of shorter hours as a means of spreading work and relieving unemployment. This was one of the main arguments for the NRA, supplemented with the theory that increased wages were necessary in order to enlarge the national consuming power. It was also the principal argument advanced in favor of the wages-and-hours (or Fair Labor Standards) Act passed in June 1938.

The 1938 law applied only to employment in and affecting interstate commerce. It set up a Wage-and-Hour Division in the United States Department of Labor and industry committees to recommend minimum wages. The act provided a minimum wage of 25 cents an hour for the first year; 30 cents an hour for the next 6 years; and thereafter a rate between 30 and 40 cents depending on recommendations of the administrator of the division based upon reports of the industry committees. The maximum work week is 44 hours for the first year under the act; 42 hours for the second year; and 40 hours thereafter. Overtime for any one week is not a violation under the following conditions: if there is an agreement that no employee shall work more than 1,000 hours in any 26 consecutive weeks; or an agreement that no employee shall work more than 2,000 hours in any 52 consecutive weeks; or if the employment is seasonal and not more than 14 weeks in a calendar year, and there is provision for time-and-a-half pay for overtime beyond 12 hours a day or 56 hours a week.

Before the passage of this Fair Labor Standards law in 1938 there had been no Federal legislation in force, except as regards hours on the railroads and hours and wages on public works. There were a number of state laws limiting working hours in especially hazardous occupations. There were a few state laws, such as the 10-hour law of Oregon, which had never been declared unconstitutional but placed such a high limit on daily hours that the limitation was ordinarily not exceeded in any case. Finally a very few states, carrying on the NRA principles, had enacted legislation for their particular jurisdictions. Thus Pennsylvania in 1937 enacted a weekly 44-hour law for industry generally.

Safety and Sanitary Conditions.—Legislation establishing standards of safety and health in industrial plants is so voluminous in state legislation and is necessarily so concerned with details that a summary review is impossible. In general the laws deal with such subjects as machine safeguarding, removal of dust, protection against poisonous substances used in various productive processes, toilet facilities, pure drinking water and seats for female workers. Some states attempt to incorporate the detailed specifications in the laws themselves; others leave a rather wide discretion to the factory inspectors and still others provide for special commissions or boards to work out the detailed rules and regulations in definite codes. All the states have some legislation in this field, some being extremely good and some very unsatisfactory. Always, however, it has been found that in order to secure good safety and health standards in actual practice it is necessary to have a staff of trained inspectors to make periodical visits to the plants, to advise with the managements and to insist upon the enforcement of the laws.

Workmen's Accident Compensation.—Under the old common law, even under statutes establishing employers liability, a worker injured in the course of his employment had only a rather remote chance of receiving compensation. The injured worker or his family had recourse only through a damage suit against the employer. To secure damages in court under the common law, the worker was usually compelled to prove that his employer had not used reasonable care in protecting his employees against injury, that the injury received was not an ordinary risk inherent in the job, that the injury was not the result of negligence on the part of a fellow worker and that the injured worker himself was free from negligence. Even in those states where after 1885 employer-liability laws had been enacted, the injured worker was obliged to resort to the courts, where he still had to present his case in opposition to that of his employer or an insurance company.

In contrast to the principle that part of the responsibility for industrial injuries should be borne by the worker is the principle underlying workmen's-compensation legislation, which is that the cost of industrial injuries should be borne by industry as part of the cost of production.

The advent of legislation compelling the employer to pay benefits to his workers without suit or proof of negligence tended to make industry aware of the economic burden of this industrial hazard. The payment of premiums on workmen's-compensation insurance, coupled with a merit-rating provision, has made him conscious of a responsibility. It has also, in some instances at least, made it profitable for the employer to cut down on his accident rate.

Abroad, Germany in 1884 and Great Britain in 1897 and 1906 took the lead in the enactment of effective workmen's-compensation systems. Laws of Maryland (1902 and 1910) and of Montana (1909) were results of early efforts in the United States, but these were without adequate regard for either legal or economic principles. By 1911, however, a number of states had adopted more or less effective laws and other states were added to the list in later years. In addition the Federal Congress enacted workmen's-compensation systems for longshoremen and harbor workers, all employees in the District of Columbia and all other Federal employees; while Alaska, Puerto Rico, Hawaii and the Philippine Islands had provided systems for their respective jurisdictions.

Notwithstanding this, the movement was quite slow and at the end of 1937 there were still two states—Arkansas and Mississippi—without workmen's-compensation laws of any kind and a number of those on the statute books of other states were far from giving as satisfactory service to injured workers as is desirable.

Scope and Character of Existing Laws.—In no case does a state compensation law cover all employments in the state. Certain employees are exempt specifically by the act or because the state has no jurisdiction over them. Employees engaged in interstate commerce are not covered by any state workmen's-compensation law because they are engaged in work that comes under the jurisdiction of the Federal Congress even though the Federal law creates liability but does not provide for compensation. Certain types of employees are not covered by the various laws. Some laws cover only employees engaged in hazardous work. Casual employees are usually exempt, and those engaged in certain occupations, such as agriculture and domestic service, are excluded from the benefits of most workmen's-compensation legislation.

Approximately one-third the compensation acts are compulsory; employers are required to comply with the terms. In the other two-thirds of the acts, an employer has the option of not accepting the act, but he is induced in most cases to accept by the provision that if he does not, then in any suit brought against him by an employee to recover damages for injury or death the employer is deprived of the common-law defenses of negligence of a fellow servant, assumption of risk and contributory negligence.

Most of the states specify that compensation shall not be paid for a period of time immediately following the injury. This waiting time varies from a minimum of 3 days to a maximum of 14 days in the various states, and the majority require a 7-day waiting period. This period for which no compensation is required to be paid has no relation to the requirement to provide medical and hospital care, as the employee is entitled to these immediately. Nearly all the states provide that if the disability continues a certain number of weeks, the payment of compensation shall be retroactive to the date of injury. This provision eliminates the danger of hardship being worked upon workmen who are permanently or totally disabled.

The amounts actually payable under the various compensation acts are determined by three factors—the rate, usually a percentage of the wages; the term or period of payment and in most states a fixed maximum weekly or total payment. The amount and method of payment also differ according to the type of injury. The acts prescribe certain payments in case of death and in case of permanent total disability and also have specific provisions covering permanent partial disability and temporary total disability. All compensation laws in the United States provide for medical aid to injured employees.

Two general methods are used in administering the workmen's-compensation laws: (1) by a special administrative commission or board created for the purpose of enforcing the provisions of the law; and (2) by the courts of the state. When administration is left to the courts it is usually because no other machinery for administration has been created and this law, like other laws, is enforced in the various state and county courts.

Administration by the courts exists in only seven states (Alabama, Alaska, Louisiana, New Hampshire, New Mexico, Tennessee and Wyoming). The major difficulties of court administration have been summed up as: (1) delay of court procedure, (2) the cost of court procedure and (3) the unfitness of the courts for the settlement of compensation. A complete understanding of industrial conditions is essential in a successful administration of the laws. The vital factors in successful administration are the giving of prompt, honest and full compensation and immediate medical aid as required by the law. To achieve these purposes a special administrative board or commission is almost essential. Where the law is administered by a commission or board, appeals to courts are usually limited to questions of law, and determination of facts is left to the exclusive jurisdiction of the commission.

Under the great majority of the laws the cost of compensation falls entirely upon the employer, although in the states having a state fund some small part of the cost is shifted to the public. The laws provide for three general schemes for insuring the risk of liability based on industrial accidents: (1) state insurance fund, (2) private insurance companies and (3) self-insurance. Approximately 40 laws permit the employer to be a self-insurer. All states except Nevada, North Dakota, Ohio, Oregon, Washington, West Virginia and Wyoming allow the employer to insure through private insurance companies. In these states an exclusive state fund is maintained and employers coming under the coverage of the compensation act are required to insure their risk in the state fund; although in Ohio and West Virginia self-insurance is permitted under certain circumstances. Other states maintain competitive state funds in which the employers may insure their risks, although insurance therein is not compulsory.

Occupational-Disease Compensation.—The early workmen's-compensation laws construed accidents in the narrow sense to include only injuries due to sudden physical violence and to exclude injuries due to the slow ravages of disease, even though the disease resulted from a particular employment. Thus a miner crushed by falling rock receives compensation; but a miner who becomes a hopeless invalid because of the gradual filling of his lungs with coal dust and rock dust is excluded from compensation benefits. The arguments usually made for such a distinction are that in practice the inclusion of occupational diseases under workmen's compensation would involve difficulties of diagnosis and might add unreasonably to the cost of the system. The experience of the states that have actually taken the step of making all types of industrial injuries subject to compensation benefits is evidence that these objections are not very serious or at least are not unsurmountable. As a result there has been a trend in recent years toward the inclusion of occupational diseases in workmen's-compensation laws. The importance of the subject has been vastly increased by the constant increase in the number of poisonous and otherwise harmful materials used in productive processes.

Social Insurance.—As the term is ordinarily understood, social insurance includes the various public systems, established on an insurance basis, for the protection of wage earners and low-salaried persons against such hazards as unemployment, sickness and old age. Workmen's-accident compensation hardly comes within this category, being more properly conceived of as a substitute for the old liability system under which the employer, theoretically, was responsible for accidents growing out of employment. Also old-age pensions, pensions for the blind and other forms of state help to the unfortunate are not properly to be included as forms of social insurance, as they represent direct gifts by the state. The Federal Social Security Act, however, included several kinds of aid or relief by the state; these, therefore, may be conveniently considered under the present heading.

The United States lagged far behind most other modern industrial countries in public social insurance. During the current century England and Germany have established comprehensive systems of unemployment, old-age and sickness insurance for low-paid workers; France has enacted a social-insurance law covering the major industrial hazards except unemployment, and many other European countries have set up more or less complete systems of this character.

In the United States the first significant legislation of this character was in 1932, when Wisconsin established an unemployment-insurance system. This was followed in 1935 by the Federal Social Security Act, which created a framework for unemployment insurance and old-age insurance and certain forms of Federal grants-in-aid to the indigent aged, to the blind, to the extension of public-health services, to vocational rehabilitation and to the welfare of children. Sickness insurance remains an untouched field in the United States.

Unemployment Compensation.—The Social Security Act does not establish any unemployment-compensation systems. The states are invited to enact laws for the compensation of their unemployed. The Federal Government does not require or seek to force them to enact laws of any particular type. Their freedom to pass those laws best suited to their local conditions and problems is protected.

The provisions of the Social Security Act relating to unemployment compensation are very simple. A payroll tax amounting to 1 per cent of pay roll in 1936, 2 per cent in 1937, and 3 per cent in 1938 and thereafter is levied on all employers of eight or more persons for 20 weeks or more. Agricultural labor, domestic service in a private home, certain maritime employment, service in the employ of the United States Government or state governments and of a nonprofit nature are excepted from the tax.

Each employer is allowed to credit against the tax, up to 90 per cent thereof, his contributions to a state unemployment-compensation fund established in accordance with a state unemployment-compensation law that has been approved by the Social Security Board.

This means that a state that passes an unemployment-compensation law will be able to withdraw nine-tenths of the pay-roll tax for its own unemployed by collecting it as contributions under its own law instead of letting the Federal Government collect it as a tax. The administration of the state law will not cost the state anything, if such administration is efficient; for under the Social Security Act the Federal Government stands ready to grant to the states sufficient amounts to pay all proper administrative expenses. Nor will the state that acts promptly be at any competitive disadvantage with other states, for the pay rolls of employers in states that do not act will be subject to the full Federal tax.

By the end of 1937 all of the 48 states, as well as Alaska, Hawaii and the District of Columbia, had established unemployment-insurance plans, under the terms of the Social Security Act. In some ways all these are alike: All establish a fund out of which to pay weekly benefits to men and women workers who are laid off or lose their jobs; they all require employers to contribute to this unemployment fund and in this way to take responsibility for unemployment, just as they pay for insuring their workers against accident to life or limb in the factory, shop or store.

The state laws are alike in certain other respects: If they have been approved by the Social Security Board and if the methods of administration meet the requirements of the Social Security Act, the Federal Government grants money to the state to pay the costs of administration. To be approved, a state law must contain certain provisions that will protect the state unemployment fund and safeguard the workers' interests.

Nevertheless, state laws vary considerably. They vary as to: (1) kind of employment funds; (2) workers covered; (3) benefit payments; (4) qualifications for receiving benefits; (5) state agency for administering the law.

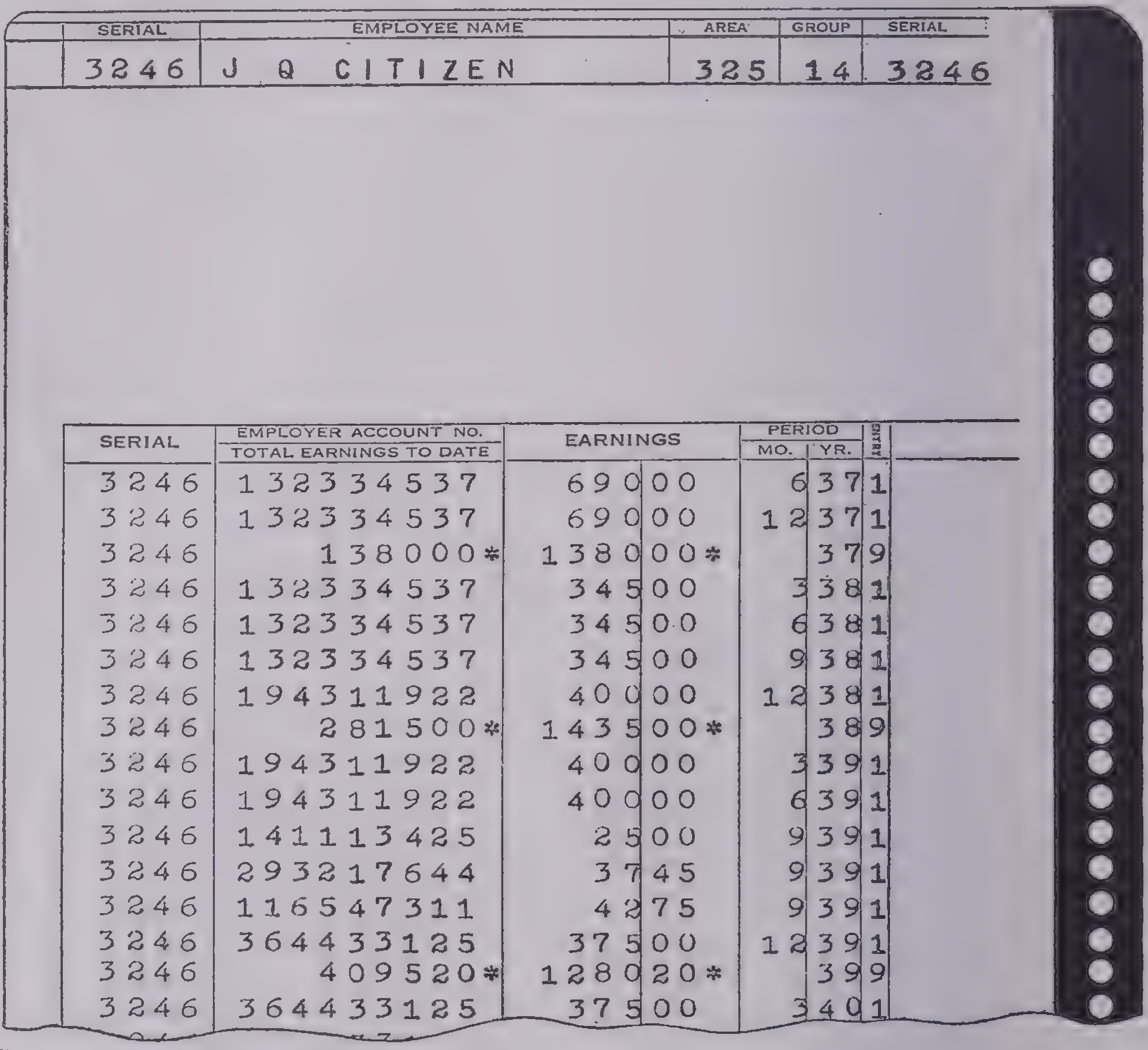
One reason for the differences in unemployment-compensation laws from state to state is the fact that the laws are all new, and no state so far has had enough experience to be sure its law is the best that could be made. With experience, it is to be expected that a set of standard provisions for unemployment compensation will develop, and that the states will amend their laws from time to time accordingly.

State Unemployment Funds.—In the state unemployment-compensation statutes so far enacted the unemployment fund is managed in several different ways. Most of the states have what is known as the state pooled fund. In most cases a merit-rating plan is combined with the pooled fund. A few states have the employer-reserve plan, in some cases combined with a pooled fund. There are certain other variations.

A state with a pooled fund requires that all contributions be paid into one common fund and that all benefits be paid out of this same fund. In other words, the cost of the benefits to unemployed workers is shared by all the contributors to the fund. This means to the workers that when they are unemployed their weekly benefits are paid without respect to the particular employer for whom they may have worked.

When merit-rating for employers is combined with the state pool plans, there is still a pooling of all employers' contributions, in order to give the same guarantee to workers that is offered in the straight-pool plan; but after benefits have been paid for 3 years, employers with records good enough to justify a lower contribution rate may get a reduction according to their record, or their "merit rating," as it is called. Those with high rates of unemployment do not get this reduction and in some states may be required to pay more than the average contribution rate.

Employer-reserve laws provide a separate account for each employer's contributions to the state unemployment fund, and benefits to any



SERIAL	EMPLOYEE NAME	AREA	GROUP	SERIAL
3246	J Q CITIZEN	325	14	3246

SERIAL	EMPLOYER ACCOUNT NO. TOTAL EARNINGS TO DATE	EARNINGS	PERIOD MO.	PERIOD YR.	ENTRY
3246	132334537	690 00	6	37	1
3246	132334537	690 00	12	37	1
3246	138000*	1380 00*		37	9
3246	132334537	345 00	3	38	1
3246	132334537	345 00	6	38	1
3246	132334537	345 00	9	38	1
3246	194311922	400 00	12	38	1
3246	281500*	1435 00*		38	9
3246	194311922	400 00	3	39	1
3246	194311922	400 00	6	39	1
3246	141113425	25 00	9	39	1
3246	293217644	37 45	9	39	1
3246	116547311	42 75	9	39	1
3246	364433125	375 00	12	39	1
3246	409520*	1280 20*		39	9
3246	364433125	375 00	3	40	1

Courtesy Social Security Board

How Social Security Accounts Are Kept: The Employee's Ledger Card

The four digits in column 1 are the last four digits of Mr. Citizen's social security account number. The first three digits of an account number indicate the area in which the worker applied for an account number. The next two digits indicate groups of 10,000 and allow for expansion of the serial number, that is, the last four digits; for instance, when account numbers have been assigned to 6,755 additional applicants in that area and in that group, the group number would automatically jump from 14 to 15, making the entire social security account number read: 325 (area)—15 (group)—0001.

The serial number of the employee, as shown in column 1, will remain the same so long as his account is being kept.

The nine digits appearing in column 2 represent the employer's identification number, the first two digits representing the Internal Revenue District in which it was issued. This number will be the same as long as the wage reports of the employee are made by that employer. When he gets a new job it will be shown in the same column by the appearance of his new employer's number, as is shown here in the sixth wage reporting. At this point the number of the first employer, 132334537, is dropped and there appears the number of a new employer, 194311922. In this same column there appear at intervals numbers followed by asterisks. This figure is the total of the wages for a given period, in this case every 12 months. This total is carried through the column cumulatively. In the sample ledger sheet shown here, the first total is $1,380 at the end of 1937 and $1,280.20 at the end of 1939.

The wage earnings as reported by the employer (or employers) are shown in column 3 with periodical totalings which in turn are added into the cumulative totals in column 2.

Column 4 is nothing more than the dates of the entries.

The final column under the word *entry* is for a series of code figures required in the mechanics of the maintenance of an account worker are paid only from the account of the employer or employers for whom he has worked. This kind of law also provides that after payment of benefits for a certain number of years, an employer's contribution to the state fund may be reduced if he has a good employment record. Such a plan puts the responsibility for layoffs directly upon the individual employer and offers him an incentive for avoiding them; but the workers' benefits are guaranteed only up to the amount of their own employer's reserve in the state fund.

The contributions that the state requires from employers are based on their pay rolls. In most states employers pay nine-tenths of 1 per cent for 1936; 1.8 per cent for 1937, and 2.7 per cent from 1938 on, except that most of the laws provide for merit rating after 1940. In some states the contributions are a little higher.

There are some states in which employers are required to contribute to the unemployment fund. These contributions are less than the employers pay, in some cases half as much or less. In the District of Columbia the law provides for a contribution from Government funds.

Workers Covered.—For the most part, the state laws apply to jobs in factories, shops, mines, offices, stores and other places of business—not to farm workers, domestic workers, city, county, state or Federal Government employees or certain other groups of workers. As a rule, also, the laws apply only where eight or more persons work for the same employer. Some of the states, however, include more kinds of employment and cover the workers where three, four or five or more are employed, and in some cases where only one or more are employed. Some states also provide that workers receiving more than a certain amount of wages—for example, more than $50 a week or $2,600 a year—shall not receive unemployment benefits.

Benefits.—In all but a few of the state laws, benefits to unemployed workers amount to half the pay they have been receiving, up to a maximum benefit of $15 a week; that is, a worker earning $20 a week would receive a benefit payment of $10 a week; if earning $30 a week, he would receive $15; but if he earns $35 or $40 he could receive no more than $15 a week in benefits. The District of Columbia law provides for payments equal to 40 per cent of the worker's pay plus 10 per cent for a dependent husband or wife, plus 5 per cent for each dependent relative, up to 65 per cent of his wages, provided the benefit payment is not more than $15 a week in all.

In many states benefits may not be less than $5, or three-fourths of full-time weekly wages, whichever is less; but in some states the minimum payment is as much as $7 and $7.50. On the other hand, some states fix no minimum.

The number of weeks during which an unemployed worker may receive benefits is limited in two ways: In all states there is a flat limit to the total number of weeks during which benefits are payable in any one year. Usually this maximum is 15 weeks, but in the different states, it runs from 12, 13, 14 and 16 weeks up to 18 and 20 weeks a year. Some of the states extend the time if the employee has been employed longer than the preceding 2 years.

Nearly all the states provide, further, that the number of weeks of benefits shall be in proportion to the amount of employment the worker has had during the past year or two; that is, he may receive benefits as a rule for 1 week of unemployment to each 4 weeks of employment in the preceding 2 years; but in some states he needs only 3 weeks of employment for 1 week of benefits. In the newer state laws, the length of time the worker may receive benefits is calculated in a different way, but the result is the same for the worker. Most of the laws provide benefits for partial unemployment, that is, for working only part time on a full-time job. In some cases special provision is made for unemployment on part-time jobs, and sometimes for seasonal jobs.

Qualifications for Benefits.—To qualify for benefits, the worker must have had a certain amount of employment the year before. Some states require that he shall have been employed for 13 weeks within the year, others require 60 days, 90 days, 16 weeks, 20 weeks or 26 weeks. Some states that require 26 weeks allow as an alternative 40 weeks within the past 104 weeks. One state requires 90 days within 12 months or 130 days within 24 months. The various state laws differ on this requirement, as they differ on others, and the newer laws differ from the others in their method of calculating the amount of employment.

A waiting period for the worker is required in unemployment-compensation laws just as in workmen's compensation for accident; that is, he must wait as a rule two or three weeks after being laid off before receiving unemployment benefits. Some states require only two weeks; others require four weeks, and there are other provisions in some of the state laws.

Unemployed workers may be disqualified for benefits or their waiting period may be lengthened if they are discharged from the job for misconduct, if they quit voluntarily or if they refuse to take a suitable job when one is available. Ordinarily benefits are not payable to workers on strike or unemployed because of a labor dispute; but there are several states in which benefits may be paid in such cases under certain circumstances.

Old-Age Assistance and Old-Age Benefits.—The Social Security Act sets up two systems for aiding the aged: One is designed to help the states to give immediate assistance to aged individuals on a basis of need; the other to provide annuities in the future to persons over the age of 65, based upon their wage experience. The two plans are complementary and may be described briefly as follows:

1. *Old-Age Assistance* (immediate-payment plan).—A state may submit to the Social Security Board for approval its plan for old-age assistance. The Board is directed to approve such plans as conform to certain requirements as to eligibility, such as age, residence and citizenship, and to requirements as to state operation and standards of administration, intended to assure proper and efficient state action by the enactment and administration of laws that may reasonably be expected to provide assistance to needy aged individuals without discrimination. After the plan is approved, the state receives from the Federal Government an amount equal to one-half the sum expended for old-age assistance by the state with respect to individuals 65 years or older who are not inmates of public institutions. The Federal Government matches on a fifty-fifty basis every dollar spent by the state for old-age assistance but does not contribute more than $15 per month for any individual. In addition the Federal Government pays for administrative expenses an amount equal to 5 per cent of the sum granted to the state.

At the end of 1937 almost all of the states had adopted old-age pension plans under the above provision and were either receiving or entitled to receive financial help from the Federal Government.

2. *Old-Age Benefits* (annuity plan).—Under this plan regular benefits are paid to qualified individuals as a matter of right out of an old-age reserve account set up in the Federal Treasury. A qualified individual is one who is at least 65 years of age, who received total wages with respect to employment after December 31, 1936, and before attaining 65 years of age, of not less than $2,000, and who has been employed in some five different calendar years after December 31, 1936, before attaining the age of 65 years.

The wages on which benefits are based do not include certain wages, for instance, wages received for agricultural labor; domestic service in a private home; casual labor; service for Federal or state governments and service for nonprofit organizations. Service in the employment of a carrier as defined in the Railroad Retirement Act of 1935 is further excluded, the railroad workers being covered by the special Retirement Act referred to. That part of an individual's remuneration in excess of $3,000 a year from each employer is not counted as such wages.

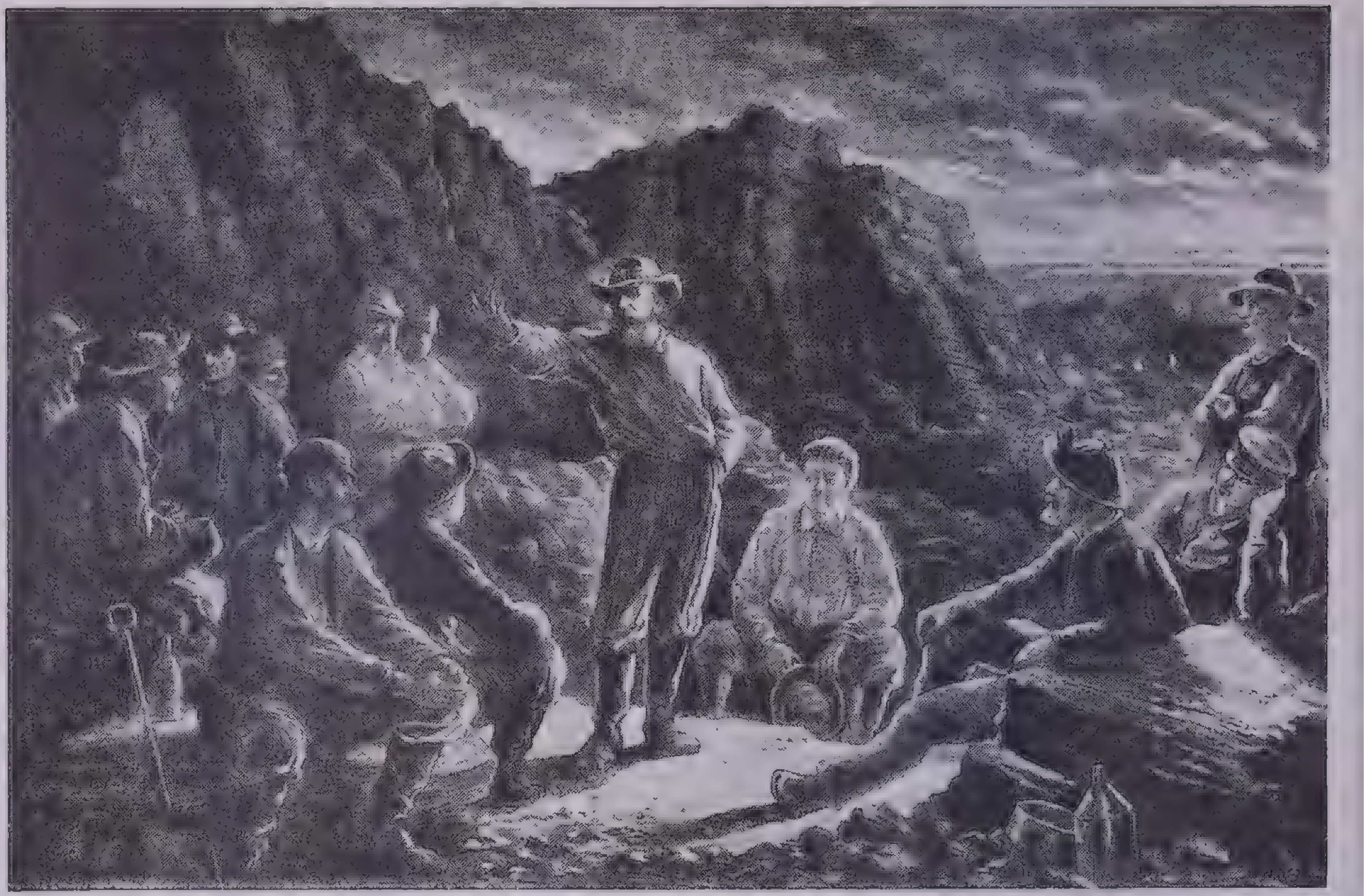
A qualified individual is entitled to benefits from the day he reaches 65, or on January 1, 1942, whichever is later, and ending at his death. The benefits will be paid at regular stated intervals, based on total wages received. The minimum monthly benefit payment will be $10, and the maximum $85. The cost of the annuity system is borne by assessments levied upon both the employer and the employee.

Security for Children.—The Act makes provision for the protection of children who are in need of special assistance. The various schemes are as follows:

1. Grants to states to assist in meeting the costs of aid to dependent children (mothers' aid).
2. Grants to states to assist in meeting the costs of maternal and child-health services.
3. Grants to states to assist in meeting the costs of services for crippled children.
4. Grants to states to assist in meeting the costs of child-welfare services.

Aid to the Blind.—The sum of $2,000,000 was appropriated for the last five months of the fiscal year ending June 30, 1936, and a sufficient sum was authorized thereafter for the purpose of enabling each state to furnish financial assistance to needy individuals who are blind. This sum is made available for making payments to states that have submitted and had approved by the Social Security Board state plans for aid to the blind.

Vocational Rehabilitation.—In order to provide for extending and strengthening programs of vocational rehabilitation of the physically disabled, the Social Security Act also authorized an appropriation of $841,000 for the fiscal year 1937 and $1,938,000 annually thereafter.



From Harper's Weekly, January 31, 1874

An Early Strike: Meeting of the Molly Maguires in the Coal Mines

During 1865–75 a group of Irishmen who called themselves the Molly Maguires organized the anthracite miners in the region around Scranton, Pennsylvania

Labor Organizations

The existence of effective labor legislation is in any large part due to the existence of effective labor organization, and the increasing scope of labor legislation has more or less followed the increasing strength of labor unions.

The earliest labor unions in the United States were local craft unions. The carpenters of Philadelphia organized as early as 1791; the shoemakers in the same city and the printers in New York, in 1794; and in 1795 a union of tailors was organized in Baltimore. These early organizations were all local and all of skilled workers in single crafts, as there was then little intercity competition and machinery had as yet done little to impair craft skill.

Probably the first movement toward a federation of crafts was in Philadelphia in 1827, following a strike among the building trades for a 10-hour day. This was followed by other efforts at federation, and in the 1830s there developed numerous workingmen's parties whose activities were chiefly political, with broad platforms including such items as free schools, universal manhood suffrage and the universal 10-hour day. These labor-political movements were not very successful, but with interruptions, such as that caused by the great panic of 1837, the workers' organizations continued for the most part to espouse political reform measures until the time of the Civil War, when the labor program changed to the more strictly labor objectives of shorter hours and higher wages.

In the 1860s there were several efforts to establish national labor unions, and in 1866 there was formed the National Labor Union, which at its crest had more than half a million members. Its program was very practical and it repudiated strikes except as a last resort. This organization lasted only a few years, and other efforts of similar character also had short lives, although having very definite influence in developing the trade-union spirit and in securing various forms of legislation for the benefit of labor. Out of these scattered movements a really powerful national organization, the Knights of Labor, finally emerged in 1869.

The Knights were at first a secret association with an elaborate ritual, and this secrecy led to much misunderstanding and hostility. There was really nothing to conceal in the organization, however, and in 1881 it gave up its cloak of secrecy. The organization won a few rather important victories in industrial matters and developed a membership of some 700,000 in 1886. This was the height of its power.

The Knights of Labor were organized on the basis of the one-big-union idea, including everyone in its membership, without regard to skill, color or creed. Its aim was a co-operative society, in which all classes should participate in a fuller life, and it did not place much weight upon opportunist methods. Its idealistic qualities led perhaps to its undoing, as it achieved too few immediate results to satisfy its membership.

A new organization with more immediate practical aims and built solely on craft unionism was growing up side by side with the Knights of Labor, and by the 1890s had completely superseded it as an effective force. By 1900 the Knights organization was practically dead, though the American Federation of Labor was developing greater and greater power, which has continued up to the present time. It gradually absorbed all the principal unions in the country except the railroad brotherhoods and up to 1936 experienced no serious split in its ranks and no serious rivalry as the mouthpiece of American Labor. In 1936 the separatist movement organized as the Committee on Industrial Organization occurred. The C.I.O. included a number of national unions, all organized on an industrial rather than a craft basis, which had previously been members of the A.F. of L. but were dissatisfied with the A.F. of L.'s organizational policies. The A.F. of L. had always favored the craft type of union, and the C.I.O. unions felt that in the modern industrial world, labor, to secure its maximum efficiency, would have to organize more and more along industrial lines, especially in the large mass-production industries. In 1936 and 1937 it was very successful in organizing the steel, automobile and certain other industries along industrial lines. This meant conflict with many of the old craft unions, such as the machinists' and carpenters' unions, which already had local branches, embracing only members of their own crafts, in many of the mass-production industries. At the end of 1937 the membership of the A.F. of L. and of the C.I.O. was understood to be in the neighborhood of 4,000,000 each.

Labor Organizations and the Law.—In their early days labor unions were in constant conflict with the law. Strikes were frowned upon by the communities and by the courts, and the association of workers into groups for the purpose of pressing their demands upon employers was often treated as a conspiracy and the members were penalized. Gradually this attitude changed, and at the present time labor is everywhere granted the legal right to organize, and many states have laws protecting union labels, union cards and other expressions of union organization. Also, at the present time the legal right to strike is, in general, everywhere recognized, although there is still wide difference of opinion in the laws and courts as to the right of members of unions to picket plants that are being "struck"; but picketing not involving violence or physical intimidation is also accepted as legal in most jurisdictions.

The injunction was early used by employers as a weapon against the activities of labor organization. The labor union bitterly resented this practice and in recent years have been successful in securing legislation by Congress and by several states forbidding the use of the injunction in labor disputes, except within rather narrow limits. In similar fashion the so-called *yellow-dog* contract has been made illegal in certain legislation of recent years. The yellow-dog contract requires the employee, as a condition of employment, to agree not to join a union while employed by that particular employer. It is a practice that the labor union charges is particularly vicious as it enables an employer to take unfair advantage of an employees' needs and thereby interferes with the employees' freedom of action.

Industrial Disputes.—Until the New Deal legislation beginning in 1933 there had been comparatively little effort on the part of the state or Federal governments to deal by law with the difficult problems of industrial relations and industrial disputes. At comparatively early dates, various states had provided for a system of state conciliation in cases of strikes and lockouts, and the Federal Government set up a special conciliation service in the United States Department of Labor when it was established in 1913. The conciliation work carried on under these laws accomplished much good, but the service offered was purely in a mediatory capacity, and no principles were established by law for the guidance of the parties concerned.

Following the example of Canada, Colorado enacted a law prohibiting strikes and lockouts until after investigation and report by the State Industrial Commission; and Kansas had a short-lived compulsory arbitration law. Otherwise important legislation in this field was limited to the railroads, which being public utilities were more amenable to public legislation than were private industries; and to special emergencies, such as the World War, when a National War Labor Board was set up with a set of principles for the adjustment of disputes and with great moral influence because of the existing war conditions.

As a result of the National Industrial Recovery Act of 1933 and related legislation, the need developed for a far more comprehensive system for the adjustment of labor disputes than had previously existed. The first major step in this direction was the creation in August 1933 of the National Labor Board. This Board, with a successor of similar name, functioned throughout the life of the NIRA and successfully handled thousands of cases arising under that Act, either directly or through a series of subordinate regional and special industry boards. As an outgrowth of this earlier experience, Congress passed in July 1935, the National Labor Relations Act "designed to diminish the causes of labor disputes burdening or obstructing interstate and foreign commerce." A quasijudicial board of three members was created for the express purpose of settling labor disputes and guaranteeing the right of collective bargaining. In accomplishing the latter object the law declares certain activities of employers "unfair labor practices." Briefly these practices are: (1) to interfere with, restrain or coerce employees in organization or collective bargaining; (2) to dominate or interfere with the formation or administration of any labor organization; (3) to encourage or discourage membership in any labor organization by discrimination in the matter of hiring, or period, term or condition of employment; (4) to discharge or discriminate against an employee because of the filing of charges against an employer; and (5) to refuse to bargain collectively with representatives of the employees.

Like Section 7 (*a*) of the National Industrial Recovery Act of June 16, 1933, the new National Labor Relations Act declares a similar purpose and object in enacting the statute: "Employees shall have the right to self-organization, to form, join, or assist labor organizations, to bargain collectively, through representatives of their own choosing, and to engage in concerted activities, for the purpose of collective bargaining or other mutual aid or protection."

The National Labor Relations Act, as thus briefly described, was directed toward a particular object—the establishment of conditions under which the principle of collective bargaining could be carried on under fair conditions. It was thus not a general act for the adjustment of all labor disputes; but as so many of the labor disputes of recent years have been due to controversy over the right of collective bargaining, the Act was of very great importance, and the board, in its short period of existence, has handled an extremely large number of important cases.

The National Labor Relations Act, in order to anticipate possible constitutional objects, was made to apply only to labor relationships of employees engaged in work of an interstate character; however, the extension of the basic principles of this Act to intrastate commerce was later accomplished in several states by the enactment of special state acts. The Federal Act was upheld by the United States Supreme Court in April 1937.

Public Employment Offices.—Public employment agencies, sometimes designated free public employment offices, are agencies supported by a public body—state, county, city, town or village. Such agencies are primarily established for the purpose of furnishing employment to workers and labor to employers.

The first free public employment office in the United States was a municipal agency established in 1890 at Cleveland, Ohio. Later the idea became a definite movement that was taken up by various states, through their legislative bodies. The movement spread until at the present time the majority of the states have provided for the establishment of public employment offices. The growth of these institutions in the United States may be attributed in part to the alleged abuses that have grown up around private agencies. At the same time social utility and economic developments, as well as the belief that obtaining employment for the unemployed is a proper exercise of public authority, have played a powerful and important part in the establishment of public employment agencies.

As established, however, not all these agencies were functioning units. Although enabling acts were adopted, some of the states made no appropriations for the maintenance of an up-to-date, efficient organization, and as a result the work of seeking to bring about contacts between the jobless man and the manless job was seriously handicapped. With the adoption of Federal-State co-operation relations in the maintenance and operation of state employment offices under the Federal Act of 1933, public employment agencies in the United States entered a new state of development.

The Federal Government first entered the field of public employment service in 1907. By an Act of the Congress of that year a division of information in the Bureau of Immigration and Naturalization (Department of Commerce and Labor) was established. The Act provided: "It shall be the duty of said division to promote a beneficial distribution of aliens admitted into the United States among the several States and Territories desiring immigration." A Federal Labor Service was organized in 1915 and was engaged mostly in the distribution of farm labor. The service was expanded during the World War, but its activities were reduced during the years immediately following. Except for the farm-labor division, the principal function of the service consisted of co-operation with the state and municipal employment agencies.

In 1931 a bill creating a co-operative national employment system was passed by both the House and the Senate only to meet a presidential veto. Later in the same session, however, the Department of Labor was granted an appropriation of $500,000 for its Employment Service. As a result of the appropriation thus obtained an enlarged Federal Employment Service was established at once with offices in every state of the Union. This system continued until it was superseded by a more comprehensive Federal Act in 1933. This Act established a national employment system in co-operation with the various states, including the territories of Hawaii and Alaska. An appropriation of $1,500,000 was provided for the fiscal year ending June 30, 1934, and $4,000,000 for each fiscal year thereafter, up to and including the fiscal year ending June 30, 1938. Thereafter the amount of the appropriation is to be determined by the Congress as may be deemed necessary.

In order to obtain the benefits of any appropriations, a state must accept the provisions of the national Act and designate a state agency with necessary powers to co-operate with the United States Employment Service. Seventy-five per cent of the amounts appropriated are to be apportioned by the director among the several states in the proportion that their populations bear to the total population of the United States. No payment shall be made to any state until an equal amount has been appropriated and made available for that year by the state.

The law provides for the appointment of a Federal Advisory Council. This board is to be composed of rep-

COMPULSORY EDUCATION AND CHILD-LABOR LAWS

(Statutory provisions relating to compulsory attendance and child labor, prepared by the United States Bureau of Education.)

Compulsory Education				Child Labor
State	Age	Annual Period	Penalty on Parents for Neglect	Age under which Specified Employments Are Forbidden
Alabama	7–16	Full term	Amount not stated; collection enforced by imprisonment	14 years, in any gainful occupation
Arizona	8–16	Full term	$5 to $50 or imprisonment 1 to 25 days or both	14 years, in factories, stores, etc.; any business during school hours
Arkansas	7–16	Full term	$10 maximum	14 years, in any remunerative occupation
California	8–16	Full term	First, $10 to $50 or 5 days' imprisonment or both; subsequent, $10 to $50 or 5 to 25 days or both	15 years, in any place of employment
Colorado	8–16	Full term	$5 to $25 or imprisonment, 10 to 30 days	14 years, in any gainful occupation
Connecticut	7–16	Full term	Not exceeding $5	16 years, in any mechanical, mercantile or manufacturing establishment
Delaware	7–17	Full term	First, $5 to $25; subsequent, $25 to $50. On default, imprisonment not over 2 days, first; subsequent, not over 5 days	14 years, in any establishment or occupation
District of Columbia	7–16	Full term	$10 or 5 days in jail or both	14 years, in any gainful occupation
Florida	7–16	"Substantially" full term	Not over $5 or imprisonment not over 5 days	14 years, in factories; 12 in stores
Georgia	8–14	Six months	$10 first offense; $20 subsequent offenses	14 years, in or about any manufacturing establishment
Idaho	8–18	Full term	As fixed by court	14 years, in factories, mercantile establishments, etc.
Illinois	7–16	Full term	$5 to $20	14 years, in any gainful occupation
Indiana	7–16	Full term	$10 to $200 or imprisonment not exceeding 60 days or both	14 years, in any gainful occupation
Iowa	7–16	24 consecutive weeks; board may require full term when school is in session	$5 to $20	14 years, in any factory, mill, shop, laundry, etc., or in stores where more than 8 persons are employed
Kansas	7–16	Full term	$5 to $25	14 years, in any factory, workshop or packing house
Kentucky	7–16	Full term	$5 to $15 for each offense	14 years, in any factory, store, office, hotel or as messenger, etc.
Louisiana	7–14	140 days or full session	Not over $10 or 10 days in prison or both	14 years, in any manufacturing or mercantile establishment or any other occupation
Maine	7–17	Full term	Not exceeding $25 or imprisonment not exceeding 30 days for each offense	15 years, in any service for hire during school hours
Maryland	7–16	Full term	Not exceeding $5	14 years, in stores, factories, canning establishments, etc.
Massachusetts	7–16	Full term	Not exceeding $20	14 years, in any employment
Michigan	7–16	Full term	Fine of $5 or $50 or imprisonment 2 to 90 days or both	15 years, in any manufacturing or mercantile establishment, workshop, laundry, store, office, hotel, messenger service, etc.
Minnesota	8–16	Full term	Not over $50 or imprisonment not over 30 days for each offense	14 years, in factories, mills, workshops or mines or any business
Mississippi	7–17	80 days	$1 to $10; second offense, $5 to $25; subsequent, $25 or 10 days in jail or both	14 years, in any mill, workshop, manufacturing establishment or cannery, except fruit and vegetable canneries
Missouri	7–16	Full term	$10 to $25 or imprisonment 2 to 10 days or both	14 years, in any gainful occupation
Montana	8–16	Full term	$5 to $20, 10 to 30 days' imprisonment	16 years, in mines, underground works and factories, etc., where machinery is used; 14, in most nonfactory occupations
Nebraska	7–16	Full term	$5 to $100 or not over 3 months in jail	14 years, in any manufacturing or mercantile establishment, office, hotel, etc.
Nevada	7–18	Full term	First, not over $10 or imprisonment not over 5 days; subsequent, $10 to $50 or imprisonment 5 to 25 days or both	14 years, in any business or service during school hours
New Hampshire	8–16	Full term	First, $10; subsequent, $20	14 years, in any manufacturing establishment, store, etc.
New Jersey	7–16	Full term	First, not over $5; subsequent, not over $25	14 years, in factories, stores, workshops, mills or manufacturing establishments
New Mexico	6–17	Full term	$5 to $100 or imprisonment 5 to 90 days	14 years, in any gainful occupation
New York	7–16	Full term	First, not over $10 or imprisonment 10 days; subsequent, not over $50 or imprisonment 30 days or both	16 years, in factories, stores or other business establishments
N. Carolina	7–14	Full term	$5 to $25 or 30 days in jail	16 years, in any store, factory or manufacturing establishment
N. Dakota	7–17	Full term	First, $5 to $20; subsequent, $10 to $50 and costs	14 years, in factories, workshops, mercantile establishments, etc.
Ohio	6–18	Full term; in no case less than 32 weeks	$5 to $20; on default, imprisonment 10 to 30 days	16 years, in any factory, workshop or other employment
Oklahoma	7–18	Full term	As for misdemeanor	14 years, in factory, workshop, etc.
Oregon	7–16	Full term	$5 to $25 fine or imprisonment 2 to 10 days or both	14 years, in any factory, store, workshop
Pennsylvania	8–17 (until June '39) 8–18 (after Sept. '39)	Full term	First, not more than $2; subsequent, not more than $5 and costs; on default, imprisonment not over 5 days	16 years, in any establishment or occupation
Rhode Island	7–16	Full term	Not fixed	16 years, in any factory, manufacturing or business establishment
S. Carolina	7–16	Full term	Not over $25 or 10 days in jail	16 years, in any factory, mine or textile establishment
S. Dakota	8–17	Full term	$10 to $50; subsequent, $25 to $100 or 10 to 30 days in jail or both	14 years, in mines, factories, stores, etc.
Tennessee	7–16	Full term	First offense, $2 to $10; second, $5 to $20	14 years, in workshops, factories, etc.
Texas	7–16	120 days	$5; $10 for second; $25 subsequent	15 years, in mills, factories, etc.
Utah	8–18	30 weeks	As for misdemeanor	16 years, in any gainful occupation
Vermont	8–16	Full term	$5 to $25	14 years, in any mill, factory or cannery, etc.
Virginia	7–15	Full term	Misdemeanor	14 years, in any gainful occupation
Washington	8–16	Full term	Not over $25	14 years, in factories, stores, etc.
W. Virginia	7–16	Full term	$3 to $20 or 5 to 20 days in jail	14 years, in any gainful occupation
Wisconsin	7–16	Full term	$5 to $50 or imprisonment not over 3 months or both	16 years, in any occupation
Wyoming	7–17	Full term	$5 to $25; not over 90 days in jail for subsequent offenses	No child whose attendance at school is required by law may be employed at any service during the time the public schools are in session

resentatives of employers and employees and the public for the purpose of formulating policies and the determining of problems relating to employment. The Federal director is required to form state advisory councils, similarly organized. Before any applicant is referred to a place for employment, notice of any strikes or lockouts must be given.

All states desiring to receive benefits under the Act must submit detailed plans to the director and must also make such reports concerning any operations and expenditures of money as the director may require. All the states have now accepted the Act, thereby making possible a well-integrated Federal-State system of public-employment offices.

The Labor Contract.—The labor contract is a contract between an employer and an employee. Under the common law, certain implications were taken for granted; for instance, that the employer should furnish a safe working place and that the employee would perform his work in a competent manner. Actually, however, the labor contract plays an unimportant part in modern industrial life. This is because, with the increasing complexity in our industrial organization, the position of the employee in the making of a contract became so weakened that statutes were enacted regulating in various ways the conditions of employment. Such statutes became more and more numerous as time went on, and have now reached the point where the most important matters in the employment contract are controlled by definite legal regulations; for instance, most states now provide that wages shall be paid at fixed intervals and must be paid in cash or negotiable instruments. This latter provision is aimed at the practice of certain irresponsible employers' paying wages in scrip or tokens not readily redeemable. Other laws of similar character prohibit or restrict the "company store." In certain remote industrial communities it was, and sometimes still is, necessary for the operating company in charge to establish a general store for the use of the employees. On the other hand, this system easily leads to serious abuses, such as those of wages being paid in store orders, or in fixing such high prices for the goods sold at the store that the employees suffer a virtual cut in their wages.

It is also to be noted that, in addition to statutory regulation of the labor contract, collective bargaining between employers and employees, where it exists, results in a group-labor contract, in which the conditions of wages, hours and employment generally may be, and often are, set out in great detail and with great precision.

Labor Departments.—The first state agency established for the purpose of enforcing labor legislation and in general looking after the welfare of the workers was the Bureau of Statistics of Labor of Massachusetts, created by a law of 1869. Other states followed this example, until at present practically all the states have agencies of this character, under varying titles, such as department of labor, bureau of labor statistics and the industrial commission. These agencies are usually vested with the duties of factory inspection and the administration of other labor laws.

In 1888 the Congress, chiefly as a result of the activities of the Knights of Labor, established the Federal Department of Labor, primarily for the purpose of collecting and disseminating statistical information of value to labor. This Federal bureau, with certain changes in its name, was merged in 1913 with a Federal department of labor which was then created with the full status of a government department and with its head a member of the President's Cabinet. The Federal Department of Labor is divided into several bureaus or divisions the names of which are indicative of their fields of activities—Bureau of Labor Statistics, Women's Bureau, Children's Bureau, Immigration and Naturalization Service, Conciliation Service, Division of Labor Standards and Division of Public Contracts.

International Labor Organization.—One of the most significant developments in the field of labor legislation was the establishment of the International Labor Organization at the close of the World War. This organization was created for the purpose of securing improved and uniform labor standards for the workers of various countries. The animating reasons as then set forth were: First, that injustice and hardship to large numbers of workers are potent causes of unrest and are thus perils to world peace; and, second, that the failure of any nation to adopt humane conditions of labor is an obstacle in the way of other nations that desire to improve their own conditions.

The general conference of the International Labor Organization, which for a number of years has met annually, is composed of delegates designated by each of the member states. Each state is entitled to four delegates, one representing employers, one the workers, and two the government concerned. Representation is thus essentially tripartite, and this tripartite character carries through all the work of the conference, its committees and also the governing body.

The function of the conference is to formulate proposals regarding labor standards. The proposals are referred to as draft conventions. It requires a two-thirds majority of the conference to adopt a draft convention. If such adoption takes place, the proposal is submitted to the competent authorities of the member states for their attention. If a state approves a draft convention it is, of course, bound by its terms. If it disapproves, no obligation at all rests upon it. In other words, the conference acts as a meeting ground for discussing and drafting proposals. The only obligation resting on the participating governments is that of formally transmitting any proposals on which the conference can agree by a two-thirds vote to the competent national authorities for their approval or disapproval. The conference has, however, an additional significance in that, representing as it does the various economic groups in a very large number of countries, any agreement arrived at by substantial majorities may be assumed to reflect in some degree the current of world opinion and may also have an influence upon such opinion and thus ultimately upon state action.

Since its establishment in 1919 the International Labor Organization has drafted many conventions dealing with such labor matters as minimum wages, hours of work and social insurance, and a large number of countries have approved these conventions. The United States did not affiliate with the International Labor Organization until 1934, and the time since has been too short to appraise the effects of the Organization's activities on conditions that existed in this country.

LEGAL HOLIDAYS

In the United States.

January 1. *New Year's Day:* In all the states (including the District of Columbia).

January 8. *Anniversary of the Battle of New Orleans:* In Louisiana.

January 19. *Lee's Birthday:* In Alabama, Arkansas, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia.

January 20. *Inauguration Day* (every four years): In District of Columbia only.

February or early in March. *Mardi Gras:* In Alabama, Florida (in counties where there are carnival associations), Louisiana (in five parishes).

February 12. *Lincoln's Birthday:* In California, Colorado, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New York, New Mexico, North Dakota, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Washington, West Virginia, Wyoming.

Georgia Day: In Georgia.

February 14. *Admission Day:* In Arizona.

February 22. *Washington's Birthday:* In all the states (including the District of Columbia).

March 2. *Anniversary of Texan Independence:* In Texas.

March 4. *Pennsylvania Day:* In Pennsylvania.

March 25. *Maryland Day:* In Maryland.

Good Friday: In Connecticut, Delaware, Florida, Louisiana, Maryland, Minnesota, New Jersey, Pennsylvania, Tennessee.

April 12. *Halifax Independence Day:* In North Carolina.

April 13. *Thomas Jefferson's Birthday:* In Alabama.

April 19. *Patriots' Day:* In Maine and Massachusetts.

April 21. *Anniversary of the Battle of San Jacinto:* In Texas.

April 22. *Arbor Day:* In Nebraska.

April 26. *Confederate Memorial Day:* In Alabama, Florida, Georgia and Mississippi.

May 10. *Confederate Memorial Day:* In North Carolina and South Carolina.

May 20. *Anniversary of the signing*

of the Mecklenburg Declaration of Independence: In North Carolina.

May (last Friday). *Pioneer Day:* In Montana, observed in public schools.

May 30. *Decoration Day* or *Memorial Day:* In all the states and territories (and District of Columbia) except Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina and South Carolina.

June 3. *Confederate Day:* In Tennessee.

June 3. *Jefferson Davis's Birthday:* In Alabama, Arkansas, Florida, Georgia, Mississippi, South Carolina, Texas and Virginia. In Louisiana, known as *Confederate Memorial Day.*

June 15. *Pioneer Day:* In Idaho.

June 17. *Bunker Hill Day:* In Massachusetts.

June 20. *West Virginia Day:* In West Virginia.

July 4. *Independence Day:* In all the states, District of Columbia and territories.

July 13. *Forrest's Birthday:* In Tennessee.

July 24. *Pioneer Day:* In Utah.

August 1. *Admission Day:* In Colorado.

August 16. *Bennington Battle Day:* In Vermont.

September (first Monday). *Labor Day:* In all the states (and District of Columbia).

September 9. *Admission Day:* In California.

September 12. *"Old Defenders' Day":* In Maryland.

September, first Saturday after the full moon. *Indian Day:* In Oklahoma.

October (second Tuesday). *Fraternal Day:* In Alabama.

October (second Friday). *Farmers' Day:* In Florida.

October 12. *Columbus Day:* Every state except Alabama, District of Columbia, Georgia, Iowa, Minnesota, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, South Dakota, Tennessee, Wisconsin, Wyoming.

October 31. *Admission Day:* In Nevada.

November 1. *All Saints' Day:* In Louisiana.

November 11. *Armistice Day:* On May 14, 1938, President Franklin D. Roosevelt signed a bill that made November 11 a national legal holiday.

This date had already been set aside as a legal holiday in 44 states, and in three states the governors were empowered to proclaim it a holiday. Before 1938 North Carolina alone had failed to make provision for the celebration of November 11 as the anniversary of the Armistice that ended the World War.

November. *Thanksgiving Day* (last Thursday in November): Is observed in all the states and in the District of Columbia, though in a few states it is not a statutory holiday and in a number is made dependent on proclamation by the governor.

December 7. *Delaware Day:* In Delaware.

December 25. *Christmas Day:* In all the states, District of Columbia and territories.

December 28. *Wilson's Birthday:* In South Carolina.

Sundays and fast days appointed by the governor are designated as legal holidays in many states. In South Carolina, Thursday of Fair Week is a legal holiday.

Arbor Day is not a legal holiday (except in Nebraska), but many states provide for its celebration in schools and otherwise.

General election day is in most states a holiday and in some states local election days are holidays in that locality.

PARLIAMENTARY LAW

Those rules, precedents and usages that are generally accepted for deliberative assemblies or organizations are called *parliamentary law.* Most of these rules had their origin in the English Parliament, although some have been changed to adapt them to the needs of other legislative bodies. The rules and usages of Congress have great weight as correct parliamentary law in the United States generally, but the legislature of each state has a code of its own containing the general rules, and special ones not commonly accepted but needed because of local conditions.

Besides the common parliamentary law recognized by deliberative bodies in general, any society or organization may make rules for its own government. When there are no special rules to the contrary, the body is controlled by the principles of common parliamentary practice, and these principles govern if there are no rules enacted by the body itself.

Uses.—Parliamentary law is needed in deliberative bodies in order that there may be a mutual understanding what may be done, that the rights of the body and of its individual members may be protected, and that business may be transacted speedily and in orderly fashion.

A gathering does not become a deliberative body until it is duly organized. This implies officers and members. There must be an officer to preside over the deliberations and a clerk or secretary to keep a record of the transactions.

Parliamentary practice presumes that ordinarily matters for discussion and decision emanate from some member or members of the meeting and that the discussing and deciding is done by the membership.

ORGANIZATION

Temporary.—At the time appointed for the meeting some one steps forward requests the meeting to come to order and, having secured attention, makes a motion that a certain person whom he names act as chairman; or he asks the assembly to nominate a chairman. And he puts motions or nominations to vote, until someone is elected to preside. The chairman then takes his place, and the organization is completed by the nomination and election of a secretary and any other necessary officers.

A Convention of Delegates. In the case of a convention of delegates (of a political party, for instance) a temporary organization is first made by electing a chairman and secretary *pro tem.* Then a committee on credentials is chosen to ascertain who are duly authorized to take part in the deliberations and the voting. This committee next reports the names of those who are found to have proper credentials and the doubtful or contested cases, on which it makes recommendations. No one without proper credentials is allowed to vote on the report of the committee or on any question until he is duly accepted as a delegate. The organization of the convention is completed by nominating and electing permanent officers.

It is then customary for some member to state briefly the object of the meeting, and business may be introduced at once. A committee is sometimes appointed to prepare resolutions while addresses are given to fill up the time. The committee reports as soon as possible or it may bring in its resolutions after a recess or at a subsequent meeting.

Permanent.—After a temporary organization is effected, the chairman calls upon some person who is taking a leading part in getting up the society to state the object of the proposed organization. A motion or resolution favoring the organization is next in order. If this motion is carried, a committee is appointed to draft a constitution or by-laws or both.

The constitution should contain five articles at least:

(1) name and object of the society,
(2) qualifications of members,
(3) officers, their election and duties,
(4) meetings of the society and
(5) how to amend the constitution.

At the second meeting the constitution is adopted, and after all have signed the constitution who wish to become members, by-laws may be adopted, and a committee is appointed to nominate permanent officers, to be elected then or at an adjourned meeting. Each permanent officer as he is elected, takes the place of the temporary one, and when all are elected, the organization is completed.

Nominations and Elections.—Generally the best way of making nominations is to place the matter in the hands of a committee created for the purpose, who, after due consideration, make the nominations and tender their report to the assembly. Then a motion is made and seconded to adopt the report of the committee. The names of the nominees are again read with a pause after each, to give opportunity for other nominations. Any member who is not satisfied with a nomination may move to substitute another name, and if this motion receives a second and is carried, the substituted name takes the place of the regular nominee.

A vote by acclamation may be taken upon each name before passing to the next. The more common way is to vote upon the names as a whole, after the entire list has been considered.

Sometimes the chairman is authorized by the assembly to make the nominations, and then the names are treated the same as if brought in by a committee.

Another way of nominating is as follows: Some member obtains the floor and says, "I nominate Mr. A" In the same way another member nominates Mr. B, and another Mr. C, and so on. When a number of candidates have thus been nominated, some member moves that the nominations close, and if this motion is seconded and carried, the chairman then takes the vote upon the names in the order in which the the nominations were made until one is elected. If there is more than one office to be filled, the same process must be gone through with for each office.

If the election is to be by ballot, and the names are on the ballots, each voter may cast his ballot as it is or may cross off names and write others in their places. If blank slips are used, each voter writes on his slip the names of the nominees or substitutes other names according to his choice. A majority of all the votes cast is necessary to a choice. If the office or offices are not filled at the first ballot, the voting must continue until the necessary officers are elected.

CONDUCT OF BUSINESS

Officers and Their Duties.—The presiding officer is generally known by the title of Chairman, President or Moderator. He should always be addressed by his title. In referring to himself he should use the third person: "It is the opinion of the chair."

It is his duty to call the meeting to order at the proper time, to announce in its order each item of business, to state all proper questions, to put them to vote, to declare the result of the vote, to see that the rules of debate are not violated, to preserve order, to state points of order or course of proceeding (by request or when he finds it necessary to do so), to receive all messages and other communications and announce them to the assembly and to act for the assembly in signing all papers.

He may sit while he is stating a question, but he should rise to put a question to vote or to speak to a question of order.

Vice-President. The vice-president acts in place of the president in his absence.

Clerk or Secretary. The recording officer, whether called clerk or secretary, keeps a correct record of the proceedings (the *minutes*) and reads them at the next meeting. In the absence of the chairman (if there is no vice-president present) it is his duty to call the meeting to order; to occupy the chair while the assembly proceeds to elect a chairman *pro tem.*; to read papers to be acted upon when he is requested to do so; to call the roll of the assembly when that is necessary; to hand to the chairman of every committee appointed a list of the persons on the committee and a statement of the matter committed to them; to make out in order and hand to the chairman before each meeting the items of business for the meeting; to have at each meeting a list of all committees; to have the custody of all papers and documents; to sign his name to the minutes; and to authenticate by his signature (alone or in connection with that of the chairman) all the acts, orders and proceedings of the assembly. In some assemblies the secretary is appointed to act as treasurer also.

Treasurer. The treasurer has charge of the funds of the society and pays them out by order of the assembly, preferably on vouchers or orders signed by the secretary. His annual report should give the amount in the treasury at the beginning of the year, the amount received, the amount paid out and the balance on hand. This report should be examined by an auditor or by an auditing committee and compared with the itemized accounts kept by the treasurer and the receipts he has received for payments made. If it is found correct, it should be approved by a vote of the society.

Committees.—A committee for deliberation or investigation should be large and should represent all classes and localities. A committee for action should be small and should consist only of those who are in favor of the proposed action.

A committee may be nominated and elected, or the chairman may be authorized (by the constitution or by-laws or by a vote of the assembly) to appoint a committee or committees. The constitution or by-laws may also prescribe the number of members of which each committee shall be composed, or the number may be included in the motion if the appointment is ordered by the assembly.

In the event that different numbers are proposed, the number is decided by vote. The vote is taken first on the highest number proposed, and then upon the next and so on until a vote is carried.

A special or select committee is a committee appointed for a particular occasion.

A *standing* committee is one appointed beforehand, for all matters that may arise of the same nature.

The person first named on a committee is the *chairman;* he calls the members together and presides until the committee elects another chairman. In the absence of the first member the next in order who is present acts as chairman. The committee chooses a secretary, who is usually one of its own members but may be a nonmember. It conducts its proceedings in the same manner as business is conducted in the assembly.

A committee must be assembled to do business, and a quorum must be present.

A paper referred to a committee must not be altered or rejected by them. The committee may present amendments written on another sheet; they may recommend a substitution; or they may make any recommendation they see fit. The report of the committee is signed by all the members or by the chairman alone, and he makes the report to the assembly unless another has been chosen to tender it. Only that which has been agreed to by the majority can be incorporated in the report, but the minority may also tender a report if they choose. The minority report may be substituted for the report of the committee by a vote of the assembly. When the committee has tendered its report in full and the report has been accepted, the committee is thereby discharged, but it may be revived by having the whole report or some part referred back to it.

Sometimes the motion to adopt the report includes a recommendation "that the committee be discharged," but the recommendation is superfluous if the report is intended to be final.

Committees may *adjourn* from time to time until their work is completed. Then the motion is to *rise,* which means the same as to adjourn and is subject to the same rules.

Committee of the Whole. The object of resolving the assembly into the committee of the whole is to permit less formality in the consideration of a subject than under ordinary circumstances. The motion is, "That the assembly do now resolve itself into a committee of the whole, to consider," and so forth, specifying the subject. If this motion is carried, the presiding officer at once calls another member to the chair and takes his place as a member of the committee. The only motions in order are "to amend," "to adopt" and "to rise and report." Before going into the committee of the whole, the assembly may pass an order limiting debate, and this order cannot be changed in the committee.

When the chairman resumes his seat, the member who presided in the committee rises and informs the chairman that he is ready to report. The report may then be received, or the time may be fixed when it shall be received.

The clerk keeps the minutes of the proceedings of the committee if there is not an assistant clerk to keep them, but the only record he makes in the minutes of the assembly is the report as received from the committee. If at any time the committee becomes disorderly, the presiding officer may resume the chair and declare the committee dissolved.

The quorum of the committee of the whole is the same as that of the assembly.

Informal Action. Instead of going into a committee of the whole, the assembly may consider a question informally with the same freedom and the same restrictions as in the committee of the whole. In this case the chairman retains his seat and there is no motion to rise and report. The chairman brings the subject that has thus been considered before the assembly, and it is treated as if it were reported by a committee.

Any motion except "to amend" or "to adopt" puts an end to the informal action. A temporary memorandum is kept the same as in the committee of the whole, and the clerk enters only the chairman's report in the minutes.

Quorum.—A quorum of an assembly, a committee or a board is such a number as is competent to transact business; and unless the number is prescribed by the constitution or by-laws or by an order of the assembly, it consists of a majority of the members. The number may be fixed at much less than a majority. When a quorum is not present, the only action that can be taken is to adjourn.

Order of Business.—In the absence of special rules upon the subject, the regular order of business is as follows:

(1) Reading the minutes of the previous meeting.

(2) Reports of standing committees (boards of managers, trustees and so forth come under this head).

(3) Reports of special or select committees.

(4) Unfinished business.

(5) New business.

To take business up out of its order requires a suspension of the rules. A better way is to lay on the table business as it comes up, and thus reach a question that it is desirable to consider first.

Introduction of Business. New business must be introduced when there is no question before the assembly. It may be brought in in the form of a resolution or recommendation or in the form of a simple motion. The member rises, addresses the chairman by his title and, after being recognized by a bow or having his name announced, reads his resolution or recommendation and moves its adoption; or he makes a simple motion as suggested above. In either case another member seconds the motion.

Amendments and all other questions are introduced in the same way as new business. The table of motions shows when each motion is in order, and how the question may be treated.

The mover of a motion may modify it or withdraw it altogether before it is stated by the chair; but after it is stated he can do neither without the consent of the assembly. If a mover modifies his motion, the one who seconded it may withdraw his support or accept the modification.

Mere routine business may be transacted without the formality of a motion if no one objects.

Resolutions and Motions.—The following are typical forms:

Resolved, That fifty dollars of the funds of this society be appropriated to defray the expenses of its delegates at the general convention.

We recommend, That a committee of three be appointed by the chair to draft resolutions, or to make recommendations, respecting the establishment of a branch office in San Francisco.

First Member: Mr. Chairman, I move that the resolutions be adopted.

Second Member: Mr. Chairman, I second the motion.

A resolution or recommendation may have a preamble or preambles worded about as follows:

Whereas, It is desirable to procure only the best of material for our new building; and,

Whereas, We deem it necessary to send a man to personally superintend its selection; therefore,

Resolved, That . . . or We recommend, That . . .

The Motion.—The basis of business—the point for discussion and decision—is called the *motion.*

A motion is a formally-worded proposition presented in a deliberative body for its consideration and for its decision by vote.

A member having something to which he desires the meeting to agree makes a motion to that effect.

Before making his motion he must obtain the floor. To do this in an organized meeting he rises and, addressing the chairman, says, "Mr. President" (or whatever the title may be) and then waits for recognition. The chairman, hearing and seeing the member who has risen, recognizes him by pronouncing his name, "Mr. ——" or "The gentleman (or member) from ——," mentioning the locality he represents.

No member has a right to make a motion, discuss a question or address a meeting until he has thus addressed and has thus been recognized by the chairman. Then he has the floor.

Having obtained the floor, the member says, "Mr. President" (or whatever the title may be), "I move . . ."

Now it is necessary for another member to indicate his desire to have the proposition considered. This is called *seconding the motion.* To do this the second member may rise and, after securing recognition from the chair, say: "Mr. President, I second the motion." This is the better form. However, it is considered proper in ordinary assemblies for the person who seconds the motion to remain seated if he desires, and say simply: "I second the motion."

Stating the Question.—The presiding officer then says, "It has been moved and seconded that . . ." He reads the resolution or hands it to the secretary to be read by him. After stating or reading the motion, the president says, "The question is on the adoption of the resolution or motion just read." Or he may say, "You have heard the motion. Have you any remarks to make?" or, "Remarks are in order" or some equivalent expression. This is *stating the question.*

After the chairman has stated the question, the subject is open to discussion.

In routine work the chairman may often put a question without waiting even for a formal motion. This can be done only with common or universal consent only in regard to minor matters. Then this method saves time and does no injustice.

After a motion has been made and seconded and the question has been stated by the chair, the members may enter upon its discussion.

If a motion is not seconded, the chair should not state it but should say: "The motion is lost for want of a second."

Debate.—To debate a question the member must secure the floor in the same manner he would secure it for the purpose of offering a motion. The ordinary rule is for the presiding officer to give the floor to the member whose voice he first hears. When two or more address the chair at about the same time, the chair must decide who is entitled to the floor. In such a case the member upon whose motion the subject was brought before the body or who presents the report, if he has not already spoken to the question, has the prior claim and should be recognized even if another addressed the chair before him. A member who has not spoken has priority over those who have.

Points of Order.—It is the privilege of any member to call attention to a breach of order in debate by obtaining the floor and saying, "I rise to a point of order." The chairman then says, "Please state your point of order." When the point is stated, the chairman decides whether it is well taken or not, and his decision is subject to appeal. When a question of order is raised, the speaker should at once take his seat and await the decision. Then if the decision is in his favor he may proceed; but if the decision is against him, and anyone objects to his speaking further, he cannot continue without permission from the assembly.

Limiting Debate.—It is the custom of bodies to limit the time of a speech and the number of times a member may speak to the same question.

The common parliamentary law is not to allow a member to speak more than once to the same question until all who desire have spoken.

If a member offers to speak a second time, and no one signifies a desire to occupy the floor, and there is no objection, the chair may permit the member to proceed. Otherwise to obtain the privilege of speaking a second time the question must be put to vote for the decision of the meeting.

An order limiting or closing debate can be adopted so that at the time specified all discussion upon it shall cease. As a body can limit the time of a speaker, it can also extend his time. The meeting can also extend the time of the debate.

In the discussion the speakers must confine themselves to the question before the body and avoid personalities or other improprieties.

The maker of a motion may vote against his motion but cannot speak against it.

Putting the Question.—If no one rises to speak, or the chairman thinks the debate has ended, he asks, "Are you ready for the question?" If then no one rises to debate it, he proceeds to put the question to vote.

In putting the question, the ordinary form will be for the chair to say, "The question is on the adoption of the motion [or resolution] you have just heard read. As many as are in favor of its adoption will say *aye.*" When the *ayes* have voted, he will then say, "As many as are of a contrary opinion will say *no*" or "All opposed will say *no.*" The chair, judging the comparative vote, will announce the result, stating that the motion is carried or lost. If he thinks the *ayes* are in the majority he says, "The *ayes* appear to have it." Then he pauses to see if anyone expresses doubt, and if no objection is raised, he says, "The *ayes* have it, and the motion is agreed to [is carried, or prevails]." If he think the *noes* are in the majority, he says, "The *noes* appear to have it," waits for an objection—and so forth.

Form of Voting.—The following are customary forms of voting:

viva voce (meaning by voice), ayes and noes;
show of hands, which are counted by the chairman or by tellers;
rising vote, the count of those standing being made by the chairman or by tellers;
voters pass between tellers, who count them;
yeas and nays;
by ballot.

Where a hand-vote is customary the chair may say, "Those in favor of the motion or resolution will hold up the right hand" and then "Those opposed will manifest it by the same sign." Excepting in a few cases a majority vote determines a question.

Discussion can be renewed even after the voting has begun, and up to the final voting of both sides.

Caution. Some chairmen make the mistake of saying: "All in favor of the motion say *aye.* Those opposed manifest it by the same sign." But the words "same sign" should be used only when the vote is being taken by a show of hands or other visible indication of the voter's preference.

When a motion is put to a vote the literal question before the house is: "Shall the motion be adopted?" The answer is either yes or no. When those in favor say "aye" (which is another form of the word *yes*), those opposed should say "no."

Division. When the chairman announces the result of a vote, any member may express a doubt as to the accuracy of the decision by rising and saying, "Mr. President, I call for a division of the house." If a member thus calls for a division, the presiding officer shall say, "A division is called for; those in favor of the motion will rise and stand until counted." After they are counted and the number is announced, he shall say, "Those opposed will rise," and they will be counted and the number announced.

The chair or the clerk (or both) may count. After the announcement of the result, a member may press the doubt further by calling for a count by tellers, and even after that has been taken there may be a demand for the *ayes* and *nays.*

Ayes and Nays. The object of calling the *ayes* and *nays* is usually to place the names of the members on record so that it will be known how each man voted. At other times it is used as dilatory motion, and is made for the purpose of consuming time. In Congress one-fifth of the members present can order the vote to be taken by *ayes* and *nays.* In some bodies it is ordered on the call of a single member. Societies should have a rule stating what small minority may order the *ayes* and *nays.* In any meeting a majority vote can order the ayes and nays. When the ayes and nays have been ordered, the presiding officer will put the question in a form similar to the following: "As many as are in favor of the adoption of the resolution will, when their names are called, answer *aye* [or *yes*]. Those opposed will answer *nay* [or *no*]. The secretary [or clerk] will call the roll."

The roll is then called, and each member, as his name is called, rises and answers *aye* or *nay,* and the answer is noted by the clerk. When the roll call is ended, the clerk reads the names of those who voted in the affirmative and then those who voted in the negative. Errors may then be corrected. The clerk gives the number voting on each side to the chair, who announces the result.

The Ballot. Sometimes a vote is by ballot. It is common and most equitable in the election of officers.

The chairman appoints at least two tellers, who distribute slips of paper upon which the members write their votes. The tellers collect and count the votes and report the result to the chairman, who announces it to the meeting. In counting ballots all blanks are ignored. To announce an election the chair will say: "The whole number of votes cast is——; the number necessary for a choice is ——; Mr. A received ——; Mr. B, ——; Mr. C, ——. Mr. A, having received the requisite number, is therefore elected."

Tie Vote. When there is a tie vote the motion fails. The chairman, if a member of the meeting or authorized by constitutional law, however, has the casting or deciding vote in such a case, and, if he gives it for the affirmative, the motion prevails. He may even vote with the minority when his vote will make a tie, and thus defeat a measure, and he may vote in any case where his vote would change the result. Thus where a two-thirds vote is necessary, and his vote given to the minority would prevent the adoption of the question, the presiding officer can so cast his vote.

Classes of Motions.—Motions are classified according to their nature and purpose:

(1) The *principal* motion or *main* question by which the subject is brought before the body.

(2) Those which bear upon the main question. These are called *subsidiary motions,* and are as follows:

(*a*) to postpone indefinitely,
(*b*) to amend,
(*c*) to refer (commit or recommit),
(*d*) to postpone to a certain day or time,
(*e*) the previous question,
(*f*) to lay on the table.

(3) *Incidental questions,* so called because they are occasioned in a casual way during the consideration of other questions. From their very nature they must be decided before the questions which give rise to them. They include:

(*a*) suspension of the rules,
(*b*) withdrawal of a motion,
(*c*) reading of papers,
(*d*) objection to the consideration of a question,
(*e*) questions of order (including appeals from the decision of the chair).

(4) *Privileged questions,* so called for their pressing importance and need of immediate attention; therefore they may interrupt other proceedings. They are:

(*a*) calls for the orders of the day,
(*b*) questions of privilege,
(*c*) the motion to adjourn,
(*d*) the motion to fix the time to which to adjourn.

Order of Precedence. The motions below numbered 1 to 9 take precedence over all others in the order given, and any one of them, except to amend or substitute, is in order while a motion of a lower rank is pending.

	(Letters refer to rules following)
Closing a meeting.	
1. To fix time to which to adjourn	B
2. To adjourn (in committees, to rise), or to take a recess, without limitation	A E F
Concerning orders, rules and so forth	
3. For the orders of the day	A E H N
To make subject a special order	M
To amend the rules	M
To suspend the rules	A E F M
To take up a question out of its proper order	A E
To take from the table	A E G
Questions touching priority of business	A
4. To lay upon the table	A E G
To bring up a question the second time.	
To reconsider debatable question	D E F I
To reconsider undebatable question	A E F I
Questions of privilege.	
Asking leave to continue speaking after indecorum	A
Appeal from chair's decision touching indecorum	A E H L
Appeal from chair's decision generally	E H L
Question upon reading of papers	A E
Withdrawal of a motion	A E
Suppressing or extending debate.	
5. For the previous question	A E M
To limit or close debate	A M
To extend limits of debate	A
Deferring action.	
6. To postpone to a fixed time	C
To refer to committee.	
7. To commit (or recommit)	D
Modifying or amending.	
8. To amend or to substitute, or to divide the question	K
Suppressing the question.	
Objection to consideration of question	A H M N
9. To postpone indefinitely	D E

Rule A. Undebatable, but remarks may be tacitly allowed.

Rule B. Undebatable if another question is before the assembly.

Rule C. Limited debate allowed on propriety of postponement only.

Rule D. Opens the main question to debate. Motions not so marked do not allow of reference to main question.

Rule E. Cannot be amended. Motion to adjourn can be amended when there is no other business before the house.

Rule F. Cannot be reconsidered.

Rule G. An affirmative vote cannot be reconsidered.

Rule H. In order when another has the floor.

Rule I. A motion to reconsider may be moved and entered when another has the floor, but the business then before the house may not be set aside. This motion can only be entertained when made by one who voted originally with the prevailing side. When called up it takes precedence of all others which may come up, excepting only motions relating to adjournment.

Rule K. A motion to amend an amendment cannot be amended.

Rule L. When an appeal from the chair's decision results in a tie vote, the chair is sustained.

Rule M. Requires a two-thirds vote unless special rules have been enacted.

Rule N. Does not require to be seconded.

General Rules.—No motion is open for discussion until it has been stated by the chair.

The maker of a motion cannot modify it or withdraw it after it has been stated by the chair, except by general consent.

Only one reconsideration of a question is permitted.

A motion to adjourn, to lay on the table or to take from the table cannot be renewed unless some other motion has been made in the interval.

On motion to strike out the words, “Shall the words stand as part of the motion?” unless a majority sustains the words, they are struck out.

On motion for previous question, the form to be observed is, “Shall the main question be now put?” This, if carried, ends debate.

On an appeal from the chair’s decision, “Shall the decision be sustained as the ruling of the house?” the chair is sustained if the vote is a tie.

On motion for orders of the day, “Will the house now proceed to the order of the day?” This, if carried, supersedes intervening motions.

When an objection is raised to considering questions, “Shall the question be considered?” objections may be made by any member before debate has commenced, but not subsequently.

HIGH SCHOOL LITERARY SOCIETY

Model for Organization.—The following is correct procedure in forming a literary society for a high school.

A group of students who are interested have met in a classroom. Mr. White, who has been active in bringing them together, takes his place on the platform, raps on the desk and says:

“The meeting will please come to order. Nominations for Temporary Chairman will be received.”

Mr. Smith (rising): “I nominate Mr. Jones.”

Miss Brown (either rising or seated): “I second the nomination.”

Mr. White: “It has been moved and seconded that Mr. Jones act as Chairman. All in favor will say *aye.*”

After considering the number voting *aye,* Mr. White says: “All opposed say *no.*”

If he is satisfied that a majority have voted *aye,* Mr. White says: “The motion is carried. Will Mr. Jones please take the chair?”

If he is satisfied that a majority have voted *no,* Mr. White says: “The motion is lost. Other nominations are in order.”

If more than one are nominated, Mr. White puts to a vote each name in the order nominated until one receives a majority.

Mr. Jones (or whoever is chosen) takes the chair and addresses the group:

“I thank you for the honor. I consider that it is greatly to our advantage to have a literary society in our high school and I trust we shall make it a source of credit to our school. Nominations for Secretary are in order.”

Miss Ames (rising): “Mr. Chairman.”

The Chairman: “Miss Ames.”

Miss Ames: “I nominate Miss West.”

Mr. Black (either rising or seated): “I second the nomination.”

The Chairman: “Are there any other nominations?” (After a pause) “As there are no further nominations, we shall proceed to vote. It has been moved and seconded that Miss West act as secretary of the meeting. All in favor say *aye.*” (After considering the number voting *aye*) “All opposed say *no.* The motion is carried. Will Miss West please take her place as secretary?”

Miss West does so and thereafter keeps a record of all motions made, seconded and carried, of officers elected, communications received and other business transacted.

The Chairman: “I shall ask Mr. Randall to state the object of this meeting.”

Mr. Randall (rising): “Mr. Chairman.”

The Chairman: “Mr. Randall.”

Mr. Randall: “It has been evident for some time that a literary society is needed in this high school. It will give us a chance to learn many things which we cannot get from our regular studies—training in parliamentary law, the art of speaking in public, practice in debating. To that end I move the adoption of the following resolution, which I ask the Secretary to read.”

He hands it to the Secretary, who reads it aloud:

> “Resolved, That a literary society be formed in this high school for the purpose of self-improvement of the members.”

Miss Arnold: “I second the resolution.”

(The person who seconds a motion or resolution need not rise nor address the chair. All others wishing to take part in the proceedings should first rise, address the presiding officer by his or her appropriate title and wait for recognition by the chair before speaking.)

The Chairman: “Are there any remarks?”

Several persons present speak for or against the resolution.

The Chairman: “Are you ready for the question?”

No one rises to speak, but several persons call out: “Question.”

The Chairman: “You have heard the resolution, which has been duly moved and seconded. All who are in favor of the adoption of the resolution will say *aye.* All opposed say *no.* The resolution is adopted.”

Miss Stewart (rising): “Mr. Chairman.”

The Chairman: “Miss Stewart.”

Miss Stewart: “I move that the Chairman appoint a committee of three to draft a constitution and by-laws, and to report at our next meeting.”

Mr. Cox: “I second the motion.”

The Chairman: “It has been regularly moved and seconded that the Chairman appoint a committee of three to draft a constitution and by-laws, and to report at our next meeting. Are there any remarks?” (Hearing none) “Are you ready for the question?” (Several say “Question”) “All who are in favor of the motion will say *aye.* Those opposed say *no.* The motion is carried. I shall appoint Mr. White, Miss Ames and Mr. Green as the committee.”

(Mr. White, being named first, is Chairman of the committee.)

Mr. Adams: “Mr. Chairman.”

The Chairman: “Mr. Adams.”

Mr. Adams: “I move we adjourn.”

Miss Moore: “I second the motion.”

This motion is not debatable, cannot be amended and takes precedence over all other business. It must be put to a vote at once unless a motion is made to adjourn to a fixed time or place.

Miss Turner: “Mr. Chairman.”

The Chairman: “Miss Turner.”

Miss Turner: “I move that we adjourn to meet again in this room two weeks from today at three o’clock in the afternoon.”

Mr. Pope: “I second the motion.”

This motion is debatable and may be amended.

Mr. Long: “Mr. Chairman.”

The Chairman: “Mr. Long.”

Mr. Long: “I move to amend the motion to read that we adjourn to meet one week from today at four o’clock in the afternoon.”

Miss Clarke: “I second the amendment.”

The Chairman: “The question is first on the amendment. Are there any remarks? All who are in favor of the amendment will say *aye.* Those opposed say *no.* The amendment is carried. The question is now on the motion as amended. Are there any remarks? All who are in favor of the motion as amended will say *aye.* Those opposed say *no.* The motion is carried, and the meeting now stands adjourned to meet again in this room one week from today at four o’clock in the afternoon.”

If the amendment is lost, the Chairman will announce: “The amendment is lost. The question is now on the original motion.” (Proceed in the regular order by asking for remarks and so forth.)

If the motion to adjourn is lost, it cannot be renewed until some business has been transacted.

One week later, at four o’clock in the afternoon, the second meeting is held, with the Temporary Chairman and Temporary Secretary still performing their respective duties as previously.

The Chairman: “The meeting will please come to order. The Secretary will read the minutes of the previous meeting.”

The Secretary does so.

The Chairman: “You have heard the minutes. Are there any corrections or additions? If not, they will stand approved as read.”

If corrections or additions are made, the announcement will be: “The minutes as corrected [or enlarged] will stand approved.”

The Chairman: “The next order of business will be the report of the committee on constitution and by-laws, of which Mr. White is Chairman.”

Mr. White: “Mr. Chairman.”

The Chairman: “Mr. White.”

Mr. White: “Your committee submits the following proposed constitution and by-laws.”

He hands the manuscript to the Secretary.

The Chairman: “What is your pleasure? Shall we read the constitution and by-laws and vote upon their adoption as a whole? Or shall we read and vote upon them article by article?”

Miss Wood: “Mr. Chairman.”

The Chairman: “Miss Wood.”

Miss Wood: “I move that we vote

upon the constitution and by-laws as a whole."

Mr. Dean: "I second the motion."

The Chairman: "It is moved and seconded that the meeting vote upon the constitution and by-laws as a whole. All who are in favor will say *aye.* Those opposed say *no.* The motion is carried. The Secretary will read the proposed constitution and by-laws."

The Secretary does so.

Mr. Young: "Mr. Chairman."

The Chairman: "Mr. Young."

Mr. Young: "I move the adoption of the constitution and by-laws as read."

Miss Faris: "I second the motion."

The Chairman: "It is regularly moved and seconded that the constitution and by-laws as read be adopted. Are there any remarks? Are you ready for the question? All who are in favor will say *aye.* Those opposed say *no.* The motion is carried, and the constitution and by-laws are adopted."

If the motion to adopt as a whole is lost, or if no such motion is made, the following should be the procedure:

Miss Gale: "Mr. Chairman."

The Chairman: "Miss Gale."

Miss Gale: "I move that the constitution and by-laws be considered and adopted article by article."

The motion is seconded and adopted.

The Chairman: "The Secretary will read the first article." (The Secretary does so.) "Are there any amendments or additions?"

If members desire to amend or add to the article, motions to that effect may be made and seconded, and the Chairman will put them to a vote until the article is satisfactory to a majority of those present; and so on with the succeeding articles.

If there are no amendments or additions, the Chairman, after a pause to ascertain the fact, will say: "All who are in favor of Article I as read will say *aye.* Those opposed say *no.* The *ayes* have it, and Article I as read is adopted." (And so on with the other articles.)

Another method, equally proper, is for the Chairman to say: "Are there any amendments or additions to this article? Are there any objections? Hearing none, I will ask the Secretary to read the next article."

In either case, after all the articles have been read and passed by or acted on, they should be adopted as a whole.

Mr. Hart: "Mr. Chairman."

The Chairman: "Mr. Hart."

Mr. Hart: "I move that the entire constitution and by-laws (as amended, if that has been done) be adopted as a whole."

Miss Knox: "I second the motion."

The Chairman: "It is regularly moved and seconded that the constitution and by-laws as amended be adopted as a whole. Are there any remarks? Are you ready for the question? All in favor will say *aye.* Those opposed will say *no.* The motion is carried and the constitution and by-laws are adopted as a whole."

The Chairman: "We will now take a recess for ten minutes, during which time all persons present who wish to become members of the new literary society will please sign the constitution and by-laws." (They do so.)

At the conclusion of the recess the Chairman raps for order again and says: "The next order of business will be the election of officers in accordance with the constitution. How will you have them selected? Shall we appoint a committee on nominations or shall we have nominations from the floor for each office?

Mr. Burton: "Mr. Chairman."

The Chairman: "Mr. Burton."

Mr. Burton: "I move that the Chairman appoint a committee on nominations consisting of three members, who shall retire and report back to this meeting as soon as they have made their selections."

The motion is seconded and carried. The Chairman appoints Mr. Burton, Chairman; Miss Knox and Mr. Hart. They retire.

The Chairman: "While we are waiting for the committee on nominations to report, I suggest that we have expressions of opinion from several present as to what our proposed literary society should do." Various suggestions are made. The committee returns to the room.

The Chairman: "Is the committee on nominations ready to report?"

Mr. Burton: "Mr. Chairman."

The Chairman: "Mr. Burton."

Mr. Burton: "The committee on nominations recommends the election of the following as permanent officers of this literary society":

Mr. Burton may read the report himself or hand it to the Secretary, who reads it.

"For President, Mr. Hill; for Vice-President, Miss Pierce; for Recording Secretary, Miss Abbott; for Corresponding Secretary, Miss Early; for Treasurer, Mr. Noble."

Mr. Kane: "Mr. Chairman."

The Chairman: "Mr. Kane."

Mr. Kane: "I move that the candidates named by the committee on nominations be declared elected."

Miss Page: "I second the motion."

The Chairman: "It is regularly moved and seconded that the candidates named by the committee on nominations be declared elected. Are there any other nominations? As there are no other nominations, are you ready for the question?"

Mr. Foster: "Mr. Chairman."

The Chairman: "Mr. Foster."

Mr. Foster: "I rise to a point of order."

The Chairman: "Please state your point of order."

Mr. Foster: "My point of order is that the constitution provides that all elections for officers shall be by ballot. Hence the motion now before the house proposes a method of election that would be illegal."

The Chairman: "The point of order is well taken. The motion that the candidates named by the committee on nominations be declared elected is out of order."

Mr. Hopkins: "Mr. Chairman."

The Chairman: "Mr. Hopkins."

Mr. Hopkins: "I move that the Secretary be instructed to cast one ballot in favor of the election of the candidates named by the committee on nominations."

Miss Cooper: "I second the motion."

The Chairman: "It is regularly moved and seconded that the Secretary be instructed to cast one ballot in favor of the election of the candidates named by the committee on nominations. Are you ready for the question? All who are in favor of the motion will say *aye.* Those opposed say *no.* The motion is carried, and the Secretary is so instructed."

The Secretary writes the names and offices on a ballot, and reports: "Mr. Chairman."

The Chairman: "Madam Secretary."

The Secretary: "The ballot has been cast in favor of the election of the following: For President, Mr. Hill; for Vice-President, Miss Pierce; for Recording Secretary, Miss Abbott; for Corresponding Secretary, Miss Early; for Treasurer, Mr. Noble."

(In practice, it is not necessary for the Secretary actually to write the names on a ballot, but it is sufficient if the Secretary states to the Chairman that the ballot has been so cast.)

The Chairman: "The ballot has been cast for the candidates named, and I declare them duly elected to their respective offices. Will Mr. Hill please come forward and take the chair, and will Miss Abbott please take her place as Recording Secretary of the meeting?" (They do so.)

If there are other nominations from the floor for any office, then the Secretary cannot be instructed to cast a ballot for that office. The Chairman takes up in turn each office for which additional nominations are made, beginning with the President, and says:

"Are there any other nominations for President? Hearing none, we will proceed to vote on the candidates in the order in which their names were proposed."

Or somebody may move that nominations be closed, which must be seconded and put to a vote. If carried, the Chairman proceeds:

The Chairman: "Mr. Hill, Miss Blake and Mr. Hood have been nominated for President. According to the by-laws, all elections for officers shall be by ballot. The Secretary will prepare ballots and distribute them to the persons present who are entitled to vote. All persons who have signed the constitution and by-laws are entitled to vote. Each member will write upon the ballot the name of the candidate for President preferred. Then fold the ballot and hand it to one of the tellers. The Chairman appoints Mr. Taylor and Miss Faris as tellers, who will collect the ballots and count them, and report the result of the vote."

If there are factions, the chair should appoint a teller from each faction, so far as possible.

The tellers collect and count the ballots. Mr. Taylor, having been named first, reports:

Mr. Taylor: "Mr. Chairman."

The Chairman: "Mr. Taylor."

Mr. Taylor: "The result of the vote is as follows:

Whole number of votes cast, 37; necessary to a choice, 18.
Mr. Hill received 19 votes; Miss Blake received 10 votes; Mr. Hood received 8 votes."

Or the tellers may hand the report to the Secretary, who reads it.

The Chairman repeats to the meeting the result of the vote, and adds: "Mr. Hill, having received a majority of all the votes cast, is duly elected President. Will Mr. Hill please take the chair."

If no one has received a majority, the Chairman says: "No one has received a majority of the votes cast. You will prepare your ballots again." And so on until one receives a majority.

The successful candidate for President takes the chair.

The same procedure is followed for the other candidates.

Instead of appointing a committee on nominations, all nominations may be made from the floor. When nominations are made from the floor, the procedure will be the same as it is when the committee on nominations makes its report.

The Chairman: "Nominations for President are in order."

Miss Page: "Mr. Chairman."

The Chairman: "Miss Page."

Miss Page: "I nominate Mr. Hill." (Nominations need not be seconded.)

Mr. Gray: "Mr. Chairman."

The Chairman: "Mr. Gray."

Mr. Gray: "I nominate Miss Blake."

Mr. Nolan: "Mr. Chairman."

The Chairman: "Mr. Nolan."

Mr. Nolan: "I nominate Mr. Hood."

The Chairman: (After a pause) "Are there any further nominations?" (No response.) "If there are no further nominations for President, I declare the nominations closed."

Or somebody may move that nominations be closed, and this motion is seconded and carried.

The Chairman: "You will prepare your ballots." (The votes are collected and counted by the tellers; they report the result to the Chairman, who announces it to the meeting, as already outlined.)

The same procedure is followed for all the officers.

If there is only one nomination, someone after being recognized by the Chairman may say: "I move that the Secretary cast one ballot for Mr. Hill for President."

If this motion is seconded and carried, the Secretary reports: "Mr. Chairman, the ballot has been cast in favor of Mr. Hill for President."

The Chairman: "The ballot has been cast for Mr. Hill, and I declare him duly elected President."

Model Constitution and By-Laws.—The constitution provides the framework, while the by-laws take care of the working details. The former is the carriage; the latter, the power. The line is not closely drawn, however, and often the whole may be merged and designated as either the one or the other.

The following is offered as a model that contains the main essentials:

CONSTITUTION

ARTICLE I

NAME. The name of this organization shall be the Adelphian Literary Society of the Springfield High School.

ARTICLE II

OBJECT. The object of the Society shall be the self-improvement of the members in public speaking, debating, essay writing, parliamentary law and kindred subjects.

ARTICLE III

MEMBERS. Members shall consist of two classes—active and honorary. Active members shall comprise students in good standing in their studies in the Springfield High School, who may sign the constitution and pay the required dues. Honorary members shall comprise teachers, alumni and guests, who shall not be required to pay dues.

ARTICLE IV

OFFICERS. The officers of the Adelphian Literary Society shall be a President, a Vice-President, a Recording Secretary, a Corresponding Secretary and a Treasurer, who shall be elected by ballot from the active members of the society at the last meeting in each semester of the school year. The officers shall assume office at the first regular meeting in each semester and shall serve for a term of one semester and until their successors shall be elected and take office. A vacancy in any office may be filled at any regular meeting for the balance of the term. The officers shall have the customary powers of such offices in parliamentary bodies.

ARTICLE V

COMMITTEES. There shall be the following standing committees, of three members each, to be appointed by the President:

Membership, Program and Entertainment.

The Membership Committee shall endeavor to secure desirable Members for the Society. All applications for membership shall first be passed on by the membership committee, who shall recommend to the Society such names as the committee approves.

The Program Committee shall arrange for the programs of each meeting.

The Entertainment Committee shall provide for special entertainment features not included in the regular programs.

Other committees, either standing or special, may be appointed as seems necessary. Unless otherwise provided for in the resolutions creating them, all special committees shall be appointed by the President.

ARTICLE VI

MEETINGS. Regular meetings shall be held at four o'clock in the afternoon of Wednesday of each week while school is in session. Where the regular meeting day falls on a holiday, the meeting shall be held on the day previous. Special meetings may be called by the President or by any five members, by posting notice thereof on the regular bulletin board of the High School, at least two days before the meeting is to be held. Such notice shall state clearly the time and place of the meeting.

ARTICLE VII

AMENDMENTS. Amendments to the constitution may be presented at any regular meeting, but shall not be voted on until the next regular meeting. A majority vote of all active members present at the meeting shall be necessary for adoption.

BY-LAWS

ARTICLE I

QUORUM. A majority of all the active members shall constitute a quorum. (If the membership is large, a smaller number than a majority may be declared a quorum.)

ARTICLE II

RIGHTS AND DUTIES OF MEMBERS. Active members may serve on committees and hold office. Honorary members shall have the right to be present at all meetings and may take part in the discussion of any question but shall not have the right to vote. They may serve on committees but shall not hold office.

New members shall be admitted in the following manner:

At each regular meeting the name of an applicant may be proposed by an active member. All names proposed shall be referred to the membership committee who shall report at the next regular meeting. If the committee's report is favorable, each name shall be voted on separately. A majority vote of all active members present is necessary to elect to membership.

ARTICLE III

DUES. The dues of active members shall be one dollar for each semester, payable during the first two weeks of the semester. If not paid within two weeks, the member shall stand suspended until the dues are paid. During suspension a member may attend meetings, but shall not take part in the program nor serve on committees nor hold office. If the dues are not paid by the end of the semester, the member's name shall be stricken from the membership roll. To become a member again his name must be proposed and passed on by the membership committee, and voted on by the membership as in the case of other applicants.

ARTICLE IV

RULES OF ORDER. All questions of parliamentary law shall be governed by *Robert's Rules of Order*, Revised Edition.

ARTICLE V

DUTIES OF OFFICERS. The President shall preside at all regular and special meetings, and appoint all committees not otherwise provided for. The Vice-President shall perform the duties of the President when the President is absent or otherwise unable to act. The Recording Secretary shall keep the minutes of all regular and special meetings in a book to be kept for that purpose. The Corresponding Secretary shall send out written notices and attend to such correspondence as may be required. The Treasurer shall collect the dues and pay such bills as have been approved for payment in open meeting. He shall keep an accurate record of all receipts and disbursements. He shall present a report at each regular meeting showing the balance on hand. At the end of his term of office he shall turn over all of the money, with his books and records, to his successor.

ARTICLE VI

ORDER OF BUSINESS. At every regular meeting, the order of business shall be:

1. Roll call
2. Reading minutes of preceding meeting
3. Program
4. Receipt of communications, bills, and so forth
5. Reports of standing committees
6. Reports of special committees
7. Unfinished business
8. New business
9. Adjournment

By a two-thirds vote at any regular meeting, the order of business may be set aside for that meeting.

The reading of the minutes may be dispensed with by a majority vote.

ARTICLE VII

AMENDMENTS. Amendments to the bylaws may be presented at any meeting, whether regular or special, but shall not be voted on until the next meeting, either regular or special. A majority of a quorum present at the meeting shall be necessary for adoption.

Abuses.—Parliamentary law was evolved as a means of giving fullest expression to all opinions and of insuring justice to all members of an assembly. However, it is not uncommon for individuals to take advantage of the wording of the law for their own advancement or that of the groups they represent. There have been several Speakers of the House of Representatives who crushed out all minority opposition and yet adhered strictly to the letter of parliamentary law. The simplest practice was to refuse to recognize members who were known to disagree with the majority. Such members were helpless to change the situation.

Members of the Speaker's own group were now and then ignored as a means of punishing them for some offense. In the Senate the most outstanding abuse of parliamentary law is for a member to filibuster, that is, to take advantage of the unlimited debate allowed by Senate rules and prevent transaction of any business by talking as long as he is physically capable.

GOVERNMENTAL AND LEGAL DICTIONARY

Abandonment, the intentional relinquishment of rights or property. There must be both the intention and the external act. Therefore lost articles are not abandoned, and title remains in the owner. Abandonment of personal property gives title of ownership to any person who takes it. An inventor who dedicates his discovery to the public abandons title to a patent. Abandonment of persons bound by relationship is illegal. It becomes *desertion* if a family or any of its members are abandoned, and the law prescribes penalties.

Abdication, the act of a sovereign in completely renouncing his royal office. It may be voluntary, as when he seeks retirement in favor of a chosen successor; but this seldom happens. Usually the ruler is forced into retirement by political pressure. Below are listed the most important abdications in the past 50 years:

Year	*Ruler*
1886	Alexander of Bulgaria
1889	Milan I of Serbia
1889	Dom Pedro of Brazil
1909	Abdul Hamid of Turkey
1910	Manuel II of Portugal
1912	Hsuan Tung of China
1917	Nicholas II of Russia
1917	Constantine I of Greece (restored, 1920)
1918	Ferdinand I of Bulgaria
1918	Charles I of Austria
1918	Wilhelm II of Germany
1918	All German kings and princes
1922	Constantine I of Greece
1923	George II of Greece (restored, 1935)
1925	Carol, Crown Prince of Rumania—but in 1930 he took the throne
1931	Alfonso XIII of Spain
1935	Prajadhipok of Siam
1936	Edward VIII of Great Britain

Abduction, the act of taking away a woman, especially a girl in her teens, by fraud, undue persuasion or force. Kidnaping, originally the forcible taking away of a man, woman or child from his or her own country and sending him or her to another, now has the meaning of any forcible taking away or imprisoning.

Absent voting, the privilege of casting a ballot without appearing in person. More than half the states of the Union, beginning with Vermont in 1896, have laws permitting absent or absentee voting, especially for students away from home and for railroad men. The reasons for voting at home are: custom, local elections, state control of suffrage requirements and the necessity for careful scrutiny of voters. The absentee laws are drafted to prevent fraud and to ensure the voters' rights.

In Great Britain Acts of Parliament in 1918 and 1920 control and permit absentee voting and also voting by proxy.

Under the German Republic, a German citizen could vote anywhere in the Reich if he had an electoral certificate or *Stimmschein*.

Abstract of title, a brief statement of the documents and facts upon which title to land depends, made for the purpose of enabling the buyer to review easily the validity of the title. The abstractor does not guarantee title, but he is usually liable for damages resulting from an incorrect abstract.

Acceptance, the receipt of a thing offered by another with the intention of keeping the thing and the indication of such intention by some act.

Acceptance of goods upon delivery, not obligatory until the buyer has had a reasonably satisfactory opportunity to inspect them to find whether their quantity, quality and condition are satisfactory. According to the Sales Act acceptance by the buyer does not free the seller from obligation to make good any defects or shortcomings that appear later and could not reasonably have been discovered on preliminary examination; but to have a good claim, the buyer should inform the seller *within a reasonable time* after he discovers shortcomings or defects.

Accessory, one who aids in the perpetration of a crime but is not present when it is committed. If present, he is one of the principals. An *accessory before the fact* is one who has knowledge of the proposed criminal act and takes no steps to prevent it; an *accessory after the fact* has knowledge of the commission of a crime and helps to shield the offender.

Accidental president, a derogatory term for a chief executive not elected to that office but succeeding on the death of the President who was elected. The accidental presidents of the United States were Tyler, Fillmore, Johnson, Arthur, Theodore Roosevelt and Coolidge.

Acknowledgment, a formal declaration before a notary or competent court officer that the instrument is one's genuine and voluntary act or deed. The certification of the officer or notary on an instrument that it has been acknowledged is also called an acknowledgment. An instrument that has been acknowledged may be used as evidence in court or recorded without further proof of its execution.

Act, the finished and formally announced will of a legislature, including any necessary approval by the proper executive officer; a *statute*. The term *bill* is properly applied only to the draft of a proposed act.

Action at law, a proceeding in a court by which one party prosecutes another for the enforcement of a right, the redress of a wrong or the punishment of an offense.

Act of God, an inevitable accident or other happening that could not be foreseen or controlled and that is not caused or aided by man.

Administrative law, that branch of law that prescribes the manner of activity and the jurisdiction of the various officers and organs of the government concerned with administration. It also deals with the system of relief against administrative action. It is a growing and rapidly developing field, among other things relating to the administration of public health measures, the regulation of public utilities and the enforcement of tax and customs laws.

In France and other continental countries there are separate courts to hear cases that arise between citizens and the Government's agents or officers. The French administrative courts are: regional for original cases; and centralized in a *Conseil d'État* for final jurisdiction.

Administrator, a person appointed by a probate, orphans' or surrogate's court to manage and distribute the estate of a person who has died without appointing an executor. Relations are usually entitled to first consideration for appointment, ranking above creditors. The administrator usually executes a bond for faithful performance of his duties; his remuneration is fixed by the court.

Admiralty, that branch of the law that deals with maritime questions and offenses. Admiralty jurisdiction in the United States is in the Federal courts. (Art. III, Sec. 2.)

Adoption, the act through court procedure by which a child becomes a legal member of another family and has conferred upon him in his new status all rights that can be claimed through natural relationship of parent and child including the right to inherit as if a blood descendant if the parent dies without a will. State laws about adoption vary widely. Some states permit adoption only by married couples, and some allow adoption of minors only.

Advertising restrictions, enacted into law during the period since 1912 in most states of the United States, forbid false representation (by circulation or publication) concerning property, services or securities offered to the public for sale. The police power of the Government is the sanction for these laws.

About 30 states have adopted the Printer's Ink Model Statute (drafted by an advertising publication named *Printer's Ink*) which provides that offering or publishing "an advertisement that is false, deceptive or misleading" is a misdemeanor.

Blue-sky laws in many states control the sale of securities.

Federal restrictions of advertising are of three kinds: postal restrictions, forbidding the use of the mails to defraud; Federal statutes with penalties for misbranding food and drug products; and the general powers of the Federal Trade Commission to issue desist orders against firms using advertising illegitimately.

Advisory opinion, an opinion by a state's highest court given for the guidance of the governor, the legislature or state official in regard to the constitutionality of a proposed measure. The opinion has no binding force since a court can legally deal only with a specific case brought before it. Colorado, Florida, Maine, Massachusetts, New Hampshire and Rhode Island are

Courtesy U. S. Department of Agriculture

The Department of Agriculture Does Important Work

Above is pictured some of the work carried on in one of the numerous divisions of the Department of Agriculture. The Bureau of Agricultural Economics sets standards for canned fruit (*left*), grades such fruit and certifies that it meets the standards for the grade under which it is sold. In the cotton-classing room of this Bureau (*right*), specialists prepare sets of official cotton standards for use all over the country in buying and selling cotton

some of the states that permit advisory opinions.

It has repeatedly been suggested that the Supreme Court of the United States should furnish advisory opinions about bills of dubious constitutionality, but the court has ruled that its jurisdiction is limited to "cases and controversies" by the Constitution (Art. I, Sec. 2, Cl. 1.).

Affidavit, a written statement sworn to before a notary, court clerk or other person authorized to administer oaths. If prepared by a second person, the declaration is read in full and if it is found to be correct, it is signed by the declarant, who then makes oath or affirmation that it is true.

Affidavit of defense, a statement made in the required legal form that the defendant has a good defense upon the merits of the case to the plaintiff's action.

Affirmation, a solemn declaration made by a person whose conscience or religion forbids him to take an oath. He affirms, rather than swears, that statements he is to make are true. An affirmation has the same effect as an oath, and one who affirms is subject to the penalties for perjury.

Affray (literally, fright, making afraid), a disturbance of the public peace by two or more people fighting and causing terror in a public place. It differs from a riot in that an affray is not premeditated.

Age has a definite bearing on one's legal status and responsibilities. Under 7, a child is assumed to be incapable of criminal intent; and between 7 and 14 the same incapability is presumed until the contrary is proved. An infant of 14 or more years is presumed to be capable of committing a crime just as an adult although the contrary may be shown. *Age of consent to marry,* formerly 14 for males and 12 for females, has been increased by statute in all but 11 states.

Full age, mature age, majority (as contrasted with being a minor or under age) is usually 21, though about one-third of the states set 18 years as the age of majority for women. In some states a female attains majority upon marriage even if she is not 21 (or 18).

The Constitution of the United States sets 35 years as the minimum age for President, 30 for senators and 25 for representatives in Congress.

Agency, the relationship that results where one party, called the *principal,* authorizes another, called the *agent,* to act for him in business dealings with third persons. An agent is distinguished from a servant only as a matter of degree, the agent generally having more authority and occupying a superior position to that of a servant.

Agriculture, Department of, an executive department of the Federal Government since 1889 with a Secretary who is a member of the President's Cabinet. From 1862 to 1889 there was a Department administered by a Commissioner. As early as 1839 Congress had appropriated money for studying farm conditions and for free distribution of seeds. The main object of the present department is "to acquire and diffuse among the people of the United States useful information on subjects concerned with agriculture."

The activities of the Department are various. It has bureaus of Agricultural Economics, Agricultural Engineering, Animal Husbandry, Biological Survey, Chemistry and Soils, Dairy Industry, Entomology and Plant Quarantine, Public Roads and Weather, each with far-reaching functions. The Department's Extension Service co-operates with the state and territorial agricultural colleges; and its Office of Experiment Stations administers Federal funds for agricultural research and home economic study in state and territorial experiment stations. The Forest Service and the Soil Conservation Service are parts of the Department. Its Office of Information handles the Department's important publications, including a *Year Book.* Comparatively recent parts of the Department are the Food and Drug Administration, the Farm Security Administration, the Commodity Exchange Administration and the Agricultural Adjustment Administration, all but the first being New Deal activities.

State governmental activities pertaining to agriculture are mostly related to the Federal Department and partly dependent on Federal funds. The state agricultural and mechanical colleges and the state experiment stations are closely connected with the practical advisory work in the field of county agricultural agents.

In the totalitarian states agriculture, like manufacturing, is completely under government control. In Russia it is practically government-owned as well as government-controlled, and each republic in the Soviet Union has its commissar (or department head) of agriculture and of state grain and livestock farms.

In Great Britain a Ministry of Agriculture was created in 1919 taking over work previously performed by a Board of Agriculture and Fisheries.

Alderman, a representative of a ward in a city, council or board of aldermen, the lawmaking body of the municipality—or, in a few cases, the lower house of the municipal legislature. Some boards of aldermen are elected in part not by districts but from the city at large. Usually there are one or two aldermen from each ward, elected for one or two years; they usually serve without pay, but salaries are provided in large cities. The mayor is the presiding officer of the board of aldermen.

The board of aldermen was abolished in New York city in 1938, and a City Council with members elected by proportional representation was substituted.

Alias or **Alias dictus** (Latin, otherwise called), used in legal language before any name assumed by a man who wishes to hide his identity. If William Grant, a criminal, fears his name will lead to his apprehension, he may change it to Edward Jones, and the authorities will call him William Grant *alias* Edward Jones.

Alias writ, a second or further writ issued after the first has expired.

Alibi (Latin, elsewhere), a defence in criminal cases that the accused was somewhere else at the time of the crime. There can be no more convincing proof of innocence than a well-substantiated alibi.

Alien, a person living in one country but a citizen or subject of another country. He is under the jurisdiction of the country in which he is a resident and he is entitled to the protection of of that country's laws. Punishment is meted out to him for his misdeeds as if he were a citizen. There is an exception to this where aliens enjoy extraterritorial privileges, as most foreigners do in China and until 1936 did in Egypt. Under this treaty arrangement, the alien remains under the jurisdiction of the courts of his own nation.

Undesirable aliens were long excluded from the United States by immigration officials on the grounds of poverty, liability of becoming public charges, bad physical condition, illiteracy, Oriental race, harboring dangerous political views. The *quota* system of 1924 cut down on immigration by allowing only about 150,000 a year from Europe and setting as a maximum from each country 2 per cent of the number from that country who were reported in the U. S. Census of 1890. This made the quota higher for immigrants from northern, northwestern and western Europe because they had been the principal factors in immigration up to 1890.

All-Union Congress of Soviets (up to 1923 on the formation of U.S.S.R. called the *All-Russian Congress of Soviets*), the "supreme organ of authority" in Russia, replaced in 1936 by the Supreme Council. The Congress held few sessions and seems to have been a mere rubber stamp for the decisions of the Communist party. It met, about 1500 strong, in the capitals of the different republics in turn, dramatizing the power of the government. Under the 1936 constitution the Council of People's Commissars is responsible to the Supreme Soviet for the administration of departments or commissariats divided into two classes: All-Union People's Commissariats operating directly from the centralized government or by bodies which these Commissariats appoint; and the Union-Republic People's Commissariats, operating through commissariats of each republic. So half the administration is centralized and half is localized. The All-Union Commissariats—Federal Commissariats we might say—are Defence, Foreign Affairs, Foreign Trade, Postal and Electrical Communications, Railways, Water Transport, Heavy Industry, Defence Industry. The Union-Republican Commissariats are Food Industry, Light Industry, Timber Industry, Agriculture, State Grain and Livestock Farms, Finance, Internal Trade, Internal Affairs, Justice, Public Health.

Althing (*al,* general; *thing,* assembly), the lawmaking body of Iceland, established in 930 A.D. by the Constitution of Ulfliot and, except for the interval 1798-1874, in continuous existence ever since. It has 42 members, 36 elected for 4 years to represent regional districts and 6 elected at large for 8 years under a system of proportional representation. These 6 with 8 more chosen from the 36 by the Althing as a body form an upper house (Efrideild), which has no more power than the lower house (Nedrideild). Often the houses meet together as a united Althing.

Ambassador, a diplomatic minister of the highest rank, considered to represent personally the sovereign or head of the nation sending him to another Power and having personal access to the head of the state to which he is sent. *Ambassador* in common use implies *ambassador extraordinary and plenipotentiary,* that is, with full powers; usually the letters of credence carried by the ambassador inform the other Power that the head of the state sending the ambassador will confirm anything done by him. Diplomatic officers of lower grade represent the country and not its ruler; some of them do not have full powers. Ambassadors are sent only to the greater Powers. In 1893 the U. S. Congress first authorized the President to send ambassadors (instead of ministers) to the Great Powers whose representatives in Washington were of similar rank. The U. S. usually sends ambassadors to: Argentina, Belgium, Brazil, Chile, China, Columbia, Cuba, France, Germany, Great Britain, Italy, Japan, Mexico, Panama, Peru, Poland, Spain, Turkey, U. S. S. R., Venezuela. The President appoints ambassadors with approval of the Senate. Often the appointees are party leaders who have been prominent and helpful in the presidential campaign; but the career diplomats, who work their way up in the foreign service, are beginning to be rewarded with ambassadorships—in 1937 ambassadors to 10 Powers in the list above were career diplomats. American ambassadors receive a salary of $17,500 a year, which is much less than some other great Powers pay. The *embassy,* official residence of an ambassador, is considered to be the territory of the Power accrediting him and is not subject to the laws of the country in which it is situated.

Amendment, improvement or more generally any alteration. In procedure the correction of an error in a writ, record or other judicial document. In parliamentary law a slight change in the form of a motion or a bill.

In constitutional law an amendment is rewriting a part of the constitution, Federal or state. The method of amendment is stated in the constitution. The Federal Constitution can be amended only by the legislatures or constitutional conventions of three-fourths of the states. Congress has the power to choose which method of ratification is to be used. Amendments to state constitutions may be proposed by constitutional convention or (in all states but New Hampshire) by the legislature. If the amendment is proposed by the state legislature, it is not effective until it is approved by popular vote—except in Delaware where amendments are in effect if they are adopted by a two-thirds vote of each house in two consecutive legislatures.

American party, a secret party formed in 1854 that sought to permit only Americans to hold office. Later it was merged with the Know-Nothing party.

Amnesty, forgetfulness of wrong, a declaration by a duly constituted authority that gives a group of offenders pardon for offenses and reestablishes them in all their civil rights. A memorable example of amnesty was the act of President Johnson in restoring all rights to those who had directly or indirectly participated in the Civil War. *Amnesty* is not a technical term of the law. In common use it implies two things that *pardon* does not: restoration to civil rights—general or full pardon; and usually the inclusion of a whole class or community.

Anarchism, the social theory that government is an evil and that an ideal community would have no government, for it would need no control. *Anarchy* is sometimes used in the same sense, but in distinction from anarchism, it means lack of governmental control—hence, chaos and confusion. The famous Russian revolutionist Mikhail Bakunin (1814-76) tried to secure anarchism speedily; the Frenchman, Pierre Joseph Proudhon (1809-65) thought it must come slowly. Other famous writers who have urged anarchist doctrines include William Godwin, "Max Stirner" (Kaspar Schmidt), Leo Tolstoy and Prince Peter Kropotkin.

Answer, the defendant's formal pleading or statement of defense in reply to the action of the plaintiff. It deals mainly with facts but may include the demurrer, which deals with law. The answer creats an issue between the two parties.

Anti-Federalists, American political party that opposed the adoption of the Constitution because it centralized power in the Federal Government. Later it became the Jeffersonian Republican party that was the forerunner of the present Democratic party.

Anti-Masonic party, an American political party formed as a result of the opposition to Masons following the disappearance of William Morgan in 1826. Morgan had been a Mason, resigned and published a book purporting to reveal the secrets of Masonry. After his disappearance it was alleged that he had been murdered by Masons. The Anti-Masonic party was organized to elect non-Masons to public office and was one of the factions forming the Whig party in 1834.

Appeal, the right of a defendant in a criminal case or a litigant in a civil suit, if he is defeated in the trial court, to ask that a higher court review the record of the case and ascertain whether errors in the trial justify another hearing or a reversal or amendment of the original decision. In the Federal system the United States Court of Appeals receives cases from the District Court, and the Supreme Court is the tribunal of final appeal. In the state judicial systems the courts vary, but from the township court of a justice of the peace and the county or circuit court appeals ultimately reach the state supreme court.

The system of appeal in our Federal courts makes it possible to carry to the Supreme Court of the United States any case involving the constitutionality of a statute. In this way the Supreme Court acquires the power of invalidating a law passed by Congress, the state legislature or any other legislative body within the state, if the Court declares the act unconstitutional.

Court jurisdiction is of two kinds: *original,* when a case goes to the court for first trial, and *appellate* or *review,* when the case comes to the court only on appeal.

In Great Britain the House of Lords is the court of last appeal, but only the law lords (who have had legal training and experience as judges) conduct the business of the House when it sits as a court of appeal. Until 1908 there was no appeal in general criminal cases from the verdict in the trial court. But after a remarkable series of official prejudices and mistakes that culminated in the wrongful conviction of Mr. Adolf Beck, the court of criminal appeal was established by the act of 1907 to rectify such errors. If an appeal against a conviction is allowed, the accused is acquitted and there is no power to grant a new trial. But on an appeal against a sentence, the court may quash the sentence, reduce it or even increase its severity.

Appearance, coming into court as a party to a suit, whether as plaintiff or defendant; the formal proceeding by which a defendant submits to the jurisdiction of the court by acting personally or through an attorney.

Appointment, the selection of public officials by a designated individual or small group as distinct from popular election. The power of appointment usually lies in the chief executive and is a relic of the royal prerogative. The President of the United States under the Constitution (Art. II, Sec. 2) "shall nominate, and by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the Supreme Court and all other officers of the United States whose appointments are not herein otherwise provided for and which shall be established by law; but the Congress may by law vest the appointment of such inferior officers as they think proper in the President alone, in the courts of law or in the heads of departments."

Members of the Cabinet are appointed by the President (sometimes as rewards for service in the election campaign), and these appointments are usually unquestioningly approved by the Senate. The President's appointments to the judiciary and to posts in the foreign service are more likely to be questioned or even disapproved by the Senate. His appointments to local posts are largely prompted by the wishes of the members of Congress (especially of his own party) from the state where the office is to be filled. Postmasterships and other minor offices are likely to be political appointments formally in the President's power but actually dictated by party leaders. Appointments for political purposes have influenced American history, notably the appointments of President John Adams in 1801 intended to offset the power of the newly elected President Jefferson. One of the appointees was John Marshall, who as Chief Justice of the Supreme Court shaped the interpretation of the Constitution quite differently from the beliefs of Jefferson and Jackson.

In the separate states the governor has far less appointing power than the President since state department heads are usually elected by the people. There is a tendency toward more power for the governor in the newer state constitutions and reorganizations of the executive and administrative offices. In New York, for example, since 1927 (by a Constitutional amendment) the governor with the consent of the Senate appoints 14 administrative heads including the secretary of state, and there has been an attempt to organize a Cabinet of department heads to advise the governor.

Federal judges are appointed by the President with the consent of the Senate; but it is a peculiarity of the American system that many state and local judges are elected by popular vote. In Switzerland, cantonal judges of the lowest courts are elected by the people; and in France in the days of the Revolution, from 1790 to 1804, judges were elected—but these are exceptions to the general rule in Europe of appointed judges.

In 38 American states even the highest judges are elected; in Rhode Island, South Carolina, Virginia and Vermont, the legislature appoints the higher judges; in Delaware and New Jersey the major judges are appointed by the governor and senate; in Massachusetts all judges are named by the governor and his council.

In England the king in theory appoints the prime minister; actually he has no choice save to take the recognized leader of the party in power. The prime minister selects the other members of the Cabinet and the king's assent is necessary before they take office. All court officers—judges, justices of the peace, sheriffs and clerks—are appointed in England, and so are the permanent county and borough administrative officers.

It is a puzzling question whether a democracy benefits by having many of its officers appointed instead of being elected by the people. Possibly posts that require expert professional or technical ability are filled better by appointment, but everything depends on the wisdom of the appointer and his freedom from partisan bias.

The power of appointment usually implies the power of removal.

Apportionment, in U.S. constitutional law the allocating to states the number of representatives they shall have in the lower House of the Congress; and similarly in a state the determination of how many legislators shall form the state legislature. As total population changes there must be reapportionment to secure any semblance of fair representation. Reapportionment need not mean redistricting since legislators may be chosen at large, that is, to represent the whole state.

The original apportionment of the Federal House of Representatives is in Art. I, Sec. 2 of the Constitution; and that section provides that the apportionment shall be based on a census taken every 10 years as Congress shall direct. No reapportionment was made in 1920, but there was one in 1930. The following table gives the representation under each census.

State constitutions usually have similar provisions for apportionment and for redistricting the state for its own legislature. Often there is a provision that every legislative district must be compact and made up of contiguous areas. This is to prevent inequalities in districts and the forming of legislative districts that will give one party an unfair advantage over the other—as by making new districts so that the party will carry most of the districts even if it has not a majority of the votes in the whole state that is made up of the districts. (This tricky practice is called a *gerrymander.*)

In England and other European countries there is no legal provision for apportionment or redistricting, for there is no attempt to keep electoral districts approximately the same in population.

Appropriation, assignment to a particular purpose, especially setting apart money. In the law of debt appropriation is the act of deciding to what particular indebtedness any one payment on account shall be applied.

In government finance an appropriation is the authorization of specific expenditure or an entire series of annual or periodical expenditures classed by purpose, manner and amount.

The U. S. Constitution provides that "no money shall be drawn from the treasury but in consequence of appropriations made by law" (Art. I, Sec. 9, Cl. 7) and limits to two years appropriations to raise and support armies (Art. I, Sec. 8, Cl. 12). The power of appropriation naturally goes with the power of raising the revenue to be expended. As all revenue measures by Constitutional provision (Art. I, Sec. 7, Cl. 1) must originate in the House of Representatives, it has become the custom that all bills for spending or appropriating money also originate in the Lower House. That House since 1921 has concentrated the task of framing appropriation measures (formerly performed by 14 sepa-

APPORTIONMENT OF STATE REPRESENTATION IN CONGRESS

	1788	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1930
Not More Than 1 in Every	30,000	33,000	33,000	35,000	40,000	47,700	70,680	93,423	127,381	131,425	151,911	173,901	194,182	211,877	280,674
State															
Alabama	...	...	...	1	3	5	7	7	6	8	8	9	9	10	9
Arizona	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Arkansas	...	...	...	...	...	1	1	2	3	4	5	6	7	7	7
California	...	...	...	...	...	...	2	2	3	4	6	7	8	11	20
Colorado	...	...	...	...	...	...	...	...	...	1	1	2	3	4	4
Connecticut	5	7	7	7	6	6	4	4	4	4	4	4	5	5	6
Delaware	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
Florida	...	...	...	...	...	...	1	1	1	2	2	2	3	4	5
Georgia	3	2	4	6	7	9	8	8	7	9	10	11	11	12	10
Idaho	...	...	...	...	...	...	...	...	...	...	1	1	1	2	2
Illinois	...	...	...	1	1	3	7	9	14	19	20	22	25	27	27
Indiana	...	...	...	1	3	7	10	11	11	13	13	13	13	13	12
Iowa	...	...	...	...	...	...	2	2	6	9	11	11	11	11	9
Kansas	...	...	...	...	...	...	...	...	1	3	7	8	8	8	7
Kentucky	...	2	6	10	12	13	10	10	9	10	11	11	11	11	9
Louisiana	...	...	...	1	3	3	4	4	5	6	6	6	7	8	8
Maine	...	...	...	7	7	8	7	6	5	5	4	4	4	4	3
Maryland	6	8	9	9	9	8	6	6	5	6	6	6	6	6	6
Massachusetts	8	14	17	13	13	12	10	11	10	11	12	13	14	16	15
Michigan	...	...	...	...	...	1	3	4	6	9	11	12	12	13	17
Minnesota	...	...	...	...	...	...	...	2	2	3	5	7	9	10	9
Mississippi	...	...	...	1	1	2	4	5	5	6	7	7	8	8	7
Missouri	...	...	...	...	1	2	5	7	9	13	14	15	16	16	13
Montana	...	...	...	...	...	...	...	...	...	...	1	1	1	2	2
Nebraska	...	...	...	...	...	...	...	...	1	1	3	6	6	6	5
Nevada	...	...	...	...	...	...	...	...	1	1	1	1	1	1	1
New Hampshire	3	4	5	6	6	5	4	3	3	3	2	2	2	2	2
New Jersey	4	5	6	6	6	6	5	5	5	7	7	8	10	12	14
New Mexico	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
New York	6	10	17	27	34	40	34	33	31	33	34	34	37	43	45
North Carolina	5	10	12	13	13	13	9	8	7	8	9	9	10	10	11
North Dakota	...	...	...	...	...	...	...	...	...	...	1	1	2	3	2
Ohio	...	...	1	6	14	19	21	21	19	20	21	21	21	22	24
Oklahoma	...	...	...	...	...	...	...	...	...	...	...	...	5	8	9
Oregon	...	...	...	...	...	...	...	1	1	1	1	2	2	3	3
Pennsylvania	8	13	18	23	26	28	24	25	24	27	28	30	32	36	34
Rhode Island	1	2	2	2	2	2	2	2	2	2	2	2	2	3	2
South Carolina	5	6	8	9	9	9	7	6	4	5	7	7	7	7	6
South Dakota	...	...	...	...	...	...	...	...	...	...	2	2	2	3	2
Tennessee	...	1	3	6	9	13	11	10	8	10	10	10	10	10	9
Texas	...	...	...	...	...	...	2	2	4	6	11	13	16	18	21
Utah	...	...	...	...	...	...	...	...	...	...	...	1	1	2	2
Vermont	...	2	4	6	5	5	4	3	3	3	2	2	2	2	1
Virginia	10	19	22	23	22	21	15	13	11	9	10	10	10	10	9
Washington	...	...	...	...	...	...	...	...	...	...	1	2	3	5	6
West Virginia	...	...	...	...	...	...	...	...	...	3	4	4	5	6	6
Wisconsin	...	...	...	...	...	...	2	3	6	8	9	10	11	11	10
Wyoming	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1
Total	65	106	142	186	213	242	232	237	243	293	332	357	391	435	435

rate committees) in a single Committee on Appropriations with 35 members and 13 subcommittees of 5 members each, dealing with appropriations for these 13 classes: (1) Agricultural Department, (2) Labor Department, (3) District of Columbia, (4) Executive Office and independent commissions, etc., (5) Interior Department, (6) legislative branch, (7) Navy Department, (8) Post Office Department, (9) State Department, (10) Treasury, (11) War Department, (12) Commerce Department and (13) Justice Department. Each bill as drafted by a subcommittee must receive the approval of the entire committee before it is reported to the House. No appropriation may be considered by the Committee unless it has been recommended by the Bureau of the Budget.

The President may not veto single items in an appropriation bill, but governors of the states have that power.

In England appropriations are made by the House of Commons acting as a Committee of Supply—the action is said to be by the House in Supply. (By meeting as a committee the House frees itself from the strict rulings of the Speaker.) The Committee does not frame the appropriations but merely acts on the recommendations of the Government, that is, of the responsible ministry. The Committee may (1) vote the grant proposed, (2) reduce it or (3) reject it—but cannot increase it. Reduction or rejection is rare; it would show lack of confidence which might overthrow the Government, lead to a general election and lose present members their seats in Parliament. Appropriations voted by the Commons must be submitted to the House of Lords but become law at the end of a month (even if the Lords do not assent) upon receiving the assent of the Crown which is given as a matter of course. The appropriation act for yearly expenditures of the British Government is officially called the Consolidated Fund Act.

Arbitration, settling disputes by other authority than judicial tribunals or courts provided by law. The authority that arbitrates may be: (1) chosen by agreement of the two parties to the dispute—sometimes each party chooses one arbitrator and these two arbitrators select a third as odd man or umpire or arbiter with a casting vote; or (2) the arbitrators may be a board or commission created by statute or by a group like a trade association. The decision of the arbitrators is called an *award.*

There are three applications of arbitration: (a) in international affairs; (b) in commercial disputes arising in business relations; (c) in disputes between employer and labor.

International Arbitration may be by a special commission or board of arbitrators chosen according to a treaty between the two Powers or by The Hague Tribunal or Permanent Court of Arbitration set up in 1899 or by the Permanent Court of International Justice, often called the World Court, established after the World War by the 14th Article of the Covenant of the League of Nations. There is no effective method, no international police, to enforce an award in international law. The 16th Article of the Covenant obliges every member of the League to adopt measures in common (sanctions) to punish any Power that does not live up to its promises to arbitrate disputes. In 1935 and '36 the League invoked against Italy for the invasion of Ethiopia economic sanctions that were not strong enough to prevent war between the two countries.

Commercial arbitration in the United States was developed first by trade associations and chambers of commerce eager to promote business peace. Federal legislation in effect in 1926 and the laws of several states (beginning with Illinois in 1917 and New York in 1926) now recognize agreements to arbitrate future as well as present disputes and make the award enforceable. North Dakota since 1921 has had county conciliation boards appointed by district judges. The American Arbitration Association has a panel of thousands of experts in different parts of the country available to settle by arbitration such questions as: disputed meaning of a contract; technical matters in engineering, architecture and other professions; quality and standards of materials; disagreements of partners. Procedure is simplified and awards are speedier than in courts of law.

Industrial arbitration of disputes about working hours and wages was made compulsory by law in New Zealand (1894) and Australia (1904). A Kansas law passed in 1920 providing for a compulsory Court of Industrial Relations was declared unconstitutional except as it applied to transportation and public utilities. Voluntary arbitration is the rule. The Federal Department of Labor since its establishment in 1913 has had a bureau of conciliation. The Secretary of Labor is authorized to act as a mediator or to appoint commissioners of conciliation whenever such action is necessary in the interests of industrial peace.

Armaments, Limitation of, a gradual method of disarming; agreement among different Powers on the size and strength of their armed forces. In theory this seems a practical way to approach the ideal condition where armies and navies and air forces would be used only for police purposes, the cost of defense would be reduced and armed forces would no longer produce constant rivalry, increased costs and the danger of conflict.

The peace treaties after the World War forced a reduction of armaments by the Central Powers defeated in the war with the avowed purpose "to render possible the initiation of a general limitation of the armaments of all nations." Article VIII of the Covenant of the League of Nations provided that the League Council "shall formulate plans for such reduction for the consideration and action" of the several governments. In 1921 a special League committee recommended limitation of land forces in Europe; the plan was rejected—because limitation must be general and not merely local and because there could be no disarmament without security.

The Washington Conference of 1922 was not general—it dealt only with naval armament and the Pacific Ocean area. The limitation of new naval shipbuilding was on the ratio of 5 units each for Great Britain and the United States and 3 units for Japan. The treaty was not renewed on its expiration at the end of 1936; Japan then refused to consider anything but equality with Britain and the United States.

The Italian invasion of Ethiopia and Hitler's announcement that Germany was rearming have spurred the Powers on to greater efforts and expenditure for increased armies, navies and air forces. In 1938 the United States began a great rearmament program. Hope for the immediate reduction of armaments is small.

Arraignment, in criminal law, bringing an accused person before the court, calling him to the bar for the purpose of identifying him, reading the indictment to him and requiring him to answer guilty or not guilty. If he pleads not guilty, a day is set for the trial giving him time enough to prepare his defense. If he pleads guilty, an early day is set for presenting sufficient evidence to provide a court record of the case and for pronouncing sentence.

Arrest, the taking of a person into custody in order that he may be held to answer for committing a criminal offense or be prevented from committing such an offense. Arrests may be made with or without a warrant, which is a duly issued authorization to make an arrest. It may be addressed to a peace officer or to a private individual. In most cases an arrest may be made by either a peace officer or a private individual without a warrant. A peace officer may arrest for a felony or a misdemeanor committed in his presence; or he may arrest one whom he has probable cause to believe is guilty of a felony. An officer may not arrest without a warrant for the commission of a misdemeanor if it is not committed in the officer's presence. An individual has the same power to make arrests, but where an arrest is made for a felony not committed in the presence of the person arresting, there must be a certainty the felony has actually been committed.

Arrest does not necessarily mean continued detention until the trial. The accused has the right to temporary liberty by furnishing bail for his appearance when he is called unless there are statutory provisions to the contrary.

Arson, the malicious and wilful burning of a house or outhouse belonging to another person. Only houses ordinarily used for human habitation and buildings within the curtilage (or immediate area of the house), such as barns, are the subject of arson. However, many states have extended by statute the definition and scope of arson.

The burning of one's own property is not arson, but if this is done with the purpose of defrauding an insurer it is a crime under particular statutes in some states. Twenty years or life imprisonment is the penalty in some states; death in others.

Article, a distinct part of a legal document. In the plural, articles often mean all the parts, all the provisos, all the items. So *Articles of Confederation* were the whole document under which the American Congress operated during the Revolutionary War and until the adoption of the Constitution. *Articles of Impeachment* are the complete list of charges brought in the indictment found by the House of Representatives. *Articles of War* and *Articles for the Government of the Navy* are collections of all rules and regulations for governing the army and navy. *Articles of Association* or *Articles of Incorporation* are the general written rules by which a corporation agrees to act and carry on its business. These articles must be approved by the Government before a charter is issued permitting the corporation to operate.

Article X of the League of Nations pledging members to preserve against external aggression the territorial integrity and existing political independence of all members was the main obstacle to its acceptance in the United States.

The Federal Constitution is cited by Article, Section and Clause.

Assault and battery. An *assault* is any unlawful offer or attempt to injure another with apparent present ability to carry out the attempt, which causes an apprehension of peril. A *battery* is any harmful or offensive touching of another. A battery is the consummation of an assault. However, there may be an assault without a battery and it is even possible to have a battery without an assault.

Assembly, gathering together. The right of peaceful assembly is guaranteed by the 1st Amendment to the Federal Constitution: "Congress shall make no law . . . abridging . . . the right of the people peaceably to assemble."

Unlawful assembly is the gathering of three or more persons with intent to commit a crime or to act in a way to endanger the public peace.

In constitutional law of many states of the Union the state legislature is called the General Assembly or the Legislative Assembly. (Etymologically *assembly* and *congress* both mean meeting, coming together.) The lower house in New York and California is called the Assembly, and in New Jersey, the General Assembly.

The lower house of the League of Nations is the Assembly, composed of not more than three representatives from each member nation; and the Assembly elects part of the Council or upper house.

Assessor, an official of township, village or city, elected or appointed to fix property values for purposes of taxation. It is not usually a salaried office; remuneration is for time actually employed. Often the same duty is performed by a board of assessors or tax board.

Assignment, any written transfer of interest or title in property. An assignment for the benefit of creditors is the voluntary transfer by the debtor of his property to an assignee in trust. The assignee is to use the property to pay the creditors and any surplus is to be returned to the debtor. A general assignment includes all the nonexempt property of the debtor; it is often made to a trustee who realizes for the various creditors.

Assize, originally a session or sitting of a court or legislative body. The only current use of the word is to mean the session three or four times a year in each English county of a judge of the High Court of Justice, called the *judge of assize,* or of a commissioner of assize appointed by the judge. This traveling court was instituted to determine issues of fact that would be heard at Westminster *nisi prius,* unless they were heard beforehand in the county. The trial is before a jury. Magna Charta in 1215 transferred assize courts from Westminster to the local county to remedy delay and save provincials the cost of coming to London.

In Scotch law an assize is a jury

trial of a criminal case or the jury in such a case. Historically the word has many meanings. The Grand Assize was a jury of 16 empowered to settle questions of ownership which had previously been decided by combat; it was one of the reforms of Henry II, King of England from 1154 to 1189, in whose time the word *assize* was also used of the ordinances issued by the King in his plan to introduce a system of royal justice to supersede local justice: the Assize of Clarendon in 1166 and the Assize of Northhampton in 1176 took jurisdiction in certain cases away from the barons and sheriffs and gave it to royal judges on circuit.

From the 12th century on there were in England *assisae venalium,* assizes of things for sale, the Assize of Bread and Ale in 1267, for example. These were limitations of price, weight and quality, especially for food, set by justices of the peace; usually the adjustment was to the price of grain.

Assumpsit, an action at law to recover damages for breach of a simple contract. It is so called from the Latin word used in the complaint, *assumpsit* (he undertook).

At large, said of a representative chosen by voters of the whole state (and not of a single congressional district) when a state is not redistricted after a new apportionment of its representation in Congress.

After the census of 1930 the following states had congressmen at large: Connecticut, 1 out of its total of 6; Illinois, 2 out of 27; New York, 2 out of 45; North Dakota, 2, the entire representation, reduced from 3 under the census of 1910; Ohio, 2 out of 24, and Oklahoma, 1 out of 9.

Ambassador at large is the unofficial term applied to a representative of one country carrying on negotiations with various other nations.

Attachment, a writ issued by a court commanding the seizure of a person for contempt of court or ordering the taking of the defendant's property into legal custody to satisfy a demand of the plaintiff.

Attainder, in old English law, loss of civil rights after judgment of death with the additional penalty of forfeiture to the state of some or all of the convicted man's personal and real property and the denial of his right to transmit property to his heirs. In 1814 attainder was restricted to cases of treason and murder, and in 1870 the whole system of attainder was swept away.

Bills of attainder were legislative acts that declared certain persons attainted without any judicial trial. They came into wide use during the reign of Richard II and continued until 1688 but after that were seldom used.

The memory of the wrongs done under Bills of Attainder was fresh enough in 1787 to cause the framers of the Constitution of the United States to prohibit Bills of Attainder (Art. I, Sec. 9, Cl. 3).

Attorney, any substitute or agent appointed to act for another. An attorney *in fact* is an agent empowered by the authority given him which is called a *power of attorney.* An attorney *at law* is a lawyer practicing in the courts where he represents his principal or client.

Attorney general, the chief law officer of the United States and of each state. The Attorney General of the United States is the head of the Department of Justice, a member of the Cabinet of the President, the legal adviser of the President in all official matters and also of the heads of the various executive departments. His salary is $15,000 per year.

The attorney general of a state occupies a similar position. He is legal adviser to all departments in the state government and he appears for the state in all cases in the supreme court of his state to which his commonwealth is a party. In most states he is elected by popular vote; but he is appointed by the governor in New Hampshire, New Jersey and Pennsylvania, by the judges of the state supreme court in Tennessee and by the Legislature in Maine.

In Great Britain the Attorney General is almost always a member of the Cabinet.

Autonomy, self-government of a community. Canada and all other dominions of the British Commonwealth of Nations are autonomous.

Bail, to deliver an arrested person to his surety upon his giving security for the arrested person's appearance before the court when required. Bail also means the persons who become the sureties. The accused may place his own property in pledge, or the required bond may be furnished by another. Cash may be deposited in exactly the amount required; real estate must be worth twice the amount. Whenever a bondsman fears a bond may be forfeited by flight of the accused, he may deliver the accused to the court and ask for cancellation of the bond. Excessive bail is prohibited by the Eighth Amendment to the Federal Constitution. Even a person charged with a capital offense may be bailed if there are no constitutional or statutory provisions to the contrary.

Ballot, a means of secret voting; originally a small ball used for secret voting; the black ball for a negative vote is the source of the phrase, *to blackball,* in the sense of voting against, excluding from membership in a club. In ancient Athens a bit of tile or pottery (perhaps at an early date an oyster shell) was used in voting to banish a citizen, and from the word *ostracon,* oyster shell or tile, comes the word *ostracize,* the practice of banishing or blackballing.

Modern ballots are written or printed. When the candidates or the party organization supplied the ballots (the regular custom in the United States as recently as 1880), there were opportunities for trickery and fraud. Now official ballots, printed by government authority, contain only the names of candidates duly nominated.

Ballot reform has been secured by the Australian ballot, the voting machine, the Massachusetts ballot, the nonpartisan ballot and the short ballot.

The *Australian ballot,* was first used in 1856 in South Australia. This system of balloting requires that all ballots be printed at public expense and delivered to each polling place in sealed packages on the eve of election; the seals are unbroken until the polls open. A ballot, marked with the initials of a judge of election, is handed to the voter as he enters a closed booth, and he secretly marks his preferences among the nominees for office. Then he folds the ballot and returns it to the judges, who deposit it in the ballot box. This system makes it impossible for any other than an official ballot to be used.

In some parts of the world the ballot to be voted is placed in an official envelope and sealed; this used to be the rule in Germany.

When the Australian ballot was

Courtesy Automatic Voting Machine Corporation

The Voting Machine Records a Secret Ballot

Two clerks verify registration records and instruct the next voter on the model voting machine while a third admits the voter to the booth. When the curtain is closed, the voter has the absolute secrecy implied by the *Australian ballot* first used the nominees of each political party were printed in separate columns (the party column ballot), and to vote for every nominee of one party a voter need only put a cross in the circle at the head of the column. To vote a split ticket, choosing candidates from different parties, the voter had to put a cross in a square before each name—so that a straight ticket was much easier to vote than a split ticket, especially if a party emblem appeared at the top of the column so that a voter could identify the party without reading any name on the ballot.

The voting machine is a mechanical device for recording votes secretly and counting them automatically. The names of nominees are arranged in party columns with the name of the party and of each nominee opposite a push-button. To vote a straight ticket for all nominees of one party, a voter pushes only one button, the one opposite the party name. To vote a split ticket, he pushes the button opposite each name that he favors. The machine automatically counts the votes for each nominee, so a minute after the polls close the results appear.

On the voting machines in New York, the names of nominees are arranged in horizontal rows by party. Over the name of each candidate is the party emblem and a small lever. This lever must be pulled down over the name of every nominee to be voted upon (only one lever for the same office will operate) and left in that position until the vote is registered as the voter leaves the booth.

Both the Australian ballot and the voting machine have the virtue of secrecy but the fault of hindering independent voting and encouraging party voting. The *Massachusetts ballot,* first used in Massachusetts in 1888, lists all candidates for the same office alphabetically under the name of the office. Usually the symbol of the party is printed after the name.

After the Australian form came into use, all official ballots were alike in one respect: there was only one ballot for a voter at any election, and it contained all the names of all candidates. It was a blanket or all-covering ballot. The natural result was a long and unwieldy ballot. To reform this situation there is a strong movement for a *short* ballot under a proposed new system of fewer elected officers and more positions filled by appointment. The theory is that the voter will make a more intelligent choice if he has only a few offices to fill.

The *nonpartisan ballot* carries the idea of the Massachusetts reform to its logical conclusion—it contains no party classification, no party symbols, no party identification. It was first used in city and local elections where national party affiliations have little meaning. Nonpartisan ballots for the election of judges are now used in Arizona, California, Idaho, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, Washington, Wisconsin and Wyoming.

Written-in ballots are those bearing names not officially printed but added by the voter—an extreme sign of independence.

Bankrupt (from Latin, bank broken), a person or company whose assets admittedly do not equal liabilities that are due and payable and demand for which has been made. Bankruptcy may result from voluntary action of the debtor; or it may be forced by creditors when utter inability to pay is shown or when the debtor is discovered in an attempt to prefer one creditor above another or to remove assets or transfer them to another with intent to defraud his creditors.

The Constitution of the United States (Art. I, Sec. 8, Cl. 4) gives Congress the power "to establish uniform laws on the subject of bankruptcies," so there are no state laws except in regard to the insolvency of certain corporations that are not included in the Federal bankruptcy laws.

Action may be begun by an appeal to a Federal court by three or more creditors or if there are fewer than twelve by a single petitioner. The court appoints a receiver, and places the case in the hands of a referee in bankruptcy. All the assets of the bankrupt not exempted by law must be turned over to the receiver. All creditors present their claims, and in due time they are paid their proportion of all money realized, less expenses incident to the proceedings.

If a bankrupt honestly relinquishes his total assets, his discharge from bankruptcy frees him from claims for debts incurred prior to the beginning of the action.

Barnburners, the radical element in the Democratic party in New York state politics (1843-48) that opposed the extension of slavery and local public works. The name was derived from the story of the Dutchman who burned down his barn to get rid of rats, the implication was that the Barnburners would destroy their political party to achieve their ends and do away with corporations and public works to get rid of their abuses. In 1848 the Barnburners nominated Martin Van Buren for President, and this split in the Democratic party resulted in a victory for the Whigs. The Barnburners merged with the Free-Soil party and later the anti-slavery groups joined the Republican party.

Benefit of clergy, in medieval law, the privilege of all priests and clerks of the Church to be tried by a church court, which could not inflict capital punishment. In the 14th century in England anyone who could read the first verse of the 51st Psalm could claim benefit of clergy and be free of danger from the severe laws that made death a common penalty. In England benefit of clergy was not abolished until 1827 and (for peers of the realm) 1841. In the United States the plea of benefit of clergy was recognized for a time in a few states, but in most jurisdictions it was either not recognized or expressly forbidden by statute. In cases of capital crimes against the United States benefit of clergy was abolished by an act of Congress in 1790.

"Best Evidence" Rule, a rule pertaining to the introduction of evidence in a court; the highest degree of proof that is possible must be produced if such evidence is accessible. Thus a copy of a contract cannot be introduced in evidence if the parties have the original contract.

Bigamy, wilfully contracting a second marriage when the contracting party knows the first marriage still exists. If husband or wife has not been heard from for 7 years (5 years in Arkansas and Indiana), under the common law the presumption of death is raised, and a new marriage may occur with no taint of bigamy.

Bill, a draft or form of a proposed act or statute, submitted to a legislature for enactment into law. Sometimes the word is used to mean an actual statute—for example in the phrase *bill of attainder,* used in the Federal Constitution (Art. I, Sec. 9, Cl. 3). A *bill of pains and penalty* is a special act of the legislature that imposes a punishment less than death upon persons supposedly guilty of some great offence without a legal trial. Bills of attainder and bills of pains and penalties are forbidden by the Constitution of the United States and by the constitutions of most of the states.

The Federal Constitution prohibits the states issuing *bills of credit* (Art. I, Sec. 10, Cl. 1), that is, paper money issued by the state on the faith of the state, designed to circulate as a medium of exchange.

Bill often means no more than legal document.

A *bill of health* is a medical officer's certificate as to absence or presence of infectious disease on board a ship leaving port.

A *bill in equity* is a written complaint addressed to a court of equity containing the names of the parties in the suit, the facts of the case with an averment that they are contrary to equity and a prayer for relief.

A *bill of exceptions* is a summary of exceptions to the rulings of a trial judge, a preliminary to an appeal.

A *bill of indictment* is the charge presented to a grand jury, which becomes a *true bill* if the jury finds that it cannot be ignored.

A *bill of particulars* is a detailed statement of a plaintiff's claim or of a defendant's set off.

Bill of Rights, any formal declaration of the rights and liberties of a people. The most famous example is the Act Declaring the Rights and Liberties of the Subject and Settling the Succession of the Crown, presented by the English Lords and Commons in 1689 to the Prince and Princess of Orange before they became William III and Mary of England. A Declaration of Right, asserting the claims of Parliament against the usurpation of the Stuart kings, had been presented to William and Mary earlier in the year when the Crown was offered to them. The Bill of Rights besides arranging the succession to the throne (more formally done by the Act of Settlement in 1701) vindicated and asserted these rights:

> That only by consent of Parliament can laws be suspended or executed, money be levied or a standing army be maintained; that Protestant subjects have the right of having arms for defense; that subjects

have the free right of petitioning the King; that elections to Parliament must be free; that speech and debate in Parliament must be free and not "questioned in any Court or place out of Parliament"; that excessive bail ought not to be required nor excessive fines imposed nor cruel or unusual punishments inflicted; that Parliament should meet frequently—and a few other claims.

In the United States the main ground of opposition to the Constitution as drafted by the Convention of 1787 was that it did not specifically recognize and guarantee the rights of the people. Clauses 2, 3 and 4 of Article I, Section 9, on *habeas corpus, ex post facto* laws and direct taxation and the definition of treason in Art. III, Sec. 3, were in the right direction, but were not of sufficiently broad scope. Twelve amendments were submitted by the First Congress in 1789 and the ten that were adopted have been popularly called the *Bill of Rights.* They deal with such fundamental rights as freedom of religion, speech, press, assembly and petition; right to bear arms, due process of law, speedy jury trial, indictment by grand jury, no excessive bail or fines, no cruel or unusual punishments, no double jeopardy by retrial for the same offense, compensation for property taken for public use. The rights of the states are covered by the 10th Amendment reserving to them powers not delegated to the United States by the Constitution.

The constitutions of the individual states contain in almost all instances a Bill of Rights or a Declaration of Rights.

In January 1918 the Third All-Russian Congress of Soviets adopted in the new constitution of the Russian Socialist Federated Soviet Republic a declaration of rights calling for: nationalization of all land, forests, underground mineral wealth, waters, livestock and banks; workers' control and then national control of factories, mines, railways and other means of production and transport; repudiation of loans by the czarist Government, landlords and the bourgeoisie; and organization of a Red army.

In the new 1937 constitution of the Union of Soviet Socialist Republics, Chapter X, headed "The Fundamental Rights and Duties of Citizens," lists these rights: to work; to rest and leisure; to maintenance in old age, sickness or loss of capacity to work; to education; to equal privilege for both sexes, all nationalities and races and "all spheres of economic, social and political life"; to freedom of conscience, freedom of worship and freedom of antireligious propaganda; to freedom of speech, press, assembly, street processions and demonstrations; and to unite in public organizations. Inviolability of person, of homes and of correspondence is guaranteed, and so is the right of asylum to persecuted foreign citizens. This remarkable Bill of Rights closes with a list of duties: "to maintain labor discipline . . . to respect the rules of socialist human intercourse . . . to safeguard and fortify public, socialist property . . . to defend the fatherland."

Blackmail, extortion, a demand for money from a person on threat of public exposure or some other form of intimidation. To constitute blackmail, it is not necessary that the attempt at extortion be successful; the demand alone is a crime, but it is hard to punish; for victims, if they are guilty of the act alleged, usually hesitate to complain to the authorities.

Bloc, a group or combination for a special purpose, especially the union of legislative members of different parties. If the bloc controls the balance of voting power, it can prevent the passage of a measure it opposes and may be able to secure the passage of legislation it favors. The *farm bloc* in the Congress of 1921 worked for agricultural legislation.

In France where there are numerous political parties the bloc is the common method of uniting a number of small parties of the same general political philosophy to protect their interests. In France after the World War, the Bloc National was the combination of all the conservative elements that defeated the socialists in 1919. The Popular Front that came into power with Léon Blum in May 1936 and continued to govern France under Camille Chautemps, was a bloc of the leftist parties.

In international politics a bloc is a group of nations with a common cause for which they work without an actual treaty or general alliance.

Blockade, in international law and in war, obstructing any communication with a country and especially its ports to prevent its receiving materials of war or even food supplies. It is a fundamental principle of international law that a "blockade to be binding must be effective, that is to say, maintained by a force sufficient to prevent access to the coast of the enemy."

A *paper blockade,* announced by publication but not followed by force to make it effective, is in effect a warning to neutrals not to approach a forbidden zone.

Blue-sky laws, the popular name for statutes that regulate the issue and sale of stocks and bonds by demanding that certain conditions of security be shown prior to issue, thus offering some assurance of value to investors. When Kansas passed the first of these laws in 1911, the reason was that some companies were capitalizing the "blue sky!" Within 20 years after that time all the states except Nevada and Delaware passed blue-sky laws.

Board, originally the table at which an administrative group met and now the group itself, whether in private business or in government. In government some of the common uses of the term are:

Board of Trade, a department in the British government with jurisdiction in Scotland as well as England over private enterprise except labor and land transport, which have separate ministries. It administers the laws regulating merchant shipping and those relating to wrecks, maintains a register of shipping, has charge of lighthouses, controls patents and trade-marks, weights and measures, administers the bankruptcy law, gathers important commercial statistics (including food prices and supplies) and authorizes municipal public utilities. It is a board only in theory; really it consists of a president and his staff. The president of the Board of Trade is usually a member of the Cabinet. (In the United States *board of trade* is not a government term but is sometimes used of local chambers of commerce.)

Board of Education, a local group in charge of schools, sometimes called *school board.* Usually there is a board for each school district, a county board and city and state school boards. In England *board* schools were those supervised by local boards elected by taxpayers; but in 1902 the school boards were abolished and local administration of schools was transferred to county and borough councils. The Board of Education in the British government is one of the great executive departments of the kingdom. Like the Board of Trade it consists of a president and his administrative staff. Its work is supervising, inspecting and co-ordinating the school machinery, making investigations and publishing reports.

Board of Health, the term applied to many state, municipal and local departments in charge of public sanitation and prevention of disease in the United States.

Board of Pardons, an advisory group in some states of the union sharing with the governor the right to pardon convicted criminals, or making recommendations to him on applications for pardon—an attempt to lessen the governor's power in this respect.

Board of Aldermen, the legislative power in many American cities.

Board of Estimate, in New York city under the charter of 1936 the administrative branch that must concur in all major legislation adopted by the Council to make it effective. It consists of mayor, comptroller (3 votes) president of the council (3 votes) and the five borough presidents with 2 votes each for the boroughs of Manhattan and Brooklyn and 1 vote for each of the other three boroughs. There are boards of estimate in other cities.

County Board, the legislative power in almost all counties of the United States including the parishes of Louisiana. A few counties in Virginia, California, Ohio, Texas and Nebraska have a county manager, selected by a board which is elected by the people; the manager appoints the principal county administrative officers. In some states there are *ex-officio* county boards, county judges and justices of the peace. Sometimes they are elected to represent the townships of the county; and sometimes they are elected at large from the whole county. In Connecticut the county boards (three members in each county) are appointed by the Legislature.

Federal Reserve Board (or Board of Governors), under the Act of 1913 setting up the Federal Reserve System, the eight members governing the system—two *ex officio,* Secretary of the Treasury and Comptroller General; and six appointed by the President with the consent of the Senate. The Board chooses three of the nine members on the governing board of each of the twelve Federal Reserve District Banks; and it supervises the Federal banking system and the banknote currency of the United States.

The U. S. Department of Interior has a Petroleum Advisory Board, and the Department of Labor has the National Labor Relations Board and also the Textile Labor Relations Board.

Bolshevik (plural Bolsheviki), from the Russian meaning members of the majority party, as contrasted with *Mensheviki,* meaning members of the minority party. The split developed at a meeting of the Social Democratic Party in 1903 over Lenin's theory advocating an armed revolution of the proletariat and a centralized party. The more radical members of the party followed Lenin and formed the Bolsheviki; and the more conservative members formed the Mensheviki under Martov. With Leon Trotsky, Nikolai Lenin returned to Russia in 1917, built up the Bolshevik strength and engineered the "rule of the proletariat," which developed into the Soviet Republics. The Bolshevist group is now the official Communist party.

Borough, originally the same word as -burg or -burgh meaning fortress in names of cities.

In Great Britain, a parliamentary district, the unit to elect members of the House of Commons. A *pocket* borough was one controlled by a single person or family, as if it were in his pocket. A *rotten* borough was one with a very few voters, represented in the Commons in spite of the small population. By the Act of 1883 a *county* borough (sometimes with different boundaries from the old-time county) with a population of 75,000 or more is represented in the Commons. There are about 256 *ordinary* boroughs in Great Britain, smaller municipal units, chartered by the Crown and controlled by the county. The Government of London Act in 1899 set up in London 28 metropolitan boroughs, each governed like an ordinary borough.

In Connecticut, Minnesota, New Jersey and Pennsylvania a *borough* is a special form of municipal government like an incorporated village or town in other states.

In the city of New York the five boroughs (Manhattan, Brooklyn, Queens, Bronx and Richmond) are the political units, each having been an independent city or county before 1898, when Greater New York was chartered.

Budget, an inclusive list of the proposed expenditures and expected receipts of an individual, business or government for a specified period, usually a year. The governmental budget system originated in England. The budget is submitted to the House of Commons as a Committee on Ways and Means in the annual financial statement of the Chancellor of the Exchequer. Although it is considered by the Committee of the Whole, no serious changes can be made in the budget without upsetting the Government and bringing about a general election.

In France each minister submits estimates for his own department. The Commission (or committee) of Finance passes on the budget; and this committee and the whole Chamber have power to alter the budget.

In the United States the business of government has only recently been put on a budget basis. The Budget and Accounting Act of 1921 created in the United States Treasury Department a Budget Bureau under a director appointed by the President but not removable by him. The President presents a budget to Congress with a special message something like the British Chancellor's budget speech. The material for the budget comes from the director of the Budget Bureau. Expenditures are checked by a General Accounting Office, directed by the comptroller general.

Six states—California, Louisiana, Maryland, Massachusetts, Nebraska and West Virginia—have constitutional provisions for a budget system; and all the other states have budgets now. The budget is made by the governor in California, Maryland, Massachusetts, Nebraska, Tennessee, Vermont and Utah, the tax commission in Louisiana, a department of finance (under a director appointed by the governor) in Illinois, a board of affairs in Wisconsin (governor, three appointees of the governor, secretary of state, two members from each house) and legislative committees in other states.

Municipal budgets in the United States preceded the Federal and state budget systems. In 1907 the New York Bureau of Municipal Research began to study budget methods. In city-manager municipalities the manager is usually director of the budget. In other cities the tendency is to give the responsibility of the budget to the mayor or to a smaller group than the city council or board of aldermen and to give the council power to reduce the budget estimate but not to increase it.

Bull Moose party, name applied to the Progressive party in 1912 when its leader, Theodore Roosevelt, declared that he felt "as fine as a bull moose."

Bureau, originally, a writing desk; then used of other furniture and of a business office, especially a minor business division of a government department.

In the French Government a *Bureau of Age* organizes each house of the French parliament when it first meets. The oldest member of the house acts as president and the six youngest members as secretaries. Then a Permanent Bureau is appointed—a president, four vice-presidents, eight secretaries and three questeurs—in each house to control procedure according to rule. The president of each permanent bureau has an important position in parliament and is a practical adviser to the president of the republic in cabinet crises.

In the United States Government there are over 50 bureaus, mostly divisions or parts of departments dealing with specialized activities. Some of the most important are:

In the Department of Agriculture, Bureaus of Agricultural Economics, Agricultural Engineering, Animal Industry, Chemistry and Soils, Dairy Industry, Entomology and Plant Quarantine, Home Economics, Plant Industry and the Weather Bureau.

In the Department of Commerce, the Bureaus of the Census, Foreign and Domestic Commerce, Standards and Fisheries.

In the Department of the Interior, the Bureaus of Indian Affairs, Education, Mines, Pensions and Reclamation.

In the Department of Justice, the Bureau of Investigation and the Bureau of Prisons.

In the Department of Labor, the Bureau of Labor Statistics, Children's Bureau and Women's Bureau.

In the Navy Department, Bureaus of Aeronautics, Navigation, Ordinance, Construction and Repair, Yards and Docks, etc.

In the Treasury Department, the Budget Bureau, the Bureau of Engraving and Printing (notes, bonds, postage stamps), the Bureau of Public Health Service.

In the War Department, the Bureau of Insular Affairs.

Outside of the departments is the independent Veterans' Bureau established in 1921 in charge of matters relating to the ex-service men in the World War.

Bureaucracy, government by bureaus, a term used to describe a narrow rigid form of government hidebound and not responsive to public opinion; or a government in which administrative officers like bureau heads control the entire government and dictate its policy instead of limiting their activities to their own bureaus or departments.

Burgess, originally a citizen of a borough and sometimes the representative of a borough in the English House of Commons. The lower house of the Virginia legislature was called the House of Burgesses in colonial times. The members of this house are now called delegates.

Burglary, originally breaking and entering by night into the dwelling-house of another with the intent to commit a felony. Now most states do not limit burglary to night or to breaking into a dwelling, and all states have extended the common law definition. But to constitute burglary, there must be *breaking into;* if the one who steals enters through an open door, the offense is not burglary. Opening a window to gain entrance is sufficient breaking into. The penalty for this crime is imprisonment up to twenty years.

Burgomaster, the title of the mayor of a borough or city in Holland, Flanders or Germany.

Business law or **Commercial law,** those parts of the law that are often and directly applied to the conduct and direction of business and to the problems and disputes arising and resulting therefrom; especially the law of partnership, corporations, agency, contracts, negotiable instruments, insurance, sales, guaranty, lien and bankruptcy.

By-election, an election to fill a vacancy, held at a time other than the regular date. Death in office or transfer to another office is the usual reason.

Bylaw, originally a local law, the rule adopted by a village or town (from *by,* Anglo-Saxon for village, as in place names like Derby and Rugby); and now the local or special rules of a society or corporation to govern details of procedure not covered by its constitution or charter.

Cabinet, originally little cabin or cage, a case or cupboard and, by extension, a small room. Then (as in the case of the words board and bureau) those who meet in a small room, a group of advisers, especially advisers to an executive.

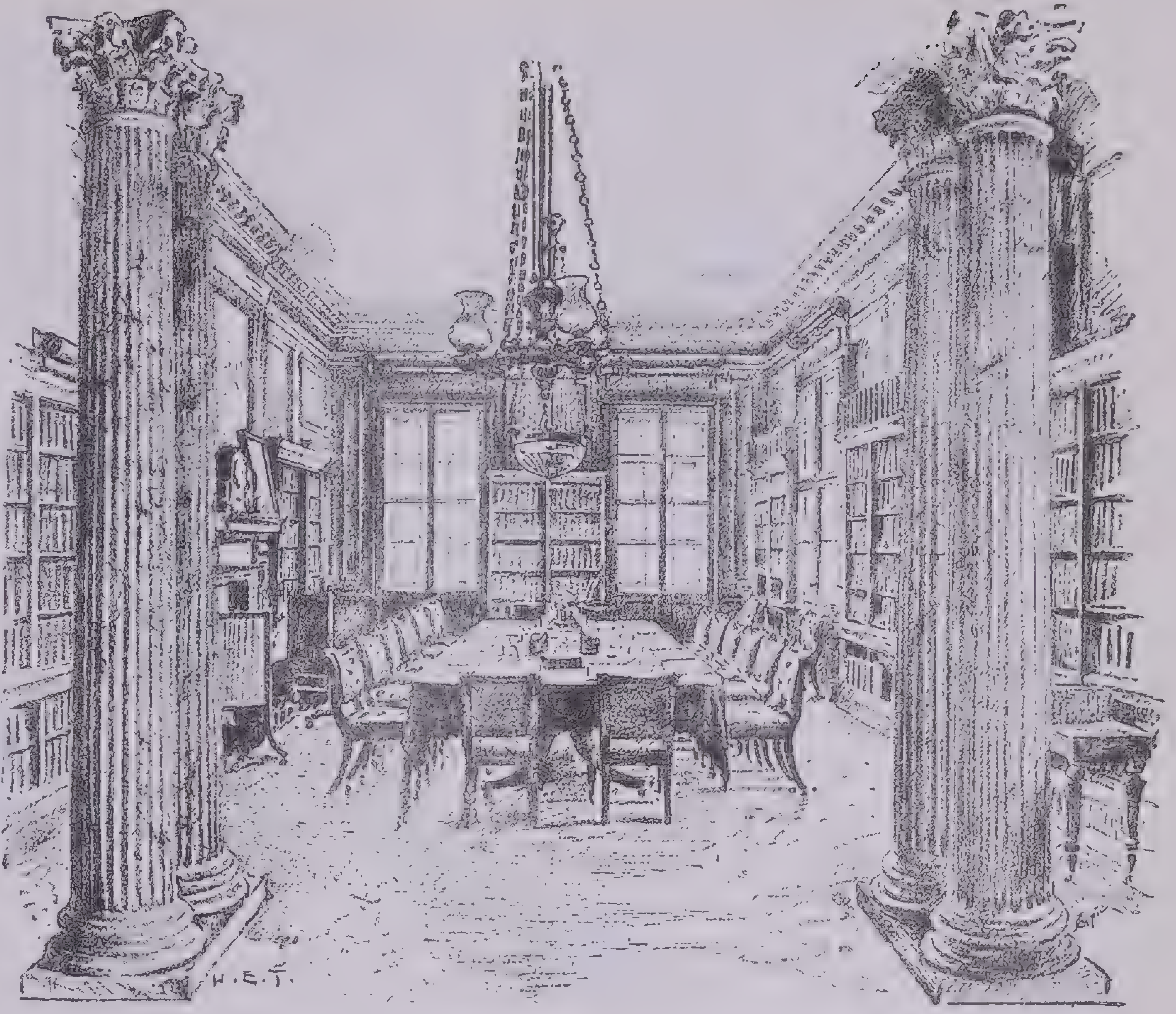
In both Great Britain and the United States the Cabinet has no constitutional authorization but is merely a matter of custom.

In England the Cabinet had its first beginning under Charles II (1660–85) when it became customary for the king to dismiss individual ministers who were objectionable to Parliament. William III (1688–1702), like Washington in the early part of his administration, first chose his ministers from both parties. But this plan did not work well, and in 1694 the king dismissed the Tory ministers and chose Whigs in their places. When the Tories became the dominant party, members of that party were chosen as ministers. Later the ministers began to meet together for purposes of conference with the king and consultation among themselves. In the years 1721 to 1742 under Sir Robert Walpole, an *inner cabinet* developed rapidly in importance, a small group (usually five) that was virtually in control of the Government.

In the middle of the 19th century the Cabinet took its present form and function. It is a group of the king's ministers (that is, heads of executive departments), all members of Parliament and responsible to the House of Commons; usually members of the majority party in the House of Commons and leaders of that party; always acting as leaders in legislation. All Cabinet members are members of the Privy Council and all are ministers. The Cabinet deliberates and advises; the Privy Council decrees; the individual ministers execute.

The life of a Cabinet depends on the favorable vote of the House of Commons. If the House votes against a Government measure (that is, one sponsored by the Cabinet), this lack of confidence may overthrow the Government and require a general election which chooses a new House of Commons. The decision to dissolve the house and call a new election lies with the Cabinet. If the new House has a different party in the majority, a new ministry (or Government) must be formed and a new Cabinet is chosen from it by the prime minister selected by the King.

Just what ministers or department heads shall be selected for the English Cabinet depends on the prime minister who is forming the ministry, on the personnel of the ministry and on other special controlling factors. The size of the Cabinet varies from ministry to ministry. During the World War it was small—for greater efficiency. From 1931 to 1937 the number of Cabinet members was, in successive Cabinets, 10, 21, 20, 22.



The English Cabinet Room at No. 10, Downing Street, London

Until the World War most English Cabinets had been composed of members of a single party, but during the war and in several Cabinets since the war different parties have been represented in the same Cabinet. Another innovation brought by the war is the Cabinet Secretariat, a staff that keeps records of Cabinet meetings—formerly only the prime minister was allowed to take notes (so that he might give information to the king)—and plans the detail of meetings and communicates Cabinet decisions to ministers.

In the United States the development of the President's Cabinet had no historical relation to the growth of the English Cabinet. The Constitution (Art. II, Sec. 2, Cl. 1) allows the President to "require the opinion in writing of the principal officer in each of the executive departments upon any subject relating to the duties of their respective offices." President Washington repeatedly asked for written advice (not always on matters connected with their departments) from department heads, especially from his Secretary of State, Thomas Jefferson, and his Secretary of the Treasury, Alexander Hamilton. These two, besides being department heads, were leaders of two diametrically opposed parties—so that their advice seldom agreed.

From an original group of four members—secretaries of state, war and treasury and the attorney general—the Cabinet of the President of the United States has now grown to 10, including in addition to the original members, the postmaster general and the secretaries of navy, interior, agriculture, commerce and labor.

Department heads were appointed by the President for his term of office. As the party system of government developed, the Chief Executive chose department heads only from his own party and the group of his advisers became a group of party leaders. Additional importance attached to the Cabinet when its members (in order of the establishment of the departments) were made the legal successors to the Presidency upon death of the President and Vice-President (Presidential Succession Act of 1886).

Like other presidential appointments, those of department heads are subject to the approval of the Senate, but this is usually granted as a matter of course. Members of the Cabinet in the United States have no legislative function—they are officially department heads and unofficially members of the President's administrative family or council, advising him and discussing with him only the matters that he chooses to bring before the Cabinet meetings. They are (also unofficially) leaders of the majority party, usually representing different parts of the country and different shades of political belief within the party. The Vice-President has sat as a member of the Cabinet since 1921, beginning with Calvin Coolidge.

Cabinet government in other countries varies from both the British and the American pattern. In France the Cabinet functions only in leading and planning legislation, but the Cabinet members need not be members of either house of parliament, and the overthrow of a Cabinet by the unfavorable vote of the Chamber of Deputies does not end the session of the House of Deputies—a new Cabinet can come into office without a general election. So the Cabinet is much weaker than in England and is the creature of the Lower House.

In Japan the Cabinet is not responsible to the Diet and the selection of the Cabinet need not follow the popular vote.

Cadets (from the initial letters of Constitutional Democrats), the abbreviated name of the Russian Constitutional Democratic party, mostly middle class, that backed Kerensky's government in 1917.

Candidate, one who offers himself or is put forward by others for appointment or election to office. The word is supposed to come from the same root as *candid,* meaning gleaming white; the explanation is that Roman candidates for office appeared in spotless white togas.

From the number of candidates the vote of the people or the appointing power of President or governor chooses the official. How are the candidates chosen in the first place? The method varies. Caucus or committee of party leaders is one type of candidate maker. Then came the convention, more definitely representing the members of the party. Direct choice by the party members is the most democratic form of selecting candidates, and this method is called the *direct primary.*

Canon law, a body of ecclesiastical law that originated in the Church of Rome, relating to matters over which the church exerts or claims jurisdiction. England has a sort of national canon law, but the canon law as a system of jurisprudence never was adopted in America. Canon law still is important in countries where the established state religion is Catholic.

Traces of canon law still remain in the common law of England and many states of the United States—notably the exemption of church property from taxation and exemption of clergy from military service or jury duty. Even as recently as a century ago the English Church courts had jurisdiction in certain cases over marriage, wills, brawling in church and defamation.

Canton, the local name of any of the 22 members of the Swiss Confederation, corresponding roughly to an American state. In France a canton is a subdivision of an arrondissement—more like a ward than any other American division. There are about 3,000 cantons in the French Republic.

Capital punishment, the penalty of death visited upon those guilty of the greatest crimes. The word *capital* is from the Latin, and means *pertaining to the head;* as beheading was the old legal method of taking life, we find in this fact the origin of the term *capital punishment.*

The crimes for which death is inflicted are not the same in all states. In Maine, Michigan, Minnesota, North Dakota, Rhode Island, South Dakota and Wisconsin life imprisonment is punishment for murder; but in North Dakota and Rhode Island a convict imprisoned for life who commits murder is punished by hanging. Treason to one's country is punishable by death; murder is thus punished in most states, and in some, abduction, arson and rape are capital crimes. In the states where the death penalty is imposed, the following methods are employed:

Hanging: Delaware, Idaho, Iowa, Kansas, Louisiana, Maryland, Mississippi, Missouri, Montana, New Hampshire, Oregon, Washington, West Virginia.

Electrocution: Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Massachusetts, Nebraska, New Jersey, New Mexico, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, Virginia.

Lethal Gas in an airtight chamber: Arizona, California, Colorado, Nevada, North Carolina, Wyoming.

Shooting or Hanging, at option of the prisoner: Utah.

In modern times capital punishment has been abolished in many countries in accordance with the present method of treating criminals, which stresses prevention, social causation and correction rather than punishment.

Cassation, annulment, quashing, making invalid, nullifying. The French Court of Cassation is a supreme court of appeal in ordinary court cases with three sections: *requests or petitions,* passed on to decide whether a civil case shall be heard on appeal; *civil,* deciding cases recommended by the petition chamber; and *criminal.* Each of these sections has a president. There are 45 other judges. A general president is in charge. When the court quashes or cassates the decision of a lower court, the case goes back for retrial to a lower court of the same grade as the one that first tried the case but not to the same court. Members of the court are appointed for life by the Council of State; the president gets 150,000 francs a year, the judges or councillors, 100,000 francs each.

Caucus (apparently a North American Indian word meaning talk, council or counselors), a party committee that plans policies and picks candidates. There was a Caucus Club in Boston in 1763. Between 1800 and 1824 party candidates for President and Vice-President of the United States were chosen by party members of Congress meeting "in caucus." This method was replaced by party nominating conventions. Congressional caucuses still select party members to serve on committees.

In England the Liberal party in Birmingham under the leadership of Joseph Chamberlain in 1867 was organized somewhat along American party lines with ward meetings of all voters of the party and with an active general committee. This method won three elections for the party and came to be called the *Birmingham caucus.*

In Australia the powerful Labour party decides its policy by caucus of party members of municipal councils, state or Federal legislatures. The official Labour party in Australia is sometimes called the *caucus.*

Caveat emptor (Latin, let the buyer beware), a maxim of English and American law that the buyer acts at his own risk in the sales of personal property, in the absence of an express warranty, where the buyer has had an opportunity to inspect the goods and the seller is guilty of no fraud and is neither the grower nor the manufacturer of the article sold. The tendency of modern regulative law is to lessen this risk and give more protection to the customer. The civil-law maxim *caveat venditor* (let the seller beware) is just the opposite principle to that of the common law.

Caveat (let him beware) is a formal caution or warning given to a judge or public official against the performance of an act or a notice given to an officer not to do a certain act until the party giving notice is heard. The phrase is used in the general sense of a precaution for self-protection.

Censorship, government restriction of freedom of speech and freedom of the press, the theater and other public agencies.

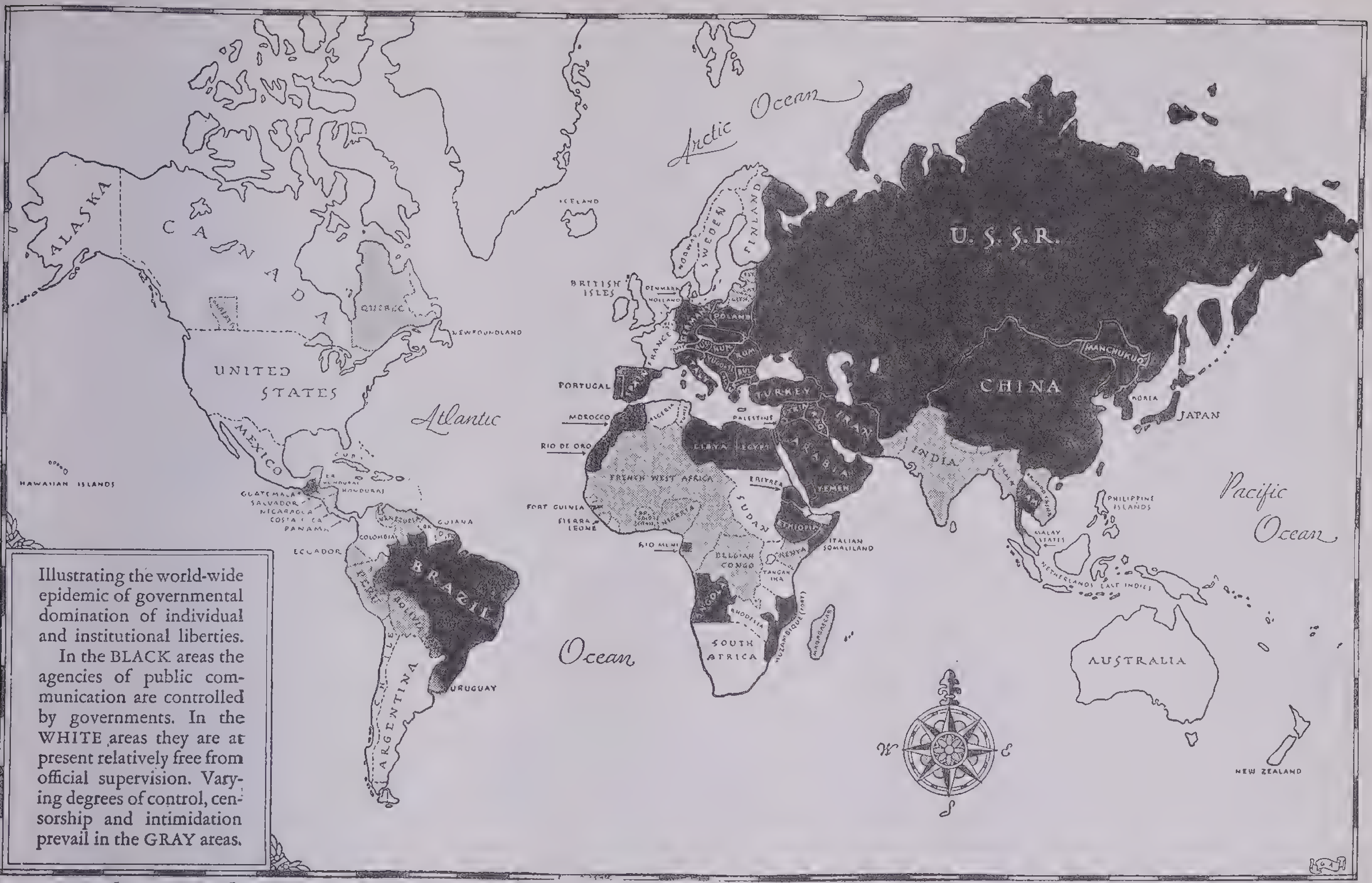
The word *censor* is Latin in its origin. Under the Roman Republic the office of censor was created in 443 B.C. to relieve the consuls of the duties of making the census or registration list. So *censor,* related to *census,* meant originally one who values or assesses. The two censors (like the consuls) had to agree if their action was to be authoritative. They could exclude any citizen from the official list on the ground of bad morals; and so censorship came to mean supervision of public morals. The early Roman emperors retained the title of censor.

In early American political history there was a *council of censors* in Pennsylvania from 1776 to 1790 and in Vermont from 1777 to 1870. It had power to investigate the operation of the state government. A convention was called by the Vermont council in 1870 to amend the state constitution by omitting the clause that created the council of censors.

The Government still exercises the police power that excludes from entry to the country undesirable visitors or immigrants on the ground of moral turpitude (baseness) or of enmity to the established form of government. But this power is no longer called *censorship.*

In modern times censorship usually applies to freedom of speech (notably in political matters); to freedom of the press—with the two main subdivisions, newspapers and books; and to control of the theater, motion pictures and radio broadcasts.

The attempts of government to control these different forms of communication are not the only kind of censorship, for there is a sort of control by the general feeling of the community, and besides there is the constantly exercised control of the publishers and owners of newspapers, magazines and books and of the proprietors of theaters, the motion-picture companies (individually and jointly) and the radio broadcasting companies. This self-


Arctic Ocean
Atlantic
Ocean
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ALASKA
CANADA
QUEBEC
NEWFOUNDLAND
UNITED STATES
MEXICO
HAWAIIAN ISLANDS
GUATEMALA
SALVADOR
NICARAGUA
COSTA RICA
PANAMA
HONDURAS
CUBA
ECUADOR
COLOMBIA
VENEZUELA
GUIANA
PERU
BOLIVIA
BRAZIL
CHILE
ARGENTINA
URUGUAY
ICELAND
BRITISH ISLES
DENMARK
HOLLAND
NORWAY
SWEDEN
FINLAND
FRANCE
POLAND
PORTUGAL
SPAIN
MOROCCO
RIO DE ORO
FRENCH WEST AFRICA
PORT GUINEA
SIERRA LEONE
NIGERIA
LIBYA
EGYPT
PALESTINE
TURKEY
IRAN
ARABIA
YEMEN
ERITREA
SUDAN
ETHIOPIA
ITALIAN SOMALILAND
KENYA
BELGIAN CONGO
TANGANYIKA
RIO MUNI
ANGOLA
RHODESIA
MOZAMBIQUE
MADAGASCAR
SOUTH AFRICA
U.S.S.R.
CHINA
MANCHUKUO
KOREA
JAPAN
INDIA
SIAM
PHILIPPINE ISLANDS
MALAY STATES
NETHERLANDS EAST INDIES
AUSTRALIA
NEW ZEALAND
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S

Illustrating the world-wide epidemic of governmental domination of individual and institutional liberties. In the BLACK areas the agencies of public communication are controlled by governments. In the WHITE areas they are at present relatively free from official supervision. Varying degrees of control, censorship and intimidation prevail in the GRAY areas.

Map prepared as a supplement to the report submitted recently by Dean Carl W. Ackerman of the Graduate School of Journalism, Columbia University

World-Wide Extent of Governmental Control of the Press, Radio and Other Agencies of Communication

censorship is very effective; it is based on the practical standard of self-interest.

Church Censorship. Government censorship arose largely out of the traditions of the Roman law and the activities of the Roman Catholic Church, which were in part based on the principles of Roman law. In 1515 the Lateran Council of the Church forbade the printing of any book that had not been examined by the proper Church authority. Permission to print, the *imprimatur* (Latin, let it be printed), was the positive side of the Church censorship; the negative side was the *Index Librorum Prohibitorum* (list of forbidden books), dating from 1546, revised in 1900, and the *Index Expurgatorius* (purifying list), which tells what must not be read unless it has been expurgated or freed from dangerous doctrine or subversive matter.

A less formal sort of ecclesiastical censorship today is the *white lists* of books and plays recommended to Catholics.

Censorship in Great Britain. In England after the Reformation the power of the Church to control the press passed to the Crown, and printing was licensed by the Star Chamber or other governmental authority. During the English Civil War the Long Parliament passed in 1643 a strict licensing act that was the occasion for John Milton's *Areopagitica . . . for the Liberty of Unlicensed Printing.* Under the Stuart kings before and after Cromwell licensing was strict, and the freedom of the press was seriously impaired. But in 1695, a few years after the accession of William and Mary, the licensing act was not renewed, and since that date the English press (both newspapers and books) has been famously free.

There is no corresponding freedom of the theater in Great Britain. An act of 1737 required all plays to be submitted to the lord chamberlain; an act of 1843 gave this official power to forbid the production of any play; and an act of 1924 gave him further power. For more than 3 centuries it has been forbidden to represent on the stage any living Christian king; and rules about royalty on the stage postponed the public presentation of Laurence Housman's *Victoria Regina* in London for several years after it appeared in New York, and then it appeared only on special permission from the Crown.

Freedom of speech in Great Britain is practically unrestrained by any censorship. Hyde Park in London is famous as the scene of soap-box orations attacking the British Government.

Censorship in America. In early Colonial America there was the same strict supervision of books and newspapers that prevailed in England under the Stuarts and the Protectorate. The governors licensed the few presses in the colonies up to 1730, and religious books were under censorship until 1695. Newspapers were frequently suppressed. In 1734 the trial of John Peter Zenger for libel marked one step toward freedom of the press as it established the doctrine that a jury shall decide whether there has been a libel.

The Bill of Rights in the original amendments to the Constitution of the United States begins with the words:

"Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press." (Article I).

Under the Constitution there can be no censorship of press or speech. But there is an old Latin proverb, *Inter arma leges silent,* that means constitutional guarantees vanish in wartime. In 1798 Congress passed the Alien and Sedition laws that permitted the President to deport editors of papers opposing the administration policy if they were aliens and that made it a crime to publish any attack on that policy. This exercise of censorship was a main factor in the speedy downfall of the Federalist party that voted these laws. But in other wars there have been similar removals of the Constitutional protection for freedom of speech and press. In the Civil War and again in the World War Congress and the Supreme Court made rules to punish those who criticized the administration and national policy. In 1920 Chief Justice Hughes recognized the extravagance of government censorship in wartime, saying: "We may well wonder whether constitutional government as heretofore maintained in this republic could survive another great war even victoriously waged."

Not merely war feeling but also any notably aroused partisan spirit is sure to result in some form of censorship. In the United States this censorship has recently been demonstrated in various local-government activities against meetings and parades of minority groups, whether labor unions, Socialists or Communists. In 1938 several municipalities, notably Jersey City, refused licenses to such meetings and practically prohibited the distribution of pamphlets or circulars by members of these groups—on the ground that the people of the community resented the activities of these groups, and so any public meeting or speaking in which they took part would provoke disorder and endanger the peace of the community.

Local censorship is applied in other fields. Though a Federal official has the say whether a book printed abroad may be excluded from the United States because it is obscene, and the Post Office Department can exclude a book or pamphlet from the mails, it is the local police officials who decide whether a book or magazine may be sold on the newsstands, and it is the local authorities who say whether a theatrical show or a motion picture may be exhibited.

Censorship in Totalitarian States. In countries where one party is supreme, where the one supreme party is the state, censorship takes an extreme form. All exists for the state and party, all is controlled by the party. Hence freedom of speech and freedom of press are impossible. The entire press of Italy is Fascist. Non-Aryan and anti-Nazi books are confiscated and burned in Germany. Charlie Chaplin's movie *Modern Times* was barred from the German movie houses. In Japan the Government attempts to censor and punish subversive thought. The totalitarian governments of Latin America exercise an equally complete censorship. Dictatorship and militarism both thrive on censorship—but the reason why is that dictatorship and militarism are one-party governments, and that tolerance and recognition of the rights of minorities are necessary to free speech and free press. The great dangers to free government today are: censorship that says, "You can't print that or say that" and propaganda that commands, "You must print this and you must say this."

Census, an enumeration or listing for taxation or other government purposes. In ancient Babylon, Persia, China and Egypt there were government censuses, some of them more than 4,000 years ago. At Rome population and property were listed every five years, and in 5 B.C. Augustus extended the Roman census to every part of the Empire, so Joseph and Mary, the mother of Jesus, went to Bethlehem to be taxed (Luke 2:1-5).

In 1085-86 William the Conqueror had a Grant Inquest of England made and the summary of this census appeared in the famous *Domesday Book.*

In modern times the first censuses were in French Canada (Quebec and Nova Scotia) in the middle of the 17th century. In the 18th century there were censuses in Sweden (1748), Denmark (1769) and Spain (1787). A census of the population of the United States is required every ten years by the Constitution (Art. I, Sec. 2, Cl. 3) to give a basis for representation in the House of Representatives and to apportion direct taxes. The first U.S. census was taken in 1790. The scope of the enumeration broadened with the inclusion of vital statistics and information on manufactures, agriculture, mining and fisheries. Since 1902 there has been a five-year census of electrical industries. From 1900 to 1920 a census of manufactures was taken every five years; after that, every two years. In 1929 the first two-year census of business was taken. The first unemployment census was made in 1937.

The Bureau of the Census, a part of the Department of Commerce, was established in 1902; before that a new organization was built up for each census. The Department of Commerce publishes census reports in full, summaries or compendiums, yearly volumes on statistics of birth and death and a monthly, *Survey of Current Business,* compiled by the Bureau.

Most states of the United States take a census every ten years, between the dates of the Federal census, that is, in years ending in 5.

In Great Britain the first general census was taken in 1801; it is decennial. In 1871 the first census of the British Empire was taken.

Centralization and decentralization of government, two opposed theories and practices. In England and most European countries administration is much more centralized than in the United States. The Dominion of Canada has provinces that are somewhat comparable to the states of the United States, and the provinces have their own legislatures; but their chief executive is a lieutenant governor not elected by the voters of the province but appointed by the Dominion authorities. The U.S. Constitution reserves to the states all powers not expressly granted to the Congress and the United States—a decentralized government. In Canada all powers not specifically given to the provinces are reserved to the Dominion Government—a high degree of centralization.

The French department and the English county or borough have none of the governmental independence that there is in the American state. Even in the United States, decentralized as government is here, there has always been a centralizing tendency, always a school of statesmen who believed that the Union should be stronger than it had been and the separate states should be weaker.

Party differences in the United States have centered (in theory, at least) on this controversy between strong central government and State rights. Hamilton wanted a strong central government; Jefferson was afraid that Hamilton's ideas would endanger the states and the liberty of the people. The party in power, whatever its name and its platform, has always been for the strong centralized government; the outs have almost always urged the preservation of State rights. Jefferson and Jackson, opposed in theory to strong central government, actually strengthened the Federal power when they were in office. And in much later times, under the pressure of national economic problems the leader of the Democratic party in the New Deal increased the powers of the Federal Government at the expense of the State rights that his party has so long upheld; and Mr. Roosevelt's Republican opponents have urged the need of decentralization—in theory, a party tenet of the Democrats.

Abroad centralization in government is on the increase. Before the World War the German Empire had its Länder, the kingdoms and duchies with their individual rulers and legislatures. Now those parts of the Reich are no longer government units.

Soviet Russia with power concentrated in the hands of Stalin and his immediate group is, in spite of that, an example of decentralization in the sense that the component parts of the Union of Socialist Soviet Republics, the separate republics, have their separate constitutions, "the right fully to secede from the U.S.S.R.," their own Council of People's Commissars and their own local Supreme Soviets.

Certiorari (Latin, to be certified, made more certain), a writ from a higher court to a lower, ordering the lower court to certify and return to the higher court the record in a particular case. It has been one of the most valuable and efficient remedies in the common law for correcting error.

Chamber, originally Latin *camera,* a vaulted room. The meeting place of the Italian lower house was called *camera* or *camara,* and the U.S. Senate meets in the Senate *Chamber.* By an extension it has come to mean those who meet in such a room, a branch of the legislature. A bicameral legislature has two chambers, two branches, the upper and lower.

Chamber of Deputies is the name of the Lower House in most Latin countries—France, Rumania, Brazil, Chile and others.

Chancellor, originally a clerk who sat at a chancel or latticed window and now a title of various high officials. The king's chancellor in England was a secretary of the king with special powers which gave rise to the system of chancery courts where petitioners came for equity that they could not find in courts of law. The *Lord Chancellor,* formerly head of the chancery court, now is president of the chancery division of the High Court of Justice and of the Court of Appeal.

A more important English official is the *Chancellor of the Exchequer,* practically a minister of finance, always a member of the House of Commons (since money measures must originate in that house) and of the Cabinet, in which he is often prime minister. Among the great chancellors of the exchequer were: Robert Walpole, William Pitt, W. E. Gladstone, Stanley Baldwin and Neville Chamberlain.

In Germany the prime minister has the title of imperial chancellor. Hitler's title is leader and chancellor.

In the United States, in states that have a distinct system of equity courts, chancellor is the title of an equity judge and particularly of a presiding judge distinguished from the other equity judges who are called vice-chancellors.

Chancery or **Court of equity,** a court where equity jurisprudence is administered. Equity as a particular judicial system developed in England and was adopted in America with various statutory modifications. The system of equity that first appeared about the middle of the 14th century developed because many cases arose for which there was no remedy at the common law. Petitions seeking relief in such cases were made to the king who usually referred them to the chancellor. Later the petitions were addressed directly to the chancellor and a separate and distinct judicial system developed outside of the common law. The controversy between these two courts raged for two centuries but finally in 1616 the prerogatives of the equity courts were affirmed by royal decree.

Much of the English equitable jurisprudence was taken from the Roman civil law, since the early chancellors were officials of the church and learned in the canon law. Now equity courts no longer administer a sort of "natural justice" unhampered by any rules. Instead the courts of equity have become as hidebound as the common-law courts by rules of procedure and the principle of *stare decisis.*

In 1873 the rules of equity in England became a part of the law of the land and special equity courts were abolished, the chancery becoming a chancery division of the high court of justice.

The states of Alabama, Delaware, Mississippi, New Jersey and Tennessee have separate chancery courts; in the other states and in Federal courts the same judges hear cases at law and cases in equity.

Chancery courts originated the *injunction,* an order or a prohibition, and other methods of making a person do something for the benefit of a plaintiff besides pay money damages, which formerly had been practically the only redress at law for wrongs to person or property.

Charter, originally a little paper, from Latin *cartula,* diminutive of *carta;* hence, any legal document, deed or conveyance. In this sense the word is now used only in the phrase a *ship's charter,* meaning the lease of a vessel.

The many present uses of the term *charter* all agree in meaning a grant from a sovereign power. The *Great Charter* (Magna Charta) of 1215 wrung from King John by the barons is the most famous of charters.

The *charter colonies* in America (Massachusetts, Connecticut and Rhode Island) had royal charters for their government without any direct interference from the Crown such as the Crown colonies had.

A *chartered company* in Great Britain is a corporation with a special charter. The East India Company and the Hudson's Bay Company were chartered companies, and in the last two or three generations the chartered company in England became as popular as the corporation in America. In both countries a certificate of incorporation is called a *charter,* and a member of an association from its beginning is called a *charter member.*

A *chartered accountant* in Great Britain is a member of a certified association, roughly equivalent to the American certified public accountant (C.P.A.).

The *People's Charter* of 1838 in England was the summary of demands made by the *Chartist* reformers who wanted universal male suffrage, vote by ballot, annual parliaments and no property qualifications.

In the present system of local government in England new boroughs must be chartered by an order in council or by an Act of Parliament.

In American local government cities and other municipalities are usually chartered by the state legislature; but the home-rule movement attempts to take this power from the legislature and give it to the voters. In Missouri the state constitution of 1875 gives each city over 100,000 in population the right to frame its own charter—so that the charter is no longer a grant from a sovereign power. Arizona, Arkansas, California, Colorado, Florida, Maryland, Michigan, Minnesota, Nebraska, New York, Ohio, Oklahoma, Oregon, Texas, Washington and Wisconsin have made similar provisions for home-rule charters.

The Fascist *Charter of Labor,* proclaimed in April 1927 by the Fascist Grand Council of Italy, claimed for the Government control of labor and granted workers a six-day week and an annual vacation with pay.

Chattels (from the Norman French, meaning goods of any kind), a broad term denoting any property, movable or immovable, that is less than a freehold. Chattels are divided into two classes—chattels real and chattels personal.

Chattels real are interests that are annexed to or concern real estate and are less than a freehold. A lease of land for years is a chattel real.

Chattels personal are things that are movable and may be taken from place to place, such as animals, furniture, automobiles or clothing.

A *chattel mortgage* is a conveyance of some present legal or equitable right in personal property usually as security for a debt, but it may be as security for the performance of some act. In some states a chattel mortgage operates as a transfer to the creditor of title to the goods on the condition that if the debt is paid or the act performed title will revert to the debtor. In other states the mortgage is treated as security only. Title to the property does not pass; there is only a lien on the property. In either case the debtor retains possession of the goods unless he fails to pay the debt due, when the creditor may take possession of the property.

Checks and balances, the precautions against too great concentration of governmental authority in any one division of government. Some of the compromises of the Constitution resulted in balancing one interest with another: for example, the Senate represents the states and the Lower House represents the people. The power of vetoing legislation gives the President and the governors (of all states except North Carolina) a check on the legislative branch. The President's appointive power is checked by the requirement that his appointments must meet with the consent of the Senate. The power of the Supreme Court to declare Federal or state laws unconstitutional is a check on Congress and the state legislatures and is a control between Federal and state authority.

This whole American governmental system of checks and balances may be called a check and balance on the American theory of sharply separated governmental functions into executive, legislative and judiciary.

Cheka, abbreviation from the initials of *Cherezoychainya Kommisiya,* literally extraordinary commission, the agency set up in the autumn of 1918 to combat counterrevolution in Soviet Russia. This branch of the secret police was replaced in 1922 by the State Political Department (G.P.U.).

Citizenship, membership in a nation or city with consequent allegiance to its government and the right of protection by that government. Citizenship does not automatically or necessarily confer suffrage (right to vote) or other political rights; its rights are civic, and the department of political science that deals with the duties of citizens and the rights of citizenship is called *civics.*

A state defines citizenship for itself, and so the theories of citizenship vary in different countries. Nations that follow the Roman Law, such as France and Italy, follow the theory of *jus sanguinis,* which is that citizenship is determined by the nationality of the father, or if the child is illegitimate, by the nationality of the mother. England follows the theory of *jus soli,* that the nationality is determined by the place of birth. The United States applies both theories: *jus soli* to all children born in the United States; and *jus sanguinis* to children born of Americans traveling abroad, if the children return as minors to live permanently in the United States or make a declaration of citizenship at majority. Due to this difference between countries, it frequently happens that a person has dual citizenship, that is, he is a citizen of two nations.

Citizenship in the United States is acquired by birth or by naturalization. The 14th Amendment (1868) to the Federal Constitution declares: "All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside." Children of

U.S. citizens born on foreign soil are citizens. Aliens who are free whites (that is, full-blooded Caucasians) or of African descent may be naturalized, but not aliens of Japanese, Chinese or Hindu races. An Act of 1922 (amended in 1930 and 1934) makes a wife's citizenship independent of her husband's: an alien who marries a U.S. citizen does not become a citizen by reason of the marriage; and marriage to an alien does not deprive a woman of her U.S. citizenship—she may give it up only by a formal renunciation.

Citizenship by naturalization is presumed to lapse upon two years' residence in the country of original allegiance or five years' residence in any other foreign country.

City, in the United States, a local government unit with a larger population than a village, town or borough, but (like those units) governed by a charter granted by the state legislature.

In Great Britain large municipalities formerly were not cities unless they were cathedral towns, but this distinction no longer holds. The British cities and other municipal government units are governed by the provisions of general Acts of Parliament with only an occasional special law for the government of a single city.

In the United States there is little uniformity of government even in cities in the same state and of the same size, since the state legislature grants individual charters. If the charter originates with the city itself, it is called a *home-rule* charter.

American city governments, though they differ in many details, may be classed under three main heads—(1) mayor-and-council type; (2) commission plan; and (3) city-manager plan.

(1) Government by *mayor and council* is the older method with one executive and a legislature and administrative body, all elected by the people. Sometimes, in addition to the council there is a board of aldermen, so that the municipality has a two-chamber legislature. Most of the larger and older cities of the United States are governed this way, usually under a system of party elections. The city of New York under the charter of 1936 elects members of the Council by proportional representation.

(2) *Commission government* is by an elected board of three, five or seven members, each of whom becomes head of a city department. The general principle is the concentration of legislative and administrative powers in a small body. Commissioners are often elected on a nonpartisan ballot, and sometimes there is provision for recalling a commissioner. The method was adopted as an emergency measure in Galveston, Tex., during a severe flood, and the commissioners were appointed by the governor. The courts decided that this was unconstitutional, and then the commissioners were elected by the voters of the city not from districts but at large. Des Moines, Iowa, adopted a commission plan in 1907; Spokane, in 1911; New Orleans, in 1912; Jersey City, N. J., Portland, Oreg., in 1913; Newark, in 1917; and Omaha in 1923. Comparatively few cities have adopted the commission form of government since 1934; and some cities that had it gave it up and returned to the mayor-and-council form—for example, Buffalo (1916-28), Denver (1912-16), Lowell (1911-20).

(3) The city-manager government started in small cities in the South—Staunton, Va., in 1908, and Sumter, S.C., in 1913. It centralizes responsibility in a manager, usually a technical expert, who is hired by the city council or the city commission—that is, the system can be combined with either of the systems already mentioned. Often the manager comes from the outside. His post is not considered political but administrative like the head of a business organization. The larger cities that have managers are: Cincinnati, beginning in 1926; Kansas City, Mo., adopted in 1926; Rochester, N.Y., since 1928; Dayton, Ohio, after the flood of 1913.

City manager, see *City.*

City planning, private or public effort to improve the physical layout of a municipality for general welfare and better health and for the improvement of traffic conditions. Even in the New World most cities are a result of careless growth with unfortunate results from the sudden (or at least unforeseen) changes brought by developing industry and such revolutions in transportation as have been wrought in the last century by railroads, automobiles and airplanes. Industry has often built factories in residential sections, and as a result middle-class residences deteriorated into shabby crowded tenements for workers. The part of town along the railroad tracks in many cities is appallingly dirty and forbidding—and it is what a visitor first sees if he arrives by train. Auto traffic, both trucks and passenger cars, pack narrow city streets to a danger point.

Gradually city governments, here and abroad, have undertaken to remedy this situation. Before 1875 German and Swedish cities had adopted *zoning* laws that limited the height of new buildings. New York in 1916 adopted a zoning resolution: the straight vertical height of a building is limited by the width of the street—on the principle that congestion depends on size of building and narrowness of street. Another reason is to secure light and air. In residence zones, a building height may not be more than one time the street width; in residence-and-business zones, the maximum height is one and a half times the street width; in business centers, twice, and in financial districts, two and a half times the street width. Additional stories above this minimum vertical height must be set back, and at any point the building must be back of an imaginary line from the center of the street to the top of the first straight vertical height. Towers may not have a floor area more than 25 per cent of the whole lot occupied by the building.

More thoroughgoing than zoning are city plans that lay down general rules for the present and make elaborate blueprints for the future. In 1907 a plan was adopted for Chicago and a city-planning commission was created for Hartford, Conn. By 1930 two-thirds of the cities in the United States with 25,000 population or more had city-planning commissions. The New York city charter of 1936 provides for a city-planning commission of six members appointed by the mayor. City plans now include such items as: parks and boulevards, traffic control, reduction of congestion, building express thoroughfares for trucks and for passenger cars, terminal facilities for freight and passengers, fire, sewer and water control and planning the city's outlying regions. A regional survey of the New York metropolitan area was completed in 1929; it covers an area of 5,528 square miles.

City-plan commissions are usually nonpartisan and the members are appointed by the mayor or by the mayor and council. Regional planning often involves co-operation of different municipalities and even states—as in the Port of New York Authority, New York and New Jersey commissioners to co-ordinate traffic and transportation in the metropolitan area. During the public-works activities of the New Deal long strides were made in carrying out city plans, as Federal funds were made available for housing and similar improvements.

Civil death, the state of a person considered dead insofar as his civil rights are concerned, although he may be actually living. The property of a person civilly dead passes to his heirs as though he were physically dead. In some jurisdictions a person who has been convicted of murder or certain other serious crimes and sentenced to life imprisonment is civilly dead.

Civil law, in early times the law governing the citizens of the particular state (*jus civile*) in contrast to the law applied in cases between citizens of different states (*jus gentium*); in the Middle Ages the Roman law of Justinian's Pandects as distinguished from the canon law of the Church; the law governing private relationships in contradistinction to the law governing public relationships; in present English usage those legal systems based on the Roman law in contrast to the common law. The civil law governs in all Europe, except England, and in those countries that were once colonies of European Powers. Thus this usage of the term *civil law* includes the law of such nations as Germany where the original Teutonic law was influenced by the Roman law, especially during the 16th century.

Civil service, the duties of all government employees not in the army, navy, legislative or judicial branches of the government; and (by extension) the whole body of civil servants. The phrase originated in India when that country was ruled by the British East India Company: the civil service of India then was the company's civilian employees, that is, those not in the army or navy.

In Federal, state and municipal governments the civil service breaks into two divisions: political appointees and those chosen on the basis of competitive examination or other set standards. *Civil service reform* is the effort to have no partisan, political appointments. An Act of Congress in 1883 created a Civil Service Commission of three members, appointed by the President with the consent of the Senate, not more than two to belong to the same party, to control examinations and appointments. The *classified* civil service, coming under the Commission, included in 1883 about 14,000 Federal employees and now includes 45 or 50 times that number.

In the states there is still a considerable predominance of political appointments. In three-fourths of the states the civil service is filled with partisan employees who may be turned out after an election that is favorable to the other party. The general methods of the Federal civil service are paralleled in California, Colorado, Illinois, Maryland, Massachusetts, New Jersey, New York, Ohio and Wisconsin. Appointments are by competitive examination for most posts and by noncompetitive examinations for employees in certain crafts. Some posts are *exempt* from examination—deputies, chief clerks and some laborers.

Municipal civil service in the United States is coming under the control of commissions, usually of the city but sometimes of the state, which conduct examinations and make appointments.

In Great Britain the civil service is distinctly nonpolitical, permanent and (in comparison with our civil service or with the British ministry and department heads) technically expert. A civil servant is not permitted to be a candidate for political office, to serve on a party committee or to take any active part in politics.

In Germany under the old Empire the civil service was excellent, highly professional in its training and quite free from political taint. The Nazi regime has made loyalty to the party the test of civil fitness—but loyalty to the party is the current definition of loyalty to the German Government.

Closure rules, regulations limiting (literally closing) debate in a legislative body. In the U.S. House of Representatives it is always in order to move the previous question (that is, whether the discussion of the main issue shall be terminated and the matter brought to a vote); if the measure is carried it bars further debate and the question is then voted on. Another House rule, adopted in 1841, limits any member to one hour in debate on any measure, and a later rule forbids any but the mover, proposer or introducer of a measure to speak more than once on the same issue. Since 1806 the U.S. Senate has had no rule giving the right to move the previous question. In 1917 a rule was passed by which a two-thirds vote (after a petition signed by 16 Senators) may adopt an hour limit on speeches upon a certain measure. This closure is seldom used.

In the English House of Commons there are these methods of closure: *simple,* by motion carried that "the question be now put"; *guillotine* closure, by motion carried that debate end at a certain time, chopping off the discussion; *compartment* closure, by setting a limit on debate upon a certain part of a bill; and *kangaroo* closure, the selection (by the Speaker or the Chairman of the Ways and Means Committee) to single out the only amendments that may be discussed—jumping like a kangaroo from one to another.

Code Napoleon, the system of civil law, really the Five Codes compiled for the French nation by order of Napoleon Bonaparte after he became emperor and enacted between 1804 and 1810. It combined the principles of the Justinian Code and Roman law in general with the Germanic law of the northern provinces of France and certain principles resulting from the French Revolution. The Napoleonic Code became the basis of the laws of the Netherlands, Belgium, Louisiana, which was a French settlement, and the Province of Quebec in Canada.

Codes, systematization and orderly arrangement of the complete body of the law. Codes have been common in the development of Roman law and civil law—not in the history of English and American law. The British adopted a penal code for India in 1860 and other codes later. Seven states of the United States have reduced their laws to code form, and Louisiana since 1808 has had a code of civil law resembling the famous Code Napoleon. Other states and the Federal Government have compiled statutes in a form to which the term code is applied in a broad and general sense. California and the two Dakotas have attempted to codify the whole body of law. In New York codes on special topics—lien law, general business law, real property law—have been enacted as statutes. Codes of procedure are common in the United States, beginning with the important pioneer work of the New York code (often called the *Field Code* from its main author David Dudley Field 1805-94), which was adopted in 1848.

Coinage, the government's power of coining money; in the United States granted to Congress (Art. I, Sec. 8, Cl. 5) and denied to the states (Art. I, Sec. 10, Cl. 1). United States mints are located in Philadelphia, Denver and San Francisco.

In 1873 Congress stopped the coinage of standard silver dollars, and in 1900 the money system of the United States was put on a gold basis. In 1933 Congress called gold into the Treasury, ceased to coin gold and made contracts to pay in gold no longer binding. In 1934 the value of the dollar was reduced to 59.06 per cent of the previous gold content.

Colony, a territory away from but belonging to one of the independent and generally powerful countries of the world. Distant from the mother country, it remains dependent upon or protected by it in various ways. The word *colony* is derived from the Latin *colere,* meaning to cultivate.

A colony is nearly always established in a region that is in a less advanced state of civilization. The purpose of colonization is to relieve overpopulation in the mother country, to exploit natural resources that have previously been ignored or used only in part or to further the interests of the mother country through agriculture and commerce. The Italian military colonization of Ethiopia is a modern illustration.

Use of the term *colony* assumes the presence of colonists, that is, a group of citizens transplanted from the mother country. Usually such a population is supplemented by immigrants from other countries who are attracted to the colony by the new and broader opportunities that it offers. Both colonists and native inhabitants are under the jurisdiction of the mother country, although they usually have a voice in some form of colonial government, such as a partly or entirely elected legislative assembly.

The Phoenicians had colonies: Carthage in north Africa became as large and powerful as Sidon and Tyre in Phoenicia. The Greek mother city (metropolis) sent out colonies called *apoikiai,* literally away from home. The Roman colonies followed Roman conquests and established little islands of Roman culture in Britain, throughout Spain and in France, Germany and the Balkans.

In the era of discovery colonies became increasingly important—in the New World, in the Far East, in Australia. Spain, Portugal, the Netherlands, France, Sweden and (above all) England built up a colonial empire. Our United States of America grew out of England's thirteen American colonies.

In the middle of the 19th century another colonial period began as Africa was opened up to Europeans and divided among the European Powers. There was much injustice to natives as a result of this colonizing, just as there had been in the 16th century when land was taken from the American Indians. The Treaty of Versailles (1918) took from Germany her colonial possessions in Africa and the Orient, gave some to the victorious Powers and gave others as mandates to certain trustees for the League of Nations. The return of the German colonies has been suggested as a means of preserving world peace through placating Germany.

The great colonial Powers today in order of the size of their colonies are Great Britain, France, Portugal, Belgium, the Netherlands and Italy.

The British colonies are administered by the Colonial Office under a Secretary for Colonies. Before 1925 this office administered all parts of the Empire outside of Great Britain and Ireland. Then a Secretary for Dominion Affairs was appointed and the Colonial Office was limited to colonies, protectorates and mandates. The British colonial policy is to give colonies as much self-government as possible. The British Crown colonies of Nigeria, Sierra Leone, British Honduras, Malta and Ceylon, for instance, are administered by governors, commissioners or other officials appointed by the Crown and responsible to the Colonial Office. These officials may be assisted by executive, advisory or legislative councils, nominated by the Crown. Many of the British dependencies are both colonies and protectorates.

The administration of the Dutch colonies, such as Netherland India and Dutch Guiana, is intrusted to a governor general whose power is curbed only by the States-General.

France attempts to assimilate the culture of the native peoples where she has colonies, and French colonization, almost all since 1880, has been much more definitely and completely under government control and initiative than the varied colonization by England since the early 17th century. A French Ministry of Colonies, established in 1894, administers and supervises the French colonies except Algeria, which is under the Ministry of the Interior and is actually governed much as if it were in Europe and a part of France proper, and Tunis and Morocco, which are more like protectorates and are administered by the Minister of Foreign Affairs.

Commerce, Department of, one of the divisions of the Executive Department of the United States, whose chief, the Secretary of Commerce, is a member of the President's Cabinet. The department was organized "to foster, promote, and develop the foreign and domestic commerce; the mining, manufacturing, shipping, and fishing industries; and the transportation facilities." It was the Department of Commerce and Labor from its organization in 1903 until 1913, when the new Department of Labor was established. In the Department of Commerce as now organized are the bureaus of Foreign and Domestic Commerce, Standards, Lighthouses, Coast and Geodetic Survey, Census, Fisheries, Steamboat Inspection Service and Navigation and the Patent Office.

Commercial law, see *Business law.*

Commissar or **Kommissar,** the Russian equivalent of our word commissioner, in the present Soviet Government the head of a commissariat or government department either in a union republic or in the Union of Soviet Socialist Republics. The commissar heads a collegium or committee that is responsible for the work of the department. In the U.S.S.R. and in each Union republic the highest executive and administrative organ of state power is the Council of People's Commissars. In the administration of the U.S.S.R. there are two types of commissariats—one, the All-Union People's Commissariats, administering throughout the whole U.S.S.R. defence, foreign affairs, foreign trade, railways, postal and electrical communications, water transport, heavy industry and defence industry; and the other, the Union-Republican People's Commissariats, operating through similarly named commissariats in each republic the food, light and timber industries, agriculture, state grain and livestock farms, finance, internal trade, internal affairs, justice and public health.

Commission, authority to act for a particular purpose, as an army officer's commission or a notary public's commission or the commission merchant who buys or sells on special orders and is paid on commission; and then by extension power that is delegated to a group of board also called a commission.

In the Federal Government several boards with powers given by Congress are called commissions: the Interstate Commerce Commission (1887), the Civil Service Commission (1883) and the Federal Trade Commission (1914).

Some subdivisions of the Federal departments are headed by *commissioners.* In the Treasury Department there are commissioners of public debt, internal revenue, narcotics and customs. The Department of the Interior has a commissioner of education, one of Indian affairs, one of general land office. The patent office in the Department of Commerce is under a commissioner. In the Department of Labor there is a commissioner of immigration and naturalization and one of labor statistics.

Commission government, see *City.*

Committee, a group to whom a matter is entrusted or committed, particularly a group in a legislature with specific duties in examining, drafting and recommending bills for action by the entire legislative body. The small groups expedite the business of the whole house. This sort of legislative machinery seems to have originated in the English Parliament.

In the Congress of the United States and in the different state legislatures all bills are referred to committees, and no measure comes before the House unless it is favorably reported by the special committee that deals with that type of bill. In the House of Representatives a measure that is buried in committee (that is, not reported by the committee) can be brought to the attention of the House only on petition with signatures of 218 members (out of a membership of 435). Committees hold hearings on bills and sometimes conduct investigations on order of the House. The membership of committees is by parties, the majority party having the most members on each committee and supplying the chairman or head of the committee. Often the majority members of a committee meet and make plans without consulting the minority members, so that committee recommendations are likely to be partisan. Membership usually goes by seniority in the House: the older members are put on the more important committees and the chairmen are usually members of the longest service. No U.S. Senator or Representative serves on more than two important committees. The choice of committee members is nominally made by the House itself; actually the members are named by the party managers or by a party caucus. The House of Representatives has 45 committees with 21 to 35 members on each. The most important of the committees in the House of Representatives is the Committee on Ways and Means, dealing with revenue bills which must originate in this House. It has 22 members and its chairman is the majority leader of the House. Other House committees are: appropriations, rules, banking and currency, commerce, rivers and harbors, military affairs, naval affairs, post offices, public lands, labor and pensions.

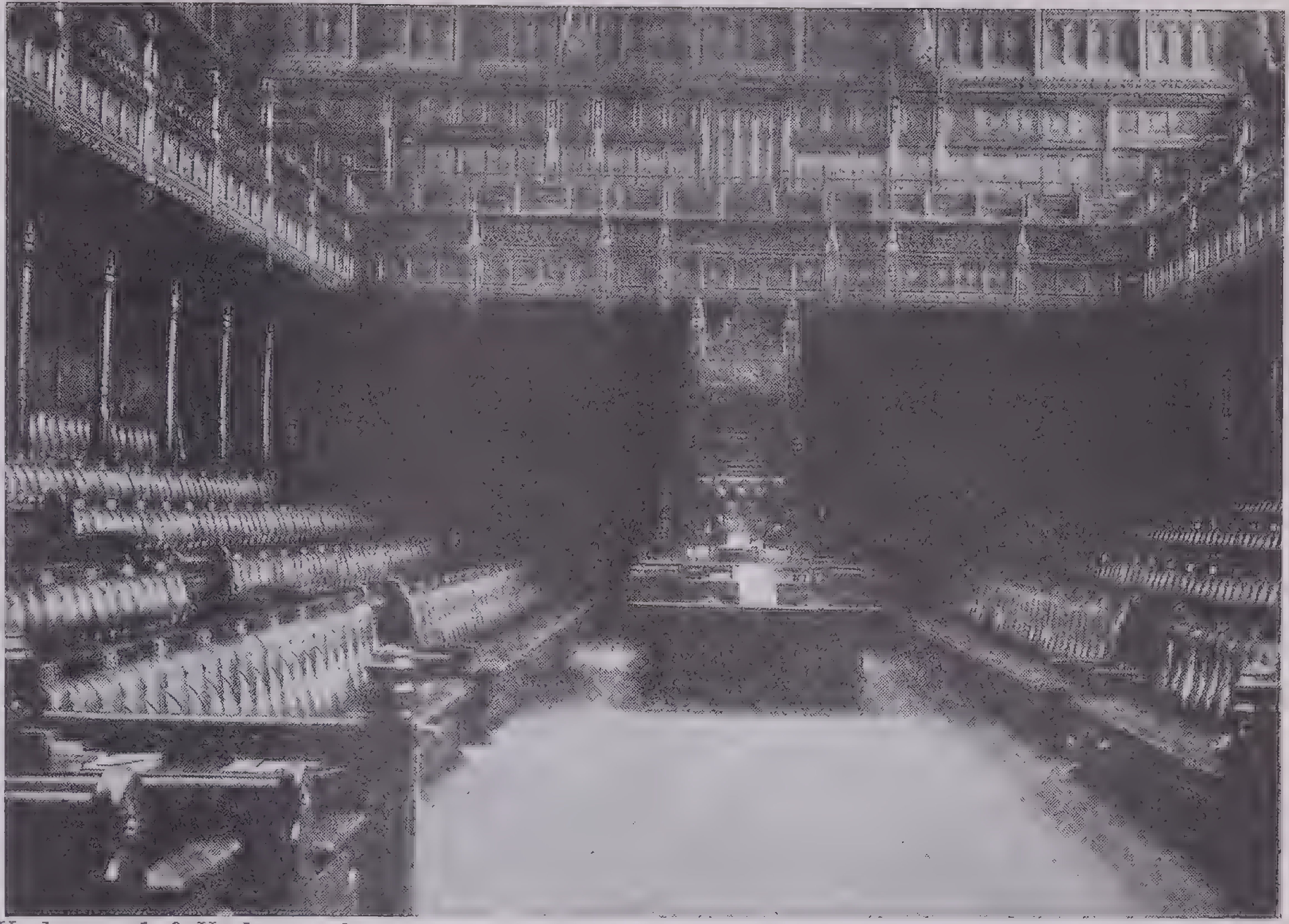
The U.S. Senate has 30 standing committees, each with 12 to 30 members. The Finance Committee in the Senate corresponds to the Ways and Means Committee in the House but has less power. The Senate Committee on Foreign Relations and that on Judiciary are particularly powerful because the Senate has powers that the House has not in foreign affairs and in approving judicial appointments. The Senate with its smaller membership and longer term of service for each member relies on committees less than the House of Representatives.

The *committee of the whole* is a peculiarity of parliamentary law. It is a meeting of the entire legislative body under committee rules that are less formal than those of the legislature, and it has a committee chairman in the chair instead of the regular presiding officer of the Chamber.

In the American state legislatures the system of committees is much the same as in Congress. A notable exception is the Massachusetts General Court (state legislature), in which committees must report back all bills. In the Nebraska Senate, the one-chamber legislature that first met in 1937, a much simplified system of committees was used with only 17 committees instead of the 70 in the former two-chamber legislature.

Steering committee is an unofficial but important group in a legislative body headed by the majority party's floor leader and composed of the more important members of the party. The group guides and manages the business of the House.

The English House of Commons is the source of the committee system. All money bills and all confirmations of provisional orders issued temporarily by government departments come before the House sitting as the Committee of the Whole House. When it considers appropriations the Committee of the Whole is called Committee of Supply (or House in Supply); and when it considers revenue measures it is the Committee on Ways and Means—which explains the use of that term in the U.S. House of Representatives. The House of Commons has four grand committees or standing committees, known by the letters A to D inclusive, and a fifth, the Committee on Scottish Affairs. They are not representative of party strength in the House, and they differ besides from American standing committees because they do not deal each with a specific type of legislation.



Underwood & Underwood

Interior of the House of Commons

To the right of the Speaker's chair are shown the benches for the Government, with the Ministers' seats in front. To the left are the seats of the Opposition with their leaders likewise in the first row—the parties' leaders are thus known as *front-benchers.* Above the Speaker's seat is the reporters' gallery, and above the reporters' gallery is the ladies' gallery. Opposite the Speaker's seat are the Peers' Gallery (right) and the Ambassadors' Gallery and seats for Distinguished Strangers (left) and behind these the Strangers' Gallery. *Division Lobbies,* into which members go to be counted when a vote is taken, are on either side of the House. The *Ayes* go to the west lobby, the *Noes* to the east lobby

The House of Commons has about 20 *select* committees, each of 15 members, to investigate specific topics; members are usually named in the motion that proposes the committee. In the House of Commons all measures referred to committees must be reported out—there can be no burial in committee as in our Congress.

In the French parliament, the House of Deputies has 19 *grand commissions* or standing committees, each with 44 members representing proportionally the different political groups in the House; and the Senate has 12 committees, each with 36 members. Each committee has a *rapporteur* who brings the committee's report to the Chamber and is responsible for the passage of the bill.

In the organization of American political parties the committee is important. National political campaigns (for presidential elections and elections to Congress) are planned and run by a national committee for each party, composed of two members, one man and one woman, from each state and headed by a chairman and a treasurer who are sometimes not chosen from the membership of the national committee. In the different states there are different methods of choosing national committee members—by primary elections of party voters, by party convention or by party state committees. The party state committee has members from each county (each town in New England) or from each congressional district, and these members are chosen by a county committee of the party by party primaries or by local conventions.

Common carrier, one who undertakes to transport persons or goods for anyone who pays the recognized charge, fare or rate. The common carrier is liable for loss or damage not caused by the shipper, by enemies of the country or by an act of God. Especially over the railroads modern governments exercise a considerable control—ranging from full government ownership and operation in some countries to our own Federal supervision of freight rates and passenger fares and legislation on relations of railroads to their employees.

Common law, a term deriving its original meaning from the medieval judicial theory that the law administered by the king's courts was the customary or common law of the realm as contrasted with the custom of local jurisdiction; now used in various senses. (1) The system of law of England and the United States in contrast to other legal systems, such as the civil law or Mohammedan law. (2) That body of the law that is based upon custom and precedent and not upon legislative enactments. (3) The body of rules and remedies administered by common-law courts as distinguished from equity courts. (4) The law of the whole country as distinct from the special law of one region.

The American common law consists of the common law of England prior to 1607, or in some cases a later date, and certain English statutes enacted prior to the Revolution, in so far as this law was considered applicable to the conditions in America, modified by local custom and subsequent decisions of American courts. Since the laws of every state are different, there is no general common law in the United States today.

Common pleas, name of a court of record in some states having general original jurisdiction in civil suits.

Commons, House of, the lower house of the English Parliament, representing the mass of the people, the commons, as distinct from the two other estates or classes of the feudal period, the nobles and the clergy, whose part in English government was played through the House of Lords. When Parliament first separated about 1344 into these two houses, Lords and Commons, the Commons represented the shires or counties (knights of the shire) and the towns (burgesses of the towns). In 1407 King Henry IV agreed that thereafter all money grants should be approved by the Commons before the Lords considered them—an important first step in the growing importance of the House of Commons. In 1911 the Commons were empowered to pass money grants or public bills without the approval of the House of Lords. Long before this, in 1689, the Commons had made the Crown its servant by adopting the Bill of Rights.

The House of Commons now has 615 members. They need not be residents of the districts that they represent. Women have been eligible since 1918, and 21 women were elected between 1919 and 1929. Barred from membership are Roman Catholic priests, clergymen of the Church of England and of the Church of Scotland, peers of the realm, government contract holders, convicts, lunatics and idiots. Twelve of the 615 members represent universities. Oxford and Cambridge return two members each; four Scotch universities, two members in all. Each graduate of a university that has this privilege may vote for a member of the House to represent the university and also for a member to represent the community in which he lives. The communities—boroughs and counties—elect one member apiece, except that 12 large boroughs and the City of London elect two members. Women vote for representatives in the House of Commons—the law of 1918 gave the suffrage to women over 30; the law of 1928 to women over 21. There are about 27,000,000 qualified voters: 14,500,000 women and 12,500,000 men. The maximum term of office is five years, but an election for the House of Commons may be called at any time that an important measure proposed by the Cabinet is defeated in Parliament.

Commonwealth, the same word as commonweal or public good; in the specialized sense, the whole body politic, all the people of a state; also a name applied to certain forms of free government, notably to the state governments of Massachusetts, Pennsylvania, Kentucky and Virginia. Each of them is officially a commonwealth, not a state.

In 1935, pending complete independence after a 10-year transition period, the Philippine Islands became a commonwealth.

England was a commonwealth and

not a kingdom from 1649, when Cromwell and his parliamentary army drove out the Stuart kings, to 1660 when the kingdom was restored.

The British Commonwealth of Nations is the name given by the Statute of Westminster (1931) to the United Kingdom and the British Dominions—Canada, New Zealand, Union of South Africa and Australia.

Australia had been declared a commonwealth on January 1, 1901. It was then the only part of the British Empire with that official classification.

Commune, a French municipal government, the smallest governmental district in the French political machine. There are about 38,000 communes in France, most of them with less than 500 inhabitants. The commune is governed by a council of 10 to 36 members (except in Paris with 80 and Lyons with 54) elected by wards in other communes that had more than 10,000 inhabitants and on a general ticket in the smaller communes. They serve six years and choose for a four-year term a mayor (*maire*) and an assistant (*adjoint*)—or in the larger communes several assistants. Paris is a commune in name but has a government unlike other communes—no mayor but two prefects (of the Seine and of police), both appointed and removable by the President of the Republic.

In French history the Commune was the government set up in Paris in 1792-94 by representatives of the communes; and this name was also given to the insurrectionary government of Paris in the spring of 1871 after the German troops left the city.

Communism, a radical and revolutionary form of socialism, opposed to the property and profit principles of capitalism and to nationalism. The ideal of communism is "From each according to his ability; to each according to his need." The government of Soviet Russia set up in 1917 by the Bolshevist revolution was actually in the hands of the Communist party. The main objectives of that party as summed up in 1918 by the Congress of Soviets were: abolishing private property, making all property national for the laboring masses to use, workers to control industry and all factories to be nationally owned, banks to be nationalized, debts of the old Russian Government to be repudiated, compulsory labor. Communism has always aimed at a world-wide revolution, but that objective has been postponed by the Soviet leaders in their efforts to accomplish a new order of things at home.

The form of government in Russia is dictatorial—a committee of the party ruling with some show of representative government.

Compensation, payment of money or an act ordered by the court to be performed by one person to another to damnify or compensate the other for losses or damage. It often refers to payment for property seized for public use. The 5th Amendment to the Federal Constitution provides that no private property "shall be taken for public use without just compensation" and the same clause requires "due process of law." By the 14th Amendment due process is made the rule for state laws so that compensation applies there too. Usually compensation must be market value of the property condemned or the equivalent of what the owner loses.

Compensation to workmen for accidents at work is the subject of a series of laws beginning in 1910 with a New York act declared unconstitutional in 1911.

Complaint, the formal statement filed by a plaintiff, his pleading to start suit against a defendant; also called a *petition* or *declaration.*

Composition with creditors, an agreement between a debtor and two or more of his creditors by which the creditors agree to accept a part payment in full satisfaction of the debt.

Conciliation, attempt by court or other authority to reconcile the disputants by bringing them together. Mediation is a mere passive act of being a go-between for the disputants; arbitration is the submission of matters in dispute to an outside authority.

Conflict of laws, divergence between the laws of different states; and the branch of law that determines whether in dealing with a legal situation the law of some other state will be recognized, be given effect or be applied. A typical case involving a conflict of laws occurs if Mr. Jones and Mr. Smith have an automobile accident in New Jersey. Then Mr. Smith sues Mr. Jones in a New York court. The New York court must then determine whether it will apply the New York law or the New Jersey law in deciding the case. In this particular instance the New York court would apply the New Jersey law. A body of law governing various situations and determining when the law of another state should be applied has recently developed.

Conscription or **Draft,** compulsory enrolment for military service—ordinarily of men, but also of national resources, production and manufacture. Conscription means listing or cataloguing the resources of men, machinery and money—not forcing them into service. In the World War more than 24,000,000 men were enrolled in the United States, but not quite 3,000,000 were actually drawn (or drafted) from this list for service.

Conscription and the draft were first employed on a large scale in France during the wars of the Revolution and the Napoleonic campaigns because the Revolution in overthrowing the monarchy had destroyed the regular, professional army of France. From 1800 to 1813 more than two and a half million men were drafted into Napoleon's armies.

In American history, some of the colonies decreed the draft in the Revolutionary War; both North and South used it in the Civil War, and in New York city the draft riots of July 13-16, 1863, resulted in the death of a thousand persons; in the World War a Selective Service Act conscripted the man power of the nation. One of the plans for peace especially urged by the American Legion is a Universal Service Act to conscript all industry and particularly to nationalize all manufacture of war equipment and munitions so that there will be no profit in that industry.

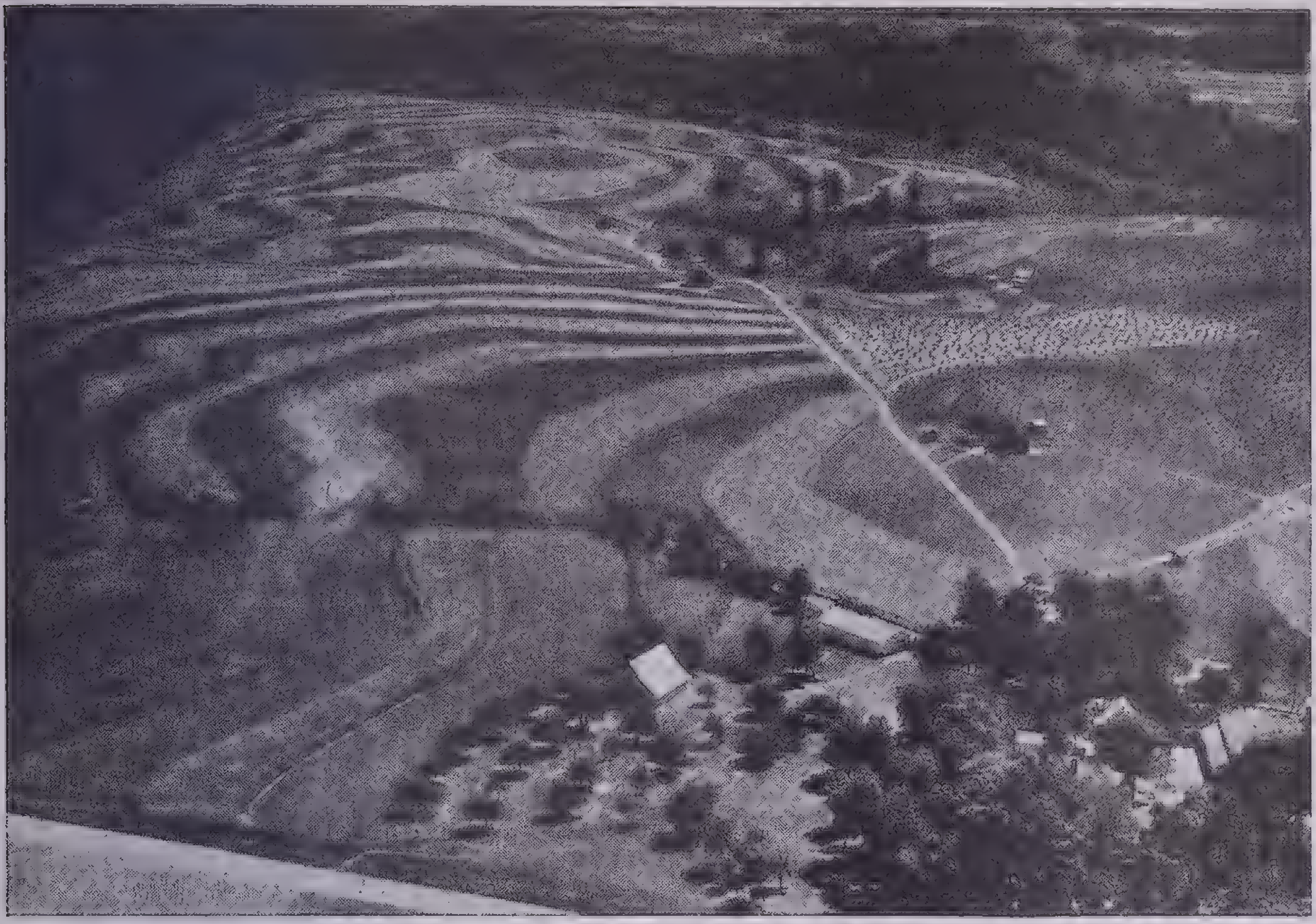
Conservation, government activity in maintaining and preserving natural resources—forests, water, soil, minerals, wild life. It was the policy of the United States Government in its early years to hasten settlement and private ownership by giving away public lands. Right after the Civil War this process was very rapid. The consequences were serious: uneconomic cutting of timber, overcultivation of crop lands and the misuse of grazing lands for raising crops. Floods and droughts were traced directly to these wasteful practices.

In 1876 a government forester was first appointed, and in 1921 certain public lands were set aside as forest reserves. The Newlands Reclamation Act of 1902 appropriated for building irrigation plants the income from the sale of arid lands in the West. In 1905 President Theodore Roosevelt persuaded Congress to give the control of public forests to the Forest Service, which was transferred from the Interior to the Department of Agriculture. In 1908 an Inland Waterways Commission and in 1909 a National Conservation Commission made elaborate reports. There was bitter opposition to every attempt at Federal conservation, but in 1911 Congress authorized the purchase of forest land on watersheds of navigable streams in the eastern states so that the program was no longer limited to the public lands of the western states.

In the early 1930s severe floods and terrible dust storms and droughts coincided with a crisis of unemployment. A new conservation policy was created to meet the occasion, aided by the Civilian Conservation Corps or CCC.

Conspiracy, the agreement of two or more persons to accomplish something that is unlawful or an agreement to perform a lawful act in an unlawful manner. A conspiracy to commit a crime is a different offense from the crime that is the object of the conspiracy. In order to complete the crime of conspiracy it is not necessary that any act should be done in pursuance of the agreement; the mere agreement constitutes the crime.

Constitution, the entire system of fundamental political institutions of a state. In the United States where a relatively large part of the fundamental institutions is embodied in written documents, the term is often confined to those documents—the Federal Constitution, drafted in 1787, ratified in 1788 and variously amended since; and the constitutions of each of the states. But these written constitutions are not complete descriptions of American government today. They do not tell all that we need to know about how the government is constituted. We can accurately say that a written constitution is the constitution of a government only in a partial sense. There is noth-



Courtesy U. S. Soil Conservation Service

Conservation of the Soil

This picture illustrates the pattern of conservation farming—contour rows, terraces and strip crops on the contour of each field. These work in combination to slow the runoff of water (holding it on the field to soak into the soil), thus minimizing the hazards of erosion. Contour rows, terraces and strip crops are placed on the level around the hill (instead of up and downhill) in order to slow runoff. Rows running up and down hills serve as channels where water concentrates and rushes off, cutting gullies and sweeping off topsoil

ing in our Constitution (or even in the laws that supplement it) about a Cabinet, parties, nominating conventions, congressional committees or many other important factors in our actual government.

In the United States not only the Federal Government has a written constitution, but each state likewise has such a constitution. Each of these constitutions establishes the method of government and also contains grants and limitations of power to the several departments of the state. The Federal Constitution gives certain powers to the national Government and denies certain powers to the individual states. Except in so far as powers are granted expressly or by necessary implication to the national Government, they are retained by the states. Both in Federal and state constitutions the individual is protected by certain fundamental rights. Laws passed in violation of a constitution are void, and whenever they are questioned they will be so declared by courts having jurisdiction.

In the United States and in each of the states the judicial interpretation of the written constitution so largely controls the government (Federal and state) that the term *constitutional law* is confined to court law in decisions interpreting, limiting and applying the constitution. There is nothing quite like this in the government of any other country.

The Supreme Court of the United States cannot decide on the constitutionality of any measure except in a suit brought before the court. Some state courts of last resort are occasionally asked for an advisory opinion on the constitutionality of a proposed law, but a ruling of this sort is hypothetical and not a binding, final interpretation or decision.

This power of the Supreme Court rests on two clauses in the Constitution: Art. III, Sec. 2, Cl. 2, giving the Supreme Court "appellate jurisdiction both as to law and fact, with such exceptions and under such regulations as the Congress shall make"; and Art. VI, Sec. 2, making "this Constitution and the laws of the United States the supreme law of the land . . . anything in the Constitution or laws of any State to the contrary notwithstanding."

The Federal supremacy laid down in the phrase last quoted is somewhat offset by the 10th Amendment: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States are reserved to the States respectively, or to the people." Repeatedly the supreme Court has ruled acts of Congress unconstitutional on the ground that they interfered with State rights.

The interstate commerce clause, Art. I, Sec. 8, Cl. 3, giving Congress power "to regulate commerce among the several states" has often been in controversy before the Supreme Court. Does commerce include manufacturing? Can the states legislate on "commerce among the several states"? Have the states power to tax commerce of that sort? In 1937 the Supreme Court upheld the right of the state of Louisiana to tax chain stores doing business in the state on the basis of the total number of units of the chain in the whole country.

The 5th Amendment declares that "no person shall be deprived of life, liberty or property, without due process of law." Repeatedly the Supreme Court has had to decide in various cases what is due process of law and the Court has often declared laws unconstitutional on the ground that they are arbitrary and unreasonable.

The most broad and far-reaching powers of Congress have been claimed under the "elastic clause," as it has been called—Art. I, Sec. 8, Cl. 18, empowering Congress "to make all laws which shall be necessary and proper for carrying into execution" the powers of the Federal Government. "Necessary" and "proper" both admit of wide variation in interpretation. So does the phrase in Art. I, Sec. 8, Cl. 1, giving Congress power to provide for "the general welfare of the United States."

The British constitution is almost entirely unwritten, a matter of custom and gradual development. The documents that form a part of it are very few and date from many different periods. Under Cromwell as Lord Protector from December 1653 to May 1657 England had a written constitution in one single document, the Instrument of Government. Today there is nothing of the sort, and the scheme of government is based on historic documents like Magna Charta and the Bill of Rights; certain laws, like the Habeas Corpus Act of 1679, the Act of Settlement of 1701, the Parliamentary Act of 1911 and the Representation of the People Act of 1918; the principles of common law, mostly not in written form; and many conventions or customs, such as the peculiar relation of Cabinet and Ministry and Cabinet and Commons.

France has a written constitution dating from 1875, amended in 1879 and 1884, but very far from being a complete description of the French government. It is peculiar in these respects:

It provides for amendment by the two houses (senators and deputies) sitting together as a National Assembly, which must meet at Versailles instead of Paris.

It provides for no judicial review of a law, no way of nullifying an act of parliament because it is unconstitutional.

The President has practically no power.

The actual constitution, as distinct from the written document, is peculiar in having so many parties that no one party secures a majority in the lower house; an upper house chosen by local electoral colleges; a great degree of centralized government; and a distinct system of administrative law, under which government officials may be sued by citizens.

In Germany and Italy modern dictatorships have largely done away with any constitution in either sense of the word. The government is what the Duce or the Fuehrer declares it to be.

The Russian U.S.S.R. on Dec. 5, 1936, adopted a new constitution providing for a federated state composed of 11 soviet socialist republics (or union republics), each with its own constitution. The legislative power is the Supreme Soviet, elected for 4 years and composed of two chambers: the Soviet of the Union, one deputy for every 300,000 of population; and the Soviet of Nationalities, 25 deputies from each union republic, 11 from each autonomous republic, 5 from each autonomous region and 1 from each national area. (The union republics are made up of autonomous republics and regions and national areas.) The Supreme Soviet in joint session chooses a Presidium of 36 members that stays in power over an election period until a new Supreme Soviet chooses another Presidium. The Presidium is an executive committee of the Supreme Soviet. Responsible to the Supreme Soviet is the executive and administrative Council of People's Commissars, the heads of the different departments of the Federated government, supervising the activities of commissars (department heads) in each of the states or republics.

The new U.S.S.R. Constitution guarantees certain rights to citizens. All Soviets are elected by universal suffrage. Men and women over 18 have the right to vote. The present constitution of the U.S.S.R. may be amended only by a two-thirds vote of each chamber.

Another recent formal constitution of considerable interest is the 1937 constitution of Ireland (Eire), formerly called the Irish Free State. The President must be 35 years of age, is elected for 7 years by direct vote of the people, is eligible for re-election once only and may be removed by the legislature on a two-thirds vote after certain formal investigation. The President appoints the prime minister (*Taoiseach*) and 6 to 14 other members of the government on the nomination of the legislature. The national parliament, called *Oireachtas,* consists of two houses, *Dail* and *Seanad* (or Senate), which meet at least once a year. Members of the Dail are chosen by universal suffrage from representative districts that may be revised every 12 years by the Oireachtas. Members of the Dail are chosen by Proportional Representation. The same Dail cannot continue for more than 7 years.

The Irish Senate has 60 members: 11 nominated by the Taoiseach; 3 elected by the National University of Ireland and 3 by the University of Dublin; and 43 to be elected from candidates listed on five panels for their knowledge and practical experience of: (1) language, literature, art, culture; (2) agriculture and fisheries; (3) labor; (4) industry, commerce, engineering, architecture; and (5) public administration and social service. These panels are to be formed "in the manner provided by law," and "provision may be made by law for the direct election by any functional or vocational group or association or council" of a certain number of senators on these panels.

The Irish President may refer any bill to the Supreme Court for a ruling on its constitutionality or the constitutionality of any part of the bill, but the President has no veto power. On petition of a majority of the Senate and not less than one-third of the Dail, the President may refer any bill to the people—and then it becomes a law only after favorable vote by the people or after it has been repassed by the Dail within a period of 18 months "after a dissolution and reassembly of the Dail."

Constitutional Union party, American political party formed in 1860 by the controversy between the North and the South that split the old parties. It was composed of the remnants of the Whigs and the Know-Nothings and other groups in the South. It nominated John Bell of Tennessee for President and Edward Everett of Massachusetts for Vice-President and adopted a platform of "No political principle but the Constitution of the country, the union of states and the enforcement of laws." Tennessee, Virginia and Kentucky were carried by the party in the election of 1860, but the Civil War put an end to the party.

Consul, a commercial agent who represents his country in a foreign city. A consul general at large inspects consulates of his country all over the world. A consul general supervises the consuls in the country or region to which he is sent. The service studies foreign markets and seeks outlets for trade from the homeland; consuls also protect the interests of fellow citizens abroad. Vice-consuls and consular agents are subordinate to the consul in certain areas. Consular officers of the United States are appointed by the President with the approval of the Senate, but the consular service has been on a civil-service basis since 1906. By the Rogers Act of 1924, the consular service and the diplomatic service were consolidated into the Foreign Service under the Department of State.

Contempt, a disrespect shown to a court, wilful disobedience of its mandates or an attempt to tamper with the course of justice. Contempt may be punished by the court without any jury trial. In the United States legislative bodies also have the right to punish for contempt, especially failure to appear or answer at a session of an investigating committee of the legislature.

Contraband, originally forbidden or contrary to a ban or edict and in common use illegal in the sense of smuggled goods. Specifically in international law contraband (or contraband of war) means goods that cannot be shipped by neutrals to one belligerent without risk of seizure by the other belligerent. *Absolute* contraband includes guns, ammunition and explosives. *Conditional* contraband is material of doubtful or double use that might be intended for peaceful purposes—cotton, gasoline, horses, for example. During the World War cotton and rubber were considered absolute contraband. The seizure of neutral ships engaging in contraband trade always tends to embroil neutral nations.

Controller or **Comptroller** (the second form is the older spelling and is the more common in government use), an officer who supervises accounts and authorizes the payment of moneys. Some states (Virginia and Massachusetts) have a controller to authorize payments and an auditor to check the payments, but usually the two functions are combined, and usually the controller has more discretion and authority than an auditor. The U.S. Budget Act of 1921 created the office of Comptroller General to settle and adjust claims made by the Government or against it. The Comptroller of the Currency is a Federal official of the U.S. Treasury and the Federal Deposit Insurance Corporation and is in charge of the supervision of all national banks and of the issue of Federal Reserve notes.

In American city governments the controller usually audits and investigates accounts and is often trustee of the sinking fund.

Copyright, the legal ownership or title in literary or artistic works, a monopoly granted under certain conditions by the state. Between 1783 and 1786 12 of the 13 states had passed copyright laws—largely at the instigation of Noah Webster, who wanted protection for his *Spelling Book.* The Constitution of the United States (Art. I, Sec. 9, Cl. 8) gives Congress power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries." The law passed by Congress in 1790 made duration of copyright 14 years from the date of publication and permitted renewal for 14 years. The present law permits 28 years of protection with renewal for another 28 years.

In Great Britain copyright is for the lifetime of the author and for 50 years after his death—an attempt to secure to the author's heirs the same monopoly. There have been various attempts to secure an agreement among all nations that will assure an international copyright, but such general agreements as have been made do not include the United States. To protect American manufacturers, Congress has refused copyright in the United States on books printed outside the United States. But the United States Government has made special individual agreements with several other nations by which the citizens of those nations may secure copyright in the United States and United States citizens may secure copyright in those countries.

Coroner, a public official charged with inquests or investigating the causes of suspicious deaths. The coroner was an English Crown officer and in some English dialects he is called *crowner.* In the United States a medical examiner sometimes replaces the coroner, but he is still a county officer in many states, usually elected by popular vote but in a few instances appointed by the executive.

Corporative state, Mussolini's name for the government he is developing for Italy: not the people but industry's employers and workers are represented. The people are regarded as producers rather than as citizens, and under this doctrine individuals have been subordinated to the omnipotence of the state. The Chamber of Deputies came to an end in 1936 and the National Council of Corporations, set up in 1934, took its place. Industry is divided into 22 category corporations, each with its own council representing the employers and the workers of that category of industry. The 22 councils have 824 members. In 1926 and 1927 all employers and workmen were organized—locally in syndicates and nationally into confederations that were later called corporations.

The real power in the corporative state is not these corporations nor their representatives who form the legislature but the Ministry of Corporations, created in 1923 with Mussolini at its head. He is the president of each of the 22 councils and of the Council of Corporations.

Nationalization of some industries seems a part of the policy of the corporative state.

Council (from Latin *concilium,* something called together), an assembly or convocation, usually one that has advisory or lawmaking powers.

In the United States the word is seldom used for any governmental agency except the city council, a legislative body or one of two legislative bodies (the other being a larger group, the board of aldermen). In Maine the governor has an Executive Council to advise him; seven members elected by the legislature form its membership.

In some city governments the *common council* is the legislative department or the lower house of the city legislature and is usually composed of one or two representatives from each of several small political divisions called wards.

Abroad the term has a much wider and very varied use.

In England the Privy Council is of great historical importance. It originated with the Norman kings as a small group of advisers to the king, the King's Privy Council; a larger group at court was called the Great Council, and it developed into Parliament. The number of privy councilors was about 20 for many years; now it numbers over 300. It has always included more commoners and new peers than members of the old nobility. The Cabinet members, present and past, belong to this Council. The Cabinet originated as a Privy Council group of committee and now has many of the powers that once made the Privy Council great. *Orders in council* are the only lawmaking power left to the Privy Council; they include summoning and dissolving Parliament, granting charters of incorporation and setting dates and providing detailed applications for new Acts of Parliament to go into effect. *Committees of the Council* have important duties, especially the judicial committee (created in 1833), which advises the Crown on appeals to the King's Council from church courts, admiralty courts and the courts of India and the colonies—and so is actually a court of last appeal in these cases.

The Privy Council meets in full strength only on the death of the king and other ceremonial occasions. For orders in council three members constitute a quorum, and usually only four members are actually summoned. In Great Britain counties and boroughs have councils like those of our American cities.

Council of State is the name of the upper legislative chamber in the government of British India that was set up in 1935. It has 260 members, 156 representing the provinces and 104 the native states.

The Council of State in France is made up of 64 members (39 in ordinary service, appointed by the President of the republic, and 25 in extraordinary service). It gives technical advice to the Government on problems of administration, and it must pass on rules of administration before they become operative. The 39 ordinary councilors sit as a court of appeals on all cases of administrative law, especially suits brought by citizens against government officials. *Regional councils* in different parts of the country hear the original cases against administrative officers.

The Council of Ministers in the French Government is the official title of the Cabinet, which includes the heads of all 18 departments. The *President of the Council of Ministers* is the actual title of the French Premier, but the President of the republic is in the chair when the council of ministers meets (usually twice a week) to transact business, especially foreign affairs and national defense. The same group meets at least once a week as a cabinet with the premier in the chair to plan policies.

In France and Belgium a *conseil des prud' hommes,* council of experts (or discreet men), acts as an arbitration board in industrial disputes. Its decisions are final in cases under 300 francs; over that amount an appeal may be taken to the regular courts. The council is made up of employers and workmen in equal numbers.

In Soviet Russia "the highest executive and administrative organ of state power is the *Council of People's Commissars.*" There is such a council in each union republic and one for the Union of Soviet Socialist Republics (U.S.S.R.). These councils are responsible to the supreme soviet of the Union Republic and the U.S.S.R., respectively.

In Italy the *Council of Ministers* is the official name of the cabinet, and it is responsible to the head of the Government, the Duce, who holds several cabinet posts.

Even more important in the actual government of Italy is the Grand Council of the Fascist Party, which in 1928 became by law "the supreme organ co-ordinating and uniting all the activities of the government that arose out of the October Revolution of 1922." The Duce is president of the Council, calls its meetings and decides what business is to come before it. He appoints for a 3-year term certain members. The Big Four of the March on Rome—the *Quadrumvirs,* as they were called—are life members of the Council; and certain key men in the government are members ex officio. The Council must be consulted on all constitutional questions. It is a party organization and an organ of government. Until the House of Deputies was abolished, its members were nominated by the Council, and this nomination was automatically approved by the voters.

County, an administrative division of a state in each of the United States (except Louisiana where the corresponding term is *parish*). There are about 3,000 counties in the U. S., 3 in Delaware, 253 in Texas. One county in California, San Bernardino, has an area of more than 20,000 square miles —much larger than Belgium or Denmark or the Netherlands or Switzerland. Most counties are governed by a board, but a few have adopted the manager plan used in some cities. The typical county officer is the sheriff (originally shire-reeve, meaning county overseer), the local police officer, elected by popular vote except in Rhode Island, where the state legislature names the sheriffs. There are county courts in about a third of the counties of the United States. Almost all the counties have a prosecuting officer, the county attorney or district attorney, usually elected by popular vote. Counties have little legislative power but wide administrative functions, usually including the administration of justice, public-health regulations, poor relief, schools and tax collection.

In England the county is an old unit of government. The Anglo-Saxon name for it was *shire,* meaning district, a syllable that remains in the names of several English and Scottish counties — Lancashire, Lanarkshire, Devonshire. After the Norman conquest shires were called *counties* because they were similar to the domains of counts on the continent.

The English Local Government Act of 1888 set up 62 administrative counties, dividing for governmental purposes the larger of the 52 historical counties or shires, incorporating each of the new counties and giving it an administrative council that is not a lawmaking body but sets tax rates and supervises schools, poor relief and highways. The council has two types of members: councilors, elected for 3 years, and aldermen who serve for 6 years, half of them going out of office every 3 years. The aldermen are chosen by the councilors; when they pick them from their own number, other councilors must be chosen at a special election.

County boroughs in England are the 80-odd cities, each over 75,000 in population, that have asked and received separate incorporation so that they are governed independently of the county in which they lie.

Coup d'état (French, stroke or blow of state), violent seizure of power. Famous examples are: Napoleon Bonaparte's overthrow of the French Directory, November 9, 1799; Louis Napoleon's establishment of the Second French Empire in December 1851; and Mussolini's march on Rome, October 30, 1922. The frequent revolutions in Latin American countries are almost all *coups d'état.* The unsuccessful stroke is called a *putsch*—for example the Munich *putsch* of November 8, 1923, when Hitler attempted to seize the government and was arrested.

Criminal law, a branch of public law that deals with crimes and offenses. It defines the various classes of actions that are contrary to the public peace and to the safety of individual or group members of society and declares the penalties that shall be visited upon offenders.

Crown, the authority and power of the English king and of his ministers. In this sense, the importance of the English Crown in government has been increasing in the last century though the personal power of the king has decreased. Certain powers of American governmental officers, especially the President and the governors of the states, are derived from the powers of the English Crown.

Legally the king is still the source of authority. Whatever is done in his name is done by the Crown if not actually by the king. All the extension of governmental functions in the last generation or so has meant more administrative activity for the Crown. The Crown is the executive—the king and his ministers have the same power in that respect that our president and state governors have. Pardon and reprieve are executive powers.

The Crown is increasingly important in the British Empire as well as in the United Kingdom. By the Statute of Westminster (1931) the United Kingdom and the Dominions formed the British Commonwealth of Nations, an association of free members, united only by their common allegiance to the Crown. Since 1926 the governor general of a British dominion has been the representative of the sovereign and legally the appointee of the king and not of the Government, that is, the Ministry or Cabinet.

Foreign relations, which in the United States are in the hands of the President and the Senate, are Crown powers in England. Treaties may be referred to Parliament, but that is not necessary.

The king-in-council, that is, the king and his Privy Council, make certain laws and have authority that is unlike anything in our American system. Other powers of the Crown that have no American parallels are: conferring honors and titles of nobility—usually done in fact by the king's ministers but always in the king's name; and acting as the head of the established churches of England and Scotland.

Damages, money compensation or indemnity for injury or loss. Originally the word meant (as it still does in the singular) the actual loss or harm suffered. Both penalties and damages in our legal system today are refinements of the early retaliation or *lex talionis,* as the Romans called it, which demanded an eye for an eye, a life for a life.

Damnum absque injuria is damage suffered without any violation of a legal right, and in such a case there is no cause of action by the person who suffers the damage against the person who caused it. Thus no damages may be recovered unless there has been a violation of a legal right.

Declaration, in common law pleading, the plaintiff's formal statement of his cause for complaint and demand for relief. In code practice this is called a *complaint;* in equity, a *bill;* in civil law, a *libel;* and in church law, the *allegations.* The declaration must contain the *count* or *counts,* that is, the cause of action; and the word *count* is sometimes used instead of declaration.

Declaration means also a statement made by a party to a transaction. Under certain conditions a declaration is regarded as original evidence and is admissible as such. It is similar to an admission.

Dying declaration is an unsworn statement by a person expecting to die, telling the cause of his death. It is admissible evidence in prosecution for murder or homicide.

Declaration of intention is the statement of an alien before a court that he intends to become a citizen and to renounce his allegiance to any foreign sovereign. It must be made 3 years before the alien is admitted as a citizen, but there are many exceptions to this rule. Some states require declaration of intention before an alien may secure title to real estate.

Declaratory judgment, a declaration by a court of the rights, status or other legal relations of a person; differing from other judgments because it does not order anything to be done. Such a declaration has the force and effect of a final judgment or decree.

Decree, the judgment or decision of a court of admiralty or equity; similar to a judgment of a court of common law. *Decree nisi* in English law is the conditional judgment that, after a certain time (usually not less than 6 months), a divorce will become absolute on motion, unless (*nisi* is Latin for unless) cause to the contrary is shown.

Deed, literally something done; any written instrument, signed, sealed and delivered; specifically an instrument for the transfer of title to real estate.

Defendant, the party sued in a court of law whether in a civil or criminal action. The other party to the suit is the plaintiff.

Del credere agency or **Del credere commission** (Italian, meaning of belief or of trust), a special agreement between an agent and his principal by which the agent undertakes to pay his principal for goods he sells if the purchaser does not pay; and the principal agrees to pay the agent additional compensation. The agent's undertaking is not required to be in writing since it is not a legal guarantee.

Delegate, a deputy; one with powers granted (or delegated) by another or by the people. The representative of a Territory in the Lower House of Congress is called a *delegate;* he looks out for the interests of his constituency but has no vote. In Maryland, Virginia and West Virginia, the Lower House of the legislature is called the *House of Delegates.*

Delegated powers, any authority that comes by grant from another. The 10th Amendment (in the Bill of Rights) to the U. S. Constitution says: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively or to the people."

In the decision that annulled the National Industrial Recovery Act the Supreme Court of the United States declared that Congress in delegating powers to the President could not give him a "roving commission" but must specify standards, list objectives and provide a definite range of action. In short, governmental powers cannot be delegated unless they are definitely specified and limited.

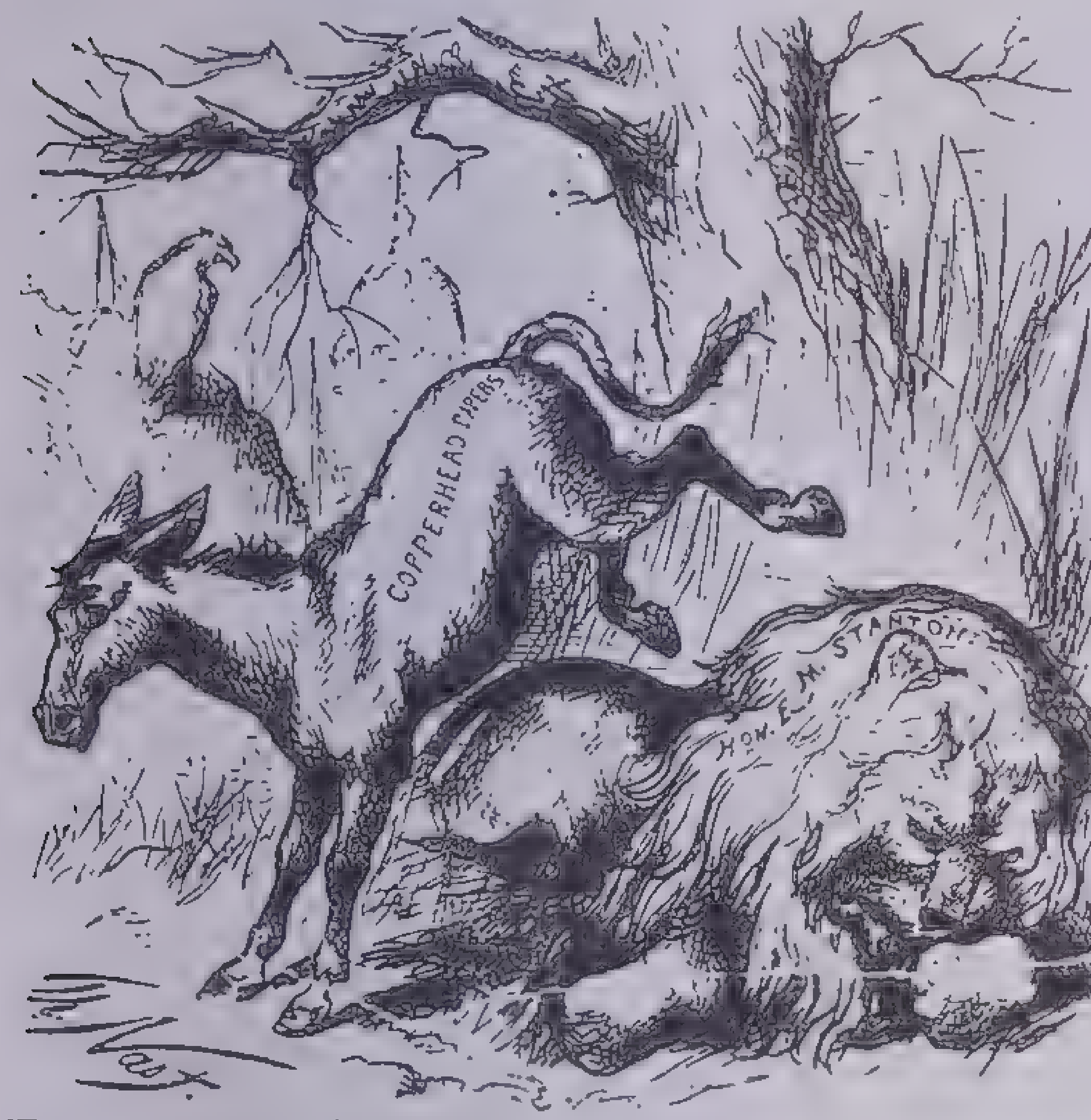
There is a growing tendency in England and in Europe to delegate legislative power. An English report on the subject points out that legislatures are busy, have not enough technical information, cannot go into necessary detail, cannot always meet emergencies. Orders in council and regulations made by government departments are the usual types of delegated legislation in England.

In France the Council of Ministers has power to set the details for the administration of certain laws. In Italy the legislative power has practically passed to the Council of Ministers and the Council of Corporations —or, more accurately, to the Duce. In Soviet Russia the Presidium of the Supreme Soviet has constitutional power to "interpret existing laws and promulgate orders," and the Council of People's Commissars "issues decisions and orders on the basis and in the pursuance of the laws in operation and supervises their execution." This is not a delegation of legislative powers because they are conferred by the Constitution.

Delivery, in the legal phrase "signed, sealed and delivered," the transfer of the document or deed to the grantee or to a third party; the transfer of possession of a thing from one person to another. No particular form of procedure is necessary in a delivery. It may be done by an act or merely by words.

Democratic party, a political party in the United States. The antagonism between business and agriculture that had been shown in Colonial times and that had found expression in the Constitutional Convention came to a head in the heated debates that marked the passage of the first Revenue Act (1789), and the country gradually became divided into two major political parties. Thomas Jefferson headed the group that has now become the Democratic party. At first it was called the *Republican* party, then the *Democratic-Republican* party and in 1829 the *Democratic* party. Thomas Jefferson and his followers were sympathetic toward the French Revolution, opposed the concentration of power in the Federal Government and stood for personal liberty. It was the party of the farmers, the industrial workers, the poor and the radicals. The opposition group was the Federalist party led by Alexander Hamilton.

In 1800 the Democratic-Republican party was successful in electing Thomas Jefferson as President and he was again elected for the following term. As the power of the Federalist party declined, that of the Democratic party grew. James Madison was elected for two terms and James Monroe followed for a similar period, being elected by an overwhelming majority. The split that had developed within the party led to the election of John Quincy Adams over Andrew Jackson in the bitter controversy of 1824. In 1829 Andrew Jackson became President and the radical Democrats came into power. After Jackson's second term another Democrat, Martin Van Buren, was elected. The Whigs were successful in 1841, electing Harrison and Tyler, but the Democrat Polk followed, and the Democrats were successful in every presidential election up to the Civil War time, except for the Whig victory under Taylor in 1848. By 1860 the Democratic party had divided into the northern and southern Democrats and did not return to power until the election of President Cleveland in 1892.



From Harper's Weekly, January 10, 1870

First Appearance of the Democratic Donkey

Thomas Nast's first use of the donkey as a symbol of the Democratic party appeared 2 weeks after the death of Edwin McMasters Stanton, erstwhile Secretary of War named to the Supreme Court bench 4 days before his death. Stanton, a Unionist and in his later days a Republican, had many enemies, particularly among the Northern Democrats or Copperheads. His strict censorship of the news during the Civil War, when he was Secretary of War, made him unpopular with the newspapers

After the withdrawal of the Republican reconstruction policy in the South, that section became strongly Democratic and the "Solid South" has remained Democratic with the exception of the election of 1928. The radical program of the Populists was largely adopted by the Democrats who nominated Bryan and fought for the free-silver policy in 1896, but the Democrats were defeated. A split in the Republican party led to the election of Woodrow Wilson in 1912, but after the World War the Republicans again came to power. For a decade the Democratic party showed little strength; then, largely due to the economic depression that began in 1929, the Democrats returned to power in 1932 under the leadership of Franklin D. Roosevelt with an overwhelming majority.

Demurrer, a written plea in behalf of a defendant, addressed to a court in a case at law admitting that the facts as disclosed are true but denying that they are sufficient to support the issue raised. If the demurrer is fully sustained by the court, the case is dismissed, but sometimes the complainant is permitted to amend the complaint to cover the points protested in the demurrer. The demurrer has been abolished in English higher courts, in equity cases in U. S. Federal courts (1913) and in the practice of New York and New Jersey. It is in general use in most state courts.

Department, a division of the executive branch of the Government of the United States. The Constitution (Art. II, Sec. 2, Cl. 1) says that the President "may require the opinion in writing of the principal officer in each of the executive departments," but these departments are not named or described in the Constitution. They have been created by statute, and by custom their chief officers are members of the President's Cabinet. An Act of Congress designates the order in which the ten department heads shall succeed to the presidency.

In state governments that have consolidated administrative systems (instead of scattered and independent administrative agencies) there are from 11 (as in Illinois) to 18 (as in New York) departments. In Illinois the departments are: Finance, Agriculture, Labor, Mines and Minerals, Public Works and Buildings, Public Welfare, Public Health, Trade and Commerce, Registration and Education, Purchases and Construction and Conservation.

In municipal governments there are usually administrative departments—Police Department and departments of Health, Education, Parks, Water Supply.

In France the department is one of 90 divisions for local government. The departments were set up in the winter of 1789–90 and have been practically unchanged since that time except that 7 have been added to the original 83. Each department has at its head a prefect, nominated by the Minister of the Interior and appointed by the decree of the President of the Republic. Departments are divided into districts called *arrondissements,* and these again are divided into *cantons.*

Dependency, a term loosely used for a province, territory or possession that is distinct and usually remote from the nation on which it depends. Dependencies of the United States are: the Philippines (until their complete independence in 1944), the Canal Zone, Puerto Rico, Virgin Islands, American Samoa and Guam.

The dependencies of Great Britain and other European Powers are more accurately called colonies, protectorates or mandates.

Deportation, the forcible removal from a country of one considered by its government an undesirable alien.

Deposition, the written testimony of a witness, in the form of questions and answers, given under oath (or affirmation), to be used in the trial of an issue at which the witness cannot be present. It cannot be used in criminal trials without the consent of the defendant.

Deputy, one to whom power is delegated or deputed, one appointed as a substitute. Any official assistant who has any of the powers of his chief is a deputy—*general deputy,* if he has all his principal's powers; *special deputy,* if he is authorized to act only for a particular purpose. There are deputy sheriffs, deputy collectors, deputy judges.

Chamber of Deputies is the name given to the lower house in the legislatures of most Latin countries—France, Mexico, the South American republics. The deputy has powers delegated by the people. The French deputies number more than 600. They are elected for 4 years by a majority vote on the first ballot or by a mere plurality at a second election if there is no majority on the first. Deputies must be 25 years old.

Devolution, a term used in England for the suggested plan to relieve Parliament of some of its responsibilities by transferring (devolving) them to other governmental agencies. These would be: (*a*) functional, new organizations set up to take over specific tasks, like health, education or social control; (*b*) regional and territorial, giving home-rule parliaments to Scotland and Wales and allowing more self-government to counties and boroughs.

Dictator, in ancient Rome an executive appointed for a special crisis, usually to repress disorder in the city. He had more power than the two chief magistrates (consuls) and did not share authority as the consuls did. He was nominated by one of the consuls, approved by the Senate and actually appointed by a law of the Comitia. Julius Caesar's selection as dictator in 48 B.C. for an indefinite period and his choice as dictator for 10 years in 46 B.C. were contrary to the original purpose of the dictatorship and were one reason for his assassination in 44 B.C. Originally a dictator laid down his office as soon as he had completed the task for which he had been named dictator. After Caesar's death Mark Antony in 44 B.C. passed a law abolishing the dictatorship.

In modern times a dictator is one who seizes power by force or by extending the authority he legally and regularly holds. In an even broader sense a dictator is one who exercises sole and autocratic power no matter how he came to power. Admiral Nicolas Horthy, regent of Hungary, is often called a dictator, though he was formally elected governor of Hungary and then regent of the kingdom in 1920 after his army had taken the government from the Communists. In Russia, in Italy and in Germany the control of the government by a single party (after the overthrow of a representative government in which two or more political parties had a voice) has given the party leader dictatorial powers in each country. It should be noted that Italy has a king who is practically a figurehead; and that Soviet Russia has a figurehead president under a formal constitution that does not recognize the supremacy of the Secretary of the Political Bureau, Joseph Stalin.

Dictators in Europe are largely an outgrowth of the confusion that followed the World War and of the growth of Communism in Russia, Nazism in Germany and Fascism in Italy. Portugal is another one-party government. The new republic of Turkey was ruled by a constitutional dictator, Mustapha Kemal Ataturk, elected president in 1923. In Greece General Metaxas, head of the army, exercised almost dictatorial powers after the restoration of the monarchy.

In South America and Central America dictatorial governments set up by sudden revolutions have been common since the time that the republics there became independent of Spain. From 1908 to 1935 Venezuela was ruled by Juan Vicente Gómez. In Bolivia, Nicaragua and Paraguay there were revolutions in 1936 that set up Fascist dictators with army backing.

Courtesy U. S. Department of State

Offices of an American Diplomat Abroad

Rear view of the American Legation at Prague, Czechoslovakia, formerly the Lobkowicz Palace, acquired by the Department of State in 1925

Diet, a legislative assembly, so called from its meeting on a set day—*dieta* in Latin meaning a day's journey, from *dies,* day. In German the corresponding word is *Tag*—as in Reichstag, the national or the imperial assembly; Landtag, the provincial assembly. In Denmark and Sweden the two-chamber legislature is called *Riksdag,* from the noun *dag,* day.

Under the Holy Roman Empire the meeting of the imperial councilors was called the Diet. Historically important are: the Diet of Worms in 1521 that declared Luther a heretic; the Diet of Spires (Speyer) in 1529 that banned Luther's teaching; and the Diet of Augsburg in 1530 that failed to settle the religious dispute over Lutheranism.

Diplomatic service, the organization of a government that handles foreign affairs and international relations; especially the personnel of that organization resident abroad.

The diplomat or diplomatist got his name from the diploma, an official document in duplicate (*diplo-* in Greek equals *dupli-* in Latin and *double* in English), which was the authority from his home government for him to act as its representative.

The importance of diplomacy in history may be suggested by what Benjamin Franklin did in France for the American colonies in winning support in the Revolutionary War; what Jefferson and his representatives did to purchase Louisiana and carry American territory to the Mississippi; or the part that Woodrow Wilson played in the World War, the Treaty of Versailles and the League of Nations.

The diplomats of any Power are personal representatives of the executive of that Power—president or king—to the executive of the Power to which they are accredited. Under the United States Constitution (Art. II, Sec. 2, Cl. 2), the President, "by and with the advice of the Senate, shall appoint ambassadors, other public ministers and consuls" and (Section 3) "shall receive ambassadors and other public ministers."

In practice the diplomatic representatives of the United States are appointed from two major classes: members of the political party of the President-elect who have been of special assistance in the political campaign just ended—wealthy businessmen, journalists and politicians; and the trained diplomatic staff of the State Department. The political appointees in the first class seldom remain in their posts for more than a single presidential term, for they are almost certain to be replaced by the friends and followers of the next newly elected President. The career men stay in the service, being promoted to more important posts on merit and their record, independent of politics. In 1924 the Rogers Act combined the consular and diplomatic services into a well-organized Foreign Service.

In Great Britain a trained diplomatic service was begun in 1816 when one or two attachés (or assistants) were sent out with each ambassador or envoy. Younger sons of noble families were almost the only material considered for this service for many years, and up to 1919 no one could be a candidate in the competitive examinations for diplomatic posts unless he had a yearly income of £500. In 1921 the whole Foreign Service was reorganized and put under the Foreign Office.

The relative rank of diplomats was defined in 1815 by the Congress of Vienna and in 1821 by the Congress of Aix-la-Chapelle, representing the principal European Powers; and those definitions have been adopted by the U. S. Department of State. There are three classes: ambassadors, legates or nuncios; envoys, ministers and others accredited to sovereigns; and chargés d'affaires who are accredited not to sovereigns but to ministers of foreign affairs. In each class the precedence at any capital or court goes to the diplomat of longest service to that country.

Secret diplomacy results in agreements or understandings between nations that are unknown to the people at large in the nations interested and to other nations. Such understandings brought Italy into the World War on the side of Britain and France—and then blocked President Wilson's efforts to make a just peace. The first of Wilson's Fourteen Points was: "Open covenants of peace openly arrived at, after which there shall be no private international understandings of any kind, but diplomacy shall proceed always frankly and in public view." This ideal has not yet been realized.

Dissolution, breaking up; especially the power to break up a legislature by bringing its session to a close so that a general election is necessary. There is no such power in our American scheme of government.

In Great Britain Parliament may be dissolved by the king, which actually means that the Cabinet has this power. It is exercised so often that Parliament seldom serves the entire 5-year term for which members of the House of Commons are elected. If the Commons votes "No confidence," the Cabinet must dissolve

Parliament and there must be a general election. Sometimes the Cabinet hastens the dissolution of Parliament so as to have a general election at a time when it will be particularly favorable to the party represented by the Cabinet or when the party leaders are eager for an expression on public policy by the voters.

In France the President of the Republic has the power to dissolve the Chamber of Deputies with the approval of the Senate. This power the executive has never used since 1877 when President MacMahon used this method in an unsuccessful attempt to set up a monarchy.

District, a division for governmental purposes. Congressional and election districts are units for electoral purposes. A school district is a unit for administration of schools.

District courts, Federal courts of first instance, that is, those in which Federal cases are first heard.

District of Columbia, a small and unique area of about 70 square miles, the seat of the Federal Government of the United States. The District was under the administration of a mayor and a council until 1878 when Congress took over the entire legislative control; since that time there has been no popular representation, citizens of the District having no vote. Three commissioners—two residents appointed by the President and the Senate and one military officer named by the President—constitute an executive board in charge of administrative activities, with power to make ordinances regarding public welfare, health and safety. Congress devotes a few days periodically to a consideration of the affairs of the District.

Similar Federal districts for the national capital have been set up in Mexico and in Australia. Mexico City is in a Federal district (Distrito Federal, abbreviated D. F.), administered by the central Government. The city of Canberra, capital of the Commonwealth of Australia, is situated in a Federal Capital Territory of 940 square miles, originally a part of New South Wales and now belonging to the Commonwealth Government. It is administered by a commission of three, one going out of office each year. There is no private ownership of land; title is with the Government, which issues leases.

Division, a formal method of taking a vote in the English House of Commons. The vote is usually taken by calling for all those in favor to say "aye" and then for those opposed to say "nay." This voting by acclamation (all calling out at once) cannot be measured accurately. The presiding officer guesses by the volume of sound. If any member challenges the Speaker's announcement of the vote, there is a division. All members of the House are summoned, the aye-and-nay shouted vote is taken again and almost certainly challenged again, and all members are then ordered to division lobbies. Those voting *nay* march to a room at the Speaker's left and those voting *aye* go to a room on his right; as they march back into the House their numbers are counted by four tellers appointed by the Speaker. This method is much speedier than the name-by-name roll-call in the U. S. House of Representatives.

In the Federal Government of the United States several administrative parts of the executive departments are called divisions: the Treasury Department has a Savings Bond Division, a Division of Printing and a Division of Internal Revenue; the Department of the Interior, a Division of Territories and Island Possessions; and the Department of State, divisions of Foreign Service Administration, Foreign Service Personnel, Far Eastern Affairs, Latin American Affairs, Western European Affairs, Eastern European Affairs, Mexican Affairs and Current Information.

Divorce, the legal dissolution of the relation of husband and wife and restoration to each of the previous condition of an unmarried person. In the United States divorce is not regulated by the Federal Government but is left to legislation by the various states; therefore the legal causes for divorce are far from uniform. In South Carolina divorce is not granted for any reason. The path to divorce is easiest in states with the lowest requirements for residence before suit—6 weeks in Nevada, 60 days in Wyoming and 90 days in Arkansas, Florida or Idaho. In most states it is 1 or 2 years; in Connecticut and Massachusetts, 3 years' residence is necessary. There are about a dozen legal causes for divorce, ranging from drunkenness to the most serious marital charges. The Roman Catholic Church does not permit divorce, though it sometimes grants annulments; and some other churches refuse marriage to divorcees.

An *annulment* is a court decision that a marriage was void from the beginning. A *separation* is a mutual agreement not to live together, usually a contract with provision for support.

Dominion, a self-governing part of the British Empire or more properly of the British Commonwealth of Nations. The Balfour Report of 1926, reviewing the status of the different parts of the Empire after the World War, created the name British Commonwealth of Nations and suggested that its self-governing parts were in no way subordinate to each other or to the United Kingdom, "though united by a common allegiance to the Crown." Under the Statute of Westminster in 1931 the dominions of Canada, New Zealand, Australia, Union of South Africa, Ireland (then known as the Irish Free State) and Newfoundland, with the United Kingdom, formed the British Commonwealth of Nations. Newfoundland in 1934 gave up its dominion status and Ireland admits no such tie. The other four dominions are ruled (in name) by a governor general, appointed by the Crown rather than by the Government at Westminster (that is, the Cabinet), so that the tie is "common allegiance to the Crown." The British Parliament passes laws for the dominions only after consultation with the dominion parliament and only if the act expressly states that it applies to the dominion and that the dominion "requested and consented to" it. Legislation by dominion parliaments requires the formal assent of the governor general, which is given as a matter of course.

In international relations the dominions are free and independent. They all belong to the League of Nations, and all are free to send ministers to other nations and to make treaties. Canada, Australia, South Africa and Ireland have diplomatic representatives in several nations.

Dominions Office, the London channel for communications between the British Government and the dominions. In 1907 the Colonial Office set up a division for the dominions. In 1925 it was separated from the Colonial Office, and in 1930 for the first time a Secretary of State for Dominion Affairs was appointed.

Drafting, see *Conscription.*

Duchy, the territory or dominion of a sovereign duke or duchess. If of considerable extent, it is generally called a grand duchy. Luxemburg, one of the smallest independent states of Europe, is a grand duchy bordering on France, Belgium and Germany. Made a duchy of the Holy Roman Empire by Charles IV in 1354, it was declared a grand duchy by the Congress of Vienna in 1815. Since 1919 it has been ruled by the Grand Duchess Charlotte. Until the regime of the National Socialist party in Germany, when all political subdivisions were rearranged and sovereignty was taken from the individual states of the Reich, such former grand duchies as Baden, Hesse, Oldenburg and Mecklenburg (Mecklenburg-Schwerin and Mecklenburg-Strelitz) played important parts. The rulers of Baden, however, had been known since the 11th century as *margraves.* Until 1917 the Republic of Finland was also a grand duchy of the Russian Empire, the czar himself holding the title of grand duke.

The Duchy of Cornwall and the Duchy of Lancaster are dukedoms of the British royal family. Cornwall was first held by the Black Prince, son of Edward III, who in 1337 was created the first English duke. Lancaster was bestowed 14 years later on the king's cousin Henry but reverted to the royal house on the marriage of Henry's daughter Blanche to John of Gaunt, Edward III's youngest son.

During the Middle Ages parts of Germany, Austria, Hungary, the Netherlands, Belgium, France and Italy constituted duchies that were powerful political allies or pawns. Among them were Normandy, Burgundy and Savoy in France, Brunswick, Saxe-Weimar and Saxe-Coburg-Gotha in Germany, Tirol in Austria, Brabant in Belgium and Tuscany in Italy.

Due process of law, regular court routine in distinction from special statute law enacted by a legislature. The U. S. Constitution in the Bill of Rights, Amendment 5, provides that "no person shall be deprived of life, liberty or property without due process of law.". The Supreme Court of the United States frequently has to decide whether a law is valid or void on the basis of this constitutional clause. There is no definition of due process or of the application of the clause—except in particular cases.

Duma, name applied to representative political councils in important cities in Russia before the Revolution, but especially the council or parliament of Imperial Russia from 1905 to the Revolution of 1917. Its composition favored the higher classes, and it was practically powerless until the early years of the World War.

Easement, a limited right to the use of certain land of another for a specific purpose without profit. The most common example is the right to pass through the land of another to reach one's own property, there being no open public road; this is called a *right of way.* In England and in some states of the United States there may be a *negative easement,* such as the right to forbid a neighbor to build anything that will obstruct the light of windows that have been in use for 20 years.

Economic control, the regulation of business activities by government.

In the Anglo-American tradition of government there has been economic control from the earliest times. About 1200 the fairs were strictly regulated by the Government, and they had to have a permit from the Crown. When the Black Death swept over Europe, it caused a great labor scarcity, and the Ordinance of Laborers (1349) and the Statute of Laborers (1351) in England declared that it was a duty to labor, fixed wages, gave a detailed regulation of the labor contract, abolished day-to-day employment and substituted term employment. It was made a criminal offense for a worker to take more than a certain wage or for an employer to entice a worker from another master. As early as 1299 records show a prosecution of a carpenter for combining with others of his trade to obtain a higher wage than was set by the ordinance of the City of London. In the Dyer's Case (1415) it was held that a contract not to use a craft for a half year in a certain town was against public policy. In 1552 legislation was passed to prevent engrossing (the crime of buying food at wholesale to sell dear at retail), forestalling (buying goods before they had reached the public market) and regrating (like engrossing but including selling at a very high retail price). This legislation was not completely repealed until 1844.

The philosophy of Adam Smith in his famous *Wealth of Nations* became the accepted attitude during the 19th century, and many governments adopted an attitude toward business of *laissez-faire* or leave-it-alone.

The tariff has played an important part in American political history and shows the interrelation of politics and economics, but a more conscious effort to control for the public good seems to date from the end of the 19th century with President Theodore Roosevelt's advocacy of conserving national resources and his attacks on the trusts.

The confusion that followed the World War and the depression that came in the early '30s forced governments in all parts of the world to mix in business. The new Soviet Russia, aiming to create a great industrial nation, took complete control of production and distribution and assumed ownership of all natural resources. In Italy and Germany the State, becoming totalitarian or all-embracing, supervised business as never before. The creation of the new postwar Republic of Turkey has been called a disciplined economic revolution.

In the United States there have been equally great changes. We are so near them that we cannot estimate their importance. They are so many that they cannot be described in detail or even listed in full. Perhaps the most important are:

The Federal Government's control of banks, beginning with the bank holiday of 1933 when bankruptcy threatened the country.

The close supervision of the stock exchanges by the Government.

The attempt through the NRA to reform business practice.

Relief for unemployed and a huge public works policy including the establishment of the Civilian Conservation Corps.

Experiments with government-owned power projects as yardsticks for the efficiency and right pricing of privately owned public utilities.

Attempts to control production, especially in agriculture, and fix prices.

The beginning of a social-security plan.

Economic legislation, see *Planning.*

Election, choice, especially the choice of government officials by a qualified group of voters (or electors) as distinct from the appointment of officials by those in authority. Election is also the choice by which under certain circumstances an official may be recalled or removed from his post. In addition, election may mean the choice of the voters between approval and disapproval of a proposed measure—a variety of election called a *referendum* (literally, matter to be referred) or a *plebiscite* (literally, people's decree). In Rome the meetings (*comitia*) of the people elected certain officers and voted certain laws.

Direct election is a vote on a candidate or measure that immediately settles the choice. *Indirect election* chooses a middleman or representative to make the choice—as in the choice prior to the 17th Amendment in 1912 of U. S. Senators by State legislators who had been elected by the people.

A primary election or *primary* chooses a party's candidates to be voted for at a regular election. A nominating convention is an election in the same sense as the primary—it makes the preliminary choice.

A *runoff election* or *second ballot* is a second voting to decide between candidates tied on a first vote or between candidates who received the highest votes but not the required majority. Second ballots are a regular thing in French elections to the Chamber of Deputies. There are many candidates for each seat, and it often happens that on the first *tour* (or voting round) only a quarter of the seats will be filled because it is difficult for a candidate to receive a majority of votes.

Electoral college, the indirect method of choosing the President and Vice-President of the United States by the vote of electors chosen by popular vote in each state, the number of electors in the state equaling its representatives in Congress—that is, two electors for each state because each state has two Senators; and in addition to these two electors as many more as the number of the state's representatives in the Lower House—from one apiece for Arizona, Nevada, New Mexico, Vermont and Wyoming to 20 for California, 27 for Illinois, 34 for Pennsylvania and 45 for New York.

In France members of the Upper House, the Senate, are chosen by a system something like our American electoral college but more elaborate and less directly representing the people. Each of the 90 departments of the republic has its own electoral college, which chooses two, three or even ten Senators—but only a third of the total number of Senators (314) is elected at one time. Every 3 years electoral colleges meet in about a third of the departments and elect Senators for 9 years. The electoral college in any one department meets only once in 9 years. It consists of: (a) all members of the Chamber of Deputies from the department; (b) all members of the department general council; (c) councilors of the arrondissements or subdivisions of the department; (d) delegates from the municipal councils of the department, the number of delegates depending on the size of the council and of the municipality.

Embargo, an order of a state prohibiting merchant vessels from leaving its ports. An embargo has as its object that of damaging another country by depriving it of its usual commerce. As a blockade shuts up the enemy's ports, an embargo prevents commerce at home ports from getting to the enemy.

Embezzlement, the act of an agent, servant or trustee in appropriating property that has been placed in his charge for safe-keeping or for disposal according to directions; the fact that he steals property that is already in his possession distinguishes it (in some states) from theft or larceny. Embezzlement is a statutory crime with different definitions and varying penalties in different states.

Emigration, see *Immigration.*

Eminent domain, the power of the government to appropriate any property for the public use of public good. In England it is called *compulsory purchase.* The Bill of Rights in the Federal Constitution (Art. V) provides that "private property shall not be taken for public use without just compensation." Most state constitutions have similar provisions.

Empire (from Latin *imperium,* command, sovereignty, authority, government), a group of nations, states or peoples under a single central government. The Latin word first applied to military power. The derived Latin word *imperator,* first meaning a victorious commander, later came to mean head of the state, including its conquered parts. So in ancient history *empire* is used of a power built by arms: the Persian Empire, Alexander's Macedonian Empire, the Roman Empire. For the same reason *empire* usually means a far-flung rule. The French Empire was created by Napoleon's victorious armies. Before the World War there were three empires in Europe, each ruled by an emperor whose title was a modification of the Latin name, Caesar, the title of the Roman emperors. The Russian Empire had its Czar or Tsar. The Austrian Empire and the German Empire each had its Kaiser, but the German word *Reich,* which we translate empire, was used of the German Republic set up after the World War and of the present Nazi state; it is really a word meaning rule or state with no implication what sort of government is meant.

Japan is called an empire because its ruler is absolute and (like Alexander and the Roman Caesars) is considered divine. The king of Italy was proclaimed emperor of Ethiopia in May 1936 after Italy conquered Ethiopia.

The British Empire is now officially the British Commonwealth of Nations. The name *British Empire* came into use after 1876 when the Prime Minister, Lord Beaconsfield, added to Queen Victoria's official titles Empress of India; but there was never any official British Empire. Especially in the period of imperialism at the end of the 19th century the word *empire* was used of any nation that was eager to spread its influence and power by conquest or colonization.

Employers' liability, a legal term with two very different meanings: (1) the liability of an employer for injury done by his employee in course of his employment, as when a delivery truck of a store injures a pedestrian; and (2) the commoner use nowadays, the liability of an employer to compensate an employee for injuries received in employment.

Enabling act, a special statute authorizing a corporation or an individual to do something or to carry on some activity that otherwise would not be legal. For example, on March 23, 1933, the German Reichstag passed by a vote of 441 to 94 the Enabling Act (Law to Combat the National Crisis) sanctioning Hitler's dictatorship and giving him 4 years of power to do anything but abolish the Reichstag or Reichsrat and diminish the rights of the President.

Equity, in the broad sense, equality or natural justice; a system of remedial justice administered by the courts of equity or chancery.

Escrow (old law French for scroll), a deed or bond duly executed by the contracting parties (grantor and grantee) and placed in the hands of a third party, to be held by him until agreed conditions between the two parties have been satisfied. Once deposited, the escrow is beyond recall by the grantor. When conditions are fulfilled, the document is delivered to the grantee.

Established church, an ecclesiastical system recognized and specially privileged by government—for example the Anglican (Protestant Episcopal) Church in England and the Presbyterian Church in Scotland. There are established churches in the following countries: Bolivia and Peru (both Roman Catholic); Greece (Hellenic Eastern Orthodox); Bulgaria (Bulgarian Eastern Orthodox); Sweden and Finland (both Swedish Lutheran). The Roman Catholic Church was disestablished in France in 1905 and in Spain in 1933. In the different states of the German Empire there were established churches—some Protestant and some Catholic—until 1918 when the head of each state (and of its church) abdicated. Russia had an established church (the Greek Eastern Orthodox) until the Bolsheviks in 1918 separated Church and State and openly crusaded against religion. In Italy, Germany and Russia the government is bitterly opposed to any church authority—that the totalitarian state supersedes any authority but its own is the dictators' idea. But in Italy the Fascist government in 1929 ended the 60-year-old quarrel of Church and State by recognizing the political independence of Vatican City, the residence of the Pope.

Estoppel (Norman French for bung, stopple or cork), the preclusion of a person from denying the truth of a fact that in the eyes of the law has become settled by an act of the person or by an act of judicial or legislative officers. If the actions of a principal create the impression that he has empowered a certain person as his agent, he cannot then dispute the agency even though it does not exist; this is called *estoppel by conduct. Estoppel by record* or *by judgment* precludes denial of anything in the judgment or record. *Estoppel by deed* or written instrument forbids "a man to aver or prove anything in contradiction to what he has once so solemnly and deliberately avowed." Estoppel by conduct or representation is sometimes called *estoppel by matter in pais* to distinguish it from estoppel by record.

Excise or **Internal revenue,** tax levied on the manufacture, sale or consumption of goods within a country. It is a tax levied for doing something, as distinguished from a property tax, which is levied on something owned. Excise taxes include levies on tobacco, liquor, gasoline, sales, amusements and incorporation.

Execution, putting into effect a legal judgment, sentence or document. The special uses of the word are: (1) *execution of a judgment,* the seizure of a debtor's property to satisfy the judgment; (2) *execution of a criminal sentence,* especially capital punishment; (3) *execution of a deed or will,* making it valid by signing, sealing and delivering.

Executor, a person named by the maker of a will to carry out the terms of the will. Frequently two or more co-executors are named. If the decedent leaves no will or if the executor he appoints cannot act, the probate court appoints an administrator. Under direction of the court, the executor or administrator discharges the obligations imposed in settling the estate; all his acts must be approved by the court.

Exemption, freedom or immunity from the general provisions of the law. A physician's instruments, a lawyer's library, the tools of any trade, the homestead of a farmer are exempt from seizure for debt (unless they are pledged by mortgage, or the exemption is otherwise waived); there are similar exemptions in bankruptcy. Editors and teachers are exempt from jury duty; ministers of the gospel, from military service.

Ex post facto (Latin, from what is done afterwards), retroactive, especially a law that makes a deed a crime that was not a crime when committed or increases the penalty for a crime or removes a lawful protection. The United States by constitutional provision (Art. I, Sec. 9, Cl. 3; and Art. I, Sec. 10, Cl. 1) forbids the passage of *ex post facto* laws, but this is interpreted only in the limited sense of applying to criminal or penal statutes. It does not apply to civil cases. The British Parliament still has power to pass *ex post facto* laws.

Exterritoriality or **Extraterritoriality,** literally being outside or beyond the local jurisdiction; privileges or immunities that make a foreigner free from the law of the land in which he lives. In Turkey, Egypt, Persia, Siam, Japan and China treaties or agreements (called *capitulations*) gave to citizens of western nations the right of exterritoriality so that they were not governed by local laws. In the East there has been a constant tendency to withdraw exterritorial rights. The first to abolish these exterritorial rights was Japan in 1892, and with the practical withdrawal of the capitulations in Egypt in 1936 China became the only nation remaining where such rights are enjoyed by foreigners. In 1902 Great Britain, Japan and the United States agreed to give up their special privileges in China when conditions warranted it, but in spite of China's requests the Powers have not considered that conditions did warrant the relinquishment.

This immunity is always granted to diplomatic representatives of one country residing in another; there is a legal fiction that the ambassador's residence is a part of his own country and not of the country in which it is actually situated. Traveling royalty is immune from the laws of lands visited.

Extradition, the surrender by one authority, state or nation to another of a fugitive from justice. Not all crimes are subject to extradition; each treaty providing for mutual favors of this nature specifies what crimes shall warrant extradition. In countries where no treaties on the subject are in force, a fugitive from justice is safe. The Federal Constitution (Art. IV, Sec. 2, Cl. 2) requires extradition from one state to another "on demand of the Executive authority of the State from which he fled." Frequently a governor has refused to honor such a request, and the Supreme Court has declared that no "clause or provision in the Constitution arms the Government of the United States with power . . . to compel the execution of this duty." On several occasions governors of northern states have refused to surrender fugitives from southern chain gangs, especially Negroes.

False imprisonment, total restraint without legal authority, whether or not the restraining force is physical. The one who falsely imprisons another has committed a crime and may be punished by the state; he also has committed a tort and is liable to the injured party for damages. Miscarriage of justice by which a jury orders a defendant to prison when he is actually not guilty is not false imprisonment. The letter of the law has been followed, and the judgment is based on all evidence obtainable. If later evidence establishes the innocence of the prisoner, he has no redress, though he can secure his freedom and sometimes the state gives him compensation.

False pretenses, untrue representation of past or present facts with intent to defraud; a criminal offense if the fraud is committed. It differs from larceny because the victim is persuaded to give up property.

Farm Credit Administration, a U.S. Government unit created in 1933 by President Roosevelt to replace the Federal Farm Board (established in 1916) that he abolished. The governor and two deputy governors supervise 12 Federal Land Banks (created in 1916)—in Springfield (Mass.), Baltimore, Columbia (S. C.), Louisville, New Orleans, St. Louis, St. Paul, Omaha, Wichita, Houston, Berkeley (Calif.) and Spokane—that make loans on first mortgages; 12 Federal Intermediate Credit Banks, which rediscount farm and livestock paper for periods between crops; 12 Co-operative Banks that finance farm supply co-operatives; and the Production Credit Corporations and Associations, which are organizing a permanent production credit system. The commissioners of these four groups assist the governor of the Credit Administration.

Fascism, the principles of the Italian group or party called Fascisti or Fascists. The name is derived from the Roman *fasces,* a bundle of rods carried by the lictor, an officer attending magistrates. The *fasces* in ancient Rome symbolized the authority and power of the law. In modern Italy the followers of Mussolini took the name of Fascisti to signify that the law must be obeyed and that force would be used against radicals, Communists and Socialists and that the state is all-powerful in every field of human activity.

In 1919 in Milan the first Fascio di Combattimento or Fascist Combat Group was formed by Mussolini who had turned violently against the Socialist doctrine he had proclaimed before the World War. The followers of D'Annunzio joined the movement in 1921 after they moved out of Fiume, which they had seized in 1919. And in 1921, 35 Fascists were elected to the Chamber of Deputies, and at the November Fascist Congress the party was organized. In August 1922 a general strike was called throughout Italy to establish the authority of the Socialist government against the Fascists and Nationalists; but within a few days the Fascists had forcibly suppressed the strike. On October 30, 1922, the Fascists entered Rome in force, and immediately afterward Mussolini became premier and minister of foreign affairs. In the middle of November the legislature gave him full powers for a year.

Since then Italy has become a Fascist state, ruled by Mussolini and his party with constantly increasing international importance—a growing friendship with the somewhat similar government of Germany and open hostility to the Soviet government of Russia.

Fascisti, see *Fascism.*

Federal Communications Commission, a U. S. Government board of seven members created in 1934 to regulate interstate telephone, telegraph and radio broadcasting. Radio broadcasting had formerly been supervised by a Federal Radio Commission created in 1927. The Communications Commission requires periodical reports and the filing of rate schedules by all companies in its jurisdiction. It may prescribe rules and fix new rates and investigate any transactions of these communications concerns. No extensions or construction of new plants or consolidation of companies (especially telephone) is allowed without the Commission's permission.

Federal government or **Federation,** a group of states united under a central government by a covenant or league that reserves some powers to the separate states. The term comes from the Latin word *foedus, foederis,* meaning league or covenant. The same root appears in the word *confederation* and in the title *Confederate States of America* adopted by the South in the American Civil War; but confederation has a very different meaning—a union for a particular purpose in which the states retain practically all power and governmental authority. In the Civil War the northern army was often called Federal to distinguish it from the Confederate forces. The German writers on government call a federation a *Bundesstaat* or union-state and a confederacy a *Staatenbund* or union of states.

The German Empire (Deutsches Reich) from 1871 to the end of the World War was a federation of German states with a double government —one of the Reich and the other of the individual states.

The Swiss Confederation was originally a league for defense, but the government has become more and more federal, especially under the Constitution of 1874. There are two houses in the legislature—one with two members from each of the 22 cantons and the other with one representative for every 22,000 inhabitants of the cantons. The Parliament elects an executive Federal Council of seven members and a President of the Confederacy.

The Dominion of Canada is a federal government in which the central government has all power not reserved to the provinces by the constitution—just the opposite of the U. S. Constitution which reserves to the states all power not expressly granted to the Federal Government.

The Commonwealth of Australia (1901) is distinctly federal with six states, one territory and a Federal Capital Territory like the District of Columbia. The Federal Parliament has two chambers: the Upper House has the same number of senators from each state; the Lower House has representatives from each state in proportion to its population but never fewer than five. The Federal legislature has wide powers.

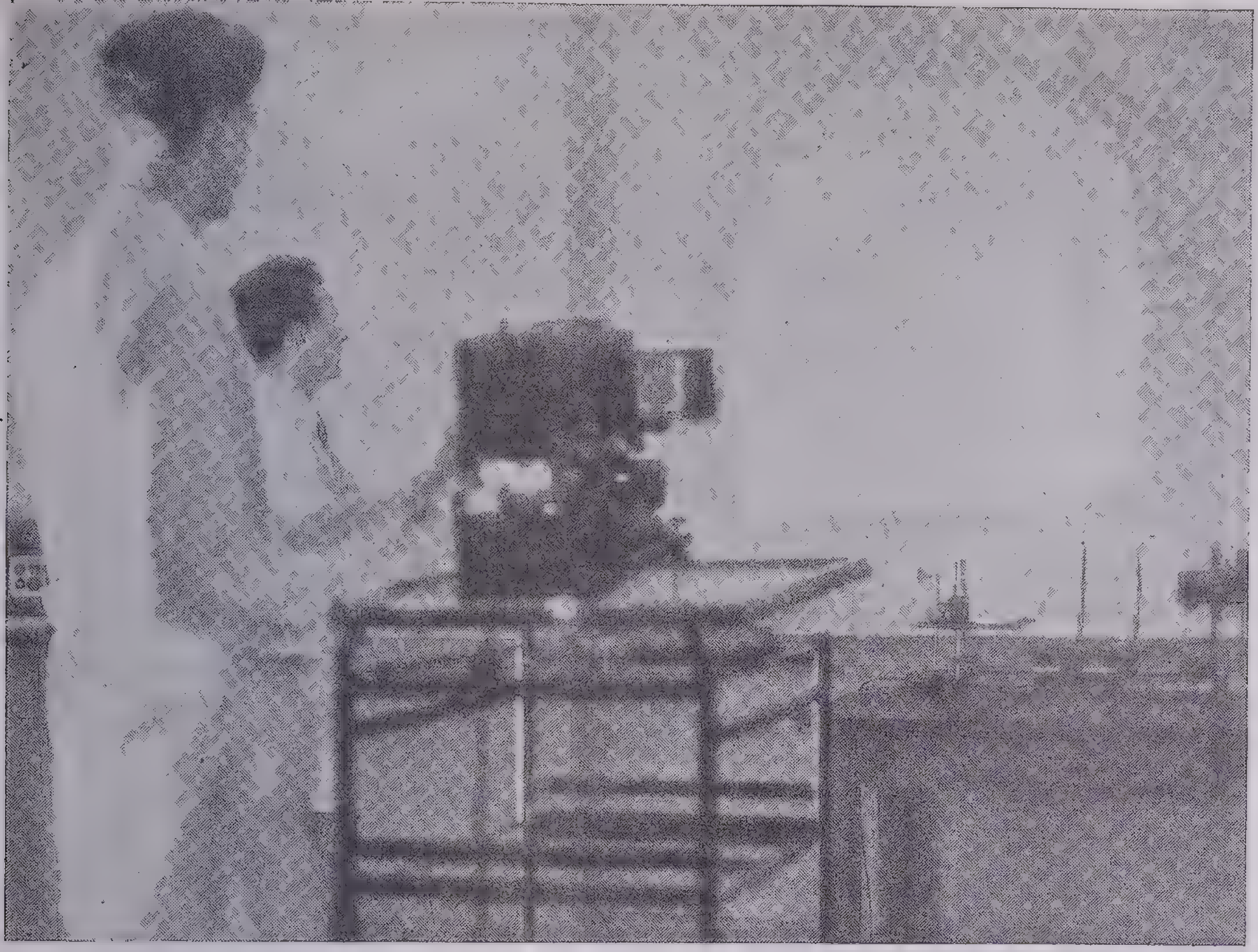
The best known of federal governments is the United States of America where the federal union under the Constitution of 1787 succeeded the loose government under the Articles of Confederation. The Federalist party backed the new constitution.

Federal appears as the first word in the titles of several important government agencies of the United States and generally is used to distinguish from separate state activities those of the central government.

Federal Home Loan Bank Board, a government agency set up by an act of Congress in 1932 to assure small home owners of safer financing at lower interest rates. It was created in the Hoover administration, but its activities were greatly expanded in the first Roosevelt administration when it supervised such emergency agencies as the Home Owners Loan Corporation and the Federal Savings and Loan Insurance Corporation (both terminated in 1937).

Federal Bureau of Investigation, a division of the Department of Justice charged with the general investigation of offenses against Federal laws, except counterfeiting, narcotics and other matters not within the jurisdiction of the Department of Justice.

Federalist party, the first American political party. Led by Alexander Hamilton, James Madison and John Jay this group urged the adoption of the Constitution by the various states and was called Federalist because the Constitution was creating a Federal government. The first elections were nonpartisan, and it was not until 1800 that there was a distinct party alignment among the voters. However, John Adams, a Federalist, was elected in 1789, and from 1801 until its breakup about 1816–20 the Federalist party was the main opposition group. The party drew its support mainly from the business and financial interests and from the large property holders.



Courtesy Federal Bureau of Investigation

FBI Technicians Project a Magnified Picture of a Fingerprint Found at the Scene of a Crime

Federal Power Commission, a U.S. Government board of five, appointed by the President with the consent of the Senate to control and supervise hydroelectric power plants on public lands or affecting navigation. New projects must secure a license from the Commission, and the license runs for 50 years. If the site is not developed within a time limit specified in the grant, the Government has the power to repossess the property. The Commission is in charge of a national power survey and an electric rate survey.

Federal Reserve system, a U.S. banking system set up by an act of 1913 (the Owen-Glass Federal Reserve Act) in force November 16, 1914. The law was urged on Congress by President Wilson. It created 12 Reserve Banks in 12 districts with headquarters in Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco. The districts do not follow state lines. They are known by the name of the central city or by numbers (in the order given above—Chicago is the seventh district). The system is under the supervision of the Federal Reserve Board of seven, appointed by the President with the consent of the Senate—and with an eye to the fair representation of different regions and of financial, agricultural, industrial and commercial interests. (Up to 1933 the Secretary of the Treasury and the Comptroller of the Currency were members ex officio, and there were six appointed members.)

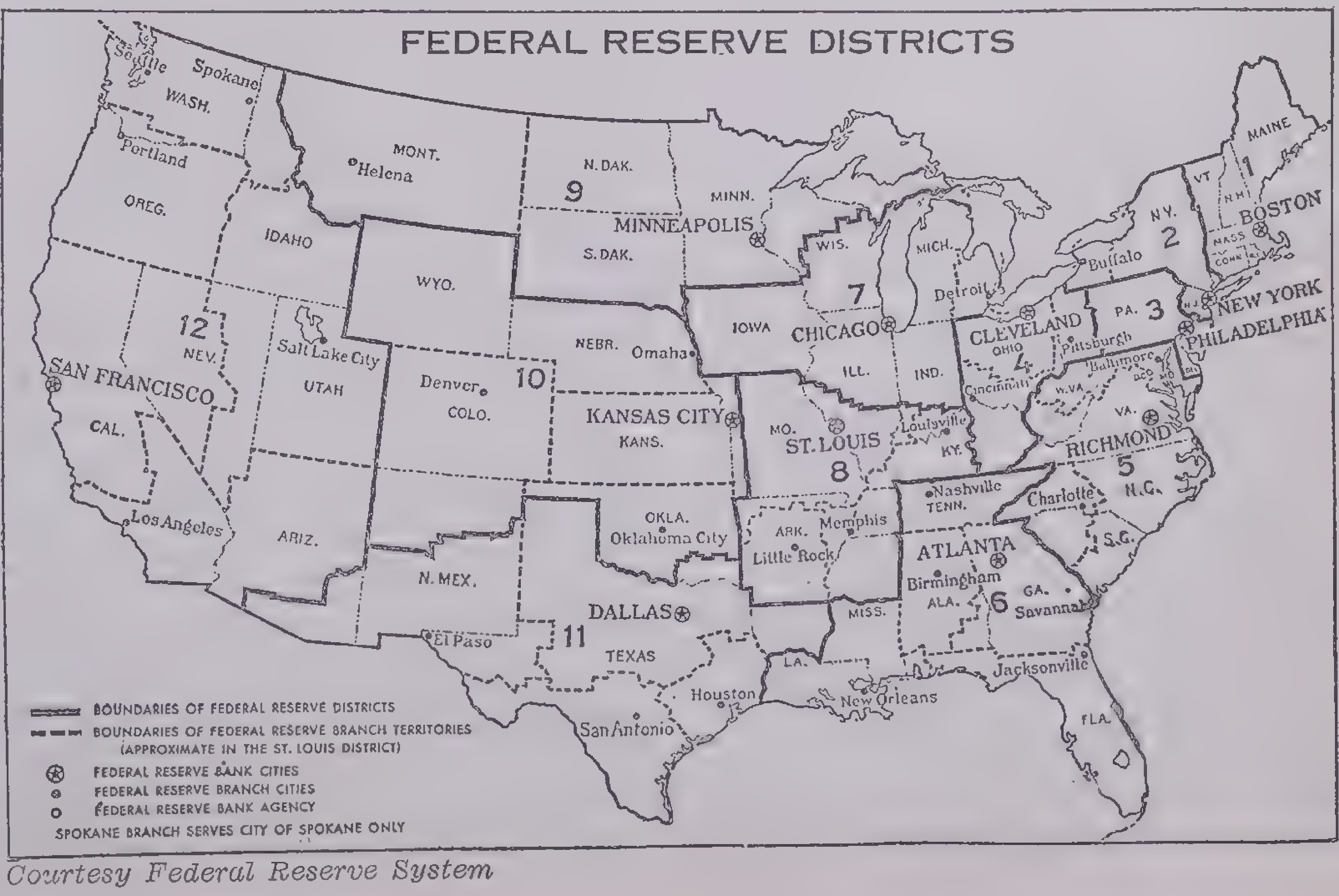
The great expanse of the territory of the United States, the wide diversity of industries and the special position of agriculture, the need for an elastic currency that could be readily expanded when business needed additional credit and the need of centralized reserves that could be utilized by the various banks were the main reasons why the Federal Reserve system was organized. Through the 12 Federal Reserve Banks, paper is rediscounted for member banks, and bank notes are issued, and the Federal Reserve acts as the financial agent of the government in certain dealings. The Federal Reserve Banks have very few dealings with the general public. They are bankers' banks and act as the general co-ordinating system of the various other banks throughout the nations. In its operation the Federal Reserve is a central banking system, making cash and credit available where it is most needed and generally performing the same services for banks that the banks perform for individuals.

The 12 Reserve Banks are privately owned by individual member banks, each being required to subscribe for Reserve Bank stock to the amount of 6 per cent of its paid-up capital and surplus. The member banks in each of the 12 districts elect six (of nine) directors of their district Reserve Bank—three bankers and three persons engaged in commerce, agriculture or industry but not officers, directors or employees of any bank. Three more directors (including the chairman who is called the Federal Reserve Agent) are appointed by the Board of the Federal Reserve system. The Board of the system is aided by the Federal Advisory Council of 12 members, one from each district, elected by the district Boards of Directors.

Federal Trade Commission, a commission of five members appointed by the President to investigate business practice and management, especially unfair methods of competition, monopoly and practices tending to lessen competition in interstate and foreign commerce. The Commission was created on the recommendation of President Wilson by an act of Congress in 1914 and received additional powers from the Clayton Antitrust Act of that year and from the Webb-Pomerene Act of 1918 (permitting concerns to associate for foreign trade).

It also took over the work of the Bureau of Corporations organized in 1903. In 1928 the Senate instructed the Commission to investigate public-utility corporations. The members are appointed for 7 years with overlapping terms. The Commission helped many industries to formulate codes of fair-trade practice before the National Industrial Recovery Act in 1933 created a new agency to draw up codes of fair competition.

The Commission has power to issue an order to "cease and desist" from unfair practices. When an offender against such an order after signing a promise that he will not continue the forbidden practice vio-


FEDERAL RESERVE DISTRICTS
Seattle
Spokane
WASH.
Portland
OREG.
IDAHO
MONT.
Helena
N. DAK.
9
MINN.
MINNEAPOLIS
S. DAK.
WYO.
WIS.
MICH.
MAINE
VT.
N.H.
1
BOSTON
MASS.
CONN.
N.Y.
2
Buffalo
Detroit
7
CHICAGO
IOWA
NEBR.
Omaha
12
NEV.
Salt Lake City
UTAH
SAN FRANCISCO
CAL.
Denver
COLO.
10
KANSAS CITY
KANS.
ILL.
IND.
OHIO
CLEVELAND
4
Pittsburgh
Cincinnati
PA.
3
NEW YORK
PHILADELPHIA
Baltimore
W.VA.
VA.
RICHMOND
5
N.C.
Charlotte
MO.
ST. LOUIS
8
Louisville
KY.
Nashville
TENN.
Memphis
ARK.
Little Rock
OKLA.
Oklahoma City
Los Angeles
ARIZ.
N. MEX.
El Paso
11
DALLAS
TEXAS
Houston
San Antonio
LA.
New Orleans
MISS.
ALA.
Birmingham
ATLANTA
6
GA.
Savannah
S.C.
Jacksonville
FLA.
BOUNDARIES OF FEDERAL RESERVE DISTRICTS
BOUNDARIES OF FEDERAL RESERVE BRANCH TERRITORIES (APPROXIMATE IN THE ST. LOUIS DISTRICT)
FEDERAL RESERVE BANK CITIES
FEDERAL RESERVE BRANCH CITIES
FEDERAL RESERVE BANK AGENCY
SPOKANE BRANCH SERVES CITY OF SPOKANE ONLY

Courtesy Federal Reserve System

lates this promise, the complaint is usually made public.

The Security Exchange Act of 1934 took away from the Federal Trade Commission authority to administer the Securities Act of 1933 and set up the SEC or Securities and Exchange Commission.

Felony, at common law, every crime that occasioned a total forfeiture of lands or goods and to which might be added capital or other punishment according to the degree of guilt. A felony is always a grave crime; lesser offenses are called *misdemeanors.* The various states have defined the terms by statutes, and there is no uniformity, so that the same crime may be a felony in one state and a misdemeanor in another.

Fictions, assumptions (true or false) that courts of law (especially in England) made and did not permit anyone to disprove. It is a legal fiction that everyone knows the law—necessary to uphold the maxim, "Ignorance is no excuse." The law of adoption is based on the fiction that a child becomes a member of a family to which it has no blood relationship. It was a fiction of English law that husband and wife are one person. That a corporation is a person is a legal fiction. It is a fiction of international law that a warship is a part of the country that owns it and that an ambassador's residence is not a part of the country in which it is situated. In another sense a legal fiction is "any assumption that conceals the fact that a rule of law has undergone an alteration." When legislation required public transfers of land, a legal fiction preserved the secrecy of titles by this method: the new owner sued to assure his title, and the old owner entered no defense, so that the court could do nothing but recognize the change of title. Blackstone said: "No fiction shall extend to work an injury, its proper operation being to prevent a mischief or remedy an inconvenience that might result from the general rule of the law." Legal fictions were long one method of changing the law in fact and in result though not in form or in theory.

Filibuster, originally a freebooter, buccaneer or pirate; and now, in the slang of legislative bodies, a person who holds up the course of legislative business by technicalities, privileges, prolonged speeches and other obstructive tactics. This method of delay also is called a filibuster, and the same word is used as a verb meaning to delay or obstruct legislative business.

Fine, in criminal law a penalty in money assessed against a defendant in a criminal case as a penalty for wrongdoing. In misdemeanors the amount is left largely to the judgment of the court; in felonies, the statutes declare what minimum and maximum fines shall be imposed, and they may be assessed in addition to sentence of imprisonment. The Constitution of the United States forbids excessive fines (Amendment 8). Originally fines were paid to avoid imprisonment or other punishment. In conveyancing, a fine is a friendly agreement by the parties and with leave of the court, by which certain land is acknowledged to belong to one of the parties.

Five-Year Plan (translating the Russian *pyatiletka*), the government programs in Soviet Russia adopted in 1927 and 1932 for the agricultural and industrial development of the nation.

Foreign affairs, the relations of one government with other nations, usually handled by the executive department with some participation by the legislative branch.

In the United States the President has large powers in foreign affairs. The Constitution (Art. II, Sec. 2, Cl. 2) says: "He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two-thirds of the senators present concur; and he shall nominate and, by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls"; and it also says (Art. II, Sec. 3): "he shall receive ambassadors and other public ministers."

Usually the President in his relations with foreign Powers acts through his Department of State, but he may communicate directly with American ministers abroad or may send special and almost personal messengers or representatives to various foreign countries. President Wilson sent Col. E. M. House to Europe before and during the World War, and President F. D. Roosevelt was represented in much the same way by Norman H. Davis. Mr. Wilson himself went to Paris for the Peace Conference.

The foreign relations activities of the Chief Executive and the Department of State are constitutionally limited by the requirement that two-thirds of the senators present must agree if a treaty is to be binding. The most famous instance is the Treaty of Versailles in 1919, largely negotiated by Wilson himself, which was defeated in the Senate by the opponents of the League of Nations.

The diplomatic representative of the United States to any foreign nation may be of the same rank as the representative that country sends the United States. This rule was adopted in 1893 and it was only then that the United States gave the title of ambassador to any of its diplomats.

Thomas Jefferson, first U.S. Secretary of State, insisted that the Federal Government could not make a treaty with a foreign Power that involved any matter reserved to the state by the Constitution; but there have been several instances where the courts have upheld a treaty obligation in a matter where the state and not the Federal Government has jurisdiction: for example, a Russian consul in Massachusetts had a treaty right to administer the estate of a Russian who died in the state though the law of the state provided otherwise; and the state authorities of Missouri were not upheld in their protest against a treaty between the United States and Canada forbidding indiscriminate killing of birds in migratory flight between the two countries.

Generally speaking there have been several main controlling ideas in American foreign relations: "To steer clear of permanent alliances"—the notion of isolation founded on Washington's Farewell Address; the Monroe Doctrine (1823) that "we consider any attempt on [the part of European Powers] to extend their system to any portion of this hemisphere as dangerous to our peace and safety"; John Hay's open-door policy (1899) demanding for the United States equal opportunity with any other Power in the economic and commercial development of any backward country; and the Kellogg Pact of 1928, drafted by the Secretary of State of the United States and signed by the major Powers, "renouncing war as an instrument of national policy."

In England foreign affairs are controlled by the Crown and conducted by the king's minister, the Secretary of State for Foreign Affairs at the head of the Foreign Office. War is declared by the king's ministers and not by Parliament, and though treaties may contain terms that require ratification by Parliament the Crown has full power to make and ratify treaties without submitting them to the House of Commons. There is no constitutional requirement as in the United States that treaties receive the approval of any lawmaking body.

In France the President of the Republic and the Council of Ministers control foreign relations, and the Minister of Foreign Affairs is often the premier. The Constitutional Law of 1875 requires the consent of the two chambers of the legislature to treaties of commerce, treaties with financial obligations and treaties applying to property rights. No cession of territory can be made without the approval of the National Assembly.

Under the 1936 Constitution of the Union of Soviet Socialist Republics the Presidium of the Supreme Soviet, which is an executive committee with 37 members, has power to proclaim a state of war in the event of armed attack on the U.S.S.R. or to fulfil international treaty obligations; to ratify international treaties; to appoint representatives to foreign states and to accept credentials of ministers who are accredited to the U.S.S.R.

Foreign service, see *Diplomatic service; Ambassador; Consul.*

Forgery, making or changing a document, especially imitating the handwriting of another person on any document with the intention to deceive or defraud. The most common forgeries are signatures on checks, notes and wills, but any secret alteration of any part of a document, even of a word, if a new meaning is given to the instrument, constitutes forgery if intent to defraud is shown. The crime is a penitentiary offense. In England forgery was a capital crime without benefit of clergy for two centuries after 1634. A clergyman was hanged for forgery in 1777, a banker in 1824.

Fraud, in its general sense, all acts or omissions involving a breach of legal duty that result in damage to another. In order to sustain an action for fraud there must have been: (1) a false, material representation that the maker knew to be false and intended should be acted upon; (2) the hearer must have been ignorant of the falsity of the representation and have relied on it as the truth, and there must have been a right to so rely; (3) a consequent and proximate damage due to the reliance on the false representation.

Freedom of speech and press, see *Censorship.*

Free-Soil party, an American political party that came into existence in 1847 largely in opposition to the extension of slavery into the new territory acquired from Mexico. It was composed of the Barnburners of New York, the antislavery Whigs and the members of the Liberty party. The party met in a convention at Buffalo in 1848, adopted a platform favoring a homestead law, a low tariff for revenue and internal improvements and nominated Martin Van Buren for President and Charles Adams for Vice-President. The party polled 291,263 votes. The supposed settlement of the slavery question in the territories by the Compromise of 1850 caused the Barnburners to split off and the Free-Soil party gave its nominee for President in 1852, John P. Hale, only 156,667 votes. Two years later it was absorbed into the new Republican party.

Garnishment (from *garn,* a variant of warn), originally a warning to a person not a party to the action to appear in court and give certain information. At present it is a judicial proceeding by which the plaintiff seeks to subject to his claim certain property of the defendant in the possession of a third party or money owed by the third party to the defendant.

Gay-Pay-Oo or **Ogpu,** the initials of the Russian *Gosudarstvennoe Politicheskoe Upravlenie,* Government Political Administration, the secret police of the Soviet Government since 1922.

Gerrymander, the process of redistricting a state or other political division so that one party gets an unfair advantage over another. In 1812 when Elbridge Gerry was governor of Massachusetts, the election districts were redistributed to the advantage of the Democratic-Republican party, and one district (a part of Essex County) had boundaries so eccentric that on the map the outline looked like a dragon. One politician compared it to a salamander. "No, a Gerrymander," another said. So the word (originally pronounced with a hard *g,* but now with a *j* sound for the initial letter) has become a general term for unfair districting. (The history experts say that Governor Gerry was not to blame; the legislature made the new election districts.)

Government, the English Cabinet and Ministry; in Ireland, the executive power of the state under the 1937 Constitution, a group of 7 to 15 members appointed by the President. The Irish Government (*Riagaltas*), like the English, is responsible to the Lower House (*Dail*). It is headed by a Prime Minister (*Taoiseach*). He appoints deputy or assistant (*Tanaiste*). These two and the head of the Department of Finance must be members of the Dail. The other members of the Government must have seats in the Dail or the Senate, but there cannot be more than two members of the Senate in the Government. The Taoiseach must resign "upon his ceasing to retain the support of a majority in the Dail," and upon his resignation the other members of the Government are automatically out of office. The Irish Constitution attempts to adopt and formulate the English practice about the Government, that is, the Cabinet and Ministry.

Governor, originally a pilot or steersman; now the chief executive of a state of the United States or the executive, representing the British Crown, in an English colony or dependency—for example, Newfoundland, Jamaica, Bermuda, British South Africa, British East Africa, British West Africa, Burma, Ceylon.

Twenty-four states of the Union elect the governor for a 4-year term; 23, for a 2-year term; and one (New Jersey), for 3 years. The governor is likely to be a leader of his party in the state and many Presidents of the United States have come to that office after acting as state governors —notably Cleveland, Wilson and the two Roosevelts. The governor of New York receives an annual salary of $25,000; six other states pay $10,000 a year or more; the others pay from $3,000 (S.D.) to $8,000. Except in Mississippi where there is something like the presidential electoral college, the governor is elected by popular vote.

The governor's executive and administrative powers in some states are limited by the fact that department heads are elected just as he is and are responsible not to him but to the voters. But there is a tendency to give the governor more power, and in states where there has been a recent overhauling of the machinery of government the new constitutions provide that the governor appoint department heads. In Maine the legislature elects a Governor's Council, and in Massachusetts a similar advisory body is elected by popular vote. In several states the governor has not the full pardoning power. North Carolina is the only state where the governor has not the power to veto legislation. In the other states a governor's veto may be overridden by a two-thirds vote, a three-fifths vote or (in a few states) by a mere majority. A few state constitutions allow the governor to veto separate items in appropriation bills, but in most states this is forbidden as in the Federal Constitution. Since 1908 the state governors have met in yearly conferences to discuss common problems.

The governors of English colonies and dependencies usually serve for 6 years. The dominions have each a governor general, a Crown appointee and representative, who serves for a minimum term of 5 years. He has a veto power in theory but seldom or never uses it.

Greenback party, a political party in the United States, organized in 1875 to bring about the repeal of the Resumption Act by which greenbacks were to be redeemed in specie beginning in 1879. As a result of the panic of 1873 the West and South were suffering from credit restrictions, and they believed that the inflation of the currency would aid in the recovery. When the supporters of the greenbacks (fiat money) failed to dominate the Democratic convention, they withdrew and formed the Greenback party. Peter Cooper, who was nominated for President, polled only 81,737 votes.

After the labor troubles of 1877, labor organizations allied themselves and formed the *Greenback-Labor party,* which sent 14 representatives to Congress in 1878, and in 1880 James B. Weaver of Iowa polled 308,578 votes as their candidate for President. After that the party showed a rapid decline, and its members returned to the old parties.

Guaranty, a contract by which one person agrees for a consideration to pay a debt if the debtor does not. Some states distinguish between surety and guaranty as follows: a guarantor pays when the debtor cannot, that is, the guarantor is secondarily liable and need pay only after a demand is made upon the debtor and refused; a surety pays when the debtor does not, that is, the surety is primarily liable and becomes responsible as soon as the debtor defaults. For most purposes the two words are synonymous.

Guardian (a variant form of *warden*), one appointed by a court to control the acts and manage the property of an infant (a person not yet of age), called a *ward.* He stands before the law as the legal parent but is not permitted to derive profit from the estate of the ward, except the compensation allowed for his services. All his acts are subject to court approval, and he is personally accountable for losses if he deliberately exceeds his authority. If an infant or person otherwise legally incapable has no legally appointed guardian, a *next friend* may act for him—that is, anyone not having an interest in opposition to that of the infant. Formerly when married women suffered from legal disabilities, they could sue only through a next friend.

Habeas corpus (Latin, *you shall have the body*), a legal writ issued by a court commanding public officials or private persons who have a person in detention to bring him into court to show cause why he is held. An application for it cannot be denied in times of peace; the Federal Constitution (Art. I, Sec. 9, Cl. 2) and most state constitutions declare that "the privilege of the writ of habeas corpus shall not be suspended unless when in cases of rebellion or invasion the public safety may require it." The writ is returnable immediately—there is no delay in bringing it to the court. If sufficient cause for the detention of the person in question is not shown, he is set free. Historically, this writ was used to establish the right of personal liberty against tyranny of nobles, king or courts. If a person is wrongfully arrested, a writ gives him opportunity at once to demand that officials show why he is held. The writ of habeas corpus has effect only where the imprisonment is illegal and there is no other remedy available to secure a release.

Habitual criminals or habitual offenders, those repeatedly convicted of crime and considered a special menace to the public safety. The British Prevention of Crime Act in 1908 gave the courts power to impose an extra preventive sentence on habitual offenders. In the United States, beginning with the New York Baumes Act of 1926, courts are required to impose extra penalties on criminals convicted a certain number of times (usually three times for felonies and five times for misdemeanors). In New York the mandatory penalty is life imprisonment for a fourth conviction for felony.

Hearing, formerly a proceeding in a court of equity in contradistinction to a trial in a court of law; now used for both. A hearing may also take place before an administrative board or a magistrate. It generally includes the right to introduce testimony and to argue the merits of the case.

Home Office, a part of the British Government, a department under the Secretary for Home Affairs, who is almost always a member of the Cabinet. The Home Office has many functions. Up to 1801 it handled all colonial affairs. It is still in charge of the Channel Islands and the Isle of Man, which are not colonies but Crown dominions; but its jurisdiction does not include Scotland.

The Home Office does not manage the affairs of local government as do the Continental Ministries of the Interior, but it does perform many extremely important home duties among which are the following: supervision of both registrations and elections; general direction of both local and national prisons; control over the naturalization of aliens; receipt and transmission of petitions to the Crown; approval of arrangements for the circuit judges; receipt of applications for pardons and advice as to their disposition; both preparation and countersigning of the orders that are to receive the signature of the Crown; and making all inspections and issuing all certificates to the various branches and departments of the police system.

Home rule, the right of cities to frame their own charters. As the city is a corporation, its charter or frame of government must originate with the state. In state legislatures the representatives of country and rural districts are likely to outnumber those from the cities and are certain to outnumber the representatives from any one city. Hence it often happens that a municipal charter drafted and granted by a state legislature is dictated largely by the interests of the rural part of the state.

The various attempts to correct this condition may be classified as follows:

Constitutional provisions against special legislation attempted to make it impossible for a state legislature to draft a charter that applies to a single city, but the courts ruled that legislatures might charter cities by classes—and usually the largest city in a state is in a class by itself, so that this method was of no avail.

Sometimes the state constitution (in Illinois, for example) allows special legislation on city charters but makes it operative only after the charter has been approved by the voters of the city.

Sometimes the legislature gives a city the choice between different types of charter.

The method that is commonly called *home rule* goes even further. It was first used in Missouri in 1875, and it permits the voters of a city (over 100,000 in Missouri) to decide whether they will adopt a charter submitted to them by a city board. The only stipulation is that the charter must be in harmony with the constitution and laws of the state. Among the states that now give this sort of home rule to their cities are: Arizona, Arkansas, California, Colorado, Florida, Maryland, Michigan, Minnesota, Nebraska, New York, Ohio, Oklahoma, Oregon, Texas, Washington and Wisconsin.

Home rule for counties was introduced in California by a constitutional amendment in 1911. A board to draft the county charter is elected by the voters of the county at an election called by the county board of supervisors or by a petition signed by 15 per cent of the voters. The charter that is drafted goes to the voters for approval and also to the state legislature. Virginia, Texas, Ohio and Nebraska now permit counties to adopt home-rule charters.

In foreign countries there is practically no home rule for cities. England and France have much more centralized control of municipal government than there is in the United States, and of course the control is by the central government in London and in Paris and not as with us in the capital of a state, county or department.

Homicide, the killing of one person by another. *Justifiable* homicide includes: the acts of officers who kill offenders fleeing from justice, the case of persons who are killed in the necessary dispersal of a mob, the legal act of putting a condemned man to death. *Excusable* homicide includes those cases in which a person kills another in defense of his own life or in which death results accidentally from the act of another person engaged in a legitimate task. *Felonious* homicide is a willful killing under such circumstances that the killer is punishable. It has two classes: murder, killing with malice aforethought, that is, premeditated; and manslaughter, when the killing is not premeditated.

Housing, dwelling accommodations and the provision of those accommodations, especially as they are controlled and regulated by government.

The bad housing conditions in large cities and in factory towns and villages are due to many causes—poverty; immigration of a class with low living standards; a change in average standards of living that was far speedier than the rate of rebuilding and remodeling; and a housing shortage that became particularly severe during the World War and the depression that followed.

The *housing problem* of inadequate and unsanitary dwellings makes it necessary for government to use its police power in setting certain minimum standards for new dwellings and in some cases has induced the government to aid new building or actually undertake it.

A Tenement House Law in 1867 for New York city forbade a tenement to cover all the lot—the law provided that there must be a 10-foot yard in the rear. Running water was required, but a backyard spigot fulfilled this requirement. Basement rooms for dwellings had to have a ceiling at least 1 foot above the sidewalk level. The London County Council, created by the Local Government Act of 1888, investigated slums and began to build model tenements.

In the 1890s the reform that was started in New York spread to Boston, Philadelphia, Chicago and other American cities that adopted laws to restrict and regulate new tenements. In 1901 New York established a Tenement House Department, and other cities followed with regular inspection of tenements by city officials and new requirements—water supply in each apartment, minimum size of rooms and minimum window space, maximum percentage of building lot to be occupied by building, maximum height of building. New state laws on housing—notably in Indiana, Michigan, Iowa and California—and the City Code of Minneapolis, for instance, in the years 1917 to 1919 carried these restrictions much further.

During the World War the United States Government built some houses for its employees, though not on the scale that this was done in England. A constitutional amendment adopted by Massachusetts in 1917 gives cities and towns power to provide at reasonable rates food and shelter in time of war or other emergency.

After the War some state and municipal governments passed laws restricting rentals, and a premium was put on new residential building by exempting certain classes of building from taxation. New York in 1926 granted 20 years of tax exemption to buildings erected under the provisions of a state law creating a Board of Housing that co-operates with limited-dividend housing companies. In California the Veterans Farm and Home Purchase Act of 1921 provided

Courtesy United States Housing Authority

Government and Housing

Since the middle of the 19th century, government has been concerned with the problem of providing safer, healthier living accommodations for low-salaried groups. In the United States, dark, disease-ridden shacks like those at the left, in a 25-acre slum area of Atlanta, Georgia, have been torn down to make way for the housing development at the right with plenty of light, space, grass and flowers and with only one family to a home. The 604 dwelling units are rented to low-income families at a base rent averaging $5.52 per room per month. These pictures present the brighter side of the housing picture: "One-third of a nation is still ill-housed, ill-clad, ill-nourished . . ."

for advantageous purchase of homes by veterans.

The New Deal made Federal funds available for loans to limited-dividend housing companies under the restrictions and control of state and municipal authorities. Private real-estate interests opposed these loans, but in 1934 the National Housing Act created a Federal Housing Administration to finance new homes under a single mortgage system that required the change of mortgage laws in 45 states. The single mortgage is insured by the Administration.

In 1937 a new Federal housing program was adopted to clear slums and build low-cost dwellings. The new U.S. Housing Authority was authorized to issue in 3 years $500,000,000 worth of bonds, guaranteed by the Federal Government. Loans to state and local boards or authorities are to be repaid with interest within 60 years. An additional $25,000,000 was appropriated for immediate aid to local housing projects.

In Great Britain housing acts of 1919, 1923 and 1924 provided government aid to local authorities—especially in the form of a guarantee against the risk of loss incurred by the local authorities, making up the difference between outgo and income. These acts fixed minimum and maximum sizes of buildings—quite predominantly single family dwellings—required a bath (except where there is no water supply), set a maximum density of buildings to the acre (12 in urban, 8 in rural areas) and provided for slum clearance.

In Belgium and France Building Societies at Low Cost (*à bon marché*) are assisted by the local and central government in their co-operative effort to lend money for dwellings.

Immigration, moving from one country *into* another. Moving *from* one's own country is *emigration*. Both governments are interested in this motion, so there are many forms of controlling both immigration and emigration.

All through the 19th century there was a continuous flow of migration from Europe to the New World with little or no control. The United States, Canada and, to a very little less degree, Central and South America are composed entirely of immigrants and descendants of immigrants. In the 10 years from 1847 through 1856 about 3,000,000 immigrants came to the United States, many of them driven from Ireland by the terrible potato famine or from Germany by the failure of the Revolution of 1848. After 1880 more immigrants came here from southern and especially southeastern Europe than from northern and western Europe, which had previously made the largest contribution. In the 10 years ending 1910 about 6,000,000 came from the south against 2,000,000 from the north; and in the next 5 years 3,000,000 (out of a total of 3,800,000) were from southern Europe. Dr. Victor Heiser's *An American Doctor's Odyssey* gives an interesting description of the medical and sanitary work of U.S. immigration authorities at landing ports in this country and at points in Europe where immigrants sailed.

In much the same way that American manufacturers persuaded Congress to put a heavy tariff on foreign-made goods, organized labor urged Congress to protect the American workingman by forbidding and limiting immigration. Chinese coolies had come to California at the time of the Gold Rush in 1849, and they had worked on the transcontinental railroads. In 1882 the first Chinese Exclusion Act was passed. In 1885 an Alien Contract Labor law forbade the entry into the United States of anyone under contract "to perform labor or service of any kind."

Later laws aimed to improve the quality of the immigration. An act of 1917 excluded illiterates over 16 years of age. Quota acts were passed in 1921, 1924 and 1929, limiting the number of immigrants from each country. The total number that can be admitted from Europe in any year is 150,000. The maximum from each country is 2 per cent of the foreign-born from that country that were in the United States at the time of the census of 1890 (when south European immigration had not yet set in.) As a result of these laws the number of English-speaking immigrants in 1927 was a little more than in 1914; but the number of non-English-speaking immigrants in 1927 was only about one-fifth as much as it had been in 1914.

All Asiatics (Chinese, Japanese and others) are excluded except students and professional men and their families.

The Chinese hurried into Australia at the time (1851) of the gold rush there, as they had come to California in '49. They were immensely unpopular. The different states adopted legislation against Chinese immigration, and one reason why the Australian federation was adopted was that the strong Labour party clamored for uniform laws against Chinese and Japanese throughout Australia. Both Chinese and Japanese as well as Asiatics who are British subjects are now excluded in effect by a law that refuses entry to anyone who cannot write from dictation 50 words in his own or some other language. Between 1905 and 1914 no alien passed this test.

In New Zealand a poll tax of £100 on immigrants of alien race keeps out Asiatics. In Canada the tax on Asiatics was set at $50 in 1886 and at $500 in 1904, and a law of 1923 permits the entrance of Asiatics only if they do not belong to the laboring class.

The home government in England, especially after the World War, made efforts to aid emigration to the different parts of the Empire. Up to 1926 (when there was no longer a demand for labor) the Dominion of New Zealand, co-operating with the London authorities, assisted immigration from Great Britain by free transportation or reduced rates. This assistance was granted only to a person whom a New Zealander of recognized standing agreed to employ. The last year this was in force (1926) more than 10,000 immigrants were assisted by the Government.

The new conditions since the World War that have changed United States laws about immigration have also affected the attitude of European governments toward emigration. New nations, eager to be self-sufficient, look on emigration as draining their man power—so Lithuania and Czechoslovakia make it hard for their citizens to migrate. So has Italy since about 1927; before that time the Italian Government tried to find the best opportunity (usually in South America) for emigrants who could no longer go to the United States or to France. Portugal, especially as regards the Cape Verde Islands from which many young men emigrate to New England, has an educational qualification for emigration—the Government wants to be proud of its emigrants.

A forced migration of Jewish professional men and women was the outcome of the anti-Semitic policy of the Nazi government in Germany. The League of Nations in 1933 began the task of aiding these refugees. Many of them settled in Palestine.

Zionism, the movement of Jews from all parts of the world to Palestine, the former home of the race, is one of the migration problems of the times. The British Government, which has a mandate over Palestine from the League of Nations and which has long been interested in the Semitic problem, has found the Arab inhabitants of Palestine bitterly opposed to Jewish immigration. Late in 1937 the Palestine Government restricted Jewish migration into the country after proposing earlier in the year that Palestine be divided between Arabs and Jews.

Imperialism, a policy of colonial expansion and overseas conquest, particularly for commercial purposes. The colonization of America by the Spanish, French, Dutch and English is one example of imperialism. Another is the division of Africa among the great Powers in the last part of the 19th century. The Spanish American War of 1898, England's war with the Boer republics of South Africa, the Japanese expansion into Korea, Manchuria and China and the Italian conquest of Ethiopia in 1934-36 are recent examples of imperialism in a violent form—excused in each instance by the theory that the aggressor has a mission to civilize a weaker and more backward nation.

Indeterminate sentence, one that gives a minimum and a maximum term but leaves the precise time that must be served to administrative officers. A sentence of 1 year to 10 years means that the prisoner must serve at least 1 year but cannot be held longer than 10 years. The purpose—to permit a prisoner's release when his reformation has been effected—is a distinctive factor in the new and more flexible type of criminology.

India Office, a part of the British Government, a department under the Secretary for India (usually a member of the Cabinet). The Secretary acts on the advice of the Council of India, composed of 8 to 12 members appointed for 7 years by the Secretary of State; at least half of them must have lived in India. The India Office is the link between the Government in London and the governor general and other administrative agents in India. The cost of the India Office is borne in part out of Indian revenues and in part by parliamentary appropriations.

Indictment (from French *inditer,* meaning to indicate or point out), a formal accusation of a crime against one or more persons, laid before a grand jury. When the grand jury finds sufficient evidence to warrant holding the accused for trial in court, the indictment is endorsed and called a *true bill of indictment.* Often the word *indictment* alone is loosely used for this finding of the grand jury.

Infant, one under legal age, a minor. Legal infancy ends the first instant of the day before a person is 21 years old. In a few states a girl comes of age at 18, except for voting. In most states an infant of 14 has reached the age of discretion, is held responsible for criminal acts and may choose a guardian. An infant cannot act for himself in court, so a guardian or next friend must act for him.

Information, a formal accusation by a prosecuting attorney or other government officer that is the basis for prosecution without any action by a grand jury. Some states of the United States have done away with the grand jury, and in these states information there takes the place of indictment. But the Federal Constitution and some state constitutions forbid any prosecution for "a capital or other infamous crime unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces or in the militia in actual service." In England information by court officials has taken the place of indictment by grand juries as a preliminary to the trial of a criminal.

Initiative and **Referendum,** two forms of direct legislation by the voters of a state.

Initiative is literally the power or right to originate a law; because the Federal Constitution provides (Art. 1, Sec. 7, Cl. 1) that "all bills for raising revenue shall originate in the House of Representatives," we may say that the House of Representatives has the initiative in revenue measures. In the special sense initiative is the right (under certain state constitutions and a few city charters) of the people to originate laws by securing a petition signed by a certain number of voters or a certain fraction of the total number and then by voting on the proposed measure, which becomes a law if it receives the required majority.

Referendum means literally "to be referred." It is the practice of submitting for popular approval or disapproval a measure passed by a legislature.

These two methods of democratic legislation were known in Greece, but in modern times they seem to have originated in the Swiss cantons and in the Swiss Federal Government. In 1831 the canton of St. Gall adopted a method of referendum by which the voters might petition that a measure be referred to them. This was called a *facultative referendum* and sometimes a *veto.* The *compulsory* or *obligatory referendum* did not follow a petition: it was required by the constitution in the case of certain laws—they must be referred to the people and approved to become operative. Any measure now passed by the Federal Assembly must be referred to the people if 30,000 signers petition for the referendum, and then it becomes law only on a majority vote at the referendum election. The *initiative* was first used in the canton of Vaud in 1845.

In the United States the common method of amending state constitutions is by a referendum to the voters of the state after the action of the legislature. (Delaware does not require a referendum; two successive legislatures may amend the constitution. In New Hampshire the people vote every 7 years as to whether the constitution needs amendment; but amendments are adopted by the constitutional convention without reference to the voters.) In states where the constitution may be amended by a constitutional convention, the question of calling the convention is sometimes submitted to the voters. New York state requires the approval of the voters to amendments adopted by the convention; and most state constitutional conventions refer their amendments to the voters even if this is not required by law. In Oregon the state constitution may be amended: at a referendum election after approval by the legislature; by popular initiative; or by a referendum vote after a constitutional convention, which can be called only after the question has been referred to the voters.

Initiative and referendum on other than constitutional matters appeared in American state governments at the turn of the century: South Dakota (1898), Utah (1900), Oregon (1902), Nevada (1904), Montana (1906), Oklahoma (1907), Maine, Missouri and Michigan (all 1908), Arkansas and Colorado (1910), California and Arizona (1911), Idaho, Ohio, Nebraska and Washington (1912) were among the first.

The referendum was extensively used in Australia and New Zealand, especially after 1910; and the 1937 Constitution of Ireland (formerly the Irish Free State) provides for submission to popular vote of measures passed by both Houses of the Oireachtas (Legislature) on a joint petition

Courtesy U. S. Office of Indian Affairs Photo by Frances Cooke MacGregor

The Work of an Important Division of the Department of the Interior

The Office of Indian Affairs is charged with the management of the scattered and widely dissimilar Indian tribes. At the left is the home of a wealthy Osage in northern Oklahoma, at the right a patchwork Indian cabin in Fresno County, California, whose owner has tried to keep his property neat and clean

signed by a majority of the Seanad (Senate) and not less than one-third of the Dail (Lower House); but even on this petition from the legislature the bill is referred to the people only if the President decides that it is necessary. If he thinks it is not necessary, the measure becomes law without the popular vote.

Injunction, a writ of a court ordering the performance of an act that the court believes is essential to justice, or prohibiting an act that is believed to be contrary to equity and justice. A *preliminary injunction* is issued to restrain the doing or continuing of the act alleged to be wrongful until the rights of the parties can be settled. It is issued only when the court believes that irreparable harm will result before the case is settled. A *full* or *perpetual* injunction is issued after hearing the case. An injunction may be issued by a court of equity if the plaintiff shows that there is not an adequate remedy at law.

Noncompliance carries the penalty attached to being in contempt of court. The injunction has been commonly used as a weapon in labor disputes. Since 1910 Congress has passed laws limiting the powers of a court to grant injunctions pending decision whether a law is constitutional; and the Clayton Act of 1914 and other acts of Congress have limited the power of courts to issue injunctions in labor disputes.

In personam and **In rem.** *In personam* means an action against a person; *in rem* means an action against the thing. An action *in rem* may be against a ship or other specified object to regain possession of it when the defendant cannot be found but the property is in the court's jurisdiction; or it may be an action regarding the status of a person, such as marriage, divorce or settlement. In such a case the status is the thing that the legal action is directed to and not the persons. The more usual legal action is against a person or persons; actions in tort and contract are actions *in personam.*

Inquest, inquiry or investigation, especially the inquiry of a coroner's jury, actually seeing the corpse of anyone who has died in suspicious circumstances or (when a death certificate has been refused by a physician) hearing testimony of doctors and of lay witnesses and giving a verdict whether death was by natural cause, suicide or homicide. If the verdict is homicide, the coroner's jury tells at whose hands the death occurred or uses the phrase "at the hands of person or persons unknown." An inquest to fix damages is the inquiry of a jury appointed to determine the amount of damages in a case where there is no question of law. The word inquest is also used of the jury that holds the inquiry and of the jury's finding.

Insanity, an unsound mental condition. Insanity is not generally considered as a legal term. The law merely attempts to ascertain whether a person has sufficient soundness of mind to be competent to perform certain acts or to be responsible for acts committed. The test of mental unsoundness is not necessarily the same in a proceeding to appoint a guardian for a person alleged to be insane and in a criminal action seeking to hold the person allegedly insane for his wrongful conduct. In criminal action in some states the English rule (McNaghten's case, 1843) is applied: Did the accused know that the act he committed was wrong? In other states insanity is interpreted as a mad, irresistible impulse, independent of any ability to distinguish between right and wrong.

Insolvency, the state of a person whose total property and other assets are insufficient to pay his debts; a general inability to pay debts when they are due. As used by the courts the term is practically synonymous with bankruptcy. Insolvency laws are state statutes governing insolvency; similar Federal regulations are called *bankruptcy* laws.

Interior, Department of the, one of the 10 executive departments of the United States Government, whose head, the Secretary of the Interior, is a member of the President's Cabinet. The department was organized in 1849, when it was called the Home Department, and it now contains the following important offices and bureaus: Land Office, Bureau of Indian Affairs, Geological Survey, Bureau of Mines, Bureau of Reclamation, National Park Service, Petroleum Conservation, Subsistence Homesteads, Office of Education, Bureau of Child Welfare and (since 1934) Division of Territories and Island Possessions. The Census Bureau and the Patent Office, once in the Department of the Interior, are now in the Department of Commerce.

Internal revenue (called *inland revenue* in England), the Government's income from domestic taxes as distinct from its income from customs or tariffs and from its income from its own property and services. The enormously increasing cost of government makes it necessary that total revenue should be much larger than it was before the World War. At the same time the drop in international trade has made it almost impossible to increase the revenue from customs taxes on imports. Hence, there has been an enormous increase in the amount of internal revenue as will be seen from these figures.

U.S. Customs and Internal-Revenue Receipts by Fiscal Years

	Customs (Millions of dollars)	*Internal* (Millions of dollars)
1911	314.5	322.5
1916	213.2	512.7
1921	308.6	4,595.4
1926	579.4	2,836.0
1931	378.3	2,428.0
1936	386.8	3,512.9

The main items in the 1936 internal-revenue total are these:

	(Millions of dollars)
Income tax:	
Income tax (corporation	738.5)
Income tax (individual	674.4)
(total)	1,413.0
Capital stock	95.0
Excess profits	14.5
Estate tax	218.8
Gift tax	160.0
Wines, liquors, beer, tobacco	1,066.6
Stamp taxes (documents, playing cards)	69.0
Manufacturers excise	382.5
(gasoline and oil	204.4)
(auto	94.5)
Miscellaneous	89.2

These figures are all national revenue. All local taxation produces another class of internal revenue.

The U.S. Treasury Department has commissioners of Internal Revenue, Narcotics and Customs. In England the Board of Inland Revenue, the Post Office and the Customs are in charge of the public revenue.

International law or **Law of nations,** the rules governing the conduct and relations of countries or states toward one another.

International law differs very materially from the acts of parliaments or national congresses and the laws of state legislatures but in general purpose resembles national or state law.

Rights of the states of the world demand recognition and protection. Chief among these rights is that of a nation to independence and the privilege of maintaining its own chosen form of government without outside interference, unless in the exercise of that right the security of neighbor states is threatened. A state must be assured of jurisdiction without interference from outside over its own territory and the people therein.

If the seas belong to all states in common, there must be recognition of the right of each to freedom of navigation. To safeguard the interests of all, the waters of the oceans and seas are considered a part of the mainland of each country for a distance of 3 miles from shore; the ships of no nation have a right to sail inside this 3-mile limit of other lands without permission, but of course except in time of war all vessels are welcome in territorial waters everywhere. All waters beyond this limit constitute the *high seas*.

International law is not written in statutes that are given validity by legislative action. There is no international Parliament or Congress, and even if there were one, even if the League of Nations were universally recognized, where is the police power to punish offenders? The attempts at League sanctions to restrain Italy in Ethiopia were of no avail. International law depends for its enforcement upon the voluntary action of all the nations; it has no binding force other than mutual assent and agreement. There is national honor as well as personal honor. A state that violates the tenets of international law dishonors itself and gains the ill-will of the world; if the offense is too great to be condoned, war is the only recourse to bring the offender to justice.

The sources of international law are numerous; they consist very largely in treaties made from time to time; in conventions or congresses of the powers wherein principles for international guidance are set forth; and in solemn declarations of a great power that in time other nations accept as a rule of international conduct. As an example of the latter, the Monroe Doctrine (United States, 1823) was denounced in Europe for many years, but the insistence of the United States in upholding its principles brought eventual recognition of its binding character. Great Britain once claimed the right to search foreign vessels and take therefrom seamen suspected of being English subjects on the theory "once an Englishman always an Englishman." The War of 1812 was fought in part in opposition to this right; and as a result of the war, the unwritten law of safety under any flag has not since been questioned.

A declaration of war brings into effect between the contending parties (known as *belligerents*) that branch of international law known as the *Laws of War*. Other nations, *neutrals,* not involved in the actual war, have new obligations imposed upon them. They must not give aid or comfort to any of the belligerents; if citizens of a neutral country violate neutrality they cannot count on their government to avert punishment.

Private International Law or *conflict of laws* is often considered as a part of international law; but private international law relates to the reference by one state with the laws of another. Thus if a contract is made in Germany and an action on it is brought in the courts in New York, that court ordinarily will enforce the contract according to the laws of Germany. Therefore private international law is enforced by the courts of a nation and is part of the law of that nation and not properly the law between nations. International law is the *jus inter gentes;* the conflict of laws refers to the *jus gentium.*

Interpellation (French, challenge, interruption, question), in French legislative procedure a challenge to a ministerial policy by a formal question put by any member of the National Assembly. The question is written. It may not apply to the budget. To a question on foreign policy the Minister of Foreign Affairs may refuse an answer for reasons of state. The Chamber sets a date for the answer to an interpellation and debates and discusses the answer when it is given. If the vote after discussion is unfavorable to the explanation given in the answer, the ministry is forced to resign.

Interstate Commerce Commission, an independent Federal Government authority of 11 members (originally 5), serving 7 years with overlapping terms, appointed by the President under the Interstate Commerce Act of 1887 to regulate commerce between the states by rail. In 1885 the U.S. Senate had investigated railways, and the Act of 1887 was a result of this investigation. The Hepburn Act of 1926 gave the commission power to fix rates for interstate railways. A law of 1926 gives jurisdiction over interstate air commerce to the Secretary of Commerce; and in 1934 the Federal Communications Commission was created to control the telephone, telegraph and radio.

The Interstate Commerce Commission (abbreviated ICC) by an act of 1920 acquired power to make *intra*state rates (that is, rates inside a single state) to replace any state rates that discriminate against interstate commerce; and the Supreme Court upheld the Commission's power to set aside rates set by the state of Wisconsin and rates in the New York state charter of the New York Central Railroad. The Commission has judicial powers—it can make decisions as well as enforce the law. The power of the Federal Government over interstate commerce is granted by the Constitution (Art. I, Sec. 8, Cl. 3).

Intestate, without a will, leaving no formal will. When one dies intestate, the court appoints an administrator to apportion the estate among the lawful heirs.

Issue, in a legal action the controverted or material point of law or fact that a trial is to determine. When the issue is joined, that is, when pleading comes to the point where one side denies and the other affirms this matter in dispute, the case proceeds to trial.

Judgment, a decision rendered by a court in a case submitted to it; a legal award.

Judicial councils, state boards studying court procedure and the reorganization of the judicial system. The movement for reform by this means began in 1922, and several states have adopted it.

Judicial review, the power of a higher court to rule on the decisions of a lower court by reason of its appellate jurisdiction. In a special sense the term is limited to the lawmaking power of the courts, as their interpretations of statutes and their decisions on the constitutionality of laws actually create the fundamental law of the land.

Jury, a group, usually 12 in number, formally selected and put on oath to return a verdict or true answer on a matter in controversy. The jury is a part of the common-law system as distinct from equity. It is judge of the facts not of the law in any controversy. The origin of the English jury system seems to have been in the inquest of the Frankish kings in the 6th or 7th century. The custom was brought into England with the Normans—instead of trial by battle they used a method of sworn inquiry before a jury.

They right of jury trial is a part of free institutions throughout the British Empire and the United States. A man has the privilege of being tried by a jury of his peers, that is, of his equals, those of his own class.

A *grand jury* is a large group, usually 12 to 23 members, which examines accusations of criminal charges as a preliminary to trial. Trial follows the grand jury's true bill of indictment, a verdict that there is ground for action. The grand jury is a county institution. Some states of the United States have abolished the grand jury or limited its activities. In England grand juries no longer indict criminals, but court officials lodge an information.

The *petit* (or petty, small) *jury,* as distinct from the grand jury, tries and decides the facts of cases in court—unless the accused agrees to trial without jury. The term *jury* is ordinarily applied distinctively to this body. The petit jury is chosen from a sheriff's panel or list of possible jurors. In criminal cases, from those summoned for a term of court, the judge, the prosecuting attorney and the attorney for the defense choose 12 by a rather elaborate process of questioning. On formal exception or objection (by either attorney) to the service of any juror (called a challenge), that juror may not serve. Challenge may be *for cause,* with an expressed reason; or *peremptory,* without any reason being given. The number of peremptory challenges allowed varies in different cases. The procedure of examination, cross-examination and challenge of jurors often produces long delays in trials; but the foundation is an attempt to secure unbiased jurors and thus assure justice.

The 12 jurors must agree in their verdict; if there is no agreement, a new trial must be held. A constitutional amendment in New York state (1937) permits verdicts by 10 of 12 jurymen in civil cases.

Certain occupations are exempt from petit-jury duty—usually all government employees, clergymen, physicians, dentists, pharmacists, attorneys, members of the army, navy, marine corps or fire department.

A California statute in 1917 provided for drawing women on juries; and Connecticut, New Jersey and other states have similar provisions making this duty compulsory for women. Rhode Island law provides that women over 25 may be called on jury duty if the courthouse has suitable accommodations. In Maine no person is disqualified for jury duty "by reason of sex." Women are permitted on juries in 10 states and in the District of Columbia. New York by a law in effect in 1937 allows women to serve or to be excused on their request. South Carolina forbids women serving on juries. About half the states have no specific legislation on the point and have not altered the practice of having only men on juries even though the 19th Amendment has given women the vote and the state law has always said that "all legal voters" are liable to jury duty.

A *coroner's jury* holds an inquest (or investigation) on the cause of a death that seems not due to natural causes. The verdict of a coroner's jury is not an indictment but may be the basis for an indictment or information.

Justice, Department of, an executive division of the Federal Government since 1870, completely consolidated in 1918 as a war measure. The head of the Department is the Attorney General, a member of the President's Cabinet from the first organization of the Federal Government (see *Attorney General*).

The Department is organized with bureaus and divisions as follows: Alien Property Bureau (dating from the World War), Bureau of Prisons (Federal penal institutions), Bureau of War Risk Litigation and Federal Bureau of Investigation (the G-men, see *Federal Bureau of Investigation*); these divisions—Antitrust, Claims, Criminal, Customs, Lands and Tax; and the Taxes and Penalties Unit. The Attorney General appoints a Parole Board of three to grant and revoke paroles of Federal prisoners; and the Department's Pardon Attorney investigates applications for clemency and makes recommendations to the President in regard to them.

Justice of the peace, the lowest officer in the judicial system of a state. He is elected as a township official and has limited judicial powers. In states in which there are no periodical grand juries, he may hear evidence in criminal cases sufficient to determine whether the accused shall be held for trial in the county court and may fix the amount of bail to be required. He has full jurisdiction in the disposal of petty civil cases, but from his decisions appeal may be taken. Where there are regular grand juries, the justice of the peace in criminal cases can only bind an accused over to the grand jury.

In the United States the justice of the peace is usually an elected officer, but in a few states he is appointed by the governor.

In England the justice of the peace is "commissioned under the Great Seal to keep the peace," which explains the title. The first justice of the peace was appointed in 1323. Until a generation or so ago only the landed gentry and country squires were justices; but now they are commissioned from every walk of life and from both sexes.

Juvenile court or **Children's court,** a special tribunal to hear cases brought against minors (under 16 in some states, 17 in some, 18 in others). In such a court a child is not treated as a criminal. With his accuser and sponsors he meets the judge in a rather informal way. The judge has a heart-to-heart talk with the offender, and if he finds the child guilty, the youthful offender may be placed upon probation, and an effort is made to care for him in such a way that he will develop into a useful citizen. The court has power to commit the offender to an institution. The first juvenile court was established in Cook County (Chicago), Ill., in 1899. Within 30 years there were children's courts in every state but Maine and Wyoming.

Kidnaping, the crime of forcibly or fraudulently carrying away from its home a child or (by extension of the original meaning of kid for child) a grown person. It is one of the most serious offenses against peace and order; in some states it is a capital offense, in others it may be punished by life imprisonment. The kidnaping of Charles A. Lindbergh's son in 1932 resulted in a Federal law against kidnaping and the development of special crime-detection methods by government agents of the Federal Bureau of Investigation.

King, a ruler in a monarchy, whether it is absolute or constitutional or (like present-day Italy) a dictatorship with only a faint trace of monarchy left.

Our word *king,* German *König,* Danish *konge* and the related Teutonic words seem to mean "descendant of the kin or nobility." The Latin *rex,* French *roi* and Italian *re* are all related to the Indian and Sanskrit word *rājā* (still used of Oriental princes in the form *rajah*); and the root idea seems to be guide, shepherd, pilot, with a figure of speech like that in the word *governor,* which originally meant steersman. In many early communities the king was chief priest or even a god in human form; and the early kings of Rome are half-mythical figures as important in religion as in government. So long as Church and State stayed closely related, the power of the Church made most European kings somewhat sacred, and there grew up the doctrine of divine right, which reached its high point in England with the Stuart kings. The English Civil War crushed that idea. After Cromwell English kings ruled under the authority of Parliament. English Common Law was largely the outgrowth of a long effort on the part of English kings to bring the courts and judges under the Crown. That law is the basis of our law in the United States. Many of the constitutional powers of the President of the United States and of the governors of states are immediately derived from the powers of the English kings—rights of appointment, power of pardon and veto, control of foreign affairs. So the history of kingship has a definite meaning even for our republican government.

There are not so many kings left in the world today, though several kingdoms have been set up since the World War of 1914–18. The following is a list of countries whose rulers have that title: Afghanistan, Albania (a postwar republic until 1924 when its president was made king), Saudi Arabia (another new state since the War), Belgium, Bulgaria, Denmark, Egypt (postwar), Great Britain, Greece (king restored in 1935; actually a dictatorship), Hungary (a kingdom with no king, but a regent dictator), Iceland, Iraq (a postwar state), Italy (a corporative state under a dictator with a figurehead king), Netherlands (ruled by a queen), Norway, Rumania, Siam, Sweden and Yugoslavia.

The World War drove off their thrones the king of Prussia (who was German emperor) and the king of Hungary (who was emperor of Austria). The king of Portugal was driven from his country in 1910, and the king of Spain was exiled in 1931.

Kingdom, a country or territory subject to the jurisdiction of a king. Most modern kingdoms are constitutional monarchies; that is, although executive and legislative authority is vested in the ruler, his power is limited or restricted by a constitution and his acts, to become effective, must be countersigned by a cabinet official or minister of state. In contrast to elective monarchies, such as prevailed in Bohemia and Poland during the Middle Ages, modern kingdoms are generally hereditary according to the laws of primogeniture, first in the male line and then in the female.

Know-Nothing party, a political movement in the period before the Civil War that worked for the election of native Americans to office. The waves of immigration during the 1840s and the concentration of Roman Catholics in the eastern cities led to a resurgence of nativism, and political organizations such as the *American party* aimed at keeping the foreign groups from control of the government. The Know-Nothing party was largely a secret organization and got its name because the members would reply to questions about the party or its policies, "I do not know." In 1854 they carried Massachusetts and Delaware and lost New York only by a slender margin. However, in 1855 when the Southerners gained control and declared in favor of the existing laws on slavery, the party split and gradually disappeared.

Labor, Department of, an executive division of the Federal Government, established independently in 1913. A Bureau of Labor was set up in the Interior Department in 1884; it became an independent bureau in 1888; and in 1903 a Department of Commerce and Labor was organized. It comprises: the Bureau of Labor Statistics (domestic and foreign), Children's Bureau (studying child welfare, health, juvenile courts as well as child labor) and Women's Bureau (promoting the welfare of wage-earning women); divisions of Labor Standards and Public Contracts; and Immigration and Naturalization Service, U.S. Conciliation Service, U.S. Employment Service and the National Re-employment Service, including a Federal Advisory Council on employment problems.

In Great Britain the Home Office inspects factories, and the Board of Trade inspects mines, but the Ministry of Labour, created in 1916, supervises employment exchanges, unemployment insurance, minimum-wage rules and industrial disputes.

Lame Duck Amendment, the 20th Amendment to the Constitution of the United States, proposed in 1932 and adopted in 1933, making the terms of Senators and representatives end on January 3 instead of on March 3. This put a stop to sessions of Congress in which there sat representatives or senators who had not been re-elected. Such members were called lame ducks because they were disabled, had lost the support of their constituencies. New members of Congress now take their seats within 2 months of their election instead of waiting more than a year until December of the year after their election.

Land. Government policies about distributing public land and the various forms of land tenure have been very important in politics and history. *Public land* (*ager publicus*) was a matter of constant controversy in the Roman republic where the state was constantly expanding by conquest of new territory, first in Italy and later in every part of the circle of lands around the Mediterranean. The common people received grants of this land sometimes as the result of efforts to reform the social conditions of Rome, sometimes as a gift or bribe to win favor for a political group. There were special grants to veterans of the Roman army.

The whole feudal system of Europe in the Middle Ages was based on the principle that land was held by grant from a superior. In England the Norman Conquest in 1066 introduced this system under which the king became owner of almost all lands, which he granted to his noble followers subject to the payment of certain dues and services. In turn the nobles could make similar grants. Lands thus granted were inherited by the oldest surviving male son; this practice is called *primogeniture.* The results of the feudal system still affect life in England and Ireland. Many large estates belonging to certain families for centuries were split up and parts of them sold in the depression years after the World War; but the evil of absentee landlords, for example, English owners of great areas in Ireland managed by agents and rented to small farmers, has not been entirely abolished. In the 19th century much common land was taken over by English cities and boroughs, which bought off the nobles who had some claim to part ownership.

Free land was the bait that drew settlers to America. It was granted in one way or another by the English Crown—and the claim was one of conquest.

Even before the present government of the United States was set up, the Continental Congress passed laws governing the distribution of public lands in the Northwest. From the Land Ordinance of 1785 down to the Morrill Act of 1862, Congress granted lands for the support of schools and colleges. In 1785 a settler could buy 640 acres at $1 an acre. In 1796 the price had doubled. In 1820 the minimum area that could be bought was reduced to 80 acres and the price to $1.25 an acre. For 20 years after 1840 there was agitation for free distribution of lands. "Vote yourself a farm" was the slogan of demagogues. A bill for free grants was defeated in Congress in 1852. President Buchanan vetoed another in 1860.

In 1862 the Morrill Act granted lands for agricultural and mechanical colleges, and the Homestead Act threw open public lands to settlement in 160-acre units, by grown citizens and by aliens who had declared their intention of becoming citizens. The distribution undoubtedly checked radical and socialist tendencies by giving to those who might have become dangerously discontented the opportunity to hold land. In 1862 the Federal Government authorized building the Union Pacific Railroad and granted it 20 sections (that is, 20 square miles) for each mile of the railroad. In 1864 public lands with coal on them were put on sale at $25 an acre.

The states had long before abolished the right of primogeniture with the result that large estates were being divided from generation to generation instead of being kept intact in the possession of the eldest son. Now the western states passed homestead exemption laws, which made the free lands given to settlers free from seizure for debt. The land policy of the Federal Government and the state governments hastened the settlement of the West. In 1900 there was little public land left. The era of homestead distribution was ended. It had been extravagant and reckless. Valuable timber had been cut to clear land for the plow. Overplowing had produced erosion—good land gone bad. Many settlers had picked bad land in the first place. In 1895 the Federal Government transferred to the states arid land that was not fit for farming.

Two new policies appeared—conservation and reclamation—to attempt a remedy for extravagance and waste. A law of 1891 authorized the President to reserve lands covered with timber or undergrowth—and President Theodore Roosevelt brought the total of forest reservations up to 150,000,000 acres. The Reclamation Act of 1902 created a Bureau of Reclamation in the Department of the Interior to reclaim desert lands by irrigation. Boulder Dam on the Colorado River, the Grand Coulee Dam on the Columbia and the Central Valley project on the Sacramento and San Joaquin rivers in California are great public works supervised by this bureau. The work of conservation was expanded to a huge scale by the establishment in 1933 of the Civilian Conservation Corps, which put to work at conservation tasks hundreds of thousands of unemployed young men.

The Resettlement Administration, originally a part of the Federal Emergency Relief Administration but since 1937 under the Secretary of Agriculture, initiates and administers projects of flood control, erosion and reforestation. It classifies rural lands by uses and capabilities. The Department of Agriculture under the New Deal has rural and suburban resettlement projects for the better use of land. The National Resources Board (1934) and the National Resources Committee (1935) have made an inventory of land resources and have drafted a report on land planning. Another important report and outlined plan is that of the Great Plains Drought Area Committee. These fact-finding reports are valuable bases for a new land policy.

Larceny, carrying away personal property of another with the intent to appropriate it to one's own use without the owner's knowledge or consent. Most states include carrying away or *asportation* as a part of the definition of larceny, but there is a tendency to consider this an unimportant factor —Texas has abolished the rule that asportation is necessary to constitute larceny. Larceny differs from burglary because it is without breaking and entering. If the value of goods taken does not exceed $15 (in some states $25), the crime is *petit* larceny; if it is more than that amount, *grand* larceny.

Law merchant, the Norman English translation of *lex mercatoria* or *lex mercatorum,* the laws that apply to trade. During the Middle Ages throughout the commercial world of Europe the practices and customs of merchants constituted this law merchant, which was administered by a group of separate courts that operated side by side with the king's courts: the *pie poudre* courts (literally, dusty-foot courts) for itinerant merchants, which tried cases at every fair or market; and the staple courts held at staple markets selling wool and leather, where alien merchants were tried by juries of foreigners. Cases were tried speedily and on the spot, and this peculiar jurisdiction avoided the conflict that would otherwise have occurred between local and foreign law. Later the law merchant was administered by the common-law courts, and certain of its principles were adopted, especially those regarding negotiable instruments. Now the same term is used sometimes to apply to all laws dealing with trade—partnerships, joint-stock companies, agency, contracts, negotiable papers.

Leader, a literal translation of the official titles of the German dictator, *Fuehrer,* and the Italian, *Duce.*

In each house of the U.S. Congress

and in the state legislatures a *floor leader* is chosen by each party to have charge of the party in the legislature. The majority leader has enormous power and influence. With the minority leader he decides who shall speak on certain measures and how much time shall be allowed for debate. The floor leader of the majority party is head of an informal steering committee that controls the procedure of the House.

Lease, a written contract for the possession and profits of land and tenements for a fixed period of time, for life or during the pleasure of the parties. If tenure is for less than a year, the agreement may be oral. The privileges and obligations of each party are an essential part of the contract. The owner is the *lessor;* the one in possession is the *lessee* or tenant. The compensation to the lessor is *rent.* The lessee's holding is a *tenancy,* and the right of the landlord is called a *reversion.*

Legal tender, money offered at the right time and place, which the law compels one to accept in payment of obligations due him. Not all money is legal tender. One is not obliged to accept copper cents to an amount exceeding 25 cents. A tender of 50 silver half-dollars to extinguish a $25 debt is not legal; half-dollars are legal tender to the amount of $10 only. In spite of the law, creditors usually accept what is offered, unless the tender proves inconvenient to handle.

Legislation, lawmaking, usually in the restricted sense of making statutes or ordinances through a body called a *legislature,* assembly or council—usually a group representing the people. In a wider sense there is legislation by the courts as they interpret the law made by the legislature.

The English Parliament gradually assumed lawmaking powers and thus became the actual center of the governmental scheme to which our American system owes so much. Originally Parliament was not a legislative body: the king made the laws and Parliament, a group of his councilors, assented. The growth of Parliament's power and importance in regard to making laws was due to the fact that the House of Commons held the purse. In most governments today the legislative power resides with the group that can raise and appropriate money: lawmaking includes taxation; lawmaking includes the authority to say how revenues shall be spent.

The lawmaking power of the executive now consists only in his veto—a power no longer used by the king of England but constantly exercised by the President of the United States, governors of states and mayors of U.S. cities.

The field that is covered by legislation is constantly widening; social security, maximum hours, workmen's compensation, recovery and relief are comparatively new subjects for statutes.

There is much law in our modern governments that did not originate with legislatures. The whole body of common law, the entire idea and practice of equity—both so important in the English and U.S systems—did not come from Parliament at all.

It is true that much legislation that comes out of our legislatures (national and state) does not originate in the lawmaking body. Nor does it originate with the political parties or the voters who elect the lawmakers. Only in a few instances is a political campaign fought on the question, "Shall this or that law be passed?" The lawmakers have few definite mandates or instructions from the voters who elected them or the party that they represent. Most ideas and blueprints for laws that are passed come from the administrative and executive branches of the Government. The Chief Executive—at least from the time of Theodore Roosevelt and Woodrow Wilson—has had a great part in initiating legislation and in seeing that it goes through Congress.

Interested special groups are always bringing pressure to bear on Congress and on state legislatures to act favorably on measures they approve and to vote against measures that these groups fear or disapprove. The voters have some powers of starting laws, vetoing laws and approving laws by the processes of *initiative* and *referendum.*

Legislation, especially in its details, is often delegated by the lawmaking body to other groups or officers. Acts of Congress outline a general policy, set up a board to carry out the policy and give that board powers to make law in detail and to judge cases that rise under the act; the Federal Trade Commission and the Interstate Commerce Commission are examples. In the New Deal program in President Franklin D. Roosevelt's administration, Congress repeatedly made laws suggested by the President and his advisers and in those laws gave the President authority to make further rulings on matters of detail. The decision of the U.S. Supreme Court in May 1935 that invalidated the National Industrial Recovery Act was based on the ground that Congress could not give the President a "roving commission"; it must specify the powers it delegated.

Delegated legislation is common in England. The Privy Council issues detailed applications of many acts of Parliament, and every department of the Government makes regulations that are law. In France the Council of Ministers and the Council of State work out the methods of applying the laws passed by the National Assembly.

Legislature, the lawmaking body of a state, consisting of one or two branches (usually two), called the *Senate* and *House of Representatives.* In some states the name *General Assembly* is the legal designation. The presiding officer of the Senate is the lieutenant governor of the state; of the House, a speaker, chosen from the membership. In the political organization of the United States, the legislature is officially the Congress.

Libel (from Latin *libellum,* little book or pamphlet, handbill), a public or published defamation of character that exposes the person defamed to contempt, ridicule or public hatred. Slander is mere spoken defamation. There can be no libel without *publication,* that is, the defamatory matter must be made known to persons other than the injured party. Truth is a defense against a civil action for libel, except (in some states) where a malicious intent is shown. Truth is not a defense in a criminal prosecution for libel, except where it has been so provided by statute. Other defenses of libel are: *fair comment,* honest and fair criticism of a public official, for example; *privilege,* absolute or qualified, the right of legislators or of witnesses under oath (absolute) or in a confidential relationship of lawyer and client (qualified privilege).

A person who has been guilty of libel or slander may be sued by the injured party for money damages or the state may bring a criminal action to punish the offender by imprisonment.

Liberal Republican party, formed in 1872 by Republicans who were opposed to Grant because of the corruption during his first term of office. Horace Greeley was nominated for President, but the other leaders charged political chicanery and failed to give their whole-hearted support. Grant was elected by a vote of 286 to 63 in the electoral college.

Liberty party, an antislavery political party formed by the Abolitionists in 1840 under the leadership of Joseph G. Birney and John G. Whittier, the poet. It showed some strength in local elections, but in 1848 it formed part of the Free-Soil party and later its leaders were instrumental in founding the Republican party.

License (from Latin *licet,* it is allowed; contrast *illicit,* meaning illegal), permission or authority to do a certain thing that would be illegal without such permission or authority. The permission may come from a private individual or corporation, as in the license of patent rights to a manufacturer, like the famous Selden patent (1895) licensed to most American makers of motor cars in 1903–11. Such licenses usually pay a royalty on sales or on units produced. The permission is often from the Government, which under certain conditions and fees allows the licensee to carry on a business that would be illegal without a government permit. The commonest sort of license from government authority is permission to manufacture and sell intoxicating liquors. Licenses are issued by appropriate authorities to permit fishing and hunting, keeping a dog, driving a motor car, running a hotel or restaurant, practicing such professions as medicine and dentistry.

Lien (French, a bond or tie), the right of a creditor who holds property of a debtor to retain possession until the debt is satisfied; in general, any charge upon property, real or personal, to satisfy a debt. If the debt is for material furnished or for wages due in the construction or repair of a building, the lien is called a *mechanics'* or *material man's* lien. A *carrier's* lien is for unpaid charges on freight; a *tax* lien is made for unpaid taxes.

Limitations, Statute of, a law that sets a period after which a claimant cannot sue. Most states require a defendant to claim benefit of the statute; some states make the limitation automatically operative. By Act of Congress "no person shall be prosecuted, tried or punished for treason or other capital offense, willful murder excepted, unless the indictment is found within 3 years next after such treason or capital offense is done and committed." There is no limitation of time within which a prosecution for murder may be commenced. Usually the periods are: 20 years for actions on real-estate title or on sealed contracts, 6 years for personal actions and 2 years for prosecutions of a misdemeanor.

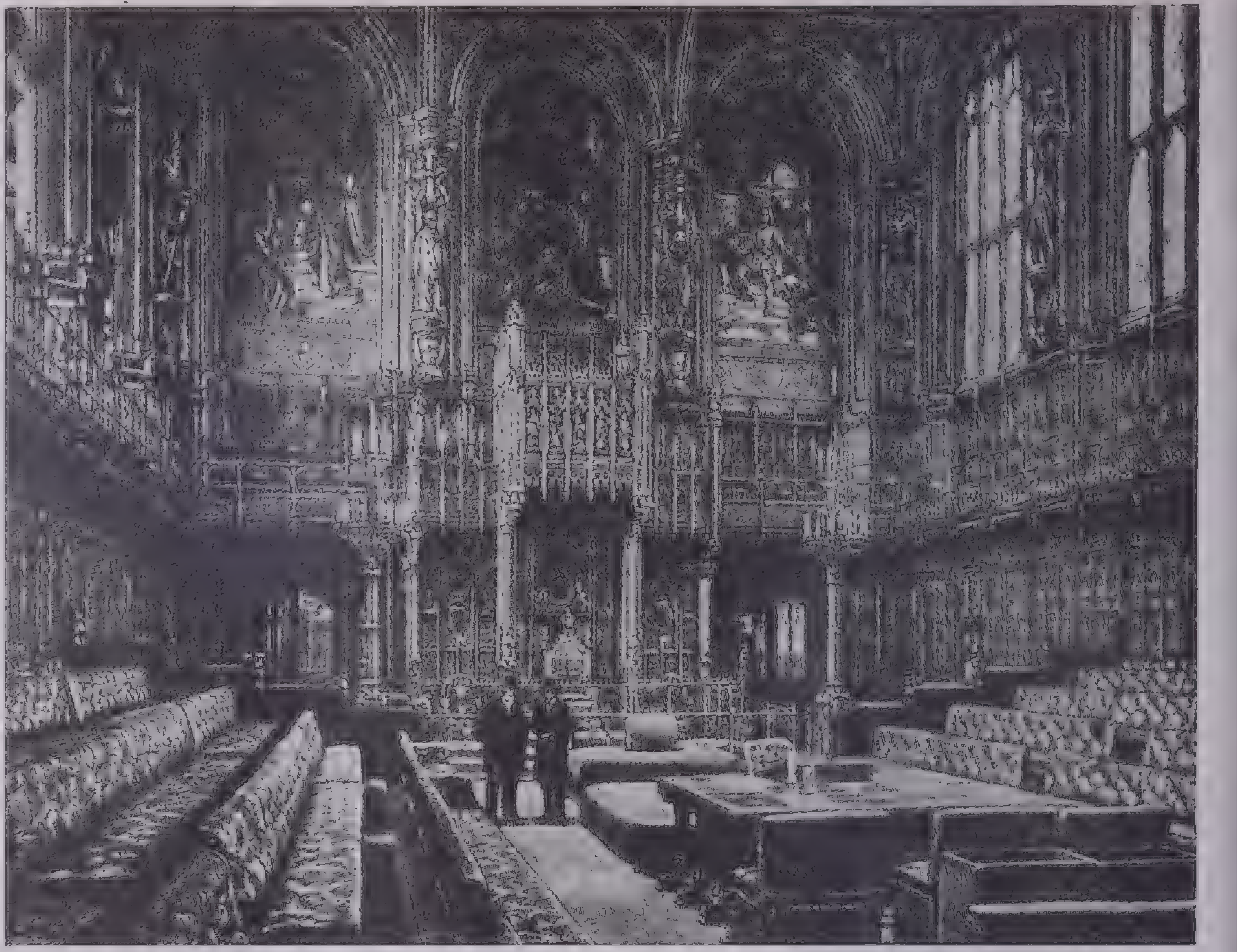
Lobby, any small room or passage; particularly the entrance or waiting room of a hotel or public building; and specifically the public entrance to a legislative meeting place; by extension, the persons who congregate there, especially those who are not members of the legislature but wish to influence legislation. Their attempts to influence legislation are called *lobbying.* They take their most vigorous form when the lobbyist represents a large number of citizens, influential industries, organized labor, associated employers, religious and reforming organizations. Munitions makers try to influence laws about neutrality. Labor unions are eager to secure statutes about strikes and picketing and wages and hours—and so, for different laws on the same subjects, are employers' associations. Government employees and war veterans want pensions.

Lobbying is usually understood as personal influence brought to bear on legislators. But the activity of these pressure groups is various, and in the last few years it has developed into mass demonstrations in the capital city (national or state) of army veterans or farmers needing relief and organized letter or telegram campaigns to legislators.

There have been many congressional investigations of lobbying, particularly that done in the interest of business, public utilities and Wall Street. Some states have tried to curb the evils of lobbying. New York, for example, requires all legislative agents to be registered with the Secretary of State and to give information about his expenditures and his employers.

A suggested remedy for the evils of lobbying is to give representation in the legislatures to Big Business, organized labor and other special interests of the sort that have lobbies. That remedy is much like the method of the Fascist corporative state in Italy where professions, Capital and Labor (rather than the people) are represented in councils that actually have no lawmaking power. In Ireland under the 1937 constitution a large part of the Senate represents trade, commerce, agriculture and fisheries.

Local government, self-government by a municipality, varied and far from uniform in the United States. In most European countries the government of cities and smaller administrative units is centralized and completely controlled by the national Government. English cities and counties have a uniform method of government laid down by Parliament, and they are immediately subject to the Board of Health. They receive grants from the national Government and raise some revenue by their local taxes.



Interior of the House of Lords

At the south end of the hall beneath the canopy are the thrones of the king and queen, but only at the formal opening of the House of Lords is the throne occupied by the sovereign. The lord chancellor sits on the woolsack (an ottomanlike sack of red cloth stuffed with wool) directly in front of the throne, and the red leather benches to the left and right are for the peers of the realm. The bar is opposite the throne at the north end of the hall; here official communications from the Commons are received and final verdicts in law suits given. This old print shows only the king's throne; the queen's, an inch lower, stands beside his

Local option, a form of delegated legislation by which a certain measure goes into effect in any minor governmental unit only after it has been approved by the voters of that local unit. The sale of liquor and the adoption of daylight-saving time are subjects often referred to local voters giving them an opportunity to exercise home rule on a small scale.

As liquor licensing in the United States is controlled by state laws, but the actual administration is usually by local authorities and the proceeds of license taxes go in part to local government units, the question of local option naturally arose. Two county courts in Georgia in 1833 received from the legislature the right to grant or refuse liquor licenses. In 1838 Connecticut and Rhode Island gave the towns in those states the same power. Local option helped secure state-wide prohibition in many states of the United States; when the National Prohibition Amendment was adopted in 1919, more than two-thirds of the inhabitants of the United States already lived in dry territory, and this was largely due to local option. Norwegian towns in 1894 were empowered to stop the local sale of liquor, and only 13 still permitted its sale at the time national prohibition was adopted in Norway during the World War. Scotland had a form of local option from 1920 on. In Canada local option made many single local units dry in the early days of the crusade against the sale of intoxicants.

Lords, English, Irish and Scotch noblemen with hereditary titles or with life titles. The hereditary titles descend from father to oldest son (sometimes to an only daughter) and were originally marks of the king's favor. These peers of the realm are not allowed to vote. The lords with hereditary titles are called *lords temporal* to distinguish them from archbishops and bishops of the Church of England, called *lords spiritual,* who have the title for life through their position in the Church. Another group of life lords are the law lords created by legislation since 1876 to sit in the House of Lords as lords of appeal in ordinary.

The House of Lords (about 720 in number) is one of the two houses of the Parliament of Great Britain and northern Ireland, now far less important in governmental authority than the House of Commons with which it had equal power until 1911. In 1909 the House of Lords had refused its consent to Lloyd George's budget, which greatly increased taxation on land and other wealth. The Parliament Act of 1911 took from the House of Lords their power to block money bills: if the lords do not approve a tax, loan or appropriation measure within a month after the bill goes from the House of Commons, it becomes a law without their approval.

The House of Lords is the highest court of appeal for England, Wales and North Ireland and for Scotland in civil cases; but all members do not act in this court, only the seven law lords who are nonhereditary members of the House and those hereditary lords who have served as judges.

The number of English hereditary lords in the House is not constitutionally limited. Peeresses (women with hereditary titles) may not sit in the House of Lords. There are 16 representative peers of Scotland. About the same number have represented Ireland, but it seems likely that there will be no successors to the Irish peers. The lords spiritual number 26—the archbishops of Canterbury and of York and 24 bishops of the Church of England.

The Crown may at any time appoint new peers of the realm, and this is done largely on the motion of the party in power. In 1832 when the Reform Bill was under consideration, it was proposed that the House of Lords should be packed with new peers to secure the passage of the act. In 1911 packing the House was threatened but was not necessary to secure the passage of the Parliament Act that reduced the power of the House of Lords.

Mandamus (Latin, we command), a writ handed down by the superior court, addressed to an inferior court, an official, an individual or a corporation, ordering the performance of some act or public duty therein specified. It refers to things the law requires to be done that have been neglected; the court has no power to order a thing done when the law leaves such performance to the discretion of the persons involved.

Mandate, a system of government by a trustee; the territory thus governed. The Treaty of Versailles at the close of the World War provided in Art. 22 of the League of Nations for mandates from the League to certain of the Allies for German colonies and some former possessions of Turkey. The Powers receiving the mandates are responsible to the League as its trustees and are supervised by a Permanent Mandates Commission of the League that has 11 members chosen for their personal knowledge of colonial administration and not to represent the nations to which they belong.

Three classes of mandates were set up: A, former Turkish territories soon to be made independent; B, former African colonies, not to be fortified by the mandatory (Power receiving the mandate); and C, German Southwest Africa and Pacific Islands, to be administered as a part of the empire of the mandatory.

In Class A were Palestine, Transjordania and Iraq, mandated to Great Britain, and Syria and the Lebanon, mandated to France. Iraq became independent in 1930 and a member of the League of Nations in 1932. In 1936 Syria became independent under French military supervision; and Lebanon will soon receive the same status.

In Class B were all German holdings in Africa except German Southwest Africa. Tanganyika (367,000 sq.m.) and parts of Togoland (13,000 sq.m.) and the Cameroons (34,000 sq.m.) went to Great Britain; most of Togoland (21,000 sq.m.) and the Cameroons (154,400 sq.m.) to France; Ruanda and Urundi (about 20,500 sq.m.) to Belgium.

In Class C the Union of South Africa received German Southwest Africa (323,000 sq.m.), conquered by forces of the Union and surrendered in 1915; the Commonwealth of Australia received the Territory of New Guinea with the Bismarck and Solomon Islands and Nauru Island (93,000 sq.m.); the Dominion of New Zealand got the mandate for western Samoa (about 1100 sq.m.); and Japan became mandatory for the former German islands in the Pacific north of the Equator, the Marshall, Caroline, Ladrone and Pellew islands (830 sq.m.), which Japan kept even after leaving the League of Nations.

Manslaughter, the killing of one person by another without the malice aforethought that characterizes murder. The crime may be voluntary manslaughter, committed in a sudden burst of temper without desire to kill; or involuntary, when death results from negligence or unlawful act, as speeding in an automobile.

Martial law, the control of government by its military power in emergencies when the police and courts cannot maintain order. Martial law has the effect of suspending civil rights, such as freedom of speech and freedom of the press, right of assembly and habeas corpus. Trial is in military courts. In a strict sense this is not law but armed force—*martial law* is a contradiction in terms. As soon as disorder is suppressed, such rule legally ceases, and those arrested are turned over to the civil authorities.

The Constitution of the United States does not mention or define martial law; but it describes it (Art. I, Sec. 9, Cl. 2) when it says: "The privilege of the writ of *habeas corpus* shall not be suspended unless when in cases of rebellion or invasion the public safety may require it." The state constitutions have similar clauses; some of them go further. The Oklahoma constitution prohibits any suspension of the privilege of the writ of habeas corpus by the state authorities. The governor of Oklahoma, who established martial law in the capital in 1923, was impeached and removed. The President's power to call out troops and the power of a state governor to order the militia to the aid of local police does not imply martial law unless there is insurrection and the civil courts are closed and cannot act.

Mayhem (originally the same word as maim, to disfigure or disable), inflicting an injury upon an adversary in an altercation that makes him less able to defend himself, for example, putting out an eye or cutting off fingers. In some states any maiming is classed as mayhem.

Mayor, the chief executive officer of a city, except in those with charters for a manager or commission government.

The word is a variation of *major,* greater, superior; and under the Frankish kings of the Merovingian line (between 500 and 750 A.D.) the mayor of the palace, *major domus,* superior of the house, became an important official, not merely steward and manager but practically premier. Charlemagne himself was a descendant of mayors of the palace who had made themselves kings.

In the United States mayors are now elected by popular vote, but it is only for a little more than a century that this has been the rule. In Colonial times the mayors were appointed by the governor of the colony or in a few cities by the council of the city. The mayor's power has increased: he appoints and can remove many administrative officials and department heads; has executive and legislative power; and often is on the board of estimate or otherwise in financial authority.

Two to four years is the usual term of a mayor in a city of the United States. The mayor of New York has a yearly salary of $25,000. Chicago pays its mayor $18,000 a year.

In Great Britain the mayor of a borough is elected by the council, often from its own number, for a 1-year term. He is chairman or president of the council; has no power of appointment; only a single vote in the council and no executive functions; and is mainly a social and ceremonial representative of the borough. A few older cities in England and Ireland (London, York, Dublin, for example) have a *lord* mayor.

In France the council of each commune elects a mayor and two assistants called *adjoints.* This mayor appoints commune officials and has much more power than the English mayor.

Mediation, in international law the action of a third Power in attempting to arrange differences between two Powers—on the invitation or with the consent of the Powers at variance. The mediating Power has no authority to hand down an award; the mediation is only advice and suggestion, not arbitration. The Hague Peace Conferences of 1899 and 1907 in their Convention for the Peaceful Settlement of International Disputes recommended mediation as the first method.

Military law, the body of regularly enacted rules that govern, regulate and control military forces in peace or war. It is enacted by the regular lawmaking body of the land and is administered by courts of inquiry and courts-martial quite independent of any civil court and of the writ of habeas corpus. Military law is entirely different from martial law.

Militia, as distinct from the regular army, the whole mass of male citizens between 18 and 45 liable to bear arms. In ordinary use the word militia is applied only to those who have had military training and are members of the National Guard. In 1916 the active forces of the individual states, then called state militia, were reorganized as the National Guard by the National Defense Act and became a part of the Army of the United States.

The word militia occurs in the U.S. Constitution only in the Bill of Rights provision (Art. II): "A well-regulated militia being necessary to the security of a free state, the right of the people to keep and bear arms shall not be infringed."

The World War made it necessary to throw the militia into the U.S. Army. Even before that time, state militiamen had seen service on the Mexican border. The almost complete transfer of the armed forces of each state to the Federal Government is one of the many examples of centralized government—a loss by the state, a gain of power by the nation.

Ministry, the department heads of a government, a term used in Europe, South America and other places but not in the United States, where the executive heads of departments are mostly called *secretaries* and the word *minister* is not used.

A minister is a servant—the king's servant in the English government system after which other nations have patterned their ministries, even those that have no king. For the minister at the head of an English government department (Prime Minister, Minister of Labor, of Transport or of Pensions, Secretary for Home Affairs or for War, for example) is now in fact far less a servant of the king than a leader of the party in power and a representative and servant of a legislature elected by the people. So though an English minister acts in the king's name and as an agent of the Crown, his power comes from the people, and he is a member of the executive committee, so to speak, of the House of Commons. In other countries the ministry represents the people and is responsible to the national legislature more or less as it is in England. The English Ministry is the group from which the Cabinet is selected.

The French Ministry, under the name Council of Ministers, is the Cabinet. There is no set number of ministers—departments may be combined under the same head and new departments are created from time to time. The departments of War, Marine, Foreign Affairs, Finance, Justice and Interior date from the Revolution. A Ministry of Labor was created in 1906. After the World War came the departments of Air, Public Health and Pensions.

No executive or legislative act of the President of the French Republic is valid without the signature of the minister whose department is concerned. The Council of Ministers is responsible to the National Assembly and is much more under the control of the legislators than the English Ministry or Cabinet.

In Russia the department heads are Commissars. The Council of People's Commissars of the U.S.S.R. is in effect a ministry, being "the highest executive and administrative organ of state power . . . responsible to the Supreme Soviet and accountable to it."

Under the new Irish Constitution of 1937 the Ministry is called the *Government.*

Minority, less than half; the smaller of two aggregates. Thus a minority party in Congress is any party except that one that has the largest representation. The term *minorities* is frequently used to refer to the racial minorities in Europe, meaning the 30,000,000 people who belong to a different race or religion or speak a different language from the majority of the population in the country where they live. At the Paris Peace Conference the minorities in the states that were created, restored or enlarged, as well as those in Austria, Bulgaria, Hungary and Turkey, were guaranteed certain specific rights. Although the League of Nations has several times enforced the continued respect of these rights, the minorities have frequently been denied equal rights, and certain groups, such as the Jews, have been persecuted.

Misdemeanor, a minor crime, less serious than a felony and distinguished from a felony by some state statutes. Other states have abolished the distinction.

Monuments, National, natural features reserved by the Government for public use. These monuments are usually smaller than national parks—sometimes scarcely more than an acre in size. They contain historic or prehistoric relics, notable geologic formations, biological material (rare vegetation and animal life worthy of preservation) and the like.

Mortgage, a conditional transfer of ownership (usually real estate) from one person to another as security for payment of a debt. If the debt is paid when due, the mortgage is canceled. If the debtor cannot pay, the creditor holding the mortgage may take possession or through a mortgage sale, called a *foreclosure,* may realize money to liquidate the debt. If the sale produces more than the amount of the debt plus interest and costs of sale, the debtor mortgager receives the residue. If the sale nets less than the amount due, the court enters a deficiency decree for the difference, and this amount can be collected out of other property of the debtor. In most states a period of time (varying from 6 months to 2 years) after foreclosure is allowed the debtor to redeem the property by paying principal, interest and costs. Mortgages must be recorded so that the history of the parcel of land may be complete; during the time that property is mortgaged, it cannot be sold except subject to the mortgage. There is a definite tendency in American law to consider the mortgage as a lien and to disregard the original idea that title passed when the mortgage was given. A *chattel mortgage* is a mortgage given on personal property pledged for payment.

Murder, killing with malice aforethought, that is, with deliberate intent. The common law recognized no degrees of murder; but statutes and state penal codes distinguish between first and second degrees. Death or life imprisonment is the usual penalty for first-degree murder; for the second degree, the sentence varies in different states from 3 years to longer periods.

The origin and development of the word illustrates the great differences between law today and the law of long ago. In England after the Norman conquest *murdrum* was a fine payable to the King's Exchequer by the hundred or district in which a stranger was found dead *unless* the slayer was brought to justice and unless the kin of the man killed proved that they were of English (not Norman) blood. This fine made a locality liable for the killing of anyone of the new ruling class.

National Guard, see *Militia.*

National Recovery Administration (NRA), an independent agency of the U.S. Government set up by the National Industrial Recovery Act (NIRA), passed in June, 1933. The act declared an emergency of "widespread unemployment and disorganization of industry" and authorized the President to approve or establish a code of fair competition for each industry or business. Some industries drafted their own codes; some accepted blanket codes drawn under the President's authority by the National Recovery Administration. About $3,300,000,000 was appropriated to carry out the Act, especially in its provisions for a program of public works. By June 1934 over 400 codes had been adopted with provisions for maximum hours, minimum rates, right of labor to organize and to bargain collectively.

On May 27, 1935, the Act was declared unconstitutional by the U.S. Supreme Court on the ground that it delegated power to the President without defining the power.

Naturalization, the process by which an alien (foreign-born person) becomes a citizen of the country where he resides. Sometimes there is a conflict between the laws of the country where an alien was born and the laws of the land where he resides and wishes to become a citizen. For practical purposes in such cases the naturalization laws of the country of his adoption are then supreme.

One of the powers of the U.S. Congress under the Constitution (Act. I, Sec. 8, Cl. 4) is: "To establish a uniform rule of nationalization," and Congress has passed such rules: for individuals, notably in 1790, 1868, 1906 (an entirely new law), 1922, 1930 and 1934; and collectively, for inhabitants of newly acquired territory—Michigan, 1794; Louisiana, 1803; Florida, 1819; Mexican cessions, 1849 and 1853; Alaska, 1867; Hawaii, 1900; Virgin Islands, 1916; Puerto Rico, 1917. All Indians born in the United States were made citizens in 1924. Chinese are ineligible by an Act of 1882, and the Supreme Court in 1923 and 1924 ruled that Japanese and Hindus cannot be naturalized. Only whites and persons of African birth or descent are eligible.

Underwood & Underwood

New United States Citizens Take the Oath of Allegiance

I hereby declare, on oath, that I absolutely and entirely renounce and abjure all allegiance and fidelity to any foreign prince, potentate, state, or sovereignty, and particularly to ...., of whom (which) I have heretofore been a subject (or citizen); that I will support and defend the Constitution and laws of the United States of America against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; and that I take this obligation freely without any mental reservation or purpose of evasion: So Help me God.

The requirements for naturalization are in these acts of Congress, but actual naturalization is not a legal but a judicial process with much latitude left to the courts. In several cases the courts have refused to naturalize applicants who refused to take up arms for the defense of the country—notably Rosika Schwimmer, a woman 49 years old, who could never have been expected to bear arms. She asked for naturalization and was refused by the Supreme Court.

The administration of the naturalization laws is in the hands of a Commissioner of Immigration and Naturalization (two distinct bureaus) in the United States Department of Labor.

An alien at least 18 years of age entering the United States with the intention to remain permanently may become an American citizen after 5 years in continuous residence, if he can prove himself worthy and can speak the English language. Three years after his arrival he may file a declaration before the clerk of a court that he desires to be *naturalized;* this may be done earlier, but no benefit accrues from haste. Two years thereafter, having been a resident for 5 years, he may petition any court of record for citizenship papers. Two witnesses must swear to the facts of his continuous residence and to his good moral character. He must renounce his previous citizenship and swear allegiance to the United States. A person may become a citizen of some of the states of the Union before he can be a citizen of the United States, for some states recognize him as a citizen immediately after his declaration of intention.

A child of American citizens who is born while his parents are in a foreign country is a citizen, provided he returns to the United States for permanent residence before the age of 18 or makes a declaration when he comes of age. When a father is naturalized his minor children receive naturalization with him; his children over 18 years of age must prove a residence of but 1 year preceding naturalization; the mother must go through the naturalization process. An American-born woman who marries an alien does not lose her citizenship by that act. An alien who marries an American citizen must be naturalized to become a citizen. Aliens who have served in the army or navy of the United States are freed from the initial declaration of intention.

Navy, Department of the, an executive division of the Federal Government, established independently in 1798 and before that a part of the War Department. The Secretary of the Navy, like the Secretary of War, is almost always a civilian; and the Department has some activities that are not primarily warlike: the administration of Guam and American Samoa, the astronomical work of the Naval Observatory (correct time service, astronomical observations, preparation of the Nautical Almanac, securing information on eclipses) and the work of the Hydrographic Office and Bureau of Navigation in making charts and studying oceanography and hydrography. The U.S. Marine Corps and the Marine Corps Reserve are under the direction of the Secretary of the Navy. The distinctly naval functions of the Department are divided among the bureaus of Aeronautics, Construction and Repair (including salvage), Engineering, Medicine and Surgery, Navigation (personnel; also Observatory and Hydrographic Office), Ordnance, Supplies and Accounts and Yards and Docks. Since 1915 there has been a Chief of Naval Operations in immediate charge of fleet operations. The Judge Advocate General of the Navy is the Department's legal adviser and representative.

In Great Britain the department that controls and maintains the navy is the Admiralty, a board of lords commissioners, partly sea lords, that is, experienced naval officers, and partly civil lords, that is, civil servants, members of the party in power. The First Lord of the Admiralty is much like the U.S. Secretary of the Navy; he is usually a member of the Cabinet and a civil lord. The British Air Ministry is independent of the Admiralty and the War Office.

Negligence, lack of prudence and reasonable care in the exercise of a duty (or the failure to do what ought to be done) that may result in distress or injury to others. A landlord allows the fire escapes on his building to become unusable. Failure to remedy the defect after being warned lays him open to the charge of negligence. A man burns rubbish in his yard; the wind carries embers to his neighbor's yard and destroys his garage; the former may be made to pay the amount of damage inflicted because of evident negligence. Negligence that leads to loss of life is not only *gross* negligence under the law but may be charged as manslaughter.

New Economic Policy (NEP), a transitional stage in the government of Soviet Russia in 1921-28 between the period of War Communism and the Five-Year Plan. The NEP substituted taxes in kind for the previous method of requiring all surplus to be turned over to the Government. It freed a few small enterprises from nationalization, allowed some private trading, granted concessions to foreign capitalists—and was hailed outside Russia as evidence that the Soviet regime was turning to a modified capitalism. But practically everything in NEP was temporary; the Five-Year Plan left no signs of a tendency toward a capitalist system.

Neutrality, taking no part in an international conflict. A neutral country must be impartial in its relations with the nations at war and must compel its citizens to be neutral in all their acts. Neutral nations are permitted free commercial intercourse with belligerents, except in articles that are contraband of war.

Nihilism, the doctrine or belief that the present form of government, economic and social, should be destroyed no matter what would take its place.

The word was first used by the Russian novelist Ivan Turgenev in *Fathers and Sons* (1862) to describe the view held by Russian revolutionists of that time. The violence that marked the growth of nihilism in Russia, notably the assassination of Alexander II in 1881, was the inevitable result of the central idea of this group. It was violence not for the sake of violence but to secure a desired end. Many anarchists—that is, believers in no government—were nihilists; but not all the nihilists were anarchists, for some of them had constructive ideas for new government by the people and a parliament of the people, and some of them were Marxian Socialists and believers in the principles underlying the present Soviet rule.

No confidence, Vote of, the majority expression by a legislative body that the Cabinet is no longer trusted. This forces the resignation of the Ministry and a general election. The method originated in the English House of Commons and is essential in the English scheme of government by a Cabinet and Ministry responsible to the House of Commons. The defeat of a Government measure (that is, one backed by the Ministry) is a more frequent cause of the Ministry's downfall. In rare cases, the Commons may pass a vote of *censure* against some specific act of the Cabinet or of one of its members. The vote of *no confidence* or *want of confidence* applies to the general policies of the Cabinet.

In the French Parliament (and especially in the Chamber of Deputies) the ministers must answer questions (*interpellations*) by legislators, and after this answer the House may vote not to accept the answer and force the Ministry to resign.

Nolle prosequi (Latin, be unwilling to prosecute), a method of discontinuing a suit by the declaration of the plaintiff or of the prosecuting attorney. The words are often abbreviated to nol. pros. It is not equivalent to an acquittal and is not a bar to a new indictment for the same offense.

Nolo contendere (Latin, I am unwilling to contend), a plea by a defendant in a criminal action without pleading guilty or not guilty, making it possible for him to deny the truth of the charges in a collateral proceeding. In the third person the Latin is: *Non vult contendere,* he will not contend. This plea is permitted in only a few states. Usually the plea must be "guilty" or "not guilty."

Nomination, the choice of a candidate for office. Literally the word means naming. It can be used of a candidate for an appointive office, named (nominated) by the President or a governor and submitted for the approval of the U.S. Senate or a state legislature. The common use is of candidates for elective office: each party or group nominates its candidate for each office to be filled; then from these candidates the whole body of voters elects to the office. The different methods of nominating candidates for elective offices are described under the headings *Caucus, Convention, Primary, Petition.*

Nonresistance, the theory and practice of certain Christian and pacifistic groups that refuse to use force to meet violence and will not resist any authority no matter how unjust its actions. The proof texts are in the New Testament: Matthew 5:39, "Resist not evil: but whosoever shall smite thee on the right cheek, turn to him the other also"; and Romans 13:1,2, "Let every soul be subject unto the higher powers. For there is no power but of God; the powers that be are ordained of God. Whosoever therefore resisteth the power, resisteth the ordinance of God." The English Quakers in the second half of the 17th century created two serious problems for government: one by their refusal to take oaths in court and the other by their pacifism and nonresistance. Nonresistance often became passive resistance or civil disobedience (as Thoreau called it in an essay he wrote at the time of the war with Mexico). Tolstoi in Russia insisted that a true Christian will take no part in any activity of the state that is compulsory.

The idea of passive resistance is Buddhist even more than Christian—a commonplace in the Orient. The Hindu nationalist leader Gandhi advocated passive resistance in his Satyagraha (truth-grasping) campaign against the British Government in India beginning in 1919. Gandhi's followers lay down in the streets and blocked traffic. Bazaars were closed in protest against policies of the government—a strike of retailers called *hartal* in India. Gandhi insisted that truth not violence was the tool for resistance. Nonco-operation is another term applied to this method of opposing the government. It has always been particularly difficult for any government to deal with.

Notary public, a minor official who under seal of his office attests the validity of signatures to deeds, contracts, affidavits and the like and administers oaths in connection therewith. Notaries receive remuneration in fees for work performed. Appointment is by the governor of the state and in the District of Columbia by the President. The commission is usually for 4 years.

Oath, a solemn pledge that statements are true or that a promise will be faithfully executed, made under a sense of responsibility to God. The Constitution of the United States declares the form of oath required of the President (Art. II, Sec. 1, Cl. 8); other oaths are patterned largely upon it. Affirmation without swearing by God is an accepted substitute in the case of persons who have conscientious scruples against the oath.

Obiter dicta, literally things said in passing (*obiter,* from *iter,* a journey); incidental remarks in a judge's opinion not bearing directly on the case or on the point of law involved in the case —and, for that reason, not binding and of no force as a court ruling.

Office, originally a service or duty; then the place or room where the service is rendered; and the division or department of government rendering a service.

The principal administrative departments of the English Government are called offices: Foreign Office, War Office, India Office, Colonies and Dominions Office, Office of Works. What Americans call the Post Office Department is called the Post Office in Great Britain.

In the Federal Government of the United States a few subdivisions of the executive departments are called offices: the General Land Office and the Office of Education in the Interior Department and the Patent Office in the Department of Commerce. The General Accounting Office, independent of any department, is under the control and direction of the Comptroller of the U.S. Another independent unit is the Government Printing Office, which prints and binds for Congress and government departments.

Ogpu, see *Gay-Pay-Oo.*

Orphans' court, name given in Maryland, Delaware, New Jersey and Pennsylvania to a court with probate jurisdiction over wills and administration of estates.

Pacifism, the principle of a movement that seeks the establishment of universal peace. It is especially directed against war and militarism. Pacifists are divided into various groups with different specific policies. Some groups oppose international war but do not oppose a class war by oppressed groups to gain economic or political equality. Pacifists do not oppose a small disciplinary police force to maintain law and order.

Religion has been a strong force in the spread of the pacifist movement. Some groups, such as the Quakers and the Moravians, made pacifism a central doctrine in their religion and are exempted from military service by the United States. Members of other religious groups who are pacifists have sought exemption from military service on this religious basis.

Pais (pronounced pay; from French *pays,* country), used in several peculiar legal phrases to mean: (1) jury or jury trial as distinct from a court hearing before a judge or from a matter of court record—in this sense, the word *country* is an equivalent, and trial by country means trial by jury, since the jury represents the country or neighborhood; (2) a matter of fact in contrast to a matter of record is called a matter *in pais*—for example, estoppel by conduct is called *estoppel by matter in pais* or *estoppel in pais* to distinguish it from estoppel by record and estoppel by deed.

Pardon, full forgiveness of a specific misdemeanor or crime and absolution from all consequences of the misdeed, restoring a criminal to liberty and civil rights. The pardoning power is usually vested in the executive authority but in some states has been given to a board of pardons and parole. The President of the United States can pardon any offender against the United States not under impeachment charges. State authorities may issue pardons for all offenses against the laws of their states but not for offenses against exclusive Federal laws, such as smuggling, counterfeiting and the like.

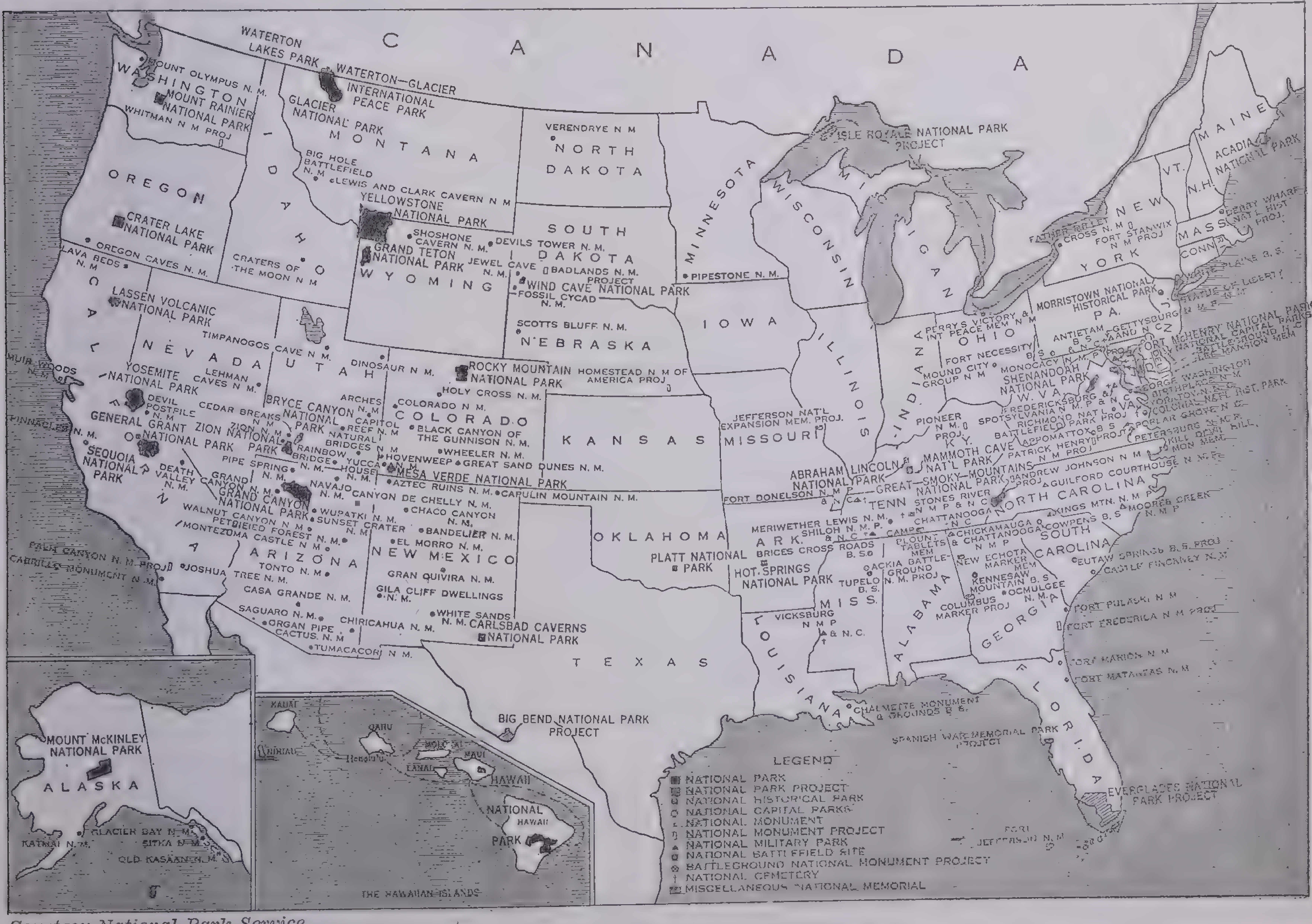
Parks, lands reserved for public use under government control (national, state, county or municipal). There seem to have been public and private parks in many ancient civilizations—small, formal gardens in Egypt and Greece; and large reserves on mountains in ancient Persia that were called by the Persian word from which we get our word *paradise,* originally meaning an enclosure and coming to mean an ideal heaven. In Rome there were city parks, many of them originally public meeting places (like the Greek *agora* or marketplace) or drill grounds, such as the Campus Martius, a grassy field on the east bank of the Tiber.

But public parks were rare until the Renaissance and not really common until the 19th century. Many European cities that had been walled and fortified in the Middle Ages discarded the fortifications in the 18th and 19th centuries and built ring parks, concentric arrangements of boulevards and public walks—Coblenz, Cologne, Strasbourg and Vienna are examples. In France the Revolution at the end of the 18th century turned over many royal parks and estates of the rich nobility to the republican government. In England about the middle of the 19th century, long after the royal parks in London and the vicinity had been made public in fact if not in name, there was a sharp controversy over common lands or commons—pieces of ground that had belonged to all the inhabitants of a community and had been farmed in common long before the Norman Conquest in 1066 introduced the feudal system of landholding under the Crown and the nobles. The great landowners as far back as 1235 and 1285 had received authority from Parliament (an assembly of barons only) to enclose parts of this land and take title to it. From 1845 to 1869 as property became more valuable about 600,000 acres of commons were enclosed by action of parliamentary committees. An act of Parliament in 1876 checked the continuance of enclosure. Many common lands were bought by the government and became parks—Epping Forest, for example, about 5,600 acres 17 miles north of London.

In the United States public parks seem to have originated from the common lands. In 1634 the Boston Common was made a public park. Throughout New England commons that were originally used for pasturing cattle and that were almost always in the center of the settlement near the church and other public buildings in time became public squares. City Hall Park in New York city was originally a commons. Planned parks began in the 50s; Bushnell Park in Hartford, Conn., around the state capitol building, was begun in 1853, and in 1857 the property for Central Park, New York city (now 840 acres) was bought. Fairmount Park, Philadelphia, 3,600 acres, one of the largest parks inside city limits, was begun in 1867. In the '90s cities began to plan series, chains of parks, inside and outside the city; Boston and Kansas City both began a program of metropolitan parks in 1892.

County park systems started about the same time: Essex County, N.J., in 1895. With the development of the automobile, special passenger automobile highways with elaborate landscaping were built, such as the Westchester County parkways and those on Long Island, both leading into the city of New York.

State parks are variously administered—in New York by a Conservation Department—and they may be historic sites, scenic marvels, forests, game preserves or sites for camping, playgrounds and recreation. The New York State Adirondacks Park is a forest reserve of more than two million acres with free camping. The Saratoga Reservation under New York state control is a 1,000-acre park with mineral springs and baths opened in 1935. Along the west bank of the lower Hudson is the Palisades Interstate Park of about 12,000 acres, which is under the joint supervision of


C A N A D A
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARK.
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KY.
TENN
MISS.
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
W. VA.
PA.
NEW YORK
VT.
N.H.
MAINE
MASS.
CONN.
ALASKA
THE HAWAIIAN ISLANDS
WATERTON LAKES PARK
WATERTON—GLACIER INTERNATIONAL PEACE PARK
MOUNT OLYMPUS N. M.
MOUNT RAINIER NATIONAL PARK
WHITMAN N M PROJ
GLACIER NATIONAL PARK
BIG HOLE BATTLEFIELD N. M.
LEWIS AND CLARK CAVERN N M
YELLOWSTONE NATIONAL PARK
CRATER LAKE NATIONAL PARK
OREGON CAVES N. M.
LAVA BEDS N. M.
CRATERS OF THE MOON N M
SHOSHONE CAVERN N. M.
GRAND TETON NATIONAL PARK
DEVILS TOWER N. M.
JEWEL CAVE N. M.
BADLANDS N. M. PROJECT
WIND CAVE NATIONAL PARK
FOSSIL CYCAD N. M.
VERENDRYE N M
PIPESTONE N. M.
ISLE ROYALE NATIONAL PARK PROJECT
ACADIA NATIONAL PARK
LASSEN VOLCANIC NATIONAL PARK
TIMPANOGOS CAVE N. M.
LEHMAN CAVES N. M.
DINOSAUR N. M.
SCOTTS BLUFF N. M.
ROCKY MOUNTAIN NATIONAL PARK
HOMESTEAD N. M. OF AMERICA PROJ
HOLY CROSS N. M.
MUIR WOODS N. M.
YOSEMITE NATIONAL PARK
DEVIL POSTPILE N. M.
PINNACLES N. M.
GENERAL GRANT NATIONAL PARK
SEQUOIA NATIONAL PARK
DEATH VALLEY N. M.
ZION NATIONAL PARK
ZION N. M.
CEDAR BREAKS N. M.
BRYCE CANYON NATIONAL PARK
ARCHES N. M.
CAPITOL REEF N. M.
NATURAL BRIDGES N. M.
RAINBOW BRIDGE N. M.
HOVENWEEP N. M.
COLORADO N. M.
BLACK CANYON OF THE GUNNISON N. M.
WHEELER N. M.
GREAT SAND DUNES N. M.
MESA VERDE NATIONAL PARK
AZTEC RUINS N. M.
CAPULIN MOUNTAIN N. M.
PIPE SPRING N. M.
GRAND CANYON N. M.
GRAND CANYON NATIONAL PARK
NAVAJO N. M.
CANYON DE CHELLY N. M.
CHACO CANYON N. M.
WUPATKI N. M.
SUNSET CRATER N. M.
WALNUT CANYON N. M.
PETRIFIED FOREST N. M.
MONTEZUMA CASTLE N. M.
EL MORRO N. M.
BANDELIER N. M.
PALM CANYON N. M. PROJ
CABRILLO MONUMENT N. M.
JOSHUA TREE N. M.
TONTO N. M.
GRAN QUIVIRA N. M.
GILA CLIFF DWELLINGS N. M.
CASA GRANDE N. M.
SAGUARO N. M.
ORGAN PIPE CACTUS N. M.
CHIRICAHUA N. M.
WHITE SANDS N. M.
CARLSBAD CAVERNS NATIONAL PARK
TUMACACORI N. M.
BIG BEND NATIONAL PARK PROJECT
PLATT NATIONAL PARK
HOT SPRINGS NATIONAL PARK
JEFFERSON NAT'L EXPANSION MEM. PROJ.
ABRAHAM LINCOLN NATIONAL PARK
FORT DONELSON N. M. P.
MERIWETHER LEWIS N. M.
SHILOH N. M. P.
BRICES CROSS ROADS B. S.
TUPELO B. S.
ACKIA BATTLEGROUND N. M. PROJ
VICKSBURG N M P & N. C.
CHALMETTE MONUMENT & GROUNDS B. S.
SPANISH WAR MEMORIAL PARK PROJECT
PERRY'S VICTORY & INT PEACE MEM N M
MOUND CITY GROUP N M
FORT NECESSITY B S
MAMMOTH CAVE NAT'L PARK
PIONEER N. M. PROJ.
GREAT SMOKY MOUNTAINS NATIONAL PARK
STONES RIVER N M P & N C
CHATTANOOGA
CHICKAMAUGA & CHATTANOOGA N M P
NEW ECHOTA MARKER MEM
KENNESAW MOUNTAIN B. S.
OCMULGEE N. M.
COLUMBUS MARKER PROJ
SHENANDOAH NATIONAL PARK
FREDERICKSBURG & SPOTSYLVANIA N M P & N. C.
RICHMOND BATTLEFIELD PARK PROJ
APPOMATTOX B S
PATRICK HENRY PROJ
PETERSBURG N M P
ANDREW JOHNSON N M
GUILFORD COURTHOUSE N M P
KINGS MTN. N. M. P.
COWPENS B S
MOORES CREEK N M P
EUTAW SPRINGS B. S. PROJ
CASTLE PINCKNEY N M
FORT PULASKI N M
FORT FREDERICA N M PROJ
FORT MARION N M
FORT MATANZAS N M
FORT JEFFERSON N M
EVERGLADES NATIONAL PARK PROJECT
ANTIETAM
GETTYSBURG N M P
MONOCACY N M P PROJ
FORT McHENRY NATIONAL PARK
NATIONAL CAPITAL PARKS
MORRISTOWN NATIONAL HISTORICAL PARK
STATUE OF LIBERTY N M
FATHER MILLET CROSS N. M.
FORT STANWIX N M PROJ
DERBY WHARF NAT'L HIST PROJ
MOUNT McKINLEY NATIONAL PARK
GLACIER BAY N. M.
KATMAI N. M.
SITKA N. M.
OLD KASAAN N. M.
HAWAII NATIONAL PARK
LEGEND
▪ NATIONAL PARK
▨ NATIONAL PARK PROJECT
▪ NATIONAL HISTORICAL PARK
○ NATIONAL CAPITAL PARKS
• NATIONAL MONUMENT
▯ NATIONAL MONUMENT PROJECT
▲ NATIONAL MILITARY PARK
△ NATIONAL BATTLEFIELD SITE
⊗ BATTLEGROUND NATIONAL MONUMENT PROJECT
† NATIONAL CEMETERY
▭ MISCELLANEOUS NATIONAL MEMORIAL

Courtesy National Park Service

National Park Service Areas and Projects

commissioners from New York and New Jersey.

National parks in the United States may be classed like the state parks. The first was the Hot Springs Reservation in Arkansas, established by acts of Congress in 1832 and 1880 and made a national park in 1921. The far western scenic parks include: Yellowstone (1872), Yosemite (1890), Sequoia (1890). Several parks in the East were added more recently—Acadia on the Maine coast and Great Smoky Mountains in North Carolina and Tennessee, which has not yet been organized as a park. There are volcano parks in Hawaii.

National monuments under the supervision of the National Park Service are historical or scientific. Especially interesting are the dinosaur fossil remains at Watson, Utah.

National military parks are battlefields; and other battlefield sites are small reservations. The Park Service administers national cemeteries on Civil War battlefields.

The national forests of the United States are scattered in 32 states, in Alaska and Puerto Rico, and each of 33 forests overlaps state boundaries. They have a total area of more than 165,000,000 acres; in both Idaho and California there are more than 19,000,000 acres; in Montana more than 16,000,000; in both Colorado and Oregon, more than 13,000,000. The forests are under the U.S. Forest Service, a division of the Department of Agriculture, and one of their uses is to provide popular outdoor recreation.

Municipalities, counties, states and the Federal Government of the United States all have game reserves and bird refuges. Under the supervision of the Bureau of Biological Survey (Department of Agriculture) are preserves for bison, elk, deer, mountain sheep, pronghorns, migratory birds. There are reserves in the larger national forests.

In Soviet Russia, Germany, Austria and Poland, huge new parks were made after the World War from royal lands taken over by the new governments. Poland has game preserves of scientific importance—once royal forests of Polish kings and Russian czars.

President Kruger of the Boer Republic in 1898 established a game preserve between the Sabi and Crocodile rivers. It has been enlarged from time to time, and in 1926 the Union of South Africa made it a national park about 220 miles long and 40 miles wide. It contains elephants, giraffes, antelopes, buffalo and perhaps a few of the rare black rhinoceros. There are two large game reserves in Kenya and three in northern Rhodesia—one of these is the Victoria Falls Reserve.

In the Belgian Congo there are two great parks—both commemorated in a 1937 issue of postage stamps. The Parc National Albert, about 780 square miles, has three volcanoes and includes the gorilla country and rare fauna and flora. Another game reserve, about 1,080 square miles, is in the Luana Valley.

In Australia there are reserves for the peculiarly Australasian animals—kangaroos, wombats, duckbill platypus—especially in Tasmania, with a park near Hobart and a 160,000-acre game reserve in the Mount Field country. New Zealand has island refuges for sea birds.

Where English Lawmakers Meet

Along the Thames in Westminster, London, stand the Houses of Parliament. Here the House of Commons and the House of Lords assemble when summoned by the king. Parliamentary law received its name because most of the principal rules accepted in parliamentary law originated in the English Parliament

Parliament, originally a conversation or parley; then a conference and the council held by the early kings of England after the Norman Conquest; and now any legislative body, specifically that of Great Britain and Northern Ireland. Parliament is the official name of the legislature in Canada, Australia and the Union of South Africa. In New Zealand the name *General Assembly* is used.

Parliamentary government is that type of government in which a legislative body has complete control over lawmaking and administration—especially the type modeled on the English system in which the control of the government is in the hands of ministers who are members of Parliament and responsible to it.

Parole (French, word, promise, word of honor), a conditional release from punishment on pledge of good conduct given by a prisoner. The paroled person must make periodic reports and must submit to certain supervision. For misbehavior the parole may be canceled and the person returned to prison.

Party, political, an organization of persons with the same general beliefs about policies the government should follow, formed for the purpose of securing the adoption of their policies by the government. The most distinctive function of the political party is that it nominates some of its leaders for public office and attempts to secure the election of these candidates.

Party government, a system of government based upon the selection of public officials from the candidates nominated by political parties. In a democratic nation there are two or more parties, and each has its own candidates and platform. The successful party in an election attempts to enact its program; the defeated party criticizes what is being done and promotes a general discussion of the policies of the party in power. In time of national crisis, such as a war, the various political parties often drop their differences and join together in supporting a national policy. In the United States and England there have generally been two major political parties, but in some countries, such as France, there has been a large number of parties.

At the beginning of the national government of the United States two political parties developed, and although their names have been changed, the general composition and programs of the parties have persisted down to the present. The Federalist-Whig-Republican party, which has had as its standard bearers Hamilton, Webster, Lincoln, McKinley and Coolidge, has mainly represented the industrial and financial interests of the nation. The Republican-Democratic party led by Jefferson, Jackson, Bryan and Franklin D. Roosevelt has primarily represented the agrarian interests and small groups of importers and industrial workers. The Federalist-Whig-Republican group has generally stood for a high protective tariff, centralized banking and a currency based on gold, internal improvements and economic measures favorable to industrialists. The Republican and Democratic parties have generally supported diametrically opposed policies. In recent years, and especially during the Franklin D. Roosevelt administration, the economic conditions in the nation have caused this old cleavage practically to disappear. The old names continue, but within both parties the division is more along the lines of the traditional English parties—Conservative and Liberal.

Both parties have been subject to splits and attacks by third parties. These parties have never been victorious in elections, but they have been influential in determining the policies of the major parties, for when a third party becomes sufficiently powerful or attracts a large number of voters it often becomes consolidated with one of the major political parties, or at least the attractive policies of the third party are adopted by the Republicans or the Democrats. For example, the Prohibition party never secured a large vote, but it was successful in obtaining the adoption of the prohibition amendment; and policies of the Socialist party have frequently been adopted by a major party.

Under a dictatorship only one political party is permitted and that is the party of the dictator. In Germany it is the National Socialist party; in Soviet Russia, the Communist party; in Italy, the Fascist party. In these countries the party is highly organized, and only a small proportion of the citizens are permitted to join the party, although they may not organize any opposing group.

Patent, a government grant to an inventor, securing to him for a stated time the exclusive right to make, use or sell any new and useful machine, process or composition of materials of his invention. It also permits the patentee to sell or authorize others to use his patent. Every article thus protected must be marked with the word *patented* and also the date of patent issue or serial number. False marking renders the offender liable to fine.

The government grant of a patent is in effect a contract by which the inventor reveals the specifications of his device so that the public can use it freely after the patent period runs out; for this future release of his property right the Government gives him a monopoly protection during the life of the patent. The term of the patent in the United States for *inventions* is 17 years from the date of patent issue. In most other countries the term runs from the date of application. Patents for *designs* run in the U.S. for 3½, 7 or 14 years, depending on which is requested in the application. Patents may be extended by act of Congress; and a law of 1928 allows any patentee who had served during the World War to secure an extension of his patent for three times his period of service if he applied for it between May and December 1928.

The Patent Office is now a part of the Department of Commerce. The original Patent Commission was created by Congress in 1790 under a provision of the Constitution (Art. 1, Sec. 8, Cl. 8), which gives Congress power "To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

The Patent Office is one of the oldest branches of the Federal Government. Samuel Hopkins took out the first patent issued in the United States, protecting a new process for making potash and pearlash. In 1825 when about 30,000 patents had been issued, a clerk in the Patent Office resigned because he thought that a patent had been given for about everything that could be patented and he feared dismissal. Today more than 45,000 patents are issued yearly, and the grand total issued in the United States is about two million. Americans hold a third of the patents issued by nations of the world. An international agreement protects an article that has been patented in one country from infringement in another.

Not every new idea is patentable, for it must be deemed useful as well as original in order to be given protection. A patent may be assigned to other persons by the patentee.

Peace movement, efforts of people throughout the world to promote universal peace. The first peace society was organized in New York city in 1815. An international peace congress was held in London in 1843, and by the time the World War broke out there were 160 peace societies with a large membership scattered throughout the world.

The peace movement has generally advocated the abolition of war by the settlement of international disputes through arbitration and by limiting and reducing the national armaments. The great gestures of the Kellogg-Briand Peace Pact, in which most of the nations of the world agreed to outlaw war as an instrument of international policy, and the efforts to reduce armaments after the World War have largely failed.

Penalty, punishment for crime or wrong doing, based on a retributive theory of law. Retaliation, punishment in kind, an eye for an eye and a tooth for a tooth, was the primitive notion of penalty. Modern criminology and psychology try to reform and readjust the criminal, giving him useful and educational occupation in prison, putting him on parole before his term is finished if his behavior is good—and sometimes suspending his sentence and putting him on probation with helpful and kindly supervision.

Crime waves, sudden outbursts of violence and kidnaping, for example, swing lawmakers and courts to the opposite extreme of extra severity toward habitual offenders as in the Baumes Law of New York, which makes life imprisonment a mandatory penalty for a habitual criminal convicted of a felony for the fourth time.

Pension, a regular government payment, especially to one who has retired from service. The Government pays pensions to various persons, such as war veterans, destitute mothers, old people with no means of support and civil employees who have been honorably retired. With the development of the feeling of social responsibility and the great numbers of unemployed, there has been a trend toward the Federal Government's taking over the pension system from the states and municipalities. This permits a better distribution of the tax burden necessitated by the pension payments and a more efficient and better co-ordinated administration of the pensions.

Military. In 1789 the Federal Government took over the payment of soldiers in the Revolutionary War, but the real beginning of the pension system was under an act of 1871 making grants to the survivors of the War of 1812. Later acts provided for pensions for veterans of the Indian Wars, the Mexican War, the Civil War, the Spanish-American War and the World War, as well as for their widows and dependent children. After a war pensions have been granted only to honorably discharged veterans who suffered from disabilities acquired in the service and the dependents of men who were killed in the war. As time passed and there were fewer veterans living, Congress pensioned all veterans irrespective of their disability, as in 1930 when all veterans of the Union Army and all widows of such veterans were pensioned.

Federal employees. Federal judges who have reached 70 years of age are pensioned, and in 1920 a Federal pension system was established to provide for government employees in specified classifications who, because of age or disability, became unfit for "useful and efficient" service. This plan is in the nature of insurance, since the employees must contribute a portion of their salary during their employment, and the age of retirement and amount of the pension are fixed in accordance with the work done. Widows of Presidents are granted a pension by special acts of Congress.

Municipal and state employees. Teachers, firemen, policemen and others are pensioned under methods that vary widely in different parts of the country.

Old age. Investigations have shown that one-third of the persons in the United States 65 years of age or older are dependent upon charity. All states except Virginia had made provisions for pensioning the aged by 1937 when a Federal plan for social security went into effect.

Mothers. Practically all of the states have provisions for pensions to be made to widows and deserted wives who have small children to support.

Industrial. Many industrial concerns have adopted pensions for their employees, making payments in proportion to the length of service and the position held, realizing that this is both a humanitarian obligation and good business.

Perjury, false swearing, wilfully false statements under oath or affirmation in a judicial proceeding in regard to something material to the case or inquiry. The offense is a felony by the statutes of most states. *Subornation* *of perjury* consists in securing another to swear falsely as to a material fact in a case.

Persona grata and **Persona non grata,** terms used to indicate that the diplomatic representative sent from another country is acceptable or not acceptable. If the representative is acceptable to the government to which he is sent, the envoy is said to be *persona grata;* if he is not acceptable he is *persona non grata.*

Personal property, movable property and certain interests in land as distinct from *real property* or *real estate,* that is, land and buildings attached to it.

Petition, a formal written request by citizens made to some governmental authority. The first amendment of the U.S. Constitution stipulates that Congress shall not abridge the right of the people "to petition the government for a redress of grievances." But this right of petition does not necessitate a consideration of it by the Government. Under a rule of the House of Representatives passed in 1836, petitions may be tabled without being referred to a committee or receiving any further consideration. The right of petition was first granted in England by Magna Charta.

Nomination by petition is permitted by some state constitutions, especially for the nonpartisan nomination of judges. The law specifies the number of signers required.

In the U.S. House of Representatives a bill not reported to the House by the committee to which it has been referred may be brought before the House for consideration if it is ordered out of committee by a petition signed by 218 representatives (out of a total of 435).

Plaintiff, the party making complaint in a case seeking a remedy for an injury. In a real action he may be called a *demandant;* in a divorce case, a *libellant;* in equity, a *complainant;* but the general usage is to call the claimant in all cases the plaintiff. The other party is the defendant.

Planning, systematized efforts to secure recovery or economic progress by governmental activities. Governmental programs for economic control became necessary in the confusion and disaster of the period after the World War and particularly in the depression that began in 1929. Planning is distinct from the isolated occasional economic legislation of earlier periods, the tariff laws, for example, that protected American infant industries even in the early days of the republic.

Government planning on a big scale after the World War began in the new Russia with a Council of Labor and Defense working through its State Planning Commission or Committee (*Gosplan*) in 1923. Between 1923 and 1928 corresponding planning commissions were organized in each of the seven republics. In 1928 the first Five-Year Plan abolished the NEP, which in 1921 had adopted some elements of the capitalist scheme. The Plan undertook to mechanize and collectivize 63,000,000 acres of farms (about one-fifth of the total) by 1933; that is, to have them operated by machinery and owned not individually but by the state or communist groups; to invest about $33,300,000,000 in agriculture, industry and education; to increase industrial output 136 per cent and farm products 55 per cent.

The second Five-Year Plan called for a much heavier investment, for a 114 per cent increase of industrial output from 1932 to 1937, for a 63 per cent increase in labor productivity in large-scale industry, for a 35 per cent reduction in retail prices and for doubling the production of consumer goods and the per capita consumption. The second Five-Year Plan was not so successful as the first, which reached the 5-year quota in 4 years. But education has advanced rapidly, and unemployment is not a problem under Soviet economic planning. Even more than in other autocratic dictatorships Russia has the power to make the people do anything that will help the cause—and the people seem enthusiastic for the cause.

In Italy an economic plan has been the central core of the entire Fascist movement.

Turkey suffered severely from the World War, which reduced her territory enormously. In 1921 and 1925 new constitutions were adopted and the government is a dictatorship with a sharply defined program, called *Kemalism* after the president-dictator, Kemal Ataturk. A Five-Year Plan adopted in 1934 aimed to build up consumption-goods industries, especially textiles, instead of capital goods as in Soviet Russia's first Five-Year Plan. Like the United States, Turkey is making special trade treaties with foreign powers in an attempt to develop foreign commerce.

Russia and Turkey are planning increased production. Other nations are limiting production or controlling it in their attempt to become self-sufficient.

Great Britain's postwar economic legislation has been complex and complete. High tariffs and government subsidies protect British industry. Doles for subsistence are paid to the unemployed, and in 1936 about 750,000 agricultural workers were added to the number protected by unemployment insurance. In 1934 more than £100,000,000 (almost half a billion dollars) was spent by the Government under the Unemployment Insurance Acts, and almost 12,500,000 persons were insured. Old-age pensions that year cost Great Britain more than £83,000,000—almost twice as much as the war pensions for the year.

In the United States the policy and practice of government were long opposed to planning. There might be some interference with business, but it was not a policy. The policy was *laissez faire,* leave it alone. The depression changed the policy. The beginnings of the change were seen in President Hoover's administration. The New Deal of President Roosevelt's administration was largely a plan, a complete policy, to effect reform, recovery and relief. The NRA attempted to make competition fair, and business ethics may be better for it even though the NRA was discarded. The Government's plan for agriculture raised farm incomes in

Photo by Charles Krutch, TVA

Government Planning: The Force of Falling Water Becomes Electric Power

A portion of the switchyard and powerhouse at the Tennessee Valley Authority's Norris Dam may be seen in the foreground of this picture, while beyond the waters of the Clinch River cascade 207 feet down the face of the spillway section—a drop almost 40 feet greater than Niagara Falls. Norris Dam, completed in 1936, helps to control seasonal floods on the Tennessee and Ohio rivers, aids navigation in months of low flow and provides for the production of electric power spite of droughts and floods. Unemployment remained so serious a problem that in November 1937 a census of the unemployed was taken by mail. Huge public works were undertaken at government expense to put men to work—relief and recovery combined. At the same time the Federal Government displayed an active interest in housing. The power projects of the Tennessee Valley and the Columbia River are part of a plan to improve and cheapen the cost of electric current for domestic and factory use.

Labor organizations were first recognized by the Government under the NRA in 1933 and then by the Wagner National Labor Relations Act; and Federal legislation began on hours of labor, wages and collective bargaining. Government relations to industry were put on a very different basis by the NRA and the recognition and encouragment of trade associations. The New Deal enlarged the power of the Federal Reserve Board over the nation's banking, and the Government organized many financing concerns, notably the Reconstruction Finance Corporation and the Federal Home Loan Bank System. New control of investments and speculation was given to the Securities and Exchange Commission created by an act of 1934.

The interests of consumers were considered by a division of the NRA while it lasted, and the Agricultural Adjustment Administration has a Division of Consumers' Counsel. A commission on consumers' co-operation was sent to Europe by the President.

The Social Security Act of 1935 plans a co-operation of Federal and state governments in care for the aged, the needy blind, dependent children and the unemployed. The problem of youth was attacked in two ways: the Civilian Conservation Corps, authorized in 1933, gave work and vocational training to unemployed males between 17 and 23 (originally 17 and 28); and National Youth Administration, set up in 1935, provided funds for part-time employment of students between 16 and 24 and out-of-school youth between 18 and 24 and encouraged job-training, counseling and placement services and the development of constructive leisure-time activities.

The New Deal planning is a little less nationalist and isolated than the plans of most other nations. It includes a policy of reciprocal trade agreements with other countries in an effort to build foreign trade.

States, counties and cities have their planning commissions and various planning activities—simplifying the processes of government, building parkways and parks, undertaking emergency public works, co-operating with the Federal government and helped by its tremendous appropriations.

This brief outline shows how much government activity has widened into many different fields and that it embraces a much more general and coordinated view of what must be accomplished. The means of securing these ends are still not perfected, not efficiently geared.

Platform, a declaration of party principles, the basis on which the candidates stand, a formal statement appealing for votes. Party platforms are adopted at national conventions in presidential campaigns and by state conventions in state campaigns. In states where there is no nominating convention, a party convention or (in Wisconsin) a party council is authorized to draft the platform.

Party platforms are general and vague—in their promise of performance and in their praise of what this party has done and their condemnation of what the other party has done.

Political parties abroad occasionally issue manifestos or statements of policies, but there is nothing in foreign party organization just like the American platform.

Plea, any pleading, especially an allegation of fact or the answer of a defendant. In particular it is the answer of a defendant arraigned in a criminal case to the question, "Do you plead guilty or not guilty?"

Pleadings, the various written statements setting forth the case and claim of the plaintiff and the answer and defense of the defendant until issue is joined—that is, the point in controversy made plain.

Plebiscite, in Roman government a decree (*scitum*) of the common people (*plebs*), which was voted by the *comitia tributa* or tribal assembly. Now the term means a vote of the people on a statute or other measure submitted to them for their decision. Any referendum is a plebiscite. The proposed Ludlow amendment to the Constitution provides for a plebiscite before a war can be declared that will take American troops outside the United States.

This was the means used for arriving at *self-determination* of territorial units after the World War: the Saar, for example, in January 1935 voted by more than 90 per cent to return to the German Reich. In Hitler's new Germany a plebiscite of November 1933 approved the decision to withdraw from the League of Nations; and in August 1934 there was an overwhelming popular vote approving Hitler's assuming the title of President. The plebiscite of March 25, 1934, in Italy gave the people's assent to the list of parliamentary candidates prepared by the Fascist General Council.

Plurality, the largest number of votes cast in an election. A *majority* is more than half the votes cast. Thus, if there are only two candidates, the one receiving a plurality would also receive a majority of the votes; but if there are three or more candidates, the one receiving a plurality may not have a majority of the votes cast.

Plural voting, the right to cast more than one vote in an election. In Belgium until 1921 some voters had three votes apiece; in many German cities, especially in Prussia, certain citizens could cast more than one ballot; and throughout the United Kingdom of Great Britain and Ireland there are two voting qualifications that give certain electors more than one vote in parliamentary elections. Before 1918 one voter could legally cast many more than two votes—if he owned property in more than two parliamentary boroughs; and before 1918 general elections were spread over a period of two weeks so that a landowner in different parts of the kingdom might vote on different days in different boroughs. The law of 1918 limited plural voting to two votes: a voter may cast his ballot (and so may the wife or husband of such a property holder) in the district where he owns a residence and in the district where he owns business property, if these are different constituencies; and as some members of the House of Commons represent universities, the degree-holders of universities who vote for these university members have that extra vote besides the one for a candidate from the voter's place of residence. The 1918 Representation of the People Act extended university representation in the Commons to many new universities—so that plural voting was actually enlarged.

Pocket borough, see *Borough.*

Pocket veto, see *Veto.*

Police power, the power of the state to regulate persons and property in the interest of the general public welfare. As this power conflicts with the rights of the individual and with property rights, in certain respects the police power is limited by the Bill of Rights in the Federal Constitution and in the state constitutions and by such legal principles as due process of law. The conflict between these two principles of law provides the material for many crucial cases before our Supreme Court. The modern trend is toward an extension of the police power at the expense of individual and personal rights that might be used in a way to endanger the public good.

Poll tax, literally head tax, since poll is an old English word meaning head or individual. As a verb *poll* means to list or count individuals and so to take a vote. *The polls* is an old phrase meaning voting place.

A poll tax is a uniform tax for each person—often on each person qualified to vote as a requirement for voting. Some states (Alabama, Arkansas, Florida, Massachusetts, Mississippi, Tennessee, Texas, Virginia and others) still require the payment of this tax, usually only a dollar; if it is not paid, a person cannot vote.

Populist party, a political party formed by farm and labor groups in 1891. Due to the economic conditions, the farmers of the South and Middle West were getting poorer, and conditions were so bad that they were burning their crops for fuel. On the other hand, the financial and commercial interests in the East were getting richer. The Populist party in 1892 adopted a platform including free coinage of silver, a graduated income tax, plenty of paper money, government ownership of railroads, direct election of Senators, an eight-hour working day, postal banks and prohibition. James B. Weaver of

Iowa was its candidate for President in 1892 and received over a million votes. When the Democratic party declared for "free silver" in 1896 and nominated Bryan, the Populists gave full support, but Bryan was defeated.

Post-mortem (Latin, *after death*), a formal examination to ascertain the cause of death. Physicians in registration areas are required to report deaths of their patients to the authorities; if the cause is not known, medical examination of vital parts may disclose it.

Post Office Department, an executive branch of the Federal Government established in 1894 under authority of the Constitution (Art. I, Sec. 8, Cl. 7), which granted Congress power "to establish post offices and post roads." The department is under the direction of the Postmaster General who is a member of the President's Cabinet. This department has jurisdiction over all post offices and other services connected with the collection, transportation and delivery of the mails.

The postal service in America was first a private enterprise, but in 1639 Massachusetts took the first step toward the establishment of a governmental postal system. For practical reasons, the framers of the Constitution followed the practice in Europe and made the mail system a public monopoly.

The services of the Post Office Department have steadily expanded so that they now include free delivery of mail in cities of over 10,000 inhabitants or where the gross receipts of a post office amount to at least $10,000 a year, registering and insuring mail, the money-order system, the parcel post, air mail and, since 1910, a system of savings banks. Special rates are granted to certain classes of educational literature. Government mail is carried free and so are certain special classes of mail, such as literature for the blind that does not carry advertising. Subsidies of the mail service are used to develop air and ocean transportation.

Universal Postal Union, a system organized under the Treaty of Paris in 1878, in which practically all nations agreed they were "a single postal territory," and established equal rates and rules for all.

Power of attorney, written authority to act for another. The delegation of power may cover all the interests of the principal, a *general* power of attorney, or only specified duties, a *special* or *limited* power. If the agent acts within the delegated powers, the principal is legally responsible for his acts; if those powers are exceeded, responsibility is shifted to the representative.

Practice and procedure, the manner and method of starting and conducting litigation, as governed by what is called adjectival law. Practice and procedure have been greatly simplified in the last century. In England the Judicature Act of 1925 (following acts of 1873) cut away a great deal of unnecessary technicality and legal circumlocution and delay. In the United States the reform of procedure began with the Field Code (named from its principal author, David Dudley Field), adopted in 1848 in New York State. The commission that reported this code had been instructed "to provide for a uniform course of proceeding in all cases whether of legal or equitable cognizance and for the abandonment of all Latin and other foreign tongues so far as the same shall by them be deemed practicable." By the end of the century this New York reform code had been adopted in 28 states and 2 territories. A few states still distinguish between common law and equity at least in the form of actions. New Jersey still has separate courts of equity and law. Louisiana practice is still based on the Civil Code.

All state constitutions make trial by jury an inviolable right, and this has served to keep some distinction between common law actions in which a jury may be demanded and equity actions with no jury.

The main steps in a legal action are:

notice to the defendant, usually by a *summons;*

filing of plaintiff's *complaint* or *petition,* which must be served on the defendant;

defendant's *appearance* entered or his *answer* filed, possibly with a counterclaim;

trial of the action;

after verdict or judgment, a defeated party may *appeal* to a higher court.

Precedent (from Latin, meaning going before), a judicial decision, method of procedure or course of action that once decided then becomes a rule or authority for other cases under similar circumstances. The English Common Law, lacking codes and statutes, was built on precedents. An ancient maxim is *stare decisis,* stand by decisions. The tendency of law by precedent is to magnify the past and lose touch with new conditions, but the courts frequently do not follow this maxim and overrule earlier cases. Equity once was one corrective of this tendency; new statutes and the adoption of modernized uniform laws or codes are other remedies.

Preferential voting, a system by which the voter marks his first, second and third choices on the ballot. Then, when the votes are counted, if one candidate has a majority of the first choices, he is declared elected. If no candidate has a majority of the first choices, the second choices are added in, and if this does not give any candidate a majority, the third choices also are counted to determine the successful candidate.

This method of voting is a definite advantage over the ordinary type and attempts to select a candidate by a majority of votes, rather than by a mere plurality. Preferential voting has been widely criticized because as much weight is given to the second and third choices as to the first choices, and the second-choice vote balances the first choice in the final tabulations. Furthermore, many voters have refused to cast more than a first choice, which defeats the purpose of the system.

Premier, see *Prime Minister.*

Press, Freedom of. See *Censorship.*

Primary election, the selection by a political party of candidates for public office to run for election on the party ticket. This selection was originally made in a legislative caucus, in which the members of the legislature had a party meeting and determined who the candidate of that party should be. In the time of President Jackson this method was supplanted by the party convention, composed of delegates of the small units of the party. Though the convention method has been retained in nominating candidates for President and Vice-President of the United States, it has been generally abandoned for other purposes.

Direct primary is the present widely used method of selecting candidates for office by the party. A primary election is held at an officially designated time prior to every election, and the members of the various parties vote for the persons whom they desire to be the party candidates in the regular election. In most states the voter in a primary election receives only the ballot of his party, on which are names nominated by petition and spaces for any names to be written in. In Wisconsin, Montana and Minnesota *open primaries* are held in which the voter receives the ballots of all parties and secretly chooses one party ballot and votes on it, the other party ballots being destroyed. The person in each party receiving the highest number of votes for a particular office in the primary election is designated as the candidate of his party for that office in the regular election. In some states where there is only one strong party, and nomination in the primary amounts to an election, there is a special provision that if no candidate receives a majority of the votes cast, a special *run off* election is held between the two candidates with the largest number of votes.

The direct primary election has not achieved the hopes of its sponsors, and the selection of candidates still remains largely in the hands of the political machine. The direct primary has been further criticized because it costs the Government so much for printing the ballots, because it costs anyone so much to secure a nomination and because the public takes so little interest in the primary election. But the direct primary seems better than any of the old systems of selecting party candidates for local offices.

The party candidates for President and Vice-President of the United States are selected in national party conventions. The delegates to the party conventions were formerly assigned on the basis of double the combined number of Senators and Representatives of the state in Congress. Owing to the objections to this system recent modifications have been made. In 1932 the Democratic party ruled that the number of delegates of each state to the convention should include twice the number of Senators and Representatives serving in the 72d Congress, with additional delegates granted to those states that had secured additional representation in Congress under the Reapportionment Act of 1930; delegates from American possessions; and four delegates at large for each Senator in Congress. It recommended that half of such delegates should be women. The rules providing for the allotment of delegates to the Republican national convention are complex, allowing four delegates at large from each state, two additional delegates at large for each representative at large in Congress from each state, two delegates at large from certain possessions and three additional delegates at large for each state casting its electoral vote for the Republican nominee for President in 1928, with adjustments under the Reapportionment Act of 1930.

In some states a direct primary is used to select the delegates to the national conventions, and in about one-third of the states the voters can express their choices for presidential candidates. Other states select their delegates by a state convention.

In the Republican national convention a majority is necessary to select the party candidate for office, but in the Democratic convention a two-thirds vote is necessary. In both, if the necessary vote is not secured on the first ballot, the candidates with a small number of votes drop out and the balloting continues until one candidate secures the requisite number and is selected as the party candidate for President. The convention then proceeds to select a candidate for Vice-President.

Prime minister, the first minister or department chief, especially in a representative government with a Cabinet of which the prime minister or premier is head.

The office developed gradually in England. About 1717 the king no longer attended meetings of the Cabinet, and thus the way was opened for one minister to take the lead and act as presiding officer. Robert Walpole from 1721 to 1742 was actually the first prime minister though he had no such title. William Pitt, who was chancellor of the exchequer and first lord of the treasury from 1783 to 1801, claimed the title of prime minister and argued that there must be a "minister . . . possessing the Chief Weight in the Council and the principal place in the confidence of the king." The 19th century saw the growth of the office and its gradual shift from responsibility to the Crown to responsibility to the Commons. In England the prime minister is rarely the foreign minister; usually he is chancellor of the exchequer and almost always he is a member of the House of Commons now that the power of the House of Lords has been diminished.

The Premier of the French Republic—more accurately, the President of the Council of Ministers—is named by the President. In France there are many parties, and often there is no recognized powerful opposition to the retiring premier. Often the premiership is offered to several leaders before one accepts it and manages to form a ministry.

In Italy the post of premier has developed into Leader of the Nation —*Il Duce.* Mussolini attained power when he was asked to form a cabinet after his Fascisti had occupied the city of Rome. He himself assumed the portfolios of foreign affairs and the interior and later those of the war, marine and air ministries.

There is no parallel in the government of the United States to the prime minister. The President forms his own Cabinet and this Cabinet is quite unlike that in England or France.

Primogeniture, a system of inheritance whereby, upon the death of the owner, his lands invariably become the legal property of his oldest male heir, thus remaining intact in the family. American government has disapproved of this system, which the legislatures have abolished, providing for the division of landed estates among the numerous heirs (with rules of distribution varying in the different states). The object and the effect have been to prevent the concentration of vast quantities of land in the possession of a privileged class.

Private law, that part of the law that is administered between citizens in contradistinction to *public law,* which deals with the public generally or some class of the public.

Privilege, originally a favor granted by a law to a private person (Latin *privus,* private, and *lex, legis,* a law) or a law applying only to a certain class; then any right or immunity not enjoyed by all persons. Now it generally means some peculiar right or favor granted contrary to the general rule. The 14th Amendment to the U.S. Constitution forbids a state to "make or enforce any law which shall abridge the privileges or immunities of citizens of the United States." Article IV, Section 2, of the Constitution reads: "The citizens of each state shall be entitled to all privileges and immunities of citizens in the several states." In the limited sense, members of Congress have "parliamentary privilege," that is, immunity from arrest in any civil case and freedom of speech during a session of Congress. *Privileged communications* are confidential as between husband and wife or attorney and client. The one who receives such a communication cannot be compelled to disclose it in court.

Privy Council, see *Council.*

Privy seal, the seal that the sovereign of Great Britain attaches to those grants and deeds that do not require the great seal. On all documents that do require the great seal the privy seal must be attached before they go to the Lord Chancellor who affixes the great seal. The custodian of the privy seal is the Lord Privy Seal, and he has cabinet rank.

Prize courts and **Prize law,** the jurisdiction and the rules governing captures at sea in time of war. (Prize is from French *prise,* taken; and is used in the phrases, prize crew and prize money.) Prize law is a law of might and force administered at the order of the executive and not upon principles of justice and equity. Controversy over prize money after the Revolutionary War called attention to the need of some authority greater than that of the courts in each state. Under the Federal Constitution the Congress has power to make rules concerning captures on land and water (Art. I, Sec. 8, Cl. 11) and Federal courts have authority extending to "all cases of admiralty and maritime jurisdiction." (Art. III, Sec. 2, Cl. 1.)

Probate court, the tribunal with jurisdiction over the estates of deceased persons, usually a separate and specific court. In some states it is named *orphans' court* or *surrogate's court.*

Probation, release of a convicted person on a suspended sentence under the supervision and guidance of a special officer called *probation officer* to whom the delinquent must report. The method is closely related to *parole.* In 1878 the city of Boston appointed several probation officers and now the system is in operation in every state of the union—less effectively in rural communities. Children's courts operate almost entirely on this principle of putting the delinquent on probation—testing, proving.

Process, a writ or mandate of a court calling a defendant into court to answer in an action, civil or criminal. A *process server* is a person who serves such a writ by presenting it to the person called into court.

Progressive party, a political party in the United States active in the presidential election of 1912; another party of the same name figured in the election of 1924. In 1912 the party was led by Theodore Roosevelt and consisted of Republicans who disapproved of Taft's policies favoring financial interests and the nomination of Taft by the Republican convention. Roosevelt carried five states and Taft carried only two, but the Progressive vote split the opposition to Wilson, and Wilson was elected.

In 1924 under the leadership of Senator R. M. La Follette the Progressive party advocated measures favorable to farmers and laborers, attacked monopolies and urged a limitation of the power of the Supreme Court. Calvin Coolidge, the Republican candidate, was elected.

Prohibition party, a political party favoring the prohibition of the manufacture, sale or transportation of alcoholic beverages and various other measures, such as woman suffrage and the direct election of senators. It was formed in 1869 by the Grand Lodge of the Good Templars in Oswego, N.Y. It has had a presidential candidate in every election since then, and although it has elected only one member to Congress and has never polled a large popular vote, it played an important part in securing the adoption of the prohibition amendment.

Proletariat, the workers; the classes of society who earn a living by working for wages. In ancient Rome it meant anyone who had less than 1,500 asses (coins of small value—at one time a dime, later a cent) and therefore was considered able to serve the state only by rearing children. It comes from a Latin adjective *proletarius* meaning belonging to children.

Propaganda, any information of a biased or exaggerated nature issued for the purpose of influencing public opinion. There is a deluge of propaganda from governments as well as from all sorts of organizations and individuals attempting to convert public opinion to some cause. In times of war, propaganda is extensively and painstakingly organized by the government in order to arouse the patriotism of the people and keep them united in support of the national program. A dictator uses a constant stream of propaganda to maintain his power and his popularity with the people. The word was originally used for the missionary work of the Roman Catholic Church; one of its administrative departments is the Congregation of Propaganda (*de propaganda fide,* literally, of spreading the faith), and a College of the Propaganda or training school for missionaries was established in 1627 by Pope Urban VIII.

Proportional representation, often abbreviated P.R., a method of choosing officials (especially legislative) so that minorities will be represented, and the number of officials from different parties will as nearly as possible be related to the actual votes cast by the voters. In 1857 an Englishman, Thomas Hare, wrote a pamphlet outlining a method of securing this result that was highly praised in John Stuart Mill's famous book *Representative Government* (1861). P.R. never came into use in England, but in different forms it is in use in Northern Ireland, the island of Malta, some Australian and Canadian provinces, in Finland (election of President and legislature), the Netherlands, Sweden, Czechoslovakia (lower House of the legislature), Belgium (lower House) and part of the United States.

The Belgian system, named after its deviser, De Hondt or d'Hondt, provides for party lists of candidates. The voter casts a single vote for the whole party list. Each party gets a proportion of all seats in the Chamber in the same ratio as the party's total vote bears to the grand total vote. This method makes it possible for blocs or groups of small parties to secure seats in the legislature.

The Hare method is a single *transferable* vote for each voter. He marks on his ballot his preferences, putting 1, 2, 3 with the names of his first, second and third choices. He may put in as many numbers as there are candidates. Up to a certain *quota* number, enough to elect a candidate, all the first-choice votes for him are counted for him; but beyond that number ballots with first-choice for an elected candidate are not credited to him, but to the second-choice candidate—and so down the line. First-choice ballots for a candidate who does not poll enough votes to pass a certain minimum (usually equal to the number of names required on a nominating petition) are not counted for that candidate but are transferred to those marked for second choice. Carrying this out by transferring both from the top and the bottom of the poll results in every ballot being credited to an elected candidate. No vote (except on a defective ballot) is thrown away.

The *quota* of votes to elect may be set by law or may be arrived at by dividing the total number of votes cast by the number of candidates to be chosen. When the quota is set by law, the number of candidates elected will vary from year to year. The 1936 charter of the City of New York provides for proportional representation with a quota of 75,000 votes, so that each of the five boroughs of the city will have as many councilors as the quotient of its total vote for the council divided by 75,000.

In Kalamazoo, Mich., and Sacramento, Calif., P.R. was adopted and declared unconstitutional. Cleveland, Ohio, had a system of proportional representation for 10 years after 1921 and then abandoned it. Cincinnati and Hamilton, Ohio, and Boulder, Colo., have proportional representation.

Another system has been used in Illinois since 1870. Three state representatives are chosen from each senatorial district, and every voter has three votes. He may give them all to one candidate, divide them 1½ and 1½ between two candidates or give 1 each to three candidates. This is called *cumulative* voting.

France tried the Belgian system in the elections of 1919 and 1924 and gave it up because it gave too much power to blocs of small parties. An excellent system of P.R. that originated in Baden was adopted by the German Reich in 1920 but went to pieces under Nazi rule. In Yugoslavia the electoral law of 1931 gives the party that receives a majority of votes at least three-fifths of the seats in the parliament—and more seats in proportion to the votes cast. This is a variation of the list system used in Belgium.

Under the 1937 constitution of Ireland the elected members of both houses of the Oireachtas are "elected on the system of proportional representation by means of the single transferable vote."

Prorogation, act by which the sovereign terminates a session of the legislature. This act ends all pending legislation, and such matters must be reintroduced at another session to receive consideration. The king of England and the king of Egypt have this power.

Protection, the system or policy of fostering and shielding home industry from foreign competition by imposing high taxes upon foreign-made goods imported into the home country. In the earliest days of the United States the Government adopted this method of aiding industry by preventing competition from foreign goods, and with the exception of a short period in the middle of the 19th century this protection policy was followed until the Franklin D. Roosevelt administration. The general principle of protection has been that the duty fixed on a foreign commodity should be determined by the difference between the cost of production at home and the cost of production abroad, but the application of this principle has been practically impossible, and tariff rates were often established much higher than necessary to equalize the difference in cost of production. This protection policy has been favored by the industrial and banking groups and has been a main doctrine of the Republican party. Economists are agreed that, in general, this policy of protection is a tax on the consumer, an especial burden on the farmer and economically undesirable, but the protection policy has been followed because of the pressure of manufacturing interests and because of a desire to develop national self-sufficiency as a measure of preparedness for war. Even England, which was traditionally a free-trade country and had grown and prospered without protection, changed its policy after the World War and adopted a protective tariff in 1932.

Under the Reciprocal Tariff Act of 1934, the President of the United States was authorized to make tariff agreements with individual foreign nations and to put these rates into effect without submitting them to the Senate for ratification. Under Secretary of State Cordell Hull, negotiations were conducted with most foreign countries and have resulted in a general lowering of tariff rates. In each case it is a bargaining agreement that seems advantageous to both nations. The "most favored nation" clause in many U.S. treaties extends to all nations who sign such a reciprocal tariff treaty the favorable tariff terms made to any other foreign country by the United States.

Protectorate, the relationship between a stronger nation and a weaker one in which the former protects and partially controls the latter, nearly always for the benefit of the stronger state. The term is also used to mean the weaker country in this relationship. The United States has exercised a protectorate over the Dominican Republic, Nicaragua, Haiti, Liberia and (from 1903 to 1934 under the Platt Amendment) Cuba. With the abandonment of an imperialistic policy, American marines were withdrawn from Nicaragua by President Hoover, and in 1934 President Franklin D. Roosevelt withdrew troops from Haiti and negotiated a treaty with Cuba abrogating the right of the United States to intervene in Cuba's internal affairs. Bechuanaland, Somaliland, Uganda and Nyasaland are countries over which Britain exercises a protectorate. Tunis, Annam and Madagascar are under the protection of France.

Protocol, in diplomacy the preliminary draft, agreement or statement of principles that is drawn up to be used as a basis for the negotiating of the final treaty; a convention not requiring ratification to become operative.

Province, any large territory or administrative division of a nation. The Romans used the term for any conquered district, but modern provinces correspond roughly to the states of the United States. The subdivisions of Canada, China and Spain are called provinces.

Public debt, the obligations of a government (national, state or local). Obligations for moneys borrowed constitute a *funded debt* as distinct from the *floating debt* of miscellaneous charges payable on demand. The idea of a public debt is easy to grasp when one realizes that any government is a business concern of long standing and continuous existence. A government that is not continuous—like the Czarist rule in Russia or the Confederate States of America—is like a bankrupt business: its debts are not paid.

The huge expenditures of the World War and the economic uncertainties of the 1930s have enormously increased almost all national debts. The national debt of the United States in 1789, including state debts assumed by the Federal Government, was about 70½ millions. At the outbreak of the Civil War (1861) it was about 90½; and at the end of that war (1866) it was 2,756 millions. In 1892 it was less than a billion. At the beginning of the World War (1914) it was 1,188 millions. At the end of the World War (1919) it had become 25,482 millions. Then for a decade it was gradually reduced so that in 1930 it was 16,185 millions. Then the demands of the depression—relief, public works and loans to states and cities—rapidly increased the debt: in 1936 it was 33,785 millions, more than twice as much as in 1930 and almost one-third more than at the end of the war.

The depression and the panic of the '30s cut so heavily into local government revenues that many states and municipalities were unable to meet their current obligations—notably, the salaries of schoolteachers and the upkeep of schools. Loans from the Federal Government and its assumption of much of the burden of relief enormously increased the public debt both national and local.

Various methods have been used to limit the debt that may be incurred by a state or municipality; the constitution or charter usually contains some limiting clause. Nebraska has no bonded state debt and the net debt of the following states is zero: Florida, Kentucky, Ohio and Wisconsin. The richest states have the largest net debt: New York, about 485 millions in 1936; Illinois, 213 millions; California, 180 millions. Several smaller and much less wealthy states have nearly as large a net indebtedness—Arkansas, 161 millions; Louisiana, 150 millions.

Cities in the United States show an extraordinary variation in their debt limits, the amounts of their debts and the relation of the debt to the assessed realty valuation. At the top of the list is New York with a net debt in 1936 of about 1,850 millions (almost one-ninth of the assessed valuation of realty). Philadelphia's net debt was 418 millions against 2,745 millions of assessed realty. Detroit with nearly 380 millions of net debt had in that year an assessed valuation less than five times that debt (1,787 millions). San Francisco's net debt, 167 millions was almost a quarter of the assessed realty valuation (692 millions).

The mere fact that a state or city has or has not a large debt is not necessarily an indication of the soundness of its financial structure. It is similar to a corporation in this respect, for you cannot judge the worth of a corporation by the amount it owes—that is, its outstanding stock. A state or city that has borrowed a million dollars for slum clearance may be in a more prosperous condition than another state that refused to borrow and allowed the slums to continue.

Public policy or **Public interest,** the general spirit or customs of the people, underlying principles, occasionally invoked by the courts. Contracts are sometimes declared illegal and void merely as being against public interest —for example, a contract under which for a consideration one promised not to marry for a certain number of years. Contracts *contra bonos mores,* against good morals, are void as a matter of public policy. Advertising a reward for the return of stolen goods "and no questions asked" is against public policy in some places and is forbidden by statute.

Public utility, a business that supplies a public service—gas, electricity, water, transportation, communication—and charges for that service prices set by the government or regulated by law. The courts have defined a public utility as a business "affected with public interest," and more and more industries are being held to come within this broad classification. The public utility, whether privately owned or built and operated by the government, tends to be a monopoly, and what it has for sale becomes a necessity. For these reasons and for the public interest in the service, utilities have been more and more regulated and controlled by government, which sets the rates to be charged and declares that there is an obligation on the part of the utilities to be reasonable in dealing with the public. It has been so in the past with ferries, hackmen and innkeepers; it is so now with light and power companies, railways, telephone and telegraph companies.

The degree of control varies. It is more obvious and simple perhaps in a government-operated utility—like the U.S. postal service; the British postal service, which includes telegraph and telephone; and the waterworks, ferries and public markets that are almost without exception owned by municipalities. In the case of privately owned and operated utilities, rate-making must be based on two considerations—advantage to the public and fair return to the private owner on his investment. This obligation of the rate-setting authority to the private owner of a utility is based on the general principles of equity and is specifically required by the due-process clause of the 14th Amendment to the Constitution of the United States.

In rate setting there are several puzzling and controversial steps:

Is valuation (determination of a base for the rate) to be the original cost or an estimated cost of reproducing the existing property at present building prices? The second may be fairer, but it is certainly much more difficult than figuring original cost. On the other hand the value may be more or less than the original cost.

If valuation means present value, how is depreciation to be figured? Is the decrease in the value of equipment and buildings continuous throughout its life—so that if a machine that costs $50,000 will last 10 years, it can be valued at $45,000 after 1 year's use, at $40,000 after 2 years and at $5,000 after 9 years?

What is a fair rate of return? Does it differ from time to time—and from place to place?

On all these questions there have been sharp differences of opinion between the utilities and the commissions that are authorized to set rates. When the disputes have been taken into court, the decisions there have not set any definite rule.

The New Deal with the development of the Tennessee Valley water power for the manufacture and distribution of cheap electric current seems to be suggesting a new method of setting rates: if the Federal Government goes into the business of a public utility, it can secure a *yardstick* to measure the cost and the efficiency of the privately owned public utility. It is an obvious criticism that a government-owned utility paying no taxes can operate at much lower cost than a privately owned utility that must pay taxes.

Public works, the construction of public projects with the especial purpose of the reduction of unemployment and the restoration of purchasing power. As a result of the economic depression that began in 1929, various agencies were organized to accomplish this purpose. The *Federal Emergency Administration of Public Works* (PWA) was established by the President under the authority of the National Industrial Recovery Act of 1933, and its life was later extended to June 30, 1937. This administration served to promote public works throughout the country in connection with non-Federal allotments of loans and grants to various governmental bodies and to private corporations. The *Works Progress Administration* (WPA) was established by an executive order of the President in 1935, under the authority of the Emergency Relief Appropriation Act, and its powers and functions were continued under executive orders in 1936 and 1937. Projects of this administration are proposed by state, local and Federal agencies, which are required to provide a portion of the costs of the project. The Works Progress Administration is also responsible for the co-ordination and planning of public works.

Punishment, the penalty inflicted by a legal authority for the violation of the law. In primitive times a punishment was inflicted from a desire for vengeance; if a man killed another the murderer had to be killed. In more modern times the idea has been to protect society by making an example of the offender and thus deter others from violating the law. At present the motive is to reform the offender and make him a constructive member of society.

Pure food laws, legislation to prevent adulteration and to protect the purchaser of foods. This type of legislation began in 1892, and such laws are now in operation in 46 of the 48 states. The Federal Pure Food and Drug Act of 1906 forbade the manufacture, sale and interstate transportation of adulterated foods and drugs; set up a Food and Drug Administration in the Department of Agriculture and established Federal inspection of slaughterhouses and packing plants. In 1872 the U.S. Supreme Court in the New Orleans Slaughterhouse Cases had decided that the police power of the states was not invalidated by the 14th Amendment (forbidding state laws abridging privileges of citizens) and that strict regulation of the meatpacking business in New Orleans was constitutional. The Pure Food Drug and Cosmetic Act of 1938 greatly extended the power of the Federal Government to prevent adulteration.

Quorum, the minimum number of members of a body who, when assembled, are legally competent to transact business: a majority unless there is a provision to the contrary.

For a long time it was the practice for members of the minority party in the House of Representatives of the United States to refuse to answer the roll call in order to delay proceedings and thus cause an adjournment on the grounds that a quorum was lacking. In 1890 Speaker of the House Reed held that members of the House actually in the chamber who declined to answer should be counted present; and it was made a rule of the House that, on demand of a member or at the suggestion of the Speaker, Representatives in attendance but refusing to respond when their names were called be counted present.

Quo warranto (Latin, by what warrant), a writ issued by a court demanding that a person or group of persons show cause why they continue in the exercise of public office, enjoy privileges their right to which is questioned, operate under a franchise which is disputed or continue in the enjoyment of certain other specified liberties. Some states no longer issue the writ; in those jurisdictions the information or pleading or even the entire proceeding to remedy such a situation is called a *quo warranto*.

Radical, one who advocates an extreme and revolutionary change in the economic or political organization; also applied to the views held by such a person. At the present time a radical is usually one who advocates the concentration of economic power in the government, to be administered for the equal benefit of all classes of society.

Rebellion, organized and armed resistance to a government or defiance of it or any lawful authority by persons subject to that authority. It is a means used to redress grievances by force or to seize power for a minority. Important rebellions are the Great Rebellion (1642-52), the English Civil War between Catholic Charles I and the Protestants led by Parliament; and the Boxer Rebellion (1900) in which certain groups of Chinese attempted to drive all foreigners out of their country.

Recall, the removal of elected officers by popular vote at an election called by a petition signed by a certain percentage of the voters. As an official is an agent of the people, this is an extension of the popular control of government. Like the initiative and referendum, it seems to have originated in Switzerland, where it was used both in cantonal elections and federal elections.

In the United States, the recall was first adopted by the 1903 charter of Los Angeles, and then by Seattle in 1906. The following states have the recall: Oregon (1908); California (1911); Arizona, Colorado, Idaho, Nevada and Washington (all in 1912); Michigan (1913); Kansas, Louisiana and North Dakota (all in 1914); Wisconsin (1926). Besides it is in the charters of many commission-governed cities. It does not apply to judges in the states of Idaho, Louisiana, Michigan and Washington. In Kansas appointed state officials as well as those elected may be recalled. In 1921 the governor, attorney general and commissioner of agriculture of North Dakota were removed by recall.

The U.S.S.R. constitutions of 1918, 1925 and 1936 require "every deputy to report to the electors on his work and on the work of the Soviet of Toilers' Deputies, and he is liable to be recalled at any time in the manner established by law upon decision of a majority of the electors."

Reception, the adoption of Roman Law into many of the legal systems of Europe, notably in Germany in the 16th century. The law of the Netherlands also had the Reception and through it and other influences Scotch Law became Roman and has only gradually been assimilated to the principles of English Common Law.

Reciprocity, in international trade mutual agreement between nations for more favorable tariff schedules than those granted other nations having no such agreement.

In 1934 Congress passed the Reciprocal Tariff Act, which authorized the President, for a period of 3 years, to enter into trade agreements with foreign countries and lower tariff rates as much as 50 per cent by proclamation, without securing ratification by the Senate. In 1937 this Act was extended for another 3 years.

Reclamation, rendering wasteland productive for farming purposes by drainage or irrigation. In 1902 Congress authorized the Secretary of the Interior to begin irrigation projects for the redemption of wastelands. Under the direction of the Bureau of Reclamation of the Interior Department, projects embracing 19,500,000 acres of land had been reclaimed by 1935. Recent projects, such as Boulder Dam and the Grand Coulee Dam, are designed to make water available for irrigation, as well as to furnish hydroelectric power and water supplies for the cities.

Recorder, title given to the public official in some states who has charge of real estate and other records; also certain judges in New Jersey with criminal jurisdiction.

Red, an Anarchist or Socialist. In the symbolism of colors, red has long been the color of the vestments worn by priests in certain Western churches at the feasts of the martyrs. Probably from the time of the French Revolution, red, the color of blood, has been used to stand for those who were willing to shed blood for their cause. In the 17th century, a red flag was the naval signal for fight. Red has been universally adopted as the color of Socialism and revolution, but the term is usually used to refer to a person holding extreme and violent revolutionary views.

Referendum, the submission of an act passed by the legislature to the people, who must approve it before it becomes effective. The usual procedure is for a petition to be drawn up, signed by the small requisite number of voters and submitted to a designated official who will then place the act on the ballot in the next election. The legislature may direct that the act be submitted to the people. Most of the states use the referendum for amending the state constitution; about half the states use the referendum for general legislation, and some 300 cities use it for municipal ordinances.

Reforestation, the replenishment of deforested areas with trees of economic or decorative value. There are nearly 550,000,000 acres of forest land in the United States, of which the national Government owns about 160,000,000 and the states 10,500,000. Remaining forest acreage is privately owned.

There were many early statutes encouraging tree planting, but permanent reforestation work was not begun until 1885, when New York State established a service to administer the state forests scientifically. Thirty-two states now have forest departments, which, in addition to other duties, supply planting stock to citizens and establish state forests.

In 1933 in connection with President Roosevelt's national recovery program steps were taken on a large scale to carry on reforestation work throughout the country, especially in order to aid in soil conservation and to reduce unemployment.

Regent, one who rules in the place of another, especially in the name and place of a sovereign. A regent takes the place of a child potentate or one who is absent or disabled. An unusual case is Hungary, which was declared a monarchy in 1920; at the same time Admiral Horthy, already governor, was declared regent of the kingdom—but the kingdom has no king.

In the United States and in Hawaii the term is used to designate a disciplinary officer. The Board of Regents of the state of New York controls the incorporated educational institutions. This control also extends to certain libraries and museums.

Courtesy U. S. Forest Service
Reforestation: Planting Crew Setting Out Seedlings in St. Joe National Forest, Idaho

Registration of voters, the entering in a registry before an election of the name, address, occupation, age, party affiliation of and similar information regarding each voter. This registration is used to determine the party of the voter at the time of the primary election, in New York and most other states; and at the regular election the registration is used as an aid in the prevention of fraudulent voting. Forty states require an unrestricted and general registration of voters; two states do not require any registration; and in the others registration is required in the more populous sections of the state.

Reich, German word meaning a country but including the idea of the government and the people as well as the geographical nation. It has been traditionally translated empire, but it is equally applicable to the German state whether it is a republic or a dictatorship.

Reichstag. The national legislature of Germany composed of 647 members, elected for a term of 4 years by all citizens with the exception of persons of Jewish descent. In 1933 and 1937 it delegated its powers to Chancellor Adolf Hitler.

Relief, measures taken to alleviate the widespread and unprecedented unemployment in the United States (estimated to have reached a total of 17,000,000) that resulted from the economic depression of 1929. This unemployment problem was more than the private and local charitable agencies could cope with, and the Federal government was forced to take over the administration of relief. A system of direct distribution of funds was first used, but this was replaced by work relief—giving employment on public works. Although the system of work relief has a higher financial cost, it is believed to be more desirable because it aids in maintaining the morale of the individual by giving him something to do and because it results in useful public improvements.

The Federal Emergency Relief Administration (FERA) was created in 1933 to relieve hardships and suffering caused by unemployment and drought. In 1937 this Administration was directed to liquidate, and its functions were taken over by the Works Progress Administration and various other agencies. In 1935 it was estimated that 22,000,000 persons were supported by Federal relief, another 2,000,000 supported by the Civilian Conservation Corps and the Public Works Administration and some 3,000,000 by local relief.

Removal power, the authority to declare an office vacant. Often this power resides in the authority that appoints to the office.

The Constitution makes no provision for the removal of Federal officials from office except by impeachment in the House of Representatives and a trial in the Senate, where a vote of two-thirds of the members present is necessary to convict. There has been a long conflict over the power of the President to remove officials. In the early days of the nation the President was allowed this power without securing the consent of the Senate, but during the administration of President Johnson Congress passed an act stipulating that officials appointed with the consent of the Senate could not be removed without similar ratification. Some 50 years later, the Supreme Court in Myers *v.* U.S. held that a restriction of the power of the President to remove first-class postmasters was unconstitutional. In 1935 in Humphrey's Executor *v.* U.S. the Supreme Court held that the President could not remove a member of the Federal Trade Commission. The court declared that the President's power of removal depended upon the class of official. The President may remove an executive officer, such as a postmaster, since this class of officer is regarded as a branch of the executive arm of the Government. But administrative officers, such as members of the Federal Trade Commission, are considered as having legislative and judicial functions and may not be removed by the President. Just what officials are executive and what officials are administrative is left to future decisions of the court. In practice Congress may prevent the removal of an officer by unofficially informing the President that Congress will not ratify the appointment of any other person to fill the vacancy.

Federal employees appointed under Civil Service may be removed "for such causes as will promote the efficiency of the service," and the President or head of a department may dismiss an employee believed to be incompetent by merely giving due notice. Such employees may not be removed for political reasons, but it is difficult to prove that removal is for politics, and the courts generally refuse to interfere with administrative heads in the removal of employees.

In the states a great diversity of removal powers and methods exists. These methods include impeachment, removal by the governor, removal by legislative or judicial action and *recall.* Generally, the governor does not have the extensive removal powers of the President, but in Colorado, Maryland, Illinois, Nebraska and Pennsylvania, the governor may remove the officials he appoints.

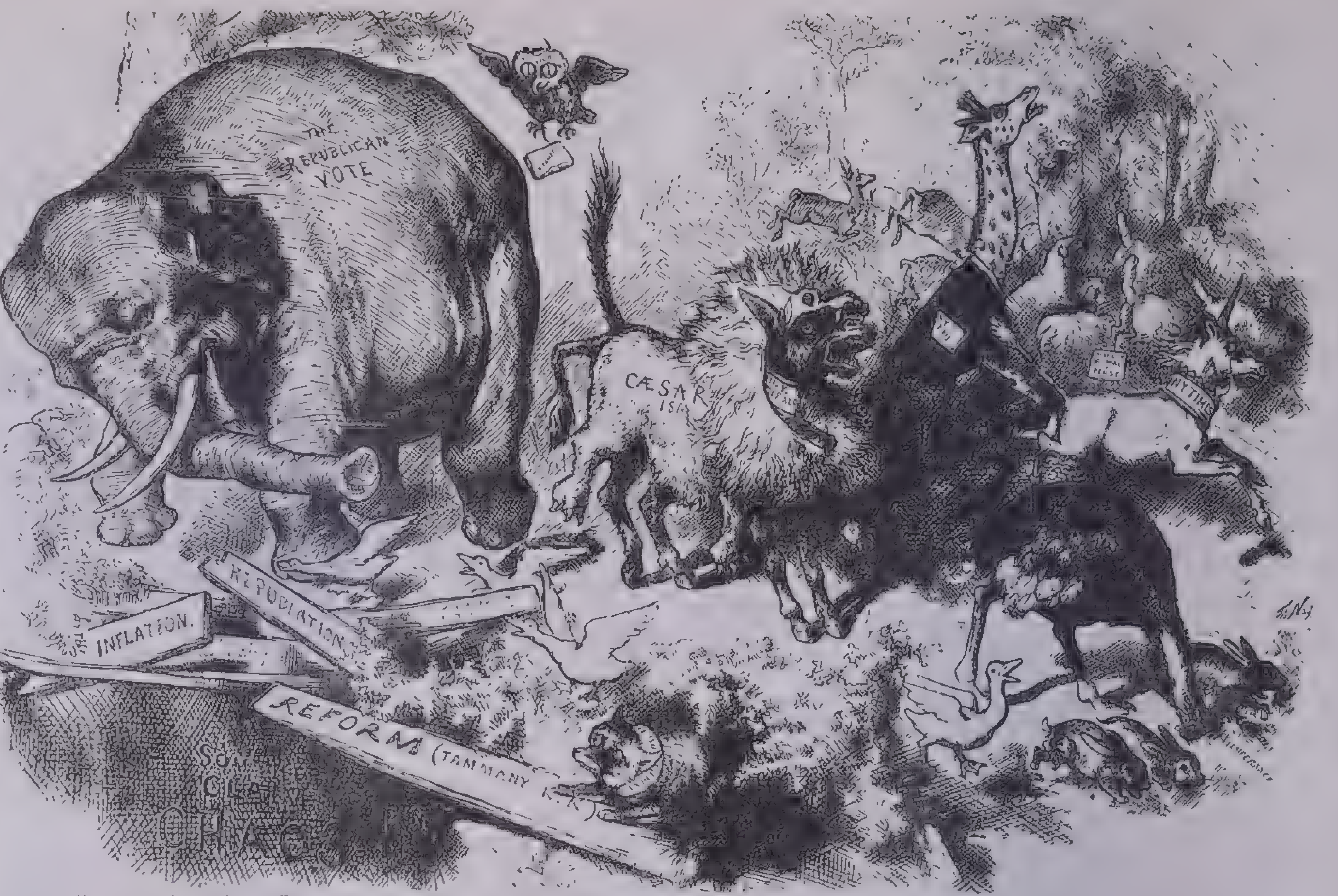
Reparations, compensation for a wrongful injury, such as the unlawful seizure or destruction of property and causing the death or injury of individuals. The term is especially applied to the indemnity assessed against Germany after the World War. The Treaty of Versailles (1919) declared that "Germany accepts the responsibility of herself and her allies for causing all the loss and damage to which the Allied and Associated Powers and their nationals have been subjected as a consequence of the war . . ." In 1921 the Reparations Commission set Germany's total liability at 132,000,000,000 gold marks (about $33,000,000,000), and Germany was forced to accept this settlement in spite of her well-founded claims that it would be impossible to pay this exorbitant demand. Under the Dawes Plan (1924) and the Young Plan (1929) the payments were scaled down, and on July 8, 1932, the principal creditors of Germany agreed to a total payment of about $3,000,000,000. Due to the world economic depression President Hoover proposed a moratorium on all intergovernmental debts in 1931, which was adopted with slight modifications. Since the expiration of this moratorium, no payments have been secured from Germany.

Repeal, the revocation, abrogation or cancellation of a law or regulation. A statute is expressly repealed when a subsequent statute specifically states that the prior one is repealed; or a statute may be repealed by implication when a subsequent statute contains provisions contrary to the prior one. The term is especially applied to the repeal of the 18th (prohibition) Amendment of the Constitution, accomplished by the 21st Amendment, ratified in 1933.

Replevin, a legal action to regain the possession of personal chattels that have been taken unlawfully from the plaintiff. The plaintiff gives security for the property thus returned to him pending court decision. The writ for return and the action in court are both called *replevin.*

Reprieve, suspension for a stated period of the execution of any sentence (especially death sentence) upon a convicted criminal. It is issued by the President of the United States in cases involving Federal law and by the governor of a state or state board of pardon in other cases. It is sought by the condemned through his attorneys in order to give opportunity to present evidence not previously available that might warrant a new trial or to permit time for a hearing as to the sanity of the criminal.

Republic, a state in which the sovereign power is vested in the citizens, who govern themselves through elected representatives. In a more general sense a republic is any nation not governed by a hereditary ruler. The ancient Greek city-states were completely democratic and the citizens governed directly. In more recent times a state was termed a republic even though the right to vote was restricted to a small class. The United States is an example of a Federal republic in which the component states are sovereign and the central government has only the limited powers delegated to it by the states. France is an example of a centralized republic.



From Harper's Weekly, November 7, 1874

The First Republican Elephant and the Third-Term Threat in 1874

In this cartoon, entitled "The Third-Term Panic," Thomas Nast first used the elephant as a symbol of the Republican party. It was based on Aesop's fable of the ass, who, "having put on the Lion's skin, roamed about in the Forest and amused himself by frightening all the foolish animals he met with in his wanderings." The New York *Herald* as the Ass is successfully frightening the rest of the forest creatures with the shout of *Caesarism,* referring to the movement to run President Grant for a third term. The elephant, representing a bulky Republican vote, is stumbling into a pitfall poorly camouflaged by deceptive planks

Republican party, in the United States, the early name of the party that became first the Democratic-Republican party about 1800 and later the Democratic party as it is known today. The present Republican party arose out of the slavery issue, which caused a split in the old Democratic and Whig parties, and specifically in opposition to the Kansas-Nebraska Bill of 1854. The antislavery Whigs and the Free-Soil and Know-Nothing parties joined the new Republican party, and in 1856 it obtained a national organization and nominated John C. Frémont for President. He was defeated but received a creditable vote. Sectional bitterness increased, and the Republicans were belligerent toward the South. In 1858 the Republicans were victorious in the congressional elections and 2 years later their candidate, Abraham Lincoln, was made President. Lincoln was re-elected to office but a split appeared in the party, which became more apparent after Lincoln's assassination. Johnson was a conservative and favored a moderate policy toward the South, but the radical Republicans, led by Sumner, Stanton and Stevens favoring a stern attitude, became the dominant faction. U. S. Grant was the successful Republican presidential candidate in 1868 and was re-elected. Scandals during the Grant administration caused another rift in the party and the formation of the Liberal Republican party, which declined after showing some strength in 1872.

The disputed returns in the election of 1878 were held by Congress to have elected the Republican nominee Hayes, but this election marked the end of the Republican domination in the South and the development of the *solid South,* which was not broken until the election of Herbert Hoover in 1928.

After the election of Hayes there tended to be a similarity in the platforms of the two major parties, and both parties contained conservative and liberal factions. The Republican party was representative of the New England and middle western financial interests and the prosperous western farmers and showed its greatest strength in the Northwest.

In 1880 the Republican nominee Garfield was elected, but at the next presidential election Cleveland was successful and became the first Democratic president since the Civil War. In 1888 the Republican party was victorious and elected Harrison. In 1896 the Republican party stood for the gold standard and conservative economic policies, in opposition to the radical Democrats led by Bryan, and McKinley was elected. Theodore Roosevelt, also a Republican, was the next President, but his splitting of the party led to the re-entry of the Democrats to power, and it was not until after the World War and the desire for a return to *normalcy* that the conservative Republicans were successful and elected Harding, then Coolidge and finally Hoover to the Presidency.

Requisition, any formal request or demand by virtue of some right; especially for the return of a fugitive from justice. In this special sense the word is used of the demand from one nation to another or from the authorities of one state of the Union to those of another. The surrender or extradition by one state to another of a person accused of a crime is required by the Federal Constitution (Art. IV, Sec. 2, Cl. 2).

Restraint of trade, any act, contract or agreement that unduly hinders or limits legitimate competition and the pursuit of business by another. Statutes prohibiting agreements in restraint of trade have been interpreted by the courts as meaning *unreasonable* agreements in restraint of trade. Just what is unreasonable depends upon the particular facts of the case and the general principles of "unreasonableness" laid down in previous decisions.

Revolution, a radical and fundamental change in the government, its personnel or policies, such as the substitution of one government for another or the adoption of a new constitution. The term is also used to mean a radical change in any field, for example, the Industrial Revolution that changed our methods of manufacture. Important political revolutions in recent times were the American Revolution (1775-83), the French Revolution (1789-95), the Russian Revolution (1917-20) and the Spanish Revolution (1936-39).

Riot, an unlawful assembly of three or more persons with tumult and violence that causes terror and a disturbance of the public peace. It must be proved that there was a premeditated unlawful assembly, that there was actual violence and force of a nature to cause terror and that the defendant was a participant in the disturbance. The English Riot Act of 1714 declared anyone guilty of felony who did not disperse upon proclamation or order to disperse by the proper law officer. This proclamation was called *Reading the Riot Act.*

Robbery, depriving a person of anything of value by taking it in his presence or from his person by force or intimidation. Some states provide degrees of robbery, as simple robbery, robbery with a gun, robbery in the daytime, and fix different penalties for each. Personal contact, force and fear enter into robbery and not into larceny.

Rotten borough, see *Borough.*

Sabotage, the purposeful waste or destruction of an employer's property. By working slowly, putting emery in lubricants to ruin machinery, breaking machines or other property and similar methods, employees seek to force the employer to grant concessions. Foreign spies sometimes succeed in sabotaging ships or other armaments. The term is also applied to the action of businessmen who cause a scarcity of goods in order to increase their profits.

Sanctions (from the same root as sacred), originally what makes anything sacred, dreaded, authoritative; then, in a general sense, anything that makes moral judgments valid—custom, conscience, public opinion; in law, the penalty and fear or the reward and hope that make the law respected and obeyed.

In international law where there is no police power to enforce decisions, sanctions is a recognized term for the co-operative action of certain nations to curb, check or punish a power breaking the law of nations.

The League of Nations Covenant provides (Art. XVI) that if any member resorts to war in disregard of the covenant, "all other members of the League . . . undertake to subject it to the severance of all trade or financial relations." Such sanctions were invoked by the League when Italy invaded Ethiopia, but the method did not prevent Italy from conquering Ethiopia in disregard of the League.

Satrap, the ruler of a province in ancient Persia. The satraps had absolute power in their provinces and so frequently abused it that the term is now used to mean a petty despot.

Seal (from Latin *sigillum,* a little sign or mark), originally an impression in wax or lead of an identifying mark to validate a signature or to take the place of a signature on a document; now any formal mark with a signature, even a mere pen scratch after one's signature around the letters *l. s.* for *locus sigilli,* place for seal.

The seal in today's law is mainly a vestigial remainder with little or no real meaning except as historical background gives it meaning. From the time of Henry II in the 12th century a legal document with a seal has had special force from this extra formality. Some states of the United States have abolished the distinction between sealed and unsealed instruments. A seal in a contract imports a consideration—that is, implies in the eyes of the law that a consideration has been given that binds the contract so that one who sues on a sealed contract does not have to prove that there was a consideration to make his case, as the consideration is taken for granted. An offer made under seal is irrevocable.

A *deed* was originally an instrument under seal, but now some states do not require a seal on the conveyance of real estate.

Secession, formal withdrawal from an association, usually by a minority group that is dissatisfied with the policies of the majority. South Carolina seceded from the Union in 1860 and was followed by 10 other southern states. The Civil War settled the question that had existed from the time of the Constitutional Convention whether a state could secede from the union.

Secret Service, a department of the government whose agents are charged with the detection of Federal crimes, especially those of a political or military nature. The secret police of some nations, such as the OGPU in Soviet Russia, have become powerful instruments for oppression and for the prevention of political opposition. In the United States the Secret Service is a division of the Department of the Treasury and is charged with the protection of the President and his family, the suppression of counterfeiting, the investigation of violations of certain acts, such as the Farm Loan Act, the Gold Reserve Act and the Liquor Trading Act, and investigations of offenses against the Treasury Department as the Secretary of the Treasury may direct.

Secretary, a public officer whose duty is to manage and direct the affairs of a department of the government. In the United States the heads of the departments of Agriculture, Commerce, the Interior, Labor, the Navy, State, the Treasury and War are designated as secretaries, and with the Attorney General and Postmaster General they make up the President's Cabinet. In Great Britain there are eight secretaries of state: for foreign affairs, home affairs, dominion affairs, the colonies, war, India, air and Scotland. They are usually members of the Cabinet; other Cabinet members are not called secretaries.

Securities and Exchange Commission (SEC), created by the Securities Exchange Act of 1934 and given additional duties under the Public Utility Holding Company Act of 1935. The Commission is charged with the supervision of registration of securities and the suppression of fraudulent practices in the sale of securities under the Securities Act of 1933; supervision of security transactions under the Securities Exchange Act of 1934; and the regulation of public utility holding companies under the Public Utility Act of 1935.

The Commission is composed of five members, not more than three of whom may be members of the same political party. The members are appointed by the President with the advice and consent of the Senate for a term of 5 years.

Security, freedom from foreign aggression or interference. The desire for security has played a major part in European politics, and nations have sought security by nonaggression pacts, alliances, fortifications, armaments and international organizations, such as the League of Nations. France, whose soil has been invaded thrice by German armies, sought to establish her security through the League of Nations, by treaties with Poland (1922), Czechoslovakia (1924), Rumania (1926), Yugoslavia (1927) and Russia (1936) and by rearmament and a series of forts on her eastern frontier. The Little Entente (Rumania, Czechoslovakia and Yugoslavia) was a somewhat similar attempt to guarantee security to the member nations.

Internal security is a matter of growing importance to government. It is discussed under *Planning* and *Social Security Act.*

Sedition, the act of agitating by action, speech or writing for overthrowing or resisting the government. During the World War, sedition acts were passed by most of the states, restricting freedom of speech and stipulating severe penalties for any acts of a seditious nature.

Separation of powers, a political doctrine in the United States that the powers conferred upon the Federal Government by the Constitution are divided among three distinct and unique departments: legislative, executive and judicial. The legislature makes the laws, the judiciary interprets them, and the executive enforces the laws. Although this theory is still recognized, there are many practical impossibilities in such a separation of powers. The appointing power of the President is shared by the Senate; the treaty-making power is shared between President and Senate; the President shares legislative power through his veto; and Congress has powers of creating inferior courts and fixing the number of judges. Regardless of the theory, the practical administration of affairs has often broken down this division. During the Reconstruction era Congress completely dominated the executive, and in times of national crisis, such as the World War and the depression of 1929, the executive has completely dominated Congress. Furthermore the development of numerous administrative agencies that act both judicially and legislatively has tended to break down this separation of powers.

Sergeant at arms, a minor official, either elected or appointed, whose duty is to maintain order in a legislature or a court. The U.S. Senate, the House of Representatives and state legislatures have such officers. In England there is a sergeant at arms in both houses of Parliament to keep order and make any arrests ordered by the Speaker.

Single tax, a plan by which all government revenue would be secured through the taxation of economic rent. Henry George (1839-97), an

American writer and economist who was the leading exponent of the doctrine, argued that poverty could largely be abolished if the Government would appropriate the amount paid for the use of land (economic rent) and the unearned increase in land values. Early economists, such as Ricardo and the Physiocrats, had worked out similar doctrines.

Smuggling, carrying goods illegally from one country and entering another country with them by stealth, to avoid payment of customs duties; or bringing persons into a country in violation of the immigration laws.

Socialism, a political movement that aims to abolish exploitation by means of the collective ownership and democratic management of the basic instruments of production and distribution. Modern socialism includes several aspects: a criticism of the capitalistic system; an idea of the future ideal state and a proposed means of achieving it; and a political movement to achieve its proposals.

The Industrial Revolution in the latter part of the 18th century and the rise of modern capitalism that accompanied it brought into practical politics the idea that there should be a redistribution of income so that the employee would obtain a more equal share of production. Shortly after the peace of 1815 Robert Owen, a prominent English textile manufacturer, proposed that "villages of co-operation" be established to alleviate economic distress and suffering. With a small group of workers who believed in his ideals Owen came to America and established a communal settlement at New Harmony, Ind., which failed after 3 years. About the same time in France, Saint-Simon, Louis Blanc and Proudhon were advocating socialistic ideas. These early socialists were all utopian idealists, and it was the German Karl Marx, working with Friedrich Engels, who gave socialism its practical theory and definite organization. The famous *Communist Manifesto* (1848), issued by Marx and Engels, and the first volume of *Das Kapital* (1867), written by Marx, are the classic statements of socialism.

In England the Fabian Society, formed in 1883 by George Bernard Shaw, Sidney Webb, Ramsay MacDonald and others, sought to achieve socialism by a gradual evolution within the existing political structure. The Independent Labor Party, founded in England in 1893, is a socialistic party and has been in power twice since the World War and continues to be a powerful opposition party. Among its leaders were Keir Hardie, Sidney and Beatrice Webb, Ramsay MacDonald, Philip Snowden and Arthur Henderson.

In the United States early advocates of socialistic ideas were Horace Greeley, editor of the *New York Tribune,* Arthur Brisbane and (in his early years) Charles A. Dana. Edward Bellamy's *Looking Backward* (1888), which sold over a million copies, created a great interest in socialism.

The *Socialist Party* was formed in 1900, has had a ticket in every election since then and is the leading third party in the United States. The best-known leader of the Socialist party was Eugene V. Debs (1855-1926), a great orator, leader and idealist, who was imprisoned because he opposed the participation of the United States in the World War. Other leaders include Morris Hillquit, labor lawyer and author; Victor Berger, long a representative from Wisconsin; and Norman Thomas, party leader and several times candidate for President. At times the Socialist party has received nearly a million votes, but it has never achieved power, except in a few municipalities, because it has not obtained the support of labor. However socialistic principles have frequently been adopted by a major party.

Social Security Act, approved August 14, 1935, a law for the purpose of establishing a permanent system of economic security and relief in the United States. The Act is administered by a board of three members appointed by the President with the advice and consent of the Senate, and not more than two members may belong to the same political party.

To accomplish the purposes of the Act, its administration is divided among three bureaus. *The Bureau of Public Assistance* makes grants to states with approved plans for old-age assistance, dependent children and the blind. *The Bureau of Unemployment Compensation* makes grants to states with approved unemployment-compensation laws. *The Bureau of Federal Old-Age Benefits* makes payments to individuals over 65 years of age and administers the collection of funds from employers and employees to build up reserves for these payments.

Payments from the Bureau of Public Assistance are made on the basis of *need.* Persons who have reached 65 years of age and have not a sufficient income to provide minimum living comforts receive small monthly cash payments. Dependent children and the blind are similarly aided. These payments are made through the states. The state may make a plan for the care of these groups, and if it is approved by the Social Security Board, grants are made to the state to assist in carrying out the plan. The Federal Government does not make any direct grants to individuals under this Bureau.

In 1938 all jurisdictions except Virginia had approved plans for old-age assistance; all except Delaware, Illinois, Kentucky, Mississippi, Missouri, Nevada, Rhode Island, Texas, Virginia and Alaska, for aid to the blind; and all except Connecticut, Florida, Illinois, Iowa, Kentucky, Mississippi, Nevada, South Dakota, Texas, Virginia and Alaska, for aid to dependent children.

The Bureau of Unemployment Compensation also works through grants to the states. The Act places a tax on the payrolls of all employers of eight or more persons, but an amount up to 90 per cent of this tax is remitted to every state that passes a satisfactory unemployment compensation law. Most states began payments under this section of the Act in 1938, and all states, Alaska, Hawaii and the District of Columbia have passed approved compensation laws.

Payments from the Bureau of Federal Old-Age Benefits are made directly from the Federal Government to the individual. This part of the Act is a compulsory insurance plan, and payments are made on the basis of wages received during employment with no reference whatsoever to the need of the individual. Farm workers, domestic servants, government employees, railway workers, employees of non-profit institutions, workers already 65 years of age and certain others do not come under this part of the Act. Other employees paid in 1 per cent of their earnings in 1937, and this amount was to be gradually increased up to 3 per cent in 1949. An equal amount is paid by the employer. To a worker who retires at the age of 65 a monthly payment will be made (beginning in 1942) based upon his total earnings between December 31, 1936, and the day he becomes 65. The minimum monthly payment is $10, and the maximum is $85. Until 1942, the bureau will merely make lump-sum payments to those who reach 65 and to the estates of those who have died before reaching 65. By January 31, 1938, 37,349,905 applications had been received for registration under this plan. The Treasury Department has estimated that the plan will eventually pay $3,500,000,000 annually in benefits, and the fund will reach $57,000,000,000. Keeping the records for this gigantic enterprise and administering the old-age benefits will then require the services of some 7,500 people.

Solicitor General, in the United States chief assistant to the attorney general and the second ranking official in the Department of Justice; in England a Crown officer next in rank to the attorney general.

Soviet, a workers' or soldiers' council in Russia. The soviets were first organized during the revolution of 1905 and were merely committees of factory workers. The soviets were revived and strengthened by the Bolsheviks during the revolution of 1917 and served as administrative and propaganda units upon which the Communist state was organized. Each soviet was supreme in the determination of its local affairs and served as the basic unit from which representatives were elected to higher congresses, the highest of which was the Union Soviet Congress. Under the Constitution of 1937 this method of indirect election was abolished, and universal direct election was adopted.

Speaker, one who presides over a legislative or deliberative assembly, enforcing rules of procedure, maintaining order and regulating the debates. The Speaker of the House of Representatives is formally chosen by a ballot of the members of the House, although in reality he is selected by a caucus of the majority party, the members of the majority party agreeing to vote for the representative so selected. The Speaker is the leader of the majority party in the House and has considerable influence in securing the adoption of measures proposed by his party.

The Speaker of the British House of Commons is likewise chosen by his fellow members and has similar authority; but he is entirely nonpartisan, and it might even be said that he is not actually a member of the House of Commons because he takes no part in debate and in no way influences legislation. "The constituency that the Speaker represents is in effect disfranchised but has its reward in the distinction he brings it," says Professor Ogg.

Spheres of influence, the area of a country weak and undeveloped in military defenses to which a powerful nation acquires pre-emptory rights to economic exploitation by agreement with other Powers. Theoretically the sovereignty of a nation is not impaired by the establishment of a sphere of influence, but actually the interested nation has great power over the area and often proceeds to annex the area as a colony. The term was first used at the time of the partition of Africa, when various Powers agreed among themselves that each should confine its economic and later political efforts to a certain area and leave other areas to other Powers.

The spheres of influence in China developed more informally, each nation taking certain sections and exercising economic domination over other areas. The British, holding Hong Kong, dominate the southern section of China around Canton; the French, holding Indo-China, dominate the province of Yunnan in the southwest; Japan after gaining Korea extended her influence to Manchuria and then after establishing military control of Manchuria extended her influence to North China and followed by military control; in the central section along the Yangtze River the United States, Great Britain, France and Germany have spheres of influence.

Spoils system, placing members of the successful political faction in lucrative government positions as a reward for their service to the political party. The spoils system slogan, "To the victor belongs the spoils" had long been a political principle—in ancient Rome, in England in the time of the Georges and in colonial America—but in the time of Andrew Jackson it became the open rule in national politics. The excuse for the system is that it is necessary to have sympathetic officeholders in order to secure the successful administration of the matters advocated by the successful political party. In practice the system usually means the appointment to office of untrained and incompetent persons in place of trained and experienced men who happen to be members of the defeated political party. The remedy for the spoils system is the adoption of a merit system of Civil Service that selects officeholders by examination and promotes them because of merit regardless of political affiliation.

State, Department of, see *Foreign Affairs; Diplomatic Service; Ambassador.*

State religion, the officially established religion of the state. Due largely to the Protestant Revolution, the Roman Catholic ideal of "One World, one Faith" broke down, and in the 17th century the principle of "One Nation, one Faith" arose. The king and the ruling class forced their form of religion upon the people, and official churches supported by special taxation were organized to teach the official religion, which, of course, varied in different times and in different countries. By the Edict of Nantes (1598) Roman Catholic France granted toleration to the Huguenots; and by the Toleration Act (1689) Anglican England granted religious toleration to the Dissenters. These acts merely allowed unmolested worship and did not grant full civil rights to those who were not adherents to the state religion, nor did it free nonconformists from taxation for the support of the established church. The Anglican Church is still the state church and religion in England, although complete religious liberty is granted.

The United States has never had any state religion, and the first amendment to the Constitution provides that, "Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof."

Statute, as distinct from common law, a law passed by a legislature, the Federal Congress or the lawmaking body of a state. Sometimes the word is used of ordinances decreed by a municipal or town body.

Subpoena (Latin, under penalty), a writ commanding the appearance in court of a person on a stated day and hour, especially to give testimony on a case then to be heard. The writ may not be disobeyed, except under penalty (*sub poena*). When the writ calls for books or records to be brought into court by the person summoned, it is called a *subpoena duces tecum* (bring with thee).

Subsidy, a governmental grant of financial assistance to an individual, corporation or foreign nation for a purpose that is believed to be beneficial to the grantor. In England during the later part of the Middle Ages Parliament granted subsidies to the king, and it was the control over these subsidies that finally gave Parliament control over the king. During the reign of Charles II (1630–85) a fixed grant collected from a land tax was substituted for the subsidy. In France the king's financial power freed him from dependence upon the States-General and enabled him to exert absolute domination. Important international historical subsidies were the grants by England to Denmark during the Thirty Years' War and to the enemies of Napoleon during the Napoleonic Wars.

The most important subsidies at the present time are those granted to private individuals and corporations. The United States grants subsidies for the development of airplane service and the merchant marine. Strictly speaking the subsidy is only the amount granted in excess of the legitimate cost of the service. Thus when the United States Government makes payments for carrying mail by air or steamers, it is only a subsidy to the extent that the amount paid is in excess of the legitimate cost of carrying the mail.

A *bounty* is similar to a subsidy but is granted for a certain service that has been rendered. Before the Civil War bounties were granted to induce enlistment in the army, and in frontier communities bounties are frequently given for killing certain dangerous wild animals.

Suicide, the death by his own hand of a sane person who has reached the age of discretion. It is a criminal act, but naturally no law can be effective when an attempt at self-destruction succeeds. Unsuccessful efforts may result in legal action, though the law is seldom invoked.

Suit, a legal claim, petition or prosecution; by extension, a case tried in a court of law or equity to decide an issue between a plaintiff (bringing the suit) and a defendant defending it. There are, of course, many highly technical details in some cases at law, but the principal steps or stages in the simplest kind of case may be summarized as follows: bringing the case to court, together with the parties involved; the definite formulation of the issue to be decided; the trial or hearing; the judgment; the judicial review (in some cases); and the execution.

Summons, a writ commanding the sheriff or other authorized person to notify a party to appear in court and answer a claim against him.

Surrogate, a judge in the state of New York with jurisdiction over the probate of wills and the administration of estates.

Suspended sentence, delayed punishment of a criminal, postponing his penalty in an attempt at merciful reformation. The suspended sentence goes a step farther than the indeterminate sentence: it holds the penalty back; the indeterminate sentence makes the penalty appreciably less for good behavior.

Syndicalism (from the French *syndicat,* meaning trade-union), a theory and plan for the forceful overthrow of existing political and economic institutions through a general strike and the substitution of a socialistic government by trade-unions. The Syndicalists advocate direct action by means of strikes and sabotage. They work for a general strike that will make the nation helpless and allow the trade-unions to seize power. Like the Socialists, the Syndicalists condemn the capitalistic system, but unlike the Socialists, they urge direct action and argue that the state is always tyrannical and whatever government there is should be by the unions. Syndicalism had its origin in France and was mainly inspired by the writings of P. J. Proudhon (1809–1865). In the United States syndicalism is advocated by the International Workers of the World (I.W.W.), an organization formed in Chicago in 1905 and now having only a very trivial number of adherents.

Tariff, a system of custom duties or taxes imposed on imports and sometimes on exports. Tariffs are imposed for protection or for revenue. Advocates of free trade oppose a tariff for protection and urge tariff for revenue or none at all. Most of the American colonies imposed tariffs in addition to those imposed by Great Britain under the Navigation Acts. A tariff averaging about 8½ per cent was passed by Congress on July 4, 1789, and we have had tariffs ever since. Tariff rates were increased after the War of 1812, raised in 1828, lowered in 1833 to placate South Carolina but raised to the old levels in 1842. In the period of prosperity about the middle of the century the rates were lower but were raised again before the Civil War and continued to be raised by various acts until the Democratic Tariff of 1894, which substantially lowered them. This policy was reversed in 1897; further increases were adopted in the Payne-Aldrich Tariff of 1909 and in the Fordney-McCumber Act of 1922 and were made the highest ever by the Smoot-Hawley Tariff of 1930. This policy was again reversed during the Democratic administration of Franklin D. Roosevelt, and the President was authorized to lower individual rates by as much as 50 per cent under reciprocal agreements with individual countries.

Taxation, the usual method of obtaining funds for public use by assessing persons who are subject to the jurisdiction of the Government. The broad powers granted to Congress by the Constitution (Art. I, Sec. 8, Cl. 1), "to lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defense and general welfare of the United States," are subject to constitutional limitations. Direct taxes must be apportioned according to the population (Art. I, Sec. 9, Cl. 4), and all taxes must be uniform throughout the United States (Art. I, Sec. 8, Cl. 1). The income tax was first declared unconstitutional because it was a direct tax and not apportioned, but the 16th Amendment (proclaimed in 1913) granted Congress the power to levy an income tax "without apportionment among the several states and without regard to any census or enumeration." Furthermore, Congress cannot tax articles exported from any state or give preferential rates to certain ports, and in some cases the Supreme Court has held that Congress cannot impose a tax that has for its main purpose some social measure, such as a tax on the owners of certain industries who employ children under a certain age limit.

Early Federal taxes were derived from import duties and a variety of internal excise taxes. In 1802 the internal revenue taxes were abandoned and, with the exception of a period during the War of 1812, were not adopted again until the Civil War. In 1909 a corporation tax was imposed, and in 1913 the income tax was adopted, followed by an inheritance tax, an excess-profits tax and an expenditure tax during the World War period. The Revenue Act of 1932 added a gift tax, manufacturers' excise tax and taxes on telephone, telegraph and radio messages, bank checks, pipe lines and safe deposit-box rentals. The Revenue Acts of 1936 and 1937 taxed undistributed net income of certain corporations at progressive rates on increasing amounts of surplus. These taxes are collected through the various branches of the Internal Revenue Bureau.

State and local taxes have generally been on land and a few articles of personal property, but in recent years many states have levied inheritance taxes, corporation taxes, liquor taxes and a general sales tax. Nearly half the states in the Union in 1938 had some sort of tax on chain stores to prevent the growth of this form of distribution.

Two recognized principles of taxation are that the tax should be easy to collect and that it should be in proportion to the ability to pay. Excise taxes, such as those on tobacco and liquor, are easy to collect unless they are too high, which encourages bootlegging and tax evasion. The income tax is levied according to the ability to pay: on small incomes there is no tax; on some incomes there is only a 4 per cent normal tax figured on the net income (gross income less certain exemptions and credits); and on larger incomes there is not only the 4 per cent normal tax but a surtax with progressively higher rates for amounts in each of a series of higher brackets—75 per cent, for example, on all above $5,000,000, with lower rates of surtax on each of 30 different brackets. The sales tax is easy to collect but it is not proportional to ability to pay, since it is more of a burden on the poor than on the rich.

Territory, any large unit of land; a region or district. In the United States, a political division under control of the Federal Government that has not sufficient population to entitle it to become a state. When a territory is entitled to statehood, Congress authorizes it to frame a state constitution; after this has been adopted, statehood is proclaimed by the President. The general rule has been that statehood may be sought when a territory's population is great enough to entitle it to one Representative in Congress. A territory is represented in Congress by a Delegate; he may debate on questions pertaining to his territory, but he has no vote. The only territories today are Hawaii and Alaska.

Even before the Constitution was adopted the Confederation Congress drafted an instrument for the government of the less inhabited parts of the country: the famous Northwest Ordinance that forbade slavery and arranged for the admission as states of parts of this wilderness when it was sufficiently developed to give up the territorial government. The first Congress under the Constitution in 1789 confirmed this ordinance so that from the start the government of territories was closely tied up with two important constitutional questions—the powers of Congress and the status of slavery. As territories not included under the provisions of the Northwest Ordinance applied for admission as states, Congress had to decide whether they should be slave or free. In 1820 the Missouri Compromise seemed to settle the question: it excluded slavery from those parts of the Louisiana Purchase north of 36° 30′ except in the state of Missouri. This was a rule for territories not covered by the Northwest Ordinance, and it was another sign that Congress assumed its right to legislate how a territory should become a state. In 1857 the decision of the Supreme Court in the Dred Scott case declared the Missouri Compromise unconstitutional and blocked the efforts of the growing Republican party to create free soil in territories and to make free states out of the territories through Congressional action.

The Constitutional status of the territories had much to do with the Civil War.

Tort (French, wrong, from Latin meaning twisted), a civil wrong, a breach of legal duty (other than under contract) that causes an injury to another. It differs from crime in that a crime is an offense against the state, to be adjudged by the state; a tort is an offense of neighbor against neighbor—but the same act may be both a tort and a crime. The law of torts embraces fraud, trespass, libel and slander, negligence, nuisance and the like.

Totalitarian, a government organized and operated upon the doctrine that the state and the state alone is sovereign in the legal sense and all-powerful in every department of the nation's political activity, social life and economic structure. The Fascist countries Italy and Germany and the Communist Soviet Union are totalitarian states. The Soviet Union is professedly devoted to the interests of the working class; and the Fascist nations are in substance, although not avowedly, capitalist dictatorships devoted to the middle-class interests. In the totalitarian state opposition political parties are abolished, the parliamentary system is substantially eliminated, open disputes between capital and labor are prohibited, and there is almost complete regimentation and direction by the state of the lives and activities of the people.

Treason, defined by the Constitution of the United States (Art. III, Sec. 3) as "levying war against them [the states], adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court. The Congress shall have the power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted." This constitutional definition of the crime, the acceptable evidence and the punishment are much more mild, generous and just than earlier treatment of traitors.

Treasury, the department of the government that has charge of public finances. In the United States, the Treasury Department was established by Congress, Sept. 2, 1789. The Treasury Department collects government revenue through the Customs Service, which collects duties on imports; and the Internal Revenue Bureau, which collects income taxes, estate taxes, capital-stock taxes, occupational taxes, tobacco taxes, amusement taxes and various others. The Treasury Department is also charged with keeping the government's money and paying its bills in accordance with congressional appropriations and the preparation of paper and metallic money and government securities. Other bureaus under the Treasury Department include the Bureau of Public Health, Supervising Architect, the Coast Guard and the Secret Service. The Department is under the supervision of the Secretary of the Treasury who is a member of the President's Cabinet.

In Great Britain the Treasury is responsible for the management of the finances of England and Scotland and is in charge of the Chancellor of the Exchequer, who ranks next to the Prime Minister in the Cabinet.

Trespass, any tort or civil wrong accompanied by violence and force, however slight—breaking a blade of grass is violence in the definition of trespass! In a more special sense trespass means illegal entry on the land or property of another; in theory such entry is forcible. Some states of the United States by statute have made trespass on another's realty a criminal trespass.

Ultra vires (Latin, beyond the powers), transcending the authority given by law. The phrase is specifically used of action by a corporation that exceeds the privileges and powers given the corporation by its charter or by statute.

Unemployment, state or condition of persons unable to obtain work. Persons who are unwilling to work or who are permanently or temporarily incapacitated or workers engaged in a strike are not a part of the economic problem of unemployment.

Unemployment of workers as a group may be either temporary or permanent. *Temporary* unemployment, when the worker is out of a job for a time but ultimately finds another job, is caused by seasonal changes in production and is most evident among dock workers, those engaged in luxury trades and in harvesting certain crops and in the automobile industry; by cyclical changes in business conditions bringing alternating prosperity and depression; and by changes in industry resulting from changed demands and business failures. Workers involved in temporary unemployment during that period may be in great want and suffering. *Permanent unemployment* of a large group is the result of our economic system and the technological progress in industry. There will always be a number of people out of work as long as there is a freedom of contract and the workers are free to give up their jobs and move around the country. Technological improvements in industry are constantly displacing men and using machines. In the United States manufacturing production increased 24 per cent from 1920 to 1926 and the number of workers employed declined 6.5 per cent. Though the production increased up to 1929, the number of workers remained practically constant. Thus the general volume of production has been increasing, but the number of workers employed has decreased.

The consequences of prolonged unemployment are disastrous to both society and the individual. The loss of a regular income by the workers means misery and suffering. By 1932 it was estimated that the health of one-fifth of the children in the United States had become impaired due to malnutrition directly traceable to unemployment of their parents. The economic maladjustment gets progressively worse, for the lack of buying power that comes from unemployment decreases the sale of goods and makes it necessary to reduce production—which again decreases employment.

Many people believe that the problem of unemployment is inherent in our capitalistic system and that it can be abolished only if the system is changed. Others suggest government assistance such as unemployment insurance and public works; planning within industry to reduce seasonal unemployment; and government planning to make cyclical unemployment less serious. To meet the problem of technological unemployment, it has been urged that the working hours be shortened and the work be spread among all.

Although numerous estimates and partial counts of the number of unemployed were previously made, the first U.S. census of unemployment was made in November 1937. About 81,000,000 questionnaires were distributed throughout the country by the post office, and a supplementary personal canvass was made in selected areas to test the accuracy of the number of voluntary returns. The total number of persons who returned questionnaires and listed themselves as unemployed was 7,822,912, and the personal canvass showed that only 72 per cent of the unemployed returned the questionnaires, which would mean that the total unemployment at the time of the census was 10,870,000.

Verdict (Latin, true saying), the answer to the court by a jury to the question of fact submitted in a trial. In Scotch law, besides "Guilty" and "Not guilty," a third verdict is possible, "Not proven," which does not relieve the accused of being retried on the same charge. The answer of a judge or referee on a question of fact is not a verdict but a *finding*.

Veto (Latin, I forbid), the power of invalidating a law, especially such power lodged in a single official. The Roman tribunes of the people—an office established in the 5th century B.C. to protect individuals from injustice—could overrule any act of the senate or any decree of a magistrate by saying *veto*, I forbid.

The French constitution of 1791 gave the king a veto power, but Louis XVI's attempt to exercise this power in June 1792 when the Assembly voted to take away his royal guards was one of the immediate causes of the French Revolution.

In the old Polish kingdom any member of the Diet could defeat certain measures by voting "No," and this was called the *liberum veto*, free, untrammeled veto; and that phrase is still used of the power to hold up any measure that requires unanimous consent.

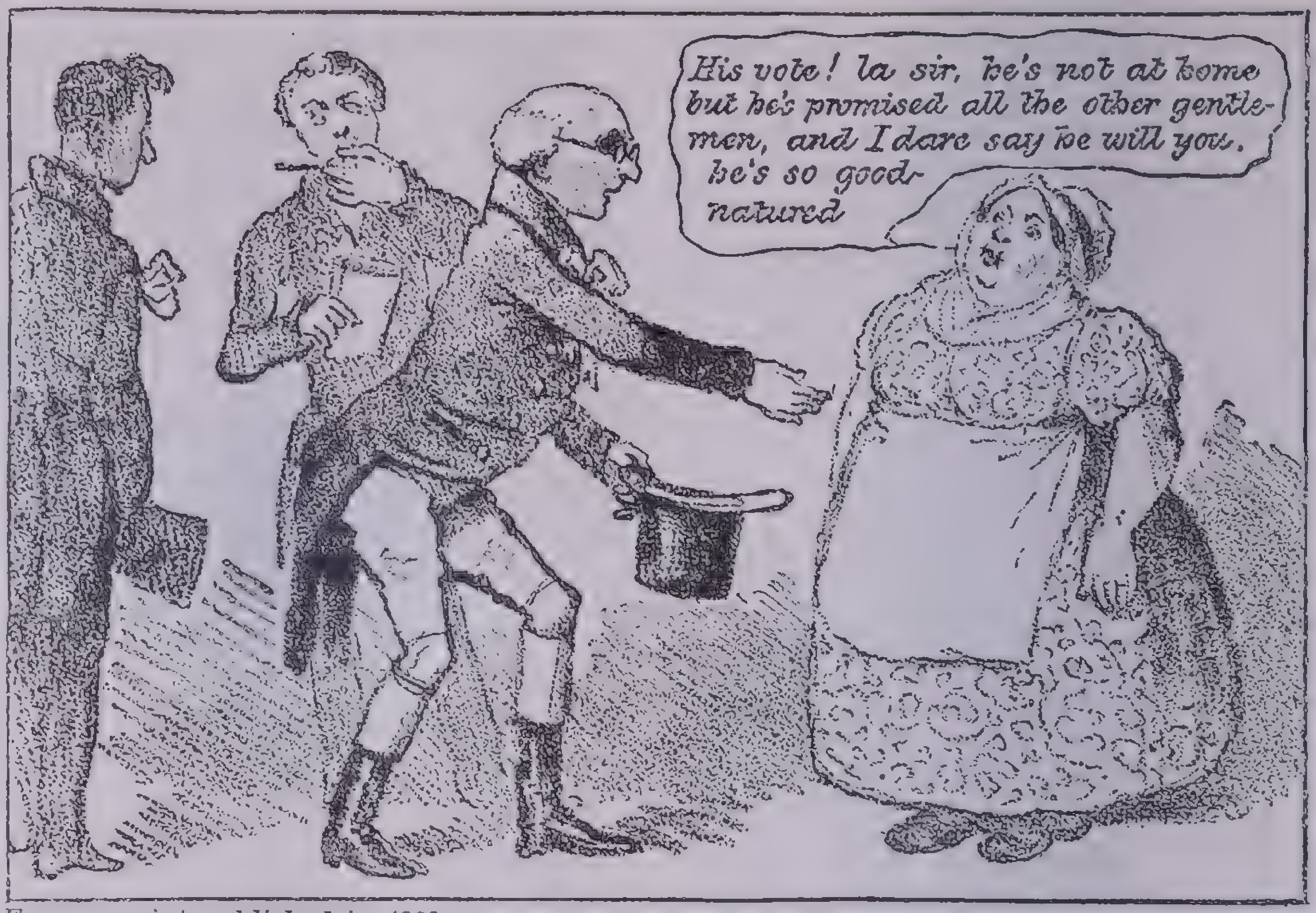
In the Constitution of the United States the President's veto power is defined in Art. I, Sect. 7, Cl. 2. His veto may be overruled by a two-thirds vote of each House. If he does not return a measure within 10 days (Sundays excepted), it becomes a law if Congress is still in session; but if "the Congress by their adjournment prevent its return, . . . it shall not be a law." This last method is called *pocket veto*, as if the measure had been invalidated by being pocketed.

All the states of the Union except North Carolina give the governor the veto power; and more than half the states permit the governor to veto separate items in appropriation bills. The President must veto an entire act and cannot veto separate items. However, in 1938 President Roosevelt requested that Congress give him the power to veto separate items in the budget, although such an act may be unconstitutional.

A somewhat similar power is exercised by the Supreme Court of the United States in declaring that an act of Congress is void because it is in violation of some provision of the Constitution and therefore unconstitutional.

Visit and search, the practice in war of boarding and examining the papers of a neutral ship to see if she carries contraband (forbidden) cargo. If the neutral merchantman is escorted by a neutral warship, this creates the *right of convoy*, freedom from visit and search. Great Britain opposed this theory of convoy but accepted it under the Declaration of London in force from 1908 to 1916; after 1916 the right of convoy again became uncertain. Merchant ships of a neutral Power escorted by warships of a belligerent are liable to capture without search.

Vote, the expression of a choice, preference or wish by one exercising the right of suffrage. Voting is a method of selecting public officials and determining controversial questions submitted to the voters. Vote is also used to describe the formal recording of the expressed opinion of any group upon a certain subject. In legislative assemblies the vote may be by means of a spoken word or other visible expression of opinion, but voting by large groups of people is usually done by a ballot. In the United States the individual state governments control the voting, subject to the constitutional provision that the vote shall not be denied on account of race, color, previous condition of servitude or sex. In all states a person must be 21 years of age to vote, and in all but two he must also be a citizen. Those guilty of certain serious crimes or of an unsound mind are usually not allowed to vote. In addition there are frequent requirements of residence, literacy, tax payment and registration. It is estimated that about 45 per cent of the population have the right to vote.


His vote! la sir, he's not at home but he's promised all the other gentlemen, and I dare say he will you, he's so good-natured

From a print published in 1832

Getting Out the Vote

Neither the radio, the press, political rallies nor advertising has superseded personal solicitation as a tried-and-true method of vote getting

Voting machine, see *Ballot*.

War Department, one of the parts of the executive government of the United States, organized by an act of Congress in 1789. It is second in age only to the State Department. There are only two bureaus in this Department—Insular Affairs and National Guard. Administrative divisions are *offices* of 15 major officers: the chiefs of Air Corps (independent of the Navy Bureau of Aeronautics), Cavalry, Chaplains, Chemical Warfare Service, Coast Artillery, Engineers, Field Artillery, Finance, Infantry, Ordnance and Signal Corps; the Inspector General, Judge Advocate General, Quartermaster General and Surgeon General. Other divisions are: the Army Industrial College for training officers in procuring munitions and mobilizing industry in wartime; the Army War College to train select officers for high command; and the General Staff. The Department supervises the U. S. Military Academy at West Point and for enlisted men post schools, unit schools and special service schools.

The Department has several activities that are only indirectly military: the work of the Corps of Engineers in improving waterways, planning and executing flood control, power and irrigation development and surveying and charting the Great Lakes; the work of the Inland Waterways Corporation; the operation and care of the Panama Canal; harbor and bridge construction; and the civil administration of the Philippine Islands and supervision of the Dominican Republic receivership.

War, Laws of, regulations that govern warfare, a branch of international law and like all international law differing widely from common law or statute law because it has not the same authority nor the same power to impose penalties. The authority of rules of warfare between nations can only be the agreement of the nations on the rules; obviously this agreement is stretched to the breaking point when nations have already so far disagreed as to go to war. The power to impose penalties for breaking the rules, usually the power of the victor in the war, is due entirely to the victor's preponderant strength in arms and is applied only after the contest is over. Punitive measures in wartime are usually retaliatory reprisals prompted by anger; they have the effect of making the laws that are already broken likely to be broken again by both belligerents. Penalties imposed by a treaty of peace are likely to be harsh and unjust. The Versailles Treaty at the end of the World War did not include an amnesty (or general forgive-and-forget clause) but provided for the trial of war criminals and insisted that Germany admit war guilt—and these terms did not promote a peaceful temper in Germany.

The laws of war today may be traced to a few major international conferences and agreements, beginning with the Geneva Convention of 1864 that drew up rules for the humane treatment of prisoners of war. These were generally adopted by the Powers for land warfare but not for sea fighting. Two international peace conferences at The Hague in 1899 and 1907 came to no agreement on reducing armaments but did adopt War Regulations that included the extension of the Geneva Convention to maritime warfare and rules for peaceful settlements of disputes to prevent war; for limiting the use of armed force for collecting international debts; for the commencement of hostilities; and rules on rights of neutrals, rights of capture, prize courts, dropping projectiles from balloons and laying submarine mines. The Hague War Regulations provided for the humane treatment and maintenance of prisoners of war with food, quarters and clothing such as are supplied to the army of the nation holding the prisoners. The use of poisonous gas and of bacteria to spread disease is strongly forbidden by The Hague Convention and by postwar conferences (Washington, 1922; Geneva, 1925), and at the Washington Conference of 1922 the use of submarines as commerce destroyers was prohibited because submarines cannot visit and search and hold vessels with prize crews. The Hague Convention of Jurists (on motion of the Washington Conference) drafted rules for aerial warfare forbidding bombing to terrorize civilian population. Several of these laws of war were repeatedly broken in the Spanish civil war and in the invasion of China by the Japanese army. Like the League of Nations' use of sanctions to punish Italy for making war contrary to the League Covenant, the laws of war have proved ineffectual.

Ward, a minor or person otherwise not in full legal capacity (lunatic, for instance) under the protection of the court or of a *guardian* appointed by the court. The relation continues until the ward reaches majority or otherwise overcomes the legal incapacity.

Warrant, a writ issued by a court directing any peace officer to perform a specified act. Commonly a warrant means an order for arrest. A *search warrant* is an order to examine a house or other specified place for stolen goods, gambling apparatus, burglars' or counterfeiters' tools and the like. The Constitution of the United States (4th Amendment) prohibits "unreasonable searches" and declares that no warrants shall be issued except "upon probable cause, supported by an oath or affirmation, and particularly describing the place to be searched and the person or thing to be seized."

Whig party, one of the main political parties in the United States in the second quarter of the 19th century. Its great leaders were Daniel Webster and Henry Clay, although neither was able to lead the party to victory. The various groups that opposed Jackson were finally formed in 1836 into an alliance although they did not join in backing a single candidate. In 1840 the Whigs were successful and elected William Henry Harrison. Clay was defeated by Polk in 1844, but in the following election the Whigs were successful in electing Zachary Taylor. The Whig party always contained diverse elements and was united mainly by its opposition to the Democrats. When the slavery issue split the country, it likewise split the Whig party, and its failure in 1852 marked the end of the party.

Whip, a member of a political party in a legislature appointed to enforce discipline among the members of the party and to secure the assistance of the members of the party in passing legislation favored by the party and opposing that proposed by opposition parties. The whip keeps in close contact with the members of his political party, informs them when important matters are to be brought before the house, endeavors to have all the members of the party present when an important vote is being taken, directs the members of the party how to vote, makes informal counts of the opinions of legislators on pending matters to determine the strength of the party's position, arranges for *pairs* so that members taking opposite sides on a question can both be absent when the vote is taken and thus not change the relative strength of the parties, and generally keeps the head of the party informed on the opinions of the members of the legislature. In England the position is of tremendous importance, and without the constant presence and activity of the whip Parliament could not function. In the United States the use of a whip has only recently been adopted. The whip is chosen by a party caucus at the beginning of each Congress.

Witness, one who gives testimony as to what he knows. A witness in court is summoned by a subpoena. He testifies only to what he knows or to what he has seen; the court is the judge what testimony may properly be admitted. A witness is not required to testify to a matter that will tend to incriminate himself. Before beginning testimony a witness is placed under oath or affirmation. If he utters false testimony, he is guilty of perjury.

Woman suffrage, the right of women to vote on equal terms with men. It was first purposed in the United States in 1848, at Seneca Falls, N.Y. in a general declaration of the rights of women. The early leaders of the movement—Susan B. Anthony, Lucretia Mott, Lucy Stone, Mrs. Stanton and many others—advocated temperance and the abolition of slavery. The National Woman Suffrage Association was formed in 1869 to work for the adoption of a constitutional amendment, and the American Woman Suffrage Association was formed in the same year to work with the state legislatures. These two organizations were united in 1890, forming the National American Woman Suffrage Association. Leaders of the movement in this period included Anna Howard Shaw and Carrie Chapman Catt. In 1869 Wyoming was the first to grant suffrage to women, and in 1920 the 19th Amendment to the Constitution was adopted declaring that the right of citizens to vote shall not be denied or abridged on account of sex.

In England the first resolution in favor of woman suffrage was introduced into the House of Lords in 1851, and Mr. and Mrs. John Stuart Mill were among the outstanding advocates of the movement. A militant suffrage movement developed in England about 1903, but it was not until after the World War that women over 30 years of age were given the right to vote, and in 1928 women were given equal voting rights with men. Woman suffrage is general in Europe, except in France, Italy and some of the Balkan States.

Underwood & Underwood

Early Suffragettes Used Militant Tactics to Forward Their Cause

The early days of the Votes-for-Women movement were marked by skirmishes between legislators and police and the militant suffragettes. In both England and America women demonstrated, marched, picketed and courted arrest at every opportunity. Many were imprisoned, and they continued their protest by hunger-striking while behind bars. This picture is from a photograph taken the month before the World War broke out; it shows police interrupting a demonstration before the gates of Buckingham Palace, London

Writ, any written order issuing from the state or a court of law for the purpose of compelling the defendant to do the thing ordered in the writ. Familiar examples are the writ of *habeas corpus,* the writ of mandamus and the writ of replevin.

Youth, young people between childhood and maturity. They are of great interest to modern governments for two reasons: to assure the government of support by its future citizens; and to insure the happiness, prosperity and usefulness of these future citizens.

A Youth Movement is a revolt by the younger generation against the values, standards and policies of the older generation arising from a strong dissatisfaction with the existing intellectual, moral, social or political order. The first Youth Movements developed in the middle of the 19th century. In 1840 a movement developed in Italy under Mazzini. It was of a political nature and aimed at achieving nationalization. In Germany there was a similar movement dominated by the idealistic and romantic doctrines of Rousseau. In Russia the Youth Movement about 1860 was materialistic, agnostic and utilitarian. Of the Youth Movements in the Orient the Chinese is the most important. Here the students revolted against the classical traditions and agitated for an adoption of the desirable aspects of Occidental culture and especially the equality of the sexes. The nationalistic demands of the students in China in 1936 and 1937 were a factor in forcing the government to make a stand against the Japanese. Youth Movements are always a sign of a break in the internal order of the nation and a quickened pace of social and economic change.

The new governments that have sprung up since the World War have been careful to cultivate the children and youth. *Giovinezza,* "Youth," is the name and theme of the official song of Fascist Italy; and Mussolini's government has three youth organizations: *Balilla* (8-14 years), *Avanguardia* (14-18) and *Giovine Fascisti* (18-21). "The Balilla instructors [says an Italian book on the subject] convey certain important principles in an elementary form suited to the child's age and . . . establish these principles so firmly that they will remain with him into manhood."

In Germany after the War and the establishment of the Hitler regime all youth organizations were either abolished or swept together into a Nazi organization, the *Hitlerjugend,* which is not strictly speaking a government activity. The Hitlerjugend conducts a Farm Service that supplies groups of young workers.

Hitler's government appropriated and extended the work of student labor-service camps that had previously had a government subsidy and had been partly relief organizations and partly patriotic. Service was made compulsory (in 1935, for both sexes), and the number quickly rose from 125,000 to nearly 300,000. About 24,000 girls were in the German Labor-Service camps in 1936.

In Switzerland, Sweden, Norway and Denmark there are work camps for young people with varying degrees of government control—practically none in Norway. None of these countries makes camp attendance compulsory. In Bulgaria a compulsory labor service—8 months of community labor for each man reaching the age of 20—was established in 1919. It was not a relief or unemployment measure but was planned to supply labor for needed public works and to check a trend toward communism.

Before these nationalist programs of camp service for youth arose, there was an *International Voluntary Service* backed by the Society of Friends that helped rebuild devastated areas in Northern France, cleaned up after Swiss avalanches, built new villages in earthquake areas in India and engaged in community improvement in the United States. These groups were often conscientious objectors to war and one of the purposes of the movement was to provide "a moral equivalent for war," an idea proposed in 1912 by William James of Harvard.

The *Civilian Conservation Corps* (CCC) is the principal organization in the United States for giving unemployed youth work and training. An act of Congress approved March 31, 1933, gave the President authority to "provide for employing citizens . . . in the construction, maintenance and carrying on of works of a public nature." Emergency Conservation Work was the official name until July 1, 1937, when the popular name Civilian Conservation Corps was adopted by the Government. A director took charge of policies and co-ordination. Four executive departments of the Federal Government handled details: the Labor Department chose the men; the War Department enrolled the men, built and administered camps and managed welfare and educational work; and the Departments of Agriculture and Interior laid out work progress and supervised the work. Organizations in each state were quickly set up and before July 1, 1933, the quota of 300,000 (250,000 young men, 25,000 war veterans and 25,000 local men) was made up. About 1,500 camps were built. Of those enrolled 90 per cent registered for job training or study. Five-sixths of the $30 monthly pay is regularly allotted to the family of the enrolled man. The Act of 1937 continuing the CCC for three years reduced the top age limit from 28 to 23. The principal types of work done by the CCC are: forest culture and protection, erosion control, flood control, transportation improvement, structural improvement, range development, wild-life conservation and landscape and recreational work in parks and forests. The CCC by 1938 had planted a billion and a quarter trees for reforestation and erosion control and had built 3,000,000 check dams.

The National Youth Administration (NYA) of the United States was established as a part of the Works Progress Administration (WPA) by an executive order of June 26, 1935. A National Advisory Committee of 32 representatives of business, labor, agriculture, education and youth assists the Executive Director and his committee of six. NYA provides funds for part-time employment of students between 16 and 24 and of out-of-school youth of the same age group, encourages services for job training, placement and employment and helps promote movements for constructive leisure activities.

Zionism, a plan and a movement to resettle the Jewish people in Palestine. From the earliest times the Jews have longed for a return to their native land, and this desire has become intensified through the ages of persecution and especially the recent anti-Semitic movements in Europe. The modern Zionist movement was founded by Theodor Herzl and the first international Zionist congress was held in Switzerland in 1898. Early negotiations with the Sultan of Turkey for a grant of land were fruitless, and an offer of land in East Africa was rejected. In 1917 the famous declaration of A. J. Balfour that "His Majesty's government favors the establishment in Palestine of a national homeland for the Jewish people . . ." gave great impetus to the movement, and a large fund was later raised in America for the rehabilitation of Palestine. After the World War large numbers of Jewish people went to Palestine, and after Palestine had been placed under British mandate in 1923, the development of the country was rapid. A large university was established and numerous co-operative agricultural communities were developed. However, the increasing numbers of immigrants led to serious disturbances and bloody quarrels between the Arabs and the Jews. The partitioning of Palestine has been suggested to the League of Nations as a solution to the problem, but the Zionists have generally opposed this step. Rabbi Stephen S. Wise led the Zionists in the United States.

Zoning, devising and enacting regulations for the use and construction of buildings upon property within a municipality. England, Germany and Sweden were the first countries to adopt regulations restricting the building in certain areas and generally planning the development of the cities. The first zoning regulations in the United States were enacted by New York city in 1916, but this lead was soon followed by other cities. New York is divided into *use districts,* controlling the character of the sections and preventing industrial or undesirable establishments in residential sections; *height districts,* requiring the setting back of the higher stories of a building; and *area districts,* regulating the amount of the property that can be covered by a building. The state legislatures, under their police powers, authorize zoning, and then the cities frame and enact their own zoning ordinances.

BIBLIOGRAPHY

Inez McFee, *How Our Government Is Run,* T. Y. Crowell, N.Y., 1931, $2.50

Eleanor Roosevelt, *When You Grow Up to Vote,* Houghton Mifflin, Boston, 1932, $1.50

G. L. Knapp, *Uncle Sam's Government in Washington,* Dodd, Mead, N.Y., 1933, $2.00

The Federal Government Today, American Council on Public Affairs, 1938, $1.00

B. M. and C. G. Haines, *The Constitution of the United States,* Crofts, N.Y., 1928, $2.00

Charles A. Beard, *An Economic Interpretation of the Constitution,* Macmillan, N.Y., 1935, $2.50

F. Frankfurter and J. M. Landis, *The Business of the Supreme Court,* Macmillan, N.Y., 1927, $5.00

William B. Munro, *The Government of the United States, National, State and Local,* Macmillan, N.Y., 1936, $3.75

L. W. Lancaster, *Government in Rural America,* Van Nostrand, N.Y., 1937, $2.85

W. S. Carpenter and P. T. Stafford, *State and Local Government in the United States,* Crofts, N.Y., 1936, $3.00

Charles A. Beard, *American Government and Politics,* Macmillan, N.Y., 1935, $2.75

Frank Kent, *The Great Game of Politics,* Doubleday, Doran, Garden City, N.Y., 1930, $2.00

Walter Lippman, *Preface to Politics,* Macmillan, N.Y., 1933, $2.00

Hugh Wilson, *The Education of a Diplomat,* Longmans, Green, N.Y., 1938, $2.50

Herman Finer, *The Theory and Practice of Modern Government,* Dial, N. Y., 1934, $1.89

John Gilbert Heinberg, *Comparative Major European Governments,* Farrar & Rinehart, N.Y., 1937, $3.00

Frederick Ogg, *European Government and Politics,* Macmillan, N.Y., 1936, $4.25

Henri Lichtenberger, *The Third Reich,* Greystone, N.Y., 1937, $3.00

E. E. Kellett, *The Story of Dictatorship,* E. P. Dutton, N.Y., 1937, $1.75

Calvin B. Hoover, *Dictators and Democracies,* Macmillan, N.Y., 1937, $1.50

Famous Utopias (anthology), Tudor, N.Y., 1937, $1.19

Max Radin, *The Law and Mr. Smith,* Bobbs-Merrill, Indianapolis, 1938, $3.00

John M. Zane, *The Story of Law,* Grosset & Dunlap, N.Y., 1935, $1.00

D. C. Lunt, *The Road to the Law,* McGraw-Hill, N.Y., 1932, $2.50

Francis Marshall, *The Layman's Legal Guide,* Blue Ribbon, N.Y., 1934, $1.00

· Book · XI ·

BIOGRAPHY

Concise and Useful Biographies of More Than Three Thousand Important Historical and Contemporary Characters—featuring the one hundred greatest men and women in history and illustrated by unusual stamp portraits ....Page 1443

John Dewey
American educator and philosopher

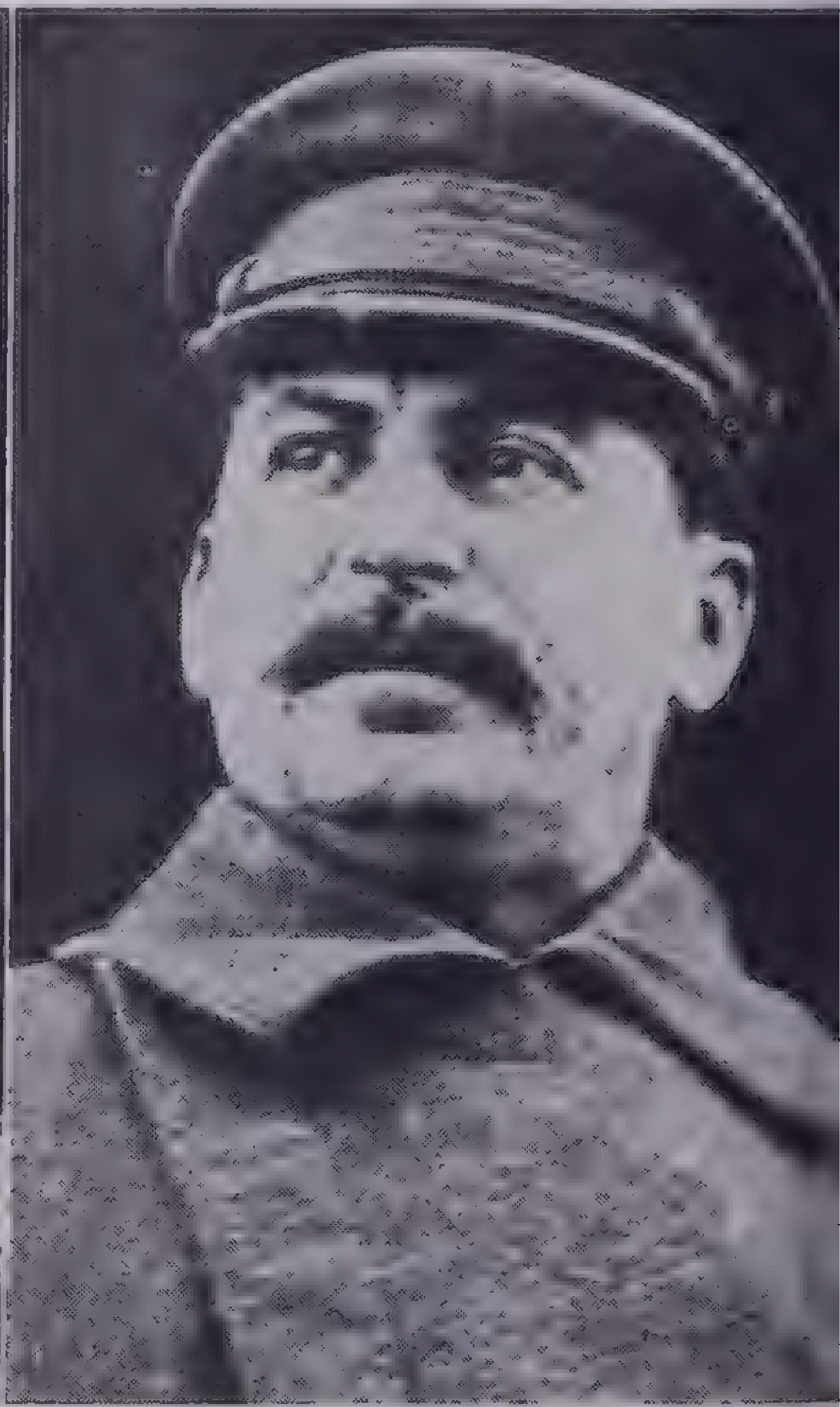
Walt Disney
American motion-picture producer

Sigmund Freud
Austrian physician; founder of psychoanal

Albert Einstein
German physicist

Chiang Kai-shek
Chinese generalissimo

Madame Chiang Kai-shek
The spokesman of her people

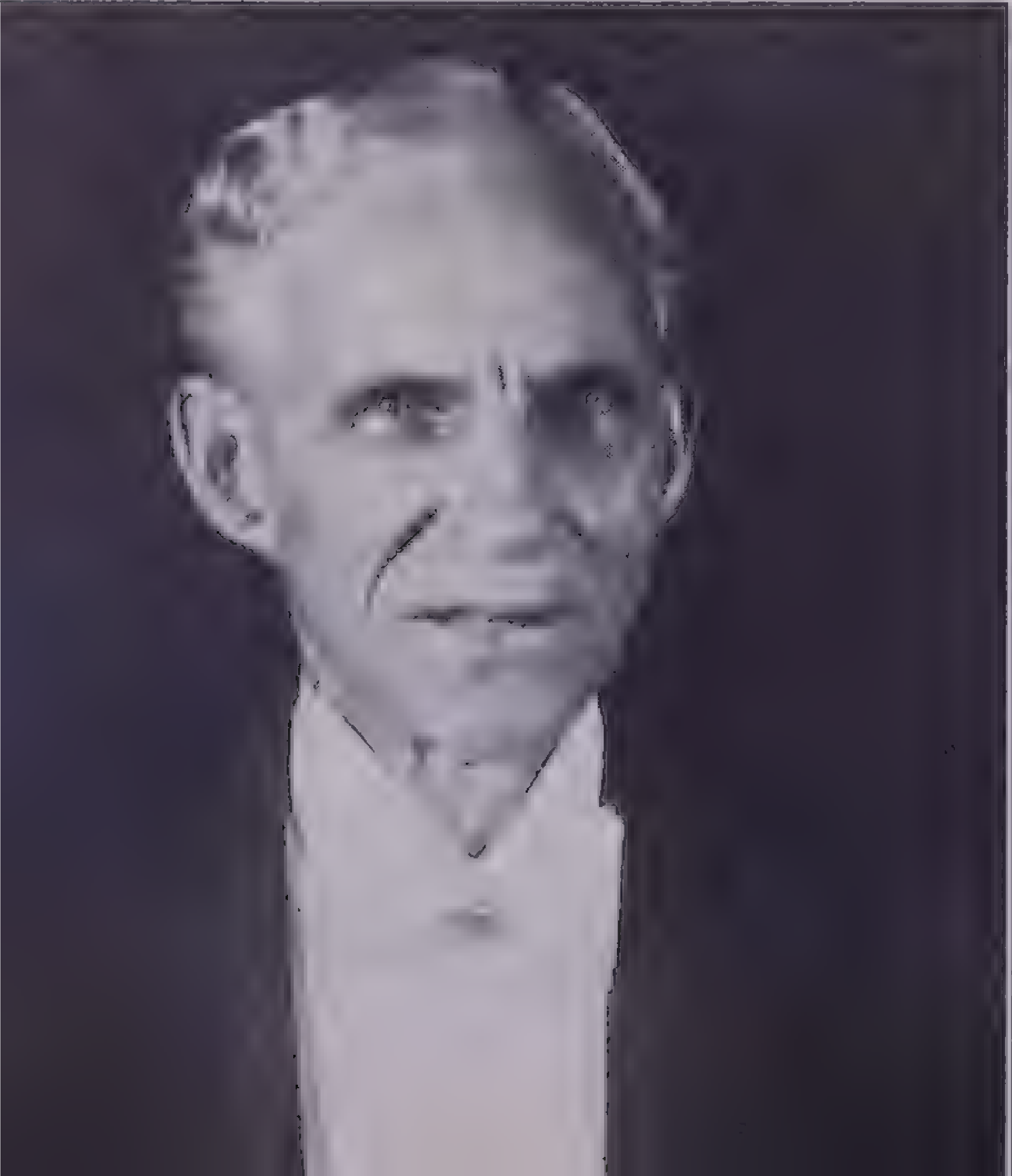


Joseph V. Stalin
Russian political leader

Outstanding Leaders in Various Fields of Activity

(*Disney photo by RKO Radio Pictures, Inc.; others by Underwood & Underwood.*)

Henry Ford
American industrialist



Franklin Delano Roosevelt
President of the United States

Arthur Neville Chamberlain
British statesman

BOOK XI: BIOGRAPHICAL DICTIONARY

Persons whose names are printed in capitals are among the one hundred greatest men and women in history—so designated by a consensus of highest authorities.

Abbas I or **Abbas the Great** (1557-1628), Shah of Persia, succeeding his father, Shah Mohammed, to the throne in 1586. He extended his rule beyond Persia proper, and at his death his dominions stretched from the Tigris to the Indus. He erected the famous buildings at Isfahan.

Abbe, Cleveland (1838-1916), American meteorologist. He studied astronomy at the University of Michigan, and from 1871 was associated with the government weather service (organized as the U. S. Weather Bureau in 1891). He gave the first daily weather forecasts based on telegraphic reports.

Abbey, Edwin Austin (1852-1911), American illustrator and painter, born in Philadelphia. He studied at the Pennsylvania Academy of Fine Arts in that city. From 1881 until his death, he lived chiefly in England. He worked in water-color and pastel and his first oil picture, *A May Day Morn,* was exhibited at the Royal Academy in 1890. Abbey is known to Americans principally for two magnificent series of murals—his *Quest of the Holy Grail* in the Boston Public Library and a historical series for the Pennsylvania capitol at Harrisburg. His pen-and-ink illustrations for editions of Herrick, Dickens, Goldsmith and Shakespeare are also famous. Among other works is the fine *Crowning of Edward VII,* painted by royal commission.

Abbott, Emma (1850-91), American operatic soprano, born in Chicago, Ill. She began her musical studies in New York city at the age of 20, sang there in concerts and continued her education in Milan and Paris. In 1876 she made her debut at Covent Garden, London, in *The Daughter of the Regiment,* and upon her return to America she won instant success on the operatic stage.

Abbott, Grace (1878-   ), American social worker, born in Grand Island, Nebr., and educated at the University of Nebraska. She taught in high school for several years before taking up her residence at Hull House, Chicago (1908). Miss Abbott thereafter devoted herself to political science, child welfare and immigration work, and her appointment as chief of the Children's Bureau, U. S. Dept. of Labor, in 1921 was widely approved. In 1934 she resigned to be professor of public welfare in the University of Chicago.

Abbott, Jacob (1803-79), American clergyman and author of juvenile fiction, born in Hallowell, Me. He was graduated from Bowdoin College, studied theology at Andover, Mass., founded schools in Boston and New York City and then devoted himself to literary work. Of more than 200 volumes from his pen, the best known include the *Rollo Books* and the *Franconia Stories.*

Abbott, John Stevens Cabot (1805-77), American author, a younger brother of Jacob Abbott. He was born in Brunswick, Me., and was graduated from Bowdoin College in 1825. For a time he was a Congregational minister, but after 1844 he devoted himself to writing. Among his popular works are books on Napoleon Bonaparte, the French Revolution, George Washington and Kit Carson.

Abbott, Lyman (1835-1922), American clergyman and editor, son of Jacob Abbott. From 1888 to 1899 he was minister of Plymouth Congregational Church, Brooklyn, having succeeded Henry Ward Beecher. Abbott had been associated with Beecher in editing *The Christian Union* and became its editor in chief in 1881. In 1893 its name was changed to *The Outlook.* Among Abbott's many books are *The Life and Literature of the Ancient Hebrews, The Theology of an Evolutionist, Henry Ward Beecher, The Spirit of Democracy* and his *Reminiscences.*

Abdul-Hamid II (1842-1918), Sultan of Turkey (1876-1909). Two years after his accession he saw his country badly defeated by Russia and witnessed the loss of more than half of Turkey's European possessions. After a long period of misgovernment, intrigue and turmoil in Turkish affairs, during which he earned the name of *The Unspeakable Turk,* Abdul-Hamid was forced by the Young Turk party to grant a constitution and subsequently was deposed. Reshid Effendi succeeded him as Mohammed V.

Abel, Niels Henrik (1802-29), Norwegian mathematician, whose early death cut short a brilliant career. His work on elliptical functions is particularly celebrated. His complete mathematical works were published in 1881.

Abélard, Pierre (1079-1142), famous French scholar and theologian, born at Le Pallet, near Nantes. At the cathedral school of Notre Dame in Paris, at which he became lecturer in 1115, he was the instructor of many distinguished men. During this period he fell in love with Héloïse, the niece of Canon Fulbert, and the two were married secretly in Brittany. Shortly afterwards they were separated, Abélard becoming a monk and Héloïse a nun. The *Letters of Abélard and Héloïse* have been translated and published. The ashes of the lovers repose today in the same tomb in the cemetery of Père Lachaise, Paris. Abélard was an important figure in the history of scholastic philosophy and established the authority of Aristotle in medieval thought.

Abercrombie, James (1706-81), British soldier, born in Scotland. In 1758, during the French and Indian War, he was a general commanding British and colonial troops in America. Defeated by Montcalm in an attack on Ticonderoga, he was relieved of his command and returned to England in 1759. There he entered Parliament.

Abercromby, Sir Ralph (1734-1801), British general, born in Scotland. He served with much ability in Holland and the West Indies and was chosen to command the forces sent in 1800 against the French in Egypt, where he was killed.

About, Edmond François Valentin (1828-85), French novelist, journalist and miscellaneous writer. For several years he made the *XIX*^{e} *Siècle,* a newspaper of which he was editor, a force in national politics. Of his books, *Le roi des montagnes* (The King of the Mountains) is perhaps best known.

Abruzzi, Luigi Amadeo, Duke of the (1873-1933), Italian naval officer, explorer and mountain climber, born in Madrid, son of Amadeo, duke of Aosta. Abruzzi's exploits included the first ascent of Mt. St. Elias, Alaska (1897); the nearest approach to the North Pole up to 1899; the ascent of Mt. Ruwenzori, Africa (1906); and an attempt on Mt. Godwin-Austin in the Himalayas (1909). He had command of the Italian fleet in the World War and later undertook a colonization project in Italian Somaliland. Some of his books about his travels have been translated into English.

Acton, John Emerich Edward Dalberg, 1st Baron (1834-1902), English historian, born at Naples. Honored by many universities, he was appointed professor of modern history at Cambridge, where he planned the famous *Cambridge Modern History,* but died shortly after the first volume appeared. His lectures and articles were collected after his death and published in *Lectures on Modern History.* He was ranked among the most learned men of his time.

Adam, Robert (1728-92), Scottish architect and designer. The Adam style in designing furniture and buildings became famous and is being imitated to this day. Robert Adam was architect of the University of Edinburgh and designed many great mansions in England. His brother James was associated with him.

Adams, Abigail Smith (1744-1818), born in Weymouth, Mass., the daughter of William Smith, a Congregational minister. She married John Adams in 1764 and was the mother of John Quincy Adams. Her letters to her husband and friends, which have been collected and published, give a vivid picture of the customs and events of her day, for she had a keen, intelligent mind, a gift for shrewd observation and a ready pen. Mrs. Adams joined her husband in France in 1784 and later went with him to London, where he was the first minister of the United States and where they had unpleasant social experiences. She was the first mistress of the White House, which was barely completed in the closing months of her husband's administration.

Adams, Brooks (1848-1927), American historian, born at Quincy, Mass., son of Charles Francis Adams (1807-86). Graduated from Harvard in 1870, he practised law for a time but turned to writing history. His books include *The Law of Civilization and Decay, The New Empire,* and *The Emancipation of Massachusetts.*

Adams, Charles Francis (1807-86), American statesman, born in Boston, the son of John Quincy Adams. He was graduated from Harvard in 1825, studied law and afterwards became a writer, state legislator and a member of the House of Representatives and of the Senate. As minister to Great Britain (1861 to 1868) during the difficult period of the Civil War he was instrumental in helping to prevent England from recognizing and assisting the Confederacy.

Adams, Charles Francis, 2d (1835-1915), American historian and railway official, son of Charles Francis Adams. He was graduated from Harvard in 1856 and 2 years later was admitted to the Massachusetts bar. Serving as a cavalry officer during the Civil War, he rose to the rank of brigadier general; and after the war began his business career. In 1884-90 he was president of the Union Pacific Railway. Always taking an active interest in public affairs, he refused all nominations for political office. He wrote several volumes devoted to railroad problems and American history. His *Autobiography* is a notable work.

Adams, Charles Kendall (1835-1902), American educator and historian, born in Derby, Vt. After graduation from the University of Michigan he spent several years in teaching and study abroad, and in 1885 he succeeded Andrew D. White as president of Cornell University. From 1892 to 1902, he was president of the University of Wisconsin. He published *Christopher Columbus* and other works.

Adams, George Burton (1851-1925), American educator and historian, born at Fairfield, Vt. He was professor of history at Drury College (Springfield, Mo.) from 1877 to 1888 and at Yale from 1888 to 1925. He edited Duruy's *Middle Ages* and Bémont and Monod's *Medieval Europe.* His own works include *Civilization during the Middle Ages, The Growth of the French Nation, European History* and *The Constitutional History of England.*

Adams, Henry (1838-1918), American historian, son of Charles Francis Adams, grandson of John Quincy Adams, was graduated from Harvard in 1858. He was secretary to his father at the Court of St. James in England (1861-68) and at that time became deeply interested in political history. He was assistant professor of history at Harvard (1870-1877) and later began an intensive study of original documents in Washington, the outcome of which was his nine-volume *History of the United States from 1801 to 1817,* one of the most scholarly works of its kind. Among other writings, his *Mont Saint Michel and Chartres,* an interpretation of the medieval spirit, and *The Education of Henry Adams,* an autobiography of peculiarly individual charm, proved him a distinguished literary craftsman.

Adams, Henry Carter (1851-1921), American economist, born in Davenport, Ia. He was for many years a professor of political economy and finance at the University of Michigan. His monograph *The Relation of the State to Industrial Action* was the first important statement of the case for public regulation as against natural right. He also wrote *American Railway Accounting.*

Adams, John (1735-1826), 2d President of the United States, born in Braintree, later Quincy, Mass. His father, also named John, was a farmer of English ancestry, who emigrated to Massachusetts from Devonshire in 1636. His mother was Susanna Boylston. Graduated from Harvard College in 1755, he became a teacher, then studied law and was admitted to the bar in 1758. Adams was an advocate of American independence, used every opportunity to advance his view and was chosen one of three to present a memorial against the Stamp Act of 1765. He represented Massachusetts in the First and Second Continental Congresses, where he was among the most active leaders. It was Adams who was largely responsible for the selection of Washington as commander-in-chief in June, 1775; and a year later his speech in defense of Richard Henry Lee's resolution that "these colonies are, and of right ought to be, free and independent states" resulted in the Declaration of Independence. Adams was on the committee appointed to draft the Declaration of Independence and was instrumental in having it adopted.

For a decade after 1778 Adams spent most of his time in Europe, though during a brief period in America in 1780 he helped to frame the constitution of Massachusetts. He won general approval by securing a loan from Holland in 1782, as well as that nation's recognition of American independence. In the negotiation of the peace treaties with Great Britain, conducted in Paris in 1782-83, Adams, as one of the commissioners, was vigilant in furthering American interests. In 1785 he was appointed minister to Great Britain, a difficult position that he filled until 1788. The British Government was cold and evasive when he attempted to discuss treaty problems. On his return home, Adams was chosen first Vice-President of the United States. In 1792 he was re-elected and at the end of Washington's second term, 1796, was elected President. Jefferson, though of another party, became Vice-President.

In the election of 1800, Jefferson and Aaron Burr, the Republican candidates, were chosen President and Vice-President, and Adams retired to private life. Two years before his death occurred on July 4, 1826, the same day on which Jefferson died, he saw his son John Quincy Adams elected President. His writings, with a biography, were published in 10 volumes in 1850-56. They include, besides his letters, a *Defense of the Constitution of Government of the United States.*

Adams, John Couch (1819-92), British astronomer, born in Cornwall. He was graduated from Cambridge University in 1843, and in 1845, while he was tutoring in mathematics, he computed the position of a hypothetical planet to account for observed discrepancies in the motion of Uranus. At nearly the same time Urbain J. J. Leverrier, a French mathematician, communicated to the Berlin Academy the results of a similar mathematical analysis. The new planet Neptune was thereupon discovered by J. C. Galle within a degree of the computed position. Because no telescopic search was made in England on the basis of Adams's calculations, Leverrier received credit for the prior discovery, but the British Astronomical Society awarded equal honors to both. Adams also did important research on the moon's motions and on the great meteor shower of 1866. He was professor of astronomy and geometry at Cambridge from 1858 until his death.

Adams, John Quincy (1767-1848), 6th President of the United States, born in Quincy, Mass. (until 1792 a part of Braintree), the eldest son of John and Abigail Smith Adams. He received his early training when he accompanied his father to France and Holland. On returning to America he went to Harvard and after graduation in 1788 he studied law. In 1794, Washington appointed him minister to the Netherlands and he remained in Europe until 1801, studying, traveling and reporting to his father, who had become President.

When he returned home he was elected to the Massachusetts Senate and in 1803 he became a United States Senator but resigned because of differences with his constituents. He was appointed minister to Russia by President Madison, was one of the five commissioners who negotiated the Treaty of Ghent (concluding the War of 1812), and was minister to Great Britain from 1815 to 1817. Appointed Secretary of State by President Monroe in 1817, he was called upon to handle several matters of international importance, notably the negotiations that brought about the acquisition of Florida, the settlement of a fisheries dispute with Great Britain and the announcement of the Monroe Doctrine, which Adams himself, rather than the President, formulated.

So great was his prestige in 1824 that his candidacy for the Presidency was taken as a matter of course. There were four candidates—Adams, Andrew Jackson, Henry Clay and William H. Crawford. When none of these received a majority vote, the election passed to the House of Representatives. Clay threw his strength to Adams and the latter was elected. Adams appointed Clay Secretary of State, and this brought charges of a political bargain. Jackson and his followers were so embittered that little constructive legislation was passed. Adams had not built up a political machine; this factor, together with his unimpressive record as President, made his re-election impossible. The Presidency went to his rival, Andrew Jackson. Adams was the only President to take a public office of lesser dignity after leaving the White House. From 1831 until his death he served his state in the House of Representatives, tireless in his efforts to block the extension of slavery and made many speeches against the slaveholders. He was the author of a voluminous diary, covering 50 years of frank entries.

Adams, Maude (1872-), American actress, born in Salt Lake City, Utah. Her family name was Kiskadden. She played her first important role in *The Midnight Bell* at the age of 16. Her popularity dated from the presentation of Barrie's *The Little Minister* (1897-98), in which, as Lady Babbie, she captivated her audiences. Other important plays included *L'Aiglon*, *Quality Street*, *Peter Pan* (a great success), *What Every Woman Knows*, *Chantecler*, *The Legend of Leonora* and *The Jesters.* After some years of retirement, she appeared in 1931 as Portia in *The Merchant of Venice* with Otis Skinner as Shylock.

Adams, Samuel (1722-1803), American statesman, born in Boston, Mass. He was a delegate to the Continental Congress in 1774-81, signed the Declaration of Independence, took an active part in framing the constitution of Massachusetts, and was governor of that state from 1794 to 1797. One of the leaders of the Revolution, Adams was particularly known for his incisive newspaper articles and other writings urging separation from Great Britain. In the proceedings of the Congress he had a marked influence.

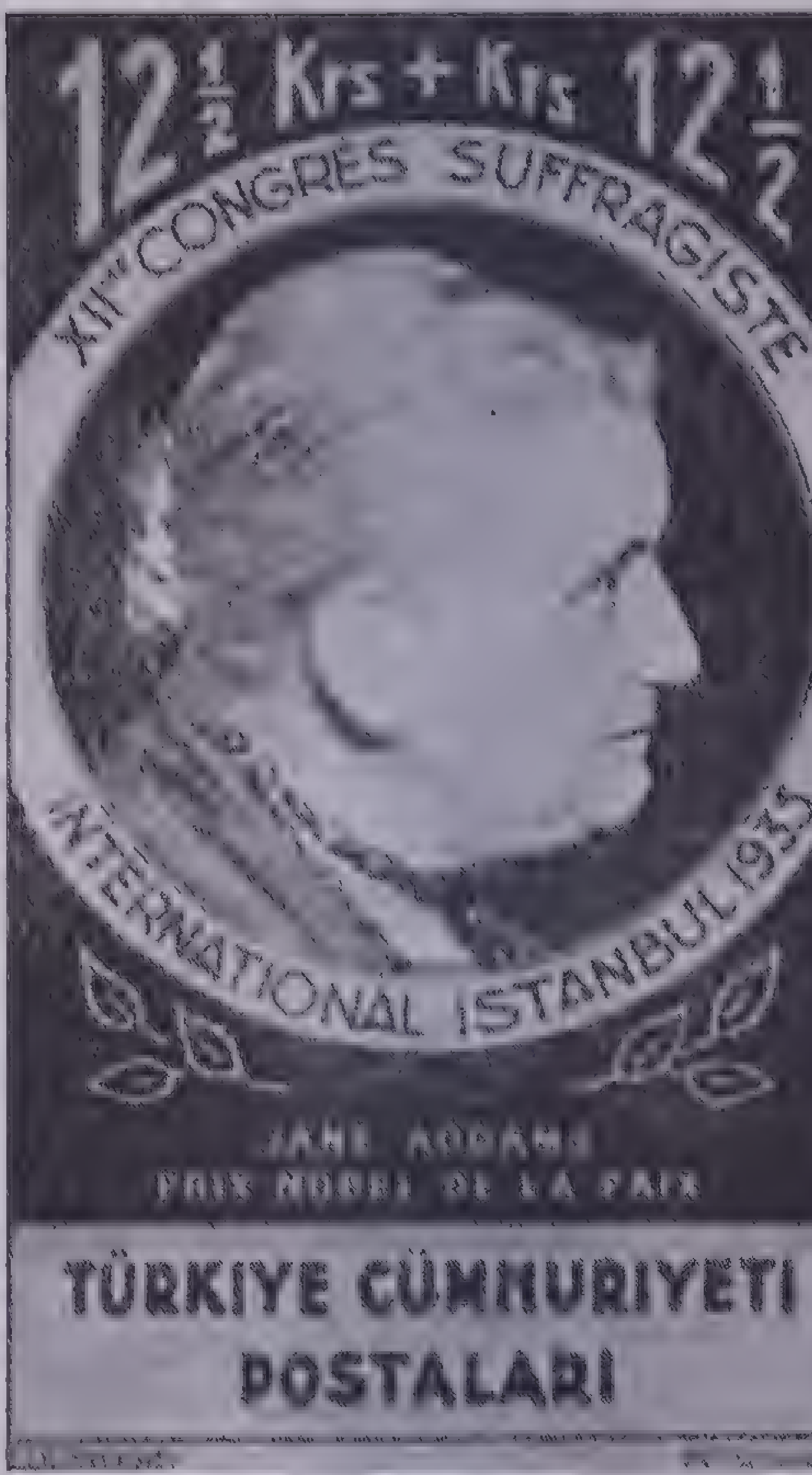
Adams, William Taylor, see *Optic, Oliver.*

Addams, Jane (1860-1935), American leader in social-settlement work. Born in Cedarville, Ill., she was graduated from Rockford College in 1881. For more than four decades she presided over the settlement called Hull House (Chicago), which, with Ellen Gates Starr, she opened in 1889 and which became a model for similar enterprises. She was prominent in movements for social reform, woman suffrage and international peace. In 1931 Miss Addams shared in the award of the Nobel peace prize. Her career in social work is vividly pictured in her *Twenty Years at Hull House* and its sequel, *The Second Twenty Years at Hull House.* Other works include *The Spirit of Youth and the City Streets*, *Democracy and Social Ethics* and *A New Conscience and an Ancient Evil.*

Addison, Joseph (1672-1719), English essayist, poet and dramatist and one of the important figures in the literature of his country. He was born in Milston, Wiltshire, and studied at Charterhouse School and at Oxford, where he became known as a skillful writer of Latin verse. Having won official favor by writing *The Campaign*, a poem celebrating Marlborough's victory at Blenheim, Addison received a government appointment. His contributions to the *Tatler*, the *Spectator* and the *Guardian* remain classics. Especially is this true of the Sir Roger de Coverley papers in the *Spectator.* Their easy, graceful style led Dr. Samuel Johnson to declare that whoever wished to attain an English style must "give his days and nights to the volumes of Addison." Addison also wrote the tragedy *Cato*, a highly artificial work much esteemed in his own day.

Ade, George (1866-), American humorist, born in Kentland, Ind. He was graduated from Purdue University and took up newspaper work. His early sketches, especially those in the Chicago *News* (1890-1900), were widely read because of their shrewd, witty comments on everyday life. Especially famous were his *Fables in Slang*, in American vernacular. He also wrote a number of successful musical comedies, including *The Sultan of Sulu* and *Peggy from Paris*, and such humorous plays as *The County Chairman*, *The College Widow*, *The Fair Co-ed* and *Just Out of College.*

Adler, Alfred (1870-1937), Austrian psychologist and psychiatrist, born in Vienna. He studied medicine and psychoanalysis but in 1911 broke away from his teacher, Sigmund Freud, to found his own system. His books include *The Practice of Individual Psychology* and *The Science of Living.*



Courtesy Scott Stamp & Coin Company

Jane Addams

Enlarged from a Turkish postage stamp issued in 1935 when the 12th Congress of the Women's International Alliance met at Istanbul, the year after Turkish women received the suffrage. Other outstanding women whose portraits appear in this series are Carrie Chapman Catt, Grazia Deledda, Selma Lagerlöf, Bertha von Suttner, Sigrid Undset and Marie Curie

Adler, Cyrus (1863-1940), American orientalist and archeologist, born at Van Buren, Ark. He was graduated from University of Pennsylvania and received a doctor's degree from Johns Hopkins, where he taught Semitic languages. For a number of years he was librarian and then secretary of the Smithsonian Institution. He founded the Jewish Historical Society of America, and in 1924 was appointed president of the Jewish Theological Seminary. He wrote many articles on Semitic philology, Oriental archaeology, comparative religion, the history of American Jewry and other subjects.

Adler, Felix (1851-1933), American educator, founder of the Society for Ethical Culture. He was born in Alzey, Germany, and brought to America in 1857. In 1870 he was graduated from Columbia University. After further studies at Berlin and Heidelberg, he was professor of Hebrew and Oriental literature at Cornell University in 1874-76. In 1876 he established in New York city the Society for Ethical Culture for those who desired spiritual fellowship outside the orthodox churches. This organization had considerable influence on educational methods and in social reforms. Adler became professor of social and political ethics at Columbia University in 1902 and for more than a quarter-century was chairman of the National Child Labor Committee. Among his books are *An Ethical Philosophy of Life*, *Incompatibility in Marriage* and *The Reconstruction of the Spiritual Ideal.*

Adrian IV (*c.* 1100-59), the only English pope, born at Langley, near St. Albans. His name was Nicholas Breakspear. Successively abbot of St. Rufus (near Arles) and cardinal-bishop of Albano, he was elected pope in 1154. During his tenure, Ireland came under the rule of England. Henry II asked permission to conquer Ireland, but whether or not the Pope invested him with right is disputed by historians.

Aeschines (389-314 B.C.), Athenian orator, second only to Demosthenes, whose rival he was. When Ctesiphon suggested that the state award a golden crown to Demosthenes, Aeschines denounced the proposal as unlawful. Demosthenes, eloquently defending

Ctesiphon with his speech *On the Crown,* won the victory. Aeschines then retired to Rhodes, where he is said to have established a school of oratory.

AESCHYLUS (525-456 B.C.), Athenian poet, the earliest of the three great tragic poets of Greece. He was born at Eleusis in Attica and before he gained distinction as a dramatist had highly distinguished himself at the battle of Marathon (490 B.C.), as he afterwards did at Salamis. He first gained the prize for tragedy in 484 B.C. *The Persians,* earliest of his extant pieces, formed part of a trilogy which gained the prize in 472 B.C. In 468 B.C. he was defeated by Sophocles and then is said to have gone to the court of Hiero, king of Syracuse. Altogether he composed seventy tragedies and gained thirteen triumphs; only seven of his tragedies are extant: *The Persians, Seven against Thebes, The Suppliants, Prometheus, Agamemnon, Choephoroe* and *Eumenides,* the last three forming a trilogy on the story of Orestes.

Aeschylus may be called the creator of Greek tragedy, on account both of the splendor of his poetry and of the improvements he introduced. Until his time only one actor had appeared on the stage at a time, and by bringing on a second he was really the founder of dramatic dialogue. His style was noble, daring and full of energy, though sometimes rugged. His plays have but little plot and his characters are drawn by a few powerful strokes.

Aesop (*c.* 560 B.C.), story-teller, supposedly Greek, the originator of *Aesop's Fables.* Nothing is known of his life, but it is thought that he was born a slave about 620 B.C., received his freedom and attached himself to the court of Croesus, king of Lydia. There is a tradition that he was ugly and deformed. No works of Aesop have been found, and it is supposed that the fables may have been spoken by him and then spread by repetition. Such fables are mentioned by Aristophanes and Plato. Babrius about 40 A.D. put Aesop's fables into Greek verse, and soon afterwards Phaedrus translated them into Latin. In 1938 the U. S. Board of Education issued an edition of the fables for classroom use to teach English to adult aliens. Many of these foreigners know the fables as folklore in their native countries.

Aëtius (*c.* 396-454), a Roman general. He fought successfully against the Franks and in Gaul, but his greatest victory was that over Attila the Hun at Châlons-sur-Marne in 451. Three years later the Emperor Valentinian III, jealous of his greatness, stabbed him to death.

Aga Khan III (Aga Sultan Sir Mahomed Shah; 1875-), leader of Ismaelian Moslems. He was born in Bombay, India, a grandson of the ruling house of Persia. He has many millions of religious followers in Central Asia and East Africa and is president of the Moslem League of India. His famous racehorses won the English Derby in 1935 and 1936. He wrote *India in Transition.*

Agassiz, Alexander (1835-1910), scientist and author, only son of L. J. R. Agassiz, born in Switzerland. He was graduated from Harvard in 1855, from the Lawrence Scientific School in 1857 and became an assistant in the U. S. Coast Survey. Later he was assistant in the Zoological Museum at Harvard (1860-65). By developing the Calumet and Hecla copper mines of Michigan he acquired wealth of which he gave generously to Harvard and other institutions. Agassiz is one of the foremost authorities on marine zoology and wrote *North American Starfishes* and other studies.

Agassiz, Louis John Rudolph (1807-73), Swiss-American naturalist, born in Motier, Switzerland. Beginning the study of medicine at Zürich, he continued at Heidelberg and Munich universities. Eventually, however, he became interested in general scientific research, especially in connection with fossil fishes and was made professor of natural history at the University of Neuchâtel (1832-46). There he wrote a 5-volume treatise, *Recherches sur les poissons fossiles.* From 1835 to 1845 he made regular summer investigations of the Alpine glaciers and in 1846 came to the United States to lecture for the Lowell Institute of Boston. In 1848 Agassiz was appointed professor of natural history at Harvard. The famous Museum of Comparative Zoölogy at Harvard was founded by him. He was an inspiring teacher. His summer school on Penikese Island in Buzzard's Bay had great influence on the teaching of science from nature and led to the establishment of biological stations. Other works of his are *Fresh Water Fishes of Central Europe* and *Contributions to the Natural History of the United States* (4 vols.).

Agesilaus II (*c.* 444-360 B.C.), King of Sparta, who ruled from about 401 B.C. to his death and was the brilliant defender of his country against the other Grecian states. His victory at Coronea in Boeotia (394 B.C.) forced the allies to make a peace treaty favorable to Sparta, and he saved his country from disaster when the Spartans met defeat at Leuctra in 371 B.C.

Agricola, Gnaeus Julius (37-93), Roman governor and general, born in Forum Julii (now Fréjus, in Provence, France). The island of Britain was completely subjugated by the Romans for the first time while he was its governor (78-84), and he conquered the Caledonians, warlike inhabitants of Scotland. A line of forts between the firths of Forth and the Clyde was built by Agricola. His son-in-law, Tacitus, wrote a remarkable biographical sketch of him.

Agrippa, Marcus Vipsanius (63-12 B.C.), Roman general and statesman of the period of Augustus. As naval commander at the Battle of Actium (31 B.C.), Agrippa defeated Antony and Cleopatra and thus helped to establish Octavian (Augustus) as sole ruler of the Roman world. When he was aedile he did much to improve and beautify Rome. The Pantheon (now known as La Rotonda) is supposed to have been built by him to commemorate the victory at Actium.

Agrippina II or *The Younger* (*c.* 15-60), infamous mother of the Roman emperor Nero. She was the great-granddaughter of Augustus. After the death of her second husband, Passienus Crispus, she persuaded the Emperor Claudius to marry her, though he was her uncle. Through intrigue and the influence she exerted over her weak husband, Agrippina contrived to have her son Nero proclaimed heir to the throne. In 54 she poisoned Claudius, and after Nero became emperor, attempted to rule through him. Her son, preferring to be his own master, had her murdered.

Aguinaldo, Emilio (*c.* 1870), Filipino leader. He was born in the island of Luzon and educated at St. Thomas University in Manila. In the rebellion of 1896 against Spain, he was an important though unsuccessful leader. When the Americans finally overcame the Spanish in 1898, he organized another insurrection, this time for Philippine independence. He was several times defeated and fled to the mountains, where he was captured by General Funston. In 1901 Aguinaldo took the oath of allegiance to the United States.

Aiken, Conrad (1889-), American poet. He was born in Savannah, Ga., was graduated from Harvard in 1912, and thereafter devoted himself wholly to writing. After 1930 he lived in England. Aiken's work consists of lyric and narrative poems and short stories. His *Selected Poems* won the Pulitzer Prize in 1930. Two volumes of his short stories were published and two novels, *Blue Voyage* and *Great Circle.*

Ainsworth, William Harrison (1805-82), English novelist. He was born at Manchester, studied law, but soon turned to novel-writing. His earliest success was *Rookwood,* with its vivid description of Dick Turpin's ride to York. By 1881 he had published about forty historical novels. Some of them were illustrated by Cruikshank.

Airy, Sir George Biddell (1801-92), English mathematician, astronomer, physicist and engineer, born at Alnwick. He was graduated from Trinity College, Cambridge, in 1823 and soon after published his *Mathematical Tracts* on the lunar theory and other subjects. As astronomer-royal at Greenwich he introduced many improvements and carried on investigations in the lunar theory, the magnetism of iron ships, the density of the earth and a great variety of other subjects.

Akbar, called *the Great* (1542-1605), Mogul emperor of India who began to rule in 1560. He built roads, established a uniform system of weights and measures, introduced legal and social reforms, encouraged art and education and was tolerant toward all religions. During his reign the empire was extended to include all of Hindustan north of the Deccan.

Akeley, Carl Ethan (1864-1926), American explorer, naturalist, author and sculptor, born in Orleans County, N.Y. From 1895 to 1909 he was associated with the Field Museum of Natural History in Chicago. It was on a tour of Africa in search of big game for the American Museum of Natural History that Akeley died. He was a sculptor and taxidermist of great ability, as his bronzes and his habitat groupings in American museums bear witness. In addition, he invented a cement-gun and a motion-picture camera for use by naturalists.

à Kempis, Thomas, see *Thomas à Kempis.*

Akenside, Mark (1721-70), English poet. He wrote *The Pleasures of Imagination,* a didactic poem once widely popular, odes and inscriptions.

Alarcón, Juan Ruiz de (*c.* 1588-1639), Spanish dramatist. He was born in Mexico, was educated in Spain, and in 1628 and 1634 published collections of his plays. *El Tejador de Segovia* (The Weaver of Segovia) has been considered his best work.

Alaric I (*c.* 376-410), King of the Visigoths (West Goths). After his invasion of Greece (395-396), he was appointed prefect of Illyricum by Arcadius, emperor of the East. Emboldened, he invaded northern Italy (probably in 400), causing the frightened Emperor Honorius to flee from Rome. Later, having been checked by Stilicho, the Roman general, Alaric entered into an agreement with Honorius by which he was to receive 4,000 pounds of gold (about $800,000). The emperor failed to keep his promise and Alaric besieged Rome three times. The last time, in 410, his soldiers plundered the city for three days, though they spared the Christian churches. Their chieftain died while making plans to invade Sicily and Africa.

Albani, Francesco (1578-1660), Italian painter, born in Bologna. There and in Rome he was associated with the Caracci, founders of the Eclectic school of painting. Albani painted mythological and sacred subjects. His best pictures show delicacy of coloring and graceful composition.

Albani, Madame (1852-1930), stage name of Marie Louise Emma Cécile Lajeunesse, Canadian dramatic soprano. She was born in Chambly, Quebec, studied with Lamperti in Milan and made her debut (1870) in Messina, Sicily, in the opera *La Sonnambula.* She sang Wagnerian and other standard roles in the leading American and European cities and in 1925 was made Dame of the British Empire. She wrote her reminiscences, *Forty Years of Song.* In private life she was Mrs. Ernest Gye.

Albeniz, Isaac (1860-1909), Spanish pianist and composer, born in Catalonia. He made concert tours of Europe and the United States, gaining fame as a brilliant pianist. His pianoforte compositions, notably the suite *Iberia,* have been much admired.

Albert I (1875-1934), King of the Belgians. The son of Philip, Count of Flanders, he was born in Brussels. His formal education was supplemented by extensive travel, and in 1898 he made a study of American railways. In 1900 he married Elizabeth, duchess of Bavaria, and in 1909 became king. Both the king and the queen won the admiration of the world by their devotion to their country during the World War. In February 1934, while he was mountain-climbing near Namur, Albert fell to his death. His eldest son ascended the throne as Leopold III. Albert's other children are Charles Théodore and Marie José, wife of Prince Humbert of Italy.

Albert, Prince (1819-61), consort of Queen Victoria of England. He was a son of the hereditary duke of Saxe-Coburg-Gotha and was born at Rosenau, Germany. In 1840 he was married to Victoria, and in 1857 the formal title Prince Consort was conferred upon him. He was a man of culture and progressive ideas. The married life of the royal couple was very happy, and Victoria owed much of her success to the good judgment, prudence and foresight of her husband. He was not, however, popular with the English, who complained that he interfered in national politics.

Alberti, Leon Battista (1404-72), Italian architect and humanist, born at Florence. He was much employed by Pope Nicholas V. He built the Rucellai Palace at Florence, and designed the church of San Francesco at Rimini. His *De Re Aedificatoria* (On Building) was translated into Italian, Spanish, French and English.

Albertus Magnus (c. 1193–1280), medieval scholastic, called *doctor universalis.* He was born at Lauingen in Suabia, and, having entered the newly-founded Dominican order, taught in the schools of Hildesheim, Regensburg and Cologne and at the University of Paris. His most distinguished pupil was Thomas Aquinas. He did much to promote the study of the scientific works of Aristotle.

Albuquerque, de, Alfonso (1453–1515), Portuguese admiral. His career was extremely successful. He extended the Portuguese power over Malabar, Ormuz and the peninsula of Malacca and made the Portuguese name respected by all the nations and princes of India.

Alcaeus (620-580 B.C.), Greek lyric poet, born in Mitylene, Isle of Lesbos. He wrote hymns, love songs, drinking songs and political odes, of which only fragments remain. Alcaeus invented a form of stanza called, in his honor, the *Alcaic*. It was successfully used also by Horace, the Latin poet.

Alcibiades (*c.* 450-404 B.C.), Athenian general. Handsome and talented, he was for a time a pupil of Socrates, by whose virtues he seems to have been little influenced. He was able but thoroughly unprincipled. His career as a soldier began and ended with the Peloponnesian War (431-404 B.C.) between Athens and Sparta. Chosen to lead an expedition against Syracuse, in Sicily (415 B.C.), he was accused of the strange mutilation of all the Hermae (busts of Hermes) in Athens. He escaped to Sparta, where he began to plot against Athens. Learning of a Spartan intrigue to have him assassinated, he fled to Asia Minor, where he allied himself with Tissaphernes, a Persian governor. Eventually, in 407 B.C., he was permitted to return to Athens. Alcibiades won several victories over the Persians and Spartans, but after the final defeat of Athens at Aegospotamos, in 405 B.C., he fled to Phrygia, and there he was murdered.

Alcock, Sir John William (1892-1919), English aviator. He was born in Manchester, gained his aviation certificate in 1912 and with the outbreak of the World War in 1914 became an instructor of the Royal Naval Air Force. During the war he performed many exploits. In 1919 he left the Air Force and with Lieut. Arthur Whitten Brown made aviation history by flying from St. John's, Newfoundland, to Clifden, Ireland, in 16 hours, 12 minutes, the first transatlantic flight.

Alcott, Amos Bronson (1799-1888), American educator and author, born in Wolcott, Conn. After working in a clock factory and peddling books he became a teacher. From 1828 to 1833 he directed schools in Boston, Germantown and Philadelphia; and in 1834 he established in Boston a school on a new plan. It was far in advance of its time, and although it demonstrated the value of his methods it was misunderstood and misrepresented. He closed it in 1839 and was the moving spirit in the communal experiment at "Fruitlands" in Harvard, Mass., from 1842 to 1844. After that he lived in Concord, Mass., whence he traveled here and there to deliver lyceum addresses or to hold with special groups his "conversations" on a variety of topics. He was in a general way an exponent of that American transcendentalism that found in Emerson its literary spokesman. In his later years a Summer School of Philosophy and Literature met for a number of seasons in a building near his house, and he was regarded as its dean. His published writings include *Orphic Sayings*, contributed to *The Dial* (1840), *Tablets, Concord Days, Table-talk, Sonnets and Canzonets, Ralph Waldo Emerson, His Character and Genius.*

Alcott, Louisa May (1833-88), American author. She was born in Germantown, Pa., daughter of A. B. Alcott and lived in Concord, Mass., in "Orchard House," which is pictured in her best-loved book, *Little Women* (1868–69), and has been preserved as a memorial of the writer. *Hospital Sketches* was inspired by her experiences as a volunteer nurse during the Civil War. Miss Alcott was at her best in juvenile stories, and these books are still loved and read. They include, besides *Little Women, Little Men, Jo's Boys, An Old-Fashioned Girl, Under the Lilacs, Eight Cousins, Rose in Bloom* and *Jack and Jill*. *Little Women*, no doubt the most popular girls' book ever written in English, was successfully dramatized and a motion picture was based on it.

Alcuin (735-804), called *Albinus Flaccus*, English scholar. He was educated at York in the archbishop's school, of which he became principal. From 781 to 790 he was in residence at Charlemagne's court at Aachen, where he directed the academy of the palace. In 796 he was made abbot of St. Martin's at Tours, whose school had high repute. He left, besides poems and letters, extensive writings on theology, philosophy, philology, rhetoric and mathematics.

Alda, Frances (1883-), stage name of Frances Davis, operatic soprano. She was born in New Zealand and after studying in Paris made her debut at the Opéra Comique (1904). Four years later she joined the Metropolitan Opera Company (New York) and thereafter she made her home in the U. S. In 1910 she was married to Giulio Gatti-Casazza, impresario of the Metropolitan.

Alden, Isabella Macdonald (1841-1930), American author of juvenile and religious books. She was born in Rochester, N. Y., served for years on the editorial staff of the *Christian Endeavor World*, and under the name "Pansy" wrote a series of books for young people.

Alden, John (1599-1687), a Pilgrim and one of the founders of Plymouth colony. He is best remembered as the hero of Longfellow's poem *The Courtship of Miles Standish*, the story of which is, however, only legendary. Alden was born in England, came to America on the *Mayflower* in 1620 and was a signer of the *Mayflower Compact*. He settled at Duxbury, Mass., married Priscilla Mullens and had a long and honored record as a magistrate in the colony, which he served as governor's assistant and deputy governor.

Aldrich, Nelson Wilmarth (1841-1915), American politician. He was born in Foster, R. I., entered local politics, was elected to Congress in 1878 and was a member of the Senate from 1881 to 1911. His name is associated with tariff and currency legislation. He was co-author of the Payne-Aldrich tariff bill of 1909 and chairman of a monetary commission that published recommendations for changes in the U. S. banking system that led to the Federal Reserve Bank.

Aldrich, Thomas Bailey (1836-1907), American author and editor. He was born in Portsmouth, N. H., served on the editorial staff of various periodicals and in 1881 succeeded W. D. Howells as editor of the *Atlantic Monthly*. In 1890 he resigned to devote himself to writing and travel. Aldrich is perhaps best known as the author of *The Story of a Bad Boy*, a tale of his own boyhood that became something of a classic. His graceful and finished poetry was published in a series of collected editions. His fiction includes *Marjorie Daw and Other People, Prudence Palfrey* and *The Stillwater Tragedy*.

Alexander I (1777-1825), Czar of Russia (1801-25), son of Paul I and grandson of Catherine the Great. Alexander began his reign with a show of liberal ideas. He encouraged literature, established a council and began to codify the laws. Later he became more conservative and was influenced by the reactionary Metternich of Austria. With the rulers of Austria and Prussia, Alexander in 1815 formed the league known as the Holy Alliance. He was temporarily an ally of Napoleon but it was during his reign that Napoleon's Grand Army was destroyed (1812) when invading Russia.

Alexander I (1888–1934), first King of Yugoslavia, son of Peter I of Serbia. He was born at Cettinje. Proclaimed Prince Regent in 1914, when his father's health failed, Alexander was in chief command of the Serbian army in the World War. In 1918 he was recognized as regent of the kingdom of the Serbs, Croats and Slovenes. His father died in 1921 and Alexander took the oath under the new constitution, becoming King Alexander I. Because of disorders arising from the Croatian autonomy movement, he proclaimed a military dictatorship. In 1929 he changed the official name of the kingdom to Yugoslavia and in 1931 proclaimed a new constitution. Several attempts were made on his life, and finally, while he was on a state mission to France, he was murdered by a Croat nationalist.

Alexander II (1818–81), Czar of Russia, son of Nicholas I. He came to the throne in 1855, in the midst of the Crimean War. After the humiliating peace of 1856, the emperor gave his attention to internal reforms and began the emancipation of the serfs. Completed in 1861, this was the outstanding achievement of his reign. Later in his reign Alexander adopted a reactionary policy. He was assassinated by Nihilists in 1881.

ALEXANDER III or THE GREAT (356-323 B.C.), conqueror, King of Macedon, son of Philip II. As a youth Alexander displayed uncommon ability. Aristotle was for a time his preceptor. In 338 B.C. he fought at Chaeronea. Philip was assassinated in 336, and Alexander had scarcely taken the throne when he was called upon to crush a revolt among Balkan tribes, then to quell an uprising of the Thebans, who hoped to throw off the Macedonian yoke. The city of Thebes was razed; only the temples and the house of Pindar were spared. Alexander now planned the conquest of Persia. In 334 B.C. he crossed the Hellespont with an army of between 30,000 and 40,000, and at the river Granicus defeated an immense force of Persians. The following year, at Issus, he overcame an even greater army under Darius III. He next moved against Phœnicia. Tyre resisted for 7 months, Gaza for 2, and then the conqueror, having occupied Syria and Palestine, moved on to Egypt, where he was hailed as a god. In 332 B.C. he founded Alexandria, which has been considered his greatest monument.

Alexander again turned his attention to Darius. He crossed the Tigris and in the battle of Arbela (331 B.C.) shattered the Persian army. Darius fled into Media, while the victor captured Babylon, Susa and Persepolis (where he burned the royal palace) and pressed on to Ecbatana, the Median capital. The fugitive Darius was killed by his cousin Bessus, who declared himself king. Alexander followed Bessus across the Oxus, captured and executed him and was then supreme ruler of the region from the Adriatic to India.

In 327 B.C. he began his campaign to invade India, then scarcely known even by name. A year's marching and fighting brought the army to the Punjab, but his weary and discontented soldiers refused to go on. Alexander then turned southward, following the Indus River to the Indian Ocean. He was trying to find a water route between the East and the West and for this purpose sent his fleet under Nearchus. This admiral sailed westward through the Persian Gulf, while Alexander led the army overland. The two met in southern Persia in 324 B.C., Alexander receiving with great joy the news of the successful expedition.

The organization of the great empire he had won was Alexander's next project, and to this end he sought a fusion of races and customs. He himself married Roxana, a Bactrian princess. Thousands of his soldiers married Orientals. Babylon was to be the capital of a world-empire and was to be developed as a great port. The conquest of Arabia was essential to the fulfillment of this design. In 323 B.C. Alexander was engaged in extensive plans for the future when he suddenly became sick after a banquet at Babylon and in a few days died, in his 33d year.

The great empire of Alexander was divided among his chief generals, and Greek kingdoms under these generals and their successors continued for centuries. The career of Alexander was not simply a series of conquests but constitutes an important period in the history of humanity. A road was opened to India, where even today he is a figure of tradition; valuable scientific material was supplied to Aristotle; the language and much of the civilization of Greece was spread through immense areas, thus inaugurating what we know as Hellenistic culture.

Alexander III (1845-94), Czar of Russia, son of Alexander II, whom he succeeded in 1881. He vigorously repressed the Nihilists and was a stern persecutor of the Jews and other dissenters. All liberal thought he stubbornly opposed. The financial condition of the country improved under his management, and he strengthened the empire in Asia. He was succeeded in 1894 by his son Nicholas II, the last of the czars.

Alexander, Grover Cleveland (1887-), American baseball player. Alexander pitched more games (696) than any other player for the National League and also won more (373). He spent 20 years in the major leagues and pitched 90 shutout games, including 16 in 1 year (1916). Alexander was elected to the Baseball Hall of Fame in 1937.

Alexander, John White (1856-1915), American painter, born at Allegheny, Pa. At the age of 18 he joined the art staff of *Harper's Magazine*, on which he was associated with Abbey, Pennell and Pyle. He later studied in Europe. White painted some excellent murals, including the well-known *Evolution of the Book* in the Library of Congress at Washington. Among his other works are *The Pot of Basil* (Boston Museum of Fine Arts) and portraits of Grover Cleveland, Joseph Jefferson and Robert Louis Stevenson.

Alexander Nevski (1220-63), Russian hero and saint of the Russian Orthodox Church, born in Vladimir. In the absence of his father, Prince Yaroslav of Novgorod, Alexander fought bravely to keep out the Danes, Swedes and Teutonic Knights and received his surname Nevski in recognition of his victory over the Swedes on the Neva river (1240). In 1252 he was made grand-duke of Vladimir. His feast day is August 30.

Alexander Severus (*c.* 208-235), Roman Emperor, adopted son of Heliogabalus, whom he succeeded in 222. The loftiness of his personal character was not matched by administrative ability, and he was unable to enforce military discipline. In 235, while he was leading a campaign against the Germans in Gaul, he was killed by order of Maximinus, a legionary who succeeded to the throne.

Alexius I Comnenus, (*c.* 1048-1118), Byzantine emperor (1081-1118) born in Constantinople. In 1081 he deposed his predecessor, Nicephorus III, who sought refuge in a monastery. Alexius bravely defended his empire against Normans and Turks and dealt with the warriors of the First Crusade by persuading them to go on to Asia Minor.

Alfieri, Vittorio, Count (1749-1803), Italian dramatic poet, born in Asti, Piedmont. He began to do serious work at the age of 25 and wrote 19 tragedies, several comedies, lyric verse (including odes on American independence) and an autobiography. He wrote in the classic Tuscan dialect. His patriotic ardor helped to arouse a desire for Italian national unity. *Saul* and *Maria Stuarda* are among his best-known works, most of which have been translated into English.

Alfonso V (*c.* 1396-1458), King of Aragon, Naples and Sicily (1416-58). He received the surname of *The Magnanimous*. His patronage of art and letters made him a notable figure of the Renaissance.

Alfonso X (1221-84), called *The Wise* (*El Sabio*), King of Castile and León, son of Ferdinand III. He was a most learned prince and labored to provide for his kingdom a code of laws and a judicial system. Astronomy and other branches of learning were encouraged by him.

Alfonso XII (1856-85), King of Spain, son of Isabella II. In 1870 his mother abdicated in his favor and in 1874 he proclaimed himself monarch of Spain. He suppressed the Carlist revolutionaries, followers of the pretender Don Carlos, established order and stabilized finances.

Alfonso XIII (1886–1941), King of Spain (1886-1931), posthumous son of Alfonso XII. His mother, Queen Maria Cristina of Hapsburg, acted as regent until 1902. In 1906 Alfonso married Princess Victoria Eugénie of Battenberg, granddaughter of Queen Victoria of England. During the World War, neutral Spain and Alfonso did splendid work on behalf of prisoners. In 1921 the king denounced the government and gave his support to a military dictatorship, headed by Primo de Rivera and himself. The economic crisis of 1929, Rivera's downfall in 1930 and the huge vote for a republic in the election of 1931 were forces which sent Alfonso into exile (April 14). He refused to abdicate formally. His property was confiscated and subsequently he lived chiefly in France.

ALFRED THE GREAT (*c.* 849–901), English king, King of the West Saxons and overlord of several other English kingdoms, born in Wantage. Alfred's elder brother Ethelred ascended the throne in 866 during a period of Danish invasions, and Alfred succeeded Ethelred in 871. In 876 a new invasion of Wessex was begun by the Danes, who had already made themselves masters of the eastern and southern coasts and of Northumbria and Northern Mercia.

Alfred was forced to retire in 878 to the Isle of Athelney and here reorganized his forces. After a few weeks he defeated the Danes at Ethandune (supposedly the modern Edington, in Wiltshire), and peace was concluded at Wedmore between Alfred and Guthrum, the Danish king. This great victory did not end the trouble. Other invasions followed at intervals, but in 896 Alfred decisively defeated his foes.

Alfred's organizing ability and his shrewdness in building fighting ships made him the hero of the country and paved the way for the consolidation of the petty kingdoms into one united realm. He divided the country into efficient administrative districts, codified and simplified the existing laws, and though he did not, as has been claimed, institute trial by jury, he did make justice for rich and for poor the rule in the kingdom. He established a court school to which he invited the best scholars of the time, translated into the language of the people such Latin works as Bede's *Ecclesiastical History* and probably ordered the compilation of the *Saxon Chronicle*, that valuable source of early English history. Alfred is a beloved figure not only of English history but in legend as well.

Algardi, Alessandro (1602-54), Italian architect and sculptor, born in Bologna. His best sculpture, *Retreat of Attila*, in St. Peter's, is a bas-relief over the altar of St. Leo. He ranks among the leading artists of his time.

Alger, Horatio (1832-99), American author of books for boys. He was born in Revere, Mass., was graduated from Harvard in 1852 and was for a time a Unitarian preacher. From 1866 he wrote more than a hundred volumes, mainly juvenile fiction. He enjoyed in his day a phenomenal popularity with stories such as *Ragged Dick* and *Tattered Tom*, about poor boys who became rich and famous.

Alger, Russell Alexander (1836-1907), American soldier and public official, born in Lafayette, Ohio. He was admitted to the bar in 1859, became colonel of a Michigan cavalry regiment in the Civil War and was brevetted to major general of volunteers. Alger was governor of Michigan in 1885-87, secretary of war in 1897-99, and United States senator from 1902 until his death. He was severely criticized for his conduct of the War Department, but defended himself in his book *The Spanish-American War*.

Alison, Sir Archibald (1792-1867), British historian, born at Kenley (Shropshire). He occupied prominent legal positions and was a writer on law, politics and literature. His *History of Europe* (10 vols.), covering the period from the beginning of the French Revolution to the return of the Bourbons, was once exceedingly popular.

Allegri, Gregorio (*c.* 1580-1652), Italian musical composer, born at Rome. He studied with Nanini, friend of Palestrina, and from 1629 until his death was a member of the choir of the Sistine chapel. His famous *Miserere*, sung there annually during Holy Week, was long kept unpublished, but in 1769 the boy Mozart wrote it down from memory after a single hearing.

Allen, Ethan (1737-89), American Revolutionary soldier, leader of the *Green Mountain Boys*, born in Litchfield, Conn. He is remembered chiefly for his surprise capture of Fort Ticonderoga in 1775 and for his command (according to his own account) to surrender "in the name of the great Jehovah and the Continental Congress." He was a prisoner-of-war in Canada from 1775 to 1778 and after his exchange became brigadier-general of Vermont militia. Allen opened negotiations with Haldimand, commander of the British forces in Canada, but with what intent is not certainly known. He was one of the picturesque figures of the Revolution.

Allen, Florence Ellingwood (1884-), American jurist, the first woman to become a state supreme-court judge and a Federal judge. A native of Salt Lake City and graduate of Western Reserve University, Judge Allen studied law at the University of Chicago and New York University and began practice in Cleveland, Ohio, in 1914. Before her elevation to the Ohio Supreme Court in 1923, she was in turn assistant county prosecutor and judge of the court of common pleas. In 1934 Miss Allen was appointed a judge of the U. S. Circuit Court of Appeals by President Roosevelt.

Allen, Grant (Charles Grant Blairfindie Allen; 1848-99), author of scientific books and novels, born in Kingston, Canada, and educated at Oxford. His scientific works include *Physiological Aesthetics*, *The Color Sense*, *The Evolutionist at Large* and *The Story of the Plants*. *The Woman Who Did* is the best-known work among his 30 novels.

Allen, Hervey (1889–), American poet and novelist, born at Pittsburgh, Pa., and a graduate of the University of Pittsburgh in 1915. In August, 1918, he was wounded in France and sent home. In collaboration with Du Bose Heyward he published a volume of verse in 1922, and in 1926 Allen published a two-volume biography of Edgar Allan Poe. His greatest work is the 600,000-word novel *Anthony Adverse* (1933), to which he devoted 5 years.

Allen, James Lane (1849-1925), American novelist, born near Lexington, Ky., where he was educated at Transylvania University. He taught in the Kentucky State University and at Bethany College, W. Va., but after 1886 devoted all his time to writing. Allen won wide recognition as a sympathetic interpreter of Kentucky life. Typical books include *Flute and Violin*, *A Kentucky Cardinal*, *The Choir Invisible*, *The Doctor's Christmas Eve* and *The Reign of Law*.

Allenby, Edmund Henry Hynman, 1st Viscount (1861-1936), British field marshal. He served in several African campaigns from 1884 to 1902. As chief of the Third Army in the World War, he fought on the Somme, was promoted to general in 1917 and made commander in chief in Egypt and Palestine. His army took Jerusalem from the Turks in December 1917 and afterward occupied all of Syria. He was made field marshal and created Viscount Allenby of Megiddo and Felixstowe.

Allison, William Boyd (1829-1908), U. S. Senator, born in Perry, Ohio, and educated at Western Reserve College, Cleveland. He began the practice of law in Ohio but in 1857 moved to Iowa. In 1863 he was sent to Congress, was elected United States Senator in 1873 and re-elected five times. He was coauthor of the Bland-Allison Act of 1878, which required the Government to purchase a specified amount of silver bullion each month to maintain a parity between gold and silver.

Allston, Washington (1779-1843), American painter and author, born in Waccamaw, S. C., was graduated from Harvard in 1800, studied at the Royal Academy, London, under Benjamin West, then in Paris, Florence and Rome and won renown both in America and Europe. His use of color shows the influence of the Venetian masters. Among his paintings are *The Dead Man Revived* (Pennsylvania Academy of Fine Arts), *The Deluge* (Metropolitan Museum), *Dante's Beatrice* and a portrait of Benjamin West. Allston was a poet, novelist and art critic of merit.

Almagro, de, Diego (1475-1538), Spanish leader with Pizzaro in the conquest of Peru. In 1535 he quarreled with Pizzaro over the limits of their respective territories, leading to conflict in 1538, when Almagro's forces were defeated near Cuzco, and he himself was captured and executed. Almagro's son (1520-42) met a like fate four years later, as an associate of the conspirators who murdered Pizzaro.

Alma-Tadema, Sir Lawrence (1836-1912), English painter, born in Dronrijp, Friesland; he established himself in England in 1870, became a naturalized citizen and was knighted in 1899. His canvases are noted for their faithful reproduction of Egyptian, Greek and Roman life. The principal paintings include *A Reading from Homer*, *At the Shrine of Venus*, *The Finding of Moses* and *Voice of Spring*.

Almqvist, Karl Jonas Ludvig (1793-1866), Swedish author, born in Stockholm. His best-known work is *The Book of the Thorn Rose*, a group of romances. He also wrote essays, lyrics and dramas. Convicted of forgery and charged with murder, he fled to the United States but returned to Europe, 1865, and went to Bremen as Professor Westermann, remaining until his death. Henning-Sjoberg wrote the story of Almqvist's trial (1929).

Alströmer, Jonas (1685-1761), Swedish industrial reformer. He made a fortune in the shipping business in England and returned to Sweden in 1724. There he established woolen factories, improved the breed of sheep and introduced improved methods in many industries. In recognition of his services, the state ennobled him, made him chancellor of commerce and erected his statue in Stockholm.

Alva, Fernando Álvarez de Toledo, Duke of (1508-82), Spanish general. As governor of the Netherlands (1567) he overcame revolt against King Philip of Spain with unsparing severity, and during his term executed 18,000 persons. In 1573, after the destruction of his fleet, he was recalled at his own request. In 1580 he conquered Portugal with characteristic tyranny, cruelty and massacre.

Alvarado, de, Pedro (*c.* 1495-1541), Spanish cavalier, born in Badajoz, sailed for America in 1510. He was chief lieutenant under Cortez, became commander of the city of Mexico and later governor of Guatemala and Honduras. He explored California and was killed in battle soon after his return to Mexico. Alvarado published letters describing Guatemala.

Alverstone, Richard Everard Webster, 1st Baron (1842-1915), Lord Chief Justice of England from 1900 until his death. He represented Great Britain in the Bering Sea settlement in 1893 and in the Venezuela and British Guiana boundary dispute of 1898. In 1903 he was president of the commission that settled the boundary dispute between Canada and Alaska and decided in favor of the United States.

Alzog, Johann Baptist (1808-78), Roman Catholic historian, born at Ohlan, Silesia. When professor of church history at the University of Freiburg he wrote his *Manual of General Church History*, still known in many languages. A later work was *Outline of Pathology*.

Amadeo, Giovanni Antonio (*c.* 1447-1522), Italian sculptor and architect of the Renaissance, born in Pavia. Among his greatest work is the decoration of the Colleoni Chapel in Bergamo, the relief sculpture on the pulpit of the cathedral of Cremona and the façade of the Certosa of Pavia. Amadeo was one of the architects of the Milan Cathedral and designed its Gothic spire.

Amanullah Khan (1892–), deposed King of Afghanistan. He came to the throne in 1919, after the assassination of his father. In 1922 he changed his title from ameer to king, and in 1928, after a tour of Europe, he instituted reforms in dress, social customs and government. The people were not ready for these reforms and forced Amanullah to abdicate (1929). The king and his wife took refuge in Europe.

Amati, family name of celebrated 16th- and 17th-century violinmakers of Cremona, Italy. Andrea Amati (*c.* 1520-80) founded the school, the traditions of which were carried on by his two sons, Antonio (1550-1638) and Geronimo (1551-1635). Surpassing all of them was Nicolò (1596-1684), the son of Geronimo. Nicolò taught Antonio Stradivarius, the greatest violinmaker of all time. Nicolò's son Geronimo (1649-1740) was the last of the family to continue the craft with distinction.

Ambrose, Saint (*c.* 340-397), Roman Catholic theologian, born at Treves, Gaul. Although a layman, he was elected bishop of Milan in 374 by popular demand. He then took up religious studies, becoming a power in the Church and, after his death, patron saint of the city. Ambrose forced the Emperor Theodosius to do penance for his massacre of the Thessalonians (390) and was instrumental in the conversion of Saint Augustine. He is the reputed author of the Ambrosian ritual. His feast is Dec. 7.

Amenhotep I (1557-*c* 1547 B.C.), King of Egypt. He succeeded his father Amasis I, carried on wars against Libya and Syria, beautified Thebes. *Amenhotep II* (reigned 1448-1420 B.C.) succeeded his father Thutmose III, built a number of obelisks and various important structures in Memphis and Heliopolis. *Amenhotep III* (reigned 1411-1375 B.C.) succeeded his father Thutmose IV. Egyptian power began to wane while he was on the throne. He encouraged trade with other nations and set up a new style of architecture in Egypt. Before he died, barbarians were overrunning Egypt's outlying provinces. *Amenhotep IV* (*c.* 1375-1357 B.C.) revolted against the power gained by the priests during his father's reign, succeeded in substituting Aton for Amon as the chief god.

Amerigo or **Americus Vespucius**, see *Vespucci*.

Ames, Fisher (1758-1808), American political leader, born at Dedham, Mass. He was graduated from Harvard, and began to practice law in Boston. A high point in his career was his speech in 1788 for the ratification of the Federal Constitution at the Massachusetts convention. Later he became Representative to the First Congress. He retired from public life with Washington and devoted himself to writing, largely political essays in Boston newspapers.

Ames, James Barr (1846-1910), American legal scholar, born in Boston, Mass. He was graduated from Harvard University, became instructor in history, professor and dean of the law school there. He compiled collections of cases on torts, pleading, bills and notes, partnership, trust suretyship, admiralty and equity jurisdiction, and was author of numerous articles in the *Harvard Law Review*.

Ames, Joseph Sweetman (1864-), physicist and college president, born in Manchester, Vt. He was graduated from Johns Hopkins in 1886 and received his doctorate there in 1890. His researches in electrodynamics gained wide scientific recognition. His works include *The Constitution of Matter, Manual of Experiments in Physics, Elements of Physics* and *Induction of Electric Currents*. From 1929 to 1935 he was president of Johns Hopkins.

Amherst, Jeffrey, Baron (1717-97), British soldier. He was in command at the surrender of Louisburg, in July 1758, and in September he superseded Abercrombie as commander in chief of the British army in America. In 1759 he captured Ticonderoga and Crown Point and in 1760 forced the last surrender of the French. In 1796 he was made field marshal. Amherst College in Massachusetts was named in his honor.

Amontons, Guillaume (1663-1705), French physicist, born in Paris. In 1687 he invented the hygrometer, for determining the moisture content of the air. His experiments with telegraphy were important. About the same time as Halley he found that the boiling point of water varies with elevation and hence with pressure.

Ampère, André Marie (1775-1836), French mathematician and physicist, born in Lyons, where he was at one time a professor of mathematics. Afterward, he taught in the Polytechnic School in Paris. Ampère's researches in the field of electricity made him famous. His name is perpetuated in the word *ampere*, the unit of intensity of electric currents.

Amundsen, Roald (1872-1928), Norwegian explorer, born in Borge, Norway. At the age of 25, he went as first mate on the Belgian Antarctic Expedition of 1897-99. In 1903, in the *Gjoa*, he started on an expedition that resulted in the discovery of the Northwest Passage and a relocation of the north magnetic pole. In the summer of 1910, he sailed from Norway in the *Fram* and on Dec. 16, 1911, with four companions, discovered the South Pole.

With Lincoln Ellsworth and Gen. Umberto Nobile, Amundsen flew over the North Pole in 1926 in the dirigible *Norge*. Nobile organized a second flight over the Pole in 1928 in the dirigible *Italia*, and the airship crashed on ice, north of Spitsbergen. Amundsen led a rescue party in a seaplane, but his expedition was never heard of again, though part of the plane was found. Amundsen published *The Northwest Passage* (1908), *The South Pole* (1912), and *My Life as an Explorer* (1927).

Anacreon (*c.* 563-478 B.C.), Greek poet, born in Teos, Ionia. He was a favorite at the court of Polycrates, in Samos, and was honored by Hipparchus at Athens. Some of his poetry has survived and is famous for its praise of the joys of wine and love.

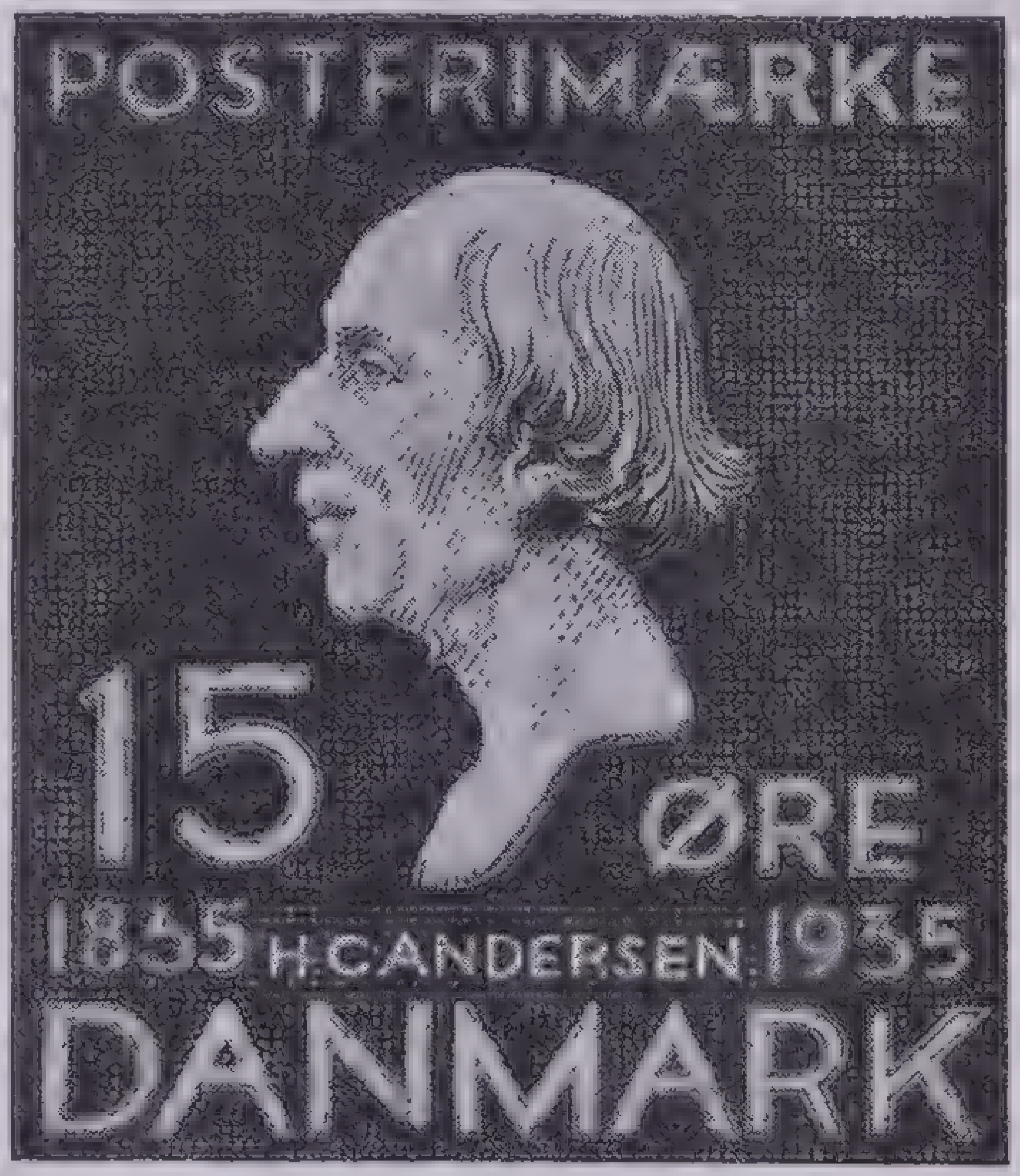
Anastasius I (*c.* 430-518), Roman Emperor of the East. He suppressed the degrading gladiatorial fights between men and wild beasts, abolished the sale of offices and built a wall on the west side of Constantinople to defend it against the Bulgars and Slavs.

Anaxagoras (*c.* 500-428 B.C.), Greek philosopher. He settled in Athens and became the teacher of Pericles, Euripides and Socrates. Anaxagoras introduced the idea that mind operates on matter and controls all material phenomena. Because his explanation of natural events was opposed to the religious ideas of the day, the enemies of Pericles sought to have him executed for impiety. Through the influence of Pericles, he was sentenced to banishment and died on the Hellespont.

Anaximander (*c.* 611-*c.* 547 B.C.), Greek philosopher, mathematician and astronomer, born in Miletus, Asia Minor. He succeeded Thales as head of the Ionian school of philosophy. Anaximander taught that the path of the sun is oblique, estimated the sizes and distances of the planets and considered the earth to be a cylinder on the top of which men live. He wrote a dissertation on geometry and is said to have invented a sundial and a celestial globe.

Anaximenes (6th century B.C.), Greek philosopher. He taught that the world evolved from vapor or air; that water condensed becomes earth and when greatly rarefied becomes fire; that the earth is a slab floating upon air.

Andersen, Hans Christian (1805-75), Danish writer of fairy tales, poems and dramas. Born of poor parents at Odense, he had little formal education, but he studied the theater and at one time tried to be an actor. Through influential friends in Copenhagen the king, Frederick VI, became interested in the boy, sent him to school and then granted him a pension. His first novel was favorably received, but he is remembered for his simple fairy tales, loved the world over. The best-known of his tales are *The Ugly Duckling, The Fir Tree, The Tinder Box* and *The Red Shoes. The Dying Child* is a poem that has been widely translated.



Courtesy Scott Stamp & Coin Company

Hans Christian Andersen

Enlarged from a Danish postage stamp issued in 1935, the 100th anniversary of the publication of Andersen's first book of fairy tales. Other stamps in the series have pictures of the Ugly Duckling and the Little Mermaid

Anderson, Carl David (1905-), American scientist, born at Pasadena, Cal., and educated at the Californian Institute of Technology. At the age of 31 he shared the Nobel award in physics with Professor V. G. Hess for his studies of cosmic rays. Professor Anderson discovered a new electron through the study of the sun's rays by photography.

Anderson, Mary Antoinette (Madame Antonio de Navarro; (1859–1940), American actress. She is famous for her presentation of Shakespearian roles, particularly Juliet and Rosalind. After her marriage in 1896 to Antonio de Navarro she retired from the stage. She wrote a book of personal recollections *A Few Memories* and collaborated with Robert Hichens on a dramatization of *The Garden of Allah*.

Anderson, Maxwell (1888-), American playwright, born at Atlantic, Pa., educated at the University of North Dakota and at Stanford. The play *What Price Glory* that he wrote with Laurence Stallings, was produced with great success in 1924. Some of the best of his own plays are: *Outside Looking In, Saturday's Children, Elizabeth the Queen, Mary of Scotland, Winterset, High Tor* and *The Star Wagon*, which have established him as an outstanding dramatist. Much of Anderson's dramatic work is in blank verse—a rarity in today's theater.

Anderson, Rasmus Björn (1846-1936), American educator and author, born at Albion, Wis., of Norwegian parentage. He received his doctorate degree at the University of Wisconsin, where he was professor of Scandinavian languages and literature (1875-83). In 1885 he was appointed United States minister to Denmark. His published works include *Norse Mythology, Viking Tales of the North, First Chapter of Norwegian Immigration* and several works in Norwegian.

Anderson, Robert (1805-71), American soldier, born near Louisville, Ky. He was graduated at West Point in 1825 and fought in the Black Hawk War of 1832, the Seminole War (1837-38) and the Mexican War. In 1857 Anderson received the rank of major; in 1860 he was placed in command in Charleston Harbor. He was commander of Fort Sumter at the opening of the Civil War and surrendered the fort on April 14, 1861, after suffering a vigorous bombardment. He was made brigadier general in charge of troops, in Kentucky, but was soon after relieved of active service because of ill health.

Anderson, Sherwood (1876–1941), American author and editor, born in Camden, Ohio. The son of poor parents, he received little schooling, went to work at twelve, was a soldier in Cuba, managed a paintshop and did newspaper work. His first novel, *Windy McPherson's Son* (1916), showed him to be a realist. *Winesburg, Ohio* (1919) and *The Triumph of the Egg* (1921) are collections of short stories; his novels include *Marching Men* (1917), *Many Marriages* (1922) and *Dark Laughter* (1925); *Mid-American Chants* (1918) is a book of verse. He settled in Marion, Va., and became the editor of two weekly newspapers of opposing political policies.

Andrássy, Gyula, Count (1823–90), Hungarian statesman. Although born of an ancient and noble family he supported the liberal program of Kossuth, and was a leader in the revolution of 1848 and the war with Austria that followed. In 1867, when the right of self-government was conceded to Hungary, he was appointed premier of the new Hungarian ministry. He was a member of the Presburg Diet in 1847–78, lord lieutenant of the county of Zempton and Hungarian ambassador to Constantinople.

André, John (1751-80), British soldier and spy, born in London of Franco-Swiss parentage. He served in the British army in America, was a member of Sir Henry Clinton's staff and became a major. He conducted the negotiations with Benedict Arnold for the betrayal of West Point, but being discovered in disguise was arrested and hanged as a spy, although Washington admitted that André was more "unfortunate than criminal." A tablet to his memory is in Westminister Abbey, and a memorial was placed by Americans on the spot where he was arrested.

Andrée, Salomon August (1854-*c.* 97), Swedish scientist and aeronaut, born in Grenna, Sweden. He received a technical education and was attached to the Swedish meteorological expedition of 1882. In July 1897 with two companions he attempted a balloon flight from Spitsbergen to the North Pole and never returned. Thirty-three years later, in August 1930, the three bodies, logbook, diaries and instruments were discovered by Norwegian seamen on White Island in the Greenland Sea. The bodies were taken to Stockholm for funeral services and there cremated.

Andreev, Leonid Nikolaievich (1871-1919), Russian novelist and playwright. He suffered much from poverty and melancholia and attempted suicide three times. His morbid stories and dramas rank him high in

Russian literature. Much of his work has been translated into English. His most successful play, *He Who Gets Slapped,* was produced in Europe and America and was made into a motion picture. He died in Finland.

Andrews, Elisha Benjamin (1844-1917), American educator, born at Hinsdale, N.H., graduated from Brown University. He was successively president of Denison and Brown universities, superintendent of schools in Chicago and chancellor of the University of Nebraska. His published works include *The History of the United States* (6 vols.): *Institutes of Constitutional History, English and American; Institutes of General History; Institutes of Economics.*

Andrews, Roy Chapman (1884-), American naturalist and explorer, native of Beloit, Wis., educated at Beloit College and Columbia University. In 1916 he headed the American Museum of Natural History's first expedition to secure data on prehistoric life in Asia. He has explored in Tibet, China, Mongolia, Central Asia, the Gobi Desert, and has made many valuable finds, including fossilized dinosaur eggs. Andrews has written a number of books on his work and travels, including *Camps and Trails in China* (1918), *Ends of the Earth* (1929) and *The New Conquest of Central Asia* (published in 1932, the first of a series of 12 volumes).

Andros, Sir Edmund (1637-1714), English colonial official, born in London. He was appointed governor over all of New England in 1686, against the wishes of the individual colonies. Connecticut colonists openly defied him and, as tradition has it, secreted their charter in an oak tree. In 1689 after the "glorious revolution" Andros was arrested and ordered to England to stand trial. Nothing came of the affair, and the once unpopular Andros was an acceptable governor of Virginia, 1692-98.

Angelico, Fra (1387-1455), the popular name of the Florentine painter, Guido da Vicchio. He became a member of the Dominican order at Fiesole in 1407, and because of his lovable nature was called *Angelico* or *angelic.* Fra Angelico's paintings are remarkable for their exquisite coloring. Among his more than 200 works are *Coronation of the Virgin, Madonna of the Star* and *The Last Judgment.* Frescoes by him in San Marco, Florence, have made the place a museum. Fra Angelico was the first to paint a landscape intelligently.

Angell, James Burrill (1829-1916), American educator, born at Scituate, R. I. He was graduated from Brown University in 1849, where he was professor of modern languages and literature (1853-60). Then he became successively editor of the *Providence Journal,* president of Vermont University (1866-71) and president of the University of Michigan, whose present high standing is largely due to his efforts. He remained there until his death with the exception of a few years in the diplomatic service in China (1880-81) and Turkey (1897-98).

Angell, James Rowland (1869-), American educator, son of James Burrill Angell, born in Burlington, Vt. He was educated at Michigan, Harvard and several universities abroad. In 1893 he became instructor in philosophy at Minnesota University and in 1894 began a long association with the University of Chicago, starting as assistant professor of psychology. In 1911 he was made dean of the university faculties and in 1918-19 was acting president. In 1921–37 he was president of Yale University. Then he investigated the educational possibilities of broadcasting.

Angell, Sir Norman (1874-), British economist. In his early years a rancher and newspaper man in the United States, he returned to England in 1898. He was well known as a journalist when he wrote the book that brought him fame, *The Great Illusion;* in it he tries to prove the futility of war. He received the Nobel peace prize for 1933.

Anna Comnena (1083-1148), Byzantine princess and historian, daughter of the Emperor Alexius I Comnenus. In 1118 she conspired against the life of her brother, then ruling as emperor. He punished her by confiscating her property, which, however, he restored. Disappointed and ashamed, she withdrew into a convent, where she composed her *Alexiad,* a famous Greek prose epic, in praise of her father and family. An English translation by Elizabeth Dawes was published in 1928.

Anne (1665-1714), Queen of England, 2d daughter of King James II (deposed in 1688). In 1683 she married Prince George of Denmark. She was the first English sovereign to use the term *Great Britain* in the royal title, for in her reign occurred the union of England and Scotland in 1707. She was successor to William III and was the last of the Stuarts, as none of her 17 children survived childhood. Anne's reign was notable for the victories won by Marlborough in the War of the Spanish Succession. Marlborough and his wife were long the power behind the throne, as Anne's character was essentially weak. Much notable literature was produced during her reign, especially the writings of Addison, Swift, Defoe and Pope.

Anne of Austria (1601-66), Queen of France, daughter of Philip III of Spain and great-granddaughter of the Emperor Maximilian II. Anne married Louis XIII of France in 1615. Their son Louis XIV was born in 1638. The queen was estranged from her husband during most of their married life, because of the enmity of his minister Richelieu, who feared the influence of her family connections. On the king's death in 1643 Anne assumed the regency and followed the advice of her own minister Mazarin. In 1661 she transmitted the royal authority to her son, Louis XIV, and spent the rest of her life in retirement.

Anne of Cleves (1515-57), Queen of England, daughter of the German Duke of Cleves. She became the fourth wife of Henry VIII of England, the match having been projected by Thomas Cromwell; it was partly the cause of that minister's ruin. Henry married her in January, 1540, and divorced her the following July, partly because he thought her extremely homely and partly because a change in events made the match no longer important politically. She spent the rest of her life in England, supported by an annuity from Henry.

Annunzio, d', Gabriele, see *D'Annunzio, Gabriele.*

Anthony the Great, Saint (251-*c.* 356), founder of monastic institutions, born in Upper Egypt. Giving up all his property at the age of 20, he retired to the desert and lived the life of a hermit. In the year 305, yielding to the pleas of his numerous followers, he founded the first monastery at Fayum, which became the model for many others.

Anthony of Padua, Saint (1195-1231), Franciscan monk, born in Lisbon, Portugal. Under the direction of Francis of Assisi, he preached and taught in Italy and France with great success. He died in Padua, Italy, and was canonized the next year by Gregory IX. He was celebrated for working miracles and is still appealed to by Catholics in the hope of his aid in finding things that have been lost.

Anthony, Susan Brownell (1820-1906), leader in woman suffrage and other reform movements, born in Adams, Mass., of Quaker parentage. She taught school at the age of 15 but after 1850 devoted her life to furthering such causes as equal suffrage, temperance, coeducation and the abolition of slavery. She was active as editor, organizer, lecturer and writer. With Mrs. Elizabeth Cady Stanton, she founded the National Woman Suffrage Association in 1869 and was its president for years. She wrote *History of Woman Suffrage* (1881-87). Her picture appeared on a U. S. 3¢ commemoration postage stamp in 1936, the 16th anniversary of the 19th Amendment.

Antigonus (382-301 B.C.), a distinguished general under Alexander the Great. Upon Alexander's death he became governor of Phrygia, Lycia and Pamphylia, and after defeating and slaying Eumenes and waging other successful wars he assumed the title of king. His ambitious schemes united his rivals and he was killed in the battle of Ipsus.

Antiochus (*d.*-187 B.C.), Syrian King, called *the Great.* He succeeded to the throne in 224 B.C. His reign was largely one of wars, and in 196 B.C. he came into conflict with the Romans, who defeated him in 191 B.C. at Thermopylae and in 190 B.C. at Magnesia. Forced by treaty to pay a heavy tribute, he plundered a temple of Bel in Elymais and is supposed to have been murdered by the angry populace.

Antiochus (*c.* 200-*c.* 164 B.C.), called *Epiphanes,* son of Antiochus the Great, succeeded his brother Seleucus IV in 176 B.C. He captured Jerusalem twice, in 170 B.C. and 168 B.C., and tried to establish there the worship of Greek gods. This plan excited the Jews to a successful insurrection under Mattathias and his sons, the Maccabees.

Antipater (*c.* 398-319 B.C.), general under Philip of Macedon and his son Alexander the Great. When Alexander went to conquer the East he made Antipater governor of Macedonia, and the latter ruled well. After Alexander's death he was reassigned to Macedonia. During most of his rule he was at war with the Greek states, but suppressed all revolts.

Antoinette, Marie, see *Marie Antoinette.*

Antoninus, see *Marcus Aurelius Antoninus.*

Antoninus Pius (Titus Aurelius Fulvus; 86-161), Roman Emperor. In 120 he was made consul; afterward Hadrian sent him as proconsul into Asia, where his wise and gentle rule won for him a high reputation. He extended the Roman dominion in Britain by ordering a new wall from the Firth of Forth to the Firth of Clyde to stop invasions of Picts and Scots. In 138 he was adopted by the Emperor Hadrian and succeeded him as emperor. His reign was peaceful. Antoninus adopted Marcus Aurelius as his successor.

Antony, Mark (Marcus Antonius; 83-30 B.C.), Roman politician and soldier, born of a patrician family. He was able but unscrupulous and by his folly brought about his own downfall. He early attached himself to Caesar and in 48 B.C. helped him defeat Pompey at Pharsalia. Antony was several times left in charge of Italy when Caesar was consolidating his power elsewhere, and in 44 B.C. he became consul with his ally. After Caesar was assassinated, Antony made an eloquent funeral oration over the body and so stirred the people to anger that the murderers fled. In 43 B.C. Antony allied himself with Octavian (the future Augustus) and Lepidus in the Second Triumvirate, and in 42 B.C. the triumvirs made themselves supreme in Italy by defeating Brutus and Cassius at Philippi.

Antony visited Asia Minor to strengthen the Roman power there. At Tarsus he met Cleopatra, Queen of Egypt, and followed her to Egypt, where he spent months in dissipation and idleness. He returned to Italy to conciliate his family and Octavian, entered into a new alliance whereby he was to be ruler of the East but finally succumbed again to the lure of Cleopatra. Octavian declared war against the queen, and near Actium, 31 B.C., the Roman fleet utterly defeated the forces of Antony after Cleopatra had withdrawn her ships. The two fled to Egypt, where both committed suicide.

Apelles (4th century, B.C.), Greek artist, the most celebrated painter of his time, born in Colophon, Asia Minor. His pictures were remarkable for their delicate coloring and accuracy of drawing. Among the most famous are a portrait of Alexander the Great wielding a thunderbolt and a picture of Aphrodite rising from the sea.

Apollodorus (2d century), Greek architect, born in Damascus. He designed the Forum and the Column of Trajan at Rome, the remains of which still stand. He also built a great stone bridge over the Danube. Hadrian, Trajan's successor, had Apollodorus put to death for criticizing projected architectural works.

Apollonius of Perga (3d century B.C.), Greek mathematician of Asia Minor, called *the Great Geometer.* He wrote a celebrated treatise on conic sections in eight books, seven of which are extant.

Apollonius Rhodius (2d century B.C.), Greek epic poet, born in Alexandria. His only extant poem, the *Argonautica,* describes the expedition of the Argonauts. Apollonius became a citizen of Rhodes and there established a school of rhetoric.

Appleseed, Johnny (John Chapman; 1774-1847), hero of American frontier history, noted for planting apple orchards through the Ohio Valley when it was still a wilderness. He was born in Leominster, Worcester County, Mass. His youth was spent in western Pennsylvania, where he collected apple seeds from the waste of cider presses and gave them to pioneering families bound west on the covered wagon trails. He paddled down the Ohio River as far as Marietta in 1806. Then for 40 years he walked through Ohio, Indiana and Illinois, tending his trees and teaching frontier settlers how to plant and care for orchards.

Apponyi, Albert Georg, Count (1846-1933), Hungarian statesman, long prominent as a leader in civic progress and, before the World War, as head of the National party. He retired from the Chamber of Deputies at the revolution of 1918 but represented Hungary at the Peace Conference and in the League of Nations; he also became speaker in the new Hungarian Parliament.

Apponyi, György, Count (1808–99), Hungarian statesman. He was a member of the Presburg Diet of 1843 and chancellor of Hungary in 1847, when he opposed revolutionary movements which caused his retirement. In 1859 he was instrumental in bringing about the reconciliation between Austria and Hungary. He is classed among the ablest of European statesmen.

Apuleius, Lucius (2d century A.D.), Roman satirical writer, born in Africa. He studied philosophy in Athens, traveled widely and made a first-hand investigation of religious mysteries. His experiences were later related in a novel, *The Golden Ass* or *Metamor-*

phoses, his most famous work and a source book for many later novelists. It has been translated into English.

AQUINAS, THOMAS, SAINT (*c.* 1225-*c.* 74), Italian philosopher and church leader. He was born near Naples of the ruling family of Aquino. He was educated at a Benedictine monastery and at the University of Naples. Aquinas was a favorite pupil of Albertus Magnus, with whom he studied in Cologne and Paris. Here he became involved in the dispute between the university and the Preaching Friars as to the liberty of teaching. He advocated the rights claimed by the latter with great energy. In 1257 he received the degree of doctor from the Sorbonne, Paris, and began to lecture on theology in London, Rome and Naples. He died on his way to Lyons to attend a general council for the purpose of uniting the Greek and Latin churches.

He wrote hymns and the ritual of several church services. He was one of the best thinkers of his time; his works show reason, common sense and moderation and are accepted as part of the official philosophy of the Roman Catholic Church.

Aquinas was called, after the fashion of the time, the *angelic doctor* and was canonized in 1323 by Pope John XXII. The most important of his numerous works, which were all written in Latin, is the *Summa Theologica.*

Arabi or **Araby Pasha** (*c.* 1841-1911), Egyptian military leader, born *Ahmed-al Arabi.* He proclaimed himself inspired to undertake a holy mission, the slogan of which was "Egypt for the Egyptians," and in 1882 assumed autocratic control of the government. An English army under Wolseley completely defeated his forces at Tel-el-Kebir, and Arabi was exiled to Ceylon. He was subsequently pardoned and in 1910 returned to Egypt.

Arago, Dominique François (1786-1853), French physicist. He made many discoveries in electromagnetism, built a polariscope and with Young and Fresnel developed the wave theory of light. His discovery of the magnetic properties of nonferrous substances, made known to the French Academy of Sciences in 1824, won for him the Copley Medal of the Royal Society of London.

Arbaces, one of the generals of Sardanapalus and the founder in 876 B.C. of the Median Empire. The dynasty of Arbaces lasted until 559 B.C. when Cyrus overthrew it.

Arbuthnot, John (1667-1735), British physician and wit, the friend of Swift and Pope, born in Arbuthnot, Scotland. In 1705 he was appointed physician to Queen Anne and her death was a severe blow to his prosperity. He and Pope assisted John Gay in writing the farce *Three Hours After Marriage.* Utterly careless of literary fame, Arbuthnot was the chief if not the sole author of the brilliant *Memoirs of Martinus Scriblerus,* first published in Pope's works. He wrote also the five tracts published under the title *History of John Bull.*

ARCHIMEDES (*c.* 287-212 B.C.), Greek mathematician and physicist, born in Syracuse, Sicily. His discovery of the law of specific gravity was made in a bath when he noticed that his body displaced its own bulk of water. He applied geometrical principles to the theory of simple machines, such as levers and pulleys, and invented the *Archimedean screw,* a large screw turning in a close-fitting case, used for raising water. Archimedes was killed by a Roman soldier whom he had asked to spare his circles, drawn in sand. He wrote *The Sphere and the Cylinder, The Measurement of the Circle* and *The Method.*

Aretino, Pietro (1492-1557), Italian author, born in Arezzo but banished from his birthplace for writing a sonnet satirizing the church's practice of granting indulgences. In Rome Pope Leo X patronized him until displeased by the publication of his *Sonnetti Lussuriosi* (1523). His next patron was Giovanni de' Medici, after whose death Aretino flourished on the patronage of Venetian aristocrats who feared his satire. His compositions were mainly sonnets, comedies and dialogues.

Argall, Sir Samuel (*c.* 1572-1626), English navigator. Beginning in 1600 he made a number of trips to America, bringing colonists and supplies. In 1612 he made a voyage up the Potomac and brought Pocahontas a captive to Jamestown. He became deputy governor of Virginia in 1617, soon became tyrannical and dishonest and was recalled to England in 1619.

Argand, Aimé (1755-1803), Swiss physician and chemist, born in Geneva. He invented the circular wick for oil lamps, which permitted a greater area of burning space and the circulation of air inside the wick. The *Argand lamp* was first used in England in 1782.

Argyll, Archibald Campbell, 8th Earl of (1598-1661), Scottish soldier and statesman, a member of the famous Scottish family, the Campbells of Argyle (or Argyll). In the long dispute between Charles I and the Scottish Presbyterians, Campbell opposed the king and in a series of conflicts involving church and state was always an important figure because of his leadership in a clan of 20,000 well-disciplined men. Charles I, on his visit to Scotland in 1641, created him Marquis. After the defeat of Worcester he defended himself for nearly a year in his castle against Cromwell's troops; but in 1652 he submitted to the Protector. At the Restoration he was committed to the Tower, from there he was sent to Scotland, tried for high treason and beheaded.

Ariosto, Ludovico (1474-1533), Italian poet. His fame rests chiefly on his metrical romance *Orlando Furioso* (1516), first published in Ferrara. It is a continuation of Boiardo's *Orlando Innamorato.* Ariosto also wrote comedies, sonnets and satires.

Aristarchus of Samos (*c.* 280-264 B.C.), Alexandrian astronomer. He seems to have preceded Copernicus in maintaining that the earth moves round the sun. He wrote a treatise on the magnitude and distance of the sun and moon.

Aristides (d. *c.* 468 B.C.), called *the Just,* Athenian statesman and general, son of Lysimachus. He was one of ten Athenian generals at the Battle of Marathon (490 B.C.); was chief magistrate in 489 B.C. and later opposed Themistocles on naval policies so vehemently that the citizens of Athens ostracized him. In the second Persian War (beginning 480 B.C.), Aristides, profiting by a general amnesty, fought for Athens at Salamis and Plataea and later helped to organize the Delian League, a confederation of a number of Greek states. He died in poverty.

Aristippus (*c.* 435-*c.* 356 B.C.), Greek philosopher, born in Cyrene, Africa. He was the founder of the Cyrenaic school of philosophy. Aristippus was a pupil of Socrates, but developed his own theory, that happiness is the highest good when its pursuit is wisely controlled.

Aristophanes (*c.* 448-*c.* 380 B.C.), Greek playwright. Little is known of his life, except that he lived in Athens as a contemporary of Socrates and other eminent men whom he ridiculed in his plays. Of 54 comedies credited to him, 11 have survived. These include *The Knights, The Clouds, The Wasps, The Birds, The Frogs* and *Lysistrata.* The last named enjoyed a successful revival on the modern American stage.

ARISTOTLE (384-322 B.C.), Greek philosopher, one of the world's greatest thinkers, born in Stagira, Macedonia. At the age of 17 he went to Athens, where he lived for 20 years. Plato, his teacher, called him the "intellect of his school." About 343 B.C., Philip of Macedon made him the teacher of his son Alexander (the Great). After the brilliant young prince had become a world conqueror, he gave his former teacher money for scientific research and had specimens of plants and animals collected for him. Aristotle returned to Athens about 335 B.C. and taught in the Lyceum, a gymnasium near the city. His school is called the Peripatetic (from the Greek for *walk*), because he taught while walking up and down or in shady walks. After the death of Alexander (323 B.C.), the Athenians included Aristotle in their hatred of Macedonians, accused him of impiety and forced him to flee to Chalcis, where he died within a year.

Aristotle was pre-eminently an organizer, for he believed in the rigid examination of facts and their classification and comparison so that an ordered whole might result. This part of his teaching is still valid, although much of his work in psychology and astronomy has since been disproved. His investigations covered the entire realm of human knowledge. He analyzed and systematized the fields of logic, grammar, rhetoric, literary criticism, politics, psychology, ethics, natural history, physiology, philosophy and government. The volume of his writing was remarkable, and though only a small portion has survived, his extant works have profoundly affected human thought from antiquity to the present. They include *Organum* (on logic), *De Anima* (psychology) and *Nicomachean Ethics.*

Arius (*c.* 280-336), Alexandrian priest, who gave his name to the doctrine called *Arianism,* namely, that Christ the Son is not coequal with God the Father but is only the first and highest of all finite beings. In 325 Arius defended his views before the Council of Nicaea, by which they were emphatically condemned. The Nicene Creed, then adopted, still remains the faith of the Roman Catholic body.

Arkwright, Sir Richard (1732-92), English inventor. Until the age of 28 he was a barber and dealt in hair and a dye of his own invention. In 1768 he produced the model of his famous cotton-spinning frame, by which thread could be spun of any required fineness and strength and at great speed. Strutt, the inventor of a knitting machine, took an interest in it, and a working machine, driven by a horse, was soon in operation. Patent was granted in 1769. Other manufacturers were very hostile; at one time they refused to buy his yarns and tried to ruin him by mischievous legislation. Arkwright, however, won out and accumulated a fortune of $2,500,000. He acquired the rudiments of learning after he was 50 years old and was knighted in 1786.

Arliss, George (1868-   ), actor, born in England. First appeared on the London stage in 1887 and made his American debut in Mrs. Patrick Campbell's company in 1901. He is especially noted for his sympathetic portrayals on stage and screen of historical characters, such as in *Disraeli, Rothschild, Alexander Hamilton* and others. He wrote an autobiography *Up from Bloomsbury.*

Arminius (*Ger.* Hermann; 18 B.C.-21 A.D.), German chieftain of the Cherusci, who became a Roman soldier but eventually devoted his life to the cause of German independence. His defeat of the Roman legions under Varus, in the Teutoburg Forest (A.D. 9), was a severe blow to the Emperor Augustus. In the years 15 and 16, Germanicus, the nephew of Tiberius, defeated Arminius in turn, but the Romans withdrew in the year 17. Arminius was murdered by his own relatives 4 years later.

Armstrong, Samuel Chapman (1839-93), American educator, born in Hawaii, educated in Honolulu and at Williams College. Armstrong fought in the Civil War, became interested in the Freedmen's Bureau and in 1868 founded the Hampton Normal and Agricultural Institute at Hampton, Va., for Negroes and Indians. He remained head of the Institute until his death, and his writings have greatly influenced educational policies.

Armstrong, William George, Baron (1810-1900), English inventor, born in Newcastle-upon-Tyne. Abandoning the practice of law, he took up mechanical engineering and produced the hydroelectric generator, the hydraulic crane and the first rifled cannon (1855), since known by his name and establishing his reputation. The inventor gave his patents to the Government, was knighted and in 1887 was created 1st Baron Armstrong. He wrote *Electric Movement in Air and Water* (1897).

Arnauld, Antoine (1612-94), French philosopher and theologian, known as *the great Arnauld.* Entering the Sorbonne he became a pupil of Lescot, confessor of Cardinal Richelieu and bishop of Chartres. With a friend, Nicole, he wrote a celebrated system of logic, *Port Royal Logic.*

Arndt, Ernst Moritz (1769-1860), German poet and historian, born on the island of Rügen and educated at Jena University. During the Napoleonic Wars his spirited songs and poems helped arouse the national spirit and unite Germany against the French. He became the revered "Father Arndt" of the people, and his fiery "What is the German Fatherland?" was long a well-loved poem in Germany. His *Geist der Zeit* (1806), his most important prose work, was useful political propaganda.

Arne, Thomas Augustine (1710-78), English composer, born in London and educated at Eton. His first opera *Rosamond* was performed with great success in 1733. Next followed his comic operetta *Tom Thumb* and *Comus.* The English patriotic song *Rule Britannia,* originally given in *The Masque of Alfred,* is his, as well as two oratorios and two operas *Eliza* and *Artaxerxes.* He wrote musical settings for many of Shakespeare's lyrics.

Arnold, Benedict (1741-1801), American soldier, born in Norwich, Conn. Early in the Revolution he fought under Ethan Allen at Ticonderoga, under Montgomery in Canada, and in 1777 rendered invaluable service at the second Battle of Saratoga, which resulted in Burgoyne's surrender. Arnold was severely wounded. His promotion to major general was tardy, but in 1778 he was put in command of Philadelphia.

A series of disputes with the civil authorities led to his court-martial, which acquitted him of deliberate misdemeanors but ordered a reprimand. Arnold was embittered. In August, 1780, then having command at West Point, he entered into treasonable negotiations with Sir Henry Clinton for betrayal of the fort. The scheme was exposed through the capture of John André. Arnold fled to the British lines, was made a brigadier general and received about $31,755 from the British Government. In 1781 he took his family to England but was scorned by the people and died in poverty and despair.

Arnold, Bion Joseph (1861-1942), American electrical engineer, born at Casanovia, Mich. He won degrees at the University of Nebraska, Hillsdale College and Cornell University. He made a study of electric traction, was associated with the electrification of the New York Central Railroad terminal in New York city, acted as consultant in the construction of subways in New York and in the rebuilding of the street railway system in Chicago. His chief invention is the magnetic clutch.

Arnold, Sir Edwin (1832-1904), English poet, journalist and educator. Educated at Oxford, he was principal of the Sanskrit College of Poona, India (1856-61), and later a member of the editorial staff of the London *Daily Telegraph,* eventually becoming its chief editor. His fame rests on his epic poem *The Light of Asia* (1879), a romantic portrayal of Buddha written in blank verse. It was criticized as being too favorable to an alien faith. His later *Life of the World* (1891) was regarded as less impressive. Other writings are several volumes of verse and books on travel.

Arnold, Matthew (1822-88), English poet and critic, eldest son of Dr. Thomas Arnold of Rugby. He was educated at Winchester, Rugby and Oxford. Arnold was elected fellow of Oriel College in 1845 and was professor of poetry at Oxford (1857-67). From 1851 to 1886 he was in the British education department and did much to improve the primary education of the country. His poetry is dignified and intellectual, and among Victorian poets has been ranked second only to Tennyson and Browning. A few of his poems are vivid and dramatic, such as *Sohrab and Rustum.* His other writings, chiefly critical, include *Culture and Anarchy, Essays in Criticism* and *The Study of Celtic Literature.*

Arnold, Thomas (1795-1842), English educator and historian, born in the Isle of Wight and educated at Winchester and Oxford. After entering the church, he passed 9 years at Laleham preparing young men for the universities. Appointed head master of Rugby school in 1828, he made that institution famous and gave new life to the entire English public school system. He introduced a number of modern courses into the curriculum and gave older boys charge of the younger. Students were urged to be independent in thought, and many of them won remarkable success in later life. The best known of Dr. Arnold's works are his edition of *Thucydides* and his *History of Rome.*

Arpád (d. 907), Magyar chieftain. According to tradition the Magyars elected Arpad leader in 890 as defense against the Bulgars and others. He led them into the present Hungarian territory and held it against many enemies. Until 1301 the Hungarian kings were always chosen from his family.

Arrhenius, Svante August (1859-1927), Swedish chemist. At 19 he received the degree of doctor of philosophy from the University of Upsala. His most important contributions are in physical chemistry: he was the first to explain the nature of electrolysis (1883) and the first to present the theory of ionization (1887). Arrhenius won the Nobel prize for chemistry in 1903.

Arrian, Flavius (*c.* 100-*c.* 170), Greek historian. The Emperor Hadrian made him a Roman citizen and governor of Cappadocia in 136. His writings are *The Expedition of Alexander* (7 vols.), an *Epistle to Hadrian,* a *Treatise on Tactics* and his *Enchiridion,* a moral treatise which contains the discourses of Epictetus, who had been his teacher.

Artaxerxes I (?-425 B.C.), King of Persia, surnamed *Longimanus,* the second son of Xerxes. He ascended the throne in 465 B.C. A great revival of Judaism took place in his reign, for which he was largely responsible.

Artaxerxes II, surnamed *Mnemon,* King of Persia (d. 361 B.C.), succeeded his father Darius II in 405 B.C. After defeating his brother Cyrus in battle, he became involved in a war with Sparta which ended with the Antalcidean treaty of peace. The reign of Artaxerxes II is noted for a revival of the religious cult known as Mithraism.

Artaxerxes III, surnamed *Ochus,* King of Persia (d. 338 B.C.), the son and successor of Artaxerxes II. He gained the throne by killing the rest of the family and reigned with true oriental despotism. While conquering Egypt he caused the divine bull Apis to be slaughtered and cooked as ordinary beef. The eunuch Bagoas, his able general and statesman, murdered him to put Darius III on the throne.

Artemisia (*c.* 350 B.C.), Queen of Caria in Asia Minor, the wife of Mausolus, whom she succeeded in 353 B.C. The Mausoleum at Halicarnassus, one of the Seven Wonders of the ancient world, was built by her as a memorial tomb for her husband.

Arteveld, van, Jacob (*c.* 1287–1345), Flemish statesman, chosen as leader of the citizens of Ghent. In 1335 he made a treaty with Edward III of England, persuading him to assume the title of king of France. To strengthen this alliance, he tried to make Edward (the Black Prince) count of Flanders, but the people rose in rebellion and Artevelde was killed.

Arthur, Chester Alan (1830-86), 21st President of the United States, born in Franklin county, Vt. After graduating from Union College, Schenectady, he taught in North Pownal, Vt., but gave up the school to study law, and he practiced in New York city before the Civil War. During the war he was quartermaster general of New York state. President Grant appointed him Collector of the Port of New York and he served for 7 years until 1878. Arthur refused to reduce the number of employes in his office when President Hayes, bent on civil service reform, determined to modify the "spoils system", and the President suspended Arthur from office. Congress supported Hayes's move and Arthur was removed.

In 1880, at the Republican National Convention that nominated Garfield for President, Arthur was nominated for Vice-President. He had been active in urging a third term for Grant. Garfield's assassination soon after his inauguration brought Arthur into the White House, and soon afterward he surprised his former political associates by urging civil service reforms. President Arthur's administration was honest and efficient.

Asbury, Francis (1745-1816), first Methodist Episcopal bishop ordained in America. He was born in England, where he was an associate of John Wesley, and in 1771 arrived in Philadelphia as a missionary to the 400 Methodists then in America. In 1784 he was elected a "superintendent" by the conference in Baltimore; the title bishop was given later. Methodism's remarkable growth in America owed much to Asbury's labors, as he put the circuit-rider system in operation, himself riding some 5,000 miles on horseback yearly. He kept a diary, published in part as *The Heart of Asbury's Journal* (1904).

Ascham, Roger (1515-68), English writer and scholar. His best-known work, *Toxophilus* (1545), is still admired as an example of classic English prose. This defense of archery brought its author a yearly pension of $500 from Henry VIII. Ascham, one of the first masters of modern English, was appointed tutor to Henry's daughter Elizabeth in 1548 and was court secretary after the Princess became Queen Elizabeth. *The Scholemaster* was published after his death and his works have been reprinted.

Ashburton, Baron, see *Baring, Alexander.*

Ashhurst, John (1839-1900), American surgeon and author, born in Philadelphia, Pa. He was professor of surgery at the University of Pennsylvania, edited the *International Encyclopedia of Surgery* and wrote *Injuries to the Spine* and *Principles and Practice of Surgery.* He took great interest in other things besides surgery, notably music and mathematics.

Ashmole, Elias (1617-92), British antiquarian, born at Litchfield, England. He founded the Ashmolean Museum at Oxford and presented to the university his valuable collection of coins, specimens and manuscripts. His *History of the Order of the Garter* is in several volumes.

Ashurbanipal (?-626 B.C.), last great King of Assyria, called Sardanapalus by the Greeks. Ashurbanipal suppressed revolts in Egypt and conquered Babylonia and Elam, carrying away rich treasures to Ninevah. He founded there an immense library of clay tablets. A portion of this valuable cuneiform literature was excavated centuries later, revealing much about the culture of Ashurbanipal's period. It was placed in the British Museum.

Aspasia (*c.* 470-410 B.C.), beautiful courtesan of Miletus, Asia Minor, later wife of Pericles. To marry her, Pericles divorced his first wife and defied the laws of Athens, which forbade a citizen to marry a woman of foreign birth. Their son was declared legitimate by a state decree. Aspasia was distinguished for her wit and learning as well as for her beauty. *The Immortal Marriage* by Gertrude Atherton is based upon Aspasia's life.

Asquith, Herbert Henry, 1st Earl of Oxford and Asquith (1852-1928), British statesman, leader of the English Liberal party and Prime Minister (1908-16). Born in Morley, Yorkshire, he was graduated from Oxford and practiced law. In 1886 he was elected to Parliament, became Home Secretary in 1892, Chancellor of the Exchequer in 1905 and Prime Minister in 1908.

Under his leadership the absolute veto power of the Lords was abolished (1911) and the Irish Home Rule Bill was passed (1914). This bill met with intense opposition and the threat of civil war in Ulster. The great crisis of the World War silenced his opponents and he formed a coalition cabinet. In December, 1916, he resigned in favor of Lloyd George. Defeated for a seat in Parliament in 1918, he was elected in 1920 and was again defeated in 1924. In 1925 he was made an earl; a year later his public career ended with his resignation as leader of the Liberal party. He wrote *Fifty Years of Parliament* and *The Genesis of War.*

Asquith, Margot, Countess of Oxford and Asquith (1864-), married Herbert H. Asquith in 1894. In 1920 her *Autobiography* created a sensation because of its frank revelations about her contemporaries. Her other writings are *Places and Persons, Lay Sermons* and *More or Less about Myself.*

Aston, Francis William (1877-), English physicist and chemist, born in Birmingham, educated at Birmingham and Cambridge universities. During the World War he was technical adviser to the Royal Air Force. He is famous chiefly for his researches with gases, electric discharges and radioactive materials. He discovered the existence of *isotopes,* elemental atoms of greater atomic weight than "normal" atoms. (Such hydrogen atoms have been widely publicized by their presence in so-called *heavy water.*) He has published *Isotopes* (1922) and *Mass-Spectra and Isotopes* (1933). He received the Nobel prize for chemistry in 1922.

Astor, John Jacob (1763-1848), merchant and capitalist, born in Waldorf, near Heidelberg, Germany, founder of the Astor family and fortune in the United States. Soon after his arrival in America, at the age of 20, he invested his small capital in furs, later acquired large holdings in real estate and was so successful in business that he left an estate valued at $20,000,000. He founded Astoria, Ore., as a fur-trading station. The Astor Library, now a part of the New York Public Library, was endowed by him. Astor's shrewdness led him to buy farm land in the vicinity of the present Times Square against the advice of skeptical friends.

Astor, John Jacob, 2d (1822-90), eldest son of William Backhouse Astor, was graduated in law from Harvard and practiced as a preparation for the management of the huge Astor estate. During the Civil War he was a colonel on the staff of McClellan. He continued the family tradition of making contributions to the library founded by his grandfather.

Astor, John Jacob, 4th (1864-1912), capitalist, was graduated from Harvard in 1888. He owned the St. Regis, the Knickerbocker and the old Waldorf-Astoria hotels, New York. He had mechanical ability, inventing a bicycle brake and other devices. He saw active service in the Spanish-American War. In 1912 he lost his life in the *Titanic* disaster.

Astor, Lady Nancy Langhorne (1879-), first woman member of the British Parliament; American-born daughter of Chiswell Dabney Langhorne of Virginia. She married first Robert Gould Shaw of New York in 1897, whom she divorced in 1903. In 1906 she became the wife of Viscount William Waldorf Astor. When her husband succeeded to the peerage in 1919, she was elected to his former seat in the House of Commons. Always taking an active interest in measures relating to the welfare of women and children, Lady Astor was re-elected to Parliament in succeeding campaigns.

Astor, William Backhouse (1792-1875), eldest son of John Jacob Astor, was educated in Germany. He doubled the value of his father's estate and made generous contributions to the Astor Library.

Astor, William Waldorf, 1st Viscount (1848-1919), son of John Jacob Astor, 2d, became a naturalized British subject in 1899. Previously he had served in the New York legislature and was ambassador to Italy from 1882-85. After his removal to England, he purchased the *Pall Mall Gazette,* a Conservative organ. In 1917 George V created him a viscount.

Atahualpa or **Atabalipa** (*c.* 1495-1533), last King of the Incas. In 1532, having defeated his half brother Huascar, he became sole ruler of Peru. Shortly afterward Pizarro, the Spanish conqueror, made a prisoner of Atahualpa by pretending to invite him to a friendly interview. Though Atahualpa supplied a vast ransom in gold, Pizarro accused him of treachery and had him killed by strangulation.

Athanasius, Saint (*c.* 296-373), theologian of the ancient Church, born in Alexandria. From 326 until his death at the age of 77 he served as bishop of Alexandria. His name is associated with the church's rejection of Arianism—the doctrine that Christ is not coequal with God. As the successful advocate of the Trinitarian doctrine, Saint Athanasius is honored today as the "Father of Orthodoxy," though he was long in such a minority that *Athanasius against the world* became a proverb.

Athenagoras (2d century), Greek philosopher, born at Athens. His principal extant work, *Embassy for the Christians,* has a clear and forceful style. In it he defends the Christian faith against charges of atheism and other accusations.

Atherton, Gertrude Franklin Horn (1857-), American novelist, born in San Francisco. She married George H. Bowen Atherton when she was twenty-five. Upon his death in 1887 she decided to write and after 1892 usually produced a book a year. Two works are histories of California. Others are *The Conqueror* (1902), a historical novel about Alexander Hamilton; *Black Oxen* (1923), a story of modern rejuvenation; *The Immortal Marriage* (1927), the story of Aspasia and Pericles; *The Sophisticates* (1931); and *The Adventures of a Novelist* (1932), autobiography. In 1933 Mrs. Atherton was elected president of the new National Academy of American Literature.

Atticus Herodes, Tiberius Claudius (*c.* 101-177), Greek educator. He was trained by the best masters, giving special attention to oratory, in which he greatly excelled. Two of his pupils were future emperors, Marcus Aurelius and Lucius Severus. His fame rests mainly upon immense expenditures for public buildings which he gave to Athens, Corinth and other Greek cities.

Atticus, Titus Pomponius (109-32 B.C.), Roman philosopher. He wrote a history of Rome but it has not been preserved. He was a friend of Cicero, who wrote many letters to him.

Attila (*c.* 406-453), King of the Huns, whose cruelty in warfare earned him the name *the Scourge of God.* He ascended the throne in 433, ruling jointly with his brother Bleda over the barbarian inhabitants of northern Asia and Europe. About 444 Attila had Bleda killed and then extended his realm, raiding into the Balkans and Italy, devastating conquered lands and exacting taxes. At the Battle of Châlons, in 451, he was defeated by the Romans under Aëtius, but the following year he renewed his invasion of Italy and spared the city of Rome only because Pope Leo I treated with him.

Atwood, George (1746-1807), British mathematician, born in London. He was educated at Cambridge University, became tutor of Trinity College and invented a machine to illustrate the relations of time, space and velocity in the motion of a falling body.

Auber, Daniel François Esprit (1782-1871), French operatic composer, born in Caen, Normandy. His best-known operas include *Masaniello* (1828), *Fra Diavolo* (1830), the most popular, *Le Domino Noir* (1837) and *Manon Lescaut* (1856). His work is characterized by brilliant orchestration and delightful melody, and his countrymen regard him as the founder of French grand opera.

Aubigné, d', Jean Henri Merle, see *Merle d'Aubigné.*

Audubon, John James (1785-1851), American ornithologist and artist, born in Mandeville, La., of French parents. He spent his boyhood in France, returned to America in 1798 and lived for a time near Philadelphia, devoting himself largely to the study of birds. He went to Kentucky and made a study of bird life there; then traveled down the Mississippi to New Orleans, paying his way by painting portraits.

His notable *Birds of America,* consisting of very large colored plates made from his own drawings, was published in parts between 1827 and 1838. The accompanying text, the *Ornithological Biography,* written in collaboration with William MacGillivray, was published in 5 vols. (1827-39). The great interest in wild birds that Audubon aroused bore fruit later in the formation of Audubon Societies for the preservation and protection of native bird life in America. His finely illustrated *Viviparous Quadrupeds of America* was published in five volumes (1842-54).

Auenbrugger von Auenbrug, Leopold (1722-1809), Austrian physician. He originated the method of examining the chest by percussion, in which the sound produced by tapping the body enables the physician to judge the condition of the tissues beneath. He published the results of his investigations in a treatise which marks an epoch in the history of medicine.

Auerbach, Berthold (1812-82), German Jewish novelist, born in Nordstetten. He wrote sociological novels showing his absorption of Spinoza's philosophy, also tales of village life. *Auf der Höhe* (On the Heights) is probably his best-known novel.

Augereau, Pierre François Charles, Duke of Castiglione (1757-1816), French soldier. His ability was such that in less than 3 years of service he was made general of a division. Later he commanded the army on the Rhine and then the army in Holland. He was made a marshal in 1804, and, after Napoleon's abdication, Louis XVIII named him a peer.

Augustine of Canterbury, Saint (d. 604), first archbishop of Canterbury. While a prior of the monastery of St. Andrew at Rome in 596 he was sent to Britain, along with other missionaries, to convert the Anglo-Saxons to Christianity. The mission was directed by Pope Gregory I. One of Augustine's first converts was Ethelbert, King of Kent (597). Christianity was re-established in the island, and in 601 Augustine was made archbishop of Canterbury. His feast is May 28 or 26.

AUGUSTINE, SAINT (Aurelius Augustinus; 354-430), one of the fathers of the early Christian Church. He was born in Tagaste, Africa, the son of Patricius (a pagan, later converted to Christianity) and Monica, a devout Christian. Augustine's parents sent him to Carthage to complete his education but he neglected serious study. A lost book of Cicero's called *Hortensius* led him to the study of philosophy; but dissatisfied with this he went over to the Manichaeans, a Persian sect which taught a dual religion (right against wrong). He was one of their disciples for 9 years but left them, went to Rome and thence to Milan, where he became a teacher of rhetoric.

St. Ambrose, bishop of Milan, converted Augustine to Christianity, and the reading of Paul's epistles changed his life and character. Returning to Africa he sold his estate and gave the proceeds to the poor, keeping only enough to support him. The people of Hippo chose him as their priest against his will since he preferred a monastic life. In 395 he became bishop there. He entered into a warm argument with Pelagius about the doctrines of free will, grace and predestination and wrote treatises on these subjects.

He died while Hippo was besieged by the Vandals. Augustine was a man of great enthusiasm, devotion and zeal. Of his writings, the greatest are *The City of God,* a vindication of Christianity, and *Confessions,* an autobiography. Both have been translated into English. His feast day is celebrated on August 28.

Augustus (63 B.C.-14 A.D.), first Roman Emperor, imperial name of Caius Julius Caesar Octavianus (Octavian). He was the grandnephew of Julius Caesar, who adopted him and made him his heir. Caesar's assassination occurred while he was studying in Illyricum. Octavian hurried to Rome and obtained a copy of Caesar's will. Mark Antony, who was consul, put obstacles in his way, and only after considerable fighting was Octavian able to take over his uncle's property. Later he and Antony became allies and in 43 B.C., with Lepidus, they formed the Second Triumvirate, which, when they defeated Brutus and Cassius at Philippi (42 B.C.), gave them control of the Roman world. Lepidus soon dropped out; while Antony, assigned to the East, ruined himself there through his infatuation for Cleopatra, Queen of Egypt. After Antony's suicide in 30 B.C. Octavian became sole ruler of Rome. In 27 B.C. the Senate decreed that his name should be Augustus, meaning *exalted* or *consecrated.*

He ruled with a strong hand. His legions won victories in Asia and Europe until checked by Arminius at the Battle of Teutoburg Forest (A.D. 9). Augustus founded cities, beautified Rome, encouraged agriculture and learning and the work of Horace, Vergil and other writers whom he befriended has given rise to the term *Augustan Age,* signifying a period of literary splendor. Augustus was succeeded in A.D. 14 by Tiberius, his stepson.

Aurelian (Lucius Domitius Aurelianus; c. 212-275), Roman Emperor who rose from a lowly state to be the *Restorer of the Roman Empire.* Of peasant birth, he became a common soldier but gained so much credit for his military exploits that the army elected him emperor in 270 as successor to Claudius. He restored order at home and in the provinces, humbled Queen Zenobia of Palmyra and won back Syria, Mesopotamia, Egypt, Spain, Gaul and Britain. Aurelian was killed by conspirators while he was fighting the Persians.

Aurungzebe (1619–1707), last great Mogul Emperor in India, 3d son of Shah Jehan. Aurungzebe deposed his father in 1658, after murdering all his relatives one after the other. He fought many wars and conquered Golconda and Bijapur.

Austen, Jane (1775-1817), English novelist, born in Steventon, Hampshire, where her father was a clergyman. Her six novels depict the everyday routine of the typical English town with realism and quiet humor. In the words of Scott, she had "the exquisite touch which renders ordinary commonplace things and characters interesting." Her novels are *Sense and Sensibility, Pride and Prejudice, Mansfield Park, Emma, Persuasion* and *Northanger Abbey.*

Austin, Alfred (1835-1913), English poet and essayist; he succeeded Tennyson as Poet Laureate in 1896. Austin wrote graceful verse and thoughtful critical essays. His verse appeared under such titles as *The Seasons, Songs of England* and *Love Poems;* his autobiography was published in 1911.

Avebury, Baron, see *Lubbock, Sir John.*

Averroes, ibn-Rushd (1126-98), Arabian physician and philosopher, born at Cordova, Spain. He devoted himself to the works of Aristotle and was called *The Interpreter* by the Arabs. His writings on Aristotle appeared in a Latin translation and he wrote also a compendium of medicine and treatises in theology and philosophy.

Avery, Elroy McKendree (1844-1935), American author and historian, born at Erie, Mich., graduate of the University of Michigan. His writings include a *History of the United States and Its People* (12 vols.) and textbooks on physics.

Avicenna or **Ibn Sina** (980-*c.*1037), Arabian philosopher and physician, whose authority for many centuries passed as indisputable. Of his many writings the best known is *Canon Medicine,* which was used as a textbook at Louvain and Montpellier universities for about 6 centuries.

Avogadro, Amadeo, Count (1776-1856), Italian chemist and physicist, born in Turin. He was professor of physics at the university there in 1821-23 and 1833-50. He formulated the hypothesis, afterwards known as *Avogadro's law,* that under the same conditions of temperature and pressure, equal volumes of gases and vapors contain equal numbers of molecules.

Ayesha (611-678), favorite wife of Mohammed and daughter of Abu-Bekr, who succeeded Mohammed as leader of Moslem believers. Ayesha was married to the prophet when 9 years old and was his third wife. She is supposed to have been a brilliant and clever woman. She survived him by nearly half a century. *Aisha* is another spelling of the name.

Azaña, Manuel (1880–1940), Spanish statesman, a leading figure in the overthrow of the Spanish monarchy. He was educated to the law, became leader of a group of advanced political thinkers, edited liberal periodicals and as head of the Accion Republican Party was made minister of war in the first republican ministry (1931). In October of that year he became president of Spain; a few months later he took the premiership. He was active in promoting many reforms, but he became unpopular as the temper of the country turned more conservative. He resigned in 1933, but in the following year he headed the provisional government of the Catalan separatists. In May 1936 following the leftist triumph in the elections he again became President.

Babbitt, Isaac (1799-1862), American inventor, born at Taunton, Mass. He discovered the soft antifriction metal called *Babbitt metal,* an alloy of copper, tin and antimony. At first a goldsmith, in 1824 he made the first pewter ware manufactured in the United States and later became superintendent of the South Boston Iron Works. For his service to the industrial world Congress voted him $20,000 in 1851.

Baccio della Porta, see *Bartolommeo, Fra.*

BACH, JOHANN SEBASTIAN (1685-1750), German composer, born at Eisenach of a family which produced many eminent musicians. As a boy he studied the violin with his father and the organ with Böhm. When he was 20, he was organist at Arnstadt, became court organist at Weimar in 1708 and in 1714 concert master to the Duke of Anhalt-Köthen with the additional duty of composing and conducting the vocal music of the ducal chapel. From 1723 he held a city appointment at Leipzig. He became blind in the last year of his life, recovering his sight only a few days before his death.

Although he is now known as the *Father of German Music,* his greatness was not recognized until half a century after his death, when the composer Mendelssohn championed his cause. Foremost among his works are the *Mass in B Minor;* the *St. John* and *St. Matthew* oratorios; the *Well-Tempered Clavichord,* 48 preludes and fugues for the pianoforte; and a quantity of chamber music. Bach had 11 sons, all distinguished as musicians. The most renowned were Wilhelm Friedemann (1710-84), a scientific harmonist and skillful organist, and Karl Philip Emmanuel (1714-88), who composed mainly for the piano.

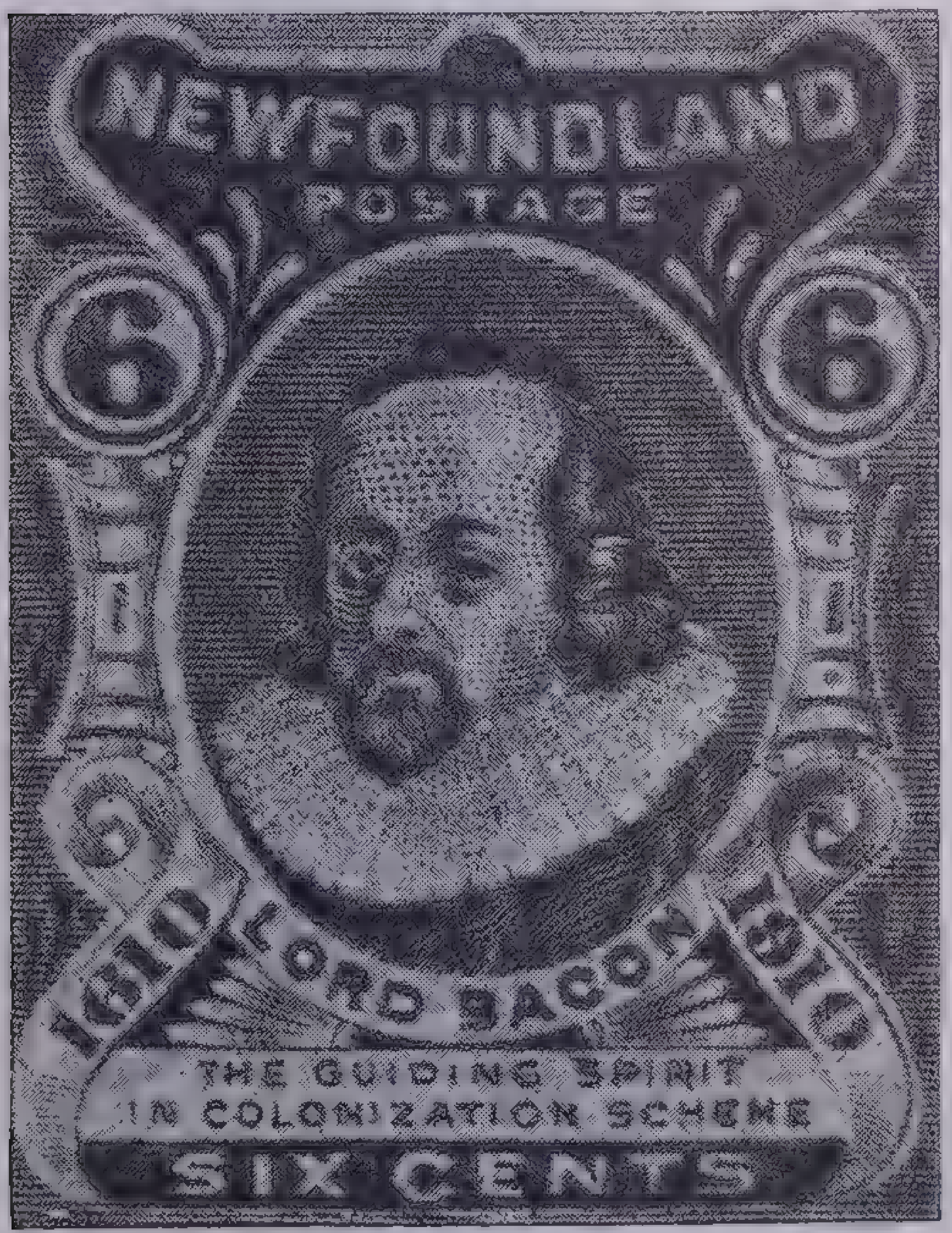
Bache, Franklin (1792-1864), American physician and chemist, great-grandson of Benjamin Franklin. Born in Philadelphia, he studied medicine at the University of Pennsylvania and was professor of medicine at Jefferson Medical College. His great achievement was his preparation of the *United States Dispensatory,* the basis of the present *United States Pharmacopeia.*

Bacheller, Irving Addison (1859-), American author, born in Pierpont, N. Y. After graduation from St. Lawrence University he entered journalism, serving on the Brooklyn *Times,* the New York *World* and *The Cosmopolitan.* With *Eben Holden,* a study of rural character, he gained his first success as an author. His best writings were those depicting early American life. Other works include the very successful *D'ri and I,* followed by *Darrel of the Blessed Isles, A Man for the Ages, The House of Three Ganders, A Candle in the Wilderness* and the autobiographical *Coming up the Road—The Story of a North Country Boyhood.*

BACON, FRANCIS, BARON VERULAM, VISCOUNT ST. ALBANS (1561-1626), English philosopher and statesman, born in London. He studied at Cambridge University and was admitted to the bar. In 1576 he went to France with the English ambassador, remaining until recalled to England by his father's death in 1579. Entering Parliament in 1584, he served continuously until 1614, after which he became attorney general and later lord chancellor. In 1618 he received the title Baron of Verulam and 2 years later was made Viscount St. Albans.

The great blot on his career during the reign of Elizabeth was, according to Macaulay and others, his prosecution of his friend the Earl of Essex in 1600, although his part was a minor one. While he was lord chancellor in 1620 Bacon was accused of accepting bribes. He confessed, was condemned by the peers, deprived of his office and fined $200,000, but the sentence was remitted. The king pardoned him, but declined to allow him to return to Parliament or the Court.

After he retired from political life, Bacon gave all of his attention to writing. Up to that time his only acknowledged works had been several editions of his *Essays*—rewritten and augmented on every occasion with infinite care; his *Advancement of Learning* (1605) and *Novum Organum* (1620). The last 5 years of his life were full of work. He produced a *History of Henry VII* (1622), *Historia Ventorum* (1622), *Historia Vitae et Mortis* (1623); his magnum opus, *De Augmentis Scientiarum* (1623), a Latin translation, with large additions, of *The Advancement of Learning; Apophthegms* (1624); Translation of the Psalms (1625). His last work, *Sylva Sylvarum* (1627), was published posthumously along with the *New Atlantis.*



Courtesy Scott Stamp & Coin Company

Sir Francis Bacon

Enlarged from a Newfoundland postage stamp issued in 1910, one of a series commemorating the colonization of Newfoundland

Bacon was great as a moralist, a historian, a writer on politics and a rhetorician. His position among the world's great thinkers, however, is due to his defense of the inductive method in science: he argued that no theories should be advanced until facts are collected and observed. To modern minds this seems self-evident, but Bacon had to fight against the idea that theories and principles could be derived from previous theories without research into the actual facts involved.

Bacon, Frank (1864-1922), American actor and playwright, born in California. He played small parts in California, went to New York and rose to prominence in *Alabama, Pudd'nhead Wilson, Me and Grant, The Cinderella Man* and *The Fortune Hunter.* In 1918 he presented and acted in his own play, *Lightnin',* which ran for 3 years in New York and was later received enthusiastically all over the nation.

Bacon, Nathaniel (*c.* 1642-76), Virginia planter and patriot, born in England. Soon after his arrival in America (1674) he became a member of Governor Berkeley's council. When Berkeley failed to protect the colonists against an Indian outbreak in 1675, they chose Bacon to lead them in an expedition. In so doing they disobeyed Berkeley's orders. He called them rebels, and the uprising termed "Bacon's Rebellion," took on the aspect of resistance to the government. Jamestown was burned (1675), but the brief civil war quickly ended when Bacon suddenly died of fever.

BACON, ROGER, FRIAR (1214-92), English scientist and philosopher. After studying at Oxford and Paris universities, he entered a monastery at Oxford. He built a microscope and telescope, and described the bacteria and nebulae he was thus able to see. This seemed like magic to people of his day and he was suspected of witchcraft by his superiors, who kept him imprisoned for years. His most important work is his *Opus Majus,* in which he discusses the relation of philosophy to religion and then treats of language and experimental science. He was interested in calendar reform and is given credit for the invention of gunpowder.

Baden-Powell, Robert Stephenson Smyth, Baron (1857-), British soldier, founder of the Boy Scouts, was born in London, the sixth son of Professor Baden-Powell, and educated at Charterhouse. As a cavalry officer in 1876 he saw much active service in Afghanistan, India and South Africa. In the Boer War his force defended Mafeking for 215 days; he was promoted to general. In 1908 he founded the Boy Scouts and Girl Guides to promote good citizenship in young people. He published many works on his experiences, including *Scouting for Boys, My Adventures as a Spy* and *Indian Memories.*

Baedeker, Karl (1801-59), German publisher, the originator of the famous Baedeker guidebooks that have long been standard, especially for European countries. The publishing house, originally at Coblenz, was moved to Leipzig in 1872 by the founder's son Fritz.

Baekeland, Leo Hendrik (1863-), Belgian chemist, born at Ghent and educated at the university there. He later studied in England, Germany and the United States on scholarships. He specialized in electrochemistry and became a teacher of chemistry and physics in his *alma mater.* After 1889 he lived in the United States, formed a company to manufacture photographic papers and 10 years later sold it to the Eastman Kodak Company. Thereafter he gave his time to chemical research, crowning his endeavors with the discovery of *bakelite,* a synthetic plastic material named for him, widely used for molded objects, insulation and varnishes. He was president of the American Chemical Society.

Baeyer, von, Adolf (1835-1917), German chemist, born at Berlin. In 1872 he became professor of chemistry at the University of Strasbourg and later at Munich. He discovered cerulein, eosin and indol, besides making other valuable contributions to the chemistry of dyestuffs. For this he received the Nobel chemistry prize of 1905.

Baffin, William (*c.* 1584-1622), English navigator and explorer, pilot of an expedition in 1615 to find the Northwest Passage and discoverer of the great bay which bears his name. His account of that voyage is in the British Museum. He served in the allied English and Persian armies against the Portuguese in 1622 and was killed in battle.

Bagehot, Walter (1826-77), English journalist, author and economist, born in Langport and educated for the law. He then joined his father, a banker and shipowner, and became an economist of note after he married the daughter of James Wilson, owner of *The Economist,* of which Bagehot was editor for 17 years—1860-77. He wrote authoritatively on economic subjects, his books including *Physics and Politics, The English Constitution* (1867), *Lombard Street* (1873) and *Literary Studies* (1879).

Baggesen, Jens Emmanuel (1764-1826), Danish poet and author, born at Korsör in the island of Zeeland. His German works fill 5 volumes; his Danish, 12 volumes. Chief among them are his *Comical Tales, Labyrinten* and *Parthenais.*

Bailey, Liberty Hyde (1858-), American botanist and writer, native of South Haven, Mich., educated in Michigan State Agricultural College; in a long career, he became an outstanding authority on horticulture. He was professor of horticulture and landscape gardening at Michigan Agricultural College and later at Cornell University. Bailey wrote many books and was editor of several encyclopedias on agriculture and horticulture. Among his works are *Survival of the Unlike, Evolution of Our Native Fruits, Lessons with Plants* and *Botany* (a textbook); his most important cyclopedic works are *Encyclopedia of Horticulture* and *Cyclopedia of Agriculture.*

Baillie, Joanna (1762-1851), Scottish poet and dramatist, born in Bothwell. She is chiefly known for her nine *Plays on the Passions.* Her *Family Legend,* produced at Edinburgh under Scott's auspices in 1810, was a great success. She is remembered for her poems in the Scottish dialect, the *Bonny Boat* and *Woo'd and Married.*

Baily, Edward Hodges (1788-1867), English sculptor and member of the Royal Academy, was born in Bristol. The statue of Nelson in Trafalgar square, London, and the bas-reliefs on the south side of the marble arch in Hyde Park are Baily's work.

Bain, Alexander (1818-1903), Scottish philosopher and educator, born at Aberdeen. After teaching natural philosophy at Anderson's University, Glasgow, he was examiner in logic at the University of London. In 1860 he entered on 20 years of notable work as professor of logic in the University of Aberdeen. His chief works are *The Senses and the Intellect, The Emotions and the Will, Logic, Mind and Body, Education as a Science* and biographies of James Mill and John Stuart Mill. He helped reform methods of teaching rhetoric and English.

Bainbridge, William (1774-1833), American naval officer, commodore in the early American navy and commander of the *Constitution* at the time it was nicknamed *Old Ironsides,* was born in Princeton, N. J. At the age of 19 he was in command of a merchant vessel and joined the navy as lieutenant when the navy was organized in 1798. In the Tripolitan War (1801-05) he was in command of the *Philadelphia;* it ran aground and he and his crew were imprisoned for more than a year. In the War of 1812 he commanded a squadron consisting of the *Constitution, Essex* and *Hornet;* the other ships being absent, the *Constitution,* alone, with Bainbridge in command, captured the British *Java.* After the war, he conducted the naval training school at Boston, and for the last 2 years of his life he was head of the board in control of naval affairs.

Baird, Spenser Fullerton (1828-87), American naturalist, born in Reading, Pa., and educated at Dickinson College, where he afterward taught natural sciences. He was later appointed secretary of the Smithsonian Institution. Through his efforts the U. S. Fish Commission was created and he was placed in charge. Baird wrote profusely on birds, fishes and reptiles. Among his works are: *History of the Birds of North America,* 5 vols.; *Birds of North America* and *Mammals of North America.*

Bajazet or **Bayazid I** (1347-1403), Sultan of Turkey, succeeded his father Murad I at the age of 42. For 3 years his military exploits bade fair to rival those of Alexander the Great, for within that period he conquered Bulgaria, Macedonia, Thessaly, a part of Serbia and a considerable portion of Asia Minor, thus largely extending Turkish power. For 10 years he besieged Constantinople, hoping to reduce it to starvation and surrender, but in this he failed. In 1402, defeated by Tamerlane at Angora, he died in captivity.

Baker, Newton Diehl (1871-1937), American statesman, born at Martinsburg, W. Va. Graduated from Johns Hopkins University in 1892, he received his law degree at Washington and Lee University in 1894. He practiced law in Cleveland, Ohio, became city solicitor (1902-12) and mayor (1912-16).

President Wilson appointed him secretary of war in 1916. Baker, a frank pacifist, was mercilessly criticized when he came out strongly in support of President Wilson's preparedness policy. When the United States entered the World War he handled the tremendous task of organizing and directing the training and transportation of men with such efficiency that General Harbord later called him "the greatest Secretary of War, in war, that our history has yet produced."

After the war he returned to Cleveland to practice corporation law and to advocate membership of the United States in the League of Nations. In 1928 President Coolidge appointed him a member of the Permanent Court of International Justice at The Hague; and in 1929 President Hoover made him a member of his Law Enforcement Commission. He was one of its two members who advocated the repeal of the Prohibition Amendment. He was frequently suggested for the Democratic nomination for President.

Baker, Ray Stannard (1870-), American journalist and author, a native of Lansing, Mich., was graduated from Michigan Agricultural College and later studied at the State University in special literary courses. He began his career as a reporter on the Chicago *Record*, after which he held magazine editorships—first on *McClures* (1899-1905), then on the *American* (1906-15). It was then that he began to write under the name *David Grayson*. His *Adventures in Contentment*, delightful rural sketches, and *Hempfield* were written under his pen name. His other writings, under his own name, are in serious vein and include *Boys' Book of Inventions, Following the Color Line, New Ideals in Healing, Our New Prosperity, Seen in Germany, History of the Peace Conference* and, as authorized biographer, *The Life and Letters of Woodrow Wilson*. During the World War he was commissioner of the Department of State to the European Allied nations.

Baker, Sir Samuel White (1821-93), English explorer in Africa, born in London. He traced part of the course of the Nile River and in 1874 discovered Lake Albert Nyanza. For four years he explored and mapped the interior in order to open up the country to trade and at the same time suppressed the slave trade in many areas.

Bakunin, Mikhail Aleksandrovich (1814-76), Russian anarchist, founder of Nihilism. Born into an aristocratic family, he served in the Imperial Guard. In 1841, he began to study in many parts of Europe and became active in various radical groups. He was ordered to return to Russia in 1847, and his property was confiscated when he refused. He was active in the German revolutions of 1848-49; was sentenced to death in Austria; sent back to Russia and condemned to exile in Siberia in 1855. Five years later he escaped to London, where he was associated in socialist movements with Marx and Engels, advocating militant anarchistic ideas. His books, urging anarchism and atheism, include *God and the State* and *The Social Revolution*.

Balakirev, Mili Aleksyeevich (1837-1910), Russian composer. At the age of 18 he became leader of the national movement in Russian music and a few years later founded the Free School of Music in St. Petersburg. He composed the symphonic poems *Russia* and *Tamara*, the music to the opera *King Lear* and some popular songs.

Balard, Antoine Jérôme (1802-76), French chemist, born at Montpellier in 1802. Beginning as a pharmacist, he soon became assistant professor at the faculty of sciences in his native town, then professor at the Royal College. In 1826 he discovered the element bromine in sea water. This brought him fame and a place on the faculty of sciences in Paris. Later he was appointed to the Collège de France.

Balbo, Italo (1896–1940), Italian aviator and colonial governor. He was one of Mussolini's officers in the march on Rome in 1922; in 1923 he commanded the Fascist militia, and later served as under secretary of state for aviation. He did much to develop Italian aviation and commanded several pioneering air flights, the most impressive being the flight of 10 airplanes from Italy to Brazil (1931) and the mass flight of 24 planes from Italy to the United States (1933). When he returned from America he was appointed governor of Libia, North Africa.

Balboa, de, Vasco Núñez (1475–1517), Spanish soldier and conquistador. He spent an irresponsible youth in Spain and at the age of 26 joined a commercial expedition to the Americas. At Darien, an insurrection elevated him to the command, but intrigues at the Spanish court demoted him in favor of another. In 1512 he was restored to favor and received a commission as governor of Darien. The next year, while engaged in exploration, he led the first party of white men across the Isthmus of Panama and discovered the Pacific Ocean. In 1514 he was superseded as governor by Avila; the relations of the two were unfriendly, and on a charge of contemplated revolt, Balboa was beheaded.

Baldung, Hans (Hans Grün; *c.* 1476-1545), German painter and engraver, contemporary of Albrecht Dürer, was born in Gmund, Swabia. His masterpiece, a painting of the crucifixion, is in the cathedral of Freiburg. Other notable paintings are *St. Sebastian* in Berlin Museum; *Bewailing the Body of Christ* in National Gallery, London; and *Death Seizing a Young Woman* in Basel Museum. Baldung excelled in woodcut engraving, especially in the designs.

Baldwin, James Mark (1861-1934), American psychologist, born in Columbia, S. C. He taught at Princeton, Johns Hopkins University, the National University of Mexico, and in Paris. At the University of Toronto he founded the first psychological laboratory in the British Empire. Among his works are *The History of Psychology* and *Between Two Wars*.

Baldwin, Matthias William (1795-1866), American inventor. In 1831-32 he built a very efficient locomotive, *Old Ironsides*, for the Philadelphia & Germantown Railroad, the first of many to bear his name down to the present. The advertisement (November 1832) of his locomotive read: "The locomotive-engine, built by M. W. Baldwin, of this city, will depart daily, when the weather is fair, with a train of passenger cars. On rainy days horses will be attached." His entire life was spent in building up the great Baldwin Locomotive Works.

Baldwin, Simeon Eben (1840-1927), American jurist, born at New Haven, Conn., and graduated from Yale in 1861. He was a member of the Yale Law School faculty from 1869 to 1919 and did much for the development of the school. In 1893 he was appointed a justice of the supreme court of Connecticut. He was elected governor of Connecticut at the age of 70. The best known of his publications are *The American Judiciary* and *The Young Man and the Law*.

Baldwin, Stanley, 1st Earl of Bewdley (1867-), British statesman, native of Worcestershire. After he was graduated from Cambridge University, he entered the family's iron manufacturing business and remained until the age of 40.

He was first elected to Parliament in 1908 as a Conservative, and rose steadily in political life. During the World War he was secretary of the treasury, and when England was sorely pressed for money, Baldwin gave one-fourth of his private fortune to the Government. In 1920 he was appointed to the Privy Council and in the following year was president of the Board of Trade, a cabinet post. After returning from the war-debt funding mission to the United States, he succeeded Bonar Law as prime minister (1923).

Only a few months later the Labor party triumphed in a national election and Ramsay MacDonald replaced him. In 1924 the Laborites lost power, and again Baldwin became leader of the House of Commons. At the next general election the Laborites were returned to power and from 1929 to 1931 Baldwin led the Conservative opposition to the Government. With the British financial system threatened in 1931, Baldwin joined Ramsay MacDonald's National Government as lord president of the Council. Baldwin conceived the idea of national government long before it received actual political expression, and this form of nonpartisan government continued for years. In 1935 the two leaders again changed places, and Baldwin was prime minister until the summer of 1937, when he accepted a peerage. His cleverness during the abdication crisis of 1937 saved the principle of constitutional monarchy. The speech he made in the House of Commons, after King Edward VIII [later the Duke of Windsor] announced his final determination to renounce the throne, represented his greatest parliamentary effort, and when he retired in 1937 his prestige stood high.

His books include *Goodwill in Industry* and *The Classics and the Plain Man*.

Balfe, Michael William (1808-70), Irish composer, born in Dublin. He wrote the light opera *The Bohemian Girl*, (1843) and won a place among music masters. Balfe produced about 20 English operas and wrote successfully in French and Italian. His first success was *Siege of Rochelle;* among others are *Il Talismano, Satanella, The Rose of Castile* and the ballet music for *La Pérouse*.

Through the generosity of Count Mazzara, he was able to go to Italy to perfect his musical education. He appeared publicly in 1816 as a violinist, and between two periods of study in Rome, he sang in Italian opera in Paris.

Balfour, Arthur James, 1st Earl of Balfour (1848–1930), British statesman hailed at the time of his death as "the last of the great Victorians." He was a native of Scotland and a graduate of Cambridge University. In a career of half a century, he rose from a private secretaryship under Lord Salisbury, his uncle (1878-80), to the post of premier (1903-05).

He was secretary for Scotland (1886–87), for Ireland (1887-91) and had to administer the Crimes Act in Ireland, which aroused resentment against him. In 1902 he succeeded Salisbury as leader in the House of Commons, holding office until 1906. When the World War forced a coalition Cabinet (1915), he was invited by Premier Asquith to become first lord of the admiralty. In the next year he was made secretary of state for foreign affairs in the coalition war ministry of Premier Lloyd George.

As leader of a commission to the United States he conferred with American authorities on their war activities and later headed the British delegation to the disarmament conference in Washington called by President Harding (1921-22). He was raised to the peerage in 1922. Always a friend of the Jewish people, the envisioned Palestine as their national home. He is the author of *Philosophic Doubts, Theism and Thought* and *Opinions and Arguments*, besides other books on philosophy.

Balfour, Francis Maitland (1851-82), Scottish biologist, born at Edinburgh and educated at Trinity College, Cambridge. Between 1879 and 1882 he brought together in his *Comparative Embryology*, all that was known about the development stages of animals, a work of the greatest value to students. In 1882 he and his guide were killed on the Alps while attempting to climb Mt. Blanc.

Ball, John (d. 1381), English priest, leader in the Peasants' Revolt or Wet Tyler's Rebellion. He was a follower of Wycliffe. The peasants set him free from prison, but he was hanged, drawn and quartered when the revolt was crushed.

Baliol, de, John (1249-1315), King of Scotland (1292-96). When Margaret, Maid of Norway, Queen of Scotland, died in 1290, she left no direct heirs. Baliol claimed the throne through a distant blood connection to the royal line, and so did Robert Bruce. Edward I of England was called upon to settle the matter, and he decided in favor of Baliol. But the new king fell out of favor with Edward, who drove him from the throne (1296) and seized it for himself. The deposed monarch was imprisoned in the Tower of London but was released in 1297 and spent his last years in France.

Ball, Sir Robert Stawell (1840-1913), British astronomer, born in Dublin and studied at Dublin University. He was professor of mathematics at the Royal College of Science in 1873 and astronomer royal for Ireland, 1874-92. He wrote *Story of the Heavens* and *Great Astronomers*.

Ball, Thomas (1819-1911), American sculptor, born in Charlestown, Mass. When he worked as an errand boy in the New England Museum in Boston, his ambition turned to sculpture. When Jenny Lind visited the United States, he made a small bust of her and continued with busts of several musician acquaintances. Ball was musical also and sang the title role in *Elijah* in its first presentation in America. A full-sized bust of Daniel Webster brought him national recognition, and he was able to go to Italy for a period of study.

An equestrian statue of Washington is in the Boston Public Gardens. The Actors' Home in Philadelphia possesses his statue of Edwin Booth. His *Emancipation Group* was unveiled in Washington in 1875, and in 1876 his bronze statue of Daniel Webster was placed in Central Park, New York. Later notable sculptures are *Saint John the Evangelist* in Forest Hills Cemetery, Boston, the statue of Josiah Quincy in the same city and the Washington monument in Methuen, Mass.

Ballou, Hosea (1796-1861), American Universalist clergyman, born in New Hampshire. He resided in Boston, and though he had little formal education he crystallized American Universalist sentiment into an organization. In 1819 he started the *Universalist Magazine*, and in 1831 began publishing the *Universalist Expositor*. In spite of his lack of early training he became an eloquent pulpit orator and the author of various books including *Notes on the Parables* (1804) and *Examination of the Doctrine of Future Retribution* (1834).

Balmaceda, José Manuel (1838-91), Chilean statesman, President of Chile, born in Santiago. He was minister of the interior and minister of foreign affairs and in 1886 was chosen President of the republic. As President he sponsored public education, built railroads and liberalized the laws; he was praised for his public policy, but his country denied him dictatorial powers, when, near the close of his term, he attempted to secure the succession for an exceedingly unpopular man. This, together with his cabinet appointments that did not meet with favor, led to open revolt and civil war followed. Balmaceda's forces were routed, and he committed suicide.

Baltimore, Lord, see *Calvert, George.*

BALZAC, DE, HONORÉ (1799-1850), French novelist, born at Tours, the first and perhaps the greatest French writer of realistic tales. While he was a student at the College of Vendôme, he undermined his health by overstudy and excessive reading of mystery books. He studied law but refused to practice it and contended himself for a time as a lawyer's clerk, where he learned many things of the underside of life that he used later in his novels. While he was engaged in this work he produced several volumes of fiction that he published under assumed names or anonymously without financial gain; and he became almost penniless. The turning point in his career came in 1829 by the publication of *Les Chouans*, a historical novel with Brittany as its background.

He was then 30 years old, and for the next few years he wrote constantly, steadily gaining in power. He made helpful acquaintances—Victor Hugo, George Sand, Lamartine and others—and fell under the spell of Madame Hanska, a Polish woman. He was heavily in debt, and no financial relief came until his belated marriage to Madame Hanska, who was a wealthy woman, a few months before his death.

Balzac's novels number 97 listed books; some of his earliest efforts he repudiated. During the 20 years between 1831 and 1850, he wrote the books that comprise his great "Human Comedy." Most popular was *Old Goriot*, but only slightly less vital was *Eugénie Grandet*, with *Lost Illusions* next in favor. Other novels were *The Physiology of Marriage, The Wild Ass's Skin, Louis Lambert* and *Seraphita*. The last-named appeared in 1849, dedicated to Madame Hanska, to crown his devotion of 15 years. His chief works have been translated into English.

Bancroft, George (1800-91), American historian and diplomat, born in Worcester, Mass., and graduated from Harvard College; he studied later in Germany, at Göttingen, Berlin and Heidelberg. Returning to the United States, he became a tutor of Greek at Harvard but soon turned to writing. Without his knowledge he was elected to the Massachusetts legislature but declined to serve and refused a later nomination. With an associate he opened a private school at Northampton but, becoming absorbed in a historical project, disposed of his interest in the school. His great work soon began to appear—*The History of the United States*—which is still read. He was engaged for 40 years in writing this voluminous history; the first volume appeared in 1834, the tenth in 1874. Two later volumes appeared as *History of the Foundation of the Constitution of the United States* (1882). Bancroft's other works are *History of the Colonization of the United States; The Necessity, the Reality, and the Promise of the Progress of the Human Race; A Plea for the Constitution of the United States* and *Martin Van Buren.*

He was collector of customs at Boston (1836); he served under President Polk as secretary of the navy (1845-46), when his influence helped to establish the Naval Academy at Annapolis; he became minister to England in 1846; and he was appointed as the first American minister to the new German Empire in 1871.

Bancroft, Hubert Howe (1832-1918), American historian, born in Granville, Ohio, began business as a bookseller in San Francisco. With the idea of publishing an encyclopedia, he gathered a vast amount of historical material but later determined to make his work historical instead, and, with the assistance of a large staff of writers and historians, published *Native Races of the Pacific States* and *A History of the Pacific States of North America*, 28 vols. He wrote several other books, including *In These Latter Days* (1917). His library of 60,000 volumes was given to the University of California.

Bandinelli, Baccio (1493-1560), Italian sculptor and painter, born at Florence, the son of a famous goldsmith. His talent secured him many patrons, and Pope Clement VII gave him an estate. The statue of St. Peter in the Cathedral at Florence is an example of his fine sculpture. In painting he was a poor colorist but a great designer.

Bangs, John Kendrick (1862-1922), American humorist and editor, born in Yonkers, N. Y., and graduated from Columbia College (1883). He studied law but not with the intention of practicing. His first literary venture (1884-88) was an editorship on *Life*, then a humorous weekly; he became editor successively of *Literature* (1898-99), *Harpers' Weekly* (1900), *Metropolitan Magazine* (1902-03) and *Puck* (1904-5). Bangs also lectured and wrote more than a score of books, among them *A Houseboat on the Styx, Ghosts I Have Met, Olympian Nights* and *The Pursuit of the House Boat.*

Banks, Sir Joseph (1743-1820), British naturalist, born in London. In 1766 he made a voyage to Newfoundland and Labrador, collecting plants; and from 1768-71 he sailed with Cook around the world in the capacity of naturalist. He wrote a work on the diseases of plants.

Banks, Nathaniel Prentiss (1816-94), U. S. Congressman and soldier, born in Waltham, Mass. He served in his state legislature and was twice elected to Congress (1853-57), becoming Speaker of the House in his second term. He became governor of his state (1858-61). He was major general of Massachusetts volunteers, commanded a corps in the Shenandoah Valley, was in command at Cedar Mountain, succeeded Gen. Benjamin F. Buter at New Orleans, captured Port Hudson and lost and won several minor engagements. After the war he was again a member of Congress (1865-73, 1875-77 and 1889-91).

Banks, Thomas (1735-1805), British sculptor, born in London. His *Caractacus Brought Prisoner to Rome* is perhaps his best-known work. The monuments of Sir Eyre Coote in Westminster Abbey and of Captains Burgess and Westcott in St. Paul's cathedral were among his last sculptures.

Banting, Sir Frederick Grant (1891-   ), Canadian physician and scientist, native of Ontario, educated at the University of Toronto. He gained renown soon after the World War as the discoverer of insulin, a remedy for diabetes. Banting shared this honor with a fellow scientist, Dr. J. J. R. MacLeod, as he did the Nobel Prize in medicine, awarded him in 1923 and shared with C. H. Best, a collaborator.

Banting had begun the practice of medicine in London, Ont., but abandoned his practice and returned to Toronto, where the university authorities gave him all possible assistance. About a year later, his great discovery was announced. The Government of Canada gave Banting an annuity of $7,500, and Ontario endowed a research foundation at $10,000 a year at the University of Toronto. He was appointed to the post. In 1934 Dr. Banting was knighted in recognition of his highly distinguished service to mankind.

Barbarossa, see *Frederick I of Germany.*

Barbour, John (*c.* 1316-95), Scottish poet and historian. He paid several visits to England and France and was archdeacon of Aberdeen from 1357 until his death. His national epic, *The Bruce*, was first printed at Edinburgh in 1571. It is verse in praise of Scottish independence.

Barclay de Tolly, Mikhail, Prince (1761-1818), Russian general. He was largely responsible for the disastrous rout of Napoleon Bonaparte in the emperor's Russian campaign. Barclay de Tolly's fellow officers were unfriendly because of his Scottish parentage, but nevertheless he rose from a sergeancy to high command and was minister of war, 1810-13. In the Napoleonic campaign he took command in the field and, by obstructive tactics and a policy of waiting, wore out the French armies and caused their virtual destruction.

Barham, Richard Harris (1788-1845), English poet and humorist, born at Canterbury. The *Ingoldsby Legends* constitute his claim to fame and were first contributed to *Bentley's Miscellany*. They are a series of humorous parodies on country superstitions, told in prose and verse.

Baring, Alexander, 1st Baron Ashburton (1774-1848), English diplomat and financier, son of Sir Francis Baring, head of a London mercantile house with important connections in North America. His name is perpetuated in the Webster-Ashburton treaty (1842), which settled the northeastern boundary between the United States and Canada. He succeeded to his father's position in 1810.

Baring-Gould, Sabine (1834-1924), English clergyman and author, born in Exeter. Educated at Cambridge University, he spent some years in European travel. Returning to England, he became curate at Horbury (1864), rector of East Mersea (1871) and 10 years later succeeded to the estate that had belonged to the family for 3 centuries. Thereafter he devoted much time to writing and produced more than 20 books. His most pretentious novel is *Mehalah*, though *John Herring* has a high rating. His archaeological offering, *Cliff-Castles and Cave-Dwellings of Europe*, was well received. He will be remembered as the author of the hymns *Onward Christian Soldiers* and *Now the Day is Over*. His acquaintance with folklore is shown in his novels.

Barker, George Frederick (1835-1910), American physicist, born at Charlestown, Mass. He studied at Yale and McGill universities, became an expert in poisons and frequently testified for the government in poisoning cases. His textbooks on chemistry and his reports to the Smithsonian Institution were published.

Barlow, Joel (1754-1812), American poet and diplomat, born in Connecticut. His literary work survives in *The Vision of Columbus* (1787), which was enlarged in 1805 and published as *The Columbiad*. During the Revolutionary War he was a chaplain with the American army, after which he was appointed as consul to Algiers, then as minister to France (1811). He died while on his way to a conference with Napoleon in Russia.

Barnard, Edward Emerson (1857-1923), American astronomer, born in Nashville, Tenn. He was graduated (1887) from Vanderbilt University and then directed the university's astronomical observatory. He next took a post at Lick Observatory, where he remained until 1895, when he went to Yerkes Observatory of the University of Chicago. There he discovered 16 comets and the fifth satellite of Jupiter.

Barnard, Frederick Augustus Porter (1809-89), American educator, born at Sheffield, Mass., and educated at Yale. After teaching the deaf and dumb for a time, he taught philosophy and mathematics in the University of Mississippi and was then elected president of Columbia (1864), in which post he remained until his death. Most of his property was willed to the university. The teaching of the sciences advanced during his presidency, but he advocated in vain the admission of women students to that university. Barnard College for women, affiliated with Columbia, was named as a memorial to him.

Barnard, George Grey (1863-1938), American sculptor, born at Bellefonte, Pa., studied at the Chicago Art Institute and the École des Beaux-Arts, in Paris. One of his most notable works, *Two Natures*, is in the Metropolitan Museum, New York. Others are *The Great God Pan*, on the campus of Columbia University; figures in the pediment of the New York Public Library; and a group called *Friendship* on a tomb in Norway. Barnard created all of the sculpture in the state capitol of Pennsylvania. Other works include *Adam and Eve*, Boston Museum of Fine Arts; *Father and Son*, Carnegie Museum, Pittsburgh; his bronze *Lincoln*, Cincinnati and Manchester, England, planned for Westminster Abbey. His remarkable collection of Gothic art was purchased for the New York Metropolitan Museum of Art by John D. Rockefeller Jr. in 1925.

Barnard, Henry (1811-1900), American educator, born in Hartford, Conn., and graduated from Yale. He was the first commissioner of education of the United States (1867); under his direction, the Bureau of Education (now Office of Education) was organized. His first public work was as a member of the Connecticut legislature, where he interested himself in education and in prison reform. He became school commissioner of Rhode Island in 1843, state superintendent of schools of Connecticut in 1850, president of the University of Wisconsin in 1857 and president of St. John's College, Annapolis, Md., in 1865. He published more than 800 pamphlets. The *American Journal of Education* (32 vols.), which he edited, is his greatest work.

Barnard, John Gross (1815-82), U. S. Army engineer, born in Sheffield, Mass. He was graduated from West Point in 1833 and served for 17 years on the Gulf Coast, in the war with Mexico. In the Civil War he served at Bull Run, in the army of the Potomac, as chief engineer of the defenses of Washington and on General Grant's staff until Lee's surrender, receiving the rank of major general.

Barneveldt, Jan van Olden (1547-1619), Dutch statesman. He was appointed advocate general of Holland and as such controlled the nation's civil affairs. Barneveldt lost in a struggle with Maurice of Nassau, head of the military powers of Holland. He won Spain's recognition of the independence of Holland and in 1609 concluded a truce for 12 years, thus keeping Holland out of the Thirty Years' War. Arrested in 1618, he was tried and condemned to death; this sentence, both illegal and unjust, was a sort of judicial murder.

Barnum, Phineas Taylor (1810-91), American showman, born in Bethel, Conn. He clerked in a country store, engaged in the lottery business, married at 19 and at 20 was a publisher in Danbury, where he was imprisoned 60 days on conviction for libel. Failing in a museum project in New York, he next sold Bibles and exhibited Negro dancers. Success came when he engaged a dwarf, advertised him as *General Tom Thumb* and put him on exhibition with other human oddities. Soon there was added *Mrs. Tom Thumb*, for the midget married; and Barnum took them to Europe where immense crowds came to see them; in London they were presented to Queen Victoria.

When Jenny Lind visited America, he paid the great singer $1,000 a night for 6 months to sing under his direction; profits soon enabled him to acquire several museums, but two of them burned. Then he organized (1871) his "Greatest Show on Earth," the big circus, with which he toured the country until 1881. In that year he merged with J. A. Bailey, and Barnum and Bailey's Circus continued for a generation. He sought political honors and was four times elected to the Connecticut legislature, but in 1866 he was defeated in his race for Congress. He wrote a popular autobiography.

Barr, Amelia Edith Huddleston (1831-1919), American novelist of English birth, who came to the United States in 1854. Through a period of 30 years she wrote advertising literature, verse and short stories. Finally, in 1884 she sold *Jan Vedder's Wife*, a pretentious novel, and the book at once established her reputation. She was then more than 50 years of age, but after that she wrote nearly 60 books. Among these are *Sheila Vedder, Friend Olivia, The Hands of Compulsion, The House of Cherry Street.* She wrote also an autobiography, *All the Years of My Life.*

Barr, Robert (1850-1912), Scottish novelist, born in Glasgow. He went with his parents to Canada and was educated at the Toronto Normal School. As special writer on the Detroit *Free Press* (1876) he used the name *Luke Sharp.* He was sent to London in 1881 to establish an English edition of that paper and from that time lived in England. With Jerome K. Jerome, he founded a weekly, *The Idler.* The books that entitle him to remembrance are *In the Midst of Alarms*, based on episodes in Canadian history; *The Unchanging East*, travel sketches; *The Face and the Mask, A Prince of Good Fellows* and *Countess Tekla.*

Barras, de, Paul François Jean Nicolas, Count (1755-1829), French patriot. Although a nobleman, he was active in the French Revolution, taking part in the storming of the Bastille and the attack on the royal palace. As a member of the National Convention he voted for the execution of the king. His zeal made him president of the Convention; and as one of the members of the Directory, he was largely responsible for ending the Reign of Terror. It was he who called upon young Napoleon Bonaparte to repel the royalist forces that were about to storm the Directory. With the Directory saved for the time, Napoleon, as second in command to Barras, was launched upon his marvelous career.

By 1799 Napoleon had become First Consul, and Barras, accused of intrigue and corruption, was forced to leave Paris to avoid the consequences of opposing the ambition of the new leader. He did not return until the restoration of the monarchy, though he lived on an estate near the city, constantly watched by Napoleon's aides.

Barrett, John (1866-   ), American diplomat, native of Vermont, educated at Dartmouth College; one-time journalist in Portland, Ore. He became minister to Siam (1894-98), and represented the United States in the International Conference of American Republics held in Mexico City in 1901. There he began his later career as director of the International Bureau of American Republics, now known as the Pan-American Union. Appointed to this post in 1906, he labored to bring about a spirit of friendship and cooperation between the United States and the Latin American countries.

Barrett, Lawrence (1838-91), American actor, long associated as co-star with Edwin Booth. Barrett was born in Paterson, N. J., of Irish parents named Brannigan. At the age of 15, he was given minor stage parts, and until the Civil War, he played supporting parts with increasing power. When war came, he joined the colors as captain. After leaving the army, he soon became a star and played such important parts as Hamlet, Shylock and Richelieu. In 1870 Booth and Barrett joined forces, and for 21 years, except for brief periods, they were together and were recognized as the leading dramatic actors of the American stage.

Barrie, Sir James Matthew (1860-1937), British playwright and novelist, born at Kirriemuir, Scotland. He studied at Dumfries Academy and Edinburgh University, began to write and moved to London in 1885. His first book *Better Dead* was about a Scot's attempt to make a living in London. Then followed *Auld Licht Idylls*, sketches about his native village, and *The Little Minister* as a novel and a play. Already established as a successful author and playwright, he gained more fame when his *Peter Pan* was produced in 1904. This play met with a rapturous reception throughout the English-speaking world. Many others followed, the most important being *What Every Woman Knows, A Kiss for Cinderella, Alice-Sit-by-the-Fire, Dear Brutus, Mary Rose* and *The Boy David.* Barrie was made a baronet in 1913. He delivered a notable address on courage when he was made rector of St. Andrews' University.

Barron, James (*c.* 1769-1851), American naval officer. In the War of 1812, while he was in command of the *Chesapeake*, he was ordered by the British *Leopard* to surrender several sailors. Upon Barron's refusal, the *Leopard* opened fire, killing 3 and wounding 18 of the *Chesapeake's* crew, whereupon the men demanded were surrendered. For this act, he was suspended from rank and pay for 5 years. A quarrel with Commodore Decatur in 1820, in which Barron charged persecution of himself, led to a duel in which Barron killed his famous adversary and was himself seriously wounded. In 1839 he became senior officer of the navy.

Barrows, Samuel June (1845-1909), American clergyman, born in New York. After graduation from Harvard Divinity School, he became the Unitarian minister at Dorchester, Mass. He edited the *Christian Register* for several years, became interested in prison reform and traveled widely. In 1897 he entered Congress, worked for prison reform and secured the passage of probation and parole laws. He wrote *Shaybacks in Camp* and *Isles and Shrines of Greece.*

Barry, Sir Charles (1795-1860), English architect, whose most notable works are the Houses of Parliament and Westminster Palace in London. The former was begun in 1840, when the foundation of the House of Lords was laid; the House of Commons was begun in 1852. Barry died before the entire structure was completed. Other great buildings planned and erected by him are St. Peter's Church in London, the Athenaeum, Manchester, and the Institute of Fine Arts in that city. A dozen or more buildings only slightly less important were constructed by this distinguished exponent of Gothic art.

Barry, John (1745-1803), American naval officer, born in Ireland, emigrated to the colonies at the age of 15. He had a liking for the sea and from his Philadelphia home managed sailing vessels and amassed a considerable fortune. When the Revolutionary War began, he was one of the first naval officers commissioned by Congress and the first to be given the rank of commodore. In command of the *Lexington*, he captured the British *Edward*, the first enemy vessel taken by an American commissioned officer. In the years following the war, Barry's entire time was given to perfecting a naval organization for the new republic, and until his death he was its ranking officer.

Barrymore, Ethel (1879-   ), American actress, born in Philadelphia, daughter of Maurice and Georgiana Drew Barrymore and niece of John Drew, in whose company she made her debut at the age of 17. She was starred in many famous plays, some of which are *Captain Jinks, A Doll's House, The Constant Wife* and *Scarlet Sister Mary.* In 1931 she revived *A School for Scandal* and starred with her two brothers in the motion picture *Rasputin and the Empress* in 1933. She played in *Whiteoaks* in 1938.

Barrymore, John (1882-   ), American actor, brother of Ethel and Lionel Barrymore, made his stage debut in 1903 in *Magda*, rose to stardom and appeared in *Glad of It, The Dictator, A Stubborn Cinderella, Uncle Sam, The Jest, Peter Ibbetson* and others. His long run as *Hamlet* at the Haymarket Theatre, London, was a record. He turned to motion pictures and appeared in many films.

Barrymore, Lionel (1878-   ), American actor, elder brother of Ethel and John Barrymore, made his first stage appearance in *The Rivals*, in which his grandmother Mrs. John Drew played Mrs. Malaprop. With his brother John he played in *The Second in Command, The Mummy and the Humming Bird* and *The Jest.* The motion picture field attracted him and he became first a studio director, then one of the most popular actors in films.

Bartholdi, Frédéric Auguste (1834-1904), sculptor, was born at Colmar, Alsace, of Italian ancestry on his father's side. His best-known work is the colossal bronze *Liberty Enlightening the World*, which was unveiled on Bedloe's Island, New York harbor, in 1886.

Bartlett, Paul Wayland (1865-1925), American sculptor; born in New Haven, Conn.; studied in Boston and Paris. Among his best-known works are the Indian figures *Bear Tamer* and *Ghost Dancer* and an equestrian statue of Lafayette, in Paris.

Bartolommeo, Fra (1475-1517), Italian painter, born in Florence. His art was influenced by Leonardo da Vinci, Michelangelo, Bellini and Giorgione. When his friend Savanarola met a tragic death, Bartolommeo became a monk; after 4 years, however, Raphael visited Florence and persuaded him to resume his work. From Raphael Bartolommeo learned much about perspective, and Raphael's art was in turn enriched by advice from Bartolommeo on the use of color. Much of Fra Bartolommeo's work, usually portraying religious subjects, is preserved in Florence; his *Marriage of St. Catherine* is in the Louvre, Paris; and the Lucca Cathedral has his *Madonna between St. Stephen and St. John.*

He is sometimes called *Baccio della Porta;* Baccio is a diminutive for Bartolommeo; and he lived near the Porta Romana—hence *della Porta.*

Barton, Clara (1821-1912), nurse, philanthropist and founder of the American Red Cross Society, born in Oxford, Mass., and educated in Clinton, N. Y. During the Civil War, she organized relief for the wounded. She went to Germany during the Franco-Prussian War (1870-1871) to establish army hospitals. Ten years of later effort resulted in the establishment of the American Red Cross (1881), of which she became president and continued as such until 1904. Originally the Red Cross was empowered to serve only in war, but she brought about a change that authorized its services in behalf of the victims of calamities. Miss Barton personally supervised relief during the Russian famine (1892), at the Johnstown (Pa.) flood of 1889, in Armenia at the time of the massacre of 1896 and in Cuba (1898), during the Spanish-American war.

Bartram, John (1699-1777), American botanist, born near Darby, Pa. He had no formal schooling but became an authority on plant life. He set up the first botanical garden in the United States near Philadelphia and to it brought many plants that he found in his travels in the eastern part of the country. He exchanged seeds with many European botanists and thus introduced many new varieties to this country. His garden was a national point of interest and is still part of Philadelphia's park system. He wrote *Observations* (1751), and his journal of a journey into Florida is part of Stork's *Description of East Florida.*

Baruch, Bernard Mannes (1870-   ), American economist and financier, son of Simon Baruch (1840-1921), Polish physician and surgeon and author of *Uses of Water in Modern Medicine.* Bernard Baruch was prominent in world affairs during the World War and was appointed by President Wilson as a member of the advisory commission of the Council for National Defense and as chairman of the Commission on Raw Materials, Minerals and Metals for war uses. Later he was the American purchasing agent for the Allies. He rose to a post on the Supreme Economic Council and was the American economic adviser of the American delegation to the Peace Conference.

Bascom, John (1827-1911), American educator, born at Genoa, N. Y. He was graduated in 1849 from Williams College and 6 years later from Andover Theological Seminary; was for 20 years professor of rhetoric at Williams and for 13 years president of the University of Wisconsin. He retired from Wisconsin in 1887 and accepted the chair of political science at Williams, from which he resigned in 1901. His writings include *Political Economy, Aesthetics, Philosophy of Rhetoric, Principles of Psychology, Philosophy of Religion* and *Comparative Psychology.*

Basil, Saint (*c.*329-79), known also as *Basil the Great,* bishop of Caesarea, the most powerful clerical post in Asia Minor, writer and one of the most eminent of the early churchmen. He lived when the churches of the East and the West were hostile to each other, and he made heroic but unsuccessful efforts to unite them. The Greek Church honors him as one of its most illustrious saints and celebrates his festival January 1st. In the West January 14 is his feast day. The *Rule of St. Basil* governs the monks of the Eastern Church.

Baskerville, Charles (1870-1922), American chemist, born in Noxubee county, Miss. He graduated from University of Virginia, 1890, and was professor of chemistry at City College, New York. His writings are *School Chemistry, Key to School Chemistry, Radium and Its Applications in Medicine.*

Baskerville, John (1706-75), English type designer and publisher. His early training was in stone-cutting, and about 1750 he conceived the idea of making type. It took him several years to design an alphabet to his liking and cast the type from his models. He manufactured his own paper and ink, quite remarkable achievements in his day, when facilities were so limited. He then printed an edition of Vergil's poems. His designs are still praised by typographical artists. Benjamin Franklin was his admiring friend.

Bassett, John Spencer (1867-1928), American educator; born at Tarboro, N. C.; graduated from Trinity College, N. C., 1888 and from Johns Hopkins, 1894. He taught history in Trinity College, N. C., 1893-1906 and in Smith College, Mass., 1906-28. He published *Constitutional Beginnings of North Carolina, Slavery in the State of North Carolina, The War of the Regulation* and a life of Andrew Jackson.

Bastian, Adolf (1826-1905), German traveler and anthropologist, author of nearly 60 works. In 1866 he became professor of ethnology at Berlin and curator of the ethnological museum. He is known as the writer of *Peoples of Eastern Asia* (6 vols. 1866-71).

Bastian, Henry Charlton (1837-1915), British physician and biologist, born at Truro, Cornwall. From a private school at Falmouth he went to University College, London, where he became professor of pathological anatomy. He was the champion of the doctrine of spontaneous generation; that is, the idea that insects and the like do not come from eggs but are formed out of filth and refuse. He wrote *Evolution and the Origin of Life, The Brain as an Organ of Mind, Paralyses—Cerebral, Bulbar, and Spinal.*

Bastien-Lepage, Jules (1848-84), French painter, born in Lorraine, the son of a peasant. When he was a boy he went to Paris from his country home and supported himself by working in the postal service but devoted all his leisure time to the study of art. He served in the Franco-Prussian War (1870-71) and afterwards studied art again. Among his most important paintings are *Joan of Arc,* in the Metropolitan Museum of Art, New York; *First Communion,* which won the medal of the Paris Salon, 1875; and the portrait of Henry Irving, National Portrait Gallery, London.

Bates, Katharine Lee (1859-1929), American educator and poet, born in Massachusetts and graduated from Wellesley College in 1880. Five years later she returned to Wellesley as teacher of English, rising to a professorship in 1891; she retired from active duty and became professor emeritus in 1925. She wrote *The English Religious Drama, History of American Literature, Spanish Highways and Byways* and *From Gretna Green to Land's End.* In poetry Miss Bates produced *America the Beautiful and Other Poems, The College Beautiful* and *Sunshine and Other Verses for Children.*

Battenberg, House of, a princely family of German extraction founded in 1858 by Prince Alexander of Hesse. Various members were influential in several European countries. The oldest son of Prince Alexander and Countess von Hanke was Louis Alexander Mountbatten (surname adopted after 1917), who was naturalized as a British subject, joined the navy, became second sea lord in 1911 and admiral of the fleet in 1912. The second son was Prince Alexander. He was chosen to rule Bulgaria in 1879, but political unrest banished him in 1886, though he was an able ruler. The third son, Prince Henry Maurice, entered the British royal family by his marriage to Princess Beatrice, a daughter of Queen Victoria. His daughter Victoria Ena became queen of Spain in 1906 through her marriage to King Alfonso XIII.

Baudelaire, Pierre Charles (1821-67), French poet who wrote beautiful lyrics on mysterious subjects. His version of the poems of Edgar Allan Poe is a French classic.

Bauer, Bruno (1809-82), German philosopher and historian. His writings include a number of critiques on the gospels and one on Strauss's *Life of Jesus.* On theological subjects Bauer has been called the *Voltaire of Germany.*

Baumgarten, Alexander Gottlieb (1714-62), German philosopher declared by some to have been the founder of the science of esthetics or the philosophy of the beautiful, though this is disputed. He spent most of his life as a professor of philosophy at Frankfort-on-the-Oder. His most important works are *Metaphysica* and *Aesthetica.*

Baur, von, Ferdinand Christian (1792-1860), German theologian, born near Stuttgart, was the founder of the Tübingen school of theology. In 1826 he was called to the chair of Protestant theology at Tübingen, which he held until his death.

Bax, Ernest Belfort (1854-1926), British lawyer and author, born at Leamington, England. He was educated privately in London and Germany. In 1885 he helped William Morris to start the Socialist League and for some time co-edited with him the weekly journal *Commonweal.* His writings include *Jean-Paul Marat, Kant's Prolegomena, The Problem of Reality, Socialism, Its Growth and Outcome, the Peasants' War in Germany, Essays in Socialism, New and Old, The Roots of Reality.*

Baxter, Richard (1615-91), English Presbyterian clergyman. He could not accept the ritual of the Church of England and did not hesitate to oppose it. During the troublous times of the Commonwealth and Restoration he supported the advent of Charles II to the throne. He declined Charles' offer to make him a bishop. When the Act of Uniformity was passed (1662), compelling universal use of the *Book of Common Prayer,* he was forced to retire. Judge Jeffreys imprisoned him for 18 months on a charge of libeling the Church of England. When the Toleration Act was passed, he again entered the ministry. Baxter wrote one book, *Saints' Everlasting Rest,* that is a classic; and many others, devotional and theological.

Bayard, Thomas Francis (1828-98), American statesman and diplomat, born in Wilmington, Del. He studied law under his father, a United States Senator, and in 1869 was elected to the Senate in place of his father, where he continued to serve until 1885, when President Cleveland appointed him secretary of state. While in the Cabinet, he arranged treaties with Russia and Great Britain and conducted the negotiations, through a commission, that settled the Bering Sea controversy. When Cleveland became President the second time, he sent Bayard to England as the first American ambassador to that country (previously the rank had been that of minister). During the Civil War both Bayard and his father opposed the conflict, calling themselves peace Democrats and favoring neither side.

Bayard, de, Pierre Terrail, Seigneur (*c.* 1473-1524), French soldier, known as *the knight without fear and without reproach.* He is best remembered as *Chevalier Bayard.* He was knighted for valor in 1495, after winning the battle of Fornovo. He is declared to have defended a bridge alone against 150 Spaniards in 1503, and he was largely responsible for the French victory at Marignano in 1515; on that battlefield he knighted his king. Bayard was fatally wounded in the battle of the Sesia, and his body was restored to France by the enemy. Throughout his life he possessed all the knightly virtues, so that even his foes in battle held him in high esteem. On several occasions when he was captured by the enemy, he was released unconditionally.

Bayliss, Sir William Maddock (1860-1924), British physiologist, born at Wolverhampton. He studied medicine at London University and physiology at Oxford, where he devoted himself to research work for 35 years. In London he studied the action of the heart and circulation of the blood and later at Oxford made researches on the digestion with Starling, demonstrating the function of hormones—the substances secreted by the ductless glands. Honors were showered on him by scientific societies, and he was knighted. His *Principles of General Physiology* is used as a textbook throughout the world.

Bazaine, François Achille (1811-88), French soldier. He served in Algeria, in Spain against the Carlists and in the Crimean War. He joined the Mexican expedition as a general in 1862 and in 1864 was made a marshal of France. In the Franco-Prussian War he surrendered at Metz, after a 7-weeks' siege. For this act he was sentenced to 20 years imprisonment on the Isle St. Marguerite, from which he escaped.

Beach, Chester (1881-), American sculptor, born in San Francisco. He studied in Paris, won many medals and awards, designed several U.S. commemorative coins and made sculptures for the Cleveland (Ohio) Fine Arts Garden, the Cleveland Museum, the Panama-Pacific Exposition, the Chicago Art Institute and others.

Beach, Rex Ellingwood (1877-), American author and playwright, a native of Michigan, educated at Rollins College, Florida, studied law in Chicago but took up a writing career. Through his novels, he became a chronicler of life in Alaska. His best sellers are *The Spoilers, The Barrier, The Silver Horde, Rainbow's End, Flowing Gold, Big Brother, The Goose Woman, The Mating Call* and *Men of the Outer Islands.* He produced in collaboration with others the plays *Going Some* and *The Spoilers.* Not all his books have an Alaskan setting, but his stories of the Northland are considered his strongest.

Beard, Charles Austin (1874-), American historian and economist, born at Knightstown, Ind. He studied at Oxford, Cornell and Columbia and was professor of politics at Columbia University, 1915-17. In 1922 he went to the Institute of Municipal Research at Tokyo, and a few years later the Japanese government appointed him adviser to the Minister of Home Affairs. Beard's books stressed the economic interpretation of American government and modern history. Among them are *American City Government, American Government and Politics* and *Economic Interpretation of the Constitution.* With his wife, Mary R. Beard, he wrote *The Rise of American Civilization* and with James Harvey Robinson the important *Development of Modern Europe.*

Beard, Daniel Carter (1850-1941), American artist, teacher and author, born in Cincinnati, Ohio. His illustrations of animals of the woodlands appeared in several magazines and he founded the first class for animal drawing in the world. He organized the first American troop of Boy Scouts and long held the post of national commissioner of the Boy Scouts Society. Mt. Beard, near Mt. McKinley, was named in his honor. He wrote in his early manhood *American Boys' Handy Book* and *Outdoor Handy Book* and later followed these with others, important among which are *Forest Handy Book, Dan Beard's Animal Book, Camp Lore and Woodcraft, Do It Yourself* and *Wisdom of the Woods.*

Beattie, James (1735-1803), Scottish poet and writer on philosophy, born at Laurencekirk. In 1776 he published his celebrated *Essay on Truth,* for which he received several honors and a pension from George III. His fame now rests almost wholly on *The Minstrel,* a descriptive poem written in the Spenserian stanza.

Beatty, David, 1st Earl of the North Sea (1871-1936), British admiral, native of Ireland. Entering the navy in 1884, he became captain in 1900 and rear admiral at the age of 39 (1910). In the World War he commanded the cruiser fleet at the Battle of Jutland, and in 1916 was raised to the post of commander of the Grand Fleet. From 1919 to 1927 he was first sea lord of the navy. He was created an earl and given $500,000 for services to his country. As British delegate he attended the Washington Disarmament Conference in 1921. Two sons were born to his wife Ethel Field, only daughter of Marshall Field of Chicago.

Beaumarchais, de, Pierre Augustin Caron (1732-99), French playwright and poet. In his early years he was a music master and taught the daughters of Louis XV. His two successful plays, *The Barber of Seville* and *The Marriage of Figaro,* were adapted as operas by Mozart and Rossini. The former was a satire on the aristocracy and contained revolutionary ideas. Beaumarchais induced his king to help the American revolutionary movement before the formal alliance with France in 1778.

Beaumont, Francis (1584-1616), English writer, famous collaborator with John Fletcher. Beaumont was the son of a judge. He was buried in Westminster Abbey. His combined efforts with Fletcher resulted in about 54 plays. *Philaster* and *Maid's Tragedy* are now considered important.

Beaumont, William (1785-1853), American physician. His experiments on digestion with a man named St. Martin, who lived for years after receiving a gunshot wound which left a hole in the stomach, were of great importance in settling the chemical nature of digestion. The experiments were reported in a book, *Experiments and Observations on the Gastric Juice,* which was published in America, Great Britain and Germany.

Beauregard, Pierre Gustave Toutant (1818-93), American soldier, born in New Orleans. He fought in the Mexican War, then served as captain of engineers until 1860 when he was appointed superintendent of the West Point Military Academy. He resigned after the bombardment of Fort Sumter and joined the armies of the Confederacy with the rank of brigadier general. After the battle of Bull Run he was raised to general. His military career closed when with Albert Sidney Johnston he surrendered to Sherman (April 26, 1865). With the return of peace, he became president of the New Orleans, Jackson & Mississippi Railroad and for a time was an officer of the Louisiana State Lottery.

Beaux, Cecilia (1863-   ), American portrait painter, born in Philadelphia. She studied art in Philadelphia and in Europe, received many honors, including memberships in the French Societé des Beaux-Arts, Paris, and the National Academy of Design in America. Among her greatest paintings are *Last Days of Infancy, New England Woman, Mother and Daughter* and *Dorothea and Francesca.*

Bebel, Ferdinand August (1840-1913), German Socialist leader, one of the founders of the Social-Democratic party (1869). Though once imprisoned on the charge of insulting the emperor, his efforts for socialism did not relax. He served his party in the Reichstag almost continuously, became an editor of two socialist organs and was an effective speaker. Bebel is esteemed by his followers as second only to Karl Marx. Bebel wrote *Women and Socialism.*

Beccaria, di, Cesare Bonesana, Marquis (1735–94), Italian economist, born in Milan. In 1764 he published anonymously *On Crimes and Punishments,* in which he argued against capital punishment and torture. He was among the first to argue for the value of education as a means of lessening crime. In 1768 he was appointed professor of political philosophy at Milan; in 1791 he was made a member of the board for the reform of the judicial code.

Becher, Johann Joachim (1635-82), German chemist, born at Spires, lived successively at Mainz, Vienna, Munich, Würzburg, Haarlem and London, where he died. His *Physica Subterranea* was the first attempt made to bring physics and chemistry into close relation.

Becket, à, St. Thomas (*c.* 1118-70), English archbishop. While he was in comparatively minor clerical posts he lived luxuriously, but abruptly changed to simplicity and austerity after he became archbishop of Canterbury. In that office, he upheld the rights of the Church against the royal will, and his loyalty to the Pope became apparent. When the Council of Clarendon decided to reduce priestly privileges, Becket obeyed only after the Pope counseled such a course. He left the country and went to Rome, for which act the king confiscated his property and income. The Pope ordered King Henry II to reinstate him, and it was done when he returned; but Henry could not long tolerate him, and in a burst of anger he begged to be rid of "this turbulent priest." Taking this as a command, four of Henry's knights murdered Becket before his altar. Two years later he was canonized; in 1229 his remains were placed in Trinity Chapel, London, where during several centuries they were revered by pilgrims. Henry VIII ordered his bones burned and scattered. The saint's day is Dec. 29, the date of his murder.

Bécquer, Gustavo Adolfo (1836-70), Spanish poet and novelist, born at Seville. His weird and fantastic tales are written after the manner of Poe and Heine and have proved very popular. He left three volumes of poems and legends, of which the best-known is *Leyendas Espanolas.*

Becquerel, Antoine Henri (1852-1908), French physician, discoverer in 1896 of the invisible radiation from uranium, known as Becquerel rays, which can penetrate many dense and opaque substances. He shared the Nobel prize for physics for 1903 with Pierre Curie and Marie Curie.

Beddoes, Thomas (1760-1808), English physician and writer, educated at Oxford University. In 1798 he opened a hospital in which he treated consumptives by having them inhale various gases. One benefit that came from these experiments was the discovery of the properties of oxygen. Beddoes published essays on consumption and fever, and his *History of Isaac Jenkins,* concerning the evils of drunkenness, had a large sale.

Beddoes, Thomas Lovell (1803-49), English dramatist and lyric poet, son of Thomas, the physician, and a nephew of Maria Edgeworth, the novelist. Educated at Oxford, he was a friend of Shelley, studied medicine and practiced in Germany, lived an eccentric life and died of a dose of South American poison, curare. His plays, *The Bride's Tragedy* (1822) and *Death's Jest Book or The Fool's Tragedy* (published after his death) were strained and artificial but with some fine phrases. A few of his lyrics are very beautiful, especially one that begins, "If there were dreams to sell."

Bede (673-735), English historian, called *The Venerable Bede* and *St. Bede,* the greatest name in the literature of the Anglo-Saxon period. Bede is known as the *Father of English History,* since he wrote the *Ecclesiastical History of England,* translated by Alfred the Great and the source of nearly all knowledge of English history up to the year 731. In the book Bede names titles of his other writings—lives of the saints, hymns and comments on the books of the Bible. He spent his whole life in monasteries in Durham.

Beebe, [Charles] William (1877-   ), American naturalist, a native of Brooklyn, N. Y., graduated from Columbia University. He was appointed curator of ornithology (birds) at the New York Zoological Society in 1899 and director of its department of scientific research. He became an authority on all manner of deep-sea life, having descended to great depths in diving apparatus, and the results of his observations have been avidly read throughout the world. He explored jungles of little-known parts of the world, which brought him distinction as a scientist, and wrote much on the animal life found there. Beebe is the author of many scientific papers and more than a dozen books, among which are *Jungle Peace, Pheasant Jungle, Arcturus Adventure, Galapagos* and *Half Mile Down.*

Beecher, Catherine Esther (1800-78), American educator, eldest child of Lyman Beecher, born at East Hampton, L. I. In 1822 she opened a school at Hartford, Conn., and ten years later a seminary for young women in Cincinnati. She made it the business of her life to improve and advance the intellectual, physical and practical education of women. She organized societies and schools for training teachers and sending them to new states and territories. She wrote a series of books pleading for privileges for women, but in her book *Woman Suffrage* she opposed the suffrage movement.

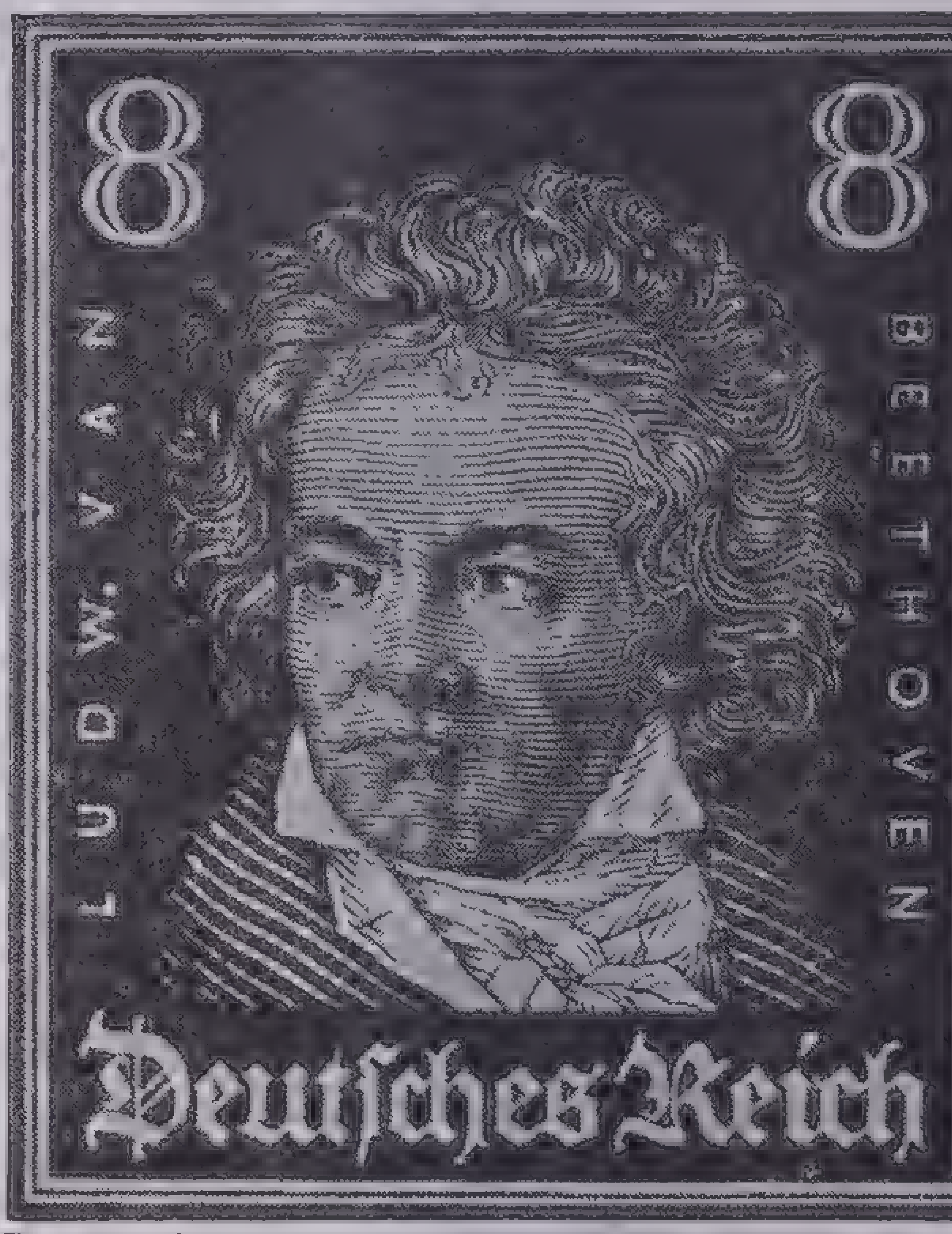
Beecher, Henry Ward (1813-87), American clergyman, born in Litchfield, Conn., was graduated from Amherst College in 1834 and later from Lane Theological Seminary, Cincinnati. As a Presbyterian minister he held pastorates in Indiana for 10 years, then for 40 years was pastor of Plymouth Congregational Church, Brooklyn, N. Y. In 1863 he went to London to influence the English public in favor of the Union cause in the Civil War, and before returning to America he accomplished much of his purpose. A long court trial and intensive investigation failed to produce proof of the charges of immorality that had been brought against him in 1870, and the majority of his church officers and members upheld him.

Beecher was editor of *The Independent,* a semireligious publication, for nearly 20 years, and for about 7 years he edited *The Christian Union.* Two of his books, *Yale Lectures on Preaching* and *Evolution and Religion,* are still read.

Beecher, Lyman (1775-1863), American Presbyterian minister, born in New Haven, Conn. After serving as pastor in Boston, he became head of Lane Theological Seminary in Cincinnati, remaining there 20 years. During those years he was tried by an ecclesiastical body on the charge of preaching false doctrines but was exonerated. Beecher was the father of seven sons, all of whom chose pulpit careers. The most famous of these was Henry Ward Beecher. One of his seven daughters also rose to eminence—Harriet, who became Harriet Beecher Stowe, the author of *Uncle Tom's Cabin.*

Beerbohm, Max (1872-   ), English caricaturist and author. He was educated at Oxford University, then became a contributor to the *Yellow Book* and critic on the *Saturday Review.* He is best known by his incisive caricatures of men prominent in society, published under the titles *Caricatures of Twenty-five Gentlemen, The Second Childhood of John Bull, Fifty Caricatures* and others. Among his published writings are *Zuleika Dobson, The Happy Hypocrite, Seven Men* and *Life of Sir Herbert Tree.*

BEETHOVEN, VAN, LUDWIG (1770-1827), German composer, born in Bonn into a musical family. Ludwig's genius found expression in instrumental music, and before his death he was recognized as the greatest composer of symphonies of all time, in spite of the fact that he began to lose his hearing at the age of 30, and wrote his *Eighth Symphony* after becoming totally deaf at 49.



Courtesy Scott Stamp & Coin Company

Ludwig van Beethoven

Enlarged from a German postage stamp, one of a series issued in 1926 honoring German national heroes

His father forced him to study the violin and piano that he might earn money. Eminent teachers were provided, and at the age of 11 he appeared in Holland in piano recitals, playing Bach's music. He soon was made assistant on the piano to his music master Neefe in the elector's chapel. At the age of 18 he was sent by the Elector to Vienna to study under Mozart and later under Haydn. Vienna became his home and the scene of his future triumphs. He established himself as a professional pianist and soon (1795) published his first composition, *Concerto in C Major,* which was immediately popular. In the same year *Opus I* for the piano appeared. Before becoming deaf he gave to the world about 20 sonatas for the piano, numerous quartets and trios and his *First* and *Second* symphonies. Between 1805 and 1810 the *Third, Fourth* and *Fifth* symphonies appeared. His last work was the *Ninth Symphony,* one of the greatest of his productions. He labored for 3 years on the *Mass in D.* Perhaps the most popular and best-known of his compositions is the *Moonlight Sonata* (1802, opus 27); and in this form he perfected the beginnings made by Haydn and Mozart.

Begas, Karl (1794-1854), German painter, born near Aix-la-Chapelle, studied in Paris and was the greatest of a distinguished family. He chose portrait, religious and historical subjects in the main. Influenced in turn by the German and Italian masters, he became a realist. From 1825 to his death he was official painter to the Prussian court. Two of his greatest religious subjects are *Christ on the Mount of Olives,* Garrison Church, Berlin and *Baptism of Christ.*

His three sons, all artists of note, were Oskar (1828-83), a painter; Reinhold (1831-1911), a sculptor; and Karl, the Younger (1845-1916), also a sculptor.

Behaim, Martin (*c.*1459-1506), German navigator, who spent an active life under the patronage of King John II of Portugal. In 1480 he first visited that country and at the age of 25 was appointed geographer of an expedition to Africa, which reached the mouth of the Congo River; so notable was his work that he was knighted by the king. He agree with Columbus as to the shape of the earth, for in 1492 Behaim made a terrestrial globe, still preserved in his native Nuremberg.

Behring, von, Emil Adolph (1854-1917), German physician and surgeon, born in Hansdorf, served for a time as army surgeon. In 1894 he was appointed to a professorship at the University of Halle. The next year he became director of the Hygienic Institute at Marburg, where he developed a diphtheria antitoxin, for which he later received the Nobel Prize in medicine (1901). Behring made great contributions to medicine through his study of immunization from disease.

Belasco, David (1859-1931), American playwright, actor and manager, born in San Francisco, was famous for spectacular stage settings. In the selection and training of the people of the stage he had few superiors. Belasco either wrote or collaborated with others in writing and arranging for the stage such successes as *The Girl I Left Behind Me, Zaza, The Girl of the Golden West* and *The Return of Peter Grimm.* He was concerned in the staging of more than 200 plays. He starred David Warfield in *The Music Master* and *The Auctioneer.* Other successful productions were *Madame Butterfly, The Gold Diggers, The Darling of the Gods, Dubarry, The Heart of Maryland* and *Laugh, Clown, Laugh.*

Belisarius (*c.* 505-565), Byzantine general under Justinian, Roman Emperor of the East. He suppressed an insurrection in Constantinople that might have had dire consequences, drove the Vandals out of North Africa, and in a war with the Goths recaptured Rome in the year 536. His enemies succeeded in bringing him to trial for conspiracy against Justinian, and he was imprisoned for 7 months (563); the emperor was then convinced of his innocence, and he was restored to favor. The tradition that his eyes were destroyed and that he was reduced to beggary appears to have no foundation in fact.

Bell, Alexander Graham (1847-1922), inventor and scientist, born in Edinburgh and educated there and in London. In 1870 he moved with his parents to Canada, where his father developed ways of teaching deaf-mutes to talk. Alexander went to Boston in 1872 to train teachers of the deaf, and in 1873 he became professor of vocal physiology in Boston University, continuing the work with the deaf that his father had begun.

As early as 1865 Bell experimented with speech transmission, and 10 years later, while he was working with a harmonic telegraph, the idea of reproducing and sending speech by electric wires came to him, resulting a year later in the invention of the telephone. It was exhibited at the Philadelphia Centennial Exhibition in that year but was considered little more than a toy.

Elisha Gray also claimed the honor of the invention of the telephone, but Bell won against Gray and all other claimants after years of litigation. He also invented the photophone, wax recorders for phonographs and instruments for the deaf. In 1883 he founded the magazine *Science.*

Bell, Alexander Melville (1819-1905), Scottish-American educator, father of Alexander Graham Bell, born in Edinburgh. He emigrated to Canada in 1870 and to the United States in 1880. In Washington, D. C., he perfected his system of "visible speech" for the benefit of the deaf and dumb. He wrote many works on elocution and also on shorthand.

Bell, Sir Charles (1774-1842), British anatomist, born in Edinburgh, studied anatomy there under the direction of his brother John, a surgeon. Charles went to London in 1804 and was distinguished as a lecturer on anatomy and surgery. His paper on the nervous system, read to the Royal Society of 1821, revealed the important discovery that the nerve filaments of sensation are distinct from those of motion.

Bell, Henry (1767-1830), Scottish engineer who introduced steam navigation to Europe. As early as 1812 he launched on the River Clyde his 30-foot vessel *Comet,* equipped with paddles moved back and forth by steam power. The first engine used by him developed 3 horsepower afterwards increased to 5 h.p. There is a monument to him on the banks of the Clyde.

Bell, John (1797-1869), American statesman, native of Nashville, Tenn., and for six terms representative of that state in Congress (1829-41). In 1860 he was nominated for the Presidency by the Constitutional Union party. Bell and Edward Everett (candidate for Vice-President) polled about 600,000 popular votes and 39 electoral votes, carrying the states of Virginia, Kentucky and Tennessee.

Bell, John (1811-95), English sculptor. His *Guards Memorial* and *Wellington Monument* are outstanding. His last great work was the group *The United States Directing the Progress of America,* for the base of the Albert Memorial in London. A terra cotta copy is in Washington, D. C.

Bellamy, Edward (1850-98), American economist and novelist, born in Massachusetts, was educated in Germany. He became a lawyer but joined the staff of the New York *Evening Post* as a financial writer. He wrote *Looking Backward,* which aroused great discussion, and *Equality;* both socialistic in character.

Bellarmine, Roberto Francesco Romolo, Saint (1542-1621), Italian churchman, Doctor of the Church, born in Tuscany. He entered the order of Jesuits in 1560 and taught theology at Louvain and Rome. Much of his writing was on political theory, and he also wrote to clarify and explain church doctrines. Few other men have so greatly influenced Catholic thought. Several of his works have been translated into English and at times have called forth Protestant replies. In 1599 he was made a cardinal against his own inclination. He was canonized in 1930; and his feast day is May 13, the anniversary of his canonization.

Bellini, Giovanni (*c.*1426-1516), Italian painter. With his brother, Gentile Bellini (*c.*1427-1507), he founded the Venetian school of painting. Both learned their art from their father Jacopo Bellini (*c.*1400-64). Giovanni chose religious themes for his work and excelled in altar pieces. Titian and Giorgione learned much of their art from him. His best-known altar-pieces are *Infant Jesus, Holy Virgin* and *Christ and the Woman of Samaria.* The National Gallery, London, possesses his *Christ on the Mount;* a *Madonna* is owned by the Metropolitan Museum, New York; *Christ on the Cross* and *The Transfiguration* are in Venice.

Bellini, Vincenzo (1802-35), Italian composer, born in Catania province. He produced many operas, the five most popular of which are *La Straniera, Capuleti ed I Montecchi, Sonnambula, Norma* and *I Puritani* (1835). Of these, *Norma* is one of the world's greatest operas. It was written when Italy was oppressed by French foes and is a lament over the bondage imposed by the Napoleonic invasion. The greatest singers since his day have appeared in his operas. His early death cut short a notable career.

Bellman, Karl Michael (1740-95), Swedish poet, born in Stockholm. His more brilliant pieces are chiefly drinking songs, idyls or humorous songs, for which he also furnished original melodies. Some of them are still popular. A monument was erected to his memory at Stockholm in 1829.

Belloc, Hilaire (Joseph Hilaire Pierre Belloc; 1870-   ), British historian and novelist, born in France, educated at Oxford University. He is best known for his histories of *Richelieu, Wolsey, Danton, Robespierre, Marie Antoinette, Joan of Arc* and *Napoleon.* Among his other works are *The Path to Rome* and *Essays of a Catholic Layman in England.* Much of his writing is from a Roman Catholic point of view. He was a member of the English House of Commons from 1906 to 1910. He wrote children's books, light verse, novels and essays and political articles.

Bellows, George Wesley (1882-1925), American painter and lithographer, born in Columbus, Ohio. His work is strong and bold in treatment and full of human interest. Perhaps the best known is *Stag at Sharkey's,* a prize-fight scene. There are collections of his work at the Metropolitan Museum, New York, at the Chicago Art Institute, in the Boston Museum of Fine Arts and in Philadelphia at the Pennsylvania Academy of Fine Arts.

Bembo, Pietro (1470-1547), Italian scholar and cardinal, born at Venice. In 1513 he became secretary to Pope Leo X, and in 1539 Pope Paul III made him a cardinal. Bembo was the leader of Italian letters for many years. He wrote poems, epistles and a *History of Venice,* all noted for purity of style.

Benavente y Martínez, Jacinto (1866-   ), Spanish playwright, born in Madrid. He is the acknowledged leader of modern Spanish drama. His collected plays were translated into English and published in four volumes in 1917. In 1922 he was awarded the Nobel prize for literature. Among his plays are *Saturday Night, The Passion Flower* and *Bonds of Interest.*

Bendemann, Eduard (1811-89), German painter, born in Berlin. From 1859 until 1867 he was director of the Düsseldorf Academy. When he was only 21 he exhibited in Berlin his *Jews Mourning in Exile,* which caused a sensation and established him as an illustrative painter. He painted the portraits of many prominent people of his time and devoted 15 years to monumental frescoes.

Benedict, Saint (480-543), Italian monk, born in Italy into a family of wealth, author of the rule of monks of the Western Church. He was well educated in Rome but, becoming dissatisfied with the superficiality and sins of the times, felt that only in solitary meditation could he find consolation. He retired to a deserted section and for 3 years lived in a cave. Austere living and devotion drew companions to him, and within a few years he was able to establish or revive 12 cloisters near by. Retiring to another retreat, he founded (529) a monastery on Monte Cassino, which in time became famous. His rule was in time adopted as the basis of all monastic life in the West.

Benedict XIII, Pope (Pietro Francesco Orsini; 1649-1730), son of a nobleman of the celebrated Orsini family, was elected Pope at the age of 74. He made an unsuccessful attempt to unite all churches under the banner of Catholicism.

Benedict XIV, Pope (Cardinal Prospero Lambertini; 1675-1758), elevated to the papal throne in 1740. He was one of the greatest of all pontiffs of the Church. Benedict advanced the cause of learning in Rome by establishing chairs in science and mathematics. He established boards of examination for all candidates to high place in the Church, to assure himself of their exalted moral character. Before his own elevation, he was archbishop of Bologna. He denounced the cruel treatment given to the Indians of Paraguay.

Benedict XV, Pope (Giacomo della Chiesa; 1854-1922), had been made a cardinal only 4 months before he was elected Pope in 1914. The conclave that chose him lasted only 4 days—the shortest in history. He was head of the Church during the World War, made strong efforts for peace, but remained strictly neutral. Benedict XV was a profound conservative; he decried modernism in religion and tried to lead his people along time-tried paths.

Beneš, Eduard (1884-   ), Czechoslovakian statesman. He was a lecturer on social science in Prague University at the outbreak of the World War and became a refugee with Masaryk in 1915. Beneš reached Paris, where he helped to mold the Czecho-Slovak movement to create an independent nation. When the new republic came into existence in 1918 he became its foreign minister, and in 1921 was chosen premier. He was one of the founders of the Little Entente. In 1935 he was elected President of Czechoslovakia and of the League of Nations Council. After the partition of Czechoslovakia in 1938 he was forced by German pressure to give up the presidency.

Benét, Stephen Vincent (1898-   ), American poet and novelist, born in Bethlehem, Pa., brother of William Rose Benét. Before his graduation from Yale in 1919 two books of his verse had already been published, *Five Men and Pompey* and *Young Adventure.* For his *John Brown's Body* (1928), a long epic poem on the Civil War, he received the 1928 Pulitzer prize. Other works are the *Beginnings of Wisdom* (1921), *Spanish Bayonet* (1926) and several stories based on American history and heroes.

Benét, William Rose (1886-   ), American poet and editor, born in Fort Hamilton, N. Y., graduate of Yale, brother of Stephen Vincent Benét. He served as editor of *Century Magazine, Nation's Business* and *Saturday Review of Literature.* His books include four volumes of verse; a novel, the *First Person Singular* (1922); a volume of essays, *Wild Goslings* (1927) and *Rip Tide,* a novel in verse.

Benjamin, Judah Philip (1811-84), American lawyer and Confederate statesman, born in the West Indies, in early life lived in North Carolina, later became a citizen of Louisiana. He rose in law and politics and in 1852 he entered the United States Senate, remaining until his state seceded, when he resigned and followed Louisiana into the Confederacy. So signally did he serve the southern cause as attorney general and then as secretary of state that he was called "the brains of the Confederacy." When the South surrendered, he succeeded in leaving the country. He settled in London and there became a barrister and built up a lucrative law practice. He wrote a standard law textbook *On Sales*.

Bennett, Arnold (1867-1931), English novelist and dramatist, born in Staffordshire and educated at the University of London. He studied law, took up journalism and became editor of *Woman*, a women's magazine. The "Potteries" in which he grew to young manhood furnished a background for a number of books that portray life with grimness yet are enlivened with a sense of humor. The first of these was *Anna of the Five Towns*, followed by *The Old Wives' Tale*, *Clayhanger*, *Hilda Lessways* and *These Twain*. Other novels with differing locale are *The Pretty Lady*, *Riceyman Steps*, *Mr. Prohack*, *Lillian*, *Sacred and Profane Love* and *The Lion's Share*. One of his most discussed smaller books, little more than an essay, was *How to Live on Twenty-four Hours a Day*. His most popular plays were *The Great Adventure*, *Milestones* (with Edward Knoblock), *Judith* and *Buried Alive*.

Bennett, James Gordon, II (1841-1918), American newspaper publisher, born in New York city, carried on the great newspaper enterprise of the New York *Herald*, built up by his father, James Gordon Bennett (1795-1872). Much of his time was spent abroad, but he kept in touch with his paper's affairs by cable, often sending long editorials. He established editions of the *Herald* in London and Paris. It was Bennett who sent Henry M. Stanley to Africa to hunt for Livingstone; at his own expense he equipped a polar expedition, headed by DeLong in the *Jeannette*. Bennett was one of the organizers of the cable service between America and Europe. He also promoted sports and offered the Gordon Bennett cups in automobile, balloon and airplane races.

Bennett, Richard Bedford (1870-), Canadian statesman, born in Hopewell, N. B., educated at Dalhousie. He practiced law, served several terms in the Canadian House of Commons and had much to do with organizing Canadian troops in the World War. He served as minister of justice and attorney general (1921); minister of finance (1826 and 1930) and was prime minister from 1930 to 1935. He took part in many international discussions, notably the Imperial Conferences of 1926 and 1930 that divided the British Empire into a community of self-governing nations.

Bentham, Jeremy (1748-1833), English philosopher, lawyer, and writer. He left the bar to devote his time to expounding the theory of law and jurisprudence. The aim of all his writing was to promote the general welfare of mankind. Among his books are *A Fragment on Government*, *Rationale of Punishment and Rewards*, *Principles of Morals and Legislation*, *Deontology, or the Science of Morality* and *Enquiry into the Original of Our Ideas of Beauty and Virtue*.

Benton, Thomas Hart (1782-1858), American editor, lawyer and statesman, born in North Carolina. He was much interested in the opening of the West and the welfare of settlers there. After having been admitted to the bar in Nashville, Tenn., he moved to St. Louis in 1815, where he edited the *Missouri Enquirer*, and most of his life was spent in Missouri. He was a United States Senator from 1820 to 1850. He was elected to the House of Representatives in 1852 but retired in 1854 and devoted his time to writing his autobiography, *Thirty Years' View*, which became valuable source material on American history. In the Senate he strongly advocated the use of both gold and silver as money, supported Jackson's anti-bank policy, voted for the bill to annex Texas but opposed nullification of law by any state and fought the principle of states' rights.

Béranger, de, Pierre Jean (1780-1857), French lyric poet, born in Paris of humble parentage. He was apprenticed to a printer. In 1815 he began to bring out a collection of national and other songs. His poems contributed in no small degree to the revolution of 1830. They offended the rulers, and on two occasions he was fined and imprisoned.

Beresford, Charles William de la Poer, Lord (1846-1919), British admiral, son of the Marquess of Waterford. He went to sea as a cadet at the age of 13 and by 1897 had risen to the rank of rear admiral. He became admiral in 1906. In 1902 he was placed temporarily on the retired list and entered Parliament; in 1908 he was in China for the Associated British Chamber of Commerce and on his return endorsed the open-door policy of trade with that country first put forth by the United States. In his naval service he commanded the important Mediterranean squadron for 3 years and then was at the head of the home squadron in the English Channel. His writings include *Life of Nelson* and *The Break-up of China*.

Berger, Victor Louis (1860-1929), Socialist editor and Congressman, born in Austria-Hungary, an emigrant to the United States before his college training was completed. Settling in Milwaukee, he taught in the public schools, became an American citizen, then served as editor of *Vorwaerts* (1892), a Socialist daily newspaper, and later of another Socialist paper, the *Leader*. In 1911 he became the first Socialist member of Congress; he was elected to the House in 1918 and 1920 but was refused the right to a seat because he was under sentence for sedition during the World War. In 1921 the Supreme Court reversed the decision in the case. He was elected in 1922 and served in Congress till his death.

Bergh, Henry (1811-88), American humanitarian, born in New York, the founder of the Society for the Prevention of Cruelty to Animals. He was educated at Columbia University and entered the diplomatic service. After 2 years as secretary of the American legation at St. Petersburg, he returned home because of the severity of the climate. The society above named was organized in 1866. He interested himself in laws to protect animals, and at his death 39 states and many foreign nations had passed legislation that he advocated.

Bergson, Henri Louis (1859-), French philosopher and writer of Jewish extraction, chosen to occupy the chair of philosophy in the College of France in 1900 and elected a member of the French Academy in 1914. He discarded the theory of intellect alone as the basis of his philosophical system and substituted that of intuition, which combines the certainty of instinct and the wide range of intellect. His works include: *Matter and Memory*, *Time and Free Will*, *Laughter*, *Creative Evolution*.

Bering, Vitus (1680-1741), Danish-Russian navigator and explorer, born in Jutland. He joined the Russian navy in 1704, and Peter the Great of Russia appointed him as explorer. His explorations gave his name to the field of his operations—the sea and strait between Siberia and America; he rediscovered in 1728 what Simon Dezhnev, a Cossack, in 1648 had already proved by sailing through the strait, that Siberia and Alaska are not a continuous land mass. Just before his death he traced the western shore of North America from the Bering Sea down to latitude 60°. Russia's claim to Alaska rested upon his exploration.

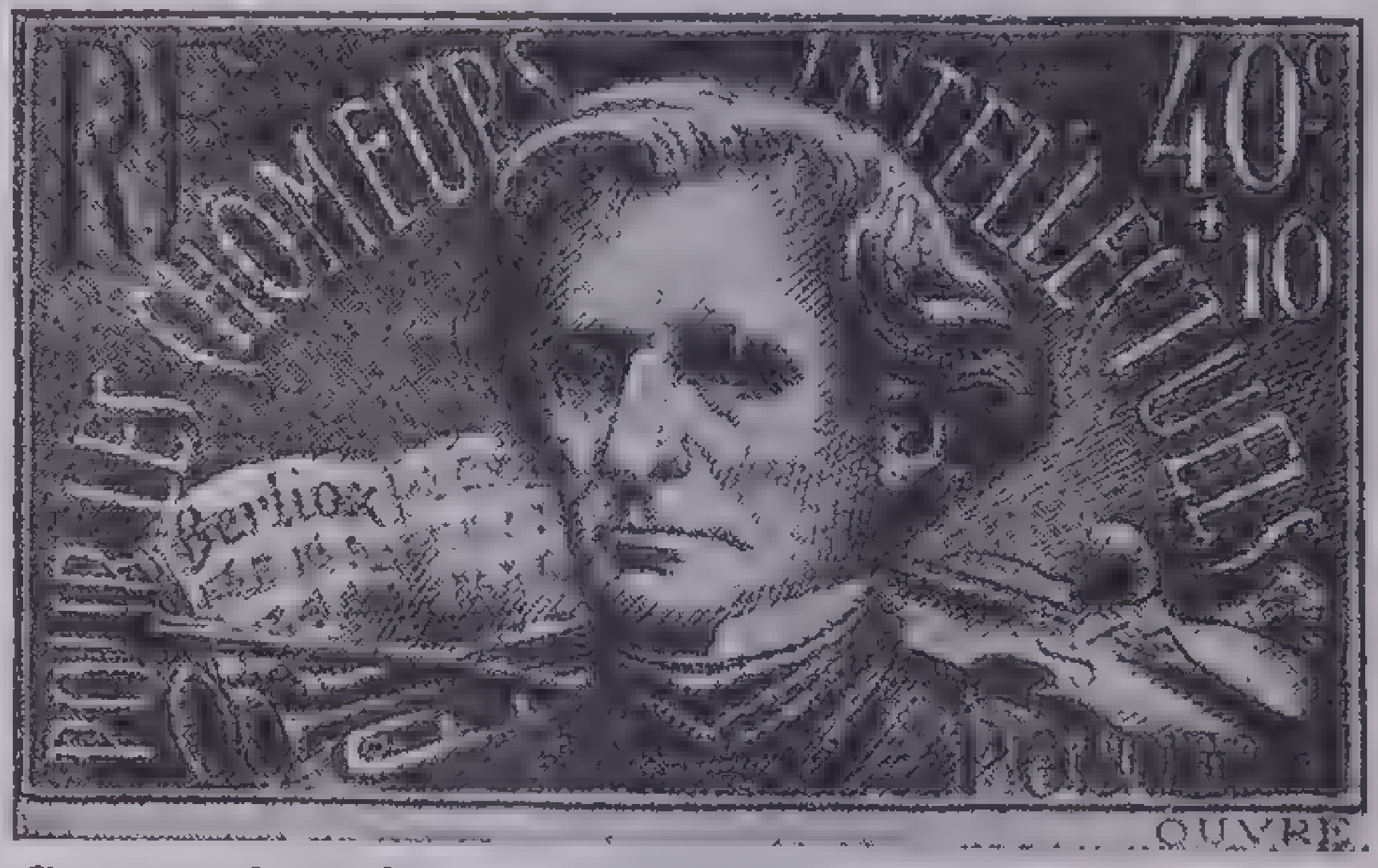
Berkeley, George (1685-1753), British churchman and philosopher, bishop of Cloyne, born in Ireland. In philosophy he was an idealist and his doctrines were a reaction against the prevalent materialism of his age. His most celebrated writings were *Essay Towards a New Theory of Vision*, *The Principles of Human Knowledge* and *The Minute Philosopher*. Dean Swift's Vanessa, Esther Vanhomrigh, left Berkeley half her estate in 1723, and he spent the years 1728 to 1731 in Newport, Rhode Island, planning a college in Bermuda that never was opened.

Berkeley, Sir William (*c.* 1610-77), English administrator, twice governor of Virginia Colony, first by royal appointment in 1641, second by election by the general assembly of the colony in 1660. When Cromwell came to power in England Berkeley resigned (1651) but remained in the colony. During his second term as governor (1660-76), Bacon's Rebellion occurred; Berkeley took stern measures with those who had defied his authority. In recalling him to England immediately thereafter, Charles II said, "The old fool has taken more lives in that naked country than I did for the murder of my father."

Berlin, Irving (1888-), American composer, born in Russia, son of Moses and Leah Baline. He was 5 years old when brought to New York, attended public school for 2 years and was a singing waiter when he began to write lyrics and compose songs. In 1911 he received international fame as the pioneer of ragtime music. He composed and published many songs and composed the music for several successful revues and motion pictures.

Berliner, Emile (1851-1929), American inventor, born in Hanover, Germany, emigrated to the United States at the age of 19. By association with the Bell Telephone Company he was able to carry on experiments that resulted in the invention of the Berliner microphone, a loose-contact transmitter, which gave to the telephone its almost perfect quality in sound reproduction. He improved the phonograph by substituting a revolving disk for the recording cylinder and by changing the mechanism with which sound was recorded for reproduction. He was a leader in the movement for pasteurized milk.

Berlioz, Louis Hector (1803-69), French composer. He began to study medicine but dropped it to follow a musical and literary career. His work is romantic and colorful; he was especially interested in the dramatic symphony and the symphonic poem. His work was not greatly appreciated in his lifetime, and Berlioz was usually in need. His best-known works are *Symphonie Fantastique*, a number of overtures and the *Rakoczy March*. His book, the English title of which is *Treatise Upon Modern Instrumentation and Orchestration*, is still a standard work.



Courtesy Scott Stamp & Coin Company

Louis Hector Berlioz

Enlarged from a French postage stamp issued in 1936. It was sold for 10 centimes more than its 40-centime postage value. The money thus collected was used to help needy white-collar refugees

Bernadotte, Jean Baptiste Jules, see *Charles XIV John*.

Bernard, Claude (1813-78), French physiologist. He studied in Paris, and held chairs in the Faculty of Sciences, the College of France and the Museum. His researches on the digestive system were important. Among his many works, *Researches on the Functions of the Pancreas* and *Researches on the Sympathetic System* are being used and quoted to this day.

Bernard of Clairvaux, Saint (1091–1153), French churchman, born of a noble family at Fontaines, in Burgundy. In 1113 he entered the Cistercian monastery of Citeaux and in 1115 became the first abbot of the newly-founded monastery of Clairvaux, in Champagne. He is considered as the last of the early Fathers of the Church and was canonized in 1174. His studious, ascetic life and stirring eloquence made him the oracle of Christendom. He was one of the greatest of the Latin hymn writers, and translations of his hymns are sung in Protestant churches, notably "Jesus, the very thought of Thee." In all, he wrote more than 400 epistles and 340 sermons.

Bernhardi, von, Friedrich (1849-1930), German officer and author. In 1909 he retired from the army with the rank of general. In 1912 he published *Germany and the Next War*, in which he glorified the martial spirit and declared that only a great war, inspired by a Germany superbly prepared, could win for his country "a place in the sun." He proposed that through such a war Germany should become the world's greatest power, and he showed to the satisfaction of his countrymen that the struggle and triumph of the strongest was the law of life. The book went through many editions, was widely translated and was read in other countries with consternation. It was followed by *The War of the Future* (1921).

Bernhardt, Sarah (Rosine Bernard; 1844-1923), French actress, the *Divine Sarah* of the stage for more than half a century, born in Paris of Jewish ancestry. Her first appearance on the stage, after a course of theatrical study, was in 1862 in *Iphigenia*. For several years she played with slowly increasing success; as the queen in Hugo's *Ruy Blas*, in 1867, the public recognized her budding genius. In 1872 she became a member of the Comédie Française, and her brilliant career was definitely launched. After a season in London she returned to the Comédie Française but repudiated her contract because of disagreements and criticism of her acting and was forced to pay $20,000 in settlement. She then made tours to London and other cities of Europe.

Bernhardt first appeared in America in 1880 and 10 years later toured South America and Australia. Returning to France in 1893, she became manager of a theater and in 1898 established the Sarah Bernhardt Theater. She was a tireless worker. Despite the loss at 70 of one of her legs when she met with an accident in the United States, she continued her performances, and on the eve of her death, when she was almost 80, she acted for motion pictures. She wrote an autobiography, published in 1908.

Bernini, Giovanni Lorenzo (1598-1680), Italian architect, painter and sculptor, born in Naples. When he was only 18 he produced a sculptured piece, *Apollo and Daphne* (now in the Villa Borghese), that won instant recognition for him. Bernini was encouraged by Pope Gregory XV, who appointed him one of the architects of St. Peter's Church. He completed the Barberini Palace and restored the Bridge of Sant' Angelo. In all, Bernini executed about 50 statues, 40 or more busts and was concerned with at least 50 architectural works.

Bernstorff, von, Johann Heinrich, Count (1862–1939), German diplomat, born in London. He held posts in the diplomatic service of his country in Turkey, Serbia, Austria-Hungary, Russia, Great Britain and the United States (1908-17). During the World War von Bernstorff strove to prevent his country from alienating opinion in the United States. He opposed the submarine campaign and warned the German chancellor that persistence in a course of violating American rights would lead to war. He realized, as did few leaders in Germany, that the entrance of the United States would surely result in Germany's defeat. "No matter what anybody in Germany may say," he wrote "the resources of the United States are enormous."

After the severing of diplomatic relations von Berstorff was then sent by his government as ambassador to Turkey, where he remained until the end of the war. He wrote *My Three Years in America.*

Berthollet, de, Claude Louis, Count (1748-1822), French chemist of the Napoleonic era, raised to the rank of count and to a senatorship by Bonaparte because he developed improved methods of making gunpowder and steel. He accompanied Napoleon on his Egyptian campaign. His fame, however, rests upon his being the first to analyze ammonia and to discover the bleaching power of chlorine. Berthollet with Lavoisier established the system of chemical nomenclature; it has survived with little change.

Bertillon, Alphonse (1853-1914), French scientist whose knowledge of anthropology led to the development of the system of fingerprint identification known as the Bertillon system. He devoted many years to the study of means by which criminals might be positively identified by marks that remain unchanged through life. His work as head of the identification department of the Paris police gave him broad scope for study and experiment. In 1880 he announced his perfected system. Bertillon was made a chevalier of the Legion of Honor.

Berzelius, Jöns Jakob, Baron (1779-1848), Swedish chemist, created a baron and a senator of the kingdom in recognition of his work. He was the author of what is known as the dualistic (or binary) theory of the chemical constitution of compounds, and he devised the form of symbolic notation and the writing of formulas now employed. Berzelius discovered the elements celium, thorium and selenium, and he was the first to develop silicon, tantalum and columbium in pure states. His reputation was world-wide and his accurate investigations greatly influenced the development of scientific chemistry.

Besant, Annie Wood (1847-1933), English theosophical leader, born in London. Originally an orthodox churchwoman, she married the Rev. Frank Besant in 1867, but after 6 years she took up theosophy and left him, the court giving the children into his custody. The next year she joined the National Secular Society, and she and Charles Bradlaugh were arrested on a charge of blasphemy for publishing *The Fruits of Philosophy,* a pamphlet of the society that advocated birth control. After a stormy trial the two were acquitted. She spent the rest of her life in spreading theosophic propaganda throughout the world. She lived for many years in India and became a leader in the Indian National Congress. In 1927 she visited the United States with her protege, J. Krishnamurti, the "world teacher."

Besant, Sir Walter (1836-1901), British novelist, born in Portsmouth and educated at Cambridge University. Through his works he was a social reformer. In collaboration with James Rice (1843-82), he produced such novels as, *The Seamy Side, Ready-Money Mortiboy* and *The Golden Butterfly.* After Rice died, Besant wrote alone. His greatest novel, *All Sorts and Conditions of Men,* exposed the squalor and sordidness of London's East End and led to efforts to remedy the conditions he pictured. Other novels are *Dorothy Forster* and *Beyond the Dreams of Avarice.* He organized the Society of Authors and was knighted by Queen Victoria in 1895.

Bessemer, Sir Henry (1813-98), English inventor, famous in the industrial world for his invention of the process of converting pig iron into steel by simpler means than had ever before been known; his name was applied to this process. Bessemer was knighted in 1879. His autobiography appeared in 1924.

The Bessemer process consists of oxidizing impurities in molten iron by blowing a blast of air through it. Bessemer also perfected a method of compressing carbon into a solid and thus simplified the making of lead pencils; he also devised a new method of casting type and an improved device for embossing letters on paper.

Bethmann-Hollweg, von, Theobald (1856-1921), German statesman, born near Berlin, educated there and in Leipzig, was chancellor of the German Empire before and during most of the World War. It was he who justified the invasion of Belgium in 1914 by the statement that the treaty recognizing Belgium's neutrality was but "a scrap of paper," a remark that at the time incensed the Allied world. Bethmann-Hollweg entered upon the important phases of his political career as governor of the province of Brandenburg (1899); by 1909 he was chancellor. He resigned in 1917 because of opposition from Hindenburg and Ludendorff regarding his peaceful efforts.

Beveridge, Albert Jeremiah (1862-1927), American Senator and historian, born on an Ohio farm and educated at De Pauw University. In 1887 he became an attorney and soon entered politics. In 1890 he was elected to the United States Senate, in which he served two terms; a third term was denied him. He then turned to writing and produced the authoritative *Life of John Marshall,* 4 vols. (1916-19). He displayed a genius for research that made his *Life of Lincoln,* 2 vols. (1928) one of the greatest histories of Lincoln's early career; Beveridge died before the second volume, on which he expected to spend 5 years, was finished.

Bichat, Marie François Xavier (1771-1802), French physician and anatomist, born at Thoirette (Jura). He devoted himself to anatomy, physiology and surgery and established with several of his friends *La Société Médicale d'Émulation,* through which he gave to the world many highly original and important memoirs, notably those on the tissues of the human body. His three great works are the *Traité des Membranes,* the *Recherches Physiologiques sur la Vie et la Mort* and the *Traité d'Anatomie Générale.* The last named was translated into several languages.

Biddle, John (1615-62), English theologian, founder of Unitarianism, born in Gloucestershire. He was several times imprisoned and once banished for his religious beliefs. For denying the divinity of the Holy Ghost (and, in consequence, the doctrine of the Trinity), he was frequently sent to prison. Once he was liberated by Cromwell. In 1648 a law made denial of the Trinity a capital offense, but because of Biddle's prominence he was only banished to the Scilly Islands for 3 years. Returning home and repeating again his heretical beliefs, he was again imprisoned and died in jail. The first name applied to his followers by themselves was Biddelians, later changed to Unitarians.

Biela, von, Wilhelm, Baron (1782-1856), German astronomer, born in Prussia. In his early years he was a captain in the army; after his discharge he gave all of his time to astronomical science and in 1826 discovered the comet that bears his name.

Bienville, de, Jean Baptiste le Moyne, Sieur (1680-1768), French explorer, born in Canada. His name is connected with the settlement of the province of Louisiana. He founded Biloxi (1699), now in Mississippi, which became his first French capital; later he founded Mobile (1702) and transferred his capital there. At different times Bienville was governor and deputy governor; his last appointment to the chief authority was in 1718, and at that time he founded New Orleans; it was made the capital in 1823. Called to France to answer charges of his enemies in 1726, he was removed from office but was reappointed in 1733 and made lieutenant governor. Historians agree that whatever failures were noted in his administration were due to poor colonial policy and not to Bienville's acts; he labored solely for the good of the colony, which necessitated his moving against both the Natchez and the Chicasaw tribes.

Bierstadt, Albert (1830-1902), American landscape painter, born in Germany and brought to the United States in infancy, his parents settling in New Bedford, Mass. He studied 4 years (1853-57) in Europe and later made repeated visits to the West and to Europe. His specialty was pictures of scenes in the Rocky Mountains, in the Sierras and in Switzerland.

Bigelow, John (1817-1911), American author and diplomat, born at Malden, N. Y., graduated from Union College, 1835; LL.D., Union and Racine College, 1886; College of City of New York, 1889. He was admitted to the bar and was one of the editors of the *New York Evening Post,* 1849-61; consul at Paris, France, 1861-64; secretary of state, New York, 1875-77. He wrote *France and the Confederate Navy* and *The Mystery of Sleep;* edited the *Writings and Speeches of Samuel J. Tilden* and the writings of Benjamin Franklin; and wrote biographies of Tilden and Franklin.

Bigelow, Melville Madison (1846-1921), American lawyer, author, dean of Boston University law school; born at Eaton Rapids, Mich.; graduated from University of Michigan, A.B., 1866, LL.B., Ph.D., LL.D., Northwestern University, 1896. Author *The Law of Estoppel; Leading Cases in the Law of Torts; The Law of Bills, Notes and Cheques; The Law of Wills.*

Bigelow, Poultney (1855-), American author and traveler, native of New York, graduate of Yale University (1879) and of Columbia Law School (1882), the son of John Bigelow. In his youth, Poultney spent years in Europe, where his father was in the diplomatic service. He was a boyhood friend of Prince Wilhelm, who later became Emperor Wilhelm II, and wrote in his defense after the abdication. Bigelow traveled extensively as a journalist for the *New York Times* and *Harper's Weekly;* for 2 years he was editor of *Outing* (1885-87). His books include *The German Emperor and His Eastern Neighbors,* various others about Germany, *White Man's Africa, Japan and Her Colonies* and *Seventy Summers,* his autobiography.

Biggers, Earl Derr (1884-1933), novelist and playwright, native of Warren, Ohio, and a graduate of Harvard University. He began his work as writer of a special column; later he was dramatic critic on the Boston *Traveler.* His first fiction was *Seven Keys to Baldpate,* a humorous tale with involved situations that made it so popular that it had a long run as a stage play and was made into a motion picture. He created the famous Chinese detective character "Charlie Chan." Other works are *Love Insurance, The House Without a Key, The Chinese Parrot, Behind That Curtain.* His plays include *If You're Only Human* and *Inside the Lines.*

Billings, Josh, see *Shaw, Henry Wheeler.*

Binet, Alfred (1857-1911), French psychologist, well known for his standard psychological intelligence tests. In this work he had the collaboration of Thomas Simon. Binet was educated in both law and medicine, and early in his career he turned his attention to experimental and physiological psychology. He edited a magazine on psychology and was a professor in the Paris Sorbonne, where he had studied. His modified tests have been widely used in the United States.

Bion, (2d century B.C.) Greek poet. Little of his work now exists, but his *Lament for Adonis* is a beautiful love poem which is reflected in English literature by Milton, Shelley and Matthew Arnold.

Biot, Jean Baptiste (1774-1862), French astronomer, optician and natural philosopher, born at Paris. He is especially celebrated for his researches in the circular polarization of light.

Birrell, Augustine (1850-1933), English author and statesman, born at Liverpool; chief secretary to the lord lieutenant of Ireland (1907-1916); Member of Parliament 1906-1918. Graduated at Cambridge, 1872; LL.D., St. Andrews; barrister, 1875; bencher Inner Temple, 1903; editor *Boswell's Life of Johnson;* author *Collected Essays, Miscellanies, William Hazlitt, In the Name of the Bodleian* and *Life of Charlotte Bronte.*

BISMARCK, VON, OTTO EDUARD LEOPOLD, PRINCE (1815-98), German statesman, born at Shönhausen. He studied at Göttingen, Berlin and Greifswald, entered the army, and was commissioned a lieutenant. He became a member of the provincial diet of Saxony in 1846 and of the Prussian diet in 1847.

He was appointed representative of Prussia in the diet of the German Federation at Frankfort in 1851, and with brief interruptions he remained till 1859, exhibiting the highest ability in his efforts to place Prussia at the head of the German states. Bismarck was ambassador at St. Petersburg, (1859-62). After an embassy to Paris of 5 months' duration in 1862, he became Prime Minister of Prussia.

Bismarck dissolved the lower house for refusing to pass the bill for the reorganization of the army (1862), closing it until the work of reorganization was complete. When popular feeling had reached its most strained point, the disposition to be made of Schleswig-Holstein acted as a diversion; Bismarck added these duchies to Prussian territory and excluded Austria from the new German Confederation, in which Prussia held the first place. He became the most popular man in Germany and in 1867 was the only one considered for the post of chancellor. His appointment followed.

As chancellor and president of the Federal Council, he made Luxembourg an independent country, though Holland had intended that it be ceded to France. In 1868 a struggle between Germany and France appearing inevitable, Bismarck made full preparations; he brought matters to a head on the question of the Hohenzollern candidacy for the Spanish throne. The Franco-Prussian War followed, with the result that Germany took the provinces of Alsace and Lorraine from France and fined that country a billion dollars (which was paid in 2 years).

Bismarck then formed the German Empire; he became chancellor, prince and Europe's strongest statesman. In 1872, he alienated the Roman Catholic party by promoting adverse legal measures and expelling the Jesuits. He then resigned, but toward the close of 1873 he returned to power. Two attempts were made to assassinate him—in Berlin, 1866; and in Kissingen, 1874. In 1878 he presided at the Berlin Congress, in 1880 at the Berlin Conference and in 1884 at the Congo Conference. In March, 1890, he disagreed with the new and impetuous young emperor Wilhelm II and tendered his resignation.

Bissell, George Edwin (1839-1920), American sculptor, born in New Preston, Conn., and educated in that state. He was a private soldier in the Civil War and from 1863 to 1865 an assistant paymaster in the navy. While in the marble business with his father in Poughkeepsie, N. Y., he began his work as a sculptor. Chief among his productions are portrayals of Horatio Gates on a Saratoga battle monument and of Abraham Lincoln, in Edinburgh; a group, *The Navy,* in New York City; and reliefs of James Kent, George Washington and Chester A. Arthur.

Bizet, Georges (Alexandre César Léopold Bizet; 1838-75), French composer, born in Paris, studied in Paris and in Italy, became a singing master in his native city. During a short life, he produced several operas of note. In 1857 a comic opera, *The Miracle Doctor,* was awarded a prize over 60 other compositions. *Djamileh* is a one-act musical tragedy. *Carmen,* his last opera, was a failure when it was first presented but has survived as one of the most popular of all operas. The opera *Don Procopio* was found in manuscript after his death.

Björnson, Björnstjerne (1832-1910), poet, novelist and dramatist, born in Österdaln, the chief literary character of Norway during the age in which he lived, except Ibsen, who excelled him only as a dramatist. In his early life a historical drama *Valborg* was accepted by the Royal Theatre, but Björnson was dissatisfied with the production and withdrew it. In 1856 the international students' reunion at Upsala stimulated him to the effort to establish a national literature, free from foreign influences. He began with *Synnove Solbakken,* a story of peasant life, and followed it with *Arne, The Fisher Maiden, A Happy Boy* and other works. *Marie Stuart, Sigurd Slembe, The Newly Married, Between the Battles* and *Lame Hulda* are well-known plays, and besides his dramas he wrote a series of folk plays, an epic and much beautiful lyric poetry. In 1903 Björnson received the Nobel prize in literature. He wrote the Norwegian national anthem, "Yes, we love this land of ours."

Black, Joseph (1728-99), Scottish scientist, born at Bordeaux, France. Between 1759 and 1763 he evolved the theory of *latent heat* on which his scientific fame chiefly rests and made important investigations on the nature of alkalis, in which he preceded the discoveries of several other scientists—Priestley, Cavendish and Lavoisier.

Black Hawk (1767-1838), chieftain of the Sac Indians, enemy of the encroaching white race and leader in the Black Hawk War. At the age of 21 he became chief of his tribe; he then lived near his birthplace, Kaskaskia, Ill. He first became openly hostile to the whites in 1804. His people had ceded their lands east of the Mississippi River to the Federal Government, but Black Hawk repudiated the agreement on the ground that the braves had been made drunk before the contract was signed. In 1812 the British coaxed the warrior to fight against the United States, but he and 500 followers did not continue this allegiance for long.

No further overt acts occurred until 1823, when Black Hawk refused to accompany the Sacs and the Foxes to new homes across the Mississippi. The Black Hawk War followed, with Black Hawk as leader of his tribesmen; but it was of short duration, for the intrepid chieftain was captured and sent to Fortress Monroe on the Atlantic seaboard, where he was kept for 10 years. In 1833 he was liberated and placed on the reservation with his tribe, near Fort Des Moines.

Black, Hugo La Fayette (1886-), American senator and Supreme Court justice, born in Harlan, Ala., was graduated from the University of Alabama in 1906, practiced law in Birmingham, Ala. He held minor local offices, was a captain in the World War, and in 1927 was elected to the U. S. Senate; reelected in 1931; and was especially prominent in certain investigating committees. In 1937 President Roosevelt appointed him to the U. S. Supreme Court, arousing a nationwide controversy based on the fact that Black had once held membership in the Ku Klux Klan. He was confirmed by the Senate and seated nevertheless. His opinions were notably radical in tendency.

Blackmore, Richard Doddridge (1825-1900), English novelist, graduate of Oxford University and of law school. For a time he was engaged in law practice, but forsook it for a literary career. His early novels include *Lorna Doone* (which established his fame as a fiction writer), *Craddock Nowell* and *Clara Vaughn.* Others are *The Maid of Sker, Alice Lorraine, Springhaven* and *Dariel.*

Blackstone, Sir William, (1723-80), English jurist, born in London. He became a judge, a member of the House of Commons, then a law professor at Oxford University, his *alma mater.* In this post his lectures attracted national attention and resulted in the publishing of his great book *Commentaries on the Laws of England* (1765-69), which ever since has been a guide to jurisprudence. Refusing an appointment as solicitor general, he was knighted (1770) and made a justice of the Court of King's Bench and soon thereafter a judge of the Court of Common Pleas.

Blackwell, Elizabeth (1821-1910), American physician, born in England but long resident in America after her 11th year. She was the first woman in the United States to receive the degree of doctor of medicine (M.D.). After conducting a boarding school with her two sisters (one of whom, Emily Blackwell [1826-1910], also became a physician), she gave all her time to studying medicine and to overcoming public prejudice against women in the medical profession. She was refused admission as a student to two medical schools, but was accepted at Geneva, N. Y., where she was graduated (1849). In 1853, with Emily, she established the New York Infirmary for Women and Children, with a medical college for women; and in 1868 she returned to London and joined the staff of the London School of Medicine for Women, in the foundation of which she had aided.

Blaine, James Gillespie (1830-93), American statesman, born in Pennsylvania, graduated from Washington (Pa.) College. He taught for a time, then moved to Maine (1854), where he became editor of the Kennebec *Journal* and later of the Portland *Advertiser.* He became a member of the state legislature and Speaker of the house. Maine sent him to Congress in 1862, where he remained until 1876 and was Speaker for 6 years.

In 1876 he was defeated for nomination to the Presidency; in the convention Robert G. Ingersoll, in placing his name before the members, referred to him as the *Plumed Knight,* and the term was applied to him during the remainder of his life. In 1884 Blaine and Cleveland were opposing nominees for the Presidency; Cleveland's rugged honesty weighed against Blaine's political mind. Blaine lost the vote of New York and the state vote decided the election. Cleveland was elected.

In 1888 Blaine's supporters again urged his Presidential fitness, but Benjamin Harrison was nominated and elected. Blaine became secretary of state, and this was his last public office.

Blake, Robert (1599-1657), English admiral who under appointment as *general of the sea* made English victories so decisive that his nation became the mistress of the sea. In 1652 he fought the Dutch commanders Van Tromp, De Ruyter and De Witt four times and destroyed the supremacy of Holland. Under appointment by Cromwell (1654) he made the English flag respected in the Mediterranean area. In 1657 he gained one of his most important victories by defeating the Spaniards in the battle at Teneriffe.

Blake, William (1757-1827), English poet and artist, born in London. He showed an interest in art at an early age and learned engraving. His first poems, *Poetical Sketches,* published in 1783, were written before he was 20. His engraving shop afforded Blake a meagre living for 20 years, but he was able to print and illustrate his own works, all of which were mystic, strange and of vigorous conception. Of his paintings, water-color illustrations and engravings, his 21 illustrations of the Bible story are among his most generally admired works. His best-known literary efforts were *Songs of Innocence* (1789) and *Songs of Experience* (1794). Blake died in obscure poverty, his strange visions and religious symbolism being little admired by his contemporaries.

Bland, Richard Parks (1835-99), American legislator, born in Kentucky. He lived for several years in western mining camps and then spent nearly all his life in Missouri. From the year 1872 until his death (excepting 1895-97), he was a Missouri member of the national House of Representatives. He was an advocate of silver money and is best remembered by the Bland-Allison Act sponsored by him in 1878, by which the coinage every month of not less than $2,000,000 nor more than $4,000,000 of silver was made obligatory. This law was changed by passage of the Sherman Act of 1890, and thereafter the silver thus purchased was not coined but held in the Treasury and represented in circulation by paper Treasury notes.

Blasco Ibáñez, Vicente, see *Ibáñez, Vicente Blasco.*

Blashfield, Edwin Howland (1848-1936), American artist, born in New York and educated in art in Paris. While in Europe he exhibited his work in the salons of Paris and at the Royal Academy in London. Blashfield returned to America in 1881 and began to produce many notable pictures. Among these are *Angel with the Flaming Sword* and *Christmas Bells.* He decorated the dome of the Library of Congress in Washington and the Baltimore courthouse; his paintings adorn several state capitol interiors; the chancels of St. Savior's Church, Philadelphia; the chapel of the College of the City of New York; and the interiors of numerous private homes. He was honored with memberships in the American Academy of Arts and Letters and the National Academy of Design.

Blavatsky, Elena Petrovna (1831-91), Russian theosophist, of noble German and Russian descent; she became a naturalized citizen of the United States and during her mature years was the leading exponent of the occult and of spiritism. She professed to have had her theosophical doctrines revealed to her while on a visit to Tibet and was thought to perform miracles. In New York city (1875) with several co-workers she founded the Theosophical Society and later established branches in India. She wrote *Isis Unveiled* (1877), which became the textbook for her 100,000 or more disciples. The Society for Psychical Research, London, investigated her mediumistic powers and could not confirm them.

Blennerhassett, Harman (*c.* 1764-1831), Irish immigrant, born in England, was thrust into fame by his connection with Aaron Burr in the scheme to colonize and form a new government in the Southwest, for which both were tried for treason. Blennerhassett emigrated to the United States and occupied an island in the Ohio River, to which his name was given. Burr visited him there and secured his assistance in the conspiracy. He was arrested, but Burr was acquitted and Blennerhassett was released. The incident cost him practically his whole fortune; he returned to Europe and died on the Island of Guernsey.

Blériot, Louis (1872-1936), French aviator, born in Nantes. He pioneered in the development of heavier-than-air planes and invented an efficient monoplane. He won a prize of £1000 and the distinction of being the first to fly across the English channel by crossing from Calais to Dover in 37 minutes on July 25, 1909.

Bligh, William (1753-1817), English navigator and rear admiral. In command of the *Bounty,* he was sent (1787) to the South Seas to secure breadfruit trees to replant in the West Indies. The crew mutinied, and Bligh and 18 men were set adrift on the open sea. They reached land 3,600 miles from where they were abandoned. When they returned home with their story, a warship was sent to capture the mutineers; some were seized, but most of them had gone. Not until 1808 was it learned that the refuge of those that escaped had been Pitcairn Island, and then there was only one survivor. Bligh had a brilliant naval career under Nelson and was at one time governor of New South Wales.

Bloomfield, Maurice (1855-1928), American philologist, born in Austria. Degrees were conferred on him by Johns Hopkins and Princeton universities. He edited for the first time, from original Sanskrit sources, the *Sutra of Kaucika;* translated the *Hymns of the Atharva-Veda* in the sacred books of the East (edited by Max Müller) and wrote on *The Atharva-Veda* and *The Gopatha Brāhmana.*

Blouet, Paul (1848-1903), better known as *Max O'Rell,* French author, writer and lecturer, born in Brittany. He lectured and acted in the United Kingdom, United States and British Dominions. His best known works are *John Bull and His Island* and *A Frenchman in America.*

Blücher, von, Gebhard Leberecht (1742-1819), Prussian field marshal and prince of Wahlstadt, born at Rostock, Germany. He first entered the Swedish army, but soon passed to the Prussian army and went through the Polish campaign of 1772. In the Waterloo campaign he commanded the Prussian army in Belgium and was severely defeated by Napoleon at Ligny. By outmaneuvering Grouchy, however, he was able to arrive at Waterloo in time to decide the victory for the allies and pursue the routed French army. It was on this occasion that the Duke of Wellington prayed for the coming of "Blücher or night." Had his army failed to arrive, Napoleon might have won at Waterloo.

Blum, Léon (1872-   ), French statesman, born in Paris, a member of an Alsatian Jewish family. Early in his career he fought by the side of Jean Jaures in the Dreyfus case. He took his degree in philosophy, studied law and in 1895 entered the Conseil d'État (the nearest French parallel to the U. S. Supreme Court). After the World War, as an active member of the Socialist party opposing the occupation of the Ruhr, he was elected to the Chamber of Deputies. When the Herriot and Poincaré governments needed the support of the Socialists, Blum, as their leader, had considerable power in France. The sweeping gains made by Socialists and Communists throughout the country elected him premier in 1936. The following year he resigned after the Senate refused him power to remedy an alarming financial situation. Before he entered politics he wrote books, poems and essays and made a name for himself as a literary and dramatic critic.

Boadicea (*d.* 62), British Queen of Iceni (of Norfolk), whose final defeat established Roman power on the island. Her husband Prasutagus willed his kingdom jointly to his family and to the Roman Emperor Nero, hoping that Nero would offer protection against all enemies. The Romans, however, desired no joint rule, and their soldiers ravaged the country, defying Boadicea and her daughters. She raised an army of 200,000 and made war upon the Romans; in a spot of their own choosing they met her in battle, killed possibly 180,000 of her soldiers and lost only 400 of their own. Boadicea in desperation committed suicide.

Boccaccio, Giovanni (1313-75), Italian writer, born in Paris, one of the most learned men of his age and one of the greatest of modern story-tellers. He was the author of the celebrated *Decameron.* In 1350 he formed an intimate friendship with Petrarch, whose influence on his career was great. It is said that he was the first Italian who ever procured from Greece copies of the *Iliad* and the *Odyssey.* While in Naples, about 1334, he fell in love with a young woman, called by him Fiammetta, supposed to be a daughter of King Robert of Naples. She returned his love and to please her he wrote *Il Filocopo,* a prose romance, and afterwards *La Teseide,* the first attempt at romantic epic poetry, of which Boccaccio may be considered the inventor.

He composed his famous *Decameron* in Naples, to please Joanna, the daughter and successor of King Robert. The stories are remarkable for literary excellence.

Bode, Johann Elert (1747-1826), German astronomer, born in Hamburg. From early youth he was a student of astronomy and at 18 he correctly calculated an eclipse of the sun. It was Bode who began the publication (1774) of the *Astronomical Year Book,* which is still continued. In 1801 he published *Uranographia,* on which his fame largely rests. In it he listed 17,240 stars, which exceeded by 12,000 the number that previously had been charted. Titius of Wittenberg had stated the relations of planetary distances; Bode restated them more clearly, and since then his name has been applied to this work as *Bode's Law.* He was director of the Berlin Observatory.

Boethius, Anicius Manlius Severinus (*c.* 480-*c.* 524 A.D.), Roman philosopher. He is the last great representative of Latin literature. His principle work *De Consolatione Philosophiae* was probably written during his imprisonment by the Emperor Theodoric just before his death by execution. "It is a golden book," says Gibbon, "not unworthy of the leisure of a Plato or a Tully."

Bogardus, James (1800-74), American inventor, born in Catskill, N. Y. Among his inventions are an 8-day clock, a dry gas meter and an engraving machine. His machine for making postage stamps received the prize offered by the British government in 1839. In 1847 he built the first cast-iron structure in the world, and the first wrought-iron beams were made from his design. The delicate pyrometer and deep-sea sounding machine that he invented were valuable additions to scientific instruments.

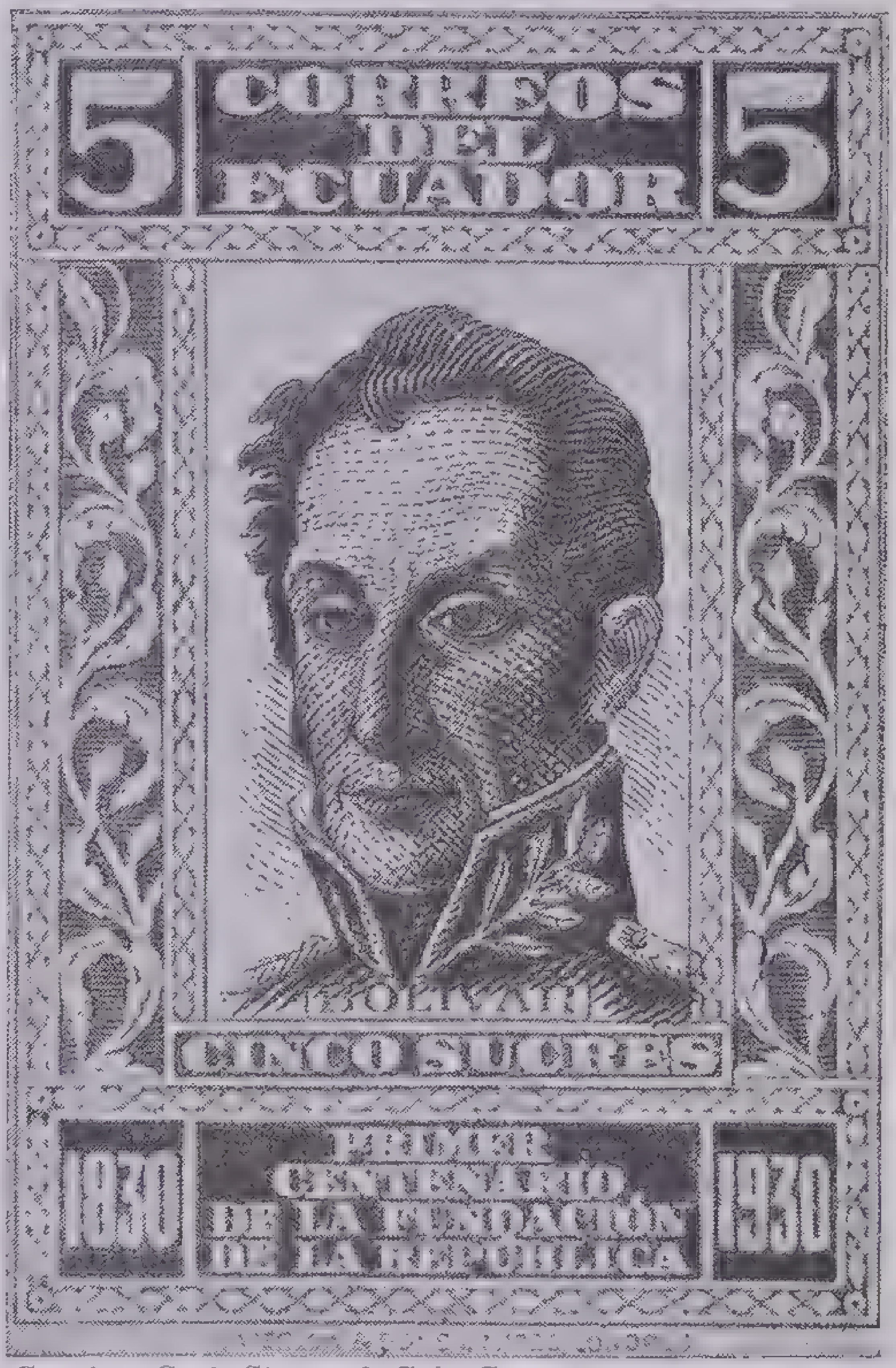
Bohr, Niels (1885-   ), a Danish scientist, born at Copenhagen, educated at Cambridge University and appointed professor of physics at Copenhagen University. Theories that he had expounded as to the structure of the atom have been verified and have led to much fruitful investigation in science. He received the Nobel Prize for physics for 1922.

Bok, Edward William (1863-1930), American editor and philanthropist, born in Helder, Holland, and brought to America at the age of 6. His formal education was in the public schools of Brooklyn, N. Y. For a time he was connected with schoolbook publishers, but in 1886 at the age of 23 he organized the *Bok Syndicate Press,* which distributed special features to newspapers. From 1889 until 1919 he edited the *Ladies Home Journal.* Thenceforth, he gave himself to philanthropy and to writing a number of books, including *The Americanization of Edward Bok,* a notable autobiography. In 1923 he offered a prize of $100,000 for the best plan for assuring the peace of the world. As a tribute to the country in which he found opportunity and wealth, he established a bird sanctuary in Florida, at Lake Wales, and erected there the Singing Tower, a marble structure containing a carillon, beneath which is Bok's tomb.

Boleyn, Anne (*c.* 1507-36), Queen of England, the daughter of Sir Thomas Boleyn, who before Anne's marriage was raised to the rank of earl; second wife of Henry VIII and successor of Catherine of Aragon. She went to France at the age of 12 with Mary Tudor, who was to be the wife of Louis XII, and remained in that court for 3 years. On her return to England, she became maid of honor to Queen Catherine, came under the eyes of King Henry VIII and became his mistress before Catherine was divorced (May 1533). As soon as the divorce was pronounced, Henry publicly married Anne (a secret marriage had already taken place), and she was crowned queen amid great splendor. In September of that year a daughter was born, who became Queen Elizabeth. Henry soon tired of Anne and charged her with indiscretions. The Privy Council heard her plea of innocence but condemned her. She was imprisoned in the Tower and on May 19, 1536, she was beheaded.

Bolingbroke, Henry Saint John, 1st Viscount (1678-1751), English statesman and writer. He entered Parliament at the age of 23 and at 26 was secretary of war and soon secretary of state for foreign affairs. While he held the latter office, he negotiated the Treaty of Utrecht (1713), by which much of Canada was ceded to Great Britain. Upon the accession of George I (1714), Bolingbroke's enemies brought a charge of treason against him, and he fled to France. His estate was confiscated, but when he was permitted to return to England in 1725, it was restored; however, the right to sit again in Parliament was denied him.

Bolivar, Simon (1783-1830), South American patriot and revolutionary general, born in Caracas, Venezuela, and educated in Spain. He is known as the *Liberator of South America* and the *Washington of South America,* for he was responsible for the overthrow of Spanish rule in a large part of the continent. His native Venezuela was first to rebel against Spain; he joined the revolution in 1810 but had to flee to save his life. He returned with a sufficient force to defeat the enemy and take Caracas; but again he fled, returning in 1819 to complete the work of liberation. Next he helped to drive Spain from Colombia; then went to the aid of Peru (1822) and was placed in command of the troops fighting Spain for freedom; succeeding after 3 years of warfare. Southern Peru was made a separate republic and named Bolivia, in his honor. Near the close of his career, he was chosen President of the Republic of Colombia and became dictator of Peru. He spent his very considerable fortune in carrying on the struggle for South American independence.



Courtesy Scott Stamp & Coin Company

Simon Bolivar

The stamp from which this portrait was enlarged was issued by Ecuador in 1929 to commemorate the 100th anniversary of the founding of the republic

Bonaparte, Charles Joseph (1851-1921), American lawyer and attorney general, educated at Harvard University and at Harvard Law School, descended from the family of Emperor Napoleon I. His grandfather, the youngest brother of Napoleon, was Jerome Bonaparte. Jerome married Elizabeth Patterson of Baltimore, while he was in the United States. Napoleon ordered him back to France but would not permit the wife to go with him. Charles Joseph, grandnephew of Napoleon I, was their grandson. He practiced law in Baltimore, was active in reform movements and was the head of the National Civil Service Reform League. Under President Theodore Roosevelt he held two cabinet portfolios—secretary of the navy (1905-06) and attorney general (1906-09).

Bonaparte, Charles Lucien Jules Laurent (1803-57), Prince of Canino and Musignano, born in Paris, eldest son of Lucien by his second marriage, and nephew of Napoleon. He acquired a considerable reputation as a naturalist, especially as a writer on ornithology. While a visitor in the United States, he published *American Ornithology.*

Bonaparte, Jérôme (1784-1860), King of Westphalia, born in Corsica, youngest brother of Napoleon. In 1803, when war broke out between France and England, Jerome was in the West Indies and had to flee for safety to the United States. There he married Elizabeth Patterson of Baltimore; their son was the only American member of the Bonaparte family. Napoleon ordered Jerome back to France, forced him to divorce his wife, created him king of Westphalia and compelled him to marry the princess of Würtemberg. His royal career ended with Napoleon's abdication. When his nephew became President of the First Republic, Jerome held the office of marshal of France and president of the Senate.

Bonaparte, Joseph (1768-1844), King of Naples and Spain, born in Corsica, eldest brother of Napoleon. After Napoleon had tested him in minor posts, Joseph was sent to conclude a treaty of friendship with the United States. When Napoleon became emperor, he made Joseph commander of the Naples garrison, in 1805 ruler of the Two Sicilies and in the next year king of Naples. To Joseph's regret, Napoleon sent him in 1808 to the throne of Spain. After the Battle of Waterloo, it was intended that Napoleon and Joseph should escape to the United States; only Joseph succeeded. In 1841 he was permitted to rejoin his wife, who had lived in Italy after 1815.

Bonaparte, Louis (1778-1846), King of Holland, brother of Napoleon and the father of Charles Louis Napoleon Bonaparte, who became emperor of France as Napoleon III. Louis's marriage to the step-daughter of Napoleon, Hortense Beauharnais, Josephine's daughter by her first marriage, preceded his appointment as king of Holland. He was only a nominal ruler, for he reigned under his brother's direction. He resigned this post in 1810 because of hostility to Napoleon's policies and lived mostly in Italy after Napoleon's downfall.

Bonaparte, Lucien (1775-1840), Prince of Canino, brother of Napoleon and a disciple of Robespierre during the French Revolution. After Robespierre's fall he was imprisoned for a time, but Napoleon's influence secured his release. Before Napoleon's power was recognized, Lucien was president of the Council of Five Hundred and used his power to advance his brother's interests. He opposed Napoleon's imperial ambitions, however, not wishing him to become emperor, and as a consequence was exiled from France. After Napoleon's fall he lived in Rome.

Bonaparte, Napoleon, see *Napoleon.*

Bonheur, Rosa (Marie Rosalie Bonheur; 1822-99), French artist, celebrated for her paintings of animals. Her father was her first teacher. At the age of 19 she contributed two pictures *Two Rabbits* and *Goats and Sheep* to the annual French exposition. Twelve years later (1853) her masterpiece *The Horse Fair,* now owned by the Metropolitan Museum of New York, was the greatest canvas displayed at the exposition. Another picture that critics praise is the large canvas *Hay-Making Season in Auvergne;* her genius shows in another pastoral scene *Plowing in the Nivernais.* Other notable pictures by her are *Wagon with Six Horses, Weaning the Calves, Ponies of the Isle of Skye, Cattle and Sheep in Pasture,* and *Foulaison.* The Empress Eugénie bestowed on Rosa Bonheur the Cross of the Legion of Honor.

Boone, Daniel (1735-1820), American pioneer, born in Pennsylvania, one of the leaders among the men who settled a wilderness. He had little education but became wise in those things that give a woodsman domination over his environment. When he was 17, his parents moved to North Carolina, where he learned surveying, for which he was in demand all his life, as well as for his natural leadership in hunting, trapping and settlement.

At 20 he was with the Braddock Expedition and learned how frontiersmen fought the Indians. When he was 32 he made his first journey into Kentucky, and 8 years later he moved his family to the Kentucky River and built a fort that he called Boonesboro.

He controlled considerable land but, because of carelessness in securing good title, lost it all and in 1790 moved into what is now West Virginia. In 1795 the family emigrated into Missouri; Boone was made commander of an Indian district by the Spanish authority and given 840 acres of land. This he lost when the United States purchased Louisiana Territory, but in 1810 Congress gave it back to him, as he had "opened the way for millions of his fellow men." Through four states—Virginia, North Carolina, Kentucky and Tennessee—runs the Boone Trail, a fine highway and present-day reminder of the early trail made by this pioneer.

Booth, Ballington (1865–1940), preacher, founder of Volunteers of America and son of the founder of the Salvation Army. He was commander of the Salvation Army in Australia (1885-87) and in the United States (1887-96), when disagreement with his father led to his resignation and the organization of his own society with the same objects.

Booth, Edwin Thomas (1833-93), American actor, born in Maryland. His first appearance, in *Richard III,* gave promise of future stage supremacy, and his talent rapidly brought him to stardom. In America and in Europe he played Shakespearean roles that created a profound impression; his three European tours commenced in 1861, 1880 and 1883. For 5 years (1886-91) Lawrence Barrett appeared with him as co-star. After his death he was elected to the American Hall of Fame. The assassination of Lincoln by his brother did not decrease the affection in which he was held by the American people.

Booth, Evangeline Cory (*c.* 1865-   ), religious leader, born in England, the daughter of William Booth. After service in the Salvation Army in London, she was transferred to the Canadian field. She organized the work in the far north at the time of the gold rush (1898), in 1904 was transferred to the United States as commander and in 1934 became general of the World-Wide Salvation Army.

Booth, John Wilkes (1838-65), American actor, the assassin of Abraham Lincoln, was a brother of Edwin Booth. As an actor he had some success in Shakesperian roles. He brooded over the cause of the Southern Confederacy, with which he was in deep sympathy and felt that if Lincoln were removed the South would triumph. While the President was occupying a box at a theater, in April, 1865, Booth entered and shot him, escaping with a broken leg in dropping from Lincoln's box to the stage. In his flight he reached Virginia but was shot by pursuers when he refused to surrender.

Booth, Maud Ballington (1865-   ), religious leader. She married Ballington Booth and assumed the rank of marshal in the Volunteers of America. In her early years she was associated with the work of the Salvation Army, organizing, with Catherine Booth, a branch of the Army in Paris.

Booth, William (1829-1912), English religious leader, founder of the Salvation Army, born in Nottingham. He became a minister (1852) in a Wesleyan Methodist church. Resigning in 1861, he did evangelistic work among the poor and 4 years later organized a mission. Booth continued this work until 1878, when its scope was broadened into an organization which he called the Salvation Army. A semimilitary aspect pervaded it, and this small militant-religious group has spread over the entire world. As general of the Salvation Army, Booth repeatedly visited America, South Africa and Australia, and his writings were printed in many languages.

Booth, William Bramwell (1856-1929), religious leader, son of William Booth. From the age of 18 he was connected with the Salvation Army, rising to the post of chief of staff in 1880 and head of the organization after his father's death in 1912. When he himself died, it was decided that another Booth should not succeed to supreme leadership, and Edward Higgins was elected to command.

Booth-Tucker, Frederick St. George de Latour (1853-1929), religious leader, succeeded Ballington Booth as head of the Salvation Army in the United States after the latter withdrew and organized the Volunteers of America. His name was Tucker, but when he married Emma Booth, daughter of the founder, he added that family name to his own. He established the work of the Salvation Army in India.

Borah, William Edgar (1865–1940), American statesman, native of Illinois, educated at the Kansas State University. In his adopted town of Boise, Idaho, he practiced law and engaged in local politics until his election as United States Senator in 1907; after that he represented his state in the Senate, rising to the chairmanship of the Foreign Relations Committee, in which he took an important part in foreign policy formation.

A Republican, and one of the leading constitutional lawyers in Congress, he had a leading part in the Senate's refusal to ratify the Treaty of Versailles and the League of Nations. He suggested the calling of the Washington Disarmament Conference, urged the recognition of Russia, crusaded for the outlawry of war, opposed the veterans' bonus and supported prohibition.

Borden, Sir Robert Laird (1854-1937), Canadian statesman, Nova Scotian by birth and after 1896 a national figure in the government of the Dominion of Canada. On the retirement of Sir Charles Tupper in 1901 he became leader of the Conservative party and in 1911 was chosen Premier of the Dominion, holding that office until 1920, when he was succeeded by Arthur Meighen. Borden was appointed a member of the Imperial Privy Council in 1912 and was created Knight Grand Cross of the Order of St. Michael and St. George in 1914. Canada sent him to Paris as one of its representatives at the Peace Conference in 1919 and he had much to do with founding the League of Nations. In 1924 he became chancellor of Queen's University, Kingston, Ont. Among his books are *Canadian Constitutional Studies* and *Canada in the Commonwealth.*

Borgia, Cesare (1476-1507), Italian cardinal, military leader and diplomat, son of Pope Alexander VI. It was charged that he caused the death of his brother Giovanni in order to increase his influence in papal affairs. His father created him a cardinal in 1493, at the age of 17, but permitted him to resign that office so that he might become a soldier and diplomat. He was sent as nuncio to the court of Louis XII at Paris and while serving there married the daughter of the king of Navarre. In a campaign with King Louis, Borgia believed he could set up for himself a kingdom in Italy and by treachery and murder nearly accomplished his purpose, but inopportunely his father, the Pope, died. This fountainhead of Cesare's power no longer existing, his influence waned, and in 1504 Pope Julius II sent him as a prisoner to Spain; he escaped, joined the forces of his father-in-law and was killed in battle.

Borgia, Lucrezia (1480-1519), sister of Cesare. Her father Pope Alexander VI ordered her first two marriages; the one to the Lord of Pisaro he annulled, and the second, to the son of the King of Naples, ended with the murder of the husband by order of her brother Cesare. Her third marriage was to Alphonso d'Este, who became duke of Ferrara. Lucretia practiced most of the vices of her day; tradition says she had ability to mix poisons that would prove fatal at once, in an hour or a day, and she would offer them to her guests, invited for the purpose of bringing about their destruction. Some of these stories have little historical support.

Borglum, Gutzon (1867-1941), American sculptor and painter, born in Idaho. He studied at the Art Academy in San Francisco. Borglum was engaged to execute colossal historical reliefs on Stone Mountain, near Atlanta, but disagreed with the society promoting the work and resigned (1925). He accepted the commission to execute another great group at Mt. Rushmore, in the Black Hills of South Dakota. He has created many statues and reliefs of note. A titanic head of Washington is in the rotunda of the national Capitol; his *Twelve Apostles* is in the Cathedral of Saint John the Divine, New York; *Mares of Diomedes* may be seen in the Metropolitan Museum, New York, and a large figure of Lincoln, seated, is in a park in Newark, N. J.

Borglum, Solon Hannibal (1868-1922), American sculptor, born in Utah, younger brother of Gutzon Borglum. He studied art in Cincinnati and Paris. His work as a sculptor won silver and gold medals at the Paris Salon; at the Exposition Universelle, Paris (1900); at the Buffalo Exposition (1901); at the St. Louis Exposition (1904). His favorite subjects portrayed frontier life on the western plains.

Bori, Lucrezia (1888-   ), Spanish soprano, native of Valencia, resident of the United States from 1921. She was educated in music at Milan and in Rome and made her debut in 1908. For several years she was with the Metropolitan Opera Company, New York, and sang with the Open-air Company, Ravinia Park, north of Chicago.

Boris III (1894-   ), King of Bulgaria, who succeeded his father Ferdinand I in 1918; the latter abdicated the throne after the defeat of the German allies in the World War. Boris received the usual literary and military education of a crown prince, and when he ascended the throne as Czar Boris III, he became at once a popular monarch. In 1930 he married Princess Giovanna, daughter of King Victor Immanuel III of Italy.

Boscawen, Edward (1711-61), English admiral, one of the most celebrated of his day, born in Cornwall, the son of Viscount Falmouth. He was engaged in most of the naval exploits of Great Britain. Because, in the *Dreadnaught,* he captured a French ship and 800 prisoners, he received the nickname

Old Dreadnaught. In 1759 he gained a decisive victory over the French at Toulon, and for this Parliament thanked him in a special bill and awarded him a pension of $15,000 a year and a seat in the Privy Council.

Boswell, James (1740-95), English barrister and writer, the biographer of Dr. Samuel Johnson and as such the perpetuator of much of Johnson's fame. The two first met when Boswell was 23 and Johnson 54; ten years later they voyaged together to the Hebrides Islands, and Boswell published his interesting *Journal* of the trip. Seven years after Johnson's death, Boswell gave to the world his celebrated *Life of Johnson;* it stands as one of the most famous of biographies. Boswell could afford to give himself to any pursuit that pleased him after 1782, in which year he inherited his father's estate, with an income of $8,000 a year.

Botha, Louis (1863-1919), South African soldier and statesman. In the Boer War he besieged British forces at Ladysmith, defeated them at Colenso and was made commander in chief of the Boer army. He headed a delegation to London to secure the organization of the Union of South Africa, becoming first prime minister of the Union and a loyal British subject. In the World War, he commanded the South African troops in the conquest of German Southwest Africa. Botha was chief of the South African delegation to the Peace Conference in 1919.

Bothwell, James Hepburn, 4th Earl of (*c.* 1536-78), nobleman of Scottish descent, third husband of Mary, Queen of Scots. She had married Lord Darnley (1565), and when the latter was murdered in 1567, Bothwell's enemies charged him with the crime. He was tried, but as he was accompanied by 4,000 followers, he was acquitted. After this he was with Mary constantly, divorced his wife, carried Mary to Dunbar Castle as a prisoner, and there they were married. When a conspiracy was formed to rid the country of him, Mary was taken to Edinburgh, again a prisoner, and Bothwell fled; he was captured in Norway, sent to Denmark under arrest and died there.

Botticelli, Sandro (*c.* 1447-1510), Florentine painter, born Alessandro Filipepi in Florence, but early called by the nickname of his eldest brother, Giovanni, *Botticello* (small cask). He studied painting under Fra Filippo Lippi. His reputation was established by the *Adoration of the Magi* painted for Santa Maria Novella (Uffizi) and he gained the patronage of the great Florentine families, especially the Medici, for whom he painted many portraits and the famous *Pallas and the Centaur* (Uffizi) and *Primavera* (Uffizi). Botticelli went to Rome (1481) to paint in the Sistine Chapel for Pope Sixtus IV and returned to Florence the following year.

The influence of the great reformer, Savonarola, led Botticelli to restrict his work to religious subjects, two of his most important Madonnas being *The Magnificat* (*c.* 1482-83) and the *Virgin with the Pomegranate* (1487), both in the Uffizi.

Boucher, François (1703–70), French painter. He became painter to the French court in 1765 and was a great favorite of Mme. de Pompadour, whose portrait he painted. He was a director of the Gobelin tapestry factory. He painted portraits, landscapes, animals and even theatrical sets. His most important works are *Peace and War, Toilet of Venus* and *Birth and Triumph of Venus.*

Bougainville, de, Louis Antoine (1729-1811), French navigator and soldier prominent in the early history of Canada. In Canada he was aide-de-camp to Montcalm, who placed in his hands the responsibility of the defense of Canada against the English. He was the first Frenchman to sail around the world (1766-69), and rediscovered the Soloman Islands, the largest of which was named in his honor. He wrote a book that added much to geographical knowledge, *Voyage autour du monde,* 2 vols. (1771-72).

Boughton, George Henry (1834-1905), English-American painter, born in England and brought to the United States when 3 years of age. He studied art in New York, London and Paris, after which he settled permanently in London. Boughton's genius brought him a membership in the National Academy of Design (1871) and the Royal Academy (1896). His most famous paintings are *The Return of the Mayflower, Puritans Going to Church* (Public Library, New York), *Coming from Church, Evangeline, The Scarlet Letter, Morning Prayer* and *Clarissa Harlowe.*

Bouillon, de, Godefroy, see *Godefroy de Bouillon.*

Bourbon, ancient French family that has given three royal dynasties to Europe: the Bourbons of France, Spain and Naples. The first of the line was Adhemar, Lord of the Bourbonnais (now Allier) at the beginning of the 10th century. The power and possessions of the family increased until 1272, when Beatrix, daughter of Agnes of Bourbon and John of Burgundy, married Robert, sixth son of Louis IX of France. Their son Louis became the first duke of Bourbon. The elder line of the dukes of Bourbon became extinct in 1527. From the younger line descended Anthony of Bourbon, Duke of Vendome, who by marriage acquired the kingdom of Navarre, and whose son Henry of Navarre became Henry IV of France.

The Spanish Bourbon dynasty originated in 1700, when Louis XIV placed his grandson Philip, Duke of Anjou, on the Spanish throne, to become Philip V of Spain.

The royal line of Naples, or the Two Sicilies, took its rise when in 1735 Don Carlos, the younger son of Philip V of Spain obtained the crown of Sicily and Naples (then attached to the Spanish monarchy) and reigned as Charles III.

Bourget, Paul (1852-1935), French novelist, poet and critic, native of Amiens. He chose scientific and analytical subjects for his books, among the most notable of which are *Cosmopolis, Pastels of Men, Impressions of America, Antigone and Other Portraits of Women, Outre-Mer, The Night Cometh, The Two Sisters* and *The Sense of Death.*

Bourinot, Sir John George (1837-1902), Canadian historian and political scientist, native of Sydney, N. S., educated at Trinity College, Toronto. For many years he was editor of the Halifax *Reporter,* which he established. He added to his political knowledge after election to the position of clerk in the Dominion House of Commons. His books are entirely political and historical and include *How Canada is Governed, Constitutional History of Canada, Parliamentary Practice and Procedure* and *Canada under British Rule.* Because of his eminence as a historian, he was knighted by Queen Victoria in 1898.

Boyesen, Hjalmar Hjorth (1848-95), Norwegian novelist, born in Frederiksvarn and educated in Norway and Germany. After he was 21, he spent his life in the United States. After editing a Scandinavian paper in Chicago, 1870-74, he was called to a chair in German in Cornell University, where he remained 6 years. From 1880 until his death he was a professor in Columbia College. His books include *Gunnar, a Norse Romance* (1884), *Tales from Two Hemispheres* (1876), *Ilka on the Hilltop, A Daughter of the Philistines, The Golden Calf.* He wrote numerous essays on literary subjects and issued a book of poems *Idyls of Norway* (1882).

Boyle, Robert (1627-91), British physicist, born at Lismore, Ireland, the seventh son of Richard, first Earl of Cork. After finishing studies at Eton College and Oxford University, he devoted himself to chemistry and natural philosophy. He made improvements on the air pump, by means of which he demonstrated the elasticity of air, and announced the law called Boyle's Law, to the effect that the volume of a gas will vary inversely to the pressure to which it is subjected, and that density and elastic force vary directly as the pressure and inversely as the volume.

Braddock, Edward (1695-1755), British general who served in America in the French and Indian War. He commanded a force of 2,000 men, which included Col. George Washington, sent to lay siege to Fort Duquesne, on the present site of Pittsburgh. He did not understand how to fight Indians and refused advice. The troops were lured into an ambush, and more than half were killed. Braddock was mortally wounded but did not die until he had been carried 50 miles to safety.

Braddock, James Jay (1906-   ), American pugilist, born in New York city. After making a creditable record he retired and lived in obscurity and poverty for years but returned to win the heavyweight championship from Max Baer in New York, June 1935. He lost the title to Joe Louis in Chicago in 1937 and shortly thereafter retired from the ring.

Bradford, William (1590-1657), a Pilgrim Father, born in Yorkshire, England, who sailed from Leyden, Holland, in the *Mayflower;* he became second governor of Plymouth Colony (1621), succeeding Governor Carver. To reach Holland from England with other Separatists was a difficult task, and he was once imprisoned for the attempt; but once in the Continental refuge, Bradford was one of the leaders in the argument for removal to America. He was governor of Plymouth until his death—for more than a generation. The success of the settlement was largely due to his great wisdom and ability as an administrator.

Bradford left a record of the colony in his *History of Plimouth Plantation,* an account so complete and authoritative that it is invaluable as a source of American history of the period. The manuscript was taken to England after his death and was not found until about 150 years later, when it was returned to the United States (1898) and published.

Bradley, James (1693–1762), British astronomer, educated at Oxford, one of the pioneers in laying the foundations of modern astronomy. He studied with his uncle James Pound, who had won high honor in the science; when he was 29, he received appointment as professor at Oxford University. In 1729 he announced his theory of the aberration of light, then published the discovery that the inclination of the earth's axis to the ecliptic was not constant, which led to the discovery of nutation. Bradley was astronomer royal at Greenwich.

Bradstreet, Anne (1612-72), American poet, born in England. She was the first woman in America to devote herself to literature. Her poems were popular in her day but are no longer appreciated except for their historical value. Her first book, published in London in 1650, was *The Tenth Muse Lately Sprung up in America.* In 1678 *Several Poems* was published.

Bragg, Braxton (1817-76), Confederate general in the American Civil War, born in North Carolina and educated at West Point. He served with distinction under General Taylor in the Mexican War, retired to private life in 1856, then became a brigadier general in the Confederate army in 1861. He succeeded General Beauregard in command of the army in Mississippi, with the rank of major general, in May, 1862. After his defeat by Grant, he was military adviser to Jefferson Davis, then was placed in the field again against Sherman.

Bragg, Sir William Henry (1862-   ), English scientist, born at Wigton, Cumberland, educated at King William College and Cambridge. With his son William Lawrence Bragg (1890-   ) he worked in investigating the structure of crystals and measuring X rays. For this they shared the Nobel prize in physics in 1915 and many other awards. His books are *X rays and Crystals, Concerning the Nature of Things* and (with his son) *The World of Sound.*

Brahe, Tycho (1546-1601), Danish astronomer, born in Knudstrup (now in Sweden). He first studied law, but abandoned it for astronomical science. After thorough study he settled at an observatory built for him by the king, upon whose death Brahe had to flee the country because of political enemies (1597). Under protection of the emperor, he located in Prague, and there was joined by Kepler 3 years later. Brahe was more precise in astronomical measurements than any preceding scientist, and it was his accuracy that enabled Kepler later to formulate the fundamental laws of motion of planetary bodies.

Brahms, Johannes (1833-97), German composer, born in Hamburg. His father, a double-bass player, first instructed him and he later studied under Eduard Marxsen. Brahms appeared as a pianist when he was 14 years of age and as accompanist to Reményi, Hungarian violinist, in 1853. The great violinist Joachim was impressed by Brahms and introduced him to Liszt and Schumann. Schumann admired the scherzo, sonata and songs Brahms had composed and wrote *Neue Bahnen,* proclaiming Brahms as the great composer of the future.

Brahms was appointed choir director and music master to the Prince of Lippe-Dietmold in 1854, which position offered much-used knowledge of choral singing. From 1863-66 he acted as director of the Singakademie in Vienna, which he adopted as his native city. His *Deutsches Requiem* (German Requiem) was first played there in 1868, but his fame was limited until the appearance of his First Symphony in 1876. Brahms showed great mastery of form in many other works for piano and orchestra and in his numerous songs.

Braille, Louis (*c.* 1809–52), French teacher and organist, blind from the age of 3, at 10 a foundling in an institution for the blind. At the age of 19 he was instructor of the blind in the National Institute of Paris. While he taught there, he invented the point symbols, named the Braille system in his honor, by which the blind read by touch. It is now standard throughout the world. He was a church organist in Paris.

Bramante, Donato d'Agnolo (1444-1514), Italian architect of the Renaissance. During part of his life he was a painter of considerable note, but he abandoned the brush to devote himself to architecture. He was employed by two popes in the galleries of the Vatican and in the rebuilding of Saint Peter's Cathedral, the master architectural monument of the period. He died before the work was completed, and other architects and painters, among them Michelangelo, Bernini and Raphael, made alterations in Bramante's plans before continuing his work.

Brandeis, Louis Dembitz (1856-1941), American jurist, born in Louisville, Ky., educated at Harvard. He had a long and successful career in the practice of law during which he often appeared for the public in arguing cases involving minimum wage laws and hours of labor. He was appointed an associate justice of the U. S. Supreme Court in 1916 by President Wilson. Always a liberal, for many years he was almost alone on the Supreme Court bench in his championship of liberal legislation. He worked zealously for the betterment of the Jewish race, to which he belonged. He wrote *Other People's Money* (1914), *Business, a Profession* (1914), *The Curse of Bigness* and many magazine articles.

Brangwyn, Frank (1867-), English artist, born in Bruges, Belgium, one of the most important painters, etchers and illustrators of the period. One of the world's largest mural paintings, *King John Signing the Magna Charta,* was made by him for the Cleveland, Ohio, courthouse; *Modern Commerce,* another mural, is in the Royal Exchange, London. Other notable paintings are found in galleries in many cities; they include *Sweetmeat Seller* (Carnegie Institute, Pittsburgh), *Burial at Sea* (Glasgow Gallery), *Mars and Venus, Venetian Funeral* and *The Baptism of Christ.* His etchings are numerous and notable.

Breasted, James Henry (1865-1935), archeologist and historian, a native of Illinois and educated at Northwestern College (Chicago), the Chicago Theological Seminary, Yale University and the University of Berlin. At the age of 29 he began teaching in the University of Chicago, as assistant in Egyptology; by 1915 he had become head of the Oriental language department. Breasted early interested himself in archeological expeditions in Egypt, Palestine and Mesopotamia. His writings include *A History of Egypt* (1905); *A History of the Ancient Egyptians, Origins of Civilization, Edwin Smith Surgical Papyrus* and *The Dawn of Conscience* (1933). His books have been translated into many languages.

Breughel, Breugel or **Brueghel,** the name of a noted Flemish family of painters. The principal member, Pieter Breughel (*c.* 1525–69), from the character and subject of many of his paintings was called *Peasant Bruegel.* He was one of the greatest of Flemish painters. His son, Pieter (1564-1637), was distinguished by the title *Hell Breughel,* from the many scenes painted by him in which devils and witches appear. His *Temptation of St. Anthony* and *Orpheus Playing on the Lyre* are noteworthy in the history of grotesque art. Jan Breughel (1568-1625), younger son of Pieter the elder, known as *Velvet Bruegel* or *Flower Breughel* is celebrated for his landscapes. He also painted with other masters, especially Rubens. Jan usually supplied the background landscapes and Rubens the chief figures.

Brewster, Sir David (1781-1868), Scottish physicist, one of Britain's great natural scientists. The kaleidoscope was his invention (1816), and with Wheaton he devised the stereoscope (1817). In the same year he was one of the founders of the Edinburgh *Philosophical Journal.* In 1819 the Royal Society awarded him the Rumford gold and silver medals for his discoveries on the polarization of light; in 1832 he was knighted and had a pension conferred upon him; in 1849 he was elected one of the eight foreign associates of the French Institute, the highest scientific distinction in Europe. In 1859 he was chosen vice-chancellor of Edinburgh University. He was a prolific writer for periodicals and published a number of books, including *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton* (1855).

Brian Boru or **Brian Boroihme** (926–1014), King of Ireland, at first ruler of the two Munsters, but after 1001 of all of the country. He defeated the Danes in upward of 20 pitched battles. In the battle of Clontarf (1014), after which he was murdered at his prayers, his troops gained a signal victory over a united army of natives who had revolted, assisted by Danes. The latter were completely demoralized, and their organization and power in Ireland was destroyed forever.

Briand, Aristide (1862-1932), French statesman, 12 times prime minister of the Republic, a native of Nantes. He was a moderate Socialist, and his socialistic writings won for him a membership in the Chamber of Deputies in 1902. After serving as minister of public instruction and minister of justice, he became prime minister in 1909. The next year he showed his versatility in settling a strike of railroad employees by calling them to the colors, thus causing them as soldiers to oppose themselves as strikers. When the World War began, he was a leader in perfecting mobilization of the man power of France. His numerous calls to the premiership resulted from frequent falls of cabinets when France believed Briand to be the man to restore political tranquility. He led the French delegation to the Washington Disarmament Conference (1921) and had a large part in establishing the Locarno Treaties (1925). In 1926 Briand, Streseman and Austin Chamberlain shared the Nobel peace prize.

Bridges, Robert (1844-1930), English poet laureate, born at Walmer and educated at Eton and Corpus Christi, Oxford. He afterwards studied medicine but abandoned practice in 1882 to write poetry. He succeeded Alfred Austin as poet laureate in 1913. Bridges' works include *Shorter Poems* (1890), *New Verse* (1925) and *The Testament of Beauty* (1929).

Briggs, Clare A. (1875-1930), American cartoonist. Most of his work appeared in newspapers under the titles *When a Feller Needs a Friend, Ain't It A Grand and Glorious Feeling, Somebody's Always Taking the Joy Out of Life* and others. His simple, kindly, humorous style has been widely copied.

Bright, John (1811-89), British statesman and orator, born of Quaker parents in Lancashire. He had little formal education. Bright and Richard Cobden began early in their careers to demand repeal of the Corn Laws. Bright entered Parliament, but was defeated for a third term because he violently opposed the Crimean War. A year after the war he again entered the House of Commons and held his seat as long as he lived.

He allied himself with Gladstone's government and approved the plans for the disestablishment of the Irish Church, but he did not believe in the Gladstone home-rule policy and opposed it with all his power; this alienated the two, much to the grief of both. He was a friend of the North during the American Civil War, though opposition to the South injured his cotton-mill interests. Throughout his life he believed in freetrade as the best economic principle for England.

Bright, Richard (1789-1858), English physician, educated in the University of Edinburgh, a London doctor for many years. He studied albuminous conditions of urine when accompanied by degeneration of the kidneys and alterations of allied organs and identified and gave to the world the name of *Bright's disease.* His description of the slowly advancing disease we now know by this name was a great contribution to medical science.

Brock, Sir Isaac (1769-1812), British general, defender of Canada in the War of 1812. When danger threatened in the vicinity of Detroit he captured the city easily after such a show of force that Hull, commander of the Americans, surrendered without resistance, an act for which he was later ordered to trial. This success spread the fame of Brock among the British and Indians, but he did not live long to enjoy his honors; he was killed in the Battle of Queenston Heights, on Niagara River.

Brontë, Anne (1820-49), English novelist, born at Thornton, the youngest child of the Brontë family. She added her poems to those of her sisters, Charlotte and Emily, to publish *Poems by Currer, Ellis and Acton Bell* (1846) with pseudonyms chosen to accord with the authors' initials. Two novels, *Agnes Grey* (1847) and *The Tenant of Wildfell Hall* (1848), preceded her early death.

Brontë, Charlotte (1816-55), English novelist born at Thornton, the daughter of an Irish-Anglican clergyman. Her first literary efforts were in collaboration with her two sisters, both novelists, but lacking Charlotte's power of portrayal. Her first and greatest success came with the publication of *Jane Eyre* (1847), one of the greatest novels of all time. Two other books, *Shirley* and *Villette,* followed. She wrote *The Professor* before *Jane Eyre* appeared, but it was refused by every publisher to whom it was offered and was not published until after her death. Her life was dreary and almost without a stirring event. She married her father's assistant pastor, the Rev. Arthur Nicholls, a year before her death.

Brontë, Emily (1818-48), English novelist, born at Thornton. Her early poems appeared with those of her sisters. Her novel *Wuthering Heights* (1847) was admired by Matthew Arnold. She died less than 6 months after its appearance.

Brooke, Rupert (1887-1915), English poet, born in Rugby and educated at Rugby, where his father was a house master, and at Kings College, Cambridge. At the beginning of the World War he enlisted in the British army and died on a hospital ship during the disastrous Dardanelles campaign. His first volume of poems appeared in 1911; a second, called *1914 and Other Poems,* was published in 1915, shortly after his death. Many of the sonnets from this volume portray the unselfish exaltation that possessed so many young men at the beginning of the war.

Brown, Henry Kirke (1814-86), American sculptor, born in Massachusetts. He rebelled against Italian influence and turned from classic subjects to natural subjects and statues. His *Indian and Panther* was the first bronze piece cast in the United States. Among his statues are those of Washington and of Lincoln (Union Square, New York), Winfield Scott and Nathanael Greene (Washington) and DeWitt Clinton (Brooklyn, N. Y.). Brown excelled in minute details of facial expression.

Brown, John (1800-59), American abolitionist, born in Torrington, Conn., descendant of a *Mayflower* Pilgrim. At 54 he was in Kansas, taking active part in the political destinies of the new state. After Kansas had decided the slavery question by state-wide vote, he became a traveling evangelist of abolition, working throughout the middle and eastern states.

In 1859 he chose a more militant attitude; with 17 white men and 5 negroes he attacked a Federal arsenal at Harpers' Ferry, captured it and took a number of citizens as prisoners. Had he retired promptly to the mountainous country nearby, he might have found at least temporary safety, but he lingered all day; by night a strong company of militia entered the town and captured Brown and his companions. He was tried for treason and executed on Dec. 2, 1859. His body was taken to North Elba, N. Y., for burial. The treasonable act produced momentous results. People in the North quite generally approved it, and within a year the song *John Brown's Body* was prophetic of the coming crisis between the North and the South.

Browne, Charles Farrar, see *Ward, Artemus.*

Browning, Elizabeth Barrett (1806-61), English poet, whose marriage to the distinguished poet Robert Browning did not detract from the literary fame that was rightly hers. From her youth, her brilliant mind gave promise of future greatness; at 11 she composed an epic poem *The Battle of Marathon;* at 20, without disclosing her authorship, *An Essay on Mind and Other Poems.* Her reputation as a poet was well established when in 1838 she published *The Seraphin and Other Poems.* Two years later, she was near death from a burst blood vessel and did not leave her room for 7 years; but her literary work did not cease.

During this time, a book of poems containing "The Cry of the Children" and "Lady Geraldine's Courtship" appeared. In the latter she praised Robert Browning's poetry. The two met in 1845 and were married the next year, over the protest of her pious but selfish and despotic father. The Brownings went to Italy to live, and in Florence their son, Robert Wiedemann Browning, was born (1849). Mrs. Browning published another volume of verse in 1850, in which "Prometheus Bound" appeared and in 1856 *Aurora Leigh.* Her last books, published shortly before her death, were *Poems Before Congress* and *A Curse for a Nation.*

Browning, John Moses (1855-1926), American inventor, born at Ogden, Utah. He designed a breech-loading rifle in 1879, then devoted himself to designing sporting rifles and automatic pistols for the Remington, Winchester and Colt companies. He received high honors for his pistols and the Browning machine gun used during the World War.

Browning, Robert (1812-89), English poet, born in London. He was educated by private tutors and in University College, London, after which he traveled in Italy and Russia.

His first book of poems, *Pauline,* written when he was 19, attracted little attention, but it contained strong and beautiful passages. Then followed *Paracelsus,* widely acclaimed; the historical drama *Strafford* (1837); and *Sordello,* a narrative poem. *Bells and Pomegranates,* a collection of poems beginning with "Pippa Passes," a powerful lyrical drama, drew praise from Elizabeth Barrett, whom he afterwards married.

Browning's masterpiece is *The Ring and the Book,* an epic poem of more than 21,000 lines and his longest. *A Blot in the 'Scutcheon,* a drama; *Evelyn Hope, Fra Lippo Lippi, How They Brought the Good News, The Flight of the Duchess, A Lost Leader* and *A Soul's Tragedy* are but a few of his poems worthy of special mention.

Browning's poetry, famous for its optimism, is often difficult to read. Much of it seems obscure, with passages heavy and ponderous; he ignored accepted forms of expression at times to give emphasis to the virility of his thought. The romance of Robert Browning and Elizabeth Barrett fills a large place in the history of literary men and women.

Bruce, de, Robert (1274-1329), King of Scotland. In his youth he did not question the authority of Edward I, English King who held sway over Scotland, though he believed in his father's right and eventually his own right to the throne through his grandfather. Later he joined others in an effort to secure Scottish independence, abandoned the idea, made peace with the king and finally took the field again in behalf of his father's claims. Once more returning to nominal allegiance, King Edward made him one of four regents to govern Scotland. His father having died, Bruce killed Comyn, one of the regents, declared himself king of Scotland and gathered an army to defend his position. The royal English forces defeated him, and he fled to Rathlin Island in Ireland, returning to his conquest as soon as new supporters could be brought together.

In 1306, after a succession of victories and defeats, his right to reign was acknowledged. His rule was beset with trouble with the English; at the Battle of Bannockburn (1314), in which Bruce commanded in person, he was forced to withdraw. When Edward III became king of England, hostilities began again, and it was not until 1328 that Scotland's independence was definitely acknowledged. Bruce contracted leprosy and spent the last 2 years of his life in retirement in Cardross Castle.

Brummell, George Bryan (1778-1840), called *Beau Brummell,* English style leader. In London he was known as the prince of dandies and was patronized by the Prince of Wales (afterward George IV). He spent a fortune in sumptuous living, and in matters of etiquette and dress his opinions were considered indisputable. He quarreled with the prince and fled from his creditors to Calais, where, reduced to destitution, he lived some years.

Bruno, Giordano (1548-1600), Italian philosopher. He became a member of the Dominican order, but his heretical philosophical opinions led to his expulsion. Between 1580 and 1591 he wandered about Europe in continual danger of arrest and condemnation. In 1591 he went to Venice where he was betrayed by a false friend and was delivered over to the Roman Inquisition. He was imprisoned for 8 years and finally burned at the stake. His condemnation was on religious grounds and not because of his support of the Copernican doctrine in astronomy. His writings were very influential in the later 17th century and were particularly admired by Spinoza and Leibnitz.

Bruno, Saint (*c.* 1040-1101), German monk, founder of the Carthusian order, born at Cologne. He became rector of the cathedral school at Rheims, but, oppressed by the wickedness of his time, withdrew in 1084 to the wild mountain of Chartreuse, near Grenoble. Here with six friends he founded the austere Carthusian Order. In 1094 he established a second Carthusian monastery at Della Torre in Calabria. His feast is October 6.

Brush, Charles Francis (1849-1929), American inventor, born in Euclid, Ohio, graduated from the University of Michigan (1869). He invented the dynamo used in arc lighting, an electric lamp and a number of devices that improved electric-lighting systems. His services to science won him election to the Legion of Honor in France and the Rumford Medal from the American Academy of Arts and Sciences.

Brutus, Marcus Junius (85-42 B.C.), Roman politician. He joined Pompey, assassin of his father, in a war against Julius Caesar. Caesar, victorious, pardoned Brutus and made him governor of Cisalpine Gaul but when the Senate conspiracy against Caesar took form, Brutus joined in the plot.

After Caesar's assassination, the story of which is familiar to all through Shakespeare's play *Julius Caesar,* Brutus fled from Rome to Athens and raised a force with the intention of establishing a new power in Macedonia. He was defeated by Octavius at Philippi and, realizing his cause lost, killed himself.

Bryan, William Jennings (1860-1925), American lawyer and statesman, born in Salem, Ill., and educated at Illinois College (Jacksonville) and Union College of Law (Chicago). After 1887 he lived in Nebraska, became a member of Congress from that state (1891-95) but failed of election to the Senate in 1893.

He was an alternate delegate to the national Democratic convention in Chicago in 1896, secured the seat of a colleague for one session and made a speech advocating free silver which so electrified the convention that he was nominated for President. His opponent, McKinley, on a gold-standard platform, easily won the election. In 1900 and again in 1908, he won the Democratic nomination but was each time defeated. During his years of ascendency he published *The Commoner,* a weekly paper, in which his policies were given wide publicity.

In 1912 he so dominated the Democratic convention that he forced the nomination of Woodrow Wilson for President, who, in forming his Cabinet, appointed Bryan secretary of state. In this office, he negotiated 30 treaties setting up machinery for arbitration of international disputes. In 1915 he resigned because of his opposition to the administration's attitude toward Germany in the World War. His last public appearance was as one of the prosecutors of J. T. Scopes, a Tennessee teacher accused of teaching evolution, contrary to a state law. He died suddenly at the end of the trial. Though it was successfully concluded from his point of view, Bryan was subjected to merciless harrowing by Clarence Darrow, the opposing attorney.

Bryant, William Cullen (1794-1878), American poet, editor and lecturer, born in Cummington, Mass., the son of a doctor. At the age of 16 he entered Williams College but left to study law. He was admitted to the bar (1815) and practiced law for 10 years. At the age of 18 he wrote the famous "Thanatopsis" (1811). He collaborated in writing a history of the United States and, besides writing a great many short poems, translated the *Iliad* and the *Odyssey,* wrote *Orations and Addresses, Letters of a Traveler* and *Letters from the East,* the last two embodying his observations in Europe. For half a century he was editor and owner of the influential New York *Evening Post.*

Bryce, James, Viscount (1838-1922), British statesman, historian, publicist and diplomat, born in Belfast and educated at Glasgow and Oxford universities. He became a professor of law (1870), filled four posts in the British Cabinet and was in Parliament from 1880 to 1907. In the latter year, he was appointed ambassador to the United States, continuing as such for 5 years. Bryce was a vigorous writer; the book which gained most fame for him was *The American Commonwealth,* a keen analysis of the government of the United States. He also wrote *The Holy Roman Empire, Modern Democracies, Studies in History and Jurisprudence, Studies in Contemporary Biography* and several books on travel.

Buchanan, James (1791-1868), the 15th President of the United States, born near Mercersburg, Pa., the son of Scotch-Irish parents. His term ended as the Civil War was about to begin, and he was the last Democratic President until the election of Cleveland in 1884. He was graduated from Dickinson College (1809) and was admitted to the bar 3 years later. Buchanan received preferment almost from the outset of his political career. Nine years after beginning the practice of law, he was sent as a representative to Congress, where he remained for five terms (1821-31) and gave acceptable service. President Andrew Jackson then appointed him minister to Russia, and in that post he negotiated a treaty (1832) that remained in force until Taft's presidency. On his return to the United States, he was chosen to fill a vacancy in the Senate (1834) and was twice re-elected but resigned in 1845 to become secretary of state in the Cabinet of President James K. Polk. In that post he settled the Oregon boundary dispute; in the Mexican War he favored the acquisition of Texas.

During the administration of Franklin Pierce, Buchanan was sent as minister to Great Britain and was one of the commissioners who issued the Ostend Manifesto proposing the acquisition of Cuba by the United States; it was coldly received by all political parties at home, but the South regarded Buchanan's part in it as establishing him as a pro-slavery man. As the political campaign of 1856 approached, Buchanan was the only man able to unite the party and was nominated and elected.

As President, Buchanan strove to annex Cuba. He did nothing to discourage William Walker, the Nicaragua filibuster, but cleared up some of the misunderstandings in Central America by treaties with Nicaragua and Honduras. He proposed to restore peace among the quarreling Mexicans by a show of force. In all his foreign policy he was almost solidly opposed by a Senate that was safely Democratic, a condition that did not tend to add to his popularity.

There was increasing bitterness between the North and South on the slavery issue, which was soon to lead to intersectional strife. It has been contended that Buchanan might have prevented the Civil War by boldness in decision and by forcing patriotic leadership upon the nation, but it is probable that the best he could have done would have averted the crisis only temporarily. He saw clearly the drift toward disunion but did not attempt to check it.

Another national election was at hand, and Buchanan was charged with having steered a middle course in the hope that the Democratics of both North and South would support him for a second term; but he lost the 1860 nomination. The Republicans elected their candidate, Abraham Lincoln.

Between election day in 1860 and the inauguration of Lincoln in 1861, momentous events quickly followed one another. Major Anderson transferred his little garrison from Fort Moultrie to Fort Sumter, the better to face the menace of batteries on the shore of the newly seceded South Carolina. Commissioners from that state traveled to Washington to negotiate peace; Buchanan would receive them as guests but not officially. Secretary of State Cass resigned, charging the President with lack of proper defense of his country. Other Northern cabinet members threatened to resign if the President permitted the surrender of Fort Sumter. Southern cabinet members announced their resignations in the event of secession; they would join the Confederacy. In the midst of these alarms, Buchanan attempted to relieve beleaguered Fort Sumter by sending supplies, but shore batteries turned the ship back. Abraham Lincoln faced a dubious inheritance.

Buchanan must be credited with distinct service to his country throughout most of his career. Only during the last 2 years of his administration was there widespread disbelief in him. After he left the Presidency at nearly 70 years of age, he retired to his modest estate near Lancaster, Pa., where he remained during the rest of his life.

Buck, Pearl Sydenstricker (1892-), American novelist, native of Hillsboro, W. Va. She first married John Lossing Buck, and together they spent many years in China as missionaries. In 1935 she married Richard J. Walsh. After long study of Chinese life, she wrote *East Wind: West Wind* (1930); *The Good Earth* (1931), a story of a Chinese farmer's family that became very popular, won the Pulitzer prize and was presented as a play by the Theater Guild (1932); *Sons* (1932), a sequel to *The Good Earth; Mother* (1934); *The Exile* (1936), about her mother; and *Fighting Angel* (1937), the story of her father's life as a missionary in China. The author also translated a Chinese classic *Shui Hu Chuan* as *All Men are Brothers.* She won the Nobel Prize in 1938.

BUDDHA (Gautama; 563-483 B.C.), the founder of Buddhism, an Indian sage, the son of a local king. His personal name was Siddhartha and his name Gautama; the sacred name Buddha means *the enlightened one.*

As a youth he was contemplative, studious and of high morality. His father, fearing he would desert the royal house and become a recluse, had him marry an attractive princess; and every comfort and luxury of the period was his. For 12 years he lived this pampered life, then at the age of 30 renounced it all for a life of austerity, study and the search for deeper spiritual satisfactions. Having attained what he believed perfect wisdom, he announced himself as The Buddha—*The Enlightened One,* with knowledge of the ills of the world and possessed of the power to counteract them. He began to preach, first at Benares, then throughout northern India. Princes and peasants became his followers, and his converts became missionaries of the new faith. From such beginnings, Buddhism spread rapidly and has lived through 2500 years; it now claims close to 140 million devotees.

Buddha was one of the earliest of the great teachers to proclaim the universal brotherhood of man and to declare that eternal felicity could be obtained only by a life of self-denial and good works; that purity of conduct, suppression of desire and deep concentration upon the virtues are necessary to reach that highest state of bliss and ultimate goal of the seeking soul, *Nirvana.* Transmigration of the soul was one of the tenets of his belief.

Budge, Donald (1915-), American tennis player, born in California. In 1937 he won the Englishmen's singles title and became co-holder of the men's doubles and mixed doubles championships. In that year his playing won the Davis Cup for the United States.

Buffalo Bill, see *Cody, William Frederick.*

Buffon, de, Georges Louis Leclerc, Count (1707-88), French naturalist, was one of the first learned men to propound the theory of evolution. He became a member of the Academy of Sciences and was made director of the Royal Gardens. Buffon's literary and scientific fame rests upon his *Natural History,* 15 vols., written in entrancing style. He also wrote *The History of Birds, History of Minerals* and *Epochs of Nature.*

Bülow, von, Bernhard Heinrich Martin, Prince (1849-1929), German statesman. At the conclusion of the Russo-Turkish War he was appointed one of the secretaries of the Congress of Berlin, and after further diplomatic service in Paris and St. Petersburg, he was appointed minister to Rumania (1888) and ambassador to Italy (1893). In 1899 he concluded a treaty with Spain, whereby the Caroline, Marianne and Pelew islands were ceded to Germany, and upon this achievement he was created Count Bülow. On the resignation of Prince Hohenlohe in 1900, he succeeded him as chancellor of the German Empire, prime minister and minister of foreign affairs of Prussia and in June 1905 was raised to the dignity of prince. He wrote *Imperial Germany.*

Bulwer-Lytton, Edward George Earle Lytton, 1st Baron Lytton (1803-73), English novelist and dramatist, educated at Cambridge. Repeatedly elected to Parliament, he was secretary of state for the colonies (1858). Although he wrote a number of horror stories and society novels, he is remembered chiefly for *Rienzi, The Last of the Barons* and especially *The Last Days of Pompeii.*

Bunin, Ivan (1870-), Russian poet and novelist who has gained high recognition for his translations, prose and poems. He translated Longfellow's *Hiawatha,* the first American work to be translated into Russian. In 1933, when he was an exile in Paris, he received the Nobel award for literature.

Bunsen, Robert Wilhelm (1811-99), German chemist. His name is perpetuated in the Bunsen burner. He was the first to produce magnesium in large quantities and in 1860 invented the magnesium light, formerly widely used in photography. His greatest claim to fame was the development of spectrum analysis in collaboration with Kirchhoff, a fellow scientist.

Bunyan, John (1628-88), English author of *Pilgrim's Progress,* born near Bedford. In youth he followed the trade of a tinker, as did his father. He married at 19 and joined the Baptists, later becoming a preacher. After the Restoration in 1660 a law forbade any ministerial work outside of the established Church of England. For his persistent preaching, he was thrown into Bedford jail and held there for nearly 12 years. During this time he wrote his great work. Bunyan wrote besides *Grace Abounding to the Chief of Sinners,* which was autobiographical, and *Holy War,* an allegory.

Burbank, Luther (1849-1926), American horticulturist and plant breeder, born in Lancaster, Mass. He showed an early interest in plant experimentation. Needing better climate and soil for his work, he moved to Santa Rosa, Calif. (1875). There he established himself and devoted his life to improving plants. He developed not only larger varieties but entirely new ones; among the latter are the Burbank potato, two new varieties of apples, new and larger plums and prunes (one of them stoneless), three new roses (peach-blow, Burbank, and Santa Rosa), the Shasta daisy increased to 4 inches in diameter, a spineless cactus, a large form of amaryllis and the white blackberry. One of his creations was the plumcot, produced by crossing the apricot with the Japanese plum. He wrote little but published *Training of the Human Plant* and *How Plants Are Trained to Work for Men.*

Burgoyne, John (1722-92), British general, prominent in the American Revolution. It was his task to drive south from Canada into the colonies and cut New England off from communication with its more southerly neighbors. His expedition, after minor successes, failed at the Battle of Saratoga (1777). His conduct of the campaign displeased his home authorities, and after his return to England quarrels with the Ministry of George III led to his retirement. Afterwards he wrote several books and a comic opera.

Burke, Edmund (1729-97), British statesman and orator, born in Dublin and educated at his home university. He was a friend of America in the English Parliament in the tense period preceding the Revolutionary War. Early literary ability and the publication of essays on *The Sublime and Beautiful* led to his appointment as private secretary to the chief Secretary for Ireland and later to the same post under the Premier, Lord Rockingham. At the age of 37 he entered Parliament and for 28 years was an influence in that body. He early evinced an interest in American colonial affairs, but it was not until 1775 that he made his great speech *On Conciliation with America;* it made a profound impression and shocked the Tory mind, but did not avert the conflict.

He was not in sympathy with the French Revolution, and bitter feeling on that subject severed many friendships. He fought for native rights in India as against the oppression and greed of officials sent to govern there.

Burne-Jones, Sir Edward (1833-98), English artist, born in Birmingham and educated at Oxford University. There he met William Morris; they worked and studied together until 1859 and were lifelong friends. He also enjoyed the companionship of John Ruskin, with whom he traveled a year in Italy. Burne-Jones's pictures are a blend of the romantic and the classic, and nearly all of them are highly decorative. Among them are *Pan and Psyche, The Days of Creation, Garden of Pan, Beguiling of Merlin, Love among the Roses, Wine of Circe, King Cophetua and the Beggar Maid* (Tate Gallery, London) and *Depths of the Sea.* Burne-Jones also designed stained-glass windows, tapestries and mosaics, the most notable being executed for the American Church in Rome.

Burnett, Frances Eliza Hodgson (1849-1924), American writer. Born in Manchester, England, she was brought to the United States with her family, the Hodgsons, at the age of 7, settling in Knoxville, Tenn. Her *Little Lord Fauntleroy* (1886), a classic for children, was so popular that the name was given to articles of clothing and the story was dramatized. *That Lass o' Lowrie's* is an outstanding word picture of the English mining district. Other books are *Surly Tim's Trouble, A Lady of Quality, A Fair Barbarian, Kathleen, The Secret Garden, Editha's Burglar* and *Good Wolf.* Plays written by Mrs. Burnett are *The Showman's Daughter, Phyllis, Nixie, Esmeralda* and *The First Gentleman of Europe.*

Burney, Frances (1752-1840), English author, daughter of Charles Burney the composer. Her first novel, *Evelina,* attracted much attention, critics comparing her to Fielding. Her second book, *Cecilia,* added to her reputation. In 1786 she became keeper of the robes to Queen Charlotte and for 5 years lived an unhappy life at court. She married Count D'Arblay, a French exile, in 1793. Her *Diary and Letters* is a work of much interest.

Burnham, Daniel Hudson (1846-1912), American architect, born in New York state, and educated in Chicago. The firm of architects that he headed was commissioned to plan the World's Columbian Exposition in Chicago (1893), and this gigantic task made Burnham's name known. He was later chairman of the committee charged with beautifying Washington, D. C. Many monumental business structures were planned by him; the Flatiron Building in New York, the old Masonic Temple in Chicago and the Union Passenger Station, in Washington, D. C., are typical of his art. He had a large share in the rebuilding of San Francisco after the 1906 double disaster of earthquake and fire.

Burns, Robert (1759-96), Scottish poet, born at Alloway, near Ayr, Scotland. He was the son of a small farmer, and was brought up in poverty. However, he received a common-school education, though most of his learning was gained from the books he read, among which were *The Spectator,* the works of Pope and the poems of Allan Ramsay.

When he was 16 years of age he fell in love, and his feelings, as he tells us, at once burst into song. His first volume of poetry was issued in 1786, from Kilmarnock, and at once became popular. The success of this volume, which was speedily republished in Edinburgh, induced him to take the farm of Ellisland, near Dumfries, where he married his "bonny Jean." He moved to Dumfries in 1791 and, having been appointed as exciseman through the influence of a friend and admirer, he lived on the $350 a year that office paid. In 1792 he wrote about a hundred songs as accompaniments to the melodies of Scotland. His health failed, partly because of intemperance, and he died at 37. Though imprudent, he was an honest, proud, warm-hearted man, combining sound understanding with high passions and a vigorous imagination. He is one of the few poets who, alive to every emotion, excelled in humor and tenderness.

Burr, Aaron (1756-1836), American army officer, lawyer, Senator and Vice-President of the United States, born in Newark, N. J. He was educated at Princeton, where his father was president of the college. He became a colonel in the Revolutionary War; was attorney general of New York (1789); United States Senator (1791-97); and was elected Vice-President in 1801. Enmity existed between Burr and Alexander Hamilton, for Burr believed Hamilton had conspired to defeat him for the governorship of New York. This bitterness led to a duel in Weehawken, N. J., in which Hamilton, who fired his weapon into the air, was killed (July 11, 1804).

Burr's career, once so promising, was now doomed. During 1805 Burr engaged in an enterprise that seemed to aim at the formation of a new government in the Southwest. He confided his plan to General Wilkinson of the army, who promptly notified President Jefferson of the treasonable design. Burr was arrested and tried (Henry Clay was his attorney), but he was not convicted. Two later arrests resulted in acquittals. Broken, he went to London and Paris. Unable to establish himself there, he returned to New York in 1812 to resume the practice of law.

Burroughs, John (1837-1921), American naturalist and author, born in Roxbury, N. Y., received an academic education and taught school for 8 years. He held a position as clerk in the Treasury Department at Washington (1864-73) and was a national bank examiner (1873-84). While he was a Treasury clerk, he wrote *Walt Whitman as Poet and Person.* Burroughs wrote a large number of books and essays, among the most important being *Birds and Poets, Bird Enemies, Winter Neighbors, An Idyl of the Honey-Bee, Squirrels and Other Fur-Bearers, Field and Study* and *Under the Apple Trees.* His last book bore the title *The Summit of the Years.*

Burton, Sir Richard Francis (1821-90), English explorer, writer and linguist. He joined the East India Company in 1842; this gave him many opportunities to travel in eastern countries and to learn and record languages —Persian, Afghan, Hindustani and Arabic. He explored widely in Africa and South America, and wrote about his travels. His best known work is a literal translation of the *Arabian Nights* from the Arabic, called *The Thousand Nights and a Night* (16 vols., 1885-88).

Burton, Robert (1577-1640), English clergyman and scholar. He is remembered for his *Anatomy of Melancholy,* which appeared in 1621 and covered a wide field of thought, quoting from many literatures. Later writers used it extensively as source material.

Butler, Nicholas Murray (1862-), American educator, born at Elizabeth, N. J., and educated at Columbia College and in Paris and Berlin. He became professor of philosophy and education in his *Alma mater,* and when the college was reorganized as Columbia University, he was made dean of philosophy, ethics and psychology. He organized Teachers College, an adjunct of Columbia. In 1901 Butler became acting head of the university. He was elected president in 1902, and under his direction its expansion was vast.

Largely through his efforts Andrew Carnegie established his Carnegie Endowment for International Peace. He worked for disarmament, American participation in the World Court and international co-operation generally. In 1931 he shared the Nobel peace prize with Jane Addams.

Butler gained a reputation as a publicist and interested himself in politics. In 1912 the Republican candidate for Vice-President (James S. Sherman) died before the election, and Butler's name was substituted, but the party was defeated. Dr. Butler was awarded many honorary degrees. He wrote, among other books, *The Meaning of Education* (1915) and *Looking Forward* (1932).

Butler, Pierce (1866-1939), American jurist, born in Dakota County, Minn., educated at Carleton College. He practised law successfully, appearing in many cases involving large corporations. He was appointed an associate justice of the U. S. Supreme Court by President Harding in 1923.

Butler, Samuel (1612-80), English poet whose one work, *Hudibras*, made him famous. He was secretary to the Earl of Kent, and in this capacity attended numerous meetings at the home of a strict Puritan. He saw many things that appealed to his sense of humor, and *Hudibras* was written to ridicule Puritanical ideas.

Byng, Julian Hedworth George, 1st Viscount (1862-1935), English soldier, 7th son of the 2d earl of Strafford, one of the great military leaders of the World War. At the age of 22 he was serving in the Sudan; he was an officer of middle rank in the South-African War (1899-1902). When the World War began he was sent on the distastrous campaign around the Dardanelles; there Byng acquitted himself so ably that he was raised to the rank of lieutenant general.

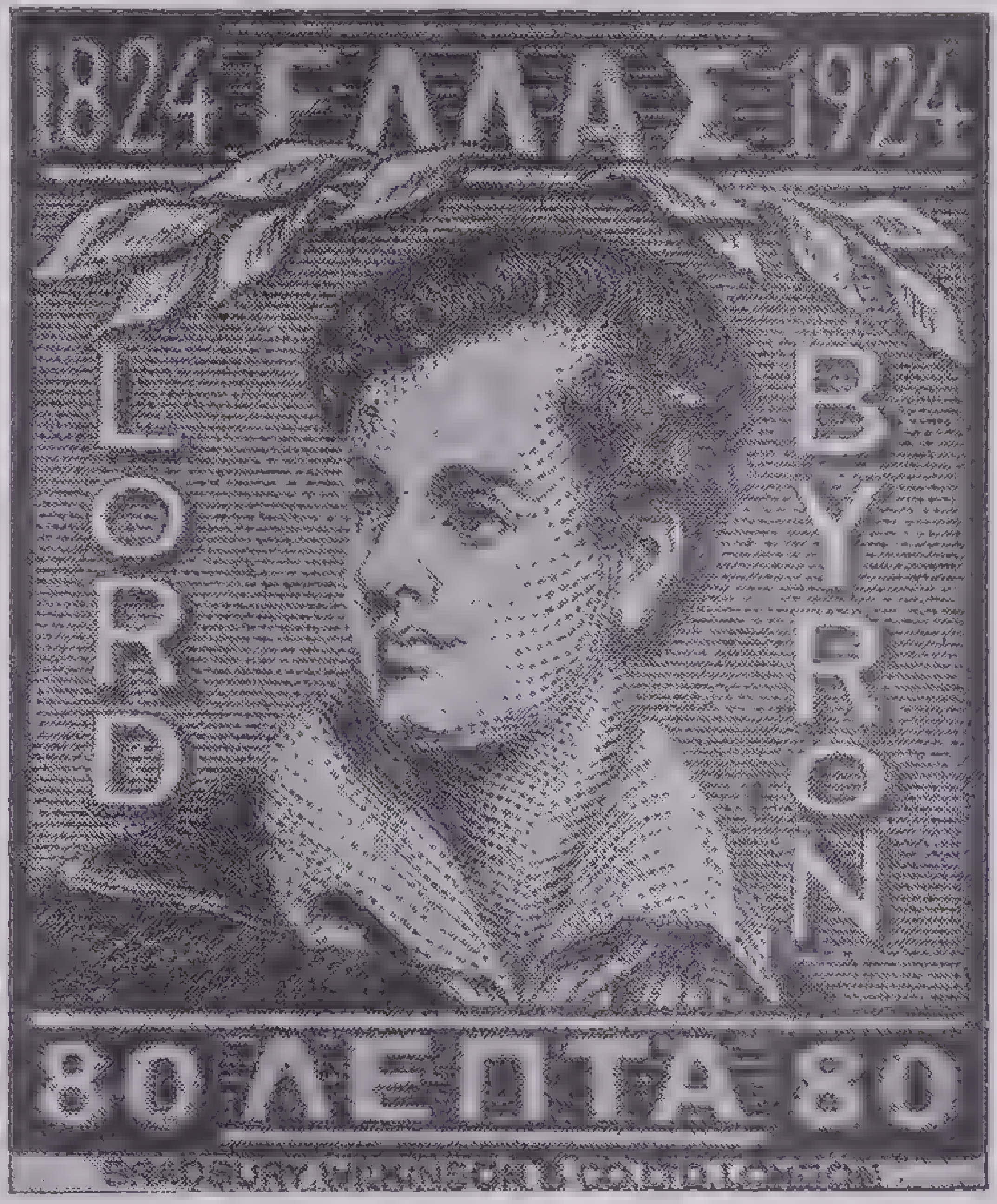
On his return to the northern zone of war, he was placed in command of the Canadian troops, and from the middle of 1917 to the close of the war he was in command of all British troops in the northern area. His signal victories at Cambrai, Arras and Vimy Ridge, won at great cost in man power, did much to turn the tide of the war. In recognition of his services, he was given the highest decorations that each of the Allied nations and the United States could confer. In 1921 Lord Byng was appointed governor-general of Canada, and served until 1926.

Byrd, Richard Evelyn (1888-), American naval officer and explorer. A native of Winchester, Va., he was educated at Shenandoah Valley Military Institute, Virginia Military Academy, the University of Virginia and the United States Naval Academy, from which he was graduated in 1912. Although he was retired in 1916 following an accident during a world cruise, he continued in service during the World War. The rank of commander was conferred on him after he accompanied the McMillan Expedition to the Arctic regions in 1925 as head of its aviation unit. In 1926, with Floyd Bennett as mechanic, he flew over the North Pole in an airplane, the first man to accomplish the feat. The next year Byrd and three companions crossed the Atlantic by plane. Late in 1928, with the most perfect equipment ever brought together for such a purpose, at a cost of a million dollars, Byrd headed a scientific expedition to Antarctica and was absent nearly 2 years. By airplane flights, he was able to correct erroneous geographical beliefs, to find and name new lands and to chart much of a vast antarctic continent. On Thanksgiving Day, 1929, Byrd and three companions flew over the South Pole. Before his return home, Congress, by special act, raised him to the rank of rear admiral. In 1933 and 1939 he headed other antarctic expeditions. He spent the entire winter of 1934 alone 125 miles from his companions for purposes of meteorological study. In 1939 he charted 900 miles of unknown coast line, and then distributed men for further charting.

Byron, George Gordon, 6th Baron (1788-1824), English poet, born in London. He became Lord Byron at 11, on the death of his uncle. He received his early education in private schools, after which he went to Trinity College, Oxford; while he was there his first volume of poems, *Hours of Idleness*, was published. Because the verses were severely criticized by a titled Scotchman, Byron retaliated with a sharp satire, *English Bards and Scotch Reviewers*. He traveled in the Mediterranean region and stayed for a time in Greece. His return to England in 1812 was followed by publication of the first part of *Childe Harold;* in Geneva he completed this poem and published *The Prisoner of Chillon*. These established him as one of the great poets, and the later release of *Don Juan* confirmed this opinion. His visit to Greece had left so delightful an impression upon him that in 1823 he returned to do what he could to help that country in its struggle for liberation from Turkish rule; he was received with enthusiasm, but his health broke, and after a short illness he died in Greece.

Cabell, James Branch (1879-), American author, born at Richmond, Va. He studied at private schools and taught French and Greek at William and Mary College. For several years he was a journalist and in 1904 published his first book. He worked in the West Virginia coal mines from 1911 to 1913 and subsequently made an extensive study of genealogy and history.

Cabell's most ambitious undertaking was a series of biographical narratives concerning the descendants of one Dom Manuel, legendary count of the mythical Poictesme. The stories are marked by an exquisite style, showing the author's mastery of delicate, graceful and subtle modes of expression. The Poictesme series includes *The Eagle's Shadow, The Cords of Vanity, Domnei, The Rivet in Grandfather's Neck, The Cream of the Jest, Jurgen, The Silver Stallion* and *The Way of Ecben*. Among his essays are *Beyond Life, Some of Us* and *These Restless Heads*. Later appeared his three-volume autobiographical series.



Courtesy Scott Stamp & Coin Company

Lord Byron

Enlarged from a Greek postage stamp, issued in 1924 to commemorate the 100th anniversary of the poet's death. The other stamp of the issue depicts Byron's arrival January 5, 1824, at Missolonghi, where he went to aid the Greeks in their fight for freedom

Cable, George Washington (1844-1925), American author, born in New Orleans, where he became a clerk at fifteen. He served in the Confederate army during the Civil War, was a reporter on the New Orleans *Picayune* and afterwards began a series of novels descriptive of Creole life in Louisiana. His first important book, a collection of short stories entitled *Old Creole Days*, appeared in 1879. Then followed, at frequent intervals, *The Grandissimes, Madame Delphine, Dr. Sevier, Bonaventure, John March, Southerner, Kincaid's Battery, Gideon's Band* and others. *The Creoles of Louisiana, The Silent South* and *The Negro Question* are expositions of Cable's views on Creole and Negro social problems that aroused so much local antagonism that he changed his residence to Northampton, Mass.

Cabot, John (*c.* 1451-*c.* 98), Italian navigator, whose exploits are a part of the early history of America. John Cabot was born in Genoa, Italy, eventually became a citizen of Venice, where his son was born; in 1490 the Cabot family moved to Bristol, England. Two years later, the news of the discovery of America stirred the European continent, and in 1497 Cabot secured permission from King Henry VII authorizing him to seek new lands for England. The Cabot expedition sailed from Bristol and landed near Cape Breton on June 24, and unaware that he was in America, he took possession in the name of the king of England. On a second voyage, in 1498, Cabot reached Greenland, Baffin Land, Newfoundland, and Nova Scotia. He died shortly after his return to England.

Cabot, Sebastian (*c.* 1472-1557), Italian navigator, son of John Cabot. It is not known if Sebastian accompanied his father on his voyages; the only authentic accounts are connected with his career after his father's death. He led a Spanish expedition to Brazil in 1526, under the patronage of Charles V, discovered the river that he named La Plata, but because he stayed three years in the district, he returned to Spain in disgrace. His later years were spent in the service of England; as governor of the Company of Merchant Adventurers, he helped to advance English trading in various parts of the world.

Cadillac, Antoine de la Mothe (*c.*1657-1730), French soldier, explorer and colonial governor, born in Gascony of a noble family; he is remembered chiefly as the founder of Detroit. It had its beginning in 1701, when Cadillac established a town on the site, with 50 soldiers and 50 settlers as the nucleus of the population. Early in his career Cadillac served as captain in the French army in Acadia, now Nova Scotia, and in 1694 became commander of Michilimackinac, now Mackinac, Mich. From 1712 to 1717, he was governor of Louisiana. He died in France.

Caedmon (*c.*670), English poet who lived in the second half of the seventh century. He was a cowherd attached to the monastery at Whitby and is supposed to have had a vision commanding him to sing of the creation of man and the world. Caedmon composed verses, and entered a monastery. Whether any of his poems survive is a matter of doubt. In a library at Oxford, there is the so-called Caedmon's *Paraphrase* or sacred epics in manuscript form, but no one knows whether Caedmon wrote any of them. In content and spirit, these poems anticipate the great epics of Milton.

CAESAR, GAIUS JULIUS (102?-44 B.C.), Roman general and statesman. His democratic sympathies were determined at an early age. When he was 17, he married Cornelia, the daughter of Lucius Cinna, friend of the democratic leader Marius. This connection gave offense to Sulla, the dictator, who was the political enemy of Marius, and upon Caesar's refusal to divorce his wife, Sulla confiscated his property and threatened his life. Caesar felt that he could not submit to Sulla, and in 81 B.C. he went into military service in Asia. On the death of Sulla (78 B.C.), Caesar returned to Rome and began to plead in the courts. Desiring to improve his oratory, he studied under Apollonius Molo at Rhodes. Caesar was *pontifex maximus* in 63 B.C., praetor in 62 B.C., and governor of Spain in 61 B.C. On his return to Rome, having united with Pompey and Crassus in the First Triumvirate, he became consul and then obtained the government of Gaul with the command of four legions.

Caesar's military career was rapid and brilliant. He compelled the Helvetii, who had invaded Gaul, to retreat to their native country, subdued Ariovistus, who at the head of a German tribe had attempted to settle in the country of the Ædui, and conquered the Belgæ. In nine years, he subdued all Gaul, crossed the Rhine twice (55 and 53 B.C.) and twice passed over to Britain. The senate had continued his rule in Gaul for another period of five years, while Pompey was to have the command of Spain, and Crassus that of Syria, Egypt and Macedonia for five years.

The death of Crassus in his campaign against the Parthians dissolved the triumvirate; and about the same time the friendship between Caesar and Pompey cooled. The Senate, influenced by Pompey, ordered Caesar to resign his offices and command within a certain time or be proclaimed an enemy to the state and appointed Pompey general of the army of the Republic. Caesar urged his soldiers to defend the honor of their leader and in 49 B.C. crossed the Rubicon, a small stream separating his province from Italy.

This was an act of war, but he made himself master of Italy without striking a blow, for Pompey fled to Greece, and the people hailed the hero of Gaul as a deliverer. Caesar then took an army into Spain, which he reduced to submission without coming to battle with Pompey's generals. He next conquered Massilia (now Marseilles), and returned to Rome, where he was appointed dictator. He followed Pompey into Greece and defeated him at Pharsalia (48 B.C.), from which Pompey escaped, only to be assassinated in Egypt. Before he returned to Rome, Caesar went to Egypt, where he won back the crown for the dethroned queen, Cleopatra.

In Rome the senate and the people strove eagerly to gain the favor of Caesar, and without changing the ancient forms of government he ruled with almost unlimited power. In 46 B.C. he crossed to Africa, defeated the Pompeians, Scipio and Cato, at Thapsus, and on returning to Rome was received with high honors. The term of his dictatorship was prolonged, the office of censor was conferred on him alone, his person was declared inviolable and his statue was placed beside that of Jupiter in the Capitol.

Soon afterward, Caesar was honored with four triumphs, made perpetual dictator, and received the title of *imperator* with full powers of sovereignty. In February, 44 B.C., he declined the diadem which Antony publicly offered him, and the next morning his statues were decked with diadems. His glory, however, was short lived, for a conspiracy was set on foot by his enemy, Cassius, joined by many of his supposed friends, including Brutus; notwithstanding the danger, he attended a meeting of the Senate on the Ides (the 15th) of March, 44 B.C., and was stabbed by many daggers.

As an orator, Caesar was second only to Cicero, and as a writer he will be remembered for that vigorous simplicity which gives historical narrative vitality and charm. All Latin students are familiar with his *Commentaries on the Gallic War* and his *Civil War*. Most of his other writings are lost.

Cagliari, Paolo Veronese, see *Veronese, Paul.*

Caine, Sir Thomas Henry Hall (1853-1931), British novelist and dramatist. Born in Cheshire, of Manx ancestry, he wrote most of his books while a resident of the Isle of Man. Abandoning architecture for journalism, he moved to London in 1881, in order to be with Rossetti, who died within a year. His first novel was published in 1885. His most enduring work is his fiction dealing with Manx life and character, including *The Deemster, The Bondman* and *The Manxman.* Others are *The Christian, The Eternal City, The Prodigal Son, The White Prophet* and *The Woman Thou Gavest Me.* Some of Caine's novels were dramatized.

Calderón de la Barca, Pedro (1600-81), Spanish dramatist, born in Madrid and educated at the Jesuit college there and at the University of Salamanca, from which he was graduated in 1619. He began writing plays at the age of 13, and within the next two decades won a reputation as the foremost Spanish writer of the sacred allegorical drama, known as the *auto*. After a brief military career, he resumed his writing, and in 1650 joined the third Order of Saint Francis. Ordained a priest in 1651, he continued his literary work. Of his plays, 118 dramas and over 70 *autos* are extant, *Life Is a Dream* is the best-known work; others are *The Wonderful Magician* and *Love After Death.*

Calhoun, John Caldwell (1782-1850), American statesman, born near Abbeville, S. C. He entered Yale in 1802, was graduated with high honors and was admitted to the bar in 1807. Then followed his election to the state legislature (1808) and election to Congress (1811). In 1817 he became secretary of war in the cabinet of Monroe. He served during both of Monroe's terms and made a strong impression as an administrator and organizer. Elected Vice-President in 1824, Calhoun served in this capacity with President John Quincy Adams, and was re-elected to the office in 1828, when Jackson was chosen President.

In the following year Calhoun declared that a state had a right to nullify any law which it considered unconstitutional. When in 1832 a South Carolina convention passed an ordinance nullifying the tariff, Calhoun resigned the Vice-Presidency and entered the Senate fully prepared to uphold the action of his state. Clay brought about a compromise, but the question of states' rights remained an issue.

Calhoun remained in the Senate until 1843, when he declined re-election; the following year he became secretary of state under Tyler. In the meantime he had become a strong advocate of slavery, and his desire to see the slave-holding territory increased led to his active support of the annexation of Texas. Though this move brought on the Mexican War, Calhoun tried his best to prevent that struggle. In 1845 he was back in the Senate, where, until his health failed, he fought unceasingly for the interests of the South.

Caligula, Gaius Caesar Augustus Germanicus (12-41 A.D.), 3d Emperor of Rome, the youngest son of Germanicus and Agrippina. He succeeded his greatuncle, Tiberius, in the year 37. Naturally cruel, voluptuous and extravagant, he at first masked his real character by ruling with tolerance and generosity; but after a serious illness that weakened his mind, he let his lowest passions have full sway and no act of cruelty or of senseless barbarity was too atrocious for him. He was finally assassinated by one of the tribunes.

Calvert, Sir George, 1st Baron Baltimore (*c.*1580-1632), English statesman and American colonist, born in Yorkshire and graduated from Oxford. He entered Parliament in 1609 at the age of 29. He became Lord Baltimore by knighthood in 1617, and two years later was named Secretary of State and a member of the Privy Council. He sent colonists to Newfoundland and visited there for two years with his family. Because of the severe climate he sailed southward to find a more congenial location for a colony and chose a spot in what is now Maryland. To settle disputes with Virginia, he sailed home to secure a new charter but soon died, and his plans were carried out by his son, Cecilius Calvert, 2d Lord Baltimore, who became colonial proprietor of Maryland. The present city of Baltimore was named in his honor.

CALVIN, JOHN (1509-1564), French reformer and Protestant theological writer, born at Noyon, in Picardy. His father, Gerard Calvin or Cauvin, diocesan secretary, dedicated him early to the church, and he was presented with a church office at the age of twelve. The income so derived enabled him to go to Paris for study. He became dissatisfied with the teaching of the Roman Catholic Church, and took to the study of law in Orleans.

In 1534 he returned to Paris and found that church reformers were still being prosecuted. So he retired to Basel where he published his great work, *The Institutes of the Christian Religion.* In 1538 in company with Farel he was expelled from Geneva because of the strict reforms they tried to introduce there. Calvin went first to Berne and then to Strasbourg.

His friends in Geneva succeeded in having him recalled, and finally in 1544 his proposed laws about church discipline were accepted and published. His college of pastors and doctors and his court of discipline formed a sort of dictatorship with himself at the head of it. This group tried to manage all municipal matters and control the social and individual life of the people. Michael Servetus, passing through Geneva in 1553, was arrested and through Calvin's instrumentality was burned alive because he had attacked the mystery of the Trinity in a book which was neither written nor printed at Geneva. This has been regarded as the great blot on Calvin's career.

Up to 1561 the Lutherans and the Calvinists were as one, but in that year Calvin rejected, among other things, the tenth article of the Confession of Augsburg, the Lutheran creed, and hence arose the name of *Calvinists.* Calvin retained his personal influence to the last; but a year or two before his death his health had broken down. As a theologian Calvin was equal to any of his contemporaries in profound knowledge, acuteness of mind and in the art of making good a point in question. As an author he merits great praise. His Latin works are written with much method, dignity and correctness. The collected works have been published in English by the Calvin Translation Society of Edinburgh in 52 volumes.

Cambyses (d. 522 B.C.), King of the Medes and Persians, second to bear this name. He succeeded his father, Cyrus the Great, in 529 B.C. After establishing his rule in Persia, Cambyses undertook the conquest of Egypt. In 525 B.C. he defeated the Egyptian king, and in the following year captured Memphis, the capital. He then subdued the Nubians but failed to overcome the Ethiopians and Carthaginians. Having learned that a usurper named Gaumata was impersonating his murdered brother, Smerdis, he started home but died in Syria of an accidental wound.

Camoëns, de, Luís Vaz (1524-1580), Portuguese poet. Born in Lisbon, of a distinguished but impoverished family, he specialized in literature at the University of Coimbra and early began writing love sonnets. He was banished from Lisbon in 1546 because he expressed his affection for a court lady too openly; thereafter he lived the life of an adventurer. After the author had spent many turbulent years abroad, he published *The Lusiad* (1572), a spirited narrative of Portuguese history. It is written in the exalted style of the heroic epics of Greece, the first epic written in a modern language. For it he is chiefly remembered; but he was eminent also as a lyric poet and dramatist.

Campbell, Alexander (1788-1866), Irish-American clergyman, principal organizer of the Disciples of Christ. He was born in Ireland, the son of a Protestant minister. The father emigrated to America in 1807; Alexander followed him two years later and settled in Bethany, W. Va. The younger Campbell soon became the leader in a movement to unite the Christian bodies of that vicinity. Alexander's followers adopted immersion as the approved form of baptism and sought to unite with the Baptists; but difficulties arose, and the separate organization called Disciples of Christ was formed about 1827. The members of this body, sometimes called Campbellites, now number over 1,375,000. Campbell was a voluminous writer, publishing numerous hymn books and doctrinal works.

Campbell, Colin, Baron Clyde (real name Colin MacIiver; 1792-1863), British field marshal, born in Glasgow, was prominent in England's wars for half a century. Through an error, he was called Campbell when introduced for an army commission, and as Colin Campbell he went through all the grades from ensign to field marshal. He fought with Arthur Wellesley (the Duke of Wellington) in Portugal; with Sir John Moore in Spain; in America in the War of 1812; in China; in the Punjab, India; and in the Crimean War; and he had a large share in the relief of Lucknow and the quelling of the Sepoy Mutiny, in 1857. He was made a peer in 1858.

Canning, George (1770-1827), British statesman and orator, identified with the political history of England for 34 years. In 1793 he abandoned law practice for a career in Parliament and soon emerged as an eloquent opponent of the slave trade and of the radical doctrines of the French Revolution, writing some of the satirical essays of the *Anti-Jacobin.* Canning held various Cabinet offices, was a firm advocate of Catholic emancipation, worked for the repeal of the Corn Laws and stood for liberal policies in domestic and foreign affairs.

Cannon, Annie Jump (1863-1941), American astronomer. Born in Dover, Del., she was graduated from Wellesley College in 1884, and later completed special courses in astronomy at Radcliffe. In 1897 she was appointed an assistant at Harvard College Observatory, becoming curator of astronomical photographs in 1911. Miss Cannon compiled a bibliography of variable stars, listing about 75,000 references, and has to her credit the discovery of 300 variables and five new stars. She made exhaustive studies of the composition of stars, completing a catalogue of 225,000 stellar spectra. In 1923 she was selected by the National League of Women Voters as one of the 12 greatest living American women.

Cannon, Joseph Gurney (1836-1926), American legislator, born in Guilford County, N. C. After being admitted to the bar he moved to Illinois, which remained his home. He was a member of the House of Representatives in 1873-91, 1893-1913, 1915-23 and was Speaker of the House from 1901 to 1911. As such he was virtually a dictator, suppressing minority groups in the interests of the Republican majority. This he was able to do because the rules of the House then permitted the speaker to appoint all committees. This was changed in 1910 by setting up the Committee on Rules for appointing committees, and "Uncle Joe" Cannon's reign was broken.

Canute (c.994-1035), called *the Great,* Danish King of England. On the death of his father, Sweyn, in 1014, Canute claimed the throne of England but was opposed by the partisans of King Ethelred and his son, Edmund Ironside. After several months of fighting, Canute and Edmund, in 1016, agreed to divide the realm, Ethelred having died. Edmund was killed soon after and Canute became sole king. Formerly a cruel and tyrannical person, he thenceforth ruled with moderation and wisdom, restoring order and granting justice to all. At his death, he was king of England, Denmark and Norway. He made his eldest son, Sweyn, king of Norway; the second son, Harold, ruler of England; and the third, Hardicanute, of Denmark.

Capet, Hugh, see *Hugh Capet.*

Caracalla (Marcus Aurelius Antoninus Bassianus; 188-217), Roman emperor, son and successor of Septimius Severus, who nicknamed him Caracalla because he liked to wear a long Gallic mantle of that name. He was declared co-ruler with his father in 198 and was with the latter on a military expedition to Britain when the emperor died (211). Caracalla then became co-emperor with his brother, Geta, but in 212 killed him. Giving full rein to his depraved nature, Caracalla ordered a wholesale massacre of his brother's adherents. He himself was murdered five years later. In order to increase the revenue from taxes, Caracalla in 212 gave citizenship to all free inhabitants of the empire. The ruins of the enormous baths he built may still be seen in Rome.

Caracci or **Carracci,** a family of Italian painters, founders of the "Eclectic" school in Bologna that combined the best elements of other systems of painting. Lodovico (1555-1619) and his two cousins Agostino (1557-1602) and Annibale (1560-1609) were the principal representatives. At their academy in Bologna, the Caracci taught the principles of composition, perspective, the correct use of color and the use of living models. Their own works included landscapes and religious and mythological subjects. Agostino was also a highly talented engraver. He and Annibale executed the famous decorations of the Farnese Palace in Rome.

Cardan, Jerome (Geronimo, Cardano; 1501-76), Italian mathematician, whose treatise *Ars Magna* contains the solution of the cubic equation. This famous problem of algebra was first published in 1545, but its reputed author did not originate it; the solution was purloined from Tartaglia, a contemporary. Cardan was highly versed in philosophy, medicine and mathematics, but was also an astrologer, gambler and cheat.

Cardozo, Benjamin Nathan (1870-1938), American jurist, born in New York city, graduated from Columbia University, admitted to the bar in 1891. He practiced law for 22 years and was then elected to the New York supreme court. Shortly afterward he was appointed to the court of appeals and in 1926 was made chief justice. President Hoover in 1932 appointed him an associate justice of the United States Supreme Court to succeed Oliver Wendell Holmes. Justice Cardozo was always a liberal in opinion; advocated restating and simplifying the law; and was active in Jewish movements.

CARLYLE, THOMAS (1795-1881), British essayist, historian and philosopher, born at Ecclefechan, Scotland. His parents were able to send him to an elementary school at Annan, and after some years at the University of Edinburgh, he tried village school teaching; but he was restless and ambitious, and in 1818 returned to Edinburgh as a free-lance writer. In 1823 his series of biographical articles for the *London Magazine* were well received and became the basis of his *Life of Schiller*. A translation of Goethe's *Wilhelm Meister* appeared in 1824; though severely criticized on its publication, in time it won favorable judgment.

Two years later Carlyle married Jane Welsh. They moved in 1828 to a lonely farmhouse on the Craigenputtock moors, and for six years Carlyle devoted himself to strenuous writing, producing the famous *Sartor Resartus* (The Tailor Done Over), essays on Burns, Voltaire, Boswell's *Life of Johnson* and other critical and biographical articles.

In 1834 they moved to London, and in the following years Carlyle published *The French Revolution, Chartism, Past and Present, Heroes and Hero Worship* and *Frederick the Great,* the last a work on which he labored for 14 years. In 1865 while Carlyle was in Scotland being appointed lord rector of Edinburgh University, Jane Carlyle died. After that he wrote nothing of great importance. Carlyle is known today as one who fought against sham, hypocrisy and the fetters of tradition. His rugged style, his stimulating criticism and his truthfulness gave him an honored place in British literature.

Carman, [William] Bliss (1861-1929), Canadian poet and journalist. He was born in Fredericton, N. B., graduated at the University of New Brunswick, continued his studies at Harvard and the University of Edinburgh. Carman wrote magazine articles and essays, and was for a time on the staff of the New York *Independent,* but he is best known for his lyrics, with their melodious phrasing and wealth of imagery. They include *Low tide on Grand-Pré, Songs from Vagabondia* (with Richard Hovey), *Pipes of Pan* and *Far Horizons*.

Carnegie, Andrew (1835-1919), Scottish-American capitalist, steel magnate and philanthropist. He was born in Dunfermline, Scotland. His family came to America in 1848 and settled near Pittsburgh. Carnegie went to work in a cotton factory, which also employed his father, his wages being $1.20 a week. At 15 he became a telegraph messenger boy, learned telegraphy and was engaged as an operator. Successively railroad clerk, train dispatcher and division manager for the Pennsylvania Railroad, Carnegie was a successful business man at the age of 24. His savings had been invested, and he was on the road to fortune.

During the Civil War he supervised military railways and government telegraph lines, and after the war he became an iron manufacturer, foreseeing the arrival of the steel age. In 1868 he introduced the Bessemer process into the industry. Thirty-three years later, he retired with a fortune of $500,000,000, having consented to the merger of the Carnegie Steel Company with the United States Steel Corporation. The rest of his life was devoted to the distribution of great sums for philanthropy, education and public welfare. Hundreds of Carnegie libraries in English-speaking countries, the Institute of Technology at Pittsburgh, endowments to Scottish universities, the Peace Palace at The Hague, the ground and building of the Pan-American Union at Washington, the Endowment for International Peace, the Foundation for the Advancement of Teaching, the Institution for Research, funds for heroes—these are a permanent monument to his industry and generosity.

Carnot, Lazare Nicolas Marguerite (1753-1823), French statesman and general, born at Nolay, Burgundy. When the French revolution broke out he was captain in the corps of engineers. In 1791 he became a member of the legislative assembly and in the convention voted for the death of Louis XVI. In 1797, having opposed the extreme measures of Barras, his colleague in the directory, Carnot was sentenced to deportation as a suspected royalist. He escaped into Germany, where he wrote his defense, which was partly responsible for the overthrow of his colleagues in 1799. On his return to Paris he was made minister of war by Napoleon but remained an inflexible republican. All his life he protested against Napoleon's assumption of the imperial dignity. Carnot's grandson, Marie François Sadi, was elected president of the French republic in 1887.

Carnot, Nicolas Léonard Sadi (1796-1832), French physicist, son of Lazare Carnot, the revolutionist. In 1824 he published a classical work which laid the foundation of the modern science of thermodynamics. Carnot was the first to see clearly the nature of the connection between heat and mechanical work, and his essay contains his theory of the reversible heat engine. In his engine a gas absorbed heat, expanded to do work and was compressed to give up the absorbed heat. This series of operations is known as Carnot's cycle.

Carol II (1893-), King of Rumania, son of King Ferdinand and Queen Marie. He eloped with a commoner's daughter, Zizi Lambrino, in 1918, but this morganatic union was dissolved by court order. In 1921 he married Princess Helen of Greece. Four years later he renounced his rights to the throne and went into exile with Magda Lupescu. When Ferdinand died in 1927, Michael, the infant son of Carol and Helen, became king; but in 1930 Carol returned to Rumania and was accepted as king. Helen divorced Carol in 1928 and then received the right to live four weeks each year with Prince Michael, heir presumptive to the throne.

Carpenter, Frank George (1855-1924), American journalist, traveler and author of geographical readers, born in Mansfield, Ohio. Two years after his graduation at Wooster University (1877), he entered journalism and subsequently traveled all over the world as correspondent for various newspapers and magazines, including the Cleveland *Leader,* New York *World* and the *Cosmopolitan.* His published books include *Carpenter's Geographical Readers, How the World is Fed* and two similar discussions of clothing and housing; *Around the World with the Children* and numerous travel books.

Carpenter, John Alden (1876-), American composer, native of Park Ridge, Ill. His academic and musical education was obtained at Harvard, Rome and Chicago, where his teachers were Sir Edward Elgar and Bernard Ziehn. Carpenter entered business life but devoted much time to music. His works include *Adventures in a Perambulator* (suite for orchestra), *Concertino* (for orchestra and piano), *The Birthday of the Infanta* (ballet-pantomime), *Skyscrapers* (ballet) and numerous songs.

Carracci, see *Caracci.*

Carrel, Alexis (1873-), American surgeon and biologist, born in France and educated at the University of Lyon, where he graduated in medicine. He came to America in 1905 and joined the staff of the Rockefeller Institute for Medical Research in 1906. In 1912 he was awarded the Nobel Prize in medicine for his successful work in joining blood vessels by stitches and in transplanting organs.

During the World War Carrel engaged in surgical work in French hospitals. He carried on many experiments in cultivating living tissue outside of the body. Carrel was regarded as one of the deftest of all surgeons in manipulation of surgical instruments. He wrote *The Preservation of Tissues, The Transplantation of Limbs, The Transplantation of Veins and Organs, Man the Unknown.*

Carroll, Charles (1737-1832), American statesman of the Revolutionary period, the last of the signers of the Declaration of Independence to die. He was a wealthy landowner of Maryland and gave generously of his riches to advance the cause of the colonies. Carroll sat in the Continental Congress and was Maryland's first Senator under the Federal Constitution. He always signed himself "Charles Carroll of Carrollton."

Carroll, Lewis (Charles Lutwidge Dodgson; 1832-98), English writer and mathematician. For 27 years he lectured on mathematics at Christ Church College, Oxford. *Alice's Adventures in Wonderland* was written for Alice Liddell and her two sisters, the little daughters of the dean of the college. It was published in 1865, and *Through the Looking Glass* in 1871. He also published various mathematical books, but his fame rests upon the story books. In 1932 the centenary of his birth was celebrated.

Carson, Christopher (1809-68), American frontiersman, popularly known as "Kit Carson." Born in Madison, Ky., in early manhood he began an adventurous life as hunter, trapper, explorers' guide and Indian agent. He was associated with John C. Frémont on two expeditions; was Federal agent to the Apache and Utah Indians; and received the brevet grade of brigadier general for his work as scout in the Union Army, in the Civil War.

Carson, Edward Henry, Baron (1854-1935), British lawyer and statesman, born in Dublin and educated at Trinity College. A distinguished barrister, member of the Irish and English bars, he was solicitor-general for Ireland and Conservative member for Dublin in the House of Commons in 1892 and solicitor general for England, 1900–1906. As a strong opponent of Home Rule, he organized armed resistance by forming the Ulster Volunteers and imported ammunition and supplies into Ulster. He drew up the Covenant of 1912, which pledged Ulster Protestants to resist submission to a Dublin Parliament. The outbreak of the World War completely overshadowed the Irish crisis, and Carson encouraged his followers to work for the general cause. In the war cabinet he occupied the post of attorney general, and later, of first lord of the Admiralty. In 1921 George V created him Baron Carson of Duncairn.

Carter, Leslie, Mrs. (1862-1937), American actress. She was born in Lexington, Ky., made her debut in 1890 in *The Ugly Duckling* and then played in musical comedy. A year and a half of training under David Belasco laid the foundation for an extraordinary career, which began with her appearance in *The Heart of Maryland,* in 1895. She was later seen in *Madame DuBarry, La Tosca, The Second Mrs. Tanqueray* and *The Circle* (with John Drew).

Cartier, Jacques (1494-*c.*1552), French navigator and explorer, born in Brittany. He made his first trip to the New World in 1534, having been commissioned by Francis I to find a new passage to the Far East. Cartier reached the Gulf of Saint Lawrence, landed at Cape Gaspé (on the coast of what is now Quebec) and took possession of the land in the name of his king. Returning the following year, he discovered and sailed up the St. Lawrence River, anchored his ships near the site of the present city of Quebec and led a small band inland to a towering hill, which he called Mount Royal; it now overlooks the city of Montreal, where an Indian village then stood.

Cartwright, Edmund (1743-1823), English clergyman, inventor of the power loom, born in Nottinghamshire. Becoming interested in machinery, he produced his first crude loom in 1785. Later, he set up 400 improved machines in a factory, but this was burned by workmen who feared the loss of their jobs. Cartwright also patented a wool-carding machine, a steam engine that burned alcohol and other devices. He helped Robert Fulton in his experiments in steam navigation.

Caruso, Enrico (1873-1921), Italian tenor, born in Naples, where he sang in clubs and churches as a boy soprano. After his first appearances in *Traviata* (1896) and *La Bohème* (1898), he was in great demand on both sides of the Atlantic. His debut in *Rigoletto* was an outstanding success at the Metropolitan Opera House, New York, in 1904 and he built up an almost unprecedented reputation. His repertoire of 40 operas included *Aïda, Il Trovatore, Cavalleria Rusticana, The Girl of the Golden West* and *Madame Butterfly.* Caruso's voice was sweet, powerful and of wide range.

Carver, John (*c.* 1575-1621), one of the Pilgrim Fathers, chosen first governor of Plymouth Colony by the signers of the Compact of Government, in the cabin of the *Mayflower* (1620). Carver had been one of the leaders of the little band of dissenters who fled to Holland from England, and it was he who secured a patent for the new colony from the Virginia Company and chartered and provisioned the ship in which they voyaged. He died in the spring of 1621, a few months after the colonists landed in Massachusetts.

Cass, Lewis (1782-1866), American statesman, called the representative pioneer of the old Northwest. Cass was born in Exeter, N. H., studied law, entered politics and fought in the War of 1812, becoming brigadier general. In 1813 he was made governor of the region known as the Territory of Michigan. His services in maintaining order and promoting progress made Michigan a settled state. In 1831 he was appointed secretary of war by Jackson, and remained in office until 1836, when he was sent to France as ambassador. Resigning in 1842, he was elected senator from Michigan in 1845, and held his seat until 1857, except for one short interval. Cass became secretary of state in Buchanan's Cabinet but resigned in 1860 because of the President's neutral attitude in the impending crisis over slavery.

Cassius (Gaius Cassius Longinus; d. 42 B.C.), Roman general and politician. Though Cassius was opposed to Caesar during the conflict with Pompey, Caesar pardoned him after the Battle of Pharsalia and raised him to the foreign praetorship in 44 B.C. Cassius, however, became disgruntled because a younger man was made city praetor and persuaded Brutus and others to join him in the conspiracy to assassinate Caesar. Popular feeling having been roused to a high pitch by Mark Antony's funeral oration, the conspirators fled. After the defeat at Philippi (42 B.C.), Cassius compelled his freedman Pindarus to kill him.

Cather, Willa Sibert (1876-), American author, native of Winchester, Va., and a graduate of the University of Nebraska (1895). She began her literary career on the staff of the Pittsburgh *Daily Leader;* published her first book in 1903, and in 1906 joined the staff of *McClure's Magazine.* After 1912 her novels appeared at frequent intervals. *O Pioneers* and *My Antonia* recall her childhood days on the prairies of Nebraska, where she played with immigrant children; *One of Ours,* a war story, won the Pulitzer prize for 1922; *Death Comes for the Archbishop* and *Shadows on the Rock* are stories of pioneers in New Mexico and Quebec. Among other books are *The Song of the Lark, A Lost Lady* and *The Professor's House.*

Catherine, Saint (1347-80), Italian nun, canonized by Pope Pius II in 1461. She practiced asceticism from childhood in Siena and became a Dominican at the age of 16. It is alleged that she bore on her body the impress of Christ's wounds; she was the author of various religious treatises and poems and played a prominent part in the Church diplomacy of the quarrel between Rome and Avignon. St. Catherine of Siena's feast is April 30.

Catherine of Aragon (1485-1536), Queen of Henry VIII of England and daughter of Ferdinand and Isabella of Castile and Aragon. As the widow of Arthur, elder son of Henry VII, she was married to Henry VIII in 1509, when he succeeded to the throne. Catherine achieved an important place in history because of the efforts of Henry to divorce her. Maintaining a calm dignity throughout the proceedings, she died at Kimbolton Castle, where she was under guard. She was the mother of Queen Mary of England.

Catherine II, called *the Great* (1729-96), Empress of Russia. As Sophia Augusta, a German princess of the Lutheran faith, she married Prince Peter of Russia in 1745 and assumed the name Catherine when baptized with Orthodox Greek rites. In 1762 she became the sole ruler of Russia, the Czar having been dethroned and murdered by conspirators acting for her. Catherine worked zealously for the advancement of education, literature, commerce and sanitation, promoted foreign relations and saw Russia expanded by the acquisition of the Crimea, Courland and a part of Poland. She greatly enhanced the prestige of Russia but failed to improve the condition of the serfs, though not opposed to their betterment. She planned great reforms that were never carried out.

Catherine de' Medici, (1519-89), Queen of Henry II of France (1547-59) and great-granddaughter of Lorenzo the Magnificent. In 1559, when her eldest son, Francis II, became king, she assumed a measure of authority that increased to full control on the accession of her second son, the weak Charles IX in 1560. Her plotting with the family of the Guises led to the terrible massacre of St. Bartholomew. She continued her intrigues after the accession of her third son, Henry III (1575), and died almost without a friend.

Catiline (Lucius Sergius Catilina; *c.* 108-62 B.C.), Roman political leader. His efforts to attain the consulship (66 B.C.) being unsuccessful, he headed a conspiracy of young nobles and plotted to overturn the government. The first attempt failed but he tried again in 63 B.C. Disheartened by the flaming eloquence of Cicero, who had learned the details of the plot, Catiline fled from the city and made his way to Etruria. There he fell in the battle in which his forces were overcome by the senatorial army.

Cato, Marcus Porcius (234-149 B.C.), Roman statesman, called *the Elder, the Wise,* and *the Censor.* In his youth he lived and worked on a small farm and there learned to value the simple customs of the old days. Later, in Rome, he severely disapproved of the Grecian influence that he believed was corrupting the citizens, and when he assumed the office of censor (184 B.C.), he performed his duties so rigidly that *the Censor* became a permanent part of his name. A visit to Carthage in 175 B.C. convinced Cato that this city was a dangerous rival of Rome. Thereafter he concluded every speech in the Senate with the words, "Carthage must be destroyed."

Cato, Marcus Porcius (95-46 B.C.), great-grandson of Cato the Elder, was called *Cato the Younger* and *Cato of Utica,* from the place of his death. He held, successively, the offices of quaestor, tribune and praetor. A rigid moralist, like his distinguished ancestor, he failed to appreciate that Rome needed leaders who could be dictators if necessary. Eventually he took sides with Pompey and opposed Julius Caesar as an enemy of the state; as tribune he had even accused the latter of being implicated in the conspiracy of Catiline. After the defeat of Pompey's forces at Pharsalia, Cato sailed for Africa. He undertook to command the opposition forces at Utica but committed suicide when convinced that further effort was useless.

Catt, Carrie Lane Chapman (1859-), American suffragist and lecturer, born at Ripon, Wis., educated at Iowa State College, in 1884, married Leo Chapman and in 1890 married George William Catt. From 1890 to 1900 she was an organizer for the National American Woman Suffrage Association, becoming its president in 1900 as successor to Susan B. Anthony. She led in the campaign to win the vote for women through a constitutional amendment. After the amendment was ratified in 1920, she organized the League of Women Voters to educate women in politics. Since 1923 she has worked in various peace movements.

Catullus, Gaius Valerius (87-54 B.C.), Roman poet, born in Verona. Little is known of his life and he died young, but his book of 116 poems established him as perhaps Rome's greatest lyric poet. His style is to some extent copied from Greek forms, but the fire and vigor of his work is remarkable.

Cavell, Edith (1865-1915), English nurse, shot as a spy by the Germans during the World War. Miss Cavell was acting as first matron of a training school for nurses in Brussels, when the war broke out. The school became a Red Cross Hospital and she remained on duty. On Aug. 5, 1915, she was arrested on the charge of having assisted Allied soldiers to escape from Belgium. She was condemned and shot on October 11. The affair served to intensify popular feeling against Germany. Brand Whitlock, United States minister to Belgium, intervened in Miss Cavell's behalf, but unsuccessfully. Her body was removed to Norwich Cathedral in 1919, and in 1920 a monument to her was erected in London.

Cavendish, Henry (1731-1810), English chemist, born in France. Cavendish spent his life in original scientific experiments, but lived as a recluse, and his writings were not published until after his death. He found the specific heats of many substances; found the chemical composition of air and water; described the properties of hydrogen (that he called *inflammable air*). He also made many discoveries in electricity and determined the density of the earth.

Cavour, di, Camillo Benso, Count (1810-61), Italian statesman, born in Turin, in Sardinia. Elected to the Sardinian Parliament in 1848, Cavour set himself toward the goal of a free and united Italy, and this remained his chief aim throughout a long career. In 1852 he became head of the government, and two years later, during the Crimean War, forced Sardinia into an alliance with France and England against Russia. Sardinia was thus qualified to sit at the Paris peace congress in 1856, and its probable status as the nucleus of an independent Italy was brought to the attention of the powers.

Cavour next devoted himself to preparing for a struggle with Austria, then dominant in Italy. He brought about an alliance with Napoleon III, and in 1859 Austria was defeated. Napoleon, however, made peace with Austria without freeing Italy, and Cavour, overcome with disappointment and humiliation, resigned his position as Minister of War. In 1860 he returned to office, the hero and spokesman of the Italian people. By consenting to the cession of Savoy and Nice to France, he secured that country's aid. Early in 1861, after Garibaldi had conquered Sicily and overthrown the kingdom of Naples, all Italy except Rome and Venetia acknowledged Victor Emmanuel as king. Cavour died that year, but not before he had witnessed the assembling of the first Italian Parliament at Turin.

Caxton, William (*c.* 1422-91), English printer, famous for his introduction of the art of printing into England. At the age of 16 he became a clothier's apprentice in London, but went to Bruges in 1441, and during a long stay abroad became a prosperous merchant, besides studying the languages and learning the art of printing. In 1474 at Bruges or Cologne, he printed the first book ever printed in English, a translation from the French of a history of Troy. In 1476 Caxton set up a wooden printing press in an almonry near Westminster Abbey, and the first book to be printed in England was issued there in 1477 (*Dictes and Notable Wise Sayings of the Philosophers*).

Cecil, Edgar Algernon Robert, 1st Viscount Cecil of Chelwood (1864-), British statesman, third son of the third Marquis of Salisbury. He studied at Eton College and graduated from Oxford, to become private secretary to his father. An active Conservative politician, he held positions as minister of blockade and lord privy seal. As one of the authors of the Covenant of the League of Nations he continued to be a strong advocate of the League. In 1924 George V made him a peer. He received the 1937 Nobel peace prize, because of his work in the League and for his efforts to promote international good will. He published *Principles of Commercial Law, Our National Church* and *Way of Peace.*

Cecil, William, Baron Burleigh (1520-98), English statesman, the son of Richard Cecil, the master of the robes under Henry VIII. At the age of 21, William Cecil entered Gray's Inn as a barrister. He first rose to power when Henry VIII appointed him secretary of state. When Mary I came to the throne he resigned his appointment but was reappointed to office by Elizabeth. For 40 years he advised Elizabeth in the many difficulties she encountered in her reign. She made him lord high treasurer and raised him to the peerage as Lord Burleigh. At times Burleigh acted with great skill and prudence, but he was ruthless to his enemies.

Cecilia, Saint (3d century), Roman martyr, member of a noble family, revered as the patron saint of music. A beautiful church in Rome contains her tomb and a statue of the maiden as she was found in death, with the strokes of the executioner's ax showing on her neck. Saint Cecilia was the reputed inventor of the organ. She was painted by Raphael, Domenichino and other masters and immortalized in verse by Pope, Dryden and Chaucer. Her festival day is November 22.

Celestine III (*d.* 1198), Pope from 1191-98. He crowned Henry VI emperor of Germany in 1191 and excommunicated him later for holding Richard I of England for ransom. Pope Celestine confirmed the statutes of the Teutonic Order of Knights in 1192.

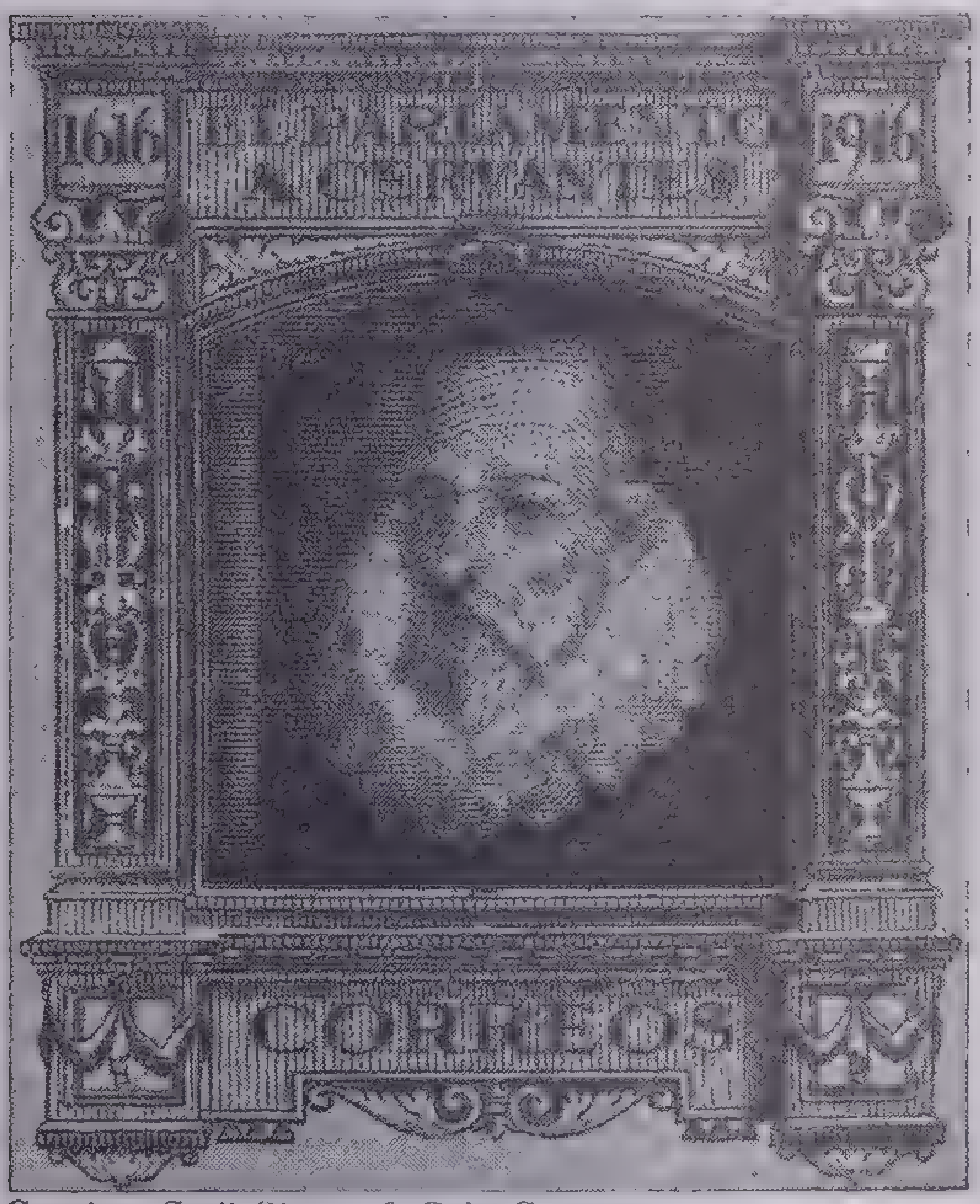
Celestine V, Saint (1215-96), Pope for a few months in 1294. At the age of 79, after years of the severest asceticism, he was elevated to the papacy in August, 1294, only to relinquish it in December that he might resume the old life of discipline and penance. He himself had issued a decree permitting voluntary abdication. His successor Boniface VIII had him kept as a prisoner in order to prevent disunion in the church. Celestine died 10 months later. His exemplary life led to his canonization in 1313 as St. Peter Celestine.

Cellini, Benvenuto (1500-71), Italian sculptor and goldsmith, born in Florence. A high temper and a quarrelsome disposition made his life a series of adventures. His varied career is described in his autobiography, which was translated into English. The chief authentic relic of Cellini's art as a goldsmith is a magnificent salt cellar of embossed gold and enamel, made for Francis I of France, and now in the Metropolitan Museum of Art, New York. Of surviving pieces of statuary, the most famous is his bronze *Perseus with the Head of Medusa,* in a public square of Florence. The Louvre, in Paris, possesses another bronze figure, *Nymph of Fontainebleau.* He was a prodigious worker, was seldom without commissions from popes and royalty and was long at the court of Francis I, in France.

Celsius, Anders (1701-44), Swedish astronomer, originator of the centigrade thermometer. Celsius occupied the chair of astronomy (1730-44) at Upsala University, in his native town, and built and directed the observatory there. Among his special lines of research was a study of the Aurora. His thermometer was first described in 1742 to the Swedish Academy of Sciences.

CERVANTES SAAVEDRA, DE, MIGUEL (1547-1616), Spanish author, born at Alcala de Henares. In 1571 he joined Don John of Austria's army and fought the Turks. In the battle of Lepanto (1571) he received a wound which deprived him of the use of his left hand and arm; but he remained in active service until 1575, when, on his way from Italy to Spain, he was captured and imprisoned by the Moors in Algiers. In 1580 his relatives and friends purchased his freedom. He returned to Madrid in his 34th year, when his literary career began.

He produced here his pastoral romance, *Galatea,* and several plays for the stage. From 1598 to 1603 all trace of him is lost, but he is supposed to have spent the interval in La Mancha, where he is said to have begun *Don Quixote* in prison. The first part was published at Madrid in 1605. In this work Cervantes hit the vulnerable point of his age and gave the finishing stroke to the mummeries of knight-errantry. Although it won great praise for him, it also aroused bitterness from those who felt that Cervantes's satire was aimed at them. Cervantes returned to Madrid and published his *Novelas exemplares,* most of which had been written earlier. In 1614 he published the *Viage del Parnaso.*



Courtesy Scott Stamp & Coin Company

Miguel de Cervantes Saavedra

Enlarged from a Spanish postage stamp issued in commemoration of the 300th anniversary of the death of Spain's foremost writer

The second part of *Don Quixote* appeared at the beginning of 1615 and was received with universal enthusiasm. This work immortalized the name of Cervantes as one of the greatest writers of all time. He had been living in great poverty, which the sale of this work relieved. But his health began to fail, and he had a presentiment of his death, indicated in the preface of his *Persiles y Sigismunda,* a serious romance that he prepared for the press at the beginning of 1616, though it was not published until 1617 by his widow. On April 19 he dictated to his wife a letter addressed to his friend Lemos, to whom he dedicated the work. Four days afterward he died, on the same day as Shakespeare.

Cézanne, Paul (1839-1906), French painter, born in Aix in Provence. He found his place in art under the influence of Pissaro in Paris and exhibited for several years. In 1879 he returned to Aix to try to get more depth into his work. Although he did not achieve immediate success, his fame constantly increased, especially after his death. Cézanne landscapes, portraits and still life paintings are in many great museums. He is called the father of Impressionism—self expression in painting, rather than representation and imitation of nature.

Chabrier, Alexis Emmanuel (1841-94), French composer, born at Ambert. His first success, the operetta *L'Etoile,* is a fine piece of work from a composer who was largely self-taught. He next attracted attention with his opera *Gwendoline,* first sung in Brussels in 1886. Then followed the dramatic work, *Le Roi Malgré Lui,* some symphonies and an orchestral rhapsody, *Espana.* Chabrier's compositions had considerable influence on modern French music.

Chadwick, George Whitefield (1854-1931), American conductor and composer, born in Lowell, Mass. Well grounded in music by years of study under American and European teachers, Chadwick became an instructor at the New England Conservatory in Boston in 1880 and was subsequently made director. His works include the *Rip Van Winkle* and *Thalia* overtures, symphonies, the lyric drama *Judith,* choral and small orchestral pieces. The best known works for the stage are *Judith* and the comic operas *Tobasco* and *The Quiet Lodging.*

Chaliapin, Feodor Ivanovitch (1873-1938), Russian operatic singer, a native of Kazan, Russia, where he sang in a boys' choir in the cathedral and in 1890 joined an opera company. Later, he had the advantage of regular instruction, which fitted him to appear in grand opera in St. Petersburg in 1894, and soon he was singing the leading basso roles in various European cities. In 1906 he appeared at the Metropolitan Opera, New York, to make his American debut. After seasons in London and other European cities, he returned to the United States in 1922. In parts such as Boris Godunov and Ivan the Terrible, his powerful voice, splendid appearance and superb acting proved tremendously effective. He wrote *Forty Years in the Life of a Singer* (1932). He was a great actor as well as a great singer, and in 1933 he played Don Quixote in a French moving picture.

Chalmers, Thomas (1780-1847), Scottish clergyman and philanthropist, born at Anstruther and educated at St. Andrews University. At the age of 19 he was licensed to preach and in 1803 he became minister at Kilmany. He soon gained a reputation as a preacher and a teacher of mathematics. In 1808 he published an *Inquiry into the Extent and Stability of Natural Resources,* and some years later his *Astronomical Discourses* had a wide popularity. The management of the poor in his parish at Glasgow was entirely in his charge. He established schools and distributed 2,000 families into 25 districts. In 1823 as professor of philosophy at St. Andrews he wrote *Use and Abuse of Ecclesiastical Endowments.* Dr. Chalmers became leader of the Free Church of Scotland, after 470 clergymen withdrew from the established church. His works are published in 34 volumes.

Chamberlain, Arthur Neville (1869–1940), British statesman, son of Joseph and half brother of Joseph Austen Chamberlain. He studied at Rugby School and at Mason College, Birmingham. He had a brief apprenticeship to business life in the West Indies and came back to his native city, Birmingham, to manage the great screw business on which the Chamberlain fortune was built. At the age of 45 he was lord mayor of Birmingham. During the World War, as director general of national service (1916), he displayed no great talents and resigned. He first entered Parliament in 1918 and for four years remained an undistinguished figure. In 1922 his political career was really launched. Bonar Law made him postmaster general. Then followed the posts of minister of health and chancellor of the exchequer, under Baldwin, and Chamberlain began to show supreme competence as an administrator. He balanced the budget and persuaded the depression-struck country to abandon free trade for tariffs. In 1937 Chamberlain as leader of the Conservative party became prime minister when Baldwin retired. He worked for a peaceable agreement with Germany and Italy and in 1938 agreed to give Germany a part of Czechoslovakia.

Chamberlain, Joseph (1836-1914), British statesman, born in London and educated at London University. He entered business with his father as a screw manufacturer and by 1874 had become wealthy. In 1873 he was elected mayor of Birmingham, and in 1876 his constituents sent him to Parliament. His ability was marked. He became president of the Board of Trade under Gladstone in 1880, and in 1886 president of the Local Government Board. Not liking Gladstone's Irish policy, he resigned and organized the Liberal-Unionist party. In 1895 he became secretary for the colonies in the Conservative (Unionist) Salisbury cabinet, a position that he retained under Balfour. Although the country was divided on his conduct of the negotiations preceding the Boer War, in the "Khaki" election of 1900 he triumphed. In 1906 he forced an election on the tariff issue, but his party was overwhelmingly defeated by the Liberals, and Chamberlain retired after thirty years of public life.

Chamberlain, Sir Joseph Austen (1863-1937), British statesman, eldest son of Joseph Chamberlain, was educated at Rugby and at Cambridge. He entered Parliament in 1892, was appointed to various posts in the Salisbury and Balfour cabinets and became Chancellor of the Exchequer in 1903. When the Unionists were defeated in 1905, Austen Chamberlain left office but remained in Parliament. The war crisis caused the formation of a coalition cabinet in 1915, in which he was secretary of state for India. Having resigned this office because the Indian Government was criticized for lack of co-operation with the troops in Mesopotamia, he joined Lloyd George's Cabinet in 1918, becoming chancellor of the exchequer in 1919. Sir Austen succeeded Bonar Law as leader of the Conservatives in 1921, and from 1924 to 1929 was foreign secretary in the Baldwin Ministry. For his efforts in behalf of the Locarno Treaty, he shared with General Charles G. Dawes the Nobel Peace Prize for 1925. Chamberlain published *Peace in Our Time* (1928) and an autobiography, *Down the Years* (1935).

Chambers, Robert William (1865-1933), American author and artist, a native of Brooklyn, N. Y. He studied art in Paris (1886-93), exhibited in the salon in 1889 and for a time was a magazine illustrator but largely devoted himself to fiction after 1893. In a period of less than 40 years, he published about 60 books. Among earlier novels are *Iole, The Fighting Chance, The Firing Line, Ailsa Page, The Common Law* and *The Business of Life.* Later volumes include *The Man They Hanged, The Drums of Aulone, The Sun Hawk, The Painted Minx, Love and the Lieutenant* and *Operator 13.* Many of his stories were adapted for the motion-picture screen.

Champlain, de, Samuel (1567-1635), French explorer, the son of a ship's captain who taught him navigation. After a period in the French army, he took command of the *Saint-Julien* and started on a cruise to the West Indies (1559), which lasted two years. He visited the Spanish settlements in South America and Mexico and, in a report to King Henry IV, suggested the feasibility of a canal across the Isthmus of Panama. In 1603 he undertook the first of many voyages to the northern part of North America, exploring the St. Lawrence River as far as the Lachine Rapids and the Saguenay for nearly 40 miles. During the next few years he explored the coast of what is now New England and helped to found a settlement at Port Royal, Nova Scotia. This colony was abandoned, however, and in 1608, when Champlain assumed his duties as lieutenant governor of New France, he established and named the town of Quebec.

He made friends with the Algonquins and Hurons and in 1609 discovered Lake Champlain while helping these Indians in a raid against the Iroquois. In 1611 he built a trading post on the site of Montreal and returned to France to obtain a grant of the fur trade monopoly. Returning to New France, he went with the Hurons to Lake Huron and Lake Ontario and mapped them. In 1629, when Quebec was captured by the English, Champlain was carried captive to England. He there prepared his *Voyages in New France.* Two years before his death, he returned to Canada.

Champollion, Jean François (1790-1832), French Orientalist, regarded as the founder of the science of Egyptology. Born at Grenoble, he studied under his brother, a famous archeologist, and in 1809 became professor of history at the Grenoble Lyceum. The discovery of the Rosetta Stone (1799) had aroused world-wide interest in hieroglyphics, and he applied himself to deciphering them for many years. His success in establishing the alphabetic character of the hieroglyphs made it possible to translate a great mass of old Egyptian writing. A professorship of

Egyptology was created for Champollion in 1831 at the College of France.

Channing, Edward (1856-1931), American historian, born at Dorchester, Mass. He studied and taught at Harvard until 1929. Much of his life was spent in writing a history of the United States, begun in 1895; seven volumes were completed and the final one was in complete notes at his death. He won the Pulitzer Prize for the sixth volume, *The War for Southern Independence.*

Channing, William Ellery (1780-1842), American clergyman and author, founder of American Unitarianism, born in Newport, R. I. He became known as the "apostle of Unitarianism" in 1819, when he first set forth the aims of that group and had a tremendous influence on the public thereafter. In 1822 he visited Europe and made the acquaintance of great authors, notably Wordsworth and Coleridge. He wrote essays and treatises, all vigorous, eloquent and open-minded. He was well in advance of his time in regard to his views on public education, his denunciation of war and his solution of labor problems. Though not allied with the abolitionists, his speaking and writing against slavery was a great help to President Lincoln. His published *Works* in six volumes passed through 11 editions.

Chaplin, Charles Spencer (1889-), American motion picture actor and producer, born in England, the son of Charles Chaplin, a vaudeville comedian. Early in his career he played in the English music halls, came to the United States in 1910 and for three years appeared in vaudeville theatres in comic sketches. Then he began to act in motion pictures, for the Keystone Comedy Co. in Los Angeles, and won instant success. In 1918 he formed his own company for producing pictures. Among the most successful films which he released and played in are *The Kid, Shoulder Arms, The Gold Rush, The Circus, City Lights* and *Modern Times.*

Chapman, Frank Michler (1864–1939), American ornithologist, a native of Englewood, N. J. After 1908 he served as curator of ornithology in the American Museum of Natural History, New York. Besides contributing to *Auk* and *Bird Lore*, with which he was associated in an editorial capacity, he wrote a large number of bird books, including handbooks, guides to bird study and defenses of the economic value of birds. Many of them are illustrated with half tones made from his own photographs. He was the first to study birds with the camera.

Chapman, George (*c.* 1559-1634), English poet and dramatist of the Shakespearian era. His plays and poems are little read today, but he has an enduring place in literature as the first to translate Homer's epics into English verse. The lofty language of the translator inspired Keats's sonnet *On First Looking into Chapman's Homer.* In collaboration with Ben Jonson and John Marston, Chapman wrote the play *Eastward Hoe* and was imprisoned by James I because it contained a slighting allusion to the Scots.

Chapman, John, see *Appleseed, John.*

Charcot, Jean Baptiste (1867-1936), French explorer of the Antarctic. He was an expert yachtsman, and in his own yachts the *Français* and the *Pourquoi Pas* between 1903 and 1910 he made important surveys and discovered a district south of Graham Land that was named Charcot Land in his honor.

Charcot, Jean Martin (1825-93), French neurologist, studied medicine at Paris, became a doctor at the Salpetrière hospital, where he developed a great clinic for treatment of nervous diseases. He contributed much to our knowledge of chronic and nervous disorders and made hypnotism a scientific study. His medical research work also included experiments on muscular and nervous diseases and certain joint affections that have been named Charcot's disease.

CHARLEMAGNE or **CHARLES THE GREAT** (742-814), Frankish Emperor, the first ruler to bear the title Holy Roman Emperor. He was the elder son of Pepin the Short, the first Frankish king of the Carolingian dynasty. On the death of Pepin, in 768, the Frankish kingdom reverted to Charlemagne and his younger brother Carloman, Charlemagne receiving the eastern part. Carloman died three years later, and Charlemagne ruled the whole realm. Master of Gaul and Western Germany, he then entered upon a brilliant career of conquest. In becoming sole king, he had excluded the sons of Carloman, and when his brother's widow sought the aid of Desiderius, king of the Lombards, Charlemagne became involved in a war with that monarch. The result was that Charlemagne conquered the kingdom (774), placing the iron crown of the Lombards upon his own head and forcing Desiderius to retire to a monastery. It was not until 787, however, that the last traces of revolt were crushed. Meanwhile, Charlemagne had confirmed his father's grant of certain lands to the Pope, thus setting up the papal claim to temporal power.

More severe was the struggle with the Saxons, a contest that Charlemagne inherited from his father and grandfather. The war went on intermittently from 772 to 804 and was marked by repeated invasions and, in one instance, a massacre of more than 4,000 Saxon prisoners. Finally the stubborn resistance was overcome, the people accepted Christianity by force, and their chiefs became vassals of the Frankish conqueror.

In 778 Charlemagne crossed the Pyrenees to make war upon the Moors. The country was taken as far as the Ebro, but on his return his rear guard was destroyed by the Basques at Roncesvalles; Roland, hero of a medieval cycle of romantic tales, was among the slain. The design of Duke Tassilo of Bavaria to unite the enemies of Charlemagne against him failed, and that country was placed under Frankish governors. War was waged against the Slavic tribes on the Baltic, and the subjection of the Avars was completed in 796. The territories of Charlemagne now extended from the Ebro to the Eider and Volturno, and his aim of restoring the Western Roman Empire was achieved. On Christmas Day, 800, he was crowned at Rome by Pope Leo III and thenceforth styled himself Emperor of the West, regarding himself at the successor of Augustus, Trajan and Marcus Aurelius. This event was the actual beginning of the Holy Roman Empire.

Charlemagne now tried to set up a strong central government in his motley empire. Laws were discussed by great national assemblies, and the edicts known as *capitularies* evince Charlemagne's wisdom. The whole dominion was divided into counties, governed by earls, who were placed under imperial delegates. He increased the power of the clergy, but kept them under his control; he encouraged trade and industry and established a uniform currency. Competent men were invited from all countries to diffuse learning in his empire.

Charlemagne himself was a diligent scholar and a patron of art. He was also an active, frugal and temperate man. His favorite residence was Aix-la-Chapelle, and there he was buried. He was survived by one son who succeeded him, Louis the Pious, upon whose death in 843 the great empire was divided into three parts. Charlemagne's work, however, lived after him. He was the chief constructive force during the Dark Ages, and he helped to prepare the way for the revival of learning.

Charles I (1600-49), King of England, Scotland and Ireland, second son of James I, came to the throne in 1625. His reign was mainly a struggle with Parliament over royal rights and privileges. When his third Parliament (1628) presented the *Petition of Right,* instead of yielding, he dissolved that body and ruled for eleven years without a legislature. An insurrection in Scotland in 1640 forced him to summon a new Parliament to obtain funds, but he dissolved it in three weeks. This so-called "Short Parliament" was followed by the "Long Parliament," equally hostile to him. Finally, in 1641, the king's attempt to arrest five Parliamentary leaders within the walls of the House of Commons brought on a war. After some early successes the royal forces were completely defeated by Cromwell's army at Naseby (1645). The king sought refuge in Scotland but was delivered to the English for trial. He was beheaded in 1649.

Charles II (1630-85), King of England, Scotland and Ireland, son of Charles I, ascended the throne in 1660. This event is known historically as the Restoration. Charles became nominally king of Great Britain at his father's death but accepted the throne of Scotland and went to that country in 1651. He invaded England, but his army was defeated at Worcester, and he managed to get to France. After nine years in exile he returned to England as king (1660) and reigned for 25 years, meeting difficulties with a great deal of wisdom. He died without legitimate issue. Six of his illegitimate sons were made dukes. Among the events of his reign were the fire and plague of London and the passage of the Habeas Corpus Act.

Charles V (1337-80), King of France, son of John the Good, was not crowned until 1364, but he ruled as regent from 1356, when his father was captured by the English at the Battle of Poitiers. He himself carried on the war against England successfully. Charles, who was surnamed "the Wise," erected the Bastille in Paris, founded the Bibliothèque Nationale (national library) and in general advanced art, literature and science.

Charles VI or **Charles the Mad** (1368-1422), King of France, son of Charles V, succeeded his father in his 12th year. When 20, he ended the regency of his uncles and was an able ruler until 1392; then, his mind having become affected, he was forced to give up control to his uncles again. Within the next few years occurred the renewal of the Hundred Years' War. France was defeated at Agincourt in 1415, and in 1420, by the Peace of Troyes, it was compelled to acknowledge Henry V of England as Charles VI's successor.

Charles VII or **Charles the Victorious** (1403-61), King of France, son of Charles VI, became his father's regent in 1418 and ascended the throne in 1422, but the kingship was an empty honor, for the English, claiming the crown for the infant Henry VI, continued their invasions of France. Charles was incapable of resisting them, and when the city of Orleans was besieged in 1428, France was apparently doomed. At the darkest hour Joan of Arc saved her country. In May, 1429, the siege of Orleans was raised, and Charles was crowned king at Rheims in July. A period of development followed, and France gradually won back all its lost territory except Calais. Charles's record is marred by his lack of decision and his abandonment of Joan of Arc to her fate.

Charles IX (1550-74), King of France, second son of Henry II and Catherine de' Medici, succeeded his brother Francis II as king of France when a boy of 10. He was declared of age three years later, but his mother was the real power in France and continued her policy of setting the Catholics against the Protestants. The miseries of the civil wars of the period came to a climax in the fearful massacre of St. Bartholomew's Day (1572). Charles, who had weakly consented to this outrage, fell a prey to remorse and died two years later.

Charles X (1757-1836), King of France, younger brother of Louis XVI, who was executed in the French Revolution, and of Louis XVIII, whom he succeeded in 1824. Throughout a brief reign of six years he sought in every way to restore the absolutism that had brought on the Revolution, for he was a true Bourbon, one who "never learned anything and never forgot anything." In 1830 his attempt to destroy all freedom of the press and to dissolve the Chamber of Deputies led to a revolution, and he was forced to abdicate. He died in exile, the last of the older line of Bourbons.

Charles V (1500-58), Holy Roman Emperor and King of Spain. He was the elder son of Philip, son of the Emperor Maximilian, and Johanna, daughter of Ferdinand and Isabella of Spain. Charles inherited the Netherlands, and in 1516 he became king of Spain by right of his mother and with that crown secured possession of Italy. In 1519 he inherited the Austrian duchies from his grandfather, Maximilian. As ruler of this immense realm, he was chosen emperor, the most powerful man in Europe. Although not a great soldier, he organized several successful campaigns. He crushed Francis of France, who had been his great rival; but he could not solve the differences of the warring parties that the Reformation had created in Germany. When his efforts failed he waged war against the Protestant princes. Charles did not want a religious war, and he preferred toleration to a civil war. He had established his supremacy in Spain and in the Netherlands, and he decided to establish it in the empire also.

Charles at first easily broke the power of the Protestant princes and also made prisoners of their leaders; but quite suddenly Maurice of Saxony turned on him, and Charles, completely surprised, had to flee for his life. Maurice and his party were able to impose their own terms, which restricted the emperor's authority. Charles was forced to agree to the Treaty of Passau (1552) and to the Peace of Augsburg in 1555, which acknowledged the existing conditions and established Protestantism over a great part of Germany. The Peace of Augsberg was the culmination of his reign. Disappointed in his ambitions and broken in health, he gave his son Philip the sovereignty over the Netherlands in 1555 and, a year later, over his Spanish dominions. He abdicated as emperor in 1556, in favor of his brother, Ferdinand, but the latter was not formally recognized as such until 1558. Charles retired to the monastery of San Yuste in Spain, two years before his death.

Charles X Gustavus (1622-60), King of Sweden, succeeded to the throne in 1654 on the abdication of his cousin Queen Christina. Trained as a fighter by arduous military service in the Thirty Years' War, he invaded Poland soon after his accession in order to eliminate King John Casimir as a claimant to the Swedish throne. With the enforced aid of Frederick William of Brandenburg, he defeated the Poles at Warsaw in 1656. Subsequently, he carried on a war with Denmark that resulted in great additions to Swedish territory. Charles won wide renown for his boldness in taking his army across the ice-bound straits between the islands and mainland of Denmark in the winter of 1657-58.

Charles XII (1682-1718), King of Sweden, called *the Madman of the North,* was one of the most brilliant soldiers of his day. When, in 1697, he succeeded his father Charles XI, he found that the security of his kingdom was menaced by the jealousy of three other rulers —Frederick IV of Denmark, King Augustus of Poland and the Russian czar, Peter the Great. By attacking the Danes and Russians separately the young Swedish king defeated both in 1700, and in 1704 he overran Poland and dethroned its king. Then followed a rash invasion of Russia in 1708, and the annihilation of the Swedish forces at the Battle of Poltava (1709). For five years Charles remained a virtual prisoner in Turkey, where he had fled. In 1714 he escaped to Sweden, foolishly attempted to recoup his losses and in 1718 was killed during an invasion of Norway.

Charles XIV John (Jean Baptiste Jules Bernadotte; 1764-1844), King of Norway and Sweden, born at Pau, France, the son of a lawyer. He saw much service as a soldier under Napoleon, became a general, was Napoleon's ambassador at Vienna (1798) and his war minister (1799). When the Empire was established he was made a marshal and governor of Hanover. He took part in other campaigns, and in 1810, just after his appointment as governor of Rome, his popularity in Sweden led to the offer of the Swedish crown and adoption by the aged Charles XIII. He accepted and took the name Charles John.

He made an alliance with Russia and England against Napoleon and helped to defeat the French army at Leipzig. Leading his army into Denmark he forced that country to cede Norway to Sweden in 1815. Charles took the throne in 1818, and much peaceful progress was made during his reign. His descendants still reign in Sweden.

Charles, Jacques Alexandre César (1746-1823), French physicist. He and Gay-Lussac both discovered laws covering the increase in volume and pressure of gases in proportion to temperature. He was the first to use hydrogen in balloons.

Charles Martel (*c.* 690-741), son of Pepin of Heristal and grandfather of Charlemagne, was mayor of the palace under the last of the Merovingians, the first dynasty of Frankish kings. Virtually king himself, he won undying fame at the Battle of Tours (732) by defeating the Saracens and saving Christianity in Europe from Mohammedan domination. This victory won him his title Martel, "the Hammer." His son Pepin the Short (Charlemagne's father) was the founder of the Carolingian dynasty.

Charles the Bold (1433-77), last Duke of Burgundy. His determination to enhance the power of the feudal lords led to a bitter struggle with Louis XI of France, which ended only with the defeat and death of Charles at the siege of Nancy in 1477. Charles's daughter Mary was the wife of Emperor Maximilan I.

Charles Stuart, the Young Pretender, see *Stuart, Charles.*

Charlevoix, de, Pierre François Xavier (1682-1761), French Jesuit traveler and historian, born at St. Quenton and educated in Paris. In 1705 he was in Canada (New France) as professor of rhetoric at the Jesuit college in Quebec. He went back to France in 1709. In 1720 he returned to America under the commission of the duke of Orleans, to determine the position of the Pacific. He sailed to New Orleans on the Mississippi, which he reached by way of Lake Michigan and the Illinois River, and reported that the Missouri River led to the Pacific. His writings, such as *History of the New France, History of Paraguay* and *History and Description of Japan,* contain valuable source material.

Chase, Salmon Portland (1808-73), American statesman, born in Cornish, N. H. and educated at Dartmouth College. He studied law, was admitted to the bar in 1829 and practiced for many years in Ohio, where he became famous as the defender of fugitive slaves. As senator from Ohio (1849-55) he fought persistently against the extension of slavery. Chase subsequently served two terms as governor of Ohio and was one of the first members and candidates of the Republican party. As secretary of the treasury under Lincoln he rendered invaluable service until his resignation in 1864. Though he had disagreed with Lincoln over war policies, the President appointed him chief justice of the Supreme Court, and in that capacity Chase presided over the impeachment trial of President Johnson. His most notable service to the government during the Civil War emergency had to do with the establishment of the national bank system by law in 1863.

Chase, Stuart (1888-), American economist, born in Somersworth, N. H. He studied at Harvard. In 1897 he began as an accountant in Boston, and later devised systems of accounting for municipalities, states and public utility corporations. The Federal Trade Commission appointed him investigator of the meat packing industry (1917-22). In 1922 he attached himself to Labor Bureau, Inc., as an economist. Chase is best known for such books as *Mexico, A New Deal, Rich Land, Poor Land* and *The Tyranny of Words.*

Chateaubriand, de, François René, Viscount (1768-1848), French writer, born at Saint-Malo. He visited the United States in 1791 but hastened back to France on hearing of the arrest of Louis XVI. He joined the émigrés, was wounded and escaped to England, where he lived until 1800. In 1797 he published his first book *Essai historique* and in 1800 the love story *Atala,* which established his literary reputation. His *René* (1805) made him the greatest romantic writer of his time in France. Chateaubriand became an enemy of Napoleon, supported the Bourbons and was made a peer of France. From 1822-24 he represented his country as ambassador to Great Britain.

Chatterton, Thomas (1752-70), English poet, born in Bristol, best known as the author of the "Rowley Poems." Although he claimed that they were the work of Thomas Rowley, a monk of the 15th century, he himself had written them, beginning when he was 12. He was a youth of rich imagination and rare creative ability, and his poetry was a source of inspiration to Coleridge, Keats, Rossetti and William Morris. Chatterton's extraordinary genius netted him so little in the way of earnings that, upon failure to obtain patronage from Horace Walpole, he killed himself at the age of 18 rather than die by starvation or accept charity.

CHAUCER, GEOFFREY (*c.* 1340-1400), English poet, the most important figure in English literature before Shakespeare. Born in London, the son of a wine merchant, he served in the army of Edward III that invaded France in 1359, and was taken prisoner. For the next 10 years he was frequently employed on diplomatic missions abroad, and his affairs were prosperous. After he sat in the Parliament of 1386, he was deprived of his offices and reduced to comparative poverty; it was not until 1398 that he received an annual pension. Chaucer's first poem, the translation of *The Romaunt of the Rose,* was written about 1369. Between 1370 and 1386 he produced *The House of Fame, The Legend of Good Women* and *Troilus and Criseyde.* His most celebrated work, *The Canterbury Tales,* completed between 1386 and 1389, consists of a series of tales in verse (two in prose), supposed to be told by a company of pilgrims to the shrine of St. Thomas à Becket at Canterbury. In its pages we get poetical skill of a high grade, in such pictures of English life and English ways of thought in the 14th century as are found nowhere else in literature. The first collected edition of his works was printed in 1532.

Chekhov, Anton Pavlovich (1860-1904), Russian author and playwright. His poems and plays have little real plot; they are cross sections of life as Chekhov saw it, full of human loneliness and pathos but colored by the author's own sympathy. He is regarded as Russia's greatest short-story writer. The Moscow Art Theatre produced all his plays which include *The Sea Gull, The Cherry Orchard, The Three Sisters* and *Uncle Vanya.*

Chénier, de, André Marie (1762-94), French poet, born in Constantinople. His father was in the French consular service, and Chenier was attached to the French embassy in London from 1787 to 1790. Horrified by the Jacobin excesses of 1792, he wrote pamphlets denouncing them. He was arrested by Robespierre and guillotined in 1794. He was one of the greatest French poets of his century, his work including the *Iambes,* stirring political satire in verse. The best known of his poems are "La Jeune Captive," "L'Aveugle" and "Le Jeune Malade." An opera *Andrea Chénier* was written around his life by Umberto Giordano.

Cheops (Khufu; *c.* 2900 B.C.), King of Egypt, famed as the builder of the Great Pyramid. To get money and labor for the work he closed the temples and stopped the offering of votive sacrifices; he kept 100,000 men working on the pyramid in 3 month relays. Cheops is the name used by Herodotus, the Greek historian; the Egyptians called their king Khufu, and this word appears on many monuments inscribed with hieroglyphics. Petrie estimates that Cheops lived from 3969-08 B.C.; Breasted places him a century later.

Cherubini, Maria Luigi Carlo Zenobio Salvatore (1760-1842), Italian composer, born in Florence. By the time he was 16, Cherubini had composed the *Mass and Credo in D,* a *Te Deum* and an oratorio. Gaining distinction for his sacred compositions, he also won fame as a dramatic composer, and his opera *Faniska* (1806) was regarded by Haydn and Beethoven as outstanding. Cherubini was director of the Paris Conservatory (1821-41). His *Mass in F* and his Requiems in C and D are among the great compositions of church music, and his treatise on fugue and counterpoint is still in use.

Chesterfield, Philip Dormer Stanhope, 4th Earl of (1694-1773), English statesman and writer whose qualities are brought to mind by the expression "Chesterfieldian," suggesting the highest standard of manners or etiquette. He succeeded to the title in 1726, thereupon taking his seat in the House of Lords. Subsequently, he was prominent in public affairs until 1748, when he resigned to enjoy the life of a gentleman and patron of literary men. His *Letters* (1744), written to his son as a guide for good manners, are famous.

Chesterton, Gilbert Keith (1874-1936), British author, born in London, educated there at St. Paul's School. He studied art at the Slade School but entered the literary field in early manhood. Chesterton's output was enormous. A brilliant style, with frequent use of the unexpected or the paradoxical, makes his writings entertaining even when not convincing. They include *The Napoleon of Notting Hill, Manalive, The Flying Inn, The Man Who Was Thursday* and the Father Brown detective stories, in the field of fiction; *Magic,* a play; *A Short History of England; All Things Considered, Heretics, Orthodoxy, Irish Impressions* and *Generally Speaking,* essays and treatises; and biographies or monographs on Dickens, Browning, Watts, Shaw and Stevenson.

Chevreul, Michel Eugène (1786-1889), French chemist. He studied chemistry at the Collège de France, Paris, and in 1830 became professor of chemistry there. He discovered and named oleic and stearic acids, and his studies of the composition of fats were of great value to the candle and soap industry. He wrote *Principles of Harmony and Contrasts of Colors,* translated into English. His 100th birthday was celebrated with great enthusiasm in France.

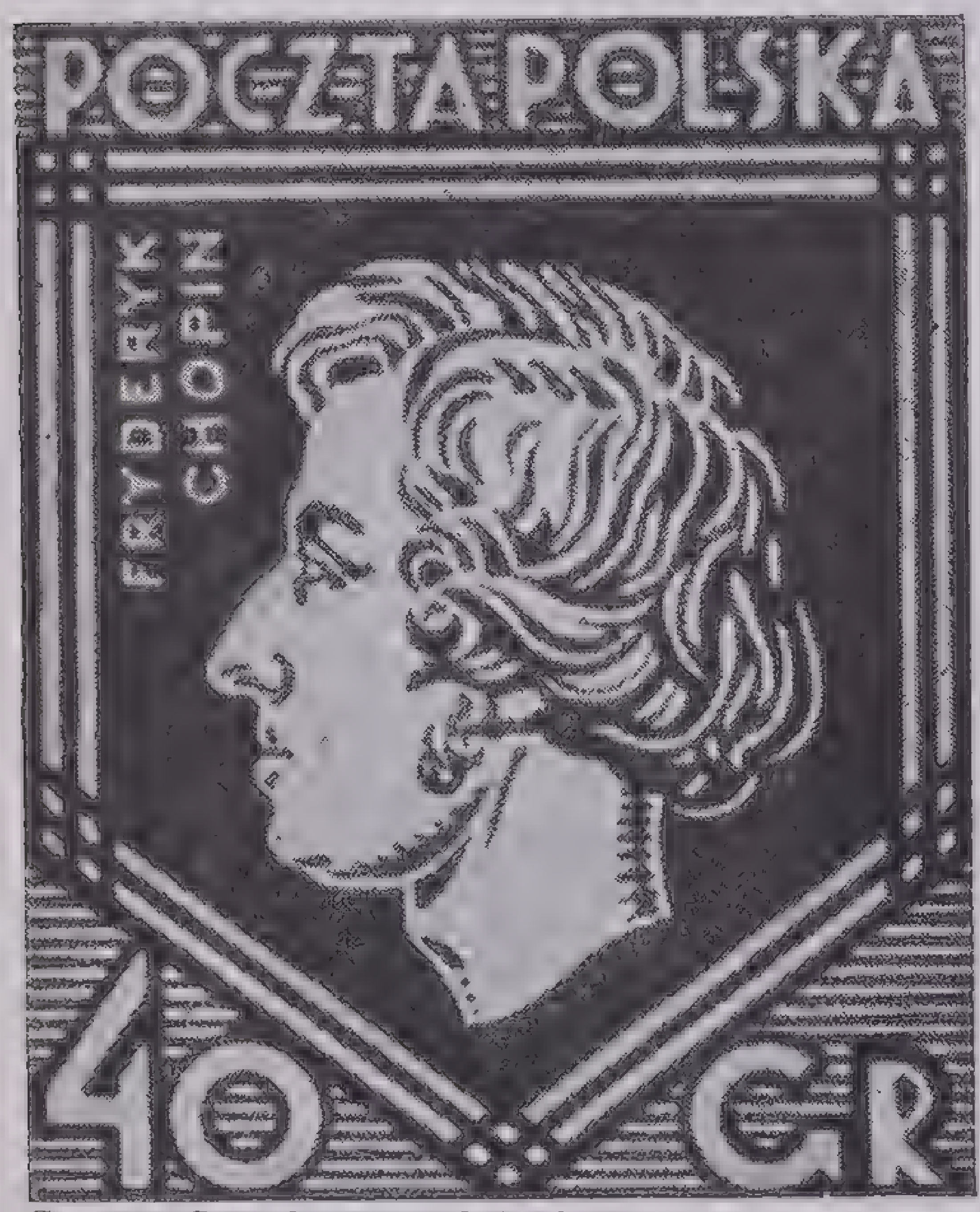
Chiang Kai-shek (1886-), Chinese general. A follower of Sun Yat Sen, he became commander in chief of Nationalist forces directed from Nanking, in 1925. Chiang led these forces to the capture of Pekin and to other victories over the northerners. In 1928 he was chosen president of the republic and 2 years later conducted campaigns against the Communists in the south and against the northerners who still refused to accept his rule. In the following years Chiang had to contend with tremendous opposition. Japan, taking every advantage of China's internal disorder, tried to make a separate political entity of North China. There was rebellion and dissatisfaction within China itself. Communist elements in the west harried his forces from that direction. In 1936 he was kidnaped by his subordinate, General Chang, who wanted to stiffen the Government's opposition to Japanese encroachments. When Japan in 1937 invaded China, Marshal Chiang Kai-shek swung back to an attitude of conciliating the Communist groups.

Chippendale, Thomas (*c.* 1718-79), English cabinetmaker and designer of furniture, born in Worcestershire. He started in the cabinet making business in London about 1750 and soon made a high reputation. He borrowed ideas from France, but gradually developed his own distinctive style, lightness and grace of line. Later furniture makers have all produced chairs and cabinets modeled after Chippendale. His *Gentleman and Cabinet Maker's Director,* published in 1754, is illustrated with his own drawings.

Choate, Joseph Hodges (1832-1917), American lawyer, born in Salem, Mass., and educated at Harvard. In 1855 he began the practice of law in New York city and continued it for more than half a century. Profiting by an introduction from his distinguished uncle, Rufus Choate, he entered the law office of Butler, Evarts and Southmayd in 1856, and in the course of years became one of the best trial lawyers in the country. He handled several of the most important cases in American legal history and helped to prosecute the Tweed ring. He served with distinction as United States ambassador to Great Britain (1899-1905) and represented the United States at the first peace conference at The Hague (1907).

Choate, Rufus (1799-1859), American lawyer, born in Essex, Mass. He was graduated from Dartmouth, studied law, was admitted to the bar and practiced in Boston. In 1841 he was elected to the Senate to fill the unexpired term of Daniel Webster, who had become secretary of state, and until his retirement from official life in 1845 was prominent in the debates on all public questions. After the death of Webster he became leader of the Massachusetts bar.

Chopin, Frédéric François (1810-49), Polish composer for the piano, born near Warsaw of French-Polish parentage. Even as a lad his genius as a piano player made him the pet of Polish society. His debut in Vienna was an immense success, and in Paris, where he finally settled, he was acclaimed a master of the piano. He published his first piano composition in 1825. Chopin's love affair with Mme. Dudevant (the writer, George Sand) is famous in history. It was during their association (1837-47) that he wrote his major compositions, including 3 sonatas, 2 concertos, 4 ballades, 4 scherzos, 19 nocturnes, 27 études and a set of 24 preludes. His melancholy compositions, filled with genuine poetry, reflected his brooding nature.



Courtesy Scott Stamp & Coin Company

Frédéric François Chopin

Enlarged from a Polish postage stamp issued in 1927

Christian II (1481-1559), King of Denmark and Norway. He also ruled over Sweden (1520-23), having recovered that country for Denmark by an armed invasion. His cruel massacre of prominent persons in Sweden led to a revolt under Gustavus Vasa, and in 1523 Christian fled to the Netherlands, after being spurned by his Danish countrymen. He made an unsuccessful attempt to recover his crown in 1531, and from 1532 until his death was kept in prison.

Christian IV (1577-1648), King of Denmark and Norway (1588-1648). He engaged in various wars and was defeated by Tilly at Lutter in 1626. A war with Sweden from 1643 to 1645 was equally unsuccessful. Christian was an enlightened ruler in civic affairs and furthered industry, science and commerce. He founded the Norwegian city of Christiania (now Oslo).

Christian IX (1818-1906), King of Denmark from 1863 to 1906. He was not in the direct line of succession, but his wife was a niece of Christian VIII, and in 1852 he was guaranteed the crown by the European powers because Frederick VII, the reigning king, was childless. In 1864, soon after Christian's accession, Denmark lost the duchies of Schleswig and Holstein to Austria and Prussia.

He was succeeded by his eldest son, Frederick VIII. His eldest daughter, Alexandra, married the Prince of Wales, afterward Edward VII; Dagmar, his second daughter, became the wife of the Russian grand duke who ruled as Alexander III; his son George became king of Greece in 1863. When Norway separated from Sweden, its first king was Christian's grandson, Haakon VII. Another grandson became Constantine I of Greece. Because of these royal alliances, Christian was often called the "Father-in-law of Europe."

Christian X (1870-), King of Denmark and Iceland, the eldest son of Frederick VIII, succeeded his father in 1912. In 1915 he granted a new constitution, in which the vote was given to women. Christian X is known as a peace-loving and progressive ruler.

Christina (1626-89), Queen of Sweden (1632-54), the daughter of Gustavus Adolphus. She ascended the throne upon her father's death in the Battle of Lützen, but until Christina's 18th birthday a regency governed. Of a restless and eccentric nature, she was not considered an acceptable ruler, especially after she adopted Catholicism. In 1654 she voluntarily abdicated in favor of Charles X Gustavus, her cousin. Thereafter she lived in Italy and France, where she became penniless. On the king's death, she sought to regain the throne but was denied entrance into Stockholm. She died in Rome.

Christy, Howard Chandler (1873-), American illustrator and painter, native of Morgan County, Ohio. In 1893 he moved to New York and established himself there as an illustrator of periodicals. He accompanied the Rough Riders to Cuba in the Spanish-American War, and his war pictures, published in *Scribner's, Harper's* and *Collier's,* made him widely known. After 1910 he was a regular contributor to the *Cosmopolitan Magazine,* and he has illustrated books by himself and others. Christy also won renown as a portrait painter; among his subjects were Warren G. Harding, President Coolidge and Mrs. Coolidge, Charles E. Hughes, Mussolini and Prince Humbert of Italy.

Chrysostom, John (*c.* 347-407), Christian saint and preacher, born in Antioch. Left fatherless in infancy, he was trained by his mother Anthusa, and when she died he began a life of renunciation in the deserts of Syria. Six years later he returned to active Christian work and in 398 was made archbishop of Constantinople. His large gifts to charity won him the surname "John the Almoner." Beloved by the people, Chrysostom aroused the hatred of the Emperor Arcadius and his wife Eudoxia by his attacks on the immoral court, and he was banished to a remote place on the Black Sea in 407. He died on his way there. His feast is Jan. 27 in the Latin Church and Nov. 13 in the Greek Church. His eloquence gave him the name Chrysostom, meaning *Golden Mouth.*

Churchill, Winston (1871-), American novelist, born in St. Louis and graduated from the U. S. Naval Academy, devoted himself to literature. His first novel *The Celebrity* appeared in 1898; it was followed by *Richard Carvel, The Crisis, The Crossing, Coniston, Mr. Crewe's Career, A Modern Chronicle, The Inside of the Cup, The Dwelling Place of Light* and others. He also wrote a three-act play *Dr. Jonathan.*

Churchill, Winston Leonard Spencer (1874-), English statesman, soldier and author, elder son of Lord Randolph Churchill, educated at Harrow and Sandhurst. Entering the army at the age of 21, he fought in India and Egypt and was a newspaper correspondent in the South African War, in which he later took part as an officer after being captured and escaping from the Boers. In 1900 he entered Parliament as a Conservative but altered his viewpoint and joined the Liberals. In 1911 when Asquith felt an approaching conflict with Germany, Churchill, as first lord of the admiralty, prepared the fleet to resist an attack by Germany. When the World War broke out he took a naval force to try to save Antwerp from the Germans. When the Liberal government fell in 1915, he went to France to command a regiment. He returned to England to be appointed minister of munitions by Lloyd George in 1917, and secretary for war and air in 1918. Churchill was chancellor of the exchequer from 1924 to 1929. During the 2nd World War, he became Prime Minister of Great Britain. A distinguished author, he published *The World Crisis, My Early Life, The Eastern Front, Marlborough* and *Great Contemporaries.*

CICERO, MARCUS TULLIUS (106-43 B.C.), Roman orator, statesman and writer, born at Arpinum, in the province of Campania. Of a cultured and well-to-do family, he received excellent training in literature, law, oratory and philosophy, and at the age of 26 began to plead in the public courts. In 70 B.C. he won wide fame as the prosecutor of Verres, governor of Sicily, where Cicero himself had served as quaestor in 76 B.C. So convincing was his first oration that Verres fled into exile without attempting a defense. Within the next few years, Cicero attained the offices of praetor and consul (63 B.C.). As consul, he made a sensational attack on the conspiracy headed by Catiline and was acclaimed the "father of his country." This triumph was later turned into defeat when Clodius, his personal enemy, charged him with having executed the Catilinarian conspirators without a formal trial. Public feeling was so aroused that Cicero fled to Thessalonica (58 B.C.) and remained in exile for 16 months.

After his return to Rome, Cicero sided with Pompey in his final struggle with Caesar. When Pompey was defeated at Pharsalia (48 B.C.), Cicero abandoned politics. He enjoyed a few years of quiet devotion to writing until Caesar's assassination (44 B.C.). At first inclined to sympathize with the conspirators, he decided finally to lend his support to Octavian (afterwards Augustus). He delivered a series of orations against Mark Antony, so fiery that they suggested the denunciation of Philip of Macedon by Demosthenes, and so have been called *Philippics.* When Antony joined Octavian in the Second Triumvirate, Cicero was killed by hired agents. As long as Latin literature is read, among its foremost examples of masterly prose will be Cicero's great works—*On Old Age, On Friendship,* the four *Orations against Catiline* and the 14 against Antony. His style has influenced writers of the West for 2000 years.

Cid or **El Cid Campeador,** meaning Lord Champion (Ruy Díaz de Bivar; 1040-99), Spanish hero. He was a Castilian soldier who spent his life in fierce warfare with the Moors, then masters of a great part of Spain. His exploits, often highly romanticized, are set forth in Spanish poetry and in Corneille's play.

Cimabue, Giovanni (*c.* 1240-*c.* 1302), Italian painter, the founder of the Florentine school. Little is known of Cimabue's life, but it is certain that he worked in Pisa and Rome as well as in his native Florence. He was a great mosaicist as well as a painter, and his mosaic figure of St. John in the apse of the cathedral at Pisa is famous. His paintings are represented by frescoes in the Church of St. Francis of Assisi and *The Madonna of Santa Trinita* (Academy of Florence).

Cimon (510-449 B.C.), Athenian statesman and general, the son of Miltiades, who was the victorious general at the battle of Marathon. Cimon was a co-officer with Aristides in command of the Athenian naval unit when the allies renewed the war with Persia (447 B.C.), and in 466 B.C., at the River Eurymedon, he was victorious over the sea and land forces of the Persians. He died while besieging a Persian garrison in Cyprus.

Cincinnatus, Lucius Quinctius (*c.* 519-*c.* 439 B.C.), Roman hero. In 460 B.C. he was elected consul, and two years later, in a national crisis, was chosen as dictator. Notified by messengers of the honor, he was found behind the plow. He dropped his work, rescued Lucius Minucius, the consul, from the Aequi and returned to his farm after 16 days. At the age of 80 he again assumed the dictatorship in order to suppress a plebeian uprising. A patriotic American organization, the Society of the Cincinnatus, is so named in honor of this Roman patriot.

Cinna, Lucius Cornelius (d. 84 B.C.), Roman politician. After Sulla, leader of the Senatorial party, had driven Marius from Rome, and before setting out against Mithridates, he allowed Cinna to be elected consul on his swearing not to disturb the existing constitution. No sooner, however, had Cinna entered on office (87 B.C.) than he impeached Sulla and agitated for Marius's recall. Cinna and Marius next declared themselves consuls after a cruel massacre of the Roman citizens. Marius died a few days later; and Cinna in 84 B.C. prepared to meet Sulla but was slain by his own rebellious troops at Brundisium. During his fourth consulate his daughter Cornelia was married to Julius Caesar.

Clark, Alvan (1808-87), American optician, engraver and manufacturer of telescopes, born at Ashfield, Mass. Early in life he was a portrait painter, but in 1845 turned his attention to the making of lenses and telescopes. Associated with his sons, he constructed large telescope lenses for universities, for the Naval Observatory at Washington, Lick Observatory in California and the Imperial Observatory at Pulkowa, Russia. His son, Alvan Graham Clark (1832-97), made many discoveries in double stars.

Clark, Champ (1850-1921), American politician, born in Anderson County, Ky., educated at Bethany College and the Cincinnati Law School. After a successful legal career in Missouri, he was elected to Congress and sat continuously in the House from 1893 until his death, except for the term 1895-97. He was for long minority leader in the House and served as Speaker from 1913 to 1919. In 1912 he was Bryan's chief opponent for the Presidential nomination, and at the Democratic convention in Baltimore he remained in the contest through 46 ballots. He wrote *My Quarter Century of American Politics*, 2 vols. (1920).

Clark, Francis Edward (1851-1927), American clergyman, founder of the Society of Christian Endeavor. He was born in Aylmer, Canada, graduated from Dartmouth College in 1873 and from Andover Theological Seminary in 1876. After entering the ministry he became interested in Christian work among young people, and an organization that he founded in 1881, while pastor of a Congregational church in Portland, Me., was the basis of the Society of Christian Endeavor, now international in scope. He became president of the world organization and editor of its official paper.

Clark, George Rogers (1752-1818), American frontiersman, born near Monticello, Va., a brother of the explorer William Clark. As a delegate to the Virginia legislature from the Kentucky district in 1776, Clark brought about the organization of Kentucky as a separate county. In 1778, having secured the approval of Governor Patrick Henry, he raised an armed force to protect the frontier against both Indians and British during the Revolutionary War. His capture of Kaskaskia, Cahokia and Vincennes enabled the United States to gain title to the Northwest Territory. He served as an Indian commissioner after the war, and in 1783 the Virginia legislature voted him a large tract in the present state of Indiana.

Clark, William (1770-1838), American explorer, born in Virginia, a brother of George Rogers Clark. In 1794, as lieutenant of infantry, William Clark fought under General Wayne against the Indians. He resigned from the army in 1796 because of ill health, not resuming military life until 1803, when he received a commission as second lieutenant. From May 1804 until September 1806 he was the companion of Lewis on the famous expedition from St. Louis to the Pacific coast and return. Clark was governor of Missouri Territory (1813-21) and was superintendent of Indian affairs thereafter. He kept a complete diary with maps and drawings, that became part of *The Original Journals of the Lewis and Clark Expedition*, edited by R. G. Thwaites.

Claude Lorrain (1600-82), French landscape painter whose real name was Claude Gelée, born in Lorraine. He was the leading representative of the classic school of landscape painting of the 17th century and his influence can be seen particularly in the 19th century work of the English painter Joseph Turner. Claude Lorrain began his art studies in Naples and Rome and spent most of his life in Rome, where under the protection of Pope Urban VIII he quickly became famous. His paintings have beautiful light and cloud effects, although the figure drawing is inferior. The National Gallery, London, possesses some of his greatest works, such as *Embarkation of St. Ursula* and *Seaport;* and a landscape and a seascape are in the Metropolitan Museum of Art, New York.

Claudian (Claudius Claudianus; *c.* 365-*c.* 408), Latin poet. He came from Alexandria to Rome in 395 A.D. and was in favor at court through the influence of Stilicho. We have two epic poems by him, *Rape of Proserpine* and the unfinished *War of the Giants*, besides panegyrics on Honorius and Stilicho, an epic called *Rufinus* and *Epigrammata*.

Claudius I (Tiberius Claudius Drusus Nero Germanicus; 10 B.C.-54 A.D.), Roman Emperor; youngest son of Drusus, the stepson of Augustus. Claudius lived the life of a student until the Praetorian Guard made him emperor in the year 41, after the murder of Caligula. Thus was inaugurated that custom whereby the Roman emperors owed their positions to the soldiers. Claudius was kindly and liberal-minded but was under the influence of two cruel and unscrupulous wives—Messalina and Agrippina. He had the former executed, and the latter poisoned him in 54 in order to place her son Nero on the throne. The conquest of Britain was begun and the Claudian aqueduct completed in this reign.

Clausius, Rudolf Julius Emanuel (1822-88), German physicist, born at Köslin, Pomerania, educated at Berlin, held professorships of physics at Zürich, Würzburg and Bonn. He is famous for his mathematical investigations in the kinetic theory of gases and for the first clear statement of the second law of thermodynamics, "Heat cannot pass of itself from a cool body to a warm one." He published many monographs and books on physical subjects.

Clay, Henry (1777-1852), American statesman, born in Virginia; was admitted to the bar, 1797, and began his career at Lexington, Ky. After three years in the Kentucky legislature, he was, at 29, appointed to an unexpired term of one year in the U. S. Senate and in 1810 to another unexpired term of one year. In 1811 he was sent to the House of Representatives, where he was immediately elected Speaker. Clay is best known as the author of the famous Missouri Compromise, restricting the spread of slavery, and of the compromise of 1850, known as Clay's "omnibus" measure. In 1824 he was an unsuccessful candidate for President, but was made secretary of state by President J. Q. Adams. He then entered the United States Senate, in which he played a leading part for many years, especially in the tariff compromise of 1833. Clay was again a candidate for President before the first Whig national convention in 1839, but Harrison was nominated and elected. He had in 1842 bidden farewell to the Senate, but returned to it after 1844 and took a leading part in bringing about the slavery compromise of 1850. Clay was a dynamic speaker and a splendid party chief, idolized by his followers. His failure to achieve the presidency was a great disappointment to him.

Clayton, John Middleton (1796-1856), American statesman, born in Delaware and educated at Yale. He became a prominent lawyer in his state, was a U. S. Senator (1829-37 and 1845-49) and in 1849 was appointed secretary of state by President Taylor. In that capacity he negotiated, with Sir Henry Bulwer, British minister, the Clayton-Bulwer Treaty (1850) concerning an interoceanic canal across Central America. Reelected to the Senate in 1851, he died in office.

Clemenceau, Georges Eugène Benjamin (1841-1929), French statesman, born in the province of Vendée. At 18 he began the study of medicine in Paris, and after a period of travel and journalistic writing, part of which was spent in the United States, he returned to Paris and became mayor of Montmartre in 1870.

In 1876 he began his career as a member of the Chamber of Deputies. Known as a maker and destroyer of cabinets, he himself was defeated for re-election in 1893 because of an unfounded charge that he was concerned in the Panama scandal. In 1902 Clemenceau was elected to the Senate from the department of the Var, was appointed minister of the interior in March 1906 and became prime minister the following October. His vigorous use of soldiers to break a miners' strike marked his definite severance from the Socialist party, but he was always more interested in social reform than in party organization. He had opposed Boulanger and supported Dreyfus, fought several duels and was named "the Tiger" for the vehemence of his actions.

Clemenceau's ministry remained in office until 1909. His term of office was notable for the establishment of the Entente Cordiale, following the trouble with Germany in 1908, and the separation of church and state. He was active in opposition from 1909 to 1917, when he again became premier and minister of war. Recognized as the strongest man in France, he saw the war brought to a successful conclusion and presided over the peace conference at Versailles in 1919. He resigned in 1920 and lived in retirement. Clemenceau completed *In the Evening of My Thought* shortly before he died, and an autobiography, *Grandeur and Misery of Victory*, was published after his death.

Clemens, Samuel Langhorne, see *Twain, Mark.*

Cleon (d. 422 B.C.), Athenian politician, an opponent of Pericles and leader of the element that advocated war with Sparta. His name has become proverbial for a demagogue. In the Athenian Assembly he proposed that the entire male adult population of Mytilene be killed for having revolted against Athens. During the Peloponnesian War he boasted that he could end the siege of the island of Sphacteria and was placed in charge of the Athenian forces. Though he made good his boast, he owed much of his success to Demosthenes. Cleon was killed in a battle before Amphipolis, the key city in Macedonia. He was represented by Thucydides as a degraded demagogue and was bitterly attacked by Aristophanes in *The Knights* and *The Wasps.*

Cleopatra (69-30 B.C.), Queen of Egypt. As Cleopatra VI, she and her young brother Ptolemy XIV succeeded their father, Ptolemy XIII (Auletes), in 51 B.C. In the third year of their reign, Ptolemy's friends dethroned Cleopatra, but she won Caesar to her cause and was reinstated by his influence. In a disturbance Ptolemy lost his life, and Caesar proclaimed Cleopatra Queen of Egypt. Another brother having been made co-ruler, the queen accompanied Caesar to Rome in 46 B.C. and remained with him until his assassination (44 B.C.). In Rome a son Caesarion was born to them.

After Caesar's death Cleopatra returned to Egypt, poisoned her brother and made her young son her colleague. Because she failed to announce her support of the triumvirs who had partitioned the Roman world, Mark Antony, ruler of the East, summoned her to meet him at Tarsus, in Cilicia. Dazzled by her beauty, he threw away honor and career, and for her eventually divorced his wife Octavia, the sister of his colleague Octavian (afterwards Emperor Augustus). In a war with Octavian, Antony's fleet was defeated at Actium (31 B.C.), and he fled to Egypt. Deceived by a report that Cleopatra had died, he killed himself. The queen soon learned that Octavian was indifferent to her charms, and preferring death to enslavement, she too committed suicide. Plutarch wrote an account of her, and Shakespeare a play.

Cleveland, [Stephen] Grover (1837-1908), 22d and 24th President of the United States, born in Caldwell, N. J. His father, a Presbyterian minister, moved his family to Fayetteville, N. Y., when his son was four years old, and later went to Clinton, where the boy was prepared for college. After his father's death Cleveland became a teacher at Batavia, N. Y. Subsequently he obtained a law education in Buffalo and began to practice there in 1859. His ability won an appointment as assistant district attorney in 1863, and in 1870 he was elected sheriff of the county. He acquired an excellent position as a lawyer in Buffalo and in 1881 became mayor. His record for honesty and efficiency as mayor brought him in 1882 the Democratic nomination for governor of New York, followed by his election. As mayor he reorganized the city government; as governor he put through a strong civil service law. In 1884 the Democratic national convention at Chicago nominated him for the presidency, and he was elected on November 4.

Cleveland's first administration was notable for the extension of the civil service, much labor unrest, the use of Federal military forces to maintain order in Utah and Panama, a drastic policy of vetoing pension bills and the passage of several important bills, including the Presidential Succession Act of 1886 and the Interstate Commerce Act of 1887. The tariff was the leading issue of the campaign of 1888, and the country was apparently in a mood for return to a high-protection policy. Renominated by the Democrats, Cleveland lost to the Republican candidate, Benjamin Harrison of Indiana, who carried his rival's own state in the election.

After an interval of four years at his law practice, Cleveland was returned to office in 1892 on a wave of dissatisfaction with the McKinley Tariff Act. In this administration he ordered Federal troops to Chicago to protect the mails during the riotous Pullman strike of 1894; he repealed the silver legislation; and insisted upon arbitration of the Great Britain-Venezuela boundary dispute involving British Guiana and Venezuela. After expiration of his second term of office he lived at Princeton, acted as a trustee of Princeton University for ten years and occasionally lectured there. President Cleveland gained a high place in public estimation for his unflinching honesty and for his diligent efforts to promote the best interests of the country.

Clinedinst, Benjamin West (1860-1931), American artist, born in Woodstock, Va., studied in Paris for five years and subsequently won renown for his illustrations for the books of Hawthorne, Stevenson, Francis Parkman, George W. Cable, Thomas Nelson Page, Bret Harte, Mark Twain and others. He also painted portraits of eminent men, including Theodore Roosevelt and Admiral Peary. Clinedinst worked in water color and in oil. Besides portraits, his subjects include scenes of everyday life. He was a National Academician (1898).

Clinton, DeWitt (1769-1828), American statesman, born in Little Britain, N. Y., was graduated from Columbia College in 1786 and admitted to the New York bar in 1788. He was soon active in politics as an Antifederalist. From 1797 until 1802, he served in the state legislature, and in 1802 was elected to the United States Senate. Resigning soon to accept appointment as mayor of New York, he held this office most of the time between 1803 and 1815. He was the choice of the Democratic-Republican party for President in 1812 but was defeated by Madison. Afterward he was a leader in various civic movements in his state and was elected governor in 1817, 1820 and 1824. He is famous for the important part he played in bringing about the construction of the Erie Canal.

Clinton, George (1739-1812), American statesman and general, born in Little Britain, N.Y. He fought in the French and Indian War, was a member of the Continental Congress and served in the Revolution as brigadier general. Elected first governor of New York in 1777, he filled that post continuously for eighteen years and was re-elected for the term beginning in 1801. From 1805 until his death he was Vice-President of the United States and cast the deciding vote in 1811 in regard to rechartering the United States Bank, thereby defeating the proposal. He also opposed the Federal Constitution, signing himself "Cato" in letters published against it, which were replied to by Hamilton as "Caesar" in the *Daily Advertiser*. He was the political opponent of John Jay and allied with Aaron Burr.

Clinton, Sir Henry (*c.* 1738-95), British general. In 1778 he was appointed to command the British forces in North America. For helping to defeat Washington in the Battle of Long Island (1776) he was promoted lieutenant general and knighted. After assuming chief command, he was defeated by the Americans at Monmouth. In 1780 he blockaded and captured Charleston, S. C. The surrender of Cornwallis at Yorktown in 1781 caused General Clinton to resign, and in 1782 he was succeeded by Sir Guy Carleton. He subsequently served in Parliament and as governor of Gibraltar.

Clive, Robert, Baron Clive of Plassey (1725-74), English soldier and statesman, born in Shropshire. In 1743 he went to Madras as a clerk in the East India Company. This trading company was Britain's sole representative in India, where at the time France was enjoying authority and prestige. In 1747 war broke out, and soon Clive's daring and resource made him a leader. In 1751 with a few men he captured Arcot, which he held during a long siege. From 1753 to 1755 Clive was in England, where he was hailed as a conqueror. Returning to India, he axacted revenge for the Black Hole outrage, recaptured Calcutta, and in 1757, by winning at Plassey against heavy odds, put an end to French rule. Clive placed a friendly native on the throne of Bengal, and he himself ruled the country until 1760, when he returned to England, entered Parliament and in 1762 was made a peer. In 1765 he went back to India to straighten out the affairs of the East India Company. In 1772 charges of dishonesty were made against him in Parliament, and an investigation followed. The report gave him credit for his services but did not fully exonerate him, and in 1774 he committed suicide.

Clough, Arthur Hugh (1819-61), English poet, born at Liverpool. In 1848 he published the *Bothie of Toberna-Vuolich* in hexameter verse. He traveled in France and Italy, part of the time with Emerson, and was appointed warden of University Hall, London, on his return in 1849.

Clovis I (*c.* 465-511), founder of the Frankish kingdom. In 481, on the death of his father, Childeric I, Clovis became king of the Salian Franks, with headquarters in the present Belgium. In 486 he defeated the Gallic Romans at Soissons and subsequently took possession of the territory now included in Northwestern France. He made Paris his capital, and at his death he was ruler of a united Frankish kingdom. In 496 he defeated the Alemanni and in accordance with a vow made to the Christian God of his wife Clotilda was baptized on Christmas Day at Reims.

Cobb, Irvin Shrewsbury (1876-), American author, native of Paducah, Ky. In his youth he was a reporter and contributor to comic weeklies and at 19 was editing the *Daily News* of Paducah. Soon he began a varied career as correspondent, staff humorist, special writer and editor for the New York *Sun*, New York *World, Saturday Evening Post, Cosmopolitan Magazine* and other periodicals. During the World War he was a field correspondent and lecturer. His writings include plays, short stories and books on a variety of subjects, written in his characteristic vein of breezy humor and gentle irony. He won the O. Henry Award for the best short story published in 1922. Typical of his books are *Live Talks with Dead Ones, The Belled Buzzard, Speaking of Operations, Shakespeare's Seven Ages and Mine, Murder Day by Day* and *Abandoned Farmers*.

Cobb, Tyrus Raymond (1886-), known as "Ty" Cobb, American baseball player, born in Georgia. He joined the Detroit team of the American League in 1905, and in 21 years of big-league service made many records and was always a daring and spectacular player. He batted over .300 for 21 consecutive seasons, played 2,805 games and stole 866 bases. He managed the Detroit team (1921-26), played with the Philadelphia Athletics (1926-7) and retired in 1928.

Cobbett, William (1762-1835), British politician and writer, born at Farnham, Sussex. He was imprisoned for denouncing flogging in the army. In 1880 while visiting America he wrote antirepublican articles under the signature "Peter Porcupine." His *History of the Reformation* vilifies Queen Elizabeth. The newspaper *Political Register* was started by Cobbett. In it he advocated reforms. He wrote in a pure and vigorous English style.

Cobden, Richard (1804-65), English economist, born in Sussex. He began work in a London warehouse at the age of 15 and in course of time became one of the partners in a calico-printing business at Manchester. The enterprise prospered, and after 1832 Cobden devoted himself to the causes of free trade and peace, which he believed were closely linked. His pamphlets, *England, Ireland and America* (1835) and *Russia* (1836), set forth his economic theories. He was instrumental in having the Corn Laws repealed in Parliament, to which he was elected in 1841; and he arranged the commercial treaty between Britain and France in 1860.

Cody, William Frederick (Buffalo Bill; 1846-1917), American scout and frontiersman, born in Scott County, Iowa. At the age of 14 he was a rider for the Pony Express, established in 1860 to carry the mails overland. He was a Union scout and guide during the Civil War and also served in the Seventh Kansas Cavalry. In 1876 he fought in the war with the Sioux Indians, killing Chief Yellow Hand in a hand-to-hand fight. Cody organized the original "Wild West Show" in 1883, and in 1887 exhibited its Indians, cowboys and animals in Europe. His grave is on a mountain near Denver. Cody won the name "Buffalo Bill" by killing buffaloes to supply meat for crews of railway builders.

Coffin, Robert Peter Tristram (1892-), American poet, born in Brunswick, Me., educated at Bowdoin, Princeton and Oxford —he was a Rhodes scholar. He served as a lieutenant in the World War, returned to the United States to teach at Wells and has been professor of English at Bowdoin since 1934. His finest poems are sensitive descriptions of nature and farm life. Among his books of poetry are *Christ Church, Dew and Bronze* and *Golden Falcon*. He published novels, essays and biographies, an autobiography, *Lost Paradise*, and a book on the Kennebeck River. He contributed to the VOLUME LIBRARY.

Cohan, George Michael (1878-), American actor and playwright, born in Rhode Island. While still a child he appeared in numerous plays and soon became popular on the vaudeville stage. Later he wrote, produced and acted in many plays and musical comedies and wrote popular songs. He was particularly successful in *Get-Rich-Quick Wallingford, Seven Keys to Baldpate, The Miracle Man* and *I'd Rather be Right*. He wrote *Twenty Years on Broadway*.

Coke, Sir Edward (1552-1634), English jurist, called to the bar in London in 1578. In 1593 he was elected to Parliament and became Speaker of the House of Commons. The following year he was chosen attorney general, in which capacity he prosecuted the Earl of Essex, Sir Walter Raleigh and the conspirators in the Gunpowder Plot. Coke was appointed chief justice of the Court of Common Pleas in 1606, and in 1613 chief justice of the King's Bench. In 1617 he was removed from office by James I because he insisted on maintaining the supremacy of the law. Later as a member of Parliament Coke helped to frame the *Petition of Right* (1628), which caused Charles I to dissolve his third Parliament and rule without one for eleven years. Coke's treatises, including *Coke upon Littleton*, are among the greatest of all writings in the field of English law.

Colbert, Jean Baptiste, Marquis de Seignelay (1619-83), French statesman, minister of finance under Louis XIV. When he took office, in 1665, Colbert found the finances of the country in such a deplorable condition that he instituted an entirely new system, effecting economies and reforms in every field. With enlarged powers he promoted art, science and literature as well as industry and commerce, gave France an adequate navy, beautified Paris and revised the laws. Colbert's great services, however, were offset in great degree by the extravagant military policy of Louis.

Cole, Thomas (1801-48), American landscape painter, born in England. He began his career in Philadelphia as a wood engraver but soon turned to painting, and after studying at the Philadelphia Academy he established himself in New York in 1825. His small canvases depicting the beauty of New York and New England have been praised for their fidelity to nature. Among other works are several large allegorical pictures, a series called *Course of Empire* (New York Historical Society) and *Oxbow*, a Connecticut River scene (Metropolitan Museum).

Cole, Timothy (1852-1931), American wood engraver, born in England. He came to America at the age of five and lived in Chicago; the great fire of 1871 left him penniless. In 1875 he settled in New York, and for many years his woodcut reproductions of great paintings appeared in magazines and won for him the reputation of being the greatest of modern engravers. The introduction of photoengraving gradually destroyed the popularity of his art. Cole received numerous honors and published several books, among them *The Magic Line* and *Wood Engraving*.

Coleridge, Samuel Taylor (1772-1834), English poet and philosopher, born at his father's vicarage in Devonshire, educated at Christ's Hospital in London and at Cambridge. As a youth he was precocious and imaginative; later, as a sophomore at Cambridge, he became discouraged and enlisted in the army as Silas Tomkyn Comberbacke. Friends secured his discharge, and he returned to Cambridge (1794), but he left without a degree. Meanwhile he made the acquaintance of Wordsworth and this provided the inspiration that Coleridge needed. They wrote a volume, *Lyrical Ballads*, of which *The Ancient Mariner* was Coleridge's main contribution. Issued anonymously, this small book definitely marked the end of English conventional poetry of the 18th century and ushered in an era of verse in which richness of imagination and freedom of expression had full sway. The Romantic spirit which transformed both prose and poetry during the next three decades owes much to the work of the two friends. At this time, Coleridge also wrote the first part of *Christabel* and *Kubla Khan*, but they were not published until years later.

Through the generosity of friends, he was enabled to go with the Wordsworths to Germany. He studied German and translated Schiller's *Wallenstein* in a few months. Coleridge settled in the English lake district after his return, with Southey and Wordsworth as neighbors, and there "the Lake poets" wrote memorable verse. Unfortunately for Coleridge the damp climate of the North gave him rheumatism, and his custom of relieving pain with opium led him into the habitual use of the drug. From 1816 until he died he was under the care of a physician friend in London, but recovered enough to produce *Biographia Literaria*, which contained autobiographical material and his views on religion, philosophy, politics, criticism and literature. Coleridge's philosophy, criticism and poetry had a great influence on English literature.

Coleridge-Taylor, Samuel (1875-1912), Negro composer, born in London, England, son of a West African physician and an English woman. Coleridge-Taylor entered the Royal College of Music in 1890 and early gained a reputation as a composer of choral pieces. His music for the *Hiawatha* trilogy is famous, and he produced also the incidental music for a series of dramas by Stephen Phillips for the use of Sir Herbert Beerbohm Tree. His other works include a variety of orchestral and piano compositions, an operetta and an oratorio *The Atonement*.

Colfax, Schuyler (1823-85), American statesman, member of Congress from 1855 to 1869, Speaker of the House from 1863 and Vice-President of the United States during Grant's first term. In 1873 charges of corruption were made against the administration, and Colfax's name was connected with the *Crédit Mobilier* scandal. Although the charges were never substantiated, he was forced to retire from active politics.

Coligny, de, Gaspard (1519-72), French soldier of noble birth, prominent in the struggle between the Catholics and Huguenots. He fought under Francis I and Henry II, and in 1552 was appointed admiral of France. Becoming the actual leader of the Huguenots in 1557, Condé being a figurehead, he fought against the Catholic forces in the religious war, carrying on after Condé's death and arranging terms of peace in 1570. Coligny's growing influence with Charles IX aroused the enmity of the queen mother, Catherine de' Medici, and in 1572 Coligny died in the massacre of St. Bartholomew, which Catherine had planned.

Collins, Michael (1890-1922), Irish statesman, born near Clonakilty, County Cork. The son of a farmer, he had a common-school education and at 15 became a clerk in the civil service in Dublin. Later he worked in a bank in London. He was imprisoned in 1916 for participating in the Easter uprising and was again jailed in 1918. After his release he became director of Irish armed resistance to England and showed himself remarkably skillful in guerrilla warfare. Collins believed that Ireland's interests lay in accepting the status defined by the Irish Free State Constitution, and he became premier of the provisional government in 1922. In August of that year, he was murdered. He is generally recognized as the chief figure in the creation of the Irish Free State.

Collins, [William] Wilkie (1824-89), English novelist, born in London. In 1851, when he became friendly with Dickens, he decided to be a novelist. His first pronounced success, *The Woman in White* (1860), appeared serially in *All the Year Round*, which Dickens edited. This baffling mystery and *The Moonstone* are Collins's masterpieces. Among others of his novels are *The Dead Secret, No Name, Armadale, The Law and the Lady* and *The Fallen Leaves*.

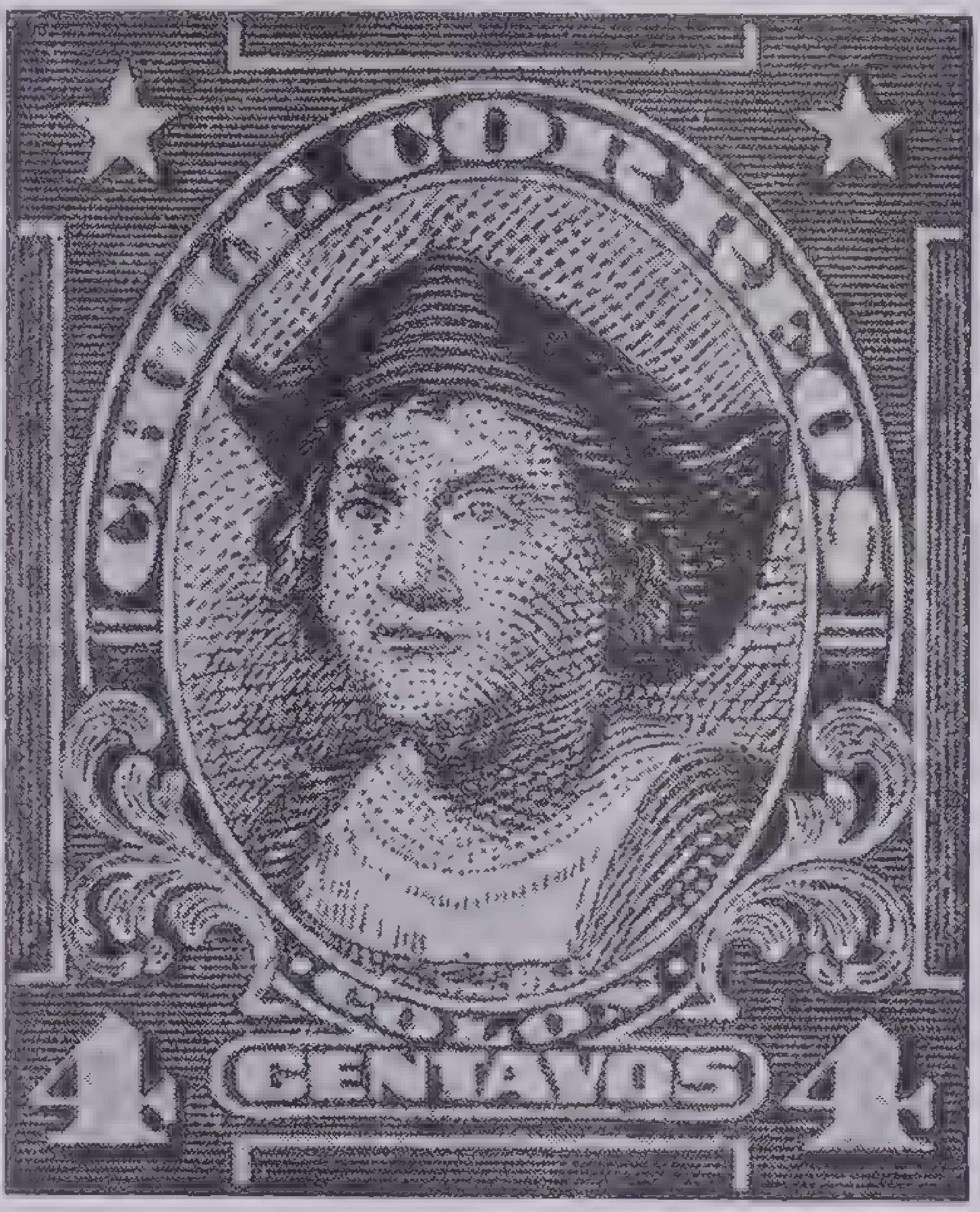
Colt, Samuel (1814-62), American inventor, born in Hartford, Conn., where he worked in his father's factory. He secured the first patent for a revolving-breech pistol in 1835 but was unable to manufacture it profitably until 1847, when he contracted to supply a thousand of the weapons for General Zachary Taylor's use in the Mexican War. An armory for their manufacture was established in Hartford in 1852. Colt also invented a battery for submarine harbor defense, and he made the first successful submarine cable.

Colum, Padraic (1881-), Irish poet, playwright and author, born in county Longford. He edited the *Irish Review* in Dublin, and helped to establish the Abbey Players, who produced his play *Broken Soil* in that city in 1903. He went to the United States in 1914, where he lectured on Irish literature, wrote plays, poetry, children's books and tales of old Irish romance. His great gift for storytelling and his feeling for the past make his work very real and interesting to Americans. Among his many books for old and young readers are: *Wild Earth* (poems), *My Irish Year, The King of Ireland's Son* (a fairy tale), *Castle Conquer* (a novel), *The Bright Islands* (Hawaiian stories), *The Fountain of Youth* and *The Story of Lowry Maen* (poems).

COLUMBUS, CHRISTOPHER (*c.* 1446-1506), discoverer of America, born probably at Genoa, Italy. He followed his father's trade of weaver until young manhood. Early documents say that Columbus started on a Genoese ship for England in 1476. The ship was attacked by pirates, and Columbus found refuge in Lisbon, where in 1477, he settled and married the daughter of a Portuguese navigator. Certain maps and charts to which he had access intensified his interest in foreign countries, and he had read Marco Polo's tales of the Far East.

Columbus was one of the few persons of his era who believed that the earth is round, and he decided that it was possible to reach Asia by sailing westward. After making a vain appeal for funds to the senate of his native state, Genoa, he turned to John II, King of Portugal, but without result. He appealed to Henry VII of England and to the dukes of Medina Sidonia and Medina Celi, who advised him to ask Isabella of Castile. After seven years of delays, Columbus's proposals were finally accepted by the Spanish monarchs, Isabella and Ferdinand. Columbus was given the rank of admiral and the promise that he was to be viceroy of such lands as he should discover and take possession of for the sovereigns of Spain.

On August 3, 1492, he set sail with one small ship, the *Santa Maria*, and two caravels, the *Pinta* and the *Nina*, the whole expedition including only 120 men. His real voyage of discovery began when he sailed westward from the Canary Islands on September 6. His men were not inspired by his hope, and a variation of the magnetic needle reduced them almost to a state of terror. On October 7 the ships were turned south of west, and flocks of land birds guided them to an island in the Bahamas, probably the one now called Watling, but named San Salvador by Columbus. Soon Cuba was discovered and then Haiti, which was named Espanola. Columbus believed it to be Cipango (Japan); to the day of his death he did not know that he had discovered, not an outpost of the eastern coast of Asia, but a New World.



Courtesy Scott Stamp & Coin Company

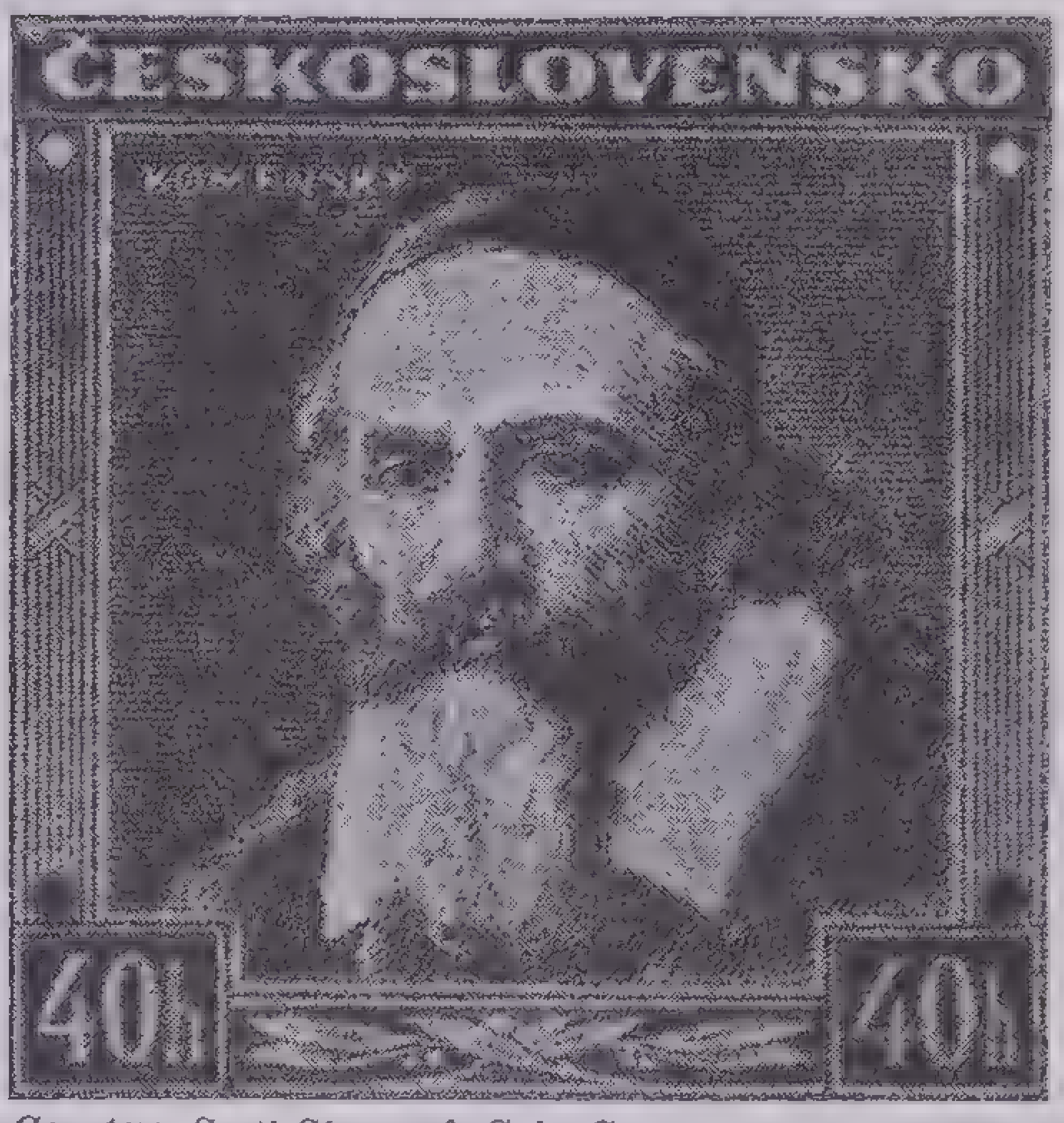
Christopher Columbus

Enlarged from a Chilean postage stamp first issued in 1915. This stamp shows clearly how the engraver brings out a picture simply by carving out more or less of the metal from which the plate is made

A storm having wrecked the *Santa Maria*, Columbus returned to Spain in the *Nina*, leaving Espanola on Jan. 4, 1493, and casting anchor at Palos, Spain, on March 15. The Spanish sovereigns received him with enthusiasm and provided the equipment for a return journey. On September 25, with 17 ships and a personnel of 1,500, Columbus set out again and on November 3 the fleet reached the island of Dominica. Discouragement attended the admiral's attempts to organize a government for Espanola, but he had help from his brother Bartholomew, who arrived at the island in 1494. When Columbus departed for Spain in 1496, he left his brother in charge of the colony, and the latter founded the city of Santo Domingo. On May 30, 1498, Columbus left Spain on a third voyage with a fleet of six vessels. He discovered the mainland of South America, skirted its coast for some distance and then proceeded to Santo Domingo, where his incapacity for administration soon became apparent. Unable to restore order, he was sent back to Spain (1500) by Francisco de Bobadilla, the new governor.

In 1503, with four ships, Columbus sailed from Spain on his fourth and last voyage, hoping to find a short route to India. He arrived at Santo Domingo, refitted his ships and coasted along the shores of Central America. His ships were unseaworthy, and he was forced to abandon his hopes when he reached the Gulf of Darien. Worn out by hardships and sickness, he managed to get back to Spain in 1504. He died at Valladolid, May 20, 1506. It is true that the lands he discovered—the Americas—received another's name, but his own name needs no memorial other than his deeds to perpetuate it. The actual fact of his accomplishment will preserve it as long as history endures.

Combe, George (1788-1858), Scottish phrenologist, born in Edinburgh. Investigation convinced him that phrenology was based on fact, and to try to prove his theory he published his *Essays on Phrenology* in 1819. He wrote on a wide range of subjects, but is chiefly remembered for his *Constitution of Man* (1828) and the *Phrenological Journal*, which he founded.



Courtesy Scott Stamp & Coin Company

Johann Amos Comenius

Enlarged from a Czechoslovakian postage stamp issued in 1936. It honors one of the nation's heroes and bears the great educator's name in the Bohemian form

Comenius, Johann Amos (1592-1670), Bohemian educator, born in Moravia. He traveled in eastern Europe, became a school principal (*rector*), lived in Poland for a time and in his 30s became bishop of the Moravian and Bohemian Brethren. His educational ideas foreshadowed the reforms of the last two generations—use of the vernacular rather than Latin, a broad and interesting curriculum, picture books as an aid to learning, milder discipline, universal schooling for girls as well as boys. He wrote several books on learning foreign languages, and his *Orbis sensualium pictus* (1658) was the first children's picture book. He helped reorganize the schools of Sweden, and he hoped to make education the means of world peace.

Commons, John Rogers (1862-), American economist, born in Hollandsburg, Ohio. He studied at Oberlin College and Johns Hopkins University and taught at Oberlin and Indiana, Syracuse and Wisconsin universities. In 1904 he became director of the American Bureau of Industrial Research. As a leading economist and an authority on the history of American labor he was appointed to several Federal and state commissions. Among his numerous books are *The Distribution of Wealth* (1893), *Proportional Representation* (1907), *Races and Immigrants in America* and *Institutional Economics* (1934).

Compton, Arthur Holly (1892-), American physicist, born in Wooster, Ohio, educated at Wooster, Princeton and Cambridge (England). He taught in a number of colleges and universities and held research appointments in industry; has been professor of physics at the University of Chicago since 1923. Much of his research work has been with X rays, for which he shared the Nobel prize in physics in 1927. He worked also on specific heats and the earth's rotation and directed the world cosmic-ray survey (1931-33). He has written *Secondary Radiations Produced by X rays, X rays and Electrons* and many magazine articles.

Compton, Karl Taylor (1887-), American physicist and educator, brother of Arthur Holly Compton. He was educated at Wooster and Princeton, taught physics in Reed College, Portland, and at Princeton and in 1930 became president of Massachusetts Institute of Technology.

Comstock, Anna Botsford (1854-1930), American naturalist and wood engraver, born in Otto, N. Y. She was graduated from Cornell and taught nature study there for many years. Besides editing *Nature Study Review*, she wrote *How to Keep Bees, Handbook of Nature Study* and notebooks on birds, animals, trees and plants. She married John Henry Comstock (1849-1931), distinguished entomologist, and together they wrote books on insects and butterflies.

Comstock, Anthony (1844-1915), American reformer, born in New Canaan, Conn. He fought in the Civil War, and after being in business, he determined to devote his whole time to crusading against immorality. He served without pay as a special agent of the Post Office Department, drafted the law forbidding the transmission of obscene matter through the mails and was active in suppressing lotteries and the sale of immoral books. He helped establish the Society for the Suppression of Vice. A life of Comstock by Heywood Broun and Margaret Leech was published in 1927.

Comte, Isidore Auguste Marie François Xavier (1798-1857), French philosopher, founder of the philosophical system known as *positivism.* He studied at the Polytechnic School in Paris and was early a pronounced republican and skeptic, though he believed in a religion of humanity. Intense application to study and writing brought on an attack of insanity at the height of his career. He accepted a position as examiner at the Polytechnic School in 1836; voluntary gifts from admirers supported him in later years. From 1830 to 1848 he wrote his monumental work, *The Course of Positive Philosophy.*

Conant, James Bryant (1893-), American educator, a native of Massachusetts, educated at Harvard. After receiving the degree of Ph.D. in 1916, he was appointed to an instructorship in chemistry in his *alma mater.* Two years later he became assistant professor; in 1925, associate professor and in 1929 was appointed Sheldon Emory professor of chemistry, a post he held until 1933 when he became president of the university. He conducted brilliant researches in organic chemistry and is the author of several textbooks.

Condé, de, Louis I de Bourbon, Prince (1530-69), French general. He rendered distinguished military service under Henry II of France but was not rewarded because the hostile Guise faction was in favor at court. After the accession of Francis II, Condé supported the Huguenots and was a victim of the religious wars of the period. In 1569 at the Battle of Jarnac, he was wounded and captured. While his wounds were being dressed, he was assassinated.

Condé, de, Louis II de Bourbon, Prince, Duc d'Enghien (1621-86), French general known as *the Great Condé.* He was the great-grandson of Louis I de Bourbon. A brilliant soldier, he distinguished himself by defeating the Spanish at Rocroi (1643), the Bavarians at Freiburg (1644) and Nördlingen (1645) and the Spaniards again at Lens (1648), in the Netherlands. Afterwards, he fell into disfavor in Paris and placed himself at the disposal of the Spanish forces in Flanders. Defeated by the French and English at the Battle of the Dunes (1658), he was pardoned a year later, when peace was declared, and in 1673 fought his final important battle for France. This was an indecisive engagement with William of Orange, at Seneffe near Brussels.

CONFUCIUS (Kung-fu-tse; 551-478 B.C.), Chinese philosopher, born in what is now the province of Shantung. At the age of 20 he was keeper of granaries in his province but retired to mourn for 27 months upon the death of his mother, an old custom that he thus revived. He studied much and became famous as a teacher. He taught veneration for old laws and records and insisted upon decorum and strict observance of all rites.

He became a magistrate and began many administrative reforms until envious officials forced him out. From 496 to 483 he was in voluntary exile, wandering about with a group of disciples, teaching and implanting his ideas. At the age of 68 he returned to his native province and devoted himself to editing the classics and writing.

He never taught Confucianism as a religion, but the people took it up as such. As a result Confucius' name is always associated with ancestor worship in China. This came about through his insistence on respect for superior persons and things. He taught that the five fundamental human relationships are between sovereign and subject, father and son, elder and younger brother, husband and wife and friend and friend. In each case the younger or inferior was to defer to the other, but at the same time the superior person had certain obligations to the inferior.

Congreve, William (1670-1729), English playwright, born in Yorkshire and educated at Trinity College, Dublin. He began his literary career by writing a novel but won his first success with a comedy *The Old Bachelor,* produced in 1693. Of dramas that followed, the most successful were *Love for Love* and *The Mourning Bride.* His last play *The Way of the World* was a failure at the time, though it ranks high today. Congreve is regarded as a master of witty dialogue. His plays are coarse, but they are a reflection of the age in which he lived.

Conklin, Edwin Grant (1863-), American biologist, born in Waldo, Ohio. He received degrees from Ohio Wesleyan University and from Johns Hopkins. He served as professor of biology at Ohio Wesleyan and as professor of zoology at Northwestern, Pennsylvania and Princeton universities. His books include: *Heredity and Environment* (6th edition, 1929), *Mechanism of Evolution, Revolt Against Darwinism; Problems of Development, Biology and Democracy.*

Conkling, Roscoe (1829-88), American politician, born in Albany, N. Y., was admitted to the bar in 1850, became a successful lawyer of Utica, N. Y. and was elected to Congress on the Republican ticket in 1858. He remained there until 1867, except for the term 1863-65, when he served as a judge advocate in the War Department. Having won a reputation for ability and eloquence in debate, he was sent to the Senate in 1867. Conkling's career in the upper house was brilliant, but after Garfield took office in 1881 he quarreled with the President in regard to Federal patronage. When Garfield's nominee for collector of the port of New York was confirmed by the Senate, Conkling and Thomas C. Platt, his colleague, objected strenuously and both resigned. The two failed to secure a vindication in the New York legislature, and Conkling returned to private law practice.

Connaught, Arthur William Patrick Albert, Duke of (1850-1938), third son of Queen Victoria. He showed great ability as a soldier from his youth; he fought in Egypt, commanded the Bombay army in India and served as chief commander in Ireland and in the Mediterranean. He was a popular and efficient governor-general of Canada (1911-16). During the World War a Canadian regiment adopted the name of his daughter Patricia and was popularly known as the Princess Pat's. In 1920 Connaught was the king's representative at the opening of the legislative councils of Madras, Bengal and Bombay.

Connor, Ralph (Charles William Gordon; 1860-1937), Canadian novelist, born in Glengarry County, Ont. In 1890 he became a missionary to the miners and lumbermen of the Northwest Territories, and in 1894 accepted the pastorate of St. Stephen's Presbyterian Church in Winnipeg. In the midst of his church duties he found time to write a series of stories that won popularity because of their interesting style and sympathetic treatment of human problems. The Ralph Connor books include *Black Rock, The Sky Pilot, The Man from Glengarry, The Doctor, Corporal Cameron, The Major,* and *To Him That Hath.* In 1915 Gordon became a chaplain to the Canadian forces in France.

Conrad, Joseph (Teodor Jozef Konrad Korzeniowski; 1857-1924), English novelist, born in Poland. He early went to sea, and for many years his life was a series of adventures. Not until he was 20 did he learn to speak English; yet he became an acknowledged master of style when writing in that language. Conrad was nearly 40 when his earliest important novel *Almayer's Folly* was published. Reflecting his own picturesque experiences in the East, it was a definite success and was followed by others in the same vein, including *The Nigger of the Narcissus, Lord Jim* and *Typhoon.*

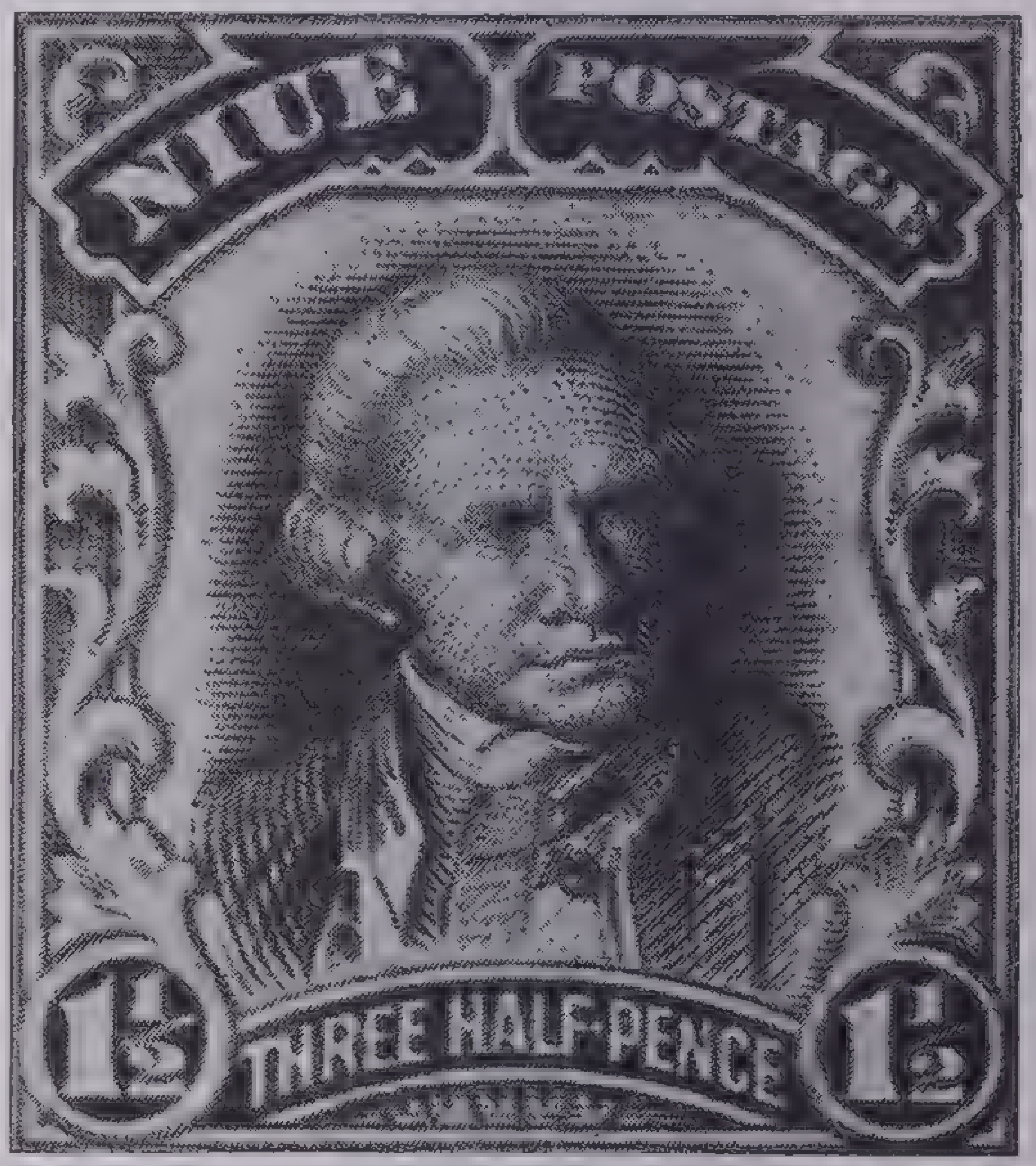
Constable, John (1776-1837), English artist, regarded as the founder of modern landscape painting, born in Suffolk, England. While he had courses in art at the Academy School in London, he learned more by painting from nature. His first canvases showed such variation from accepted standards that from 1803 to 1814 he could sell them only to his friends. However, after three pictures were exhibited in the French Salon in 1824, his work met with appreciation. In his treatment of atmospheric effects and his subordination of form to color, Constable laid down new principles of landscape art. As typical of his work may be mentioned *Cornfield, Valley Farm* and *Hay Wain* (National Gallery, London) and *The White Horse* and *Scene on the River Stour* (Metropolitan Museum, N. Y.).

Constantine I or **Constantine the Great** (272-337), Roman Emperor. He succeeded his father Constantius Chlorus as emperor of the West in 306. The claims of various aspirants to both the Eastern and Western empires led to years of fighting, but Constantine defeated all who opposed him and in 325 became sole ruler of the Roman world. In 329 he began to rebuild Byzantium on the Bosporus, making it his capital and renaming it Constantinople. Constantine adopted Christianity in 313, after a battle near Rome in which he defeated his rival Maxentius. Soon after, he issued the Edict of Milan, granting toleration to Christians in the Western Empire.

Constantine I (1868-1923), King of Greece, the son of George I, whom he succeeded in 1913. He was educated in Germany and married Sophia, sister of former Emperor William II of Germany, in 1889. His sympathies, therefore, were with the Germans in the World War, and he steadfastly opposed the efforts of Venizelos, a pro-Ally, to bring Greece into the struggle. In 1917 he was forced into exile. A reaction against Venizelos restored him to the throne in 1920, but after the defeat of his armies in the Turkish War in Asia Minor, he was again forced to abdicate (1922). He died in Palermo, Sicily.

Converse, Frederick Shepherd (1871–1940) American composer, a native of Newton, Mass., and a graduate of Harvard. After studying at the Royal Academy of Music in Munich, he became instructor in harmony in the New England Conservatory (1899-1901) and subsequently taught at Harvard until 1907. Later, he was appointed professor of theory and composition at the New England Conservatory. His compositions embrace orchestral and piano pieces, the operas *The Pipe of Desire* and *The Sacrifice,* songs, tone poems and an oratorio.

Cook, James (1728-79), English navigator and explorer, born in Yorkshire. He began work at the age of 12, eventually became mate for a shipping company and in 1759 obtained a master's warrant and appointment as master of the *Mercury* in the navy. His published reports on Newfoundland and Labrador induced the Royal Society to send him on an expedition to Tahiti in 1769 to observe the transit of Venus. On the return voyage Cook charted the coasts of New Zealand and Australia and obtained other important data, and in 1771 he was honored with the rank of commander. Subsequently he explored the Antarctic region from New Zealand to Cape Horn and was made a captain. In 1776-78 in the *Resolution* he rediscovered the Sandwich (Hawaiian) Islands and surveyed the American coast north to Bering Strait. On his return to the islands he was killed in a fight with the natives.



Courtesy Scott Stamp & Coin Company

James Cook

Enlarged from a postage stamp issued in 1920 by the Pacific island of Niue which was discovered by Captain Cook

Coolidge, Calvin (1872-1933), 30th President of the United States, born on July 4, 1872, on a farm near Plymouth, Vt. He worked on his father's farm, attended the village school and received a high school education at neighboring academies. In 1895 he was graduated from Amherst College. He then took up the study of law in Northampton, Mass., was admitted to the bar in 1897 and at once began practice in that city, which was to be his permanent home.

His election as councilman was followed by a succession of local victories; he was city solicitor, clerk of courts, member of the General Court of Massachusetts, mayor of Northampton, member of the Massachusetts senate and its president (1914-15), lieutenant governor of Massachusetts (1916-18) and, for two terms (1919-20) governor of his state. The policemen's strike in Boston (1919) brought him into national prominence through his firm and expert handling of the trouble.

In the Republican convention of 1920 Coolidge was nominated for the Vice-Presidency by acclamation and shared in Harding's victory over Cox and Franklin D. Roosevelt. President Harding's death, on August 2, 1923, occurred while Coolidge was visiting his father at his Vermont farmhouse, and on August 3 Calvin Coolidge took the oath of office as President, his father, a notary public, officiating. A second oath was taken two weeks later in Washington. No changes were made in the Cabinet until the Teapot Dome investigation began, following which Edwin L. Denby, secretary of the navy, and Harry M. Daugherty, attorney general, were forced to resign. In this administration, the war veterans were demanding adjusted compensation, and the Soldiers' Bonus Act was passed over the President's veto. Coolidge also vetoed a pension bill in behalf of veterans of the Civil and Spanish-American wars and a bill increasing the pay of postal employees. He restricted immigration and reduced the income tax, and as he had the confidence of the people his nomination for a full term seemed inevitable. In 1924 he was re-elected with Charles G. Dawes as Vice-President.

The term beginning in 1925 was notable for an international agreement renouncing war, the continued reduction of the public debt, the funding of debts owed to the United States by foreign nations, a wave of prosperity with attending speculation in stocks and the development of aviation. Coolidge was considered a strong condidate for a second elected term, but in the summer of 1927 he announced his refusal to seek re-election in a message marked by his usual brevity: "I do not choose to run for President in 1928." Some did not take his decision seriously, and "draft Coolidge" movements were encouraged in various sections. The President frowned on these movements, but his name was actually presented in the convention of 1928, which nominated the secretary of commerce, Herbert Hoover, by a great majority. Coolidge retired from the Presidency with the good will of the great body of citizens. He reopened his law office in Northampton and for a time engaged in journalistic work, having accepted an offer from a magazine to write his life and another from a daily paper to contribute a column on current affairs. His death occurred from heart failure, entirely without warning.

Coolidge, William David (1873-), American physical chemist, born in Hudson, Mass., and educated at the Massachusetts Institute of Technology and the University of Leipzig. He invented the improved X-ray apparatus known as the "Coolidge tube." After a career as teacher and research worker at the Massachusetts Institute of Technology, he became associated (1905) with the General Electric Company in Schenectady, N. Y., becoming assistant director of the Research Laboratory in 1908. He received the Rumford Medal for his invention and application of ductile tungsten.

Cooper, Dexter Parshall (1880-1938), American hydraulic engineer, brother of Hugh Lincoln Cooper and associated with him in building American power dams. The younger Cooper devoted his last years to the plan for harnessing the Bay of Fundy tides with a dam at Passamaquoddy, Me., a project that was abandoned in 1936.

Cooper, Hugh Lincoln (1865-1937), American power engineer, son of a famous bridge-builder, built electric power works in every part of the world, notably at Keokuk, Iowa, Niagara Falls, Muscle Shoals, Ala., and the great Dnieprostroy dam in the Ukraine region of the U.S.S.R.

Cooper, James Fenimore (1789-1851), American novelist, born in Burlington, N. J. He studied at Yale and then decided to be a sailor in the merchant marine. In 1820 he produced his first novel *Precaution*. It was a failure because it dealt with the English aristocracy, about which he knew nothing, but *The Spy* (1821-22) was a pronounced success and proof that his strength lay in adventure stories about the young America. Thereafter Cooper wrote books in rapid succession. Not all of them were up to the standard of his best novel—*The Last of the Mohicans*—but he produced a number that give him rank with the foremost writers of fiction. *The Pioneers, The Prairie, The Pilot, The Red Rover, The Pathfinder* and *The Deerslayer* are robust stories of power and imagination. The author preserved for future generations a phase of life that was soon to pass, and he added a few genuine characters to American fiction—Harvey Birch, the spy; Natty Bumppo or "Leather-stocking," the hero of the pioneer romances called "Leatherstocking Tales"; Long Tom Coffin; and Uncas, the Indian. Besides his novels he wrote a history of the United States navy.

Cooper, Peter (1791-1883), American inventor and philanthropist, born in New York city. At the age of 17 he became apprentice to a carriage maker, and a few years later he invented a machine for shearing cloth that was used in the War of 1812. Cooper began the manufacture of glue and isinglass in 1824 and maintained that business for half a century. He also made iron products and in 1830 built the first steam locomotive used on an American road, the famous *Tom Thumb*. The laying of the Atlantic cable was due in part to his efforts. He was the founder of Cooper Union, a day and evening school for the working people of his native city. In 1876 he was nominated for the Presidency by a group of independents and received nearly 100,000 votes.

Cope, Edward Drinker (1840-97), American naturalist, born in Philadelphia. After attending a Friends' school for some years he was settled on a farm by his father but soon turned his thoughts to the study of biology. He became a member of the Academy of Natural Sciences at Philadelphia and published several scientific papers on reptiles. He made a large collection of fossil mammals and sold it to the American Museum of Natural History, New York. In all, he published 1,281 scientific papers.

COPERNICUS, NIKOLAUS (1473-1543), Polish astronomer, born in Thorn (then part of Poland). He is famed for his publication of the theory upon which modern astronomy is based—that the planets revolve about the sun. Having studied medicine and theology at Cracow and law at Bologna, he was made a canon of Frauenburg in 1497. In 1500 he went to Rome, where he taught mathematics and astronomy. He studied medicine at Padua and in 1505 finally left Italy for Prussia to carry out the work of his life.

Doubting that the motions of the heavenly bodies could be so confused and complicated as the Ptolemaic system made them, he brought out the simpler hypothesis that the sun was the center round which earth and the other plants revolve. Besides announcing this fundamental truth, Copernicus stated other facts of astronomical science, such as the motion of the earth round its axis and the immense distance of the stars, which made their apparent position the same from any part of the earth's orbit. His general theory also enabled him to explain for the first time many of the important phenomena of nature, such as the variations of the seasons and the precession of the equinoxes.

The great work in which Copernicus explained his theory, *De Orbium Coelestium Revolutionibus* ("On the Revolutions of the Celestial Orbs"), was completed in 1530, but the author delayed publishing it until 1543, because the public was not ready for a theory apparently so opposed to religious teaching.

Copley, John Singleton (1738-1815), American painter, born in Boston. Since he painted many of the important Americans of the Revolutionary period, his portraits are historically valuable, especially since his style is most realistic. Among the best portraits are those of John Hancock and Samuel Adams in the Boston Museum. He also painted many historical scenes.

Coquelin, Benoît Constant (1841-1909), French actor, remarkable for his ability to portray a wide variety of roles with convincing realism. To each characterization he gave an original interpretation. He made his debut in Paris as a comedian, in 1860, and was immediately successful. He visited the United States three times, appearing in Rostand's *L'Aiglon* as leading man for Sarah Bernhardt. Coquelin's most celebrated role was that of Cyrano de Bergerac.

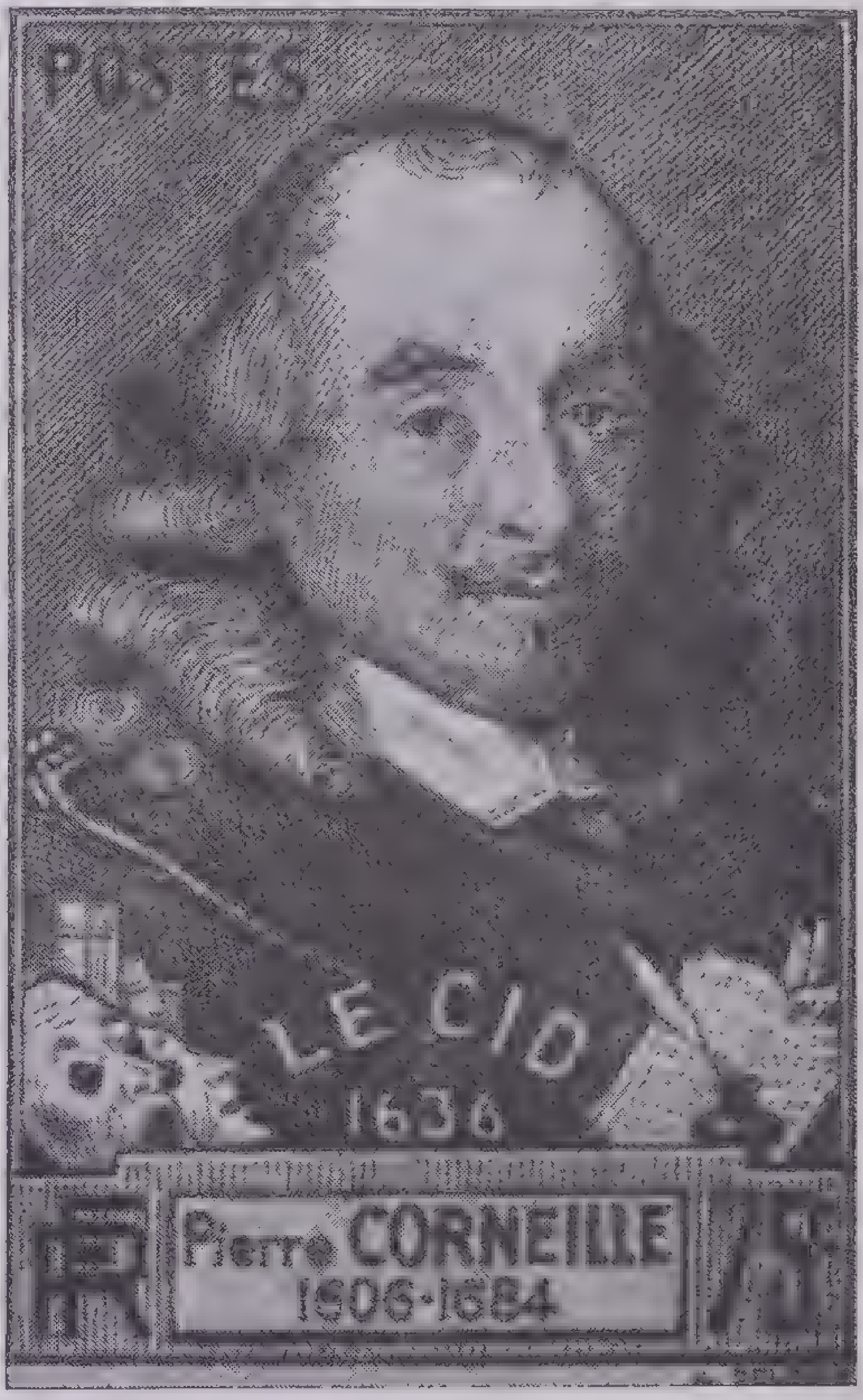
Corbett, James John (1866-1933), American pugilist. He won the world's heavyweight championship from John L. Sullivan in New Orleans in 1892 and lost it to Robert Fitzsimmons in Carson City, Nev., in 1897. Known as "Gentleman Jim", he had worked in a bank and after gaining fame acted in a number of stage plays.

Corday d'Armont, de, Marie Anne Charlotte (1768-93), French revolutionary, born in Normandy of noble parentage. At first she sympathized with the people of the Revolution, but after the fall of the moderate Girondist party, she turned from the Revolutionists who were inaugurating a reign of terror. Convinced that France would be saved only by the death of Marat, she forced her way into his house, and pretending that she could give him the names of certain Girondist enemies, stabbed him while he was in his bath. She herself paid a murderer's penalty under the guillotine.

Corelli, Marie (1864-1924), English novelist, the daughter of a Scottish mother and an Italian father. She was adopted in her infancy by Charles Mackay, British poet and journalist. After her education in London and in a French convent, she tried novel writing, chiefly to help her foster father. Her first two successful books, *The Romance of Two Worlds* and *The Vendetta* (1886), were followed by a long list of novels that were very popular. They include *Thelma, Barabbas, The Sorrows of Satan, The Master Christian* and *Secret Power.*

Coriolanus (5th century B.C.), Roman hero. Of patrician birth he scorned plebeians, and in 491 B.C., during a famine, he was banished for proposing that no grain be distributed among the people unless they gave up their tribunes (officials appointed to represent and protect them). In revenge he took command of the Volscian forces and led them close to Rome, which was threatened with capture. Refusing to listen to the several messengers sent to plead with him, he finally yielded to the entreaties of a group of matrons, among whom were his wife and aged mother. Coriolanus then led the Volscians back to their own country and remained there until his death. The legendary story of Coriolanus forms the subject of one of Shakespeare's plays.

Corneille, Pierre (1606-84), French dramatist, born in Rouen and educated for the law. The success of his first play *Mélite* (1629) induced him to take up literature as a profession. He wrote a number of mildly successful comedies, but when *Le Cid* appeared in 1636, his greatness was seen. This play, part tragedy and part comedy, is regarded as the beginning of modern French drama. Not all of Corneille's subsequent plays were in a class with this masterpiece, but at least three of his tragedies—*Horace, Cinna* and *Polyeucte*—are among the great examples of dramatic literature.



Courtesy Scott Stamp & Coin Company

Pierre Corneille

Enlarged from a French postage stamp issued in 1936 to commemorate the 300th anniversary of the publication of *The Cid*

Cornelia (2nd century B.C.), Roman matron, celebrated as the mother of Tiberius and Gaius Gracchus. When some one asked to see her jewels, she pointed to her sons and said, "These are my jewels." Upon her death, a statue was erected to her memory, on the base of which were inscribed the words—"Cornelia, Mother of the Gracchi."

Cornelius, von, Peter (1783-1867), German historical painter, born in Düsseldorf, where he studied at the academy. In Rome, which he visited in 1811 in order to broaden his talent, he fell in with a group of German painters called "Nazarenes," whose aim was the restoration of simplicity and sincerity to painting. Cornelius and some of the Nazarenes were asked to decorate a room in the Prussian consulate, and in carrying out this commission they revived the art of fresco painting. In 1825 Cornelius was appointed director of the Academy of Munich. His frescoes for the Glyptothek in that city, representing Greek myths, are representative of his best work, noble in conception and excellent in composition. The actual painting was done by pupils from their teacher's masterly cartoons.

Cornell, Katharine (1898-), American actress, born in Berlin, Germany, educated in New York state. Miss Cornell began her stage career in 1917 as one of the Washington Square Players and in 1919-20 and 1920-21 was with the Jesse Bonstelle Stock Company. She traveled with *The Man Who Came Back*, in 1920 and the same year played in London in *Little Women*. Subsequently, ably directed by her husband, Guthrie McClintic, she starred in the New York productions of *Bill of Divorcement, Candida, The Green Hat, The Letter, The Barretts of Wimpole Street, Saint Joan* and *Romeo and Juliet*.

Cornwallis, Charles, 1st Marquis and 2d Earl (1738-1805), English general and statesman, born in London. After completing his education at Cambridge, Cornwallis entered the army, participated in the Seven Years War and became major general in 1775. He commanded British forces in America against the revolutionary colonies, acting under Generals Howe and Clinton. In 1781, after a siege at Yorktown, Va., he surrendered to General Washington. This marked the end of the Revolutionary War and indicated victory for the American colonies. Back in England, Lord Cornwallis was appointed governor general of India.

Corot, Jean Baptiste Camille (1796-1875), French artist, called the "lyric poet of the Barbizon painters." He visited the important countries of Europe and studied under good teachers, but his art was unique, an expression of his desire to show the beauty of nature in delicate and tender forms and moods. Soft colors and misty backgrounds were his delight. Corot spent most of his life in the forest of Fontainebleau and the Seine Valley. In his later years, honors and riches made up for an early lack of recognition. Among his paintings are *Bridge of Narni, Dance of the Nymphs, Paysage, Morning* (Louvre, Paris) and *Ville d' Avray* (Metropolitan Museum, N. Y.). He also executed some religious and historical paintings.

Correggio, da, Antonio Allegri (*c.* 1494-1534), Italian painter, called Correggio from the place of his birth. Little is known of his early life, but it is believed that he came under the influence of many prominent artists of his time and that he did excellent work before he was 20. Correggio was a master of technique; in his handling of light and shade, his use of perspective and his ability to impart an effect of dramatic action he is an outstanding figure. Masterly, too, is his handling of color. His frescoes on the cupola of San Giovanni, together with those in the convent of San Paolo and the cathedral, all in Parma, are the summit of Correggio's achievements. Other famous works are *Marriage of St. Catherine* (Louvre, Paris), *Holy Night* (Dresden) and *Danaë* (Borghese Gallery, Rome).

Cortes or **Cortez, Hernando** (1485-1547), Spanish adventurer, famed as the conqueror of Mexico. In 1504 he departed for Santo Domingo, where he helped to suppress a revolt of the natives. Under Velasquez he displayed remarkable ability in the conquest of Cuba and in November, 1518, before his chief could stop him, set out for the mainland in command of seven vessels. The following spring, after many adventures, Cortes and his company founded a town on the site of Vera Cruz, renounced all allegiance to Velasquez and leaving a small garrison behind started inland for Mexico.

The capital city of the Aztecs was entered on Nov. 8, 1519. The visitors were at first unmolested. Later, when Cortes learned that the natives were plotting to drive him out, he seized Montezuma, the Aztec chief, and kept him as a hostage. While Cortes was absent on an expedition against Narvaez, who had been sent by Velasquez to arrest him, fighting broke out between the natives of Mexico City and the Spaniards under Alvarado. On his return, Cortes was permitted to enter the city but was at once attacked. Montezuma was killed and the Spaniards were driven out by a new emperor. After being harried by the Mexicans for six days, Cortes in desperation gave battle at Otumba and won a decisive victory (July, 1520). Within a year the conquest of Mexico was completed, colonists were brought over from Spain, and Mexico City was practically rebuilt. Through the intrigues of his enemies at home, Cortes was deprived of civil authority in Mexico, and in 1539 he returned to Spain, dying neglected and poor. During his sojourn in Mexico, he discovered Lower California (1536).

Cosgrave, William Thomas (1880-), Irish statesman, born in Dublin. One of the most active leaders of the Sinn Fein movement, he suffered imprisonment and at one time was under sentence of death. When Great Britain offered Ireland the status of a self-governing member of the empire, Cosgrave agreed to co-operate, and in August, 1922, on the deaths of Griffith and Collins, he became head of the provisional government. In December of that year, after the ratification of the Constitution, he was elected president of the executive council and held that position until 1932, when he was defeated by De Valera.

Coulomb, de, Charles Augustin (1736-1806), French physicist. Besides doing important original work in the field of electricity and magnetism, he invented the torsion balance for verifying electrical and magnetic laws. His name is preserved in the coulomb, the unit to measure quantity of electricity.

Coulter, John Merle (1851-1928), American botanist and educator, born in China, educated at Hanover College, Ind., and at Harvard. From 1872 to 1896, he was successively botanist to the United States Geological Survey in the Rocky Mountains, professor of natural science at Hanover College, professor of biology at Wabash College, president of Indiana State University and head of Lake Forest (Ill.) University. From 1896 until his death he was head of the botany department at the University of Chicago. He wrote a number of books on botanical subjects, including some widely used texts.

Courtois, Bernard (1777-1838), French chemist, born at Dijon. He is especially noted for having discovered the element iodine in 1812 by leaching the ashes of burnt seaweed. He did not make his discovery known until a year later, when the French Institute named it iodine for its color (from Greek *iodes*, violetlike). He was forgotten until 1832, when the Academy of Sciences awarded him 6,000 francs in appreciation of his services to medicine.

Coverdale, Miles (1488-1568), English clergyman, famed as the translator of the first complete Bible issued in the English language. Originally a Catholic monk of the Augustinian order, he accepted the Reformed faith about 1526 and brought out his translation of the Bible in 1535; the Psalms of this version are those used in the Book of Common Prayer. He became bishop of Exeter in 1551 but was removed from office and imprisoned by Mary I. A year later he was released and lived abroad until 1559. Coverdale wrote a number of tracts in support of the Reformation.

Coward, Noel (1899-), British playwright, composer and actor, born at Teddington, near London, and educated privately. He first appeared on the stage in 1910, and a few years later turned to writing plays. Some were unsuccessful, but he found himself a distinguished London playwright after *The Vortex* was produced in 1921. He soon became known as the most versatile man in British and American theaters, writing plays and revues, acting in many of them and producing some. His great successes are: *Hay Fever, On With the Dance* (Revue), *Bitter Sweet* (Operetta), *Private Lives, Cavalcade* and *Tonight at Eight-Thirty* (a series of nine one-act plays). Coward wrote and published in book form *Collected Sketches and Lyrics, Conversation Piece* and an autobiography, *Personal Indicative*.

Cowley, Abraham (1618-67), English poet and essayist. Inspired by reading Spenser's *Faerie Queene*, he wrote poems in boyhood and won renown at Cambridge as a translator and author of an epic on the life of David. Because of his royalist sympathies, Cowley was expelled from college during the Civil War and lived away from England for a decade. After the Restoration, he retired to an estate in Surrey. His best work includes his elegies on William Harvey and Richard Crashaw, his Pindaric odes, *To Light* (a hymn) and a number of gracefully written essays.

Cowper, William (1731-1800), English poet. He was admitted to the bar in 1754 but never practiced law because he was too shy and nervous and was subject to fits of religious insanity. Under the influence of a local curate Cowper wrote a number of hymns and soon began to produce poetry. He wrote much in blank verse about nature and simple country life and was widely imitated. Among his best known poems are, "The Colubriad," "John Gilpin," "To Mrs. Unwin," "To Mary" and "The Loss of the Royal George."

Cox, Kenyon (1856-1919), American artist and writer, born in Warren, Ohio. After studying for five years in Paris, under Carolus Duran and Gérôme, he returned to the United States, where he helped to found the Society of American Artists. Noteworthy mural paintings by Cox may be seen in the Library of Congress, Bowdoin College, the state capitols at St. Paul, Minn., and Des Moines, Iowa, and in other public buildings. He also designed the mosaics in the dome of the capitol at Madison, Wis. The Metropolitan Museum possesses his portrait of Saint-Gaudens and his *Harp Player*. Cox wrote a number of books on art, including *Painters and Sculptors* (1907) and *Concerning Painting* (1917). He married Louise Howland King, also a successful painter of figures and murals, who studied under Cox. Mrs. Cox is known especially for her portraits of children.

Crabbe, George (1754-1832), English poet, born in Aldeburgh, Suffolk. He became an unsuccessful practitioner of medicine in his native town, then in 1780 attempted to establish himself in London as a poet. His poetry won popularity and the admiration of Johnson, Scott, Wordsworth and other celebrities. Its chief merit is a vigorous realism in the description of nature and the lives of the poor. Its great defect is lack of imaginative power. *The Village* is Crabbe's best-known poem.

Craik, Dinah Maria, see *Mulock, Dinah Maria.*

Crane, Stephen (1871-1900), American novelist and journalist, born in Newark, N. J., educated at Lafayette College (Easton, Pa.) and Syracuse University. He became a reporter and newspaper writer in early manhood. When only 21, Crane wrote his first novel, *Maggie, a Girl of the Streets*. In 1896 his *Red Badge of Courage* made a deep impression because of its realistic description of the horrors of war. The next year, during the Greco-Turkish War, he was correspondent for a New York daily, and he also reported the Spanish-American War from Cuba. Before his death, which cut short a career of great promise, he had to his credit 14 novels, many short stories and a book of poems.

Crane, Walter (1845-1915), English illustrator, painter and writer, born in Liverpool and privately educated. He was an associate of the Pre-Raphaelite artists—Rossetti, Holman Hunt and Burne-Jones—and of William Morris, a leader in arts and crafts. Crane's talents found expression in many different fields, but he is especially well known as an illustrator of juvenile books, such as *The Baby's Opera, Grimm's Household Tales* and *Pan Pipes. The Birth of Venus* (Tate Gallery, London) and a self-portrait (Uffizi Gallery, Florence) are among his best paintings. Crane also designed tapestries, wallpapers and stained glass windows. An ardent socialist, he sought to correlate his economic and artistic views of life.

Cranmer, Thomas (1489-1556), English prelate. He came to the notice of Henry VIII by suggesting that Henry submit to the European universities the question of the legality of his marriage to Catherine of Aragon. In 1533 he was made Archbishop of Canterbury and was Henry's agent in divorcing Anne Boleyn and Anne of Cleves. He worked for the establishment of the Reformed faith during this reign and the succeeding one, when Edward VI was king. On the accession of Queen Mary, Cranmer was accused of treason, sentenced to death and burned at the stake in 1556.

Crawford, Francis Marion (1854-1909), American novelist, born in Italy, the son of the sculptor Thomas Crawford. He was educated in America, England and Germany and lived abroad most of his life. He began his literary career in 1879 as editor of the *Indian Herald* of Allahabad. Three years later, on the appearance of *Mr. Isaacs*, he emerged as a successful novelist, and his reputation in America and Europe steadily grew with the publication of a succession of romantic novels. Among these are *Dr. Claudius, A Roman Singer, Saracinesca, Via Crucis, In the Palace of the King, The Heart of Rome* and *The White Sister*. His play *Francesca da Rimini* was produced by Sarah Bernhardt in 1902.

Crawford, Thomas (*c.* 1813-57), American sculptor, born in New York, studied in Rome, where he spent most of his life. Crawford's work includes the figure *Armed Freedom* above the dome of the Capitol at Washington; an equestrian statue of Washington and figures of Patrick Henry and Jefferson for the Washington Monument in Richmond, Va.; *The Dancer; Dying Indian Maiden; Flora* (Metropolitan Museum, N. Y.); and a bust of Beethoven (Symphony Hall, Boston). Crawford married Louise Cutter Ward, and their youngest son was Francis Marion Crawford, novelist.

Crawford, William Harris (1772-1834), American statesman, born in Amherst County, Va. He was admitted to the Georgia bar in 1798, entered politics and in 1802 was elected to the state legislature. He entered the U. S. Senate by appointment in 1807 and was elected to a full term in 1811. In 1813 he was minister to France; secretary of war in 1815 and secretary of the treasury (1816-25) during Monroe's administration. In the election of 1824 he was an unsuccessful candidate for the Presidency, being third choice among four nominees. From 1827 until his death, Crawford served as a circuit judge in Georgia.

Creasy, Sir Edward Shepherd (1812-78), English historian, born in Bexley, Kent. He was called to the bar in 1837 and subsequently taught history in the University of London. From 1860 to 1870 he was chief justice of Ceylon. He is best known for his *Fifteen Decisive Battles of the World* (1852), an analysis of 15 military engagements that affected history in a decisive way.

Critias (*d.* 403 B.C.), Athenian orator and poet, pupil of Socrates. He was a leader of the Four Hundred, which for a time governed Athens, but was exiled in 411 B.C. After the defeat by Sparta, Critias returned to Athens and became head of the Thirty Tyrants (404 B.C.). He was cruel and arrogant, and no one mourned his death a year later, in a revolt against the Tyrants. His elegies, tragic poetry and history were admired by Plato.

Crittenden, John Jordan (1787-1863), American statesman, born in Kentucky, served in the state legislature at four different periods, the last time 1855-61. He was state governor (1848-50) and attorney general under Presidents Harrison and Fillmore. His name is perpetuated in the Crittenden Compromise (1860), which he offered in the U. S. Senate to prevent the secession of the South. Crittenden was consistently loyal to the Union in the Civil War, during which he died.

Crockett, David (1786-1836), American frontiersman, born in Greene County, Tenn. He had practically no schooling, yet he was sent to the state legislature in 1821 and 1823 and was three times elected to Congress, in 1826, 1828 and 1832. In the war between Texas and Mexico, Crockett fought with the Texans and was one of six survivors at the surrender of the Alamo to Santa Anna (1836). Santa Anna ordered them all massacred when they gave themselves up. His *Autobiography*, written in Crockett's racy backwoods style, is one of the treasured documents of American literature.

Croesus (*c.* 560 B.C.), last King of Lydia, a monarch so wealthy that his name is now a symbol of great riches. An oracle having told him that he would destroy a great empire, Croesus attacked the Persians under Cyrus the Great and suffered a crushing defeat. His magnificent capital Sardis was surrendered, and he saw the oracle's prophecy fulfilled in the loss of his own empire. His own fate is unknown, but it is believed his life was spared by his conqueror Cyrus.

Cromer, Evelyn Baring, 1st Earl (1841-1917), British statesman and diplomatist, called *Maker of Modern Egypt* because of his brilliant career as consul general in that country between 1883 and 1907. He began his active career in the army in India and was successively secretary to the governor general of India, financial executive in Egypt and finance minister of India. As virtual viceroy in Egypt he thoroughly reorganized the government and administration of that country. He published *Modern Egypt, Ancient and Modern Imperialism* and *Political and Literary Essays*.

Crompton, Samuel (1753-1827), English inventor, born near Bolton. In his youth he was engaged in weaving at home. Dissatisfied with the machines then in use, he perfected a device in 1779 that revolutionized the cotton industry by spinning a yarn suitable for weaving muslin. Many people were made rich by the invention, but Crompton realized only about $350 for his machine. In 1812 Parliament voted him a grant of about $25,000.

CROMWELL, OLIVER (1599-1658), Lord Protector of the Commonwealth of England, born in Huntingdon, a relative of Thomas Cromwell, Earl of Essex. Oliver went to a free school in his native town and in 1616 entered Sidney Sussex College at Cambridge but remained there less than a year. Having early experienced a "saving change," he emerged from a period of gloom a stern, convinced Puritan and Calvinist and a determined rebel against the authority of the Established Church. Cromwell sat as a member for Huntingdon in the Parliament of 1628 and during his earlier years in public life seems to have been more interested in opposing ecclesiastical tyranny than in fighting the political despotism of Charles I. This attitude was maintained in both the Short and the Long Parliaments (1640), in which he was a member for Cambridge.

His opportunity came when Civil War began in England. He fought at Edgehill (1642) and there perceived the weakness of the parliamentary troops against the spirit and dash of the royalist cavaliers. He saw that a counter-motive was required to meet the gallant traditions inspiring the king's soldiers, and this he found in the stern godliness of the English yeoman. Having organized his famous cavalry regiments from this class, he demonstrated the superiority of his troops, the "Ironsides," at Marston Moor (1644) and Naseby (1645) and stood forth as the greatest English military leader of the time.

Cromwell early attached himself to the independent party in the army and the state and was its representative in the struggles with Parliament, which, after Naseby, wished to disband the army. War was renewed and the opening battle was a great victory over the Scottish royalists near Preston (1648). Cromwell took an active part in the trial of Charles I, whose life the army had demanded, and was one of the signers of his death warrant. After Cromwell's return from a ruthless expedition against the royalists in Ireland, he was summoned to Scotland, where he won a decisive victory at Dunbar in 1650. A year later he ended his military career by winning at Worcester, England, a victory over the Scots army that had crossed the border with Charles II.

Though his military supremacy was unquestioned, Cromwell met serious difficulties as England's "uncrowned king." The Rump Parliament (remnant of the Long Parliament) showed itself so incompetent that Cromwell dismissed it (1653). Its successor, the Little or Barebones Parliament, was no better and dissolved itself voluntarily. At this point, the committee of officers drew up, in written form, the Instrument of Government, which made Cromwell practically a dictator, created for him the title Lord Protector of the Commonwealth of England, Scotland and Ireland, and provided for the election of a Parliament of one chamber. The first assembly summoned showed no comprehension of the needs of the country. A second, called in 1656, drew up a new constitution providing for an upper house and offering Cromwell the title of king. He refused the honor and in 1658 dissolved Parliament for the last time. Thenceforth he ruled without a legislature.

Meanwhile he had been upholding England's prestige abroad. He wanted his country to be the champion of Protestantism and so brought to an end an undesired war with Holland. He humbled Spain on the seas and allied England with France in an attack against the Spanish Netherlands. In this war the English soldiers covered themselves with glory before Dunkirk (1658), and England received that city as its share of the victory. At home Cromwell's stern military rule kept peace and order in the demoralized country. Puritanism was tolerated, but Catholicism and all tendencies towards Episcopalianism were resented. After the lapse of nearly three centuries, Cromwell stands out as one of the commanding figures in English history.

Cromwell, Thomas, Earl of Essex (*c.* 1485-1540), English statesman of humble birth and little education who rose to positions of influence through native ability. He entered Parliament as a protegé of Cardinal Wolsey, and became private secretary to Henry VIII. In 1540, after receiving a succession of appointments, he attained the rank of Earl of Essex. Meanwhile he had forced the Act of Supremacy by suppressing monasteries and had given the king valuable aid in establishing the Reformed faith in England. Cromwell arranged Henry's marriage to Anne of Cleves and shortly afterwards was accused of treason. The king, now disgusted with this marriage, had Cromwell beheaded.

Crookes, Sir William (1832-1919), British chemist and physicist, born in London. He studied at the Royal College of Chemistry and held positions in the Radcliffe Observatory, Oxford and at the Chester Training College but after 1854 devoted most of his time to original research and to editing scientific journals. He shared in the Nobel Prize for chemistry in 1907. Crookes discovered the element thallium (1861) and computed its atomic weight; he originated the radiometer, for measuring the intensity of radiant energy; introduced a new method of spectroscopic investigation; and discovered a process for separating gold and silver from their ores. The Crookes tube is his chief invention. This is a glass bulb that has two electrodes, cathode and anode. Crookes discovered the rays that appear when a high-voltage electric current is used.

Crosby, Fanny (1820-1915), American hymn writer, born in Southeast, N. Y., educated at the New York Institution for the Blind. She subsequently taught there until her marriage in 1858 to Alexander Van Alstyne, a music teacher. Sightless from infancy, Fanny Crosby wrote about 6,000 hymns, including *Safe in the Arms of Jesus; Pass Me Not, O Gentle Saviour; Jesus Is Calling; I Am Thine, O Lord; Blessed Assurance;* and *Close to Thee*. She wrote an autobiography *Memories of Eighty Years* (1906).

Crozier, William (1855-), American soldier, native of Carrollton, Ohio. He was graduated from West Point in 1876 and between that date and the outbreak of the World War served in campaigns against the Indians, in the Philippine insurrection and in the Peking relief expedition. During the World War he was chief of ordnance and a member of the War Council with the rank of major general, serving in France and Italy in 1918. With General Buffington, General Crozier invented the disappearing gun carriage that bears their name.

Cruikshank, George (1792-1878), English caricaturist, painter and etcher, the son of a London artist. He followed his father's profession but early developed great skill as an etcher. His famous book illustrations are in the works of Dickens, Scott, Defoe, Goldsmith, Fielding, Smollett and Ainsworth. His drawings on political subjects are of great historical value.

Cullom, Shelby Moore (1829-1914), American statesman, born in Wayne County, Ky., was taken to Illinois in infancy, residing in that state permanently. He began the practice of law and from early manhood was befriended by Lincoln. One of the first members of the Republican party, Cullom was also a delegate to the convention that nominated Lincoln. After serving many terms in the Illinois state legislature, he was elected to Congress and completed three terms after 1865. He was governor of Illinois (1876-83), and United States Senator (1883-1913). Cullom was the author of the Interstate Commerce Act of 1887. In 1911 he published *My Fifty Years of Public Service*.

Cunard, Sir Samuel (1787-1865), English shipowner and founder of the steamship line that bears his name, born in Halifax, N. S. He engaged in lumbering, whaling enterprises and banking, and in 1838 he moved to England. The Cunard Line, established in 1878, was the outgrowth of the Royal Mail Steam Packet Company, founded in 1839 by Cunard, with Nova Scotian and British backers. In 1840 its first vessel crossed from Liverpool to Boston in 14 days 8 hours.

Curie, Marie Sklodowska (1867-1934), French scientist, born in Warsaw, a resident of France, where she married Pierre Curie in 1895. Together they discovered radium and received half the Nobel Prize in Physics (1903). After her husband's death she was appointed his successor in the chair of physics at the Sorbonne. In 1911 she received the Nobel Prize in Chemistry. In 1919 she became professor of radiology at Warsaw. The French Government founded the Curie Institute, with Mme. Curie its director, for research work in the treatment of cancer. Mme. Curie's daughter Irène (Mme. Curie-Joliot) succeeded her as director of the Institute.

Curie, Pierre (1859-1906), French scientist, born in Paris, discovered the element radium with the aid of his wife, Marie. Inspired by Becquerel's discovery of radio-activity the Curies began their search for radio-active substances in 1896 and in 1898 announced their epoch-making discovery of radium and polonium. In 1903 they were awarded half the Nobel Prize in Physics.

Currie, Sir Arthur William (1875-1933), Canadian general, commander of the Dominion forces in Europe during the World War, born in Ontario. After being graduated from Strathroy Collegiate Institute, he taught school and engaged in business in British Columbia. He joined the Canadian Garrison Artillery in 1895 and subsequently became lieutenant colonel. When the World War broke out, Currie was commissioned brigalier general and in 1915 directed a brigade at Ypres. In June 1917 he was appointed head of the Canadian forces. From 1920 until his death he was principal of McGill University, Montreal.

Curtis, George Ticknor (1812-94), American jurist and historian, born in Watertown, Mass. and educated at Harvard. Admitted to the bar in 1836, he practiced law for the rest of his life, at first in Worcester and Boston and afterward in New York city and before the Federal Supreme Court. His many notable cases included those involving Dred Scott, legal tender and the Colt revolver patents. He was an eminent expert concerning the United States constitutional history and had a long list of books to his credit.

Curtis, George William (1824-92), American author and orator, born in Providence, R. I. He became associated with the New England writers who founded Brook Farm and lived there for a time when he was 18. After some years of travel Curtis returned to America in 1850 and began a distinguished literary career. He edited *Putnam's Monthly* and contributed his famous "Editor's Easy Chair" to *Harper's Magazine*. Curtis had a pleasing, graceful style, which may be enjoyed in such books as *Prue and I*, in his collected essays and his travel series.

Curtiss, Glenn Hammond (1878-1930), American pioneer in aviation and inventor. Born and educated in Hammondsport, N. Y., Curtiss showed mechanical ingenuity from boyhood and as early as 1902 had started a motorcycle factory in Hammondsport. He began to give the first public airplane flights in America (the Wright brothers were conducting their work in secret), and in 1908 he won the Scientific American trophy for the first public flight of one mile, piloting the June Bug, a plane of his own construction. After winning the Gordon Bennett Cup and the New York World Prize of $10,000 for flights in Curtiss-designed biplanes, he made the first public demonstration of the hydro-aeroplane in 1911. In 1912 his flying boat (an airplane equipped with pontoons) won the prize of the Aero Club of America. In 1914 Curtiss built for Rodman Wanamaker the America, the first heavier-than-air flying craft designed for overseas flight. The first Atlantic crossing achieved by any kind of aircraft was made by a Curtiss machine in 1919. During the World War Curtiss built all types of planes for the United States and allied nations.

Curzon of Kedleston, George Nathaniel, 1st Earl (1859-1925), English statesman, born at Kedleston, Derbyshire. He attended Eton and Oxford and entered Parliament in 1886 as a Conservative. After holding several cabinet positions he was appointed viceroy of India in 1898. Resigning in 1905 to show his disapproval of Kitchener's method of commanding the military forces in India, he returned to England and became a member of the cabinet during the World War. In 1919 he succeeded Balfour as foreign minister, a post he held until 1924. In 1895 Curzon married Mary Leiter of Chicago.

Cushing, Caleb (1800-1879), American statesman, born at Salisbury, Mass., and educated at Harvard. After some experience in local politics, Cushing was elected to Congress as a Whig in 1835 and served four terms. Subsequently, he became a Democrat and in 1843 went to China as the representative of President Tyler, there concluding a treaty that was of material advantage to American interests. During the Mexican War Cushing rose to the rank of brigadier general. He continued prominent in public and served as attorney general during Pierce's administration (1853-57) and as one of the American representatives in the settlement of the Alabama claims (1872). His last public service was performed as minister to Spain (1874-77).

Cushman, Charlotte Saunders (1816-76), American actress, born in Boston. She studied for the operatic stage, making her debut in 1835, but her voice failed within a few months, so she turned to the speaking stage and enjoyed a long career as one of America's leading actresses. She won great acclaim as Lady Macbeth and was much liked as Meg Merrilies in Scott's *Guy Mannering*. For years Miss Cushman played season after season in the Park Theater, New York, and was also a favorite in Europe. Among other successful impersonations were those of Queen, Lady Teazle, and Romeo, which she played to her sister Susan's Juliet.

Custer, George Armstrong (1839-76), American soldier, best known as the leader of a band of cavalry annihilated in a battle with the Sioux Indians. Custer was born in New Rumley, Ohio, and was graduated from West Point in 1861, just in time to participate in the first battle of Bull Run. He served with distinction throughout the war, rising to the rank of brevet major general of volunteers. As lieutenant colonel of the Seventh Cavalry he became an Indian fighter in 1867 and in 1873 was ordered to Dakota Territory to help suppress a revolt of the Sioux under Sitting Bull and Crazy Horse. In June 1876 on the Little Big Horn River, Custer and five companies of his regiment (about 250 men) were suddenly attacked by a superior force of Indians and were massacred. A national cemetery occupies the site of the battle. Custer was buried at West Point.

Cuvier, Georges Léopold Chrétien Frédéric Dagobert, Baron (1769-1832), French scientist and naturalist, born in Montbéliard, France. After 4 years at the Academy of Stuttgart, he devoted his time to the study of animal anatomy. In 1795 he moved to Paris, speedily won recognition there and in 1800 became professor of natural history at the College of France. Two years later, he became professor of comparative anatomy at the Jardin des Plantes.

From that time Cuvier devoted himself steadily to the investigations that have given him fame as the founder of the science of paleontology. His *Leçons d'anatomie* (1800-05) and *Le règne animal* (1816) contain the essentials of his theory of comparative anatomy. He put forth the idea that any one part of a body has a definite relationship to all other parts, since all work together. The purpose of one part, such as a bone, can be found by examining its shape, size and the like. That examination should tell so much about the size and habits of the animal that the shape and size of other bones can be described without ever having been seen.

Cuvier was able to do this: he could tell from the inspection of a single fossil bone not only the family to which it ought to belong, but the genus to which it must be referred. Even the very species of animal could be decided, and the restoration of its external form as it might have lived and died, became in his hands an object of certainty and precision. His book on the animal kingdom has been frequently translated and forms the basis of all arrangements followed at the present time. Cuvier filled many offices of importance and was honored by Napoleon, Louis XVIII, Charles X, and Louis Philippe.

Cyrus the Great (6th century B.C.), founder of the Persian Empire. According to cuneiform records he was the son of the Persian King Cambyses. Herodotus calls him the grandson of the Median King Astyages, whose vassal he was. Few rulers have been so often the subject of legend, but we know that Cyrus defeated Astyages in 549 B.C. and then reigned over the Medo-Persian realm. He subdued Croesus of Lydia in 546 B.C., thus becoming ruler of practically all Asia Minor. In 539 B.C. Cyrus brought his career to a climax by conquering the city of Babylon, whose king, Nabonidus, was an exile. Cyrus permitted the captive Jews to return to Jerusalem to rebuild their Temple, as told in the Book of Ezra. Ten years later, the conqueror fell in battle while fighting a nomad people to the north. Cyrus was a humane and enlightened ruler.

Cyrus the Younger (424-401 B.C.), King of Persia, second son of Darius II. In 404 B.C. Cyrus plotted against his older brother who had ascended the throne; when his scheme was disclosed, he was saved from death only by the plea of his mother. Though made a governor of Asia Minor, Cyrus continued his plotting, and in 401 B.C. left Sardis, the Lydian capital, with a great army that included 13,000 Greek mercenaries. This army met defeat at Cunaxa, where Cyrus was killed. The retreat of 10,000 Greeks, who fought their way out, is the subject of Xenophon's *Anabasis*.

Czerny, Karl (1791-1857), Austrian pianist and composer, born in Vienna. He was a pupil of Beethoven and an instructor of Liszt. Czerny's compositions for the piano, his most significant work, are much used by students of that instrument.

Daguerre, Louis Jacques Mandé (1789-1851), French inventor of the photographic process named daguerreotype. This type of photography was shown publicly in 1839, 6 years after the death of J. N. Niepce, who had collaborated with Daguerre in the invention. Daguerre received a State pension and membership in the Legion of Honor. Earlier in his career he was an opera scene painter and set up a diorama in Paris in 1822. The daguerreotype process was described to the Academy of Sciences a few days after the publication of the Talbot-type process.

Dahlgren, John Adolph (1809-70), American naval officer and inventor of the gun that bears his name, a native of Philadelphia. He enlisted in the navy as midshipman in 1826, was promoted to lieutenant in 1837 and in 1844 was transferred to the ordnance bureau, of which he was chief in 1862-63 and 1868-70. Dahlgren became a rear admiral in 1863 and commanded the South Atlantic squadron until the end of the Civil War. The Dahlgren high-powered shell gun, invented in 1850, was used by the navy during that war. In the last months of his life he had charge of the Washington navy yard.

Dale, Sir Thomas (d. 1619), colonial governor of Virginia. From 1611 to 1616 he was in control of the colony (the period becoming known as "5 years of slavery" under the severe Dale Code). He did, however, restore private ownership, improve sanitary conditions and provide against Indian attacks. Through just dealing with the Indians he won their favor.

Dalhousie, James Andrew Broun Ramsay, 10th Earl and 1st Marquis of (1812-60), British administrator, born in Scotland. He was elected to Parliament as a Conservative in 1837. The young man's excellent record as president of the Board of Trade in 1845-46 won him appointment as governor general of India in 1847. In his administration of nine years, British India profited by a great development of transportation and resources and considerable territorial expansion. Dalhousie was created a marquis in 1849.

Dallas, George Mifflin (1792-1864), American statesman, born in Philadelphia, educated at Princeton and admitted to the bar in 1813. After holding public offices in Pennsylvania, he was in the U. S. Senate (1831-33) and subsequently filled the offices of attorney general of his state (1833-35) and American minister to Russia (1837-39). He became Vice-President in 1844 on the ticket with James K. Polk. Dallas was appointed minister to the Court of St. James in 1856 and remained in London until 1861.

Dalton, John (1766-1844), English scientist, born in Cumberland. After 1793 he lived chiefly in Manchester, where he taught mathematics and the physical sciences. He is renowned as the formulator of the atomic theory and for Dalton's Law of partial pressures. Though it has been modified by the later electron theory, the atomic theory was the foundation of modern chemistry. In the realm of physics, Dalton was distinguished for his investigation of mixed gases, the force of steam, the elasticity of vapors and the expansion of gases by heat. He published the first scientific account of color blindness, often called Daltonism.

Damien de Veuster, Joseph (1840-89), Roman Catholic missionary, native of Belgium, honored for his devotion to the lepers on Molokai Island, Hawaii. He was sent to the leper colony in 1873 at his own request, and during his stay there not only organized educational and religious work, but improved housing and sanitary conditions and taught the lepers personal hygiene. He himself became a leper in 1884 and remained among his people until he died of the disease. Robert Louis Stevenson's *Open Letter to the Reverend Dr. Hyde* is a famous reply to an attack on Father Damien. His life has been written by several biographers, including Clifford and Stoddard.

Damrosch, Frank Heino (1859-1937), choral conductor, elder son of Leopold, received his early instruction in his native city of Breslau. He came to America with his father in 1871, was conductor of the Chorus Club in Denver, 1882-84, and chorus master at the Metropolitan Opera House in 1885-91. Thereafter he organized and conducted several choral societies and singing classes in New York and Philadelphia. In 1905 he resigned his position as director of music in the New York public schools to become organizer and director of the Institute of Musical Art.

Damrosch, Leopold (1832-85), composer and conductor, born in Posen, Prussia. After graduating in medicine, he practised for a few years but abandoned medicine for music. He studied music, appeared in concerts as a violinist and became a conductor in Breslau. In 1871 he came to the United States and until his death was identified with the musical life of New York city. He founded the Oratorio and Symphony Societies, organized choruses and music festivals and established German opera at the Metropolitan Opera House. His compositions include cantatas, songs and pieces for the violin.

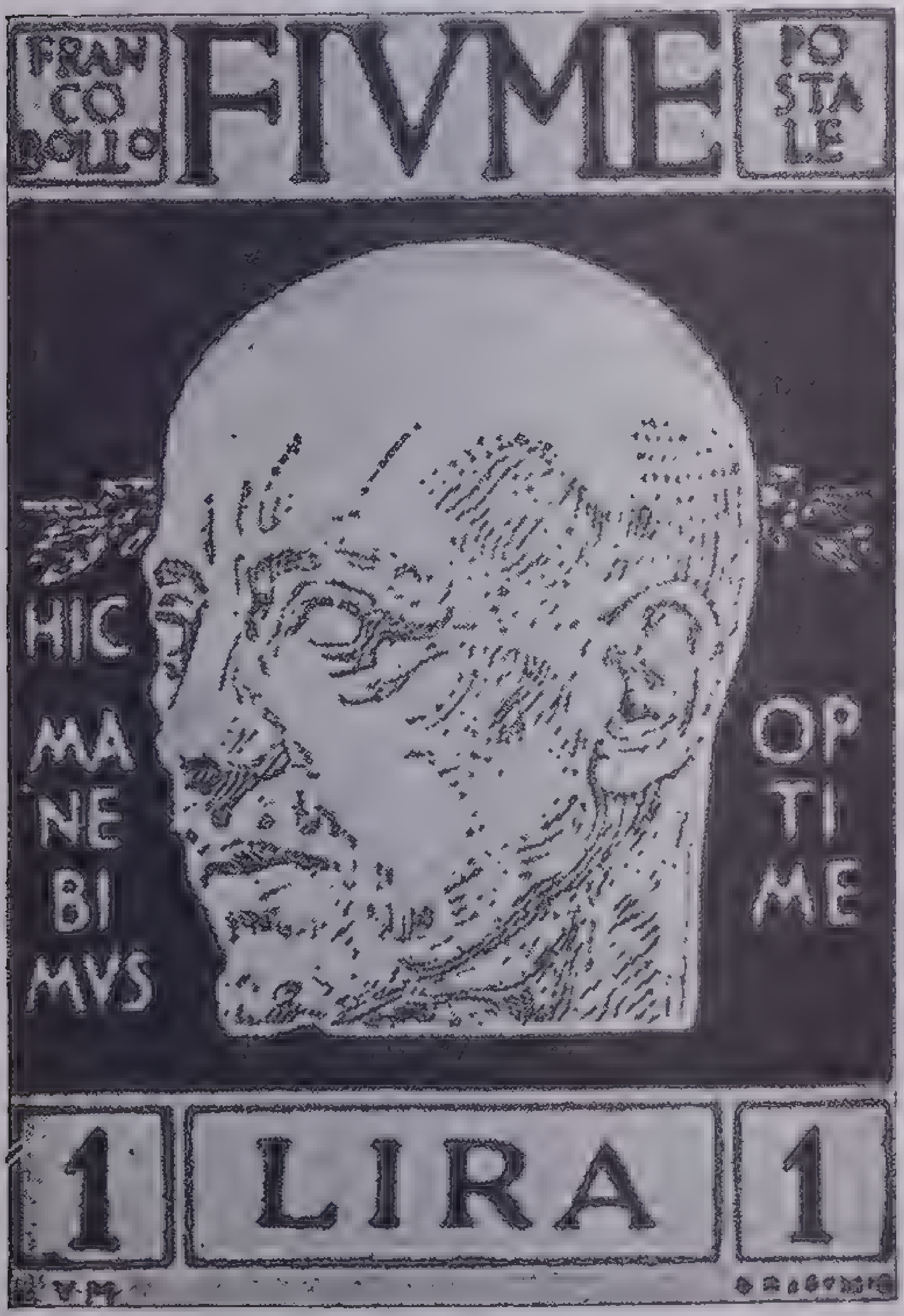
Damrosch, Walter (1862-), conductor and composer, son of Leopold, was also a native of Breslau, studied under his father and Hans von Bülow. He came to America in 1871 and on the death of his father in 1885 became assistant conductor and director of the German Opera Company and director of music for Oratorio and Symphony societies. The Damrosch Opera Company, founded by him in 1894 to produce Wagner's works, made several tours of the United States. Damrosch organized the New York Symphony Orchestra on a permanent basis in 1903. During the World War, he founded a school for bandmasters of the A.E.F., at Chaumont, France. After 1928 he was music counsel for the National Broadcasting Co. and developed music appreciation by radio broadcasts. He composed three operas, *The Scarlet Letter, Cyrano* and *The Man Without a Country.*

Dana, Charles Anderson (1819-97), American journalist, born in Hinsdale, N. H. His first editorial experience was with the *Harbinger,* the organ of Brook Farm. He was one of the founders of the New York *Tribune* and was on its staff from 1847 to 1862, resigning after a disagreement with Horace Greeley about war politics. In 1862-65 he did valuable work in the U. S. War Department. From 1868 until his death he was editor in chief of the New York *Sun.* The simple, clear literary style that he advocated had a great influence upon American journalism. Dana edited the *New American Cyclopedia* (with George Ripley) and its successor, the *American Cyclopedia.*

Dana, James Dwight (1813-95), American geologist and educator, born in Utica, N. Y. He studied at Yale 1830-33, and after an interval of three years, during which he traveled abroad as instructor in the United States navy, he returned to Yale as assistant to Professor Silliman. He traveled with the Wilkes exploring expedition 1838-42, and the permanent records of his investigations are today valuable governmental reports. Dana held the chair of natural history at Yale in 1855-90. From 1846 until his death, he served as editor of the *American Journal of Science.* His various books on mineralogy and geological subjects are standard authorities.

Dana, Richard Henry, Jr. (1815-82), American lawyer and author, born in Cambridge, Mass. He is best known for his book *Two Years Before the Mast,* which Dickens called "about the best sea book in the English language." The book is a record of a two-year voyage on the Pacific in the brig *Pilgrim,* and it portrays his own experiences as a common sailor. He took the trip to cure a weakness of eyesight, but it was also an outlet for a boyish passion for the sea. After his return Dana was graduated from Harvard (1837), and became a successful lawyer and distinguished authority on international law.

Daniels, Josephus (1862-   ), American editor and politician, secretary of the navy during Wilson's two terms (1913-1921). He was born in Washington, N. C., and educated for the law, but did not practice. He became state printer for North Carolina (1887-93), chief clerk of the Department of the Interior (1893-95), and after 1894 editor of the Raleigh (N. C.) *News and Observer,* which represents a consolidation of several newspapers. Daniels wrote, among other books, *Our Navy at War* (1922) and *Life of Woodrow Wilson* (1924). In 1933 he became U.S. Ambassador to Mexico.

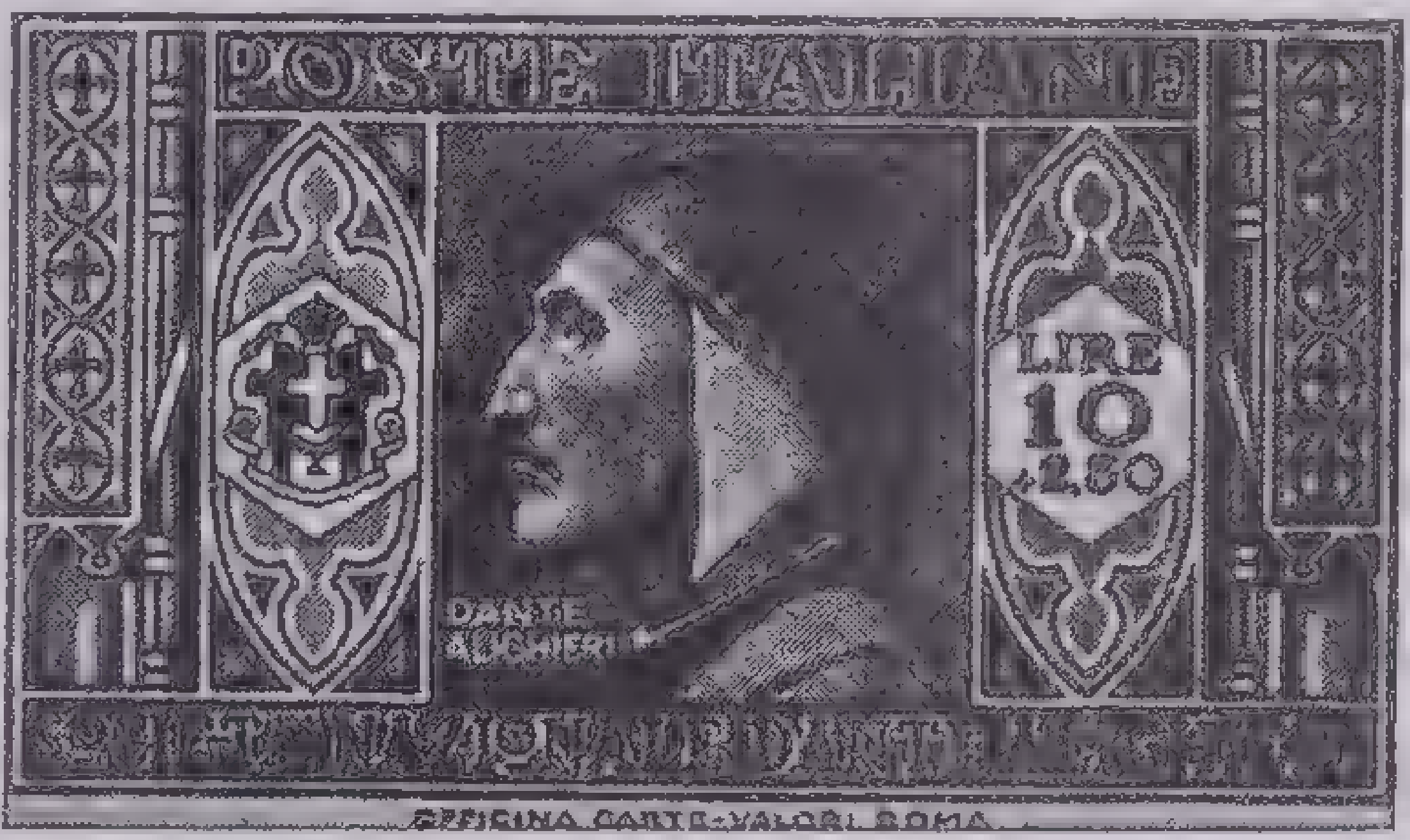


Courtesy Scott Stamp & Coin Company

Gabriele d'Annunzio

Enlarged from a postage stamp issued by the city of Fiume in 1920. The poet's portrait appears on a series of 14 denominations

D'Annunzio, Gabriele (1864-1938), Italian novelist, poet, dramatist and soldier. He began writing poetry at the age of 15. His first novel, *The Child of Pleasure* (1889), showed the author's interest in the psychological analysis of character. As a novelist D'Annunzio had passed the height of his powers when his *Flame of Life* (1898) appeared; it relates his love for Eleonora Duse, the Italian actress, who had appeared in *Gioconda, Francesca da Rimini* and other plays by D'Annunzio. The finest examples of his verse are in his *Laudi.* When he is at his best, his language, in poetry or prose, is highly artistic and splendidly imaginative. An intense patriot, he used his eloquence to persuade the Italians to enter the World War, took part in it himself as submarine raider and aviator and after the war defied the Allies and his own government by occupying Fiume. Though he was compelled to leave the city in 1921, it was later ceded to Italy. His fiery eloquence and passionate enthusiasm helped build the Fascist party.



Courtesy Scott Stamp & Coin Company

Dante Alighieri

Enlarged from an Italian postage stamp of 1931. The issue was sponsored by the Dante Alighieri Society. Other stamps in the series show portraits of 11 other famous Italian writers

DANTE (Dante Alighieri; 1265-1321), Italian poet, son of a lawyer, born in Florence, educated at Bologna and Padua universities. Dante was interested in politics and helped govern his native city. Because of a quarrel, he was condemned to be burnt alive and had to spend the rest of his life wandering to escape the penalty. He died in the city of Ravenna. Through life Dante dreamed of a great empire that would bring peace and unity to Italy and Europe. In his work *De Monarchia* he advocated the supremacy of the emperor in temporal, and that of the Pope in spiritual affairs.

When he was 9 years old, Dante met for the first time Beatrice Portinari, then 8 years of age, and the love then enkindled in the heart of the boy remained the inspiration of his life. Beatrice married Simone de Bardi and died young. A few years after her death Dante married Gemma Donati, by whom he had four children. He wrote a long poem, *The Divine Comedy.* It is full of marvelous learning and is one of the world's treasures. It describes an imaginary pilgrimage of the human soul, guided by Vergil and Beatrice. They descend through hell's three divisions and climb a seven-terraced purgatory into the earthly paradise, where Vergil leaves Beatrice to guide the pilgrims through the heavenly spheres. The *New Life,* completed in 1292, describes his love for the earthly Beatrice. He wrote several other works in Latin, besides many canzones, sonnets and lyrics in Italian; most of his lyrics were collected in his *Convito.* The best English translations of *The Divine Comedy* are those of Cary and of Longfellow.

Dante's writings in Italian practically established that language as a literary vehicle.

Danton, Georges Jacques (1759-94), French statesman, born in Arcis-sur-Aube. His training, brilliant mind and marked oratorical gifts made him one of the most successful lawyers of Paris. In sympathy with the Revolution from the beginning, he became one of its most radical adherents and in 1792 attained the office of minister of justice. Danton urged and voted for the death of the king in 1793 and was made president of the powerful Committee of Public Safety. As such he suppressed the moderate faction, or Girondists, and helped to set in motion the Reign of Terror. Later, when he sought to adopt a moderate policy, he himself fell victim to the guillotine, being seized by Robespierre and his friends.

Dare, Virginia (*b.* 1587), the first white child of English parents to be born in America. Her parents were Ananias and Ellinor Dare, who were members of Sir Walter Raleigh's colony on Roanoke Island off North Carolina. A relief ship from England brought supplies to the island in 1591 only to find the colony vanished and with it all trace of the child.

Darío, Felix Rubén (1867-1916), Spanish-American poet, born in Nicaragua. He spent the early part of his career in South America and was imprisoned in Ecuador after he had written an attack on that Government. He roamed from one country to another and from continent to continent. Dario brought grace to Spanish poetry. His early work, *Azul,* initiated the *modernista* (poetic prose) movement in Spanish-American literature. He wrote *Prosas Profanas and Other Poems* (in English, 1922). Between 1893 and 1912 11 volumes of his prose appeared, including *Los raros,* a volume of criticism, and his own *Life of Rubén Darío.*

Darius I the Great (*c.* 558-*c.* 486 B.C.), King of Persia, succeeded Cambyses in 521 B.C., after participating in a conspiracy to murder Gaumata. Darius was a great organizer and divided his empire into 20 satrapies, improved the methods of taxation, built roads and introduced a postal system. Though he greatly extended his empire and put down revolts, he was unsuccessful in his invasion of Greece; brought about by the efforts of the Athenians to help the rebellious Ionians. The great Athenian victory at Marathon occurred in 490 B.C. Darius died while he was planning a third invasion of Greece. He was succeeded by Xerxes.

Darius III, called *Codomannus* (*d.* 330 B.C.), last ruler of the Persian Empire. In 336 B.C. he ascended a throne menaced by the ambition of Philip of Macedonia, whose designs were carried to completion by his son, Alexander the Great. Defeated successively at Issus and Gaugamela, Darius was killed by his followers as he fled from the conqueror and with his death the Persian Empire came to an end.

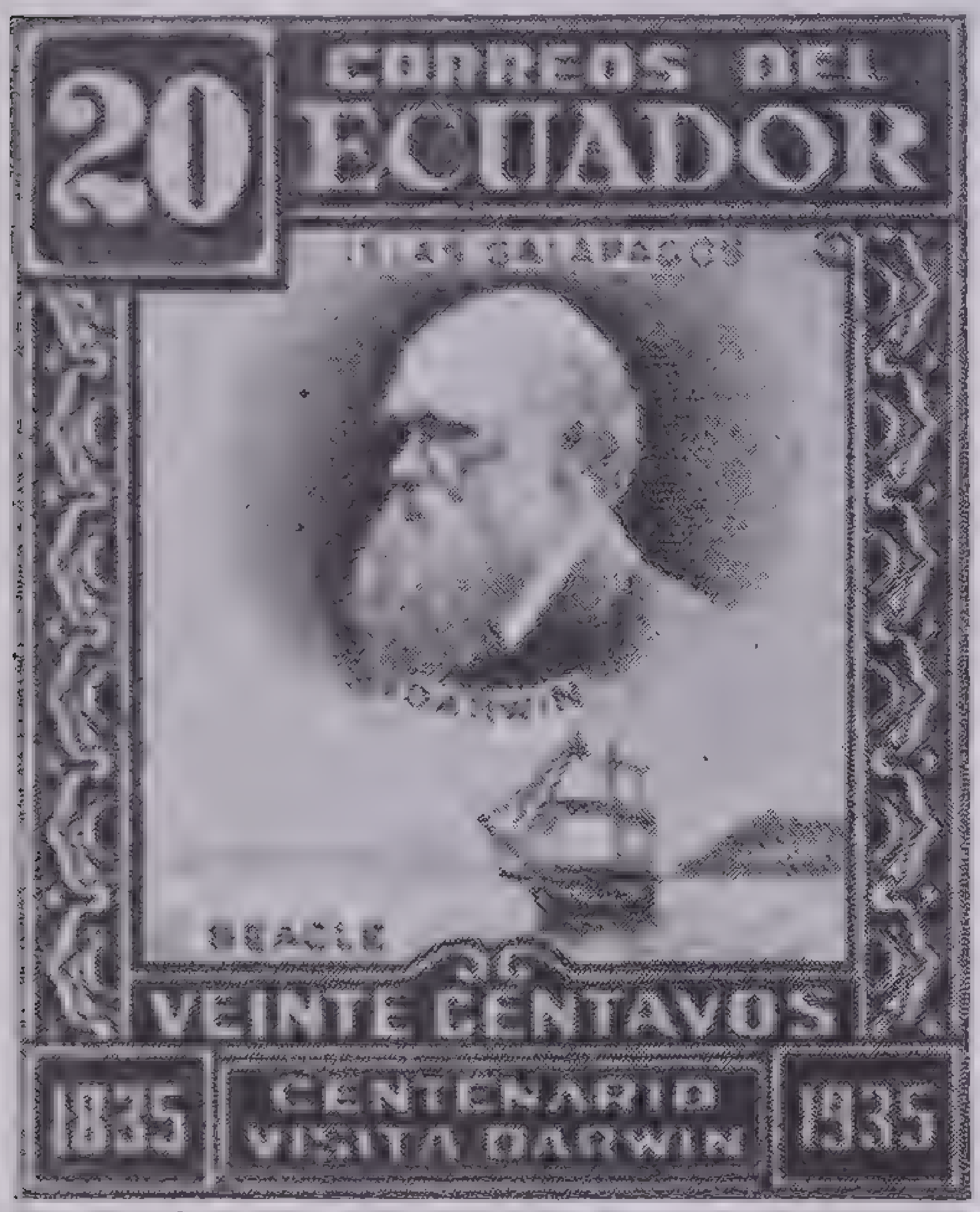
Darnley, Henry Stewart, Lord (1545-67), claimant to the throne of England, second husband of Mary Queen of Scots, father of James I of England, son of the Earl of Lennox and Margaret Douglas. Through his mother he was descended from Henry VII. Darnley's short married life, marked by his part in the murder of Rizzio, Mary's secretary, was ended when he was killed in an explosion.

Darrow, Clarence Seward (1857-1938), American lawyer, born at Kinsman, Ohio, educated in Ohio public schools, and admitted to the bar in 1878. Darrow became widely known through his connection with many spectacular trials, especially those involving monopolies, labor and crime. He was chief counsel for the anthracite miners in the coal-strike arbitration of 1902-03; was attorney for the McNamara brothers in the Los Angeles dynamite case (1911); represented Loeb and Leopold, youthful Chicago murderers; and fought against William Jennings Bryan in defending Scopes in the evolution case in Dayton, Tenn. He wrote *The Story of My Life* (1932). In 1934 Darrow was chairman of a governmental body appointed to investigate the operations of the National Recovery Act, and he severely criticized some of its features.

DARWIN, CHARLES ROBERT (1809-82), English naturalist, born in Shrewsbury, the son of a physician and grandson of a distinguished naturalist, educated at Edinburgh and Cambridge universities. He early devoted himself to the study of natural history and in 1831 was appointed naturalist to the surveying voyage of H. M. S. *Beagle.* The vessel sailed round the world, and Darwin came home with rich stores of knowledge, part of which he soon gave to the public in various works. In 1839 he married his cousin Emma Wedgwood and henceforth spent the life of a quiet country gentleman, engrossed in scientific pursuits—experimenting, observing, recording, reflecting and generalizing. In 1839 he published his *Journal of Researches During a Voyage Round the World;* in 1844 *Structure and Distribution of Coral Reefs; Geological Observations on Volcanic Islands,* etc.; in 1846 *Geological Observations in South America;* in 1851 and 1854 his *Monograph of the Cirripedia* and soon after the *Fossil Lepodridae and Balaenidae of Great Britain.* In 1859 his name attained its great celebrity by the publication of *The Origin of*

Species by Means of Natural Selection. This work, derided though it was at first in certain quarters, revolutionized biological science. In it for the first time was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection.

The rest of his works are largely based on the material he had accumulated for the elaboration of this great theory. The principal treatises are these: *Fertilization of Orchids* (1862), *Plants and Animals under Domestication* (1868); *Descent of Man and Selection in Relation to Sex* (1871); *The Expression of the Emotions in Man and Animals* (1872); *Movements and Habits of Climbing Plants* (1875); *Insectivorous Plants* (1875); *Cross and Self Fertilization* (1876); *The Power of Movement in Plants* (1880); and *The Formation of Vegetable Mould* (1881), which contains a vast amount of information in regard to the common earthworm.



Courtesy Scott Stamp & Coin Company

Charles Robert Darwin

Enlarged from an Ecuadorian postage stamp issued to commemorate the visit of Charles Darwin to the Galápagos Islands, September 17, 1835. Darwin wrote about the curious flora and fauna of the islands in *The Voyage of the Beagle*

D'Aubigné, Jean Henri Merle, see *Merle D'Aubigné, Jean Henri.*

Daudet, Alphonse (1840-97), French novelist, born in Nîmes, Provençe. In Paris, where he lived with his brother, a journalist, Alphonse began his literary career by publishing a volume of poems, *Les Amoureuses* (1858) followed by several plays. Between 1872 and 1888, he completed a remarkable series of novels depicting provincial and city types of character, displaying a gift for good-natured satire and a humorous appreciation of humanity's foibles that made him akin to both Dickens and Thackeray. Daudet's best works include *Tartarin on the Alps, The Nabob, Kings in Exile* and *Sapho. The Little Chap* and *Jack* are reminiscent of his unhappy experiences as a tutor in a boys' school. His *La Belle Nivernaise* and *Lettres de mon moulin* are books often read in French classes in American schools.

Daumier, Honoré (1808-69), French lithographer and painter. In 1831 he drew a clever cartoon of the king and for it he was sent to jail for six months. Upon his release he contributed drawings to the political journal *Caricature,* mercilessly depicting the blunders and corruption of the government. He produced about 5,000 lithographs during his life. As a painter he handled light and shade superbly. While Daumier lived he had to struggle against poverty and lack of appreciation and to add to his troubles, he lost his eyesight. He is now recognized as the most important French painter and caricaturist of the 19th century. His great painting *Third Class Carriage* is in the Metropolitan Museum, New York.

David, Félicien César (1810-76), French composer, called the "musical Orientalist." The atmosphere of the East in his compositions is derived from a rich imagination and personal contact with the Orient, for he wandered for two years in Turkey, Syria and Egypt before he began his career as composer. His first great success, a symphonic ode entitled *The Desert* (1844), achieved a triumph at the Paris Conservatory concerts. Besides several successful operas in the same vein, including *La Perle du Brésil* (1851) and *Lalla Roukh* (1862), David produced chamber music, songs and pieces for solo instruments. Bizet and Massenet owed much to him.

David, Jacques Louis (1748-1825), French painter of the Revolution and the Napoleonic era and founder of the modern French school of classicism. He took the coveted *Prix de Rome* in 1774 and his later work shows the influence of his devotion to the art of classic antiquity, studied during his 5 years in the Italian capital. Large historical canvases and realistic portraits are typical of his work. His classical subjects include *Oath of the Horatii* (Louvre), *Brutus Condemning his Sons to Death* (Louvre), *Death of Socrates* and *Rape of the Sabines* (Louvre). The portrait of Mlle. Du Val D'Ognes is in the Metropolitan Museum, New York. He became court painter under Napoleon but was banished on the restoration of the Bourbons and died in Brussels.

Davies, Arthur Bowen (1862-1928), American painter, born in Utica, N. Y. He studied at the Art Institute, Chicago, and in New York. For a time he was an illustrator of magazines, but his paintings attracted attention and he exhibited them in New York in 1899. Davies is best known as one of the romantic school. Some of his work shows marked cubist tendencies. Among his works are *Along the Erie Canal,* in the Phillips Memorial Gallery, Washington, D. C., *The Girdle of Ares,* in the Metropolitan Museum, New York, and *Night Overture* and *Spring in a Valley* in the Minneapolis Institute of Art.

Davis, Jefferson (1808-89), American statesman, President of the Confederate States of America, was born in Christian (now Todd) County, Ky. He entered Transylvania University, Lexington, Ky., but before graduation was transferred to West Point and was graduated there in 1828. After an interval of military service on the northwestern frontier, Davis lived for several years in retirement on his Mississippi plantation. He entered local politics in 1843 and in 1845 took his seat in Congress, where he was a supporter of Senator Calhoun and the states-rights doctrine. In 1846 he left Congress to participate in the Mexican War. As colonel of the Mississippi Volunteers, Davis fought at Monterey and Buena Vista. From 1847 until 1851 he represented Mississippi in the Senate, resigning in 1851 to run for governor of his state. Defeated by a small margin, he re-entered public life in 1853 as secretary of war under President Pierce and in that position showed great ability as organizer and executive. In 1857 Davis resumed his place in the Senate and from that time until the outbreak of the Civil War consistently upheld the southern viewpoint. His election to the Presidency of the provisional government of the Confederacy in 1861 and his re-election as President for the regular six-year term in 1862, were generally approved in the South.

He was personally incorruptible but sometimes showed lack of judgment and had no practical grasp of the problems at hand. Often he interfered with the plans of his generals. In May 1865 after Lee's surrender, he was captured in Georgia and imprisoned in Fortress Monroe. Though indicted for treason, he was released on bail in 1867 and in 1869 received unrestricted liberty. Davis traveled and engaged in business before retiring to Beauvoir, near Biloxi, Miss., in 1879, where he spent the rest of his life. He was buried in Richmond.

Davis, John (*c.* 1550-1605), British navigator, born in Devonshire. He undertook three voyages in search of the Northwest Passage. On these voyages he discovered Cumberland Sound on Baffin Island and sailed through Davis Strait into Baffin Bay. He crossed Hudson Strait; discovered and named Cape Chidley, Labrador. Although he did not find the Northwest Passage, he did much to clarify geography in the Arctic region. Davis served against the Spanish Armada and made several voyages to America. In 1592 he discovered the Falkland Islands. On his last voyage to the East Indies in 1604, his vessel was attacked by Japanese pirates near Singapore, and Davis was killed. He invented a quadrant long used by mariners.

Davis, John William (1873-), American lawyer and diplomat, born at Clarksburg, W. Va., graduated from Washington and Lee University. He completed a law course in 1895 and was admitted to the bar. After teaching in the law school of his university, he began as practicing lawyer in Clarksburg, W. Va. In later years, he became a member of a New York firm. In 1899 he served in the West Virginia House of Delegates and was subsequently elected as representative in the 62d and 63d congresses. Davis resigned his seat in 1913 to become United States solicitor general; he was ambassador to Great Britain 1918-21. In 1924 he was nominated for President by the Democrats, but was defeated by Calvin Coolidge.

Davis, Richard Harding (1864-1916), American journalist and novelist, born in Philadelphia, and educated at Lehigh and Johns Hopkins universities. He began an active career as a reporter in Philadelphia, later joined the staff of the New York *Evening Sun* in 1890 and was managing editor of *Harper's Weekly* 1891-94. About this time he began writing magazine stories and in 1895 published his first long narrative. He acted as a field correspondent in the Graeco-Turkish, Spanish-American, South African, Russo-Japanese, Balkan and World wars and was one of the most widely read of the war journalists. His gift for spirited narrative, realistic description and clear-cut characterization is shown in such stories as *Ranson's Folly, The Bar Sinister, Van Bibber and Others, Soldiers of Fortune* and *Captain Macklin.*

Davitt, Michael (1846-1906), Irish journalist and political leader, born in Straid, County Mayo. His early life was one of poverty and hard work; he was self-educated. From 1867 he was an active leader in the Irish movement for freedom, and during 1870-77 served half of a prison sentence for bearing arms into Ireland, being released on a ticket of leave. In 1879 Davitt organized the Irish Land League, which developed into a national movement. Subsequently imprisoned on two different occasions, and unseated after being elected to the House of Commons, Davitt remained a bitter opponent of English rule. In economic matters he was an opponent of Parnell.

Davy, Sir Humphry (1778-1829), English chemist, born in Cornwall. His first notable achievement was the discovery of the anesthetic effects of nitrous oxide, or laughing gas. This led to his appointment as lecturer at the Royal Institution of London, at the age of 22. For a decade (1802-12) he occupied the chair of chemistry there. He made valuable contributions to chemical theory, for he decomposed potash, soda, lime, baryta and strontia. He also proved that chlorine is an element and combines with hydrogen to form hydrochloric acid. He invented the Davy safety lamp long used to protect miners from explosions of fire damp.

Dawes, Charles Gates (1865-), American banker and statesman, born at Marietta, Ohio, and educated at Marietta College and the Cincinnati Law School. In 1887-94 he practiced law in Lincoln, Neb., and, in 1897, after moving to Evanston, Ill., he was appointed comptroller of the treasury by President McKinley. Later he established a banking business in Chicago which developed into the Central Trust Company of Illinois. Brilliant service during the World War, in the engineering division and on the purchasing board of the allied forces, led to his later appointment by President Harding as first director of the Bureau of the Budget. He left the service with the rank of brigadier general. In 1923 Dawes was made chairman of the committee which organized the "Dawes Plan" to rehabilitate German finances. The next year he was elected Vice-President with President Coolidge and at the close of the administration in 1929 was appointed ambassador to Great Britain by President Hoover. He resigned this post in January 1932 to become president of the Emergency Reconstruction Corporation, created to deal with financial problems rising out of the depression. As soon as the Corporation was in working order, Dawes resigned to resume his banking career. The Nobel Peace Prize for 1925 was awarded jointly to Dawes and Sir Austen Chamberlain.

Dawson, George Mercer (1840-1901), Canadian geologist, son of Sir John W. Dawson, an educator. He studied at McGill University and the Royal School of Mines, London. In 1874 he became assistant director of the Canadian Geological Survey, serving as its director from 1895 until his death. Dawson City, capital of Yukon Territory, was named for him as a tribute to his work on the government survey of that region in 1887. Dawson served on the Bering Sea Commission (1894), which arbitrated the seal-fisheries controversy. He was the author of numerous scientific books, papers and reports.

Deane, Silas (1737-89), American diplomat who, with Benjamin Franklin and Arthur Lee, signed the treaty of commerce and alliance with France during the Revolution (1778). Deane had previously acted as business agent of the United States at Paris and on his return was asked for an accounting of expenditures, Lee having implied that he has misused public funds. He was unsystematic in his financial records and was unable to convince Congress of his integrity and he passed the latter part of his life in Europe. Not until half a century after his death did Congress wind up his affairs and declare Lee's accusation as "a gross injustice." Deane's heirs then received $37,000.

Debs, Eugene Victor (1855-1926), American labor organizer and Socialist leader, candidate for President of the United States in 1904, 1908, 1912 and 1920. He was born in Terre Haute, Ind., and became a fireman on a local railroad at the age of 16. Debs organized the American Railway Union in 1893 and as its leader brought about a victory for labor in the railroad strike of 1894. In the Pullman strike of that year, which was broken by President Cleveland's use of Federal troops in protecting the mails, Debs was arrested for violating an injunction and was sentenced to a jail term of six months. While he was in jail Victor Berger interested him in Socialism. Thereafter he was one of the most prominent Socialist leaders in America. For his speeches opposing America's participation in the World War, Debs was sentenced to serve ten years in the penitentiary and was a prisoner from April 1919 to December 1921, when President Harding pardoned him. While he was in prison, he was the Socialist candidate for President (1920) and polled about 919,000 votes.

Debussy, Claude Achille (1862-1918), French composer of the modern school. He showed remarkable ability from the time he began studying at the Paris Conservatory at the age of 11, and won many prizes, the greatest being the *Grand Prix de Rome* (1884), awarded for his cantata *L'Enfant prodigue.* Though Debussy's work aroused widespread comment and evoked admiration for originality and refinement, public appreciation came slowly. Representative compositions include *Printemps,* a symphonic suite; *Petite Suite* (for piano); *Pelléas et Melisande,* a grand opera; the famous orchestral tone-poem *L'Après-midi d'un faune; La mer,* a rhapsody for clarinet and orchestra; *Jeux,* a ballet; and piano pieces, songs and dramatic compositions.

Decatur, Stephen (1779-1820), American naval officer, born in Sinnepuxent, Md. He entered the navy as midshipman on the *United States* in 1798. In 1801 Tripoli declared war because the United States refused to pay a large tribute for immunity against attacks on its shipping. After the frigate *Philadelphia* had been grounded in the harbor of Tripoli, Decatur took charge of a small raiding party which burned the ship to the water without any loss of life (February 1804). For this "most daring act of the age," he was promoted to the rank of captain. Early in the War of 1812, he added to his reputation by capturing the English frigate *Macedonian,* but was forced into inactivity by the English blockade and in January 1815 was compelled to surrender his flagship, the *President,* in a fight against heavy odds. During a renewal of the wars with the Barbary States he ended piracy and blackmail in the Mediterranean. Decatur was navy commissioner at the time of his death, which occurred in a duel with Commodore James Barron. The toast "Our country, right or wrong" was Decatur's.

Defoe, Daniel (*c.* 1661-1731), English author, born in London. He wrote more than 375 novels, treatises, political pamphlets and miscellaneous works, but is known especially for that classic among adventure stories, *Robinson Crusoe.* As one of the first long narratives in English fiction, it had an important part in the development of the modern novel. It is a remarkable example of realistic story telling, and one of the best books of its kind. Defoe had a long and varied career as political agent for the Government and as political pamphleteer. He was imprisoned and exposed in the pillory three times for his *Shortest Way with the Dissenters* (1702), a satire which the authorities took seriously.

The first part of *Robinson Crusoe* was published in 1719. It ran serially and scored a great success. Then followed a number of realistic tales that the public read eagerly, for prose fiction in English was a novelty in the early 18th century. Among these stories are *Memoirs of a Cavalier, Captain Singleton, Moll Flanders, Colonel Jack* and *The Fortunate Mistress.* Defoe's *Journal of the Plague Year* (1722) ranks next to his *Robinson Crusoe* in literary value. It is an accurate and vivid description of the great calamity that befell London in 1665. This remarkable writer is regarded as the founder of English journalism.

De Forest, Lee (1873-), American inventor, native of Council Bluffs, Iowa, educated at Sheffield Scientific School and the graduate school of Yale University. As one of the pioneers in the development of wireless telegraphy in America, he installed the first high-powered radio for the U. S. Navy. Of more than 200 devices connected with radio telegraphy and telephony, on which he secured patents, the most important is his *audion* or vacuum tube, now widely used in radio broadcasting and receiving.

Degas, Hilaire Germain Edgar (1834-1917), French painter of the impressionist school, born in Paris. He is best known for his studies of ballet girls, but he exhibited several paintings of contemporary life, including milliners, jockeys, horse races and scrubwomen. The Metropolitan Museum, New York, and the Luxembourg in Paris have examples of his work, which is especially notable for beauty of line. *Dancers Practicing, Woman with Chrysanthemums* and *The Rehearsal* are in the Metropolitan Museum.

De Kalb, Johann, Baron (1721-80), general in American Revolution, born in Germany. In 1743 he joined the French army, and in 1777 accompanied Lafayette to America. He attained the rank of major general, helped drill and discipline the American troops, fought bravely under Washington and Gates and commanded the American army at the Battle of Camden in 1780, when he was mortally wounded.

Dekker, Thomas (*c.* 1570-*c.* 1641), English playwright, born in London. He wrote a number of plays, some of them in association with Ben Jonson, Webster and Massinger. His own work portrays the poorer people of London with cheerful humor and his most successful plays are *The Shoemaker's Holiday* (successfully revived in 1938) and *Old Fortunatus.* The collaborations are *The Roaring Girl* and *The Virgin Martyr.* Dekker also wrote charming lyrics, including the well-known "Art Thou Poor?" Jonson's *The Poetaster* ridiculed Dekker, who replied with his *Satiromastix.*

De Koven, Henry Louis Reginald (1861-1920), American composer, born in Middletown, Conn., graduated from Oxford University in 1879. He studied singing and operatic composition under European teachers and returned to America in 1882. His earliest success, *Robin Hood,* is one of the best examples of light opera. Its delightful melodies and fun making remain as popular as when the work was first produced in 1890. He conducted the Washington Symphony Orchestra for two years and was long a music critic for the New York *World.* His other operettas include *The Begum, The Algerian, Rob Roy, The Three Dragoons, The Student King* and *Rip Van Winkle.* He wrote more than 300 songs, including the "O Promise Me" and "My Love is Like a Red, Red Rose."

de Kruif, Paul (1890-), American bacteriologist and writer, born in Zeeland, Mich., educated at the University of Michigan. He was on the faculty of his *alma mater* (1912-17) and was with the Rockefeller Institute (1920-22). His books for laymen, describing scientific achievements, are widely popular. Among them are *Microbe Hunters,* stories of pioneer bacteriologists; *Hunger Fighters, Seven Iron Men* and *Men Against Death.* He furnished material for Sinclair Lewis's *Arrowsmith.*

Delacroix, Ferdinand Victor Eugène (1799-1863), French painter. When only 24 he exhibited his first picture *Dante and Vergil.* This canvas and his *Massacre of Chios* (1824) caused much discussion and severe criticism of his revolutionary style. He became a leader of the romantic school. Delacroix was chosen by the government to decorate many public buildings, and was elected to the Academy in 1857. There is freshness and boldness in his brushwork, and his pictures are full of emotion and dramatic action. They include also *Milton and his Daughters, Death of the Bishop of Liége, Entry of the Crusaders into Jersusalem, The Barricade* and *Triumph of Apollo.* The last adorns the ceiling of the Gallery of Apollo in the Louvre.

de la Mare, Walter John (1873-), British poet and novelist, born in Kent and educated at St. Paul's School, London. In 1889-1908 he earned his living as a bookkeeper, and his first novels were written in his spare time, but a small pension from the government enabled him to devote all his time to writing. His most successful novels are *Henry Brocken* and *Memoirs of a Midget.* He is best known as a poet, however, and much of his poetry is written for children or about them. The other published works include the noted *Peacock Pie; The Connoisseur and Other Stories; Stuff and Nonsense; On the Edge,* a collection of short stories; *Down-adown Derry; Poems for Children;* and *Fleeting and Other Poems.*

Delambre, Jean Baptiste Joseph (1749-1822), French astronomer, born at Amiens. His principal achievements are his computations of the motions of Uranus, Jupiter and Saturn, the measurement of the arc of the meridian between Dunkirk and Barcelona and completion of the measurements upon which the metric system is based. Delambre received scores of honors and awards and was an officer of the Legion of Honor.

Delaroche, Hippolyte Paul (1797-1856), French historical painter, born and educated in Paris. He became one of the most popular artists of his time, for he combined the good drawing of the Classic School with the fine coloring of the Romantic, and so pleased nearly everyone. His outstanding work, containing 70 life-sized figures, is an allegorical representation of the arts of the nations, adorning a semicircular wall in the Theatre of the School of the Fine Arts, Paris. Delaroche was an accurate painter, but his work has been criticized for its theatrical effect and lack of deep feeling.

Delcassé, Théophile (1852-1923), French statesman. By allying France with Russia and then with Great Britain he brought about the Triple Entente which bound England and Russia to stand by France at the outbreak of the World War. Delcassé also established friendly relations between France and Italy, drew closer to Spain and came to an agreement with Britain over the French occupation of Fashoda in the Egyptian Sudan. His policy of creating relations of amity between France and the rest of Europe alarmed Germany, and when the two countries were in disagreement over Morocco in 1905, Delcassé was asked to resign, probably on Germany's demand. Subsequently, as president of the naval commission, he helped to build up the French navy. He was minister of foreign affairs in 1898 and in 1914.

De Lesseps, Ferdinand, see *Lesseps, Viscount de.*

Democritus (*c.* 460-*c.* 362 B.C.), Greek philosopher, native of Abdera, in Thrace. He wrote voluminously on physics, mathematics, ethics, and grammar; but only a few scattered fragments have survived. Democritus believed that matter is made up of minute, indivisible particles, thus anticipating the modern atomic theory. He considered the highest aim of human existence to be pleasure without pain. Little is known of him, but a reputation for great learning and high character has persisted through the centuries.

De Morgan, William Frend (1839-1917), English novelist, the son of a professor at University College, London. He studied there for three years, and then took courses in art at the Royal Academy. De Morgan became a worker in stained glass, then for three decades after 1870 devoted himself to pottery; he also invented various mechanical devices. He was past 65 when he wrote his first novel—*Joseph Vance: an Ill-Written Autobiography.* It was a great success. Other popular novels are *Alice-for-Short, It Never Can Happen Again, When Ghost Meets Ghost, An Affair of Dishonor* and *A Likely Story.*

Demosthenes (*c.* 384-322 B.C.), Greek orator, born in Athens. His father left him a comfortable fortune, of which his guardians tried to defraud him. Demosthenes at the age of 17 conducted a suit against them himself and won his cause. He then set himself to study eloquence, and though he had weak lungs, defective articulation and awkward gestures, by perseverance he at length surpassed all other orators in power and grace. He thundered against Philip of Macedon in a series of orations known as the *Philippics,* and tried to instil into his fellow-citizens the patriotic fervor that fired his own soul. He labored to induce the Greeks to combine against the encroachments of Philip, but their lack of patriotism and the influx of Macedonian gold made his efforts useless. He was present at the Battle of Chaeronea (338 B.C.), in which the Athenians and Boeotians were defeated by Philip, and Greek liberty was crushed.

On the accession of Alexander in 336 B.C. Demosthenes tried to stir up a general rising against the Macedonians, but Alexander at once adopted measures of extreme severity, and Athens sued for mercy. In 324 B.C., he was imprisoned on a false charge of having received a bribe from one of Alexander's generals but managed to escape into exile. On the death of Alexander, in 323 B.C., he was recalled, but the defeat of the Greeks by Antipater caused him to seek refuge in the temple of Poseidon, in the island of Calaurea, on the coast of Greece, where he poisoned himself to escape from the emissaries of Antipater (322 B.C.).

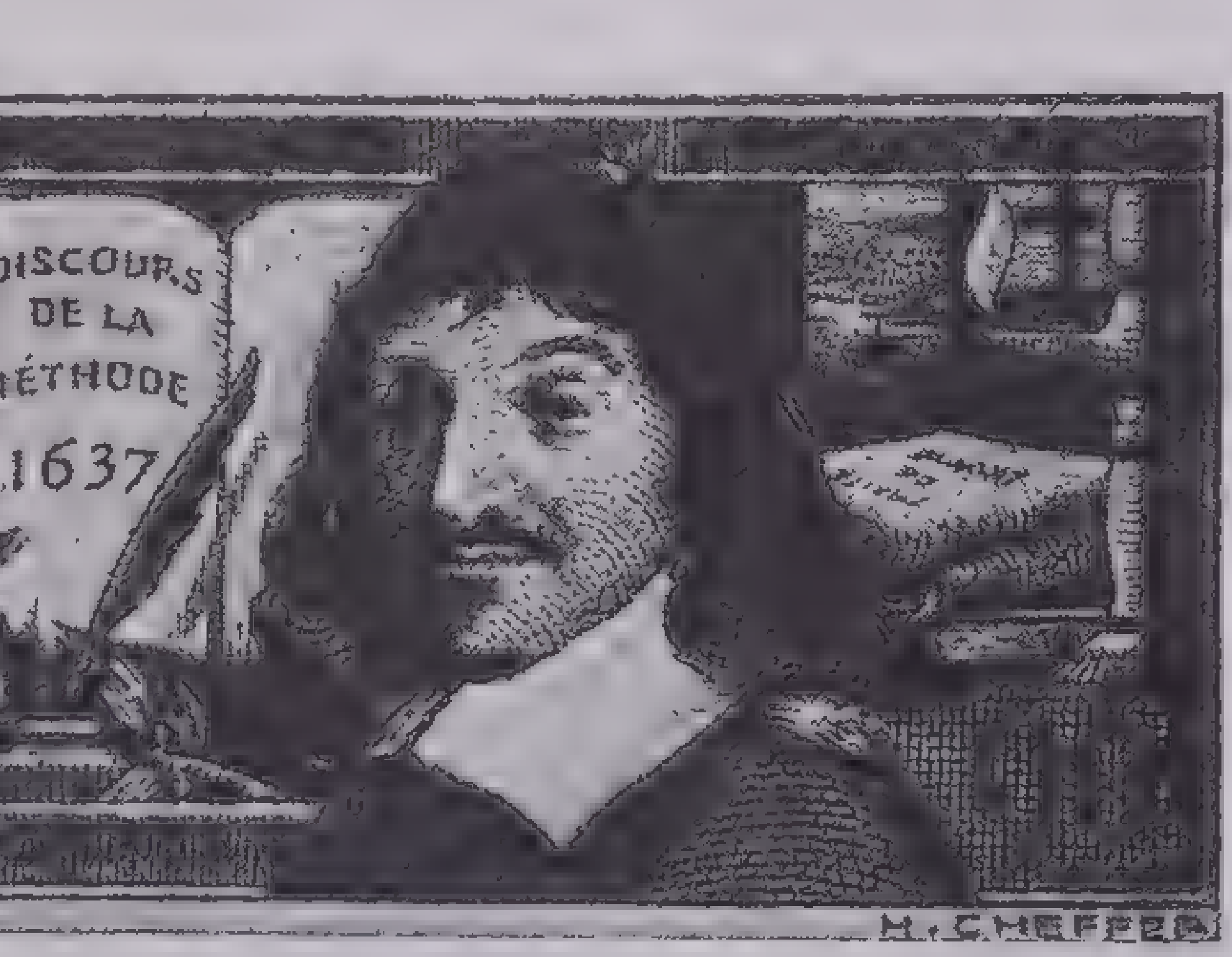
The character of Demosthenes is by most modern scholars considered almost spotless. Cicero pronounced him to be the most perfect of all orators. He carried Greek prose to a degree of perfection that it never before had reached. Everything in his speeches is natural, vigorous, concise, symmetrical. We have under his name about 60 orations, but some of these are believed to be spurious. The most celebrated of the authentic speeches, *On the Crown,* was an answer to the charges of Aeschines, the orator's bitter rival.

Dempsey, Jack (William Harrison Dempsey; 1896-), American pugilist, born at Manassa, Col. He entered professional pugilism in 1916, won the world's heavyweight championship from Jess Willard at Toledo, Ohio, in July 1919 and lost it to Gene Tunney at Philadelphia in September 1926. Dempsey was one of the most popular champions who ever lived.

de Musset, Alfred, see *Musset.*

De Quincey, Thomas (1785-1859), English writer, born in Manchester. A shy, dreamy lad, he was so unhappy in the Manchester grammar school that he ran away when 17 and was found a year later in London. His family rescued him and sent him to Worcester College, Oxford, where he studied for five years. Meanwhile, he had come under the influence of Wordsworth and Coleridge, leaders of the new Romantic school, and in 1808 he went to live in the Lake district to be near them. In spite of an unending struggle with the opium habit, he accomplished an extraordinary amount of work of the highest quality. His later years were spent in Edinburgh writing for the magazines. His best-known work is *The Confessions of an English Opium-Eater,* a remarkable example of imaginative and rhythmical prose. This was first published in 1821 in the *London Magazine;* it is still a classic in the field of the biographical essay.

DESCARTES, RENÉ (1596–1650), French philosopher and mathematician, born in Touraine. He spent several years at the Jesuit college of La Flèche and was a student of exceptional ability, but at the age of 16 he decided to abandon books and seek a military life. Service in the army, in Holland and Bavaria, did not bring the results he desired and in 1621 he began a period of travel. In 1629 he settled in Holland, where he devoted himself to study and writing. Descartes founded the Cartesian system of philosophy. His fundamental principle is the dominance of thought expressed as "I think, therefore I am." His ideas were set out in his *Discours de la Méthode,* and more fully in *Meditationes de Prima Philosophia* and *Principia Philosophiae.* Descartes is one of the world's great thinkers. He contributed greatly to the advancement of mathematics and physics. The higher departments of geometry were greatly extended by him.



Courtesy Scott Stamp & Coin Company

René Descartes

Enlarged from a French postage stamp issued in 1937 to celebrate the 300th anniversary of the publication of the famous *Discourse on Method,* as noted on the stamp itself

Desmoulins, Camille (Lucie Simplice Camille Benoît Desmoulins; 1760–94), French revolutionist and journalist, born in Picardy. He was a deputy in the States-General of 1789, summoned by Louis XVI. The king dismissed Necker, the people's favorite, and Desmoulins sprang into national fame on July 12, 1789, by making a fiery speech in a Paris cafe, calling the people to arms. This was really the spark that set off the French Revolution. His pamphlets and journals were immensely popular, but in 1794 with Danton he began to advise moderation, and he and his wife were guillotined by the Jacobins.

De Soto, Hernando (*c.* 1499-1542), Spanish explorer, discoverer of the Mississippi River. His adventurous spirit and physical courage found an outlet in expeditions to the Isthmus of Darien, Guatemala and Yucatan, and he also served under Pizarro in the conquest of Peru (1532), gaining great wealth thereby. In 1537 the Emperor Charles V appointed him governor of Cuba and Florida. Two years later he started from Havana with the idea of penetrating the unexplored wilderness of what is now Florida, Georgia, Alabama, Mississippi and Arkansas. De Soto's band, originally 600 men, struggled through the jungles and swamps for three years, harassed constantly by the Indians, and in 1542 the leader died of fever and was buried in the great river he had discovered the year before. Only a remnant of the expedition returned to civilization.

Dessalines, Jean Jacques (1758-1806), Emperor of Haiti, born in Africa. When the blacks of Haiti revolted, Dessalines was set free along with the other slaves in San Domingo in 1794. He became the leader of the Negroes and after the evacuation of the island by the French was appointed governor with absolute power. In 1804 he commenced to rule as emperor, and although he had courage, he acted in a brutal and savage manner. One of his soldiers killed him.

De Valera, Eamon (1882-), Prime Minister of Eire (Ireland), born in New York, of an Irish mother and a Spanish father. De Valera was educated at Blackrock College and the Royal University of Ireland and for a time was a teacher of mathematics and languages in various colleges in Ireland. He had early become identified with the Irish movement and was sentenced to death in 1916 for taking part in the Easter Rebellion, but the sentence was commuted to life imprisonment. In the general amnesty of 1917, De Valera was released and the same year was elected president of the Irish Republic by a Sinn Fein convention. Again imprisoned, he escaped in 1919 and visited the United States. Though he secured funds from American sympathizers, he was unable to get the party conventions of 1920 to insert Irish independence planks in their platforms. In 1921 he returned to Ireland. He steadfastly refused to endorse the political organization of the Irish Free State, but in 1927, with 43 of his followers, he decided to participate in the Free State Parliament, hoping to increase his influence in this way. In 1932 his party won a majority of the seats in Parliament, and he succeeded Cosgrave as president of the executive council. He broke the good relations with Great Britain by wishing to abolish the oath of allegiance and refusing to pay interest on money borrowed for land purchase. In 1938, under the new constitution, Ireland virtually achieved the status in the British Commonwealth of Nations toward which De Valera had striven for more than 15 years; and his party was successful in the election of that year.

De Vries, Hugo (1848-1935), Dutch botanist, born in Haarlem and educated in Holland and Germany. His most notable achievements were the development of the theory of mutations and his introduction of experimental methods in the study of evolution. De Vries carried on his experiments at the University of Amsterdam, whose faculty he joined in 1871.

Dewar, Sir James (1842-1923), Scottish scientist, educated at Edinburgh University. After serving there as assistant in the chemistry department, he was appointed professor of experimental philosophy at Cambridge and later became professor of chemistry in the Royal Institution. With Sir Frederick Abel he invented cordite, a smokeless powder. Dewar devised the thermos bottle. He also made notable investigations in the physiological action of light and the liquefaction of gases; by subjecting liquid hydrogen to a reduced pressure, he secured a temperature of 13° absolute, the lowest obtained up to that time.

De Wet, Christian Rudolph (1854-1922), Boer soldier. When the South African War broke out he was farming in the Orange Free State. He was made commander in chief of the Free State army and became an adept at guerilla warfare, repeatedly escaping from entanglements and ambushes. When the war ended, he submitted to the British command and subsequently served as minister of agriculture for the Orange Free State. At the beginning of the World War, De Wet joined the German forces against Great Britain and was captured and imprisoned for a year.

Dewey, George (1837-1917), American naval officer, born in Montpelier, Vt. He was graduated from the United States Naval Academy in 1858 and saw active service in the Civil War, giving effective aid to Farragut in the capture of New Orleans (1862) and in the subsequent campaign against Vicksburg. Dewey was assigned to various duties and different stations during the next three decades and in 1896 reached the grade of commodore.

When war with Spain broke out in 1898, he was in command of the Asiatic squadron, stationed near Hong Kong. Ordered to Manila Bay, where the Spanish fleet under Admiral Montojo was guarding the city, he engaged in battle on May 1 and totally destroyed the enemy squadron without the loss of a single American vessel or sailor. In August he helped the land forces under General Merritt to capture Manila and returned to America in 1899 a national hero. He was promoted to the rank of rear admiral and received the thanks of Congress after the victory of Manila and the special rank of admiral of the navy. From 1900 until his death Admiral Dewey was president of the general board of the navy, and in 1901 he presided over the court of inquiry which decided the Sampson-Schley controversy.

Dewey, John (1859-), American philosopher, native of Burlington, Vt., educated at Vermont and Johns Hopkins universities. His teaching career included professorships at the universities of Minnesota and Michigan, and in 1894 he accepted the chair of philosophy at the University of Chicago, where he remained until he resigned in 1904 to become professor of philosophy at Columbia. His numerous books on philosophy and social problems include *How to Think, Democracy and Education, Reconstruction in Philosophy, The Public and Its Problems* and *The Philosophy of John Dewey.*

Dias, Bartolomeu (*c.*1450-1500), Portuguese navigator, noted for his discovery of the Cape of Good Hope in 1488. Commissioned by King John of Portugal to sail around the coast of Africa, he left port in the summer of 1487 and early in 1488 rounded the southern end of Africa without sighting land, having been driven south by storms. On February 3 he anchored in Mossel Bay. After proceeding eastward to Algoa Bay, he turned back, sighting Table Mountain and the Cape of Good Hope in May and reached Portugal in December. Dias was the first to follow an ocean route around Africa to the Far East.

Diaz, Armando (1861-1928), Italian soldier, born in Naples. In the World War he first commanded a division on the Carso front; in 1916 he was promoted to the command of the 23d Army Corps and in 1917, when General Cadora's forces suffered disaster at Caporetto, succeeded him as generalissimo. Diaz saved the Italian army from utter rout and checked the threatened Austro-German invasion of Venetia. In 1918 his forces carried the attack against the enemy and hastened the collapse of Austria. He retired as a duke, with the rank of marshal of Italy.

Diaz, Porfirio (1830-1915), Mexican president, born in Oaxaca of mixed Spanish and Indian parentage. He studied for the priesthood, abandoned theology for the law and in 1847 entered upon a military career. As a brilliant commander of his own Indian forces, he compelled the retirement of several Mexican leaders and in 1877 became president of Mexico. In 1884 he was again elected to the presidency and had the Constitution changed so that he might retain the office indefinitely. For 27 years Diaz ruled with an iron hand and used his power to promote education, finance, manufacturing, transportation and sanitation. In 1911 he was forced into exile by a revolution engineered by Madero, and he lived in Europe until his death.

DICKENS, CHARLES [JOHN HUFFAM] (1812-70), English novelist, born in Hampshire, the son of a pay clerk. The family moved to London, and as a child Charles worked in a factory. His father fell on evil days and was imprisoned for debt. Charles, now thrown on his own resources, soon learned about the hardships and pleasures of the poor. He managed to attend school for a few years, studied law, learned shorthand and became a reporter. In 1833 he began to write fiction and, calling himself "Boz," published stories of London life in the *Evening Chronicle.* These were published in serial form in 1836 as *Sketches by Boz* and were followed by the *Pickwick Papers,* which made him famous. He left the reporting work and became editor of *Bentley's Miscellany.* In this periodical *Oliver Twist* appeared, and then followed *Nicholas Nickleby, The Old Curiosity Shop* and *Barnaby Rudge.* After a visit to the United States he wrote *Martin Chuzzlewit* (1843), and then the Christmas books, beginning with *A Christmas Carol.* In rapid succession he created

Dombey and Son, David Copperfield, Bleak House, Hard Times, Little Dorrit, A Tale of Two Cities, Great Expectations and *Our Mutual Friend.* When Dickens died, *The Mystery of Edwin Drood* was unfinished. In 1934 his *Life of Our Lord* was published. He had written this for his children, and it was given to the public on the death of the last surviving member of the family. Dickens is considered by many to be the greatest English writer of fiction. His many characters are human and real and under his subtle touch become unforgetable.

Dickinson, Emily (1830-86), American poet, born in Amherst, Mass., where she lived a secluded life. She permitted publication of only a few of her poems, but after her death several collections appeared. Her strangely mystic and beautiful work has placed her among the greatest women poets of modern times. In 1894 her *Poems* appeared and at once attracted attention. A collection of new poems, *The Single Hound,* was published in 1914; *The Complete Poems of Emily Dickinson* followed in 1924, and when more verses were discovered by her niece Martha Dickinson Bianchi, the *Further Poems* appeared in 1929.

Diderot, Denis (1713-84), French writer, philosopher and editor, especially noted for his part in the compilation of the *Encyclopedie,* a monument of learning on which he toiled for 20 years. Originally intended to be a French edition of a British publication, it was expanded by Diderot, D'Alembert, Rousseau and others, into a 28-volume encyclopedia and dictionary (1751-72) that went through many editions. This great work served as a vehicle for philosophical and religious ideas, and it has a definite place in the intellectual history of mankind. Diderot also wrote essays, critical treatises, fiction and plays.

Diesel, Rudolf (1858-1913), German inventor, born in Paris. He is famous for his invention of the Diesel engine, an internal-combustion engine operating on unrefined oils and requiring no electrical ignition system. Diesel patented his idea in 1892, but the first successful engine was not built until 1895. Diesel's first engine developed so much more power than he expected that it exploded on trial and injured him severely. He did not live to see his engine come into the wide use it now has.

Dinwiddie, Robert (1690-1770), Governor of colonial Virginia, born in Scotland. He made Virginia his home while holding the office of surveyor of the Southern colonies and the West Indies (1738-51). In 1753, when he was governor, he sent George Washington, newly appointed adjutant general, on a mission to the French forts on the Ohio, conveying a demand that the French withdraw from land in western Pennsylvania claimed by Virginia. The French attacked Washington's forces and thus renewed the French and Indian War. Dinwiddie was recalled to England in 1758. His ill temper and greed had made him very unpopular among the colonists.

Diocletian (Gaius Aurelius Valerius Diocletianus; 245-313), Emperor of Rome (284-305). He was elevated to this office by his fellow soldiers, succeeding the murdered Numerianus. Diocletian appointed Maximian as his colleague in 286, giving him the western empire; in 292 Constantius Chlorus and Galerius were appointed Caesars, as division of authority was considered necessary because of the persistent attacks of the barbarians on the eastern and western fronts. Diocletian abdicated in 305 after an able rule, but his record is marred by a cruel persecution of Christians beginning in 303. The Edict of Diocletian (301), by setting a wage scale and prices for food, ruined agriculture and the markets.

Diogenes (*c.* 412-323 B.C.), Greek philosopher of the Cynic school, born in Asia Minor. In Athens, where he became a pupil of Antisthenes, he adopted a mode of life remarkable for simplicity. He wore little clothing, slept in a tub and ate only the coarsest food. Many anecdotes are told of him, the most familiar one being the story of his going about with a lantern in search of an honest man. On a voyage to Aegina he was captured by pirates. Eventually he was sold as a slave to a rich man of Corinth, who freed him and made him the tutor of his children. Diogenes left no formal statement of his philosophy but set an example of upright and simple living.

Dionysius the Elder (*c.* 430-367 B.C.), tyrant of Syracuse. He made himself master of the city in 406 B.C., defeated the Carthaginians in 396 B.C. and in a renewal of the war in 392 B.C. compelled them to acknowledge his authority over eastern Sicily. Subsequently he conquered the southern part of Italy, and his prestige was enhanced throughout the Grecian world. In the wars between Athens and Sparta he aided Sparta. Though he was cruel and despotic, Dionysius was devoted to the interests of his city and was a patron of art and learning.

Dionysius of Halicarnassus (*c.* 54-*c.* 7 B.C.), Greek critic, rhetorician and historian, lived in Rome the last 22 years of his life. He wrote a history entitled *Antiquities of Rome* in 20 books, of which the first nine have survived in their entirety. This work, though not based wholly on historic facts, is a valuable source of information on the life of the early Romans.

Disney, Walt (1901-), American cartoonist, born in Chicago, where he studied at the Art Institute. After a brief career as a commercial artist in Kansas City, Disney went to Hollywood, Cal., and began producing animated cartoons. For some years he experimented with various types of characters and finally he originated Mickey Mouse, who immediately became popular. A second success, *Silly Symphonies,* soon followed; it was inaugurated by *Three Little Pigs* in full color, which carried its laughable story around the world. In 1938 he produced the first full-length animated cartoon feature picture. The scenes and characters were drawn from the famous Grimm fairy tale *Snow White and the Seven Dwarfs,* and the picture (in color) ranked with the greatest motion pictures of modern times.

Disraeli, Benjamin, Earl of Beaconsfield (1804-81), British statesman and author, born in London, the son of Isaac D' Israeli, poet and novelist. The family was Jewish, but Disraeli's parents adopted the Christian faith, and all their children were baptized in the Church of England. Benjamin was educated under his father's direction and before entering politics traveled in Europe for three years. In 1826 he published a successful novel, *Vivian Grey.* He was determined to enter Parliament, however, and in 1837 was elected. His first speech in the House of Commons excited laughter for his theatrical manner, and as he sat down, he said prophetically, "The time is coming when you will hear me." Leader of the Young English party, with its program of social and political reform, Disraeli was soon a notable figure. He was not afraid to reverse his stand on current problems when he saw that in doing so he would have the support of the people. He held his first Cabinet office—Chancellor of the Exchequer under the Earl of Derby—in 1852, and was reappointed in succeeding ministries in 1858 and 1866. He sponsored the Reform Bill, passed in 1867, enlarging the franchise, and in 1868 he became prime minister. Though his ministry was defeated within a year, he assumed office again in 1874 and for six years guided the nation through one of the most brilliant administrations of its history.

The keynote of Disraeli's policy was aggressive imperialism. In domestic affairs he was a friend of the poor, in foreign matters he labored to exalt the British Empire. He bought enough shares in the Suez Canal to gain control of that waterway; proclaimed Queen Victoria Empress of India; withheld from Russia the spoils of victory in its clash with Turkey and acquired Cyprus for Britain. The Queen honored him by creating him Earl of Beaconsfield in 1878. Two years later his ministry was overthrown; he had already begun to fail in health and died in 1881. Disraeli was the author of a number of excellent novels including *Henrietta Temple, Coningsby, Sybil, Tancred* and *Lothair.*

Döbereiner, Johann Wolfgang (1780-1849), German chemist. For many years he was professor of chemistry, pharmacy and technology at the University of Jena. He is remembered for what is called Döbereiner's lamp, a piece of platinum sponge that ignites a jet of hydrogen in the presence of oxygen. This was in use before the introduction of sulphur matches. He also discovered furfural, a compound prepared from wood and other vegetable products, which is now widely used in making plastics. Döbereiner published his correspondence with his friend Goethe, and books titled *Zur pneumatischen Chemie* (1821-25) and *Zur Chemie des Platins* (1836).

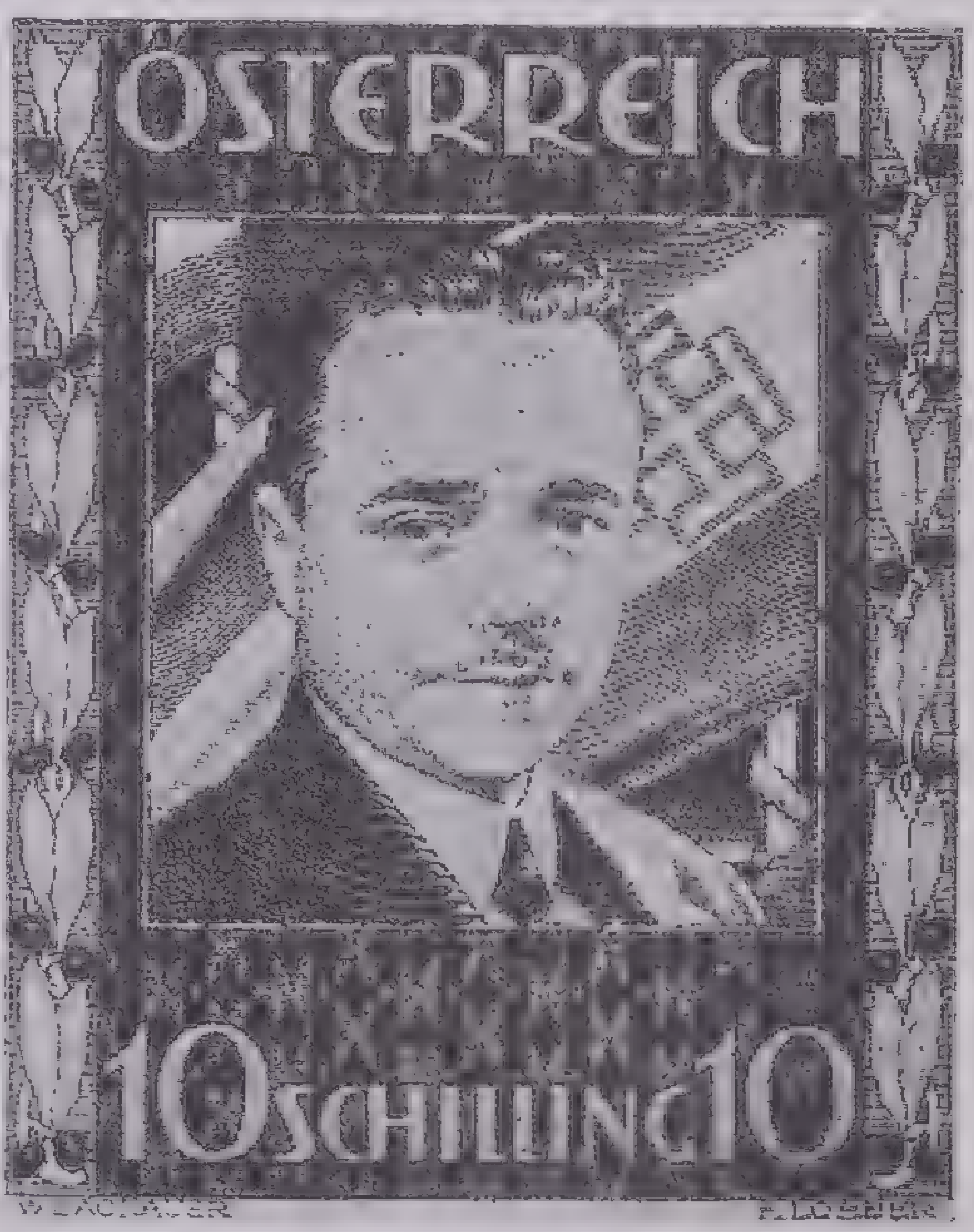
Dobson, Austin (1840-1921), English poet and essayist, born in Plymouth, educated in private English schools and in Strasbourg. He served as a civil-service clerk from 1856 to 1901. Some of his verse was published as early as 1868, and after 1901 he devoted himself wholly to literature, producing graceful poetry, critical and biographical essays and books and miscellaneous prose, all marked by scholarship, a finished style and literary charm. Especially noteworthy are the collections of his melodious light verse, *Vignettes in Rhyme, Old World Idylls* and *Proverbs in Porcelain.*

Dodds, Harold Willis (1889-), American university professor, native of Pennsylvania, educated in Grove City (Pa.) College and Princeton University, whose president he became in 1933. He had taught there since 1927. He became an authority on government, especially municipal, and was executive secretary to the United States Food Administration (1917-1919), technical adviser in the Tacna-Arica dispute in South America and electoral adviser to the government of Nicaragua.

Dodgson, Charles Lutwidge, see *Carroll, Lewis.*

Dole, Sanford Ballard (1844-1926), first Governor of Hawaii, born in Honolulu, where his parents, Americans, were engaged in missionary work. Dole was graduated from Williams College, studied law in Boston and began practice in Honolulu. In 1893 he headed the provisional government that replaced the rule of the deposed Queen Liliuokalani, and in 1894 he was elected constitutional president of the republic. President Cleveland's opposition postponed annexation of Hawaii to the United States until 1898, after which a plan of government was worked out. Dole was governor of the Territory of Hawaii, 1900-3, and United States district judge, 1903-15.

Dollfuss, Engelbert (1892-1934), Chancellor of Austria. With a notable war record, he entered public life as secretary of a league of peasants. Thereafter he held several political positions and in 1931 received a post in the cabinet. The following year he became chancellor. His office was difficult, with Fascists and Nazis fighting for power. He tried to suppress the Nazis; as a consequence a party of them assassinated him.



Courtesy Scott Stamp & Coin Company

Engelbert Dollfuss

Enlarged from an Austrian postage stamp issued in commemoration of the 2d anniversary of the death of Austria's assassinated chancellor.

Dominic, Saint (Domingo de Guzmán; 1170-1221), Spanish monk, founder of the order of friars known as the Dominicans. He became canon of the cathedral at Osma in Castile and was sent by Pope Innocent III to preach to the dissenting Albigenses in southern France. Out of this crusade arose his order of friars, which Pope Honorius III confirmed in 1216. Dominic lived austerely and devoted himself to arduous toil in behalf of the order. He was canonized in 1234.

Donatello or **Donato** (1386-1466), Italian sculptor of the early Renaissance, born in Florence. Breaking away from the ideals of the Classic school, he introduced intense realism into his work. Donatello's scores of figures in bronze and marble adorn the galleries and churches of Florence, Rome, Venice and other art centers. In Florence are his *John the Evangelist, St. George* (in armor), *St. Peter* and *St. Mark,* a colossal *David,* the monument of Pope John XXIII (in the baptistery), *Judith and Holofernes* and others. Among his sculptures in Rome is a fine *Burial of Christ,* in St. Peter's.

Donizetti, Gaetano (1797-1848), Italian operatic composer, born in Bergamo. Between 1819 and 1843, he composed about 60 operas, the best known being *Lucia di Lammermoor,* based on Scott's *Bride of Lammermoor.* The sparkling quality of the famous Sextette from this opera is typical of Donizetti's work. In his comic operas *Don Pasquale* and *Daughter of the Regiment* he showed a natural gift for comedy. *Lucrezia Borgia* ranks next to *Lucia* among his tragic operas.

Donne, John (1573–1631), English poet and clergyman, educated at Oxford (he may also have attended Cambridge). He traveled widely in Europe and returned to England to become secretary to Sir Thomas Egerton, the lord keeper. He married his employer's niece secretly, and when this was discovered his career was ruined.

He wrote a great deal of cynical and realistic verse as a young man, but after 1601 he took a more serious turn, and he began to write on religious and moral topics. King James I urged him to enter the church, and he became the royal chaplain and dean of St. Paul's. He was the finest preacher of his day, and his poetry became profoundly philosophical. He greatly influenced 17th-century verse and was widely imitated. Among his books of verse are *An Anatomy of the World, The Progress of the World* and *Holy Sonnets.*

Dooley, Mr., see *Dunne, Finley Peter.*

Doré, Paul Gustave (1833-83), French painter, illustrator and sculptor. Doré was entirely self-taught, and there are notable flaws in his large historical paintings, among which are *Tobit and the Angel* (Luxembourg Museum, Paris) and *Retreat from Moscow* (Metropolitan Museum, N. Y.). He is chiefly famous for his book illustrations, especially those showing weird and gloomy scenes. He is best known for his illustrations for Balzac's *Contes Drolatiques,* Dante's *Inferno,* Milton's *Paradise Lost,* Poe's *The Raven* and Tennyson's *Idylls of the King.*

Dorr, Thomas Wilson (1805-54), American politician, born in Providence, R. I. He claimed election as governor of Rhode Island in 1842 by the Suffragists, a party organized in opposition to the law that limited the vote to landholders. A regularly elected governor inaugurated at the same time received the moral support of the Federal authorities, and Dorr fled to Connecticut. In 1844 he was sentenced to imprisonment for life but was released within a year. The adoption of a liberal constitution in 1842 resulted in the Dorr movement.

Dorsey, George Amos (1868-1931), American anthropologist, born in Hebron, Ohio, and educated at Denison (Ohio) and Harvard universities. In 1891-92 he conducted investigations in South America for the Chicago Columbian Exposition of 1893; he subsequently held positions at Harvard, the Field Museum (Chicago), Northwestern University Dental School and the University of Chicago. In 1925 he became lecturer on anthropology for the New School for Social Research, New York. He wrote more than 70 papers relating to anthropology and anatomy. Among his popular books on science are *Why We Behave Like Human Beings, The Nature of Man,* and *Hows and Whys of Human Behavior.*

DOSTOEVSKI, FEODOR MIKHAILOVICH (1821-81), Russian novelist, master of psychological analysis and of realistic narrative, born in Moscow, the son of a physician. After a successful career as a military engineer, Dostoevski produced his first novel, *Poor People.* While he was planning for a literary career he became implicated in a radical plot and was banished to the mines of Siberia. Frail health and physical sufferings as a prisoner account to some extent for the morbid tone of his later writing after he was pardoned in 1855. His novels reveal sympathy for the poor and ill-treated. They are *The Downtrodden and Oppressed, Memoirs from a Dead House, Crime and Punishment* and *The Brothers Karamazov.*

Douglas, Stephen Arnold (1813-61), American statesman, born in Brandon, Vt. He passed his youth in the East but in 1833 settled in Jacksonville, Ill., where, in 1834, he began the practice of law. After a career as state legislator and judge of the state supreme court, Douglas was elected to the national House of Representatives and served there from 1843 to 1847. From 1847 until his death he was a United States senator and a leading figure in the Democratic ranks. Impressive in debate and adroit in political leadership, Douglas was popularly called "Little Giant," for with his small stature went massive shoulders and a vigorous delivery. He was an advocate of the doctrine of squatter sovereignty, that the question of slavery in any state or territory should be settled by the people locally, not by the Federal Government. This was the basis of the Kansas-Nebraska Bill, sponsored by Douglas in 1854.

In 1858, while he was campaigning for re-election to the Senate, he engaged in a series of debates with Lincoln, in which he was forced into a position that alienated his southern friends. Consequently, in the election for the Presidency in 1860, Douglas was defeated through a split in the Democratic party, the southern wing having nominated John C. Breckinridge. He gave Lincoln vigorous support when the South seceded and was in the midst of a speaking campaign in behalf of the Union when he died.

Doumergue, Gaston (1863-), French statesman, a native of Aigues-Vives. After a career as colonial magistrate in Indo-China and Algiers, he became active in the Radical Socialist party and was elected to three terms in the Chamber of Deputies, meanwhile holding various executive positions. In 1910 Doumergue was elected to the Senate and in 1913 was minister of foreign affairs in the Cabinet of which he was the head. Forced to resign in 1914, he became minister of the colonies at the outbreak of the World War, and in 1917 re-entered the Senate, becoming its president in 1923. The following year, Doumergue succeeded Millerand as president of France and served the full term of seven years.

Dow or **Dou, Gerard** (1613-75), Dutch painter, born in Leyden, where he studied under Rembrandt. Skill in expressing light and shade was one result of his work under the master; he also excelled in composition and the use of color. He was pre-eminently a painter of everyday life depicting with exact realism such subjects as *Woman Sick of the Dropsy, Girl at the Window, Poulterer's Shop* and *Young Mother.* His *Evening School* (in Amsterdam) reveals his skill in portraying candle-light effects.

Doyle, Sir Arthur Conan (1859-1930), British novelist and physician, born in Edinburgh, educated at Stonyhurst and in Germany. From 1882 until 1890 he practiced medicine at Southsea, during which time he wrote *A Study in Scarlet, Micah Clarke, The Sign of the Four* and *The White Company,* the success of which led to his final abandonment of medicine for literature. *The Adventures of Sherlock Holmes* and *The Memoirs of Sherlock Holmes* formed a brilliant series of detectives stories that overshadowed the excellence of his historical romances. He volunteered for service in the Boer War, was in the medical service and wrote *The Great Boer War.* During his last 10 years he lectured and wrote on spirit communication.

Draco (*c.* 7th century B.C.), Athenian legislator, who, in 621 B.C., codified and put into writing the common laws. Because even the smallest crimes were punishable by death, the Draconian code in later times was said to have been written in blood, not in ink. Draco, however, did not originate these harsh laws; on the contrary, he had set up a court of appeal to prevent injustice. Solon years later modified the severity of the code.

Drake, Sir Francis (*c.* 1540-1596), English navigator, born in Devonshire. He served as a sailor in a coasting vessel and afterwards joined Sir John Hawkins, a relative, in his last expedition against the Spaniards. As Drake grew older he turned to privateering and enriched English coffers at the expense of Spanish shipping. His swift raids with two small ships on the Spanish Main bewildered his enemies and made him Spain's most feared and respected antagonist. In 1577 Drake made the most famous of his voyages. With five ships he plundered along the coasts of Peru and Chile and captured a galleon laden with jewels and gold. He then went as far as 48° north latitude, seeking a passage to the Atlantic, touched Port San Francisco, then steered for South Africa and England, the first Englishman to sail around the world. He arrived laden with treasure, and Queen Elizabeth knighted him in 1580. Five years later Drake was again attacking the Spaniards in the West Indies. His greatest triumph came in 1588, when the Spanish Armada, the most powerful flotilla ever assembled, set sail to invade England. Drake led the counterattack and, displaying superb seamanship, scattered and burned the Spanish fleet. This victory broke the power of Spain and made England mistress of the seas.

Drake, Joseph Rodman (1795-1820), American poet, born in New York city. He is remembered chiefly for his patriotic lyric, *The American Flag,* and for *The Culprit Fay.* Drake's death was the occasion of the beautiful tribute by his friend Fitz-Greene Halleck, beginning "Green be the turf above thee." In collaboration with Halleck, Drake wrote satirical verse for the New York *Evening Post* under the pen name *Croakers.*

Dreiser, Theodore (1871-), American novelist, native of Terre Haute, Ind., received public school education in Warsaw, Ind., and attended the University of Indiana. Dreiser began newspaper work on the Chicago *Globe* in 1892, was soon connected with both the St. Louis *Globe-Democrat* and *Republic* and in 1894 began an editor's career in New York, serving as editor in chief of the Butterick publications in 1907-1910. Meanwhile he had contributed stories and articles to various magazines and had published his first novel *Sister Carrie* (1900). This book was censored and withdrawn from circulation. Other novels followed, and the author's reputation was soon established. Realism and insight into human motives and weaknesses are revealed in such stories as *Jennie Gerhardt, The Financier, The Titan, An American Tragedy* (dramatized for the stage and screen) and *A Gallery of Women.* He also published verse, essays and plays. Dreiser has a loose, sometimes awkward style, but contemporary critics unite in praising his grasp of life's problems and his forceful manner of presenting them. His *Tragic America* (1932) is an excursion into the field of economics.

Drew, John (1853-1927), American actor, born in Philadelphia, the son of John Drew, an Irish comedian, and Louisa Drew, actress; and uncle of John, Ethel and Lionel Barrymore. He began his stage career at the age of 20. After a few years, he was playing with Edwin Booth and other stars and became one of the foremost light comedians of the American stage, appearing in such plays as *Taming of the Shrew, The School for Scandal* and *Major Pendennis.* At his death he was acting in an all-star revival of *Trelawney of the Wells.* His portrayals were always finished, intelligent and touched with a flavor of the romantic.

Dreyfus, Alfred (1859-1935), French soldier, born in Alsace of Jewish parents. Dreyfus entered the army in 1882, reached the rank of captain of artillery in 1889 and in 1891 was appointed to the general staff. In 1894 he was accused of having sold military secrets to Germany and after an unfair trial was degraded and sent to Devil's Island, off the coast of French Guiana. The case was reopened after disclosures that pointed to gross injustice, and in 1899 a second court-martial was held at Rennes. Dreyfus was again declared guilty "with extenuating circumstances" and condemned to 10 years' imprisonment, but was soon pardoned by President Loubet. Clemenceau and Zola fought for Dreyfus and aroused the public against the injustice of the case. Zola became so fiery that he was sent to prison for a year. Twelve years after Dreyfus was first accused his name was fully cleared. He was reinstated in the army but resigned. In the World War he commanded a fort protecting Paris and was promoted a lieutenant colonel. In 1919 he was decorated as an officer of the Legion of Honor.

Drinkwater, John (1882-1937), British poet and playwright, born near London. He studied at the Oxford high school and at the age of 19 entered an insurance office. Long before he gave up business life, he began writing verse and plays. He published his first volume of poems in 1903 and in 1911 his first play, *Cophetua.* This was performed in Birmingham by the Pilgrim Players, an amateur society of which he was one of the founders. The outgrowth of this venture was the Birmingham Repertory Theatre, which produced Drinkwater's first great success, *Abraham Lincoln,* a chronicle drama (1918). It was followed by *Mary Stuart, Oliver Cromwell, Robert E. Lee* and *Robert Burns.* A comedy, *Bird in Hand,* was produced successfully in New York and London (1929). Drinkwater's other works include literary monographs, a biography of Byron, another of Carl Laemmle and poems for children.

Drummond, Henry (1851-97), Scottish clergyman and biologist, born in Stirling and educated at Edinburgh University. After studying for the ministry at New College he became an evangelistic missionary and was notably successful in his work among college students. Drummond is remembered especially for his attempts to reconcile the doctrines of Christianity and evolution, as exemplified in his *Natural Law in the Spiritual World* and *The Ascent of Man.* His famous work, *The Greatest Thing in the World,* is intended to commend the first principles of the Christian faith.

Drusus, Nero Claudius (38-9 B.C.), Roman general, stepson of the Emperor Augustus, younger brother of Tiberius, successor of Augustus and father of Emperor Claudius and Germanicus Caesar. His place in history is that of a brilliant military leader. Between 19 and 10 B.C., when he was killed in a fall from his horse, he subdued the Alpine tribes, the Gauls and their German allies and several other barbarian peoples who were revolting against Roman supremacy. Drusus also promoted the construction of canals, bridges and other public works.

Dryden, John (1631-1700), English poet, born in Northamptonshire. After graduating at Cambridge he entered upon a literary career and succeeded Sir William Davenant as poet laureate in 1670. His essay on *Dramatic Poesy,* according to Dr. Johnson, created the school of English criticism. Dryden's plays are nearly all forgotten. He was more successful with his poems, the chief of which are his satires, notably *Absalom and Achitophel,* an attack on Lord Shaftesbury. Other poems are "The Hind and the Panther," written to defend the Church of Rome, and the remarkable short lyric, "Alexander's Feast." In his old age he made translations from Vergil and Juvenal.

Du Barry, Marie Jeanne Bécu, Comtesse (1746-93), French adventuress, daughter of Anna Bécu and favorite of Louis XV of France, who was so under the sway of her beauty and charm that he let her dominate himself and his court for five years. When he died in 1774, she was banished from court but was unmolested until the French Revolution. In 1793 Robespierre had her tried and guillotined, the charges being waste of public funds, conspiracy and wearing mourning for the late king. Du Barry was her legal name; she had married Comte Guillaume du Barry in 1768.

Du Bois-Reymond, Emil (1818-96), German physiologist, born in Berlin. His name is chiefly identified with animal electricity, the subject of his chief work, which has given him a commanding place among modern scientists. Two volumes of his collected memoirs and addresses appeared in 1885-87.

Du Chaillu, Paul Belloni (1835-1903), American explorer, born in New Orleans, La., of French descent. His father, a trader in the Gabun region, took his son to Africa, and the boy learned the language and customs of the tribes along the coast. He spent about four years investigating conditions in equatorial Africa and obtained much new and valuable information about plant and animal life there. He was the first white man to secure specimens of the gorilla, and he described numerous forms of bird life unknown to ornithologists and made a study of the mysterious pygmies of the interior. Du Chaillu published several volumes of narrative and descriptive matter.

Dudevant, Aurore, see *Sand, George.*

Dumas, Alexandre (1802-70), French author and playwright, born in Villers-Cotterets, the son of a general under Napoleon. His father's parents had been a French nobleman of Haiti and a Negress of the island. A boyish love for the stage turned his thoughts from the study of law and in 1823 he went to Paris to seek fame and fortune. He found work as a secretary in the home of the future King Louis Philippe and in 1829 had a successful play produced—*Henry III and his Court.* After a period of playwriting he began a series of novels, narratives of adventure and romance that are read today by millions. Such stories as *The Count of Monte Cristo, The Three Musketeers, Twenty Years After* and *The Viscount Bragelonne* made Dumas rich and famous, though he squandered his wealth and, when ill and impoverished, was cared for in his last years by his son. Dumas permitted his name to appear on the title pages of about 300 novels, but some of these were written by hirelings whom he supplied with ideas, and some were merely revised by him. He left enough of his own work, however, to place him among the world's greatest writers of fiction.

Dumas, Alexandre, "the Younger" (1824-95), French playwright and novelist, is best known as the author of *La dame aux camélias* (called *Camille* in English). Originally written as a novel (1848), it was dramatized in 1852 and proved very successful on the stage. Beginning in 1853, Dumas wrote a series of plays having for their purpose the teaching of moral lessons. They proved to be good entertainment. Among them are *The Money Question, A Prodigal Father* and *Monsieur Alphonse.* His *Entr'actes* are four volumes of social essays.

Dumas, Jean Baptiste André (1800-84), French chemist, born at Alais. In 1821 he served as tutor in the polytechnic school at Paris and then as professor of chemistry in the École de Medicine. His researches in organic chemistry, on atomic weights, sulphuric ether and the law of substitutions attracted the attention of the world of science. In 1848 he was a member of the legislative assembly, and in 1849-51 held the portfolio of agriculture and commerce.

Du Maurier, George [Louis Palmella Busson] (1834-96), British artist and author, born in Paris. At the age of 17 he went to London and began to study art. In 1865 he joined the staff of *Punch,* and for years his sketches of social life were a feature of its pages. He began novel writing late in life and published two successes, *Trilby* and *Peter Ibbetson,* both of which were dramatized for the stage. A third novel, *The Martian,* appeared after his death.

Dunbar, Paul Laurence (1872-1906), American negro poet, born in Dayton, Ohio, of parents who had been slaves. His book of verse, *Lyrics of Lowly Life* (1896), won him fame. His dialect poems were especially popular. Later came *Complete Poems,* several volumes of short stories and four novels, the best of which is *The Sport of the Gods.*

Dunglison, Robley (1798-1869), American physician, born in England. He went to the United States in 1824, after having studied medicine in England and Germany. On Thomas Jefferson's recommendation he was appointed professor of medicine at the University of Virginia. From 1836 to 1868 he taught in the Jefferson Medical College, Philadelphia. He translated and edited a number of foreign medical works and published about 20 original volumes, including *A New Dictionary of Medical Science and Literature.*

Dunne, Finley Peter (1867-1936), American humorist, known as the creator of Mr. Dooley, born in Chicago. He represented Dooley as an Irish-American commenting on the news of the day. His humorous sketches appeared in *The Chicago Times.* Dunne published the monologues in book form as *Mr. Dooley in Peace and War, Mr. Dooley's Opinions, Mr. Dooley Says* and so on.

Dunsany, Edward John Moreton Drax Plunkett, 18th Baron, (1878-   ), Irish playwright and author. He served as a soldier in the South African and World Wars but is better known as a writer. His first play, *The Glittering Gate,* was produced by the Abbey Theatre, Dublin, in 1909. Other plays followed, including *A Night at an Inn* (1916) and *Alexander* (1925). *The Queen's Enemies* and *If* were produced in New York. Lord Dunsany also wrote the tales: *The Chronicles of Rodriquez, Dreamer's Tales, Travel Tales of Jorkens* and *Jorkens Remembers Africa.* He depicts his fantastic characters in a simple and powerful manner.

Duns Scotus, Joannes (*c.* 1265–1308), famous Franciscan monk, called *The Subtle Doctor,* a native of Scotland or Ireland. He studied at Oxford University where in 1301 he became professor of theology. Duns Scotus, as one of the most eminent of the Franciscans, was a chief opponent of the teachings of the Dominicans, the two parties representing at that time two different schools of theology. His lectures were famous throughout Europe. He brilliantly defended the doctrine of the Immaculate Conception of the Virgin Mary and contended that divine revelation is essential to an understanding of religious truths. From his name the word *dunce* was formed. First it meant a pedant or quibbler; then, a stupid and ignorant person.

Dunstan, Saint (*c.* 925-988), English philosopher and prelate of the early Church, born in Glastonbury, educated at the school connected with the monastery there. Under kings Edmund and Edred, Dunstan enjoyed great influence in ecclesiastical and court circles, but was banished by Edwy in 956 because he criticised the new king's attitude toward the Church. On the accession of Edgar in 958 Dunstan was recalled, and in 960 he was created archbishop of Canterbury. He had much to do with the success of the king's reign. After Edgar's death in 975 Dunstan's influence again declined.

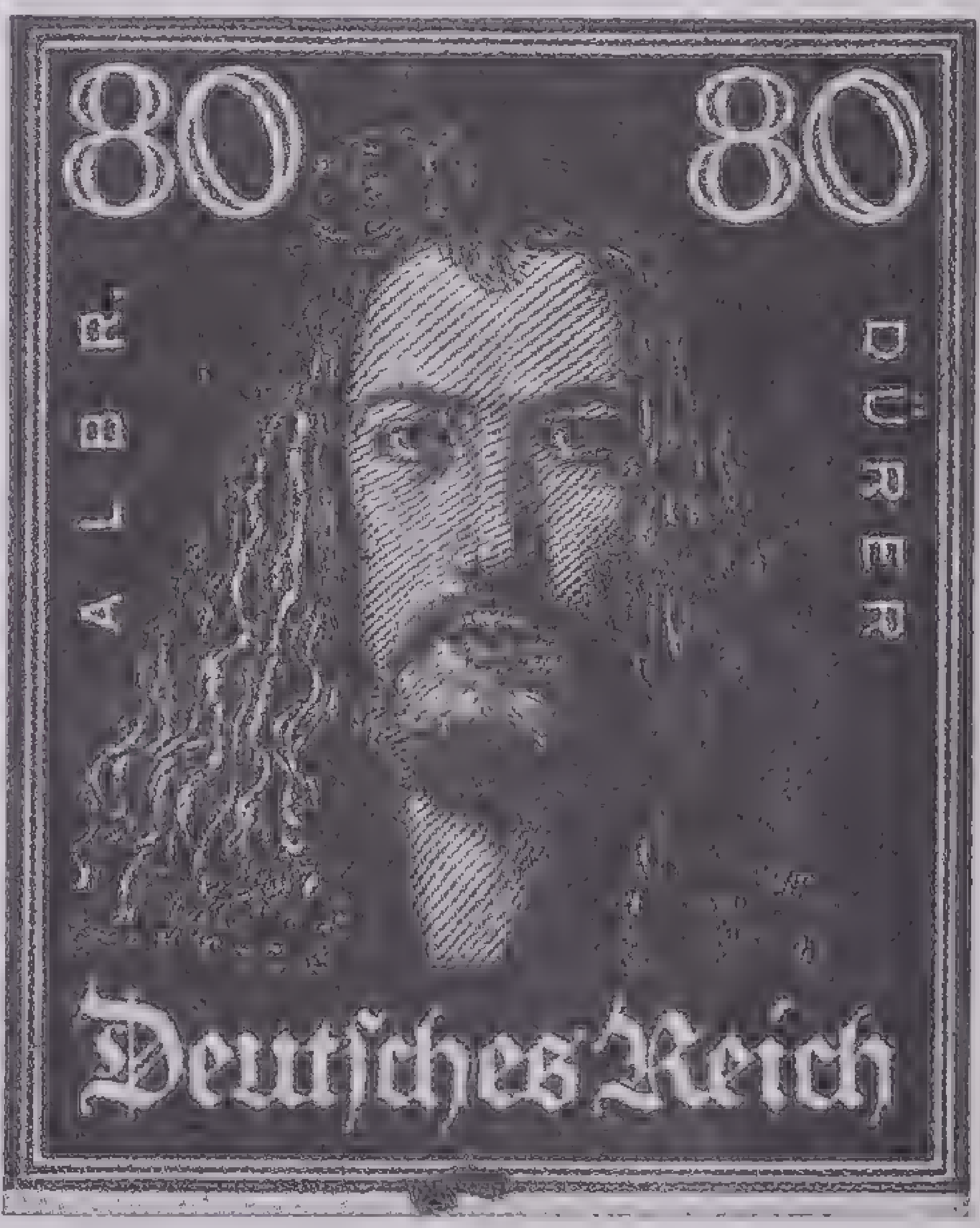
Du Pont, a family of American manufacturers. The line starts with Pierre Samuel Du Pont de Nemours (1739-1817), French statesman and economist. He was one of the diplomats who discussed American independence in 1783 and who drafted the treaty recognizing the United States. He lived in the United States from 1799 to 1802, returning to France to become a member of the commission that negotiated the Louisiana Purchase. He published a number of works on commerce and politics; his correspondence with President Jefferson from 1798 to 1817 has been published. He lived in the United States from 1815 until his death.

His son, Eleuthére Irénée Du Pont (1771-1834), born in Paris, was taken by Lavoisier into the royal powder works at the age of 17. He learned to make explosives, but in 1791 took over his father's publishing house. During the Revolution he was arrested three times; finally the Jacobins sacked the shop, and Du Pont with his father and a brother Victor Marie emigrated to America. In 1802 they set up a powder mill near Wilmington, Del., that was instantly successful and that has since grown to be one of the largest industrial establishments in the world, producing chemicals, plastics, dyes and the like.

Since the founding, the company has had eight presidents, all members of the Du Pont family. Three brothers are now important in its management: Pierre Samuel Du Pont (1870-   ), Irénée Du Pont (1876-   ) and Lammot Du Pont (1880-   ).

Dupré, Jules (1812-89), French landscape painter of the Barbizon school, born in Nantes. He studied in Paris, but his most valuable lessons were learned through study of the masters in the Louvre and personal contact with nature. Dupré excelled in depicting nature in her darker moods and melancholy aspects. The Metropolitan Museum, New York, possesses several of his canvases, including *Old Oak, Hay Wagon,* and *Summer.* Among Dupré's other notable pictures are *Interior of a Forest, Valley of Montmorency, Environs of Southampton* and *Storm at Sea.*

Dürer, Albrecht (1471–1528), German painter and engraver, was born in Nuremberg, and in boyhood learned there the art of his father, a goldsmith. In 1486, at his own request, he began the study of painting under Wohlgemuth, remaining at the latter's school for about three years. Then followed several years of travel and study, including two visits to Venice. Later, he studied the works of the Flemish painters in Netherlands. Dürer was court painter to the emperors Maximilian and Charles V. Among his best-known paintings are his masterpiece *The Four Apostles* (Munich), *Adoration of the Magi* (Uffizi, Florence), *Feast of the Rose Garlands* (Prague), *Charles the Great* (Nuremberg) and numerous portraits. His genius as a copperplate engraver is represented by *Arms of Death, Death and the Devil, St. Jerome* and *The Passion. The Four Horsemen of the Apocalypse* is one of his famous woodcuts.



Courtesy Scott Stamp & Coin Company

Albrecht Dürer

Enlarged from a German postage stamp. It was issued in 1926 as one of a series honoring German national heroes. The picture was made from Dürer's own self-portrait

Duse, Eleonora (1859–1924), Italian actress, was born near Venice, the daughter of traveling players. She appeared on the stage when a child, and after a period of discouragement, won recognition in Naples in 1878. Thereafter her position as an actress of first rank was acknowledged in Europe and America. A quarrel with D'Annunzio, who wrote many of the plays in which she had the leading role, and his frank revelations of her private life in his *Flame of Life* led to her retirement in 1902. In 1920 she reappeared on the stage in order to regain the fortune lost through the World War. Her great roles include the heroine parts in *Magda, La Tosca, Cavalleria Rusticana, Ca-*

mille, The Second Mrs. Tanqueray and *A Doll's House.* She was very impressive in tragic roles, but effective, too, in comedy. She disdained the theatrical artifices of the conventional actress.

Dvořák, Anton (1841-1904), Bohemian composer, born in Mühlhausen. His early training in music was cut short by lack of funds; he then found employment playing the viola in bands and orchestras. An engagement at the new Bohemian Theatre in Prague (1862) gave him an opportunity to study Beethoven's scores, and he later began a successful career as composer of symphonies, operas, chamber music, sacred pieces, and instrumental music of a varied nature. Dvořák's compositions are national in spirit, vigorous and original. He introduced two new forms—the Dumka (elegy) and Furiant (a scherzo). His chief works include *Stabat Mater, Requiem Mass, The Specter's Bride* (a cantata), *Slavonic Dances* (for the pianoforte) and *From the New World* (a symphony). His *Humoresque* for piano or violin is his best-known short composition. He was engaged as director of the New York National Conservatory in 1892 and knew rural America as well as the great city. After 1895 he lived in Prague.

Dwight, Timothy (1828-1916), American educator, grandson of Timothy Dwight (1752-1817), born at Norwich, Conn. After studying and teaching at Yale College, he became its president, and the various schools and departments were reorganized and the title changed to University during his presidency (1886-98). Dwight served as a member of the American committee for the revision of the English version of the Bible. He wrote *Memories of Yale Life and Men* (1903).

Dykstra, Clarence Addison (1883-), American city manager and university president, born in Cleveland, Ohio, educated at the University of Iowa. He taught history and political science in a number of schools and universities, became known as an expert in civic affairs and was often called into consultation and service in such matters. In 1930 he was chosen city manager of Cincinnati, Ohio, and became internationally known for the efficiency of his administration especially in the flood of 1937. In 1937 he became president of the University of Wisconsin.

Eads, James Buchanan (1820-87), American engineer and inventor, born in Lawrenceburg, Ind. He was a steamboat clerk before he mastered the principles of engineering and was largely self-taught. His greatest achievements were the designing and construction of the three-span bridge at St. Louis that bears his name and the jetties at the mouth of the Mississippi River. He also built for the Federal Government seven ironclad gunboats, which were used in the capture of Fort Henry early in the Civil War.

Eakins, Thomas (1844-1916), American painter and sculptor, born at Philadelphia. He studied at the Pennsylvania Academy and taught there and in Paris. His paintings are notable for their plain, unadorned realism, and many have won wide acclaim. He painted portraits of Cardinal Martinelli, Dr. Gilbert L. Parker, Louis Kenton, Carroll Beckwith and P. Hayes Agnew. Other works include *The Chess Players, The Cello Player, The Clinic of Professor Agnew* and *The Crucifixion.* His sculptures include the horses on the Brooklyn Soldiers' and Sailors' Monument and two reliefs on the Trenton Battle Monument.

Earhart, Amelia (Mrs. George Palmer Putnam; 1898-1937), American aviator, born at Atchison, Kan. She studied at schools in Atchison and Philadelphia and matriculated for medicine at Columbia University in 1919. During the World War she volunteered for work under the Canadian Red Cross and afterwards was a teacher and social worker in Massachusetts. She trained for a pilot's license in California. In 1931 she made a solo flight across the Atlantic, and in 1935 she flew from Honolulu to California—the first woman to fly the Atlantic and the Pacific oceans. In 1932 she received the Distinguished Flying Cross. On July 2, 1937, flying 2570 miles from New Guinea to Howland Island on a leg of her nearly completed round-the-world flight, she was lost in the Pacific with her navigator, Captain F. J. Noonan.

Early, Jubal Anderson (1816-94), American soldier, born in Franklin County, Va. After his graduation from West Point in 1837, he practiced law, sat in the state legislature and served in the Mexican War as major of Virginia volunteers. Although he opposed the secession of his state, Early gave his services to the Confederacy and was in action at Bull Run (both battles), Antietam, Fredericksburg, Chancellorsville and Gettysburg, rising to the rank of lieutenant general. Despite his defeats by Sheridan in the Shenandoah Valley and by Custer at Waynesboro, he was one of the ablest of the Confederate generals. He was a manager of the Louisiana lottery after the war.

Eastlake, Sir Charles Locke (1793–1865), English painter, born at Plymouth. From 1809 he studied under Haydon, in the Royal Academy schools and in Paris. He produced two full-length portraits of Napoleon. His other paintings are *Christ Blessing Little Children* (in the National Gallery, London), *Lord Byron's Dream, Pilgrims in Sight of Rome* and *The Raising of Jairus's Daughter.* A style of machine-made furniture was named after him; it was something like the William Morris styles.

Eastman, George (1854-1932), American inventor, born in Waterville, N. Y. He studied at Rochester, N. Y., where the great Eastman factories are now located. Out of amateur experiments he arrived at a process for making gelatin dry plates and began their manufacture in 1880. He then devised and manufactured a small camera for amateurs that he named *kodak,* as well as a transparent rollable film. Eastman made generous use of his great fortune, donating about 90 million dollars to education and philanthropic enterprises. He committed suicide by shooting on March 14, 1932.

Eaton, Walter Prichard (1878-), American author, critic and lecturer on dramatic subjects, native of Malden, Mass. In 1900, the year of his graduation from Harvard, he became a reporter on the Boston *Journal.* Two years later began to write dramatic criticism in New York and during 1909-18 was dramatic critic for the *American Magazine.* His numerous books, chiefly juvenile stories and theatrical writings, include *Plays and Players, The Bird House Man, The Actor's Heritage, Boy Scouts on the Green Mountain Trail* and *Ten Years of the Theater Guild.*

Ebers, Georg Moritz (1837–98), German novelist and Egyptologist, born in Berlin. He devoted many years to travel and study in connection with his favorite subject, Egyptology, and at various times was associate professor at Jena and Leipzig. His novels were written to describe ancient Egyptian life in a way that would appeal to public interest. They include *An Egyptian Princess, Uarda, The Sisters* and *Serapis.* He also published stories of Dutch, German and Greek life. The *Papyrus Ebers* is a remarkable Egyptian medical treatise discovered by Ebers in 1872.

Ebert, Friedrich (1871–1925), first President of the German republic, born in Heidelberg. He became a journeyman saddler, settled in Bremen and was active there in the trades-union movement. The Social Democratic party appointed him a leader, and this led to his election to the Reichstag in 1912. He was a liberal but not an extremist, and Germany owed much to his wise prudence during the upheavals of 1918. He helped form the first provisional government and was elected president of the Reich by the National Assembly in November, 1919. His term was extended to 1925, and he died in office.

Echegaray, José (*c.*1832-1916), Spanish playwright, mathematician and political economist, born in Madrid and educated at its university. Before entering politics he taught mathematics. In the government he held posts as minister of education and minister of finance. His versatility was extraordinary. He wrote over 80 plays, and many were translated into other European languages; he is regarded as the founder of the new school of Spanish dramatics. Among his most successful works are *Madman or Saint, Mariana* and *The Son of Don Juan.* In 1904 he won the Nobel Prize for literature.

Eck, von, Johann Maier (1486–1543), German theologian, able opponent of Luther and the Reformation, born in Swabia. He studied at the leading German universities and rose to the position of chancellor and canon of Eichstädt. In 1519 he engaged in a famous disputation with Luther at Leipzig, and it was through his urging that Pope Leo X issued the bull of condemnation that Luther publicly burned. Doctor Eck took part in disputations at Baden and Basel and was present at the convocations of Worms (1540) and Regensburg (1543). He made a German translation of the Old Testament.

Eckener, Hugo (1868-), German airship pilot. He brought the Z R-3 (later the *Los Angeles*) to the United States from Germany in 1924, the first airship flight over the Atlantic. Later he piloted the German dirigible *Graf Zeppelin* on a round-the-world flight and with the *Hindenburg* established regular commercial service between Germany and the United States.

Eddington, Sir Arthur Stanley (1882-), English astromoner and physicist, educated at Cambridge. He became professor of astronomy at Cambridge in 1913 and director of its observatory a year later. He made many important contributions to knowledge of the evolution, motion and structure of the stars and was an exponent of the theory of relativity. Eddington in his writings tried to reconcile science and religion and to bring about a new understanding of the nature of the universe according to advanced theories. His most influential books were *The Nature of the Physical World, The Expanding Universe* (1933) and *New Pathways in Science* (1935). In 1938 Eddington was honored by the Order of Merit.

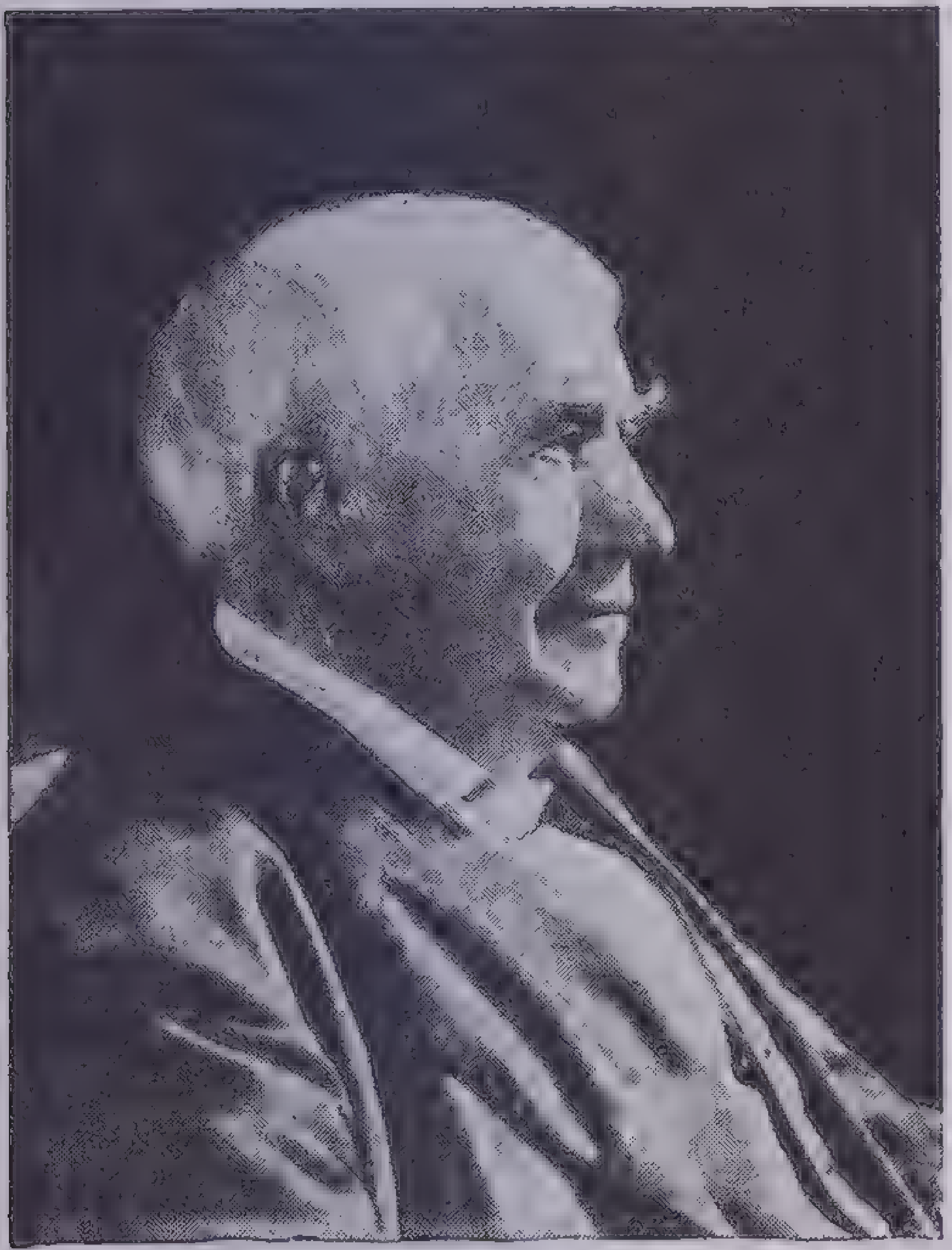
Eddy, Mary Baker Glover (1821–1910), founder of Christian Science, born in Bow, N. H., educated in public schools and privately. In her youth she joined the Congregational church and remained a member until she organized her own Church. She became convinced of the truth of Christian Science, that disease is an illusion and can be cured by working on the mind. She published *Science and Health, with Key to the Scriptures* (1875). This textbook of Christian Science has been reprinted many times. Mrs. Eddy organized the Church of Christ, Scientist, in Boston in 1879. Reorganized in 1892 as the First Church, it is recognized as the Mother Church by Christian Scientists. Besides *Science and Health,* Mrs. Eddy wrote *Miscellaneous Writings, Church Manual, Unity of Good, Christian Healing* and many pamphlets.

Eden, Anthony (Robert Anthony Eden; 1897-), English statesman, educated at Eton and Oxford. He served as a captain in the World War. Elected to Parliament in 1923, he served from 1926 to 1929 as private secretary to Sir Austen Chamberlain, then Secretary for Foreign Affairs. From 1931 to 1933 he was undersecretary for foreign affairs; Lord Privy Seal, 1934–35; minister without portfolio for the League of Nations, 1935. In that year he became secretary of state for foreign affairs, winning world-wide notice for his vigorous attempts to maintain peace in Europe. He resigned in February, 1938, because he could not agree with Prime Minister Neville Chamberlain's conciliatory attitude toward Germany.

Edgeworth, Maria (1767-1849) British novelist, born in England but brought up on her father's estate in County Longford, Ireland. Contact with the life about her gave her first-hand knowledge of the Irish peasants and gentry that appear in her *Castle Rackrent, Ennui, The Absentee* and *Ormond.* Scott was inspired to write novels of Scottish life by reading her stories of Irish life, and the Russian Turgenev was similarly influenced. Miss Edgeworth wrote of English life in *Belinda, Leonora* and *Helen;* she also produced moralizing books for children.

EDISON, THOMAS ALVA (1847-1931), American inventor, born in Milan, Ohio, of mixed Dutch and Scottish descent. His formal schooling, at Port Huron, Mich., was slight; he gave his mother sole credit for his early instruction. When he was a boy of 12, he sold newspapers on the Grand Trunk Railway; in 1862 he started a weekly paper, the *Grand Trunk Herald,* which he sold on the trains. When a fire broke out in the section of the baggage car where he did the printing and which was a tiny experimental laboratory, Thomas was ordered off the train with a blow on the ear that eventually brought on permanent deafness. In later years, Edison refused to have the trouble corrected, for he found that his world of silence was a help, rather than a hindrance, to a life of experiment and research. Another accident made him a railway telegrapher. He snatched a little boy out of the path of an oncoming train, and the child's father, a station master, offered to teach the youth telegraphy at the Mt. Clemens (Mich.) office. Edison became a skilled operator and held positions at various stations in the United States and Canada. He was meanwhile continually studying and experimenting and by 1869 had become permanently interested in invention. In 1876 he set up a workshop in Menlo Park, N. J., but in 1887 transferred his activities to West Orange; that laboratory was the scene of his labors to the end of his life.

At the time he became a telegraph operator, only one message at a time could be sent over any single wire. He invented the duplex, the quadruplex and then the sextuplex system that permits the transmission of six messages over the same wire at the same time. His carbon transmitter made the telephone much more efficient. He invented a phonograph with cylindrical records, creating thereby a new form of entertainment and a new industry, and later perfected a disk machine with a permanent diamond-point needle. Edison was a pioneer in developing motion pictures, for the parent of the modern projection machine was the Edison kinetoscope in 1889, a peephole device that showed pictures in motion on a loop of film. He attempted talking pictures as early as 1908 but withdrew the combination of phonograph and camera because it was imperfect. The incandescent lamp is perhaps the most important of Edison's inventions, measured by value to humanity. His inventions number in the hundreds and include the microphone, the electric pen and mimeograph, the alkaline storage battery and the self-regulating dynamo for use on electric railways. He devised the first successful carbon-filament lamp, and he perfected a system whereby current was properly divided among several circuits. After the outbreak of the World War he designed and operated chemical plants for making benzol and other materials required in industry.



Thomas Alva Edison

Edison was decorated as Chevalier of the Legion of Honor by France in 1878, and 50 years later, in 1928, he received the Congressional gold medal as a token from his own government in recognition of his part in "revolutionizing civilization." Other decorations and awards came to him from many sources. Edison stood in the front rank of those who have applied scientific principles to usable devices, and the inventions that he gave the world have lightened the burdens of innumerable workers, revolutionized industry and contributed to the enjoyment of life in every civilized land.

Edmund or **Eadmund II,** called *Ironsides* (*c.* 981-1016), King of the English people, the son of Ethelred II, the Unready. He possessed great physical courage and as a king of Mercia he rallied to his father's defense in 1015 when Canute, the Danish King, invaded England. In 1016 after Ethelred's death and Edmund's defeat at Assandun in Essex, Canute and Edmund agreed to divide the kingdom between them, but Edmund died within a few weeks.

Edward I (1239-1307), King of England, eldest son of Henry III. He became king in 1272, the first of eight rulers of England of that name. He succeeded in making Wales a part of the kingdom by 1282. The attempt to conquer the Scots cost Edward many years of fighting, and he died with Robert Bruce defying him as king of an independent Scotland. As an administrator Edward was one of England's great kings. He brought about greater democracy in Parliament by summoning to his Model Parliament in 1295, representatives of cities, boroughs and towns as well as churchmen and nobles. He established the principle that Parliament alone has the right to levy taxes.

Edward II (1284-1327) King of England, succeeded his father Edward I in 1307. As heir apparent he had been created Prince of Wales in 1301, a title to which the eldest son of each king has been eligible ever since. Edward's reign was largely taken up by wars with Scotland and disputes with Charles IV of France over territory claimed by the English. His army was defeated by Bruce at Bannockburn in 1314, and eventually Edward had to agree to a truce with Scotland. The trouble with Charles IV resulted in an uprising of banished nobles. The king was deposed by Parliament in 1327 and was murdered the same year while a prisoner in Berkeley Castle.

Edward III (1312-77), King of England, son and successor of Edward II, was chosen king by Parliament in 1327, six days before his father was deposed. His mother ruled as regent until 1330. He renewed the struggle with Scotland, but neither his invasions nor their defeats crushed the Scottish spirit of independence. In this reign began the Hundred Years' War between England and France, in which his son, the Black Prince, won distinction at Crécy and Poitiers. Though the English gained some advantage, Edward was compelled to agree to a truce in 1375, when both sides were too weakened to continue fighting.

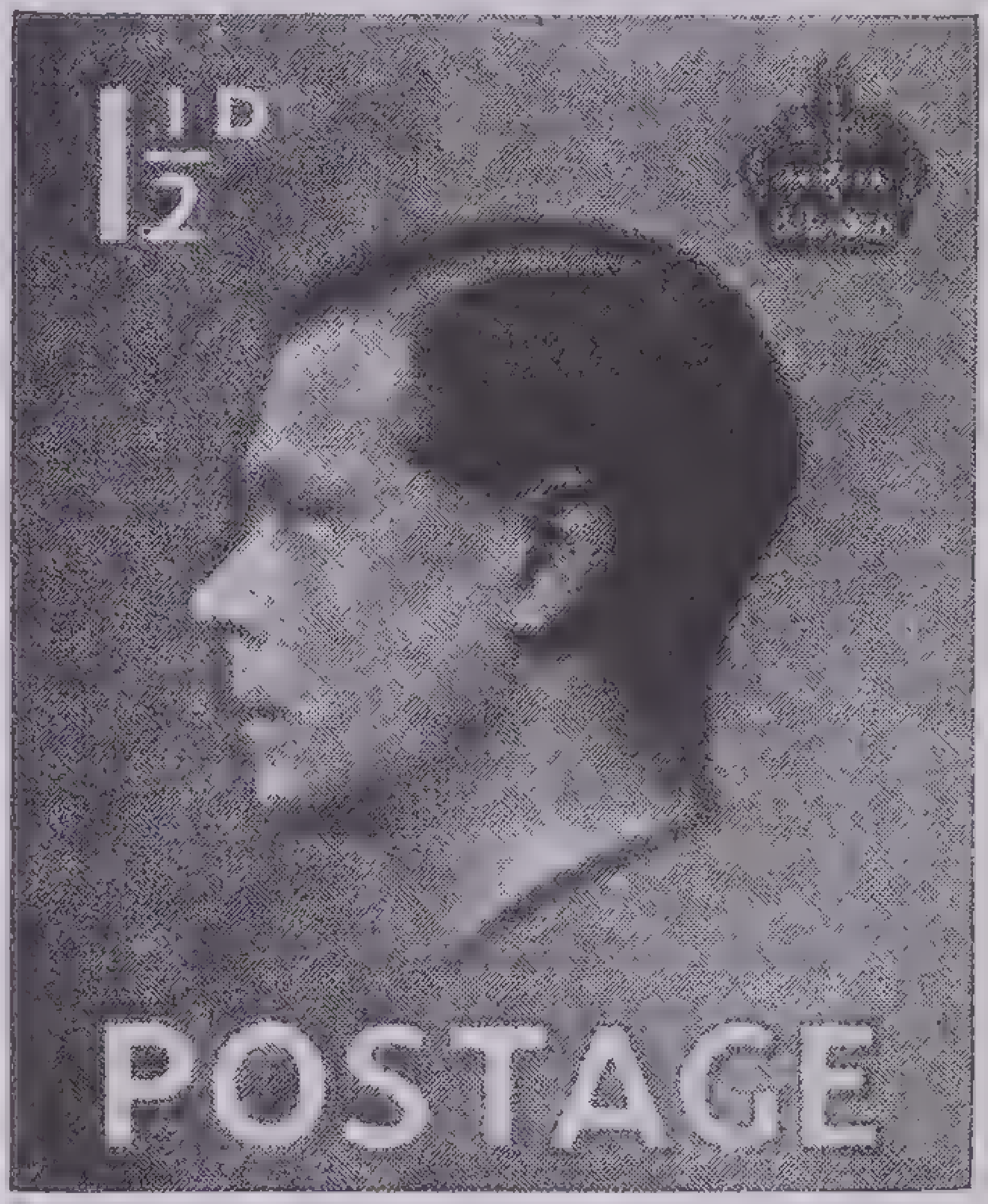
Edward IV (1442-83), King of England, the son of Richard, Duke of York. He laid claim to the throne in 1461, two months after the death of his father at the battle of Wakefield (December, 1460) in the Wars of the Roses. Edward, as leader of the Yorkist faction, defeated the Lancastrians and was crowned King. The struggle continued, however, and in 1470 an uprising led by the Earl of Warwick restored for a time Henry VI, who had been imprisoned in the Tower. Edward again defeated the Lancastrians at Tewkesbury in 1471 and reigned until his death. He believed in the supremacy of the Crown and paved the way for the absolutism of the Tudors.

Edward V (1470-83), King of England, son of Edward IV, succeeded his father in 1483 but never ruled. Before the date set for his coronation he and his younger brother were confined in the Tower by their uncle, Richard, Duke of Gloucester. The young princes were killed at Richard's command, and Richard ascended the throne as Richard III.

Edward VI (1537-53), King of England, son of Henry VIII and Jane Seymour. The boy prince was only 10 when his father died (1547), and the young king's uncle, Edward Seymour, Duke of Somerset, was the actual ruler for 5 years. Somerset was deposed and executed in 1552. His successor, John Dudley, Duke of Northumberland, induced Edward, on his deathbed, to nominate Lady Jane Grey as his successor. After a reign of nine days she was executed, and Mary I ascended the throne.

Edward VII (1841-1910), King of Great Britain and Ireland, eldest son of Queen Victoria, succeeded his mother in 1901. His full title was King of the United Kingdom of Great Britain and Ireland and of all the British Dominions beyond the Seas, Emperor of India. As Prince of Wales, he used his baptismal name, Albert Edward. He was educated by private tutors and at the universities of Edinburgh, Oxford and Cambridge and in 1860 visited the United States and Canada. The year 1863 marked his entrance into the House of Lords and his marriage to Alexandra, eldest daughter of Christian X of Denmark. They had six children; the eldest surviving son succeeded his father as George V in 1910. Prince Albert Edward was long the representative of Queen Victoria in social and public gatherings and was keenly interested in art, science and charity, besides being an enthusiastic sportsman. His reign of 9 years was notable for his efforts to promote friendly relations among the countries of the world, and he was popular throughout the British Empire.

Edward VIII (1894-), King of Great Britain and Ireland, eldest son of King George V and Queen Mary. He was christened Edward Albert Christian George Andrew Patrick David and was called David by his family and friends. He was prepared for the navy, entered Osborne in 1907, the Royal Naval College at Dartmouth in 1909 and in 1911 served as midshipman on H.M.S. *Hindustan.* His investiture as Prince of Wales in July, 1911, was an innovation in that it took place in Wales. The prince enrolled as a student at Oxford in 1912 but left at the outbreak of the World War, in which he showed an eagerness to share all the hardships and dangers of the soldiers. After the war he visited all parts of the British Empire, the United States and South American countries. On the death of his father, January 20, 1936, he became king. On December 10, still uncrowned, he abdicated the throne to marry Mrs. Wallis Simpson, an American who, because she had been twice divorced, was unacceptable to the British Government as the king's consort. Edward then left England and was made Duke of Windsor. His brother succeeded him as King George VI.



Courtesy Scott Stamp & Coin Company

King Edward VIII

Enlarged from a British postage stamp issued in 1936, one of a series of four denominations, the only stamps to bear the portrait of Edward as king

Edward, the Black Prince (1330-76), the eldest son of Edward III of England. His popular name, bestowed long after his death, was derived from the black armor worn by him at the Battle of Crécy, where, as a lad of 16, he led an army division to victory. In 1356 at the Battle of Poitiers he captured the French king, John II, subsequently taking him to London for ransom. Prince Edward's valor and his ability as ruler of Gascony and Aquitaine did not prevent the gradual decline of English power in France, and in 1371 he returned home an invalid. He died some months before his father and was buried in Canterbury Cathedral. Richard II was his son.

Edward the Confessor (*c.* 1002-66), King of England, son of Ethelred II, the Unready, and Emma of Normandy. Edward lived in Normandy until 1041, when he was invited to England by King Hardicanute, his half-brother. (Edward's mother married Canute, the Dane, after Ethelred's death.) Edward was elected king in 1042 on Hardicanute's death and in 1045 married the daughter of Earl Godwin, leader of the Saxon party, who exercised more actual power than the quiet, monkish king. Edward the Confessor is renowned as the founder of Westminster Abbey. He was canonized in 1161 by Pope Alexander III, who bestowed on him the title Confessor.

Edwards, Jonathan (1703-58), American theologian, born in East Windsor, Conn. He was graduated from Yale in 1720 at the head of his class and was pastor of a church in Northampton, Mass., 1727-50. A great exponent of evangelism and of strict Calvinism, Edwards aroused opposition in his parish by ruling that only those who had been converted should partake of the Lord's Supper. This stand led to his dismissal, and from 1750-58, while he was a missionary to the Indians at Stockbridge, he wrote his famous book on theology, *An Inquiry into the Freedom of the Will.* Edwards accepted the presidency of Princeton College in 1758, a few weeks before his death.

Egan, Maurice Francis (1852-1924), American author and diplomat, born in Philadelphia and educated there privately and at La Salle College. He was successively professor of English literature at Georgetown College, editor of various periodicals and professor of literature at the Catholic University, Washington, D. C.; and in 1907 he became United States ambassador to Denmark, remaining there until 1918. He was the author of poems, essays, miscellaneous writings and the autobiographical *Recollections of a Happy Life.*

Egbert the Great (d. 839), first King of Anglo-Saxon England to become overlord of all other Saxon kings. The son of Eahlmund, King of Kent, he fled to the court of Charlemagne about 789 to escape the hostility of the king of Wessex. In 802 he returned to England, became king of the West Saxons and subsequently conquered Cornwall, Mercia, Kent, Sussex and Essex. He became supreme overlord in 829. He successfully defended the country against invading Northmen and left the throne to his son Ethelwulf.

Eggleston, Edward (1837-1902), American author, born in Vevay, Ind. After a varied career as preacher, salesman and editor of juvenile and religious papers in Chicago, he became editor of the New York *Independent* (1870) and finally editor of *Hearth and Home*. His best-known novel, the realistic *Hoosier Schoolmaster*, ran serially in this magazine. Eggleston's gift for portraying the life and dialect of the early Middle Westerner is also displayed in such tales as *The Hoosier School Boy, The End of the World, The Graysons* (about Lincoln), *The Mystery of Metropolisville* and *Roxy*. He wrote biographies of Tecumseh, Pocahontas and other Indians and several volumes on American history.

Ehrlich, Paul (1854-1915), German physician and specialist in bacteriology, born in Silesia and educated at the universities of Breslau, Strasbourg, Freiburg and Leipzig. Many of his experiments were carried on at the Royal Institute for Experimental Therapeutics, at Frankfort, of which he was made director in 1899. His standardized diphtheria antitoxin was widely used, and he did valuable research work in the treatment of cancer. His most important discovery was the specific salvarsan or *606* for the treatment of syphilis. In 1908 Doctor Ehrlich shared with Doctor Metchnikoff the Nobel Prize for medicine.

Eichelberger, William Snyder (1865-), American astronomer, graduated from Johns Hopkins University in 1891. He became professor of mathematics for the United States navy in 1900 and was in charge of the eclipse stations at Fort de Kock, Sumatra, and at Daroca, Spain. In 1910 he became director of the *National Almanac*. He contributed numerous scientific articles to government publications.

Eiffel, Alexandre Gustave (1832-1923), French engineer, born in Dijon, famed as the designer and builder of the great tower in Paris that bears his name. He built the framework for the Statue of Liberty in New York harbor, made designs for the Panama Canal locks and constructed several bridges and viaducts, including the iron bridge over the Garonne River, Bordeaux. His *Resistance of the Air* is an authoritative discussion of air mechanics.

Einstein, Albert (1879-), physicist, born in Germany of Jewish parentage; he became a Swiss naturalized citizen in 1901. While in Switzerland he wrote his theory of relativity (1905). In 1909 Einstein joined the faculty of Zurich University, in 1911 was professor of physics at Prague and in 1912 returned to Zurich to become full professor of theoretical physics at the Technische Hochschule. In 1914 he received a research professorship at the Royal Academy of Sciences at Berlin, enabling him to devote his entire time to study. The publication of his paper on general relativity in 1915 and that on the unity of gravitation, electricity and magnetism in 1929 were sensational events in the world of science. Doctor Einstein received acclaim on his visits to the United States in 1930 and 1931. In 1933 he left Germany, and his property was confiscated; in 1934 he was deprived of his citizenship by the Nazi Government. The principal universities of several countries offered him posts. He lived for a while in England and Belgium and then became head of the school of mathematics in the Institute for Advanced Study at Princeton. In 1921 he was awarded the Nobel Prize for physics.

Elgar, Sir Edward (1857-1934), English composer, son of an organist in Worcester, who supervised his education in music. Elgar succeeded his father as organist in 1885. After 1891 he devoted himself chiefly to composition, winning his first outstanding success with an oratorio, *The Dream of Gerontius* (1900). *The Apostles* and *The Kingdom* were composed as parts of an oratorio trilogy, and he also wrote symphonies, overtures and other orchestral pieces. His most popular composition was *Pomp and Circumstance*. In 1904 he was knighted and in 1905-8 occupied the chair of music at the University of Birmingham. Elgar's last but unfinished composition is *Third Symphony*.

Elgin, James Bruce, 8th Earl of (1811-63), British administrator, born in London and educated at Eton and Oxford. He served as governor of Jamaica in 1841 and was governor general of Canada, 1847–54. His administration in Canada was notable for the establishment of responsible government and the negotiation of a reciprocity treaty with the United States. He was viceroy of India at the time of his death. Lord Elgin's father, Thomas, secured for the British Museum the famous Greek sculptures afterward known as the Elgin Marbles.

El Greco (*c.* 1548-1625), Cretan painter in Spain, born in Candia. His real name was *Domenicos Theotocopoulos*, known in Spain as *Domenico Theotocopuli* or more commonly as El Greco, which means the Greek. He studied under Titian and Michelangelo. He introduced a new treatment of religious subjects that aroused mixed comment in the art circles of his day. His works include *The Stripping of Christ before the Crucifixion, Christ and the Money Changers* and *St. Dominic*.

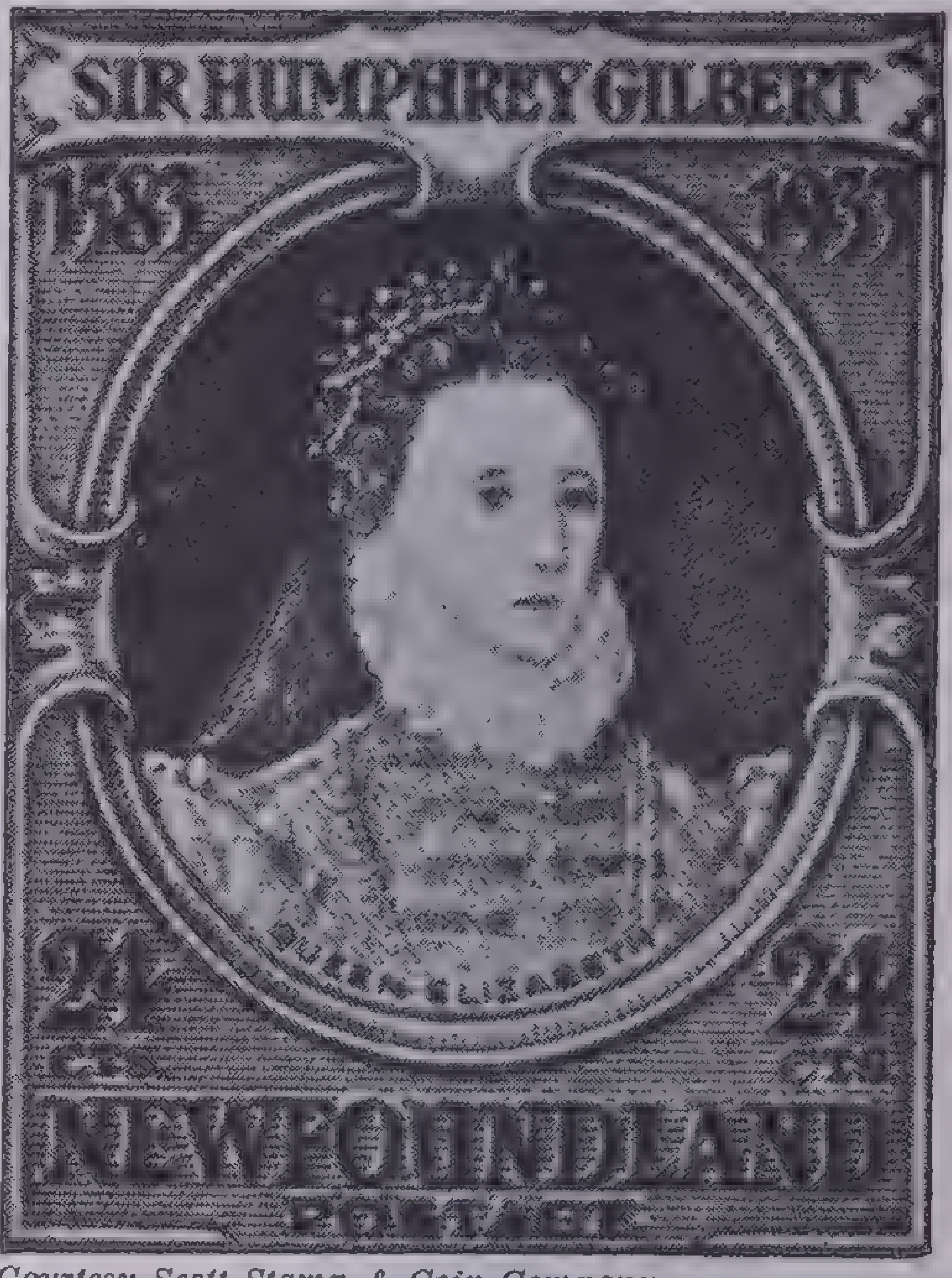
Eliot, Charles William (1834–1926), American educator, born in Boston and graduated from Harvard in 1853. He was professor of chemistry at Massachusetts Institute of Technology and in 1869 became president of Harvard. Under his administration this institution developed into one of the great universities of the world. To President Eliot is due the introduction of the elective system as a recognized principle of American education. This is perhaps his outstanding achievement, but he is also remembered for many valuable books on education, for his work in behalf of world peace. In 1909, after 40 years as president, he retired from active duties at Harvard.

Eliot, George (Mary Ann Evans; 1819-80), English novelist, born at Arbury in Warwickshire. She began her literary career by a translation of Strauss's *Life of Jesus* and became in 1851 a contributor to the *Westminster Review*. During this time she formed the acquaintance of George Henry Lewes, with whom she lived as his common-law wife. Lewes encouraged her to publish her first stories, *Scenes from Clerical Life*, contributed to *Blackwood's* in 1856. The stories proved a signal success and were followed by a series of seven novels, beginning in 1858 with *Adam Bede*, which attained an immense success and at once secured her rank with the most eminent novelists of the day. This was followed in 1859 by *The Mill on the Floss* and in 1861 by *Silas Marner, the Weaver of Raveloe*. In 1861 the *Scenes of Clerical Life* were republished from *Blackwood's Magazine*. In 1863 *Romola* appeared; *Felix Holt* was published in 1866 and *Middlemarch* in 1872; *Daniel Deronda* and *Impressions of Theophrastus Such* appeared later. She wrote two volumes of poems, including the famous "Choir Invisible."

Eliot, John (1604-90), early American evangelist, called the *Apostle to the Indians*, born in Hertfordshire, England. He migrated to America in 1631, preached for a year in Boston and then settled in Roxbury. With this town as his headquarters he devoted his life to the conversion of the Indians, learning their language so that he might preach to them in their own tongue. Several settlements of "praying Indians" were established but were disrupted in 1675 by King Philip's war. Eliot wrote a *Catechism* for his people, made a translation of the Bible into Algonquin (the first Bible printed in America) and helped to prepare the famous *Bay Psalm Book*.

Eliot, Thomas Stearns (1888-), English poet, born in St. Louis, Mo., educated at Oxford, became English citizen in 1927. His work is modern in style and is widely discussed. Among his books of poetry are *Poems, The Waste Land, Ash Wednesday* and *Sweeney Agonistes*. He also wrote several volumes of critical essays and a play in verse, *Murder in the Cathedral*.

ELIZABETH (1533-1603), Queen of England and Ireland, the daughter of Henry VIII and Anne Boleyn. In 1536 her mother was executed; her father took little interest in his daughter. In 1558 she became queen and her reign lasted for 45 years. Her first act was to release the imprisoned Protestants and to re-establish Protestantism. Very early in her reign she was troubled by the pretensions of the friends of Mary, Queen of Scots, who was now the next heir to the throne. As Mary was a most zealous Catholic, the counselors of Elizabeth were anxious that she should marry in order to secure the Protestant succession. Though she negotiated and coquetted with one person after another, she finally refused to marry, though it is believed that she would have accepted her favorite, the Earl of Leicester, for a husband, if she had not been prevented by her other counselors, especially Cecil, Lord Burleigh. Twelve years after her accession, in 1570, Elizabeth was excommunicated by Pope Pius V. Sixteen years later, in 1586, the Babington conspiracy was formed, the object of which was to re-establish the papacy and to set Mary, Queen of Scots, on the throne of England. This plot led to Mary's execution after she had been imprisoned in England for 19 years. In 1588, two years after this conspiracy, Elizabeth had to contend with a more formidable enemy in Philip II of Spain, who avowed his resolution to annihilate Protestantism, but whose threatened invasion of the country was prevented by the defeat and destruction of his armada. The firmness and sagacity of Elizabeth's advisers, especially of Burleigh, protected her against these dangers; and at the close of her reign England was stronger and greater than it had ever been before. Elizabeth was great mainly through her counselors, among whom were some of the most eminent statesmen that England has produced. The Elizabethan age was a period of glory in English history. Its literature alone would make it memorable. The discoveries of Drake, Hawkins and Raleigh belong to this period.



Courtesy Scott Stamp & Coin Company

Queen Elizabeth

Enlarged from a Newfoundland postage stamp issued in 1933 to commemorate the landing there of Sir Humphrey Gilbert on August 5, 1893, on authority of letters patent issued to him by Queen Elizabeth

Ellis, Henry Havelock (1859–1939), English psychologist and writer, native of Croydon, Surrey. He was educated in a London boys' school and by private tutors. Ellis began his active career as a teacher in charge of a government school in New South Wales (1878-80). He returned to England to study medicine. His books are regarded as among the best in the special field of sex psychology. They include *Man and Woman, The World of Dreams, The Dance of Life* and *Essays of Love and Virtue* (two series).

Ellsworth, Lincoln (1880-), American explorer and aviator, native of Chicago. After 2 years study at Columbia University he spent several years in railway engineering and gold prospecting in Canada and Alaska. In 1924 he organized a geological expedition to the Andes Mountains, sponsored by Johns Hopkins University. He conducted and navigated the *N 24* on the Amundsen-Ellsworth Polar Flying Expedition of 1925, but the explorers reached only 88° N. The next year, however, Ellsworth, Amundsen and Nobile flew across the Pole in the dirigible *Norge*. In 1933 and again in 1935-36 Ellsworth explored the Antarctic by plane. On this last trip with a disabled plane and a radio that failed he was missing in the Antarctic for two months before being rescued.

Ellsworth, Oliver (1745-1807), American jurist and statesman, born in Windsor, Conn., graduated from Yale in 1766. In 1771 he was admitted to the Connecticut bar. As a member of the Continental Congress he represented his state in the Constitutional Convention of 1787, in which he had an important part in the organization of the national legislative system. He was elected to the Senate in 1789 and as chairman of the Judiciary Committee drew up the plan for the present Federal court system. After serving 3 years as chief justice (1796–99), he was sent to France to assist in the negotiation of the treaty of 1800.

Elman, Mischa (1891-), American violinist, born in Russia. He played in public at the age of 5 and later studied with Auer in St. Petersburg. He made an American debut in New York city with the Russian Symphony Orchestra in 1908 and thereafter devoted himself to concert work.

Ely, Richard Theodore (1854-), American economist, native of Ripley, N. Y., and educated at Columbia University and abroad. He occupied the chair of political economy at Johns Hopkins (1881-92) and had a similar position at the University of Wisconsin (1892-1925). He then became research professor of economics at Northwestern University. Professor Ely founded and became director of the American Bureau of Industrial Research and other organizations devoted to economic problems. He wrote numerous books and magazine articles.

Elzevir, Louis (*c.* 1540–1617), Dutch publisher. He produced his first book at Leyden in 1583 and set up a business that continued until 1712. Elzevir and his descendants made low-priced books, usually small and with narrow margins. The types they designed are extremely legible and still influence modern designers. A style of type now used is named for them.

Emanuel the Great or **the Happy** (1469-1521), King of Portugal from 1495 until his death. During his reign Portugal became the first naval power of the world. Emanuel promoted the expeditions of Vasco da Gama, Cabral and other famous explorers, and his reign is regarded as the golden age of Portugal.

EMERSON, RALPH WALDO (1803-82), American essayist, poet and philosopher, born in Boston, the descendant of a long line of clergymen. The boy grew up in a home of refinement and culture and received the traditional New England education, being graduated from Harvard in 1821. In 1829 he became pastor of the Second Unitarian Church of Boston. His congregation could not approve of his desire to dispense with the rite of the Lord's Supper, and he resigned his pastorate in 1832. The next year, when he made the first of three trips to Europe, he met several writers of note and formed a deep and lasting friendship with Carlyle. After his return to America Emerson settled in Concord, Mass., married and began his lifelong career as writer and lecturer.

His first published book, *Nature* (1836), contains the essentials of his philosophy of life, a philosophy of inspiration, rather than one of organized theory. In 1837 he delivered at Harvard the Phi Beta Kappa oration that he called *The American Scholar*. Again he sounded the note of self-confidence and individualism. Emerson's *Essays* appeared in parts in 1841 and 1844, and between these dates he wrote several articles for the *Dial*, the periodical of the Transcendentalists of which he was editor for a brief period. His first book of poems was published in 1847. His poems tend to be meditative and intellectual; the *Concord Hymn* and a few others are often quoted and contain lines of deep beauty. In 1850 *Representative Men* appeared. This contains some of the lectures delivered on a second visit to England. Another outcome of this voyage was a book of travel, *English Traits* (1856). Then followed *The Conduct of Life*, another collection of poems and, in 1870, *Society and Solitude*. His last volume of essays *Letters and Social Aims* was published in 1874.

Emmet, Robert (1778-1803), Irish patriot, born in Dublin, studied for a time at Trinity College. From 1800 to 1802 he was in Europe trying to get French support for an Irish revolution. He and his followers made the attempt in Dublin in 1883 but failed, and Emmet had to hide in County Wicklow. He was captured and hanged when he returned to Dublin to see his sweetheart. Emmet's whole plan was foolish and had been known to the English authorities from its beginning. However, his daring appealed to the Irish people, who made him a national hero. His exploit is celebrated in a number of songs.

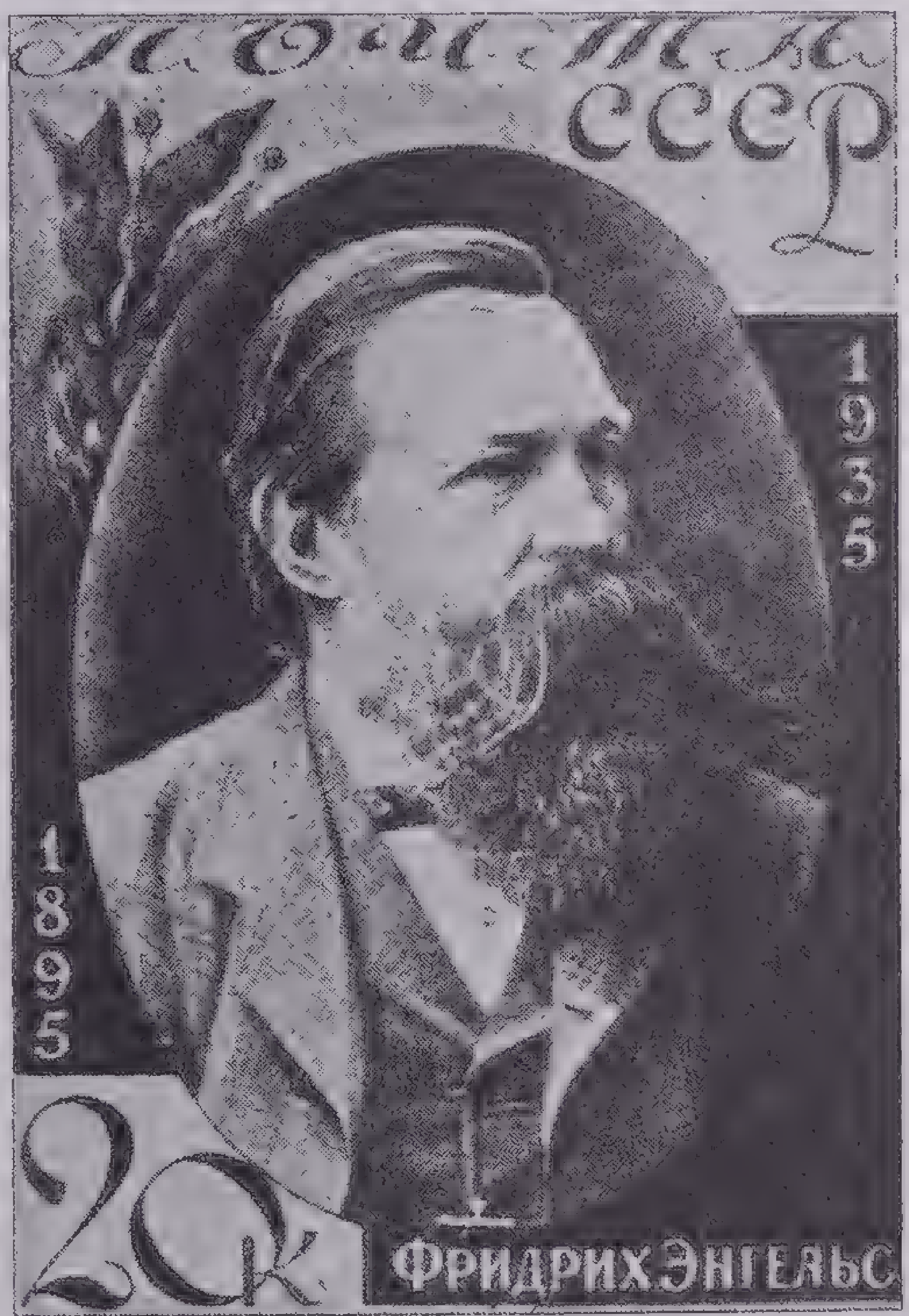
Empedocles (*c.* 500-*c.* 430 B.C.), Greek philosopher and poet, born in Sicily. He taught that matter consists of four primary elements: fire, air, earth and water; and that change is the result of two primal forces, "friendship" and "strife." The first he called the uniting force; the second, the separating force. Fragments of two of his poems have survived. According to legend, Empedocles leaped into the burning crater of Mt. Etna, hoping thereby to spread a belief that he had been transported alive to heaven. Matthew Arnold made this story the basis of his poem *Empedocles on Etna*.

Encke, Johann Franz (1791-1865), German astronomer, born in Hamburg. He is best known for his computation of the period of the comet discovered in 1818 by the French astronomer Jean Louis Pons. It is now called *Encke's comet* and has the shortest period of any comet known; it revolves about the sun in about 1,200 days. Encke also determined the orbit of the brilliant comet of 1680 and computed a value of the sun's parallax long accepted as standard.

Endicott, John (*c.* 1588-1665), governor of Massachusetts Colony (1628-30). He came to America at 39 and was prominent in a number of administrative positions for 36 years. He is chiefly known for the severe rules of personal conduct that he imposed on the colonists. In later years he persecuted the Quakers severely.

Enesco, Georges (1881-), Rumanian violinist and conductor. He studied at the Vienna Conservatorie and in Paris with Massenet and Fauré. In 1900 he began a tour of Europe, playing and conducting in many of the large cities. He also appeared in North America as a guest conductor. The two symphonies that he composed are strongly nationalistic in tone.

Engels, Friedrich (1820-95), German socialist, the son of a wealthy textile manufacturer. He served an apprenticeship in Germany and then went to work in his father's factory in Manchester, England. He is famous for his collaboration with Karl Marx in organizing an international socialist movement and in completing Marx's great book *Das Kapital*.



Courtesy Scott Stamp & Coin Company

Friedrich Engels

Enlarged from a Russian postage stamp issued in 1935 in commemoration of the 40th anniversary of the death of the socialist leader

Ennius, Quintus (239-169 B.C.), Latin poet considered by the Romans the father of their literature. He was a native of Calabria in southern Italy and knew Greek, Latin and the Italian dialect called *Oscan*. Cato the Elder took him to Rome, where he taught Greek and Latin and gained the friendship of the noblest Romans of his day. He wrote tragedies and comedies, satires, epigrams and an epic *Scipio*. Nothing now remains of his works but fragments quoted by other ancient authors. He wrote satires, a peculiarly Latin form of literature, and composed Latin poetry in hexameters, following the Greek meter.

Enver Pasha (*c.* 1881–1922), Turkish statesman and soldier. As an army officer he came in touch with leaders of the Young Turk movement and himself became its leader. He had much to do with the overthrow of Sultan Abdul Hamid in 1909. After that he assumed much power and was virtually dictator during the World War. He left Turkey at the close of the war and was killed in a skirmish with Russian revolutionists.

Epaminondas (*c.* 418-362 B.C.), Theban statesman and general, who made Thebes supreme in Greece. By his superior generalship at the battle of Leuctra, 371 B.C., the Thebans defeated a larger Spartan force and saved Thebes from Spartan domination. From that time on Epaminondas devoted himself to weakening the power of Sparta and in 362 B.C., while engaged in his fourth expedition against the enemy, overwhelmed the combined Spartan and Athenian forces at Mantinea. He himself fell in battle, and the power of Thebes soon waned.

Épée, de l', Charles Michel, Abbé (1712–89), French priest, born in Versailles, one of the pioneers in the education of deaf-mutes. After he entered the priesthood, he was obliged to leave his position at Troyes because of his beliefs and in 1755 began to develop a sign-language system for the deaf and dumb. The school that he founded became a government institution after his death. He wrote a dictionary of manual signs.

Epictetus (*c.* 60-*c.* 120), Greek Stoic philosopher, born in Hieropolis, Phrygia. He became a slave in Rome during the reign of Nero; and Epictetus seems not to be his real name since in Greek it means purchased or bought. After he was set free, he began his philosophic studies in Rome but was banished by the Emperor Domitian; he then settled in Epirus. The Greek historian Arrian, his most famous pupil, published some of his master's teachings. Epictetus taught many principles later associated with Christ, such as the love of good and hatred of evil, and he exalted patience, temperance and self-control.

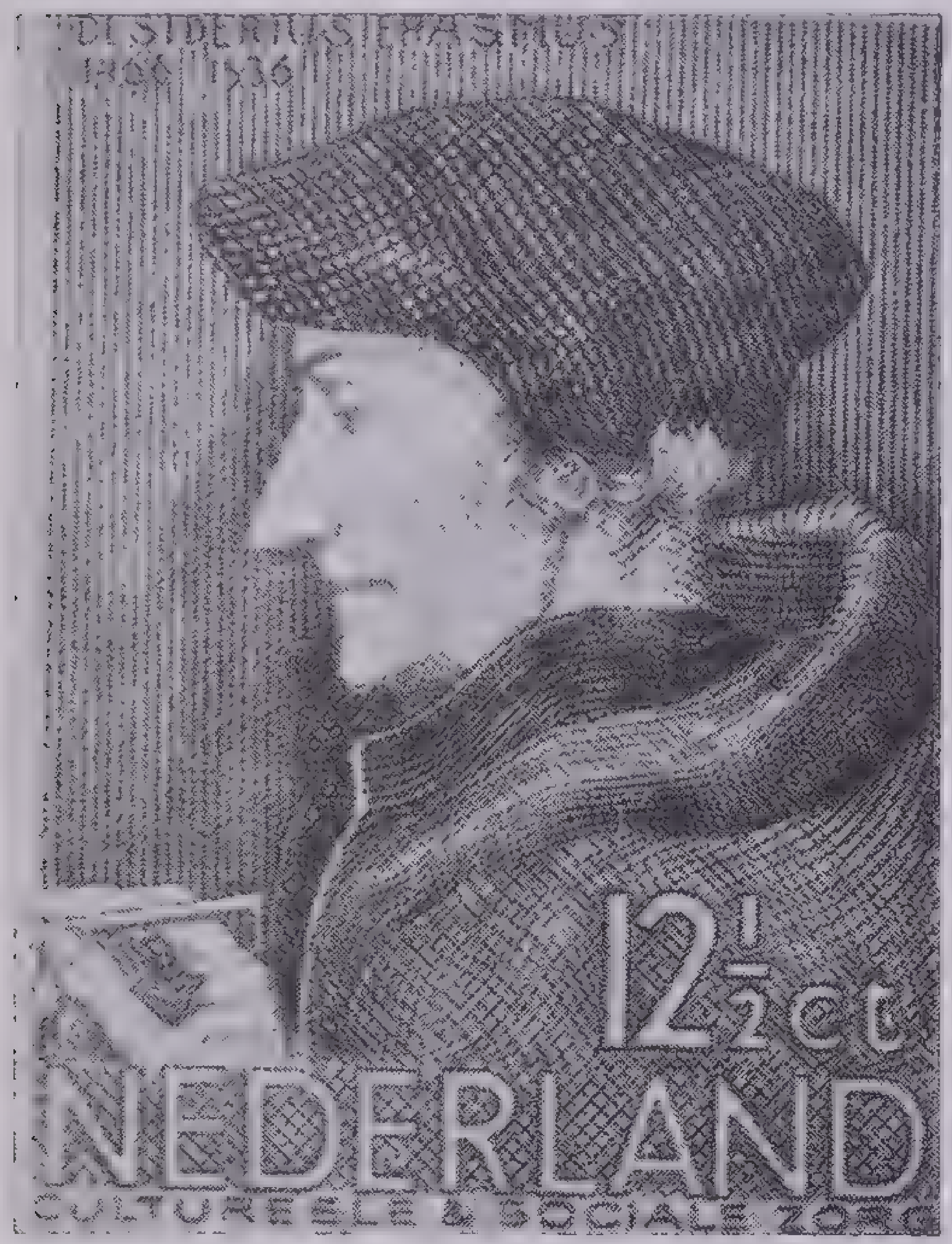
Epicurus (*c.* 342-270 B.C.), Greek philosopher, born on the island of Samos of Athenian parentage. Epicurus settled in Athens in 306 B.C. and founded the Epicurean school in a garden, attracting to himself pupils from far and wide. The central idea of his philosophy was that pleasure is good and pain is evil. By pleasure he did not mean sensual enjoyment but the joy that comes from prudence, temperance and justice. The happy person is the one whose soul is free from fear and whose body is free from pain. In physics he taught the atomic theory of Democritus; that the universe was formed by combinations of atoms. Though little has survived of his voluminous writing, Cicero, Seneca and Plutarch expounded his theories, and Lucretius embodied his philosophy in his great poem *On the Nature of Things*.

Épinay, d', Louise Tardieu d'Esclavelles, Madame (1725–83), French writer. in 1745 she formed a close intimacy with Rousseau. An unfortunate jealousy that Rousseau conceived for Grimm, another friend of Madame d'Épinay, was followed by an open rupture with his benefactress. In 1774 she wrote *Les Conversations d'Emilie*, a book for the education of her granddaughter, which was crowned by the Academy in 1783. Her memoirs and letters throw a vivid light on the literary and social life of the period.

Epstein, Jacob (1880-), sculptor, of Russo-Polish parentage, born in New York. He made his home in England. His unusual style of sculpture has received both ardent praise and adverse criticism. He produced massive creations in stone or bronze. In the British Medical Association Building, London, are 18 large figures; in the Père Lachaise Cemetery, Paris, is the *Oscar Wilde Memorial;* and in the Metropolitan Museum, New York, is his *American Soldier* in bronze.

Erasistratus (*c.* 300 B.C.), Alexandrian anatomist—"Father of Physiology"—born on the island of Ceos. After a career as practicing physician he settled at Alexandria, where he devoted himself to study and writing. Erasistratus made original discoveries in the anatomy of the blood vessels and nerves and was the first to reveal the distinction between motor and sensory nerves and their common origin in the brain. He was also the first to trace the veins and arteries to the heart.

ERASMUS, DESIDERIUS (*c.* 1466-1536), famous Dutch scholar of the Renaissance, born in Rotterdam. He became a monk but soon abandoned the monastery for the life of a scholar, teacher and writer. Considering that Erasmus neither founded nor led a great movement and wrote no outstanding classic, his influence on his times was remarkable. In an age that produced Columbus, Thomas More, Luther and Calvin, Erasmus was content to point out abuses, suggest reforms and work for an increase of knowledge. He has been called the *apostle of common sense and of rational religion*. He took no active part in the Reformation but was in favor of moderate reform in the Catholic Church. Erasmus visited many different countries; spent considerable time in England, where he became the friend of More, and taught Greek at Cambridge. Besides producing numerous works in Latin, he prepared a new edition of the Greek New Testament and made a parallel translation in Latin. His 3,000 extant letters are regarded as valuable source material. He made a remarkable collection of proverbs, the *Adagia*. Perhaps his greatest work was the *Praise of Folly* (*Moriae Encomium*), a satire on the faults of the Church and its dignitaries.



Courtesy Scott Stamp & Coin Company

Desiderius Erasmus

Enlarged from a Netherlands' postage stamp issued in 1936 to commemorate the 400th anniversary of the death of the great Dutch scholar. The head on the stamp is taken from the portrait by Hans Holbein the Younger

Eratosthenes (*c.* 276-*c.* 195 B.C.), Greek astronomer and geographer, born in Cyrene, North Africa. About 240 B.C. Ptolemy Euergetes, his royal patron, placed him in charge of the great library at Alexandria. Eratosthenes wrote on a wide variety of subjects, notably astronomy, geography, mathematics, philosophy and literature. He knew that the earth is round, computed its circumference, and estimated the inclination of the axis with a very small degree of error. In old age he lost his eyesight and voluntarily starved himself to death.

Eric the Red (*c.* 1000), Scandinavian explorer, colonizer of Greenland. Having settled in Iceland as a fugitive from justice, he was compelled to flee again about 980 and sailed to a western island, discovered, it was said, a century before. In 985 Eric went to Norway and assembled a band of colonists whom he took with him to Greenland, as the island was called. According to tradition, Eric's son Leif introduced Christianity into Greenland. The settlement founded by Eric lasted about 400 years, but no traces of it exist today.

Ericson, Leif, Scandinavian explorer, son of Eric the Red and supposedly the discoverer of the North American continent. According to accounts in the Icelandic sagas (hero tales), about the year 1000, Leif discovered a land to the west of Greenland that he called Vinland. No one knows whether this was Labrador, Newfoundland or a part of New England. Since nothing came of the discovery, Columbus has always been honored as the real discoverer of the Americas.

Ericsson, John (1803-89), Swedish-American inventor, born in Värmland, Sweden. He was an army engineer before his removal to England in 1826. There he invented a new type of screw propeller for steamships. In 1839 he went to America to engage in construction work for the U. S. Navy. He designed the ironclad *Monitor*, which won the battle of Hampton Roads; it was built in about 3 months and was the "cheese box on a raft" that defeated the Confederate ship *Merrimac* early in the Civil War (March 9, 1862).

Erskine, John (1879-   ), American educator and author, born in New York city, educated at Columbia University. After teaching English at Amherst College he joined the faculty of Columbia, where in 1916 he was appointed professor of English. Though he began writing on literary subjects in his college days and published books at frequent intervals for years, he is best known as the author of a series of witty, satirical novels about legendary or Biblical characters. The first of these, *The Private Life of Helen of Troy*, appeared in 1925. It was followed by *Galahad, Adam and Eve* and *Penelope's Man. Uncle Sam* and *Cinderella's Daughter* are collections of parables in a similar vein. He was co-editor of the *Cambridge History of American Literature*. Professor Erskine was a brilliant pianist and for several years acted as chairman of the Juilliard School of Music in New York City.

Esarhaddon (d. 668 B.C.), King of Assyria, the son of Sennacherib. He reigned 681-668 B.C. Esarhaddon, who was a great warrior, was successful in attacks against Chaldea, Sidon and Egypt. He died while on an expedition against the Egyptians, who had rebelled. One of the constructive acts of this king was the rebuilding of Babylon, which his father had destroyed. He was succeeded by his son Assurbanipal. The British Museum has many inscriptions listing Esarhaddon's conquests and his building operations.

Espy, James Pollard (1785-1860), American meteorologist, born in Pennsylvania. His *Philosophy of Storms*, published in 1841, was commended by the French Académie des Sciences. Appointed in 1842 to the Washington Observatory, Espy laid the basis of the Weather Bureau. He was the first to explain the cause of rain (1836) as accepted in modern meteorology.

Essex, Robert Devereux, 2d Earl of (1567-1601), English statesman and favorite of Queen Elizabeth. As the ward of the powerful Lord Burleigh, Essex was introduced at court under friendly auspices. He showed ability as coleader with Henry IV of France against the Spaniards (1591) and as joint commander with Lord Howard in 1596. In 1598 he succeeded Lord Burleigh as chancellor of Cambridge. A year later Essex was sent to Ireland as lord lieutenant, but his administration of that rebellious island was a failure and on his return he lost all his offices. When he was released from prison by Bacon's intercession, he raised a force of 300 men in an attempt to oust his enemies among the queen's counselors but was tried and beheaded as a traitor.

Estaing, d', Charles Hector, Count (1729–94), French admiral, commander of the fleet sent to America in 1778 during the Revolution to help the colonies in their fight for independence. D'Estaing returned to France in 1780 after capturing two islands in the West Indies and taking part in the unsuccessful attack on Savannah. During the French Revolution he was in sympathy with the moderate faction. He testified in behalf of Marie Antoinette and in 1794 the extremists ordered that he be executed as a royalist.

Ethelbert (*c.* 552–616), English King of Kent who came to the throne in 560. By 593 he had extended his rule over all the territory south of the Humber River. Through the influence of his wife Bertha, a Frankish princess, and Saint Augustine (or Austin), Ethelbert was converted to Christianity in 597. A legal code issued by him in 600 is memorable as the first written compilation of Saxon laws.

Ethelred II, called *The Unready* (*c.* 968-1016), King of the English (*c.* 978-1016). His surname had reference to his lack of good *rede* or judgment. Ethelred married Emma, daughter of the Duke of Normandy; one of their sons was Edward the Confessor. The king's energies had to be diverted from civic matters to fighting the Danes, with whom he finally concluded a peace treaty in the year 1000. War again broke out in 1002 because of a general massacre of the Danes in England. Ethelred frequently bought peace by money payments, but war continued intermittently until his death. Ethelred's reign was one of the most unhappy in English history. His son Edmund made an agreement with Canute, the Dane, by which they were to rule England jointly, but Edmund soon died.

Ethelwulf (d. 858), King of Wessex and Kent (839-58), the son of Egbert. He married Judith, daughter of Charles the Bald of France, and was the father of Alfred the Great. While Ethelwulf was on a pilgrimage to Rome (855-56), his son Ethelbald fomented a rebellion; on his return Ethelwulf granted the son the throne of Wessex, and he himself ruled over Kent.

Eucken, Rudolf Christoph (1846-1926), German philosopher, born in East Friesland and educated at Göttingen and Berlin. He held the chair of philosophy at Basel (1871-74) and thereafter had a like position at Jena. Eucken lectured at Harvard and in Japan. In 1908 he received the Nobel Prize for literature. His idealism emphasizes the worth of the inner life; all knowledge is faith. English translations of his works include *The Meaning and Value of Life, The Truth of Religion* and *Collected Essays*.

EUCLID (*c.* 300 B.C.), called the *Father of Geometry*, a Greek mathematician who lived in Alexandria during the reign of Ptolemy I (306-285 B.C.). His *Elements*, the basis of all later texts on geometry, consisted of thirteen books, of which only six are in use today. It is said that when Ptolemy asked him if there were not an easier method of learning geometry than studying the *Elements*, Euclid replied, "There is no royal road to geometry."

Eudoxus of Cnidus (*c.* 409-*c.* 353 B.C.), Greek mathematician and astronomer, called by Cicero the *Prince of Astronomers*. He studied under Plato and then under the Egyptian scholars. He founded a school in Cyzicus and spent his later years in Cnidus, where he had an observatory. It is claimed that he discovered the solar year to be 6 hours longer than 365 days, invented a sundial and developed the part of geometry that is in Euclid's 5th book.

Eugénie [de Montijo de Guzmán] (1826–1920), Empress of France, wife of Napoleon III, born in Granada, Spain, and educated in France. Her father was a Spanish grandee and her mother was the daughter of an American-Scot. In 1853 Eugénie married the newly crowned emperor, who was fascinated by her beauty and charm. In the days of her prosperity she set the fashions, and there have been modern revivals of "Empress Eugénie" styles. The empress was partly responsible for her husband's attempt to set up a French empire in Mexico and for his declaration of war against Germany in 1870. After Napoleon's surrender at Sedan, Eugénie fled to England, where her husband joined her in 1871. All hopes for her restoration to power were lost by Napoleon's death in 1873 and that of their only son in 1879. She died in Spain and was buried in England.

Euler, Leonhard (1707-83), Swiss mathematician, a founder of the science of pure mathematics. He taught in St. Petersburg Academy and in the Academy of Sciences at Berlin. Among the most important expressions bearing his name are *Euler's Constant, Euler's Equation* and *Euler's Formula*. He did other notable work in astronomy, hydrodynamics and optics.

EURIPIDES (480-406 B.C.), youngest of the three Greek tragic poets who made Athens famous in literature, the others being Aeschylus and Sophocles. Euripides was born on the island of Salamis on the day, it was said, that the Greeks won the decisive battle over the Persians in the adjoining straits. He was of humble birth but received a good education and began his dramatic writing in youth. His first play *The Daughters of Peleus* was produced in Athens when he was 25; though it won only third place in the competition of that year, he was encouraged to go on. It was 14 years before he won first prize; he probably attained that coveted honor but five times in all his career. In 408 B.C. he was invited to the court of Archelaus in Macedonia and died there 2 years later. Euripides was more appreciated in later times than in his own age, partly because of his human quality and tenderness, and partly because he was more modern than the earlier dramatists. The romance of his plays marked a new note that his own age did not appreciate. His work reveals him as one of the world's greatest tragic poets. Typical among his extant dramas are *Alcestis, Medea, Iphigenia in Tauris, Iphigenia in Aulis* and *Orestes*.

Eusebius of Caesarea (*c.* 260–*c.* 340), Greek historian, the *Father of Ecclesiastical History*, born in Palestine. He studied under Pamphilus of Caesarea and so is often called *Eusebius Pamphili* (Pamphilus's Eusebius). He became bishop of Caesarea in 313 and enjoyed a wide reputation for learning and piety. His most important work (10 books) is a history of the Christian Church to the year 324.

Eustachio, Bartolommeo (d. 1574), Italian anatomist, whose name was given to the ear tube leading from the upper part of the pharynx, because he wrote the first accurate description of that part of the ear—the eustachian tube. He also made valuable discoveries in the anatomy of the thoracic duct, the teeth and the kidneys.

Evans, Mary Ann, see *Eliot, George.*

Evans, Robley Dunglison (1846-1912), American naval officer, born in Floyd County, Va., graduated from Annapolis in 1863. During the Civil War he took part in the capture of Fort Fisher, where he was severely wounded. In 1891 he forced an apology from the commander of a Chilean war vessel in Valparaiso harbor for insults to Americans. The incident gave him the popular name of "Fighting Bob." In the battle of Santiago, 1898, in the Spanish-American War, Evans commanded the *Iowa.* He was promoted rear admiral in 1901 and made commander of the Asiatic fleet in 1904. In 1908 he was retired with the thanks of the Navy Department. He wrote his reminiscences.

Evarts, William Maxwell (1818-1901), American lawyer and statesman, born in Boston. He rose steadily to a prominent place in law and politics and during the Civil War represented Lincoln in a diplomatic capacity in England. As senior counsel of President Johnson he helped to win an acquittal for the Chief Executive in the impeachment trial. In 1868–69 Evarts was attorney general in Johnson's Cabinet; in 1872 he was chief American counsel in the Geneva Court of Arbitration. He represented the Republicans before the Electoral Commission that decided the Hayes-Tilden contest. Evarts was secretary of state under Hayes and was U. S. Senator (1885-91).

Evelyn, John (1620-1706), English writer, known for his *Diary.* This day-by-day account of 17th century England, covering 70 years, is valuable as source material. In 1817 it was discovered in an old clothes basket.

Everett, Edward (1794-1865), American educator and statesman, born in Dorchester, Mass. After being graduated from Harvard in 1811 he became a Unitarian minister, serving a congregation in Boston, 1813-15. He then traveled and studied to fit himself for the professorship of Greek literature at Harvard. He edited the *North American Review* (1820–24) and then for ten years represented Massachusetts in Congress. Everett was governor of Massachusetts (1836-40), minister to Great Britain (1841-45) and for the years 1846–49 was president of Harvard. In 1852 he succeeded to Webster's place as secretary of state, holding it for the remaining 4 months of Fillmore's term. In 1860 Everett was nominee for Vice-President with Bell on the Constitutional Unionist ticket, which received 39 electoral votes. He later gave Lincoln his undivided support and was the chief orator of the day at the dedication of the battlefield of Gettysburg. His long, polished address that day received much more attention at the time than Lincoln's short speech.

Ewell, Richard Stoddert (1817–72), Confederate cavalry leader, born in Georgetown, D. C. He was graduated at West Point, saw service in the Mexican War and fought against the Apache Indians in 1857. When the Civil War began, Ewell joined the Confederate army. As major general he fought at Bull Run and Antietam, was severely wounded at Warrenton Turnpike and succeeded to Stonewall Jackson's command after Jackson's death and was promoted as lieutenant general. Ewell's corps was captured by Sheridan at Sailor's Creek in 1865.

Eyck, van, Hubert (*c.* 1370–1426), Flemish artist who aided his brother, also a painter, in the development of the Flemish school of painting. He was born in the Belgian town of Maaseyck. Hubert taught his brother Jan and for years worked on a colossal altarpiece, *Adoration of the Lamb,* for the Church of St. Bavon in Ghent, where he died. This is the only work that is known positively to be his. He died before it was finished. Some of the panels were removed to Berlin in 1816 but were restored to Ghent by provisions of the Treaty of Versailles, and the magnificent painting may now be seen there in its entirety. Hubert and his brother followed a secret method of mixing oils, and their colors were so brilliant and so skilfully applied that their work still retains its fresh beauty. Hubert's art had a deep, spiritual quality; the religious paintings and portraits supposed to be his may be seen in numbers in the chief galleries of Europe.

Eyck, van, Jan (*c.* 1390–1440), Flemish artist, younger brother of Hubert. His brother died while at work on the altarpiece in St. Bavon's Church, and Jan completed it. Jan is known to have lived at various times in The Hague, Bruges and Lille and at Lille to have been court painter to Philip the Good, Duke of Burgundy. He died in Bruges. His art was remarkable for finish, even to minute details. The Metropolitan Museum, New York, has a portrait possibly of *Thomas à Becket* by Jan.

Fabius Maximus, Quintus (*c.* 210 B.C.), Roman general who won his nickname *Cunctator, the Delayer,* by his tactics in the Second Punic War. Instead of engaging in open battle with Hannibal, the Carthaginian general, he cut off his supplies and wore out his patience by indefinite marches and skirmishes. This "Fabian" policy, which Washington studied and adopted in the Revolutionary War, gave the Romans time to consolidate their strength and led to their ultimate victory.

Fabre, Jean Henri (1823-1915), French naturalist, known for his stories of insect life. Much of his writing has been translated into English, including *The Life and Love of the Insect, Social Life in the Insect World, The Life of the Spider, The Life of the Fly* and *The Mason Wasps.* For several years he taught in Avignon and was professor of physics at the College of Ajaccio. He retired to Serignan in 1871 to devote himself to writing. Fabre's descriptions are based on personal observation of living insects, especially bees, wasps, spiders, grasshoppers and caterpillars.

Fahrenheit, Gabriel Daniel (1686-1736), German physicist, born in Danzig. He lived chiefly in England and Holland. In Holland he became a manufacturer of instruments used in the study of the weather. He originated the thermometer scale that bears his name, brought the mercury thermometer into general use (1720) and discovered that other liquids besides water have a fixed boiling point.

Fairbanks, Charles Warren (1852-1918), American politician and Vice-President, born in Union County, Ohio. He was educated at Ohio Wesleyan University. In 1874 he was admitted to the Ohio bar and after moving to Indianapolis soon became prominent in Indiana politics as a Republican. He was elected to the Senate in 1897 and re-elected in 1903. He resigned in 1904 to become Vice-President in Theodore Roosevelt's administration. Fairbanks was nominated for the same office on the Hughes ticket in 1916.

Fairfax, Thomas, 6th Baron (1692-1782), American colonist, born in Yorkshire, England. In 1746 he settled in Virginia on his princely estate inherited from his father. He employed the youthful George Washington as a surveyor on this estate; Lord Fairfax and Washington were distantly connected by marriage and were warm friends, though Fairfax retained his loyalist principles throughout the Revolution.

Faisal (1885-1933), King of Iraq, 3d surviving son of Husein ibn-Ali (1856-1931), first king of Hejaz. Faisal was born in Taif, Turkey, and was educated at Mecca and Constantinople. He was active in the military operations of his father, who became emir of Mecca in 1908; he took part in the revolt of the Arabs against the Ottoman Turks during the World War. Faisal was spokesman for the Arabs at the Paris Peace Conference and was proclaimed king of Iraq in 1921. In 1925 he opened the first Parliament under the new Iraq Constitution.

Falkenhayn, von, Erich (1861-1922), German general. Early in the World War he succeeded Von Moltke as chief of the general staff but lost this position to Hindenburg in 1916 after the failure of the German attack on Verdun. General Falkenhayn was then appointed commander in chief of the ninth army, composed of Austro-German divisions; these he directed in the opening drive against Rumania. He was sent to the Turkish sector in 1917 but was replaced in 1918. Falkenhayn disagreed at times with Hindenburg and Ludendorff but was considered a great strategist by many authorities.

Falkner, William (1897–   ), American novelist and poet, born in Ripley, Miss. His first book, published in 1926, was *Soldier's Pay,* describing his World War experiences. His later books are bitter and often gruesome stories about the Southern "poor whites." Among them are *The Sound and the Fury, As I Lay Dying, Sanctuary* and *Light in August.* He has written many short stories and poems. His family name was originally spelled with a *u,* Faulkner.

Fallières, Clément Armand (1841–1931), French statesman, 8th President of France. Though of peasant stock he received a good education and studied law. Entering the Chamber of Deputies in 1876 as a radical Republican, Fallières became undersecretary in the Department of the Interior in 1880 and held a succession of Cabinet positions until 1890, when he was elected to the Senate. After serving as president of that body until 1906 he was elected President of France, succeeding Loubet. He himself was succeeded in 1913 by Poincaré. The Fallières administration was notable for its favorable attitude toward labor.

FARADAY, MICHAEL (1791-1867), English chemist and physicist, born near London, the son of a blacksmith. He received no formal education, but a keen interest in science led him to attend a series of lectures by Sir Humphry Davy, professor of chemistry at the Royal Institution. Davy was so impressed by the young man's notes that he made him his assistant in 1812. Years later Faraday was appointed to Davy's former position at the Institution. Faraday's contributions furnish much of the groundwork on which modern civilization is built. He discovered electrical induction, which in turn led to his invention of the electric generator. He formulated the laws of electrolysis, carried on valuable research in the use of polarized light and gave to the world many other discoveries in electricity and chemistry. The *farad,* the unit of electrical capacity, as in a condenser, is named in his honor, and so is the *faraday,* the unit of electrical quantity.

Farley, John Murphy (1842-1918), American Roman Catholic churchman, born in County Armagh, Ireland. He came to the United States at the age of 18 and was graduated from St. John's College, Fordham, N. Y., in 1866. He continued his studies at St. Joseph's, in Troy, and at the American College in Rome, where he was ordained a priest in 1870. After his return to America Father Farley served as secretary to Cardinal McCloskey for 12 years; in 1884 he was appointed private chamberlain, with the title of monsignor; in 1891 he became vicar-general of the New York diocese and in 1895, assistant bishop. He succeeded Archbishop Corrigan in 1902 and in 1911 was made a cardinal.

Farnese, Alessandro, see *Paul III.*

Farouk I (1920–   ), King of Egypt, son of Fuad, whom he succeeded in 1936 under a regency that lasted until he came of age July 29, 1937. He was educated in England. In 1938 he married Mlle. Sasi Naz Zulficar, the granddaughter of a former prime minister. The early months of his reign were marked by partisan strife (especially over the question of greater constitutional government and less power for the king) and by a growth of nationalism and a decline of British influence in Egypt.

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Courtesy Scott Stamp & Coin Company

King Farouk

Enlarged from an Egyptian postage stamp issued in 1937 when he came to the throne

Farragut, David Glasgow (1801-70), American naval officer, born near Knoxville, Tenn., the adopted son of the naval hero David D. Porter. He was trained for seamanship by actual service in the navy, which he entered as a midshipman at the age of 9. He participated in the War of 1812, traveled to all parts of the world and in 1841 reached the rank of commander. In the interval between the Mexican War and the Civil War Farragut was assigned to various duties and helped to establish the Mare Island navy yard in San Francisco Bay.

Though he had numerous southern ties of friendship and family, he offered his services to the Union when the South seceded, and late in 1861 was placed in command of the

West Gulf blockading squadron, being ordered to co-operate with Porter in the capture of New Orleans. The surrender of the city in April, 1862, was brought about by Farragut's dash past the forts and his destruction of the Confederate fleet in open battle. This exploit won for him the rank of rear admiral. In August, 1864, he won new laurels in the battle of Mobile Bay, where his tactics destroyed a Confederate fleet and silenced the protecting forts. At the close of the year, he was raised to the rank of vice-admiral and in 1866 to that of admiral, these grades having been created for him by Congress.

Farrar, Frederick William (1831-1903), English clergyman and author, born in Bombay, India, educated in London and at Cambridge and ordained a priest in the Church of England in 1857. Farrar was head master of Marlborough College, 1871-76; in 1876 he was appointed canon of Westminster Abbey and rector of St. Margaret's and by 1895 had attained the deanship of Canterbury. He was an eloquent pulpit orator and a versatile writer, publishing fiction, theology, biography, history, commentaries and moral treatises. His *Life of Christ* passed through several editions.

Farrar, Geraldine (1882-), American operatic soprano, native of Melrose, Mass. After studying in Berlin and Paris, Miss Farrar made her debut at the Royal Opera House, Berlin, in 1901, appearing as Marguerite in *Faust.* She became a great favorite with American audiences and sang with the Metropolitan Opera Company in New York, 1906-22. Subsequently, she appeared in concert work but retired from that field to become a radio entertainer. Her greatest operatic roles were Marguerite, Madame Butterfly, Manon, Elizabeth, Tosca, Carmen and Gilda.

Faulkner, William, see *Falkner.*

Favre, Jules Claude Gabriel (1809-80), French statesman and writer, born in Lyons. He prepared himself for the law and after 1835 became prominent in the legal and political circles of Paris. Favre was an ardent Republican and used his influence in behalf of the restoration of the Republic after the Franco-German War. As minister of foreign affairs under Thiers, Favre signed the Treaty of 1871. He then resumed the practice of law. Favre wrote a number of books on sociology and politics, including his *Discours.*

Fawkes, Guy (1570-1606), English conspirator, the principal figure in the famous Gunpowder Plot of Nov. 5, 1605. After James VI of Scotland ascended the English throne as James I, Fawkes, originally a Protestant, and several other Catholics plotted to blow up the king, his ministers and both houses of Parliament on the day it was to assemble, hoping thereby to set up a Catholic government. The plot was discovered, and he and three confederates were executed. November 5 is still celebrated in parts of England by processions and the burning of Guy Fawkes effigies.

Fénelon, François de Salignac de La Mothe (1651-1715), French theologian and author, archbishop of Cambrai. Completing his studies at the Seminary of Saint Sulpice, he took holy orders and in 1689 became tutor to the young duke of Burgundy, grandson of Louis XIV, for whom he wrote several educational books, including *Fables, Dialogues des Morts and Télémaque.* He was appointed archbishop of Cambrai in 1695. In 1699 his *Maxims of the Saints* was condemned by Pope Innocent XII, and he was banished from court, and his influence was greatly diminished. Fénelon was a man of sincere piety and lovable personality and in his educational and political ideas was ahead of his times. His treatise on the education of young girls has been used in the fashionable schools of France.

Ferber, Edna (1887-), American author and playwright, native of Kalamazoo, Mich. She studied at the high school in Appleton, Wis., and began her active career there as a reporter for the *Daily Crescent.* After some work for the Milwaukee *Journal* and Chicago *Tribune,* Miss Ferber became a popular writer of short stories, winning an appreciative following with *Buttered Side Down, Roast Beef Medium, Personality Plus, Emma McChesney & Company, Half Portions* and others. Her novels, which have been equally successful, include *So Big, Show Boat, Cimarron, American Beauty* and *Come and Get It. So Big* and *Cimarron* were popular also as motion pictures, and *Show Boat* was produced by Ziegfeld as a musical play. With George S. Kaufman, Miss Ferber wrote the successful plays *The Royal Family* and *Dinner at Eight.* She received the Pulitzer Prize in 1925.

Ferdinand I (1503-64), Holy Roman Emperor and King of Bohemia, the son of Philip I of Spain and the younger brother of Charles V. He received the hereditary Austrian possessions from Charles in 1521; and in 1526, after the death of his brother-in-law, Louis II of Hungary and Bohemia, succeeded to the throne of Bohemia but was unable to secure the kingship of Hungary. He was chosen German king in 1531 and in 1556 succeeded Charles V as Holy Roman Emperor, though his title was not fully recognized until 1558.

Ferdinand II (1578-1637), grandson of Ferdinand I, became king of Bohemia in 1617 and in 1618 king of Hungary. His determination to stamp out Protestantism in his dominions led to the Thirty Years' War. He was Holy Roman Emperor after 1619.

Ferdinand II (1810-59), King of the Two Sicilies, comprising Naples and Sicily, the son of Francis I, whom he succeeded in 1830. His reactionary policy and the wretched economic condition of his subjects led to a series of rebellions. In 1848, a year of revolution in Europe, he was forced to grant his people a constitution. The following year Ferdinand put down an uprising in Sicily by bombarding Messina, thereby earning the epithet, "King Bomba." His despotism and political persecutions resulted in the intervention of Great Britain in 1858, and he was compelled to free thousands of people whom he had wilfully imprisoned.

Ferdinand V or **Ferdinand the Catholic** (1452-1516), Spanish ruler and builder of the monarchy, son of John II of Aragon. In 1469 Ferdinand married his cousin Isabella, sister of Henry IV of Castile, and on the death of Henry in 1474 most of the nobles proclaimed Ferdinand and Isabella co-sovereigns. Five years of civil war followed, and in 1479 when King John died, the kingdoms of Castile and Aragon were united. The prosperous rule of these monarchs laid the foundation for the subsequent greatness of Spain. They aided Columbus, who sailed under their auspices and discovered the New World in 1492. Granada was annexed the same year, ending the Moorish power in Spain. After the death of Isabella in 1504 Navarre also was added to the kingdom. Other events of this reign were the expulsion of the Jews from Spain and the reorganization of the Inquisition.

He was Ferdinand V of Aragon, Ferdinand II of Aragon and of Sicily and Ferdinand III of Naples.

Fermat, de, Pierre (1601-65), French mathematician. He is noted for his contribution to the theory of numbers, published after his death in his *Opera Mathematica.* He formulated several laws and principles of higher mathematics.

Ferrero, Guglielmo (1871-), Italian historian and lecturer. He studied law at Pisa and literature at Bologna and in 1898 lectured on militarism at the University of Milan. In 1906 and 1908, respectively, he was lecturer at the College of France and Lowell Institute, Boston. As a historian, Ferrero is best known for his *Greatness and Decline of Rome,* brought out in an English edition, 1907-9. His other writings include *Four Years of Fascism, The Unity of the World, Peace and War* and *Life of Julius Caesar.*

Ferris, Jean Léon Gérome (1863-1930), American painter, born in Philadelphia, the son of a portrait painter. He studied with his father and in Paris and London. His principal achievement is a series of paintings portraying scenes of American history between 1492 and 1865; the collection, representing over 70 subjects, is housed in Congress Hall, in a gallery built expressly for the pictures by the city of Philadelphia. In 1927 Ferris presented to the National Museum in Washington a collection of over 3,000 historical etchings and engravings.

Fessenden, William Pitt (1806-69), American statesman, born in Boscawen, N. H., and educated at Bowdoin College. He became prominent in law and politics in Portland, Me. and served in Congress as a Whig, 1840-43. From an early period, Fessenden was a forceful orator against slavery. He was elected to the Senate in 1854 and was re-elected as a Republican in 1859. In that body he remained a leading figure until his death, except for a brief period in 1864-65, when as secretary of the treasury he helped to reconstruct the country's finances.

Feuillet, Octave (1821-90), French novelist and playwright, born in Normandy. He at first collaborated with Alexandre Dumas the Elder, but about 1848 he began to write independently. Feuillet's work has both romantic and realistic elements and was popular in its day. He became a member of the Academy in 1862. His principal novels include *The Romance of a Poor Young Man* (dramatized in 1858), *Histoire de Sybile, Monsieur de Camors* and *Journal d'une Femme.*

Fichte, Johann Gottlieb (1762-1814), German philosopher, born of working-class parents in Rammenau, Upper Lusatia. The unusual intelligence of the boy influenced a wealthy nobleman to provide for his early education, and he entered the University of Jena at the age of 18. There and at Leipzig and for several years after his graduation, he supported himself by tutoring. An interview with Immanuel Kant at Königsberg, in 1791, proved eventful, for the older philosopher advised him to publish his *Critique of all Revelation.* The scholarship displayed by this work made Fichte a man of note and won for him the chair of philosophy at Jena in 1794. In 1798 he published a magazine article that was regarded as atheistic, as a result of which he lost his position; but he was soon lecturing to appreciative audiences in Berlin, and in 1805 he received a professorship in Erlangen. During the Napoleonic invasions, Fichte stirred the nation by his patriotic addresses and in 1809 was appointed to the chair of philosophy at the newly organized University of Berlin. His addresses to the German people inspired them and instilled in them the spirit of unity.

Field, Cyrus West (1819-92), American financier, noted for his part in the laying of the first Atlantic cable, born in Stockbridge, Mass. At the age of 15 he entered the business world and at 33 retired with a fortune of $250,000. In 1854 Field became interested in the idea of a transoceanic cable and organized the New York, Newfoundland and London Telegraph Co., of which Peter Cooper was president. After many failures a submarine line between Ireland and Newfoundland was put into operation in 1858, but the cable soon broke. This disaster, together with financial troubles, postponed the success of the venture until 1866. Field subsequently turned his attention to railroad development. He was one of the organizers of the elevated railway system of New York city.

Field, David Dudley (1805-94), American jurist, born at Haddam, Conn. He entered Williams College, 1821, studied law and was admitted to the bar in 1828. He settled in New York and soon made his way into the front rank of his profession. In 1848 the New York state code of civil procedure, usually called the Field code, was enacted—he had proposed the idea and had headed the commission to execute it. In 1867 he brought before the British Association for Social Science a proposition to frame an international code. This led him to prepare what was really a complete work on international law, though entitled *Draft Outlines of an International Code.*

Field, Eugene (1850-95), American journalist and poet, born in St. Louis, Mo. He lived in Amherst, Mass., and entered Williams College when 18 years of age. Field studied later at Knox College (Galesburg, Ill.) and at the University of Missouri. In 1873, after a tour of Europe, he became a reporter on the St. Louis *Journal.* He first came widely into notice as the writer of a column in the Chicago *Morning News* (later the *Record*), which he conducted for 12 years (1883-95) under the heading *Sharps and Flats.* Readers of today are more familiar with Field's poems for children, such as "Wynken, Blynken, and Nod," "Little Boy Blue," "Seein' Things at Night" and "The Delectable Ballad of the Waller Lot." His prose work includes a book of essays, *The Love Affairs of a Bibliomaniac, A Little Book of Profitable Tales* and with his brother Roswell (1851-1919) *Echoes from the Sabine Farm.* A memorial statue of Eugene Field, chiefly the gift of American school children, was erected in Lincoln Park, Chicago, in 1922.

Field, Marshall (1835-1906), American merchant, born in Conway, Mass., educated in public schools. He began business life at the age of 17 in a dry-goods store in Pittsfield, Mass. In 1856 he became clerk and traveling salesman in a Chicago wholesale establishment and 4 years later became a junior partner of the company. In 1865 he helped to organize the firm of Field, Palmer and Leiter. On the retirement of Palmer and Leiter, the name was changed to Marshall Field & Company in 1881, and this business developed into the largest wholesale and retail concern in the world. Part of Marshall Field's immense fortune was set aside as an endowment for the Field Museum of Natural History, Chicago.

Fielding, Henry (1707-54), English novelist, born near Glastonbury, England. He studied at Eton and afterward at the University of Leyden. On his return from Leyden he commenced writing for the stage and for 10 years was a prolific playwright. In 1737 he entered as a student of the Middle Temple and in 1740 was admitted to the bar; but his new profession not proving remunerative he returned to literature and in his remaining years produced the works with which his name is now principally associated. Chief of these are *Joseph Andrews, The History of Jonathan Wild, Tom Jones* and *Amelia.*

Fillmore, Millard (1800-74), American political leader, Vice-President, then 13th President of the United States succeeding Zachary Taylor, who died after 16 months in office. Fillmore was born in Cayuga County, N. Y. He worked on his father's farm as a young boy and at 14 was apprenticed to the cloth trade. He received little schooling but determined to become a lawyer and at 19 began to study in the office of a Cayuga County judge. In 1823 he was admitted to practice and opened an office in East Aurora, N. Y., remaining there until his removal to Buffalo in 1830. Fillmore became one of New York's foremost lawyers. He served three terms in the state legislature and in 1833 entered the national House of Representatives as a member of the Antimasonic party, although he soon became a Whig. In Congress he favored the abolition of slavery in the District of Columbia and was the author of the tariff law of 1842. In 1847 Fillmore attained the office of state comptroller and in 1848 was elected Vice-President on the ticket with Zachary Taylor. He was called upon to preside over the Senate during the slavery arguments of 1850, as well as to sign the measures as President after Taylor's sudden death in July 1850. By signing the act for the surrender of fugitive slaves he brought about the utter defeat of the Whig party. His term of office ended in 1852. Again a candidate in 1856, he won only one state. Fillmore then retired from active politics and spent the rest of his life in Buffalo, where he devoted himself to education, civic welfare and philanthropy.

Finsen, Niels Ryberg (1860-1904), Danish physician, famed for his development of the treatment of skin disease with light rays. He was born in Strömö in the Faroe Islands and was graduated in medicine from Copenhagen in 1890. The Danish government financed the establishment of his Medical Light Institute near Copenhagen, where he effected many remarkable cures of eczema, lupus, superficial cancer and other skin ailments. In 1903 he received the Nobel Prize for medicine.

Firestone, Harvey Samuel (1868-1938), American manufacturer and writer, native of Columbiana County, Ohio. He received public-school and business-college education, entered the rubber business and in 1900, at Akron, Ohio, organized the Firestone Tire & Rubber Co. with 17 employees. During the next three decades the number of workers there increased to over 20,000 and as many native laborers were employed in Liberia, West Africa, where a million acres of rubber land were leased in 1926. Firestone wrote *Rubber, Its History and Development* and *Men and Rubber.*

Fish, Hamilton (1808-93), American statesman, born in New York city and educated at Columbia College (Columbia University since 1896). He became a member of the bar in 1830, in 1842 was elected to Congress as a Whig, in 1848 became governor of New York and in 1851 began a term in the U. S. Senate. During the Civil War Fish was instrumental in bringing about the exchange of Federal and Confederate prisoners. He served as secretary of state during Grant's two terms (1869-77); in this capacity he helped to negotiate the Treaty of Washington, providing for the arbitration of the Alabama Claims; and he brought about the settlement of the northwestern boundary dispute with Great Britain.

Fisher, Dorothy Canfield (1879-), American author, born Dorothea Frances Canfield in Lawrence, Kan., educated at Ohio State University and Columbia. She married John R. Fisher in 1907 and moved to Vermont, where she made her home. Rural Vermont forms the background of many of her stories. She wrote *The Brimming Cup, Understood Betsy, The Bent Twig, The Homemaker* and *The Deepening Stream,* among other books. She also wrote much on education.

Fisher, Harrison (1875-1934), American artist, born in Brooklyn, N. Y., best known for his drawings of the "American Girl," particularly the many used as cover designs of magazines. He studied at the Mark Hopkins Institute of Art in San Francisco and in England and France. His work consists of portraits and illustrations for books and magazine stories.

Fisher, Irving (1867-), American economist, native of Saugerties, N. Y., educated at Yale and in Berlin and Paris. He became a tutor in mathematics at Yale in 1890 and was steadily promoted. In 1898 he was appointed to the chair of political economy. Fisher became actively identified with such movements as conservation, national health and hygiene, prohibition, eugenics, the League of Nations, free trade, tuberculosis prevention, tax reform, international peace and the commodity dollar; and he published numerous books and articles on a wide variety of subjects. Among his books are *Stabilizing the Dollar* and *The Theory of Interest.*

Fisher, John Arbuthnot, 1st Baron Fisher of Kilverstone (1841-1920), British Admiral. He entered the navy in 1854. From 1855-82 he saw much service in the Crimean War and in Chinese and Egyptian waters. He became first sea lord in 1904, resigning in 1910, but he was recalled at the outbreak of the World War, finally resigning in 1915.

Fisk, James (1834-72), American financier, born in Bennington, Vt. During the Civil War he made a fortune by trading in cotton. He set up a brokerage house in New York city in 1866, thereafter becoming one of the most feared, hated and admired of business buccaneers. With Jay Gould he carried on unscrupulous manipulations of Erie Railroad stock that wrecked the company but gave them millions. Other operations led to the famous "Black Friday" stock market crash in 1869, which ruined hundreds. He lived luxuriously and dabbled in production of plays and operas. He was shot by a former business partner.

Fiske, John (1842–1901), American philosopher and historian, born at Hartford, Conn. He studied at Harvard, where in 1869 he began to lecture on philosophy. He soon turned to writing and published such books as *Outlines of Cosmic Philosophy, Darwinism and Other Essays, The Destiny of Man, The Beginnings of New England, The Discovery of America* and *The Dutch and Quaker Colonies in America.* Fiske spent part of his life trying to popularize Spencerian evolution and to interpret Darwin to his readers. He was one of the leading historians of the 19th century.

Fiske, Minnie Maddern (1865-1932), American actress, born in New Orleans of theatrical parents. She first appeared on the stage at the age of 3, winning a star's role at 16. After her marriage to Harrison Grey Fiske in 1890 Mrs. Fiske retired for an interval of study; after 1893, when she played in her husband's drama, *Hester Crewe,* she was almost constantly before the public. Her talents found expression in a variety of roles, notably in *Tess of the D'Urbervilles, Becky Sharp, The Rivals, Salvation Nell, A Doll's House* and *Erstwhile Susan.*

Fitch, Clyde (1865-1909), American dramatist. He became a prolific writer of plays, one of the first and most successful being *Beau Brummell,* produced in 1890 as a vehicle for Richard Mansfield. Other successes include *The Moth and the Flame, Nathan Hale* (first produced with Nat Goodwin and Maxine Elliott), *Barbara Frietchie* (with Julia Marlowe), *Captain Jinks* (with Ethel Barrymore), *The Climbers, The Girl with the Green Eyes, The Truth* and *The City.*

Fitch, John (1743-98), American inventor, born in Windsor, Conn. When he was engaged in making a map of the Northwest after the Revolution, he conceived the idea of navigating the American rivers with steamboats, and he devoted the best years of his life to the application of steam power to navigation. After much difficulty he formed a company and built several boats equipped with steam engines, but financial difficulties forced him to drop the project. In 1793 he went to France to secure further aid but was again disappointed. Unable to continue his plans in America after his return, he committed suicide. Fitch preceded Fulton in designing a ship using steam, but his models were inferior to Fulton's as practical carriers of passengers and freight.

FitzGerald, Edward (1809-83), English poet and translator, born near Woodbridge, Suffolk, and educated at Cambridge. His fame rests chiefly on his translation from the Persian of the Rubáiyát of Omar Khayyám. FitzGerald did not translate slavishly but expressed the author's thought in exquisite poetry, taking whatever liberties with the original he deemed necessary to preserve the atmosphere of the famous quatrains. He was the friend of Thackeray, Tennyson and Carlyle.

Flagg, Ernest (1857-), American architect, born in Brooklyn, N. Y., studied architecture in Paris, practiced in New York city throughout his career. He built the 45-story Singer Building in New York, which on its completion in 1908 was the highest building in the world (612 ft.). His other works include the Scribner Building, New York; the Corcoran Art Gallery, Washington, D. C.; buildings for the U. S. Naval Academy and many apartments and dwellings. He developed new methods of planning and construction, especially of small houses and low-cost building projects. He wrote *Small Houses, Their Economics, Design and Construction.*

Flagg, James Montgomery (1877-), American artist and author, native of Pelham Manor, N. Y. He studied at the Art Students' League, New York, and in England and Paris but was a skilled artist in boyhood, having had a drawing published in *Life* when he was only 14. Flagg's rich vein of humor, excellent draftsmanship and realism have made his illustrations widely popular. They have appeared in numerous magazines for several decades. His portraits in both water color and oil also are admirable. Flagg wrote and illustrated a number of books, including *Yankee Girls Abroad, Tomfoolery, City People* and *Boulevard all the Way—Maybe.*

Flammarion, Camille (1842-1925), French astronomer, author of several popular books on astronomy. Flammarion entered the Paris Observatory in 1858 and was subsequently editor of *Cosmos* and *L'Astronomie.* In 1887 he founded the Astronomical Society of France. Although some of his writings have been said to reveal too much imagination and too little fact, Flammarion did sound work on double and multiple stars, the proper motion of stellar bodies and the nature of Mars and the moon. Several of his books were translated into English.

Flaubert, Gustave (1821-80), French novelist, born in Rouen. A nervous disease that afflicted him from childhood and a distaste for the masses made Flaubert spend most of his life in seclusion. He wrote and rewrote his novels tirelessly, seeking and achieving perfection of style and form. His work was a connecting link between the dying Romantic school and the naturalistic fiction of the next era; it greatly influenced Zola and Flaubert's godson, Guy de Maupassant. Among his principal works are *Madame Bovary, Salammbô* (a story of ancient Carthage, made into an opera in 1890) and *Trois Contes.*

Flaxman, John (1755-1826), English sculptor and draftsman, born in York, the son of a maker of plaster casts. In 1770 he began to study at the Royal Academy, London, and a few years later became an employee in the famous pottery of Josiah Wedgwood. There he gained valuable experience as a designer of reliefs and medallions. Then he turned his attention to executing monumental sculptures. In 1810 he became professor of sculpture at the Royal Academy. He produced numerous funeral reliefs, memorial monuments for Westminster Abbey and other churches and classical figures for private homes. Collections of his drawings may be seen in the principal museums of England. He was a leader in the Classical revival in English art.

Fleming, Sir John Ambrose (1849-), English physicist, born in Lancaster. He studied at London University, the Royal College of Chemistry and at Cambridge University, where he afterward lectured on applied mechanics. He became greatly interested in the development of the telephone, electric lighting and wireless telegraphy and is the inventor of the thermionic valve that made wireless telephone possible. In more than 40 years of scientific research he wrote many works, including *Waves and Ripples in Water, Air and Ether* (4th ed. 1929), *Memories of a Scientific Life* (1934) and *Fifty Years of Electricity.*

Fleming, Sir Sandford (1827-1915), Canadian civil engineer, born in Scotland. He went to Canada in 1845, supervised the construction of the Intercolonial Railway (1867–71) and surveyed the route followed by the present Canadian Pacific. Sir Sandford planned the Pacific cable system connecting Great Britain, Canada, Australia and New Zealand, and he devised the system of standard time now in universal operation.

Fletcher, John (1579-1625), English writer, collaborator with Francis Beaumont. He was the son of a bishop of London. Fletcher wrote, probably in its entirety, *The Woman Hater,* and he was in large part responsible also for *The Faithful Shepherdess.* He died of the plague.

Fleury, de, André Hercule (1653-1743), French statesman. He received favor and promotion from Louis XIV and was appointed tutor to the boy who in 1715 became Louis XV. In 1726, at the age of 73, Fleury succeeded the Duke de Bourbon as prime minister and soon after was appointed cardinal. Fleury did much for the internal progress of France and was instrumental in bringing to completion the great library at Paris, the Bibliothèque Nationale.

Flexner, Simon (1863-), American pathologist, born in Louisville, Ky. After completing postgraduate studies at Johns Hopkins University, at universities abroad and at the Pasteur Institute, Dr. Flexner joined the faculty of Johns Hopkins University. Later he took up hospital work and in 1903 became director of the laboratories of the Rockefeller Institute for Medical Research, New York. He is best known for his research work in the causes, transmission and cure of infantile paralysis and for his discovery of the serum for the treatment of epidemic cerebrospinal meningitis, which greatly reduced the death rate from that disease.

Flotow, von, Friedrich (1812-83), German composer of light operas, born in Mecklenburg. He wrote 18 operas but only one, *Martha*, is heard on the operatic stage today. The charm of its melodies, picturesque setting and attractive story have made *Martha* a lasting favorite. It is sometimes found in the repertoire of grand opera companies but more often is considered as an operetta to be sung in English. Flotow's *Stradella* was a success for some time but gradually waned in popularity.

Foch, Ferdinand (1851-1929), French general, born in Tarbes in the French Pyrenees. The defeat of France in 1870 and the severe peace terms imposed by Germany made an indelible impression on the young soldier, who had fought in the Franco-Prussian War. In 1878 he was made a captain of artillery and was soon engaged on staff work. When the World War began, General Foch was in command of an army corps at Nancy. His ability as a strategist was brilliantly displayed in 1914 in the defense of Nancy, the battle of the Marne and the battle of Ypres, and in 1916 in the fighting on the River Somme. He strongly urged unity of command in 1917, and in April 1918 he was put in command of all the armies on the western front: French, British, American and Belgian. He was made marshal of France in August, 1918, and framed the armistice terms in the fall of that year. Foch was present at the opening of the disarmament conference in Washington, in 1921. He lies buried in the Hôtel des Invalides, in Paris, beside Napoleon.

Fontana, Domenico (1543-1607), Italian engineer and architect, born near Lake Como. Among his important achievements are the completion of the dome and lantern of St. Peter's at Rome, the setting up of the Egyptian obelisk in the Piazza of that church, the construction of the Lateran Palace and the building of the Vatican Library. Under Pope Sixtus V, Fontana was papal architect; after the Pope's death, he was employed by the king of Naples.

Fontenelle, de, Bernard le Bovier (1657-1757), French poet and dramatist, born in Rouen. He was the nephew of the great tragic poet Corneille. Fontenelle lived to be 100 years old and during his long career exercised a powerful influence on the thought and writers of his day. He has been called the connecting link between "the great stylists of the 17th century and the philosophers of the 18th." His chief writings include *Dialogues of the Dead, Discourse on the Plurality of Worlds* and *The Geometry of the Infinite*.

Foote, Andrew Hull (1806-63), American naval officer, born in New Haven, Conn. He entered the navy in 1822 as midshipman. During the next 4 decades Foote visited various parts of the world in connection with his naval duties, and in 1861, soon after the outbreak of the Civil War, he took command of naval operations in the Southwest, having reached the rank of captain. Early in 1862 he co-operated with the land forces under Grant in the capture of Forts Henry and Donelson and was so severely wounded that he asked to be detached from the flotilla. He was promoted to the rank of rear admiral, was chief of the Bureau of Equipment and Recruiting in 1862-63 and in June, 1863, was appointed to command the fleet off Charleston. He died before he could begin his new duties.

Foote, Arthur (1853-), American musician, born at Salem, Mass. After receiving a master's degree at Harvard in 1875 he studied music under some of the best teachers of the day, including John Knowles Paine. He then began his career as organist, teacher of the piano and composer. His compositions include orchestral works, chamber music, cantatas, musical settings for *Hiawatha* and other poems, piano and organ pieces and numerous songs.

Forbes-Robertson, Sir Johnston (1853-1937), English actor, born in London. He received his education at Charterhouse and Rouen. He made his first stage appearance in 1874 in *Mary Queen of Scots;* he subsequently played with Ellen Terry, Sir Henry Irving, Mrs. Patrick Campbell (in *Romeo and Juliet*, under his own management), with his wife, Gertrude Elliott, and with other celebrities. He made several tours of the United States, where he won general admiration for his work, especially in *Hamlet, The Passing of the Third Floor Back* and *The Light That Failed*. He was knighted in 1913 and retired after a farewell season in 1914. He is generally recognized as one of the greatest Shakespearean actors of all time.

Ford, Henry (1863-), American automobile manufacturer, born in Greenfield, Mich. He attended a district school, worked on his father's farm and at the age of 16 began work as a machinist in Detroit, eventually becoming chief engineer of the Edison Illuminating Company. In 1895 he began to experiment with horseless carriages run by steam, then turned his attention to gasoline power. In 1903 at Dearborn, Mich., he started the business that grew into the Ford Motor Co., and he soon became the largest maker of motor cars in the world. He pioneered in installing mass-production methods, in lowering prices to extend the market and in increasing wages to secure efficiency. He wrote *My Life and Work, Today and Tomorrow* and *Moving Forward*.

Ford, Paul Leicester (1865-1902), American novelist and historical writer, born in Brooklyn, N. Y. His fame as a novelist rests chiefly on his *Honorable Peter Stirling*, which was inspired by his personal contact with New York politics, and on *Janice Meredith*, a story of American Revolutionary days. His historical writings include *The True George Washington, The Many-Sided Franklin* and *The New England Primer*.

Forrest, Edwin (1806-72), American tragic actor, born in Philadelphia. He made his first professional appearance in Home's *Douglas* at the age of 14, and 6 years later scored a triumph as Othello, always one of his greatest roles. His fine stage presence and rich voice were important factors in his interpretation of Shakespearean roles, and he won renown as perhaps the greatest tragedian of the 19th century. He provided for the establishment of a home for aged and destitute actors.

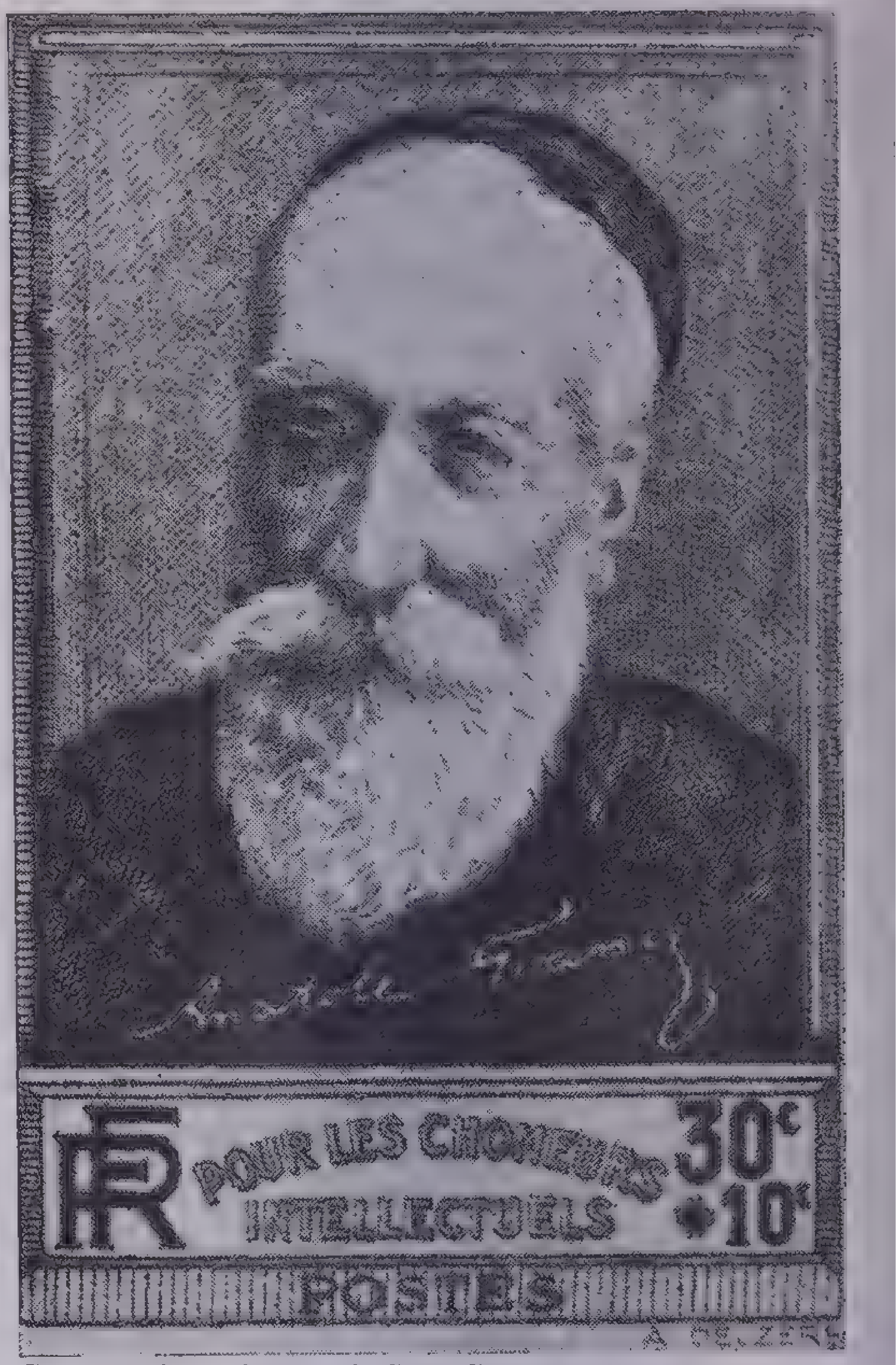
Forrest, Nathan Bedford (1821-77), Confederate cavalry leader, born near Chapel Hill, Tenn. He had little formal education but became a successful cotton planter in Mississippi. When the South seceded, he entered the Confederate army as a private and was soon asked to organize a cavalry battalion. Forrest participated in the defense of Fort Donelson but withdrew before the surrender. In 1864 as major general he had charge of the cavalry with the Army of Tennessee; the following year as lieutenant general in command of a larger force he was forced to surrender at Gainesville.

Foscari, Francesco (*c.* 1372–1457), Doge of Venice, 1423-57. In this office he followed a military policy that brought most of northern Italy under the rule of Venice. But Venice lost influence in the Grecian world, and the doge suffered much from the misbehavior of his son Giacopo, who was twice banished and died in exile. About a week before his own death, Foscari was deposed. Byron based his tragedy *The Two Foscari* on the lives of the father and son.

Foster, John Watson (1836-1917), American diplomat and statesman, born in Pike County, Ind. He joined the Union army at the outbreak of the Civil War and rose to the rank of colonel. Foster entered the diplomatic service in 1873 when appointed minister to Mexico and subsequently was sent to Russia and to Spain. In 1892-93 he was secretary of state and in 1898 was a member of the commission to settle controversies between the United States and Canada. Foster participated in the settlement of the Alaska boundary dispute in 1903; in 1907 he acted as delegate from China to the second Hague conference. He wrote several books on diplomatic subjects and an introduction to Mannix's *Memoirs of Li Hung Chang*.

Foster, Stephen Collins (1826-64), American song writer, born near Pittsburgh, Pa. He wrote both words and music, though he had no formal musical training, and he must be regarded as a natural genius. Among the best known of his songs are *My Old Kentucky Home, The Suwanee River, O Susanna, Nelly Bly, Old Dog Tray, Old Black Joe, Nelly Was a Lady, Old Uncle Ned, Massa's in the Cold, Cold Ground* and *Come Where my Love Lies Dreaming*. He wrote about 125 songs, and over 400,000 copies of *My Old Kentucky Home* were sold in his lifetime.

Foucault, Jean Bernard Léon (1819-68), French physicist. He hung a 200-foot pendulum from the roof of the Pantheon in Paris. Free to oscillate in any direction, it never traced the same path twice, but constantly varied to the right. This experiment showed that the floor was moving under the pendulum—that the earth was rotating. Foucault also proved that light travels faster in air than in water. He invented the gyroscope, the Foucault polarizing prism and the spheroid mirror for use in reflecting telescopes. His work was carried on in his native city of Paris, where he became physicist of the observatory in 1854 and in 1864 was made an officer of the Legion of Honor.



Courtesy Scott Stamp & Coin Company

Anatole France

Enlarged from a French postage stamp issued in 1937. It was sold for 10 centimes more than its 30-centime postage value. The money thus collected was used to help needy intellectuals and refugees from other lands

Fourier, François Marie Charles (1772–1837), French socialist, born in Besançon. He began his active career as a traveling mercantile agent and later established a business of his own in Lyons. In 1794-96 he served in the Revolutionary army. He re-entered business after his discharge but devoted himself chiefly to the working out of his socialistic theories, which he wrote under *Treatise on Domestic and Agricultural Association* and other titles. The sufferings of the poor and the injustices of the capitalistic system made a profound impression upon him in his earlier years. His system, known as *Fourierism*, taught that an entirely new social order was necessary; that men and women must be allowed to live as they like, free from the trammels imposed by civilization. The Brook Farm experiment in America was based on Fourier's ideas.

Fourier, Jean Baptiste Joseph, Baron (1768-1830), French geometrician, born at Auxerre. In 1802 he was appointed prefect of the Isère and in 1815 of the Rhône. Being afterward displaced, he gave himself up entirely to scientific studies and was made in 1817 a member of the Academy of Sciences. His chief works are *Annales de physique, Théoric analytique de la chaleur* and *Analyse des equations déterminées*.

Fox, Charles James (1749-1806), English statesman, born in London, educated at Eton and Oxford. He entered Parliament at the age of 19. His rise was rapid, his policies were liberal. He advocated freedom for the American colonies. In 1789 he greeted the fall of the Bastille with great speeches, and he remained a firm supporter of the French Revolution. This led to a rupture of his long friendship with Burke. Fox's political life was mainly spent in opposition to the government, but when his great rival Pitt formed his last administration, he wished Fox to join it. The king, however, refused to give his approval. On Pitt's death in 1806 the king was at last obliged to admit Fox to office, and he became foreign secretary in

Grenville's ministry. His last motion in Parliament was directed against the slave trade, and he died a few months before the measure founded upon it passed into law. He was the finest orator of his time.

Fox, George (1624-91), founder of the Society of Friends, born in Leicestershire, England. Early adopting Quakerism, he suffered continual persecution for many years. His leading doctrines or convictions were—the futility of learning for the work of the ministry, the presence of Christ in the heart as the "inner light" and the necessity of trying men's opinions and religions by the Holy Spirit and not by the Scriptures. He told a magistrate to "tremble at the word of God," hence the name "Quaker." Fox called his followers the Society of Friends.

Fox, John William, Jr. (1863-1919), American novelist, born in Bourbon County, Ky., graduated from Harvard University in 1883. He depicted the life of the Southern mountaineers, and some of his novels had wide popularity. Among his books are *A Mountain Europa, The Kentuckians, The Little Shepherd of Kingdom Come, Trail of the Lonesome Pine* and *The Heart of the Hills.*

Foxe, John (1516-87), English author of a famous book on martyrs, born in Boston, Lincolnshire, educated at Oxford. He adopted the Reformed faith and fled to the Continent on the accession of Mary I. In Strasbourg he began in Latin his *Actes and Monuments.* First issued in English in 1563, it is now universally known as *Foxe's Book of Martyrs.*

Fra Diavolo (Michele Pezza; *c.* 1771-1806), Italian bandit who became a legendary figure. Expelled from a monastery, he organized a band of brigands and terrorized the countryside. He was later made a colonel in a war against France but was executed in Naples for trying to start a revolution. His name was used as the title of a popular opera by Auber and Scribe, although the plot is not entirely the story of his life.

Fragonard, Jean Honoré (1732-1806), French painter, born in Grasse. He began his art studies at the age of 18 and in 1752 won the Prix de Rome. From about 1770 until the French Revolution Fragonard was one of the most popular artists of his day. His work is representative of the so-called rococo period, when classic simplicity was replaced by elaborate decoration and an atmosphere of gaiety. Among his principal works is the series entitled *Romance of Love and Youth,* now in the Frick collection, New York. Many of his studies of contemporary French life are to be found in the museums and galleries of Europe.

France, Anatole (Jacques Anatole Thibault; 1844-1924), French author, the son of a bookseller of Paris. He devoted himself to literature and began to write novels. Before long he had the reputation of being one of the greatest men of letters in France. In 1896 he was elected to the French Academy. A socialistic freethinker, he defended Dreyfus and used his pen to vindicate the cause of France during the World War. He wrote many novels and was honored with the Nobel Prize for literature in 1921. The English titles of some of his best books are *Penguin Island, Revolt of the Angels, Thaïs* and *The Crime of Sylvestre Bonnard.*

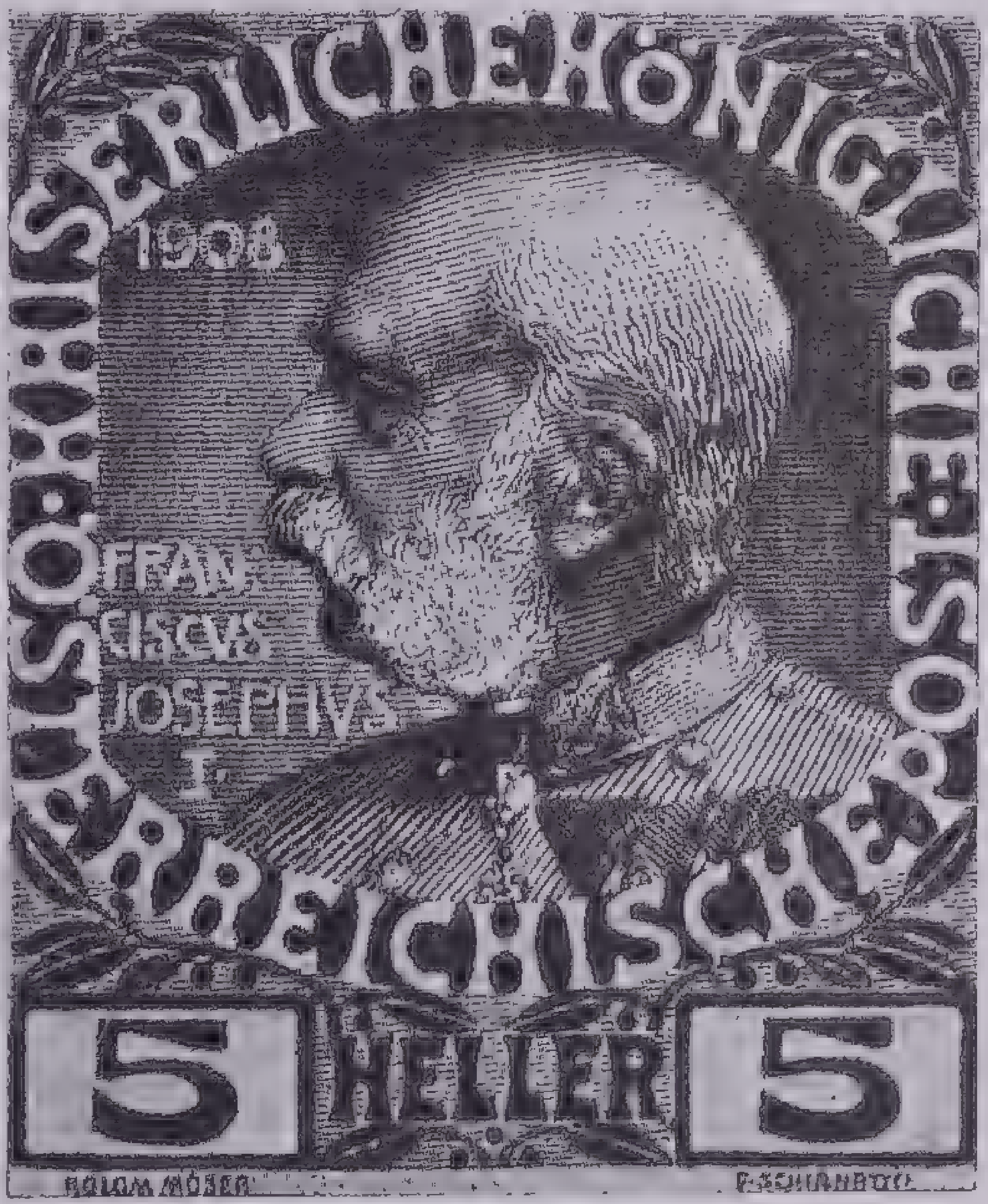
Francis I (1494–1547), King of France, son of Charles, Count of Angoulême, succeeded his father-in-law Louis XII in 1515. The election of Charles V as Holy Roman emperor in 1519 started a long series of wars between Francis and Charles. Francis sought the aid of Henry VIII of England, and in 1520 the two kings met on the Field of the Cloth of Gold. Henry, however, decided to ally himself with Charles. In 1525 Francis was taken prisoner at Pavia and was kept captive for more than a year. Three years before he died, Francis made peace with Charles V at Crespy. He is honored for his generous patronage of art and learning. He founded the Collège de France in 1530.

Francis I (1708-65), Holy Roman Emperor, son of the duke of Lorraine, succeeded to his father's title in 1729. In 1735 he ceded the duchy to France in return for the succession to Tuscany, of which he became grand duke in 1737. In 1736 he married Maria Theresa of Austria, who succeeded her father Emperor Charles VI in 1740. Francis had little to do with the government of his wife's realm; she herself assumed direction of the War of the Austrian Succession (1740-48) and the Seven Years' War (1756-63). It was due to her efforts that Francis was elected Holy Roman emperor in 1745. Their son Joseph succeeded to the title in 1765.

Francis II (1768–1835), Austrian Emperor, eldest son of Emperor Leopold II and the last emperor of the Holy Roman Empire. He was the brother of Marie Antoinette. From 1797-1809 he was often at war with France; in 1813 he joined the allies and assisted in the final defeat of Napoleon. Francis was the first emperor of Austria (1804) and the last emperor of the Holy Roman Empire, which was dissolved in 1806 after an existence of 10 centuries. Though Napoleon married Maria Louisa, daughter of Francis, in 1810, Francis joined the coalition against the conqueror. After Napoleon's defeat the Austrian emperor became associated with Russia and Prussia in the Holy Alliance.

Francis Ferdinand (1863-1914), Austrian archduke, son of Archduke Charles Louis and nephew of Emperor Francis Joseph I. He became heir apparent to the crowns of Austria and Hungary on the death of his cousin, Prince Rudolph, in 1889. In 1900 Francis Ferdinand contracted a morganatic marriage with the Countess Chotek, who was created Princess Hohenberg. Children of the couple were barred from succession rights because the princess was not of royal blood. On June 28, 1914, the archduke and his wife were assassinated at Sarajevo, Bosnia, and the rapid train of events that ensued had a climax in the World War.

Francis Joseph I (1830–1916), ruler of the Austro-Hungarian monarchy at the outbreak of the World War. He became emperor of Austria in 1848 and king of Hungary in 1867, when the two countries were united in the dual monarchy. Francis Joseph succeeded to the Austrian throne on the abdication of his uncle, Emperor Ferdinand I. During his reign of 68 years Francis Joseph faced rebellion in his own country, domestic tragedy and foreign wars, including the humiliating Seven Weeks' War with Prussia (1866) that ended Austria's long dominance in German affairs. However, the emperor held on and instituted political reforms. He took the fatal step of declaring war on Serbia after the assassination of his heir, Francis Ferdinand, in 1914. Francis Joseph died in the midst of war and was succeeded by his grandnephew, the Archduke Charles Francis Joseph, who ruled as Charles I until the end of the war.



Courtesy Scott Stamp & Coin Company

Francis Joseph I

Enlarged from an Austrian postage stamp of 1914. The designer and engraver of the stamp are named at the bottom

FRANCIS OF ASSISI, SAINT (1182-1226), founder of the Franciscan Order, one of the most remarkable men of his age, born in Assisi, Italy. His father, a cloth merchant named Giovanni, renamed him Francesco (the Frenchman) because of his fondness for France. In his youth Francis lived the usual life of a wealthy young man, broken by a spell of military service during which he was taken prisoner and held captive for a year at Perugia. An illness that he contracted then turned his thoughts toward religion, and although he returned to the army, a second illness at Spoleto decided his career for life. In his 26th year he resolved to fulfill literally the counsels of the Scriptures and decided to live in poverty. His father brought him before the bishop to have him legally disinherited. Francis left his native city as a pauper. He soon attracted a few followers and in 1210 went to Rome to obtain permission to found an order devoted to poverty, work and service. Thus the Franciscan Order came into being.

Many disciples crowded to Francis' standard; he sent them off in parties to different provinces of Italy. Five of the brotherhood went to Morocco to preach to the Moors, and as the first martyrs of the order they fell victims to their daring. Success removed all the hesitation with which the institute at first was regarded, and in 1216 the order was approved by Pope Innocent. From this date it increased with extraordinary rapidity. At the first general assembly held in 1219, 5,000 members were present. Francis himself inaugurated the future missionary character of his Order by going (1223) to the East.

Francis of Sales, Saint (1567–1622), Roman Catholic saint and writer, born of noble parentage at the family seat in Savoy. Though he was educated for the law, he entered the priesthood from love of religious work and in 1594 was sent to the province of Savoy. After years of effort there he won the people to Catholicism. In 1602 he was appointed bishop of Geneva. As priest, bishop and writer, St. Francis was simple, earnest and deeply pious. His *Introduction to the Devout Life* is one of the most widely read of all religious books. In 1665 he was canonized by Pope Alexander VII.

Francis Xavier, Saint, see *Xavier.*

Franck, César Auguste (1822-90), French musician, born in Liége, Belgium. He established himself in Paris in 1844, where he won distinction as a teacher and church organist. His compositions were appreciated by Liszt and a few others and were studied by many contemporary musicians, but his popularity as a composer developed very slowly. His chief works include the oratorio *Les Béatitudes,* such orchestral pieces as *Ruth, Redemption* and *Rebecca,* chamber music and his only symphony, *Symphony in D Minor.*

Franco, Francisco (1893-), Spanish general and revolutionary leader, born at the naval base at El Ferrol, where his father was commandant. Franco's younger brother, Ramón, became a world famous aviator in 1926 when he flew from Cadiz to Buenos Aires. Francisco Franco was in the Spanish army in Morocco at 17. He helped to organize the Spanish Foreign Legion and was liaison officer with the French army during the Riff uprising of 1925. At 34 he became a general, the youngest in the Spanish army, and was in command of the forces in Morocco.

For 5 years after the formation of the Spanish republic in 1931 the trend in elections was steadily toward the Left. In April, 1936, Manuel Azaña became president and began a campaign against private property and the church. Rightist elements had not been idle, and a revolt led by the army was scheduled for July 25, with General Sanjurjo in charge. The killing of a Fascist deputy on July 12 hastened events, and on July 17 Franco began a revolt in Spanish Morocco and crossed into Spain with the Foreign Legion and thousands of Moorish troops.

Three days late Sanjurjo was killed in an airplane accident, and Franco became generalissimo. Backed by Fascist nations he began a long campaign against the government forces, which in turn were backed by communist and liberal nations and individuals the world over. Franco became known as *El Caudillo,* "the chief."

Frank, Glenn (1887–1940), American educator, born in Queen City, Mo. He studied and taught at Northwestern University. In 1919 he became associate editor of *Century* and chief editor in 1922. Three years later at the age of 38 he was appointed president of the University of Wisconsin, where he launched an "experimental" college that was discontinued in 1930. In 1937 he ended his duties as president after a quarrel with the state government; and he was commissioned by the Republican party to draft new party policies. He is the author of *Thunder and Dawn.*

FRANKLIN, BENJAMIN (1706-90), American statesman and scientist, born in Boston. He was apprenticed to his brother, a printer, at the age of 12. His brother started the *New England Courant;* Franklin secretly wrote some pieces for it and had the satisfaction of finding them well received. When his brother discovered the identity of the writer, Benjamin was severely lectured for his presumption and treated with great harshness. Soon afterward he quitted his brother's employment and at the age of 17 started for Philadelphia, where he found work as a compositor.

Here he attracted the notice of Sir William Keith, the governor of Pennsylvania, who induced him to go to England to buy type and equipment for establishing his own business in America. The scheme came to nothing, and after working 18 months in London Franklin returned to Philadelphia. He again took up his trade, in a short time became owner of *The Pennsylvania Gazette* and in 1732 started the popular *Poor Richard's Almanac.* By his exertions a public library, improved systems of education and a scheme of insurance were established in Philadelphia.

In 1746 he saw for the first time some experiments in electricity, which led him to begin those investigations that resulted in the identification of lightning and electricity and the invention of the lightning conductor. As member of the provincial assembly of Pennsylvania he showed himself very active, and in 1757 he was sent to England as the agent of the province. His reputation was now such, both at home and abroad, that he was appointed agent of the provinces of Massachusetts, Maryland and Georgia. Oxford and Edinburgh conferred on him their highest academic degrees, and the Royal Society elected him a fellow.

In 1762 he returned to America but was again appointed agent in 1764 and brought to England a remonstrance against the project of taxing the colonies. He opposed the Stamp Act and in 1774 presented to the King the petition of the first American Congress. On his return he was elected member of the Congress and exerted all his influence in favor of the Declaration of Independence. In 1776 he was sent to France on behalf of the American colonies. After the surrender of Burgoyne he concluded with France the first treaty of the United States with a foreign power (1778) and was subsequently named one of the commissioners for negotiating peace with the mother country. On his return to America he was governor of Pennsylvania, served as a delegate in the Federal convention of 1787 and helped to draw up the Constitution of the United States in 1788. During his busy career he spent some time in scientific research, particularly on electricity. Practical results were his inventions of the lightning rod, bifocal glasses and the Franklin stove, a kind of open stove devised to preserve heat by placing the hearth out in the room and connecting it with the chimney by a flue.

His works include his unfinished *Autobiography* and a great number of political, financial, economic and scientific papers.

Franklin, Sir John (1786-1847), English explorer, born in Spilsby, Lincolnshire. He became a midshipman in the navy at the age of 14, fought under Nelson at Trafalgar in 1805 and became a lieutenant in 1808. He commanded two successful Arctic expeditions, 1819-21 and 1825-27, was raised to the rank of captain and in 1829 was knighted. After a period in the Mediterranean, Sir John served as lieutenant governor of Van Diemen's Land, now Tasmania, 1836-43. In 1845 he started on his last expedition, in command of the *Erebus* and *Terror.* The party never returned, and it was not until 1859 that definite proof was found of the tragic end of the expedition and the attainment of its goal, the discovery of the Northwest Passage.

Fraser, James Earle (1876-), American sculptor, native of Winona, Minn. He attended the public schools of Minneapolis, studied at the Chicago Art Institute and in Paris and in 1906 became an instructor and one of the directors at the Art Students' League, New York. His principal works include a bust of Theodore Roosevelt, in the Senate Chamber, Washington; a monument to Bishop Potter, in the Cathedral of St. John the Divine; an equestrian portrait relief of the Whitney children; the sculpture, *End of the Trail,* at the western terminus of the Lincoln Highway, San Francisco; *Journey Through Life,* in the Rock Creek Cemetery, Washington, D. C.; and the design for the 1913 five-cent coin, with a buffalo on one side and an Indian head on the other. His wife, Laura Gardin Fraser (1889-), studied at the Art Students' League and became a well-known designer of medals and memorial coins.

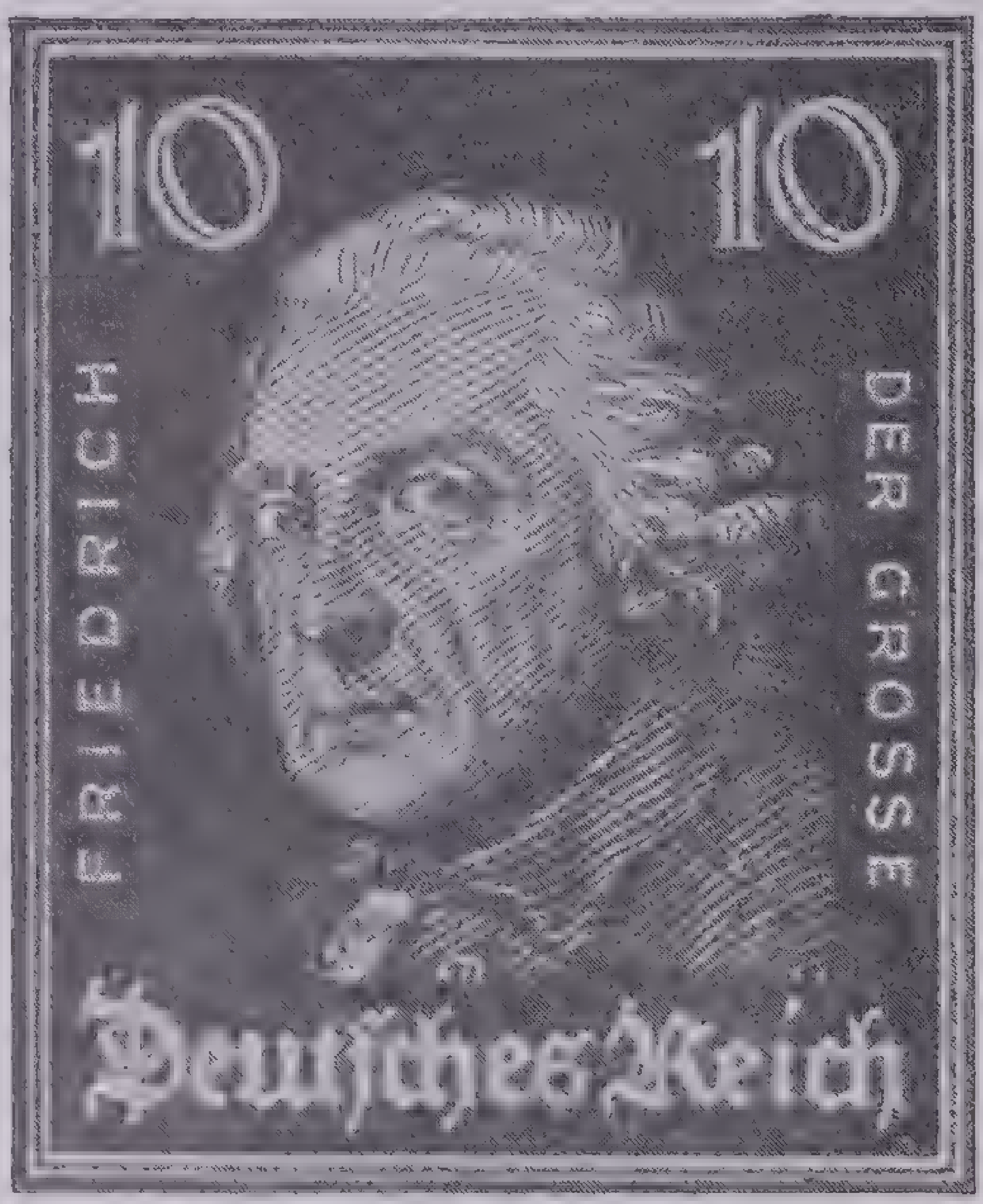
Fraunhofer, von, Joseph (1787-1826), German physicist and optician, born in Straubing, Bavaria. He made great improvements in optical glass for prisms and lenses and invented several valuable optical devices, but he is best known for his discovery of the dark lines in the solar spectrum known as *Fraunhofer lines.* He is honored as the founder of spectroscopy.

Fréchette, Louis Honoré (1839-1908), French-Canadian poet, born in Point Lévi, Que., and educated at the Quebec Seminary and Laval University. He practiced law and edited French papers in Quebec, Montreal and Chicago, but his greater field was lyric poetry. Fréchette sang of the beauty of nature, friendship and family devotion, and he struck a deep patriotic note. He also wrote plays and essays.

Frederick I, called *Barbarossa* or *Red Beard* (*c.*1123-1190), Holy Roman Emperor, succeeded his uncle, Conrad III, as king of Germany in 1152. After establishing order at home, he proceeded to Italy to carry out a plan of asserting his authority over the powerful Lombard cities. In 1155 Pope Adrian IV crowned him Holy Roman emperor, but the cities rebelled against him; he also had to contend with the hostility of Pope Alexander III, Adrian's successor. Frederick set up several antipopes and destroyed Milan in 1162, but the Lombard League, formed in 1167, renewed the war and gained a decisive victory at the battle of Legnano (1176). In 1183 a compromise was agreed upon, giving the cities local autonomy, and Frederick returned to Germany. Having established peace in all his dominions, he started in 1189 on a crusade to the Holy Land but was drowned the following year crossing a small river in Cilicia.

Frederick II (1194-1250), King of Naples and Sicily, Holy Roman Emperor, the son of Emperor Henry VI and the grandson of Frederick I. He succeeded to the throne of Sicily in 1198 but was under the guardianship of Pope Innocent III until 1208. In 1212 he disputed Otho IV's claim to the imperial throne of Germany and in 1220 was crowned Holy Roman emperor. During most of his reign he contested against the Lombard cities and Popes Gregory IX and Innocent IV, both of whom excommunicated him. In 1229 on a crusade to Palestine, Frederick was crowned king of Jerusalem. He was a patron of learning and literature.

FREDERICK II, called *The Great* (1712–86) King of Prussia, born in Berlin. He ascended the throne in 1740, in succession to his father, Frederick William I, who had pursued a policy of stern economy. The young king fell heir to a well-filled treasury and a splendidly trained army. His first act was to invade Silesia. Two wars (1740-42 and 1744-45) were fought for possession of this territory, and the struggle was concluded in 1748 by the Treaty of Aix-la-Chapelle, which put Silesia in Frederick's possession and brought him renown as a great military leader. This prestige reached its greatest heights in the ensuing Seven Years' War (1756-63), in which Frederick, with England as his ally, fought a coalition of five continental powers—Austria, France, Russia, Saxony and Sweden—and emerged victorious. Prussia emerged from the struggle one of the five great powers of Europe, and Frederick thenceforth devoted himself to undoing the suffering and devastation that were the price of victory. He reorganized the finances, built roads and canals, promoted agriculture and industry, equalized taxation and instituted justice for rich and poor alike. By taking part in the first partition of Poland (1772), Frederick added more territory to Prussia. In 1778 he again made war on Austria and again enlarged his kingdom. He died without sons, and his nephew, Frederick William II, succeeded him.



Courtesy Scott Stamp & Coin Company

Frederick the Great

Enlarged from a German postage stamp, one of a series issued in 1926 honoring German national heroes

Frederick William, called *The Great Elector* (1620-88), German ruler, succeeded his father as elector of Brandenburg in 1640. His country was then in the throes of the Thirty Years' War; finances were in disorder, the towns and villages almost depopulated. By the Treaty of Westphalia, in 1648 he recovered the Brandenburg possessions that had been seized, and within a decade he had built up a well-organized standing army. After years of warfare with Sweden and Louis XIV of France, the Elector was free to give his attention to internal reforms. By encouraging immigration, promoting industry, opening up canals, organizing a postal system and promoting education—all of which were helped by his genius for finance—he laid the foundations for the supremacy of Prussia among the German states, for Brandenburg was the nucleus of the modern state of Prussia.

Frederick William I (1688-1740), King of Prussia, son of Frederick I. Early in his reign (1713) he entered the war waged by Sweden against Russia, Poland and Denmark, at the end of which he acquired Pomerania with Stettin. The remainder of his reign was devoted to improving the internal condition of Prussia. He was sternly practical and determined; he despised the arts and sciences and was rigidly economical and strict in his ideas of justice. At his death in 1740 he left the country in a sound financial position and with an army of more than 80,000 men, the best disciplined force in Europe. His son Frederick the Great succeeded him.

Frederick William III (1770-1840), King of Prussia, son of Frederick William II, succeeded his father in 1797. The Napoleonic Wars were then in progress, and though the king at first refused to join the allies who were leagued against Napoleon, popular clamor brought Prussia into the coalition in 1806. For years after the Treaty of Tilsit (1807) Prussia was practically a French province, but the king and people, aided by the statesman Stein, steadily prepared for a war of liberation. The battle of Leipzig (1813) restored Prussia's freedom. In the era that followed the defeat of Napoleon at Waterloo Frederick William adopted a reactionary policy, joining Russia and Austria in the Holy Alliance; but he established a customs union and otherwise advanced the material welfare of the country.

Freeman, Edward Augustus (1823-92), English historian, graduated from Trinity College, Oxford, in 1845. He acted as examiner in the School of Law and Modern History at Oxford at various times and became professor of modern history in 1884. His first published book, *History of Architecture,* appeared in 1849. He made his reputation as a historian by his *History of Federal Government* which he did not finish, and his *History of the Norman Conquest,* published in six volumes (1867-79). He wrote on many other phases of European history, giving especial attention to political institutions.

Freeman, Mary Eleanor Wilkins (1862-1930), American novelist, born in Randolph, Mass., educated at Mount Holyoke Seminary. For many years she was secretary to Oliver Wendell Holmes. She began her literary career as a writer of magazine stories and verse. In 1902 she married Dr. Charles M. Freeman. Her first book, *The Adventures of Ann,* was published in 1886. Among others are *A New England Nun, Jane Field, Pembroke, Silence and Other Stories, The Portion of Labor, By the Light of the Soul, The Jamesons* and *People of Our Neighborhood.*

Frelinghuysen, Frederick (1753-1804), American lawyer and soldier, born in Somerset County, N. J., graduated from Princeton in 1770. He was admitted to the bar in 1774, served on the Committee of Public Safety, was a major of the Minute Men and as captain of artillery fought at the battle of Trenton. Later he was active as colonel of New York militia. After the Revolution Frelinghuysen served in the Continental Congress and was U. S. Senator, 1793-96. In the Whisky Insurrection he served as major general of the New Jersey militia.

Frelinghuysen, Frederick Theodore (1817-85), nephew of Theodore and grandson of Frederick Frelinghuysen, born in Millstone, N. J., was graduated from Rutgers College in 1836. In 1839 he began the practice of law in Newark, gained eminence as corporation counsel and was one of the founders of the Republican party. In 1866 Frelinghuysen became U. S. Senator by appointment and in 1871 was elected for a full term. He served on the Electoral Commission that decided the Tilden-Hayes contest and in 1881 succeeded Blaine as secretary of state.

Frelinghuysen, Theodore (1787-1862), son of Frederick, born in Millstone, N. J., graduated from Princeton in 1804. He was admitted to the bar in 1808 and following his father's example became a soldier, commanding a company of volunteers in the War of 1812. He was elected to the U. S. Senate as a Whig in 1828. Not being re-elected, he resumed law practice in Newark, N. J. and was mayor of that city, 1837-38. He shared Clay's defeat in 1844, having been nominated by the Whigs as Vice-President. From 1850 to his death Frelinghuysen was president of Rutgers College.

Frémont, John Charles (1813-90), American explorer and soldier, born of French parentage in Savannah, Ga., educated at Charleston College, S. C. He early became interested in railway surveying and in 1842 made his first government expedition to the West, leading a party of 21 men over the Oregon Trail to the Rocky Mountains. Frémont Peak (13,790 feet), named for him, was ascended on this trip. On his next expedition (1843-44), he reached Fort Vancouver by way of the Columbia River and returned home by way of California. On a third expedition, which took him again to California (1845-47), he became involved in the Mexican War and helped to wrest California from Mexico. Commodore Stockton assumed chief command there, and when General Kearney arrived on the scene in 1846, Captain Frémont refused to acknowledge his authority. A subsequent court-martial sentenced him to dismissal for mutiny. The sentence was remitted, but he resigned in 1848. He was elected as California's first U. S. Senator in 1850, and in 1856 the new Republican party named him as its first presidential nominee, but he lost to Buchanan. Frémont was given a command in the Civil War, but not wishing to subordinate his private feelings to army discipline, he resigned in 1862. He served as governor of Arizona Territory (1878-82), and in 1890 Congress placed him on the retired list with the rank of major general.

French, Daniel Chester (1850-1931), American sculptor, born in Exeter, N. H. He spent a year at the Massachusetts Institute of Technology, studied anatomy in Boston under Dr. Rimmer and worked for a time in the studio of J. Q. A. Ward before producing the *Minute Man,* his earliest statue and one of his best, for the town of Concord, Mass. After studying in Florence with Thomas Ball, French returned to America. His portrait and memorial statues and decorative pieces are noted for grace and beauty of technique. They include *John Harvard,* Cambridge, Mass.; *Lewis Cass,* rotunda of the Capitol, in Washington; *Death and the Sculptor,* memorial for Martin Milmore, in Forest Hills Cemetery, Boston; the colossal statue, *The Republic,* in Jackson Park, Chicago; bronze relief on the doors of the Boston Public Library; and the bronze Lincoln for the Lincoln Memorial in Washington.

French, John Denton Pinkstone, Earl of Ypres (1852-1925), British field marshal. He joined the army in 1874 and won distinction in the South African War as commander of cavalry; he was promoted to the grade of lieutenant general for his services. General French attained the rank of field marshal in 1913 but he resigned from the service in 1914 because of dissatisfaction with the Government's Irish policy. When Britain entered the World War, he reported for duty and was sent to France at the head of the expeditionary forces. His disclosures regarding ammunition supplies were partly responsible for the fall of Asquith's cabinet. In 1915 French yielded the command to General Haig and returned to England as head of the home forces. From 1918 until his retirement in 1921 he served as lord lieutenant of Ireland. In 1921 he was created Earl of Ypres.

Freneau, Philip (1752-1832), American poet, born in New York city of French parentage, graduated from Princeton in 1771. He had a varied career as teacher, law student, journalist, seaman, privateer and editor; but he is best known as the author of lyrics, including "The Indian Burying-Ground," "The Wild Honeysuckle," "Eutaw Springs" and "The Rising Glory of America."

Frère, Pierre Edouard (1819–86), French painter, born in Paris. He studied there under Paul Delaroche and at the School of Fine Arts. His pictures, admired for their coloring and fidelity to life, include *The Little Cook, Going to School* and *First Steps.*

Fresnel, Augustin Jean (1788-1827), French physicist, one of the great research workers in the field of optics. He disproved Newton's corpuscular theory of light and demonstrated by actual experiment that light is a wave movement. Fresnel also showed that light waves have a transverse movement in the ether. Among other achievements, he greatly improved lighthouse illumination.

Freud, Sigmund (1856-), Austrian scientist, born in Freiburg, Moravia. He was graduated in medicine from the University of Vienna, continued his studies in Paris and in 1902 became professor of neuropathology at Vienna. Freud's theory of the conflict between the conscious and subconscious parts of the mind that gives rise to hysteria and other neurotic conditions has received wide attention, as has his method of approach, called *psychoanalysis.* He modified his original theory in one particular, placing less emphasis on sex as a vital factor. This part of his theory had been especially criticized by other specialists in abnormal psychology. He wrote *Delusion and Dream* and *Totem and Taboo.* In the wave of anti-Semitism that swept Austria after the Nazi seizure in 1938 Freud was despoiled of his property. Through the friendly offices of foreign sympathizers he was permitted to leave the country, and he settled in England.

Freytag, Gustav (1816-95), German novelist, dramatist and critic, born in Kreuzberg, Silesia. He studied at Breslau and Berlin universities, lectured at the former on German literature and was editor of *Die Grenzboten,* 1848-70. His most successful comedy, *Die Journalisten* (1853), is still seen on the German stage. In 1855 he published his widely translated novel *Soll und Haben* (Debit and Credit). In his more mature years Freytag produced a series of six novels, under the title *Die Ahnen* (The Ancestors) written between 1872 and 1880. This work gives a picture of German life from earliest times to the period of the Napoleonic Wars.

Frobisher, Sir Martin (*c.*1535-94), English navigator. He made his first voyage to Guinea before he was 20. The first of his three unsuccessful expeditions in search of a northwest passage to China was made in 1576. He reached an inlet of Baffin Island of the Northwest Territories, Canada. It was named Frobisher Bay in his honor. In 1586 he sailed as vice-admiral in Drake's expedition to the West Indies, and in 1588 he was in command of a ship that helped to defeat the Armada. In that battle he so distinguished himself that he was knighted on board his own ship. He took part in other expeditions and battles, until he died of a wound received in an attack on Brest.

Froebel, Friedrich (1782-1852), German educator and founder of the kindergarten, born in Oberweissbach, Thuringia. At the age of 15 he was apprenticed to a forester; this gave him an opportunity for contact with nature and devotion to self-education. In 1799 he studied for a few months at the University of Jena; then followed more forestry work, surveying, estate management and the study of architecture. He decided to be a teacher and spent several months with Pestalozzi at Yverdon, but not until 1815, after active service in the War of Liberation, did he give himself unreservedly to education. He founded a school at Griesheim (1816) in which he began to develop his ideas of child education. He encountered much opposition but continued to train teachers and in 1837 established at Blankenburg the world's first kindergarten. This name, meaning child garden, had flashed into his mind only the year before. Froebel died without realizing the far-reaching effects of his work. Competent educators declare that the kindergarten system with its emphasis on self-expression and the development of all phases of the child's nature must be regarded as the most important educational movement of the 19th century.

Frohman, Charles (1860-1915), theatrical producer, born in Sandusky, Ohio. He spent most of his life in New York, where, in his youth, he was employed as a theater usher. He began his active career as manager of a minstrel troupe and later sent several dramatic companies on tour. In 1893 he established himself in his own business in New York and within a few years had control of numerous theaters in that city and in London. He was especially successful in bringing out talented actors who became stars, including Maude Adams, John Drew, Julia Marlowe, Ethel Barrymore and Billie Burke. He lost his life when the *Lusitania* was sunk during the World War.

Frohman, Daniel (1851–1940), theatrical producer, born in Sandusky, Ohio, brother of Charles Frohman. He began his theatrical career as manager of traveling companies. Among the New York theaters under his control at various times were the Fifth Avenue, Madison Square, Lyceum and Daly's. For many years he interested himself in the welfare of members of the profession as president of the Actors' Fund of America.

Froissart, Jean (*c.*1337-*c.*1410), French historian, best known for his *Chronicles,* a history in four books of the main events of western Europe from 1325 to 1400. He went to England at the age of 18 and entered the household of Edward III. After a leave of absence that lasted 5 years he returned in 1361, bringing with him a rhymed account of the wars of the time. He then became secretary to Queen Philippa. He gathered material for his *Chronicles* from King David of Scotland, King Edward, the Black Prince and many other personages who gave him their versions of historical events. Froissart's *Chronicles* were printed several times before 1510 and received wide and speedy distribution.

Frontenac, de, Louis de Buade, Count (*c.*1620-98), Governor of New France (Quebec). Until his appointment to that post, in 1672 he had led the life of a soldier and had reached the rank of brigadier general at the age of 26. He was an able administrator, and the prosperity of early Canada owed much to him. He promoted French interests by aiding the expeditions of Jolliet, Marquette and La Salle. Quarrels over religious matters led to his recall by Louis XIV in 1682, but it was soon evident that New France needed a man like Frontenac, and he was reappointed in 1689. His warfare on the Iroquois Indians forced them to make peace in 1696.

Frost, Robert (1875-), American poet, born in San Francisco and educated at Dartmouth and Harvard. Before becoming known as a poet Frost worked at various trades, managed his own farm near Derry, N. H. (1900-05), and was a teacher (1905-12). He resided in England (1912-15) and there published his first poems, *A Boy's Will* and *North of Boston.* After his return to America he became professor of English at Amherst College and at the University of Michigan. He won the Pulitzer Prize in literature in 1924 and in 1931. Frost's later volumes include *Mountain Interval, New Hampshire, West-running Brook* and *Collected Poems.* He has been called "the voice and embodiment of rural New England."

Froude, James Anthony (1818-94), English historian, born in Devonshire, educated at Winchester and Oxford. He prepared for the Church, but a change of views led him to leave it for a literary career. Among other activities, he served as editor of *Fraser's Magazine,* rector of St. Andrew's University and professor at Oxford. Froude's greatest work is his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada,* 12 vols.

Frye, William Pierce (1831-1911), American statesman, born in Lewiston, Me., educated at Bowdoin College. In 1871 he entered the House of Representatives, to which he was re-elected five times. From 1881 till his death he was U. S. Senator. He was president *pro tempore* of the Senate in 1896 and its permanent presiding officer after the death of Vice-President Hobart in 1899. Frye again held that office in 1901, when McKinley's death made Theodore Roosevelt President. He was one of the peace commissioners at the conclusion of the Spanish-American War.

Fuertes, Louis Agassiz (1874-1927), American illustrator and painter of bird life, born in Ithaca, N. Y. He was the son of Estevan Antonio, a civil engineer of international reputation. He graduated from Cornell University in 1897. Fuertes later made a series of pictures of birds and animals for the *National Geographic Magazine* and illustrated numerous animal books. His paintings for the New York Zoological Society and his habitat bird groups for the American Museum of Natural History are among other admirable contributions to the pictorial history of zoology.

Fuller, Margaret, Marchioness Ossoli (1810-50), American essayist and critic, associate of Emerson in the Transcendental movement. She was born in Cambridgeport, Mass., educated by her father and in private schools. She edited the *Dial* (1840-42) and became literary critic for the New York *Tribune* in 1844. In 1846 she went to Europe and a year later in Rome married the Marquis Ossoli. She shared his flight to the mountains in 1849 during the French siege of the city. When bound for New York with an infant son, the three were drowned after a shipwreck on Fire Island, Long Island. Among Margaret Fuller's books are *Women in the Nineteenth Century* and *Papers on Literature and Art.*

Fuller, Melville Weston (1833-1910), American jurist, born in Augusta, Me. He was chief justice of the United States Supreme Court from 1888 until his death. He graduated from Bowdoin College, and began the practice of law in Augusta (1856). In the midst of a successful career he moved to Chicago and became influential in Illinois state politics. President Cleveland appointed him chief justice to succeed Morrison R. Waite. He was one of the arbiters in the boundary dispute between Great Britain and Venezuela in 1899.

Fulton, Robert (1765-1815), American inventor, engineer and artist, born in Lancaster, Pa. He designed guns during the Revolutionary War and early in his career was a successful artist, doing portrait and landscape work and mechanical drawing in Philadelphia. He became greatly interested in promoting the building of canals and in inventing machinery for dredging canals. The War of 1812 turned his attention to war devices, and he spent years in developing fairly successful torpedoes and submarines, working in Europe for some years.

In 1806 he returned to the United States, bringing with him an English steam engine. With Robert R. Livingston he built the steamboat *Clermont* in which he installed the engine. The boat made the first successful trip in 1807, and in the next year Fulton and Livingston secured a monopoly on steamboat service on the Hudson. Fulton built many other ships, including the *Fulton,* the first steam-driven warship.

Funston, Frederick (1865-1917), American soldier, born in New Carlisle, Ohio. He fought with the Cuban insurgents in 1896 and on the outbreak of the Spanish-American War was sent to the Philippines as colonel of the 20th Kansas Volunteers. He became a national hero in 1901 by his capture of Aguinaldo, leader of the Filipinos. He was promoted to the grade of brigadier general, served successively as commander of various departments and in 1915 commanded the expedition to Vera Cruz, attaining the rank of major general. Funston was in command of operations against Villa along the Mexican border in 1916.

Furness, Horace Howard (1833-1912), American Shakespearean scholar, born in Philadelphia and graduated from Harvard in 1854. The great work of his life was the *New Variorum Shakespeare,* 15 vols., which appeared at intervals from 1871 to 1913. This great contribution to scholarship shows all the variations in text of the plays studied and the opinions of editors on disputed points. His son Horace Howard (1865–1930) published critiques on additional plays.

Furnivall, Frederick James (1825-1910), English philologist and Shakespearean scholar, born in Egham, Surrey, educated at University College, London, and at Cambridge. Furnivall founded societies for the publication of texts of early English writings, ballads and the works of Chaucer, Shakespeare, Browning, Wycliffe and Shelley. He prepared for publication 43 facsimilies of the quartos of Shakespeare's plays and was an editor of the Oxford English Dictionary.

Fustel de Coulanges, Numa Denis (1830-89), French historian, born at Paris. He taught at Amiens, Paris, Strasbourg and from 1875 at the École Normale at Paris. After the war of 1870 he turned his whole attention to history. His first historical work *La Cité Antique,* showing the part played by religion in the development of Greece and Rome, made its author famous, and he became a member of the French Institute.

Gabrilowitsch, Ossip (1878-1936), Russian pianist and conductor, born at Petrograd. He studied under Rubinstein, winning the Rubinstein prize in 1894, and under Leschetizky. After extended concert tours in Europe, he came to the United States in 1900 with continued success. In 1918 he became conductor of the Detroit Symphony Orchestra. He married Clara Clemens, daughter of Mark Twain.

Gade, Niels Wilhelm (1817-90), Danish composer, born at Copenhagen. He was court organist at Copenhagen and wrote several symphonies, overtures and cantatas, as well as many choral and solo productions. The overture *Ossian* won honors in Copenhagen. His compositions had a great influence on Scandinavian music.

Gadsden, James (1788-1858), American diplomat, born at Charleston, S.C. He served in the War of 1812 and against the Seminole Indians. In 1853 he was appointed minister to Mexico and negotiated the purchase of part of what is now Arizona and New Mexico, then known as the *Gadsden purchase,* an area of 45,535 square miles, which the United States wanted because it was the most practicable route to use in building a railroad to the Pacific.

Gadski, Johanna (1871-1932), German operatic soprano, born and educated in Prussia. She made her operatic debut in Berlin in the title role of *Undine* in 1889. Four successful years in Berlin and a tour of Germany and Holland followed. In 1895 Madame Gadski came to America under the auspices of Walter Damrosch. From 1898 to 1917 she was one of the leading prima donnas of the Metropolitan Opera Company. In later years she sang in concert and in special performances of German opera. Her portrayal of Brünnehilde in Wagner's *Die Walküre* was acclaimed in Europe and America.

Gage, Thomas (1721-87), British general and colonial governor of Massachusetts. Gage first came to America as an officer under General Braddock and fought throughout the French and Indian War (1754-60). He was commander in chief of the British forces in America (1763-72). After two years in England he returned as governor of Massachusetts and again commanded the army. Soon he was at odds with the rebellious colonists, and it was his military orders that led to the battle of Lexington. He was recalled to England in 1775 after the battle of Bunker Hill.

Gaillard, David Du Bose (1859–1913), American army engineer, born at Fulton, S. C., and graduated from West Point. He made his reputation as an engineer on difficult hydraulic and channel-dredging projects. He was in charge of building the central section of the Panama Canal. This included the excavation of the Culebra Cut, the most troublesome part of the entire canal. He succeeded at the cost of his health, and after his death the cut was renamed the Gaillard Cut.

Gainsborough, Thomas (1727-88), English painter, born in Sudbury, Sussex. He had some instruction in London but was essentially an artist of original genius. Gainsborough spent 14 busy years in Ipswich and in 1759 went to Bath, where his services as a portrait painter were in great demand by the beauties of that fashionable watering place. His reputation was such that soon after his return to London in 1774 he was summoned to court to paint the portraits of George III and his family. Gainsborough's portraits (more than 200 in number) are remarkable for their grace, beauty of coloring and expression of personality. Among the most famous are his *Mrs. Siddons* (National Gallery, London), *The Blue Boy* (Huntington collection, San Marino, California) and *Duchess of Devonshire* (Metropolitan Museum, N. Y.). His most remarkable landscapes are *The Market Cart* and *The Harvest Wagon.*

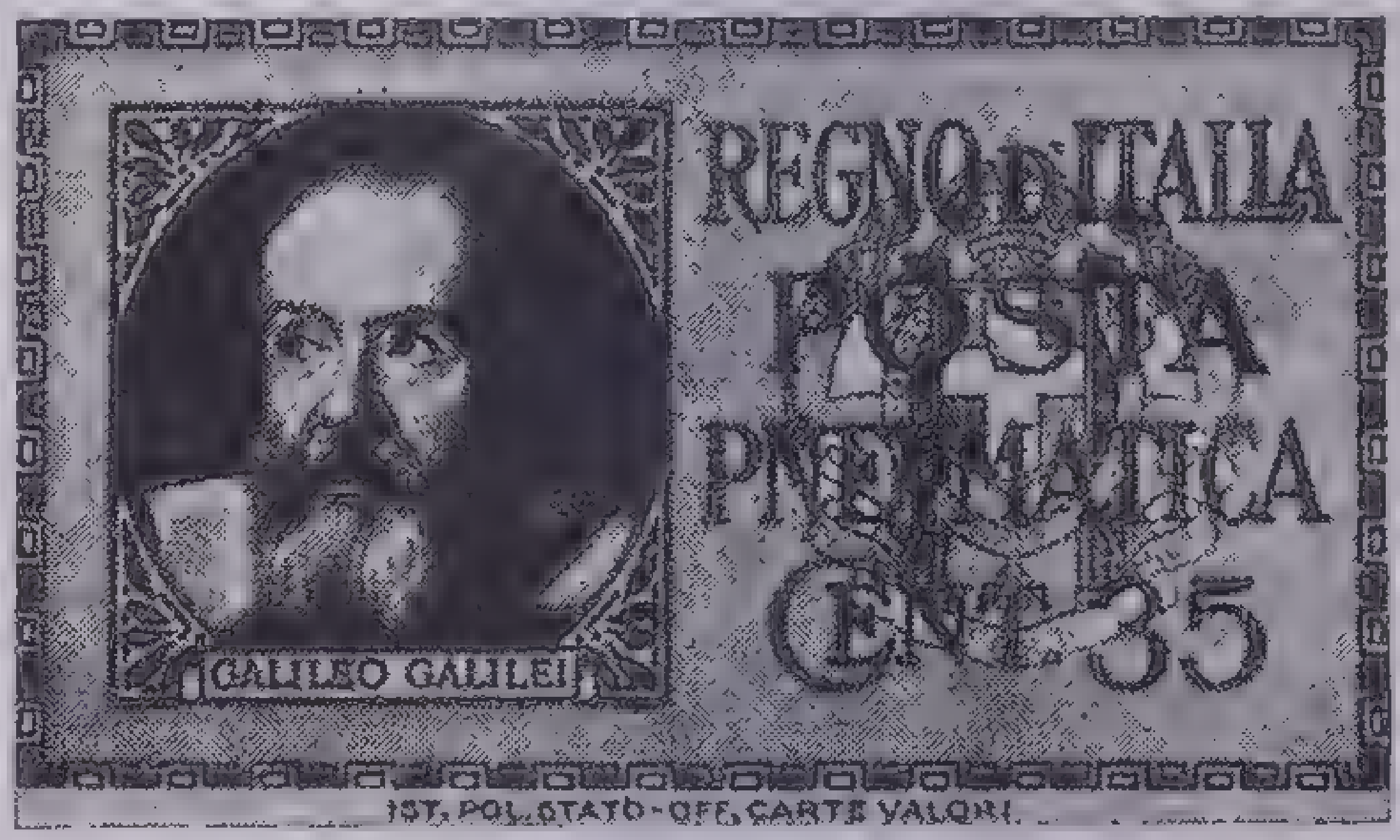
Gaius (*c.* 110-*c.* 180) Roman jurist, author of the *Institutes,* the earliest complete textbook of Roman law. This manual (4 books), was the basis of the *Institutes* of Justinian, the next great legal authority. The Gaius manuscript was lost for centuries but was discovered in 1816 in the cathedral library of Verona and since then has been almost completely deciphered. Gaius wrote numerous other works on law, of which Justinian made extensive use.

Galba, Servius Sulpicius (3 B.C.-69 A.D.), Roman Emperor, successor to Nero. He ruled for 7 months, 68-69 A.D. Galba won a favorable reputation as a soldier and administrator in the provinces and was in military service in Spain when the Gallic legions revolted against Nero in the year 68. When he learned of Nero's death, he accepted the imperial office from the Praetorian Guard. His administration was a disappointment, for he proved to be greedy, partial and harsh, and in January, 69, he was killed by his rebellious soldiers.

Gale, Zona (1874-1938), American novelist, native of Portage, Wis. She graduated from the University of Wisconsin in 1895 and later became a member of its board of regents. She entered journalism as staff writer for Milwaukee papers, then was employed by the New York *World* and other papers, 1901-04. In 1906 she published her first novel *Romance Island.* Her later writings include, in the field of fiction, *The Loves of Pelleas and Etarre, Friendship Village, Neighborhood Stories, Birth, Miss Lulu Bett, Faint Perfume, Preface to a Life* and *Yellow Gentians and Blue;* the plays *Borgia, The Neighbors* and *Uncle Jimmy;* and *Portage, Wisconsin, and Other Essays. Miss Lulu Bett,* dramatized, won the Pulitzer Prize in 1921; the novel *Birth* was dramatized as *Mister Pitt.*

Galen, Claudius (130-*c.* 200), Greek physician, born in Asia Minor. He studied in his native town and in other cities of the Graeco-Roman world, including Alexandria, and practiced in his later years in Rome, where he was physician to Commodus, heir of Marcus Aurelius. Galen announced that the arteries contained blood and not air and was the first to understand the pulse. Although his diagnosis and methods of cure were often faulty, he emphasized the importance of studying anatomy by actual dissection and is considered the founder of experimental physiology. He wrote at least 500 treatises, some of which are extant, and they proved him to be, after Hippocrates, the greatest of Greek physicians.

GALILEO GALILEI (1564–1642), Italian astronomer and mathematician, born in Pisa. He began the study of medicine and philosophy at the university there but soon turned to mathematics and natural science. When only 18 Galileo made known the fact that a simple pendulum takes a certain length of time to swing through its arc; the time is the same whether the arc is short or long. Galileo discovered this by studying the movement of a hanging lamp in the cathedral in Pisa. He became professor of mathematics in the university in 1589. During his 2 years there he discovered the law of falling bodies. Galileo was primarily an experimental scientist; by dropping balls of varying weight from the Leaning Tower of Pisa he learned that freely falling bodies have a uniform velocity (in a vacuum) regardless of weight. Hampered by the ill will of the followers of Aristotle, whose theories he rejected, he resigned in 1591. A year later he was lecturer on mathematics in the University of Padua.



Courtesy Scott Stamp & Coin Company

Galileo Galilei

Enlarged from an Italian postage stamp issued in 1933, intended as postage for local mail carried through pneumatic tubes

During the succeeding 18 years Galileo was a most popular and honored instructor and rose to his greatest heights as an astronomer. He completed a refracting telescope in 1609, the first instrument adapted to astronomical research. It opened up a new world to him. He saw for the first time the roughened surface of the moon and knew that its illumination is the sun's light reflected by mountains and valleys. He saw the mysterious Milky Way resolved into a host of radiant stars. Then in 1610 came the discovery of four satellites revolving about Jupiter. He observed also the movable spots on the sun, deducing that the sun rotates on its axis. Among his inventions of this period were a proportional compass and a thermometer.

In 1610 he was invited to Florence by his patron, the duke of Tuscany, and became the great duke's official mathematician and philosopher. But Galileo was soon in difficulty with the Church authorities because he advocated the Copernican theory that the earth and other planets revolve about the sun. His career came to a climax in 1632 with the publication of his *Dialogue Concerning the Two Great Systems of the World.* He was summoned before the Inquisition, forced to retract his theories and then sentenced to indefinite imprisonment. Galileo was never kept in close confinement, however, and was living in seclusion in Florence, aged and blind, when he died. His tomb and a memorial monument may be seen there today in the church of Santa Croce. He was the first scientist to use the modern method of making new discoveries by actual experiment and observation.

Gall, Franz Joseph (1758-1828), German anatomist, the founder of phrenology, born in Tiefenbrunn, Baden. While he practiced medicine in Vienna, he developed his theory that the mental and moral characteristics of a person are determined and indicated by the shape of the head, because of a direct relation between the brain and the outer appearance of the skull. He became widely known through his lectures, which he continued in other countries after the Austrian government prohibited them (1802). In 1807 he established himself in Paris; a year later a committee of the Institute of France reported unfavorably on the system as presented by Gall and his associate Dr. Johan Spurzheim.

Gallait, Louis (1810-87), Belgian painter of historical subjects and portraits, born in Tournai. His best known canvases are *Plague of Tournai* and *Abdication of Charles V* (Brussels Museum), *Capture of Antioch by Godfrey de Bouillon* (Versailles) and *The Prisoner* (Metropolitan Museum, N. Y.). His Dutch historical paintings were greatly admired by contemporary artists.

Gallatin, Albert (1761-1849), American statesman, born and educated at Geneva, Switzerland. He emigrated to the United States in 1780 and entered public life in 1789 as a delegate to the Pennsylvania constitutional convention. The following year he sat in the state legislature and helped to avert the worst excesses of the Whisky Insurrection. Though he was elected to the Senate in 1793, he was declared ineligible because the time since he had taken the oath of citizenship was less than 9 years. In 1795 he entered the House of Representatives, where he showed an aptitude for finance, and in 1801 was appointed secretary of the treasury by Jefferson. Gallatin held this post for 12 years and did much to systematize national expenditures. In 1814 he helped negotiate the Treaty of Ghent, during 1815-23 was minister to France and from 1826-27 served as minister to Great Britain. In his later years he was interested in education and ethnology and helped to found the American Ethnological Society in 1842.

Gallaudet, Thomas Hopkins (1787-1851), American educator of the deaf, born in Philadelphia, educated at Yale and Andover Theological Seminary. In 1817, after a trip to Europe to study methods in vogue there, Gallaudet and a teacher from Paris opened the first American deaf-mute school, at Hartford, Conn. Funds for the enterprise were secured from individuals and churches, and the movement spread to other states. Gallaudet retired from the principalship in 1830. Gallaudet College for the deaf, Washington, D. C., was named for him.

Galle, Johann Gottfried (1812-1910), German astronomer. While assistant to Johann Encke at the Berlin Observatory, he discovered the planet Neptune (1846), basing his search on the calculations of Leverrier. In 1851 Galle was appointed professor of astronomy and director of the observatory at Breslau.

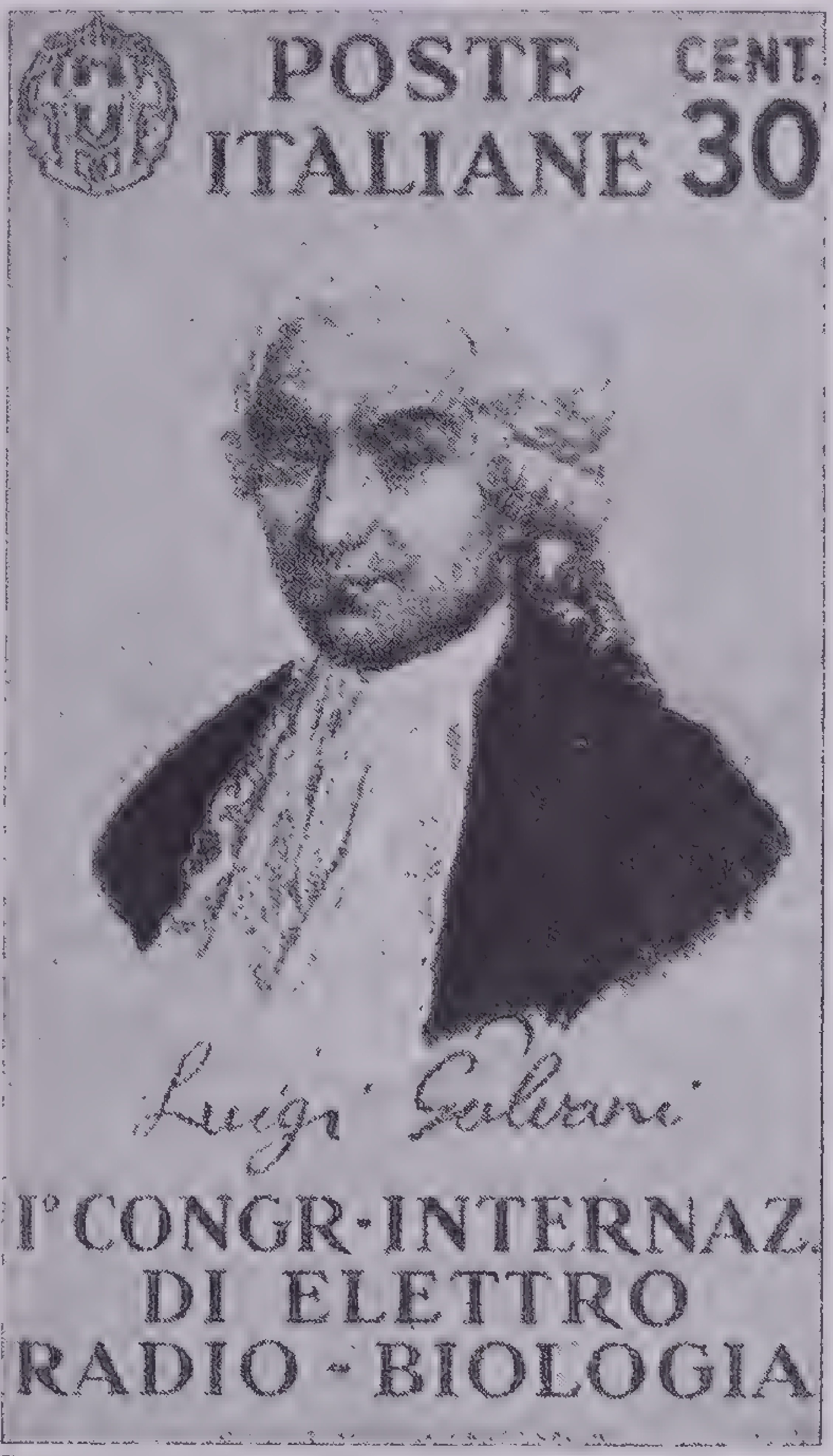
Galli-Curci, Amelita (1889-), Italian coloratura soprano, born in Milan. She studied piano, composition and harmony at the Royal Conservatory, Milan. As a vocalist she was self-taught. In 1909 she made a successful debut in Rome in the opera *Rigoletto*, and her brilliant career then took her to the musical centers of Europe, South America and the United States. She was a leading prima donna for the Chicago Opera Co., 1916-25, and also sang at the Metropolitan Opera House. Her concert tours were as successful as her appearances in opera.

Gallieni, Joseph Simon (1849-1916), French soldier. He was an administrator in the Sudan, Madagascar and other French colonies. In the World War he sent troops into the battle of the Marne from Paris in taxicabs and probably saved Paris from capture by the Germans. In 1915 he was minister of war in Briand's Cabinet.

Galsworthy, John (1867-1933), English author, born in Coombe, Surrey, and educated at Harrow and Oxford. He became a lawyer in 1890 but gave his time to reading and travel and in 1898 began his long literary career by publishing (as *John Sinjohn*) the novel *Jocelyn*. Thereafter, at frequent intervals, he wrote plays, novels and essays of uniformly high quality. Galsworthy's plays, including *The Silver Box, Strife, Justice, Loyalties, The Skin Game* and *Escape*, deal largely with social problems. His novels are remarkable for their penetrating analysis of English life and character and are written with exquisite lucidity. Most famous is the series devoted to the Forsyte family, consisting of six novels and several short stories. The earlier ones were published together as *The Forsyte Saga*, the later ones as *A Modern Comedy*. For *The Forsyte Saga* he won the Nobel prize for literature in 1932. In *Maid in Waiting* (1931), Galsworthy began another family narrative, which he did not finish. His last novel was *One More River*.

Galton, Sir Francis (1822-1911), English anthropologist, father of the science of eugenics, and author of the general law of ancestral inheritance. He was born in Birmingham, the grandson of the eminent physician and naturalist Erasmus Darwin, and cousin of the still more famous Charles Darwin. Galton spent several years in travel in the interests of anthropology and devoted himself to meteorology also, originating a method of map making followed today in weather forecasting. His fame rests chiefly on his development of biological theories as applied to inheritance and the improvement of the race. He published several books devoted to these subjects and first used the word *eugenics* in *Enquiries into Human Faculty* (1883).

Galvani, Luigi (1737-98), Italian physician and discoverer of current electricity. While he held the professorship of anatomy at the university in his native town of Bologna, he performed a series of experiments that led to Volta's invention of the electric battery. Galvani studied the effects produced on the legs of a freshly killed frog when, with a copper hook piercing its spine, it was placed in contact with another metal. The twitching of the frog's legs he attributed to animal electricity; today we know that, when the two different metals were moistened by the saline juices of the frog's body, an electric current was generated by chemical action. *Galvanism, galvanic* electricity, *galvanizing* and the *galvanometer* were named for him.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Luigi Galvani
I° CONGR-INTERNAZ. DI ELETTRO RADIO-BIOLOGIA

Courtesy Scott Stamp & Coin Company

Luigi Galvani

Enlarged from an Italian postage stamp issued in 1934 to commemorate an International Electricity-Radio-Biology Congress

Gama, da, Vasco (*c.* 1469–1524), Portuguese navigator, discoverer of the sea route to India by way of the Cape of Good Hope. In July, 1497, under commission from King Emanuel I, da Gama started with four ships from Lisbon, rounded the southern point of Africa in November and anchored off Calicut, on the Malabar coast, in May 1498. On a second expedition in 1502 he bombarded and sacked the town and destroyed the fleet of the hostile rajah. In 1524 da Gama was sent as viceroy to India by John III to correct abuses in the Portuguese possessions, but he died of fever soon after his arrival.

Gambetta, Léon (1838-82), French statesman. He began his career as a lawyer in Paris and was a member of the Chamber of Deputies when the Franco-German War began. During the siege of Paris he escaped from the city in a balloon and set up a dictatorship in Tours. To show his disapproval of the peace treaty, which he regarded as treasonable, he went to Spain but soon returned to France and became one of the most radical men in the newly organized Republic. Gambetta was president of the Chamber of Deputies in 1879 and was premier of France for two months at the close of 1881.

Gandhi, Mohandas Karamchand (1869-), Indian Nationalist, called *Mahatma* (Great Soul) by his followers. Born in Porbandar, Western India, of a middle-class well-to-do family, he studied law in London and then returned to practice as a barrister in Bombay. He spent about 20 years in South Africa, handling legal affairs of Asiatics unjustly treated by the whites. After many mental and physical hardships Gandhi won social and legal rights for his countrymen in India. During the World War he raised a volunteer ambulance corps in London. In 1919 Gandhi became the outstanding leader of a strong Nationalist movement in India. He led millions of Mohammedans and Hindus in the movement known as nonco-operation and organized a boycott of British goods and a movement for economic independence. In 1922 he was arrested for sedition and sentenced to a term of imprisonment; but in 1924, having still 4 years to serve, he was released. After a period of quiet he renewed his agitation in 1930; his violent speeches in which he urged the expulsion of the British from India led again to his arrest. He was, however, soon released, and at Delhi he made an agreement with the Viceroy in return for a large measure of self-government for India to stop the boycott. In 1931 he came to London to attend the Round Table Conference and demanded complete independence for India. He was imprisoned shortly after his return to India but was later released. Gandhi wrote *Indian Home Rule, Young India* and his autobiography.

Garbo, Greta (Greta Gustafsson; 1906-). Swedish-American film actress, born in Stockholm. In 1922 she began to work in films. After a picture in Germany she went to Hollywood and made her first picture, *The Torrent*. For some time she was featured in pictures for her beauty, but as a great emotional actress she won new laurels in talking pictures. These include *Anna Christie, Mata Hari, Grand Hotel, Queen Christina* and *Camille*.

García, Manuel (1805–1906), Spanish musician, born in Madrid, the son of a tenor singer and voice instructor who was his early teacher. The young man traveled with his father's opera company for a time but left the stage in 1829 and settled in Paris as a singing teacher. In this work he was very successful; Jenny Lind was one of his pupils. Garcia was professor of singing at the Royal Academy of Music in London for 45 years beginning in 1850. He was still teaching privately when he died at the age of 101. He invented the laryngoscope, a device for viewing the interior of the larynx.

Garcia y Inigues, Calixto (*c.* 1836-98), Cuban patriot and soldier, born in the province of Santiago. He began his military career in 1868 as a rebel fighter in the Ten Years' War and eventually became commander in chief of the revolutionary army in Oriente. He was held a prisoner in Spain, 1880-95, but escaped to the United States and accumulated arms and munitions. He fought with distinction in the last Cuban insurrection and led a Cuban force at El Caney in the Spanish-American War. He died in Washington, where he was attending a conference on Cuban affairs.

Garden, Mary (1877-), American operatic soprano, native of Aberdeen, Scotland. She was brought to America by her parents when she was 6. Her education in music began at that time. She became a concert pianist but in 1896 went to Paris to study voice. An unexpected opportunity to play the role of Louise at the Opera Comique, when she substituted for the prima donna in the third act, was the beginning of a long and successful career. She made her American debut in 1907 in New York under Oscar Hammerstein and sang with the Chicago grand-opera organization 1910-30; for one year she was its manager. Miss Garden's unusual dramatic gifts were especially admired in such roles as Mélisande, Salome, Thaïs and Carmen.

Gardiner, Samuel Rawson (1829-1902), English historian, born in Ropley, Hampshire, and educated at Oxford, Edinburgh and Göttingen universities. He taught modern history at King's College, London, 1877-85, and was examiner in history at Oxford, 1886-89. His greatest achievement as a historian is the 10 volume *History of England* from the accession of James I to the outbreak of the Civil War. It was followed by *History of the Great Civil War* and *History of the Commonwealth and Protectorate*. Three volumes of the last had been issued when the author died. He based his work on an exhaustive study of original sources and treated his subject with remarkable lack of bias.

Garfield, Harry Augustus (1863-), American educator, born at Hiram, Ohio, the son of President Garfield. He was graduated at Williams College, 1885, studied law at Columbia Law School, Oxford and Inns of Court, London. He practiced law in Cleveland (1888-1903) and then became professor of politics at Princeton University. From 1908 until his retirement in 1934 he was president of Williams College, Williamstown, Mass. During the World War as fuel administrator he introduced the "heatless Mondays."

Garfield, James Abram (1831-81), 20th President of the United States, born in a log cabin in Orange, Cuyahoga County, Ohio, on November 19. As a young boy he knew the meaning of hard work on a farm. At the age of 17 he drove horses and mules on the towpath of the Ohio Canal, and at 18 he entered the academy at Chester, Ohio, to prepare for teaching. Two years later he studied at Western Reserve Eclectic Institute (now Hiram College) and in 1854 matriculated at Williams College (Williamstown, Mass.) from which he was graduated with honors in 1856. He taught Latin and Greek at Hiram College and in 1857 was chosen president of the institution.

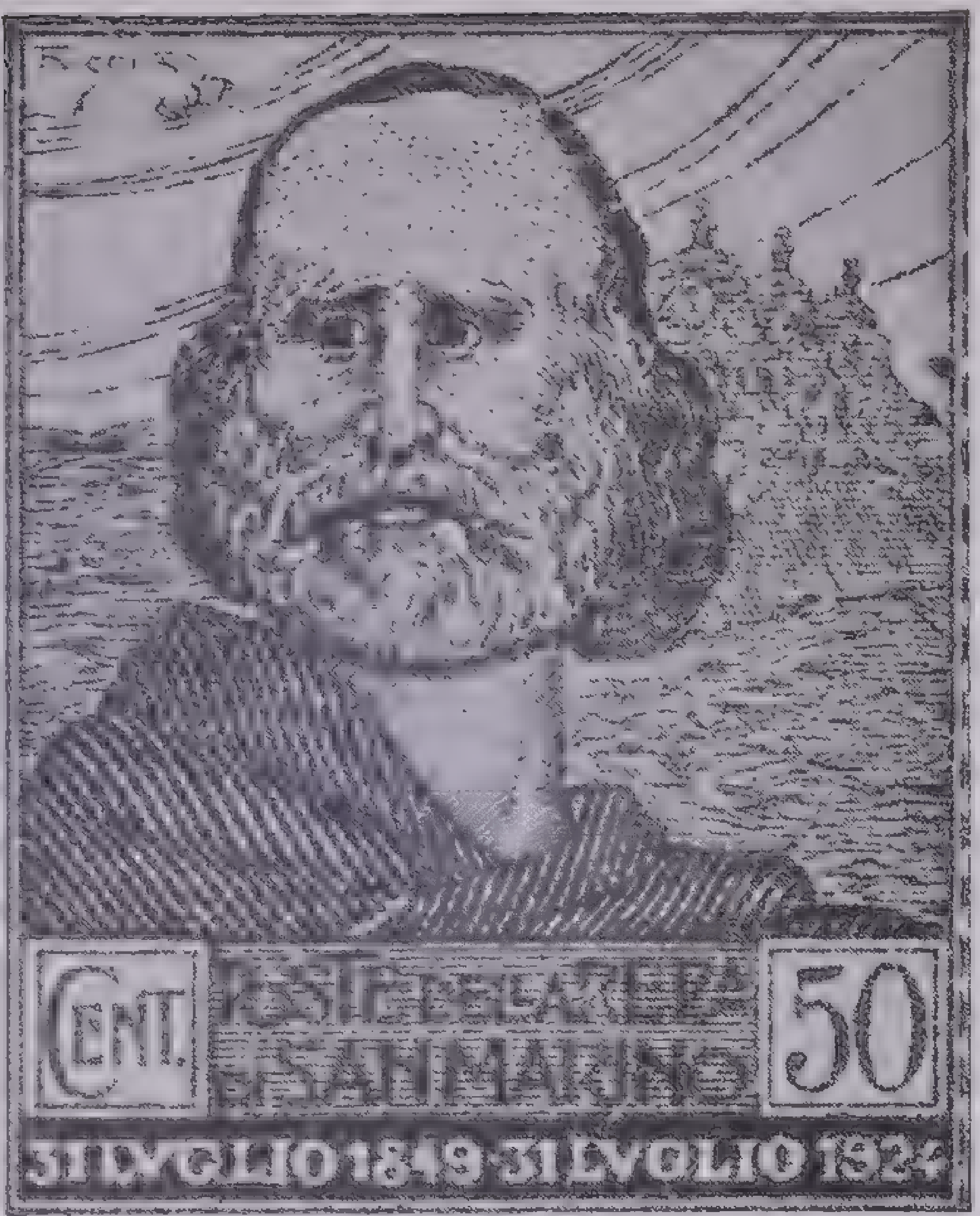
He studied law privately and in 1861 was admitted to the Ohio state bar, but the Civil War and the call of politics prevented his entering practice. Always an antislavery man and one of the first members of the Republican party, Garfield offered himself for service when the war began. In 1861 he was commissioned lieutenant colonel of Ohio volunteers and gave meritorious service in Kentucky under Buell and at Shiloh, Corinth and Chickamauga, rising to the rank of major general. His home district elected him to Congress in 1862, and he resigned from the army the following year. In the House he gave valuable service as a member of the military committee and in connection with the enforcement of the Draft Act. In the troubled days that followed Lincoln's assassination, Garfield was in the forefront of those who sought a constructive policy. He voted for President Johnson's impeachment. He was a member of the House until 1880, when the Ohio legislature elected him U. S. Senator, but he never took his seat in the Upper House; instead, he was elected President with Chester A. Arthur as his running mate.

Garfield began his term with a serious handicap—the still smoldering hostility between the Republican factions—and he came to an open break with Senator Conkling of New York over Federal patronage. On July 2, only 4 months after his inauguration, he was shot in Washington by Charles J. Guiteau, a mentally unbalanced lawyer who had sought vainly to be appointed to a diplomatic post.

Garibaldi, Giuseppe (1807–82), Italian patriot, born in Nice (then a part of Italy), the son of a seaman. Contact with the Young Italy leaders, including Mazzini, inspired him with a zeal for Italian liberation. He took part in a futile uprising in Genoa in 1834 and was forced to flee to France. During the next few years Garibaldi led a roving, adventurous life and at one time helped the Uruguayans fight the dictator of Argentina. He returned to Italy in 1848, when he heard of the revolt of Northern Italy against Austria, and was one of the defenders of Rome when it was besieged by the French. Again he was forced into exile and lived for a time on Staten Island, N. Y. In 1854 he settled on the isle of Caprera in the Mediterranean, where he waited for the next great uprising. In 1859, under the leadership of Victor Emmanuel II of Sardinia and Cavour, his prime minister, the crucial struggle began. Garibaldi's special contribution was leading a band of volunteers that conquered Sicily and Naples (1860), opening the way to the proclamation of Victor Emmanuel as king of united Italy.

In 1862 and again in 1867 he made unsuccessful attempts to conquer Rome. He fought for the French Republic in the later phases of the Franco-German War and was elected to the Italian Parliament in 1874. His last years were spent on Caprera.

Garland, Hamlin (1860–1940), American novelist and poet, born in West Salem, Wis. He completed a literary course at Cedar Valley Seminary, Osage, Ia., in 1881, later taught school in Illinois and then began his literary career in Boston. Much of his writing was done while he was a resident of Chicago, where he founded the Cliff Dwellers, a club for professional people. Garland's first book, a collection of short stories entitled *Main-Traveled Roads,* appeared in 1890. Later volumes include *Prairie Folks, The Eagle's Heart, The Captain of the Gray Horse Troop* and a series portraying the experiences of a pioneer family titled *Middle Border.*


CENT.
POSTE DELLA REP. DI SAN MARINO
50
31 LVGLIO 1849 · 31 LVGLIO 1924

Courtesy Scott Stamp & Coin Company

Giuseppe Garibaldi

Enlarged from a postage stamp issued by San Marino commemorating the 75th anniversary of Garibaldi's taking refuge there in 1849 after his defeat by the combined forces of Naples, Spain, Austria and France

Garner, John Nance (1869-), Vice-President of the United States, born in Red River County, Tex. He had little opportunity for formal schooling but studied law and was admitted to the bar in 1890. He sat in the lower house of the Texas Legislature, 1898-1902, after which he represented his district in Congress until 1933. He became chairman of the important Ways and Means Committee in 1921, a stepping-stone to the Speakership of the House, which post he reached in 1928. Candidate for the Democratic nomination for the Presidency in 1932, he threw his Texas votes to F. D. Roosevelt and won the Vice-Presidency nomination by acclamation. He was renominated and re-elected in 1936. In the second Roosevelt administration Garner seemed out of sympathy with the New Deal.

Garrick, David (1717-79), English actor, born in Hereford. He studied at Lichfield under the famous Dr. Johnson, and the two went to London together in 1736. In 1741, after some preliminary theatrical experience, Garrick appeared in a London theater as Richard III. Thereafter he enjoyed uninterrupted prosperity until his retirement in 1776. He was especially identified with the historic Drury Lane Theater, which he managed for a long time. His natural manner of acting, his ability to play almost any type of character and his insistence on presenting Shakespeare's plays as he thought the author meant them to be produced and acted were all noteworthy factors in his success.

Garrison, William Lloyd (1805-79), American abolitionist, born in Newburyport, Mass., where in his youth he learned the printing business and began writing for the newspapers. In 1826 he became editor of the Newburyport *Free Press* and an advocate of the abolition of slavery. He started *The Liberator* at Boston in 1831. At first he alone did all the writing, typesetting, printing and distributing of his small sheet. In 1835 he was mobbed in the streets of Boston; and because the U. S. Constitution permitted slavery, he called it "a covenant with Death and an agreement with Hell." As an opponent of slavery he wrote brilliantly and was president of the American Antislavery Society. In 1865 on the abolition of slavery he was presented with $30,000 by admirers of his courage, energy and ability.

Gary, Elbert Henry (1846-1927), American financier and lawyer, born near Chicago and educated at Wheaton (Ill.) College and the University of Chicago. Admitted to the Illinois bar in 1867, he served two terms as county judge and later became a successful corporation counsel in Chicago, his field of practice for 25 years. In 1901, when the merger that resulted in the United States Steel Corporation took place, Judge Gary was selected its president, and he held that position until 1926, when he became chairman of the board of directors. Gary, Ind., which contains the main plant of the corporation, was named for him.

Gaskell, Elizabeth Cleghorn Stevenson (1810-65), English novelist, born in London and educated in Stratford-on-Avon. She began writing fiction in 1848, producing both novels and short stories at intervals until her death. Her best work, aside from her *Life of Charlotte Brontë,* is *Cranford,* which pictures life in the quaint little town of Knutsford in Cheshire, her girlhood home.

Gates, Horatio (1728-1806), American general, born in England. He came to America in 1755 to take part in the French and Indian War and served under Braddock and Monckton. At the outbreak of the Revolutionary War in 1775, he left his farm in Berkeley County, Va., and in 1777 was in command of the Northern army that forced the surrender of Burgoyne at Saratoga, the turning point of the war. The unsuccessful Conway Cabal against Washington aimed to put Gates in supreme command in Washington's place. In 1780 after an interval of inactivity Gates took command in the South and was defeated by Cornwallis at Camden, S. C.; he was suspended and superseded by General Greene. In 1782 he was reinstated.

Gatling, Richard Jordan (1818-1903), American inventor, born in Hertford County, N. C. The Gatling gun, invented in 1862, was officially adopted by the U. S. Army after the close of the Civil War and was the best of the earlier rapid-fire weapons. Gatling also devised a hemp-breaking machine, a steam plow and machines for sowing cotton and cereals.

Gatti-Casazza, Giulio (1869–1940), Italian opera conductor. He began a career as a naval engineer but in 1890 succeeded his father as manager of a theatrical company in Ferrara. He directed the La Scala Opera House in Milan, 1898-1908, and the Metropolitan Opera House, New York, from 1908 until his retirement in 1935.

Gauguin, Paul (1848-1903), French painter. He took up painting as a hobby when he was working in a Paris bank and after 1881 devoted all his time to art. He rejected all existing rules of painting and became an impressionist, painting his own interpretation of objects rather than the objects themselves. After 1891 he lived mostly in Tahiti, living the life of the natives and painting the scenes around him in brilliant, unmixed colors. Gauguin's work had a great influence in directing the world of art into modernistic styles.

Gauss, Karl Friedrich (1777-1855), German mathematician. He discovered the geometrical method of dividing a circle into 17 equal arcs, invented a new method for calculating the location of bodies on the celestial sphere and is regarded as the founder of the mathematical theory of electricity. Important among his numerous writings is the discussion of the method of least squares. Gauss was considered by Laplace the foremost mathematician of Europe.

Gautier, Théophile (1811-72), French author, born in Tarbes. He began life as a painter, turned to poetry in 1830 and made a name for himself in verse, fiction, art and literary criticism and as a writer of travel books. Gautier's writing was of the extreme romanticist type. He early became the disciple of Victor Hugo. In 1830 he published *Albertus,* a metrical romance that was favorably received. He was also the author of a great number of novels and poems.

Gay, John (1685-1732), English poet and dramatist, born in Devon. His *Beggar's Opera,* a ballad operetta, was a great success when first presented in 1728. About 200 years later it was revived and had a record run (three and a half years) in London. His pastoral play *The Shepherd's Week* was suggested to him by Pope. Gay began his literary career in 1708 and wrote a succession of plays, ballads and other poems, of which the best known are his *Fables,* popular tales in verse.

Gay-Lussac, Joseph Louis (1778-1850), French scientist. He studied chemistry under Berthollet and became his assistant. Gay-Lussac made studies of vapor densities and pressures, and his first memoirs were on these and related subjects. In collaboration with Von Humboldt, he published in 1804 the fact that hydrogen and oxygen, in the ratio of two to one (by volume), unite to form water, from which Gay-Lussac was led to the discovery of the general law of volumes, a fundamental concept in chemistry. His later investigations resulted in new processes that were of great value in the chemical industries, and he was the first to obtain hydriodic and iodic acids and cyanogen.

Geber or **Jabir** (8th century), Arabian chemist, often called *The Father of Chemistry.* He lived at Bagdad and seemed to have had some knowledge of nearly all the chemical processes in use down to modern times. His reputed writings describe various kinds of furnaces, distillation and other chemical processes, the properties of metals and the functions of mercury, silver and arsenic. He thought that one metal could be transmuted into another, leading to centuries of experiments in alchemy.

Geddes, Sir Auckland Campbell (1879-), British scientist and diplomat, native of Scotland. He studied medicine at Edinburgh University, in London and in Freiburg, Germany. He held the professorship of anatomy at Edinburgh, Dublin and McGill (Montreal) universities. Geddes served in the South African War and in 1916 had charge of recruiting in England. He served as minister of national service, (1917-19), and in 1919 was appointed president of the Board of Trade. Geddes was England's ambassador to America in 1920-23.

Geikie, Sir Archibald (1835-1924), Scottish geologist, born in Edinburgh and educated there at the university. He became director of the Geological Survey of Scotland in 1867, professor of geology and mineralogy in the University of Edinburgh, 1871-82, and was director general of the Geological Survey of the United Kingdom and director of the Museum of Practical Geology in London, 1882-1901. He lectured in the United States in 1897. Geikie published several volumes on geology, including textbooks that are admirable for organization and clearness.

Geikie, James (1839-1915), Scottist geologist, born and educated in Edinburgh. From 1882 until his death, he held the chair of geology in Edinburgh University, having succeeded his brother Sir Archibald as professor. He was one of the founders of the Royal Scottish Geographical Society, the author of several geological books and an authority on glacial geology.

Genevieve, Saint (*c.* 422-512), patron saint of Paris. Her name is associated with the threatened invasion of the city by Attila and his Huns (450), which Genevieve was said to have averted by prayers and fasting. Another story tells how she gathered food for the starving people of Paris during a famine. During the French Revolution her body was taken from its burial place (beneath the present Panthéon) and burned, but her relics may be seen in the Church of St. Étienne du Mont. Her festival day is January 3.

Genghis Khan (*c.* 1162-1227), Mongol conqueror, the son of a tribal chief who died when the boy was 13. In 1204, when Genghis Khan was 42, he gained the mastery of the Mongol and Tatar tribes. He soon entered upon a wider field of conquest, bringing northern China under his sway and capturing Peking in 1215. Bokhara, Samarkand and other cities of Turkestan next yielded to him, and the Mongols soon swept over Persia, penetrated into northern India and ravaged the land between the Volga and the Dnieper. The great Empire of the conqueror was divided among his three sons, but the major portion eventually passed to his grandson Kublai Khan, the founder of the Mongol dynasty in China.

Genseric (*c.* 390–477), Vandal king who won repeated victories from the Roman emperors in the last years of the Western Empire. Genseric began his career of conquest in 429, the year in which he became sole king of the Vandals. He subjugated northern Africa and in 439 made Carthage his capital. In 455 he led his armies into Italy and captured Rome, which his followers were allowed to plunder for two weeks. In 457 the emperor of the West lost a naval battle to Genseric in the Bay of Cartagena, and a fleet of the ruler of the East was defeated in 468. When Genseric died in 477, his Empire was still intact.

Geoffroy Saint-Hilaire, Étienne (1772–1844), French anatomist. He became a pupil of Haüy at the College of Navarre, Paris, and in 1793 was appointed professor of zoology in the museum of natural history. He wrote *Philosophie anatomique* and *Notions synthétiques, historiques et physiologiques de philosophie naturelle* (1838). His evolutionary theories were opposed by Georges Cuvier.

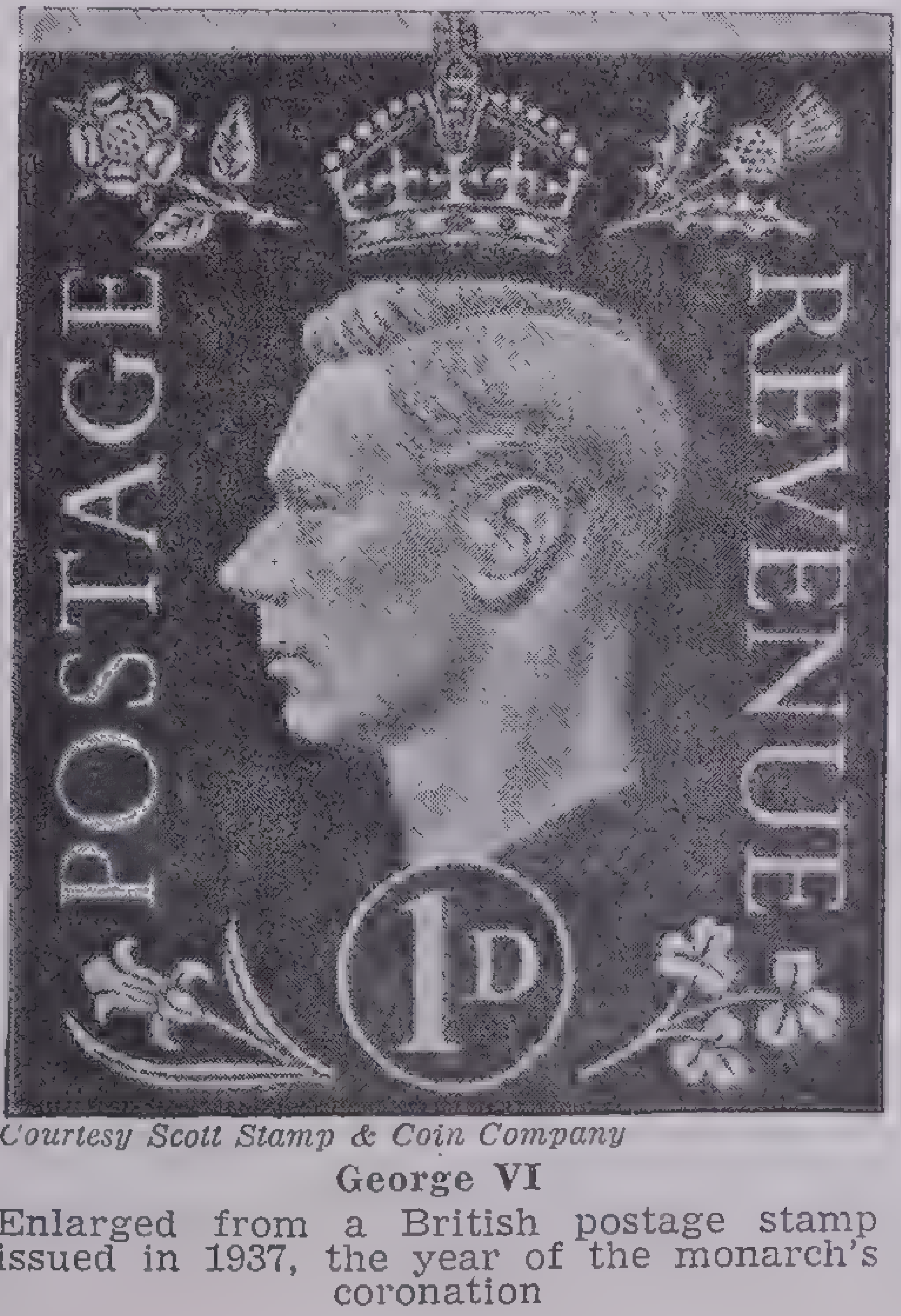
George I (1660–1727), King of England, the son of Ernest Augustus, elector of Hanover, and Sophia, granddaughter of James I of England. By the Act of Settlement of 1701, which declared his mother next successor to the English throne, Prince George became heir apparent. His mother died two months before the death of Queen Anne, and he succeeded as George I in 1714. George, educated in Germany and with slight knowledge of the English language, left the actual government largely to his ministers, notably Sir Robert Walpole. During this reign the country experienced a financial panic through the collapse of the South Sea Company; Walpole was able to avert disaster, though many investors were ruined.

George II (1683-1760), King of England, son of George I, succeeded his father as elector of Hanover and king of Great Britain and Ireland in 1727. He was born in Hanover and lived there until his accession; however, he learned the English language. He did not interfere much with politics, especially when Walpole was his prime minister. In 1745 he led an army in the field against the French at Dettingen. George ruled for nearly 33 years. His reign was notable for the Jacobite rising in 1745 and for war with France; the reign ended with victories (1759) in three continents. In America England won Canada, and Clive's victory at Plassey laid the foundations for the Empire of British India. Walpole continued as prime minister until 1742. Later in this reign, William Pitt was England's most influential statesman.

George III (1738-1820), King of England, 1st Hanoverian king, born in England, the son of Frederick Louis, Prince of Wales, who died in 1751. George III succeeded his grandfather George II in 1760. Through his mother's influence he grew up with a definite conception of royal authority and set about at once to destroy the power of the Whigs, who had dominated the two preceding kings. It was not until 1770 that he found in Lord North a prime minister who exactly suited him. During the administration of this Tory premier the Revolutionary War won independence for the United States. Other wars of this reign included those with the Revolutionary government in France, with Napoleon and with the young American nation in the War of 1812. In 1801 the legislative union of Great Britain and Ireland was concluded. George III became blind in 1809 and insane in 1811.

George IV (1762-1830), King of England, son of George III, was crowned in 1820 but had ruled as prince regent from 1811. George was noted for his extravagance. He occupied the throne for 10 years but had no great influence on public affairs. The later wars of his father's reign occurred during his regency. Late in his own reign an act was passed providing for Catholic emancipation. He was succeeded by his brother William IV.

George V (1865–1936), King of England, 2d son of Edward VII of England and Alexandra of Denmark, ascended the throne in 1910. The king's full title was "George V, by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India." As a prince George received thorough training in the navy, rising from cadet to vice-admiral. In 1893 he married Princess Victoria Mary of Teck, who became Queen Mary. She had been engaged to his elder brother Prince Albert Victor, who died in 1892. The reign of George V was marked by recurring crises, for the country had to cope with the World War, the post-war problems of unemployment and economic readjustment, the settlement of the Irish question and the Nationalist movement in India.

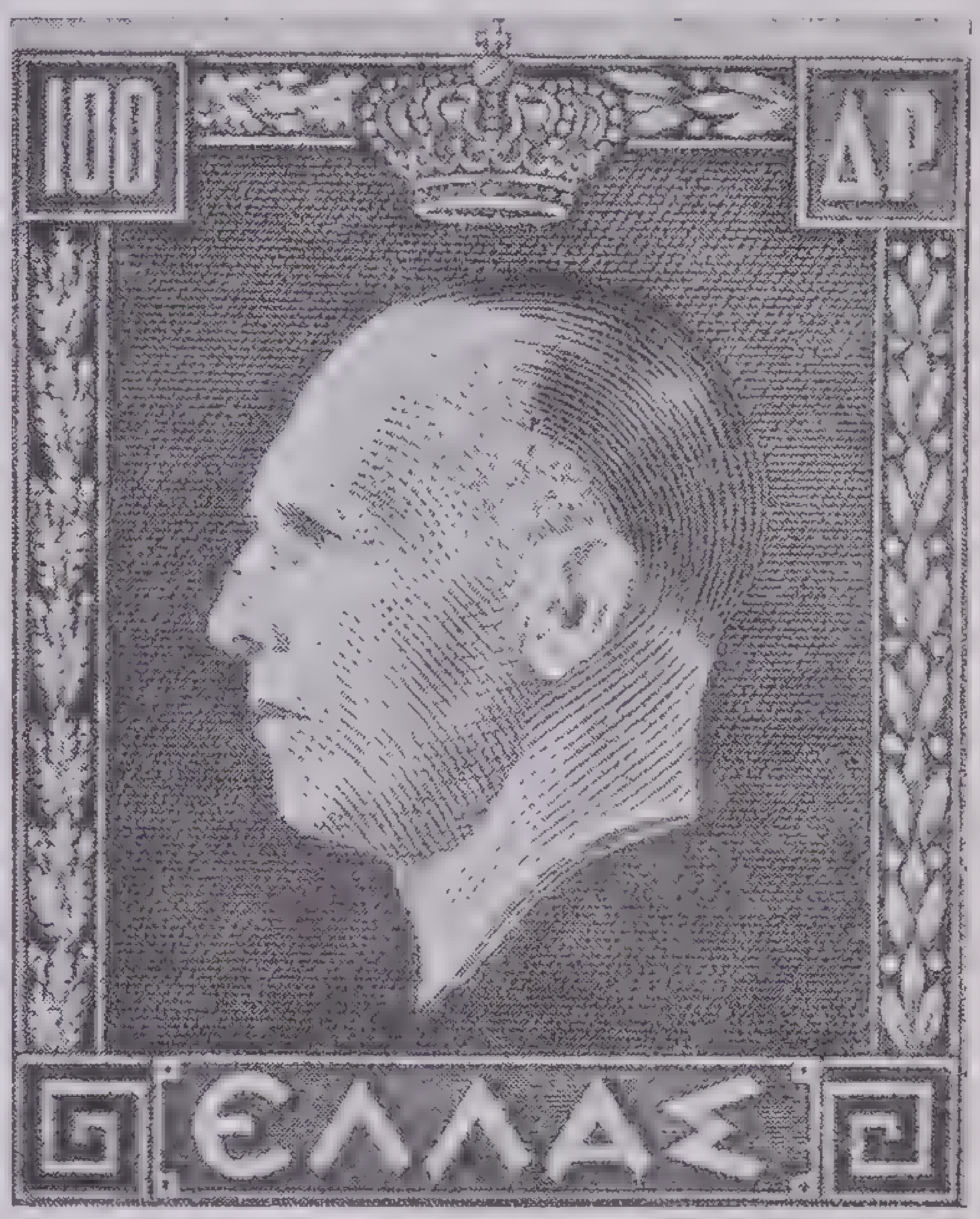


Courtesy Scott Stamp & Coin Company

George VI

Enlarged from a British postage stamp issued in 1937, the year of the monarch's coronation

George VI (1895-), King of England, 2d son of George V, born in London and named Albert Frederick Arthur George. He became Earl of Inverness, Baron Killarney and the Duke of York. In 1923 he married Lady Elizabeth Bowes-Lyon (b. 1900). Two daughters were born, Elizabeth Alexandra Mary (1926) and Margaret Rose (1930). On December 12, 1936, George was proclaimed king following the abdication of his brother Edward VIII, who was made the Duke of Windsor.



Courtesy Scott Stamp & Coin Company

George II

Enlarged from a Greek postage stamp issued in 1937, one of a series of four denominations each bearing the portrait of the ruler

George I (1845-1913), King of Greece, 2d son of Christian IX of Denmark. He ascended the throne in 1863 after the revolution that deposed King Otho. Prince Christian William (as George I was then called) accepted the crown of Greece with the consent of the European powers and won the esteem of his subjects in spite of a disastrous war with Turkey (1897) and constitutional and financial difficulties. He married the Princess Olga of Russia in 1867. While he was on a visit to Salonika during the Balkan War, King George was assassinated by a lunatic. His son Constantine I succeeded to the throne.

George II (1890-), King of Greece, eldest son of Constantine I, whom he succeeded in 1922. In the next year there was so much hostility to the throne that he had to leave the country and a plebiscite was taken to decide whether Greece would continue as a monarchy or become a republic. In October, 1935, Field Marshal George Kondylis executed a *coup d'état* that restored George to the throne.

George, David Lloyd, see *Lloyd George, David.*

George, Henry (1839-97), American economist, born in Philadelphia. From the time he was 14, when he left school, until 1865, when he attained some success as a journalist in San Francisco, George drifted from one employment to another and was usually close to poverty. During his sojourn in California, where he witnessed a spectacular rise in land values, he evolved his theory of the single tax, the most important economic principle developed by an American. George first discussed this theory in *Our Land Policy* (1871) but gave it more elaborate treatment in his famous *Progress and Poverty* (1879). In brief he believed that a single tax on the rent of land and the unearned increase in land value was the most equitable form of taxation. George was independent candidate for the mayoralty of New York city in 1886 and 1897 but was defeated both times. He died before the election in 1897.

George, Saint (d. *c.* 303), patron saint of England and Portugal. According to tradition, he was born in Lydda, Palestine, and suffered martyrdom in Nicomedia under Emperor Diocletian. The accounts of Saint George are legendary. The English Crusaders brought back many stories of him, and in the 14th century Edward III made him patron of his new Order of the Garter. The red cross of Saint George, on a white ground, may be seen on the British flag, the Union Jack.

Gerard, James Watson (1867-), American lawyer and diplomat, born at Geneseo, N. Y., and educated at Columbia University and the New York Law School. He began the practice of law in New York in 1892, became prominent in politics as a Democrat and was associate justice of the New York supreme court, 1908-13. In 1913 he was appointed ambassador to Germany by President Wilson and remained at Berlin until diplomatic relations were severed in 1917. Gerard resumed his law practice after returning to America. His experiences in Germany are related in his *Face to Face with Kaiserism* and *My Four Years in Germany*.

Germanicus Caesar (15 B.C.-19 A.D.), Roman general, son of Nero Claudius Drusus and the adopted son of the Emperor Tiberius, his uncle. In 15-16 he gained renown by defeating Arminius, the German chieftain who had conquered Varus and his legions in the Teutoburg Forest in 9 A.D. Because of his nephew's popularity, which he considered dangerous to himself, Tiberius sent him on a mission to the East. Germanicus died near Antioch; according to his friends, he was poisoned at the command of the jealous emperor.

Gérôme, Jean Léon (1824-1904), French painter and sculptor, one of the most distinguished pupils of Paul Delaroche. He gained his reputation as a sculptor after he had accomplished his most significant work as a painter. Gérôme considered his finest paintings to be his *Gladiators before Caesar* and the companion picture *Pollice Verso* ("Thumbs Down"). Among others are *Phryne before the Tribunal, Cleopatra and Caesar, The Death of Caesar* and *Greek Cockfight*. His work is impressive, sometimes spectacular; he excelled in drawing and composition. His chief pieces were several bronze equestrian statuettes of historic characters and a bronze monument for the battlefield of Waterloo.

Geronimo (*c.* 1829-1909), Apache Indian chief, born in New Mexico. He was notorious as a raiding leader and terrorist in the southwest United States from 1884 to 1886. In 1886 he agreed to surrender to General George Crook but escaped to the Mexican mountains with his followers and was not subdued until General Nelson A. Miles took charge of the campaign. Geronimo died a prisoner in Fort Sill, Okla.

Gerry, Elbridge (1744-1814), American statesman, born in Marblehead, Mass., and educated at Harvard. He began his public career in 1772 as a member of the General Court of Massachusetts and was a prominent member of the Continental Congress, 1776-1781 and 1783-85. He signed the Declaration of Independence but refused to affix his signature to the Constitution, which he steadfastly opposed as a delegate to the Constitutional Convention. Gerry was elected to the first two Congresses from Massachusetts and in 1797 was one of three envoys sent to treat with the French Directory. Elected governor of Massachusetts in 1810 and 1811, he was criticized for signing a law to redistrict the state so as to give his own party (Democratic-Republican) a political advantage (a practice since named for him, *gerrymandering*). Gerry was elected Vice-President of the United States on the ticket with Madison in 1812 and died in office.

Gershwin, George (1898-1937), American composer, born in Brooklyn, N. Y. His parents were Russian Jew immigrants. He started as a young pianist with a firm of music publishers and soon began to write songs. At the age of 20 he wrote the musical comedy *La La Lucille*. As a leader in the development of jazz, he is famous for his *Rhapsody in Blue*. He composed *Concerto in F* and the American folk opera *Porgy and Bess*, a success of the 1935-36 season.

Gest, Morris (1881-), Russian-American theatrical producer, native of Vilna, Russia. He came to the United States in 1893 and attended the Boston public schools. With F. Ray Comstock as his partner, Gest produced such notable plays as *Experience, The Wanderer, Chu Chin Chow, Aphrodite* and *Mecca*, and he produced the first Russian ballet in America. His company also introduced to American audiences Balieff's *Chauve-Souris* and the artists from the Moscow Art Theater. Eleonora Duse played her farewell tour under Gest-Comstock auspices, and the partners sponsored the production called *The Miracle* (1924).

Ghiberti, Lorenzo (*c.*1378-1455), Italian sculptor and goldsmith. His bas-reliefs on the two bronze gates of the baptistery in his native city of Florence are considered the finest of their kind in the world. It required over 20 years to complete the twenty-eight panels of the north gates that picture scenes from the life of Christ and the evangelists. The east portals display Old Testament scenes. Ghiberti spent 27 years in doing this part of the work, the beauty of which inspired Michelangelo to exclaim that the portals were worthy to be the gates of Paradise. Ghiberti also designed some of the painted glass windows for the cathedral in Florence and assisted in the architectural plans.

Ghirlandaio, Domenico (1449-94), Italian painter, born in Florence. A fine fresco of St. Peter and St. Andrew in the Sistine Chapel of the Vatican was painted by him when he was 32. Most of his representative paintings may be seen in Florence, including his *Last Supper* and *St. Jerome* in the monastery and church of Ognissanti, the frescoes of St. Francis for the Sassetti Chapel in the Sacred Trinity and the frescoes in Santa Maria Novella that contain portraits of members of leading Florentine families. At one time Michelangelo was a pupil of Ghirlandaio.

Gibbon, Edward (1737-94), English historian, author of one of the masterpieces of literature, *The Decline and Fall of the Roman Empire*. He was born in London and at 15 went to Magdalen College, Oxford. He was dismissed from Oxford after 14 months because he had become a convert to Catholicism. He pursued further study at Lausanne, Switzerland. The influence of a Calvinist minister in whose house he lived led to Gibbon's reconversion, but eventually he renounced all religious belief.

He returned to England in 1758 and continued to read and study. In 1763, he began a continental tour that took him to France, Switzerland and Italy. While in Rome, contemplating the ruined monuments of the city's past, he resolved to write the history of its decline. A long period of research led to an expansion of the plan so that the famous *History* includes the whole story of imperial Rome. The first volume appeared in 1776, the second and third volumes in 1781 and the concluding three in 1788. This monument of scholarship was Gibbon's life work, the culmination of an amazing amount of reading and study. He also wrote an excellent autobiography that was published after his death as *Memoirs of My Life and Writings*. He sat in Parliament, 1774-83, but was not conspicuous there.

Gibbons, James (1834-1921), Roman Catholic cardinal, born in Baltimore, Md. He studied for the priesthood at St. Charles College, Md., and at St. Mary's Seminary, Baltimore, being ordained in 1861. He rose by degrees to the rank of archbishop of Baltimore (1877) and in 1886 was appointed cardinal by Pope Leo XIII. Cardinal Gibbons was the author of *Faith of Our Fathers, Our Christian Heritage, The Ambassador of Christ* and *A Retrospect of Fifty Years*.

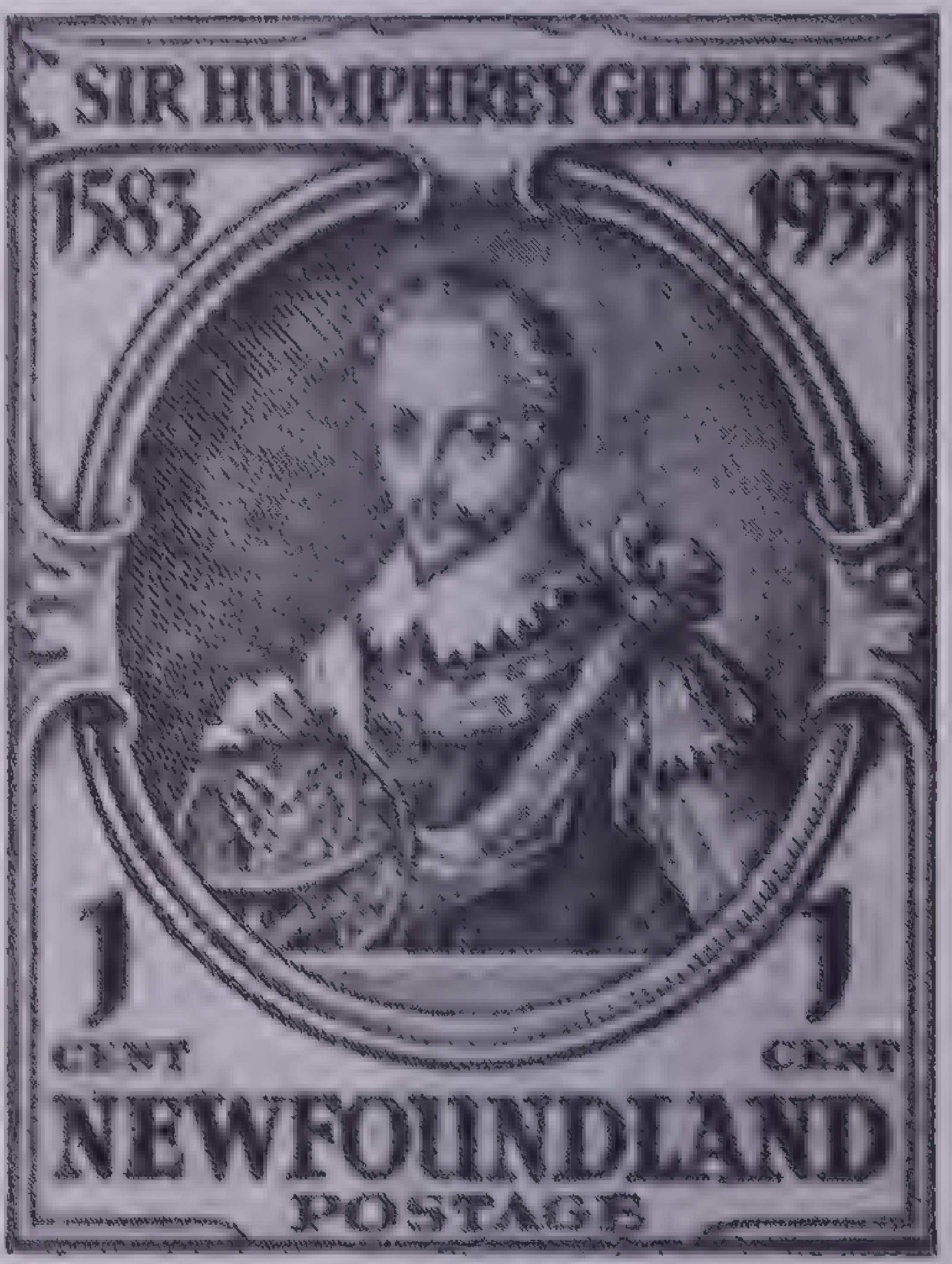
Gibbs, Sir Philip Hamilton (1877-), English author and war correspondent. He began his career as an editor, entering journalism in 1902 and had his first experience as field correspondent in the Balkan War of 1912, when he was employed by the London *Daily Graphic*. During the World War he wrote descriptions of life at the front; and after the war his novels treated the problems created by the war and the peace. In 1920 he was knighted. Sir Philip edited *The Review of Reviews*, 1921-22. At various times, he lectured to American audiences. Typical of his books about the war are *Battles of the Somme, The Hope of Europe, Now It Can Be Told, More That Can Be Told*, and *Out of the Ruins*. His *Street of Adventure, Heirs Apparent, The Middle of the Road* and *The Golden Years* are novels.

Gibson, Charles Dana (1867-), American artist, born in Roxbury, Mass. He received training at the Art Students' League, New York, which he attended (1884-8[illegible]); in later years he studied in Paris, London and Munich. Gibson became an illustrator for *Life*, the *Century, Scribners, Harpers* and other magazines. His drawings of a type of American girl, the *Gibson girl*, brought him great popularity. Later he turned to portrait painting in oils. He is the author of *Drawings, Pictures of People, The Education of Mr. Pipp, The Americans, The Social Ladder* and other books.

Gibson, John (1790-1866), British sculptor, born in North Wales. In 1817 he went to Rome, where he came under the influence of Canova and Thorwaldsen, leaders of the classical school of art. Gibson's admiration of Greek ideals may be seen in such pieces as *Sleeping Shepherd Boy* and *Hylas and Nymphs* as well as in his Queen Victoria group in the Houses of Parliament. He followed the Greek practice of tinting his sculpture. *Hours Leading the Horses of the Sun* is an admirable example of his bas-relief work.

Gilbert, Cass (1859-1934), American architect, native of Zanesville, Ohio. He received professional training at the Massachusetts Institute of Technology and began practice in 1883. He designed the Minnesota State Capitol at St. Paul; the Essex County Courthouse, Newark, N. J.; the Woolworth, New York Life Insurance and United Customhouse buildings, New York city; the Central Public Library, St. Louis, Mo.; and the United States Treasury Annex and Chamber of Commerce, Washington, D. C. He also helped to design the new Union Club in New York and was consulting architect on the George Washington and Kill Van Kull bridges.

Gilbert, Sir Humphrey (*c.* 1539–83), English explorer and colonizer, educated at Eton and Oxford. He was a half brother of Sir Walter Raleigh. He served with the army in Ireland and became governor of Munster in 1569. Then he became interested in exploration and in 1576 wrote a book called *Discourses*, arguing that there must be a northwest passage around America. The influence of this book led to the voyages of Frobisher and Davis and guided English exploration for 2 centuries. In 1578 he led an unsuccessful expedition, but in 1583 he reached Newfoundland, which he claimed for England. He explored farther to the southwest, then turned back toward England. On the return trip he was drowned when his ship sank.



Courtesy Scott Stamp & Coin Company

Sir Humphrey Gilbert

From a Newfoundland postage stamp issued in 1933 in commemoration of Sir Humphrey's arrival there August 5, 1583, with letters patent issued to him by Queen Elizabeth

Gilbert, William (1540–1603), English physician and physicist, born in Colchester. At the age of 18 he went to Cambridge University, from which he was graduated in 1560. After he had been chosen president of the Royal College of Physicians, Queen Elizabeth appointed him her chief physician. His fame rests on the discoveries he made in electricity and magnetism. Thales had recorded the attraction of light bodies by a piece of amber, and Gilbert showed that other bodies also possessed this property. To these he gave the name *electrics* from the Greek *elektron*, amber. From this beginning the experimental study of electricity increased rapidly. Gilbert devoted all the time he could spare from his professional duties at Court to describe his researches on magnetism in *De magnete, magneticisque* *corporibus et de magno magnete tellure.* This remarkable treatise was published in London in 1600. It described the earth as being a great magnet with its magnetic poles, equator and axis. Gilbert was praised and admired by Galileo and Kepler for advocating the Copernican theory but was belittled by Francis Bacon.

Gilbert, Sir William Schwenck (1836–1911), British playwright and author, born in London, where he was practicing law when he came into notice as a contributor to the magazine *Fun,* which printed his famous *Bab Ballads* (1869–73). From 1871 to 1896 he collaborated with the musician Sir Arthur Sullivan to write the words for a number of comic operas known today as the Gilbert and Sullivan operas, of which the best are *H. M. S. Pinafore, The Pirates of Penzance* and *The Mikado.*

Gilder, Richard Watson (1844-1909), American poet and editor, born in Bordentown, N. J., and educated at his father's seminary in Flushing, L. I. He became famous as an editor of *Scribner's* and later as the editor of the *Century* magazine. Aside from his literary activities he took part in such public movements as political reform, international copyright, tenement legislation and civil service. He wrote and published 16 volumes of poetry, including *The New Day, Five Books of Song, For the Country* and *In the Heights.*

Gildersleeve, Basil Lanneau (1831-1924), American philologist and classical scholar, born in Charleston, S. C., and educated at Princeton University and abroad. When Johns Hopkins University began classroom work in 1876 Gildersleeve was appointed to the chair of Greek and retained this post until 1915 when, at the age of 84, he retired. From 1880 he was editor of the *American Journal of Philology,* which he founded. Gildersleeve's contributions to the study and history of the classics include *A Latin Grammar, Syntax of Classical Greek* (with C. W. E. Miller) and *Hellas and Hesperia.*

Gildersleeve, Virginia Crocheron (1877-), American educator, born in New York city and graduated from Barnard College and Columbia University. She became Dean of Barnard in 1911 and was one of the first women to become head of an important college. She wrote *Government Regulation of the Elizabethan Drama.*

Gillette, William Hooker (1855-1937), American actor and playwright, born in Hartford, Conn., and educated at the University of New York and the Massachusetts Institute of Technology. Beginning as a stock company actor in 1877, he was soon adapting and writing plays with great success. He became a popular star in comedy dramas, chiefly in those of his own authorship. The plays that he wrote or of which he was coauthor include *Sherlock Holmes, The Professor, The Private Secretary, Esmeralda* (with Mrs. Frances H. Burnett), *Held by the Enemy* and *Secret Service.* Gillette also appeared in *Admirable Crichton, Dear Brutus* and *Diplomacy,* but by far the most popular of his many parts was the title role in *Sherlock Holmes.*

Gilman, Daniel Coit (1831-1908), American educator, born in Norwich, Conn., and a graduate of Yale, class of 1852. After 17 years of service at Yale as librarian, professor of geography and secretary of the Sheffield School he became president of the University of California (1872). Gilman was one of the founders and the first president of Johns Hopkins University, serving from 1875 to 1901, when he became president of Carnegie Institution, Washington, where he remained until 1904.

Giordano, Luca (1632-1705), Italian painter, born in Naples. He learned to paint in his boyhood under his father, who hurried him so persistently that the son became known as *Luca Fa-Presto* meaning "Luke, work fast." In later years Giordano painted with incredible speed; though he was a good colorist and used his brush with skill, his paintings show the effects of too rapid execution. As court painter to Charles II of Spain Giordano decorated the grand staircase of the Escorial with the frescoes *Battle of Saint-Quentin* and *Taking of Montmorency.* He made use also of Biblical and mythological subjects and was one of the most popular artists of his day.

Giorgione (Giorgio Barbarelli; *c.* 1478–1511), Venetian painter, born in Castelfranco. Giovanni Bellini was his first teacher. Comparatively little has remained that is undeniably his work, but he is known to have painted religious and mythological pictures into which he introduced landscapes of idyllic beauty and figures that looked like real men and women, not the unnatural figures of the early religious art. Giorgione's work had a profound influence upon his contemporaries, especially Titian. Among his works are *Christ Bearing the Cross, Three Ages of Man, Sleeping Venus* and the altarpiece in the cathedral of his native place.

Giotto (Giotto di Bondone; *c.* 1276–*c.* 1337), Italian painter who also worked as a sculptor and architect, born in Colle, Tuscany. His finest paintings are frescoes of religious subjects, notably the *Allegories of St. Francis,* in the Church of the Saint at Assisi; the decorations of the Arena Chapel, Padua, and the frescoes in the Bardi and Peruzzi Chapels of Santa Croce, Florence. Also noteworthy are an altarpiece for St. Peter's and the mosaic *Navicella,* in the vestibule of that church. In the Gardner collection, Boston, is the *Presentation of Christ in the Temple,* a good example of Giotto's panel pictures. His place in the history of painting is important because he established the basis for the work of the Renaissance artists by showing that painting could be natural and unrestrained. Giotto designed the beautiful bell tower of the cathedral at Florence, called Giotto's Tower.

Girard, Stephen (1750-1831), American philanthropist, born in Bordeaux, France. He settled in Philadelphia at the outbreak of the Revolution, became a purveyor of military supplies and in later years amassed a fortune in the banking business, being a large stockholder of the First and the Second United States banks. During the War of 1812, Girard gave the Government valuable financial assistance. He used the capital of a large fortune to found a college in Philadelphia for orphan boys.

Gladstone, William Ewart (1809-98), English statesman, born in Liverpool of Scottish ancestry. He distinguished himself at Oxford University, in scholarship, oratory and debating, receiving a double first degree in 1831. In 1832 he was elected to Parliament. At this time he was a Tory (Conservative) in his political thinking, and he became a follower of Sir Robert Peel, who was called upon to form a cabinet late in 1834. In Peel's short-lived ministry, Gladstone was undersecretary for the colonies for a few weeks in 1835. He did not attain a cabinet position until 1843, when he was made president of the Board of Trade in the Peel Ministry of 1841-46. In performing the duties of this office he showed a remarkable aptitude for finance. He was out of Parliament in 1845-47, when he served as colonial secretary, but this was the only period in which he did not hold a seat in a career of over 50 years. As chancellor of the exchequer in the Aberdeen Cabinet in 1853 Gladstone presented such a remarkable plan for taxation in connection with the new budget that he held this office in three succeeding cabinets, the third being that of the Liberal leader Lord Russell. Gladstone himself for several years had been gradually turning away from the Conservatives, and his enthusiastic support of Lord Russell's reform bill of 1866 for the broadening of the franchise marked his open espousal of Liberal principles. In 1867 he succeeded Russell as the party leader.

One year later Gladstone became prime minister on the issue of disestablishment of the Irish Church. After this measure was carried, he put through a bill in 1870 to give relief to the Irish tenants. In 1874 he relinquished the Government to Disraeli when his party lost to the Conservatives in the general election of that year. After an interval of retirement Gladstone came back into political life as an opponent of Disraeli's foreign policy, and in 1880 his party was returned to power on this issue. In his second ministry (1880-85), Gladstone was unfortunate in his handling of the Irish question, for his moderate policy pleased neither the English nor the Irish nationalists, so in 1885 the Cabinet resigned. In 1886 the Conservatives again gave way to the Liberals, but the failure of Gladstone's plans for home rule for Ireland again put him out of office. But the election of 1892 saw him prime minister for the fourth time. A new Home Rule Bill passed the Commons in 1893, but when it failed to carry in the House of Lords, he resigned in 1894.

He was an orator and scholar and wrote on every conceivable subject—especially on the Homeric poems.

Glasgow, Ellen (1874-), American novelist, born at Richmond, Va. Her brilliantly written novels picture the new South and at the same time ridicule some of the romantic traditions of the ante-bellum days. Among her books are *The Descendant* (1897), *The Wheel of Life, The Builders, Barren Ground, The Romantic Comedians, They Stooped to Folly* and *Shadowed Beauty.*

Glass, Carter (1858-), American statesman, one of the leaders in national financial legislation, born in Lynchburg, Va., and educated there in public and private schools. He learned the printing business and became publisher and owner of the Lynchburg *Daily News* and *Daily Advance.* Glass entered public life in 1899 as a member of the Virginia senate and in 1902 was elected to the 57th Congress. After successive re-elections, he resigned in 1918 to become secretary of the treasury. He retired from this position in 1920 to become Senator from Virginia by appointment. He was elected to full terms in 1920, 1926 and 1932. As chairman of the House Committee on Banking and Currency, Glass was active in the formulation of the Federal Reserve System. In the Senate he was coauthor with Henry B. Steagall of the credit relief bill of 1932. He violently opposed some of the measures of the Roosevelt New Deal legislation.

Glauber, Johann Rudolf (1604-68), German chemist and physician, born in Karlstadt, Franconia. In 1658 by treating sodium chloride (salt) with sulphuric acid he prepared the white crystalline compound known today as Glauber's salt. This is used in the glass and dye industries and as a purgative in medicine.

Gluck, Alma (Reba Fiersohn; 1884–), American soprano, born in Rumania. She sang leading roles at the Metropolitan Opera House, New York, from 1909 to 1912 and later was widely popular as a concert singer. In 1914 she married Efrem Zimbalist, famous violinist.

Gluck, von, Christoph Willibald (1714–87), German composer, born in Weidenwang, Bavaria. He studied in Prague, Vienna and Milan where he brought out his first opera *Artaserse* (1741) and for 20 years continued his career as operatic composer, producing works modeled on the popular though frivolous Italian type. In 1762 he produced in Vienna the first of his reform operas, *Orfeo et Euridice.* The presentation of *Iphigenie en Aulide* in Paris (1774) marked the definite acceptance of the new operatic form in which music and words were co-ordinated.

Godefroy de Bouillon (*c.* 1061-1100), Duke of Lower Lorraine, leader of the First Crusade, a descendant of Charlemagne on his mother's side. For his valor and sagacity he was proclaimed king of Jerusalem at the time of its capture (1099) but declined the honor. At Ascalon he defeated a far superior force under the sultan of Egypt, then set for himself the task of organizing the government of Jerusalem. He drew up a code of laws that reflected the best in jurisprudence of the feudal period. In *Jerusalem Delivered* Tasso praised Godefroy's manifold virtues, and his valorous deeds are set forth in the *Chansons de Geste.*

Godowsky, Leopold (1870-1938), Russian pianist and composer, native of Vilna. He played in public at the age of nine and later secured training in music in Paris under Saint-Saëns. Godowski began his first American tour in 1884 and was director of the piano department of the Chicago Conservatory of Music, 1895-1900. In 1909 he was appointed director of the Imperial School at Vienna; later he made numerous tours in various parts of the world. Godowsky's playing shows a mastery of technique. He composed many pieces for piano and stringed instruments.

Godwin, Earl of Wessex (d. 1053), head of an English family prominent in the reigns of Canute and Edward the Confessor. As Earl of Wessex, wealthy and powerful, he wielded great influence during Edward's reign and was a consistent advocate of the Saxon or national party as opposed to the Norman courtiers. In 1051 he incurred the king's ill will and was outlawed but in the following year won back his property and position through a show of force and the enthusiastic support of the people.

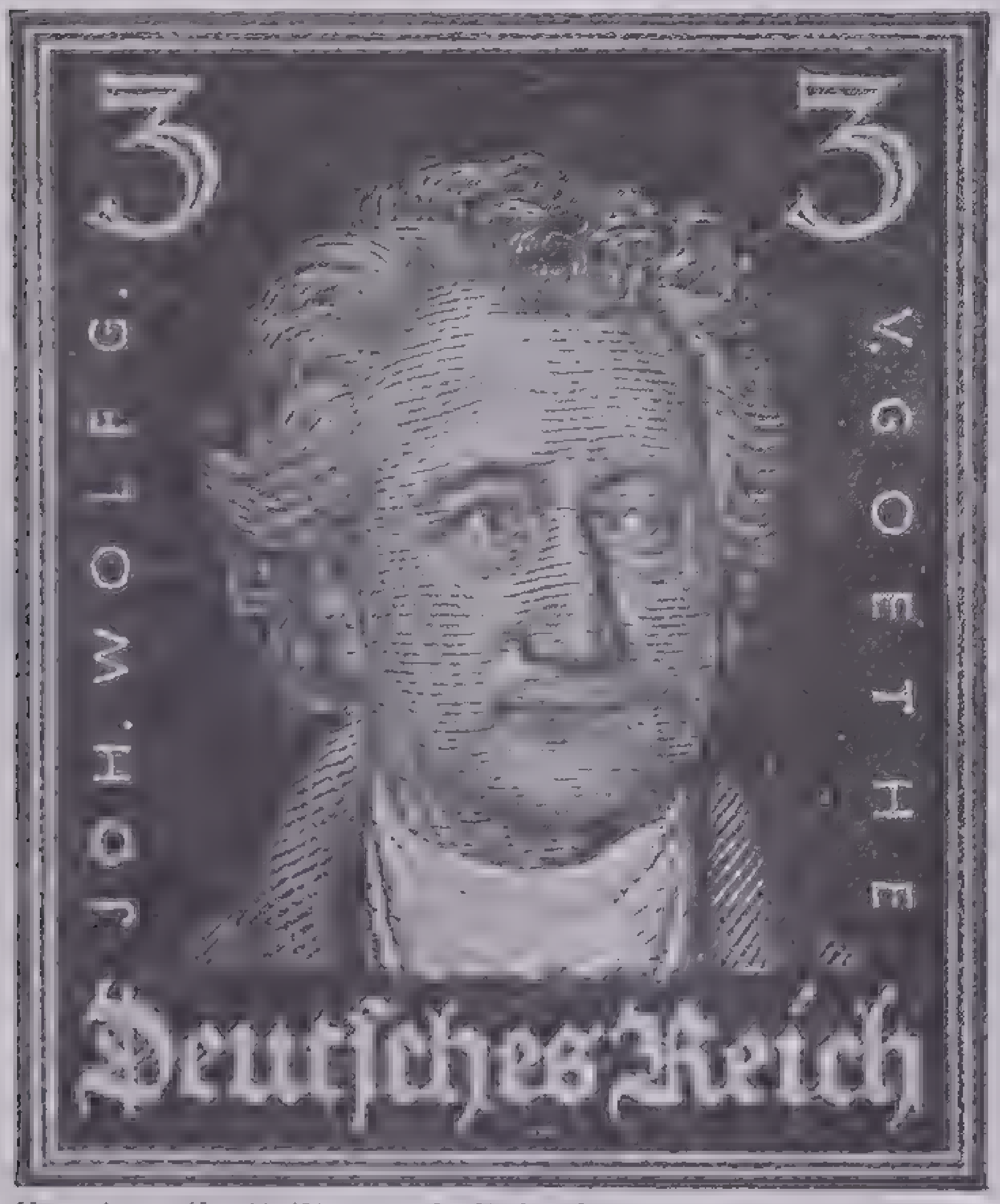
Goebbels, Paul Joseph (1897-), German political leader, born near Düsseldorf, graduated from Heidelberg in 1921. Goebbels was lame and did not serve in the World War. He became politically prominent in 1926, when he was the Nazi leader in Brandenburg and editor of the official Nazi newspaper *Der Angriff.* He rose to power with Hitler and was responsible for the election of many Nazis to Reichstag seats before Hitler became chancellor. Hitler placed him in charge of all education and propaganda, giving him complete control of radio, press, theaters and the arts. Goebbels was believed to have originated many Nazi policies, especially persecution of Jews and supermilitarism. His rise was largely a result of his abilities as a writer and orator of the spellbinder type.

Goering, Hermann Wilhelm (1893-), German political leader, born in Upper Bavaria. He was a distinguished aviator during the World War and led the famous Richthofen squadron. He was early associated with Hitler and took part in the unsuccessful beer hall revolt in Munich in 1923. Goering escaped arrest and lived abroad for 4 years. In 1928 he entered the Reichstag and rose to power with Hitler, whose chief lieutenant he was from the beginning.

When Hitler became chancellor and virtual dictator in 1933, Goering was made a general, premier of Prussia, minister for aviation, speaker of the Reichstag and head of the secret police. He put down opposition to his party by crushing it without compunction. He was active in the Blood Purge of 1934.

Goethals, George Washington (1858-1928), American soldier and engineer, born in Brooklyn, N. Y. Graduating from West Point in 1880, he became second lieutenant in the corps of engineers and in 1885 assistant professor of military engineering at the Academy. During the Spanish-American War he served with the volunteers as chief of engineers with the rank of lieutenant colonel. By successive promotions Goethals reached the grade of major general in 1915. He was selected by President Theodore Roosevelt in 1907 as the best man to build the Panama Canal and was made chairman and chief engineer of the commission in charge. The completion of the project in August, 1914, several months ahead of time, was a matter of world-wide comment. Goethals was governor of the Canal Zone, 1914-16. In 1919 he retired from active service.

GOETHE, VON, JOHANN WOLFGANG (1749–1832), German poet, dramatist, novelist and philosopher, born in Frankfort-on-the-Main, where he received his early education. Young Johann did not attend school regularly but studied under tutors and was greatly influenced by his mother. The boy learned quickly, assimilated much of art and music and could speak several languages at the age of 10. At 16 he went to Leipzig to study law but devoted himself chiefly to art and classical literature. In the fall of 1768 a serious illness sent him back to Frankfort. He had already begun to write; and two dramatic works, begun in Leipzig, were later finished in Frankfort. On his recovery Goethe went to Strasbourg to complete his legal education and in 1771 took his degree. Through his friendship with Herder, Goethe fell under the spell of Shakespeare and German folk songs and this stirring of the imagination bore fruit in the romantic drama of a 16th-century robber knight, *Götz von Berlichingen* (1773). It was soon followed by his novel, *The Sorrows of Young Werther*, an expression of a melancholy period in his own life when he was hurt by both love and friendship.



Courtesy Scott Stamp & Coin Company

Johann Wolfgang von Goethe

Enlarged from a German postage stamp, one of a series issued in 1926 honoring German national heroes

For a decade after 1775 Goethe lived in Weimar under the patronage of Charles Augustus, the reigning Duke of Saxe-Weimar. He held several administrative offices and studied intensively such sciences as geology, botany, anatomy and morphology. He wrote little but found time to begin a masterpiece of fiction *The Apprenticeship of Wilhelm Meister*. Then followed a sojourn in Italy (1786-88), during which he resumed his dramatic writing, working on *Iphigenie, Egmont, Tasso* and *Faust*. The literary beauty of these plays is unquestioned but none is especially suited to stage presentation. Goethe returned to Weimar, and under the inspiration of a close association with Schiller he finished *Wilhelm Meister* (1796) and wrote the pastoral epic *Hermann and Dorothea* (1797) in addition to several ballads. Later came his novel *Elective Affinities*. Then followed an autobiography, a sequel to *Wilhelm Meister*, lyrics, scientific and critical writing and, the year before his death, the second part of his great poetic masterpiece *Faust*, the first part of which had appeared in 1808. On this drama he had labored during the greater portion of his entire creative period. It was, as he said, his confession of what life had revealed to him, an expression of his belief that the soul finds the answer to its problems in continual striving. In his scientific work, especially his discovery of the intermaxillary bone in man, he made a definite contribution to the science of anatomy.

Gogh, van, Vincent (1853–90), Dutch painter, born at Groot-Zundert. He left his work as an art dealer to become an evangelist among coal miners. In 1882 he took up painting, using conventional styles. Four years later he joined his brother Théo, an art dealer, in Paris. There he met followers of more unconventional practices in painting, and his whole point of view was changed. He spent several years in the south of France and there produced most of his work, including landscapes, still lifes and figure studies. His mind began to fail, and he spent his last years in an insane asylum. Van Gogh's paintings are crude in form and drawing but are done in rich, barbaric colors. His paintings are full of light. Among his best-known works are *The Potato Eaters, Berceuse, The Bridge at Arles, Sunflowers, Gypsy Camp* and a self portrait.

Gogol, Nikolay Vasilevich (1809-52), Russian novelist, born in the province of Pultowa of Cossack ancestry, founder of the modern Russian novel. His first literary work, sketches called *Evenings at a Farmhouse*, revealed a gift for realistic description of provincial life and brought him a professorship in history in St. Petersburg (Leningrad). Other stories followed, including *Taras Bulba*, a tale of the Cossacks. He wrote *The Inspector General*, a play satirizing official corruption, in 1836. In 1842 Gogol wrote *Dead Souls*, Vol. I, a remarkable picture of contemporary Russian life. In a fit of religious mania he destroyed the second volume of this novel, but a few fragments were found and published after his death.

Goldoni, Carlo (1707-93), Italian playwright, born at Venice. He wrote a tragedy *Belisario*, and though it proved successful, he is better known as the founder of modern Italian comedy. In 1761 he undertook to write for the Italian theater in Paris and was attached to the French court until the Revolution. He wrote many plays, among the best are *Il Caffè, La Pamela* and *La Casa nova*.

Goldsmith, Oliver (1728-74), Irish writer. He was graduated from the University of Dublin, 1749. For several years thereafter he wandered about Europe, playing the flute, talking philosophy and literature and studying in an irregular fashion at Edinburgh, Leyden and Padua. He returned to England in 1756. His first publication of note, an *Inquiry Into the Present State of Polite Learning in Europe*, was published in 1759. In 1764 *The Traveller* appeared and at once placed him in the front rank of English authors. Two years after this he published the *Vicar of Wakefield*, which indicated his proper rank in the literary world. In rapid succession he produced his other works: the comedy *Good-Natured Man* (1768), *Roman History* (1769) and *The Deserted Village* (1770)—the sweetest of all his poems. In 1773 his dramatic masterpiece *She Stoops to Conquer* was produced at Covent Garden with great success.

Gómez y Báez, Máximo (*c.* 1826–1905), Cuban patriot, born in Santo Domingo. At first a soldier in the Spanish army he joined the Cuban rebels in 1868 and was made colonel. In the insurrection of 1895 h served as general in chief of the army of th Cuban Republic, adopting a policy of harrying rather than of fighting in the open Gómez co-operated with the Americans during the Spanish-American War and helpe to organize the civil government of Cuba He was governor of Santa Clara provinc under President Estrada Palma.

Gompers, Samuel (1850-1924), American labo leader, president of the American Federation of Labor for over 40 years, born i England of Jewish ancestry. With his parents, he came to the United States in 1863 worked as a cigar maker, his father's trade and in 1864 helped to organize an international union of cigar workers. After serving as president of the New York State Federation of Labor, in 1881 he took a prominent part in organizing the National Federation, of which he was president continuously until his death, except for the year 1884. His policy was always to improve the working conditions of labor through legislation.

Goodspeed, Edgar Johnson (1871-), American educator, born at Quincy, Ill. He studied at Denison University, Yale, the University of Chicago and in Berlin, and in 1891 he became teacher of classics at Morgan Park (Ill.) Academy. After 1915 he held the chair of Biblical and Patristic Greek at the University of Chicago. Professor Goodspeed became widely known for his modern American version of the New Testament and for *The Story of the New Testament* (1916) and *The Story of the Old Testament* (1935).

Goodyear, Charles (1800-60), American inventor, born in New Haven, Conn. He experimented with crude rubber and accidentally discovered that a mixture of rubber and sulphur, when it is subjected to heat, becomes elastic and retains its elasticity under all conditions of temperature. He spent years in perfecting the process of vulcanization and patented it in 1844. It is the basis of the modern rubber industry.

Gordon, Charles George (1833-85), British soldier. He was graduated in 1852 from the Royal Military Academy in his native town of Woolwich and fought in the Crimean War (1855). His leadership of the Chinese soldiers who suppressed the Taiping Rebellion (1863-64) gained him the nickname of "Chinese" Gordon. At the request of the Khedive he was sent in 1874 to organize the Egyptian Sudan, of which he was governor (1877-80). He was sent to the Sudan again in 1884 to organize the withdrawal of troops before the Mahdi's advance, was besieged in Khartoum for 10 months and was killed there 2 days before relief arrived.

Gordon, Charles William, see *Connor, Ralph.*

Gorgas, William Crawford (1854-1920), surgeon general of the United States army, born in Mobile, Ala., and educated in New York at the Bellevue Hospital Medical College. Appointed army surgeon in 1880, he became widely known for the sanitary campaign that wiped out yellow fever in Cuba after the Spanish-American War. His record there brought about his appointment as chief sanitary officer of the Canal Commission, and he made it possible to build the Panama Canal by eliminating yellow fever and checking malaria in the Canal Zone. In 1914 Gorgas went to South Africa to help combat pneumonia in the mines of the Rand. He was promoted to the rank of major general in 1915.

Gorky, Maxim (Aleksyey Maksimovich Pyeshkov; 1868-1936), Russian novelist, born near Nizhni Novgorod. His first short story, *Makar Chudra*, was published in a magazine in 1892, and soon Gorky was one of the most popular of contemporary writers of Russian fiction. He stood for revolutionary doctrines and became one of the foremost figures in Soviet Russia, being a friend of Lenin and Stalin. Among his writings are *My Childhood, In the World, My University Days, Fragments from My Diary* and *Reminiscences of My Youth.* The city of Nizhni Novgorod in central Russia was renamed Gorky in his honor.

Gosnold, Bartholomew (d. 1607), English navigator, born in England about the middle of the 16th century. In 1602 he left Falmouth with a ship and 20 colonists, attempting to cross the ocean in a direct line. Contrary winds took his vessel to the Azores, whence, after a tedious voyage of 7 weeks, he reached the coast of Maine. Following the land-line in a southwesterly direction, he discovered Cape Cod and Martha's Vineyard. In 1606 Gosnold and Captain John Smith brought the first settlers to Virginia. Through their joint efforts the settlement of Jamestown was established in 1607, the first permanent English colony in America. Gosnold, however, did not approve of placing the colony on the Jamestown site.

Gosse, Sir Edmund (1849-1928), English writer, born in London. He served as translator to the Board of Trade (1875-1904), was professor in English literature at Trinity College, Cambridge (1884–90) and librarian to the House of Lords (1904-14). He was knighted in 1925. Among his writings are *Studies in the Literature of Northern Europe, History of Modern English Literature,* several volumes of verse and a drama; but to many his greatest book is *Father and Son,* published anonymously and describing his father Philip Gosse a naturalist with an old-fashioned theology, who differed on many points with his literary son. Edmund Gosse was knighted in 1925.

Gosse, Philip Henry (1810-88), British naturalist, born at Worcester. In 1827 he went to Newfoundland as a clerk and was afterward a farmer in Canada, schoolmaster in Alabama and naturalist in Jamaica. In 1839 he returned to England. He is best known for his work *The Romance of Natural History.* His other publications are *The Birds of Jamaica* and *A Naturalist's Sojourn in Jamaica.*

Gottschalk, Louis Moreau (1829-69), American pianist and composer, born in New Orleans, La. He completed his education in music in Europe, made successful tours of the continent and in 1853 began a triumphant career in his native country. He undermined his health by overwork and died in Rio de Janeiro on a tour of South America. The best of his varied compositions are pieces for the piano, but he composed for the orchestra also.

Goujon, Jean (*c.* 1510–*c.* 1568), French sculptor, leader of the Renaissance school in France. His work as a sculptor was done chiefly in association with Pierre Lescot, a notable architect, and beginning in 1546 the two decorated a new section of the Louvre in Paris. For one of the galleries Goujon made four supporting figures having great classical beauty. His bas-reliefs for the Fountain of the Innocents are also exceptional. Goujon's group, *Diana and Stag,* (Louvre) is a masterpiece of Renaissance sculpture.

Gould, Benjamin Apthorp (1824-96), American astronomer, born in Boston and educated at Harvard and Göttingen. He founded the *Astronomical Journal* in 1849 and published it for many years. He was director of longitude determinations of the Coast Survey, 1852-67, and of Dudley Observatory at Albany, N. Y., 1855-59. Gould determined longitude relations between America and Europe by use of the Atlantic cable. He made possible a wider knowledge of the Southern heavens by establishing the National Observatory at Cordoba, Argentina, in 1870.

Gould, George Jay (1864-1923), born in New York city, eldest son of Jay Gould. He increased the Gould railway holdings to 50,000 miles and developed the Wabash into a transcontinental line; but by 1912 he had lost control of the Gould system. Gould was president of the Manhattan Elevated Railway, New York, from 1892 to 1913 and was a prominent clubman and sportsman.

Gould, Helen Miller (1868-1938), born in New York city, daughter of Jay Gould. She married Finley J. Shepard, prominent railway official, and they adopted three children. She was a generous contributor to many public causes. Her gifts include the library building and Hall of Fame, New York University; a contribution of $100,000 for sanitary and hospital purposes during the Spanish-American War; a building to the naval branch of the Brooklyn Y.M.C.A. and a dormitory to Northfield Seminary.

Gould, Jay (1836-92) Founder of the family of American financiers, born in Roxbury, N. Y. He attended public schools and an academy, while supporting himself as a blacksmith's helper and store clerk. Gould laid the foundations for his fortune by buying railroad stock after the panic of 1857 and selling when prices reached a higher level. He invested his profits in bonds of the Rutland & Washington Railroad and in 1859 moved to New York city. By following a system of buying stock at depressed values he acquired control of the Erie, Union Pacific, Missouri Pacific, Wabash, Texas Pacific and St. Louis & Northern railroads, representing about one-tenth of the railway mileage of the United States. In 1869 he and his partner, James Fisk, brought on the famous "Black Friday" panic of September 24 by a raid on the gold market. Gould also bought control of the Western Union Telegraph Company in 1881 and at his death left a huge fortune.

Gounod, Charles François (1818–93), French operatic composer, born in Paris. He studied music at the Paris conservatory and in 1839 won the prize for composition. He then visited Rome and Vienna and in 1849 became an organist in Paris. His first opera, *Sapho,* was written in 1851. This was followed by *La Nonne Sanglante, Le Médicin malgré lui, La Colombe, Philémon et Baucis, Mireille, La Reine de Saba, Roméo et Juliette* and *Faust*—the last two are the best known of his operas. He composed beautiful church music, masses and oratorios.

Goya, de, Francisco José (1746–1828), Spanish painter, born near Saragossa, Aragon. His principal paintings include portraits of Charles IV of Spain and other celebrities of the day; the cupola frescoes of St. Anthony for the Church of San Antonio de la Florida and numerous canvasses depicting the life and activities of the common people. Equally famous are his series of etchings based on paintings by Velasquez. The modern French school of painting owes much to Goya's work.

Graaf, de, Regnier (1641-73), Dutch physician and anatomist, born in Schoonhove. He discovered the nature and purpose of pancreatic juice. The Graafian follicles were discovered by him and named after him, though he mistook their functions. He rendered great service to anatomy through his use of injections into the blood vessels, which Swammerdam and Ruysen afterward brought to a state of comparative excellence.

Gracchus, Gaius Sempronius (*c.* 153-121 B.C.), younger son of the Roman general and administrator Tiberius Sempronius Gracchus and Cornelia, daughter of Publius Scipio Africanus the Elder. Elected to the tribuneship in 123 B.C., he enforced the agrarian laws drafted by his brother and introduced new reform legislation. He was re-elected in 122 B.C., but his enemies prevented a second re-election, and civil war resulted. Rather than fall into the hands of the aristocrats, Gaius ordered his slave to kill him. He and his brother are known in history as the Gracchi.

Gracchus, Tiberius Sempronius (*c.* 162–133 B.C.), elder of the Gracchi. He began a military career in his youth and was present at the siege and storming of Carthage, 146 B.C. In the course of the next few years he became seriously concerned about the unequal distribution of public lands and the condition of the poor. Elected tribune of the people in 133 B.C., he forced the passage of laws that partly corrected the evils and offered himself for re-election at the end of his term. Riots ensued, in which he and many of his followers were killed.

Grahame, Kenneth (1859-1932), English author. He was secretary of the Bank of England from 1898 to 1908 but is best known for his charming and imaginative books, *The Golden Age, Dream Days,* about his own childhood and *The Wind in The Willows,* a children's classic. He edited the *Cambridge Book of Poetry for Young People.*

Grainger, Percy (1882-), British-American pianist and composer, born in Melbourne, Australia. His mother began his training in music, and later he studied in Germany. He played in concerts at the age of 10 and thereafter toured the principal countries of the world, playing and conducting his own compositions. After 1915 he made the United States his home. Grainger became a recognized master of the piano and a specialist in folk music. Among his scores of works for instruments and voice are *Mock Morris, Shepherd's Hey, Children's March, Molly on the Shore, Six Dukes Went A-Fishin'* and *Brigg Fair.*

Grant, Robert (1852–1940), American jurist and author, born in Boston and educated at Harvard. He served as judge of the probate court of Suffolk County, 1893-1923, but published books at intervals from 1879. His earlier work was written in a vein of light humor; *Unleavened Bread,* a serious novel, won general praise on its appearance in 1900. Later novels include *The Undercurrent, The Law-Breakers, The Chippendales* and *The Bishop's Granddaughter. Opinions of a Philosopher* and *The Art of Living* are collections of his essays. His autobiography *Fourscore* appeared in 1934.

Grant, Ulysses Simpson (1822-85), 18th President of the United States and a general in the Civil War, born at Point Pleasant, Clermont County, Ohio, the son of a farmer. He attended the public schools until he was 17, then went to West Point, being graduated in 1843. He served under General Taylor in the war with Mexico, 1846, up to the capture of Monterey. In 1852 he served in Oregon but in 1854 resigned his commission and settled in St. Louis, Mo., whence, in 1859, he moved to Galena, Ill., and engaged in the leather trade. At the beginning of the Civil War, in 1861, he volunteered his services and was appointed colonel of an Illinois regiment. In August he was appointed brigadier general, commanding the district around Cairo. He then occupied Paducah and led an expedition on the Mississippi. In February, 1862, he distinguished himself in the capture of Fort Donelson on the Tennessee river and was made a major general.

On April 6th following, after a preliminary defeat, he won a great battle over the Confederates at Pittsburg Landing or Shiloh. Succeeding General Halleck in the West, he commanded the land forces that, in conjunction with the navy, reduced Vicksburg, July 4, 1863. This was soon followed by the fall of Fort Hudson and the opening of the Mississippi. In 1864 he was appointed lieutenant general and commander in chief and personally directed the operations of the great final struggle in Virginia, in which the northern forces, though often repulsed with heavy losses, finally compelled the evacuation of Richmond, April 2, 1865, followed on the 9th by the surrender of the Confederate army under General Lee. Congress, in recognition of his eminent services, passed an act reviving the grade of "general of the army of the United States," to which Grant was immediately appointed.

In 1868 as a Republican he was elected President, defeating Horatio Seymour by an electoral vote of 214 to 80. His first term of office saw the passage of the 15th amendment to the Constitution and the settlement of the Alabama claims dispute. Scandals among high officials were discovered during Grant's second term of office (1873-77). Although innocent of any actual corruption himself, he did delay and obstruct improvement of conditions at times by refusing to believe wrong of anyone who was his friend. He retired from public life in 1877. Grant visited Europe and toured the World. In England and France he received an enthusiastic welcome. Simple, reticent, earnest, and persevering in his character, he owed his military success not so much to strategy as to superior numbers and resources and hard fighting. Having lost his moderate fortune in an unfortunate speculation, Grant battled heroically with cancer to finish his *Memoirs* and thus provide a competence for his family before death overtook him.

Grattan, Henry (1746-1820), Irish statesman and orator, born in Dublin and graduated from Trinity College in that city. After studying at the Middle Temple, in London, Grattan was admitted to the Irish bar in 1772. He was elected to the Irish Parliament in 1775 and held his seat during most of the next 25 years. From 1805 until his death, Grattan was a member of the British House of Commons. For his services in easing the restrictions on Irish commerce, the Irish Parliament voted him $250,000 and a house and lands. In the British Parliament he worked unceasingly for Catholic emancipation.

Gravier, Jacques (1651-1708), Jesuit missionary in Canada and Illinois, born in Moulins, France. He came to Canada in 1685 and worked with the St. Ignace mission at Mackinac, aiding the Indians, and then was sent to Illinois to help Father Allouez with the tribes in that region. Although constantly opposed by the medicine men, he was very successful among the Kaskaskia Indians, many of whom he baptized. He compiled a grammar of the Illinois tongue.

Gray, Asa (1810-88), American botanist, born in Paris, N. Y. He was graduated in medicine at Fairfield Medical School in 1831 but never practiced, having become absorbed in the study of plants and determining to follow it as a scientific career. Through the influence of the eminent botanist John Torrey, Gray became curator of the Lyceum of Natural History in New York. In 1836 he published the first of his remarkable botanical texts, *Elements of Botany.* He served as Fisher professor of natural history at Harvard, 1842-73, and during that period organized the study of botany, collected a herbarium and standardized the system of classification. His greatest book, *Manual of the Botany of the Northern United States,* has been repeatedly revised since its first publication in 1848.

Gray, Elisha (1835-1901), American inventor, born in Barnesville, Ohio. He received his education at Oberlin Preparatory College. In 1867 he secured his first patent, for a telegraphic switch and annunciator. The 70 patents for which he applied include those for multiplex telegraphy, a type-printing telegraph and the telautograph, which was demonstrated at the Chicago World's Fair in 1893. Gray applied for a patent for the speaking telephone in 1876, but the rights were awarded to Alexander G. Bell, and Bell's claims were upheld by the U. S. Supreme Court.

Gray, George (1840-1925), American jurist and senator, born in New Castle, Del., and educated at Princeton and the Harvard Law School. He was admitted to the bar in 1863, became attorney general of Delaware in 1879, and held a Democratic seat in the U. S. Senate 1885-99, when he upheld President Cleveland on tariff and financial questions. He was judge of the United States Circuit Court, 1899–1914; as an arbiter Judge Gray had a notable record. He was, at various times, a member of the Anglo-American Joint High Commission, the Paris Peace Commission, Anthracite Coal Strike Commission and North Atlantic Fisheries Arbitration Board.

Gray, Stephen (1696-1736), English physicist, educated at Charterhouse and a fellow of the Royal Society. He evolved the principles of the communication of electric power from native electrics to other bodies, noted the possibility of the insulation of conductors by cakes of resin and was the first to show that the human body is a conductor.

Gray, Thomas (1716-71), English poet, most widely known for his "Elegy Written in a Country Churchyard." He was born in London and educated at Cambridge. Most of his life was spent in Cambridge as student and writer; though appointed professor of history and modern languages at the university in 1768, he never lectured. Gray's exquisite "Elegy" was written in the churchyard at Stoke Poges, his mother's home. He was buried there, near the church of the "ivy-mantled tower." His other poems, though few, have much of the finish of his masterpiece, notably his odes. He was one of the transition poets who paved the way for the great romanticists, Wordsworth, Shelley and their contemporaries.

Greco, see *El Greco.*

Greeley, Horace (1811-72), American journalist, born on a farm in Amherst, N. H. At the age of 15 he was apprenticed to a newspaper publisher in East Poultney, Vt., and after some experience as a journeyman printer settled in New York in 1831. He made an unsuccessful attempt in 1833 to found a newspaper called the *Morning Post,* supposed to have been the first 1-cent daily. He had better fortune in 1834 with a weekly literary paper, *The New Yorker,* for which he wrote essays and verse, and which was published until 1841. In that year he merged the *New Yorker* with the *Log Cabin,* issued during 1840 as a campaign organ for William Henry Harrison, and the merger resulted in the *Daily Tribune,* which became one of the great newspapers of America. A weekly edition, started a few months later, was for years the most influential journal in the northern and western states.

From 1850 until the Civil War, Greeley and his editorial associates, Bayard Taylor, Charles A. Dana, George Ripley and others, fought for the antislavery cause. Greeley himself was one of the delegates to the Republican convention that nominated Lincoln, and once the war was started he urged its vigorous prosecution. But he was sensitive to the horrors of the conflict and in 1864 tried to reach a compromise with Confederate agents in a conference in Canada. When the war ended, he favored a universal amnesty; his participation in the bail bond of Jefferson Davis was in accordance with his principles, though it brought keen censure from northern extremists. Greeley made an unsuccessful attempt to enter Congress in 1870 and in 1872 joined the Liberal Republicans as an opponent of the renomination of Grant. He was nominated for the Presidency by this faction and endorsed by the Democrats but carried only border and southern states, six in all. He died soon after election. Greeley originated the phrase, "Go west, young man, and grow up with the country."

Greely, Adolphus Washington (1844-1935), American explorer, born in Newburyport, Mass. He served throughout the Civil War, rising to the rank of brevet major of volunteers, and after the war was attached to the Signal Corps in the regular army, becoming chief officer in 1887. He commanded a government expedition to establish one of a chain of polar stations in 1881, his party reached latitude 83° 24′, the farthest point north attained up to that time, but only seven survivors were left when Commodore Schley's relief expedition reached them in 1884. Between 1898 and 1902 thousands of miles of telegraph and cable lines were built under Greely's direction, at home and abroad. In 1906, when he reached the rank of major general, he was placed in command of relief operations in San Francisco to care for the victims of the earthquake and fire. Greely's geographical discoveries were of great value. In 1935 a Congressional Medal of Honor was bestowed on him.

Green, John Richard (1837-83), English historian, born in Oxford and educated at the university there. Graduating at Jesus College in 1859, he took holy orders in 1860 and was in the service of the Church until 1869. In that year, he began his historical studies, the result of which was his famous *Short History of the English People,* which gave an interesting picture of his country's social development. It was expanded into a four-volume work that appeared 1877-80.

Green, William (1873-), American labor leader, born at Coshocton, Ohio, and educated in the public schools. He became subdistrict president of the United Mine Workers of America in 1900, president of the Ohio District Mine Workers' Union in 1906 and secretary-treasurer of the United Mine Workers of America in 1913. In 1924 Green was elected president of the American Federation of Labor, succeeding Samuel Gompers. As a Democrat he served two terms in the Ohio senate. He advocated a 30-hour week as the only permanent solution of unemployment.

At the American Federation of Labor Convention in the fall of 1935 Green came into sharp conflict with John L. Lewis, president of the United Mine Workers of America, an affiliated union. Lewis wanted to organize the mass-production industries as units, according to "vertical unionism" principles. Green prevented Lewis from swinging the Federation to this plan. Lewis withdrew and organized his rival group, the Committee for Industrial Organization. Green held to more conservative labor policies and for several years fought a losing battle; the Federation was weakened by secession of member groups and wide public approval of Lewis's tactics.

Greenaway, Kate (1846-1901), English painter. She was famous for her pictures of child life and illustrations for children's books. Much of her work is in water colors. Among the books she illustrated are *Under the Windows, The Birthday Book,* Browning's *Pied Piper of Hamlin* and *Kate Greenaway's Almanacs.*

Greene, Nathanael (1742-86), American soldier, regarded by many as second only to Washington in ability among the Revolutionary generals. He was born in Potowomut, R. I. Enlisting as a private in 1774 Greene was appointed to the command of the Rhode Island division in 1775, with the rank of brigadier general, and was soon promoted to that of major general. He showed brilliant qualities of leadership at Trenton and Princeton and saved the Americans from rout at Brandywine. At Germantown he commanded the left wing. He won greater fame, however, as commander of the often defeated Army of the South, which he took over from General Gates (1780). After reorganizing the dispirited forces Greene began a campaign to divide the British armies and to force them to win costly and fruitless victories, by which he gained control of Georgia and the Carolinas and paved the way for the surrender of Cornwallis.

Greenough, Horatio (1805-52), American sculptor, born in Boston. He began to study art in youth and completed several courses in anatomy at Harvard. After taking his degree he went to Rome, where he came under the influence of the Classical school, of which his teacher, Thorwaldsen, was a leader. Greenough made busts of many notable men of his day: a group called *The Rescue,* for the east portico of the Capitol in Washington; a colossal statue of Washington (Smithsonian Institution) and several groups of mythological subjects.

Gregory I, Saint, called *The Great* (*c.* 540-604), Pope of Rome, elected to the Papal chair in 590 as successor to Pelagius II. He was born in Rome of a well-to-do family and studied law; about 575, however, he voluntarily entered the monastery of St. Andrew in Rome. According to the Venerable Bede, he was touched by the sight of some fair-haired Anglo-Saxon youths who were being sold as slaves and decided to go to Britain as a missionary. Pope Pelagius had other duties for him, but after Gregory became Pope, he sent St. Augustine to England. Gregory was one of the greatest administrators and organizers of the Catholic Church and the last of the four Latin fathers. The present forms of the ritual and sacred chants (*Gregorian chants*) are ascribed to him.

GREGORY VII, SAINT (Hildebrand, *c.* 1020–85), Pope of Rome from 1073. Born of the Hildebrand family in Tuscany, Italy, he passed his youth in a monastery in Rome. He won the friendship of Pope Leo IX, who made him a cardinal subdeacon in 1049, and during the years that followed Hildebrand rose steadily in prestige and authority. On the death of Pope Alexander II in 1073 Hildebrand was unanimously elected to the papal chair in Rome but was not consecrated until he had secured confirmation in his election from Henry IV, King of Germany and Holy Roman Emperor. The new Pope at once applied himself to effecting reforms, ecclesiastical and political. Such abuses as clerical marriage and simony (the buying of holy offices), he speedily corrected, but the general practice of secular investiture brought him into direct conflict with Henry. In 1075 he threatened to excommunicate anyone who received investiture from a layman. In 1076 Henry defied him by offering protection to Church officials thus punished; when summoned to Rome the emperor retaliated by having Gregory deposed by a decree of a diet at Worms. Gregory in turn excommunicated the emperor, who soon promised submission.

Early in 1077 Henry went to the Pope's castle at Canossa, Italy, and for three days was forced to stand before the gates, barefooted in the snow and exposed to the severe cold. Absolution having been granted, he soon displayed the insincerity of his submission, for he made war on and defeated his rival, Rudolf of Swabia, and in 1080 deposed Gregory, setting up an antipope in the person of Guibert, archbishop of Ravenna. In 1084 Henry entered Rome and had himself crowned by his own Pope, who had assumed the name Clement III. Gregory took refuge in the Castel Sant' Angelo and was rescued by Robert Guiscard, a Norman duke, but he could not maintain his position in Rome and died in retirement at Salerno the following year. In 1728 he was canonized. Gregory consistently enforced the law of the Church.

Grenfell, Sir Wilfred Thomason (1865-1940), British medical missionary, born in Cheshire and educated at Oxford and at the London Hospital. In 1889 he cruised the North Sea in the first hospital ship, giving aid to the fishermen. After 1892 he devoted his life to caring for the people of Labrador, establishing hospitals, missions, homes, stores, mills and schools. He received a knighthood in 1927. He wrote *The Harvest of the Sea* and *A Labrador Doctor.*

Grenville, Sir Richard (*c.* 1541-91), English naval hero, a cousin of Sir Walter Raleigh. He commanded a fleet that brought colonists to Virginia in 1585. He won his reputation in 1591 as commander of the *Revenge,* one of a fleet preying upon Spanish treasure ships. Grenville and the *Revenge* became separated from the other ships and fought a 15-hour engagement against 15 Spanish vessels before he was captured. Tennyson's poem "The Revenge" tells the story.

Gresham, Walter Quinton (1832-95), American statesman, born in Harrison County, Ind. He was admitted to the bar in 1853 and had become prominent in local Republican politics at the outbreak of the Civil War, in which he saw active service. Gresham was United States district judge for Indiana, 1869-82, when he entered Arthur's Cabinet as postmaster general. He was appointed Federal judge for the seventh judicial district in 1884. Gresham did not favor the protectionist policies of the Republicans, and in the campaign of 1892 he supported Cleveland, who made him secretary of state. He died in office.

Greuze, Jean Baptiste (1725-1805), French artist. He completed his art studies in Paris, won early commendation and when 30 years of age was elected to the Paris Academy. Greuze was at his best in such canvases as *Girl with Doves, The Dead Canary, The Broken Mirror* and *Girl Winding Wool* (Metropolitan Museum, N. Y.). He was especially gifted in imparting grace, delicacy and sentiment to his work. He painted portraits of Robespierre, Bonaparte (Versailles), Jeaurat (Louvre) and Sophie Arnould (London).

Grévy, François Paul Jules (1807-91), French statesman. He was a law student in Paris during the revolution of 1830 and was thenceforth an ardent Republican, giving legal aid to political prisoners after he was in practice. During the regime of Louis Napoleon he kept out of politics but was active in the National Assembly that met after the Franco-German War. In 1876 he became president of the Chamber of Deputies. Grévy was elected President of France in 1879 and was re-elected in 1885. He was forced to resign in 1887 because of a political scandal involving his son-in-law.

Grew, Nehemiah (1641-1712), English botanist and physiologist. He studied at Cambridge and Leyden, taking the degree of M.D. in 1671. His writings on the anatomy and physiology of plants were the first in that field of science, and his famous work *Anatomy of Plants* (1682) revealed the discovery of sexual organs and reproduction methods among plants. A number of papers on chemistry are included in this noted book. He also wrote *Anatomy of Vegetables Begun* and *Idea of a Phytological History.*

Grey, Albert Henry George, 4th Earl (1851-1917), British statesman of the Liberal party and successful colonial administrator. After graduation from Trinity College, Cambridge, in 1873, he entered political life and represented Northumberland in Parliament, 1880-86. He served 6 years as director of the British South Africa Company and was appointed governor general of Canada in 1904. His 5-year administration was very popular.

Grey, Edward, 1st Viscount Grey of Fallodon (1862-1933), British statesman, educated at Winchester and at Balliol College, Oxford. He entered Parliament as a Liberal in 1885 and a decade later, as secretary of state for foreign affairs, had become an outstanding figure in European diplomacy. The Triple Entente was formed by Great Britain, Russia and France while he was in the Foreign Office, and he fostered peace in the Balkans in 1913. He endeavored to prevent the World War through arbitration. Grey guided British policy until the resignation of Asquith's coalition cabinet in 1916; he then retired and was created Viscount Grey of Fallodon. In 1919 he visited the United States on a peace mission and in 1928 he was elected chancellor of Oxford University. Gray published his memoirs in 1925. He was a great authority on fly-fishing and an excellent amateur naturalist with a special interest in birds.

Grey, Lady Jane (1537-54), Queen of England for nine days. She was the eldest daughter of Henry Grey, Duke of Suffolk, her mother being a granddaughter of Henry VII. Late in the reign of Edward VI the Duke of Northumberland, who was Lord Protector, brought about the marriage of Lady Jane to his son Guilford Dudley. He then induced the king to declare the succession in favor of Lady Jane, hoping thus to transfer the crown from the Tudors to the Dudleys. Lady Jane, good and accomplished, was innocent of the conspiracy. After the king's death on July 6, 1553, she was proclaimed queen, but Mary's friends were too strong for her, and on the 19th she was arrested. She was tried, sentenced to death for high treason and on February 12, 1554, was beheaded with her husband.

Grey, Zane (1875-), American writer, born in Zanesville, Ohio. After a public school education, he completed a course in dentistry at the University of Pennsylvania and practiced in New York, 1898-1904, when he turned to writing popular stories of the west. His books include *Riders of the Purple Sage, The Light of Western Stars, Under the Tonto Rim, Fighting Caravans* and *Thunder Mountain.*

Grieg, Edvard Hagerup (1843-1907), Norwegian composer of Scottish descent. After some early instruction under his mother he continued his training in music in Leipzig and Copenhagen. In Copenhagen he became absorbed in the study of folk music. His compositions have a national quality that classes them with the work of Chopin. Grieg founded the Philharmonic Society of Christiania in 1871 and was its conductor until 1880. As a composer he produced numerous songs of great beauty, piano pieces and a variety of orchestral works. His *Peer Gynt Suite* is one of his best-known compositions.

Griffith, Arthur (1872-1922), Irish statesman, founder of the Sinn Fein. He did most of his work for a self-governing Ireland as editor of a series of newspapers and was second in command to Eamon De Valera throughout the early stages of the fight. When De Valera refused the treaty setting up the Irish Free State, Griffith became the first President of the constitutional Free State (1922) but died within a few months.

Griffith, David Wark (1880-), American producer and motion-picture director, native of LaGrange, Ky. He became interested in motion pictures in 1908, appearing first as an actor and later becoming a director for Biograph and Mutual and then an independent producer. Among the innovations credited to him are the *close-up* and *fade-out;* he revealed also the possibilities of the screen through such spectacular productions as *The Birth of a Nation, Orphans of the Storm, Intolerance, Way Down East* and *America.*

Grillparzer, Franz (1791-1872), Austrian playwright, born in Vienna. He studied law and in 1813 entered the civil service, in which he remained until 1856. He first attracted notice in 1817 by a tragedy *Die Ahnfrau,* which was followed by *Sappho, Das Goldene Vlies, Des Meeres und der Liebe Wellen* and *Der Traum, ein Leben.* He produced much good lyric poetry and one prose novel, *Der Arme Spielmann* "The Poor Musician," which is considered his greatest accomplishment.

Grimm. The name of two brothers, German philologists, Jakob Ludwig Karl Grimm (1785-1863) and Wilhelm Karl Grimm (1786-1859). Both studied law at the University of Marburg, and in 1840 both received professorships at Berlin. They are best known as the authors of *Grimms' Fairy Tales.* This work was first published in Germany in 1812 as *Kinder-und Hausmärchen.* It has been translated into many languages. Jakob Grimm produced a four-volume German grammar that established Grimm's law, the statement of consonant change between different Indo-European languages.

Grosvenor, Gilbert Hovey (1875-), American editor, born in Constantinople, Turkey, the son of a professor of history in Robert College. He was educated at Worcester (Mass.) Academy and at Amherst College. Grosvenor was editor in chief of the *National Geographic Magazine* and director and president of the National Geographic Society. Lake Grosvenor in Alaska was named for him.

Grote, George (1794-1871), English historian, best known as the author of a history of ancient Greece. In this work he exalted the democratic principles of the old Grecian state and wrote with a wide understanding of Greek life. This great *History of Greece* was in preparation for more than 20 years before the 12 volumes were published between 1846 and 1856. Though he was a businessman and a banker and not a college graduate Grote was greatly interested in university education and was president of University College (London) and vice-chancellor of the University of London.

GROTIUS or **DE GROOT, HUGO** (1583-1645), Dutch jurist, born in Delft, the son of the local burgomaster, who was also curator of the University of Leyden. Hugo entered that university in his 11th year and 4 years later received his degree. In 1599 he began his career as a practicing lawyer in The Hague. Grotius was appointed council pensionary (chief magistrate) at Rotterdam in 1613. At that time the Protestants of the Netherlands were involved in a bitter dispute over theology, being divided into two groups—the orthodox Calvinists and the more liberal followers of Jacob Arminius, called *Arminians* or *Remonstrants.* Grotius sided with John van Olden Barneveldt, an Arminian, and narrowly escaped his fate—death on the scaffold as a heretic. Instead he was sentenced to life imprisonment in the fortress of Loewestein but escaped after 18 months when his wife contrived to have him carried out of the castle in a linen chest. Grotius at first sought refuge in France and there wrote his great work *De jure belli et pacis* (1625) ("On the Law of War and Peace"). Originally published in Paris, it ranks as the first text on international law. After an absence of 12 years Grotius returned to his native country, relying on the protection of Frederick Henry, Prince of Orange, who wrote him a sympathetic letter. His enemies, however, succeeded in having him banished, and in 1634 he entered the diplomatic service of Sweden. He was Swedish ambassador to the French court, 1635-46. Besides his work on law Grotius wrote verse in Latin and Dutch, histories and theological treatises.

Grouchy, de, Emmanuel, Marquis (1766-1847, French general. He began his military career at the age of 14 and was rapidly advanced. He fought in the Republican army during the foreign wars of the French Revolutionary government and later became one of Napoleon's most trusted officers, especially distinguishing himself at Hohenlinden and in the retreat from Moscow. When Napoleon returned from Elba, Grouchy entered his service again and was promoted to the rank of marshal. As commander of an army division he was ordered by Napoleon to engage Blücher's forces after their defeat at Ligny. Grouchy kept the Prussian rear guard in action but permitted the main body of German troops to move on to Waterloo, where they joined the British under Wellington. Upon the restoration of the Bourbons Grouchy went into exile and lived in Philadelphia for 5 years but was permitted to return to France in 1819. After the revolution of 1830 his rank as marshal was restored.

Grove, Sir George (1820-1900), English engineer and writer on music, born in London. He erected the first two cast-iron lighthouses in the West Indies and assisted in the Britannia tubular bridge, which unites Anglesey and Wales. He was knighted in 1883 on the opening of the Royal College of Music, of which he was director until 1895. His *Dictionary of Music and Musicians* (1879-89), a standard reference volume, and *Beethoven and His Nine Symphonies* (1884-90) are his best known works.

Grove, Sir William Robert (1811-96), British physicist, born at Swansea. He studied at Oxford, was admitted to the bar, raised to the bench (1871), knighted (1872) and in 1875-87 was a judge in the high court of justice. He used his leisure to study and experiment in electricity and optics, and in 1839 he invented the powerful voltaic cell known by his name. He published very important lectures in which he propounded the theory of the mutual convertibility of the natural forces, the *Correlation of the Physical Forces, Voltaic Ignition* and the *Continuity of Natural Phenomena.* The Grove cell is a simple storage cell where hydrogen and oxygen are used as electrodes.

Guericke, von, Otto (1602-86), German physicist, born at Magdeburg. He traveled in England, Sweden and France and returned to hold public office in his native town. In 1650 he invented a vacuum pump with which he pumped the air from two close-fitting hollow hemispheres. Atmospheric pressure held them together so tightly that eight horses attached to each could not pull them apart. He demonstrated this experiment in public. In the field of electricity he discovered conduction of current and electric sparks. He collected his most important observations and described them in his *Experimenta Nova* (1672).

Guggenheim, Daniel (1856-1930), American capitalist, born in Philadelphia. He engaged with his brothers in the mining and smelting business left them by their father, Meyer, but became most widely known as the donor of a $2,500,000 fund for the promotion of aviation. When the affairs of the fund were wound up in 1929, twice the original amount had been expended. Guggenheim also gave half a million dollars as an endowment for an aviation school at New York University.

Guggenheim, Meyer (1828-1905), American capitalist, born in Switzerland. He came to the United States at 19 and built up a flourishing business in importing Swiss embroideries. At the age of 60 he bought some Colorado mining property, but he soon saw that the greatest profits were to be made from processing, and he set up smelters and refineries. He and his seven sons established an enormously profitable network of metal-processing plants.

Guggenheim, Simon (1867-1941), American capitalist, born in Philadelphia, brother of Daniel. He went to Colorado in 1888 and, elected as a Democrat, represented the state in the U. S. Senate for the term 1907-13. In memory of his son he established in 1926 the John Simon Guggenheim Memorial Foundation with a capital of $3,500,000, which each year grants fellowships to deserving U. S. students for advanced study abroad.

Guido d'Arezzo or **Guido Aretino** (*c.* 990-*c.* 1050), Italian Benedictine monk who named the notes of the musical scale and introduced other innovations, such as the four-line staff (previously only two lines were used). He was long thought to have been a native of Arezzo, Italy, but it is now believed he was born near Paris. His service in the field of music notation was recognized by Pope John XIX, who studied the new system and helped to popularize it. Guido became prior of the monastery of Avellano in 1029 and probably died there.

Guido Reni (1575-1642), Italian artist, one of the leading representatives of the school of painting founded in Bologna by the Caracci. The chief masterpiece of his first period, after he had attained an individual style, is the now famous *Aurora,* a fresco on the ceiling of the Rospigliosi Palace in Rome. In his middle period he developed a warm golden tone, as seen in his *Massacre of the Innocents* (Bologna) and *Four Episodes from the Myth of Hercules* (Louvre, Paris). Later he used a silvery-gray tone that marked the decline of the Bolognese school; yet his celebrated *Nativity,* in Vienna, is done in this mode. His late work shows deterioration, for he painted with feverish haste in order to recoup losses suffered at the gaming tables.

Guillaume, Charles Édouard (1861–), French physicist, born in Switzerland, winner of the Nobel Prize in physics in 1920. In 1883 he was appointed assistant in the International Bureau of Standards in Paris and in 1915 became its director. Guillaume first came into public notice in 1896 as the discoverer of *invar,* a steel-nickel alloy that does not expand appreciably with heat. It greatly decreased the cost of geodetic measurements. He also discovered *platinite,* a nickel-iron alloy that cut the cost of electric light bulbs, since it replaced the expensive platinum as the material for the wire that carries current through the glass of the bulb.

Guilmant, Félix Alexandre (1837-1911), French organist and composer, born in Boulogne. After studying under his father, a professional organist, he took courses in playing and harmony from other teachers and in 1853 became organ master at the local Church of St. Joseph. In 1896 he was appointed to a professorship at the Paris Conservatory. Guilmant gave many successful concerts in European and American cities, attracting wide notice through his brilliant playing and remarkable gift for improvising. He published numerous works for the organ, including some with orchestral accompaniment, and compositions for the voice.

Guise, Claude of Lorraine, Duke of (1496-1550), second son of the duke of Lorraine. He fought under Francis I at Marignano in 1515, thereby helping the French king to reconquer Milan. He then remained at home as a defender of France against the English and Germans. For suppressing the peasant revolt in Lorraine in 1527, Francis created him first duke of Guise, so called for the town of that name.

Guise, François de Lorraine, Duke of (1519-63), son of Claude of Lorraine, one of the greatest generals of France. He and his brother Charles, the cardinal, managed to become all-powerful during the reign of Francis II. Guise and Montmorency won a victory over the Huguenots at Dreux in 1562, and Guise was assassinated by a Huguenot during the siege of Orleans.

Guise, Henry I de Lorraine, Duke of (1550-88), 3d duke of Guise, son of Francis. He fought on the Catholic side in the Wars of Religion in 1569, forced Coligny to raise the siege of Poitiers and was active in the Massacre of St. Bartholomew's Day. King Henry III feared his growing power and had him assassinated at Blois.

Guise, Henry II de Lorraine, Duke of (1614-64), the 5th duke, grandson of Henry I of Guise. He abandoned his position as archbishop of Reims when his elder brother's death (1640) made him heir to the dukedom. Having joined the league against Richelieu, he was condemned to death but fled to Flanders. He put himself at the head of Masaniello's revolt in Naples as the representative of the Anjou family but was taken by the Spanish in 1647 and carried to Madrid, where he remained 5 years. After another attempt to win Naples (1654), he settled at Paris. The direct line of the dukes of Guise became extinct in 1667, 3 years after his death.

Guitry, the name of a father and son prominent in the French theater. Lucien Germain Guitry (1860-1925) made his debut as an actor in Paris (1878) and later played for 9 years in Russia. He returned to Paris to direct and act in the leading theaters there. He was considered France's finest actor, especially in the plays of Henri Bernstein.

Sacha Guitry (1885-), French actor and playwright, son of Lucien Germain Guitry, began to write for the stage at 21 and produced more than 60 plays. Among the most popular were *Pasteur, un sujet de roman* (in which Sarah Bernhardt and the elder Guitry played), *Le Clef* and *Le Comédien.* Guitry and his wife Yvonne Printemps were great favorites in the United States.

Guizot, François Pierre Guillaume (1787-1874), French historian and statesman, born in Nimes. His father was guillotined in 1794 during the Terror, and François was educated in Geneva, Switzerland. He began his literary career in Paris, and his first publication (1809) was a dictionary of synonyms. In 1812 Guizot was appointed professor of history at the Sorbonne. Between that date and the July Revolution of 1830 he alternated writing with a political career but was most prominent in French politics during the 18 years of Louis Philippe's reign, serving successively as minister of the interior, minister of public instruction, ambassador to London and minister of foreign affairs in the Soult Cabinet (1840-47). During the last year of the king's reign, Guizot was prime minister and helped to bring on the crisis that overthrew the monarchy. Guizot escaped to England but returned in 1849 and gave the last of his life to historical research and writing.

Gustavus II Adolphus (1594–1632), King of Sweden, son of Charles IX, whom he succeeded in 1611. His efficient reorganization of his government and his victories over the armies of Denmark, Russia and Poland made him an outstanding figure in 1630, when he entered the Thirty Years' War to assist the Protestants. He added further to his reputation as the first soldier in Europe by his victory at Breitenfeld (1631). A year later, on the field of Lützen, he overcame the forces of the German general Wallenstein but fell mortally wounded.

Gustavus V (1858-), King of Sweden, the son of Oscar II, whom he succeeded in 1907. His education at the University of Upsala was supplemented by European travel in 1878-79, and he secured training for his career by acting as regent at various periods when his father was ill or away from court. Gustavus was criticized in 1914 for making a militaristic speech, but he consistently upheld Sweden's neutrality during the World War. His wife, Queen Victoria, descended from the ducal family of Baden. Gustavus Adolphus, the eldest of five sons, became heir apparent.

GUTENBERG, JOHANNES (*c.* 1397-1468), German printer, born in Mainz. His father's name was Gensfleisch, but Johannes assumed the name Gutenberg (his mother's birthplace). He became a citizen of Strasbourg about 1420, where it appears he devoted many years to mechanical experiments. As early as 1438 he had a press, movable types, forms and other appliances for printing. After 1444 there is no record of him until 1448, when he was again in Mainz. In 1450 he entered into a partnership with Johann Faust (or Fust), a goldsmith, to carry on a printing business; Faust financing their undertaking. The partnership ended after 5 years, most of the materials being taken by Faust for his investment. Afterward Gutenberg apparently carried on a successful business alone. In 1465 he abandoned printing and entered the service of Adolphus, archbishop-elector of Nassau. In his own and in modern times he shared with Faust and Peter Schöffer, Faust's son-in-law, the credit of his invention; but in the preface to a German translation of Livy (Mainz, 1505) it is distinctly declared by Schöffer that the "admirable art of printing was invented in Mainz, in 1450, by the ingenious Johann Gutenberg." The opinion of most modern writers seems to be that Gutenberg not merely invented the art but practiced it long before he became associated with Faust. The Gutenberg Bible was the masterpiece of his press.

Guyot, Arnold Henry (1807-84), Swiss geographer and naturalist, born near Neuchâtel, and educated there and at the University of Berlin. In 1848 he came to the United States, where he became a lecturer at the Lowell Institute, Boston. From 1855 until his death he was professor of physical geography and geology at Princeton. Guyot's principal contributions to science include his investigation of the structure of glaciers, the organization of weather observations and the preparation of meteorological tables, geographical texts and wall maps. Some of his papers were published by the Smithsonian Institution.

Haakon VII (1872–), King of Norway, the second son of Frederick VIII, who was King of Denmark and a nephew of Queen Alexandra of Great Britain. His baptismal name was Charles, but he assumed the name of Haakon on becoming king, November 18, 1905, when Norway and Sweden separated. King Haakon and Queen Maud made their formal entry into Christiania, November 25, 1905, and the king took the oath before the Storting on the 27th and was crowned at Trondhjem on June 22, 1906. He had married Princess Maud Alexandra, daughter of King Edward VII, July 22, 1896. His son and heir apparent is Prince Alexander, born July 2, 1903, and renamed Prince Olaf on his father's accession to the throne.

Hadley, Arthur Twining (1856–1930), American educator and economist, president of Yale University, 1899–1921, born in New Haven, Conn., the son of James Hadley, once professor of Greek at Yale. He took postgraduate courses at Yale and abroad and in 1879 joined the faculty of his *alma mater.* From 1883 until he became president of Yale, Hadley lectured on railroad management and taught political economy in the university and was dean of the graduate school, 1892–95. The first lay president of Yale, he had much to do with its development as a foremost American institution of higher education. His writings include *Economic Problems in Democracy* and *Liberty and Equality.*

Hadley, Henry Kimball (1871–1937), American composer, born at Somerville, Mass. He came from a line of musicians and first showed his genius at the age of 12 when he wrote some waltzes and orchestrated them although he had not studied counterpoint. Later he studied in Boston and then went to Europe. He conducted at the Mayence Stadttheater (1908), at Seattle (1909) and San Francisco (1910–15). For several years he was one of the associate conductors of the New York Philharmonic Orchestra, and in 1929–32 he directed the Manhattan Symphony Orchestra. In 1935 he conducted the Chicago Symphony Orchestra at the World's Fair. His compositions include four operas: *Cleopatra's Night, Bianca, Azora* and *Safie;* four symphonies and a rhapsody; also many songs and orchestral and piano music.

Hadrian (76–138), Roman emperor, successor of Trajan. He began his reign by restoring peace to the Empire, preferring to limit its frontiers rather than engage in constant warfare. In 135 he curbed the last revolt of the Jews. Hadrian spent many years in travel and built and improved towns in all parts of his realm. Near Tivoli are the ruins of his splendid villa, or country home. In Rome he erected an impressive mausoleum, the Castel Sant' Angelo, popularly called "Hadrian's Tomb," and the Arch of Hadrian at Athens.

Haeckel, Ernst Heinrich (1834–1919), German scientist, born in Potsdam. He studied medicine and science at Wurzburg and Berlin but after a few months of practice turned definitely to the study of zoology. He began lecturing at the University of Jena in 1862 and was appointed professor of zoology there in 1865. Jena remained the field of his labors except for several journeys for zoological research. An ardent believer in the theory of evolution, Haeckel first advanced his views in a treatise on radiolaria published in 1861. In 1868 he summarized the theory in *History of Creation,* in which he showed that the descent of man from the ape was unbroken. He later devoted himself to the exposition of monism, the supposition that all forms of organic and inorganic matter possess an essential unity. His *Riddle of the Universe* has been widely translated. It explains the universe as brought about by natural causes without the assistance of any divine power.

Hafiz, (Shams-ed-Din Muhammad; d. *c.* 1389), Persian poet, born in Shiraz, near which his tomb may be seen today. Hafiz is a title meaning "of retentive memory," bestowed upon the poet in recognition of his having learned the entire Koran by heart. His verse, consisting of odes, sonnets and other lyrics, has as its principal theme the beauty of love and wine, the nightingale and the rose.

Hagen, Walter (1892–), American golfer, born at Rochester, N. Y. He was the first American to win the British Open Championship (1922), and he won it again in 1924, 1928 and 1929. He was American professional champion from 1924–27; was twice American open champion and won many other national and regional titles.

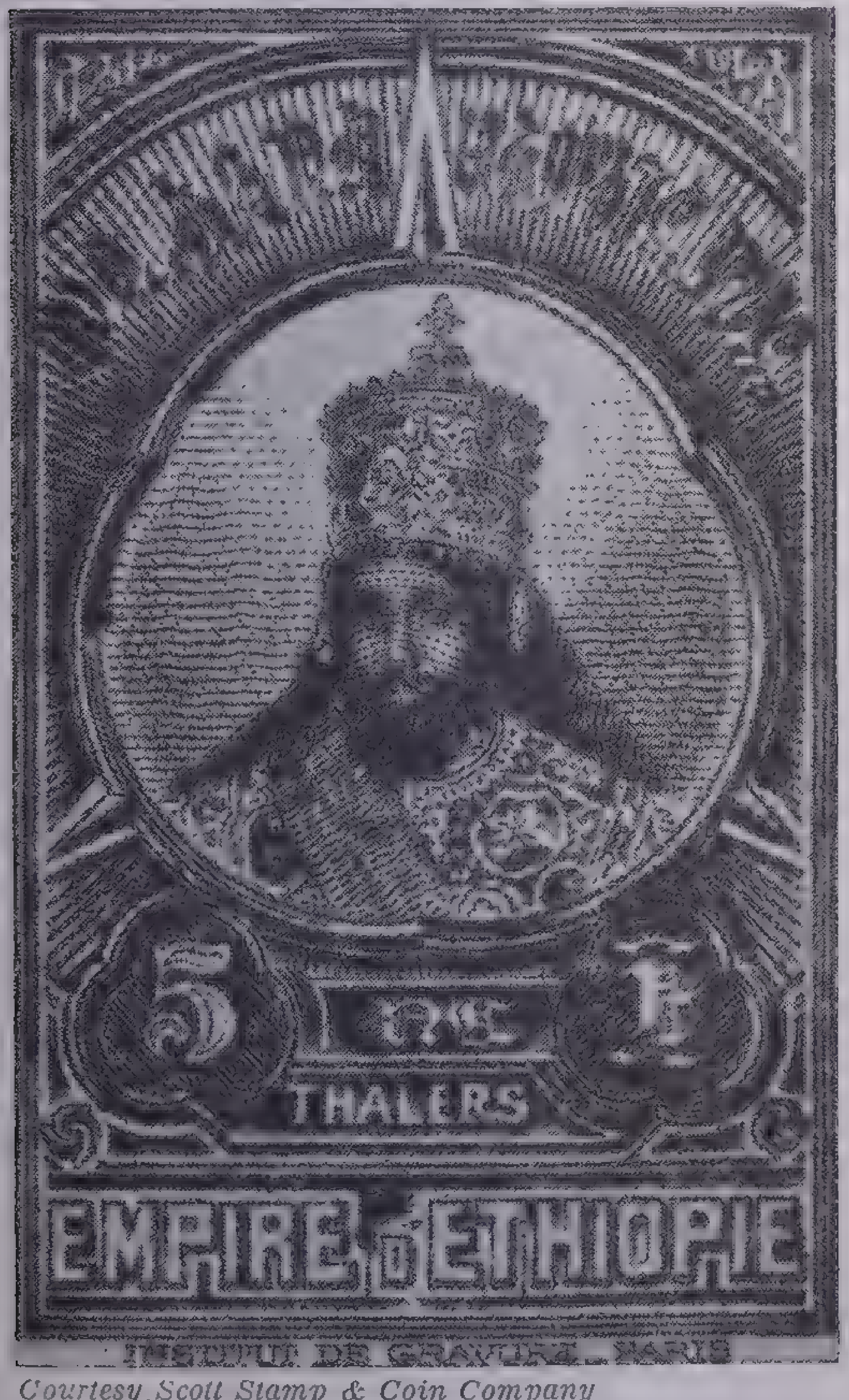
Hagenbeck, Carl (1844–1913), German animal collector, born near Hamburg. In 1866 he took over a menagerie founded by his father and greatly increased it through expeditions to various parts of the world. He made several exhibition tours of Europe and exhibited more than a thousand animals at the Chicago World's Fair in 1893. In 1907 he established a great zoological garden at Hamburg on new principles, keeping the animals in the open as far as possible. Hagenbeck was the first showman who trained wild animals of different species to perform together.

Haggard, Sir Henry Rider (1856–1925), British novelist, born in Norfolk and privately educated. In 1775 he went to South Africa on duty for the government. On his return to England he studied law and was admitted to the bar. He wrote a number of highly popular novels with an African background and took a great interest in agricultural conditions in England and the Salvation Army colonies. His first novel, *Dawn* (1884), was followed by *King Solomon's Mines, She, Allan Quatermain's Daughter* and others. He was knighted in 1912. Haggard also published books on rural problems and conditions.

Hahnemann, Samuel Christian Friedrich (1755–1843), German physician, born in Meissen, Saxony. He received his medical degree at the University of Erlangen in 1779. In 1790, while in practice in Leipzig, he became interested in the similarity between the effects of quinine and other drugs upon a healthy person and the symptoms of the diseases for which the drugs were used as remedies. He maintained that like must be cured by like; drugs must be used in small quantities to produce in the sick person the same results that they would produce in a healthy one. This was called *homeopathy.* These ideas were covered in his *Organon,* published in 1810. Hahnemann encountered opposition from apothecaries and was forced to leave Leipzig, but in 1821 he was welcomed to Köthen, where he was appointed court physician to the duke of Anhalt-Köthen. In 1835 he went to Paris, where he built up a wide practice.

Haig, Douglas, 1st Earl of Bemersyde (1861–1928), British soldier, born in Fifeshire, Scotland, and educated at Oxford. He fought under Kitchener in the Sudan in 1899, served with distinction in the South African War as a cavalry officer and rose steadily in the service, reaching the rank of lieutenant general in 1910. At the outbreak of the World War he went to France as commander of the first division, serving at Mons and through the terrible winter months until January 1915, when he took over the command of the first army. In December 1915 he succeeded French as commander in chief on the western front, being leader at the Battle of the Somme (1916), in the indecisive engagements of 1917 and, under Foch, the final offensive that drove back the enemy and finished the struggle. Early in 1919 Lord Haig retired from active service. Titles, grants, honors of every kind were showered upon him.

Haile Selassie (1890–), Emperor of Ethiopia, born at Harar, the grandnephew of Emperor Menelik. When Waizern, Menelik's daughter, became sovereign in 1916, Ras Tafari Makonnen (Haile Selassie) was declared heir to the throne. In 1928 he was crowned King of Shoa, Ethiopia's main province, his title being "King of Kings of Ethiopia, the Conquering Lion of Judah and the Elect of God." Following the death of Zauditu, he became emperor in 1930 and took the name Haile Selassie I. His diplomatic ability was clearly indicated throughout the Italo-Ethiopian struggle, which began in January 1935. On May 18, 1935, he decreed abolition of slavery in Ethiopia and at the same time ordered that land taxation be equalized. When the Italian armies were about to enter Addis Ababa in 1936, Haile Selassie fled with his family to French Somaliland and from there to Palestine, where the British gave him sanctuary. Afterward he took up residence in England.



Courtesy Scott Stamp & Coin Company

Haile Selassie

Enlarged from an Ethiopian postage stamp issued in 1931. This was the last issue to bear the portrait of the Emperor before Ethiopia was annexed by Italy

Hakluyt, Richard (*c.* 1552–1616), English geographer and author. In 1588 he wrote *Principal Navigations, Voyages, and Discoveries of the English Nation,* called the "prose epic of the English." It was issued in an expanded form in 1598–1600 and contains valuable source material on the 16th-century period of exploration. Hakluyt interested himself in the colonization of Virginia and had practical ideas on the teaching of geography, advocating the use of maps and globes. The Hakluyt Society, named for him, was organized in 1846 for the purpose of printing rare and valuable records of discovery and exploration.

Haldane, Richard Burdon, 1st Viscount of Cloan (1856–1928), British statesman and philosophical writer, born in Cloan, Scotland, and educated at Edinburgh and at Göttingen, Germany. After a career as a lawyer he entered Parliament as a Liberal in 1885 and was secretary of state for war, 1905–12. In this capacity he carried out a complete reorganization of the army, creating the Territorials (Volunteers) and a new general staff. He rejected Germany's proposal that Britain remain neutral in any war in which Germany might take part. On the organization of the coalition cabinet in 1915 he resigned his office as lord high chancellor and was out of politics until 1924 when, from January to November, he was chancellor in the Labour government. During his retirement Lord Haldane wrote the *Reign of Relativity* and *Philosophy of Humanism;* his autobiography was published in 1928.

Hale, Edward Everett (1822–1909), American author, born in Boston, graduated from Harvard in 1839. He was the grandnephew of Nathan Hale and the nephew of Edward Everett Hale. He was pastor of a church at Worcester, Mass. (1842) and of one at Boston (1856). He became chaplain of the U. S. Senate in 1903. During his long career he wrote more than 50 books on historical, literary and religious subjects and many short stories and magazine articles. *The Man without a Country* is his best-known story. *Ten Times One Is Ten* and *In His Name* inspired the formation of the Lend-a-Hand clubs.

Hale, George Ellery (1868–), American astronomer, native of Chicago, Ill., graduated from the Massachusetts Institute of Technology in 1890. He took graduate courses at Harvard Observatory and in Berlin. Beginning in 1890 as director of Kenwood Astrophysics Observatory, Professor Hale continued in that field at Beloit College, at Yerkes Observatory and the University of Chicago; at Mt. Wilson Observatory, Pasadena, Calif., which he helped to organize in 1904, he was director until 1923, when he became honorary director in charge of policy and development. He made outstanding contributions to the science of spectroscopy and invented the spectroheliograph for the study of sun spots. He also wrote interestingly of island universes and outer space in *The New Heavens, The Depths of the Universe* and *Beyond the Milky Way.*

Hale, Nathan (1755–76), American Revolutionary hero, born in Coventry, Conn. He joined a Connecticut volunteer regiment when war with England began. In 1776 he was commissioned captain in the regular army, and after the Battle of Long Island he volunteered to enter the British lines to obtain information needed by Washington. Hale carried out the plan in the disguise of a Dutch schoolmaster, but just as he was about to return, he was recognized and arrested and on the morning of September 22, 1776, was hanged as a spy by order of General Howe. His last words were, "I regret that I have but one life to lose for my country."

Hales, Stephen (1677–1761), English physiologist, born in Manchester. He is noted for an early treatise on plant physiology and for a discussion of blood circulation and blood pressure, both published in his *Statistical Essays* in two volumes (1727–33). Hales invented a ventilating system and other devices.

Halévy, Jacques François Fromental Élie (1799–1862), French composer, born in Paris of Jewish ancestry. He studied counterpoint under Cherubini for 5 years. He won the *Prix de Rome* in 1819 with *Herminie,* a cantata, then began to compose operas, reaching the height of success in 1835 with *La Juive* (The Jewess), a tragic grand opera still popular and greatly admired by critics. *L'Eclair* is the best of his comic operas.

Halévy, Ludovic (1834–1908), French dramatist and novelist, born in Paris. He began his career by writing comedy in collaboration with Henri Meilhac, with whom he also furnished librettos for Offenbach's operas and the book for Bizet's *Carmen.* Their *Frou-Frou,* a serious drama, was a great success when produced in 1869. *Tricoche and Cacolet* (1872) is typical of their best farces. Halévy's independent work was in the field of the story. His *L'Abbé Constantin* (1881) became very popular, and he was also successful in his novels of the Cardinal family.

Haliburton, Thomas Chandler (1796–1865), Canadian humorist and historian. He is best known as the creator of the fictitious Sam Slick, a Yankee clockmaker and peddler. The droll sayings of this character first appeared in a Nova Scotia newspaper in 1835; the sketches were issued in book form, with additions, in 1837, 1838 and 1840 and had wide popularity. Haliburton's use of dialect made him the founder of a school of American humor. In 1828 he became chief justice of the court of common pleas and in 1842 judge of the provincial supreme court. After 1856 he lived in England. His best-known work is *Historical Account of Nova Scotia,* the first history of that province.

Halifax, Charles Montagu, 1st Earl of, (1661–1715), British financier and statesman, a founder of the Bank of England. In 1689 he entered Parliament and 3 years later was appointed commissioner of the treasury. The adoption of his proposal to borrow a million pounds (1692) established the national debt of England. He founded the Bank of England in 1694 as proposed by William Paterson. Montagu then became chancellor of the exchequer and with Isaac Newton effected the recoinage of 1695 and issued the first exchequer bills. In 1697 he succeeded Godolphin as prime minister; two attempts to impeach him before the House of Lords were unsuccessful. On the accession of George I Halifax was made an earl and again became lord of the treasury but died within a year.

Hall, Asaph (1829–1907), American astronomer, born in Goshen, Conn. He discovered the two satellites of Venus—Deimos and Phobos (1877). After some instruction in mathematics at Central College, McGrawville, N. Y., and limited work in astronomy at the University of Michigan in 1857 he secured a position as assistant at Cambridge Observatory. In 1862 he was appointed an aide at the Naval Observatory, Washington, D.C., and a year later became professor of mathematics there, retiring in 1891. He was professor of astronomy at Harvard, 1896–1901. Hall's great contributions to astronomical progress are shown in his 500 or more published papers. He investigated the orbits of the satellites, star distances and the mass of Saturn's rings and secured much other celestial data.

Hall, Charles Martin (1863–1914), American inventor, born in Geauga County, Ohio. He is known chiefly as the inventor of the electrolytic process for the reduction of aluminum. In 1888 he began the commercial manufacture of the product, having secured financial backing from the Mellon interests. The widespread use of aluminum is chiefly the result of the Hall invention, which greatly decreased the cost of the metal. His patent rights, granted in 1889, were upheld by a U. S. court in 1893.

Hall, Granville Stanley (1846–1924), American psychologist, president of Clark University, born in Ashfield, Mass., and graduated from Williams College in 1867. He subsequently attended Union Theological Seminary and spent 2 years in Germany studying psychology and philosophy. Hall taught psychology at Antioch College (Ohio) 1872–76 and in 1878 received his Ph. D. degree from Harvard. After further study in Germany he became professor of psychology at Johns Hopkins in 1881. His laboratory at this institution, first of its type in America, attracted many scholars. As the head of Clark University (1888–1919) and as professor of psychology there from 1893 he was a vital force in national education, especially in the promotion of child study. Professor Hall founded the *American Journal of Psychology* and published several books.

Hallam, Arthur Henry (1811–33), son of Henry Hallam, an essayist of promise and a friend of Alfred Tennyson. His death at the age of 22 is the theme of Tennyson's *In Memoriam*.

Hallam, Henry (1777–1859), English historian and critic, born in Windsor. He was graduated from Oxford in 1799 and afterwards practiced law. Having secured a private income and a government position, he abandoned law for a literary career. Hallam's principal works, which are marked by accuracy and a clear style, were published between 1818 and 1839. They include a study of medieval Europe, a constitutional history of England from Henry VII to George II and the four-volume *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries*.

Halleck, Fitz-Greene (1790–1867), early American poet, born and educated in Guilford, Conn. He was a clerk in a New York bank, 1811–31, and in 1832 became John Jacob Astor's confidential agent and an original trustee of the Astor Library. During his banking career Halleck was associated with Joseph Rodman Drake in writing *The Croaker Papers* for the *Evening Post*. When Drake died in 1820 his friend wrote a touching poem in his memory, beginning "Green be the turf above thee." Other verse by Halleck includes a satire on current fashions and customs, entitled *Fanny*, and *Marco Bozzaris*, in memory of the Greek hero.

Halleck, Henry Wager (1815–72), American soldier and lawyer, born at Westernville, N. Y., graduated from West Point. He served in California during the Mexican War but later resigned from the army to practice law there. In 1861 Lincoln made him a major general in command of the Missouri Department. This was an administrative rather than a combat post, and Halleck's talent for organization made possible several victories over the Confederates. He took the field himself early in 1862 and captured Corinth, Miss., an important railroad center for the southern forces. In July of that year Lincoln made him commander in chief of the Federal armies, in which post he was succeeded by Grant in 1864. Halleck was an expert on fortifications, and his book *Elements of Military Art and Science* had much influence during the Civil War.

Haller, von, Albrecht (1708–1777), Swiss physiologist, anatomist and author, born in Bern. He studied medicine at Tübingen and Leyden and became professor of anatomy, medicine and botany at Göttingen where he organized schools, edited a journal, composed poems and wrote three philosophical romances, *Usong*, *Alfred the Great* and *Fabius and Cato*. Haller is best known to scientists for his studies on the irritability of muscles and for having opposed Wolff's theory of eugenics, thereby retarding the progress of embryology.

Halley, Edmund (1656–1742), English astronomer. His first notable achievement was the preparation of a catalogue of the stars of the Southern Hemisphere, published in 1679 after a 2 year stay on the island of St. Helena. His prediction of the return of the comet named after him was based on observations made in 1682, when the comet was visible for about a month. He wrote on sunspots, and magnetism and in 1701 published a general chart of variations of the compass. In 1720 he became Astronomer Royal at Greenwich.

Hals, Frans (*c.* 1587–1666), Dutch painter, born in Malines. He spent most of his life in Haarlem. His gift for portraiture may be seen in his group pictures of various military guilds and in his famous *Laughing Cavalier*. In technique he ranked with Rembrandt, though he did not equal that great master in imaginative power. Hals was at his best when painting fisher folk, market women or street urchins and delighted to portray them in laughing moods. His work greatly influenced the style of the Dutch school of painting.

Hamilcar Barca (d. 229 B.C.), Carthaginian general, the father of Hannibal. The Romans first came into contact with him in 247 B.C. during the First Punic War, when, at the age of 23, he was given command of the Carthaginian forces in Sicily. Though the Romans were in control of most of the island, Hamilcar constantly outwitted them and kept his line of supplies open for several years. After the naval defeat of Hanno, 241 B.C., Hamilcar was forced to abandon Sicily. In 236 B.C. he led the Carthaginian forces to Spain, planning to conquer that country and use it as a base from which to make war on Rome. He fought 9 years in Spain and built up the power of Carthage before he was killed.

Hamilton, Alexander (1757–1804), American statesman, born in the West Indies on the island of Nevis, the child of a Scottish father and a mother of French-Huguenot descent. When 16 years old, he was placed in a grammar school at Elizabethtown, N. J., and a year later entered King's College, the present Columbia University. He volunteered for service in the Revolutionary War and showed such capability in the early campaigns that in 1777 he was made an aide and confidential secretary to Washington, with the rank of lieutenant colonel. In the last year of the war (1781) he left this post to join the ranks and took part in the battle of Yorktown.

In 1782 Hamilton was admitted to the bar in Albany and began practice in New York. That year he also took his seat in the Continental Congress, where he was a leader in the discussions pertaining to finance. During the period under the Articles of Confederation he was instrumental in bringing about the call for the Constitutional Convention, in which he sat as a delegate from New York. His articles in *The Federalist* and great speeches in the New York convention helped secure the adoption of the Constitution by the states. In 1789 Congress established the treasury department, and Hamilton was appointed the first secretary. His grasp of financial problems during his 6 years in office carried the young nation through a critical period. He had the government assume the state debts, and provided funds by establishing a system of import duties and taxes on liquor and other domestic products. A national bank and mint were founded. These and other measures established the credit of the United States and gave its financial system stability.

For this great work he is now recognized as a brilliant man. Hamilton advocated a strong central government and so aroused the determined opposition of Jefferson and others, who believed that power must come from the people. Out of these conflicting ideas originated the first two political parties, Federalist and Antifederalist. Hamilton resigned from the Cabinet and returned to law practice, but he remained an influence in politics. He was killed in 1804 by Aaron Burr in a duel arising from a political quarrel.

Hamlin, Hannibal (1809–91), American statesman, Vice-President of the United States during the first term of Lincoln. Hamlin began the practice of law in Hampden, Me., in 1833, entering politics 2 years later by election to the state legislature as a Democrat. He won a seat in Congress in 1841, became an antislavery man and in 1846 introduced the Wilmot Proviso to exclude slavery from territory purchased from Mexico. Hamlin sat in the Senate from 1848 to 1856, then resigned to become governor of Maine. In the meantime he had helped to found the Republican party. He returned to the Senate in 1857 and subsequently served again, 1869–81. He was minister to Spain, 1881–83.

Hammond, John Hays (1855–1936), mining engineer, born in San Francisco. He was graduated from the Sheffield Scientific School (Yale) in 1876 and completed a mining course in Freiburg, Germany. In 1880 he began his career as mining expert by examining the California gold fields for the U. S. Geological Survey. His activities took him to all parts of the world, and in South Africa he became consulting engineer for Cecil Rhodes. Suspected of being implicated in the Jameson Raid, Hammond was sentenced to 15 years' imprisonment by the Boer government but was released on payment of a fine of $125,000. After his return to the United States he became active in the development of hydroelectric and irrigation projects and lectured at leading universities.

Hammond, John Hays, Jr. (1888–), inventor, born in San Francisco, graduated from the Sheffield Scientific School in 1910. He won renown as the originator of radio adaptations and of devices used in warfare. His many inventions include the following: a wireless-controlled torpedo for coast defense; a system of automatic torpedo firing; a radio system of ship control; a system of selective radio telegraphy for carrying eight messages on one wave; improvements in pipe-organ mechanisms and a new type of reflecting modulator for pianos, adopted by several symphony orchestras. At the request of the Italian government Hammond built a high-power selective radio station in Rome, making use of his own patents.

Hammurabi (d. 2125 B.C.), the sixth King of the first dynasty of Babylon, celebrated as the originator of a code of civil laws engraved in cuneiform characters on a black stone, the three pieces of which were discovered at Susa in 1901–2. Hammurabi's code is regarded as remarkable, in view of the age in which this king lived. It guaranteed justice for all and protection of the poor against oppression by the rich. It regulated rents, wages, insurance and so forth and provided for various penalties for theft and other crimes. The criminal code was a stern one, however, based literally on the "eye for an eye" doctrine. Hammurabi did much to promote the prosperity of his people.

Hampden, John (1594–1643), English statesman. He entered Parliament in 1621 and came into public notice in 1627 when he was sent to prison for refusing to contribute to a general loan forced on his subjects by Charles I. Hampden was released in time to sit in the Third Parliament and went into retirement on its dissolution in 1629. In 1635 he refused to pay a tax levied by the king. He argued his own case in 1637 when he stood trial and in the end won. Hampden sat in both the Short Parliament and the Long Parliament and was one of the five members whom the king attempted to arrest in the House of Commons (1642). He raised a regiment when the Civil War began and was mortally wounded in the Battle of Chalgrove Field.

Hampden, Walter (1879–), American actor, native of Brooklyn, N.Y., educated at Harvard and the Brooklyn Polytechnic Institute. He made his first stage appearance in 1901 in England in the company of F. R. Benson, then playing in classical repertory. Hampden succeeded the younger Irving in the part of Hamlet in 1905 and in 1907 returned to America, where he supported Nazimova at the Bijou Theater, New York. Subsequently he won wide acclaim for his splendid acting in Shakespearean plays and in *Cyrano de Bergerac*. His real name was Walter Hampden Dougherty.

Hampton, Wade (1818–1902), American soldier who rose to prominence in the Confederate army. He was born in Columbia, S.C., and studied law at the state university, but never practiced. Though opposed to secession he supported his state in the Civil War, and Hampton's Legion, a company that he equipped at his own expense, followed his leadership at Bull Run, in the Peninsular campaign and at Fair Oaks. Hampton was wounded three times at the battle of Gettysburg, was commissioned lieutenant general in 1864 and received a cavalry command. After the war he worked to reconstruct the South and in 1876 was elected governor of South Carolina. He was in the Senate, 1879–91, and was commissioner of railroads, 1893–97.

Hancock, John (1737–1793), American patriot, born in Braintree, Mass., graduated from Harvard in 1754. Early in his career he was a selectman of Boston and member of the Massachusetts General Court. His later activities in behalf of the Colonial cause brought him into disfavor with Governor Gage, whose attempt to arrest Hancock and Samuel Adams led to the battles of Concord and Lexington. In 1775 Hancock was elected president of the Continental Congress and in this capacity was the first to sign the Declaration of Independence. When Massachusetts became a state in 1780, he was elected its first governor. He was re-elected annually, with the exception of 2 years, until his death.

Hancock, Winfield Scott (1824–86), American soldier, born in Montgomery County, Pa. After graduating from West Point in 1844 he served against the Indians and fought in the Mexican War, winning the brevet of first lieutenant. He reached the rank of captain in 1855 and soon after the outbreak of the Civil War was appointed brigadier general of volunteers, taking command of a brigade in the Army of the Potomac. In 1862 as major general of volunteers he suffered defeat at Fredericksburg but helped to save the Federal forces from destruction at Chancellorsville in 1863. At Gettysburg he was in chief command until the arrival of Meade. He received a commission as major general in the regular army in 1866. General Hancock was the unsuccessful Democratic nominee for the Presidency in 1880, losing to Garfield.

Handel, Georg Friedrich (1685–1759), German composer, born in Halle, Saxony. He studied music and at the age of 18 became a violinist in the orchestra of the Hamburg Opera House. Two years later in Hamburg he produced *Almira,* his first opera. A sojourn of 3 years in Italy increased his interest in Italian opera, especially as his *Roderigo, Agrippina* and several other works were received with great public favor. In 1710 he returned to Germany and became chapelmaster to Elector George of Hanover (afterwards George I of England); and later that year he went to London, where his opera *Rinaldo* was produced successfully. After 1712 he made England his home, becoming a naturalized citizen in 1726.

Handel's first composition with English words consisted of a *Te Deum* and *Jubilate* in celebration of the Peace of Utrecht (1713), and it so pleased Queen Anne that she awarded him a pension. George I, her successor, after overcoming his resentment at Handel's desertion of Hanover, was even more generous. Handel was in the service of the duke of Chandos, 1718–20, and then resumed composing, completing more than 20 operas in as many years, 1720–40. An attempt at independent management brought financial disaster, but he recouped his losses by devoting himself to oratorios, producing *Saul* and *Israel in Egypt* in 1739, followed by *The Messiah, Samson, Judas Maccabeus, Jephtha* and a score of others. When *The Messiah* was first produced in London (1743), George II and the entire audience, moved to spontaneous emotion, rose as the strains of the "Hallelujah Chorus" fell on their ears. Every Christmas season in Britain and America is marked by performances of this well-loved oratorio.

Handel excelled all other composers in ability to achieve majestic choral effects through simple musical forms. Besides 27 oratorios he composed cantatas, anthems and some 30 concertos. He was blind in his later years but played the organ accompaniment for *The Messiah* a week before he died. He was buried in Westminster Abbey.

Hanna, Marcus Alonzo (1837–1904), American politician, born in Lisbon, Ohio. He amassed a fortune in a coal, iron and shipping business and extended his interests to include ownership of Cleveland newspapers, theatrical enterprises, street railways and railroad and bank stock. From about 1880 Hanna was prominent in Republican politics in Ohio and became a figure of national interest in 1896 through his activity in securing McKinley's nomination and election. He entered the Senate by appointment in 1897, was elected to the full term in 1898 and served until his death.

Hannibal (247–183 B.C.), Carthaginian general, the son of Hamilcar Barca. At the age of 9 he was taken to Spain by his father, who had the boy swear eternal enmity to Rome. In 221 B.C. Hannibal was elected commander in chief of the Carthaginian forces and at once laid plans to crush his country's rival. He began his campaign by laying siege to Saguntum (in Spain), an ally of Rome, capturing the city after 8 months. Rome retaliated by declaring war in 218 B.C. and so began the Second Punic War. Hannibal's plan was to invade Italy and eventually march on Rome. In 218 B.C. he left New Carthage (in Spain) with 90,000 foot soldiers, 12,000 horsemen and a band of elephants. He crossed the Pyrenees into southern Gaul, defeated a Roman army in the Rhone Valley and then made his celebrated march across the Alps, overcoming incredible difficulties during 15 days of struggle with man, weather and the Alpine wilds. With only a small part of his original army he defeated Scipio in the battles of the Ticinus and the Trebia.

In the spring of 217 B.C., marching toward Rome, he almost annihilated one great Roman army at the Trasimene Lake. Failing to entice Fabius, "the Delayer," into open battle, Hannibal pushed into southern Italy and in the summer of 216 B.C. crushed another Roman army at Cannae under Terentius Varro and Aemilius Paulus. A winter at Capua demoralized his soldiers by months of idleness and luxury. The campaign continued with no decision, for Hannibal's forces were growing smaller. The defeat of his brother Hasdrubal, 207 B.C., forced Hannibal to remain on the defensive in the mountains, and in 203 B.C. he was called back to Carthage, then in danger of capture by the Romans. At Zama, in 202 B.C., his unbeaten army was conquered at last by Scipio, and the next year Carthage accepted a humiliating peace. Hannibal attempted preparation for another war on Rome but was driven out of Carthage by his enemies and at last sought refuge at the court of Bithynia. When the Romans demanded his surrender, he killed himself by taking poison.

Hanson, John (1715–83), American patriot, born in Maryland, elected president of Congress in 1781, when the Articles of Confederation went into effect. His public career began in 1757 with election to the colonial assembly of Maryland; he was a member of that body for nearly every term until 1779, when he was sent to the Continental Congress. As first president of Congress under the Articles of Confederation Hanson bore the title "President of the United States in Congress Assembled," and by some he is considered the first President; he was not, however, the first President under the Constitution. He resigned office after a year because of ill health. Maryland placed his statue in Statuary Hall, Washington.

Harding, Warren Gamaliel (1865–1923), 29th President of the United States, born on November 2 in a farmhouse near Caledonia (now Blooming Grove), Ohio, the son of a physician. He was graduated from Ohio Central College at Iberia. Harding worked in a newspaper office and in 1884 purchased the Marion *Star,* a struggling weekly with a large deficit. He married Florence Kling de Wolfe in 1891 and with her help developed the *Star* into a prosperous daily that became a great influence in Ohio Republican politics. Harding was a good campaign orator and represented his district in the state senate (1900–04), was lieutenant governor of Ohio (1904–06) and was elected a delegate to the national conventions of 1908, 1912, 1916 and 1920. Meantime, in 1914, he was elected to the U. S. Senate, one of the first senators to be chosen by popular vote in accordance with the 17th Amendment.

Though he built up no national following, Harding was occasionally mentioned as a presidential possibility. Political friends urged his candidacy to break the deadlock between the conservative and progressive factions in the convention of 1920; accordingly he was nominated with Governor Calvin Coolidge of Massachusetts as his running mate and won over James M. Cox and Franklin D. Roosevelt by a majority of about 7 million.

Early in his administration separate peace treaties were negotiated with Germany and Austria, because Congress refused to ratify the Treaty of Versailles, which contained the Covenant of the League of Nations. In 1921 a conference on limitation of arms met in Washington at the President's invitation. The outcome was that America, Great Britain, France, Italy and Japan agreed on a restriction of navy building. In domestic policies Harding favored a "return to normalcy." Immigration was restricted, a national budget system was established for the first time, and a beginning of debt reduction was made. Harding's worry about an investigation of the Teapot Dome and other oil-lease scandals probably contributed to the brain hemorrhage that killed him in August, 1923, in San Francisco, on his return from an inspection trip to Alaska. The funeral train carrying the President's body from California to Washington was viewed by millions of citizens along the 3,000-mile route, and his death was sincerely mourned.

Hardy, Thomas (1840–1928), British novelist and poet, born in Dorsetshire, the county called in his novels by the old name Wessex. After studying at King's College, London, he became at 16 a pupil of a church architect. Early in his career he applied himself to both writing and architecture but turned definitely to literature in 1868. His first important novel was *Under the Greenwood Tree* (1872), and his last story of novel length was *The Well-Beloved* (1897). Between those dates there appeared *Far from the Madding Crowd, The Return of the Native, The Woodlanders, Tess of the D'Urbervilles* and *Jude the Obscure;* also collections of short stories. In his later years Hardy turned again to poetry, which had absorbed his interests in youth. His masterpiece in verse is *The Dynasts* (1904–08), an epic drama about Napoleon; his last poems were lyrics showing great power and emotion.

Hargreaves, James (d. 1778), English inventor, born in Lancashire. When he was very young, he supported his family by spinning and weaving in his own house in Stanhill. He invented the carding machine in 1760 and the spinning jenny in 1764. The jenny was named for his wife. He sold a few of the jennies, which did eight times the work of the old machines, and his fellow spinners, fearing the loss of their jobs, broke into his house and destroyed his machine. In 1768 he moved to Nottingham, where he built a spinning mill and went into the business of making yarn. Because he had sold machines before he secured a patent, he was unable to protect the rights to his invention.

Harington, Charles Robert (1897–), British scientist, born in London. He studied at Cambridge and Edinburgh universities and afterward he did research work in Edinburgh and lectured at the University College Hospital medical school. In 1931 he became professor of pathological chemistry at the University of London. He is best known for having been the first to synthesize thyroxin, in 1927. His writings include *The Thyroid Gland in its Chemistry and Physiology* (1933) and papers published in *The Biochemical Journal.*

Harper, William Rainey (1856–1906), American educator and Hebrew scholar, born in New Concord, Ohio, and educated at Muskingum College and at Yale. After a preliminary career as teacher, in 1879 Harper became professor of Hebrew at the Baptist Union Theological Seminary, Chicago, and in 1886 went to Yale, where he was professor of Semitic languages and of Biblical literature. The last 15 years of his life (1891–1906) were devoted to building up the University of Chicago. He was the author of numerous books on Hebrew language and literature.

Harriman, Edward Henry (1848–1909), American financier and railroad administrator, born at Hempstead, N. Y. He was a member of the New York Stock Exchange at 21 and in 1887 became vice-president of the Illinois Central Railroad. At that time he began to organize and consolidate railroads. He got control of the Central Pacific and Southern Pacific but was blocked by J. J. Hill in his efforts to control the Northern Pacific. The fight between the two men caused the stock-exchange panic of 1901. The Interstate Commerce Commission condemned his operations.

Harris, Joel Chandler (1848–1908), American author, best known as the author of the "Uncle Remus" tales, born in Eatonton, Ga. After some experience as a printer's apprentice and assistant on a local weekly, he studied law and began to practice but soon abandoned law for journalism. In 1876 he joined the staff of the Atlanta *Constitution,* serving as its editor from 1890 to 1901. His popular studies in Negro folklore—*Uncle Remus, His Songs and His Sayings*—were first published in that paper. Among other writings in this vein are *Uncle Remus and His Friends, On the Plantation, Uncle Remus and Brer Rabbit* and *Daddy Jake the Runaway.* Harris wrote also a memoir of Henry W. Grady and a history of Georgia.

Harris, William Torrey (1835–1909), American educator and philosophical writer, born in Killingly, Conn., educated at Phillips Andover Academy and at Yale College. He was connected with the public-school system of St. Louis for 31 years (1857–88), serving as superintendent from 1867. Doctor Harris had an equally notable record as an expounder of German philosophy and as educational editor. He founded the *Journal of Speculative Philosophy* in 1867 and was U. S. Commissioner of Education, 1889–1906.

Harrison, Benjamin (1833–1901), 23d President of the United States, born at North Bend, Ohio, the great-grandson of the Benjamin Harrison who was a signer of the Declaration of Independence and a grandson of William Henry Harrison, 9th President. His father, John Scott Harrison, served in Congress, 1853–57. Benjamin Harrison learned to read in a country schoolhouse, studied under private tutors, attended an academy near Cincinnati and finally entered Miami University, from which he was graduated in 1852. In 1853 while studying law in Cincinnati, he married Caroline Scott, a college friend. In 1854 he began law practice in Indianapolis and was becoming well established in his profession when the Civil War began. He had been elected reporter for the Indiana supreme court in 1860. As soon as his 2-year term was completed, he volunteered for service and was commissioned colonel in a regiment that he helped to raise. Harrison's war record was meritorious, especially his services in the Atlanta campaign, and he received the brevet rank of brigadier general in 1865. Having been re-elected court reporter in 1864, he returned to that office and served until 1868. In the years that followed, he became prominent in national Republican politics and was instrumental in bringing about the nomination and election of James A. Garfield in 1880. Harrison could have had a place in Garfield's cabinet but decided instead to take his seat in the Senate, to which the Indiana legislature had elected him. Though defeated for re-election in 1886, because of a Democratic majority in the state legislature, Harrison had made a good record in the Senate and was nominated for the Presidency in 1888 on the eighth ballot. He won the election, defeating Grover Cleveland by an electoral vote of 233 to 168, though the latter received a larger popular vote. The tariff was the principal issue of the campaign.

Harrison's administration was marked by the passage of the Sherman Silver Purchase, McKinley Tariff and Sherman Anti-Trust acts, the suppression of the Louisiana lottery, further reform of the civil service and the admission of several new western states into the union. Through the influence of James G. Blaine, secretary of state, reciprocity treaties were negotiated with Brazil and Spain, and the first Pan-American Congress was held in Washington. The tariff was again an issue in the campaign of 1892, and again Harrison and Cleveland were the nominees. As public opinion had turned against the high-protectionist policy of the Republicans, Cleveland won by an electoral vote of 277 to 145, and Harrison returned to his private law practice. He represented Venezuela in its boundary dispute with Great Britain. In 1897 he published a book on American government, *This Country of Ours.*

Harrison, John (1693–1776), English inventor, born in Foulby, Yorkshire, the son of a clock repairer. As a young man he was interested in the construction of timepieces, and after much experimenting he invented a clock pendulum that would not change in length with changes in temperature. Harrison also devised four chronometers for use in finding longitude at sea, one of which determined longitude within 10 miles. For this achievement he was granted a prize of £20,000, the first award in a competition sponsored by the British Government.

Harrison, William Henry (1773–1841), 9th President of the United States, born at Berkeley, Va., the son of Benjamin Harrison, signer of the Declaration of Independence, and the grandfather of Benjamin Harrison, 23d President. Harrison was graduated from Hampden-Sidney College in 1790 and the next year was commissioned an ensign in the First Infantry, his father's death having left him free to enter upon a military life instead of the medical career intended for him. As lieutenant and aide-de-camp to General Anthony Wayne Harrison was active in the war with the Indians on the frontier and was promoted to the rank of captain in 1797. Resigning from the army in 1798 he was appointed secretary of the Northwest Territory and in 1799 became the first territorial delegate in Congress. In this capacity he secured the passage of the first homestead laws and also used his influence to have the Northwest Territory divided. He was governor of the western part, called Indiana Territory, 1801–12.

Harrison's success in securing land cessions from the Indians was widely approved, while his victory over the followers of Tecumseh and his brother the Prophet at the Battle of Tippecanoe (1811) made him a national hero. On the outbreak of the War of 1812 he was appointed major general of Kentucky militia but was soon made brigadier general of the regulars and given chief command of the army in the Northwest. In 1813 he was raised to the rank of major general. The climax of his career was his victory over both the Indians and the British in the Battle of the Thames (1813), after Perry's victory on Lake Erie.

In 1814 Harrison retired from the army. He represented Ohio in Congress, 1816–19, and sat in the state senate, 1819–21. In 1825 he entered the national Senate and in 1828 was appointed first minister to Colombia. The Whigs made him their presidential candidate in 1836, and he carried seven states with an electoral vote of 73. In the popular vote in several states he ran close to Van Buren, the Democratic candidate who defeated him. Four years later, however, Harrison and Tyler won in the so-called "log-cabin and hard-cider" campaign, with its slogan of "Tippecanoe and Tyler too." Harrison's personality was the deciding factor in the vote, but he had no opportunity to show his fitness for presidential duties. A month after his inauguration he died of pneumonia, leaving the presidency to Vice-President Tyler.

Hart, Albert Bushnell (1854–), American historian, born at Clarksville, Pa. He graduated from Harvard in 1880 and studied abroad for 3 years. After his return to the United States his lifelong career as a teacher at Harvard began. In 1926 he became professor emeritus. He was an ardent admirer of Theodore Roosevelt and a leader in the Progressive party. He wrote several volumes of the "American Nation" series (28 vols.); wrote *Epochs of American History* (4 vols.); *American History Told by Contemporaries* (5 vols.) and *Commonwealth History of Massachusetts* (5 vols.). He edited *The American Yearbook* from 1911 to 1932.

Harte, [Francis] Bret (1836–1902), American writer, born in Albany, N.Y. At the age of 15 he went to California where the first gold rush was still at full tide. He became a gold miner, then a schoolmaster, and in 1857 a typesetter employed in the printing office of the San Francisco *Golden Era.* He began writing sketches for this paper, became its assistant editor and in 1864 secured a position on the *Weekly Californian,* which published the parodies later issued under the title *Condensed Novels.*

He edited the *Overland Monthly,* 1868–70, and for this journal he wrote some of his finest short stories, including *The Luck of Roaring Camp* and *The Outcasts of Poker Flat.* For a few years he was secretary of the U. S. Mint in San Francisco. In 1871, after a brief career at the University of California, where he was professor of recent literature, Harte went to New York. After 1878 he lived abroad and was in the consular service until 1885. His last years were spent in England. He won great fame in America as well as Britain for his humorous prose and poems and especially for the parodies in his *Condensed Novels.*

Harun-al-Rashid (*c.* 766–809), Caliph of Bagdad, succeeded his brother as fifth and most famous Abbasid caliph. A son of Mohammed Mahdi, when he was young he conducted a successful war against the emperor of Byzantium. His reign is marked by another victory over Byzantium and by the murder of the Barmecides, a Persian family that had become very powerful under Mahdi. He owes his real fame, however, to the fact that commerce, art and science flourished under him, as immortalized by the stories about him in *The Arabian Nights.*

Harvard, John (1607–38), British clergyman, chief founder of Harvard College, born in London and educated at Cambridge University. He emigrated to Charlestown, Mass., in 1637 and entered upon his duties as assistant pastor of First Church. He died about a year later. His will bequeathed a library of 260 volumes and the sum of £400 for the founding of a college, named Harvard in his honor. There are monuments to him in Cambridge, Mass., and in Cambridge, England.

Harvey, William (1578–1657), English physician, born in Folkestone, Kent. He was educated at Cambridge and at the University of Padua, Italy, receiving a medical degree at Padua in 1602. Beginning practice in England, Harvey developed his theory of blood circulation, became physician at St. Bartholomew's Hospital in 1609 and in 1618 was appointed physician to James I. He held the same post under Charles I until 1646. Harvey is famous for discovering the circulation of the blood, which he explained first in his lectures, and afterward in a book entitled *Exercitatio de Motu Cordis et Sanguinis* (Treatise on the Motion of the Heart and Blood, 1628). It excited considerable objection and controversy, but he lived to see its general acceptance both in England and on the continent. He also did pioneer work in the field of animal and human reproduction.

Hasdrubal, name borne by several historical characters connected with the story of Carthage. The Hasdrubal who was a son-in-law of Hamilcar Barca founded the city of New Carthage in Spain and conquered most of the tribes of the Spanish peninsula. The consolidation of their power in Spain enabled the Carthaginians to engage in the Second Punic War against Rome. Hasdrubal was assassinated in 221 B.C., but his work was continued by Hannibal. Another Hasdrubal was the brother of Hannibal. He invaded Italy in 207 B.C., was attacked by the Romans near the Metaurus River and was there defeated and slain the same year. This battle marked the beginning of the downfall of the Carthaginian rule.

Hassam, Childe (1859–1935), American painter and etcher, a leading figure in the Impressionist school of American painting. He began his studies in his native city, Boston, and later had instruction in Paris, but his technique was always highly individual. He did outstanding work in figure and landscape painting, and his pictures may be seen in the leading galleries of America. His war-time pictures of Fifth Avenue, New York, excited much favorable comment. Among Hassam's more important works are *The Little June Idyll, Evening Bells, Winter, Manhattan's Sunset Towers, Broad and Wall Streets* and *Summer Sea.*

Hastings, Warren (1732–1818), English statesman, born in Oxfordshire. At the age of 17 he became a secretary for the East India Company in the Calcutta office. During the next few decades he showed such ability in various administrative positions that he was appointed president of the supreme council of Bengal in 1772. Two years later he began his duties as governor general of India, this position having been created by Parliament in 1773. Hastings held this office for 12 years and was instrumental in establishing the judicial and administrative systems upon which England built its Indian Empire. His unscrupulous methods of raising money brought him severe censure on his retirement and return to England. In 1788 an impeachment trial was begun in the House of Lords; the proceedings called forth the eloquence of Burke, Fox and Sheridan, and the trial dragged on for 7 years. He was charged with a number of crimes, including the hiring out of British troops to make war, but he was finally acquitted in 1785.

Hauptmann, Gerhart (1862–), German author, born in Obersalzbrunn, Silesia. He tried to be a sculptor before definitely becoming a writer. His first play *Before Sunset* (1889) revealed him as the founder of naturalistic German drama, which he carried forward with *The Festival of Peace, Lonely Lives* and *The Weavers,* all written as a protest against militarism and social injustice. In these early works Hauptmann showed himself a disciple of Zola, Ibsen and Tolstoi. Between 1894 and 1897 he wrote in an idealistic and mystic vein, producing the dramas *Hannele, Florian Geyer* and *The Sunken Bell.* More recent works include the novel *Atlantis; Der weisse Heiland,* a dramatic phantasy; *Phantom,* the memoirs of a convict; and *Island of the Great Mother,* the story of a South Sea Utopia. In 1912 he received the Nobel Prize for literature.

Havelock, Sir Henry (1795–1857), British general, born in Bishop-Wearmouth, Durham. He entered the army soon after the battle of Waterloo and saw active service in India in the Afghan and Sikh wars. During the Indian Mutiny in 1857 he had command of a small force sent to relieve several cities. He fought his way from Allahabad to Cawnpore and from Cawnpore to Lucknow but had to lay by near Cawnpore until re-inforcements under General Outram arrived. In September, in command of both contingents, Havelock reached Lucknow and was himself besieged but was able to hold out until the arrival of Sir Colin Campbell brought relief on November 19. Havelock died of dysentery 5 days later.

Hawkins, Sir John (1532–95), English seaman born in Plymouth. He followed the sea from boyhood. In 1562 he obtained command of a ship that was profitably engaged in carrying slaves from Africa to South America. In 1567 he led a small fleet on the same errand, Sir Francis Drake being one of his officers. He got a good deal of plunder but lost it in a battle with the Spanish in Vera Cruz harbor, from which only two English ships out of six managed to escape. He was elected to Parliament in 1572, was an efficient treasurer of the navy and became a prosperous shipbuilder. In 1588, as rear admiral, Hawkins commanded the *Victory* in the battle with the Spanish Armada and was knighted for bravery. He died while on a plundering expedition to the Spanish Main with Drake, who was then off Puerto Rico.

Hawks, Frank Monroe (1897–1938), American aviator, born at Marshalltown, Iowa. He learned to fly in California in 1916 and taught flying during the World War. He broke transcontinental speed records in 1930 and 1933 and at one time held 214 city-to-city records. He wrote *Speed* in 1931.

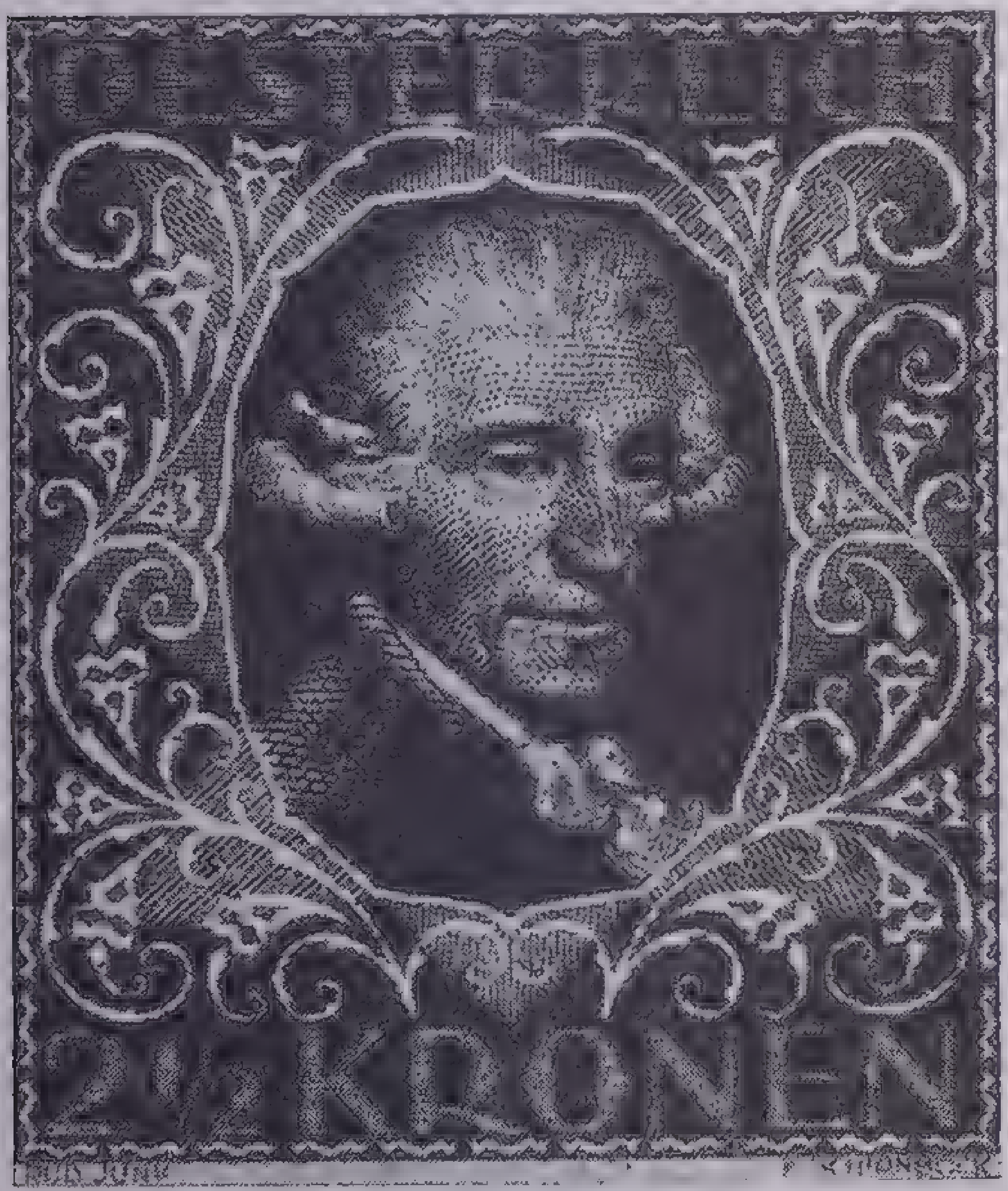
Hawthorne, Nathaniel (1804–64), American writer, born in Salem, Mass., of English ancestry. He made a creditable record at Bowdoin, from which he was graduated in 1825 with Longfellow. After leaving college Hawthorne studied further and began writing his first story, *Fanshawe.* For several years he wrote magazine stories and essays that attracted little attention; the public was even apathetic toward his *Twice-Told Tales* (1837), which inspired sincere praise from Longfellow. In 1841 in Salem he published *Grandfather's Chair,* a book of New England historical tales for children. Then, after an experiment with the community life at Brook Farm he moved to Concord, settling with his wife Sophie Peabody in the Old Manse that had been Emerson's home. There he wrote a new series of *Grandfather's Chair* and *Twice-Told Tales* in addition to two volumes of *Mosses from an Old Manse* including some of the best stories and sketches in American literature.

While working in the customhouse at Salem Hawthorne began a full-length novel, which was published under the name *The*

Scarlet Letter (1850). This tale, in which the Puritans of New England figure prominently, established his reputation. Thereafter the public approved and bought his work. He wrote three other romances, *The House of the Seven Gables* (1851), *The Blithedale Romance* (1852) and *The Marble Faun* (1860), in addition to *The Snow Image, and Other Twice-Told Tales*, the juvenile *Wonder Book*, a life of Franklin Pierce (Hawthorne's friend and classmate), notebooks on his European travels and an impression of England entitled *Our Old Home*. He spent 7 years in Europe (1853–60), 5 in the consulate at Liverpool and 2 in France and Italy.

Hay, John [Milton] (1838–1905), American diplomat, born in Salem, Ind. He was graduated from Brown University in 1858 and in 1861 was admitted to practice in the supreme court of Illinois. Instead of following his profession he accompanied Lincoln to Washington and became the President's assistant private secretary. Hay also saw active service in the Civil War and reached the brevet rank of colonel. After a varied career as legation secretary, editor of the New York *Tribune*, assistant secretary of state and writer, he was appointed ambassador to Great Britain in 1897. In 1898 he began his career as secretary of state under McKinley and Roosevelt. Hay's greatest triumph was his success in securing the open-door policy in China. He also negotiated the Hay-Pauncefote Treaty, making possible the Panama Canal, helped to re-establish an arbitration court at The Hague and fathered numerous other treaties. His *Abraham Lincoln; a History* (written with John G. Nicolay) is a monumental work in 10 volumes.

Haydn, [Franz] Joseph (1732–1809), Austrian composer, born in Rohrau. He studied music and supported himself until Metastasio introduced him to wealthy patrons. In 1758 he obtained a position as musical director with a Viennese nobleman and 2 years later became chapelmaster to Prince Anton Esterhazy. During 30 years of service with the prince and his successor, Haydn composed a great variety of orchestral works, operas and church music, besides directing the family orchestra and choir. This period was memorable, too, for a close friendship with Mozart, the association being mutually helpful. During the London concert season of 1791–92 (under Salomon), six of Haydn's famous *Twelve Grand Symphonies* were produced and were received with great enthusiasm, as were a second six played in London in 1794–95. In 1798 the oratorio *The Creation* was brought out in Vienna and was followed in 1801 by *The Seasons*, one of the composer's last works. Though not the originator of the symphony, Haydn was its first great master; his development of orchestral music was of value to Beethoven and later composers. His output was enormous—his symphonies, string quartets, concert overtures, concertos, sonatas, sacred pieces and other compositions numbering many hundreds.



Courtesy Scott Stamp & Coin Company

Franz Joseph Haydn

Enlarged from an Austrian stamp issued in 1922. It is one of a series in honor of Austrian musicians. Other stamps in the series show portraits of Schubert, Mozart, Beethoven, Bruckner, Johann Strauss and Hugo Wolf

Hayes, Helen (Helen Hayes Brown; 1902–), American actress, native of Washington, D. C. She was graduated from the Sacred Heart Academy in Washington in 1917. In private life she became Mrs. Charles MacArthur. Her first appearance on the stage was at the age of 6. She was a member of the Columbia Players for four seasons, later toured with Lew Fields and John Drew and eventually became a star. Her gift for portraying fine shades of pathos and comedy was brought out in such plays as *Pollyanna, Penrod, Dear Brutus, Coquette, What Every Woman Knows, The Good Fairy* and *Mary of Scotland*. She also played in the motion pictures *The Sin of Madelon Claudet, Arrowsmith* and *A Farewell to Arms*. For her artistry in *The Sin of Madelon Claudet* she was acclaimed the leading film actress of 1932. The stage claimed her again in 1936 for *Victoria Regina*.

Hayes, Patrick Joseph, Cardinal (1867–1938), American prelate, born in New York city and educated at Manhattan College and at the Catholic University of America, in Washington, D.C. Ordained a priest in 1892, he became chancellor of New York in 1903 and was president of the Cathedral College, 1903–14. In 1914 he was consecrated auxiliary bishop of New York. In 1915 he became rector of St. Stephen's Church. During the World War Bishop Hayes was Catholic chaplain bishop for the United States army and navy. He was elevated to the archbishopric of New York in 1919 and in 1924 was created cardinal.

Hayes, Rutherford Birchard (1822–93), 19th President of the United States, born in Delaware, Ohio, and graduated from Kenyon College (Gambier, Ohio) in 1842 at the head of his class. He prepared himself for law by 2-years' study in a private office in Columbus followed by 2 years at Harvard Law School, from which he was graduated in 1845. He practiced in several Ohio cities and became well known in his profession. He served as city solicitor of Cincinnati, 1858–61. At the outbreak of the Civil War he volunteered and became a major of the 23d Ohio Regiment. He fought with conspicuous bravery and was breveted major general in 1865. His home district rewarded him by sending him to Congress; at the end of his term, 1867, the Ohio Republicans elected him governor of the state, re-electing him in 1869 and again in 1875. In 1876 he received the Republican nomination for the Presidency on the seventh ballot. He was a compromise candidate, representing the choice of the opponents of James G. Blaine. His advocacy of sound money drew him into the national limelight. The Democrats nominated Samuel J. Tilden, and the vote was exceedingly close, being complicated by disputes over the electoral votes of Louisiana, Florida and South Carolina. Finally, after months of intense partisan feeling, an electoral commission decided that Hayes had won by an electoral vote of 185 to 184. During his term he made great efforts for civil-service reform. The withdrawal of Federal troops from the South and the resumption of specie payments were sound constructive movements of his administration that laid the foundations of national unity and prosperity.

Hayne, Robert Young (1791–1839), American statesman, born in St. Paul's Parish, S.C. He became a lawyer in Charleston and rose to prominence in local politics. Hayne entered the national Senate in 1823 as a states' rights Democrat. In 1830 he engaged in a debate with Daniel Webster that became celebrated as a brilliant exposition of two theories of government. Webster's speech denying the right of a state to nullify a Federal law is one of the great examples of American oratory, but it did not change his opponent's convictions. Hayne was governor of South Carolina, 1832–34; mayor of Charleston, 1835–37; and thereafter a railroad executive.

Haynes, Elwood (1857–1925), American inventor, born in Portland, Ind., and graduated in 1881 from Worcester Polytechnic Institute. He later took special courses in science at Johns Hopkins. In 1886, after teaching science in a normal school, he began a business career. He originated the first successful gasoline automobile made in the United States. Built in 1893, it was equipped with a one-horse-power marine engine and had a speed of 6 or 7 miles an hour. This car is now in the Smithsonian Institution. In 1898 Haynes organized an automobile factory at Kokomo, Ind. Besides inventing the "horseless carriage," he discovered stellite and other steel alloys.

Hays, Will H. (1879–), American lawyer, born in Sullivan, Ind., educated at Wabash College (Ind.). In 1900, the year of his graduation, he was admitted to the bar, began practice in Sullivan and within the next few years gained much prominence in both local and national politics, becoming chairman of the national Republican committee in 1918. In March, 1921, President Harding appointed him postmaster general; a year later Hays resigned to become president of a new organization of film executives, the Motion Picture Producers and Distributors of America. This position made him practically a censor of motion pictures and czar of the organized industry.

Hazlitt, William (1778–1830), English writer, born in Maidstone, Kent. He studied for the ministry but forsook the Church for art. He lived in Paris and painted portraits, but becoming friendly with Coleridge he soon turned to writing and settled in London. There he worked for the *Edinburgh Review, The London Magazine* and other publications. Hazlitt achieved fame as a literary critic and an essayist whose range of interests included nearly all phases of life. His penetrating comments on English writers, especially his work on the Elizabethan drama, have stood the test of time; his style was clear and graceful, vigorous and stimulating. His best essays, published as *The Round Table*, appeared originally in the *Examiner*, owned by his friend Leigh Hunt.

Hearn, Lafcadio (1850–1904), American author, born of a Greek mother and an Irish father on Leucadia, one of the Ionian Islands. He was educated in Europe. At 19 Hearn emigrated to the United States and worked on newspapers in Cincinnati, New Orleans and New York. His newspaper sketches were so unusual as to attract wide attention. He went to Japan in 1891, intending to become a newspaper correspondent, but instead he obtained a professorship of English in the University of Tokyo. Charmed by Japanese life, he married a native woman and became a naturalized citizen and a Buddhist. His books include *Glimpses of Unfamiliar Japan, Out of the East, Japan: an Attempt at Interpretation* and *Japanese Fairy Tales*.

Hearst, William Randolph (1863–), American publisher, born in San Francisco, studied at Harvard. His father gave him charge of the San Francisco *Examiner*, and after experience with that paper he went to New York and bought the *Morning Journal*, whose circulation he built up by resorting to sensational journalism. His success led him to form a nation-wide chain of newspapers. He acquired a number of magazines, including *Good Housekeeping, Hearst's International-Cosmopolitan, Harper's Bazaar, Pictorial Review* and *Motor*.

Hearst was always ambitious for public office and was a member of the House of Representatives from 1903 to 1907. He was defeated for mayor of New York in 1905 and 1909 and for governor of New York in 1906.

He dictated the editorial policies of his papers, which did much to bring about the Spanish-American War. They opposed the entrance of the United States into the World War, fought against The League of Nations and adopted a nationalistic attitude in post-war years.

Heber, Reginald (1783–1826), English prelate, born in Malpas, Cheshire, and educated at Brasenose College, Oxford, where his first poem *Palestine* won a prize in 1803. After regular promotions, Heber was consecrated bishop of Calcutta in 1822 and spent the rest of his life among the people of India. He wrote a number of hymns, among them the well-known *Holy, Holy, Holy; From Greenland's Icy Mountains;* and *The Son of God Goes Forth to War*. His prose writings include *A Life of Jeremy Taylor, Sermons* and *Journey through India*.

Hedin, Sven Anders (1865–), Swedish traveler, native of Stockholm, educated in Sweden and Germany. In 1899 in *Through Asia* he published an account of his travels in East Turkestan, across the Pamir Plateau, in northern Tibet, China, Mongolia and Siberia, covering the years 1894–97. During his next expedition, which took him to the Gobi Desert and Tibet, he attempted unsuccessfully to enter the sacred city of Lhasa. A later trip to Tibet (1906–08) resulted in the compilation of the first detail map of that part of Asia. In 1914, at the request of the German kaiser, Hedin visited Belgium to study the effects of the German invasion. In 1932 he published *Across the Gobi Desert*, a description of his travels, 1927–31, and in 1934 *A Conquest of Tibet*.

HEGEL, GEORG WILHELM FRIEDRICH (1770–1831), German philosopher, born in

Stuttgart, educated at the University of Tübingen. In 1800 he settled at Jena, where he became a professor. A few years later, his reputation as a philosopher having been made, he was chosen professor of philosophy at Heidelberg. In 1818 he went to Berlin University. At Jena he became a disciple of Schelling, and the two conducted a philosophical journal (1802–03). Eventually they adopted widely divergent views. Hegel was one of the foremost exponents of idealism. His system has three divisions—logic, the philosophy of nature and mental philosophy. Much of his work is accessible in English translations, including *Logic* and *Philosophy of Mind*, *Philosophy of Right*, *Philosophy of Fine Art*, *Philosophy of History*, *Philosophy of Religion* and *History of Philosophy*.

Heifetz, Jascha (1901–) Russian-Jewish violinist, native of Vilna. He completed a 3-year course at the Royal School of Music in Vilna when 8 years old. He then became a pupil of Professor Leopold Auer in St. Petersburg (now Leningrad). Heifetz began public concert work at the age of 5 and received an overwhelming ovation on the occasion of his Berlin debut in 1912. His family fled with him to the United States to escape the Russian Revolution of 1917. He later made regular tours of the principal countries of the world. His playing is considered remarkable for perfect technique, beauty of tone and interpretation.

Heine, Heinrich (1797–1856), German poet and author, born in Düsseldorf of Jewish parentage. He studied law at Bonn and then took up literature. Some of his finest lyrics were published in Berlin in 1822, and in 1823 he published poems inspired by a visit to the North Sea. A trip to the Harz Mountains was followed in 1826 by his *Harzreise*, as delightful in its style as in its humor. This was the first of the sketches incorporated in *Pictures of Travel*, the third volume of which appeared in 1830. Meanwhile Heine's collected lyrics were published in 1827 under the title *Buch der Lieder* (Book of Songs). Though his reputation as a writer was established, his admiration for Napoleon and satirical comments on the Prussian government made his presence in Germany undesired, and in 1831 he went to Paris, thenceforth his home. He became a complete invalid but continued to write, and his *Romanzero* (1851) contains some of his finest lyrical poetry. He wrote on French art and literature and some fine short stories.

Heliogabalus (Varius Avitus Bassianus; *c.* 205–22), Roman Emperor, 218–22. He was elected to the throne by his troops upon the death of his cousin Caracalla. In Rome he tried to establish the Syrian sun god Elagabalus as the chief deity. His folly and scandalous life led to his death in a minor rebellion.

HELMHOLTZ, VON, HERMANN LUDWIG FERDINAND (1821–94), German scientist, born at Potsdam. Becoming a doctor, in 1849 he was made professor of physiology at Königsberg; in 1855 he moved to Bonn and in 1858 to Heidelberg. In 1871 he was appointed professor of physics at Berlin and in 1887 became director of the Physico-Technical Institute at Charlottenburg. As a physicist he developed the idea of the conservation of energy. He was responsible for the invention of the ophthalmoscope. He wrote valuable papers on optics and acoustics, and his researches into the problem of sight are of the highest importance. Of his many publications the best known are: *The Conservation of Force* (1847), *Physiological Optics* (1856–66), *Popular Lectures on Scientific Subjects* (1873 and 1881) and *Sensation of Tone as a Physiological Basis for the History of Music* (London, 1875).

Hemingway, Ernest (1898–), American novelist, born at Oak Park, Ill., educated in the public schools. He made a world-wide reputation with three books dealing with postwar life in Europe: *The Sun Also Rises*, *Men Without Women* and *A Farewell to Arms*. They are highly realistic in outlook, written in a vigorous, clipped style that has been widely imitated. Later books are *Death in the Afternoon*, about bullfighting in Spain, and *Green Hills of Africa*, the account of a hunting trip in Africa.

Henderson, Arthur (1863–1935), British labor leader and statesman, born in Glasgow. In his youth he was an iron molder but became mayor of Darlington and a magistrate. He was elected to Parliament in 1903 and led the Labour Party, 1908–10 and 1914–17. He was important in the coalition ministry of the war years and became home secretary (1924) and foreign secretary (1929–31) when Ramsay McDonald was prime minister. He received the Nobel Peace Prize in 1934 for his work as chairman of the League of Nations Disarmament Conference.

Hendricks, Thomas Andrews (1819–85), U. S. Vice-President, born on a farm near Zanesville, Ohio. He was graduated in 1841 from South Hanover College, Ind., and was admitted to the Indiana bar in 1843. He soon became prominent in local Democratic politics, was elected to the lower house of the Indiana legislature in 1848; represented the Indianapolis district in Congress, 1851–55; and was commissioner of the U.S. land office, 1855–59. As U.S. Senator from Indiana (1863–69) he was a critic of Lincoln's policies but supported Johnson on reconstruction. He was elected governor of Indiana in 1872 and was candidate for the Vice-Presidency on the ticket with Samuel J. Tilden in 1876. Hendricks was renominated and elected Vice-President in 1884 as the running mate of Cleveland; he died 9 months after his inauguration.

Heney, Francis Joseph (1859–1937), American lawyer, born in Lima, N. Y. He was admitted to the bar in 1883 and rose to prominence in his profession in Arizona. He settled in San Francisco in 1895, where he achieved a national reputation for his prosecution of famous criminal cases, most noteworthy of which was his conviction of Mayor Schmitz and Abraham Ruef for municipal corruption in 1908. During this trial he was shot down and wounded in the open court. In 1917 he served as special attorney for the Federal Trade Commission in an investigation of the high cost of living. In 1924 he was counsel for the Senate committee investigating the Internal Revenue Bureau.

Henley, William Ernest (1849–1903), English writer, born in Gloucester. In his early twenties he became a close friend of Robert Louis Stevenson, and the two wrote four plays together: *Deacon Brodie*, *Beau Austin*, *Robert Macaire* and *Admiral Guinea*. Beginning in 1877 he edited a number of journals that he used as vehicles for criticism of art, literature and life. His poetry has the force and originality of his prose but also possesses at times a note of high lyric beauty. His most famous single poem, "Invictus," clearly expresses his unconquerable will, with its ringing "I am the captain of my soul."

Hennepin, Louis (*c.* 1640–*c.* 1701), Flemish Franciscan missionary, born in Ath, Belgium. He joined the Franciscans, preached in Belgium and Northern France and in 1675 went to Canada with La Salle. He began his missionary work at Fort Frontenac and in 1678 accompanied La Salle on an exploring trip westward. By way of Niagara Falls, the Great Lakes and connecting rivers, the explorers reached the Illinois, where they built Fort Crèvecoeur. Early in 1680 Hennepin left the party, which proceeded down the Illinois to its mouth, and followed the Mississippi northward to the falls that Hennepin named for St. Anthony. He was held captive by the Sioux Indians for 3 months, and after his rescue by a party of Frenchmen he returned to France. His narratives of his travels, though marred by exaggerations, contain valuable source material.

Henry I (1068–1135), King of England, youngest son of William the Conqueror, born in Yorkshire. Because of his learning he was called *Beauclerc* (Good Scholar). On the death of his brother William Rufus in 1100, he claimed the throne and was crowned at Westminster. He reigned for 35 years and is regarded as the developer of the English system of justice. Henry's brother Robert, Duke of Normandy, disputed his claim to the throne, and war broke out between the brothers in 1101. In 1106, after a temporary truce, Henry took Robert prisoner and acquired Normandy, but this he retained at the cost of a war with Louis VI of France. Henry's reign was notable in that it witnessed a drawing together of the Saxon and Norman elements, a development of national sentiment and a strengthening of the royal power at the expense of the great nobles. Henry was succeeded by Stephen of Blois, though he had designated Matilda, his daughter, as his successor.

Henry II (1133–89), King of England, first of the Plantagenet line, son of Geoffrey Plantagenet, Count of Anjou, and of Matilda, daughter of Henry I of England. On the death of Henry I (1135) the crown was seized by his nephew Stephen, a grandson of William the Conqueror. Years of civil war followed; not until 1153 was it finally decided that Stephen should retain the crown and be succeeded by Prince Henry. When Henry II became king, he was the possessor of a vast French domain, acquired by inheritance and through his marriage to Eleanor, divorced wife of Louis VII of France. His reign of 35 years was notable. He strengthened the royal power by curbing the great nobles who had made themselves practically independent; he reorganized the judicial and financial systems and built roads and embankments. A struggle with the clergy over the supremacy of the royal power led to the assassination of Archbishop Thomas à Becket and to the thwarting of Henry's plans for making the clergy amenable to civil law. In 1173 he had to face a rebellion in which his eldest son Henry took part. His other three sons, Richard I, John and Geoffrey, at one time or another rebelled against him. He brought Ireland under the rule of England. Richard I succeeded him.

Henry III (1207–72), King of England, eldest son of King John. He succeeded his father in 1216, but affairs were directed by regents until the prince was declared of age in 1227. His submission to foreign courtiers and the numerous relatives of his wife, Eleanor of Provence, as well as his weak attitude toward ecclesiastical tyranny and the drains on the treasury for military projects, made Henry extremely unpopular, and civil war broke out between the king and his barons, headed by Simon de Montfort, Earl of Leicester. In 1264 Henry was defeated at Lewes and imprisoned. In 1265 de Montfort summoned a Parliament in which the commoners were represented. His dictatorship was short-lived, for in the same year he was defeated and killed at Evesham by the forces of Prince Edward, who ruled thereafter in his father's stead.

Henry IV (1367–1413), King of England, eldest son of John of Gaunt, Duke of Lancaster, ascended the throne in 1399 on the enforced abdication of his cousin Richard II. In the uprising that led to this event Henry, then Earl of Derby, took a leading part. Since Parliament authorized the abdication and the new king's claim to the crown, Henry may be considered England's first constitutional monarch. He was also the first of the Lancastrian line. He vigorously suppressed rebellions of the nobles and revolts of the Welsh and Scots and ordered the persecution of the Lollards or "Poor Priests." Henry befriended Chaucer, England's first great poet, and other literary men. Shakespeare wrote two plays about Henry IV.

Henry V (1387–1422), King of England, eldest son and successor of Henry IV. He was made Prince of Wales in 1399 and became king in 1413. After suppressing a rising of the Lollards he set in motion a far-reaching design for the conquest of France and the acquisition of the French crown, which he claimed through descent from his great-grandfather Edward III. This renewal of the Hundred Years' War was marked by the capture of Harfleur (1415) and in the same year by the great victory of the English at Agincourt. After conquering the whole of Normandy Henry forced the French to sign the Treaty of Troyes (1420), by which he was recognized as the successor of Charles VI of France and regent during his lifetime. Catherine of Valois, a daughter of Charles VI became his wife. Henry died within 2 years and was succeeded by his son Henry VI.

Henry VI (1421–71), proclaimed king of England on the day of his father's death, when he was an infant of 9 months. A few weeks later he was proclaimed king of France, his rights in that country being entrusted to the care of his uncle, the duke of Beaufort and Gloucester. In 1429 the French united against the English under the inspiration of Joan of Arc, crowned Charles VII at Reims and refused to acknowledge any other king. Henry was amiable and pious but from 1453 was subject to attacks of insanity. Richard Duke of York, was made protector, but the faction fights that led to the War of the Roses had begun; these were struggles between the rival houses of Lancaster and York, and they led to civil war in 1455. In 1460 Henry was made a prisoner. York then claimed the throne, but it was decided that Henry should reign during his lifetime. The war was quickly renewed. York was killed at Wakefield, and his son made himself king in 1461 as Edward IV. In 1470 Henry, now an imbecile, was restored to the throne through an uprising under Warwick. Edward returned from exile, regained the crown in 1471 by his victories over the Lancastrians and then put the Prince of Wales and later his father Henry VI to death.

Henry VII (1457–1509), King of England, first of the Tudor line, succeeded Richard III, the last Yorkist king, in 1485. He was the son of Edmund Tudor, Earl of Richmond, and Margaret, granddaughter of John of Gaunt. Many of the Yorkist nobles had been horrified by the crimes of Richard III, and

Henry collected an army, gained their support and defeated him on the field of Bosworth. Through a descendant of John, Duke of Lancaster, Henry was crowned as the first Tudor king; he then made an end of rivalry by marrying Elizabeth of York, daughter of Edward IV.

Henry maintained the royal power at the expense of the nobles and was popular with the middle classes because he kept the country at peace and furthered prosperity by promoting commerce. John Cabot, in 1497, discovered the continent of North America, laying the basis of England's claim to Canada. Henry's eldest daughter Margaret became the wife of James IV of Scotland; his eldest son, Arthur, married Catherine of Aragon, daughter of Ferdinand and Isabella of Spain. Arthur having died in 1502, Henry was succeeded by his second son, Henry VIII.

Henry VIII (1491–1547), King of England. He became king in April 1509 and in June was crowned with his bride, Catherine of Aragon, his brother Arthur's widow, whom he had just married. Early in his reign he was drawn into the rivalry between two powerful monarchs when Charles V of the Holy Roman Empire and Francis I of France both sought his aid, but his interference had little effect on the outcome of the wars. Affairs of state were largely in the hands of Henry's minister, Cardinal Wolsey, though the king was the real power. When Wolsey failed to secure from the Pope an annulment of Henry's marriage to Catherine, he was stripped of his honors and arrested for treason. Henry later secured a divorce and in 1533 secretly married Anne Boleyn, a lady in waiting. She was charged with crimes against the king and beheaded in 1536, and Henry married Jane Seymour. Her death in 1537 left him free to marry the German princess, Anne of Cleves (1540), the choice of Thomas Cromwell who had risen to royal favor.

Anne did not please Henry, and he had the marriage annulled; this led to the execution of Cromwell. Henry's fifth wife, Catherine Howard, was beheaded for unfaithfulness, and in 1543 he married Catherine Parr, who outlived him. Henry's defiance of papal authority had its outcome in the fall of Wolsey and the separation of the Church of England from the Roman Catholic body. Acts of Parliament made the English sovereign supreme head of the Church of England. Henry was succeeded by Edward VI, his son by Jane Seymour. Two of his daughters became English queens—Mary, whose mother was Catherine of Aragon, and Elizabeth, daughter of Anne Boleyn.

Henry I (*c.* 1005–60), King of France, a grandson of Hugh Capet. He ruled from 1031, spending his time and energy fighting William, Duke of Normandy, and others.

Henry II (1519–59), King of France, 2d son of Francis I, succeeded his father in 1547. In two wars with England, beginning in 1550 and in 1557, France recovered all possessions still held by the English, the last stronghold, Calais, being taken in 1558. By an alliance with the Germans Henry secured possession of Toul, Verdun and Metz, but he was defeated in a war with Philip II of Spain and in 1559 signed the Treaty of Cateau-Cambresis. Henry II is known as the husband of Catherine de Médicis and the father of three kings: Francis II, Charles IX and Henry III. His daughter married Philip of Spain and later Henry IV of France.

Henry III (1551–89), King of France, 3d son of Henry II. He succeeded his brother Charles IX in 1574. His reign was marked by a continuation of the religious wars between the Catholics and Huguenots, which began in his father's reign. Henry had a powerful enemy in the duke of Guise, head of the Holy League, a Catholic organization secretly working to secure the reversion of the crown to the Guises. In 1588 Guise was killed by the king's guards. This assassination and that of Guise's brother, the Cardinal of Lorraine, aroused the League to fury, and Henry had to seek the protection of his cousin, Henry of Navarre. In 1589 the two Henrys led a Huguenot army to Paris; but before the city could surrender, Henry III was slain by a young Dominican. Henry of Navarre succeeded to the throne as Henry IV.

Henry IV (1553–1610), King of France, successor of Henry III, the son of Antoine de Bourbon. He became king of Navarre (an independent kingdom north of the Pyrenees) by virtue of his marriage to the princess royal. Henry succeeded to the crown of Navarre in 1572. The marriage of the Huguenot Henry and Margaret of Valois, sister of Charles IX, in Paris, in August 1572 was followed by the Massacre of St. Bartholomew, but Henry's life was spared when he promised to become a Roman Catholic. In 1576 he escaped from Paris and became a leader of the Huguenot army that besieged Paris in 1589. On the assassination of Henry III he became the first Bourbon king of France but was unable to assume the royal power until he publicly recanted his Protestantism in 1593. Even his brilliant victories over the Catholic forces at Arques (1589) and Ivry (1590) brought him no advantage. In 1598 Henry signed the Edict of Nantes, granting religious liberty of the Huguenots, and then turned his energies to restoring peace and prosperity to the kingdom. He married Marie de' Medici in 1600. In 1610 he was assassinated, as he planned war with Spain.

Henry III (1017–56), Holy Roman Emperor, son of Conrad II. He succeeded his father as king of Germany in 1039. During the early years of his reign he consolidated his kingdom and extended his authority as a feudal lord over portions of Poland, Bohemia, Hungary and Italy. In 1046 Henry was summoned to Italy to settle the conflicting claims of Benedict IX, Gregory VI and Sylvester III, all claimants to the papal chair. He appointed a new Pope, Clement II, and on Christmas Day was crowned emperor. Henry continued to nominate the papal candidates and tried to check ecclesiastical abuses.

Henry IV (1050–1106), Holy Roman Emperor, son of Henry III. He succeeded his father as king of Germany, Italy and Burgundy at the age of 6. His mother, who acted as regent, was an incompetent ruler; when Henry assumed control of affairs in 1065, he found himself at the head of a greatly weakened and disordered state. It was 10 years before he established his authority, and then he entered upon a struggle with Pope Gregory VII. In 1075 Gregory forbade all prelates to accept appointments from secular princes, thus striking a blow at Henry's power and prestige. Henry called a council at Worms in 1076 and had the Pope deposed, but an edict of excommunication forced him to outward submission in 1077. Civil war in Germany followed, and in 1084 Henry captured Rome, placed Clement III on the papal throne and was crowned emperor. Though Gregory died in exile, Henry was forced out of Rome by Robert Guiscard, and in 1105 he was compelled to abdicate, his own son having turned against him. While preparing to reinstate himself, he died.

Henry the Lion (1129–95) Duke of Saxony and Bavaria. On assuming control of his domain in 1146 he began war against Emperor Conrad III, who had seized Bavaria from Henry's father. The young duke was unsuccessful, but Bavaria was restored to him by Conrad's successor, Emperor Frederick Barbarossa. In 1176 Henry refused to support the emperor's campaign against the cities of Lombardy in Italy, by whom Frederick was defeated at Legnano. The emperor then banished Henry in 1181. A reconciliation with the Hohenstaufens was effected in the reign of the next emperor, Henry VI.

Henry the Navigator (1394–1460), Portuguese prince who won his surname through his promotion of exploration and discovery. He was the 5th son of John I. While fighting the Moors in the little-known continent of Africa he became interested in the geography of this new land and soon began to send out exploring expeditions from Sagres, a seaport at the southwestern end of Portugal. There he established an observatory and a school for navigators. Under his inspiration Portuguese seamen reached the Madeira Islands in 1420, Cape Bojador in 1434, Cape Blanco in 1441, Cape Verde in 1445 and the mouth of the Gambia in 1455. The rounding of the Cape of Good Hope by Vasco da Gama (1497) and the development of a Portuguese Empire in India and Brazil may be ascribed to Prince Henry's activities.

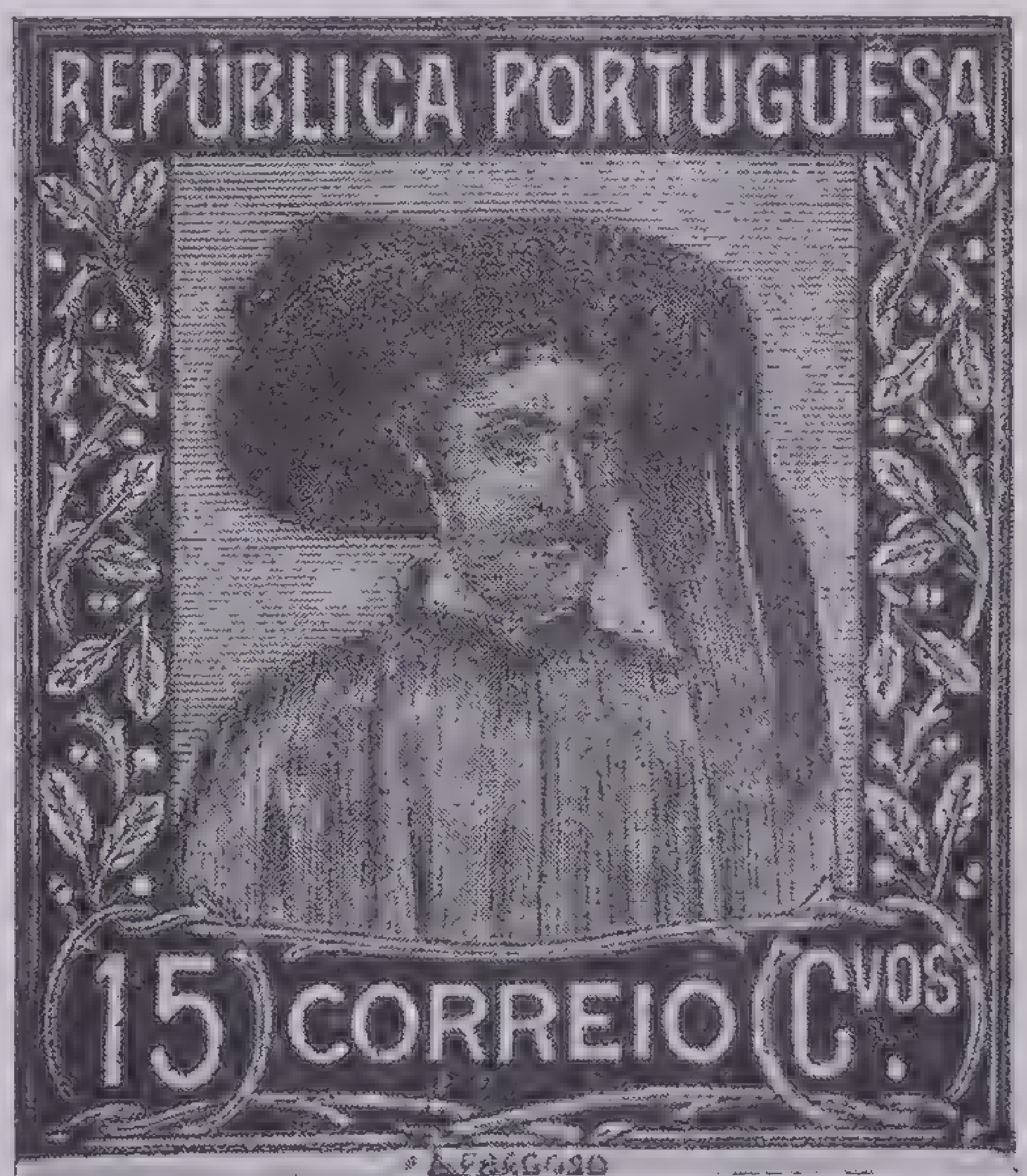
Henry, Joseph (1797–1898), American physicist, born in Albany, N.Y., of Scottish ancestry. He went to a local school but took little interest in study. At the age of 16, when he was working at watch making, he read a book on natural history that made him ambitious, and he saved enough money to carry him through a course at the Albany Academy. He continued studies in chemistry, anatomy and philology, and in 1826 he became instructor in mathematics and natural philosophy at the academy. In 1832 he was called to the chair of natural philosophy at Princeton.

Henry devised the electro-magnet (in 1829) now used in practically its original form in every electrical dynamo or motor. His discoveries in electromagnetism prepared the way for the telegraph Morse invented.

His discovery of a singular form of electrical induction, announced in 1832, prompted the International Congress of Electricians to give his name to the standard unit of inductive resistance. The researches he made in induction enabled him to transmit electric force without wires through the walls of a building, and he magnetized a needle from a lightning flash 8 miles away. These experiments were made several years before the discovery of the action of ether waves of the type used in radio telegraphy and telephony today. Henry's researches in meteorology and acoustics helped to create the U.S. Weather Bureau. In 1846 he became first president of the newly formed Smithsonian Institution, which he made into the first great agency to distribute and exchange scientific papers. He established the National Lighthouse Board and was its president until his death. In 1880 a *Memorial* of Henry was published by order of Congress.

Henry, O., see *Porter, William Sydney.*

Henry, Patrick (1736–99), American statesman of the Revolutionary period, born in Hanover County, Va., of Scottish and Welsh descent. After failing as a farmer and merchant, he began the practice of law in 1760. He had completed a course of reading lasting only 6 weeks but received a license on condition that he continue his studies. In 1763 he achieved fame by a brilliant speech as counsel for the defendants in the Parsons' Cause, a suit involving ministers' salaries. His eloquence made him a success in his profession and as a member of the legislature of Virginia. He advocated taking up the struggle against Great Britain, and in the Virginia Provincial Convention of 1775 he made the speech containing the famous declaration, "I know not what course others may take, but as for me, give me liberty or give me death." Carried away by his oratory, the assembly voted to organize the Virginia militia. Henry was governor of Virginia in 1776–79, then served in the state legislature until 1784 and was again governor (1784–86). He declined further public office until 1799, when he was elected to the House of Delegates, but he died before he could take his seat.



Courtesy Scott Stamp & Coin Company

Henry the Navigator

From a Portuguese stamp issued 1935–36

Henty, George Alfred (1832–1902), English writer, best known as the author of historical books for young people. He was graduated from Cambridge and served in the department of supply in the Crimean War. He developed his talents as a writer after 1866 through his work as war correspondent for the London *Standard*. In this capacity he spent years in adventurous travel. Henry's earlier stories were conventional novels. In middle life he began a series of juvenile historical tales that had an immense sale. Among them are *In the Irish Brigade*, *Out with Garibaldi*, *With Roberts to Pretoria*, *With Clive in India* and *With Kitchener in the Soudan*.

Heraclitus (6th century B.C.), Greek philosopher, born at Ephesus. Only fragments of his work *On Nature* have been preserved, but the records of Plato and Aristotle tell more about his teaching. He taught that all things change; that nature and human affairs never stand still. He said, "You cannot descend into the same stream twice." Heraclitus formed his opinion through thought and philosophy, but the discoveries of modern experimental science confirm his views.

Heraclius (*c.* 575–641), Byzantine Emperor, born in Cappadocia. He was occupied with many wars during his reign. In 620 he concluded peace with the Avars and in 622 began a campaign against the Persians, who were totally defeated by 628. Later in his reign he turned against the Arabs, but there he was less successful, and much of the Empire in the west had been lost when he died.

Herbart, Johann Friedrich (1776–1841), German philosopher, born in Oldenburg. As a student at the University of Jena he came under the influence of Fichte but subsequently worked out an opposing system of philosophy. His interest in education was aroused by contacts with Pestalozzi. He made original contributions to both fields. He held the chair of philosophy at Göttingen, then at Königsberg and again at Göttingen, where he remained after 1833. Herbart originated the principle of apperception as applied to education and taught that one acquires knowledge by correlating new ideas with those already known and understood. He emphasized the importance of arousing the pupil's interest, and he insisted that morality or character training was the paramount end of all education. His philosophy was based on the existence of *reals*, corresponding to the atoms of Democritus. Just as the reactions between these primary elements give rise to the physical universe, so are men's ideas called forth by the conflict between the *reals* of the mental world.

Herbert, George (1593–1633), English poet. His poems are in a volume called *The Temple*, first published in 1633. Some of the verses are religious poetry at its best. He also wrote a manual, *A Priest to the Temple*, while he was rector at Bemerton, Wiltshire.

Herbert, Victor (1859–1924), Irish-American composer, born in Dublin. He studied in Germany, played the cello in leading European cities and in 1886 became solo cellist at the Metropolitan Opera House in New York. Later he played under Anton Seidl and Theodore Thomas, was assistant conductor of the Worcester (Mass.) Festival in 1889–91 and in 1893 succeeded Patrick S. Gilmore as bandmaster for the 22d Regiment. Herbert conducted the Pittsburgh Symphony Orchestra, 1889–1904; he thereafter acted as guest conductor for the New York Philharmonic and other organizations. His many successful light operas include *Babes in Toyland, Mademoiselle Modiste, Naughty Marietta, Angel Face* and *The Dream Girl.* He also composed orchestral works and the grand operas *Natoma* and *Madeleine.*

Herder, von, Johann Gottfried (1744–1803), German writer, born in Mohrungen, East Prussia. He attended the University of Königsberg, supporting himself by tutoring, and taught in the cathedral school at Riga, 1764–69. He was pastor at Bückeburg, 1771–76, and after 1776 acted as court chaplain and superintendent of the church district at Weimar, a position he secured through the influence of Goethe. Herder first made a reputation as a critic but subsequently turned to philosophy. In his greatest work, *Ideas on the History of Mankind,* he put forward a theory of historical evolution. He translated folk songs and also wrote poems.

Hergesheimer, Joseph (1880–), American novelist, native of Philadelphia, where he attended a Quaker school and the Academy of the Fine Arts. He began his literary career by writing stories for the *Saturday Evening Post* and was encouraged by the editor of that periodical to attempt full-length romances. After his first novel *The Lay Anthony* (1914) was published, he produced a succession of popular books. His other works include *Mountain Blood, Black Pennys, Java Head, Linda Condon, Tampico, The Bright Shawl* and *The Party Dress.*

Herod, the name of a line of rulers of Palestine at the time of Christ. The founder of the family fortune was Antipater (d. 43 B. C.). His son Herod the Great (*c.* 62–4 B. C.) gave the family its name. He was a friend of Mark Antony, who made him king of Judea. Herod tried to mollify the Jews by showing them special favor—Roman governors were not popular in Judea. Herod married 10 times and executed several of his own children for plotting against him.

It was Herod the Great who was ruling at the time of Christ's birth and who ordered the slaughter of the innocents. He divided his kingdom among his three sons. Herod Antipas was ruler of Galilee and Peraea at the time of Jesus' death. He executed John the Baptist.

The line of Herods continued until about 100 A.D. They were not good or capable rulers and are blamed for the continual unrest in Palestine at the beginning of the Christian era.

Herodes Atticus, see *Atticus Herodes.*

Herodotus (*c.* 484–425 B.C.), Greek historian, called the father of history, born in Halicarnassus, Asia Minor, of a prominent family. He visited the shores of the Hellespont and journeyed in Scythia, Syria, Palestine, Babylon, Egypt and other parts of the then known world, acquiring information and gaining firsthand impressions that were of great value to him as a writer of historical narrative. He first visited Athens in 447 B.C. It is said that in 446 B.C. the Athenian assembly decreed a reward to him for his *History*, which he had read publicly; and that he gave public readings at Athens and other cities and also before the assembled Greeks at the great Olympian festival. About 443 B.C. Herodotus went to Thurii, a colony newly founded by the Athenians near the site of the former Sybaris, where he is said to have passed the remainder of his life perfecting his *History.* The abruptness of its close and occasional traces of incompleteness indicate that it was not entirely finished at his death.

The main subject of the *History* is the Persian war of invasion, yet the author diverges from it to introduce his historical, geographical and antiquarian knowledge. In Egypt the priests took advantage of his ignorance of the language to magnify the antiquity of their nation and to modify inglorious portions of their history. His accounts of Babylon are correct in outline, though somewhat lacking in detail and precision. His Persian history is based mainly on authentic national records, diversified (especially in the earlier part) by tales from romantic chroniclers. His chief defect as a historian is an undue love of the marvelous, but Herodotus is truthful and accurate whenever he speaks from his own observation. The simple beauty of his style, the grandeur of his plan and the charm of his narrative have been the admiration of scholars from antiquity.

Herrera, de, Francisco, the Elder (1576–1656), Spanish painter, born in Seville. He founded a national school of Spanish painting marked by vigorous naturalism. He was the teacher of the great Velásquez, in whose hands the new style was brought to perfection. Herrera chose as his subjects religious and historical events and scenes of everyday life. Among his extant works are the *Last Judgment* and *The Marriage at Cana* (Seville); *Israelites Gathering Manna* (Louvre, Paris); and *Christ Disputing with the Doctors* (National Gallery, London).

Herrera, de, Francisco, the Younger (1622–85), Spanish painter, born in Seville. He did not equal his father in design or execution but became famous as a painter of still life, especially fish. He also painted religious-subject frescoes, of which the most important example is his *Ascension of Mary* (Madrid).

Herrick, Myron Timothy (1854–1929), American diplomat, born in Huntington, Ohio, and educated at Oberlin College and Ohio Wesleyan. He began law practice in Cleveland in 1878, later became active in the railroad business and in banking and also was prominent in Republican politics. Herrick was governor of Ohio, 1903–05, and was ambassador to France, 1912–14. His helpfulness during the early months of the World War endeared him to the French people, who welcomed him again as ambassador in 1921. He died in Paris, in the embassy building that he had bought for the U.S. Government out of his own funds.

Herrick, Robert (1591–1674), English poet, born in London. He was graduated from Cambridge and in 1629 became vicar of the church at Dean Prior, Devonshire. The Puritans turned him out in 1647, but he resumed his church duties in 1662, after the restoration of Charles II. Herrick's poems were published in London under the titles *Hesperides* and *Noble Numbers.* Often quoted single poems include "Corinna's Maying" and "Gather Ye Rosebuds." Swinburne called Herrick the greatest of English song writers.

Herrick, Robert (1868–1938), American educator and author, born in Cambridge, Mass. He was educated at Harvard. In 1893 he became instructor in rhetoric at the University of Chicago and occupied a chair of English there, 1905–23. Herrick made his first reputation as a novelist with his *The Gospel of Freedom* (1898). In a score of novels he treated such problems as conflicts in marriage and commercial greed with honest realism. His books include *The Common Lot, Master of the Inn, Together, Waste, Wanderings, Chimes* and *End of Desire* (1932).

Herriot, Édouard (1872–), French statesman, born at Troyes. After serving as professor of rhetoric and literature at the University of Lyons he became active in public life and in 1905 was elected mayor of Lyons. He entered Parliament as a senator and in 1915 was minister of food supplies in the Briand Cabinet. As a member of the Radical Socialist party Herriot and his political allies were subjected to much criticism during the World War, but in the postwar reaction his party was swept into power and he became premier in 1924. A defeat on financial policies caused his resignation in 1925; for two days in 1926 he again served as premier. He was subsequently minister of public instruction in the Poincaré Cabinet, which resigned in 1928. He became premier again in 1932 and represented France at the Lausanne conference on German reparations. A brilliant classical scholar, he was honored by the Academy for his *Philon le juif* in 1897.

Herschel, Caroline Lucretia (1750–1848), German astronomer, born in Hanover. She went to England in 1772 and became her brother Sir William's assistant. Her achievements include the discovery of five comets, several nebulae and a number of star clusters. In 1798 she published a catalogue of stars which contained records of 561 stars not previously listed.

Herschel, Sir John Frederick William (1792–1871) English astronomer, son of Sir William Herschel, born in England and educated at Cambridge. In addition to revising and enlarging his father's catalogue of northern nebulae and star clusters, he made a survey of the Southern heavens from an observatory he had established at the Cape of Good Hope. The results of his labors were published in 1847. His *Outline of Astronomy* appeared in 1849. He also made important investigations in light, sound, celestial physics and natural philosophy.

Herschel, Sir William (1738–1822), German astronomer, born in Hanover. He went to England in 1757 and for several years earned his living as a musician. While serving as an organist in Bath he became interested in astronomy and eventually devoted himself entirely to that science. He made a series of telescopes, 1773–86, culminating in a giant reflector with a 4-foot mirror. In 1781 he discovered the planet Uranus, which at first he believed to be a comet. For this achievement he received appointment as astronomer to George III, who also knighted him. Herschel located two satellites of Uranus and two of Saturn, determined Saturn's period of rotation, decided the direction of motion of the solar system and the motions of binary stars and was the first astronomer to give estimates of the immensity of the universe. He increased the number of catalogued nebulae to about 2,500. Herschel discovered the infrared rays of the solar spectrum and contributed to the development of photography.

Hertz, Heinrich Rudolph (1857–94), German physicist, born in Hamburg, famous as the first scientist to demonstrate by actual experiment the waves now used in radio communication. In 1880 he became assistant to Helmholtz at the University of Berlin and 3 years later went to Kiel. In 1885, while professor of physics at the Polytechnic Institute at Karlsruhe, he discovered electromagnetic waves, originally named *Hertzian waves* but now known as radio waves. In 1889 Hertz was appointed professor of physics at the University of Bonn.

Hertz, Henrik (1798–1870), Danish dramatist and lyric poet, born in Copenhagen of Jewish ancestry. He studied law at the University of Copenhagen but decided to write for the stage. During 1826–36 he established his reputation as an author of entertaining comedies with *Mr. Burchardt and His Family, Love and Policy, The Moving Day, Amor's Strokes of Genius* (written in rhyme), *The Only Fault* and *The Savings Bank.* Influenced by the Romantic movement, Hertz published *Svend Dryrings Hus* (1837) and attained international fame in 1845 with *King René's Daughter,* a lyrical drama of chivalry.

Hesiod (8th century B.C.), one of the earliest Greek poets, born in Ascra. He was the founder of didactic poetry, which aims to give instruction or to point a moral. Little is known of Hesiod's life. As a lad in Boeotia, he tended his father's sheep. Tradition says that he became a wandering bard and died in Locris. Three authentic works of

Hesiod are extant—*Theogony,* containing stories of the gods; *The Shield of Heracles,* also mythological in content; and his greatest and earliest poem, *Works and Days.* This poem is a sort of almanac, consisting of moral reflections about labor, rules for the farmer and a religious calendar showing lucky and unlucky days for performing certain tasks. Though lacking the vivid beauty of Homer's epics, Hesiod's poetry had an important influence on Greek education.

Hess, Victor Franz (1883–), Austrian scientist. In 1912 he proved the existence of penetrating rays (cosmic rays) that enter the earth's atmosphere from outside. Doctor Hess was professor at Innsbruck University in 1936 when he shared the Nobel Prize for physics with Carl D. Anderson for their work on cosmic radiation. His *Electrical Conductivity of the Atmosphere* has been translated into English (1928).

Heyse, von, Paul Johann Ludwig (1830–1914), German author, born in Berlin and educated at the universities of Berlin and Bonn. After a year of travel and study in Italy he was called to Munich (1854) to become one of the literary protégés of King Maximilian II. He had already published a romantic drama *Francesca da Rimini* and the epics *Die Brüder* and *Urica.* Heyse thereafter divided his time between Munich and Italy. In 1911 he received the Nobel Prize for literature. He is famous as a master of the short story and wrote many fine lyrics and narrative poems. The best of his longer verse narratives is the epic *Thekla.* His novels, dealing with social problems and contemporary life, are remarkable for their graceful style, but they never achieved the fame of his short stories.

Hibben, John Grier (1861–1933), American educator, born in Peoria, Ill., educated at Princeton and Berlin universities and at Princeton Theological Seminary. He taught logic at Princeton in 1891, became assistant professor, then professor and in 1912 was chosen president of the university as successor to Woodrow Wilson. He published numerous books on logic and philosophy, including *Inductive Logic, Deductive Logic* and *Problems of Philosophy.*

Hicks, Elias (1748–1830), American preacher, born in Hempstead, L.I., founder of the division of the Society of Friends known as Hicksites. He began preaching at the age of 27 and became widely known as a traveling minister and antislavery orator. About 1828 a division occurred between the followers of Hicks and the orthodox Quakers. Hicks was liberal in his theology, and the orthodox Friends charged him with denying Christ's divinity and the Atonement.

Higginson, Thomas Wentworth (1823–1911), American clergyman, author, soldier and Abolitionist, born in Cambridge, Mass., graduated from Harvard in 1841. His college associations were remarkable, as he studied under Longfellow and was a friend of Thoreau, Lowell, Holmes, Whittier and Edward Everett Hale. After graduation Higginson studied theology at Harvard and began preaching in Newburyport, Mass. He was active in Worcester in the Unitarian movement, 1850–58. A militant antislavery man, he enlisted for service in the Civil War and in 1863 was wounded while in command of the first regiment of freed slaves. After the war Higginson devoted himself to writing, to woman suffrage and other reforms. He wrote many books, including two histories of the United States, essays, novels and literary reminiscences.

Hildebrand, see *Gregory VII.*

Hill, Ambrose Powell (1825–65), American soldier, born in Culpeper County, Va. He was graduated from West Point in 1847 and became an artilleryman in the Mexican War. In 1861 he resigned to enter the Confederate service as a colonel. In 1862 he was commissioned major general, helped to save Lee's army from destruction at Antietam and led a division under Jackson at Fredericksburg. He ultimately was placed in charge of an army corps and made lieutenant general. His corps fought at Gettysburg and in the battles before Richmond. He was killed at Petersburg.

Hill, David Jayne (1850–1932), American diplomat and historian, born in Plainfield, N.J., graduated from Bucknell University in 1874. He was professor of rhetoric at Bucknell, 1877–79; president of the university, 1879–86; president of the University of Rochester, 1886–96; assistant secretary of state under John Hay, 1898–1903; and was appointed minister to Switzerland by President Theodore Roosevelt in 1903. He remained at Bern until 1905, when he was transferred to The Hague, and he was subsequently ambassador to Germany, 1908–11. Among Hill's writings are lives of Irving, Bryant and Grotius and books on rhetoric, psychology, philosophy, political science, diplomatic questions and finance.

Hill, James Jerome (1838–1916), American financier, born in Ontario. He left his father's farm for business life in Minnesota and in 1870 established a steamship company operating to Winnipeg by way of the Mississippi and Red rivers. In 1875 he organized a fuel company but sold out his interest 3 years later, in the meantime having formed a syndicate that secured control of the St. Paul and Pacific Railroad from its Dutch owners. He reorganized the system as the St. Paul, Minneapolis and Manitoba Railway Company and was its general manager (1879–82), vice-president (1882–83) and president after 1883. This railway became part of the Great Northern system (1890). Hill became president of the entire Great Northern system and before his death had developed a network of railroads that covered the northwest of the United States. He was also a leader in the building of the Canadian Pacific Railroad.

Hill, Sir Rowland (1795–1879), English educator, famed for his part in the introduction of penny postage. He began his active career as a teacher, but a few years before 1837 he became interested in correcting the defects of the English postal system. Rates depended on distance and were so high that few persons could afford to carry on much personal correspondence. Hill's pamphlet, *Post-Office Reform* (1837), urged a uniform penny rate for half-ounce letters throughout the United Kingdom and the use of adhesive stamps. The plan was adopted in 1840, and Hill was put in a position in the civil service. While working out the details he was dismissed for political reasons but subsequently was made secretary to the postmaster general: after his retirement he received a grant of £20,000 and a pension of £2,000.

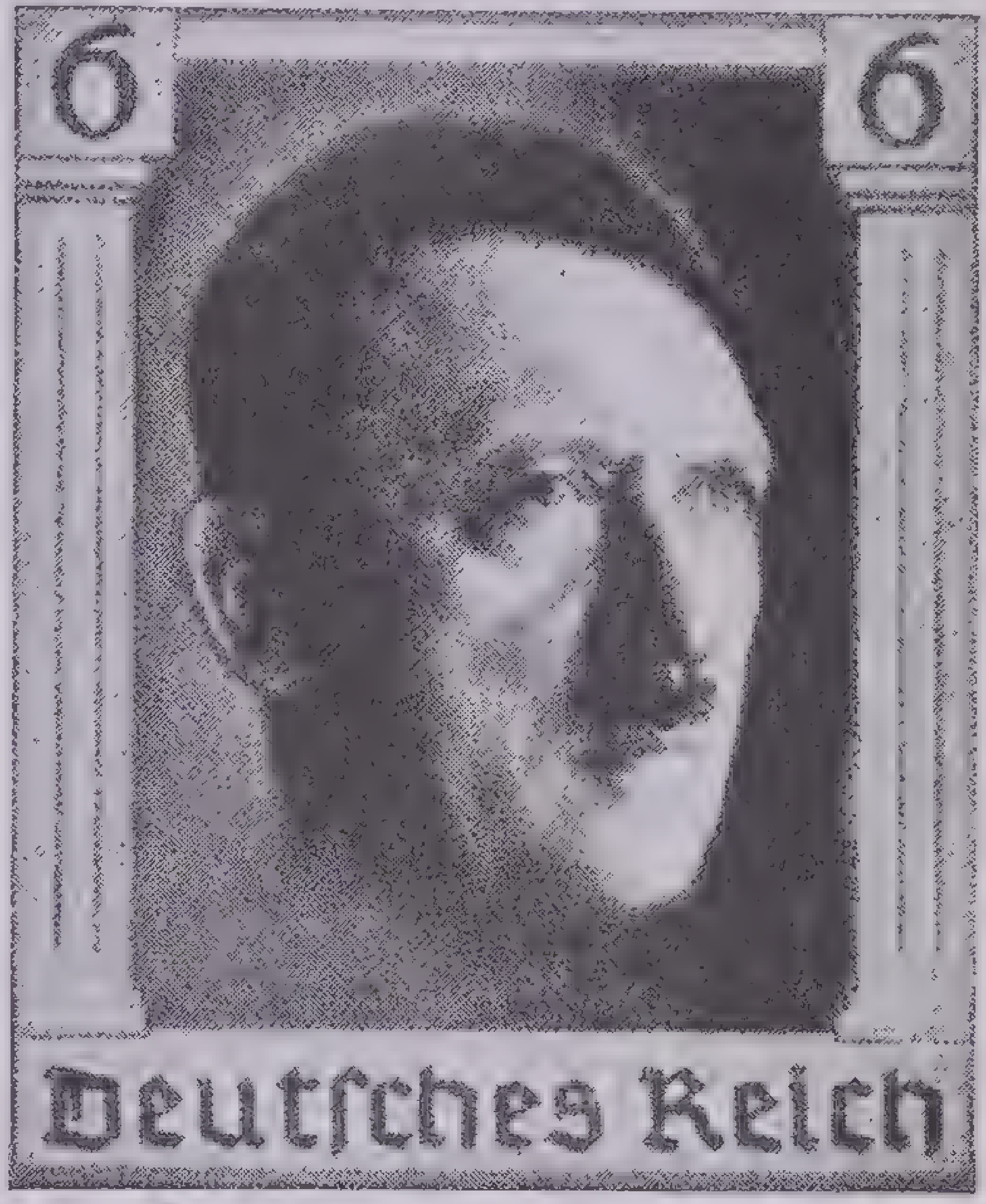
Hindenburg, von, Paul (1847–1934), German soldier, born in Posen. He received a military education, was active in the war against Austria in 1866 and served in the Franco-Prussian War. Later he was a lecturer on applied tactics in the War Academy. During the years of peace he rose steadily in rank until he became a general. In 1911 he retired but in 1914 was recalled to active service and given command of a German army in East Prussia. Before the end of August he had defeated two Russian army corps and in 3 days' fighting had captured 70,000 Russians and their entire equipment. After further victories in Poland von Hindenburg received the rank of field marshal from Emperor William II and in 1916 succeeded Falkenhayn as chief of staff. During the rest of the war he was in command of the German field armies. Von Hindenburg remained the idol of the German people and was elected to the presidency of the Republic in 1925 and re-elected in 1932, but his authority practically disappeared with the rise of Hitler.

Hipparchus (*c.* 160–*c.* 125 B.C.), Greek astronomer and mathematician, born in Nicaea, Asia Minor. He carried on his scientific work in Rhodes and discovered the precession of the equinoxes. He compiled a catalogue of 1,080 stars, showing the celestial latitude and longitude of each. Hipparchus also calculated the length of the seasons, the length of the solar year, the distances of the sun and moon from the earth and the orbital motions of the planets. Through his use of higher mathematics he became one of the founders of trigonometry.

Hippocrates (460–*c.* 377 B.C.), Greek physician, born on the island of Cos of a family of priests and physicians. The medical school of Cos gained wide fame through his practice and writings. He was much in advance of the ideas of his age and is called the *Father of Medicine.* He believed that human health was affected by climate, water, environment, food, exercise and other personal factors, and he treated disease by attention to the patient's diet and general regimen. He observed and recorded symptoms with great care and used the light, airy temples as hospitals. Hippocrates left over 70 treatises on medical subjects. The custom of holding inviolate the secrets of the sick room is said to have originated with him; each of his pupils took a solemn oath to this effect, known today as the Hippocratic oath and still observed in medical schools.

Hirohito (1901–), Emperor of Japan, the son and successor of Yoshihito. He ascended the throne of Japan in 1926. From 1921 he had ruled as regent, as his father was incapacitated by illness. Hirohito received his education under private tutors and at the Imperial Institute in Tokyo, and at the age of 18 he took his seat in the House of Peers. Just before he assumed the regency he visited several European countries, being the first Japanese prince to leave his own land.

Hitler, Adolf (1889–), Chancellor of Germany, with the title *Reichsfuehrer* (leader of the nation), born in Austria, the son of a customs inspector at the German border. He lived in Munich in 1912, did carpentry work there and studied art. After serving in the German army during the World War, he formed the National Socialist German labor party (the Nazis) in Munich in 1920. He led the "Hitler Putsch," a revolt against the government in Munich in 1923; this resulted in his sentence to a 5-year prison term from which he was soon released. He reorganized his party but remained peaceful until 1930, when 107 Nazis gained seats in the Reichstag. In 1932 Hitler, having become a German citizen, entered the presidential election campaign against von Hindenburg and polled several million votes; the National Socialist party gained 230 Reichstag seats. Late in 1932 von Papen's government fell, von Schleicher became chancellor for two months, and early in 1933 Hitler, leading a coalition party, was made chancellor by President von Hindenburg.



Courtesy Scott Stamp & Coin Company

Adolf Hitler

Enlarged from a German stamp issued in 1937 in honor of Hitler's brithday. It is a good example of modern stamp design, which stresses simplicity and avoids engraved curlicues and flourishes

Hitler, now in power, assumed a virtual dictatorship almost at once. He purged other political parties through wholesale arrests; the freedom of the press was abolished by decree (1933); buildings and churches were raided, and hundreds of clergymen were arrested; Jews were persecuted and ousted from professions, public service and the universities. Hitler nominated governors and von Hindenburg appointed them to the various states. Hitler made himself governor of Prussia, and all sovereign powers of the state were transferred to the Reich (1934). To quell a rising revolt within the National Socialist party, the famous "Nazi purge" took place. Hitler's closest friend, Captain Ernest Roehm, was executed, as were von Schleicher and his wife. When von Hindenburg died (1934), the office of Reich president was joined with that of chancellor. Hitler revived compulsory military service and instituted compulsory labor service. His book, *Mein Kampf* ("My Battle"), had a tremendous circulation.

He disregarded the limitations imposed upon Germany with regard to the size and nature of its army and navy and in the course of several years built up a formidable armament. In 1937 he formed an understanding with Benito Mussolini, the Fascist dictator of Italy, a mutual "hands off" policy that was called *the Rome-Berlin axis.* In March part of the German Empire. When he invaded Poland in 1939, England and France declared war. In successive campaigns he conquered Poland, Danzig, Memel, Denmark, Norway, the Netherlands, Belgium, France, and Yugoslavia. He added most of this territory to the German Reich, making it a truly powerful nation.

Hoar, George Frisbie (1826–1904), American lawyer, born in Concord, Mass. He graduated from Harvard Law School and in 1849 began practice in Worcester, Mass. One of the first members of the Republican party, Hoar was successively elected by the state Republicans to both branches of the legislature and then to Congress and in 1877 entered the Senate. He was re-elected four times in succession and served 27 years as senator. Hoar was prominent in the debates regarding the acquisition of the Philippines. He wrote the *Autobiography of Seventy Years,* in two vols.

Hobart, Garret Augustus (1844–99), U. S. Vice-President, born in Long Branch, N.J. He was graduated from Rutgers College in 1863, began the practice of law in 1869 in Paterson, N. J., was a member and presiding officer of both branches of the state legislature and became prominent in national politics. As Vice-President he enjoyed a measure of power not usually associated with that position. Hobart died in office.

Hobbema, Meyndert (1638–1709), Dutch artist, born in Amsterdam. He is believed to have studied under Jacob van Ruysdael; the two were the foremost representatives of the Dutch school of landscape painting, but Hobbema's paintings are in a quieter mood than those of Ruysdael and are remarkable for their finish of detail. Hobbema is now recognized as one of the greatest of the painters of Dutch life. His most famous work is *The Avenue Middlelharnis* (National Gallery, London), *Water Mill* and *Ruins of Brederode Castle.*

Hobbes, Thomas (1588–1679), English philosopher, born in Malmesbury and educated at Oxford. He spent several years in tutoring young noblemen, traveling on the Continent and carrying on his philosophical and political studies. He published his first book, a translation of Thucydides, in 1628. From 1640 until 1651 he lived chiefly in Paris, his writings on political science having made him unpopular in England. From 1651 he lived quietly under the Commonwealth and then under Charles II, who granted him a pension, but his later life was one of quarreling with churchmen and scientists. Hobbes strongly upheld the monarchial form of government but believed that the power of the king was derived from the people and was not based on divine right. The fame of Hobbes rests upon *The Leviathan, or the Matter, Form, and Power of a Commonwealth.* It has had great influence on political thought.

Hobson, Richmond Pearson (1870–1937), American naval officer, born in Greensboro, Ala., and graduated from Annapolis in 1889. While serving in the Spanish-American War under Admiral Sampson, Lieutenant Hobson became a national hero by attempting to sink the collier *Merrimac* in order to blockade Santiago harbor. Hobson resigned from the navy in 1903 and represented an Alabama district in Congress, 1907–15. Later he lectured on international peace, naval preparedness and prohibition. In 1932 he was awarded the Congressional Medal of Honor for his naval services.

Hoe, Richard March (1812–86), American printer, son of Robert Hoe. He became a partner in his father's business and brought about several improvements in the Hoe press. In 1846 he introduced a rotary press, the first of the type used in modern newspaper printing. He next invented the web perfecting press, which prints both sides of a sheet at the same time and cuts and folds the papers as they are printed and counts them.

Hoe, Robert (1784–1833), English printer. He emigrated to the United States in 1803 and became associated with his brothers-in-law, Peter and Matthew Smith, in the manufacture of a hand printing press that Peter had invented. From 1823 Hoe carried on the business alone. He made and introduced the original Hoe press, a flat-bed cylinder type, used in England.

Hoe, Robert (1839–1909), American printer, born in New York, grandson of Robert Hoe. He continued the family tradition and was widely known for his promotion of artistic bookmaking and for his practice of collecting rare books and manuscripts. He was one of the founders of the Metropolitan Museum of Art, New York.

Hofer, Andreas (1767–1810), Tirolese patriot, born in the Valley of Passeier at St. Leonard. In 1796 when the Tirol was invaded by the French, Hofer led a body of riflemen against them at Lake Garda. During the Napoleonic Wars he continued to fight for his people and was one of the commissioners sent secretly to Vienna after the Treaty of Pressburg to plead for the reunion of the Tirol with Austria. Napoleon's decree stood, however, and to free his land from Bavaria Hofer took a leading part in an insurrection in 1809. He won temporary victories, but the varying tide of his fortunes ended with his flight to the mountains. Early in 1810 he was betrayed, delivered to the French and shot by order of Napoleon. Hofer's bravery has been the subject of ballads and tragedies.

Hofmann, Josef (1876–   ), American pianist, native of Cracow, the son of a professor in the conservatory in Warsaw, who gave the boy his first lessons. He appeared in public as a pianist when only 9 and gave recitals in London, New York and other capitals. At 11 years of age he was withdrawn from the concert platform on a tour of the United States at the insistence of the Society for the Prevention of Cruelty to Children. At 16 Hofmann became Rubinstein's only pupil and in 1894 made his adult debut in Dresden. In 1898 he returned to the United States and gave recitals. He became director and instructor of piano at the Curtis Institute of Music, Philadelphia, toured the world and made an international reputation. His compositions include concertos and sonatas, and he wrote on piano technique. Some of his published compositions are signed "Dvorsky."

Hogarth, William (1697–1764), English painter, born in London, where he began his career as a designer and engraver. In 1726 he won a considerable reputation through his copperplate illustrations for Butler's *Hudibras,* but he soon turned to painting and, between 1733 and 1745, completed a remarkable series of satires, including *A Rake's Progress* and *Marriage à la Mode.* These have all had wide circulation as engravings. Hogarth was a master of portraiture. A collection in the National Gallery, London, includes his *David Garrick as Richard III* and his own portrait with his dog. His famous picture *Peg Woffington* is in the Metropolitan Museum, New York.

Hohenstaufen, royal house of Germany, members of which wore the crown most of the time between 1138 and 1254. The name was derived from a castle in Württemberg, built by Frederick of Staufen, son of Frederick of Büren, founder of the family. The first Hohenstaufen king of Germany was Conrad III. He was followed by Frederick I, called *Barbarossa,* Henry VI, Frederick II and Conrad IV, the last of the line.

Hohenzollern, family name important in German history between 1701 and 1918. From Frederick I of Prussia (1701–13) to William II, who abdicated in 1918, the Hohenzollerns furnished kings to Prussia and emperors to Germany (1871–1918) in unbroken succession. The name came from the ancestral Castle Zollern or *Hohenzollern* (High Zollern), in Swabia, but accounts of the origin of the family are wholly legendary. The Hohenzollern rise to power began in 1415, when one of the princes became elector of Brandenburg as Frederick I. Eleven electors followed him, and the last one became the first king of Prussia in 1701. There were eight succeeding kings of Prussia; three of them reigned as emperors of Germany.

Holbein, Hans (*c.* 1497–1543), German painter and engraver, born in Augsburg. He studied under his father, known as "Hans Holbein the Elder." In 1519 the younger Holbein established himself in Basel, Switzerland, where he painted interiors, religious subjects and portraits, besides making designs for painted glass and woodcuts. Because conditions of the Reformation period were unsettled, he went to England in 1526, carrying letters from his friend Erasmus to Sir Thomas More, and 10 years later he was made court painter to Henry VIII. Holbein is one of the world's great portrait painters. He painted *Sir Thomas More* (it hangs in Windsor Castle), *Christina of Denmark* (National Gallery, London), *Erasmus* and *Anne of Cleves* (Louvre, Paris), *Lady Rich, Lady Guildford* and *Margaret Wyatt* (Metropolitan Museum, N. Y.). Holbein's masterpiece, an altarpiece, is in the palace at Darmstadt. As an engraver he is best known for the series of 58 woodcuts called *Dance of Death.*

Holberg, Ludvig, Baron (1684–1754), Danish author, recognized as the founder of Danish literature and the greatest of Danish authors. He traveled in Europe, studied 2 years at Oxford University and in 1718 received a professorship at the University of Copenhagen. His brilliant *Peder Paars* appeared in 1719, and in 1722 he wrote the first important comedy in Danish. Hitherto only French and German had been used on the Danish stage, but Holberg in 5 years wrote many comedies that endure as masterpieces. Among his other works are *History of Denmark, Moral Reflections* and *A History of the Jews.* He created a Danish national literature.

Holden, Edward Singleton (1846–1914), American astronomer, born in St. Louis, Mo., educated there at Washington University and at West Point. During 1873–98 he was, successively, professor of mathematics at the Naval Academy, director of Washburn Observatory, Madison, Wis., president of the University of California and director of Lick Observatory, San José, Calif. Much of the development of the equipment at this observatory is due to his efficient management. Holden was noted as an editor and writer and was librarian of the United States Military Academy from 1901 until his death.

Holinshed, Raphael (d. *c.* 1580), English chronicler, born in Cheshire. He is remembered for one book, *Chronicles of England, Scotland and Ireland* (1577), from which Shakespeare took much of the material for his historical plays. The work was originally planned as a universal history and was begun by Reginald Wolfe, printer to Queen Elizabeth, for whom Holinshed acted as a translator. After Wolfe died, Holinshed completed and published the book.

Holland, John Philip (1840–1914), Irish-American inventor, born in Liscannon, Ireland, educated in Limerick at the Christian Brothers' School. Holland was one of the most successful of pioneer submarine designers. He built nine submarines in a period of 20 years before the U.S. government accepted his design for naval use (1898).

Holman-Hunt, William (1827–1910), English painter, a leader in the Pre-Raphaelite movement. His most famous pictures are *Flight of Madeline and Porphyro, Finding of Christ in the Temple* and his masterpiece, *The Light of the World* (Keble College, Oxford, and St. Paul's Cathedral, London), a picture of Christ crowned with thorns. Hunt received the Order of Merit and was buried in St. Paul's Cathedral.

Holmes, Oliver Wendell (1809–94), American poet and writer, born in Cambridge, Mass. He attended Phillips Andover Academy, graduated from Harvard College in 1829 and then began the study of law, which he soon abandoned for medicine. He completed his medical course in Paris and became a doctor in Boston but 10 years later gave up the profession for a literary life. He published two important medical treatises, however, which greatly interested the profession.

Dr. Holmes became an outstanding man of letters. He published a volume of poems in 1836, and his delightful, light-hearted verse was keenly appreciated. Holmes's *Autocrat of the Breakfast Table* was published in the early numbers of the Atlantic Monthly after its founding in 1857. In this series of informal talks, sparkling with wit and wisdom, Holmes transferred to the printed page a conversational talent that made him the most entertaining talker among his friends, including Emerson, Longfellow, Lowell and Whittier. *The Autocrat* was followed by *The Professor at the Breakfast Table* (1860); about a decade later *The Poet* appeared. The series was completed with *Over the Tea-Cups,* written when Holmes was more than 81. As a novelist Holmes is best known for *Elsie Venner* (1861), an interesting treatment of a problem in heredity. This theme also appears in his two other novels, *The Guardian Angel* and *A Mortal Antipathy.* He produced both serious and humorous verse of high quality, including the "Chambered Nautilus," "Old Ironsides," "The Voiceless," "The Last Leaf," "The One-Hoss Shay" and "Parson Turrell's Legacy."

Holmes, Oliver Wendell (1841–1935), American jurist, born in Boston and named for his father, the poet and writer. He was educated at Harvard, completing a law course there in 1866. During the Civil War he saw active service with the 20th Massachusetts Volunteers and was three times wounded. He began law practice in Boston in 1867, lectured at Lowell Institute, was on the faculty of Harvard Law School and in 1882 became associate justice of the supreme court of Massachusetts. He acted as chief justice of that court from 1899 to 1902 and in 1902 began 30 years of distinguished service as associate justice of the U.S. Supreme Court. In 1932 he completed one of the longest judicial careers in the history of the United States when he resigned at the age of 91. His speeches, lectures and decisions have been published in book form.

HOMER (9th century B.C.), Greek poet. Little is known of his life; even his birthplace is not known. He is believed to have been blind and to have traveled about singing his poems. According to some authorities he actually lived between 1200 and 850 B.C.; others think of him as a legendary figure. However, two of the world's greatest epics are attributed to him. The *Iliad* and the *Odyssey* are facts beyond doubt. Their great age is unquestionable, as is their immense importance as sources not only of later poetic inspiration but even of the popular religious faith of the Greeks.

It is now known that neither the *Iliad* nor the *Odyssey* is *one* poem; both are collections of stories and legends about heroes and gods, all skilfully welded together and perhaps rewritten by the unknown person who gave these works to the world. Both stories are written in the Ionic dialect, and each is divided into 24 books. The *Iliad* describes events in the siege of Troy; the *Odyssey* describes the wanderings of Ulysses (Odysseus) after the fall of that city. There are many English translations of both poems.

Homer, Winslow (1836–1910), American painter, born in Boston where, after some experience as a lithographer, he began designing book illustrations. Later he studied at the National Academy of Design, New York, and during the Civil War was field correspondent and artist for *Harper's Weekly*. He began also to work in oil, producing *Prisoners from the Front* and other canvases depicting war scenes. He spent some time in Paris and exhibited there and in Brussels and Antwerp. Homer painted New England village scenes, negro life and marine subjects. His greatest works are *Maine Coast* (Metropolitan Museum, New York) and *On a Lee Shore* (Providence).

Honorius, Flavius (384–423), Roman Emperor, the second son of Theodosius the Great. On his father's death in 395 Honorius received the western half of the realm; his brother Arcadius became emperor of the East. Until 408, the emperor Stilicho kept the barbarians at bay until his murder at Ravenna. Honorius could or would do nothing to stop the German and Gothic tribes, and by the time of his death Rome had lost several of its provinces.

Hood, Thomas (1799–1845), English poet and humorist, born in London. His earlier verse was published in the *London Magazine*, of which he became an editor in 1821. He later published two series of *Whims and Oddities* and nine editions of the *Comic Annual* (1830–38). In 1830 he edited another annual, the *Gem*, which contained his remarkable poem *Eugene Aram's Dream*. His sketches and verse were printed also in *Hood's Own* and the *New Monthly Magazine*, the latter containing his best comic poem, *Miss Kilmansegg*. In 1844 he issued his last periodical, *Hood's Magazine*. He was a master of punning and was equally skilled in writing pathos and comedy. Two serious poems, "Song of the Shirt" and "Bridge of Sighs," received high praise from critics.

Hooker, Joseph (1814–79), American general, born in Hadley, Mass. He was graduated from West Point in 1837 and saw active service in the Mexican War but resigned from the army in 1853. Re-entering the service in 1861 as brigadier general of volunteers, he became known as "Fighting Joe" and fought with distinction at Williamsburg, Va., in the Peninsula campaign, at Bull Run, South Mountain and Antietam. He became brigadier general in the regular army in 1862 and at the battle of Fredericksburg commanded two army corps. Early in 1863 Lincoln gave him command of the Army of the Potomac, but criticism over his defeat at the battle of Chancellorsville caused him to resign. Later at Chattanooga Hooker's brilliant conduct won for him the brevet grade of major general. His last engagement was the attack on Atlanta, under Sherman.

Hooker, Thomas (*c.* 1586–1647), American Colonial theologian, born in England. He preached in Holland for 3 years and in 1633 went to New England with John Cotton and established himself in Newtowne (Cambridge). In 1636 he led a number of his parishioners to the Connecticut Valley, becoming chief founder of Hartford. Hooker was also a leader in the organization of the New England settlements for protection against the French and Indians. The United Colonies of New England, organized in 1643, won a place in history as the first union of the kind in America.

Hoover, Herbert Clark (1874–), 31st President of the United States, born on August 10 on a farm near West Branch, Ia., the son of a Quaker. At the age of 17 he entered Stanford University, from which he was graduated in 1895 with an engineering degree. Hoover worked in a California mine, then found a position with a San Francisco engineer and in 1897 was sent to Western Australia to develop some mines for a London syndicate. That was the beginning of a career that kept him abroad for nearly 20 years. He returned to America in 1899 to marry his college friend, Lou Henry, and took his bride to China to begin his duties as chief engineer of the Chinese Imperial Bureau of Mines. In 1903 Hoover became head of a firm of mining engineers in London; his professional duties during the next decade took him to widely scattered places in Asia, Africa and both the Americas.

At the outbreak of the World War he was in London and was appointed chairman of the American Relief Commission. He helped Americans stranded in Europe to reach the United States. In 1915 he was chairman of the Commission for Relief in Belgium. When the United States entered the World War, he was called home to take charge of the Food Administration Bureau. After the Armistice he organized relief measures in the countries threatened with famine. This work occupied him until 1921, when he took his place in Harding's cabinet as head of the Department of Commerce. He served until 1928, when he received the Republican nomination for President. He defeated Alfred E. Smith by 444 to 87 electoral votes. During the Hoover administration the Kellog-Briand peace pact was ratified.

The stock-market crash of October 29, 1929, was the first of a series of serious economic crises that led to much criticism of the administration. Hoover set up measures for relief of the unemployed, created a campaign against hoarding and formed the Reconstruction Finance Corporation to stimulate industry by granting loans. The country was still in the grip of economic difficulties when the election of 1932 approached. The Democrats had won control of the House in 1931, but the 72d Congress worked in cooperation with the President by passing measures to avert a threatened collapse of the entire credit structure of the country. In the election of 1932 Hoover was defeated by the Democratic nominee Franklin D. Roosevelt. Following his retirement in Palo Alto, Calif., Mr. Hoover made public appearances in which he criticized the Roosevelt administration, notably at the Republican National Convention in June 1936. In 1938 he made a tour of Europe and was everywhere welcomed with great enthusiasm.

Hope, Anthony (Sir Anthony Hope Hawkins; 1863–1933), English novelist and playwright, educated at Oxford. He was admitted to the bar in 1887 and 4 years later began to write romantic novels. *The Prisoner of Zenda*, published in 1892, set the style for many other writers. The sequel, *Rupert of Hentzau*, was equally popular, and both were dramatized.

Hopkins, Sir Frederick Gowland (1861–), English biochemist. He was the first professor of biochemistry at Cambridge. He discovered the connection of lactic acid with the contraction of muscles. He is best-known for his discovery of the importance of vitamins to health. He shared the Nobel Prize for medicine in 1929.

Hopkins, Harry L. (1890–), Federal administrator, born at Sioux City, Iowa, graduated from Grinnell College. He directed a number of social-welfare and health-promotion organizations or held executive posts in them. He was director of the New York Tuberculosis and Health Association when he was chosen to head emergency-relief activities in New York in 1931. In 1933 he became head of the National Emergency Relief organization and in 1935 became Works Progress Administrator. As such he was in charge of all unemployment relief activities made necessary by the depression.

Hopkins, Johns (1795–1873), U. S. financier, born in Anne Arundel County, Md., of Quaker parentage. He amassed a fortune in the grocery business in Baltimore. Property valued at over 4 million dollars and a public park were his gifts to the city of Baltimore, and he donated over 3 million dollars to found Johns Hopkins University there.

Hopkins, Mark (1802–87), American educator, born in Stockbridge, Mass. He was graduated from Williams College in 1824 and became professor of moral philosophy there in 1830. Six years later Professor Hopkins began his long service as president of the institution. He was 34 when he took office, and 70 when he laid aside its duties. In those 36 years he exercised a valuable influence on the college as a whole and on the students individually. He remained pastor of the college church and professor of moral philosophy at Williams until his death.

Hopkinson, Francis (1737–91), American poet-composer, born and educated in Philadelphia. He served in the Continental Congress in 1776, signed the Declaration of Independence and helped to draft the Articles of Confederation. In 1779–89 Hopkinson was judge of admiralty for Pennsylvania. His best-known work, *Seven Songs* (1788), was the first book of music published by an American composer. He also wrote humorous prose and political pamphlets. A son, Joseph Hopkinson, wrote the words of *Hail Columbia*.

Hopper, [William] De Wolf (1858–1935), American comedian and singer, native of New York city. He made his first stage appearance in 1879 in *Our Boys* and gained further experience with Frohman's Madison Square Company. After studying vocal music he joined the McCaull Opera Company and later starred in a long list of comic operas, sometimes under his own management. He was regarded as one of the most gifted comedians of his time in such productions as *Wang, Pinafore, The Pirates of Penzance, The Mikado, Erminie* and *The Chocolate Soldier*. Another outstanding success was his interpretation of Old Bill in *The Better 'Ole*, and throughout his career he was famous for his recitation of "Casey at the Bat."

Horace (Quintus Horatius Flaccus; 65–8 B.C.), Roman poet, born in Venusia, southern Italy, and educated in Rome and in Athens. While in Athens he joined the republican army under Brutus, one of Caesar's assassins, and was present at the Battle of Philippi. On his return to Rome Horace became a clerk in the quaestor's office. In 38 B.C. Vergil introduced him to Maecenas, and through this connection Horace gained an income, a home and the friendship of the Emperor Augustus, to whose reign he contributed much literary glory. His principal writings include *Odes* (4 books), his greatest work; *Epodes*, short poems; *Satires* (2 books); and *Epistles* (2 books), the last epistle being the well-known *Art of Poetry*. He was Rome's greatest lyricist and is the most widely read of all Latin poets. Horace's *Odes* are a standard study requirement in advanced Latin courses.

Houdini, Harry (Ehrich Weiss; 1874–1926), American magician and writer. He was famous for his escapes from locks, handcuffs, strait jackets and sealed chests under water. He was known also for exposures of spiritualistic mediums and their tricks. He wrote *Miracle Mongers and Their Methods, A Magician among the Spirits* and *The Unmasking of Robert-Houdin*.

Houdon, Jean Antoine (1741–1828), French sculptor, born in Versailles, where his boyish imagination was stirred by many fine examples of decorative sculpture. After receiving some instruction in Paris he won the *Prix de Rome* in 1761 and for 10 years studied in the Italian capital. He is known to Americans as the sculptor of the Washington statue in the Capitol at Richmond, Va. The Metropolitan Museum, New York, possesses his *Bather*, a female figure. He executed over 200 portrait busts, including those of Franklin, Rousseau and Voltaire.

House, Edward Mandell (1858–1938), American statesman, born at Houston, Texas, educated at Cornell University. As a member of the governor's staff in Texas, House acquired the title of colonel. He was President Wilson's personal representative to the European governments in 1914–16 and was a delegate to the Peace Conference in 1917. Colonel House also helped to formulate the Covenant of the League of Nations. After the war he edited *What Really Happened at Paris*, and his papers were collected under the title *The Intimate Papers of Colonel House*.

Housman, Alfred Edward (1859–1936), English poet and scholar, educated at Oxford. As professor of Latin at Oxford and Cambridge, he was famous as a classical scholar and for his editing of Manilius, Juvenal and Lucan. The world at large, however, knows him for two volumes of verse, *A Shropshire Lad* (1896) and *Last Poems* (1922). They are pictures of the English countryside, rather pessimistic in tone, and have been widely imitated.

Housman, Laurence (1865–), English author and artist, brother of Alfred Edward. His first novel, *An Englishwoman's Love Letters*, appeared anonymously in 1900 and was very popular. *Trimblerigg* and *The Duke of Flamborough* are political satires. Volumes of verse are *Green Arras* and *Spikenard;* his best known play is *Prunella*. His stories about Queen Victoria were dramatized as *Victoria Regina*, played with great success by Helen Hayes.

Houston, Sam (1793–1863), American soldier and statesman born in Rockbridge County, Va. He moved to Tennessee in 1806 and at the age of 15 ran away from home to join the Cherokee Indians in the eastern part of the state. After 3 years he returned to his own people and was active in the War of 1812. Houston then studied law, began practice in Lebanon, Tenn., and in 1822 was elected to Congress. He was elected governor of Tennessee by the Jackson Democrats in 1827. Two years later he resigned his office and returned to his Cherokee friends.

Houston took up the cause of the Americans in Texas in 1832, and at San Jacinto in southeast Texas he led the volunteers who defeated the Mexican forces under Santa Anna in 1836. He was elected president of the republic of Texas in the same year and again in 1841–44. After Texas was admitted to the Union he represented the state in the Senate, 1846–59, and was governor, 1859–61, being deposed because he would not take the oath of allegiance to the Confederate States.

Hovey, Richard (1864–1900), American poet, born at Normal, Ill., graduated from Dartmouth College in 1885. He spent several years wandering in Europe, where he translated some of Maeterlinck's works. Upon his return he was by turns journalist, poet, lecturer, actor and playwright. His own poems are not so highly valued as those he wrote with Bliss Carman, published under the title *Songs from Vagabondia.*

Howard, Oliver Otis (1830–1909), American general, born in Leeds, Me. He was graduated from West Point in 1854 and taught mathematics there, 1857–61. On the outbreak of the Civil War he left the regular army and became a colonel of Maine volunteers, fought at Bull Run, in the Peninsular campaign, at Fair Oaks—where he lost an arm—and at Antietam and Fredericksburg, reaching the rank of major general of volunteers by the end of 1862. As commander of the Eleventh Army Corps he was conspicuous in the battles of Chancellorsville, Gettysburg and Chattanooga. During Sherman's march from Atlanta to the sea Howard was in command of the right wing, which comprised the Army of the Tennessee. He retired with the rank of major general in the regular army in 1894. As a tribute to his active interest in negro welfare, Howard University in Washington was named for him. In 1895 he founded the Lincoln Memorial University in Tennessee.

Howe, Elias (1819–67), American inventor, born in Spencer, Mass. He started working as a mechanic; and while he was a machinist in Cambridge, Mass., he started the experiments that resulted in the invention of the sewing machine. At first Howe could not get financial backing in America; then while he was in England, his invention was pirated. After tedious lawsuits he established his patent rights and grew rich manufacturing his sewing machines. He fought as a private in the Civil War in a regiment which he supported. In 1915 his name was placed in the Hall of Fame at New York University.

Howe, Julia Ward (1819–1910), American poet, born in New York city, educated privately. In 1843 she married Dr. Samuel Gridley Howe, noted educator of the blind. Mrs. Howe assisted her husband in editing the Boston *Commonwealth,* an antislavery journal, and lectured on social and religious subjects. While she was visiting military camps near Washington in 1861, she was inspired to write the poem that made her famous, *The Battle Hymn of the Republic.* Mrs. Howe was subsequently active in movements for woman suffrage, prison reform and international peace. She published several volumes of prose and verse, including *Sex and Education, Life of Margaret Fuller, Reminiscences* and *Passion Flowers.*

Howe, Richard, Earl (1726–99), British admiral, active in England's service for 50 years. He began his naval career at the age of 14 and in 1746 was wounded in a fight with the French off Scotland. Howe won his first outstanding successes during the French and Indian War. In command of the *Dunkirk* in 1755, he captured the *Alcide* off Newfoundland and in 1759 took part in the English victory in the Bay of Biscay, where he served under Sir Edward Hawke. As vice-admiral he took command of the fleet in America in 1775 and in 1778 defeated a naval force under D'Estaing. A brilliant victory at Gibraltar in 1782 won for him the title first lord of the Admiralty, and in 1794 Howe became one of England's greatest heroes by defeating the French in the battle off Ushant on June 1.

Howe, William, 5th Viscount (1729–1814), British general, brother of Admiral Richard Howe. His military career began in Flanders when he was 17. In the French and Indian War in America he took part in the capture of Louisburg and in the storming of Quebec. In spite of his sympathy with the colonies he was sent to Boston when the Revolutionary War broke out, and he led the British forces at Bunker Hill. As lieutenant general he succeeded Gage in command of the troops outside of Canada and in 1776 won the battles of Long Island and White Plains. Howe defeated Washington at the Brandywine in 1777, held Philadelphia and was then succeeded by Sir Henry Clinton. Howe resigned in 1778, claiming lack of support from England. He received the rank of general in 1783.

Howells, William Dean (1837–1920), American novelist, born in Martin's Ferry, Ohio, the son of a country journalist. He worked as a compositor in his father's newspaper office, became successively a correspondent and editor and in 1860 wrote a *Life of Lincoln.* In appreciation Lincoln appointed him to the consulate at Venice, where he remained during 1861–65. Howells joined the staff of the *Atlantic Monthly* in 1866 and served as its editor, 1872–81. After a visit to England and Italy he became associated with *Harper's Magazine* and was its editor during 1886–91. He wrote many novels dealing in a realistic way with American life. They include *Their Wedding Journey, A Chance Acquaintance, A Foregone Conclusion, An Indian Summer, The Rise of Silas Lapham, A Hazard of New Fortunes* and *The Kentons.* Howells also wrote several farce comedies and many volumes of criticism, essays, reminiscences, travel sketches and verse.

Hoxie, Vinnie Ream (1847–1914), American sculptor, born in Madison, Wis. When only 18 she won a $30,000 prize for the statue of Lincoln now in the rotunda of the Capitol in Washington. Later she received a government commission to make the statue of Farragut that stands in the square of that name in Washington. She was selected in 1911 as the sculptor of the statue of Sequoyah, Oklahoma's representative in Statuary Hall. Mrs. Hoxie was the first woman sculptor to be given a government commission.

Hoyle, Edmond (1672–1769), English authority on games. He spent many years in London as a teacher of whist and other games and wrote *Short Treatise on the Game of Whist* (1742). He issued similar books on backgammon, piquet, quadrille, brag and chess. The expression "according to Hoyle," meaning according to standard rule, indicates the prestige of his books.

Hubbard, Elbert (1856–1915). American author, born in Bloomington, Ill., educated in the public schools. Inspired by the arts and crafts movement in England, Hubbard established the Roycroft Press at East Aurora, N.Y., for issuing special editions of books. He and his associates organized a handcraft community to make artistic furniture and furnishings. Hubbard founded and edited two periodicals devoted to the discussion of current problems and general comment, *The Philistine* and *The Fra.* He called himself "Fra Elbertus." His essays and series of *Little Journeys* were widely sold, and his unconventional point of view and brisk style of writing and speaking found many admirers. His best-known essay is *A Message to Garcia.* He was drowned in the sinking of the *Lusitania* in 1915.

Hudson, Henry (d. 1611), English seaman, discoverer of the river, strait and bay that bear his name. He entered the employ of the Muscovy Company of London in 1607 and for the company made two voyages to the neighborhood of Spitsbergen in search of a northerly route to China. His exploits became known to the Dutch East India Company, which commissioned him to continue the search. Sailing from Amsterdam in 1609 in the *Half Moon,* he again skirted the north coast of Europe but finally decided to cross the Atlantic to the New World and in September reached Sandy Hook. He ascended the Hudson River to the site of Albany. This voyage convinced him that there was no connecting passage in that region between the Atlantic and the Pacific. Under English auspices in April 1610 Hudson made another voyage to the New World, hoping to find a northwest passage. Through the strait now called *Hudson* he entered the bay now named for him and spent several months exploring it. The severity of the long northern winter led to a mutiny of the crew, and in June 1611 Hudson, his son John and five sailors suffering with scurvy were cast adrift in an open boat to die.

Hudson, William Henry (1841–1922), British author and naturalist, born in South America. He went to England in 1880, where he won recognition as a writer after years of effort. Hudson's best-known novel, *Green Mansions,* a fantasy laid in the upper Orinoco, received great praise for its beauty of style and poetic imaginative quality. Other titles include *The Naturalist in La Plata, Idle Days in Patagonia, Birds in London, Afoot in England, The Book of a Naturalist* and *A Hind in Richmond Park. Far Away and Long Ago* is autobiographical.

Huerta, Victoriano (1854–1916), Mexican President, born in Colotlan, Jalisco, of Indian descent. He became a trusted official under President Porfirio Diaz, rising to the rank of brigadier general. Huerta took charge of the government forces under President Madero, who succeeded Diaz in 1911, but soon deserted his chief and declared himself provisional President in February 1913. Shortly afterward Madero and the former Vice-President were murdered and the United States refused to recognize Huerta's government. A revolt headed by Carranza broke out against him, with Villa in command in the field. Some American sailors were arrested in Vera Cruz in April 1914, and U. S. troops soon occupied the city. War was averted after a mediation conference conducted by Argentina, Brazil and Chile. In July 1914 Huerta resigned and went to Spain. The following year he was arrested at El Paso, Texas, on the charge of violating the neutrality laws of the United States. He died in prison while awaiting trial.

Hughes, Charles Evans (1862–), American jurist, born in Glens Falls, N.Y. He was educated at Colgate and Brown universities and Columbia Law School. Admitted to the bar in 1884, he continued in practice in New York city until 1891, when he became professor of law at Cornell University. In 1893 he returned to practice but varied this by giving special lecture courses at Cornell and at New York Law School. In 1905–6, Hughes attracted wide notice through his work as special investigator of life-insurance companies and the coal situation, and in 1907 he began his first term as governor of New York. Re-elected for a second term, he resigned in 1910 to become associate justice of the United States Supreme Court. That office he relinquished in 1916, when the Republicans nominated him for President; but Hughes was defeated by Wilson in a close contest and returned to his law practice. In 1921 he accepted from President Harding a place in the Cabinet as secretary of state and retained this post under Coolidge until 1925. In 1929–30 he completed the unexpired term of John Bassett Moore as judge of the Permanent Court of International Justice. He was appointed chief justice of the Supreme Court in 1930 by President Hoover.

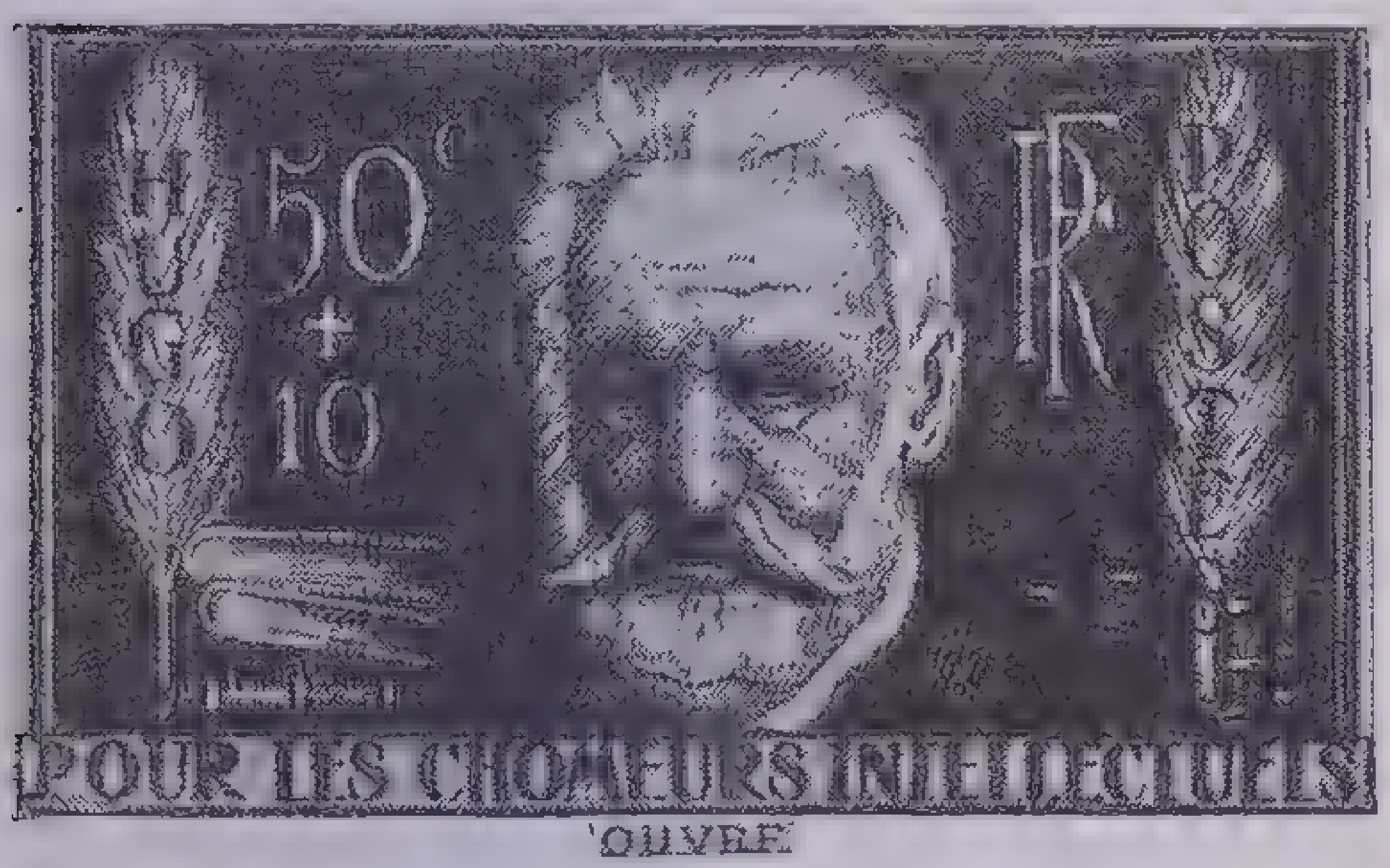
Hughes, Howard [Robard] (1904–), American aviator and moving-picture producer, nephew of Rupert Hughes and son of a Texas millionaire who invented the cone-shaped oil drill. He was born in Houston and educated at Rice Institute there. He spent and made millions on *Hell's Angels* and other motion pictures. In 1935 he made a world's record airplane speed of 352.388 miles an hour. He made several long-distance flying records, especially coast to coast, and in July 1938 flew around the world, 14,824 miles in 91 hours, 8 minutes. 10 seconds; actual flying time 71 hours, 14 minutes.

Hughes, Rupert (1872–), American writer, born in Lancaster, Mo., educated at Western Reserve and Yale universities. He acted as assistant editor of *Godey's Magazine, Current Literature* and *The Criterion.* In 1916 he served as a captain on the Mexican border. Hughes published his first book in 1898. His fiction includes *The Old Nest, The Thirteenth Commandment, The Unpardonable Sin, The Cup of Fury, Souls for Sale, The Patent Leather Kid, Mermaid and Centaur* and *The She-Devil.* Many of his stories have been adapted for the screen, and he wrote and directed several motion pictures. Among his plays are *Alexander the Great, All for a Girl* and *Excuse Me.* He published a monumental 3-volume biography of George Washington (1926–28).

Hughes, Sir Sam (1853–1921), Canadian army officer, born in Darlington, Ont., educated at Toronto University and the Royal Military College. In 1897 he joined the volunteer militia, became active in imperial affairs and in the South African War served in the intelligence and transportation departments. In 1902 he was promoted to the rank of colonel. Hughes was elected to the Canadian Parliament as a Conservative in 1892, was five times re-elected and in 1911 became minister of militia in the Borden Cabinet. He was made a major general in 1914. His services in organizing Canadian troops during the World War were of great value to the Allies.

Hughes, Thomas (1822–96), English writer, best known as the author of *Tom Brown's School Days,* a classic of schoolboy life. It was inspired by the author's own experiences at Rugby, where he was a pupil under Dr. Thomas Arnold. Hughes was graduated from Oxford in 1848 and was a prominent lawyer. He was interested in the welfare of the working classes and helped to found the Workingmen's College in London. His other writings include *The Scouring of the White Horse, Alfred the Great, Memoir of a Brother* and *Vacation Rambles.*

HUGO, VICTOR MARIE, VISCOUNT (1802–85), French author, born in Besançon, the son of a general who fought under Napoleon. He spent his childhood and youth in Paris, with the exception of a year or two in Madrid. As a schoolboy of 15 Victor competed for an Academy prize by writing a poem entitled *On the Advantages of Study* and won honorable mention. He published three volumes of odes and ballads and two novels, *Han d'Islande* and *Bug-Jargal* (1822–26). With the publication of *Cromwell* (1827) Hugo was recognized as the herald of the Romantic school of the drama, and his *Marion Delorme*, which the censors banned until 1831, and *Hernani* (1830) confirmed his position as a leader of the new school. Between 1831 and 1843 he produced the plays *The King Amuses Himself* (the basis of the opera *Rigoletto*), *Lucrecia Borgia, Mary Tudor, Ruy Blas* and *Les Burgraves;* other writings were *Claude Gueux*, a plea against capital punishment; four volumes of poems; and books on literature, philosophy and travel.



Courtesy Scott Stamp & Coin Company

Victor Hugo

Enlarged from a French stamp issued in 1936 to raise money for helping needy intellectuals and refugees from other countries. The postage value of this stamp was 50 centimes, but an extra 10 centimes was collected for the relief fund

Hugo was elected to the French Academy in 1841. Louis Philippe made him a peer in 1845, but in 1848, when Louis Napoleon (Napoleon III) became head of the republic, Hugo supported the new regime and was a member of the Constituent Assembly. The alliance was temporary, for in 1851 Napoleon overturned the republic. Hugo, who sought to organize a resistance, was forced into exile. He took refuge in Brussels, then in Jersey and finally in Guernsey, where he remained until the beginning of the Franco-Prussian War. His next writings were *History of a Crime* and the satire *Napoleon the Little*. A collection of personal poems, *Les Contemplations*, appeared in 1856 and the first volume of a lyrical epic, *The Legend of the Centuries* in 1859.

Hugo's great work in prose, *Les Misérables*, was published in 1862; the first edition was issued simultaneously in 10 different languages. Other successful books were *Toilers of the Sea, The Man Who Laughs* and *Ninety-Three*. Poems also appeared at intervals, including *The Terrible Year*, inspired by the French defeat of 1871. Hugo returned to France in 1870, became a member of the National Assembly that convened at Bordeaux and after a brief stay in Belgium went to Paris for the last time. There, at the age of 80, he published the poetic drama *Torquemada*. Probably the best-known of his many works are the world-renowned romances, *Notre Dame de Paris* and *Les Misérables*, but it is above all as a poet that he is remembered in France.

Hull, Cordell (1871–), American statesman, born at Carthage, Tenn. He was graduated in law at Cumberland University, and in 1893 he began a political career as a member of the lower house of the Tennessee legislature. He saw service in Cuba in the Spanish-American War, and soon after its close was elected a circuit judge. In 1907 he became a member of the House of Representatives and served continuously except for 2 years until 1931, when he was elected to the Senate. In 1933 he became secretary of state in Franklin Roosevelt's Cabinet. Hull formulated the Federal income tax laws of 1913 and of 1916 and the Federal inheritance tax law of 1916. His major work was negotiating commercial treaties with various foreign countries.

Hull, Isaac (*c.* 1773–1843), American naval officer, born in Derby, Conn. He entered the merchant service in boyhood and became a lieutenant in the navy in 1798. Hull commanded the *Argus* in the war with Tripoli. He became a national hero by winning the first American victory in the War of 1812. In August 1812, as commander of the *Constitution*, Captain Hull, after escaping from a pursuing squadron of five warships, forced the surrender of the British frigate *Guerrière*. He continued in the naval service after the war and attained the rank of commodore.

Hull, William (1753–1825), U. S. army officer, born in Derby, Conn. At the outbreak of the Revolution he left law practice for a military career and fought well in several battles, reaching the rank of lieutenant colonel in 1779. From 1805–12 he served as governor of the Territory of Michigan. In 1812 he was promoted to the rank of brigadier general and took command of the Northwestern Army. At the opening of the War of 1812 he was in command of a force of 2,000 men at Detroit. He delayed his attack on the British and was completely surrounded when he surrendered the city to General Brock. His lack of genuine resistance led to his court-martial in March 1814. He was sentenced to death, but President Madison reduced the punishment to dismissal from the army.

Humbert I (1844–1900), 2d King of Italy, son of Victor Emmanuel II, whom he succeeded in 1878. In the war between Prussia and Austria (1866) Prince Humbert commanded an Italian division at Custozza. Though defeated by the Austrians he showed ability in organizing the Italian retreat. His reign was marred by financial depression and the discontent of an overtaxed people. He tried to set up an Italian colony in Abyssinia, but his armies were defeated there. However, Humbert retained the affection of his people, who called him *Humbert the Good*. He was assassinated by an anarchist in 1900. His son Victor Emmanuel III succeeded him.

Humboldt, von, Alexander, Baron (1769–1859), German scientist, born in Berlin. His first important publication (1790) was based on his geological investigations in the Harz Mountains and the Rhine Valley. After spending 8 months at the Academy of Mining at Freiberg he was appointed superintendent of mines in Bayreuth and Anspach but resigned in 1797 to travel and study. He went to South America in 1799 with Aimé Bonpland, a French botanist. Their 5-year journey included visits to Mexico and the United States. Humboldt began publishing the results of their investigations in 1807, a task that occupied him for 20 years. The last of the 30 volumes appeared in 1827. The masterpiece of his later career is the five-volume *Kosmos*. This description of the universe is one of the greatest of all scientific writings.

Humboldt, von, Karl Wilhelm, Baron (1767–1835), German philosopher and statesman, born in Potsdam, Prussia. He entered the diplomatic service, represented Prussia at Rome and Vienna and had an important part in drawing up the treaties growing out of the Napoleonic wars. From 1808–10, as minister of education, he founded the University of Berlin. He produced volumes of verse, essays and philological studies that are classics.

Hume, David (1711–76), Scottish philosopher and historian, born in Edinburgh. He was trained for the law but turned to literature and in 1737 wrote *A Treatise of Human Nature*. Hume then turned to subjects of political interest and published *Essays, Moral and Political* (2 vols., 1741–42), which revealed him as a rational and enlightened thinker. He issued a revised version of his *Treatise* under the title *Inquiry Concerning Human Understanding* (1748) and published *Inquiry Concerning the Principles of Morals* (1751), followed by another volume of essays, *Political Discourses* (1752).

Except for his *Natural History of Religion* (1755) Hume concentrated for the next 10 years on his *History of England*, which gave him a great reputation. In 1763 he was again abroad, attached to the British embassy in France; on his return he acted as undersecretary of state (1767–69) and then settled permanently in Edinburgh. One of his last works was his autobiography, *My Own Life*.

Humperdinck, Engelbert (1854–1921), German composer, born in Sieburg, near Bonn. His education in music profited by an early association with Wagner, who had the young composer assist him in preparing *Parsifal* for its first presentation at Bayreuth in 1882. Besides a number of operas Humperdinck wrote ballads, choruses and incidental music for Shakespeare's plays. He was at his best when composing for folk tales and fairy stories, and his best-known work is the delightful fairy opera *Hänsel und Gretel* (1893). Another favorite of the same type is *Die Königskinder* ("The Royal Children"), produced at the Metropolitan Opera House, New York, in 1910.

Hunt, [James Henry] Leigh (1784–1859), English writer, born in London. In 1808 he became editor of the *Examiner*, a political newspaper started by his brother. In it he wrote a libelous article about the Prince Regent (later George IV), calling him a *fat Adonis of fifty* and was sent to prison for 2 years in 1813. While there Hunt occupied himself by writing verse. In 1821 he went to Italy and joined Shelley and Byron in editing a radical journal called the *Liberal*. Shelley's death and a disagreement with Byron put an end to the venture, but Hunt continued to write verse, literary criticism and essays until late in life. His literary fame rests on his *Lord Byron and Some of His Contemporaries* and an *Autobiography*.

Hunt, Richard Morris (1827–95), American architect, born in Brattleboro, Vt., the brother of William Morris Hunt. At the age of 15 he began the study of architecture in Geneva and Paris. After a period of travel he helped his old teacher, Lefuel, in the construction of the new Louvre in Paris, then returned to America in 1855. He worked on the enlarging of the Capitol at Washington and then founded in New York the first American studio for the training of architects. Among other buildings Hunt designed the old Lenox Library in New York, the United States Naval Observatory in Washington, the Administration Building at the Chicago World's Fair of 1893 and the pedestal of the Statue of Liberty.

Hunt, William Holman, see *Holman-Hunt, William*.

Hunt, William Morris (1824–79), American painter, born in Brattleboro, Vt., brother of the architect Richard Morris Hunt. While studying in Paris he came under the inspiration of the Barbizon school, being especially influenced by Millet. In 1855 he established himself in Boston as a teacher and painter and introduced French ideals and methods to American painters. Hunt was at his best as a landscape artist, but he painted many excellent figure subjects and portraits. Typical among his works are *Peasant Girl at Barbizon* and *Hurdy-Gurdy Boy* (Boston Museum), *The Bathers* (Metropolitan Museum, New York), portrait of Chief Justice Shaw (Salem, Mass.), *Gloucester Harbor* and *Falls of Niagara* and the mural decorations in the Capitol at Albany.

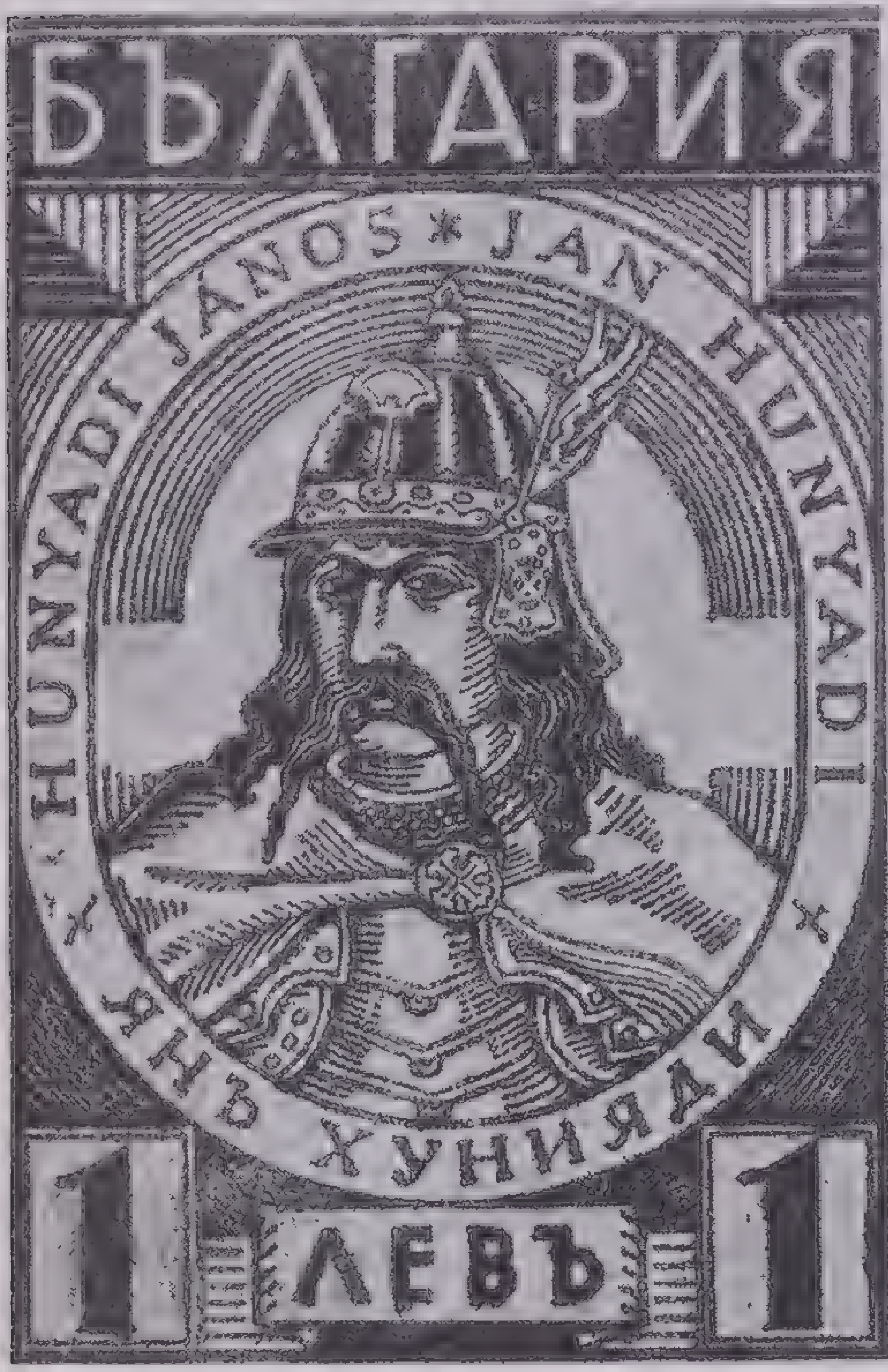
Hunter, John (1728–93), Scottish surgeon, born in Glasgow. He began the study of anatomy in 1748 and became house surgeon at St. George's Hospital, London, in 1756. Three years later he served as staff surgeon in the army. He resumed practice in London in 1763 and in 1768 became a surgeon at St. George's. He was surgeon to the king from 1776 and deputy surgeon general to the army from 1786. His years of experimentation and study, including the dissection of more than 500 different animal species, yielded valuable results. Hunter was accounted the best operating surgeon of his time, the most competent anatomist and unsurpassed as a zoologist. He made an anatomical collection, and his 10,000 specimens were given to the Royal College of Surgeons.

Huntington, Daniel (1816–1906), American painter, born in New York city, educated at Hamilton College (Clinton, N.Y.). He studied in America under Henry Inman and Samuel F. B. Morse and in Rome. The Chamber of Commerce, New York, possesses his *Lady Washington's Reception Day* and *Atlantic Cable Projectors*. His *Republican Court*, containing over 60 figures, is in the Stuart Collection, New York. Among his numerous portraits are those of several famous Americans, including Lincoln (Union League Club, New York).

Hunyadi János (d. 1456), Hungarian statesman and general. He fought in the army of King Sigismund and, under the next ruler, King Albert II, was in 1438 made head of Szoreny, a district exposed to attack by the Turks. Turkish forces invaded the country during a period of civil war but were defeated by Hunyadi and forced to accept peace in 1443. In a renewal of the war Hunyadi was defeated at Kossovo (1448), but he maintained Hungarian independence a few years later through his victory at Belgrade, which Mohammed II besieged in 1456. The defeated Turks lost 80,000 men and were compelled to raise the siege. Within a few days Hunyadi died of the plague.

Hurst, Fannie (1889–), American writer, born at St. Louis, Mo. She graduated from

Washington University and in 1915 married Jacques S. Danielson. Her stories usually deal with the life problems of ordinary people. Among her most popular novels are *Lummox, A President Is Born, Back Street* and *Imitation of Life.* Collections of short stories are titled *Humoresque, Gaslight Sonatas* and *The Vertical City.*



Courtesy Scott Stamp & Coin Company

Hunyadi János
Enlarged from a Bulgarian postage stamp issued in 1935 to commemorate the battle of Varna

Huss or **Hus, John** (*c.* 1369–1415), Bohemian church reformer, born in Husinetz, Bohemia, of Czech parents. He took his name from his birthplace. He was educated at the University of Prague, at which he was successively lecturer, dean of philosophy and rector. In 1401 he was ordained a priest and became interested in the doctrines of Wycliffe, the English theologian. His preaching of Wycliffe's doctrines aroused the anger of the authorities, and he was charged with heresy. Huss and his followers were excommunicated in 1410, but Huss continued to write and speak against ecclesiastical abuses. In 1414 he was summoned to appear before the general council in Constance. Within a month after his arrival he was thrown into prison; in 1415 he was tried, convicted of heresy and was burned at the stake. His martyrdom brought on a political and religious revolution in Bohemia.

Hutchins, Robert Maynard (1899–), American educator, born in Brooklyn, N.Y. He studied at Oberlin College and at Yale. In 1923 he became secretary of Yale University. In 1927, while serving as dean at Yale, he introduced courses in psychology and economics; later, while he taught at the medical school, he helped to organize the Institute of Human Relations at Yale. He was chosen president of the University of Chicago at the age of 30 and at once abolished compulsory courses and attendance and the giving of grades. On the other hand he did not approve of other modern tendencies in education. He felt that not enough attention was being given to the classics and to the principles, theories and philosophies underlying modern life problems.

Hutchinson, Anne (*c.* 1590–1643), American religious leader in the colonial period, born in Lincolnshire, England. She married William Hutchinson in 1612 and emigrated with her family in 1634, settling in Boston. She soon began to hold religious meetings and to teach salvation by grace instead of by works. This was considered heresy, and she was banished from the colony. At first she took her followers to Rhode Island, but after her husband's death in 1642 she moved to Dutch territory that is now just north of New York city. In 1643 she and all her family except one daughter were murdered by the Indians.

Hutchinson, Thomas (1711–80), last royal governor of Massachusetts, born in Boston, graduated from Harvard College in 1727. He rose to prominence in the colony and was elected to the General Court in 1737. While serving as chief justice in 1761, he became very unpopular by issuing writs of assistance or search warrants; later he tried to enforce the Stamp Act because it was his duty to do so, although he personally did not approve of it. As a result his house was sacked and burned by a mob. Hutchinson became acting governor in 1769 and governor in 1771. His unpopularity increased, and in 1774 he was replaced by General Gage. His *History of Massachusetts Bay* is a valuable narrative of his times.

Huxley, Aldous [Leonard] (1894–), English writer, the grandson of Thomas Henry Huxley, educated at Eton College and Oxford University. His first published work was a collection of poems, and his first novel *Crome Yellow* (1921) was followed by many others. In 1928 *Point Counter Point* attracted considerable attention, and since then his most notable works have been *Brave New World* (a novel, 1932), *World of Light* (a play, 1932), a biography of T. H. Huxley (1932) and *Beyond the Mexique Bay* (travel book, 1934). Huxley edited *The Letters of D. H. Lawrence* (1932) and *The Encyclopedia of Pacifism* (1938).

Huxley, Julian Sorell (1887–), English biologist, grandson of T. H. Huxley and older brother of Aldous. Educated at Eton and at Balliol College, Oxford, he taught at Rice Institute, Houston, Texas, and at King's College and the Royal Institution, London. In 1935 he became secretary of the London Zoological Society. He wrote poems and essays as well as books on zoology and edited T. H. Huxley's *Diary.*

Huxley, Thomas Henry (1825–95), English biologist, born in Ealing, near London. He received a degree in medicine from the University of London in 1845. As assistant surgeon on the royal navy ship *Rattlesnake* (1846–50), during a 4-year survey of the Great Barrier Reef region of Australia, he collected and studied many forms of marine life and classified them under a system of his own. While he was abroad, Huxley sent various scientific papers to London to be published in the *Philosophical Transactions* of the Royal Society (1849). He was elected a fellow of that organization in 1851. Huxley was given many honors for his work, and in 1881 he became president of the Royal Society. He supported Darwin's theory of evolution, although with certain qualifications, and helped to bring about popular acceptance of the theory. He wrote texts on physiology and biology.

Huygens, Christian (1629–95), Dutch scientist and mathematician, born in The Hague and educated at Leyden and Breda. Huygens is famed as the originator of the wave theory of light, by which he was able to explain reflection and refraction. He also discovered polarization of light and made preliminary studies in the physics of moving bodies that were of great value to Newton. Huygens made several high-powered telescopes, and with one of them he discovered the ring and fourth satellite of Saturn (1655). He also made the first pendulum clock.

Huysmans, the name of three 17th century Flemish painters, all born in Antwerp.

Jacob Huysmans (*c.* 1633–96) went to London and became a fashionable portrait painter. His portraits of Queen Catherine of Braganza and of Izaak Walton now hang in the National Portrait Gallery, London.

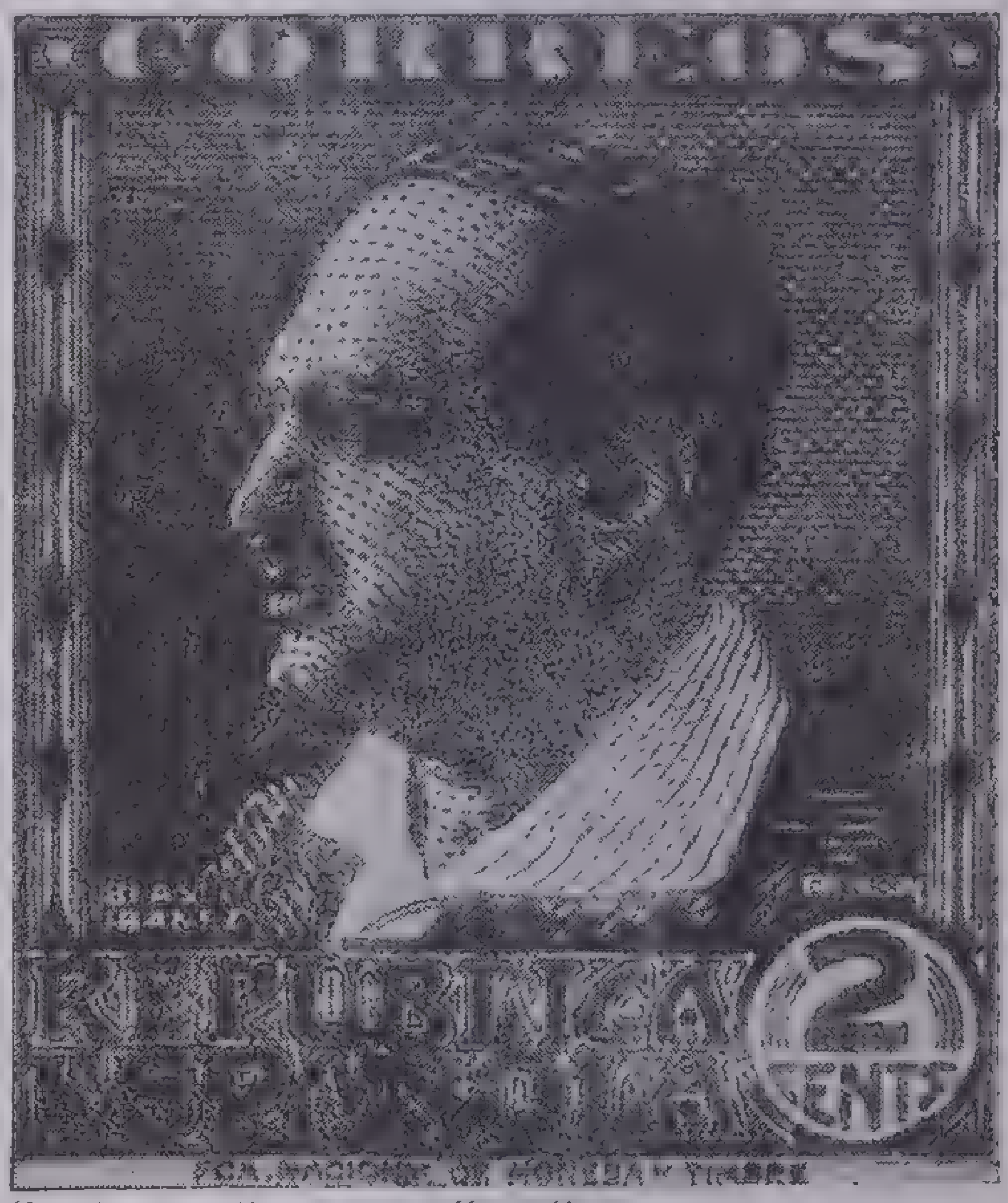
Cornelis Huysmans (1648–1727) is best-known for his brilliantly colored landscapes although he painted many religious and historical subjects also.

Jan Baptist Huysmans (1654–1716) was the brother of Cornelis. He painted landscapes with figures, many of which now hang in European museums.

Hyde, Douglas (1860–), Irish scholar and first President of Ireland under the Constitution of 1937. The son of a Protestant clergyman, he was educated at Trinity College, Dublin, and early devoted himself to the language and literature of Ireland. For a year (1901–02) he taught in the University of New Brunswick. From 1893 to 1915 he was president of the Gaelic League and in 1906 he raised £11,000 for the League in the United States. He wrote poems and plays in Gaelic, notably *The Twisting of Rope,* translated by Lady Gregory and presented at the Abbey Theater in Dublin. He retired from teaching at the National University in 1932, and in 1938 he was chosen President of Ireland by the agreement of De Valera's party and the opposition led by W. T. Cosgrave. In Ireland he is known as *An Craoibhin Aoibhinn,* "the delightful little branch," a phrase in a famous poem from his pen.

Hypatia (d. 415), Greek philosopher, daughter of Theon of Alexandria. She was educated by her father, a mathematician, astronomer and head of the Neo-Platonic school. Hypatia gathered around herself a large number of pupils in Alexandria. A mob stoned her to death in a church because they thought her responsible for persecution of the Christians in Alexandria. Her story inspired Charles Kingsley's romance *Hypatia.*

Ibáñez, Vicente Blasco (1867–1928), Spanish novelist, born in Valencia. Eight times Valencia elected him to the Cortes (legislature). Because of his outspoken criticism of the Spanish monarchy, he was imprisoned 30 times and finally exiled, after which he made his home in Mentone, France. He is best known as the author of *The Four Horsemen of the Apocalypse,* a colorful story of the World War and the German invasion of France. Among other novels are *Mare Nostrum, Blood and Sand, The Torrent* and *The Temptress,* all of which were translated into English.



Courtesy Scott Stamp & Coin Company

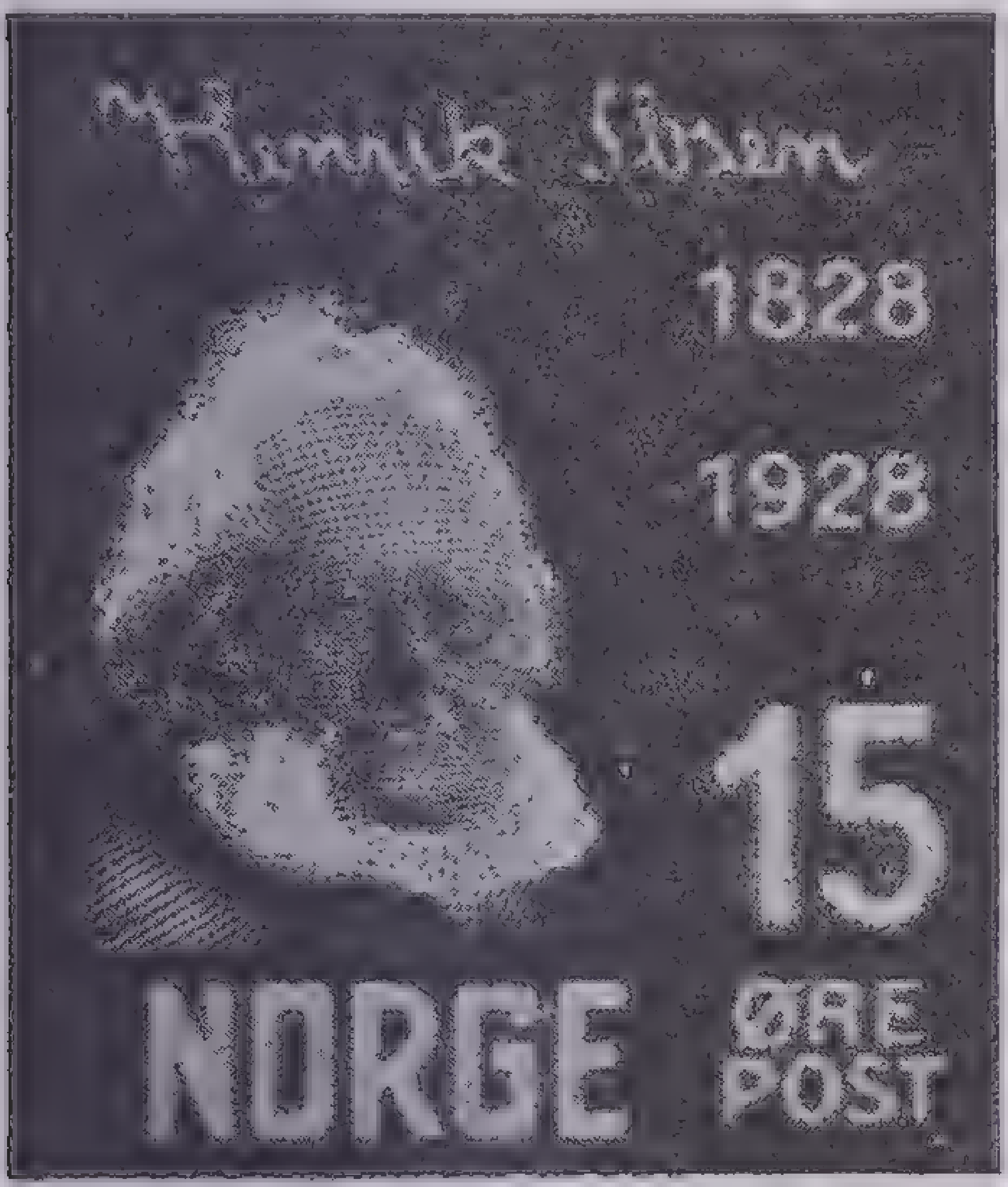
Vicente Blasco Ibáñez
From a Spanish postage stamp issued 1931–34

Iberville, d', Pierre le Moyne, Sieur (1661–1706), French-Canadian naval officer, founder of Louisiana province, born in Montreal. Early in his career he distinguished himself as a French naval officer in various battles with the English. In 1698 he founded a French colony on the Gulf of Mexico and built a fort on the site of Biloxi. The colonists suffered great hardships from sickness, and he moved most of them to Mobile (1702), which became the capital of Louisiana province.

Ibn-Saud, Abdul-Aziz (1880–), King of Saudian Arabia. His father was driven into exile in 1891 when usurpers took the throne. In 1900 he transferred his rights to his son, who in 1901 recaptured Riad, the capital city, and after that gradually extended his power. He was not active in the World War but was kept on the Allied side by a British subsidy. In 1925 a treaty with Great Britain fixed the frontiers of his kingdom, and later treaties with neighboring rulers settled long-standing feuds. In 1932 the name of the kingdom was changed to Saudian Arabia from the Hejaz and Nejd. Ibn-Saud derived much authority from the fact of being hereditary head of the Wahaki sect. He tried consistently to induce his people to give up a nomadic life and become farmers.

Ibsen, Henrik (1828–1906), Norwegian playwright, born at Skien, in south Norway. He studied medicine and was a chemist's assistant at Grimstad (1842–50) but soon devoted himself wholly to literature. His first drama about Catiline was a failure. In 1857 he became director of the national theater in Christiania. His next dramas, *The Warriors in Helgeland, The Pretenders* and *Love's Comedy* placed Ibsen in the foremost rank of Scandinavian dramatists. In 1862 the national theater became bankrupt, and Ibsen, enraged because Norway would not help the Danes in their struggle against the Germans, left his country and lived in Rome, Dresden and Munich (1864–92).

The Norwegian Parliament granted him a pension in 1866. In 1866–67 appeared his lyric drama *Emperor and Galilean.* There followed *Pillars of Society, A Doll's House, Ghosts, Rosmersholm, Hedda Gabler, The Master Builder, Solness, When We Dead Awaken* and *John Gabriel Borkman.* These plays aroused a storm of controversy in the literary world because their author advocated individual liberty. As a playwright Ibsen ranks with the greatest.



Courtesy Scott Stamp & Coin Company

Henrik Ibsen

Enlarged from a Norwegian postage stamp issued in 1928 on the centenary of the birth of the Norwegian dramatist

Ickes, Harold Loy (1874–), American lawyer and Federal administrator, born in Blair County, Pa., educated at the University of Chicago. He was active in municipal reform in Chicago and fought against domination of city government by business. He followed Theodore Roosevelt from the Republican into the Progressive Party in 1912 and directed that party's activities in Illinois for 3 years. In 1924 he managed Hiram Johnson's campaign for the Republican Presidential nomination. In July 1932 President Franklin Roosevelt appointed him secretary of the interior and administrator of public works. In that position he directed the spending of billions of dollars for public-works projects. He wrote *The New Democracy* (1934).

Ictinus (5th century B.C.), Greek architect, of the time of Pericles. He designed the Parthenon at Athens, the Hall of Mysteries at Eleusis and the Temple of Apollo Epicurius at Bassae in Arcadia. Sculptures from the Parthenon and the Temple of Apollo are now among the treasures of the British Museum, London.

Ignatius, Saint (d. *c.* 107), bishop of Antioch, probably born in Syria. There is a tradition that he was a disciple of the Apostle John. Seven letters to the early Christians, written by Ignatius, have an important place in the records of the Roman Catholic Church. The first use of the term *Catholic,* as applied to the Church, occurs in one of these epistles. He became bishop of Antioch, but at some date between 107 and 138 he was taken prisoner to Rome. Tradition says he was thrown to the lions in the arena.

Ignatius of Loyola, see *Loyola.*

Inge, William Ralph (1860–), English clergyman and author. He became vicar of All Saints, London (1905), was professor of divinity at Cambridge, 1907–11, and in the latter year was appointed dean of St. Paul's Cathedral, London, which post he resigned in 1934. His frank and pointed criticism of contemporary manners and customs, both in his speeches and his writings, gave him the reputation of being a pessimist. His *Outspoken Essays, Lay Thoughts of a Dean* and *The Idea of Progress* have been widely read in the United States, where he became well known as a lecturer.

Ingelow, Jean (1820–97), English poet and novelist, born in Lincolnshire. In 1863 a volume of her verse was received with much favor and passed through more than 20 editions. Among the well-known poems in this collection are the ballads *High Tide on the Coast of Lincolnshire* and *Songs of Seven.* She wrote the novels *Off the Skelligs* and *Sarah de Berenger,* as well as many stories for children.

Ingersoll, Robert Green (1833–99), American orator and lawyer, born in Dresden, N.Y. He moved to Illinois in 1845 and established a successful law practice in Peoria. He fought in the Civil War as colonel of an Illinois cavalry regiment. He became active in Republican party affairs and was widely acclaimed for his eloquent speech in behalf of James G. Blaine at the Republican national convention of 1876. His attacks on Christianity and other religious faiths made him lose political favor. Among his writings are *Some Mistakes of Moses, Great Speeches* and *Lectures Complete.*

Ingres, Jean Auguste Dominique (1780–1867), French painter. He won the Prix de Rome in 1801 with his *Achilles Receiving the Messenger of Agamemnon,* which enabled him to study in Rome from 1806 to 1820. He painted in the classic style. His work is graceful and sure but without much originality. Among his best paintings are *Jupiter and Thetis* (Aix Museum), *Apotheosis of Homer* (Louvre, Paris) and *Napoleon as First Consul* (Liége Museum).

Inman, Henry (1801–46), American painter, born in Utica, N.Y. He was at his best in portraiture but also painted landscapes and figure studies. Among his portraits are those of Fitz-Green Halleck, Chief Justice Marshall, Audubon and Martin Van Buren; the Van Buren portrait is now in the Metropolitan Museum, New York. In 1844 Inman went to England and, among other notables, painted Wordsworth and Macaulay. The landscape *Rydal Falls, England,* is one of his best. His figure studies include *Rip Van Winkle, The News Boy* and *Boyhood of Washington.*

Innes, Cosmo (1798–1874), Scottish historian and antiquarian, born at Durris, educated at Glasgow and Oxford. He became professor of constitutional law and history at the University of Edinburgh. He is best-known as the author of *Scotland in the Middle Ages* and *Sketches of Early Scotch History.*

Inness, George (1825–94), American landscape painter, born in Newburgh, N.Y. He studied art but was essentially self-taught. His years of residence in Paris and Rome did not change the individualistic character of his work, though he was greatly impressed by the Barbizon painters of France. In his more mature years Inness was more interested in atmospheric and poetic effects than in detail. His mastery of color is shown in such canvases as *Millpond* and *Florida Pines* (Chicago Art Institute); *Autumn Oaks* and *Delaware Valley* (Metropolitan Museum, New York); *Georgia Pines* and *Niagara* (National Gallery, Washington).

Inness, George (1854–1926), son of George Inness, born in Paris. He maintained a studio there from 1895 to 1899 but after 1875 lived chiefly in the United States. He painted animals effectively. Many of his best landscapes show something of the color characteristic of his father's paintings. His finest work *The One Hope* may be seen in a church in Tarpon Springs, Fla., his winter home. The Metropolitan Museum, New York, possesses his *Shepherd and Sheep* and *The First Snow at Cragsmoor.* Other paintings include *Monarch of the Farm, The Coming Storm* and *Morning on the River.* Inness was an illustrator for *Century Magazine* during the last 13 years of his life.

Innocent III (Giovanni Lothario Conti; 1161–1216), Pope of Rome, born in Anagni, Italy, the nephew of Clement III, who created him a cardinal. While still a layman he was elected to the papal chair in 1198 at the age of 37. His great aim was to make the Church the ruling power over civil government. He first restored church supremacy in Rome and then made his power felt in every European country. Among the sovereigns who yielded to him were Philip Augustus of France, Alfonso IX of Leon and John of England. Pope Innocent also began the Fourth Crusade, which resulted in the capture of Constantinople.

Irene (*c.* 752–803), Byzantine Empress, born in Athens. In 768 she became the wife of Leo, who ascended the throne of the Byzantine Empire in 775 as Leo IV. On his death in 780 Irene became regent and ruled during the minority of her son Constantine VI. Through her influence a council at Nicaea (787) restored image worship to the Eastern Church. In 797 she caused her son to be blinded and barred from control of the government, but her misrule led to a conspiracy in 802, and she was banished to Lesbos, where she soon died.

Irving, Sir Henry (John Henry Brodribb; 1838–1905), English actor, born in Somersetshire. His stage name was legalized in 1887. He made his first professional appearance in a stock-company production of *Richelieu* at the Lyceum, Sunderland, but did not gain much recognition until 1867, when he began playing at the Queen's Theatre, London. One of his most successful parts was that of Petruchio in *Taming of the Shrew,* in which Ellen Terry played Katherine. As Digby Grant in the comedy *Two Roses* Irving won a sensational success in 1870 at the Vaudeville Theatre and was soon engaged as leading man for the Lyceum productions. He took over the management of the Lyceum in 1878 and with Ellen Terry as leading lady made theatrical history in London.

In 1883 the company made the first of several visits to the United States. Chief among his triumphs in a long stage career were his portrayals in *Hamlet, The Merchant of Venice, Macbeth, The Bells* and *Faust.* Irving was the first English actor to be knighted (1895). He was buried in Westminster Abbey.

Irving, Washington (1783–1859), American writer, born in New York. At the age of 16 he entered a law office but soon abandoned the law to study literature. New York at this period was a town of about 50,000 inhabitants, many of whom were descendants of the original Dutch settlers. They kept many quaint manners and customs of which Irving was a curious observer. In 1809 he wrote *A History of New York, From the Beginning of the World to the End of the Dutch Dynasty, by Diedrich Knickerbocker,* a burlesque chronicle written in so quiet a vein of humor that it has sometimes been taken for an actual history. He visited England in 1815 to take charge of the English branch of the family's hardware business.

In 1819 he published the well-known *Sketch Book,* containing "The Legend of Sleepy Hollow" and "Rip Van Winkle." At the invitation of Edward Everett, American ambassador to Spain, he accompanied Everett to Madrid to translate documents connected with the life of Columbus. With these materials he wrote his *History of the Life and Voyages of Columbus, Voyages of the Companions of Columbus, The Conquest of Granada* and many Spanish works. From 1843 to 1846 he represented the United States as minister to Spain. In 1846 was published his *Life of Goldsmith,* and his ambitious but disappointing *Life of Washington* was published in 1855–59.

Isabella I (1451–1504), Queen of Spain, the daughter of John of Castile. In 1469 she married Ferdinand of Aragon and in 1474 succeeded her brother on the throne of Castile. When Castile and Aragon were united under the rule of Isabella and Ferdinand in 1479, the greatness of Spain began. The year 1492 witnessed the discovery of America, the capture of Granada and the conquest of the Moors. Isabella lent her support to Columbus so that he might make his memorable voyage westward across the Atlantic. She was grandmother of Charles V of Spain and the mother of Catherine of Aragon, who became the first wife of Henry VIII of England.

Ismail Pasha (1830–95), Khedive of Egypt, son of Ibrahim Pasha. He succeeded his uncle, Said Pasha, as viceroy in 1863, became wealthy as a cotton producer during the American Civil War and encouraged the construction of the Suez Canal. He received the title of khedive in 1867. Ismail was virtually an independent sovereign, but his extravagance led to financial troubles and the interference of the European powers. In 1879 the sultan of Turkey forced his abdication in favor of Ismail's son Mohammed Tewfik. From 1888 until his death Ismail lived in Constantinople.

Isocrates (436–338 B.C.), Greek writer and teacher, born in Athens. Although he is often classed as an orator, Isocrates was not an effective public speaker. He devoted himself rather to composing speeches and to preparing young men for public life. He was the first political pamphleteer, and his writings had an important place in the development of Greek prose. In early life he studied philosophy under Socrates. His great ambition was to unite all Greeks against the Persians, their common foe, and to this end he wrote his famous *Panegyricus,* the best of his speeches. It is said that Isocrates committed suicide after the conquest of Greece by Philip of Macedon.

Israels, Joseph (1824–1911), Dutch-Jewish painter, born in Groningen. He studied in Amsterdam and Paris and for a few years devoted himself to historical painting. He went to a fishing village near Haarlem to recuperate from an illness and was so impressed by the hard life of the fisherfolk about him that a new note entered his work. He found his themes in the experiences of the lowly and painted such works as *Alone in the World*, *The Cradle*, *Toilers of the Sea* and *Frugal Meal* (Metropolitan Museum, New York). Israels also painted portraits and produced some excellent etchings.

Ito, Prince Ito Hirobumi (1841–1909), Japanese statesman. In 1861 he went secretly to England, where he remained a year or more studying British customs. On his return to Japan he set in motion the changes that modernized the Empire, and later trips to Europe and America eventually resulted in the adoption of a uniform coinage system in Japan. The reconstruction of the Japanese Cabinet (1885) was also his work, and in 1889 the government adopted a liberal constitution that he prepared. Ito was premier at four different times and in 1909 retired as resident general of Korea (Chosen). While on a visit to Harbin he was assassinated by a Korean.

Iturbide, de, Agustín (1783–1824), Emperor of Mexico, born in Valladolid (now Morelia), the son of a Spanish nobleman. He entered military service at the age of 15 and was long loyal to Spain. In 1820 he joined the insurrectionists and in 1821 issued a proclamation known as the "Plan of Iguala," which proposed an independent Mexican state. With a force of 16,000 men Iturbide entered Mexico City and signed a treaty with the viceroy, becoming head of a regency and commander of the army. In 1822 he was crowned with the title of Emperor Agustin I. Dissensions arose, and in 1823 he abdicated. The succeeding republican government outlawed him, and when Iturbide returned to Mexico in 1824, he was shot as a traitor.

Ivan III, Vasilevich (*c.* 1440–1505), called *the Great*. He succeeded his father as Grand Duke of Muscovy in 1462 and began a policy of conquest by which he threw off the yoke of the Tatars and brought most of Russia under the rule of Moscow. In 1477 the free city of Novgorod was annexed. In 1492 Ivan married Sophia, niece of the Byzantine emperor; the double eagle was added to the Russian arms, and Ivan assumed the title of emperor. He reformed the courts, codified the laws, encouraged art and industry and entered into diplomatic relations with western Europe.

Ivan IV, Vasilevich (1529–84), called *the Terrible*, the grandson of Ivan III. He was the first Russian ruler to take the title Czar (1547). During his youth he had been horrified by the atrocities and cruelties practiced upon the common people by the nobles or boyars. When he came into power, he repressed the aristocrats and confiscated their estates. Later his own cruel acts brought him the nickname, *the Terrible*. In a frenzy of rage he killed his own son in 1580 and is said to have died of grief. To his credit may be placed his efforts to encourage art and commerce. In his reign Siberia was conquered, the city of Archangel was built (in 1584), and a commercial treaty with England followed.

Ives, Frederic Eugene (1856–1937), American inventor, born at Litchfield, Conn., and educated in public schools. He had charge of the photographic laboratory at Cornell University, 1874–78. In 1878 he invented the first successful process of half-tone photoengraving. The process now in general use was perfected by Ives in 1886. His experiments in color photography led to the development of three-color printing. He also invented a process for taking motion pictures in natural colors. Ives received more than 70 patents, and he received many honors in America and Europe.

Jackson, Andrew (1767–1845), 7th President of the United States, born in the Waxhaw settlement on the border between North and South Carolina, son of a Scotch-Irish emigrant farmer. Andrew was 2 years old when his father died; he lost his mother and two brothers during the Revolutionary War and was left alone in the world at the age of 14. His military career was begun in boyhood. At 13 he was taken prisoner by the British when they invaded South Carolina. Jackson began the study of law at 17 and was admitted to the bar before he was 20. In 1788 he became public prosecutor of the Western District of North Carolina (now Tennessee). He was elected to Congress in 1796 and 2 years later was made judge of the Tennessee state supreme court. For a few years he managed a store and plantations, but his business career was marked by frequent quarrels, one of which led to a duel in which he received a crippling wound and killed his opponent.

As major general of the Tennessee militia Jackson and his 2,500 men volunteered in the War of 1812 and went immediately into action. He won decisive victories over the Creek Indians (1813–14) and was appointed major general in the regular army (May 1814). Without waiting for orders from Washington he captured Pensacola, the British base, and moved on to New Orleans. There he hastily built defenses and on Jan. 8, 1815, repulsed a much larger British force. The Treaty of Ghent had already ended the war, but neither army knew about it. The news of the victory made Jackson more popular than ever. He was made commander of the southern division of the army, and in 1818 he defeated the Seminole Indians in Florida and destroyed their principal towns. Jackson executed two British citizens whom he accused of stirring up the Indians, and this involved the United States in serious trouble with Great Britain and with Spain. However, Spain ceded Florida to the United States in 1819. Jackson was appointed governor of Florida in 1821. His few months in office were marked by a clash with a judge in the territory, but he again escaped censure for going beyond his authority.

Jackson was elected to the U.S. Senate in 1823 and was nominated for the Presidency in 1824 after the Tennessee legislature presented his name as its Democratic candidate. He was one of four candidates, none of whom won a majority of the votes, and the contest was decided by the House of Representatives. Jackson, having led in number of popular votes, deeply resented the election of John Quincy Adams, to whom Clay had thrown his influence. He resigned from the Senate in 1825 and opposed Adams until his own election to the Presidency in 1828, with Calhoun as his running mate. In 1832 he was re-elected, defeating Clay by a decisive majority. Martin Van Buren was elected Vice-President.

The period covered by Jackson's two terms was notable in many respects. The President was regarded as the friend and representative of the people, and Democrats still honor him as one of the founders of their party. He was a man accustomed to give rather than take advice, and his cabinet had little voice in affairs. He relied on the opinions of a few close friends who made up what was popularly called the *Kitchen Cabinet*. Jackson's administration was marked by the introduction of the spoils system, and Jackson was the first President to build up a political machine composed of officeholders.

One of his outstanding acts was a decisive rebuke to South Carolina's attempt to nullify an unpopular tariff law. He even went so far as to concentrate troops and warships near Charleston. Whatever the merits of the case, the President made it clear that the Federal Union would be preserved at all costs. Jackson showed stubborn reliance on his own judgment in vetoing a bill for rechartering the United States Bank. He ordered the government's deposits removed, thus putting an end to the bank. This so angered the Senate that it adopted formal resolutions of censure; they were, however, erased from the record in 1837. In his last year of office Jackson issued the famous Specie Circular, ordering payments for public lands to be made in gold or silver. This policy combined with other factors to bring on the panic of 1837, which had to be met by Van Buren, Jackson's successor. Jackson retired from office with an even greater following than when he was elected.

Jackson, Helen Maria Fiske Hunt (1831–85), American novelist and poet, born in Amherst, Mass. She married Major Edward B. Hunt in 1852 and in 1875, 13 years after his death, became the wife of William S. Jackson, of Colorado Springs, Colo. Her first published book *Verses by H.H.* (1870) was well received, and she continued to write until her death. She is best-known for *Ramona*, the pathetic story of an Indian girl. Other of her novels are *Mercy Philbrick's Choice* and *Hetty's Strange History*. She also wrote books for children, volumes of poetry and essays and *A Century of Dishonor*, a protest against unjust treatment of the Indians.

Jackson, Thomas Jonathan (1824–63), American Confederate general, born in what is now Lewis County, W. Va. He was graduated from West Point in 1846 and served with distinction in the Mexican War. From 1851 to 1861 he taught at Virginia Military Institute, Lexington, Va. When the Civil War broke out, he was appointed brigadier general in the Confederate service. At the battle of Bull Run, July 1861, his troops "stood like a stone wall," hence his sobriquet "Stonewall." He captured Harper's Ferry, taking 11,000 Federal prisoners, commanded a corps at Antietam and was made lieutenant general after the defeat of the Union army at Fredericksburg. In 1863, by a clever flank movement, he defeated the 11th Corps of General Hooker's army at Chancellorsville and after dark of the same day was fired at by a patrol party of his own men, who mistook him and his staff for a detachment of Union cavalry. He died of his wounds on May 10. He was one of the great military geniuses of the 19th century.

Jacobs, Helen Hull (1908–), American tennis player, born at Globe, Ariz., studied at the University of California. She won the national junior championship in 1924 and 1925; the United States women's singles and doubles in 1932; the singles in 1933; the singles, doubles and mixed doubles in 1934; the singles and doubles in 1935. She won many other tennis victories in the United States and abroad. She wrote *Modern Tennis* (1932) and many magazine articles.

Jacquard, Joseph Marie (1752–1834), French inventor, born in Lyons. He learned the art of weaving from his father and is famed for inventing the automatic loom that bears his name. He completed the model after years of experimentation and was awarded a bronze medal at the Industrial Exposition in Paris in 1801. In 1806 the French government bought the invention, which eventually revolutionized the weaving industry. The state granted him an annuity and a royalty on all looms sold. Jacquard was mobbed by a crowd of workmen, who thought that his invention would destroy their means of livelihood.

Jahn, Friedrich Ludwig (1778–1852), Prussian teacher, born in Lanz. He was the father of the German gymnastic system, which led to the modern *Turnverein*. Depressed by the plight of Germany, which had been crushed by Napoleon's tyranny, Jahn believed that outdoor exercises would help to restore the country's morale. While he was a teacher in Berlin in 1811, he organized the first open-air gymnasium for boys. The movement spread rapidly, kindling a spirit of patriotism in the youth of the land. The leader himself fell a victim to the reactionary regime that followed Napoleon's downfall, and in 1819 he was arrested for "treasonable associations." Released in 1825, he retired to Freyburg, where he died in obscurity.

James I (1566–1625), King of England, the son of Mary, Queen of Scots, and Lord Darnley. He succeeded to the throne of Scotland in 1567 as James VI, but the real ruler was the Earl of Morton, who was regent until 1578. As a child James was delicate and throughout his life was awkward and ungainly. He ascended the throne of England as James I in 1603 on the death of Queen Elizabeth. He was the first king to rule over a combined England and Scotland and was also the first of the Stuart monarchs. The most important events of his reign include the founding of the first English colony in America at Jamestown (1607), the establishment of Plymouth Colony (1620) and the publication of the *King James Version* of the Bible (1611). His religious ideas were heartily disliked by both Puritans and Roman Catholics, and his foreign policy was neither consistent nor wise. In 1589 he married Princess Anne of Denmark, and from their daughter Elizabeth the present royal family of England is directly descended.

James II (1633–1701), King of Great Britain, second son of Charles I. In 1648, during the civil war, he escaped to France and later entered the military service of Spain. With the Restoration, he returned to England with his brother Charles II and was made a Lord High Admiral. He commanded the fleet in battles with the Dutch and later went to Scotland to suppress the Covenanters. He was prominent in public life throughout his brother's reign. In 1685 he became king in spite of opposition that was raised because he had been converted to Catholicism. Three years of his rule aroused such a storm of protest that an invitation was sent to William of Orange to come and take the crown. So thoroughly had James alienated his people that he found himself unable to defend his throne, and William became king of England (1688). In 1690 James was in Ireland and made an effort to oust his rival, but the campaign failed. He retired to France to spend the rest of his days.

James, Henry (1843–1916), American-English novelist, born in New York. He spent most of his youth abroad in travel and study but returned to America at 19 to enter Harvard

Law School. Although he qualified to practice law, he continued the literary career begun while he was in school and in 1875 won wide recognition with the novel *Roderick Hudson.* In all he wrote about 40 novels, besides volumes of literary criticism, travel sketches, biography and plays. His novels include *Daisy Miller, The Bostonians, The Tragic Muse, What Maisie Knew* and *The Ambassador.* Long a resident of England he became a British subject in 1915.

James, William (1842–1910), American philosopher, born in New York, a brother of Henry James. He received a degree in medicine from Harvard in 1869, completing an education begun abroad. From 1872 to 1907 he taught philosophy and psychology at Harvard. He also lectured at Edinburgh and Oxford. As a philosopher James ranks among the foremost thinkers, and his *Principles of Psychology* (1890) became a classic. He possessed an exceptionally lucid style; it has been said that he was a psychologist who wrote like a novelist, whereas his brother Henry was a novelist who wrote like a psychologist. William James was the founder of pragmatism, a philosophical principle adopted and modified by John Dewey. Among other books by James are *The Will to Believe, Varieties of Religious Experience* and *A Briefer Course in Psychology.*

Jameson, Leander Starr (1853–1917), British colonial administrator in South Africa, born in Edinburgh. Jameson received a medical education in London, settled in Kimberley, Cape Colony, in 1878, and practiced his profession until 1890, when he became an associate of Cecil Rhodes in colonization schemes. Through Rhodes's influence Jameson was appointed administrator of Rhodesia in 1891. When the discontent of the "Uitlanders" (foreigners) in the Transvaal became acute, Rhodes placed Jameson in command of about 600 men, stationing them on the border in anticipation of an uprising to overthrow the Boer government. On his own initiative Jameson crossed the line into the Transvaal late in December 1895. On January 2 his force was surrounded by the Boers at Doornkop. Starved into surrender, Jameson and his officers were turned over to the British authorities, who sent them to England for trial. Jameson served less than a year of a prison sentence. He fought against the Boers again in 1899–1900 and later held administrative offices in South Africa. He returned to England and was knighted in 1911.

Jasper, William (*c.* 1750–79), American soldier, born in South Carolina. A sergeant in a South Carolina regiment, he distinguished himself in June 1776 by rehoisting the flag over Fort Moultrie under heavy British fire. He was rewarded for his bravery, but he refused a lieutenant's commission because he considered himself not well educated. As a scout he added to his reputation. He was killed in action.

Jay, John (1745–1829), American statesman, born in New York. He was graduated from King's College (now Columbia University) in 1764, and in 1768 he began the practice of law in New York. Jay was active in various official capacities throughout the Revolution and served as president of Congress, 1778–79. He went to Spain as ambassador and later to Paris, where in 1782–83 he helped to make the peace treaty that closed the Revolutionary War. From 1784 to 1789 he was secretary of state for foreign affairs under the Confederation. As a contributor to the *Federalist,* Jay helped to bring about ratification of the Federal Constitution. He was the first chief justice of the Supreme Court, filling this office with distinction until 1795. In 1794 he negotiated the Jay Treaty, which eased many strained relations between the United States and England. He served as governor of New York from 1795 to 1801 and then retired to private life.

Jeans, Sir James Hopwood (1877–), English astronomer, mathematician and physicist, educated at Oxford. He taught mathematics at Princeton University in the United States (1905–09), returned to England to teach at Cambridge (1910–12) and later at Oxford (1922). He was research associate at the Mt. Wilson Observatory in California in 1923. He is famous for his work in applying mathematics to problems of physics and astronomy and for his many discoveries of the nature and formation of heavenly bodies. Among the books he wrote that are popular with laymen are *The Mysterious Universe, The Universe Around Us* and *Through Space and Time.*

Jefferson, Joseph (1829–1905), American actor, born in Philadelphia of a theatrical family. He is best known for his portrayal of Rip Van Winkle. After years of playing in stock companies and appearing in minor roles, he joined Laura Keene's company and in 1857 won success in *The Heir-at-Law.* He appeared in *Our American Cousin* with E. A. Sothern. The role of Rip Van Winkle best suited him, however, and he played the part constantly for 15 years (1865–80). Other characters that he successfully portrayed were Bob Acres in *The Rivals* and Caleb Plummer in *Cricket on the Hearth.*

JEFFERSON, THOMAS (1743–1826), 3d President of the United States, born in Shadwell, Albemarle County, Va. His father owned a large estate, Old Shadwell. Thomas entered the College of William and Mary, Williamsburg, Va., at 17. After his graduation he studied law and was admitted to the bar in 1767. Politics became his chief interest, though he was successful as a lawyer and could have had an outstanding career in that profession. His political life began when he was elected to the Virginia House of Burgesses in 1769. In 1775 he was elected to the Continental Congress and in June 1776 was appointed chairman of a committee to draw up the Declaration of Independence, which Congress adopted on July 4. Jefferson wrote the first draft.

During the next few years Jefferson was busy with state affairs. As a member of the Virginia House of Delegates he worked for 2 years on a revision of the Virginia legal code and in 1779 succeeded Patrick Henry as governor of the state. He served two terms; in the second the British invaded Virginia. In 1783 he took his seat in Congress, where he urged adoption of the decimal system of coinage. He prepared a plan for the government of the public domain northwest of the Ohio River that was later the basis of the famous Ordinance of 1787. With Franklin and Adams, Jefferson was sent to Europe in 1784 to arrange commercial treaties, and in 1785 he became U.S. minister to France. In 1789 he returned home on a leave of absence and remained to become the first secretary of state. He held this office until 1793. As a believer in the ability of the people to govern themselves, Jefferson came into conflict with Hamilton, Washington's secretary of the treasury and a firm advocate of strong central government. Though the names of the parties have changed, the Democrats of today regard Jefferson as the chief founder of their party, and the Republicans honor Hamilton in much the same way.

Jefferson's next public office was that of Vice-President in the administration of John Adams, who belonged to Hamilton's party, the Federalists. Adams and Jefferson were the only candidates in the election of 1796. According to the law at that time, Adams was chosen President because he had the most votes and Jefferson, with three fewer ballots, became Vice-President. He remained an opponent of the party in power and wrote the Kentucky Resolutions as an answer to the Alien and Sedition Laws.

In the election of 1800 Jefferson and Aaron Burr received the same number of votes among four leading candidates, and the final choice was made by the House of Representatives, which selected Jefferson for the Presidency and Burr for the Vice-Presidency. Both were members of the same party, then called Republican or Democratic-Republican. Jefferson owed his election to the influence of Hamilton, who buried personal feelings to keep Burr from the office. In 1804 by an electoral vote of 162 out of 176 Jefferson was re-elected, with George Clinton of New York as Vice-President. The outstanding events of his first term were the purchase of Louisiana from France (1803) and the suppression of the Barbary pirates, who were defeated by a squadron under Decatur in the Mediterranean.

Jefferson's second term was notable for the failure of his embargo on all United States foreign commerce at the time of a general European war and for the republicanizing of government and White House customs. Other events of the period include the founding of the U.S. Military Academy at West Point, the abolition of the slave trade, the organizing of the Lewis and Clark Expedition and the completion of Fulton's steamboat, the *Clermont.* Jefferson refused to be a candidate for a third term and in 1809 retired to his plantation, Monticello. He devoted much time to the schools of the state, particularly to the establishment of the University of Virginia. Jefferson died on July 4 on the 50th anniversary of the adoption of the Declaration of Independence, and on that day John Adams also died. The essence of Jefferson's political beliefs was his faith in free speech, education and a truly representative government.

Jeffreys, George, 1st Baron (1648–89), English judge, born at Acton. He became a member of the bar in 1668. He had been a Puritan but began to intrigue for court favor. He was made solicitor to the duke of York, was knighted in 1677 and became recorder of London in 1678. His first exploit was the judicial murder of Algernon Sidney, but in every state trial he submitted to the crown, thus earning the favor of James, who raised him to the peerage in 1685. Among his earliest trials were those of Titus Oates and Richard Baxter. In the so-called Bloody Assizes he was sent to try the followers of Monmouth and hanged 331, transported 849 to the American plantations and whipped or fined 33 others. He was lord chancellor from 1685 until the downfall of James. When James fled, Jeffreys tried to follow disguised as a sailor but was caught at Wapping and was sent to the Tower to save him from the mob. There he died 4 months later.

Jellicoe, John Rushworth, 1st Earl (1859–1935), British admiral. He entered the navy when 13, saw active service in Egypt in 1882 and commanded the naval brigade that took part in the relief of Peking in 1900. In 1912 he became second sea lord of the Admiralty. When the World War began, he was given command of the Grand Fleet and was in chief command at the battle of Jutland, May 1916. Later in the year he was appointed first sea lord and had charge of the antisubmarine campaign. In 1918 he was raised to the peerage as Viscount Jellicoe of Scapa. From 1920 to 1924 he was governor of New Zealand and in 1925 was created an earl.

Jenghiz or **Jenghis Khan,** see *Genghis Khan.*

Jenks, Jeremiah Whipple (1856–1929), American economist, born in St. Clair, Mich. He was graduated from the University of Michigan in 1878, received a doctor's degree in Germany and subsequently studied law. From 1891 to 1912, he was professor of political economy and social science at Cornell University and later held a research professorship of government at New York University. As a government expert, Professor Jenks rendered valuable service in the investigation of trusts, currency reform, taxation, labor, international exchange and immigration. He served as director of the Far Eastern Bureau, 1913–21. His principal publications are *The Trust Problem, The Immigration Problem, Principles of Politics* and *Governmental Action for Social Welfare.*

Jenner, Edward (1749–1823), English physician, born in Gloucestershire. In 1770 he began a medical course at St. George's Hospital, London, where he was a pupil of Dr. John Hunter, and in 1773 he practised as a country doctor. He began the serious study of cowpox as a preventative of smallpox, as it was common talk in Gloucestershire that dairymaids who contracted cowpox never had the more serious smallpox. Many years of experiment and investigation elapsed before Jenner performed his first public inoculation with vaccine in 1796. In spite of violent opposition he eventually saw the general acceptance of vaccination by the medical profession. His discovery started the first research on bacteria. He received many honors, besides money grants from Parliament. Jenner was also a pioneer in the study of heart diseases.

Jeritza, Maria (1887–), Austrian operatic soprano, born in Brünn. She studied piano, stringed instruments and voice in her native town and made her operatic debut in Olmutz in the role of Elsa in *Lohengrin.* She sang at the Imperial and Royal Opera in Vienna, 1913–21, and was a leading soprano with the Metropolitan Opera Co., New York, 1922–32. She had much success as a singer on the concert platform and on the radio.

Jerome, Saint (*c.* 340–420), scholar of the Christian Church, born at Stridon, Dalmatia. He was ordained in 379 and lived in Rome from 382 to 384, where he served as secretary to Pope Damasus. There he revised the Latin version of the Bible and won great popularity and influence by his sanctity, learning and eloquence. Many pious persons placed themselves under his spiritual direction, the most outstanding of whom were Lady Paula and her daughter Eustochium. They followed him to the Holy Land, where he took up his permanent residence at Bethlehem in 386. Lady Paula founded three convents and a monastery, and Jerome completed his Latin version of the Bible (*The Vulgate*). He is universally regarded as the most learned and eloquent of the Latin fathers.

Jerome, Jerome Klapka (1859–1927), English humorist and playwright, born in Staffordshire. With Robert Barr, he was editor of the *Idler*, 1892–97, and he also edited *To-Day,* 1893–97. Jerome won immediate success in 1889 with his humorous *Three Men in a Boat* and followed with his *Idle Thoughts of an Idle Fellow.* His best-known play *The Passing of the Third Floor Back* (1907) has been played many times in Britain and the United States. Among other writings of Jerome are *Stage Land, Sketches in Lavender, Miscellany of Sense and Nonsense* and *Prude's Progress* (a comedy).

Jerome of Prague (1365–*c.* 1416), Bohemian religious leader, associated with Wycliffe and Huss as one of the forerunners of the Reformation. After studying at the universities of Prague, Oxford, Heidelberg, Cologne and Paris, he attracted attention by his defense of Wycliffe's ideas and was a champion of Huss, whom he surpassed in criticism of Church abuses. When he heard of Huss's arrest, Jerome started for Constance to defend him. He was arrested at Hirschau (April 1415) and was carried to Constance in chains. While in prison he recanted, but in 1516 he withdrew his recantation and was burned at the stake.

Jerrold, Douglas William (1803–57), English humorist and playwright, born in London. He served in the navy for a few years and became a printer's apprentice in London. His first play *More Frightened than Hurt* (1818) was not well received, but he scored a sensational success in 1829 with his *Black-Eyed Susan.* He wrote about 70 plays, noted for witty dialogue. In 1841 Jerrold became a staff writer for *Punch,* which published his popular and humorous series entitled *Mrs. Caudle's Curtain Lectures* and *Story of a Feather.* He edited several magazines and the successful newspaper *Lloyd's Weekly.*

Jevons, William Stanley (1835–82), English logician and economist, born in Liverpool. He studied at University College, London. After a 4-year stay in Australia, he became professor of logic at Owens College, Manchester (1866) and was professor of political economy in University College, London (1876). His widely influential books are characterized by a lucid style and original and constructive thinking. They include *Treatise on Logic, Theory of Political Economy, Money and the Mechanism of Exchange* and *The Coal Question.* It was Jevons's theory that economics is basically a mathematical science.

Jewett, Sarah Orne (1849–1909), American writer, born in South Berwick, Me., and educated at a local academy. She began a literary career in 1869 with a story in the *Atlantic Monthly* and thereafter wrote many books. She was at her best in stories describing New England life and people. Among her works are *Deephaven, A Country Doctor, A Marsh Island, Tales of New England, The Country of the Pointed Firs* and *The Tory Lover.*

Joachim, Joseph (1831–1907), Hungarian violinist, born in Kittsee, Hungary. He began to study music at the age of 5, under the concert master of Budapest. He made his first public appearance 2 years later. Joachim continued his studies in Vienna and Leipzig and in 1849 became concert master of the orchestra at Weimar but resigned because of disagreements with Liszt, chapelmaster of the reigning duke. He held a musical post at Hanover and in 1869, a year after his appointment as head of the newly founded Royal School of Music in Berlin, started his famous string quartet. Joachim was a master of the violin, distinguished for his technique and for the depth and feeling of his playing. His most notable composition is the *Hungarian Concerto* for violin, but he was a greater violinist than composer.

JOAN OF ARC (1412–31), French heroine, born of peasant parents at Domremy. She learned to perform the household tasks and outdoor duties of the ordinary village girl. In her 13th year she began to hear "voices" and was convinced that she was receiving divine messages urging her to go to the rescue of France, the northern part of which was held by the English and their Burgundian allies. When the city of Orléans seemed in danger of capture in 1429, Joan obtained an audience with the uncrowned Charles VII. She convinced him and the court theologians of her sincerity, donned a suit of armor and led the French troops into battle with such spirit that the English were forced to raise the siege.

The French refused to allow her to return home, for she was the embodiment of all their revived hopes and aspirations. Joan failed in several military efforts, including an attack on Paris, but continued to lead the soldiers of France to battle until May 1430, when she was wounded and captured by the Burgundians. Six months later they sold her to the English, who imprisoned her in Rouen. After a prolonged and brutal trial Joan was found guilty of sorcery and heresy, and on May 30, 1431, she was burned at the stake in Rouen. In 1920 she was canonized. An immense literature has grown up around "the Maid of Orleans," as Joan is often called.

Joffre, Joseph Jacques Césaire (1852–1931), French soldier, born in Rivesaltes, in the Eastern Pyrenees. He entered the army in 1870 and saw active service in the Franco-Prussian War. He served in Indo-China, West Africa and Madagascar and in 1911 was appointed chief of the general staff. In August 1914 General Joffre took command of the French armies on the western front and retained that position for over 2 years in spite of severe criticism. His plans failed to check the German advance, but he must be credited with some share in the victory of the Marne, and he retained the affection of the rank and file. He retired in December 1916, and in 1917 he was created marshal. He visited the United States in 1917 to discuss American participation in the World War.

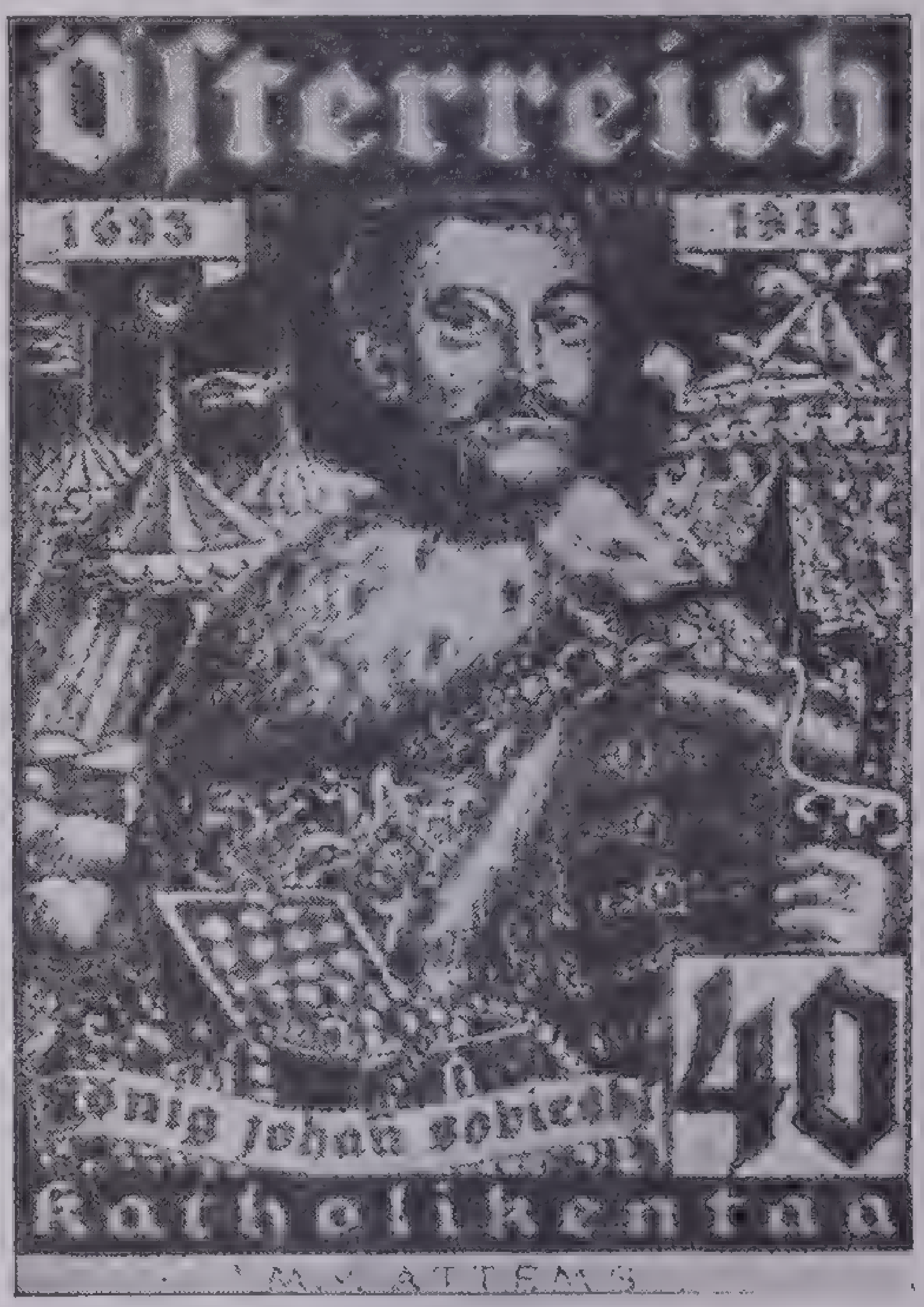
John (*c.* 1167–1216), King of England, the youngest of the five sons of Henry II. His father called him John Lackland, as most of the royal dominions were left to the elder sons. John succeeded his brother Richard I in 1199, and the 17 years of his reign were disastrous. In 1203 he murdered his nephew Arthur at Rouen and imprisoned Arthur's sister Eleanor in Bristol castle. In 1215 he signed The Magna Charta upon the demand of his barons, headed by Stephen Langton, Archbishop of Canterbury.

Though King John thus accepted the charter that has been solemnly ratified on 38 different occasions by subsequent kings, he had no intention of being bound by it. He procured from Pope Innocent III a bull annulling the charter, and he brought in foreign soldiers to fight against the barons, who immediately offered the throne to Louis, son of Philip of France. Louis accepted the offer, but the plan was dropped when John died in the midst of the struggle. During his reign the English lost nearly all their French possessions.

John II (1319–64), King of France, surnamed *The Good,* the second son of the Valois family. He succeeded his father, Philip VI of Valois, in 1350 and began his reign with acts of despotism and cruelty. Many Frenchmen appealed to England for help, and Edward the Black Prince brought an army that defeated John at Poitiers in 1356. John was imprisoned in London from 1356 to 1360. He was released after he gave hostages and promised to pay a ransom. His son broke his parole as a hostage in 1363, and the king returned to London to save his honor.

John of Gaunt (1340–99), son of Edward III of England, born at Ghent (anglicized as Gaunt). In the Hundred Years' War he served with great bravery under his brother Edward, the Black Prince. In 1359 he married Blanche, heiress of the duke of Lancaster, and himself became duke in 1362. Ten years later he married Constance, a Spanish princess through whom he had a claim to the throne of Castile. Toward the end of his father's reign he became the chief man in the kingdom and perhaps wanted the English throne. At any rate the young king, Richard II, distrusted him and sent him on an expedition to recover his Castilian kingdom. This resulted in a treaty between John and Henry Trastamara, who had possession of the Castilian throne, by which John's daughter Catharine should succeed as queen of Castile. John's son became Henry IV, of England, and the line was named the house of Lancaster. Through a third marriage John was also ancestor of the Tudor line of English monarchs.

John III or **John Sobieski** (1624–96), King of Poland, born in Galicia. He rose to distinction in the military service of King John Casimir, who appointed him grand marshal in 1665 and commander in chief of the Polish army in 1667. Sobieski won a victory over the Turks at Khotin in 1673, and in 1674 the national Diet made him king. After a 2-year campaign he forced the Turks to make peace at Zaravno (1676) and won back much of the Ukraine. Through the influence of his queen John concluded an alliance with Leopold of Austria, whose regiments he reinforced in 1683 when Vienna was besieged by an army of Turks. The defeat of the enemy was followed by the liberation of Hungary. This is regarded as a great victory for Christendom, made possible largely by Sobieski's efforts.



Courtesy Scott Stamp & Coin Company

John Sobieski

Enlarged from an Austrian postage stamp of 1933 commemorating the 250th anniversary of the battle in which the Polish king defeated the Turks and restored Vienna to Christendom

Johnson, Amy (*c.* 1904–), English aviatrix, born in Yorkshire. She took a degree in economics at Sheffield University and began to fly in 1928. In 1930 she became famous as the first woman to make a solo flight from London to Australia. The following year she flew from London to Japan; in 1932 she set a new record in a flight from London to Cape Town, South Africa, and return. On these African flights she bettered the record time of her husband, James A. Mollison, who had previously flown the same courses. As copilot with Mollison she flew westward across the Atlantic Ocean in July 1933. In a forced landing near Bridgeport, Conn., both fliers were injured. In 1936 she made other record flights to Africa. Miss Johnson became president of the Women's Engineering Society in 1935.

Johnson, Andrew (1808–75), 17th President of the United States, born at Raleigh, N.C. His father had died when Andrew was an infant, and at the age of 10 he became an apprentice to a tailor. He learned to read after working hours. In 1826 he moved to Greenville, Tennessee, where he opened a tailor's shop, married and began to take an interest in local affairs. He entered politics in 1840 as a presidential elector in Tennessee for Van Buren, the Democratic candidate. In 1843 he became a member of Congress, where for 10 years he supported the policy of the Democratic party. In 1853 and again in 1855 he was elected governor of Tennessee. Two years later he was elected to the U. S. Senate and, on the occupation of Nashville by Federal troops in 1862, was appointed by President Lincoln military governor of Tennessee. In this position he gave such satisfaction to the North that in 1864 he was nominated by the Republican party for Vice-President and was elected with President Lincoln.

He became President on April 14, 1865, after the assassination of President Lincoln. He lost much public favor by some indiscreet and violent speeches made on a tour to Chicago and St. Louis. In the Congressional elections his opponents triumphed by increased majorities. His vetoes were generally nullified by the two-thirds vote of both houses. In 1867 Johnson suspended Stanton, Secretary of War, who was reinstated by the Senate the following year. An attempt to gain possession of the War Department during this quarrel led to the impeachment of the President in 1868, but he was acquitted by a single vote. His term of office expired in 1869; he was afterward elected U. S. Senator, taking his seat a few months before he died.

Johnson, Hiram Warren (1866–), American political leader, born in Sacramento, Calif. He attended the University of California, studied law and in 1888 began practice in Sacramento. In 1902 he moved to San Francisco, where 6 years later he conducted the prosecution of Abe Ruef in a famous case involving graft. Johnson was elected governor of California on a platform of opposition to the Southern Pacific Railroad and served during 1911–17, resigning in the middle of his second term to enter the U. S. Senate. As one of the founders of the National Progressive party in 1912, he was nominated for Vice-President on the ticket with Theodore Roosevelt. He was re-elected to the Senate, where he remained a consistent isolationist, opposing the League of Nations and America's interference in foreign affairs. The Johnson Act of 1934 placed a Federal ban on loans to foreign governments defaulting on their war debts.

Johnson, Hugh Samuel (1882-1942), American soldier and administrator, born at Fort Scott, Kan., graduated from West Point. He later studied at the University of California. His early days in the army were spent at western cavalry posts. In 1916 he went into Mexico with Pershing's column and in 1917 went to Washington, where he originated the plan for drafting troops in the World War. During the rest of the war he directed all purchases for the army and arranged for their transportation.

He resigned from the army in 1919 with the rank of brigadier general and worked on industrial and research problems until 1933, when he was called to Washington to help draft the National Industrial Recovery Act (NRA) and was its administrator until his resignation in 1934. He directed work-relief activities in New York city for a few months in 1935. Later he became well known as a newspaper columnist and radio commentator.

Johnson, James Weldon (1871–1938), American negro author, born at Jacksonville, Fla., educated at Atlanta and Columbia universities. He was American consul in Venezuela and Nicaragua from 1906 to 1912. He founded the National Association for the Advancement of Colored People. He wrote light operas, an autobiography, several volumes of verse, the best-known of which is *God's Trombone,* and compiled collections of negro poems and songs.

Johnson, Martin (1884–1937), American explorer, born in Rockford, Ill. He was a member of Jack London's expedition on the *Snark.* With his wife, Osa Johnson, he made expeditions to the South Seas, Borneo and Africa, collecting animal specimens for museums and recording wild animal life in motion pictures and books. Among his books are *Safari, A Saga of the African Blue, Cannibal Land, Lion—African Adventure With the King of Beasts* and *Camera Trails in Africa.* After his death in an airplane crash in California, Mrs. Johnson carried on with his work.

Johnson, Richard Mentor (1780–1850), American soldier and Vice-President, born in Bryant's Station, Ky. He was educated at Transylvania University and began the practice of law. He held a seat in Congress, 1807–13, was in active service in the War of 1812 and is said to have killed Tecumseh at the Battle of the Thames. After further service in Congress, 1815–18, he was elected to the Senate to complete the term of John J. Crittenden and remained in the Upper House until 1829. From 1829 to 1837, Johnson was again a member of the House of Representatives and was then elected to the Vice-Presidency under Van Buren (1837–41).

Johnson, Robert Underwood (1853–1937), American poet and editor, born in Washington, D.C., educated at Earlham College. He was associated with *Century Magazine* for 40 years and was its editor from 1909 to 1913. He persuaded General Grant to write his memoirs and did much to bring about protection of copyrights by law and international agreement. He worked with John Muir in the creation of Yellowstone National Park. He was made director of the Hall of Fame at New York University in 1919 and was Ambassador to Italy (1920–21). He wrote several volumes of verse.

Johnson, Samuel (1709–84), English writer and lexicographer, born at Lichfield, where his father was a bookseller. He studied at Pembroke College, Oxford, for 3 years but had to leave the university without a degree because of poverty and ill health. In 1731 Johnson became an underteacher in a school in Market Bosworth, Leicestershire. Disgusted with the ill treatment he received there, he left and was next employed in Birmingham, translating for a bookseller. Here in 1736 he married the widow of Mr. Porter, a merchant. His wife was 20 years his senior, but this she compensated for by bringing her husband £800 ($4,000). With the money he opened a classical boarding school but could get only three pupils, one of whom was David Garrick, who later became a famous actor.

Disappointed in this enterprise, he and Garrick started for London. There, in 1737, Johnson was employed as a writer by Cave, the founder and proprietor of the *Gentleman's Magazine.* In 1738 Johnson's poem *London,* an imitation of the third satire of Juvenal, was published. He wrote the parliamentary debates for the *Gentleman's Magazine* (1740–43) and issued the prospectus of his *English Dictionary* (1747), for which he was to receive £1,575 ($7,875). This great work appeared in 1755, and immediately the University of Oxford awarded him the degree of M.A.

On the death of his mother in 1759, Johnson wrote the story of *Rasselas* to pay her funeral expenses. In 1762 a pension of £300 ($1,500) a year was granted to him by the king, and later he was given the title of doctor of laws from the universities of Dublin and Oxford. In 1781 he published the *Lives of the Poets.* After a life spent in incessant literary labor and much talk, he died at his house in a lane off Fleet Street, London. In debates he generally won by the incisive expressions of a mind of unusual power. He loved to talk with his friends Burke, Goldsmith, Reynolds, Garrick and Boswell. Johnson would not be so well remembered had Boswell not written his *Life of Johnson.*

Johnson, Tom Loftin (1854–1911), American municipal reformer, born in Georgetown, Ky. In youth he worked for a street-railway company. Later he invented a fare box and other devices and became owner-manager of traction lines in several cities. Johnson was elected to Congress as a Democrat in 1890 and 1892 and in his campaigns advocated the single tax and government ownership of utilities. He became mayor of Cleveland in 1901, and for 8 years he fought graft, built parks and playgrounds, introduced better sanitary measures and in many ways improved the condition of the poor.

Johnson, Walter (1887–), American baseball player, born in Humboldt, Kan. He entered professional baseball in 1906; the next year he went to Washington in the American League and with that team made his brilliant record as a fast-ball pitcher for 20 years. For 12 seasons he led American League pitchers in strikeouts. He managed the Washington team (1929–32) and the Cleveland Indians (1933–35).

Johnston, Albert Sidney (1803–62), American soldier, born in Washington, Ky., graduated from West Point in 1826. He resigned from the U. S. Army in 1834 and joined that of Texas, becoming commander in 1837. He fought in the Mexican War and in other western campaigns. In 1861 he became a general in the Confederate army and was defeated at forts Henry and Donelson, for which he was severely criticized. He concentrated his forces, attacked Grant at Shiloh and was killed in the battle.

Johnston, Joseph Eggleston (1807–91), Confederate general, born in Prince Edward County, Va. After graduation from West Point in 1829 he fought in the Indian and Mexican wars. In April 1861 he entered the Confederate service as one of the first five brigadier generals and won promotion to the rank of general. He took part in the first battle of Bull Run, the Peninsula campaign and the battle of Fair Oaks, in which he was wounded. In 1863 he made an unsuccessful attempt to relieve the siege of Vicksburg. Placed in command of the armies in the Southwest, he carried on a long campaign against Sherman and was attempting to hold Atlanta when he was replaced by General Hood (July 1864). In 1865 Johnston took command of such forces as he could muster and made a last desperate effort to drive Sherman back, but he was forced to surrender at Durham's Station, N.C., on April 26. Authorities on military tactics give Johnston high praise for his ability to overcome great difficulties in defensive warfare.

Johnston, Mary (1870–1936), American novelist, born in Botetourt County, Va. Miss Johnston found an appreciative circle of readers with her first novel *Prisoners of Hope* (1898) and became popular as the author of historical novels, especially those dealing with colonial America. Her works include *To Have and to Hold, Audrey, Lewis Rand, The Long Roll, Cease Firing, The Slave Ship, The Great Valley* and *The Exile.*

Joinville, Jean de, Sire (*c.* 1224–1317), French historian. In 1248 he accompanied Louis IX on a crusade to Egypt and based his *Life of St. Louis* on personal knowledge gained while with the king. The work was completed after the death of Louis IX (Saint Louis) and presented to Louis X. He also wrote *Credo,* a confession of faith. Joinville is one of the great historians of medieval France.

Jókai, Maurus (1825–1904), Hungarian writer. In 1863 he became editor of a newspaper in Budapest. During the revolutionary uprising of 1848–49 Jokai was imprisoned as a radical agitator; his *Revolutionary Battle Pictures* (1849) describes some of his experiences at that time. Among his many novels are *The Turks in Hungary, An Hungarian Nabob, Black Diamonds* and *A Modern Midas.* His books give an excellent picture of the social and political history of Hungary and are notable for style, humor, imagination and interesting plots. Jokai became prominent in political life in his later years.

Jolliet, Louis (1645–1700), French-Canadian explorer, born in Quebec, Canada. He studied for the priesthood at the Jesuit College, Quebec. With Marquette he was selected to explore the western country and to push through to the Mississippi. They started west in May 1673, reaching the Mississippi at the mouth of the Wisconsin in June. They floated down the Mississippi, passing the mouths of the Missouri and the Ohio and going far enough to be sure that the river flowed into the gulf of Mexico. Jolliet upset his canoe on his way back, losing all his maps and papers, so he had to tell about his travels from memory. His contribution to geography was of enormous importance. (The name is sometimes spelled *Joliet.*)

Jones, Henry Arthur (1851–1929), English playwright, born in Buckinghamshire, the son of a farmer. He began work at the age of 13, and whatever education he later acquired was obtained through his own initiative. His first drama was *The Clerical Error* (1879); his second *The Silver King* (1882) ran in London for more than a year. He then wrote a series of comedies picturing contemporary manners and social conditions. They were popular in both Europe and the United States. These plays include *Saints and Sinners, The Dancing Girl, The Liars, Mrs. Dane's Defence, The Hypocrites, Mary Goes First* and *The Lie.*

Jones, Inigo (1573–1652), English architect, born in London. He spent 4 years abroad in study and in Venice was especially influenced by the work of Palladio, whose classic Italian style he introduced into England. Jones, therefore, is sometimes called the *English Palladio.* Examples of his architectural designs include the banqueting hall of the palace of Whitehall, Chiswick Villa, St. Paul's in Covent Garden, Surgeons' Hall and Ashburnham House, Westminster.

Jones, John Paul (1747–92), American naval hero, born in Scotland. His name was John Paul, but later he added Jones to it. He went to sea as a boy and after some years on a slave-trading boat settled in Virginia. In 1775 the Continental Congress voted him a commission as senior lieutenant. He captured a number of British merchantmen as a free-lance commander, was promoted to the rank of captain and in 1777 sailed for Europe on the *Ranger.* While commander of this ship he seized the port of Whitehaven and captured the *Drake,* a British man-of-war. Through the influence of Franklin, then American commissioner at Paris, Jones secured an old French vessel that he reconditioned and named the *Bonhomme Richard.* In September 1779 this craft and the British *Serapis* engaged in a spectacular 3-hour fight in the waters between Scotland and France. Jones captured the British ship after terrible hand-to-hand fighting. His own vessel was so badly damaged that it sank, and he brought his crew to France on the *Serapis.* After the Revolution Jones served in the Russian navy and won a sea fight over the Turks. He lived in Paris from 1790 until his death. In 1905 his body was brought to Annapolis for reburial.

Jones, Robert Tyre (1902–), American golfer, born in Atlanta, Ga. He was graduated as a mechanical engineer from Georgia School of Technology in 1922 and in 1924 received the degree of B.S. from Harvard University. He studied law at Emory University, was admitted to the bar in 1928 and began practice in Atlanta. His first golf championship was the southern amateur title, won in 1917. He held the national amateur championship five times, 1924, '25, '27, '28 and '30; the national open championship four times, 1923, '26, '29 and '30. Jones was British amateur champion in 1926, '27 and 1930 and British open champion in 1930. His greatest achievement was the winning of the British and American amateur and open titles in a single year, 1930. A year later he retired from competitive golf to practice law in Atlanta. He wrote *Down the Fairway* and appeared in a series of motion-picture shorts on golf.

Jonson, Ben (*c.* 1573–1637), English dramatist and poet, born in London. He began his dramatic career in London as an actor and reviser of plays. His first comedy, a satire entitled *Every Man in His Humor,* was produced in 1598 at the Globe Theatre, with Shakespeare in the cast. The plays that followed include *The Case Is Altered, Every Man Out of His Humor, Cynthia's Revels, The Poetaster, Volpone, The Alchemist* and the tragedies *Sejanus* and *Catiline.* Jonson also wrote a series of masques for James I, who appointed him poet laureate in 1619. Best known of all his works is the lyric "To Celia," beginning, "Drink to me only with thine eyes." As a playwright Jonson was second only to his intimate friend Shakespeare. He was buried in Westminster Abbey.

Jordaens, Jakob (1593–1678), Flemish painter, born in Antwerp, where he studied under Van Noort, who was also Rubens's master. Through Rubens's influence Jordaens received commissions from the courts of England and Sweden. His work is essentially Flemish, and his pictures of the people of his day are notable for a humor and realism that sometimes became coarse. He also painted religious and mythological subjects, portraits and historical scenes. His masterpiece is the mural *Triumph of the Stadtholder,* painted for the palace of the widow of Frederick Henry of Orange, now in the House in the Wood, The Hague.

Jordan, David Starr (1851–1931), American educator and scientist, born in Gainesville, N.Y. After being graduated from Cornell in 1872 he received a medical degree from Indiana Medical College (1875) and the degree of Ph. D. from Butler University, Indianapolis (1878). He was professor of zoology at Indiana University, 1879–85, and president of that institution, 1885–91. In 1891 he was chosen president of Leland Stanford (now Stanford) University. He served for 22 years and became chancellor in 1913. A recognized authority on fish, Dr. Jordan served on the Federal Fish Commission as investigator of the fur, seal and salmon fisheries. He was an ardent pacifist and chief director of the World Peace Foundation in 1910–14. He wrote a number of books on North American fishes, besides volumes on religion and international peace.

Joseph II (1741–90), Holy Roman Emperor (1765–90), the son of the Emperor Francis I and Maria Theresa of Austria. His mother remained the actual ruler until her death in 1780. Joseph then put into effect various reforms, but his home and foreign rule were alike unsuccessful. He quarreled with Pope Pius VI and declared himself independent of the papacy; his later years were troubled by an unsuccessful war with Turkey and by a revolt in the Netherlands.

Josephine (Marie Josèphe Rose Tascher de la Pagerie; 1763–1814) 1st Empress of the French, born in Martinique. She first married the Vicomte de Beauharnais and became the mother of Eugène and Hortense, later Queen of Holland. Her husband was guillotined during the Reign of Terror, and in 1796 she married Napoleon Bonaparte, the newly appointed commander in chief of the army of Italy. Sharing her husband's fortunes, she became empress in 1804, and her beauty and amiable manners won the hearts of the people. Upon her failure to bear a son to succeed to the throne, Napoleon divorced her in 1809. Josephine thereupon retired to her château at Malmaison with the title of empress-queen-dowager and an annual grant of two million francs.

Josephus, Flavius (*c.* 37–*c.* 95), Jewish historian, born in Jerusalem. In the year 67, while governor of Galilee, he was taken prisoner by Vespasian, who had been sent there by Nero to crush an uprising of the Jews. Because he prophesied that Vespasian would one day be emperor, Josephus received a considerable degree of liberty. He took the name Flavius, Vespasian's family name. He witnessed the capture of Jerusalem by Titus (70) and thereafter lived in Rome as a writer. The existing works of Josephus include his *History of the Jewish War, Jewish Antiquities* and an autobiography. His books are considered of great value as Jewish history.

Joubert, Petrus Jacobus (1831–1900), Boer general, born in Cape Colony of Dutch-Huguenot parents. He became a wealthy farmer of the South African Republic, in which he also gained political prominence. As commander of the Boer forces in 1880–81, Joubert helped to win a war against the British. He acted as president in the absence of Kruger, 1883–84, and in 1893 was elected vice-president. Joubert was in command of the army that checked the Jameson raid into the Transvaal and held the position of commandant general when the South African War began in 1899. He had already laid siege to Ladysmith when his health failed. He died at Pretoria.

Joule, James Prescott (1818–89), English physicist, born in Lancashire. He was an invalid and so was educated at home. John Dalton was one of his teachers. Taking up the study of electricity and magnetism, Joule developed several important theories. His great work was the investigation of problems of heat and energy, and he was the first to demonstrate the mechanical equivalent of heat (1847). He devoted 40 years to research. The *joule,* named after him, is a unit of electrical work or energy.

Juarez, Benito Pablo (1806–1872), Mexican statesman, born in Oaxaca of Indian parents. He gained prominence as governor of Oaxaca and as leader of the Liberals became President of Mexico in 1858. A civil war followed, and Juarez did not establish himself in Mexico City until January 1861. Re-elected in March, he tried to remedy Mexico's financial distress by suspending payments on the national debt, but this measure brought British, Spanish and French troops into Mexico. War with France resulted, and Archduke Maximilian became emperor. Juarez put up a stubborn resistance but was driven to the North. Finally, through the influence of the United States, the French troops were withdrawn. Maximilian was captured and shot in 1867, and Juarez returned to be twice re-elected president. Revolutionary uprisings continued until his death.

Judd, Orange (1822–92), American editor, born near Niagara Falls, N.Y. He was graduated from Wesleyan University, Middletown, Conn., in 1847, and began his long career in the field of agricultural journalism in 1853. Judd was editor of the *American Agriculturist,* 1853–83; agricultural editor of the New York *Times,* 1855–63; editor of the *Prairie Farmer,* 1883–88; and thereafter editor of the *Orange Judd Farmer.* He was largely responsible for the establishment of the first agricultural experiment station, at Middletown, Conn., in 1875.

Judson, Adoniram (1788–1850), American missionary, born in Malden, Mass., graduated from Brown University and Andover Theological Seminary. He organized the American Board of Commissioners for Foreign Missions and in 1812 was appointed one of a group of missionaries to India. He was soon converted to the Baptist faith and did most of his work thereafter in Burma. Judson translated the Bible into Burmese and compiled a Burmese grammar and dictionary.

Jugurtha (d. 104 B.C.), King of Numidia. On the death of his uncle, King Micipsa, in 118 B.C., Jugurtha was given a share of the kingdom with his two cousins, one of whom he murdered. The other, driven out of the country, appealed to Rome. Jugurtha obtained the western and richer half of Numidia by bribery. He killed his surviving cousin and several Romans in 112 B.C., bringing on the Jugurthine War. For years Jugurtha evaded capture by bribing the Roman generals but was eventually defeated by Metellus and was captured in 106 B.C. by Marius, who carried him to Rome 2 years later. After a humiliating appearance in the triumph of Marius, Jugurtha was imprisoned to die of starvation. A story of his career was written by Sallust.

Julian (Flavius Claudius Julianus; 331–63), Roman Emperor, born in Constantinople. He was the nephew of Constantine the Great. He studied in Athens and later abandoned Christianity, whence his name of Julian the Apostate. In 355 his cousin, Emperor Constantine, made him joint ruler and put him in charge of Gaul, where he won several victories over the Germans. In 316 the troops in Gaul revolted from Constantine and declared Julian emperor. He robbed the Christian churches and divided the spoils among his soldiers. He tried in many ways to undermine Christianity and wanted to rebuild the temple at Jerusalem so that the prophecy of Christ might be falsified. He was prevented from doing this and soon afterward was killed in an expedition against the Persians.

Julius II (*c.* 1443–1513), Pope of Rome, born in Italy of the family of Della Rovera. His uncle Sixtus IV made him a cardinal in 1471. He succeeded Pius II as Pope and reigned for 10 years. He won back most of the territory formerly held by the Church. After driving Cesare Borgia from the Romagna, he entered into the League of Cambrai against Venice (1508). In 1511 he formed the Holy League, which broke the French power in Italy. His death in 1513 interrupted his plans for a campaign against the Spanish. Julius began the rebuilding of St. Peter's and was a patron of art.

Jung, Carl Gustav (1875–), Swiss physician and psychologist, born at Basle. He was a disciple of the Freudian school of psychology until 1911, after which he developed new theories and taught them at Zurich. Jung divided the human mind into conscious and unconscious parts and said that the two can be made to co-operate and eliminate emotional disorders.

Justin Martyr (*c.* 100–*c.* 165), early Christian writer, born in Flavia Neapolis, a Roman city in Samaria. Educated as a pagan, he studied the Stoic and Platonic philosophies and accepted the latter; but he was converted to Christianity in Ephesus about 135. After that he made every effort to win converts to his adopted faith. Justin was the author of *Apologies for the Christians* (2 vols.), addressed respectively to the Roman emperor and the Senate, and of *Dialogue with Tryphon the Jew.* He is said to have suffered martyrdom in the reign of Marcus Aurelius.

Justinian the Great (Flavius Anicius Justinianus; 483–565), Roman ruler of the Byzantine Empire, nephew and successor of Justin I. He ascended the throne in 527 and reigned for 38 years. His long reign was made brilliant by the military exploits of his generals Belisarius and Narses, who conquered the Vandal kingdom in Africa and re-established Roman authority in northern Italy and in Spain. Justinian I built the Church of St. Sophia (now a mosque) in Constantinople (now Istanbul) and constructed aqueducts and other public works, but his work as legislator and lawgiver gives him greater distinction. Under his direction a committee of eminent lawyers completed a codification of the Roman laws that became the basis of most of the European legal systems.

Juvenal (*c.* 60–*c.* 140 A.D.). Roman satirist. Little is known of his life except that he served in the army and visited Britain and Egypt. Juvenal is noted for his *Satires,* perhaps the most famous of their kind. The 16 known satires describe the manners and morals of Rome in his time, but his stories are now considered to be greatly exaggerated. Juvenal's third and tenth satires were imitated by Samuel Johnson in his poems *London* and *The Vanity of Human Wishes.*

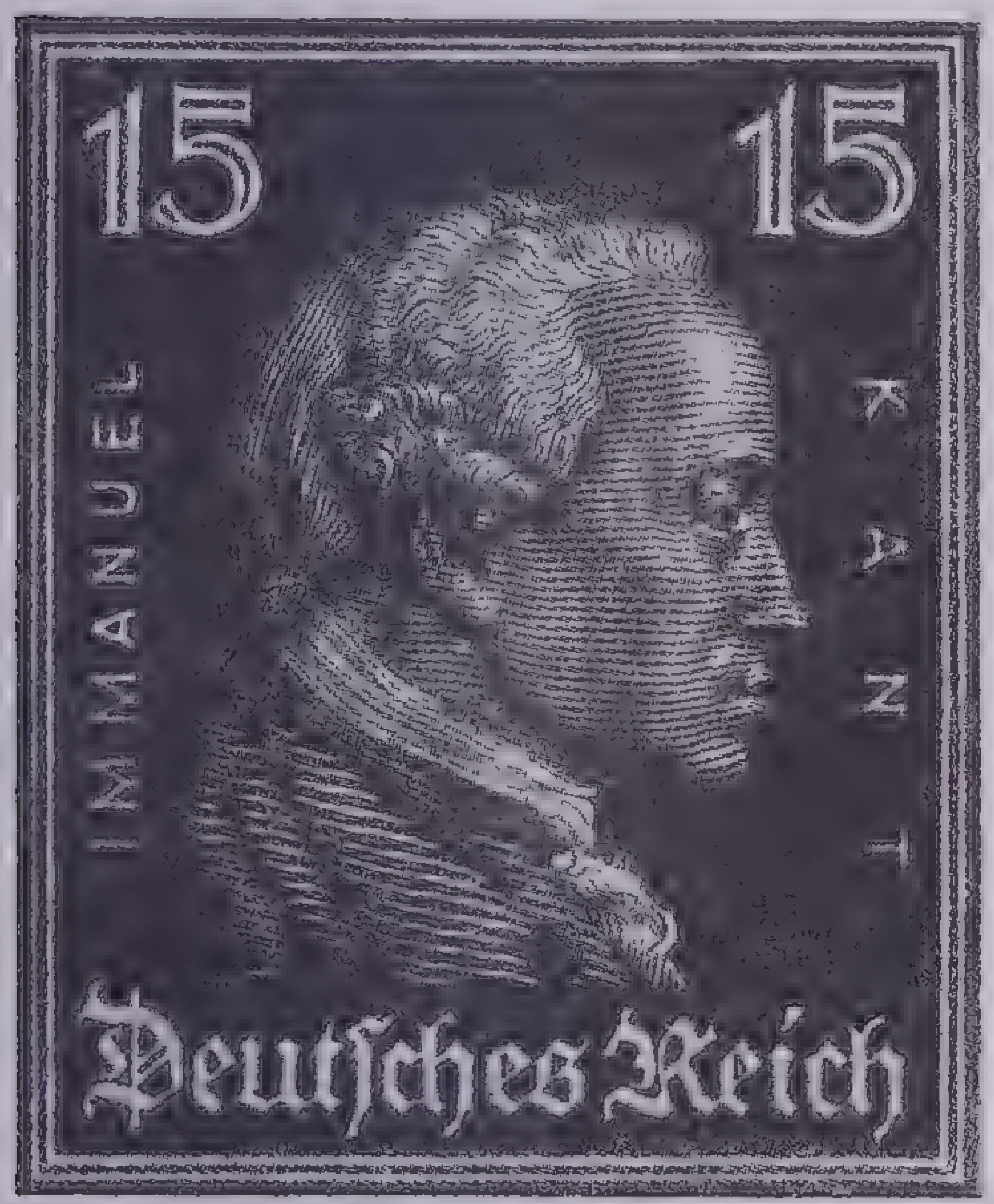
Kalakaua, David (1836–91), 7th King of the Hawaiian Islands, elected to the throne by the legislature in 1874; his predecessor Lunalilo had died childless. Rioting broke out, led by supporters of Emma, the Dowager Queen, but order was soon restored by marines and sailors from British and American warships anchored in the harbor. Kalakaua's reign was marked by quarrels between himself and the more progressive elements, especially after he tried to ignore a new Constitution that had been ratified in 1887. He was succeeded by his sister Liliuokalani.

Kalb, von, Baron, see *De Kalb.*

Kames, Henry Home, Lord (1696–1782), British philosopher, born at Kames, Berwickshire, Scotland. He was admitted to the bar in 1723 and appointed to the bench as Lord Kames in 1752. He wrote books on Scottish laws and *Essays on Morality; An Introduction to the Art of Thinking; Elements of Criticism,* his best known work; and *Sketches of the History of Man.*

Kane, Elisha Kent (1820–57), American explorer and scientist, born in Philadelphia. He was graduated in medicine from the University of Pennsylvania in 1842 and in 1843 became an assistant surgeon in the U. S. Navy. In 1850 Dr. Kane was a member of the first Grinnell expedition to the Arctic regions in search of Sir John Franklin. He organized a second expedition, which started northward in 1853. In command of the *Advance* he reached a latitude of 80° 35′ north in June 1854; this remained for 16 years the most northerly point reached by man. The *Advance* was abandoned in the spring of 1855, and the expedition used small boats to reach a rescue party. Kane's first published accounts of the expeditions gained much attention. Honors were bestowed on him by European and American scientific groups.

KANT, IMMANUEL (1724–1804), German philosopher, born in Königsberg, Prussia, the son of a Scottish saddler. He was graduated from the University of Königsberg in 1755 and began lecturing there on logic, metaphysics, mathematics and several of the sciences. In 1770 he became professor of logic and metaphysics and held this post for 27 years. His famous *Critique of Pure Reason,* containing the fundamental doctrines of his system, appeared in 1781. Two supplementary works, *Critique of Practical Reason* and *Critique of the Power of Judgment,* were published in 1788 and 1790.



Courtesy Scott Stamp & Coin Company

Immanuel Kant

Enlarged from a German postage stamp issued in 1926 as one of a series honoring 9 great Germans—Kant, Goethe, Schiller, Frederick the Great, Beethoven, Lessing, Leibnitz, Bach and Dürer

Kant's ideas had a great influence on other thinkers. He taught that all our knowledge begins when the senses transmit images made out of space and time. But these images are not knowledge until they have been unified by the inner power of understanding. The act of unifying follows 12 laws of thought that Kant called *categories.* They include such notions as quantity, quality, cause and effect. All knowledge, then, is made up of sensations linked up by the power of thought according to its own laws. Our knowledge of good and bad, though, is not gained by experience or sensation but is part of the inner understanding. It is one of the *categorical imperatives*—things we feel but cannot explain.

Károlyi, Michael, Count (1875–), Hungarian statesman. He entered the Hungarian parliament in 1905 and in 1912 changed from a liberal to a radical. After the outbreak of the World War he tried to bring about peace. Following the Hungarian revolution of 1918, he was made prime minister, and in 1919 he became president of the Hungarian republic. He resigned when revolutionists under Bela Kun established a soviet form of government. Count Károlyi went into exile after the conservative government was re-established. The High Court of Hungary found him guilty of treason because of his pacifist and radical views and confiscated his estates. In 1926 he published *Fighting the World.*

Katsura, Taro, Prince (1847–1913), Japanese statesman and soldier, three times premier of Japan. When he was in his early twenties, he fought on the imperial side in the civil wars of the restoration period. His distinguished service in the war with China (1894–95) won him the rank of viscount, and he was minister of war in 1898–1900. During the Russo-Japanese War he served as premier but resigned in 1906, protesting against the Treaty of Portsmouth. Katsura was premier (1908–11) and held the office for 2 or 3 months in 1912–13. In 1911 he was created a prince. The Anglo-Japanese alliance was formed during his premiership, 1901–05.

Kaulbach, von, Wilhelm (1805–74), German painter, born in Arolsen, Westphalia. He studied under Cornelius at Düsseldorf and in 1826 followed his teacher to Munich; his frescoes, *Apollo and the Muses,* were painted for the Odeon in that city. From 1849 until his death Kaulbach directed and worked at the Munich Academy. He is known especially as a painter of historical subjects. Typical of his work is a series of murals on the staircase of the Berlin Museum, representing six epochs from the fall of Babel to the Reformation. His designs for engravings also brought him fame. In this field he was a disciple of the English engraver Hogarth, whose vein of satire he admired.

Kaunitz, Wenzel Anton, Prince (1711–94), Austrian statesman. In 1735 he became councilor under Charles VI, but he is known chiefly for his work in the service of Maria Theresa, daughter and successor of Charles. She placed almost unlimited trust in Kaunitz. As chancellor and minister of foreign affairs he brought about the Austro-French alliance against Frederick the Great in 1756, which was followed by the Seven Years' War. He represented the empress in the partition of Poland in 1772 and in 1775 wrested Bukowina from Turkey. Under Maria's successor, Joseph II, Kaunitz worked for reforms favored by the emperor. He retired in 1792.

Kean, Edmund (1787–1833), English actor, born in London, the son of an actress. Between the ages of 16 and 27 he toured the provinces without gaining much recognition, but in 1814 he won a sensational success in London, as Shylock. He subsequently appeared in *Richard III, Hamlet, Othello, King Lear, Macbeth* and other tragedies and dramas. In 1820 and 1825 Kean visited the United States, and critics proclaimed him the greatest actor of his day.

Keane, Augustus Henry (1833–1912), British ethnologist and geographer, born at Cork, Ireland. He was educated in England, Italy, Ireland and Germany and traveled extensively in Europe, Asia and North America. He taught Hindustani at the University College, London. He edited Stanford's *Asia, Africa, Central and South America* and was the author of *Ethnology; Man, Past and Present; The Gold of Ophir; The Boer States;* and *The World's Peoples.*

Keats, John (1795–1821), English poet, born in London, the son of a stablekeeper. He attended a private school at Enfield until 1810, when he was apprenticed to a surgeon at Edmonton. He continued with this work for about 4 years but in the meantime had come to admire Spenser's romantic *Faerie Queene* so much that he longed to write poetry himself. He went on with his studies for 2 years in London, where he made friends with Leigh Hunt, Shelley and others and gladly left surgery for literature after his verses were published in the *Examiner.* In 1816 Keats's sonnet "On First Looking into Chapman's Homer" appeared in this journal; in 1817 he issued a volume entitled *Poems by John Keats,* which was received with indifference. His *Endymion* (1818) was savagely criticized in *Blackwood's Magazine* and the *Quarterly Review.* In 1820 he published his last book of verse, *Lamia and Other Poems.* Meanwhile his health had failed, and he sought relief in Italy, where he died in Rome.

Keats's longer poems include *Hyperion, Endymion,* the unfinished *Lamia, The Pot of Basil* and *The Eve of St. Agnes.* His genius is best revealed in the shorter poems, notably such unique pieces as the odes "To a Nightingale" and "To Autumn"; the sonnet "Chapman's Homer," the "Ode on a Grecian Urn" and the ballad "La Belle Dame sans Merci."

Keble, John (1792–1866), English poet and clergyman. At the age of 15 he entered Corpus Christi College, Oxford, where he won several prizes and otherwise distinguished himself. In 1827 he published his volume of sacred poetry, *The Christian Year,* which was widely read. He was one of the leading spirits in what was known as the *Tractarian Movement* in the English Church, and for several years was actively engaged with Pusey, Newman and others in issuing *Tracts for the Times.* The movement was really a defense of the Church against threats brought about by political changes and new habits of thought. Keble's sermon "National Apostasy," preached in 1833, was responsible for the formation of the Oxford Movement.

Kelland, Clarence Budington (1881–), American author, born at Portland, Mich. He studied law in Detroit but preferred journalism and from 1903 to 1907 was successively reporter, political editor and editor of the *Detroit News* and of *The American Boy.* He is widely known as a writer of humorous short stories and novels. Insight into character and interesting plots characterize such stories as the "Scattergood Baines" series, *The Steadfast Heart, Miracle, Rhoda Fair, Dance Magic, Dynasty* and *The Cat's Paw.*

Keller, Helen Adams (1880–), American author, born in Tuscumbia, Ala. She became blind and deaf after a serious illness at the age of 2. When she was 8, she became the pupil of Anne Mansfield Sullivan, a teacher at the Perkins Institution for the Blind. She learned to read in Braille and later to write and to use the typewriter. By degrees she learned to speak and even gave public lectures. She was graduated with honors from Radcliffe in 1904. Besides contributions to current magazines she has written *The Story of My Life, Optimism, The World I Live In, Out of the Dark, My Religion* and *Midstream—My Later Life.*

Kellogg, Frank Billings (1856–1937), American statesman, born at Potsdam, N.Y. He was admitted to the bar at Rochester, Minn., in 1877 and 10 years later moved to St. Paul. He became widely known as special counsel for the United States in cases involving large corporations and represented Minnesota in the Senate (1917–23). In 1924 he was appointed ambassador to Great Britain and was secretary of state in the Cabinet of President Coolidge (1925–29). He was the originator in 1928 of the treaty for renunciation of war, commonly called the Kellogg-Briand Peace Pact. He was awarded the Nobel Peace Prize for 1929.

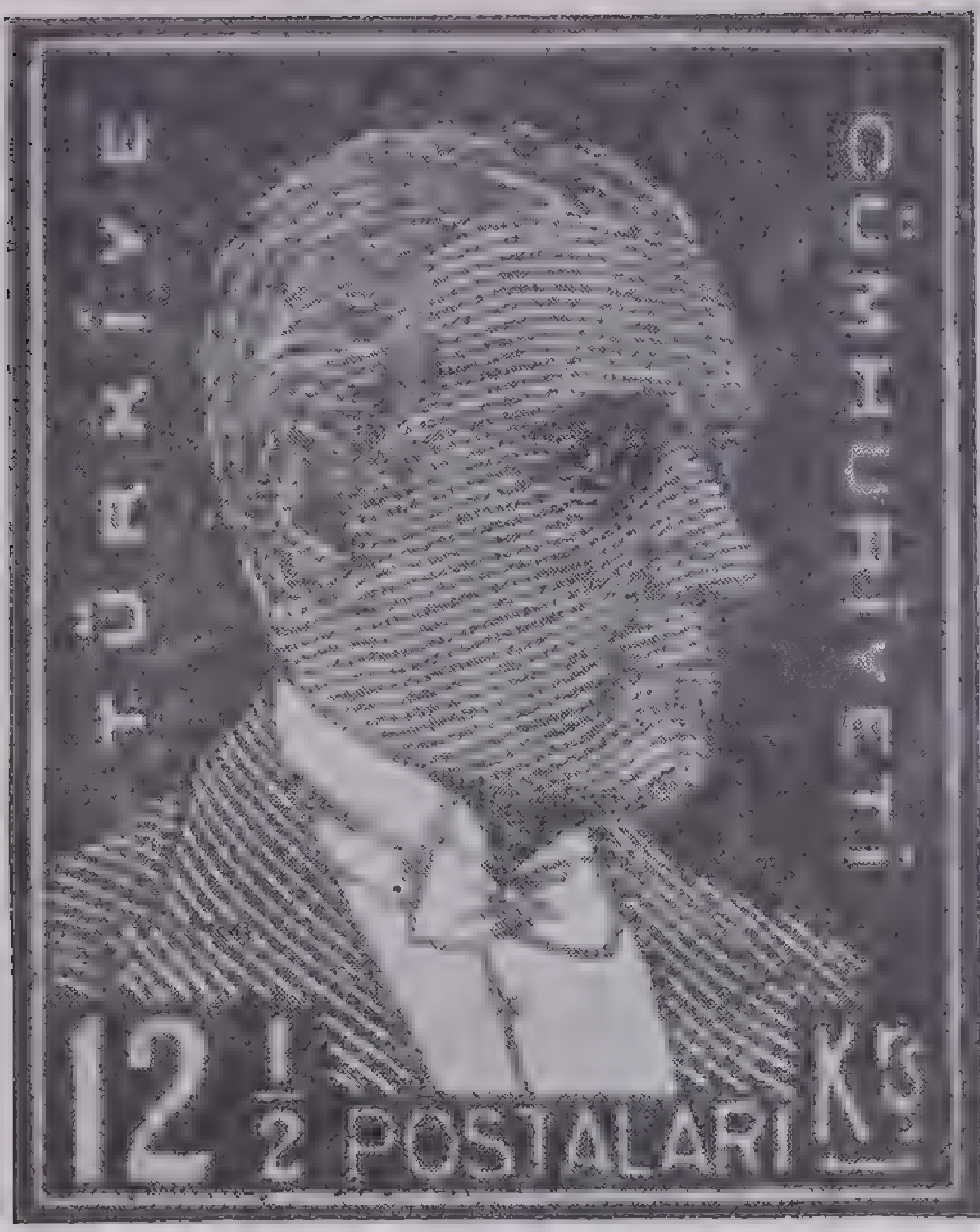
Kellogg, Vernon Lyman (1867–1937), American zoologist, born at Emporia, Kan. He was graduated from the University of Kansas in 1892 and subsequently studied in Leipzig and Paris. He taught entomology at his *alma mater* (1890–94) and for the next 16 years held the chair of entomology at Stanford University. From 1919 he served as permanent secretary of the National Research Council at Washington. Kellogg became widely known for his books on various phases of animal life and wrote about the food supply problems in Europe during and after the World War.

Kelly, James Edward (1855–1933), American sculptor, born in New York, N.Y. He studied in New York at the National Academy of Design. His principal works include a statuette of Paul Revere, a relief of Edison from life, *Monmouth Battle Monument,* equestrian figure of Theodore Roosevelt at San Juan Hill, *McKinley Memorial* at Wilmington, Del., *Sons of the Revolution,* a bronze relief made for Columbia University, and two series made from life of bronze heads of generals who took part in the Civil and Spanish-American wars. Forty generals, including Grant, Sherman and Sheridan, sat for Kelly when the first series was made.

Kelvin, William Thomson, 1st Baron (1824–1907), British mathematician and physicist, born at Belfast, Ireland, the son of a professor of mathematics. He was graduated from St. Peter's College, Cambridge, studied in Paris and in 1846 became professor of natural philosophy at the University of Glasgow. He held that position for 53 years and in 1904 was made chancellor. His long career was remarkable for unceasing activity and achievement and won him many honors at home and abroad. Thomson received a knighthood in 1866 and was created first Baron Kelvin in 1892. In 1857–58 and 1865–66 he served as electrical engineer for the companies laying the Atlantic cables. This work led to his invention of the mirror galvanometer for cable signaling and a siphon recorder for receiving signals.

He invented a mariner's compass that is not affected by the iron of the ship and a sounding apparatus for use in deep water. Several forms of electrometer, the ampere balance, the electrostatic voltmeter and electric-supply meters are results of his original work in electricity and magnetism. He also studied much in the fields of heat, sound and light and worked out ideas as to the nature of ether and inertia.

Kemal Atatürk (Mustafa Kemal Pasha; 1881–1938), Turkish statesman, born in Salonika. He was educated in Constantinople in the Mohammedan faith, though of Spanish-Jewish descent. He fought in the Tripolitan and Balkan wars and commanded the Turkish armies on the Gallipoli peninsula in 1915. As the head of a group of nationalists he was strong enough in 1922 to abolish the office of sultan. In 1923 Kemal won a diplomatic victory when the Treaty of Lausanne restored to Turkey much of the territory she had lost. Kemal was chosen president of the republic in the same year, and Turkey was rapidly westernized. He abolished the Arabic alphabet in favor of the English alphabet. He was re-elected in 1927 and 1931, and in 1934 he was awarded



Courtesy Scott Stamp & Coin Company

Kemal Atatürk

Enlarged from a Turkish postage stamp issued in 1931–32. This issue included stamps of 19 denominations each bearing the portrait of Turkey's ruler

the family name Atatürk, meaning "chief Turk."

Kemble, Charles (1775–1854), English actor, born in Brecon, South Wales. He was the youngest son of Roger Kemble, founder of the famous family of actors. He was educated at the English College of Douai, France. Kemble made his first stage appearance in London at the age of 19, appearing as Malcolm in *Macbeth* at Drury Lane. While he never rose above the level indicated in the phrase "a first-rate actor in second-rate parts," Kemble was popular in comedy and in Shakespearean plays for 36 years. In 1832–34 he was enthusiastically received in America.

Kemble, Fanny (Frances Anne; 1809–93), English actress, daughter of Charles Kemble. She was born in London and educated in France. She made her stage debut as Juliet in London in 1829. She possessed good looks, a fine stage presence and a flexible voice and won great popularity in such parts as Portia, Beatrice, Lady Teazle and Julia (in *The Hunchback*, by Sheridan Knowles). In 1832 Miss Kemble visited the United States with her father, sharing his success. She married an American planter, Pierce Butler, and lived for some years on his plantation in Georgia, where she acquired a bitter hatred of slavery that she later expressed in her *Journal of a Residence on a Georgia Plantation*. The marriage broke up by divorce in 1849. Thereafter she divided her time between Europe and America and at one period made her home in Lenox, Mass. She was an able writer, producing autobiographical sketches, poetry and a tragedy *Francis the First*. The American novelist Owen Wister, who died in 1938, was her grandson.

Kemble, John Philip (1757–1823), English actor, eldest son of Roger Kemble, born in Prescott, Lancashire. After his return to England from the College of Douai, he went into the theater. He made his first appearance at Drury Lane as Hamlet (1783) and in 1788 became manager of the theater. For a long time his sister, Mrs. Siddons, was his leading lady. Kemble was manager of Covent Garden from 1803 to 1817. A fine tragedian, he excelled in such parts as Coriolanus, Cato, Hotspur, Hamlet, Macbeth and Wolsey.

Kemble, Sarah, see *Siddons, Sarah Kemble*.

Kempis, à, Thomas, see *Thomas à Kempis*.

Kendall, Amos (1789–1869), American politician, born in Dunstable, Mass. He was graduated from Dartmouth College in 1811. In 1814 he was admitted to the Kentucky bar but turned to journalism and politics, becoming a strong supporter of Andrew Jackson. When Jackson was elected President, Kendall was appointed to a treasury post and later became a leader in Jackson's so-called *Kitchen Cabinet*, a circle of close friends and advisers. In 1835 Kendall was appointed postmaster general and continued in the office under Van Buren. Among other innovations, he instituted the money-order system. During the Civil War he supported Lincoln.

Kennan, George (1845–1924), American writer and war correspondent, born in Norwalk, Ohio. From 1865 to 1871 he installed telegraph systems in Russia and Siberia. He saw much of the life of Russian political exiles and described it in a number of magazine articles. He lectured in the United States and Great Britain and later wrote *Siberia and the Exile System* (1892). In 1901 the Russian government expelled him from that country. He was correspondent for the *Outlook* during the Spanish-American and Russo-Japanese wars. Among his books are *A Russian Comedy of Errors*, *The Salton Sea* and *E. H. Harriman, A Biography*.

Kent, James (1763–1847), American jurist, born in Fredericksburg, N.Y., and graduated from Yale in 1781. Admitted to the bar in 1785, he advanced steadily in his profession and served two terms in the state legislature. He became a justice of the state supreme court (1798) and was chief justice (1804–14). Thereafter he served as chancellor of New York until 1823. From 1793 to 1798 and from 1823 to 1826 he was professor of law at Columbia. He is remembered for his *Commentaries Upon American Law* (1826–30).

Kent, Rockwell (1882–   ), American painter and author, born at Tarrytown Heights, N. Y., educated at Columbia University. He traveled in South America, Alaska, Greenland and Labrador, and many of his paintings are of the people and scenes in the north. His style is vigorous and original. Among his books are *Wilderness*, *Voyaging*, *N by E* and *Salamina*.

KEPLER, JOHANNES (1571–1630), German astronomer, born in Weil, Württemberg. He entered the University of Tübingen in 1589 as a student of theology and the classics. His interest in the teachings of Copernicus led him into the study of astronomy, and in 1594, though inadequately prepared, he became professor of astronomy and mathematics at the University of Graz. In 1600 he was called to the observatory near Prague to assist Tycho Brahe. When Brahe died in 1601, Kepler took his place as imperial astronomer and mathematician. He also continued the preparation of the new astronomical tables that he and Tycho Brahe had begun for Emperor Rudolph II. The Rudolphine Tables, with a catalogue of 1,005 stars, were published in Ulm in 1627. Meanwhile, in 1612 Kepler had become mathematician to the states of Upper Austria, with headquarters at Linz. In 1628 he accepted a similar position under Wallenstein. His greatest work, *Astronomia Nova* (1609), contains the first two of the celebrated planetary-motion laws—those on elliptical orbits and equal areas. The third Kepler law, on the relations between periods and distances, was published in a treatise in 1619. These laws, on which were founded Newton's discoveries, modernized the science of astronomy in general.

Kerenski, Aleksandr Feodorovich (1881–   ), Russian revolutionist, born in Simbirsk. He studied law in St. Petersburg (now Leningrad) and practiced in Moscow. Kerenski sat as a moderate Socialist in the last Duma under Czar Nicholas II. He was minister of justice in the provisional Cabinet set up in March 1917, and in the newly formed ministry in May he dominated the Cabinet as minister of war. In July he became president of the new republic and was for a time the ruler of the country. The Bolshevists proved too strong for him, and in November, with the triumph of Lenin and Trotzky, Kerenski was forced to flee from Russia. He published *The Prelude to Bolshevism* (1919) and *Crucifixion of Liberty* (1934).

Key, Francis Scott (1780–1843), American musician, author of *The Star-Spangled Banner*. He was born in Frederick county, Md., studied law at St. John's College, Annapolis, and began practice in Fredericktown in 1801. Later he lived in Washington and was appointed district attorney of the District of Columbia. During the War of 1812 he was sent on an errand to the British fleet in the harbor of Baltimore, under a flag of truce. Kept on shipboard during the bombardment of Fort McHenry he watched the battle throughout the night, and when the dawn disclosed the stars and stripes floating over the fort, he wrote the famous song. Although generally known thereafter as the national anthem of the United States and adopted as such by the Army and Navy, it was not officially sanctioned by Congress until 1931.

Keyserling, Hermann, Count (1880–   ), German philosopher and writer, born in Estonia of a noble Russian family. He was well educated in universities in several countries. While traveling around the world (1911–12) he became deeply interested in Oriental philosophy, and this colored his later work. He lectured in many countries. His books have been widely read and translated. Among them are *The Travel Diary of a Philosopher*, *The World in the Making*, *The Recovery of Truth* and *America Set Free*.

Khayyám, Omar, see *Omar Khayyám*.

Kidd, William (*c.* 1650–1701), British pirate, probably born in Scotland. He followed the sea from youth, settled in Boston and became a trader. During the wars of William III Captain Kidd received a commission to suppress piracy on the high seas and in 1696 sailed from Plymouth, England, in the galley *Adventure*. After taking on more men at New York he proceeded to Madagascar. He is believed to have taken up piracy himself in the course of his adventures. In 1699 he was arrested in Boston, charged with killing a mutinous gunner on the *Adventure*. Kidd was tried in England and hanged in 1701. Some of the treasure taken by him was dug up on Gardiner's Island, N.J., in 1699, and seized by colonial officials. A vindication of Kidd appeared in 1911 under the title *The Real Captain Kidd*.

Kilmer, Joyce (1886–1918), American poet born in Brunswick, N.J., educated at Rutgers College and Columbia University. He took up editorial work in New York and at one time was on the staff of the New York *Times*. He also contributed articles and verse to current periodicals. His poetry was published under the titles *Summer and Love*, *Trees, and Other Poems* and *Main Street, and Other Poems*. "Trees" is his best known poem. Kilmer edited an *Anthology of Catholic Poets*. He was killed in action during the World War.

King, Clarence (1842–1901), American geologist, born in Newport, R.I. He was graduated from the Sheffield Scientific School of Yale in 1862. In 1863 he studied glaciology under Agassiz and worked on geological surveys in the west. His work was of such importance that in 1879 he was appointed first director of the U. S. Geological Survey. After 1881 he was a practicing mining engineer. His achievements include the determination of the age of gold-bearing rocks, the discovery of mounts Whitney and Tyndall and the survey of the 40th parallel.

King, William Lyon Mackenzie (1874–   ), Canadian statesman, born in Berlin (now Kitchener), Ont., and graduated from the University of Toronto in 1895. He took postgraduate courses at the University of Chicago and received his doctorate at Harvard. King became deputy minister of labor in 1900 and settled several industrial strikes. He was elected to the House of Commons as a Liberal in 1908 and became first minister of the Department of Labor in 1909. Defeated in the election of 1911 he devoted himself to economic research and in 1914 accepted the invitation of the Rockefeller Foundation to make an extensive study of capital and labor problems. King returned to political life in 1921, and except for a short time in 1925–26 he headed the Liberal government as prime minister until 1930, when the Conservatives were again in power. In 1935 the Liberals under Mackenzie King once more controlled the government.

King, William Rufus (1786–1853), American politician and diplomat, born in Sampson County, N.C. In 1810 the Democrats elected him to the House of Representatives, where he remained until his appointment in 1816 to a diplomatic post in Russia. He represented Alabama in the U. S. Senate, 1819–44, and was minister to France, 1844–46. In 1848 he returned to the Senate by appointment, was elected for the term ending in 1853 and resigned in January of that year to become Vice-President on the ticket with Franklin Pierce. He took the oath of office while in Cuba but never actually served as he died a month after the inauguration.

Kingsley, Charles (1819–1875), English clergyman and writer, born in Devonshire and educated at Cambridge University. In 1842 he became curate and in 1844 rector at Eversley, Hampshire, his home for the rest of his life. He also held the positions of canon of Chester (1869–73), canon of Westminster (1873–75), chaplain to Queen Victoria and professor of modern history at Cambridge (1860–69). Kingsley was actively associated with the Christian Socialist movement; his sympathy for the poor inspired the novels *Alton Locke* and *Yeast*. Better known to modern readers are his historical novels *Hypatia*, *Westward Ho!* and *Hereward the*

Wake. He was also the author of a fairy tale, *Water Babies,* verse, sermons and some miscellaneous writings under the name of Parson Lot.

Kipling, Rudyard (1865–1936), English writer, born in Bombay, India, where his father was professor of sculpture in an art school. He was sent to school in England. His book *Stalky & Co.,* is a group of stories of school life suggested by his experiences at the United Services College in Devonshire. In 1881 he returned to India, where he held editorial positions with the Lahore *Civil and Military Gazette* and the Allahabad *Pioneer.* His early verse and stories appeared in these periodicals. Between 1887 and 1889 he published *Plain Tales from the Hills, Soldiers Three, The Phantom 'Rickshaw, Wee Willie Winkie* and other short stories that established his reputation as a writer of unique powers. Before the end of the century he had produced the popular *Barrack-Room Ballads, The Light That Failed* (a novel), two *Jungle Books, Captains Courageous* and other characteristic works in fiction. On the celebration of Queen Victoria's Diamond Jubilee (1897). he wrote *The Recessional,* a hymn that is still sung in churches everywhere.

After 1890, he spent several years in travel and during one period made his home in Vermont, for he had married an American woman in 1892. Kipling's *Kim, The Just-So Stories* and *Puck of Pook's Hill,* written 1901–06, were in his characteristic vein, but some of his later works seemed to lack the spontaneity and freshness his admirers had learned to expect. He wrote busily, however, producing short stories, verse, political articles, essays and a collection of his speeches, entitled *Book of Words* (1928). Kipling was the first British author to receive the Nobel Prize (1907). In 1923 he succeeded Barrie as lord rector of St. Andrew's University, Scotland, one of the many academic honors conferred on him. He was buried in Westminster Abbey.

Kirchhoff, Gustav Robert (1824–87), German physicist. He taught physics at the universities of Breslan, Heidelberg and Berlin. He is especially noted for his work with the spectroscope; with Bunsen he discovered the elements, calcium and rubidium, and explained the Fraunhofer lines in the solar spectrum.

Kitchener, Horatio Herbert, 1st Earl (1850–1916), British general, born at Ballylongford, Ireland. He trained at the Royal Military Academy in England and joined the Royal Engineers in 1871. He fought for France as a volunteer during the Franco-Prussian War. He did survey work in Cyprus, 1878–82, and then became an officer in the Egyptian army and served in campaigns in Egypt and the Sudan. In 1892 he became sirdar or commander of the Egyptian Army and by his victories at the Atbara and Omdurman destroyed the power of the Mahdi and restored Khartoum and the Sudan to British influence.

In 1899 Kitchener left Egypt, becoming chief of staff to Roberts in South Africa. He succeeded Roberts as commander in chief and was created a viscount in 1902 for his contribution to the victory over the Boers. After valuable service in India, he was promoted to field marshal in 1909. Appointed consul general of Egypt in 1911, he did not leave his post until June 1914, when he went home on leave; at that time he was created an earl and was on the point of returning to Egypt when the World War broke out. He at once assumed the heavy responsibilities of secretary of state for war and with shrewd foresight made plans for a struggle of at least 3 years. While on a mission to Russia in 1916 Kitchener and his staff were lost in the North Sea; their ship, H.M.S. *Hampshire,* was sunk, and conflicting rumors regarding the tragedy have been widely circulated.

Kléber, Jean Baptiste (1753–1800), French general. He was conspicuous in the wars of the French Revolution, went to Egypt with Napoleon and was left in command there when Napoleon returned to France in 1799. He was assassinated at Cairo.

Klopstock, Friedrich Gottlieb (1724–1803), German poet, born in Quedlinburg. He devoted himself to writing religious poetry. His great work is *Der Messias* (The Messiah). The publication of the first three cantos at Leipzig in 1748 marked the beginning of the classical period of German literature; the last of the 20 cantos did not appear until 1773. He was invited to Copenhagen in 1751 by the Danish king, who gave him a yearly pension. From 1771 until his death he lived chiefly in Hamburg, where *The Messiah* was completed. Klopstock also wrote odes, dramas and hymns.

Knox, Henry (1750–1806), American general, born in Boston. He joined the Revolutionary forces after the battle of Lexington and fought at Bunker Hill. A capable engineer and artilleryman, he was commissioned brigadier general of artillery in 1775 and after distinguished service from Princeton to Yorktown was promoted to the rank of major general in 1781. Congress appointed him the first secretary of war in 1785, and he occupied this position under Washington, 1789–95.

Knox, John (*c.* 1505–1572), Scottish church reformer, born at Gifford in East Lothian. He studied for the priesthood, becoming apostolic notary at Haddington about 1540. He adopted the reformed faith in 1546. After the murder of Cardinal Beaton, Knox fled to the castle of St. Andrews for protection, but it was captured by the French and Knox was taken prisoner. Released in 1549 by the intervention of Edward VI, he remained in England to further the Reformation there but left the country when Edward died (1553). He was pastor of the English Church in Geneva, 1556–59, where he came under the influence of Calvinism. In 1558 he returned to Scotland, where the reformers were in power, and was soon their leader.

In 1561 the young Queen Mary, a Catholic, returned to Scotland from France and quickly aroused the anger of Knox, who was forced to retire for a time because of his outspoken opposition. The queen's ill-advised marriages and reckless conduct turned popular feeling against her, and she was forced to abdicate. Knox regained his former prestige. Before his death in 1572 he saw Protestantism firmly established in his country. His chief book is the *History of the Reformation in the Realme of Scotland.*

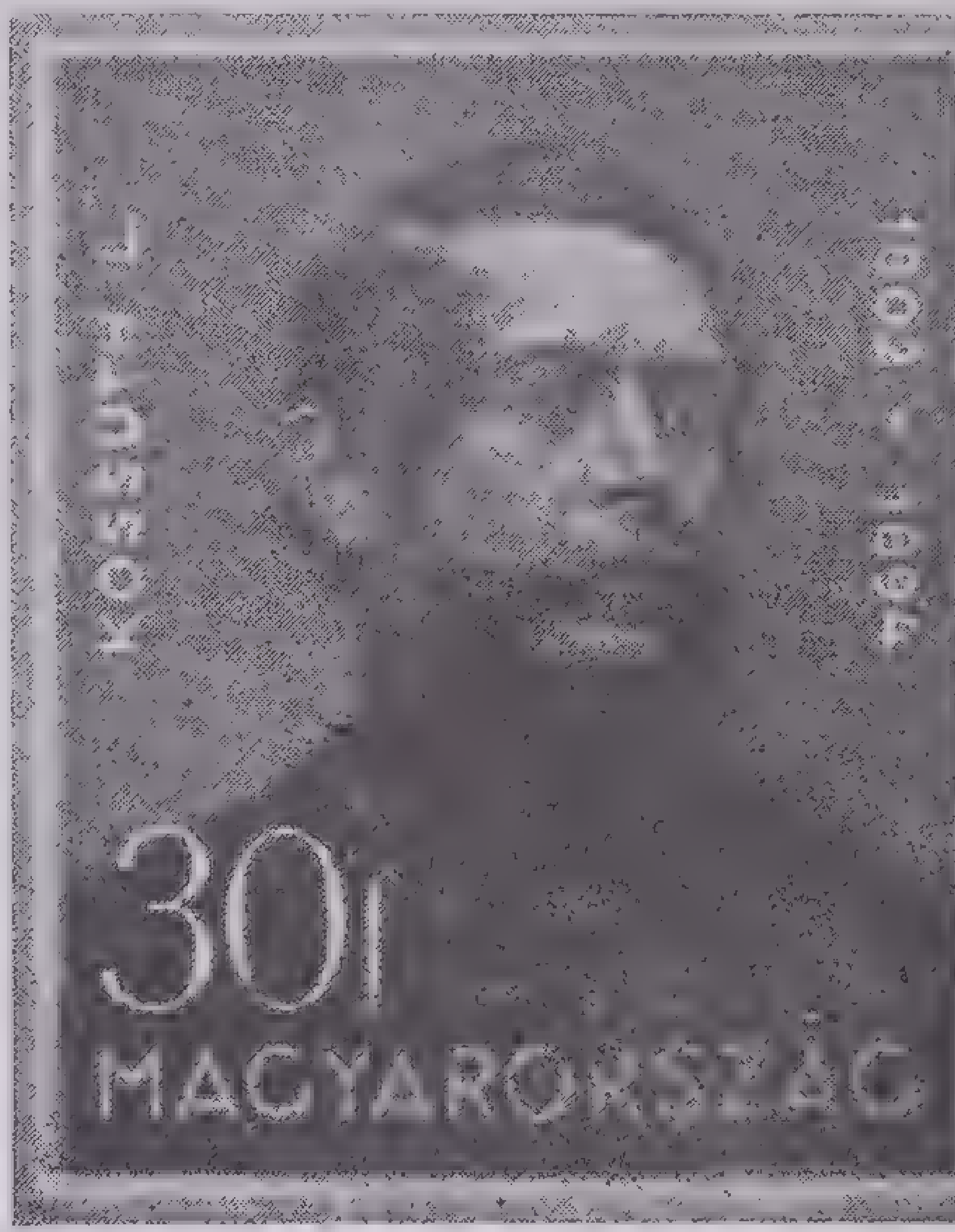
Knox, Philander Chase (1853–1921), American statesman, born in Brownsville, Pa., and educated at Union College, Ohio. He was admitted to the bar in 1875, built up a practice in Pittsburgh and became attorney for the Carnegie Steel Company. In 1901 McKinley appointed him attorney general of the United States. Knox remained in office under Roosevelt until 1904; he was widely known for his prosecution of trusts. In 1904 he entered the Senate by appointment, as successor to Senator Quay, and was elected for the term 1905–11. In 1909 he resigned to become secretary of state under Taft. Knox was re-elected to the Senate in 1916 and died in office. He was one of the leading opponents of the Treaty of Versailles and of the League of Nations Covenant.

Koch, Robert (1843–1910), German scientist, born at Klausthal. He studied medicine at Göttingen University; and while he was practicing at Wollstein, he gave his time chiefly to research. In 1882 he announced the discovery of the bacillus of tuberculosis and in 1883 that of cholera. Dr. Koch spent much time in South Africa, discovered the causes of sleeping sickness and malaria and prepared antitoxins for their treatment. Tuberculin or Koch's lymph, used in the treatment of tuberculosis, was one of his discoveries. He published his findings in several books. In 1905 he received the Nobel Prize for medicine.

Komura, Jutaro, Marquis (1855–1911), Japanese statesman, born in Hyuga and educated at Harvard University at his government's expense. He began his public career in 1877 as an official in the department of justice, was transferred to the foreign office in 1884 and later was Japanese minister successively at Washington, St. Petersburg (now Leningrad) and Peking. In 1901 he became minister of foreign affairs. Komura took part in the negotiation of the Portsmouth Treaty in 1905. He was ambassador to Great Britain, 1906–08, and from 1908 until his death again held office as minister of foreign affairs.

Kosciusko, Thaddeus (1746–1817), Polish patriot, born in Lithuania. He received a military education and became a captain in the Polish army. In 1776 he proceeded to America to fight for the American colonists against Great Britain. He served as colonel under General Gates, helping to construct the fortifications at West Point. He was later made adjutant to Washington. After the war Congress awarded him the brevet of brigadier general. Kosciusko returned to Poland in 1786 and in 1792, as lieutenant general, gave valuable service in the war with Russia, holding back a superior army at Dubienka for 5 days and retreating with small losses. In the Polish insurrection of 1794 he kept up the fight against heavy odds but, severely wounded, was taken a prisoner to St. Petersburg (now Leningrad). In 1796 the Russian emperor released him. Kosciusko freed the serfs on his estate in Poland in 1817, the year of his accidental death.

Kossuth, Louis (1802–94), Hungarian leader, born in Monok. He began public life as a lawyer, but his enthusiasm for reform carried him into politics and journalism, and in 1837 he was imprisoned for illegal publication of a liberal paper. After being released in 1840 he continued his propaganda as editor of the *Pest Journal.* In 1847 Kossuth was elected to the Diet of Hungary and became a leading spirit in the revolutionary outbreak of the following year. The success of his army in the spring of 1849 led the Diet to proclaim the independence of Hungary, with himself as dictator. The movement failed, and in August he fled to Turkey. The Turkish government refused to deliver him to Austria, and through the intervention of Britain and the United States he was set free. He visited both countries and received enthusiastic ovations from the people. He spent the rest of his days as an exile in England and Italy.



Courtesy Scott Stamp & Coin Company

Louis Kossuth

Enlarged from a Hungarian postage stamp issued in 1932. Other stamps in the series show portraits of such famous Hungarians as János Arany, Franz Liszt, Ignaz Semmelweiss and Mihály Munkácsy

Kreisler, Fritz (1875–   ), Austrian violinist, born in Vienna. When he was only 10 years old, he won the first prize and gold medal at the Vienna Conservatory and at 12 received the Premier Prize of Rome at the Conservatory of Paris. Kreisler made his first tour of the United States in 1888–89 and played repeatedly in North America and England. He possesses the Josef Guarnerius del Gesu of 1737, one of the most valuable violins in the world. Kreisler fought in the Austrian army as captain, 1914–15, and wrote of his experiences in *Four Weeks in the Trenches.*

Kropotkin, Petr Aleksyeevich, Prince (1842–1921), Russian revolutionary leader, born in Moscow of noble descent. In 1862 he joined the Cossacks and was stationed with his regiment in the Amur region in Siberia. While there he did much geographical work. When he returned to St. Petersburg (Leningrad) in 1867, he left the army. In 1872, after an expedition to Finland to study the glacial deposits, Kropotkin became associated with the radical workers' movement in Switzerland. He was imprisoned by the Russian authorities for anarchistic propaganda (1874) but escaped to England (1876). He returned to Switzerland (1877), only to be expelled when Czar Alexander II was assassinated (1881). He thereafter spent most of his time in England but returned to Russia in 1917. He criticized the Bolshevist regime but was allowed to remain in Moscow, where he died.

Kruger, Stephanus Johannes Paulus (1825–1904), Boer statesman, born at Colesberg, Cape Colony. In 1836 he trekked into the Transvaal with his family. He became active in the military and political history of the province and was leader in the revolt against British annexation. During the war of 1880–81 he was the active spirit of the provisional government. Kruger was elected president in 1883 and was re-elected for three successive terms. He made every possible preparation for the South African War, which he saw was inevitable. In 1900, after the fall of Pretoria, he fled to Europe and spent most of his remaining years in Holland.

Krupp, the name of a family of German armament makers.

Friedrich Krupp (1787–1826), established a small plant in his native city of Essen, Prussia, in 1810. He invented a formula for making cast steel.

Alfred Krupp (1810–87), son of Friedrich, was given his father's formula. He established the present steelworks in Essen. Krupp was a brilliant metallurgist and the inventor of weldless railway ties, the breech-loading rifle and other guns.

Friedrich Alfred Krupp (1854–1902), son of Alfred, greatly extended his father's steelworks, which became known the world over for the manufacture of heavy guns. Friedrich's daughter Bertha (Mrs. Gustav von Bohlen) carried on the business after her father's death; the "Big Berthas," large German guns used in the World War, were named for her by the British troops. The Essen plant turned to the manufacture of industrial products after the war but is best known as armament works.

Kubelik, Ján (1880–1940), Bohemian violinist, native of Miehle, a town near Prague. Kubelik was a boy prodigy and played in public when he was 8 years of age. He studied for 6 years at the Prague Conservatory, gaining a remarkable mastery of technique. After 1901 he made numerous tours of the United States. In 1903 he became a naturalized Hungarian. Kubelik composed three violin concertos.

Kublai Khan (*c.* 1216–94), Mongol Emperor of China, grandson of Genghis Khan. Kublai Khan succeeded his brother as grand khan of the Mongols in 1259. He devoted 20 years to the conquest of China, begun by his brother, and established his capital on the site of the present Peking. Southern China yielded to him in 1279, and he then became head of a great Mongol Empire. Under him Buddhism became the state religion. His empire lasted only until 1368, when the Ming dynasty, a native family, came to the throne. Kublai Khan was the patron of Marco Polo, who described his magnificent court.

Kuroki, Tamemoto (Tamesada), Count (1844–1923), Japanese soldier, born in Kagoshima, province of Satsuma. He fought on the imperial side in the Satsuma uprising of 1877, won distinction in the Chino-Japanese War (1894–95) and was commander of the First Army in the Russo-Japanese War (1904–05). Kuroki fought in the battles of Yalu, Liao-Yang, Shaho and Mukden, and in 1906 he was appointed inspector general of the army.

Kuropatkin, Aleksyey Nikolaevich (1848–1925), Russian general. He gained experience with the French in Algeria in 1874, was a staff officer in the Russo-Turkish war of 1877–78 and gained victories in Turkistan and Caucasia. In 1904 he commanded the forces against Japan. He was in command of the armies on the northern front in the earlier part of the World War but in 1916 was made governor of Turkestan. A year later he was shorn of authority by the Bolsheviks. He wrote *The Russian Army and the Japanese War.*

La Bruyère, de, Jean (1645–96), French writer. He was tutor to the duke of Bourbon and lived most of his life in the duke's household. He is known for his book *Les Caractères,* a careful description of the life and people of his time. It was enormously successful and is still a valuable source of historical information and a model of French style.

Ladd, George Trumbull (1842–1921), American educator, born at Painesville, Ohio. He studied at Andover Theological Seminary in 1869 and 10 years later lectured there. He was professor of philosophy at Yale from 1881 to 1905. In 1899 he went to India and lectured on philosophy at the University of Bombay and at Calcutta and Madras. He toured Japan, Hawaii and France, received many honors and returned to America to resume his duties at Yale. Dr. Ladd wrote many books on religion, philosophy and psychology, including his well-known *Philosophy of Mind,* which has been translated into various foreign languages.

La Farge, John (1835–1910), American painter, born in New York of French descent. He studied art in the United States and in Paris. In 1876–77 he completed the mural decoration of Trinity Church, Boston, and in 1878 began glass painting and window designing. Among his numerous church murals are those in St. Thomas's, Church of the Ascension, Church of the Incarnation and Church of the Paulist Fathers, New York. His commissions included mosaic windows for churches in Chicago and New York and for the Crane Memorial Library, Quincy, Mass. He also worked in oils and water colors.

La Farge, Oliver (1901–), American author, born in New York city, educated at Harvard. He taught ethnology at Tulane University (1926–28). Later he headed three archeological expeditions to Arizona for Harvard; two to Mexico and Guatemala for Tulane and one to Guatemala for Columbia. He wrote *Laughing Boy* in 1927, a novel of Navaho Indian life for which he received a Pulitzer Prize. He was given the O'Henry Memorial Prize for his story "Haunted Ground." *The Sparks Fly Upward* is a novel laid in Central America.

Lafayette, de, Marie Joseph Paul Roch Yves Gilbert Motier, Marquis (1757–1834), French statesman, descended from an ancient family of Auvergne, born in the castle of Chavagnac (now in the department of Upper Loire). He early became a soldier and in 1777 came to America to fight with the colonists in the Revolutionary War. Congress entrusted him with the defense of Virginia, where he rendered important services. He became acquainted with liberal principles in this country, and on his return to France he eagerly tried to promote reform there. The extreme French republicans soon came to dislike him because he advocated a constitutional kingdom; at the same time he was unpopular with the court party, especially the queen, because of his zeal for a new order of things. Along with Bailly, he founded the club of the Feuillants.

After the adoption of the constitution of 1790 he retired to his estate of Lagrange until he was chosen to command an army fighting the Austrians. He lost his power and position in France through attacks by the Jacobins and was accused of treason but was acquitted. After several efforts to maintain the cause of rational liberty he left Paris for Flanders, but he was taken prisoner by the Austrians and held at Olmütz until Napoleon liberated him in 1797. He sat in the chamber of deputies, 1818–24 and 1825–30. In 1824 he revisited America by invitation of Congress, which voted him a grant of $200,000 and a township of land. He took part in the French Revolution of 1830.

Lafitte, Jean (1780–*c.* 1825), American pirate, born in France. He and his brother Pierre were the leaders of a band of outlaws who had their headquarters on an island in Barataria Bay, off Louisiana. They preyed upon shipping, engaged in smuggling and were the terror of traders in the Gulf of Mexico. In the War of 1812 he offered his services to Andrew Jackson and took part in the battle of New Orleans (1815). In recognition of his patriotism, President Madison pardoned Lafitte and his men. Lafitte later returned to his old ways.

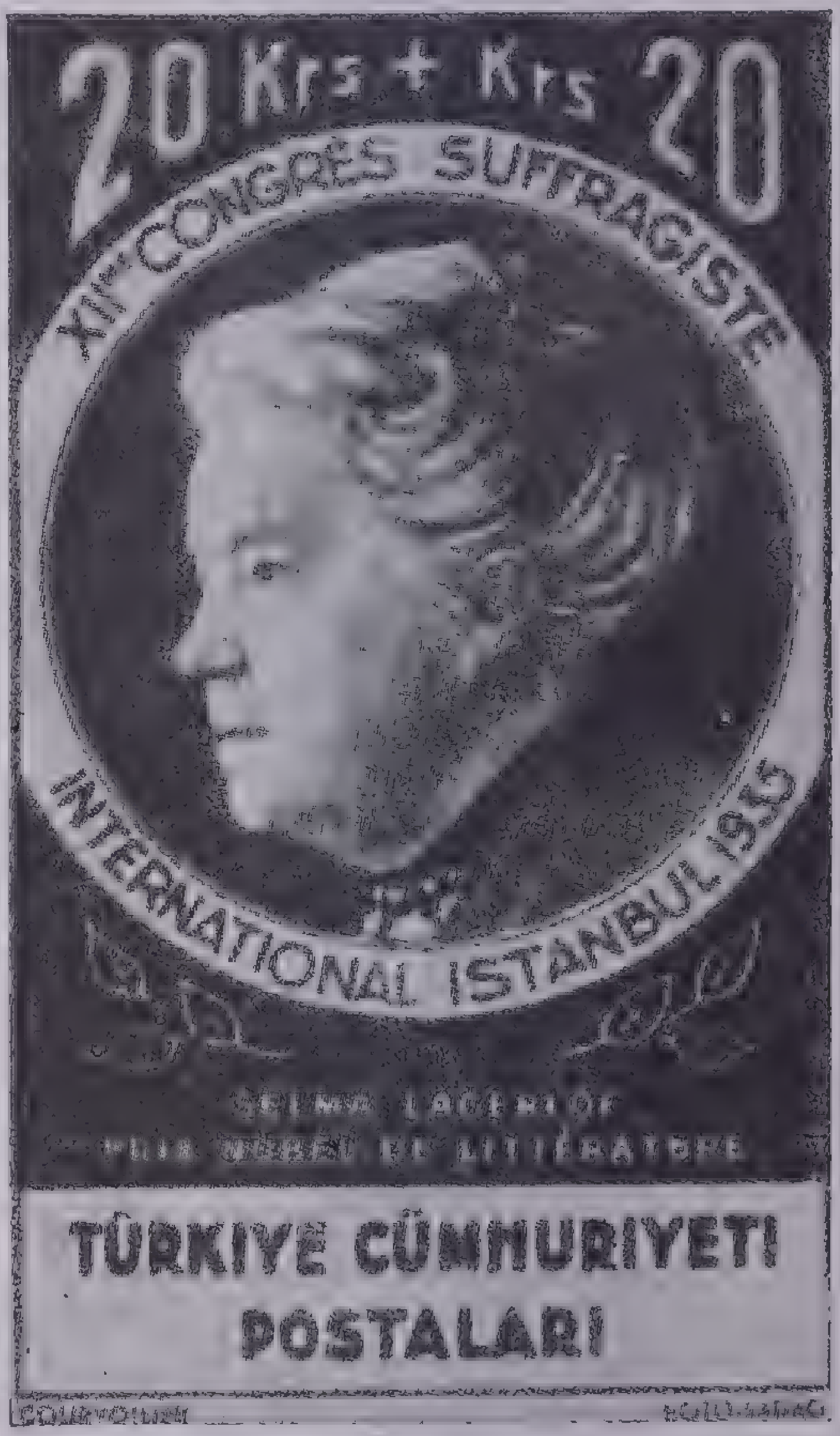
La Follette, Philip Fox (1897–), American statesman, son of Robert Marion La Follette. He was elected governor of Wisconsin on the Progressive ticket in 1930 and again in 1934. With his brother he attempted to form a new political party in 1938.

La Follette, Robert, Jr. (1895–) American statesman, son of Robert Marion La Follette, whose secretary he was for 6 years. He was elected to the Senate in 1925 to fill his father's unexpired term and reelected in 1928 and 1934.

La Follette, Robert Marion (1855–1925), American statesman, born in Primrose, Wisconsin. His name is associated with such doctrines as direct primaries, just taxation, pacifism, control of railroad rates and government ownership. He graduated from the University of Wisconsin in 1779 and began to practice law the following year. He served 4 years as district attorney of Dane County and 6 years in the House of Representatives (1885–91); then, having been defeated for re-election, he resumed law practice. During this period he attracted notice as a leader of those in revolt against the Republican machine in Wisconsin and in 1900 was elected governor on the issue of political reform. Twice re-elected, he resigned in 1905 to enter the U. S. Senate, and he remained there until his death. *Fighting Bob,* as he was called, was an insurgent Republican throughout his senatorial career. Though his opposition to American participation in the World War lost him much prestige for a time, he regained his standing and in 1924 was nominated for the Presidency by the newly organized Progressive party, polling a popular vote of 4,868,681. He won the electoral vote of only his own state.

La Fontaine, de, Jean (1621–95), French writer, born in Chateau-Thierry, in Champagne. He studied for the priesthood but took to the law instead. In 1661 he began to write, and during the next few years he published the volumes on which his fame rests. The most famous are the *Fabliaux* ("Fontaine's Fables") written in verse. They are really satires on the life of his time. The first six books appeared in 1668 and the second and third sets in 1679 and 1693. He was elected to the French Academy in 1683.

Lagerlöf, Selma (1858–1940), Swedish author, born on a farm in Värmland and educated in Stockholm. She taught school before she became a professional writer. Her first important book *Gösta Berling's Saga* was published in 1891. Thereafter she was acknowledged as a writer of exceptional talent and in 1909 received the Nobel Prize for literature. She was elected to the Swedish Academy in 1914, the first woman to be so honored. Miss Lagerlöf's books include *The Wonderful Adventures of Nils* (a children's classic), *Jerusalem, The Girl from the Marsh Croft, The Outcast, The General's Ring* and *Anna Svärd.*



Courtesy Scott Stamp & Coin Company

Selma Lagerlöf

Enlarged from a postage stamp issued in 1935 when the 12th Congress of the Women's International Alliance met at Istanbul. Other outstanding women whose portraits appear in this series are Carrie Chapman Catt, Jane Addams, Grazia Deledda, Bertha von Suttner, Sigrid Undset and Marie Curie

LaGuardia, Fiorello Henry (1882–), American public official, born in New York city and graduated from New York University in 1910. From 1901 to 1906 he was in the consular service and from 1907 to 1910 was interpreter at Ellis Island. He was deputy attorney general of the state of New York from 1915 to 1917. In 1917 he was elected to the House of Representatives but during part of the term commanded the American air forces on the Italian-Austrian front with the rank of major. He was president of the Board of Aldermen of New York city in 1920 and 1921 and served in Congress from 1923 to 1933. In 1934 he was elected mayor of New York city on a fusion ticket and was re-elected in 1937. He became nationally famous through his reforms, his relentless war on lawless elements and his refusal to be governed by party politics.

Lajoie, "Larry" (Napoleon Lajoie; 1875–), American baseball player, born at Woonsocket, R.I. He entered professional baseball in 1895 and at various times played as infielder, outfielder and catcher. He played in the major leagues for 20 years; his best records were made with the Cleveland team, which he later managed.

Lalande, de, Joseph Jérôme Lefrançais (1732–1807), French astronomer. The French Academy sent him to Berlin in 1751 to determine the moon's parallax and in 1753 elected him assistant astronomer. In 1762 Lalande became professor of astronomy in the College of France and in 1795 director of the Paris observatory. In 1802 he founded an annual prize of 540 francs for special work in astronomy. He was a popular lecturer and writer.

Lamar, Lucius Quintus Cincinnatus (1825–93), American jurist and statesman, born in Putnam County, Ga., and educated at Emory College. He began the practice of law in 1847 and in 1856 was sent to Congress by the Mississippi district to which he had moved in 1855. In 1860 Lamar joined the secessionists; he drafted the secession ordinance passed by the Mississippi convention. He saw active service early in the war and later went to Europe as a representative of the Confederacy (1862–64). Lamar sat in the lower House of Congress, 1873–77, was U. S. Senator, 1877–85, secretary of the interior under Cleveland, 1885–88, and thereafter associate justice of the Supreme Court.

Lamarck, de, Jean Baptiste Pierre Antoine de Monet, Chevalier (1744–1829), French scientist, founder of invertebrate paleontology (study of fossils). He put forth a theory of evolution that was a notable advance in scientific thought, though later scientists would not accept his ideas about the inheritance of acquired characteristics. Lamarck is also famed for his reform of the classification of animals, having added much to the system established by Linnaeus. In 1788 he was appointed keeper of the herbarium of the Royal Garden (now the Jardin des Plantes) and in 1793 became professor of invertebrate zoology at the Museum of Natural History. His evolutionary theories are contained in his *Zoological Philosophy* (1809). *History of Invertebrate Animals*, in seven volumes, was published between 1815 and 1822. In a sense he was a forerunner of Darwin, but he knew nothing of natural selection and the variation of types.

Lamb, Charles (1775–1834), English author, born in London. He attended Christ's Hospital School until he was 14. In 1792 he began his work in the accounting office of the East India Company, where he remained for 33 years. It was during this period that his most important literary work was done. Tragedy shadowed all of Lamb's life. His mother suffered from a taint of insanity, which appeared once in himself, though temporarily, but which affected his older sister Mary throughout her life. In 1796 she stabbed their mother to death, and thereafter Lamb devoted himself to her, giving up thoughts of marriage and keeping her at his home during her intervals of sanity. Fortunately she was able at times to assist him in his literary work.

In 1796 Lamb had four sonnets published in a book of poems by Coleridge, his school friend. He continued to write but met with no real success until 1807, when *Tales from Shakespeare* by Charles and Mary Lamb appeared as a part of Godwin's *Juvenile Library*. Mary wrote the comedies for this series. Charles produced *Adventures of Ulysses* in 1808 and *Specimens of English Dramatic Poets Contemporary with Shakespeare*. His greatest fame rests on his *Essays of Elia*, begun in 1820 for the publishers of the *London Magazine*. These were collected in book form in two volumes, the second appearing in 1833 as *Last Essays of Elia*. They represent a wide variety of themes, full of humor, imagination and delicate charm. Among them is the well-known story of the Chinese who discovered roast pork when his house burned down and cooked his pig. Lamb retired from business life on a pension in 1825 and spent his last days in Edmonton. His sister lived until 1847.

Landon, Alfred Mossman (1887–), American statesman, born at West Middlesex, Pa. He studied at Marietta Academy, Ohio, and graduated in law from the University of Kansas in 1908. He moved to Kansas in 1912, became an oil producer and subsequently an important figure in state politics. As chairman of the Republican State Central Committee he directed the Hoover 1928 campaign in Kansas. In 1933 he was elected governor of Kansas and was reelected in 1935. He received the Republican nomination for President in 1936 but was defeated by Franklin D. Roosevelt.

Landor, Walter Savage (1775–1864), English author, born in Warwick and educated at Rugby and Oxford. For a time he lived in Wales and wrote poems. Later he raised and led a force to help Spain in the Peninsular War. His fame as a prose writer rests chiefly on his *Imaginary Conversations* (5 vols.). Other works are *Citation and Examination of William Shakespeare, Pericles and Aspasia* and *The Pentameron*. His best verse was published under the titles, *Hellenics, Simonides* and *Collected Poems*.

Landseer, Sir Edwin Henry (1802–73), English artist, born in London. His father, an eminent engraver, gave him lessons in drawing from early childhood. He produced etchings and paintings by the time he was 12, and as early as 1815 some of his pictures were exhibited at the Royal Academy, of which he became a member in 1831. His first outstanding canvas, *Fighting Dogs*, was exhibited in 1819. Other pictures include *High Life and Low Life, A Distinguished Member of the Humane Society, Dignity and Impudence, Monarch of the Glen* and *The Stag at Bay*. All of these remain remarkably popular.

Landseer excelled in the ability to give naturalness and sentiment to his animal subjects. He was also a good portrait painter and sculptor. The world-famous lions at the base of the Nelson monument in Trafalgar Square, London, were designed by him.

Lang, Andrew (1844–1912), Scottish author, born in Selkirk, educated at St. Andrews and Oxford universities. In 1868 he was elected a fellow of Merton College. He wrote almost constantly until a year or two before his death and covered a wide range of subjects. He wrote on myths and folklore, the Greek classics, psychical phenomena and primitive religions. He produced verse, fiction, literary criticism, biography, history and translations. Typical works in these varied fields include *Ballades and Verses Vain; Life of John G. Lockhart; Myth, Ritual and Religion; Joan of Arc; The Mystery of Mary Stuart* and *Homer and His Age*. Lang is known to all children for his collections of fairy tales, the first was *The Blue Fairy Book*, followed by *The Red Fairy Book, The Green Fairy Book* and others.

Langland, William (*c.* 1330–*c.* 1400), English poet. He is famous as the author of *The Vision of Piers Plowman*, a picture of the life of the time in England. Little is known of Langland's life. He became a priest and probably spent most of his life in London as a singer of masses for the dead.

Langley, Samuel Pierpont (1834–1906), American scientist, born in Roxbury, Mass. He studied at the Boston Latin School and in Europe. He became assistant at the Harvard Observatory in 1865, was soon appointed assistant professor of mathematics at the United States Naval Academy and after 1887 served as secretary of the Smithsonian Institution. He invented the bolometer, an instrument for measuring radiant heat, and he established the Astrophysical Observatory and National Zoological Park at Washington. Langley gave years of study to transportation by air and finally designed a motor-driven plane that performed successfully in the air in 1896. His machine embodied the correct principles of airplane construction. Langley is generally credited with having proved the possibility of mechanical flight, although his machine failed to carry a man on a flight. His book *The New Astronomy* was published in 1888.

Langmuir, Irving (1881–), American chemist, born in Brooklyn, N.Y., studied at Columbia University and in Germany. In 1919 he became associate director of the General Electric Company's research laboratories. He developed several important theories as to atomic structure. He introduced the use of hydrogen gas in welding (to prevent oxidation of the metals being welded), invented a gas-filled incandescent lamp in 1913 and contributed much to the development of the vacuum tubes used in broadcasting. He won the Nobel Prize in chemistry in 1932.

Langton, Stephen (d. 1228), Roman Catholic prelate, educated in Paris but probably of English descent. In 1207 he was appointed archbishop of Canterbury by Pope Innocent III, but King John refused to acknowledge the appointment until 1213. Langton took a leading part in drawing up the Magna Charta. He opposed the king after the reconciliation of the ruler and the Church and was suspended from his office for 2 years. Reinstated at Canterbury in 1218 under Henry III, he held office until his death. It is supposed that he introduced the present chapter division of the Old Testament.

Langtry, Lillie (Emily Charlotte Le Breton; 1852–1929), English actress, born on the island of Jersey. She was married to Edward Langtry in 1874. She made her debut in London in 1881, playing at the Haymarket in *She Stoops to Conquer*. Her great beauty won her the popular name of "the Jersey Lily." She made several tours of North America, where she appeared in *Lady Windermere's Fan*, which was written for her by Oscar Wilde. In 1903 she was starred in *The Crossways*, which she wrote in collaboration with J. Hartley Manners. She published her memoirs, entitled *The Days I Knew*.

Lanier, Sidney (1842–81), American musician and poet, born in Macon, Ga., and educated at Oglethorpe College. He fought in the Confederate army and after the Civil War took up the profession of law. However, after 1873 he devoted himself to the two arts he loved most—music and poetry. He played the flute in the Peabody Symphony Orchestra in Baltimore, and in 1875 his famous poem *Corn* was published in *Lippincott's Magazine*.

His first volume of collected poems appeared in 1877, and in 1879 he became lecturer on English literature at Johns Hopkins University. His lectures were published under the titles *The Science of English Verse* and *The English Novel*. The melodious quality of Lanier's verse is shown in such poems as *The Song of the Chattahoochee, The Marshes of Glynn* and *Sunrise*. His health had been impaired in the Civil War, and he died at 39.

Lansdowne, Henry Charles Keith Petty-Fitzmaurice, 5th Marquis (1845–1927), British statesman, educated at Eton and Balliol College, Oxford. In 1866 he succeeded to his father's seat in the House of Lords as a Liberal-Unionist, was lord of the treasury from 1869 to 1872 and in 1883 became governor general of Canada. His term of 5 years was notable for the completion of the Canadian Pacific Railway, the settlement of the fisheries dispute with the United States and the suppression of the Riel Rebellion. Lord Lansdowne was viceroy of India from 1888 to 1893 and then returned to England, where he was prominent as Unionist leader in the House of Lords. After serving as minister without portfolio in Asquith's coalition cabinet he retired to private life in 1916. During the World War he advocated a peace with Germany.

Lansing, Robert (1864–1928), American statesman, born in Watertown, N.Y., and educated at Amherst College. He began the practice of law in 1889 and became prominent as counsel for the United States in the controversies with Great Britain involving the Alaska boundary and the Bering Sea and North Atlantic fisheries. In 1915 he succeeded Bryan as secretary of state in the Wilson Cabinet, retaining office until 1920. As secretary of state his knowledge of international law was very useful. He handled many critical situations incident to the World War and attended the Peace Conference in Paris. In 1921 he published *The Peace Negotiations, a Personal Narrative*.

Lao-tse (6th century B.C.), Chinese philosopher, the founder of Taoism. He was a contemporary of Confucius, who visited him several times and who was deeply impressed by the spirituality and humility of the old teacher. The precepts of Lao-tse are contained in his *Tao-teh-king*, one of the sacred books of China. He taught a belief in the transmigration of souls and his Taoism, which says: "All things originate from Tao, conform to Tao, and to Tao they at last return."

La Pérouse, de, Jean François de Galaup, Count (1741–*c.* 88), French navigator, born near Albi. He fought in the Seven Years' War and in the American Revolutionary War, in which he captured the British forts in Hudson Bay. In 1785 he sailed with two ships from Brest, France, to look for the Pacific entrance to the Northwest Passage. He was at the same time supposed to study whaling in the Pacific, the American fur trade and to explore coast lines bordering the Pacific. He actually finished much of the work and sent records overland from Siberia. He was killed when both his ships were wrecked in the New Hebrides.

Laplace, de, Pierre Simon, Marquis (1749–1827), French scientist, born in Beaumont-en-Auge and educated at the College of Caen. His name is associated with the nebular hypothesis, a theory designed to account for the solar system. This hypothesis has long since been abandoned, but many remarkable discoveries make Laplace's fame secure. He was called the *Newton of*

France. In mathematics he developed the theory of probabilities and did brilliant research work in integral calculus. In astronomy he extended scientific knowledge concerning the motions of Jupiter and Saturn, the theory of the tides and the stability of the solar system. His two chief astronomical works are *Celestial Mechanics* and *Exposition of the World System,* the latter containing the nebular hypothesis. In 1816 he became one of "the forty immortals" of the French Academy.

Lardner, Ring (Ringgold Wilmer Lardner; 1885–1933), American author and humorist, native of Niles, Mich., educated at the local high school and at Armour Institute, Chicago. He began his career in 1905 as a reporter for the South Bend (Ind.) *Times* and was later a sports writer for various newspapers, chiefly in Chicago. After 1919 he became a syndicate writer and contributed fiction to the *Saturday Evening Post* and other magazines. He and George S. Kaufman wrote the play *June Moon.* Lardner was noted for his humorous short stories written in a characteristic American vernacular. His books have been published under the titles: *Bib Ballads; You Know Me, Al; Gullible's Travels; Treat 'Em Rough; My Four Weeks in France; The Love Nest; The Story of A Wonder Man;* and *First and Last.*

La Rochefoucauld, de, François, 6th Duc, Prince de Marcillac (1613–80), French author and moralist, best known for his widely translated *Maxims,* published anonymously in 1665 under the title *Reflexions ou Sentences et Maximes Morales.* He was born in Paris of a noble and ancient family and joined the army at the age of 16. He figured in the politics of the period and fought in the wars of the Fronde. After being severely wounded in 1652 he retired to his country home. In later years he was a prominent figure in the literary salon of Madame de Sablé.

La Salle, de, René Robert Cavelier, Sieur (1643–87), French explorer, born in Rouen. He emigrated to Canada at the age of 23, acquired a tract of land near Montreal and became a fur trader. In 1669 he started westward on a tour of exploration that took him to the junction of the Ohio and the Mississippi or, according to some authorities, as far as the Louisville rapids of the Ohio. When his men deserted, La Salle returned to Lake Erie alone. He immediately began to plan other expeditions and was aided by Frontenac, governor of Canada. In 1680 he descended the Mississippi to its mouth and took possession of the great valley in the name of France, calling it *Louisiana* in honor of Louis XIV. After building a fort on the Illinois River, on the bluff now called Starved Rock, he went to France to organize a colonizing expedition. In 1684 four vessels carrying 400 men and stores of supplies set sail for the New World. By mistake the colonists were landed at Matagorda Bay at the mouth of the Colorado, and the captain of the fleet departed for France before the error was discovered. After months of wandering in search of the Mississippi, during which the colony dwindled, La Salle started on foot for Canada and was murdered by his men.

Lassalle, Ferdinand (1825–64), German socialist, born in Breslau of Jewish ancestry. He became a radical disciple of men like Hegel and Marx and in 1848 was imprisoned for his outspoken criticism of the government. In later years he wrote political pamphlets that had much influence with the workers. In 1863 he founded a revolutionary society dedicated to the overthrow of capitalism. A year later he was killed in a duel, the outcome of a love affair. This romance is the basis of George Meredith's novel *The Tragic Comedians.* Modern socialists look to Marx as the exponent of their economic principles, but Lassalle was influential in giving the movement a political character. He wrote *System of Acquired Rights.*

Latimer, Hugh (*c.* 1485–1555), English bishop, born in Leicestershire and educated at Cambridge. As a member of the ecclesiastical court that passed on the legality of the marriage of Henry VIII and Catherine of Aragon, Latimer upheld the king in declaring the marriage void and was appointed bishop of Worcester in 1535. Dissatisfied with the progress of the Reformation, he resigned in 1539 and was imprisoned in the Tower of London in 1546. He was released when Edward VI took the throne and was again imprisoned when Mary became queen in 1553. After many months in the Tower he was tried and condemned to death at the stake.

Latrobe, Benjamin Henry (1764–1820), British-American architect, born in Yorkshire, England. He came to the United States in 1796 and helped to build the James River and Appomattox Canal. Later he superintended the building of the penitentiary in Richmond. In 1798 Latrobe settled in Philadelphia, where he designed the Bank of Pennsylvania, the old Academy of Art and the Bank of the United States. As surveyor of public buildings in Washington, under President Jefferson, he had an influential part in designing the original Capitol and superintended the rebuilding after it was burned in 1814. Latrobe designed the Roman Catholic Cathedral in Baltimore, the first cathedral built (1805–21) in the United States.

Laud, William (1573–1645), English archbishop, born in Reading and educated at Oxford. Ordained as a priest in 1601, he soon became chaplain to James I. His advancement was rapid. In 1626 Charles I made him bishop of Bath, in 1628 he was made bishop of London and in 1633 he became archbishop of Canterbury. Laud set up strict rules for worship and persecuted those who did not conform. This policy was the cause of much unrest, especially in Scotland. In 1641 he was arrested by order of the House of Commons, which had impeached him on charge of high treason, and he was beheaded on Tower Hill, London.

Lauder, Sir Harry [MacLennan], (1870–   ), Scottish comedian, born in Portobello, a suburb of Edinburgh. In childhood and youth he worked as a flax spinner and coal miner. His gift of song and humor early attracted attention. He made successful tours of Scotland and Ireland and in 1900 appeared in the London music halls. Lauder was enthusiastically received on his first visit to America in 1907. He composed the words and music of some of the songs he sang, written in Scottish dialect and of a humorous or sentimental character. For his work as entertainer among the British troops in the World War, King George knighted him in 1919. Lauder wrote *Roamin' in the Gloamin'* (an autobiography with the title from one of his famous songs) and *A Minstrel in France.*

Laurens, Henry (1724–92), American statesman, born in Charleston, S.C. In 1776 he became a member of the Continental Congress, representing South Carolina, and in the following year was elected its president. In 1779 he was sent on important state business to Holland but was captured on the way by a British ship-of-war and taken to London, where he was kept prisoner in the Tower of London for 15 months. When the Revolutionary War ended, he was freed and became one of the group that drew up the treaty of peace.

Laurier, Sir Wilfrid (1841–1919), Canadian statesman, the first French-Canadian to become premier of the Dominion. He was born in St. Lin, Quebec, and educated for the bar at L'Assomption College. He rose rapidly in his profession and in 1871 was elected as a liberal to the Quebec Provincial Assembly. In 1874 he was elected to the Federal Assembly. On the retirement of Blake in 1891 he was chosen leader of the Liberal party, and at the general election of 1896 he led his followers to a notable victory. His tariff legislation during 1897, giving Great Britain the benefit of preferential trade with Canada, aroused much enthusiasm in both countries, and he was warmly welcomed when he went to London. In 1900 he again secured the approval both of the Dominion and of the Empire by the prompt sending of Canadian troops to aid the mother country in South Africa, and he led his party to another victory at the polls in November. He attended the Colonial Conference and the Coronation in England in 1902. He was again returned to power in 1904 and 1908. During the World War he urged the French Canadians to fight for the Allied cause.

Laval-Montmorency, de, François Xavier (*c.* 1623–1708), French prelate, born in Laval, France. Ordained a priest in 1645, Louis XIV sent him to Canada in 1659 as apostolic vicar. He became the first bishop of Quebec in 1674, and after 1683 he occupied himself with the management of the Seminary of Quebec, founded by him in 1663. Laval University was named for him.

LAVOISIER, ANTOINE LAURENT (1743–94), French scientist, one of the founders of modern chemistry, born in Paris and educated at the College Mazarin, where he distinguished himself in mathematics, botany and chemistry. In 1768 he was elected to the Academy of Sciences, and in 1769 he was given a government office. The income from this position enabled him to carry on investigations and to take his place among the great pioneers of chemical research. Lavoisier was the first scientist to use the quantitative method of solving chemical problems. By actual weighing he proved that matter may be altered but is never destroyed, and until recent times his theory was accepted without question. In experiments with combustion he showed that the combustible substance always combines with oxygen, which he named.

He proved that water is a compound of two elements, hydrogen and oxygen, and paved the way for the scientific grouping of elements and compounds as they are classified today. The generally accepted system of chemical language is described in his *Method of Chemical Nomenclature* (1787). Lavoisier did much for scientific agriculture in France, improved the manufacture of gunpowder, introduced reforms in accounting, taxation and banking and helped to organize the metric system of weights and measures. He became a victim of the French Revolution and was guillotined.

Law, Andrew Bonar (1858–1923), British statesman, born in New Brunswick, Canada. He went to Scotland at the age of 12, entered business and became a successful iron manufacturer at Glasgow. In 1900 he entered Parliament as a Unionist or Conservative and was active in politics thereafter. In 1911 he succeeded Balfour as leader of the Opposition and joined Asquith's War Cabinet in 1916 as secretary of state for the Colonies. He became chancellor of the exchequer under Lloyd George in the crisis of December 1916 and acted as leader of the House of Commons. In 1918 he gave up the exchequer post but remained colonial secretary until March 1921 when he resigned because of bad health. In October 1922 after the end of the War Ministry he became prime minister, but in the following May he resigned. He was buried in Westminster Abbey.

Law, John (1671–1729), a Scottish financier, born in Edinburgh. He is remembered chiefly as the originator of the so-called Mississippi Scheme, or Mississippi Bubble. In 1694 he was sentenced to death for killing a man in a duel but escaped, and for 20 years he roamed about Europe. He could not persuade the Parliament of Scotland to take up his idea of a land bank but he was more successful in France. In 1716 he started a bank in Paris, and this became a national bank in 1718. For a time it flourished, and in 1719 Law founded a company to develop the region along the Mississippi River. Shares were sold to the public. In 1720, after a general orgy of speculation, the crash came, and Law, having just been made controller general of finance, found that he could not meet his obligations. His property was confiscated, and he fled from France to live in England, where he died in poverty.

Lawrence, James (1781–1813), American naval officer who gave the navy a motto with the words, "Don't give up the ship." He was born in Burlington, N.J., entered the naval service in 1793 and fought in the war with Tripoli. He served under Decatur in the expedition that burned the captured *Philadelphia.* Promoted to the rank of captain in 1811, he was voted a gold medal by Congress early in the War of 1812 for capturing the British brig *Peacock.* In June 1813, while commanding the *Chesapeake,* he attacked the frigate *Shannon* off the coast of Boston and received a mortal wound. It was while he was being carried below that he uttered the famous words. He was taken to Halifax with the captured *Chesapeake* and died there.

Lawrence, Sir Thomas (1769–1830), English artist, born in Bristol. In 1792 he succeeded Sir Joshua Reynolds as painter to George III and in 1815 was knighted by George IV. Sir Thomas painted portraits of the royal family and many foreign rulers and celebrities, including Pope Pius VII. His portraits of the delegates to the Congress of Aix-la-Chapelle (1818) hang in Windsor Castle. In the National Gallery, London, are his portraits of Benjamin West, Mrs. Siddons and others. There are several paintings by Lawrence in American private galleries and in the Metropolitan Museum, N.Y.

Lawrence, Thomas Edward (1888–1935), British soldier and explorer, known as "Lawrence of Arabia." He was born in Carnarvonshire, Wales, and educated at Oxford University. Intense interest in Oriental archeology and native languages and customs kept him in Arabia, Syria and Mesopotamia for several years. After the outbreak of the World War he joined the British intelligence service. In 1916 the British government sent him to Arabia, where he organized the Arab tribes for war, led them in battle and was the mainspring of the campaign that destroyed Turkish influence in that region. The Arabs were greatly devoted to him. He wrote an account of his adventures, *The Seven Pillars of Wisdom* (1926); an abridged edition, called *Revolt in the Desert*, appeared in 1927. He disliked publicity, and although he had attained the rank of colonel, he enlisted in the Royal Air Force as a private, under the legally adopted name of Shaw. Lawrence was a man of many and unusual talents. He died in England after having a motorcycle accident.

Leacock, Stephen Butler (1869–), Canadian writer, born in England and taken to Canada as a child. He studied at Toronto and Chicago universities and in 1891 joined the faculty of McGill University, Montreal, as master of modern languages, becoming professor of political economy in 1908. He wrote biographies of Canadian celebrities, books on political science and economy and essays. He is best known for his volumes of short, humorous stories, such as *Literary Lapses, Nonsense Novels, Winsome Winnie, Short Circuits* and *Winnowed Wisdom.*

Lear, Edward (1812–88), English artist and humorist, born in London. He was a successful painter of birds and landscapes but is best known for his books of nonsense verse, including *The Book of Nonsense* and *Nonsense Songs.* He traveled widely and wrote *Illustrated Journals of a Landscape Painter* about his experiences.

Le Brun, Charles (1619–90), French artist, born in Paris. After studying in Rome, where he came under the influence of Poussin, he returned to Paris and from 1642 until his death was the most influential painter and decorator in France. He founded the Royal Academy of the Fine Arts in 1648, designed the fountains and statues of the park at Versailles, superintended the adornment of the palace and became first director of the Gobelin tapestry factory. He produced numerous historical pictures and portraits, including the series in the Paris Louvre based on the life of Alexander the Great.

Lebrun, Marie Anne Élisabeth Vigée (1755–1842), French artist, born in Paris. In 1776 she married the grandnephew of Charles Le Brun. In 1779 she painted a portrait of Marie Antoinette that won the queen's approval, and she soon became the favorite artist of society and the royal family. In 1782 she was admitted to the Academy. Among her well-known portraits are those of Madame de Staël, Lady Hamilton, Lord Byron and several of herself. She painted more than 600 portraits and some 200 landscapes.

Lecky, William Edward Hartpole (1838–1903), Irish historian, born near Dublin and educated at Trinity College, Dublin. He originally planned to go into the Church, but an interest in literature and history led him into a writing career. From the publication of his first book *The Religious Tendencies of the Age* (1860) he was recognized as a writer of remarkable force, originality and learning. The greatest monument to his scholarship is the *History of England in the Eighteenth Century* (8 vols., 1878–90), written after 10 years of research. Other works include *Rise and Influence of the Spirit of Rationalism in Europe, Poems, History of European Morals from Augustus to Charlemagne* and *Democracy and Liberty* (2 vols., 1896).

Lee, Charles (1731–1782), American general, born in England. He accompanied Braddock to America in 1755 and later served in the Portuguese army against Spain. In 1773 he settled in America. Lee supported the patriot cause and in 1775 was appointed major general in the Continental army. He accepted undeserved credit for the brilliant defense of Charleston, S.C., and in 1778 showed indiscretion by disobeying Washington's orders and failing to cross the Hudson, almost causing a severe American defeat. Lee was captured by the British but was exchanged. A court-martial suspended him, and he was later dismissed for writing an impertinent letter to Congress.

Lee, Fitzhugh (1835–1905), American army officer, born in Clermont, Va., nephew of Robert E. Lee. After graduation at West Point in 1856 he served with the cavalry in the war with the Comanche Indians. Later, when he was an instructor at West Point, he resigned to enter the Confederate army and fought throughout the Civil War, reaching the rank of major general. He was governor of Virginia, 1886–90, and was consul general at Havana during a critical period, 1896–98. At the close of the Spanish-American War he served as military governor of Havana, and later, as commander of the department of Missouri, he was made brigadier general in the regular army.

Lee, Francis Lightfoot (1734–97), American patriot, brother of Richard Henry Lee. As a member of the Virginia House of Burgesses (1758–76) he boldly urged resistance to England. He was a member of the Continental Congress (1775–79) and signed the Declaration of Independence. He served in the Virginia senate and later retired to his plantations in Virginia. He supported the Constitution, although his brother was opposed to it.

Lee, Henry (1756–1818), American army general and statesman, the father of Robert E. Lee, *Light Horse Harry* Lee, as he was called, was graduated from Princeton in 1773 and on the outbreak of the Revolution became a cavalry captain. His nickname was given him because of his quickness and energy in scouting and outpost duties. In 1780, at the head of "Lee's Legion," he covered General Greene's retreat through the Carolinas and fought brilliantly in several battles. He held various public offices after the war, including the governorship of Virginia (1792–95). Lee sat in Congress, 1799–1801. He was called upon to give a eulogy of Washington, and delivered the oration that is remembered for the famous phrase, "First in war, first in peace, first in the hearts of his countrymen."

Lee, Richard Henry (1732–94), American patriot, born in Stratford, Va., and educated in England. As a leading member of the Continental Congress he introduced (June 7, 1776) the resolution declaring the colonies independent of Great Britain. This was adopted on July 2. Two days later the Declaration of Independence was adopted, and Lee later signed it. He was elected U.S. Senator from Virginia after the ratification of the Constitution, and in spite of his opposition to the Constitution he supported the new regime. He proposed the Tenth Amendment. Lee retired to private life in 1792 because of failing health.

LEE, ROBERT EDWARD (1807–70), American Confederate general, born in Westmoreland County, Va. At 18 he entered West Point, was graduated second in his class in 1829 and received a commission in the corps of engineers. In the Mexican War he was chief engineer of the central army in Mexico and was severely wounded at the storming of Chapultepec. He was superintendent of the U.S. Military Academy (1852–55) and greatly improved its efficiency. He was in command in Texas in 1860. At the outbreak of the Civil War Lincoln offered him command of the Federal forces, but Lee refused. Resigning from the U.S. Army, he offered his services to Virginia. He soon became military adviser to Jefferson Davis and in 1862 was promoted to command the forces around Richmond. There he won some success, completely turning the tide of war for a time in favor of the South.

In 1863 he won a great victory at Chancellorsville, and, although defeated at Gettysburg, he managed to hold his own against superior forces. In February 1865 Lee was put in command of all the southern forces, but by then they were too weak to make an impression on the strengthened Northerners. On April 9, 1865, Lee surrendered his army to General Grant at Appomattox Court House, Va., and the war was practically ended. After the war ended, he frankly accepted the result and, although he had lost all his property, he refused offers of money and accepted the presidency of what came to be called Washington and Lee University, at Lexington, Va., where he remained until his death. Many military critics regard Lee as the greatest military leader of the 19th century.

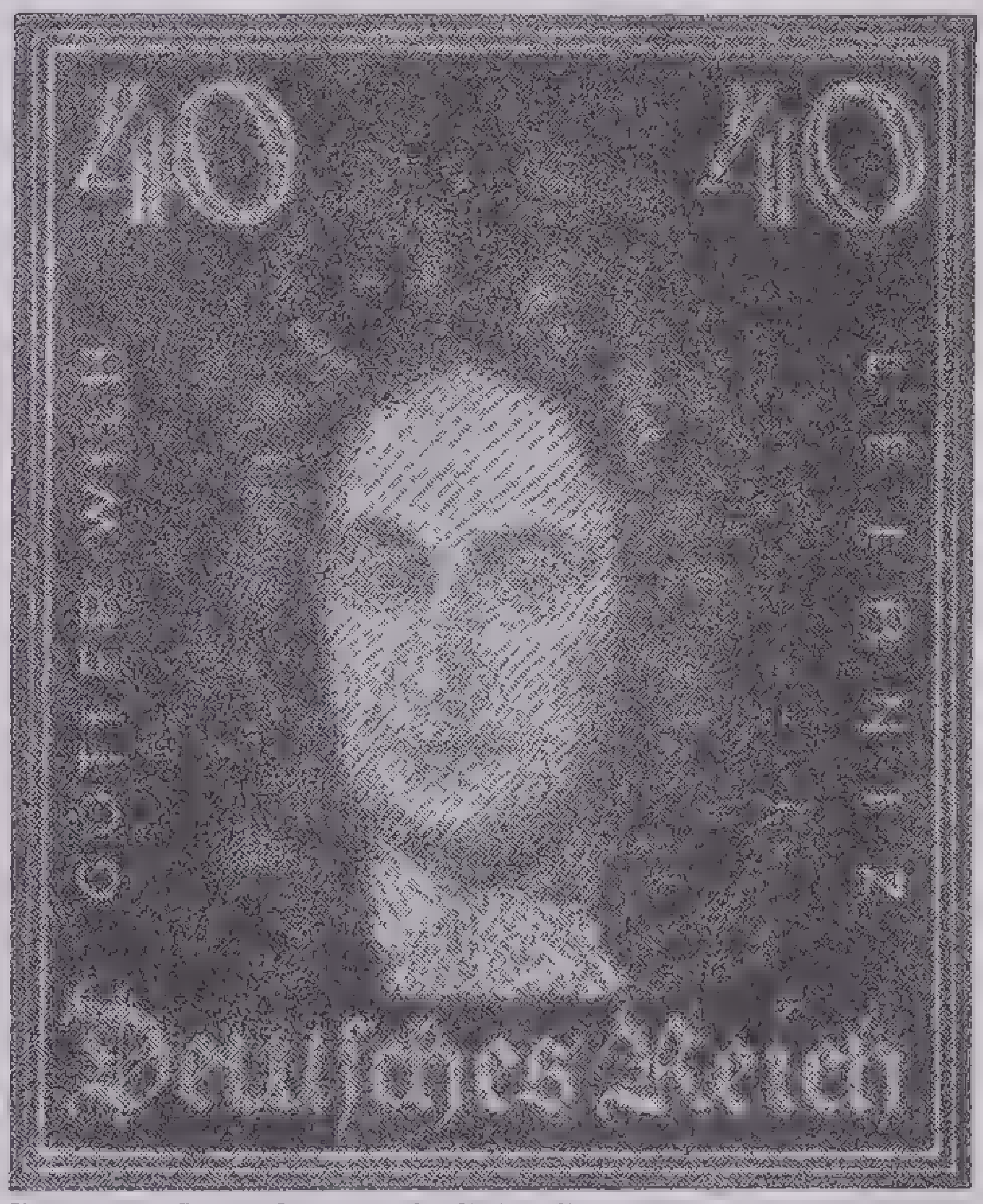
Leeuwenhoek, van, Anton (1632–1723), Dutch microscopist, born in Delft. As a youth he used lenses in examining cloth in a factory in Amsterdam. In later years he assembled microscopes of great strength, some of them magnifying objects 270 times. He examined red blood cells and gave the first complete description of blood. He studied the anatomy of many insects and investigated the principle of male and female reproduction. The Royal Society of England honored him for being the first to see bacteria (1677).

Le Gallienne, Eva (1899–), American actress and dramatic director born in London, daughter of Richard Le Gallienne, the poet. She was educated in Paris, went on the English stage in 1915 and toured America the next year. In 1926 she opened the New York Civic Repertory Theater, of which she was founder, director and one of the principal players. She wrote an autobiography called *At 33.*

Le Gallienne, Richard (1866–), English poet and critic, born in Liverpool. He was in business in England, spent many years in the United States and finally settled in London to write. His books of verse include *My Lady's Sonnets, The Lonely Dancer* and *The Junk Man and Other Poems.* He wrote many essays, a book of of literary reminiscences called *The Romantic '90s* and edited two anthologies: *The Le Gallienne Book of English Verse* and *Anthology of American Verse.* He was the father of Eva Le Gallienne, American actress.

LEIBNITZ, VON, GOTTFRIED WILHELM (1646–1716), German scholar, born in Leipzig. He studied law at Leipzig University. Though he was ready for his degree at the age of 20, the university authorities considered him too young for the honor, and he received his LL.D. at Altdorf (1666). He wrote several legal and theological treatises that showed his remarkable scholarship, and in 1670 he entered the diplomatic service of the state of Mainz. In 1676 he was made librarian and privy councilor to the duke of Brunswick, at whose request he began a history of the House of Brunswick. For the rest of his life, Leibnitz lived chiefly in Hanover, but he visited Paris, London and other centers of learning at various times, and he was on intimate terms with some of the best minds of the period.

He persuaded Frederick I, King of Prussia, to found the Academy of Sciences of Berlin in 1700, and Leibnitz became its first president. He won distinction in many fields—history, theology, political science, engineering and general literature—but his best work was done as a philosopher. He developed a theory in which substance consists of atoms or monads, each self-contained and individual, the whole forming a perfect harmony with God, its center and creator. In mathematics Leibnitz shares honors with Newton for the development of the differential and integral calculus.



Courtesy Scott Stamp & Coin Company

Gottfried Wilhelm von Leibnitz

Enlarged from a German postage stamp, one of a series issued in 1926 honoring German national heroes

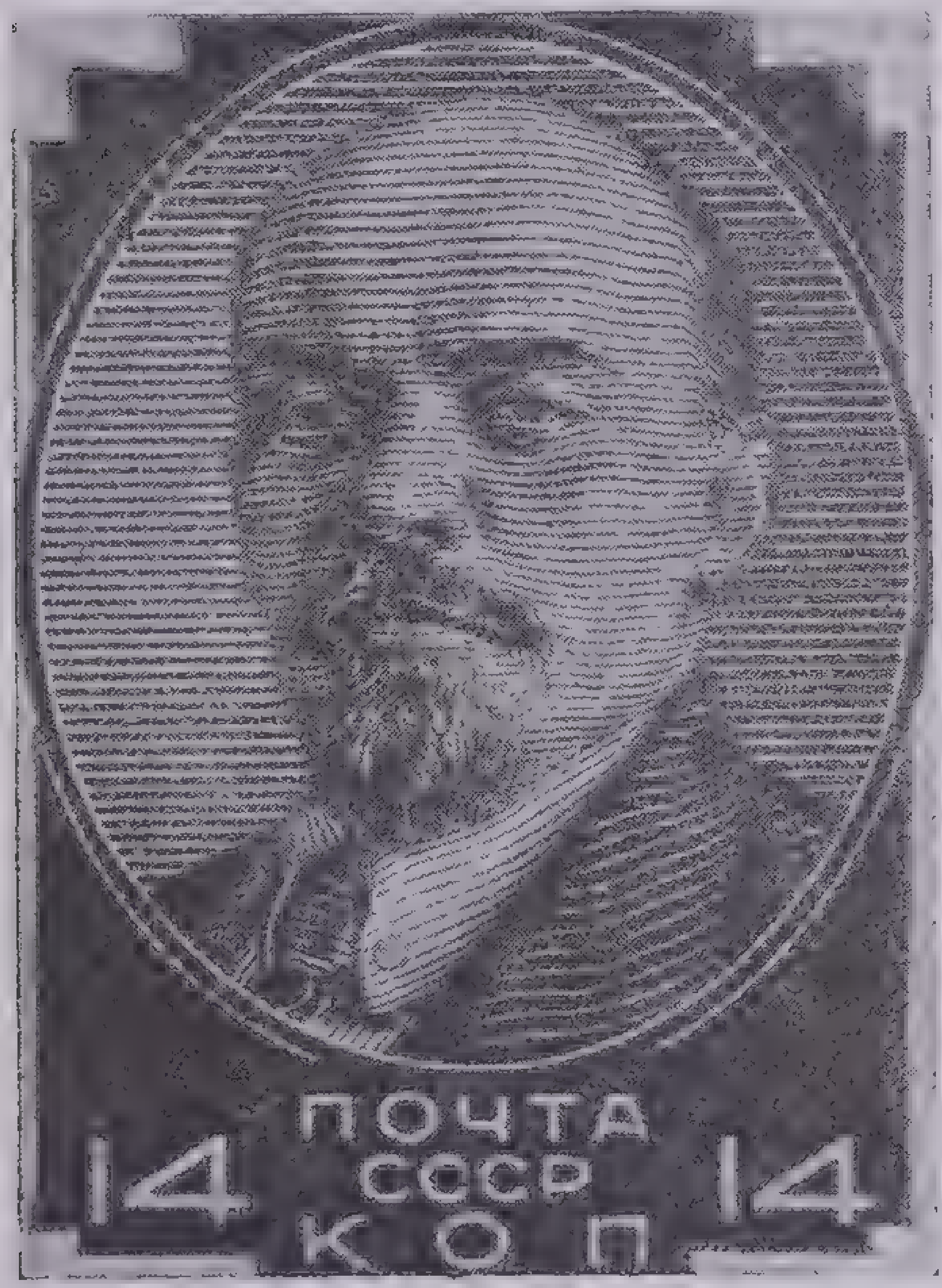
Leicester, Robert Dudley, Earl of (*c.* 1532–88), English courtier. In 1553 he was imprisoned in the Tower of London for sharing in the plot to place Lady Jane Grey on the throne, narrowly escaping the fate of his father, the duke of Northumberland, who was beheaded. After Elizabeth came to the throne, he enjoyed many favors and was the queen's avowed suitor. She created him earl of Leicester. His first wife, Amy Robsart, died from a fall in 1560, and it was rumored that he had a share in her death. The story is elaborated in Sir Walter Scott's *Kenilworth.* In 1573 he married Lady Shenfield, and in 1578 he bigamously married Lettice, Countess of Essex, but continued to pay his addresses to Elizabeth, whose favorite he remained until his death.

Leland, Charles Godfrey (1824–1903), American author, born in Philadelphia, educated at Princeton College and in England. He was admitted to the bar in Philadelphia in 1851 but continued the journalistic work begun in college days. Eventually he abandoned law for a literary career. As a humorist he is best known for the series of stories about Hans Breitmann, told in the Pennsylvania German Vernacular. His chief contributions to literature are his books about gypsies and their folklore. These include *The English Gypsies and Their Language* and *The Gypsies.*

Lely, Sir Peter (Pieter van der Faes; 1618–80), Dutch-English painter, born in Westphalia. He went to England with William of Orange in 1641 and was soon famous for his portraits of important people. He was made court painter and was knighted by Charles II. His well-drawn pictures are now historically valuable. He painted Oliver Cromwell, Charles I and Neil Gwynn. Two of his historical subjects are *Susannah and the Elders* and *Rape of Europa.*

L'Enfant, Pierre Charles (1754–1825), French army engineer and architect, born in Paris. He served with the French army but became filled with enthusiasm for the cause of the Americans in the Revolutionary War. He came to America and joined the Continental army, in which he rose to the rank of major and was highly regarded by Washington. When Congress decided to build a Federal city, L'Enfant drew up the plans for it (1791). They called for wide avenues and large tracts set aside for parks and gardens. He was appointed to carry out the work, but his disposition was such that nobody could work with him, and finally others built the city according to his plans.

Lenin, Nikolay (Vladimir Ilich Ulianov; 1870–1924), Bolshevist leader, born in Simbirsk on the Volga, the son of a government school official. He studied law at the universities of Kazan and St. Petersburg (Leningrad) and was admitted to the bar in 1891, but his dominant interest was in revolutionary politics. A brother had been executed in 1887 for conspiring against Czar Alexander III, and Lenin himself was for a time exiled in Siberia (1895–1900). He continued his radical activities in Russia and abroad and during the revolution of 1905 was editor of the first socialist daily openly published in St. Petersburg. The World War gave Lenin his great opportunity. He was in Switzerland when the revolution of 1917 overturned the imperial government. Through the aid of the German secret service he was permitted to go to Russia through Germany and within a few months had triumphed over Kerenski and his associates, who could not counteract the propaganda of the Bolsheviks. In November Lenin set himself up as the president of the council of the people's commissars. He shaped the subsequent course of the revolution and set up the Soviet Union and the system known as Bolshevism. As a revolutionary strategist Lenin has been honored among radicals.



Courtesy Scott Stamp & Coin Company

Nicolay Lenin

From a Russian postage stamp issued 1929–31

Leo I, Saint (*c.* 390–461), called *the Great,* Pope from 440 to 461, born in Tuscany. Leo upheld papal authority over the Church, the universal character of which he strongly emphasized. He also suppressed nonorthodox theories. In 452, when Attila the Hun invaded Italy, Leo persuaded him not to sack Rome. He was also instrumental in saving the city from destruction by the Vandal hordes of Genseric (455).

Leo X (1475–1521), Pope (1513–21), son of Lorenzo the Magnificent, born in Florence and created cardinal by Pope Innocent VIII when only 13. Six years later he was expelled from Florence with the other members of the Medici family and spent some time in travel. In 1513 he became successor to Pope Julius II. Leo's pontificate was remarkable for his patronage of art and learning. He encouraged Raphael and other artists of the Renaissance and welcomed to his court the finest scholars of the time. Abuses connected with raising funds to rebuild St. Peter's led to the reform movement under Luther, who was excommunicated by Leo in 1520. The Pope was drawn into the controversy between Francis I of France and Charles V, Holy Roman Emperor. In 1516 he concluded a concordat with Francis but later gave his support to Charles V.

Leo XIII (1810–1903), Pope (1878–1903), born in Carpineto, Italy, and baptized Gioacchino Pecci. He studied for the priesthood, was ordained and became a domestic prelate under Gregory XVI (1837). In 1853 Pope Pius IX made him a cardinal as reward for his years of service as archbishop of Damietta and of Perugia. Upon the death of Pius IX he was elected Pope (1878) and entered upon one of the longest papal reigns in history. Leo XIII restored the hierarchy to Scotland, began one in India, settled religious difficulties in Germany and maintained friendly relations with France. He regarded himself as a prisoner in the Vatican, refusing to recognize the Italian government in Rome. Leo issued statements on capital and labor, Christian marriage, freemasonry and other controversial subjects. In 1883 he opened the Vatican archives to scholars interested in historical research. A man of scholarly tastes Leo wrote Latin prose and poetry of high merit.

Leonardo da Vinci, see *Vinci, Leonardo da.*

Leonidas (d. 480 B.C.), King of Sparta. He succeeded his half brother Cleomeneo I about 490 B.C. In 480 B.C., when a great army of Persians under Xerxes threatened Greece, Leonidas went to the mountain pass of Thermopylae to hold back the invaders. For two days his 300 Spartans and 5,000 Thespians and Thebans successfully opposed the invading horde, but on the evening of the second day Ephialtes, a traitor, told the enemy of a secret path at the rear. The next morning Leonidas sent his auxiliary forces home, and he and his little band of Spartans met the onslaught of the invaders alone, each man fighting till death.

Leopold II (1835–1909), King of the Belgians, eldest son of Leopold I, whom he succeeded in 1865. His reign was notable for the development of Belgian interests in Africa. In 1876 he organized the International African Association and a year later financed Stanley's exploration of the Congo. In 1885 the Berlin Conference placed the Congo Free State under the personal sovereignty of Leopold. A system of forced labor and ruthless exploitation of the rubber and ivory industries caused an international scandal, Leopold being held responsible for the virtual enslavement of the natives. In 1908 the Congo Free State was turned over to the Belgian government. He was succeeded in 1909 by his nephew Albert I.

Leopold III (1901–), King of the Belgians, succeeded his father Albert I in 1934. When the World War broke out, he was studying in England but returned home to enter the army and saw much service. His father was careful to train him for his coming duties as king, and Leopold traveled widely. He became an extremely popular monarch.

Lepidus, Marcus Aemilius (d. *c.* 13 B.C.), Roman politician prominent in the latter days of the republic. He was virtual dictator of Rome while Caesar was absent in Spain in 49–48 B.C. and was associated with him as consul in 46 B.C. After Caesar's assassination Lepidus joined Antony and Octavian (Augustus) in the Second Triumvirate and was given Gaul and Spain as his share of the Roman world (43 B.C.). After the triumvirs defeated Brutus and Cassius at Philippi in 42 B.C., they renewed their agreement, and Lepidus was given Africa as his province. Because he felt neglected by his colleagues, he attempted to take Sicily by force. By 36 B.C. he had lost his army, his province and his place in the triumvirate, and he had retired to obscurity.

Le Sage, Alain René (1668–1747), French novelist and dramatist, born in Brittany. He studied law in Paris but received a pension on which he could live, so he decided to write. His masterpiece, the novel *Gil Blas,* appeared in four parts between 1715 and 1735. It is the story of the adventures of a picturesque rogue, Gil Blas, written in a realistic style that inspired many other authors. Le Sage's other works include the comedy *Turcaret* and the novel *The Devil on Two Sticks.*

Lesseps, de, Ferdinand, Viscount (1805–94), French engineer, born in Versailles. He entered the consular service in 1825 and while on a visit to Egypt in 1832 was impressed by the need of a canal across the Isthmus of Suez. Twenty-two years later Said Pasha, viceroy, granted him a concession to build such a waterway, but work was not begun until 1859. Lesseps was made president of the construction company, which completed the Suez Canal in 1869. Ten years later he was asked to accept the presidency of a French company formed to construct a canal across the Isthmus of Panama. This project was abandoned in 1888 after the company became bankrupt. Lesseps was financially ruined, discredited, tried and sentenced to imprisonment.

Lessing, Gotthold Ephraim (1729–81), German author and critic, born in Kamenz, Saxony. He studied theology at the University of Leipzig but was much more interested in philosophy and the drama. In 1748 he settled in Berlin as a translator, literary critic and author of verse and plays. Here Lessing associated with Voltaire, Moses Mendelssohn and other literary figures. In 1755 he published a collection of his writings, including the drama *Miss Sara Sampson,* the first German tragedy dealing with the common people.

He is best known for his *Letters on Literature,* which appeared from 1758 to 1765. Other important works are *Laokoon,* a treatise on poetry and painting; *Minna von Barnhelm, Emilia Galotti* and *Nathan the Wise.*

Leucippus (5th century B.C.), Greek philosopher, said to be a native of Miletus. Very little is known of him; in fact his very existence is denied by Epicurus, but there are proofs that he studied under Zeno and founded a school at Abdera. Leucippus is regarded by Aristotle as being the founder of the atomic theory in association with Democritus.

Leutze, Emanuel (1816–68), German-American painter, born in Württemberg. His parents moved to Philadelphia, and he studied art locally and in Europe. He lived in Düsseldorf from 1845 to 1859, then returned to the United States. Leutze is best known for the popular *Washington Crossing the Delaware,* a copy of which may be seen in the Metropolitan Museum, N.Y. Another outstanding work is the fresco in the Capitol at Washington, *Westward the Star of Empire Takes Its Way.* Other paintings include *Columbus in Chains, Washington at Monmouth* and *Cromwell's Visit to Milton.*

Lever, Charles James (1806–72), Irish novelist, born in Dublin and educated at Trinity College. He later took a course in medicine at Göttingen, Germany, and received his medical degree at Trinity (1831). His first novel *The Confessions of Harry Lorrequer* was printed serially in *Dublin University Magazine* in 1837. Among 30 others may be mentioned *Charles O'Malley, Jack Hinton, Tom Burke of Ours* and *The Dodd Family Abroad.* Lever was at his best in descriptions of Irish characters.

Leverrier, Urbain Jean Joseph (1811–77), French astronomer, born at St. Lô. He studied the motions of the planet Uranus and concluded that there must be another planet farther out in space. This resulted in discovery of the planet Neptune. The English astronomer, J. C. Adams, had come to the same conclusion a little earlier but had not announced his findings. Both men shared the honor, however. In 1854 Leverrier became director of the Paris Observatory. He wrote several valuable records of his observations.

Lewes, George Henry (1817–78), English author, born in London. His knowledge of the literature and philosophy of Germany was reflected in his writings. He left medicine for literature and in 1863 founded the *Fortnightly Review,* which he edited for 15 years. His best-known book is his *Life of Goethe.* He also composed fiction, tragedies and comedies. His long association with George Eliot (Marian Evans) had much influence on her writings.

Lewis, Isaac Newton (1858–1931), American army officer, born at New Salem, Pa. He was graduated at West Point in 1884 and commissioned second lieutenant of artillery. In 1913 he retired with the grade of colonel because of physical disability. Lewis made a special study of the manufacture and supply of ordnance materials and originated the American plan of artillery organization. In 1911 he invented the Lewis machine gun. For several years it did not interest the United States, but England, France and Belgium used it with great success during the World War.

Lewis, John Llewellyn (1880–), American labor leader, born at Lucas, Iowa, and educated in the public schools. He worked in coal mines until he became an executive in the affairs of the United Mine Workers of America. He became president of that union in 1920. During the World War he was a member of the government committee that supervised coal production. In 1933 he was an adviser on labor problems to the NRA administration.

Lewis became a national figure after the American Federation of Labor convention in the fall of 1935. The Federation was organized around the skilled trades, and Lewis suggested that the mass-production industries be organized as units—"vertical unionism." He was blocked by William Green, President of the Federation. Lewis withdrew his union from the Federation and set about forming a rival organization called the *Committee for Industrial Organization.* It grew rapidly; its membership included not only the unions that seceded from the Federation but also a great many workers previously not unionized. Strikes were called in the motor, steel and shipping industries, among others, and the C.I.O. won notable victories, especially the unionization of the United States Steel Corporation in 1936.

Lewis, Meriwether (1774–1809), American explorer, born near Charlottesville, Va., leader of the expedition that charted the Louisiana country during Jefferson's administration. In 1803, when President Jefferson decided to send an expedition into the West, he gave the leadership to Lewis, then his private secretary. Lewis chose his friend Captain William Clark as associate leader, and the exploring party was gone until 1806. For his services Lewis received from Congress a tract of 1,500 acres. In 1807 Jefferson appointed him governor of Louisiana Territory. Lewis was mysteriously killed in 1809 while he was going to Washington with records of the expedition.

Lewis, Sinclair (1885–), American novelist, born in Sauk Center, Minn. He was graduated from Yale in 1907 and began his career as a reporter, working on newspapers in New Haven, Conn., and San Francisco. He acted as editor of *Transatlantic Tales, Volta Review* and *Adventure* and for New York book companies. In 1914 with the publication of *Our Mr. Wren* he became known as a novelist. His first outstanding success was *Main Street* (1920), a study of the typical small town of the Middle West. Then followed *Babbitt, Arrowsmith, Mantrap* (a romance), *Elmer Gantry, The Man Who Knew Coolidge, Dodsworth, Ann Vickers, Work of Art, It Can't Happen Here* and *Prodigal Parents.* Lewis won the Nobel Prize for literature in 1930, being the first American to receive this award. Several of his novels have been dramatized on stage and screen.

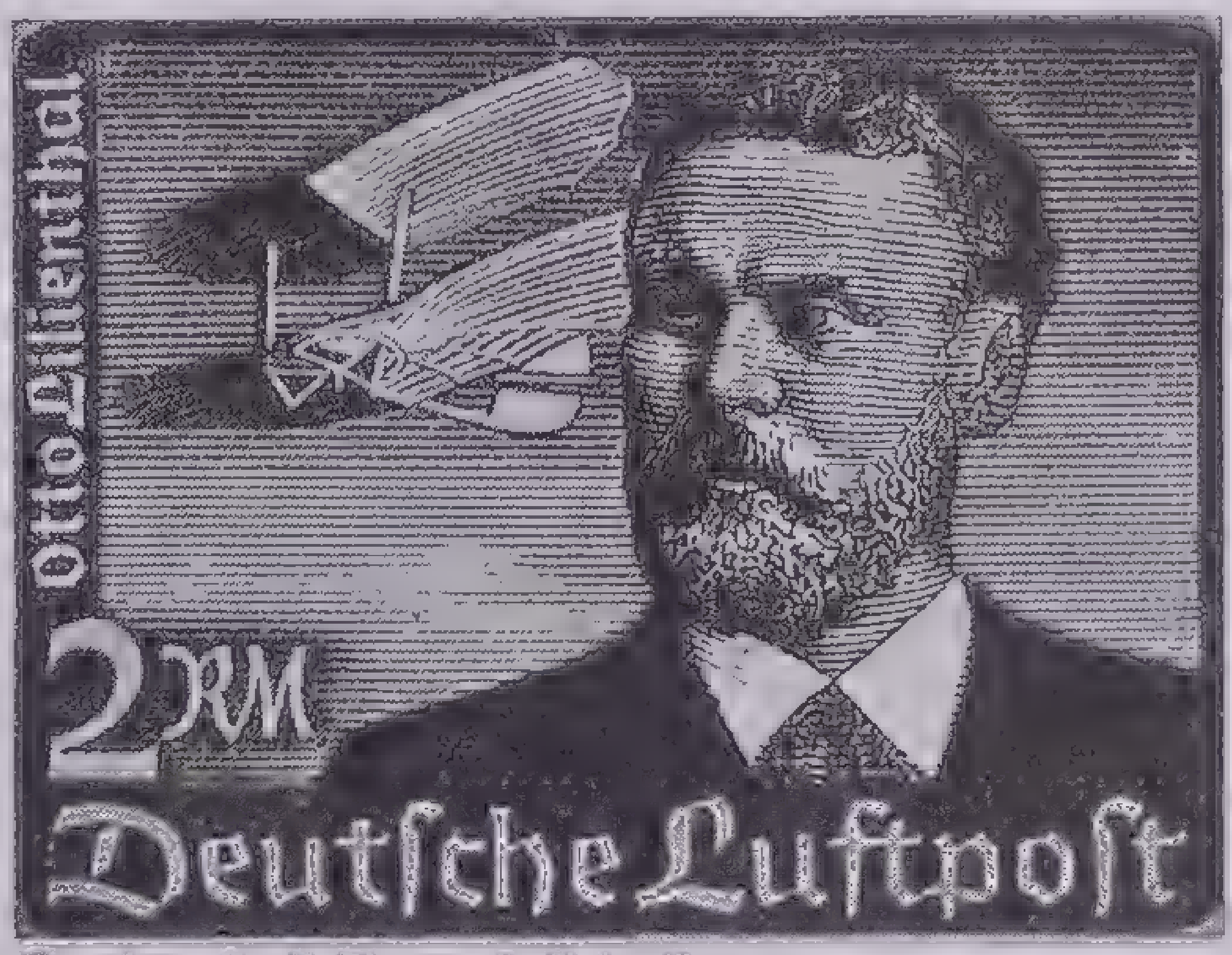
Liebig, von, Justus, Baron (1803–73), German chemist, born in Darmstadt, where he became an apprentice to an apothecary when 15 years of age. In 1822 he received his doctor's degree at Erlangen. A year later, in Paris, Liebig published a paper on fulminates, which led to his appointment as professor of chemistry at the University of Giessen when he was only 21. He remained there for 28 years. From 1852 until his death he was professor of chemistry at Munich. Perhaps the leading chemist of his day, he is remembered as one of the founders of organic chemistry. He discovered and studied numerous carbon compounds, including chloral and chloroform, and explained the fundamental principles of the combustion of food. His studies of plant food made him one of the founders of modern agricultural chemistry.

Liebknecht, Wilhelm Philipp Martin (1826–1900), German Socialist leader, born at Giessen. He was educated locally and at Berlin and Marburg. He acquired radical views in his student days. He was in Paris when the German revolution broke out in 1848, and he led some volunteers to Baden in a vain attempt to establish a republic. Leibknecht then fled to London, where he came under the influence of Karl Marx. He wrote for several German newspapers and with the amnesty of 1861 returned to his native land to become editor of a newspaper. He was banished from Prussia in 1865 for his bitter opposition to Bismarck, and in 1872 he and Bebel were imprisoned for 2 years for libeling the Chancellor. While in jail he was elected to the Reichstag. He became editor of *Vorwärts,* and in 1895 his written attack on the monarchy caused his arrest and imprisonment.

Liggett, Hunter (1857–1935), American army officer, born at Reading, Pa. After his graduation from West Point in 1879 he fought against the Indians, and during the Spanish-American War he served in the Philippines as major of volunteers. He became director and later president of the War College, from which he was graduated in 1910. In the World War, as commander of an army division, he took active part in the second battle of the Marne, in the engagements at St. Mihiel and in the Argonne. After the Armistice he commanded the third Army of Occupation on the Rhine and in 1921 retired with the rank of major general.

Li Hung Chang (1823–1901), Chinese statesman, born in Luchow, a student at Hanlin College. In 1853, in the Taiping rebellion, he joined the imperial army as secretary. In 1864 he was appointed governor general of the Kiang provinces and in 1872 of Chih-li and was later made senior grand secretary. He founded the Chinese navy and promoted a native mercantile marine. On the outbreak of the war with Japan in 1894, Li, in supreme command of the military and naval forces in Korea, was thwarted by the incompetence, dishonesty and cowardice of inferior officers. The Chinese forces were swept out of Korea, and Li, whose policy was that of peace, was deprived of his honors and summoned to Pekin. He refused to obey, and the emperor soon restored him to his place. Through his efforts the war was brought to a termination in 1895, China ceding Formosa and paying a war indemnity of 175 million dollars. Professedly friendly to foreigners and well aware of the value of western culture and industry, he visited Russia, Germany, France, England and America in 1896.

Lilienthal, Otto (1848–96), German engineer and aeronaut, born at Auklam and educated at the trade school in Berlin. He established his own factory (1880) in which he manufactured several articles of his own invention. He became interested in aeronautics, made a close observation of the flight of birds and succeeded in constructing a plane in which gliding flight could be maintained. Lilienthal was the first to demonstrate the superiority of arched over flat surfaces in flying. He made over 2,000 glides, but in one of his experiments he was killed. He wrote *Birdflight as the Basis of Aviation* in 1889.



Courtesy Scott Stamp & Coin Company

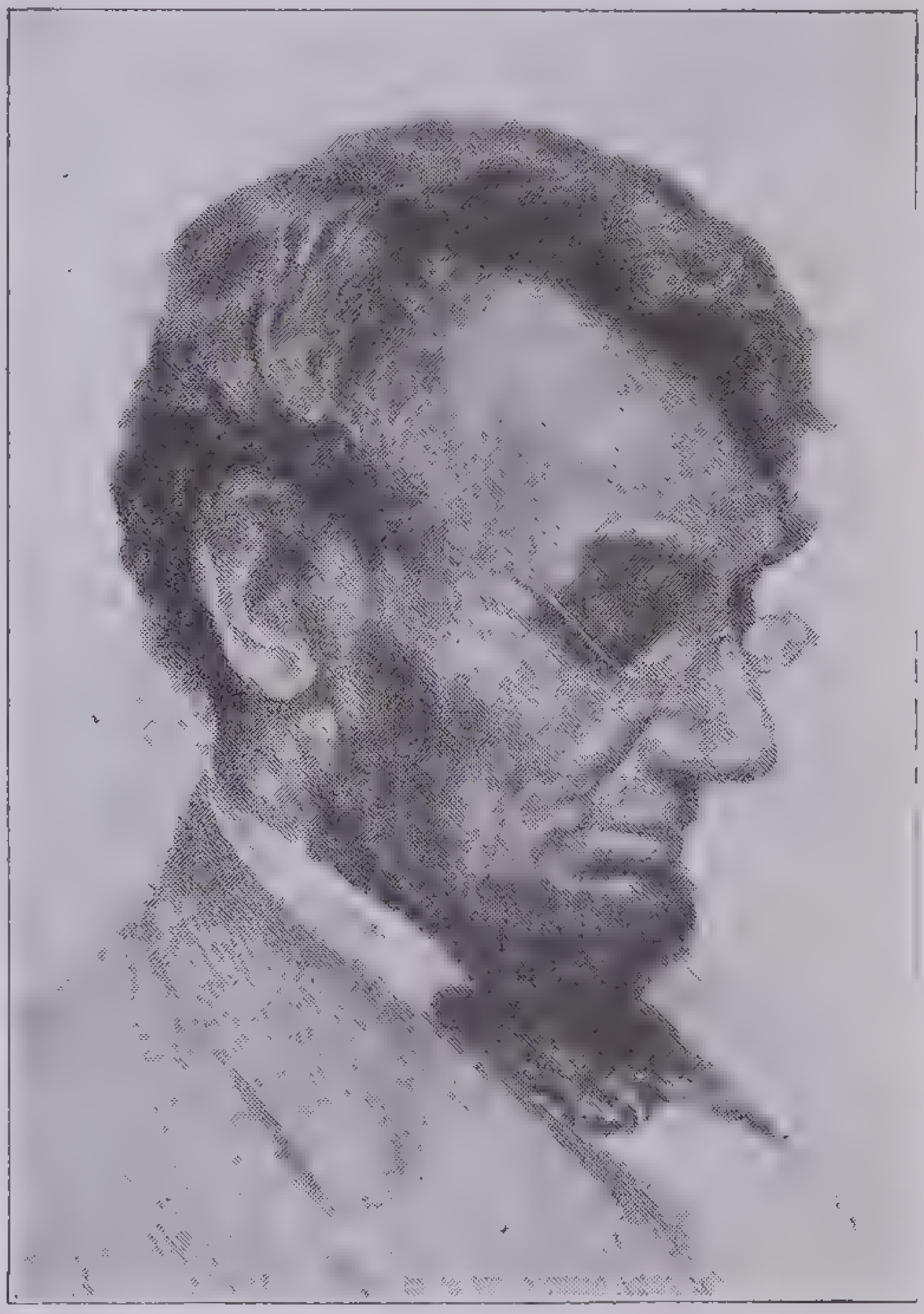
Otto Lilienthal

Enlarged from a German air-mail stamp issued in 1934 honoring the German aviation pioneer

Liliuokalani, Lydia Kamekeha (1838–1917), last Queen of the Hawaiian Islands. She succeeded her brother Kalakana in 1891 but was deposed in 1893 because she attempted to introduce reactionary measures and to rule without the Constitution. A republic was established in 1894, but the plan to annex Hawaii to the United States failed at that time through President Cleveland's opposition. After annexation in 1898 the deposed queen retired to her estate but made several efforts to regain her throne. Congress granted her a pension of about $40,000 a year.

LINCOLN, ABRAHAM (1809–65), 16th President of the United States, born on a farm in Hardin (now Larue) County, Ky. He moved with his family in 1816 to Spencer County, Ind.; for the next 10 years did manual labor of various kinds and was able to get only about a year's schooling. Twice he left farming to work on cargo boats that sailed down to New Orleans. He became a clerk at New Salem, Ill., joined a campaign against the Black Hawk Indians in 1832 and served for 3 months as captain of a volunteer company. Then he opened a country store, was appointed postmaster of New Salem, began to study law and at the same time turned amateur land surveyor. In 1834 he was elected to the Illinois legislature and was three times re-elected to 2-year terms. In 1836 he was licensed to practice law.

In 1846 he went to Congress as a representative from Illinois and there voted steadily with the antislavery party. The Republican party was formed to prevent any extension of the slave-holding area. Lincoln soon became its leader in Illinois and continued a series of debates on slavery with Stephen A. Douglas, who defeated him in the campaign for U.S. Senator from Illinois in 1858. In the Republican national convention held in Chicago in May 1860 Lincoln was nominated for the Presidency. The southern states, alarmed at the aggressive antislavery policy declared by many of the leading Republicans, began one after another to secede from the Union and to form armies to resist the Federal Government.



From a dry point by O. S. Schneider

Abraham Lincoln

Lincoln was elected in November 1860, and he took office on the 4th of March, 1861. It was his intention to conciliate the southern states if possible, but he was determined to preserve the Union even if he could not free the slaves. The Southern Confederacy had been formed on the 4th of February, and on the 14th of April the first blow in the Civil War was struck when the Confederates captured Fort Sumter. Lincoln's persistence in raising and pouring in fresh troops after every disaster finally enabled the Federal Government to win. He himself took a large part in directing the campaigns.

In 1863 he announced the emancipation of the slaves. In 1864 he was re-elected. Grant's victory over Lee on April 2, 1865 was followed by Lee's surrender, and peace was in sight. On April 14th President Lincoln was shot in Ford's Theater, Washington, by John Wilkes Booth, and he died on the following day. In the affections of America Lincoln holds a place second only to Washington.

In 1842 Lincoln married Mary Todd. Only one (Robert Todd Lincoln) of his four sons survived him. The best known of Lincoln's speeches and writings are the Gettysburg Address and the letter to Mrs. Bixby following the death of her sons in battle.

Lincoln, Joseph Crosby (1870–), American novelist, born in Brewster, Mass., of a seafaring family. He began his career as a commercial artist and later went into editorial work. He is known for his cheerful novels of Cape Cod people, the first of which was published in 1904. Among them are *Cap'n Dan's Daughter, Quahaug, Galusha the*

Magnificent, Queer Judson, Doctor Nye, Silas Bradford's Boy and *Storm Girl. Blair's Attic* was written in collaboration with his son Freeman in 1929.

Lincoln, Robert Todd (1843–1926), American lawyer and diplomat, the eldest son of Abraham Lincoln, born in Springfield, Ill. He graduated from Harvard University in 1864 and became a captain on the staff of General Grant. After the Civil War he entered Harvard Law School and was admitted to the bar in 1867. He practiced in Chicago until 1881, when Garfield appointed him secretary of war. Lincoln served as minister to Great Britain (1889–93) and then accepted the position of counsel for the Pullman Company, becoming its president 4 years later; in 1911 he was made chairman of the board of directors.

Lind, Jenny (1820–87), Swedish soprano, born in Stockholm. She studied in Paris (1838–41). In 1847 she appeared for the first time in London and later made her home in England where, known as "the Swedish nightingale," she was very popular. Jenny Lind retired from the operatic stage in 1849 but was a concert favorite for many years. She made her first visit to the United States in 1850 under the management of P. T. Barnum and was a tremendous success. She died at Malvern, England.

Lindbergh, Charles Augustus (1902–), American aviator, born in Detroit, Mich., the son of Congressman Charles A. Lindbergh. Taken to Little Falls, Minn., in childhood, he was graduated from the local high school in 1918. In 1920 he entered the University of Wisconsin as a student in mechanical engineering but left in 1922 to enroll in a flying school at Lincoln, Neb. In 1924 he entered the United States Air Service Reserve at Brooks Field, San Antonio, Tex. Having reached the grade of captain, Lindbergh joined the air-mail service in 1926, making his first trip between Chicago and St. Louis on April 15, When he heard of the Orteig prize of $25,000 for the first nonstop flight from New York to Paris, he ordered a specially designed monoplane to be built in San Diego, Calif. He received financial backing from several residents of St. Louis and named his plane the *Spirit of St. Louis*. In this plane he took off from San Diego on May 11, 1927, reaching Curtiss Field, Long Island, in record time—21 hours 20 minutes.

He took off from Roosevelt Field, Long Island, on May 20, at 7:50 A.M. and landed at Le Bourget Field, Paris, 33½ hours later. This was the first nonstop flight between New York and Paris and the first solo flight across the Atlantic Ocean. On his return to America he was officially welcomed by President Coolidge, from whom he received the Distinguished Flying Cross and a commission as colonel in the Army Reserve Corps.

Then followed a flying tour to 75 cities of the United States under the auspices of the Daniel Guggenheim Foundation for the Promotion of Aeronautics. Upon the invitation of President Calles of Mexico, Lindbergh flew from Washington to Mexico City. There he met Anne Morrow, daughter of the United States ambassador; the two were married in May 1929. After completing a "good will" flight over Mexico, Central America and the West Indies and helping to inaugurate air-mail service with these regions and South America, Lindbergh became an executive with a commercial aviation company. He continued his private flights, and in 1931 he and Mrs. Lindbergh, who herself had become a skilled pilot, flew to Japan by way of Alaska and Siberia. In 1933 they visited 21 countries in a 30,000-mile trip.

The kidnaping of their son Charles Augustus, Jr. led to the famous Hauptmann case. Bruno Hauptmann was convicted of the crime and executed in 1936.

The story of the Paris flight is told in his book *We*, published in 1927. For his good-will flight, he received the Woodrow Wilson medal and a $25,000 award in 1928. Later he became interested in biological research and invented several laboratory instruments.

Lindsay, [Nicholas] Vachel (1879–1931), American poet, born in Springfield, Ill., and was educated at Hiram College (Ohio), Chicago Art Institute and New York School of Art. In 1912 he walked from Illinois to New Mexico distributing verse and lecturing, a modern wandering minstrel, trying to arouse a response to beauty among the people. His published poetry collections, in which his chants are outstanding, include *The Chinese Nightingale, The Congo and Other Poems, Every Soul Is a Circus* and *Collected Poems.*

Lindsey, Benjamin Barr (1869–), American jurist, born in Jackson, Tenn. Admitted to the bar in 1894, he was appointed public guardian and administrator in Denver under the Colorado Juvenile Court Law of 1899 and served as judge of the juvenile court from 1900 to 1927. After 1927 he interested himself in an attempt at solution of marriage problems, arousing wide discussion and much criticism for his advocacy of companionate marriage. His writings include *The Beast and the Jungle, The Revolt of Modern Youth, The Companionate Marriage* and other books. He won an international reputation as a pioneer of the juvenile-court system.

LINNAEUS, CAROLUS (Karl von Linnê; 1707–78), Swedish naturalist, born in Rashult. He was the greatest botanist of his day and one of the founders of modern botany. He went to Vexiö for preparatory and college training and studied botany and medicine for a year at Lund. In 1728 he entered the University of Upsala, later studied in Holland and received his degree in medicine at the University of Harderwijk in 1735. For a few years he practiced medicine in Stockholm, and in 1741 he was appointed professor of medicine at Upsala. A year later he began to teach botany there.

When Linnaeus began the study of botany the method of classifying plants was so confused as to be almost worthless. He introduced a system based on the number of stamens and pistils that was the starting point of the orderly grouping in use today. He is also honored as the father of the two-name method of naming plants and for his simplification of descriptions of plants. Among the more important of his many books are *Systema Naturae, Fundamenta Botanica, Genera Plantarum, Philosophia Botanica* and *Species Plantarum.*

Lippi, Filippino (*c.* 1457–1504), Florentine painter, born in Prato. Son of Fra Filippo Lippi. He was taught by his father and later by Botticelli. At the age of 23 he was commissioned to finish the frescoes begun by Masaccio in the Brancacci Chapel, Florence. These and various other early works show his father's influence, but in later years he developed a taste for exaggerated poses and extreme decoration rather in the baroque style. Examples in this manner include his frescoes for the Strozzi Chapel, Florence.

Lippi, Filippo, Fra (*c.* 1406–69), Florentine painter. He was raised in the Carmelite convent at Florence. In 1456 he became chaplain of the nunnery of Santa Margherita at Prato. According to the biographer Vasari, he fell in love with a beautiful nun whom he abducted to his house in the town. The two were permitted to marry after being released from their vows, and she became the mother of his son. Filippo Lippi's paintings are noted for an exquisite blending of realism and spiritual beauty. Examples of his Madonnas may be seen in the Florentine Academy, the Louvre, the Pitti and Uffizi palaces and in Berlin and Munich museums. His frescoes from the lives of John the Baptist and St. Stephen in the cathedral at Prato are also famous.

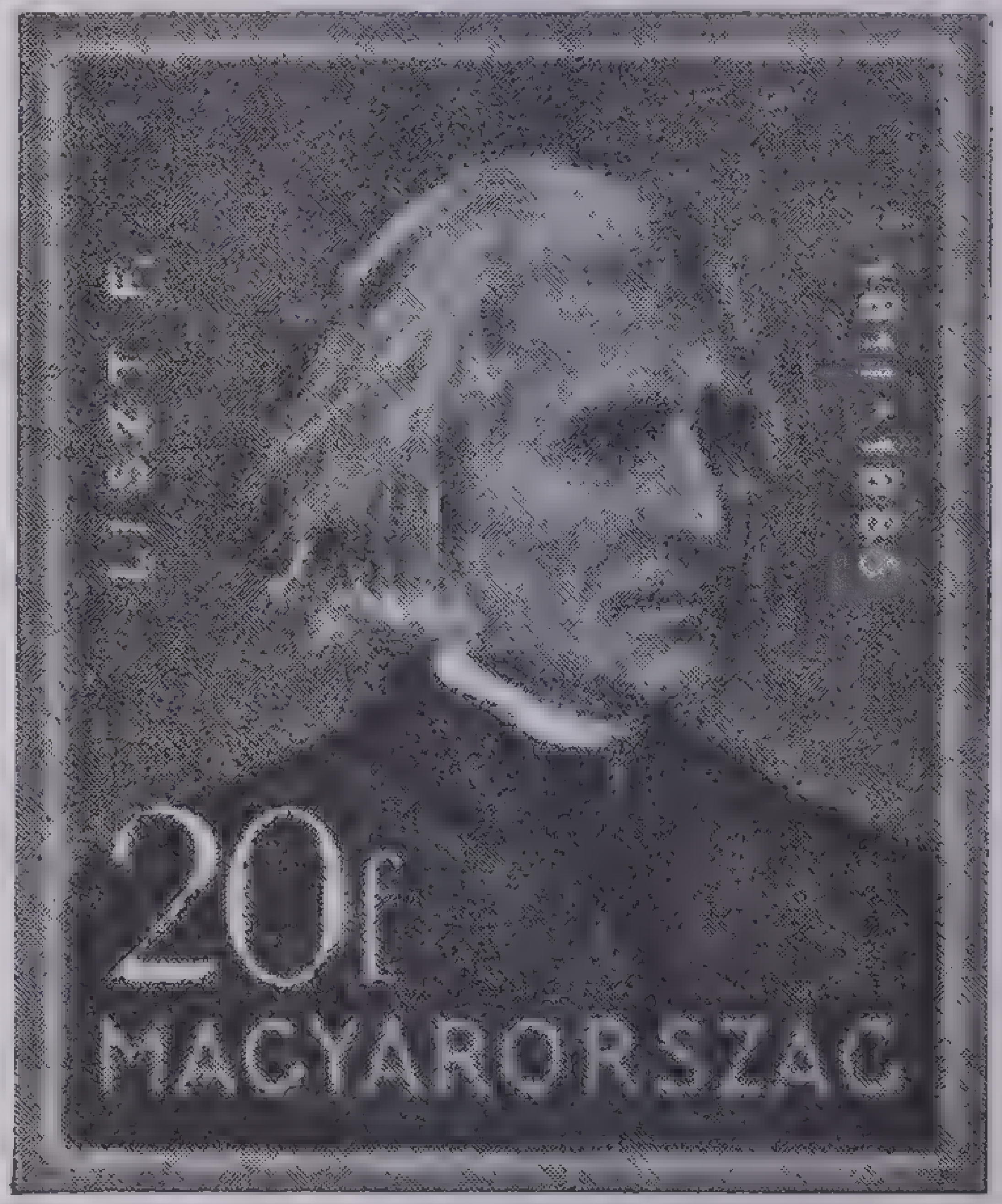
Lippmann, Gabriel (1845–1921), French physicist, born in Luxembourg. He taught experimental physics and was head of the research laboratory at the Sorbonne in Paris. He invented a process of color photography and many scientific instruments. He also did much important research in thermodynamics and the measurement of time. He won the Nobel Prize in physics in 1908.

Lippmann, Walter (1889–), American author and editor, born in New York city and graduated from Harvard. He was associate editor of the *New Republic,* but when the United States entered the World War he became assistant to Secretary of War Baker and later prepared data for the use of the American delegation at the peace conference. He was on the editorial staff of the New York *World* from 1921 to 1931, serving as editor in the last 2 years of that period. Later he became a newspaper columnist, commenting on political and economic affairs. His books include *A Preface to Politics, Public Opinion, The Phantom Public* and *A Preface to Morals.*

Lipton, Sir Thomas Johnstone (1850–1931), British merchant and sportsman, born in Glasgow, Scotland, of Irish parentage. At 15 he emigrated to the United States, where he worked until he had saved enough to open a grocery store in his native city. The small shop, started in 1876, developed into a mammoth chain-store business that received supplies from his own tea, coffee and cocoa plantations. He was knighted in 1898 and was created a baronet in 1902. He was known the world over as a yachtsman, especially for his five unsuccessful attempts to win the America's Cup from the United States.

Lister, Joseph, 1st Baron (1827–1912), English surgeon and scientist, born in Upton, Essex. He was graduated in medicine from the University of London in 1852. After hospital experience in London he became assistant surgeon at the Edinburgh Royal Infirmary and in 1860 was appointed professor of surgery at the University of Glasgow. He became professor of clinical surgery at Edinburgh University in 1869 and was professor of surgery at King's College Hospital, London (1877–93). Lister was one of the greatest surgeons of his time but is chiefly famous for his discovery of antiseptics. He had seen that nearly every surgical case was complicated by pus formation and fever. He found the key to the difficulty in Pasteur's discovery that microbes cause infection. In 1865 Lister made known his method of excluding pus-forming bacteria by careful cleansing and sterilizing of all surgical equipment.

Liszt, Franz (1811–86), Hungarian pianist and composer, born in Raiding. As a youth he showed so much ability that his education was financed by a group of Hungarian nobles. He studied in Vienna and Paris and soon performed on concert platforms, appearing in London and other large cities. He was conductor of the opera at Weimar (1849–61) and director of the Pest Academy of Music (1875). Liszt produced over 1,200 compositions, of which the best known are the *Hungarian Rhapsodies.* He was the creator of the symphonic poem, leaving 12 examples of that musical form. In 1865 he joined the Franciscan order and after 1869 he was known as the Abbé Liszt.



Courtesy Scott Stamp & Coin Company

Franz Liszt

Enlarged from a Hungarian postage stamp issued in 1932. Other stamps in the series show portraits of such famous Hungarians as János Arany, Ignaz Semmelweiss, Louis Kossuth and Mihály Munkácsy

Littleton, Sir Thomas (*c.* 1422–81), English jurist, best known as the author of *The Tenures,* the first printed treatise on English law. Originally written in Norman French, it was printed in 1481, the year of his death. From 1466 he was a judge of the Common Pleas Court in London.

Livingston, Edward (1764–1836), American lawyer and statesman, brother of Robert Livingston, born in Clermont, N.Y. He graduated from Princeton in 1781 and was admitted to the New York bar in 1785. He was a member of Congress from 1795 to 1801. In 1801 he became U. S. attorney for the district of New York and in 1804 was admitted to the bar in New Orleans. He soon rose to distinction as a lawyer in the South and compiled *A System of Penal Law.* He again served in Congress, 1823–29, entered the Senate in 1829 and in 1831 became secretary of state under Jackson. Two years later he was appointed minister to France, where he tried to secure payment of American claims for damage to shipping in the Napoleonic wars.

Livingston, Robert R. (1746–1813), American patriot and statesman, brother of Edward Livingston, born in New York and graduated from King's College (now Columbia

University) in 1765. He became a member of the bar in 1773, developed a successful practice and for a time was a partner of John Jay. Livingston was a delegate to the Continental Congress and served on the committee that drew up the Declaration of Independence. He helped draft the constitution of New York and as first state chancellor administered the oath of office when Washington was first inaugurated. In 1781 he became secretary of foreign affairs under the Confederation. He went to France as minister in 1801 and helped to negotiate the Louisiana Purchase. On his retirement from public life he devoted many years to scientific agriculture and steam navigation. He financed Robert Fulton's development of the *Clermont*.

Livingstone, David (1813–73), Scottish missionary and explorer, born in Blantyre. He studied medicine at Glasgow and in 1840 sailed for Africa as a missionary. He worked among the natives in Bechuanaland until 1849 when he left to explore the country to the north. Between 1849 and 1856 he discovered Lake Ngami, the Zambezi River and Victoria Falls, having followed the Zambezi from its upper reaches to its mouth in the Indian Ocean. He published his *Missionary Travels and Researches in South Africa* after his return to London in 1856.

In 1858 he was appointed British consul for the east coast of Africa and commissioned to explore East and Central Africa. Lakes Shiriva and Nyassa were discovered in 1859, and the results of the expedition were published in England in 1864–65. He began his third and last journey to Africa late in 1865, to discover the source of the Nile and suppress slavery. The 6 years of this expedition were marked by hardship and privation of every sort. In 1871 he was rescued at Ujiji by Stanley, who had been sent by James Gordon Bennett, Jr. of the New York *Herald* to find him. Livingstone died in Africa in 1873 and was buried in Westminster Abbey.

Livy (Titus Livius; 59 B.C.–17 A.D.), Roman historian, born at Patavium (Padua), in the north of Italy. He was the most popular of the Roman historians. His history of Rome, *The Annals of the Roman People,* was written partly at Rome and partly at Naples, under the patronage of Emperor Augustus. It consisted originally of 142 books; but of these only 35 have come down to us and some of these in a very imperfect state. The history begins with the foundation of the city and ends with the death of Drusus, the younger brother of Emperor Tiberius. It covers the years 753 B.C.–9 A.D.

Lloyd George, David (1863–), British statesman, born in Manchester, England, of Welsh descent. He studied law and was admitted to the bar at 21. He was elected to Parliament in 1890 as a Liberal. At that time he was regarded as radical in his views. He opposed the South African War in 1899. In 1905 he entered Campbell-Bannerman's cabinet as president of the Board of Trade. Three years later, as chancellor of the exchequer under Asquith, Lloyd George was responsible for important social legislation, including unemployment insurance, old-age pensions and a financial policy that was adopted by the Liberal party. When the World War began, he prevented a financial collapse and maintained England's credit. He was appointed minister of munitions in the war Cabinet of 1915 and became war minister on the death of Kitchener. He was chosen prime minister late in 1916. Lloyd George led Britain through the war and represented the British Government at the Peace Conference. In 1922 he did not get support in his Irish and Greek policies, and he had to dissolve his ministry. From that time he became a member of the opposition and leader of one of the three divisions of the Liberal party.

Locke, David Ross (1833–88), American humorist, born in New York city. He wrote under the pen name of *Petroleum Vesuvious Nasby* and is chiefly remembered for a series of letters, printed originally in the *Jeffersonian* of Findlay, Ohio (1860). Later they were published in the Toledo *Blade,* of which Locke became editor and part owner. These letters were supposed to have been written by a Democrat who liked whisky, favored slavery and yearned to be postmaster. Their satire so influenced public opinion that they were an aid to Lincoln's cause in the Civil War.

LOCKE, JOHN (1632–1704), English philosopher, born in Somersetshire. He was educated at Oxford, and lectured there from 1661 to 1664 on Greek, rhetoric and moral philosophy. He also studied medicine and became a physician. In 1666 Locke became acquainted with Lord Ashley, afterward Earl of Shaftesbury, and he held various offices under the patronage of that nobleman. For political reasons Shaftesbury sought refuge in Holland; Locke followed him into exile and remained abroad until the abdication of James II brought William and Mary to the throne (1689). Under the new government Locke was made commissioner of appeals, and in 1696 he was appointed commissioner of trade and plantations. This post he resigned in 1700 because of failing health.

Locke had organized the plan for his famous *Essay on Human Understanding* as early as 1670. He continued the work in exile and published it in complete form in 1690. In 1700, when a fourth edition was issued, he added a chapter on "association of ideas." He discussed the original sources and the scope of human knowledge. His conclusions were that all knowledge is the result of experience and that beliefs in good or evil arise largely from the association of ideas; that the human mind is like a sheet of white paper, upon which experience writes the impressions of the senses, and that sensation and reflection are the two sources of all our ideas. Among other works of Locke are his *Letters on Toleration; Thoughts Concerning Education; Reasonableness of Christianity; Two Treatises on Government; Notes Upon St. Paul's Epistles to the Galatians, Corinthians, Romans, and Ephesians* and *Treatise on the Conduct of the Understanding.*

Locke, William John (1863–1930), British novelist, born in Barbados, educated in Trinidad and at Cambridge University. His first books, *The Morals of Marcus Ordeyne* (1905) and *The Beloved Vagabond* (1906), were successful, and he took up writing as a career. In these and later novels Locke showed his affection for the whimsical and impractical characters around which his stories are built. Other of his novels are *Septimus, Simon the Jester, The Glory of Clementina, Stella Maris, The Fortunate Youth* and *The House of Baltazar.*

Lockhart, John Gibson (1794–1854), a Scottish writer, best-known as the author of a biography of his father-in-law, Sir Walter Scott. Lockhart was graduated from Oxford in 1813 and although admitted to the Scottish bar in 1816 soon left law for journalism and general literary work. He contributed to *Blackwood's Magazine,* translated old Spanish ballads, wrote novels and from 1825 to 1835 edited the *Quarterly Review.* Lockhart married Sophia Scott in 1820. His life of Scott appeared in 7 volumes (1836–38). He also wrote biographies of Napoleon and Burns.

Lockyer, Sir Joseph Norman (1836–1920), English astronomer, born in Rugby. In 1868 he announced a method of studying the prominences of the sun in daylight. One of his many astronomical books was called *The Chemistry of the Sun.* Under government auspices he took part in eight expeditions for the observation of eclipses. He was director of the Solar Physics Observatory at South Kensington in 1885 and in 1913 was appointed to a similar office at the Hill Observatory, Devonshire.

Lodge, Henry Cabot (1850–1924), American author and statesman, born in Boston and educated at Harvard, where he received degrees in law and philosophy. He lectured at Harvard and was editor of the *North American Review* and *International Review,* then entered political life. He sat in the House of Representatives from 1887 to 1893, and from 1893 until his death he represented Massachusetts in the Senate. Senator Lodge was one of the most influential Republican leaders. He was the leader of the opposition to President Wilson's peace policies after the World War. Known as the "scholar in politics," he published biographies of Webster, Hamilton and Washington, *The Story of the American Revolution* and *The War With Spain.*

His grandson, Henry Cabot Lodge, Jr., (1902–) was a journalist and in 1937 became U.S. Senator from Massachusetts.

Lodge, Sir Oliver Joseph (1851–1940), English scientist, born in Staffordshire. A graduate of University College, London, he became assistant professor of applied mathematics there in 1879, was professor of physics at University College, Liverpool (1800–1900) and from 1900 until 1920 was principal of the University of Birmingham. He won numerous honors, including knighthood in 1902. Lodge made important investigations in the field of electricity. His researches on the nature of sound and electro-magnetic waves were especially valuable and helped to make wireless telegraphy possible. Later he gave much attention to psychic research.

Loeb, Jacques (1859–1924), German biologist. He taught physiology at Würzburg and Strasbourg, and after 1891 he held professorships in America at Bryn Mawr College and at Chicago and California universities. In 1910 he was appointed director of the department of experimental biology at Rockefeller Institute, New York. His researches on the origin of life convinced him that "life in all its branches is mechanistic." He exposed the eggs of sea urchins to ultraviolet rays and succeeded in developing them.

Logan, John Alexander (1826–86), American soldier and political leader, born in Jackson County, Ill. He fought in the Mexican War and was afterward graduated at Louisville University. Admitted to the bar in 1852, he became prominent in Illinois politics and in 1859 took his seat in Congress as a Democrat. Logan was re-elected but resigned to enter the army. He made a distinguished record in the Civil War, especially at Vicksburg and in the Atlanta campaign and rose to the rank of major general. General Logan re-entered Congress as a Republican, serving in the House from 1867 to 1871 and in the Senate until 1877. He was Blaine's running mate in the presidential campaign of 1884 and after the Republican defeat was re-elected to the Senate.

Lombroso, Cesare (1836–1909), Italian scholar, born in Venice. He was successively professor of diseases of the mind at Pavia, superintendent of the hospital for the insane at Pesaro and professor of medical law at Turin. Lombroso published *The Criminal,* in which he brought out the theory that there is a definite criminal type, distinguished by a sloping skull, abnormal features and slight growth of beard. Although modern scientists do not accept this theory, Lombroso's researches started the science of criminology. He also discovered that pellagra is caused by faulty diet.

London, Jack (1876–1916), American novelist, born in San Francisco. London's fiction was often based on his own experiences; he went to sea at 17, joined the gold rush to the Klondike, hunted seals in the Bering Sea, tramped through the United States and Canada and became a newspaper correspondent in the Russo-Japanese War and the Mexican border troubles of 1914. London's first novel *The Son of the Wolf* appeared in 1900. Others include *The Call of the Wild, The Sea Wolf, Before Adam, The Valley of the Moon, The Star Rover* and *The Little Lady of the Big House.* His stories were very popular in Europe, especially in Russia.

Long, Crawford Williamson (1815–78), American physician, born in Danielsville, Ga. He was the first to use ether for anesthetic purposes. Long graduated from Franklin College in 1835 and took his medical degree at the University of Pennsylvania in 1839. After experiments upon himself, he used ether vapor in 1842 in an operation for the removal of a neck tumor. In 1846 a Boston dentist, William T. G. Morton, made a public demonstration of the anesthetic properties of ether. Long's discovery had not been published at that time, so Morton received general credit for discovering the uses of ether.

Longfellow, Henry Wadsworth (1807–82), American poet, born in Portland, Me. His mother traced her descent from John and Priscilla Alden, whose romantic story Longfellow told in *The Courtship of Miles Standish.* He entered Bowdoin College at the age of 15, and after his graduation in 1825 he was offered the chair of modern languages there. After 3 years of travel and study in France, Spain and Italy, he took up his duties, which he varied by writing a book of travel sketches, *Outre-Mer.* In 1835 he made a second trip to Europe to prepare for the Smith professorship of modern languages at Harvard. He settled in Craigie House, Cambridge, which he eventually bought for a permanent home. During that 17-year period at Harvard Longfellow produced some of his best-known poetry.

Longfellow's most significant work is his lyric, narrative and reflective poetry. He has been criticized for using commonplace or prosaic phrasing, but occasionally, as in *Hymn to Night,* he rises to heights of lyric beauty. His reflective and descriptive poems are *A Psalm of Life, The Bridge, Excelsior, Resignation, The Village Blacksmith* and *The Rainy Day.* Longfellow possessed a remarkable gift for narrative, which he expressed in ballads and in longer poems. Of this group are *The Wreck of the Hesperus, The Skeleton in Armor, Hiawatha The Courtship of Miles Standish, Tales of a Wayside Inn* (including *Paul Revere's*

Ride) and the popular *Evangeline*. Longfellow was the first American whose bust was placed in the Poets' Corner of Westminster Abbey, London.

Longstreet, James (1821–1904), Confederate general, born in Edgefield, S. C. He graduated from West Point in 1842 and served against the Indians on the western frontier and later in the Mexican War. In the Civil War he joined the Confederacy, became lieutenant general, took part in the first and second battles of Bull Run, commanded the Confederate left at Fredericksburg and directed Pickett's charge at Gettysburg. He helped win the battle of Chickamauga and was severely wounded in the battles of the Wilderness but returned to active service in 1864. After the war he became a Republican and held several government positions, including that of minister to Turkey.

Longworth, Nicholas (1869–1931), American legislator, born in Cincinnati, Ohio, and educated at Harvard and at the Cincinnati Law School. Admitted to the bar in 1894, he soon became prominent in local politics as a Republican and in 1899 entered the state legislature. He took his seat in the national House of Representatives and from 1903 to 1913 and from 1915 until his death he was an able legislator; he became Speaker in 1925. In 1906 he married Alice Roosevelt, daughter of the 26th President.

Lope de Vega, see *Vega Carpio, de.*

Lorenz, Adolf (1854–), Austrian surgeon, born in Silesia. He studied medicine at Vienna, where he later taught. He became an authority on such physical deformities as clubfoot and flatfoot and won world-wide fame for his bloodless operations. He developed methods of correcting deformities by manipulation rather than surgery.

Lorimer, George Horace (1868–1937), American journalist and author, born in Louisville, Ky., and educated at Colby College and Yale University. He became editor of the *Saturday Evening Post* in 1899. He is given most of the credit for the magazine's present importance. In 1902 and 1904 his *Letters from a Self-Made Merchant to His Son* and *Old Gorgon Graham*, a continuation, were published in the *Post*. He is also the author of *The False Gods* and *Jack Spurlock, Prodigal.*

Lossing, Benson John (1813–91), American historian, born in Beekman, N.Y. He was apprenticed to a watchmaker in Poughkeepsie in 1826 and 9 years later became editor of the local *Daily Telegraph*. He moved to New York, edited the *Family Magazine* and wrote a number of books, illustrated with his own wood engravings. Lossing's literary output includes *Pictorial Field Book of the Revolution* and a similar series on the Civil War, a popular series of school histories, *Our Country, Cyclopaedia of American History* and biographical studies.

Loti, Pierre (Louis Marie Julien Viaud; 1850–1923), French writer, born in Rochefort, of Huguenot ancestry. He was a naval officer until 1910 but found time to write many successful books. His scenes are laid in faraway lands, and his descriptions suggest the color and romance of strange places. His novels include *Mon Frère Yves, Pêcheur d' Islande, Aziyade* and *Le Mariage de Loti.*

Lotze, Rudolf Hermann (1817–81), German philosopher, born in Bautzen and educated at Leipzig University. After teaching there (1842–44), he succeeded Herbart as professor of philosophy at Göttingen. Lotze was the founder of what is called *teleological idealism.* He believed in a personal God as the author of all things but also in the orderly procedure of natural phenomena. Behind the universe, he said, there is a great purpose; science represents a fulfilling of a divine plan. His best-known book is *Microcosmus* (1856–64; in English, 1885).

Loubet, Émile (1838–1929), French statesman, president of France from 1899 to 1906. He was born in Marsanne, studied law in Paris and in 1870 was elected mayor of Montélimar, where he had established himself as a lawyer. In 1876 he was elected to the French Parliament and in 1885 was sent to the Senate. Between that date and his election to the presidency, Loubet held important ministries and was for a time premier. The agitation for the reinstatement of Dreyfus and passage of the law separating Church and state occurred during his term. He was succeeded by Fallières.

Louis IX (1215–70), King of France, called *St. Louis.* He succeeded his father Louis VIII in 1226. He was trained by his mother, Blanche of Castile, who acted as regent. When he came of age, he carried on a war against Henry III of England. In 1248, in fulfilment of a vow made during an illness, Louis led a crusade and was taken prisoner in Egypt by the Mohammedans. He continued his journey after the payment of a ransom. In 1270 he started on another crusade but died of the plague in Tunis. Louis did much to improve French law. He was canonized in 1297.

Louis XII (1462–1515), King of France, son of Charles, Duke of Orleans. He succeeded Charles VIII in 1498. During the early years of his reign Louis tried to gain possession of Milan. In 1508 he joined the League of Cambrai against the Venetians, having as his allies Pope Julius II, the Emperor Maximilian and Ferdinand of Aragon. He defeated the Venetians at Agnadello in 1509 but in 1511 faced an alliance of his former allies and Henry VIII of England, who were united in the Holy League. Henry VIII defeated the French in 1513 in the battle of the Spurs, and peace was made the next year. Among the terms was a provision for the marriage of Louis and Mary Tudor, Henry's sister. Louis was a just king and gained the title of *Father* of his people.

Louis XIII (1601–43), King of France, son of Henry IV and Marie de' Medici. He succeeded to the throne in 1610 when his father was assassinated. His mother acted as regent until 1617. During most of his reign affairs of state were dominated by Cardinal Richelieu, who increased the royal power at the expense of the nobles and destroyed the political power of the Huguenots, capturing their stronghold, La Rochelle, in 1628. Louis had two sons by his wife, Anne of Austria; the elder son succeeded him as Louis XIV.

Louis XIV (1638–1715), King of France. He succeeded his father Louis XIII when he was 5 years of age. On the death of Mazarin (1661), the minister who had been all-powerful during his minority, Louis declared that he would be his own minister. In 1667 his army invaded the Spanish Netherlands and gained several victories until checked by a combination of Dutch, Swedish and English troops. Louis retained possession of French Flanders in 1668 by the Treaty of Aix-la-Chapelle but was forced to relinquish Franche-Comté. A renewal of the war made Louis dominant in Europe, but he suffered reverses when faced by a powerful coalition headed by William III of England. The wars were finally concluded by the Treaty of Utrecht (1713), France losing many of her conquests. Louis reigned for 72 years and was by far the most prominent figure in the Europe of his day. He surrounded himself with luxury and splendor, and his court had a world-wide influence on politics, art, literature and fashion.

Louis XV (1710–74), King of France, the son of the duke of Burgundy and the successor of his great-grandfather, Louis XIV. He reigned for nearly 60 years. From 1755 to 1763 France was at war with Great Britain. By the peace treaty, signed in Paris in 1763, England took possession of Canada, Nova Scotia and France's other North American colonies, besides Granada, Dominica and Tobago, in the West Indies. During his later years Louis was governed wholly by his favorites, among whom were the Marchioness de Pompadour and Madame Du Barry. Weak and sensual, the king had little influence in the affairs of state.

Louis XVI (1754–93), King of France, the grandson of Louis XV, whom he succeeded. He married Marie Antoinette of Austria, daughter of Maria Theresa and sister of the Emperor Joseph. Louis's first acts as king endeared him to his people, for he gave them new privileges and made many reforms in the administration. He was soon beset by financial troubles and was not wise in his choice of ministers. The state of the country gradually became worse, and in 1789 the French Revolution began. In June 1791 Louis escaped from Paris to Vincennes, but he was captured and brought back. Until September 1792 he reigned as a constitutional king, but the office was then abolished, and Louis was tried and guillotined on January 21, 1793.

Louis XVII (1785–95), King of France in name only. The second son of Louis XVI and Marie Antoinette, he became dauphin (title borne by the eldest son of kings of France) in 1789 on the death of his elder brother. In 1792 the little prince was imprisoned with his parents but was separated from them and given into the keeping of a brutal cobbler. In 1795 he was reported to have died of abuse and neglect. Several pretenders to the throne later pressed their claims as the lost dauphin, but they were all shown to be impostors.

Louis XVIII (1755–1824), King of France from 1814 to 1824, a younger brother of Louis XVI. His title was Count of Provence. He fled from Paris on the same night that his brother made his unsuccessful attempt to escape and reached the Belgian frontier. After the death of the dauphin he assumed the title of king and was living in England when Napoleon met his downfall in 1814. Soon afterward Louis went to Paris and assumed the crown but fled when Napoleon returned from Elba. Reinstated by the allied powers after the battle of Waterloo, he reigned until 1824. He was succeeded by his brother Charles X.

Louis Philippe (1773–1850), King of France, the eldest son of Philippe Egalité, Duke of Orleans. He had joined the cause of the French Revolutionists, repudiating his titles and fighting in the foreign wars of the period, but he fell under the suspicion of the government and in 1793 escaped into Austrian territory. In 1814, on the fall of Napoleon, Louis Philippe returned to Paris and recovered his estates. He gained the favor of the people, who welcomed him as king in 1830 after the abdication of Charles X. His popularity decreased steadily during the 18 years of his reign. The rising tide of unrest reached a climax in the revolution of 1848; the "Citizen King" abdicated in favor of his grandson and fled to England, where he lived until his death.

Louis, Joe (Joseph Louis Barrow; 1914–), American pugilist, born in Alabama. Entering the ring as an amateur at 18, he soon entered professional ranks, rising to the top in a swift series of sensational bouts. He won the world's heavyweight championship from James J. Braddock in 1937 and in 1938 defeated Max Schmeling, German challenger.

Lovelace, Richard (1618–58), English poet, born at Woolwich and educated at Oxford. In 1642 he was imprisoned when he presented a petition to the House of Commons in favor of the king. He raised a regiment and fought for Louis XIV of France. He wrote two volumes of lyric poems, of which "To Althea from Prison" and "To Lucasta, on Going to the Wars" are still widely read.

Lover, Samuel (1797–1868), Irish novelist and poet, born in Dublin. He was well-known as a painter and writer of Irish ballads and sketches before he published the first of his novels *Rory O'More* (1837). Even more popular was the farcical *Handy Andy*, relating the comic mishaps of an awkward servant lad. His *Treasure Trove* is a story of an Irish brigade. Among Lover's ballads are *Rory O'More, The Four-Leaved Shamrock* and *Molly Bawn.*

Low, Seth (1850–1916), American statesman and educator, born in Brooklyn, N.Y., and educated at Brooklyn Polytechnic Institute and Columbia College. He gained a wide reputation for efficiency and honesty as mayor of New York (1882–86) and in 1890 became president of Columbia College. During his 11 years in that office, the college was organized as a university and moved to its present location on Morningside Heights, where several new buildings were erected. Among these is the Low Memorial Library, which President Low built in honor of his father. He served as fusion mayor of Greater New York, 1902–03, but was defeated for re-election in spite of a progressive administration. He was actively interested in various public movements and in 1914 served on an arbitration commission appointed to settle a Colorado coal strike.

Lowell, Abbott Lawrence (1856–), American educator, successor to Charles W. Eliot as president of Harvard University. He was born in Boston and graduated from Harvard in 1877. After receiving his degree at the Harvard Law School he practiced law in Boston. In 1897 he was appointed lecturer on the science of government at Harvard and from 1900 to 1909 was full professor. In the latter year he became president of the university and served in that office until 1932, when he retired. From 1900 he was the sole trustee of Lowell Institute and in 1910 was elected trustee of the Carnegie Foundation for the Advancement of Teaching. A recognized authority on government, Lowell wrote *Government and Parties of Continental Europe, The Government of England* and *Conflicts of Principle.*

Lowell, Amy (1874–1925), American poet, born in Brookline, Mass., of a distinguished family; President Lowell of Harvard and Percival Lowell, the astronomer, were her brothers. Miss Lowell was privately educated. Besides publishing many volumes of verse she lectured at the Brooklyn Institute of Arts and Sciences and at Yale and Brown universities. Her books include *Sword Blades and Poppy Seed, Six French Poets, Tendencies in Modern American Poetry, Fir Flower Tablets* and a critical biography of John Keats.

Lowell, James Russell (1819–91), American poet, born in Cambridge, Mass. He graduated from Harvard in 1838, where he distinguished himself in literature. Lowell's first published volume was a collection of poems entitled *A Year's Life* (1841). In 1843, he became editor of a periodical of criticism, *The Pioneer*, to which Poe, Hawthorne and Whittier contributed. The *Biglow Papers*, first printed in the Boston *Courier* in 1846, gave Lowell a reputation for shrewd humor; this rhymed satire on the Mexican War was enjoyed for its witty use of the New England dialect. Two other poems appeared in 1848—the inspiring *Vision of Sir Launfal* and *A Fable for Critics*.

He was professor of modern languages at Harvard (1855–77), as successor to Longfellow. He edited the *Atlantic Monthly* (1857–61) and was associate editor of the *North America Review* (1864–72). In 1877 he became ambassador to Madrid and in 1880 to London. He left the diplomatic service in 1885.

His best literary and critical essays were collected under the titles *The Old English Dramatists, Among My Books* and *My Study Windows*. In the *Atlantic Monthly* appeared a second series of *Biglow Papers*, expressing his antislavery sentiments. The finest single poem of this period is "Commemoration Ode," which the author delivered in 1865 in honor of the Harvard men who had fallen in the Civil War. Lowell is best known as a poet. Some of his shorter pieces, for example, "The Present Crisis," are among the finest in American literature.

Lowell, Percival (1855–1916), American astronomer, born in Boston, founder of the Lowell Observatory, at Flagstaff, Ariz. He graduated from Harvard in 1876. After several years of residence in Japan he returned to the United States and began work at Flagstaff in 1894. He was appointed professor of astronomy at Massachusetts Institute of Technology in 1902. Lowell became widely known for his study of the markings on Mars and wrote several books in support of his theory that living beings exist on Mars. In 1905 he predicted, from mathematical calculations, the discovery of a new planet. It was discovered in 1930 and named Pluto.

LOYOLA, DE, SAINT IGNATIUS (Iñigo López de Recalde; 1491–1556), Spanish saint, born in the province of Guipuscoa, Spain, of a noble Basque family. He founded the Society of Jesus, commonly called the *Jesuits*. In his youth he was a page in the court of Ferdinand and Isabella, where he saw all the vices and frivolities of the age. As a young man he entered the army and was severely wounded in a war with the French. Druing his long convalescence he read books on devotion and lives of the saints, with the result that in 1522 he dedicated himself to the service of the Church. About this time he wrote the book of devotion called *Spiritual Exercises*.

After entering the Church Loyola made pilgrimages to Rome and Jerusalem and from 1524 to 1527 attended the schools and universities of Barcelona, Alcala and Salamanca. In 1528 he went to Paris, where he completed a 7-year course of general and theological training. In 1534 he and six others took vows that marked the foundation of the Society of Jesus, dedicated to work for the conversion of the heathen. In 1540, when the order was formally founded by Pope Paul III, Loyola became its first general. The rest of his life was passed in Rome in organizing the society. He was canonized by Gregory XV in 1622.

Lubbock, Sir John (1834–1913), English naturalist and anthropologist, born in London and educated at Eton. He was a member of the House of Commons almost continuously from 1870 to 1900, when he was elevated to the peerage as Lord Avebury. His fame rests chiefly on his work as a scientist. His *Prehistoric Times* (1865), the result of original research, was long a standard text on archeology. Lubbock also specialized in the study of insects, and on this subject he wrote *Ants, Bees, and Wasps* and other books.

Lucretia, legendary Roman heroine, wife of Lucius Tarquinius Collatinus, a member of the Tarquin family. Having been brutally attacked by Sextus Tarquinius, son of Tarquin the Proud, she killed herself after calling upon her husband and father to avenge her. The incident (about 509 B.C.) caused an uprising of the people, who expelled the Tarquins and vowed never to be ruled again by kings. From this revolt came the Roman republic.

Lucretius (Titus Lucretius Carus; 96–55 B.C.), Roman philosopher and poet. He is famous as the author of the poem *De Rerum Natura* (On the Nature of Things). In the 7,500 lines of this work Lucretius set forth the philosophy of Epicurus on atoms and the void. Little is known of his life. There is a tradition that he died by suicide.

Lucullus, Lucius Licinius (d. *c.* 57 B.C.), Roman general who fought under Sulla in the Social War and won further honors in the wars with Mithridates, King of Pontus. Because his soldiers mutinied, he was superseded in Asia by Pompey (66 B.C.). At Rome he tried to check the ambitious designs of Pompey but failed. He was extremely wealthy and thereafter lived in luxury in his town house and suburban villas and was the patron of artists and writers.

Ludendorff, von, Erich F. W. (1865–1937), German general, born in the province of Posen, Prussia (now a part of Poland). He received a military education and in 1898 became attached to the general staff of the army. At the outbreak of the World War, having reached the grade of major general, he took part in the invasion of Belgium. As Hindenburg's chief of staff, he contributed to the victories over the Russians at Tannenburg and in the Masurian Lakes region. After Von Falkenhayn's failure at Verdun (1916), when Hindenburg was made chief of staff of all the armies, Ludendorff was appointed chief quartermaster general. He favored intensification of the submarine campaign and helped plan the drives of 1918, by which the Germans sought to end the war before the United States could take a full part. In October 1918 he was discharged and after a stay in Sweden settled in Munich. Later he was active in German politics as a Nazi (National Socialist) and as a leader in the pagan antichristian movement.

Ludwig, Emil (1881–), German author, born in Breslau. He began his literary career by writing plays. He produced some novels, but his reputation rests upon his biographies. The first was a life of Bismarck, which he followed with lives of Napoleon, William II, Goethe, Abraham Lincoln, Cleopatra and Franklin D. Roosevelt, all psychological studies.

Lukeman, Henry Augustus (1871–1935), American sculptor, born at Richmond, Va. He studied at the National Academy of Design, New York, and at the School of Fine Arts, Paris. He became widely known for his statues of eminent men, portrait busts, monuments and war memorials, also for bas-reliefs and other decorative work. His sculptures include statues of William McKinley for Adams, Mass., and Dayton, O.; *Manu* for the Appellate Court building, New York city; colossal statues in marble for the Royal Bank of Montreal; a statue of *Columbus* for the Customhouse, New York; *Women of the Confederacy*, a monument at Raleigh, N.C.; Brooklyn's *Honor Roll and Soldiers' Memorial* in Prospect Park; statues of *J. Z. George* and *Jefferson Davis* for Statuary Hall and *Stone Mountain Confederate Memorial* in Georgia.

LUTHER, MARTIN (1483–1546), German religious reformer, born at Eisleben. At school he made rapid progress in Latin and other studies and in 1501 entered the University of Erfurt, from which he received a master's degree in 1505.

About this time he discovered a Latin Bible in the library of the university and found that it contained more than the excerpts in common use. Although his father had intended that he be trained in law, the reading of this Bible caused Luther to turn to the study of religion. Contrary to his father's wishes he entered the monastery of the Augustines at Erfurt in 1505. In 1507 he was consecrated priest and in 1508, by the influence of his patron, Staupitz, who was provincial of the order, he was made professor of philosophy in the new University of Wittenberg.

He became doctor of theology in 1512, and his profound learning and powerful eloquence drew large audiences. The arrival in 1517 of John Tetzel in Wittenberg to sell indulgences for sins roused Luther and caused him to draw up his famous protest in 95 propositions, which he nailed to the church door in Wittenberg. The result was that the sale of indulgences ceased, Tetzel fled, and a great religious reform spread rapidly through Germany.

Luther was summoned to Rome to explain his heretical proceedings but refused to go; nor were the efforts of Cardinal Cajetan able to effect a reconciliation between him and the Pope. His dispute with Dr. Eck at Leipzig in 1519, in which he denounced indulgences and questioned the authority of the Pope, was followed in 1520 by a bull of anathema—a document that Luther straightway burned publicly in Wittenberg. This open defiance of Rome required that he defend himself, which he did in a pamphlet addressed to the *Christian Nobles of Germany*, with the result that many rallied to his aid. When summoned to appear before the German emperor, Charles V, at the Diet of Worms (1521), Luther appeared, acknowledged his writings, made an eloquent defense but refused to recant. When he retired from Worms he was met by a friendly troop of soldiers belonging to Frederick, the Elector of Saxony, who took him to the castle of Wartburg, where he remained for nearly a year. Here he translated the New Testament into German, but when he heard that disturbances had been excited in Wittenberg on the question of images, he could no longer bear the inaction. Returning suddenly Luther succeeded in quieting the people.

In 1524 he laid aside his cowl as a priest of the Roman Church and in 1525 married Catharina von Bora, one of nine nuns who had renounced their religious vows under his teaching.

From the year 1521 Luther had been busy translating the Bible into German with the aid of Melanchthon and others, and the great task was completed in 1534. This important work, taken in connection with the Protestant Confession drafted at Augsburg in 1530, served to establish the reformer's doctrines in Germany and closed the important part of his public life. He continued his private work of teaching, preaching and writing until his death.

Lycurgus (9th century B.C.), lawgiver of ancient Sparta, reputed founder of that city state's constitution. All the facts of his life are in some doubt. Tradition says that as regent he governed wisely for his young nephew, King Charilaus, and then traveled in Crete, Ionia and Egypt. On his return the citizens implored him to rescue the state from the disorder into which it had fallen. Lycurgus introduced a new social order and laid the foundations for the military supremacy that Sparta later enjoyed. He then went into voluntary exile, having made the people promise to maintain the new laws without change.

Lyell, Sir Charles (1797–1875), British geologist, born in Scotland, and educated at Oxford and at Lincoln's Inn, London. While practicing law he began the geological studies in which he eventually specialized. Two extensive tours of Europe, made in 1824 and 1828–30, convinced him that geological changes take place over long periods of time and not through sudden upheavals. This fundamental principle was embodied in his *Principles of Geology*, first published in 1830. Lyell's work had a great influence on the modern study of geology.

Lysander (d. 395 B.C.), Spartan statesman. In 407 B.C., as commander of the Spartan fleet in the Aegean Sea, he defeated the Athenians, and in 405 B.C. he gained a complete victory over an enemy fleet of 180 vessels at Aegospotami in the Hellespont. The next year Lysander captured Athens and destroyed the Long Walls. He was killed at Haliartus while commanding an army against the Boeotians.

Lysias (*c.* 450–*c.* 380 B.C), Attic orator, born in Syracuse. His father settled in Athens about 440 B.C., and there in later years Lysias and a brother built up a shield-manufacturing business. During the reign of the Thirty Tyrants (404–403 B.C.) their house was attacked and the brother murdered. Lysias escaped and used his eloquence in prosecuting Eratosthenes as his brother's murderer. Thereafter he made a business of writing speeches for others. The 34 orations that have been preserved are remarkable for pureness and simplicity of diction.

Lysimachus (*c.* 361–281 B.C.), Greek general who fought in the army of Alexander the Great. On Alexander's death, in 323 B.C., Lysimachus received Thrace and the region bordering on the Danube and in 306 B.C. assumed the title of king. By conquest he added a part of Asia Minor to his realm. In 288 B.C. he formed an alliance with Ptolemy, Seleucus and Pyrrhus against Demetrius Poliorcetes, by which he obtained control of Macedonia. To please a new wife he murdered his son Agathocles; this roused his Asian subjects, and with the aid of Seleucus they defeated and killed him at Corus in Phrygia.

Lysippus (4th century B.C.), Greek sculptor. He was Alexander the Great's favorite worker in bronze and made many portrait busts of the conqueror. Lysippus was the founder of a new school at Sicyon in the Peloponnesus. Of the 1,500 busts and statues attributed to him, only copies are in existence, notably the Apoxyomenos (Athlete scraping off oil) in the Vatican. His style greatly influenced Hellenistic sculpture.

Maartens, Maarten (Joost Marius Willem van der Poorten-Schwartz; 1858–1915), Dutch-

English novelist, born in Amsterdam. He studied in Germany and England and later at the University of Utrecht, where he became a professor in 1883. From 1889 until 3 years before his death he wrote (in both English and Dutch) stories of peasant and village life in Holland. The best of them are *The Sin of Joost Avelingh, The Greater Glory, Brothers All, The Price of Lis Doris* and *Eve*.

Mabie, Hamilton Wright (1846–1916), American essayist and critic, born in Cold Spring, N.Y. He graduated from Williams College and Columbia Law School. In 1879 he joined the editorial staff of the *Christian Union* (afterward the *Outlook*); later he became associate editor. Among his works are *My Study Fire, Essays on Books and Culture, The Life of the Spirit, Myths Every Child Should Know, Japan To-Day and To-Morrow, William Shakespeare* and *Backgrounds of Literature*.

McAdam, John Loudon (1756–1836), Scottish inventor, born in Ayr. He lived in New York for a few years following 1770 and after 1800 was in charge of road-maintenance projects in Scotland and England. He was later appointed general surveyor of the metropolitan roads in England. The method of paving invented by him was first used in road construction in England in 1815; a *macadam* road is a thick layer of small broken stones of uniform size, which become cemented together by the action of water on stone dust. Such roads cannot stand up under heavy motor traffic and are now being replaced, usually by concrete highways.

McAdoo, William Gibbs (1863–1941), American lawyer and Senator, born near Marietta, Ga., and educated at Tennessee University. Admitted to the bar in 1885 he practiced in Chattanooga and New York city. As president and director of the Hudson & Manhattan Railroad Company he supervised the construction of the first Hudson River tunnels. In 1904 he was a delegate to the Democratic National Convention and was acting chairman during most of the campaign of 1912, which resulted in Wilson's election. In 1914 he married President Wilson's daughter Eleanor. He served as secretary of the treasury (1913–18) and became director general of railways during the World War. Then he retired from public office and returned to law practice. In the 1924 convention he was a leading presidential candidate through more than 100 ballots. In 1932 he helped to swing the convention for Franklin Roosevelt, and in 1933 he entered the Senate, representing California.

MacArthur, Douglas (1880–), American army officer, born in Arkansas. He was graduated from West Point in 1903 with first honors. He was promoted steadily from second lieutenant of engineers to major general (1925). He served in the Philippines, 1903–04, took part in the Vera Cruz expedition of 1914 and in the World War distinguished himself as commander of the Rainbow Division. He reached the rank of general in 1930, the ninth army officer in the United States to be so honored. In 1930 he began a 4-year term as chief of staff of the army. At the request of President Quezon he supervised the organization of the national defense forces of the Philippine Islands in 1935–36.

Macaulay, Thomas Babington (1800–59), English historian, born in Leicestershire. He could read fluently at the age of 3, and at 7 he composed a universal history. At Trinity College, Cambridge, which he entered in 1818, Macaulay twice won first honors in prize-poem competitions. In 1825 he took his master's degree, and in the same year his essay on Milton was published in the *Edinburgh Review*. He became a barrister in 1826, and was elected to Parliament as a Whig in 1830, where he supported the Reform Bill. He served on the supreme council in India, 1834–38, was returned to Parliament from Edinburgh in 1839 and held his seat until his death, except for the period from 1847–1855. In Melbourne's ministry he was secretary of war (1839–41); later he served as paymaster general (1846–47). In 1857 Queen Victoria created him Baron Macaulay of Rothley.

Macaulay's writings began with *The Battle of Ivry*, which he wrote while at Cambridge. His stirring *Lays of Ancient Rome* appeared in 1842, and a year later he published *Essays* (3 vols.), which included the famous dissertations on Lord Clive and Warren Hastings. The first two volumes of his great work, *History of England from the Accession of James II*, appeared in 1848. Though left unfinished at his death the *History* gives a picture of England to the close of William III's reign. Historians have criticized it for lack of accuracy and undue partiality to the Whigs, but it was immensely popular with the public, which was surprised to find that history could be made as interesting as fiction. Macaulay's prose style is remarkable for its clearness and smoothness. He wrote some vivid verse, full of lines that linger in the memory, especially in *The Lays of Ancient Rome*.

Macbeth (d. 1057), King of the Scots. As ruler of the province of Moray and chief general in Duncan's army, Macbeth revolted against his king in 1040 and killed him at Dunsinane. He then ruled Scotland until his own death at Lumphanan in a battle with Malcolm, Duncan's son, and his English ally, the earl of Northumbria. The story as told by Holinshed in his *Chronicle* served as the basis of Shakespeare's *Macbeth*.

McBurney, Charles (1845–1913), American surgeon, born in Roxbury, Mass. He received his medical education at the College of Physicians and Surgeons, New York city, and was on the faculty of the college from 1872 until his retirement in 1907, serving as professor of clinical surgery from 1892. Dr. McBurney gained an international reputation as operating surgeon, authority on appendicitis and pioneer in asepsis. In 1894 he first used a type of incision in surgery that is now known by his name.

Macchiavelli, see *Machiavelli*.

McClellan, George Brinton (1826–85), American general, born in Philadelphia. He was graduated from West Point in 1846 and distinguished himself in the Mexican War but resigned from the army in 1857. When the Civil War broke out, he was commissioned major general of Ohio Volunteers, and in November 1861 he was appointed commander of the Federal troops. His lack of decisive action in the Peninsular campaign caused much criticism, and Halleck took his place in July 1862. As commander of the Army of the Potomac McClellan checked Lee at Antietam but again failed to make the most of the victory and was superseded by Burnside. In the political campaign of 1864 he was the unsuccessful Democratic candidate for the Presidency.

McCloskey, John (1810–85), Irish-American prelate and the first American cardinal. He was born in Brooklyn, N.Y., and educated in Maryland, Rome and France. Ordained a priest in 1834 he became first president of St. John's College (Fordham, N.Y.) in 1841 but soon returned to his parochial duties. He was made first bishop of Albany in 1847 and during his years of service built the cathedral at Albany and founded the Theological Seminary at Troy. He was created archbishop of New York in 1864 and cardinal in 1875. Cardinal McCloskey founded churches, seminaries and missions and helped to build St. Patrick's Cathedral, New York.

McCormack, John (1884–), Irish-American singer, born in Athlone, County Westmeath. He won first prize at a musical festival in Dublin in 1904 and entered the concert field; after studying for 2 years in Milan, he made his operatic debut in London (1907) in *Cavalleria Rusticana*. Possessing a fine tenor voice, he became famous and subsequently sang with the Manhattan, Chicago-Philadelphia, Chicago, Metropolitan and Monte Carlo grand-opera companies, but he won his greatest successes in concert, especially in programs of Irish songs. In 1919 he became an American citizen. Later he was made a papal count.

McCormick, Cyrus Hall (1809–84), American inventor, born at Walnut Grove, Va. He is famous for his invention of the reaper, the first important contribution to mechanized agriculture. McCormick gave the first public demonstration of his machine in 1831 but did not patent it until 1834. The basic features of the most modern reaper are practically unchanged from McCormick's first design. At first McCormick made reapers for local sale; he did not try to expand his market for 10 years. In 1847 he built a factory in Chicago. He built up an enormous fortune, much of which he used in his philanthropies.

McCosh, James (1811–94), Scottish-American philosopher and educator, born in Ayshire and educated at the universities of Glasgow and Edinburgh. In 1850 his book *The Method of Divine Government* won wide favor; in 1851 he became professor of logic and metaphysics in Queen's College, Belfast. In 1868 Dr. McCosh accepted the presidency of Princeton College (Princeton, N.J.) and held the office for 20 years. After his retirement in 1888 he retained the professorship of philosophy at Princeton. He

Underwood & Underwood

Two Notable Postwar Statesmen—MacDonald and Briand

James Ramsay MacDonald, left, was prime minister of Great Britain from January to November 1924, and again from 1929 to 1935. Until 1931, when the Government was reorganized on a coalition basis, his was the first Labour Government in Britain. In 1924 MacDonald, with Premier Edouard Herriot of France, submitted the Geneva Protocol, a plan for the submission of all disputes to arbitration, to the League. MacDonald died in 1937. Aristide Briand, right, was the wartime premier of France from October 1915 to March 1917 and from 1925 until his death in 1932 served almost without interruption as minister of foreign affairs. He was co-author with Secretary of State Frank B. Kellogg of the Kellogg-Briand Peace Pact advocated common-sense philosophy and opposed Kant and Mill.

McCutcheon, George Barr (1866–1928), American novelist, born on a farm in Tippecanoe County, Ind. He studied at Purdue University and began his writing career in 1889 as a reporter for the Lafayette *Journal;* later he was city editor of the Lafayette *Courier.* In 1901 he won popular favor with *Graustark,* a tale of adventure; he wrote about 40 other novels before he died. His other most successful works include *Brewster's Millions, Beverly of Graustark, Shot with Crimson, Blades* and *Merivales.*

Macdonald, George (1824–1905), Scottish writer, born in Huntley, Aberdeenshire; educated at Aberdeen University and the Independent College, London. In 1853 he left the ministry to take up writing. His works, which were very popular, include *David Elginbrod, Robert Falconer* and *Marquis of Lossie.* He published also several volumes of poetry, and wrote *The Light Princess* and *At the Back of the North Wind* for children. His novels reflect Scottish life and ideas of the time.

MacDonald, James Ramsay (1866–1937), British statesman, born at Lossiemouth, Scotland, of working-class parents. He taught in the village school for a few years and went to London in his 20th year intending to enter journalism, but he had to work as a clerk in a warehouse. He became identified with the Fabian Society and the Labour Party and was soon influential in those groups. He edited the *Socialist Review* and wrote on socialism. In 1906 he entered Parliament and held his seat during several governments until 1918, when his pacifist ideas caused his defeat. In 1922 he was again elected to Parliament and led the Labour party, which was then the official opposition in Parliament. In 1924, on the defeat of the Conservative government, MacDonald was called upon to form a ministry. He became the first Labour prime minister in Great Britain. His ministry fell within a year and did not return to power until 1929, when MacDonald was again prime minister, until a financial crisis led to its downfall in 1931. With a few of his followers MacDonald joined forces with the Conservative and Liberal parties, and a National government was formed with him as prime minister. A general election was held, and the people sent an immense majority to support the coalition government in the House of Commons. In 1935 MacDonald resigned and was succeeded by Baldwin. Although his eyesight had been failing for years, he continued to hold office in the Cabinet as lord president of the council until May 1937 when poor health and lack of public support forced him to resign. Ramsay MacDonald struggled all his life in the Labour-Socialist movement; at times he was ordered out of Parliament and almost out of the country because of his association with antinational forces. He gained the respect of the British people but was disowned by the Labour party because his ministry contained Liberals and Conservatives.

Macdonald, Sir John Alexander (1815–91), Canadian statesman, born in Glasgow, Scotland. He went to Canada with his parents and settled in Kingston, Ontario. As a rising young lawyer he was elected in 1844 to the Legislative Assembly of Canada as a Conservative. In 1841 Upper and Lower Canada had been united under one legislature, but the union did not give full satisfaction, and in the period between 1844 and confederation in 1867 Macdonald was one of the most influential leaders in the movement that brought about the formation of the Dominion of Canada. He held various minor offices until 1857 and during the next decade was several times head of the government. In 1867, after the passage of the British North America Act, he headed the first Dominion Cabinet. Macdonald resigned in 1873 but once again became premier in 1878 and retained the office until his death.

MacDonough, Thomas (1783–1825), American naval hero, born in Newcastle County, Del. He served with Decatur in the war with Tripoli. He left the navy for the merchant service in 1808 but returned in 1812. He commanded a small fleet on Lake Champlain and built more vessels there. In 1814 the British forces planned an attack on the United States from the north; to succeed, they had to control Lake Champlain. McDonough's fleet defeated the superior British fleet, and the British had to retreat into Canada. He remained in the navy until his death at sea.

MacDowell, Edward Alexander (1861–1908), American composer, born in New York city From 1876 to 1886 be lived abroad, studying in Paris, Wiesbaden and Frankfort and became a teacher of piano at the conservatory at Darmstadt in 1881. MacDowell received much favorable notice in Germany, both as teacher and as composer and numbered Liszt among his admirers. In 1888 he established himself in Boston, where he played his own works in concert. He accepted the chair of music in a newly organized department of Columbia University and remained there until his health failed in 1904. MacDowell is considered one of the most original of American composers. *Woodland Sketches* and *Sea Pieces* for the piano and the orchestral *Indian Suite* are typical of his best work.

McFee, William (1881–), English-American marine engineer and author, born in London. He was a marine engineer in the merchant service and came to the United States in 1911. His vigorous stories deal with the sea and seafaring people. Among them are *Aliens, Casuals of the Sea, The Harbourmaster* and *The Beachcomber.* He wrote besides a *Life of Sir Martin Frobisher* and a book of verse.

MacGrath, Harold (1871–1932), American writer, born in Syracuse, N.Y. He became known as a novelist in 1910. His many books include *The Man on the Box, The Drums of Jeopardy, The Green Stone, Green Complex, The Goose Girl, The Sporting Spinster, The Luck of the Irish* and *The Million-Dollar Mystery.* He also wrote an operetta *The Watteau Shepherdess.*

McGraw, John (1873–1934), American baseball player and manager, born at Truxton, N. Y. He began to play professionally at 17 and had a brilliant career as a third baseman. In 1902 he became manager of the New York Giants.

McGuffey, William Holmes (1800–73), American educator, born near Claysville, Pa., educated at Washington and Jefferson College. He taught in rural schools and became professor of languages at Miami University. He served as president of Cincinnati College and of Ohio University. From 1845 to 1873 he taught at the University of Virginia. He is known as the editor of the McGuffey Eclectic Readers. The First and Second were published in 1836, the Third and Fourth in 1837, the Fifth in 1844 and the Sixth in 1857. For two generations they passed through many editions and were standard textbooks throughout the country. About 122 million copies were sold. They were compilations of stories from many sources; usually they taught some moral lesson. The McGuffey Readers had a tremendous influence on the shaping of the 19th-century American mind.

MACHIAVELLI, NICCOLÒ DI BERNARDO (1469–1527), Italian statesman and writer, born in Florence of a noble family. During the exile of the Medici, he served (1498–1512) as first secretary of the council of the Republic of Florence. His chief literary work was done while he lived in retirement. The best-known of his books is *The Prince,* which is based on the theory that the ruler or prince is justified in taking any steps that will maintain his power, even resorting to deceit and treachery. From this is derived the term *Machiavellian,* meaning crafty or expert in political cunning.

Mack, Connie (Cornelius McGillicuddy; 1862–), American baseball player and manager, born in East Brookfield, Mass. He became a big-league catcher in 1886, with the Washington Club of the National League. He became manager of the Philadelphia Athletics in 1901 and has remained in that post ever since.

Mackensen, von, August (1849–), German general, born in Saxony. He entered the Saxon army in 1869 and saw active service in the Franco-Prussian War. He rose rapidly in the army of the new Empire, becoming head of an army corps. In the World War he served as a general under Hindenburg and commanded the Austro-German divisions in the Carpathians. His successes over the Russians won him promotion to the rank of field marshal in 1915. He led the armies that conquered Serbia and later occupied Rumania. After the war he retired from military service and became leader of an organization of war veterans.

Mackenzie, Sir Alexander (*c.* 1755–1820), Canadian explorer and fur trader, born in Inverness, Scotland. In 1789, under the auspices of the Northwest Company, he started on an expedition from Lake Athabasca to the Arctic Ocean and on this journey discovered the great river that bears his name. Three years later he went westward to the Pacific, ascending the Peace River and crossing the Rockies, to complete the first overland journey across the northern part of North America. His experiences are related in his *Voyages,* published in London in 1801. He served several years in the Legislative Assembly of Lower Canada and was knighted for his services. He returned to Scotland in 1808.

MacKenzie, William Lyon (1795–1861), Scottish-Canadian political agitator, born in Dundee, Scotland. He emigrated to Canada in 1820. His radical speeches in the Legislative Assembly, to which he was elected from York (Toronto) in 1828, caused him to be expelled after each re-election, but he secured a seat in 1834 when his party gained a majority. He took part in the uprising that broke out in 1837 and proclaimed the establishment of a provisional government; when this was crushed he escaped to the United States, where he was arrested and imprisoned. He was permitted to return to Canada in 1849 and again sat in the legislature. During his stormy career he organized and published several periodicals, mostly as a means of spreading his political views.

McKim, Charles Follen (1847–1909), American architect, born in Chester County, Pa. He studied at Harvard and at the School of Fine Arts, Paris. In 1872 he opened offices in New York city, where he was later associated with William R. Mead and Stanford White. McKim's special talent for combining massive effects with decoration was revealed in the Boston Public and Columbia University library buildings; the Pennsylvania Station, Morgan Library and Bowery Savings Bank, in New York; and in the Agricultural Building at the Chicago World's Fair of 1893. He also helped to design the Washington Arch in New York, the Library and Hall of Fame of New York University and several prominent club houses in Manhattan. McKim co-operated with D. H. Burnham and F. L. Olmsted, Jr., in making plans for beautifying Washington, D.C.

McKinley, William (1843–1901), 25th President of the United States, born on January 29 at Niles Center, Ohio. In boyhood he worked in an iron foundry but attended the public schools and for a time was a pupil at an academy in Poland, Ohio. He also studied a year at Allegheny College, Meadville, Pa., which he entered in 1859. He was a teacher at the outbreak of the Civil War, but he resigned to enlist in the Union army. McKinley served with the 23d Ohio Volunteers throughout the war and in 1865 was brevetted major of volunteers. Study of law followed, and in 1867 he became a member of the bar. In 1869, while practicing law in Canton, Ohio, he was elected prosecuting attorney of Stark County, though he ran on a Republican ticket in a county that was normally Democratic.

McKinley showed his aptitude for politics and public speaking during the campaign of 1875, when he helped Rutherford B. Hayes win re-election as governor of Ohio. His own election to Congress took place in the following year. He was repeatedly returned, holding his seat until 1891 except for one brief interval. In 1880 he was appointed to the ways and means committee and became its chairman in 1888. McKinley framed the tariff bill of 1890, which bore his name and won for him national prominence as an advocate of protection. His election as governor of Ohio followed in 1891 and re-election in 1893.

He was nominated for the Presidency on the first ballot at the Republican convention of 1896. His Democratic opponent was the "boy orator of the Platte," William Jennings Bryan. McKinley conducted his campaign from the porch of his home in Canton and delivered many speeches denouncing Bryan's free-silver platform. Bryan won more than 6,500,000 popular votes but was defeated by an electoral vote of 271 to 176. Though McKinley had at one time favored bimetallism, he had become a convert to the gold standard, and the election was won chiefly on that issue. He was again elected in 1900, defeating Bryan. Notable events of the McKinley administration were the Spanish-American War, which made the Philippines, Puerto Rico and Guam American possessions; the annexation of the Hawaiian Islands; the first conference of The Hague Tribunal; the Boxer Rebellion in China; and the passage of the tariff bill. On September 6, 1901, the President was shot by an anarchist, Leon Czolgosz, during a public reception at the Pan-American Exposition in Buffalo. He died 8 days later. He was succeeded by the Vice-President, Theodore Roosevelt.

MacLeish, Archibald (1892–), American poet, born at Glencoe, Ill., educated at Yale, Harvard and Tufts. He is perhaps best-known for his poem *Conquistador,* which won the Pulitzer Prize in 1932. Among his other poetic works are *The Pot of Earth, Streets in the Moon* and *Union Pacific—A Ballet.* He wrote two plays, *Panic* and *Nobodaddy* and contributed to many magazines, especially *Fortune.* In 1939, he was appointed Librarian of Congress.

MacLeod, John James Rickard (1876–1935), British physiologist, born in Dunkeld, Scotland, and educated at the University of Aberdeen. He held a post in biochemistry at London Hospital and then became professor of physiology at Western Reserve University, Cleveland, Ohio. In 1917 he was appointed to the chair of physiology at Toronto University. There MacLeod and Banting discovered insulin as a treatment for diabetes. They shared the Nobel Prize for medicine in 1923. MacLeod is the author of *Diabetes, Physiology and Biochemistry in Modern Medicine* and many magazine articles.

MacMahon, de, Marie Edmé Patrice Maurice, Count (1808–93), French marshal and President of the Republic. In 1859 he defeated the Austrians at the battle of Magenta and was created marshal of France and duke of Magenta. In the Franco-German War he was in command of the army that was defeated at Sedan. In 1871 he led the Army of Versailles in the battle that wrested Paris from the Commune; and in 1873 he was elected President of France to succeed Thiers. MacMahon resigned in 1879 and retired to private life. During his administration there was a constant struggle between the republican and monarchical factions, and his actions aroused a good deal of hostility.

McMaster, John Bach (1852–1932), American historian, born in Brooklyn, N.Y., and educated at the College of the City of New York. He was a civil engineer at the beginning of his career and taught civil engineering at Princeton in 1877. In 1883 he became professor of American history at the University of Pennsylvania and remained there for 37 years. His greatest writing is the 8-volume *History of the People of the United States,* covering the period from the Revolution to the Civil War. One of his last works was a narrative of Lincoln's administration, published in 1927.

MacMillan, Donald Baxter (1874–   ), American Arctic explorer, born in Provincetown, Mass. He was graduated from Bowdoin College in 1898 and completed postgraduate courses there and at Harvard. He became a member of the Peary North Pole Expedition of 1908 and organized many independent expeditions thereafter. His explorations covered the Hudson Bay region, the Kane Sea glaciers, Labrador and Greenland. He added much to scientific knowledge of the Arctic region. His expedition of 1925 was the first to make use of airplanes in the far North. MacMillan wrote *Four Years in the White North, Etah and Beyond* and *Kahda.*

MacMonnies, Frederick William (1863–1937), American sculptor and painter, born in Brooklyn, N. Y. He began to study under Saint-Gaudens in 1880, at the same time attending night classes at the New York Academy of Design and the Art Students' League. Later he studied in Munich and Paris. He first won fame for his colossal fountain at the Chicago World's Fair (1893). Among numerous other notable works are his statue of Sir Henry Vane, Boston Public Library; a statue of Shakespeare in the Library of Congress, Washington; the *Pioneer,* a monument at Denver; and the group *Civic Virtue,* City Hall Park, New York.

MacSwiney, Terence James (1880–1920), Irish patriot, born in Cork and educated at the Christian Brothers' school in that city. After he became prominent in the Sinn Fein movement his life consisted mainly of arrests, the first being in May 1916. He became lord mayor of Cork upon the death of Mayor MacCurtain; but on August 12, 1920, he was arrested and sentenced by court-martial to 2 years' imprisonment for possessing seditious documents. Soon after the sentence was passed MacSwiney went on a hunger strike at Brixton Prison, London, and on October 25 he died of starvation, having fasted 74 days. The Sinn Fein authorities publicly announced the abandonment of the hunger strike as a weapon in November 1920.

Madero, Francisco Indalegio (1873–1913), President of Mexico and revolutionary leader, born in San Pedro, Coahuila. He became a leader of the liberal movement opposed to the dictatorship of Diaz. In 1910 he was nominated for the Presidency by the National Democratic party, but Diaz had him arrested and kept him in prison until it was impossible for him to be elected. After his release he issued a reform plan and urged the people to revolt. He fled to the United States, but his followers overthrew the government. He returned and was elected President without opposition, in 1911. Constantly hampered by the Congress and by revolts he was displaced by General Huerta early in 1913. Madero was arrested and killed. It is generally believed that a group of Huerta's men assassinated him.

Madison, James (1751–1836), 4th President of the United States, born in Port Conway, Va. He entered the College of New Jersey (Princeton) in 1769, was graduated in 1771 and then studied theology, history and law at the college and at home. His public career began in 1774 when he was appointed a member of his country's Safety Committee. In 1776 he served on the Virginia constitutional committee with Jefferson and supported Jefferson's plea for religious toleration. He was elected to the first State Assembly in 1777 and in 1780 represented Virginia in the Continental Congress. To this body he was returned in 1787 and in that year was instrumental in calling the Constitutional Convention at Philadelphia. He was the author of the Virginia plan, which formed the basis for many sections of the Federal Constitution drawn up by the Convention. He then wrote many pamphlets, urging ratification of the Constitution. About a third of the papers collectively known as *The Federalist* are his. His notes on the debates of the convention have been preserved and are source material of the greatest value.

Madison was elected to the first House of Representatives as a Federalist and served throughout Washington's administration (1789–97). He gradually drew away from his party and became a leader of the Jeffersonian group, called *Republicans* at that time. In the House he was prominent in bringing about the adoption of the first 10 amendments. When John Adams was elected President, Madison retired to his home in Virginia. He wrote the Virginia Resolutions protesting against the Alien and Sedition Acts and in 1799–1800 served in the Virginia legislature. In 1801, after Jefferson became President, Madison entered the Cabinet as secretary of state and in 1809 was himself elected President. Madison lost many of his followers during the War of 1812, for he was essentially a man of peace and not very successful as a war president; however, he was re-elected for a second term a few months after war was declared. Several American defeats on land and the burning of the Capitol in Washington increased his unpopularity. The war ended when the Treaty of Ghent was signed in December 1814. Madison then adopted some of the Federalist principles. He supported the second Bank of the United States, proposed a protective tariff and advocated a system of new roads and canals. At the close of his second term he retired to Montpelier, his estate in Virginia. He interested himself in education and agriculture and in 1829 was a delegate to the state constitutional convention. His home life was made delightful by the social talents of his charming wife, Dolly (Dorothy) Payne Todd Madison. Mrs. Madison had a prominent part in the social functions at the White House. She acted as first lady during Jefferson's administration as well as for her husband's terms.

Maecenas, Gaius Cilnius (*c.* 70–8 B.C.), Roman statesman, remembered especially for his patronage of literature. After the assassination of Caesar (44 B.C.) he rose to prominence in the service of Octavian. When Octavian became emperor, Maecenas was appointed administrator of Italy. In his later years he had a luxurious home on Esquiline Hill, where he entertained literary men, notably Virgil and Horace.

Maeterlinck, Maurice (1862–   ), Belgian dramatist and essayist, born in Ghent. He studied at the College of Saint-Barbe and the University of Ghent. In 1887 he began the practice of law but soon turned to writing. In 1911 he received the Nobel Prize for literature. A distinctive feature of his work is a mystical and fatalistic strain. His best-known play is *The Blue Bird,* a work of idyllic beauty. Other plays include *The Blind, The Intruder, Sister Beatrice, The Betrothal, Pelleas and Melisande* and *Monna Vanna. The Life of the Bees* is representative of the author's work as an essayist, which has received high praise from critics. *The Life of Space* is a discussion of the fourth dimension, written from the standpoint of a philosopher.

Magellan, Fernando (Port., Fernão de Magalhães; *c.* 1480–1521), Portuguese navigator, the first European to cross the Pacific Ocean. His renown rests chiefly on the fact that on his last voyage one of his ships made the first complete circumnavigation of the globe. In spite of his good reputation in Portugal he had been unable to obtain backing there for a projected voyage to the East Indies, which he hoped to reach by sailing westward. He was more successful at the Spanish court; and in August 1519 under the auspices of Charles V of Spain Magellan's fleet of five vessels started from St. Lucar, Spain. Overcoming storms, threatened mutiny and other difficulties, the navigator discovered in October 1520 the strait now named for him. In November he entered the Pacific Ocean, which he named. In March 1521 he reached the Ladrones and then spent some time in the Philippines. In April he was killed in battle on Mactan island, through the treachery of a native ruler whom he had trusted. One vessel, the *Vittoria,* reached Spain in September 1522, completing the first voyage around the world.

Mahan, Alfred Thayer (1840–1914), American historian, born at West Point, N.Y., the son of a professor in the U.S. Military Academy. He himself was graduated from the Naval Academy, Annapolis, in 1859, and served in the Civil War with blockading squadrons in the South Atlantic and the Gulf of Mexico. He reached the grade of captain in 1885, was chosen president of the Naval War College at Newport in 1886 and in 1896 retired from active service. During the Spanish-American War in 1898 he became a member of the naval board of strategy. In 1906 he was appointed a rear admiral on the retired list. Mahan's several books dealing with the effect of the sea power of nations had wide influence.

Mahomet, see *Mohammed.*

Maintenon, de, Françoise d'Aubigné, Marquise (1635–1719), the second wife of Louis XIV of France. She was left an orphan at 16 and married Paul Scarron, poet, novelist and dramatist. Though he was crippled and deformed, his home was the rendezvous of the intellectual circle of Paris. After Scarron's death she received a pension from the king, in whose household she became a governess in 1669. Louis made her a marquise in 1678, and in 1684 they were privately married. She had great influence over the king and was responsible for the improvement in the moral tone of his court.

Malory, Sir Thomas (d. 1470), English writer. He appears to have been also a politician and a soldier. His *Morte d'Arthur* is one of the treasures of English literature. He evidently collected the legends about Arthur and his knights and arranged them in an orderly way. The book was finished in 1469 and was first printed by Caxton in 1485.

Malpighi, Marcello (1628–94), Italian physiologist. He taught medicine at Bologna, Pisa and Messina; in 1691 he became physician to Pope Innocent XII. Malpighi is noted as the founder of microscopic anatomy and is also famous as the first to prove the existence of capillary circulation. He described the structure of the human lung and secreting glands and added to knowledge of the kidney, spleen and brain. He studied the cell structure of plants and gave excellent descriptions of all his findings in several memoirs.

Malthus, Thomas Robert (1766–1834), English economist. He became a curate in 1797. In 1798 he published anonymously his *Essay on the Principle of Population,* which set out to prove that increase of population is dependent upon the presence of warmth and food and may only be checked by the lack of these things or by such positive checks as disease, epidemics, wars and plagues. In 1805 he was appointed professor of political economy at Haileybury College, near London. He also wrote *Principles of Political Economy* (1820).

Manet, Edouard (1832–83), French painter, born in Paris, where he began his art studies under Couture. After visiting several other European art centers to study the old masters, he settled in Paris and became the greatest exponent of the Impressionist school. His work aroused much hostile criticism and was frequently excluded from the Salon. Manet and his followers were thus obliged to exhibit their work in independent art circles. Manet did much to revitalize modern painting. His works include *Olympia, Music at the Tuileries, The Guitar Player, The Garden* and *Bar at Folies-Bergère.*

Mann, Horace (1796–1859), American educator, born in Franklin, Mass. He was graduated from Brown University in 1819 and in 1823 was admitted to the bar. He sat in the Massachusetts Legislature from 1827 to 1837 and there attracted notice through his criticisms of the state public-school system. In 1837 he began 8-years' service as secretary of the State Board of Education. He stirred the country to the development of a better public-school system and was influential in the establishment of the first normal school, at Lexington, Mass. Mann was in Congress from 1848 to 1853; in the House he was active in the antislavery movement. He became president of Antioch College in 1852.

Mann, Thomas (1875–), German writer, born in Lübeck. He studied at the University of Munich and began his literary career in that city as a staff writer for *Simplicissimus,* a humorous weekly. In 1901 he published his first novel *Buddenbrooks.* The books that followed include *Tonio Kröger, Unordnung und Frühes Leid, The Magic Mountain, Royal Highness, Joseph and His Brothers* and *Joseph in Egypt.* Mann was awarded the Nobel Prize for literature in 1929. His work is characterized by finish of style and power of observation. He left Nazi Germany in 1934.

Manning, Henry Edward (1808–92), English cardinal, born in Hertfordshire. He studied at Balliol College, Oxford, was made rector of Lavington in 1834 and archdeacon of Chichester in 1841. Manning was attracted by the Oxford Movement and in 1851 joined the Church of Rome. He was ordained priest and worked as chief of the oblates of St. Charles at Bayswater, London. He was assistant to Cardinal Wiseman and succeeded him in 1865 as archbishop of Westminster. In 1875 he was made a cardinal. He did great work in London in behalf of temperance, education and the social improvement of the masses.

Manning, William Thomas (1866–), American bishop, born in England, brought to the United States at the age of 10. He was educated at the University of the South and was ordained a priest in 1891. He held many church posts in various parts of the country, taught theology at his *alma mater* and from 1908 to 1921 was rector of Trinity Parish, New York city. In 1921 he was consecrated bishop of the New York diocese. Four years later he began a campaign to raise funds for the building of the Cathedral of St. John the Divine.

Mansfield, Katherine (Kathleen Beauchamp; 1890–1923), English writer, born in New Zealand. In 1913 she married John Middleton Murry, a literary critic. She spent most of her life in France, fighting against the tuberculosis that caused her early death. Her short stories are regarded as models: one of them, "The Fly," is considered among the best ever written. They have been collected under the titles *In a German Pension, Bliss, The Garden Party* and *The Dove's Nest.* She wrote also a book of poems.

Mansfield, Richard (1857–1907), American actor, born in England. He studied painting and worked as a clerk in Boston, but returned to England and made his theatrical debut as a singer in Gilbert and Sullivan operas. In 1878 he appeared on the New York stage in the opera *Les Manteaux Noirs* and a few years later entered the regular dramatic field, winning great popularity in tragic and romantic roles. Among his successes were leading parts in *Dr. Jekyll and Mr. Hyde, Beau Brummell, The Scarlet Letter, Monsieur Beaucaire, Julius Caesar* (in which he played Brutus), *Cyrano de Bergerac, Richard III* and *Merchant of Venice.* He was one of the great actors of his day, popular in both England and the United States.

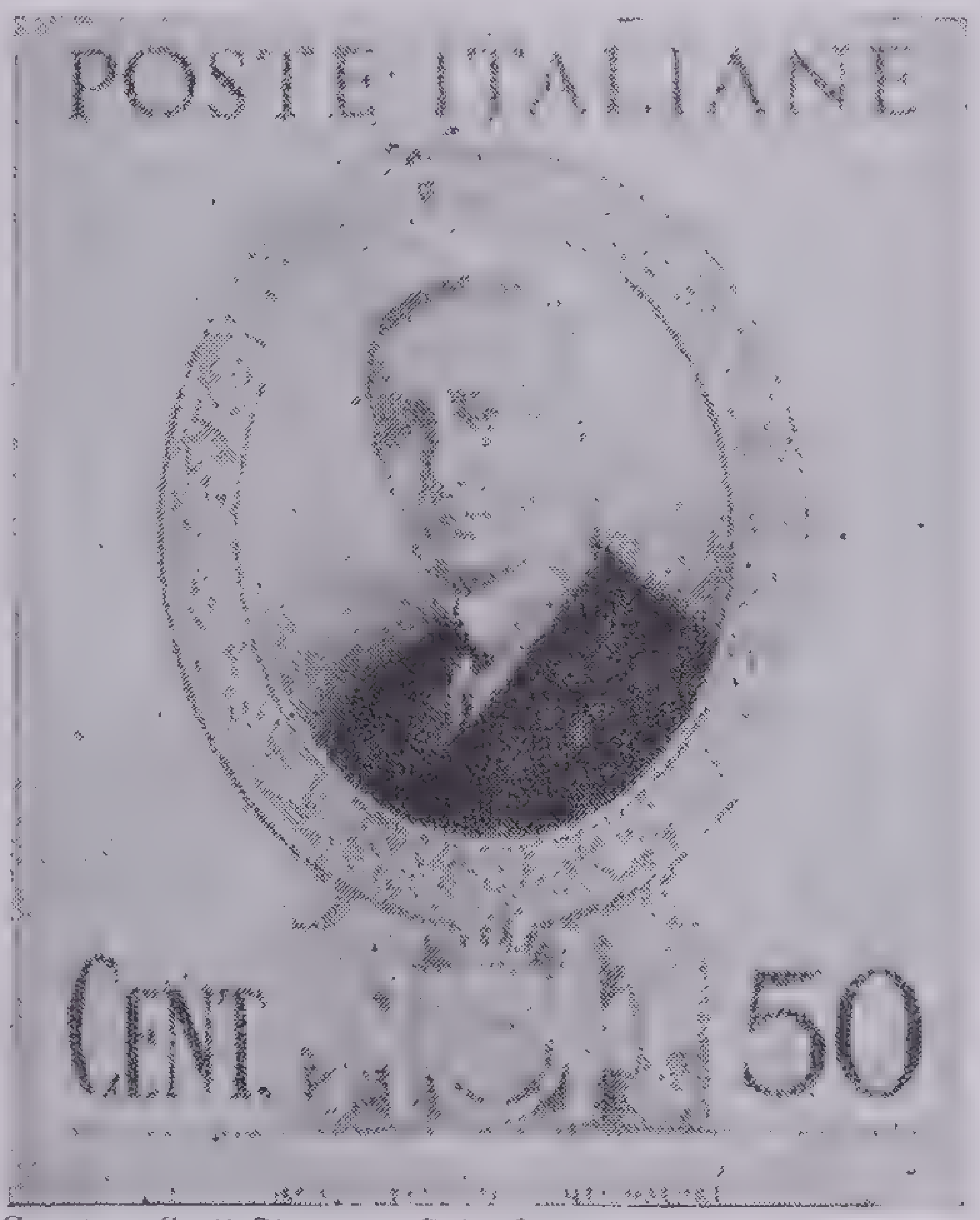
Manship, Paul (1885–), American sculptor, born at St. Paul, Minn., studied art in the United States and abroad. Among his best-known works are *Centaur and Dryad, Little Brother* and *Pauline* (Metropolitan Mus., N.Y.); *The Infant Hercules* fountain in Rome; *Indian and Pronghorn Antelope* and *Dancing Girl and Fauns* (Art Institute, Chicago). Manship follows the classical traditions, but his work has a feeling of modernity.

Mantegna, Andrea (1431–1506), Italian painter. He established a studio in Padua when he was 17 and remained there until 1459. After that he lived mostly in Mantua, where he was under the patronage of the court. Mantegna's work greatly influenced later artists. His numerous paintings include *The Triumph of Caesar, Agony in the Garden* and *Man of Sorrows.*

Manutius, Aldus (1450–1515), Venetian printer. He was himself a scholar and became interested in printing as a means of providing books for other scholars. At the age of 40 he set up a print shop in Venice. His books were small in size and very well designed. He hired the best scholars available—Erasmus was one—as editors and proofreaders. He produced the first edition of Greek and Latin classics, including the work of Aristotle, Demosthenes, Plato and Plutarch. Manutius designed a number of type faces and was the first to use small capitals and italics.

Marat, Jean Paul (1744–93), French revolutionary leader, born near Neufchâtel, Switzerland. He studied medicine, practiced in London and in 1777 settled in Paris. He published a political newspaper in which he attacked the French government, and he was forced to seek refuge in England in 1791. He returned to France the following year and was elected to the Assembly. He then engaged in a bitter struggle with the Girondists that ended in the fall of that party. Charlotte Corday, a Girondist sympathizer, stabbed him to death in his bath.

Marconi, Guglielmo, Marquis (1874–1937), Italian engineer, born in Bologna and educated in Leghorn and at the University of Bologna. He began to experiment with wireless communication in his youth, after Heinrich Hertz had announced his discovery of electromagnetic waves in 1888. By 1890 Marconi had made considerable progress in transmitting signals through the air but was unable to interest the Italian Government in his ideas. He went to England in 1896 and received the first patent for wireless apparatus ever issued. In 1897 the Marconi Wireless Telegraph Company was organized in London, and in 1899 signals were transmitted across the English Channel. In that year wireless was first used for saving life at sea. Marconi's apparatus was so improved by 1901 that messages were being sent across the Atlantic. Transoceanic communication was placed on a commercial basis in 1903. In 1914 he began experiments with short waves, which led to the beam system of long-distance and directed wireless transmission. He shared the Nobel Prize for physics in 1909, was appointed a Senator of Italy for life and in 1929 received the hereditary title of marquis.



Courtesy Scott Stamp & Coin Company

Marquis Guglielmo Marconi

Enlarged from an Italian postage stamp issued after the inventor's death

Marco Polo, see *Polo, Marco.*

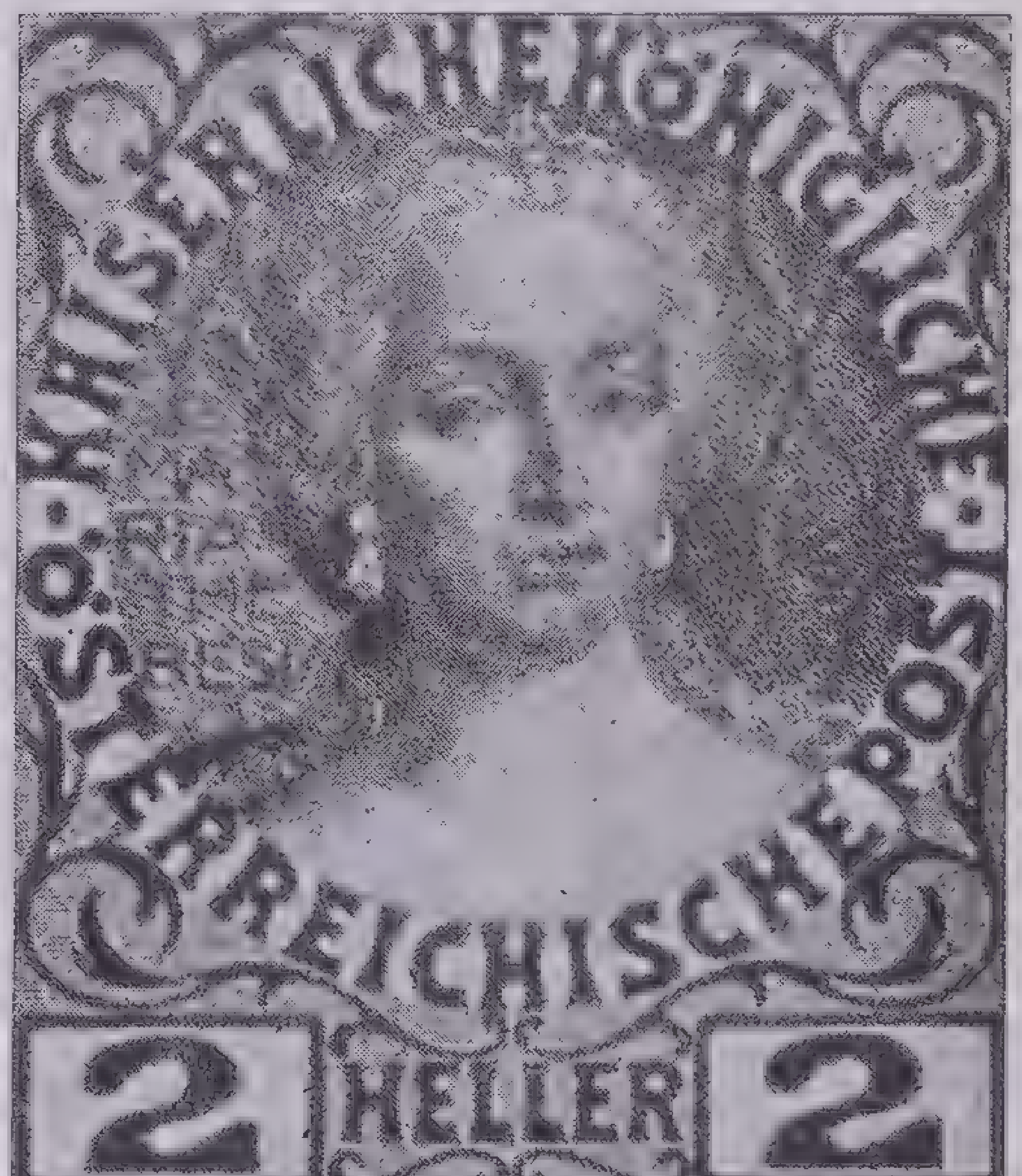
MARCUS AURELIUS ANTONINUS (121–180), Roman Emperor, the son of Annius Verus; he was originally named Marcus Annius Verus but was renamed at the age of 17 when he was adopted by Emperor Antoninus Pius. Marcus Aurelius was made consul in the year 140 and was a trusted official of the emperor, whom he succeeded in 161. Until 169 he shared the government with Lucius Verus, who claimed credit for the victories of the Romans in the Parthian War, the first event of the reign. In 168 Marcus Aurelius led his legions to the Danubian provinces to put down a revolt; this was the first of a series of uprisings that kept the emperor on the field of battle most of the time. His private life was irreproachable and his learning great, although one blot on his record is his merciless persecution of Christians. He wrote a book called *Meditations,* reflecting the Stoic philosophy, that is still regarded as a masterpiece.

Marcy, William Learned (1786–1857), American statesman, born in Southbridge, Mass. He was graduated from Brown University in 1808 and began the practice of law in Troy, N.Y. He fought in the War of 1812 and subsequently became active in state politics. In 1831 Marcy was elected to the U. S. Senate as a Democrat. While he was defending President Van Buren's use of Federal patronage he uttered the now famous remark, "To the victor belong the spoils of the enemy." In 1832 he resigned his seat to become governor of New York, and he held that office until 1838. He became secretary of war in Polk's Cabinet, and in 1853 Pierce made him secretary of state.

Margaret of Anjou (1430–82), Queen of Henry VI of England. She was remarkable for the energy that she put into her husband's cause during the Wars of the Roses. In 1461, however, the Yorkish party was triumphant at Towton, and Edward IV ascended the throne, though Henry VI was still alive. Margaret made several efforts to regain the crown for her family, but her cause was finally lost with the defeat of the Lancastrians, her son being one of those killed. She was imprisoned in the Tower of London for 5 years but was eventually released through the intercession of Louis XI of France. She then returned to France.

Margaret of Denmark (1353–1412), Queen of Denmark, Norway and Sweden, the daughter of Valdemar IV of Denmark. She married Haakon VI of Norway in 1363. Their son Olaf became king of Denmark when Valdemar died; when Haakon died, Olaf also ruled Norway under Margaret's regency. She claimed the Swedish throne as well, defeated the Swedes and took Sweden in 1395. The next year she placed her grandnephew Eric on the Swedish throne. However, Margaret remained the real ruler of all three nations until her death, after which the union fell apart.

Margaret of Navarre (1492–1549), Queen of Navarre, daughter of Charles of Orleans and sister of Francis I of France. In 1527 she became the wife of Henri d'Albret, King of Navarre. Their daughter, Jeanne d'Albret, was the mother of Henry of Navarre, who ruled France as Henry IV. Margaret wrote poetry and prose, and is noted for her *Memoirs* and *The Heptameron.*



Courtesy Scott Stamp & Coin Company

Maria Theresa

Enlarged from an Austrian postage stamp issued in 1908, one of a series depicting the rulers of the Austrian Empire

Maria Theresa, (1717–80), Empress of the Holy Roman Empire, daughter of Charles VI, Holy Roman Emperor, who, as he had no male heir, secured a pledge from the leading European powers that his daughter would be recognized as heiress to the Hapsburg territories. When Charles died in 1740 Maria Theresa became queen of Hungary and Bohemia and archduchess of Austria. Her claims to her father's possessions were disputed by several nations, in spite of their promises, bringing on the 8-year War of the Austrian Succession. The Hungarians supported their queen, and by the Peace of Aix-la-Chapelle (1748) Maria Theresa's titles were recognized, though she lost Silesia to Frederick II of Prussia. Aided by her minister, Kaunitz, she developed her country's agriculture and commerce and introduced financial reforms. In 1756 she renewed the struggle with Frederick II, and the ensuing Seven Years' War (1756–63) exhausted the country without restoring the lost province of Silesia. Joseph II, son of Maria Theresa and Francis I, succeeded his father as Holy Roman emperor in 1765 and in 1772 persuaded his mother to take part in the First Partition of Poland. In 1777 Bukowina was acquired from Turkey. Among the ten surviving children of the empress was Marie Antoinette, Queen of France.

Marie (1875–1938), Queen of Rumania, daughter of the duke of Edinburgh (second son of Queen Victoria) and the Grand Duchess Marie, a Russian princess. She was married in 1893 to Crown Prince Ferdinand of Rumania, who succeeded to the throne in 1914 and ruled until his death in 1927; during these years Marie wielded immense political power. In 1926 she made a tour of the United States and Canada. Her eldest son assumed the crown in 1930 as Carol II, after several years of exile.

Marie Antoinette, Josèphe Jeanne de Lorraine (1755–93), Queen of Louis XVI of France, daughter of Francis I and Maria Theresa. At the age of 15 she married the prince who later became Louis XVI. Soon after Louis's accession in 1774 stories were circulated about her gaiety and extravagance, and she became unpopular with the masses. In 1789 she was mobbed by a crowd of infuriated women who stormed the Palace of Versailles. The royal family moved to the Tuileries in Paris. In June 1791 she persuaded Louis to flee from France, but the fugitives were stopped at Varennes and returned to Paris. During the Revolution the king and queen barely escaped murder at the hands of a mob that attacked the Tuileries. They sought refuge in the Convention Hall but were shortly afterward placed in prison. Marie was regarded as responsible for much of the misery in the land and as the evil genius of her husband, although by no stretch of the imagination could the terrible condition of France be charged against the queen. Her relationship with Austria was disliked. At her trial she defended herself with dignity and spirit, but sentence of death was passed October 16, 1793, and on the same day she was guillotined.

Marie de Médicis (1573–1642), wife of Henry IV of France and queen regent after his death in 1610. She was the daughter of Francesco de' Medici, Grand Duke of Tuscany, and married Henry in 1600. She acted as regent until 1617, when her son Louis XIII assumed control. She was at war with her son from 1617 to 1620 and was forced to go into exile; but in 1622 they were reconciled. In 1630 Richelieu exiled her to Compiègne, whence she escaped to Brussels.

Marie Louise (1791–1847), Empress of the French, daughter of Emperor Francis I of Austria. Napoleon divorced Josephine, because he wanted an heir, and married Marie Louise in Paris in April 1810, after rites by proxy had been held in Vienna. Their son, born in 1811, received the title of Napoleon II, which was destined to be meaningless. He died in 1832. Marie Louise did not go with Napoleon into exile. The Congress of Vienna awarded her the duchies of Parma, Piacenza and Guastalla. She was twice remarried and died in Vienna.

Marion, Francis (1732–95), American general, born near Georgetown, S.C. At the outbreak of the Revolutionary War, he was made captain in Colonel Moultrie's regiment. In 1780 he organized *Marion's Brigade,* a volunteer troop of South Carolina mountaineers, hunters and others. Though poorly equipped and fed they were invaluable in scouting, securing supplies, intimidating the Tories and otherwise harassing the British in the Carolinas. Marion was nicknamed the "Swamp Fox." After the war, he served in the South Carolina senate (1782–90).

Marius, Gaius (*c.* 155–86 B.C.), Roman soldier and statesman. He was of lowly birth and deficient education but won fame as a military leader in the Numantine War. He became consul in 107 B.C. and ended the war against Numidia by capturing its king, Jugurtha. He next crushed the Teutones and Cimbri, who had invaded the Roman realm. Although he was called *the Savior of Rome* and elected consul for the sixth time, his popularity began to wane. In 88 B.C. he involved Rome in civil war by attempting to deprive Sulla of his command in the Mithridatic War. He was forced to flee but obtained help from Cinna, and the two captured Rome while Sulla was away. Marius then ordered a terrible massacre of his enemies, and for 5 days, it is said, 4,000 slaves reveled in the task of slaughter. He died a few weeks after he had been chosen consul for the seventh time.

Markham, Edwin (1852–1940), American poet, born in Oregon City, Ore. He attended normal school and college after a boyhood spent in California as farmer, blacksmith and cattle herder. He began to write poetry at an early age and in 1899 came into world-wide notice as the author of *The Man with the Hoe,* a poem suggested by Millet's famous painting of a laborer bent with toil. The acclaim that greeted this poem caused it to overshadow his later verse, which has genuine merit and human appeal. His books of poems are *Lincoln and Other Poems, Gates of Paradise* and *New Poems* (1932). Markham wrote also a series of articles on child labor, *The Children in Bondage.*

Marlborough, John Churchill, Duke of (1650–1722), English general, born in Devonshire; educated at St. Paul's, London. He was an ensign in the army at 17 and fought against the Moors at Tangier, served under Turenne, the French commander, against the Netherlands and in 1678 was given the rank of colonel. He won favor under James II by his skill in suppressing Monmouth's rebellion. Marlborough supported William III after James fled, and in 1689 William created him earl of Marlborough. In 1701, when the War of the Spanish Succession began, he commanded the British forces in the Netherlands. He did his best work after Queen Anne came to the throne in 1702. His wife Sarah Jennings (1660–1744) was an intimate and influential friend of Queen Anne. He was created a duke, and his great victories at Blenheim, Ramillies, Oudenarde and Malplaquet marked the height of his success.

At home his wealth and unscrupulous acts gained him many enemies, who seized the opportunity afforded by his wife's quarrel with Queen Anne to obtain his recall in 1711. He was charged with embezzling public funds but was not convicted. He was, however, dismissed from office. Marlborough was active in placing George I on the throne and was reinstated for a time. His life was written on a large scale in the 1930s by his descendant Winston Churchill.

Marlowe, Christopher (1564–93), English dramatist, born in Canterbury and educated at Cambridge University. He began his career in London as a writer of tragic dramas. The first of his plays *Tamburlaine the Great* was produced about 1588. Then followed *Doctor Faustus, The Jew of Malta* (based on the story used in *The Merchant of Venice*) and *Edward II.* Marlowe was the first to use blank verse as we understand the term, and his poetry is sometimes very beautiful. His promising career was cut short when he was killed in a quarrel at the age of 29. The well-known phrase, "Marlowe's mighty line," is a tribute to the stateliness of his verse.

Marlowe, Julia (Sarah Frances Frost; 1866–), British-American actress, born in England. She was brought to the United States at the age of 5, and at 12 she left the public schools to join a juvenile light-opera company. After further experience in stock companies she went to New York, where she spent 3 years in study. Miss Marlowe made her metropolitan debut as Parthenia in *Ingomar* (1888). She thereafter won great popularity in Shakespearean and other romantic roles but reached the height of her career in the years following 1910, when she toured the country with her husband, E. H. Sothern. She had previously married Robert Taber, her leading man, in 1894, but they were divorced in 1900. Miss Marlowe's principal roles included Viola, Rosalind, Juliet and Portia. She retired in 1924.

Marquette, Jacques (1637–75), French explorer, born in Laon. In 1666 he went to Canada as a Jesuit missionary to the Indians and in 1668 founded a mission at Sault Ste. Marie. In 1673 he accompanied Joliet on an expedition in search of the Mississippi River. For several years he worked among the Indians around the Great Lakes. In 1675 he was trying to establish a mission among the Illinois Indians, but he had to give up on account of bad health. He died near the present town of Ludington, Mich.

Marquis, Don (Donald Robert; 1878–1938), American author and playwright, born at Walnut, Ill. He conducted widely read newspaper columns in the New York *Sun* and later in the New York *Tribune.* He created a number of amusing characters through which he expressed social and political opinions: Archy the cockroach and Mehitabel the cat were world-famous. Many of his short sketches are collected under the titles *Hermione, The Old Soak's History of the World, Archy and Mehitabel, Chapters for the Orthodox* and *Archy Does His Part.* A successful play *The Old Soak* was based on his book of the same name.

Marryat, Frederick (1792–1848), British novelist. He entered the navy as a midshipman at the age of 14 and was almost constantly in the service until 1830. Marryat reached the grade of captain and received a medal from the Royal Humane Society for saving many lives at sea. He adapted a code of signals to use in the merchant marine. His many books, in which he wrote of his own experiences of the sea, continue to be popular among boys. Some of the best are *Peter Simple, Jacob Faithful, Mr. Midshipman Easy, Masterman Ready* and *The Children of the New Forest.*

Marshall, John (1755–1835), American jurist, born in Germantown, Va. The Revolution interrupted his study of law. From 1775 to 1779 he fought under his father, Col. Thomas Marshall, and rose to the rank of captain. In 1781 he began the practice of law in Fauquier County, Va. During the next few years he served several terms in the state legislature and in 1797 was sent as envoy to France with Pinckney and Gerry to settle the problems created by French restrictions on American commerce. Marshall was elected to Congress in 1799 and in 1800 was appointed secretary of state by President John Adams. In 1801 he began his long career as chief justice of the Supreme Court, serving 34 years with the highest distinction. His decisions did much to strengthen the Federal Government.

Marshall, Thomas Riley (1854–1925), American lawyer and statesman, born in North Manchester, Ind. He was graduated from Wabash College in 1873, became a member of the bar in 1875. He practiced law and became prominent in Indiana Democratic politics. He served as governor of Indiana (1909–13). In 1912 Marshall was elected Vice-President on the ticket with Wilson and was re-elected in 1916.

Martel, Charles, see *Charles Martel.*

Martial (Marcus Valerius Martialis; *c.* 40–*c.* 102 A.D.), Roman writer, born at Bilbilis, Spain. He lived in Rome between the years 64 and 98 and was a favorite of the Emperors Titus and Domitian because of his wit and poetic ability. He wrote epigrammatic short poems about the men and women of Rome. Each verse had a clever thought or a surprising twist. His epigrams are still valuable today for their historical interest.

Martin, Homer Dodge (1836–1897), American painter, born in Albany, N.Y. He spent 5 years in France (1881–86) and came under the influence of Corot and Boudin. His own work represents a blending of the poetical and the natural and shows nature in its more somber moods. His principal paintings include *The Old Mill, Adirondack Scenery, Evening on the Seine* and three in the Metropolitan Museum—*Sand Dunes at Lake Ontario, Harp of the Winds* and *Mounts Madison and Jefferson.*

Martinelli, Giovanni (1885–), Italian tenor, born in Montagnano. He studied under Mandolini and made his debut in 1910 at La Scala, Milan, singing the tenor role in Verdi's *Ernani.* Two years later he appeared in Covent Garden, London. After 1913 he became one of the leading tenors of the Metropolitan Opera House in New York. His repertoire included *Aïda, Samson and Delilah, Pagliacci, Otello* and *Il Trovatore.*

MARX, KARL (1818–83), German economist, born in Treves, Prussia, and educated at Bonn and Berlin universities. While he was in Paris (1843–45), he helped to edit a radical paper to which Friedrich Engels contributed, and the two were later associated in the formation of the Communist League. In 1847, at a radical congress at Brussels, Marx and Engels issued the manifesto that states the aims of the Communists. Marx returned to Germany in 1848, was expelled the next year and spent the rest of his life in London, where he devoted himself to furthering the Socialist cause. The first volume of his famous book, *Capital* (*Das Kapital*), was published in 1867. His ideas are that all wealth is produced by labor and should go to labor, and that since this leaves nothing for the capitalist, who can therefore never accept the system, the worker must prepare for a war in which capitalism will be destroyed.

Mary I (1516–58), Queen of England, daughter of Henry VIII and Catherine of Aragon. She succeeded her half-brother Edward VI in 1553 after an attempt had been made to place Lady Jane Grey on the throne. In 1554 she married Philip II of Spain, but the union was unhappy. Mary Tudor began her reign by repealing the laws directed against the Roman Catholic religion in England. Later she began the persecutions of the Protestants that gave her the name *Bloody Mary*. Through Philip's influence she waged a war with the French in which England lost Calais, its last foothold in France. She was succeeded by Elizabeth.

Mary II (1662–94), Queen of England, daughter of James II and Anne Hyde, whose father was the Earl of Clarendon. At the age of 15 Princess Mary was married to William of Orange. In 1689, after the flight of James, William and Mary were crowned joint sovereigns of England. Mary managed the affairs of state during her husband's frequent absences.

Mary of Guise (1515–60), called *Mary of Lorraine,* daughter of the Duke of Guise. She married Louis of Orleans, Duke of Longueville, who died in 1537. In 1538 she became the wife of James V of Scotland, whose death in 1542 left her with one child, Mary, who later became queen of Scots.

Mary, Queen of Scots (1542–87), also called *Mary Stuart,* the daughter of James V of Scotland and Mary of Guise (or Lorraine). She was only a week old when her father died, but as next heir to the throne she was at once proclaimed queen of Scotland. She was taken to France in childhood and in 1558 was married to the heir to the French throne, who in 1559 became Francis II. After her husband's death in 1561 she returned to Scotland. A stanch Catholic, she was opposed to the Calvinistic movement that had made great headway through the teachings of John Knox. She married her cousin, Lord Darnley, who was jealous of her Italian secretary, Rizzio, and who had him murdered in Queen Mary's presence.

After the birth of their son (the future James I of England) in 1566, Mary and Darnley drifted further apart. In 1567 Darnley was killed by an explosion that blew up the house in Edinburgh in which he lay ill. James Hepburn, Earl of Bothwell, was suspected of committing the murder, and Mary herself aroused added suspicion when she married Bothwell 3 months later. This reckless act caused a revolt among the nobles. They imprisoned Mary, but she escaped and fled to England, where her cousin, Queen Elizabeth, kept her a prisoner for 19 years. In 1587 Mary was tried for complicity in a plot to murder Elizabeth and was executed on a charge of high treason.

Masaryk, Thomas Garrigue (1850–1937), Czechoslovakian statesman, born in Hodonin, Moravia, and educated at the universities of Vienna and Leipzig. He had been a blacksmith before he went to college. Now he was prominent in the literary circles of Bohemia and in 1882 became professor at the University of Prague. He was a member of the Austrian Parliament (1891–93). He was re-elected in 1907 and opposed Germany's policy toward Austria and the aggressive policy of Austria in the Balkans. He organized the Czechoslovakian (Bohemian) movement for independence after the outbreak of the World War, lectured in London and went to Russia to form an army of Slav subjects. He gained the sympathy of foreign nations, and in 1918 the Allies recognized the Czechoslovakian Government. Masaryk was elected president of the republic by acclamation. In December 1935 he resigned the presidential office he had held for 17 years. He wrote *The New Europe* (1918) and *The Making of a State* (1925). He had many friends in the United States, notably President Wilson, and he married an American, whose family name he took as his middle name.

Mascagni, Pietro (1863–), Italian composer, born at Leghorn. While studying for the law he took secret music lessons. He wrote a symphony and other compositions that were produced at the Instituto Luigi Cherubini. They aroused so much attention that he was sent to study at the Milan Conservatoire. He soon left the conservatory, and after a time suddenly achieved a brilliant success with his opera *Cavalleria Rusticana*. His fame was to live by this alone, for none of his later operas was successful. He composed a *Rapsodia Satanica,* an experiment in film opera.

Masefield, John (1875–), English poet and novelist, born in Ledbury. He was only 14 when he ran away to sea, where he worked as a common sailor for many years. This fact probably accounts for the vividness of his *Salt Water Poems and Ballads.* Fame came to him through *The Everlasting Mercy* (awarded the Edmond de Polignac Prize in 1912), *The Widow in the Bye Street, Dauber* and *The Daffodil Fields.* In 1930 he was appointed poet laureate. Masefield has also written dramas and a good deal of prose. His dramas include *Pompey the Great, The Faithful* and *Good Friday.* Among his novels are *Captain Margaret, Sard Harker* and *The Hawbucks.* He wrote two remarkable books on Shakespeare.

Massasoit (*c.* 1580–1661), American Indian chief. He ruled the Wampanoag Indians in the southern part of Massachusetts when the Pilgrims landed at Plymouth Rock. He visited the colony with 60 warriors in March 1621 and made a treaty of peace and friendship that was kept for half a century. He lived on the site of the present town of Warren, R.I., and here befriended Roger Williams after Williams was banished from Massachusetts.

Massenet, Jules Émile Frédéric (1842–1912), French composer, born in Montaud and educated at the Paris Conservatory, where he won prizes in piano playing and composition. After studying under Ambroise Thomas, Massenet won the Grand Prize of Rome in 1863. He became professor of advanced composition at the Paris Conservatory and made a successful tour of Great Britain (1878). His operatic works are noted for their melodious arias and ensembles; some of them are among the most popular of the operas heard today. Among them are *Herodiade, Manon, Thaïs, Sapho* and *Le Jongleur de Notre-Dame.* He also wrote orchestral suites, oratorios and popular melodies.

Masters, Edgar Lee (1869–), American author, born at Garnett, Kan. He attended Knox College, studied law, was admitted to the bar in 1891 and practiced in Chicago. He became active as a writer after 1898. *Spoon River Anthology* (1915) is his greatest work. It consists of some 200 tombstone epitaphs in free verse, purporting to be honest confessions of those who have died. Among his later books of verse are *Songs and Satires; Starved Rock; The New Spoon River; Lee, a Dramatic Poem* and *The Fate of the Jury. Mitch Miller* and *Skeeters Kirby* are novels. Two of his finest short poems (in *Songs and Satires*) are "Silence" and "All Life is Life."

Mather, Cotton (1663–1728), American clergyman and author, son of Increase Mather, born in Boston. He was graduated from Harvard when he was only 15, and 2 years later he became his father's assistant at North Church, Boston, assuming full charge during the father's absence in England. Mather was known as a linguist and published an enormous number of books. Among them are his *Ecclesiastical History of New England* and a book on witchcraft, which helped to bring on the persecution of "witches" in Salem. He was interested in science and advocated inoculation against smallpox. He helped to found Yale University.

Mather, Increase (1639–1723), American clergyman, born in Dorchester, Mass. He was graduated from Harvard College in 1656, followed his father's calling and for nearly 60 years was pastor of North Church, Boston. During the years 1685–1701 he also served as president of Harvard. He was important in matters of state. The people of Massachusetts sent him to England in 1688 to secure a charter, which William III granted. He was the author of books on colonial history and theology.

Matisse, Henri (1869–), French painter, sculptor and lithographer, born at Cateau. He became the leader of a new school of art, rejecting classic principles and scorning the Impressionists, who were then considered daringly revolutionary. Matisse took his inspiration from the art of primitive peoples. He used bright colors in large unbroken planes. The watchwords of his method were "Simplification, organization and expression."

Matthews, Brander (1852–1929), American author and critic, born in New Orleans and educated at Columbia University. He left law practice for literature and teaching and served as professor of literature at Columbia from 1892 to 1900 and from 1900 to 1924 held the chair of dramatic literature in that university. He became a recognized authority in the field of dramatic criticism and wrote *Margery's Lovers* and other plays, short stories and books on language. He was a prominent advocate of simplified spelling. His numerous books include *Americanisms and Briticisms, Essays on English, Molière: His Life and Work* and *Introduction to the Study of American Literature.*

Maugham, William Somerset (1874–), English writer. He studied medicine but never practiced. His experiences in medical school are reflected in his books, *Liza of Lambeth* and *Of Human Bondage. Moon and Sixpence* is based on the life of the French painter Gauguin. Many of his stories are laid in the South Seas or Far East. *The Trembling of a Leaf* included a story later dramatized as *Rain.* Maugham's own successful plays are *Our Betters, The Circle, The Constant Wife* and *The Letter.* His *Cakes and Ale* was a much discussed novel based partly on the life of Thomas Hardy.

Maupassant, de, Henri René Albert Guy (1850–93), French novelist, born in Normandy. He began life as a clerk in the Navy Department but was inspired to write through the influence of Flaubert. His genius won general recognition in 1880 when *A Ball of Tallow,* a short story, appeared. His best-known books are *La Maison Tellier, Une Vie, Bel-Ami* and *Pierre et Jean.* Maupassant's work has great strength because of his powers of observation and his ability to portray what he saw with stark realism. Many of his stories are the result of his experiences as a soldier in the Franco-Prussian War. He became insane in 1892.

Maurois, André (André Herzog; 1885–), French writer, born in Elbeuf. His best-known works are his biographies of Shelley (titled *Ariel*), Byron, Disraeli and Voltaire. He also wrote literary criticism.

Maury, Matthew Fontaine (1806–73), American naval officer, born in Spottsylvania, Va. In 1825 he entered the navy as a midshipman. In 1841, after his leg was broken and he was permanently lamed, he was appointed supervisor of charts and instruments in the Navy Department and was active in organizing the Naval Observatory and the Hydrographic Office. In 1853 he received the rank of commander. Maury aided the Confederate cause in the Civil War as head of the coast defenses. After the war, he went to Mexico to serve as commissioner of immigration under the Emperor Maximilian. He was later professor of physics at Virginia Military Institute. He published textbooks on geography.

Maxim, Sir Hiram Stevens (1840–1916), American-British inventor, born in Sangerville, Me. He early showed mechanical ability and at the Paris Exposition of 1881 exhibited several electrical devices. He went to England in 1881 and developed his famous automatic gun, which is loaded and fired by the energy of its own recoil. He also invented explosives and ordnance materials, a smokeless powder and an apparatus for defense against poisonous gases. Maxim became a British subject and in 1901 was knighted.

Maxim, Hudson (1853–1927), American chemist, born in Orneville, Me. He established a factory for the manufacture of ordnance and explosives, made the first smokeless powder developed in the United States and in 1901 prepared the formula for a high explosive called *maximite.* At the age of 22 he formulated a theory of the compound nature of atoms.

Maximilian I (1459–1519), Holy Roman Emperor, son of Frederick III. In 1477 he married Mary, daughter of Charles the Bold, Duke of Burgundy. When Charles died, Maximilian was attacked by Louis XI of France, who claimed part of Mary's inheritance. In 1482, by the Treaty of Arras, Louis received Burgundy and other French territory, and Maximilian kept most of the Netherlands. He was elected king of the Romans in 1486 and succeeded his father as emperor in 1493. Much of his reign was occupied with warfare against the French and the Turks. In 1499 the Swiss won their independence from him. By the marriage of his son Philip to Juana of Spain, he brought about the succession of the Hapsburgs to the vast Spanish dominions. The marriage of his grandson Ferdinand to Anna of Hungary brought in Hungary and Bohemia.

Maximilian (Ferdinand Maximilian Joseph; 1832–67), Emperor of Mexico, a son of Francis Charles, Archduke of Austria. His elder brother, the Emperor Francis Joseph made Maximilian governor of Lombardy and Venetia, then Austrian possessions. In 1863 Napoleon III thought of conquering Mexico and setting up an empire and offered the crown to Maximilian, who went to Mexico in 1864. When the French troops left Mexico in 1866, the Empire fell to pieces. Maximilian tried to form a native army for his own defense, but he was captured and executed by the republicans.

MAXWELL, JAMES CLERK (1831–79), British physicist, born in Edinburgh, educated at the University of Edinburgh and at Cambridge. In 1871 he became first professor of experimental physics at Cambridge, and while there he published his greatest book *Electricity and Magnetism.* Maxwell also contributed much to knowledge of heat, color perception and color blindness and the kinetic theory of gases. He is famous for his theoretical demonstration that light waves are electromagnetic. This and his ideas about electromagnetism in general led to much experimentation by many other scientists that finally resulted in radio communication.

May, Thomas Erskine, 1st Baron Farnborough (1815–86), English jurist and writer, born in London. His *Treatise on the Law, Privilege* and *Proceedings and Usage of Parliament* have been translated into several languages; his *Constitutional History of England* (1760–1860) is a continuation of Hallam's; and his *Democracy in Europe* shows great learning and impartiality. On his retirement as a judge he received the title Baron Farnborough.

Mayo, Charles Horace (1865–1939), American surgeon, born in Rochester, Minn. He received his medical degree at Northwestern University in 1888 and began practice in his home city. With his brother William he established the Mayo Foundation for Medical Education and Research in 1915, the brothers giving $1,500,000 toward the endowment. The Foundation became a department of the University of Minnesota. During the World War, in which he held the rank of colonel, he was chief consultant for all surgical devices, alternating with his brother in the work.

Mayo, William James (1861–1939), born at LeSueur, Minn. He received his medical degree at the University of Michigan in 1883 and established himself in Rochester, where he was joined by his brother in establishing the Mayo Foundation. He and his brother both received the United States Distinguished Service Medal, as well as numerous other honors at home and abroad.

Mazarin, Jules (1602–61), Italian cardinal and diplomat, born in Piscina, educated at the Jesuit College in Rome and the university in Alcala, Spain. He went to Paris to represent the Pope on a diplomatic mission and attracted the notice of Richelieu, who recommended him to Louis XIII, whose chief minister he became. Mazarin was later naturalized, and he retained his power under Louis XIV. He was made a cardinal in 1641 and brought the Thirty Years' War to a successful conclusion with the Treaty of Westphalia in 1648. The Mazarin Bible, so called because a copy was found in his library about 1760, is the first Gutenberg Bible printed from movable type.

Mazeppa, Ivan Stefanovitch (*c.* 1640–1709), Cossack trader, born in the province of Kiev, Russia, of a noble Polish family. While a page in the service of the king of Poland Mazeppa incurred the ill will of a Polish nobleman who had him stripped and bound to the back of a horse. He was thus carried to his own province, from which he fled in shame to the Ukraine. He became a leader of the Cossacks and rose to distinction under Peter the Great but deserted the czar's service for that of Charles XII of Sweden. Mazeppa took part in the battle of Poltava in 1709 and fled with his defeated master to Turkey, where he soon died. He is the hero of Byron's well-known poem, *Mazeppa.*

Mazzini, Giuseppe (1805–72), Italian patriot and author, born and educated in Genoa. He became a lawyer but soon began revolutionary activities. He was expelled from Italy in 1830 and lived in exile for several years in France, Switzerland and England, meanwhile carrying on an agitation for a united Italy. In 1831 he organized the society called *Young Italy.* For forty years (1830–70) he kept in close touch with the Italian patriots and vigorously supported Garibaldi and Cavour. He was one of the triumvirs of the short-lived Roman republic of 1849. Mazzini died knowing that Italy was united.

Mc, see under *Mac.*

Meade, George Gordon (1815–72), American soldier, born in Cadiz, Spain, of American parents. He was graduated from West Point in 1835. He served in the Seminole War, engaged in civil engineering for several years and again saw active service in the Mexican War. In the Civil War, as brigadier general of volunteers, he fought with distinction at Mechanicsville, Gaines's Mill, in the Peninsula campaign, at Bull Run and at Antietam and was promoted major general. He took part in the battles of Fredericksburg and Chancellorsville, and just before the engagement at Gettysburg he took Hooker's place as commander of the Army of the Potomac, with which he won the battle of Gettysburg. He served under General Grant during the last year of the war. His promotion to major general in the regular army followed.

Mechnikov, see *Metchnikoff, Élie.*

Medici, de', Lorenzo I (1449–92), ruler of the Florentine republic, a prominent member of a celebrated family that exercised great influence in Italy and other European countries. Lorenzo and his brother Giuliano became leaders of the Florentine state in 1469. In 1478 a conspiracy was formed by the Passi, another powerful family, which resulted in Giuliano's assassination. Lorenzo was wounded but lived to crush his opponents, among whom was Salviati, Archbishop of Pisa. He fully earned the epithet *Lorenzo, the Magnificent* by the way he spent his great wealth in beautifying Florence and encouraging artists and poets. The Laurentian Library, founded by his grandfather, was enriched with priceless classical manuscripts. Lorenzo was one of the great figures of the Italian Renaissance.

Meer, van der, Jan, see *Vermeer, Jan.*

Mehemet Ali (1769–1849), Turkish soldier, born in Macedonia. He became pasha of Egypt in 1805 after he had taken a prominent part in expelling the French under Napoleon. Though forced to acknowledge the nominal authority of the sultan, he exercised independent power and did much to develop the country. In 1811 he crushed the Mamelukes by a general massacre at Cairo and for several years thereafter warred against the Wahabis in Arabia. He conquered a good part of Arabia and part of the Sudan and helped the Turks in their struggle with the Greeks. In Egypt he remained powerful until he became insane in 1848. His adopted son, Ibrahim Pasha, succeeded him.

Meighen, Arthur (1874–   ), Canadian statesman, born in Anderson, Ontaria. He was graduated from the University of Toronto in 1896, practiced law and in 1908 entered the Canadian Parliament as a Conservative. Between 1913 and 1920 he held many important government positions and in 1920 succeeded Sir Robert Borden as premier of Canada. He went out of office in 1921 and again assumed the premiership in 1926 but could not command a majority over the Liberals, who were returned to power after a few months.

Meissonier, Jean Louis Ernest (1815–91), French painter, born in Lyons. He spent most of his life in Paris, where he studied art. He fought under Napoleon III and during the Franco-Prussian War was lieutenant colonel of artillery in the National Guard. Meissonier was the leader of a school of artists who painted each detail with absolute realism, even showing variations of facial expression. His chief military pictures include *Friedland, Cavalry Charge* and *Napoleon and His Staff in 1814.*

Melanchthon, Philipp (1497–1560), German reformer, born in Bretten, Baden. His family name was *Schwarzerd* (Blackearth), which in Greek becomes Melanchthon. He took his bachelor's degree at Heidelberg in 1511, at the age of 17 received his master's degree at Tübingen and became professor of Greek at the University of Wittenberg in 1518. The Augsburg Confession, official statement of the Protestant position, was drafted by him in 1530. Melanchthon tried to reconcile the ideas of the Calvinists, Lutherans and moderates, and he died praying that the churches might be "of one mind in Christ."

Melba, Nellie (Helen Porter Mitchell; 1861–1931), Australian singer, born in Melbourne. She received her first musical training in her native city, then studied in Paris and made her operatic debut in Brussels (1887) as Gilda in *Rigoletto.* She gained international fame in concert and in opera and was a favorite with American audiences. She was made a *Dame of the British Empire* for nursing and singing to the wounded during the World War. She published *Melodies and Memories.*

Mellon, Andrew William (1855–1937), American financier, born in Pittsburgh, Pa., educated at Western University (University of Pittsburgh). He expanded the fortune left by his father, Judge Thomas Mellon, and became one of the nation's leading financiers and industrialists. He developed coal, coke and iron corporations, controlled the aluminum trust and oil companies and was a leading banker. In 1921 he resigned as president of the Mellon National Bank to be appointed secretary of the treasury by President Harding. He held this office in the Coolidge and Hoover administrations and in 1932 was appointed ambassador to Great Britain. In the last months of his life he directed the establishment of a national gallery of art in Washington, which he presented to the United States.

Melville, Herman (1819–91), American author, born in New York city. He went to sea in a whaler when 17, deserted twice, was captured by cannibals in the South Seas and eventually joined a man-of-war. He returned to Boston in 1844 and began writing. His books *Typee* (1846) and *Omoo* (1847) are tales of life among the cannibals. In 1850 came *White Jacket,* which tells of his experiences as a sailor. It helped to abolish flogging in the navy. In 1851 appeared his masterpiece, *Moby Dick,* a tale of the sea and whaling. His "Benito Cereno" is considered one of the world's great short stories.

Memling, Hans (1430–95), Flemish painter. Little is known of his life, except that he was chiefly active in Bruges. Memling's principal paintings are on sacred themes; they include several for the Hospital of St. John in Bruges, notably *Marriage of St. Catharine, Adoration of the Magi* and *Shrine of St. Ursula.* He was also a master of portraiture.

Menander (*c.* 343–291 B.C.), Athenian poet. He studied drama under Alexis, his uncle, who was a leading writer. Menander was closely associated with Theophrastus, Epicurus and Demetrius. He was awarded a prize for a comedy at the age of 21 and later won first prize for eight plays. He won a reputation for his comedies, of which only fragments survive. Plautus and Terence, famous Roman writers of comedy, made adaptations of his plays.

Mencius (Meng-tse; 372–*c.* 289 B.C.), Chinese moral teacher, born in what is now Shantung province. He was a traveling teacher and had many followers. The basis of his philosophic system is a belief in the ethical goodness of man's nature. He also taught advanced economic and political principles, advocating freedom of trade, the unseating of bad rulers, popular education and the abolition of war. After he died, his disciples published his sayings and conversations as the *Book of Meng-tse.*

Mencken, Henry Louis (1880–   ), American editor and writer, born in Baltimore, where he began his literary career as a reporter on the *Morning Herald.* He was literary critic of *Smart Set* (1908–23) and co-editor of this periodical (1914–23). From 1924 to 1933 he edited the *American Mercury,* which he helped to found. He became widely known as a critic of contemporary letters, politics, religion and customs. A new version of his book, *The American Language,* first published in 1919, appeared in 1936. His essays appear in a series of books called *Prejudices.*

Mendel, Gregor Johann (1822–84), Austrian priest and botanist, born in Silesia. He carried on long experiments in heredity that resulted in the modern science of genetics. He grew many generations of garden peas, crossing and hybridizing them and keeping careful records. In this way he discovered what characteristics are passed on to offspring under varying conditions and with various matings. Much modern research is devoted to amplifying his original findings.

Mendelssohn, Jacob Ludwig Felix (1809–47), German composer, born in Hamburg, Germany, of Jewish parents. The family adopted the Christian faith and changed the name to Mendelssohn-Bartholdy. Felix was an accomplished piano player and composer before he was 12. He had the best musical instruction available and traveled in Europe to meet and learn from other musicians. At the age of 24 he became director of public music at Düsseldorf and 2 years later was appointed director of public concerts in Leipzig, where he organized the now famous conservatory. In 1846 he conducted his oratorio *Elijah* at Birmingham, England. His most popular compositions are the *Wedding March* from his *Midsummer Night's Dream,* his *Spring Song* and *Consolation.*

Mendelyeev, Dmitri Ivanovich (1834–1907), Russian chemist, born in Tobolsk, Siberia. He is famous for his development of the *periodic law* of the elements, announced in 1869. It shows that all the chemical elements have a definite relationship with each other; when arranged in a table according to their atomic weight, many valuable groupings and characteristics can be seen. Mendelyeev's table showed gaps representing undiscovered elements. By means of the table he could predict what their properties would be.

Menelik II (Negus Negusti or King of Kings; 1844–1913), Emperor of Ethiopia. He succeeded his father, Heili Melekot, in 1866.

He claimed to be a direct descendant of Solomon and the queen of Sheba. Founder and organizer of the modern Empire of Ethiopia, he made war against the Italians to preserve the independence of his kingdom and defeated them at Aduwa in 1896. Menelik was a humane ruler, enlightened and progressive. His son Lidj Jeassu succeeded him.

Meng-tse, see *Mencius.*

Mercator, Gerhard (1512–94), Flemish geographer, born in Rupelmonde and educated at the University of Louvain. He studied geography and mathematics, set up a shop in Louvain and was employed as cartographer in the campaigns of Charles V. Mercator published many maps and geographical descriptions of European countries. He invented the system of showing parallels and meridians on flat maps of the world by means of lines intersecting at right angles, the so-called *Mercator's projection.* Such maps are valuable to navigators because they show true direction, but land masses distant from the equator are much distorted.

Mercier, Désiré Joseph (1851–1926), Belgian prelate, born in Braine-l'Alleud. Ordained in 1874 he studied at Louvain and Paris. He became a teacher of philosophy at a seminary in Malines in 1877 and in 1882 was appointed professor of philosophy at the University of Louvain. In 1906 he was made archbishop of Malines and in 1907 became cardinal. Cardinal Mercier was active in defending Belgium's rights when German troops invaded Belgium in 1914. He wrote *War Memories* (1920) and was an authority on the philosophy of Thomas Aquinas.

Meredith, George (1828–1909), British novelist and poet, born in Portsmouth, where he received his early schooling. He studied for 2 years in Germany and returned to England to take a course in law but abandoned the law for literature. His first poem was published when he was 21. He published a volume of *Poems* in 1851 and in 1859 attracted attention with his first and one of his greatest novels, *The Ordeal of Richard Feverel.* The series of novels that followed showed Meredith's ability to analyze character. These books include *Evan Harrington, Sandra Belloni, Rhoda Fleming, Beauchamp's Career, Diana of the Crossways* and *The Egoist.* His best known verse is in *Poems and Lyrics of the Joy of the Earth.*

Meredith, Owen, see *Bulwer-Lytton, Edward Robert.*

Mergenthaler, Ottmar (1854–99), German-American inventor, born in Württemberg, Germany, where he became a skilled watchmaker. In 1872 he settled in the United States and until 1876 had charge of government clocks, bells and signal-service apparatus in Washington, D.C. The typesetting machine that he invented, parent of the modern linotype, was perfected in Baltimore in 1884.

Mérimée, Prosper (1803–70), French novelist, born in Paris. He entered the civil service and in 1853 became a senator. In 1831 he was appointed inspector of archeological monuments; among his writings are authoritative works on the archeology of France. *Colomba,* a story of Corsica, is his most popular novel, though it is not so well known to English readers as *Carmen,* the basis of Bizet's opera. In 1844 he was elected to the French Academy. Mérimée wrote in a polished and precise style.

Merle d'Aubigné, Jean Henri (1794–1872), Swiss church historian and preacher. He studied theology at Geneva and Berlin. He became court preacher to William I of the Netherlands but returned to Switzerland after the separation of Belgium and Holland in 1830. In Geneva he was active in establishing a new church, the Evangelical. His large scale *History of the Reformation* has been widely read and much translated. His other works include *An Essay on the Study of the History of Christianity, Lutheranism and the Reformation* and *Germany, England and Scotland.*

Mesmer, Franz (1733–1815), German physician, born in Switzerland. He received his medical training in Vienna. In 1778 Mesmer met with much success when he treated his patients with *mesmerism,* a method of sending a person into a trance or sleep by the use of suggestion and movements of the hands. Mesmer used these methods and other aids, such as a darkened room hung with mirrors and filled with scents. Modern research has shown that he could induce a trance state that is identical with hypnotism.

Metchnikoff, Élie (1845–1916), Russian biologist, born in the province of Kharkov and educated in Russia, Germany and Italy. From 1870 to 1882 he was professor of zoology at Odessa but thereafter devoted himself to research and in 1895 became director of the Pasteur Institute in Paris. In 1908 Metchnikoff shared with Paul Ehrlich the Nobel Prize for medicine. His name is identified with the theory, now accepted, that inflammation is caused by a struggle between disease germs and white blood corpuscles, which he called *microbe eaters.* He made valuable contributions to the treatment of infectious diseases and aroused much discussion through his theory that the approach of old age is caused by intestinal putrefaction and that senility can be postponed by lactic ferments found in sour milk.

Metternich, von, Klemens Wenzel Nepomuk Lothar, Prince (1773–1859), Austrian statesman, born in Coblenz, educated at the University of Strasbourg. He became Austrian ambassador at Dresden in 1801, was transferred to Berlin in 1803 and to Paris in 1806. As Minister of Foreign Affairs he consistently worked for Austria's advancement. He was the dominant personality at the Congress of Vienna, over which he presided. From 1815 he became very powerful, and by his founding of the Holy Alliance and subsequent suppression of all popular movements he contributed largely to the period of reaction in Europe.

Meyerbeer, Giacomo (1791–1864), French composer, born in Berlin of Jewish parents. He showed exceptional talent as a boy pianist and when he was 15 was sent to Darmstadt to study. He settled in Paris in 1826 and here he produced his best work. His earlier operas were chiefly of the Italian school, but his most significant work was done after he devoted himself to the study of French opera. His fame rests on *Robert le Diable, Les Huguenots, Le Prophète* and *L'Africaine,* produced between 1831 and 1864.

MICHELANGELO BUONARROTI (1475–1564), Italian painter, sculptor, architect and poet, born in Caprese, a mountain village of Tuscany. He grew up in Florence, where he received his first art lessons from the painter Ghirlandajo. He attracted the attention of Lorenzo de' Medici by the skill with which he restored the mutilated head of a laughing faun, and he was taken into the Medici household. During the next few years his art reached maturity. While on a visit to Rome about 1500 he carved the famous *Pieta* that now graces St. Peter's. A colossal *David,* the masterpiece of his early period, was completed in 1504 for the city of Florence.

In 1505 Michelangelo was called to Rome by Pope Julius II, who wanted plans for a tomb (for himself) to be erected in St. Peter's. The design called for so large a monument that the plan of the church itself was changed to accommodate it. Difficulties arose between the sculptor and his patron, and the work was interrupted (1506). The colossal *Moses* intended for the tomb was erected in a small church in Rome. Instead of finishing the Julian tomb the artist painted the ceiling of the Sistine Chapel in the Vatican. This task he began in 1508 and completed within 4 years. The decorations are frescoes depicting the Creation and other Bible subjects and are among the outstanding paintings of all time. He later devoted several years to designing the tombs of the Medici for their memorial chapel in San Lorenzo, Florence.

At the age of 60 he painted *The Last Judgment* in the Sistine Chapel. This altarpiece is the largest fresco in the world, containing over 100 life-size figures and reaching a height of 70 feet. In his last years he turned to architecture, his most notable undertaking being the design for St. Peter's. Refusing all pay for his labor, he did not live to see the work completed. His sonnets rank among the finest examples of Italian poetry.

Michelet, Jules (1798–1874), French historian, born in Paris. When he was 23 years of age, he was appointed to the chair of history in the College Rollin, Paris. He became widely known for his anticlerical prejudice while a professor in the College of France. He was an ardent democrat, with great sympathy for the masses, and his emotional and imaginative powers were expressed in his writings. His chief works include *History of France, Priests, Women and Families* and *The Jesuits.*

Michelson, Albert Abraham (1852–1931), American scientist, born in Germany. From 1875 to 1879 he taught physics and chemistry at the United States Naval Academy, from which he had been graduated in 1873. While professor of physics at the Case School of Applied Science (1883–89), Michelson began a series of experiments to test the relative motion of the earth through space, the negative results of which suggested to Einstein the theory of relativity. From 1892 to 1929 Professor Michelson was head of the physics department at the University of Chicago. With E.W. Morley he conducted an experiment to determine the effect of the earth's motion on the speed of light (1887); in 1925 he repeated the test, both results being negative. He invented the interferometer, a valuable astronomical instrument used to make measurements of the standard meter in terms of the wave length of the red radiation of cadmium. He received the Nobel Prize for physics in 1907.

Miles, Nelson Appleton (1839–1925), American general, born in Westminster, Mass. At the outbreak of the Civil War he left his place as a Boston clerk and enlisted in the Union army, becoming first lieutenant of the 22d Massachusetts volunteers. He commanded a New York regiment at Fredericksburg and Chancellorsville and won the rank of major general of volunteers in 1864. After the war he joined the regular army, with the rank of colonel. Miles distinguished himself in the Indian wars, was advanced in rank and served in Puerto Rico during the Spanish-American War. When the army was reorganized in 1900, he was awarded the revived grade of lieutenant general.

Mill, James (1773–1836), British philosopher, historian and journalist, born near Montrose, Scotland. He was educated at the University of Edinburgh and in 1802 began his literary career in London. Through his writings on philosophic radicalism he had great influence in England's political circles. The basis of his philosophy was that of Bentham. Greatest of his published work was the monumental *History of India.* He became head of India House, London, in 1830.

Mill, John Stuart (1806–73), English economist, born in London. His father, James Mill, personally guided his early education; in later years he studied French, law, history and philosophy. In 1823 he entered India House as a clerk and eventually succeeded his father as head of the establishment. In economics, philosophy and logic he was one of the greatest thinkers of his age. In ethical philosophy he held that public policy should be based on the idea of the greatest good for the greatest number. In logic he developed the principle of induction, and in economics he made clear the real meaning of value and its relation to supply and demand. Mill wrote *A System of Logic, Principles of Political Economy* and *On Liberty.*

Millais, Sir John Everett (1829–96), English artist, born in Southampton. After completing art studies at the Royal Academy he helped to establish the Pre-Raphaelite Brotherhood, in association with Holman Hunt, Rossetti and other enthusiasts who sought to return to the simplicity and sincerity of the old masters. His earlier works were in this mood and include *Lorenzo and Isabella, Christ in the Carpenter's Shop* and *Ophelia.* As his art matured, Millais drew away from the strict tenets of the school, and his canvases became more conventional. He painted many portraits, including those of Gladstone, Carlyle, Tennyson and other noted men. His landscapes are represented by *Chill October, The Vale of Rest* and *Dew-Drenched Furze.* He illustrated the novels of Anthony Trollope and Tennyson's poems. His popular paintings included *Cherry Ripe, Bubbles* and *The Boyhood of Raleigh.*

Millay, Edna St. Vincent (1892–), American poet, born in Rockland, Me., and graduated from Vassar in 1917. Her volumes of verse include *Renascence and Other Poems, A Few Figs from Thistles, Second April, The Harp-Weaver and Other Poems, The Buck in the Snow* and *Fatal Interview.* She wrote the book for the opera *The King's Henchman,* produced at the Metropolitan Opera House, 1927. Her verse has a charming originality; the sonnets are worthy of particular note.

Miller, Joaquin (Cincinnatus Heine Miller; 1841–1913), American poet, born in Indiana. He was taken to Oregon in childhood, and ran away from home at the age of 15. He studied law after an adventurous career in the California gold mines and in Indian camps and became county judge of Grant County, Ore., in 1870. Later he did newspaper work in Washington, D.C.; after 188 he lived in California. Miller's love of Western scenery and gift for picturesque versemaking are shown in his *Songs of the Sierras, Songs of the Sunlands* and *Songs of the Mexican Seas.*

Millerand, Alexandre (1859–), French statesman, born in Paris. He practiced law and in 1885 was elected to the Chamber of

Deputies as a Radical Socialist, winning prominence as an advocate of social reform. He served as editor of Socialist papers in which he expressed his views and continued to work for progressive legislation while holding a succession of cabinet posts. In 1920 he succeeded Clemenceau as premier and later in that year succeeded Deschanel as president. He resigned in 1924, when his partisans lost control of the Chamber, and became a senator in 1925.

Millet, Jean François (1814–75), French painter of the Barbizon school, born in Gruchy, Normandy. He showed a natural aptitude for drawing and studied in Cherbourg; the people of that town financed his studies in Paris. He settled at Barbizon and became famous for his paintings. Among them are the famous *Angelus* and *The Gleaners* in the Louvre, Paris. The Metropolitan Museum, New York, possesses *The Sower, Water Carrier* and others. *The Man with the Hoe*, which inspired Markham's poem of that title, is in the San Francisco Museum. Millet is recognized as a great painter of peasant life.

Millikan, Robert Andrews (1868–), American physicist, born at Morrison, Ill. He studied at Oberlin College and at Columbia, Berlin and Göttingen universities. He was on the faculty of the University of Chicago from 1896 to 1921. In 1921 he became chairman of the executive council of the California Institute of Technology and director of the Norman Bridge Laboratory. Through his famous "oil drop" experiments he measured fundamental electrical quantity and proved that all electrons are alike. His isolation and measurement of the electron and his achievement of exact photoelectric determination of the light quantum won him the Nobel Prize for physics in 1923. He received the Roosevelt Association medal in 1932 for his discovery of cosmic rays. He contributed to knowledge of X rays and many physical and electrical phenomena. He wrote and lectured much in an effort to reconcile science and religion.

Mills, Clark (1815–83), American sculptor, born in Onondaga County, N.Y. He is best-known for equestrian statues of Jackson and Washington, both in Washington, D.C., and for the colossal statue of Liberty, from a design by Crawford, which crowns the dome of the Capitol, finished in 1863.

Mills, Roger Quarles (1832–1911), American politician, born in Todd County, Ky. Admitted to the bar at the age of 20, he was elected to the Texas House of Representatives in 1859. He was a Confederate officer and commanded a brigade at the battles of Missionary Ridge, New Hope Church and Atlanta, where he was twice wounded. He was a member of Congress, 1873–92, U.S. Senator, 1892–93 and 1893–99 and the author of the Mills tariff bill.

Milne, Alan Alexander (1882–), British writer, born in London. He began his career as a writer after his graduation at Cambridge in 1903. He was assistant editor of *Punch* (1906–14). All of his work, verse and prose, has a quaint charm that appeals to children and adults alike. Among his plays are *Mr. Pim Passes By, The Dover Road, The Truth About Blayds, The Great Broxopp, The Ivory Door, Michael and Mary* and *The Perfect Alibi*. His books for children, written especially for his son, Christopher Robin, include several in verse, such as *When We Were Very Young, Winnie-the-Pooh* and *Now We Are Six*. He also wrote fiction under the titles *Mr. Pim, The Red House Mystery, Two People* and *Four Days' Wonder*.

Miltiades (5th century B.C.), Athenian general. He commanded the army that defeated the Persians at Marathon in one of the most decisive battles in history. After the battle the Persians took to their ships and sailed to attack Athens, expecting to find it undefended. However, Miltiades was there when they arrived and again repulsed them. He had driven his tired troops on a spectacular overland march. Later Miltiades attacked the island of Paros to regain control of the Aegean but was defeated. He was ordered to pay a heavy fine for misleading the people as to his motive for attacking Paros. He was unable to pay and was put in prison, where he died.

MILTON, JOHN (1608–74), English poet, born in London, educated at St. Paul's School and Christ's College, Cambridge. He obtained his master's degree in 1632 and then spent 6 years on his father's country estate, devoting himself to literature. His early poems, "L'Allegro," "Il Penseroso" and "Lycidas" (a lament for the death of Edward King), show the influence of country life, as well as the classical learning and the beauty of language that mark his later works. In this period he also wrote the masque *Comus*, performed at Ludlow Castle in 1634. After a tour abroad Milton turned to politics and prose writing. Most of his prose works deal with theology, for Milton strongly opposed the doctrines of the Episcopal Church. His *Areopagitica* is the greatest plea for liberty of speech in the English language. In the Civil War he favored the Parliamentary cause. He became Latin secretary to the Commonwealth in 1649 and in 1655 secretary to Cromwell. During these years he wrote a few sonnets and some Greek and Latin verse. In 1658, after he lost his eyesight, he began work on a great poem that had long filled his mind. The restoration of Charles II in 1660 sent him into political retirement and permitted him to complete *Paradise Lost* in 1665. The blind poet dictated this to his three daughters. The greatness of its theme, the fall of man, and the stately beauty of its verse make it one of the great epic poems of the world and place Milton second only to Shakespeare among English poets. In 1671 he published a second epic, *Paradise Regained*. Other well-known shorter works are his "Hymn on the Morning of Christ's Nativity," "On Shakespeare" and "To Cyriack Skinner." The sonnet on his blindness, written in later years, is one of the finest inspirational poems in the English language. His last poem, *Samson Agonistes*, a Greek tragedy, was written 3 years before his death.

Minot, George Richards (1885–), American physician and pathologist, born in Boston, educated at Harvard. He taught medicine at Harvard and Johns Hopkins and became director of Thorndike Memorial Laboratory in Boston. With W. P. Murphy and G. H. Whipple he won the Nobel Prize in medicine in 1934 for researches on the value of liver in the treatment of anemia.

Minuit, Peter (1580–1641), Dutch governor of New Amsterdam, born in Wesel, Rhenish Prussia. Minuit became director-general of the Dutch West India Company's North American settlements; in 1626 he purchased Manhattan Island from the Indians for goods and trinkets valued at 60 guilders (about $24). He was recalled by the Dutch in 1631 but later entered the employ of the Swedish West India Company and in 1638 built Fort Christiana, near the site of Wilmington, Del.

Mirabeau, de, Honoré Gabriel Riquetti, Count (1749–91), French statesman, born near Nemours. He spent his youth in wild living and was imprisoned and sentenced to death but was pardoned in 1782. He then lived by writing until he was elected a delegate to the States-General. By refusing to accede to the king's request to adjourn the Third Estate or commoners, he precipitated the French Revolution. Mirabeau tried by his great oratory to put the king at the head of the Revolution by forming a new government on the English plan, but he failed through the interference of Marie Antoinette. He was elected president of the Jacobin Club in November 1790 and became president of the National Assembly a few months before he died.

Mitchell, John (1870–1919), American labor leader, born in Braidwood, Ill. He began work in the Illinois coal mines at the age of 13, developed an interest in labor problems and in 1890 joined the United Mine Workers. He was appointed national organizer of the union in 1897, and he served as president from 1899 to 1908. From 1898 to 1914 he was a vice-president of the American Federation of Labor. Mitchell directed the strikes of the anthracite miners in 1900 and 1902 and did much to improve working conditions in the American mining industry. In 1915 he was made chairman of the Industrial Commission of the state of New York. He wrote *Organized Labor* and *The Wage Earner*.

Mitchell, Maria (1818–89), American astronomer, born in Nantucket, Mass. She made a series of astronomical observations while she was librarian of the Nantucket Athenaeum and first came into public notice in 1847, when she discovered a new comet. For this achievement Miss Mitchell was awarded a gold medal by the king of Denmark. She later built an observatory at Lynn, Mass., and was professor of astronomy at Vassar College (1865–88). She was the first woman to be admitted to the American Academy of Arts and Sciences.

Mitchell, Silas Weir (1829–1914), American physician and author, born in Philadelphia and graduated from Jefferson College in that city. Dr. Mitchell became widely known as the originator of a system of rest cure for neurotic patients. He was assistant surgeon at the Federal hospital for nervous diseases during the Civil War, and his literary career dates from that time. His writing included medical treatises, historical novels, juvenile stories and verse. Outstanding among them are his *Hugh Wynne, Free Quaker; The Adventures of François; The Red City* and *John Sherwood, Ironmaster*.

Mitchell, William (1879–1936), American general, born in France. He served in the Spanish-American War and in 1903 supervised the building of the Government telegraph system of Alaska. During the World War, in which he took part in 14 major engagements, he commanded the U. S. air forces in France. In 1920 he was appointed brigadier general in the Air Service; in 1926 he retired. General Mitchell was a severe critic of the aviation policies of the Government and wrote *Our Air Force* and numerous magazine articles in favor of a strong air force.

Mithridates (*c.* 132–63 B.C.), called *the Great*, King of Pontus. He succeeded his father at the age of 13 but did not assume control until he was 20. Mithridates fought three bitter wars with Rome between 88 and 65 B.C. and was finally defeated by Pompey. After the third war he retired to the Crimea. When his son Pharnaces led a rebellion against him, Mithridates took his own life. The Romans regarded him as their most formidable enemy.

MOHAMMED, MAHOMET or **MUHAMMAD** (*c.* 570–632), founder of Mohammedanism or Islam, called the *Prophet*. He was born in Mecca, Arabia, of a family of the tribe of Koreish. He was orphaned when he was young and was cared for first by his grandfather and later by an uncle, Abu Talib. With his foster father Mohammed made caravan journeys through Syria and Arabia and at the age of 25 entered the employ of a widow named Khadija, serving as her agent or possibly as her camel driver. He married Khadija, who was 16 years his senior; they had two sons, who died in infancy, and four daughters. Mohammed remained faithful to his wife until her death in 619, after which he established a harem.

For about 10 years after his 30th birthday Mohammed made periodical visits to a solitary cave on Mount Hira, near Mecca, for religious contemplation; when he was 40, he told his wife of a vision in which he had received a revelation from the angel Gabriel. He felt assured, he said, that he was called by God to be the prophet of a faith that should reclaim the Arabs from the idolatry into which they had fallen. He went about seeking converts, at first with very little success, and he aroused such opposition that his uncle had him removed to a fortified castle outside of Mecca. There he remained for 3 years. Some of his adherents fled to Abyssinia, but at a critical moment he received help from the city of Yathreb (Medina), where he had a following made up of pilgrims who had been converted while in Mecca. They urged him to come to their city, and in 622 he and his friend Abu Bekr secretly left Mecca. This flight of the prophet or *Hegira* is the event with which the Mohammedan calendar begins. Mohammed established himself in Medina as the political and religious leader of the community and proceeded to make war on the tribesmen who remained hostile. In 630 Mecca was captured, other victories followed, and in a few years Mohammed had won all Arabia. In the last year of his life he made a final pilgrimage to Mecca at the head of 40,000 pilgrims. He left no son, being survived only by his daughter Fatima, wife of Ali ibn-abu-Talib. The doctrines of Mohammedanism are contained in the Koran, which is made up of the prophet's revelations as written down by his disciples. He taught that man must submit himself to the one God; that nations are punished for rejecting God's prophets; that heaven and hell await in the future life and that the world will come to an end in a great judgment day. Mohammed offered himself to Jews and Christians as the successor of Jesus Christ but met with severe opposition. He condemned the Jews in his teachings.

Mohammed Ali, see *Mehemet Ali*.

MOLIÈRE (Jean Baptiste Poquelin; 1622–73), French dramatist, born in Paris, the son of a well-to-do upholsterer in the employ of the court. He was well educated and for a time followed his father's trade but became a theatrical manager in 1643. He joined a troupe of actors in 1646 and toured the provinces. King Louis XIV saw him act in Paris in 1658 and was so pleased that "the king's comedians," as the Molière players were called, enjoyed the patronage of the court for 15 years.

Molière had already adapted plays and

written two of his own, but the presentation of his *Affected Misses* in 1659 ushered in a new school of dramatic satire. Play followed play, holding up to ridicule the follies, affectations and frailties of human nature, satirizing the miserly, the bores, the pedants and the hypocrites. Typical of the Molière plays are *The School for Husbands, The Bores, The School for Wives, The Misanthrope, The Hypocrite, The Miser* and *The Imaginary Invalid.* The last named was the immediate cause of Molière's death, for he played the leading part while he was desperately ill.

Molnár, Ferenc (1878–), Hungarian author and playwright. He did newspaper work in Budapest but is chiefly known as a playwright. Among the plays popular in the United States are *The Devil, Liliom, The Guardsman, The Glass Slipper* and *The Good Fairy.* He also wrote several novels.

Moltke, von, Helmuth Karl Bernhard, Count (1800–91), Prussian field marshal, born in Mecklenburg. He was educated at a military school in Copenhagen and entered the Prussian army in 1822 as second lieutenant. Rising steadily in authority and rank, he was appointed chief of the general staff in 1857 and had much to do with the transformation of the army into the efficient machine that defeated Denmark (1864), Austria (1866) and France (1870–71). In the Franco-Prussian War he planned the concentration on Metz, which resulted in the French defeat at Sedan. For this success he was promoted to the rank of field marshal and received a grant equivalent to $225,000.

Mommsen, Christian Matthias Theodor (1817–1903), German historian and archeologist, born in Garding, Schleswig. He studied at the University of Kiel (1838–43) and traveled in Italy and France for 3 years, studying archeology. From 1850 to 1858 he was professor of law at Leipzig and professor of Roman law at Zurich and Breslau; in 1858 he became professor of ancient history at Berlin. For more than 20 years he acted as secretary of the Royal Academy of Sciences of Berlin and also sat in the Prussian Parliament. His *Roman History* (English translation 1854) is the acknowledged classic work on the Roman Republic. It has been said that no man knows Roman history until he has mastered Mommsen. Of even greater influence with scholars were his less popular works *Römisches Staatsrecht* (Roman constitutional law), *Römisches Strafrecht* (Roman criminal law) and hundreds of special articles in philological journals. Mommsen also edited the great collection of inscriptions known as the *Corpus Inscriptionum Latinarum.* He received the Nobel Prize for literature in 1902.

Monck, George (1608–70), English soldier and politician, born in Devonshire. Early in his career he served in the Spanish and Dutch armies. He fought for Charles I in the Civil War, was captured at Nanturich and imprisoned in the Tower at London for 2 years. Released when he promised to support the Parliamentary cause, he made a brilliant record under Cromwell, conquering Scotland in 1651. Monck also fought in the naval war with Holland. Though he supported Richard Cromwell, he realized the national demand for the restoration of the monarchy, and in 1660, as commander of the army, he brought about the return of the crown prince as Charles II. Charles made him duke of Albemarle and appointed him to high civil positions. In 1666 he won a great naval victory over the Dutch.

Monet, Claude (1840–1926), French painter, born in Paris and a student there. He was influenced by the landscapes of Corot and other Barbizon painters and by the work of Manet. Monet's insistence on reproducing the effects of light and air, in the face of hostile criticism, had a beneficial influence on modern painting. The name *Impressionist* is derived from the title of his painting *Impression, Rising Sun.* Among other works are *Fontainebleau Forest, The Orchard, Rouen Cathedral* and *Views of the Thames.*

Moneta, Ernesto Teodoro (1833–1918), Italian editor and patriot. He worked with Garibaldi in the movement for unification of Italy (1859–66). Beginning in 1867 he was active in the cause of peace, working mostly through his newspaper, *Il Secolo.* Moneta received the Nobel Peace Prize in 1907.

Monk, George, see *Monck, George.*

Monmouth, James Scott, Duke of (1649–85), English rebel, born at Rotterdam. He was the son of Lucy Walters and Charles II. Very much in favor with the king and the people at first, he was created duke of Monmouth in 1663. He acquired a reputation for vice, lost the king's favor and was exiled after the discovery of the conspiracy known as the Rye House Plot (1683). When Charles died in 1685, Monmouth returned to England, where he became the center of a rebellion against James II. The Scottish rebels and his own forces were defeated at about the same time (July 1685). Monmouth was captured, imprisoned in the Tower and beheaded.

Monroe, Harriet (1860–1936), American author, born in Chicago, educated at Visitation Academy, Georgetown, D.C. She is best-known for her encouragement of modern verse writers through the medium of *Poetry: a Magazine of Verse,* published in Chicago. She founded the periodical in 1912, by securing funds from more than 100 persons, and became its editor. Miss Monroe wrote the *Columbian Ode* sung at the dedicatory ceremonies of the World's Columbian Exposition (1892). She wrote *The Passing Show* (modern plays in verse), several volumes of poetry and *Poets and Their Art.*

Monroe, James (1758–1831), 5th President of the United States, born in Westmoreland County, Va. At the age of 16 he entered the College of William and Mary, but in less than 2 years the Revolution broke out, and he left to join a Virginia regiment. He took part in the battles of Harlem Heights, White Plains and Trenton and was an aide on the staff of William Alexander ("Lord Stirling") in the campaign of 1777–78. He received the rank of lieutenant colonel in 1778 but saw no further active service. Through the influence of Thomas Jefferson, Monroe was elected to the Virginia assembly in 1782, and from 1783 to 1786 he was a delegate to the Continental Congress. When his last term expired, he hoped to retire to private life, but his state re-elected him to the assembly and in 1788 sent him to the state convention called to ratify the Federal Constitution. A determined Antifederalist, he spoke vigorously against adoption but in 1790 was elected to the Senate under the document he opposed. There Monroe continued his opposition to Federalist policies as carried out by Washington and Hamilton. Thus he became, with Jefferson, a leader in the party that was formerly called Democratic-Republican and is today the Democratic party.

In 1794 Monroe went to France as minister, but his inability to improve relations between France and the United States brought about his recall in 1796. From 1799 to 1802 he served as governor of Virginia, and afterward he was, in turn, special envoy to France, minister to London and envoy to Madrid. In Paris he arranged the purchase of Louisiana by the United States. When he returned home in 1807 he was again elected to the Virginia assembly. In 1811 he was again chosen governor, but he resigned within a few months when President Madison appointed him secretary of state. Monroe remained at the head of the State Department until his own election to the Presidency. The election of 1816 was the last in which the Federalists functioned as a party. Monroe defeated their candidate, Rufus King, by an electoral vote of 183 to 34. In 1820 he was re-elected without opposition. The principal events of the Monroe administration include a war with the Seminole Indians, the passage of the Missouri Compromise, the acquisition of Florida and the promulgation of the Monroe Doctrine. At the end of his second term Monroe retired to private life. He served as regent of the University of Virginia in 1826 and was a delegate to the state constitutional convention in 1829. Like Adams and Jefferson, he died on the Fourth of July.

Montagu, Lady Mary Wortley (1689–1762), English writer, daughter of Evelyn Pierrepont, afterward Duke of Kingston. As the wife of Edward Wortley Montagu she was a favorite in court and literary circles during the reign of George I. In 1716 Montagu was appointed ambassador at Constantinople, and Lady Mary lived with him in Turkey until 1718. In the East she became interested in vaccination for smallpox, and she introduced the practice of inoculation against the disease when she returned to England. As a writer she is remembered especially for her *Letters,* which are among the best of that form of literature. She is the "Sappho" of several poems by Pope.

MONTAIGNE, DE, MICHEL EYQUEM, SEIGNEUR (1533–92), French writer, philosopher and moralist, born at the castle of Montaigne in the country of Périgord. The boy was taught to speak Latin and Greek. At the age of six he became a pupil at the College of Guienne in Bordeaux and at 13 began to study law. He was a parliamentary counselor at Bordeaux (1554–67) and some time later became a member of the court. In 1580 he published the first two books of his *Essais* and immediately afterward set out on a journey through Germany, Switzerland and Italy for the sake of his health. From 1581 to 1585 Montaigne was mayor of Bordeaux. In 1588 he republished his *Essais,* with the addition of a third book. After a last visit to Paris he seems to have lived quietly in his chateau.

Montaigne's essays cover a variety of topics and are notable for the grace and freshness of their style. Sentences and anecdotes from the ancients are interspersed with the author's own remarks about his own nature and that of humanity as a whole. His writings had great influence on later authors and were known to Shakespeare through a translation by John Florio. His *Voyages,* a diary of his journeys in 1580–82, was published in 1774.

Montcalm de Saint-Véran, de, Louis Joseph, Marquis (1712–59), French soldier, born at Nîmes. He entered the army in 1721 and after service in Italy and Germany was sent to Canada (in 1756) to direct the king's forces in the last struggle for French supremacy in North America. In 1756 he captured Fort Ontario from the British; in 1757 he seized Fort William Henry and in 1758 warded off the attack on Ticonderoga. After the French had lost Louisburg and Fort Duquesne, Montcalm met defeat on the Heights of Abraham at Quebec in 1759. Routed in battle by Wolfe, he tried vainly to rally his forces, was wounded and died the next day. Quebec surrendered a few days later. A monument in that city honors the two commanders.

Montesquieu, de, Charles de Secondat, Baron de la Brède et (1689–1755), French political historian, born at the Castle of Brède near Bordeaux. He followed the family tradition by studying law and in 1716 became president of the Bordeaux parliament, holding that office until 1726. His first published work, *Lettres Persanes* (1721), is a daring and subtle travesty on the follies of the day, purporting to be the correspondence of two noble Persians traveling in Europe.

Though Montesquieu always ridiculed the French Academy in these letters, he was admitted to membership in 1728. He spent the years 1729–31 in travel, remaining for some time in England to study the British political system, which he greatly admired. After he returned to France, Montesquieu retired to his estate near Bordeaux and devoted himself to literature. In 1734 he published a survey of the greatness and decline of Rome. In 1748 appeared the work on which his fame chiefly rests, *The Spirit of Laws.* Twenty-two editions were published in 18 months, and the book remains a classic in the field of political science.

Montessori, Maria (1870–), Italian teacher, founder of the system of child training that bears her name. She was graduated with a medical degree from the University of Rome in 1894, the first woman so honored in Italy. As assistant in the university clinic she became interested in the needs of feebleminded children and tested some of her ideas while principal of a school for the underprivileged (1898–1900). After further study Dr. Montessori opened the first "House of Childhood" in Rome in 1907. She also applied her method of self-education to the training of normal children. The Montessori system aims to develop the child's individuality in every possible way; he is taught to look after himself. Work in the open air is encouraged.

Montezuma II (*c.* 1480–1520), the last Aztec Emperor of Mexico. He took the throne in 1503 and engaged in wars of conquest, adding Honduras and Nicaragua to his realm, but he lost the favor of the people there by his despotic rule and oppressive taxation. The Spaniards under Cortès invaded Mexico in 1519, marched to the capital and soon made the emperor a virtual prisoner. In 1520 Montezuma tried to prevent the Mexicans from attacking the Spaniards, but he was himself attacked by them, made a prisoner and killed.

Montfort, de, Simon, Earl of Leicester (*c.*1208–65), English statesman, born in France of French-English descent. He went to England in 1230 and in 1238 married Princess Eleanor, sister of Henry III. At first a great friend of Henry, who created him earl of Leicester, he afterward fell into disfavor. For many years he led the barons in attempts to make the king rule wisely and in 1265 called a parliament that was the forerunner of modern government. He was defeated that year at Evesham by Edward, Prince of Wales, and was killed in a renewal of the civil war.

Montgolfier, Jacques Étienne (1745–99), French inventor, son of a paper manufacturer. He began experiments on balloons about 1782 with the aid of his brother Joseph (1740–1810); together they invented the first practical balloon. Louis XVI granted the brothers 40,000 francs so that they could give all their attention to aeronautics. Joseph also invented the parachute, hydraulic screw and other devices.

Montgomery, Richard (1736–75), American general, born in Swords, County Dublin, Ireland. He joined the British army and came to Canada in 1757 to fight in the French and Indian War. He left the army, settled in New York and in 1775 was appointed brigadier general in the Continental army. He succeeded General Philip Schuyler as leader of the campaign against Canada. After capturing Montreal Montgomery joined Benedict Arnold in the attack on Quebec and was killed in action.

Moody, Dwight Lyman (1837–99), American evangelist, born at Northfield, Mass. He began his religious career in 1856 in Chicago, where he directed a mission Sunday School that attracted over 1,000 children. Moody was employed by the Christian Commission during the Civil War and later established a church in Chicago. A larger building, built after the great fire of 1871, became the Auditorium of the Moody Bible Institute. Moody was aided in his evangelistic work by the revival singer, Ira D. Sankey. Their campaigns in Great Britain and the United States caused great enthusiasm.

Moody, William Vaughn (1869–1910), American poet and educator, born in Spencer, Ind., and graduated from Harvard in 1893. He became assistant in English at Harvard and Radcliffe. In 1895 he joined the faculty of the newly organized University of Chicago, and from 1901 to 1907 he was assistant professor of English and rhetoric there. He is best-known for his play *The Great Divide*, produced in 1907. Another play, *The Faith-Healer*, appeared 2 years later. Moody also wrote a lyrical drama, *The Masque of Judgment*, and several volumes of verse. "Ode in Time of Hesitation" is an outstanding single poem. With R. R. Lovett he wrote a *History of English Literature*.

Moore, George (1852–1933), Irish novelist. He studied painting in Paris as a young man but turned to poetry. He wrote *Flowers of Passion* and *Pagan Poems*, then took up the prose writing in which he made his greatest reputation. He is best-known for *Esther Waters, Evelyn Innes, Sister Teresa, Brook Kerith* and *Aphrodite in Aulis. Confessions of a Young Man, Hail and Farewell* and *Conversations in Ebury Street* are autobiographical. Moore's work is marked by a brilliant style.

Moore, Sir John (1761–1809), British general, born in Scotland. He entered the army at the age of 15 and saw service in Ireland and in America during the Revolution. Later he won distinction under Abercrombie in Corsica, the West Indies, Holland and Egypt. He then fought in Sicily and Sweden and in 1808 was sent to the Spanish Peninsula to aid the allied armies fighting Napoleon. In January 1809 Moore was mortally wounded at Coruna and died knowing that his army was victorious. His death inspired the poem *Burial of Sir John Moore*, by Charles Wolfe, a British clergyman.

Moore, John Bassett (1860–), American jurist, born in Smyrna, Del., and educated at the University of Virginia. He studied law at Wilmington, Del., became a law clerk in the Federal State Department and served as third assistant secretary of state (1886–91). He became professor of international law and diplomacy at Columbia University in 1891 and while holding that position was appointed counselor to the Department of State and member of the Permanent Court of Arbitration. In 1921 he was elected a judge of the Permanent Court of International Justice (World Court) but resigned in 1928 to prepare a treatise on international law.

Moore, Thomas (1779–1852), Irish poet, born in Dublin and educated at Trinity College, Dublin University. In 1799 he went to London to study law but became a writer, and in 1801 he published *The Poetical Works of the Late Thomas Little, Esq.*, using a pen name suggested by his small stature. He is best remembered for his songs, which began to appear in 1807. Later they were collected under the title *Irish Melodies*. Among them are "Believe Me if All Those Endearing Young Charms," "The Last Rose of Summer," "Oft in the Stilly Night" and "The Harp That Once Through Tara's Halls." His *Lalla Rookh*, an Oriental romance in verse, was very popular in his day. Moore also wrote *The Life of Byron*.

Moran, Thomas (1837–1926), American landscape painter, illustrator and etcher, born in Bolton, England, brought to Philadelphia as a child. He studied wood engraving and water-color painting before he took up oil. Among his best-known works is his *Grand Cañon of the Yellowstone*, which occupies a panel in the Capitol at Washington. Later he painted a companion picture —*Chasm of the Colorado*—that Congress purchased. Other works include *The First Ship, Ruins on the Nile* and *Bringing Home the Cattle*. In the use of color he was a disciple of Turner.

More, Hannah (1745–1833), English author, born in Gloucestershire. She was the daughter of a schoolmaster and began writing verse and prose in childhood, composing a pastoral drama when she was 17. In 1774 she went to London and became friendly with Johnson, Burke, Garrick and other celebrities. Garrick produced her tragedy *Percy* in 1777, but after his death she renounced the theater and became a philanthropist. She wrote on moral and religious subjects, and her *Coelebs in Search of a Wife* went through numerous editions.

More, Sir Thomas (1478–1535), English scholar and lawyer, born in London and educated at Oxford. In 1501 he was called to the bar, and after working up a large practice he rose to a position of favor under Henry VIII. The king entrusted him with confidential missions and in 1521 knighted him. More succeeded Wolsey as lord chancellor, but he resigned that office in 1532. He believed in church reform, opposed the extreme measures adopted by Luther and refused to recognize the king as head of the church. In 1535 he was accused of high treason, committed to the Tower and beheaded. More was beatified in 1886 and canonized in 1935. He wrote *Utopia*, describing an ideal state, and the word has since come into common use in the language.

Morgan, John Hunt (1825–64), Confederate general, born in Huntsville, Ala. At the outbreak of the Civil War he became colonel of a band of raiders—Morgan's Squadron—that perpetually harassed the enemy in Kentucky and Tennessee. He was promoted to brigadier general in 1862 and in that year made the famous "Christmas Raid" into Kentucky. In 1863 he and some of his followers were captured and placed in prison in Columbus, Ohio. Morgan escaped and resumed his guerrilla tactics but in 1864 was surrounded by Federal troops near Greeneville, Tenn., and was shot while attempting to escape.

Morgan, John Pierpont (1837–1913), American financier, born in Hartford, Conn. He studied at the University of Göttingen, Germany, and entered the bank of Duncan, Sherman & Company, New York city, in 1857. In 1871 he became a member of a firm later known as J. P. Morgan & Company. He built up a railroad empire largely by reorganizing bankrupt lines and took part in many famous financial battles for railroad control. He formed the United States Steel Corporation in 1901 and built up other huge industrial combinations. Some of his operations were severely criticized.

He made large donations to museums, churches, libraries and colleges, especially in New York city. He founded the Morgan Library in New York to house his great collection of books, manuscripts and pictures.

Morgan, John Pierpont (1867–), American financier, born in Irvington, N.Y., son of John Pierpont Morgan. He entered the family banking business in the London branch and took charge after the death of his father in 1913. The firm was important in the World War. It raised huge loans and financed many of the combatant nations. After the war it sold more than 2 billion dollars' worth of foreign government and corporation securities and twice that amount of American securities. Morgan continued many of his father's philanthropies.

Morgenthau, Henry (1856–), American public official, born at Mannheim, Germany. He came to the United States in 1865 and was educated at the College of the City of New York and Columbia Law School. He practiced law in New York and became a director of various industrial corporations. Morgenthau was chairman of the Democratic finance committee in 1912 and 1916, and in 1913 President Wilson appointed him ambassador to Turkey, where he remained until 1916. He was actively identified with Near East relief as chairman of the Greek Refugee Settlement Commission. He is the author of *Ambassador Morgenthaw's Story* and other books relating to his experiences.

Morgenthau, Henry, Jr. (1891–), American public official, born in New York city, studied at Cornell University. He became a farm expert and published an agricultural journal. In 1930 Franklin Roosevelt, then governor of New York, appointed him to plan a farm-relief program for the state, and later Morgenthau became state conservation commissioner. When Roosevelt became President, he made Morgenthau chairman of the Federal Farm Board and later governor of the Farm Credit Administration. In 1933 he acted as secretary of the treasury when Secretary Woodin fell ill, and when Woodin resigned, he took his place. He was one of Roosevelt's closest advisers. He favored a moderate cheapening of the dollar and a government-managed currency.

Morley, Christopher [Darlington] (1890–), American author, born in Haverford, Pa. He graduated from Haverford College in 1910 and during the next 3 years was a Rhodes scholar at New College, Oxford. He then joined the editorial staff of a publishing house and later became a staff writer for magazines and newspapers. In 1924 he was an editor of the *Saturday Review of Literature*. Among his chief works are *Where the Blue Begins, Thunder on the Left, Parnassus on Wheels, Chimneysmoke, Seacoast of Bohemia, I Know a Secret, Human Being, Hasta la Vista* and *The Trojan Horse*.

Morley, John, Viscount (1838–1923), English statesman and writer, born in Blackburn and educated at Oxford. After 1859 he was editor, successively, of the *Literary Gazette, Morning Star, Fortnightly Review* and *Macmillan's Magazine*. In 1883 he entered Parliament as a Liberal, supported Gladstone's Irish Home Rule policies, was chief secretary for Ireland (1886, 1892–95) and secretary for India (1905–10). In 1914 he resigned from the Cabinet in opposition to the war policy. He wrote a three-volume life of Gladstone and a life of Edmund Burke.

Morrill, Justin Smith (1810–98), American economist, born in Strafford, Vt. He engaged in business and farming before his election to Congress in 1854. From 1867 until his death Morrill sat in the Senate as a Republican. The Morrill Acts of 1862 and 1890 provided for the establishment of land-grant colleges through the sale of public lands and made possible the present system of state colleges of agriculture.

Morris, Gouverneur (1752–1816), American statesman, born at Morrisania, his father's estate in New York. From 1777 to 1780 he served in the Continental Congress and in 1778 presented the report calling on Great Britain to recognize the independence of the colonies before the opening of peace negotiations. He developed the decimal system of coinage used in the United States. In 1787 he represented Pennsylvania in the Constitutional Convention and was one of the committee that drew up the final draft of the Constitution. He was minister to France in 1792–94 and U.S. Senator from 1800 to 1803.

Morris, Gouverneur (1876–), American author, great-grandson of the signer of the Declaration. He was born in New York, was educated at Yale and wrote many novels and short stories especially for magazines.

Morris, Robert (1734–1806), American financier and signer of the Declaration of Independence. He came from England to Philadelphia when he was 13, became a clerk in the countinghouse of Charles Willing, a Philadelphia merchant, and was a partner in the firm (1754–93). He lent money to the Government throughout the Revolutionary War, founded the Bank of North America and was superintendent of finance (1781–84). Morris sat in the first U.S. Senate until 1795. He suffered serious financial losses in his last years and was in debtors' prison from 1798 to 1801.

Morris, William (1834–96), English poet. He was educated at Oxford, where he formed a close friendship with Edward Burne-Jones, the painter. Morris was an architect, but he branched into the manufacture of furniture and household decorations. He did much to improve the public taste in wallpapers, fabrics, tapestry and other house furnishings. In the field of literature he is best known for his historical narratives in verse, including *Life and Death of Jason, The Earthly Paradise* and *Sigurd the Volsung*. The Morris chair, a kind of easy chair, was named for him, though he did not invent it. Morris was a leader in the British socialist movement.

Morrow, Dwight Whitney (1873–1931), American lawyer and diplomat, born in Huntington, W. Va. He studied at Amherst College and Columbia Law School and in 1899 established himself in law practice in New York. He was a member of the banking firm of J. P. Morgan & Co., 1914–27. Appointed ambassador to Mexico in 1927, he represented his country with distinction during a difficult period. In 1928 he went to London at the request of President Hoover to act as delegate to the Naval Conference; later in the year he was elected Senator from New Jersey. He died at the beginning of his second term. He was the father of Anne Morrow Lindbergh.

Morse, Samuel Finley Breese (1791–1872), American inventor and artist, born at Charlestown, Mass. After graduating from Yale in 1810 he studied painting and is considered one of the best of our earlier American portrait painters. He was one of the founders and the first president of the National Academy of Design. In 1835 he was appointed professor of the history of art at New York University. In 1835 he demonstrated the first workable electric telegraph.

In 1843, after many discouragements, Congress voted $30,000 for an experimental line between Washington and Baltimore. More hardships were encountered before the line was finally completed; but at last, on May 24, 1844, the first public message was sent over the line, the now historic words, "What hath God wrought?" He successfully defended his rights to the invention through a long series of lawsuits. The first submarine telegraph cable was laid in New York harbor by Morse; and, with John W. Draper, he introduced the first daguerreotype photography into the United States.

Morton, Levi Parsons (1824–1920), American banker and statesman, born in Shoreham, Vt. In 1850 he entered the banking business in Boston. Later he moved to New York, where he became head of one of the best-known private banking firms in America. He sat in Congress as a Republican, was minister to France (1881–85) and Vice-President of the United States in the administration of Benjamin Harrison. In 1895 he became governor of New York.

Morton, William Thomas Green (1819-68), American dental surgeon, born in Charlton, Mass. He studied dentistry in Baltimore at the College of Dental Surgery and afterward studied medicine in Boston. He is famous as the first medical practitioner to recognize and demonstrate the importance of ether as an anesthetic. He first used it on September 30, 1846, in the extraction of a tooth. It was afterward learned that the first operation under ether had been made in 1842. Dr. Morton patented ether under the name *letheon*. He was later involved in a series of lawsuits.

Moseley, Henry Gwyn-Jeffreys (1887–1915), British physicist, born in Northumberlandshire, the son of an Oxford professor of anatomy and grandson of a famous astronomer and physicist. He was educated at Eton and Trinity College, Oxford. In his early 20s, as an assistant to Ernest Rutherford, he studied the number of electrons emitted during the disintegration of radium. When he was 24, he determined the number of positive charges in an atom of gold and in atoms of other elements. He studied the X-ray spectra of 38 elements and found the number and order of the elements—the Law of Atomic Numbers. This revised Mendelyeev's Table and related it to valency, disproved the discovery of some supposedly new elements and specified the characteristics of elements that have since been found. Moseley, one of the most brilliant of modern physicists, enlisted in the World War and was killed at Gallipoli at the age of 28.

Moses, Robert (1888–), American public official, born in New Haven, Conn., educated at Yale, Oxford and Columbia. At 25 he became an investigator for the New York Bureau of Municipal Research, and at 30 he was head of the New York State Reconstruction Commission that reorganized the departments of the state government. In 1924 he became president of the State Council of Parks and of the Long Island State Park Commission. On Long Island he opened beach parks in spite of bitter opposition from owners of large estates and built parkways for motor cars. He was the unsuccessful Republican candidate for mayor of New York in 1933 and was appointed city park commissioner by Mayor LaGuardia, who had defeated him. Among the many additions to the city parks that he brought about are the Flushing Meadows Park (site of the 1939 World's Fair) and the Henry Hudson Parkway on the river front over the New York Central railway tracks.

Mosley, Sir Oswald, 6th Baronet (1896–), British Fascist leader. He served in the World War, was a member of Parliament in 1918-31 and was in MacDonald's Cabinet in 1929-30, but resigned and left the Labour party. He became leader of the British Union of Fascists. Sir Oswald married Lady Cynthia Curzon, daughter of Marquis Curzon.

Motley, John Lothrop (1814–77), American historian and novelist, born in Dorchester, Mass. He graduated from Harvard in 1831 and later studied at Göttingen and Berlin. After returning to America he studied law and was admitted to the bar but was diverted to literature. He published a novel *Morton's Hope* in 1839 and in 1845 became a contributor to the *North American Review*. His famous history *The Rise of the Dutch Republic* appeared in 1856. This was followed by a *History of the United Netherlands* (1860–69). Motley served as minister to Austria (1861–67) and was minister to Great Britain (1867–80).

Moton, Robert Russa (1867–1940), negro educator, born in Amelia County, Va. He graduated from Hampton Institute in 1890 but remained there as commandant of cadets until 1915, when he succeeded Booker T. Washington as principal of Tuskegee Institute. Favorably known as a leader in the movement for improving his race, Moton was the author of *Racial Good Will*, *Finding a Way Out* (autobiographical) and *What the Negro Thinks*.

Moulton, Forest Ray (1872–), American astronomer, born in LeRoy, Mich., educated at Albion College and the University of Chicago. He held a professorship in astronomy at Chicago and was research associate for the Carnegie Institution. During the World War he was in charge of artillery ballistics in the U. S. Army. He won international renown for developing, with Thomas C. Chamberlin, the planetesimal theory of the origin of the planets. He wrote *Celestial Mechanics*, *Introduction to Astronomy*, *Differential Equations* and other technical works.

Moultrie, William (1731–1805), American general, born in Charleston, S.C. He had some military experience in the early wars with the Cherokees and on the outbreak of the Revolutionary War became colonel of a South Carolina regiment. In 1776 he received the thanks of Congress for his brilliant defense of Charleston. A crude fort that he erected on Sullivan's Island was named Fort Moultrie. He was taken prisoner in 1780 when Charleston surrendered to the British. In 1782 he was exchanged for Burgoyne and raised to the rank of major general. He served as governor of South Carolina in 1785 and 1794.

Mount Stephen, George Stephen, Baron (1829–1921), Canadian financier and railroad builder, born in Banffshire, Scotland. He emigrated to Canada in 1850 and began a business career in Montreal, becoming president of the Bank of Montreal. He was later associated with Donald Smith and J. J. Hill in the ownership of the St. Paul & Pacific Railroad, the extension of which led to the building of the Canadian Pacific. In 1886 Queen Victoria knighted him for his services in completing this road, and in 1891 he was created a baron.

Mozart, Wolfgang Amadeus (1756–91), Austrian musician and composer, born in Salzburg. When the boy was 4 years of age, his father Leopold Mozart, a violinist of repute, began to teach him to play the harpsichord. A year later he wrote so difficult a concerto for the harpsichord that only experts could play it. In his 6th year Mozart was taken by his father, along with his sister, to Munich and Vienna, where the little artists were received at court with great favor. In 1763 the family made a journey to Paris, where Mozart published his first sonatas for the harpsichord; in the following year they went to England, where the child-musician performed before the court the most difficult compositions of Bach and Handel. The family again went to Vienna in 1767, where the boy received a commission from the emperor to write the music of a comic opera, but owing to the opposition of the court musicians the work was never performed.

In 1769 Mozart, who had been made master of the concerts at the court orchestra at Salzburg, commenced a journey to Italy. In Rome he wrote down, on hearing it, the famous *Miserere*, annually sung during Holy Week. At Milan in 1770 he composed, in his 14th year, his first opera *Mithridates*, which was performed more than 20 times in succession. Henceforth he resided chiefly in Salzburg but also visited Paris, Munich and finally Vienna. Although he was appointed composer to the Viennese court, he found it necessary to maintain himself by giving lessons in music and writing waltzes. After a period of financial difficulty he produced with tremendous success his opera *The Marriage of Figaro* (1786); in 1787 *Don Giovanni* was equally successful. In 1791 he produced *The Magic Flute*. Mozart made a great deal of money for others, but his generosity and carelessness kept him poor. He did a tremendous amount of work in his short lifetime. Besides his operas he composed 41 symphonies, 30 string quartets, 15 masses and many sonatas and concertos.

Mühlenberg, Heinrich Melchior (1711–87), German-American clergyman, born in Eimbeck, Prussia, educated at Göttingen and Halle. In 1742 he came to the United States as missionary to the Lutheran congregations in Pennsylvania. He founded the German Lutheran Church in America and organized the first Lutheran synod in America in 1748.

Muir, John (1838–1914), American explorer and naturalist, born in Dunbar, Scotland. He settled in Wisconsin in 1849, from 1850 to 1854 was a student at the State University and then began a career of exploration that took him to every continent. He was a pioneer in the conservation movement in America; it was partly through his efforts that the Sequoia and Yosemite regions were made national parks. The Yosemite Valley was his headquarters for 10 years. He discovered 65 permanent glaciers in the Sierras and Muir Glacier in Alaska. His writings include *Our National Parks*, *The Yosemite* and *Story of My Boyhood and Youth*. He made a fortune raising tokay grapes in the Alhambra Valley in southern California.

Müller, Max (1823–1900), German scholar, born in Dessau. He specialized in Sanskrit at Leipzig and studied in Berlin. In 1845, when in Paris, he began work on an edition of the *Rig-Veda* but found that he needed better source material. He went to England to examine the manuscripts of the East India Company. The company volunteered to pay his expenses, and the six volumes were published between 1849 and 1874. He was appointed professor of modern languages at Oxford in 1854 and in 1868 became professor of comparative philology there. In 1876 he undertook the huge task of editing *The Sacred Books of the East*.

Mulock, Dinah Maria (Dinah Craik; 1826–87), English novelist. She is chiefly remembered for the young people's classic *John Halifax, Gentleman*. Other books are *The Adventures of a Brownie* and *The Little Lame Prince*. Though her stories were written to inculcate a rather stiff Victorian morality, they are still read with pleasure.

Mumford, Lewis (1895–), American author and editor, born at Flushing, Long Island, graduate of Columbia and New York universities. He edited several literary and sociological magazines and lectured on sociological subjects in the United States and abroad. Among his written works are *The Story of Utopias*, *The Golden Day*, *The Brown Decades* and *Technics and Civilization*. He was coauthor of *Civilization in the United States*, *Whither Mankind* and *Living Philosophies*.

Münchhausen, von, Karl Friedrich Hieronymus, Baron (1720–97), German soldier and storyteller. He served in the Russian cavalry in a war with the Turks (1737–39) and afterward gave an incredibly exaggerated account of his adventures. He won a reputation by his "tall tales"; they were collected and in 1785 were published in English as *Baron Münchhausen's Narrative of his Marvelous Travels and Campaigns in Russia*.

Mundelein, George William (1872–1939), American cardinal, born in New York city. He studied at the Urban College of the Propaganda in Rome and was ordained a priest in 1895. He became monsignor in 1905, auxiliary bishop of Brooklyn in 1909, in 1916 archbishop of Chicago and in 1924 was created a cardinal by Pope Pius XI. He founded the Seminary of St. Mary's of the Lake, at Mundelein, Ill.

Munkácsy, Mihály (Mihály Lieb; 1844–1900), Hungarian painter, born in Munkács. He received his first lessons from a strolling portrait painter but later was able to continue his studies in Munich and Düsseldorf. In 1870 his first notable picture *The Last Day of a Condemned Man* was exhibited in the French Salon. As his art matured, he produced a series of pictures marked by lofty sentiment and intense dramatic power. Among these are *Blind Milton Dictating Paradise Lost* (New York Public Library), *Christ Before Pilate* (Wanamaker Collection) and *The Last Moments of Mozart* (Alger Collection, Detroit).

Munroe, Kirk (1850–1930), American writer of juvenile adventure stories, born near Prairie du Chien, Wis. He studied civil engineering at Harvard and was a railroad surveyor before he began writing. He edited Harper's *Round Table* (1879–82). His books for boys have been published under the titles, *The Flamingo Feather, Cab and Caboose, The Fur Seal's Tooth, Under the Great Bear* and *For the Mikado.*

Munsey, Frank Andrew (1854–1925), American publisher, born in Mercer, Me., educated in the public schools. He worked in a country store, later became manager of the Western Union telegraph office in Portland and in 1882 went to New York. There he started *The Golden Argosy,* a children's weekly, which afterward was published as a monthly magazine of fiction for adults. In 1889 *Munsey's Weekly* was launched, and in 1891 this became *Munsey's Magazine,* a successful 10-cent monthly. He bought and merged newspapers in New York, Baltimore, Philadelphia and other cities. He was the first publisher to exploit the low-priced magazine field; and he owned a chain of grocery stores.

Münsterberg, Hugo (1863–1916), German-American psychologist, educator and author, born in Danzig and educated at Leipzig and Heidelberg. He taught psychology at the University of Freiburg (1887–92) and from then until his death was professor of psychology and director of the psychological laboratories at Harvard. Münsterberg was severely criticized for his outspoken pro-German views during the World War. He wrote many books on psychology and related subjects.

Murat, Joachim (1771–1815), King of Naples, born in La Bastide, France. He enlisted in a cavalry regiment in 1787 and rose to distinction under Napoleon, whose sister he married in 1800. When the Empire was established, Murat was created a prince, marshal and grand admiral of France. His brilliant service in the Austrian campaigns won the throne of Naples for him. Murat led the army in the disastrous retreat from Moscow (1812) and commanded the cavalry in the battle of Leipzig. He then allied himself with the Austrians but returned to his former allegiance when Napoleon escaped from Elba. Murat lost his army and his throne through a severe defeat in northern Italy. He tried to recover his kingdom and landed on the coast of Calabria with a small army, but he was defeated, captured, tried by court-martial and shot at Pizzo.

Murfree, Mary Noailles (1850–1922), American writer, born in Murfreesboro, Tenn. Her stories were published under her pen name, Charles Egbert Craddock. She was interested in books and writing from childhood, as lameness kept her from an active life. In many of her novels she pictured the characters and scenes of the Tennessee mountains. Her books include *In the Tennessee Mountains, The Prophet of the Great Smoky Mountains, The Frontiersman* and *The Story of Duciehurst.*

Murillo, Bartolomé Esteban (1618–87), Spanish painter, born in Seville. Early in his career he supported himself by painting crude, hastily drawn pictures for the local merchants. He was eager to study art and finally went to Madrid. There he was befriended by Velásquez and learned much by copying the old masters. By 1650 he was recognized as the leader of the Sevillian school of art. He left about 400 canvases, principally religious subjects and studies of street children. His best-known pictures are *Immaculate Conception* (in the Louvre), *Charity of St. Thomas of Villanueva* (Museum of Seville) and *The Betrothal of St. Catherine,* painted for the Capuchin church in Cadiz. He was working on the *Betrothal* when he fell from a scaffold and was fatally injured. Murillo's pictures of the little urchins he saw every day have always been favorites with the public. His work in general is criticized because of its lack of restraint or of selective power.

Murphy, William Parry (1892–   ), American physician, born at Stoughton, Wis., educated at the University of Oregon and at Harvard. He served in a number of hospitals and from 1924 was on the medical faculty of Harvard. With G. R. Minot and G. H. Whipple he won the Nobel Prize in medicine (1934) for his discoveries in the use of liver for treating pernicious anemia.

Murray, Sir James Augustus Henry (1837–1915), Scottish lexicographer, born at Denholm, graduated from London University. His *Dialect of the Southern Counties of Scotland* made him well known as a philologist. The great work of his life, the editing of the *New English Dictionary,* was begun at Mill Hill, 1879, and was continued at Oxford until its completion in the 1920s. Murray was knighted in 1908.

Murray, Lindley (1745–1826), American grammarian, born in Swatara, Pa., and educated in Philadelphia at a Quaker academy. At the outbreak of the Revolution he was a lawyer in New York; he amassed a fortune during the war by selling merchandise to the British. In 1784 he went to England, where he devoted himself to writing and botany. Murray's *Grammar of the English Language, English Reader* and *Spelling Book* had an immense sale in his day.

Musset, de, [Louis Charles] Alfred (1810–57), French poet, author and playwright. His first success was in 1830, when he published *Contes d'Espagne et d'Italie,* a series of romantic poems. His greatest lyric poems, *Les Nuits,* reached a high place in French poetry. They were written as a result of his disappointing romance with George Sand (Aurore Dudevant). He also wrote several successful light comedies, some of which are still produced. His best-known novels are *Confessions of a Child of the Age, Mimi Pinson* and *Margot.*

Mussolini, Benito (1883–   ), Italian statesman and dictator, born in Predappio, Forli province, the son of a blacksmith. He was educated at a normal school and became a teacher but soon went to Switzerland as a journalist. He was expelled from Switzerland and also from Austria for organizing strikes. Back in Italy he became a socialist editor and writer. When the World War broke out he wanted Italy to remain neutral but was converted to the Allied cause; for this he was expelled from membership in socialist groups. He founded the paper *Il Popolo d'Italia* in Milan and, when Italy entered the war in 1915, volunteered as a private soldier. He was severely wounded and in 1917 again became editor of *Il Popolo d' Italia.*

The disturbed conditions in Italy after the close of the war brought out Mussolini's gifts as a leader. In 1919 he organized the first group of Fascisti or Black Shirts at Milan. When the Fascists marched on Rome, King Victor Emmanuel dismissed Prime Minister Facta and invited Mussolini to enter Rome on October 30, 1922. Mussolini became the dictator of Italy with the title of *Il Duce,* that is, leader or chief. He held the premiership and at the same time the ministries of foreign affairs, interior, colonies, war, marine, air and labor. Mussolini put down all opposition. Government control of the press eliminated free speech. In 1929 he arranged the treaty that reconciled the Papacy, the Pope becoming sovereign of the newly created state of Vatican City; and all differences on questions of education were settled to the satisfaction of both parties.

Mussolini began his invasion of Ethiopia early in 1935, although actual undeclared war did not begin for several months. The invasion gave Italy a chance to avenge the massacre of Italians at Aduwa in 1896, and Mussolini argued besides that Italy needed colonies for expansion. In 1936 he replaced the Italian Chamber of Deputies with a chamber of Fascists and corporations. Large private industries were also abolished, with a view to nationalizing them for war purposes. Four of the largest Italian banks were transformed into government institutions. Mussolini announced the annexation of Ethiopia in May 1936. A forceful, vigorous leader, he found time to do a considerable amount of writing. He published *My Diary, 1915–1917* (in English, 1920) and *My Autobiography* (in English, 1928).

Mutsuhito (1852–1912), Japanese Emperor, born in the mountains of Kyoto. He succeeded his father Osahito in 1867. The young emperor began his reign at a time when Japan was emerging from medievalism. He supported the new ideas that had come into vogue, changed his capital from Kyoto to Yeddo (renamed Tokyo) and abolished feudalism. A parliamentary government was established, and a system of justice was substituted for trial by torture. Public schools multiplied, European dress became common, and the European calendar was adopted. Mutsuhito was forced to put down three rebellions started by those in favor of the old ways. In 1894 and in 1905 Japan was successful in wars with China and Russia. The emperor left a modernized empire; his reign was called *Meiji* (enlightened peace).

Myers, Frederick William Henry (1843–1901), English author, educated at Cambridge. He became a school inspector and wrote poetry, essays and biography (Wordsworth and Shelley). In 1882 he founded the Society for Psychical Research; and he wrote two important books on the evidence for a future life, *Human Personality* and *Science and the Future Life.*

Myers, Philip Van Ness (1846–   ), American historian, born at Tribes' Hill, N.Y., educated at Williams College and Yale Law School. From 1879 to 1890 he served as president of Farmer's College (Ohio), and from 1890 to 1900 he was professor of history and political economy at the University of Cincinnati. In 1919 he became honorary lecturer in history at Cincinnati. He is known as the author of histories adapted to high-school courses. Among these are his *Ancient History, Medieval and Modern History, General History* and narratives of Greece and Rome.

Myron (5th century B.C.), Greek sculptor. He was famous as a worker in bronze. He lived before Phidias made his contributions to art, but his work shows great technical skill and naturalness. No original works of Myron have been preserved. The most celebrated of his sculptures, the *Discobolus* (discus thrower), is known through copies.

Nansen, Fridtjof (1861–1930), Norwegian explorer, born at Froen and graduated from the University of Christiania. He started on his first Arctic expedition in 1882; in May he started his famous journey across Greenland, which took him 46 days. In 1893 Nansen sailed in the *Fram* to explore the whole Polar Region. He reached 85° 57′, the most northerly point reached by man up to that time. He returned home to become professor of zoology at Christiania and took an active part in the separation of Norway and Sweden in 1905. In 1906 he represented his Government as ambassador to Great Britain. After he returned to academic life at Oslo University in 1908, he made several oceanographic expeditions. After the World War he carried on relief work during the famine in Russia; this and his work with refugees on behalf of the League of Nations earned him the Nobel Peace Prize in 1923. His books include *Farthest North, Scientific Results, Eskimo Life, Russia and the Peace* and *In Northern Mists.*

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Fridtjof Nansen

Enlarged from a Norwegian postage stamp issued in 1935. The price is 25 öre, of which 15 is the actual postage value and 10 öre is used for relief of refugees driven out of other countries

Napier, John (1550–1617), Scottish mathematician, born in Edinburgh and educated at St. Andrews University. In 1614 he described his famous invention of logarithms, a system of tables used in multiplying and dividing long numbers. He first used the present decimal notation, originated several formulas in trigonometry and invented mechanical devices similar to modern calculating machines.

NAPOLEON BONAPARTE (1769–1821), Emperor of the French (Napoleon I), born at Ajaccio, Corsica. At the age of 11 he went to a military school in Champagne and in 1784 to the military school of Paris. In 1788 he became a junior lieutenant in the army. He was in Paris in the early stages of the French Revolution, saw the mob invade the Tuileries and witnessed the overthrow of the monarchy. In 1793 he took a leading part in ousting the British from Toulon and in 1794 was appointed general, commanding the French artillery in Italy. He married Josephine de Beauharnais in 1796; 2 days later he left to command the army in Italy. He won a series of victories, first over the Sardinians and then over the Austrians.

Bonaparte returned to Paris and got permission from the Directory to invade Egypt, which he meant as the beginning of an effort to restore French supremacy in India. He conquered Egypt, but Nelson's victory on August 1 in the battle of the Nile (Aboukir) was a bitter reverse, and the French fleet was destroyed. In 1799 Napoleon invaded Syria and returned to Egypt, where he defeated the Turks in the battle of Aboukir. Hearing of the successes of the second coalition in Europe, of the French loss of Italy and of the condition of France, he returned home. The revolution of November 9, 1799, gave Napoleon autocratic power as First Consul under a new constitution.

Austria and England were now the chief foes of France. Austria was quickly defeated. On March 27, 1802, the peace of Amiens was signed with Britain; on August 1 Bonaparte was proclaimed consul for life. The concordat with the Pope had already been signed, and Napoleon, as he was henceforth called, gave to the nation the bank of France and the Code Napoléon, reformed its educational system, conciliated many of the old nobles and instituted the Legion of Honor. During 1802–03, however, Napoleon made preparations for a fresh development in foreign policy. He proposed to found one colonial empire in the New World and another in India. His schemes with regard to America were frustrated when fever destroyed his army in Haiti in 1803. In the same year he sold the territory of Louisiana to the United States for $15,000,000. He then determined to rearrange the map of Germany and to destroy Britain's commerce. Early in June 1802 he became president of the Italian republics, and in September and October he annexed Piedmont, Parma and Piacenza. In February 1803 he reconstituted Switzerland and sent secret agents to stir up rebellion in Ireland. Furthermore, he persisted in demanding the British evacuation of Malta. On May 18, 1803, war between France and England broke out, and Hanover was occupied by French troops.

In 1804 he became emperor as Napoleon I. Then followed a period of despotic government at home, with several campaigns abroad. In 1807 France and Spain agreed to conquer Portugal, and Junot entered Lisbon. No sooner had Napoleon made Joseph Bonaparte King of Spain, than the Spanish people rose, an English expedition landed in Portugal, and Wellington won the battle of Vimeiro. The Peninsular War proved to be one of the principal causes of the fall of Napoleon. War with Austria again broke out; after the battles of Aspern and Wagram the Emperor Francis was forced to sign the humiliating treaty of Vienna (Schönbrunn), October 1809.

In order to strengthen his political position Napoleon divorced Josephine and in 1810 married Marie Louise of Austria. At the same time he made almost superhuman efforts to ruin England by his "continental system," an agreement among France, her allies and neutral nations not to trade with England. The czar of Russia showed a desire to abandon the system; Napoleon resolved to invade Russia. His disastrous defeat at Moscow (1812) encouraged Europe to rise against him, and in 1813 the war of liberation began. Russia, Prussia and Austria united against him, and the French were defeated at Leipzig.

The allies invaded France; Napoleon abdicated (1814) and was exiled to Elba. He escaped and landed in France on March 1, 1815, and the famous Hundred Days began. The battle of Waterloo (June 18) completed the downfall of his hopes. After his surrender to the British he was exiled to St. Helena, where he died.

Napoleon II (Napoléon François Charles Joseph Bonaparte; 1811–32), son of Napoleon and Marie Louise of Austria. He was given the title of king of Rome shortly after his birth; when Napoleon abdicated in 1814, he named his son as his successor. The young duke, however, never ruled. He was virtually a prisoner in Vienna from 1815 until he died of tuberculosis. He is the subject of Rostand's play *L'Aiglon*.

Napoleon III (Charles Louis Napoleon Bonaparte; 1808–73), Emperor of the French, nephew of Napoleon I and son of Louis Bonaparte, King of Holland. After Napoleon's only son died in 1832, Louis Napoleon, as he was called, regarded himself as the rightful heir to the throne. In 1836 he tried to stir up a revolution in Strasbourg, and the government exiled him to the United States. In 1840, when he made a second attempt to displace Louis Philippe and restore the Napoleonic dynasty, he was sentenced to life imprisonment in the fortress of Ham. Six years later he escaped to England. The revolution of 1848 and abdication of Louis Philippe gave him his opportunity. In June of that year Louis Napoleon was elected to the National Assembly and the following December was chosen president of the new republic. In 1851, by a show of military force, he secured his election for a period of 10 years. His next step was the *coup d'état* of 1851, by which he dissolved the constitution, and in the following year he became emperor. His foreign policy was unsuccessful. The Franco-Prussian War, into which he was drawn by Bismarck, resulted in the total defeat of the French and the collapse of the empire. Napoleon fled to England, where he died. His son Napoleon was killed in 1879 while fighting in Africa in the campaign against the Zulus.

Narváez, de, Pánfilo (*c.* 1470–1528), Spanish soldier and explorer, born in Valladolid. He was lieutenant to the governor of Cuba and helped to conquer that island. In 1520 he was sent to Mexico to discipline Cortes, but his soldiers deserted to the Mexicans, and Narvaez, wounded, was captured and imprisoned for 2 years. Later he obtained a grant of land in Florida from Charles V and in 1528 landed on the west coast and explored into the interior but failed to find valuable minerals. Narvaez and most of his men were lost in an attempt to reach Mexico.

Nasmyth, James (1808–90), Scottish engineer, born and educated in Edinburgh. He became interested in mechanics in boyhood. In 1834 he established a machine-tool factory at Manchester and invented a nut-shaping machine and a hydraulic punch. He invented the steam hammer in 1839. With James Campbell he wrote *The Moon Considered as a Planet* (1874); his *Autobiography* followed in 1883.

Nast, Thomas (1840–1902), American cartoonist and illustrator, born at Landau, Germany. He was brought to the United States at the age of 6. He studied art and at 15 was drawing for prominent magazines. He was several times sent abroad as a reporting artist, for example, during Garibaldi's campaign in 1860. His Civil War cartoons made him famous. He added to his reputation by almost singlehandedly breaking up the corrupt Tweed Ring that was ruling New York city. Nast created the political party symbols still used; the tiger for Tammany Hall, the elephant for the Republican party and the donkey for the Democratic party.

Nazimova, Alla (1879–), Russian-American actress, born in the Crimea. She made her professional debut in London in 1905 in *The Chosen People,* in which she spoke Russian. She soon learned to speak English and delighted New York audiences in *A Doll's House* and other dramas. After a period in moving pictures, Nazimova appeared in the stage presentation of O'Neill's *Mourning Becomes Electra.*

Nearchus (3d century B.C.), Macedonian naval commander, native of Crete, who settled in Amphipolis, during the reign of Philip of Macedon. He formed a close friendship with Prince Alexander, Philip's son, and after Alexander's accession joined him in the conquest of the Persian Empire. Alexander placed Nearchus in command of a fleet that he built on the Hydaspes River; Nearchus made a memorable voyage down the Indus, along the Persian Gulf and up the Pasitigris to Susa in 324 B.C. Parts of his narrative are preserved in the *Indica* of Arrian.

Nebuchadnezzar (d. 562 B.C.), King of Babylon, son of Nabopolassar. He reigned from about 605 B.C. until his death. In 597 B.C. King Jehoiachin of Judea rebelled against him. Nebuchadnezzar besieged Jerusalem; when the city fell, he sent the king and 10,000 of his subjects into exile. Zedekiah, who was placed on the vacated throne, also revolted, and in 586 B.C. Nebuchadnezzar destroyed the city, blinded the king and carried about 4,000 Jews into captivity. He captured Tyre after 12 years' siege and invaded Egypt. Nebuchadnezzar built the Hanging Gardens in Babylon, one of the Seven Wonders of the ancient world, to please his wife, who complained of the flatness of the country.

Necho (reigned *c.* 610 to 594 B.C.), Egyptian King, second ruler of the 26th dynasty. He was the successor of Psammetichus I. Early in his reign Necho defeated and killed Josiah, King of Judah, at Megiddo, and 3 months later he deposed Johoahaz, Josiah's son. In an effort to extend his kingdom in the Euphrates Valley he was totally defeated by Prince Nebuchadnezzar of Babylon (605 B.C.). Necho tried to build a waterway between the Nile and the Red Sea, forerunner of the route of the Suez Canal.

Necker, Jacques (1732–1804), French financier, born in Geneva, Switzerland. He amassed a fortune in Paris as a banker and after his retirement from business became widely known as a writer on financial and economic subjects. In 1777 he was appointed director general of finances, and though he immediately put notable reforms into effect, he was too late to save the country from bankruptcy. In 1788, after a period of exile, he was recalled, and on his advice the National Assembly was convened. Necker was again director general in 1790.

Nelson, Horatio, Viscount (1758–1805), British admiral, born in Norfolk. He entered the navy at the age of 12. In 1777 after voyages to the West Indies, the Arctic regions and the East Indies, he became a lieutenant and in 1779 was promoted to captain. He saw continuous service until 1787, when he married and retired. Nelson returned to the navy in 1793 to take part in the war with France. He commanded the *Agamemnon,* one of the squadron under Admiral Hood. He was active in the conquest of Corsica. During the blockade of Calvi he lost his right eye, but he remained on duty in the Mediterranean and as commodore was responsible for the victory off Cape St. Vincent in 1797. In 1797 he suffered his only major defeat in an attack on Santa Cruz, a port on the island of Teneriffe. Here Nelson lost his right arm.

Napoleon was winning victories on land and threatening to become the conqueror of all Europe, but his plans were hampered by Nelson's telling blows at the French navy. In 1798 he annihilated a French fleet in the Bay of Aboukir (the Battle of the Nile) and was raised to the peerage as Baron Nelson. In 1801, having become vice admiral, he defeated the Danish fleet at Copenhagen and was created viscount. When the war with France was renewed in 1803, Nelson took command of the Mediterranean fleet, with the *Victory* as his flagship. For 2 years the French fleet evaded him, but on October 21, 1805, he met the enemy in a decisive battle off Cape Trafalgar, annihilating the combined French and Spanish fleets but losing his own life at the moment of victory. At the start of the battle he displayed the now famous signal, "England expects every man to do his duty."

Nepos, Cornelius (1st century B.C.), Roman historian, a friend of Cicero and the reputed author of a monumental series of biographies, 25 of which survive. Until the 16th century the *Lives* were supposed to be the work of Aemilius Probus. These biographies are thought to be a section from the lost *De Viris Illustribus.* While they are sometimes marred by inaccuracy, they are written with great conciseness and purity of style, and the collection is a standard Latin textbook.

Nernst, Walter (1864–), German physicist, born in West Prussia and educated at Zurich, Berlin and other German universities. He joined the faculty of Leipzig University, later became professor of physics at Göttingen and in 1895 organized and became director of the Institute for Physical Chemistry there. Nernst published numerous books on scientific subjects. In 1920 he was awarded the Nobel Prize in chemistry for his invention of an electric glow lamp and for his discoveries in thermodynamics.

Nero (Nero Claudius Caesar Drusus Germanicus; 37–68 A.D.), Roman Emperor. He was adopted by the Emperor Claudius in the year 50 and succeeded him in 54, displacing Claudius's son, Britannicus. At first his evil impulses were curbed by his tutor, the philosopher Seneca, but most of his reign was marked by sensuality, brutality and cruelty. He had Britannicus poisoned, and to please his favorite, Poppaea Sabina, he ordered his mother (Agrippina) put to death. Afterward he divorced and murdered his wife, Octavia, in order to marry Poppaea; he later killed Poppaea in a burst of passion. When Antonia, daughter of Claudius, refused to marry him, he caused her death; then he married another woman after he had her husband killed. He accused the Christians of the burning of Rome and had many put to death, afterward building a magnificent new city. In 68 his troops revolted in favor of Galba, and Nero fled from Rome, saving himself from execution by suicide.

Nerva, Marcus Cocceius (32–98 A.D.), Roman Emperor, born in Umbria. He was elected emperor by the Senate in 96 as successor to Domitian. The army and the people favored this choice, and Nerva fulfilled their hopes by ruling with moderation and justice. He was succeeded by Trajan, whom he had adopted.

Nestorius (d. *c.* 451), Syrian bishop, patriarch of Constantinople. He studied theology at Antioch and then retired to a monastery, from which he was called to become bishop of Constantinople (428). He held that Mary should not be called the Mother of God, because Jesus had two separate natures as Son of God and as Son of Mary. Nestorius's teachings were condemned, and he returned to his monastery near Antioch but was later banished to Egypt. There are still followers of Nestorius, the Nestorian or East Syrian Church in Turkey and Persia. The Nestorians had missions in China and Tartary as early as the 7th and 10th centuries.

Nevin, Ethelbert (1862–1901), American composer, born in Pennsylvania. He was an accomplished piano player at the age of 10 and was sent to Germany for further study. He taught successfully in Boston and then (1893) went to live in Italy. From 1900 to his death a year later he taught music at Yale University. Best-known of his compositions are *Narcissus* of the group *Water Scenes; In Tuscany,* a piano suite; and *The Rosary.*

Newcomb, Simon (1835–1909), American astronomer, born in Nova Scotia. He emigrated to the United States in 1853 and in 1858 was graduated from Lawrence Scientific School, Harvard. In 1861, as professor of mathematics in the U. S. Navy, he supervised the construction of the 26-inch telescope at the Naval Observatory. He accepted the professorship of mathematics at Johns Hopkins University in 1884, and from 1877 to 1897 he took charge of the *Nautical Almanac,* a book containing tables of astronomical data for use by navigators. He was a brilliant mathematician and astronomer. He collected the accumulated records of 25 centuries with regard to the moon's motion and thus made possible the preparation of accurate tables. He was the first American after Benjamin Franklin to be made an officer of the French Legion of Honor. Among his many publications are *Popular Astronomy, Astronomy for Schools and Colleges* and about 300 scientific memoirs.

Newman, John Henry (1801–90), English cardinal, born in London, graduated from Trinity College, Oxford, in 1820. He entered the church in 1824 and became vicar of St. Mary's, Oxford, in 1828. There he built up a wide reputation through his eloquence in the pulpit and his strong personality. He became one of the leaders of the Oxford Tractarian Movement or the High Church Movement, which resulted in the conversion of himself (1845) and many others to Roman Catholicism. He was ordained a priest in Rome and from 1854 to 1858 was rector of Catholic University at Dublin. In 1879 Pope Leo XIII created him a cardinal. Newman defended his position in his *Apologia pro Vita Sua;* his other well-known work, *Grammar of Assent,* is on the philosophy of faith. He wrote the hymn *Lead, Kindly Light* and the poem *Dream of Gerontius.*

NEWTON, SIR ISAAC (1642–1727), English mathematician, born in Woolsthorpe, Lincolnshire. He entered Trinity College, Cambridge, took his degree in 1665, received a fellowship in 1667 and in 1669 became professor of mathematics. For 30 years he was associated with Cambridge University, and his discoveries resulted from research work there.

Between 1665 and 1668 Newton discovered the binomial theorem and the method of tangents; laid down the first rules of differential calculus, which he announced at the same time as Leibnitz; explained the influence of gravity on the moon; and built his first reflecting telescope.

It was in this same period that he is said to have watched an apple fall in the garden at Woolsthorpe, which suggested to him that every particle of matter in the universe attracts every other particle. Many years later he was able to complete the mathematical statement of the law of universal gravitation, the foundation of modern astronomy. His great work embodying his conclusions, *Principia Mathematica,* was issued in 1687. His researches in optical phenomena were published in 1704 under the title *Opticks.*

He made the first demonstration of the fact that white light is a combination of the colors seen in the rainbow. He separated these colors by passing a beam of sunlight through a glass prism in a darkened room, producing the band of colors known as the solar spectrum. Newton favored the theory that light is composed of minute particles of matter (corpuscles).

He represented Cambridge University in Parliament and from 1699 until his death was master of the mint. He became president of the Royal Society in 1703 and 2 years later received a knighthood. He died in London and was buried in Westminster Abbey.

Ney, Michel (1769–1815), marshal of France, born in Saarlouis, Prussia, the son of a cooper. In 1788 he entered the army as a private and reached the rank of general of brigade in 1796. During the Napoleonic wars Napoleon called him *bravest of the brave.* In 1804 he became a marshal of the empire. As commander of the rear guard during the retreat from Moscow he saved the remnants of the army. Louis XVIII made him peer of France. Sent to oppose Napoleon on his return from Elba, he rejoined him and fought bravely at Waterloo. At the second restoration he was tried by a court-martial and was shot for high treason.

Nicholas I (Petrović Njegoš; 1841–1921), King of Montenegro. He succeeded (1860) his uncle Danilo I, who was assassinated. He was defeated by the Turks in 1862 but won the independence of his country through the intervention of the great powers. He renewed the war in 1876 and defeated the Turks. The Congress of Berlin in 1878 made Montenegro a sovereign state and added to its territory. Nicholas proclaimed himself king in 1910. He sided with the central powers in the World War. He was deposed in 1918, and Montenegro was absorbed by Yugoslavia.

Nicholas I (1796–1855), Czar of Russia, son of Paul I. He succeeded his brother Alexander I in 1825. At the beginning of his reign he relentlessly crushed a military insurrection. He ruled so sternly that he was called the *Iron Czar.* He extended Russian territory by successful wars with Persia and Turkey. He made the kingdom of Poland a Russian province. In the Crimean War (1855) Turkey defeated Russia with the aid of Britain and France. Nicholas died during this campaign.

Nicholas II (1868–1918), Czar of Russia, son of Alexander III, whom he succeeded in 1894. He was educated by private tutors and traveled widely. After taking the throne he married Princess Alix of Hesse-Darmstadt, who assumed the name Alexandra. In 1899 he was responsible for the first meeting of the International Peace Congress at The Hague. At home he refused the people a share in internal affairs and opposed the growth of social democracy. However, the Czar had to make a concession to the strong revolutionary feeling by setting up a representative assembly, the Duma, in 1905, but this body possessed little real power.

After the defeat of Russia in the Russo-Japanese War (1905–06) conditions grew steadily worse, and a revolution was averted only by the outbreak of the World War, which Russia entered as a protector of the small Slav nations. The Russian people revolted in 1917, and the czar abdicated on March 15. He and his family were later imprisoned at Ekaterinburg by the new Bolshevik power. In July 1918 Nicholas, his wife and five children (four daughters and a son) were executed by the revolutionists.

Nicholson, Meredith (1866–), American author, born in Crawfordsville, Ind., and educated in the public schools of Indianapolis. At 18 he began 15 years of newspaper work in Indianapolis. He wrote several volumes of verse and essays but is best-known for his fiction, including realistic, romantic and mystery novels. Among these are *The Main Chance, The House of a Thousand Candles, The Port of Missing Men, A Hoosier Chronicle, Broken Barriers* and *The Cavalier of Tennessee.* In 1933-35 he was American minister to Paraguay.

Nicolay, John George (1832–1901), American author, born in Essingen, Bavaria. He came to the United States in 1838. Nicolay was assistant to the secretary of state at Springfield, Ill., when he met Abraham Lincoln, then a young lawyer, who took him to Washington as private secretary when he became President. Nicolay was American consul at Paris (1865–69) and marshal of the Supreme Court (1872–87). The 10-volume biography of Lincoln written by Nicolay and John Hay was issued in book form (1890–94) after appearing serially in the *Century Magazine.*

Nicolle, Charles Jules Henri (1866–1936), French physician. He studied medicine at Rouen and practiced in Paris, where he also worked at the Pasteur Institute. In 1903 he went to Tunis and there studied the bacteriology of many diseases. He identified the virus of cattle plague and showed that typhus was transmitted by the body louse. He won the Nobel Prize for medicine in 1928.

Niebuhr, Barthold Georg (1776–1831), German historian and statesman, born in Copenhagen. He attended Kiel and Edinburgh universities, then held several positions under the Danish government and in 1806 entered the Prussian civil service. At the opening of the University of Berlin in 1810 he became professor of Roman history. Niebuhr is best-known as being one of the first to apply scientific methods to the study and writing of history. In his time it was considered revolutionary on his part to urge that history be taught on the basis of facts and figures rather than legend and tradition. His greatest work *The History of Rome* was written when he had access to original sources while Prussian envoy to Rome (1816–23).

Niehaus, Charles Henry (1855–1935), American sculptor, a native of Cincinnati, Ohio. He studied in Germany at the Royal Academy of Munich, where he received the first medal awarded to an American. His best-known works are statues of famous men and historic monuments. Among these are the Garfield Monument at Cincinnati; statues of Garfield and William Allen for the Capitol at Washington; a statue of McKinley and a lunette for the McKinley Mausoleum in Canton, Ohio; statues of Gibbon and Moses for the Congressional Library; and various soldiers' and sailors' memorials.

Niepce, Joseph Nicéphore (1765–1833), French physicist, born at Châlon-sur-Saône. He served in the army and from 1795 to 1801 was governor of the district of Nice. In 1801 he returned to his birthplace and with his brother Claude went into mechanical and chemical research. He developed a process of obtaining photographs on metal plates (1827) but found that Daguerre was working along the same lines. In 1829 the two joined forces, and Daguerre perfected the process after Niepce died.

Nietzsche, Friedrich Wilhelm (1844–1900), German philosopher, born near Leipzig and educated at the universities of Bonn and Leipzig. In 1869 he became professor of classical philology at the University of Basel, but ill health forced him to resign in 1879. Nearly all his writings attack the foundations of Christian society—the church, democracy, morals and marriage. He taught that all men should aim to become supermen and as powerful as possible without regard for the methods used to gain power. Anyone who could not rise to power was unimportant and fit only to be ruled. Nietzsche said that morality is only for slaves; his whole philosophy might be summed up as, "Might is right." His mind failed 11 years before his death. He wrote in an artistic style. Some of his philosophical works are *Beyond Good and Evil, Thus Spoke Zarathustra, The Will to Power* and *The Genealogy of Morals.*

Nightingale, Florence (1820–1910), English nurse and hospital reformer, born in Florence, Italy, and educated in England. She became interested in hospitals and nursing at an early age and at 22 began a training course at the Protestant Deaconess's Institute at Kaiserwerth, Germany. After she had served as superintendent of a hospital in London, she took a staff of 38 women to nurse the wounded during the Crimean War. In 4 months the death rate in the hospitals was reduced from 42 per cent to 2 per cent. She made her hospitals efficient but still found time to go around the wards at night with a lamp, comforting the sick; she became known as "The Lady of the Lamp." After the war she founded hospital schools for nursing.

Nobel, Alfred Bernhard (1833–96), Swedish chemist and inventor of dynamite, born at Stockholm. His father, a mechanician, settled in St. Petersburg and in 1862 began to manufacture nitroglycerine. In 1867 Alfred, who assisted him, discovered, through the accidental escape of some nitroglycerine from a cask into the siliceous sand of the packing, how to make a safe and manageable explosive—dynamite. He also invented blasting jelly and several kinds of smokeless powder. At his death he left a fortune of some $10,000,000, most of which he ordered to be used to found the five Nobel prizes, which are awarded annually for the most important discoveries and works for the benefit of humanity in chemistry, medicine, physics, literature and the furtherance of peace in the world.

Nobile, Umberto (1885–), Italian explorer, born near Naples. He left the Polytechnic Institute of Naples to take up aeronautics. He designed and built airships for the Italian navy during the World War. In 1926 Nobile piloted the dirigible *Norge,* built under his direction, in a flight over the North Pole from Spitsbergen. The expedition was commanded by Roald Amundsen. In 1928 Nobile commanded another dirigible, the *Italia,* on a successful flight over the Pole, but on the return journey the dirigible crashed on ice floes north of Spitsbergen. He and the other survivors were saved by Norwegian airplanes and a Russian ship. One airplane rescue party, led by Amundsen, was lost during the search.

Nogi, Maresuke, Count (1849–1912), Japanese general. He fought in the Satsuma rebellion and in the Chino-Japanese War. In the Russo-Japanese War he became famous as leader of the army that forced the surrender of Port Arthur (January 1905). In 1906 General Nogi was created a count. He and his wife committed hara-kiri (suicide) in accordance with tradition, when the Emperor Mutsuhito died in 1912.

Nordau, Max Simon (1849–1923), German author, born in Budapest, Hungary, of Jewish descent. He studied at the Budapest Royal University and at the Faculty of Medicine in Paris. He practiced medicine in Budapest for a time but eventually settled in Paris. His best-known works include *Conventional Lies of Our Civilization, Paradoxes* and *Degeneration,* in which he attacked most of the conventions accepted by modern civilization. The theme of *Degeneration* strives to show the mental unsoundness of many distinguished writers. Nordau was one of the leaders of the Jewish Zionist Movement.

Nordenskjöld, Nils Adolph Erik, Baron (1832–1901) Swedish explorer, born in Helsingfors, Finland. In 1857 he settled in Stockholm, became a naturalized citizen of Sweden and later was appointed director of the Royal Museum. He made the first of several expeditions to the Arctic regions in 1858. On the expedition of 1878–79, in the *Vega,* he discovered and navigated the Northeast passage from the Atlantic to the Pacific along the north coast of Asia. He wrote several books on geographical subjects.

Norris, Charles Gilman (1881–), American author, born in Chicago, brother of Frank, husband of Kathleen. He graduated from the University of Chicago and began his literary career as editor of *Country Life in America.* He became editor of *Sunset Magazine* in 1905 and was art editor of the *American Magazine* (1908–13). His novels, realistic pictures of everyday life, have won general popularity and critical appreciation. They include *Brass* (1921), *Bread* (1923), *Seed* (1930) and *Hands* (1935).

Norris, Frank (1870–1902), American author, born in Chicago. He studied art in Paris (1887–89) and later attended Harvard University and the University of California. He reported the Jameson Raid in South Africa as a correspondent for the San Francisco *Chronicle.* During the Spanish-American War he represented *McClure's Magazine* in Cuba. His first important novel, *McTeague,* which appeared in 1899, attracted notice because of its vivid descriptions of the San Francisco slums. Norris's most ambitious work was a trilogy: *Octopus,* the story of wheat growing, appeared in 1901. It was followed in 1903 by *The Pit,* a tale of the grain exchanges; *The Wolf,* a story of famine, was left unfinished at his death.

Norris, Kathleen (Kathleen Thompson; 1880–), American author, born in San Francisco, wife of Charles G. Norris. She became a very prolific writer of the day. Her first novel, *Mother* (1911), proved a great success, and it was followed by many popular books, including *Certain People of Importance* (1922), *Love of Julie Borel* (1931), *Manhattan Love Song* (1934) and *Woman in Love* (1935).

North, Frederick, Lord (1732–92), English statesman, son of the Earl of Guilford. He studied at Eton and Trinity College, Oxford. He entered the House of Commons at the age of 22 and served in various minor executive positions until 1767, when he became chancellor of the exchequer. He upheld the tea tax, which was so unpopular in America, and when he became prime minister, he showed himself a servant of George III. Lord North realized the danger of the king's policy as early as 1776 but did not resign office until 1782, when the war was virtually over. In his last years he was blind.

Northcliffe, Alfred Charles William Harmsworth, 1st Viscount (1865–1922), British journalist and publisher, born in Dublin, the son of a barrister. He began his journalistic career by doing free-lance writing. In 1888 he founded a weekly called *Answers.* Other papers were started, and the foundation was laid for a great publishing business. He and his brother Harold bought the *Evening News,* a London daily (1894). In 1896 they founded the *Daily Mail.* For the next quarter of a century Northcliffe was the most influential newspaper publisher in the British Empire. During the World War he supported Lloyd George, and the attacks of his newspapers led to the downfall of the Asquith government. He received a peerage in 1917.

Norton, Charles Eliot (1827–1908), American scholar, born in Cambridge, Mass. He graduated from Harvard in 1846 and entered the publishing business. From 1864 to 1868 he was coeditor, with James Russell Lowell, of the *North American Review.* He was a lecturer and the first professor of the history of art at Harvard (1874–98). He edited and published the letters and literary fragments of many of his friends, including Carlyle, Emerson, Ruskin and Lowell and wrote a biography of Longfellow. His prose translation of Dante's *Divine Comedy* is well known.

Noyes, Alfred (1880–), English poet, born in Staffordshire and educated at Exeter College, Oxford. He began his literary career by contributing verse and articles of criticism to magazines. His first volume of poems *The Loom of Years* appeared in 1902. In 1913 he gave a series of lectures on *The Sea in English Poetry* at Lowell Institute, Boston, and was visiting professor of English literature at Princeton (1914–23). His fame as a poet of the sea was established wth the publication of *Drake, Forty Singing Seamen* and *The Last Voyage.* Among his other works are *Robin Hood* (1927), a poetic drama, and the epic of scientific discovery called *The Torchbearers.* He wrote a biography of Voltaire.

Nye, Bill (Edgar Wilson Nye; 1850–96), American humorous writer, born in Shirley, Me. In 1876 he was admitted to the bar in Wyoming and was at later times a member of the legislature, postmaster and newspaper correspondent. In 1886 he settled in New York, continuing a literary career begun in the West. In his time he was extremely popular. Among his works are *Bill Nye and the Boomerang; Baled Hay; Fun, Wit and Humor* (with James Whitcomb Riley); and *Comic History of the United States.*

Obregon, Alvaro (1880–1928), Mexican President. He entered public life in 1913, when he took a leading part with Villa and Gonzalez in Carranza's revolution. He entered Mexico City August 15, 1914, as head of the constitutional forces. Villa turned against Carranza in 1915, Obregon led the campaign against Villa. He lost his right arm in battle. In 1920 he was chosen president and held that office till 1924, when he was succeeded by Plutarco Calles, but in 1928 he was again elected President. Strong opposition to his rule by Serrano and Gomez caused a revolt, which was quelled after the two leaders were executed. Before Obregon could take office for his second term, he was assassinated by a student.

O'Casey, Sean (1884–), Irish dramatist, born in Dublin. He grew up in the slums, which formed the background of some of the plays he later wrote. His first play *The Shadow of a Gunman* was successfully produced at the Abbey Theatre, Dublin, in 1923. Others, popular in the United States, are *Juno and the Paycock, The Plough and the Stars, The Silver Tassie* and *Within the Gates.* O'Casey's plays often deal with Ireland's internal political struggles. They are realistic, with a rich, racy dialogue.

Ochs, Adolph Simon (1858–1935), American newspaper publisher, born in Cincinnati, Ohio, and educated in the public schools of Knoxville, Tenn. His earliest juvenile task was that of copy carrier, from which he rose to typesetting. He remained a compositor for 4 years, and at the age of 20 he became publisher of the *Chattanooga Times.* In 1896 he gained controlling interest in the New York *Times,* and under his management it developed into one of the most important papers in the world. He consolidated the *Philadelphia Times,* which he bought in 1901, with the *Public Ledger* and sold the property to Cyrus H. K. Curtis. Mr. Ochs encouraged exploration and financed the Byrd polar flights.

O'Connell, Daniel (1775–1847), Irish patriot, nicknamed *The Liberator,* born in County Kerry. He was called to the Irish bar in 1798 and displayed a great gift for oratory. In 1828 he entered Parliament, and as head of the Catholic party he fought for the admission of Catholics to the House of Commons. At that time Catholics were morally unable to take the oath required by Parliament. In 1829 the Irish Catholics were emancipated. He organized a propaganda group, the *Catholic Association,* and in 1841 began his agitation for the repeal of the union of Great Britain and Ireland. The British Cabinet under Peel opposed him. Mass meetings were held everywhere. O'Connell was arrested on the eve of success, found guilty of creating discontent, imprisoned and a few months later set free. In 1841 he became the first Catholic lord mayor of Dublin since the reign of James II.

O'Connell, William Henry (1859–), American cardinal, born in Lowell, Mass., and educated at Boston College and at the North American College in Rome. Ordained a priest in 1884, he was rector of the North American College in 1895. In 1901 he returned to the United States to become bishop of Portland, Me. He performed several important special missions, including a trip to Japan as an envoy of the Pope, and later was chosen archbishop of Boston. He became a cardinal in 1911. Cardinal O'Connell translated *The Passion of Our Lord,* by Cardinal de Lai.

O'Connor, Thomas Power (1848–1929), Irish journalist and parliamentary leader, popularly known as *Tay Pay,* born at Athlone. He did newspaper work in Dublin and later in London, where he was a sub-editor on the *Daily Telegraph.* He entered Parliament as member for Galway (1880–85) and later represented Liverpool in the House of Commons from 1885 until he died. After 1918 he was known as the "Father of the House of Commons." He became one of the leading journalists of England and founded the *Star,* the *Sun,* the *Weekly Sun* and *T. P.'s Weekly.*

Octavia (d. 11 B.C.), Roman matron, a sister of the Emperor Augustus and wife of Mark Antony. She first married Gaius Marcellus and then Mark Antony, who left her for Cleopatra and so brought about the renewed quarrel with Augustus (Octavian) that ended in Antony's death. Octavia reared Antony's children by his first wife and Cleopatra, as well as her own.

Odoacer (*c.* 434–493), Italy's first barbarian ruler. He entered the military service, rapidly rose to eminence and took part in the revolution by which Orestes drove the Emperor Julius Nepos from the throne in 475. He assumed control of Italy and reigned for 13 years but was defeated by Theodoric, King of the Ostrogoths. Odoacer hid in Ravenna for 4 years, finally surrendering with the stipulation that he was to rule the Roman state jointly with Theodoric. Shortly afterward Theodoric himself murdered Odoacer at a banquet.

Offenbach, Jacques (1819–80), French operetta composer, born in Cologne. He studied at the Paris Conservatory of Music and became a famous cellist. In 1855 he opened the Bouffes Parisiens. Offenbach composed many light operas, including *Tales of Hoffmann, Bluebeard, Orpheus in Hades, The Two Blind Ones, The Brigands* and *The Daughter of the Drum Major.* The Barcarolle from *Tales of Hoffmann* (published after his death) is his most popular short composition.

O'Flaherty, Liam (1896–), Irish novelist, born in County Galway. He ran away from home to fight in the World War and later traveled widely and was interested in labor movements. His novels include *Thy Neighbor's Wife, The Informer* (later dramatized), *Mr. Gilhooley* and *The House of Gold. The Mountain Tavern* is a collection of short stories. *Two Years* is autobiographical.

Oglethorpe, James Edward (1696–1785), English general, born in London. He served in the British army and later entered Parliament. He planned a colony in America as a refuge for persecuted Protestants and debtors. George II gave the land, which was named Georgia in his honor, and Parliament contributed $50,000. In 1733 Oglethorpe sailed with 130 persons and founded the city of Savannah. He surrendered the colony to the British Government in 1752 and lived thereafter in England.

Ohm, Georg Simon (1787–1854), German physicist, born at Erlangen, Bavaria. He studied at the University of Erlangen and later taught physics at Cologne, Nuremburg and Munich. *Ohm's Law* was a result of his researches in electricity. It states that in a current flowing in a conductor, the electromotive force in volts is equal to the product of the current strength in amperes multiplied by the resistance of the conductor in ohms. The measure of resistance, called the *ohm,* was so named by the Paris Congress of Physicists in honor of his achievements.

Olaf Trygvesson (969–1000), King of Norway, a grandson of Harold Fairhair. Little is known of his early life except that part of it was spent in exile and slavery. He helped his father-in-law, the Wendish king, in his wars and raided along the British coasts. He was converted to Christianity and made peace with England about 994. The next year he went to Norway, overthrew King Haakon and took the throne. He tried to convert Norway to Christianity by force as well as by argument. He was defeated when he tried to conquer Sweden and Denmark and died in a naval battle. His romantic life is the subject of a great many old songs and legends.

Olney, Richard (1835–1917), American statesman, born at Oxford, Mass. He was graduated from Brown University in 1856 and from Harvard Law School in 1858. He practiced law in Boston and later became secretary of state in Cleveland's Cabinet. In that post he announced the "Roosevelt Corollary" of the Monroe Doctrine, to the effect that the United States was sovereign on the North American continent. This was for many years an important part of the foreign policy of the United States.

Omar Abu-Hafsah-ibn-al-Khattab (582–644), second caliph of the Moslems. After Mohammed's death he caused Abu-Bekr, Mohammed's chief disciple, to be proclaimed caliph. When Abu-Bekr died, Omar succeeded as caliph. He pushed the wars of conquest with increased vigor. In 637 he was summoned to Jerusalem to receive the keys of that city and before leaving gave orders to build a mosque, the Mosque of Omar, on the site of the Temple of Solomon. He conquered Palestine, Syria and Egypt.

Omar Khayyám (*c.* 1050–1123), Persian mathematician, astronomer and poet, born at Nishapur. Omar was the son of a tentmaker (Khayyám). He reformed the Moslem calendar by order of the Sultan, and his treatise on algebra made him famous as a mathematician even in the Western World. In Europe he was unknown as a poet until Edward Fitzgerald translated (1859) a number of his quatrains and published them as the *Rubáiyát.* The beauty of the translation is considered finer than the original Persian.

O'Neill, Eugene [Gladstone] (1888–), American playwright, born in New York city. He studied at Princeton and Harvard universities. He was a sailor and engaged in various lines of business in the United States and Central America before he began to write. He spent the summer of 1916 at Provincetown, Mass., where he met the Provincetown Players, the theatrical group that later produced nearly all his short plays. O'Neill rapidly became the most famous of the younger American dramatists. His greatest successes are his *Emperor Jones, Desire under the Elms, Anna Christie, The Hairy Ape, The Great God Brown, Strange Interlude, Mourning Becomes Electra* and *Ah, Wilderness.* He received the Pulitzer Prize three times (1920, 1922, 1928) and the Nobel Prize for literature in 1936.

Optic, Oliver (William Taylor Adams; 1822–97), American writer of juvenile stories. Though of little literary merit, the Oliver Optic stories had an immense vogue in the last years of the 19th century. More than 100 novels and nearly 1,500 shorter stories were written by him.

Origen (*c.* 185–*c.* 254), Greek father of the Church, born at Alexandria of Christian parentage. He influenced the course of church history for centuries, formulating its dogmas and founding Biblical criticism. His writings are said to have amounted to 6,000 titles, but by far the greater number are lost. He compiled *Hexapla,* the first polyglot of the Old Testament, and wrote a defence of Christianity against Celsus and many other works.

Orlando, Vittorio Emanuele (1860–), Italian statesman. During the World War he held important ministries and finally became premier. He headed the Italian delegation to the peace conference at Versailles. There, with Lloyd George, Clemenceau and Wilson, he became one of the "Big Four" who dominated the proceedings. He retired from politics when the Fascist rule began.

Orlov, Grigori Grigoryevich (1734–83), Russian statesman. He was a favorite of Catherine the Great, whom he had helped to place on the throne and to whom he gave the 194¾-carat *Orloff diamond.* As such he helped to rule Russia. He favored a partial emancipation of the serfs. His brother Aleksyey Grigoryevich Orlov (1737–1809) was also one of the conspirators who enthroned Catherine and is supposed to have killed Peter III. He was a distinguished soldier and a breed of Russian trotting horses is named after him.

Ortega y Gasset, José (1883–), Spanish writer. He wrote a great deal on political, social and economic subjects. His attacks on the Spanish monarchy were influential in bringing about the Revolution of 1931. The titles of two of his books, translated into English, are *The Modern Theme* and *The Revolt of the Masses.*

Osborn, Henry Fairfield (1857–1935), American paleontologist, born at Fairfield, Conn., and educated at Princeton. For many years he taught anatomy, biology and zoology. In 1891 he became curator of vertebrate paleontology at the American Museum of Natural History, which he later served as president. As head of the museum, he extended its educational work and introduced new methods of mounting the collections. He went on many expeditions for study and collection. He wrote, among other books, *From the Greeks to Darwin, The Age of Mammals, Men of the Old Stone Age, The Origin and Evolution of Life, Creative Education* and *Fifty-two Years of Research, Observation and Publication.*

Osborne, Thomas Mott (1859–1926), American penologist, born at Auburn, N. Y. and graduated from Harvard. He published a newspaper and was active in politics and civic affairs. He was made chairman of a New York State commission on prison reform and became a voluntary prisoner at the Auburn penitentiary to study conditions there. He became an active reformer and served as warden at Sing Sing and commandant of the naval prison at Portsmouth, N. H. Osborne believed that the purpose of prisons should be to educate rather than to punish. He set up systems of self-government by which the inmates choose their own officers and enforce discipline among themselves.

Osceola (*c.* 1804–38), Seminole Indian chief. His father was a white man; his mother, an Indian, daughter of a chief of the Creek nation. Osceola's wife, a half-breed, was taken from him and sold to her mother's former owner, and Osceola killed the government agent who had imprisoned him to prevent a scheme of revenge. He then declared war against the whites and in one day massacred 110 Federal soldiers. For nearly 2 years the war continued. Finally Osceola accepted a truce to discuss terms of peace, but he was seized and sent to prison, where he died.

Osler, Sir William (1849–1919), Canadian physician, born at Bond Head, Ont., graduated from McGill University, Montreal. He was, in turn, professor at McGill University, professor of clinical medicine at the University of Pennsylvania and of principles and practice of medicine at Johns Hopkins. In 1904 he became professor of medicine at Oxford University, England. He did much research work, especially on spleen and blood diseases, infections of the heart and malaria.

Ossietsky, von, Carl (1898–1938), German author and pacifist, born in Hamburg. He wrote against Germany's military policy and was twice imprisoned. When the Norwegian Legislative Assembly named him for the 1936 Nobel Peace Prize, the German Government protested and issued a decree forbidding Germans to accept Nobel prizes in the future.

Ostenso, Martha (1900–), American novelist, born in Bergen, Norway. She was brought to the United States in infancy and studied at the University of Manitoba and at Columbia. Her books deal mostly with pioneer families in Minnesota. Among them are *Wild Geese, The Dark Dawn, The Mad Carews, Waters Under the Earth* and *White Reef.*

Otis, Elisha Graves (1811–61), American inventor, born at Halifax, Vt. He was a pioneer in the development of elevators; in 1854 he invented a safety device that prevents an elevator from falling even though the cables break. He installed the first passenger elevator in New York city; its success made tall buildings practicable.

Otis, James (1725–83), American patriot, born at West Barnstable, Mass. He studied law, became a leader of the Boston bar and in 1760 was appointed advocate general by British authority. When the British demanded warrants for the arrest of smugglers among the colonists, he refused to issue them and resigned his post; thereafter he was prominent in resisting the revenue acts. His mind weakened after he was wounded by royalists in 1769. His fame rests chiefly on *The Rights of the Colonies Asserted,* published in 1764.

Otto I (912–973), Holy Roman Emperor, called *Otto the Great,* son of Henry I. He was crowned German king in 936 and spent some years subduing his dissatisfied nobles, the Bohemians, Danes and Wends. In 955 he defeated the Magyars. He went to Italy to quell disturbances, and while he was there Pope John XII crowned him as the first Holy Roman emperor. Later Otto asserted the superiority of the civil over the papal authority by deposing John XII and raising his own candidate to the chair of the Pope as Leo VIII.

Otto II (955–983), Holy Roman Emperor, son of Otto I. His reign began peacefully, but he was soon embroiled in wars with nearby rulers of Bavaria, Lorraine and Bohemia, whom he defeated. He consolidated his power in Italy but met defeat at the hands of the Greek emperor, who had the aid of the Saracens.

Otto III (980–1002), Holy Roman Emperor, son of Otto II. He was crowned at the age of 3 and ruled during his minority through his maternal relatives. After becoming emperor in his own right he conquered rebellious portions of Italy and supplanted Pope Gregory V with Sylvester II. His ambition was to make Rome his great capital, but the Romans rose against him, and he fled to Ravenna, where he died.

Ouida (Louise de la Ramée; 1839–1908), English novelist, born at Bury St. Edmunds. She is best-known for her romantic tale *Under Two Flags;* her *Moths* and *In Maremma* were also popular. Her books for children are still read: *Two Little Wooden Shoes, Bimbi* and *A Dog of Flanders.*

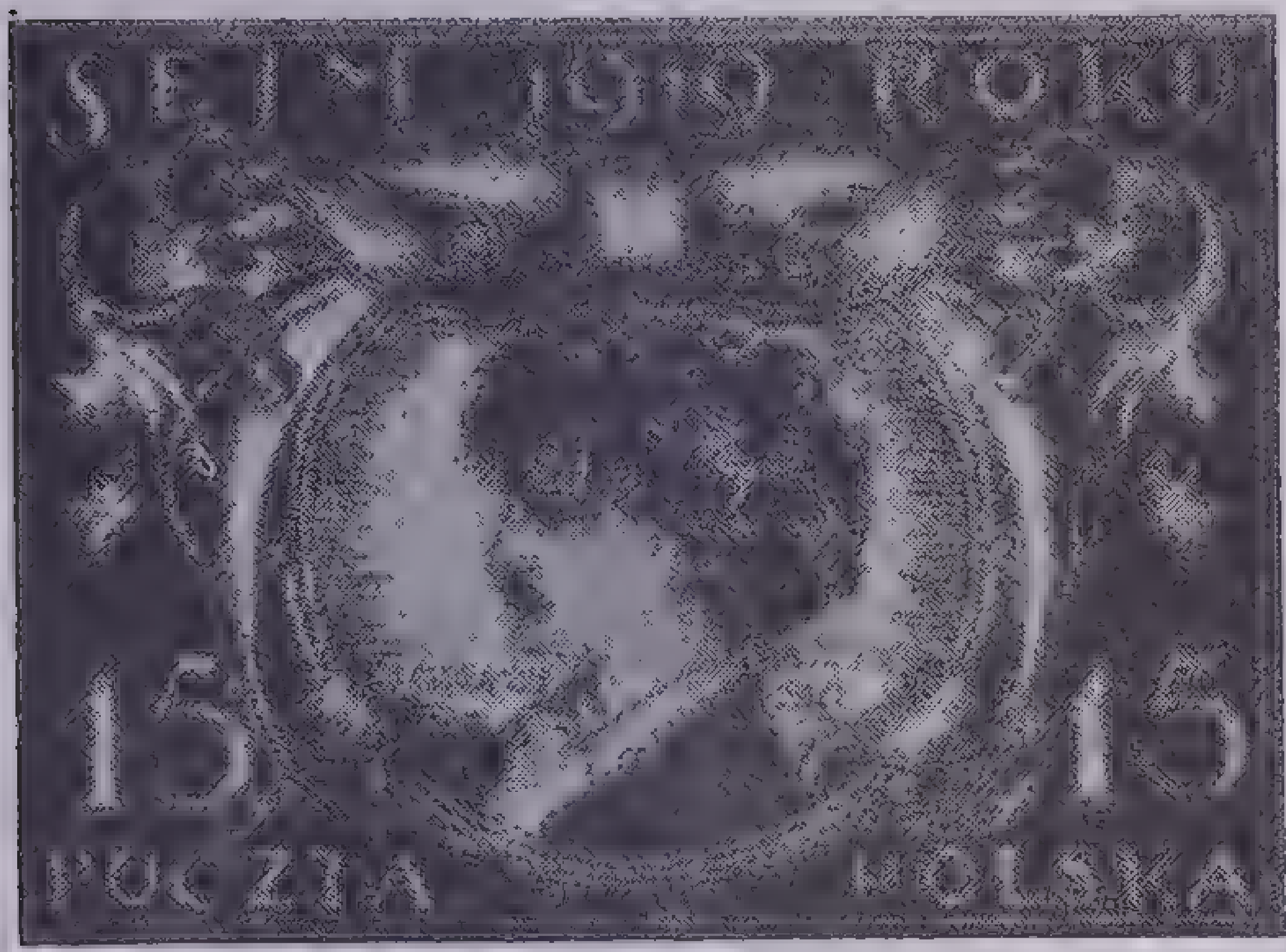
Ovid (Publius Ovidius Naso: 43 B.C.–17 A.D.), Roman poet, born at Sulmo, Italy. He belonged to a noble family and was destined for the law. He early left public life in order to write poetry. He was a favorite of the Emperor Augustus but for some reason was banished to Tomi on the Black Sea, where he died. His *Metamorphoses* is a series of 11,000 verses in hexameter, in which he describes all the changes that persons and things underwent from the beginning of the world to the time of Julius Caesar. Ovid also wrote a great many love poems and several books on love relationships.

Owen, Robert (1771–1858), British social reformer, born in Wales. When he was 10 years old, he started work; at 19 he was manager of a cotton mill and at 28 was part owner. He set up a sort of paternal rule over his employees, something unheard of in the British factory system. He demanded that his workmen live temperate and orderly lives. He came to the United States in 1824 and tried to found a communist society at New Harmony, Ind., but the scheme failed. In 1827 he returned to Scotland, where he again tried to run experimental communities on co-operative lines. He lost his wealth and spent the rest of his life in spreading socialistic and spiritualistic propaganda.

Owen, Ruth Bryan (1885–), American diplomat, born at Jacksonville, Ill., the daughter of William Jennings Bryan. She served as her father's secretary in the presidential campaign of 1908. She married Reginald Owen, an English army officer, in 1910. During the World War she helped to found the American Women's Hospital in London. She later became a lecturer, was elected to Congress in 1929 and in 1933–36 was minister to Denmark, the first woman to be a minister. In 1936 she married a Danish officer named Rohde.

Oyama, Iwao, Prince (1842–1916), Japanese general, born in Kagoshima. He entered the Japanese army, was appointed colonel in 1871, promoted to major general in the same year, to lieutenant general in 1877, to general in 1891 and in 1898 to field marshal. He served as military attaché during the Franco-Prussian War and upon his return to Japan became minister of war. When war broke out with Russia he was appointed commander in chief in Manchuria. He helped to defeat the Russians in the three great battles of Liau-Yang, the Shaho and Mukden.

Paderewski, Ignace Jan (1860-1941), Polish pianist, composer and statesman, born in Podolia. From 1872 to 1884 he studied at Warsaw and Berlin. In 1884 he moved to Vienna for 3 more years of study, after which he made his debut in Vienna. He soon became world-famous and made many concert tours. During the World War he organized a relief fund for Polish sufferers and formed a corps of Polish volunteers. He represented Poland at the Peace Conference, helped to establish the Polish Republic (1918–19) and became first premier of Poland in 1919. He was Poland's representative to the League of Nations (1920). In 1921 he abandoned politics and returned to the concert platform. In 1937 from his retirement in Switzerland he sent a message to Poland decrying dictators and preaching democracy. In the same year he starred in a British film *Moonlight Sonata.*



Courtesy Scott Stamp & Coin Company

Ignace Jan Paderewski

Enlarged from a Polish postage stamp issued in 1919 to commemorate the first National Assembly of Poland, an event that Paderewski, perhaps more than any one man, had helped to bring about

Paganini, Nicolò (1782–1840), Italian violinist. He first appeared in public at the age of 11 and thereafter toured Italy, Austria and Germany (1828–29) and Paris and London (1831). His virtuosity on the violin was so admired that he amassed a fortune before his retirement in 1835. His violin is preserved in the Genoa Municipal Palace.

Page, Thomas Nelson (1853–1923), American author, born in Hanover County, Va., educated at Washington and Lee University. He practiced law at Richmond, Va., but turned to literature and lecturing. Among his books are *In Ole Virginia, Two Little Confederates, Among the Camps, Red Rock, Bred in the Bone* and *John Marvel, Assistant.*

Page, Walter Hines (1855–1918), American journalist and diplomat, born at Cary, N. C., and educated at Randolph-Macon College and Johns Hopkins University. He became editor of *The Atlantic Monthly* (1896) and was later a member of the publishing firm of Doubleday, Page and Company. In 1900 he founded and became editor of *World's Work.* In 1913 President Wilson appointed him ambassador to Great Britain, and he filled that office with great ability, especially during the World War. He observed an outward attitude of neutrality until the sinking of the *Lusitania,* when he urged the declaration of war against Germany.

Paine, Albert Bigelow (1861–1937), American author and editor, born at New Bedford, Mass. He was associate editor of *St. Nicholas Magazine* (1899–1907) and wrote poems and a number of books for children. He is chiefly known as Mark Twain's literary executor. He wrote *Mark Twain, A Biography, The Boy's Life of Mark Twain, Mark Twain's Letters* and *A Short Life of Mark Twain.*

Paine, Robert Treat (1731–1814), American jurist. He studied for the ministry and served as chaplain during part of the French and Indian War but left the church to study and practice law. He was a member of the Massachusetts convention called in 1768 after Governor Bernard had dissolved the General Court, and he prosecuted Captain Preston and his men after the Boston Massacre. He served in the Continental Congress (1774–78) and signed the Declaration of Independence. In 1775 he was a member of the commission that tried to win Canada over to the cause of the colonies. After the Revolutionary War he held important governmental posts in Massachusetts.

Paine, Thomas (1737–1809), American patriot and writer, born at Thetford, England. In 1774 he came to America and joined the staff of the *Pennsylvania Magazine* in Philadelphia. He took up the colonists' cause and published a pamphlet, *Common Sense,* which was widely acclaimed and which really began the open drive for independence. For his series of treatises called *The Crisis,* Congress voted him $3,000, and New York state gave him 300 acres of land. He went to England and France, where his literary efforts were less successful. On the appearance of Edmund Burke's *Reflections on the Revolution in France,* Paine wrote a fierce vindication of the Revolution, the *Rights of Man.* His radical opinions forced him to flee England in 1792. He went to France and became a member of the National Convention. He refused to support the excessive radicalism of the Jacobin party and was imprisoned. The attack on the Bible in his *Age of Reason* practically caused him to be ostracized on his return to the United States n 1802.

Palacio Valdés, Armando (1853–1938), Spanish novelist and critic. He wrote a number of realistic novels; among those translated into English are *The Fourth Estate, José, The Grandee* and *Tristan.*

Palestrina, da, Giovanni Pierluigi (*d.* 1594), Italian composer, born at Palestrina, near Rome. He studied in Rome and became music director in one of the chapels of St. Peter's there. After his *First Book of the Masses* was published, the Pope made him a singer at the Sistine Chapel; later he was chapel master at the Church of the Lateran. Pope Pius IV made him composer to the Pontifical Chapel. Palestrina composed many motets, masses, hymns and other works.

Palgrave, Sir Francis (Cohen; 1788–1861), English historian. He studied law and became a prominent lawyer, especially in cases brought before the House of Lords. He wrote many magazine articles, became interested in gathering public records and in 1838 was made keeper of the government archives. He wrote mostly about medieval history. Among his books are *History of the Anglo-Saxons, Rise and Progress of the English Commonwealth* and *The History of Normandy and England.*

His son Francis Turner Palgrave (1824–97) edited a number of anthologies, such as *The Golden Treasury, Sonnets and Songs of Shakespeare* and *Treasury of Sacred Song.*

Palissy, Bernard (1518–80), French potter. When very young he was apprenticed in a glass works at Agen, where he learned the art of painting on glass. After completing his apprenticeship, he toured France and Germany in 1528, paying his way by painting glass and surveying land. During his travels he studied all the books within his reach and acquired an extensive knowledge of natural science. When he returned to France he was attracted by a fine specimen of enameled pottery, and he resolved to discover for himself the secret of the enamel. He knew nothing of the potter's art and had to grope his way. After 16 years of labor he produced the pure white enamel that made him famous. It was especially useful as a background for decoration. Palissy was also famous for his pieces bearing colored plants and animals in high relief. He was made royal potter by Catherine de' Medici, but Henry III imprisoned him as a Huguenot, and he died in prison. He left several works on religion, philosophy and agriculture.

Palma, Thomás Estrada (*c.* 1835–1908), Cuban President, born in Bayomo. He joined an insurrection against Spanish rule (1868–78). He was made President of the provisional Cuban Republic but was captured by Spanish troops (1877) and imprisoned until the close of the war. He then went to Honduras, where he prospered, married the daughter of the country's President and became a member of the Cabinet. He returned to Cuba in 1895 to help in another rebellion. When Cuba was freed in 1898, Palma became its first constitutional President. In 1906 he was elected for a second term but soon resigned on account of internal dissension.

Palmer, Alice Freeman (1855–1902), American educator, born at Colesville, N. Y., and graduated from the University of Michigan in 1876. Three years later she became professor of history at Wellesley College and in 1882 became its president. When the University of Chicago was organized in 1892, she became its nonresident dean of women. Mrs. Palmer served as member of the Massachusetts State Board of Education and for a time was active in the reorganization of the state normal schools.

Palmer, George Herbert (1842–1933), American educator. He graduated at Harvard and was on the Harvard faculty from 1870 to 1919. He translated the *Odyssey* and Sophocles's *Antigone,* wrote biographies of his wife Alice Freeman Palmer and George Herbert and the *Autobiography of a Philosopher* and published many volumes on philosophy and literary criticism.

Palmerston, Henry John Temple, 3d Viscount (1784–1865), British statesman, born near Romsey, Hants. He entered Parliament in 1807 and at once became junior lord of the admiralty. For 20 years after 1811 he represented Cambridge University in Parliament. He began a long career as foreign secretary in 1830 and was widely influential in European political affairs. At various times he was extremely unpopular even in his own country and was dismissed in 1851 because of his unofficial approval of the *coup d'état* that put Napoleon III on the French throne. He became home secretary in 1852 and prime minister in 1855; during his term he carried on the Crimean War. His administration fell in 1858, but he was returned to power in 1859 and retained that post until his death. He was nominally neutral during the American Civil War but actually favored the Confederate cause.

Pankhurst, Emmeline (1857–1928), British suffragist, born in Lancashire, educated in Paris and at Victoria University, Manchester. She was refused admission to Lincoln's Inn as a law student and helped to found the Women's Franchise League (1889). In 1903, with her daughter Christabel, she organized the Women's Social and Political Union, which became the most aggressive woman's organization in history. Between 1908 and 1914 Mrs. Pankhurst was several times imprisoned when militant methods took the place of peaceful propaganda. She was sentenced to 3 years in prison in 1913, but went on a hunger strike and was released. At the outbreak of the World War her organization turned to recruiting and other patriotic services. When women won their fight for suffrage in 1918, she joined the Conservative party.

Papin, Denis (1647–*c.* 1714), French physicist, born at Blois. He studied medicine and practiced in Paris. Later he taught mathematics in Germany. Papin made the first apparatus in which a piston is moved by steam, thus paving the way for the development of the steam engine. He also discovered the principle of the siphon.

Papini, Giovanni (1881–), Italian author, born in Florence. He founded a philosophical journal and wrote a great deal of fiction, verse and criticism. He is best-known, however, for his immensely popular *Life of Christ.* Others of his books are *The Memoirs of God* and *The Laborers in the Vineyard.*

Paracelsus, Philippus Aureolus (1493–1541), Swiss chemist and physician, born in Switzerland. He entered Basel University at 16, studied alchemy and chemistry and learned the properties of metals and minerals at the mines in the Tirol. He was a famous doctor and lectured on medicine at Basel University. Paracelsus disproved many current medical theories, taught the use of specific remedies instead of indiscriminate bleeding and purging and introduced many new medicines. However, much of his work is colored by his beliefs in magic and alchemy. Not more than a tenth of the 250 works attributed to him are genuinely his, according to critics. The others are supposed to have been written by his followers, the "Paracelsists."

Paré, Ambroise (*c.* 1517–90), French surgeon. In 1529 he went to Paris, became a hospital attendant and later served as army surgeon in several wars. He made many important improvements in surgical methods. He was the first to use a ligature instead of cautery in amputations and led surgeons away from treating wounds with boiling oil. He popularized the use of artificial limbs and eyes. Although he was a Huguenot, he is said to have been spared by the king's command in the massacre of St. Bartholomew.

Pareto, Vilfredo (1848–1923), Italian economist and sociologist, born in Paris of noble parents who had been exiled from Italy. The family moved back to Italy when Pareto was 10. He studied engineering at Turin and became a railroad engineer and metallurgist. He continued to study, mostly on social and economic subjects, and taught political economy in Switzerland. He tried to reduce the laws of economics to mathematical formulae and set up many new theories of sociology. Mussolini made him a member of the Italian Senate in 1922. His best-known work is *Mind and Society* (4 vols.; 1935).

Paris, de, Louis Philippe Albert d'Orléans, Count (1838–94), claimant to the French throne, a grandson of King Louis Philippe. He was born in Paris, educated in England. As a claimant to the French crown he was expelled from France in 1886 and returned to England, where he wrote *A History of the American Civil War,* which he had observed on McClellan's staff.

Parker, Sir Gilbert (1862–1932), British novelist, born in Canada and educated at Trinity College, Toronto. At the age of 24 he went to Australia and edited a Sydney newspaper; later he traveled extensively before settling down to writing. Among his books are *The Right of Way, The Seats of the Mighty, The Trail of the Sword, An Adventurer of the North, The Trespasser, The Promised Land, World in the Crucible* and *History of Old Quebec.* During his travels he became convinced that there should be a closer union of the British colonial possessions. He moved to London in 1896 to promote his idea and was elected to Parliament. He received a knighthood in 1902 and a baronetcy in 1915, and in 1916 he became a privy councilor.

Parker, Horatio William (1863–1919), American composer, born in Massachusetts. He studied at the conservatory in Munich, received honorary degrees from Cambridge and Yale universities and became professor of the theory of music at Yale (1894). His first successful composition, *Hora Novissima,* an oratorio, appeared in 1893. The opera *Mona* (1911) was awarded the Metropolitan Opera Prize of $10,000, shared by Parker and Brian Hooker, who wrote the libretto. Four years later their *Fairyland* won a prize of like amount given by the National Federation of Women's Clubs for a new American opera. Parker composed the cantata *Morven and the Grail.*

Parker, Matthew (1504–75), English prelate, born at Norwich. He studied at Corpus Christi College, Cambridge, was ordained a priest and became head of the College in 1544. He was chaplain to Henry VIII and Anne Boleyn and in 1552 became dean of Lincoln. After Mary came to the throne, he lost all his offices and lived in seclusion. When Elizabeth became queen, she called him from retirement and appointed him archbishop of Canterbury in 1559. He took a leading part in translating and publishing the *Bishop's Bible* (1563–68) and left valuable ancient manuscripts to Corpus Christi College.

Parkman, Francis (1823–93), American historian, born in Boston and graduated from Harvard (1844). He began the study of law but abandoned it to write historical literature. He lived for some time among the Indians of the Rocky Mountains and wrote *The Conspiracy of Pontiac, Montcalm and Wolfe, A Half Century of Conflict* and *The California and Oregon Trail.* After he returned East he became almost an invalid and studied horticulture, on which he wrote and which he later taught at Harvard. His health improved, and he resumed his study of Canada and life in the Northwest. He wrote *The Pioneers of France in The New World, The Jesuits in North America* and other books. He wrote vigorously and accurately, but his work shows some of his own prejudices.

Parmenides (*c.* 6th century B.C.), Greek philosopher and greatest member of the Eleatic school, born at Elea. In his didactic poem *On Nature* he sought to demonstrate the reality of absolute being. According to Aristotle, Parmenides developed the teachings of Xenophanes.

Parnell, Charles Stewart (1846–91), Irish Nationalist politician, born in County Wicklow and educated at Cambridge University. He entered Irish political affairs by skilfully organizing the Irish party in the House of Commons. He gained considerable notice, and his party acquired influence by obstructing parliamentary business. He wrecked the first Salisbury government and made an alliance with Gladstone in the hope of realizing Irish Home Rule ambitions. In 1888 the *London Times* accused Parnell and his followers of certain crimes committed in Ireland. A special commission was appointed to examine the charges; Parnell was acquitted and sued the *Times* for libel. He was given about $25,000 in damages. Entanglement in a divorce case led to his withdrawal into private life and to the split in the Irish party.

Parrish, Anne (1888–), American author, born at Colorado Springs, Colo., educated in private schools. She married Charles Corliss in 1915. Among her best-known books are *Pocketful of Posies, The Perennial Bachelor, All Kneeling, The Methodist Faun* and *Sea Level.*

Parrish, Maxfield (1870–), American artist, born in Philadelphia and educated at the Pennsylvania Academy of Arts. For a time he studied under Howard Pyle. Parrish developed a style that presented detail in backgrounds, with delicate design and rich gradations in tone and color. His book illustrations are widely popular, especially those in *Mother Goose in Prose, Arabian Nights,* the *Knickerbocker History of New York,* Eugene Field's *Poems of Childhood* and Edith Wharton's *Italian Gardens.*

Parry, Sir William Edward (1790–1855), British explorer. He entered the navy and served against the Danes in 1808. He began Arctic exploration as a lieutenant on the frigate *Alexandria,* at the age of 21. In 1819 and again in 1821 and 1824, in command of the *Hecla,* he tried to find the Northwest Passage. In 1827 he made an unsuccessful attempt to reach the North Pole by going north of Spitsbergen; 82° 45′ was the most northerly point he reached, and that stood as the record for nearly 50 years. He discovered Barrow Strait and Melville Island. Parry received high honors from his country for his achievements. In 1829 he was knighted by King George IV. He retired from the navy in 1852 with the rank of rear admiral.

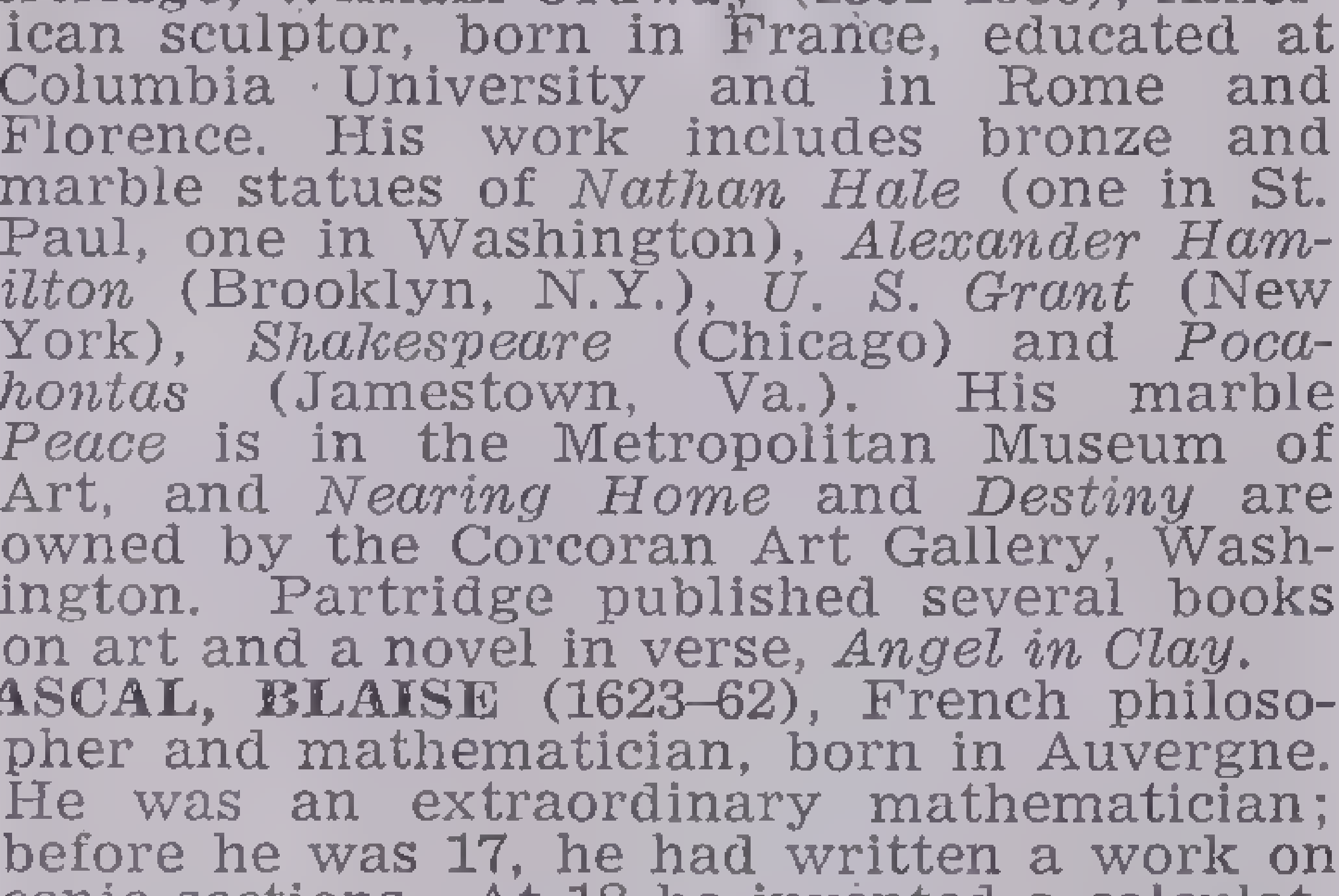
Parsons, William Barclay (1859–1932), American civil engineer, born in New York city and graduated from Columbia University. He won recognition by surveying a Chinese railroad line to a distance of 1,000 miles inland from Canton. Returning to America in 1900 he designed and constructed the East River tunnels in New York and designed early subway systems there. President Theodore Roosevelt appointed him a member of the Panama Canal Commission, and he had an important part in the construction of that waterway. For his engineering service to the Allied cause in the World War he was decorated by Great Britain, Belgium and his own government.

Partridge, William Ordway (1861–1930), American sculptor, born in France, educated at Columbia University and in Rome and Florence. His work includes bronze and marble statues of *Nathan Hale* (one in St. Paul, one in Washington), *Alexander Hamilton* (Brooklyn, N.Y.), *U. S. Grant* (New York), *Shakespeare* (Chicago) and *Pocahontas* (Jamestown, Va.). His marble *Peace* is in the Metropolitan Museum of Art, and *Nearing Home* and *Destiny* are owned by the Corcoran Art Gallery, Washington. Partridge published several books on art and a novel in verse, *Angel in Clay.*

PASCAL, BLAISE (1623–62), French philosopher and mathematician, born in Auvergne. He was an extraordinary mathematician; before he was 17, he had written a work on conic sections. At 18 he invented a calculating machine. Pascal contributed a number of theories and methods to mathematics and a great deal to the development of differential calculus. He worked out the physical principle known as *Pascal's Law,* which covers the transmission of pressure by an enclosed liquid. It is the basic principle of most hydraulic machinery, such as presses and elevators.

He took great interest in the religious doctrines of the Jansenists, became identified with them and came to their defense in his famous *Provincial Letters* (1656–57). Another book on religious and philosophical subjects in his *Pensées;* numerous editions have appeared in French and in English.

PASTEUR, LOUIS (1822–95), French chemist, born at Dôle. He studied at the Sorbonne, Paris, and taught physics and chemistry at Dijon, Strasbourg and Lille. At Lille he made his famous discovery that souring of wine was caused by living microorganisms and went on to study the whole subject of fermentation. He then taught and carried on his research in Paris. In the years that followed he studied and successfully combated fowl cholera, anthrax and the contagious silkworm disease. He learned to treat many diseases by the use of vaccines. He made an extensive study of hydrophobia; the Pasteur Institute was founded in 1886 to put into practice Pasteur's method of vaccination against that disease. Pasteur must be regarded as the parent of the whole modern science of bacteriology. Thanks to his experiments, prophylactic treatment of diphtheria, tubercular disease, yellow fever, cholera and plague has been made possible. The principle of pasteurization, named for him, is based upon his discoveries.



Courtesy Scott Stamp & Coin Company

Louis Pasteur

Enlarged from a French postage stamp issued in 1936 and sold for 10 centimes more than the 40-centime postage value. The proceeds went for relief of needy white-collar refugees from other lands

Pater, Walter Horatio (1839–94), English critic and man of letters, born near London and educated at Oxford. He came early under the influence of Keble, Jowett and Ruskin. His *Studies in the History of the Renaissance* (1873) revealed him as a penetrating critic with a beautiful prose style. Among his other works are *Marius the Epicurean, Imaginary Portraits, Plato and Platonism, The Child in the House* and *Greek Studies.*

Patmore, Coventry Kersey Dighton (1823–96), English poet. He was a member of the Pre-Raphaelite group, which attempted to revive the art forms practiced in Italy before 1500. His best-known work is *The Angel in the House,* a series of poems about married love. He also wrote *The Unknown Eros* and a number of sonnets.

Patrick, Saint (*c.* 389–461), patron saint of Ireland, born at Bannaventa Berniae, Britain (perhaps Caerwent, Chepstow, Monmouthshire). He was the son of a Roman military officer. When Patrick was 16 years old, he was captured by Irish raiders, and after being enslaved for 6 years he escaped to the Continent and studied at Tours, France. He declared that a vision urged him to return to Ireland as a missionary, which he did in the year 432. Then for more than 60 years he worked for the physical and spiritual welfare of the islanders. Pope Celestine I consecrated him bishop, entrusting him with Ireland's conversion. He established missionary settlements in Armagh and Down. Downpatrick remains the great shrine of St. Patrick. His feast day is March 17, an Irish holiday the world over.

Patti, Adelina (1843–1919), Italian operatic soprano, born in Madrid, Spain. She made her first public appearance in New York city at the age of 16. Her operatic debut at Covent Garden, London, was a great success, and thereafter she was received everywhere with extraordinary enthusiasm. She sang in nearly every country in Europe, in Canada, the United States and South America. Her remarkable voice was preserved in all its strength and purity into old age. In 1885 she bought a castle in Wales and installed a theater, where she gave concerts to the people.

Paul I (1754–1801), Czar of Russia, born in St. Petersburg (now Leningrad), son of Peter III and Catherine the Great. He was half insane, and his condition grew worse as he became older. Nevertheless, he was crowned in 1796, and he proved to be extremely cruel and reactionary. He joined the second coalition against Napoleon. His conduct finally became unbearable; members of the court demanded his abdication and killed him when he refused.

Paul III (Alessandro Farnese; 1468–1549), Pope, 1534–49. He was a member of one of the greatest Italian families. His election to the Papacy marked the beginning of a new era in the history of the Roman Catholic Church. In the preceding 15-year period the Protestant Revolt had spread over all northern Europe and threatened to destroy Catholicism. With Paul III began the Catholic Counter Reformation movement, designed to reform the Church from within and to check the spread of heresy by a vigorous missionary campaign. Paul III convened the Council of Trent, which instituted far-reaching reforms in church organization and eliminated many of the evils that the Protestants were attacking. At the same time the Council reaffirmed with uncompromising confidence the fundamental dogmas of the old religion. To provide a militant missionary organization Pope Paul approved the formation of the Society of Jesus (Jesuits) by Ignatius Loyola in 1540. Paul was a patron of the arts.

Paul-Boncour, Joseph (1873–), French statesman, born at St. Aignan. He was a Socialist member of the Chamber of Deputies from 1909 to 1914 and fought throughout the World War. He became prominent in French politics after the war, held a number of ministries and was prime minister several times. He is best-known, however, for his work for peace and with the League of Nations. He was French deputy to the League from 1919 to 1928; in 1932 he became a permanent delegate and represented France at several disarmament conferences. He steadfastly held to his idea that an international military force should be placed at the service of the League of Nations to act as a police force and put down aggressors.

Pauncefote, Julian, Baron (1828–1902), British statesman. He served successively as chief justice in the Leeward Islands, legal adviser to the Colonial Office, undersecretary for foreign affairs and on the Suez Canal Commission. In 1889 he went to Washington as minister from Great Britain and from 1893 until 1902 acted as British ambassador to the United States. Pauncefote became popular in the United States. He had a part in settling the Bering Sea controversy and the Venezuela-British Guiana boundary dispute. The Hay-Pauncefote Treaty settled the Panama Canal question. He was made baron in 1899.

Pavlov, Ivan Petrovich (1849–1936), Russian physiologist, born in the district of Ryazan. He studied and practiced medicine but became famous in research and was made director of the Institute for Experimental Medicine at St. Petersburg (Leningrad). He is best-known for his study of the digestive organs, for which he received the Nobel Prize for medicine in 1904 and for his research in blood circulation and in conditioned reflexes.

Pavlova, Anna (1886–1931), Russian dancer, born in St. Petersburg (Leningrad). She entered the Imperial Ballet School in St. Petersburg at the age of 10. Later she became principal dancer at the Marinsky Theater, St. Petersburg. In 1910 she visited London with Michael Mordkin and after a tremendous reception returned to Russia to dance at the Imperial Opera House. In later years she appeared in the United States and many other countries. Her most famous dance was *The Dying Swan,* inspired by the music of Saint-Saëns.

Payne, John Howard (1792–1852), American actor and playwright, born in New York. His first appearance on the stage was in his native city in 1809. He wrote several plays, of which the best-known are *Brutus, Charles II* and *Clari.* The song *Home Sweet Home* for which he is remembered is in *Clari,* which was produced as an opera at Covent Garden, London, in 1823. For many years Payne appeared as a successful actor in England and France. In 1842 he was appointed American consul at Tunis, where he died.

Peabody, Elizabeth Palmer (1804–94), American educator, born at Billerica, Mass. She was educated at a private school and began to teach at 16. She established the first kindergarten in the United States in Boston (1860) and set up a kindergarten-teacher training school. Later she taught in the school operated by A. Bronson Alcott, father of Louisa May Alcott. Her sisters married Nathaniel Hawthorne and Horace Mann.

Peabody, George (1795–1869), American merchant and philanthropist, born at South Danvers, Mass. He was apprenticed to a grocer and later managed a warehouse in Georgetown, D.C. He went into the dry goods business in Baltimore, became the head of his firm in 1829 and established Philadelphia and New York branches. In 1843 he disposed of his large interests and went to London, where he built up another business. He established the Peabody Trust to provide houses for the working classes of London. In 1851 he paid for the American display at the exhibition in the Crystal Palace, London, the first world's fair. He contributed $1,400,000 to the city of Baltimore for an institute of science, literature and the fine arts; and $8,000,000 for the promotion of education, endowment of libraries and similar purposes in the United States. This vast sum was known as the *Peabody Fund.*

Peale, Charles Wilson (1741–1827), American painter, born in Queen Anne's County, Md. He received his art education from Copley and Benjamin West. During his active career he painted the portraits of many leading Americans, including 14 of George Washington and two of Martha Washington. Other portraits were of Franklin, Generals Greene and Gates, Henry Clay, Thomas Jefferson, Robert Morris, John Hancock and Alexander Hamilton. In 1785 he formed a collection of natural curiosities and founded Peale's Museum at Philadelphia. During the Revolutionary War he commanded a company of soldiers at Trenton and at Germantown.

Peale, Rembrandt (1778–1860), American painter, the son of Charles W. Peale, born in Pennsylvania. He studied art in England and in France and painted several historical pictures, among them the well-known *Roman Daughter* and *The Court of Death.* His most celebrated work is a portrait of Washington on horseback.

Peary, Robert Edwin (1856–1920), American explorer, a native of Pennsylvania and a graduate of Bowdoin College (1877). He entered the Navy as a civil engineer (1881). Peary explored the northern seas in 1891–2 under the auspices of the Philadelphia Academy of Natural Sciences, explored Northern Greenland and reached Melville Island. In 1898 he commanded another Arctic expedition financed by the Peary Arctic Club of New York and was 4 years in the far North, reaching 84° 17′ N. Other trips followed, and on the eighth expedition Peary discovered the North Pole (April 7, 1909). He was raised to the rank of rear admiral by a special vote of Congress and was made a Grand Officer of the Legion of Honor by the President of France. He wrote *Northward Over the Great Ice, Nearest the Pole* and *The North Pole.*

Pedro I (1798–1834), first Emperor of Brazil, son of John VI of Portugal. In his youth he went with his parents to Brazil; when his father returned to Portugal, Pedro remained as regent in Brazil. The Portuguese legislature tried to transform the country into a Portuguese colony, but the Brazilians sought independence, and Pedro was declared emperor in 1822. He became unpopular and in 1831 was forced to abdicate in favor of his son Pedro II.

Pedro II (1825–91), Emperor of Brazil, son of Pedro I. Pedro was proclaimed emperor in 1831 at the age of six when his father abdicated. However, he was not crowned until he was 16. For about 30 years he had to contend with a series of rebellions. In 1888 slavery was abolished, largely through his efforts. He then left Brazil on a visit to Europe and the United States and on his return faced a revolution that overturned the Empire. Pedro received a grant of money from the revolutionary government and spent the rest of his life in Portugal.

Peel, Sir Robert (1788–1850), British statesman, born at Bury, Lancashire. He entered Parliament at the age of 21 and held office as secretary for Ireland when he was 24. In 1822 he became home secretary and in this capacity formed a new police force in England, known to this day as *Bobbies* and as *Peelers.* He became leader of the Conservative Opposition in the Parliament of 1833 and was made prime minister in 1834. In 1839 and again in 1841 he led the government, on the last occasion holding office for 5 years. Peel introduced and passed the Bank Charter Act, which still regulates England's currency; repealed the penal laws against Roman Catholics (1829); and repealed the Corn Laws (1846) in face of tremendous opposition. Then he resigned and thereafter took little interest in political affairs.

Penn, William (1644–1718), the founder of Pennsylvania, born in London, the son of Sir William Penn (1621–70), British admiral. Young Penn was frequently imprisoned because he was a Quaker. He had inherited his father's claim against the Government for $80,000 and received in settlement a large tract of land in America, west of the Delaware River and north of Maryland. It was called *Pennsylvania* in the royal patent. Penn resolved to form this territory into a commonwealth based upon religious tolerance. He arrived in Delaware Bay in 1682 and signed a treaty with the Indians. In the next year he founded Philadelphia, so naming it because he intended it to be what the name implies, a "City of Brotherly Love." In 1684 he returned to England, where he was again persecuted for his religious views. Penn went to debtor's prison rather than pay the claims of a dishonest steward. After his death his son Thomas Penn (1702–75) represented him in Philadelphia. Many of William Penn's books, notably *The Cause of Liberty of Conscience,* were written in prison.

Pennell, Joseph (1857–1926), American illustrator and author, born in Philadelphia. He studied at the Pennsylvania Academy of Fine Arts and the Pennsylvania School of Industrial Art. He developed a style emphasizing sharp contrasts of light and shade. He settled in England, where he was greatly influenced by Whistler. His etchings are famous, especially his *Nelson Monument* and *Thames Embankment.* He illustrated scores of books. Pennell's works are represented in American art galleries and in many of the museums of Europe and Australia. He wrote *The Illustration of Books, The Work of Charles Keene, Lithography and Lithographers, The Life of James McNeill Whistler* and *Etchers and Etching.*

Pepperrell, Sir William (1696–1759), American soldier and merchant, born at Kittery Point, Me. He and his father carried on a profitable business in lumber, fishing and shipping. He became a colonel in the Maine militia, a member of the Massachusetts general court and in 1730 its chief justice. In 1745 he co-operated with a British fleet in the capture of the French garrison at Louisburg, Cape Breton. Pepperrell was made a baronet, the only New Englander to be so honored. Later he held a number of administrative positions and was acting governor of Massachusetts in 1756–58.

Pepys, Samuel (1633–1703), English public official and diarist, born at Bampton and educated at Cambridge University. He held several important public appointments and sat in Parliament as secretary of naval affairs. In 1684 he became president of the Royal Society. From 1659 to 1669 he kept his famous *Diary.* His detailed description of his own daily life and of important events of the day make interesting reading and are highly important as history. The *Diary* was written in shorthand; John Smith translated it in 1819–22, and it was published in 1825.

PERICLES (*c.* 495–429 B.C.), Athenian statesman. He began to take an active part in public affairs as a young man and took the side of the majority against the aristocratic element. He gained a following strong enough to cause the ostracism of Cimon, head of the aristocratic party. Pericles wanted to unify Athens and make it a great state famous for beauty and culture. His friend Phidias, the great sculptor, was commissioned to adorn Athens. As rapidly as the city could afford them, Pericles ordered the building of the Parthenon, the Propylaea and other famous structures. He distinguished himself as a general and a statesman, notably in his recovery of the rebellious island of Euboea and by subduing Samos. In the Peloponnesian War with Sparta most of his work was undone, and he lost much of his standing in Athens although he was still in power when he died.

Perkins, Frances (1882–), American public official, born in Boston, Mass., educated at Mount Holyoke College and Columbia University. She taught in a girls' school near Chicago and there came under the influence of Jane Addams. Miss Perkins left teaching and began to study social service under Miss Addams at Hull House. She returned east in 1917 to become executive director of the New York Council of Organizations for War Service. In 1923 Governor Smith appointed her to the N. Y. State Industrial Commission, and she served as its chairman (1926–29). Governor Franklin D. Roosevelt appointed her N. Y. state labor commissioner in 1929, and in 1933, when he became President, he appointed her secretary of labor in his Cabinet. She was the first woman cabinet officer. In 1934 she published *People at Work.* She married Paul Wilson of New York in 1913.

Perrault, Charles (1628–1703), French poet and writer, born in Paris. He wrote a series of French Mother Goose tales for children, including the fairy tales about "Little Red Riding Hood," "Beauty and the Beast," "Cinderella" and "Puss in Boots." Eighteen of his fairy tales were reprinted and published in 1928 as *Histories or Tales of Past Times told by Mother Goose, with Morals.*

Perrin, Jean Baptiste (1870–1920), French physicist. He was professor of physical chemistry at the Faculty of Sciences from 1910. He carried on valuable research on the molecular structure of matter and on light and electricity. He won the Nobel Prize in physics (a posthumous award) in 1926.

Perry, Bliss (1860–), American educator and author, born at Williamstown, Mass., graduated from Williams College in 1881. From 1886 he was successively professor of English at Williams and at Princeton, editor of *Atlantic Monthly* and professor of English Literature at Harvard. Some of his books are *The Broughton House, Salem Kittredge and Other Stories, The Plated City, The Powers at Play, A Study of Prose Fiction, The Amateur Spirit, Walt Whitman, Whittier, The Praise of Folly, The American Mind, The American Spirit in Literature* and *Emerson Today.* His memoirs were called *And Gladly Teach* (1935).

Perry, Matthew Calbraith (1794–1858), American naval officer, born in Newport, R.I. At the age of 15 he entered the naval service and by 1833 had risen to be superintendent of the construction of steam-driven naval vessels. He became a commodore in 1841. Perry is primarily famous for his negotiation of the first commercial treaty between the United States and Japan. In 1856 he published an account of his round-the-world expedition in the *Mississippi*.

Perry, Oliver Hazard (1785–1819), American naval officer, born in South Kingston, Rhode Island. During the War of 1812, when in command of the *Commodore Chauncey* on the Great Lakes, he captured the British fleet commanded by Captain Barclay. His report to General Harrison is famous: "We have met the enemy and they are ours." Perry commanded a fleet that sailed to Colombia and ascended the Orinoco River in 1819. He died of yellow fever in Trinidad.

Pershing, John Joseph (1860–), American general, born in Linn County, Mo., educated at the Kirksville (Mo.) Normal School and at West Point. After his graduation (1886) he saw active service in the Apache Indian campaigns in the West (1886) and against the Sioux (1890–91). In 1898 he took part in the Spanish-American War. He commanded an expedition against the Moros in 1902, and between periods of active service he held various administrative posts. He became military governor of Morro province in the Philippines in 1909. In 1914 he was placed in command of American troops on the Mexican border, and in 1916 he headed the expedition sent into Mexico against Francisco Villa.

When the United States entered the World War, President Wilson appointed him commander in chief of the American forces in France. Pershing was made a general, the fourth officer to have this rank since Washington. In July 1917 he sailed for England and France with the first contingent of men. Pershing insisted on keeping the American troops together as a fighting unit, although Marshal Foch and other Allied leaders wanted to spread them among the more seasoned British and French regiments. Pershing won his point and was justified by the series of victories won by his men. He returned to the United States on September 8, 1919, and received an enthusiastic public welcome.

From 1921 to 1925 Pershing was chief of staff of the U.S. Army. In 1925 he headed the commission that held a plebiscite in the Tacna-Arica boundary dispute between Bolivia and Chile. After retiring from the army he supervised the care of American soldiers' graves in the military cemeteries of France. General Pershing married the daughter of Senator Warren of Wyoming. Mrs. Pershing and their three daughters perished in the fire that burned the Hotel Presidio, San Francisco, in 1913.

Perugino (Pietro Vannucci; 1446–*c.* 1523), Italian painter, born near Perugia, whence his name. He was a favorite of Pope Sixtus, who commissioned him to decorate parts of the Sistine Chapel. One of his paintings there is *Christ Giving the Keys to Peter*. Later, in Florence, Raphael was among his pupils.

Pestalozzi, Johann Heinrich (1746–1827), Swiss educator, born at Zürich. He established a school for waifs and strays on his estate. The governing idea of his educational system was that everything should be treated in a concrete way. Almost all Pestalozzi's methods are now used by elementary teachers in the schools of Europe and America. He is really the father of modern primary instruction. His chief works are *How Gertrude Instructs Her Children* and *Leonard and Gertrude*. During the last 2 years of his life he wrote an autobiography.

Petain, Henri Philippe (1856–), French soldier. He was a colonel at the outbreak of the World War but did such valuable work that he was promoted to the command of an army corps in 1914. After the Germans had captured the outer defenses of Verdun in 1916, Petain's methods of defense saved that stronghold. The cry of the French at that time, "They shall not pass," was echoed throughout the Allied world. In April 1917 Petain became chief of the general staff and later he was made commander in chief of the French armies under Foch, who commanded the Allied forces. During subsequent offensives Petain was successful in co-ordinating the movements of his troops with those of Britain and America. After the war he was created marshal of France. He was made Premier of France in 1940, when it was conquered by Germany.

Peter I (1844–1921), King of Serbia, a member of the great Karadjordjević family. He studied at Budapest, trained in a military school in France, became an officer in the French army and saw active service in the Franco-Prussian War. Peter incited the Balkan states to revolt and helped to free Serbia from Turkish rule, though the Karadjordjević family was denied the throne. In 1903 the ruling King Alexander was assassinated, and Peter himself was proclaimed king. He fought with the Serbian army during the World War, but when his country was reconquered and became Yugoslavia he retired to Belgrade. His son became king of Yugoslavia as Alexander I.

PETER THE GREAT or **PETER I** (1672–1725), Czar of Russia. He succeeded Ivan, a half brother, who renounced the crown in 1862 because of his mental condition. Peter's mother, widow of the former Czar Alexius, served as regent for him. His half sister Sophia was full sister of Ivan and another brother, Feodor; she wanted Feodor to be coruler with Peter. Feodor died in 1682, and Ivan in turn claimed equal rights with Peter. Both brothers were crowned, but in 1689 Peter forced Sophia into a convent. After that he was virtually sole ruler, though outwardly the dual reign of Peter and Ivan was recognized until Ivan's death in 1696. Peter was determined to raise his country out of its barbarism and to place Russia in the ranks of civilized nations. He traveled in Holland and England (1796–98), worked in shipyards and wherever he might learn anything he could turn to his advantage. He used that information when he returned to Russia. Young Russian nobles were obliged to travel for study and observation; schools of navigation were founded; agriculture was improved. Peter established factories and distributed metallurgists through the mining districts of Russia; roads and canals were built.

Peter created a navy and gave Russia a seaboard. In 1696 he went to war with Turkey, and 3 years later with Sweden, but he was beaten at Narva by Charles XII. He married Catherine, the wife of a Swedish soldier.

In 1703 he laid the foundation of St. Petersburg, made it the capital and established an academy of sciences. He abolished or altered laws and institutions that in any way interfered with his projects. He repudiated Catherine on the ground that she conspired against him in favor of his son Alexis because of his attitude toward the reorganization of the Russian Church. Alexis joined in a conspiracy against his father, but Peter forced Alexis to renounce his right to succession and condemned him to death. Alexis died suddenly before sentence could be carried out. Catherine was crowned in 1724 and succeeded Peter after his death.

Peter the Hermit (d. 1115), medieval preacher, born at Amiens, France. He made a pilgrimage to the Holy Land about 1093 and saw there the cruelties inflicted upon the Christians by the Mohammedans. On his return he reported to Pope Urban II, who authorized Peter to preach the First Crusade for the recovery of Jerusalem from the Turks. His last years were spent in obscurity in a monastery that he had founded at Huy.

Peterkin, Julia [Mood] (1880–), American novelist, born in Laurens County, S.C., educated at Converse College. Her stories deal with the Gullah Negroes of the South Carolina coast. Among them are *Green Thursday, Black April, Bright Skin* and *Scarlet Sister Mary,* which won a Pulitzer Prize and was successfully dramatized.

Petrarch, Francesco (Francesco Petrarca; 1304–74), Italian poet, born at Arezzo in Tuscany. He settled at Avignon and became deeply attached (1327) to the beautiful Laura, in whose honor he wrote the sonnets and odes that made him famous. Her identity is unknown, but she may have been Laure de Noves. He was invited to Naples, Paris and Rome and received the laureate crown in Rome. Petrarch wrote both in prose and in verse, but he is remembered principally for his lyrics and for the sonnets still called *Petrarchan*. He was one of the finest of the *humanists*, the group that renounced the medieval point of view and sought inspiration in the classics of Greek and Roman antiquity.

Petrie, Sir William Matthew Flinders (1853–) English Egyptologist, born in London. He was educated privately and became interested in archeology, especially that of Egypt. He began his early explorations on Salisbury Plain and published his book *Stonehenge*. He went to Egypt and studied the pyramids and temples of Giza and the mounds of Said and Naukratis. In 1904 he founded the Egyptian Research Fund, which later was enlarged into the British School of Archaeology. For about 40 years he was professor of Egyptology in University College, London. He wrote *Pyramids and Temples of Gizeh, Racial Portraits, Ten Years' Digging, History of Egypt* and *Egyptian Tales*.

Phelps, William Lyon (1865–), American educator and writer, born in New Haven, Conn. He was educated at Yale and Harvard and from 1892 to 1933 taught English at Yale. His writings include *Essays on Modern Novelists, A Dash at the Pole, Human Nature in the Bible, The Twentieth Century Theatre, Some Makers of American Literature* and *The Excitement of Teaching*. For years he conducted a column of literary criticism in *Scribner's Magazine*.

PHIDIAS (*c.* 500–*c.* 432 B.C.), Greek sculptor. He became famous probably about 460 B.C., when he produced the bronze statue of Athena Promachos, the Lemnian Athena and other works. When Pericles was the dominating figure in Athens, he commissioned Phidias to beautify the city. Phidias supervised the building of the Parthenon and made the statue of Athena for that temple. From about 437 B.C. to 433 B.C. he worked on the statue of Zeus for the temple at Olympia, one of the Seven Wonders of the Ancient World.

He was the greatest of Greek sculptors. The chief characteristics of his work were largeness, dignity and magnificence; all his work was marked by a certain repose; he believed that violent action cannot be represented in sculpture. His principal works contained an inner core of wood or stone; this was covered with plates of polished ivory for the parts representing flesh, and gold was used for the drapery. He was equally skilled in working with ivory, bronze, marble, gold and ebony. Emperor Theodosius I took the statue of Zeus to Constantinople about 390 A.D., and it was destroyed there in a fire in 475. A little remains of the outside sculptures of the Parthenon, especially the frieze (of which the Elgin marbles are a part), but it is not certain that they were all actually his own work. He was accused of sacrilege because he had portrayed himself and Pericles on the shield of his statue of Athena.

Philip (King Philip; d. 1676), Wampanoag Indian chief, second son of Massasoit. Philip came to power over his tribe in 1662. For several years he remained outwardly friendly with the white settlers, but their gradual encroachments angered him. He organized an alliance of several tribes and began "King Philip's War" in 1670. Hundreds of colonists were murdered during the next 6 years; then Philip was caught and killed in Rhode Island.

Philip II (382–336 B.C.), King of Macedonia. He came to the throne in 359 B.C. and at once set out to pacify and consolidate his kingdom and to bring all Greece under his dominion. The Amphictyonic Council, a union of Grecian states to which Athens did not belong, appointed Philip commander of their forces against the Athenians. Athens was alarmed for its safety; Demosthenes spoke his "Philippics" against the coming invader, and the city prepared to defend itself. It formed an alliance with Thebes, but Philip defeated the united force and became master of all Greece at the battle of Chaeronea (338 B.C.). He ruled only 2 years before he was assassinated. His son succeeded him as Alexander the Great.

Philip II (1527–98), King of Spain, born at Valladoid, son of Charles V. In 1543 he married Mary of Portugal, and after her death Mary of England became his second wife in 1554. He succeeded his father in 1556 as ruler over a vast empire—Spain, Sicily, Milan, the Netherlands, Mexico, Peru and part of France. He greatly injured Spain by crushing her chivalrous spirit, by persecuting the industrious Moors and by destroying her commerce with heavy taxation.

He sent the Spanish Armada to crush England after Elizabeth had succeeded Mary on the English throne. The complete defeat of the Armada in 1588 finally broke the power of Spain.

Philip II Augustus (1165–1223), King of France. He began to rule for his father Louis VII in 1179 and took the throne himself in 1180. In 1181 he had to fight against a coalition of Flanders, Burgundy and Champagne. By 1186 he had won out and regained control over much territory. In 1187 he attacked the English possessions in France and with the help of Richard, son of Henry II of England, won a little territory by 1189. In 1190 Philip and Richard, who had succeeded to the throne after Henry's death, set out on the Third Crusade, but they soon quarreled, and Philip returned to France in 1191.

He made war against Richard and by 1199 had lost most of the territory he had gained. After John came to the English throne, Philip opposed him, too, but with better success, for he forced John to give up Normandy, Brittany, Anjou, Maine and Touraine. In 1214 Philip defeated an alliance between John and the Holy Roman Emperor Otto IV and thereby made France a leading Power. By the end of his reign Philip had strengthened royal power at the expense of that of the nobles and had made many changes in the administration of justice and finance. His diplomatic operations were somewhat underhanded, however, and he was charged with the responsibility for the failure of the Third Crusade.

Philip IV (1268–1314), called *the Fair,* King of France, born at Fontainebleau. He succeeded to the throne in 1285, and by his marriage with Queen Joanna of Navarre he added Navarre and Champagne to his kingdom. The chief feature of his reign was his dispute with Pope Boniface VIII, which grew out of his attempt to levy taxes upon the clergy, which the Pope directed them not to pay. On the death of Boniface and of Benedict XI, Philip brought about the election of his own candidate, Clement V, and established the papal residence at Avignon. The reign of Philip marked the decline of feudalism and the growth of the royal power.

Phillips, David Graham (1867–1911), American novelist, born in Madison, Ind. He graduated from Princeton University at the age of 20 and began active life in New York city as a member of the staff of the New York *World.* His first novel *The Great God Success* was instantly popular, and he left newspaper work to give all his time to fiction. His other works are *Old Wives for New, The Second Generation, The Husband's Story, The Grain of Dust, The Fortune Hunter* and *The Hungry Heart. The Story of Susan Lenox* was left in manuscript form and was not published until 1916. Phillips was killed by a lunatic.

Phillips, Stephen (1868–1915), English playwright, born near Oxford. He studied for the civil service but went on the stage instead, playing various parts with Frank Benson's company. His plays include *Paolo and Francesca, Herod, Ulysses* and *Nero.*

Phillips, Wendell (1811–84), American orator and reformer, born in Boston, educated at Harvard. He gave up his law practice to fight for the abolition of slavery.

In December 1837 a meeting was called at Faneuil Hall to protest against the killing of Elijah Lovejoy in Alton, Ill., by a proslavery mob. Lovejoy had been editor of an antislavery newspaper there. At the meeting Phillips made his greatest speech and from that time became a leader in the antislavery movement. After the slaves were freed by Lincoln's proclamation, Phillips interested himself in woman suffrage, prison reform and prohibition.

Phillpotts, Eden (1862–   ), British novelist and playwright, born in India, where his father was an army officer. He was educated at Plymouth, England, and went to London to study for the stage but left it when he found that he had too little dramatic ability. He then took up writing and produced a series of novels with a Devonshire setting. These include *Children of the Mist, Some Everyday Folks, Down Dartmoor Way, The Human Boy, Sons of the Morning* and *The American Prisoner.* His plays, *The Farmer Takes a Wife* and *Yellow Sands,* were outstanding successes.

Phocion (402–317 B.C.), Athenian general. He fought against Philip of Macedon several times, though in politics he sided with him against Demosthenes. He recognized Athens's weakness and Macedonia's strength and opposed the anti-Macedonian party. When Phocion conquered Athens, he became virtual ruler of the city. He was charged with plotting to hand over Piraeus, the seaport of Athens, to the Macedonian enemy, was sentenced to death by the Athenians and forced to drink poison.

Phyfe, Duncan (*c.* 1768–1854), American cabinetmaker, born in Scotland. He came to the United States in 1783 and settled in Albany. Later, soon after 1790, he went to New York and set up a furniture shop. His designs in furniture had great influence in his day and are still followed. His earlier work, before 1820, is best; he then adapted his work from that of Adam and Sheraton. Later his designs followed the Empire style and became heavy and overornamented. His best work has graceful curves and parallel rows of reeding, with well-placed and simple ornaments, usually a lyre, acanthus or oak leaf.

Piccard, Auguste (1884–   ), Belgian physicist. He became professor of physics at the University of Brussels in 1922. He is best-known for his balloon ascents into the stratosphere for the study of cosmic rays. The first flight was in 1931, when he and an assistant rose to 51,793 feet. In 1932 he reached 54,120 feet and made other ascents in following years. His twin brother Jean Piccard, a chemical engineer, became an American citizen in 1931.

Picasso, Pablo (1881–   ), Spanish painter and sculptor, born at Malaga. He originated *cubism,* an effort to create form in art rather than to imitate nature. His earlier pictures are subjects from circus and city life; a greenish-gray color predominates in them. He is equally well-known for the costumes, curtains and settings he designed for the Russian ballet. Picasso's sculpture and etchings are as highly regarded as his paintings.

Pickering, Edward Charles (1846–1919), American astronomer and physicist, born in Boston. He graduated from Harvard University and taught mathematics there. He became professor of physics at the Massachusetts Institute of Technology, and there he established the first physical laboratory in the United States. As director of the Harvard Observatory he introduced photometry and photography into astronomical observation and collected the "photographic library of the sky"—more than a quarter of a million photographic plates. Professor Pickering directed the erection of the observatory at Arequipa, Peru.

Pickering, Timothy (1745–1829), American statesman, born in Massachusetts. He served as colonel in the Revolutionary War and became Washington's adjutant general in 1777. Pickering drew up the first plans for a military academy at West Point. In 1795 he became secretary of war but was soon transferred to the post of secretary of state, serving until 1800. He was U. S. Senator, 1808–11. He wrote several political treatises and paid much attention to the development of agriculture.

Pickett, George Edward (1825–75), Confederate officer, born in Richmond, Va. He graduated from West Point and served in the Mexican War and against the Indians on the frontier, rising to the rank of captain. When Virginia seceded from the Union, he joined the Confederate army as a colonel and rose to the rank of major general. At the Battle of Gettysburg (1863) "Pickett's Charge" on Cemetery Ridge made him famous. He and his men faced heavy rifle fire and took the first Union line. He also won distinction at Fredericksburg, Petersburg, Five Forks and Dinwiddie Court House.

Pickford, Mary (Gladys Smith; 1893–   ), American actress, born in Toronto, Canada. She was a child actress in Canada and later appeared in New York but soon began screen work under D. W. Griffith. She played in many films and became known as "America's Sweetheart." Among her films were *Rebecca of Sunnybrook Farm, Poor Little Rich Girl, Daddy Long Legs, Pollyanna, Sparrows* and *Secrets.* She married Owen Moore, divorced him in 1920, then married Douglas Fairbanks and in 1935 divorced him. She married Charles "Buddy" Rogers in 1937. She wrote an inspirational book *Why Not Try God?*

Pierce, Franklin (1804–69), 14th President of the United States, born at Hillsborough, N. H. He studied at Bowdoin College, Me. Nathaniel Hawthorne was a fellow student there. Pierce was admitted to the bar in 1827 and 2 years later began his political career as a Democratic member of the state legislature. He was speaker in 1831 and 1832. In 1833 he entered Congress, first as a Representative and later as the youngest member in the Senate (1837). He resigned in 1842 to resume his law practice.

He went into the army at the outbreak of the Mexican War and was rapidly promoted; he was brigadier general when he entered Vera Cruz with General Winfield Scott. The Democratic Convention of 1852 was split into many hostile factions, and to break the deadlock Pierce was nominated as a compromise candidate for the Presidency against General Scott, the Whig nominee. He received the votes of all but four states. He appointed an able Cabinet, including Jefferson Davis as secretary of war. During his administration the Missouri Compromise was repealed, the treaty for reciprocity of trade with the British-American colonies was made, a treaty with Japan was negotiated, and the U. S. Court of Claims was created.

Pike, Zebulon Montgomery (1779–1813), American soldier and explorer, born at Lamberton (Trenton), N. J. At the age of 15 he joined a regiment commanded by his father; he became a first lieutenant at 20.

In 1805–6 he commanded an expedition sent by the Government to find the source of the Mississippi. He mistakenly reported the source to be Cass Lake but brought back much valuable information. He was then sent to find the source of the Red River. He explored westward along the Missouri River, followed the Arkansas River to the Royal Gorge, then traveled westward to the site of Pueblo, Colo. He made a short side trip northward and discovered Pike's Peak, which is named for him. Pike rose to the rank of colonel and took part in the opening phases of the War of 1812. He was killed in an attack on York, Canada.

Pilsudski, Joseph (1867–1935), Polish statesman, born in Lithuania. He was exiled because of his nationalistic and socialistic tendencies and spent 4 years in Siberia. Later he was again imprisoned in St. Petersburg (1901), but he escaped and visited Great Britain. The outbreak of the World War found Pilsudski again in Poland, and he invaded Russia with a Polish army. When Russia fell into the hands of the Bolsheviks, Poland declared its independence, and German arms upheld Pilsudski as dictator under the new government. He became first President of the new republic set up in Poland in 1919, resigning in 1922. Four years later he made his famous march on Warsaw and seized the government, which was weak and feeble. Again he became dictator. The Presidency was offered him, but he refused it, taking instead the posts of prime minister and minister of war. In March 1932 he was appointed minister of military affairs, and Alexander Prystor took office as prime minister.

Pinchot, Gifford (1865–   ), American forestry expert, public official and writer, born at Simsbury, Conn., and graduated from Yale. He did forestry work in North Carolina, was made a member of the National Forest Commission and rose to the post of chief forester of the Bureau of Forestry. He won a reputation as a liberal in politics by his work in founding the Progressive Party. He was governor of Pennsylvania from 1923 to 1927 and again from 1931 to 1935. He wrote a number of books on forestry and travel.

Pinckney, Charles Cotesworth (1746–1825), American statesman, born in Charleston, S. C., educated in England and at a military school in France. He practiced law in England but returned home in 1769. He fought in the Revolutionary War and was a member of the Constitutional Convention. When difficulties arose with France in 1796, Pinckney was made minister to that country, and with John Marshall and Elbridge Gerry he discussed with Talleyrand future relations between the two countries. When Talleyrand hinted that a money payment might smooth diplomatic relations, Pinckney is said to have replied, "We have millions for defense, but not one cent for tribute." In 1804 and 1808 Pinckney was an unsuccessful Federalist presidential candidate.

Pindar (522–*c.* 448 B.C.), Greek lyric poet, born in the village of Cynoscephalae, in Theban territory. He wrote verses at an early age, and his poetry was in demand throughout Greece for occasions of every kind. His works consisted of songs, poems of sentiment, odes, hymns and dirges. His *Epinicia* or odes are divided into four books dealing respectively with the Olympian, Pythian, Nemean and Isthmian games.

Pinero, Sir Arthur Wing (1855–1934), British dramatist, born in London. He was educated in private schools, became an actor and appeared in Shakespearian plays. In 1885 he began to write comedies and in a few years won a leading position among British playwrights. His most successful plays are *The Second Mrs. Tanqueray, The Gay Lord Quex, Trelawney of the Wells, His House in Order, Sweet Lavender, The Enchanted Cottage* and *The Notorious Mrs. Ebbsmith.*

Pinkerton, Allan (1819–84), American detective, born in Scotland. He emigrated to America in 1842. He gained local fame in Chicago, especially after he captured an entire gang of counterfeiters; this exploit led to his appointment to a 4-year term as deputy sheriff. In 1850 he opened a detective agency in Chicago, and one of his early successes was the recovery of a large sum stolen from the Adams Express Company.

He organized the U. S. Secret Service, was Lincoln's guard and suppressed an Irish secret society, the Molly Maguires.

Pirandello, Luigi (1867–1936), Italian playwright and novelist, born at Girgenti, Sicily, educated at Rome and at the University of Bonn in Germany. He taught Italian literature in Rome from 1897 to 1921. His first efforts were short stories and novels, but none of them was outstandingly successful until after his plays had made his name well-known. The first highly successful play was *Six Characters in Search of an Author*, produced in Rome in 1921. Others are *Right You Are if You Think You Are*, *Each in His Own Way*, *As You Desire Me* and *Tonight We Improvise*. His characters are usually humble people, but his plays often are based on subtle and abstract philosophical questions. He won the Nobel Prize for literature in 1934.

Pisistratus (605–527 B.C.), Greek statesman, ruler of Athens, the son of Hippocrates, who left him a large fortune. He usurped the throne in 560 B.C., and, although he was twice expelled, he regained it and ruled with mildness and justice. He enforced the laws of Solon, who was his friend and relative; founded the first public library at Athens and collected and arranged the poems of Homer.

Pitcher, Molly (Mary Hays or Heis; 1754–1832), American patriot, born in what is now Carlisle, Pa. During the fighting at the battle of Monmouth, N.J., she won fame by carrying water to the hard-pressed colonial forces and thus acquired her nickname. Pennsylvania provided a pension for her in 1822. Tradition has confused Molly Pitcher with Margaret Corbin (1751–1800), who at Fort Washington, N.Y., November 16, 1776, assisted her husband at his cannon.

Pitman, Sir Isaac (1813–97), inventor of a system of shorthand, born in Trowbridge, England. His textbook *Stenographic Sound Hand* was published in 1837, and his *Phonetic Journal* in 1843. Shorthand became very popular in Britain. Benn Pitman (1822–1910), a brother of Isaac, introduced a system of shorthand into the United States, founded the Phonographic Institute in Cincinnati and invented a process of relief engraving.

Pitt, William, 1st Earl of Chatham (1708–78), English statesman, born in London and educated at Oxford. He entered Parliament in 1735 and later became a member of the Privy Council. He was called upon to form a new Cabinet in 1756, of which the duke of Devonshire was prime minister. He resigned in 1761 but 5 years later was called upon to form another Cabinet and became Viscount Pitt and Earl of Chatham. Ill health forced his retirement in 1768, but he kept up an active interest in public affairs in the House of Lords. He opposed Lord North's policy of taxing the colonies and, upon the alliance of the colonies and France, protested in a last great effort against the proposal to make peace. He wanted just treatment of the colonies but opposed any breaking up of the British Empire and so opposed independence for the colonies. At the close of his speech he fell into the arms of his friends. He died a few days later. He was called the *Great Commoner*. His son of the same name is known as William Pitt the Younger.

Pitt, William (1759–1806), English statesman, born at Hayes, son of William Pitt. He was educated at Cambridge, studied for the bar at Lincoln's Inn and entered Parliament in 1781. At the age of 23 he became chancellor of the exchequer and at 25 was regarded as one of England's most powerful ministers. He held the position until 1801, during one of the most stormy periods of British history. In 1784 he established a new constitution for the East India Company.

In 1799 he brought about union with Ireland. He had intended to free the Roman Catholic laity from all restrictions and to grant a public maintenance to their clergy, but he was blocked by the obstinacy of the king. Chagrined by this failure, Pitt resigned in 1801. He returned in 1804 when fear of a Napoleonic invasion brought him support from all parties, for he was known as a great war minister. As head of the government he formed a new coalition with Austria and Russia against France. When he heard the news of Napoleon's success at Austerlitz, Pitt, then in poor health, returned from Bath to London where he died.

Pius IX (Giovanni Maria Mastai-Ferretti; 1792–1878), Italian Pope, born near Ancona. He was elected in 1846, and his pontificate covers one of the most eventful periods of the Papacy. After the insurrection at Rome (1848) he fled to Gaeta but was restored by French aid 2 years later. In the same year he established a Catholic hierarchy in England and in 1854 defined the doctrine of the Immaculate Conception of the Virgin. In 1870 the dogma of papal infallibility was decreed. After the French left Rome, in 1870 it was declared the capital of Italy and was occupied by the troops of Victor Emmanuel. The Pope was held practically a captive in the Vatican until his death.

Pius X (Giuseppe Sarto; 1835–1914), Italian Pope, born near Treviso. He was educated at Castelfranco and the Diocesan Seminary of Padua and in 1858 was ordained a priest. In 1884 he was appointed bishop of Mantua; Leo XIII made him a cardinal and patriarch of Venice in 1893. His charity and tact made him popular, and more than once he settled serious strikes and labor disputes. On the death of Leo XIII, 1903, the conclave met and elected him Pope. His life was spent in the pastoral and episcopal service of the Church rather than in diplomatic and official affairs. He was interested in the reform of church music and in other matters of ecclesiastical discipline. In 1907 he issued a decree entrusting the revision of the *Vulgate Bible* to the Benedictine Order and later an encyclical against the modernist movement in the Church.

Pius XI (Achille Ratti; 1857–1939), Italian Pope, a native of Desio, near Milan. He was educated in church schools and became a priest at the age of 22. He was appointed Ambrosian librarian at Milan, was made a professor in the leading seminary at Milan for the education of priests, then transferred to the Vatican as librarian. During the last days of the World War he was selected papal nuncio to Poland, where he endeared himself to all classes while the new republic was in the making. For his success there he was raised to the rank of archbishop of Milan. In 1921 Pope Benedict XV created him a cardinal; on February 16, 1922, after 8 months in that office, he was elected Pope to succeed Benedict. The outstanding event of his reign was the understanding reached with the Government of Italy whereby Vatican City was established as an independent state (1929), thus re-establishing the temporal power of the Papacy.

Pius XII (Eugenio Pacelli: 1876–), Italian Pope, born in Rome of a family distinguished for its services to the Church. Son of Philip Pacelli, a brilliant ecclesiastical lawyer, and brother of a political representative of the Vatican, he was from boyhood trained for the papal diplomatic service. When first ordained a priest, he was assigned to a minor position in the office of the Papal Secretary of State. In 1912 he was promoted to Undersecretary of State. Soon after his appointment, the World War began, and the Vatican entered upon its most trying times. For the next five years Pacelli kept at his desk constantly. When Pope Pius X died in 1914, Pope Benedict succeeded, and soon noticed that it was young Pacelli who was doing most of the work. In 1917 Pope Benedict made Pacelli the Papal Nuncio in Munich, where he made a brilliant attempt to carry out Pope Benedict's plan for an end to the war. Pacelli next became Papal Nuncio to the new German Republic. He worked out a Papal treaty with the State of Prussia, then a stronghold of Lutheranism, that was so favorable to the Vatican that the rank of Cardinal was conferred upon him.

When Cardinal Gasparri resigned, Pacelli was named Papal Secretary of State. It was in this position that he gained such worldwide popularity, for he covered both hemispheres in his travels. In 1934 he attended the Eucharistic Congress in Buenos Aires. He toured the United States by airplane in 1936. No other Pope ever had travelled by air. Having a good radio voice, Pacelli often spoke over the air, and thus spread more good-will. He was elected Pope in 1939, after one of the shortest conclaves in history. His diplomatic training gave him familiarity with modern ideas, and the ability to read and speak the dead languages, and 7 modern ones.

Pizarro, Francisco (1471–1541), Spanish explorer, born in Trujillo. He entered the Spanish army and saw service in Italy. In 1509 he made a voyage of exploration to America with Commander Alonzo de Ojeda. Later he was with Balboa's expedition when the Pacific Ocean was discovered (1513). In 1526 he joined Almagro and others in exploring the west coast of South America. Pizarro and a few followers landed on a Peruvian island, and overcoming native hostility they explored the mainland. Pizarro had too few men to attempt a settlement; it was not until 6 years later that Pizarro, Almagro and 183 men landed at Tambez. He found the country weakened by warfare between two native princes, Atahualpa and Huascar. By an act of treachery he captured and executed Atahualpa and set up Manco as ruler. Cuzco was taken in 1533, and on January 6, 1535, Pizarro founded the city of Lima as the new capital.

The Spanish king made Pizarro a marquis and gave Almagro a vast tract of land. In quelling native uprisings two of Pizarro's brothers were killed. Almagro seized the other two and held them until his demand for ownership of Cuzco was recognized. Almagro was then captured and put to death. This act incensed Almagro's followers; they announced their support of their dead leader's son as his successor, intending to dispossess Pizarro. The matter was soon settled, for in a quarrel at Lima the Almagro clan in a surprise attack mortally wounded Pizarro.

Planck, Max (1858–), German physicist, born at Kiel. He studied at Munich and Berlin universities and became professor of physics at Berlin. He won international fame for his law of radiation, later known as the Quantum Theory. In general, the theory is that light and other forms of energy are emitted as "particles of energy." In 1918 he won the Nobel Prize for physics. As editor of the *Annalen der Physik* he gained a reputation in scientific circles in Europe. He was elected a foreign member of the Royal Society in 1926.

PLATO (*c.* 427-347 B.C.), Greek philosopher, born in Athens. When he was 20 years old, political troubles forced him to leave Athens for a time, and he lived at Megara with Euclid. Plato made two visits to Syracuse, in 387 and 361 B.C. He became closely connected with Archytas and the Pythagorean philosophers. When he returned to Athens, he began to teach philosophy publicly in the Academia, a pleasant garden in the most beautiful suburb of Athens. He soon attracted a large school of distinguished followers, who carried on his work after his death under the name of the Philosophers of the Academy. He never married and must have had an independent income, because he always opposed teaching philosophy for fees and never held any public office.

Plato's philosophy is expressed by the word *idealism* as opposed to realism, materialism or sensationalism, using these words in their most general and least technical sense. It would be an error to look on Plato as a man of mere speculation and a writer of metaphysical books. Neither Plato nor any of the great Greeks regarded their intellectual exercises and recreations as an end in themselves. With them philosophy did not mean mere knowledge or speculation but wisdom, and wisdom meant wise action, and wise action meant virtue. Plato was the first philosopher to formulate satisfactory principles of ethics. His philosophy was the source of that great body of thought that became known as Platonism. It profoundly influenced Christian principles. Plato wrote in the form of dramatic dialogues, in which the chief speaker is Socrates, into whose mouth Plato put theories developed after Socrates's death. Substantially all of Plato's known writings, 35 dialogues, have survived.

Plautus, Titus Maccius (*c.* 254–184 B.C.), Roman comic poet, born in Umbria. He traveled widely and eventually returned home penniless. He did menial work for a baker but wrote three plays on the side and took up writing as a career. Of a possible 150 comedies ascribed to him, only 21 have been preserved to the present day. They are adaptations from Greek originals; the action is rapid, the humor keen and shrewd, and the characters lifelike. Plays by Dryden, Molière, Jonson and Shakespeare are based on comedies by Plautus.

Pliny (Gaius Plinius Secundus the Elder; 23–79 A.D.), Roman naturalist, born at Como. The number of his works is not known; the only one that has survived the centuries in complete form is his *Historia Naturalis* (Natural History). It represents a vast amount of labor; the work includes 37 books and covers about 20,000 topics. Besides writing from his own study and exploration he recorded the best information from at least 2,000 volumes written by others. The book contains little of value for the scientist of today but is of enormous interest to students of ancient civilization as it preserves a great deal of information that is found nowhere else. Pliny was appointed commander of the fleet at Misenum by Vespasian. He died when the eruption of Vesuvius destroyed Pompeii.

Pliny (Gaius Plinius Caecilius Secundus the Younger; *c.* 62–*c.* 114 A.D.) Roman orator and statesman, nephew and adopted son of Pliny the Elder. At the age of 20 he was considered one of the most brilliant Romans. He is especially known for a series of *Letters,* written in the most precise language. They throw a great deal of light on the history of his period, including treatment of early Christians. Pliny passed in turn through the offices of military tribune, quaestor, praetor and consul.

PLUTARCH (*c.* 46–*c.* 120 A.D.), Greek biographer, born at Chaeronea, Boeotia. In A.D. 66 he was a pupil of the philosopher Ammonius at Delphi. He visited Italy and spent some time at Rome, lecturing there on philosophy as early as the reign of Domitian; but his name is not mentioned by any of his contemporaries. He returned to his native town, where he held various magistracies and was appointed priest of Apollo. He was still living in 120, but the exact time of his death is not known.

His great work is entitled *Parallel Lives,* biographies of 46 eminent Greeks and Romans, arranged in pairs, each pair accompanied by a comparison of characters. They are written with a moral purpose and present not orderly narratives of events but portraitures of men, drawn with much graphic power, with great good sense, honesty and kindheartedness. Few books of ancient or modern times have been so widely read and so generally admired as these *Lives.* Most of Plutarch's other writings are ethical and are entitled *Moralia.*

Pocahontas (*c.* 1595–1617), daughter of an American Indian chief, Powhatan, who was the ruler of the tribes of Virginia. She became acquainted with the leading members of the Jamestown colony. According to legend, her father captured Captain John Smith and was about to kill him when Pocahontas threw herself upon him and begged her father to spare his life. This was supposed to have occurred in 1607, and Smith reported the incident in a letter to the queen of England. However, 2 years later, in his book *True Relation of Virginia,* he did not mention it, although he recorded that the princess was a vivacious and beautiful child. In 1612 the Indians captured a number of white prisoners; the settlers in turn captured Pocahontas and held her as hostage for the safe return of their comrades. During her captivity she became a Christian and in 1614 married John Rolfe, a settler. She went with her husband to England where she was welcomed as a princess. She died at Gravesend, not far from London.

Poe, Edgar Allan (1809–49), American author and poet, born in Boston, Mass. His parents died when he was very young and he was cared for by John Allan of Richmond, Va., who took him to Europe, where he attended schools in England and Scotland. In 1820, on their return, Edgar went to school in Richmond and began to write poetry. He studied at the University of Virginia for a term (1826), then went back to Boston, where he published *Tamerlane* (poems) in 1827. He served in the army for a while and entered West Point in 1830 but was dismissed the following year for being absent from roll call.

He earned $100 for the story *A Manuscript Found in a Bottle,* and this won back some of the friends he had lost and enabled him to marry his cousin, Virginia Clemm. He became an associate editor of a Richmond magazine, where by hard work he increased its circulation sevenfold. His bad personal habits lost him his position, and he worked briefly on a number of other magazines. In 1837 he moved to New York, where he gained attention with *The Narrative of Arthur Gordon Pym.* He became editor of *The Gentleman's Magazine* in Philadelphia, and here he published some of his best stories under the title *Tales of the Grotesque and Arabesque.* Poe excelled in creating an atmosphere of mystery and horror in such tales as "The Pit and the Pendulum," "The Masque of the Red Death," "The Murders in the Rue Morgue" and "The Fall of the House of Usher." Among his best-known poems are "The Raven," "Annabel Lee" and "The Bells"; the first named, published in 1845, helped to make him famous throughout the world.

Poincaré, Raymond (1860–1934), French statesman, born at Bar-Le-Duc. He became one of the most successful lawyers in Paris before political life attracted him. He entered the Chamber of Deputies (1887), was finance minister (1894–95 and 1906) and became premier and minister of foreign affairs in 1912, resigning on his election as President of the Republic, January 17, 1913. He served ably throughout the World War. In 1920 his term as President expired, and his election as a Senator followed. He advocated strict treatment of Germany, and this attitude gained for him a second appointment as premier (1922). He held this post and also that of foreign minister until the election of May 1924, when he was defeated and resigned. He formed a ministry again in 1926, and as premier and finance minister he brought about the stabilization of the franc at one-fifth its value (1928). In 1929 he resigned office from the Chamber of Deputies; elected to the Senate in 1932, he continued to call for adequate guarantees of safety for France.

Polk, James Knox (1795–1849), 11th President of the United States, born in Mecklenburg county, N. C. He helped his father in farming and surveying, and at 18 he began 2 years of study under a tutor, then entered the University of North Carolina. After graduation he studied law and was admitted to the bar in 1820. He practiced law for nearly 20 years, during which time he often held political office. He was elected to the House of Representatives in 1825, as a Jeffersonian Democrat, and he remained in Congress until 1839. After 1835 he was Speaker. He was chosen governor of Tennessee in 1839 and served one term. In the national convention of 1844 Lewis Cass, Martin Van Buren and James Buchanan fought for the presidential nomination. The deadlock was broken by nominating Polk, who had been a candidate for the Vice-Presidency. He defeated Henry Clay in an exciting campaign in which the Oregon boundary dispute was prominent. During his administration this question was settled by compromise with Great Britain.

The Texas boundary disagreement led to the Mexican War in 1846. The Rio Grande River had been considered the southeast boundary of Texas, and in 1845 the Texas Republic was admitted to the Union, with the boundary so fixed; Mexico said the boundary was at the Neuces. Polk ordered General Taylor to occupy the area in dispute. The Mexican army advanced and engaged Taylor at Palo Alto. Polk then asked for a declaration of war, and Congress complied. As a result the vast territory was added to the national domain. During Polk's term an independent treasury system was adopted, and the tariff was reduced. Polk retired to Tennessee at the close of his term, where he died 3 months later.

Pollock, Sir Frederick (1845–1937), British jurist and writer, born in London. He studied at Eton and Cambridge and was called to the bar at Lincoln's Inn (1871). He taught jurisprudence at Oxford (1882–83) and became professor of common law in the Inns of Court, London (1884). He delivered a course of lectures at the Lowell Institute, Boston, in 1903 and again visited the United States in postwar years. Several of his legal writings are standard textbooks, but he is best-known as editor of the *Law Reports.*

Polo, Marco (1254–1323), Italian traveler. His father was a merchant; in 1271 Marco accompanied him on a journey to the court of Kublai Khan. Marco was given a governorship by the Khan (emperor) and sent on missions to India and China. Eventually the Europeans wanted to return home. The emperor wanted them to stay, but arranged for them to join a westbound caravan, which started for Persia in 1292. The journey was long and tedious, and in 1295 they reached Venice after an absence of 24 years. In 1296 Marco fought in a war against Genoa. He was captured by the enemy and imprisoned. While in jail he dictated the story of his experiences in China to a fellow prisoner, and it was published as *The Book of Marco Polo.* The narrative created a great sensation throughout Europe. Many believed the tale to be imaginary, but other explorers came back to verify the facts that had been written. Marco became a member of the Grand Council of Venice.

Polybius (*c.* 205–*c.* 123 B.C.), Greek historian, born in Megalopolis, Arcadia. In 168 B.C., after the Roman conquest of his country, Polybius and a thousand other prominent Greeks were taken to Rome as hostages. Polybius remained there for 17 years, and influential Romans became his friends. One of them was Scipio Africanus, whom Polybius accompanied to Africa during the Third Punic War. Polybius returned to Greece, which was again defeated by Rome. However, Polybius was able to arrange good peace terms through his Roman friends. He wrote *Histories,* 40 books giving an account of Rome and neighboring countries. Only five have been preserved, but fragments of others still exist.

Polycarp, Saint (*c.* 69–155), Greek bishop of Smyrna. He was reared in Smyrna, became a Christian and in the organization of the new religion was appointed bishop of his native city. He was on intimate terms with St. John. After Polycarp's return from a conference in Rome concerning the proper date for the celebration of Easter, he was arrested by Roman officials on the charge of being a Christian and was executed. Of several episcopal letters that he wrote, only one has been preserved, the *Epistle of St. Polycarp to the Philippians.*

Pompadour, de, Jeanne Antoinette Poisson le Normant d'Étioles, Marquise (1721–64), known as the Marquise de la Pompadour, born in Paris, a favorite of Louis XV of France. Her supposed parents were poor, but a rich man, thought to be her real father, provided lavishly for her and prepared her for the most exclusive French society. She had suitors by the score but became the wife of her benefactor's nephew, le Normant d'Étoiles. Louis XV saw her at a masked ball and persuaded her to take up her residence at Versailles as his mistress. She had great influence over the king and brought about the alliance with Austria in the Seven Years' War because of her dislike for Frederick the Great. Ministers of state sought her support in carrying out their policies, and prominent literary men accepted her leadership.

Pompey (Gnaeus Pompeius Magnus; 106–48 B.C.), Roman general and statesman. As a young man he allied himself with Sulla and helped to crush Marius. He was granted a triumph for his victories over the Marians in Sicily and Africa, and the title *Magnus* or "the Great" was conferred upon him by Sulla in 81 B.C. After the death of Sulla, Pompey helped to put down the uprising of Lepidus (77 B.C.), and for several years conducted a war against the rebellious Sertorius in Spain. On his return to Italy in 71 B.C. he gained additional reputation by stamping out the remnants of the slave insurrection of Spartacus. He formed a political alliance with the great capitalist Marcus Licinius Crassus and thus secured the Consulship for the year 70 B.C., although he was several years younger than the legal age. In 67 B.C. he received extraordinary military powers to deal with the Cilician pirates who at that time were terrorizing the Mediterranean. The following year those powers were extended. He swept the pirates from the Mediterranean in 40 days, defeated Mithridates and added his province of Pontus to Rome, defeated the Armenian king, annexed Syria, conquered Jerusalem and made its territory a tributary province. Pompey's political ties with Caesar were strengthened when he married Caesar's daughter Julia. Caesar, Pompey and Crassus formed their powerful triumvirate (59 B.C.). As Caesar's influence increased, Pompey's declined; when the inevitable civil war broke out, Pompey was decisively defeated at Pharsalus (48 B.C.). He fled to Egypt, where he was assassinated.

Ponce de León, Juan (*c.* 1460–1521), Spanish explorer, born in San Servos. He shipped with Columbus in 1493; after the conquest of Puerto Rico, he became its governor (1510). He had heard a fable about a fountain on an island called *Bimini* with water that contained curative properties—a "fountain of eternal youth." He went in search of it and on Easter Sunday, 1513, found a new land, the Florida peninsula. He gave the territory its present name. In 1521 while attempting to colonize the land, he was mortally wounded by an Indian arrow.

Pons, Lily (1904–), French operatic soprano, born at Cannes. She first studied piano but turned to singing and made her operatic debut in France in *Lakmé.* She became very popular in the United States after her American debut at the Metropolitan Opera House, New York, in 1931. Later she sang in motion pictures and radio, as well as in opera. Her principal roles are Lucia, Gilda and Rosina. In 1938 she married André Kostelanetz.

Pontiac (*c.* 1720–69), Ottawa Indian chief. In his youth Pontiac favored the French against the British cause in America. His tribes were at the command of the French for years; it is thought that Pontiac led his Indians in the battle in which Braddock was killed (1775). In 1763 he formed a confederacy of Indian tribes and launched attacks on 14 of the British western posts. This campaign, known as Pontiac's War (1763–65), met with great success, but he was finally forced to surrender in 1765. Pontiac was an outstanding organizer, military leader and statesman. He was killed at Cahokia, Ill., by a Kaskaskia Indian, and in vengeance the tribes made war. The accounts of Pontiac's death seem legendary.

Pope, Alexander (1688–1744), English poet, born in London. He attended two private schools for a time, then was tutored by two priests. He early showed poetic talent, and he was only 12 when his *Ode to Solitude* was published. When he was 23, *Essays on Criticism* appeared; and in the next year, *Rape of the Lock*. Before his 30th year he began translations of the *Iliad* and the *Odyssey*, which were to take all his time until about 1726. He published the *Dunciad* in 1729; this was satire directed against his critics and his adversaries in general. Some of the most popular phrases in the English language are from Pope's verse, as for instance; "Hope springs eternal in the human breast," "The proper study of mankind is man." "An honest man's the noblest work of God." Possibly his *Essay on Man* is most frequently read today.

Porter, David (1780–1843), American naval officer, born at Boston, Mass. He sailed on merchant vessels as a boy, joined the American navy and served against the French in the West Indies and in the War with Tripoli. When the War of 1812 began, he was put in command of the *Essex* with a roving commission to harass the enemy. He sailed around Cape Horn and captured several British vessels. On his return to home waters he was acclaimed a hero. Trouble with the Spanish authorities in Puerto Rico in 1824 forced his resignation. He was charged with exceeding his authority in compelling a Spanish ship to salute the American flag. Porter then gave his services to the Mexican navy for 3 years with the rank of admiral. Upon his return home President Jackson sent him as consul general to the Barbary states. Later he was transferred to the diplomatic service at Constantinople, where he died.

Porter, David Dixon (1813–91), American naval officer, son of David Porter, foster brother of David Glasgow Farragut. When 13 years of age he accompanied his father on his cruise in the West Indies in search of pirates. He entered the Mexican navy with his father but returned to the United States (1829). As a lieutenant in the navy he commanded an American gunboat in the Mexican War and rendered distinguished service. When the Civil War began, he was promoted to the rank of commander. He could have been chief officer in charge of the campaign to blockade the Mississippi, but he asked that Farragut be given the task. Porter was second in command, however, and did such good work that he became a rear admiral. Later he supported Grant at Vicksburg, from the river; was transferred to the Atlantic squadron; and took Fort Pickens. From 1865 he was superintendent of the U. S. Naval Academy at Annapolis. The rank of vice-admiral was given him in 1866; when Farragut, the first American admiral, died in 1870, Porter was raised to that rank.

Porter, Gene Stratton (1868–1924), American author, born in Wabash County, Indiana. At the age of 18 Miss Stratton was married to Charles D. Porter. She served on the staffs of several magazines and was widely popular as a writer of fiction. Her best-known works, *Freckles* and *A Girl of the Limberlost*, have been translated into many languages. Scarcely less popular were *The Song of the Cardinal, What I Have Done with Birds, Laddie, The Keeper of the Bees, Her Father's Daughter, Michael O'Halloran, The Harvester, Music of the Wild, Homing with the Birds, A Daughter of the Land* and *At the Foot of the Rainbow*.

Porter, Jane (1776–1850), Scottish novelist, born in Durham and educated in Edinburgh. A friend of Sir Walter Scott, she often visited his home to hear his tales of border heroes and warfare. Her first book, *Thaddeus of Warsaw*, published in 1803, won her a Polish decoration. Seven years later her historical novel *Scottish Chiefs* established her reputation as one of the great writers of the period. These two books have remained popular for more than 100 years.

Her other works are *Sir Edward Seaward's Diary, The Pastor's Fireside* and *Coming Out*. In co-operation with her sister Anna Maria (1780–1832) she wrote *Tales Round a Winter Hearth* (1826) and *The Fields of Forty Footsteps* (1829).

Porter, William Sydney (pen name, O. Henry; 1867–1910), American writer, born at Greensboro, N. C. For a time he was editor of a humorous paper, *The Rolling Stone*, at Austin, Tex., but then went into banking. He was charged with embezzlement and served a term in prison. Later he returned to journalism in Houston and then in New Orleans. There he was surprised to learn that his "yarns" were increasing circulation in the newspapers in which they appeared. He went to New York city and began to write the short stories that made him famous. He wrote more than 200 of them, collected under the titles of *Cabbages and Kings, The Four Million, The Voice of the City, The Trimmed Lamp, Waifs and Strays* and *Options*. The characters he compels his readers to love or hate are tramps, shopgirls, clerks, office boys, cowboys.

Portes Gil, Emilio (1891–), Mexican statesman. He was a lawyer, active in political affairs. He served two terms as governor of his state and two terms in the Mexican Congress. He was minister of the interior in the Calles Cabinet when President Obregon was assassinated (July 1928). Portes Gil was then elected to fill out Obregon's unexpired term. He retired when Rubio was chosen President at the next election but became minister to France in 1931.

Post, Emily (Emily Price; 1873–), American writer, born in Baltimore, Md. She wrote several novels and then turned to the study of manners and etiquette. Her published works include *Etiquette, How to Behave Though a Debutante* and *The Personality of a House*.

Post, Wiley (1898–1935), American aviator, born in Grand Saline, Texas. At the age of 17 he abandoned farming and entered an automobile school in Kansas City. During the World War he served in a training camp in Oklahoma. He learned to fly in 1925 and toured the West in exhibition flights and parachute jumps. He took a job as oil driller in Oklahoma to earn more money, and he lost the sight of one eye in an accident. This did not interfere with his flying, and he was soon an airmail pilot and a racer. He joined Harold Gatty in an around-the-world flight in 1931. They covered 15,400 miles in 8 days, 15 hours, 51 minutes. In 1933 Post made a solo flight around the world and broke the previous record by more than a day. He was killed in a plane crash, Aug. 17, 1935, near Point Barrow, Alaska, on a flight with Will Rogers.

Pound, Ezra (1885–), American poet, educated at Hamilton College and the University of Pennsylvania. He settled in England in 1907 and traveled widely in Spain, France and Italy. His verse is deliberately artificial in form and is not written for popular appeal. Pound's books of poetry include *Provença, Canzoni* and *Cathay*. He also wrote several volumes of criticism.

Pound, Roscoe (1870–), American jurist, born in Lincoln, Neb., educated at the University of Nebraska. He was admitted to the bar in 1890 and practiced for some years but soon began to teach law at his *alma mater* and elsewhere. He became dean of the Harvard Law School in 1916. His writings on law are widely used. They include *Outlines of Lectures on Jurisprudence, The Spirit of the Common Law, Laws and Morals* and *Criminal Justice in America*. From 1892 to 1903 he was director of the Nebraska Botanical Survey, and he wrote on botany.

Poussin, Nicolas (1594–1665), French painter, born in Normandy. He worked as a pupil of famous painters and sculptors and in 1624 went to Rome, where he remained 6 years. His reputation rests on his success with classic landscapes. About 40 of his paintings are in the Louvre in Paris, including the series, *The Labors of Hercules*. The origin of Poussin's art was French, and he influenced French painting for generations.

Powell, John Wesley (1834–1902), American geologist, born in Mount Morris, N.Y. He studied at Oberlin College but before graduation enlisted in the army and fought in the Civil War until the battle of Shiloh, where he lost an arm. In 1865 he was appointed professor of geology in Illinois Wesleyan University. He led geological expeditions to Colorado and in 1869 made a daring 3-months journey through the Grand Canyon by boat. His published report of this exploration brought him wide fame in the scientific world. A Congressional appropriation enabled him to continue work along the Colorado, and he surveyed nearly 100,000 square miles. The U. S. Geographical and Geological Survey was established in 1879 largely through his efforts. He became director of the Bureau of Ethnology and later of the Survey.

Powell, Maud (1868–1920), American violinist, born in Peru, Illinois. She studied in Chicago and Europe. At 17 she made her debut in Berlin and within a few years was acclaimed as the greatest woman violinist. She played solo performances with the greatest orchestras of her time and made concert tours to every continent.

Powers, Hiram (1805–73), American sculptor, born in Vermont. He became the companion of a sculptor, who taught him to model figures in clay. He became proficient in the art and spent a number of years in making wax figures for a dime museum. He went to Washington, where he made portrait busts of leading citizens. At the age of 32 he settled in Florence, Italy. One of his most famous pieces of statuary is *Eve Disconsolate*, now in the Cincinnati Museum. The *Greek Slave*, of which a replica is in the Corcoran Art Gallery, Washington, also is among his best works. The Metropolitan Museum, N. Y., has his *Fisher Boy*.

Powhatan (*c*. 1550–1618), Indian chief. His domain in Virginia extended about 200 miles inland from the sea, and its length from north to south was still greater. He was head of an Algonquian confederacy that at one time included about 30 tribes. He is remembered chiefly for the incident in which his daughter Pocahontas saved the life of Captain John Smith. In 1609, when the settler's supplies were low, Smith created Powhatan "Emperor of the Indies," hoping that the honor would lead the natives to provide food. In 1612, 3 years after Smith left the colony, Pocahontas was taken captive by the English and held as hostage. Powhatan accepted the situation and thereafter remained friendly with the English.

Powys, the name of three English brothers, all writers.

John Cowper Powys (1872–) was born in Derbyshire and educated at Cambridge. His novels are *Wood and Stone* and *Wolf Solent*. *Weymouth Sands* is a collection of short stories; *Wolfsbane* and *Mandragora* are books of verse. He also wrote an autobiography and several volumes of criticism and philosophy.

Theodore Francis Powys (1875-) was born in Derbyshire and educated at private schools. He wrote a number of extremely realistic novels, including *Black Bryony* and *Mr. Weston's Good Wine*.

Llewellyn Powys (1884–) was born in Dorset and educated at Cambridge. He traveled widely, in spite of a constant fight against tuberculosis. He wrote *Skin for Skin, The Verdict of Bridlegoose, The Cradle of God* and *A Pagan's Paradise*.

Prajadhipok (1893–), King of Siam. He came to the throne in 1925 and reigned for 10 years as the last absolute monarch in the world. He and Queen Rambaibarni traveled widely and introduced modern institutions into Siam, built railroads and encouraged education. After a bloodless revolution in 1932 he signed a constitution that limited his powers, set up an elected Parliament and gave full franchise to the people. His efforts to liberalize the government were opposed by the aristocracy, and he abdicated. His young nephew succeeded him.

Praxiteles (4th century B.C.), Greek sculptor. He lived at Athens, where he was probably born. His works are known mostly by copies that exist. He executed statues in both bronze and marble and is best-known for his female figures. He made several statues of *Apollo*, one of *Hermes Carrying Dionysus* (found in 1827 after lying buried for centuries) and a group called *Niobe and Her Children*, now in Naples.

Preble, Edward (1761–1807), American naval officer, born in Portland, Me. He ran away from home to sail on a privateer, later joined the Massachusetts naval service and was captured by the British in 1781. He sailed in the merchant service for some years after the Revolutionary War but rejoined the navy in 1798 and was soon promoted to captain. He commanded a Mediterranean squadron in the war against the Mediterranean pirates; his flagship was the *Constitution*.

Prescott, William Hickling (1796–1859), American historian, born at Salem, Mass. While he was a student at Harvard, he lost the sight of one eye in an accident, and his studies so affected the other eye that he became nearly blind. As a result he gave up the study of law, went to Europe for medical treatment and took up writing when he returned home. His first important work, *The History of Ferdinand and Isabella* appeared in 1837. He next devoted 6 years to the *History of the Conquest of Mexico* and 4 years to the *Conquest of Peru*. These two histories have ranked as classics ever since. Between 1855 and 1858 he published three volumes of the *History of Philip II* but left it unfinished.

Priestley, Joseph (1733–1804), British chemist, born in Yorkshire. He studied for the ministry and served the Church for several years but changed his religious views and began to study science. In 1767 his *History of Electricity* was published. His fame rests chiefly on his discovery of oxygen in 1774. He again became active in religious work as a Unitarian, at that time a faith subject to much criticism. This and his approval of the French Revolution caused him much trouble. His house, library, manuscripts and apparatus were burned by an infuriated mob. He found safety in the United States and settled in Northumberland, Pa., where he died. He wrote more than 70 books on a wide variety of subjects. Among his discoveries were nitric oxide, hydrochloric acid and sulphur dioxide. His work on gases led to Dalton's atomic theory. Priestley was the first to use carbon dioxide in the preparation of "mineral" waters.

Prior, Matthew (1664–1721), English poet and diplomat, born in Dorsetshire and educated at Cambridge. He was secretary to the British ambassador at The Hague for a time; during Queen Anne's reign he was sent on several important missions to France. He took an important part in drawing up the Treaty of Utrecht, which ended the War of the Spanish Succession. Prior was impeached and imprisoned after a new party came into power in England. He is remembered today for his poetry rather than for his statesmanship. He wrote two long satiric poems, *Alma, or the Progress of the Mind* and *Solomon, or the Vanity of the World.*

Pritchett, Henry Smith (1857–1939), American astronomer and educator, born in Missouri and graduated from Pritchett College. He studied astronomy at the U. S. Naval Observatory and in 2 years was appointed assistant astronomer. He became director of the observatory in 1880. He went to New Zealand in 1882 to observe the transit of Venus, and on his return was appointed professor of astronomy at Washington University, St. Louis (1883), which post he left in 1897 to become superintendent of the U. S. Coast and Geodetic Survey. In 1900 he was appointed president of the Massachusetts Institute of Technology, but he resigned in 1906 to be president of the Carnegie Foundation for the Advancement of Teaching. He retired in 1930.

Proctor, Alexander Phimister (1862–), Canadian-American sculptor, born in Ontario. As a child he observed wild life in the Colorado mountains, and later he studied art in Paris. He is best-known for animal figures and for portraits. Examples of his work are *Panthers* (Prospect Park, Brooklyn), *Princeton Tiger* (Princeton Univ.) *Broncho Buster* and *On the Warpath* (Denver, Colo.), *R. E. Lee Inspiring Youth of the South* (Dallas, Tex.) and an equestrian statue of Theodore Roosevelt at Portland, Oreg.

Proctor, Richard Anthony (1837–88), English astronomer and writer, born in London. He studied at St. John's College, Cambridge. He wrote on astronomy for scientific magazines and for encyclopedias; the reputation he gained led to his election to the Royal Astronomical Society. In 1881 he moved to the United States and made it his residence. His daughter Mary became an astronomer of note. Proctor's popular books are *Saturn and Its System, Gnomonic Star Atlas, Half-hours with the Telescope, Half-hours with Stars, Other Worlds Than Ours. Light Science for Leisure Hours, Elementary Astronomy* and *Border Land of Science.*

Protagoras (*c.* 481–411 B.C.), Greek philosopher, a native of Abdera. He settled in Athens and became a well-known teacher of philosophy and literature. His doctrine was a form of agnosticism, his favorite saying being "Man is the measure of all things." He wrote a book *On the Gods* in which he neither affirmed or denied their existence, and he was banished from Athens when he was convicted of blasphemy.

Proudhon, Pierre Joseph (1809–65), French political theorist, born at Besançon. He expressed his extreme democratic opinions so vigorously that he became one of the leading figures of his day. He wrote a book, *What is Property,* and answered his question by declaring, "Property is theft." His economic views are set forth in that volume and in another in which he laid down a strange system of economics.

Proust, Marcel (1871–1922), French novelist, born in Paris, educated at the Lycée Condorcet. From 1890 to 1905 he was prominent in Paris society. After 1905 he lived in seclusion in a soundproofed apartment, writing a series of novels based on the social life he had observed, with close attention to individual psychologies. Among his books are *Swann's Way, Cities of the Plain, The Captive, The Sweet Cheat Gone* and *The Past Recovered.*

Ptolemy (Claudius Ptolemaeus; 2d century A.D.) Egyptian astronomer and geographer. He lived in Alexandria from 127 to 150 and carried on his astronomical observations and writing there. His 13 volumes are known as the *Almagest.* Ptolemy developed the *Ptolemaic System,* in which the earth is described as the fixed center of the universe, with the sun, moon, planets and stars revolving around it in separate zones from east to west. This sytem was everywhere accepted as true until Copernicus disproved it in 1543.

Ptolemy I Soter (*c.* 367–285 B.C.), first King of the Macedonian dynasty of Egypt. He was one of the favorite generals of Alexander the Great; at the death of that conqueror the vast empire he left was divided, and Ptolemy chose Egypt for his share (323 B. C.). His control of Egypt was disputed by the Egyptian people, and he had to fight to keep his throne and establish his supremacy. He succeeded in that and also won the confidence of his subjects. During his reign he added Phoenicia to Egypt. Ptolemy built the library and museum at Alexandria. He was a patron of literature and science and under his rule Egypt became the leading commercial nation. Two years before his death he abdicated in favor of his son.

Ptolemy II Philadelphus (*c.*309–247 B.C.), King of Egypt, son of Ptolemy I. He built a canal from the Red Sea to the River Nile to help Egyptian commerce and constructed the famous lighthouse on the island of Pharos that is considered one of the Seven Wonders of the Ancient World. He patronized the arts and engaged Manetho to write a history of the Egyptians and an account of their religion.

Ptolemy III Euergetes (282–222 B.C.), King of Egypt, son of Ptolemy II. He carried his wars into Western Asia and brought home many images of the Egyptian gods that had been taken away when Cambyses despoiled Egypt. The return of these sacred treasures gave him the name *Benefactor* or *Euergetes.* He controlled the country as far eastward as Damascus and Antioch. A patron of learning, he extended the Alexandrian Library. During his reign Egypt rose to its highest position in wealth and military glory.

Puccini, Giacomo (1858–1924), Italian composer, born at Lucca of a family known for generations as musicians. He studied at Milan Conservatory and became a professor there. In 1893 he produced his opera *Manon Lescaut* and achieved his first success. After this came *La Bohème, La Tosca, Madame Butterfly, The Girl of the Golden West, Le Rondine, Il Tabarro, Suor Angelica, Gianni Schicchi* and *Turandot.* His *Girl of the Golden West,* one of the few operas with an American setting, was first produced at the Metropolitan Opera House in 1910.

Pulaski, Casimir, Count (1748–79), Polish soldier, born in Podolia. He took part in rebellions against King Stanislaus and was exiled from Poland. In 1772 he came to America and in 1777 joined the colonial army. For his distinguished service at the battle of Brandywine he received a brigade of cavalry, which he commanded until March 1778. He resigned rather than serve under General Anthony Wayne. He then organized an independent cavalry unit, the Pulaski Legion, and was defeated at Egg Harbor, N. J., and in South Carolina. He was mortally wounded while leading a cavalry charge at Savannah.

Pulitzer, Joseph (1847–1911), American editor, born at Budapest, Hungary. He emigrated to the United States at 17 and at once enlisted in the Federal army for the remaining 12 months of the Civil War. He was admitted to the bar in St. Louis and there became a reporter on the *Westliche Post,* a German-language newspaper, in 1869. He purchased the St. Louis *Dispatch* and the *Evening Post* and combined them under the name *Post-Dispatch* (1878). In 1883 he became owner of the *New York World* and gained national prominence with his aggressive editorial policy, particularly through his demand for war with Spain in 1897. Pulitzer was elected to Congress from New York in 1885, but dislike for public life, coupled with failing eyesight, brought about his resignation before the end of his term. Within 2 years he became totally blind, but he continued to direct his newspapers almost to the day of his death. He endowed the School of Journalism at Columbia University and provided a fund for annual awards in journalism, letters, drama and music, known as the Pulitzer prizes. These awards vary from $500 to $2,000 and are given yearly for the best American play; the best American books in the fields of the novel, poetry, American history and American biography; and the best work done in various phases of journalism.

Pullman, George Mortimer (1831–97), American inventor, born at Brocton, N.Y. When he was 22, he was given a contract to remove buildings that were obstructing the widening of the Erie Canal. He made his home in Chicago after 1859 and entered the building trade. In 1863 he built the first Pullman sleeping car, after which he designed the corridor train and the modern restaurant car. In 1880 he founded the town of Pullman, near Chicago, for his employees. It later became a part of the city of Chicago.

Pupin, Michael Idvorsky (1858–1935), American inventor and writer, born in Serbia. He emigrated to the United States at the age of 16. He graduated from Columbia University in 1883, then continued his studies at Cambridge and Berlin universities. When he returned to America, he was appointed professor of electromechanics at Columbia. He became famous for his inventions in telephony and his X-ray researches. His books include *From Immigrant to Inventor, Thermodynamics* and *Yugoslavia.*

Pushkin, Aleksandr Sergyeevich (1799–1837), Russian poet, born in Moscow. He wrote a number of poems then considered revolutionary and was exiled. Emperor Nicholas I recalled him during his first year as czar and made him a court official so that he could devote himself to writing. Pushkin was killed in a duel. Today he is best-known for his long, fairy-tale poems *Ruslan and Ludmilla* and *Evgeni Onegin,* which is the basis for Tchaikovsky's opera of the same name. Pushkin's *Boris Godunov* was made into an opera by Moussorgsky. His best prose is his short story "The Queen of Spades."

Putnam, Israel (1718–90), American general, born at Danvers, Mass. He was a captain in the French and Indian War and later became active in movements that brought on the Revolutionary War. Putnam commanded the American troops in the battle of Long Island and was prominent at Brooklyn Heights, where he was defeated by Howe. Afterward he campaigned in Connecticut, the Highlands and at West Point. He became paralyzed before the war ended, and he never recovered.

Pu-yi, Henry (1906–), last Emperor of China, Emperor of Manchukuo, born in the royal palace at Peking. When the Empress Dowager died in 1908, he was proclaimed emperor under a regency. He abdicated when the Chinese Empire fell and the Republic was established (1912) but was permitted to live in the palace. The young prince, then known as Hsan Tuang, was given a liberal education. After trips to England and the United States he adopted western costumes and changed his name to Henry Pu-yi. In 1924 a revolution drove him from Peking, and he fled to the Japanese concession at Tientsin, where he became the central figure in the Japanese scheme to seize Manchuria and there establish a Japanese-controlled state. The plan was carried out in 1932. Pu-yi was named President of the new nation, which had been renamed Manchukuo. In 1934 he was proclaimed emperor and received the name *Kang Te.*

Pyle, Howard (1853–1911), American painter and author, born in Wilmington, Del. He studied in private schools and at the Art Students' League, New York. Among the books written and illustrated by him are: *The Merry Adventures of Robin Hood, Pepper and Salt, Within the Capes, The Wonder Clock, The Rose of Paradise, A Modern Aladdin* and *Men of Iron.* He made magazine illustrations for many years, at the same time writing and illustrating his own books, mostly for young people. He was at his best in picturing romantic and colorful figures and scenes.

Pym, John (1584–1643), English statesman and patriot, born in Somerset. He entered Parliament in 1614, assisted in Buckingham's impeachment in 1626, supported the Petition of Right in 1628, led the Short Parliament in 1640 and brought about the impeachment of Strafford in that year. He was one of the five members who escaped arrest by Charles I just before the outbreak of the English Civil War. Pym, always interested in colonization, urged the settlement of Connecticut.

Pyrrhus (*c.* 318–272 B.C.), military leader of ancient Greece. He became king of Epirus, lost his throne and took refuge in Egypt. He married the daughter of Ptolemy I (Soter), whereupon his father-in-law helped him to recover his throne. He conquered Macedonia and defeated the Romans in two famous battles; near Heraclea in 280 B.C. and at Asculum in 279 B.C. These victories were won at so great a cost in lives that the modern expression "Pyrrhic victory" means a gain at a cost almost too great to be borne. It is said that when Pyrrhus was congratulated on his victory, he remarked, "Another such victory, and Pyrrhus will be ruined."

Pythagoras (b. 582 B.C.), Greek philosopher, born at Samos. As a young man he traveled widely in search of learning. He is supposed to have roamed from Persia to Gaul and from India to Egypt. He returned home, became a teacher of mathematics and later established a school of philosophy at Crotona. There, about 539 B.C., he gathered around him an enthusiastic band of followers. What is now viewed as one of the fundamentals of geometry was proved by him and has been called the *Pythagorean theorem.* Mathematicians refer to it as the 47th Proposition in Euclid: "The square of the hypotenuse of a right-angled triangle is equal to the sum of the squares of the other two sides." This proposition required proof from the simplest admitted fact to the ultimate conclusion, and its demonstration showed Pythagoras to be a mathematical genius.

The central idea of his philosophy was that number was the first principle of the universe and that on it depended the harmonies that keep the universe in ordered motion and create music and art. He left no writings; the *Golden Sentences* extant under his name were compiled by later philosophers.

Queensberry, John Sholto Douglas, Marquis of (1844–1900), English noble and sportsman. He served in the army and navy and sat in the House of Lords. His hobby was pugilism, and in 1867 he drew up a set of rules that revolutionized the sport. The basic ideas set forth in the "Marquis of Queensberry rules" are still in force. They eliminate the use of brass knuckles and bare fists and make blows below the belt illegal.

Quiller-Couch, Sir Arthur Thomas (1863–), British novelist, born in Cornwall. He was educated at Trinity College, Oxford, and for a time he lectured there on literature. He wrote *Dead Man's Rock* while he was at Oxford. Eventually he returned to Cornwall as a restful place in which to work and there produced some of his best work. In 1910 he received a knighthood and in 1912 became professor of English literature at Cambridge. As a pen name he used the letter "Q." His works include *The Blue Pavilions, The Warwickshire Avon, The Delectable-Duchy, Verses and Parodies, Shakespeare's Christmas, From a Cornish Window, News from the Duchy, The Ship of Stars* and *Fort Amity.* Some of his essays take high rank; among them are "Adventure in Criticism," "On the Art of Writing" and "On the Art of Reading." In 1897 he was commissioned to finish R. L. Stevenson's uncompleted novel, *Saint Ives.*

Quincy, Josiah (1772–1864), American educator and statesman, born in Boston and educated at Harvard. He became active in politics and for four terms (1805–13), soon after his admission to the Massachusetts bar, he was a member of Congress. In 1813 he was elected to the Massachusetts Senate, then to the state House of Representatives, where he became speaker. Quincy was one of the first to protest against slavery, in a speech against the admission of Louisiana to the Union in 1811. He was mayor of Boston (1820–28) and then left public life to become president of Harvard College (1829–45). His writings include a history of Harvard University, *The Municipal History of the Town and City of Boston During Two Centuries* and *The Life of John Quincy Adams.*

Quintilian (Marcus Fabius Quintilianus; *c.* 35–*c.* 100 A.D.), Roman teacher and rhetorician, born in Spain. He went to Rome and organized a school of oratory. His pupils included Pliny the Younger. Quintilian prepared a series of 12 books called *Institutiones Oratoriae* (Institutes of Oratory), a collection of what he considered the finest available methods in education and rhetoric. It was a standard guide for teachers for many centuries.

RABELAIS, FRANÇOIS (*c.* 1490–1553), French author, born in Chinon, Touraine. He was successively a Franciscan, a Benedictine monk, a professor of anatomy and a priest at Meudon. He went to Rome at different times to visit Cardinal Jean du Bellay, who had a great influence on his life. He invented the giants Gargantua and Pantagruel and carried them through amusing adventures in his stories. His five books, written between 1532 and 1564, are original and powerful in style. They are really a satirical history of human civilization. Allowing for the taste of the times, they convey an understanding and love of humanity and a passion for justice and culture. Rabelais has been set down by many as a gross buffoon, and there is much in his writings to justify the harsh judgment.

Rachel (Élisa Félix; 1821–58), French-Jewish actress, born in Switzerland. She was taken to France at the age of 3, and a year later she sang in the streets of Lyons. She and her sister went to Paris, where a musician heard her unusual voice and paid for her training. Her stage debut was made in 1838, and from that time she grew in dramatic power until she became a great tragedienne. She was famous for her interpretations of the plays of Racine and Corneille.

Rachmaninov, Sergei Vassilyevich (1873–), Russian composer and pianist, born in the province of Novgorod. He was educated in music in St. Petersburg (now Leningrad) and Moscow and won a gold medal in 1892 for his opera *Aleka.* He made several concert tours and in 1903 was conductor of the Imperial Opera. He conducted at Moscow, 1912–13, and after the Russian Revolution he escaped to Sweden and eventually settled in America. He wrote operas, symphonies, piano concertos and many smaller piano works, of which the *Prelude in C Sharp Minor* is most famous.

Racine, Jean Baptiste (1639–99), French classical dramatist, born in Aisne. He went to Paris in 1662 and spent much time at court. Many of his plays were written to please the royal following. He began to write tragic plays in 1664. His masterpiece is perhaps *Phèdre,* although it was a commercial failure when first produced. Racine's other tragedies are *Andromache, Britannicus, Bérénice, Bajazet, Iphigenie* and *Mithridate.* After several years of retirement, at the request of Madame de Maintenon, he wrote two plays, *Esther* and *Athalie,* religious in subject, for her girls' school at St. Cyr.

Radcliffe, Ann Ward (1764–1823), English novelist, born in London. She married William Radcliffe, a magazine editor. Her books were very popular. They are full of mystery and horror, usually laid in ruined castles with trapdoors and secret passages. Among her books are *The Mysteries of Udolpho, The Romance of the Forest* and *The Italian.*

Radek, Karl (1885–), Russian political leader, born in Austrian Poland. He became a revolutionary at the age of 14. During the World War he carried on antimilitary propaganda in Germany and Switzerland but lost his place in the Communist councils because he failed in an effort to bring about a revolution in Germany. He joined the Trotsky group in 1924, was expelled from the Communist Party in 1927 but was readmitted in 1930.

Raeburn, Sir Henry (1756–1823), Scottish portrait painter, born at Edinburgh. At 22 he painted the Countess of Leslie whom he married; together they visited Rome, where he studied for 2 years. He then settled in Edinburgh and soon attained pre-eminence among Scottish artists. He was elected to the Royal Academy in 1815, received a knighthood in 1822 and was appointed king's painter for Scotland a few days before his death. His style was to some extent founded on that of Reynolds. His best-known portraits are those of Lord Newton and Dr. Alexander Adam.

Raffaello, see *Raphael.*

Raisa, Rosa (1893–), Polish singer. During the Russian Revolution, at the age of 14, she escaped to Italy and was befriended by the wife of the conductor Campanini. She studied under Campanini and learned five operatic parts before he permitted her to appear on the stage. Her operatic debut was made in Milan, and she first sang in the United States in 1914, with the Chicago Civic Opera Company. With the exception of a few brief contracts during the opera season in Europe, Mexico and South America, she remained with the Civic Opera until 1932.

Raleigh, Sir Walter (1552–1618), English explorer and writer, born in Devonshire and educated at Oxford. He went on an exploring voyage to America with his half brother Sir Humphrey Gilbert, later fought in Irish wars and in 1582 attracted the attention of Queen Elizabeth, with whom he speedily rose high in favor. In 1584 he fitted out two ships at his own expense, sailed to America and discovered and claimed for England the territory known as Virginia. Later he sponsored several unsuccessful colonization projects there. According to legend he introduced the potato and tobacco into England at this time. In 1595 he sailed to South America in search of gold but failed to find any. He wrote *Discovery of Guiana* about the journey. Later he fought in several wars and for a time was governor of Jersey.

Elizabeth died in 1603. Her successor, James, regarded Raleigh with suspicion and dislike, which he was at no pains to conceal. Raleigh was accused of plotting against the king. He was sentenced to death, but James did not dare execute him, and he was kept prisoner in the Tower of London for 13 years. During his imprisonment he wrote his *History of the World,* still notable as one of the finest models of the quaint and stately old English style. He was released in 1615 so that he might make another voyage to Guiana in search of gold. On his return he was condemned to death, apparently for failure to find any gold, and was beheaded.

Rambaud, Alfred Nicolas (1842–1905), French historian, born at Besançon. He was a member of the French Cabinet from 1879 to 1880 and in 1896 became minister of public instruction. He was appointed professor of history at the University of Paris in 1883. He wrote a number of great works on Byzantine, Russian and French history and was editor of a general history covering the period from the 4th to the 20th century.

Ramée, de la, Louise, see *Ouida.*

Ramsay, Sir William (1852–1916), British chemist, born in Scotland, educated at Glasgow University, with later courses in Germany. He became professor of chemistry at University College, London. He is especially known for his discovery of the five inert atmospheric gases: helium, argon, krypton, neon and xenon. He was assisted in some of the work by Lord Rayleigh and Morris William Travers. He won the Nobel Prize in chemistry in 1904 and was knighted in 1906. His writings include many scientific papers and books, the most important being *Argon, a New Constituent of the Atmosphere; Helium, a Constituent of Certain Minerals* and *The Molecular Surface-Energy of Liquids.*

Ramses, the name of several Egyptian kings.

Ramses I (d. *c.* 1314 B.C.) made a treaty with the Hittites and maintained the conquests of Egypt as far as Wadi Halfa. He subjected Ethiopia, which had revolted, established a fleet in the Mediterranean and erected some of the largest of the Egyptian edifices, notably the Hall of Karnak. He reigned only two years.

Ramses II reigned 67 years (possibly 1324–1258 B.C.). He repaired many royal tombs and built a number of obelisks and public buildings. He carried on a 16-year war with the Hittites and finally made peace with them and married the Hittite king's daughter. This peace treaty was found; it is inscribed in both Hittite and cuneiform characters and so is valuable for comparing and translating the languages. His mummy is preserved at Cairo.

Ramses III came to the throne several years after Ramses II. During his reign papyrus and Egyptian styles of writing were introduced into Phoenicia. He was extremely pious and the priests of Ammon had great influence over him. A rather full account of his reign is given in a papyrus written immediately after his death.

Randolph, Edmund Jennings (1753–1813), American statesman, born at Williamsburg, Va., graduated from William and Mary College. He studied law with his father and practiced in Williamsburg. During the Revolutionary War he was an aide to Washington. In 1776 he helped to draw up the Virginia constitution and became attorney general of Virginia. He served in the Continental Congress (1779–82) and was elected governor of his state (1786–88). He was prominent in the Constitutional Convention; it was he who presented the Virginia Plan, and he opposed the Constitution as it was finally drawn up. He became attorney general in Washington's first Cabinet and later was secretary of state. In 1795 he resigned public office and again took up the practice of law in Virginia. He defended Aaron Burr when Burr was tried for treason.

Randolph, John (1773–1833), American statesman and orator, born in Chesterfield County, Va., a descendant of John Rolfe and Pocahontas; he is commonly called Randolph of Roanoke, because he lived there alone on a huge estate. He studied at Princeton and Columbia. He was a member of the U. S. House of Representatives for 24 years, first taking his seat in 1779 and being re-elected every term (except 1813) until 1829. He entered the Senate in 1825 just after he was elected again to the House. He was appointed special envoy to Russia in 1830. Randolph was a man of great influence, eloquence and eccentricity. He championed state sovereignty. He was feared by his political opponents for his ready wit and ability at repartee and for his bitter personal hatreds.

Ranke, von, Leopold (1795–1886), German historian, born in Thuringia and educated in the universities of Halle and Berlin. He became head master of the gymnasium at Frankfort-on-the-Oder, where he wrote on historical subjects during his leisure. His books, *A Critique Upon the Later Historians* and the *History of the Roman and Germanic Peoples from 1495 to 1535,* attracted wide attention and won him the chair of history at Berlin in 1825; this he retained until 1871. His most complete and elaborate work is his *German History in the Time of the Reformation.* In 1880, in his 84th year, he published the first volume of his *Weltgeschichte* (History of the World), writing a volume annually. He also wrote *History of the Popes of the 16th and 17th Centuries;* it has been several times translated into English.

Rankin, Jeanette (1880–), American public official and social worker, born near Missoula, Mont. She graduated from the University of Montana, later took a course in social service work in New York city and studied suffrage work at the University of Washington. In 1916, after a campaign among the mining camps of Montana, she was elected to Congress as Republican representative-at-large from Montana. She was the first Congresswoman. In 1918 she was a candidate for the Senate but was defeated. She then resumed her work as a sociologist.

RAPHAEL (Santi Raffaello; 1483–1520), Italian painter, born at Urbino. Timoteo Viti was his first master. He entered Perugino's atelier in 1499 or 1500, where he was also under Pinturicchio's influence. To his Urbino period belong *The Vision of a Knight* and *St. Michael.* To the Peruginesque period belong, among other paintings, three Madonnas—two in Berlin and one in the Hermitage, St. Petersburg (Leningrad) and *The Marriage of the Virgin* in the Brera at Milan.

Raphael went to Florence in 1504 and came under the influence of Leonardo da Vinci and Michelangelo. Raphael contributed nothing new to art but borrowed and carried to perfection special techniques of other painters. To his Florentine period belong *The Ansidei Madonna;* the Madonnas called *Del Granduca, Del Cardellino* and *La Belle Jardinière; St. Catherine;* and *The Entombment of Christ.*

In 1508 he was summoned to Rome by Pope Julius II to decorate the state apartments in the Vatican. (Michelangelo was working nearby, in the Sistine Chapel.) Works by older masters were destroyed to give him wall space, and he collected a school of artists to help him.

He decorated the ceilings and walls of four apartments and received about $1,075 for each wall painting. The subjects are extremely varied: (1) *Poetry* or *The Parnassus; The Disputa* or *Triumph of Faith; Philosophy* or *The School of Athens; Jurisprudence.* (2) *Expulsion of Heliodorus from the Temple; The Mass of Bolsena; Attila at the Head of His Army; The Deliverance of Peter from Prison.* (3) *L'Incendio del Borgo* (Fire in the Borgo); *Victory at Ostia Over the Saracens; Charlemagne Crowned by Leo III; Oath of Leo III.* (4) *Victory of Constantine Over Maxentius at Ponte Molle.* The famous loggias in the Vatican were decorated with Biblical scenes and arabesque ornamentations designed by Raphael.

To his Roman period also belong the various cartoons for tapestries, the Chigi *Sibyls,* the graceful and beautiful paintings in the Chigi Chapel, the Farnesina designs and the superb *Galatea,* full of the sense of life and enjoyment. Of his many Madonnas the finest, exclusive of those mentioned, are the *Garvagh, Di Casa d'Alba, Di Foligno* and the magnificent *Sistine Madonna* at Dresden. His Madonnas were painted in a spirit of dreamy fancy or a cheerful outlook on life.

Among his finest portraits are *Julius II, La Donna Velata* and *Joanna of Aragon.* Raphael is considered one of the greatest and most versatile of painters. He not only excelled in every branch of his art but was loved by all who knew him. His last work, *The Transfiguration,* was almost completed when he died.

Rapp, Jean, Count (1772–1821), French soldier, born in Alsace. He rose from private to general under Napoleon and was wounded more than 20 times. After Napoleon retreated from Russia, Rapp held Danzig against the Russians for more than a year but finally had to surrender. When Napoleon returned from Elba, Rapp was one of the generals who were sent to arrest him but joined him instead. He went to Switzerland when Napoleon fell but returned to France in 1818 and was made a peer.

Rasmussen, Knud Johan Victor (1879–1933), Danish explorer, born in Greenland of part-Eskimo ancestry. In 1902 he began 30 years of exploration in the Arctic. He tried to prove that the ancestors of the Eskimos migrated to northern America from Asia. In 1910 he set up the Thule base camp at Cape York only 800 miles from the North Pole and from this station carried on five expeditions. Between 1921 and 1924 he explored 29,000 miles of the Arctic. He was one of the greatest authorities on the Eskimo people of Greenland. Among his books are *Lapland, My Journal, Greenland by the Polar Sea* and *Across Arctic America.*

Rasputin, Grigoryi Efimovich (G. E. Novy; 1871–1916), Russian monk, born in Siberia. He had a great and evil influence on the Russian Church and Court. He practiced religious exercises but adopted the attitude that it was necessary to sin in order to obtain forgiveness, and despite his orgies he surrounded himself with an air of mysticism. Those who did not come under his influence considered him an uncouth, tricky schemer for power. Friends of the royal family brought about his murder in an attempt to save the household and the czarist regime from disaster. He was shot at a supper given by the Grand Duke Dmitri Pavlovitch.

Rauch, Christian Daniel (1777–1857), German sculptor, born at Arolsen. The work considered his masterpiece is the colossal monument to Frederick the Great, dedicated in Berlin in 1851. Another statue that attracted notice was his *Sleeping Endymion and Artemis.* He made busts of most of the great men in northern Europe.

Ravel, Maurice (1875–1938), French composer, born at Ciboure, studied music in Paris. His music is ultra modern in character; much of it is for the piano. There are several popular ballets, including *Daphnis et Chloe;* orchestral pieces, such as the *Scheherazade Suite* and *Natural History.* The *Bolero* is Ravel's most popular composition.

Rawlinson, George (1812–1902), English historian and Orientalist, a native of Oxfordshire and a graduate of Oxford University. He became a professor of history at Oxford in 1861. He took holy orders and became canon of Canterbury Cathedral (1872) and then rector of All Hallows, London (1888). His historical works cover nearly the whole range of Oriental development, beginning with a life of Herodotus. Chief among his other books are *The Five Great Monarchies of the Ancient Eastern World, The Sixth Great Oriental Monarchy, The Seventh Great Oriental Monarchy, A History of Ancient Egypt* and *A Manual of Ancient History.*

Rawlinson, Sir Henry Creswicke (1810–95), British soldier and Orientalist, brother of George Rawlinson. He entered the military service of the East India Company at the age of 17 and soon transferred to government service in the Bombay Presidency, where he remained until 1833. He was assigned to reorganize the Shah of Persia's troops, became interested in Persian lore and for a number of years studied the history of that country. Rawlinson became an authority on cuneiform inscriptions; he translated the famous Behistun inscription of King Darius. In 1851 he continued the French excavations in Assyria. He served as British ambassador to Persia (1859) and on the Council of India after 1868. He wrote *England and Russia in the East, The Cuneiform Inscriptions of Western Asia* and *Outline History of Assyria.*

Rayleigh, John William Strutt, 3d Baron (1842–1919), English physicist, educated at Cambridge. He became professor of experimental physics at Cambridge in 1879 and later taught at the Royal Institute (1897–1905). He carried on much research in light and sound and did valuable work in electricity and molecular physics. With Sir William Ramsay he discovered the element argon. He received the Nobel Prize in physics in 1904.

Read, Thomas Buchanan (1822–72), American painter and poet, a native of Pennsylvania. He studied painting in Cincinnati, Boston and Philadelphia, before going to Florence, Italy, where he spent most of the rest of his life. He was a successful portrait painter; among his subjects were George Peabody, Mrs. Browning and Henry W. Longfellow. However he is best-known today for his poem, "Sheridan's Ride," commemorating an incident of the Civil War. His books of verse are *Lays and Ballads, The House by the Sea* and *The New Pastoral;* and in prose, *Female Poets of America,* which he also illustrated.

Reade, Charles (1814–84), English novelist and playwright, born in Oxfordshire and educated at Oxford University. He was called to the bar in 1843. He first began writing in 1850; his earliest success was *Peg Woffington,* produced first as a play and then as a novel. Other successful plays were *A Courier of Lyons* and *Drink.*

Reade's *It Is Never Too Late to Mend,* an exposé of the British prison system, caused a furor in England; *Put Yourself in His Place* concerns labor unions; *The Cloister and the Hearth* is a story of the father of Erasmus. Other titles were *Griffith Gaunt; A Woman Hater,* which advocated women's rights; *Good Stories of Man and Other Animals; Hard Cash* and *Christie Johnstone.*

Reading, Rufus Daniel Isaacs, 1st Marquis (1860–1935), English statesman, born in London. He studied at University College, London, and in Brussels and Hanover. He became a prominent lawyer and entered Parliament (1904). His rise was rapid. He was attorney general (1910) and lord chief justice of England (1913–21). He received a peerage, and as Viscount Reading he visited the United States in 1917 as special envoy and in 1918 as high commissioner and special ambassador. From 1921 to 1926 Lord Reading was viceroy of India, and here his judicial mind and pleasing personality helped to create orderly government in that country. When he returned to England in 1926, he was raised in rank to marquis.

Réaumur, de, René Antoine Ferchault (1683–1757), French physicist and biologist. He was educated at Poitiers, Bourges and Paris. At the age of 25 he was elected a member of the French Academy of Sciences. He devised the thermometer scale named for him, in which the freezing point of water is 0° and the boiling point 80°. He discovered the method of tinning iron. He wrote several works on biology and other subjects; his *Natural History of Ants* has been translated into English.

Récamier, Jeanne Françoise Julie Adélaïde Bernard (1777–1849), French social and political leader, born at Lyons. At 15 she married Jacques Récamier, a middle-aged banker. She was a beautiful and witty woman; the greatest leaders of her time gathered at her home, and she had much influence in arts and politics. Even after she became old and blind, she was still loved and admired.

Red Jacket (Sa-go-ye-watha; *c.* 1751–1830), Seneca Indian chief. The name *Red Jacket* was given to him because he was very proud of a brilliant red coat that an English officer gave him. During the Revolutionary War he sided with the British and frequently carried messages for them. With the return of peace he opposed the white man's encroachment on Indian lands. In the War of 1812 he led his people to fight for the United States. He visited General Washington and received a medal from him. On visits to the cities of Washington and New York as a guest of the Government, he made several good-will speeches that were among the finest specimens of Indian eloquence.

Redmond, John Edward (1851–1918), Irish statesman, born in Waterford and educated at Trinity College, Dublin. He became a clerk in the House of Commons in 1880 and a year later was elected a member. He was powerful in debate on the Home Rule question. In 1891 he was appointed leader of the Irish party. Under his leadership the Home Rule Bill was passed in 1914, but it was suspended during the World War. He went to Ireland to seek volunteers for the British army, tried to soothe the rebellious element and refused a cabinet post in the coalition government. In 1917 he took an important part in the convention called to discuss Irish self-government, but he died before the convention came to any agreement.

Reed, Thomas Brackett (1839–1902), American statesman, born at Portland, Me., and educated at Bowdoin College. He practiced law, became interested in political affairs and was elected to the U. S. House of Representatives in 1876. He served for 23 years before he resigned to enter law practice in New York city. During his career in the House he was elected Speaker three times and gained the nickname of "Czar Reed." He gained power for his party at critical times by ruling that House members present but not voting could be counted for a quorum. He was one of the wittiest men in public life in his day. One of his favorite sayings was, "You can always depend upon the Democrats to do the wrong thing at the right time."

Reed, Walter (1851–1902), American army surgeon, born in Virginia. He studied at the University of Virginia and at Johns Hopkins. In 1874 he joined the army medical corps; in 1898 he discovered much about typhoid fever through his study in an epidemic among the American troops in the Spanish-American War. In 1900 he studied yellow fever in Cuba and proved that the disease is transmitted by mosquitoes. As a result yellow fever was eliminated from Cuba and from part of Panama when the Panama Canal was built.

Regulus, Marcus Atilius (d. *c.* 250 B.C.), Roman general. He took Brundisium while he was consul in 267 B.C. In 256 B.C. he was again made consul, and with Manlius he defeated the Carthaginian fleet, landed at Clypea and ravaged the enemy's territory. The Carthaginians at last defeated him and took him prisoner. After 5 years' captivity he was sent to Rome as a hostage on parole to sue for peace between Rome and Carthage. Although he could have been a free man had he advocated peace, he refused to take such a step; on the contrary he urged before the Senate that Rome give Carthage no quarter and that the war against Carthage be relentlessly pursued. He voluntarily returned to Carthage where the angry rulers put him to death (250 B.C.)

Rehan, Ada (Ada Crehan; 1860–1916), American actress, born in Limerick, Ireland. She was brought to the United States in childhood. Her first important engagement was in Philadelphia; in 1879 she went to New York and joined Augustin Daly's stock company. As a theatrical star of the first magnitude she played Rosalind in *As You Like It*, Katharina in *The Taming of the Shrew* and Roxane in *Cyrano de Bergerac*. Her American successes were duplicated in frequent tours in England, France and Germany.

Reid, Whitelaw (1837–1912), American journalist and diplomat, born at Xenia, Ohio, and educated at Miami University. He joined the editorial staff of the New York *Tribune* in 1866, rose to the post of editor in chief and in 1872 gained financial control of the paper. He served as minister to France, was nominated for the Vice-Presidency in 1892, was a member of the Spanish-American Peace Commission in 1898 and from 1905 to 1912 was ambassador to Great Britain. He had a state funeral in Westminster Abbey, and his body was returned to the United States on a British warship. His writings include *The Scholar in Politics, The Scot in America* and *The Monroe Doctrine*.

Reinhardt, Max (1873–), Austrian actor and producer, born near Vienna. He worked in a bank until he was 17, then became an actor in a Berlin theater. Later he owned several cabaret theaters and was director at important German theaters. He became world-famous for his productions, among which were *Faust, Oedipus Rex, Salome* and *Everyman*. He became famous for his lavish, large-scale settings. He produced *The Miracle* in the United States in 1924 and *The Eternal Road* in 1937.

REMBRANDT VAN RIJN (1606–69), Dutch painter, born in Leiden, Holland. He studied art in his native city and in Amsterdam. At the age of 16 he fitted up a studio in the base of his father's windmill on the bank of the Rhine. In 1631 he settled in Amsterdam. His output was enormous; about 600 paintings, 2,000 drawings and 300 etchings have survived. They include landscape work and portrait studies; and his studies of old age are particularly noteworthy. Rembrandt painted many portraits of himself and of his wife Saskia. He must have had a large income from his work, but his expenditures seem to have been greater. His son and his housekeeper helped him sell his later pictures for reasonable sums, after a sad experience during which creditors disposed of some of his greatest paintings at very low prices.

One of his greatest landscapes, *The Windmill*, was sold by the late Lord Lansdowne to the late P. A. B. Widener of Philadelphia for a reputed price of $500,000. Among other outstanding pictures are *The Sacrifice of Abraham, The Auctioneer, Girl at a Window, Burgomaster Jan, Pilgrims at Emmaus, The Night Watch, The Anatomy Lecture* and *Syndics of the Cloth Hall*.

As Rembrandt's talent developed, he paid less attention to detail and painted in broad strokes, with rich color harmonies of gold, brown and gray. His work is especially notable for its skilful blending of light and shadow.

He was equally great as an etcher; some critics say that his etchings have never been surpassed. They include portraits, landscapes and biblical characters; most of them were done between 1639 and 1661. Among the best-known are *Christ Healing the Sick* (famous as "The Hundred-Guilder Print"), *Descent from the Cross, Three Trees, Cottage and Barn* and *Burgomaster Six*.

Remington, Frederic (1861–1909), American artist, born in Canton, N.Y. He studied art at Yale and at the Art Students' League in New York city before ill health drove him to the western plains. He lived as a rancher and cowboy in Wyoming and Montana and fought with the army against the Indians. He became a painter of western scenes of action and everyday life. At the same time he wrote stories of the West. Among his paintings are *The Last Stand* (an Indian battle scene), *A Dash for the Timber, Conjuring the Buffalo Back, The Emigrants* and *Past All Surgery*. Two of his finest sculptures, *Broncho Buster* and *Wounded Bunkie*, are in the Metropolitan Museum in New York. He wrote and illustrated *Crooked Trails, Pony Tracks* and *The Way of an Indian*.

Remsen, Ira (1846–1927), American chemist, born in New York city, educated at the College of the City of New York and the College of Physicians and Surgeons, New York. He became professor of chemistry at Williams College in 1872; later he taught at Johns Hopkins. In 1901 he was elected president of Johns Hopkins. Notable among his discoveries was saccharin. He founded the *American Chemical Journal* in 1879 and remained its editor for about 40 years.

Renan, Joseph Ernest (1823–92), French philologist, historian and critic, born in Brittany. He received his doctor's degree at the University of Paris at the age of 25 and in 1850 obtained a post in the Bibliothèque Nationale. In 1862 he was chosen professor of Hebrew in the Collège de France, but the emperor refused to ratify the appointment. However he did get the post in 1870. His European reputation dates from the publication of the *Life of Jesus* in 1863. In it he takes the position that Jesus was a highly superior man; this aroused the hostility of the Church. Among his other numerous works are studies of St. Paul and Marcus Aurelius and a history of the people of Israel.

Reni, Guido, see *Guido Reni*.

Renoir, Pierre Auguste (1841–1919), French painter, born at Limoges. Although he painted landscapes, portraits and scenes of peasant life with great success, he was at his best in painting the nude female figure because of his skill in showing flesh tones. His paintings include a number of studies of bathers, *The Ball at Montmartre, The Dancer* and *Box at the Opera*. Among his best portraits are those of Monet, Cézanne, Wagner and *Mme. Charpentier and Her Children*.

Repplier, Agnes (1858–), American essayist, born in Philadelphia, educated at the Sacred Heart Convent, Torresdale, Pa. Her essays cover many phases of life as she saw them; they are written from a scholarly background and with a sharp wit. Among her books are *Americans and Others, Points of Friction, Essays in Miniature, Essays in Idleness, Books and Men, A Happy Half Century* and *To Think of Tea*. She wrote two biographies: *Life of Père Marquette* and *Mère Marie of the Ursulines*.

Revere, Paul (1735–1818), American patriot, born in Boston, Mass. An engraver by trade, he was among the finest of America's silversmiths and is credited with being the first to smelt copper ore in America. He is most famous, however, for the ride he made the night of April 18–19, 1775, from Charlestown (Boston) to Lexington to warn John Hancock and Samuel Adams of the coming of the British. This inspired Longfellow to write his well-known poem "Paul Revere's Ride," one of *The Tales of a Wayside Inn*. Later Revere designed and printed the first issue of Continental money. He was ambitious to become prominent as a soldier but never quite succeeded. He prospered in business after the Revolutionary War; he operated a copper foundry and shipped ice to the West Indies.

Reynolds, Sir Joshua (1723–92), English painter, born at Plympton, Devonshire. He began his career as a portrait painter at Devonport but soon moved to London, where he lived and worked throughout a busy life, except for 3 years spent in Italy. He became first president of the Royal Academy in 1768 and in 1784 was appointed painter to George III. He was especially famous for his portraits, of which he executed fully 2,000, including the celebrated *Mrs. Siddons as the Tragic Muse*. Johnson, Burke, Garrick and Goldsmith were Reynolds's friends, and their portraits are among his finest work.

Rhodes, Cecil John (1853–1902), English statesman, born in Hertfordshire. He went to Natal, South Africa, for the sake of his health. He reaped a fortune from the diamond fields around Kimberley, then went home to complete his education and graduated from Oriel College, Oxford, in 1881. He then returned to South Africa to try to extend British possessions. Rhodes entered the Cape Colony House of Assembly, was made a member of the Cabinet and from 1890 to 1896 was prime minister. He made Bechuanaland a British protectorate and in 1899 formed the British South Africa Company to penetrate northward. The company was given control over what was later known as Rhodesia.

He planned the Cape-to-Cairo Railroad, advocated local self-government in South Africa wherever practicable, crushed uprisings when they menaced the progress of colonization and political improvement and tried to keep good feeling between the British and Boer settlers. Rhodes approved the Jameson Raid and as a result had to withdraw as prime minister. For the rest of his life he worked for the development of Rhodesia. In his will he left about $30,000,000 to various philanthropies including the famous Rhodes Scholarships at Oxford University, England.

Rhodes, James Ford (1848–1927), American historian, born in Cleveland, Ohio, educated at the universities of New York and Chicago and the Collège de France in Paris. He was in the iron-and-coal business for a time but gave it up so as to be able to write history. His works include *History of the United States from the Compromise of 1850* (seven vols.), *Lectures on the Civil War* and *Historical Essays*.

Rice, Alice Hegan (1870–1942), American writer, born in Shelbyville, Ky., educated at Hampton College, Louisville. Her *Mrs. Wiggs of the Cabbage Patch* was an instant success, and *Lovey Mary* and *Rebecca of Sunnybrook Farm* were almost as popular. Other of her books are *Sandy, Mother Carey's Chickens, The Diary of a Goose Girl, A Romance of Billy Goat Hill, The Buffer* and *Mr. Pete & Co.* With her husband Cale Young Rice (1872–), a poet and dramatist, she wrote *Turn About Tales* and *Winners and Losers*.

Rice, Elmer (E. Reizenstein; 1892–), American playwright, born in New York city, educated at New York Law School. His first play *On Trial* was produced successfully in 1914. A series of popular plays in following years made him one of the outstanding figures in the American theater. Among them are *The Adding Machine, Left Bank, Counsellor at Law* and *We the People*. His *Street Scene* won the Pulitzer Prize in 1929.

Richard I Coeur de Lion (1157–99), King of England, the third son of Henry II. He became duke of Aquitaine in 1170. He sided with his mother Eleanor of Aquitaine in a family dispute and as a young man fought against his father several times and both with and against his brothers. He succeeded Henry as king in 1189; he reigned for 10 years but passed only a few months in England. Soon after his coronation he joined Philip of France in the Third Crusade. Richard nearly impoverished his kingdom by borrowing money to finance the enterprise, but he won a great reputation as a warrior. The crusade was eventful but not particularly successful. Richard was shipwrecked on the return home in 1192 and was held for ransom in Germany until 1194, when a large sum was paid for his release. He was killed in battle near Limoges. Richard was thoroughly neglectful of his duties as a king and owes his fame chiefly to his personal bravery. He married Berengaria, daughter of the king of Navarre, but he left no direct heirs. His successor was his brother John.

Richard II (1367–1400), King of England, born at Bordeaux, France. He was the son of Edward the Black Prince and grandson of Edward III, whom he succeeded. He took the throne under a regency at the age of 11. His reign was notable chiefly for quarrels with his uncles and with his parliaments on behalf of worthless favorites with whom he was surrounded. John of Gaunt, Duke of Lancaster, and Thomas, Duke of Gloucester, tried to bend their royal nephew to their own purposes. He resisted them successfully, but the murder of Gloucester, who was arrested near London and slain at Calais in 1397, fixed an indelible stain upon his memory. Two years afterward he was defeated and deposed by his cousin, Henry of Bolingbroke, Duke of Hereford, who succeeded him. Richard is believed to have been murdered in Pontefract Castle, Yorkshire, not long after his abdication. His reign was full of trouble. Taxation was heavy, and mob riots took place in many parts of the country, the most serious being the uprising led by Wat Tyler.

Richard III (1452–85), King of England, a brother of Edward IV. Throughout Edward's reign Richard supported him loyally and was rewarded with many high offices. However, as soon as Edward died, he usurped the crown from his nephew Edward V. Richard's young heir and his younger brother, the duke of York, were killed in the Tower of London; Richard is believed to have ordered their death. In 1485 Henry, Earl of Richmond, landed at Milford Haven with a force of a few thousand men and defeated the king in the battle of Bosworth Field, in Leicestershire. Richard was killed in this battle. The House of York and the Plantagenet line of kings ended with his death. He was succeeded by Henry VII, the first of the Tudor line.

Richards, Theodore William (1868–1928), American chemist, born at Germantown, Pa. He studied at Haverford College and in Germany. He taught at Harvard and later was associated with the Carnegie Institute. Much of his work was with isotopes and determination of atomic weights. He won the Nobel Prize for chemistry in 1915.

Richardson, Owen Willans (1879–), English physicist, born in Yorkshire, educated at Cambridge. He came to the United States to teach physics at Princeton (1906–14), then returned home to teach at King's College. His best-known experimental work was with the emission of electrons from hot bodies. He won the Nobel Prize for physics in 1928.

Richardson, Samuel (1689–1761), English novelist, born in Derbyshire. He was apprenticed to a printer and after a few years succeeded in establishing his own business. He became official printer to the House of Commons and later law printer to the king. But he is known today as a writer.

His first book, *Pamela,* published in 1740, became a famous novel. Eight years later *Clarissa Harlow* appeared, and it was even more enthusiastically received by the public. In 1753 came the *History of Sir Charles Grandison.* He had a distinct plan in these three novels: they dealt in turn with the life of the lowly, the middle class and the aristocracy. Richardson did much to give permanent form to the English novel.

Richelieu, de, Armand Jean du Plessis, Duke (1585–1642), French cardinal and minister of Louis XIII. He received an education along two distinct lines—military and ecclesiastical. He chose the Church and in 1607 was made a bishop. He was selected as a church representative in the States-General in 1614, where he came to the notice of Marie de' Medici, mother of King Louis XIII. She kept him at court, and in 1616 he became secretary for foreign affairs. In 1622 he was made a cardinal and within 2 years was the dominant power in France. In order to bring about an alliance with England he arranged a marriage between the Prince of Wales and Henrietta Maria, sister of Louis XIII.

His policy throughout had three great aims: to suppress the political power of the Huguenots, to strengthen the royal authority and to make France secure against the threatened domination of the Hapsburgs. He was successful largely because he and the king gave each other mutual support. However the king never liked him, nor after a time did Marie, his original patron. He often avoided a break with the king by publicly giving him credit for accomplishments that Richelieu himself had brought about. He knew little of finance, however, and had to lay heavy taxes to cover the enormous amounts he spent in the Thirty Years' War. This led to widespread revolts. During his ascendancy he founded the French Academy and rebuilt the Sorbonne, one of the most famous schools of France.

Richter, Jean Paul Friedrich (1763–1825), often called *Jean Paul,* German novelist, born in Bavaria. He studied at Leipzig and began his literary career in 1783 with the publication of *The Greenland Lawsuits.* In 1789 appeared *Selections from the Papers of the Devil* and in 1793 *The Invisible Lodge.* This was followed by *Hesperus,* the work by which he is best-known outside of Germany.

Rickenbacker, Edward Vernon (1890–), American aviator, born in Columbus, Ohio. He went to France with the American Expeditionary Force as a mechanical expert in the automotive division but soon transferred to aviation. He rose to the command of the 94th Aero Pursuit Squadron and personally accounted for 26 of the 69 enemy planes destroyed by his unit. He received the Distinguished Service Cross and the Croix de Guerre. He published an account of his experiences in France in *Fighting the Flying Circus.* After the war he manufactured automobiles and later became an executive with commercial air lines.

Ridley, Nicholas (*c.* 1500–55), English bishop and martyr, born in Northumberland, educated at Cambridge and the University of Louvain, Belgium. He was a leader of the reformed faith and one of the compilers of the *English Prayer Book* (1548). In 1550 he became bishop of London. When Edward VI died, he supported Lady Jane Grey in opposition to Mary; when Mary became queen, he was arrested and tried for heresy. After a year of imprisonment he was burned at the stake in Oxford, where a monument now stands in his honor.

Ridpath, John Clark (1840–1900), American historian, born in Putnam county, Ind., educated at Asbury University (now De Pauw). He became professor of history at Baker University, Baldwin, Kan., and later taught history and English literature at his *alma mater.* His writings include *New Complete History of the United States, Ridpath's History of the World, The Great Races of Mankind, Life of James A. Garfield* and *Life and Times of Gladstone.*

Riel, Louis (*c.* 1844–85), Canadian rebel, born in Manitoba of French and Indian ancestry. In 1869–70 he led the half-breeds of the Northwest in a rebellion against the Dominion government. They resented the fact that the government was about to take over their territory, hitherto controlled by the Hudson's Bay Company. The revolt, known as the Red River Rebellion, failed, and Riel fled to the United States. He was elected to the Dominion Parliament, returned and attempted to take his seat but was expelled and declared an outlaw in 1875. He started another rebellion in 1885, was arrested on a charge of high treason, was found guilty and was hanged.

Rienzi, Niccolò Gabrini (1313–54), a Roman patriot, born in Rome, the son of an inn keeper. His aim was to restore the former glory of Rome by putting an end to the disorders that prevailed in and around the city. In 1347 he led an attack against the nobles and took the title of *tribune* with dictatorial powers. He proved an excellent leader at first but soon became elated by success, caused himself to be crowned with seven crowns and lived in great splendor and extravagance. The people grew tired of him and his vanity, and he was obliged to escape from the city disguised as a monk. In 1354 he returned to Rome and tried to restore himself to power, but he was assassinated.

Riis, Jacob August (1849–1914), American author and journalist, born in Ribe, Denmark. He came to America, and while police reporter on the New York *Sun* he made investigations that resulted in slum reforms. He was secretary of the New York Parks Commission (1897) and executive officer of Good Government Clubs. Riis wrote several books, among the most important being *How the Other Half Lives, The Children of the Poor, The Making of an American* (his autobiography), *The Battle With the Slum* and *Children of the Tenements.* A public park in New York city has been named for him.

Riley, James Whitcomb (1853–1916), American poet, born at Greenfield, Ind. He traveled with a troupe of actors and did odd jobs that brought him into intimate contact with the common people. In 1875 he began to contribute poems to Indiana papers. Their homely sentiments, written in Hoosier dialect, skyrocketed him to popularity and financial success. For a number of years he lectured throughout the country and gave readings from his works. Among his best-known poems are "The Old Swimmin' Hole," "Afterwhiles," "Old-Fashioned Roses," "Pipes of Pan at Zekesburg," "Rhymes of Childhood," "When the Frost is on the Punkin" and "Little Orphant Annie."

Rimski-Korsakov, Nikolay Andreevich (1844–1908), Russian composer, born in the province of Novgorod. He studied at a naval academy and entered the navy. He soon turned to music, however, and became a leader among young composers who tried to express in music the spirit of the Russian people. Much of his music is based on folk melodies. Later he taught music and conducted the Russian Symphony Orchestra. He wrote 13 operas, of which *Le Coq d' Or* is best-known in the United States. His other compositions include symphonies and many songs.

Rinehart, Mary Roberts (1876–), American novelist, born in Pittsburgh, Pa., educated in the public schools and at a training school for nurses. In 1896 she married Dr. Stanley Marshall Rinehart. She wrote a series of mystery stories; their success started her on a long career as a novelist. During the World War she visited the Western Front in France under protection of the Allied Powers and told the story in *Kings, Queens, and Pawns.* When the United States entered the war, she volunteered her services as a nurse. Among her writings are: *K, Tish, The Amazing Interlude, The Street of Seven Stars, The Circular Staircase, The Poor Wise Man, Two Flights Up, Twenty-three and One-Half Hours' Leave, The Breaking Point, The Door* and *The Doctor.* She collaborated with Avery Hopwood in writing and producing a play called *The Bat,* which had a long run, and she wrote several other plays.

Rinehart, William Henry (1825–74), American sculptor, born in Maryland. He began his career as a marble worker in Baltimore. In 1855 he studied in Italy. He completed Crawford's bronze doors for the Capitol at Washington and executed a fine bronze statue of Chief Justice Taney. He died in Rome, leaving his property as a fund for needy students of art.

Ristori, Adelaide, Marchioness del Grillo (1822–1906), Italian actress. Her parents were strolling players. At the age of 14 she created a furor among theatergoers in Europe by her acting in *Francesca da Rimini.* A few years later she appeared as the leading actress in *Mary Stuart.* Her other successes were in *Macbeth, Phaedra* and *Judith.* She appeared frequently in the United States.

Rivera, Diego (1886–), Mexican painter, born in Guanajuato. He studied art in Mexico and under Picasso in Europe. He held advanced political views and believed that the artist should interpret political and economic subjects in his paintings. He returned to Mexico in 1921 and painted a number of murals dealing with the history and problems of Mexico. To the farmers and workers Rivera became a prophet or symbol of a new order to come. Among his murals in the United States are those in the Stock Exchange and Fine Arts Building in San Francisco and in the New School for Social Research, New York city. His murals in the Detroit Institute of Arts show his interpretation of industrial America. A mural he painted for Rockefeller Center, New York city, was removed because it included a portrait of Lenin.

Rivera y Orbaneja, de, Miguel Primo (*c.* 1873–1930), Spanish general and dictator. He received a military education and served with distinction in the Spanish-American War. In 1923 when anarchy threatened in Spain, he announced himself as dictator, with the quiet approval of King Alfonso. Corrupt officials were forced from office, strict censorship of the press was instituted, the rising threat of communism was crushed, and the attempt of some of the provinces to secede was defeated. He ruled through his control of the army until in the opinion of himself and the king it was safe to restore the ordinary processes of government. With the help of the French he succeeded in putting down the Riff insurrection in Morocco. In 1925 he gave up his dictatorship and took the post of premier in a constitutional government. His enemies gained influence within the next 3 years, and Rivera went to France, where he died.

Rizzio, David (*c.* 1533–66), a favorite of Mary, Queen of Scots, born near Turin, Italy. In 1561 he went to Scotland as secretary of the Piedmontese ambassador. He came to Mary's attention as a singer in her private chapel. Soon he was her secretary and chief adviser. His haughty manner made him unpopular, and the nobles did not like him because of his influence over the Queen. Several of the nobles formed a conspiracy and killed him.

Robbia, della, Luca (*c.* 1400–82), Italian sculptor, born at Florence, Italy. He founded a school of sculpture and introduced enameled or glazed terra cotta. He used a secret process that was never revealed, and Robbia ware long remained famous. He also excelled in work with bronze and marble. He specialized in Madonnas, angels and dancing boys. One of the best-known examples of his work is in the cathedral at Florence, a series of "Singing Galleries," 10 panels in high relief representing children singing.

Robert I, see *Bruce, de, Robert.*

Roberts, Elizabeth Madox (1886-1941), American poet and novelist, born at Springfield, Ky. Among her novels are *The Time of Man, Jingling in the Wind, The Great Meadow* and *He Sent Forth a Raven. Under the Tree* is an anthology of poems for children.

Roberts, Frederick Sleigh, 1st Earl (1832–1914), British soldier, born at Cawnpore, India, where his parents were stationed with an army garrison. He was educated at Eton College and Sandhurst (military school), England. In 1851 he went back to India with an army commission and served there for 25 years, rising to one of the highest posts in the British army. He served through the Sepoy Mutiny and made his famous march (1880) through Afghanistan to the relief of Kandahar. From 1885 to 1893 he was commander in chief in India. In 1895 he was made field marshal and commander in chief of the forces in Ireland. He was put in command of the British army in South Africa after the Boers had won a series of victories. He pushed his forces northward, carried the war to the Boers' strongholds and scattered the enemy so that they were reduced to guerilla warfare. Roberts then turned over the command to Kitchener and returned to England to receive an earldom and an award of $500,000. He predicted that a great war would take place and urged England to prepare itself against Germany. Several years later he died while reviewing the British army in France. He was greatly beloved and was nicknamed Bobs, partly in allusion to his diminutive stature.

Robeson, Paul (1898–), American negro actor and singer, born at Princeton, N. J., educated at Rutgers, where he was a famous athlete and a high honor scholar (Phi Beta Kappa), and at Columbia, where he studied law. In 1924 he played in Eugene O'Neill's *The Emperor Jones* and *All God's Chillun Got Wings.* In 1925 he began to give concert performances, especially of negro folksongs. He played Othello with great success in London, where he spent most of his time.

Robespierre, de, Maximilien Marie Isidore (1758–94), French lawyer and revolutionary leader, born at Arras. He became a deputy to the States-General (Constituent Assembly) of 1789 during the French Revolution and rose rapidly to power. After defeating his rivals, Hébert and Danton, he established the Committee of Public Safety. As leader of this committee he was responsible for the Reign of Terror in Paris in 1793. Among the thousands guillotined were Hébert and Danton. He became a dictator and, with the support of the Paris commune, organized the Jacobin Club that was responsible for so many brutal excesses. A conspiracy was formed against him, and after fierce tumult in the Convention he was arrested. He was rescued by his own troops but hesitated to call for a new revolution. His enemies seized the opportunity and guillotined him.

Robinson, Edwin Arlington (1869–1935), American poet, born at Head Tide, Me. He was educated at Harvard and became a member of the National Institute of Arts and Letters. His early work was recognized for its originality, but his talent did not develop until the publication in 1916 of *The Man Against the Sky.* It was followed by *Merlin, Lancelot, The Three Taverns* and *Avon's Harvest Time.* He won the Pulitzer Prize for poetry three times: in 1921 for *Collected Poems,* in 1925 for *The Man Who Died Twice* and in 1927 for *Tristram.* Later works include *The Glory of the Nightingales, Mathias at the Door* and *Nicodemus.*

Robinson, James Harvey (1863–1936), American historian and educator, born at Bloomington, Ill., educated at Harvard and in Germany. He was professor of history at Columbia from 1895 to 1919; in 1919 he was one of the founders and first director of the New School for Social Research. From 1911 to 1920 he edited the *American Historical Review.* Robinson's writing and lecturing have had great influence on the study and teaching of history. His best-known work is probably his *Mind in the Making.* He also wrote *Introduction to the History of Western Europe, The German Bundesrath* and *Petrarch, The First Modern Scholar and Man of Letters* (with Rolfe).

Robinson, Joseph Taylor (1872–1937), American political leader, born in Lonoke, Arkansas, educated at the University of Arkansas. In 1903 he was elected to the U. S. House of Representatives. He became governor of Arkansas in 1913 but resigned that post within a few months to enter the U. S. Senate. In 1928 he was nominated for Vice-President on the Democratic ticket headed by Alfred E. Smith, but he was defeated. He became the leader of his party in 1923 and was re-elected to the Senate for the terms beginning 1925, 1931 and 1937.

Rob Roy (Robert MacGregor or Campbell; 1671–1734), Scottish outlaw. In 1712 he gathered together a band of followers and carried out raids on the estate of the duke of Montrose, who, he alleged, was unfairly pressing him for debt. After a long career as a freebooter with many amazing escapades he was imprisoned, but he was later pardoned. Rob Roy introduced a lucrative type of trading by returning stolen cattle to their owners for a commission. Sir Walter Scott's novel *Rob Roy* tells of his adventures.

Rochambeau, de, Jean Baptiste Donatien de Vimeur, Count (1725–1807), French soldier. He saw service in the War of the Austrian Succession and in the Seven Years' War. He commanded 6,000 French soldiers sent over to help the Americans during the Revolutionary War. He aided Washington at Yorktown. During the French Revolution he was in command of the Army of the North for 2 years. He narrowly escaped execution after being imprisoned under the Reign of Terror.

Roche, Josephine (1886–), American public official, born at Neligh, Neb., educated at Vassar and Columbia. She became a probation officer with the Family Court of Denver, Colo., then served with the Children's Bureau in Washington and later returned to the Denver Court as referee. She inherited a mining company and immediately set up a new standard of relations between employer and employee. In 1933 President Roosevelt made her an executive in the Public Works Administration and in 1934 she became assistant secretary of the treasury. Later she became Federal alcohol administrator.

Rochefoucauld, see *La Rochefoucauld.*

Rockefeller, John Davison (1839–1937), American oil magnate and philanthropist, born at Richford, N.Y., educated in the public schools. At the age of 14 he moved to Cleveland, Ohio, and in that city his vast interests developed. He became a clerk in a produce commission business, and when 19 he formed a commission firm with a partner, as Clark & Rockefeller. The firm soon began to deal in oil, and by 1867 it operated the largest oil refinery in Ohio. In 1870 Rockefeller united his company with other firms under the name of the Standard Oil Company, and by gradually absorbing smaller oil-producing companies he ultimately controlled about 90 per cent of the American refineries. The Standard Oil Trust was formed as the head and front of all Rockefeller interests, but it was ordered dissolved in 1911 when the U. S. Government attacked it under the antitrust laws. Rockefeller thereafter operated his industrial empire as individual units under such names as Standard Oil Company of New Jersey and Standard Oil Company of Indiana, He continued as president of the New Jersey corporation until 1911, when he retired from active business, the richest man in the world. As a philanthropist he distributed some $600,000,000 of his wealth, most of it for the establishment of the Rockefeller Foundation, the General Education Board, the Laura Spellman Rockefeller Memorial and the Rockefeller Institute for Medical Research.

Rockefeller, John Davison, Jr. (1874–), American capitalist, son of John Davison Rockefeller, born in Cleveland, Ohio, graduated from Brown University. He took an active part in his father's business and philanthropies. His gifts helped to build the Riverside Church in New York, and he contributed large amounts for rebuilding Reims Cathedral and other European landmarks damaged in the World War. In 1932 the Rockefeller interests began the erection of the huge building project in New York known as Rockefeller Center (Radio City). He financed the restoration of Williamsburg, Va.

Rodin, Auguste (1840–1917), French sculptor, born in Paris. His first exhibition in the French Salon was *The Age of Bronze* (1877). This was followed by *The Kiss, Danaid, The Bather, Adam, Eve, La Guerre,* the *Hand of God* and *The Thinker.* He executed a great monument of Victor Hugo. His famous bronze doors, *Portal of Hell,* represent 20 years' work.

Rodney, George Brydges, 1st Baron (1719–92), English admiral. He joined the navy when a boy and after 28 years in the service rose to the rank of rear admiral. In 1779 he was given the rank of admiral. He destroyed the sea power of France in a battle near Martinique, defeated the Dutch fleet and drove Spain from Gibraltar and Minorca. He received a pension of $10,000 a year to be continued to his heirs, and he was elevated to the peerage as Baron Rodney.

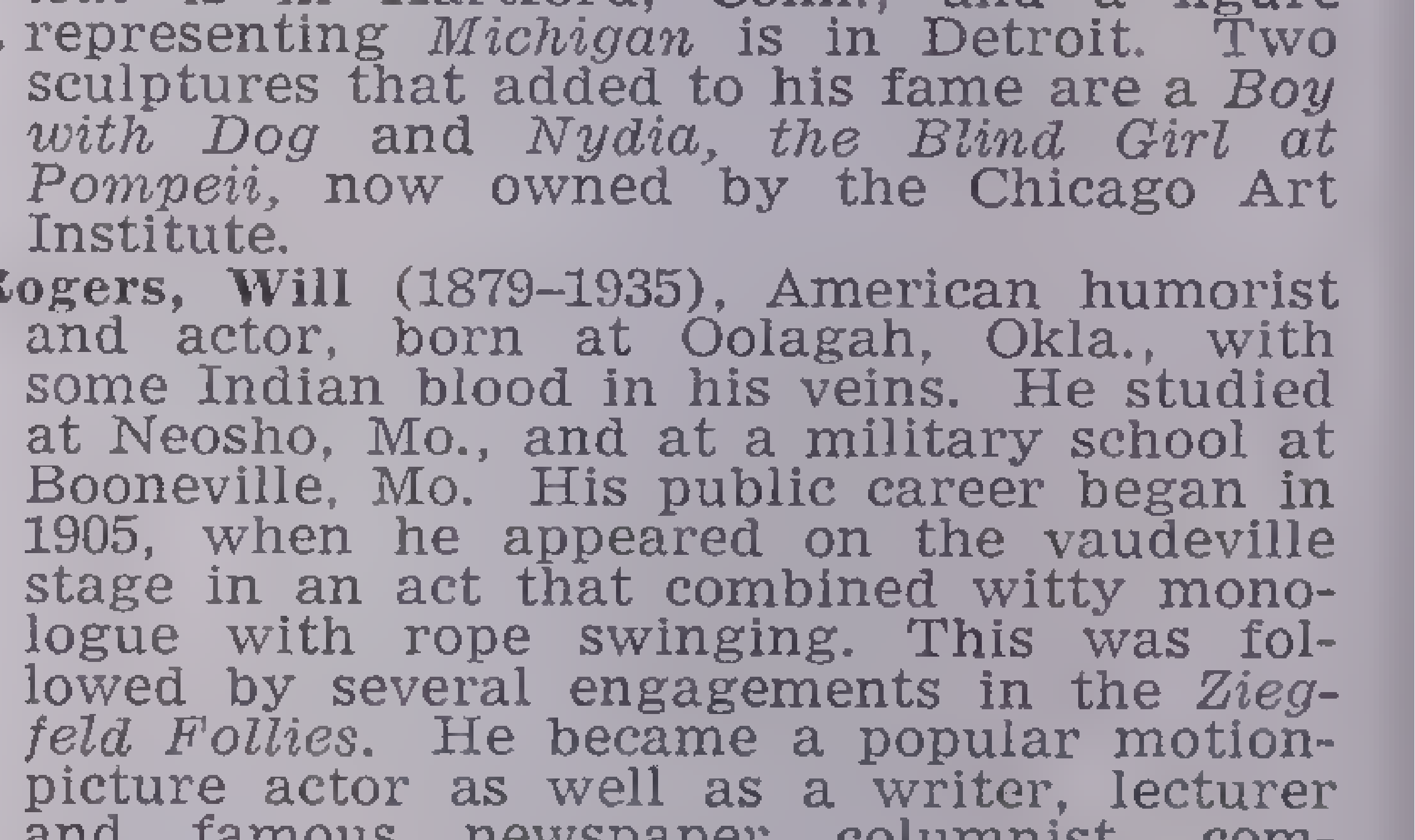
Roebling, John Augustus (1806–69), German-American engineer, born in Prussia. He studied engineering in Berlin and emigrated to the United States at the age of 25. He failed at farming in Pennsylvania and became a railroad surveyor. He later began to manufacture steel cable and became a pioneer builder of suspension bridges. He designed and built the Brooklyn Bridge across the East River in New York city, his largest project. Other notable achievements were the suspension bridges over the Ohio River at Cincinnati, one at Niagara Falls and two at Pittsburgh spanning the Allegheny and Monongahela rivers. He constructed four aqueducts of the suspension type on the Delaware and Hudson Canal.

Roentgen, Wilhelm Konrad (1845–1923), German scientist, born in Düsseldorf. He taught physics at Strasbourg and later at Giessen, Würzburg and Munich. In 1895 he described to a German physicomedical society his discovery of a new and powerful form of radiation that he called *X rays,* since known as *Roentgen rays.* Roentgen was also the first to show that these rays would pass through the body and print a shadow picture of the bones on a sensitive photographic plate. In 1901 he received the Nobel Prize for physics. As a professor of physics, he achieved fame in the universities at Würzburg and Munich.

Rogers, Randolph (1825–92), American sculptor, born in Waterloo, N.Y. He produced the bronze doors of the Capitol at Washington and a great statue of *Lincoln,* in Philadelphia. His statue *Genius of Connecticut* is in Hartford, Conn., and a figure representing *Michigan* is in Detroit. Two sculptures that added to his fame are a *Boy with Dog* and *Nydia, the Blind Girl at Pompeii,* now owned by the Chicago Art Institute.

Rogers, Will (1879–1935), American humorist and actor, born at Oolagah, Okla., with some Indian blood in his veins. He studied at Neosho, Mo., and at a military school at Booneville, Mo. His public career began in 1905, when he appeared on the vaudeville stage in an act that combined witty monologue with rope swinging. This was followed by several engagements in the *Ziegfeld Follies.* He became a popular motion-picture actor as well as a writer, lecturer and famous newspaper columnist, commenting on current events with rare shrewdness and humor. He died with Wiley Post in an airplane crash. His books include *The Cowboy Philosopher on Prohibition, What We Laugh At, Illiterate Digest* and *Letters of a Self-Made Diplomat to His President.*

Roland de la Platière, Marie Jeanne Philipon (1754–93), French revolutionist. Her husband was a public official, and before the Revolution their home was a meeting place for the conspirators who planned the uprising. They allied themselves with the Girondists, and Roland became minister of the interior under the new regime. When Marat and Robespierre overthrew the Girondists, Roland escaped, but his wife was arrested, imprisoned, condemned and guillotined. As she walked to her death, she cried out, "O Liberty, what crimes are committed in thy



Courtesy Scott Stamp & Coin Company

Auguste Rodin

Enlarged from a French postage stamp issued in 1936. The purchaser paid 10 centimes more than the 90-centime postage value of the stamp, and the money so collected was used to aid needy refugees from other countries. Rodin's masterpiece, *The Thinker,* appears in the background name!" When her exiled husband heard of her death, he committed suicide.

Rolfe, John (1585–1622), English colonist in America. He sailed from his home in England in 1609, was shipwrecked and reached Virginia in 1610. He became a leading colonist and the first white man to plant a crop of tobacco in Virginia. In 1613 he married Pocahontas, daughter of the Indian chief Powhatan. Rolfe and Pocahontas visited England, where Pocahontas died. Rolfe returned to Virginia with their son and became a member of the Virginia council.

Rolland, Romain (1868–), French writer, born at Clamecy, Burgundy. He studied music in Paris and was professor of the history of music at the Sorbonne (1903–10). He wrote *Jean-Christophe,* a 10-volume novel based on the life of Beethoven. His *Au dessus de la Mélee* (1915) made him unpopular in France, as the book was too pacifistic for the patriotic spirit of World War days. Other words include *L'Ame Enchantée, Goethe et Beethoven,* several studies of musicians and a number of plays. He received the Nobel Prize for literature in 1915.

Romains, Jules, pen name of Louis Farigoule (1885–), French author, born in the Ardèche, educated in Paris. He taught philosophy in Paris, Nice and elsewhere for 10 years, but is best-known as a writer. He wrote poetry, drama and a long novel in several volumes called *Men of Good Will.*

Romney, George (1734–1802), English painter, born in Lancashire. He worked as a cabinetmaker for a time, then went to London and later to Paris and Rome to study art. He returned to London and was for 35 years one of the most successful and popular portrait painters in England. His favorite subject was Lady Hamilton, whom he painted a number of times as a historical or mythological character. Besides making portraits of many of the most prominent people of his day he painted historical and imaginative works, such as *Newton Making Experiments With the Prism, Milton and His Daughters* and scenes suggested by Shakespeare's plays.

Röntgen, Wilhelm Konrad, see *Roentgen.*

Roosevelt, Franklin Delano (1882–), 32d President of the United States, fifth cousin of Theodore Roosevelt, son of James and Sara Delano Roosevelt. He was born at the family estate, Hyde Park, N.Y., on January 30, 1882. He graduated from Harvard University in 1904 and in the same year became a student in the law school of Columbia University. After he was admitted to the bar in 1907, he began to practice with a firm of lawyers in New York city. He was elected as a Democrat to the New York Senate in 1910 and resigned in 1913 to became assistant secretary of the navy in Woodrow Wilson's administration. In 1920 he was nominated for the Vice-Presidency on the ticket with James M. Cox but was defeated.

In 1921 his political career was temporarily halted by an attack of infantile paralysis. In 1924, seated in a wheel chair on the platform of the Democratic National Convention, he nominated Alfred E. Smith for the Presidency. From 1929 to 1931 he was governor of New York; he promoted social legislation, regulation of public utilities and state development and operation of water power. In 1932 he was the Democratic nominee for President. He won 472 of the 531 electoral votes to defeat Herbert Hoover, the Republican incumbent. In February 1933 an attempt to assassinate Roosevelt in Florida failed. He was inaugurated on March 4, 1933, at a time of national financial crisis, and he began to set in operation forces for national recovery. Almost at once he closed all the banks in the country, declaring a "bank holiday" for a brief period. This he followed by his "New Deal" program, which he broadcast to the public, the first President to make use of the radio in this manner.

Roosevelt quickly acquired enormous powers. Appropriations amounting to seven billion dollars were placed at his disposal to restore buying power among the people and to put millions of idle men and women to work. Thus he established the National Recovery Administration (NRA), the Home Owners Loan Corporation and the Federal Emergency Relief Administration. The President was supported by a strongly Democratic Congress; a huge public-works program was put through, and an elaborate plan of farm relief was instituted. The 18th Amendment was repealed in 1933. The NRA and the AAA (Agricultural Adjustment Act) were later declared unconstitutional by the U. S. Supreme Court, as were other New Deal features. This led to the President's later effort to reform the Supreme Court. The dollar was devalued to 59 cents, and the Government impounded all the nation's monetary gold. A widespread conservation program was set up. The Civilian Conservation Corps, made up of young men, began to improve forests and plant trees and to build antierosion projects. Rivers were dammed for power, flood control and irrigation. The Tennessee Valley power and flood-control project was set up in the hope of making the valley a new industrial center.

The 1936 contest for Roosevelt's re-election was bitterly fought, but he defeated Alfred Landon, the Republican candidate, by the greatest plurality any candidate had received. This verdict Roosevelt interpreted as a mandate to continue in some form the features of the NRA.

In 1940, for the first time in U. S. history, Roosevelt was elected for a third term. In 1941 he was given greater power than any other peacetime president had ever enjoyed.

He married Anna Eleanor Roosevelt, niece of Theodore Roosevelt. Roosevelt's writings include *Whither Bound?* (1926), *The Happy Warrior—Alfred E. Smith* (1928), *Looking Forward* (1933). *On Our Way* (1934) and *The Public Papers and Addresses of Franklin D. Roosevelt,* 1928–36.

Roosevelt, Theodore (1858–1919), 26th President of the United States, born in New York city, son of Theodore and Martha Bullock Roosevelt. His father was of Dutch descent and his mother, Scotch-Irish-Huguenot. He entered Harvard University at 18 and was graduated in 1880. He began the study of law but was elected to the New York legislature. In 1884 he was chosen a delegate to the Republican National Convention and later in the year went to North Dakota, where he spent 2 years on a ranch, raising cattle. In 1886 he was an unsuccessful candidate for mayor of the city of New York. He was appointed a member of the United States Civil Service Commission in 1889 and served until 1895, when he resigned to become president of the police board of New York city in a reform administration.

President McKinley appointed him assistant secretary of the navy in April 1897. Upon the outbreak of the Spanish-American War in 1898 he resigned to help organize the first U. S. volunteer cavalry—the "Rough Riders." Shortly after the war he was nominated for governor of New York and was elected November 1898. Two years later he was unanimously nominated for Vice-President of the United States by the Republican National Convention at Philadelphia and was elected. He succeeded to the Presidency September 14, 1901, when President McKinley was assassinated, and at the close of the term he was re-elected. He had long been an advocate of administrative, political and social reform.

One of the high points in his administration was the "trust-busting" campaign, an attempt to break up or at least to bring under control the huge industrial combinations. He made the Interstate Commerce Commission an active and powerful body, supported the growing demand for meat inspection and pure-food laws and began the building of the Panama Canal.

His efforts to bring about peace between Japan and Russia in 1905 were important and effective; in 1906 he was awarded the Nobel Peace Prize. He was an enthusiastic hunter of big game, and after the close of his term, March 4, 1909, he led a scientific expedition to East Africa to collect specimens for the Smithsonian and National museums at Washington. When he returned, he again entered politics. There had been a strong sentiment in favor of his candidacy for a third term, but President Taft was nominated by the Republicans. A long friendship between the two men was broken off; Roosevelt withdrew from the party and entered the race as head of the Progressive party called the *Bull Moose.* This so split the Republican vote that the Democratic candidate Woodrow Wilson was elected.

Roosevelt then went on another exploring trip, this time into the jungles of the Amazon in Brazil. He returned and became a bitter critic of Wilson's administration. He wanted to raise a volunteer force to serve in the World War, but the War Department would not allow this. He did much to defeat Wilson's peace program and died soon afterward. Among his important publications are: *The Winning of the West, History of the Naval War of 1812, Hunting Trips of a Ranchman, Life of Gouverneur Morris, American Ideals and Other Essays, The Rough Riders, Life of Oliver Cromwell* and *The Strenuous Life.*

Roosevelt, Theodore, Jr. (1887–), American statesman, born on Long Island, N. Y., son of Theodore Roosevelt, graduated from Harvard in 1908. He was an executive in several industries and distinguished himself as a soldier during the World War. He was assistant secretary of the navy from 1921 to 1924, when he resigned to run for the governorship of New York; he was defeated by Alfred E. Smith. Roosevelt was governor of Puerto Rico from 1929 to 1932 and governor general of the Philippine Islands from 1932 to 1933.

Root, Elihu (1845–1937), American statesman and lawyer, born in Clinton, N.Y. He studied at Hamilton College and at the law school of New York University. President Arthur appointed him United States attorney for the southern district of New York (1883–85). He served as secretary of war (1899–1904) and secretary of state 1905–09) and then devoted himself to the cause of international peace and was awarded the Nobel Peace Prize in 1912. In 1908 he was elected U. S. Senator from New York for the term 1909–15. He headed a diplomatic mission to Russia in 1917 and represented his country at the Washington Disarmament Conference in 1921. As one of the founders of the World Court (1920) he suggested in 1929 that the United States enter the Court as a member with reservations.

Root, George Frederick (1820–95), American composer born at Sheffield, Mass. After studying music for a year in Paris, he returned home and found themes for his poetic and musical talent in the spirit of the nation before and during the Civil War. He left many songs that are still sung. Among them are "Music in the Air," "Battle Cry of Fredom," "Just Before the Battle Mother," and "Tramp, Tramp, Tramp, the Boys are Marching."

Rosa, Salvator (1615–73), Italian painter, born at Arenella near Naples. At Rome his social talents—he was a skilful musician, actor and poet—and his princely generosity made him a great favorite. But he also made powerful enemies by his satires and had to go to Florence for 9 years. He owes his reputation mainly to his landscapes of wild and savage scenes, though his masterpiece is considered the *Conspiracy of Catiline.*

Roscius, Quintus (*c.* 126–62 B.C.), Roman actor, born a slave at Solonium. He taught oratory to many prominent Romans, including Cicero. Sulla befriended him and raised him to higher rank. Roscius was the greatest actor of his time. Cicero's defence of him in a lawsuit is preserved among Cicero's works.

Rosebery, Archibald Philip Primrose, Earl of (1847–1929), British statesman. He went to Oxford but did not graduate. He married the wealthy Hannah Rothschild in 1878, became a friend of Gladstone and was soon important in political circles. In 1881 he joined the Liberal ministry; in 1883 was made commissioner of works and in 1885, lord privy seal; in 1886 Gladstone made him foreign secretary. He again held that post from 1892 to 1894, and in 1894 succeeded Gladstone as prime minister. He had a famous racing stable and won the Derby in 1894, 1895 and 1905. He wrote *Appreciations and Addresses, Sir Robert Peel, Napoleon, The Last Phase, Oliver Cromwell* and *Literary and Historical Miscellanies.*

Rosecrans, William Starke (1819–98), American soldier, born at Kingston, Ohio, and graduated from West Point. He was trained as an engineer and had settled down to coal mining when the Civil War broke out. He joined the Federal army in 1861 and distinguished himself during the campaigns of 1862 and 1863. He was afterward minister to Mexico, a member of Congress and from 1885 to 1893 register of the U. S. Treasury.

Rosenwald, Julius (1862–1932), American merchant and philanthropist, born in Springfield, Ill., educated in the public schools. From 1885 to 1906 he was a clothing manufacturer, then became an executive and in 1910 president of Sears, Roebuck and Co. He set up savings plans and pension funds for the employees of the company. He was much interested in improving the condition of the negro race, founded many schools for negro children and endowed many negro branches of the Y.M.C.A. In his will he left 20 million dollars to be used for "the well-being of mankind." The money has been used largely for educational purposes.

Ross, Betsy (Elizabeth Griscom Ross; 1752–1836), American flagmaker, reputed maker of the first American flag. On June 14, 1777, Congress declared in a resolution that "the flag of the thirteen United States be stripes alternate red and white; that the union be thirteen stars, white in a blue field, representing the new constellation." A committee consisting of George Washington, Robert Morris and George Ross was appointed to design such a flag, their work to be accepted or rejected by the Congress. The committee visited the wife of the nephew of George Ross, and there the design for the new flag was discussed. Mrs. Ross suggested that the stars should be five-pointed instead of six-pointed, and that form was adopted and has been continued to this day. The flag modeled by her proved satisfactory, and Congress gave her a contract to make the government flags. For more than 20 years she continued this work, and her daughter carried it on until 1857.

Ross, Sir James Clark (1800–62), British explorer, born in London. He made five voyages to the Arctic Regions, using sledges for journeys over the ice; on the last of these expeditions (1834) he determined the position of the north magnetic pole. He commanded a famous Antarctic expedition in the ships *Erebus* and *Terror* and reached the farthest point south that had ever been attained, 78° 10′. During this trip he discovered and named Victoria Land, in honor of his queen, and located two extinct volcanoes, which he named for his vessels. He commanded an expedition in search of Sir John Franklin in 1848.

Ross, Nellie Tayloe (1880–), American public official, born at St. Joseph, Mo., educated in private schools there. In 1902 she married William Bradford Ross, who was elected governor of Wyoming in 1922 and died in 1924. She succeeded him and became the first woman governor. She served until 1927. In 1933 she was appointed director of the U. S. Mint. No woman had previously held that office.

Ross, Sir Ronald (1857–1932), English physician, born in India, educated in London. He entered the Indian Medical Service in 1881 and began a special study of malaria. He discovered much about transmission of the disease by mosquitoes and about tropical diseases in general. Ross received the Nobel Prize in physics in 1902.

Rossetti, Christina Georgina (1830–94), English poet, younger sister of Dante Gabriel Rossetti and W. M. Rossetti. She wrote beautiful lyrics in her teens and was painted by her brother Gabriel, Holman-Hunt and other Pre-Raphaelites. Her first book *Goblin Market* (1866) was a great success and so was her children's song book *Sing-Song* (1872). From 1871 to her death she suffered from goiter. She was intensely religious, and her prose writings are theological. Her verse is rich and beautiful.

Rossetti, Dante Gabriel (1828–82), English poet and painter, born in London of Italian ancestry. He was educated at King's College and the Royal Academy of Art. At the age of 20 he and other artists formed the Pre-Raphaelite Brotherhood in an effort to restore art to the simplicity and spirituality that characterized it before the era of Raphael. Rossetti was the leader of this group. His poem "The Blessed Damozel" was written before he was 20. A collection of his poems was buried with his wife (Elizabeth Siddall, d. 1862) but was disinterred and published in 1870. A great passion for beauty is the principle that unifies his art and poetry. His painting *Lady Lilith* is in the Metropolitan Museum, New York.

Rossetti, William Michael (1829–1919), English critic and author, brother of D. G. and Christina Rossetti. He worked in a government office but was one of the Pre-Raphaelite Brotherhood and edited its magazine *The Germ*. He translated Dante's *Inferno* into English blank verse; discovered Walt Whitman for the British public; defended the Pre-Raphaelites; wrote biographies of Keats, Shelley and his brother Dante Gabriel; edited William Blake, Shelley and his brother; and wrote some fine sonnets.

Rossini, Gioachino Antonio (1792–1868), Italian composer, born at Pesaro. He was the son of a strolling musician and showed such talent by the time he was 15 that he was sent by a royal patron to study music at Bologna. When he was still only 22, he produced the opera *Tancredi*, which was performed for the first time in Venice. In 1816 he produced *The Barber of Seville*, his most famous composition. He wrote an opera *Otello*, which had a happy ending. His *Guillaume Tell* appeared in 1829, and he composed *Stabat Mater* between 1832 and 1839. He produced no other important work after the age of 37, but his fame had been made as one of the greatest Italian composers.

Rostand, Edmond (1868–1918), French dramatist, born in Marseilles. His first three plays, *Les Romanesques*, *La Princesse Lointaine* and *La Samaritaine*, were produced with fair success, but his masterpiece was *Cyrano de Bergerac*, which made a tremendous sensation when first produced and which is frequently staged today. Later came *L'Aiglon*, a play about Napoleon's son, the duke of Reichstadt, and *Chantecler*, a farmyard fantasy in which Maude Adams made a great hit in the United States.

Rothschild, name of a world-famous banking family.

Meyer Anselm Rothschild (1743–1812), founder of the family, was born in Frankfort, Germany. Though his parents intended that he should be a rabbi, he went into the business of moneylending. He was appointed financial adviser to the Landgrave of Hesse, and the rulers of the Austrian Empire sought his financial assistance and advice. He died in 1812, leaving five sons who had been thoroughly schooled in the business. The Rothschilds became essential to the financial stability of Austria. In 1822 the five brothers were made barons: Meyer Anselm de Rothschild (1773–1855), Solomon (1774–1855), Nathan (1777–1836), Karl (1788–1855) and Jacob (1792–1868). Nathan made the house of Rothschild the greatest banking concern in the world; he established the London branch. Four branches were operated by the other members of the family in Frankfort, Vienna, Naples and Paris.

The Rothschilds financed several wars, and some governments were so much in their power that several times war was prevented by their refusal to lend money for armament. Philanthropic measures were financed; they gave money to establish the modern educational systems of Germany and France. Industrial Europe owed much of its advancement to the Rothschilds. At the height of their power the family fortune was estimated at two billion dollars. An important descendant in the family, Baron Lionel Walter Rothschild (1868–1937), lived in England. Well known as a zoologist, he collected more than 280,000 specimens of birds in 40 years. He spent over a million dollars on the collection. It is now a part of the American Museum of Natural History in New York city.

Rouget de Lisle, Claude Joseph (1760–1836), French soldier and poet. He is best-known as the author of the *Marseillaise*, which became the national song of France. He did not call it by this title but named it *Chant de l' Armée du Rhin* (Song of the Army of the Rhine), for he was stationed with French troops at Strasbourg at the time it was composed (1792). Paris first heard the song when a Marseille detachment returning from the Rhine sang it in the city streets in 1796, and Paris gave it its popular name from their city. Rouget received a pension from the king (Louis XVIII), and a monument was erected to him at Choisy-le-Roi, where he died. Napoleon suppressed the song as antimonarchical while he ruled France, but in 1876 Parliament adopted it as the national song.

ROUSSEAU, JEAN JACQUES (1712–78), French philosopher and writer, born in Geneva, Switzerland. After a period of roaming around the country districts of Switzerland and France, he found his way to Paris, and there began to teach and to write. The turning point in his life came when he was appointed secretary to the French minister at Venice. He left the post because he disliked his employer's condescending attitude and returned to Paris. He prepared to bring suit against the minister but found that a commoner had no standing in court against the aristocracy. This experience led him to study the structure of society, government and education. So ably did he write of his convictions that Napoleon said later, "Without him the French Revolution would not have occurred." He preached democracy and with unanswerable arguments proclaimed the equality of man. He achieved fame with his book *La Nouvelle Héloïse*, with its genuine sentiment and love of nature. His *Emile* gives his views on education, and many of his beliefs in this field were adopted by Froebel and Pestalozzi. Other works from his pen are *The Social Contract* and *Discourse on Inequality*. His 12-volume *Confessions* is one of the strangest of autobiographies.

Royce, Josiah (1855–1916), American philosopher and educator, born in California. He studied at the University of California, Johns Hopkins and in Germany. He returned to his *alma mater* to teach English literature and after 1882 taught philosophy at Harvard. In his philosophy he taught the importance of personality and will; he held that ethics and morality were to be explained in terms of loyalty. Among his books are *The Religious Aspect of Philosophy*, and *The Problem of Christianity*.

Rubens, Peter Paul (1577–1640), Flemish painter, born at Siegen, in Westphalia. He attended the Jesuit College at Antwerp and began painting under Verhaagt, a landscape painter. Later he became more interested in historical painting and studied under other masters. He went to Italy in 1600 and was befriended by the duke of Mantua. The duke sent him on a mission to Philip III of Spain, and he painted several portraits of Spanish noblemen. He also spent considerable time at Venice and Rome, copying paintings for the duke and making a reputation with his own work.

In 1621 he visited Paris by invitation of Marie de' Medici, and in 1625 he planned 24 great pictures illustrating her life. They were placed in the Palace of the Luxembourg but are now in the Louvre. Rubens was sent by the Infanta Isabella, widow of the Archduke Albert, on a diplomatic mission to Philip IV of Spain in 1628 and in the following year on a similar mission to Charles I of England, who knighted him in 1630.

Some of his 1,250 paintings are among the most valuable in the world. His *Descent from the Cross* is in the Notre Dame Cathedral at Antwerp; this painting is regarded as his masterpiece and is one of the world's greatest paintings. *The Flight into Egypt* is in the Louvre, Paris. Other great works of his are *The Crucifixion of Saint Peter*, *The Holy Family of Saint George* and *Adoration of the Magi*.

Rubinstein, Anton (1830–94), Russian musician, born in Volhynia. He began to study at the Paris Conservatoire at the age of 11 and attracted the attention of Liszt and Chopin. He became a teacher of the piano in Vienna and later went to St. Petersburg (Leningrad), where a wealthy woman became his patron and supplied him with funds; this made it possible for him to give his time to composition. His first opera *Dimitri Donskoi* appeared in 1851, and thereafter he engaged in concert work. In 1862 he founded a conservatory of music in St. Petersburg. This he conducted for some years, but he also found time for tours in the United States and England. He composed *Ocean Symphony* and *Dramatic Symphony*, the oratorios *Christus* and *Paradise Lost* and two other operas, *Nero* and *The Demon*.

Rude, François (1784–1855), French sculptor, born in Dijon and educated in art in Paris. He won the Prix de Rome in 1812 and began work on his masterpieces, *Mercury Fastening His Sandal* and the *Neapolitan Fisher Boy*. These made him famous. Others of his pieces are *The Departure*, *Awakening to Immortality*, *Christ on the Cross*, *Napoleon*, *Joan of Arc*, *Hebe and the Eagle* and *Marshal Saxe*.

Rudolph I (1218–91), Holy Roman Emperor, founder of the Hapsburg imperial dynasty, born in a castle near the union of the Aar and the Rhine, where the early Hapsburgs lived. They were counts, and in 1273 Rudolph was chosen German king. The new ruler increased his possessions through marriage and gained others by conquest and inheritance. Soon he was king of Austria and Swabia as well. The last of the Hapsburg line, Charles I, successor to the Emperor Francis Joseph of Austria-Hungary, abdicated in 1918 and died in 1922, leaving his son, Francis Joseph Otto, as head of the house of Hapsburg.

Ruisdael, Jacob, see *Ruysdael.*

Rumford, Benjamin Thompson, Count (1753–1814), English physicist and public official, born in Woburn, Mass. He took the British side in the Revolution, was a major in the British army at 19 and was sent to England with messages. There he found a post in the Foreign Office and later fought for the Austrians against the Turks. He was asked to help govern Bavaria and did so for years. He made many improvements there, reorganized the army, set up hospitals and asylums and improved the living conditions of the people. He had always been interested in science and in 1804 went to Paris, where he carried on scientific research for the rest of his life. He left money to found a professorship of physics at Harvard. To the Royal Society of England he left funds to be used in the awarding of the Rumford medals.

Rush, Benjamin (1745–1813), American physician, born near Philadelphia. He graduated from Princeton in 1760, studied medicine at Edinburgh and at Paris and became professor of chemistry in the Philadelphia Medical College. He founded the Philadelphia Dispensary, the first in America, and the College of Physicians of that city. Rush Medical College of Chicago, now the medical department of the University of Illinois, was named in his honor. He was a founder of America's first antislavery society; signed the *Declaration of Independence* and was surgeon general of the Continental Army.

Ruskin, John (1819–1900), English art critic and author, born in London, educated at Christ Church College, Oxford. Before graduating he won the Newdigate Prize (1839) for poetry. From 1869 to 1879 he was professor of art at Oxford. His *Modern Painters* is an elaborate treatise on the principles of art, and in it he tried to prove that modern landscape artists are superior to the masters of the period following the Renaissance. New editions of the book appeared for more than 15 years; some of the volumes were illustrated by Ruskin himself. *The Seven Lamps of Architecture* and *Stones of Venice* were attempts to bring about a higher conception of architecture than had existed in England. Ruskin was also greatly interested in social problems; he wrote *Unto This Last* and *Munera Pulveris,* both of which attack the imperfect science of political economy. His *Sesame and Lilies* is a collection of charming essays, and *King of the Golden River* is a fairy-tale classic for children. Other important books are *Ethics of the Dust, The Crown of Wild Olive* and *The Queen of the Air.* Ruskin's collected works fill 39 volumes on art, political economy, Greek myths, home industries, wayside flowers and many other subjects. His autobiography *Praeterita* tells about his early life.

Russell, Bertrand Arthur William, 3d Earl (1872–), English philosopher and mathematician, born at Trelleck, a grandson of Lord John Russell, prime minister during 1846–52. He was educated at Cambridge. He taught at Cambridge for many years. He opposed the World War, campaigned actively against it and was imprisoned for antiwar publications. He wrote many books on mathematics, philosophy and biography. In his writings he brings mathematics and philosophy together and expresses logic in terms of mathematical symbols. Russell and his wife opened a school in England in 1927. He has lectured in many parts of the world. Among his books are *The Principles of Mathematics, Introduction to Mathematical Philosophy, Principles of Social Reconstruction, Marriage and Morals, The Scientific Outlook* and *Freedom versus Organization, 1814–1914.*

Russell, John, 1st Earl (1792–1878), English statesman, born in London and educated at the University of Edinburgh. He was elected to Parliament at 21. He was a leader in the parliamentary reform movement, sponsored the Catholic Relief Bill in 1829 and in 1832 became widely popular through the passage of his Reform Bill, which tripled the number of people allowed to vote. Later he served as home secretary (1839), colonial secretary (1841) and prime minister (1846). In that office he quieted Ireland, which had been in turmoil because of a potato famine. In 1852 he lost office chiefly through the opposition of Lord Palmerston, whom Russell had dismissed from the Foreign Office in 1851. He represented England at the Vienna Conference (1855), was raised to the peerage in 1861 and again served as prime minister for a short time (1865) before his retirement.

Russell, Lillian (Helen Leonard; 1861–1922), American actress and singer, born in Clinton, Iowa. At the age of 18 she sang in the chorus of the light opera *Pinafore,* and her voice attracted attention. Later she became prima donna in a light-opera company. She formed her own company and appeared in most of the cities of the United States and England. At the height of her popularity Miss Russell was considered the most beautiful woman on the American stage. In 1912 she married Alexander P. Moore a newspaper publisher.

Ruth, "Babe" (George Herman Ruth; 1894–), American baseball player, born in Baltimore, Md. He entered professional baseball at the age of 20. He started in as a pitcher, but his hitting was so powerful that he was transferred to the outfield. Ruth was extremely popular as a player with the New York Yankees. Among the records he set was that of 60 home runs in a single season. He retired in 1935 but returned to the game in 1938 as coach for the Brooklyn Dodgers.

Rutherford, Ernest, 1st Baron (1871–1937), English physicist, born in New Zealand, educated there and at Cambridge. He became professor of physics and director of physics research at Manchester (1907–19) and later at Cambridge (1919–1937). He is best-known for his work in radioactivity and was a pioneer in changing one element to another by bombarding its atoms. He won the Nobel Prize in chemistry in 1908.

Rutledge, John (1739–1800), American jurist, born in Charleston, S. C. He studied law in England and returned to practice in his native city. He took part in the Stamp Act Congress in 1765, represented South Carolina in the Continental Congress for long periods, was chairman of the convention that framed the constitution of his state and became the first governor of South Carolina. After the Revolutionary War ended, he again entered Congress and was a member of the Constitutional Convention. In 1789 he was appointed an associate justice of the U. S. Supreme Court and in 1791 became chief justice of the South Carolina supreme court.

Ruysdael, Van, Jacob (*c.* 1628–81), Dutch painter, born in Haarlem. Little is known of his life, except that it was full of illness, disappointment and privation. He died in an almshouse. His work was not appreciated in his lifetime. His pictures are chiefly of rural scenes, including *Storm at Sea* (Louvre, Paris), *Cottage Under Trees, Wheatfields* and *Forest Stream* (Metropolitan Museum, New York), *View of Haarlem* and *Agitated Sea* (British Museum), *Jewish Cemetery* (Dresden Gallery) and *Landscape with Ruins* (National Gallery, London).

Ryan, Thomas Fortune (1851–1928), American financier, born in Nelson county, Virginia. At the age of 17 he worked as a clerk in a Baltimore dry goods store. He went to New York at 20, began to speculate and in 1874 became a member of the New York Stock Exchange. He gained controlling interest in railroads, mines in the United States and Africa and in an American life-insurance company.

Saadi, Muslik-ud-Din (*c.* 1184–1291), Persian poet, born at Shiraz. He studied science and theology at Bagdad and from there made the first of 14 pilgrimages to Mecca. He is called the *nightingale of a thousand songs,* and the catalogue of his works contains 22 different kinds of writing in prose and poetry. Especially famous are his *Būstān* (Fruit Garden), *Gulistān* (Rose Garden) and *Dīvān* (Many Leaves, a lyric collection).

Sabatini, Rafael (1875–), English author, born at Jesi, Italy. He studied in Switzerland and Portugal and went to England to become a writer. His first novel *The Tavern Knight* received little notice, but when *Scaramouche* appeared in 1921 he became popular. His other historical novels include *Captain Blood, The Sea Hawk, The Lion's Skin, Bardelys the Magnificent, Bellarion the Fortunate* and *Scaramouche the King Maker. Torquemada and the Spanish Inquisition* and *The Life of Cesare Borgia* are biographies; and he wrote several plays.

Sacagawea (Bird Woman; b. 1788), Indian guide who accompanied the Lewis and Clark Expedition (1804–06). She was the wife of Charbonneau, French interpreter of the expedition. She had traveled over most of the Northwest with the Shoshone tribe and had been her husband's companion on his long journeys and so was able to render invaluable service to Lewis and Clark.

Sachs, Hans (1494–1576), German poet and playwright, born in Nuremberg. He wandered through Germany as a traveling shoemaker but devoted all his spare time to writing. In all he wrote about 6,000 songs and poems and more than 200 comedies and tragedies. He is noted as the best of the meistersingers.

Sage, Margaret Olivia Slocum (1828–1918), American philanthropist, born in Syracuse, N.Y. At the age of 41 she married Russell Sage. Upon the death of her husband in 1906 she inherited his fortune. The following year she gave $10,000,000 to the Russell Sage Foundation, established to better social and living conditions in the United States. At her death she left $36,000,000 to charity.

Sage, Russell (1816–1906), American capitalist, born in Oneida county, New York, and educated in the public schools. He became a grocer's clerk and established himself as a wholesale grocer in Troy, 1839. He was a member of Congress (1852–56), moved to New York (1863), purchased a seat on the Stock Exchange and associated himself with Jay Gould in extensive railway operations, gaining a wide reputation by his close bargaining and successful speculation. His fortune was estimated at $65,000,000.

Saint Clair, Arthur (1734–1818), American general, born in Scotland. He served in the British navy as a physician. During the French and Indian War he sailed to the American colonies with the fleet, and before the close of the war he resigned his commission and became a Pennsylvania civilian. He joined the Continental Army under Washington and served in the battles of Trenton and Princeton, commanding the New Jersey troops. After the war he became a member of the Continental Congress; for 2 years he was its presiding officer. In 1780 he became the first governor of the newly organized Northwest Territory.

Sainte-Beuve, Charles Augustin (1804–69), French writer. He studied medicine in Paris, after an early education in Boulogne and soon began to write. His friendship with Victor Hugo helped him in his career. Sainte-Beuve is best-known for his volumes of literary criticism, especially the *Causeries du lundi* (Monday Chats), papers that he contributed first to the *Constitutionnel* and then to the *Moniteur.*

Saint-Gaudens, Augustus (1848–1907), American sculptor, born in Dublin of French and Irish parentage. He was brought up in New York and studied at Cooper Institute at night while working at cameo cutting during the day. He studied art at the École des Beaux Arts in Paris and soon became the leading American sculptor. He made the famous statue of Lincoln that stands in Lincoln Park, Chicago. Among his portrait statues are those of R. L. Stevenson (Edinburgh), Admiral Farragut, Sherman and Peter Cooper (all in New York). His *Adams Memorial* in Rock Creek Cemetery, Washington, D.C., is universally admired, as was the *Diana* above the old Madison Square Garden in New York. Saint-Gaudens had a tremendous influence on American sculpture.

Saint-Pierre, de, Jacques Henri Bernardin (1737–1814), French author, born in Havre. He joined the army and became a military engineer but left the service to lead a wandering life that took him as far as the island of Mauritius. When he returned to France, he wrote *Paul and Virginia.* It has been translated into many languages. His *Etudes de la Nature* undertook to prove the existence of God from the wonders of nature. *A Visit to the Isle of France* won a pension for him.

Saint-Saëns, Charles Camille (1835–1921), French composer, born in Paris, educated at the Paris Conservatoire. In 1853 he was appointed organist of the Church of Saint Merri in Paris and in 1858 of the Church of the Madeleine. He retired from that position in 1877 and gave recitals in Europe and America. His most important composition is the opera *Samson and Delilah.* He wrote other operas, symphonies, concertos, choral works and chamber music.

Saintsbury, George Edward Bateman (1845–1933), English critic, born at Southampton and educated at Merton College, Oxford. He was a schoolmaster at Manchester, Guernsey and Elgin (1868–76) but soon after established himself as one of the most active critics of the day and became professor of English literature at Edinburgh University. Among his books are *Short History of French Literature, History of Elizabethan Literature, Essays in English Literature, History of Criticism, History of Nineteenth-Century Literature, The Earlier Renaissance, Minor Caroline Poets, A History of English Prosody* and *A History of the French Novel.*

Saint-Simon, de, Claude Henri, Count (1760–1825), French philosopher, born in Paris. At 16 he entered the army and fought in the American Revolution. He published *L'Industrie ou Discussions Politiques, Morales et Philosophiques* (1817–18). The last and most remarkable work of Saint-Simon is his *Nouveau Christianisme,* which contains his final and matured convictions. In the French Revolution he urged reforms that were not unlike measures adopted by dictators many years later. He believed that the leaders of science and industry should organize society. He urged the union of all European nations and the building of the Suez and Panama canals.

Saladin (1137–93), Sultan of Egypt, born at Tikrit, Mesopotamia. Saladin won renown when fighting in Egypt for the Caliph Nureddin against the Christians, and in 1170 he became vizier of the country. He came to the throne in 1171, when Nureddin died. He extended his authority and was soon sultan of Egypt and Syria and had conquered Mesopotamia and most of Asia Minor. Saladin is best-known for his campaigns against the Latin kingdom of Jerusalem in the Third Crusade, which began in 1187. In spite of the efforts of the Crusaders he captured Jerusalem, but he was checked by Richard I, who arrived with a fresh army. A truce was made in 1192, and a few months later Saladin died.

Salisbury, Robert Arthur Talbot Gascoyne Cecil, 3d Marquis of (1830–1903), British statesman, born in Hatfield. After leaving

Oxford University he was elected to Parliament in 1853 as Lord Robert Cecil—the title of his great ancestor in Elizabeth's time. In 1868 he became Marquis of Salisbury and had to leave the House of Commons. He was secretary of state for India in 1866 and again from 1874 until 1878. He was foreign secretary in 1878–80, attended the Congress of Berlin and with Lord Beaconsfield (Disraeli) played a prominent part in the proceedings. Salisbury succeeded Beaconsfield as leader of the Conservative party in 1881. In 1885, upon Gladstone's retirement, Salisbury was prime minister and also acted as foreign secretary for 6 months. In 1886 he entered his second term as prime minister and was in office until 1892; his third term was from 1895 until his retirement in 1902. During Salisbury's administration, Germany received the island of Helgoland from England in exchange for concessions in East Africa.

Sallust (Gaius Sallustius Crispus; 86–34 B.C.), Roman historian, born in the Sabine country. He was made tribune in 52 B.C. After serving in Africa he became governor of Numidia, where he amassed great wealth by oppressing the people. He returned to Rome and built a magnificent palace. Though the building was destroyed, the spot where it stood is now called *Sallust's Garden*. He then devoted himself to historical writing. His history of the Roman Republic for the years 78 to 67 B.C. has not been preserved except for a few fragments. The *Conspiracy of Catiline* and *History of the Jugurthine War* are intact.

Sampson, William Thomas (1840–1902), American naval officer, born in Palmyra, N.Y. He graduated from the Naval Academy at the age of 21 and then divided his time between instructing at the Academy and service at sea. He was made chief of the Bureau of Ordinance and became widely known through his efforts to strengthen and enlarge the navy. In the Spanish-American War (1898) he commanded the Atlantic squadron and as acting rear admiral was placed in charge of operations in Cuban waters. When the Spanish fleet under Cervera took refuge in the harbor of Santiago, Sampson blockaded the port and destroyed the Spanish fleet as it tried to escape from the harbor. Sampson retired as a rear admiral in 1902.

Sand, George (Amatine Lucile Aurore Dupin; 1804–76), French novelist, born in Paris, educated in convents. She married Casimir Dudevant (1822), with whom she passed an unhappy time until she left him in 1831. She became a journalist in Paris. For several years she lived openly with Jules Sandeau, and the two collaborated in writing several books under the name *Jules Sand*. When they separated, she took for her pen name *George Sand*, and in her first book *Indiana* she wrote about marriage problems. She formed a liaison with the poet Alfred de Musset and later with Chopin, the composer. The latter half of her life was spent mostly in the country at Nohant.

She wrote more than 80 novels. Her earlier books, including *Lélia* and *Jacques*, show a spirit of revolt, but her best work is in the later pastoral novels, such as *Jeanne* and *La Mare au Diable*. She is the heroine in one series of novels, but in the next phase her books show an interest in socialism and kindred political subjects. It is said that in *Lucrezia Floriani* she portrayed herself and Chopin as the leading characters.

Sandburg, Carl (1878–), American poet, born at Galesburg, Ill. His early life was such as to especially fit him to become the poet of industrial America. He was from time to time milk driver, porter, scene shifter, truckman, dishwasher, harvest hand, advertising manager, salesman and newspaper man. His first volume of verse appeared in 1904, but he was unknown to the literary world until 1914, when one of his poems "Chicago" was awarded the Levinson Prize of $200. His poems are in free verse. They are distinctively American in feeling and are often brutally frank. Among his books are *Cornhuskers* (1918), *Smoke and Steel* (1920) and *The American Song Bag* (1927). His prose works include *Abraham Lincoln: The Prairie Years, Abe Lincoln Grows Up* and (for little children) *Rootabaga Stories*.

Sanger, Margaret Higgins (1883–), American leader in the birth-control movement, born in Corning, N. Y., educated as a nurse. She believed that persons with low incomes should not have many children. She founded the American Birth Control League in 1917 and set up clinics in which she taught birth-control methods. As a result she was often in trouble with the police, but a series of court actions led to the legal decision that physicians can give birth-control information for the sake of health. Later she traveled all over the world, lecturing and opening clinics. She founded and edited the *Birth Control Review*. Among her books are *Woman and the New Race, Happiness in Marriage* and *My Fight for Birth Control*.

San Martín, de, José (1778–1850), South American revolutionist, born in what is now Argentina. He served with the Spanish army in Europe but returned home in 1812 to take part in a revolution in his country. He led the army of liberation against Upper Peru and decided that the best way to the royalist stronghold in Peru would be through Chile. He led his army across the Andes and defeated the Spanish at Chacabuco in 1817 and at Maipú in 1818. He thus freed Chile from Spanish rule. San Martín refused dictatorship over Chile; instead he set out to conquer Peru. He had partially succeeded when he met Bolívar, and he turned over the rest of the work to him. San Martín spent the last part of his life in Europe.

Santa Anna, de, Antonio López (*c.* 1795–1876), Mexican politician and soldier, born in Jalapa, in the province of Vera Cruz. He enlisted in the army at 15 and by 1821 had joined Iturbide in opposing Spanish occupation. He became a revolutionist and when elected president of Mexico in 1833 was a virtual dictator. After Texas declared its freedom from Mexico, Santa Anna and his Mexican forces were victorious at the Alamo, but he was defeated and made prisoner at San Jacinto. He was deposed but resumed his dictatorship as president in 1841. In 1845 he was banished for 10 years but in 1846 was recalled. As commander of the Mexican army in the war with the United States he was largely unsuccessful and was again deposed in 1848. Santa Anna left Mexico and traveled in South America, only to be recalled in 1853. Two years later he was banished but returned to serve under Maximilian. Again ordered out of the country he was an exile for a while but returned in 1874 and died in Mexico City.

Santayana, George (1863–), American poet and philosopher, born in Madrid, Spain. He came to the United States at the age of nine and at 23 he graduated from Harvard University. After 2 years spent in study in Berlin he became professor of philosophy at Harvard and continued in that post for more than 20 years. During his teaching years he produced philosophical books and a few volumes of poetry. His first book was *Sonnets and Poems* (1894), and it was followed by the philosophical *The Sense of Beauty* (1896). After this book was published, he studied at Cambridge University and lectured at the Sorbonne, Paris. One of his chief works, *The Life of Reason*, is a 5-volume philosophical work. His other works include *Scepticism and Animal Faith, Platonism and the Spiritual Life, The Realm of Matter, The Genteel Tradition at Bay, Three Philosophical Poets* (Lucretius, Dante, Goethe), *Egotism in German Philosophy, Philosophical Opinion in America* and *Character and Opinion in the United States*. His first novel *The Last Puritan* (1936) had an immense sale.

Santos-Dumont, Alberto (1873–1932), French aviator and inventor, born in São Paulo, Brazil, educated in France. He made his first ascent in a balloon in 1897. Later he attached a gasoline motor and a screw propeller to a dirigible balloon and after several failures flew for some minutes over Paris. In 1901 a prize was offered for a machine to start from a designated spot in Paris and fly to the Eiffel Tower and circle around it; Santos-Dumont won the prize, about $20,000, in a dirigible flight lasting about 30 minutes. In the next year he tried to fly a dirigible across the Mediterranean Sea but landed in a bay on the coast of France. He persisted in his experiments and in 1906 constructed an airplane in which he flew 750 feet in 21 seconds.

SAPPHO (*c.* 7th century B.C.), Greek poet, probably a native of Mitylene, in Lesbos. She was a contemporary and friend of Alcaeus. Except for some fragments, only two of her compositions have come down to us anywhere near complete—one of 27 lines and one of 16. According to the writings of critics of her time she was a supremely gifted poet with great simplicity of phrase, tremendous passion and wonderful mastery of meter.

Sardou, Victorien (1831–1908), French dramatist, born in Paris. He studied medicine but soon turned to literature and wrote more than 70 plays. He won his first reputation with *M. Garat*, produced at the Déjazet Theater. Among his best-known plays are *Les pattes de mouche, La taverne, Candide, Cleopatra, Robespierre, Dante, Fédora, La Tosca, Madame Sans-Gêne* and *Divorçons*.

Sarg, Tony (Anthony Frederick; 1882–), German-American artist. He served in the German army until 1905 then went to England as an illustrator and in 1915 emigrated to the United States. He illustrated humorous stories for a time, then produced a series of marionette shows. He became widely known for his puppets and for the books that he wrote and illustrated. They include *Tony Sarg's Animal Book, Tony Sarg's Alphabet, Tony Sarg's Wonder Zoo, Tony Sarg's Trick Book* and *Book of Marionette Plays*.

Sargent, John Singer (1856–1925), American painter, born in Florence, Italy. He was educated in Europe and spent most of his life in England. He is best-known for his portraits. He also painted landscapes and figure pieces, of which the most famous is *The Weavers*. His best-known portraits are those of Ellen Terry, "Mme X" (Mme Gautreau), Edwin Booth, Joseph Jefferson and Woodrow Wilson. Sargent won the Grand Prize at the Paris Expositions of 1889 and 1900, the Grand Prize at the St. Louis Exposition of 1904 and the gold medal of the National Institute of Arts and Letters (American) in 1914. He was elected to the Royal Academy (Great Britain) in 1897 and was made an officer of the Legion of Honor in France.

Sarto, del, Andrea (1486–1531), Italian painter, born in Florence. He painted two series of frescoes in Florence, the best of the first series being *Nativity of the Virgin* and *Journey of the Three Kings*. The most celebrated of his single pictures are the *Last Supper*, the *Madonna of the Harpies* and *Fathers of the Church Disputing*. *Holy Family* by Andrea is in the New York Metropolitan Museum. He was a rapid worker, excelled in accurate drawing and was called *Andrea the Faultless*.

Sassoon, Siegfried [Loraine] (1886–), English writer, educated at Cambridge. He served in the World War and wrote two books of verse in which he expressed his feeling of the brutality and uselessness of war. They are *The Old Huntsman* and *Counter Attack*. Others are *Picture Show, Satirical Poems* and *The Heart's Journey*. Two autobiographical books are *Memoirs of a Fox-Hunting Man* and *Memoirs of an Infantry Officer*.

Savonarola, Girolamo (1452–98), Italian religious and political reformer, born in Ferrara. He joined the Dominican Order in 1475 and preached on the sinfulness and corrupting influence of power. After the death of Lorenzo the Magnificent in 1492 he led his party in the new republic and ruled Florence as a Christian commonwealth, sternly putting down all luxury and frivolity. He was accused of heresy by Rome and excommunicated. The new system in Florence failed, and the people turned against him. In 1498 he was strangled and burned at the stake. He is an important figure in George Eliot's novel *Romola*.

Scarron, Paul (1610–60), French writer. He was crippled through illness at the age of 30. After that he lived in Paris and became famous chiefly through his burlesque plays and poems. His *Roman comique* is a novel of the strolling players of the time. In 1652 he married Françoise d'Aubigné, later known as Madame de Maintenon. Scarron's shorter novels furnished plots for Molière, Beaumarchais and other French dramatists.

Schacht, Hjalmar (1877–), German financier, born in Schleswig. He became an important figure in German banking and as president of the Reichsbank worked with the Dawes Committee in 1924 to settle the tangled problems of German reparations payments. In 1934 he became Hitler's minister of economics. As such he was for 3 years economic dictator of Germany.

Scheele, Karl Wilhelm (1742–86), Swedish chemist, born at Stralsund in Prussia. By profession an apothecary and to a large extent self-taught he made many important chemical discoveries. He found oxygen gas, independently of Priestley, in 1774. Among his other discoveries are the element chlorine (1774), tartaric acid and glycerin. The substance known as *Scheele's green* is the arsenite of copper identified by him.

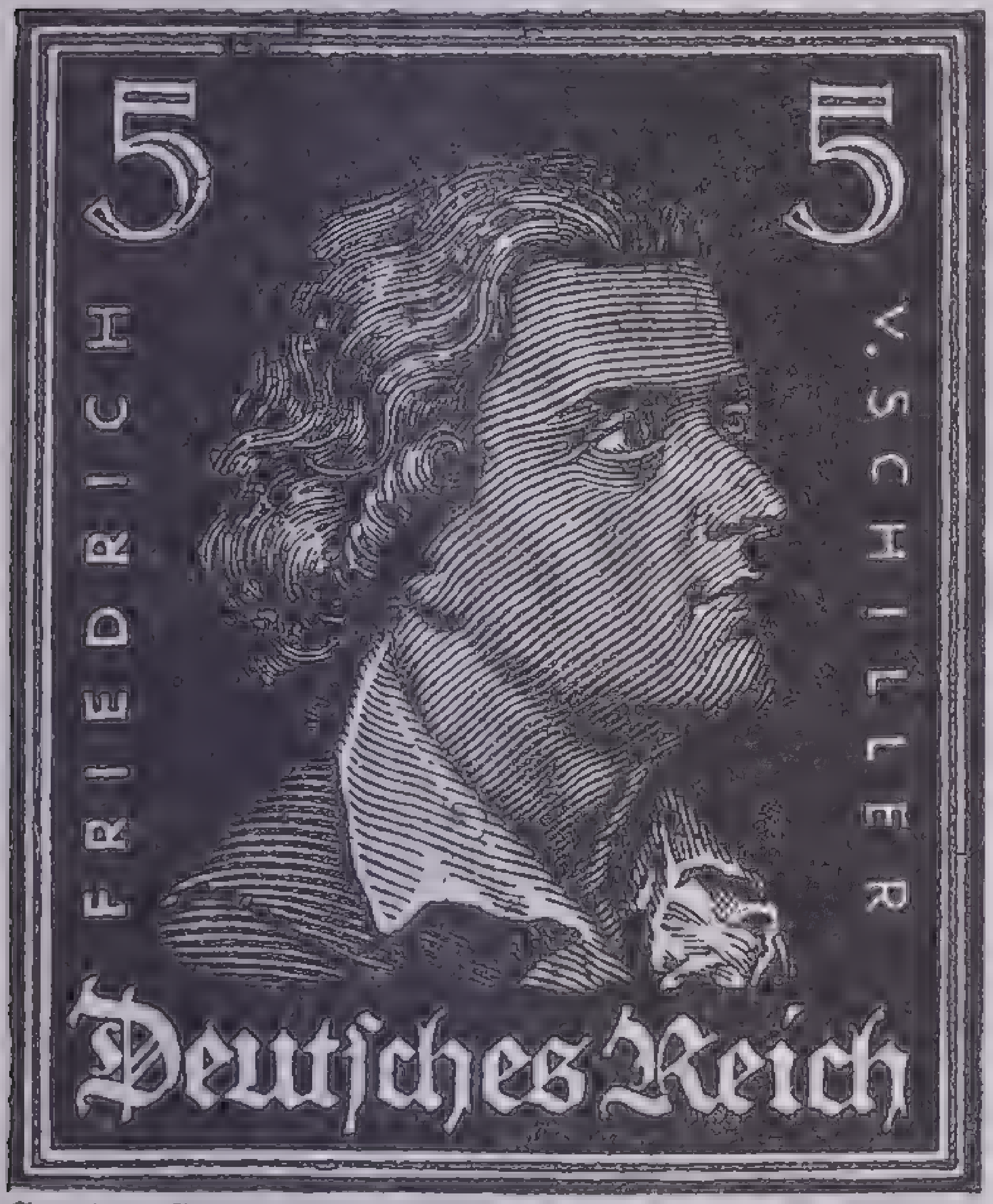
Scheffer, Ary (1795–1858), French painter, born at Dordrecht, Holland. He first made a reputation with his paintings of scenes in everyday life. Later he painted historical subjects, but about 1836 his work began to have a strong religious tone. Many of his subjects were based on the writings of

Goethe and Byron. He also made some remarkable portraits of Lafayette, Béranger, Lamartine and many others.

Schelling, von, Friedrich Wilhelm Joseph (1775–1854), German philosopher, born in Württemberg. He studied theology and philosophy at Tübingen and science and mathematics at Leipzig. He began as a follower of Fichte and Hegel, with whom he ranks equally among German philosophers, but later was influenced by Spinoza and Boehme and developed a transcendental idealism. His more important works were collected and published by his sons after his death.

SCHILLER, VON, JOHANN CHRISTOPH FRIEDRICH (1759–1805), German poet and dramatist, born at Marbach, Württemberg. He was educated at a military school under the patronage of the duke of Württemberg and was trained to become a military surgeon. His first play, *Die Räuber* (The Robbers), appeared in 1782 and created a tremendous sensation by its revolutionary sentiments. Schiller fled from the harsh service of the duke into Franconia, where he completed his *Fiesco* and *Kabale und Liebe*. *Don Carlos* was also outlined there.

In 1783 he went to Mannheim and was for some time closely connected with actors and theatrical life. To this period belong several of his lesser poems. *Kabale und Liebe* marked the end of the first poetic period in Schiller's career, otherwise known as the *Stürm und Drang* period. In 1785 he went to Leipzig, where he wrote *Lied an die Freude*. After a few months he went to Dresden, where he began the practice of composing during the night. *Der Geisterseher* was written here, and the drama *Don Carlos* was completed.



Courtesy Scott Stamp & Coin Company

Friedrich von Schiller

Enlarged from a German postage stamp one of a series issued in 1926 honoring German national heroes

In 1787 he was invited to Weimar, where Goethe and he eventually became the closest friends, and each contributed to the development of the other. Schiller's *History of the Thirty Years' War* first appeared in 1792. On the occasion of the poet's marriage in 1790 to Charlotte von Lengefeld, the duke of Meiningen made him a privy councilor; the French Republic also conferred on him the right of citizenship; and in 1802 the emperor raised him to the rank of nobility.

While staying for a year with his relatives in Württemberg he wrote his exquisite letters on esthetic culture. After 1795 the finest of his lyrics and dramas were produced—as "Der Spaziergang" and the "Lied von der Glocke" (Song of the Bell), *Wallenstein, Maria Stuart, Die Jungfrau von Orleans, Die Braut von Messina* and finally *Wilhelm Tell*. Schiller ranks next to Goethe among Germany's greatest poets.

Schlegel, von, August Wilhelm (1767–1849), German historian and critic, born at Hanover, educated at Göttingen. He first came to public notice for his literary work while he was a lecturer in the University of Jena. In 1800 his first volume of poems was published, and in 1801 appeared *Charakteristiken und Kritiken*. His most valuable and most widely popular work was his *Lectures on Dramatic Art and Literature*, originally delivered at Vienna in the spring of 1808 and translated into most European languages. In 1818 Schlegel was raised to the nobility and soon became professor of history in the University of Bonn. There he devoted all possible time to the history of the fine arts and to philological research. He was one of the first students of Sanskrit in Germany; he established a Sanskrit printing office at Bonn.

Schleiermacher, Friedrich Ernst Daniel (1768–1834), German philosopher, born in Breslau, celebrated for his defense of religion against the attacks of skeptics and materialists. As professor at the University of Halle (1804–10) and dean of the theological faculty at the University of Berlin (1810–34), Schleiermacher's powerful personality influenced thousands of students who later became the leaders of 19th-century German theology. Schleiermacher drew his main philosophical inspiration from Plato and Kant, the great representatives of the idealistic philosophic tradition. While he rejected the crude supernaturalism of dogmatic theology, he was tireless in insisting on the importance of "the religious experience" as the only way to the good life and on the necessity of an attitude of reverence for the performance of any constructive work. "No great man ever lived, no great work was ever done, save in an attitude toward the universe that is identical with that of the religious man toward God."

Schleiermacher's principal works were *Reden über die Religion* (1799) and *Monologen* (1800). Throughout his life he was an active correspondent, and his *Letters* (first published, 1860) are a valuable source for the study of the German philosophical revolution of the early 19th century.

Schley, Winfield Scott (1839–1911), American naval officer, graduated from the U.S. Naval Academy in 1860. He saw active service in the Civil War with the blockading squadron on the Gulf of Mexico and the Mississippi River and was praised for his valor at Port Hudson. In 1884 he was ordered to Arctic Regions to search for the Greely party (two preceding relief expeditions had failed), and he returned home with Greely and six other survivors. Schley was in command of the flying squadron during the Spanish-American War and was in temporary command of the American fleet when Cervera's fleet was destroyed at Santiago. Both he and Sampson claimed credit for this victory. Schley was made rear admiral in 1899 and in 1901 took command of the South Atlantic squadron.

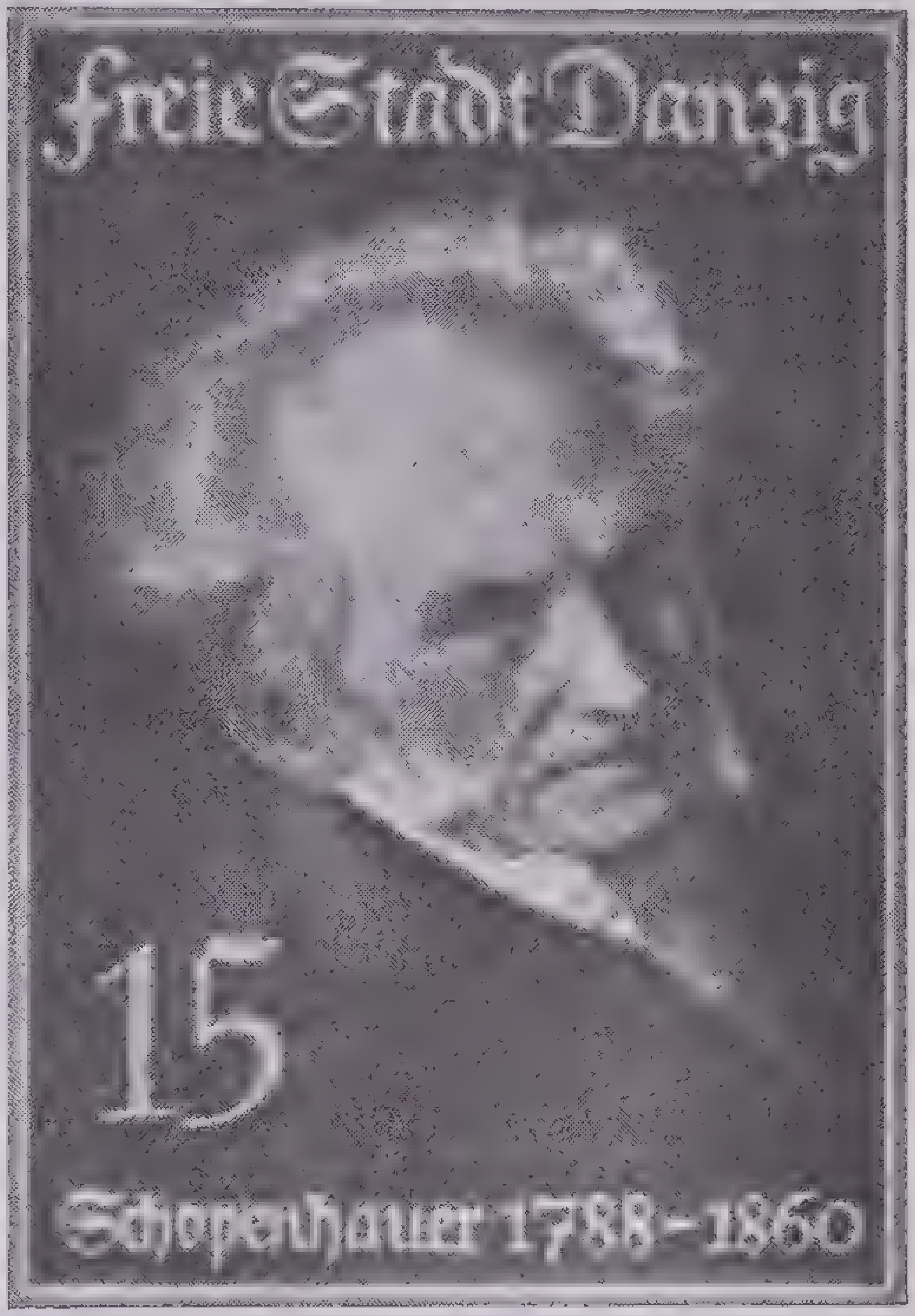
Schnitzler, Arthur (1862–1931), Austrian dramatist and novelist. He studied medicine but left it to take up writing. He attracted wide attention when his play *Anatol* was produced in 1893. After that he wrote other plays and many short novels that show the author's powers of observation and knowledge of the psychology of his characters. Among Schnitzler's plays that have been translated into English are *Anatol, Liebelei, The Green Cockatoo* and *Professor Bernhardi*. His famous novelettes include *Fräulein Else* and *Daybreak*.

Schofield, John McAllister (1831–1906), American general, born in Gerry, N.Y. He was graduated from West Point in 1853 and became an instructor there in 1855. When the Civil War broke out, he entered the army as a major. He fought in Sherman's southern campaign and was in most of the battles that ended with the taking of Atlanta. Then he returned to Tennessee, defeated Hood at Franklin and was with General Thomas at the battle of Nashville. In 1868 he became secretary of war and major general in the regular army. Upon the death of General Sheridan in 1888 he succeeded to the command of the U. S. Army. He was made lieutenant general before he retired. He published a biography entitled *Forty-six Years in the Army*.

Schoolcraft, Henry Rowe (1793–1864), American ethnologist and explorer, born at Watervliet,, N.Y. He studied at Union College, made a geological survey of Missouri and wrote *A View of the Lead Mines of Missouri*. Under General Lewis Cass he explored the Lake Superior copper region. He became an Indian agent with headquarters at Sault Ste. Marie and began to study the life of the tribesmen and later to write about them. As a member of the legislature of Michigan Territory, from 1828 to 1832, he founded Michigan's historical society. An expedition that he commanded in 1832 discovered the sources of the Mississippi. In 1836 he made a treaty with the Indians that gave the United States 16 million acres. His works include narratives of his journeys and a 6-volume *History of the Indian Tribes in the United States*.

Schopenhauer, Arthur (1788–1860), German philosopher, born in Danzig. He studied first at Göttingen and afterward at Berlin and Jena. He then proceeded to Dresden, where he published a treatise, *Sight and Color*, which was followed 3 years later by his great work, *The World as Will and Idea*. He lived from 1820 to 1831 in Berlin, where he tried to lecture at the University but without much success. After that he lived in retirement.

Schopenhauer was a pessimist, and his philosophy is a depressing one. However he presented his ideas with such skill that he took a place with the greatest of philosophical writers. Each living thing, he said, has in it a blind "will-to-live," but each being, in trying to express itself, is continually resisted by all other beings and objects in the world. Life, therefore, is a never-ending struggle. To will and not to find satisfaction is pain; there is more pain in life than pleasure. In fact pleasure is only the temporary absence of pain. And if all desire were to be realized, there would be only boredom left. Therefore we should give up all desires and wants, although we can find some relief from sorrow and struggle in science and the arts.



Courtesy Scott Stamp & Coin Company

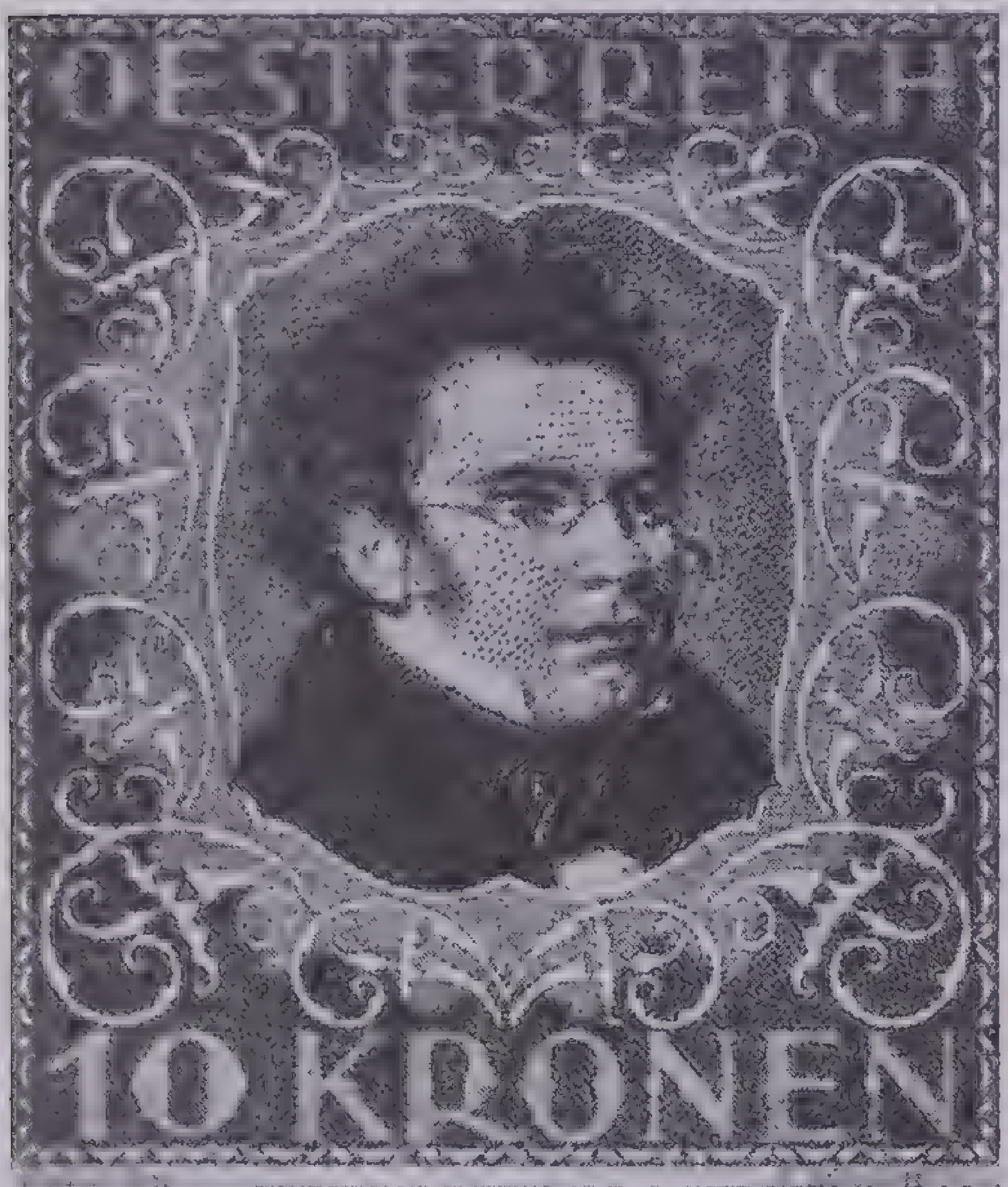
Arthur Schopenhauer

Enlarged from a postage stamp issued by Danzig in 1938 in commemoration of the 150th anniversary of the birth of the philosopher in that city, February 22, 1788

Schouler, James (1839–1920), American lawyer and historian, born at Arlington, Mass., graduated from Harvard in 1859 and admitted to the Massachusetts bar in 1862. He lectured at Boston University, National University and Johns Hopkins University during various periods. Most important of his works is a 7-volume *History of the United States Under the Constitution*.

Schubert, Franz (1797–1828), Austrian composer, born in Vienna. He never studied music very thoroughly, but his genius for creating melodies made his technical faults seem unimportant. He wrote a symphony at 16 and soon produced his *The Erlking* and *Mass in F*. He was practically penniless throughout his life; he sold some of his finest songs for 20 cents and had only about 10 dollars when he died. He left more than 600 songs, 8 symphonies, 20 piano sonatas, 6 masses and a great deal of chamber music. His best symphonies are the *C Major* and the *B Minor*, the "Unfinished Symphony."

Schumann, Robert (1810–56), German composer, born in Zwickau. He began the study of law but soon turned to music. His genius showed itself when he set *Psalm 150* to music at the age of 11. He became a pupil of Friedrich Wieck, his future father-in-law. His first work of importance was the cantata *Paradise and the Peri*. He was a most prolific composer of works for the piano, symphonies, concertos, quartets, songs and chamber music. In 1850 he moved to Düsseldorf, where for 3 years he was director of music. A mental malady attacked him, and he died in a private asylum. His widow Clara (1819-96), a great pianist, edited his complete works in 34 volumes.



Courtesy Scott Stamp & Coin Company

Franz Schubert

Enlarged from an Austrian stamp issued in 1922. It is one of a series in honor of Austrian musicians. Other stamps in the series show portraits of Haydn, Mozart, Beethoven, Bruckner, Johann Strauss and Hugo Wolf

Schumann-Heink, Ernestine Rössler (1861–1936), American contralto, born in Bohemia. At the age of 17 she made her operatic debut at Dresden in the character of Azucena in *Il Trovatore*. She sang in the Hamburg State Theater for several years and made her first appearance in London in 1892. In 1898 she first sang in America, appearing in *Lohengrin* in Chicago. Her Wagnerian roles were extremely popular in Chicago and New York. In 1907 she began to devote most of her efforts to concert work, but as late as 1926 she sang *Das Rheingold* with the Metropolitan Opera Company.

Schurz, Carl (1829–1906), German-American statesman, born in Prussia. He studied at Cologne and Bonn, was active in the revolution of 1848 and had to flee to Zurich. In 1852 he emigrated to the United States and in 1856 settled in Watertown, Wis., where he became active in Wisconsin politics. He campaigned actively for Lincoln and was appointed minister to Spain in 1861. At the outbreak of the Civil War he joined the Union forces, and he rose to the rank of major general. He settled in Missouri after the war, became editor of a German newspaper and in 1869 was elected U.S. Senator from that state. From 1877 to 1881 he was secretary of the interior and from 1892 to 1901 president of the National Civil Service Reform League. He was editor and part owner of the New York *Evening Post*, 1881–83; a leader in the Republican bolt to Cleveland against Blaine in 1884; backed Cleveland again in 1892; and was principal editorial writer for *Harper's Weekly*, 1892–98. He wrote biographies of Henry Clay and Abraham Lincoln, and his *Reminiscences* were published after his death.

Schuyler, Philip John (1733–1804), American soldier, born in Albany, N. Y. His family was prominent in New York. He served in the French and Indian War and later was in charge of northern New York as a major general in the Continental Army. He was in constant trouble throughout the Revolution. He had become widely unpopular through his work in fixing the boundaries of New York, New Hampshire and Massachusetts. Later there were army intrigues against him. He remained in the army until after the battle of Saratoga. Schuyler served in the Continental Congress in 1775, 1777 and 1779–81. His daughter married Alexander Hamilton.

Schwab, Charles Michael (1862–1939), American steel manufacturer, born in Williamsburg, Pa., educated in the village school and at St. Francis College. He entered the service of the Carnegie Company as stake driver and became chief engineer in 1881. He became superintendent of the Homestead Works and finally president of Carnegie Steel Company. In 1903 he gained control of the Bethlehem Steel Corporation. During the World War the Bethlehem Corporation made half a billion dollars' worth of steel and munitions for the Allies.

Scipio Aemilianus Africanus Minor, Publius Cornelius (*c.* 185–129 B.C.), Roman soldier. After distinguishing himself in Spain he proceeded to Africa to take part in the third Punic War. Here he laid siege to Carthage, took it by storm and leveled it to the ground in 146 B.C. He was afterward sent to Spain, where he captured Numantia after a stubborn resistance. He was killed in his bed.

Scipio Africanus Major, Publius Cornelius (237–*c.* 183 B.C.), Roman general. In 212 B.C. he was elected aedile and in the following year proconsul, with command of the Roman forces in Spain. He defeated the Carthaginians at Ilipa on 206 B.C. In 205 B.C. he returned to Rome, where he was elected consul, and in the following year sailed from Lilybaeum in Sicily, at the head of a large army, for the invasion of Africa. His success compelled the Carthaginian Senate to recall Hannibal from Italy. Peace was concluded the following year, when Scipio returned to Rome and enjoyed a triumph. His laurels, however, did not protect him from the intrigues of his enemies in Rome. Various charges were brought against him, and at length he retired in disgust to his country seat at Liternum.

Scott, Hugh Lenox (1853–1934), American soldier, born in Danville, Ky. He graduated from the U. S. Military Academy in 1876, entered the cavalry and rose from second lieutenant to major general. In 1897 he was attached to the Bureau of Ethnology to prepare a book on the sign language of the Indians. During and after the Spanish-American War he was adjutant general in Cuba. He was transferred to the Philippines, where he abolished slavery and the slave trade in the Sulu archipelago. From 1906 to 1910 he was superintendent of the U. S. Military Academy. In 1914 he was assistant chief of staff of the U. S. Army and in 1917 became chief of staff. He retired in 1919.

Scott, Robert Falcon (1868–1912), British explorer, born in Devonshire. He joined the British navy in 1880. From 1900 to 1904 he was in command of the *Discovery*, exploring the Antarctic Regions. He discovered King Edward Land and reached the record southern latitude of 82° 17′. As a reward he was made a captain, the youngest in the British navy. He sailed for the Antarctic in June 1910, established a base at McMurdo Sound and dashed for the South Pole with four companions. He reached the pole on Jan. 18, 1912, only to find that Roald Amundsen had discovered it a month and four days earlier. The party began its trip back to the base camp, but all died on the way. A searching party recovered their bodies in the following spring. Scott's diary tells one of the most dramatic stories of heroism and self-sacrifice ever recorded.

Scott, Sir Walter (1771–1832), Scottish novelist and poet, born in Edinburgh. He studied law at the University of Edinburgh, took an active part in Edinburgh society and explored the countryside, collecting old songs and stories. He practiced law with fair success, but in 1799 he received a political appointment that allowed him to give more time to writing. He had translated several books from German, and in 1802–03 his collection of songs was published as *Minstrelsy of the Scottish Border*. This and *The Lay of the Last Minstrel* (1805) made him an extremely popular writer.

He bought a partnership in a publishing firm and in a theater and began to accumulate a large fortune. In this period he wrote *The Lady of the Lake, Marmion, Vision of Don Roderick* and *Rokeby*. In 1814 *Waverly*, the first of a series of novels, was published anonymously and was instantly successful. A steady stream of novels followed: *Guy Mannering, The Antiquary, Rob Roy, The Heart of Midlothian, Ivanhoe* and others. He was made a baronet in 1820 and after that wrote *Kenilworth, Quentin Durward* and *Redgauntlet*. In 1826 he was ruined financially through the failure of his publishing house. He determined to pay every cent of indebtedness and drove himself to write *Tales of a Grandfather, The Fair Maid of Perth, Castle Dangerous* and other books before his death.

Scott, Walter Dill (1869–), American educator, born in Cooksville, Ill. He was educated at Northwestern University and at the University of Leipzig, Germany. He returned to Northwestern University as associate professor of psychology and education and director of the psychological laboratory; in 1908 he was advanced to the post of professor of psychology, which he gave up 12 years later to become president of the university. His writings include *Theory of Advertising, Psychology of Public Speaking, Psychology of Advertising in Theory and Practice, Influencing Men in Business, Personnel Management, Common Sense in Working with Men* and *Increasing Human Efficiency*.

Scott, Winfield (1786–1866), American general, born in Petersburg, Va., educated at William and Mary College. He practiced law for a year (1807) and then entered the army as a captain. When the War of 1812 began, he was raised to the rank of lieutenant colonel and ordered to the Canadian front. He was wounded at Queenston Heights and Lundy's Lane. For conspicuous service he was made a major general. His great peacetime service was the compilation of the first manual of arms ever made for the U. S. Army. He served against the Indians on the Western border and commanded the United States forces in the Mexican War. Scott was the Whig candidate for the Presidency in 1852, but was defeated by Franklin Pierce, Democrat. He received the rank of brevet lieutenant general in 1855; and when the Civil War broke out, he remained in the U.S. Army and was in general charge until November 1861.

Scribe, Augustin Eugène (1791–1861), French dramatist, born at Paris. The best-known of the many plays written by him alone or in collaboration with other playwrights include *Une Nuit de la garde nationale* (1815), *La Verre d'eau* (1840) and *Adrienne Lacouvreur* (1849). Scribe wrote the librettos for the operas *Les Huguenots* and *Fra Diavolo*. He was elected a member of the French Academy in 1834.

Scripps, Edward Wyllis (1854–1926), American newspaper publisher, born at Rushville, Ill. He established more than 30 newspapers and was a founder of the Scripps-McRae Press Association, which later developed into the United Press. His political views were liberal. His interest in science led him to establish Science Service, a news bureau of scientific information. His will endowed at Miami University, Oxford, Ohio, the scientific study of population growth and changes.

Sedgwick, Anne Douglas (1873–1935), American novelist, born in Englewood, N.J. She was taken abroad at the age of 9 and lived mostly in France and England. She studied art, and some of her paintings were exhibited in Paris, but she preferred writing. In 1911 she published *Tante*, which was favorably received. Several other volumes followed, but it was not until *Little French Girl* appeared in 1924 that her reputation became international. This book sharply contrasted English and French standards and ideals. Some of her other works are *The Dull Miss Archinard, The Rescue, Paths of Judgment, Annabel Channice, A Childhood in Brittany Eighty Years Ago, The Third Window, Adrienne Toner, The Old Countess, Dark Hester* and *Philippa*.

Seeger, Alan (1888–1916), American poet, born in New York city. He entered Harvard University in 1906 and became an editor of the Harvard monthly magazine. He went to Paris in 1912 and wrote a number of poems published under the title *Juvenilia*. At the beginning of the World War he enlisted in the French Foreign Legion and served until he was killed in 1916. He showed great literary promise and is best-known for his poem, "I Have a Rendezvous with Death." His letters about the war were published in 1917.

Selden, George Baldwin (1845–1922), American engineer and inventor, born at Rochester, N.Y. After graduation from Yale he studied law until his interest turned to engineering. In 1879 he filed application for the first patent for a gasoline motor-propelled vehicle. After long litigation he received his patent in 1896, and American automobile makers, except Ford, produced their cars under the Selden license until 1911. Selden sued Ford, and after more litigation the court declared for Ford, who pleaded that he had followed what was known as the Otto patent in the construction of his motors. By that time most automobile makers had adopted the Otto system, and payments of royalties to Selden ceased.

Selkirk, Alexander (1676–1721), Scottish sailor whose experience on a lonely island has been immortalized in Defoe's *Robinson Crusoe*. As a young man Selkirk privateered in the South Seas. He quarreled violently with the captain of his ship and asked to be put ashore upon a nearby island, called *Juan Fernandez*, about 400 miles west of the coast of Chile. He lived there alone for more than 4 years and was finally rescued by a British naval vessel. His experiences were published in two books dealing with sea stories; Daniel Defoe saw them, talked to Selkirk and finally wrote *Robinson Crusoe* around Selkirk's experiences, although he added a number of imaginary incidents. Selkirk became a lieutenant on the *Weymouth*, the ship that had rescued him.

Semmelweiss, Ignaz Philipp (1818–65), Hungarian physician, born in Buda, educated at Pest and Vienna. He taught obstetrics at Vienna. His great contribution to medicine was his discovery of the way puerperal fever is transmitted. Semmelweiss insisted on scrupulous cleanliness in caring for mothers and infants; as a result, deaths from puerperal fever decreased notably.

Semmes, Raphael (1809–77), American naval officer, a native of Maryland. He became a midshipman in the navy at the age of 13. He studied law in his leisure time and was admitted to the bar but remained in the navy. He saw service with the Gulf squadron in the Mexican War and later was inspector for the Lighthouse Board. He resigned his commission in 1861 and became a Confederate officer. He was in command of the *Sumter* and *Alabama* during the Civil War and won many victories. Semmes lost the *Alabama* in a fight with the *Kearsarge* in 1864. He was rescued by a British vessel, reached home and was made an admiral. After the South lost its navy, Semmes was made a brigadier general in the army. After the war he was arrested for treason and remained in prison nearly 3 years but was released (1868) through President Johnson's third amnesty proclamation.

Seneca, Lucius Annaeus (*c.* 4 B.C.–65 A.D.), Roman philosopher of the Stoic school, born at Corduba, Spain. He was banished by Claudius to the island of Corsica. On the marriage of Claudius to his second wife Agrippina, Seneca was recalled and appointed tutor to her son Domitius, afterward the Emperor Nero. Five years later his pupil ascended the throne, and Seneca became one of the chief advisers of the young emperor. All his influence failed, however, to restrain Nero's viciousness and licentiousness. After Nero murdered Agrippina, Seneca asked permission to retire from court. It was his hope to avoid public life and devote himself to his philosophical studies; but the emperor, who both disliked and feared him, followed him into his retirement and tried to poison him. After the conspiracy of Piso, in 65 A.D., Seneca was mentioned by one of the conspirators as having shared in the plot and without further proof was ordered to put himself to death. Of Seneca's writings that have come down to us the greater part are on moral and philosophical subjects; but there are also 9 tragedies by him that were popular with European dramatists for many centuries but have little value. He wrote a witty satire on the deification of the Emperor Claudius describing how he was turned into a pumpkin.

Serra, Junípero, Miguel José (1713–84), Spanish friar, born on the island of Majorca. He was educated in theology and philosophy, became a missionary to Mexico and almost at once began to advocate the establishment of missions. In 1767 he headed a band of monks to California to plant missions there. He established 21 missions and spent the rest of his life developing them. Between 1781 and 1784 under his religious instruction 5,000 Indians became Christians.

Service, Robert William (1874–   ), Canadian writer, born at Preston, England. He came to Canada in 1907 and explored the western coast and the vast stretches of the Yukon. His well-known poems of the North, *Songs of a Sourdough*, were published soon after his arrival in Canada. Other books were *The Spell of the Yukon, Rhymes of a Rolling Stone, The Pretender, Ballads of a Cheechako, The Trail of '98* (a novel) and *Rhymes of a Red Cross Man.* During the World War he served in France as an ambulance driver and newspaper correspondent.

Seti I (**d.** *c.* 1292 B.C.), King of Egypt. He sent his armies eastward into Syria with considerable success, though the Hittites could not be conquered. He built the remarkable Hall of Columns at Karnak, his most important contribution to architecture. The mummy of Seti was discovered during British excavations in 1881, as was also that of Ramses II, his illustrious son.

Seton, Ernest Thompson (1860–   ), Anglo-American writer and artist, born at South Shields, England, educated at Toronto Collegiate Institute and the Royal Academy, London. A lover of nature, he has used wild life almost exclusively as the subject of his painting, drawing and writing. He left England at an early age and lived for years close to the forests and mountains of western Canada and on the western plains of the United States, where he studied Indian as well as animal life. Among his books are *Wild Animals I Have Known, The Trail of the Sandhill Stag, The Biography of a Grizzly, Lives of the Hunted, Woodcraft and Indian Lore, Manual of the Woodcraft Indians, Sign Talk, Cute Coyote and Other Animals, Lives of Game Animals, Wild Animals' Ways, Bannertail, Scouting for Boys* and *Two Little Savages.*

Seton's great interest in young people led him to organize the Woodcraft Indians in 1902. From 1910 to 1915 he was chief scout of the Boy Scouts of America.

Seward, William Henry (1801–72), American statesman, born in Orange County, N.Y. A lawyer with a large practice, he entered New York state politics in 1830, serving in the state Senate and later as governor. In 1849 he was chosen U. S. Senator from New York and constantly fought against slavery. He became Lincoln's secretary of state and served until 1869. He showed remarkable ability in handling the delicate diplomatic relations with Great Britain, especially in the troublesome Trent Affair and the *Alabama* Claims. The assassins who killed Lincoln also tried to kill Seward on the same night, but he recovered and served as President Johnson's secretary of state. In this term he arranged for the purchase of Alaska.

Seymour, Horatio (1810–86), American statesman, born at Pompey, N.Y. He studied at a military school, then took a law course and was admitted to the bar (1832). He was elected to the New York legislature in 1841 and remained there for a number of years, part of the time as Speaker of the House. He was elected governor of New York in 1852 and again in 1862 and came into prominence as one of the North's "war governors." He was Democratic candidate for President in 1868 but was defeated by the Republican nominee, U.S. Grant.

Shackleton, Sir Ernest Henry (1874–1922), British explorer, born in Kilkee, County Clare, Ireland. He sailed on merchant ships and later accompanied Scott in the Antarctic expedition of 1901–04. In 1908 he sailed from New Zealand on the *Nimrod*, in command of an expedition that reached a point only 100 miles from the South Pole. In 1914–1916 the second expedition of which he was commanding officer made an unsuccessful attempt to cross the Antarctic continent. In 1921 he again set out in the *Quest*, but he died of heart disease on board his ship near South Georgia Island. His writings include *South* and *The Heart of the Antarctic.*

Shafter, William Rufus (1835–1906), American army officer, born in Galesburg, Mich. He enlisted in a Michigan regiment in the Civil War and by 1864 had risen to the rank of colonel of volunteers. In 1866 he entered the regular army as lieutenant colonel, was promoted colonel in 1879 and brigadier general in 1897. In the Spanish-American War, as major general of a division of volunteers, he was placed in command of the land forces in Cuba. He fought with distinction at El Caney and San Juan Hill. He subsequently served in the department of California and retired in 1901.

Shaftesbury, Anthony Ashley Cooper, 1st Earl of (1621–83), British statesman, born at Winborne in Dorsetshire. He was educated at Exeter College, Oxford, and studied law at Lincoln's Inn. He entered the Short Parliament in 1640 and in 1654 supported the Cromwellian party. Later he rejoined the Royalists and Charles II made him chancellor of the exchequer in 1661. In 1672 he was created an earl and appointed lord chancellor. His conduct on the bench was able and impartial, but he lost his office and at once became one of the most powerful leaders of the opposition. In 1679 he became president of the Council and was instrumental in passing the Habeas Corpus Act. He entered into the plots of the Monmouth Rebellion and had to escape to Holland, where he spent his remaining years.

Shah Jahan (*c.* 1592–1666), Mogul Emperor of Delhi. He succeeded his father in 1627. He was an able administrator, and he greatly increased his own power and dazzled his subjects with architectural wonders created at his command. He founded the modern city of Delhi and built the beautiful Taj Mahal at Agra, a mausoleum for his favorite wife. In the new imperial palace he built the amazing *Peacock Throne,* said to have cost 33 million dollars.

SHAKESPEARE, WILLIAM (1564–1616), English poet and dramatist, born at Stratford-on-Avon, Warwickshire. His father John Shakespeare seems to have belonged by birth to the class of yeoman. His mother Mary Arden came of an old Warwickshire family. Of a family of four sons and four daughters born to them William was the third child. Shakespeare undoubtedly received all his education at the free grammar school at Stratford. At the age of 18 he married Anne Hathaway, some 8 years his senior. There were three children of the marriage: the son, Hamnet, died in childhood, but Susanne and Judith, the two daughters, survived their parents.

At the age of 22 Shakespeare went to London. No certain details have come down to us as to his earlier relations with the London theater. According to one tradition he was content at first to turn a penny by holding horses at the door. According to another Shakespeare graduated through the posts of actor and patcher of old scripts to the position of playwright, poet and part owner of the Globe Theatre. His first play, the three parts of *King Henry VI,* seems to have been produced in 1590, and from then until 1613 he produced at least one play every year. He was soon a favorite with the common people and the nobility. He had the approval of Queen Elizabeth and James, her successor. He spent more and more time in Stratford and in 1610 settled down there, although he continued to write for 3 years more. He seems to have had a comfortable fortune at that time. He died on his 53d birthday and was buried in Stratford churchyard.

He was essentially a man of noble character and was obviously of a most kindly and lovable disposition; his pleasurable wit and good nature made him delightful as a companion; and it was as "gentle Will Shakespeare" that he was familiarly known to his contemporaries. His collected works, as published today, contain 37 plays, 2 long poems and 154 sonnets, as well as other items of verse. The plays are divided into 17 comedies, 10 histories and 10 tragedies. The following are his best-known tragedies and comedies: *Macbeth, Hamlet, King Lear, The Merchant of Venice, A Midsummer Night's Dream, Romeo and Juliet, Love's Labor Lost, The Comedy of Errors, Two Gentlemen of Verona, As You Like It, Twelfth Night, Merry Wives of Windsor, Julius Caesar, Henry IV, Richard III, King John, Taming of the Shrew, Othello, Antony and Cleopatra, All's Well That Ends Well, Coriolanus, Measure for Measure, The Tempest, Winter's Tale, Timon of Athens* and *Cymbeline.*

Shaler, Nathaniel Southgate (1841–1906), American scientist and author, born in Newport, Ky., graduated from Harvard in 1862. He served 2 years as artillery officer in the Union army during the Civil War. He was professor of paleontology (1868–87) and afterward professor of geology at Harvard; from 1884 to 1906 he was geologist in charge of the Atlantic division of the U. S. Geological Survey. His works include *A first Book in Geology; Kentucky, a Pioneer Commonwealth; Sea and Land; American Highways; Features of Coasts and Oceans; Domesticated Animals: Their Relation to Man;* and *The Individual.*

Shaughnessy, Sir Thomas George, 1st Baron Shaughnessy of Montreal (1853–1923), Canadian railway president, born at Milwaukee, Wis. He entered the railway service in 1869, in the purchasing department of the Chicago, Milwaukee & St. Paul Railroad. In 1882 he became general purchasing agent of the Canadian Pacific Railway; in 1891 he became the vice-president and in 1898 its president. He received a knighthood in 1901 and was elevated to the peerage in 1916.

Shaw, Albert (1857–   ), American editor and writer, born in Shandon, Ohio, graduated from Iowa College in 1879. He received the degree of Doctor of Philosophy at Johns Hopkins University in 1884. Shaw began his professional career as an editorial writer on the Minneapolis *Tribune,* where he remained until 1888. After 3 years of study in Europe he returned home and helped to establish the *Review of Reviews,* which he edited until 1938. He became a member of numerous learned societies and delivered lectures in many universities and colleges. His writings include *Icaria—A Chapter in the History of Communism; Municipal Government in Continental Europe, The Outlook for the Average Man, The Business Career, Political Problems of American Development* and *Abraham Lincoln.*

Shaw, Anna Howard (1847–1919), American woman-suffrage leader, born in England.

She was brought to the United States in early childhood. She was graduated in theology from Boston University and was ordained a minister of the Methodist Protestant denomination. She preached in several churches in Massachusetts and became the chief lecturer and later president of the National American Woman Suffrage Association. Her book *The Story of a Pioneer* is the record of her work for the cause of woman suffrage. The year of her death saw the fulfilment of her hopes, for in 1919 the law that enfranchised women became effective.

Shaw, George Bernard (1856–), British playwright, born in Ireland. At the age of 20 he went to London to become a writer. He published a few novels, wrote musical criticisms for newspapers and began his work as a dramatic critic for the *Saturday Review* in 1895. In 1882 he had become a socialist and was active in the propagandist work of the Fabian Society, for which he wrote tracts. He gained recognition as a brilliant debater before he became known as an author. Shaw began to write for the stage, but *Mrs. Warren's Profession*, written in 1893, was banned until 1902. His *Candida* (1894) won success only in Germany. His first stage success in England was *Man and Superman* (1903); then followed *John Bull's Other Island, Major Barbara, The Doctor's Dilemma, Caesar and Cleopatra, Getting Married, Androcles and the Lion, Pygmalion, Arms and the Man* and others. Three of his greatest plays, *Heartbreak House, Back to Methuselah* and *Saint Joan*, were written after he was 60. *The Apple Cart* was produced in 1929 and *Too True to be Good* in 1932. Other late works, not plays, were *The Intelligent Woman's Guide to Socialism* and *The Black Girl in Search of God*. The plays have qualities that have come to be known as Shavian—wit, epigram and exaggeration for effect. Shaw received the Nobel Prize for literature in 1925.

Shaw, Henry Wheeler (1818–85), American humorist, known as *Josh Billings*, born in Lanesborough, Mass. He was a farmer and auctioneer in the West. In 1859 he began to write and in 1860 sent "An Essa on the Muel, bi Josh Billings" to a New York paper. It was reprinted in several comic journals and extensively copied. His most successful literary venture was his *Farmer's Allminax*, a travesty on the *Old Farmer's Almanac*. He began to lecture in 1863 and for the last 20 years of his life contributed regularly to the New York *World*.

Shaw, Thomas Edward, see *Lawrence, T. E.*

Shays, Daniel (1747–1825), American soldier and rebel, born in Hopkinton, Mass. He served as ensign at the battle of Bunker Hill and attained the rank of captain in the Continental army. There was a financial depression after the Revolution and much discontent among the farmers of western Massachusetts. Shays and his followers protested against what they considered excessive salaries paid to office holders, exorbitant taxes and administrative abuses. What is known in history as *Shays' Rebellion* started in 1786, when he headed 600 men, marched to Springfield, made a demonstration before the Supreme Court and forced a recess of that body. In 1787 he marched at the head of 2,000 men and tried to take several arsenals. Shays escaped after the insurrection had been put down and was pardoned in 1788.

Sheldon, Charles Monroe (1857–), American author, a native of New York state, educated at Brown University and Andover Theological Seminary. He became a Congregational minister; was pastor of the Central Congregational Church in Topeka, Kan., from 1889 to 1919; and was editor of *The Christian Herald* in 1920–25. His fame rests chiefly upon a novel based on Jesus Christ's teachings, *In His Steps* (1896). More than 23 million copies of this work have been distributed about the world. His other books include *Life Story, Let's Talk It Over, He's Here* and an autobiography published in 1925.

Shelley, Mary Godwin Wollstonecraft (1797–1851), English author. She married the poet Shelley as his second wife and accompanied him to Italy. While they were at Byron's villa on Lake Geneva, it was suggested that Byron, Shelley, Dr. Polidori and Mary should each write a ghost story. Mary's *Frankenstein*, published in 1818, is probably the best of all novels of terror. Mrs. Shelley's later writings included romances, biographies and several books on travel.

Shelley, Percy Bysshe (1792–1822), English poet, born in Sussex. He was shy and sensitive and was tormented by his schoolmates, who called him "mad Shelley." In 1808 he left school and after 2 years spent at home, was sent to Oxford. He wrote a pamphlet called *The Necessity of Atheism*, which he circulated during the second year of his college course and which led to his expulsion from Oxford. In 1811 he married Harriet Westbrook, but they were separated in 1814. She drowned herself in 1816, and 3 weeks later he married Mary Godwin. Six years afterward Shelley was accidentally drowned. In 1813 appeared his poem *Queen Mab*, which was printed only for private circulation. In 1818 he left England for Italy, and while at Rome he produced his two finest poems—the grand lyrical drama *Prometheus Unbound* and the tragedy *The Cenci*. His best-known shorter poems are "To a Skylark," "The Cloud" and "Ode to the West Wind." His "Adonais" is a lament for the death of John Keats.

Shepard, Helen Miller Gould, see *Gould, Helen Miller.*

Sheridan, Philip Henry (1831–88), American general, born in Albany, N.Y. He graduated from the U. S. Military Academy in 1853. At the outbreak of the Civil War he was made quartermaster of the Department of Missouri. Before the end of 1863 he had risen by merit to the rank of major general and had distinguished himself in many battles, including Murfreesboro, Chickamauga, Winchester, Chattanooga, Cedar Creek and Five Forks. Sheridan's hurried dash from Winchester to Cedar Creek, where he arrived in time to rally his disorganized force and pull victory out of almost certain defeat, won him a major generalship and the special thanks of Congress. It was the inspiration for the poem "Sheridan's Ride" by Thomas Buchanan Read. Sheridan became commander in chief in 1883, and in 1888 he became a general.

Sheridan, Richard Brinsley (1751–1816), British dramatist and politician, born in Dublin. He was educated at Harrow and studied law at the Middle Temple, London. In 1775 he produced *The Rivals* at Covent Garden, with great success. In 1777 he became part proprietor of Drury Lane Theatre, London, in which he produced *The School for Scandal*, and this also met with enthusiastic approval. Sheridan then turned to politics. He was elected to Parliament in 1780 and became foreign secretary in 1782. His part in the impeachment of Warren Hastings made his political reputation. His theatrical affairs met with disaster, and he died in poverty. He was buried in Westminster Abbey.

Sherman, James Schoolcraft (1855–1912), American lawyer and statesman, born in Utica, N.Y., graduated from Hamilton College in 1878 and admitted to the bar in 1880. He was mayor of Utica (1884), chairman of New York state Republican Convention in 1895 and again in 1900 and chairman of the national Republican Congressional Committee (1906–1909). He became a member of Congress from 1887 to 1891 and again from 1903 to 1909. He was elected Vice-President of the United States in 1908 on the ticket with William H. Taft. He was renominated for the same post in 1912, but he died before the meeting of the Electoral College, and the name of Nicholas Murray Butler was substituted for his on the defeated ticket.

Sherman, John (1823–1900), American statesman, born at Lancaster, Ohio, a brother of William T. Sherman. He was admitted to the bar in 1844, entering into law practice with his brother. He became an antislavery Whig, entered Congress in 1855 and continued in the House until 1861, the recognized leader of the Republican party. He was elected U. S. Senator and held that post from 1861 to 1897, with the exception of 4 years (1877–81), when he was secretary of the treasury, and 2 years (1897–98), when he served as secretary of state. The many important financial measures that he fostered include the Sherman Antitrust Act and the Sherman Silver Law.

Sherman, Roger (1721–93), American political leader and signer of the Declaration of Independence, born in Newton, Mass. He held the posts of justice of the peace, member of the lower house of the Connecticut legislature, common-pleas court judge, treasurer of Yale College, member of the state senate and mayor of New Haven. He was an important figure in the Continental Congress from 1774 to 1784 and in the Constitutional Convention in 1787, when he and his Connecticut colleagues helped compromise disagreements between the large states and the small states. He helped to draft the Declaration of Independence and the Articles of Confederation. In 1789 he entered Congress and later in that year took his seat in the Senate.

Sherman, William Tecumseh (1820–91), American general, born in Lancaster, Ohio. He was graduated from West Point in 1840 and received a commission as first lieutenant in the U. S. Army in 1841. During the War with Mexico he was promoted to the rank of captain. In 1861 he re-entered the army and distinguished himself at the battle of Shiloh and as major general in the siege of Vicksburg. He marched across the state of Mississippi, took command of the Army of Georgia, forced General Hood to evacuate Atlanta and captured Savannah and Charleston, from which point he moved north and, by cutting off the resources of General Lee, compelled the evacuation of Richmond and the surrender of General Lee to General Grant, April 9, 1865. His march through Georgia won him the bitter hate of Southerners and the high praise of military critics. He was appointed lieutenant general in 1866 and in 1869 became general and commander in chief. In point of daring originality of design, fertility of resource, brilliant strategy and untiring energy, General Grant pronounced him "the best field officer the war had produced." He retired from the command of the army of the United States in 1884.

Sibelius, Jean Julius Christian (1865–), Finnish composer, born at Tavastehus. He studied music in Helsingfors, Berlin and Vienna. He wrote a number of symphonies, symphonic poems, operas and concertos. His best-known compositions are full of the spirit of his own country, notably *Finlandia, Valse Triste, Oceanides* and *Carelia*.

Siddons, Sarah Kemble (1755–1831), British actress, born in Wales, the daughter of Roger Kemble, manager of a company of itinerant players. When she was 18, she married William Siddons, also an actor. In 1775 she made her first appearance in London, as Portia in *The Merchant of Venice*, but disappointed even her friends. She persevered, however, and next played at Drury Lane (1782) as Isabella in *The Fatal Marriage*. In 1785 she electrified audiences as Lady Macbeth, her greatest role, and in 1788 appeared as Queen Catherine in *Henry VIII*. Thenceforth her course was a continual triumph. She is now best remembered by Gainsborough's portrait of her.

Sidney, Sir Philip (1554–86), English author and statesman, born in Kent, educated at Oxford. He traveled in Europe on diplomatic missions, and upon his return home he became a favorite at the court of Elizabeth. She called him "the jewel of my dominions." He was ordered to go to the support of the Netherlands in their struggle against Spain and was killed at the battle of Zutphen. His literary contributions are *Arcadia*, written for the queen's entertainment, sonnets (*Astrophel and Stella*) and *Apologie for Poetrie*. Spenser dedicated *The Shepherd's Calendar* to Sidney.

Sienkiewicz, Henryk (1846–1916), Polish novelist, born in Lithuania, educated at the University of Warsaw. In 1876 he came to the United States and for a time, in company with Madame Modjeska and other Poles, lived in a Polish colony in California. He returned to Poland and in 1880 wrote *Tartar Slavery*. Later came a novel, *With Fire and Sword*. This was succeeded by *The Deluge, Pan Michael, Without Dogma* and *Children of the Soil*. His masterpiece, *Quo Vadis*, a tale of the time of Nero, has been widely translated. Later works include *The Knights of the Cross* and *Monte Carlo*. In 1905 he received the Nobel Prize for literature.

Sigsbee, Charles Dwight (1845–1923), American naval officer, born in Albany, N.Y. He graduated from the U. S. Naval Academy, and in the Civil War he saw service in the battle of Mobile Bay and in the attacks on Fort Fisher. He was in command of the battleship *Maine* when the *Maine* was blown up by a torpedo in Havana harbor, February 15, 1898. He commanded the battleship *Texas* in the Spanish-American War. In 1903 he received the rank of rear admiral. He wrote *Personal Narrative of the Battleship Maine* and a book on deep-sea sounding.

Simms, William Gilmore (1806–70), American writer, born in Charleston, S.C. He started his career as a lawyer but soon turned to literature; in 1827 *Lyrical and Other Poems* was published. His other writings are novels of frontier and southern life, including *The Yemassee, Kathleen Walton* and *Eutaw*.

Simpson, Sir James Young (1811–70), Scottish physician, born at Bathgate, Scotland. He studied medicine at the University of Edinburgh, graduated in 1832 and in 1840 began to teach obstetrics there. In this field he was the first to use anesthesia by ether during childbirth. He received many honors and was created a baronet in 1866.

Sims, William Sowden (1858–1936), American naval officer, born in Canada. He moved to the United States in his early youth, settled in Pennsylvania and from that state was appointed to the U.S. Naval Academy, from which he was graduated in 1880. He served in the North Atlantic for 8 years and thereafter was stationed in various parts of the world. In 1909 he became commander of the *Minnesota* and 2 years later was promoted to captain. During the World War he commanded the U.S. fleet in European waters and reached the rank of admiral. He was president of the Naval War College in 1917, left the post when he was appointed to European sea duty and returned to it after the war. For his work in the war he received decorations from all the Allied governments. In 1921 he published *Victory at Sea.*

Sinclair, Upton (1878–), American writer and Socialist, born in Baltimore, educated at the College of the City of New York and Columbia University. He became a prominent Socialist and from time to time was active in experimental communities, such as the Helicon Home Colony (1906) at Englewood, N.J. He ran for Congress twice on the Socialist ticket—in New Jersey in 1906 and in California in 1920; he also sought election to the United States Senate in 1922. His writings have had considerable influence, notably *The Jungle,* which exposed conditions in the stockyards and *The Brass Check,* attacking evils in journalism. Among his novels are *King Midas, Oil* and *King Coal.* His EPIC (End Poverty in California) platform failed to win the election after he was nominated for governor of California in 1934.

Sitting Bull (*c.* 1837–90), American Indian leader, born in what is now North Dakota. He succeeded his father as chief of the Sioux, after distinguishing himself in plains warfare. He first came to the attention of the whites when he raided Fort Buford in 1866. For 10 years he was a menace to westward migration. In 1876 General Sheridan headed an expedition against him; in the campaign Sitting Bull massacred Custer and his men. He escaped to Canada but returned to surrender in 1881. He still urged opposition to white invasion, was again captured and was killed when he tried to escape.

Skeat, Walter William (1835–1912), English philologist, born in London, graduated from Christ's College, Cambridge, in 1858. In 1878 he became professor of Anglo-Saxon there. He was the first director of the English Dialect Society, established in 1873, which later published the *English Dialect Dictionary.* Skeat contributed more than any scholar of his time to a sound knowledge of middle English and English philology generally. His works include editions of *Piers the Plowman,* Barbour's *Bruce,* Chaucer's *Treatise on the Astrolabe,* a famous *Etymological English Dictionary* and *Principles of English Etymology.*

Skinner, Otis (1858–1938), American actor, born in Cambridge, Mass. He played in amateur theatricals and later became a professional monologuist; the first play in which he appeared was *Woodleigh,* staged in Philadelphia, 1877. He had important roles with Booth, Modjeska, Barrett and Daly. His later plays include *Kismet, Sire, A Celebrated Case, The Honor of the Family* and sundry character sketches in dialect, such as *Mr. Antonio.* His daughter Cornelia Otis Skinner (1901–) was a famous monologuist.

Slidell, John (1793–1871), American statesman, born in New York city, graduated from Columbia College. He was a successful lawyer in New Orleans and was elected to the U.S. House of Representatives in 1843. He entered the U.S. Senate in 1853 but resigned in 1861. He represented the South in France during the Civil War. He and James M. Mason, the Confederate minister to England, sailed for Europe in a British ship, the *Trent.* They were captured on the high seas by Captain Wilkes of the Navy, and both were carried as prisoners to the United States where they were confined in Fort Warren. On the demand of England they were released, with apologies, and proceeded on their missions. After the war Slidell lived in England.

Smetana, Friedrich (1824–84), Bohemian composer. He began to make public appearances as a pianist when 6 years of age. In 1856 he became Philharmonic conductor in Gothenburg, Sweden, and was conductor in the National Bohemian Theatre from 1866 until approaching deafness caused his retirement. His compositions were full of the spirit of his native country. Among his musical numbers were scores for the operas *The Bartered Bride, Dalibor, The Secret,* and *The Devil's Wall.* He wrote a number of symphonic poems and some string quartets.

Smiles, Samuel (1812–1904), Scottish writer, born in Haddington. He completed a medical course in Edinburgh at the age of 20 and began to practice, first in his home town, then across the border at Leeds, where he later became a newspaper editor. His writings include *Self-Help, Thrift, Character* and *Duty;* these books sell remarkably well even today. Others are *Life and Labour* and the *Lives of the Engineers,* notably a biography of George Stephenson, whom Smiles knew personally.

Smith, Adam (1723–90), Scottish economist, born at Kirkcaldy and educated in the universities of Glasgow and Oxford. He became professor of moral philosophy at Glasgow in 1751 and published his *Theory of the Moral Sentiments* in 1759. His *Wealth of Nations* (1776), the first scientific exposition of the principles of political economy, had a wide influence and has been translated into many languages. It recommended freedom of trade and circulation of gold as the bases of national prosperity and influenced England in making commercial treaties.

Smith, Alfred Emanuel (1873–), American statesman, born in New York city of Irish parentage, educated at a parochial school. He entered politics in 1895. In 1903 he was elected to the New York Assembly as a Democrat and became speaker in 1913. He was elected sheriff of New York in 1915 and in 1918 became governor of the state. He lost the 1920 election for governor but won in 1922, 1924 and 1926. In 1924 he divided honors with W. G. McAdoo as Democratic choice for President; John W. Davis was nominated to break the deadlock. He was nominated for President in 1928, but he was defeated by Herbert Hoover in the election. It was generally thought that there were two important reasons for his defeat: his religious affiliations as a Roman Catholic and his advocacy of the repeal of the prohibition amendment. He was a candidate for the presidential nomination again in 1932 but was defeated in the convention by Franklin D. Roosevelt. Smith continued to be an important figure in national politics and in Tammany Hall.

He was urged to run for mayor of New York city and for U.S. Senator. Instead, he headed a company of financiers that built the Empire State Building, and Smith became president of the controlling corporation. In 1936 he became an opponent of President Roosevelt's New Deal policies.

Smith, Francis Hopkinson (1838–1915), American painter, novelist and engineer, born in Baltimore. He started his career as an ironworks employee, then became an engineer after a period of special study. He constructed a sea wall around Governor's Island, in New York Bay, and another on Staten Island; he built the foundation for the Statue of Liberty, in New York harbor, and a lighthouse at New London, Conn., on Long Island Sound. His art included much work in charcoal and water colors. His writings reflect the old South. He is especially well-known for his novel *Colonel Carter of Cartersville.* Books he illustrated himself include *Gondola Days* and *Old Lives in New Black and White.*

Smith, Goldwin (1823–1910), English author and educator, born in Reading and graduated from Magdalen College, Oxford. He was called to the English bar in 1847 and later taught history at Oxford. He came to the United States in 1864, anxious to support the cause of the Union in the Civil War; he later taught English and history at Cornell. He lived in Canada from 1871 until his death. His works include, *Irish History and Irish Character, Lectures on Modern History, Shakespeare, the Man, In the Court of History, My Memory of Gladstone, Labor and Capital* and numerous magazine articles.

Smith, Captain John (1580–1631), English adventurer and colonist, founder of Virginia, born in Lincolnshire, England. He had many adventures as a soldier of fortune in Europe, Asia and Africa. In 1606 he joined an expedition which sailed from England to found a colony in Virginia. He was captured by Powhatan's Indians on one of his journeys into the country for corn. His life was saved by the chief's daughter Pocahontas. On his return to Jamestown he found the colony reduced to about 40 men, who were anxious to return to England but were induced by Smith to remain until others arrived. He then explored the coasts of Chesapeake Bay in two voyages and made a map of the country. In 1614 he explored the coast of New England and undertook the founding of a colony in New England in 1615, but his vessel was captured by a French warship, and he was carried to La Rochelle. After his escape he wrote an account of his voyages.

Smith, Joseph (1805–44), founder of the Mormon sect or the Church of the Latter-day Saints, born in Vermont. During a religious revival he declared that he had seen a vision in which he was ordered not to join any church but to await further guidance. According to his account, he was led to discover hidden gold plates on which were inscribed the tenets of a new religion. He translated the inscriptions and announced them as *The Book of Mormon.* He became leader of the Church of Latter-day Saints, commonly called *the Mormons,* in 1830 at Fayette, N.Y. Missionaries were sent out; one of the early converts was Sidney Rigdon of Mentor, Ohio. With Smith he greatly enlarged the new faith and built a Mormon community at Kirtland, Ohio. The sect spread to Nauvoo, Ill., where the legislature granted Smith almost unlimited power. The town was Mormon governed, and a temple was designed. By this time Brigham Young had become one of Smith's ablest leaders.

A rumor was circulated to the effect that Mormonism was about to declare in behalf of polygamy. The anti-Mormons in the community rose in arms. Smith and his brother Hyrum and other leaders were arrested (June 25, 1844) and taken to Carthage for safety. Two days later a mob stormed the jail and shot Smith and his brother. Brigham Young then became leader.

Smith, Sydney (1771–1845), English journalist and clergyman, born in Essex, and educated at Oxford. He entered the ministry of the Church of England and from 1831 until his death was a canon in St. Paul's Cathedral, London. He was one of three who in 1802 founded the *Edinburgh Review,* and was one of its most influential contributors. Author of many works, he was noted for his wit and his humane toleration. He vigorously championed the removal of the civil disabilities of Catholics at a time when such advocacy of an unpopular cause was injurious to his career.

Smithson, James Macie (1765–1829), English physicist, born in France, educated at Oxford. He was elected a fellow of the Royal Society in 1790 in recognition of his discovery of an ore of zinc (zinc carbonate), which was named smithsonite. The Smithsonian Institution in Washington, D.C., was founded under the provisions of his will. The bequest amounted to $600,000.

Smollett, Tobias George (1721–71), British author, born in Dumbartonshire, educated at the University of Glasgow. He became a surgeon but was unsuccessful and soon took up a literary career. His writings were many and varied. In 1748 he published *Roderick Random,* based upon his adventures as a ship's surgeon. Then followed *Peregrine Pickle, Ferdinand Count Fathom,* a *History of England, The Adventures of Sir Launcelott Greaves, Travels in France and Italy* and *The Expedition of Humphrey Clinker.*

Smuts, Jan Christiaan (1870–), South African statesman, born in Cape Town, educated at Cambridge University. He became a lawyer, practicing first at Cape Town and later at Johannesburg, where he became state attorney under Kruger in the Transvaal republic. In the South African War (1889–1902) he supported the cause of the Boers and rose to high military command. After the war he took a prominent part in unifying the South African colonies, which was accomplished in 1910. During the World War he commanded operations in East Africa. His memorandum on the League of Nations became in substance the Covenant of the League. He was prime minister of the Union of South Africa from 1919 to 1924 and in 1933. He was interested in botany and philosophy and wrote *Holism and Evolution.*

Snorri Sturluson (1179–1241), Icelandic poet and historian. He traced his descent from the kings of Norway and early studied their history. He made a collection of sagas called the *Heimskringla* (Ring of the World) in which are interspersed songs of his own composition. Snorri became chief judge of Iceland, but his ambitious and intriguing character led to his assassination. He is honored as the composer of the *Prose Edda,* one of the greatest examples of Icelandic literature.

Snowden, Philip, 1st Viscount (1864–1937), British statesman, born in Yorkshire. He entered the Civil Service in 1886 and held various administrative posts until 1893, when he entered politics. In 1891 he had been permanently crippled in a bicycle accident. He joined the Independent Labour party in 1893 and was its chairman in 1903 and 1917. From 1906 to 1932 he was a Labour member of Parliament. He was an authority on financial matters and became chancellor of the exchequer under Ramsay MacDonald in 1924 and again in 1929. When the Coalition (National) government was formed in the critical days of 1931, he remained in charge of finance and was responsible for England's going off the gold standard. In 1932 he resigned and was created a peer. He wrote *Socialism and the Drink Question, Socialism and Syndicalism, The Living Wage, Labour and Finance* and *Labour and the New World.*

SOCRATES (469–399 B.C.), Greek philosopher, born at Athens. His father, Sophroniscus, was a sculptor, and he followed the same profession in the early part of his life.

He had the usual education of an Athenian citizen, which included not only readings in the Greek poets, but also the elements of arithmetic, geometry and astronomy, as then known. Little is known of his life except in connection with his philosophical studies.

He served as a foot soldier, but about the middle period of his life he gave himself up to the career that made him famous. He gathered around him a number of pupils, the two most famous being Xenophon and Plato. He taught that self-knowledge is more important than speculation about the universe; that truth and virtue are inseparable and that vice arises from ignorance.

Early in the morning he frequented the public walks, the gymnasia for bodily training and the schools where youths were receiving instruction. He was to be seen in the market place at the hour when it was most crowded, among the booths and tables where goods were exposed for sale. He talked with anyone, young or old, rich or poor, who addressed him in the hearing of all who stood by. He was accused of corrupting the youth of Athens and was condemned to death by drinking hemlock. His defense is preserved by Plato, under the title of the *Apology of Socrates.* Socrates was not a writer, and what we know of his teaching was recorded by his pupils, Xenophon in his *Memorabilia* and Plato in his *Dialogues,* in most of which Socrates is the chief speaker. He was grotesquely ugly in face and feature and was henpecked by his shrewish wife Xantippe.

Solon (*c.* 639–559 B.C.), Athenian lawgiver, born at Salamis of a family of ancient royal lineage. He engaged in commerce, traveled extensively and then devoted himself to public affairs. He first gained fame by winning Salamis back to Athens and more than once exercised unusual administrative powers. Solon was made chief magistrate and was entrusted with the writing of a new constitution and the compilation of a legal code. He divided the population into four classes according to their means, each class having definite duties. If fragmentary history can be relied upon, he then left Athens for 10 years to see how the constitution would work. At the end of that time he returned to find the government in the hands of the tyrant Pisistratus. Solon left again and lived in Cyprus until his death.

Solyman or **Suleiman** (*c.* 1496–1566), Turkish sultan known as *The Magnificent.* In 1521 he marched into Hungary and captured Belgrade. In 1522 he drove the knights of St. John from Rhodes and then for a few years settled down to improve his realm. He did much to encourage learning and the arts. In 1526 he again invaded Hungary and won an overwhelming victory at Mohacs that is still remembered in Hungarian songs and folk tales. He continued to drive to the north and also made conquests in northern Africa, bringing the Barbary states under his control. By 1547 Solyman had conquered a large part of Hungary and surrounding territory. A brilliant naval victory in 1561 over the Knights of Malta and their allies, the Spaniards, and an expedition to Hungary in 1566 were the chief events of the remainder of his reign. Solyman lifted the Ottoman Empire to the peak of its power.

SOPHOCLES (*c.* 496–406 B.C.), Athenian dramatist, born at Colonos, near Athens. He received a good education. He was 15 when the battle of Salamis was fought, and for his remarkable beauty and his skill in music he was chosen to lead the chorus that sang in celebration of victory.

His first appearance as a dramatist was in 468 B.C. when he had Aeschylus for his rival and won the victory. Of the next 28 years of his life nothing is recorded; but it is known that he made poetry his vocation and that he composed a great many plays.

The *Antigone,* the earliest of his extant tragedies, was brought out in 440 B.C. and won the prize. The number of plays attributed to him was 113, of which 81 were probably produced after the *Antigone.* Seven only are extant: *Antigone, Electra, Trachinian Women, King Oedipus, Ajax, Philoctetes,* and *Oedipus at Colonus.* He carried Greek drama to its highest perfection and greatly changed the accepted forms in which drama was presented.

Sophocles lived to be nearly 90 and in his last years wrote the *Oedipus at Colonus,* which was not presented on the stage until 5 years after his death.

Sothern, Edward Hugh (1859–1933), American actor, born in New Orleans and educated in England. In 1879 he made his first stage appearance in a small part at Abbey's Park Theater, New York. Later he starred with his own company in *Lord Chumley, An Enemy to the King, The Adventures of Lady Ursula, The Son of the Sword, The Sunken Bell, Hamlet, Richard Lovelace* and *If I Were King.* In 1904 he began to produce Shakespeare's plays with Julia Marlowe, whom he married in 1911.

Sousa, John Philip (1854–1932), American conductor and composer, born in Washington, D.C. From early youth he devoted himself to music; at 17 he was already a conductor and when he was 26 he was bandmaster of the U. S. Marine Corps. He left this post in 1892 to organize his own band, and with it he toured the United States, Canada, Great Britain, Ireland and most of the countries of Europe. His compositions consist of military marches, light operas, waltzes, songs and symphonies. The most popular marches are *Stars and Stripes Forever, Washington Post March, El Capitan* and *Semper Fidelis.*

Southey, Robert (1774–1843), English writer, born at Bristol, educated at Westminister School and Oxford. He was intimately associated with Coleridge and Wordsworth. In 1795 Southey traveled in Spain and Portugal and returned to England to settle permanently in the Lake District. He became poet laureate in 1813. His chief poetical works are *Madoc, Thalaba, The Curse of Kehama* and *Don Roderick.* Today he is better appreciated for his prose, notably his *Life of Nelson, History of Brazil* and *History of the Peninsular War,* although a few shorter poems such as "The Inchcape Rock" and "Blenheim" have retained their popularity.

Sparks, Jared (1789–1866), American historian, born at Willington, Conn. He graduated at Harvard in 1815, later studied theology and settled as a Unitarian minister at Baltimore. In 1823 he became proprietor and editor of the *North American Review.* He was 10 years a professor at Harvard and for 4 years president. His writings include *Life of John Ledyard* and *Life of Gouverneur Morris.* Among the works edited by him were: the *Writings of George Washington,* 12 volumes; *The Diplomatic Correspondence of the American Revolution,* 12 volumes; and *The Works of Benjamin Franklin,* 10 volumes.

Spartacus (1st century B.C.), leader of an uprising of Roman slaves, born in Thrace. He became a shepherd. Later he was taken by the Romans and trained as a gladiator, but he escaped from Capua and joined a band of slaves. He soon became their leader; under his direction they started on a career of plunder, in which much of Italy was devastated. Several Roman armies were sent against them, but the Spartacists maintained themselves for 2 years (73–71 B.C.). Spartacus was finally killed in the battle in Calabria, near Strongoli, and 6,000 of his followers captured by the Roman generals Crassus and Pompey were crucified.

Speaker, "Tris" (Tristram; 1888–), called *Tris,* born at Hubbard City, Tex. He was a brilliant, hard-hitting outfielder, with a lifetime batting average of .345 for his 2,789 games. He was manager of the Cleveland Indians (1919–27).

Spemann, Hans (1869–), German scientist. His discovery that frog's eggs could be developed by chemicals is recognized as a great achievement. He received the Nobel Prize for medicine in 1935.

Spencer, Herbert (1820–1903), English philosopher, born at Derby. He was educated at home by his father, who was a schoolmaster and also secretary of the Philosophical Society. From 1831 to 1846 he was engaged in engineering, but in 1848 he became subeditor of *The Economist.* His first important book, *Social Statics,* appeared in 1850. Spencer's philosophy applied a sort of evolutionary process to all phases of life. Every structure in nature, he said, divides itself by entering into relationships with other structures, but all the divisions come together again in new and better form. Therefore man's ideas, as well as man's body, have been continuously adapting themselves to surroundings, and only the best survive in the long run. Thus as time goes on man's mind and morals improve. These theories and others he explained in his books: *First Principles, Principles of Biology, Principles of Psychology, Principles of Sociology* and *Principles of Ethics.* With T. H. Huxley he helped to bring about popular acceptance of Darwin's theory of evolution.

His other works include *Education, Essays, Scientific, Political and Speculative, Classification of the Sciences, The Study of Sociology, Man Versus the State, Facts and Comments* and an *Autobiography.* He also published an elaborate *Descriptive Sociology* compiled by other writers but classified and arranged by himself.

Spengler, Oswald (1880–1936), German philosopher, born at Blankenburg. He studied extensively in many fields—science, history, philosophy and the arts. In his writings he is able to show unexpected parallels in widely separated subjects. Spengler held that every civilization or culture passes through a cycle from youth through maturity and finally to death. His belief that western civilization is approaching its end is set forth in *The Decline of the West.* Among his other works are *Man and Technics* and *The Hour of Decision,* which upholds and lauds the old German militaristic ideals.

Spenser, Edmund (*c.* 1552–99), English poet, born in London of humble parentage. He spent 7 years at Cambridge University on a grant from a charitable fund. The earl of Leicester and Sir Philip Sidney became his patrons. In 1579 Spenser published *The Shepherd's Calendar;* it was hailed as marking a new epoch in English literature. He received a secretaryship under the lord lieutenant of Ireland and, apart from a few visits to England, spent the rest of his life in Ireland. He is best remembered for his *Faërie Queene.* He intended it to be a narrative poem in 12 books, in which 12 knights were to embody as many great moral qualities; however, only 6 books were completed. Spenser introduced a new form of verse in the *Faërie Queene,* known as the Spenserian stanza. Among his other works are *Colin Clout, Complaints* and *View of the Present State of Ireland.* He was buried in Westminster Abbey.

SPINOZA, BARUCH (1632–77), Dutch-Jewish philosopher, born at Amsterdam. His first serious studies were of the Bible and the Talmud, but he could not accept their teachings fully. He made no secret of the doubts that grew up in his mind and was exposed to much persecution because of them. He was at last excommunicated from the Jewish synagogue and, driven from Amsterdam, lived for a time near Leyden and afterward at The Hague. He devoted himself wholly to philosophy, earning a living by polishing glasses for optical instruments.

His aim was to build on the knowledge of God as a foundation a system of morals by a rigorously mathematical method. Everything in the universe, he said, works by the interaction of one part on another. Human lives and actions are entirely directed by the influences of other humans and things. Therefore there is no free will and no such thing as choice or chance. His influence on the mind of Goethe was overpowering.

Spinoza embodied his ideas in his *Ethics* and other works published after his death.

Spreckels, an American family of sugar refiners, bankers and civic reformers. The head of the house in America was Claus Spreckels (1828–1908), a native of Darmstadt, Germany. He emigrated to the United States at the age of 18 and settled in San Francisco. He established a small sugar refinery that grew to such proportions that he became known as the sugar king. Sugar cane was imported from Hawaii, where he owned huge plantations. Spreckels invented several new processes of refining.

His son, Rudolph Spreckels (1872–), became president of the business in Hawaii. Later he spent much time in California and became interested in a crusade against dishonesty in public office. He financed a graft investigation in San Francisco in 1906 that resulted in the elimination of corporation control from the government of the city and the state.

Staël, Madame de (Anne Louise Germaine de Staël-Holstein; 1766–1817), French writer, born in Paris, the daughter of Jacques Necker, who was Louis XVI's finance minister. She married Baron de Staël-Holstein in 1788. Her first published work was *Letters on the Works and Character of Rousseau.* She was compelled to leave France during the Revolution and wrote a defense of Marie Antoinette. She gathered the materials for the novel *Corinne* in Italy. Her *De l'Allemagne,* a description of the habits, literature and political tendencies of the German people, was printed in Paris in 1810, but by the order of Bonaparte was immediately suppressed. Soon afterward she visited England, where she wrote *Ten Years of Exile,* denunciation of Bonaparte and his arbitrary rule. Her other writings include *Delphine* (a novel) and *Thoughts on the French Revolution.* She died in Paris.

Stalin, Joseph Vissarionovitch (Joseph Dzugashvili; 1879–), Russian statesman, born in a mountain village in Georgia in the Caucasus, the son of a poor cobbler. He was expelled from the Theological Seminary at Tiflis for his radical political views. He joined the Social Democrats in Russia and started a revolutionary agitation in Georgia. For 10 years he wandered over Russia spreading propaganda and organizing strikes. This led to frequent imprisonments in Siberia, from which he managed to escape. He directed the Bolshevik campaign of 1913 in the Duma, though he was not himself a member. During the Revolution he became general secretary of the Central Committee of the Russian Communist party and on Lenin's death (1924) succeeded him as dictator. When he was opposed by Trotzky in a struggle for power he was ruthless; Trotzky was banished, first to Siberia and then to Constantinople. Stalin gained power by making himself popular with the young people of Russia and by his spectacular devices for speeding up the modernization of Russia, such as the 5-Year Plan.

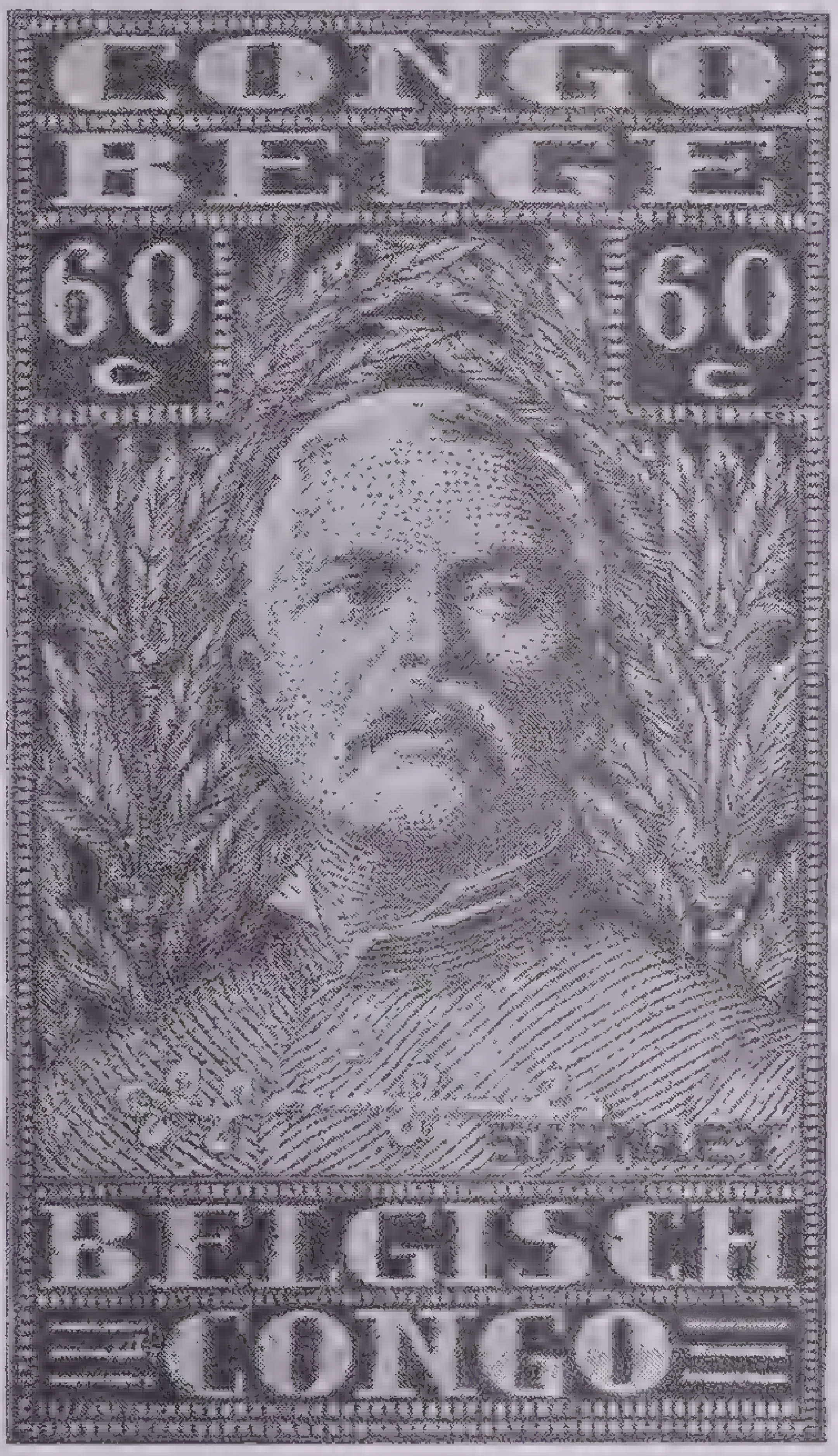
Stallings, Laurence (1894–), American playwright, born at Macon, Ga., educated at Wake Forest College and Georgetown University. He entered newspaper work and then served in the World War. His war experiences were the basis for the play *What Price Glory,* which he wrote with Maxwell Anderson and which was a sensational success when produced in 1924. Other plays are *The Buccaneer* and *First Flight.* Stallings wrote a novel, *Plumes,* about the World War and edited a book of photographs, *The First World War.* Later he became an executive in the motion picture industry.

Standish, Myles (1584–1656), English colonist, born in Lancashire. He joined the army and so distinguished himself in a war in Holland that he was made a lieutenant when very young. He joined the Pilgrims and came to America in the *Mayflower* in 1620. He was one of the founders of the colony of Massachusetts. Chosen military leader of the settlers, he led them in several fights with the Indians. He was sent to England on a mission for the colony and on his return became one of the settlers of Duxbury, Mass., where he was made a magistrate and held the post for the rest of his life. In the *Courtship of Miles Standish* Longfellow tells of an incident in his life.

Stanford, Leland (1824–93), American railroad builder, born at Watervliet, N. Y. In 1852 he went to California and became a merchant in San Francisco. He served as governor of California (1861–2) and was one of the builders and presidents of the Central Pacific Railroad. From 1885 to 1893 he was in the U. S. Senate. He gave a large sum for the founding of Stanford University, as a memorial to his son.

Stanhope, Lady Hester Lucy (1776–1839), English traveler, born in London. She was private secretary to her uncle, William Pitt. After his death she left society and in 1810 she went to live on Mt. Lebanon. She became a powerful figure among the Arabs, who regarded her as a prophetess.

Stanley, Sir Henry Morton (John Rowlands; 1841–1904), African explorer, born near Denbigh, Wales. He came to the United States in 1859 to work for a New Orleans merchant named Stanley, whose name he took. He fought in the Confederate Army and after the war became a newspaper correspondent. The New York *Herald* sent him to find the English explorer, David Livingstone, lost in Central Africa. He reached Zanzibar early in 1871, organized a large expedition and found Livingstone on November 10, 1871. In 1874 he set out on a second African expedition for the New York *Herald* and the *London Daily Telegraph.* He reached Victoria Nyanza in February 1875 and was the first to circumnavigate the Lake. He also discovered the Shimeeyu River. In 1879–84 he helped develop the Congo Free State. Near the close of 1886 Stanley, under the auspices of the Egyptian Government and of English societies and individuals, undertook an expedition for the relief of Emin Pasha. He wrote *How I Found Livingstone, Through the Dark Continent, Congo and the Founding of Its Free State* and *In Darkest Africa.* He was a member of Parliament (1895–1900) and was knighted (1899).



Courtesy Scott Stamp & Coin Company

Sir Henry Morton Stanley

Enlarged from a postage stamp issued in 1928 to commemorate the English explorer and the founding of the Belgian Congo

Stanton, Edwin McMasters (1814–69), American statesman, born in Steubenville, Ohio. He practiced law in Pittsburgh (1847–57) with great success and then moved to Washington, D.C. He served as attorney general in President Buchanan's Cabinet and in 1862 was invited by Lincoln to become secretary of war. He was against slavery although he upheld state rights. During the war he ably discharged his duties as secretary, although his strong individualism often brought him into conflict with other leaders. Lincoln's tact and management drew out Stanton's best qualities and prevented disruption that might otherwise have arisen from Stanton's pugnacious personality. After Lincoln's assassination he continued in office and often clashed with President Johnson. When Stanton refused to resign he was suspended; this led to Johnson's impeachment. Congress reinstated Stanton; when the President was acquitted, Stanton retired.

Stanton, Elizabeth Cady (1815–1902), American suffragist and reformer, born in Johnstown, N.Y. She married Henry B. Stanton, an antislavery advocate. Mrs. Stanton was one of the organizers of the first woman-suffrage convention, held at Seneca Falls, N. Y., in 1848. From 1865 to 1893 she served as president of the National Woman's Suffrage Association. She wrote her autobiography and a history of the movement to which she had devoted her life.

Stark, John (1728–1822), American soldier, born at Londonderry, N.H. At Bunker Hill he was colonel of a regiment in which he had enlisted. On August 16, 1777, he fought the Battle of Bennington, which brought him the thanks of Congress and the rank of major general. He cut off Burgoyne's retreat from Saratoga, and, after serving in Rhode Island and New Jersey, had charge, in 1781, of the northern department, with headquarters at Saratoga.

Stead, William Thomas (1849–1912), English journalist, born in Northumberland. He is best-known as the founder and editor of *Review of Reviews.* His writings include *If Christ Came to Chicago, The United States of Europe, Her Majesty the Queen, Satan's Invisible World, A Study of Despairing Democracy* and *The Americanization of the World.* He died in the *Titanic* disaster.

Stedman, Edmund Clarence (1833–1908), American poet and critic, born at Hartford, Conn., educated at Yale. From 1852 to 1855 he edited newspapers in Connecticut, then was on the staff of the New York *Herald* until 1861. During the Civil War he was a correspondent for the New York *World.* He purchased a seat on the New Stock Exchange in 1869 and held it until 1900.

Among his books are *The Blameless Prince, Lyrics and Idyls, The Nature and Elements of Poetry, Alice of Monmouth, Mater Coronata, Victorian Poets* and *Poets of America.* He edited the *Victorian Anthology, An American Anthology, The Works of Edgar Allan Poe* and *A Library of American Literature.*

Steele, Sir Richard (1672–1729), British playwright and essayist, born in Dublin, educated at Oxford. He was an army officer from 1694 to 1700. His early writings include *The Funeral or Grief a la Mode, The Lying Lover* and *The Tender Husband.* In 1709 he founded the famous *Tatler;* it was followed by the *Spectator* and the *Guardian,* Addison co-operating in all. Steele was elected to Parliament in 1714 but soon was expelled for libelous utterances in a pamphlet called *The Crisis.* His best play is *The Conscious Lovers.*

Steen, Jan (1626–79), Dutch painter, born in Leyden and educated at the university there. He brought sympathy and a sense of humor into his canvases showing family scenes of everyday life. His best-known works are *The Rustic Wedding, Saint Nicholas Day, The Marriage Contract, The Painter's Family, The Oyster Party, Twelft Night, A Merry Company* and *Bad Company.*

Stefansson, Vilhjalmur (1879–), Arctic explorer, born at Arnes, Canada, of Icelandic parentage. He graduated from the University of Iowa, then studied anthropology and theology at Harvard. He began his explorations with an archeological trip to Iceland in 1904, undertaking another for Harvard in 1905. On one Arctic expedition (1908–12) he discovered a tribe of blonde Eskimos that had never seen a white man. He commanded a Canadian expedition to the Arctic (1913–18), and in 1924 he penetrated the northern territory of Australia. Stefansson Strait, named in his honor, separates the Antarctic Archipelago from Hearst Land in Antarctica. He is the author of *The Friendly Arctic* and *The Folklore of the Eskimos.*

Steffens, Lincoln (1866–1936), American editor and author, born in San Francisco, educated at the University of California and in Germany and France. He returned to enter newspaper work in New York and was later an editor on several magazines. He traveled about the country investigating municipal corruption and reporting his findings in magazines and books. Later he was associated with radical political movements. Among his books are *The Shame of the Cities, The Least of These, Moses in Red* and an interesting autobiography.

Stein, Gertrude (1872–), American author, born in Allegheny, Pa., and educated at Radcliffe. After 1903 she spent most of her time in Paris, where she associated with authors, composers and painters. Her writings, whether poetry or prose, called forth a great deal of comment. They were applauded as being a new form of expression and condemned as being meaningless. Among the titles are *Useful Knowledge, The Making of Americans* and *Portraits and Prayers.* Her play *Four Saints in Three Acts* was produced in 1934.

Steinmetz, Charles Proteus (1865–1923), American electrical engineer, born in Breslau, Germany. He studied at Breslau, Zurich and Berlin, became involved in political troubles and went to the United States in 1889. In 1893 he became a consulting engineer with the General Electric Company and continued there until his death. His many contributions to the field of electricity marked him as a genius, particularly in the mathematics of engineering. He devised a metallic electrode arc lamp and an induction regulator. In the hope of developing a lightning arrester, he produced a bolt of artificial lightning of 1,000,000 horsepower. He was professor of electrical engineering at

Union College, Schenectady, from 1902 to 1913.

Stendhal (Marie Henri Beyle; 1783–1842), French novelist and biographer, born in Grenoble. He admired Napoleon greatly and served under him in several campaigns. Later he was involved with Italian revolutionary movements and was banished from Italy. He is best-known today for two novels, *The Red and the Black* and *The Chartreuse of Parma.* He wrote biographies of Haydn, Mozart, Napoleon and Rossini besides art criticism and travel sketches.

Stephens, Alexander Hamilton (1812–83), American statesman, born in Georgia, educated at the University of Georgia. He became a lawyer in 1834, entered politics and in 1843 was sent to Congress, where he served continuously in the House of Representatives until 1859. Stephens opposed Georgia's secession but gave up his stand when a majority favored the move, and he became Vice-President of the Confederate States. He opposed the policies of President Jefferson Davis, and before the close of the Civil War he left Richmond, the capital city. Shortly after the war, he was elected to the U. S. Senate but was not allowed to take his seat. Later he served in the House of Representatives and was governor of Georgia.

Stephens, James (1882–), Irish poet and novelist, born in Dublin. He was a clerk in Dublin when his first book, *A Crock of Gold,* appeared. It was a collection of delightful fairy stories. His work throughout is full of delicate and fanciful imagery. Other books of verse are *Insurrection, The Hill of Vision* and *Strict Joy.* Among the prose titles are *The Charwoman's Daughter* and *The Demigods. Here are Ladies* and *Etched in Moonlight* are collections of short stories.

Stephenson, George (1781–1848), British engineer, born in Northumberland. At the age of 14 he joined his father in his work as fireman in a colliery. There he acquired a large amount of sound practical knowledge of mechanics. He added to his income by mending boots, clothes and cleaning clocks.

In 1812 he was appointed engineer at the colliery, at a salary of $500 a year. Soon afterward he built his first locomotive for use on colliery railroads.

In 1821 he constructed the Stockton and Darlington Railway. From that time improvement followed on improvement not only in the form of the locomotive but also in the rails and other equipment. Finally a complete railway system was developed under Stephenson's supervision, and the Liverpool and Manchester railways opened in 1830. Stephenson became one of the most popular men of science in Europe. Later he served as consulting engineer on railways in Spain and Belgium.

Stephenson, Robert (1803–59), British engineer, son of George Stephenson. He learned engineering in the same Northumberland colliery in which his father had been employed, and joined him in the manufacture of locomotives. He formed the firm of Robert Stephenson & Company to build locomotives and bridges. He constructed the Victoria Bridge across the St. Lawrence River at Montreal, the Britannia Tubular Bridge across the Strait of Menai, the Victoria Bridge at Berwick-on-Tweed, two bridges across the Nile and many others.

Sterne, Laurence (1713–68), British novelist, born in Clonmel, Ireland, educated at Cambridge. He became a clergyman for a time. He is best-known for his *Tristram Shandy,* The first two volumes of this novel were published in 1760; the last, ninth in the series, appeared seven years later. His *Sentimental Journey through France and Italy* was published in 1768. Besides these, he wrote the *Letters to His Intimate Friends,* edited by his daughter; *Letters from Yorick to Eliza;* and *Twelve Letters to His Friends.*

Steuben, von, Fredrick William, Baron (1730–94), Prussian-American general, born at Magdeburg, Prussia, a descendant of a noble family. At 17 he was in the German infantry and 11 years later was a captain. He served with distinction in the Seven Years' War and at its close became grand marshal in a princely German house. During the American Revolution he offered his aid to the colonies and was made a major general. Steuben did his best work in organizing, drilling and disciplining the American troops, although he was also important in combat at Monmouth and Yorktown. He was voted grants of land by four states after the war and a pension by Congress. He prepared a manual of arms for the U. S. Army.

Stevenson, Adlai Ewing (1835–1914), 23d Vice-President of the United States, born in Christian county, Ky., educated at Center College, Danville. He was admitted to the bar in Illinois in 1859, was elected to Congress in 1875 and again in 1879. Stevenson was first assistant postmaster general during Cleveland's first term, and was Vice-President in Cleveland's second term (1893–1897). Again a candidate for the Vice-Presidency on the ticket with William Jennings Bryan, he was defeated in 1896.

Stevenson, Robert Louis [Balfour] (1850–94), British poet and writer, born in Edinburgh and educated at Edinburgh University. In 1875 he was admitted to the bar but soon abandoned law for writing. In 1878 appeared his first book, *An Inland Voyage,* quickly followed by *Travels With a Donkey, Virginibus Puerisque, Familiar Studies* and *Treasure Island.* As a writer of adventure and romance, he established himself permanently in the public favor with *Kidnapped, The Master of Ballantrae, Dr. Jekyll and Mr. Hyde* and others. His versatility in letters was further revealed in his charming *A Child's Garden of Verses, Ballads, Memories and Portraits* and *A Footnote to History.* In 1887 he left England for America and in 1889 after a yachting cruise in the Pacific settled in the South Seas at Samoa on an estate that he called *Vailima* and from which he sent home *David Balfour* and other fine stories. He was in poor health and died while writing *Weir of Hermiston.*

Stimson, Henry Lewis (1867–), American statesman, born in New York city, educated at Yale and Harvard. His first public office was that of U. S. attorney for southern New York state (1906–09). In 1911 he became secretary of war in the Cabinet of President Taft. In the World War he went to France as lieutenant colonel of the 305th Field Artillery. From 1927–29 he was governor general of the Philippine Islands and in March 1929 was made secretary of state by President Hoover. Stimson headed the American delegation to the London Conference on reduction of naval armaments (1930–31).

Stock, Frederick August (1872–), American orchestra conductor, born at Jülich, Germany. He came to the United States in 1895, under contract as viola player in the Theodore Thomas Orchestra, and when Thomas died in 1905 succeeded him as director. The name of the organization was changed later to Chicago Symphony Orchestra. In 1925 he was decorated by the Government of France as Chevalier of the Legion of Honor. He was general director of music for the 1933 Century of Progress Exhibition at Chicago. His compositions include *Symphony in C Minor* and *Festival March.*

Stockton, Frank R. (Francis Richard; 1834–1902), American writer, born in Philadelphia. He turned early to journalism and literature and worked on several magazines and newspapers. His short story *The Lady or the Tiger* aroused much interest because of its unusual ending; it is now regarded as a classic. Among his books are *Rudder Grange, The Casting Away of Mrs. Lecks and Mrs. Alestine, The Late Mrs. Null, The Bee Man of Orn, The Squirrel Inn* and *The House of Martha.* He wrote a number of books for children; among them are *Roundabout Rambles, What Might Have Been Expected, Tales Out of School, A Jolly Fellowship, The Floating Prince* and *Personally Conducted.*

Stoddard, Richard Henry (1825–1903), American writer, born at Bingham, Mass. He is best-known for two anthologies, *Poets and Poetry of America* and *Female Poets of America.* Among his volumes of poetry are *Songs of Summer, Under the Evening Lamp* and *The Lion's Cub and Other Poems.*

Stokowski, Leopold [Antoni Stanislaw] (1882–), American conductor, born in London of Polish parentage. He studied in Paris and London and conducted opera and orchestras abroad then came to the United States in 1905 to become musical director of a New York church. He conducted the Cincinnati Symphony (1909–12) and the Philadelphia Orchestra (1912–36). After 1936 he appeared in motion pictures.

Stone, Harlan Fiske (1872–), American jurist, born at Chesterfield, N.H., graduated from Amherst and Columbia Law School. He practiced law in New York city and from 1910 to 1923 was professor of law and dean of Columbia Law School. In 1924 he became attorney general, in 1925 was appointed an associate justice of the U. S. Supreme Court, and in 1941, Chief Justice.

Stone, Lucy Blackwell (1818–93), American reformer and advocate of woman's rights, born at West Brookfield, Mass. She graduated at Oberlin College in 1847. She aided in organizing the first national woman's rights convention, at Worcester, Mass., and was always zealous in that cause. After her marriage to Henry B. Blackwell in 1855, she used her maiden name and as a result the Lucy Stone League was formed of married women who used their maiden names.

Story, Joseph (1779–1845), American jurist, born at Marblehead, Mass., graduated from Harvard in 1798. After serving as a member of Congress he was appointed an associate justice of the Supreme Court and retained that post for 34 years. His standard books on law and government include *Commentaries on the Constitution of the United States* and *Commentaries on the Conflict of Laws.*

Stowe, Harriet [Elizabeth] Beecher (1812–95), American writer, born at Litchfield, Conn. She married Rev. C. E. Stowe in 1836. Even in her childhood she had a horror of slavery; her brother had told her many stories from his experiences as a clerk in New Orleans. She wrote *Uncle Tom's Cabin* in 1850. The antislavery feeling this book aroused was partly responsible for the Civil War. The book has been dramatized and translated into more than 20 foreign languages. Mrs. Stowe also wrote *Lady Byron Vindicated; Dred, a Tale of the Great Dismal Swamp; Old Town Folks;* and *The Minister's Wooing.*

Strabo (*c.* 63 B.C.–*c.* 21 A.D.), Greek geographer, born at Amasia in Pontus. He spent many years in travel and wrote a geography in 17 parts, in which he describes Europe, Asia, Libya and Egypt. It is considered to be one of the most important geographies of ancient times, since it was based largely on Strabo's own observations. He wrote a history of Rome down to the year 27 B.C., but this work has been lost.

Strachey, Lytton (1880–1932), English essayist and biographer, educated at Cambridge, the son of a British general (Sir Richard Strachey), administrator of Indian affairs for many years. He decided upon a literary career. His first book, *Landmarks in French Literature,* appeared in 1912 and was well received. His *Eminent Victorians,* published in 1918, made him famous. His other writings are *Books and Characters, Queen Victoria, Elizabeth and Essex* and *Portraits in Miniature.* Strachey created a new style in biographies with his vivid and often caustic language and his penetrating wit. He analyzed his subjects from a psychological point of view, thus clarifying the reasons for their actions.

Stradivarius, Antonius (1644–1737), also called by his Italian name *Antonio Stradivari,* Italian violinmaker, born at Cremona. He was apprenticed to Nicolas Amati, one of a great family of violinmakers and improved on his master's work. Some authorities say that the excellence of Stradivarius's violins is due to a varnish that he developed and used, much darker than the yellow varnish used by Amati. It is believed that Stradivarius made 2,000 violins during his lifetime; today more than 500 of his violins are known to exist, as well as about a dozen violas and more than 50 cellos. They command enormous prices.

Strafford, Thomas Wentworth, Earl of (1593–1641), an English statesman, born in London, studied at Cambridge. He was a member of four Parliaments—three under James I and one under Charles I. His political career was a series of ups and downs. In 1629 he first opposed Charles and then sided with him and strove to put down all opposition to the royal authority. He went to Ireland in 1632 as lord lieutenant and changed the country from anarchy to order and prosperity. Accused of high treason during the Scottish Rebellion, he was beheaded in the Tower of London.

Stratton-Porter, Gene, see *Porter, Gene Stratton.*

Strauss, David Friedrich (1808–74), German theologian and critic. He was educated at Tübingen, where he came under the influence of Ferdinand Christian Baur, the most radical theological thinker and biblical critic of the time. He later studied at Berlin under Hegel and Schleiermacher. In 1835 he startled conservative Europe by his *Life of Jesus,* which treated the gospel narratives as ordinary historical source material to be judged according to the rules of criticism in the same fashion as ancient secular writings. The book raised a storm of controversy. It brought upon Strauss the violent hatred of the orthodox but was eagerly accepted by the growing class of young intellectuals in France and England as well as in Germany. In 1846 the English translation by George Eliot introduced the work to a wider English public. Strauss was appointed in 1839 to a professorship at Zürich but was prevented by clerical opposition from entering upon his duties. From then until the end of his life he never occupied a university position.

Strauss, Johann (1804–49), Austrian composer, born in Vienna. He played the viola in several orchestras and then formed an organization of his own in 1824. In time he became music conductor at the royal balls in Vienna. He made his name as the greatest composer of dance music of the day with the *Täuberl-Walzer* (1826). He formed his own concert band, which at one time consisted of more than 200 performers, with which he toured Europe.

Strauss, Johann (1825–99), Austrian composer, born in Vienna, the son of Johann Strauss. He conducted orchestras in Europe and the United States and came to be known as *The Waltz King*. He composed the most famous of all waltzes, *The Blue Danube*. In all he produced about 500 dance numbers.

Strauss, Richard (1864–), German composer, born in Munich. He began his professional career as conductor at Meiningen (1885). In 1889 he became chapelmaster at Weimar, in 1895 was appointed conductor at the Munich Opera House and in 1898 was called to Berlin to be conductor at the Royal Opera House. Among his most famous compositions are *Till Eulenspiegel, Macbeth, Don Quixote, Don Juan, Guntram, Salome, Elektra, Rosenkavalier* and *Feuersnot*.

Stravinski, Igor Fedorovich (1882–), Russian composer, born near St. Petersburg. He is famous for the ballets he wrote. They are still among the most popular ballets performed by leading companies. Among them are *Petrouchka, Le Sacre de Printemps* and *L'Oiseau de Feu*. He also wrote orchestral pieces, chamber music, songs, the oratorio opera *Oedipus Rex* and the ballet *Apollo Musagetes*.

Stresemann, Gustav (1878–1929), German statesman, born in Berlin, educated at the universities of Berlin and Leipzig. He entered the Reichstag in 1907 and in 1917 became leader of the National Liberal party. In 1923 he became chancellor and at the same time held the post of foreign minister. He directed the negotiations that brought about his country's acceptance of the Dawes Plan and of the later Young Plan for reparations settlement. He had a leading part in the making of the Locarno Treaty. Stresemann worked energetically for peace and was largely responsible for Germany's entrance into the League of Nations. He received the Nobel Peace Prize in 1926.

Stribling, Thomas Sigismund (1881–), American novelist, born in Clifton, Tenn. Most of his books have a southern setting, although he also wrote adventure stories laid in the Caribbean Sea and South America. Among his best-known books are *Teeftallow, Birthright, Bright Metal* and a trilogy covering three generations of southern life: *The Forge, The Store* (which won the Pulitzer Prize in 1932) and *Unfinished Cathedral*.

Strindberg, Johan August (1849–1912), Swedish author, born in Stockholm. He studied for a while at Upsala University. The poverty of his early days was possibly responsible for much of the cynicism that appears in his works. His first great drama, *Master Olof*, appeared in 1878. Three tragic marriages did not tend to give him a cheerful outlook, and he wrote one morbid book after another. His works include many plays and stories, treatises on history, the theater, philosophy and miscellaneous subjects. Among his plays are *The Father, Miss Julia* and *The Creditors*.

Stuart, Charles Edward Louis Philip Casimir (1720–88), English prince, known as the *Young Pretender* (pretender to the throne of England), born in Rome. At 14 he served with Berwick in the siege of Gaeta, an attempt to restore Don Carlos. Urged by the English and Scottish Jacobites to try to regain the English throne for the Stuarts, Charles landed in Scotland with an army in 1745. The Highland clans flocked to his support and he had early successes against the English army that came north to meet him. But he did not receive much support from the Jacobites of England and his army was defeated with much loss of life at Culloden Moor in April 1746. Many songs were written about *Bonnie Prince Charlie*, as he was called.

Stuart, Gilbert [Charles] (1755–1828), American portrait painter, born at Narragansett, R. I. In 1778 he made his way to London, where his talent was recognized by Benjamin West, president of the Royal Academy, who took him into his family, and whose full length portrait he painted for the National Gallery. He wanted to do portraits of George Washington, so he returned to America in 1792. He painted some original studies of the first President from life and a number of replicas. Others of his subjects were James Monroe, Albert Gallatin, Edward Everett, John Jay and Jerome Bonaparte.

Stuart, James Ewell Brown (1833–64), Confederate general, born in Patrick county, Virginia. He graduated from West Point in 1854. When the Civil War broke out he was a captain in the Union army but resigned to enter the Confederate service. He was one of the outstanding cavalrymen of the Civil War, a dashing and romantic figure as well as a clever and daring officer. He was mortally wounded at Ashland in an attempt to halt the progress of General Sheridan and died at Richmond, Va.

Sturluson, see *Snorri Sturluson.*

Stuyvesant, Peter (*c.* 1602–1682), Dutch colonial governor, born in Holland. Military service for the West India Company took him to Curaçao, where he was director for 10 years. In 1645 he was sent to New Netherland to direct colonial activities for the company and did much to develop New Amsterdam (now New York city). He was an energetic leader, but his despotic manner made him unpopular. He refused the demands of his people when they asked for a share in the control of affairs. In 1655 he sallied across the Hudson River, captured the strongholds of the Swedes and added this domain to New Netherland. When a fleet of English ships sailed into New Amsterdam harbor in 1664, he was forced to surrender the colony after the Dutch colonists refused to defend it. He went to Holland in 1665 but returned to settle on his plantation the *Bouwerie* (Dutch for farm), from which the street called the *Bowery* in present-day New York was named.

Sudermann, Hermann (1857–1928), German writer, born in East Prussia, educated at the universities of Königsberg and Berlin. His early years were spent as a journalist and in teaching, then he turned to literature. Though his novels show keen powers of observation, it is to his plays that he owes his fame. *Die Ehre,* appearing in 1880, brought him instant renown. This was increased by several others, notably by *Magda*, his masterpiece, in 1892. His principal novels are *Frau Sorge* (*Dame Care*), *Song of Songs* and the *Mad Professor*.

Sue, Eugène (Marie Joseph; 1804–57), French novelist, born in Paris. After completing a course in medicine he became a surgeon in the army. In 1850 he was elected to the Legislative Assembly, but he inherited a considerable fortune and after that gave his time largely to literature. His reputation as a writer rests mainly on *The Wandering Jew* and *The Mysteries of Paris*.

Suetonius (Gaius Suetonius Tranquillus; 2d century A.D.), Roman historian. Little is known of his life except that he was Hadrian's private secretary. His only remaining work is *Lives of the Caesars* from Julius to Domitian. He dealt mostly with the private lives of the Caesars, but the book is valuable historically. He wrote biographies of other important men of his time, but only fragments remain.

Sulla, Lucius Cornelius (138–78 B.C.), Roman commander and dictator. He became quaestor in 107 B.C. under Marius in Africa and brought about the surrender of Jugurtha. After distinguishing himself in the Teutonic Wars, he became propraetor in Cilicia, returning to Rome in 91 B.C. Coming into political conflict with Marius he was driven from Rome but returned and drove Marius from the city. Sulla conducted the Mithridatic War from 87 to 83 B.C. In 82 B.C. he returned from the East at the head of a victorious army and made himself dictator. He put down opposition with ruthless energy, introducing the system of proscriptions, under which his personal and political enemies were hunted out like wild beasts. He remodeled the constitution in the interests of the senatorial oligarchy. He abdicated in 79 B.C. at the height of his power.

Sullivan, Sir Arthur Seymour (1842–1900), English composer, born in London of Irish parentage. He studied music in Germany. He wrote many popular songs, including *The Lost Chord,* but is best remembered through his collaboration with Sir W. S. Gilbert in the composition of light operas. The most famous of these are *The Mikado, Pirates of Penzance, Patience, Iolanthe, The Yeoman of the Guard, H. M. S. Pinafore, Ruddigore* and *The Gondoliers*. He also composed hymns, of which *Onward Christian Soldiers* is best-known. He received a knighthood in 1883.

Sullivan, John Lawrence (1858–1918), American pugilist, born in Boston. He defeated Paddy Ryan for the heavyweight championship in New York in 1883 and lost it to James J. Corbett in 1892. While he held the title the Marquis of Queensberry rules came into use. Sullivan won the championship under bare-knuckle rules and lost it under modern rules.

Sully-Prudhomme, René François Armand (1839–1907), French poet, born in Paris. He was one of a group called *The Parnassians,* who published their works in their own magazine. His best-known long poems are philosophical in tone: *La Justice* and *Le Bonheur*. His most famous poem is "The Broken Vase." He won the Nobel Prize for poetry in 1901.

Sully, Thomas (1783–1872), American painter, born in Lincolnshire, England. He lived in the United States from childhood but spent several months in London working under Benjamin West. He was widely known as a portrait painter. Among his subjects were Jefferson, Lafayette, Madison and Jackson. He produced about 2,500 paintings. *The Torn Hat,* a picture of his young son, is famous.

Sumner, Charles (1811–74), American statesman, born in Boston and educated at Harvard. He studied law and was admitted to the bar in 1834. He entered the U. S. Senate in 1851, retaining his seat until his death. He was prominent in debate, especially on the repeal of the Missouri Compromise and on the contest in Kansas. His speech "The Crime Against Kansas" incensed Preston S. Brooks of South Carolina, who assaulted Sumner at his desk and crippled him. He wrote *White Slavery in the Barbary States* and *Orations and Speeches.*

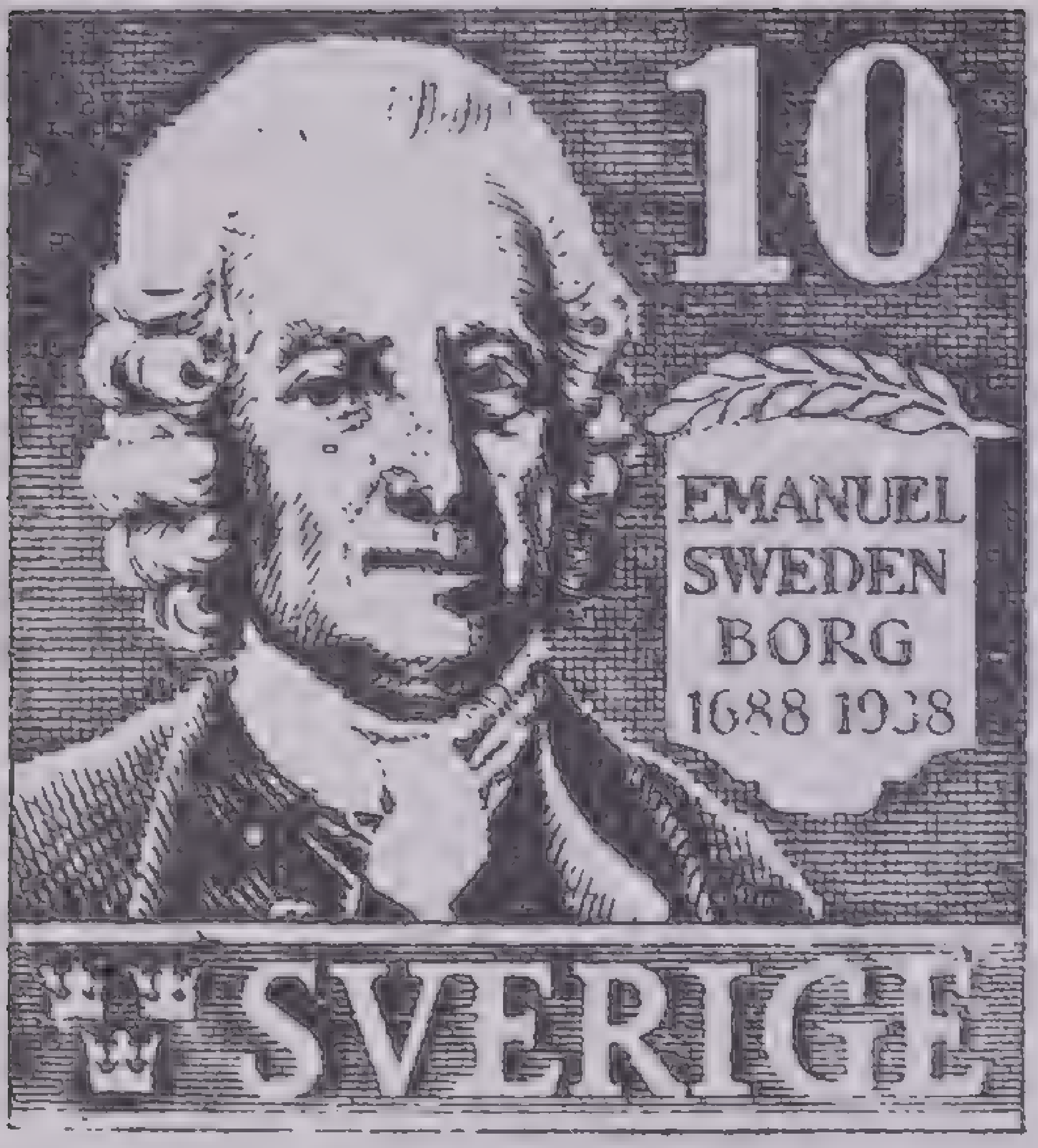
Sun Yat-sen (Sun Wen; 1866–1925) Chinese reformer, born near Canton. He was educated to be a physician in the Hong Kong School of Medicine and practiced for a year in Macao. He organized the revolutionary party in 1893, and after many desperate attempts he overthrew the Manchu dynasty, which had ruled China for nearly 300 years. He became first president of the republic. In his efforts to establish a democratic form of government, he led his Kuomintang party against the revolutionaries who had deserted him. Dr. Sun entered into relations with the Soviet Government after his term and began to spread communism. He spent much time in writing and in establishing coolie unions. In 1924 he tried to lead the nation once more, but ill health prevented him. He became the patron saint of Chinese nationalism with an impressive memorial at Nanking.

Sutherland, George (1862–), American jurist, born in England. He was brought to Utah as an infant. He graduated from the University of Michigan and practiced law in Utah. He served in the state senate (1896–1900), the U. S. House of Representatives (1901–3) and the U. S. Senate (1905–17). He was appointed an associate justice of the U. S. Supreme Court by President Harding in 1922. In 1937 he retired from active service.

Sutter, John Augustus (1803–80), American frontiersman, born in Germany. He came to the United States in 1834 and gradually worked his way west, reaching California in 1839. He settled in the Sacramento Valley and set up a powerful colony that he called *New Helvetia.* When gold was discovered on his property, the famous California gold rush began. Sutter tried to fight off the invasion that swarmed over his holdings. The U. S. Supreme Court refused to uphold his claim to his land, and he returned to Pennsylvania penniless in 1873.

Swan, Sir Joseph Wilson (1828–1914), English physicist, born in Sunderland. He was first a druggist and later a manufacturing chemist. He contributed much to photography by inventing photographic plates that could be used when they were dry; until that time plates had to be used as soon as the emulsion was applied to them. In 1860 he made an incandescent electric bulb with a carbon filament. It was not commercially successful largely because there were no sources of sufficient electric power. Edison's lamp, which came 20 years later, was based on the same principles as Swan's.

Swedenborg, Emanuel (1688–1772), Swedish scientist, philosopher and mystic, born in Stockholm. He was a well-known engineer and studied in almost every field of science. In 1743 he claimed a divine commission to interpret the true inner doctrines of Scripture. He told of seeing visions and conversing with spirits. Of these he treats in *Heaven and Its Wonders, The Last Judgment* and *The Earth in the Universe*. He lived in Stockholm, London and Amsterdam, spreading his beliefs but not trying to establish a new sect. He hoped that his "New Church" might include members of any Christian



Courtesy Scott Stamp & Coin Company

Emanuel Swedenborg

Enlarged from a stamp issued in 1938 on the 250th anniversary of the philosopher's birth

churches. However, after his death the Church of the New Jerusalem was set up to conform to his teachings.

Swift, Jonathan (1667–1745), British author, born in Dublin of English parents, educated at Trinity College, Dublin. He moved to London, where he became secretary to Sir William Temple. In Sir William's house he met "Stella" (Hester Johnson) and wrote *The Tale of a Tub*, a brilliant satire on abuses in religion and learning. He studied for the Church, was ordained in 1694 and held benefices in Ireland. He divided his time between Dublin and London, where his gifts as a satirist made him a valuable ally to the Tory party. In 1713 he was made dean of St. Patrick's Cathedral, Dublin, and from there he wrote the famous *Drapier Letters* that compelled the Government to abandon a scheme for supplying Ireland with copper coinage. The triumphant author made his last visit to England in 1726. In that year *Gulliver's Travels* was published, the most popular of all his works. It is now a children's classic, although it was originally intended to express Swift's savage misanthropy, his view of mankind as "the most pernicious race of little odious vermin that nature ever suffered to crawl upon the surface of the earth." His *Journal to Stella* is a collection of letters written to her. It is not definitely known whether she was his wife.

Swinburne, Algernon Charles (1837–1909), English poet and critic, born in London, educated at Oxford University. His first productions were the comedy dramas *Queen Mother* and *Rosamond*, but they were only moderately successful. In 1835 he wrote the lyric tragedy *Atalanta in Calydon*, considered to be his finest work. His other volumes of poetry include *Songs before Sunrise, Poems and Ballads, Bothwell, A Song of Italy, Songs of Two Nations* and *Studies in Prose and Poetry*. Much of his work shows a wonderful sense of rhythm. He also wrote plays and critical essays.

Sylla, see *Sulla*.

Synge, John Millington (1871–1909), Irish poet and dramatist, born in Dublin, educated at Trinity College. He lived in Paris for several years working at literary criticism, but he was persuaded by his compatriot Yeats to return to Ireland and lead in the movement to revive Irish folklore and the Irish drama. Synge had an unusually deep insight into the character of the peasantry and wrote a series of remarkable plays illustrative of their life and their feelings. *The Playboy of the Western World* is considered by many to be the greatest of these plays. His other plays are *The Shadow of the Glen, The Well of the Saints, Deirdre of the Sorrows, The Tinker's Wedding* and *Riders to the Sea*. In 1904 he founded the Abbey Theatre, Dublin, with Lady Gregory and W. B. Yeats. He wrote *Poems and Translations* (1909).

Tacitus, Publius Cornelius (b. *c.* 55 A.D.), Roman historian. He studied rhetoric and early became a successful pleader at the Roman bar. He married the daughter of Agricola, the conqueror of Britain; was in Germany from 89 to 93 and was consul in 97. His writings are: a dialogue on oratory, remarkable literary criticism; *Agricola*, a biography; *Germania*, an account of German peoples; *Annals*, a history of Rome from 14 to 68 A.D.; and *Histories*, covering events from 68 to 96 A.D. He is noted for his concentration of thought and for his biting satire—all the more effective for being conveyed chiefly by restrained innuendo and by compact, picturesque phrases. His pictures of the early Roman emperors have fixed their characters for all time in spite of proofs by modern scholars of Tacitus's prejudice and personal animus.

Taft, Lorado (1860–1936), American sculptor born at Elmwood, Ill. He studied at the University of Illinois and the École des Beaux Arts in Paris. He returned to the United States to become an instructor in sculpture at the Chicago Art Institute. Later he taught art at the universities of Chicago and Illinois. Among his sculptures are *Black Hawk*, the figure of an Indian, 50 feet in height, overlooking Rock River, Ill.; *The Spirit of the Great Lakes*, at the Chicago Art Institute; the *Fountain of Time*, near the University of Chicago; *Alma Mater*, on the campus of the University of Illinois; *Columbus Memorial Fountain*, in Washington; *Solitude of the Soul*, in Chicago; and a *Washington Monument*, in Seattle. He wrote *History of American Sculpture* and *Recent Tendencies in Sculpture*.

Taft, William Howard (1857–1930), 27th President of the United States, born in Cincinnati, Ohio. He was graduated from Yale in 1878, studied law in Cincinnati and became a lawyer in 1880. He practiced law for several years in Ohio. In 1886 he became a judge in the superior court in Cincinnati. He resigned this position to accept President Harrison's appointment to the Cabinet as attorney general.

In 1892 Harrison appointed him a U. S. circuit judge, a position he retained for 8 years. During his career as judge the Spanish-American War was fought, and the Philippine Islands became an American possession. Taft was prominent in the establishment of civil government in the Philippines and was civil governor of the islands, 1901–04. In 1904 he became secretary of war in Theodore Roosevelt's Cabinet. When the War Department intervened in a Cuban crisis in 1906, Taft went to the island as provisional governor. During his term in the Cabinet he visited Panama, Cuba, Puerto Rico, the Philippine Islands, Japan and Russia. In 1908 he was elected President on the Republican ticket, defeating William Jennings Bryan. Taft was Roosevelt's choice as his successor. During Taft's administration the Standard Oil and other trusts were dissolved. The general level of tariff taxation was increased by the passing of the Payne-Aldrich Bill.

Before the election of 1912 Roosevelt had let it be known that Taft must not be renominated because he had forsaken liberalism and had gone over to the conservative faction of his party. When Taft received the nomination, Roosevelt and his followers bolted; the Progressive party was formed, and Roosevelt was nominated for President. The election of Woodrow Wilson, the Democratic candidate, was assured by the split in Republican ranks. From 1913 to 1921 Taft was professor of law at Yale. During the World War he served on a governmental planning board. In 1921 he was appointed chief justice of the Supreme Court. He retired in 1930 a few weeks before his death.

Tagore, Sir Rabindranath (1861–1941), Bengali poet and sage, born in Calcutta. He was educated in India and then traveled widely. In 1901 he founded in Bengal a school that developed into a kind of international university, called *Visva-Bharata*, making this his life work. In 1913 he won the Nobel Prize in literature and gave the proceeds to his school. In 1915 he was knighted by King George V. Tagore visited the United States in 1916 and lectured on internationalism. He translated many of his own writings from Bengali into English. His 30 volumes of poetry, as well as many essays, novels, dramas and sermons, reveal a keen sense of the beauties of nature and a deep love of children.

Taine, Hippolyte Adolphe (1828–93), French historian, born in Vouziers. At the age of 23 he was appointed professor of philosophy in Toulon University. In 1864 he became professor of esthetics and the history of art at the École des Beaux Arts in Paris. His chief writings are *History of English Literature, Origins of Contemporary France, Philosophy in Art, Voyage to the Pyrenees, The Ancient Regime* and *The Ideal in Art*.

Talleyrand-Périgord, de, Charles Maurice (Prince de Bénévent; 1754–1838), French statesman, born in Paris. He was trained for the priesthood and was ordained. As bishop of Autun he was a member of the States-General, which was convoked in 1789. The progress of the revolution led to his retirement to England and afterward to America; but after the fall of Robespierre he returned to Paris, and through the influence of Madam de Staël with Barras he was appointed foreign minister. In return for his services he was made grand chamberlain, and (1806) prince of Bénévent. After the fall of Napoleon he became for a time prime minister under Louis XVIII. By his skilful diplomacy at the Congress of Vienna (1815) he saved France from the heavy territorial losses and crushing indemnities that the victorious Allies were at first disposed to inflict. In 1830 he played an important part in the foundation of modern Belgium, and at the same time as ambassador to England he negotiated an alliance between England, France, Spain and Portugal.

Tamerlane (Timur Lenk, lame Timur; *c.* 1333–1405), Oriental conqueror, born near Samarkand. At the age of 25 he succeeded as tribal leader. In 1369 he had conquered the Mongol clan of the Berlas to which his tribe belonged, and after a short reign with his brother Hussein he set up his own rule under the title *Sahib Karan* ("Emperor of the Age"). He defeated other Mongol tribes as far to the west as the Volga River and the Persian tribes that stood in his way. In 1398 he turned south and invaded India. He captured the capital, Delhi, and decreased the number of prisoners by wholesale slaughter. In 1402 he captured Bagdad, Aleppo and Damascus and had a great victory over the Turks at Angora. On his way eastward to subdue China he died of a fever. Christopher Marlowe wrote a tragedy about him, *Tamberlane*.

Taney, Roger Brooke (1777–1864), American jurist, born in Calvert county, Md. After graduation from Dickinson College he studied law and was admitted to the bar. He entered politics as a Federalist but soon turned to the Democratic party of that day and in 1827 became attorney general in Andrew Jackson's Cabinet. He left the Cabinet in 1834 owing to popular protest against his part in the administration's attack on the Second Bank of the United States. He was then appointed to the Supreme Court, succeeding John Marshall as chief justice (1836) and thereafter becoming a champion of states' rights and of the Fugitive Slave Law. Taney handed down an important decision in the Dred Scott case, which denied the right of citizenship to a Negro, no matter in what state he might be, and also denied to Congress the right to keep slavery out of the territories. He firmly upheld the Fugitive Slave Law. After the southern states seceded, he delivered another famous decision denying the right of the President to suspend the writ of *habeas corpus*.

Tarbell, Ida Minerva (1857–), American author and editor, born in Erie county, Pa., graduated from Allegheny College. She was associate editor of the *Chautauquan Magazine*, 1883–1891; of *McClure's Magazine*, 1894–1906; and of the *American Magazine*, 1906–1915.

She wrote mostly on historical and economic subjects, often from a critical point of view. Among her books are *Life of Abraham Lincoln, In the Footsteps of the Lincolns, Short Life of Napoleon Bonaparte, The Tariff in Our Times, The Rising of the Tide, New Ideals in Business, In Lincoln's Chair, The Ways of Women, A Reporter for Lincoln, He Knew Lincoln* and *Life of Judge Gary*. Her *History of the Standard Oil Company* (1904), exposing the methods of cutthroat competition and monopolization that had characterized much of the large scale business of the late 19th century, was widely influential in arousing public discussion of social control of business.

Tarkington, Booth (Newton B. Tarkington; 1869–), American author, born in Indianapolis, Ind. He studied at Purdue and Princeton universities. He served a term (1903) in the Indiana legislature, then devoted his time to literature. He won the Pulitzer Prize in 1919 and 1922. Among his many popular books are *The Gentleman from Indiana, Monsieur Beaucaire, Alice Adams, The Conquest of Canaan, Penrod, Penrod and Sam, The Magnificent Ambersons* and *Claire Ambler*. Tarkington also wrote a number of plays, including *The Man from Home* (with Harry Leon Wilson), *Clarence* and *Mister Antonio* (with Julian Street).

Tarleton, Sir Banastre (1754–1833), British soldier, born in Liverpool and educated at Oxford. In 1775 he came to America with Cornwallis and campaigned in the East for

2 years. He was promoted to major and later commanded the British Legion, a combined cavalry and light infantry unit that operated in the South. He won a series of victories but was defeated at Cowpens. After that he was again extremely useful to Cornwallis and made many daring raids. He moved with secrecy and great rapidity but did not control his men well, and they often committed cruel acts for which Tarleton was blamed. After he returned to England, he was a member of Parliament.

Tasso, Torquato (1544–95), Italian poet, born in Sorrento. In 1565 he entered the service of Cardinal Luigi d'Este and was invited to the court of the Cardinal's brother, Alfonso, Duke of Ferrara. While there he wrote his pastoral drama *Aminta* and in 1575 finished his great epic *Jerusalem Delivered*, describing the First Crusade. Shortly afterward his mind became deranged, and he was confined to a hospital for 7 years. Eventually he was summoned to Rome to be crowned as poet laureate, but he died before the ceremony could take place.

Taussig, Frank William 1859–1940), American economist, born at St. Louis, Mo., educated at Harvard. He became an instructor at Harvard in 1882 and from 1901 was professor of economics. From 1917 to 1919 he was chairman of the United States Tariff Commission. His books on economics include *A Tariff History of the United States, Principles of Economics, International Trades* and *Social Origins of American Business Leaders.*

Taylor, Bayard (1825–78), American journalist and poet, born at Kennett Square, Pa. As a young man he roamed through Europe for three years (1844–46) and wrote a popular book about his travels, *Views Afoot*. During the California gold rush he traveled in the West as correspondent for a New York newspaper. He continued to travel throughout his life and was a well-known lecturer. From 1862 to 1863 he was secretary at the American embassy at St. Petersburg, and in 1874 he was in Iceland and Egypt. He was appointed United States minister to Germany in 1878, where he died the same year. He was an industrious worker and wrote many volumes. Some of his best travesties are in the *Echo Club*. Among the finest of his poems are "Bedouin Song," "The Quaker Widow" and "The Old Pennsylvania Farmer." His masterpiece is a translation of Goethe's *Faust*.

Taylor, Deems (1885–), American composer and music critic, born in New York city and educated at New York University. He served as a newspaper correspondent during the World War and later was an associate editor of *Collier's Weekly*, editor of a music magazine and music critic for newspapers and a broadcasting network. He wrote two operas, *Peter Ibbetson* and *The King's Henchman* (for which Edna St. Vincent Millay wrote the text), both produced at the Metropolitan Opera House. Other works include an orchestral suite *Through the Looking Glass* and a cantata *The Chambered Nautilus*. He wrote *Of Men and Music* (1938), a book of criticism.

Taylor, Jeremy (1613–67), English divine, born in Cambridge. He was graduated from Cambridge University and soon afterward became chaplain to Charles I, as rector of Uppingham (1638–42). He moved to Ireland in 1657 and after the Restoration was made bishop of Down and Connor. His chief works are *Holy Living* and *Holy Dying*. Coleridge called him the most eloquent of divines, if not of men.

Taylor, Zachary (1784–1850), 12th President of the United States, born in Orange county, Va., the son of a colonel who fought in the Revolutionary War. He entered the army in 1808 as lieutenant, reached the rank of major in the War of 1812 and was promoted to colonel during the Black Hawk War (1832). After serving against the Seminoles in Florida he was transferred to the Southwest and in 1845 was ordered to Texas to ward off possible Mexican invasions. When the Mexican War began, he tried to prevent the enemy from coming north of the Rio Grande, the boundary claimed by Texas. The Mexicans claimed the River Neuces as the boundary; Taylor refused to retire to that point, and hostilities began. The battles of Palo Alto and Resaca de la Palma were won by Taylor; he won the battle of Buena Vista, although the Mexicans outnumbered his men four to one. He became the hero of the day.

After the war he planned to retire to a farm, but the Whig party, alert for a winning candidate for the Presidency in the election of 1848, chose "Old Rough and Ready," as he was called. Taylor easily defeated Lewis Cass, the Democratic candidate, and on March 4, 1849, he became the 12th President of the United States. Important issues commanded his attention during his term in office: the admission of California to the Union, the organization of New Mexico and Utah as territories, bills for the suppression of the slave trade in the District of Columbia and a tightening of the provisions of the Fugitive Slave Laws. His physical strength failed under the strain, and he died suddenly July 9, 1850, only 16 months after his inauguration.

Tchaikovsky, Petr Ilich (1840–93), Russian composer, born in the Ural Mountains region. He studied music at St. Petersburg (Leningrad) under Zaremba and Rubinstein. In 1866 he became a professor of musical theory at the Moscow Conservatory, and while he taught he gave his spare time to composition. His marriage in 1877 was not successful, and Tchaikovsky tried to kill himself by standing in icy water. After 1869 he was able to give all his time to composition through the generosity of a wealthy friend, Mme. von Meck. He became known to the musical world through his opera *Eugen Onégin* in 1879. His fame reached America soon afterward, and the *Concerto in B Flat Minor* was presented in Boston. His last production was *Pathetic Symphony*, presented during the year in which he died. Besides these he composed *Romeo and Juliet, Manfred, Francesco da Rimini, Nutcracker Suite* and *The Tempest*; six symphonies; and concertos, ballads, overtures, piano numbers and songs.

Teasdale, Sara (1884–1933), American poet, born in St. Louis, Mo., and educated in private schools. Her poetry is delicate and musical. Among her books of verse are *Helen of Troy, Rivers to the Sea, Stars To-Night* and *Strange Victory*. She compiled two anthologies, *The Answering Voice* and *Rainbow Gold*. She won the Pulitzer Prize for poetry in 1917. She married Ernst B. Filsinger, a foreign-trade expert.

Tecumseh (d. 1813), Shawnee Indian chief, born near the present city of Springfield, Ohio. Little is known of his early life, but in 1810 he and his brother Tenskwatawa, "The Prophet," went among the tribes from the Ohio River to the Gulf of Mexico, forming them into a confederation to oppose the white invasion. This is known as the *conspiracy of Tecumseh*, and it brought on the Creek War of 1813. In the War of 1812 Tecumseh allied himself with the British and received the rank of brigadier general. At the Battle of the Thames in 1813 he commanded one wing of the army, composed almost entirely of Indians, and in this battle he was killed.

Temple, Sir William (1628–99), English diplomat and writer, born in London, educated at Cambridge. His great diplomatic success was the formation of the Triple Alliance in 1668—of England, Holland and Sweden—against France. In 1677 he helped to bring about the marriage of the prince of Orange with the Princess Mary. He twice refused the secretaryship of state offered him by Charles II. He retired in 1651 and spent the rest of his life in writing and gardening.

Teniers, the family name of two Flemish painters, David the Elder and David the Younger, father and son.

David the Elder (1582–1649) was born in Antwerp and studied under Rubens. Among his paintings are *A Dutch Kitchen, Playing at Bowls* and *Peasants Carousing*.

David the Younger (1610–90) was educated in art by his father. In 1651 he became court painter in Brussels, a post of honor that he kept until his death. Chief among his canvases are *The Barber Shop, Merry Repast, The Marriage Festival* and *Peasants' Dance*.

Tenniel, Sir John (1820–1914), English caricaturist and illustrator. He became world-famous through his long connection with *Punch* (1850–1901), for which he drew the principal weekly cartoon. He made the illustrations for *Alice in Wonderland, Through the Looking Glass, Lalla Rookh* and *Ingoldsby Legends*. He painted a fresco for the House of Lords in London. In 1893 he was knighted by Queen Victoria.

Tennyson, Alfred, 1st Baron (1809–92), English poet, born in Somersby, Lincolnshire, where his father was rector. He was educated at Cambridge University. At Cambridge he won the chancellor's medal with his blank-verse poem *Timbuctoo*, but his literary career properly dates from 1830, when his *Poems, Chiefly Lyrical* appeared. His *Poems* (1842) raised him to the high place in literature that he occupied until his death. *The Princess, a Medley* appeared in 1847, and in 1850 *In Memoriam* was published, occasioned by the death of his friend Arthur Hallam. In 1850 Tennyson succeeded Wordsworth as poet laureate, in which capacity he wrote his *Ode on the Death of the Duke of Wellington* (1852). In 1855 appeared *Maud, and other Poems*. The *Idylls of the King* at once took rank as one of the noblest poems in the language. It was followed in 1864 by a volume containing "Enoch Arden," "Aylmer's Field," "Tithonus" and a few other poems. Of his plays, *Becket* is perhaps the finest. His "Charge of the Light Brigade" and "Crossing the Bar" are popular single poems. In 1884 he was created a hereditary peer, Baron Tennyson of Freshwater and Aldworth. He was buried in Westminster Abbey.

Terence (Publius Terentius Afer; *c.* 190–*c.* 159 B.C.), Latin poet, born in Carthage, North Africa. He was taken to Rome as a slave and was sold to a member of the Senate, who gave him his freedom and educated him. Terence gained public favor; leading Romans, including Scipio the Younger, were his patrons. His works include the comedies *Andria, Adelphi, Eunuchus, Hecyra* and *Phormio*. Some of these are read as parts of present-day college courses in Latin. His famous line, *Homo sum; humani nihil a me alienum puto* ("I am a man; nothing human is outside my interests"), has often been quoted as a supreme expression of the philosophy of social cosmopolitanism.

Terhune, Albert Payson (1872–), American author, born in Newark, N. J., and educated at Columbia. He traveled on horseback through Egypt and Syria (1893–94) and lived among the Bedouins. When he returned to the United States he entered newspaper work. He became park commissioner for the state of New Jersey in 1925. He is best-known for his dog stories. Among them are *Black Gold, Grey Dawn, Lad of Sunnybank* and *The Way of a Dog*. Terhune also wrote a number of motion-picture plays, short stories and verse.

Terry, Ellen [Alicia] (1848–1928), English actress, born at Coventry. In 1856 she made her first appearance on the stage in Charles Kean's Shakespearean revivals. She made a sensation as Portia in 1875. In December 1878 she began her memorable association with Henry Irving at the Lyceum Theatre. After Irving's death in 1905 she continued to act at the Court Theatre under her own management. She was made Dame of the British Empire in 1925. Millais's portrait of her as Portia is in the Metropolitan Museum, New York.

Tertullian (Quintus Septimius Florens Tertullianus; *c.* 160–*c.* 230 A.D.), Latin theologian and bishop of Carthage. He was one of the most influential of the early Church Fathers, and his voluminous writings have a literary excellence in addition to their interest as religious polemics. His most important work, the *Apologeticus* ("Defense"), is a vigorous refutation of the false charges that were brought against the early Christians by the pagans. Some of Tertullian's expressions have passed into proverbs, for example, "The blood of martyrs is the seed of the church" and "It is certain because it is impossible."

Tesla, Nikola (1857–), American electrical inventor, born in Smiljan, Austria-Hungary. He came to the United States in 1884 and for several years was employed at Edison's laboratory near Orange, N. J. He was a pioneer in the study of high-tension electricity and made many discoveries in the development of radio. He invented an arc light, the very important induction motor and a high-frequency generator. Tesla designed the power stations at Niagara Falls. In 1898 he announced the discovery of a method of transmitting electrical energy without wires, which he patented in 1900. After 1903 he was occupied in the development of telegraphy and telephony. The Tesla coil or transformer is another important invention.

Tetrazzini, Luisa (1874–1940), Italian singer, born in Florence. She made her debut in 1895 at Florence. In 1907 she captured London on her first appearance at Covent Garden. She was in the United States with the Chicago Opera Company (1910–14). A coloratura soprano, she excelled in Italian opera, and her favorite roles were Lucia and La Sonnambula. She wrote *My Life of Song* (1922).

Thackeray, William Makepeace (1811–63), English author, born in Calcutta, India, student at Cambridge. He studied art but soon took up writing instead. He contributed to *Punch* both as artist and writer. In 1840 appeared his first book *The Paris Sketch-book*. Early in 1847 he began *Vanity Fair*, issuing it in monthly parts. It was finished in July 1848. Thackeray's reputation was made, and he became the idol of society. In 1849 *Pendennis* appeared; in 1852 *The*

History of Henry Esmond; in 1855 *The Newcomes.* In 1851 he delivered and published his *Lectures on the English Humorists of the Eighteenth Century* and in 1856 his *Lectures on the Four Georges.* He made successful lecture tours in the United States, 1852–53 and 1855–56. In 1858 he published *The Virginians,* a continuation of the Esmond story. He knew a great deal about the people of his period—their history, customs and manners—and his stories are accurate pictures of life in Thackeray's time, especially in the higher social levels.

Thales (*c.* 640–546 B.C.), Greek philosopher, statesman, mathematician and astronomer. He put forward the idea that water is the first principle of the universe, everything else being but a variant of it. Although this theory appeared stupid in later years, Thales was the first to suggest a scientific explanation of the facts of the universe. He derived much fame from his accurate prediction of an eclipse of the sun that occurred 585 B.C.

Thayer, Abbott Handerson (1849–1921), American artist, born in Boston, Mass. He studied art there and in France. When he returned to the United States, he became a portrait painter. He is best-known, however, for his pictures of young girls. Among the most famous of these are *Young Woman in Olive Plush* (Worcester Art Museum), *Young Woman* (Metropolitan, N. Y.) and *The Virgin* (Freer Gallery, Washington, D. C.)

Thayer, William Roscoe (1859–1923), American author and poet, born in Boston, Mass., and graduated from Harvard. Even as a boy he was interested in Italy's fight for independence and later wrote two books about it: *The Dawn of Italian Independence* and *The Life and Times of Cavour.* Other works are *A Short History of Venice, Throne-Makers* and *Life and Letters of John Hay. The Confessions of Hermes* is a book of his verse.

Themistocles (*c.* 527–*c.* 460 B.C.), Athenian general and statesman. He became the political leader in Athens after Aristides was exiled (482) and induced the Athenians to build a navy and fortify the harbor at Piraeus. In 480 B.C. Xerxes attacked Athens with a huge fleet, and Themistocles defeated him near the isle of Salamis. This victory and others over the Persians made Athens the foremost maritime power of the period. Themistocles, however, lost the confidence of the people. He was exiled in 471 B.C. and settled at Magnesia, where he died.

Theocritus (3d century B.C.), Greek pastoral poet. Almost nothing is known of his life. He was perhaps born in Syracuse where he apparently was patronized by Hiero II. He also lived for a time in Alexandria. He is usually considered the last of the great Greek poets and the foremost representative of the pastoral (shepherd life) poetry tradition that has been influential throughout literary history. He was imitated by Vergil in his *Eclogues* or *Bucolics* and in modern times by many poets, including Spenser (*The Shepheards Calendar*) and Milton ("Lycidas").

Theodora (*c.* 508–48), East Roman Empress. Little is known of her early life; it is said that she was a dancing girl and later a spinner before she married Justinian I in 523. He came to the throne in 527, but Theodora was the real ruler. She saved his crown by inducing him to stay in Constantinople and put down the Nika rebellion in 532. She was extremely cruel and dictatorial. Her fascinating career has been the subject of many stories and plays.

Theodoric (*c.* 454–526), founder of the monarchy of the Ostrogoths (East Goths); son of Theudemir, the Ostrogothic King of Pannonia. He was the most powerful of the Gothic kings, with an empire including Italy, Sicily and Dalmatia, besides German possessions. As a ruler he proved himself as wise as he was strong and became in after years one of the great heroes of German legend. He figures in the *Nibelungenlied.*

Theodosius I (*c.* 346–395 A.D.), called *The Great,* Roman Emperor of the East. He was the son of Theodosius, a famous general under the Emperor Valentinian. In 378 he was selected by Gratian, Emperor in the West, as the successor to Valens, eastern Emperor, who had been killed in the disastrous battle of Adrianople against the Visigoths. Theodosius carried on the war with the Visigoths with success and also put down the usurper Maximus, who had taken advantage of the troubled state of affairs in the East to seize the imperial power in the West. In 380 Theodosius became a Christian, and his most lasting historical importance arises from his vigorous establishment of Christianity as the state religion and his forcible repression of Arianism and Paganism.

Theotocopoulos, see *El Greco.*

Thiers, Louis Adolphe (1797–1877), French statesman and writer, born in Marseille. He became a lawyer and in 1821 went to Paris, where he soon became a prominent Liberal. In 1830 he helped to found a newspaper, the *National,* which helped to provoke the revolution of that year. Thiers held several offices in the government. He took the post of minister of the interior and in 1840 found himself at the head of the ministry. Exiled for a year (1851) by Louis Napoleon, he returned to politics in 1863, and after the fall of the Empire in 1870 he negotiated for peace. From 1871 to 1873 he was President of the Republic. His 20-volume history of the Empire won a prize of 20,000 francs, and as a young man he wrote a history of the Revolution of 1789.

Thomas à Kempis (Thomas Hämmerlein; 1380–1471), German mystic. His entire life was devoted to the service of the Church. About the year 1400 he joined the Augustinian Canons and was ordained in 1413. His great work the *Imitation of Christ* was composed sometime before 1425. It is one of the great Christian classics and has influenced millions of lives. Next perhaps to the New Testament itself it has been the most widely read book of Christian inspiration. Besides the *Imitation* Thomas à Kempis wrote many treatises on monastic life and a few Latin hymns, some of which are still sung today.

Thomas, Augustus (1857–1934), American playwright, born in St. Louis, Mo. He was educated in the public schools, then studied law for 2 years but did not practice. After a number of years in journalism he turned his attention to playwriting. His first play was an adaptation of Frances Hodgson Burnett's *Editha's Burglar.* Among his successful plays are *Arizona, The Hoosier Doctor, The Harvest Moon, The Copperhead, Colorado, Nemesis* and *Still Waters.*

Thomas, George Henry (1816–70), American general, born in Southampton County, Va., graduated from West Point in 1840. He saw service against the Indians in Florida and in the Mexican War. Later he taught at West Point and served at a Texas frontier post. He became brigadier general of Federal volunteers in the Civil War. He won distinction at Mill Springs, Corinth and Perryville and especially at Murfreesboro and in the battles near Chattanooga. His conduct won highest praise and gained for him the sobriquet of *Rock of Chickamauga.* After the battle of Nashville he was raised to the rank of major general. When peace came, he commanded, successively, the departments of Kentucky, Tennessee and the Pacific.

Thomas, Norman Mattoon (1884–   ), American Socialist leader, born at Marion, Ohio, graduated from Princeton and Union Theological Seminary. He served as a minister in New York churches until 1918, when he founded a paper called *The World Tomorrow* and began to lecture on political and economic subjects. He became an editor of *The Nation* and was active in a number of associations holding advanced views. He ran unsuccessfully on the Socialist ticket for governor of New York (1924), mayor of New York city (1925 and 1929), representative to Congress (1930) and President (1928 and 1932). He was several times arrested because of his activities in behalf of the American Civil Liberties Union. Throughout his stormy political career he lectured, debated and wrote on politics, pacifism and reform. Among his books are *The Challenge of War, Socialism of Our Time, The Choice Before Us* and *Human Exploitation.*

Thomas, Theodore (1835–1905), American musician, born in Essen, Germany. His parents emigrated to the United States when he was 10. At 16 he was a violinist in a New York orchestra. He organized an orchestra of his own in 1861, gave concerts in New York and instituted the famous Irving Hall Symphony performances. His career took him to a number of cities. He went to Chicago and founded the Chicago Orchestra, now the Chicago Symphony Orchestra.

Thompson, Francis (1859–1907), English poet, born at Preston. He studied medicine at Owen's College, Manchester, but did not care to complete his courses and went to London. He lived in poverty until some of his verses came to the attention of Wilfrid Meynell, an editor. Meynell and his wife took Thompson under their care, and he became well-known. His volumes of verse are *Poems, Sister Songs* and *New Poems.* His "The Hound of Heaven" is one of the great mystic poems of the 19th century. He wrote notable essays, especially on poetry; his essay on Shelley is a classic.

Thomson, Elihu (1853–1937), American engineer, born in Manchester, England. He was brought to the United States as a child. From 1870 to 1880 he was professor of chemistry at Central High School, Philadelphia, and in 1880 founded the Thomson-Houston Electric Company, which later developed into the General Electric Company. He invented the electric-welding process that bears his name and many important devices connected with electric lighting and power.

Thomson, James (1700–48), Scottish poet, born in Port Glasgow. He studied 6 years at Edinburgh University. His fame rests upon his poems *The Seasons,* the first of which "Winter," appeared in 1726, followed by "Summer," "Spring" and "Autumn." *The Castle of Indolence* is the best-known of his other poems. He wrote several plays. In the masque *Alfred,* the joint work of Thomson and David Mallet, occurs the famous song "Rule Britannia," which was probably written by Thomson.

Thomson, James (1834–82), Scottish poet. His most important work, *The City of Dreadful Night,* is a powerful expression of the terrible pessimism that his melancholy temperament engendered. He wrote also a number of critical essays, using the signature "B. V." by which he was generally known to contemporary readers. His life was a constant battle with poverty, illness and melancholia. In his long poem "Sunday up the River" occurs the popular song, "Give a man a horse he can ride."

Thomson, Sir Joseph John (1856–1940), English physicist, born near Manchester and educated at Cambridge. He was professor of experimental physics from 1884 to 1918. Thomson is famous for his discovery of the electron and for his work in radioactivity and the study of the passage of electricity through gases. He won the Nobel Prize in physics in 1906 and was knighted in 1908. Among his books are *Beyond the Electron, The Structure of Light, The Atomic Theory* and *Electricity and Matter.*

Thomson, Sir William, see *Kelvin, 1st Baron.*

Thoreau, Henry David (1817–62), American writer, born at Concord, Mass., graduated from Harvard in 1837. At first he was a surveyor, but he preferred to work only when he needed money. In 1852 he retired to a cabin on the shore of Walden Pond, near Concord, and there he studied nature and wrote. He gave an account of his experiences in his popular book *Walden* published in 1854. Many of the most prominent men of his time were his friends—Emerson and Hawthorne, among others. Besides *Walden* he wrote *Cape Cod, The Maine Woods* and *A Yankee in Canada.*

Thorndike, Ashley Horace (1871–1933), American educator and author, born in Houlton, Me., and educated at Wesleyan and Harvard. He taught English at a number of universities and was professor of English at Columbia University from 1906 until his death. He was an authority on the drama and especially on Shakespeare. Among his books are *English Comedy, Shakespeare's Theatre, The Minor Elizabethan Drama* and *A History of English Literature.* He edited a number of textbooks and anthologies.

Thorndike, Edward Lee (1874–   ), American educator and psychologist, born at Williamsburg, Mass., and educated at Wesleyan, Harvard and Columbia. He taught at Western Reserve before beginning his long service at Columbia in 1899. He did much to build up Teachers College there and taught several courses in educational method and psychology. He wrote *Principles of Teaching, Educational Psychology* and *The Measurement of Intelligence* and planned and edited *The Thorndike-Century Junior Dictionary* based on a statistical study of the most frequently used words in the English language.

His brother Lynn Thorndike (1882–   ) wrote on medieval history and published *A Short History of Civilization.*

Thorvaldsen, Albert Bertel (1770–1844), Danish sculptor, born at Copenhagen. He studied at the Academy of Copenhagen, where he won the first gold medal in sculpture and was sent by the academy to study in Rome in 1796. Among his best pieces are the *Entry of Alexander Into Babylon, Cupid and Psyche,* the *Dying Lion* at Lucerne and busts of Byron and the Danish poet Oehlenschläger.

Thucydides (*c.* 471–*c.* 400 B.C.), Greek historian, born in Athens into great wealth and influence. In 424 B.C. he was commander of part of the Athenian navy but failed to arrive at Amphipolis in time to prevent the surrender of Sparta, and he was banished for 20 years. While in retirement on his Thracian estate and in Italy and Sicily, he wrote his voluminous *History of the Peloponnesian War,* a valuable record of that period. After the close of the war he returned to Athens and died, probably by violence. Thucydides is universally regarded as the greatest ancient historian; his painstaking accuracy, his critical insight and his grasp of the forces that underlie historic movement have been admired for 2,000 years. He wrote, "As for the facts and occurrences of the war, I have thought it my duty to give them, not as ascertained from any chance informant nor as seemed to me to be probable, but only after investigating with all possible care each detail, both for those events in which I myself participated and those concerning which I got my information from others. And the endeavor to determine the facts was no easy task, for I found that the several witnesses did not give the same reports concerning the same things, but reports varying according to their championship of one side or the other or according to their recollection. It may well be that the absence of the fabulous from my narrative will make it less pleasing to the ear; but for those who wish to have a clear view both of the events that have happened and those that will some day, in all human probability, happen again in the same or a similar way—for these to adjudge my history as profitable will be enough. Indeed it has not been composed as a prize essay, but as a possession for all time."

Thutmosis III or **Thothmes** (*c.* 1515–*c.* 1461 B.C.), King of Egypt. He conquered all southeastern Asia from the Nile eastward into Syria, Palestine and Mesopotamia. He built the two obelisks now familiarly known as Cleopatra's Needles; they stood until 14 B.C. before the Temple of the Sun at Heliopolis, then were moved to Alexandria. In 1878 one of them was taken to London and set up on the Thames Embankment, and 2 years later the other was placed in Central Park, New York city. On these obelisks the names of Thutmosis III and Ramses II are inscribed. Thutmosis' mummy was found in 1881.

Thwaites, Reuben Gold (1853–1913), American historian, born in Dorchester, Mass., student at Yale. He moved to Wisconsin at 16; at 23 he was editor of the *Wisconsin State Journal*. In 1886 he became superintendent of the Wisconsin State Historical Society. His works include *Early Western Trails, Down Historic Waterways, The Colonies—1492–1750, Daniel Boone, George Rogers Clark, France in America, Brief History of Rocky Mountain Explorations* and *Wisconsin*.

Thwing, Charles Franklin (1853–1937), American educator, born in Maine, educated at Harvard. He became a Congregational minister and held pastorates in Cambridge, Mass., and Minneapolis from 1879 to 1890. In 1890 he was elected president of Western Reserve University of Cleveland, Ohio, retiring in 1921 as president emeritus. He was secretary of the board of trustees of the Carnegie Foundation for the Advancement of Teaching for 16 years and a member of many other boards and societies. Thwing published many educational books.

Tibbett, Lawrence [Mervil] (1896–), American singer, born in Bakersfield, Calif. He was educated in the Manual Arts Junior College in Los Angeles and studied music in that city and in New York. He first appeared on the concert stage in Los Angeles in 1917. His operatic debut was made in the Hollywood Bowl in 1923, where he sang the baritone role in *Aïda*. This appearance attracted the attention of opera managers in New York, and late in the same year he was given the part of Valentine in *Faust* in the Metropolitan Opera House. In 1929 he appeared in his first motion-picture musical production.

Tiberius (Tiberius Claudius Nero Caesar; 42 B.C.–37 A.D.), Roman Emperor, son of Tiberius Claudius Nero and Livia Drusilla. He campaigned in Armenia and (with his brother Drusus) on the Rhine and Danube. He became consul in 7 B.C. and then retired to Rhodes for 7 years. When he returned, he was adopted as the heir of the Emperor Augustus. After more campaigning he came to the throne in 14 A.D. and at once took voting power from the popular assembly and gave it to the senate. He was extremely cautious and suspicious and was much influenced by Sejanus, whom he later put to death. Although Tiberius was despotic and cruel, he did lighten taxation and greatly strengthened the empire.

Tibullus, Albius (*c.* 54–*c.* 18 B.C.), Roman poet. Very little is known of his life. His poems are of the type known as elegaic—a special verse form dealing with a conventionalized subject, usually some phase of the pangs of love—and are the best examples of this form in Latin.

Tieck, Johann Ludwig (1773–1853), German poet and critic. He was educated at the universities of Halle, Göttingen and Erlangen. His voluminous writings, issued over a period of more than 50 years, are an important contribution to the German romantic movement. Thomas Carlyle translated some of his romances, and Tieck edited Schlegel's translation of Shakespeare.

Tiffany, Charles Lewis (1812–1902), American jeweler, born in Connecticut. At the age of 25 he established a jewelry, fancy-goods and stationery store in New York city. In 1847 he began to manufacture jewelry and silverware and in 1851 introduced the English standard of sterling silver into America. In 1851 the store became Tiffany & Company, and a few years later branches were established in numerous European cities.

Louis Comfort Tiffany (1848–1933), his son, was an artist of note. He invented a kind of colored glass (Favrile glass) for windows. The Louis Comfort Tiffany Foundation at Oyster Bay, N. Y., was instituted to enable artists to sketch and work from nature at nominal expense.

Tilden, Samuel Jones (1814–86), American statesman, born at New Lebanon, N. Y. He was educated at Yale and New York University and admitted to the bar in 1841. In 1866 he became chairman of the state Democratic committee; he attacked and destroyed the "Tweed Ring." In 1874 he was elected governor of New York, and 2 years later he became the Democratic candidate for President. The Republicans nominated Rutherford B. Hayes. The election was one of the most exciting in American history. Tilden appeared to have received the most popular votes, but the returns from some states were disputed. Congress appointed an Electoral Commission to decide the matter, and the Presidency was given to Hayes. Tilden left a large amount of money to found a free public library in New York city.

Tilden, William Tatem, Jr. (1893–), American tennis player, born in Philadelphia, Pa. He was tennis champion of the United States and the world (1920–25). He regained the United States championship in 1930 when he also won the championship of Switzerland and the Netherlands. He became a professional player in 1931. Tilden wrote sports articles for newspapers and several books on tennis, notably *Me—the Handicap* (1929) and a novel *Glory's Net* (1930). In 1925 he appeared as an actor in *The Kid, Himself*.

Tilly, von, Johann Tserclaes, Count (1559–1632), German soldier, born in Belgium. He already had a distinguished record as a soldier when he was given command of the forces of the Catholic League in the Thirty Years' War (1618). He won many victories, including the storming of Magdeburg in May 1631, when 40,000 people were butchered. In the following September Tilly was routed by Gustavus Adolphus at Breitenfeld; in April 1632 he was killed at the battle of the Lech.

Timour or **Timur Lenk**, see *Tamerlane*.

Timrod, Henry (1829–67), American poet. He was born in Charleston, S. C., and was one of the leading southern writers. His best poetry was inspired by the Civil War. Among his famous poems are "Ode to the Confederate Dead at Magnolia Cemetery," "Carolina" and "Ethnogenesis." Timrod was a friend of Paul Hamilton Hayne, who collected and published Timrod's work after his death.

Tintoretto, Il (Jacopo Robusti; 1518–94), Italian painter, born in Venice, son of a dyer (*tintore*) and so called *Tintoretto*, little dyer. He studied under Titian. By the time he was 30 he had painted *The Last Judgment*, which caused Ruskin to rank him among the "five supreme painters." Among other of his famous paintings are *The Miracle of Saint Mark, Moses Striking the Rock, The Crucifixion, Plague of Serpents, Christ with Mary and Martha, Miracle of the Loaves and Fishes* and *Doge in Prayer before the Redeemer;* the last two are in the Metropolitan Museum, New York.

Tirpitz, von, Alfred (1849–1930), German admiral. He entered the navy in 1865 as a cadet, became captain in 1880, chief of staff in 1892 and grand admiral in 1911. As secretary for the navy (1897–1916) his aim was to make Germany a great naval power. During the World War he commanded the navy from August 1914 to March 1916 and was a strong advocate of the ruthless submarine policy. He entered the Reichstag in 1921.

Tissot, James Joseph Jacques (1836–1902), French painter, born in Nantes. His great work was a series of some 700 water colors illustrating the Bible and 350 drawings of events in the life of Christ. His great painting *Faust and Marguerite* was bought by the state for the Luxembourg Gallery.

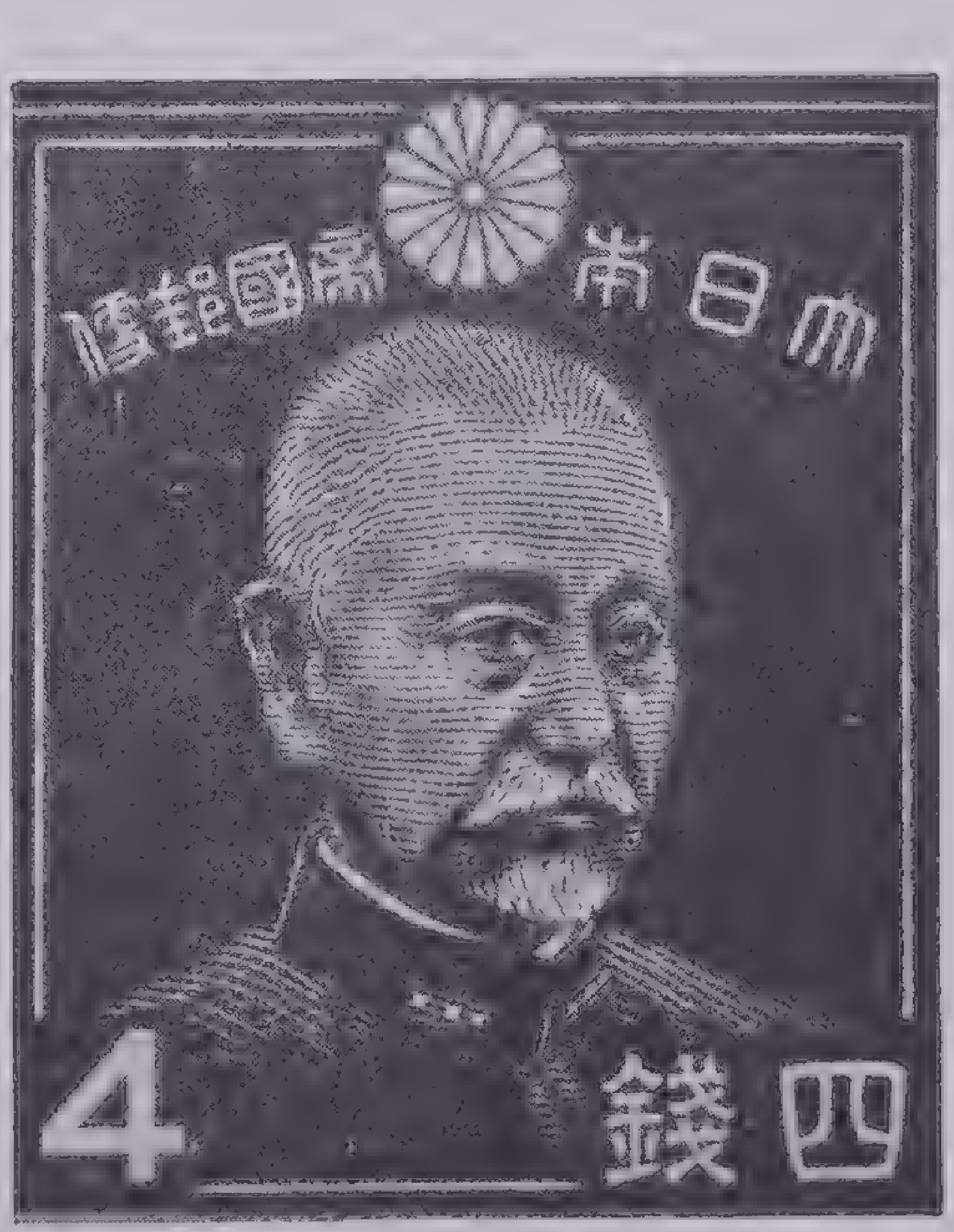
TITIAN (Tiziano Vecellio; 1477–1576), Italian painter, born at Pieve de Cadore, in the Carnic Alps. He studied under Gentile and Giovanni Bellini at Venice. In 1511 he was invited to Padua, where he executed three remarkable frescoes, which are still there. In 1512 he completed the unfinished pictures of Bellini in the Sala del Gran Consiglio at Venice, and the senate was so pleased that it gave him an important office. To this period are attributed his pictures *Tribute Money* and *Sacred and Profane Love*.

His *Assumption of the Virgin* is considered one of the finest pictures in the world. He produced his magnificent picture *The Death of St. Peter the Martyr* about 1528; it was destroyed by fire in 1867. In 1530 Charles V invited him to Bologna to paint his portrait and execute various other commissions. Titian painted many of his masterpieces in Madrid, where *The Sleeping Venus, Christ in the Garden, St. Margaret and the Dragon* were to be found before the bombardments of 1936 and 1937 during the civil war. His other pictures are *Annunciation, The Descent of the Holy Ghost on the Apostles, The Sacrifice of Abraham, David and Goliath, The Virgin and San Tiziano, Pope Paul III, Cardinal Farnese* and *Duke Ottavio Farnese*. Titian excelled as much in landscape as in figure painting. As a colorist he is almost unrivaled, and his pictures often reach the perfection of sensuous beauty. He painted hair in a rich red tone that is called *Titian* or *Titian red*. Three portraits by him are in the Metropolitan Museum, New York.

Titus (Titus Flavius Sabinus Vespasianus; 40–81 A.D.), Roman Emperor, the son of Emperor Vespasian. In his youth he lived in the home of Nero. In 70 he besieged and destroyed Jerusalem, and for this great victory the Arch of Titus was erected in his honor. He was made joint emperor with his father, who died in A.D. 79. Titus then became sole ruler and began to beautify his capital. The great Colosseum, started by Vespasian, was completed by Titus. He built magnificent baths and restored famous buildings. Herculaneum, Pompeii and Stabiae were buried by lava from Vesuvius, in 79 A.D., the first year of his reign.

Tocqueville, de, Alexis Charles Henri Clérel (1805–59), French writer, born at Verneuil. In 1831 the government sent him on a mission to the United States to study its prison system and on his return he wrote *Democracy in America*, which created vast interest throughout Europe. He became successively a member of the Academy of Moral Sciences and of the French Academy. He was the most formidable opponent of the socialists and extreme republicans and strenuously opposed Louis Napoleon. Another important publication was his *The Old Regime and the Revolution*.

Togo, Heihachiro, Count (1847–1934), Japanese admiral. He received his naval training in England and returned to Japan to build up a modern navy there. In 1904 he commanded the Japanese fleet in the Russo-Japanese War. Togo's great victory was in the Sea of Japan, where he destroyed the



Courtesy Scott Stamp & Coin Company

Count Heihachiro Togo

Enlarged from a Japanese postage stamp issued in 1937, three years after the death of the admiral

Russian fleet. For his distinguished service Togo was made a count in 1907 and was appointed admiral of the fleet in 1912.

TOLSTOY, LEV NIKOLAEVICH, COUNT (1828–1910), Russian author and social reformer, born at Yasnaya Poliana, the family estate in Tula province. He studied at the University of Kazan, joined the army and served in the Crimean War. After the war he left the army and devoted himself to literature. His *War and Peace,* a tale of the invasion of Russia by Napoleon, is regarded as his masterpiece; but *Anna Karenina,* which appeared in 1876, was more popular. He wrote all his life—poems, novels and essays. Other important works include *What is Art?, The Resurrection* and *The Kreutzer Sonata.* The last few years of his life he devoted to the welfare of the peasants. In 1881 he worked out a religious doctrine for himself and preached it to others in a number of books. He said that men should rid themselves of civilized artificialities and return to a state of primitive Christianity. He put his ideas into practice and gave up all his property. This led to a complete break with his wife and family.

Tomlinson, Henry Major (1873–), English writer. He was on the editorial staff of several London newspapers and served as correspondent throughout the World War. From 1917 to 1923 he was a magazine editor. Among his novels are *Gallions Reach* and *All Our Yesterdays.* Other works—essays, travel sketches and criticism—are *The Sea and the Jungle, Out of Soundings, Tidemarks* and *Below London Bridge.*

Tonty, de, Henry (*c.* 1650–1704), Italian explorer. In 1678 he sailed with La Salle to Canada; 2 years later they built Fort Crèvecoeur on the site of the present Peoria, Ill. Tonty went back to Canada by way of Green Bay and Mackinac. Later he went down the Mississippi with La Salle and claimed the territory for France. In the following years Tonty continued his explorations and led his Indian allies in wars with hostile tribes. He added a great deal to early knowledge of the Mississippi Valley.

Toombs, Robert (1810–85), American statesman, born in Wilkes County, Georgia. From 1853 to 1861 he was a member of the United States Senate, but he resigned to take the post of secretary of state in the Confederacy. He gave up that post to become brigadier general in the Confederate army. After the war he lived in France, England and Cuba, and on his return to the South he refused to take the oath of allegiance to the United States Government. He practiced law until his death.

Torquemada, de, Tomás (1420–98), Spanish inquisitor, born in Valladolid, the nephew of a Spanish cardinal. He became prior in the monastery of Santa Cruz and confessor to Ferdinand and Isabella of Spain. In his zeal for the destruction of heresy he induced the Pope to permit the creation of the Spanish Inquisition, which was more strict and more definitely national than the earlier papal Inquisition. His ruthless persecutions have made his name a byword for cruelty. During the 18 years in which he remained inquisitor-general he caused 2,000 heretics to be put to death at the stake. The Pope rebuked him, but Torquemada replied by sending embassies to Rome to defend his actions. He drove the Moors and (in 1492) about 800,000 Jews from Spain; their loss to the business of Spain was deplorable. He was so intensely disliked that he never dared appear in public without a strong guard. Near the close of his career he retired to a monastery.

Torricelli, Evangelista (1608–47), Italian physicist. He became a pupil of Galileo and later succeeded him as professor of physics (then called natural philosophy) and mathematics in the university at Florence. He conducted experiments with a column of mercury in a glass tube closed at one end to balance the atmospheric pressure, and this led to the invention of the barometer. The space above the mercury in the closed tube has been named the Torricellian vacuum in his honor. He also improved Galileo's telescope and constructed a microscope.

Toscanini, Arturo (1867–), Italian conductor, born in Parma. He studied at the conservatory there. After 1886 he conducted orchestras in Europe, North America and South America. He was chief conductor at the Metropolitan Opera House, New York (1908–15). In 1921 he returned to the La Scala Opera in Milan and toured with his orchestra. He became one of the permanent conductors of the New York Philharmonic Orchestra in 1929 but returned to Italy in 1936. He directed a series of radio concerts from New York in the 1937–38 season; a large orchestra was especially assembled for him. Toscanini's remarkable memory permitted him to conduct without using a score.

Tourgée, Albion Winegar (1838–1905), American author, born in Ohio, educated at the University of Rochester. He served with the Federal army in the Civil War, was wounded at Bull Run and was taken prisoner at the battle of Murfreesboro. After the war he settled in North Carolina, helped to frame a new state constitution and wrote a number of novels based on his experience in the war and during the period of reconstruction. In 1897 he became American consul at Bordeaux, France, and in 1903 was transferred to Halifax, Nova Scotia.

Toussaint L'Ouverture, François Dominique (1743–1803), West Indian negro insurgent, born in Haiti. He was taken out of the ranks of slave laborers and made his master's coachman, rose to authority as assistant overseer of the plantation and was given opportunity for study. He took part in the negro rebellion in 1791. For services rendered against the Spaniards he was made commander of the island army in 1795. When Napoleon proclaimed the re-establishment of slavery, he refused to obey and was seized and taken to France, where he died in prison of exposure and starvation inflicted by Napoleon's orders.

Townsend, Francis Everett (1867–), American reformer, born at Fairburg, Ill., and graduated from the medical college of the University of Nebraska. He practiced medicine in the West for many years and became assistant health officer of Long Beach, Calif. (1919–31). In 1934 he proposed his Old Age Revolving Pensions Plan (Townsend Plan), calling for payment of $200.00 a month to citizens of the United States over 60 years of age. The money was to be spent within each month. The fund was to be built up through a 2 per cent tax on all business transactions. Townsend attracted a wide following, and the idea was even proposed in Congress, but the agitation gradually died out.

Trajan (Marcus Ulpius Nerva Trajanus; *c.* 52–117 A.D.), Roman Emperor, born at Italica, in Spain, and adopted by Nerva. He succeeded Nerva in 98 A.D. and ruled for 19 years. Under him the empire reached its widest extent, for he made Dacia, Mesopotamia, Armenia and Assyria Roman provinces. The *Column of Trajan* was erected to commemorate his victories. He built many new bridges, roads and canals and established libraries.

Tree, Sir Herbert Beerbohm (1853–1917), English actor, born in London. He made his stage debut in London in 1877. In 1884 he took the theater world by storm as the curate in *The Private Secretary.* He played melodrama for 10 years and later staged Shakespeare with great success. In 1906 he toured in the United States. He received a knighthood in 1909.

Treitschke, von, Heinrich (1834–96), German historian. He studied at the universities of Leipzig and Bonn and became professor of history at Freiburg in 1863. He later taught at Kiel, Heidelberg and Berlin. In the latter part of his life he was one of the most influential of German scholars. He used the immense resources of his learning in the partisan service of militant nationalism, and partly to his great authority may be attributed many of the antirational shibboleths of modern fascist Germany. Aggressive imperialism, anti-Semitism and the Aryan Myth, antisocialism and antidemocracy were all supported by Treitschke, and he must be regarded as one of the main intellectual forces that went into the making both of the World War and of German contemporary totalitarian politics. Treitschke's principal historical work is *The History of Germany in the Nineteenth Century.*

Trent, William Peterfield (1862–), American scholar and teacher. For many years he was professor of English literature at the University of the South and later at Columbia University. His exhaustive study of the culture and literature of Queen Anne's period is one of the great contributions of American scholarship to literary history. His 10-volume life of Defoe with its extensive bibliography is the standard source book for the study of Defoe and his times. Among his other works are *War and Civilization, A History of American Literature* and *Greatness in Literature and Other Essays.*

Trollope, Anthony (1815–82), English author, born in London. He became a post-office surveyor, his duties taking him to Ireland, the West Indies and Egypt. He traveled later in the United States, Africa and Australia, acquiring in his journeys material for books. He wrote on schedule—250 words every quarter hour for 2½ hours every day before breakfast—and made a business success out of his 50 novels. He wrote several novels on Irish life. His first successful novel *The Warden* and the Barsetshire series that followed were stories of English clergymen, their ambitions and their families. *Barchester Towers* is the best, with the possible exception of the first and shortest, *The Warden.* He published several volumes of travel and wrote biographies of Caesar, Cicero and Thackeray; also his *Autobiography* that describes his methods of writing.

Tromp, Martin Harpertzoon (1597–1653), Dutch admiral, born at Briel. He entered the navy in 1624 and rose to the rank of junior admiral. In 1639 he defeated a superior Spanish force near Gravelines and was made lord admiral. His name is associated with the struggle for sea supremacy between the Dutch and the English. In the naval battle with the English, July 31, 1653, off the coast of Holland, the Dutch lost 30 vessels, and Admiral Tromp was killed.

Trotsky, Leon (Lev Davidovich Bronstein; 1877–1940), Russian revolutionist, born of Jewish parentage at Odessa. He was twice deported to Siberia for revolutionary activities but escaped each time and continued his socialistic campaigns in Germany, France, Switzerland and finally in the United States, where he assisted in the publication of *Novy Mir,* a Russian socialistic paper, in New York city. In 1917 he returned to Russia where, with Lenin, he was prominent in organizing the Bolshevist Party. After the revolution of 1917 he became commissar for foreign affairs, and after the treaty of Brest-Litovsk, which took Russia out of the World War, he became commissar for war. After a sharp contest for leadership of the Communist party, following Lenin's death, he was defeated by Stalin. In 1927 he was expelled from the Communist party and exiled to Turkestan. In 1929 he went to Turkey, in 1936 to Norway and in 1937 to Mexico. Among his books are *My Life, From October 1917 to Brest-Litovsk* and *The Defense of Terrorism.*

Trumbull, John (1756–1843), American painter, son of Jonathan Trumbull, born at Lebanon, Conn., graduated from Harvard College, studied art in Boston. He served in the Revolutionary War as aide to Washington and later to General Gates. He left the army in 1777 and went to study art in London in 1780, when he was arrested and imprisoned for 7 months as a reprisal for the execution of Major André. For a time he lived in Paris. His historical pictures are *Battle of Bunker Hill, Death of Montgomery, Signing of the Declaration of Independence, Surrender of Cornwallis* and *Resignation of Washington.* He painted a number of portraits of prominent men, including Washington, Hamilton, John Jay and the duke of Wellington. There is a large collection of his paintings in Yale University, New Haven, and there are several of Trumbull's portraits in New York City Hall.

Trumbull, Jonathan (1710–85), colonial governor, born in Lebanon, Conn., educated at Harvard College. He was licensed as a preacher and later as a lawyer. He entered politics as a member of the Connecticut assembly in 1733 and became speaker 6 years later. In 1766 he became chief justice of the superior court and in 1769 was elected governor of Connecticut. He was an intimate friend of Washington, and it became Washington's habit, when called upon to decide a matter of importance, to say, in effect, "Let us hear what Brother Jonathan says." "Brother Jonathan" became a name representative of the American people as "John Bull" is of the English.

Tschaikowsky, see *Tchaikovsky.*

Tunney, Gene (James Joseph Tunney; 1898–), American pugilist, born in New York city. During the World War he enlisted in the U. S. Marines and became light heavyweight champion of the A. E. F. Returning to civilian life he became a professional boxer and won the heavyweight championship from Jack Dempsey at Philadelphia in September 1926. He retired undefeated in July 1928.

Turenne, de, Henri de la Tour d'Auvergne, Viscount (1611–75), French general, born in Sedan. In 1641 Richelieu put him in command of the French troops engaged in the Thirty Years' War, during which, with Condé, he won several victories. In the civil wars in France Condé and Turenne were on opposite sides. Turenne, almost always with inferior forces, was uniformly victorious, finally driving Condé from France. Turenne conquered part of the Netherlands, ravaged Alsace and advanced into Germany but was killed at Salzbach.

Turgenev, Ivan Sergyeevitch (1818–83), Russian author, born in Orel, educated in St. Petersburg (Leningrad), Moscow and Berlin. His first successful work was *A Sportsman's Sketches,* published in 1852. This book, written about peasant life, was later important in the emancipation of the serfs. His best-known work, *Fathers and Sons,* was resented by the radicals, and Turgenev was criticized so much that he left Russia and thereafter lived mostly in France. The social problems of the day are reflected in all his writings. Among his best-known novels are *Fathers and Sons, Liza, Smoke, Rudin, Journal of a Useless Man, On the Eve, Virgin Soil, Clara Militch* and *Faust.* His character sketches made western Europe acquainted with Russian life.

Turgot, Anne Robert Jacques, Baron de l'Aulne (1727–81), French statesman and economist, born in Paris. He was educated for the Church and was prior of the Sorbonne in 1749. Later he became a public official in Limoges. He tried to have oppressive taxes removed, set up schools, developed industries and built roads. Under Louis XVI he was put in charge of the finances of the country; if his plans had been accepted by the nobility and statesmen, France might have been spared the horrors of the Revolution. He warned the court that only widespread reforms could prevent revolution and himself tried to make some changes, but he was accused of trying to destroy the monarchy. Among his writings are *Reflections Upon the Formation and Distribution of Riches* and *Usury.*

Turner, Frederick Jackson (1861–1932), American historian. He was educated at the University of Wisconsin and at Johns Hopkins. For 14 years (1910–24) he was professor of history at Harvard and strongly influenced a generation of historical students. His most widely known work *The Frontier in American History* is a classic that established a new school of history.

Turner, Joseph Mallord William (1775–1851), British landscape painter, born in London. He studied under Reynolds and exhibited at the Royal Academy when only 15. In 1799 he was elected an associate of the Royal Academy and 3 years afterward attained the full dignity of Academician. Turner painted in two distinct styles. His early pictures are quiet in coloring. The works of his middle and late periods are marked by splendor of color and brilliance of light, such as *The Fighting Téméraire* and *The Sun of Venice Going to Sea.* Others are *The Slave Ship, The Castle of Indolence* and *Grand Canal.* His pictures are in the National and Tate galleries in London.

Turpin, Dick (1706–39), English robber. He was apprenticed to a butcher as a boy but soon joined a gang of smugglers and from then on lived a life of crime. He participated in many daring robberies and was finally executed. Many legends grew up around him, and he is the subject of a number of English folk songs.

Tutankhamen (14th century B.C.), Egyptian King of the 18th Dynasty. His reign appears to have lasted only 9 years. In 1922 his tomb-chamber was found intact by excavators working under the direction of Lord Carnarvon. The outer and inner chambers of the tomb contained treasures in profusion. The discovery proved to be the most remarkable ever made in the history of Egyptological research. Tutankhamen's mummy is now in the Museum of Cairo.

Twain, Mark (Samuel Langhorne Clemens; 1835–1910), American humorist, born in Missouri. He left the village grade school, learned the printer's trade and worked as a compositor in several cities. At the age of 16 he became a steamboat pilot on the Mississippi. He left the river when the Civil War broke out, was briefly a member of a volunteer band of Confederate sympathizers and then accompanied his brother to Virginia City, Nev. There he worked as a reporter for the local *Territorial Enterprise* and enlivened his articles with what was a characteristic form of his wit—the serious treatment of the most preposterous statements. Then followed a period of reporting in San Francisco, a short mining career, a trip to the Sandwich (now Hawaiian) Islands and successful lecturing. In 1867 his first story *The Jumping Frog of Calaveras County* was published. In 1867 he toured the Mediterranean, and his letters and notes about the journey were the basis of his *Innocents Abroad* (1869). After his return he edited the Buffalo *Express* for 2 years and in 1871 settled at Hartford, Conn., as a writer of fiction. From 1889 to nearly the end of the century he lived in Europe, where his humor was thoroughly appreciated. Financial losses compelled him to make a lecture tour of the world in 1896. His best-known works of humor are *Huckleberry Finn, The Adventures of Tom Sawyer, A Tramp Abroad, The Prince and the Pauper* and *A Connecticut Yankee at King Arthur's Court. Joan of Arc* is a serious historical study.

In *What is Man?* and *The Mysterious Stranger,* published after his death, Mark Twain reveals a pessimism and misanthropy comparable with that of Swift and Schopenhauer.

Tweed, William March (1823–78), American political "boss," born in New York city. He became a fireman but was soon influential in local politics. He was commissioner of public works in New York and later state senator. His power grew until he controlled his party in the city and throughout the state. He organized a ring of politicians bent on plunder of the public treasury. From 1869 to 1871 the sums taken in graft by Tweed and his followers reached a total of $100,000,000. The ring was exposed, and Tweed was sentenced to 12 years in prison. He was released on legal technicalities, was rearrested and jailed. He managed to escape but was followed to Cuba, then to Spain. He was again imprisoned in the United States in 1876 but died 2 years later.

Tyler, John (1790–1862), 10th President of the United States, born at Greenway, Va. He graduated from William and Mary College (1807), studied law and was admitted to the bar. In 1825 and again in 1827 he was chosen governor of Virginia and in 1833 was elected United States senator. From this time he was a Whig and an active supporter of Henry Clay. In 1840 he was elected Vice-President on the ticket with William Henry Harrison. Tyler became President when Harrison died a month after his inauguration. His term of office was marked by almost continual controversy both with Congress and his cabinet. High spots in the administration were the passing of a protective tariff law, the annexation of Texas in 1845 and the completion of the Webster-Ashburton Treaty, which settled the northeastern boundary dispute with England. In 1861 Tyler came out of retirement to preside at the Peace Congress in Washington and upon its failure became a member of the Confederate Congress.

Tyler, Moses Coit (1835–1900), American historian, born in Connecticut, educated at Yale University and Andover Theological Seminary. He traveled extensively in Europe and then spent several years in the ministry. In 1867 he taught English at the University of Michigan and in 1881 he became professor of American history at Cornell University. His works include *History of American Literature During the Colonial Time, A Literary History of the American Revolution, Three Men of Letters, Patrick Henry, Manual of English History* and *Glimpses of England.*

Tyler, Wat (d. 1381), English rebel, born in Colchester. Nothing is known of his life until 1381. At that time the people of England were in great distress as a result of the plague in 1351 called the *Black Death.* Furthermore, there were heavy taxes, and by the Statute of Laborers nobody could ask for or receive more pay than had been paid before 1351. Revolts broke out all over England, but the worst one began south of London, when Tyler led several thousand followers toward London, burning the houses of officials and landlords and destroying tax records. His mob was strengthened by others, and the whole force reached the outskirts of London and demanded to see King Richard II, then only 14. The king agreed to grant the relief Tyler demanded, and the mob dispersed. Tyler, however, remained for another conference with the king, and the next day he was killed. Parliament then revoked the king's promises.

Tyndale, William (*c.* 1492–1536), English translator of the Bible, born in Gloucestershire, educated at Cambridge and Oxford universities. He found it impossible in England to complete or to publish his version of the New Testament into English, so he carried his project to Luther in Germany, and in 1525 he began to have the Testament printed in Cologne. He remained on the Continent and in 1530 published a translation of the Pentateuch (the first five books of the Bible). When his New Testament entered England, it met with opposition from Cardinal Wolsey and Henry VIII, and they had Tyndale arrested and imprisoned near Brussels. He was tried and convicted on a charge of heresy and was executed. His version of the Bible was not complete, but it was excellent so far as it went and became the basis for the King James version. He was one of the greatest of the early English Protestant reformers.

Tyndall, John (1820–93), British scientist, born in County Carlow, Ireland. In his early life he was a surveyor and a railroad engineer. Later he filled many important posts, such as professor of natural philosophy at the Royal Institution, London, where he succeeded Faraday as director. He lectured in England and the United States and went to Switzerland to study the Alpine glaciers. His scientific studies in heat, sound and light are important. His publications include *Heat Considered as a Mode of Motion; On Sound,* a work on music and acoustics; *Faraday as a Discoverer; Fragments of Science for Unscientific People; Notes on Light;* and *Forms of Water.*

Udall, Nicholas (1505–56), English schoolmaster and playwright, born in Hampshire, educated at Oxford. He became headmaster of Eton College (1534–41) and of Westminster School (1555–56). He published several translations from the Latin, and wrote *Ralph Roister Doister,* the first English comedy.

Undset, Sigrid (1882–   ), Norwegian novelist, born in Denmark. In 1912 she wrote her first successful novel, *Jenny,* which was translated into English in 1917. She became a Roman Catholic after the World War and wrote a novel of the 14th century, *Kristin Lavransdatter,* a trilogy that was translated into English in 1930. She received the Nobel Prize for literature in 1928. Her later publications include *Ida Elizabeth* (1933), *Saga of Saints* (1934) and *The Faithful Wife* (1937).

Untermeyer, Louis (1885–   ), American poet and editor, born in New York city. He entered the jewelry business but left it in 1923 to study and write. He helped to edit several magazines and contributed poetry to them. His volumes of verse include *Challenge, Roast Leviathan* and *Food and Drink.* He translated Heine, wrote parodies of the work of contemporary poets and compiled the anthologies *Modern British Poetry, Modern American Poetry* and *This Singing World.*

Untermyer, Samuel (1858–1940), American lawyer and civic leader, born at Lynchburg, Va., and educated at Columbia. He helped to draft the Federal Reserve Bill and was counsel in a number of governmental investigations and in many famous law suits. He was instrumental in maintaining the 5-cent subway fare in New York city in a series of spectacular lawsuits. Untermyer exposed government corruption, fought against the power trusts and advocated government ownership of railroads. He was active in the Zionist movement.

Urban VIII (Maffeo Barberini; 1568–1644), Pope from 1623 to 1644, born in Florence. He founded the College of the Propaganda, brought about many changes in the church, erected many public buildings and added greatly to the Vatican library. He permitted the condemnation of Galileo, although he had previously admired him. In the Thirty Years' War Urban joined France against Spain and the Emperor on political rather than religious grounds.

Urban, Joseph Maria (1872–1933), Austro-American architect and stage designer, born in Vienna. He was a successful architect in Vienna and built an important bridge at Leningrad. He designed decorations for the Paris Exposition in 1900 and for the St. Louis Exposition in 1904. He became famous for his stage settings, including those for *Othello, Tristan and Isolde, Parsifal* and for the *Ziegfeld Follies.*

Urey, Harold Clayton (1893–   ), American chemist, born in Walkerton, Ind., educated at the universities of Montana and California. He was an industrial chemist for a time, taught chemistry at Johns Hopkins and became professor of chemistry at Columbia in 1934. He investigated the isotopes and received the Nobel Prize for chemistry (1934) for his discovery in 1931 of heavy water.

Vaihinger, Hans (1852–1933), German philosopher, founder of the "As-If" philosophy. He studied at Tübingen, Leipzig and Berlin and began a teaching career at the University of Strasbourg in 1877. His earlier philosophical work was a careful criticism and exposition of the work of Kant. He later developed his own system. Vaihinger's leading idea was that the ultimate nature of reality must always be unknown, but that man develops fictions or theories as a basis for action and then proceeds "as-if" the theories were true. The philosophy of "As-If" thus has much in common with the philosophy of pragmatism made influential in the United States by the work of William James.

Valera, de, Eamon, see *De Valera, Eamon.*

Valéry, Paul (1871–), French poet and essayist. He began his literary career under the influence of the symbolist movement. He wrote a critical study *Leonardo da Vinci* in 1894 but shortly after withdrew from an active career and lived as a student and recluse for nearly 20 years. He began publishing poetry again in 1917 and soon acquired great fame as an intellectual artist. He was elected to the French Academy in 1925 upon the death of Anatole France. His published works include *Charmes* (1922), *Poésie* (1928) and *Eupalinos.*

Vallandigham, Clement Laird (1820–71), American politician. Beginning in 1840 he was active as a Democrat in Ohio politics, was elected to the Ohio Legislature (1847) and to the United States Congress as a representative from Ohio (1858). He was a member of Congress during the exciting days of secession and civil war, and he vigorously opposed the policy of President Lincoln and supported the theory of states' rights. Defeated for re-election to Congress in 1862, he returned to Ohio where he continued agitation against the Government's conduct of the war. He was arrested by General Burnside, then commanding the Ohio Department, and his court-martial and sentence was widely discussed as a violation of civil liberty. Lincoln defended Burnside's action but commuted Vallandigham's sentence. Vallandigham was the outstanding leader of the numerous group reproachfully termed *Copperheads,* as if they were snakes in the grass.

Van Buren, Martin (1782–1862), 8th President of the United States, born in Kinderhook, N. Y. He began to study law at 14, and in 1803 he was admitted to the bar. He gained prominence when he became state senator in 1812 and N. Y. attorney general in 1815. In 1821 he entered the United States Senate. He resigned from the Senate to become governor of New York in 1828, and left that office when he was appointed secretary of state by President Jackson. Again he resigned office when he was made ambassador to Great Britain in 1831. The Senate rejected his appointment in 1832. In November 1832 he was elected Vice-President on the ticket with President Jackson. In 1836 he easily won the presidential election. The question of depositing state funds in private banks was important in his administration, as were several slavery questions on which he took a firm antislavery stand. A severe business depression began in 1837, and Van Buren was blamed, although he was not responsible. His unpopularity prevented reelection, although he was nominated by the Democratic party in 1840 and in 1848.

Vancouver, George (1758–98), English naval explorer. Early in his naval career he was a member of Captain Cook's second and third expeditions. In 1791 he left England and sailed around Cape of Good Hope to Australia and New Zealand. He made new explorations, then went to Tahiti and the Sandwich Islands (Hawaii) and up the Pacific slope to the island now called in his honor Vancouver Island. After an absence of three years he returned to England via Cape Horn.

Vanderbilt, Cornelius (1794–1877), American capitalist, founder of the Vanderbilt family and fortune, born on Staten Island, N. Y., of poor parents. As a boy he ferried passengers and freight between Staten Island and Manhattan and became known as Commodore. After a time he controlled most of the New York ferries and started a shipping line to California. In 1864 he withdrew from shipping, invested in railroads and became president of the New York Central Railroad. In 1872 he founded Vanderbilt University at Nashville, Tenn., with gifts of about a million dollars.

Van Devanter, Willis (1859–1941), American jurist, born in Marion, Indiana. He practiced law in Cheyenne, Wyo., and became city attorney. He was appointed chief justice of the Wyoming supreme court in 1889. From 1897 to 1903 he was an assistant attorney general of the United States, and a United States circuit judge from 1903 to 1910. In 1910 President Taft named him as an associate justice of the Supreme Court of the United States. In 1937 he retired from active service.

Van Dine, S. S. (Willard Huntington Wright; 1888–1939), American writer, born at Charlottesville, Va., and educated at Pomona College and at Harvard. He wrote a number of books on art and literary criticism under his own name before becoming famous under the pen name S. S. Van Dine as the author of mystery stories featuring the detective Philo Vance. Among the latter are: *The Benson Murder Case* (1926), *The Canary Murder Case* (1927), *The Bishop Murder Case* (1929), *The Scarab Murder Case* (1930), and *The Casino Murder Case* (1934).

Van Doren, Carl Clinton (1885–), American editor and critic, brother of Mark Van Doren, born at Hope, Ill. and graduated from the University of Illinois. He taught English at Columbia from 1911 to 1934. He was literary editor of *The Nation* (1919–22) and of *Century Magazine* (1922–25). His critical works include *Contemporary American Novelists, American Literature* and studies of Swift, Sinclair Lewis and Cabell. *Other Provinces* and *The Ninth Wave* are novels. He was managing editor of *The Cambridge History of American Literature.* His wife Irita Bradford Van Doren (1891–) became editor of *Books* in 1924, the weekly literary supplement of the New York *Herald Tribune* since that year.

Van Doren, Mark (1894–), American poet and critic, brother of Carl Van Doren, born in Hope, Ill., and educated at the universities of Illinois and Columbia. He taught English at Columbia and was literary editor of the *Nation.* He wrote crtiical studies of Thoreau, John Dryden and Edwin Arlington Robinson and compiled anthologies of poetry. Among his books of verse are *Spring Thunder and Other Poems, Now the Sky* and *Jonathan Gentry.* His wife, Dorothy Graffe Van Doren (1896–), became associate editor of *Nation* in 1926 and wrote several novels.

Van Dyck, Sir Anthony (1599–1641), Flemish painter, born in Antwerp. A great deal of his experience was gained by studying under Rubens. In 1620 he visited England and painted a portrait of James I. From 1623 to 1628 he was in Italy painting religious subjects. He returned to England in 1632 and painted *Charles I on Horseback.* In Antwerp he produced *Christ on the Cross,* recognized as his greatest historical canvas. Other works are *Adoration of the Shepherds, Ecstasy of Saint Augustine, The Deposition,* a portrait of *Ferdinand of Austria* and *Portrait of a Lady and Child.* He was also a talented etcher.

Van Dyke, Henry (1852–1933), American writer, born in Germantown, Pa., graduated from Princeton College in 1873 and from Princeton Theological Seminary in 1877. He was a nationally known Presbyterian minister before he was appointed professor of English literature at Princeton. He was United States minister to the Netherlands from 1913 to 1917. His literary work includes sermons, poetry, essays, fiction and criticism. Among his books are *Fisherman's Luck, The Other Wise Man, The Ruling Passion, The Valley of Vision, Fighting for Peace, The Reality of Religion, The First Christmas Tree, The Spirit of America, Six Days of the Week, The Golden Key, The Man Behind the Book* and *Gratitude.*

Vane, Sir Henry (1613–62), English statesman and writer, called *the Younger* to distinguish him from his father, Sir Henry (1589–1654), one of Charles I's advisers and then a leader in the Parliamentary party.

Young Sir Henry studied at Oxford and on the continent. In 1635 he emigrated to New England where he hoped to find religious toleration. In 1636 he was governor of Massachusetts, but he became involved in the religious controversy regarding the banishment of Anne Hutchinson, and his support of toleration in her case compelled him to leave the colony. He returned to England where he took an active part in politics. He was a member of the Long Parliament, where he supported the antiepiscopal party. In 1643 he was one of the commissioners who negotiated the Solemn League and Covenant with the Scots. He was opposed to the execution of Charles I (1649), but he continued to be a member of the council of state. During Cromwell's rule he agitated for religious toleration and was finally arrested upon his refusal to give a promise not to oppose the government. Upon Cromwell's death Vane returned to active politics. On the restoration of Charles II Vane was arrested, charged with high treason and executed.

van Loon, Hendrik Willem (1882–), American writer, born at Rotterdam, Holland, educated at Cornell and Harvard universities and in Munich. He was a newspaper correspondent in Washington, D. C., and in Europe during the World War, lectured on modern history at Cornell and was professor of history at Antioch College. Among his best-known books are *The Story of Mankind, The Golden Book of the Dutch Navigators, Short History of Discovery* (1918), *Ancient Man* (1920), *America, Life of Rembrandt, Van Loon's Geography* and *The Arts* (1937).

Varro, Marcus Terentius (116–*c.* 27 B.C.), Roman scholar and writer. He was known as the most learned man in Rome. Most of his enormous output has been lost except two books, one almost complete (*De Re Rustica*), the other a large fragment (*De Lingua Latina*). He wrote verse, biography, criticism—on every conceivable subject. Varro was made director of a public library founded by Julius Caesar, although he had fought against Caesar in the Civil War.

Varus, Publius Quintilius (d. 9 A.D.), Roman soldier. He was consul in 13 B.C. and later was governor of Syria. In 9 A.D. he was appointed governor in Germany by Augustus. He made an imprudent march into the interior and was surprised and overwhelmed by the German barbarians led by Hermann (Arminius) in a battle in the Teutoburger Wald in what is now Westphalia.

Vasari, Giorgio (1511–74), Italian painter and writer. In his early youth he studied painting under such masters as Andrea del Sarto and Michelangelo. In 1550 he published *Lives of the Greatest Italian Architects, Painters and Sculptors,* based upon personal knowledge as well as vast learning. Though it is inaccurate in details, the book is one of our most valuable sources for Renaissance cultural history. Vasari's artistic work includes several famous Vatican murals, frescoes in the Duomo at Florence and ceiling paintings in the Palazzo Vecchio at Florence.

Veblen, Thorstein (1857–1929), American economist and teacher. He graduated at Carleton College and studied at Johns Hopkins, Yale and Cornell. His best-known book *The Theory of the Leisure Class* (1899) is a classic of original economic thinking. With mordant wit Veblen traces many of the characteristic customs of modern society to the jungle psychology of man's early ancestors. The modern striving for "conspicuous consumption" and "conspicuous leisure," reflecting the "pecuniary standard of taste," is shown to be a form of primitive deference to personal exploits in war, hunting and decoration of the cave. *The Theory of the Leisure Class* has immensely influenced modern sociological thought. Some of Veblen's other writings, notably *The Theory of Business Enterprise* (1904) and *The Vested Interests and the State of the Industrial Arts,* though less popular than *The Theory of the Leisure Class,* have affected technical economic thinking to an even greater degree.

Vega Carpio, de, Lope Félix (1562–1635), Spanish dramatic poet, born in Madrid. He is said to have written 1,800 comedies and more than 400 shorter works, which included religious pieces, books of fiction, epics and lyrics. He founded the Spanish national theater and had great influence on the European drama. His first long production was a poem, *Hermosura de Angélica.* The more notable of his miscellaneous works are: *Rimas,* short pieces; *Peregrino en su Patria,* a romance; *Jerusalen Conquistada,* an epic patterned after that of the Italian poet Tasso; a collection of lighter verse, with the *Gatomaquia,* a mock-heroic poem; and *La Dorotea,* a prose drama, the story of his own early love adventures. He is remembered above all for his plays, which though imperfect in form are remarkably accurate pictures of all classes of Spanish society in the early 17th century. He became the idol of all Spain, and the best of his plays are still popular.

Velásquez, Diego Rodríguez de Silva y (1599–1660), Spanish painter, born in Seville. He studied under Herrera, then under Pacheco, whose daughter he married and at whose house he met Cervantes and other notables. He became the favorite of Philip IV, was elected court painter and held various offices at court.

In 1648 he went to Italy, commissioned by Philip to buy pictures in order to form a Spanish academy. While in Rome he painted the magnificent portrait of *Innocent X.* On his return he was made marshal of the court. In his own country his influence was not wide, but he has become a dominating influence in the world of art today.

Velásquez painted what he saw, with great skill. He had a trick of picking out the essential characteristic of a person or scene and then keeping other things subordinated. Among his best pictures are *Venus With a Mirror, The Water Carrier, Expulsion of the Moriscos, Surrender of Breda, Maids of Honor, The Topers, Forge of Vulcan* and *Portrait of Philip IV.*

Vendôme, de, Louis Joseph, Duke (1654–1712), French general, born at Paris. He first saw service in the Dutch campaign of 1672. In

1702 he fought an indecisive battle with Prince Eugene at Luzzara, then invaded the Tirol and later returned to Italy to check the united Savoyards and Austrians. The defeat at Oudenarde, 1708, cost him his command, but in 1710 he was sent to Spain to aid Philip V. His appearance turned the tide of disaster; he brought the king back to Madrid and defeated the English at Brihuega and Villaviciosa. He died at Vinaroz in Valencia.

Venizelos, Eleutherios (1864–1936), Greek statesman, born near Canea in Crete, graduated from the University of Athens. He practiced law in that city and in Crete. He became president of the Cretan Assembly and took part in the Cretan insurrectionary movements of 1896 and 1904. In 1909 he settled in Athens and became prime minister of Greece in 1910. His sympathies were with the Allies during the early days of the World War, but he got no support from his sovereign and resigned in 1915. After Constantine was dethroned in 1917 Venizelos was again prime minister until 1920. He held the office again in 1924 and from 1928 to 1933, when he retired to Crete. He led a revolution in 1935 to prevent the recall of George II (Constantine's son) to the throne but lost and went into exile in France, where he died.

Vercingetorix (d. 46 B.C.), Gallic patriot, leader of the great revolt of Gaul against Julius Caesar, 52 B.C. He was a chief of the Arverni, a powerful tribe in the south of Gaul, and a young man of the greatest ability; *summae potentiae, summae diligentiae* and *summae imperii severitatis* are the admiring expressions of Caesar. In the early spring of 52 B.C. the Gallic chieftains took advantage of the unsettled political conditions at Rome that they hoped would keep Caesar from joining the Roman army in Gaul and formed a conspiracy with the intention of throwing off the Roman domination. Vercingetorix's genius for leadership soon brought him to the head of the rebellion. He urged the Gauls to burn all their towns to prevent them from falling into the hands of the Romans; if this policy had been carried out as completely as Vercingetorix wished, the Roman army would have been starved.

For a considerable time it appeared that the revolt would be successful; practically all the Gallic states joined, including even the Haedui who had long been the chief Roman allies. For the only time in his Gallic campaigns Caesar was confronted with an opponent of first-rate organizing and military ability in command of numerically larger forces. The decisive action of the campaign was the siege of Alesia, where Vercingetorix made the serious mistake of allowing himself to be surrounded. Alesia was reduced by starvation, and Vercingetorix surrendered. He was sent by Caesar to Rome where he was imprisoned for 6 years; in 46 B.C. he was strangled as part of the ceremony of Caesar's triumph. The crushing out of Vercingetorix's rebellion ended Gallic resistance to the Roman conquest.

Verdi, Giuseppe (1813–1901), Italian composer, born at Roncole. At the age of 15 he composed a symphony and then went to Milan to study. In 1839 he produced his first opera, *Oberto.* His first success came in 1842 with *Nabucodonoser.* Verdi's most famous contributions to the Italian school of opera are *Ernani* (1844), *Rigoletto* (1851), *Il Trovatore* (1852) and *La Traviata* (1853). In 1871 he produced *Aïda;* this marked a change from his earlier melodic style to a dramatic method that shows the influence of Wagner. His *Manzoni Requiem,* in memory of his friend Alessandro Manzoni followed in 1874. After that came his opera *Otello,* and in 1893, when he was 80, he closed his remarkable operatic career with *Falstaff.* He wrote sacred music even after that—four famous pieces in 1898. Verdi's work is highly dramatic and theatrical; this and its notable rhythm makes it exceedingly popular.

Vereshchagin, Vasili Vasilevich (1842–1904), Russian painter, born at Tcherepovets, in Novgorod. In 1884 he made a journey to India, Syria and Palestine and produced a series of pictures of the life of Christ. He painted gigantic pictures of the execution of mutinous sepoys by English soldiers and of Nihilists by the Russian authorities. He was blown up on Makaroff's flagship off Port Arthur in the Russo-Japanese war.

VERGIL (Publius Vergilius Maro; 70–19 B.C.), Roman poet, born near Mantua in Cisalpine Gaul, in the valley of the Po, the son of a farmer. Vergil was educated at Cremona, Milan, Naples and Rome. He appears to have gone to Rome about 41 or 40 B.C., when his estate was lost at the time of the agrarian division. It was restored to him, however, after he applied to Augustus, who became his patron. Maecenas also befriended him, and he was intimate with Horace. His health was delicate, and his retiring nature led him to live mostly outside of Rome, either at Tarentum or Naples.

His *Eclogues,* a series of bucolic or pastoral poems, were written about 41–39 B.C. His *Georgics,* a poem on agriculture, was completed in 31 B.C. The *Aeneid,* an epic in 12 books celebrating the glory of Rome and of the Julian house, was probably begun about 29 B.C. Vergil worked on it for many years but never quite finished it. Nevertheless it is the greatest epic in Latin.

His poems exhibit a remarkable command of language and great taste and skill in the management of all the materials of poetry. He is unrivalled in beauty of versification. He was amiable and modest, free from envy and jealousy and of irreproachable character. Medieval legends represent him as a magician, although a harmless one, and many stories were told in Italy about his magical powers.

Verlaine, Paul (1844–96), French lyric poet. He is associated with the symbolist movement but more especially with the literary group known as the *decadents,* whose work was characterized by a morbid sensitivity and preoccupation with what are ordinarily called unhealthful emotions. His life was wretched. His works include *Sagesse* (1881), *Jadis et naguère* (1884) and *Parallèlement* (1889).

Vermeer, Jan (1632–75), Dutch painter, born in Delft. Little is known of his life except that he was an important figure in one of the Delft guilds. He was forgotten for nearly 2 centuries after his death; his few remaining paintings took on great value and are now highly appreciated. His work seems very modern and has a remarkable luminous quality. The best-known paintings are *Diana at Her Toilet, The Coquette, Young Woman With a Water Jug, Lacemaker* and *Lady with a Lute.*

Verne, Jules (1828–1905), French writer, born at Nantes. He went to study at Paris, where he became well-known as a writer of librettos and comedies. The travel stories of his friends and his own interest in science led him to write the tales for which he is famous. He visioned the submarine in *Twenty Thousand Leagues under the Sea* and pictured the flying machine and fast steamships in *Around the World in Eighty Days.* His other imaginative stories are *From the Earth to the Moon, Five Weeks in a Balloon* and *Michael Strogoff.*

Veronese, Paul (Paolo Cagliari; 1528–88), Venetian painter, born in Verona, from which he took the name by which he is known. He turned from his father's occupation of stonecutter and took up painting. After working in Verona and Mantua, he settled in Venice (1555) where he earned fame. His earliest work is seen in the Church of San Sebastiano, but he acquired greater dignity and style after he came under the influence of the work of Michelangelo and Raphael. His *Mars and Venus* is in the Metropolitan Museum, New York. The *Marriage of Cana,* considered his masterpiece, containing 130 life-size heads and figures, is in the Louvre, Paris. *Feast of the Levite* is owned by the Venice Academy. The *Feast of Simon* is at Milan. The *Family of Darius* is in the National Gallery, London. The *Adoration of the Magi* is exhibited by the Dresden Gallery.

Vesalius, Andreas (1514–64), Flemish anatomist and physician. His principal work *On the Structure of the Human Body* (1543) was the first substantial contribution to anatomy since the days of Galen. Vesalius turned from slavish study of the ancient writers to actual dissection and observation and is thus an important figure of the Renaissance revolt from authority toward observation and induction that ushered in the modern scientific era. Vesalius was also one of the boldest and most skilful of early surgeons.

Vespasian (Titus Flavius Sabinus Vespasianus; 9–79 A.D.), Roman Emperor. He came of a poor family and worked his way upward in the army through sheer ability. He headed an expedition into Britain and conquered the Isle of Wight. As consul, in the year 63, he was governor of Rome's African provinces and in 66 waged war in Judea. In 69 he was declared emperor and seized Rome from Vitellius. Vespasian began the construction of the Colosseum, and his son Titus completed it. He sent Agricola to Britain, and North Wales and Anglesea were added to the Roman realm. During the 9 years of his reign he led a simple life; literature flourished under his rule.

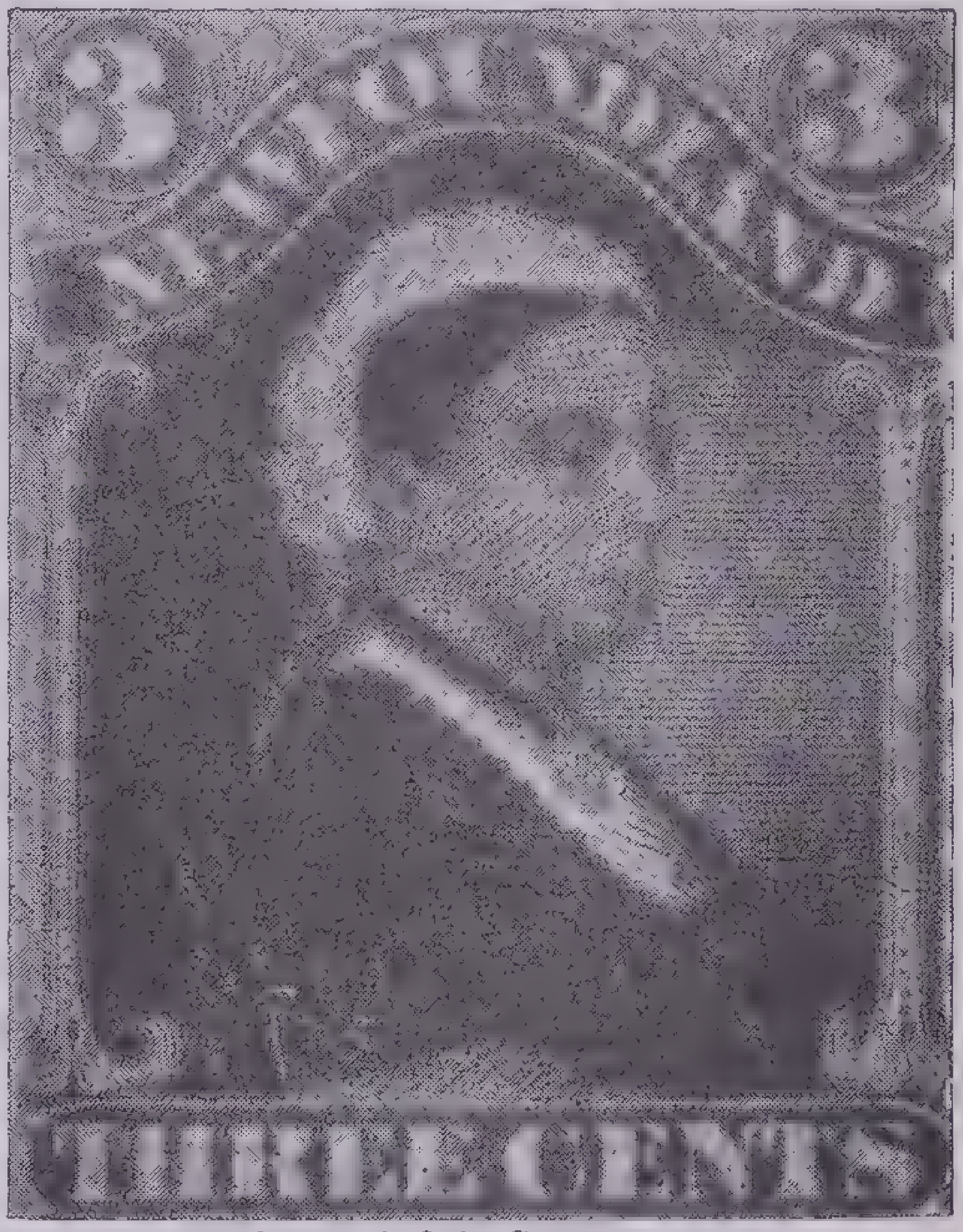
Vespucci, Amerigo (1451–1512), Italian explorer, born in Florence. He became a provision contractor and furnished the supplies for one or two of the voyages of Columbus. When he was 50, he embarked at Cadiz in one of a fleet of five ships commanded by Alonso de Hojeda and after 37 days' sailing reached America, coasted along the continent for several hundred leagues and returned to Spain. In 1506 he was recalled to the court of Spain and 2 years afterward was appointed chief pilot, which office he retained until his death. The Latin form of his name (Americus) was given to the continent through the erroneous belief, fostered by the letters he wrote, that he had reached and discovered the mainland in 1497, the year before Columbus.

Viaud, Louis Marie Julian, see *Loti, Pierre.*

Victor Emmanuel II (1820–78), King of Sardinia from 1849 to 1861 and King of Italy from 1861 until his death. He was born in Turin. He succeeded to the Sardinian throne on the death of his father, Charles Albert. After his accession he allied himself with France against Austria. With the help of his army and Garibaldi and by diplomacy with the help of his minister, Cavour, he was the real creator of a united Italy. As king he ruled as a strictly constitutional monarch.

Victor Emmanuel III (1869–), King of Italy, born in Naples, the son of King Humbert I and grandson of Victor Emmanuel II. He ascended the throne in 1901 after his father was assassinated. He did good work in the World War; but the end of the war found Italy in such a state of disorder that he dismissed the prime minister and invited Mussolini to Rome. The Fascist party under Mussolini's leadership ultimately absorbed practically all the functions of government.

Victoria (Alexandrina Victoria; 1819–1901), Queen of the United Kingdom of Great Britain and Ireland and Empress of India. She was born in the royal palace of Kensington, the only child of Edward, Duke of Kent (fourth son of George III). Her mother was Victoria Maria Louisa, a daughter of the duke of Saxe-Coburg-Gotha. Only William IV, the reigning king, stood between her and the English throne after she was 10 years old, but until she was 12 she was not told that she was destined to be the future queen of millions of subjects. When informed of her future power and dignity, she was sobered beyond her years and said simply, "I will be good." She succeeded William IV, June 20, 1837, and married her cousin, Prince Albert of Saxe-Coburg-Gotha in 1840. Victoria became the mother of nine children, four sons and five daughters.



Courtesy Scott Stamp & Coin Company

Queen Victoria

Enlarged from a Newfoundland postage stamp issued 1876–79, one of the few postage-stamp portraits of the queen showing her as a mature woman

Victoria made her influence felt in the political affairs of the empire, although as a constitutional monarch she followed the policy indicated by her prime ministers. Among her prime ministers were Melbourne, Peel, Palmerston, Disraeli, Gladstone and Salisbury. Her long reign saw more changes—political, social, industrial and scientific—than any other in British history.

The British Empire was considerably enlarged; the greater colonies achieved self-government; successive reform bills extended the franchise; free trade was adopted; wars were waged in China and Afghanistan; and Victoria's rule in India involved her country in the Indian Mutiny. In Africa there were Zulu wars, the Boer War and the South African War. In Europe she took part in the Crimean War. Victoria's husband, the Prince Consort, died in 1861. Throughout her reign the court obeyed the strictest rules of propriety; her influence was reflected throughout the social fabric of the Empire.

Vieta, François (1540–1603), French mathematician, born in Poitou. He was in the service of Henry IV of France when he discovered the key to the code in which Spain sent secret messages to the Netherlands. Philip II of Spain could not believe that the code could be deciphered and complained to the Pope that the French were using sorcery. Vieta's fame rests chiefly on his work as the founder of modern algebra. His writings could be used as textbooks today, except that he had not developed the sign for equality.

Villa, Francisco (Pancho; 1877–1923), Mexican revolutionary. He began his career as a cattle thief. In 1910 when Madero made war upon President Diaz, he joined Madero's forces. When Huerta made him prisoner, he escaped to the United States. In 1914 he returned to aid Carranza in his fight with Huerta. In 1916 Villa and his forces made a raid into New Mexico, and Col. John J. Pershing was sent into Mexico with an army to capture him but failed to do so. In 1920 Villa made terms with the Mexican authorities and settled down to a more peaceful life. He was killed by his own men 3 years later.

Villard, Henry (1835–1900), American publisher and financier, born in Bavaria. He came to the United States in 1853 and became a reporter on German-American newspapers. He won a reputation by reporting the Lincoln-Douglas debates. In 1873 he was agent for German bondholders in a western railroad. He became interested in railroad development and organized the Northern Pacific in 1881. He was president of the Edison General Electric Company (1890–93). He became owner of the New York *Evening Post* in 1881.

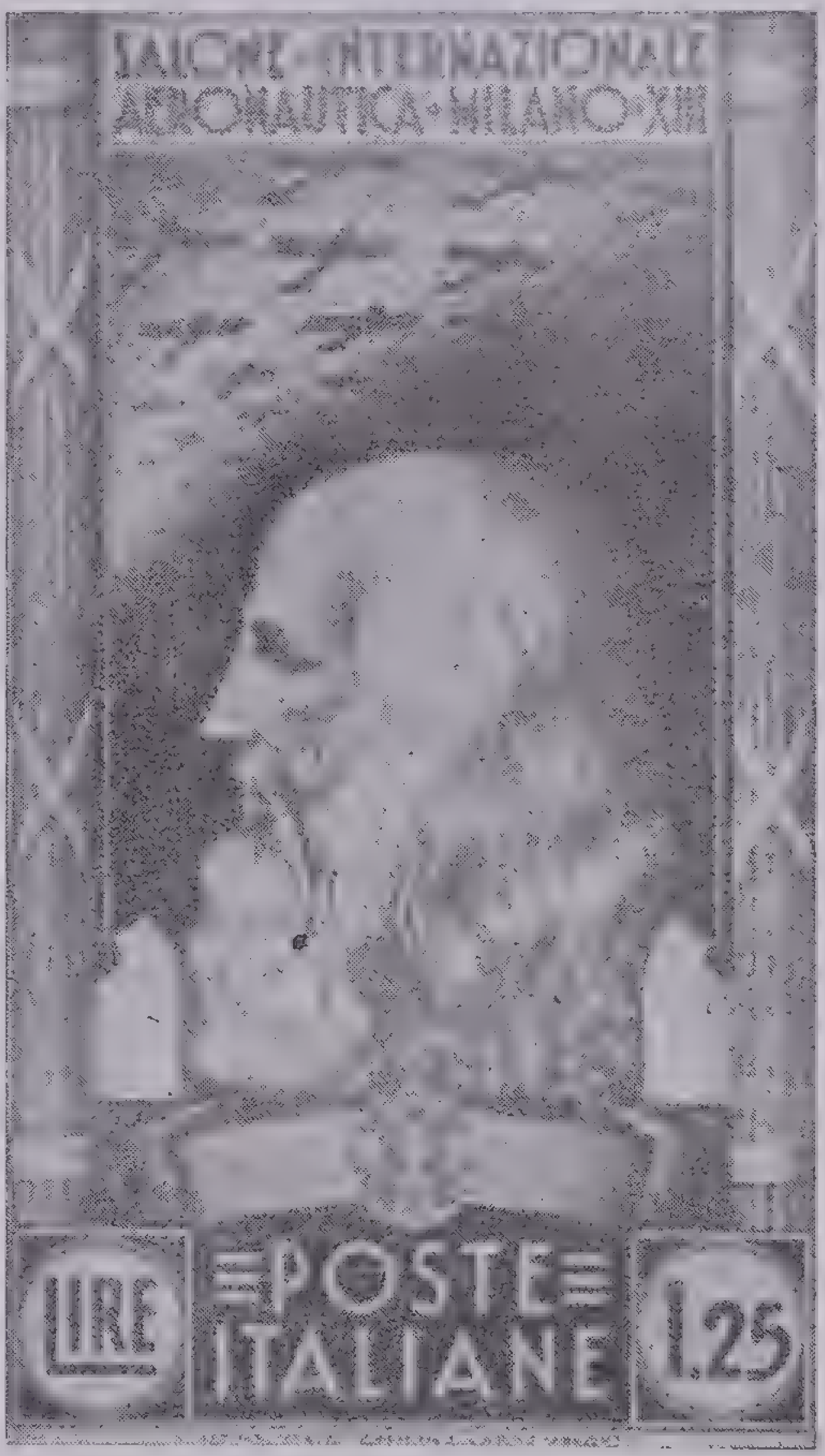
Villard, Oswald Garrison (1872–   ), American journalist and author, son of Henry Villard, born in Germany and educated at Harvard. He worked on newspapers in Philadelphia and in 1897 became an editorial writer on the New York *Evening Post*. Later he was part owner of that paper. He bought the *Nation* in 1918 and changed it from a conservative to a liberal weekly. Villard was always interested in Negro welfare and was a trustee of Tuskegee College. He wrote *John Brown: A Biography Fifty Years After*, *Germany Embattled* and *Prophets True and False*.

Villon, François (François de Montcorbier; 1431–*c.* 63), French poet, born in Paris. All that is known of his life comes from his own poems and from police records. He was a vagabond, living with criminals and in constant trouble with the police. In 1463 he was condemned to death, but the sentence was changed to 10 years exile from Paris; it is thought that he died soon afterward. In spite of his character Villon was the greatest lyric poet of his time. His works are gay and tender but show that Villon thought much about death. Most of his works are collected in *Petit Testament* (1456) and *Grand Testament* (1461); each is in the form of a burlesque will. The best-known individual poems are "Prayer to Our Lady" and the "Ballad of Dead Ladies" with the famous refrain "Where are the Snows of Yester-Year?"

Vincent de Paul, Saint (1576–1660), French ecclesiastic. He was ordained priest in 1600. From 1604 to 1607 he was a slave in Tunis, having been captured by pirates. He escaped, went to Paris and devoted himself to charitable works. In 1632 he founded the Mission of Sisters of Charity. He was canonized by Pope Clement XII in 1737.

VINCI, DA, LEONARDO (1452–1519), Italian painter, scientist and engineer, born at the village of Vinci, near Florence, educated in Florence, where he studied under Verrocchio. His unfinished *Adoration of the Kings* and his *Medusa's Head* belong to his Florentine period. In 1482 he settled in Milan and to his Milanese period are ascribed his most celebrated productions—the two versions of *Our Lady of the Rocks* and *The Last Supper*. He also founded an academy of arts, for which he wrote *Notes for a Treatise on Painting*. The French armies took Milan in 1499; Leonardo returned to Florence and was commissioned, with Michelangelo, to decorate the council hall of the Signoria. His famous *Mona Lisa*, painted in 1504, is a portrait of Mona Lisa del Giocondo, a lady of Florence. For 10 years (1506–16) he divided his time between Florence, Rome and Milan, and the last years of his life were passed in France near Amboise.

Da Vinci was a man of astonishing versatility, and his achievements in scientific fields would have marked him as one of the first men of his age even if he had not painted a single picture. The typical Renaissance ideal of Francis Bacon, "I have taken all knowledge to be my province," may be applied even more appropriately to Leonardo. He was a good musician, made a number of discoveries in anatomy, invented machinery, made plans for tunneling and swamp-draining projects and actually worked as an engineer. He carried on many experiments in the hope of discovering the secrets of mechanical flight.



Courtesy Scott Stamp & Coin Company

Leonardo da Vinci

Enlarged from an Italian postage stamp issued in 1935 when the First International Aeronautical Salon met in Milan. Leonardo was the first to experiment with the idea of a flying machine

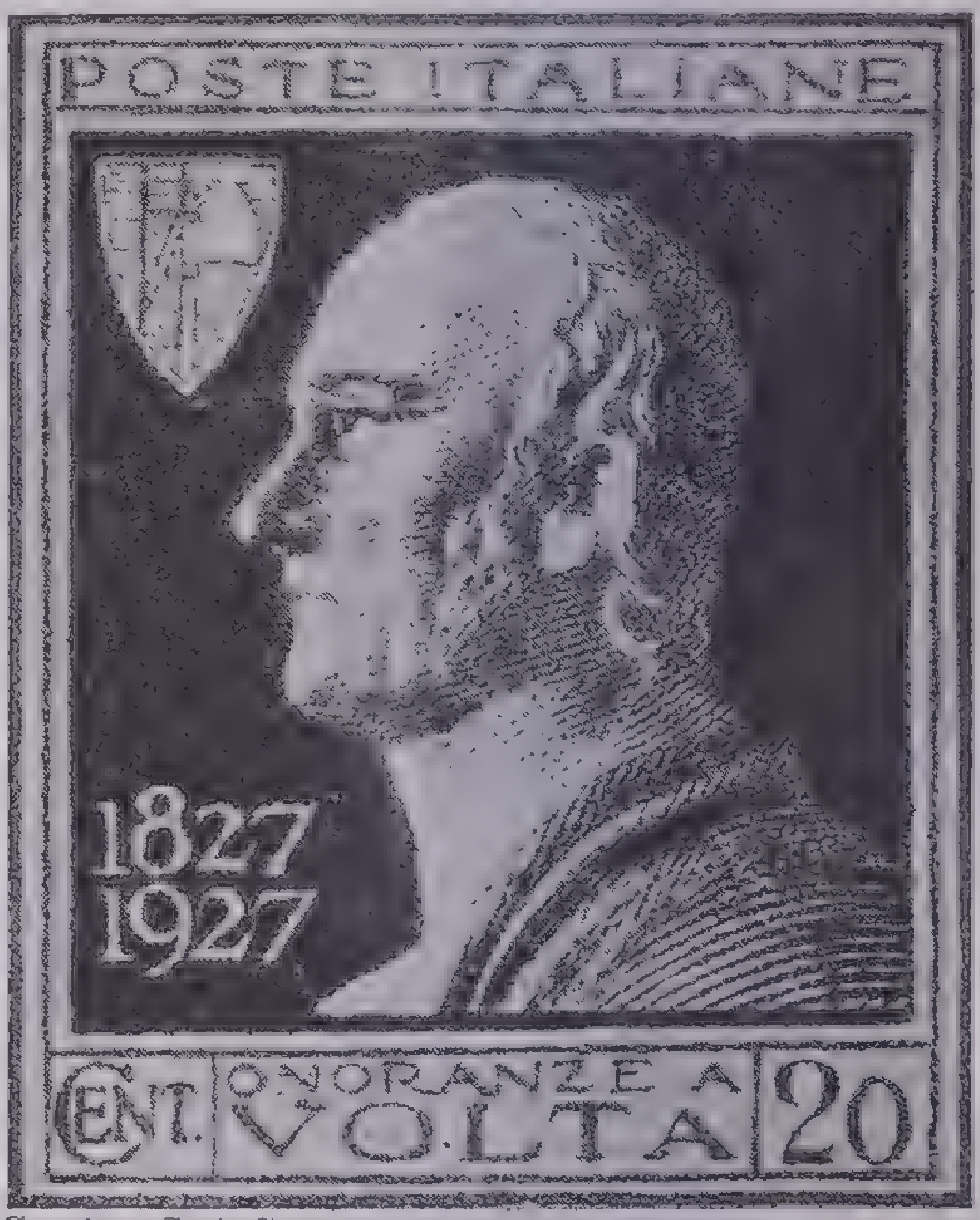
Virchow, Rudolf (1821–1902), German physician and pathologist. His most important work was *Cellular Pathology* (1858), which practically founded the science. Virchow took an active part in politics and was a liberal leader in the German Reichstag (1880–93) and in the Prussian Diet (1862–1902).

Virgil, see *Vergil.*

Volney, de, Constantin François de Chasseboeuf, Count (1757–1820), French skeptic and historical philosopher. His major work, *Ruins, or Thoughts on the Revolutions of Empires* (1791) became in the 19th century a kind of sourcebook for skeptics and anticlericals. Primarily a work on the causes of the fall of ancient civilization, the book is full of caustic analysis of what Volney considered religious superstition.

Volstead, Andrew Joseph (1860–   ), American legislator, born in Goodhue County, Minn., educated at St. Olaf's College and Decorah Institute. He practiced law and became county attorney. He sat in the United States House of Representatives from 1903 to 1923 and was one of the strongest advocates of the measure popularly called the Volstead Act. It was passed over the veto of President Wilson on October 18, 1919, and defined an intoxicating beverage as one containing more than ½ of 1 per cent alcohol. It made the Eighteenth Amendment actually effective.

Volta, Alessandro (1745–1827), Italian physicist, born in Como. Napoleon was interested in him and gave him high rank in Lombardy. He added much to the world's knowledge of electricity, and the *volt* (the unit of electrical pressure) was named for him. He taught physics in the royal school at Como and later in the University of Pavia. He invented one of the first electric batteries, called the *Voltaic pile,* an electrical condenser and a device for producing static electricity.



Courtesy Scott Stamp & Coin Company

Alessandro Volta

Enlarged from an Italian stamp issued in 1927, the 100th anniversary of the inventor's death

VOLTAIRE, DE, FRANÇOIS MARIE AROUET (1694–1778), French author, playwright and philosopher, born at Chatenay (near Paris), educated in Paris. He soon became known in the literary world. He went to England on the invitation of Lord Bolingbroke and lived there until 1729, when he returned to Paris. During this period he greatly increased his fortune by successful speculation. In 1749 he accepted Frederick the Great's invitation to live at his court at Potsdam. Here he was received with great honor, but a series of disagreements with the king ended in Voltaire's retirement from the Prussian court in 1753. He then lived with his niece, Madame Denis, at Ferney on Lake Geneva, where he received a constant stream of distinguished visitors and kept up a correspondence with many important people, including most of the crowned heads of Europe. In 1778 he went to Paris, where he was received with enthusiasm by all classes. The excitement of the occasion hastened his death.

He wrote on a wide variety of subjects—poetry, the drama, romance, history, philosophy and even science. His chief characteristic was his hatred of fanaticism and superstition; and nearly all his works were strongly colored with hostility to religious bigotry. Voltaire's literary fame rests chiefly on his philosophical novels, *Zadig, Candide* and *L'Ingénu;* his histories, *Siècle de Louis XIV* and *Histoire de Charles XII;* his correspondence, and more than all, perhaps, on his poetical epistles, satires and occasional light poems, which all show wit, gaiety, vivacity and grace. Several of his plays, such as *Zaïre, Alzire, Merope and Mahomet,* had great success in their day. His *Henriade,* an epic poem, became famous and had a powerful influence on French literature.

Vondel, van den, Joost (1587–1679), Dutch poet and dramatist. His first important work *Palamedes, or Murdered Innocence* was a fierce attack on Maurice of Nassau for the judicial murder of his political opponent, Jan van Olden Barneveldt. Vondel's outspokenness endangered his life, and he was for a time forced into hiding. He continued, however, to agitate for a wider religious toleration and issued powerful satires against the fanaticism of the extreme Calvinists. He associated for a time with Hugo Grotius. In 1640 he joined the Roman Catholic Church. Most of his great poetical dramas that have given him the position of the first Dutch poet were produced during the last half of his long life. *Lucifer*, usually thought his masterpiece, was published in 1654 and is believed by some critics to have influenced the English poet Milton.

WAGNER, RICHARD (Wilhelm Richard; 1813–83), German composer, born at Leipzig, educated at Leipzig and Dresden. From 1834 he filled various musical engagements at Magdeburg, Riga and Königsberg. In 1839–41 he went to Paris and London and composed his operas *Rienzi* and the *Flying Dutchman*. The brilliant success of these operas secured him the conductorship at the royal opera of Dresden in 1843.

He joined the insurrectionary movement of 1848–49 and was compelled to exile himself. Until his return to Germany in 1864 he spent most of his time in Switzerland, Italy, Paris and London. His *Tannhäuser* and *Lohengrin* appeared in 1845 and 1850, respectively. The king of Bavaria, Louis II., became an enthusiastic and liberal patron of Wagner, and the theater at Bayreuth, especially built for Wagner, was chiefly supported from the king's purse. Here his famous tetralogy *Der Ring des Nibelungen*, consisting of *Das Rheingold, Die Walkure, Siegfried* and *Götterdämmerung*, was first performed in 1876 before an unusually brilliant and appreciative audience. Then followed *Tristan und Isolde* and *Die Meistersinger*.

About a year before his death he produced his last creation, *Parsifal*. Wagner labored to reform dramatic music according to the ideas of Gluck and Weber and gave his creations a national character by selecting his subjects from old German heroic legends. His theory was that in a perfect musical drama the three arts, poetry, music and dramatic representation, should be welded together into one well-balanced whole. This theory he demonstrated with consummate ability and unsurpassed magnificence. His particular views on music are embodied in a well-known work entitled *Oper und Drama*.

Waite, Morrison Remick (1816–88), American jurist. He graduated from Yale University in 1837, then went into an Ohio law office and was admitted to the bar in 1839. He rose to distinction and in 1871 was one of the tribunal to negotiate the *Alabama* claims. In 1874 President Grant named him as chief justice of the United States Supreme Court.

Wald, Lillian D. (1867–1940), American social worker, born in Ohio, educated at Mt. Holyoke and as a nurse. She became head of the Henry Street Settlement in New York city. In 1902 she organized the first city school nursing service in the world. The establishment of the Federal Children's Bureau (1908) was her idea, and so was the town and country nursing service of the Red Cross.

Walker, Francis Amasa (1840–97), American political economist, educator and administrator, born in Boston, educated at Amherst College. He fought in the Civil War and rose to the rank of brigadier general. In 1869 he became chief of the Bureau of Statistics and was superintendent of the ninth and tenth decennial censuses. From 1873 to 1881 Walker was professor of political economy at Yale University and in 1881 was elected president of the Massachusetts Institute of Technology. He wrote *The Wages Question, Money, Bimetallism* and *General Political Economy*. He opposed the old *wage-fund* theory.

Walker, William (1824–60), American adventurer, born in Nashville, Tenn., graduated from Tennessee University, studied medicine in Philadelphia and later studied law and was admitted to the bar. In 1850 he went to California, where he practiced law and edited newspapers for several years. In 1853 he planned to conquer the state of Sonora, Mexico, and set himself up as its president. He gathered a group of followers and captured several towns in Mexico, but his ammunition ran out and he fled across the border and surrendered to the United States authorities to avoid capture by the Mexicans. He stood trial for violation of neutrality laws but was acquitted. In 1855 he fitted out another expedition and invaded Nicaragua. He captured one town and became secretary of war and military commander of Nicaragua. He contrived a successful war with Nicaraguan troops and proclaimed himself president of Nicaragua and Costa Rica. His arbitrary conduct led to his expulsion; again he surrendered to United States authority (1857), was taken on a naval vessel to New Orleans and placed under bond to keep the peace. In 1860 he headed an expedition against Honduras, and after capturing one town he was captured by the Honduras authorities, found guilty of insurrection and shot.

Wallace, Alfred Russel (1823–1913), British naturalist. He gave years to the study of natural selection and formed his theory of evolution at the same time as Darwin. On many points he differed from Darwin, particularly in regard to selection in animals. He traveled extensively. The "Wallace line" is an imaginary line drawn through the Malay Islands, to the north of which exists mammals widely differing from those to the south. Among his many books are *Travels on the Amazon and Rio Negro, Man's Place in the Universe* and *Social Environment and Moral Progress*.

Wallace, Edgar (1875–1932), English writer. He was educated in a London boarding school and then served in the army for six years. He became a journalist, a war correspondent and dramatic and racing critic. Wallace wrote more than 150 novels and 14 plays, most of them dealing with crime and its detection. His books sold at the rate of 5,000,000 copies a year.

Wallace, Henry Agard (1888–), American public official, born in Adair County, Iowa, educated at Iowa State College. His father was Henry Cantwell Wallace, Secretary of Agriculture in Harding's cabinet. Henry A. Wallace succeeded his father as editor of *Wallace's Farmer*. He was made secretary of agriculture in 1933, by President Roosevelt, and in 1941 became Vice-President of the United States. He wrote *Agricultural Prices, Corn and Corn Growing, Statesmanship and Religion* and *Whose Constitution?*

Wallace, Lew (Lewis; 1827–1905), American writer and soldier, born in Indiana. He dropped his study of law to serve in the Mexican War as a lieutenant. When the war ended he was admitted to the bar (1848) and began a successful practice. He joined the Union army in 1861, with the rank of colonel and was later promoted to major general. After the war he was a member of the court that tried Lincoln's assassins. In 1878 he became governor of the territory of New Mexico and in 1881 was appointed minister to Turkey. In 1880 he wrote *Ben Hur*, a story that was instantly popular. Others of his books are *The Fair God, The Prince of India* and *The Boyhood of Christ*.

Wallace, Sir William (*c.* 1272–1305), Scottish national hero. He was outlawed for killing an Englishman in a quarrel. He gathered a small band of followers and carried on a sort of guerrilla warfare against English officials. In 1297 he led an uprising and drove the English from Scotland. He was then made guardian of Scotland and ruled wisely. In 1298 he was defeated by Edward I at Falkirk. After being imprisoned in France, he was again declared an outlaw and in 1305 was captured by treachery and executed at the king's orders.

Wallach, Otto (1877–), German chemist. He became director of the Chemical Institute at Göttingen. He carried on valuable research in the composition of organic compounds and received the Nobel Prize in 1910.

Wallenstein, von, Albrecht Wenzel Eusebius, Duke of Friedland (1583–1634), German general, born in Bohemia. His parents were Protestants, but he became a Catholic and spent most of his life leading Catholic armies in the Thirty Years' War. He maintained his army from his own resources and by allowing his troops to plunder at will. Gustavus Adolphus of Sweden defeated him at Lützen in 1632. Wallenstein did not follow up the advantage of Gustavus's death, and the German emperor suspected Wallenstein of wishing to make himself king of Bohemia and had him killed.

Walpole, Horace, 4th Earl of Orford (1717–97), English author, born in London, studied at Cambridge. In 1747 he purchased his famous estate, Strawberry Hill, Twickenham. In this house he collected works of art and curiosities of every description. He installed a private printing shop and published his own works and the writings of some of his friends. He wrote *Anecdotes of Painting in England, The Castle of Otranto* (the ancestor of the modern mystery story) and *Reminiscences of the Courts of George I and II*. He is now remembered chiefly for his *Letters*, and he has been called "the best letter writer in the English language."

Walpole, Hugh Seymour (1884–), English novelist, born in New Zealand, educated at Kensington College. He taught for a time, then served with the Russian Red Cross in the World War. His first book, *The Wooden Horse* (1909), was not a success, but later ones were very popular. Among them are *Jeremy, Harmer John, The Cathedral, Golden Scarecrow, The Captives, The Old Ladies, Dark Forest, Portrait of a Man with Red Hair, Wintersmoon, Hans Frost, The Silver Thorn, Secret City, Fortitude, Judith Paris, Mr. Perrin and Mr. Traill, The Dark Tumult, Vanessa* and *The Fortress*. *The Cathedral* has been dramatized.

Walpole, Sir Robert, 1st Earl of Orford (1676–1745), English statesman. He was born in Norfolk, and graduated from Cambridge. He entered Parliament in 1701. He was secretary of war (1708); treasurer of the navy (1709); chancellor of the exchequer (1715–17) and prime minister (1721–42). Walpole was the first prime minister of England; the first at least recognized as such and deserving the name. Until his time English cabinets had been only a group of advisers to the Crown. His government was the first that was responsible to the House of Commons. Walpole urged the establishment of a sinking fund for reducing the national debt. He was an enemy of war and a strong supporter of the Protestant succession. On his retirement in 1742 he was created earl of Orford.

Walsh, Thomas James (1859–1933), American statesman, born in Two Rivers, Wis., educated at the University of Wisconsin. In 1890 he moved to Helena, Montana, practiced law and entered politics. He was elected to the United States Senate in 1912 and remained in office until his death. Senator Walsh received nation-wide attention in 1924 when he directed the investigation of the leasing of the naval oil reserve in the Teapot Dome inquiry.

Walter, Thomas Ustick (1804–87), American architect, born in Philadelphia, Pa. In 1848 his design for the extension of the capitol at Washington, D. C., was adopted. While in Washington he also designed the extensions of the Patent Office, Treasury and Post Office buildings, the dome of the Capitol and the government hospital for the insane.

Walther von der Vogelweide (fl. 1198–1228), German minnesinger of noble birth. He was the finest lyric poet of the Middle Ages. He wandered from court to court singing his songs, for which he wrote both verses and music. He was famous for the maxims he wrote, mostly on political subjects, and for his bold outspokenness on political and religious subjects. His love songs won him the title of "master of our song" (*unsers Sanges Meister*) from the bards of his day.

Walton, Izaak (1593–1683), English merchant and writer, called the *Father of Angling*. He was a linen draper in London, but retired from business in 1643 and thereafter became a writer. Fishing was his delight and he wrote *The Compleat Angler*, a book which gives delightful glimpses of rural scenes and country pastimes. Walton also wrote biographies of John Donne, Richard Hooker and George Herbert.

Warbeck, Perkin (1474–99), pretender to the English throne, born in Tournay, France. He claimed to be one of the two young sons of King Edward IV—the princes who were killed in the Tower of London by their uncle Richard. It was believed, however, that he was a Jew who resembled the prince and had been trained to represent himself as such. Several Irish earls and the Emperor Maximilian supported him in his claims.

He went to England in 1495 but could not raise a following. Then he went to Scotland, where James IV received him and married him to James's cousin, Catherine Gordon. Warbeck went to Cornwall in 1497 and raised a rebel army but surrendered when the royal forces attacked. He was imprisoned; 2 years later he was caught in a plot to seize the Tower of London and was executed.

Warburg, Otto Heinrich (1883–), German physiologist. He became famous for his research on the assimilation and oxidation of substances by the body and won the Nobel Prize in 1931.

Ward, Artemus, see *Browne, Charles Farrar*.

Ward, Mrs. Humphry (Mary Augusta Arnold Ward; 1851–1920), English novelist, born in Hobart, Tasmania, the granddaughter of Thomas Arnold (1795–1842), the famed master of Rugby. In 1872 she married Thomas Humphry Ward, a teacher, writer and critic, and they settled in London. Her first successful novel was *Robert Elsmere* published in 1888; her other popular books are *The Marriage of William Ashe, David Grieve, Diana Mallory* and *Fenwick's Career*. Mrs. Ward translated the *Journal* of the Swiss poet Henri Fréderic Amiel.

Ward, John Quincy Adams (1830–1910), American sculptor, born in Urbana, Ohio. He worked for 7 years in a Brooklyn (N. Y.) studio, and there helped to make the equestrian statue of Washington which now stands in Union Square, New York city. Between 1857 and 1859 he was in Washington, where he made portrait busts. In 1861 he moved permanently to New York city, and there did the work on which most of his fame rests. He executed the *Indian Hunter,* the first statue to be placed in Central Park, New York; *A Private of the Seventh Regiment, The Freedman* and *Shakespeare,* all before 1870. His other works are the colossal *Washington* in Wall Street, New York; *Horace Greeley* in Greeley Square, New York; *Beecher* in Brooklyn, Generals *Sheridan* and *Thomas* in Washington, a soldiers and sailors' monument in Syracuse, N. Y., *Hancock* in Philadelphia, *Crowning Group of Victory* for the Naval Arch in New York, *Lafayette* in Burlington, Vt., and *Garfield* in Washington.

Ward, Nathaniel (1578–1652), English clergyman and writer, born in Suffolk, educated at Cambridge. He traveled extensively in Europe, entered the Church in 1618, became a Puritan and went to Massachusetts in 1634. He and John Cotton drew up the first code of laws for the colony adopted in 1641 as *The Body of Liberties.* He had much influence in colonial affairs but is best-known as the author of *The Simple Cobbler of Agawam,* published in England in 1647. It protests against religious toleration and criticizes women's dress and fashions.

Warner, Seth (1743–84), American Revolutionary hero, born at Roxbury, Conn. He was a leader with Ethan Allen in resisting the claim of New York to the territory that is now Vermont and as a result was outlawed by New York authorities in 1771. When the Revolutionary War began, he was a leader of the Green Mountain Boys, and he captured Crown Point from the British. Later he took part in the invasion of Canada and in other campaigns.

Warren, Joseph (1741–75), American Revolutionary leader, born at Roxbury, Mass., graduated from Harvard. He became a leading physician in Boston. He was prominent in the opposition of the Stamp Act and wrote the Suffolk Resolves, presented to the colonial convention in 1774, in which he spoke for forcible resistance to England. Warren was a member of the original Committee of Correspondence in Boston. It was he who sent Paul Revere on his famous ride. Warren was killed at Bunker Hill.

Warwick, Richard Neville, Earl of (1428–71), called *the Kingmaker,* English soldier and statesman. From his boyhood his great wealth and his important family connections made him the most influential nobleman in England. He joined the Yorkist faction in the War of the Roses (1453), won the first battle in which he engaged and was rewarded with the governorship of Calais. In 1457 he took command of the fleet. In 1460 he defeated the Lancastrian army and became virtual ruler of England. He took Henry VI prisoner and was able to put Edward, Duke of York, on the throne as Edward IV. Warwick and the new king quarreled, and Warwick went over to the other side in the war. He formed an alliance between the House of Lancaster and the king of France and in 1471 fought and defeated Edward, placing Henry VI back on the throne. As soon as Edward could rally his forces he routed Henry's army, and Warwick was killed.

Washington, Booker Taliaferro (*c.* 1859–1915), American negro educator, born near Hale's Ford, Va., the son of a slave. He worked his way through Hampton Institute and later studied at Maryland Seminary. In 1879 he became a teacher at Hampton, and in 1881 he was chosen by the state authorities to organize and be president of Tuskegee Institute, which under his administration became the greatest school for Negroes in the United States. He wrote *Story of My Life and Work, Up from Slavery, Sowing and Reaping, Future of the American Negro, Character Building, Working With the Hands* and *Tuskegee and Its People.*

WASHINGTON, GEORGE (1732–99), first President of the United States, born in Westmoreland county, Va., the great-grandson of John Washington, an Englishman, who emigrated in 1657, and the son of Augustine Washington, a substantial farmer. His education was limited to the elementary subjects, but he acquired a fair knowledge of mathematics and surveying, chiefly without a teacher, and when his widowed mother prevailed upon him to abandon the idea of entering the British navy, he adopted surveying as a profession.

His military career began at the age of 19, when he was appointed adjutant general of Virginia militia. In the French and Indian War he proved an able soldier although he had to surrender to a superior French force in 1754. In 1755 he accompanied General Braddock as a volunteer and was almost the only officer who returned safe from the disastrous expedition. In 1758 he took an important part in the expedition that captured Fort Duquesne, where Pittsburgh now stands.

In the meantime extensive estates and plantations at Mount Vernon had come into his possession through the death of his half brother. To these possessions he added largely by marrying, in 1759, Mrs. Martha Custis, a wealthy young widow. For some years he was a member of the Virginia assembly. Shortly after the outbreak of the War of Independence, Washington was elected commander in chief of the American forces. His career henceforth is part of American history. He was compelled by superior forces at times to retreat and was reduced to the most desperate straits by disaffection, lack of men and supplies and even conspiracies against his authority; but by his calm courage, prudence, firmness and perseverance he brought the war, with the aid of powerful allies, to a successful close. After the independence of the 13 colonies was achieved, he retired from the army to Mount Vernon, which he had visited but once during the 8 years of war.

In 1784 he crossed the Alleghenies to see his lands in West Virginia and planned the James and Potomac river canals. In 1787 as representative of Virginia he presided at the Constitutional Convention in Philadelphia. This body formed the present Federal Constitution, considered by him as the only alternative to anarchy and civil war.

Under this Constitution he was chosen President and was inaugurated at New York, April 30, 1789. He did not want to run for a second term but was persuaded to do so and served for 4 years more. In 1796 he positively declined a re-election and on March 4, 1797, returned to Mount Vernon for the quiet of home life. In 1798, when war was threatened with France, he again took command of the army, but a treaty of peace made his services unnecessary, and he returned to his Mt. Vernon home.

On December 12, 1799, he was exposed for several hours to cold and snow. He became ill and died December 14. He was mourned by the whole nation and amply deserved the immortal epitaph, "First in war, first in peace, and first in the hearts of his countrymen." He had no children. His birthday, February 22, is a holiday in the United States; schools and banks are closed under state laws on this day.

Wassermann, von, August (1866–1925), German physician, born in Bavaria. He began to practice medicine in Strasbourg in 1888 and later became director of research at the Koch Institute in Berlin. He is best-known for his discovery of the *Wassermann reaction,* a certain test for syphilis.

Watson, John Broadus (1878–), American psychologist, born at Greenville, S. C., studied at Furman University and the University of Chicago. He taught at Chicago and Johns Hopkins universities and in 1924 entered the advertising business in New York city. He is known chiefly as the originator of the *behaviorist* school of psychology. In it all human behavior is explained in terms of automatic physiological response to outside stimuli; no mental activity is involved.

Watson, Sir William (1858–1935), English poet, born in Burley, Yorkshire. His early poems were published in the *Liverpool Argus* in 1875 and his first book, *The Prince's Quest,* appeared in 1880. Between 1890 and 1928 he wrote a considerable quantity of verse, including *Wordsworth's Grave, For England, Sable and Purple* and *The Muse in Exile.* Collected editions of his works appeared in 1898 and 1906. He was knighted in 1917.

WATT, JAMES (1736–1819), British engineer and inventor, born at Greenock. His father was a merchant and magistrate of Greenock, and Watt received a good education there. He decided to become a maker of mathematical instruments and went to London in 1754 to learn the trade. He returned home after a year because of bad health. Shortly afterward he tried to establish himself in Glasgow, was appointed mathematical instrument maker to the university in 1757 and remained there until 1763.

From 1763 to 1774 he was a civil engineer and made surveys for canals and harbors. He is famous for the improvements he made on the crude steam engines then in use. Newcomen's engine, then used for pumping water from mines, was very inefficient. Steam pushed the piston, then cold water was thrown on the cylinder to condense the steam, and atmospheric pressure pushed the piston back. Watt devised a system for condensing the steam outside the cylinder, which greatly improved the engine's efficiency. In his engine steam power was applied alternately to both sides of the piston, and he devised a governor for controlling speed.

Watt invented or improved a number of other machines, including a letter-copying press. He was an ardent student of chemistry and possessed a wide and varied knowledge of literature and science.

Watteau, Jean Antoine (1684–1721), French painter, born at Valenciennes. When he was still a small child, he went alone to Paris, ragged and penniless. After a long, hard struggle he got some instruction in art and later won a scholarship in Italy. He excelled as a painter of pastoral scenes and costume pictures and was expert in handling both design and color. Many of his pictures show gay groups dancing or picnicking in the fields. His name is usually associated with his fanciful pictures of shepherds and shepherdesses. He became wealthy and set the styles in dress for the men of Paris.

Watterson, Henry (1840–1921), American journalist, known as "Marse Henry," born at Washington, D. C. He served with distinction in the Confederate army as chief of scouts under General Joseph E. Johnston. Later he settled at Louisville, Ky., where he founded and edited the *Courier-Journal,* which he made one of the foremost Democratic newspapers. In the years following the close of the Civil War he tried to bring about reconciliation between the North and South and fought against the activities of the Ku Klux Klan. He served in the House of Representatives in 1877–78. He wrote *History of the Spanish-American War, Oddities of Southern Life and Character* and *Marse Henry,* an autobiography.

Watts, George Frederick (1817–1904), English painter and sculptor, born in London. He first exhibited at the Royal Academy in 1837 and gained a reputation for the size, artistic excellence and beauty of coloring of his paintings. His most important pictures are *Caractacus, Cymbeline, Fata Morgana, Life's Illusions* and *Sir Galahad.* He is best known for his pictures of classical figures and symbolic groups. Among them are *Love and Death, Love and Life* and *Paolo and Francesca.* He painted portraits of Browning, Tennyson, Gladstone, Carlyle and other prominent men. His best-known sculpture is *Physical Energy,* a memorial to Cecil Rhodes.

Watts, Isaac (1674–1748), English hymn writer and theologian, born at Southampton. He wrote many theological works; his treatise on *Logic* had a considerable reputation. He is best-known, however, for his hymns; the most famous are "O God our help in ages past," "Jesus shall reign" and "When I survey the wondrous cross." There are many famous verses in his *Divine and Moral Songs for Children,* notably

"How doth the little busy bee
Improve each shining hour."

He has a monument in Westminster Abbey but is not buried there.

Wayne, Anthony (1745–96), American general, born at Easton, Pa. He served in the Pennsylvania legislature from 1774 to 1775. He was among the first to offer his services in the Revolutionary War and raised a regiment of volunteers, becoming its colonel. He went with the expedition into Canada and showed great strategy in covering the retreat of his troops, after which he commanded at Ticonderoga until 1777, when he was made a brigadier general. His most brilliant victory was at Stony Point in 1779. He became known as "Mad Anthony" and for his daring exploits was made a major general. In later years he was sent to the Northwest, where he brought the Indians to terms and opened up that territory to settlement. He was made commander in chief of the army in 1792.

Webb, Sidney James, 1st Baron Passfield (1859–), English economist and statesman, born in London, educated in private schools and on the continent. Most of his work was done in collaboration with his wife, Beatrice Potter Webb (1858–). They were very important in building up socialism in England and in the development of the Labour Party. Webb was elected to Parliament in 1922 and in 1929 was secretary of state in MacDonald's cabinet. He was one of the founders of the Fabian Society. From 1885 he taught economics at the University of London. Both he and his wife wrote a number of books on economics and government individually or in collaboration.

Weber, von, Karl Maria, Baron (1786–1826), German composer, born at Eutin. He studied under Michael Haydn at Salzburg. At the age of 13 he composed his first opera, *Das Waldmädchen;* it was produced at Freiburg. He held positions as music master and conductor at Prague and Dresden and did much to popularize German music. He composed

Peter Schmoll (1801), later wrote *Rubezahl, Sylvana* and his greatest opera, *Der Freischütz.* His other compositions include the operas *Oberon* and *Euryanthe, a Jubilee Mass* and a number of piano solos.

Webster, Daniel (1782–1852), American statesman, born at Salisbury, N. H., the second son of Ebenezer Webster, a farmer and judge of the county court. He graduated from Dartmouth College in 1801, studied law at Boston and in 1805 was admitted to the bar. He practiced law at Boscawen and later at Portsmouth, N. H. Webster entered politics as a member of the Federalist party and was elected to Congress. He took his seat in the special session of May 1813 during the War of 1812. On June 10, 1813, he delivered his first speech, on the repeal of the Berlin and Milan decrees; his oratory and his knowledge of currency and finance won great prestige for him. At the close of the session Webster moved to Boston, where he practiced law for 7 years. He refused political office and became the acknowledged leader of the New England bar.

In 1822 he became a member of the Massachusetts constitutional convention and later in the same year was elected to Congress from Boston, taking his seat after an absence of 10 years from that body. He quickly gained a dominant place in the House by his oratory and his efforts to revise the criminal laws of the United States. He was elected U. S. Senator from Massachusetts in 1826 and rose to great heights in debates with R. Y. Hayne and John C. Calhoun on state rights and nullification.

He had hoped to be the Whig candidate for President in 1840 but was disappointed; William Henry Harrison was chosen, and Webster became his secretary of state. He kept the post under Tyler long enough to complete his work on the Webster-Ashburton Treaty, which settled the Northeastern boundary dispute with Great Britain. He returned to the Senate (1845–50) and took part in the slavery disputes, but his moderate stand won favor with neither side. He again became secretary of state under Fillmore (1850–52).

Webster was as prominent in private practice as in national affairs. He took part in many highly important cases, including the Dartmouth College Case, the Rhode Island Case and the Girard Will Case.

Webster, Noah (1758–1843), American lexicographer, born at Hartford, Conn., educated at Yale College. He served in the Revolutionary War, practiced law in Hartford, Conn., and did much work for New York newspapers. Webster served in the Massachusetts legislature and was president of the first board of trustees of Amherst Academy. He was an active member of the Federalist Party and edited a Federalist newspaper in New York from 1793 to 1798.

He lived in a time of great change: he saw the country gain its independence and try to establish itself as a nation. Webster traveled widely among the new states and learned the needs of the country. He believed passionately that the United States had a great destiny of its own to work out. He resented the ignorance shown by English books about America and the things America stood for. He wrote his books as a contribution to the cultural life of the new nation.

In 1783 his *Elementary Spelling Book* (often called the *Blue-Back Speller*) was published; millions of copies were sold (nearly 20,000,000 before his death) and it was a standard school textbook for a century. His *Philosophical and Practical Grammar of the English Language* was published in 1807. His *Compendious Dictionary* appeared in 1806, and his major work, *The American Dictionary of the English Language,* appeared in 1828. Webster had spent 10 years in study before he began the 7 years of actual preparation of the dictionary. He had 10,000 more words and 30,000 more definitions than had been published in any previous dictionary. He was responsible for the American method of simplified spelling—*honor* instead of British *honour,* for example.

Wedgwood, Josiah (1730–95), English potter, born at Burslem, Staffordshire. His family had been makers of pottery for generations. He was apprenticed to his brother at the age of 9. In 1759, after a partnership with Thomas Whielden, he established his own manufactory, producing only the highest grade of ware. He was much impressed by discoveries of ancient Greek and Roman vases and began to make classic shapes, with figures in relief on them. Wedgwood pottery is still much in demand and has been widely copied. One of Josiah Wedgwood's daughters became the mother of Darwin, the famous scientist.

Weismann, August (1834–1914), German biologist, born at Frankfort. He taught zoology at Freiburg University, then turned his attention to biology. Weismann is best-known as the author of the germ-plasm theory of heredity, which rejects the inheritance of acquired characters and is therefore opposed to the Lamarckian concept of evolution.

Welles, Gideon (1802–78), American statesman, born at Glastonbury, Connecticut, and graduated from Norwich University in Vermont. At 24 he was editor of the Hartford *Times,* and at 25 a member of the Connecticut legislature. In 1836 he became chief of the Bureau of Supplies in the United States Navy. Welles was originally a Democrat, but became a Republican when that party was organized in 1856. Lincoln appointed him secretary of the navy in 1861 and again in 1865. Welles handled naval affairs with great efficiency during the Civil War.

Wellington, Arthur Wellesley, 1st Duke of (1769–1852), British soldier and statesman, born at Dublin, Ireland, educated at Eton College and at a military school in France. By 1797 he had reached the rank of colonel in the British army, through service in Flanders and in India. He was a major general before he was 35. His military career was interrupted by his election to Parliament in 1805. He became secretary of state for Ireland 2 years later. In 1808 he was made a lieutenant general and sent to command the English army in the Peninsular War, which he won in a series of brilliant campaigns. He was made duke of Wellington and ambassador to Paris. In 1815 he was given command of the allied armies and defeated Napoleon at Waterloo. He became prime minister in 1828 and resigned in 1830. He was foreign secretary under Peel (1834–35) and a member of the Cabinet (1841–46). In 1842 he was made commander in chief of the army for the remainder of his life.

Wells, Herbert George (1866–), English writer, born at Bromley, Kent, educated in the Royal College of Science and London University. He taught for a few years. In 1895 his first novel, *The Time Machine,* was published. It was the first of a long series of books that treated scientific fact and speculation in fictionized form with a growing admixture of social philosophy. They include *The Invisible Man, The Food of the Gods* and *The First Men in the Moon.* The social philosophy is more dominant in *Tono Bungay, Mr. Britling Sees It Through* and *The World of William Clissold.* As a part of his plan of social betterment by more accurate information he wrote *The Outline of History* and *The Work, Wealth and Happiness of Mankind;* he also urged the preparation of a great encyclopedia that would sum up all modern knowledge and make it available to all readers. With Huxley and G. P. Wells he wrote *The Science of Life.*

Welsbach, von, Carl Auer, Freiherr (1858–1929), Austrian inventor, born in Vienna. He studied at the universities of Berlin and Heidelberg. He is best-known as the inventor of the Welsbach light or gas mantle that revolutionized gas lighting for homes. This burner, attached to a gas jet, increased the ordinary gas flame to many times its original light intensity. The Welsbach burner is a cone-shaped cotton mesh structure coated with a mixture of the oxides of thorium and cerium, which became incandescent. Welsbach discovered and isolated three chemical elements: *neodymium* (1885), *praseodymium* (1885) and *lutecium* (1907), all in the rare-earth group.

Werfel, Franz (1890-), Austrian author, born at Prague. His first publication, a book of verse, appeared in 1911. Later he turned from poetry and began to write prose, colored by the revolutionary viewpoints that he acquired in the World War. He wrote several plays but is best-known for his novels *Verdi, The Pure in Heart* and *The Forty Days of Musa Dagh.*

Werner, Alfred (1866–1919), Swiss chemist, born in France. He became professor of chemistry at Zürich (1895–1919) and did valuable research in double valency. This was extremely important later, when heavy water and the like came into scientific prominence. He received the Nobel Prize in 1913.

Wesley, Charles (1707–88), English hymn writer, born at Epworth, Lincolnshire. He was associated with his brother John in the Methodist movement in Georgia. He is the author of a great number of hymns, many of which are among the best and most admired in the English language.

Wesley, John (1703–91), English divine, born at Epworth, Lincolnshire. In 1730 while he was at Oxford University he and his brother Charles with a few other students formed themselves into a religious society. He attracted much attention; the other students named the group *Methodists* because they acted according to a strict set of self-imposed rules. Wesley with some others, chiefly Moravians, came to Georgia in 1735, but the strictness of discipline that he attempted to introduce proved very distasteful to the colonists. After a residence of less than 2 years in America he returned to England, preached to open-air meetings and gathered many followers. He built meeting-houses in London, Bristol and other places.

For some time he was associated with George Whitefield; but they differed over a theological doctrine and separated. After that the Methodists were split into two groups. Wesley traveled almost continuously for many years in England, Wales, Scotland and Ireland.

Every moment of his life was devoted to the organization of his sect and he preserved his influence over it to the last. His preaching was extemporaneous, but not vehement. He dwelt much upon practical religion, though he taught his followers to seek inspiration of the Holy Spirit and to aspire to a state of sinless perfection.

West, Benjamin (1738–1820), American artist, born in Springfield, Pa. As a boy he was taught by Indians to mix pigments such as they used in painting their ornaments. His first colors were compounded from berries and leaves, and he made brushes from hairs pulled from pet cats. When he was 16 he painted *The Death of Socrates.* He moved to New York in 1758 and with the help of friends soon went to Rome to study. There he produced two canvases, *Cimon and Iphigenia* and *Angelica and Medora,* that were highly praised. A turning point in his career came in 1763, when he visited London. He won the favor of George III, and the king remained his friend and patron for the remainder of their lives—they died in the same year. West painted 28 religious subjects to adorn Windsor Castle. He was one of the founders of the Royal Academy, succeeded Sir Joshua Reynolds as its president in 1792 and held the post as long as he lived.

West was buried in St. Paul's Cathedral. Among his most famous paintings are *The Death of Wolfe, Christ Healing the Sick, Penn's Treaty with the Indians, Hector Parting with Andromache, The Black Prince of Poitiers, The Battle of LaHogue* and *Death on the Pale Horse.* West revolutionized historical painting with his *Death of Wolfe,* which showed the soldiers dressed in their correct uniforms. Before West's time it was customary to make such characters look as much as possible like Romans.

Westinghouse, George (1846–1914), American engineer, born at Central Bridge, N. Y., studied at Union College. In 1864 he became an assistant engineer in the navy. He invented the railroad frog, a movable device for switching a train from one track to another. In 1872 Westinghouse patented his famous air brake, which acts automatically in case of accident. It was quickly adopted on practically all railways of the world. Westinghouse also invented improved railway signaling devices and built dynamos for the Niagara Falls power plant.

Wharton, Edith Newbold (1862–1937), American novelist, born in New York city. She was privately educated. In 1885 she married Edward Wharton, a Boston banker. Her later years were spent abroad, chiefly in France and Italy. Among her best-known books are *Ethan Frome, The Old Maid, The Children, Hudson River Bracketed* and *The Gods Arrive. Ethan Frome* was successfully dramatized. Mrs. Wharton won the Pulitzer Prize of 1920 for *The Age of Innocence,* which was dramatized later.

Wheatstone, Sir Charles (1802–75), English scientist, born at Gloucester. He became professor of experimental philosophy at King's College, London, where he carried on research in sound, light and electricity. With W. J. Cooke he invented in 1837 a system for transmitting messages by means of electric currents. In 1838 he invented the stereoscope. The *Wheatstone bridge,* used to measure the resistance in an electrical conductor, is named for him.

Wheeler, Benjamin Ide (1854–1927), American educator and philologist, born at Randolph, Mass., graduated from Brown University in 1875. He became professor of Greek at Cornell in 1887. In 1899 he was made president of the University of California, a post he held until retirement 20 years later. His many works include *The Greek Noun-Accent, Analogy in Language, Organization of Higher Education in the United States* and a biography of Alexander the Great.

Wheeler, Joseph (1836–1906), Confederate general, born at Atlanta, Ga., graduated from

West Point. He was an officer in the army until the outbreak of the Civil War, when he joined the Confederate forces. He was a distinguished cavalry commander in Kentucky and Tennessee and opposed Sherman in the march to the sea. He became a lieutenant general. After the war he settled down as a planter and lawyer and served in the United States House of Representatives. He was a major general in the Spanish-American War and commanded a brigade in the Philippines. He wrote *The Santiago Campaign.*

Wheeler, Wayne Bidwell (1869–1927), American reformer, born at Brookfield, Ohio, educated at Oberlin and Western Reserve. He became superintendent (1902) of the Ohio Anti-Saloon League, and as such he was a leader in the fight for prohibition legislation in Ohio. Later (1916) he was attorney for the National Anti-Saloon League and helped to draft the Volstead Act. He was one of the ablest of the dry leaders.

Wheeler, William Almon (1819–87), Vice-President of the United States, born in Malone, N. Y. He studied at the University of Vermont and became a lawyer in 1845. He was district attorney of New York, a member of the lower house of the legislature (1850–1851) and of the state senate (1857–60). Five times (1861–63 and 1869–77) he represented his district in Congress as a Republican. In 1876 he was elected Vice-President of the United States on the ticket with Rutherford B. Hayes. He served the 4-year term and then retired to private life.

Whipple, George Hoyt (1878–), American pathologist, born at Ashland, N. H., educated at Yale and Johns Hopkins. He became professor of pathology and dean of the medical school at the University of Rochester. His valuable research in pernicious anemia and the use of liver in its treatment won for him a share in the Nobel Prize in 1934 (with G. R. Minot and W. P. Murphy).

Whistler, James Abbott McNeill (1834–1903), American artist, born in Lowell, Mass. He traveled with his father to Moscow where he studied at the Imperial Art Academy. When his father died in 1849 he returned to the United States and studied at West Point for 3 years. Then followed a brief service as a draftsman with the Coast Survey, from which he was forced to resign because he etched a caricature on an important official plate. He went to Paris and produced the *Little French Series* of etchings. In 1863 he settled in England, where he gained a reputation as a wit. His earlier etchings show scenes in many parts of Europe. They are collected as *The Thames Series, The Venice Series* and *The Paris Series.* Of his many portraits, the two most outstanding are *The Artist's Mother,* in the Louvre, Paris, and *Portrait of Carlyle* at Glasgow, Scotland. Whistler is best represented in America by *Old Chelsea,* in the Metropolitan Museum of Art, and others in the Freer Collection in the National Gallery, Washington.

White, Andrew Dickson (1832–1918), American educator and diplomat, born in Homer, N. Y. He was graduated from Yale College at the age of 21, went for further study to France and Germany and on his return was appointed professor of literature at the University of Michigan. In 1867 he helped to organize Cornell University and became its first president. During his lifetime he gave 20,000 volumes to the Cornell library. He was minister to Germany (1879–81), minister to Russia (1892–1894) and ambassador to Germany (1897–1902). He headed the American group at the Hague Peace Conference in 1899. His most important book was the *History of the Warfare of Science with Theology in Christendom* (1896).

White, Henry (1850–1927) American diplomat; born at Baltimore, Md., studied at Harvard and Johns Hopkins. He entered the diplomatic service and served as secretary of the legation at Vienna and at London. President McKinley appointed him ambassador to Italy (1905–07) and later to France (1907–09). He helped to prevent a break between France and Germany at the Algeciras Conference. Later he was sent to Chile on a special mission in 1910 and took part in the Peace Conference in 1919. White was the first American *career diplomat*—that is, the first to rise from the ranks to become an ambassador.

White, Peregrine (1620–74), American pioneer. He was born on the *Mayflower* as she lay in Cape Cod Bay, November 20, 1620, and so was the first white child born in New England. He settled at Marshfield, Mass., and became a minor official.

White, Stanford (1853–1906), American architect, born in New York city. He learned architecture by practical experience with architectural firms. In this early part of his career he helped to build Trinity Church in Boston. In 1881 he became a partner in the corporation known as McKim, Mead & White. White designed old Madison Square Garden, Columbia University Library, Madison Avenue Presbyterian Church, Century Club, Metropolitan Club and the Washington Arch, all in New York city. He designed new buildings for the University of Virginia. His buildings are usually marked by their well-sculptured Renaissance decorations. He was killed in the tower of Madison Square Garden by Harry K. Thaw.

White, Stewart Edward (1873–), American author, born at Grand Rapids, Mich., graduated from the University of Michigan. He worked at various jobs for a time and took part in The Black Hills gold rush, then studied law in New York (1896–97) and began to write. *The Blazed Trail* (1902) established his reputation. Later he went on several expeditions to Africa and wrote *The Land of Footprints* and *African Camp Fires* about his experiences. Later in his career he wrote a number of books about early days in the West, including *The Forty Niners, The Long Rifle* and *Ranchero.*

White, William Allen (1868–), American journalist, born in Emporia, Kansas, and educated at the University of Kansas. He began his journalistic career on the El Dorado *Republican,* then worked on several Kansas City papers until 1894, when he bought the Emporia *Gazette.* In 1896 he wrote the famous editorial, "What's the Matter with Kansas?" Soon his editorials drew comment from all over the country. His published books include *God's Puppets, In the Heart of a Fool, A Certain Rich Man, Life of Woodrow Wilson, Life of Calvin Coolidge, Masks in a Pageant* and *The Editor and His People,* collected editorials.

Whitefield, George (1714–70), English preacher, born at Gloucester and educated at Oxford. He was one of the original Methodist group formed at Oxford by John and Charles Wesley. He was a missionary in Georgia for a short time in 1738 but later made other trips there. He was expelled from the Anglican Church and took to preaching in the open. It is said that he sometimes attracted crowds of 20,000. In 1741 he broke away from the Wesleys and became the leader of the Calvinistic Methodists. He was the great evangelist of his time and one of the leaders in the *Great Awakening,* an American religious revival that began about 1734. He visited the American colonies several times, died on one of his preaching tours and was buried at Newburyport, Mass., in the Presbyterian church.

Whiteman, Paul (1891–), American orchestra leader, born at Denver, Colo. He became a musician and played violin and viola with the Denver and San Francisco symphony orchestras. He was a band leader during the World War. Later Whiteman organized a band and became a prominent figure in popular music. He worked to modernize music and to bring about popular acceptance of new musical forms.

Whitlock, Brand (1869–1934), American diplomat, born in Urbana, Ohio. He began the practice of law in Toledo, Ohio, and became mayor of that city in 1905. He served with distinction as ambassador to Belgium during the World War, gaining a reputation for his handling of difficult situations during the German invasion, when he represented seven countries besides his own. He wrote novels, biographies and histories: *The 13th District, Her Infinite Variety, The Happy Average, The Turn of the Balance, Abraham Lincoln, The Gold Brick, The Fall Guy, Forty Years of It, Belgium under the German Occupation, Transplanted, Big Matt, Lafayette, The Little Green Shutter* and *Narcissus.*

Whitman, Marcus (1802–47), American pioneer, born at Rushville, N. Y. He studied medicine at Pittsfield, Mass., and practiced for 4 years in Canada. He offered to do medical missionary work among the Indians of the West and in 1836 went to Oregon in a covered wagon. Whitman was largely responsible for the early interest in the Pacific Northwest. He returned East (1842–43), where he wrote pamphlets and newspaper articles about the fertility and resources of the new territory. When he returned to Oregon, he led a train of 200 wagons and was soon followed by a stream of new settlers.

WHITMAN, WALT (1819–92), American poet, born on Long Island, N. Y. His early days were spent in a variety of occupations—typesetter, carpenter, drayman, ferryman and cab driver. He tried journalism before he turned to literature. In the course of several years he wrote some 400 poems, which he published as *Leaves of Grass* in 1855. This work, in rugged, forceful style, sought to express the right of mankind to individual freedom. It was not well received at first because of its frankness and because it did not follow standard verse forms. However, literary critics in Europe called *Leaves of Grass* the most truly representative of any American literary production. His prose works are *Specimen Days* and *Democratic Vistas.* Whitman's writings became a vital literary force in America. Among the best-known of his individual poems are "Captain, My Captain," "Song of the Open Road" and "When Lilacs Last in the Dooryard Bloom'd."

WHITNEY, ELI (1765–1825), American inventor, born at Westboro, Mass. He worked his way through Yale University. He became interested in cotton culture while he was in Georgia on the plantation of Mrs. Nathanael Greene, wife of the revolutionary general. He invented the cotton gin, which speeded 200-fold the hitherto slow process of separating cotton fibers from the seeds. He realized little profit from his invention, as he was constantly fighting infringers of his patent, but three southern states voted him a total grant of $90,000. He later went into the manufacture of firearms and made a fortune. Whitney may be called the father of mass production in America, for in his firearms factory he introduced systems for making all parts to standard size so that they could be interchanged.

Whittier, John Greenleaf (1807–92), American poet, born at Haverhill, Mass. He owed his deep love of nature to his schoolmaster at Haverhill Academy. As a young man he worked as a cobbler and a teacher. From 1828 to 1832 he edited and contributed to papers in Haverhill, Boston and Hartford. From 1833 he was active in the fight against slavery. Later he served in the Massachusetts legislature and again held editorial posts. Bad health caused him to retire in 1840, but soon afterward he became corresponding editor of the *National Era.* Whittier's poems have been known and loved for generations. Among them are "Maud Muller," "Barbara Frietchie," "Ichabod" and "The Barefoot Boy." His longest and perhaps his best poem, *Snow Bound,* appeared in 1866. His poetry reflects much of the Quaker spirit, and it is in the spiritual sphere, as in "My Psalm," that he excels. His narratives are typically American, as in the ballad "Skipper Ireson's Ride" and the tales in *Tent on the Beach.* He also wrote several books of prose, including *The Stranger at Lowell* and *Old Portraits and New Sketches.*

Wieland, Christoph Martin (1733–1813), German poet, born in Württemberg. He became professor of philosophy at the University of Erfurt, but left this post to serve as tutor to the son of a titled lady. He had leisure in which to write, and it was during this period that he wrote *Oberon,* the most celebrated of his works. Two of his most brilliant compositions are the didactic poem *Musarion* and *The Choice of Hercules.* He was a prolific writer; his works filled more than 50 volumes. He translated 22 of Shakespeare's plays into German prose (1762–66).

Wiggin, Kate Douglas (1859–1923), American writer, born in Philadelphia, educated at Abbot Academy, Andover, Mass. When she was 17 years old she went to California and became a teacher. She founded a kindergarten training school in San Francisco which became well-known. Her widely read books include *The Birds' Christmas Carol, Timothy's Quest, The Diary of a Goose Girl, Rose o' the River, Mother Carey's Chickens, Bluebeard, Penelope's Postscripts, Homespun Tales, Ladies in Waiting* and, most famous of all her works, *Rebecca of Sunnybrook Farm.*

Wilberforce, William (1759–1833), English philanthropist, born in Hull and educated at Cambridge University. In 1780 he entered Parliament and soon began his long fight for the abolition of slavery. He took an active interest in philanthropic schemes. Wilberforce was buried in Westminster Abbey.

Wilbur, Ray Lyman (1875–), American educator and government official, born in Boonesboro, Iowa. He was graduated from Leland Stanford University in 1896, studied medicine and for 20 years taught physiology and medicine at Stanford. He became president of the university in 1916. During the World War he served on the U. S. Food Administration. Upon the election of his friend Herbert Hoover as President of the United States, Wilbur took a leave of absence from Stanford to serve in the Cabinet as secretary of the interior (1929–33). He collaborated with W. A. Du Puy on *Conservation in the Department of the Interior* (1931).

Wilcox, Ella Wheeler (1855–1919), American poet and writer, born near Madison, Wis., educated at the University of Wisconsin. In 1884 she married Robert M. Wilcox. Her writings include *Poems of Pleasure, Poems of Sentiment, Poems of Progress, Lest We Forget* and *World Voices.* She is best remembered as the author of the line, "Laugh and the world laughs with you; weep and you weep alone."

Wilde, Oscar [O'Flahertie Wills] (1856–1900), British author and playwright, born at Dublin, educated at Trinity College, Dublin, and at Oxford. While he was still in college he became a leading exponent of the esthetic movement and in 1882 toured the United States, lecturing on this subject. By 1890 he had become widely known as a writer and dramatist. His chief prose works are *The Picture of Dorian Gray* and a volume of essays, *Intentions.* Among his plays are *Duchess of Padua, Lady Windermere's Fan, A Woman of No Importance, The Ideal Husband* and *The Importance of Being Earnest.* His play *Salome* was produced by Bernhardt in Paris in 1894. Other books include *Ballad of Reading Gaol* and *De Profundis.* The *Ballad* was written while he was serving a prison sentence after conviction for immoral practices. *The Happy Prince* was a volume of fairy tales.

Wilder, Thornton (1897–), American author, born at Madison, Wis., educated at Oberlin and Yale universities and in Rome. He taught in a preparatory school for 7 years and from 1930 at the University of Chicago. His first novel, *The Cabala,* was popular but was surpassed by his next, *The Bridge of San Luis Rey,* which won the Pulitzer Prize in 1927. Other novels are *The Woman of Andros, The Angel That Troubled the Waters* and *Heaven's My Destination.* His plays are *The Trumpet Shall Sound* (1926) and *Our Town* (1938), which was awarded the Pulitzer Prize.

Wilhelmina (1880–), Queen of the Netherlands, born in the royal palace at The Hague, the only child of William III, whom she succeeded in 1890 under the regency of her mother, Queen Emma. Wilhelmina was crowned when she was 18. In 1901, Queen Wilhelmina married Henry Wladimir Albert Ernst, Duke of Mecklenburg-Schwerin, who died in 1934. Her daughter Juliana was born April 30, 1909. As a constitutional monarch her influence was indirect. Nevertheless she had great influence over the manners and morale of her country, particularly in the trying years of the World War, during which her country remained neutral.

Wilkes, Charles (1798–1877), American naval officer and explorer, born in New York city. He was graduated from the United States Naval Academy at the age of 20. As a lieutenant he commanded a small vessel in South Atlantic waters on a government expedition, and on his return reported the finding of a new continent in the Antarctic. He was not believed at first, but later his findings were confirmed. One spot in that continent, 3,000 miles south of Australia, has been named Wilkes Land. During the Civil War he stopped a British naval vessel on the high seas and seized Mason and Slidell, high commissioners of the Confederate Government, who were on their way to Europe to obtain aid and recognition for the Confederacy. This act violated international law; Mason and Slidell were set free and an apology was sent to the British Government to avoid serious complications.

Wilkes, John (1727–97), English political leader. He was elected to Parliament in 1757, securing his seat by the lavish use of bribery. For the remainder of his life he was a storm center in political life. His caustic wit, contempt for sham and hypocrisy and genuine love of liberty were his strong points; the dissoluteness of his private life and his imprudence in bragging about it gave his enemies an opening for attacks upon him. In 1764 he was forced to flee England as a consequence of his political opposition and an obscene publication *An Essay on Woman.* He returned in 1768 and was re-elected to Parliament. The question of whether he should be permitted to take his seat became one of the main political wrangles of the day. In later years Wilkes triumphed over his opponents; in 1782 the Parliamentary censures against him were expunged. In spite of grave deficiencies of character, Wilkes's name was during his lifetime a rallying point for liberal reform agitations; after his death he became a hero to the New Dealers of the early 19th century. Byron, for example, classes Wilkes with George Washington as an effective fighter against the reactionism of George III. He was very popular in the American colonies and the Pennsylvania city of Wilkes-Barre was named in honor of him and of Isaac Barré, who opposed the Stamp Act.

Wilkins, Sir George Hubert (1888–), Australian explorer, born at Mount Bryan, South Australia. He studied engineering at the Adelaide School of Mines. Then became an aeronautical photographer. As a photographer and newspaper correspondent he reported most of the action in the Balkan Wars of 1912–13 and took the first motion pictures of troops in action. He was with the Arctic Expedition of Stefansson from 1913 to 1917, then enlisted in the Australian Flying Corps and became head of the Australian photographic section in France.

In 1926 and 1927 he commanded expeditions in the Arctic and added much to knowledge of Arctic geography. In 1928 and 1929 he explored some of the Antarctic continent by air. In 1931 he attempted to explore the Arctic by submarine.

At the request of the Russian Government he searched the Arctic in 1938 for a group of Russian explorers who were missing. He was knighted in 1928 by the king of England and honored by geographical societies of Great Britain and the United States.

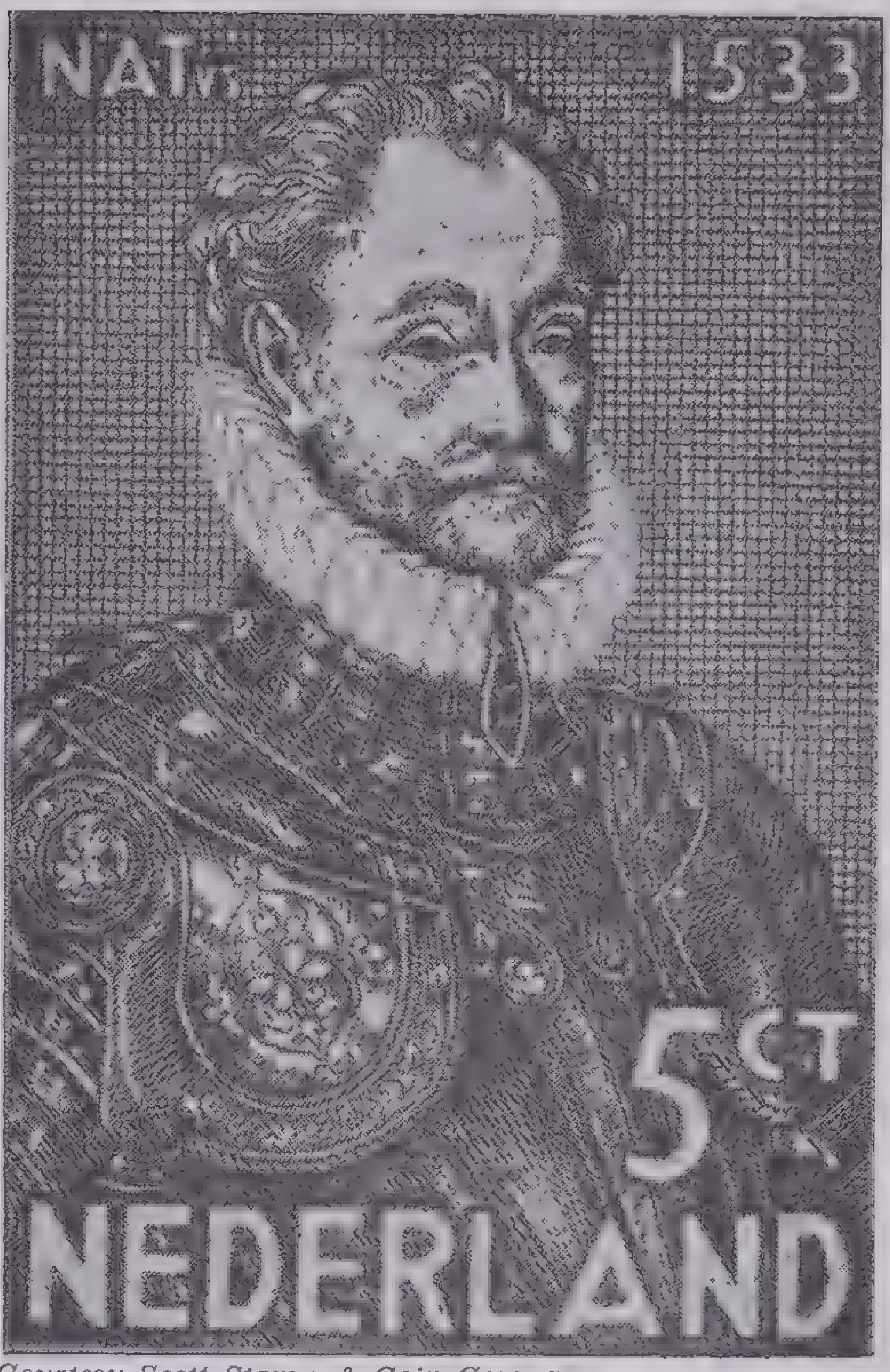
Wilkinson, James (1757–1825), American soldier, born in Benedict, Md. He was trained in medicine but entered the Revolutionary Army in 1775, was breveted brigadier general after Burgoyne's surrender and became Gen. Gates's adjutant. After the war he settled in Louisville, Kentucky, and intrigued there for the Spanish and against the British. For several years he was in the pay of the Spanish authorities in Louisiana. In 1805 he became governor of the upper part of Louisiana Territory, and he began to plot with Aaron Burr to conquer the Southwest and set up an independent empire there. But he betrayed Burr and secured his arrest. Wilkinson himself was court-martialed but was acquitted. He served in the War of 1812 as a major general but failed in the campaign against Montreal. He spent his last years in Mexico.

Willard, Emma C. (1787–1870), American educator, born at Berlin, Conn. In 1808 she married Dr. John Willard. In 1830 she traveled in Europe, and by her efforts a school for the training of native women teachers was founded in Greece. After 10 years as a teacher and principal, she founded a girls' boarding school at Troy, N. Y. It is now known as the Emma Willard School. She wrote *A History of the United States, Universal History in Perspective,* many other textbooks and a volume of poems including "Rocked in the Cradle of the Deep."

William I (*c.* 1027–87), King of England, called *The Conqueror,* the natural son of Robert II, Duke of Normandy. He laid claim to the throne of England upon the death of Edward the Confessor. In 1066 he landed at Pevensey in Sussex, defeated Harold II at the battle of Hastings and was crowned king of England in Westminster Abbey on Christmas day. He carried out a complete survey of his English realm, the results being preserved in the Domesday Book. His entire reign was stormy, as he had to enforce his control, bring the Saxon nobles to terms and put down a series of rebellions. He made many changes in church and government and brought over Normans to act as officials. This resulted in radical changes in English points of view, and the enforced use of the French language greatly enriched the Saxon speech.

William II (William Rufus; 1056–1100), King of England, the son of William the Conqueror. He came to the throne in 1087 and promised his people a wise rule, but ignored their rights. The barons revolted and were temporarily appeased by promises. He took Normandy from his brother Robert, became ruler of that duchy and brought the Scottish throne under his control. His cruelty earned for him the hatred of his subjects, and there was little sorrow when he was found dead in the New Forest with an arrow in his breast.

William III (1650–1702), King of England, the posthumous son of William II, Prince of Orange, and Mary, daughter of Charles I. He carried on the struggle of the Dutch against Louis XIV. In 1677 he married Mary, daughter of James II of Britain. In 1689, after James II lost the throne, he and Mary became joint sovereigns of England, his main object in accepting the crown being to insure participation in the war against France. The expenses of the war caused the institution of the National Debt in 1695. William was influential in obtaining passage of the Toleration Act of 1690 granting liberty of private worship to Dissenters. Through his diplomacy England entered the War of the Spanish Succession against Louis XIV. He was a great figure in Europe.



Courtesy Scott Stamp & Coin Company

William the Silent

Enlarged from a Netherlandish postage stamp issued in 1933 in commemoration of the 400th anniversary of the birth of Prince William I. It is from a contemporary portrait by van Goltjins. Two other stamps in the same issue were from other portraits of the great prince

William IV (1765–1837), King of Great Britain and Ireland, third son of George III. After a term of service in the navy he was created duke of Clarence in 1789 and became lord high admiral of the fleet. For 20 years he was associated with Mrs. Jordan, their children bearing the name of Fitzclarence. He married Adelaide of Saxe-Meiningen, but had no children. When the duke of York died in 1827 he became heir presumptive to the throne, to which he succeeded on the death of his brother, George IV, in June 1830. The great event of the reign of William IV was the passing of the Reform Bill. He was succeeded by his niece Queen Victoria.

William I (1533–84), called *The Silent,* Count of Nassau and Prince of Orange, born in the castle of Dillenburg at Nassau. He was favored by the Emperor Charles V and became governor of Holland, Zeeland and Utrecht. In 1567 he declared himself in favor of the Netherlands against Spanish domination and of Protestantism against Roman Catholicism. He failed to unite all the provinces of the Netherlands into one independent state, but in 1579 the Union of Utrecht established the seven northern provinces of Holland, Zeeland, Utrecht, Friesland, Gelderland, Groningen and Overijssel. This was the foundation of the Dutch republic. Two years later the united provinces declared themselves independent. William twice refused to rule the new country. He was assassinated at Delft.

William I (Wilhelm Friedrich Ludwig; 1797–1888), King of Prussia and Emperor of Germany, second son of Frederick William III of Prussia. In 1857 his brother the king became insane, and William acted as regent until his brother died. In 1861 he ascended the throne and became the head of the North German Confederation in 1867. He found in Bismarck an able minister who could rule without a parliamentary majority. At Ems in July 1870 the memorable interviews between William and the French ambassador, Benedetti, took place, which resulted in the Franco-Prussian War of 1870–71. William commanded at the decisive battles of Gravelotte and at Sedan. In 1871 he was proclaimed German emperor in the palace of the French kings at Versailles.

William II (Friedrich Wilhelm Viktor Albert; 1859–) German Emperor and King of Prussia, eldest son of Frederick III and Victoria (eldest daughter of Queen Victoria of England). He succeeded his father in 1888. He was an able yachtsman, poet, composer and painter. He set out at once to strengthen the power of the throne. This brought him into conflict with Bismarck, who had been accustomed to complete control. William finally forced Bismarck's resignation in 1890. He often spoke and acted hastily and involved his country in a number of diplomatic controversies. He tried to repress liberal movements in Germany. He built up a strong military machine, considering its presence the best guarantee of peace; he was not anxious to engage in the World War. Once it began, however, he had little to do with directing military affairs. He was forced to abdicate November 9, 1918, and took refuge in the little village of Doorn, Holland.

Williams, Roger (*c.* 1604–83), founder of the Rhode Island colony, born in Wales, educated for the Church at Cambridge. He emigrated to America in 1631 and joined the colony in Boston. He served the Puritan Church at Salem, later at Plymouth and again at Salem. His religious beliefs brought him into trouble with the civil authorities, and he was banished from Massachusetts.

In 1636 he went to the present site of Providence and founded the first Rhode Island settlement. He later purchased the land from the Indians. Religious tolerance was the basis of the church he established, now known as the first Baptist church in America. In 1643 he journeyed to England and secured from the king a charter for "The Providence Plantations in the Narragansett Bay." This included Providence, Newport and Portsmouth.

Williamson, John Ernest (1881–   ), American photographer, born in England. He became a resident of the United States in 1889. After graduation from high school he was a draftsman in a shipbuilding company, a newspaper cartoonist and later a newspaper photographer. He studied deep-sea photography and took the first underwater pictures in 1913. A year later he produced undersea motion pictures and thereafter devoted most of his time to such work. He devised the Williamson submarine tube, by which photographers can work below the surface.

Willis, Nathaniel Parker (1806–67), American writer, born in Portland, Maine, educated at Yale. He helped to establish *The Home Journal* in Boston and for several years edited the *American Monthly Magazine.* He wrote several books, the most notable of which is *Pencilings by the Way,* in which he described many persons prominent in his day. He belonged to the Knickerbocker group of writers in New York with Drake, Halleck and Irving.

Wills, Helen Newington (1906–   ), American tennis player, born in Centerville, Calif. She graduated from the University of California in 1927 (Phi Beta Kappa) and held the women's national championship of the United States from 1923 to 1929 (except in 1926 when an illness prevented her from defending the title) and again in 1931 and 1935. She was defeated by Suzanne Lenglen in 1926, but she became champion of England and France, 1927–30. In 1938 she reentered the Wimbledon tournament and was again victorious. Miss Wills has written articles and books on tennis and exhibited etchings and paintings (1930). In 1929 she married Frederick S. Moody, Jr., of San Francisco.

Wilson, Charles Thomson Rees (1869–   ), English physicist. From 1925 he taught natural philosophy at Cambridge. He did much research in ionization and developed a method of studying ionized particles. In this device, the *Wilson cloud chamber,* water vapor condenses upon the particles and can thus be photographed. In 1927 he shared the Nobel Prize in physics with Arthur Compton.

Wilson, Henry (1812–75), 18th Vice-President of the United States, born at Farmington, N. H. He was elected to the Massachusetts legislature by the Whig party in 1840 and contributed to the formation of the Free-Soil party in 1848. In 1855 he succeeded Edward Everett as United States Senator and became one of the leaders of the Republican party. In 1872 he was elected Vice-President of the United States on the ticket with Grant but died before finishing his term of office. He wrote an elaborate *History of the Rise and Fall of the Slave Power in America.*

Wilson, James (1742–98), American statesman, born in Scotland. He came to America in 1765, was admitted to the bar in 1767, was a member of the Continental Congress and a signer of the Declaration of Independence. In 1789 he became an associate justice of the first U. S. Supreme Court and served until his death. He was the first professor of law at the College of Philadelphia and at the University of Pennsylvania when it was reorganized in 1791.

Wilson, Woodrow (Thomas Woodrow Wilson; 1856–1924), 28th President of the United States, born at Staunton, Va., the son of the Rev. Joseph R. and Jessie Woodrow Wilson. He was educated at Princeton and Johns Hopkins universities and became president of Princeton in 1902. In 1910 he resigned to serve as governor of New Jersey. He was elected as a reform governor but aroused much opposition by his policies. He introduced workmen's compensation and the direct primary and set up regulatory agencies for control of trusts and big business.

He was nominated as the Democratic candidate for President, at Baltimore, on July 2, 1912, and defeated William H. Taft, Republican, and Theodore Roosevelt, Progressive. He was inaugurated March 4, 1913, and shortly afterward called Congress in special session to consider tariff and other reforms. Tariffs were reduced; the Federal Reserve Act was passed in 1913 and the Clayton Anti-Trust and Trade Commission Acts were passed. During his first term he had to contend with a series of difficult problems in Latin America. The World War broke out and Wilson's administration was hard pressed to maintain neutrality. He was renominated for president at the convention of his party held in St. Louis, June 1916. There followed one of the most strenuous campaigns in the history of the country. At the November election, 1916, he was re-elected over Charles E. Hughes, Republican nominee, by an electoral vote of 276 to 255. He favored neutrality during the early days of the World War, but the continued ruthless submarine campaign forced him to advocate joining the Allied cause in April 1917. In his second term the prohibition amendment to the Constitution was adopted, and the Federal Farm Loan bill was passed. Wilson took a leading part in peace negotiations. In 1918 he enumerated his famous Fourteen Points. He suggested the formation of the League of Nations.

While he was on a speaking tour of the United States advocating the acceptance by Congress of the Versailles Treaty without reservation, his health gave way. Neither the League nor the Treaty was approved by Congress, and President Wilson retired in 1921 to private life in Washington. In 1919 he was awarded the Nobel Peace Prize. His writings include the 5-volume work *A History of the American People, The State: Elements of Historical and Practical Politics, Division and Reunion, The New Freedom, Mere Literature and Other Essays, A Study in American Politics* and *When a Man Comes to Himself.*

Winant, John Gilbert (1889–   ), American statesman and social reformer. He began his political career during the World War when he was elected to the New Hampshire House of Representatives. In 1925 he became governor of New Hampshire; he was re-elected on the Republican ticket in 1930 and in 1932. He took an active interest in problems of labor and economic security. In 1935 he was appointed by President Roosevelt to head the new Social Security Board. He resigned this position in 1936 to campaign for Roosevelt and the Social Security program. In 1935 he went to Geneva to represent the United States in the International Labor Office, an organ of the League of Nations. In 1938 he became Director of the International Labor Office, the first American to hold this key position.

Windaus, Adolf (1876–   ), German chemist. He became head of the chemical research institute at The University of Göttingen. His studies on vitamin D were especially valuable. He won the Nobel Chemistry Prize in 1928.

Winkelried, von, Arnold (d. 1386), Swiss hero. According to legend his actions turned the tide in favor of the Swiss during a war with the Austrians. He is supposed to have rushed against the enemy ranks single-handed, gathered all the enemy spears within reach to his breast and thus formed an opening at which his comrades attacked.

Winslow, Edward (1595–1655), American colonial governor, born in Worcestershire. He came to America on the Mayflower and became friendly with the Indian chief Massasoit. He returned to England as an agent of the colony and there published his *Good Newes from New England.* He returned to Plymouth and was chosen governor three times (1633, 1636 and 1644). He made another trip to England in 1635 and was imprisoned for a short time because of his Puritan teachings. In 1646 he was in England again to defend the colony and wrote *Hypocrisie Unmasked.* Later he was friendly with Cromwell, who sent him on an expedition against the Spanish in the West Indies, where he died.

His son, Josiah Winslow (1629–80) was born in Plymouth and served as governor from 1673 to 1680. He commanded the New England forces in King Philip's War.

Winthrop, John (1588–1649), American colonial governor, born in Suffolk, England, and educated at Cambridge University. He developed a sympathy for Puritanism and was appointed governor of the Massachusetts Bay Company in New England. He sailed in 1630, landing in Salem. Winthrop served 12 terms as governor and acted as deputy governor under Dudley in 1631, under Haynes in 1635 and Vane in 1636. He slowly gained a large following, succeeded Vane as governor in 1637 and held the office almost continuously until his death. He left a *Journal* of the colony, a valuable source of history of early New England.

Wise, Stephen Samuel (1872–   ), American rabbi, born in Budapest, Hungary, and graduated from Columbia University in 1892. He served as rabbi in New York (1893–1900) and in Portland, Oreg. (1900–06). He returned to New York city in 1907 and founded the New York Free Synagogue. Rabbi Wise also helped to establish the Zionist Organization of America.

Wister, Owen (1860–1938), American author, born in Philadelphia, educated at Harvard. He set out to be a musician but later returned to Harvard to study law. After several trips to the West he began to write short stories. He was a friend of Theodore Roosevelt and wrote a biography of him (1930). Wister's best-known work is *The Virginian* (1902). His other books did not equal *The Virginian* in popularity; among them are *When West Was West* and *U. S. Grant.*

Witte, Sergyey Yulievich, Count (1849–1915), Russian statesman, born at Tiflis of German parentage and educated at Odessa. After he had demonstrated ability in organizing the transport in a war in 1877, he was appointed director of the Russian Southwest Railways. He became minister of finance (1893–1903), set up the gold standard and caused the sale of alcohol to be taken over by the government. He was one of the Russian representatives in the negotiations for peace with Japan in 1905 and was afterward made a count and appointed president of the new ministry.

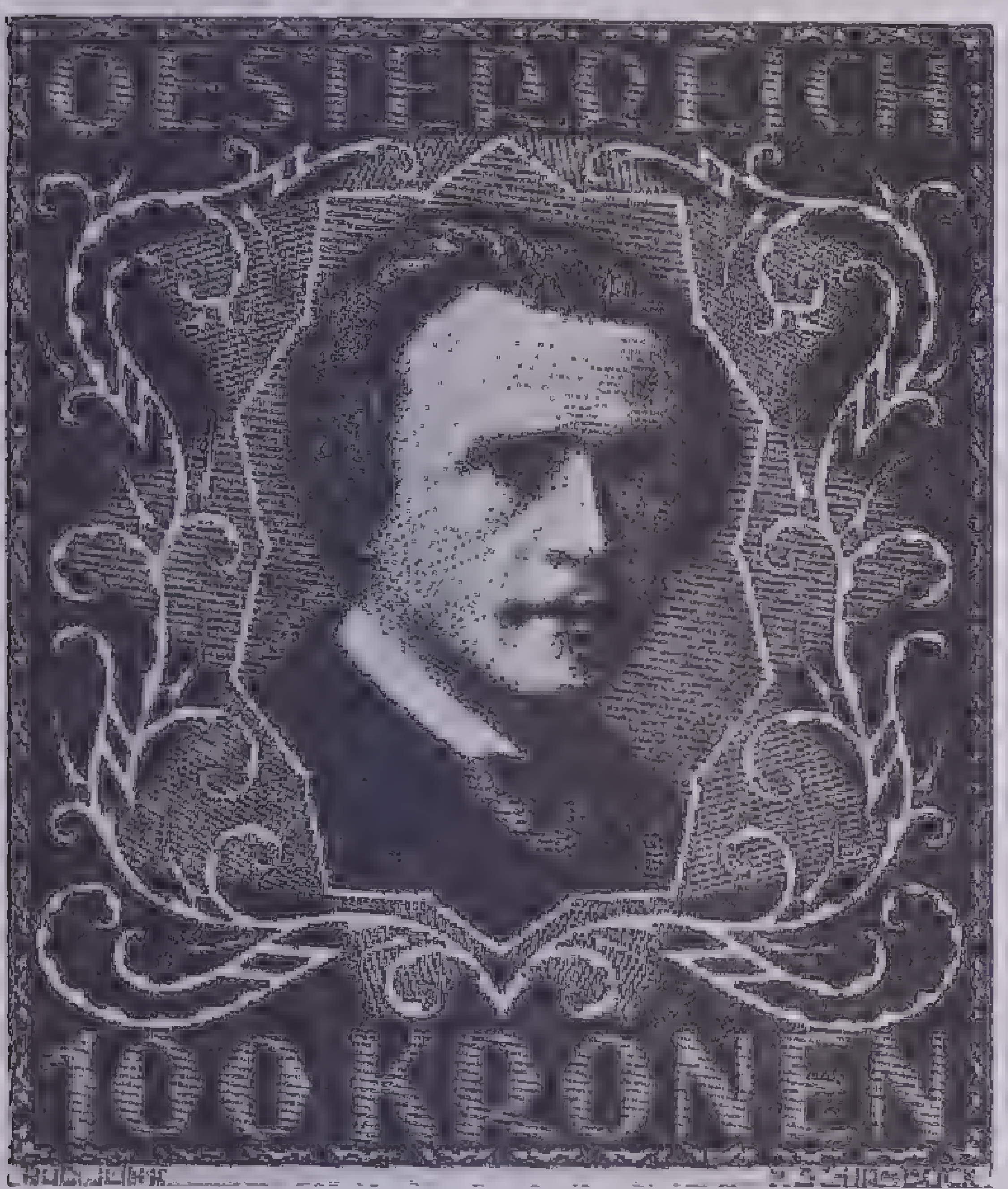
Wodehouse, Pelham Grenville (1881–   ), English humorist, educated at Dulwich College. His stories of humorous English characters are famous the world over. The earlier books had for a central character Psmith, a roving Englishman, but the later and more popular stories revolved around Jeeves, a butler. Wodehouse wrote lyrics for many musical comedies.

Wolcott, Oliver (1726–97), American patriot and soldier. He was the son of Roger Wolcott, Colonial Governor of Connecticut. Having graduated from Yale (1747) he entered the army and fought against the French in King George's War. On the outbreak of the American War of Independence Wolcott was sent as a delegate to the Continental Congress. He was one of the signers of the Declaration of Independence. He served as brigadier general in the campaign against Burgoyne. In 1796 he became governor of Connecticut. His son, Oliver Wolcott (1760–1833) was secretary of the treasury from 1795 to 1800.

Wolf, Friedrich August (1759–1824), German classical scholar, born in Hanover and educated at Göttingen. At Halle from 1773 to 1807 he was professor of classical philology, a new science that he persuaded the University to recognize. His *Prolegomena* to Homer (1795) was the first elaborate criticism of the authorship of the *Iliad* and *Odyssey.* His last years of teaching were at Berlin.

Wolf, Hugo (1860–1903), Austrian composer of musical settings for songs, born in Styria. At 24 he became musical critic for a Viennese paper, and at 27 he published music for 12 songs that made his reputation. For the last 6 years of his life he suffered a nervous breakdown. He wrote music for scores of songs—51 by Goethe alone. In 1922 his portrait appeared on an Austrian stamp.

Wolfe, James (1727–59), English general, born in Kent. In 1742 he entered the army, served in Flanders and later in the American colonies. Wolfe was conspicuous for his bravery at the siege of Louisburg, and when the news of the exploits of the "hero of Louisburg" reached London he was commissioned a major general and given the task of capturing Quebec, the stronghold of the French in North America.



Courtesy Scott Stamp & Coin Company

Hugo Wolf

Enlarged from an Austrian postage stamp issued in 1922. It is one of a series in honor of Austrian musicians. Other stamps in the series show portraits of Haydn, Mozart, Beethoven, Bruckner, Schubert and Johann Strauss

The French were securely intrenched on the Plains of Abraham, a high promontory, but Wolfe's army scaled the heights and took the fortress. As a result Canada became British in 1760. Wolfe was killed in the battle. A monument to him stands on the heights in Quebec.

Wollstonecraft, Mary (1759–97), English writer and feminist. She was a governess at 21 but later became a literary adviser in a London publishing house. In 1792 her *Vindication of the Rights of Women* was published, the first great feminist document. It aroused a storm of opposition. She went to Paris to observe the French Revolution and stayed there for several years. She married William Godwin and their daughter became the wife of the poet Shelley. Among her other books are *Thoughts on the Education of Daughters* and *A Vindication of the Rights of Men.*

Wolsey, Thomas (*c.* 1475–1530), English cardinal, born at Ipswich and educated at Oxford University. He became a royal chaplain in 1506. His rise under Henry VIII was rapid. In 1515 he was consecrated archbishop of York; at about the same time he was appointed lord chancellor, prime minister and cardinal. He became one of the most influential men in Europe. His income was enormous, and he kept a court with as much splendor and pomp as the king's. He used some of his great wealth to found the college of Christ Church at Oxford. He failed to bring about a divorce from Catherine of Aragon for Henry, and that was the beginning of his downfall. In 1529 he was deprived of his post as chancellor and was later arrested for high treason. He died on his way to trial.

Wood, Leonard (1860–1927), American general, born at Winchester, N. H., graduated from the Harvard Medical School in 1884. He joined the United States army, saw action against the Apaches in the West and received the Congressional Medal of Honor for his services. He helped Roosevelt to organize the Rough Riders and fought in Cuba in the Spanish-American War. He was military governor of Cuba (1899–1902) and then became governor of the Moro province in the Philippines. From 1906 to 1908 he commanded the army in the Philippines and in 1906 returned home to command the Department of the East. In the World War he was in charge of a western enlistment camp.

In 1921 he was sent to the Philippines as a member of an investigating committee and while he was there was appointed governor general. In 1920 he was a prominent candidate for the Republican Presidential nomination, but he was defeated by Warren G. Harding.

Woolley, Mary Emma (1863–), American educator, born at South Norwalk, Conn. After 14 years of teaching in various colleges she was president of Mount Holyoke College from 1900 to 1936. As one of the leading women educators, she was chosen to serve in organizations working for woman suffrage, labor legislation and judicial settlement of international disputes. She was a delegate to the Disarmament Conference at Geneva in 1931.

Woolworth, Frank Winfield (1852–1919), American merchant, born near Rodman, N. Y. He began his business career in 1879 with a 5-cent store at Utica, N. Y. He found that the articles he sold lasted for a long time; there was no immediate demand for new purchases. In 1879 he moved to Lancaster, Pa., and opened a 5-and-10-cent store; this time he selected goods for which there was more constant consumer demand. From this start the Woolworth chain of stores grew until they numbered thousands, located in the United States, Canada, Great Britain, Ireland and throughout the largest cities of the country. The Woolworth Building in New York city was erected in 1911 and at that time was the highest commercial building in the world.

Worde, de, Wynkyn (Jan van Wynkyn; d. *c.* 1534), English printer born in Alsace. He probably went to England with William Caxton in 1476. He helped Caxton at his Westminster press and when Caxton died took his place. He printed more than 700 books and designed a number of type faces.

Wordsworth, William (1770–1850), English poet, born at Cockermouth, Cumberland, and educated at St. John's College, Cambridge. He crossed to France in 1791 and saw the events of the French Revolution, for which he had much sympathy. His *Evening Walk and Descriptive Sketches* (1793) was published after his return to England. In 1798 *Lyrical Ballads,* written in collaboration with Coleridge, was published. Although this volume was received with almost complete public indifference, Wordsworth felt that he had found his mission, and after a winter spent in Germany, he settled at Grasmere in the Lake District of England. He was a government inspector of stamps, but this office paid very little. He moved to Rydal Mount and made several journeys into Scotland and to the Continent. When Southey died in 1843 Wordsworth was appointed poet laureate. In his early work Wordsworth tried to show the beauty of everyday things and used the language of common people. Later he turned to more classical styles. His best work was done before 1807, although he continued to write for many years after that. Among his most widely read poems are "Ode to Duty," "Ode on Intimations of Immortality," "Tintern Abbey," "Lucy" and "The World is Too Much With Us."

Wouwerman, Philips (1619–68), Dutch painter, born at Haarlem. His early pictures were on religious subjects, but later he painted military scenes. His pictures are skilfully done and have much spirit and dramatic force. He gave special attention to horses and almost always centered attention on a white horse. His brothers Pieter and Jan also were painters.

Wrangel, von, Ferdinand Petrovich, Baron (1794–1870), Russian explorer, born in Esthonia. He commanded an expedition that explored the Arctic in 1820. He tried unsuccessfully to reach a large land area north of Siberia, now called Wrangel Land in his honor. He was governor of Alaska (1829–34) and opposed the sale of Alaska to the United States.

Wren, Sir Christopher (1632–1723), English architect, born in Wiltshire. He was educated at Oxford, where he became a professor of astronomy. He had little actual training in architecture. The great fire of 1666 in London gave Wren his opportunity. He prepared a plan for rebuilding the city; his scheme was not followed, but he designed new buildings, including the new St. Paul's Cathedral, his greatest work. For many years thereafter he designed important buildings in London and furnished plans for 53 churches. He was knighted in 1672. In his lifetime he was famous as a mathematician.

Wright, two brothers who invented the first successful flying machine.

Orville Wright (1871–), was born at Dayton, Ohio, and Wilbur Wright (1867–1912) was born near Millville, Ind. They graduated from high school in Dayton, Ohio, then established a weekly newspaper. They gave it up to enter the bicycle business. Both were natural mechanics and they invented and made devices for use on bicycles. The brothers' interest in aviation began in 1896, when they read of the death of Otto Lilienthal, the German experimenter, in a glider accident. In 1900 they built their first glider and took it to Kitty Hawk, N. C., for trial. That spot was chosen for its favorable flying weather. They experimented for 2 years and made many glider flights.

Then they designed and built their own gasoline engine, installed it in a plane, and on December 17, 1903, made the first successful man-carrying flight. They continued their work but received little notice until 1908. In 1908 they started an airplane factory. They made spectacular flights in the United States and abroad. In 1909 the U. S. Government accepted their plane for army use.

Wright, Sir Almroth Edward (1861–), English physician and bacteriologist, born in Yorkshire, educated at Dublin University and at the universities of Leipzig, Strasbourg and Marburg. He taught pathology at Cambridge, at Sydney and in the Netley army medical school and in 1902 became professor of experimental pathology at the University of London. He made important researches in parasitic diseases. He originated a system of antityphoid inoculation and made extensive studies of other toxins. He was consulting physician to the army in France from 1914 to 1919. He had been knighted in 1906. His published works include *System of Anti-Typhoid Inoculation, Principles of Microscopy, Studies in Immunization* and *The Unexpurgated Case Against Woman Suffrage.*

Wright, Frank Lloyd (1869–), American architect, born at Richland Center, Wis., studied at the University of Wisconsin. He worked in an architect's office in Chicago for 7 years, then set up his own practice. He designed a number of residences, distinguished by their low height and projecting eaves. He introduced many new ideas both in structure and design of buildings. He pioneered in the use of poured concrete and introduced building with a double wall of pre-cast concrete blocks. He has had more influence on present-day architecture than any other American, and his work is typical of what has been called *The New School of the Middle West.* Among his best-known structures are the Larkin factory in Buffalo, the Oak Park Unity Temple in Chicago and the Imperial Hotel in Tokyo, which was the only building left standing after the earthquake of 1923. Wright has lectured and written much on architecture.

Wright, Harold Bell (1872–), American novelist, born at Rome, N. Y. He was a student for 2 years in Hiram College, Ohio. There have been several best sellers among his books, which include *The Shepherd of the Hills, The Calling of Dan Matthews, Their Yesterdays, The Eyes of the World, When a Man's a Man, The Winning of Barbara Worth* and *The Mine With the Iron Door.*

Wright, Willard Huntington, see *Van Dine, S. S.*

Wycherley, William (*c.* 1640–1716), English dramatist, born in Shropshire, educated at Oxford and in France. His first play, *Love in a Wood,* was produced in 1671. It was very popular, and Wycherley became a court favorite. In following years he wrote *The Gentleman Dancing Master, The Country Wife* and *The Plain Dealer.* He lost favor through an unfortunate marriage but later was pensioned by James II. He became a friend of Pope, who helped him edit his verses. Wycherley's plays are typical of life and thought in the Restoration period. They are coarse and vulgar in subject matter, and the dialogue is brittle and cynical. *The Country Wife* has often been revived.

Wycliffe, John (*c.* 1320–84), English reformer, born in Yorkshire, educated at Balliol College, Oxford, of which he became master in 1356. He was rector at several churches and held other ecclesiastical offices. He sided with John of Gaunt's antipapal policy; and after he took a bold stand against the endowed clergy, 5 of 18 *Conclusions* he had announced were condemned in a papal bull of 1377. Twice condemned as a heretic, he escaped punishment because his views were gaining ground in England and were popular with a powerful political group. The Peasants' Revolt of 1381 turned some of the more conservative against him—he seemed to be preaching rebellion. His greatest work was the translation, with the help of Nicholas Hereford and John Purvey, of the Vulgate Bible into English. This was the earliest complete English version, the first to arouse the opposition of the orthodox in the Church and, in its many happy phrases, the forerunner of the King James version. He was a herald of the Protestant Reformation, especially in his attacks on transsubstantiation and the temporal power of the Church. He had a great influence on the Continent with Huss and Luther.

Wyss, Johann Rudolph (1781–1830), Swiss author. He was professor of philosophy at the University of Bern. His best-known story, *The Swiss Family Robinson,* is still popular with children and the only successful imitation of Defoe's *Robinson Crusoe.* Wyss wrote much Swiss folklore and is the author of the Swiss national anthem.

Xanthippe, wife of Socrates, Greek philosopher. She was noted for her peevishness and ill temper. Some say that Socrates married her to mortify his spirit by her nagging.

Xavier, Saint Francis (1506–52), Spanish missionary, born at the foot of the Pyrenees. He was a disciple of Loyola, whom he assisted in missionary work in Italy. He was ordained a priest in 1537 and was one of the seven original members of the Society of Jesus, founded by Loyola in 1534. He did missionary work in Malacca, the Molucca Islands, the Banda Islands, India, Ceylon and Japan. Xavier's great success in his work in this part of the world gave him the title, "apostle to the Indies." The mission he founded in Japan existed for 100 years. Xavier died while he was making preparations to go to China to establish a Jesuit center. In 1622 he was made a saint of the Church.

Xenophon (*c.* 434–*c.* 355 B.C.), Athenian soldier and writer, a pupil of Socrates. When Cyrus the Younger of Persia organized a military expedition against Artaxerxes, a Greek group of 10,000 mercenary soldiers joined it, and Xenophon went with that group. The event became one of the great episodes in Xenophon's life. The Persians quarreled with the Greek contingent and killed all their chief officers. The story of the entire expedition and an account of the perilous march back under Xenophon's leadership is given in the *Anabasis.* Xenophon wrote the *Memorabilia,* a record of the life and teachings of his friend Socrates; the *Oeconomics,* dealing with home and farm management; the *Hellenica,* a continuation of the history of the Peloponnesian War from the year 411; and the *Cyropaedia,* a romance having Cyrus the Elder as its central figure.

Xerxes (d. *c.* 465 B.C.), King of Persia, son of Darius I, whom he succeeded in 485 B.C. In 480 B.C. he attempted to subdue Greece both by sea and land. Checked for a time at Thermopylae by Leonidas and his Spartans and Thespians, he advanced to Athens to see his fleet destroyed at Salamis by Themistocles. Xerxes was assassinated by Artabanus, captain of his bodyguard.

Yale, Elihu (1648–1721), English philanthropist, born near Boston, Mass. When 4 years old he was taken to England by his father and never returned to America. Yale College was named for him in the charter of 1745. Previously the building and, before that, the school at Saybrook had been called by the name. He donated many books and about $2,500 to the school, now Yale University.

Yeats, William Butler (1865–1939), Irish poet and dramatist, born in Dublin, educated in London and at Erasmus Smith School in Dublin. At 21 he turned from painting to a study of ancient Irish life and became the chief writer of a new school of Irish poetry. He was one of the founders of the Abbey Theatre in Dublin (1904). His works include *The Countess Kathleen, The King's Threshold, Deirdre. Reveries Over Childhood and Youth, The Pot of Broth, October Blast* and *The Tower. The Cutting of the Agate* and *The Trembling of the Veil* are among his best reminiscent and critical works. He also wrote volumes of short stories and collected Irish folk and fairy tales. In 1922 he became a Senator of the Irish Free State. He received the Nobel Prize in 1923.

Yerkes, Charles Tyson (1837–1905), American capitalist, born in Philadelphia. He built up a fortune in the stock market and later controlled the street-railway systems in Philadelphia and Chicago and then the London underground railway. He endowed the observatory that bears his name, at Williams Bay, Wis. His career was the basis for Theodore Dreiser's novels *The Titan* and *The Financier.*

Yonge, Charlotte Mary (1823–1901), English novelist, born at Otterbourne, where she spent most of her life. She wrote on religious and educational subjects and produced many novels that deal with rural life in England. They are filled with much sentiment and romance. For over 30 years she edited *The Monthly Packet.* Among her novels are *The Heir of Redclyffe, The Daisy Chain, The Clever Woman of the Family* and *The Trial.*

York, Alvin C. (1887–), American soldier. He was a native of the mountain region of Tennessee. He went to France in 1918 with the American Expeditionary Force. On October 8, 1918, armed with an automatic revolver and a Springfield rifle, advancing alone against the enemy, he captured Hill 223, killed 20 Germans, compelled the surrender of 132 others, including a major and three lieutenants, and captured 35 machine guns. For this he received the Croix de Guerre, the Congressional Medal of Honor and a farm, purchased by popular subscription. He established the York Foundation for the education of mountain children and became president of the Alvin York Agricultural Institute.

Yoshihito (1879–1926), Japanese Emperor, 3d son of Emperor Mutsuhito. His two older brothers died, and he was declared crown prince in 1887. In 1912 he succeeded to the throne. He received a good education and spoke several languages. He was the first Japanese sovereign who was not an absolute monarch at the time of his accession, for during his father's reign Japan adopted constitutional government. He was succeeded by his oldest son Hirohito, who had acted as regent during 5 years of his father's illness.

Young, Brigham (1801–77), American Mormon leader, born at Whittingham, Vt. In 1832 he joined the Mormon community at Kirtland, Ohio, was made an elder and began to preach. He was later chosen one of the 12 apostles of the Church and after the death of Joseph Smith (1844) became president. He led his people from Nauvoo, Ill., to Utah in a historic overland journey that was beset with enormous hardships. The group of colonists founded Salt Lake City. Young was the first governor of Utah (1850). When there was a general outcry against the Mormons, particularly because of their belief in polygamy, Young was not reappointed in 1858, but his tact prevented an open break with the United States. Much of the marvelous success of the settlement of Salt Lake City was due to his organizing ability.

Young, Charles Augustus (1834–1908), American astronomer, born at Hanover, N. H., and graduated from Dartmouth College. He taught mathematics at Western Reserve College and later was professor of astronomy at Dartmouth and then at Princeton. He was in charge of several astronomical expeditions. He was the first to study the spectrum of the sun's corona. He wrote *The Sun, General Astronomy* and many other textbooks.

Young, Edward (1683–1765), English poet, born at Upham, near Winchester, Hampshire, educated at Oxford. In his 40s he entered the ministry and in 1730 became rector of Welwyn, in Hertfordshire. His chief poetical work is *Night Thoughts on Life* (1742), once famous for its religious sentiment and sententiousness. He had written satires and plays before he became a clergyman.

Young, Francis Brett (1884–), English poet and novelist. He was educated for medicine at Epsom College and at the University of Birmingham. He practiced medicine and served in a medical unit in the World War. Later he lectured extensively. His *Portrait of Clare* (1917) won the James Tait Black Memorial Award and was published in America as *Love Is Enough.* His other books include *Marching on Tanga, The Crescent Moon, Poems, Sea Horses, Black Roses* and *They Seek a Country.*

Young, Mahonri Mackintosh (1877–), American sculptor and etcher, born in Salt Lake City. He studied art in Salt Lake City and later in New York and Paris. His work is simple and dignified and of exquisite craftsmanship. His small figures of laborers and cowboys are notable. Among his productions are *Man With Pick, A Laborer, Rolling His Own* and the *Sea-Gull Monument* in Temple Square, Salt Lake City. Several of his etchings are in the New York Public Library.

Young, Owen D. (1874–), American lawyer and financier, born at Van Hornesville, N. Y. He was educated at St. Lawrence University and Boston University Law School and until 1913 was connected with the law firm of Tyler and Young in Boston. In 1918 he was chosen chairman of the board of the General Electric Company at Schenectady, N. Y., and when the Radio Corporation of America was organized, he became chairman of the international trusteeship for the control of radio patents.

Young and Charles G. Dawes represented the United States in the conference on German reparations in 1924 and administered the *Dawes Plan* while it was in effect. He headed the reparations conference of 1929 and his *Young Plan* reorganized reparations on a financial rather than a political basis.

Younghusband, Sir Francis Edward (1863–), English explorer and author, born in India, educated at Sandhurst. He explored Manchuria in 1886, making many discoveries and describing previously unknown territory. In 1902 he went on a special mission to Tibet, which resulted in a treaty with the Dalai Lama in 1904. Later he surveyed parts of India. Among his writings are *Heart of a Continent, Wonders of the Himalaya, Dawn in India* and *Living Universe.*

Ysaye, Eugène (1858–1931), Belgian violinist, born in Liége. He studied music in Liége, Brussels and Paris. At the age of 28 he became professor and dean of the department of violin instruction in the Conservatory of Brussels, a position he held for 11 years. Thereafter he made concert tours throughout Europe and America and for a time during the World War conducted the Cincinnati Symphony Orchestra. He composed for the violin.

Yuan Shih-kai (1859–1916), Chinese statesman, born in Honan province. His diplomatic career began with service in Korea, and later he was governor of Chihli. He supported the Empress Dowager and the conservative Manchu party, became governor of Shantung, and then viceroy of Chihli. Upon the overthrow of the monarchy, after the Manchu abdication in 1912, Yuan was made President of the Chinese Republic. In 1915 he led a movement to restore the monarchy and won the support of the people. His death ended the movement.

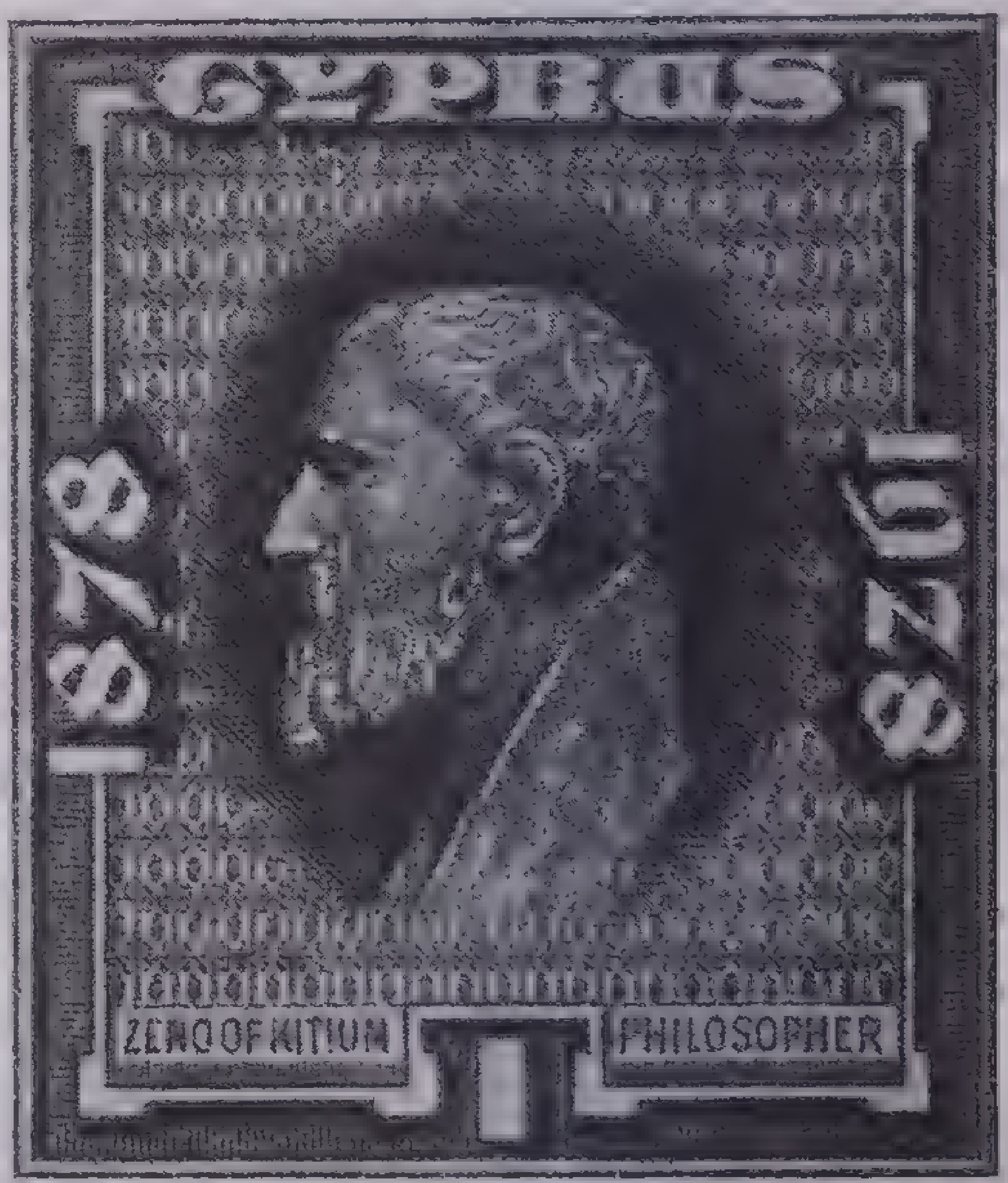
Zangwill, Israel (1864–1926), English writer, born in London, graduated from London University. He did newspaper work in London and founded a humorous journal there; wrote many novels, essays, poems and plays; lectured in Great Britain and Ireland, Jerusalem, Holland and the United States and was president of the international Jewish territorial organization or Zionist movement. He became famous through *Children of the Ghetto,* a story depicting Jewish life among the poorer classes. His other writings include *The Premier and the Painter, Merely Mary Ann, The Master, They That Walk in Darkness, Plaster Saints* and *The Melting Pot.*

Zarathustra, see *Zoroaster.*

Zeeman, Pieter (1865–), Dutch physicist, born in Zeeland, studied at Leyden. He became professor of physics at Amsterdam in 1900 and director of the Physical Institute at Amsterdam in 1908. His greatest work was in splitting up the spectral lines in a magnetic field, the *Zeeman effect.* He received the Nobel Prize in 1902.

Zeiss, Carl (1816–88), German optician and technician, born at Weimar. He was educated in medicine, but in 1864 he founded the famous optical works at Jena that still bear his name. The Zeiss planetarium, first constructed at Jena, was developed by his company.

Zeno of Citium (*c.* 275 B.C.), Greek philosopher, founder of the Stoic philosophy. He apparently began his speculative career as a Cynic but started his own school of thought after deciding that the Cynics had betrayed the philosophical heritage of Socrates, whom Zeno greatly admired. Stoicism (so named from the *stoa* or porch at Athens where Zeno taught) became one of the main philosophical systems of the ancient world. None of Zeno's own writings has been preserved, but the character of the Stoic philosophy can be learned from such later masters as



Courtesy Scott Stamp & Coin Company

Zeno of Citium

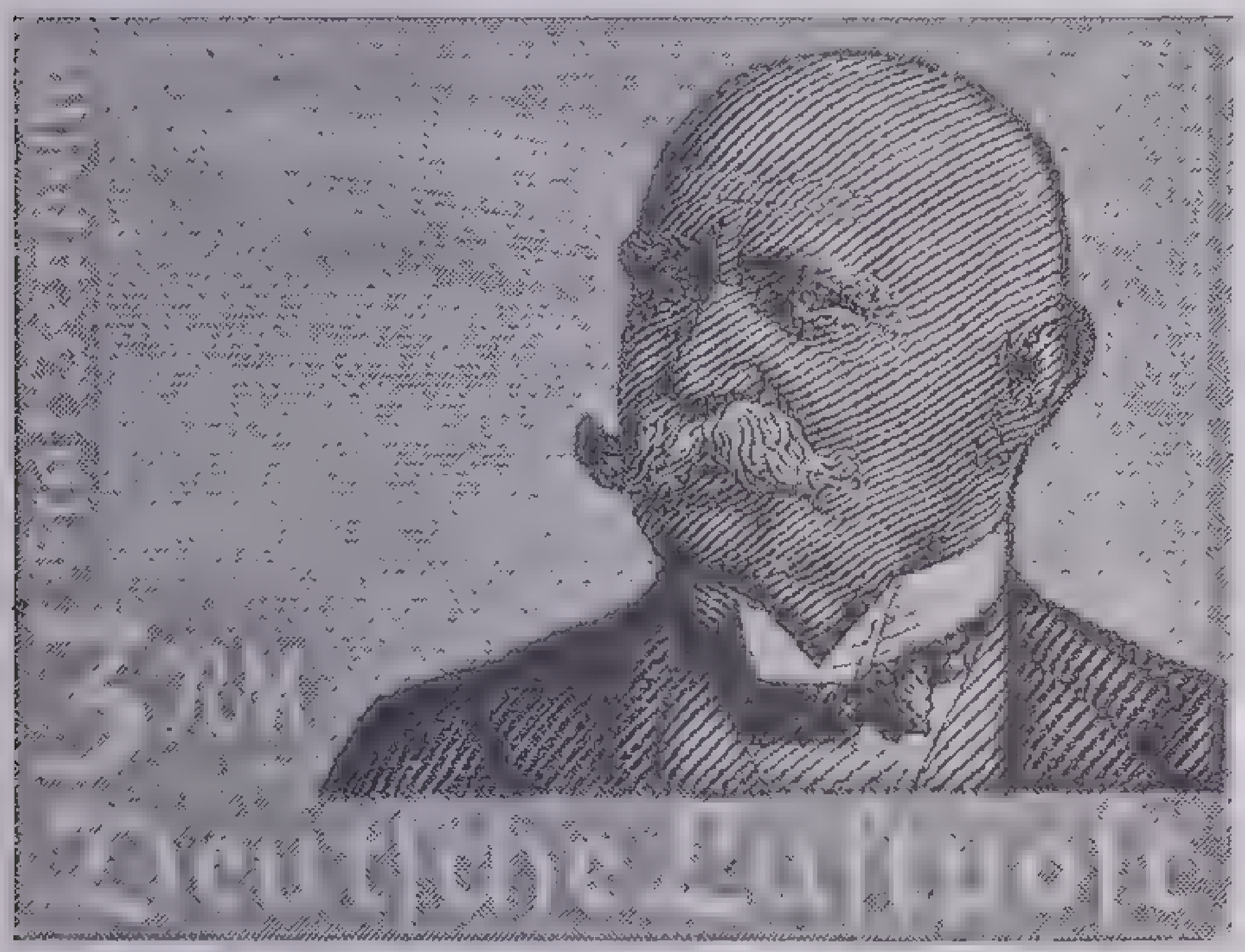
From a postage stamp issued by the colony of Cyprus in 1928

Seneca, Epictetus and Marcus Aurelius. Its outstanding feature was the doctrine that the wise man must control his emotions and accept the universe. Zeno died by suicide.

Zeno of Elea (*c.* 475 B.C.), Greek philosopher. He is chiefly remembered for his paradoxes on motion, which were preserved by Aristotle. Zeno's paradoxes prove with logical rigor that motion is impossible because motion requires the splitting up of finite time and space into an infinite number of indivisible intervals. The philosophical problems raised by this idea of infinity are still hotly debated by philosophers and mathematicians. Zeno was a disciple of Parmenides, who figures as the principal speaker in one of Plato's dialogues, and with Xenophanes was the founder of the Eleatic school of philosophy.

Zenobia, Septimia (3d century), Queen of Palmyra, succeeded her husband Odenathus. Aurelian marched against her with a large army, and after defeating her in several battles, besieged her in Palmyra. She attempted to escape but was captured and brought to Rome. She was a woman of great courage, high spirit and remarkable beauty.

Zeppelin, von, Ferdinand, Count (1838–1917), German inventor and aeronautical engineer, born at Constance, Baden. He was educated in Stuttgart, at the University of Tubingen and at the Ludwigsburg military school. He went to the United States and fought with the Union army during the Civil War. He fought in the German army against France. He retired from the army in 1891 with the rank of lieutenant general and began to experiment with dirigible balloons. In 1892 he manufactured his first ship. He was the first to make airships with rigid metal frameworks. His dirigibles were important in the World War. The *Graf Zeppelin, Hindenburg* and other modern dirigibles were built in the manufactory he established at Friedrichshafen.



Courtesy Scott Stamp & Coin Company

Count Ferdinand von Zeppelin

Enlarged from a German air-mail stamp issued in 1934

Zeuxis (5th century B.C.), Greek painter, a native of Heraclea. He was noted for his skill in expression and coloring. Among his great paintings were *Pan, Alcmena, Helena at Croton* and *Penelope*. He is said to have painted a bunch of grapes so realistically that birds swooped down to eat them.

Ziegfeld, Florenz (1869–1932), theatrical producer, born in Chicago. He entered the theatrical business in Chicago in 1892 but is most famous for his productions of *Ziegfeld's Follies*. He married Billie Burke (1886), an actress later famous on the screen. Among his other most noted productions were *The Pink Lady, Sally, Rio Rita, Kid Boots* and *Show Boat*.

Zimbalist, Efrem (1889–), Russian violinist and composer, born at Rostov-on-Don. He studied first under his father, an orchestra conductor. Later he studied under Leopold Auer. He made his debut in Berlin in 1907, later touring Europe and America. In 1914 he married the dramatic soprano Alma Gluck.

Zinoviev, Grigoryi (1883–1936), Russian communist leader. He became active in revolutionary work in 1903. In 1908 he had to leave Russia because of his part in the Kronstadt mutiny. He returned after the Revolution and was president of the Communist International and chairman of the Petrograd Soviet. He opposed the Trotsky faction in 1923–4, but in 1925 he himself became head of the opposition to Stalin. He was expelled from the party in 1927, readmitted in 1928 and again expelled in 1932. Zinoviev wrote a biography of Lenin, with whom he collaborated on the book *Socialism and War*.

Zinzendorf, von, Nikolaus Ludwig, Count (1700–60), German religious leader, born at Dresden. He accidentally met a wandering carpenter named Christian David, a member of the old sect of Moravian Brethren, who described the persecutions to which the sect was exposed. Zinzendorf invited him and his friends to settle on his estate; the colony, known as *Herrnhut,* flourished for years. Zinzendorf was ordered to leave Saxony because his religious views were considered dangerous. After 1736 he traveled widely, spreading the Moravian doctrines. He founded a strong Moravian colony in Bethlehem, Pa., in 1741. Later he lived in England and finally returned to Germany.

Zog I (Ahmed; 1895–), King of Albania. He was born into one of the four ruling families of the Albanian mountain district and fought for Austria during the World War. After the war he held a Cabinet post and was later premier of Albania. Albania chose to be a republic; he was named President in 1924, but an opposing faction drove him into exile in Yugoslavia. He returned the next year to enforce his claims and exiled his enemies. He convinced his countrymen, most of whom are Mohammedans of medieval type, that a monarchy would better serve their interests, and the change in government was brought about in 1928.

Zola, Émile (1840–1902), French novelist, born in Paris, educated at the Lycée Saint-Louis. He began to write short stories before he was 20. His *Thérèse Raquin* (1866) is a gruesome story based on scientific and sociological problems. Soon after this he formed with Flaubert, Daudet and the Goncourts, the naturalistic school of fiction. In a series of novels called *Les Rougon-Macquart,* Zola tried to show the effects of heredity and environment upon the members of a single family. In 1898 he came to the defense of Captain Dreyfus in the famous Dreyfus case. His pamphlet *J'Accuse* created a sensation. It was a denunciation of those who had prosecuted Dreyfus. Zola was tried for libel and condemned, appealed the case but left France before the second trial opened. While he was in exile he wrote *Fécondité*. Other works include *Nana, Le Débâcle, Germinal* and *La Terre*.

Zorn, Anders Leonhard (1860–1920), Swedish painter, etcher and sculptor, born in Mora, studied in Stockholm and later in London. He traveled widely but did most of his work in the town of his birth. His earliest work was with water colors, but later he painted in oil and made many etchings. His fame rests chiefly on his figure paintings, among which are his *Dance at Dalecarlia, Baking in Mora, Midsummer Dance* and *Watering the Horse*. His painting represents the matured impressionistic group. He excelled also in sculpture; among his best pieces are *Faun and Nymph* and the *Broken Pitcher*.

Zoroaster (Spitama Zarathustra; *c.* 660–*c.* 583 B.C.), a great religious teacher, founder of the Persian religion, Zoroastrianism. He was probably a native of the east of Persia, but there is great uncertainty as to the time in which he appeared as a religious teacher. His doctrines are to be found in the Parsee scriptures called the *Avesta*. The fundamental idea of his doctrine is the existence since the beginning of a spirit of good (Ormazd) and a spirit of evil (Ahriman). These two are in perpetual conflict, and the soul of man is the great object of the war. Ormazd created men free, so that if they allow themselves to fall under the sway of Ahriman they are held to be justly punishable. When a man dies, his good and evil deeds will be weighed against each other, and accordingly as the balance is struck he will be sent to heaven or to hell. If they are exactly equal, the soul passes into an intermediate state and remains there until the day of judgment. Ormazd is to triumph ultimately, and then there will be one undivided kingdom of God in heaven and on earth.

Zsigmondy, Richard (1865–1929), Austrian chemist, educated at Vienna and Munich. In 1908 he became professor of inorganic chemistry at Göttingen. He contributed much to knowledge of colloidal chemistry and invented the ultramicroscope. He won the Nobel Prize for chemistry in 1925.

Zwingli, Ulrich (1484–1531), Swiss reformer, born at Wildhaus, Switzerland. He served for a time as a soldier in the Italian army, then became a parish priest. He soon began to preach reforms within the Church and found a pastorate in Zurich. Like Luther he opposed the sale of indulgences. In 1523 he and his reforming followers in Zurich won the canton of Bern to the Protestant side. Open warfare between Swiss Catholics and Protestants followed. In 1531 Zwingli was killed while serving as chaplain with the Protestant forces. The full belief of Zwingli is contained in 67 theses that he wrote in 1523, the basis of Reformed Church theology as distinct from Lutheran. He had persuaded the Zurichers in 1521 to give up the old Swiss practice of renting soldiers to the highest bidder. His theology and politics strongly influenced the development of the government of Switzerland.

THE ONE HUNDRED GREATEST MEN AND WOMEN

Aeschylus
Alexander the Great
Alfred the Great
Aquinas, Saint Thomas
Archimedes
Aristotle
Augustine, Saint
Bach, Johann Sebastian
Bacon, Francis
Bacon, Roger
Balzac, Honoré de
Beethoven, Ludwig van
Bismarck, Prince von
Buddha
Caesar, Gaius Julius
Calvin, John
Carlyle, Thomas
Cervantes, Miguel de
Charlemagne
Chaucer, Geoffrey
Cicero, Marcus Tullius
Columbus, Christopher
Confucius
Copernicus, Nikolaus
Cromwell, Oliver
Dante
Darwin, Charles
Descartes, René
Dickens, Charles
Dostoevsky, Feodor
Edison, Thomas Alva
Elizabeth
Emerson, Ralph Waldo
Erasmus, Desiderius
Euclid
Euripides
Faraday, Michael
Francis of Assisi, Saint
Franklin, Benjamin
Frederick the Great
Galileo
Goethe, Johann von
Gregory, Saint
Grotius, Hugo
Gutenberg, Johannes
Hegel, Georg Wilhelm
Helmholtz, Hermann Ludwig von
Homer
Hugo, Victor
Huygens, Christian
Jefferson, Thomas
Joan of Arc
Kant, Immanuel
Kepler, Johannes
Lavoisier, Antoine Laurent
Lee, Robert E.
Leibnitz, Gottfried
Lincoln, Abraham
Linnaeus, Carolus
Locke, John
Loyola, Saint Ignatius de
Luther, Martin
Machiavelli, Niccolo di
Marcus Aurelius
Marx, Karl
Maxwell, James Clark
Michelangelo
Milton, John
Mohammed
Molière
Montaigne, Michel de
Napoleon Bonaparte
Newton, Sir Isaac
Pascal, Blaise
Pasteur, Louis
Pericles
Peter the Great
Phidias
Plato
Plutarch
Rabelais, François
Raphael
Rembrandt van Rijn
Rousseau, Jean Jacques
Sappho
Schiller, Johann von
Shakespeare, William
Socrates
Sophocles
Spinoza, Baruch
Titian
Tolstoy, Lev Nikolaevich
Vergil
Vinci, Leonardo da
Voltaire, François
Wagner, Richard
Washington, George
Watt, James
Whitman, Walt
Whitney, Eli

COLLECTIONS OF BIOGRAPHICAL MATERIAL

History has often been called the mere shadow cast by a few famous men and women. Nothing in history sticks in our minds as surely as an anecdote about a historical person.

For this reason and because a collection of biographical material on many persons is more valuable for reference than a few separate volumes each a biography of one individual, this page is devoted to a brief survey of some of the famous collections of biographies—first, those that have made a great impression on our life and thought; and second, those that are now used for quick reference.

Ancient History and Biography

From the end of the 1st century of the Christian era came down to us Plutarch's *Parallel Lives* in Greek of 23 Greeks and 23 Romans. The parallel was a comparison of a Greek and a Roman whose careers were something alike—Alexander the Great and Julius Caesar, for instance, and Demosthenes and Cicero—so that the sketches were in pairs. Much that the western world now knows of ancient Greece and Rome is the story as it is told by Plutarch—or as it is told in Shakespeare's plays from the material that Shakespeare took from Plutarch. He took it from the English translation of the *Lives* made by Sir Thomas North, dedicated to Queen Elizabeth in 1579. Second only to the King James version of the Bible, North's Plutarch was the prime influence from the outside on English literature of the 1600s.

Besides Plutarch the only ancient collection of biographies that has survived and has affected modern thought or feeling about historical characters is Suetonius's *Lives of the Caesars,* written in the first half of the 2d century A.D. It is a brilliant book, full of gossip and scandal, strangely potent in coloring the general impression that the uncritical reading world now holds about Julius and Augustus and their successors, especially Nero.

Church Biography

The same epoch in which Plutarch and Suetonius appeared in English dress witnessed two remarkable original biographical series in English. John Foxe's *Book of Martyrs* (1563), a thrilling partisan story of early Protestant leaders on the Continent and in England, was eagerly and passionately read for two or even three hundred years in England and America where it fanned a hot flame of hatred against the Roman Catholic Church, the Inquisition and "Bloody Mary" of England. A more literary and scholarly work that had nowhere near the power of Foxe's *Martyrs* was the quaint, wise, witty and tolerant Thomas Fuller's book *The Worthies of England* (1662), sketches of the lives of English Churchmen and other county personages who lived in a milder time than the early Reformation. Fuller's book was arranged geographically by the counties of England. It described the county first and then the famous inhabitants.

In that same fruitful era of the 17th century the famous Catholic series of biographies began, and it has continued to our own day under the title *Acta Sanctorum* or *Deeds of the Blessed Saints.* In 1630 a group headed by the Jesuit father Jean Bolland, and since called Bollandists in his honor, began this painstaking and scholarly work that has been the source of so much devotional fervor among the masses and of countless literary treatments of anecdotes in the lives of Catholic worthies. The first volume was published in 1653. The Jesuit order was suspended in 1773, but the labor of these hagiographers (or biographers of the saints) was resumed again a half century later, and since 1837 it has been aided by the Belgian Government.

Nationalism in Biography

In organized biographical writing as well as in politics the 19th century was the new age of nationalism. A 23-volume dictionary of Swedish biography appeared in 1835-57. Overlapping it in time were a similar Dutch work in 24 volumes (1852–78) and an Austrian biographical dictionary in 35 volumes (1856–91). The Germans did a thoroughly scientific and well-organized piece of work in the *Allgemeine Deutsche Biographie* (45 volumes, 1875–1900). Even more remarkable for its literary and critical qualities was the British *Dictionary of National Biography* in 63 volumes (1885–1900) with later supplements. The DNB (as the English series is abbreviated) was edited by two English scholars, both knighted for their work on it—Sir Leslie Stephen and Sir Sidney Lee, the Shakespearean scholar. The *Dictionary of National Biography* is now published by the Oxford University Press. It contains about 40,000 biographical sketches.

In the United States there were several biographical dictionaries in the nationalist 19th century. Jared Sparks of Harvard edited a 25-volume *American Biography* (1834–38; 1844–47). Appleton's *Cyclopaedia of American Biography* (1887–89) had fine portraits and carefully prepared short sketches. The 20th century brought the *Dictionary of American Biography,* an American work on a scale as elaborate and with scholarship and literary value comparable to the *Dictionary of National Biography* in Britain. This elaborate American biographical cyclopedia was prepared under the auspices of the American Council of Learned Societies and had the financial backing of the *New York Times* and its publisher Adolph S. Ochs from 1925 to its completion in 1937. It was edited by Allen Johnson (to his death in 1931) and by Dumas Malone. The first volume appeared in 1928; the 21st, an index, in 1937. It treats of 13,633 persons.

Specialized Series

Another class of biographical studies has been specialized series devoted to a particular field with an individual volume for each eminent person in the field. The *English Men of Letters* in 43 volumes (1878–1902) was edited by the English statesman and man of letters John Morley, himself the biographer of Burke, Cromwell, Gladstone and Walpole. There are two later series of the same title. A corresponding *American Men of Letters* series in 20 volumes (1881–1904) was edited by the essayist and humorist Charles Dudley Warner. In the *American Statesmen* series of 33 volumes (1882–1909), such statesmen as Henry Cabot Lodge and Theodore Roosevelt contributed excellent biographies. The editor J. T. Morse wrote the lives of Lincoln, Franklin, the Adamses and Jefferson. In 1906, 1910, 1921 and 1927 Professor J. M. Cattell edited a volume called *American Men of Science.*

Current Biographical Information

Till comparatively recent times most biographical writing was limited to the story of the dead. Some of Erasmus's most interesting Latin letters are those in which he chats about the scholars, churchmen and statesmen of England whom he met —but that was not considered real biography. The perspective for a proper picture of a man and his times could come only after he was dead—or so the older biographers thought. Now we all feel that the lives of men and women who still are alive and powerful are of the most interest and importance.

Ever since the middle of the last century there has been in England—though that country has always been famous for preserving the privacy of its citizens—a yearly publication that contained this sort of personal information about thousands of living celebrities. It is called *Who's Who: An Annual Biographical Dictionary,* and the information it contains is furnished by the subjects of the biographical sketches.

One recent issue of the English *Who's Who* contained 3,722 pages and tens of thousands of biographies. Two volumes called *Who Was Who* contain similar sketches of those who died between 1897 and 1928.

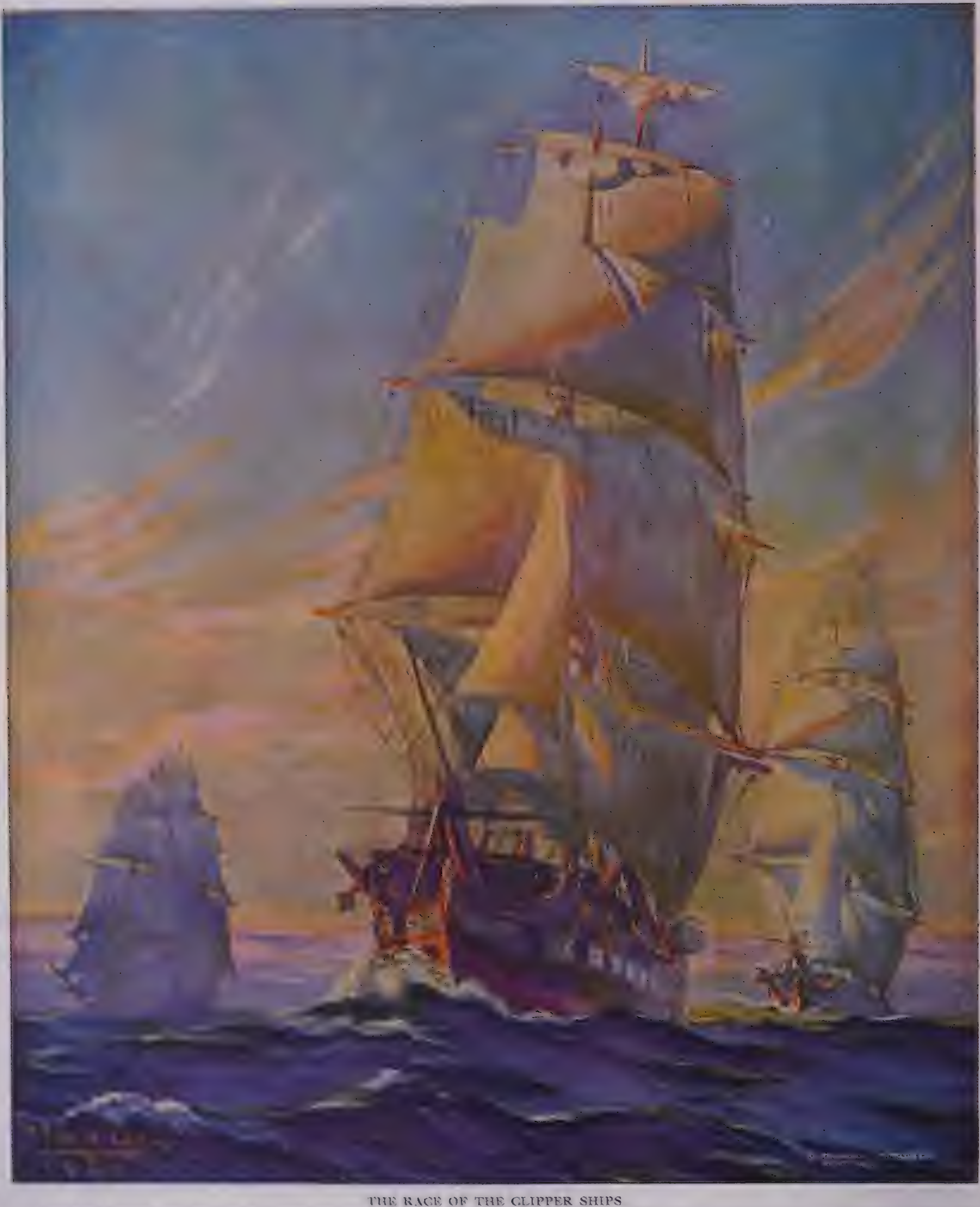
In France and Germany there were annuals of contemporary biography from 1905 up to the time of the World War. They imitated the English book and were called respectively *Qui êtes vous?* and *Wer ist's?*

The first volume of *Who's Who in America* was for the turn of the century in 1890-1900. A recent issue had 31,434 biographical sketches. The material comes from the subject of the sketch but is reduced to a standardized form.

· *Book* · *XII* ·

INDUSTRY *and* TRADE

Introduction to Industry and Trade Page 1613
Inventions and Engineering in Modern Life 1617
Industrial Dictionary 1623
Industrial Statistics 1764
Tabulations on Agriculture, Horticulture and Animal Husbandry 1768
Economics of Plants, Animals and Minerals 1786
Economics 1800
Economics and Business Dictionary 1807
Monetary System of the United States .. 1841
Bibliography 1841



THE RACE OF THE CLIPPER SHIPS

Trade and industry owe much to the clipper ships which reached the height of their glory in the middle of the nineteenth century. The name "clipper" was derived from the fact that the bow was so designed that it cut through the waves instead of hitting them. For a period of time clipper ships literally sailed every other type of craft from the seas and were adopted wherever maximum speed and seaworthiness were essential. Splendid prizes were held out to the captains and crews as an inducement, and the keenest rivalry existed between ships in the race home, a spirit of competition even more strong than that which existed between ship-owners. As long as the word "clipper" remains in the English language, so will these clipper races remain famous alike for the skill as for the competitive instinct in the crews that got them home in record time.

In our picture the artist, Manning deV. Lee, has depicted three clippers racing with taut sails and flying spray for the valuable cargo of Brazilian coffee which will belong to the winner. Intense rivalry developed between ship-owners to bring each new crop of the aromatic beans to market at the earliest possible moment.

BOOK XII: INDUSTRY AND TRADE

INTRODUCTION TO INDUSTRY AND TRADE

The problem of earning a living is perhaps the most important problem that an individual or a society faces—a problem with which people at all times and in all places have been forced to cope. Its solution is basic to human existence and social progress. The manner in which it is solved determines the degree of physical comfort and security that any people may attain; and through its influence upon leisure shapes or limits the development of culture and the arts. The manner in which a group of people secures a living, the ways and means by which the wants of the individual and of the social group are supplied is what we refer to when we use the term economy or economic organization.

Division of Labor.—Perhaps the outstanding characteristic of modern economic organization as contrasted with that of the people of earlier times is the degree to which specialization or the division of labor prevails and the role that machinery plays in the production and distribution of goods. In primitive societies people lived in relatively isolated groups, only the simplest hand tools existed, wants were few and these were largely supplied by the direct, unspecialized efforts of the individuals within the group. The great mass of goods were not bought and sold in a market but were produced directly by those who consumed them.

In England in the Middle Ages the masses of the people, who were little better than serfs, lived on great landed estates called *manors* under the domination of a feudal lord. They gained their living primarily by cultivating the soil. These manors were isolated communities. Each was economically self-sufficient; that is, each largely met its own needs by its own labor. The peasants built their own cottages, made their own clothes, cut their own firewood, raised their own produce, ground their own grain at the village mill. Very little trade existed. Only a few articles such as salt and iron not obtainable locally were secured outside the manors. There was little or no money in the community and little need for it.

Conditions were similar in early Colonial times after the settlement of America; although trade had come to occupy a very much more important place in the national economy, our forefathers lived largely on farms, raised their own food, made their own clothes and built their own homes. Although some trade was carried on, the inhabitants lived to a very considerable degree in little independent economic worlds.

In contrast the wants of the individuals in our society today are supplied by means of specialized production for sale in the market, that is, through industry and trade. Some people make their living by agriculture, some by stock raising, others by mining, still others by manufacturing shoes, clothing, furniture, automobiles or the myriad other fabricated products that enter into commerce and that we meet or actually use in our everyday lives. Goods are no longer made with simple hand tools by the same persons who consume them directly but in factories employing hundreds and even thousands of workers operating complicated, precise and powerful machines.

Exchange and Trade.—Such specialized industrial activities are co-ordinated through exchange and trade. The production of particular commodities is far in excess of the needs of those who make them. The goods are not generally produced on special order to meet directly the immediate needs of the producers; they are produced to be sold to individuals themselves engaged in the specialized production of other commodities. With the proceeds from selling these products those engaged in making the goods purchase the varied products and services essential to their livelihood. Moreover both the services of those engaged in the production of goods and the raw materials upon which the laborers work are bought in the open market by the owners of industry. Thus industry is organized upon a basis of trade. Workers secure the means of their livelihood through the operation of industry. Some industries supply the raw materials that other industries remanufacture. By such means of specialized production and trade the host of finished products upon which consumers have come to depend for the satisfaction of their wants find their way to the market; and by remuneration for the physical production and distribution of the goods the consumers obtain the means to purchase them.

Specialization.—The processes of specialization have been carried much farther than the brief account above would indicate. Specialization has involved not only a separation of occupations as described above but a territorial specialization among geographic areas and a division of labor within a particular occupation or industry.

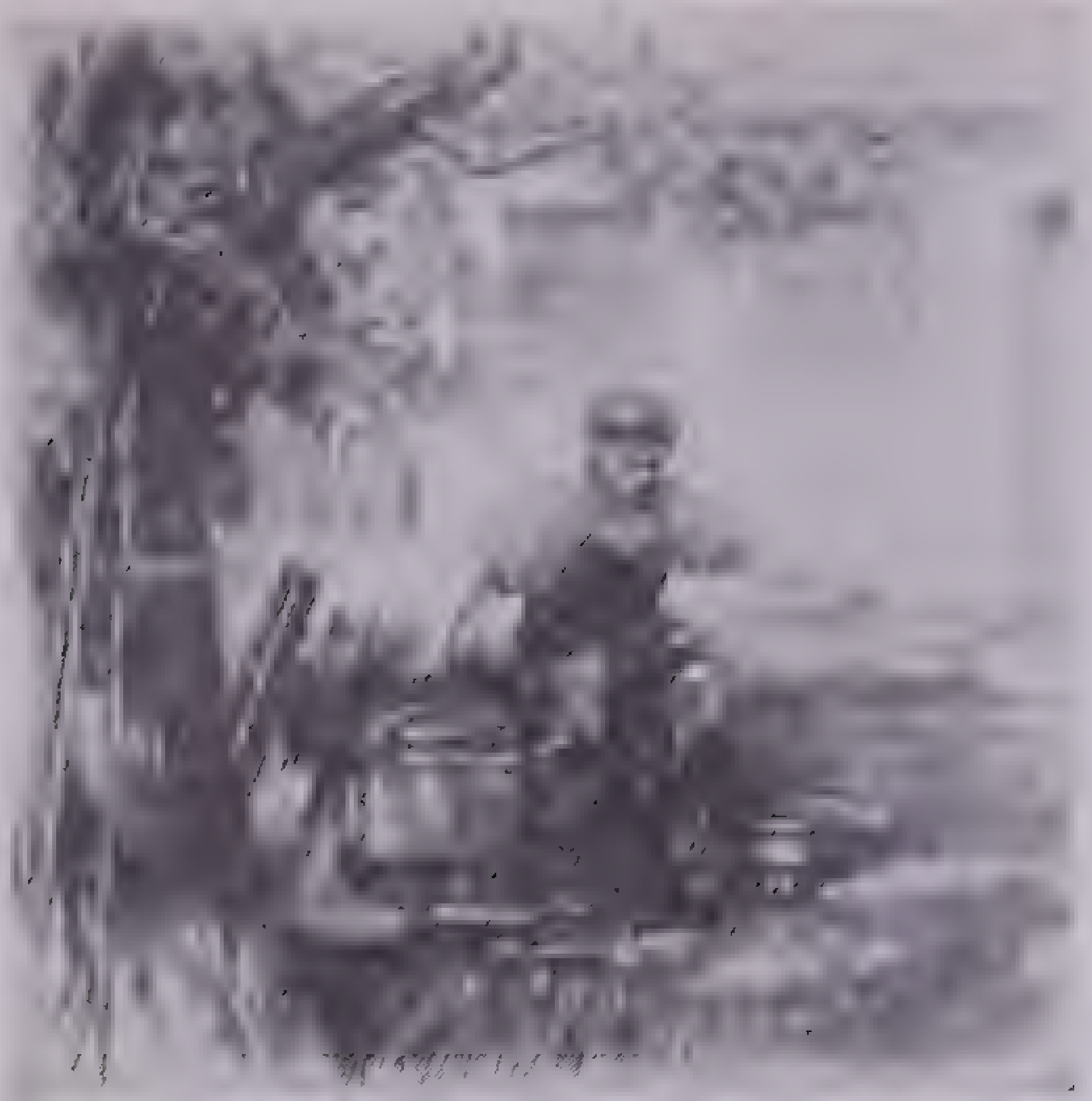
Labor specialization or division of labor was apparent as long ago as the last quarter of the 18th century, when Adam Smith, father of the science of economics or political economy, as it was called then, wrote his great treatise on economics entitled *The Wealth of Nations.* In the manufacture of pins Smith found that one man drew out the wire, another straightened it, a third cut it, and a fourth ground it at the top for receiving the head. Altogether he discovered 18 distinct operations in pin making. Those of you who have visited the assembly plant of a modern automobile factory have seen specialization in its most highly developed form. In the manufacture of the 1914 Model-T Ford car 15,000 men worked in gangs in a single assembly plant on the moving-track system. Each gang and each man in each gang had only one small thing to do and did it over and over again. In 2 hours a mere skeleton of a frame that was pushed forward on a moving belt passing before many workers, each specializing in a single function, grew into a car that was driven off the assembly line by its own power. Different gangs had added to the frame nuts, bolts, parts, engine and wheels. Such specialization, itself made possible by the use of machinery, increased very greatly the productivity of industry. In 1935 it was possible for the iron ore that arrived at the Ford Company's River Rouge docks near Detroit on a work day at 8 A.M. to leave the plant in a finished car by noon of the following day.

Just as individual workers and groups of workers have come to specialize in a single task in the production process, so geographic regions possessing the advantage of natural resources or climate are devoted to the production of a single commodity, raw or manufactured. About 90 per cent of the world's supply of nickel comes from a single locality near the little town of Sudbury in Canada, and more than half the world's sulphur is produced along the gulf coast of Texas and Louisiana. The Southern States produce about 40 per cent of the world's supply of cotton, and more and more the Southern cotton mills turn this raw material into cotton cloth.

Localization of factories in special industries is not always governed by the nearness of raw materials—sometimes by cheap power, sometimes by a labor supply on the spot. We all know that Detroit makes automobiles, Pittsburgh produces steel, Chicago is the center of meat packing.

This brief analysis of the role that occupational and territorial specialization and the division of labor have come to play in our modern economy suggests its interdependent and co-operative character.

Interdependence of Modern Industry.—The individual who receives his share of the social income in the form of money payment for a specialized ac-



From Harper's New Monthly Magazine, January, 1885

An Old-Time Shoemaker

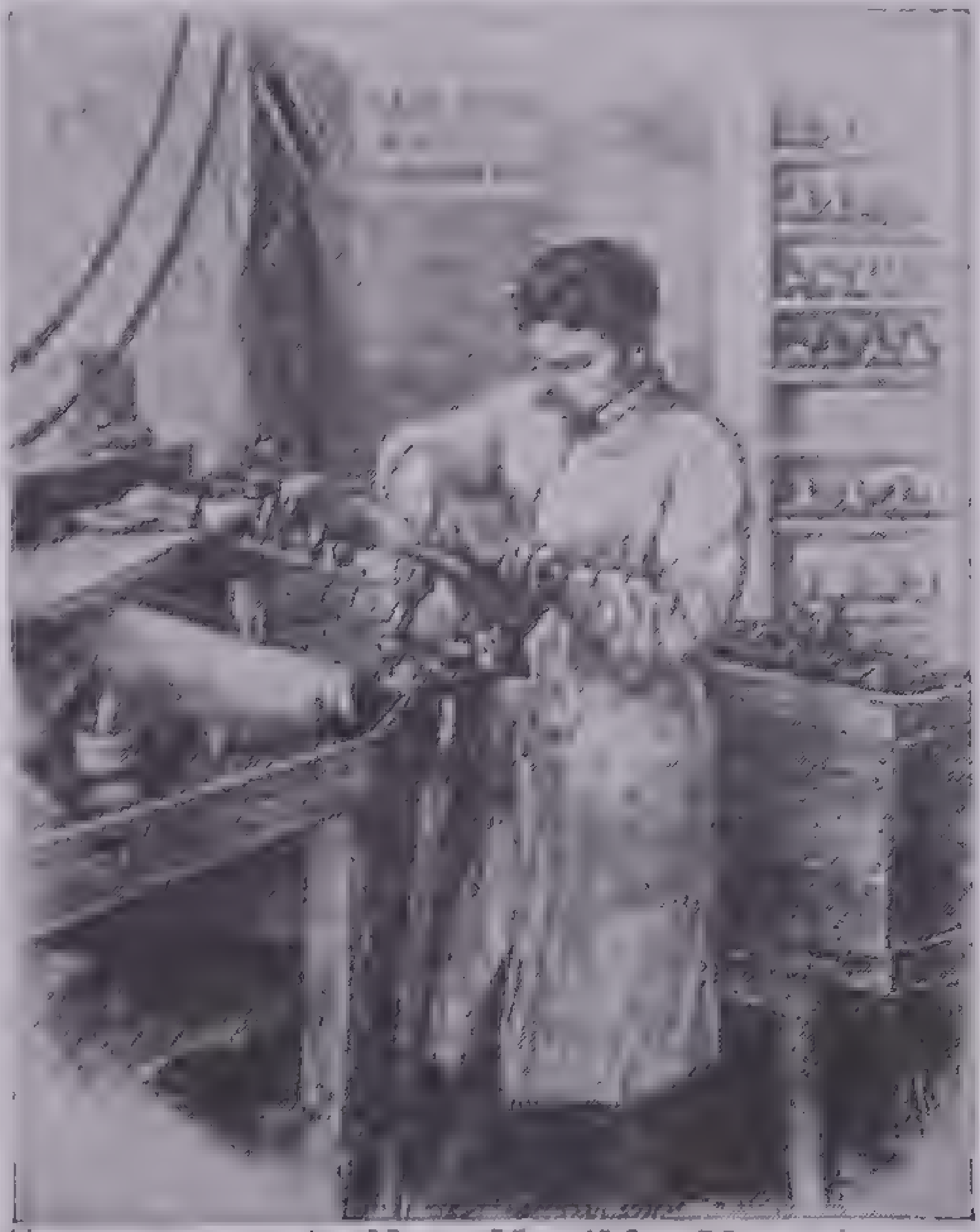
His home was his factory, and by hand methods he performed all the operations that go into the making of a finished shoe

tivity is dependent upon the combined activity of all others who work for the satisfaction of his wants. When he arises in the morning he receives a newspaper delivered by the newsboy and milk from the milkman. He travels to his office or his job by a trolley or bus operated by the local traction company or by his own auto, which was manufactured under mass production methods. He works in a building in the construction of which he played no part. His house is furnished with furniture and electrical appliances made by specialized manufacturing concerns. In the production of his food he has played no direct role and it may have been assembled through trading companies and merchandisers from the four corners of the globe. Through industry and trade, frequently worldwide in character, his wants are supplied.

Primary Industries.—There is a similar dependence among the varied industries of modern society and among geographic areas. As everybody knows, today the finished products of one industry become the raw materials of another. The manufacture of a modern telephone receiver uses vegetable and mineral products from many parts of the world: cotton, paper, rubber, china, wood, oil, nickel, copper, zinc, aluminum, tin, lead, iron and numerous other minerals whose names are less familiar. The wheat farmer of Minnesota may feed the cotton spinner of England, a German chemist or a Swiss watchmaker. These in turn may supply the Minnesota farmer with clothes or chemicals or a watch. Individuals, industries, geographic areas and nations have become mutually interdependent, and among them, through the mechanism of industry and trade, an involuntary co-operation has been established.

Those industries that are concerned with obtaining from our physical environment the raw materials upon which other industries depend are sometimes called the *primary industries*. The primary industries may be subdivided into two classes, extractive and genetic. The *extractive* industries are those that draw raw materials from the earth or water without replacing them. Such industries include hunting, fishing, grazing, lumbering and mining. These industries reduce the store of raw materials. The genetic industries likewise draw raw materials from the earth but in doing so they do not necessarily rob the earth of its capacity to reproduce such raw materials. The *genetic* industries involve the cultivation of plants and the breeding of animals. They include forestry, stock raising, farming and fish culture.

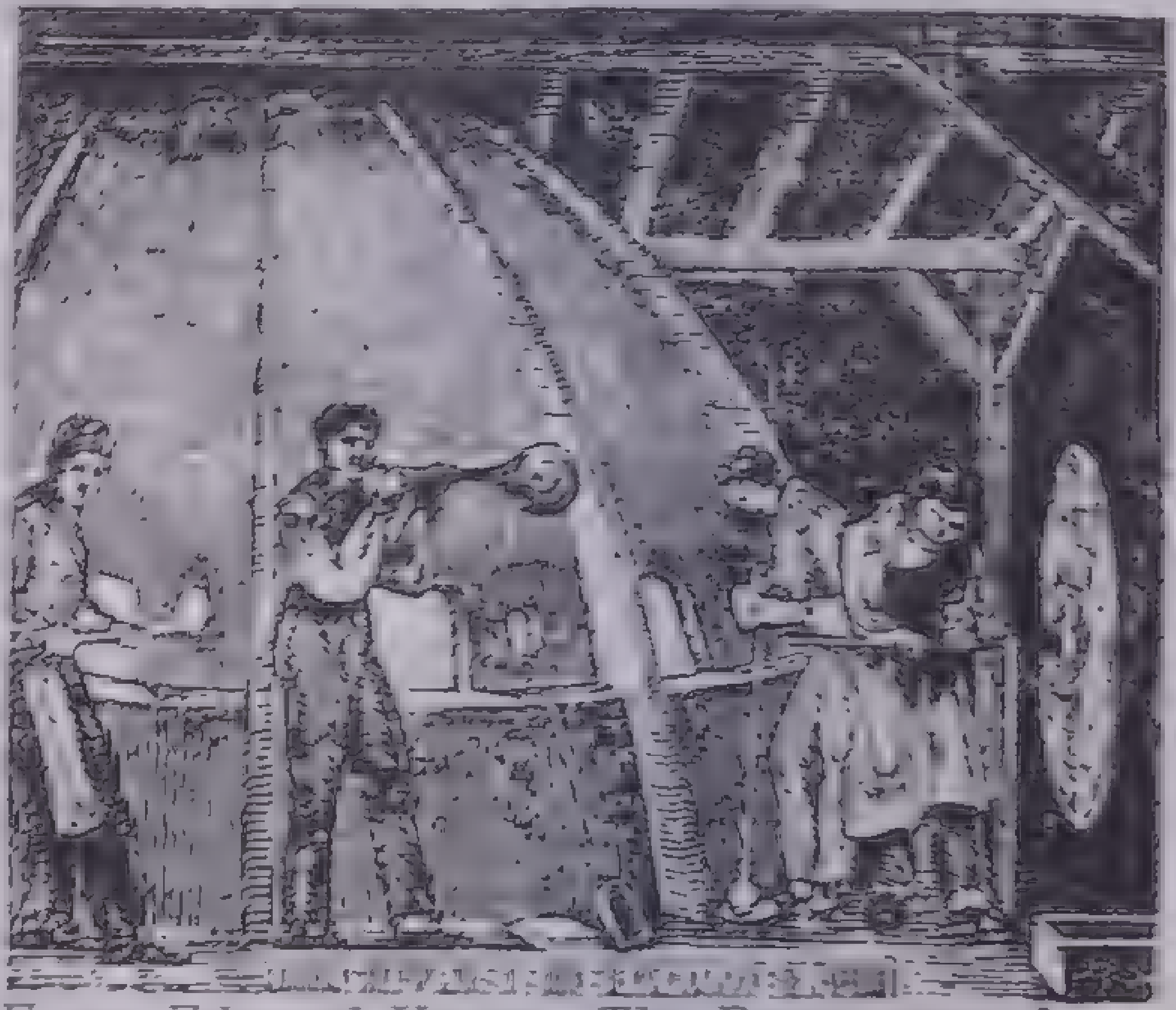
Those industries that use the raw materials produced by the primary industries and shape them into the great variety of finished products that enter into our everyday lives—clothing, houses, office buildings, bridges, highways, automobiles, furniture, household appliances, books, musical instruments, athletic equipment, foods—are called manufacturing and construction industries. The United States Census classifies the manufacturing industries according to the nature of their basic materials under the following 16 groups: food and kindred products; textiles and their products; forest products; paper and allied products; printing and publishing; chemical and allied products; products of petroleum and coal; rubber products; leather and its manufactures; stone, clay and glass products; iron and steel and their products, excluding machinery; nonferrous (other than iron) metals and their products; machinery, not including transportation equipment; air-, land- and water-transportation equipment; railroad repair shops; miscellaneous industries. These are broad groups and under each the Census lists numerous subdivisions.



From Harper's New Monthly Magazine, January, 1885

Trades in the 1800s: The Laster

Trade and Transport.—Industry does not consist merely of making or producing goods. Specialization in the production of physical goods, which creates mutual interdependence on the part of individuals, industries and geographic areas, can contribute to social welfare only when the surpluses produced are made available to those who need them—that is, only through trade. Trade over broad areas obviously is dependent upon the development of adequate transportation facilities and the machinery of exchange. Industry is bound together today by remarkable systems of transportation and communication. It took Columbus 70 days to cross the Atlantic Ocean in 1492; in 1927 Lindbergh performed this feat by airplane in 33½ hours. The steamship *Queen Mary* does the journey regularly with cargo and passengers in a little more than 4 days. The founders of our republic required 3 days to go from New York to Philadelphia. The journey now is made by airplane in less than half an hour and by train in 2 hours. Airplanes speeding at 200 miles an hour, trains at 60, steamships at 40, the telegraph, the cable and the radio have brought the four corners of the earth into intimate contact and by so doing they assure continuous, rapid and easy transit of goods. Almost 250,000 miles of railways and over 690,000 miles of surfaced automobile highways in the United States are the traffic lines that bind industry and trade in this country into a unified whole.



From Edward Hazen: The Panorama of Professions and Trades, 1836

The Glass Blower

He represents the next stage in development of the modern industrial system. He specialized more or less in doing one certain kind of work, but hand operations were the rule rather than the exception. The machine had not yet become all-important

Financing Industry.—Transportation facilities alone, however, are not adequate to permit the ready carrying on of trade based on specialized production. Productive enterprises must be financed and it is necessary to have a system of marketing by means of which surplus goods are made available at the time and place they are wanted. Modern production is on a large scale; it involves the purchase of raw materials in large amounts, the use of expensive and complicated machinery and the employment of a large number of laborers. This requires a large outlay of capital permanently invested in an enterprise and a somewhat smaller amount of working capital, that is, money with which to meet the daily expenses of operation. A single individual rarely possesses sufficient capital to start a large-scale productive enterprise. Once an enterprise has been started, continuing sales may afford adequate working capital, but generally those engaged in industry or trade find it necessary at one time or another to borrow funds to meet temporary shortages.

To meet these needs, our modern

system of commercial and investment banking has developed. *Commercial banks* are the deposit banks with which every schoolboy has some acquaintance. They are found in all urban centers.

Commercial banks accept for deposit such monies as individuals or business concerns wish to place with them for safe keeping. Against these deposits those who have made them draw checks authorizing the bank to pay a specified amount to a third party to whom money may be owed. Modern trade is carried on largely by means of these checking transactions. Commercial banks advance loans to business men who may be temporarily in need of additional funds either to operate or expand their businesses. Banks frequently advance the sums by means of which the current operating expenses of a business are met. By lending their own credit the banks are able to expand greatly the total available purchasing power of a community. Loans are made on a basis of the risk involved and the certainty of repayment. This is largely a matter of judgment on the part of the bankers. It is clear, therefore, that bankers exercise a great deal of influence in shaping the character and scope of industrial enterprise. Upon them rests the responsibility of determining to whom money shall be lent, in what amounts and for what purposes.

The chief function of *investment banking* is to assist in making capital available in the amounts necessary for the permanent financing of large-scale industrial operations. Just as the scale of industrial operations has expanded very greatly in modern times, so the character of ownership has changed greatly. A century and a half ago business enterprises were owned for the most part by those who operated them; that is, by individual businessmen or partnerships. Since the scale of operations was small, adequate capital could be supplied by a few individuals. Today, when millions of dollars invested in permanent equipment may be required if the full advantages of machinery and large-scale production are to be secured, the corporate form of business organization has become almost the rule.

Business Organizations.—A *corporation* is an association of individuals authorized by law to act as a single individual for the purpose of carrying on some particular enterprise. A corporation operates under a charter granted by the state. The charter states the purpose for which the corporation is organized, delimits the field of the corporation's activities and authorizes securing the necessary funds with which to operate through the sale of stocks and bonds. Those who buy stocks are the owners of the enterprise; those who buy bonds are its creditors, having lent money on certain security. The stockholders are entitled to share in the earnings of the business, to elect the corporation directors and through the directors to control the business. The bondholders are entitled to receive a rate of interest specified on the face of each bond for the money they have lent the enterprise, and only in case of default on interest payments do they have any participation in the management of the concern.

Investment banking houses specialize in the sale of these corporate securities. If a group of businessmen wish to launch an industrial enterprise requiring large sums of money or to secure additional funds for the expansion of an enterprise already in operation, they may make arrangements with an investment banking house to sell the stocks and bonds of the corporation organized to carry on the business. A few large investment banking houses operate on a national and even international scale. Through their own branches and through associated concerns, they offer securities for sale to the investing public, charging a commission for their assistance or promotion activities, as they are called. By such operations they assemble from the relatively small savings of scattered individuals the large sums available for industrial enterprise. They exercise their judgment as to what business undertakings are worthy of promotion, and they obviously play a very important role in determining the character and scope of industrial activity.

Not only must the products of industry be made available at particular points by a transportation system, and production be assisted and guided by banks but trade itself involves a special marketing organization. Specialization has been extended to the processes of buying, assembling, distributing and selling. Between the producer of raw materials and the consumer of the finished product are numerous intermediaries.

The raw materials produced by the primary industries must be assembled for manufacture. In some industries the concern that fabricates the raw materials controls the raw-material supply; for example, many oil refineries are supplied with oil produced by a corporation under the same general ownership as the refinery. In many instances all the operations from the production of crude petroleum to the roadside sale of gasoline to the motorist are united under the control of a single corporation. Such a business is called an integrated industry. The Standard Oil Company of New Jersey, through companies that it controls, produces as well as buys crude oil; transports it through pipe lines and by tank steamers; refines it into gasoline and lubricating oils; and markets these products to automobile users through its own filling stations. It likewise buys much oil that it does not produce and sells much of the gasoline that it manufactures through filling stations that it does not own. In the same way many iron and steel companies are integrated, mining their own iron ore and producing crude iron and steel and many finished and semifinished steel products. When such integration exists, merchandising is reduced to a minimum until the finished product is ready for distribution to the consumer.

Complex Distribution.—On the other hand, the raw materials of many industries are produced on a relatively small scale by independent producers. This is generally true of agricultural products. When such is the case, specialization has developed in the field of marketing. Cotton produced on farms scattered throughout the South is bought by local buyers who sell to commission or brokerage houses that concentrate the cotton in warehouses located at strategic points for sale and shipment to manufacturing concerns throughout the world. Wheat is con-

Courtesy General Motors Corporation

Specialization Rules the Automobile Industry

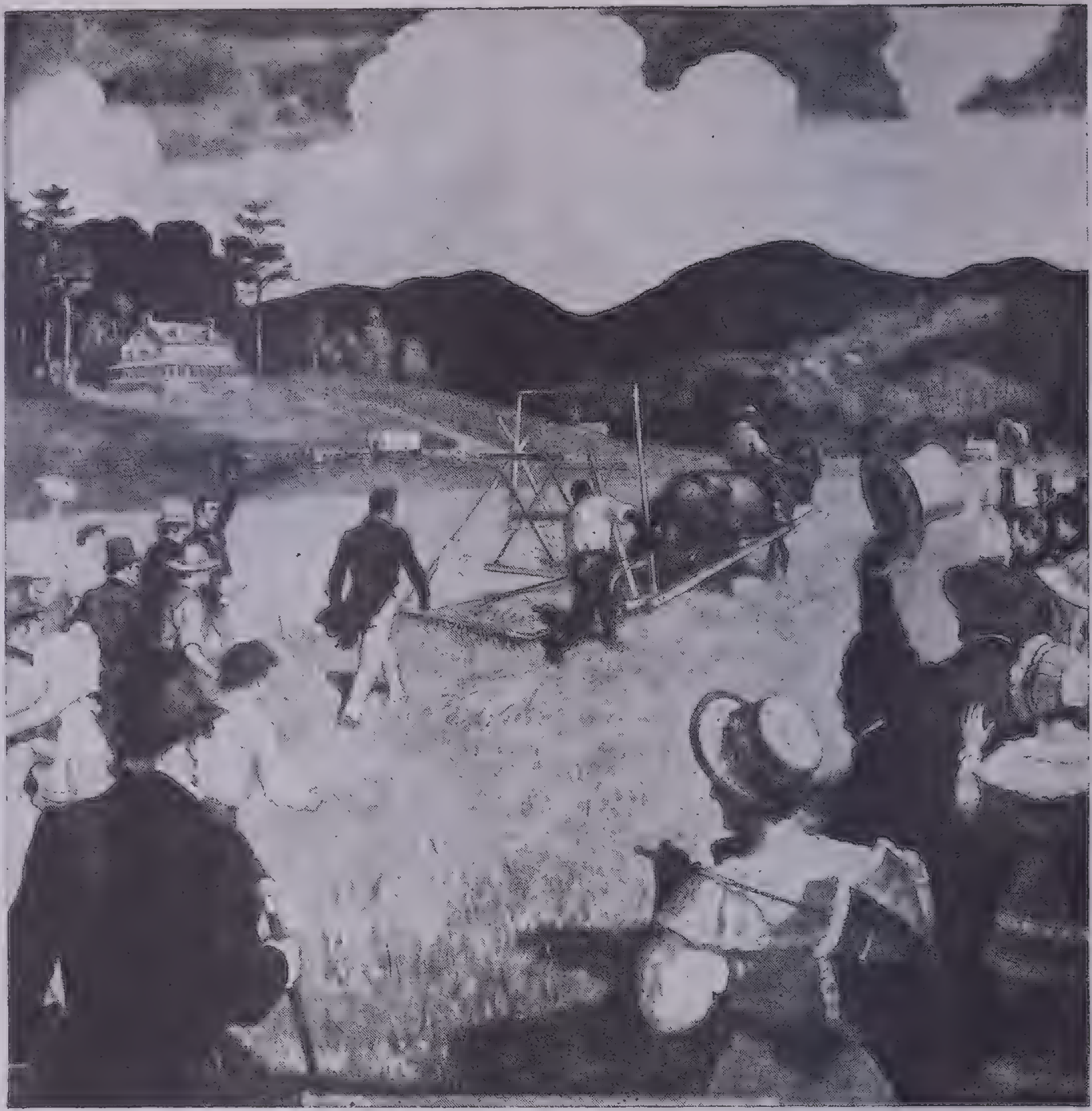
These men are drilling holes in carburetor bowls; they perform only the one operation. The machines, too, were especially designed for this type of work centrated in a somewhat similar manner for sale to flour-milling concerns. When products of industry are in the finished stage, other marketing specialists makes their appearance—wholesalers, jobbers and the local retail stores with which we are familiar.

The wholesaler and jobber buy finished goods of all varieties from manufacturers and make them available in such amounts and at such times as the local retailer may desire. In recent years the development of chain stores operating on a national basis has eliminated some of these steps in the marketing process. The national chain stores generally buy not from the wholesaler but directly from the manufacturer on specification; in many instances they themselves are engaged in manufacturing.

As production has come to be carried on more generally for a national market, many manufacturers have found it desirable to sell their product under a brand or trade name, nationally advertised through the press, the radio or outdoor signs. Advertising is now a great national business. There are no precise authentic figures on expenditures for advertising, but annual outlay for such purposes runs into the hundreds of millions of dollars.

Importance of Industry.—This outline of industrial activity is not complete, but it indicates the general character and scope of industry today. By specialized industrial activities, integrated and unified through transportation, finance and merchandising, the varied wants of the countless consumers in our modern economy are met. Some idea of the relative importance of the various branches of industry in the United States is indicated by the Federal Census of 1930. The Census enumerates approximately 49,000,000 persons as gainfully employed in that year. Of these, 28.9 per cent were engaged in manufacturing and mechanical industries; 21.8 per cent in agriculture, forestry and fishing; 15.3 per cent in trade; 9.2 per cent in transportation; 2.6 per cent in the extraction of minerals; 2.3 per cent in public services; 7.1 per cent in professional services; 9.9 per cent in domestic and personal services; and 2.9 per cent in occupations not classified.

The United States has unusually abundant and varied natural resources. Although it contains only about 6 per cent of the world's population and 7 per cent of the total land area, it currently produces about 95 per cent of the world's supply of natural gas, 60 per cent of the petroleum, more than half the sulphur, about 50 per cent of the copper, 21 per cent of the aluminum, nearly 50 per cent of the zinc, 50 per cent of the mica, 40 per cent of the cotton and 50 per cent of the Indian corn. Our country lacks entirely or produces in inadequate amounts tin, nickel, tungsten, platinum, potash and numerous tropical or semitropical products such as rubber, tea, coffee, bananas, spices and sugar. It has therefore not been able to live by itself alone but has bought materials it did not possess all over the world and has disposed of its surplus over a similarly broad area. Its six leading exports for 1935 in the order of their importance were raw cotton, automobiles, petroleum and its products, machinery, tobacco and tobacco products and iron and steel.



From a painting by N. C. Wyeth, courtesy International Harvester Company

Public Demonstration of the McCormick Reaper, Rockbridge County, Virginia, July 25, 1831

Cyrus Hall McCormick is striding behind the machine that revolutionized agriculture

Our imports are largely those raw materials of which we have an inadequate supply. Chief of our manufactured imports is silk.

Though our foreign trade constitutes but a very small portion of our total trade (by value less than 10 per cent), its importance is greater than this figure would indicate. Some industries are organized on an export basis and could not survive without their foreign markets. The depressed condition of the cotton industry during the last decade is to be explained in part by its losing a part of its foreign market. Though our imports are small compared with the total volume of our trade, we could not do without them, for some imports are absolutely essential to our domestic industries.

The Machine Age.—Within our own continental area our industries and trade, free from artificial trade restrictions, have undergone a phenomenal development during the century and a half since the founding of the republic. A standard of living unequaled by mass populations anywhere in the world has aided industry—and has been aided by this development of industry. This rapid material advance has been the product of the wealth of our natural resources, the efficiency of our economic organization and the development of a machine technology.

The outstanding difference between our modern economic organization and that of earlier times is in specialization and in the use of machinery for production. So generally has the machine been harnessed for the service of man that our period has become known as the Machine Age. In England in the Middle Ages all industrial activity was carried on largely by means of hand tools. Toward the beginning of the modern era simple hand tools began to be replaced by power machinery. This transition became so rapid in England during the last quarter of the 18th century and the first half of the 19th that historians have called it the Industrial Revolution. During this period the manufacture of textiles was revolutionized; great advances were made in the methods of producing iron and steel; the steam engine was perfected and applied to both manufacture and transportation. Machinery generally replaced the use of hand tools and industry shifted from the home and workshop to the factory. This movement, the pace of which was so greatly accelerated about the beginning of the 19th century, has continued to our own time, and the mechanical innovations of the last quarter of a century have been no less significant and far-reaching in their industrial and social aspects than those of a century ago. They include the gasoline engine, the automobile, the airplane, the radio and the motion picture.

Growth of Capital and Labor.—The machine brought large-scale methods of production. This necessitated large accumulations of capital and the employment of labor in large groups in a factory system. Calculations based upon Census data indicate that the average American manufacturing plant in the 70 years from 1850 to 1920 multiplied its capital by more than 37, its number of wage earners by nearly 5 and the value of its products by almost 26. During the same period of time the average amount of capital per establishment in iron and steel production increased from $46,716 to $4,976,883; the average number of workers from 53 to 596; and the average annual value of products from $43,650 to $5,213,984. These gains were partly due to the increase of large plants.

As long ago as 1919, even though the number of plants with an average product value above $100,000 was only 20.5 per cent of all manufacturing establishments in the country, those plants produced 92.6 per cent of the total value of manufactured products. One-fifth of the number turned out more than nine-tenths of the product value.

This trend to large-scale output has been accompanied by a trend to concentrated control of industry. In 1929 there were about 300,000 nonbanking business enterprises in the United States operating under the corporate form of organization. Of these, 200, each with individual assets of about 100 million dollars or more and with total assets of 81 billions of dollars, controlled approximately one-half the total nonbanking corporate wealth of the country.

Social Control of Industry.—This increase in the scale of production and the concentration of economic power have created serious problems of social control. In some industries large-scale production and concentration of control have proceeded so far that competition in the sale of products and services has virtually disappeared.

Our Government has come to recognize the noncompetitive character of such industries as railroads and public utilities, and in the public interest has undertaken to regulate the rates charged by such enterprises. In the case of railways, since the establishment of the Interstate Commerce Commission in 1887, this regulation has centered in the Federal Government. The regulation of public utilities that have operated as local monopolies has been by the municipalities or by the several states.

There has been more general regulation too. In 1890 the Federal Congress enacted the Sherman Anti-Trust Law designed to prevent the disappearance of competition and the growth of monopoly in industries engaged in interstate commerce. This legislation, inadequate to stem the trend towards concentration in the control of industry, was supplemented by the establishment in 1914 of the Federal Trade Commission to establish standards of fair competition and to investigate alleged violations of the Anti-Trust Act. Because of practices believed to have been detrimental to the interests of consumers on the one hand and farmers and stock raisers on the other, the great meat-packing houses and the stockyards were brought under Federal control in 1921. Speculation in the organized grain market was subjected to regulation under the Futures Trading Act of the same year. Since competitive sale of foods and drugs frequently results in misbranding and false claims for these products, a Pure Food and Drug Act was passed in 1906. In an effort to protect the private investor who supplies funds for corporate operation, the issue and sale of stocks and bonds of corporations doing business in interstate commerce was subjected to the regulations of the Securities and Exchange Commission (abbreviated SEC), established by Congress in 1933.

Many other laws, Federal and state, have been enacted to bring the business operations of private concerns under public supervision and control. As our economic organization has grown more complex and as specialization and machinery have made economic welfare depend less upon the isolated action of individuals and more on the smooth functioning of all parts of our complicated economic machine, the necessity for public control of industry in the general interest has become recognized. The decade of the great depression brought home to us the fact that our society depends on the smooth functioning of our economic organization. The accumulation of stocks of agricultural commodities, the decline in agricultural prices, the decrease in manufacturing output, the tremendous increase in unemployment, the loss of confidence in the stability of our banking system, widespread want and suffering in the midst of potential abundance—and all the other economic discomforts of the depression period challenged our collective capacity to control our economic destiny. It is extremely unlikely that the effort to establish social control over economic processes will be abandoned.

INVENTIONS AND ENGINEERING IN MODERN LIFE

In the section that follows you will find descriptions of hundreds of machines, processes and industries. Some of them will be familiar; others may seem more like magic than the work of men. Taken all together they lead us to say that we live in the Machine Age, the Industrial Age or the Steel Age. We like to compare our times with the past, and of course there is a great difference between smoke signals and radio and between a crude millwheel and a hydroelectric turbine. But the story of the Machine Age cannot be told in terms of machines only. Something must be said also about the change in human thought that made the Machine Age possible.

When we wish to make sure that an idea is correct, we check it with laws and principles. When an inventor is working out a scheme, he begins with laws and principles and then bases his experiments upon them. This seems so natural that you may be surprised to know that this way of thinking is as great a change from former habits of mind as the San Francisco bridge is a change from a log placed across a stream.

First Steps in Science.—Before the days of Christ there were men who were considered the greatest thinkers of their time, and who were as far from being savages as we are. They wondered, just as we do, why the sun rises and sets; what fire is; what makes a flower blossom. But instead of actually studying the flower or the seasons, they sat down and just argued without really knowing what they were talking about. The man who presented the best argument why a flower blooms was credited with having the right answer; the best orator was the lawmaker. If a man could convince the others by the force of his argument that everything was made of fire, then everything *was* made of fire, and the law was set down in the books for others to study.

Now all this sounds extremely silly to us. If anyone tried to tell us that everything is made of fire, we would at once ask him, "How do you know? Where are your facts? What experiments can you show to prove your point?" We would pay no attention to him unless he could produce proof. But the scholars of long ago did not ask for proof. They were satisfied if the argument was good.

It has been said that the greatest discovery ever made in science is that nature acts according to law. The old scholars didn't know that, and certainly the common people did not. The ordinary person in those days had been taught that everything in the world was operated and changed, if necessary, by a group of supernatural beings. Fire burned because it contained an actual god who made it burn. Lightning flashed because the god of lightning was angry. Sickness came because some other god was angry or because some witch had called down a curse.

More than 22 centuries ago Aristotle, a Greek scholar, said that bodies fall at speeds corresponding to their weight: that a 10-pound stone falls 10 times as fast as a 1-pound stone. It took the world about 2,000 years to produce a man who thought of actually testing this to see if it were true. About 350 years ago Galileo Galilei dropped unequal weights from the Leaning Tower of Pisa and thus proved that the answers to all questions could not be drawn out of men's minds.

Was Galileo praised and honored

for having disproved the old and false notion? He was not. He was ridiculed, ostracized and nearly lost his life for daring to question a statement as old and as widely accepted as Aristotle's. Galileo discovered the laws of the pendulum and invented the thermometer, the telescope and the microscope, but his greatest achievement was to start off an era in which men went to nature to learn her secrets and turn them to their own use.

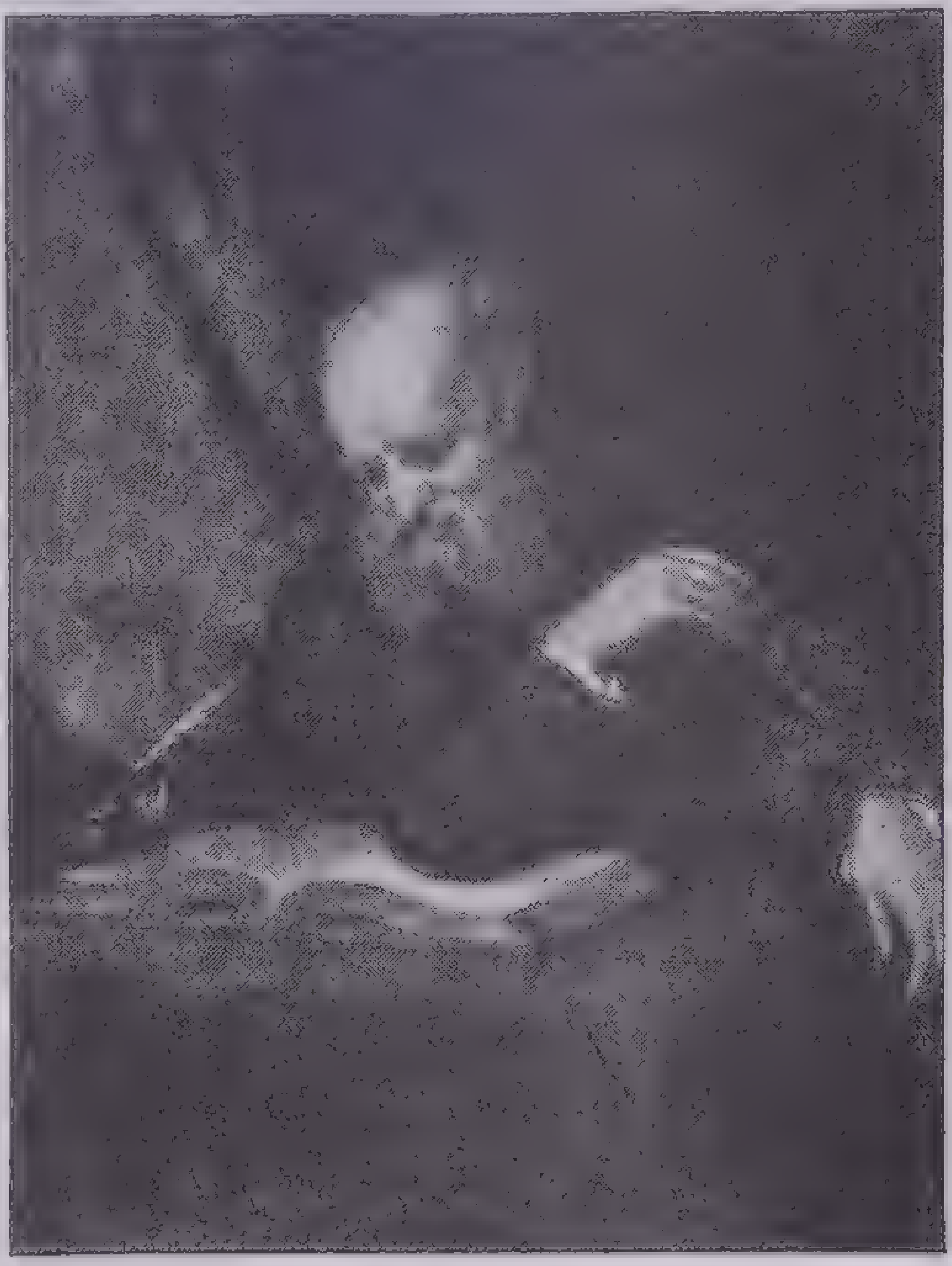
So Galileo represents one great step toward the Machine Age, and after him came thousands of other men, each with his own contribution. Elsewhere in this book you will find their names and what they did. There is one other man, though, who gave progress as big a push as Galileo did. He was Michael Faraday. He started the world off on the use of electricity, which really made the Machine Age possible, and which may some day make even machines unnecessary.

A century ago Faraday discovered magnetic induction, producing an electric current by the use of a magnet. He found that he could make a current flow in a coil of wire by moving a magnet about the coil. That was one of the most important discoveries ever made, because it is the basic principle of all generators and motors. Besides, the generator made it possible for experimenters to have as much electric current as they wanted, and that led to electric lighting and many other things that would be impossible if there were only batteries to depend upon.

So the Machine Age began when men learned how to get true answers to their natural questions about the world around them. Of course there are a great many people who are still living mentally in the days before Galileo. They may not believe in witches, but they do go to fortune tellers. They wonder how certain peoples can believe in sacred cows and elephants, but they themselves are horrified when a black cat runs across their path. They believe that the stars control their fate, that thirteen is an unlucky number and that they must not start a journey on Friday. People with such habits of thought never could build a Machine Age, and such people actually living in a Machine Age built by others will prevent everybody from making the fullest and best use of the tools we have. Superstitious people refuse to look at facts. People who refuse to look at facts can never discover anything for themselves or learn to use properly the discoveries of others.

Science and Invention—Twins.—Nobody needs to know any science to be able to use the simple machines—the lever or inclined plane or even the wheel. But complex machines cannot be built or even used except after a study and understanding of scientific laws and principles. The generator, the radio or automobile engine could never have developed from simple machines. Laws and principles had first to be discovered and then applied.

Even simpler mechanisms never developed in some parts of the world. It should be clear to a child that rolling friction is less than sliding friction; anybody who ever stepped on a rolling pebble should have been able to develop a wheel for a cart. And yet our American Indians never did learn to use the wheel. They dragged their belongings from place to place on the *travois,* a crude platform on poles. Why couldn't they have thought of the wheel? And why didn't somebody try the stone-dropping experiment before Galileo did? Their habits of mind worked exactly opposite to ours. All their thoughts tended to keep things as they were rather than to improve them.


Galileo

Consider what a change has come about in the 300 years since Galileo's death; most of it within 100 years, for the past century has seen more mechanical development than in the entire history of the world before Galileo. No one could describe in a dozen volumes the multitude of patented mechanisms that today may be seen on every hand. Whether it is a fountain pen or a typewriter that automatically prints telegraph messages as they are received, a lead pencil eraser, an electric refrigerator, a new kind of shoe blacking box or a radio, all are so common that the words *patented* or *patent applied for* seldom even attract our attention. We may not know or even care to know what the device has cost hundreds, even thousands of inventors. Edison spent many years and more than $100,000 in perfecting the incandescent lamp. Morse was on the point of starvation when Congress finally appropriated $30,000 for a telegraph line to connect Washington and Philadelphia (March, 1833). When that line was completed and put in operation, the total receipts from tolls the first week were only 73 cents. Nothing could show more clearly the public's lack of interest in scientific discoveries and inventions. People generally felt no need for more rapid communication than was given by semaphores and by "messengers on fleet horses." Even the Battle of New Orleans had not aroused them, a 9-day battle in which more than 2,000 lives were lost 2 weeks after the signing of the treaty of peace because the news of the signing had not yet reached either of the opposing armies.

When Cyrus Field, just 25 years after the Morse telegraph became a reality, was attempting to raise the money to lay a cable across the Atlantic Ocean and failed in the first three attempts, a candidate for the vice-presidency of the United States asserted that "the fact that some people think that messages can be sent across the Atlantic Ocean on wires is the most amazing example of human credulity that has ever come to my attention." However, everybody did not agree with this critic. After several cables had failed, Field succeeded in finding people willing to advance the money for a new and much larger cable. It was laid and was a great success. Some 40 years later messages were being sent across the Atlantic without any cables at all. Another 40 years and we sit in our homes and listen to music from Berlin or to the Pope speaking in Rome. The dreams of scientists and inventors oftentimes come true.

Science and invention cannot be separated. They not only go hand in hand, they are akin—indeed, they are Siamese twins. It is foolish to speak slightingly of the scientists who never invent anything but spend their lives discovering new facts about nature. It is worth while just to know and understand our environment; and the fact remains that sooner or later such discoveries are always put to some practical use by inventors. Many years ago someone found that air contains small amounts of five strange gases, all chemically inert; that is, they would not combine with other elements. For years they remained mere scientific curiosities, but now a mere listing of their names will show that several of them are extremely useful: neon, argon, krypton, xenon and helium.

The incandescent lamp is generally considered a one-man invention; but Edison was forced to use platinum wires to lead the current into and out of the glass bulb, as platinum was the only metal then known that would expand and contract at practically the same rate as the glass when the temperature changed. Someone else before Edison had discovered platinum ores, how to extract the metal and how to draw that metal into wires. Someone had discovered how to make glass, how to generate the gas used in melting glass and had invented the burner through which the gas was used. Air was removed from the Edison lamp bulb by air pumps invented by Otto von Guericke more than 200 years earlier and improved later by Geissler, Crookes and others. Edison used currents from dynamos based on the discoveries of Faraday. If all these things had not been at Edison's service, or if one of them had been missing, he might not have been able to invent the incandescent lamp. Each generation is indebted to all those that have gone before.

Life and Health.—Before the days of rapid transportation people seldom got out of sight of the place where they were born. Rarely did they move among people other than their own family and neighbors. The cities were small and far apart. It would seem that there would be little chance for contagious disease to spread, but in those days people died by the millions of one disease alone—the bubonic plague.

Think, then, of the opportunity for the spreading of disease today, when so many are crowded together in cities, when we travel about with the greatest of speed and freedom and use goods from every part of the world. By comparison with earlier days, when every family lived in what amounted to an isolation ward, modern man should be at the mercy of disease. And he would be if medical science had not made such enormous progress, and if, in turn, invention had not given to medicine important tools with which to work.

From the standpoint of health mechanical inventions that make rapid transportation possible are a menace. But other inventions offset the danger. Among them may be listed our apparatus for providing pure water and for carrying away sewage; X-ray equipment; surgical devices and instruments; pulmotors; air-conditioning installations; vacuum cleaners; refrigerators and a score of others. That science is winning the fight is shown by the increasing average life span.

Although man himself need not fear a health danger from his constant moving about, that is not true of plants and animals. We all know of the rapid spread of corn borer, Japanese beetle and other diseases and pests attacking plants and animals. In every case they have been brought into our country from some foreign part and have been spread by the very transportation systems that bring food to us.

Our chestnut trees seem doomed to extinction by a blight that, in its native Europe, was not particularly dangerous. An Australian fly carried into Hawaii promptly attacked most soft-skinned fruits and vegetables, so that it is now impossible to raise peaches, tomatoes and the like in Hawaii without taking elaborate precautions. Here is a field for future inventions.

Food.—More than a century ago the English sociologist Malthus predicted that there must come a time when the growth of population must stop, since enough food could not be produced to feed a constantly increasing population. That prediction would certainly have come true before this had it not been checkmated by mechanical inventions for increasing food production and for making its distribution easier.

In the discussion of food production only two foods need be treated—wheat and corn. These foods supply man with cereals; feed his livestock and poultry to furnish him his animal food; and feed his horses, giving them power to till his fields to raise more food. There were no tractors, cultivators or threshing machines a century ago. Then a farmer with a good team, working from sunup to sundown, could plow an acre or two of land in a day. Now with a gang plow and tractor he can plow 10 to 15 acres, and if he is rushed for time, he can double the acreage by running the tractor both day and night. A century ago his single shovel plow had to make four trips across the field for each row of corn in it. Now, with his cultivator ploughing two rows at a time and drawn by a tractor moving two or three times as fast as a horse, a man can tend twenty to thirty times the corn acreage possible before tractors were invented.

A century ago wheat was cut with a sickle or a cradle, bound in bundles by hand and threshed by pounding it with a flail or by arranging some of the unthreshed grain in a circle and driving horses round until the grain was tramped out. Obviously no individual could raise much more wheat than was needed for his own and his family's consumption. The invention of the reaper and the threshing machine increased production but not to a very great degree, for the early machines were quite crude. The wheat was still bound in bundles by hand, and the threshing machine was run by a horse walking on a treadmill. McCormick's first self-binders cut and bound the grain in bundles tied with wire. Farmers objected that the wire might injure their stock when eating straw. Farm laborers sometimes burned these self-binders and the wheat reaped with the machines, because the labor-saving device shortened the harvest period during which double wages were paid farm hands.

As soon as a device was invented that would tie a knot in a string, the wire self-binder was superseded. The twine self-binder is generally used today in the central and eastern states where grain fields are relatively small. But in the west, where many farms have large wheat fields, a *combine* or combination harvester and thresher, cuts the wheat, threshes it, cleans it and sacks and loads the grain in wagons as the combine is drawn through the field by horses or a tractor. Such methods so reduce the cost of production of wheat that the small grower, who cannot use such machines efficiently, has been practically forced out of competition.

Indeed, mechanical inventions have been so efficient that food may now be produced faster than it can be distributed. Engineers and inventors must solve the problem of making our distribution system more efficient and economical. Many of the last century's food production improvements have been in the field of transportation. If a load of corn had to be carted from Iowa to New York city, the horses would eat half the corn on the outward trip and the other half while returning—and they would need hay and grass to eat besides the corn. From London to Leeds, England, is only about 180 miles, but before railroads were constructed freight rates between the two cities were more than $63 per ton. Now for less than one-twentieth of that figure and much less time in transit coal can be hauled 1,000 miles.

Courtesy Armstrong Cork Company

Courtesy International Harvester Company

The Machine Age Comes To Agriculture

Once all farmers used such primitive methods and equipment as are shown at the left, depicting a jute field in India under cultivation. The tractor-drawn plow at the right is typical of the machines that have made farming a modern industry

Cities like London and New York would have been impossible with transportation facilities no better than they were a century ago. Inland cities could not have become much more than large towns.

Now there are other problems for agricultural experts and experimenters to solve. A few years ago a California botanist, Dr. W. F. Gericke, began some remarkable experiments in growing plants with no soil. Dr. Gericke reasoned something like this: it is known what makes plants grow, what they take from the air and what chemicals they take from the soil. It is known what sunshine has to do with plant growth. But in spite of all the known facts, once a seed has been planted much is left to the vagaries of weather and to attack by disease and insects. So why not grow plants under cover, in a tank of water in which the proper food-chemicals have been placed?

He began his experiments and produced tomato vines 25 feet tall, on which tomatoes grew for 8 months, producing at the rate of 217 tons to the acre, in contrast to the usual outdoor yield of 7 tons to the acre. Tobacco plants 22 feet high have been produced. The tank method is still too costly to consider putting into general use, but what will happen in the future depends upon the scientist and inventor.

Power.—If all the sources of power are traced to their beginnings, it is found that all originate in the sun, but man has not yet learned to use sun power directly. Instead, he uses power from his own and animal muscles, power from moving water and wind and power from energy released in the burning of various fuels, mostly coal, wood, oil and gas.

The first mechanical devices for power generation were sails for driving boats, windmills and water wheels used chiefly for grinding grain. But wind and water power cannot be used directly to propel vehicles on land, so animals for long continued to be the only available power carrying freight overland. As this transportation was very slow and expensive, people built their towns on the seashore or on the banks of navigable rivers, so that they might use sail boats for transportation. Many canals were constructed when it was found that a horse could pull more freight on a canal boat than he could pull on a wagon along the kinds of roads they had in those days. Canals were abandoned when railroads were constructed, but railroads would not have been built had man not learned how to use heat sources for the production of power.

The steam engine was not invented by James Watt, nor did Watt discover the expansive force of steam. Heron of Alexandria in Egypt, constructed (*c.* 130 B.C.) an engine that used the expansive force of steam. It operated on the same principle as the rotary water sprinkler, in which the ends of a horizontal water pipe, pivoted at its center, are bent in opposite directions and at right angles to the pipe. The water jets escaping from the ends of the pipe rotate the pipe in a direction opposite to that of the jets. In place of water jets Heron used steam jets. The Heron engine was worthless from the practical point of view, but it is proof that the expansive force of steam was known 2,000 years before Watt was born. Newcomen steam engines were in use pumping water out of English coal mines 50 years before Watt's birth. The Newcomen engine used a piston moving in a steam cylinder, but it was so inefficient that it was used only at coal mines where coal was plentiful and cheap, with no transportation charges. Watt was employed to recondition a Newcomen engine in need of repairs. He not only made the necessary repairs, but introduced many improvements that increased the efficiency of steam engines so much that they soon began to be used for purposes other than pumping water out of coal mines.

The steam engine is doubtless the most important mechanical device ever invented. Excluding automobiles and waterpower-operated machinery, it is probably true that 90 per cent of all the machinery of the world is powered by steam engines. People are quite likely to think otherwise because they are almost always in the presence of some kind of electrically-operated apparatus and see few steam engines other than locomotives. They should not overlook the fact that the electrical power required for the operation of electrical machinery is almost always generated by steam engines.

The Corliss engine, the multiple-expansion engine and the turbine are all more efficient than any single cylinder engine of the slide valve type; but the best of these more efficient types of steam engines do not convert into mechanical energy more than 25 per cent of the heat energy required to operate them. They waste at least 75 per cent. Because there is this waste, and because coal and oil reserves are being rapidly depleted and will be exhausted sooner or later, there has recently been a very rapid development in the use of water power. The total water power available in the United States is estimated at 55 million horsepower, of which 17 million are already being used. Modern water turbines have an efficiency of more than 90 per cent—compared to 25 per cent for the best steam engine, 5 to 10 per cent for an ordinary steam engine and about 8 per cent for the gasoline engine.

But even if high efficiency turbines enable us to develop all the 55 million horsepower, this is but a drop in the bucket to what man needs, or thinks he needs. The total registration of automobiles and trucks in the United States is, in round number, 30 million. Assuming 100 horsepower to be the average for cars and trucks (a low estimate), these machines alone represent 3,000 million horse-power, almost seven times the total available water power in the United States and twenty times that now used. Note, too, that the above estimate of horsepower derived from gasoline and oil does not include oil-burning locomotives and ships, tractors, airplanes, stationary gas and oil engines and millions of small gas engines used on farms and elsewhere. When estimating the fuel required for operating machines, one must include oil used in factory operations, oil-burning furnaces, oil lamps and many other purposes. Our oil fields cannot stand this drain indefinitely. Here again inventive genius must solve the problem.

Transportation.—What change has come to man himself through his conquest of space? Read about the trials and hardships of the Utah pioneers or of the Forty-Niners and then contrast them with travelers today. Men still living can remember families moving from one state to another. Such a trip from Indiana to Kansas would take a month, but today the distance can be covered in a one-day automobile drive and in a regular passenger airplane in a few hours. An airplane has been flown from Los Angeles to New York in less than 7½ hours. One may eat his breakfast in New York city, take a regular passenger plane and have his breakfast the next morning in Los Angeles. Air mail has become a commonplace.

The automobile has come into such general use that the United States has been called the land of gypsies. People think little of driving hundreds or even thousands of miles to see a ball game, visit friends, see big cities or scenic parks. Offsetting the danger of spreading diseases are the educational and physical benefits of travel, and the better understanding and deeper sympathy that result from a larger acquaintance and association with one's fellow man.

Communication.—The human voice was, and still is, the common method of thought conveyance between individuals within hearing distance of one another. For distances outside the range of his voice the savage beats a tom-tom or a hollow log. For distances over which he can see but cannot hear, he uses flares or fires by night and flags in the daytime. Flag or flare signalling is still used for communication between ships unless both are radio-equipped. At the time Morse was trying to introduce his telegraph, semaphores, flags or flares were mounted on towers so that they could be seen at greater distances. It was this semaphore system that some members of Congress considered so adequate that they opposed Morse's petition for funds to enable him to establish something better.

The first Morse instruments received messages by making dots and dashes on a moving strip of paper. Soon it was found simpler and cheaper to read the messages by the clicks of the hammer as it recorded the dots—the method in use today in stations not equipped with automatic telegraph typewriters that print messages as they arrive. The teletypewriter is the latest development in the evolution of the telegraphic communication.

Multiplex telegraphy, by which several messages can be sent simultaneously over a single wire, was an important development invented by Edison, himself a telegraph operator.

After the telegraph came the telephone, for which Alexander Graham Bell usually receives all the credit, although some should go to Elisha Gray, for the telephone transmitter as used today is much more closely related to the transmitter on which Gray asked for a patent than to the instrument on which Bell's patent was granted. But Bell's application for a patent on an electric telegraph was received by the patent office a few minutes earlier than Gray's application. The present transmitter was invented by Edison and is vastly superior to the original Bell transmitter.

Courtesy American Tel. & Tel. Co.

First New York-Chicago Telephone Conversation

Alexander Graham Bell is shown talking from New York, October 18, 1892

Gray was not discouraged by his bad luck. In a few years he produced the telautograph, an instrument that transmits to and reproduces at a distant station the handwriting of the operator at the sending end, never missing the dotting of an *i* or the crossing of a *t*. The instrument is very useful in transmitting signatures to notes, deeds and the like. But since people can talk so much faster than they can write and much better than they can spell, the telautograph never became a real competitor of the telephone.

The radio is the latest development in the evolution of rapid communication of sound, including speech and music. If the radio had no other use than the communication with ships at sea, its importance could hardly be overestimated. Radio beacons and radio communication between planes and landing fields have helped to make air travel safer. Radio is being used effectively by police in fighting crime and by explorers to keep in touch with their base—Byrd in Little America, for example, and the Soviet aviation group at the North Pole in 1937. We get quick news over the air and can hear political debates and programs of propaganda and education that may greatly affect our whole attitude toward life—all because inventors and engineers have discovered and harnessed new forces.

Engineering.—The Golden Gate Bridge with a single span 4,200 feet (almost a mile) long is a wonderful structure, more wonderful than any of the Seven Wonders of the World of ancient times. The Boulder Dam is another of the world's modern wonders: almost a quarter of a mile wide and more than an eighth of a mile high, it forms a lake 40 miles wide and 115 miles long, whose waters, after generating almost 2 million horsepower, will be used for "making the desert blossom like the rose." The Golden Gate Bridge and the Boulder Dam are outstanding examples of the engineer's application of science, and though they could never have been built without the use of numerous mechanical inventions, yet bridges and dams themselves are not inventions.

The Empire State Building, the Washington Monument and the Moffat Tunnel are not inventions. All such things are the result of the engineer's application of science, in designing the structure that he visions and his use of mechanical inventions in making his vision a reality. The present may be considered the mechanistic age, the electric age, the airplane age, the age of rapid transit and rapid communication, the age of machines, but it is equally logical to call it the Power Age, for had man not discovered how to generate and apply power he would have had no big bridges, skyscrapers, Simplon tunnels, electric lights, stream-lined trains, automobiles or machines of any kind. Life as it is now lived would be impossible without machines and an abundant supply of power for their operation.

Chemistry.—Too often we think of the chemist as a sort of scientific putterer, making complicated tests with a few drops of evil-smelling liquids. Of course we know that he has made artificial dyes, perfumes and drugs, and that he checks up on things as they are made in factories. But his place in industry is rather vague to most of us; certainly we do not think of him as being responsible for the output of huge masses of materials, or that he has been quietly revolutionizing our lives and the future of civilization, yet that is exactly what has been going on.

In a general way we might say that the chemist has been using nature's laws to make it unnecessary for us to rely too much on nature herself. We have mentioned dyes and drugs. Our grandfathers used dyes and drugs made mostly from plant juices and minerals. The chemists found out just what those juices contained that made them valuable as medicines and then proceeded to make them in the laboratory out of coal tar or something equally unlikely. So now our medicines are always uniform in quality; the supply does not depend on exploration, weather and other uncertainties, and they are much cheaper. We can have blue dyes without worrying about the indigo crop; we can have rose perfume even though disease kills off half the roses in the world.

Then there is the important matter of fertilizers. Formerly it was necessary to depend absolutely on certain mineral deposits in different places in the world if farm land was to be fertilized properly. Wars or natural disasters or unfriendly relations between nations might cut off that supply at any moment. So the chemists figured out ways of taking nitrogen from the air and preparing it into fertilizers much better than the natural product.

As the Machine Age developed, bigger and faster machines were needed, but if built of plain steel they would unavoidably be enormously large and heavy to get the necessary strength. So the chemists promptly devised alloy steels to fit every need. They can make an alloy nowadays that will be as strong, stiff, brittle, hard or springy as the user wants it. Alloys have come into great use in automobiles. If there were no alloys, and somebody built an automobile that would be as strong, as fast and as safe as a modern car out of plain steel and iron, that car would look more like a locomotive.

Nowadays rubber is obtained from trees, but perhaps not for long. Making synthetic rubber that will be as good as natural rubber is a problem not yet solved, but much progress has been made. Perhaps very soon no concern need be felt about the fact that thousands of miles of ocean separate us from the tropical lands on which we now depend entirely for rubber.

The list of new materials the chemist has given us is a long one. Rayon, for instance, and its first cousin cellophane are cellulose materials that have none of the drawbacks of wood or plant fibers. There are also the highly useful plastics—those hard, shiny colorful materials that have so many applications in the making of buttons, pencils, wall panels, handles and in electrical insulation.

Achievements in other fields of science may be more spectacular than the chemist's discoveries, but it is safe to say that few are more important in the long run.

Machines.—Machines that mold huge billets of steel as we mold wax between our fingers; machines that cut inch-thick strips from a block of metal; machines that handle tiny objects more delicately than any human fingers; machines that find the answers to complicated mathematical problems in a few seconds; machines that cut, shape, inspect and accept or reject small parts so swiftly and accurately that they seem almost to be thinking—these marvels are taken for granted because there are so many of them in our world.

No matter how clever a mechanical engineer may be, he cannot make a machine without first being sure that there will be power to run it. Power comes first, then machines. There were machines before the days of electric and steam power, of course.

They were operated by human or animal muscles, and therefore they could never be so swift and strong as modern ones.

It would be impossible to outline here the history of machines, beginning with the lever held in the cave man's hand and coming up to the linotype, the automatic screw machine or the machine that makes electric light bulbs complete without being touched by a human hand. There is one modern machine, though, that will serve as an illustration of the place of the mechanical engineer in life today. It is the die-casting machine.

Casting is making articles by pouring molten or plastic material into a mold. A good example is the bowl or casing of an automobile carburetor. It is very irregular in shape with many projections, corners and holes, to which other parts must be fitted accurately. Carburetor bowls have for long been made of cast metal, but the finished casting was rough and had to be sent to the machine shop for drilling, smoothing, polishing and the like.

And now we have the die-casting machine, one of the greatest steps forward in modern machinery, and one that will have a tremendous effect in the future. The mold, made of a special alloy, is in a number of parts depending upon the shape of the piece to be made. There is a reservoir of molten metal. The operator turns a wheel and the die parts come together; he pushes a lever, and compressed air forces the metal into the die. It solidifies almost instantly, for it is only hot enough to be barely fluid. Another turn of the wheel and the parts of the mold pull apart again, and the finished piece drops out.

One such machine is about as big as a grand piano and costs about $5,000. It can cast eight carburetor bowls a minute, which amounts to more than 4 million a year if the machine works 24 hours a day. Each machine needs the attention of only one man, and he is not really needed, for the machine can be made to work entirely automatically. One machine working constantly could make all the carburetor bowls for the world's automobile industry. Furthermore, the bowls would fall out of the die so smoothly and accurately shaped that very little work in the machine shop would be necessary.

There are plenty of other machines just as remarkable, and there will be as many others as are needed. The effect of automatic machines is always to permit a man to produce far more than he otherwise could.

Such a machine is not exceptional or even unusual in modern industry. Further invention will result in machines even more remarkable. And their effect, as is true with all machines, will be to enable men to produce goods more cheaply and with less and less human labor and toil. At present we are trying to find out how to adjust our lives to machine production, and when we have found the answer we will know that machines have made the lives of human beings richer, fuller and easier.

Courtesy Wheeling Steel Corporation

Symbol of the Machine Age

This battery of machines is rolling out a white-hot steel ingot. That only one man can be seen in the picture testifies to the reliability of the machines

Machines and Jobs. In any discussion of industrial machines, someone is sure to speak of machines taking the place of many men and thus throwing them out of employment. In answer to this the Ford Motor Company supplies the following illustration: the hubcap of a modern car costs 12 cents to make by machinery. The press and dies that form it cost more than $44,000. A man making such hubcaps by hand would need only $24 worth of tools, but the machine will turn out 2,160 hubcaps while the handworker is making one.

Certainly a press like that would seem to take the place of a great many men, but the story does not end there. In the first place, the work of many men went into the machine itself. The $44,000 it costs represent 24 years of employment by one man at $7 a day. Besides, other men have worked to build the factory the machine stands in; still others must work to supply the power to run it.

The most important point, however, is this: would there be more jobs if handworkers made hubcaps? Is the machine destroying 2,160 jobs? The handworker could turn out only a few finished pieces a day, which at current rates of wages and prices of materials would cost $2.50 each, instead of 12 cents. If all parts of the car were so made, a car now one of the lowest in price would cost nearly $18,000. Few if any cars would be sold at such prices, and so none of the 2,160 men would have jobs. If a man were paid only at the rate of 12 cents per hubcap, he would receive less than 50 cents a day.

The point is that there are 3 million men employed in making, selling and servicing cars, and none of them would have jobs if it were not for machines. Without machines automobiles could not be produced at prices people could pay, and consequently there would be no automobile industry.

Electronics.—This is a word you will hear very much more often as the years go on. It is a new subdivision of science and refers to the characteristics and action of the electron, which is nothing but a particle of electricity that not only makes up matter but moves about and does all sorts of amazing things. Experimenters nowadays work with tubes exhausted of air and perhaps filled with some inert gas such as neon, in which a stream of electrons flows through the space from one electrode to another. Simple enough, but such study has already given us the x-ray machine, the radio tube, the converter tube for changing alternating current into direct current and the television tube.

But *electron* is only one of our new words. There are others such as *neutron* and *proton,* which are the names of other tiny particles that, with the electrons, are the building blocks of which chemical elements are built. They are assembled in different proportions and arrange themselves around each other in different patterns, and these differences as we know them are the differences between lead and hydrogen, or carbon and iron.

Then if an atom of lead, for instance, would lose some of its electrons, wouldn't it become an atom of something else—maybe gold or chromium or something? Yes, it would—and that is the old alchemy idea all over again, except that now it is based on actual knowledge rather than a mere wish that it might be so. Now, in several laboratories in the United States, scientists are picking up a neutron or a proton, whirling it around to give it speed and then throwing it like a bullet at an atom in order to knock off part of the atom and change it into something else. And they are succeeding! Such transmutation is only on a very tiny scale and is very uncertain. But who knows what the future inventions will bring about?

Design and Art.—For a great many years everybody worked at top speed just to make things that would work efficiently, and nobody bothered much about how they looked. Only a few years ago we suddenly realized that in our hurry we had overlooked a great many details, one of which was the appearance of the things we turned out. Nobody expects an engine lathe to be beautiful, but we do expect automobiles, for instance, to be pleasing to the eye as well as efficient. We began to streamline everything.

The airplane designers were largely responsible for this. By their very nature airplanes must go fast or they won't go at all, and that takes a great deal of power. An airplane built to smash its way along, pushing huge volumes of air out of its way, will use much more power than one designed to slip through the air with the least possible disturbance. So the designers studied falling raindrops and the shapes of fishes and birds and began to smooth off the surfaces of airplanes, curving all parts according to strictly mathematical principles. Modern planes are marvels of streamlining and gain in efficiency thereby. At they same time their smooth, curved surfaces are very handsome to look at.

So the automobile makers and designers of trains began to streamline their products too. It means very little in efficiency to streamline an automobile, which doesn't go fast enough for streamlining to make much difference; besides, the automobile's basic shape prevents really thorough streamlining. So it is just a way of beautifying the car itself; beautifying it not according to the standards of 100 or 200 years ago but in a way to fit the spirit of the times.

A hundred years ago carriages were elaborately carved, perhaps with gilt cupids here and there, and were lined with luxurious silks. The coach used by the British royal family, familiar to us through the newsreels, is an example. But we would not think of so decorating our automobiles. The spirit of the times demands clean shapes, economical use of materials and broad unbroken outlines.

The streamlining idea has been carried so far that we are now rounding the corners of refrigerators and toothbrush handles and calling it *streamlining,* which is absurd. But that is only a temporary thing—what we are really arriving at is a new idea in art and one that will probably stand as the accepted form for years to come. It is called *functional design,* which means that anything we make should be formed, designed and decorated according to its use and purpose, not according to some standard style of decoration. For instance, we might build a typewriter to look like a Greek temple—sillier things have been done—and in past ages it might have been greatly admired, but not now.

Today we insist that a typewriter be designed so as to look like an attractive *typewriter,* at the same time following our new preference for smoothness, clean outlines and the like, so long as such things do not interfere with the working of the machine.

The same applies to decoration. A wreath of rosebuds on a tomato-can label or on a steam radiator seems wrong to us because we feel that decoration should be simple and should have a connection with the thing it decorates.

So our inventions have not only given us a machine age but also a machine age art. The new ideas as to form and decoration have spread into architecture, home furnishing and clothing. It is reflected indirectly in new forms of writing, music and painting.

INDUSTRIAL DICTIONARY

abrasives (from Latin *abrasum,* scraped off), substances used to grind or polish hard materials. Even the most ancient craftsmen had grinding tools supplied by nature. A chunk of sandstone, for instance, could be used to make a pointed tool from a bone; and *emery,* an impure aluminum oxide found in nature as a variety of corundum (Al_2O_3), has been used for grinding since the time of the Pharaohs in ancient Egypt; however, modern chemistry has given us artificial abrasives that are much better than nature's. Artificial abrasives, in the form of grinding wheels of many kinds, find their greatest use in precision shaping of metal products, especially hardened steel parts in machine tools. Grinding as fine as a ten-thousandth of an inch can be done on them.

Abrasive grains are incorporated in floors of machine shops, schools, hospitals, platforms and stairways to make them slipproof. Artificial abrasives possess valuable heat-resisting properties and are used in lining furnaces where extreme heat is maintained.

Edward Goodrich Acheson (1856-1931), who had been in Edison's employ, in 1891 discovered the first artificial abrasive. Realizing that the diamond (carbon in its crystal form) was the hardest known substance, he attempted to produce crystalline carbon that would possess some of the properties of a diamond and yet be cheaper. He passed a strong electrical current through a mixture of coke and clay. The resulting material, which was later analyzed as silicon carbide (SiC), Acheson called *carborundum* (from carbon and corundum). It has a hardness of 9½ as compared to 10 for diamond, the hardest known substance.

The first carborundum furnace produced ¼ pound a day, and the product was sold to jewelers and lapidaries for $80 a pound. Modern electric furnaces produce over 10,000 pounds in 24 hours, and the product sells for 15 cents a pound. The mixture used in the modern furnace is somewhat different from that used by Acheson: 56 per cent sand (pure glass sand), 35 per cent coke, 7 per cent sawdust and 2 per cent salt. The sawdust makes the mixture porous and allows the gases to escape; the salt forms chlorides with the impurities and helps to eliminate them from the finished product; sand provides the silicon; and coke, the carbon. The principal factory is at Niagara Falls, N. Y., where the necessary large amounts of electric current are available.

With the discovery of carborundum a whole new field was opened up, and many more artificial abrasives were given to modern industry. In 1900 Charles B. Jacobs and in 1901 Charles M. Hall (discoverer of the method of reducing aluminum) received patents for making artificial corundum (crystalline alumina) by melting bauxite (aluminum hydroxide) in an electric furnace. This abrasive is similar to the ruby and sapphire in chemical composition but possesses properties of hardness, toughness and uniformity that make it a better abrasive than the natural products. Corundum rates 9 on the scale of hardness. It, too, is manufactured at Niagara Falls. Quartz with a hardness of 7 and crushed steel (hardness, 6½) are other much-used abrasives.

The annual output of the American abrasives industry is made up of about 50,000 tons of aluminum oxides; 25,000 tons of silicon carbides; and 15,000 tons of metallic abrasives. Worcester, Mass., was probably the first American city to manufacture abrasives (vitrified emery wheels were made there in 1873), and this city, in the heart of the New England machine-tool area, is still an important producer.

acoustical engineering, improving the methods of producing, transmitting and receiving speech and music, and of reducing noise. The work includes the design and improvement of auditoriums, churches, broadcast studios and the like for either hearing or recording sound; the study of noise reduction in hospitals, schools, factories and other places; the study and design of musical instruments, sound measuring devices, microphones, loudspeaker horns, sound recording apparatus and other devices.

Experimental acoustical engineering dates back to antiquity, possibly beginning with the first megaphone, formed when some primitive savage cupped his hands, or with the selection of the hollow log that constituted the first drum. In many respects it still remains in an experimental state.

It has been found that the principal qualifications for good reception of sound in an auditorium, as judged by an audience, are: adequate loudness or volume; absence of perceptible echo effects and troublesome reverberations or the continuation of sound after the source has been removed; a uniform reception over the entire range of audible sound frequencies—that is, all sounds should reach the entire audience with the same relative intensities as they had when leaving the source.

In large auditoriums, elevated platforms and low ceilings are desirable for good sound reception. Great improvements were made in the 1930s by installing public-address systems, consisting of microphone, amplifier and one or more loud-speakers.

In order to reduce undesirable echoes it has been shown that ceilings of even the largest auditoriums should not be higher than 40 feet above the floor, unless large flat surfaces are broken up with false beams or covered with some sound-absorbing material. Especially in broadcasting studios it is also desirable to cover back and sidewalls and even the floor, with sound-absorbing materials, such as rock wool panels and draperies for the walls and heavy carpets for the floor. Reverberations or continuing echoes—echoed echoes—can be overcome by the same means. An older method was to string horizontal and parallel wires at various heights above the floor, but experiment showed that such wires had no real effect upon the acoustical properties of a room. In designing new auditoriums, careful selection of dimensions and shape will insure good sound reception.

City noise, with its harmful effect on nerves and efficiency, is being carefully studied in many places. The remedies are to prevent the making of undue noise in the first place and to blanket rooms and buildings completely with sound-absorbing materials. The blanketing of walls and ceilings serves two purposes; it shuts out noises from the outside and prevents echoes inside the room.

The design of sound-producing instruments has only recently become established upon a really scientific basis, but to a limited extent only. Although the principles of sound production and propagation are well understood, science has not succeeded in producing a violin, for example, superior or even equal to those built in the 18th century by trial-and-error methods.

Science's record is much better with sound-reproducing systems. For one thing, the result desired is perfectly definite, as the problem is to reproduce a known sound so that the reproduction will appear natural; whereas, in sound production there is usually no certainty just what is wanted, due to the vagaries of the human ear.

For several decades the public demanded only clearness of the telephone or even the phonograph. There was little thought of quality or naturalness of tone. Radio broadcasting has done much to change that attitude. Competition between manufacturing companies has served to educate the public, which now demands improved quality.

At first a great deal was done by improving the electrical design of the equipment, but it was soon found necessary to make improvements in the acoustical design also. This has led to a heretofore unknown consideration of the properties of air columns and cavities; characteristics of diaphragms; and, in fact, careful study of all of the other component parts of individual sound devices. Fundamental to this work is the study of sound itself; to find out, for instance, why the sound of the note *E* played on violin and trumpet have an entirely different quality when heard by the ear. Elaborate electrical equipment has been devised to make pictorial records of various sounds as they are produced by an instrument.

adding machine, see calculating machine.

agricultural implements, tools and machines used in farming. Agriculture in both ancient and modern times has always required the expenditure of enormous amounts of energy. At first man had only his own muscles to rely upon; gradually he shifted the burden, first to beasts and then to machines, but for ages there was a sort of prejudice against labor-saving devices, and it has been only in recent times that any real changes have been made in farming methods. The first machines came into use only a century ago, but development has been rapid, and the future holds promise of tremendous improvement through the increase of rural electrification.

The story of farm mechanization is illustrated in the changes in grain-harvesting methods throughout the centuries. The first implement was the *sickle,* which dates back to the Stone and Bronze ages. This was followed by the *scythe,* supposedly introduced by the Romans, which remained the standard tool until our own Revolutionary period, when it was replaced by the *cradle.*

Not until the machine *reaper* made its appearance after 1830 was there a better substitute for the cradle and the hand labor it represented. Along with the reaper's development, by Hussey and McCormick, came the *threshing machine* to replace the centuries-old *flail.* One of the landmarks in agricultural history was the invention only a few years ago of the *combine,* which unites in one machine a harvester and a thresher. This machine definitely put agriculture into the class of big business and permitted mass production and other business methods to be applied to the farm. For one thing, it practically drove the Middle West out of wheat production. It comes into full efficiency only when used on large tracts,

Courtesy J. I. Case Company

A Modern Cornhusker at Work

This machine strips the corn from two rows at once, husks it and drops it into the wagon

Courtesy John Deere, Moline, Ill. *Courtesy International Harvester Co.*

Modern Farm Machinery

The four tractor-drawn seeding machines at the left are sowing wheat in a strip 44 feet wide. At the right is a combine or combination reaper and thresher. The truck has come into the field to take the wheat threshed by the machine

so that small wheatfields are now doomed.

The combine, together with improved forms of plows, harrows and the like, pulled by tractors, have brought about startling reductions in the cost of producing wheat. In 1830 3½ hours of human labor were required to produce a bushel of wheat; the figure is now less than 10 minutes. The cost of such labor has dropped from more than 17 cents in 1830 to only a cent or two now.

There were almost no farm machines in the Colonial period in this country, unless one considers iron-shod plows and wooden peg-toothed harrows as such. Soon afterward farm machines began to appear, slowly at first, but more and more rapidly as the manufacturing facilities of the country increased. A partial list of the more important of these innovations includes:

1793, cotton gin
1797, cast-iron plows
1814-20, improved plow with demountable share
Bailey rotary-cutter mower
1830-50, steel plows, reciprocating-knife mowers and reapers, treadmills for animals, corn shellers and the like
1850-60, grain drill, two-row corn planter and baling press
1870, sulky plow and automatic binder
1872, horse fork
1874, hay loader
1875, automatic check-row corn planter
1876, manure spreader, ensilage cutter and silo filler
1880, self-propelled steam engine for driving machinery
1885, corn husker and cornstalk shredder
1890, Babcock milk tester
1896, gasoline engine for driving farm machinery
1902, steam tractors for large farms
1910, milking machine and small tractor
1925, combine
application of electric power
1936, cotton picker

The importance of agricultural machinery is shown by the fact that the value of machines and implements in this country has increased from about 151 million dollars in 1850 to well over 3½ billions at the present.

agricultural implements industry, the manufacture of tools and machines used in farming. In the United States the industry is carried on in some 250 factories, gives employment to about 60,000 people and each year manufactures products valued at about $290,000,000. There are one or more establishments in each of 32 states, with a definite concentration in the farming districts of the Middle West. Illinois has about one-seventh of all factories and produces half of the agricultural machinery by value. Wisconsin also is important in this field.

Manufacturing processes are relatively simple, since great accuracy in fitting and measurements is not essential. There is little precision shaping by machine tools; most of the parts are rolled, forged or cast.

Agriculture is the preparation of soil and the growing and harvesting of crops and is usually taken to include the breeding and management of livestock as well. Agriculture is of course our oldest and most important industry and like all other industries has undergone great development, with many changes since the twentieth century began.

Primitive agriculture was a simple process. The ground was plowed, seeds were dropped, and the result was left to chance and the weather. Many farmers unfortunately still use similar processes, but others have learned to apply business methods and truly scientific processes. Land is drained with underground tile and fertilized correctly after chemical tests. Seed is carefully selected, and growing plants are watched for insect pests and diseases.

Just as there was an Industrial Revolution when machinery first came into use, and manufacturing moved from the kitchen to the factory, so there was also an Agricultural Revolution. Before the Industrial Revolution most people were primarily farmers, expecting to raise all or most of their food. Manufacturing was purely a sideline. But as soon as a large part of the people went to work in the factories they could no longer raise their own food and had to depend on other people who specialized in farming and did not work in factories at all.

Until that time came no farmer was much interested in raising anything he did not need for his own family. Then, when he was expected to feed other people and be paid for it so that he could buy the things they made in the factories, the Agricultural Revolution was born. Farming became a business rather than a normal, natural way of living. The machine came to the farmer's rescue and made it possible for him to produce enough food for everybody.

Agriculture is definitely an industry today, although it has not developed as such as rapidly as, say, cotton weaving or steel manufacturing. Until Revolutionary times in our country the farmer had no machinery except iron-shod plows and harrows and no knowledge of actual plant processes. It was not until nearly 1850 that a scientific study of plants and soils showed exactly what the plant took for growth from air, soil and water. After that fertilizers could be accurately made and blended, and soil could be tested to find what it needed.

Industrialization of farms has been rapid since 1900. Gang plows, threshers and reapers came into general use. Between 1920 and 1930 750,000 motor tractors were bought; the number of farm horses and mules dropped by 6 million. The purchase of tractors dropped off during the depression years but is now on the increase again.

But tractors and similar labor-saving machinery cannot be used on 10-acre farms. They are economical to use only when they do a full day's work every day. So the greatest amount of mechanization has taken place on new tracts in the West, where enormous areas can be planted to wheat or cotton and operated like factories. Such farms are specialized; they are simply production plants, operated with costly machinery designed for mass production, such as combines or combination reapers and threshers. Such a farm can produce wheat at a much lower price per bushel than can the small farmer. As far as staple crops are concerned, this seems to be the way of the future.

If large farms are to furnish staple crops, what is to become of small farmers? The only answer yet discovered is co-operation—small farmers must work together to market their products on a large scale or perhaps find some way of working a number of farms together as one unit, thus giving competition to the mass-production farms.

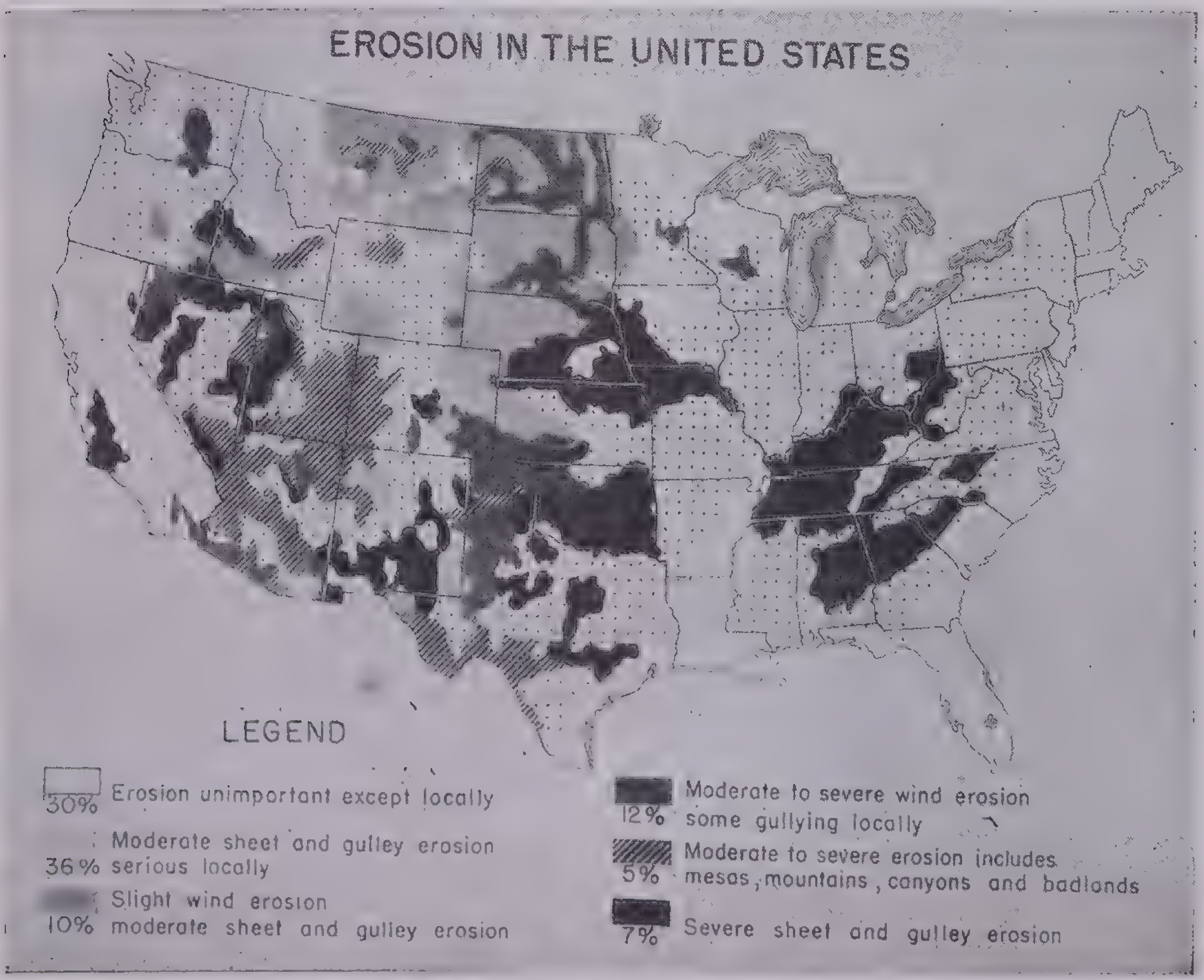
There are, however, more immediate problems. Many errors of the past must be corrected before agriculture can build for the future. Attention can be turned to these things now because the farmer's main problem is not how to produce enough—improved methods have made ample output possible—but rather how to dispose of what he does produce.

Farm leaders point out three main problems: to maintain farm income by properly adjusting production; to improve the system of land ownership so that farmers will have greater security; to safeguard natural resources.

There must be some form of control so that we shall not have surpluses one year and deficits the next. This applies particularly to grain crops, and farm leaders are looking forward to the establishment of an *ever-normal granary* so that only as much grain is put on the market each year as demand calls for, thus keeping prices level.

Insecurity among farmers results not only from irregular crops but also from the ages-old system of land ownership. The farmer is governed by the same financial system as other producers, but this is often a hardship to him since he is at the mercy of things beyond his control—several seasons of bad weather or grasshopper plagues, for instance—and many a farmer has lost his land through no fault of his own. This must probably be remedied before farms can be put on a sound industrial basis.

The third problem is that of conserving the land. For generations farmers have been allowed to do as they please: produce as much or as little as they like on any sort of land they see fit to use. Such looseness was not harmful in the pioneer days, but now we realize that since we all depend upon the farm lands for life, we all have an interest in them and therefore have the right to say that they shall not be ruined. Through carelessness, millions of acres have been allowed to go to ruin through erosion. Through ignorance, vast areas of land unsuitable for farming have been tilled, resulting in more spoiled land and insecurity among farmers using it.


EROSION IN THE UNITED STATES
LEGEND
30% Erosion unimportant except locally
36% Moderate sheet and gulley erosion serious locally
10% Slight wind erosion moderate sheet and gulley erosion
12% Moderate to severe wind erosion some gullying locally
5% Moderate to severe erosion includes mesas, mountains, canyons and badlands
7% Severe sheet and gulley erosion

Courtesy U. S. Soil Conservation Service

air conditioning, the simultaneous control of humidity, temperature, motion, cleanliness and distribution of air within an enclosure, to meet the requirements of manufacturing processes or of human comfort. The first attempt at air conditioning was carried out in printing plants. About 30 years ago it was found that the shrinkage and expansion of paper was caused by variations in temperature and humidity, and air conditioning was started in an effort to bring it under control. Large-scale methods of increasing humidity, however, were first tried out in cotton mills and malting floors both in this country and abroad. In the cotton mills, water was evaporated from kettles, but this did not increase the humidity sufficiently to permit the spinning of the finest yarns except in a few particular localities of high humidity. The problem was solved by spraying water into the air through nozzles. In the breweries air was forced through a coke filter over which water trickled or through a maze of wetted baffle plates.

These early methods (including attempts to cool and humidify theaters in summer) were not entirely successful because all the factors in the problem were not understood. The air was usually chilly and clammy rather than comfortable. A satisfactory year-round air-conditioning system must clean and distribute air all the year, heat and humidify it in winter, cool and dehumidify it in summer.

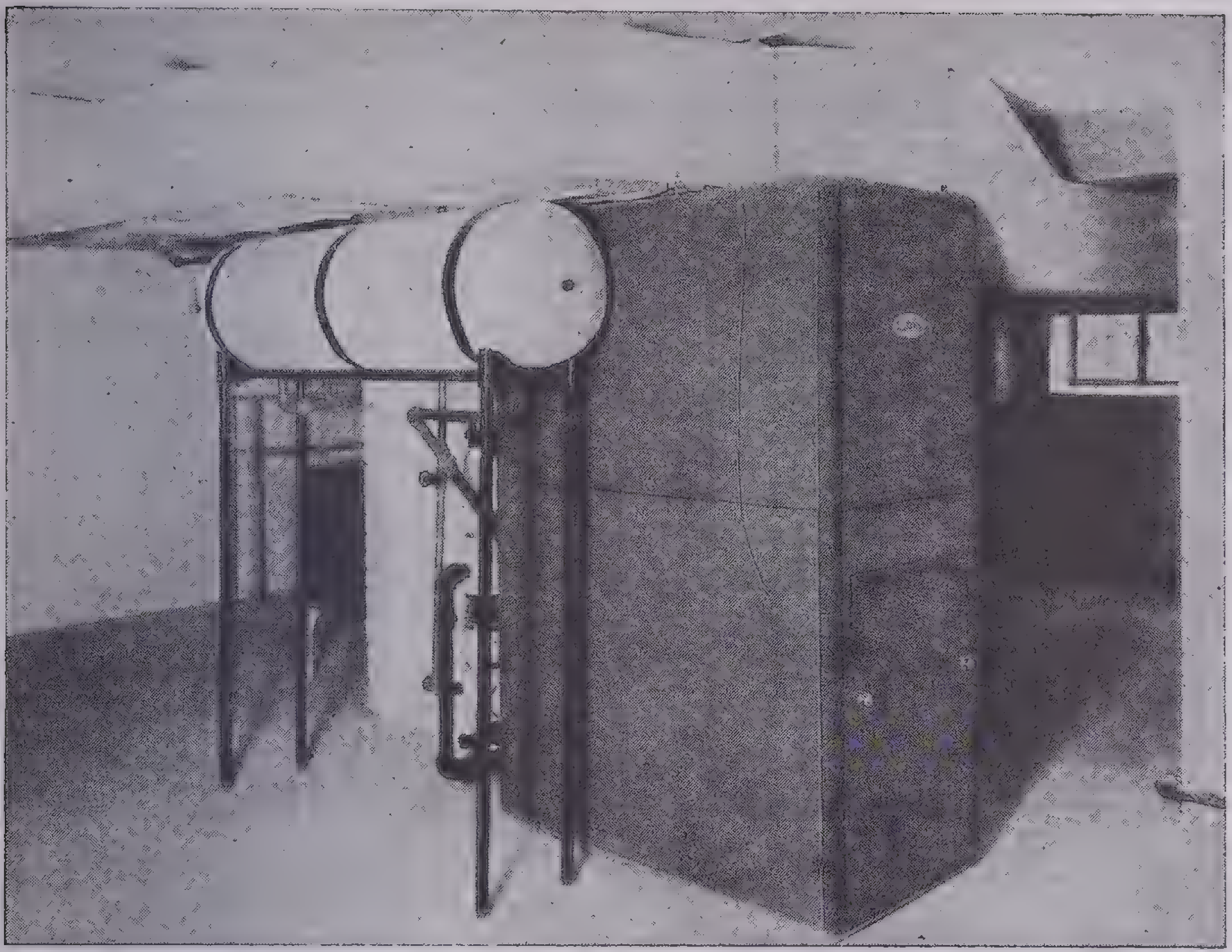
Cleaning and Distribution. Among the impurities that pollute the air are soot from smoke, particles of earth, sand, bits of wood, thread, lint, animal and vegetable matter, bacteria, pollen, particles resulting from combustion and chemical processes, as in artificial gas plants, packing houses, sewers and chemical establishments. Dust, smoke and fumes overtax the nose and lungs. If human beings are confined within restricted spaces, there is a decrease in the oxygen content of the air, a corresponding increase in carbon dioxide and an increase in moisture from respiration and perspiration that produces objectionable odors. As far as the purity is concerned, it is necessary to renew the air from the outside source at a rate of at least 10 to 15 cubic feet per minute per person—more if there is considerable smoking or production of fumes.

Another factor is air distribution. Proper circulation within a single room is assured by equalizing the air motion to various rooms so as to avoid dead spots or drafts. This can be brought about with the proper fans, ducts and sundry apparatus.

Heating and Humidifying. The heating of dwellings need not be discussed at length here. Today houses and buildings are usually heated by stoves or by hot water, steam or warm-air centralized heating plants.

Humidifying is the addition of water to warm air to bring comfort and improved health. Air may be compared to a sponge in that it can hold only a certain amount of water. It is called *saturated air* whenever it has absorbed all the moisture that it can possibly hold. The higher the temperature of the air, the greater the quantity of water it can hold. One cubic foot of air at 100° F. can contain as much as 20 grains of moisture, whereas at 50° F., it can contain only 4 grains. Under normal conditions air is seldom (if ever) saturated and so can absorb more water. Therefore as the normal air absorbs moisture from our bodies, it produces a cooling effect.

The term *relative humidity* describes the moisture-absorbing capacity of air. Air at 70° F. could hold 8 grains of moisture per cubic foot, but if it actually contains 4 grains per cubic foot, then we say it has a relative humidity of 50 per cent. In other words, the air would be capable of absorbing 4 grains more per cubic foot before becoming saturated. Such



Courtesy Carrier Corporation

Home Air Conditioning

This neat, compact unit is a combined furnace, air conditioner and water heater. It contains an oil or gas burner besides the fans and filters necessary for air conditioning. The unit is soundproofed and almost completely automatic in operation

air would feel much cooler than saturated air at the same temperature because of its ability to absorb moisture from the body. Dry air, then, feels cooler than moist air even if both are at the same temperature. When we heat the air in our homes in winter, we should see that it is adequately humidified to get the most good out of the fuel burned. Even if incoming air is about the correct relative humidity, it will no longer be so after its temperature is raised in the furnace. In air-conditioning systems the method most commonly used is to force the air through a chamber containing a spray of water. It is then passed over baffle plates that remove the free moisture and wet solid particles, leaving the air clean and saturated.

Cooling and Dehumidifying. Incoming air is cooled by passing it over coils that are cooled by water or mechanical refrigeration, by passing the air through a cold-water spray or by passing the air over ice. Dehumidifying involves removing the moisture from the cool air by passing it through a cold-water spray, over cold coils or by passing it through a moisture-absorbing agent. The air is dehumidified so that it will be capable of absorbing more body moisture, thus having a cooling effect.

The requirements specified by the American Society of Heating and Ventilating Engineers in order to insure human comfort are as follows: the relative humidity shall not be less than 30 per cent nor more than 60 per cent in any case; the temperature shall range between 64° and 69° F. when heating or humidification is required and between 69° and 73° F. when cooling or dehumidification is required.

Some day all our homes may have apparatus for removing all impurities from the air we breathe. Such devices are already being installed in stores and hospitals and are used by hay-fever sufferers to remove from the air the tiny pollen grains that are responsible for hay fever.

The air is passed through a flue between two electrodes with a high-voltage electrostatic field. The air particles become ionized; that is, they take on an electrical charge. When they are thus charged, they must move toward the positive electrode. On the way they attach themselves to any particles of foreign matter in their path—tiny grains of carbon that form smoke and soot, droplets of grease, grains of face powder, even bacteria.

These are deposited on the electrode, from which the accumulation can be cleaned now and then. Air containing 650,000 bacteria to the cubic centimeter can be entirely purified by this process.

Air-conditioning has quickly proved its worth in terms of human health and comfort. It is believed that universal installation of air-conditioning systems will become a major industry within the next decade. In stores, theaters, hotels and other public places air conditioning is the rule rather than the exception. A good deal of research probably remains to be done before completely satisfactory systems for use in homes are developed.

airplane, a heavier-than-air mechanical device for navigation in the atmosphere above the surface of the earth. The main parts are: the *fuselage* or body structure; the *wings,* single or double; the *tail unit,* comprising a fin, rudder, stabilizer and elevator; and one or more motors and propellers.

The lightest serviceable airplane weighs about 1,200 pounds, and it can carry one person, the pilot. The largest weighs more than 25 tons and has a carrying capacity of more than 100 persons. How can an airplane weighing even 1,200 pounds rise in the air and move forward at a rate exceeding 100 miles an hour?

Stand facing a heavy breeze with a long board in your hands so held that the wind will strike it at right angles. The pressure of the air will force the board straight back toward your body. Incline the board at an angle of 45° away from your body; the wind on striking the board is now deflected downward, with a consequent tendency to lift the board. This lifting force is increased by the fact that over the top of the board a partial vacuum is formed, and a vertical suction is created. This is the lifting principle of the airplane. It flies because there is a lifting effect of moving air upon a surface inclined slightly at an angle toward the wind. The propeller bites into the air somewhat like a great screw and produces a pull or thrust that drives the airplane against the air resistance.

The surfaces that support the airplane in flight are the wings; the names of various types depend on the number of wings on each side. A single wing on each side marks the airplane as a *monoplane;* if there are two wings on each side, one above the other, the machine is a *biplane;* a few *triplanes*—three wings on a side—were built in the early days of the industry. A variation is the *sesquiplane,* a biplane in which the lower wing is much shorter than the upper.

Airplane design was at first largely experimental; the pioneers were not sure a plane would fly or that a certain part would work until they had tried it in flight. Now, however, design is based upon a large body of aerodynamic principles and laws. The correct shape of the wing, for instance, with the front edge thicker than the rear, is no longer a matter of guesswork; it is an exact curve determined by knowledge of the laws governing air in motion.

The pilot's cockpit is variously placed in different types and sizes of airplanes—wherever the controls can be placed efficiently and where the pilot will have the best view. In any case he has before him an instrument board showing the faces of a few or a great many instruments. The most important are: the tachometer, which indicates engine speed in revolutions per minute; and the oil-temperature and the oil pressure gages, which tell whether the motor is receiving proper lubrication. Not connected with the operation of the motor but of equal importance are: the compass; an altimeter, which indicates the height of the airplane above the ground; the air-speed indicator, which shows the airplane's speed relative to the air; the inclinometer, containing an air bubble in a curved tube filled with colored alcohol to indicate whether the ship is on an even keel; and a gage that registers the quantity of gasoline in the tanks.

Mechanics of Flight. It is a fact that the automobile is more complicated in operation than the airplane. Although an airplane is physically easier to operate, a higher degree of skill is required. The airplane pilot is not troubled with a brake, clutch or gears to change; in these respects he has an advantage over the automobile driver. In clear weather the pilot has only to watch the performance of his motor, keep his ship on an even keel and follow his compass direction. He governs speed by feeding more or less gasoline to the engine with the throttle. He has two flying controls: a control stick (or wheel) for the hands and the rudder bar in small planes operated by the feet.

The stick controls the *elevator* at the tail surface and the *ailerons*, movable flaps at the ends of the wings. Moving the stick forward causes the nose of the plane to dip; moving it back causes the nose to rise. When the stick is moved sideways, it operates the ailerons. When one aileron is depressed, it presents a flat surface to the rushing air and acts as a sort of brake, causing that wing to lift. The two ailerons work in opposite directions; when one is depressed, the other is lifted, so that one wing is pushed down and the other up. It is the action of the ailerons that causes a ship to heel over sharply in making a turn. Without the aileron action, a ship making a turn would simply skid sidewise through the air; a sharp turn could not be made and the plane could easily get out of control. But because the ailerons tip the wing so as to present a broad, flat surface to the air, the plane can "bank" around a very sharp curve, just as an automobile can turn a corner faster when the road is inclined than when it is flat.

The rudder bar controls only the rudder at the tail surface for right and left motion. When the pilot makes a turn to the right, he pushes down on the right rudder bar to turn the plane in that direction and at the same time moves the stick to the right to bring the ailerons into play and dip the right wing. Then, to *level out* he must use left rudder and move the stick a little to the left to bring the wings up to level again.

In flight there is safety in height. If the motor dies at an elevation of 4,000 or 5,000 feet, for example, the pilot has plenty of time to face his emergency, for an airplane will glide for a considerable time with its power shut off. Pilots usually estimate that they can glide over a horizontal distance seven times the height at which the glide starts. Another reason for flying at a safe height is the fact that in case of a side slip, spin, nose dive or other emergency the pilot has time to bring the ship under control before it falls to dangerous levels. Most airplane accidents occur in taking off or landing when the ship is flying so near the ground that it crashes before the pilot can regain control. Still another reason for flying high is to be sure that parachutes will have time enough to open, in case pilot or passengers must jump.

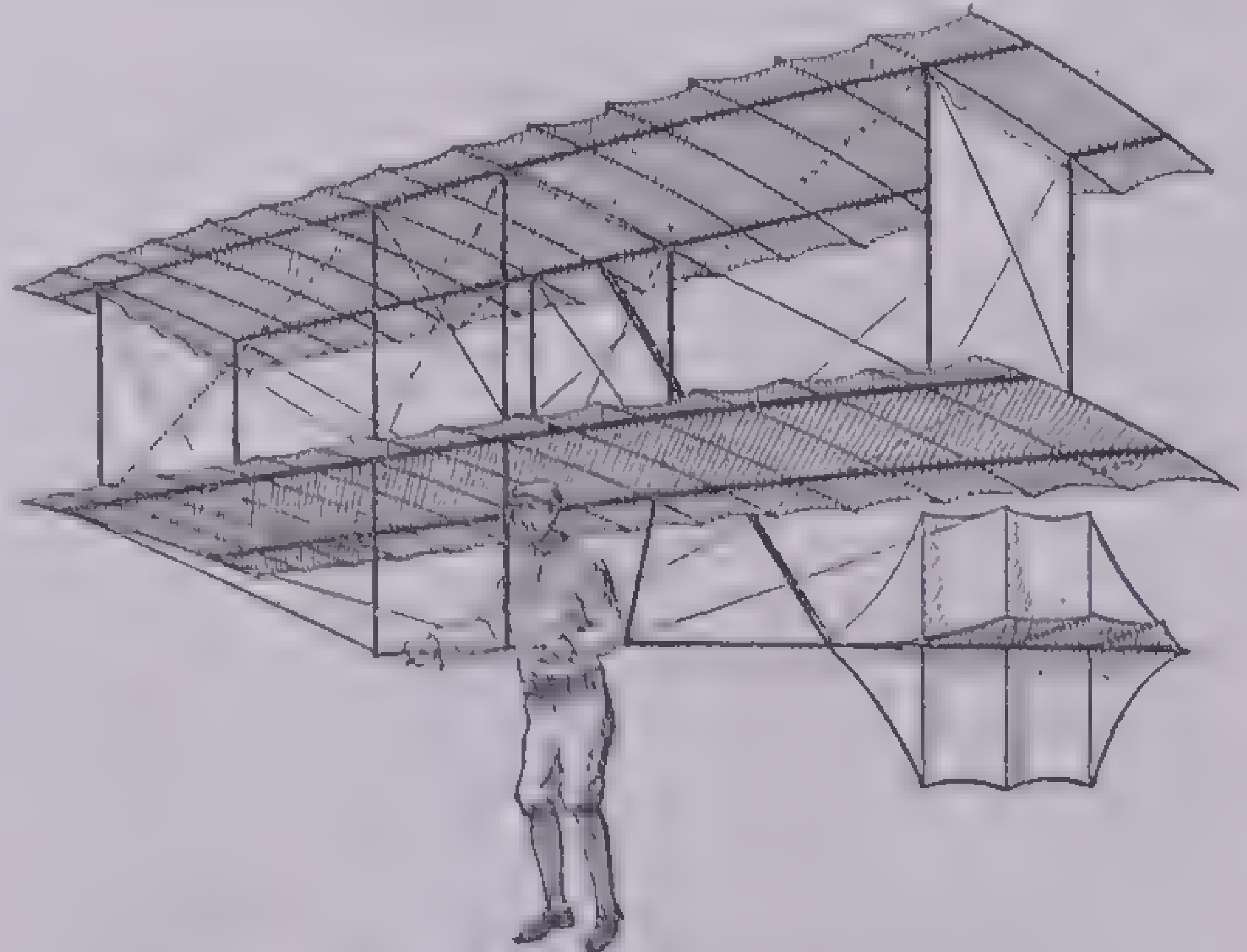
Pilots are required to take a rigid course in aerodynamics and spend many hours in the air before they can be licensed and placed in control of airplanes.

The Pioneers. The years between 1840 and 1903 have been called *the period of gliders*, when men were studying wing forms and discovering aerodynamic laws by watching the effect of wind currents on wings and control surfaces. A glider is a rudimentary airplane without motor or propeller but with wings and control surfaces. It is of much lighter construction than an airplane. Gliders today are launched mechanically, usually by "snapping" them off the ground with elastic cords or by towing them with an automobile until they rise. Once in the air they fly by the action against the wings of wind and rising and falling air currents from the ground.

Stringfellow and Henson of England in 1842 built a model flying machine that quite closely resembled our early monoplanes. The model was probably the first self-propelled, self-driven, heavier-than-air machine to sustain itself in the air by its own power. But for lack of financial assistance Stringfellow stopped further experiments.

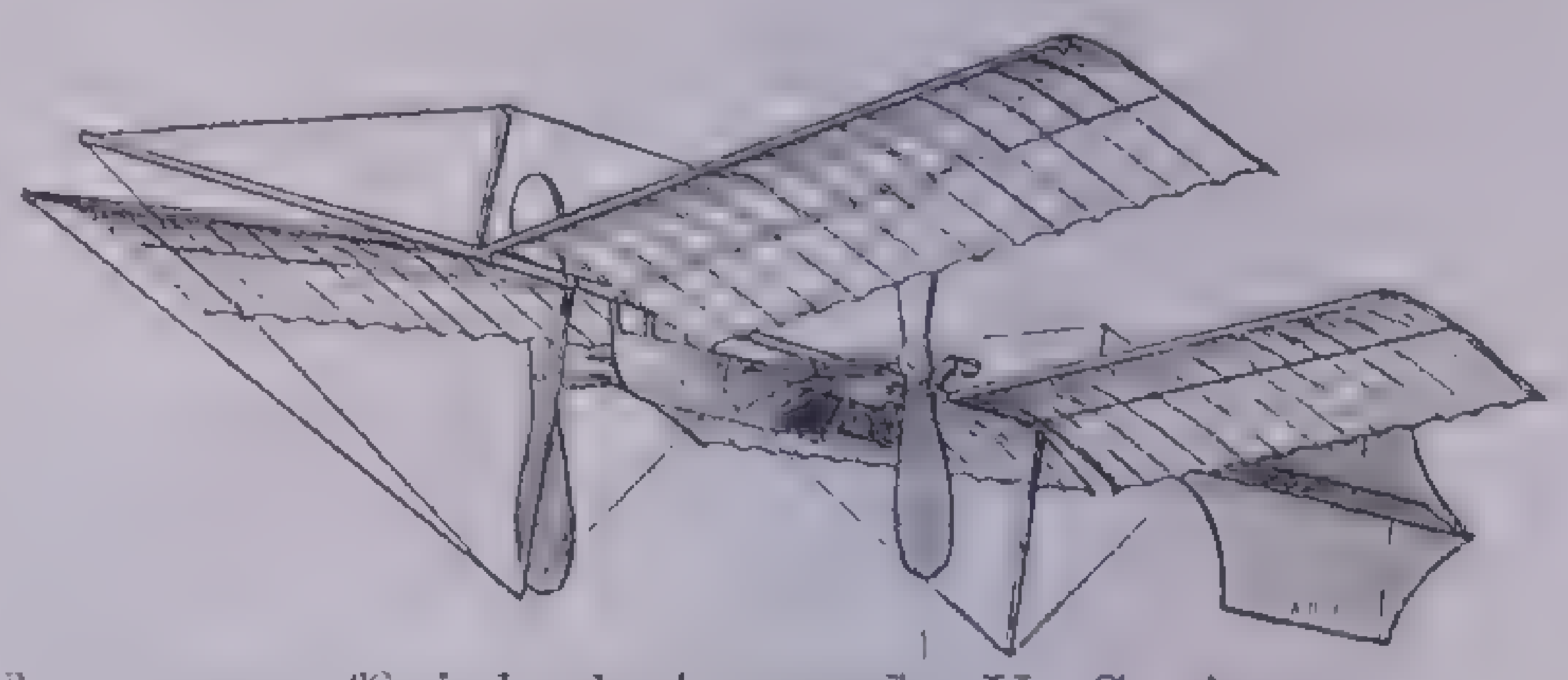
Two of the principal figures during this early time were the Lilienthal brothers of Germany. In 1885-89 they discovered the flight advantages possessed by curved wings. Otto Lilienthal made many glider flights and found that he could steer either to the right or to the left. In testing a new horizontal steering arrangement he fell 50 feet and was killed. Fortunately, however, this great experimenter left a mass of valuable data for others to study.

Octave Chanute of Chicago made the next advance by developing movable control surfaces. In 1895 he built five large gliders, one a Lilienthal type, and next a *multiple-winged* machine and a *double-deck* type, which is now called a *biplane*. In these he made several hundred flights around the sand dunes of Indiana near Lake Michigan.



Octave Chanute's Glider of 1895

In 1891 Dr. Samuel P. Langley, an American scientist of the Smithsonian Institution at Washington, began to build a flying machine. On May 6, 1896, in Washington his power-driven airplane or *aerodrome* flew for a little more than 1 minute and then dropped down on the Potomac River. Langley's machine did not carry a passenger.

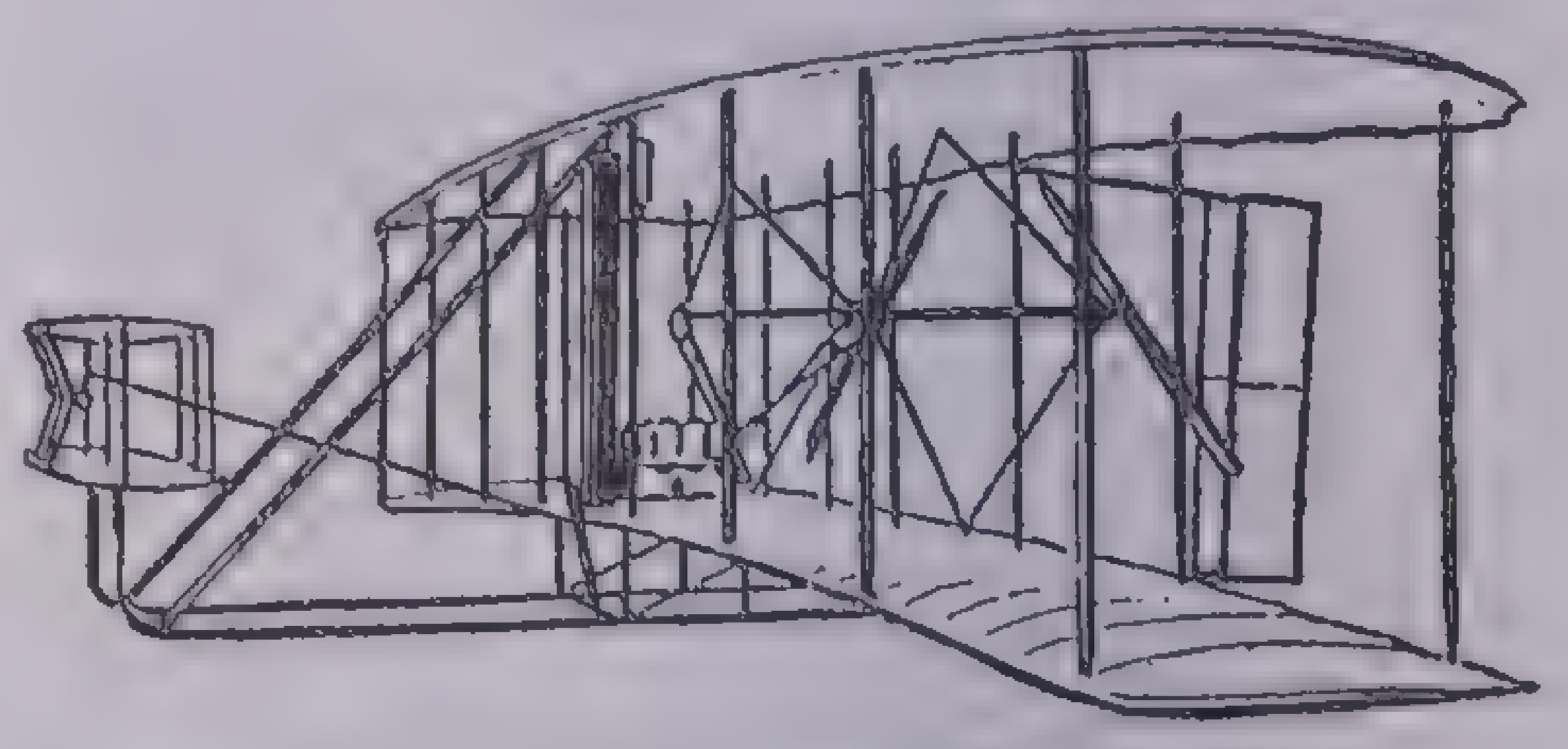


From an official photograph, U. S. Army Air Corps

Langley Tandem

Side view of Samuel P. Langley's steam-driven aerodrome No. 5, immediately after its two flights of May 6, 1896, showing its condition after two descents from heights of nearly 100 feet, during each of which the aerodrome flew something over half a mile, descending in safety

During this same time, Wilbur and Orville Wright of Dayton, Ohio, achieved better results than Lilienthal, Chanute or Langley, and the early work of the Wright brothers is stamped indelibly upon present-day aircraft. The history of American invention contains no more fascinating story than that of the years of study and work by the Wright brothers preceding that memorable December 17, 1903, at Kitty Hawk, N.C., when, after innumerable trials, changes and disappointments, their flimsy airplane (fitted with a 16-horsepower, 4-cylinder gas motor and twin propellers) rose of its own power and carried Orville Wright on the first successful man-carrying flight. The flight lasted only 12 seconds, and the distance covered was only a few hundred feet, but the hope of centuries had become a reality. The success of the Kitty Hawk flight led to further experiments, culminating on October 5, 1905, in a flight by the Wrights of 24½ miles, lasting 38 minutes, at an average speed of about 38 miles an hour.

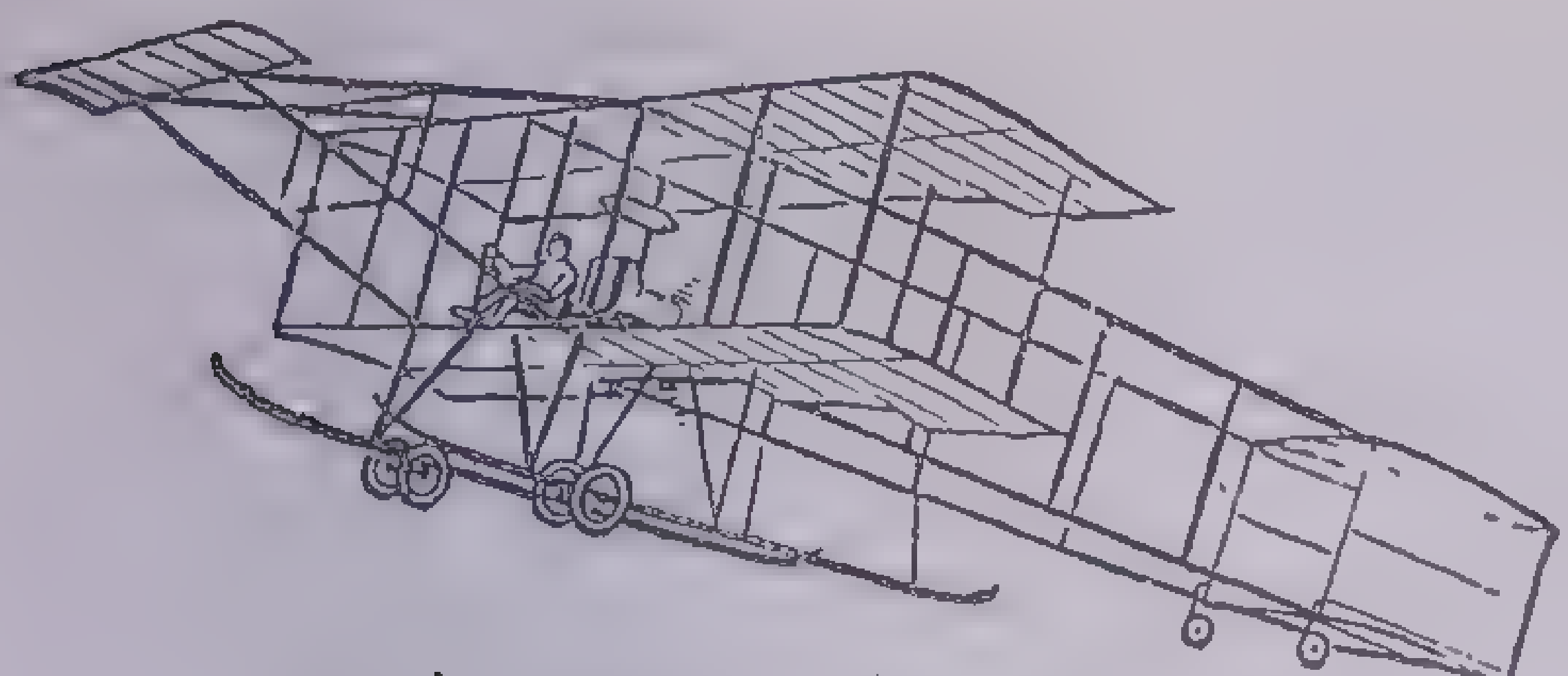


Wright Brothers' Biplane

The plane that made the historic flight at Kitty Hawk, North Carolina, Dec. 17, 1903

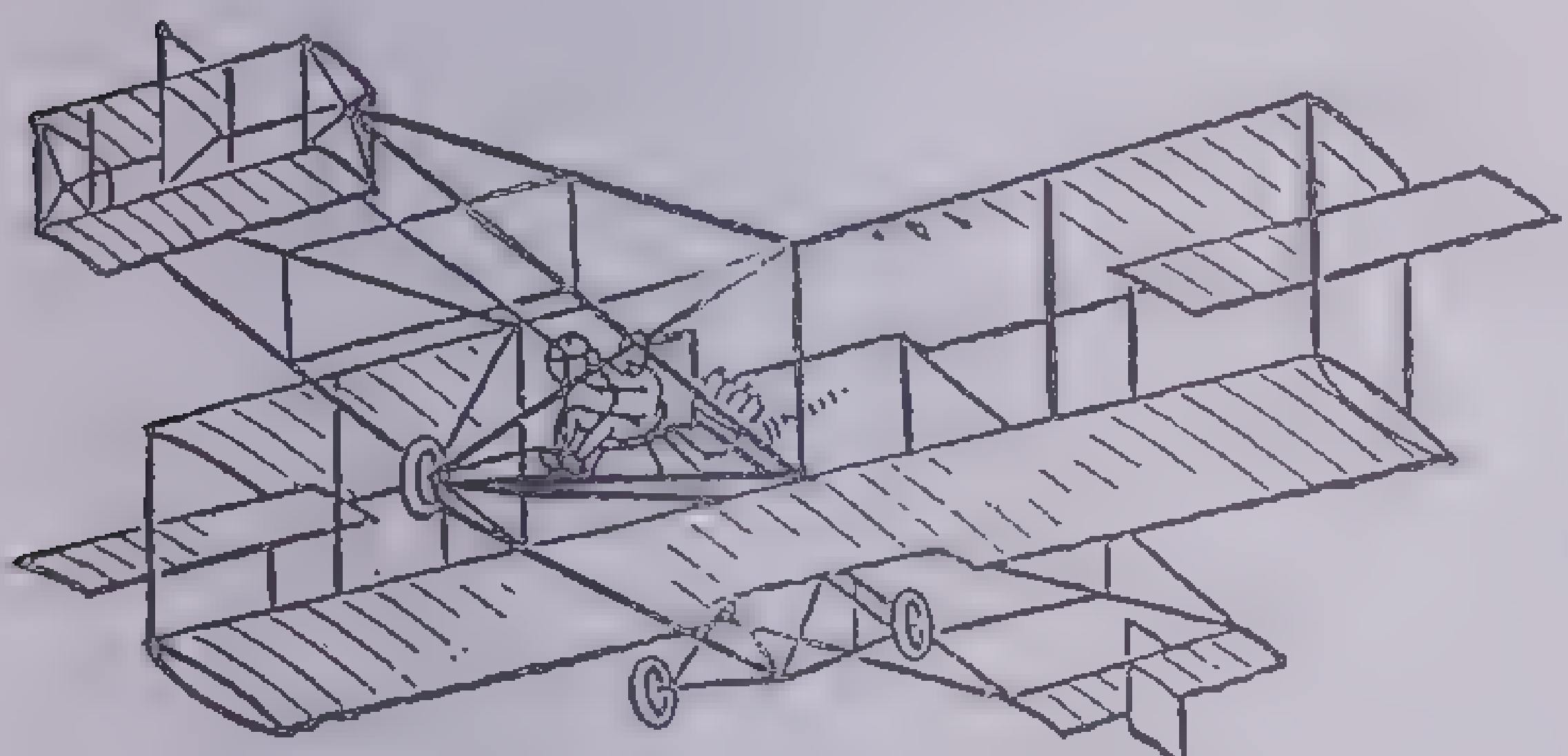
Airplane activity seems then to have been transferred to France for a time, where experiments were carried on by such pioneers as Santos-Dumont of Brazil and the Frenchmen, Henri Farman, the Voisin brothers, Delagrange and Bleriot.

Following the Wright brothers closely was Glenn H. Curtiss, who won the Scientific American Cup for the first pre-announced public demon-



Henri Farman's Biplane, 1908

stration flight on July 4, 1908. In the year following he put floats under the wings of an airplane and thus developed the first plane to rise from water and land on it. In 1909 he won the first Gordon Bennett Cup Race at a speed of 50 miles an hour.



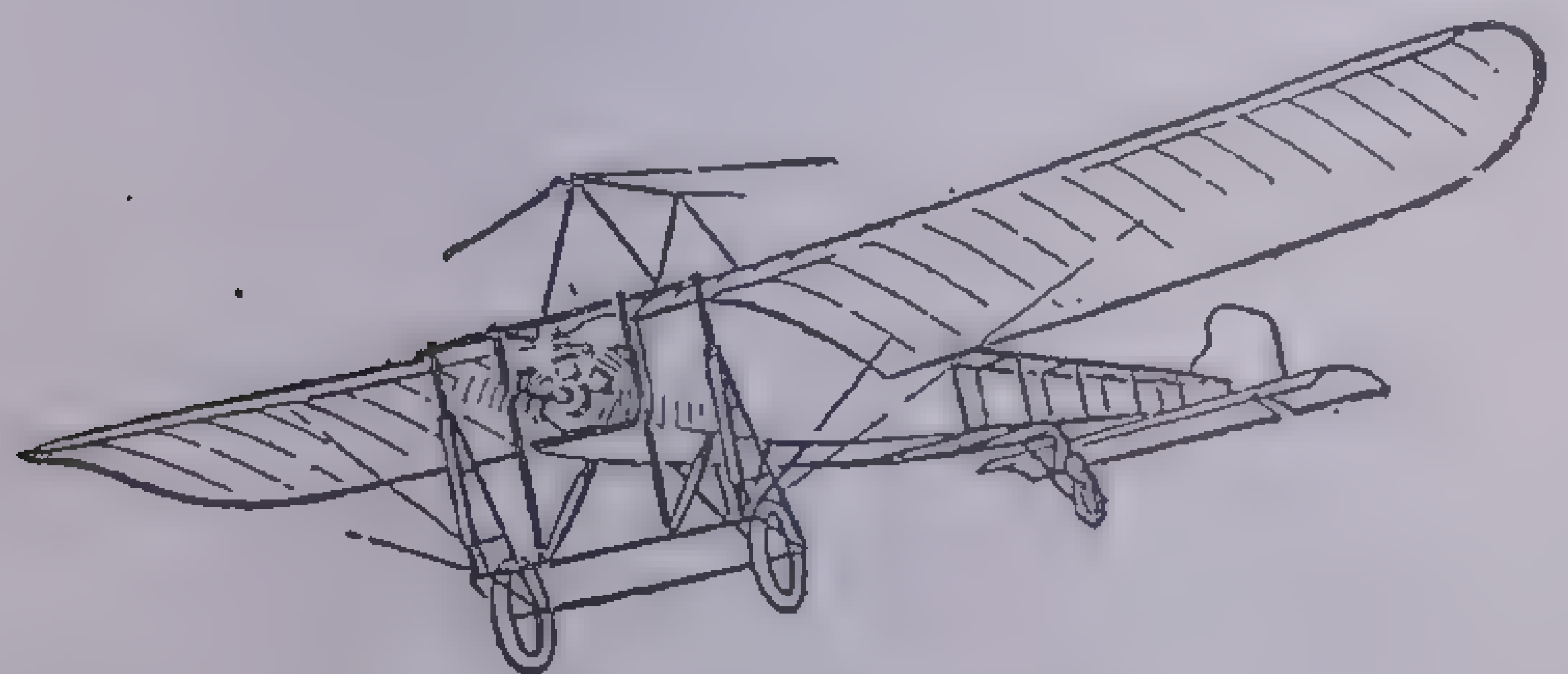
Curtiss's Airplane of 1908

As a comparison with present planes it is interesting to record the specifications issued in 1907 by the U.S. Army for a flying machine of advanced type. It was required to carry two men, remain aloft 1 hour continuously, maintain an average speed of 40 miles an hour and be able to carry sufficient fuel for flying at least 125 miles.

It was in connection with trial flights under these government specifications that Wright astounded the world by a flight over the drill ground of Fort Myer, Va., lasting somewhat more than 1 hour. Delays and difficulties attended the flights of this first government airplane, but on July 27, 1909, Wright again sailed triumphantly over Fort Myer Field, this time for 1 hour, 12 minutes and 40 seconds, to the delight of 10,000 spectators, including President Taft and members of his Cabinet.

At a meeting in Rheims, France, in 1909 when aviators awed spectators by creeping cautiously to a height of 500 feet, it was confidently predicted that 1,000 feet was the greatest altitude possible; a year later in 1910 Legagneux established a record of 10,747 feet. No sooner, in fact, did some timid prophet say a thing was impossible than a courageous pilot proved that it could be done.

Bleriot, in a machine built by himself, made the first overseas flight across the English Channel from Baraquas to Dover, at the same time giving a new type of airplane, the *monoplane,* its first real test.

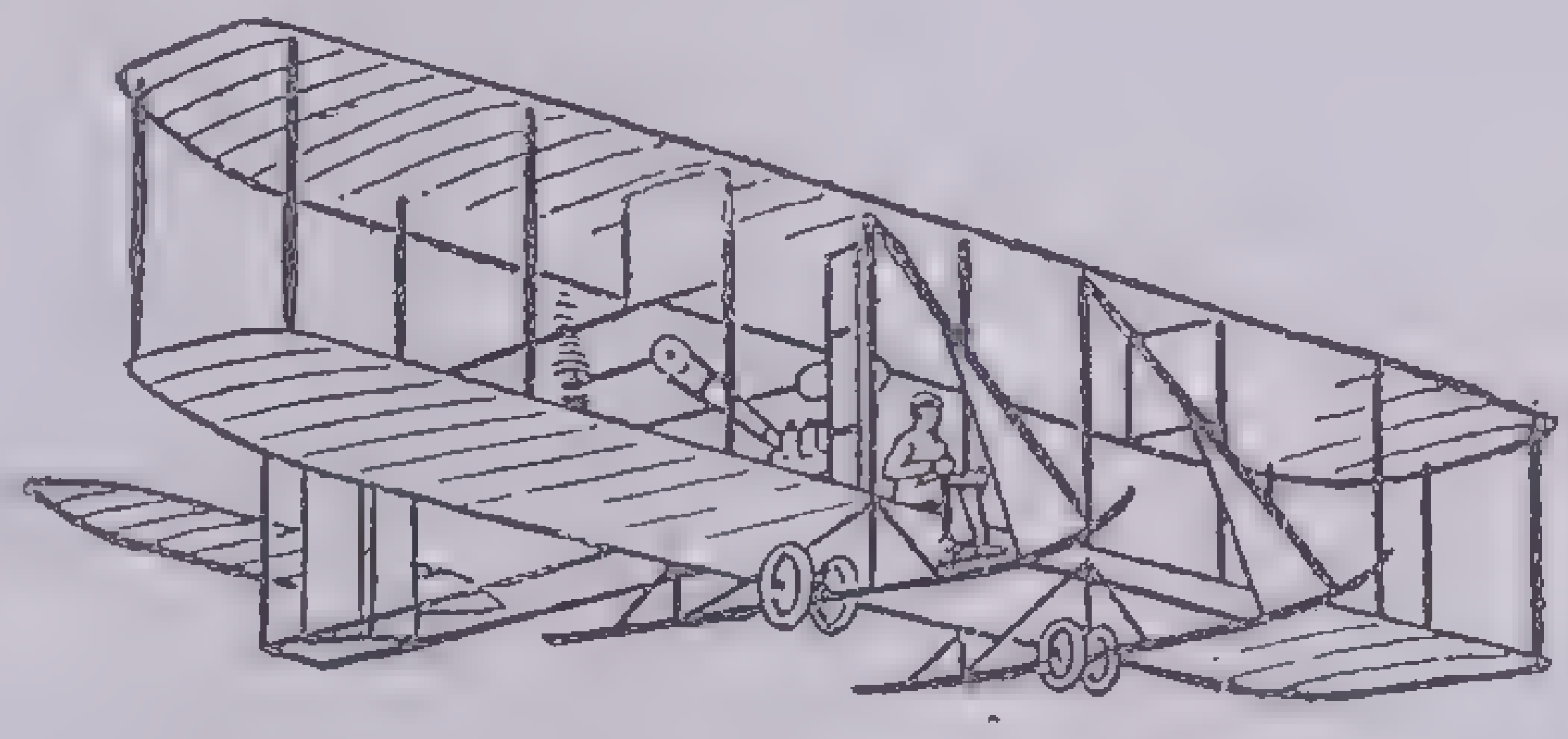


Louis Blériot's Monoplane
The first plane to fly the English Channel, July 25, 1909

The Next Twenty Years. From 1909 on the development of aeronautics can best be pictured by a review of the outstanding events of each year. The recital of these events grows monotonous unless the reader keeps in mind that each one, at the time, was a courageous and glorious adventure. Constant development appears in the year-by-year proof of improved construction, increased skill in piloting and growing confidence in man's right to fly.

At the close of 1909 world records had been established as follows: A cross-country flight of 40 miles in 1 hour and 3 minutes with a speed of 49.99 miles per hour and an altitude of 1,486 feet; Henri Farman had made the first recorded flight with a passenger; Madame Piltier of France had demonstrated that women could fly; Wilbur Wright had circled the Statue of Liberty and Count de Lambert had flown over the Eiffel Tower in Paris.

The year 1910 brought the first airplane exposition at Brussels and a hundred organized meets and exhibitions in America, including that at Belmont Park, N.Y., with 29 aviators and 37 planes entered, 10 of which were once in the air at the same time. *Dips* and *spiral dives* and *banking* earned places in aviation language.

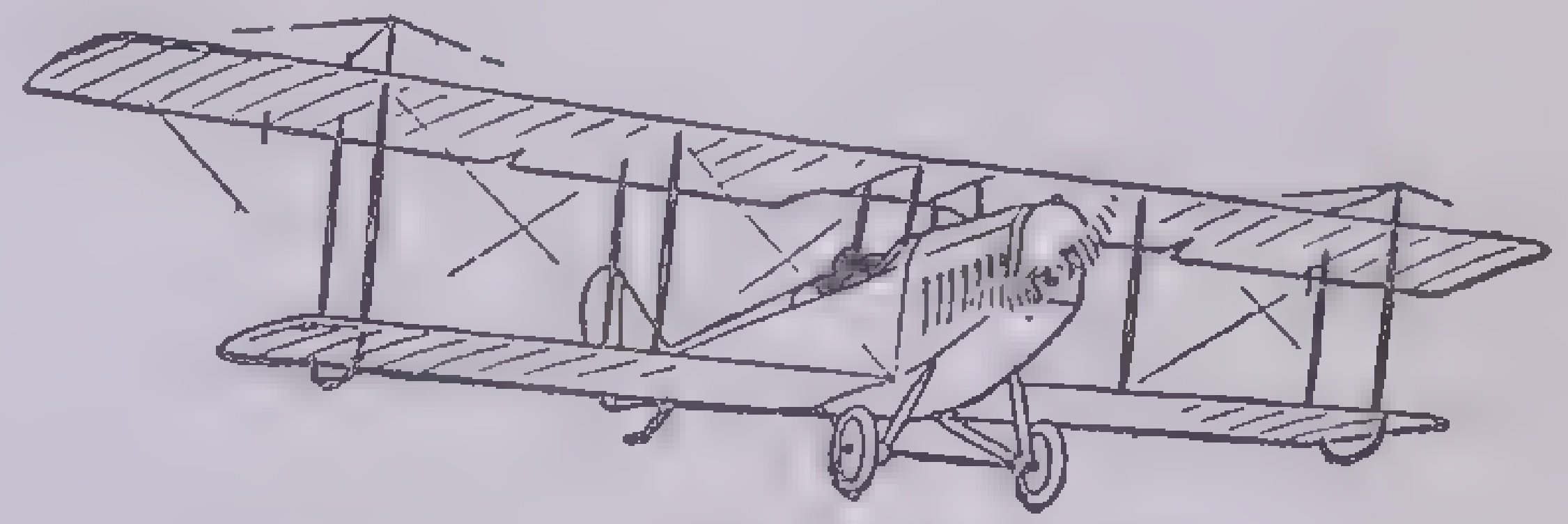


Wilbur and Orville Wright's Airplane of 1910

In 1911 the International Aviation Meet was held at Chicago, where from 10 to 15 airplanes could be seen in the air at one time. During the meet a new altitude record of 12,828 feet was made by Lincoln Beachey in a Curtiss *pusher,* an airplane with the propellers at the rear of the supporting surfaces. Shortly following this meet C. P. Rogers made the first American coast-to-coast flight, starting from Sheepshead Bay, N.Y., September 17 and landing on November 5 at Los Angeles. The first air mail in the United States was flown from Nassau Boulevard Airdrome, on Long Island, to Mineola, L.I.; Ely demonstrated that an airplane could rise from a battleship; McCurdy flew from Key West, Fla., to Cuba; Beachey dipped over Niagara Falls and flew through the Gorge; Prier of France made the first nonstop flight from London to Paris, a distance of 250 miles, in about 4 hours.

In 1913 reports were brought of Sikorsky, a Russian, flying with seven passengers, thus again showing the possibilities of the airplane as a common carrier. An American flew over the Panama Canal. A statement in the House of Representatives said "Five years ago no one would fly in a wind blowing 5 miles, but today (1913) flying is done in puffy winds of 40 to 45 miles per hour," which was immediately proved by a pilot flying in a 50-mile wind. The same year contributed a nonstop flight from Paris to Berlin and one of 930 miles from Paris to Warsaw in 11 hours. Two American pilots flew from Chicago to Detroit by way of the Great Lakes, a distance of 900 miles. M. Pegoud in France made the first intentional *loop the loop* in an airplane.

Previous records were shattered in 1914; altitude now stood at 26,246 feet; speed, at 126.66 miles per hour; duration, at 21 hours, 38 minutes and 48 seconds. Parmelee, an American pilot, flew over Mont Blanc, and Silas Christofersen flew 1,000 feet over the peak of Mt. Whitney in California. Garaix, a French pilot, established a world record by carrying three passengers for 4 hours, 3 minutes and 29 seconds; and W. C. Robinson of Grinnell, Iowa, in a monoplane built by himself, broke the American cross-country record.



Curtiss's Airplane of 1916

During the next 4 years, with the World War going on in Europe, aviation passed largely from record-breaking and cup-racing to grimmer pursuits, bringing radical changes in the design of planes and adding heroes of a new type to history's roll of honor.

A few outstanding peace events also claimed attention: A flight by Victor Carlstrom, Chicago to New York, with two stops, actual flying time, 8 hours 28 minutes; a nonstop flight of 590 miles by Ruth Law in 8 hours 55½ minutes.

In 1918 a world altitude record of 28,900 feet was made by Maj. R. W. Schroeder, U.S.A., and the first regular air-mail service in the world was established between New York and Washington.

Airplane building made great progress during the World War and with energy released from the strain of war 1919 witnessed some remarkable achievements. First moves were made toward municipal air fields; small passenger-carrying companies sprang up over the country; the carrying of air mail increased and exhibition flights again claimed attention.

The following year, 1920, was marked by a number of notable flights: The first nonstop flight across the Atlantic from St. John's, N. F., to Clifton, Ireland, by John Alcock and A. W. Brown of England; the first transatlantic flight, Newfoundland to Portugal by way of the Azores by Lieut. Com. A. C. Read, U. S. N., in the *NC-4;* a nonstop flight from Paris to Morocco; a flight from Buenos Aires to Valparaiso, Chile; the first nonstop flight from Chicago to New York by Capt. Earl White; a flight over the Andes Mountains by Lieut. Cortinez; a flight from London to Darwin, Australia (11,500 miles), between November 12 and December 10 by Capt. Ross Smith. A United States Navy plane was launched from a flying dirigible. Further events in 1920 included Major Schroeder's new altitude record of 33,113 feet; a new speed record of 194 miles per hour; a successful trip by four planes from New York to Nome, Alaska, and return—9,000 miles in 112 flying hours; and the inauguration of the transcontinental mail route, New York to San Francisco.

The next 2 years were comparatively quiet ones, but included an altitude record of 34,507 feet by John A. Macready. The air mail from San Francisco to New York established a new time record of 33 hours and 20 minutes; Lieut. Doolittle flew from Jacksonville, Fla., to San Diego; Lieuts. Kelly and Macready made a nonstop flight from San Diego to Fort Benjamin Harrison, Ind., a distance of 2,060 miles; two Portuguese flyers flew from Portugal to Brazil, a total of 3,490 miles; Sir Alan Cobham made tours covering 8,000 miles in Europe and flew from Belgrade to London in a day.

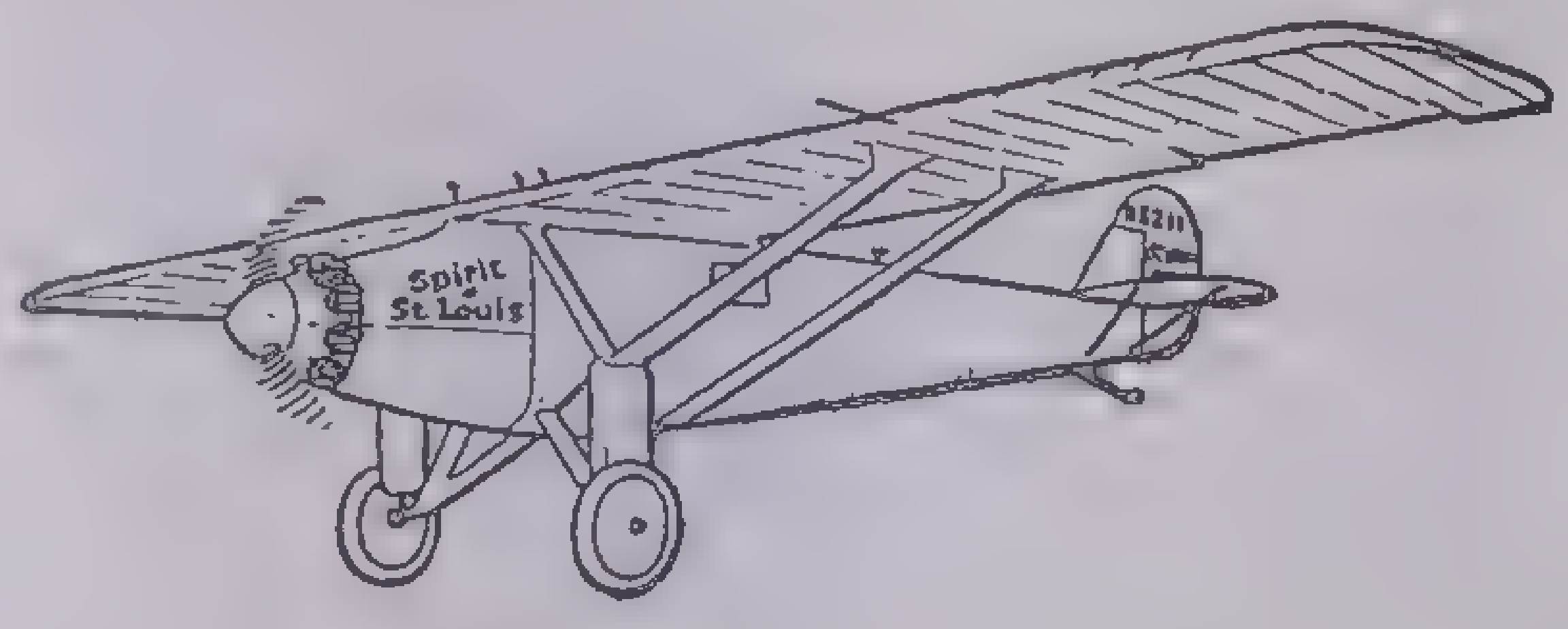
In 1923 the air mail, now 5 years old, had five routes in operation, with the airplanes flying 1,589,389 miles during the year. Lieut. Rittenhouse, U.S.N., won the International Seaplane Race off the Isle of Wight; Lieuts. Kelly and Macready of the Army Air Service made another nonstop record flight from the Atlantic to the Pacific coast in 26 hours 50 minutes and 38 seconds.

World interest at the beginning of 1924 centered on the attempt of the Army Air Service to fly around the world. Four planes left Seattle on April 6, and on September 28 two of them finished the 27,534-mile trip. There were 5 days of actual flying time at an average speed of 76.36 miles per hour. This year also saw the first dawn-to-dusk American transcontinental flight—2,645 miles in 21 hours 48 minutes by Lieut. Russell Maughan.

In 1925 occurred the first of many attempts to fly across the Pacific Ocean, when the naval plane *PN-9, No. 1,* made a brave but unsuccessful attempt to fly to Hawaii. A new nonstop record was established by French aviators of 2,732 miles in 45 hours and 12 minutes; Sir Alan Cobham flew from London to Rangoon and back; also to Cape Town and back to London; MacMillan put airplanes to new use in his exploration of the Arctic. In 1925 the air-mail planes flew a total of 2,076,764 miles, carrying 9,300,520 letters.

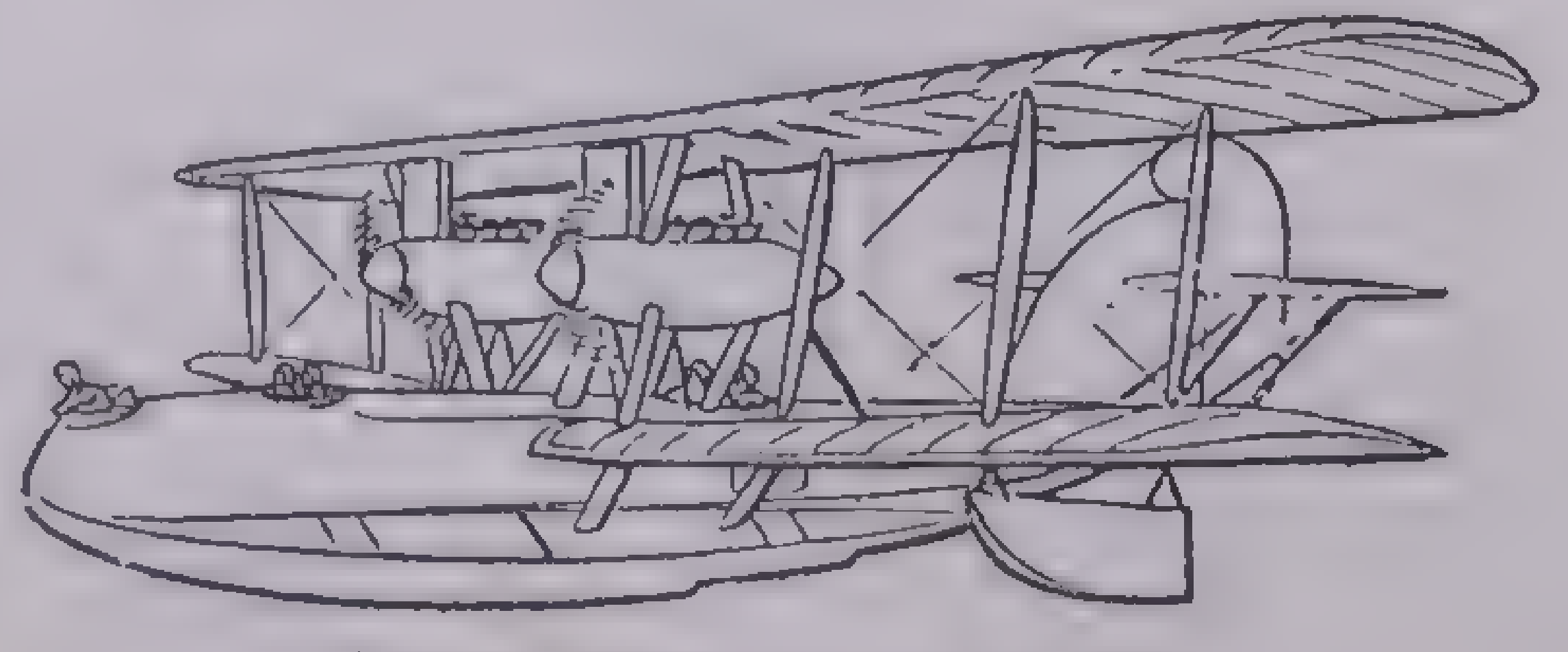
The year 1926 marked the opening of many new air-mail routes operated by private capital. Comdr. Richard E. Byrd and Floyd Bennett flew from Svalbard (Spitzbergen) to the North Pole and back in 15 hours, to be followed a few days later by Capt. Roald Amundsen, whose dirigible flew from Svalbard to Teller, Alaska (2,700 miles), over the top of the world. French airmen made a nonstop flight of 3,313 miles from Paris to Jask, Persia; U.S. Army airplanes made a goodwill flight around Latin America, covering 20,000 miles; and the altitude record moved up to 37,569 feet.

Lindbergh inaugurated the historic airplane year of 1927. The world suddenly became acutely air-minded when the unknown air-mail pilot took off one day from San Diego, broke the record to St. Louis, then flew to New York and in his own good time flew out over the Atlantic and in 33 hours 30 minutes landed in Paris. It may be said that American and, indeed, world aviation had a new birth with Lindbergh's memorable flight. His supreme confidence proved contagious.



Lindbergh's *Spirit of St. Louis*
The Ryan monoplane in which Lindbergh made his historic flight from New York to Paris May 20–21, 1927

Newer Exploits. There followed with breath-taking rapidity a series of exploits that only a few years before would have been pronounced incredible. They include Commander Byrd's transatlantic flight to the north coast of France, 3,477 miles in 42 hours 6 minutes; Clarence Chamberlain's flight to Germany, 3,905 miles in 42 hours 45 minutes, thus establishing a new distance record; the first successful flight to Hawaii by Lieuts. Maitland and Hegenberger (2,407 miles); Smith and Bronte's flight to Hawaii in a small monoplane; the race to Hawaii won by Goebel and Davis in 25 hours 17 minutes; a flight by Chamberlain from the ocean liner *Leviathan* 120 miles out from New York; Lindbergh's tour of the United States (22,350 miles), visiting 82 cities and in every instance except one arriving at his destination on scheduled time; Lindbergh's nonstop flight to Mexico City and his good-will tour of Latin America, covering 7,860 miles in 101 flying hours; the second Arctic Expedition by Sir Hubert Wilkins; a new endurance record by the German flyers, Risticz and Edzard, of 52 hours, 23 minutes and 11 seconds; a new altitude record by Champion of 38,474 feet; the Newfoundland-to-Japan flight by Brock and Schlee; and the round-the-world tour of the French pilots, Coste and LeBrix. During the winter of 1927-28, Sir Alan Cobham flew all around Africa in a seaplane, laying out the African through route for airplanes.



Navy Hydroplane of 1928

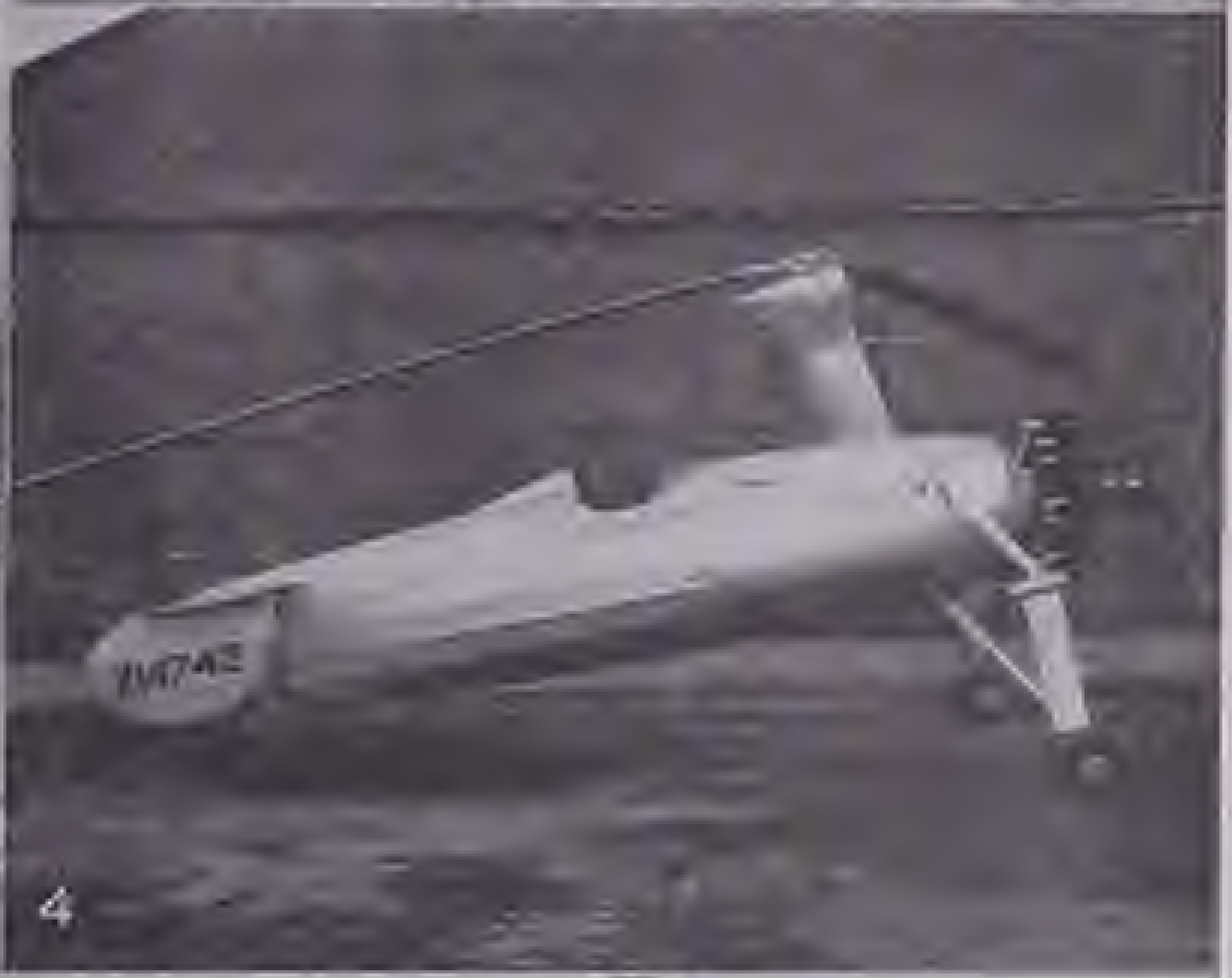
Aeronautical courses were established in educational institutions, the air express service was inaugurated, and the air mail counted 11,446 miles of routes in operation with an authorized 8,000,000 miles of flying per year. To this practical everyday demonstration of flying by the air-mail pilots, aviation owes a great debt.

Great as were the 1927 accomplishments, 1928 saw some of them eclipsed. There were a new distance record of 4,763 miles and a duration record of 65 hours and 25 minutes. The year brought the first westward flight over the North Atlantic by the monoplane *Bremen,* from Dublin to Greenly Island, north of Newfoundland; a nonstop flight from Point Barrow, Alaska, to Spitsbergen by Capt. Wilkins and his pilot C. B. Eilson. Amelia Earhart, in the *Friendship,* piloted by Stultz and Gordon, was the first woman to make a successful transatlantic flight; the *Southern Cross,* with Capt. Kingsford-Smith and three companions, made a memorable flight from Oakland, Cal., across the Pacific to Australia—the longest over-water flight ever made; Goebel flew eastward across the United States in 18 hours 58 minutes; Bert Hassel in the *Greater Rockford* flew from Rockford, Ill., to Greenland; a speed record of 319 miles per hour was made by an English pilot; and a successful flight across the English Channel was made by an autogyro or *windmill* plane. Development of the airplane along commercial lines was even more marked. The production of airplanes in 1928 was two and one-half times that of the preceding year. Airplane timetables became commonplace, and 13,000 miles of airways were lighted for night flying.

In 1929 there was great progress in air travel, with 125,000,000 miles covered and 3,500,000 passengers carried. This development was brought about by the improvement in large transport airplanes, navigation equipment, fog-flying instruments, radio beacons and weather reports by radio. The establishment of scores of new airports did much to afford facilities for aircraft. In the United States about 7,000 airplanes were sold during the year. About 600 training schools were opened, and pilots numbered about 10,000, of whom 7,000 were licensed by the Department of Commerce.

The Byrd Expedition to the South Pole was an outstanding event. After many scientific explorations with Little America as a base, the successful flight to the South Pole was accomplished on November 29, 1929. With Admiral Byrd were Bernt Balchen as pilot, Capt. Ashley McKinley as aerial surveyor and Harold I. June as radio operator.

Transatlantic flights again were in evidence. Williams and Yancey flew from America to Rome, Italy. Assolant, a Frenchman, flew from Maine to Spain. The South Atlantic was crossed twice by Jiminez and Iglesias and shortly thereafter by Larre-Borges and Challe. The world's record for speed made by the British pilot Orlebar jumped to 357.7 miles



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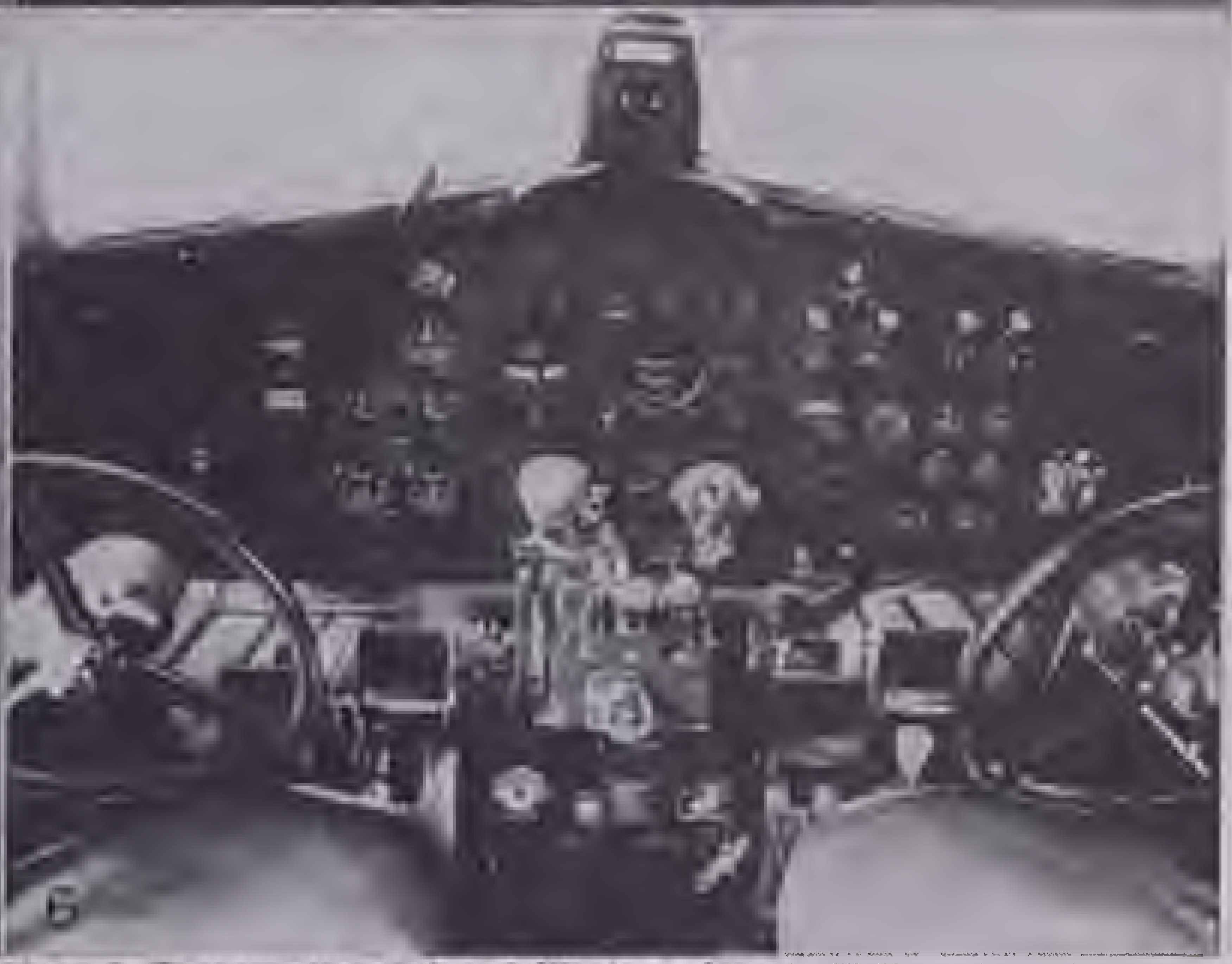
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Courtesy: 1, Pan American Grace Airways; 2, Curtiss-Wright Corporation; 3, Transcontinental and Western Air; 4, Kellett Autogiro Corporation; 5, The Glenn L. Martin Company; 6, Sperry-Gyroscope Company, Inc.

Modern Airplanes

1. Even the formidable Andes Mountains of Chili are no barrier to the powerful modern planes that fly over them on regular schedules.
2. This U.S. Navy seaplane is used for scouting and observation. Military tactics require the finest and most advanced equipment.
3. A transcontinental plane is shown with San Francisco's waterfront and its immense new bridges as background.
4. The newest type of autogiro has no wings whatever. The rotor blades above provide the lift supplied by wings in conventional planes.
5. This flying boat is designed for transoceanic flight. It has a wingspread of 157 feet and can fly 5,000 miles without stopping.
6. The pilot has many dials to watch. Between the control wheels is a gyropilot, which the pilot can switch on to fly the plane automatically.

an hour. The world's altitude record was raised to 41,794 feet by Neuenhofen in Germany. Captain Hawks made a flight from New York to California and return in 36 hours 48 minutes. The year came to a close with the winning by the Curtiss *Tanager* of the $100,000 Prize for the Safe Airplane Competition sponsored by the Guggenheim Foundation for Aeronautics.

The year 1930 was memorable in aeronautics. After a series of flights started more than a year previously, Wing-Commander Charles Kingsford-Smith, of Australia, completed a world flight in the airplane *Southern Cross.*

In July and August, O'Brine and Jackson of St. Louis in the airplane *Robin* set a duration flight record of 657 hours 28½ minutes, breaking a duration record set by the Hunter brothers of Chicago a few weeks earlier. They had remained aloft 553 hours 45 minutes.

In August Capt. Wolfgang von Gronau made an unheralded flight from Germany to New York, stopping at the Faroe Islands, Iceland, Greenland and Nova Scotia.

In the same month Capt. Frank Hawks made two transcontinental records: a flight from New York city to Los Angeles in 14 hours 50 minutes and a return flight over the same course in 12 hours, 25 minutes and 3 seconds.

In September Coste and Bellonte of France, in the red airplane *Question Mark,* made the first nonstop flight from Paris to New York city in 37 hours 18½ minutes.

In November Capt. Roy W. Ammel landed at France Field, Balboa, C.Z., having flown 3,189 miles from Brooklyn, N.Y., to the Panama Canal in 24 hours 35 minutes, the first solo nonstop flight between these points.

On March 6, 1931, Ruth Nichols established a new woman's altitude record of 28,743 feet and on April 13 made a new speed record for women of 210.64 miles per hour. Starting on June 23 Wiley Post and Harold Gatty flew around the world in 8 days, 15 hours and 51 minutes. In this flight the total distance covered was 25,474 miles. On September 4 Maj. James H. Doolittle established a new transcontinental record when he flew from Burbank, Calif., to Newark, N.J., in 11 hours 16 minutes. Lieut. G. H. Stainforth of England established a new speed record for seaplanes when he traveled 406.99 miles per hour. In November Bert Hinkler made the first west-to-east flight across the South Atlantic in about 22 hours.

In 1932 Amelia Earhart flew from Harbor Grace, Newfoundland, to Culmore, Ireland, in 13 hours 30 minutes. This was the first crossing of the Atlantic by a woman flying solo, and Miss Earhart's crossing was the fastest yet made. James Mattern and Bennett Griffin next made the first nonstop flight to Berlin from America, starting on July 6. Taking off from the municipal airport at Los Angeles on August 24, Miss Earhart made the first woman's solo nonstop flight coast-to-coast across the continent. Mrs. Mae Haizlip of St. Louis broke the world's land speed record for women on September 5 when she traveled at a speed of 255.513 miles per hour.

On April 3, 1933, two British planes successfully flew over Mount Everest, the highest peak in the world (29,140 feet). In July Gen. Italo Balbo landed in Chicago with his Italian armada of 24 seaplanes. He left Orbetello, Italy, on July 1 and completed the trip on July 15. On December 19 Col. Charles A. Lindbergh and his wife, Anne Morrow Lindbergh, completed a trip of 29,081 miles, during which they visited 21 countries in four continents. James Mattern flew across the Atlantic from New York to Jomfruland Island, Norway, in 23 hours 55 minutes, during which time he covered 3,600 miles. Wiley Post made the first solo trip around the world in 7 days, 18 hours and 50 minutes. Major Doolittle established a new speed record for 100 miles when he attained a maximum speed of 6 miles per minute. On October 8 Lieut. Guglielmo Cassinelli set a new world's speed record for land planes —393.33 miles per hour.

The American aviation industry suffered a severe blow during 1934 when all the domestic air-mail contracts were canceled as a result of the Black air-mail investigation by the U.S. Senate. The country was without air-mail service for 2 weeks for the first time since the inauguration of the service in 1918. The U.S. Army Air Corps took over the service temporarily and there were more than a dozen crashes that brought death to 12 Army pilots. This unfortunate situation finally resulted in new congressional legislation and the appointment of the Federal Aviation Commission.

In 1935 the flying time required to span the continent was 18 hours and the hop from Chicago to New York took 4 hours. The success of the Curtiss *Condor,* a 12-passenger sleeping plane, induced the Douglas Aircraft Company to design a new craft having sleeping accommodations for 16 persons. The event of greatest interest in 1935 was probably the inauguration of the transoceanic flying service to the Philippines. The Martin flying boat *China Clipper* made the westbound trip of 8,110 miles in 60 hours flying time. Wiley Post also made four unsuccessful attempts to fly from California to New York in the substratosphere. The plane he used, the *Winnie Mae,* was equipped with a special two-stage supercharger for high-altitude flying. Wiley Post came to an untimely end when his plane crashed 15 miles south of Point Barrow, Alaska, on August 15, 1935.

On October 30, 1936, Capt. James A. Mollison landed his low-wing monoplane at Croyden, England, after a flight across the Atlantic from Harbor Grace, Newfoundland. His average speed was 177 miles per hour. Richard Merrill and Harry Richman departed from Southport, England, on September 30 and landed at Musgrave Harbor, Newfoundland, 17 hours 24 minutes after the take-off. By 1938 long-distance flights were taken for granted, although much attention was given the Howard Hughes circumnavigation in July—with elapsed time of a little over 91 hours. Interest in Douglas Corrigan's unscheduled flight from New York to Ireland in July was largely a sentimental one, since Corrigan made the flight without official permission in a 9-year-old plane. British and German planes made transatlantic survey flights in preparation for regular service. The British tests were significant in that they marked the first use of the *pickaback* plane, in which the heavily loaded transatlantic plane was lifted on the back of a large plane from which it took off when a safe altitude was reached.

Pan-American Airways inaugurated a 5-day passenger service over the Pacific starting from San Fransisco and ending at Manila in the Philippines.

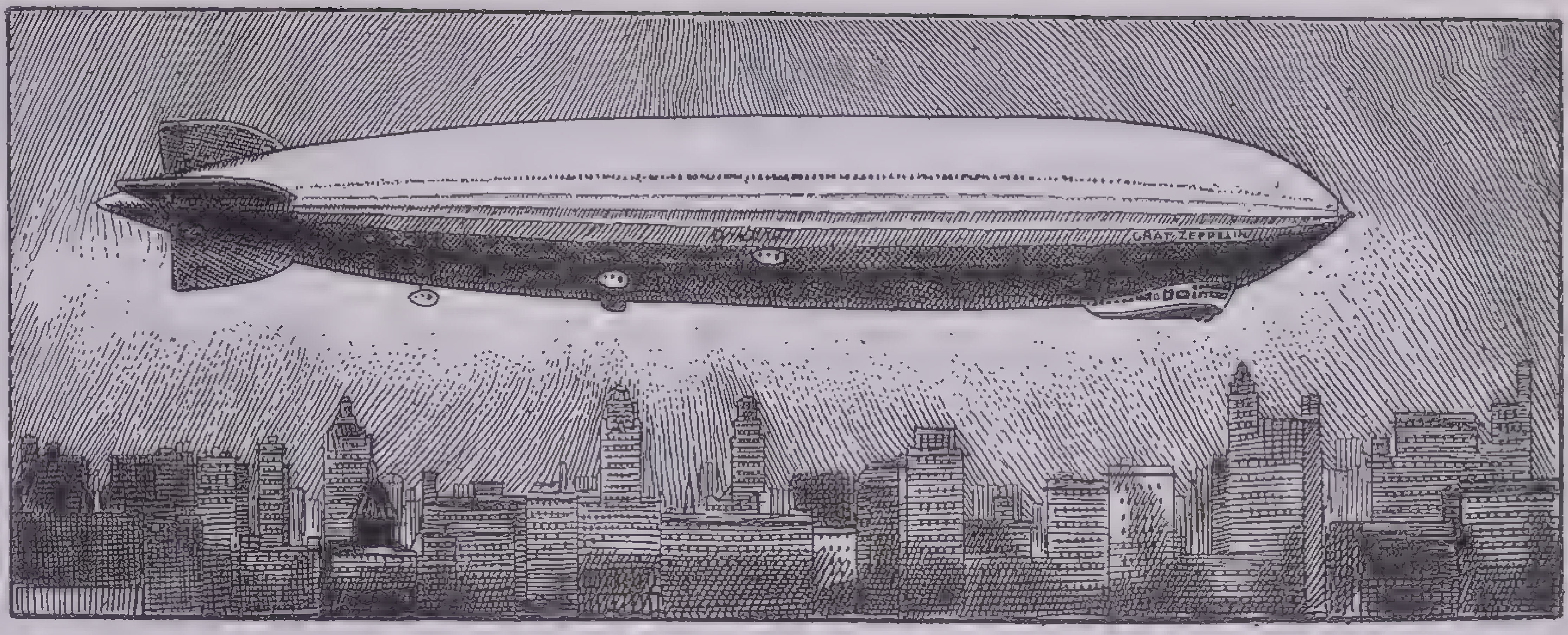
Looking back over the records to 1903, the greatest distance covered in that year by an airplane was 852 feet, or about one-sixth of a mile; in 1937 an airplane made a 6,295 mile nonstop record. In 1903 the duration record was 12 seconds; in 1930, 647 hours 28½ minutes. In 1903 the speed record was 25 miles per hour; in 1938, 440.6 miles per hour. In 1903 the altitude record was 27 feet; in 1938, 51,361 feet.

The present trend is toward large airplanes. The Junkers in Germany and the Fokkers in America carry 32 passengers and heavy additional loads of freight and mail. The *Commodore* flying boats of America carry 20 passengers. The Italian *Caproni 90 P.B.,* a great land plane fitted for use as a bomber, could also be used as a passenger plane carrying approximately 100 persons.

Officials of an American company have authorized a research program to investigate the possibility of flying passengers at a height of 30,000 feet instead of the present 10,000 feet. Flying at this altitude will reduce the air time from Los Angeles to New York to 10 hours, on account of lower air resistance and higher cruising speeds.

Safety in air travel is engaging much attention. The National Advisory Committee for Aeronautics has entered upon a study of the causes of spinning in an attempt to reduce this danger. The Department of Commerce licenses air lines and grants licenses only to those showing satisfactory personnel and equipment. The Bureau of Standards has worked out a system of radio beacons and is studying the flying problems arising in foggy weather.

airship, a lighter-than-air flying machine, depending for lift upon an enclosed volume of light gas. There are three kinds: nonrigid, semirigid and rigid. The rigid type is the most highly developed; it was brought to perfection by Count von Zeppelin of Germany and is called a *Zeppelin* in his honor. Another name for the rigid airship is *dirigible,* which means steerable.



The *Graf Zeppelin*

A notable event of 1929 was the circumnavigation of the globe by the German airship, *Graf Zeppelin*. In many flights this great ship has proved herself

The nonrigid type is represented by the ordinary balloon; it carries passengers in a suspended basket or car; its direction of flight cannot be controlled, for it is at the mercy of air currents. The semirigid airship differs from the ordinary balloon type only in form, which may resemble that of a great sausage, and in the fact that it has a rigid girder in its keel from which the gondola is swung. From this form, through experiment and trial, the rigid type with a full metal framework was perfected. The dirigible alone seems to have commercial value; the other types are used only for sport, experiment and military purposes.

Air has weight, but we do not realize it and are not physically conscious of its presence when it is not in motion. A column of air 1 square inch in area, extending upward from the earth's surface to the limits of atmosphere, weighs about 14.7 pounds.

If air in great quantities could be confined and weighed, it would be found that 30,000 cubic feet at standard atmospheric pressure and temperature of 32° F. would weigh nearly 2,421 pounds. The lightest gas known is hydrogen; 30,000 cubic feet of it would weigh only about 169 pounds at atmospheric pressure and 32° F.

If a large quantity of hydrogen gas were placed in an extremely light receptacle, it would cause the receptacle to rise. The pulling power or lift would be the difference between the combined weight of the gas and receptacle, and the weight of the air displaced; the ship would therefore rise until the air became so rare that its weight would be equal to the weight of the gas and its receptacle. Any considerable load attached to the gas bag can be lifted from the ground, as long as the weight of the entire apparatus is less than that of an equal volume of air.

An airship with great lifting power must be very large, so that it can contain a vast quantity of gas. The form best adapted to navigate the air is one of great length and of comparatively small diameter. Dirigibles are therefore shaped like a mammoth cigar.

The framework of a modern airship is made up of lengthwise girders forming a keel. These not only stiffen the ship but serve to connect and brace a number of ring-shaped vertical members that give form to the skeleton. The material is usually a light but very strong aluminum alloy.

The gas does not fill the whole interior, as in a balloon, but for safety and convenience is contained in a number of metallic or flexible containers. Over the skeleton a covering envelope is spread. The fabric used is heavy cotton weighing nearly 3 pounds to the square yard; this is coated with several applications of acetate or "nitrate dope," mixed with a fine screen of aluminum powder.

Under the great envelope from six to eight motors are hung; they are controlled from a navigator's cabin, which also has compartments for passengers. The propellers attached to the motors bore into the air and move the vast bulk forward. Rudders control direction. With one or two motors idling, to provide control, the ship can remain practically motionless in the air for indefinite time.

The most famous Zeppelins are the *Graf Zeppelin,* the *Akron,* the *Macon,* and the *Hindenburg*. The *Akron,* the *Macon* and the *Hindenburg* are now only ghosts of the past, each having been destroyed disastrously.

German Airships. In 1929 the *Graf Zeppelin* made the first round-the-world flight by a lighter-than-aircraft. The qualities of the ship had been amply proved during a round-trip flight across the Atlantic in the previous year. The world flight began at Friedrichshafen, Germany, on July 31 and ended at the same place on September 4 (total mileage 21,238). The ship was commanded by Dr. Hugo Eckener.

The *Hindenburg* was launched in very convincing style. On the return voyage of her maiden trip across the North Atlantic from Lakehurst to Frankfort her time was about 48 hours. During the summer of 1936 the *Hindenburg* made 10 round trips over the North Atlantic, carrying more than 1,000 passengers and about 18,000 pounds of mail and freight. On May 6, 1937, the ship was destroyed by fire and explosion as it was about to tie up to its mooring mast at the Naval Air Station at Lakehurst, N.J.

American Airships. The United States has owned four rigid ships of the Zeppelin type. These were the *Shenandoah,* the *Los Angeles,* the *Akron* and the *Macon.*

In the history of American aeronautics, the flights and fate of the U.S. Navy dirigible *Shenandoah* are indelibly written. On September 4, 1923, at the Naval Air Station at Lakehurst, N.J., it made its first trip. The flight inaugurated a new epoch in air transportation, for it was the first flight for a rigid ship using the noninflammable gas helium. It had taken 2 years to build this 30-ton ship, at a cost of $2,000,000.

Two years after the *Shenandoah* was launched, it started out on a trip to the Middle West. On the night of September 3, 1925, manned by a crew under Commander Lansdowne, it encountered a terrific storm in Ohio, and the first American airship fell to the earth, a mass of wreckage.

The *Los Angeles* (formerly the *ZR-3*) was built in Germany; it was turned over to the United States as part of the peace agreement at the close of the World War. It was delivered in 1924, a year after the *Shenandoah* was launched, and shared the big hangar with its sister ship. The *Los Angeles* was equipped with all modern conveniences, for its purpose was to carry passengers, not guns. It was in service until 1934 and afterward was used for experimental purposes only.

The *Akron* and the *Macon* were both built at Akron, Ohio. They were the world's largest airships and aroused much public interest. After completing 1,500 flight hours the *Akron* crashed into the sea on April 4, 1933. In like fashion the *Macon* plunged into the Pacific Ocean on Feb. 12, 1935.

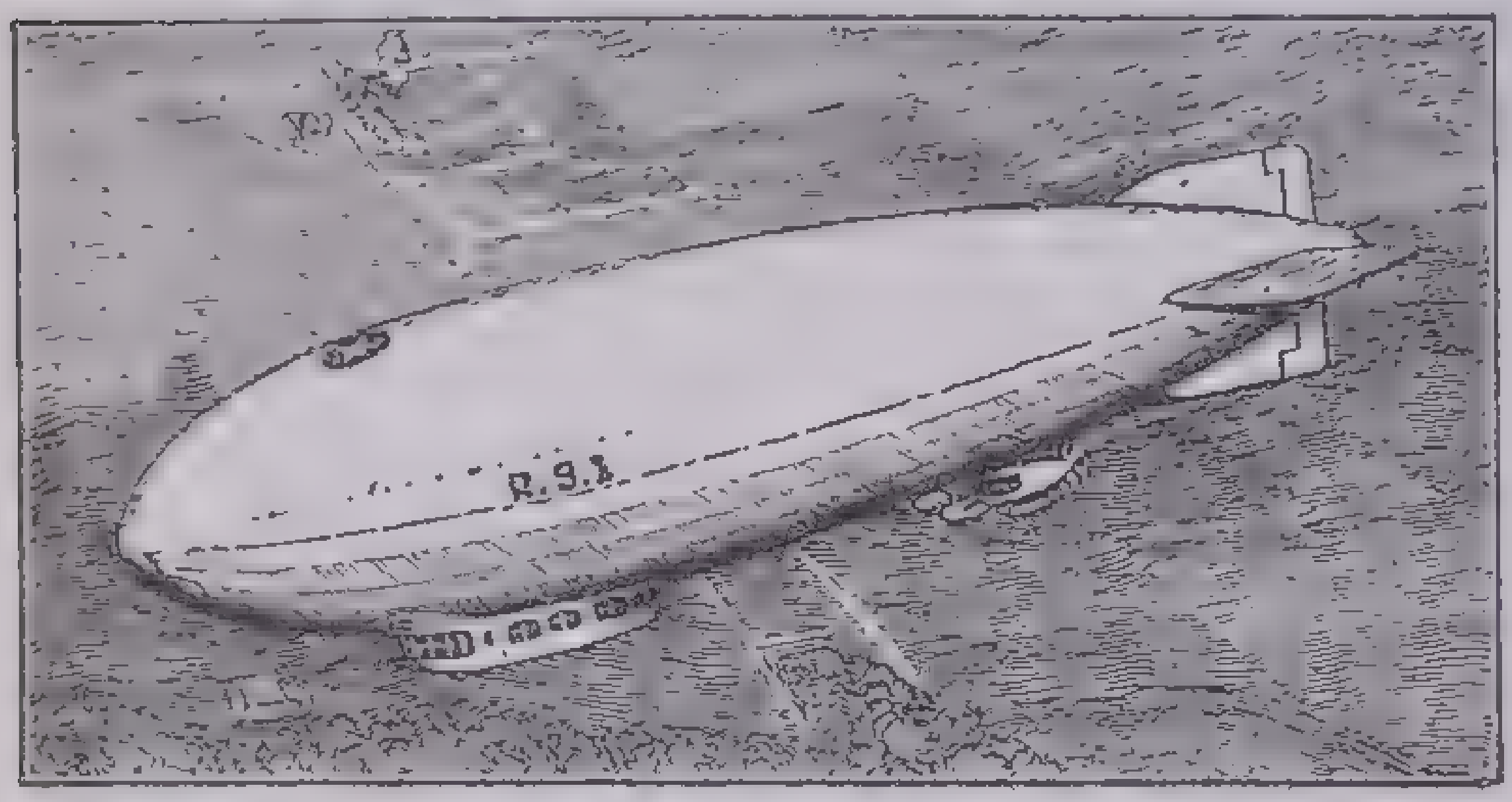
Future of the Airship. In spite of the series of accidents to rigid airships designed in England and the United States, there are some who still retain belief in their practicability. No doubt the spark of hope has been kept alive by the remarkable

THE ZEPPELIN AIRSHIPS

	Graf Zeppelin LZ 127	*Akron*	*Macon*	*Hindenburg LZ 129*
Nominal gas volume, cu. ft.	3,700,000	6,500,000	6,500,000	7,063,000
Length, feet	776	785	785	803.8
Maximum diameter, feet	100	132.9	132.9	135.2
Height over all, feet	132	146.5	146.5	146.7
Gross lift, pounds	258,000	403,000	403,000	472,940
Number of engines	5	8	8	4
Total horsepower	2,750	4,480	4,480	4,400
Maximum speed, m.p.h.	80	84	84	84.4
Range without refueling at cruising speed, miles	6,125	10,580	10,580	8,750

performances of the *L. Z. 127,* the *Graf Zeppelin,* in its numerous trips back and forth across the South Atlantic.

A new German Zeppelin (*LZ-130*) is under contruction. It will be similar to the *Hindenburg* except that helium gas will be used in place of the highly inflammable hydrogen. Although helium has the advantage over hydrogen of being safe, it is more expensive and has only about 92 per cent of the lifting power of hydrogen. The United States controls 99 per cent of the world's supply of helium. It occurs in natural gas wells in Texas. Formerly the policy of the Government was to prohibit the sale of helium to other countries, but this has recently been changed and other nations will now be permitted to use our helium in times of peace.



America's First Semirigid Airship
The *RS-1* represented an early type of American dirigible

alcohol, an organic liquid composed of carbon, oxygen and hydrogen, important in industry as a solvent and as a reagent in many processes. There are many different alcohols, but only three are outstandingly important: the ethyl, methyl and butyl alcohols.

Ethyl alcohol is also called *ethanol* or grain, *industrial* or molasses alcohol. The chemical formula is C_2H_5OH. It is made by fermentation of sugars derived from plants. Sugarcane molasses, formerly a waste by-product in refining sugar, is the chief source, and corn is second in importance, although alcohol can be made from almost any form of plant life. When yeast is added to sugar, it produces alcohol and carbon dioxide. This is the basic principle involved in making ethyl alcohol.

Ethyl alcohol is chiefly used as a solvent. It is also a base in paints and varnishes, a cleaning fluid and is important in the manufacture of plastics. Alcohol is also used extensively in medicines and food, as antifreeze for automobiles (and instead of mercury in thermometers subject to intense cold), as fuel, in munition manufacturing, dyes, artificial silk and photography.

Industrial alcohol is sometimes made synthetically from acetylene, a hydrocarbon generated from calcium chloride. The carbon dioxide that comes off is used to charge soda water, as a preservative, as *dry ice* and in many other ways. The material that remains after the carbon dioxide is removed contains 6 to 10 per cent of alcohol. This is distilled off; the remaining material (called *distillery slop*) is burned and yields potash, an important fertilizer. The gases coming from the furnace are captured and washed and *ammonia* is recovered. Ammonia has many uses, the most important of which is as a fertilizer.

Methyl alcohol or methanol (wood alcohol) is made by dry distillation of wood (1 cord of wood furnishes 8 or 9 gallons of alcohol). In the manufacture of methyl alcohol, certain important by-products are obtained. One of these *methyl acetone,* is used as a paint remover. A mixture of ketones, obtained as a by-product, makes a solvent for lacquers.

Methyl alcohol may be made also from carbon monoxide and hydrogen in a process involving great pressures. This method may eventually displace the distillation of wood. Methyl alcohol is widely used for a fuel, as in internal-combustion engines. It is important as a solvent; but because it is poisonous, other solvents are substituted wherever possible. It is also a useful reagent in such processes as the making of artificial colorings. It is the raw material from which the disinfectant *formaldehyde* is made; in recent years it has been also an essential in the manufacture of plastics.

Butyl alcohol or butanol is made from corn. It has special characteristics that make it extremely good as an element in lacquers.

Absolute alcohol, first produced in 1926, is free from water, which makes up 5 per cent of ordinary alcohol. Commercial absolute alcohol contains not more than 1 per cent water.

For many years ethyl alcohol in the United States was thought of only in connection with its use in alcoholic beverages. Finally in 1906 denatured alcohol (ethyl alcohol mixed with methyl to make it unfit for use as a beverage) was made tax-free. For the first time it was possible for American industry to use alcohol in organic chemistry, although countries like Germany had been doing so for many years.

Until the World War there was no great alcohol industry. All alcohol was a by-product of liquor distilleries. War pressure, however, caused the establishment of an alcohol industry on a proper footing. The war also brought the other alcohols into use. Before that time, only ethyl alcohol had been of any importance; the others were merely laboratory specimens.

alcoholic beverages, liquids obtained from many different raw materials by one of three methods: natural fermentation, distilling or brewing.

Fermented Beverages. Most wine is obtained by allowing grape juice to ferment naturally. The fermentation is caused by very small fungi present on the skins of ripe grapes. These fungi provide a natural yeast that combines with the sugar in the grapes, ferments and produces alcohol. Light wines have 9 to 12 per cent alcohol (by volume); heavy wines, 18 per cent; fortified wines, 25 per cent.

The many different kinds of wine vary in color from light yellow to deep red. White grapes produce the lighter-colored wines, while red grapes yield red wines. Wines range through many degrees from very tart (called *dry*) to very sweet. A difference in the sweetness of the grapes accounts for the variation.

During the fermentation carbon dioxide is produced. If wine completes its fermentation process before bottling, all the gas escapes and a *still* wine is the result; if the wine is bottled before fermentation is complete, some gas remains in the wine, and a sparkling or bubbling wine is produced. Any type of grape will make sparkling wine, but usually only the better grades are used. The most famous of all sparkling wines is the world-famous Champagne from the Champagne district of France (Department of Marne), where sparkling wines were first produced.

Some wines are fortified; that is, brandy and spirits are added to increase the alcoholic content and make the wine stronger. Many of the wines of southern France, Spain and Italy are of this type. One of the most famous is Muscatel, made from the Muscat grape, to which brandy or spirits is usually added. If a fortified wine is of a good grade, only brandy or spirits distilled from grapes is used.

France is by far the greatest producer of wine, with an annual output of around a billion gallons. The finest and most famous French wines are those produced around Bordeaux, Dijon and Burgundy and in the Champagne district.

Chianti is one of the most widely known of Italian wines. Spain is famous for Sherry, Malaga and Tarragona. Port wine, a native of Portugal, is a sweet fortified wine that enters world commerce at Oporto and so is called *port.* Germany's best wines are white, and the most famous varieties are produced in the Rhineland area and along the Moselle Valley.

In the United States, California and New York are the principal producers. The output is not large as compared to that of France but is increasing rapidly. Most of the vineyards are operated by people who received their training in the leading European centers.

Distilled Beverages. Many alcoholic beverages are produced by distillation, some from grains or potatoes and others from fermented grape juice. All distilled beverages have a high alcoholic content, varying from 25 to 50 per cent or more by volume. Some of the most widely known distilled beverages are brandy, whisky, gin and vodka.

Brandy (originally *brandywine,* burnt or distilled wine) is produced by distilling fermented grape juice. It is usually a pale amber color and has a very high alcoholic content, 40 to 70 per cent by volume. The color is imparted to the brandy by the wooden casks in which it is stored for aging after distillation. Brandies made from the juice of cherries, apples or some other fruit by a similar method are not, strictly speaking, brandies. Cognac is a brandy named for the district in France where it is made.

Whisky (Gaelic, *usquebaugh,* water

of life) is made from rye, barley, corn or potatoes. The grain is boiled until it forms a mash, to which malt is added. Malt is grain, usually barley, softened in water until it sprouts. The sprouting converts the starch content into sugar. The mixture of the malt and mash stands until the sugars are converted into alcohol. The alcohol is then separated from the mixture by distillation. Whisky is an intoxicating beverage of high alcoholic content, usually 48 to 54 per cent by volume and sometimes 75 per cent.

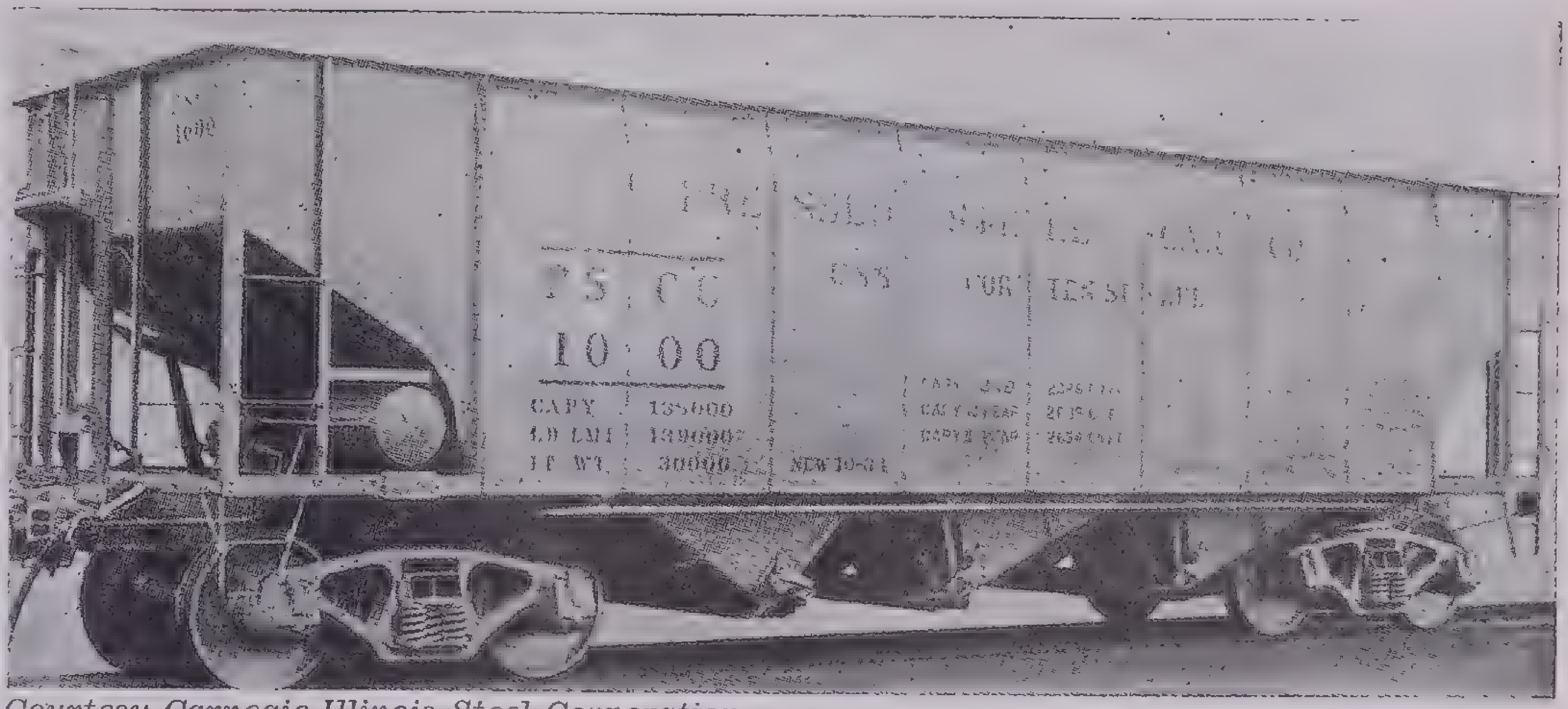
Gin is made from grains, usually barley, by a distillation process. Juniper oil for flavoring is added to the colorless liquid. In some parts of the world other flavorings are used—almond, orris root, cassia or some other aromatic substance. Gin usually has an alcoholic content of 25 to 48 per cent; but much so-called gin is not distilled but a mixture of raw spirits with water and flavoring.

Vodka was the national beverage of Russia. It is a drink of high alcoholic content (sometimes as much as 70 per cent), made from potatoes or corn mixed with green rye malt. In the old days barley malt was used and rye was the cereal.

Brewed Beverages. These, known also as malt beverages, are made by fermenting crushed cereals. The raw materials are malt, water and hops. The malt is prepared usually from barley, and frequently barleys from several different areas are blended. This malt is boiled with hops and fermented with yeast. A model brewery is careful to preserve cleanliness and purity. The chemical reactions that take place during the manufacturing process are so subtle that carelessness or ignorance may produce an inferior product or one injurious to the consumer.

The difference between the various malt beverages is largely one of alcoholic content brought about in the manufacturing process. *Lager beer* is one of the most common of the malt beverages in the United States. Lager means bed or storehouse; this beer is stored for several months to ripen and mellow. *Ale,* the national drink of England, is of higher alcoholic content and lighter in color than lager beer. *Porter* is a dark strong ale. *Stout* is a very strong porter, higher in alcoholic content than any other malt beverage.

alloy, a mixture of different metals by fusion. In recent years alloys have grown to supreme importance, and today we are using more alloys than simple metals. Such alloys as brass and bronze have been known for centuries, but the discovery of iron and steel alloys gave tremendous impetus to industry. The modern automobile, for instance, could never have been developed without them. Alloys of aluminum are constantly finding wider uses and may some day be as important as the ferrous alloys.



Courtesy Carnegie-Illinois Steel Corporation

Not an Ordinary Freight Car

Because this car is built of special alloy steels, it is as strong as the old kinds but 11,500 pounds lighter. The side sheets are only 3/32 of an inch thick. They and the bottom sheets are only half as thick as in old models

An actual example of the value of alloys is this: In 1928 the average recovery of gasoline from petroleum was a little over 41 per cent. The cracking process was discovered, and by that more than 60 per cent of the gasoline could be recovered. This method could never have been put to use if tubes and other parts of the equipment were made of plain steel, which could not stand the high heat and pressure involved. A chrome-nickel alloy easily resists these forces.

There are many hundreds of ferroalloys, each designed for a particular use, with the emphasis on such varied qualities as strength, toughness, rigidity and hardness. If an alloy rod 1 inch thick is as strong as a plain steel rod 2 inches thick, it is obvious that the alloy is better, because of the saving of weight and material. If an alloy steel is harder than plain steel, it can be used to cut plain steel. In fact, one alloy leads to another. After a hard or tough alloy steel is developed, it is of no use until a harder and tougher steel can be produced to cut it.

A small amount of *chromium,* 1 to 2 per cent, added to steel gives the steel great hardness. This steel is used for tools such as chisels, axes, hammers, projectiles, dies for crushing ores and the like. More chromium, 12 to 14 per cent, makes stainless steel (because it always has a thin impenetrable film of chromium oxide on the surface) which is useful for cutlery, surgical instruments and turbine blades. Such steel is unharmed by as much as 6 months' immersion in sea water.

The addition of less than 7 per cent of *manganese* makes steel so brittle that it can be powdered with a hammer; but above that percentage brittleness disappears and the steel is hard and tough to a degree incredible to early experimenters. Manganese steel is used for railroad rails and switches, crusher parts, rifle barrels, axles and the like.

Molybdenum with steel makes a very hard alloy, useful for high-speed cutting tools. It is very magnetic and resists heat so well that it is used for such purposes as making boiler tubes.

Nickel is combined with steel in a wide variety of alloys. At first it was used only for armor plate because it is hard and tough. Nowadays a 3 per cent alloy of nickel with steel is used for gears, drive shafts, axles and bolts; 5 per cent, for connecting rods, gears, bullet-proof plates; 22 per cent, for noncorrosive alloy for parts in contact with sea water. A 36 per cent nickel alloy with steel is called *invar.* It expands very little with heat (none at all after it is heated above 200° C.) and so is ideal for balance wheels in watches, tape measures and many instruments. Official standards of length are often made of invar. With 46 per cent of nickel the steel alloy is called *platinite.* It has the same coefficient of expansion as glass and so can be used as the lead-in wire in electric bulbs. Formerly the expensive platinum was the only satisfactory metal known for this purpose. With 78 per cent nickel the alloy is *permalloy,* which is highly magnetic and is widely used in telephone equipment.

Tungsten in amounts up to 4 per cent added to steel makes a very hard steel used for cutting tools; with slightly more tungsten the alloy makes fine magnets. The addition of 15-18 per cent tungsten to steel makes a metal suitable for cutting tools that will cut at extremely high speeds. Other alloys combine one or more of these ingredients. Examples are chrome-vanadium steel and nickel-chrome. All of them have special uses. Other metals used for alloys with steel are cobalt, copper, aluminum, titanium and silicon.

The lightness of *aluminum* makes it attractive to machine designers, but its softness and lack of strength are drawbacks. Many aluminum alloys, however, are finding places for themselves in industry. With a 5 per cent mixture of silicon (or sometimes zinc or copper) it makes a harder and stronger material for casting than pure aluminum. The addition of copper up to 4 per cent gives an aluminum alloy much used for crankcases and the like. One such alloy with the trade name *duralumin* is composed of 95½ parts of aluminum, 3 parts of copper, 1 part of manganese and ½ part of magnesium. A copper-aluminum alloy is used to make airplane propellers; a silicon-aluminum alloy is widely used to make light, strong pistons. Unfortunately aluminum alloys corrode but not if they are plated with a thin film of pure aluminum. Such a plating is called *alclad* (a trade name). An entire dirigible was made of this material; it was gas-tight and sufficiently strong, although the metal was only 1/100 of an inch thick.

Other alloys, of softer metals, are *solder*, which is two-thirds lead and one-third tin; and *type metal,* composed of lead with 20 per cent of antimony.

aluminum, a metallic element, chemically active, light in weight, silvery in color, resistant to erosion and food acids, a good conductor of electricity. It is the most abundant of all metals, being found in clay, slate, marl, granite and hundreds of other minerals; it makes up a very large proportion of the earth's crust (almost 8 per cent) but is difficult to extract.

In order to be classed as *ore*, rock in which there is aluminum should be at least 50 per cent *alumina* (aluminum oxide). The most common ore of aluminum is *bauxite*, a whitish-gray clay, mainly aluminum hydroxide; as found in nature more than half of it is alumina. Bauxite was named for the town of Baux in southern France where there are huge deposits of the mineral—enough to last for 200 years at the present rate of use. France leads the world in bauxite production. There are deposits also in British and in Dutch Guiana, Italy, Yugoslavia and the Gold Coast of Africa. By far the most important bauxite deposit in the United States is in central Arkansas, which state produces 96 per cent of the ore mined in the United States.

Metallic aluminum is also found in *cryolite,* a sodium-aluminum fluorite that occurs only in Greenland; but the main value of cryolite is as a flux to help melt alumina. *Corundum* (a form of native alumina in crystals, masses and grains) is the hardest mineral except the diamond. Emery, its granular form, is used as an abrasive. Precious stones—sapphire, ruby, amethyst, emerald—are the pure, transparent, crystallized corundum, differentiated according to the oxides that color it. The less precious stones —topaz, turquoise and lapis lazuli— are mostly aluminum oxide.

Aluminum compounds with silicon include mica, fuller's earth, feldspar, the fine clay called *kaolin* used in making porcelain, and all the other clays used in brick, tile and stoneware. Aluminum sulphate (concentrated *alum*) is widely used to purify water, size paper and tan skins and also in dyes. *Corundum* and *alundum,* artificial oxides of aluminum, are abrasive materials and are used for making laboratory crucibles. *Thermit,* a mixture of granulated or powdered aluminum with iron oxide, is valuable in welding—when the active element, aluminum, is heated, it takes oxygen away from the iron oxide and forms aluminum oxide, leaving pure iron in a melted form that fills in cracks and fuses the two ends to be welded.

Practically all aluminum is obtained from bauxite. The manufacturing process involves a purification of the ore to almost pure alumina (aluminum oxide) and the conversion of this alumina into the metal aluminum.

The ore is first crushed, washed and baked to remove moisture and some of the impurities. It is then screened and is ready for concentration to separate the alumina. The most common method is to mix the bauxite with a solution of sodium hydroxide. This dissolves all the impurities and leaves a fine crystalline powder, aluminum oxide or alumina.

Metallic aluminum is taken from the concentrated alumina by electrolysis. The cells in which this is done are large—8 feet long, 5 feet wide and 2 feet high. As many as 40 such cells are connected as a battery. They are lined with pure carbon to serve as cathodes. Cryolite, the flux, is first melted by the passage of the electric current, and then alumina is added. Pure aluminum melts out and goes to the bottom of the cell, from which it is drawn off, and oxygen goes to the anode. Two pounds of alumina are required to obtain 1 pound of aluminum. Although in theory the cryolite should not be used up, a small amount of it does go off with the aluminum and must be replaced.

Because of the large amounts of electricity required for this process, reduction plants are usually located where such power is available. In the United States there are plants at Niagara Falls and Massena, N.Y.; Alcoa (a name coined from an abbreviation for Aluminum Co. of America), Tenn.; and Badin, N.C.

One of the most valuable properties of aluminum is its lightness. A cubic foot of aluminum weighs only a little more than one-third as much as a cubic foot of steel. Although 50 per cent of all aluminum is used in castings, the pure metal is never used because it is too expensive and too soft. It is combined with other metals to form light-weight alloys: *duralumin,* which has the hardness that aluminum lacks, is a trade-named alloy of 95½ parts of aluminum, with 3 parts of copper, 1 of manganese and ½ of magnesium; and *magnalium,* an alloy of aluminum and magnesium, is used for airplane and auto parts. Aluminum bronze and aluminum gold are alloys with varying quantities of copper that produce different colors; these and an aluminum bronze with a little silver added (aluminum silver) are used for decorative articles, marine fittings, journal bearings, and the like.

About two-thirds of all the aluminum produced in this country is used by some branch of the transportation industry (notably airplanes and automobiles), the electrical industry or for cooking utensils. Aluminum wire is displacing copper in some high-voltage electric wiring. Aluminum paint is particularly good for metalwork, as it is heat-resistant and noncorrosive. Aluminum competes with tin and lead in the manufacture of collapsible tubes, and aluminum foil competes with tinfoil as a wrapper for candy, other foods and tobacco. Aluminum is used for reducing chromium and other expensive metals from their ores, the reaction being much the same as in thermit welding. The activity of the element makes it a valuable purifier of steel: it prevents the formation of bubbles in the steel by combining with gases formed during the process of steel manufacture.

The United States leads in the production of aluminum, with an annual output of 60,000 tons out of a world total of 283,000 tons. The proportion produced in the United States is not nearly so great as it was a few years ago; though the output here has increased rapidly, production abroad, particularly in Germany, Russia and Switzerland, has gone ahead even faster.

ammeters and **voltmeters,** instruments for measuring the strength and force, respectively, of an electric current. The working parts of most ammeters and voltmeters are identical. Since in any direct current circuit the current is equal to the voltage divided by the resistance, there is in an instrument having a fixed resistance a definite value of voltage corresponding to each value of current.

Most voltmeters and ammeters depend for their operation upon the fact that a magnetic field is set up whenever an electric current flows through a conductor. This conductor usually consists of a long wire wound into the form of a coil. When current is sent through the coil, a magnetic field is set up in the center of it. The strength of the field is proportional to the current flowing in the wire. Whenever a piece of iron is introduced into such a coil, magnetic force tends to draw it to the center of the coil, much as a magnet acts upon a piece of iron.

In some inexpensive instruments an iron plunger is fixed on a pivot so that it can swing into the coil. It carries a pointer that moves across the scale. A spring is arranged in such a way as to oppose this movement. When a current flows in the coil, the iron plunger enters the coil until the magnetic pull upon it is just balanced by the resisting force of the spring. Thus for every value of current flowing there is a corresponding position of the iron plunger and the pointer carried thereby.

In making the instrument, if currents of known values are passed through the coil, the corresponding positions of the pointer may be marked in amperes. Such an instrument is called an *ammeter*. In the same way, if *voltages* of known values are passed through the coil and the scale marked in volts, the instrument is a *voltmeter*. By combining these instruments with other devices in electrical circuits, they can be made to indicate temperature, pressure, speed, displacement and many other quantities.

The better types of ammeters and voltmeters operate on another principle: if a conductor carrying an electric current is placed perpendicular to a magnetic field, a force is exerted upon the conductor. In direct current instruments, the magnetic field is provided by a strong permanent magnet mounted solidly in the case of the instrument. A coil of small wire wound on a frame carrying the pointer is mounted on a pivot, so that it can turn through a magnetic field against the reaction of a thin coiled spring. These instruments are called *d'Arsonval instruments.* Their accuracy is very high, and the current required to actuate them is very small. When they are used to measure heavy currents, they are not placed directly in the circuit; a small current is bypassed to them, nevertheless the reading is accurate.

Such instruments cannot measure alternating currents and voltages. Since alternating currents flow first in one direction and then in the other, the forces on the coil act alternately in both directions, and a reading could not be taken; however, if the direction of the magnetic field is reversed at the same instant that the current through the coil reverses, the deflecting force is always in the same direction, and its value is proportional to the current flowing. This is done by substituting a coil for the permanent magnet of the d'Arsonval instrument. Because the field is produced electromagnetically and the coil producing it carries the same current as that in the deflecting coil, the desired result is attained. This is called the *dynomometer-type instrument.* It can be used on direct current as well as on alternating current, the direct current being merely the special case of an alternating current whose frequency is zero; but its accuracy is not so high as that of the d'Arsonval instrument.

Many current-indicating instruments are based on the fact that a current passing through a wire heats the wire. Such instruments are called *hot-wire meters.* Earlier forms took advantage of the fact that a wire expands when it is heated. Thus if a wire is stretched tight when it is cold between two points, it sags when it is heated by a current. The middle of the wire is linked mechanically to a pointer. Such an instrument is not highly accurate.

Another type of hot-wire instrument that is coming into widespread use at present is a combination of a heating element and a thermocouple. A thermocouple consists of two different metals, usually a copper wire and a constantin (nickel-copper alloy) wire, joined together. If the junction of the wires is at a higher temperature than their other ends, an electromotive force is produced. In this type of instrument the heater and the junction are mounted close together, a sensitive voltmeter is connected to the thermocouple, and the scale of the instrument is calibrated in amperes flowing in the heater circuit. Hot-wire instruments are particularly useful in measuring currents in high-frequency circuits because they have low inductance; the inductance of dynamometer-type instruments interferes with their accuracy at high frequencies.

One of the most accurate ways of measuring voltage is by means of a *potentiometer.* In its simplest form, the potentiometer is a straight piece of resistance wire connected to a source of constant electromotive force, such as a battery, with a sliding contact that can make connection at any point along the wire. The current decreases in potential uniformly along the length of the wire. The device whose voltage it is desired to determine, such as a battery, is connected between one end of the wire and the slider in series with a sensitive instrument of the d'Arsonval type. The slider is moved along the wire until the instrument reads zero, which indicates that the potential drop of the wire is just equal to the electromotive force of the source of voltage. The length of wire between the slider and terminal is measured.

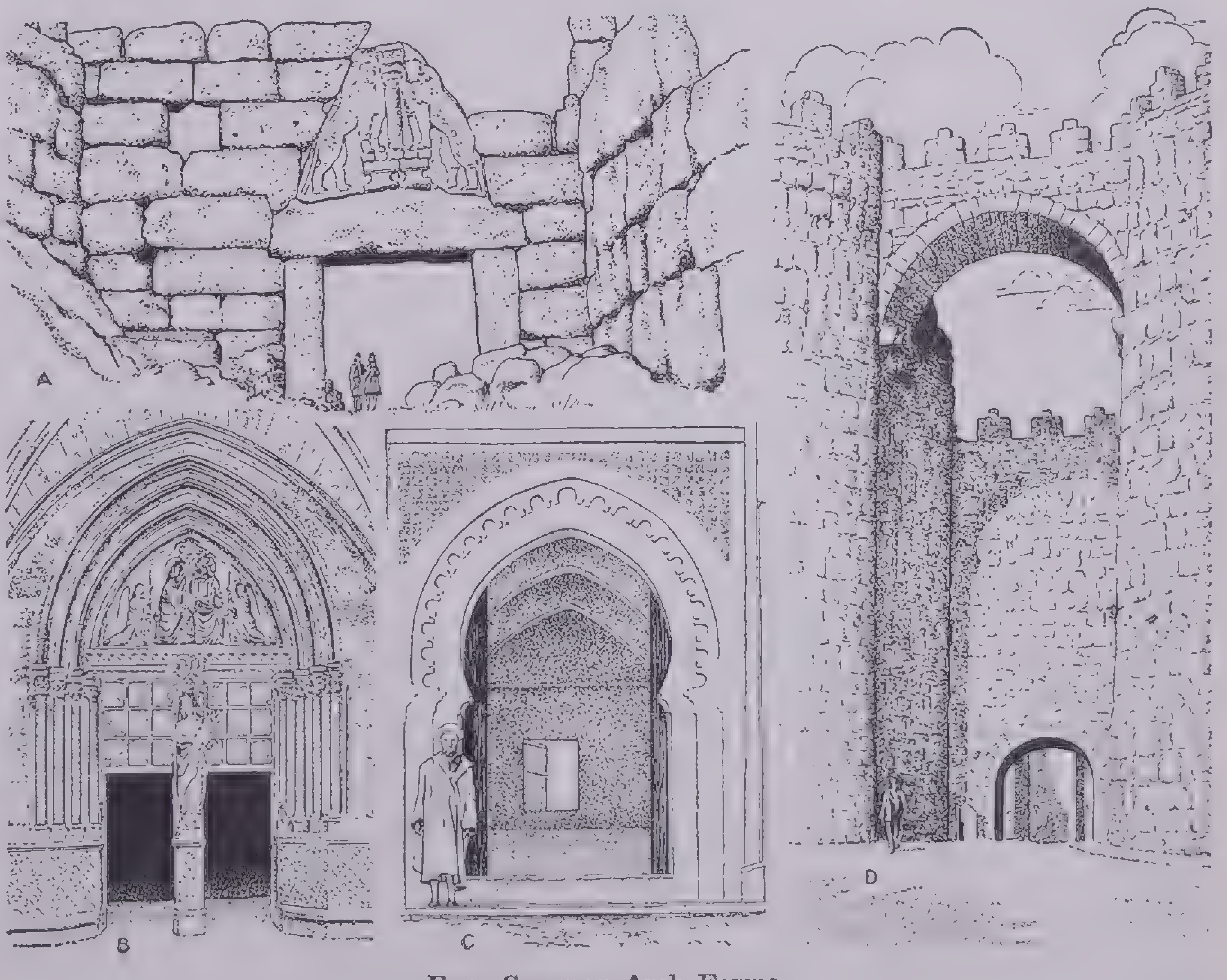
Next a battery whose electromotive force is known is substituted for the source of unknown voltage and the procedure is repeated. The unknown voltage can then be calculated by simple proportion, the ratio between the unknown voltage and that of the standard cell being equal to that between the two lengths of wire needed to balance the voltages. As very sensitive instruments for use in circuits such as this are available, and the voltages of standard cells are known to a high degree of accuracy, this provides an extremely accurate method of measuring potentials. In practice a set of carefully standardized resistances that can be set in different combinations by means of dial contacts is usually used in place of the long wire. This makes the potentiometer easier to use and eliminates the inaccuracy involved in producing very exact lengths of the straight wire.

ammonia, a gas (NH_3) that finds wide industrial use not only by itself but also as a carrier of nitrogen, placing that valuable element in a soluble, hence usable form. In bygone days ammonia was obtained by distilling the horns and hoofs of animals and was called *spirits of hartshorn.* Nowadays it is produced as a by-product of coke manufacture, in the manufacture of ethyl alcohol and in the nitrogen fixation process whereby nitrogen is extracted from air.

Commercially ammonia appears in water solution or as ammonium sulphate. In the latter form it is extensively used as a fertilizer for the sake of the nitrogen content. When ammonia is used other than as a source of nitrogen, it is valuable as a cleaner and in mechanical refrigeration.

arch, a structure composed of separate wedge-shaped blocks, arranged in a curve and depending for support upon mutual pressure. It is used to span openings in buildings, support roofs, bridges and conduits. The arch is very old and was probably first discovered by some member of a primitive race in leaning together two flat stones so as to form an inverted V, a thing that is rediscovered by every child while playing with blocks. Although such a triangular arch is still used to some extent, it has almost entirely been replaced by curved arches of greater strength and beauty, some of the designs still in use having been worked out as early as 4000 B.C. by both the Egyptians and Chinese.

The component parts of an arch are the supports, which may be the wall itself, piers or columns; the imposts or capstones upon which it rests; and the voussoirs or wedge-shaped blocks that



Four Common Arch Forms

A. Primitive post-and-lintel: Gate of the Lions, entrance to the Acropolis, Mycenae, Greece; *B.* Pointed Gothic: doorway, La Sainte-Chapelle, Paris; *C.* Moorish lancet: Entrance to the Casbah, Algiers; *D.* Round arch: doorway, San Vicente Gate, Avila, Spain form the curve. Special terms are used to designate the different voussoirs: the lowest one on each side is known as the springer; those forming the remainder of the sides, the haunches; and finally, the single voussoir at the top or crown is known as the keystone, since its removal will usually result in the collapse of the arch.

Inasmuch as the arch is not self-supporting until actually completed, it is necessary to provide a supporting structure during construction. This usually consists of a wood or steel framework or form and is removed as soon as the mortar or concrete has hardened or the last rivet has been put in place.

The arch is often used as a memorial, such as the triumphal arch, which is usually constructed in an open square or street. Usually it commemorates victory in war. Such an arch may be of a temporary type of construction and removed as soon as the celebration is over or it may remain as a permanent monument. Some of the earliest triumphal arches that still remain are in China and Siam; they were constructed before the dawn of the Christian era. At a somewhat later date, such arches were built in Egypt, then in Rome and so on down to the present time in England, France, Germany and other European countries as well as in our own.

artesian well, any well drilled deep enough to penetrate the layers of rock in the earth's crust. Originally the term applied only to wells from which water spouted or flowed freely without the aid of pumps. The word *artesian* comes from the name of a French town, Artois, where such wells were first sunk.

The geological formation necessary for an artesian well consists of an inclined layer of sand or other porous material that lies between two other layers that are impervious to water, such as clay or rock. Under such conditions, if the porous layer is exposed to either surface or underground sources of water, it becomes saturated, and a hydrostatic pressure will be set up at all points lower in the layer than the source of water. This pressure will be proportional to the difference in elevation of the point and the source, amounting to about 10 pounds per square inch for each 23 feet of difference in elevation.

The most striking effect of this is that if a well is drilled so as to penetrate the porous layer below the source, water will actually spout from the mouth of the well, provided that the mouth is also appreciably lower than the source. When the difference in elevation is small or when the mouth is actually higher than the source, it is necessary to install pumps, either to increase the flow or to secure any water at all.

Artesian wells have existed for centuries in many parts of the world, supplying water for domestic and industrial uses and for irrigation. Some are as much as 3,000 feet deep. In general the water from these deep wells is found to be relatively free from bacteria; but it often contains large amounts of dissolved mineral matter or gases, such as hydrogen sulphide and carbon dioxide. The temperature of the water increases with the depth of the well, ranging from about 40° to 80° F. These temperatures have been found fairly reliable indications of the temperature of the earth's crust at the different depths.

Recent droughts have led to many surveys in some states to determine the extent and availability of the subterranean water in this country.

asbestos, a fibrous mineral, extremely useful because of its resistance to heat and acids and its insulating qualities. Asbestos is used chiefly to conserve heat, usually in the form of a covering for steam pipes and the like. It is valuable also in fireproofing theater curtains, firemen's suits and building materials, as packing for refrigerators, for soundproofing and antifriction linings and leakproof packings, as in valves.

The name *asbestos* is from a Greek word meaning unquenchable. It derives from an old Greek legend about a rock that once set afire could not be extinguished. Asbestos has been known to man for many centuries; it is mentioned by Plutarch and Pliny as being material for lampwicks and cremation shrouds.

Chemically asbestos is a silicate of either calcium or magnesium or both. It occurs in narrow veins and is usually green or brown, but the fibers, when they are separated, are pure white. Sometimes it is found in thick matted sheets and is then known as *mountain leather* or *mountain cork*. In that form it was formerly thought to be the fossilized hide of prehistoric animals. Most commercial asbestos is a hydrous magnesium silicate called *crysotile*.

Since long fibers are desirable, the raw mass is separated without crushing, usually by air blasts. The fibers are smooth and hard, like fine polished wires, and spinning is difficult; but they are carded or combed much like wool or cotton, and yarn is made from them and woven into a fabric. The thread is sometimes combined with brass wire, rubber or paper. Mixed with powdered cement, asbestos makes wallboard, shingles and tiles.

Domestic production of asbestos is only 9,400 tons a year, mostly from Vermont, but some from Arizona. Most of the 166,500 tons imported every year comes from Canada, but Russia supplies a part of it. Other deposits are in Rhodesia, the Union of South Africa and Cyprus.

asphalt, solid or semisolid bitumen, a mixture of hydrocarbons occurring as a dark sticky residue from partially evaporated or partially refined petroleum.

Most asphalt (over 80 per cent) is obtained from petroleum refineries, though it is also found in a natural state—notably in the 100-acre natural asphalt lake on the island of Trinidad in the West Indies.

About half of all asphalt produced is used for road building. It binds together the stone and sand used in surfacing. Nearly one-third of the asphalt supply is used for roofing material. It is valuable also for floor coverings, sealing compounds, paints and varnishes and as insulation.

autogyro, a heavier-than-air flying machine in which an engine and propeller provide forward motion, and semi-horizontal rotating vanes supply lift. The autogyro resembles a standard airplane only in that it has a fuselage, landing gear, engine and propeller. The wings are either very short or nonexistent.

A perpendicular post above the fuselage supports three or four long, narrow vanes, called *airfoils,* which revolve horizontally. The cross-section of an airfoil resembles that of a conventional airplane's wing. The airfoils rotate around the post either freely or under power from the engine. The latest type has no wings, ailerons or rudder; it is controlled by tilting the vane assembly.

The advantages of the autogyro over the airplane is that it does not require a runway; it can take off after a run of only a few feet and lands almost perpendicularly. At the take-off the vanes are turned by engine power; since each vane, as it rotates, acts much like an airplane wing and exerts lifting force, the autogyro rises. Once in the air the motor is disconnected and the vanes continue to rotate by wind pressure. When landing, the pilot can stop the forward motion of the craft, but it will descend slowly since the vanes are still rotating and supplying lift. With the motor stopped the autogyro will descend slower than a parachute.

The autogyro is the invention of a Spaniard, Juan de la Cierva; the first successful flight was made in 1923. In its present state of development the autogyro is much slower than the airplane; it has yet to reach a speed of 200 miles an hour. Its weight-carrying ability is low. It can compete with the airplane only in reaching places where an airplane could not land.

automobile, a self-propelled usually four-wheeled vehicle not confined to tracks. The word originally was not a noun, but a French adjective meaning self-movable, and the words *motor car, truck* and *motor truck* are gradually supplanting it, particularly in America.

There are two main parts of every motor car—the *chassis* and the *body*. The chassis includes the steel framework on which the body rests and all the machinery and wheels. The body is the enclosed or partly enclosed upper structure having seats for passengers or space for freight. Regardless of the variety of models an automobile factory may produce, the same chassis usually serves for all body styles in a particular price class. For the different classes, the chassis vary in length by the distance (*wheelbase*) between the centers of front and rear wheels.

Assembled in small space in a modern car are features that rival the products of Aladdin's lamp. A relatively small motor with from 4 to 16 cylinders furnishes power to drive the average car, weighing from 1,200 pounds to more than 2 tons, at a sustained speed of more than 1 mile a minute; modern brakes can bring the car to a stop within a few yards. Every car contains an electric-light system and usually a heating system for winter driving. Its air-filled rubber and fabric tires eliminate the discomforts of driving over uneven roadways. For a few hundred dollars any family may enjoy automobile comforts that no king could have commanded a quarter century ago.

The internal-combustion engine is the heart of the car. Its fuel, gasoline, is reduced to a vapor and mixed with air in a *carburetor,* from which it is sprayed to each of the several cylinders by suction of the pistons. In the head of each cylinder the gas is ignited by a spark. In burning, the gas vapor expands greatly, with a pressure so powerful that the pistons are moved up and down with a speed proportionate to the amount of vapor received. The pistons are attached to a crank shaft that communicates power to an intricate device known as the *transmission;* this leads to the rear axle and thence to the wheels (the rear wheels, in all except two types of cars). The intense heat developed in the motor is removed by water circulated around the cylinders from the radiator at the extreme forward end of the car.

The rear axle is not in one piece but in two sections, each fastened solidly to one rear wheel. Between the inner ends of the two sections is a device known as a *differential,* consisting of a series of *bevel gears* separated by *cone gears.* This mechanism permits one wheel to revolve faster than the other, a necessity when the car is turned, for the wheel at the outside of the curve has a greater distance to travel.

A system of selective gearing permits the operator to apply much power at the expense of speed, as in starting the car from rest; or to throw other gears in mesh, which permits greater speed at the expense of power, after the car has gained momentum. When the car is standing still, the motor need not be stopped, for the gears may be thrown out of mesh.

A device called a *clutch* connects and disconnects the motor from the driving mechanism. It is a series of two or more plates that, when pressed together by a spring, will transmit motion. Part of the plates are attached to the engine and part to the drive shaft.

To suit individual tastes as many as a dozen different styles of body designs are offered to the public. A *runabout* or *roadster* is a single-seated car with a fabric top that may be raised or lowered; a *coupé* (other names also are applied to this type) is a single-seated, enclosed car; a *coach* is wholly enclosed, has two seats, but only one door on each side; a *phaeton* (formerly known as a *touring car*) is a two-seated car, with a fabric top capable of being raised or lowered; a *sedan* has a covered body, two seats and two doors on each side. All other designs are variations of these types.

There are now more than 40 million motor cars in the world. The United States alone has 24 million passenger cars, over 4 million trucks, nearly 100,000 motorcycles and close to a million trailers. France has 2¼ million; England, nearly 2 million; Germany, 1⅓ million; Canada, 1¼ million; Australia, 690,000; Italy, 415,000; Russia, 356,000. No other country has as many as 300,000. The United States makes more than three-quarters of all cars.

During the past few years passenger comfort has been emphasized in automotive design. Compartments have been enlarged to make roomier seats; knee-action or independent wheel suspension was introduced to relieve shock from uneven road beds; many new ventilating devices have been introduced—even complete air-conditioning for the interior of passenger cars.

Cars have been made safer by increased braking power, improved steering equipment, better lighting equipment, more rigid frames, enlarged windshields for increased visibility, safety glass and windshield defrosters. How to improve the appearance of the automobile is a problem that is always before the designing engineer. Aerodynamic principles have been applied to modern automobiles, which is evidenced by the ever-increasing degree of streamlining.

Engine power in relation to car weight is being increased. Some of the devices that have made for better engine performance are: superchargers, heat-resisting alloy valves, forced lubrication systems, improved clutches, automatic shifting devices and thermostatically controlled cooling systems.

An automobile embodying the most advanced ideas is the Scarab, developed by William B. Stout. In this car the engine is located in the back, making possible the elimination of the long propeller shaft of the conventional type. At the front of the car a short dummy hood covers a baggage compartment. This ultra-streamlined car has no separate chassis frame, as it has been designed on the principle underlying an airplane fuselage. Full advantage is taken of the wheelbase in that the passengers are all seated between the axles. The seats are movable and can be converted into couches, and a table is available for the use of passengers. Electric push buttons operate all of the doors.

automobile electrical equipment, a generator and a storage battery that will provide power for ignition, lights, starting and such accessories as cigar lighters, pumps or blowers for heaters, defrosters, fans and radios.

The earliest application of electricity to the automobile was for ignition purposes only, the source of energy being either several dry cells or a magneto. Later on, a storage battery and D. C. generator were introduced in order to make electric lights possible, although in a few instances a low-tension magneto alone was used for lighting. The second method was not considered very satisfactory, however, since the lights would burn only when the engine was running, and the brilliancy of the headlights would vary greatly with the speed of the engine. These disadvantages, together with an ever-increasing demand for electric starters, finally resulted in the universal adoption of the storage battery and generator combination.

Ignition. The only satisfactory method of igniting the explosive mixture of gasoline vapor and air is by means of an electric spark. The installation is not overly complex, is controllable and reliable and furnishes a high concentration of heat. The complete system as ordinarily used today consists of two circuits: a *primary circuit* made up of a storage battery in series with the primary of an induction coil, and a contactor driven by a cam that is either geared or chain-connected to the engine; and a *secondary circuit* that includes the secondary winding of a coil with many times more turns than the primary, a high-tension distributor that consists of a rotating switch arm and as many points as there are cylinders and the spark plugs that are connected to the points in the distributor by means of high-tension cable.

If the high-voltage distributor and cam operate at the same speed, as is ordinarily the case, they will make one revolution for each complete cycle of operation of the engine, which consists of four strokes (two revolutions). In this way it is possible for the contact points to close quickly, to remain closed for some time and then to open very quickly.

When contact is made with any of the points in the contactor, current flows through the primary circuit. When the contact is broken, the high-voltage current induced in the secondary coil flows through the secondary circuit. It jumps across the terminals of the spark plug in the form of an arc, which fires the gas-air mixture in the cylinder.

The problem of ignition is complex, involving such matters as engine speed, compression and temperature; however, cathode-ray oscillographs are now available for making high-speed studies of actual operations in the engine, and it is expected that ignition troubles will soon become a thing of the past.

Lighting. Since little night driving was done in the early days, automobiles were usually provided with oil lamps. Later acetylene lights were substituted. Brighter and less troublesome lights were demanded as car speeds increased and night driving became commonplace, and electric lighting was introduced. Although this is convenient and gives ample light, it has brought on another problem—headlight glare, the cause of many accidents and the subject of much research and legislation.

For a long time cars were equipped with means of dimming headlights for the benefit of approaching drivers. Then there was much experimentation with reflectors and prismatic lenses; but all such devices cut down the amount of light thrown on the road, an added danger at the high speeds made possible by better highways. This eventually led to the use of two headlight bulbs of equal brilliance, one mounted directly above the other. When used with a special reflector, switching from one to the other produced the same effect as though the whole light had been tilted. More recently the general effect of switching the lights sidewise has been obtained by providing two filaments placed side by side; or else by depressing the beam of the right-hand light, the left one being permanently focused toward the right-hand side of the road.

Such devices would eliminate most of the danger from headlight glare if all drivers used them conscientiously. But some drivers deliberately neglect to do this and the rest forget upon occasion. Attempts have been made to develop an automatic system for performing the necessary switching, usually involving the use of photoelectric cells and other light-sensitive devices; but there are circumstances under which this, too, might be dangerous, as at the brow of a hill or at corners.

One control method quite different in principle uses polarized light. Light consists of electromagnetic waves that are also classified as transverse vibrations, since they occur at right angles to the direction of travel or of *propagation,* as it is called. In this way they resemble the water waves set up by dropping a stone in a pond, for although the waves travel outward along the surface of the pond, the particles of water move up and down. Under ordinary conditions the vibrations in a beam of light occur simultaneously in all directions around the direction of propagation.

By the introduction of a device known as a *polarizer,* however, they can become *plane polarized;* that is, the vibrations will be confined to a single plane, the action of the polarizer being to screen out the vibrations in all other directions. As a result, if one starts with a beam of light, introduces a polarizer in its path so that the plane of polarization is horizontal, say, and then introduces a second polarizer in the path that will only permit the passage of light whose vibrations occur in a vertical plane, no light will get through this combination.

Such a scheme can be applied to automobiles by first equipping the headlights with polarizing lenses and then by using a polarizing windshield, whose plane of polarization is at right angles to the headlights, or by having drivers wear glasses of the same sort. In this way no light can go directly from the headlights of one car to the eyes of the driver of another car meeting it.

Because of the crown and banking in the highway and certain other irregularities, this condition cannot always be obtained. It has been found, however, that small departures from the ideal condition will not permit enough light to reach the driver to be annoying, as the headlights still appear quite dim. Thus, although the method would reduce headlight glare in an effective and entirely automatic fashion, one may ask, "Would not the use of such devices prevent the driver from seeing the road and other objects as well?"

When polarized light strikes a rough surface, such as a highway under ordinary conditions, most of the light that is reflected will be *depolarized;* that is, it will be diffused so that the vibrations again occur in all directions. As a result, part of the light from the headlights of both cars, reflected from the road, will be able to pass through the windshields to the eyes of the drivers. This assures the general success of the scheme, although it might be necessary to use more brilliant headlights as part of the light is screened out at each of the polarizers. Since there would be no headlight glare anyway, the only real objection to the method is the loss in efficiency.

There are various natural and synthetic polarizing substances that could be placed between two sheets of glass for making lenses and windshields. Not only would this reduce headlight glare but it would also do away with the glare from wet or icy pavements, since a large part of the light reflected from smooth surfaces becomes polarized during the process of reflection.

The Generating System. Because energy must be available when the engine is not running, part of the output of the generator must charge the storage battery. Although batteries with ratings ranging from 6 to 24 volts have been used in the past, 6-volt batteries have now become universal, as higher voltage batteries are more expensive and less rugged.

Present-day automobile generators are invariably shunt wound, three-brush D. C. generators, and the usual charging rate during the daytime is from 5 to 25 amperes. These are driven directly from the engine by means of an appropriate gear, chain or belt system. Since an automobile generator must operate over a wide range of speeds, and the generated voltage of a simple shunt generator varies rapidly with the speed, it is necessary to provide some special means of automatically regulating the charging rate.

This is usually accomplished by connecting the field between the negative brush and an adjustable third brush placed at a small distance from the positive brush. The cross-magnetizing effect of the armature when carrying current results in a distortion of the magnetic field about the air gap; and the voltage across the field when connected in this fashion will automatically decrease with increased armature current. Although it is not possible to maintain a constant generator current by this means over a wide variation in speed, it can be kept between satisfactory limits that can be varied by adjusting the position of the third brush.

Though the use of the third brush has proved to be very satisfactory in regulating the charging rate when the car is operating above 10 or 15 miles per hour, it is necessary to make some provision for disconnecting the battery from the generator when the engine is either at rest or turning very slowly. Otherwise the battery would discharge back through the generator armature, would quickly become discharged and the armature might even be burned out. So an automatic switch or circuit breaker known as a *charging cut-out* has been developed. When the generator's voltage output is higher than the battery's, the cutout closes the circuit between them, and opens the circuit when the generator voltage falls below that of the battery.

Starting. The starting system consists of the storage battery, switch, starting motor and the starting clutch or drive, which automatically connects the starting motor to the engine at the beginning of the starting operations and disconnects it as soon as the engine starts firing. The use of a single machine to serve as both generator and starting motor has now become obsolete.

Starting Motors. The conditions under which starting motors are required to operate are quite different from most other D. C. motor applications, as an extremely high torque is necessary to overcome the inertia, compression and friction of the engine. Besides after the motor starts turning over the torque varies through wide limits due to the compression and suction of the engine. All these factors, together with the short duration of the starting period, have resulted in the design of a motor that gives its maximum output for only a short time. It can, therefore, be much smaller than a motor that must give the same maximum torque continuously without becoming overheated. Because the high torque is necessary, series motors are invariably used, both the armature and field coils having a very few turns of large-sized conductors. This can easily be understood if one considers that, if 200 to 300 amperes may be drawn at start from a 6-volt battery, the total resistance cannot be greater than a few hundredths of an ohm at the most.

automobile manufacturing, the most important industry in the United States. The total value of all the passenger cars and trucks produced in 1936 was more than 2½ billion dollars. The industry is carried on in 340 separate plants and gives employment to 150,000 workers. If one were to include garages, filling stations, tire-repair shops, motor-transportation companies and a score of other industries directly dependent on automobile manufacturing and sales, it is probable that at least one out of ten persons gainfully employed in the United States gets his living from the automobile industry.

The industry is closely related to many others. It uses 20 per cent of the steel we consume, 34 per cent of the lead, 73 per cent of the plate glass, 18 per cent of the copper, 46 per cent of the upholstery leather and 80 per cent of the rubber. It provides various governmental agencies with 1½ billion dollars in revenue every year, or 15 per cent of all taxes collected.

The United States is by far the leading maker of automobiles in the world, producing between 75 and 80 per cent of all motor vehicles; and residents of the United States own

70 per cent of the world's motor vehicles. There is a car for every four and a half persons in the country, and more than half the families own automobiles. Practically all automobile manufacturing is carried on in the northeastern quarter of the United States within the automobile belt. This area extends from St. Louis on the west to New York city on the east. Near the center of the automobile belt lies Detroit, which, with adjacent towns in Michigan, Indiana and Ohio, produces from 80 to 85 per cent of all motor vehicles manufactured in this country.

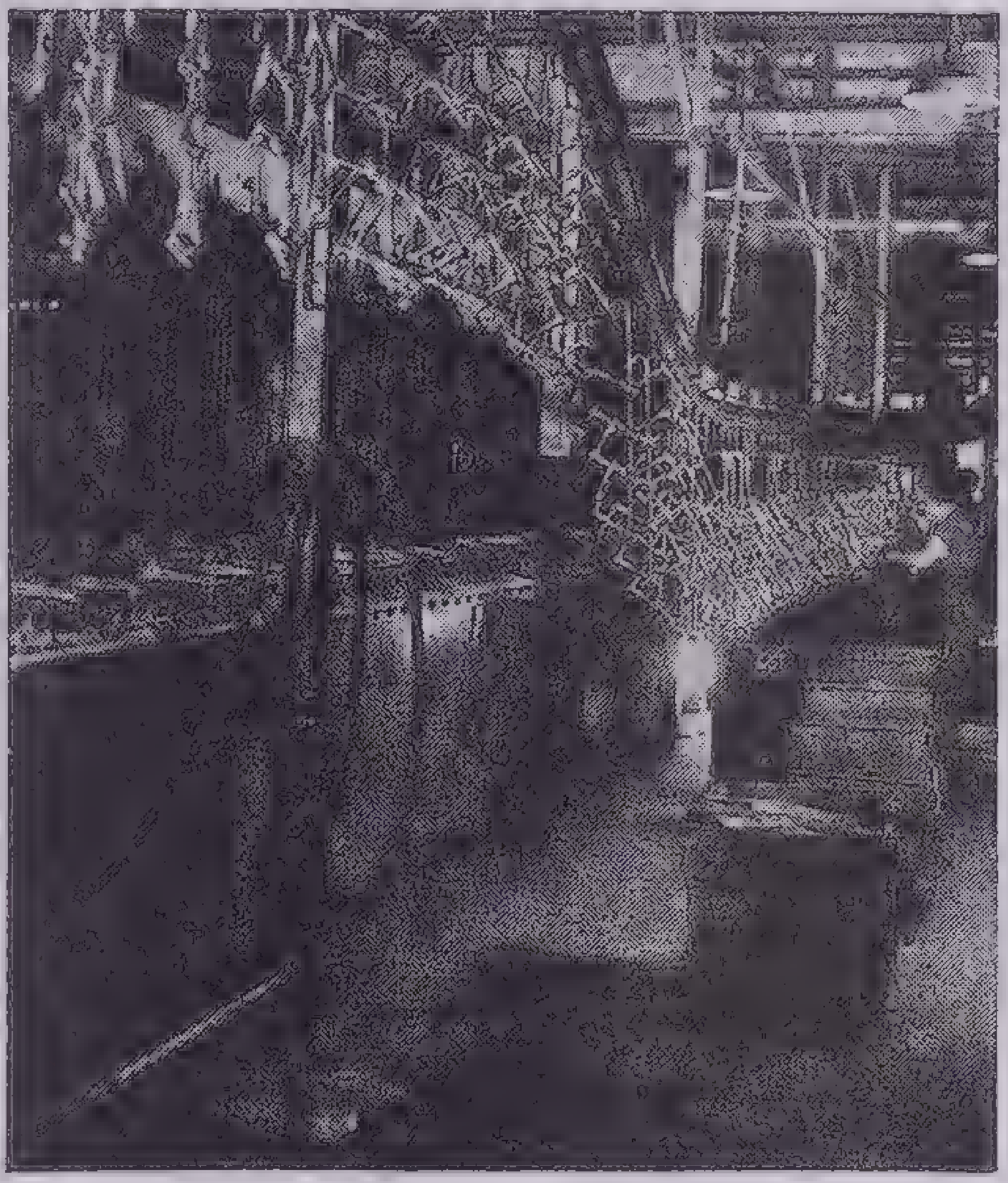
This concentration is due to several factors: the accident that most of the early inventors lived near Detroit (Henry Ford, R. E. Olds, David Buick, Henry M. Leland) or in Ohio (Alexander Winton, the Whites); supplies of iron and copper in Michigan and considerable steel production and bicycle and wagon business in Ohio; the greater readiness of midwestern bankers to back the new industry and the natural tendency of newcomers in a field to settle near the pioneers of the industry and close to the source of a skilled labor supply.

The automobile industry has profited by the two opposing principles of modern industry—competition and co-operation. There have always been independent manufacturers, with Henry Ford the best-known example. From the early days of the industry there has been a certain amount of co-operation, beginning with the forced community of interest among manufacturers who paid royalties from 1903 to 1911 for the use of the patent secured in 1879 by George B. Selden of Rochester. Henry Ford did not join the Association of Licensed Automobile Manufacturers, and in 1911 when the courts ruled that Ford had not infringed the patent, the Association dissolved.

In 1913 the National Automobile Chamber of Commerce was organized, and in 1915 its manufacturer members agreed to pool all patent rights without any payment of royalties. At present only patents secured before 1930 are subject to this agreement, so that there is now a certain amount of competition even among the members of the Chamber. The Ford Company's competition was always a spur to members of the Chamber and to the smaller group that in 1908 became the General Motors Corporation.

Manufacturing Process. Although automobile manufacturing is the leading industry in the United States, less than a half century has elapsed since the first experimental models of "horseless carriages" were built. Today it is a complex, integrated and large-scale industry. In the maze of a modern automobile factory, though, four distinct industrial processes can be seen: engineering, designing, mass production (based on the principles of division of labor, standardization and interchangeable parts) and assembly.

It is in the engineering laboratory that new automobiles are first conceived, new contrivances first tried out and a new model really begins. Draftsmen work out designs. A corps of engineers then put the draftsmen's ideas to various tests and attempts to bring them to fruition. Engineers check formulas, chemists test materials, patternworkers make models. From these engineering laboratories come the new features of automobiles—all-steel bodies, four-wheel brakes, knee action, new types of metals and all the hundred and one features of a modern finished automobile.



Courtesy General Motors Corporation

Mass Production

These are automobile door handles—thousands of them—being carried past the inspectors on a moving conveyor

After every conceivable laboratory test has been applied to a new feature, it is incorporated in a car and severely tested on proving grounds that are designed in such a way that within a few days the car is subjected to the wear and tear it would receive in years of ordinary service. There are hills, sand, rocky roads, speedways and refrigerator rooms that provide Arctic temperatures. The car, with the new feature incorporated, is driven fast and slow and even overturned on the proving ground in order to disclose any weaknesses. It is only after this grueling test that new features are approved or discarded; for each new feature accepted, scores are turned down.

General Motors pretests new features in another way—by submitting to large numbers of car owners a questionnaire on projected improvements. The results of this test show what the buying public wants as accurately as the road tests show what will give good value and good wear.

As soon as it is known what features will be included in the model, designing begins. The designer's job is to style the body. Drafting-board designs are made and certain of them are approved; blackboard large-scale drawings of them are carefully studied by the engineers and production men. After approval, preliminary models are rendered in clay or carved in wood. These are usually on a small scale and are subjected to various tests; for example, in a wind tunnel. Finally one is chosen and a full-sized wooden model is made, complete in every detail. From it all the various parts of the car are produced; new dies are cut, needed new machinery is installed and a sample working model constructed. This *pilot car* is then taken apart and sent through the factory and assembled for a production test.

After the engineering department has tested new features and parts of the car, after the designers have modeled the new body and after the new machinery has been installed, then production actually begins on a commercial scale.

Mass production did not come with the very beginning of the automobile industry. In 1900 the Locomobile Company of America made 1,000 cars; in 1903 the Olds Motor Works made nearly 4,000 and in 1908 the Ford Motor Company turned out 10,000 cars. There was no need of mass production until there was a mass market. Instead, automobiles and practically everything else made in factories were custom built. That is, all parts were made to approximate dimensions. If a part had a hole in it three-thousandths of an inch too big, it was still usable; it meant only that an oversize shaft would have to be made to fit it. So a cut-and-try system was used throughout. A part for one car would not fit another; if a part broke in use, a new one to that car's measure would have to be specially made.

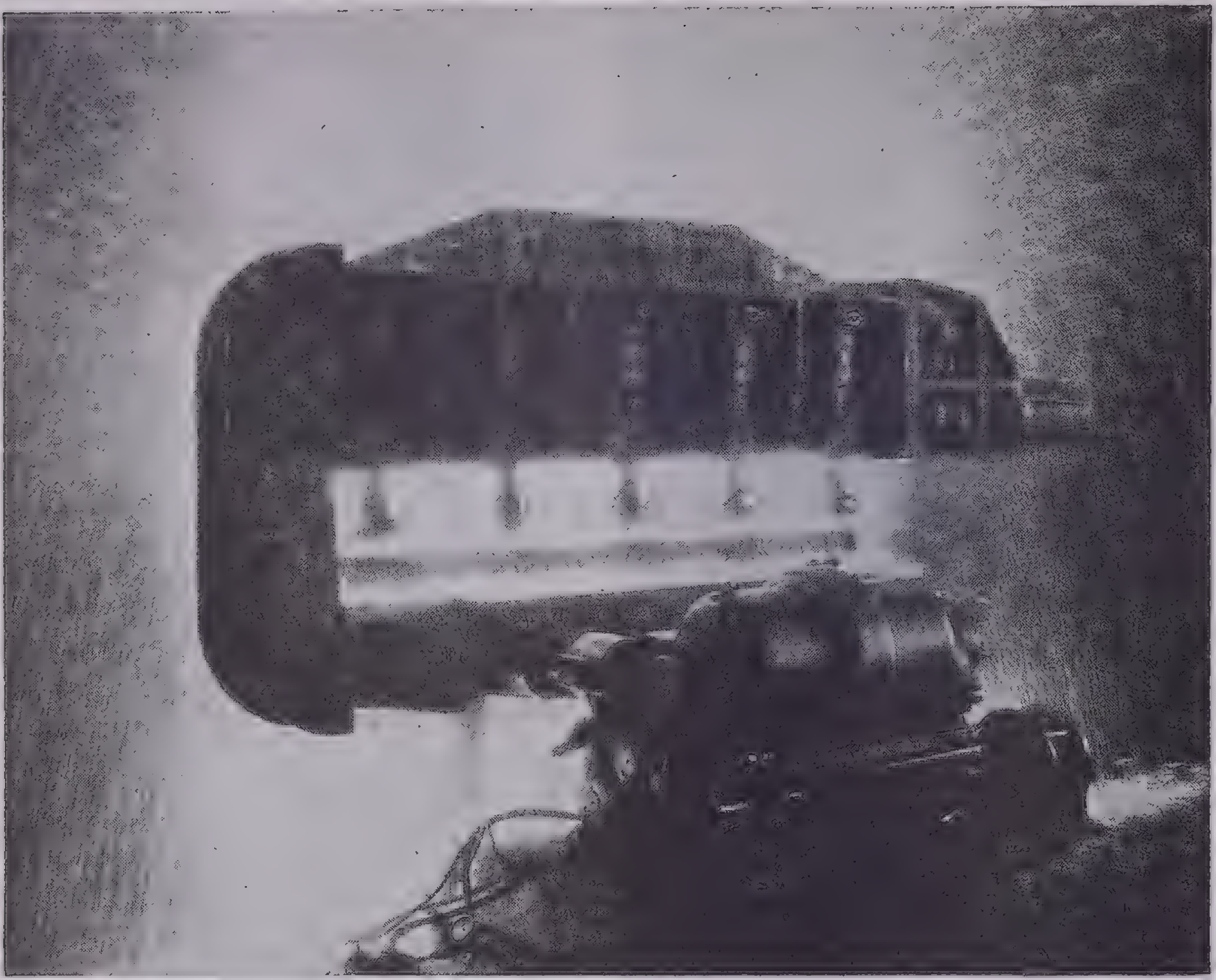
Mass production was made possible by copying the methods used in the production of firearms and locks by Eli Whitney at the beginning of the century: precision shaping of every part that assured interchangeability of parts, and division of labor.

Interchangeability of parts was America's great contribution to the automobile industry. In 1903 Henry M. Leland took three American cars to England, drove them around the Brooklands race track, dismantled them and reassembled them from the confused pile of parts. In Ford's Model T all parts were standardized and all so accurately machined that no adjustment needed to be made when the parts were assembled.

A further gain was made by co-operation in the industry. The Society of Automotive Engineers, founded in 1904, established a Standards Committee in 1910, and this Committee has simplified engineering problems by adopting standard sizes for axles, spark plugs and the like, to be used not merely in a single factory but in practically all American auto factories.

Division of labor is another great factor in mass production. The manufacture of parts is grouped in various departments, each handling a single part. This may be done in different departments under the same roof or in widely separated factories.

All the parts then *flow* into assembly on conveyor belts. The conveyor belt seems to have been adapted for automobile factories from the Chicago packing plants, where speed and economy were already secured by hanging a whole beef on a hook and



Courtesy General Motors Corporation

Fireworks in an Automobile Factory

This machine is welding together sections of an automobile body. Millions of white-hot sparks make a spectacular display

moving it from one specialized operator to another until it had been separated into the desired number of parts. "Keep material moving and 3 feet from the floor" was the Ford motto when conveyors were installed in the Highland Park plant. The height of 3 feet is convenient for the workman. The material moves from one workman to the next—each having one small specialized task. Every process of manufacture is analyzed into its constituent operations, and each of these operations is the specialized and sole task of certain workmen. Thirteen workmen perform the 13 different items in the one task of making one leaf for a set of springs. All the machinery involved is continuously busy.

The conveyor system moves finished parts to a place of initial assembly where the primary units are assembled—motor, radiator, frame and the like, and the final assembly, in which a certain amount of testing usually takes place, brings these units together into a complete car. At the end of the assembly line the finished car is driven off ready to be shipped to one of more than 30,000 automobile dealers of the country. Final assemblies are often made in widely separated plants, each strategically placed so that there is the least distance to travel and the least cost involved in getting the car to the dealer.

barley, a hardy Temperate Zone cereal. It grows well on poor soils, ripens in a short growing season and is highly resistant to drought. Barley is most important in those areas of the world where conditions are not suited to other cereals. It grows and matures in the short rainy (winter) season of North Africa, in the almost Arctic climates of Norway and Finland and in mountain regions as much as 2½ miles above sea level in Tibet and northern India. In Japan it is raised on slopes too steep for rice. In many other parts of the world it grows in areas of deficient rainfall. In the United States most barley production is confined to the Dakotas and Minnesota.

Barley is used in making malt for brewing, as a breakfast cereal, as a thickener for soup and as a food for cattle. Barley flour has practically no gluten and cannot be made into a porous loaf.

battery, electric, an apparatus for generating and storing electric energy by chemical action. Batteries are important chiefly because they are a portable source of current and because their current is available for use at all times, day and night, without any attention. All large telephone systems, for instance, keep batteries in readiness so that they can be put into service at once if anything happens to prevent the generators from running. Another good illustration is the automobile, which carries both a generator and a battery. Electric current for ignition and lights is supplied from the generator most of the time when the car is in motion; but it is necessary to carry a battery to operate the starting motor and to supply various accessories when the engine is not running.

Batteries depend for their operation on the fact that when certain dissimilar materials are separated by certain chemical solutions, an electromotive force exists between them. A vessel containing two pieces of such dissimilar materials (called *electrodes*) immersed in the proper chemical solution (called the *electrolyte*) is called a *cell.* Cells can be used singly, but several are usually connected in series to make a unit with a higher voltage than a single cell can deliver. The common automobile storage battery, for instance, is a unit of three 2-volt cells, so that the output of the battery is 6 volts.

There are two general types: *primary* batteries and *secondary* or *storage* batteries. Primary batteries are those that become exhausted chemically with use and will not work again until new chemicals are added. Storage batteries, however, may be restored to usefulness by passing currents through them in the direction opposite to their electromotive forces.

The most common type of primary cell is the *dry cell.* Its negative electrode is sheet zinc so shaped as to act as the container for the other materials. The positive electrode is a rod of carbon set in the center of the zinc container and insulated from it at the bottom by pulp board. Between the carbon and zinc electrodes is packed a mixture of crushed carbon and other ingredients, saturated with a solution of sal ammoniac to act as the electrolyte. In a strict sense this is not a dry cell at all, since it depends upon the moisture in the sal ammoniac solution for its operation. Such a cell has an electromotive force of approximately 1.5 volts.

Storage batteries are much more widely used than dry cells because their chemical action can be reversed by passing current through them in the direction opposite to that in which it flows during discharge. There are numerous combinations of materials and electrolytes with which this can be done, but only two types of battery have come into widespread use. These are the *lead-acid type* and the *nickel-iron-alkali* or *Edison* type.

The lead-acid battery consists of two sets of lead plates immersed in a solution of sulphuric acid. When the battery is charged ready for use, the positive plate is covered with lead peroxide. During discharge the action of the sulphuric acid electrolyte causes both plates to become covered with lead sulphate, the electrolyte being reduced to water. When the battery is recharged, the sulphate is taken up by the electrolyte from the plates to form sulphuric acid again, and the positive plate is oxidized again (into lead peroxide) ready for service.

Such batteries have an electromotive force of about 2 volts per cell, the voltage of the battery depending on the number of cells in the battery unit. They are capable of providing very heavy currents for short periods of time, which makes them particularly desirable for use with automobile starters. The starting motor of an automobile may require 400 times as much current as that taken by an ordinary 100-watt lamp.

The nickel-iron-alkali battery is commonly called the Edison battery in honor of its inventor Thomas A. Edison. Its positive electrode is a set of perforated nickel containers packed with nickel oxide; its negative electrode is of perforated nickel-plated steel containing finely divided iron; and its electrolyte is a potassium hydrate solution. The chemical reactions are quite complex. Such a cell has an average discharge voltage of about 1.2 volts. It has a higher resistance than the lead-acid cell, but is so rugged that it is widely used for such heavy-duty applications as electric trucks and locomotives.

bauxite, a claylike mineral, aluminum hydroxide, the most important aluminum ore. It takes its name from the town of Baux in France, where the world's largest known deposit is located. Besides its use as an ore, bricks of bauxite make excellent refractory linings for furnaces.

benzene, a volatile and inflammable hydrocarbon (C_6H_6), mostly obtained as a by-product of petroleum refining. It is one of the lighter fractions of crude oil and boils at 79.6° C. It is used as a cleaning fluid, a solvent of fats, resins and oils, (when mixed with gasoline) a fuel for internal-combustion engines, in the manufacture of dyes and other chemicals and as an illuminant when mixed with gas. *Benzol* and *benzene* refer to the same thing.

boiler, a heat-absorbing apparatus for converting a liquid into a vapor. The Greek experimenter Hero built a combination boiler and turbine in 130 B.C., but whether it was merely a curiosity or actually performed useful work is unknown. Newcomen of England in 1705 constructed a boiler for use with a pumping engine. In 1765 Watt made improvements on the Newcomen-type boiler. All boilers up to this time were operated at atmospheric pressure or very near to it. Watt was opposed to any attempts to increase the pressure of the steam.

During the early part of the 19th century John Stevens built one of the first water-tube boilers. It was actually used on a Hudson River steamboat but proved unsatisfactory because the tubes failed as a result of poor circulation of the water. Stephen Wilcox in 1856 developed a water-tube boiler that was the forerunner of modern boilers. It had all of the essential elements of the present-day horizontal boiler. Pressures were gradually increased until they reached 50 pounds per square inch during the first half of the 19th century.

All boilers may conveniently be classified as either water-tube or fire-tube, depending upon whether the tubes serve as a passage for the water or for the hot gases from the fire. In the fire-tube boiler the hot gases pass through the boiler tubes and in so doing give up heat to the water around them. In the water-tube boiler the hot gases encircle the outside of the tubes and heat the water flowing in them. Locomotive boilers are of the fire-tube type. Usually the efficiency of these boilers is very low because the gases flow through the tubes so rapidly that they give up only a part of their heat.

By 1865 pressures had risen to 100 pounds per square inch. There was little improvement in boilers themselves between 1890 and 1900, although in that period boiler efficiencies were increased by the introduction of mechanical stokers. These devices feed fuel at a constant rate, and avoid the loss of heat through open fire doors necessary in hand stoking. In the period from 1900 to 1915 the sizes of boilers and stokers were rapidly increased, thanks to the demands of the growing power industries. The introduction of pulverized coal made possible a faster burning of fuel and a greater output of steam. Early experiments with pulverized coal clearly showed that the rate at which fuel could be burned depended on the melting point of the ash and the ability of the brickwork to withstand the heat. Water-cooled walls were then introduced to help overcome this difficulty—an extremely important development.

Boiler pressures have continued to increase until now 400 pounds per square inch is considered conservative, and experimental boilers are now operating at pressures up to 3,500 pounds per square inch.

Mercury Boilers. Engineers know that water is not necessarily the perfect fluid for boiler work. As compared with many other vapors steam contains so little heat that it must be used quickly. In 1912 experimenters began to work with boilers using mercury as the fluid, with results that indicate that boilers of the future may not be water boilers.

Mercury vapor is developed at such a high temperature that even after it has been used to turn a turbine it retains much heat. So much, in fact, that water used to condense it turns to steam, which is used to turn another turbine. Thus two turbines are turned for one heating of fluid.

Such plants are much more efficient than steam plants. The best steam plants use only 27 per cent of the energy of the burning coal; mercury plants use 36 per cent, an advantage of a third over steam. The advantage over ordinary steam plants is as much as 50 per cent.

There are disadvantages, though. Mercury is expensive—something like a dollar a pound—and great care must be taken to be sure that all equipment is leakproof. On the other hand mercury does not decompose or attack the materials of boilers and turbines.

Mercury plants are being installed for power production and even in locomotives. It is not wise to say, however, that mercury boilers will replace water boilers. Other substances—ammonia is one—may prove to be still better than mercury. Now that they must prove their worth, water boilers are being improved rapidly.

bookbinding, assembling the pages of a book in proper order and encasing them in a protective cover. In ancient times manuscripts were prepared on a long continuous sheet of paper, which was rolled around a spindle. The manuscripts were read by starting another spindle at the loose end of the sheet and rolling the paper from one spindle to the other. To reach a certain part of the volume, it was necessary to reroll it up to that point. This disadvantage has been overcome by binding together numerous cut sheets, as in the modern book, so that any sheet may be read without opening the others.

Most books are made up of a number of *gatherings* or *quires* bound side by side. Each quire consists of a relatively small number of sheets folded together and sewed through the central fold. In the earliest form of binding single sheets were folded together. In most modern bookbinding all the sheets of a given gathering are run off the printing press in a continuous strip and then folded together. This produces folds at the different edges of the book.

After the gatherings have been folded and sewed at the back, they are stacked in the proper order and pressed flat, so as to make them more compact. The books are then trimmed on three edges. Then the various gatherings are fastened together, usually by sewing and gluing them to a flexible tape; a better but more costly method is to sew them to several cords laid across the back of the book. The concave shape of the front edge of the book is produced by striking it with a curved tool before the glue is dry.

The process of covering the pulp or wood boards with cloth or leather and attaching such a binding to the book is called *casing*. It is in this process of bookbinding that the major artistry is introduced. A lacquered cloth casing is used on the great majority of books. In recent years washable, waterproof cloth has been introduced. Expensive books are hand bound in handsomely tooled leather with or without gold and inlays of colored leather.

In some small establishments most of these operations are carried on by hand, but in the large binderies automatic machinery is used. Quires are folded automatically as they come from the printing presses, or, if they consist of single sheets, they are stacked in the proper order by gathering machines. These are, in effect, moving belts that pick up the sheets consecutively from stacks arranged in the proper order. Sewing is done by power-driven sewing machines. Three-knife trimmers cut the folds from three edges of the book at the same time. Even the gluing and casing are done by machinery. One machine, known as the Sheridan casemaker, is capable of attaching the boards and casing cloth to 2,000 books an hour.

brass, a yellow alloy of copper and zinc in varying proportions according to intended use, but usually 2 parts copper to 1 part zinc. It is manufactured in tubes, sheets, wire and ingots for casting. Brass is extremely useful because it is relatively cheap, easy to shape, does not rust, is harder than zinc or copper and takes a high polish. Most brass objects are stamped out of sheets, as alarm-clock gears, or made into small castings. Brass is enormously important in the building industries for hardware and water pipes.

The brass industry in America began before the Revolution in the Naugatuck Valley of Connecticut near some small copper mines. Buttons for men's coats were the chief output at first. Today Connecticut is still the leading brass-producing state, with the cities of Waterbury and Bridgeport important. The automobile manufacturing centers also produce much brass.

breakwater, a barrier built out into a lake or sea for the purpose of protecting vessels at anchor against currents or waves. In some cases they protect a natural harbor; in others they provide an artificial harbor or haven for coastwise vessels during storms. Records show that breakwaters date back to the earliest days of civilization, since they are described by both Greek and Roman writers.

Breakwaters may be either connected to the land or isolated, and they are usually divided into several classes depending on their type of construction, as follows:

1. Timber-crib, with or without a masonry deck.
2. Mound of stone rubble or of concrete blocks or a combination of the two.
3. Mound (as in 2) that reaches about to the water line and is then surmounted by a solid superstructure of masonry.
4. Mound with its top considerably below the water level, the remainder consisting of a vertical wall of masonry.
5. Solid upright wall that is built up from the bottom of a sea or lake.

The choice of the type in any particular project is usually based on importance, cost and permanence, as well as upon the possible effect of waves, tide, ice and scouring by sand.

bricks, clay or clayey material molded into block form and hardened by burning, used in building or paving. The standard size of building brick is 2¼ by 3¾ by 8 inches; of fire brick (for lining furnaces and other fire-resistant uses), 2¼ by 4½ by 9 inches; of paving brick, usually 8 inches long, 4 wide and 2½, 3, 3¼ or 3½ inches thick.

Brickmaking is known to be one of the oldest industries, for bricks 6,000 years old have been found in the ruins of the ancient city of Ur of the Chaldees. It remained a hand trade for a long time. As late as the 16th century clay was dug in the early autumn so that it might weather all winter; and finished bricks were dried for 2 years under shelter.

The first machine came into use only 100 years ago. It was a pugmill, with a simple tank-and-stirrer for mixing the clay and knives for cutting it into bricks (wires are used for that purpose nowadays).

After machine molding had been developed, human labor was still needed for *striking* (removing the surplus clay from the molds) and *bumping* (loosening the bricks from the molds). Automatic machinery for these two operations increased the daily output in soft-mud brickmaking from 30,000 to 100,000. In 1862 Cyrus Chambers of Philadelphia invented a machine for making bricks of stiff clay. It worked almost exactly like a sausage machine. Subsequent improvements make it possible for such a machine to deliver 100,000 to 300,000 bricks a day.

Bricks were formerly sun-dried or sun-baked. Now they are fired in a kiln. (The word *kiln* is an English short form of the Latin word *culina,* kitchen, from which we have the adjective *culinary,* meaning cooking.) Different types of brick kilns are named from the direction of the draft of air through them—*up-draft, down-draft, horizontal* or *serpentine;* or from the form in which the kiln is built. The *car tunnel* kiln, 300 to 400 feet long, dries 40,000 to 70,000 bricks a day.

Brickmaking is essentially a small local business, since it does not pay to ship such bulky, heavy material long distances—except bricks for specialized uses, like fire bricks.

Pressed brick is a smooth compact building brick that has been subjected to heavy pressure before it is burned. *Tapestry* or *texture* brick has a rough surface with color variations. *Milwaukee* brick has a yellow color quite different from the typical brick-red; the difference is due to the color of the clay.

bridges, structures built to provide passage over a waterway or other obstacle. The first bridge was a tree that accidentally fell across a creek, and the first man-made bridge was a tree trunk purposely so placed. According to Chinese legend the first carefully planned bridge in that country, built of wood, was erected about 1003 B.C.

The Romans built very substantial bridges of masonry, the remains of which are still standing in many places in Europe. Cast iron came into use toward the end of the 18th century but it has not enough tensile strength for such purposes, and wrought iron soon replaced it. Later steel displaced wrought iron, and today special alloy steels are widely used. Bridges are of four types: girder or truss, suspension, arch and cantilever.

Girder bridges are not different in principle from the tree trunk across the creek. They are built of one or more massive, stiff members, perhaps I-beams, or girders made of many parts.

Truss bridges use the girder principle. A truss is a built-up structure containing many parts, instead of being a solid girder. It resembles a network of beams and rods, all forming triangles. Each member is so placed and shaped that it carries a particular part of the load and transmits stress in toward the place where it will be supported.

Suspension bridges are those supported by cables, chains or ropes. Primitive suspension bridges are supported by ropes made of bamboo or vines. Some bamboo ropes have tensile strengths as high as 20,000 pounds per square inch. Heavy hand-forged-chain suspension bridges are found in China.

Suspension bridges, in which the roadbed is swung from cables supported by towers securely fastened at the land ends, are in favor today. They are well suited for bridges that must cross wide bodies of water, since there are few if any piers to obstruct the waterway. The cables used in the San Francisco-Oakland Bay Bridge are each 28¾ inches in diameter and can support 40 million pounds. Each cable is composed of 17,464 separate wires grouped into 37 strands of 472 wires each.

The *steel-arch bridge* is also widely used in modern practice. It has no cables; fabricated steel arches transfer the weight and pressures to solid abutments reaching down to bedrock.

The *cantilever bridge* is a system of parts that may be compared to shelf brackets. From each shore a securely fastened shelf stretches out over the water, and the main central part of the bridge merely rests upon them.

FAMOUS BRIDGES

Ambassador Bridge, spanning Detroit River between Detroit, Michigan, and Sandwich, Ontario, completed in November, 1929. Length of suspension span is 1,850 feet; length of bridge structure 7,400 feet. Cost, $20,000,000.

Bayonne Bridge, crossing Kill van Kull between Bayonne, N. J. and Staten Island, has a span of 1,675 feet, the longest steel-arch bridge to date. It carries highway traffic and was opened in 1931.

Bear Mountain Bridge, crossing Hudson River, north of Peekskill, N. Y., for vehicles. Length, 2,258 feet. Main suspension span, 1,632 feet. Cost, $6,000,000. Completed 1924.

Birchenough Bridge, crossing the Sabi River in Rhodesia, has a steel-arch span of 1,080 feet, one of the longest in the world. Built for railway use, it was opened in 1935.

Bridge of the Holy Trinity, at Florence, Italy. Was built in 1569. It is 322 feet long, constructed of marble and stands unrivaled as a work of art.

Britannia Tubular Bridge, carrying a railway across the Menai Straits in Wales, consists of two parallel rectangular wrought-iron tubes resting on three piers. There are two central spans of 459 feet, and two shore spans of 230 feet. Its erection was begun 1846 and it was the first great iron bridge ever built.

Brooklyn Bridge. A wire-cable suspension bridge connecting New York with Brooklyn; designed by John A. Roebling. Length, with approach, 6,016 feet; length of central span, 1,595½ feet. Cost, $17,909,000; opened, 1883. It was the first great suspension bridge and for many years was the longest span in the world.

Cabin John Bridge, D. C. Stone aqueduct with span of 220 feet; constructed 1857–1864, at which time it was the longest stone arch in the world.

Cairo, Ill., crossing the Ohio River, a truss bridge, 20,461 feet long, including approaches; cost, $3,500,000. A railway bridge, finished in 1889.

Carquinez, over Carquinez Straits, Calif.; length, 4,482 feet; cost, $8,000,000. It has two 1,100-foot cantilever spans, carries highway traffic, and was opened in 1927.

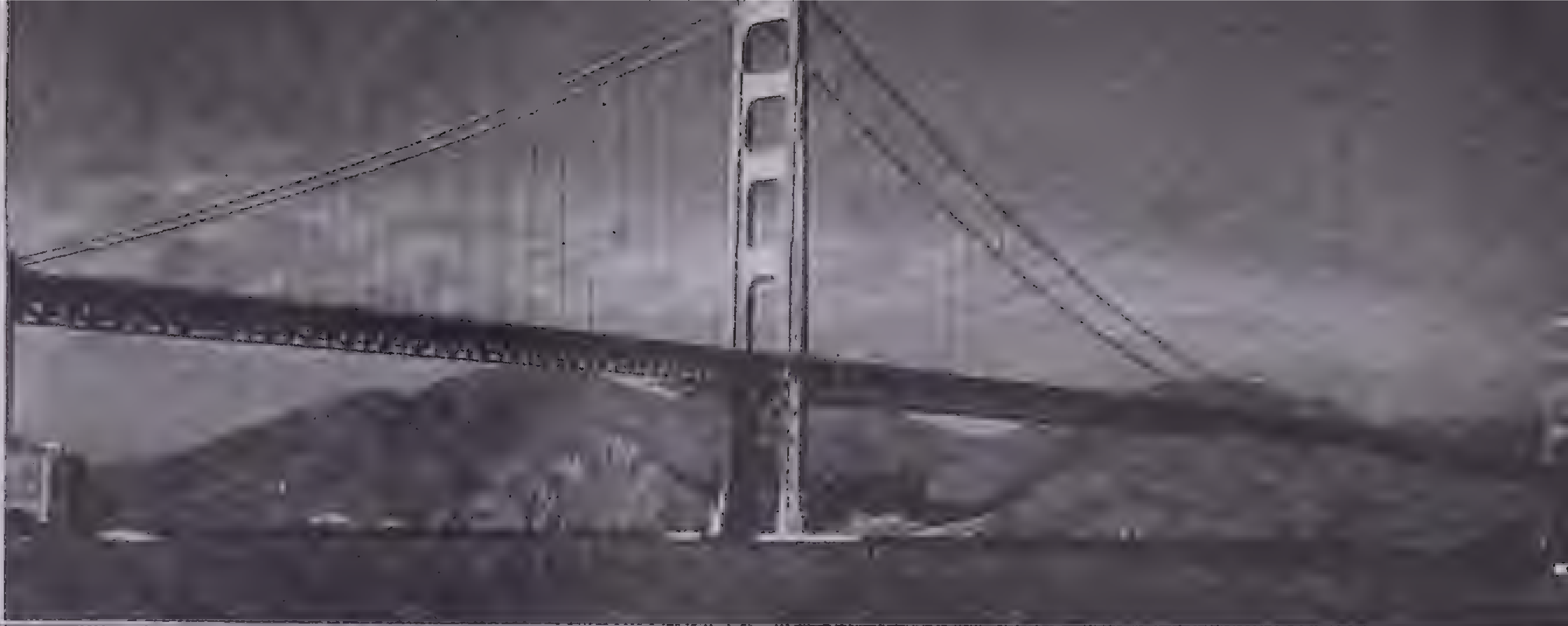
Castleton Bridge, a railway bridge crossing the Hudson River a few miles below Albany, N. Y., has a steel-truss span of 1,008 feet, the longest such span known. It was opened in 1924.

Charleston, S. C. Highway bridge over Cooper River; length, 3 miles; cost, $6,000,000. The main cantilever span is 1,050 feet long. Finished 1929.

Chicago, Ill. (1) Halsted Street Bridge over Chicago River; noted lift bridge, with towers of steel framework, and a suspended truss span. (2) Michigan Avenue Bridge, erected in 1918–20, a general traffic double-deck, two-leaf bascule bridge. The bridge is 92 feet wide, 340 feet long and weighs 10,000 tons.

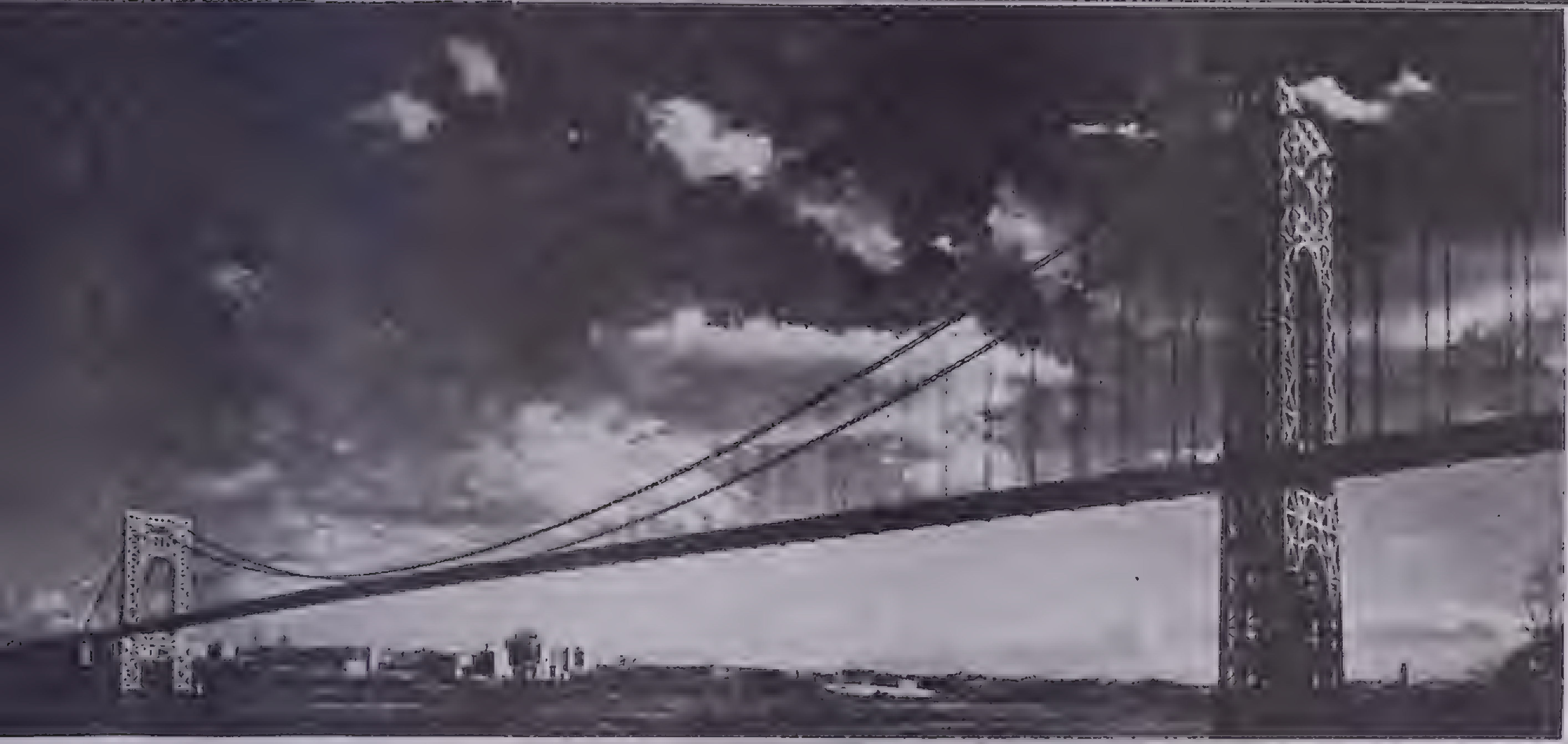
Cincinnati and Covington (over the Ohio). Built 1867; reconstructed, 1897; length, 2,720 feet; suspension type with main span 1,057 feet long; carrying a railroad.

Cleveland, Ohio, high-level bridge crossing



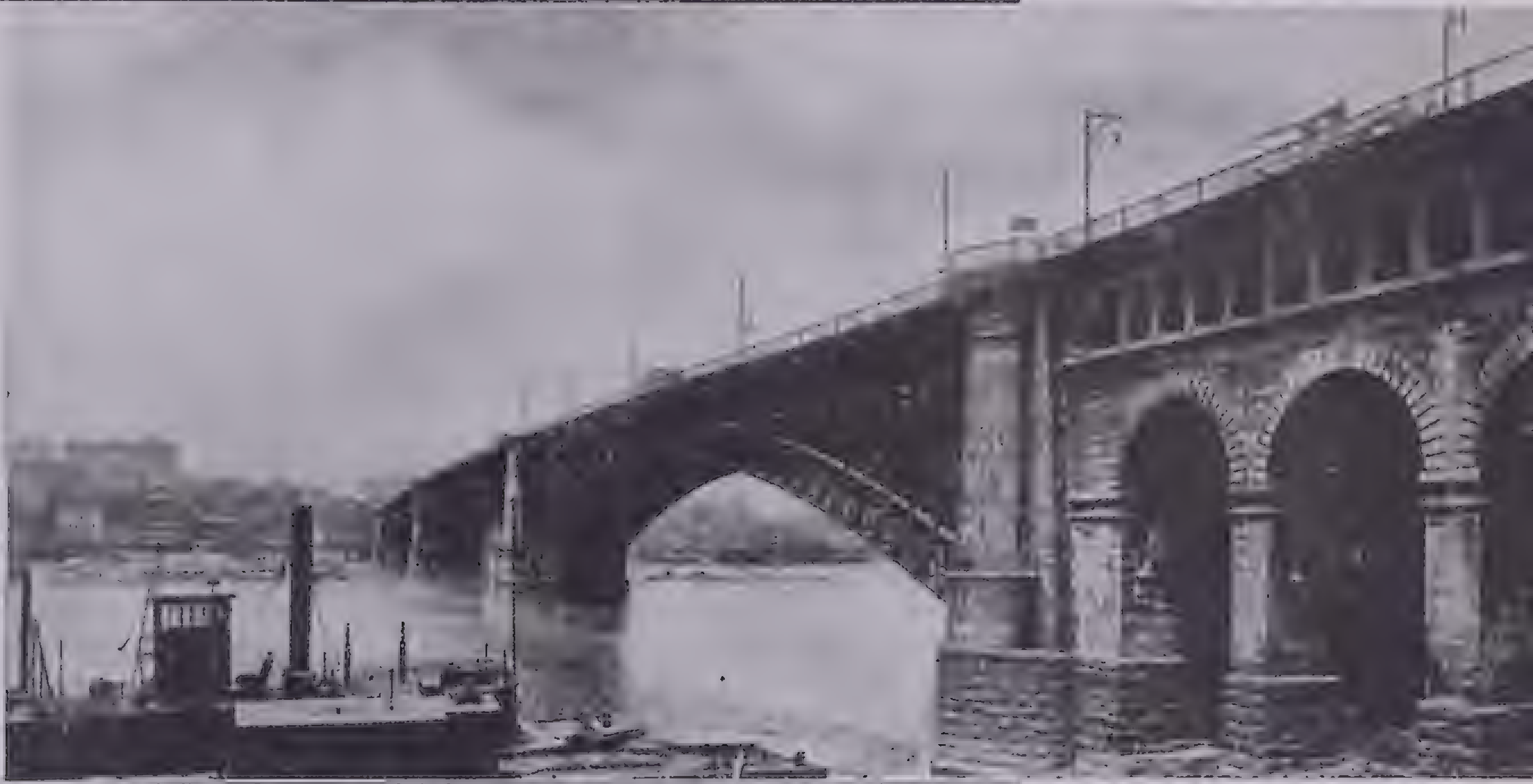
Golden Gate Bridge, a 9,217-Foot Suspension Span over the Golden Gate between Marin County and San Francisco

Courtesy Redwood Empire Association



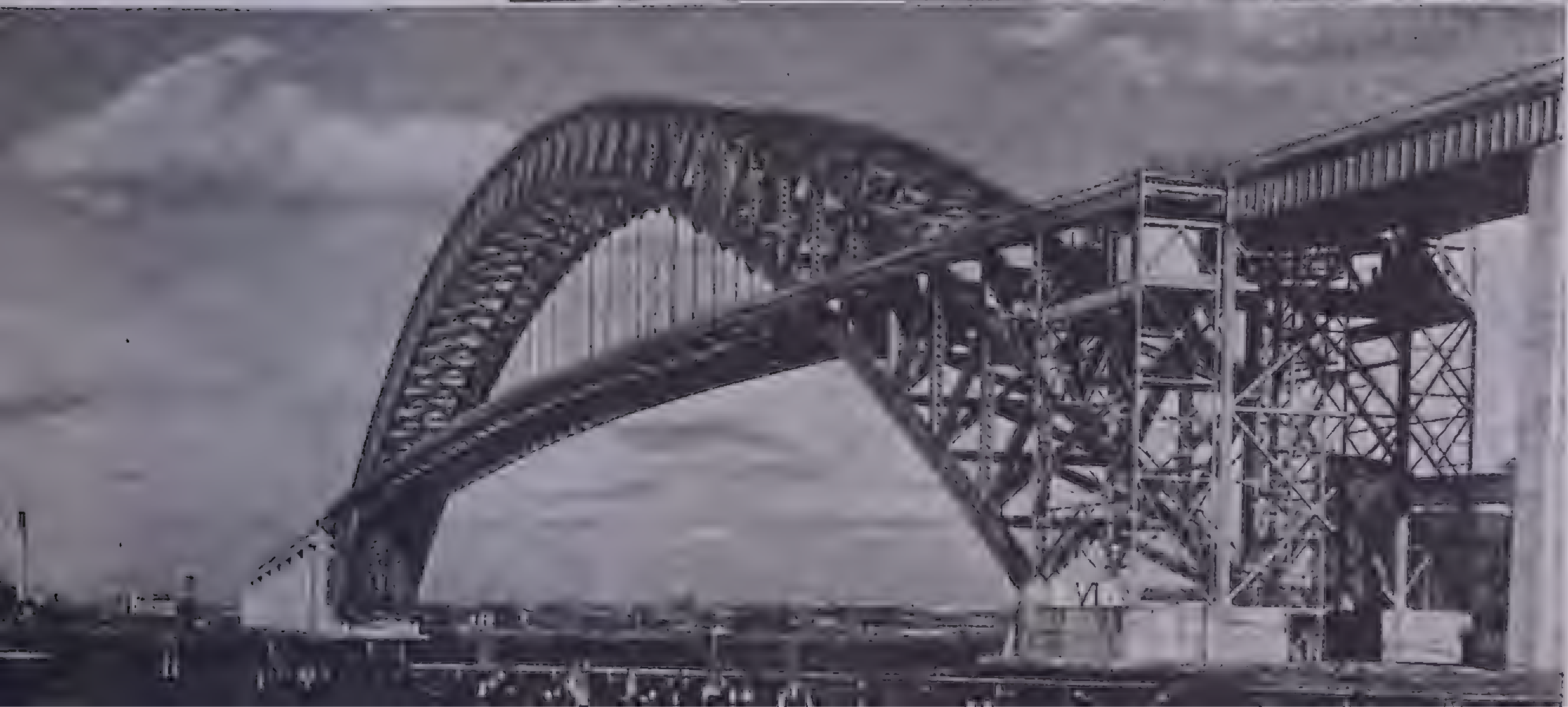
George Washington Bridge, a 3,500-Foot Suspension Span over the Hudson River Connecting New York and Fort Lee, New Jersey

Courtesy Port of New York Authority



Eads Bridge, a 6,434-Foot Span across the Mississippi River at St. Louis, Missouri

Bridges



Bayonne Bridge Connecting Staten Island, New York and Bayonne, New Jersey, with a 1,675-Foot Steel Arch Span

Courtesy Port of New York Authority

Cuyahoga River, 96 feet above water level. Two-deck bridge 81½ feet wide, 2,880 feet long, upper level roadway 45 feet wide. Twelve concrete arches, central span of steel, 174 feet between arches.

Clifton, or Upper Arch (over Niagara River). Length, 1,268 feet. Blown down 1889, rebuilt in 1898, wrecked by ice jam, 1938.

Danube River, at Cerna-Voda, Rumania; carrying a railroad; length, with approaches, 12 miles.

Delaware River Bridge from Philadelphia, Pa., to Camden, N. J. Length 8,126 feet; height above water, 135 feet; main suspension span 1,750 feet; completed 1926; cost $29,000,000. It carries highway and rapid-transit traffic.

Douro Bridge, an arched iron structure near Oporto, Portugal, total length, 1,150 feet; span of arch, 520 feet; height from low water to crown of arch, 198 feet. Opened in 1877.

Eads, St. Louis, Mo. Cast-steel arch, 6,434 feet long; main span, 520 feet; for railroads; opened, 1874.

Forth Bridge. Over the Firth of Forth, Scotland; cantilever; iron and steel; length, nearly 2 miles, including approaches; channel span, 1,710 feet. Opened in 1890; cost, $15,800,000; railway.

Fribourg Suspension Bridge. Over the Sarine valley, Switzerland, 870-foot span; 167 feet above the river; built 1833–34.

Garabit Viaduct. Over the Truyere, in the south of France. The total length is 1,849 feet; the main portion, 1,469 feet in length, is of steel and includes a trellis parabolic arch with a span of 541 feet. The rail level is 401 feet above the river. Begun, 1879; completed, 1884.

George Washington Bridge over the Hudson, New York city to Fort Lee, N. J. A suspension span of 3,500 feet, rising clear 213 feet above the river, it has a total length of 7,800 feet. In 1931, when completed, it was twice the length of any other suspension span. The towers supporting the cables rise 635 feet above the river. It cost about $75,000,000, and is designed for highway and rapid-transit traffic.

Golden Gate Bridge crosses the entrance to San Francisco Bay by a suspension span 4,200 feet long, the world's greatest to date. It is supported from towers 746 feet high. It was finished in 1937. The bridge is 9,217 feet long; with approaches, 4½ miles long; it carries highway traffic.

Harlem River Aqueduct (High Bridge) in New York city. Stone; length, 1,450 feet; semicircular arch, 425 feet long; completed 1848.

Hell Gate Bridge. A steel-arch bridge, 18,000 feet long, crossing East River in New York city. Main span, 1,017 feet. Construction cost, $15,000,000. Opened, 1917. For railway traffic.

Huey Long Bridge crosses the Mississippi River 5 miles north of New Orleans. It is 23,000 feet long, with a main cantilever span of 790 feet. Carrying railway and highway traffic, it was opened in 1935.

International Peace Bridge. Crosses Niagara River from Buffalo, N. Y., to Fort Erie, Ontario, Canada; opened on August 7, 1927. It is 4,150 feet long; with a vertical clearance of 100 feet above the river, and a main truss span of 360 feet. It is a vehicular bridge; cost, $4,500,000.

Interstate, a vertical-lift bridge crossing the Columbia River at Vancouver, between the states of Oregon and Washington. It is 23,000 feet long, 150 feet in height. The main span is 275 feet. Completed 1917.

Karlsbrücke (Charles's Bridge), over the Moldau at Prague. Built by Emperor Charles IV of Germany, 1384. 1,855 feet long. Gate towers at either end, ornamented with groups of statuary. Greatly damaged by flood, September, 1890; since repaired.

London Bridge. A historic stone-arch bridge crossing the Thames where a bridge has stood about 1,000 years. It is 925 feet long, with a main span of 152 feet. Total cost, $7,291,000.

Longview. A 1,200-foot cantilever highway span crossing the Columbia River at Longview, Oreg. Opened 1930.

Luxembourg. Stone, containing span of 277 feet; largest single-arch stone bridge in the world.

Manhattan. A suspension bridge crossing the East River in New York city, 135 feet above high water. Length is 6,855 feet; main span, 1,470 feet. Construction cost, $16,700,000. Opened for traffic 1909.

Metropolis, Ill., crossing the Ohio River. Truss, 5,700 feet; main span, 720 feet; railway; opened 1917.

Mid-Hudson Bridge, Poughkeepsie, N. Y., over the Hudson River; total length, 4,072 feet; main suspension span, 1,500 feet; clearance, 135 feet; height of towers above water, 308½ feet; estimated cost, $6,000,000. Highway; opened 1930.

Montreal Suspension Bridge, crossing the St. Lawrence River. The main suspension span is 1,097 feet long; opened 1930.

Plougastel Bridge at Brest, France, crossing the Elorn. It has three concrete arches of 612 feet span, the world's greatest of that type. Opened 1930.

Quebec. Cantilever bridge at Quebec, Canada. Length, 3,240 feet; height, 150 feet; span, 1,800 feet. Completed 1917, at cost of $9,000,000.

Queensborough, N. Y. Iron cantilever bridge across the East River; opened in 1909; length, 7,449 ft.; main span, 1,182 ft.; has elevated railroad tracks, highway lanes and walks for pedestrians. Cost, $15,000,000.

Rockville Bridge. Near Harrisburg, Pa., four-track stone railway bridge. Length, 3,810 feet. It contains forty-eight 70-foot stone arches and cost $1,000,000.

San Francisco-Oakland Bridges (Trans-Bay). Crossing San Francisco Bay from San Francisco to Oakland, Calif. Carries highway and rapid-transit traffic; opened 1937. There are two suspension spans each 2,310 ft. long and a 1,400-ft. cantilever span; total length, 4.3 miles; cost, $77,000,000.

St. Louis Municipal Bridge. Simple truss, crossing the Mississippi River at St. Louis, Mo. Length is 17,922 ft.; length of main span is 668 ft. Height, 65 ft. Opened 1913.

Stockholm Harbor. Opened 1934; highway and rapid-transit traffic. Its 535-ft. concrete arch span is one of the longest of that type.

Storstrom Bridge, Europe's longest bridge. It connects the Danish islands of Zealand and Falster and has a footpath, a bicycle lane, a driveway and a railway track. Total length, 10,432 ft., cost, about $8,844,000.

Sukkur Cantilever Bridge, crossing the Rori branch of the Indus at Sukkur, with a single span of 790 ft., opened in 1889.

Sydney Harbor, Australia. A single steel-arch span of 1,650 ft., with over-all length, including approaches, of 3,770 ft. Cost $40,000,000.

Tower Bridge. Steel-and-masonry bascule drawbridge across the Thames below London bridge. It has a central opening of 200 ft. between two high towers; opened in 1894. Cost, $7,786,400.

Triborough Bridge at New York city, crossing Hell Gate and connecting Long Island to Manhattan and the Bronx. Opened 1936; cost $60,000,000. The main span is 1,380 ft. long, suspension type; highway traffic.

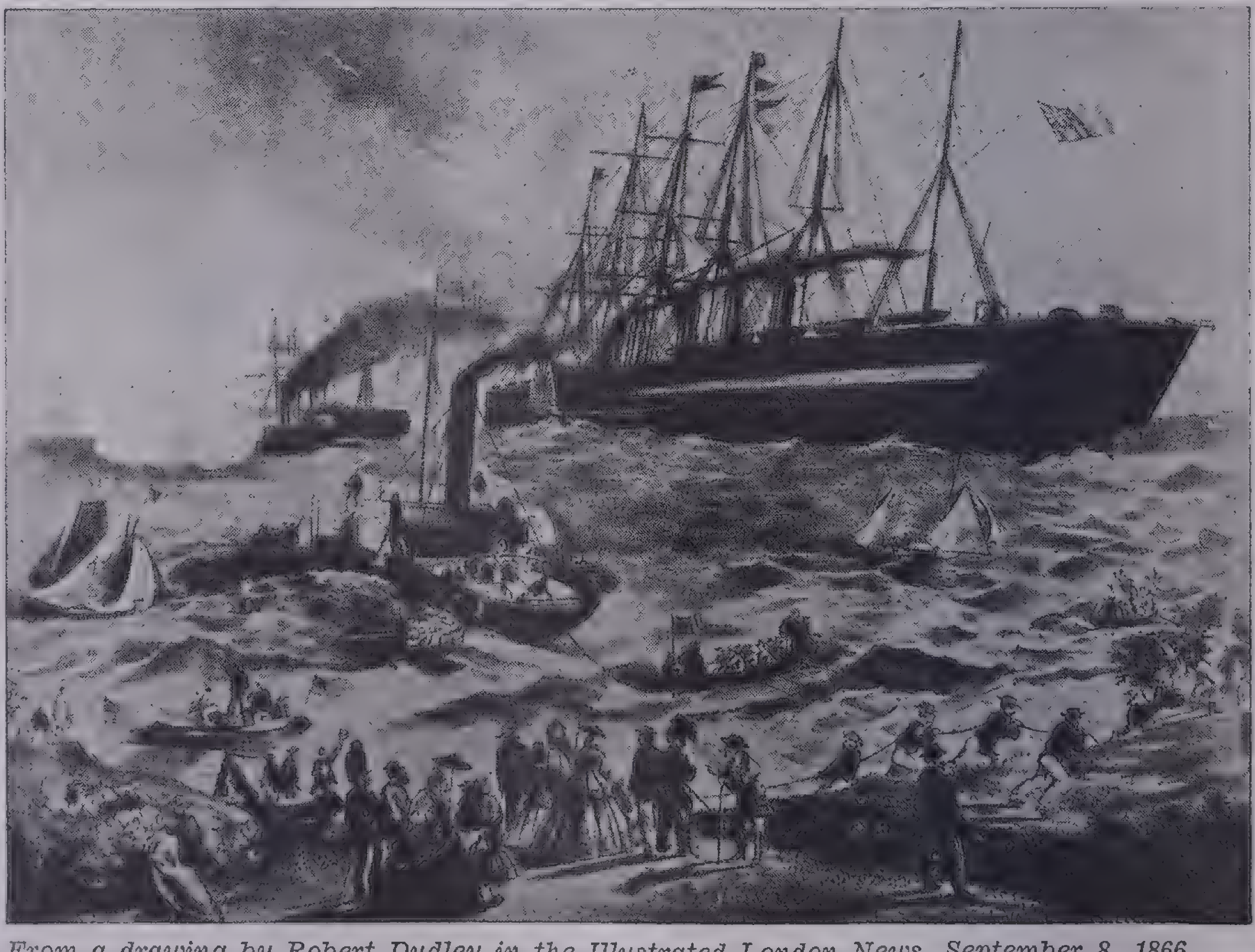
Washington Bridge (across Harlem River valley, N. Y.); two steel arches of 509 ft. span; roadway, 80 ft. wide; length, 2,375 ft.; height above the Harlem River, 133½ ft.; opened, December, 1888. Construction cost, $2,851,000.

Williamsburg. Across East River, connecting Manhattan and Brooklyn. Total length, 7,308 ft.; main suspension span, 1,600 ft.; width, 118 ft.; height above mean high water, 135 ft.; cost, $15,000,000, exclusive of real estate. Opened in 1903.

bronze, an alloy of copper and tin, harder than either of them. Bronze becomes harder and more brittle as the tin content increases. Usually it contains at least 80 per cent copper. Some bronze (especially that for building hardware, such as hinges) has a little zinc in it; this makes it less brittle and easier to machine than the true bronze with no zinc, which is better for cast products. Bronze with zinc added is often used for machine bearings; usually it has more tin and less copper. Bronze for bells (bell metal) has 3 to 5 parts of copper to 1 of tin. Speculum metal, formerly used for telescope reflectors, had 2 to 2½ parts of copper to 1 of tin, often with arsenic, antimony or zinc in small quantity to whiten the alloy. Aluminum bronze has 5 per cent, more often 10 per cent of aluminum in the alloy. Bronze is resistant to atmospheric moisture and is, therefore, widely used for such things as bells, statuary and ornamental doors, which must have long life while exposed to the weather.

cable, telegraphic, a telegraph line crossing the ocean floor to permit overseas communication. Before the first cable was laid across the Atlantic communication was slow—3 or 4 weeks elapsed between mailing a letter to Europe and receiving a reply. The cable as now perfected makes possible an exchange of messages within a few hours.

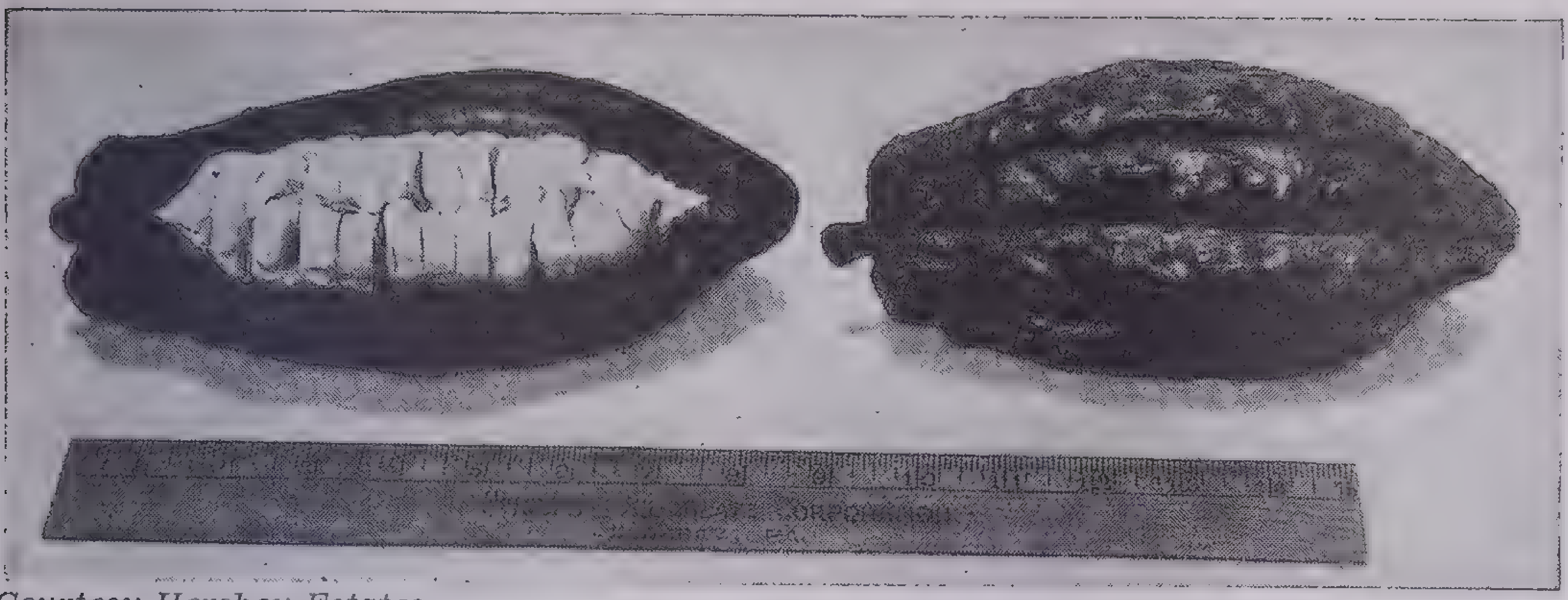
To lay a continuous cable along the ocean floor for a distance of 2,000 miles or more was a prodigious task, but it was accomplished in 1858 by



From a drawing by Robert Dudley in the Illustrated London News, September 8, 1866

Two Continents Are Linked

The first Atlantic telegraph cable stretched from Valencia, Ireland, to Heart's Content, Newfoundland. This picture shows the *Great Eastern* landing the cable on the Newfoundland shore July 27, 1866. The shore end of the cable was actually landed from a small boat as shown here: the *Great Eastern* could come no closer to the land because of her size



Courtesy Hershey Estates

Cacao Pods

The one at the left has been cut away to show the cacao beans from which cocoa and chocolate are made

Cyrus W. Field. Up to that year 100 miles was the greatest distance spanned by a cable, and that was in comparatively shallow water. At first it was thought that the depth of the ocean would prevent laying a transatlantic cable; but surveys showed that a submarine shelf extended for most of the distance between Newfoundland and Ireland. This simplified the task, and Field tried in 1855 to lay the first cable across the shallowest part of the ocean. The cable broke repeatedly, but after other trials the two continents were linked temporarily in 1858.

After a few weeks of service the cable failed, and Field found it difficult to raise more money to try again. In 1865 a large ship, the *Great Eastern,* was chartered to make another attempt; after losing 1,000 miles of cable, two cables were eventually landed in Ireland and proved stable. Now 100,000 miles of cable connect the continents.

In the modern cable electrical impulses forming the message are flashed along a small copper wire. To protect the wire against the water it is first wound with a layer of permalloy, an alloy of nickel and iron; this actually increases the effectiveness of transmission by heightening the magnetic effect of the current. Over the winding of permalloy there is complete insulation of the copper wire and permalloy by a thick layer of gutta percha. Then a layer of jute is followed by another of steel wires, providing strong protection, over which there is another jute wrapping, followed by the final and exterior wrapping of tarred hemp cords. A wire 2,000 miles long offers extremely high resistance to the passage of an electric current. A current strong enough to carry signals clearly audible would burn out the cable, so the current actually used is very weak and is stepped up or intensified by instruments in receiving offices. Improvement in materials and in the sending and receiving devices has gradually increased the efficiency of cable service. When Queen Victoria sent a message to President Buchanan on the completion of the first cable in 1858, the 50 words of her congratulatory note required 1½ hours for transmission. Today a speed of about 200 words a minute is possible, and by the aid of a duplex device messages can be sent in both directions at the same time.

cacao, the large seeds of the South and Central American cacao tree (*Theobroma cacao*), from which chocolate and cocoa are obtained. The cacao beans are contained in a pod that grows on the trunk and larger branches of the tree. These pods are from 7 to 10 inches long and about 4 inches in diameter.

The finest cacao is raised in South America and the West Indies, but more than half of the world's total supply now comes from British West Africa, where the output more than trebled between 1916 and 1926. Some cacao is grown in Java and Ceylon.

The distribution of cacao trees in different parts of the world and the fact that ripe pods may be found on the trees almost any time of the year assure a remarkably constant and continuous supply. The United States takes about 40 per cent of the world's output; Germany and Great Britain, about 12 per cent apiece and the Netherlands and France about 9 per cent apiece.

Cacao requires a hot, continuously moist climate and a fairly good soil. Strong winds and excessive sunshine damage the trees and reduce the yield.

calcimine or **kalsomine,** a liquid wall covering, not so heavy or durable as oil paint. It is made from a mixture of water and carbonate of lime (whiting) or zinc white and coloring matter. To give it adhesive qualities a binder of glue, casein or a resinous gum is added. It differs from whitewash because it has a binder and is made in different colors.

calculating machine, a machine for performing mathematical computations. Such a machine eliminates errors, relieves monotony of work and increases the speed of the process. Calculating machines of various types have been used for a very long time. The earliest form is the *abacus,* the invention of which has been claimed by the Chinese who still use it. It was known also to the Egyptians as early as 460 B.C. It consists of a set of wires upon which beads are strung. One row of beads represents units; the next, tens; the next, hundreds and so on. The operator moves the beads in a certain relationship, with respect to the numbers to be added or subtracted and observes their final positions to read the result.

The Romans and European merchants of later ages figured by the same method, except that they did not use beads on wires. Instead they laid loose stone counters on a chart representing an abacus. These stones were called *calculi,* and from this we get our word *calculate.*

Modern adding machines usually consist of a series of wheels, positions on the circumference being assigned numbers from 1 to 10. The wheels are so connected mechanically that for each full revolution of a given wheel, the adjacent wheel makes one-tenth of a revolution in much the same manner as mileage is totalized on an automobile speedometer. The wheels are usually caused to revolve by operating keys on a keyboard similar to that of a typewriter. Usually several columns of keys are provided, one representing units, another tens, another hundreds and so on.

The mode of operation of the machine can be best explained by means of an example. If the 5 key in the units column is depressed, the first wheel makes five-tenths of a turn. If the 7 key in the same column is then depressed, the wheel makes an additional seven-tenths turn, which causes it to move two places past its original position, moving the next wheel, the tens wheel, forward one-tenth turn to the position marked 1. Thus it now reads 12, which is the sum of 5 and 7. If now the 3 key is pressed in the tens column, signifying the addition of 30, the second wheel moves forward to position 4, the units wheel remaining stationary, so that the wheels now indicate 42, which is the sum of 5, 7 and 30. Such a machine is not different in principle from the ancient abacus.

There are many types of office machines that employ this principle. Some provide only a visual indication of the total; some print both the numbers and the sum on a strip of paper; and another is a combination of a typewriter and an adding machine so that the various entries in bookkeeping can be made at the same time the calculations are made. Multiplying and dividing also can be done on adding machines but usually it is rather a complicated process.

The most common form of multiplying device is the slide rule. It consists of two linear scales so arranged as to slide past each other, with the numbers arranged as logarithmic scales. As a result the sum of two or more distances measured along the scales corresponding to as many numbers on the logarithmic scale is proportional to the sum of the logarithms of the numbers. Because of the logarithmic scale, however, one actually reads the product of the given numbers instead of the sum of their logarithms. For example, to multiply 2 by 3 on a slide rule, one moves the sliding scale to the point where its first mark is opposite the figure 2 on the stationary scale. Next he finds the number 3 on the sliding scale, and opposite this on the stationary scale he reads the answer, 6. Many operations other than multiplication can be performed on slide rules, depending on the scales employed. Slide rule results are only approximate, however, and not absolutely accurate as in the case of adding machines, the degree of accuracy depending upon the length of the scale used.

One of the most ingenious of office machines is that used for sorting and tabulating information. The most common type, the Hollerith machine, was developed for sorting and tabulating census figures. It uses cards punched with holes. The positions for the holes are arranged in columns and rows, and each position is assigned some special significance. For instance, in a census, the card for a Chinese woman might be punched with two holes, say the third hole in the first column to indicate *Chinese* and the fifth hole in the fourth column to indicate *woman.* If it were decided to determine the number of Chinese women in a particular city, all the cards for that city would be run through the machine, but the machine would tabulate only those having holes punched in the two positions mentioned.

In the Hollerith machine tabulation is done electrically. It has a number of electrical contacts that correspond to the number and position of the possible holes on the card. Above these are a set of electrical brushes, equal in number and position to the hole positions on the card. When it is placed between the contacts and the brushes, the card allows contact between all where holes occur. The card itself prevents contact in unpunched areas. The current passing through is conducted to an electrical counter, which thus tabulates the total. If it were desired to tabulate the number of cards having holes in the fourth position in the second column, for instance, the counter would be connected to the fourth contact in the second column, and the counter would record only when such a card came through. Since machines can handle as high as 400 cards per minute, tabulations can quickly be made that with human labor would require many months of effort.

Another type of sorting and tabulating device is the Powers machine. It uses punched cards similar to those used in the Hollerith machine, but it operates mechanically rather than electrically. Instead of using electrical brushes and contacts, it is equipped with a set of metal pins that drop into the holes in the cards.

camera, a chamber or box into which light reflected from some external object enters through an aperture or lens and is brought to a focus upon a plane surface, where a light-sensitive area records the image of the object. The development of the camera resulted from the chance observation that if one is in a darkened room and light is admitted through a small hole, an inverted image of the objects from which the light comes will be formed on the back wall. When such a device is used as an aid in sketching or in making direct observations, it is known as the *camera obscura* (Latin for darkened chamber); when the image is formed upon a light-sensitive film, plate or paper for the purpose of automatically making a permanent record, the device is known as the *photographic camera* or simply *camera.*

The camera obscura with a so-called pinhole aperture was known as early as 300 B.C., when it was used for demonstrating the properties of light and for sketching the constellations. Although the use of a pinhole resulted in a sharp image the intensity was very low because of the limited amount of light that could be admitted through such a small aperture. Later the intensity of the image was increased by collecting the light over an appreciable area and bringing it to a focus either with a lens or with a concave mirror. Focusing means taking all the light that passes through the aperture from a point on the object and bringing it together at a point on the image.

The use of the mirror for focusing was first described in 1550 by Girolamo Cardano, the famous Italian mathematician, physician and astrologer; and the use of the lens by Daniello Barbaro, a Venetian nobleman who described it in 1568. In 1589 the lens was described by the Italian physicist Giambattista della Porta (1541–1615).

Although the camera obscura was of great value, it was obvious that a permanent record of the image would be still better. It was also recognized that first a light-sensitive surface had to be devised upon which the effect of the light would be to produce a change in color, either simultaneously with exposure or else as the result of some treatment subsequent to exposure.

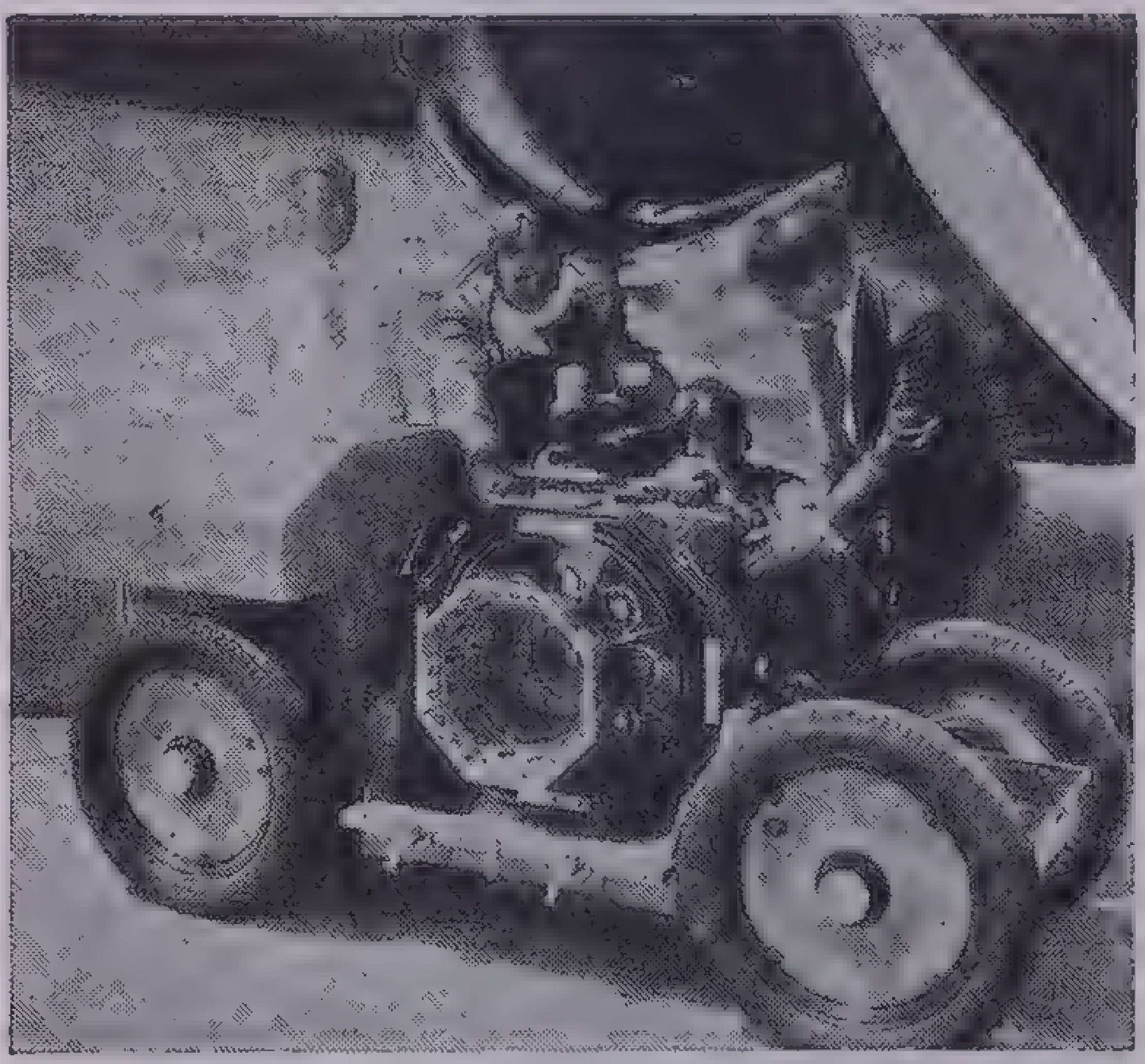
The first photographic camera was of the same general form as the camera obscura, except that the image was formed upon a light-sensitive surface. The plates were very slow and the lenses small in diameter, so that an exposure of several minutes was usually necessary. It must be admitted, however, that those small lenses had an advantage in that they did not require critical focusing. This is in direct contrast to the modern high-speed lenses with large apertures.

With the discovery of more sensitive materials the exposure time necessary to obtain a satisfactory photograph was greatly decreased; it had been reduced to a few seconds by 1850 and to small fractions of a second in 1878. This improvement was almost immediately followed by the development of lenses that would give much more intense images, making possible still shorter exposure time.

It was discovered that a simple lens with spherical surfaces resulted in several different kinds of distortion, the principle ones being *chromatic* and *spherical abberation, astigmatism* and *coma.* Furthermore, the depth of focus of fast lenses, whether corrected or uncorrected for distortion, is greatly reduced, especially when focusing on nearby objects. It has been found necessary, therefore, to provide some means of focusing high-speed lenses in order to obtain sharp images of objects that are at different distances away from the camera. Today the various kinds of distortion have been satisfactorily corrected through the use of two or more lenses of the proper design; the problem of focusing is solved by varying the distance between the lens and film or between the component lenses.

The best lenses for a given size of image are now ordinarily rated according to *focal length* and *f-number.* The focal length is the distance from the center of the lens to the image when the lens is focused on a very distant object; the f-number is the ratio of focal length to lens diameter. This dual rating is necessary because the dimensions of the image are approximately proportional to the focal length of the lens, and the amount of light admitted is proportional to the area of the lens, which in turn is proportional to the square of the lens diameter. Hence the focal length can be taken as a measure of the image size and the f-number as a measure of the intensity of the image, which actually determines the speed of the lens.

In general the shorter the focal length of a lens, the smaller the image but the greater the depth of focus. However, the perspective is poor for nearby objects. Professional photographers and advanced amateurs often have a wide variety of special-purpose lenses available for use on the same camera, such as a wide-angle lens for large group and panoramic use; a telephoto lens for closeups of distant objects; a short-focal-length lens for copying purposes.



Courtesy U.S. Coast and Geodetic Survey

Fairchild Mapping Camera

This enormous camera with its equipment weighs 750 pounds. It is used for aerial survey work. It has a central lens surrounded by eight others. The central lens records the area directly below it. Eight slanting mirrors pick up images of territory lying outside the range of the central lens and reflect the images into the other lenses. In this way the flying cameraman can photograph 31.2 square miles from an altitude of 6,875 feet and 313 square miles from a height of 21,780 feet. The composite photograph reproduced on the next page was 35.4 inches square

With the development of fine lenses came improved cameras. Although the early ones could obtain fair results without providing special means for focusing, the matter of accurate focusing is of the highest importance today. At first this was accomplished by a telescope arrangement, soon replaced by the leather bellows. In many of the cameras for general snapshot work, the bed of the camera is graduated for distance; in the so-called view and studio cameras, a ground-glass back is first inserted and the camera used as a camera obscura while focusing. The plate or film holder is then put into place and the exposure made. Although this is a very effective method and permits the substitution of different lenses, its use was for a long time limited to still pictures.

This limitation has been removed by the development of the reflex camera. In this a mirror inclined at an angle of 45 degrees reflects the image on a ground-glass screen at the top. After the camera is focused, the picture is taken by depressing a trigger that releases the mirror, which swings upward against the top, whereupon a focal-plane shutter is released. Still another type of reflex camera employs an auxiliary focusing lens, which makes possible the use of an ordinary shutter in this model. Another focusing method quite popular in recent years in higher-priced miniature cameras consists of mounting a range finder on the camera and mechanically linking it with the lens motion. This has proved satisfactory; compactness is claimed as one of its advantages over the reflex method.

Besides fast lenses and sensitive films a rapid-acting shutter is necessary for high-speed work. The most common type is mounted within the lens assembly and consists of an arrangement of thin metal leaves that are opened and closed symmetrically by a spring, the speed being controlled principally by the spring tension. In the higher grades such a shutter is constructed with the precision of a watch and is ordinarily built for speeds as high as 1/300 of a second.

For extreme high-speed work, however, the focal-plane shutter used in many reflex cameras is very effective. This is a curtain pierced by several transverse slits regularly arranged along its entire length. It is mounted on rollers and stretches across in front of the film or plate. In its normal position the curtain completely shuts off the light. The upper roller is under spring tension, and upon release enough of the curtain travels by to permit one of the slits to make a complete passage from one roller to the other across the face of the plate, thus making the exposure. By the proper choice of spring tension and width of slit a large variety of exposures ranging between 1/10 and 1/1000 of a second are available.

During the past few years the miniature camera has become increasingly popular. This is principally because of its compactness and the low cost of its film, as well as to the comparatively low cost and great depth of focus of the short-focal-length lenses required. However, the pictures must be enlarged to obtain prints of a satisfactory size. This inconvenience may soon be removed by development of more efficient enlargers.

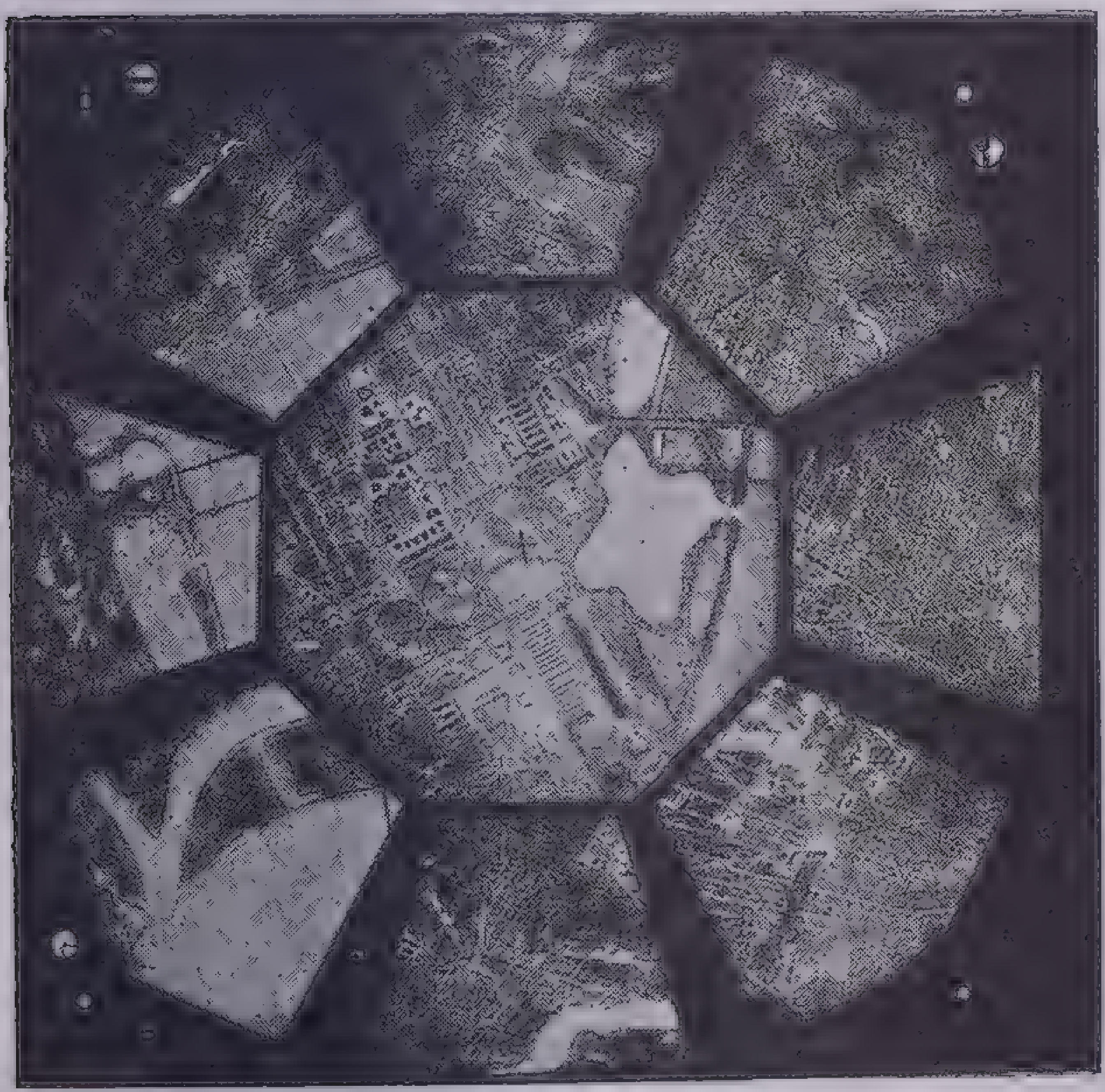
camphor, a white, gumlike substance ($C_{10}H_{16}O$), used in medicine and derived from a tree (*Cinnamomum camphora*) of the laurel family native to Japan and China. It is prepared by steam distillation: the camphor tree is cut into chips, and these are superheated in a still; the camphor content, in volatile form, is carried into a receptacle; after it cools into a white mass, it is cut into small blocks for the market.

In liquid form camphor is 70 per cent alcohol, 10 per cent camphor and 20 per cent water. Besides its use in medicine as a stimulant, a sedative and a perspiration-producer, laurel camphor is used in making celluloid and in manufacturing fireworks.

Borneo or *Malay* camphor is made from a large East Indian tree, *Dryobalanops aromatica; mint* camphor is made from peppermint, and *thyme* camphor, from thyme.

A monopoly of laurel camphor was set up in Formosa in 1899 to control production, and in 1903 it was extended to include the whole Japanese Empire. Camphor producers are licensed and controlled by strict government rules. The monopoly maintained the price, with the result that a synthetic substitute came into the market and now supplies more than half the world's total production, 2,400 tons out of 4,500. Synthetic camphor is made from oil of turpentine by passing hydrochloric-acid gas into the oil.

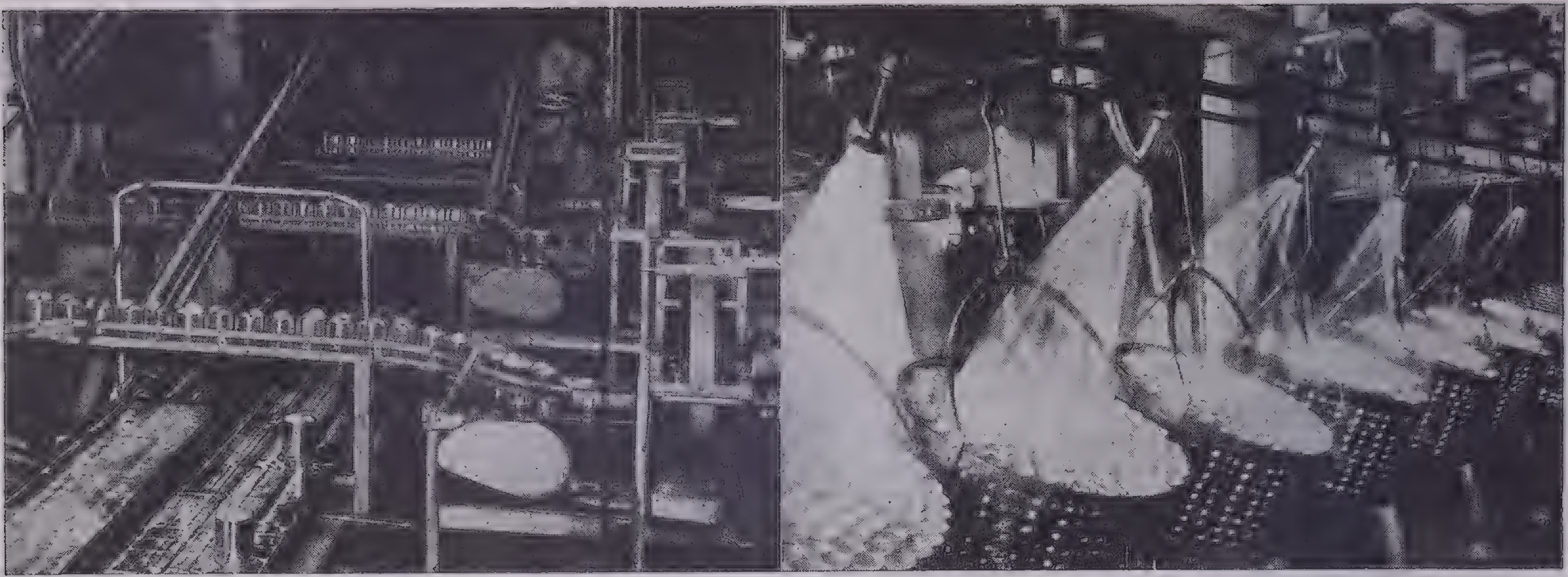
canning and preserving, the conservation of food by processing and sealing in air-tight containers; preserving involves cooking with sugar. Canning and preserving on an industrial scale are relatively recent developments. Man has preserved foods by such methods as salting and drying from the very beginning of civilization, but



Courtesy U.S. Coast and Geodetic Survey

Photograph Taken by the Mapping Camera

This is the composite photograph taken by the aerial mapping camera described above. The nine pictures are not in their normal relationship; they must be assembled correctly and joined as shown at the right. The scene shows the city of Washington, D.C., as photographed from a height of 6,900 feet



Courtesy California Packing Company *Courtesy Food Industries*

Canning Industries—The Nation's Chefs

Food factories are highly mechanized. At the left are peaches traveling on conveyors from one processing machine to the next. At the right are cans of spaghetti fresh from the cooking vats. They are being sprayed to cool and clean them

it was not until Napoleon's time that any attempt was made to industrialize food preservation and put it on a mass-production basis.

In 1810 François Nicolas Appert, a Frenchman, received a prize of 12,000 francs from Napoleon for his discovery (about 1795) that meat could be kept in a hermetically sealed container. An English patent on the process was taken (not by Appert) in 1810. Appert put food in a glass bottle, covered it with water, inserted a cork, then heated it gradually for a long time. The bottle was then sealed.

Appert did not understand why this process preserved the food, because the whole science of bacteriology was not developed until later by Pasteur, who in the last half of the 19th century found that all foods, water, air and containers were carriers of bacteria, which the heating of the food and containers killed. The sealing excluded the bacteria on the outside. Until about 1898 it was supposed that the exclusion of air was the important thing.

The canning industry in the United States began in New York city about 1820, when Ezra Daggett and Thomas Kensett packed salmon, lobsters and oysters. Today the United States is the largest producer and consumer of canned foods in the world. The 1935 census reports 3,018 establishments in the United States engaged in canning and preserving food. They employ nearly 130,000 wage earners, and the yearly production is worth more than $900,000,000. Vegetables and soups make up 39 per cent of the total; fruits, 16 per cent; canned fish and oysters, 7 per cent; dried fruits, 9 per cent; pickles, preserves and sauces, 22 per cent; all other types 7 per cent. These figures do not include canned meats and milk.

Because the industry uses such a variety of perishable raw materials, its plants are widely scattered. California is the leading state, and California, New Jersey and New York produce almost half of the industry's products by value. Peas, corn and tomatoes are canned in the states where these vegetables are produced in largest quantities.

The canning and preserving industry is almost world-wide. English and Scotch jams and marmalades are famous, and some English manufacturers have established branches in the United States. France and Italy have large canneries for vegetables and fruits, especially peas, tomatoes and cherries. The Scandinavian countries specialize in canned fish, and Norway exports canning machinery. Sardines are canned in almost every country with sea fisheries. Japan and Soviet Russia have huge canneries for crab meat. In South America there are canneries of beef and corned beef owned by United States packers.

The Canning Process. Although the process differs somewhat with each product, certain steps are common to all—collecting, grading, washing and preparing the food product, filling the cans, sealing, processing and cooling.

Careful grading assures uniformity of size, appearance and quality. Grading for size is done very largely by machines. Fruits are passed over screens having standard-sized openings; peas are sifted through perforated cylinders; beans are passed over vibrating rolls that sort them on the basis of thickness. Grading for quality consists of choosing products of uniform texture, color and the like. This work must be done almost entirely by hand.

Fruits and vegetables are washed much more thoroughly in canneries than in home kitchens. Each can of peas, for example, is washed with nearly a gallon of water. Not only the product to be canned but the containers and the machinery as well must be kept very clean.

Many vegetables and some fruits are given a brief cooking in hot water. This operation, known as blanching, removes the sticky substance from the surface of vegetables and softens them so that they are easier to handle and more tender to eat. Blanching fruit brings about greater flexibility, which aids in better packing and produces uniformity of color. Bleaching the product is not the object of the process, as many people assume. Most fruits are hand-packed; and most vegetables, machine-packed. All fruits are packed by weight; and most vegetables, by volume.

Nearly all products have a syrup or brine added. All high-grade fruits are packed in syrup; only the lowest grade is packed in water. Vegetables require a salt brine or a sweet brine that contains a mixture of salt and sugar. Some products, of course, such as tomatoes, pumpkin and the like, do not require the addition of any liquid. Nothing is added to salmon except dry salt; tuna are usually packed in salt and olive oil; sardines may have a mustard or tomato sauce or oil. Meat jelly is usually added to meats. When a syrup or brine is used, it is added by machinery after the product has been placed in the can.

After the cans have been filled and the brine, if needed, has been added, the cans are gradually heated to drive out the air or are sealed in a chamber under a partial vacuum. The cans are then closed and sealed. In most canning factories this is done by automatic machinery that places the cover in position and crimps the edge to the can by means of heavy rolls.

The cans are then ready for processing. This is the final sterilization, and consists of heating the filled cans. This may be done below, at or above the boiling point, depending on the product. The cans are next cooled, to prevent prolonged cooking, by pouring or spraying cold water over them or by allowing air to circulate freely around them. Finally they are labeled and packed in cases ready for the market.

Many ingenious machines have been developed to save hand labor: the *viner*, for instance, into which pea vines (with the pods intact) are put, and which delivers shelled peas. Others are machines for paring and coring fruits.

Most products are never touched by

hand from the beginning to the end of the canning process; but some—asparagus, for instance—call for much hand work.

carburetor, a device that vaporizes and mixes gasoline or kerosene with air to make a fuel for an internal-combustion engine. The air is needed to provide oxygen for combustion, and to introduce the fuel into the cylinder in explosive form.

A chemically perfect mixture ratio is 15 parts of air to 1 part of fuel by weight. If too little air is supplied, fuel is wasted because some of it does not burn; if too much, the mixture is weak in fuel and a weak explosion results.

The working principle is illustrated by the simplest type, known as the *plain tube* carburetor. It consists of a storage chamber in which the fuel level is held constant by a float, and a nozzle that discharges fuel into the intake manifold. The intake manifold is the pipe through which vaporized fuel enters the engine cylinders. When the engine is working, air rushes upward through the manifold, picking up and vaporizing the fuel forced through the nozzle by pressure in the float chamber.

If the engine always ran at the same speed, such a carburetor would be satisfactory; but an automobile engine runs at many speeds, and a plain-tube carburetor cannot maintain the proper air-fuel ratio. It discharges only a certain constant amount of gasoline, and when engine speed increases and more air rushes into the manifold, the mixture is certain to be weaker. There have been many devices attached to carburetors to overcome such handicaps. One is a metering pin in the nozzle that permits more fuel to flow when more air is drawn into the manifold.

When an engine is idling, it needs a rich mixture because the vapor is diluted by exhaust gases remaining in the cylinder, a condition not important at high speeds. So carburetors now have an extra jet or nozzle so placed that there is suction on it when the throttle is closed. This jet feeds more fuel into the air stream.

The latest important development is a pump that enriches the mixture during acceleration. It comes into operation when the throttle is moved.

casein (from the Latin word for cheese), several proteins precipitated from milk. Increased demands for butter fat have left a larger supply of skim milk available. For a long time it was wasted, but it is now an important raw material in many processes. There are three principal types of casein:

Self-soured casein is produced by allowing skim milk to sour in tubs. It is then heated from 135° to 165° F. and the coagulated mixture is broken up with wooden rakes. This separates the watery whey (used as hog food) from the more solid curd or casein. The curd is pressed to remove excess moisture and dried on trays.

In making *acid casein* the skim milk is agitated, and diluted acid (usually sulphuric or hydrochloric) is added; the mixture is held at 140° F. The agitators are then stopped and the curd and whey allowed to separate.

In the manufacture of *rennet casein* only fresh skim milk can be used. It is heated to 104° F. and rennet is added in the proportion of 1 part to 5,000 parts of milk. (Rennet is obtained from the lining of calves' stomachs.) As the rennet is added, the milk is agitated until coagulation takes place. The curd is then allowed to settle, and the whey is run off.

Self-soured and acid caseins are used to give a smooth hard coating to paper (replacing animal glues that are more affected by moisture). Casein-coated papers take ink much better than those that are glue-coated. Caseins are used also in the manufacture of many new-type glues that can be applied cold and are stronger than the animal glues. Joints so glued are stronger than the wood itself. Casein is used also as a binder in many cold-water paints for interior use. Such paints dry smoothly, are water resistant and may be cleaned with water.

Casein is also used in the preparation of easily digested foods, in the manufacture of cheese, in the preparation of massage creams and as a sizing for plaster. Mixed with insecticide solutions for spraying trees, it helps to hold the poison on the sprayed parts.

Rennet casein finds its greatest use in plastics.

cathode-ray tube, apparatus for producing a stream of high-velocity electrons called *cathode particles.* Usually the electrons strike a target and there produce X rays or excite a fluorescent screen or crystal in order to transform electrical energy into some form of visible or invisible radiation for some useful purpose.

As long ago as 1859 German scientists were working with the so-called Geissler tubes—glass tubes filled with rarefied gas in which the electric discharge produces light. They noticed that a bright fluorescence appeared on the inner surface of the glass. It was soon found that the fluorescence was produced by something originating at the cathode—the negative electrode—for when an object was placed in front of the cathode it appeared to cast a well-defined shadow upon the walls of the tube. The exact nature of the invisible radiation remained a mystery until 1895, when it was definitely established that it consisted of particles having a negative charge. The name *electron* was later given to such a particle.

Subsequent work, principally by Prof. Robert A. Millikan in this country, measured both the charge and effective radius. In general an electron can now be considered as simply a small concentrated charge of electricity and nothing else; its apparent mass is due to the energy residing in the magnetic field set up about it when it is in motion. Because of their electrical nature electrons can be deflected by an electrostatic or a magnetic field. It is on account of these properties of the electron that cathode-ray tubes have come to play such an important part in high speed measurements and television, since a beam of these comparatively inertialess particles can be moved back and forth at high speed.

Although many types have been developed, all cathode-ray tubes include a cathode that acts as a source of electrons; a system of electrodes or both electrodes and coils to speed up the electrons to a high velocity and to focus them into a beam; and finally an air-tight envelope either of glass or metal. The tube is either exhausted of air or filled with a gas, such as helium, neon or argon. In some applications the gas-filled tube is useful, since the gas helps to focus the beam.

The Coolidge tube, invented by Dr. W. D. Coolidge of Schenectady, N. Y., is a cathode-ray tube operating at very high voltages. This tube is generally used as a source of cathode rays.

Since electrons attain a very high velocity, they also acquire a considerable amount of energy. In fact so great is this energy that, if a very thin sheet of metal or some other strong material is mounted at the end of the tube, the electrons will penetrate this window and pass on into the space outside. This makes it possible to study the effects of cathode rays upon different objects in the open air. It has been found that some crystals, for example, will glow brightly when they are exposed to the rays, the glow often persisting for a considerable time after the tube has been shut off. The effects of the rays upon bacteria, the growth of plants and the like have been carefully studied.

In one laboratory a rabbit's ear was exposed to the rays. The rabbit indicated no distress, but some days later the hair came off and was replaced by a much more luxuriant growth. A second, more prolonged treatment resulted in the perforation of the thin membrane of the ear. This is both significant and disappointing, since it probably excludes the use of cathode rays as a hair restorer because it may be dangerous.

Aside from such experiments cathode rays produced by such tubes are extensively used in the study of the structure of materials, including the arrangement of the different atoms in crystals.

X-ray Tubes. When high velocity electrons strike a metallic object, such as tungsten, for example, high-frequency electromagnetic waves are produced. These are known as X rays, and they can penetrate many substances. X rays have proved their value in the practice of medicine, where they play an important part in both the diagnosis and treatment of diseases. A great deal of the development work carried out on high-voltage cathode-ray tubes has been in connection with the making of X-ray tubes. As a matter of fact the present-day Coolidge tube is essentially an X-ray tube minus the target, and can actually be considered a by-product of X-ray tube development.

Cathode-ray Oscillograph Tubes. The ease with which cathode rays can be deflected by either an electrostatic or magnetic field has resulted in the development of the cathode-ray oscillograph tube. This is extensively used in the study of high-frequency wave phenomena, such as sound waves, high-frequency alternating currents, mechanical vibrations and either natural or artificial lightning discharges, for example. The results of these studies are felt in our everyday life in improved radio reception, phonographic reproduction and riding qualities of automobiles, as well as in reduction in the number of interruptions in our lighting service. We may have cathode ray tubes in our homes if television develops along its present lines.

Courtesy General Electric Company
Cathode-Ray Tubes
The tube at the left operates at 70,000 volts, the one at the right at 300,000 volts

In a cathode-ray oscillograph tube the stream of electrons is speeded up by a number of current-carrying coils. Other devices bring the beam to a focus, much as a lens focuses a beam of light. The beam falls upon a screen made of barium platino-cyanide; calcium, magnesium and zinc tungstate; calcium phosphate or sulphate; zinc and calcium sulphide; or zinc borate. Wherever the beam strikes such a plate, a luminous glow is produced. For some work the beam falls upon a photographic plate.

The beam of electrons can be steered about by an electrostatic or a magnetic field, the amount of deflection of the beam depending on the strength of the field. It is clear, then, that the tube can be used as a sort of meter for measuring the strength of currents in such fields. It will not only measure the current but, by falling on a photographic plate or by producing a moving luminous spot, it will actually register the amount by which the beam has been moved. Furthermore, it can measure several quantities at once when one current is so arranged as to pull the beam sideways while at the same time another is pulling it up and down. Such a tube is used in radio studios and like places to show a complete picture of a sound at the moment it is produced. The various qualities of a voice or of a note from an instrument appear on the oscillograph screen as a moving, waving light, greenish-yellow or bluish-white, depending upon the screen material.

Television Tubes. Cathode-ray tubes for television reception purposes are known as *kinescopes* (trade name copyrighted by the Radio Corporation of America), *image tubes* or *reproduction tubes.* The details of construction and theory of operation of such a tube are essentially the same as for the glass tubes constructed for oscillographic purposes; variation in the intensity of the spot of light is obtained by introducing the television signal into the grid circuit, and the back-and-forth motion of the beam by means of an appropriate system controlled by a series of synchronizing signals originating at the transmitting station. In Germany such tubes have been made with screen diameters as great as 18 inches, but in the United States the largest size has been 16 inches. *The projection kinescope* is a special tube designed to make it possible to show pictures larger than can be projected on the regular type of kinescope. A small, intense image is produced on a screen and is then projected onto a motion-picture screen by means of an appropriate lens system.

Zworykin Iconoscope. This is a special form of cathode-ray tube used in a television transmitter to translate various intensities of light from a picture into electrical impulses of corresponding strength. It differs little in internal construction and principle of operation from oscillograph tubes. In the iconoscope the screen consists of a layer of substance that emits electrons when it is exposed to light. This material is uniformly deposited, in the form of small globules insulated from one another, over the surface of a conducting plate that is first given a thin coating of some insulating material. The plate is then mounted inside the tube so that it makes an angle of 30 degrees with the axis of the tube, the coated side facing the source of cathode rays. The beam of rays can be brought to a focus and moved about to any point on the screen.

When the picture or scene to be transmitted is brought to a focus upon the screen by means of a suitable camera arrangement, electrons are emitted at each point at a rate proportional to the light intensity there, so that each little condenser thus formed becomes gradually charged. The result is that as the electron beam traverses the screen it discharges each of the condensers in rapid succession, which produces a series of impulses in the external circuit. Thus a series of electrical impulses are produced that correspond in intensity to the brilliancy of the successive small areas passed over on the image.

cattle, bovine animals raised in the more progressive sections of the world for meat, milk or both. Beef cattle are quite different in build from dairy cattle. They are larger, have broader, fuller backs and shorter, thicker necks. Dairy cows must be more carefully housed and require more attention. They are fed on juicy grasses and are given large quantities of water. Beef cattle eat more concentrated food than do dairy cows.

Most of the world's dairy cattle are raised near markets where the milk can be sold. The development of fast transportation and refrigeration has extended the distance from which a city can receive milk, but milk is a bulky and perishable product that cannot be shipped great distances under any circumstances.

Certain sections of the world, as Denmark and Switzerland, are especially suited to dairying, except for the fact that they do not have a market large enough to absorb all the milk they produce. Consequently they condense it into products of smaller bulk and higher value, such as cheese, butter and evaporated or condensed milk, which can be shipped without deterioration to other countries.

In the United States the distribution of dairy cattle corresponds closely to the distribution of the human population; and there is, besides, a specialized dairy belt from Wisconsin and Minnesota eastward to the St. Lawrence Valley. This area produces fresh milk for the city markets, but it is more important as a producer of butter and cheese.

About two-thirds of the beef cattle for the American market are grown west of the Mississippi River, though two-thirds of the market is east of the Mississippi. The reason is, of course, the West's open grazing ranges.

Besides meat beef cattle furnish hides for leather, hoofs for gelatin and glue, bone for making fertilizer, blood for fertilizer and material for the manufacture of a meal to feed young cattle and for some bakery materials. Beef-gland extracts—pepsin, insulin and others—are of great medicinal value.

The world's greatest exporter of beef and beef products is Argentina. Other exporting countries are Uruguay, Australia, New Zealand and the United States. The cattle population of the world is 684,300,000, of which the United States has 67,000,000.

There are two new developments in raising beef cattle. Cattle are no longer sent direct from the western ranges to the slaughterhouse. They are shipped instead to middle-western pastures where they are fattened for some months. The other change has to do with the cattle themselves. Because American families are smaller than in past generations, smaller cuts of meat are wanted. Beef animals are now killed before they have reached full growth—baby beef—and smaller breeds of animals are being developed.

caustic soda or **sodium hydroxide,** a white, waxlike solid (NaOH), soluble

Courtesy du Pont Company

How Cellophane Is Made

At the left the workman is removing sheets of spruce wood pulp that have been steeped in caustic soda. In the center the pulp has been ground and treated with carbon disulphide. Further processing produces a plastic material that is forced through a thin slit and hardened to produce the finished sheet shown at the right

in water and highly corrosive, readily attacking a great many substances. It is manufactured from common salt by electrolysis—breaking down the salt into sodium hydroxide and chlorine by passing an electric current through it. An older method is decomposing soda ash (Na_2CO_3) with calcium carbonate.

Caustic soda is an important alkali reagent in the manufacture of hard soaps (soft soaps are made with potash instead of soda), paper, rayon and textiles; and in refining oils, tanning leather and making synthetic dyes. Caustic soda gives cotton fibers or cotton goods a high luster; the process of application is known as *mercerizing*.

cellophane (trade name), a transparent cellulose sheeting. It is used chiefly for packaging and wrapping, but a cellulose sheet not greatly different from cellophane is the basis of photographic film. Cellophane has minor uses—transparent dressings for wounds, for instance. It is produced in all colors and can be printed.

The principal raw materials are cellulose in the form of wood pulp or cotton linters (the short fibers that cling to the seed after the long fibers have been removed for other uses), caustic soda, carbon disulphide and sulphuric acid. The raw materials are very carefully selected, because they have an important bearing on the quality of the finished product.

First of all the cellulose must be changed to a nonfibrous, uniform-textured mass called *viscose*. Bleached sheets of wood pulp, the usual source of cellulose, are steeped in a caustic-soda solution. The fibers swell and through chemical action form sodium cellulose and water. The sheets are then pressed and shredded, and the crumbs are placed in aging cans where they are kept at a temperature of about 75° F. for 48 to 72 hours.

After aging the crumbs are brought in contact with carbon disulphide and lose their fibrous nature. The resulting material is cellulose xanthate of sodium, which is again mixed with caustic soda and water to produce a viscose solution. This is ripened at a constant temperature for 4 or 5 days, during which it is filtered to remove dirt and other foreign matter. After air bubbles have been removed, the viscose is ready for casting.

The mass is now in plastic form, ready to be shaped. The usual method is to force viscose through a long, narrow slit. The soft sheet that emerges passes at once into an acid bath, which hardens it. Rolling finishes the process.

It is only the shape in which the viscose is cast that makes cellophane different from rayon; for rayon the viscose is squeezed through a tiny hole to make a thread instead of through a slit to make a sheet.

celluloid, trade name for a synthetic plastic made from nitrated cellulose dissolved in camphor.

cellulose, the principal part of the cell walls of plants. All cellulose is very much alike, whether it is derived from cotton, wood or some other source—white and fibrous in appearance. It is an increasingly important raw material in the making of the synthetic substances that claim so much attention from today's inventors. A cellulose pulp is produced as the first step in paper manufacturing. Rayon (artificial silk), cellophane, plastics, artificial leather, camera films, explosives and smokeless powders and a host of other products are made from cellulose.

Cellulose is transformed into a nonfibrous, uniform-textured mass called *viscose* by dissolving the fibers in some chemical. Viscose is then handled in different ways to make the various final products. If it is to be rayon, the viscose is squirted through tiny nozzles into an acid bath that hardens it into thread; for sheets, such as cellophane, the liquid is forced through narrow slits into the bath.

cement, any material that, mixed with water, hardens by chemical action into a solid stony mass; and especially such material used for building and engineering. The ancient Egyptians, Greeks and especially the Romans knew how to make excellent cement. Many of the historic Roman structures are made with cement. The Forum has a concrete foundation, and the Temple of Julius shows marks of the forms into which the concrete was poured. Ordinary mortar made of lime had been known long before the Romans' time, but their cement was so good because they mixed with it a reddish sand, called *pozzuolana,* volcanic ash from the foot of Mt. Vesuvius. This made a hydraulic cement, that is, one that would harden under water. The secret was lost for a long time, and European writers in the 18th century, commenting on the poor cement then in use, speak of the Roman cement as a lost art.

In 1756 an English engineer, John Smeaton, undertook to build a new lighthouse on Eddystone Rock in the British Channel. Other lighthouses had been placed there but had been swept away. In some way Smeaton rediscovered the Roman secret. He sent to Rome for pozzuolana, mixed it with the local lime mortar and thus made a concrete underwater foundation for the lighthouse.

In many places in the world there are deposits of minerals already mixed by nature that, when treated, will make cement much like Smeaton's, and builders used this for a long time. They were careful not to overheat it in the making, and threw out pieces baked too hard. If only they had ground up such pieces, they would have had Portland cement! Not until 1824 was this known, when a British bricklayer, Joseph Aspdin, patented the process. He took materials not mixed by nature—pulverized lime and clay—and burned them at high temperatures. The resulting cement he called *Portland cement* because he thought it resembled the building rock from the island of Portland.

Natural cement was first made in the United States in 1818 from a natural deposit near Fayetteville, N. Y. This was the canal-building era; the demand for canals stimulated production of cement, and cement was thereby popularized as a building material.

Portland cement, when it was discovered, was so much better than the natural kind that it was in great demand in the United States. It was first manufactured here by David O. Saylor about 1870. At first engineers refused to use it, preferring the imported product, but the business grew rapidly when the Government endorsed domestic cement at the end of the century by ordering large quantities for fortification work. The industry was hampered by lack of uniformity in the product, and a great advance was made by the adoption in 1904 of standard specifications for Portland cement, governing the production of all American manufacturers.

The chief ingredient of Portland cement is limestone, which reaches the cement mill as chunks of rock blasted out of limestone hills or quarries. This rock is pulverized during various steps through the mill until it is reduced to a powder so fine that its particles will readily pass through a sieve with a mesh small enough to hold water. The limestone dust then goes into slowly revolving horizontal kilns, invented by Edison, that look like long sections of sewer or water mains.

Heat as great as 2500° F. is applied inside the kiln, from powdered coal, gas or oil, usually coal. All moisture is driven off, and slag, the waste glassy material from blast furnaces, is mixed in. This takes the place of the volcanic ash used by the Romans. Chemical changes are brought about by the heat, and a new product results—hard lumps called *clinker*. Because the kiln slants slightly, the raw material goes in at one end, and clinker comes out at the other.

In the final grinding a small quantity of gypsum is introduced; the amount of gypsum regulates the speed at which the cement will harden when used. The product is now Portland cement. It is so finely ground that it will pass through a sieve with 40,000 openings to the square inch. This fine division is important in bringing about the chemical action that hardens cement.

From the time the great chunks of limestone reach the mill to the moment when the cement is placed in bags ready for shipment, human hands do not touch the product. This is remarkable, for the material passes through about 80 processes.

Cement is produced in many parts of the United States. The cost of shipping such bulky material is so high that the industry must have plants wherever there are supplies of raw material. More cement is manufactured in the Lehigh Valley in northeastern Pennsylvania and northwestern New Jersey than in any other part of the United States.

When cement is used, it is mixed with sand, which not only reduces costs but is necessary for good concrete. Sand prevents shrinkage and cracking and allows air to penetrate the mass so that it will harden. Water also is added, and this too serves two purposes—it makes the concrete plastic and usable, and it is necessary in the hardening, which is not an evaporation or drying-out process but a definite chemical change.

Cement is so widely used that we may be said to live in a new stone age. The United States leads the world in per capita use of cement. Its principal use, about 34 per cent, is in structural work for all kinds of buildings, dams, bridges, tunnels, reservoirs, storage tanks and the like. Over 32 per cent goes into highways and pavements; farm uses alone take 17 per cent; masonry products, such as pipe, tile and block, use 7 per cent; and railroads consume 6 per cent. Besides its use in concrete, cement is used for stucco, an exterior coating for buildings. The value of cement manufactured in the United States is about $120,000,000 annually.

charcoal, brittle, porous carbon that burns without smoke or flame. It is prepared from wood (or other vegetable substance) or from animal matter by charring (burning) in a kiln with insufficient air for complete combustion. The centuries-old method was to take a number of small logs, pile them into a mound or pyramid, cover them almost entirely with earth and set them afire. Since the earth covering excluded almost all air except that admitted through valves, the fire smoldered. The heat permeated the wood and partially consumed it, but charcoal remained. Once all charcoal was produced by this method, which is still used to some extent. Of course industry has devised scientifically constructed kilns for large-scale charcoal making.

Hardwoods make the best charcoal, but almost any wood can be used. Wood charcoal is burned for many special heating purposes. In powdered form it is used as a water filter; it serves as a gas absorber in the laboratory, in furnaces and in gas masks. Combined with other materials, it is a metal polish. Artists use charcoal pencils for sketching.

Animal charcoal, also called bone black, is made from bones by much the same process. It is used as a filter in sugar refining. Animal charcoal was used in gas masks until it was discovered that wood charcoal kept at a red heat for some time acquired extra power of absorption. This is called *activated charcoal.*

chlorine, a greenish, poisonous gaseous element, obtained from common salt by electrolysis. Heavy electric current passed through the salt solution breaks it down into caustic soda (NaOH) and chlorine, which, either pure or in compounds, finds thousands of industrial uses. It is indispensable for bleaching paper and cloth. Because it attacks disease-carrying bacteria, it is widely used to purify drinking water and water in swimming pools. Chlorine is the basis of chloroform and is a part of many medicines, dyes, cleaners and useful chemical compounds.

chocolate, a food, beverage and confection made from the seed kernels of the cacao tree, from which cocoa also is obtained. Both chocolate and cocoa are made from cacao beans, but in manufacture the natural fat is removed from the cocoa and left in the chocolate. This makes chocolate more nutritious than cocoa.

In the manufacture of chocolate the cacao beans are crushed between machine rollers to a pasty mass. For sweet chocolate sugar is added. In milk chocolate besides a small sugar content, there is 12 to 15 per cent of milk by volume. The paste is then hardened into cakes.

Chocolate was a favorite drink of the Aztecs in Mexico when the Spaniards conquered that part of the New World. It was drunk cold, and the unsweetened ground cacao beans were flavored with peppers and spice. Adding sugar was a Spanish idea; and as long as they could the Spaniards kept the process of manufacture a secret.

In 1657 a chocolate shop in London offered bar chocolate for sale at 10 to 15 shillings ($2.40 to $3.60) a pound. In England and on the Continent chocolate shops where the beverage was served became fashionable resorts. Prices were kept high by import duties in England and other countries until the 1850s.

Courtesy Hershey Estates

Millions of Kisses!

All the preparation and shaping of chocolate products is done by machinery

cigar, a cylindrical mass of tobacco, tightly rolled, for smoking. It consists of three parts. The inside or filler is tobacco leaves that have been stripped of their midribs and stems; these leaves are then rolled and covered with a wide leaf as a binder. Outside of this is rolled in spiral fashion a thicker and more durable leaf to serve as a protective wrapper.

The inner tobacco may be domestic tobacco, and the outer cover may be tobacco grown in the tropics, known as *Havana* tobacco. Domestic wrappers of the Havana type are grown in the United States, especially in the Connecticut Valley. Pure Havana cigars are the most expensive. Most cigars are now made entirely by automatic machinery. Although the use of cigars is steadily decreasing in the United States, about 5 billion are produced here every year.

cigarette, a small pencillike cylindrical mass of finely cut tobacco in an open-end wrapper or cover of thin rice paper. Cigarettes are now made entirely by machinery of intricate design; each machine is capable of making many thousands of cigarettes in a day. More than half the states of the Union prohibit their sale to minors, and some states forbid their sale entirely.

The cigarette business has grown very rapidly in the United States since the World War. In 1913 the production of cigarettes was 15½ billion; now it is well over 140 billion.

clay, a common earth, mostly hydrous aluminum silicate (kaolin), usually mixed with sand, aluminum silicates, iron oxides and other minerals. It is easily molded with simple tools when damp; it dries hard. The greatest use of clay is in the manufacture of bricks, cement, pottery and tiles. In dry countries it is used also to build mud huts. If a more permanent building material is desired, clay bricks are formed and sun-dried. If the bricks are fire-baked, they are resistant to almost all weather conditions.

The main types of clay are:

Brick and Tile Clay, the commoner sorts. Clay for bricks is better if it has up to 25 or 30 per cent sand and other impurities that keep the clay from shrinking too much when it is fired. The less sandy kinds are better for tile.

Fire Clays are relatively free from alkalis, and since bricks made from it are not affected by great heat, they are used to line blast furnaces and the like.

China Clay (kaolin) for porcelain and china is white, crumbly and earthy; it is usually formed by the decomposition of granite.

Unburnt Clay is used to produce a smooth, coated surface on paper and for filters.

Building trades use most of the product of clay-working industries. In the United States four important industries—cement, brick, pottery and glass—included in this group give employment, directly or indirectly, to ¼ million workers and add products worth a billion dollars to our industrial life. The value of pottery and porcelain products is over $65,000,000 a year and that of brick and tile about $110,000,000.

The basic raw material is clay or sand. Each industry relies on heat to effect change or fix the form of its products. Large amounts of fuel are necessary. The products are bulky, fragile or heavy, and because of shipping difficulties usually are manufactured near their market.

clocks and watches, instruments whose moving parts measure and indicate the passing of time. Among the earliest time-keeping devices were the sundial, the hourglass and the clepsydra. The hourglass indicates the passage of time by the receding surface of sand trickling through a small hole in a vessel; in the clepsydra, water replaces the sand. This led to the adoption of a mechanism whereby the water dropping through the hole fell on a small paddle wheel that turned a pointer to indicate the time of day. It is not known when the energy of falling weights was substituted for that of falling water to move the pointer. The Chinese claim this invention as of 2000 B.C.; the Germans claim it as of the 11th century A.D.

The oldest known clock built according to modern principles was made by Henry De Vick and installed in the tower of the royal palace of France in 1379. It used the energy in a raised weight to turn a train of wheels carrying the pointer and an escapement for regulating their speed, known as the *crown wheel escapement.* This is merely a wheel having wedge-shaped projections that cause a bar and staff to oscillate back and forth, the wheel progressing one cog for each oscillation.

The introduction of the pendulum into clockwork mechanism was one of the most important contributions to timekeeping. Its value lies in the fact, discovered by Galileo and first used in a clock about 1657, that a pendulum swings through its arc in the same length of time, regardless of whether the arc is long or short. The time of the swing depends only on the length of the pendulum itself. When a pendulum and escapement mechanism were substituted for the crown wheel, bar and staff, a clock of greatly improved accuracy was produced. Some of the most accurate clocks in existence today are regulated by pendulums. One source of error is the lengthening of the pendulum when the temperature rises. A long pendulum swings more slowly than a short one; therefore simple pendulum clocks tend to run fast in winter and slow in summer. Such error is avoided if the pendulum rod is made of two different metals, such as steel and copper, having different rates of expansion. They are arranged so as to expand in opposite directions and are so proportioned that the net expansion is zero.

Portable timepieces were first used about the end of the 15th century. The essential parts of a watch are the balance wheel with a hair spring for regulating the movements, an escapement, a train of gears with face and hands for indicating the time and a mainspring with apparatus for winding. The gear wheels in the better watches are mounted on jewel bearings to decrease friction.

The accuracy of a watch depends in a large measure on the construction and adjustment of the balance wheel and hair spring. In cold weather watches tend to run fast because of the contraction of the hair spring and the balance wheel. To overcome such variations the rim of the escapement wheel is now made of two dissimilar metals in much the same way as bimetallic thermostats. The rim sectors are mounted only at one end, so that the other end is free to move toward the center of the wheel. As the temperature drops the difference in rates of expansion of the two metals causes the rim to expand, thus tending to reduce the speed and overcoming the tendency of the watch to run too fast.

A chronometer is essentially a large watch of very precise construction for use in navigating ships. Since the rolling of a ship prevents the use of pendulum mechanisms, a great deal of experimenting was necessary before satisfactory chronometers were perfected. The knowledge so gained was then used in making pocket watches.

The measurement of time, like the measurement of longitude, begins from the prime meridian that passes through Greenwich, England. When the sun is directly above the prime meridian it is 12 o'clock noon at that point; therefore, when a ship is at a point on the ocean 1/24 of the distance around the earth to the west, the longitude being 15° W., it is 11 A.M. Greenwich time. If a navigator whose chronometer registers Greenwich time takes astronomical observations that show the time to be 11 o'clock when his chronometer indicates 12 o'clock, he knows that his longitude is 15° W.

There are many time-indicating systems in which only one clockwork mechanism operates a number of different sets of hands and clock faces at different points. In many industrial establishments a master clock of high accuracy controls secondary clocks at various points throughout the plant. These secondary clocks have the appearance of ordinary clocks but have no clockwork mechanism of their own. Their hands are moved by electric or pneumatic impulses sent out from the master clock. In this way higher degrees of accuracy and uniformity are obtained. The most extensive of these systems is that of the Western Union Telegraph Company. Their standard clock is adjusted periodically by means of time signals coming directly from the U.S. Naval Observatory in Washington. From this standard clock periodical impulses are sent out over their telegraph lines to all parts of the country to control secondary clocks.

Electric clocks are driven by synchronous motors, that is, being alternating current motors whose speed can change only when the speed of the generator supplying them with electrical energy is changed. Inexpensive electric clocks are thus no less accurate than the most expensive ones. The accuracy of these systems is remarkably high; the maximum deviation from correct time in some of the systems has not exceeded a few seconds in a full year.

clothing industry, making ready-to-wear apparel. The industry began in France about 1830 when a Paris tailor, Barthélemy Thimmonier, invented a sewing machine and got army contracts for uniforms. Before then all clothing had been made to individual measure. About the same time in America a few tailors began to supply clothing for sailors who had only a short time in port. The business was later extended to supply the slaves of the southern plantations with cheap clothing. Shops designed the garments and cut the cloth. The sewing was done in the homes of city people or on farms during the winter months.

The sewing machines invented by Howe in 1846 and Singer in 1851 and the circular disk cutter invented in

1873, which made possible the simultaneous cutting of many thicknesses of cloth, soon brought about the mechanization of the industry.

About 1845-50 there were serious persecutions of Jewish people in Austria-Hungary, Russia and Poland. They fled to America, especially to New York city, in great numbers and supplied the labor for the growing clothing industry in the United States; and also in England, many Jews settled in London to do tailoring. Immigrants from other countries also found employment, but the Jewish people made up the most important single group in the industry. Working conditions were very bad in the needle trades, and many laws have been passed in the United States and in England to improve working conditions, shorten hours and increase pay. The clothing trades were the last of modern industries to have much *outwork,* that is, processes carried on in the workers' homes and not in a factory.

Courtesy Consolidated Sewing Machine and Supply Co.

Mass Production in the Garment Industry

Cloth is folded into layers and the whole pile is cut to pattern by these machines

The modern clothing industry is specialized to a high degree. Workers are no longer tailors: they are cutters, fitters, machine operators, pressers and so forth. Furthermore they work only on one type of garment—a coat worker never makes dresses, for instance. Each person performs only one detailed task; the making of a pocket requires 13 operations, each done by a different person. Machinery is similarly specialized. There are machines for sewing buttons, for making buttonholes, pressing, hemming and the like.

One essential in making ready-to-wear clothing is a table showing sizes to which the garments are to be cut. These must necessarily be averages taken from a great many actual measurements of human beings. Measurements of soldiers in the Civil, Spanish-American and World Wars have been of great help to the clothing industry. A retail dealer knows exactly how many suits of each size he will need. He knows also how many suits he will require to take care of the various types of figure. One such table is this, designed for a store carrying 500 suits in stock: 45 per cent regular; 6 per cent long; 13 per cent short; 2 per cent extra short; 8 per cent stout; 3 per cent short stout; 2 per cent long stout; 4 per cent portly; 2 per cent long portly; 3 per cent short portly; 3 per cent forward (stooped); 3 per cent young stout; 3 per cent stalwart; 2 per cent corpulent.

There has been no way of obtaining similar figures for women, although in recent years measurements of women in colleges have been helpful.

The first step in making ready-to-wear clothing is production of a design, and the making of paper patterns representing each part of the garment. These parts are carefully laid out according to the width of the cloth so that there will be the least possible waste of material in cutting. The cloth is folded into a number of thicknesses—as many as 50 to 60 in work clothes—and cut according to the arrangement of the patterns. The assembling and sewing may be done in an entirely different factory.

Fully 80 per cent of all ready-to-wear clothing, both men's and women's, is made in the big cities. New York alone turns out 75 per cent of all women's clothing and 35 per cent of the men's. Most factories are small. Nearly half the shops in New York employ fewer than five workers and only about 5 per cent of them employ more than fifty. The annual output of the clothing industry in the United States is worth almost a billion and a half dollars: men's, boys' and youths' clothes, over 500 millions; work clothes over 170 millions; women's and children's dresses, 475 millions; women's and children's coats and suits, 210 millions; children's outerwear, 50 millions.

coal, solid, combustible carbon, the chief source of industrial power and heat and a valuable industrial raw material. Coal was formed from semidecayed swamp vegetation in ancient times. As the plants died their stalks and leaves sank beneath the water level. The acids formed by decay impregnated the water of the swamp and stopped further decay. This material collected in vast amounts and was later covered by sediment. Heat and pressure, produced by the weight of this cap and by diastrophic movements of the earth's crust, brought about physical changes in the accumulated vegetable mass. At the same time bacteria and fungi set up chemical actions. The physical and chemical changes produced coal.

The tremendous coal beds of today could never have been formed without climate conditions that produced abundant and luxuriant plant growth. Such conditions existed at the close of the Paleozoic era in the Carboniferous period (so-called because it produced this form of carbon), and in the Permian period at the very end of the same era. In some parts of the world there are as many as 100 coal seams separated by strata with fossil remains. This and other evidence shows that the coal age must have been millions of years ago.

The many kinds of coal differ in hardness and in carbon content. The chief types are peat, lignite, bituminous and anthracite.

Peat is bog turf, semicarbonized dead plants mixed with living swamp mosses and a large percentage of water. It is really incompletely formed coal. Dug or chopped from the surface and dried, peat is used as fuel in parts of the world where there is no other form of coal. There are peat deposits in almost half the states of the Union, but they are of little commercial importance in this country.

Lignite or *brown coal* is woody in appearance. It represents the next stage after peat of coal formation. It contains a high proportion of moisture and volatile material and has a low carbon content. Lignite has low heating value, crumbles easily and produces a large amount of smoke. It is used near the mine mouth to produce electricity and for household purposes where other coal is not available. There are deposits in the western states and in Louisiana and Mississippi.

Bituminous or *soft coal* is dead black in color. It contains small proportions of moisture and volatile matter. Its carbon content is usually between 60 and 70 per cent. Bituminous coals are the best for making coke and are used widely for industrial purposes, by railroads and for domestic heating. There are deposits in the Appalachian region, around the Gulf of Mexico, along the Mississippi Valley, in the Great Plains and in the Rocky Mountains. United States mines produce 435 million tons a year. *Cannel coal* is a variant of bituminous; it is compact and clean, lights easily and burns so readily that it is used in open-fire grates. The word *cannel* is a variant of candle. *Parrot coal* is another name—from the spluttery noises this coal makes as it burns. It is not suitable for making coke but is excellent for making gas. Cannel coal is relatively scarce. There are deposits in Indiana, Texas, Kentucky and other American states and in Lancashire and Yorkshire, England. A very hard, rare variety of cannel coal found in some parts of Spain and near Whitby in Yorkshire, England, is *jet,* which is turned and polished and made into jewelry.

Courtesy Hudson Coal Co.

The Electric Locomotive has Replaced the Mule in Most Coal Mines

Anthracite or *hard coal* is the hardest of the commercial coals. It contains little volatile matter or moisture and is very high (over 90 per cent) in fixed-carbon content that does not escape as a gas. Anthracite does not ignite easily but holds fire well. It has a high heat value, gives off little smoke and leaves little ash. It is used chiefly for domestic fuel. (When carbonization proceeds beyond the stage of anthracite, the product is graphite or diamond.) Anthracite in the United States comes almost entirely from eastern Pennsylvania. About 55 million tons are mined yearly.

Distribution of Coal. It is estimated that within 6,000 feet of the earth's surface there are 7.8 trillion metric tons of coal, enough to last for about 6,000 years. Not all areas of the world, though, are equally well endowed. North America has 69 per cent of the world's reserves, and the United States alone has about 50 per cent. Asia ranks second, with about 17 per cent, and Europe is third.

The industrialized sections of North America and Europe account for 80 per cent of the production. It is evident, therefore, that all deposits are not worked or are only partially utilized. Whether a field will be developed depends on such factors as the location of the field with respect to transportation facilities, labor supply, markets and raw materials. The size of the deposit, the kind of coal, the thickness of the coal seam, the depth of the seam below the surface and the nature of the surrounding rock affect the workability of a deposit. Fields such as those in Asia are remote from civilization and inaccessible; others contain low-quality coal. In some fields the seams are too thin or too deep. Actual mining of coal deposits, therefore, is limited to a few outstanding sections of the world.

Areas of Production. The United States leads the world with an average production of about 490 million tons per year. Among the important producing regions the so-called *Eastern Province,* which runs from Pennsylvania to Alabama through the Appalachian Mountains, is the richest and most productive. This area contains 90 per cent of the high-quality coal of the United States. The Pittsburgh bed in western Pennsylvania, West Virginia and eastern Ohio is the largest deposit of bituminous coal in the world and is the basis of the great iron and steel industry of that section.

The seams in this coal bed are almost horizontal and average 7 feet in thickness. In the northeastern section of Pennsylvania is the richest anthracite field in this country. At the southern end of the Appalachian field the coal is used in the iron-and-steel plants of Birmingham, Ala.

An area of secondary importance in the United States is the so-called *Interior Province* of which the deposits in southern Illinois and Indiana are the most important. The relatively high quality of the coal and nearness to the large Middle West market give this district considerable importance.

In Europe the United Kingdom, with an annual production of about 28 million tons, and Germany with 173 million tons are the leading producers, followed by France, Poland, Belgium and the U.S.S.R.

The only other centers of production are China, Japan, India and the Union of South Africa. Japan's coal is poor and expensive to mine. China's coal reserves, though they seem to be large, are not extensively worked. In both India and the Union of South Africa there is a small local industry. Production is not large, but it is increasing.

coal mining, working veins of coal to obtain it for use. The methods vary greatly in different parts of the world. An increasing amount of bituminous coal is stripped or dug out by *open-cutting*—quarrying rather than mining.

Underground workings require roof supports. These are of two kinds: solid blocks of coal left in place—the *room-and-pillar* method; or cribs of timber filled with rock—the *long-wall* method. The room-and-pillar method is almost standard practice in seams that are more than 4 feet thick. The pillars themselves are *robbed* when the room is to be abandoned.

Accidental falls or cave-ins may result from weak pillars or cribs or from explosions. Most coal-mine explosions are caused by fire damp, a combustible gas (methane) formed by decomposition of the coal. Fine dust in the air may be exploded by an uncovered flame. To guard against these dangers the miners' safety lamp was invented in 1816 by Sir Humphry Davy. In this lamp a wire-gauze cylinder, 2 inches wide and 8 inches high, surrounds the flame and supplies it with air but keeps the heat from igniting the fire damp. Electric lights are now used in most mines. To prevent dust explosions many coal mines are now *rock-dusted;* that is, the dust of shale or other finely ground rock is scattered around to neutralize the combustibility of the coal dust.

In the mine the coal is either blasted from a solid face or is shot loose or otherwise broken down after a preliminary cut into the coal has been made by hand or by machine. Underground methods are therefore classified as shooting from the solid, mining by hand and mining by machine.

Shooting from the solid is injurious to the mining property, for the heavy charges of powder weaken the roof and pillars and increase the danger of falls of roof and coal—the commonest cause of fatal accidents to coal miners. Another objection to this method is that the heavy charges of powder blow much of the coal into small pieces, and weaken the lumps so that they break up when handled. As there is an increasing demand for powdered coal to be burned by mechanical stokers, this objection is losing force; however, the danger to miners has not been lessened, and the method is forbidden by law in some coal-mining states.

Cars run on rails and pulled by mules were used in coal mines at a very early date. Although in most mines small electric motors have replaced the mules, a few are still used; they are kept underground and become practically blind.

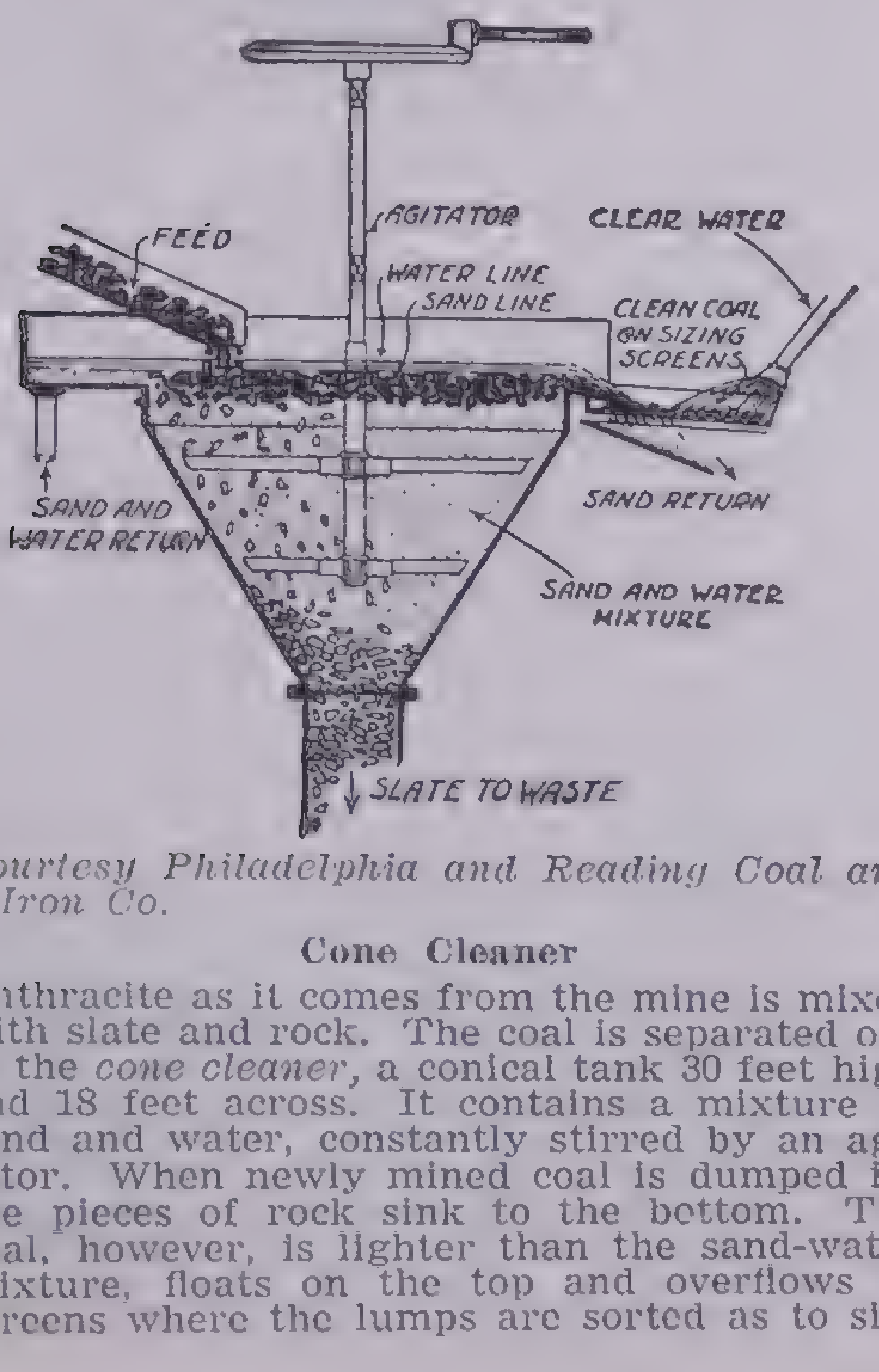
History of Coal. Coal may have been used in Manchuria 3,000 years ago to smelt copper. Marco Polo in his travels saw in Cathay (China) "a black stone dug out of the mountains that burns like wood." But for all practical purposes the history of coal begins in England. Along Hadrian's Wall, built 120-123 A.D. by Roman soldiers, coal cinders and pits from which coal was dug have been found.

The invention of the steam engine and the beginning of the iron industry in England in the last half of the 18th century developed the coal mines of England and Wales. A few centuries earlier it had been against the law to burn coal, lest woodchoppers be thrown out of work. Then coal was ruled out by the world of fashion, and a guest invited to dinner would not accept if he knew that the food was to be prepared with a coal fire. By 1635 the attitude had changed, and the use of coal was encouraged, although popular sentiment against it had to be overcome. In that year Sir Robert Mansell was given the British glass-making monopoly as a reward for being the first person to use mined coal instead of wood in industry.

There was no coal industry in the United States until after 1791, although the Indians in Pennsylvania had used what was known as *stone coal* (anthracite). In that year an anthracite outcropping was found at Summit Hill near Mauch Chunk in eastern Pennsylvania, and soon afterward the Lehigh Coal Mine Company was formed there. Coal was mined on hill tops and sent down a winding railroad to the water level of the Lehigh River where a canal was built (1829) for its transportation to the seaboard. The Lehigh Valley Railroad was built along the same route primarily as a coal carrier, and it was soon paralleled by the Central Railroad of New Jersey, another coal carrier. So coal played a large part in the development of steam railroads, even apart from its use as a source of power.

The peak production of anthracite in the United States was 100 million tons, mined in 1917. Since then the output has dropped to about 55 million tons a year with a value around 250 million dollars.

For bituminous coal 1918 was the best year, with an output in the United States of nearly 580 million tons. Current annual productions average close to 500 million tons.



Courtesy Philadelphia and Reading Coal and Iron Co.

Cone Cleaner

Anthracite as it comes from the mine is mixed with slate and rock. The coal is separated out in the *cone cleaner,* a conical tank 30 feet high and 18 feet across. It contains a mixture of sand and water, constantly stirred by an agitator. When newly mined coal is dumped in, the pieces of rock sink to the bottom. The coal, however, is lighter than the sand-water mixture, floats on the top and overflows to screens where the lumps are sorted as to size

Courtesy Hudson Coal Co.

A Tremendous Amount of Timber is Needed to Support the Roof in a Coal Mine

coal tar, an oily black pitch distilled from bituminous coal; it is practically identical with the wood tar obtained in the preparation of charcoal. The steel industry produces most of the coal tar as a by-product of coke used in smelting. A minor source of coal tar is from distillation of coal to recover gas. Every ton of coked coal yields 8-10 gallons of tar, about 5 per cent of the original weight.

For many years the tar was considered a nuisance and was burned as fuel. Then in 1850 coal tar was distilled to get tar and pitch for roofing. Later creosote (a wood preservative) was extracted, and now about 200 valuable products are taken from coal tar. As an example, naphthalene, one of the derivatives, is used in explosives, plastics, insecticides, dyes and moth balls. More than ½ billion tons of coal tar is distilled annually into many useful substances.

The components of coal tar are taken out of it one by one by the process of *fractional distillation.* Each constituent of the tar has a different boiling point, and fractional distillation consists of raising the tar to the boiling point of each successively. As soon as the lowest boiling point of any constituent is reached, the temperature remains practically unchanged until all of that fraction is distilled off; then the temperature rises to the boiling point of the constituent with the next higher boiling point.

The main derivatives of coal tar, in order of ascending temperatures as they are distilled, are:

Benzene, used as a solvent, a cleaner, a motor fuel and the source of nitrobenzol (nitrobenzene), from which aniline (for synthetic dyes) and various explosives, artificial flavoring extracts, perfumes and photographic materials are made. It is distilled around 80° C.

Xylene and *toluene,* distilled at temperatures of 100° and 140° C., respectively, are used in making dyes. From toluene come artificial indigo and the explosive TNT (trinitrotoluene).

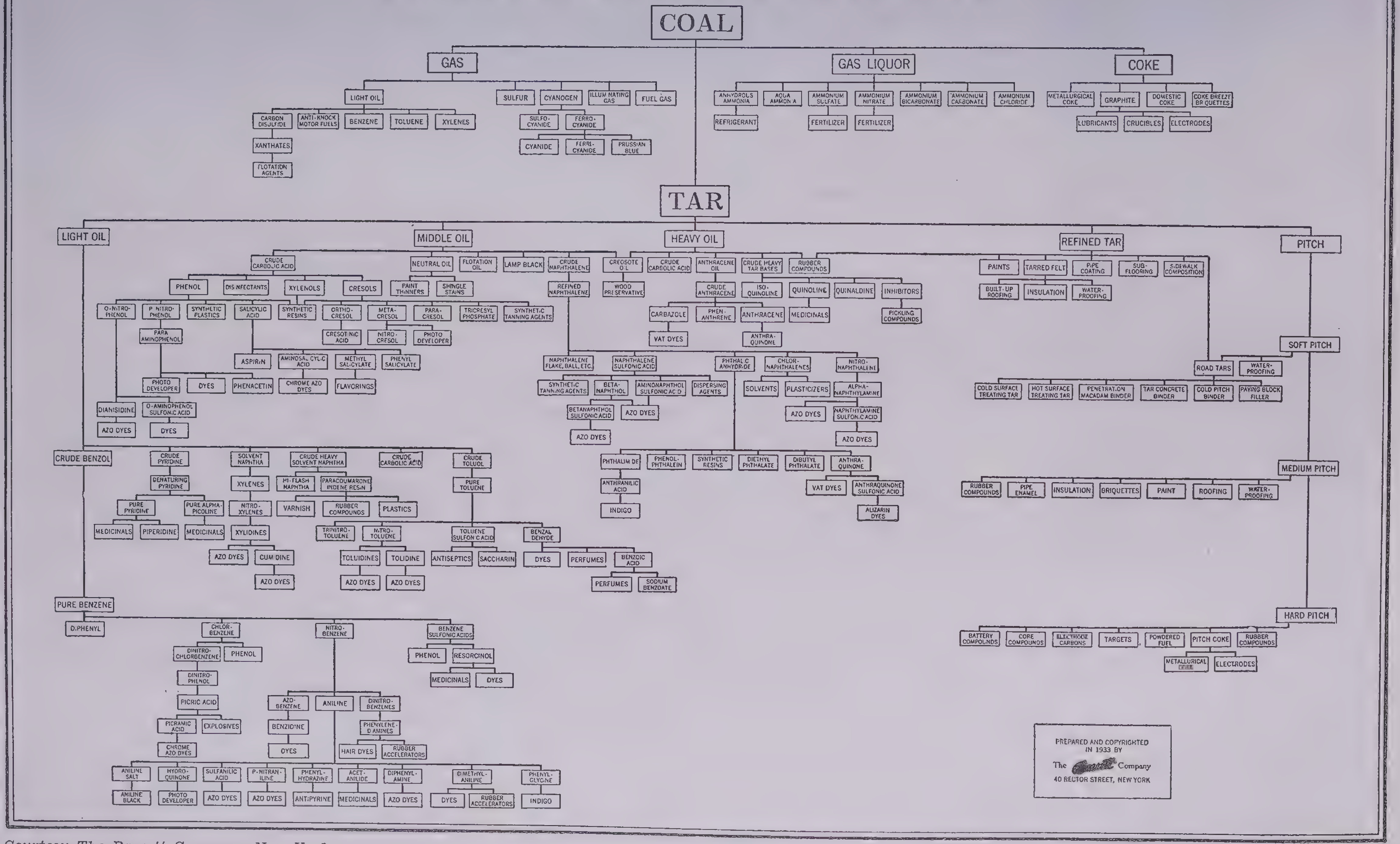
Crude carbolic oil or *light creosote* is the product of the third distillation; *heavy creosote,* of the fourth. Derivatives of crude carbolic oil are the *phenols,* many of which, like carbolic acid, are valuable antiseptics. Another phenol, picric acid, is used in making explosives and dyes. From the heavy creosote, used in the crude form as a preservative, are derived the naphtha oils, which are useful both in the crude form and for their derivatives.

Anthracene oil is the fifth fraction, distilled at about 300° C., amounting to almost 12 per cent of the volume of the tar. From this a variety of products used for dyes and for medicinal purposes are derived.

The residue left after these five distillations is *pitch,* amounting to 50 or 60 per cent of the original volume of coal tar. This pitch—like that distilled directly from wood—is used for waterproofing, street paving, paint making, lubrication and insulation.

coca, a South American shrub (*Erythroxylon coca*) with leaves somewhat like those of the tea plant. The natives of Peru and Bolivia chew the leaves on long journeys over the mountains when they have no other sustenance. The coca bush is cultivated on plantations in the West Indies to supply *cocaine,* principally used as a local anesthetic, either injected or

PRODUCTS DERIVED FROM COAL


COAL
GAS
LIGHT OIL
CARBON DISULFIDE
XANTHATES
FLOTATION AGENTS
ANTI-KNOCK MOTOR FUELS
BENZENE
TOLUENE
XYLENES
SULFUR
CYANOGEN
SULFO-CYANIDE
FERRO-CYANIDE
CYANIDE
FERRI-CYANIDE
PRUSSIAN BLUE
ILLUMINATING GAS
FUEL GAS
GAS LIQUOR
ANHYDROUS AMMONIA
REFRIGERANT
AQUA AMMONIA
AMMONIUM SULFATE
FERTILIZER
AMMONIUM NITRATE
FERTILIZER
AMMONIUM BICARBONATE
AMMONIUM CARBONATE
AMMONIUM CHLORIDE
COKE
METALLURGICAL COKE
GRAPHITE
LUBRICANTS
CRUCIBLES
ELECTRODES
DOMESTIC COKE
COKE BREEZE BRIQUETTES
TAR
LIGHT OIL
CRUDE BENZOL
CRUDE PYRIDINE
DENATURING PYRIDINE
PURE PYRIDINE
MEDICINALS
PIPERIDINE
PURE ALPHA-PICOLINE
MEDICINALS
SOLVENT NAPHTHA
XYLENES
NITRO-XYLENES
XYLIDINES
AZO DYES
CUMIDINE
AZO DYES
CRUDE HEAVY SOLVENT NAPHTHA
HI-FLASH NAPHTHA
PARACOUMARONE INDENE RESIN
VARNISH
RUBBER COMPOUNDS
PLASTICS
CRUDE CARBOLIC ACID
CRUDE TOLUOL
PURE TOLUENE
TRINITRO-TOLUENE
NITRO-TOLUENE
TOLUIDINES
AZO DYES
TOLIDINE
AZO DYES
TOLUENE SULFONIC ACID
ANTISEPTICS
SACCHARIN
BENZALDEHYDE
DYES
PERFUMES
BENZOIC ACID
PERFUMES
SODIUM BENZOATE
PURE BENZENE
DIPHENYL
CHLOR-BENZENE
DINITRO-CHLORBENZENE
DINITRO-PHENOL
PICRIC ACID
PICRAMIC ACID
CHROME AZO DYES
EXPLOSIVES
PHENOL
NITRO-BENZENE
AZO-BENZENE
BENZIDINE
DYES
ANILINE
DINITRO-BENZENES
PHENYLENE-DIAMINES
HAIR DYES
RUBBER ACCELERATORS
ANILINE SALT
ANILINE BLACK
HYDRO-QUINONE
PHOTO DEVELOPER
SULFANILIC ACID
AZO DYES
P-NITRANILINE
AZO DYES
PHENYL-HYDRAZINE
ANTIPYRINE
ACET-ANILIDE
MEDICINALS
DIPHENYL-AMINE
AZO DYES
DIMETHYL-ANILINE
DYES
RUBBER ACCELERATORS
PHENYL-GLYCINE
INDIGO
BENZENE SULFONIC ACIDS
PHENOL
RESORCINOL
MEDICINALS
DYES
MIDDLE OIL
CRUDE CARBOLIC ACID
PHENOL
O-NITRO-PHENOL
DIANISIDINE
AZO DYES
O-AMINOPHENOL SULFONIC ACID
DYES
P-NITRO-PHENOL
PARA AMINOPHENOL
PHOTO DEVELOPER
DYES
PHENACETIN
SYNTHETIC PLASTICS
SALICYLIC ACID
ASPIRIN
AMINOSALICYLIC ACID
CHROME AZO DYES
METHYL SALICYLATE
FLAVORINGS
PHENYL SALICYLATE
DISINFECTANTS
XYLENOLS
SYNTHETIC RESINS
CRESOLS
ORTHO-CRESOL
CRESOTINIC ACID
META-CRESOL
NITRO-CRESOL
PHOTO DEVELOPER
PARA-CRESOL
TRICRESYL PHOSPHATE
SYNTHETIC TANNING AGENTS
NEUTRAL OIL
PAINT THINNERS
SHINGLE STAINS
FLOTATION OIL
LAMP BLACK
CRUDE NAPHTHALENE
REFINED NAPHTHALENE
NAPHTHALENE FLAKE, BALL, ETC.
NAPHTHALENE SULFONIC ACID
SYNTHETIC TANNING AGENTS
BETA-NAPHTHOL
BETANAPHTHOL SULFONIC ACID
AZO DYES
AZO DYES
AMINONAPHTHOL SULFONIC ACID
DISPERSING AGENTS
PHTHALIC ANHYDRIDE
PHTHALIMIDE
ANTHRANILIC ACID
INDIGO
PHENOL-PHTHALEIN
SYNTHETIC RESINS
DIETHYL PHTHALATE
DIBUTYL PHTHALATE
ANTHRA-QUINONE
VAT DYES
ANTHRAQUINONE SULFONIC ACID
ALIZARIN DYES
CHLOR-NAPHTHALENES
SOLVENTS
PLASTICIZERS
NITRO-NAPHTHALENE
ALPHA-NAPHTHYLAMINE
AZO DYES
NAPHTHYLAMINE SULFONIC ACID
AZO DYES
HEAVY OIL
CREOSOTE OIL
WOOD PRESERVATIVE
CRUDE CARBOLIC ACID
ANTHRACENE OIL
CRUDE ANTHRACENE
CARBAZOLE
VAT DYES
PHEN-ANTHRENE
ANTHRACENE
ANTHRA-QUINONE
CRUDE HEAVY TAR BASES
ISO-QUINOLINE
QUINOLINE
MEDICINALS
QUINALDINE
INHIBITORS
PICKLING COMPOUNDS
RUBBER COMPOUNDS
REFINED TAR
PAINTS
TARRED FELT
BUILT-UP ROOFING
INSULATION
WATER-PROOFING
PIPE COATING
SUB-FLOORING
SIDEWALK COMPOSITION
ROAD TARS
COLD SURFACE TREATING TAR
HOT SURFACE TREATING TAR
PENETRATION MACADAM BINDER
TAR CONCRETE BINDER
COLD PITCH BINDER
PAVING BLOCK FILLER
PITCH
SOFT PITCH
WATER-PROOFING
MEDIUM PITCH
RUBBER COMPOUNDS
PIPE ENAMEL
INSULATION
BRIQUETTES
PAINT
ROOFING
WATER-PROOFING
HARD PITCH
BATTERY COMPOUNDS
CORE COMPOUNDS
ELECTRODE CARBONS
TARGETS
POWDERED FUEL
PITCH COKE
METALLURICAL COKE
ELECTRODES
RUBBER COMPOUNDS

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Courtesy The Barrett Company, New York applied to a mucous membrane. For its narcotic effect cocaine is taken also by drug addicts, so that there is careful regulation of its sale in almost all countries.

cocoa, a popular confection or beverage made from the seeds of the cacao tree. In the cocoa factory the beans are run between heavy, heated rollers, and the cocoa mass is released in a viscous state and allowed to harden in large pans. *Cocoa butter,* the fatty element of the bean, is then removed. (If it is not taken out, the product is *chocolate* not cocoa.) The residue is ground into a reddish-brown powder, the commercial cocoa.

The first soluble cocoa was made in the Netherlands by C.J. van Houten in 1828. He treated the cacao with an alkaline salt that made it less acid and less likely to sink to the bottom of the cup. Besides several famous cocoa manufacturers in the Netherlands there are huge factories in England, almost all of them run by three families of Friends (Quakers): Fry of Bristol, Cadbury of Birmingham and Rowntree of York, famous for their philanthropy, their model workers' homes and their chains of newspapers (the "cocoa press"). Switzerland is famous for milk chocolate. The industry is strong in the United States, which takes for manufacture as much cacao beans as Germany, Great Britain, Holland and France combined.

coconut palm (*Cocos nucifera*), the most important tree of the palm family. It is found everywhere in the tropics, as the seed is well protected, easily carried by the waves and quick to grow on any beach where it is cast.

Juice from the flower buds or the sap of the tree makes a drink called *toddy* in its unfermented form and *arrack* when it is fermented and distilled. A sugar is derived from the sap. Milky juice from the nut is a local beverage. The nut furnishes the meat for grated coconut and, more important, large amounts of vegetable fat for the manufacture of margarine (butter substitute). The fibers of the outer husk are used in the manufacture of coarse rope and door mats; and the shell is converted into charcoal and used as an air filter in gas masks.

Most of the world's coconuts are raised on small plantations. They do best with continuously warm wet weather. The tree is from 7 to 15 years of age before it begins to produce. Each tree yields from 30 to 40 nuts per harvest. The nuts, either picked from the trees or gathered from the ground, are split open and dried in the sun. The dried nut meat (*copra*) is shipped to the vegetable-oil factories of the industrial nations. Each nut produces about ½ pound of copra; and 16 to 20 pounds of copra yield 1 gallon of oil. Ceylon and India are important producers.

coffee, the seeds of the berries of the coffee shrub (*Coffea,* same family as madder and cinchona); also a beverage made from the roasted and ground beans. The coffee bush is a native of the Old World, and the beverage was used in Persia, Arabia and Turkey for centuries before it was introduced into Europe. About 1650 coffee houses were established in England and France.

Courtesy National Coffee Department of Brazil

Acres of Coffee

Coffee berries are spread out to dry in the open. These men are "plowing" the coffee with shovels to expose it to the sun

Coffee will grow in many places in the tropics, but it does best in tropical highlands with a long rainy and a short dry season. About 60 per cent of the world's coffee is now produced in the highland district of Brazil, especially the state of São Paulo. Coffee makes up three-fourths of Brazil's total exports. The coffee-raising area is the economic, political and cultural center of the country. The plantations are located on a rolling upland 1,800 to 2,000 feet above sea level, in a rich, volcanic soil known as *terra roxa* (red earth). The climate in this part of Brazil is characterized by two seasons—one hot and rainy and the other warm, clear and dry. During the hot, wet season the berries mature; they are picked in the dry season.

In many coffee sections of Brazil the coffee pickers are careless and do not take time to separate the inferior from the high-grade berries. Consequently Brazilian coffee is not so high in quality as that produced in places where more care is taken.

A crop of coffee, milder than the Brazilian, is grown throughout Central America, some of the West Indies, especially Haiti, and in the northern part of South America (Colombia, Venezuela, Costa Rica, Honduras, Salvador and Guatemala). Arabia, India (Mysore), Sumatra and Java also produce some, and there are new plantations in Central Africa. The Old World output is only about one-tenth of the New World's, but it is of high quality and important in blending.

For years Brazil has met with trouble by not being able to control the size of the crop. Huge surpluses drove prices down disastrously, and since Brazil is essentially a one-crop country, the effect was widespread. Finally in 1923 the State Bank of São Paulo undertook to stabilize prices by paying growers a small bounty for keeping surpluses off the market and holding them until the next season.

The crops of 1927 and 1929 were unusually large—and the occurrence of two big crops so near together was unusual, too. In 1929 the Coffee Institute set up by the State Bank failed. Production continued to increase, so that there was a constantly greater surplus held over from year to year.

In 1930 a new Federal Government took over the surplus stock from the State of São Paulo. Since 1930 big crops have been cut to fit the market. The Government pays the grower a small amount—about 30 cents per 132-pound bag—for surplus coffee, usually the lower grades, and then burns it or dumps it into the sea. From 1931 to 1937, 50 million bags were so destroyed.

It seems probable that the overproduction of coffee in Brazil cannot be controlled by this method. Perhaps a greater diversification of crops will restore the balance—that is, growers might plant oranges or some other crop on some of the coffee land.

cofferdam, an enclosure for excluding water from the site of construction work; for instance, in building bridge piers into a river bottom, the water of the river must be shut out by a cofferdam. This is usually built by driving rows of piles, in the form of an inner and outer square, into the river bed. Planks are fastened to the piles to from walls, and the space between the walls is then filled with some such material as clay and the water is pumped out of the inclosure.

coke, the fixed carbon that remains when bituminous coal is distilled, that is, heated in the total or partial absence of air and the volatile parts (nitrogen, oxygen and so on) driven off. Coke is porous and honeycombed in structure (because the volatile matter has escaped), silver gray in color and very light in weight. It is a commercial fuel and one of the three basic materials in making pig iron.

The oldest and simplest method of manufacture is in the beehive oven, which produces nothing but coke. The later by-product oven saves the volatile materials that are lost in the older beehive process. The by-products are gas, ammonia, light oils, pitch and the coal tar whose derivatives are so important in modern industry.

The beehive oven, mound-shaped like an old-fashioned beehive, holds 4 or 5 tons of pulverized coal, which is poured through an opening at the top. Another opening at the bottom permits the coke to be withdrawn. When coke making begins, all openings are closed, except a small one on the side that allows slow combustion. A slow-burning wood fire is built in the oven and the coal is then added. Because the oven is preheated, the coking process begins immediately. The time usually needed to convert the coal into coke is about 48 hours. Today more than 90 per cent of all the coke produced in the United States is manufactured in by-product ovens, although some thousands of beehive ovens still exist.

The by-product ovens (in the form designed about 1898 by Heinrich Koppers of Essen, Germany, and improved in 1922 by an American, Joseph Becker) are built in series or batteries of 50 or more with gas-fired flues between them. Each oven is rectangular, 6 to 10 feet high, 1½ to 2 feet wide and 30 or 40 feet long. Since they are narrow, the heat penetrates through the coal and cokes it. The heat from the flues first melts the coal. The volatile material so released passes off through pipes to be distilled and refined.

Coke was first produced in the manufacture of gas from coal and was then considered waste. Now it is produced in largest quantities by steel manufacturers who use the coke in making pig iron and the gas to heat the open-hearth furnace.

The principal American producer of coke, Koppers, is also one of the largest coal producers in the world and has a remarkably integrated business with huge holdings of gas companies and close relations to the steel business, the production of tar and many other industries. The great fortune of Henry Clay Frick (1849-1919) was built on steel and coke in the period of the beehive coke oven.

compass, an instrument for indicating geographical direction. Two types of compass are now used in navigating the sea and air—the *magnetic* and the *gyroscopic.* The use of the magnetic compass dates back so far that its origin is obscure. The gyroscopic compass is so new that it has come into practical use only within the last quarter century.

The earth is in itself a huge magnet surrounded by magnetic lines of force. Therefore a small magnet, supported so that it is free to turn, places itself in a position pointing to the north magnetic pole. In a mariner's compass, the magnetic needle is usually mounted on a card marked with the points of the compass and also graduated in angular degrees. It is mounted in a compass bowl so that it can turn freely, its weight usually being supported on a pivot. Another form of compass, called the spirit compass, has the bowl partly filled with an alcohol solution so that the buoyancy takes most of the weight from the pivot, thus making a very stable and sensitive instrument.

Directions are indicated by means of a mark, called the *lubber's point,* placed on the bowl adjacent to the card. The compass is mounted on the ship in such a way that a line through the pivot and this point is parallel to the keel of the ship. Thus the direction in which the ship is traveling can be observed by reading the markings on the compass card opposite the lubber's point.

A navigator using a magnetic compass must be familiar with the errors inherent in its use or he may be easily led astray. These errors arise chiefly from the fact that the magnetic north pole is not the true north pole of the earth, and that the magnetic materials in the ship disturb the position of the compass needle. The former error called *declination* is usually compensated by means of charts, the correction depending on the location of the compass on the earth's surface and the time at which the reading is taken. The latter errors can be fairly well neutralized by placing compensating magnets in the proper positions around the compass, the positions depending upon the location of iron parts in the ship and being determined by trial at the time the compass is installed.

The *gyroscopic compass* is one in which a rotating wheel maintains itself in a fixed position due to the rotation of the earth. Such a compass is free from both the major errors of the magnetic compass, and for this reason is coming into widespread use.

concrete, hard, durable artificial stone, used in a variety of building operations and in ornamental stonework. It is a composition of Portland cement, water, sand and filling material (called *aggregate*), such as pebbles or small particles of crushed rock. Water and cement form the binder that unites the component parts into the hard, solid mass. The strength of the concrete depends on the proportions of cement, sand and aggregate (always stated in that order). A mix of 1:1:2 (that is, 1 part cement, 1 part sand and 2 parts aggregate) is used for underwater construction. The 1:2:4 mix is strong enough for most reinforced-concrete buildings; and 1:3:6 is used in foundations requiring no great strength.

The selection of materials is important. Portland cement is manufactured under specifications dictated by the U. S. Bureau of Standards. Sand must be pure; that is, it must be free from dust, soil, vegetable matter and refuse of any kind, because these impurities weaken the finished concrete. It must be also of a gritty sharp-cornered type that will bind well. Ordinary sea sand, which is rounded, cannot be used.

For building purposes concrete is either poured during the progress of construction, or used in blocks previously formed. In large structures upright and transverse steel bars are placed through the mixture as it is poured to give rigidity and add to strength, to take up all tensile stresses, to help resistance to shear (movement of particles of the mass) and to prevent undue compression. The mix is poured into wooden forms in which the reinforcing rods already have been placed. After the concrete is thoroughly dry, the boards are removed.

Concrete blocks, generally used for small structures, are large brick forms about 18 inches in length and 8 to 10 inches wide. They are not solid, but the openings reduce the weight without materially sacrificing the strength. In building they are placed like bricks and bound with mortar.

Concrete has become the most widely used paving material. The best concrete roads are reinforced with iron crossbeams. After concrete is laid, several weeks should be allowed for thorough drying. If the water is lost rapidly, the roadbed will be brittle and easily worn away. A finished road is usually covered with straw to shut out direct sunshine and assure slow drying.

Because concrete is a plastic substance at the time of mixing, it can be poured into a mold and so cast in any desired ornamental form, which fact adds greatly to its uses.

The value of concrete products (building blocks, trimmings, concrete roof tile and the like) made in the United States is about 45 million dollars annually.

condenser, an apparatus for relieving back pressure in steam engines and turbines. James Watt's first steam engine had a vertical cylinder open at the top. Steam pushed the piston up, and then cold water was thrown on the piston and cylinder. That condensed the steam and created a partial vacuum in the cylinder, drawing the piston down again ready for another admission of steam. It was a wasteful and inefficient system.

In 1769 Watt closed the cylinder at both ends and had to invent the condenser in order to take away the pressure of the still-expanding steam on the side of the piston not being pushed by steam. In all more modern steam engines the steam pushes alternately on both sides of the piston, and the exhaust steam is condensed into water. Since the water occupies much less room than the steam, a partial vacuum is produced, thus making it easier for steam to push the piston from the other side and greatly increasing the efficiency of the machine.

A *surface condenser* is a tank with many brass tubes through which cold water runs. Steam is admitted and condenses against the tubes, and the cooling water must be recooled, perhaps by spraying it into the air. The condensed water runs back into the boiler to be turned into steam again. It is kept as hot as possible in order to save fuel in the reheating.

A *jet condenser* is one in which steam is focussed upon a spray of cold water. Another kind of condenser, often seen on the roofs of ice plants is that in which the steam goes through a number of horizontal tubes over which a sheet of cooling water flows.

control devices, industrial, see *electrical control devices.*

converter or **convertor,** any device for changing electrical energy from one form to another, for example, from A.C. (alternating current) to D.C. (direct current) or vice versa; or from

A.C. at one frequency or number of phases to A.C. at another; especially rotating machines that accomplish such changes.

It was recognized at a comparatively early date that it is most convenient and economical to generate, transmit and distribute most of the electrical energy in the United States as 3-phase, 60-cycle A.C.; but there are still some consumer demands for A.C. at a different frequency or for direct current. Direct current is absolutely essential for electrolytic processes; for example, in the purification of aluminum and copper; and it is also preferred in many applications that require variable speed motors, such as street railway systems. In converting A.C. to D.C. it is often important to have 25-cycle A.C. available; so a large installation to furnish D.C. from a 60-cycle source might well consist of two converters, one for changing the energy from 60 cycles to 25 cycles and another for changing the resulting 25-cycle A.C. into D.C. In this sort of installation the frequency converter is often in a substation of the power company and the synchronous converter is at a different substation or even on the customer's premises.

Converters are used also by power companies to interconnect into larger systems neighboring distribution systems of different types. This is for two purposes: to improve the service rendered to the consumer, and to obtain a better allocation of load throughout the day to the different generating stations.

Any one of these changes in the form of electrical energy can invariably be brought about by an appropriate motor generator set which has the highest possible degree of flexibility in the control of the output voltage under various load conditions; but the converter, though it is less flexible than the special motor generator, is smaller, costs less and shows smaller energy losses. Converters are now becoming obsolete at a very rapid rate because of the successful development of the more flexible and even more economical steel-cased, grid-controlled mercury vapor tubes within the past decade. Many are still in operation, however, and a few are still being built. The principal types are the synchronous, booster, inverted or inverter and frequency converters.

Synchronous or Rotary Converter. This is used to convert A.C. into D.C. and is a machine that looks much like a D.C. generator of about the same rating. The essential difference is that in addition to the commutator and brushes at one end of the shaft, it also has sets of brushes and slip rings at the opposite end. The purpose of these is to make electrical connections to the armature for the A.C., the slip rings being permanently connected to different points around the armature winding. As a result of this arrangement, it is possible to supply A.C. to the slip rings and to obtain D.C. at the commutator. Thus a single machine has been devised that will function simultaneously as both a synchronous motor and a D.C. generator.

Booster Converter. This consists of a combination of a synchronous converter and a much smaller A.C. generator with the same number of poles and mounted on the same shaft between the slip rings and armature. The armature windings of the converter proper and of the booster are connected in series in such a fashion that the voltage generated in the booster can either aid or oppose the line voltage. In this way by varying both the magnitude and direction of the field current in the booster the A.C. voltage impressed across the converter armature can be varied over a range equal to twice the voltage rating of the booster. This results in a corresponding change in the D.C. terminal voltage; furthermore the booster can be provided with a series field winding that carries the D.C. load so that any degree of compounding can be obtained automatically.

Inverter or Inverted Converter. Any synchronous converter can be used to change D.C. into A.C., this process being commonly known as *inversion.* The principal use of large-sized inverters is to tie A.C. and D.C. systems together. When it is so used, the machine operates as an inverter at certain times during the day when it is necessary to transfer energy from the D.C. system to the A.C. system; at other times it will operate as a converter to transfer energy in the other direction.

Another application of inverters is where it is necessary to charge large storage batteries from a D.C. power supply. Such batteries are also used to provide stand-by service, or equalize the load throughout the day, in a system that is otherwise strictly A.C. Many small inverters are now being manufactured to provide A.C. for appliances where only D.C. would otherwise be available. They enable the use of A.C. radio receiving sets, neon signs, A.C. motor-driven air conditioners and so on from D.C. distribution lines, 30-volt farm-lighting plants or even from 6-volt storage batteries. In fact this method is very commonly used in automobile and farm radios.

Frequency Converter. This is one in which there is a change in frequency in the conversion of the electrical energy, which can be accomplished by the use of a machine that is essentially a wound rotor induction motor; for if an A.C. voltage of a given frequency is impressed across the stator windings of such a machine, the frequency of the currents set up in the rotor circuit will depend not only upon the stator frequency but also upon the rotor speed. Thus a frequency converter can be used to bring about either a decrease or an increase in frequency. In order to maintain the correct speed an auxiliary synchronous motor with the proper number of poles must be mechanically coupled to the converter and tied into one of the lines.

One of the principal uses of frequency converters is to tie together two dissimilar A.C. systems. Another is to supply A.C. to 25-cycle rotary converters from a 60-cycle source, as in substations carrying railway loads.

copper, a soft, reddish, metallic element that has been valued by man for at least 10,000 years. We use copper in so many ways that it has been called the most versatile metal. Copper is easy to extract from its ore because it has a low melting point. It unites readily with other metals to form various important alloys, such as brass and bronze. Fully 70 per cent of all copper is used in the electrical industry because it is a good conductor, is relatively cheap and can stand exposure to weather.

Copper occurs in many ways in nature, and workable deposits are more widespread than iron-ore deposits. It is found pure as well as in combination with other metals and is disseminated through a wide zone in rock. In the early days of copper mining only the richer deposits could be handled economically. The poorer ores could not be used until methods were found by which large amounts of rock could be handled cheaply. That was brought about by using machinery wherever possible.

In some of the larger ore bodies, notably in Utah, mining is carried on by the open-pit method, the ore being scooped out with steam shovels that load it into waiting freight cars. As the pit becomes deeper, temporary roadbeds are built down into it; but elsewhere the ore is taken by the underground gallery system of mining.

Although methods vary considerably, copper is usually extracted from the ore in three ways: concentration, smelting and refining.

Most copper comes from low-grade ore, which means that a great deal of ore must be handled to get a small amount of metal. Ore as it comes from the mine must first be reduced in bulk. This is done either by water concentration or flotation. In *water concentration* the powdered ore is washed across oscillating trays. Since the mineral-bearing particles are heavier than the barren rock, they sink to the bottom and are recovered. In the *flotation process* pulverized ore is placed in a tank containing water and oil. The tank is agitated, and the copper-bearing particles adhere to the oily froth that forms on the surface. The gangue (waste rock) sinks to the bottom of the tank and is then drawn off.

If the ore contains much sulphur it must now be roasted to drive out the unwanted impurities. In any case the final step usually is *smelting* in a blast furnace, reverberatory furnace or converter. The blast furnace is similar to that used in the iron and steel industry. The reverberatory furnace resembles the steel industry's open-hearth furnace, and the converter, the Bessemer converter. Some copper ore is not smelted. The metal is changed to copper sulphate by washing with sulphuric acid, and pure copper is separated out in electrolytic cells. Copper that has been purified in the Bessemer furnaces is almost 99 per cent pure. It is called *blister copper* because, when it is cast into pigs, escaping air blisters the surface of the pigs. Refined copper is formed into various standard shapes for further

Courtesy Utah Copper Company

Copper from a Giant's Stairway

Copper has been taken from this open-pit mine at Bingham Canyon, Utah, since 1904. The terraces average 70 feet in height and some are 250 feet wide. Many miles of roads and railway tracks run along the huge steps

use, usually as wire, tubing and sheets or ingots.

Other metals occur with copper in the ore and are taken out in refining; for instance, in one year the Anaconda Copper Mining Co. produced copper worth 39 million dollars; silver worth 7 million; gold worth 3½ million; zinc, 5 million; and lead, 3 million.

Smelters are usually located near the mines in order to avoid shipping a product of small value per unit of bulk. Refineries, on the other hand, are located in or near the markets they supply. About three-quarters of all the refineries in the United States are located on the Atlantic Seaboard and most of the copper refined in the United States goes to the Connecticut Valley for manufacture.

In the United States Arizona is the leading copper state, with most of the production centering around the towns of Globe, Bisbee and Jerome; Montana is second in importance with the industry centering at Butte and Anaconda; Utah is third, followed by Michigan, where the industry was first developed on a large scale in the Keweenaw Peninsula.

From 1895 to 1921 the United States led the world in copper production, and American capital controls much of the production in Chile, Mexico, Peru and Poland. The year 1933 was the first in which the copper production of South America exceeded that of the United States, and in 1934 African output also was greater than that of the United States. In 1936 the United States produced 613,000 tons.

The many wartime uses of copper created a heavy demand and very high prices during the World War. After the war there was a slump in copper, as in so many other products. In 1926 demand had again reached the 1916-17 peak of war; but production capacity had enormously increased, and at the same time the mines with very low costs of production were gaining a greater advantage over the mines with high costs. Many high-cost and low-cost producing plants were owned by the same groups of capital, and the owners were unwilling to close the high-cost producers.

In 1926 Copper Exporters, Inc., was organized in the United States to restrict production and keep prices up; but the corporation did not control the new sources of copper in Africa—Katanga, Belgian Congo, and Rhodesia, which is British—nor all the older sources. In 1929 just before the depression began the price of copper was so high (24 cents a pound) that buying stopped. In 1930 the price fell to 13 cents. In 1932 the United States imported more copper than it exported. In 1933 the price fell to 5 cents a pound and a protective tariff of 4 cents was laid on imports. In 1935 foreign producers representing 75 per cent of the foreign production entered into a 3-year agreement, under which before 1 year was up the foreign producers set their quota at 95 per cent of capacity.

cork, the light, spongy outer bark of an oak (*Quercus suber*) that grows in Spain, Portugal and North Africa. The word *cork* is derived from the Latin *quercus,* an oak.

The inner bark and the coarser grades of cork are used in tanning leather. The better grades are used chiefly for bottle stoppers, linings in bottle caps, hats and shoes, floats for nets, filling for life preservers, artificial legs and arms and in the manufacture of linoleum (ground cork, linseed oil and burlap) and other floor and wall coverings.

Cork is very light, being composed of dead vegetable cells filled with air; its specific gravity is 0.24. The cork oak grows 40 feet high. It must be 15 or 20 years old before it is stripped. Only the bark on the trunk is removed. The first stripping and the second, 8 or 10 years later, are too coarse for most uses. The texture improves in fineness each time the tree is stripped, at 8 or 10-year intervals. Some trees have been stripped regularly for 150 years.

corn (Indian) or **maize,** a native American cereal. The word *corn* is used of any cereal, usually of the most important crop in a country, and so it means wheat in some parts of the world, oats in others (Scotland, for example) and maize in the United States, Canada and Australia. Long before the white man found the shores of the New World, corn was a staple food for many of the Indian tribes. It was easy to raise and gave a high yield of food in small space. It could be planted among stumps of trees, so it was not necessary to clear land completely. The early settlers learned from the Indians to plant corn in hills and fertilize each hill by burying a fish in it.

Up to 1927 the world produced more corn than any other cereal, but since then the wheat crop has been about equal. In the United States the 1936 crop of 1½ billion bushels was about 25 per cent less than normal. The value of the corn crop in the United States averages 2–2½ times the value of the wheat crop.

Physical Conditions. Corn requires a growing season of nearly 5 months with very warm summers and annual rainfall of 25–50 inches, 7 or 8 inches of which should come in the 2 months preceding harvest. The ideal condition is plenty of sunshine and plenty of rain with warm humid conditions both day and night. In the corn belt of the United States (Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri) climatic conditions are almost ideal. Days and nights are warm and humid. The days are long and sunny. Much of the rain comes as thunderstorms, and long periods of cloudy or rainy weather without sunshine are exceptional.

A rich loam (a mixture of sand and clay) is the best soil. The land should be slightly rolling to provide good drainage. If the land is not well drained naturally, tiling or some other method is used to provide good drainage; but, corn is raised in many less-favored areas, as in dry areas of the Mediterranean countries, on many semiarid interior plateaus (often under irrigation) and on the steep slopes and thin soils of mountain areas. In such places the yield per acre is generally low, but the yield in food value is much greater than could be obtained from other grains.

Varieties of corn. *Dent corn,* of which there are some 300 kinds, is the type usually grown as animal feed. *Flint* types are harder; their large quantities of starch give them a high food value though they do not supply a balanced diet. Corn meal is usually made of flint corn. *Sweet corn* is high in sugar content and is much more palatable as a human food, whether it is fresh picked or canned. Its production is important throughout the eastern and northeastern parts of the United States. *Popcorn* is a variety with a hard outer shell and a moist center. Steam generated in the center by quick heating causes an explosion that makes the corn pop.

Areas of Production. The United States produces about 10 times as much corn as any other country. A quarter of the domestic production comes from Iowa and Illinois. Argentina, Rumania, the U.S.S.R., Yugoslavia, India, Netherland India, Mexico, Hungary, Manchuria and the Union of South Africa are in that order areas of importance.

Trade. Corn is much less important than wheat in the world market. In the United States about 85 per cent of all corn raised is fed to animals (45 per cent, to hogs; 15 per cent, to horses and mules; 20 per cent, to cattle; and 5 per cent, to sheep and poultry). Corn thus indirectly enters the export market as meat or lard. In many sections of the world all the corn raised is consumed locally as human food. Argentina is the only exporter of significance, as the large production and relatively small local market provide a surplus for export. Argentina's annual export of 320 million bushels is many times greater than the 17 million exported by the next highest shipper—the Black Sea region. Some corn from Argentina is imported into the United States. Much corn goes to northwest Europe for livestock feed in the dairy sections or for industrial purposes, such as the manufacture of alcohol.

Uses. Corn's principal use is to fatten livestock, as it is rich in nitrogen and has more protein than any other cereal. It is eaten as a staple human food in areas with a low living standard or where other cereals are not available. Corn meal has a low gluten content and cannot be made into a light bread. It is an important raw material in the manufacture of breakfast cereals, cornstarch, corn syrup, corn sugar, alcohol and many other products. Cornstalks are finding increasingly wide use in the manufacture of wallboard and coarse paper.

cotton, the fluffy mass of white fiber around the seeds of the cotton plant (*Gossypium*). In the plant the fibers protect the seed and provide wings for wind-distribution of the ripe seed. In international trade cotton outranks all other agricultural products. Cotton is the most important of vegetable fibers for spinning and weaving into textiles and as a source of cellulose in the plastics, lacquer and explosives industries. Its seed furnishes an oil much used in cookery, paint making and the manufacture of artificial rubber. The residue after the oil is pressed out is a good cattle feed.

Cotton fiber varies in softness, color and (most important) in length. The finest cotton, the sea-island variety, comes from the West Indies. Until the boll weevil ruined the crop, it was grown along the coast of South Carolina and of Georgia. Sea-island cotton has a fiber 1½–2 inches long. At the other extreme is certain cotton from India with fiber only ⅜ of an inch long. Most American cotton is about halfway between these lengths and is generally of medium grade.

American cotton is different from most other varieties in that the fiber clings tightly to the seed. In other countries the fiber is only loosely attached and can be removed with simple roller machinery. Without Whitney's cotton gin American cotton would not be in the least important.

Physical Requirements. Cotton needs a growing season of 180 days with a summer temperature of 77–78° F. Both night and day temperatures should be high. An early frost may cut the yield seriously; an unusually late frost, on the other hand, will add thousands of bales to the season's crop. The plant does best with a moderate but frequent supply of moisture. Cotton is a drought-resisting crop. Too little rainfall, although it reduces the yield, seldom causes a complete crop failure. The average rainfall of the best sections for cotton production in the United States varies between 35 and 50 inches a year.

Cotton requires a fairly rich loam soil. It is attacked by many insects and plant diseases. Chief among insect enemies is the boll weevil; but grasshoppers in certain areas, army and leaf worms and the pink bollworm are also destructive. Increasingly successful methods of controlling these pests are being developed through research by the U. S. Department of Agriculture.

Cotton and Labor. The production of cotton calls for a large supply of cheap labor, which no doubt accounted for the continuance of slavery in the South. Much of the work must be done by hand. Picking long defied mechanization, though a workable machine picker has recently been developed. The economic consequences of its widespread use in the South might be very dangerous, for many thousands of tenant farmers would be thrown into the ranks of the unemployed. At the least it would eliminate the small grower, just as the combine thresher brought about big-scale wheat production and drove small growers out of the Middle West.

The World's Cotton. Cotton is the chief crop of southeastern United States. Every year 17 states plant over 30 million acres of cotton, the yield totaling from 10 to 18 million 500-pound bales. It gives employment to over 6 million people. Its importance as a cash crop has shaped the economic and political development of the South since Colonial times. Many other crops could be raised in the cotton belt, but cotton is so important that it is raised on nearly all the good land; in fact in the good cotton-producing areas throughout the cotton belt, it occupies never less than half of all cultivated land and some years as high as 80 per cent of it.

The United States still leads the world in cotton production but no longer dominates the market. Today our country furnishes only about 40 per cent of the world's crop, whereas in the 19th century it accounted for about 90 per cent and as recently as 1914, for about 60 per cent. This decrease is only partly accounted for by the increased production in other parts of the world; in the United States there has been an actual reduction in acreage planted, from more than 44 million acres in 1925 to a low point of 27 million acres in 1935. In the same period the crop's value was halved.

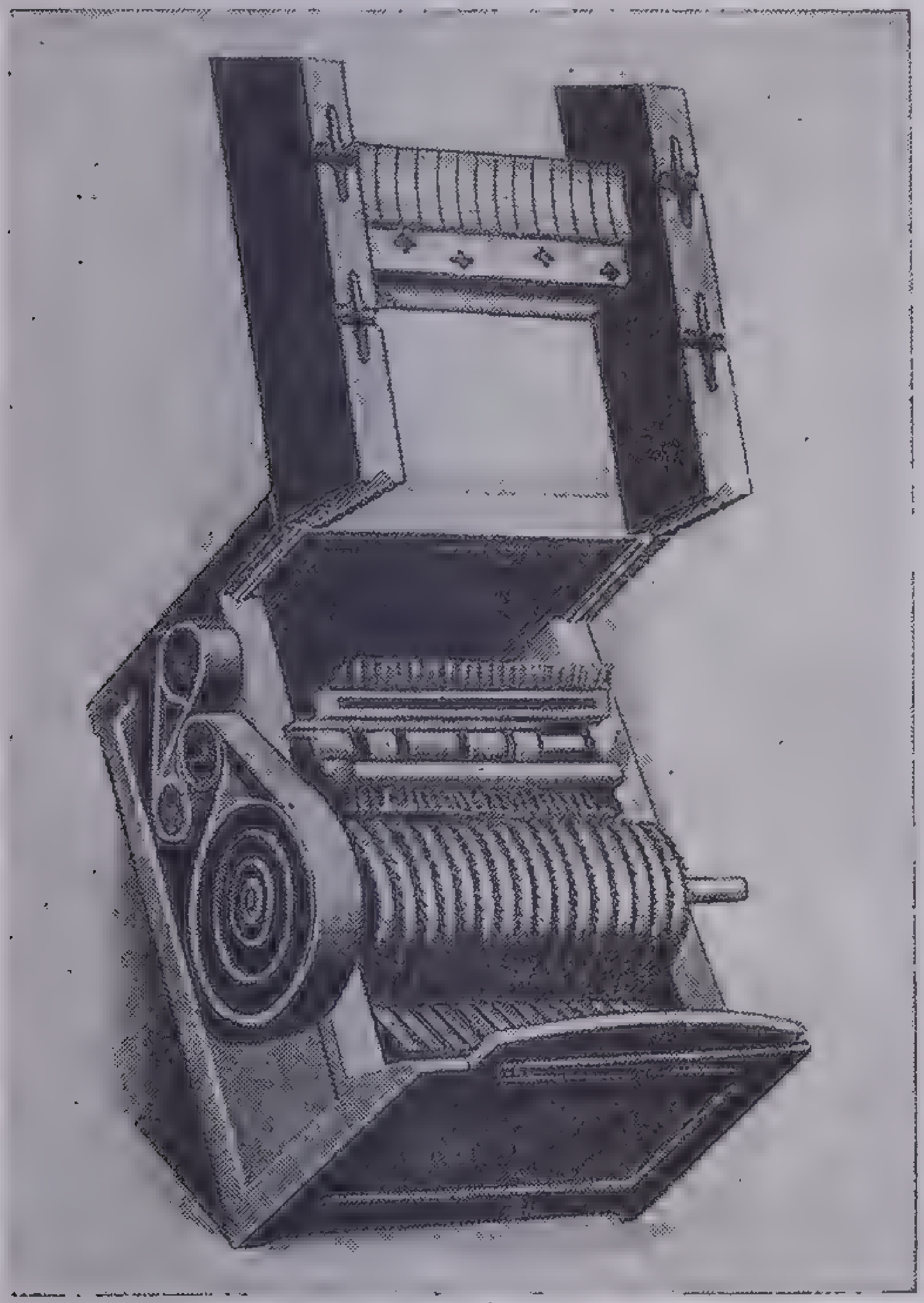
India is the second as an important producer, with an annual output of about 4½ million bales; however, India's short-fiber cotton is suitable only for low-grade textile manufacturing. China and Russia, with a production of approximately 2½ and 2 million bales, respectively, rank third and fourth in importance. Close behind, with 1½ million bales, comes Egypt. Both China and Russia (Russian Turkestan) produce short-fiber cotton. Egypt's cotton is a very high-grade long-fibered type closely resembling sea-island cotton. A newcomer in the field of major producers is Brazil. Her present production is over 1 million bales and it is increasing rapidly.

The principal exporters of cotton are the United States (6 million bales in 1936), British India (2½ million bales) and Egypt (1½ million bales). Most of the cotton moves from these areas to the industrialized sections of northwestern Europe, the United Kingdom, Germany, France and, to a lesser extent, Italy. Japan imports much cotton from India and the United States. Because Japanese textiles are destined for the low-quality markets of eastern Asia, the short-fibered cotton of India can be used.

The World War seriously affected the whole industry by creating an abnormal demand for cotton to make explosives. Prices were forced up in the boom period that followed the war. An already variable total world crop became even more unbalanced—one year much too small and the next much too large for the market—as damage from the boll weevil increased. In 1929 the Federal Farm Relief Board was established to help United States farmers stabilize prices of wheat and cotton. Growers were paid to keep surpluses off the market in a good year, saving it for the next season. The prices guaranteed by the Board proved to be too high, and the Board had to get bank loans to finance the 1932 crop. It gave the Red Cross huge amounts of the held-over supply.

When President Roosevelt came into office in 1933, the price-stabilizing policy was dropped, and under the Agricultural Adjustment Act the Federal Government began paying farmers to reduce their crop by ploughing under cotton already planted—the money to come from a processing tax to be paid by manufacturers of cotton goods. This processing tax was declared unconstitutional in January 1936, so that the cotton raisers benefited only for a few seasons. During that time American cotton exports had decreased and foreign production had increased.

cotton gin, a machine for separating the seeds and debris from cotton fibers. Simple roller machines for ginning cotton had been used in other countries for a long time prior to the invention of the cotton gin, but they would not work with American varieties of cotton, which have a very rough seed to which the fibers cling tightly.



Courtesy Continental Gin Company

Model of Eli Whitney's Cotton Gin

The saw blades pull the fibers from the seeds, and the brushes take the fibers from the blades. Modern gins are not different in principle from Whitney's although an air blast sometimes takes the place of the brushes

The fundamental principle of the cotton gin is quite simple. It consists of a number of circular saws with fine teeth operating in slots that are so narrow that, although the cotton fibers can be pulled through, the seeds cannot. The major problem in development was not that of removing the seeds from the fibers but of removing the cotton from the saws. The problem was solved by operating a circular brush against the saws, the bristles moving in the same direction as the teeth but at a higher speed so as to lift the fibers from the teeth. Another method now in use removes the fibers from the saws by means of compressed air.

Before the gin was invented by Eli Whitney in 1793, the work was done by hand, so slow a process that very little cotton was produced. When one considers that it would take about 5,000 people working by hand to clear the same amount of cotton from the seeds as one of the machines will gin in the same time, one realizes the tremendous importance of the invention.

cotton manufacturing, spinning yarn, weaving fabrics and making garments and various other articles from cotton fibers. It is the most important of the textile industries. Measured in terms of millions of pounds, there is nearly 10 times as much cotton used as wool, cotton's closest rival.

Cotton was not a cheap textile when the fibers had to be separated from the seeds by hand. Whitney's gin, invented in 1793, lowered production costs tremendously. The use of cotton cloth has again increased within our times. The better heating of homes has made possible the use of lighter-weight clothing. Improvements in the techniques of weaving and finishing have produced more attractive summer clothes for women.

Although cotton is manufactured in 30 of the Union states, 97 per cent of all the cotton-manufacturing equipment is concentrated in New England and the southern cotton-growing states. Fully 90 per cent of the southern spindles are in North Carolina, South Carolina, Georgia and Alabama; 70 per cent of the New England spindles in Massachusetts and Rhode Island. Massachusetts in the North and North Carolina in the South are the principal manufacturing states in their respective areas.

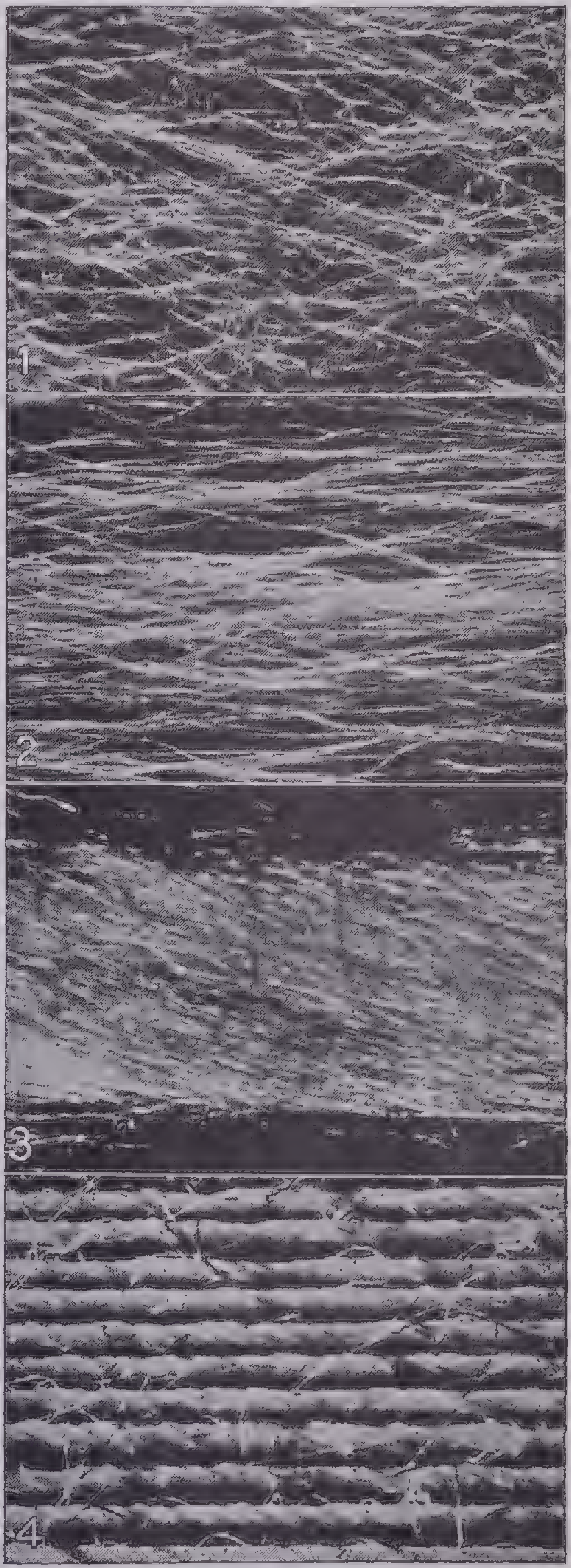
New England's supremacy in American cotton manufacturing was first threatened by the South around the end of the 19th century. In 1900 the New England spindles numbered over 13 millions and in the South there were fewer than 4½ millions. By 1936 only 9 million of the nation's 29 million spindles were in New England.

The reasons for the shift to the South were many: lower taxes, cheaper labor, lack of labor organization, lower transportation costs on raw materials and the advantage of operating with the most up-to-date machinery and more efficient layout.

Cotton manufacturing on a large scale was first developed in England around the city of Manchester in the period 1750–1800, the beginning of the Industrial Revolution. Manchester and the surrounding territory is still important in cotton manufacture, especially for fine goods, but there is not nearly so great a volume from these English mills as there was before the World War. At the expense of both England and the United States, cotton manufacture has increased greatly in Europe, India, Japan and China. British India is itself a large producer, besides buying from Japan an average of ½ billion square yards of cotton cloth a year.

Woven cotton cloth is frequently processed to bring out special characteristics. If a very smooth finish is desired, the surface of the cloth is singed by passing it over a gas flame. Some cloth is steamed to soften the yarn so that it will absorb a filler, such as starch or glue, to give added weight. Shirtings are pre-shrunk with live steam (*Sanforized*—a patented process), so that they will not shrink when laundered. All these operations (including *mercerizing*—treating with caustic soda—which gives a silky finish to cotton and strengthens the fiber) make up the separate and important branch of the cotton textile industry known as *finishing*. Unfortunately there are some finishing processes that make a fabric attractive in appearance at the expense of durability.

Most products of the industry fall into one of three great classes: house



Courtesy Pepperell Manufacturing Co.

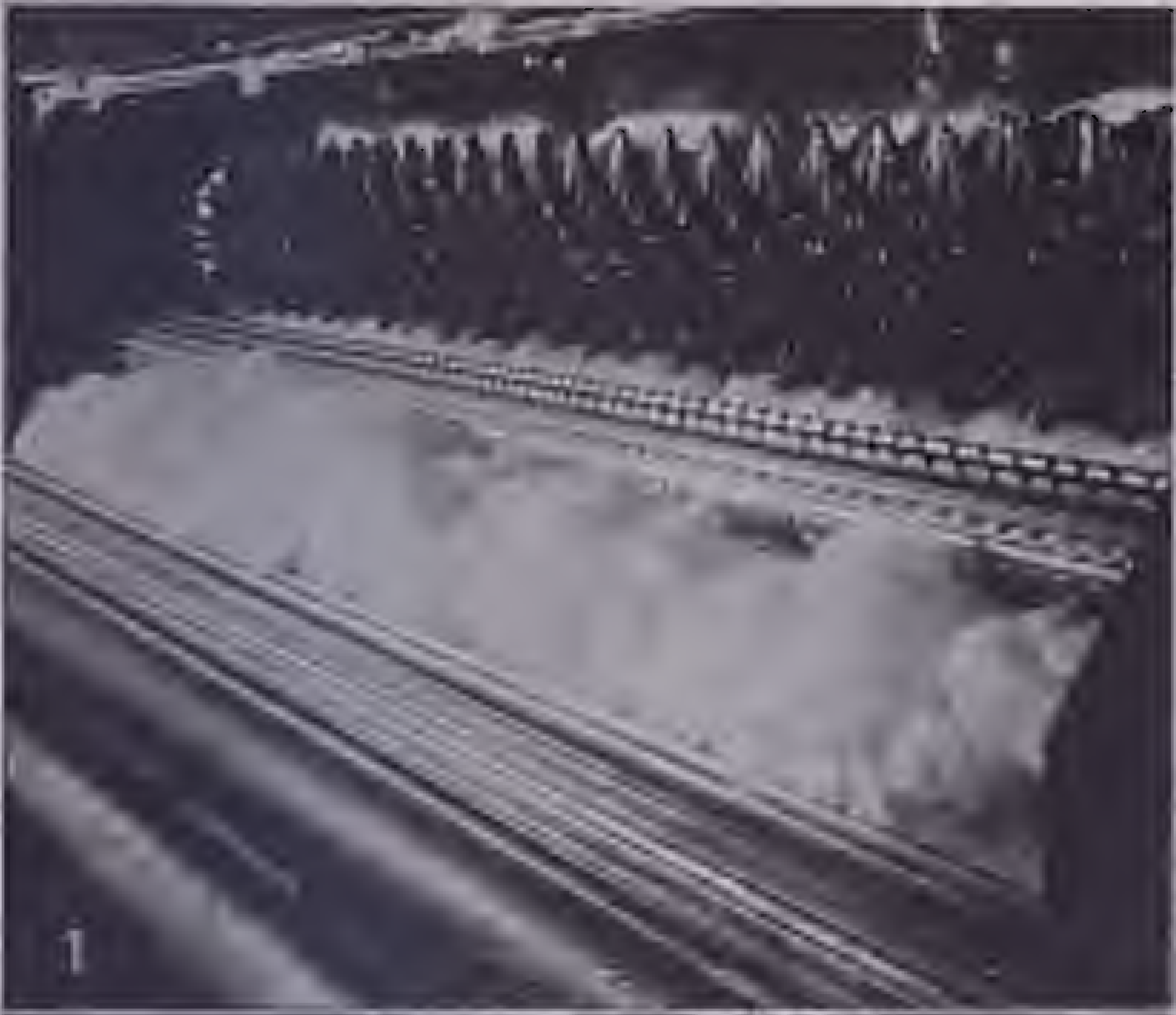
Cotton Fibers Under the Microscope

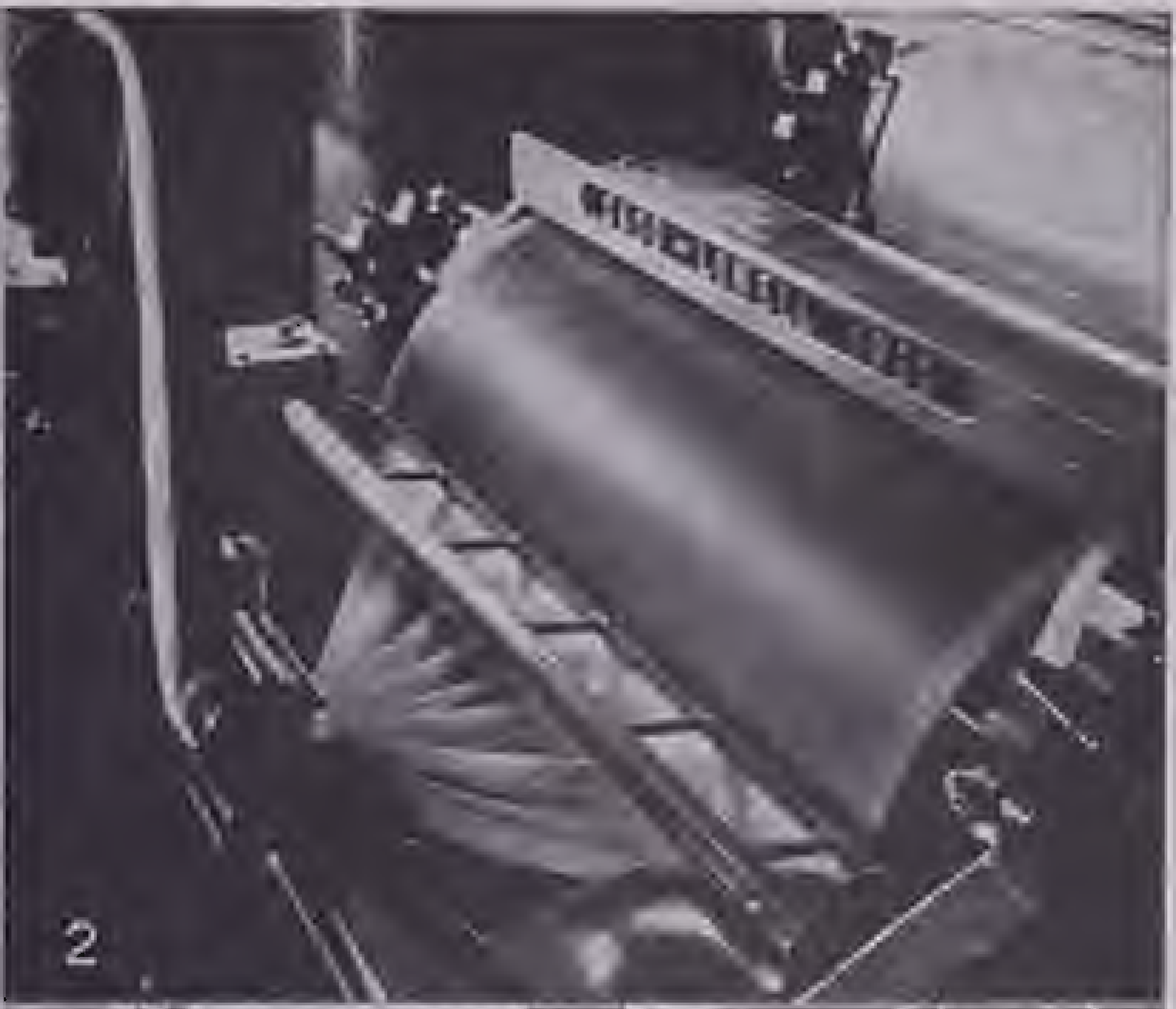
Most of the cotton-mill processes involve straightening the tangled fibers and twisting them into thread. *1.* Cotton coming from the breaker-picker is clean but tangled. *2.* After combing and rolling, the fibers are more nearly parallel. *3.* After more pulling and rolling, the fibers are collected into a soft and loose thread, already partly twisted. *4.* The thread is now dense and hard. It will be treated to improve its surface and then go to the looms to be woven into cloth

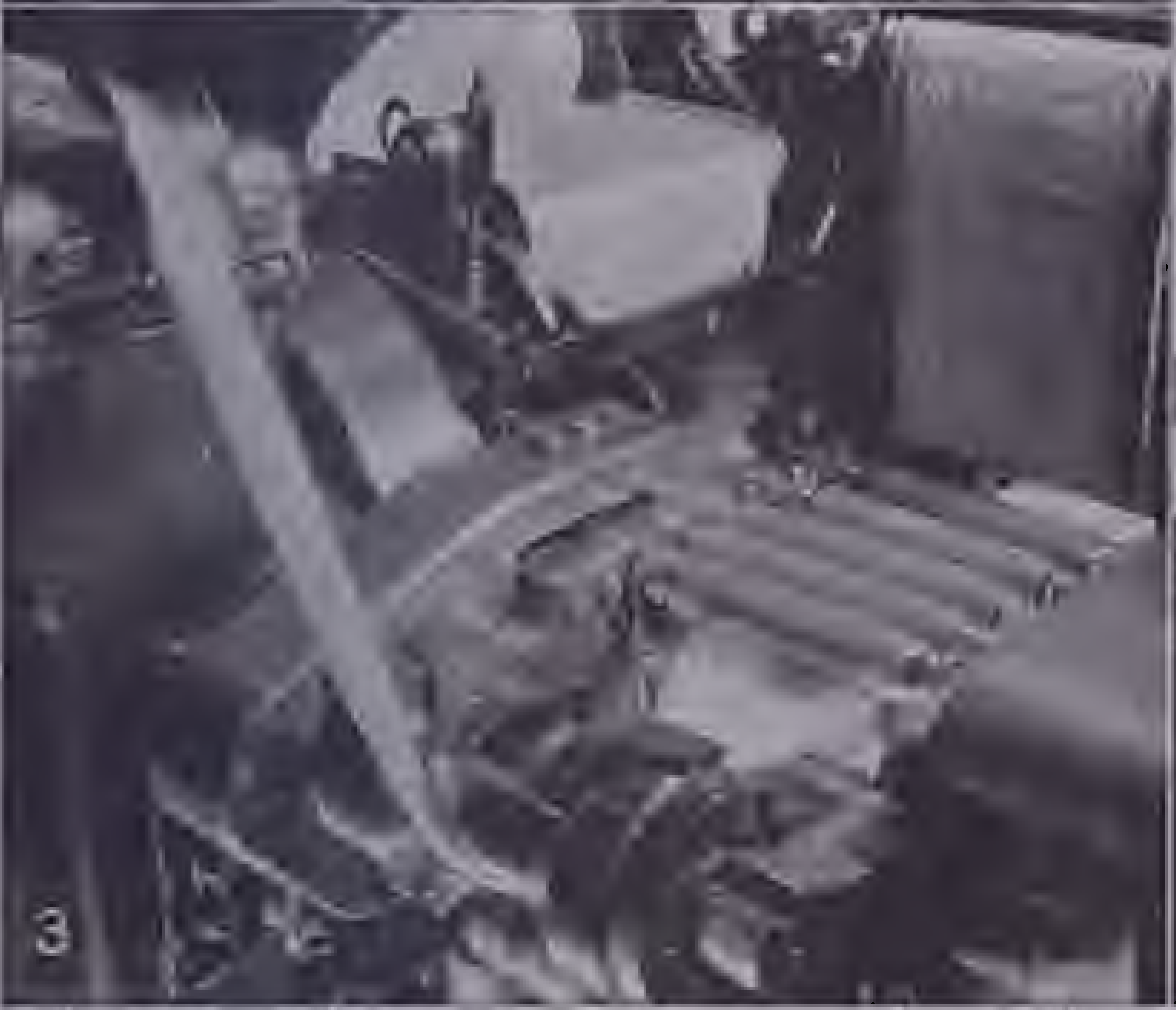
Courtesy Anderson, Clayton & Company

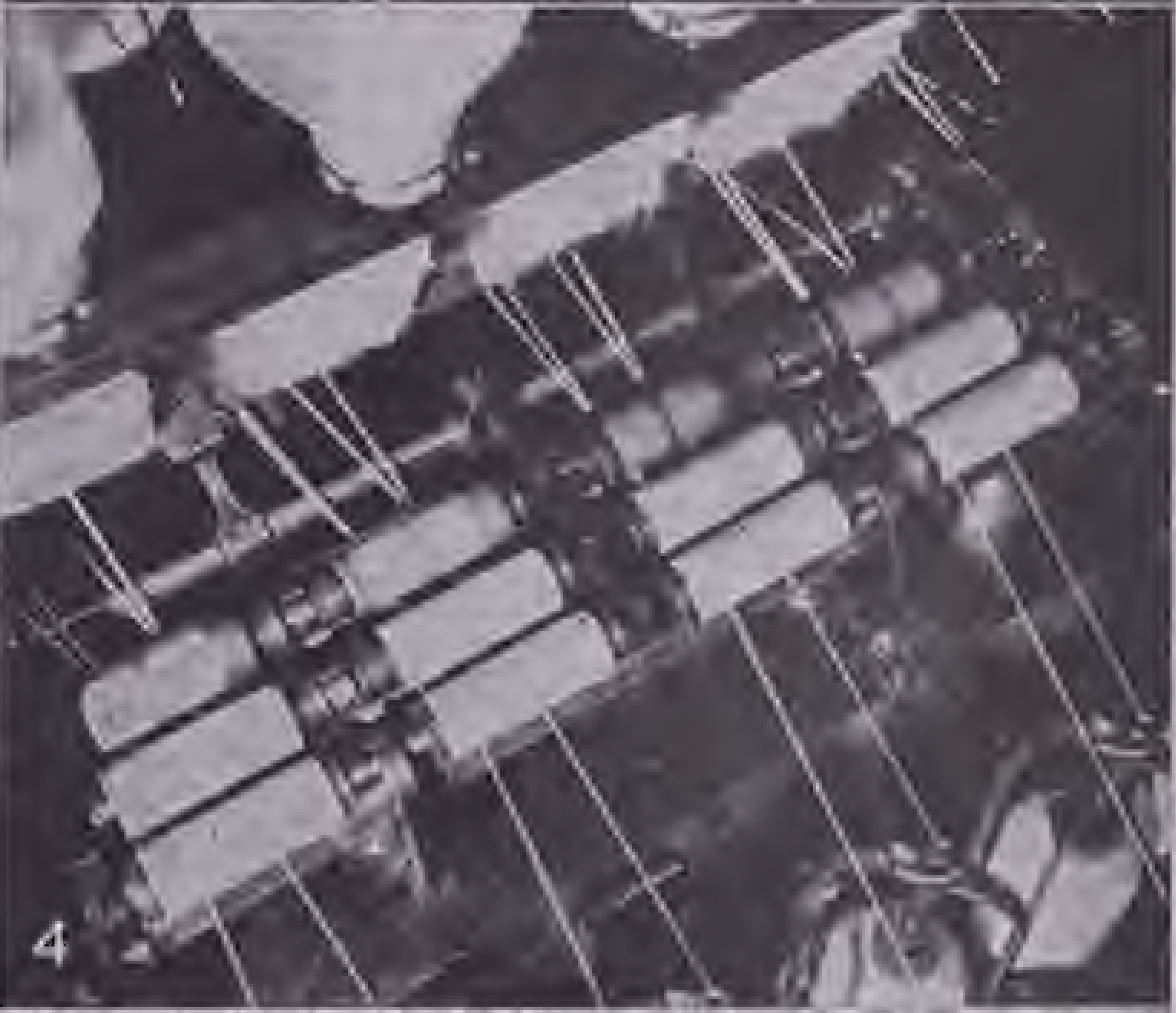
Cotton from Seed to Mill

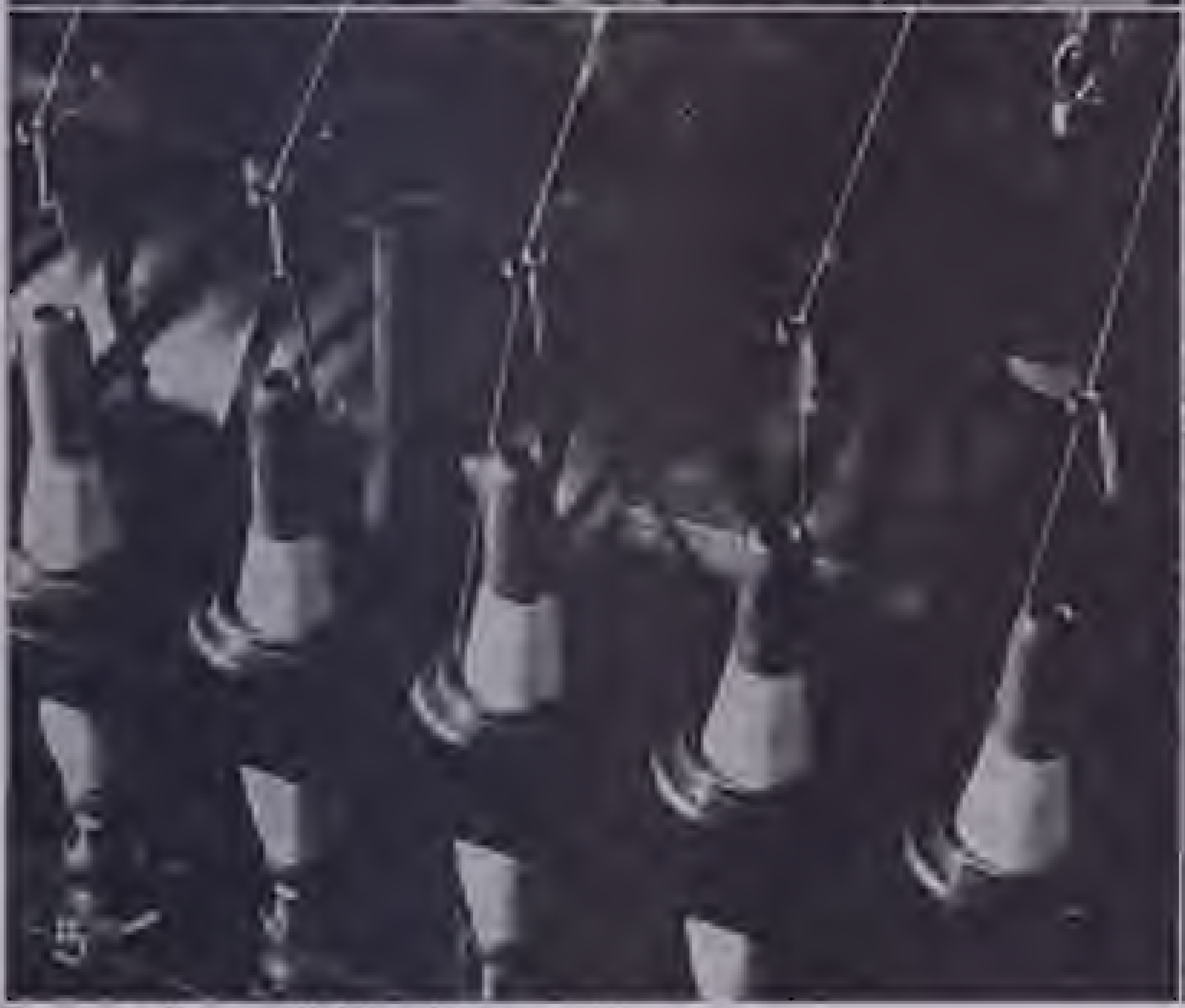
When the cotton plants are several weeks old, they must be thinned out to prevent overcrowding.
The leaves have been removed from this plant to show the amount of cotton one stalk can produce.
Picking cotton by hand requires more time and labor than any other cotton-raising process.
The farmer hauls his crop to the gin. Here cotton is being taken out of the wagon by a suction tube.
Once ginned and compressed into 500-pound bales, cotton is shipped to every corner of the world.
Raw cotton is examined and graded by experts before going to the mills for spinning and weaving.

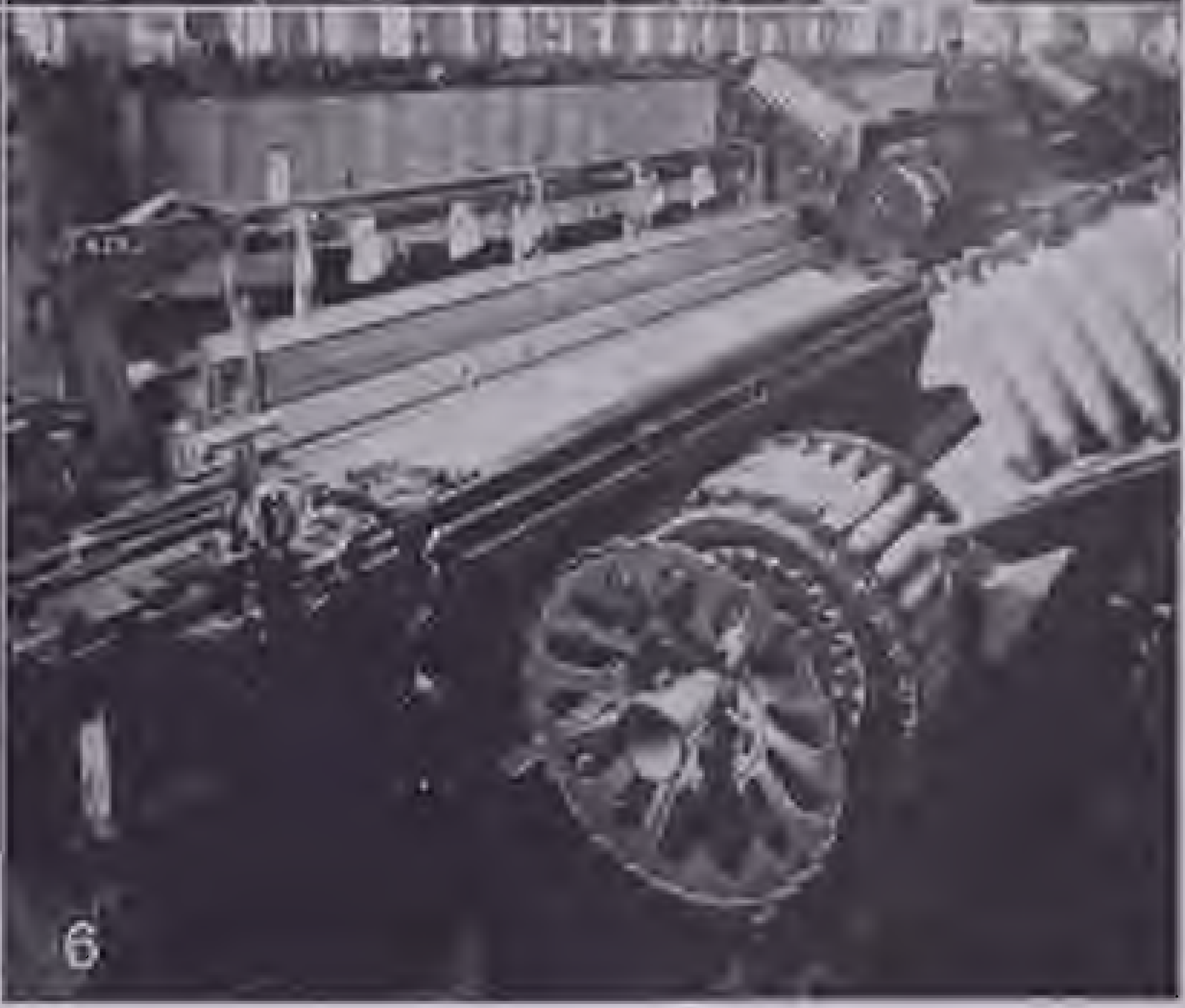












Courtesy Pepperell Manufacturing Company

From Raw Cotton to Woven Cloth

1 The revolving fingers of the "breaker-picker" fluff up the cotton fibers, and a blast of air carries away leaves and other foreign matter.
2 The cylinder of this carding machine is covered with thousands of wire brushes which pick off a thin film of cotton fibers from the mass of cleaned cotton. This picture shows the discharge end of the machine, where fibers are taken off the brushes and collected into a loose rope.
3 The ropes, collected into a blanket, go into this combing machine, where the fibers are straightened somewhat and the short, weak ones taken out. The rollers shown here are pulling out the long, usable fibers and laying them nearly parallel with each other.
4 More rolling and pulling. The front rollers turn faster than those in the rear. The thread is becoming smaller and more dense.
5 The thread is wound on bobbins after passing through the ring shown directly above, which gives it the necessary twist.
6 The finished thread goes to this loom and is here shown being woven into cloth. The many bobbins carry thread for the weft or threads going crossways of the sheet of cloth. As soon as one bobbin is empty another automatically replaces it.

furnishings, clothing and industrial fabrics. In the house furnishings group are such products as sheetings, blankets, towels and draperies. The cloth used in clothing is so varied and classified under so many technical trade names that an analysis of it here is impracticable. The single most important item is print cloth. Industrial cotton fabrics include such articles as tire fabrics, sail cloth and bagging.

In 1935 the industry gave employment to nearly 400,000 workers in the United States, and the value of the products was more than a billion dollars.

cotton picker, a machine for picking ripe cotton from the plant. Such a machine has been the dream of inventors for many years, but not until 1936 was one developed to perfected form. It is the invention of the Rust brothers of Louisiana and gives promise of revolutionizing the entire cotton industry.

One great difficulty in designing such a machine lies in the fact that all the cotton bolls on a bush do not ripen at once. The machine must be able to pick only the fully ripe cotton without damaging the green bolls or the plant. In the Rust machine a succession of smooth, whirling and moistened spindles combs through the plant. The spindles twist off the fluffy ripe cotton, and as they turn into the body of the machine cotton is taken off by an air blast or a comb.

Growing and picking cotton has been carried on with only human labor for so many years that a large body of people depend upon these operations for their living. A machine that can do the picking more efficiently would throw thousands of people in the South out of employment, and create a grave social problem. The general use of such machines must probably wait until some way can be found to care for the people thus left without any other means of livelihood.

dam, a structure built across a watercourse to obstruct the flow of water and impound it. Usually a dam has a spillway for discharging the water after a certain level has been reached. The chief uses of dams are to raise the level of water in a shallow stream so as to make it suitable for navigation, or to store water for power generation, use in cities and for irrigation and flood control.

Dams are of two main types. In the *gravity* type the vast weight of the structure alone is relied upon to resist the pressure of the water behind it. The *horizontal arch* type is built in the form of a curve pointing upstream. This kind of dam does not rely on weight alone but takes advantage of the strength of the arch form of construction. The pressure is transmitted to the ends of the arch that bear against the banks of the stream. Such dams can be built only in narrow gorges whose walls are composed of suitable rock that can withstand the thrust of the ends of the arch.

NOTED MODERN DAMS

Dams to control water flow are constructed for purposes of irrigation, to supply cities and towns with water, to aid navigation and to supply power. The following list embraces many of the important larger modern dams, together with their location and size.

NAME, LOCATION AND DATE OPENED	HEIGHT, FEET	LENGTH, FEET	STORAGE CAPACITY MILLION GALLONS
United States			
American Falls, Idaho, Snake River, 1927	78	4,971	553,946
Arrowrock, Idaho, Boise River, 1915	349	1,100	91,238
Ashokan, Olive Bridge, N. Y., Catskill Watershed, 1915	252	4,650	130,400
Belle Fourche, S. Dak., 1909	122	6,493	66,500
Bonneville, Columbia River, Oreg.-Wash.	170	1,250	....
Boulder (Hoover), Colorado River, Ariz.-Nev., 1935	727	1,180	10,000,000
Cobble Mountain, Little River, Mass., 1932	263	700	264,500
Conowingo, Md., Susquehanna River, 1928	105	4,633	107,000
Coolidge, Ariz., Gila River, 1928	250	915	391,020
Croton Lake, N. Y., Croton Watershed, 1915	297	2,168	33,815
Diablo, Skagit River, Wash., 1931	389	1,180	241,200
Dix River, Ky., 1925	275	1,020	98,000
Don Pedro, Calif., Tuolumne River, 1923	283	1,040	95,000
Elephant Butte, New Mex.-Tex., Rio Grande River, 1916	306	1,310	860,000
Exchequer, Calif., 1926	330	930	94,000
Fort Peck, Missouri River, Montana	242	11,900	6,350,000
Gatun, Panama, 1913	105	7,800	....
Grand Coulee, Columbia River, Wash.	550	4,000	3,131,000
Hetch Hetchy, Yosemite Park, Calif.	427	.....	117,000
Kennett, Sacramento River, Calif.	420	.....	958,000
Kensico, N. Y., Bronx and Byram Watershed, 1915	307	1,825	38,000
Keokuk, Iowa, Mississippi River, 1913	53	4,650	....
Marshall Ford, Colorado River, Texas	154	8,377	1,000,000
Norris, Clinch River, Tenn., 1936	265	1,700	1,108,400
Owyhee, Owyhee River, Oreg., 1932	417	1,010	241,240
Pardee, Mokelumne River, Calif., 1929	358	1,337	72,300
Parker, Colorado River, Ariz.-Calif.	340	.....	228,000
Pathfinder, Neb.-Wyo., N. Platte River, 1922	218	432	348,660
Roosevelt, Ariz., Salt River, 1911	280	1,125	533,515
Saluda, Saluda River, S. C., 1930	208	7,838	....
Salt Springs, Mokelumne River, Calif., 1931	332	1,300	42,300
Schoharie, Schoharie Co., N. Y., Catskill Watershed, 1924	182	2,000	20,000
Seminoe, North Platte River, Wyo.	261	.....	325,800
Shoshone, Wyo., Shoshone River, 1910	328	200	148,783
Tallapoosa River, Ala.	160	1,248	80,000
Tieton, Wash., Yakima River, 1925	222	905	65,985
Tygart, Tygart River, W. Va.	232	1,850	106,600
Wachusett, Mass., Nashua River, 1906	207	1,476	....
Wilson, Muscle Shoals, Ala., Tennessee River, 1926	142	4,500	....
Yadkin, Stanley, N. C., 1916	217	1,400	....
Foreign			
Ashti, India, Ashti River, 1878	58	12,709	....
Aswan (Assouan, Assuan), Egypt, Nile River, 1902	144	6,400	1,323,000
Barberine, Switzerland, Simplon, 1921	271	933	82,809
Burrinjuck, New South Wales, Australia	148	784	251,317
Camarasa, Spanish Pyrenees, 1920	333	700	264,200
Dnepropetrovsk, Dnieper River, Russia, 1932	200	5,000	291,800
Lloyd Barrage, Indus River, India, 1932	190	5,333	....
Sautet Drac, French Alps, 1936	414	262	35,540
Sennar, Sudan, Blue Nile River, 1926	128	9,900	140,000
Van Ryneveld's Pass, South Africa	152	1,170	208,600

Many dams are built of solid concrete or masonry, though they may be made also of loose rock or earth. In such cases there must be a waterproof concrete facing on the water side of the dam, going all the way down to a rock stratum under the bed of the stream.

The world has many famous dams. The Almansa Dam in southeastern Spain was built for irrigation purposes in 1586 and has withstood a maximum pressure of over 14 tons to the square foot for more than 300 years. Egypt's Aswan Dam, built across the Nile to control the waters of that river—the very lifeblood of the nation—was built in 1912. It is of masonry and contains 1,170,000 cubic yards of granite.

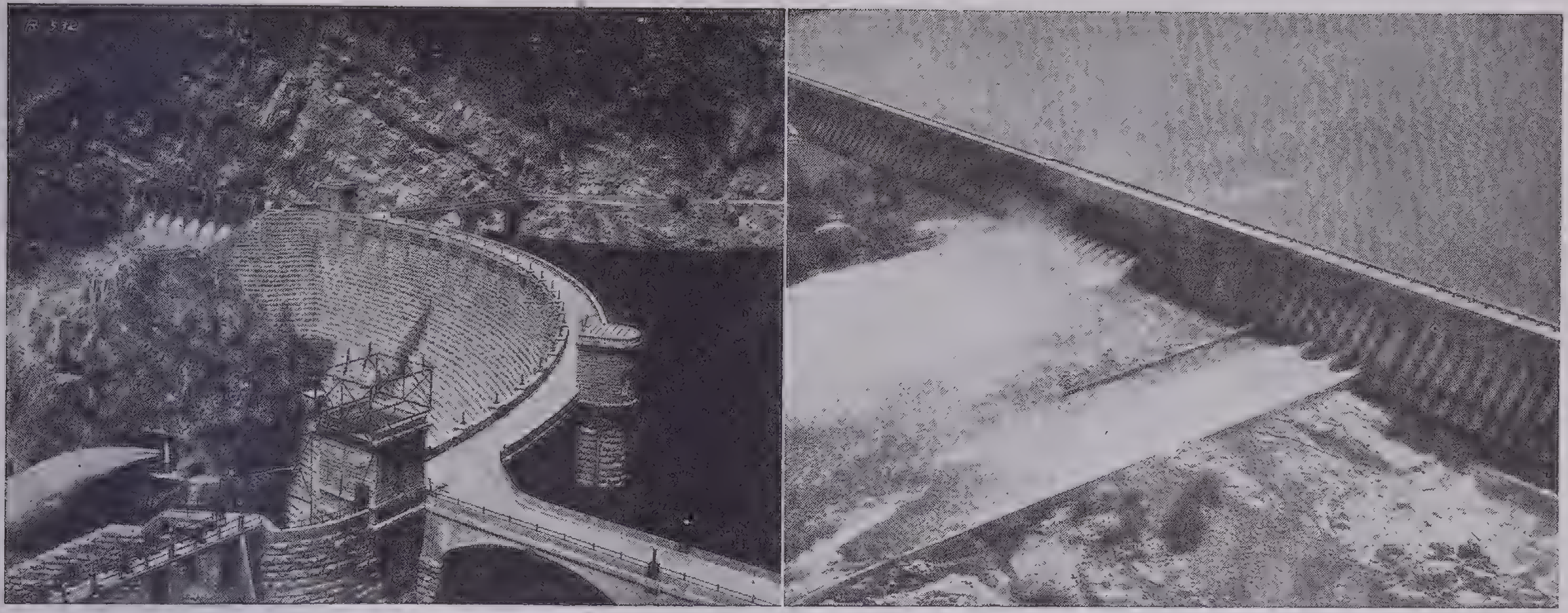
By far the largest dam in the world is the Boulder Dam, which spans the Colorado River in Arizona and Nevada. It is of horizontal-arch construction and contains 4,400,000 cubic yards of concrete—enough to build a highway 16 feet wide from Miami, Fla., to Seattle, Wash. It was built for flood control, irrigation, power and city water supply. The reservoir of water that it backs up is the world's largest artificial lake; when it is full it will be 115 miles long and 8 miles wide at the broadest point. The water would cover the state of Connecticut to a depth of 10 feet.

Diesel engine, an internal-combustion engine that differs from a gasoline engine in that it uses cheap, crude fuel, has no electrical ignition system or carburetor and is fired by the heat of compression.

The Diesel engine is the invention of Dr. Rudolph Diesel of Germany, who in 1893 built his first experimental engine. It developed so much more power than he expected that it flew to pieces on its first trial, nearly killing the inventor. In 1897 he built a new and successful model, and since then the Diesel engine has become increasingly important in industry.

The working of the Diesel engine can best be explained by comparison with the familiar gasoline engine. Both have cylinders, pistons, cooling systems and the like; but there the similarity stops. The gasoline engine sucks into the cylinder a mixture of gasoline vapor and air combined in a carburetor, compresses it to 40–50 pounds per square inch and fires it with an electric spark.

The Diesel engine sucks in air and compresses it to 500–600 pounds per square inch. This raises the temperature of the air to 1000° F.—*red-hot air.* Then a little oil is squirted into the cylinder and burns rapidly—but



U. S. Bureau of Reclamation Photo Courtesy Hamilton M. Wright

Two Types of Dam Construction

At the left is the Roosevelt Dam across the Salt River in Arizona, an example of the type in which the pressure of the water against the arch is transmitted to the abutments on both banks. At the right is the Aswan Dam across the Nile in Egypt. It is of the gravity type, resisting pressure by weight alone

does not explode—and pushes the piston down.

From the engineering standpoint the difficulties are to build an engine strong enough to stand the high pressures and yet small and light enough not to be cumbersome, and to inject the liquid fuel against high pressure into the superheated air in the cylinder. The fuel is now usually injected by a special pump that, at the right moment, forces the fuel in; but the pump must be capable of exerting a pressure of 1,500–4,000 pounds per square inch to overcome the pressure of the air in the cylinder. This is *airless injection;* in another method, now going out of use, the fuel was shot into the cylinder in spray form along with a high-pressure column of air.

A Diesel engine will use almost any kind of fuel, although it is usually built with a particular fuel in mind. Most Diesel engines burn the fuel oil left in petroleum refineries after gasoline and other light fractions have been taken out; but they will operate on coal oil, castor oil, cottonseed oil, soy-bean oil, waste lubricating oil from automobiles and even on coal dust.

The gasoline engine has an efficiency of 17–20 per cent; that is, it actually delivers as power 17–20 per cent of the energy in the fuel. A steam locomotive is 5 per cent efficient; a good stationary steam plant, 20 per cent; and a Diesel engine, 33 per cent. Other advantages claimed for the Diesel are: low fuel cost—about one-fifth that of gasoline; it uses a nonvolatile fuel, lessening danger from explosion; it has no sensitive electrical system and so causes no radio interference and is insensitive to weather conditions; it has no carburetor; water in the fuel has no effect, and the engine will operate if the fuel is mixed with 30 per cent water; there is a separate feed pump to each cylinder, so if one gets out of order the whole engine does not stop; the control is simple—nothing but a throttle; it is impossible to dilute the lubricating oil, and when piston rings are worn and lubricating oil gets past them into the cylinder, the engine merely burns it as fuel; the exhaust fumes contain little carbon monoxide.

Diesel engines were little used in the United States until the depression period of 1930–35, but now they are relied upon increasingly for trucks, tractors and watercraft. Larger types are extremely important for stationary uses, as for industrial power, mining, pipelines, irrigation, small power plants and the like. To a limited extent they have been adapted to aircraft. The most spectacular installation is in the modern streamlined trains. In the 4-year period between 1933 and 1937 Diesel installation increased from 280,000 to 2,850,000 horsepower.

Although a few Diesel engines have driven passenger automobiles experimentally, it is unlikely that they will replace gasoline engines in the near future, even though there would be at least a 50 per cent saving in fuel costs. As compared to the gasoline engine the small Diesel is bulky and expensive, vibrates excessively and cannot accelerate nearly so fast.

dirigible, a lighter-than-air flying machine depending for its lift upon an enclosed volume of light gas; it has a rigid framework and motors and propellers for drive.

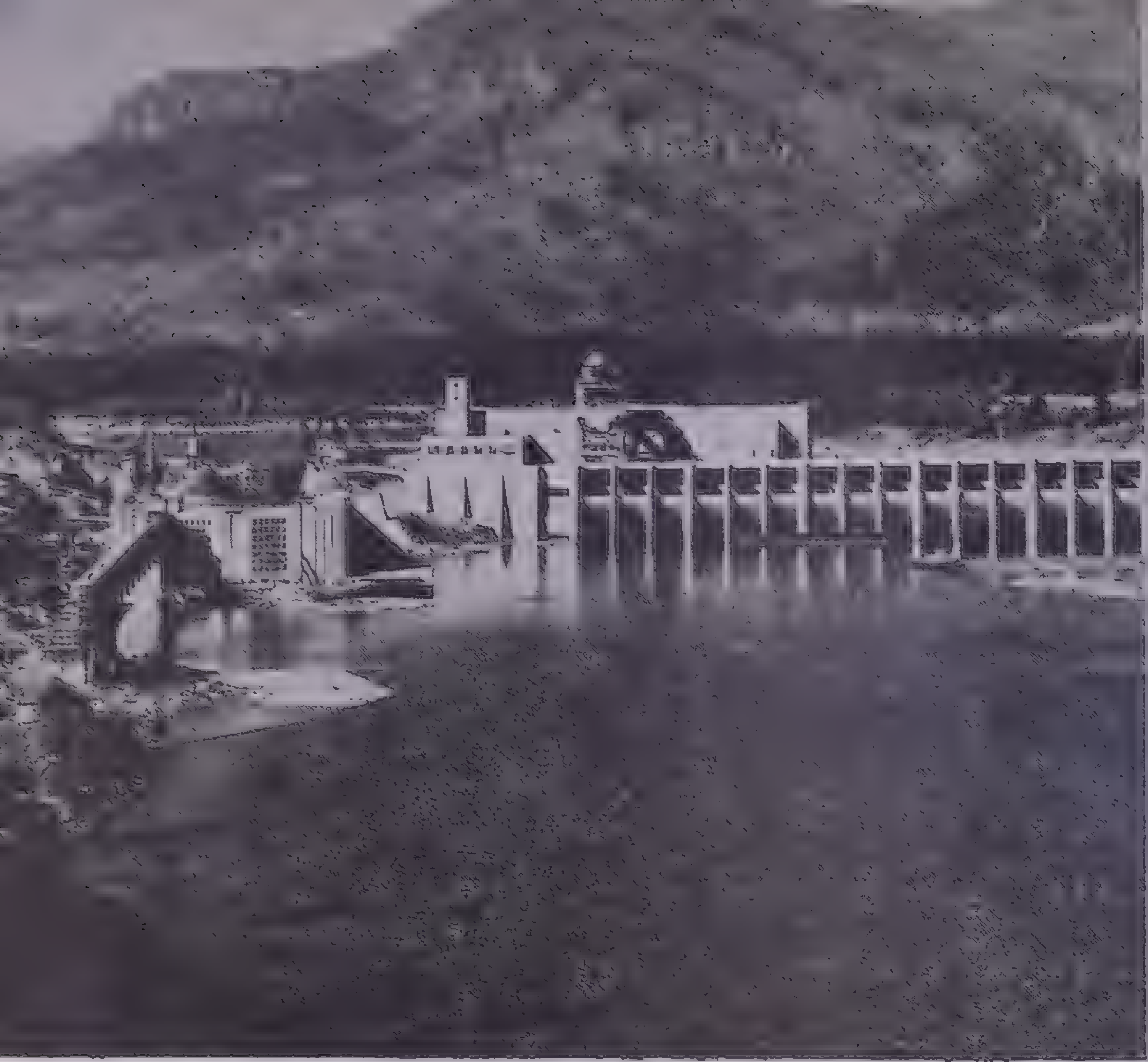
diving, going below the surface of the water. Even primitive man dived—for pleasure, to escape enemies or to gather shellfish, pearls, sponges and plants. In more recent times men have found it necessary to work under water, as in building piers or breakwaters. Since underwater pressure increases at the rate of nearly ½ pound per square inch per foot of depth, and since the most experienced diver cannot stay down more than about 3 minutes at the most, it is obvious that diving without any mechanical aid is seriously restricted. Every diving apparatus is designed with a view to extending the length of time a man can safely stay under water.

Among the oldest of such devices is the *diving bell,* said to have been first used in Spain during the early part of the 16th century. It consisted of a large iron kettle several feet in diameter that was lowered into the water in an inverted position. In this way an amount of air equal to the content of the vessel at atmospheric pressure was trapped for use by the diver. Since no means were supplied for renewing the air, and since the bottom was open, which made the pressure within the bell the same as that of the water, the diver could stay down only a comparatively short time and could not go down to any greater depths than when diving without apparatus.

An improved bell was constructed by the great English astronomer Edmund Halley in 1714. It was in the form of a large wooden box with an open bottom, the lower edge being weighted with lead to maintain it in an upright position when suspended from a boat by means of a rope. It was further equipped with several casks of air that could be opened when necessary, and it had a plate-glass top to admit light. It is said that with this apparatus a diver could descend to a depth of more than 50 feet and remain there for about 2½ hours.

Since the time of Halley many other diving bells have been constructed in various shapes and sizes and with various arrangements for renewing the air. Although air can be satisfactorily renewed by means of pumps, bells can be used only at limited depths because they are open at the bottom. Today, however, large fabricated-steel diving bells are used to some extent in laying concrete and stone foundations under water.

For general subsurface construction and repair work the diving bell has been almost entirely replaced by *diving suits* of one form or another. These are made either of waterproof



urtesy Corps of Engineers, U. S. Army

Bonneville Dam across the Columbia River between Oregon and Washington: View of Powerhouse Superstructure and Lock Gates

Courtesy Tennessee Valley Authority

Norris Dam across the Clinch River, Tennessee; Three Steel-Drum Gates at the Top of the Spillway Raise the Reservoir Level 14 Feet

Noted Modern Dams

Boulder Dam across the Colorado River between Arizona and Nevada: Air View Showing Lake Mead, a 115-Mile Lake Which, When Completely Filled, Will Hold 30,500,000 Acre-Feet of Water

ourtesy U. S. Bureau of Reclamation

Courtesy Caterpillar Tractor Company

Diesel Power At Work

This Diesel-engined tractor is expected to haul 18–20 logs at one time and to make ten trips a day. The fuel cost is $1.77 a day

canvas for shallow diving or of steel for deep diving, the head being covered in either case by a spherical helmet with glass windows. The first diving suit and helmet, of leather, was described in 1664; the name of the inventor is not known. In 1798 Kleingert built one in the form of a sheet-steel cylinder with leather legs and sleeves. Fresh air was conveyed to him through pipes, and he was able to work at depths as great as 20 feet for extended periods.

For work at ordinary depths divers in modern times rely mostly on rubber suits inflated against the water pressure, air being supplied through rubber hose. With the heavy steel construction now available, a record of 275 feet was established while salvaging the submarine *F4* near Honolulu. That record was broken in 1937 by Max E. Nohl, who descended in a homemade diving suit to a depth of 420 feet in Lake Michigan, where the pressure was about 183 pounds per square inch.

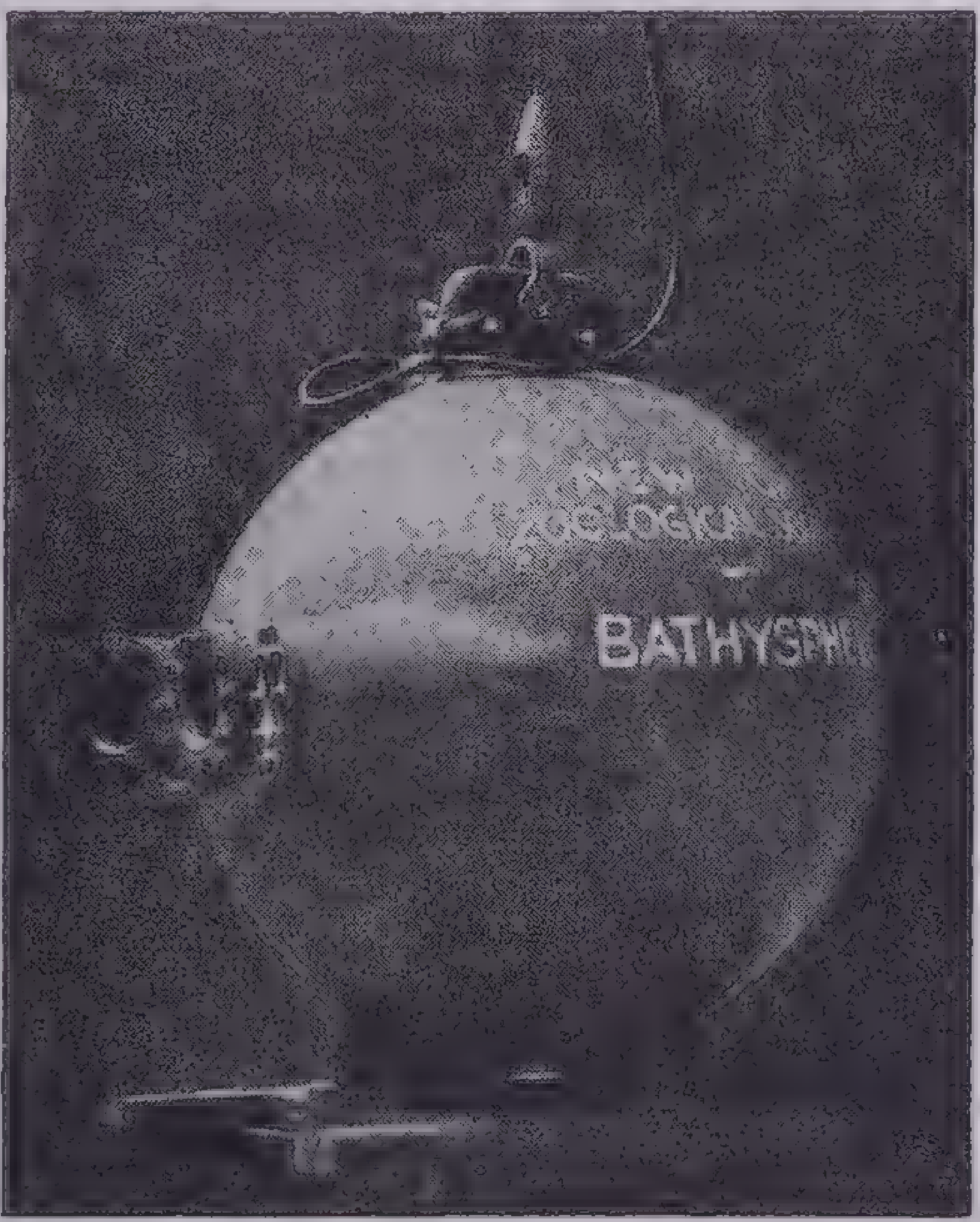
Besides diving bells and diving suits other devices for underwater work and exploration have been used. Deep caissons equipped with windows have been developed for undersea observation and photography.

There is some experimentation with tractors on caterpillar tracks for running on the ocean floor. Diving to a depth of not over 40 feet, using only a helmet supplied with air through a hose, is becoming an increasingly popular sport.

The greatest depth reached by man is 3,028 feet. This record was set in 1934, near Bermuda, by the American scientist William Beebe in a bathysphere. This is an extremely strong steel ball, with suitable windows, lowered from a ship by a steel cable. The air is not renewed but is freshened, oxygenated and dehumidified with chemicals.

dredging, making excavations under water to deepen or clear channels and harbors, obtain mineral-bearing sand and gravel or gather shellfish, seaweed and the like. Large-scale dredging is now done by highly specialized machines, the more common types being characterized by the dipper, grapple or grab, elevator and suction devices.

The dipper dredge is the counterpart of the shovel on land; it is similar in both construction and theory of operation. It is especially useful when the material to be removed contains boulders or pieces of rock; but it is not efficient in water more than 50 feet deep. Several of the largest dredges of this type maintain the channel of the Panama Canal. Each is supported by twin steel hulls 136 feet long and 44 feet wide. The dipper is mounted on a 72-foot handle and has a capacity of 15 cubic yards, which is considerably less than the capacity of the largest shovels on land.



Courtesy American Museum of Natural History

Bathysphere

In this steel ball, the explorer William Beebe has dived to a depth of half a mile. The bathysphere is 4 feet 9 inches in diameter, 1¼ inches thick and weighs 5,400 pounds

The grapple or grab dredge resembles a derrick mounted on a barge, except that the hook is replaced by a clamshell-type grapple—two scoops hinged together at the top. When it is in an open position and dropped from a considerable height, the two halves strike into the earth and close over a considerable amount of material. Such dredges also are made in very large sizes, one in service on Lake Erie having a bucket weighing 15 tons. This has a capacity of 10 cubic yards, and in a 10-hour working day can remove enough material in 65 feet of water to load 10 scows, each having a capacity of 400 cubic yards.

The elevator or ladder dredge consists of an endless chain belt equipped with buckets. When it is in use, this arrangement is lowered at an angle until it rests on the bottom. As each bucket comes around it scoops up a bucketful of material, elevates it to the top and empties it into a chute that conveys it to the scow that is being loaded. This type of dredge is also extensively used for depths as great as 50 feet and is especially effective in removing sand or silt.

The suction dredge operates upon much the same principle as the vacuum cleaner, except that the vehicle is water instead of air, and the fan of the vacuum cleaner is replaced by huge centrifugal pumps. Suction dredges remove only fine materials but are very effective when operating under the proper conditions. It is because of this that the *sand sucker* has become a familiar sight in river harbors, such as those of New York and New Orleans.

drilling, making straight, round holes in solid materials. For softer materials, such as wood, a common type of drill consists of a straight rod flattened and sharpened at one end to a rather blunt spearpoint, given a rotary motion in a hand brace. Such a drill is cheap and rapid but can perform only rather rough work. Another type consists of a round rod with two straight flutes—a favorite in the *automatic drills* that give an oscillatory motion. Here, again, precision is limited; such drills are used principally by carpenters and cabinetmakers for making screw, nail or small dowel holes.

When clean, accurate holes are desired, the twist drill is the most satisfactory. Instead of having flutes the twist drill is milled with a spiral similar to the thread of a screw. Drilling in wood is usually limited to comparatively small holes; bits or augers of one form or another are preferred when larger holes are desired.

In drilling metals the twist drill is

most commonly used, although flat-point drills of the first type described above are occasionally encountered in rural communities, being known as *blacksmith's drills.* Twist drills are regularly listed in a large variety of sizes, ranging from 135 ten-thousandths of an inch to 5 inches in diameter. Some of the larger ones are provided with spiral oil holes for lubrication and cooling. In drilling metals it is essential to use plenty of good cutting oil, even for the smallest sizes, since this improves the cutting, clears the chips and reduces friction.

The first rock drilling on a large scale was done in quarries by means of a steel rod with a blunt chisel edge at the cutting end. This was held in one hand and hit with a hammer held in the other, the drill being rotated slightly between blows. A series of holes somewhat less than an inch in diameter were drilled to a depth of several inches and spaced a few inches apart along a desired line of cleavage. Wedges were then driven into each hole, resulting in a fairly smooth fracture along the desired line. This method, though it is very old, is still used in small quarries.

With the introduction of blasting it was necessary to drill deeper and larger holes into which to place the charge. At first these holes were made by larger drills of the same general type as mentioned above. Although this method is used to some extent today in small construction and excavation jobs, reciprocating drills driven by steam, compressed air or electricity have become more common.

Steam and compressed air drills usually consist of a cylinder, a piston and piston rod to which the drill is clamped; also in some instances an arrangement for producing rotation. Although many of the larger drills are mounted on tripods and equipped with a screw feed, the smaller ones are held by the operator. Power drills usually have a bit in the form of a cross, and their use is principally limited to the drilling of holes for blasting.

In drilling deep holes for wells the drill is usually suspended by a cable so that it can be raised by a derrick arrangement and then suddenly released, the device acting as both hammer and drill. By this method wells more than 1 mile deep have been sunk.

A hollow rotary drill that cuts a plug 2 inches or more in diameter is used for studying underground rock formation or sampling concrete pavements. It is quite common, in the former case, to stud the bit with black diamonds, which in some instances cost several hundred dollars each. An alternative type for drilling larger holes in rock is a soft-iron pipe slotted at the end and filled with steel shot. When it is rotated, the shot abrades the rock. Such drills may be 3 feet in diameter. A similar and smaller arrangement for drilling glass and porcelain uses emery instead of shot.

dust prevention, the precipitation and collection of dust to avoid air pollution. Dust consists of particles of solid matter so finely divided and light that they can easily be blown about by air movements. Smoke contains dust composed of soot, ashes and sometimes tiny drops of tar.

Many devices have been used for the removal of dust. One interesting type is known as the *Cottrell precipitation process.* This method makes use of an electrostatic field to remove dust from the gases given off in metallurgical processes. The dust-laden gases are passed through a flue in which two electrodes are charged with a direct current potential of about 100,000 volts. The negative electrode is a wire or chain; the positive electrode a plate or screen.

Passage of the current from the negative electrode ionizes the surrounding gases, and the ions travel toward the positive electrode. The moving ions charge any solid or liquid particles present in the gas, and they too are attracted to the positive electrode where they collect. This process is used in cement mills, smelters and chemical plants to salvage valuable particles or prevent the escape into the air of substances injurious to human health or vegetation. This method is also used to purify air entering homes.

dynamite, a powerful explosive containing 40–70 per cent of nitroglycerin. When dynamite is prepared for the market, it appears in the shape of a cylinder or stick about 8 inches long and from 1 to 3 inches in diameter. It was invented in 1866 by Alfred Nobel, who later founded the Nobel prizes.

Nitroglycerin in liquid form is extremely dangerous; it will explode on slight impact. In dynamite it is absorbed in an inert base like kieselguhr, a white, chalky substance. In this form it is easy to handle, will not explode so readily and can be worked into convenient forms with comparative safety. Kieselguhr dynamite is called *dynamite No. 1. Extra* dynamite has for a base a nitrate mixture that takes part in the explosion.

Dynamite is set off by a fuse ending in a detonator or more usually nowadays by an electric current.

Dynamite is used extensively in quarrying and certain mining operations, building and railway construction, removing obstructions to navigation and clearing fields for farming.

electrical appliances, household, time- and labor-saving devices for home use that enable one to accomplish various household tasks more speedily, economically or with improved sanitation. Electricity provides almost ideal power for use in the home. It can very easily be made available all over the house by means of simple wiring. Motor-driven devices leave no objectionable residues of dirt and fumes. Electric motors can be started by the mere touching of a button, and their speed can be easily controlled. Heating devices using electric power go into service instantaneously, and the danger of fires from open flames is eliminated; they also can easily be held at a constant temperature by thermostatic controls.

The use of electricity became widespread about 1910, but first served chiefly for lighting and power. Shortly thereafter electrical household appliances began to make their appearance, but it was not until about 1918 that they came into general public acceptance. There were three major reasons for the rapid adoption of such devices at that time: wages were sufficiently high to enable many people to buy them; the power companies pushed their sale with a great deal of advertising, chiefly as a way of selling more current; and the manufacturers had so improved their products as to make them very attractive. Descriptions of the commoner electrical household appliances follow.

Coffee Maker or *Percolator,* is a specially constructed pot at the top of which the ground coffee is contained in a perforated cup, through which passes a tube connection to the bottom of the pot. Water is placed in the pot, beneath which is the heating element. When the water boils, steam forces it up through the tube and splashes it on the coffee, through which it filters and extracts the flavor.

This practice of bringing the water into contact with the coffee only after the water has reached the boiling temperature apparently produces finished coffee of a better flavor. Many coffee makers are equipped with thermostatic controls, so that the electric current is turned off when sufficient heat has been supplied to the percolator. Usually it is not desired that the percolating action cease when the current is turned off; for this reason, heating elements are frequently so designed that considerable heat is stored in them.

Dishwasher. This is a tublike device in which dishes are mounted in racks and cleaned by hot soapy water thrown against them by a motor-driven fan. Suitable valves and drains permit removing the soapsuds and rinsing the dishes with clean hot water without removing them from the racks, where they are left to dry. Although electric dishwashing machines have not been adopted to the extent that many other electrical appliances have been, several very successful models have been produced.

Garbage Grinder. This is a device for the disposal of kitchen refuse. It consists of a motor-driven chopper mounted underneath the kitchen sink and connected to the sewer drain. Practically all kitchen refuse except bones, cans and glass can be reduced to a pulp and safely flushed away down the drain. This is a great convenience to the housewife, and it provides quick and sanitary refuse disposal.

Iron. In the hand iron electrical heating elements are so mounted that they convey heat as uniformly as possible to the working surface of the iron. The heating elements are usually flat strips of metal folded upon each other so as to occupy the minimum possible space. They must be insulated from each other by an insulating material that will not deteriorate at high temperatures. Sheet mica is commonly used. The connecting prongs over which the cord attachment fits are insulated by washers of lava or some heat-resisting ceramic material.

Many modern irons have thermostatic controls for maintaining the temperature at an approximately constant value. They can usually be set for different temperatures by a control knob mounted on top of the iron. This makes it possible for the user to adjust the temperature to suit the different types of material being ironed. One of the advantages of thermostatic control is the fact that the iron will not overheat if left standing unused. There is one other advantage that is not quite so obvious—the heating element of an iron so controlled may be much more powerful than that of an iron not so controlled. If the iron is not automatic, the heating element must liberate only enough heat to maintain the proper temperature on average work. If the work requires more heat (as very damp or heavy material does), such an iron must be set aside frequently in order to maintain the proper temperature. If the heating element were strong enough for this kind of ironing, the temperature would be too high for ordinary work. The automatic iron thus adjusts itself to any kind of service. Another advantage of the high-power element is that less time is required to bring it up to operating temperature.

The iron is the most popular electrical appliance in the United States; more than 20 million are in use.

Mangle. The mangle is a most useful device where a large amount of ironing is to be done, particularly if much of it is flat work. The most common type has a padded cylinder, rotated slowly by an electric motor, that operates in contact with a polished electric heating plate curved to fit the cylinder. The ironing plate may be brought into contact with the rotating cylinder by touching either a hand or a knee control. This type of ironer is particularly good for flat work, because the pieces are drawn through the machine with practically no effort on the part of the operator; but a skilled operator can handle practically any type of work on such a machine.

Another type of mangle is the press ironer. Instead of the cylinder construction this ironer has a padded plate and a heater plate, both practically flat. The heater plate can be brought into contact with the padded plate under a high pressure, supplied by an electric motor or a powerful hand lever. The plates usually come together with a slight sliding action in order to impart the desired finish to the work. When large flat pieces are being finished with this type of ironer, they are usually folded so that several thicknesses can be pressed at the same time.

Mixer, a portable electric motor equipped with suitable gearing and beaters. Such a device has many uses in the preparation of foods. Usually it can be operated at a number of different speeds—for instance, to whip cream a high speed is required; to mix cake batter, a lower speed is needed. Many such appliances have special attachments, so that they can be used for extracting fruit juices, food chopping, shelling peas, peeling potatoes and the like.

Razor, an electrically driven mechanism for shaving, enthusiastically accepted by the public. Advantages claimed for electric razors are: no lathering or other advance preparation is needed; the skin cannot be cut, nor is it irritated in shaving; the cutting elements are not dulled by continued use.

The cutting is a shearing action between stationary and moving blades. The stationary cutter is a hollow steel head, the face of which is very thin and provided with slots of some form so that the hairs enter them when the razor is drawn over the skin. Within the head is a movable cutter having slots to match those in the stationary head. The two elements are held in close contact by spring action. The movable head is vibrated rapidly by an electric motor, thus cutting off the hairs that have entered the slots at the point where the two heads are in contact.

The moving cutters must operate at very high speeds, and the motors driving them must necessarily be very simple and compact. Conventional types of electric motors are unsuitable; most of them cannot be made to run fast enough, and others are too complicated. The maximum speed of most alternating-current motors is determined by the frequency of the voltage; for instance, on the standard frequency of 60 cycles per second, most types of motors cannot be made to run faster than 3600 revolutions per minute.

Electric razors use motors whose speed is independent of the frequency. Instead of depending upon the natural pulsations of the current, a set of contacts make and break the circuit, the contacts being operated by a cam on the shaft of the motor. The field structure is simply a stack of C-shaped steel plates on which is mounted a coil connected in series with the contacts and the supply line. The armature carries no windings whatsoever. It is a block of laminated steel, substantially rectangular in shape, mounted on the shaft of the motor. The contacts and cam are so constructed that, when the armature is in line with the field, the circuit is broken, thus destroying the attraction between them. If the armature is turned so that it is approximately perpendicular to the field, the contacts close, thus energizing the field and drawing the armature around so as to line up with the field again. At this point, the contact is broken and the armature is carried around by its momentum to the point where the contact is closed.

It can readily be seen that the speed of the make-and-break of the contacts increases with the speed of the motor, thus making the motor speed independent of the line frequency. Such a motor must usually be started by hand, since it has no turning force if the contacts happen to be open, and the momentum gathered in starting from rest is usually not sufficient to carry it over the inactive part of the revolution even though the contacts are closed at the instant when the motor is connected to the line.

Stove. Although the cost of electrical energy is greater per unit than that of gas, it is possible to build electric stoves so efficient that this disadvantage is overcome. When an oven, for instance, is heated by gas, it is usual to have some circulation of air through the oven; that is, the mixture of air and unburned gas enters the oven continuously and at the same time the burned gases must be thrown off. This means that gases at a high temperature are continuously leaving the oven and in this way losing heat. An oven heated by electricity may be air-tight, so that if it is well insulated little heat is required except that needed to bring the oven up to the proper temperature at the beginning.

Electricity has many advantages when used for cooking. Electric ranges do not throw off dirt and fumes. The insulation that cuts power consumption also prevents heat in the kitchen while cooking is being done. The heating element may be mounted in any position and may be designed either to concentrate the heat at a particular point or to distribute it over a wide area. In electric ovens the heating elements are distributed so as to give an almost perfectly uniform temperature throughout the oven, a condition that cannot be obtained with other fuels. An additional advantage is the fact that various automatic control devices can be very easily applied to electric ranges. Temperature can be held accurately at the desired degree by means of thermostatic controls; time controls can be set so that heat will be turned on at a specified time of day and turned off automatically when the cooking is completed, without any attention whatsoever.

Toaster. All electric toasters depend upon conductors heated to a red heat by the passage of an electric current from which heat travels by radiation to the slices of bread. The heating wires may be either horizontal or vertical, but vertical wires are the more common as they prevent crumbs from lodging in the exposed heating element.

Automatic toasters are so constructed that the current is automatically interrupted when the toasting is completed. This is done by a clockwork mechanism that is started when the bread is put in place and that can be set to run for various lengths of time depending upon the degree of toasting desired. There is usually some means of indicating when the current has been cut off, such as a bell ringing or ejection of the toast.

Vacuum Cleaner, a suction device for removing dust and dirt from rugs, furniture and the like; it consists essentially of a nozzle, suction fan and dust collector and air filter combined. When the nozzle is placed in contact with the material to be cleaned, the air rushing into the nozzle carries the dirt with it and discharges it into the collecting bag. H. C. Booth invented and made the first appliance of this kind in 1901.

Vacuum cleaners are generally classified as portable or fixed. The portable type is a self-contained unit that can be carried from place to place. The fixed type generally used in hotels and large buildings is different in that the fan, dirt collector and air cleaner are usually located in the basement. Pipes throughout the building connect the suction fan to wall outlets. The nozzle is attached to a long flexible hose that can be plugged into the wall outlets. Fixed installations using a displacement fan are capable of removing from 28 to 35 cubic feet of air per minute per cleaning nozzle at work. If a multistage fan is used, the working capacity is increased from 50 to 70 cubic feet per minute per cleaning nozzle at work, and at the same time a lower suction pressure is maintained.

Machines much like domestic cleaners are used in industry, for moving dust, soot, ashes and powdered materials.

Washing Machine. The electrically driven washing machine forces soapy water through fabrics to remove dirt. The type most widely used and generally considered to be the quickest in removing dirt has an agitator mounted on a vertical shaft that extends upward from the bottom of the tub at its center. It carries paddles of a shape designed to give the water a churning motion as it rotates. The shaft is connected to an electric motor through suitable gearing, and a reversing mechanism causes the agitator to rotate first in one direction and then in the other. The paddles create movement of the water and thus force it through the clothing, which also is moved gently but is not seized and dragged through the water by the agitator. There is thus little wear on the fabrics.

The cylinder type of washer has a constantly rotating cylinder mounted horizontally in the tub in such a way that only a part of it is submerged in the water. The cylinder is made of perforated metal or of wooden slats so that water may pass through it easily. The clothing to be washed is placed in the cylinder, and when it rotates the clothing rolls over and over, thus producing the agitation required to remove the dirt. The action is similar in some respects to that of a concrete mixer.

Among other types built to operate electrically are: the oscillator type, in which the whole tub rocks back and forth; in another, vacuum cups move up and down in the tub; and a type that appears to have very gentle action is one in which no moving mechanical parts come in contact with the clothing, but cleansing is secured by circulating water through the tub with a power-driven pump. This type has not as yet had wide use as a domestic appliance.

Devices for wringing or drying the clothes are usually part of the washing machine. The familiar roller wringer is still widely used. Another device is the spinner, operating by centrifugal force; it has a vertical cylinder made of perforated metal, mounted on a motor-driven shaft and encased in a cylindrical tub. When the clothes are taken out of the water, placed in the spinner, and the spinner started rotating, the water is thrown out through the perforations. This provides uniform action on all pieces of clothing regardless of their thickness and eliminates the necessity of handling the pieces one at a time.

electrical control devices. Civilization depends upon man's use of power, but uncontrolled power would be useless. The electric motor and generator and all the machinery to which they give rise could never have been developed if at the same time the means of controlling them had not also been devised. Not only must there be ways of starting and stopping them but also devices to vary the speed, driving force, current and many other quantities while the machines are in operation.

The most widely used means of control is electric current. This is so not only because electrical devices must be controlled electrically but also because electrical controls can operate quickly, easily and from a distance. Electrical control schemes are illustrated by manually-operated systems in which an operator closes a switch, turns a knob or performs some like operation; but the outstanding advantages of electrical control are realized in the automatic systems that control domestic apparatus, such as refrigerators, ironers and heating plants, and industrial machinery and processes. They are quicker to act and far more sensitive than any man-operated mechanism could be.

One simple and very useful control device is the limit switch in combination with a motor. This is a switch so placed that it will be opened or closed by the movement of a mechanical part when it has reached a certain position, thus starting a motor that performs another consecutive function. The descriptions of some industrial set-ups using this device seem quite fantastic, but such a control is nevertheless very effective.

One of the most important of the automatic electric controls is the contactor or relay. It consists of a set of contacts operated by an electromagnet. By varying the design of the magnetic circuit and of the contactor mechanism it is possible to make devices of this type to control various quantities. Common applications are automatic shut-offs of power supply to a machine or a series of relays for feeding power gradually to a machine while it gathers momentum. A major advantage of this system is its ability to operate power devices at a distance, the only connection required being a circuit of small wires. Most of the large electrically driven machines and all the large power systems depend to a very considerable extent upon relays for their operation.

One of the most significant recent developments has been the application of electron tubes as controls in a large number of industrial processes and specialty devices. Among the most important reasons for their use is their ability to operate in almost unbelievably short periods, to am-

Courtesy Westinghouse Elec. and Mfg. Co.

An "Electric Eye" at Work

The small device above the painted arrow is a photoelectric cell of the type that develops an electric current when light falls upon it. It is arranged so that daylight will not operate it, but light from an automobile's headlights, either by day or night causes it to send current through a circuit that operates the motors that open the door plify the power input, to repeat operations a large number of times in exactly the same way and to respond to variations so minute that no other available device could do the work. A good example of this sensitivity is found in the photoelectric cell, which responds to the feeble impulses of energy in a beam of light.

The so-called *alkali metals*—cesium, potassium, selenium and others—have different properties when light falls upon them and when they are not illuminated. When suitable apparatus is mounted in a tube, it is possible to obtain three different effects: when it is illuminated, the metal will give off electrons from its surface, will become a better conductor of electricity than if it were dark or, when in a circuit, will actually generate a current of electricity

These effects have been put to use in numberless ways; one application has made sound movies and television possible. Equally spectacular are the control devices that use them. Such tubes, for instance, can "judge" whether fruit is of the proper color, or whether a page has been printed black enough. The tubes send out an impulse that makes other apparatus work to throw out a defective article. In some processes the tubes control the speed and precision of the work done by a machine; in making paper bags, the long roll of paper is printed with a series of small marks along the edge. When each mark passes under it, the photoelectric tube acts to control the cutters and other parts of the machine; thus nothing can get out of step.

Another common application is the use of a tube to count the number of people entering a door. As a person enters his body interrupts a beam of light, causing a stoppage of current in the tube, and this is registered mechanically. Much the same sort of system automatically opens doors as a person approaches.

electric furnaces, heating apparatus in which an electrical current produces the heat. Whenever electric current flows through a conductor, the conductor is heated by the passage of the current. This is often a disadvantage, as in most electric circuits and motors, because the heat represents a loss of energy. The fact is turned to advantage, however, in electric heating apparatus, as well as in incandescent lamps where the emission of light is due to the high temperature of the filaments.

The amount of heat liberated depends not only upon the strength of the current but also upon the size and material of the conductor through which it flows. Current flowing through a silver conductor produces little heat; but if the conductor is a piece of tungsten of the same dimensions, heat is liberated rapidly. Silver, copper and other metals are said to have a low resistivity, and are therefore good conductors, but the resistivity of tungsten, iron and other metals is relatively high. Obviously one of the requirements for a material to be used as a heating element is that it have a high resistivity.

Electric furnaces are useful chiefly because they produce extremely high temperatures, high enough to change the physical or chemical nature of the material heated in them. They are of three types, depending on the manner in which the charge is heated. In a *resistance furnace* the heat comes from a conductor carrying the current and is transferred to the charge by conduction, convection, radiation or a combination of these. In an *arc furnace* the heat is produced by an electric arc. An *induction furnace* is one in which the current is caused to flow in the charge itself.

There are many different designs of resistance furnaces, depending on the maximum temperature desired, the material used as a heating element, the character of the material to be heated and other factors. The most widely used materials for heating elements are nickel-chromium alloys. They do not readily oxidize or burn at high temperatures, and their resistance is practically the same at all temperatures. With these alloys furnaces can be built to give temperatures up to 1000° C., and no special provisions need be made to prevent oxidation of the heating element.

Another material that has wide use is iron tape, but at high temperatures furnaces using it must operate in an atmosphere of hydrogen, nitrogen, steam or some such medium to prevent burning of the iron. For temperatures from 1000° C. to 1600° C., molybdenum, tungsten and platinum are used. Molybdenum and tungsten must have a nonoxidizing atmosphere at these high temperatures. Platinum may be used in air at temperatures up to 1400 C. This is a distinct advantage, but the high cost of platinum makes its use impractical in most cases.

Carbon rods and also carbon granules packed in tubes serve to some extent as heating elements, but they too are subject to rapid oxidation. Recently a new heating element of carborundum and some form of binder molded into the form of a rod has come into rather widespread use. With these it is possible to operate successfully at temperatures from 800° to 1000° C. Their resistance, however, changes with age, impairing the operation of the furnace.

In the arc type of furnace (widely used commercially for melting various materials, usually metals), an electric arc is drawn between two or more carbon electrodes or between the electrodes and the charge, the heat from the arc heating the charge. In a common design the carbon electrodes are placed close above the charge so that the heat can pass readily; but even if the electrodes are placed as close to the charge as possible without short-circuiting them electrically, the efficiency is low, and so this method is not widely used. Usually the charge is one terminal of the arc, the electric current passing from the carbon electrode to the charge and vice versa. Furnaces of this type are widely used for melting cast iron and steel, particularly for producing high-grade steels. Some are large enough to melt 40 tons of steel at one time.

Where the composition of the charge is such that carbon from the electrodes would contaminate it, the arc furnace cannot be used. In such cases the induction furnace is the solution. There can be no contamination by the heating agent since these furnaces have no electrodes. The circuit of the heating current is entirely within the metal being heated.

The current is produced by a voltage induced in the charge in exactly the same way that the voltage in the secondary winding of a transformer is induced. If two coils are wound on a core of laminated iron and an alternating current caused to flow in one of them, a voltage is induced in the second coil that will produce a current in it if the circuit is closed. In the induction furnace the secondary coil consists, in effect, of a single-turn coil, which is the material to be heated. The material is arranged in a *doughnut* or a hollow-rectangle form around an iron core in a trough made of refractory material. The primary coil is wound around the other end of the core. It is connected to a source of electric power of the proper voltage and frequency, and current flowing in the primary coil produces a current in the charge that heats it to the melting point if desired.

One of the shortcomings of this furnace is the fact that there must always be sufficient material in the trough to complete the circuit. If, for instance, the trough were filled with broken pieces of brass, the electrical resistance between them would be so high that sufficient current could not be developed to melt them. This disadvantage is overcome in the high-frequency induction furnace in which the primary coil is wound around the vessel holding the charge, no iron core being used. If two coils are wound concentrically and an alternating current passed through one, called the *primary,* a voltage is induced in the other coil, called the *secondary.* Here the charge within the vessel acts as the secondary coil.

In the absence of the iron core, however, it is usually necessary to use a frequency higher than the common frequency of 60 cycles per second in order to induce a strong current. Furnaces for melting steel use a current alternating at 500 cycles per second. While these furnaces are not as efficient as the type using iron cores, they do melt metals without contamination. Without them it would not be possible to make many of the high-quality alloys in common use.

electric generator, a machine that converts mechanical energy into electrical energy; it depends for its operation upon the fact that when a conductor of electricity is passed through a magnetic field in such a way that the magnetic lines of force are cut, an electric current is set up in the conductor and flows through it if the circuit is completed.

If the construction of a generator is such that the current in the circuit flows continuously in one direction, it is a *direct-current generator.* If the current in the circuit flows first in one direction and then in the other, repeating these reversals continuously at a rapid rate, the machine is an *alternating-current generator.*

Direct-Current Generators. The first D.C. generator was built by Michael Faraday, an English scientist, in 1831. It consisted of a copper disc rotating between the poles of a permanent magnet. It had two brushes, one touching the outer edge of the disc and the other touching the center. When the brushes were connected by a wire, it was found that an electric current flowed continuously from one to the other. Such a machine is called a *homopolar generator.*

While its importance as a discovery can scarcely be over-estimated, the machine itself was of little practical importance because it produced only low voltages and could be used only with a single conductor. To secure a sufficiently high voltage to be practical for most power applications it is necessary to have a machine in which the electromotive force is induced in a number of insulated conductors, so that they can be connected in series to make their voltages additive. The first machine with a wire-wound armature was built in 1832. In it the magnetic flux, instead of passing from one stationary magnetic pole to another opposite the moving conductor, passed from the stationary magnetic pole into a moving armature of magnetic material carrying the conductors and thence to the other stationary magnetic pole. A machine so constructed is called an *heteropolar machine* or *magneto.* Practically all modern generators and motors are of this type. In 1845 Sir Charles Wheatstone substituted electromagnets for the permanent magnets of Faraday, which (on account of their increased strength) greatly increased the power output.

Most of the early generators had an armature winding known as the Gramme *ring winding.* The magnetic core for such a winding is made with a hollow center, so that the wire can be passed across the surface of the armature, back through the center, across the surface again and so on until sufficient turns are connected in series to secure the voltage desired. Such a winding is very sturdy mechanically but has several disadvantages: it is difficult to construct, and less than half of the wire is useful in converting mechanical energy into electrical energy, since no voltage is induced in that part of the wire passing through the center or across the ends of the armature.

In 1871 Alteneck brought out the *drum* type of armature winding, now used in almost every electric generator and motor. In this winding a conductor on the armature, instead of passing back through the center of the core, passes from one magnetic pole across the end of the armature and returns along the surface of the armature under a pole of opposite polarity. The returning wire thus becomes another active generator of electromotive force. As a consequence of this improvement the power output and efficiency of a given size of machine was very greatly increased, and its operating characteristics were improved.

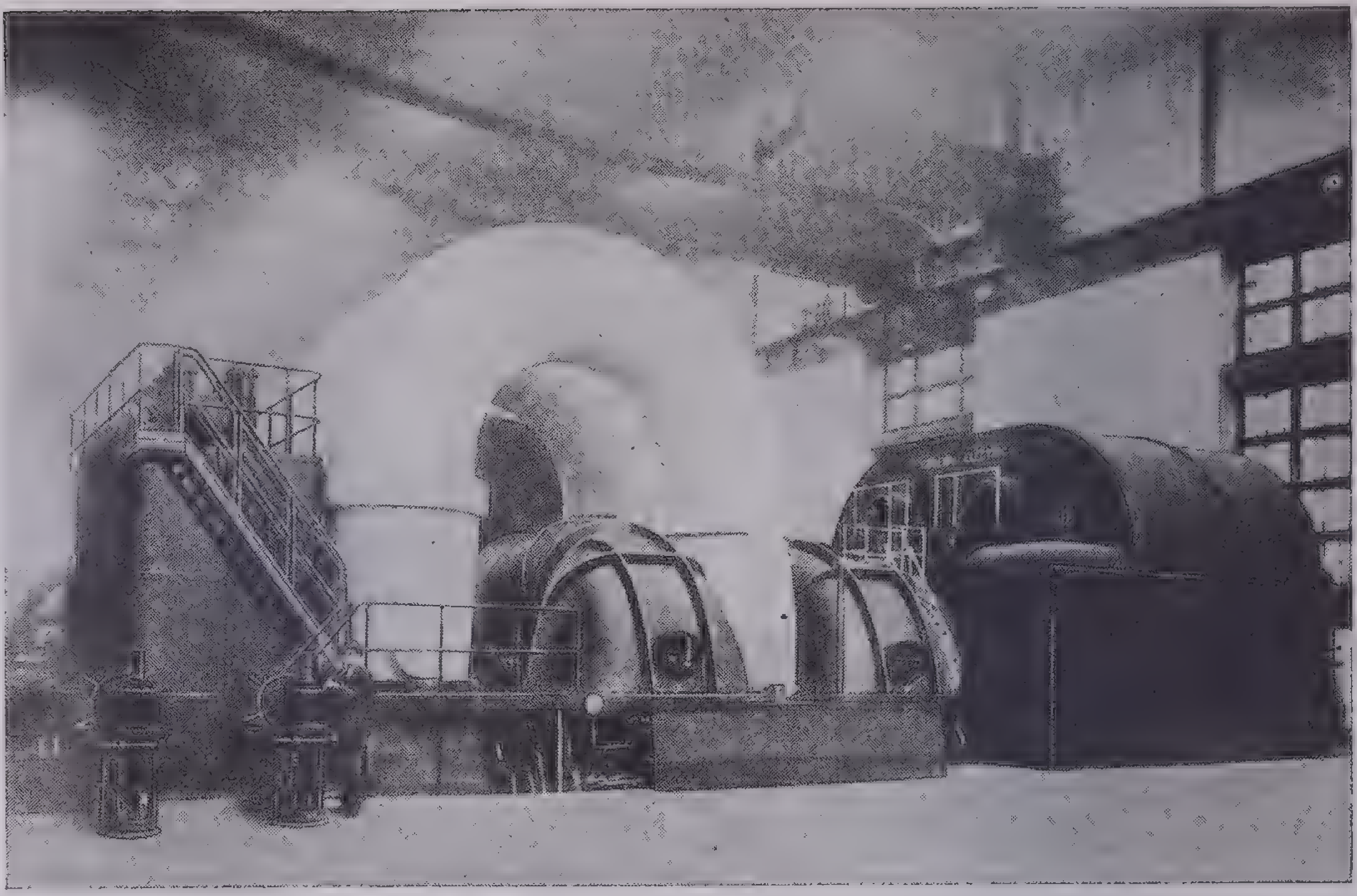
If the windings were connected directly to the external circuit the current flowing would be A.C.; that is, it would flow first in one direction then the opposite. This is true because the conductors on the armature pass under north and south magnetic poles alternately, thus inducing voltages that continuously reverse their direction. In order to get direct current from such a generator there must be some form of reversing switch between the armature conductors and the external circuit. In D.C. machines this reversing is done by the commutator and brushes.

A *commutator* is a cylinder made up of alternating bars of copper and some insulating material, such as mica. The commutator rotates on the same shaft as the armature, and the copper segments are connected electrically to the armature coils in which the current is generated. The purpose of the *brushes* is to take the generated current from the conductors and carry it into the circuit. They are blocks of carbon that rest upon the rotating commutator.

Now consider what happens in one loop of the conductor wire wound back and forth on the armature. In one strand the current flows north; but when the strand doubles back along the armature, the current in that strand flows south. One of the brushes picks up the north current from one of the copper bars in the commutator, but as the armature and commutator turn a fraction of a revolution this brush meets one of the mica segments and for an instant carries no current and will not until the next north-current-carrying strand moves around into position; but in that instant the other brush is picking up the south current and feeding it into the circuit while the first brush is idle. A simple bend in the wire from one of the brushes is enough to redirect the current so that it flows in the same direction as that from the other brush. Thus while the current in the armature conductors is actually alternating, the current in the external circuit flows continuously in a given direction.

The armature core itself is made of iron in order to carry strong magnetic fields. At first it was not realized that this iron core, moving through the magnetic field, would generate electromotive force in exactly the same way as the copper conductors placed on its surface for that purpose. As a result heavy undesired currents, called *eddy currents,* which wasted a great deal of power, were set up in the armature core.

In 1878 Thomas A. Edison realized this and constructed a generator in which the armature was made up of a series of thin iron discs, insulated from one another in order to break up the eddy-current paths, and in this way greatly reduced the power loss. Whereas earlier generators operated at efficiencies of about 50 per cent, Edison's new machine operated at the astounding efficiency of 90 per cent. This was one of the major factors that made possible the commercial use of electricity shortly thereafter. All modern machines have this laminated armature construction. The coils are embedded in slots in the armature core, which gives a more



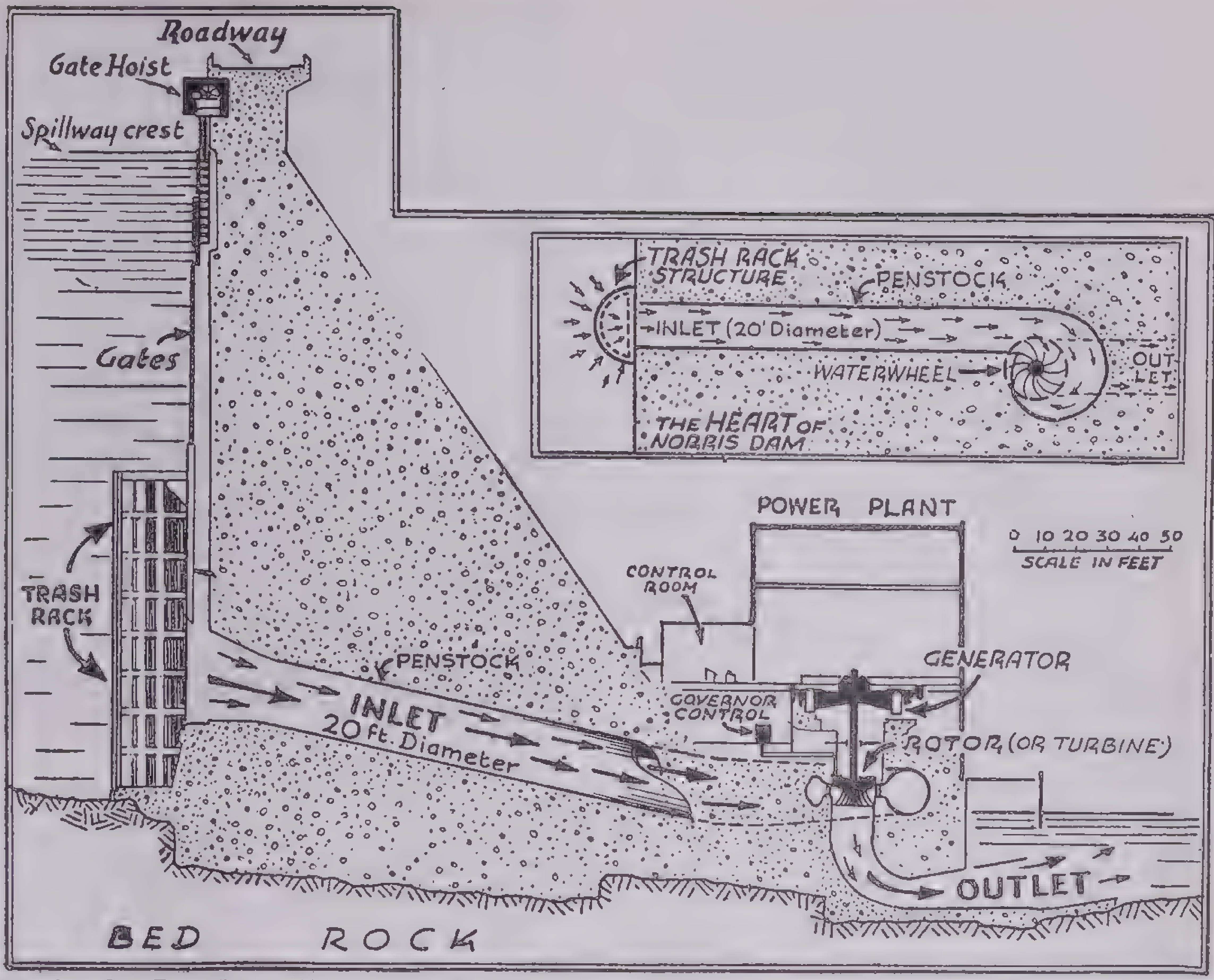
Courtesy General Electric Company

Steam Turbine Generator

This plant at Brooklyn, New York, produces 160,000 kilowatts of current rigid mechanical construction and a better magnetic field.

D.C. generators are usually classified according to the manner in which the magnetic field is produced. In Wheatstone's first generator the coils of the electromagnets were excited by current from an outside source, such as a battery. In 1857 he built a machine in which the field coils were connected directly across the armature terminals, thus using part of the voltage produced by the machine itself to excite the field, so that there was no need for a separate source of power.

This type of machine is called a *shunt generator.* If the field coils (electromagnets) are so connected that all the armature current passes through them, their strength increases as the electrical load increases, and the result is a generator whose voltage increases with the load. In other words the faster the machine runs, the higher is the voltage of its current. Such a machine is called a *series generator.* The increase of voltage, however, is too great for most uses. It is used chiefly as a booster, connected to a power line to counteract drops in voltage.



Drawing by Douglas Wilson, courtesy The New York Daily News

How Power Is Produced at Norris Dam

The water that turns the turbine rushes through a penstock or tube near the bottom of the dam structure. The turbine is mounted horizontally; it turns the generator placed above it. There are two such 50,000-kilowatt generators at Norris Dam

In 1881 C. F. Brush constructed a machine that had both shunt and series windings. By properly proportioning the strength of the two fields, he was able to produce a machine whose voltage varied only slightly with its current. This is called a *compound generator.* It is the most widely used type of D.C. generator. In a distribution line the voltage losses increase as the current increases, so it is desirable to have a generator whose voltage increases by the proper amount to counteract the loss of voltage in the line. This can be done with a compound generator.

While the first electrical systems all used D.C., many have been replaced by A.C. There still remain a number of applications in which direct current is required. Street-car systems, for instance, use D.C. motors because of their superior operating characteristics. Many processes, such as electroplating, require direct current because of their very nature. Consumers of D.C. in an area supplied with A.C. may have their own generators, or may change the A.C. to D.C. with converters.

Alternating-current generators, in their most common form, do not differ in principle of operation from D.C. generators. Any D.C. generator actually produces A.C., and the current flows in one direction only because of the commutator arrangement. Although any D.C. generator (except the unipolar machine) may be used as an alternator by replacing the commutator with collector or slip-rings connected to appropriate points in the armature winding, it has been found better to build alternators with a stationary armature and rotating field. In this way the generated current can be taken from a stationary instead of a rotating part. The only moving contact, then, is that which supplies current to the field windings (the electromagnets), which is only about 1 per cent of the generated current.

Alternators may be conveniently classified, depending upon their principle of operation, purpose or type of construction, as: synchronous alternators, inductor alternators, single-phase and polyphase alternators, induction alternators, turbogenerators and water-wheel generators.

Synchronous generators correspond to the D.C. generator in principle of operation. Although small ones are occasionally built with rotating armatures, they are usually of the rotation *field* type; but regardless of the type of rotor used, the frequency of the current—the number of times it reverses direction per second—is found in this formula: frequency $= \frac{pN}{120}$, in which p is the number of poles in the field, and N the speed in revolutions per minute. In the United States the most common frequency now being used in power systems is 60 cycles per second, although one occasionally encounters 25-, 40- or 50-cycle systems. These are usually an inheritance from earlier days, although energy at 25 cycles per second is sometimes used for conversion to D.C.

Alternators are built in very large sizes for steam-turbine or water-wheel drive, and often the larger sizes are designed to operate at potentials as high as 13,200 volts. This necessitates special insulation on the armature coils. Micanite tape is used for the inside wrapping followed in succession by varnished cambric and cotton tape. The completed coil is impregnated with a plastic insulating compound to fill up all the voids and then placed in the armature slots, which may be lined with horn fiber. In the larger machines, strip-wound fields are used: the field coils are made up of copper strips wound on edge; paper or asbestos is placed between the turns for insulation. If asbestos is used, it is possible to operate the alternator at temperatures well above the boiling point of water, so a small machine can be operated at speeds that would otherwise be impossible.

Inductor alternators are those in which the variation in the amount of flux linking with the armature coils is produced by a steel rotor provided with teeth. They are discussed under the heading *Radio Transmitters.* Besides their use in radio they furnish power for induction furnaces.

Induction Alternators. If an inductor motor is connected to an A.C. line and driven faster than synchronous speed, which is given by $\frac{120f}{p}$, it will deliver energy to the line, the amount of this depending upon the speed. Since it must draw its magnetizing current from the line (for an induction motor has no field winding), induction alternators must always operate in parallel with a system that also includes one or more synchronous alternators. It is for this reason that they are only occasionally used, although they are considerably cheaper than a synchronous alternator of the same rating.

Single-phase and *polyphase alternators* as the names imply are used to generate single-phase and polyphase energy, respectively. A.C. flows first in one direction, then the other; each round trip is called a *cycle* and is expressed as 360°. *Phase* indicates the status of the current at a given instant of time. A single-phase system is an A.C. circuit that carries a single current. Two currents of equal strength flow in a two-phase system, but they differ in phase by 90°; that is, the currents do not surge back and forth together, but the cycle of one current is completed when that of the other is only three-fourths completed—90° is one-fourth of the complete 360° cycle. A three-phase system has three equal-strength currents differing in phase by 120°. Although most of the power is generated, transmitted and distributed at three-phase and 60 cycles per second, there are still a few instances in which either single or two-phase power is used. As a result the manufacturers are occasionally called upon to build alternators with different numbers of phases.

Turbogenerators are special high-speed alternators driven by steam turbines; it is common for the same company to build both machines as a single unit. To withstand the tremendous centrifugal forces, the rotor often consists of a large steel forging in which deep slots are milled for the reception of the field coils, which resemble large armature coils in appearance.

The size of turbogenerators has been gradually increasing. One of the largest at the present time is a 165,000-kilowatt unit located in the Richmond Station of the Philadelphia Electric Company. One of the latest innovations in turbogenerator design, although it has been used in other types of machines for about 15 years, is hydrogen cooling.

Water-wheel generators are found in hydroelectric stations, where they are now directly coupled to the water wheels. In most installations they are mounted in a vertical position but are occasionally encountered in horizontal units, usually of a comparatively small size. The speed of a water wheel depends upon the *head,* or height from which the water drops to the wheel. Since in this country *heads* are rather low, water-wheel generators are usually slow-speed machines that are short in length, large in diameter and have a large number of electromagnetic poles.

One of the most interesting of the early applications of water-wheel generators was at Niagara Falls in 1895. In that year eleven 3,750-kva. 2,200-volt machines were put in operation. These were of the vertical type, had an external revolving field and operated continuously for 26 years. They were then rewound for 12,000 volts, operated continuously for 3 years more and are still used for reserve service 43 years after their installation. Since then the sizes of water-wheel generators have nearly kept pace with those of turbogenerators.

Within the past few years, five 77,500-kva. units have been built for the Dnieprostroy Station in U. S. S. R., and the generators for the Boulder Dam project are rated at 82,500 kva. These last are the largest water-wheel generators that have ever been built. Each weighs 2 million pounds. They were shipped in sections, 40 freight cars being required to haul each one. The rotor alone weighs 1,250,000 pounds, including a shaft 38 inches in diameter that weighs 115,000 pounds.

Photo by Charles Krutch, TVA

Where a River Goes to Work

This is the 20-foot penstock that conducts water to one of the generators at Norris Dam. At this point the penstock curves sharply around the water wheel (compare diagram) and the water enters the turbine blades through the openings shown at the right

electrical measuring instruments, devices that give an indication of the magnitude of electrical quantities. In general they respond to some characteristic of a current passing through a conductor or the storage of electric charge upon it.

There are several effects of electric current that may be used as a basis for measurement; for instance, whenever a conductor carries current, the current produces a measurable magnetic field surrounding it whose intensity is dependent upon the current flowing. Whenever current flows through a conductor, the conductor is heated, and the degree of heat may be measured as an indication of the amount of current flowing. When a current flows through certain liquid conductors, decomposition takes place, and the extent of this decomposition may be taken as an indication of the quantity of electricity that has passed. Whenever conductors are charged electrically, a force of attraction or repulsion exists between them, and this force can be made to produce movement of a part, as a needle, to indicate the magnitude of the charges.

The basic instruments for measuring electrical quantity are the *ammeter,* which measures the strength of the current in amperes; and the *voltmeter,* which measures the electrical pressure in volts. The physical characteristics of the conductor determine the amount of current that flows. If a large current flows for a given voltage, the conductor is said to have a low resistance; if a small current flows, the resistance is high. Resistance is expressed in ohms, and instruments for measuring its value are called *ohmmeters.* The *wattmeter* measures power in units called *watts,* obtained by multiplying volts times amperes. The *watt-hour meter* adds the element of time of flow to the measurement of power.

Many quantities may be measured electrically even though they themselves are not electrical in nature. The quantities must first be translated into electric current and then carried to the instruments; for instance, the level of gasoline in the tank of an automobile is usually indicated on an ammeter on the instrument panel of the car. Battery current flows through the meter and also through a resistance unit at the gas tank. The amount of current flowing through the unit depends upon the position of a float inside the tank itself.

The temperature of an oven may be recorded electrically in several ways. A kind of coil that changes its resistance according to temperature may be placed inside the oven and connected to an instrument outside; or the variations in electromotive force of a thermocouple may be measured.

The speed of an engine can be shown by a voltmeter whose scale is read in revolutions per minute. A small electric generator whose voltage increases with speed is mounted on the engine shaft and connected to the instrument.

electric motor, a machine for transforming electrical energy into mechanical energy. It depends for its operation upon the fact that, when a conductor carrying a current cuts magnetic lines, a force is exerted on the conductor tending to carry it out of the magnetic field. This is the exact reverse of the action of a generator; but the parts of the two machines are practically the same. The actions of both motor and generator involve the placing of a conductor in a magnetic field. Any direct-current generator will operate as a motor if supplied with the proper current. Most motors, however, are designed for a particular use and so have special features that may make some of them look rather different from generators.

One of the outstanding advantages of electric motors is their ability to adjust themselves automatically to changes in load. When an automobile engine is called upon to do more work, the operator must feed it more fuel; in a steam engine, a governor must open the steam valve wider; but an electric motor makes such adjustments itself. Since it contains all the elements of a generator, the armature conductors of a running motor are at the same time generating current. This voltage is opposite in direction to that of the generator from which the motor is securing its power; for this reason, it is usually called the *back voltage* of the motor. It opposes the flow of current into the motor. If this voltage were exactly equal to that of the generator, no current would flow in the circuit; the amount of current that does flow depends upon the difference between these two voltages.

If a certain motor is driving two machines, and another machine is added to the load, requiring a greater driving force in the motor, the first reaction is that the motor's speed decreases. Since the magnitude of the voltage generated in the armature of the motor depends upon the motor speed, it also decreases; thus there is less opposition to the incoming current, and more flows, providing the motor with a greater driving force to take care of the increased mechanical load. The amount by which the motor drops in speed for a given change in load is determined by the design of the machine. The change in speed from no load to a full load is called the *speed regulation* and is often the deciding characteristic in selecting a motor for a given application.

Like generators motors are most frequently classified according to the manner in which their field windings are supplied with current. If the field winding is in parallel with the armature circuit, it is called a *shunt motor;* if it is in series with the armature, a *series motor;* if both shunt and series field windings are used, a *compound motor.* Each has its own peculiar characteristics and is suited for a different class of applications.

The difference between line voltage and back voltage is usually very small; that is, the motor must run at such a speed as to generate a voltage almost equal to the line voltage. The voltage that is induced in a conductor depends upon both the speed at which it is moving and the strength of the magnetic field through which it is moving. Thus we see that the motor that has the most nearly constant speed is the one in which the magnetic field varies the least. The shunt motor has this characteristic. Since the field circuit is connected in parallel with the armature directly across the line, variations in armature current do not affect its voltage or current; for this reason shunt motors are widely used where it is desired that the speed be almost constant regardless of changes in mechanical load. Another characteristic of the shunt machine is the ease and efficiency with which its speed may be adjusted to suit the needs of the operator. A variation in the amount of current exciting the magnetic coils changes the magnetic flux passing through the armature and therefore changes the speed at which the motor operates when carrying a given mechanical load. So speed of the motor can be controlled by regulating (by means of a resistance) the current supplied to the field coils. Such a resistance is called a *field rheostat.*

When the field windings carry the full current passing through the armature, the motor is called a *series motor.* Obviously the strength of the magnetic field in such a machine increases whenever the current through the armature increases. Each of these things has the effect of increasing the driving force, called *torque.* Therefore the series motor has a torque that increases very rapidly when the current increases; for this reason it is unsurpassed for driving mechanical devices that are hard to start or are subject to temporary overloads. It does not draw nearly so large a current from the line in starting heavy loads as a shunt motor or an A.C. motor does. This is an important feature for motors used where the load must be started frequently, as in trolley-car service. A large proportion of the trolley-car systems use D.C., even though they must first change it from A.C., so that they may take advantage of the characteristics of the series motor.

Another advantage of the series motor is that it pulls just as well from a standing start as it does when it is running. In an automobile engine the driving gears must be changed on a steep grade in order to increase the driving torque by decreasing the speed of the car. The series motor does this automatically without the use of gearing. Since an increase in armature current strengthens the field of a series motor, it need not run as fast in order to generate a voltage almost equal to the line voltage. Thus the normal speed of a series motor decreases automatically as the current drawn from the line is increased. When a trolley car starts up a steep grade the speed drops, naturally, decreasing the back voltage, which permits more electric current to flow into the machine and thus greatly increases the driving torque as described. Millions of dollars have been spent without much success, in an effort to construct a mechanical device for use in automobiles that would have the same characteristics as a series motor.

The compound motor, having both shunt and series field windings, has characteristics that are a compromise between those of the other two machines. If the series field is strong in comparison to the shunt field, the machine has the ability to start heavy loads but its speed varies over a wide range as the load changes; if the series field is weak in comparison to the shunt field, the machine does not have such a good starting torque but has a more nearly constant speed.

While D.C. motors have been widely replaced by A.C. motors, it is not likely that they will be entirely eliminated by any present types of A.C. motors. The D.C. series motor has no equal in traction apparatus; for applications requiring adjustments in speed, the shunt motor is unsurpassed; and for applications in which the duty is severe, and versatility is required, the compound motor is almost essential.

Alternating-Current Motors. If an A.C. generator is connected to a power line instead of to a source of mechanical energy, it can be made to operate as a motor. If it continues to run at exactly constant speed, it is a *synchronous motor;* if the speed changes with load, it is an *asynchronous motor.*

As compared with D.C. motors of the same rating, A.C. motors are usually more efficient, but it is much more difficult to vary their speed. Besides this disadvantage many types of A.C. motors have a low starting torque; ordinary types of synchronous and single-phase induction motors are not even self-starting unless provided with extra starting windings.

A.C. motors can be classified as follows: synchronous, single-phase- and polyphase-induction, series, fractional-horsepower, electric-clock and variable-speed.

Synchronous motors operate at constant speed. Construction of such a motor is practically the same as that of a synchronous generator of the same frequency, voltage, speed and power ratings. Polyphase motors, however, are usually provided with a heavy induction-motor winding for starting purposes. Some of the more common uses for synchronous motors are to drive D.C. generators, the two machines together constituting a motor-generator set; to drive centrifugal pumps, blowers, rolling mills, printing presses and other applications where power is desired at a constant speed. Synchronous motors are often used for power factor correction or voltage regulation purposes alone, carrying no mechanical load. When they are so used, they are called *synchronous condensers.* These have been built in very large sizes. In 1935 two 60,000-kva., 13,800-volt, 60-cycle hydrogen-cooled synchronous condensers were constructed for installation at the receiving end of the 287,000-volt transmission line running from Boulder Dam to Los Angeles. These machines are automatically started and maintain constant voltage at the receiving end of the line under all conditions of load on the line.

Induction Motor. Invented by Nikola Tesla in 1888, the induction motor is essentially a transformer in which one winding, usually the secondary, can rotate with respect to the other. The stator winding is identical in construction to those used on alternators and synchronous motors of comparable ratings. Some manufacturers use the same frames and stator windings for both induction and synchronous motors, the two types differing only in their rotors.

Polyphase Induction Motors. The most common method of analyzing the performance of a polyphase induction motor consists in first showing that a polyphase winding distributed symmetrically about the stator will set up a magnetic field of constant magnitude that rotates at synchronous speed. Because this field is cut by the rotor winding, voltages will be induced in the rotor bars that set up currents. As a result the rotor will start up and tend to move with the same speed as the rotating field. Since no flux would be cutting the rotor if it were actually to do so, it never reaches synchronous speed, even at no load, unless driven by some external source of mechanical energy. The difference between the speeds of the field and the rotor is known as the *slip speed;* this usually varies in an 8,800-r.p.m. motor from about 1 r.p.m. (when running light) to 50–100 r.p.m. at full load. Thus a polyphase induction motor has about the same speed regulation as a D.C. shunt motor.

Although this type of motor is very rugged and low in cost, due to the simple construction of the rotor, it cannot be used where a motor must start a heavy load immediately upon being itself started. Polyphase-induction motors have been built with ratings as great as several thousand horsepower for operating steel mills and centrifugal pumps, as well as for ship drive.

Single-Phase-Induction Motors. Since polyphase power is not usually available for small loads, there is a demand for small single-phase-induction motors. In general they are similar in appearance to polyphase motors, but because the field set up by the stator winding is pulsating rather than rotating, they are not self-starting unless provided with some special form of starting arrangement. Once rotating at a fairly high speed they will speed up to nearly synchronous speed at no-load and will then have about the same general operating characteristics as a polyphase motor. Single-phase-induction motors are classified as *split-phase*, *condenser*, *shading-coil* and *repulsion motors*, according to their method of starting.

Series Motors. These are similar in appearance and theory of operation to D.C. series motors and have about the same characteristics. Because the field flux is alternating, however, the pole-and-yoke structure, as well as the armature, must be laminated. A.C. series motors can be used, in general, in all applications where a D.C. series motor would be satisfactory, including electric railways, cranes, shovels and the like. They are ordinarily used in vacuum cleaners and electric fans and are often known as *universal motors* because they can operate about equally well on either D.C. or A.C.

Fractional-hp. Motors. With the increased number of domestic and farm applications of electricity, fractional hp. single-phase A.C. motors have become a familiar sight to almost everybody. These may be any one of the types described above or may even be designed to operate at synchronous speed.

Electric-clock Motors. Although these tiny motors appear to be very simple in construction, it has been necessary to use all sorts of induction and synchronizing effects in order to obtain a very low-speed synchronous motor with a very low rating. The rotor in one type consists of a toothed wheel; in another it has a squirrel-cage winding; yet another one consists of two rotors, one within the other.

electric power transmission, carrying electric current from the source of generation to the point where it is to be used. One of the advantages of using electric power is the fact that it can be generated in central stations and transmitted for use at distant points. When the distances are great, however, many problems arise. Precautions must be taken to avoid excessive losses of power in the line and to prevent the voltage from dropping too low for satisfactory operation of electrical devices at the point of use.

In the interests of human safety domestic systems must operate at a relatively low voltage, usually 115 volts; but power cannot be transmitted economically at a low voltage. (*Power* as a technical term is voltage expressed in *volts;* the number of which multiplied by the number of *amperes*, gives the amount or strength of the current.) If the voltage is low, the current must be high in order to transmit a given amount of power. The power losses in the line vary as the square of the current. Comparison between a 115-volt system and a 115,000-volt system shows the meaning of that law. Since the current is 1,000 times as large in the 115-volt system, and the square of this is 1 million, we arrive at the striking conclusion that the loss in the low-voltage system is 1 million times as much as that in the high-voltage system. Commercial amounts of power can be transmitted economically only a few hundred feet at 115 volts.

One of the earliest inventions intended to overcome this difficulty was the three-wire system brought out by Thomas A. Edison. In this system two generators were used in series at the generating station, the two main wires leading out from the combination, and the third wire, called the *neutral* wire, was attached to the wire connecting the two machines. This system made two voltages available at the point of use, one twice as high as the other. Power was also transmitted at a high voltage and used at a low voltage, thus increasing the system's efficiency.

Suppose a system has 110 volts between neutral and outside lines, the voltage between the two outside lines is thus 220 volts, since they are in series. Suppose the load in one house is connected between the neutral wire and one outside line, that the load in an adjacent house is connected between the neutral wire and the other line and that the electrical loads in the two houses are the same. The current in the first load passes on through the second load because they are in a series, the neutral wire carrying no current whatsoever; so there is no power loss in the neutral line. It is evident, therefore, that the current in the wire is only one-half as great as it would be if the two loads were in *parallel* on a 110-volt system, and that the total power loss in the line is only one-fourth as great.

If the loads in the two houses are not equal, the neutral line carries a current equal to the difference between their two currents. In practice an effort is made to distribute the loads between the two sides of the line, so that they will be approximately balanced, thus making possible the use of a smaller wire for the neutral than is used for the outside lines. The three-wire system was a very important development at the time, but it could not greatly extend the distance of effective transmission.

Courtesy Los Angeles Department of Water and Power

Transmission Line Tower

This steel tower is one of 2,695 that support the cables carrying electricity from Boulder Dam to Los Angeles, a distance of 266 miles. The conductor is a hollow copper cable 1.4 inches in diameter. Current is carried at 275,000 volts

The *series system* was used to a considerable extent in the early days. Here the various lamps or other devices to be operated are connected end to end, so that the total voltage is the sum of their individual voltages; for instance, if ten 110-volt lamps are connected in series, the *voltage* supplied must be 1,100 volts, but no more *current* need be supplied than would be needed by only one lamp. Obviously since the losses in the line depend on the current only, no more power is being lost than would be the case if only one lamp were in use. Although this might appear to be the ideal solution of the problem, the circuit has several disadvantages that greatly limit its usefulness. Perhaps the greatest drawback is the high voltage: 1,100 volts would not be a safe potential to use in a residence. Another is the fact that the current is the same through all units; a 100-watt lamp could not be used in series with a 50-watt lamp, since it requires twice as much current; furthermore, if one of the lamps burns out, thus interrupting the current through it, the others would go out at the same time, because they are supplied with the same current. This type of circuit, however, is still used to a considerable extent, chiefly in street lighting, where the circuits are well isolated, the lamps are all the same size and special devices have been developed to restore the circuit in the event of the failure of one lamp.

One possible scheme for transmitting power at high voltage and using it at a lower voltage would be to use a motor-generator set at the consumer's end of the line; that is, the incoming current would drive a high-voltage motor, which in turn would drive a generator producing current at low enough voltage for safe use in the home. The advantage gained in the reduction of transmission losses might be nullified by the high cost of the motor-generator set. The possibility of breakdowns would reduce the reliability of the system; and each set would require considerable attention on the part of a skilled operator.

The real solution to this problem came in 1886 with the invention of the transformer, which in an alternating circuit does the same things a motor-generator set does in a D.C. circuit, at the same time almost eliminating the disadvantages listed for the motor-generator. The transformer depends for its operation upon the fact that the flux in an iron core set up by a coil carrying A.C. is continually changing in value and will therefore generate an alternating voltage in any other coil wound around the core. The voltage generated depends upon the number of turns of wire in the second coil. When it is desired to transform from a high to a low voltage, the power is brought in through a coil having a large number of turns and taken away from a coil having a small number of turns.

Transformers are inexpensive and exceptionally efficient, efficiencies of 99 per cent being common in large ones. They require no attention and are very reliable, as they have no moving parts. The use of A.C. is essential to their operation, and the desire to use them is one of the chief reasons for the adoption of A.C. instead of D.C. systems. They operate equally well to increase voltages and to decrease voltages. At the power plant transformers step up the voltage to the value best for long-distance transmission, and others at the receiving end step the voltage down to the value best for actual use of the power.

The power in a given system may pass through a number of transformations, a typical system being one in which the power is generated at 12,500 volts, transmitted over a cross-country line at 133,000 volts to substations, reduced to 2,300 volts for distribution through city streets and further reduced to 115 volts for use in the home by transformers mounted on poles.

The high-voltage lines that transmit the power over long distances are called the *transmission* lines; the intermediate and low-voltage lines that distribute the power to the consumers are called the *distribution* system. In the older *radial distribution* system, lines go out from the substation radially by the shortest possible route to the points of use. A newer arrangement, the *network system,* ties the various distribution lines together in such a way that power can come in to a consumer by way of two or more different lines. If there is a breakdown in one line, power can still be supplied through another. In case of such line troubles as short circuits, however, there is the possibility that excess current will be drawn from other lines and that they too will be put out of service. This difficulty is overcome by automatic circuit breakers that disconnect a faulty line from the system before the difficulty has had time to spread to other lines.

Very little D.C. power is generated and transmitted at the present time in the United States; most of it is three-phase alternating current. The three-phase generator is so constructed that it acts somewhat like three single-phase generators in which the current in one is maximum in a given direction at the instant when the current in each of the other two is half its maximum value in the opposite direction. Whereas six wires would be necessary for the three separate single-phase generators, only three need be used for a three-phase system. This might appear to represent a saving of one-half of the copper, but this is not strictly true because the size of the wires is not the same for the two systems. Taking this into account, the three-wire three-phase system uses only about three-fourths as much copper as does the other.

A modern development in high-voltage transmission systems is the interconnection of various lines to form the so-called superpower systems. In case one generating plant breaks down power for the whole system can be supplied from some other power house in the network. Such systems are thus extremely reliable. Only those stations that operate at the highest efficiencies need be run at maximum capacity, reserving the less efficient stations for use when the power demand is too large for the others. Less equipment is needed for supplying a given load, since an isolated station would need extra equipment for stand-by use in case of failure of one of the generators. It is particularly important in some of the systems using water-power generators, as the load can be received from steam plants in periods when the flow of water is too low to supply the load.

Perhaps the most outstanding power-transmission system at the present time is the one that connects the generating station at Boulder Dam, Col., with the city of Los Angeles. It was put into service in 1936. It has two power lines, each about 266 miles in length and is capable of carrying 240,000 kilowatts of power. It is a three-phase line operating on 275,000 volts, the highest voltage ever used. The maximum voltage used in transmission before its construction was 220,000 volts.

electric railway, any rail system with cars propelled by electrical power. The first street railway in America was put into service in 1832 in New York city. The wheels of the horse-drawn cars ran in deep grooves that were later abandoned because the wheels of ordinary vehicles were continually getting caught in them.

Steam engines in street cars were tried without a great deal of success, and so were the early internal-combustion engines. But the only serious competitor of the electric motor in the early days of its use for traction lines was the cable system. In this a cable ran over pulleys for the full length of the line. It traveled in a slot parallel to the tracks. The cable was kept in motion by a steam engine located at an appropriate point. The cars had a gripper device with which they could start or stop by gripping or releasing the cable. The first system of this type, installed in 1873 in San Francisco, was followed by many others in various parts of the country.

It was natural that the invention of the electric motor should suggest it as a means of driving cars. In 1835, 3 years after Joseph Henry invented the electric motor, Thomas Davenport of Brandon, Vt., mounted a small motor in a miniature car and thus drove the car around a short track. This was probably the first attempt to adapt electric power to traction purposes. During the next 40 years many attempts were made to adapt the electric motor to street-car operation, but none was successful on a commercial scale. One drawback was the fact that the current had to come from batteries. Electric power for traction had to wait upon the invention of the dynamo.

The first practical full-sized electric railway system was installed at the Berlin International Exposition in 1879 by Siemens and Halske, a German manufacturing company. It had a dynamo-driven locomotive that pulled three cars capable of carrying 20 people, along a track one-third of a mile long. The first electric railway system to operate for fares was the Union Passenger Railway of Baltimore, Md., installed by Leo Daft in 1885. It had four electric motors, each of which pulled a train of cars. It used a third rail between the main rails as one side of the supply line, the traction rails serving as a return path. The first system using overhead trolley lines was built in Kansas City. In this system the complete circuit was carried overhead, two wires being used, with a trolley wheel riding on top of each.

Electric railway development was greatly stimulated in 1888, when a system was built in Richmond, Va., containing 12 miles of track and using 40 cars, each equipped with two motors. This is generally looked upon as the pioneer of electric railway systems. Until it was built there were only 48 miles of electric railway tracks in the whole country.

A very important development for use in elevated and subway systems is the multiple-unit control, invented in 1895 by F. J. Sprague, who contributed more than any other one man to the development of the street railway industry. This apparatus makes it possible for one operator to control the motors of a whole train of cars.

Since one of the major items in the cost of installation of an electric railway system is the cost of circuits for carrying the electric power, it was found desirable to use the ground and the rails as one side of the line; but the telephone companies also used a ground return, and the railway circuit caused a great deal of static interference in telephones. This led to lawsuits between traction companies and telephone companies, but the telephone companies found two-wire circuits to be superior and gave up the ground returns.

Electric traction has several definite advantages in main-line trains as well as street-car systems. An electric locomotive can pull a heavier load than a steam locomotive of the same weight because in electric drive there is a constant force acting on the wheels, whereas in a steam locomotive the flow of power pulsates because of the piston action, tending to make the wheels slide. Electric trains can be accelerated and reversed much faster, and their smooth operation results in greater passenger comfort. In metropolitan areas the elimination of smoke and steam is an important consideration. While the installation cost of the electric system is greater, electrification of main lines is proceeding at a fairly rapid rate in order to secure its advantages.

Railroads use one of three general types of electrical systems: direct current, single-phase alternating current or three-phase alternating current. The earlier systems all operated on D.C., which permits the use of simple equipment. Furthermore D.C. motors have characteristics especially suited to traction needs; but it is difficult to generate and use D.C. at the high voltages necessary for efficient transmission. The maximum voltage used in D.C. railways in this country is 3,000 volts; whereas single-phase A.C. systems operate at voltages up to 16,500 volts.

Three-phase current makes for better motor performance than single-phase current, but requires two trolley wires instead of one, so the installation cost is much higher. Three-phase systems are used to a considerable extent in Europe but are not popular in the United States.

The voltage to be used in a particular system is decided largely by the amount of power required and the distance it is to be transmitted. If two lines each carry the same amount of current, and the voltage of one line is half that of the other, the wires in the low-voltage line must be four times as heavy if the line is to operate at the same efficiency as the high-voltage line. This comes about because resistance losses are proportional to the square of the current, and much more current must be carried in the low-voltage line. The cost of copper in a given system would be 25 times greater in a 600-volt system than in one using 3,000 volts.

If the line is short, the cost of equipment for generating and utilizing the high voltage is too great to justify its adoption, but if a long line is to be used, the cost of conductors makes the low-voltage system impractical. The most common voltage used in urban street-car systems, for which the runs are not long, is 600 volts, but some D.C. systems in the United States use as high as 3,000 volts. One of the most noted main-line electrifications is that of the Chicago, Milwaukee, St. Paul and Pacific Railroad, installed in 1916, in which 676 miles are electrified, using a 3,000-volt D.C. system.

An interesting feature of this system is its use of regenerative braking. The motors in a locomotive going downgrade are made to act as electric generators, thus supplying power for use elsewhere in the system. The train schedules are arranged so that when one train is coming down a grade, another is going up and power is transferred from one to the other. Theoretically only enough power is required from the generating station to overcome losses.

Perhaps the outstanding advantage of A.C. systems is the ease with which transformation can be made from one voltage to another. All that is required for making this change is a transformer, a device that is relatively simple, inexpensive and reliable. In many of the single-phase systems, transformers are mounted in the locomotive itself, the trolleys operating at voltages up to 16,500. A large part of the power used at the present time is produced at the generating station as A.C., even though it is to be used in D.C. systems. It is transmitted to the railroad as high-voltage current, where it is reduced in voltage by means of transformers and converted into D.C. by means of motor-generator sets, rotary converters or mercury-arc rectifiers. In some metropolitan systems a number of these rectifying substations are located at various points along the lines. Many of them operate automatically.

A recent innovation in street-car service is the use of trackless trolley cars, running on rubber-tired wheels. Since they have no track to be used as a return circuit, they must have a double trolley system. They are guided by the operator by means of a steering wheel, and one of their advantages is that they can be pulled in to the curb to discharge and receive passengers. Some are equipped with both electric motors and internal-combustion engines so that their runs can be extended beyond the end of the trolley system. On account of their comfort and convenience these rubber-tired cars are doing much to increase the popularity of trolley systems. They were first tried out in 1928 and 1929; by the end of 1937 more than 1,700 units were in use.

electric wiring, the installation of suitable wires for conveying electricity throughout a building to the points of use. To those unfamiliar with electric circuits, it may appear that the only requirement is a two-way metallic path between the source of power and the point at which it is used, but that is far from true. Not only must the circuit be completed but the wires used must be large enough to carry the current required; the insulation must be adequate for the voltage used; the wiring must be supported in a permanent manner, must be constructed and installed in such a way as to minimize the fire hazard in case of overheating and must be protected from mechanical injury that would destroy the insulation; and finally the circuit must be provided with proper safety devices that will safeguard against overloads and poor circuits.

The behavior of electric current in a wire can be compared with the flow of water in a garden hose. If the hose is short, the pressure at the nozzle is practically the same as at the hose connection; but if a long hose is used, the pressure is less on account of the friction of the water passing through the hose. The pressure may be restored by substituting a hose of larger diameter to compensate for the increase in length. Furthermore the addition of extra nozzles along the hose has the effect of decreasing the pressure at the nozzles already in operation.

In the same way if an electrical device is located at a considerable distance from the source of power, the electrical pressure (voltage) available is less than it would be if the device were located close to the source. Electric current has difficulty in passing through a wire in much the same way as water passing through a hose. Expressed in technical terms, the conductor has *electrical resistance*. This resistance increases with the length of the wire, and it is less if a thicker conductor is used. If more current-using devices are added at a given outlet, the voltage at that outlet is reduced in much the same manner as the pressure in the garden hose is reduced by the addition of nozzles. This is a disadvantage because electrical devices operate best when supplied with the voltage for which they were designed. Another disadvantage of excessive-voltage drop caused by resistance is the fact that power is wasted in the wires themselves; this not only increases the power bill but may overheat the wire and cause a definite fire hazard.

Many homes now using electricity were wired before electrical appliances came into such widespread use, and so about six homes out of ten are inadequately wired for the loads being carried.

There are two fundamental types of electrical circuit—the *series circuit* and the *parallel circuit*. In the series circuit the various units are connected end to end, so that the same current flows in all. In the parallel circuit the units are connected side by side, so that the same voltage is supplied to each. Practically all devices used in residences are connected in this way, because all of them are designed to operate at the same voltage, the current for each being determined by the amount of power needed. The meters, fuses and switches, however, must be connected in series. The meters must be connected in series with all of the devices for which they are intended, in order to indicate the energy consumption, so that an increase of current in any of these devices will also increase the metered current; the fuses and switches must be in a series, so that the current in the circuits they control will be interrupted whenever they are opened.

From the main distribution line in the street the two wires of the system go directly to the watt-hour meter in order that all the energy used will be recorded. From the meter the wires go to the main switches and protective devices. Switches must be provided at this point, so that the current can be cut out from all circuits in the house; protective devices must be provided near the point where the power enters the building, so that the lines will be disconnected automatically if a short circuit or overload occurs at any point.

Formerly almost all electric circuits in residences were protected by fuses, short lengths of conducting material having a low melting point. They are inserted in the circuit, so that an excessive current flowing through them will melt them down and thus break the circuit. One of their disadvantages is that a new fuse must be provided whenever one opens. Instead of fuses recent practice favors small circuit breakers of a type in which contacts are thrown apart under the action of a spring when excessive current flows, an electromagnetic tripping mechanism releasing the contacts. With such devices all that is necessary to restore the service is to throw switch to the *on* positions. These devices are usually so constructed that they combine the function of circuit protection and switching.

The old system of installing the wiring in the house was called *knob-and-tube* wiring. Rubber-insulated copper wires were attached to porcelain knobs nailed to the various timbers of the house and the wires were threaded through porcelain tubes wherever they passed through walls or other solid material. This method gives poor protection to the electric circuits.

One of the best types of wiring installation is that in which the insulated wires are enclosed in rigid steel pipes called *conduits.* The conduit is installed in much the same way as gas piping, and at various points along the system openings, called *outlet boxes,* are provided. When the pipes are ready the wires are pulled through them into proper position. Fiber and other types of conduits also are used to some extent.

Perhaps the most popular wiring system for residences at the present time is that using *flexible armored conductors.* This system has practically all the advantages of the rigid conduit system and has the additional advantages of lower cost and greater ease of installation. The protective covering is applied to the insulated wires at the factories and usually consists of interlocking galvanized steel strips, wound spirally around the wires. Another type, less commonly used, has a lead sheath instead of the spiral steel armor. Still others have nonmetallic flexible covering. One of the outstanding advantages of flexible armored conductors is the fact that they can be easily curved to fit into restricted spaces, between walls and underneath floors.

Electric wiring is a highly specialized trade. It should be undertaken only by skilled workmen who are familiar not only with the requirements of the circuits themselves and the precautions to be taken but also with the provisions of the Electrical Code and the special regulations in effect in the locality where the building is situated.

electrolysis, the process of bringing about chemical change by passing an electric current through a substance. Electricity is becoming more and more important to industry as a chemical agent, besides being the almost universal source of power. Solutions of various kinds are broken down by the passage of electric current, and chemicals are produced in this way—hypochlorites, chlorates, permanganates, pure sodium, oxygen, caustic soda, caustic potash, chlorine and many others.

Electrolysis is used also in extracting metals from their ores and in refining some metals (copper, aluminum, zinc).

Electrons, passing from one electrode to the other, behave differently when they are passing through a gas from what they do when the medium is a liquid. Electrons in gases often travel alone; but, when the medium is a liquid, they always attach themselves to particles of matter and carry them along to the opposite electrode. This fact is the basis of all electrolytic processes.

electroplating, precipitating metals out of solutions with electric currents. William Cruikshank discovered this process shortly after Volta's invention of the battery in 1800. By passing currents through solutions he was able to decompose magnesium, sodium and ammonium chlorides and to precipitate silver and copper from solutions of salts of these metals.

Michael Faraday was one of the first scientists to make a quantitative study of these reactions. In a paper published in 1833 he set down two of the relationships that are still accepted as fundamental. He showed that the weight of material deposited is proportional to the current passing through and the time of its duration, but that it does not depend on the size of electrodes or the amount of chemical solution used. He showed, in addition, that the amounts of metal deposited depend not only on the current and the time but also on the kind of material deposited, the weights being proportional to the chemical equivalent weights of the metals.

If the electrochemical reaction is such that the metal deposited adheres very firmly to the electrodes, the process is called *electroplating.* It is very widely used commercially for depositing thin layers of metal over other metal objects. Silver, zinc, copper, nickel, chromium and certain alloys, such as brass, are deposited in this way.

Electroplating equipment consists essentially of a solution of a chemical compound contained within a vessel, a plate of the metal to be deposited connected to the positive side of a source of electric current, and the article to be plated connected to the negative side of the source, both immersed in the solution. The process depends on the fact that molecules in a chemical solution become ionized, the metals acquiring a positive charge. When the current passes through the electroplating solution, these positive metallic ions are attracted to the negative electrode. As they deposit there, other molecules go into solution at the positive electrode and become ionized. The quality of the deposit secured depends on the nature of the metal being deposited, the nature of the material being coated, the temperature and chemical properties of the electrolyte and the strength of the current. Some metals are much more easily deposited than others. Copper can be deposited upon iron by using a simple solution of copper sulphate as the electrolyte; but the quality of the deposit is poor and does not adhere firmly to the iron. To get a good copper deposit on iron some other electrolyte must be used, such as a solution of copper oxide dissolved in the deadly poison, potassium cyanide. Good deposits of nickel and iron can be secured by using their simple salt solutions.

It is extremely important that the material to be plated be chemically clean, otherwise the deposit will not be uniform and will quickly scale off when in use. The electrolyte must be very carefully made and impurities avoided. The electrolyte should be kept at a constant temperature, the best temperature for a given process being determined experimentally. The current to be used in a particular case is determined by the exposed area of the article being plated. For most materials a low current density is used, commonly 20 amperes per square foot. Chromium is one notable exception to this, current densities of 100 to 200 amperes per square foot giving the best results.

When articles of irregular shape are being plated it is frequently difficult to get a satisfactory deposit on recessed areas. Different electrolytes produce different results in this regard. Uniformity of deposits can be improved also by shaping the metal electrode from which the plating is done to conform to the general shape of the article being plated, or by moving the article continuously in the electrolyte.

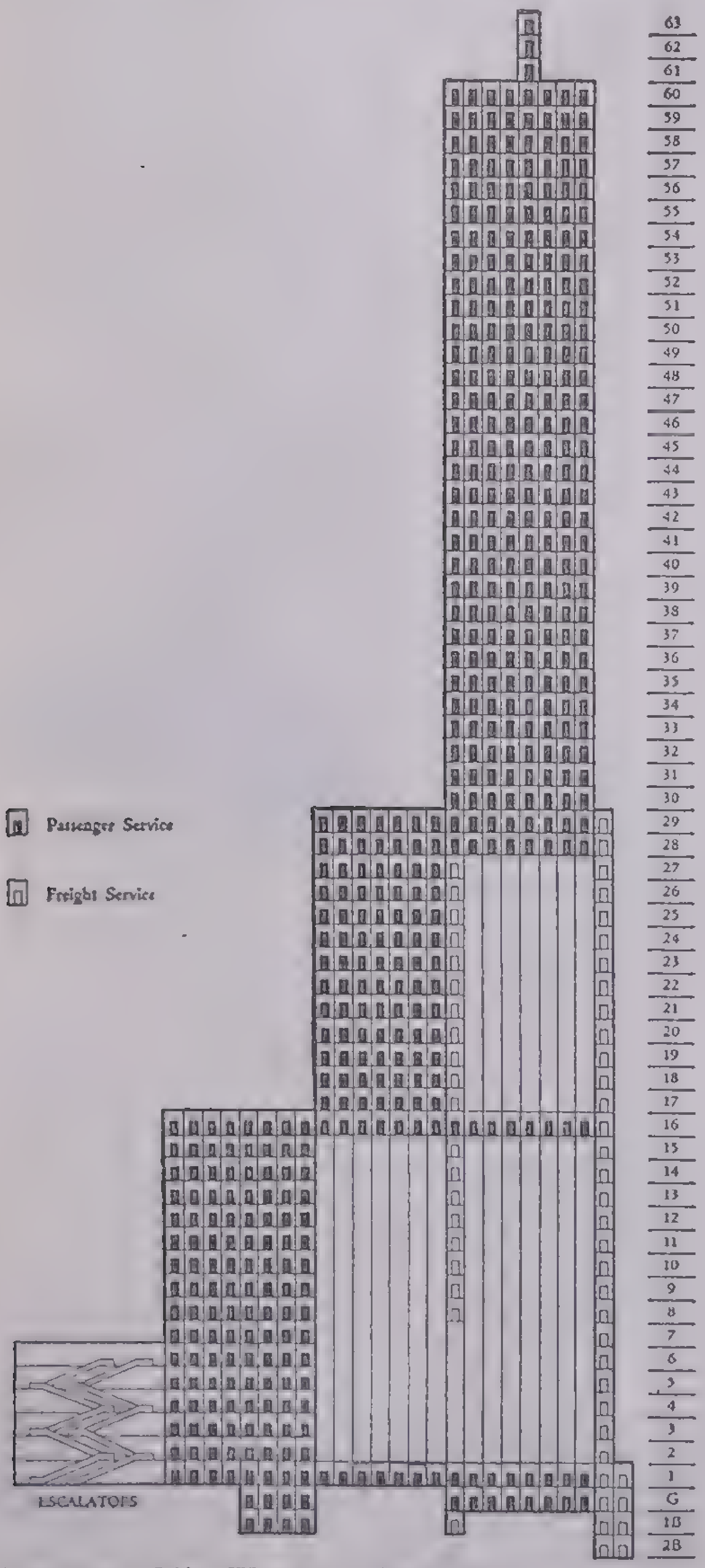
The most common use for electroplating is to provide a protective and decorative covering for metals that would otherwise corrode in air. Chromium is one of the most satisfactory materials for this purpose because of its hardness and great resistance to corrosion.

Modern high-speed printing depends largely upon the electroplating process. A wax impression is made of the original type set up in page form. This impression is coated with graphite (to make it an electrode) and placed in the electroplating tank, where a thin shell of copper or chromium is deposited on it. The shell, now an exact duplicate of the type, is backed up with metal to make it rigid and usable on the printing press. Any number of copies of the original type can be made by this method.

elevator, an apparatus for transporting people or materials vertically, as from one floor to another in a building. The earliest elevators were operated by hand power by means of a sort of block-and-tackle arrangement. The first elevator that could be considered a forerunner of modern types was installed in a building in New York city in 1850. It operated only between two floors. In 1852 Elisha Graves Otis began building elevators, and his name has been outstanding in elevator engineering ever since. He installed the first passenger elevator in 1857, in New York city; the first passenger elevator to operate in an office building was also in a New York city structure (1869).

Such early types were powered by steam engines that pulled ropes attached to the car. One inventor of that period built what he called a *vertical railway,* in which the car moved at the end of an enormous screw. After 1870 many elevators were moved by long plungers operated by hydraulic pressure.

Nowadays practically all elevators are operated by electric motors. Many ingenious safety devices have eliminated the possibility of serious accidents in modern elevators. They are increasingly automatic in operation and take much responsibility from the operator. A person wishing to board an elevator causes it to stop automatically when he pushes the button. The operator inside the car pushes buttons corresponding to floors at which passengers wish to get off, and the car responds automatically. Devices bring the car platform level with floors without "inching" by the operator.



Courtesy Otis Elevator Company

Diagram of an Elevator System

There are three separate banks of elevators, each serving a vertical section of the building (marked in black), besides escalators for the six lower floors

The development of elevators has had much to do with American architecture. Tall buildings would be impractical without means of transporting people swiftly to upper floors. Modern elevators move at a speed of 1,000 feet a minute.

Escalator. The trade name for a moving stairway. It has advantages over an elevator in that movement is continuous and operating costs are lower. Most escalators are built at an angle of 30°. A height of 60 feet seems to be the limit for efficient operation.

engineering, the branch of science that deals with the application of the laws of mathematics, physics and chemistry in order that the natural forces of nature may be directed to the uses of man.

In ancient times an *architecton* was a person who planned buildings, canals, waterworks and other public works. Until about 1700 the ancient word *architecture* included the present field of architecture as well as parts of what is now known as *civil engineering.*

In the late Roman Empire army men assigned to build roads, forts and other works of a military nature were known as *ingeniarii.* Until the 16th century the term *engineering* applied strictly to military engineering. At that time men engaged in building or planning works other than military began to call themselves *civil* or *civilian engineers.*

The Society of Civil Engineers of London held its first meeting in 1793. The Institution of Civil Engineers was formed in 1818; and in 1852 the American Society of Civil Engineers was founded.

With the development of the steam engine a branch of civil engineering separated and became known as *mechanical engineering.* The Institution of Mechanical Engineers in England was founded in 1847; and the American Society of Mechanical Engineers was formed in 1880.

At about this same time another group broke away from civil engineering and was later known as *mining engineering.* The American Institute of Mining Engineers was founded in 1871.

With the advent of electrical devices and machines, *electrical engineering* became important. In 1883 the Institution of Electrical Engineers was formed and in 1884 the American Institute of Electrical Engineers was founded.

The very rapid growth of the chemical industry led to the organization of a new branch, *chemical engineering.* The American Institute of Chemical Engineers was founded in 1908.

The engineer has harnessed the rivers and falls; built bridges; constructed tunnels through which vehicles travel under rivers; built railways and the cars and locomotives for them and provided power to run them; he has furnished means of sending messages with or without wires; provided artificial light; drained the lowlands and irrigated the arid regions; constructed water-supply systems for carrying water to large cities; provided for sewage disposal; created new substances for the use of man and so on through an almost endless list.

The engineer is therefore concerned with the design, construction and operation of machines, works and processes. He puts to practical use the discoveries of pure science. The theory of differential equations that was worked out by mathematicians is used by engineers to determine deflections in beams and columns of buildings. Studies carried out by the physicist have aided the engineer in the design and construction of thermostats. Dynamite, the discovery of a chemist, is used by mining engineers in the construction of mine shafts.

Each of the main divisions of engineering is subdivided into many sections; for example, in mechanical engineering there are the following sections: aeronautic, automotive, heating and ventilating, railway, steam power, refrigeration and production.

Chemical Engineering branches are usually classified according to the industries they serve, as: organic, which produces rayon, drugs, plastics and cellulose explosives; heavy chemicals; soap; foods; paper; fuel; paint and varnish; glass and fertilizer. Although chemical engineering has been recognized as a separate division of knowledge for only a few years many of the operations included under it are probably older than recorded history. A definition for a chemical engineer proposed in 1880 stated: "A chemical engineer is a person who possesses chemical and mechanical knowledge and who applies that knowledge to the utilization on a manufacturing scale of chemical action."

Civil Engineering includes railroad, highway, hydraulic, sanitary, city, structural and military engineering. The civil engineer is trained to build, design and maintain highways, railroads, bridges, tunnels, dams, structures, breakwaters, lighthouses, docks, canals and harbors. Civil engineering is one of the oldest divisions of engineering. Its descent can be traced from both architecture and military engineering. John Smeaton, the famous English builder of lighthouses, was the first man to call himself a civil engineer in 1761. For almost a generation after Smeaton mechanical engineering was included as a part of civil engineering.

Sanitary Engineering is a subdivision of the branch called *hydraulic engineering* and deals with the prob-

Courtesy General Electric Company

Electrical Engineering: Huge Turbogenerators Are Here Being Installed at Boulder Dam

Photo by Charles Krutch, TVA

Mechanical Engineering: This Gantry Crane Was Designed for Shifting Equipment and Materials at Wheeler Dam, Alabama

Courtesy U. S. Bureau of Mines

Mining Engineering: This Tunneling Machine Is Cutting a New Entry Into a Coal Mine

Courtesy The New York Sun

Civil Engineering: The Manhattan Entrance to the Lincoln Tunnel under the Hudson River

Courtesy General Motors Corporation

Industrial Engineering: Careful Planning Produced These Thousands of Automobile Engines

Courtesy General Motors Corporation

Chemical Engineering: The Chemist Tests and Checks Almost Every Step in Many Manufacturing Processes

The Engineers Build a New World

lems involved in city water supply, sewage and garbage disposal and city cleaning. During the past few years sanitary engineering has become recognized as a main branch of engineering rather than a subdivision of civil engineering. The sanitary engineer is primarily interested in protecting human health by providing for pure water and satisfactory disposal of city wastes. Not only must he be grounded in the fundamentals of engineering but he must have a working knowledge of biology, bacteriology and chemistry.

Military Engineering is the section of civil engineering that deals with such military functions as surveying, topography, fortifications, bridge construction, road building, searchlight operation, demolitions and communications. This work, along with the construction of dugouts, trenches, barbed-wire entanglements and the placement of large guns is in charge of the Corps of Engineers in the U.S. Army.

Mechanical-engineering problems involved in the actual construction of guns are cared for by the Ordnance Department. These problems cover many phases of engineering; for example, the difficulties encountered in the design and construction of one of the 16-inch guns that guard the Panama Canal. This type of gun weighs about 130 tons and is 49¼ feet long. The projectile weighs 2,400 pounds and is driven by a powder charge weighing 667 pounds.

Electrical Engineering is a branch of engineering that deals with electrical manufactures, electric-power generation and application, communications and illumination. Although this is one of the youngest of the major branches, the extent to which electricity is being applied for the advancement of civilization makes it highly important.

A principal part of electrical engineering comprises the design, installation, operation and maintenance of power-generating stations and of connected transmission lines, substations and networks of distribution lines. Electrical engineering deals also with electrical machinery and its application to industry. The traction field includes street railways, subways and elevated lines and electric haulage in shops and mines.

The communications section includes the telephone, telegraph, submarine cable, television and radio. Lighting and illumination constitute the section of electrical engineering that has to do with lighting homes, streets, factories and buildings of all kinds.

Mechanical Engineering was probably the first division of civil engineering to be recognized as a separate branch. By the beginning of the 19th century the increase in number and size of steam engines was so rapid that the millwrights and smiths were no longer competent to design or construct new engines. As a result the mechanical engineer, a specialist in steam engines, came into existence.

This division of engineering deals with machinery, mechanical movements, power production and utilization and (because of intimate association therewith) some phases of heat transfer. The field is frequently and somewhat arbitrarily subdivided into power engineering; transportation; production; heating, ventilating and air conditioning; refrigeration; industrial engineering; and marine engineering. *Power engineering* covers the design, operation and construction of steam, gas and water-power plants and equipment. The transportation division includes the mechanical engineering activities in connection with railway, automotive, marine and aerial transportation. The study of conveyors, hoists and elevators is also included in this subdivision. *Production engineering* has to do with the design and construction of tools for production and factory equipment, agricultural implements and mining machinery. *Industrial engineering* is the working out of economical production methods and the selection and training of personnel.

Marine Engineering deals with the design, construction and maintenance of ships. The general field is subdivided into *military* and *civil* marine engineering. The military part covers the design, construction and maintenance of ships of war; the handling of war materials, such as submarine mines; the construction of torpedoes and mine laying. All other types of watercraft ranging from row boats to ocean liners are embraced in the civil branch of marine engineering.

Mining Engineering covers surveying, testing, locating and evaluating mineral deposits; methods of obtaining and treating the ores; construction of tunnels, shafts and other details. The mining engineer is trained in civil, mechanical, electrical and chemical engineering and in chemistry, geology and mineralogy.

Throughout history minerals have been used to improve the conditions of man's existence. From a very early origin mining and related activities have progressed rapidly. In the beginning of modern mining development small concerns often employed only one man to supply all the technical knowledge of mining, ore concentrating and smelting and the use of machinery. Today all large companies have a number of experts, each of whom is a specialist in one phase of the work. Some of the factors that have played chief parts in the development of mining and metallurgical engineering are the discovery of gold in California, 1848; the development of the Bessemer process, 1855; the discovery of dynamite, 1867; the introduction of the flotation process, 1910; the development of knowledge and control of alloys, 1900–37 and the integration of mineral enterprises into large concerns, 1880–1937.

explosives, solid, liquid or gaseous substances that can undergo rapid chemical change from their original states so as to produce a large volume of gas, usually with a large release of heat. The explosive action of a substance may therefore depend upon either or both of two factors: first, the formation of gas, either by combustion or decomposition of the substance (in the case of a solid or liquid explosive the volume of gas would be very great in comparison to the volume of the explosive); second, the liberation of a large amount of heat whose tendency is to increase the volume of the gas produced.

In the case of a *gaseous* explosive, however, such as the gasoline-air mixture in an automobile or the mixture of such substances as acetylene and oxygen, the most important factor is the expansion of gas by the heat generated in burning. In any case the sudden tremendous increase

Courtesy du Pont Company

One Big Bang—One Long Ditch

Laborious digging has been outmoded by the use of explosives. In blasting out a ditch dynamite cartridges are spaced from 12 to 18 inches apart and exploded all together. The dirt is thrown 100 feet into the air. The ditch so formed has no high banks of removed earth in temperature exerts great pressure if the action takes place in a confined space.

The explosives industry is really an industry of peace. Only 3 per cent of all American explosives go into use in war or hunting. Today a year's production of explosives for industrial use is much larger than the entire amount made in the United States for military purposes during any year of the World War. Without explosives we could not mine enough ore and coal to keep one steel plant in operation. The breaking down of rock for cement and in excavations for new buildings would be long and expensive tasks without explosives. Many kinds of explosives are made to fit industrial uses. The most important varieties are:

Blasting Powders. These are mixtures of a nitrate, charcoal and sulphur. When the nitrate is potassium nitrate-saltpeter, the explosive is called *class A* blasting powder. Its principal use is in fireworks, safety fuses and black gunpowders, the cost of the saltpeter making it too expensive for general blasting purposes. *Class B* explosive contains sodium nitrate. Although it is not so powerful as the other, it is quite satisfactory for general blasting purposes and was the principal explosive used for blasting until dynamite was invented. It is still the most widely used explosive in underground coal mines because the explosion of dynamite releases much poisonous gas and is so violent that it shatters the coal.

Dynamite is a mixture of a high explosive, usually nitroglycerin, with an absorbing and inert material, such as kieselguhr (a chalky earth) or a very fine sawdust. When sodium nitrate also is mixed with the sawdust the product is called *extra dynamite.* Dynamite is very effective for blasting hard materials such as bedrock. During the present century it has almost entirely replaced black powder in the construction camp, in quarries and on the farm.

Permissible Explosives are those approved by the U. S. Bureau of Mines for use in coal mines. To be safe for this work the flame of the explosion must be comparatively cool and limited in size, so as not to start dust or gas explosions; furthermore the explosives must not liberate much poisonous gas during the explosion.

Other High Explosives. This class includes pure *nitroglycerin,* together with mixtures of it with other explosives; *trinitrotoluol* (TNT); *liquid oxygen explosives;* and *liquid carbon dioxide.*

Nitroglycerin was first prepared in 1846 and is now manufactured by introducing glycerin in the form of a fine spray into a mixture of nitric and sulphuric acids. The nitroglycerin separates out in the form of an oily liquid that is subsequently washed and purified. Its principal use is as a constituent of dynamite as mentioned above.

Trinitrotoluol (TNT) is made by treating toluene, a liquid obtained in distilling coal tar, with a mixture of nitric and sulphuric acids and other chemicals. TNT is used mostly as a constituent of gunpowders and to a limited extent for blasting.

Liquid-oxygen explosives consist of a mixture of liquid oxygen with some very finely divided combustible material, such as lampblack, wood pulp or easily oxidized metals. These solid materials are packed in porous bags and are soaked in the liquid oxygen just before use. When the combustible material is fired by a detonator, it swiftly combines with the oxygen and produces a large amount of gas and heat. This explosive finds a great deal of use in open mines and quarries.

When liquid carbon dioxide is used as an explosive, it is compressed to about 1,500 pounds per square inch in a steel shell about 4 inches in diameter and 3 feet long. In this shell there is also a smaller container filled with a mixture of an oxidizing agent and a combustible material, usually sodium chlorate, powdered aluminum and powdered charcoal. When it is fired electrically, this mixture burns rapidly and liberates much heat. The pressure of the carbon dioxide is multiplied about 15 times by the heat. It blows out the lower end of the container and releases a large amount of gaseous carbon dioxide, which constitutes the blast. This method is extensively used in both open and underground coal mines.

Initiating Powders. These include a large number of compounds that can be fired by heat, shock or friction. In the form of a cap or primer they set off the actual charge. One of the most common is fulminate of mercury, a salt of fulminic acid, $CH_2(NO_2)CN$. Such substances are chemically unstable and decompose with violence under heat, shock or friction.

Military Explosives are those used in shells, grenades, mines, bombs, torpedoes and the like. The most common explosive for these purposes today is TNT, either alone or mixed with ammonium picrate (amatol). Formerly picric acid, ammonium picrate, nitrostarch explosives, guncotton and other substances were used, but these have been almost obsolete in this country since the World War.

Shotgun, Rifle and Cannon Powders are either black powder or smokeless powder. Black powder was the principal explosive for firearms until 1900; since then smokeless powder has largely replaced it. In general smokeless powder, which is so named because of the relatively small amount of smoke it produces in comparison to black powder, consists of nitrocellulose and nitrocellulose-nitroglycerin powders. Smokeless powder is molded into a variety of shapes that give it desirable burning properties.

feldspar, any of several rock minerals that are silicates of aluminum with calcium, potassium, sodium or barium. Feldspar is an important part of nearly all crystalline rocks. It is mixed with kaolin in most pottery clays, where it serves as a flux that binds the various materials as they fuse. Feldspar and borax are used to toughen some sorts of glass. Most of the feldspar used in industry comes from North Carolina, New York and Maine.

felt, a fabric made by pressing or beating fur, wool or hair fibers so that they mat; it is thicker than woven textiles. Tiny barbs on the fibers intertwine and cling to each other. In the process of felting the material is moistened, heated, rolled and submitted to pressure.

The principal uses of felt are for hats, for which the hair of the rabbit, muskrat and beaver are most desirable, and for roofing, for which cows' hair is largely used. Other commercial products into which felt enters are floor coverings, hammers for piano keys, surgical dressings, polishing cloths, linings for overshoes and gloves, table pads to keep heat from the polished wooden surface, waterproof covers (felt and asphalt), soundproofing material and steam-pipe covering.

fertilizer, animal, mineral or synthetic substances added to soil to increase its fertility. For many centuries man fertilized his farm lands by trial-and-error methods; but nowadays soil chemistry has become a science and is a very important field for research. It is now known that plant fertility must be restored with varying proportions of nitrogen, phosphates, potassium, animal manures and calcium oxide.

The proper amount of *nitrogen* gives good growth and color to plants. Too much of it leads to overgrowth, slow ripening and low resistance to insect pests and disease. Nitrogenous fertilizers should be applied carefully or plants will be mostly straw and leaf, with no fruit.

Before the World War the chief source of nitrogen was sodium nitrate from natural beds in Chile and ammonium sulphate from the distillation of coal; but during the war nitrogen was needed for explosives as well as fertilizers, and several processes were devised for making ammonia or nitrates by taking nitrogen from the air.

The nitrates of sodium, calcium, potassium and ammonium salts are widely used. In the soil ammonium salts change to ammonia, which is quickly oxidized into nitrate. The principal ammonium salts are the sulphate, phosphate and chloride. Other nitrogen sources are urea ($CO(NH_2)_2$), a synthetic product, and calcium cyanimide ($CaCN_2$), which in the soil changes to urea by the action of microorganisms. Urea is particularly valuable, and it is coming into wider use, as it contains 47 per cent nitrogen —three times as much as an equal amount of sodium nitrate.

Phosphates are valuable chiefly in early stages of a plant's growth. They hasten the growth of the seedling and cause cereals to *head out* early. Phosphate starvation results in stunted plants and a great decrease in their food value to men and animals. In the United States there are four chief sources of fertilizer phosphates: super-phosphate (also called acid phosphate), slag from blast furnaces, mineral phosphate and animal bones.

Superphosphate is a mixture of calcium sulphate, monocalcic phosphate and some free phosphoric acid. It is made by treating natural phosphate rock with sulphuric acid.

Slag contains much phosphoric oxide (P_2O_5), which is readily taken up by plants. Phosphoric oxide makes up 18 per cent of Bessemer slag but open-hearth slag contains less. Very finely ground slag is used mostly to fertilize pasture land.

Bones are a good source of phosphate, but the supply is limited. As a general rule bones so used are scraps from factories that make knife handles and the like.

If there is ample *potassium* in the soil, plants do not depend so much upon sunshine. They will thrive even with limited sunshine. Potassium also increases resistance to disease and insects and makes plants continue to grow over a longer period. (This is important for such plants as cotton, whose bolls do not ripen all at once and must be picked from time to time over a long season.) It is supplied to soil usually in the form of sulphate, chloride, a mixture of potassium and magnesium chlorides or a mixture of the chlorides and sulphates of potassium, sodium, and magnesium. German mines supplied the world with potassium salts until 1914. During the World War local sources in many places were opened up, but since then the German and Alsatian deposits have again been relied upon; however, some comes from California.

Organic matter, chiefly *animal manures*, are rich in nitrogen and potassium, and the cellulose contained in them helps the plants to absorb these foods and also improves the physical structure of the soil.

Calcium oxide in the form of lime, limestone or chalk also helps to divide or lighten the soil, makes it easier to work and counteracts excessive hydrogen—a condition known as soil *acidity*. In the United States all these fertilizer elements are usually mixed instead of being sold and used separately. There are a great number of standard mixes to suit different soil conditions. The amount of fertilizer used depends largely on farm prosperity. Nearly 7 million tons a year have been used in recent years.

Fertilizers of the future will be synthetics, to avoid reliance on natural deposits. Large amounts of electric power are needed to fix nitrogen and to obtain phosphoric acid from electric furnaces, and it is supposed that the Tennessee Valley electrification project will be the chief source of such fertilizers in the future.

firearm, an apparatus, usually tubular, from which a projectile is discharged at high velocity by the pressure created by burning explosives. The term is usually limited to small portable arms, such as pistols, rifles and shotguns, the word *gun* applying in a strict sense only to heavy arms mounted on carriages.

The first firearm was merely a straight tube in which the explosive and projectile were placed. There was a touchhole at the back end through which a spark or flame was introduced to set off the explosive. The first important mechanism applied to firearms was the *matchlock*. It was a trigger-and-cock arrangement that thrust the burning match mechanically into the touchhole. Next came the *flintlock*, invented in Spain about 1625. This was a more reliable mechanism in which a piece of flint held in the hammer struck a steel plate; the resulting spark ignited the powder in the firing chamber. Flintlocks were widely used until long after the Revolutionary War.

All the early arms were *muzzleloaders;* that is, the charge of powder and the bullet were inserted at the muzzle and forced firmly into position with a ramrod. The proper charge of powder had to be measured out each time the arm was loaded. The first cartridges were merely paper packages containing the ball and the proper amount of powder, so that the package could be torn open and the powder poured directly into the bore. The *breechloader*, using such a cartridge, was invented by Hall in the United States in 1811. The charge was fired by the *percussion cap* invented in 1807. This was a small metal cap containing an explosive that could be set off by impact. In early breechloaders the touchhole was in the form of a nipple, on which the percussion cap was placed. The fall of the hammer upon it exploded it, and the flame traveled down the touchhole and set off the propelling charge.

Paper cartridges, although they were an improvement, were dangerous because burning gases escaped around the joints of the breech. Finally charge, bullet and percussion cap were all mounted firmly in a metal case—the cartridge of today. All firing, even that of the cap, takes place inside the firing chamber, so that there is no leakage of gases and no uncertainty of firing, as there formerly was in wet weather.

A *rifle* is an arm having spiral grooves in the surface of the bore. As the bullets pass through, the spiral rifling gives them a spinning motion that greatly increases their accuracy of flight. The first repeating rifles were built by Colt in 1840. Various repeating mechanisms are in use at the present time, including pump action, lever action, bolt action and automatic devices. In any case extra cartridges are carried in a magazine, and the repeating action removes the empty cartridge from the firing chamber, cocks the firing mechanism and inserts a fresh cartridge. In automatic firearms the pressure of the exploding charge is used to perform these functions, so that the person using the piece need do nothing except press the trigger. In some automatic arms the trigger may be held in a fixed position while all the cartridges in the magazine are fired in quick succession. For accurate long-distance shooting with small arms, the rifle is unsurpassed. The Springfield rifle formerly used in the U.S. Army fires a bullet 0.3 inch in diameter and 1.26 inches long. It has a range of over 3 miles, and the bullet will pass through 2 feet of white pine placed 500 yards away from the muzzle.

In the United States the *caliber* or bore of firearms and diameter of bullets is usually measured in hundredths of an inch; a 22-caliber rifle or bullet is 22-hundredths of an inch in diameter. (This is usually expressed .22). Countries using the metric system usually measure caliber in millimeters.

The *pistol* is so named for its invention in Pistoia, Italy, in 1540, by Camillo Vettelli. This firearm has a curved stock to fit the hand and was originally designed to provide cavalrymen with an easily portable weapon. The two common types of repeating mechanism are the *revolver* and the *automatic pistol*. In a revolver the cartridges are mounted in a cylindrical container whose axis is slightly below and parallel to that of the bore. Each time the trigger is pressed, the cylinder revolves so as to present a fresh cartridge in line with the bore. In the automatic pistol the cartridges are mounted in a magazine usually located in the handle of the piece; the pressure of expanding gases from the burning powder operates the mechanism.

Shotguns are arms that fire a charge of small shot instead of a single bullet. They are used most widely in hunting small game, where a single large projectile is not necessary and it is desirable to spread the charge over a considerable area. The bore of shotguns has no rifling. Most shotguns are chokebored: that is, the diameter of the bore is reduced slightly near the end of the barrel. The effect is to hold the shot together in a smaller group than would be obtained with straight bore. It is common practice to mount two barrels in the same gun, either side by side or one above the other, so that two shots can be fired in quick succession. Repeating shotguns are widely used; their construction is similar to that used in repeating rifles.

The sizes of shotgun barrels are not measured directly, but are expressed in *gauges*. A ten-gauge shotgun, for instance, is one of such barrel diameter that ten lead balls of equal diameter would weigh one pound.

fish, in the commercial sense any usable water animals, including fish, crabs, lobsters, shellfish and the like. Fish are a source of human food, of oils and fertilizers. Most commercial fishing is carried on in cool, shallow seas. Innumerable fish are to be found in tropical waters, but many kinds are inedible, or they are so unfamiliar that it would be difficult to market them. Warm waters, however, provide tuna and sardines, practically all of which are canned. Great numbers but fewer varieties live in cooler waters, with cod, mackerel, herring, salmon, flounder, halibut and haddock among the most popular for food.

The fishing industry in the United States sells its catch for around 80 million dollars a year and gives employment to 125,000 men. Products and by-products of canneries are worth 130 million dollars. The New England states were the earliest center of the industry and for long the leaders. Now the Pacific coast catch is more valuable. The Atlantic coast, however, from Massachusetts to Newfoundland has been of great importance since soon after the discovery of America. Most of the fishing there is done above the Banks, a series of broad submarine peaks paralleling the shore line for 1,100 miles. They are a favorite feeding ground for many kinds of fish.

Fishermen the world over depend upon nets and traps of several kinds. The *pound net* is a permanent trap of netting staked out usually in fairly shallow water near shore. In principle it consists of a large *leader* or entrance into several compartments with successively smaller entrances through which the fish can easily swim but cannot readily find their way out again. The last chamber, called the *pot* or *crib,* has a floor of netting that is raised to permit removal of the captured fish.

The *gill net* is simply a curtain of netting supported at the surface by floats and anchored to the bottom. A fish, on colliding with the net, thrusts its head through the mesh, which becomes entangled in the gills, preventing withdrawal. Small fish can swim right through the mesh.

Courtesy U. S. Bureau of Fisheries

A Good Catch

Hundreds of fish have just been emptied from the net to the deck of a New England trawler

The *seine* or *draw net* is most commonly used. Purse seines are used in deeper water for fish that school (gather) near the surface. The seine is run around the school and the bottom of the net is drawn together by the purse line, thus preventing the fish from settling and escaping under the net.

Hand lines are important in many kinds of fishing. Great numbers of bluefish and weakfish are taken by trolling with artificial bait on outriggers, which make it possible to handle six or seven lines from a small boat without fouling them. *Trawl lines* are used in catching halibut, cod and haddock on the Banks. A trawl line is a heavy hand line 1,000 to 5,000 feet long, with baited hooks tied at 6-foot intervals. The trawl is set out with buoys and anchors and is raised once or twice daily to remove captured fish and rebait the lines.

Modern commercial fishing is done in large steam- or Diesel-powered vessels, equipped to stay at sea for months at a time if necessary, and furnished with refrigerating machinery to keep the fish in good condition. Machinery sets and raises the nets, which may measure 1,000 feet in length and 150 feet in width.

The very shallow waters along certain coastlines yield shellfish, such as oysters, clams, lobsters, shrimps and crabs. Large quantities of these are shipped fresh to markets, but they also are the basis for important canning industries. Baltimore, for example, cans oysters taken in Chesapeake Bay.

Commercial inland river and lake fishing, while on a much smaller scale than the salt-water industry, still secures an 8-million-dollar catch every year. Another fishing area of great importance is along the Pacific coast from San Francisco to Alaska, where a chain of canneries depends on the salmon caught in the rivers of that area as they go upstream to spawn. Sardines are tinned in huge canneries in many parts of the world.

The principal commercial fishing areas of the world are in the North Sea off the coast of Norway and Iceland and off the Newfoundland and New England Banks. The fish caught in these areas are sold fresh, pickled, smoked or dried. Some fish not suited to human consumption, such as menhaden, are made into fertilizers and many other products.

Fish are important to the United States and Europe, but they are really vital in China, Japan and other crowded places where there is not enough land that can be devoted to grazing cattle and other meat animals.

Before the days of refrigeration only dried and salted fish could be shipped inland. Now fresh ocean fish are quickly transported to all parts of the country. This is especially true since the introduction of new quick-freezing processes, by which fish are frozen in 30–60 minutes by the use of brine as cold as 50° below zero.

Fish-liver oil, especially of cod and halibut, is valuable in treating cases of impaired nutrition. Only lean-bodied fish have livers yielding oil. The fat fish that yield oil from other parts of the body include salmon, tuna and sardines. This fish oil is used in making soap, paints and varnishes, linoleum, leather, lard substitutes and various waterproofing compounds.

Isinglass, a pure gelatin, is prepared from the air bladders (called sounds) of the sturgeon and other large fish. It is used to make jellies and glue and is sometimes called fish glue. Fish offal—that is, waste scrap, especially skin—is used like the waste in stockyards as a material for animal glue. Fish meal, made from inedible fish and cannery scrap, is used as stock and poultry food or fertilizer.

flax, a Temperate Zone plant from whose inner fiber linen is made and whose seeds (linseed) are the source of a valuable oil. When flax is raised for its fiber, the stalk (about 2 feet high) is pulled out by the roots just before it is ripe. Pulling is generally done by hand. The seeds are then removed with a comblike apparatus called a rippler. Then the stalks are soaked in pure, soft water until the fiber is loosened from the stalk. This operation, called *retting* or *rotting,* usually takes about 10 days or 2 weeks. Overretting weakens the fiber, and underretting leaves gummy material that interferes with spinning and weaving the linen.

The stalks are then thoroughly dried and the fibers separated from the woody center by *scutching*—beating and shaking. The fiber thus obtained is used to spin linen yarn and twine and to weave all kinds of linen goods. Linen yarn is used as warp in carpets and rugs.

The separation of the fiber from the woody stalk requires so much hand labor that flax for linen is usually grown only in those areas where an abundant and cheap labor supply is available. The principal areas of production are Russia (less important now than before the World War), the Baltic States, Belgium and Northern Ireland.

Flax is grown for seed in Minnesota and the Dakotas, in Argentina and in India. Argentina now exports more than a million tons of linseed yearly, and India more than 350,000 tons valued at about seventeen million dollars. The tropical varieties produce larger seed, but the quality of the oil is not so good as that from seed grown in colder climates. *Linseed oil* is an important ingredient in oil paints and varnishes and in printing and lithographic inks. The residue after the oil is extracted is called oilcake; like cottonseed meal it is a valuable stock feed.

flood control, confining, redirecting or storing flood waters to prevent damage to property. A river is ordinarily confined to its channel, but in floodtimes (that is, when heavy rainfall or melting snow greatly increase the river's volume), the lowlands bordering its banks serve as overflow basins for the water the channel cannot carry.

The Mississippi River and its tributaries, for instance, have been flooding for countless centuries; but this did not matter until man took over the rich lowlands for farming land and built his industries on the cheaper land along the rivers. Now when the river overflows, as rivers must, there is much loss and suffering.

Man still further cramps the river by building levees along its banks, thus confining the flood waters at the levees but making certain that there will be more water to overflow at some lower point farther down the river. Then, as the river deposits more and more silt in its own channel, the level of the water rises and the levees have to be built higher and higher. If this goes on long

U. S. War Department photo

Mississippi River Levee below New Orleans

The riverside slope of the levee is paved with asphalt to resist the wearing effect of the running water

enough, as it has in some places in China, the bottom of the river itself will actually be higher than the surrounding country; the river will run in a sort of man-made trough.

As long as man intends to occupy the natural flood plains of a river, he must attempt to control it. This can be done by building enough levees; by deepening the river channel to make it hold more water; by increasing the speed of the river water so that it will drain away faster; by providing lakes to hold excess water in floodtime; by providing spillways near the mouth to drain floodwater away over wasteland.

The river channel can be enlarged by dredging; the speed of the water can be increased by straightening out curves, removing debris and smoothing rough parts of the channel. Both these processes are extremely costly, must be carried on continually and are not very practicable for large rivers. Artificial reservoirs or lakes can be created by damming the river, but large rivers, like the Mississippi, cannot be dammed. The Boulder Dam across the Colorado is an example of this method. Artificial drainways leading out into the natural depository of river water can be built only near the mouth, as are the spillways in Louisiana above New Orleans.

In 1879 the Federal Government organized the Mississippi River Commission, which built miles of low levees, then considered adequate. In 1882 and 1912 there were serious floods, and in 1914 the Commission adopted a standard levee height 3 feet above the high watermark in the 1912 flood. It was then thought that the problem had been solved for all time, but in 1927 a disastrous flood covered 18,000 square miles of the Mississippi's 30,000-square-mile flood plain. So levees must be built higher and higher as the river builds up its bottom with sediment.

Forestry experts have for years pointed out that denuding the land of trees and underbrush has contributed to the flood problem. Vegetation absorbs much water and temporarily holds back still more, so that excess water does not rush immediately into the rivers but must travel more slowly. These experts have urged replanting trees wherever possible as a flood-prevention measure. A fast-growing forest uses as much as 12 inches of water a year; the average rainfall for the United States is 40 inches. A well-covered forest floor will absorb all the water that falls in a steady 48-hour downpour.

Vegetation serves again by preventing erosion, the carrying away of earth by fast-running water. Erosion has carried off much fertile topsoil in the United States, and soil-charged water drops its load on the bed of the river it ultimately reaches, thus helping to fill up the channel.

flour milling, converting wheat or other cereal into meal. (*Mill* and *meal* are related words.) Finely ground meal is called *flour,* originally the same word as *flower* and meaning the best of the grain. The conversion of wheat into flour is one of the simplest of all manufacturing operations; it is almost wholly mechanical and consists of pulverizing the grain and screening out the portions most edible and palatable.

In the early days there were flour mills in practically every community; the miller ground the local farmers' grain and took part of the flour as pay. There are still a large number of local gristmills; but 80 per cent of the flour in the United States is produced in some 400 large plants.

With the development of the north Mississippi states, known as the *spring-wheat belt,* and the consequent cheap wheat this area provided, the milling industry concentrated in and near Minneapolis. For a time difficulties were encountered, for the wheat was extremely hard to grind. It was not until a new method of grinding (the gradual-reduction process described below) was developed that the wheat could be used for flour.

Once this problem was solved, Minneapolis became and still remains the chief milling center in the United States, greatly helped by the water power from the Mississippi River. There are several other important milling centers: in the Pacific northwest in the midst of the great wheat fields of the Columbia basin, in Kansas and in Buffalo, N. Y.

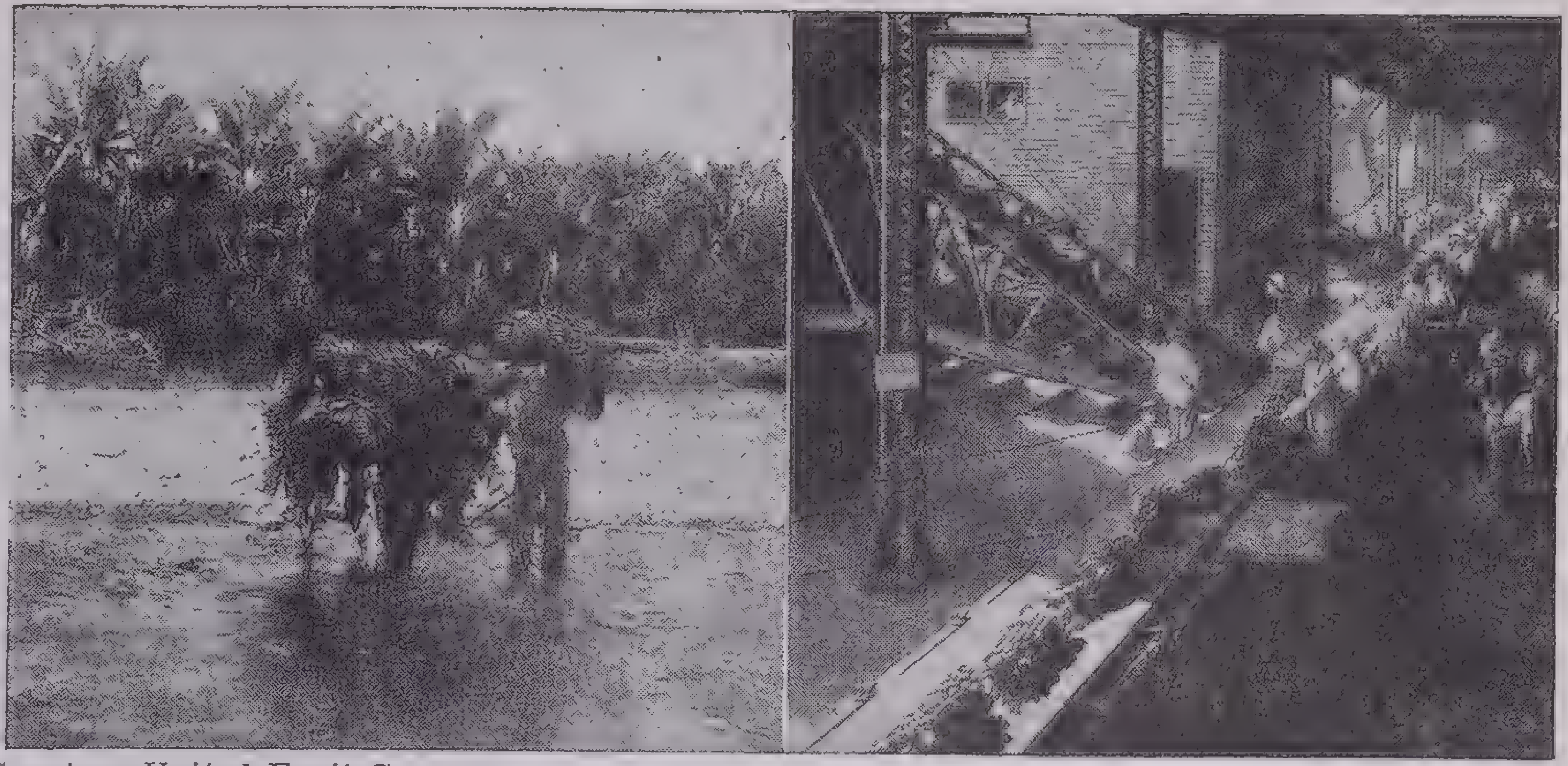
Buffalo is the only one of these centers not in the middle of a great wheat belt. Buffalo's importance dates only from the World War. It is favored by its location on the Great Lakes, between the wheat-producing sections of the West and the flour-consuming areas of the East. It is also on the line of the main eastbound route for wheat exported from Canada. As a result Buffalo grinds large amounts of Canadian wheat destined for export flour.

The Milling Process. To understand wheat milling one must know something of the kernel itself. The wheat kernel consists of four parts: (1) On the outside there are five layers of a tough husk known (when it is ground) as *bran.* (2) Beneath this husk there is a flintlike shell known as *gluten.* (3) Inside the gluten and merging with it is the *starch.* (4) At one end of the kernel and readily distinguishable is the *germ.* The germ is small, dark, oily and sweet to the taste; it is the true seed from which the plant develops. Nature surrounds this embryo with starch and gluten, which serve as a food supply for the germ in the early stages of germination. The tough coat or husk is simply a protection.

Man found that the germ causes the pulverized grain to deteriorate and that it discolors the flour. In order to produce high-grade flour it must be screened out in the early part of the grinding process. Bran also discolors the flour, absorbs moisture readily and is tough. The gluten and starch ground together are the desirable elements of the flour. Gluten improves the bread-making qualities of wheat; it makes the dough elastic and resilient, enables it to hold moisture and to retain the gases generated during fermentation. Wheat with a high gluten content, however, was hard to grind. It was not until improvements in grinding methods were introduced that hard wheat (wheat with high gluten content) could be successfully milled.

In the early days grinding was done with millstones, flat circular stones operated in pairs. The bottom or nether stone was stationary and the top or runner stone rotated on a vertical axis. The grain was fed into an opening in the center of the upper stone. As the stone turned, the grain gradually worked its way to the outer edges where it emerged in a pulverized form. The product was then sifted and the coarser particles were reground.

Most of the wheat raised while this method was in vogue was of a low gluten content and hence soft. After the Civil War new agricultural areas began to come into production. Such regions as the Dakotas, Minnesota and Wisconsin had to grow hard spring wheat or none at all. The wheat, however, was produced cheaply, so millers began to seek new methods of grinding it.



Courtesy United Fruit Company

Two Ways of Handling Bananas

Muscle power is still relied upon to a large extent at the plantations. However, when ships are unloaded at such ports as New Orleans, the enormous amounts of green fruit must be moved mechanically. At the right are shown slanting conveyors taking bananas from a ship's hold

About this time there was introduced from Hungary (a hard-wheat area) the *roller* or *gradual-reduction process* of milling. In this process fluted rollers are set to crush the grain in the initial operations without pulverizing the husk. The inner contents are squeezed out. The grain is again put through the rolls and crushed and sifted. This continues until unwanted portions are removed and all the gluten and starch have been pulverized.

Several important by-products are obtained in the milling process. Particularly valuable are various animal feeds. The supply of mill feed in the Buffalo district is a valuable asset to the dairy belt of northeastern United States. Until the end of the World War the United States had long been the greatest exporter of flour, but our exports have dropped from 20 million barrels in 1920 to 3½ million in 1936. Canada and Argentina are now the major suppliers of the world. Argentina averages 100,000 tons a year.

flux (literally, flow), any substance, such as lime in iron smelting or cryolite in aluminum smelting, which helps the melting and fusion of minerals or metals.

fountain pen, a pen carrying a supply of ink that flows to the point for writing as it is needed. Fountain pens were made in England in the early part of the 19th century. The chief problem was to feed the ink at the proper rate. Various schemes were tried, none very successfully, such as regulating the ink flow with a piston.

The first satisfactory arrangement was described by L. E. Waterman in a patent in 1884. This was a solid piece underneath the pen carrying several fine slits that conducted the ink slowly downward as it was used. The piece also had a larger groove that admitted air into the barrel of the pen to replace the ink used. This arrangement is in use in practically all fountain pens today.

Fountain pens are usually equipped with gold points to resist the corrosive action of the ink. In the better grades of pens the points are tipped with iridium, a metal more expensive than gold but much more durable.

The early fountain pens were filled by removing a cap at the top of the barrel and filling it with a medicine dropper. Modern pens, however, are filled automatically. One common method consists of enclosing a rubber sac within the barrel of the pen, from which the air is expelled by means of a lever or plunger system, the ink being drawn in when the sac is released and permitted to expand to its normal shape. In another type the barrel is a cylinder fitted with a piston, which draws the ink into the pen in much the same manner as the piston in a water pump.

fruit, the edible pulp covering the seeds of many trees and plants. Commercially important fruits need no longer be grown close to the market. Not many years ago fruits had to be used where they were grown. Such southern fruits as oranges and grapefruit were rare delicacies in the north, and few varieties could be enjoyed out of season. Now careful packing and refrigerated cars have made long-distance shipments possible. A large part of most fruit crops is canned, and the canning industry is nearly as scattered and distant from the market as the orchards are.

Not only have great industries been set up (based on new methods of handling and preserving fruit) but the diet of all Americans has been enriched. We may have oranges, grapefruit, bananas and the like all the year round, and relatively unfamiliar fruits, like the avocado, pomegranate, pawpaw and prickly pear are coming into nation-wide use.

California with its many sunshiny days and expensive irrigation raises citrus fruits, plums, peaches, pears, grapes, figs, currants, apricots and other varieties. The even climate produces fruit of uniform size and quality, a decided advantage to the shipper and canner.

Other important fruit-raising districts include the valleys of Washington and Oregon (apples); the eastern and southern shores of the Great Lakes (apples, cherries); the Ozark Mountains (apples); the shores of the Gulf of Mexico and Florida (citrus fruits); Georgia and portions of the Appalachian Mountain system, especially in Virginia (peaches); and the coastal plain in Delaware, Maryland, Virginia and New Jersey. Most of these areas specialize in a certain type of fruit.

Hawaii is the principal producer of pineapples. Bananas come to North American markets from the Central American plantations. South Africa and to a smaller degree South America supply certain fine fruits for the luxury trade of the Northern Hemisphere in the winter season.

Besides its use as food fruit also serves as a raw material in the manufacture of alcoholic and nonalcoholic beverages. Most wine, for example, is simply fermented grape juice. By distilling the fermented juice various brandies are produced. The growing use of fruit juices for the American breakfast table has stimulated bottling and canning.

The accompanying table gives the annual United States output and shows the enormous scale on which fruit-growing is conducted:

Apples	108,031,000 bushels
Plums	133,600 tons
Prunes, dried	177,200 tons
Cherries	106,050 tons
Peaches	46,118,000 bushels
Pears	24,128,000 bushels
Apricots	223,000 tons
Figs, dried	20,000 tons
Grapes	1,878,790 tons
Oranges	60,891,000 boxes
Grapefruit	27,383,000 boxes
Lemons	8,316,000 boxes
Limes	20,000 boxes
Cranberries	515,300 barrels

fuel oil, heavy, dark oil burned as fuel for heating or for generating steam. It is a by-product obtained in refining petroleum: the oil residue left over after the lighter fractions have been driven off. An increasing number of steamships, railroads and industrial plants burn oil for power, either by generating steam or by direct use in Diesel engines. Fuel oil is an important source of heat in homes and industry.

fuller's earth, a claylike, highly absorbent substance, chemically an impure hydrous aluminum silicate. Like chalk fuller's earth was formed from the shells of tiny sea creatures, called diatoms. For many centuries fuller's earth was widely used in cleansing wool and cloth, a process called *fulling*. It readily absorbs grease, and so is valuable as a filter in clarifying mineral oils and decolorizing vegetable oils and in the manufacture of soaps and toilet articles and in the sugar-refining industry. It is a valuable catalyst. Fuller's earth is either dug in open pits or mined. Most of it comes from England. It occurs in the United States in several states and one type is called *Florida earth.* A Japanese variety is called *Kombara clay* or *Japanese acid earth.*

fur, the hair-covered skin of certain animals, valuable in making high-priced coats, hats and other wearing apparel. There are three main sources of furs: the colder parts of the world, from which come the most valuable furs; the middle latitudes, which supply less costly furs from small animals; and fur farms. Fur farms, most of which are in northeastern United States and Canada, are increasing in importance. The fur is often better than that from trapped wild animals, and the supply is more assured.

North America supplies the furs of beaver, muskrat, marten, fisher, ermine, several kinds of fox, seal, raccoon, bear, wolf, lynx and wolverine. Northern Europe and Siberia are important for squirrel, Russian sable, fox, wolf, bear, badger, kolinsky, mink, marmot, fitch, several martens, otter and muskrat. Other European furs are moleskin, rabbit, otter, wildcat and stoat. China supplies marmot, kid, goat and lamb. Central Asia's only important fur is lamb. Australia and New Zealand furnish opossum, red fox, wallaby and rabbit; South America, nutria, skunk and chinchilla.

Many furs would not find a ready market if they were offered in their natural state under their own names, but skilful cutting, plucking and dyeing and a special trade name make them acceptable. Thus rabbit fur appears as coney, and marmot is dyed to resemble mink, muskrat or seal. To avoid deception trade regulations demand that purchasers be given the real name of the fur as well as the trade name.

Dealers in furs usually buy them at auction in large markets such as those in London, Leipzig, New York and St. Louis. The fur trade in the United States has a value of 143 million dollars.

The fur trade had much to do with the exploration of the New World. Without the European demand for furs the French might not have hastened to explore Canada and the Mississippi Valley. The English Hudson's Bay Company, a large fur trader, was for 250 years energetic in exploring and settling Canada.

furniture manufacturing, the conversion of wood, metal and other materials into furniture. It is an important industry, especially in the United States, where it is carried on in some 3,000 plants, gives employment to about 150,000 workers and has an annual output valued at nearly half a billion dollars. About 75 per cent of all American furniture manufactured is for household use and about 84 per cent of it is of wood. There is a specialized branch manufacturing office furniture, some of which is of steel or aluminum.

Furniture manufacturing in the United States first began as a part-time activity in the carpenter shops of the east during the Colonial period. By 1812 furniture making had separated itself from general carpentry, and by 1815 there were cabinetmakers' shops in all principal cities. With wider use of machinery furniture factories soon displaced the cabinetmakers' shops. One of the first factories was founded in Charlestown, Mass., in 1817. Other factories were soon built in all the larger cities. The distribution of factories closely corresponded to the distribution of population, although New England was the dominant center.

Supplies of raw materials declined in the east, and the industry followed population in its westward migration. Today the leading American cities in the manufacture of wood furniture are New York, Chicago, Grand Rapids, Mich., High Point, N. C., Jamestown, N. Y., Rockford and Evansville, Ill., and Gardner, Mass.

All the wood-furniture factories of the country use much the same processes, which fall into three principal operations: machine work, cabinetmaking and finishing. Before manufacturing begins, the lumber is air-dried, sometimes for as long as 2 years. Immediately before using it is kiln-dried. The rough lumber is cut and dressed and the various parts of the finished article are fashioned —by machinery, wherever possible. After shaping they are sanded smooth and frequently ornamentally carved by hand or by a machine that carves the same design at one time on as many as 36 pieces of wood. Woodworking machines are fundamentally the same as the carpenter's hand tools —saw, plane, drill, chisel and the like. The machines merely apply power to such tools, and are of course much faster and more accurate than the hand worker.

In recent years the industry has been able to turn out a cheaper product through the use of *veneer* and *plywood.* Veneer is a thin sheet of ornamental wood used as facing over cheap wood. Plywood, valuable for structural parts, is made up of thin sheets glued together with the grain of alternate layers at right angles. It is stronger than a solid piece and less liable to warp.

In the cabinetmaking department the various parts of a piece of furniture are assembled and fitted together into the finished article. Most of this work is done by hand and considerable skill is necessary.

In the finishing department the processes are filling, staining, sanding, varnishing, rubbing and polishing. One to three coats of varnish may be applied by spraying or with a brush. After each coat of varnish the piece is rubbed with a mixture of oil, water and rottenstone or is sandpapered. The piece is then rubbed and polished.

galvanized iron, sheet iron coated with zinc to prevent rusting. The zinc makes an unbroken coating because there is an actual zinc-iron alloy at points of contact. A further protection to the iron is the fact that if the zinc is scratched, exposing the iron, the zinc will oxidize, but not the iron. Only zinc has these protective properties. Steel is also treated in the same way to produce galvanized steel.

There are four methods of galvanizing. The original, named after Galvani (1737–98), the first student of galvanic electricity, is electroplating, which is slower and much less thorough than the other processes. The commonest method is the *hot-dip,* in which the iron or steel is dipped in molten zinc. *Sherardizing* is tumbling the iron about in zinc dust under high heat; the method is named from its inventor, Sherard Cowper-Coles. Sometimes hot zinc is sprayed on.

Galvanized sheet iron or steel goes into the making of containers, culverts and heavy corrugated sheets for construction purposes. Wire, fence posts and many other iron and steel objects are galvanized. Nearly half of the zinc produced is used for galvanizing.

gas, commercially and industrially, the combustible gases used as fuels and illuminants. The main varieties are: natural gas, coal gas, water gas, liquefied petroleum gases and acetylene.

Natural gas that is combustible is usually a methane found in regions where there is petroleum. In the Baku oil fields on the Caspian natural gas has been known for more than 1,000 years; and in the west China province of Szechwan gas from salt beds has long been used to heat brine in saltmaking and to light houses into which the gas is piped in bamboo. In the United States gas was used as an illuminant as early as 1824 in a hotel at Fredonia, N. Y., but it came into common use only when large supplies were found in drilling for petroleum in western Pennsylvania in 1859–60.

The gas collects in underground caves and pockets, and drilling that opens one of these containers brings the gas to the surface. Natural gas, piped into homes, was used for lighting in Rochester, N. Y., and Titusville, Pa., in 1872. Oklahoma, Texas, California, West Virginia and Louisiana later became large producers.

The eastern or Appalachian type is made up almost entirely of paraffin hydrocarbons. In Kansas, Oklahoma and Texas the natural gas is high in nitrogen (sometimes more than 60 per cent) and in helium, the very valuable gas (of which the United States has practically the world's total) for filling dirigible balloons. The Pacific coast type has more carbon dioxide than there is in the midcontinent or eastern type: Los Angeles gas, 6.5 per cent CO_2; midcontinent, 0.2 to 1.4 per cent; eastern, practically none. The deepest gas well is probably the 7,756-foot well at Ligonier, Pa., which has almost 3½ miles of casing, and pumps a gas that is 98.8 per cent methane.

Gas has been conveyed from Louisiana and Texas to distant cities—Atlanta, St. Louis, Denver and Chicago. It is an industrial fuel of great importance and also a source of much gasoline—about a billion and a half gallons a year in the United States. Natural-gas gasoline is called *casing-head gasoline.*

The total annual production of natural gas in the United States in 1918 was about 720,000 thousand cubic feet; in 1930, the peak year, the output was 1,917,400 thousand cubic feet with a value of more than $415,000,000; and since then the quantity has been a little less and the value occasionally more.

In a recent typical year the production of manufactured gas was 239,525,800 thousand cubic feet. Of this water gas accounted for 148,781,800 thousand cubic feet; coke-oven gas, 55,136,400 thousand cubic feet; retort coal gas, 22,583,100 thousand cubic feet; oil gas, 12,051,900 thousand cubic feet; butane-air gas, 972,600 thousand cubic feet.

Coal gas is a by-product of the distillation of bituminous coal. Coke is a by-product of the manufacture of gas—and quite as often gas is a by-product in making coke. In making gas the coal is burned in retorts, collected and condensed by cooling and washing, cleansed by various filtering processes and finally stored in a pressure tank from which it is piped to the consumer. The first commercial plant in the United States was built in 1853 at Greenpoint, L. I., now Long Island City.

Water gas is made from coke or anthracite (or any incandescent carbon) in two stages: (1) a *blow* or *air blow,* forcing hot air through a mass of burning coke or anthracite; (2) the *run* or *steam blow,* forcing a jet of steam through the white-hot fire so that the water molecules are broken by the heat and there is this reaction:

$$C + H_2O < H_2 + CO$$

The mixture of hydrogen and carbon monoxide burns with an intensely hot blue flame that is valuable in industrial processes. This *blue water gas* is enriched or carbureted by a spray of volatile oil or by adding coal gas; then it can be used as an illuminant. Its carbon monoxide content makes water gas dangerous—it is poisonous and has no warning odor. The blue gas made for immediate use in smelting furnaces is often called *producer gas.*

Liquefied petroleum gases or bottled gases for domestic and industrial uses where gas mains are not available have a constantly increasing production.

Acetylene, another packaged gas, is a compound of carbon and hydrogen (C_2H_2) produced by the action of water on calcium carbide (CaC_2). In a bicycle lamp or acetylene lantern this combustible gas can be produced by water trickling down a wick and falling on a piece of calcium carbide. Five cubic feet of acetylene can be produced from one pound of calcium carbide. The compound is very explosive when it is mixed with common air. In steel acetylene tanks or containers the acetylene under pressure of 16 atmospheres is dissolved in acetone (a product of wood distillation), and friction is reduced by porous packing; pressure is released when the valve is opened and the acetylene is released from the acetone.

In open jets acetylene uses two and one-half times its own volume of oxygen for complete combustion, so it can be used for lighting only in isolated places, like buoys or signals, unless it is mixed with other gases or is burned in a special burner with many fine holes. It gives nearly 15 times as much light as ordinary coal gas, and colors can be seen by it as well as in sunlight. The main use of acetylene is in welding torches. Heat has been absorbed in its formation, and as it burns it generates heat with a temperature of 3,000° to 3,500° C.

gasoline, a volatile and inflammable liquid hydrocarbon derived from petroleum or from natural gas by refining and cracking. Its principal use is as a fuel for internal-combustion engines, particularly automobiles. The production of petroleum gasoline in the United States was more than 300,000,000 barrels every year since 1926; it now averages more than 500,000,000 barrels. The output of natural gas or *casing-head* gasoline did not increase so much in the same decade; annual production is about 1,750,000,000 gallons. (The gasoline barrel contains 42 gallons. The petroleum output is measured in barrels; the natural-gas gasoline, in standard gallons.)

gelatin, animal jelly refined from bones, skin, tendons and ligaments of animals slaughtered for food and from the air bladders of fish. The animal waste is treated with hydrochloric acid to dissolve mineral substances. Boiling then produces a mass fit for glue. It is further purified by hot filtration through a bath of large alcoholic content. The residue hardens into a light-yellow substance ready to be worked into any commercial form of gelatin. Fish gelatin is known as isinglass.

Gelatin is a food for the sick because it is an easily digestible protein. It is made into capsules to hold medicine; jellies and other table delicacies have gelatin as a base; as an ingredient of ice cream it prevents the formation of ice crystals; and it is used to make candies, such as marshmallow.

Gelatin is used in the manufacture of printer's ink and as a *size* or stiffener for cloth and paper; it is important in making camera films and in the photogelatin process of making prints. The hectograph bed for manifolding by ink impressions is gelatin. In bacteriological laboratories gelatin is used as a culture medium in which bacteria are grown. A mixture of gelatin and tannin is used in tanning leather.

glass, a hard, brittle, transparent substance made by melting several materials, chiefly sand, salt and lime. There are always four steps in the manufacture: mixing, melting, shaping and annealing.

The raw materials used and the proportions in which they are mixed depend entirely on what the finished product is to be. In general the materials are pure silica sand, limestone, soda ash, ground glass, salt and coloring matter; but the formulas for various uses may be widely different. *Flint glass,* the finest and clearest glass, has a large lead content. It is used for tableware, art objects and lenses. *Crown glass,* on the other hand, contains no lead. *Window glass* is mixed in these proportions: silica sand, 51 per cent; salt, 1½ per cent; limestone, 15 per cent; soda ash, 21½ per cent and feldspar, 11 per cent.

The materials will also vary widely according to the color of glass desired. A deep-blue glass has 300 parts of sand, 200 of lead, 100 of soda ash, 3 of cobalt oxide, 50 of niter, 4 of borax and 8 of manganese. The best ruby-red glass is colored with gold; emerald-green, with iron filings; black, with pulverized coke.

Nowadays the mix is melted (2,300° F.) in pots or tanks; the fuel is oil or gas, instead of the wood and coal formerly used.

The shaping process depends upon the form of the object. There are in general three types of glass products—hollow ware, pressed ware and flat sheets. In making hollow ware molten glass is blown against the inside walls of a mold by a current of air. Bottles, light bulbs, tumblers and the

Courtesy Corning Glass Works

The Glass Blower Still Has Work To Do

Although most glass shaping is done by machinery, craftsmen like this one are still needed for special work like are made in this way. Pressed ware is formed by shaping molten glass between metal forms, much like placing batter between the halves of a waffle iron. This method is used to make fancy dishes, bowls and other open ware. Sheets of glass, such as window or plate glass, are produced either by flattening a batch of plastic glass on a metal table under heavy rollers or by drawing molten glass continuously from the furnace under a series of rollers.

Courtesy Owens-Illinois Glass Co.

Glass Is Important in Architecture

In modern buildings, such as the Lawton School, San Francisco, glass blocks are used to form walls as well as to admit light

In the shaping process glass will cool very rapidly from 2300° to 1300° F. If this were allowed to continue the glass would buckle, crack and otherwise lose shape. It must be cooled slowly; this is done in a *leer* or *lehr,* an oven through which the shaped glass passes, meeting successively lower temperatures until all danger of losing shape is past.

New types of glass are constantly coming on the market; some of them displace older materials, others fill new needs. This is shown by the fact that the industry's product was valued at 192 million dollars in 1933 and 284 millions in 1935 in a period when building operations, which usually consume more than one-third of all glass produced, were far below normal. One of the industry's new products is shatterproof glass, used chiefly in automobiles. It is made of two sheets of glass held together by a plastic binder. Bulletproof glass is thicker, with three layers of glass and two of plastic. Such glass can be cracked and broken, but the pieces do not fly because they are held by the flexible plastic layer.

Hollow glass blocks are proving to be an excellent building material for walls and windows in homes and factories. Spun glass or glass wool is an important insulating material, and it is also woven into fabrics. Glass food containers are increasingly favored by consumers. High-grade optical glass, formerly imported, is now being turned out by American factories.

Building glass accounts for 37 per cent of the value of all glass produced; jars and bottles, 34 per cent; pressed and blown ware (light bulbs, tableware and the like), 24 per cent; chemical and optical glassware (lenses and laboratory apparatus), 5 per cent.

Pennsylvania and West Virginia are the most important states in the manufacture of glass. They are favored by good supplies of cheap fuel (natural gas), good sand and limestone and a large market. Other states important in the industry are Indiana, Ohio, Illinois, New York and New Jersey.

Plate and window glass are produced mainly in Pittsburgh, Pa., Toledo, Ohio, and Clarksburg, W. Va. Most table glass comes from Pittsburgh and Wheeling. Milk bottles seem to have been invented in Elmira, N. Y., and they are made in large quantities there and in Toledo. Other bottles and containers are made mostly in Toledo, Wheeling and Charleston, W. Va. Laboratory glassware and other specialties are made in Corning, N. Y.

glue, an adhesive made from the horns, hoofs and bones of animals and from the skin and other waste parts of fish. All these contain mineral as well as animal matter, and the mineral matter must be taken out. The basic substances are boiled, chemically treated and reduced to a jelly. When it is purified, the mass hardens and forms the glue of commerce. Still further refinement produces gelatin. The manufacture of glue naturally centers in the great meat-packing companies.

goats, hollow-horned mammals that are similar to sheep; well adapted to rugged and dry areas. Most goats are raised for their milk or their skins. Morocco leather is made from goatskins and is one of the valuable materials used in bookbinding and for leather goods. Kidskin and goatskin are used also in glovemaking. The Angora type yields hair that is woven into *mohair,* a textile largely used for covering furniture and automobile seats. The goats of Kashmir and other parts of the Himalayas have a fine underlayer of wool much softer than the outer coat and used to make the luxurious Cashmere shawls.

Goats are raised in greatest numbers in Turkey, India, Greece, Bulgaria, the U.S.S.R. and the Union of South Africa. In the United States the greatest concentration is in the Edwards Plateau of west central Texas; and demand is increasing for the rich milk and the cheese made from it.

granite, a hard crystalline rock of volcanic origin composed chiefly of quartz, feldspar and mica. It is second in importance as a building stone, limestone standing first. It is very durable and hard to work. In crushed form it is valuable ballast for roads and railroads. Granite paving blocks are used for roadways with heavy traffic. An interesting variety is *graphic granite,* in which the quartz crystals are so arranged that a flat section of the rock looks like a tablet written over with Oriental characters.

gunpowder, an explosive mixture of saltpeter (potassium nitrate), sulphur and charcoal, used in firearms. It was made in the 13th century by the English friar Roger Bacon, and was manufactured in France, Italy and England in the first half of the 14th century—some time before 1354, which is sometimes given as the date of discovery by a German monk named Berthold Schwartz. Bacon's discovery came from his experiments in making pure niter (saltpeter).

Gunpowder is made from saltpeter (75 per cent), sulphur (10 per cent) and charcoal (15 per cent), though for certain purposes these proportions are varied slightly. These substances undergo numerous processes in manufacture. In the final process the mixture is rolled into fine grains, then glazed so that the particles resist moisture.

gypsum, hydrous calcium sulphate ($CaSO_4 2H_2O$), an important material for plaster. It is obtained from the dry beds of extinct lakes. In its crystalline form it is called *selenite;* in its granular form, *alabaster.* Gypsum is colorless or white or (in alabaster) sometimes yellow, pink or gray. Gypsum is very soft; its specific gravity is 2.3. Selenitic water, that is, water with some gypsum, is used in brewing certain ales. Most of the gypsum produced in the United States comes from New York. It was first obtained from the vicinity of Paris and calcined to a state where the water content was reduced one-half (hemihydrate); in that form it is called *plaster of Paris.* Gypsum is used as a top dressing for land and in the preparation of fireproof building material and foundry cores or inner molds. It is an essential in manufacturing cement, being added in varying quantities to regulate the speed at which the cement will harden.

gyroscope, a swiftly rotating body, usually in the form of a flywheel, mounted in such a way that it is free to rotate about any axis. It is familiar to all as a toy. The only real difference between the gyroscope and another toy, the top, is that the gyroscope shaft is supported at both ends. The action of both toys illustrates the two principles of gyroscopic action that are the basis of so many useful devices. In fact any rotating body acts as a gyroscope, but it is only when a heavy body rotates very swiftly that this is noticeable.

The first principle is that of *rigidity in space.* In other words a gyroscope, once spinning, tends to keep on turning in the same position, regardless of other forces working on it. According to the laws of gravity a top-heavy body resting on a point should immediately fall over, but a top does not do so. The forces of inertia are strong enough to overcome the forces of gravity. Even if a top is pushed, it will skid sidewise rather than fall.

If a gyroscope is kept spinning, it will appear to lean over as the hours go by and, at the end of 24 hours, to have made one complete revolution. Actually it has not turned over; it has, according to the principle of rigidity in space, tended to keep on rotating in the same place with regard to space. What has happened is that the earth has turned under it and made the gyroscope appear to turn.

An attempt to move a gyroscope out of its plane of rotation will meet with considerable resistance. The force that the gyroscope develops to resist such movement is called a *torque.* If a bronze flywheel 8 inches in diameter and 2 inches thick, mounted so that it is free to turn in any direction, is spinning at 10,000 r.p.m. on a shaft 2 feet long, a weight of 350 pounds at one end of the shaft is needed to move the flywheel out of position.

The second gyroscopic principle is that of *precession,* which explains what happens when an effort is made to change the plane of rotation. When a top begins to run down, the upper end of it begins to sweep around in a circle—it wobbles. As it loses speed, it begins to lose some of the torque that kept it steady; the pull of gravity is now more important. It is trying to find the same plane as that of the strong force now beginning to make itself felt and to keep on rotating in it.

The earth itself is a huge gyroscope. It wobbles at the poles just as the top does. The reason is that the earth is not a perfect sphere, since it bulges at the equator, and this tends to throw the earth out of its plane of rotation. This force it resists by precessing.

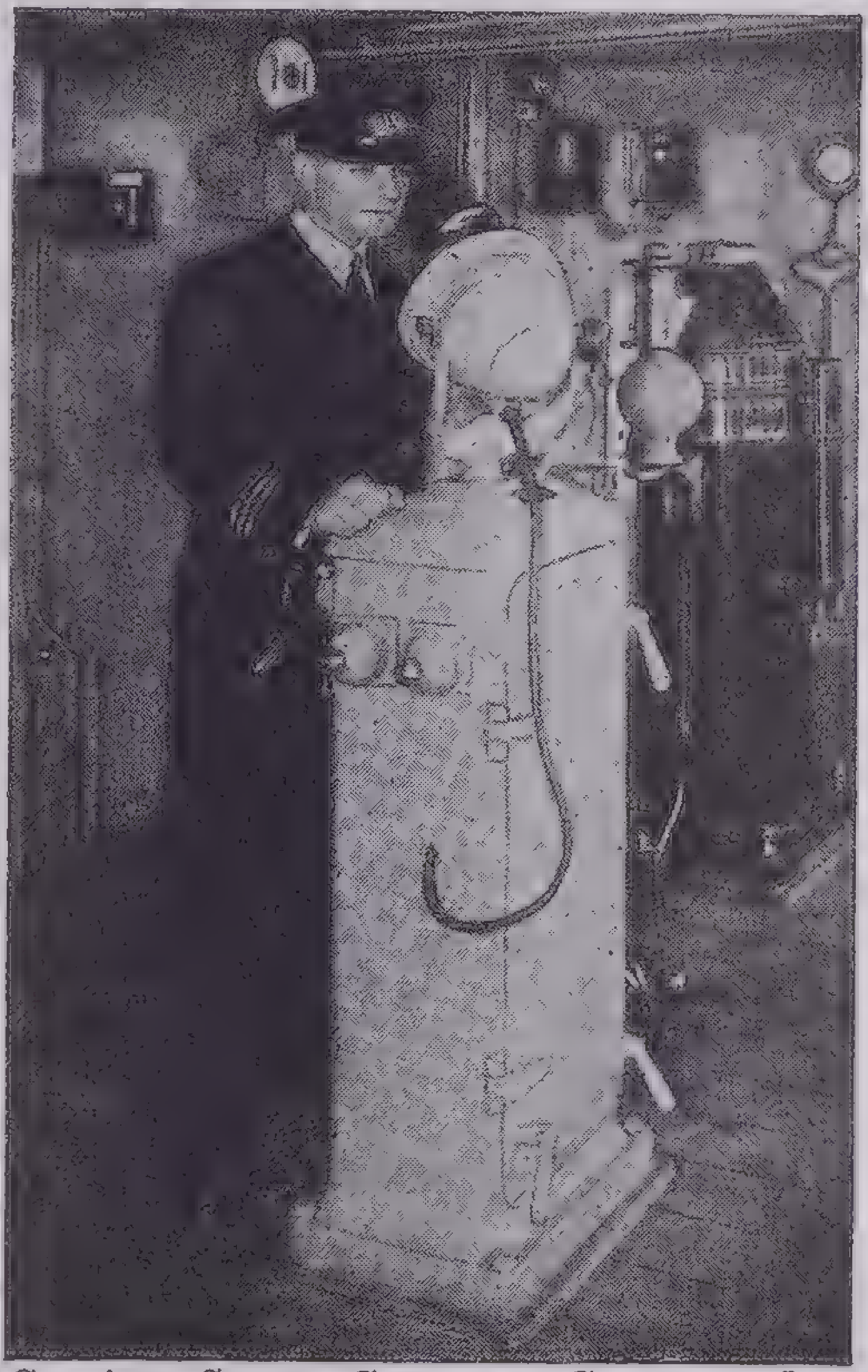
Men studied gyroscopic action long ago, for as early as 1487 Italian workmen were cutting spiral grooves, which we now call rifling, in gun barrels. The purpose is to give gyroscopic action to a bullet by rotating it swiftly in flight, so that it will fly truer. Gyroscopes were next applied to torpedoes, to keep them on a straight course. Such apparatus was developed by Luppis in Austria (1860) and Robert Whitehead (1870), a Scot, who had helped Capt. Luppis of the Austrian navy when Whitehead was an engineer in Fiume.

From time to time for many years experimenters have tried to work out a *monorail system*—a one-rail track on which cars are held steady by gyroscopes. A number of such systems actually have been built and used for a time, especially in Europe.

A really useful gyroscopic device is the *track recorder,* invented by the American, Elmer A. Sperry (1860–1930), who did more than anyone else to make the gyroscope useful. The track recorder automatically records the condition of a railroad track—the differences in elevation of the two rails, amount of rail spread and the depth of depressions in rails or of low rail joints.

In all useful applications of the gyroscope the flywheel is kept rotating at a constant rate by electric motors.

The first application of the gyroscope to ships was in 1911, when a *gyroscopic compass* or *gyrocompass* was installed on a merchant ship traveling between New York and Norfolk, Va. This also was developed by Sperry and was the result of many years of concentrated work. Because the earth rotates, a spinning body develops a torque that will tend to parallel its axis of rotation with the earth's axis. Since the angular velocity of the earth is only one revolution per day, this torque is very small; for example, if the bronze flywheel mentioned above were kept rotating at 10,000 r.p.m. with its axis in an east-and-west direction, the torque developed would be only about .004 pound feet.[1] Although this is small and decreases rapidly as the axis becomes more nearly parallel to the earth's axis, it has been found possible to develop several different methods of mounting to enable the gyroscope to respond to even so small a force.



Courtesy Sperry Gyroscope Company, Inc.

Gyropilot

This gyroscopic steering device, installed in an ocean liner, can steer the ship much more efficiently than a steersman

The two inherent advantages of the gyrocompass over the magnetic compass are: first, it indicates the true geographic north rather than the magnetic north that requires correction; and second, it is unaffected by the presence of iron and steel objects. Another advantage is that the gyrocompass is not affected by the rolling and pitching of the ship. Immediately following its first application to a merchant ship in 1911, it was adopted by the U.S. Navy. Today it is almost universally used on all large boats with the possible exception of some sailing ships. If the size of the vessel warrants it, the gyrocompass outfit usually consists of a master compass with others mounted at various places about the ship and electrically coupled to the master compass.

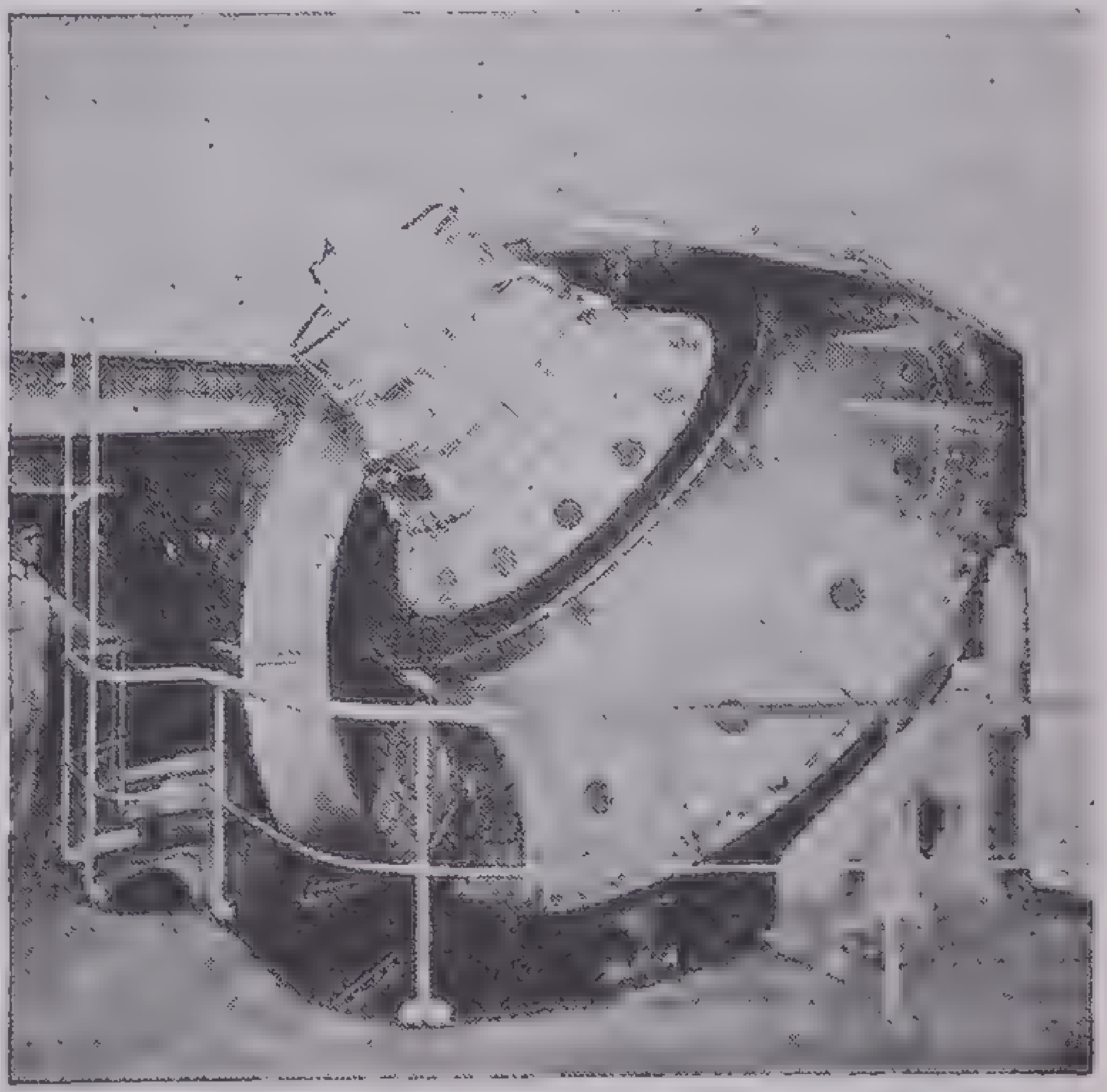
Gyroscopes are used also on battleships for establishing a base line for gunnery and on all types of ships for producing an artificial horizon when taking sights with a sextant.

Another apparatus, the *gyropilot,* controlled by the compass, can be set on a certain course and will hold the ship on that course perfectly.

Another interesting application of the gyroscope to ships is the *gyrostabilizer,* another Sperry invention. It reduces the roll of passenger steamers and pleasure yachts and thus reduces the stresses set up in the ship when it is traveling in heavy seas. The gyrostabilizer consists of a large gyroscope mounted on gimbals athwart the ship. When the sea is smooth, its axis is vertical; when the ship rolls, the stabilizer rotates about its bearings and produces a counter torque that opposes the tendency to roll. As an example, a stabilizer in a ship of 18,000 tons displacement limits the roll to 3 or 4 degrees, even in the roughest weather. For a ship of that size the flywheel would be about 13 feet in diameter and weigh about 225,000 pounds. The action of the stabilizer can be reversed and made to roll the ship. This is useful in working a vessel off sandbars or through ice.

The first application of the gyroscope to aerial navigation was in the form of a gyroscopic compass. Since the World War other devices have been developed and applied to various types of planes. These include bank-and-turn indicators, an artificial horizon, course recorder and finally, the gyropilot. The bank-and-turn indicator is a small instrument that weighs only a few ounces. It is so mounted as to be independent of rolling and pitching and therefore records only the turning movements of the plane. Such a device was used by Lindbergh on his flight from New York to Paris in 1927.

The gyropilot mechanically steers the plane and thus releases the pilot for other duties, such as radio communication, weather observations and the like, which is especially convenient in bad weather. Airplanes can be flown much more accurately by means of a gyropilot than by manual control. The gyropilot is a combination of



Courtesy Sperry Gyroscope Company, Inc.

Gyrostabilizer

This huge gyroscope is one of three installed in a transatlantic liner to reduce rolling of the ship. The man at the left indicates the comparative size of the unit turn recorder and horizon finder, that regulates the flow of oil to pistons, which in turn are connected to the steering apparatus of the plane and move it. A typical gyropilot with its auxiliary equipment weighs only about 60 pounds.

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[1] A force of 1 pound at a distance of 1 foot from the center produces a torque or moment of torque of 1 pound-foot.

heating and ventilating, maintaining the proper atmospheric conditions indoors to insure bodily health and comfort. The human body continuously generates and dissipates heat. It loses heat by radiation and conduction from the skin (evaporation of perspiration), and a certain amount passes off with the exhaled breath. The factors that affect the rate of loss are temperature of the air, humidity of the air and air motion. It is the problem of the heating-and-ventilating engineer to regulate these variables in such a way that human comfort is assured.

Heating systems are classified as follows: fireplace, stove, hot-air, steam, hot-water and district heating. The *fireplace* consists of a fuel container, an opening and a chimney made of brick or stone. Heat is radiated from the heated back wall of the opening. Only 20 per cent of the heating value of the fuel actually passes into the room; the rest is lost up the chimney. Although a *stove* is more efficient than a fireplace, it has various disadvantages—a separate stove usually is needed for each room and requires much space; it is unsightly; and the heat is inefficiently transmitted by radiation.

The development of the *hot-air furnace* removed the heating plant from the living quarters. The furnace consists of a firebox and flue surrounded by a metal casing. Air passing between the firebox and casing is heated and then made to flow through pipes to the various rooms of the house. One disadvantage of the hot air furnace is that the movement of the air depends entirely on the difference in temperature between the heated and the cool air.

The parts of a *steam-heating* plant are the steam boiler or generator, piping and radiators. Steam is generated in the boiler and flows through the piping to the radiators located in each room. The heat absorbed by the water when it is converted into steam is released when the steam condenses in the radiators. The simplest form is known as the single-pipe installation; the steam flows to the radiators and condenses, and the condensate trickles back down the steam line. Trapped air escapes through an air valve located in each radiator. The chief disadvantages of this system are the noise, the odor and the drip from the air valves. These drawbacks are overcome in the two-pipe system. A special thermostatic trap on the discharge side of the radiator allows the condensate and air to return to the boiler by a separate return pipe. A two-pipe steam-heating system that operates under very low pressure (a few ounces) is called a *vapor system*. If a vacuum pump is installed in the return line, the system is known as a *vacuum system*. This method improves the circulation throughout the installation and is used in all large buildings.

In the *hot-water systems* warm water circulates from the boiler through the radiators back to the boiler. As in the case of steam there are single- and double-pipe systems.

By *district heating* is meant the heating of a number of individual buildings by steam or hot water from one centralized plant.

Ventilation deals with the problem of keeping air in a condition proper for human health and comfort. It seems to have been first seriously studied in 1811, when Sir Humphry Davy surveyed the ventilation problems in the Houses of Parliament.

The supply of oxygen needed for life is an important phase of the ventilating problem. The average person requires about 425 cubic feet of air in 24 hours. Air that has passed through the lungs shows a decrease in oxygen content and an increase in carbon-dioxide content. Authorities usually set 4 parts of carbon dioxide in 10,000 parts of air by volume as the standard for pure air. It has been found that stuffiness of air is due mainly to odors and excessive temperature and humidity. Efficient ventilating systems tend to eliminate these factors. Ventilating systems range from the open window to elaborate fan arrangements.

hemp, the fiber of a plant grown principally in the Philippine Islands, used in the manufacture of high-grade rope and cordage. Hemp is also known as *abaca* and *Manila hemp*. The plant grows on warm, moist hillsides. The fiber is separated by soaking and beating, in much the same way that flax fiber is separated from its stalk.

incubator, a chamber in which a constant temperature and humidity can be maintained, for hatching poultry, for laboratory work with bacteria and for infant care in medical practice.

In the earlier forms of incubators hot water, oil lamps and gas jets were used as the source of heat. Modern types are heated by electricity because it is free from fumes and easy to control. In almost every case the supply of heat is regulated automatically by some form of thermostatic device. Such controls depend for their operation either upon the expansion of solids, such as the elongation of a metal bar when heated, or upon fluid expansion, such as the distension by heat of a flexible, liquid-filled bellows. In incubators these expansions may close valves regulating the flow of water or gas or may open air vents or move the electric contacts that control the heating element.

In bacteriological incubators there is usually no need to provide for humidification or circulation of the air, the prime requirement being the accurate control of temperature. Normally a temperature variation of ½° is permissible. In large laboratories complete rooms are maintained at constant temperatures and used as incubators.

An interesting form of incubator is that used for the care of infants too weak to be exposed to the open air. These incubators must be maintained at the proper temperature, and the humidity and circulation of air must be carefully controlled. These incubators are usually made in two sections. The infant is placed in the upper one, and the air is heated and humidified in the lower. Air is heated electrically and is moistened by passing it through wet cloth. A passageway is provided at one end through which the air can circulate between the two compartments.

The most familiar incubators are those in which baby chicks are hatched. The eggs are placed in trays, maintained at the proper temperature and left there until the hatching period; but they must be turned over from time to time, and moisture must be introduced as needed (this is determined on the basis of experience). Nowadays most hatching is done at large centrally located incubators instead of small ones on the farms. The central plants have better success because conditions can usually be accurately controlled by skilled operators.

internal-combustion engine, one in which the combustion of the fuel takes place within the cylinder of the engine itself. To the internal-combustion engine we owe the existence of the modern automobile, small tractor, airplane, war tank and many other power-driven devices. For all these gasoline engines are definitely superior to steam engines and other types of motors because they weigh less for a given power output. Small gas engines are almost as efficient as large ones, whereas small steam engines are much less efficient than large ones. Another advantage is that the internal-combustion engine delivers power immediately after starting.

In 1680 an experimental engine was built that used gunpowder as a fuel. The hot gases from the burning gunpowder filled the cylinder during the first part of the cycle. The gases were then cooled, which decreased the pressure in the cylinder, and atmospheric pressure acting on the open side of the piston caused the working stroke.

Beginning about 1800 many inventors tried to make a practical internal-combustion engine using liquid or gaseous fuel. In 1857 a free-piston engine and a crude spark ignition were proposed by Barsanti and Matteucci. In 1860 Lenoir designed the first engine having any commercial value; it was a horizontal, double-acting, reciprocating unit, with crank and flywheel, working on a two-stroke cycle, and benzene was used as fuel. Schmidt, in 1861 and Beau de Rochas in 1862 developed the four-stroke cycle. George Brayton invented a liquid-fuel engine in 1872, and it is interesting to note that his engine consumed gasoline. At this point a German inventor, Dr. Nicholas Otto, and Eugen Langen entered the field of internal-combustion engines and produced a free-piston engine that was a refinement of the Barsanti and Matteucci design. In 1876 Otto developed the famous Otto silent gas engine, a single-cylinder horizontal unit with sliding-plate admission valve and poppet exhaust valve. Otto's engine was the first to offer real competition to the steam engine, and it was the forerunner of today's automobile engine.

All these engines, however, were so heavy and slow that they could not be applied to vehicles for road use. In 1886 Gottlieb Daimler (1834–1900), a German, invented a small, light four-stroke internal combustion engine that operated at 800 r.p.m. It was first used to propel a bicycle; later, a car. Karl Benz (1844–1929), a German engineer, also worked out a light engine and made an automobile in 1885, which he patented a year later.

Most modern engines operate on the four-stroke cycle. First, on the intake stroke, the piston recedes down into the cylinder, drawing the fuel and air in through the intake valve. On the next upward piston stroke the charge is compressed. During compression the temperature of the gas rises, which aids greatly in igniting it. At the beginning of the next stroke the charge is ignited by the ignition system, building up a high pressure that pushes the piston down. On the fourth or exhaust stroke the exhaust valve is open and the burned gases are driven out as the piston comes up again. Power is applied, and the piston does its work, only during one-fourth of the whole cycle. A single-cylinder engine must have a large flywheel to keep it going during the other three-fourths of the cycle; but automobile engines and the like have a number of cylinders, which fire alternately to give a smoother flow of energy.

To get more power from an engine of a given size and to make it operate more smoothly the two-stroke-cycle engine was developed. This requires that the charge be somewhat compressed before it enters the cylinder, since it must enter and be ignited in a very short time. In some cases this is done in a separate cylinder, but more usually in the crank case of the engine, the under side of the piston compressing the gas. Such motors are used to some extent for motorcycles and very small power plants, but their performance is not usually so good as that of the four-stroke-cycle designs.

If the fuel is gaseous, it may be taken directly from the pipe line and mixed with air for use in the engine. For vehicle motors, however, it is usually necessary to use a liquid fuel, such as gasoline, mixed with air in a carburetor. In most gas engines the charge is ignited by a hot electric spark discharging between two electrodes inside the combustion chamber.

If there were no way of disposing of excess heat, the cylinders would become so hot that it would be impossible to maintain lubrication between the cylinder walls and the pistons. The most common cooling method is to surround the cylinders with water that is cooled in a radiator and circulated either by convection or by means of a water pump. In another method a blast of air cools the cylinders, which are usually equipped with fins to increase the exposed cooling surface.

Although the most important fuel for internal-combustion engines is gasoline, a number of other fuels can be used satisfactorily, and scientists are constantly in search of more. Theoretically an internal-combustion engine can use either alcohol or gasoline, but actually a gasoline engine would have to be redesigned in order to use pure alcohol efficiently. For this reason and also because it would hardly be possible to make enough alcohol to replace gasoline, the defenders of alcohol as a fuel advocate mixing the two liquids. At present blends containing up to 25 per cent alcohol are being used everywhere, especially in foreign countries where gasoline must be imported and is very expensive, costing perhaps 75¢ a gallon. The use of such blends is being urged in the United States to conserve the natural oil reserves and to aid the farmer by the use of farm products to make the alcohol.

The only other important type of internal-combustion engine is the Diesel engine, which burns cheap, crude fuel and requires no ignition system.

iron, the most useful of all metallic elements; it has several advantages that make it indispensable to modern industry. It ranks second among the metals as to abundance in nature (aluminum is first), and it can be easily and cheaply extracted from its ore. Almost every country has iron deposits.

Iron is magnetic, which makes it an essential in the electrical industries, such as the manufacture of motors, generators, telephones, telegraph and radios. By alloying it with other metals or altering the manufacturing process it can be made brittle or tough, hard or soft, pliable or rigid as required.

Most iron is obtained from four kinds of ore: hematite, limonite, magnetite and siderite. Because of its high iron content and the magnetic quality, *magnetite* is the best of the ores; it is an oxide, usually very dark, almost black, in color. *Hematite* also is high-grade ore; it is an iron oxide, reddish in color. *Limonite,* a brownish-colored ore, is an iron oxide combined with water; it is usually lower in quality than hematite. *Siderite* is an iron carbonate, usually yellowish brown. There is only one siderite deposit of any great importance—in the Cleveland Hills of England.

Although deposits of iron ore are fairly widespread, not all of them are now being used. Since smelting requires great amounts of fuel, an ore deposit cannot be worked economically unless it is near coal mines or near water transportation that will carry the iron to a coal region. There are other deciding factors, too, such as the depth of the deposit beneath the surface, the richness of the ore and the amount of impurities it contains.

The United States is the leading producer of iron ore, and fully 80 per cent of the output comes from the hematite deposits around Lake Superior. The iron-ore reserves of the Lake Superior district are the largest in the world, but they are by no means inexhaustible. Minnesota, Wisconsin and Michigan are the outstanding producers. The Great Lakes are highly important to the iron industry, as fleets of vessels haul the ore cheaply to Chicago, Cleveland, Buffalo and other lake ports, where it is smelted or shipped by rail to centers like Youngstown, Pittsburgh and Wheeling. The ore boats are specially constructed for rapid loading and unloading.

Despite its tremendous reserves and the enormous production of iron ore the United States exports very little (some goes to Canada, again by way of the Great Lakes), but some is imported, particularly along the eastern seaboard. The blast furnaces of this area are more cheaply supplied with ore from Chile and Cuba than from the Lake Superior district. The total amount of trade, either import or export, is relatively small.

Canada and Newfoundland have considerable reserves of iron ore, but only two sections are producers worthy of mention. The south coasts of Newfoundland and of Nova Scotia produce some for local use and export a little to the United States.

The principal producing section of Europe is the Lorraine field, which extends through parts of Belgium, Luxembourg, France and Germany. This ore is limonite, and because of its phosphorus content it could not be smelted by the early Bessemer process. When the Bessemer process was improved, and the open-hearth furnace invented, the European ores came into use.

Coal to smelt the iron is available from the Ruhr and Saar districts of Germany, and there is a well-developed network of rail lines and canals to tie the Lorraine ore to the German coal. Although this section could be a complete unit for iron and steel production, it has been cut up by political boundaries to such an extent that full development is handicapped.

Great Britain has large deposits of siderite, many of which are nearly exhausted or are of low grade. Consequently the British steel industry depends in large measure upon imports of iron ore from Spain and Sweden, both of which are important producers and have large reserves, although neither of them uses much ore; most of it is exported.

Russia has great quantities of iron ore, and some of her deposits are very rich. The major producing areas are in the southeast and near the Ural Mountains.

The other countries of the world are very small producers. There are fair-sized reserves in India, and some iron is made for local use. Japan is almost completely lacking in reserves. China may or may not have large amounts of iron ore; the answer must wait upon more thorough exploration of the country. In South America, Brazil has a tremendous reserve in the state of Minas Geraes, but the complete absence of coal has delayed its development. Chile has developed her deposits for export to the United States.

iron and steel manufacturing, by far the most important of the metal industries. Nearly 50 times as much pig iron as copper (second in importance) is consumed in a normal year in the United States, where iron and steel are particularly important, as it normally manufactures about half of the world's supply. Their great significance in the United States is also explained by the wide use of machinery in the industries and the high standard of living. People demand huge amounts of manufactured goods, and machines can manufacture these standardized products more cheaply and more quickly than they can be made by hand. This would not be possible without a cheap and suitable metal, and iron fills all the requirements.

In addition the great size of the United States has led to the development of an elaborate transportation system. The railroads are among the largest consumers of iron and steel goods. Very important too, is the plentiful supply of coal, iron ore and limestone, the raw materials essential to the iron and steel industry.

The industry is a very complicated business organization. Some companies smelt the raw ore into pig iron, refine it into steel and shape or fabricate it into some finished product. These companies may operate their own mines and quarries, furnaces, rolling mills, foundries, fabricating shops and even the railroads and steamships that carry the raw materials or the finished products. In fact large-scale operation is characteristic of the industry. Steel is "big business." Some seven companies in the United States account for about three-fourths of the steel produced here; but steel is manufactured in over 400 plants scattered throughout 29 of the 48 states. Many of these plants, though, are small and carry on only one operation, such as fabricating wire, pipe or some small article. Four major areas produce most of the steel. The eastern district (including New England, parts of eastern Pennsylvania, New Jersey and Maryland) produces about 9 per cent of the pig iron and about 11 per cent of the steel; the Pittsburgh district (including western Pennsylvania and the Ohio River district) produces about 36 per cent of the pig iron and 38 per cent of the steel; the Great Lakes district (extending along the lakes from Minnesota to New York) produces about 39 per cent of the pig iron and 42 per cent of the steel; and the southern district (including parts of southern Ohio, Virginia, West Virginia, Kentucky, Tennessee and Alabama) produces about 16 per cent of the pig iron and about 7 per cent of the steel.

The eastern area is the oldest, and its origin goes back to Colonial times. A certain amount of local ore and limestone was available. The forest furnished wood for the charcoal used as fuel. The district was further favored when anthracite coal displaced charcoal in the smelting operation; but the area soon came into competition with more abundant and cheaper Great Lakes ores and the bituminous coal (in the form of coke) of the Pittsburgh district and became less and less important. Today its chief advantages are nearness to a big market area and to seaports at which relatively cheap foreign ores (Chilean and Cuban) are received. The growing use of scrap iron as a raw material has led to a certain revival of the eastern district in recent years.

The Pittsburgh district for a time depended on local supplies of iron ore and fuel. It was not until coke became the major fuel for smelting that this region, with its great deposits of bituminous coal, achieved phenomenal success. Local ore, never abundant, was soon used up, and iron ore had to be imported from the Lake Superior deposits. The Pittsburgh area, although it was once supreme and still is a great producer, is losing in relative importance, especially to the Great Lakes district.

The Great Lakes district developed after the Civil War. It grew up to meet the demands of the expanding West and to supply the railroads being built into that area. The district has several advantages. Lake Superior iron ore can be carried over an all-water route; coal is available from the southern Illinois and Appalachian fields; the district is in the center of a great market, which uses many iron and steel products in the manufacture of railroad supplies, automobiles and agricultural machinery.

The southern district is not unified. Parts of it are old and have declined greatly in recent years. The region around Birmingham, Ala., is the most important. Here all the raw materials, iron ore, coal and limestone, are found close at hand. The greatest handicap is the lack of a local market sufficiently large to absorb the possible production; but since the South is becoming more important as an industrial section, the southern iron and steel industry may develop rapidly.

Manufacturing iron and steel is not a simple process. Pure iron is seldom found; rather, it is combined with other elements in the form of ore. Some of these foreign materials are desirable; others are not. The most important of the desirable ingredients is carbon, which is present in large or small amounts in all types of iron and steel. By varying the amount of carbon, steel makers can produce iron and steel with widely differing characteristics and properties. There are other differences, but the carbon content is of extreme importance.

Pig iron is the basic material of all iron and steel production. It is obtained by smelting iron ore in a blast furnace. The blast furnace is a tall (90 to 100 feet) cylindrical furnace about 20 feet in diameter, lined with firebrick. Four raw materials are put into this furnace: iron ore, coke, limestone (which lowers the melting point of some of the ingredients and absorbs some of the impurities) and hot air. Sometimes scrap iron or steel is substituted for part of the iron ore. The hot air is forced into the bottom of the furnace; the oxygen of the air combines with the carbon to produce heat. As a result of this action three products are obtained: molten iron, molten slag (made up principally of limestone and the earthy materials of the ore) and an inflammable gas. The molten metal is taken in huge ladles to the steel mills to be converted into steel or is poured into molds to become pig iron.

Pig iron is limited in its usefulness; it is hard and brittle because it contains much carbon and will break easily. The only way it can be formed for use is by casting it into molds of desired shapes. Steam radiators, for example, are made from pig iron in this way.

For a long time men looked for ways of removing the impurities in pig iron, particularly the high carbon content. Finally the *puddling furnace* was developed. A flame is directed against the surface of molten pig iron. A man with a long metal rake *puddles* the metal; that is, he stirs it, exposing fresh surfaces to the flame. Gradually the flame burns out the carbon and other impurities, and the mass changes from a liquid to a paste. This is then removed and further processed in the rolling mill. The resulting metal is known as *wrought iron.* Because it is so soft, it can be worked into shapes either while it is hot or after it is cold, without breaking. Although wrought iron is a very useful metal and suitable to many uses, it has the disadvantage of being expensive.

Pig iron and wrought iron failed to meet all the demands for an effective metal. Man needed something that was cheap to produce and yet possessed toughness and strength. There was little real advance until after 1850. Then, within a period of 10 or 15 years, two different processes were discovered—the Bessemer and the open-hearth—that made cheap steel a reality. Both are extremely simple.

The *Bessemer method* consists of forcing air through molten pig iron in a container. As the air bubbles through the pig iron it burns out the carbon and other impurities. The product is not unlike wrought iron. To this a carefully measured quantity of carbon is added, depending on the quality of steel desired. The *open-hearth method* is really a refinement of the puddling process. In order to keep the iron in a liquid rather than a pasty state, as in the puddling furnace, the temperature is kept exceedingly high by preheating the fuel.

In the *Bessemer process* the impurities in the pig iron are oxidized or burned out. Air is blown through molten metal, and the oxygen combines chemically with the carbon, silicon and manganese. In every ton of molten pig iron there are approximately 70 pounds of carbon, 25 pounds of silicon and 15 pounds of manganese. The combination of these materials with the air provides the fuel for the converter in which the process takes place and no outside combustible is needed.

The *Bessemer converter* is like a huge metal egg swung "amidships" on pivots. It is lined with refractory (heat-resisting) bricks and is open at the top. Air from a blast pipe is admitted through one side. The converter can be swung to a horizontal position for loading and discharging and to an upright position for the operation called *blowing* (forcing the air through the liquid iron). Molten metal is introduced into the converter, which is then swung to an upright

Courtesy Carnegie-Illinois Steel Corporation

The Story of Steel

1. An open-pit iron-ore mine at Hibbing, Minnesota. The mine has been excavated in a series of terraced steps.
2. Great Lakes freighters like the one shown here carry ore from the mine country to lower lake ports. Ore from railroad cars runs down the chutes into the ships.
3. A river of molten iron runs from the blast furnace into a ladle. It will be carried in the ladle by a crane to the steelmaking department.
4. The huge egg-shaped object is a Bessemer converter in which iron is being changed to steel. Burning gases rush from the top.
5. Mechanical hands lift a white-hot steel ingot from the soaking pit, a heated chamber in which the ingot has taken on a uniform temperature throughout.
6. The ingot passes through a series of rollers that reduce it to usable size. Most steelmaking equipment is very large.

Courtesy Carnegie-Illinois Steel Corporation

Open-Hearth Steel

At the left is a scene familiar in industrial regions—the exterior of an open-hearth plant. A blast furnace is at the left. The tanks in the center are called stoves. In them hot gases from the steelmaking process give up their heat to air that will flow preheated into the steelmaking chamber. To the right of the stoves is a dust catcher that cleans the exhaust gases before they enter the stoves. The picture at the right shows molten steel being discharged from an open-hearth furnace.

position. Air is blown through for 10 or 15 minutes. When the blowing is completed, the converter is turned down again to a horizontal position and the metal is poured into ladles. The Bessemer furnace can handle from 15 to 20 tons at one time.

The *open-hearth process* employs a furnace that can handle up to 300 tons at one charge. The furnace is a low rectangular structure with walls of firebrick. It is similar in principle to the puddling furnace in that the molten metal is held in a shallow open hearth and heated by gas flames beating upon the surface. The raw materials—molten pig iron, cold scrap, limestone and iron ore—are charged into the furnace on one side; the finished products of the operation—raw steel and slag—are withdrawn from the furnace on the other side.

On both sides of the furnace there are two chambers lined with checker-bricks. Air passes through one, gas through the other. (The gas is usually that generated by the blast furnace.) One set of chambers is closed, and air and gas from the other set is allowed to flow over the molten metal in the furnace. Combustion takes place when air and gas meet, and the burning gas plays over the metal for about 15 minutes. It is then allowed to escape through the other set of chambers. The checker-bricks which line the chambers are porous refractory bricks that absorb a great deal of the heat from the outflowing gas. They are arranged with alternate open spaces in such a way that they permit the flow of the gas and absorb its heat. New gas and air are then allowed to pass between the heated bricks and are thus preheated. Then they pass over the molten metal as described above and, eventually, out the other set of chambers. Preheating the fuel and passing the gas and air from one side to the other gives much higher temperatures in combustion than would otherwise be attained. The production of steel by this process requires from 8 to 10 hours.

Although these two processes of making steel came into existence about the same time, the open-hearth output leads the Bessemer ten to one, although Bessemer was the leader until about 1905. This seems rather curious since the plant investment per ton of capacity is only about one-fourth as much for the Bessemer as for the open-hearth; the Bessemer process is completed in minutes instead of hours; and the whole operation requires no fuel. The supremacy of the open-hearth method is explained by two factors—quality and cost.

The quality of steel is adversely affected by the presence of phosphorus. It was soon found that the Bessemer process could not handle iron that contained more than 1/10 of 1 per cent of phosphorus. Finally a method was discovered by which ores with a high phosphorus content could be used. The converter was lined with limestone instead of the sandstone that had previously been used. However, this new method would not work satisfactorily with ores of less than 2 per cent of phosphorus. Unfortunately most of the ores of the United States had a phosphorus content intermediate between what could be used in the sandstone-lined (so-called *acid Bessemer*) converter and the amount that the limestone-lined (*basic Bessemer*) converter could handle.

The open-hearth furnace will handle ores of the intermediate type; permitting the use of cheap domestic ores. Moreover, the Bessemer converter handles only molten pig iron, whereas the open hearth will take scrap iron and steel in amounts ranging from 40 to 60 per cent of their output. Another quality factor also favors the open-hearth process. During the 8 or 10 hours of operation frequent tests can be made and any necessary ingredient can be added in exact proportions. In 1870 an Englishman, Benjamin Huntsman, made an important contribution by his invention of *crucible steel.* Originally the crucibles were made of clay, but later the development of graphite crucibles by Joseph Dixon revolutionized the crucible industry. Clay crucibles are still used for making high-grade tool steels, in which the carbon content must be carefully measured; the graphite carbon would affect the process. Graphite crucibles are used to make steel for casting purposes.

In either case a charge of steel mixed with coke is fired in a preheated crucible. Impurities are driven out by heat and the presence of such chemicals as manganese. High-grade steel can be made in this way, but the process is not suited to large-scale production. Nowadays the electric furnace competes strongly with the crucible process.

The *electric furnace,* which operates on heat generated by electricity, is also used for making steel. It was invented in 1880 but did not come into commercial use until about 1900. The electric furnace is a spherical steel shell lined with refractory bricks. The raw materials are put in at the top or through a door in the side; the finished product is poured out through a spout by tipping the whole furnace. The heat is furnished by electricity conducted into the roof of the furnace by electrodes. Mechanically and chemically the electric furnace acts in the same way as the open hearth, except that the oxidizing influence of the gas flame is absent. It usually requires about 4 hours to complete the refining of a charge. The electric furnace has certain advantages. Higher temperatures can be achieved; the heat can be controlled; greater cleanliness is possible because no impurities are introduced by the electric current; the equipment takes up less space; there is a better assimilation of alloys. In fact, this method is used almost exclusively for making high-grade steel alloys.

irrigation, artificially watering soil to promote the growth of crops. Irrigation usually is not resorted to except when there has been a large increase in population in a region of limited arable land or an actual decrease in the arable acreage following climatic changes, such as decreased rainfall. In either event a choice must be made between migration and irrigation, or starvation becomes imminent.

At least as early as 4000 B.C. in Egypt water was carried from the Nile in buckets and goatskins and poured on the crops. Although this now seems a very primitive method, it is still employed in China and other countries, including the United States, to sustain small garden or truck patches through the dry summer months.

The first improvement was probably the device known in Egypt as the *shadoof.* A long pole with a bucket at one end is supported and pivoted near the butt, which is heavily counterweighted. The bucket can be quickly lowered into the water by pulling down on a rope, and when it is released, the bucket is as quickly raised by action of the counterweight. In this way water is lifted from the river during the low water stages and dumped into irrigation ditches extending back from the top of the bank high above the river level. If the total height through which water is to be raised is greater than the range of a single shadoof, it can be raised in steps by a series of them.

The first power-driven device was a water wheel of openwork construction, usually made of bamboo. Small wooden buckets were fastened around the outside edge, and the wheel was mounted in an upright position so that it dipped down into the water. When it was revolved, the buckets would fill at the bottom and discharge into a trough while passing over the top. An alternative type consisted of an endless rope belt to which small buckets were fastened. This passed over a grooved pulley and hung down into the water, operating in much the same manner as bucket-and-chain pumps of today. These primitive pumps were driven by animal power supplied by donkeys, oxen or camels. They followed a circular track in pulling around a horizontal pole called a sweep connected to the pump by a system of toothed wheels and axles.

Such pumping arrangements proved satisfactory because they produced an almost continuous stream of water with very little attention other than that involved in keeping the animal in motion. They are still in use in many parts of the world. In China alone there are thousands placed regularly along the banks of the rivers. They are driven by a sweep, a human treadmill or even by water power, as the discovery was made that if the wheel were equipped with inclined vanes in addition to the buckets and set in the stream at an angle, the force of the current would operate it.

About 230 B.C. the Greek Archimedes developed an exceedingly ingenious arrangement known as the *Archimedes Screw,* somewhat similar in appearance to an auger bit. It consisted of a central shaft around which was wound a continuous spiral metal fin. This was mounted so as to make a fairly good fit in a wooden pipe. The pipe was usually between 1 and 2 feet in diameter and 8 to 10 feet long. If this arrangement were placed at an incline with its lower end dipping into the water, and the shaft were then rapidly rotated in the proper direction by means of a crank, water could be lifted at an appreciable rate. Similar devices, now motor driven, are still used to get water from deep wells and to carry grain to elevators. When they are used in a horizontal position to carry grain, they are known as *transveyors.*

Another old irrigating method used where a river had a sloping bed was to dig a canal along the bank for some distance upstream, so as to connect with the river at a much higher elevation. Water would then flow down this canal and could be transmitted to the points needed by a system of intersecting ditches. At low water stages the river was dammed with a structure of brush, stones and mud or clay, so as to back up the water into the irrigating canal. Such a construction (known as a *weir* or *barrage*) saved a great deal of digging as it raised the level of the canal.

From Egypt the practice of irrigation spread rapidly to other parts of the world: first to the Tigris and Euphrates valleys, then to Europe, India and China. Today it is practised on every continent and on many of the larger islands. Some idea of its importance can be gained by a study of the accompanying table, which gives the amount of land under irrigation in the countries where the practice is carried out on a large scale.

World Areas Under Irrigation

Country	*Acres*
India	50,000,000
United States	20,000,000
Russia	8,000,000
Japan	7,000,000
Egypt	6,000,000
Mexico	5,700,000
Italy	4,500,000
Spain	3,500,000
France	3,150,000
Chile	3,000,000
Java	3,000,000
Argentina	2,000,000
Siam	1,750,000
Morocco	1,500,000
Australia	1,000,000
China	1,000,000
Peru	800,000
South Africa	800,000
Canada	400,000
Algeria	400,000
Philippines	250,000
Hawaii	200,000
British Guiana	100,000
Cuba	50,000

Only the methods of storing the water have been improved; the water is still conveyed to the fields through ditches just as it was in antiquity. In modern times irrigation dams are of stone or masonry, built squarely across a river. In this way all available water can be impounded for distribution, and the energy of the water can be turned into electric power.

In the United States irrigation was probably first started in the Southwest by the conquering Spaniards and is still confined principally to the western states where, although there may be an annual rainfall as great as 5 to 20 inches, only a small proportion of it is actually received during the growing season.

jute, a vegetable fiber used in the manufacture of burlap, gunny sacks, rugs and coarse cloth. It is obtained from a plant raised almost exclusively in the Ganges-Brahmaputra delta of northern India. The plant requires plenty of moisture (supplied by the monsoon rains), bright sunshine, high temperatures and good soil. Jute soon exhausts the fertility of the soil. It can be raised year after year in the Ganges delta because the rivers overflow every year, like the Nile in Egypt, and deposit fresh, fertile soil. Most of the fiber is made up into various products in or near Calcutta, India, but some is sent to the United States and the countries of northwest Europe for manufacture.

Courtesy Armstrong Cork Company

Cutting Jute in India

kaolin, a white clay, hydrous aluminum silicate; it makes up about 40 per cent of the raw materials used in pottery. Kaolin gives translucency and a nonporous structure to porcelain and stands firing without becoming discolored. Strictly speaking the clay should be called *kaolinite* and the word *kaolin* applied to a mixture of clay and rock, which occur together in nature and have the same chemical composition.

Kaolin was found originally in China and was named from a Chinese locality. Most of the kaolin used in the United States is imported from Devon and Cornwall in England, although there are small local supplies in North Carolina, Delaware, Pennsylvania, Maryland, Connecticut and Colorado. A clay almost exactly like kaolin is found abundantly in Missouri and Texas; it is extremely useful and is coming into wider favor in pottery making. Besides its use in pottery kaolin is mixed with graphite to make lead pencils and is used as a *filler* for paper and textiles.

kerosene, a hydrocarbon oil obtained principally from petroleum and burned for heat or light. Before the widespread use of electricity and gas in homes it was the most important product taken from crude oil and was the civilized world's chief illuminant. Kerosene is sometimes called *coal oil,* a name that originated in early days when most kerosene was obtained by distilling bituminous shale. Although its use as an illuminating fuel has declined, it is increasingly valuable for heating purposes and as a source of power, as in farm tractors. In the United States 56 million barrels of kerosene are produced every year.

kiln, an oven or furnace for burning, roasting or drying in industrial processes. Burning action is involved in reducing limestone to lime, in firing pottery, brick, tiles and certain abrasives and in charring wood to make charcoal. Roasting ores and other materials drives out such substances as moisture, volatile matter, carbon dioxide and sulphur compounds. Drying is a low-heat process whose main purpose is to drive away moisture, as in the artificial seasoning of lumber.

Kilns for making charcoal, brick and lime have been used in this country since early Colonial days. In brickmaking, however, the kilns were constructed of the bricks themselves, a practice that has persisted in many parts of the country to this day. The early lime and charcoal kilns were either of brick or stone; wood or coal was used as a fuel in the lime kilns, whereas the charcoal kilns were self-sustaining. Today kilns are made of brick, stone or even steel; and coke, oil or gas may be used as a fuel. Present-day kilns are classified according to purpose, type of construction and method of operation.

lampblack, a black coloring pigment, almost pure carbon. The smoke of a candle or an oil flame is lampblack in a somewhat impure state; for commercial use it is made by burning tar, petroleum, pitch, rosin and so on in a fireplace that does not admit enough air for complete burning. The dense smoke passes through a flue into large chambers where it collects on the sides; that from the last chamber is the purest carbon deposit. This soot is the ordinary lampblack used in making printer's ink. After further purification it is used also as a pigment in the manufacture of artist's colors and India ink. For centuries the blackest and smoothest lampblack has been made by burning ivory or bones.

lead, one of the nonferrous metals most important in modern industry. It is easily worked and shaped, is highly resistant to acids and has a low melting point. About 60 per cent of all lead produced is used for paint, for storage batteries, as a covering for electric cables, in the manufacture of ammunition and in the building and chemical industries. Lead is rarely found free in nature. Most of it comes from ores (principally galena or lead sulphide) that also contain other metals, such as zinc or silver.

North America produces about 50 per cent of the world's supply; and the United States alone, some 40 per cent—about 15 to 16 million short tons with a value around two billion dollars. The chief area of production in the United States is in the so-called tri-state district, where Missouri, Kansas and Oklahoma meet. Many of the western states also are important producers. Canada, Mexico, Silesia in eastern Europe and the Broken Hill district of Australia all produce considerable amounts of lead.

Mines in the Missouri district are not deep, ranging from 100 to 700 feet below the surface; western deposits are deeper. Lead ore is found in thick horizontal veins, like underground blankets. As ore is taken out, huge underground caverns form, the roof supported by enormous pillars of rock left for that purpose. Such caves may be 100 feet high, and there is one in Missouri 3 miles long.

The ore is ground to a fine powder and put into tanks of water that contains air bubbles, oil and certain chemicals. The rock particles sink, but the metal-bearing particles come to the top, are scraped off and go to smelters where the metal is melted out. There is much mystery about this flotation process; science does not yet clearly understand how it works, although most lead, zinc and copper are separated out in this way.

Lead is used in many forms; it is shaped into sheets, tubes, pipes and small balls for shot. Mixed with antimony, tin and other metals in different proportions it becomes type metal or storage-battery plates, solders; metal for casting small objects, such as toys, bearings and low-melting-point metals that operate fire-preventing sprinkler systems.

leather, the tanned or cured hides or skins of cattle, sheep, goats, horses, swine, kangaroos, ostriches, lizards, snakes, alligators and sharks. The leather industry puts products worth nearly one-third of a billion dollars on the market every year. This includes the value of tanning, as well as the value of manufacturing the leather into finished products. About four-fifths of all leather used goes into the manufacture of shoes. The remainder is made up into gloves, belts, luggage, garments, harness and many other things.

Tanning is a very simple process, but skilled workmen are required to carry it out. The methods in use today have not changed greatly since Colonial times, when almost every community had its own tannery. In those days the hides were first soaked in running water to make them pliable, and the layer of fat on the inside and the hair on the outside were scraped off. The hide was then tanned into leather by soaking it in a solution of water and tanbark (obtained from oak or chestnut trees) to prevent the fibers from rotting or turning to glue. The leather was then made firm or pliable according to the purpose for which it was to be used. The whole process was very slow, and it usually took from 9 months to 1 year to tan a hide.

Today the same operations are performed by machinery. Chestnut is still the most important source of tannin, the essential element of tanbark. Tannin is also obtained from the quebracho (a South American tree), the gambier, valonia, logwood, mangrove, spruce and sumac. In the late 1880s the leather industry was revolutionized by the discovery that certain chromium salts (sulphate, chloride), if used instead of vegetable tannins, simplified and speeded up the tanning process. Now this *chrome process* is used almost exclusively in making light leathers; and leather can be tanned in a few days.

Since the Civil War the industry has undergone many changes. In 1870 there were 7,500 tanneries employing about 35,000 workers in the United States. In 1935 there were only 384 plants and about 54,000 workers. Much more leather is tanned today than in 1870, but the tanneries are fewer and larger; furthermore, each tannery specializes to a large degree; each produces a certain kind of leather. They may be roughly divided into tanneries that produce heavy leather and those that make light leather.

The *heavy leather* branch of the industry produces leather from hides of large animals—cattle, horses or oxen. This leather is used for shoe soles, machine belts and harness. Four or five big companies produce most of the heavy leather. Their plants are located in Pennsylvania, West Virginia, Tennessee, Kentucky, the Carolinas and Michigan.

Light leather is manufactured from skins and *kips*. Kips come from small beef cattle, calves, sheep, lambs, kids, pigs, kangaroos or other small animals. The United States produces 85 to 90 per cent of all the hides it uses but imports more than half of the skins and nearly half of the kips used in the light-leather industry. Skins and kips come from Argentina, Australia, New Zealand, India, Brazil and the Union of South Africa. Most hides are tanned by the use of vegetable tannin. Skins and kips are usually tanned by the chrome process.

With new methods heavy leathers can be made in about 100 days. Light leathers can be made in a much shorter time, but the process is very complicated and calls for extensive equipment and highly skilled labor. The plants are much smaller and more numerous than in the heavy-leather industry. Light leather goes into shoe uppers, gloves, handbags, bookbindings and novelties. Partly because many of the skins and kips used in the production of light leathers are imported, most of these tanneries are in the Middle Atlantic States, near the seaports.

lighthouse, a tower or other structure with a strong light placed at a channel, port or point of danger to serve as a guide or warning to mariners. The earliest lighthouse of which there is any record was built in 300 B.C. on a small island in the harbor of Alexandria, Egypt. It is said to have been 550 feet high. In modern times the first lighthouse of any importance was the Tour de Cordouan at the mouth of the Garonne in France; it was begun in 1584 and completed in 1610. This lighthouse is 197 feet high.

The first lights were simply wood fires; later fires were made with coal. It is not known when oil was first used as an illuminant. A few years prior to the French Revolution parabolic reflectors, a great improvement in lighting, were introduced. They are made of sheet copper plated with silver and formed into a parabolic curve, and they throw the light forward in a horizontal direction. In another method now in general use the rays from a central lamp are transmitted by a combination of lenses that surround the lamp. Electric lights are used wherever current is available.

Lighthouses are classified by the type of signal sent out by the light. In *fixed lights* the light is steady. *Flashlights* blink on and off rapidly; the light appears to twinkle. In *intermittent lights* the light appears and disappears suddenly, but with longer intervals than in a flashlight. In *occulting lights* the light is interrupted by very short periods of darkness. *Revolving lights* are those which sweep a beam of light around a complete circle, so that when they are seen from any one point they appear and disappear gradually and regularly.

The periods of light and darkness vary from lighthouse to lighthouse and are known to mariners. They can identify a lighthouse and hence their position by observing the timing of the light.

Many lighthouses today also are equipped with radio beacons, so that ships can locate and identify them in foggy weather.

The most famous lighthouses are perhaps the Eddystone, the Bell Rock and the Skerrymore lighthouses in the British Isles. The Eddystone stands about 15 miles south-southwest of Plymouth. The treacherous rocks at this point have been marked by a lighthouse since 1696. Winstanley, the builder of the first, disappeared with his tower in 1703 during a terrific gale; the second burned in 1755. The third tower was a stone structure built by John Smeaton in 1756; it might be standing today if the rocks upon which it was built had not begun to crumble. The present one was built about 50 years ago.

The Bell Rock Lighthouse is in the North Sea about 22 miles east of Dundee, Scotland. The first lighthouse there was built by Robert Stevenson, under the direction of John Rennie, between 1807 and 1810 and is still in use. Directly west across Scotland from Bell Rock stands Skerrymore Lighthouse on a reef in the Atlantic. This was built by Alan Stevenson, son of the Robert Stevenson who built Bell Rock. Skerrymore Lighthouse was begun in 1838 and completed in 1843.

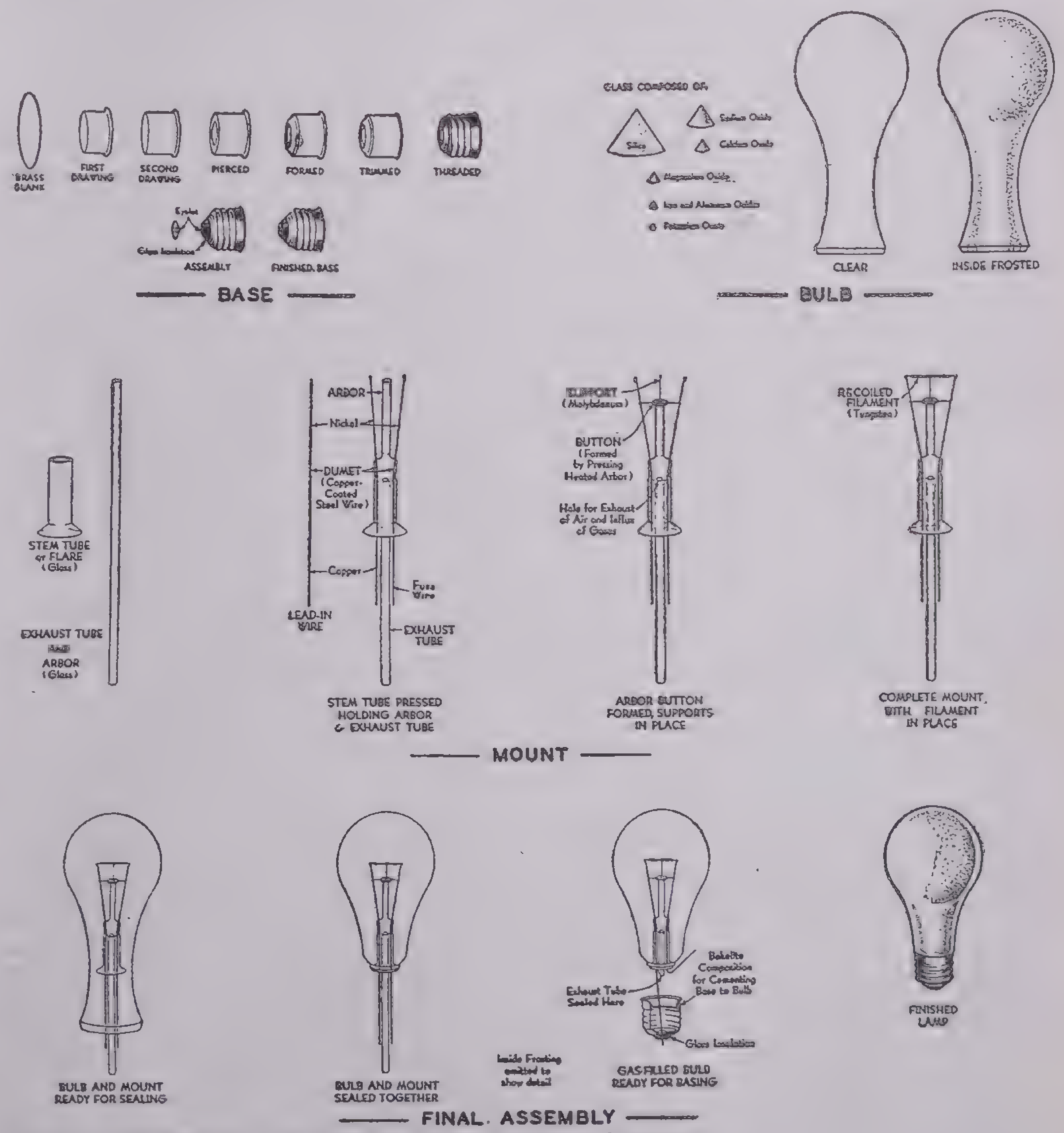
The first American lighthouse was built in 1716 at the entrance to the harbor of Boston and has since been replaced. The Sandy Hook Lighthouse at New York, which was erected in 1764, still stands. The two most noteworthy American lighthouses are Minot's Ledge and Spectacle Reef. Minot's Ledge stands at the southern entrance of Massachusetts Bay. This lighthouse was designed by Joseph Gilbert Totten, Chief Engineer of the U. S. Army, and was built by Barton Stone Alexander of the Corps of Engineers in 1855–60. The building of Minot's Ledge was in many respects a more difficult task than any of the three notable early British lighthouses had been, because only a part of the Ledge was bare at low tide. The lighthouse at Spectacle Reef was built in 1870–74 by Orlando Metcalfe Poe, General in the Corps of Engineers, and in some respects is similar to the one on Minot's Ledge. It is off the coast of Michigan in Lake Huron and more than 10 miles from the southeast end of Bois Blanc Island. Because this lighthouse stands at a point where the rock is 11 feet below water, it must withstand waves and ice packs that have arisen occasionally to a height of 30 feet around it.

lighting.—For thousands of years man's only source of artificial light was the open flame. As civilization progressed, new and better light-giving materials were burned to create the flame, such as natural and artificial gas, but it is only within the last century that the flame has given way to more efficient sources of light.

Even when all artificial light came only from wood fires, man found that the resinous woods were particularly suitable, a favorite being the pine knot. In some cases the resins were extracted from wood and burned in open vessels. Many kinds of oil and grease have been burned in lamps, such as oil from fruits and nuts, animal fats and, more recently, the mineral oils extracted from petroleum.

Candles have been used throughout the Christian era. The first candles were merely pieces of wood dipped in tallow. Later a mixture of beeswax and tallow was found to be better, and the wood splinter was replaced by a wick of cotton fibers. For a long time a favorite candle material was spermaceti, a waxy substance obtained from the heads of whales. Modern candles are usually made of paraffin wax and stearin (a hardening agent derived from animal fats).

Primitive *oil lamps* were not very satisfactory because of their ineffectual lighting and smoky flame. They were much improved when in 1784 Argand equipped the oil lamp with a glass chimney. Smoke is caused by incomplete combustion due to lack of air, and the lamp chimney increases the supply of air to the flame in the same way that a chim-


BRASS BLANK
FIRST DRAWING
SECOND DRAWING
PIERCED
FORMED
TRIMMED
THREADED
Eyelet
Glass Insulation
ASSEMBLY
FINISHED BASE
BASE
GLASS COMPOSED OF:
Silica
Sodium Oxide
Calcium Oxide
Magnesium Oxide
Iron and Aluminum Oxides
Potassium Oxide
CLEAR
INSIDE FROSTED
BULB
STEM TUBE or FLARE (Glass)
EXHAUST TUBE and ARBOR (Glass)
ARBOR
Nickel
DUMET (Copper-Coated Steel Wire)
Copper
Fuse Wire
LEAD-IN WIRE
EXHAUST TUBE
STEM TUBE PRESSED HOLDING ARBOR & EXHAUST TUBE
SUPPORT (Molybdenum)
BUTTON (Formed by Pressing Heated Arbor)
Hole for Exhaust of Air and Influx of Gases
ARBOR BUTTON FORMED, SUPPORTS IN PLACE
RECOILED FILAMENT (Tungsten)
COMPLETE MOUNT, WITH FILAMENT IN PLACE
MOUNT
BULB AND MOUNT READY FOR SEALING
BULB AND MOUNT SEALED TOGETHER
Inside Frosting omitted to show detail
Exhaust Tube Sealed Here
Bakelite Composition for Cementing Base to Bulb
Glass Insulation
GAS-FILLED BULB READY FOR BASING
FINISHED LAMP
FINAL ASSEMBLY

Courtesy Westinghouse Electric and Manufacturing Company

Steps in Making an Electric Light Bulb

ney increases the draft in a furnace.

For many years gas was one of the most important illuminants used in cities. The early discovery of natural gas was made in England by Shirley in 1659, when he found gas bubbling through the water in a well. In the last half of the 17th century Dr. John Clayton discovered that by heating coal in a retort he could produce gas that would burn—the first *artificial gas.* It was a century later, however, before gas came into practical use for lighting.

The first gas lights were merely open jets in which the flame burned with a deficiency of air. The light from the flame came from the incandescent particles of carbon that had failed to ignite. Later other substances were used with burning gas to give a whiter light. The *limelight,* for instance, was a device in which lime was heated to a very high temperature by a gas flame; but the materials found to be the best producers of light when hot were the oxides of thorium, cerium and zirconium. In 1885 Welsbach brought out the *Welsbach mantle,* a device by means of which a combination of these oxides could be suspended in the gas flame. It produced a brilliant white light and was responsible in no small degree for the rapid extension of domestic gas lighting in towns and cities.

Gas and oil lamps have been largely replaced in cities by electric lamps, but they are still widely used in rural districts. The oil most widely used is kerosene. One source of gas for lighting on the farm is calcium carbide, a solid material that gives off gas when water comes into contact with it. Another is gas from liquid distillates of petroleum, such as gasoline, which give off gas suitable for lighting when subjected to high temperatures. Usually the heat from the same flame that is producing the light serves to generate the gas. In both the carbide and gasoline lamps it is common practice to use the Welsbach type of mantle.

Although there had been experimentation with *electric lighting* since 1820, it could not be applied commercially until a source of abundant and cheap power was developed. That time came in 1875, when Gramme produced the dynamo. In 1876 Jablochkov put his *candles* or *arc lamp* on the market. In this a brilliant blue-white light is produced by an electric spark passing across the space between two electrodes. In 1879 Edison produced his first successful *incandescent lamp,* a long thin carbon filament of high resistance sealed in a glass vessel from which the air had been exhausted. For 30 years the design of the incandescent lamp remained virtually unchanged. In 1907 in Vienna Alexander A. Just and Franz Hanaman brought out the pressed *tungsten filament.* Although it was quite fragile, it was more satisfactory as a light source than carbon. In 1910 Dr. William D. Coolidge of the General Electric Company developed a process for making drawn tungsten wires that were much stronger than either the pressed tungsten or carbon filaments. The next great improvement brought out by Dr. Coolidge and Dr. Irving Langmuir, consisted of filling the bulbs with a gas. This lamp has a much higher efficiency than the old vacuum type.

The limit of efficiency of electric lamps has not yet been attained. The ideal lamp would be one in which all the energy consumed would be transformed into useful light, but in an incandescent light about 80 per cent of the energy goes off as heat. In many applications where the optical requirements are not exacting, lamps of efficiencies higher than 20 per cent are now being used. The *sodium-vapor lamp,* for instance, is coming into use for highway lighting, although its light is too yellow for other purposes. In 1937 the Mazda lamp companies brought out a lamp in which the fine tungsten filament wire is first wound into the form of a tiny spiral; this spiral is then wound into the form of another spiral, producing a double-coiled filament. The lamp is similar in appearance to older types, but it gives out about one-fourth more light than does the 1927 lamp of the same power rating. Its output is almost four times as great as that of the best carbon-filament lamp of the same size ever produced.

In recent years an extensive campaign has been carried on to educate the public as to correct lighting for homes. The yearly sale of electric bulbs in the United States is about 460 million large bulbs and 420 million miniature bulbs. Every year American homes use about 15,375,000,000 kilowatt-hours of current, most of which goes into lighting.

lightning, the violent and dangerous discharge of electricity from one cloud to another or from a cloud to the ground. The brilliant light is only a by-product caused by ionization of gases of the air. (Neon lighting is a small-scale imitation of lightning.) That the clouds carry electric charges was first demonstrated by Benjamin Franklin in his famous kite experiment, in which a kite attached to a wire was flown up into a cloud and a key attached to the wire became charged electrically.

The exact nature of the charge is not known. In 1909 G. C. Simpson formulated a theory based upon his observation that raindrops falling from the front portion of a cloud carry positive electrical charges, whereas those falling from the receding edge of the cloud are sometimes negatively charged. He suggested that rising air, encountering falling drops of water, broke up the drops and left them positively charged, the air continuing upward with the corresponding negative charge. He assumed that these negative charges attached themselves to smaller droplets of water at the higher altitudes. The lighter drops fall to the rear of the cloud, which accounts for the appearance of negative drops.

Later observations, especially those by C. T. R. Wilson in 1916, do not agree exactly with Simpson's theory. They indicate that the lower regions of the cloud are positively charged and the upper regions carry a negative charge. The presence of the charge on the rain is explained by the fact that it is falling through the electrostatic field of the earth.

It is a commonly accepted fact that the earth is normally charged negatively, although the existence of this electric field is not known to most laymen. The intensity of the field is great; there may be a difference of potential of 100 to 150 volts between air at the top of a man's head and that near the ground. The magnitude of the voltage depends on weather conditions and other factors. The electrostatic charge acquired by a single drop of rain is small, but the total of all such drop-charges in a cloud may be enormous. To cause a discharge of electricity across 1 foot of air requires about 915,000 volts. Since lightning discharges sometimes extend for several miles, the voltage accumulated in clouds must be very great.

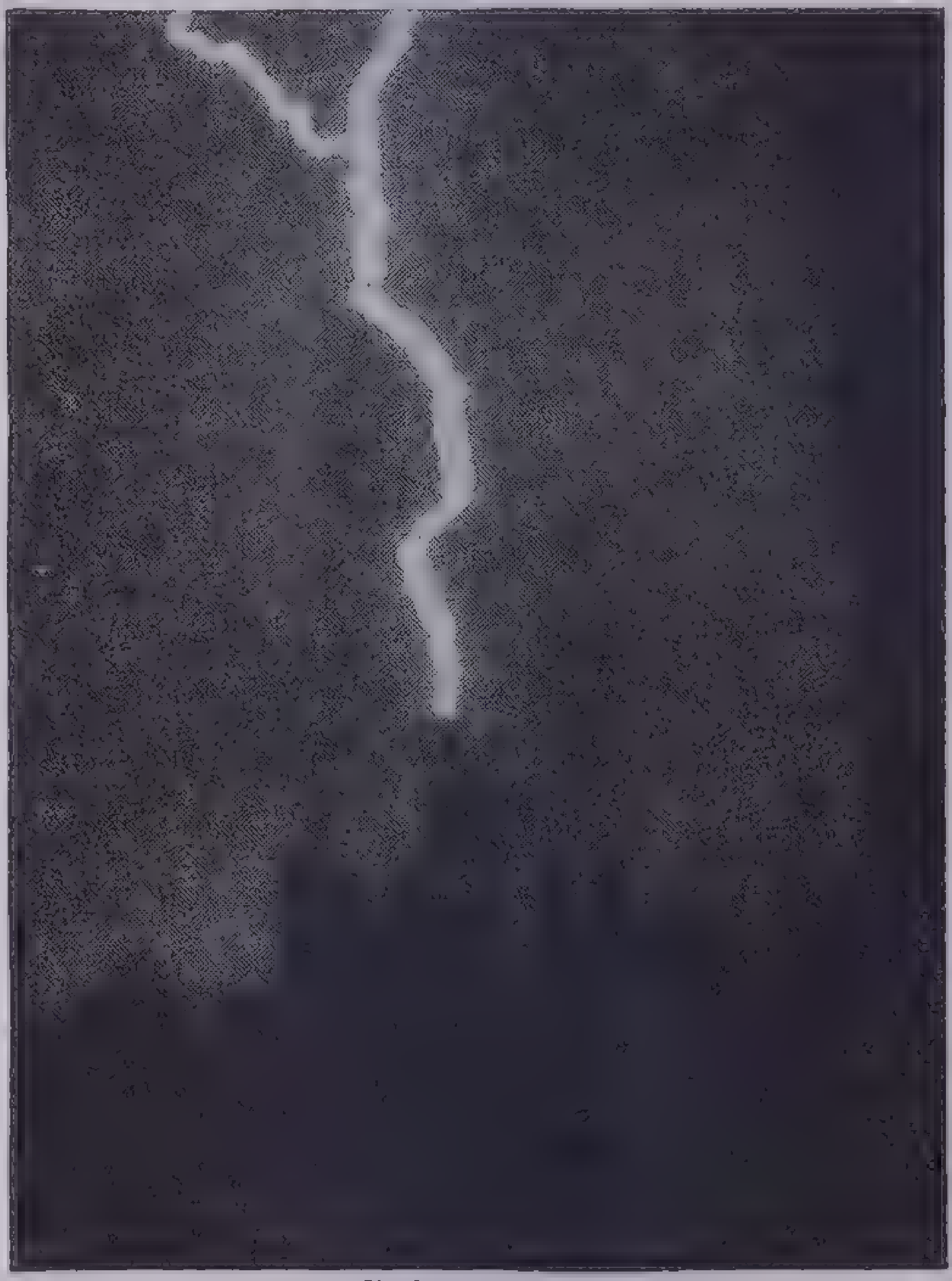


Photo by Henry Shimer

Lightning Strikes the Empire State Building

The building is struck in almost every storm, but no damage ever results because the charge is carried off harmlessly through the decorative metal strips down the full height of the building into the ground. Occupants of the building are never aware that it has been struck

About one out of ten lightning discharges takes place between clouds and the earth; the rest are between clouds of different potentials. There are two common types of lightning discharge, known in popular language as *forked lightning* and *sheet* or *heat lightning.* Forked lightning is the sudden brilliant discharge appearing as a zigzag line. Sheet lightning is a diffuse glare in the clouds. It usually occurs during the very warm season in temperate climates, and it occurs frequently the year round in tropical climates. A third type is called *ball lightning,* but little is known of it from a scientific viewpoint.

Lightning discharges of any type

begin with the concentration of charge at definite points. When a sufficiently high charge accumulates, the air in that region begins to be ionized, resulting in a glow. If the charge increases a bright streamer may pass from one part of the cloud to another, but it may not be intense enough to discharge from one cloud to another; that explains sheet lightning. (However if distant lightning is diffused or reflected by clouds, it may look like sheet lightning.) If the breakdown is sufficient to extend from one cloud to another or to the earth, there is an extremely rapid exchange of charge between the two points; this produces the so-called forked lightning.

Lightning causes only a few deaths —about ½ of 1 per cent of the annual accidental deaths—but property damage from lightning is large—usually burned houses and barns in rural communities. Both death and property damage are largely avoidable, and *lightning protection* is valuable, especially in rural districts.

Damage by lightning may be caused by the direct stroke or by a high voltage induced by the rapid discharge of the cloud. The rapid movement of electrical charges in the air during a lightning stroke results in the generation of high voltages in metal parts, even though they are not in the direct path of the discharge. This is particularly true of long sections of wire that are not connected to the ground. Protective systems on electrical transmission lines are designed to guard them against these induced strokes as well as the direct strokes. Wire fencing is a common point of danger to life and property during lightning storms. It is a good rule to stay away from all large metallic objects during electrical storms.

Buildings are usually protected by lightning-rod systems—a network of copper wires that makes a solid connection to the ground. Pointed lightning rods are usually placed at the highest points of the building. A common error is the statement that the lightning rods drain the charges from the clouds and thus prevent lightning strokes. The rods really act as conductors through which the discharge can pass harmlessly to the ground rather than through the structure itself.

The statement that lightning rods draw lightning to buildings so equipped is equally false. Lightning tends to strike the highest point in the immediate vicinity; in the case of sky-scrapers, it is possible that lightning is drawn a short distance to them and that smaller buildings near them are relatively safe. Very little special protective equipment is required for a skyscraper because the steel framework of the building acts as an effective path for a safe discharge to the ground.

One of the major problems of an electric power company is that of protecting its transmission lines against lightning. Since the lines are very long and insulated from the ground, they are not only in great danger from direct strokes, but they also acquire excessive induced voltages. There is danger of mechanical damage to the poles and insulators of the transmission system, and there is also the likelihood that the discharge will be conducted into the generating stations and will damage the generating equipment.

The power lines are therefore protected by *lightning arresters*—devices through which the current can flow to the ground under the influence of the very high voltage of a lightning discharge, but which will not conduct current under the influence of the normal voltage of the line. There are a number of different forms of lightning arresters. The *resistance type* consists of two conductors so mounted that the gap between them is too large to be broken down by the normal voltage of the line but small enough to break down under the influence of a lightning discharge. The *valve type* of arrester is one made of special materials that will carry current at abnormally high voltages but become nonconducting again when the voltage drops to a value near that of the line itself.

A lightning stroke has so much power because the current is discharged in a very short space of time. C. T. R. Wilson estimates the average electric charge involved in a lightning flash to be about 20 coulombs. Approximately 20,000 times this much electric charge can be drawn from an ordinary automobile storage battery. The voltages involved, however, are enormous; his estimate is about 1 billion volts. Assuming the lightning discharge to take place in 1/1,000 of a second, the average current discharge would be 20,000 amperes.

lime, calcium oxide, a product of limestone decomposed by heat. Lime is used very largely in making mortar and whitewash, is a constituent of bleaching powder and has important uses in the paper, sugar, glass, steel and tanning industries. In agriculture it restores the fertility of acid soils. In the form of limewater it has medicinal uses.

In making lime limestone in small pieces is heated to 1800° F. in a kiln. As lime forms in a dry powder, it drops into a receptacle at the bottom of the kiln. When it is cooled, it is hard, coarse-grained and nearly pure white. The quality depends upon the density of the limestone from which it is derived and the degree and duration of the heat applied.

In the state that lime comes from the kiln, it is called *quicklime*. When it is mixed with water, lime changes to a fine moist powder, and the chemical action is so great that the water boils; this makes *slaked* or *slacked lime*.

limestone, the most important of the natural building stones found in the United States; it is composed of calcium carbonate and is usually formed from the inorganic remains of sea life. Many fine buildings in the United States are constructed with limestone. Some of the best grades for building purposes are quarried in Indiana. Limestone is valuable also as a raw material in many industries; for instance, as a flux in the iron and steel industry. Limestone underlies much of the United States. The fact that it is soluble in water accounts for the many underground caverns.

linen, a superior cloth manufactured from the fibers of the flax plant and used for the best quality of handkerchiefs, collars, shirts, towels, napkins, tablecloths and the like. Coarser linens, called *duck* and *crash,* are made into toweling, tent covers, bedticking and some qualities of linings.

Flax grown for seed is allowed to ripen; but that intended for linen is taken from the ground before maturity; it is pulled up by the roots in order to retain the greatest possible length of stalk.

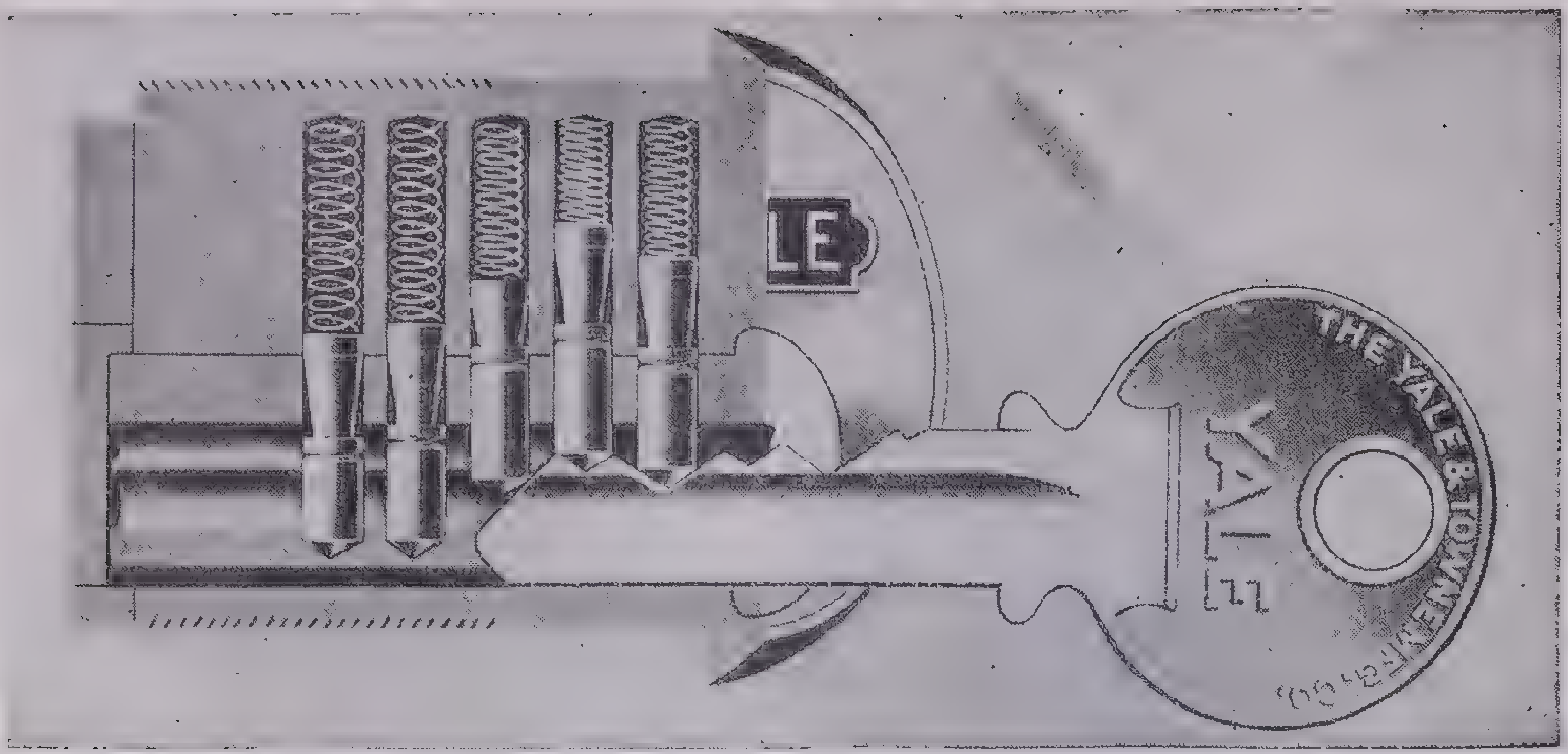
The first of many processes is separating the seed from the stalk by drawing the stalks or fibers through combs; this is called *rippling.* The fibers are then combed out, untangled and laid in straight lengths, preparatory to *retting,* that is, soaking in water to weaken the resinous matter binding the outer and inner fibers together. When the fibers are cleared, they are straight and almost pure white in color, ready to be delivered to the mills for spinning into thread and weaving cloth. All the preparatory work is performed by hand labor.

It is more difficult to weave flax than cotton, for the flax fibers are less elastic and more easily broken. During weaving the fibers are kept moist, to reduce brittleness and soften the slight quantity of glutinous matter still remaining in the fibers. Machines now make almost all linen cloth, though the hand loom is still found in some rural districts. Belgium and Ireland are noted as producers of the world's finest linens, though England has important centers of the industry.

lock, a mechanical device for fastening a door or lid; the operation depends on the movement of a bolt by means of a removable key. The earliest known locks were manufactured by Egyptian locksmiths. Many elaborate locks made in the medieval period are really works or art and have now found their way into museum collections; but they were more beautiful than secure and could be opened by almost any roughly shaped piece of metal.

In 1774 Robert Barron invented a *double-tumbler lock.* Previously only one tumbler or guard had to be lifted to allow the bolt to slide. Barron's lock had two tumblers; consequently a much more accurately made key was required.

The more tumblers or levers there are to prevent the sliding of the bolt, the more accurate must be the key that lifts them out of the way and allows the bolt to move. Jeremiah Chubb's *detector lock* in 1818 was revolutionary in that it had six levers; furthermore, it had a special lever that was lifted if the wrong key were applied. It stayed up until the right key was turned, and so the owner



Courtesy Yale and Towne Manufacturing Co.

How a Cylinder Lock Works

The side view of the lock shows the five-fold protection offered by the five steel pins. Only the correct key will raise all five of them to the exact position where the division between the two halves will coincide with the rim of the plug

could tell when the lock had been tampered with.

The modern *cylinder lock,* the invention of Linus Yale in 1848 has a cylindrical plug that can be turned by a key, and the plug pushes the bolt out or pulls it back. When the mechanism is locked, five steel pins in the casing drop into holes in the plug, preventing it from turning. The right key lifts these pins until their ends are just even with the outer circumference of the plug, which can then be turned. Inserting the key raises the pins; a turning motion of the key then pulls the bolt back. The pins drop into the plug to five different depths; a key that raised only four of them to the right height would still be unable to turn the lock. In making such locks each of the five pins may be designed to drop to any one of eight standard depths. The total number of possible combinations is thus 32,768. This number can be multiplied many times by cutting various lengthwise slots along the key, and only the proper keyhole will be shaped to fit them.

In *combination locks* four or five discs, each with an opening, are mounted on the same axis. It is necessary to turn the discs into such a position that the openings line up before the bolt can be operated. The face of such a lock has a knob and a dial marked numerically, and the mechanism is usually so arranged that the discs are operated consecutively by consecutive forward and backward movements of the knob. This makes it unnecessary to carry a key; a knowledge of the combination for which the lock is set is all that is required.

Padlocks are detachable locks arranged to be linked through a staple passing through a hasp. They may be operated either by combination or tumbler mechanisms.

Only the most outstanding types of locks have been mentioned here. It is estimated that about 150 locks are used in and about a modern residence. About 50,000,000 locks are made each year.

lock, a watertight chamber in a canal or river, closed by gates at each end and used for transferring vessels from one level of a waterway to another. Many rivers can be made navigable only by placing locks at points where the natural bed of the river slants so sharply that the water flows too fast for safe navigation. In canal building it is often cheaper to build locks than to excavate the channel to a uniform level. Even if the level is uniform, the danger from surging tides may make locks necessary.

A ship enters a lock through an opened gate, which is then closed. If the ship is to be raised to a higher level, water is pumped in until the water level in the lock is the same as that in the waterway which the ship is to enter. The upper gate is then opened, and the ship moves out of the lock. The process is reversed when a ship going in the opposite direction must be lowered; the water is allowed to flow out of the filled lock.

In modern locks the water does not enter through openings in the gates but through sluices in the walls of the locks. In the old canal days the gates were made of oaken planks and were opened with a hand crank, but in locks like those of the Panama Canal the gates are enormous steel structures moved by powerful motors. They are divided in the middle; each half swings from a *heelpost* at the side of the canal. It is usually important not to waste water in operating a lock. Some locks have reservoirs from which water is taken to fill a lock, and into which water is pumped when a ship is lowered. To save water modern locks are built barely large enough to accommodate the largest ship.

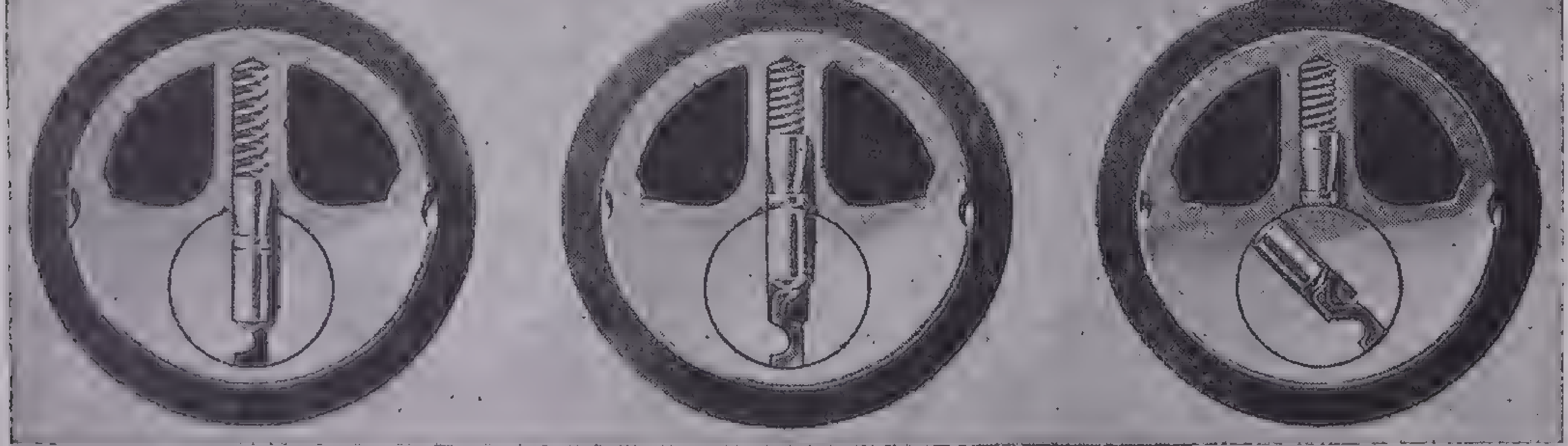
The lock dimensions of the world's important canals must be kept in mind by the designers of new battleships and merchant vessels. The largest lock in the world serves as the entrance to the North Sea-Amsterdam ship canal in the Netherlands. It is 1,312 feet long and 164 feet wide. The highest lock in the world is in Germany; it raises vessels 65 feet. Lifts of 20 to 40 feet are not uncommon in the United States and Europe.

locomotive, a self-propelling engine mounted on wheels and traveling on a railway. The first locomotive was constructed by Nicholas Joseph Cugnot, a Frenchman, in 1769. He operated it over the streets of Paris at a speed of 3 to 4 miles an hour. One of Cugnot's locomotives upset when it was turning a street corner, and as a result it was condemned as dangerous. In 1784 William Murdock built a locomotive that attained a speed of 6 to 8 miles per hour.

As a result of a wager in 1803 Richard Trevithick, a Cornish miner, also constructed a steam locomotive that was later used for hauling iron. During the test run the unit successfully pulled 9 tons of iron 9 miles at a speed of 5 miles per hour. The unit later jumped the track and was then converted into a stationary steam plant. This was the first locomotive to employ forced draft, which eliminated the high smoke stacks.

In 1829 George Stephenson demonstrated the practicability of a steam locomotive by his experiments with the *Rocket.* During the tests the *Rocket* pulled a coach containing 30 passengers at a speed of 29 miles per hour. The first locomotive to operate on American soil was built in Stourbridge, England, about 1828. This locomotive, the *Stourbridge Lion,* made its first trip on August 8, 1829, at Honesdale, Pa. Parts of it are now stored in the National Museum, Washington, D. C.

Progress in locomotive design and construction has been very rapid.



Courtesy Yale and Towne Manufacturing Co.

How a Cylinder Lock Works

The locked position is shown at the left. The central plug cannot be turned because of the steel plug pushed down into it by the spring. In the center the key has been inserted, raising the two pins so that their meeting place is even with the outside surface of the plug. By turning the key, as at the right, the plug and the latch can be moved

Courtesy New York Central System *Courtesy Atchison, Topeka & Santa Fé Railway Co.*

Aristocrats of the Rails

At the left is a steam locomotive of modern design with lines as sleek as those of the Diesel-electric locomotive at the right. Both pull passenger trains.

During the period 1905-20 the standard steam pressure was 200 pounds per square inch, whereas today 300 pounds per square inch is not uncommon. The Delaware and Hudson Railroad operates a four-cylinder, triple expansion locomotive at 500 pounds per square inch top pressure. In 1905 the average horsepower rating per axle for a freight locomotive was about 240; today the modern locomotive frequently exceeds 1,000 horsepower per axle. With the use of increased steam pressure came the introduction of superheated steam, by which more useful work can be obtained from the steam as it expands in the cylinder.

In the early days a locomotive could be used for either passenger or freight service, but this is no longer true. Because freight locomotives must pull heavy loads, they now have smaller wheels than the passenger types. The smaller wheels increase pulling power but sacrifice speed. Because locomotives of today are so much heavier than the early types, they have more wheels to distribute the weight. If only four wheels were used on one of the modern locomotives, the rails and roadbed would soon fail.

Locomotives are classified according to the F. M. White system. A locomotive classified as a 4-6-4 has four wheels ahead of the drivers, six driving wheels and four wheels following the drivers. Power is supplied only to the drivers; the others are weight-carriers. A 4-6-4 type pulls the famous *Twentieth Century Limited* train between Chicago and New York. The large freight locomotives called *Mallets* are designated as 2-8-8-2, which means that they are really two engines in one, having two sets of eight driving wheels.

Modern steam locomotives have been developed to maintain speed with heavy loads rather than ultra high-speed passenger service. The engine *999* that pulled the *Empire State Express* in the '90s could make 112 miles per hour over short periods of time but could not maintain this speed over a long distance. In contrast to this the modern freight locomotive is so designed that a speed of 50 miles per hour can be maintained while it is pulling 125 box cars—about 5,000 tons.

The four essential parts of a steam locomotive are the firebox, boiler, cylinders and driving wheels. Fuel is delivered to the firebox, where it burns and liberates large amounts of energy in the form of heat. Part of the heat is absorbed by the water surrounding the firebox and fire tubes, and the remainder is lost. The water is converted into steam, which, controlled by suitable valves, is conveyed to the cylinders, where its expansive force moves the pistons. Steam exhausting from the cylinders discharges up the stack and creates the necessary draft. The pistons are linked to the wheels by the connecting rods and side rods.

Builders of steam locomotives have felt the competition of the very recent Diesel-electric locomotives. One answer to the challenge is the *Hiawatha,* an oil-burning, streamlined steam locomotive, designed in 1935 for high-speed service. It operates from Chicago to St. Paul in 6 hours 30 minutes, a distance of 408 miles. This engine has a maximum speed of 120 miles per hour.

Probably the most important experiment in steam for railroad use in

Courtesy Atchison, Topeka & Santa Fé Railway Co. *Courtesy New York Central System*

The Railroads' Work Horses

Freight engines still follow the old designs. The modern engine and tender at the left cover 100 feet of track. At the right is an electric locomotive that hauls trains in and out of New York city this country is the construction for the Union Pacific Railroad of a 5,000 horsepower, high-pressure steam, two-unit *turboelectric* locomotive. This is a very significant experiment, since the only previous attempts to utilize this type of drive were made in England in 1910 and 1923. The energy of steam is changed to electric current in a turbine and generator, and the wheels are powered electrically.

One of the more recent types of locomotive is the *Diesel-electric*. It differs from the conventional steam locomotive in that power is generated by Diesel engines and then transmitted electrically to the driving wheels. The thermal efficiency of a Diesel engine is several times that of a steam locomotive. This advantage, together with the fact that the power can be smoothly and quietly transmitted electrically to the driving wheels, makes for a unit that is showing rapid progress in all types of railroad service. Diesel-electric trains are now making long runs, one of which is from Chicago to Denver, 1,000 miles in 16 hours. The Diesel locomotives have another advantage in that they will run for thousands of miles with little or no maintenance expense, whereas steam locomotives must be overhauled frequently.

Where large numbers of people must be transported rapidly in congested areas, as between neighboring large cities, complete electrification of railroads is justified. Where noise and smoke elimination are important factors, the electric locomotive is the ideal type of motive power. In electrified systems the power is generated in a central plant and transmitted to the locomotive by means of a third rail or overhead trolley. The electrified section of the Pennsylvania Railroad is probably the busiest transportation network in the United States. This system maintains hourly passenger schedules between New York and Philadelphia and operates freight trains over the same right-of-way.

In view of the progress made in rail transportation during the past 20 years, it is now a recognized fact that the steam locomotive is no longer the only satisfactory type of motivating power for trains. In the future steam locomotives may gradually be replaced by Diesel-electric and all-electric locomotives, more suitable for some types of service.

loom, a hand device or a machine for weaving thread or yarn into fabric.

lubricating oils, for reducing friction in machinery, are now obtained almost entirely from petroleum. Formerly whale oil, animal fats and vegetable oils, such as cottonseed and olive oils, were the only lubricants known. In most cases petroleum oils are more effective and cheaper.

Although there are many different grades of lubricating oils, they can be divided roughly into light and heavy oils. In refining petroleum fuel oil is left in the still after gasoline, kerosene and other light fractions have been driven off. A high temperature then applied drives off a combination of lubricating oil and wax. The wax, used for candles, sealing wax, and the like, is hardened by chilling and filtered out. The remaining oil is treated to remove other impurities and filtered through fuller's earth.

The heavier-bodied lubricating oils remain in the still, combined with asphalt, wax, sulphur and other impurities. These are driven off by chemical treatment and by separation in a centrifugal machine.

lumber and timber, the wood of forest trees, important in construction and building and in arts and crafts; it is also the source of other valuable industrial materials—turpentine, pitch and pulp for paper and cellulose.

Lumber originally meant a pawnshop, because most pawnshops in England were kept by Lombards (from Lombardy, Italy). Then the word came to mean junk—such odds and ends as clutter up a pawnshop. Then the logs that have to be cleared away from cutover land for farming were called lumber. The word is now used of cut-and-sawed wood in small pieces. *Timber* refers to wooded land, the wood on it or the wood cut and ready for construction.

Forests and forestry. The timber most important for industrial uses includes the softwoods—pine, spruce, fir, hemlock, larch, cedar, sequoia and cypress. With a few exceptions the softwood forests are in the cooler regions of the Northern Hemisphere. The principal softwood or conifer forest regions are: (1) North America, including Canada; Alaska; western, northeastern and southeastern United States; and the Sierras of Mexico; (2) northern Europe; (3) central Europe; (4) Asiatic Russia (Siberia); Manchuria (now Manchukuo); and part of Japan. North America has about two-fifths of the world's conifer area; Europe another fifth and Asia one-third. These three continents of the Northern Hemisphere embrace 95 per cent of all softwood forest land.

Of the area of Temperate Zone hardwoods Asia has nearly one-half, North America one-fourth and Europe one-sixth, the three continents containing 87 per cent of such hardwoods. Of the area of tropical hardwoods Asia has 17.5 per cent; Africa, 21.2 per cent; North America, 3 per cent. South America contains more than 50 per cent of the world's total.

In the United States the sections that have successively predominated in lumber production are the Northeast, the Great Lakes section, the South and the Pacific coast section.

The big timber production is now on the Pacific coast. Out of an average annual production of 15,500 million board feet the state of Washington produces nearly one-fifth; Oregon almost one-sixth; and California and Nevada together, almost one-fifteenth. Then come the southern states: Mississippi, about 6 per cent; Louisiana, about 5 per cent; Alabama, 4 per cent; Arkansas, almost 4 per cent; Texas, 3¾ per cent; North Carolina, 3½ per cent. Classed by varieties of wood the average cut is: Douglas fir, more than one-fourth; ponderosa pine, almost one-eighth; oak, 7 per cent; white pine, 5 per cent; hemlock, 3 per cent.

The present stand of timber in the more important producing states has been estimated (in millions of board feet) as follows: Oregon, 396,000; California, 282,400; Washington, 256,000; Idaho, 81,300; Montana, 49,800; Colorado, 49,200; Louisiana, 41,000; Maine, 40,000; Michigan, 40,000; Minnesota, 36,000; Alabama, 33,000. The available and accessible timber resources of the Dominion of Canada are estimated at 290,595 million board feet of saw lumber and more than 900 million cords of pulpwood. The average annual production is almost 2,000 million board feet of saw lumber and about 4¾ million cords of pulpwood.

Sawmill and planing-mill production in the United States reaches ¾ billion dollars in value a year; furniture, more than 400 million; wood pulp, 165 million; and matches, 30 million.

machine tools, see *metal shaping.*

marble, a building stone valued for its variegated patterns and colors and because it takes a high polish; it is really close-textured limestone. The colors are due to impurities; for instance, iron oxides produce reds and browns, and bituminous matter makes black marble.

It is not durable unless protected from the weather. When it is exposed to rain or the fumes in city air, the surface crumbles. Much marble in building interiors is a sort of veneer —thin plates used as a facing over brick or cement.

The most famous marble is the Carrara marble from the Province of Massa e Carrara in northern Italy. It has been for centuries the best-known material for statuary. The Venus de Milo and Michelangelo's statues are of Carrara marble. It is snow-white and of fine sugary texture; it also occurs in colors. France, Belgium and Spain also produce fine marbles.

In the United States Vermont furnishes marble of statuary grade. White and gray marble comes from western New England and central New York. Colored marbles are found near Lake Champlain and in Maryland and Tennessee.

matches and lighters, manufactured articles by means of which fire may be instantly produced for lighting lamps, fuel, tobacco and the like. Man probably first made fire by rubbing two pieces of wood together until the friction generated enough heat to ignite them. This method was widely used by American Indians and is still practiced by a number of savage tribes. When it is very skilfully done, a blaze can be produced in a few seconds.

The next method was to strike hot sparks from iron with a piece of flint, the sparks falling on inflammable material called *tinder* and igniting it. This practice probably came into use about the beginning of the iron age, although refined iron is not essential; iron pyrites, a form of iron ore, can be used. The common forms of tinder were very dry, half-burned linen, the pith from certain reeds and certain forms of partly decayed wood. In later years the flame from the tinder was used to ignite a stick that had been dipped in sulphur.

The first friction matches, invented by John Walker of Durham, England, in 1827, were splinters of soft wood dipped first in sulphur and then in a mixture of potassium chlorate and antimony sulphide in an adhesive solution. These matches were ignited by scratching them on a piece of sandpaper. Nowadays matchheads are usually made of a phosphorus sulphide and potassium chlorate or potassium nitrate, mixed with some form of binder. In earlier times uncombined yellow phosphorus was used instead of the phosphorus sulphide; this highly poisonous ingredient resulted in many deaths. In 1906 an international convention agreed to outlaw the use of yellow phosphorus. In safety matches the two essential compounds are separated; the phosphorus (in the red, nonpoisonous form) is placed on the matchbox and the other compounds form the heads of the matches themselves. This reduces the danger of accidental ignition because the matches can be lighted only by striking them on the phosphorus-coated surface of the box.

Today's cigar lighters are only a modern form of the old flint-and-steel method. Usually a serrated steel wheel is rubbed against the flint to produce a shower of sparks, which fall upon a wick saturated with some inflammable liquid. In electric lighters a coil of resistance wire is heated to glowing by the passage of electric current; no flame is necessary to ignite cigars or cigarettes.

meat packing, the process by which fresh or preserved meats are prepared for shipping and marketing. It developed on a large scale as populations became concentrated in large cities. Before that most meat came from local sources. As cities grew, local supplies proved inadequate, and it became necessary to ship meat from greater distances. In America today two-thirds of the animals slaughtered for meat come from west of the Mississippi River. More than 1,200 packing plants in the United States produce every year meats and by-products worth more than 2¼ billion dollars. These plants are located in every one of the 48 states, but most of those outside the Middle West are small. The big packing plants are in Chicago, Kansas City, Omaha, St. Louis, St. Paul and Denver.

Modern packing-house processes are relatively simple and are highly mechanized. The carcasses are carried along on a conveyor from one workman to another, each of whom performs a single operation and becomes highly skilled. In many ways the packing-house operations are similar to assembling metal products, except that here the workers are disassembling.

Slaughtered hogs, for instance, are fastened head downward to a conveyor; as it moves along the carcasses are scalded, dehaired and cleaned. After they have been properly dressed, split and trimmed they are thoroughly checked by government inspectors and refrigerated at 38°F. for 24 hours. If the pork is to be sold as fresh meat, it is removed from the cooler, sometimes divided into various smaller cuts and delivered to the retailer. Methods of processing other animals are similar to the methods used for hogs but not identical.

Most of the industry's early problems had to do with marketing and shipping the meats. Before 1870 livestock was transported to distant markets in box cars; meats were preserved by salt. The area over which fresh meats could be distributed was very small; furthermore, each market has always had its own consumer preference regarding type and grade of meats. These problems were largely solved by artificial refrigeration and its adaptation to railroad and steamship transportation, so that fresh meats from the United States and Argentina can now be sold nearly all over the world.

Besides meat the industry furnishes many by-products, such as lard, soap, glue, gelatin, fertilizer, leather, bone black, hair and skins. Indeed there is scarcely any part of the animal that is not utilized. Hoofs and horns are made into buttons, combs, umbrella handles, and the like; bones are made into dice, knife handles, chessmen; hair is used for upholstery and as a binder in plaster; blood is used to fertilize vineyards and in cookery and furnishes the serum albumin used in making glue; intestines of sheep make strings for musical instruments and surgical thread, and those of pigs make casings for sausages. About 50 medicinal products are made from the glands and membranes of freshly killed animals.

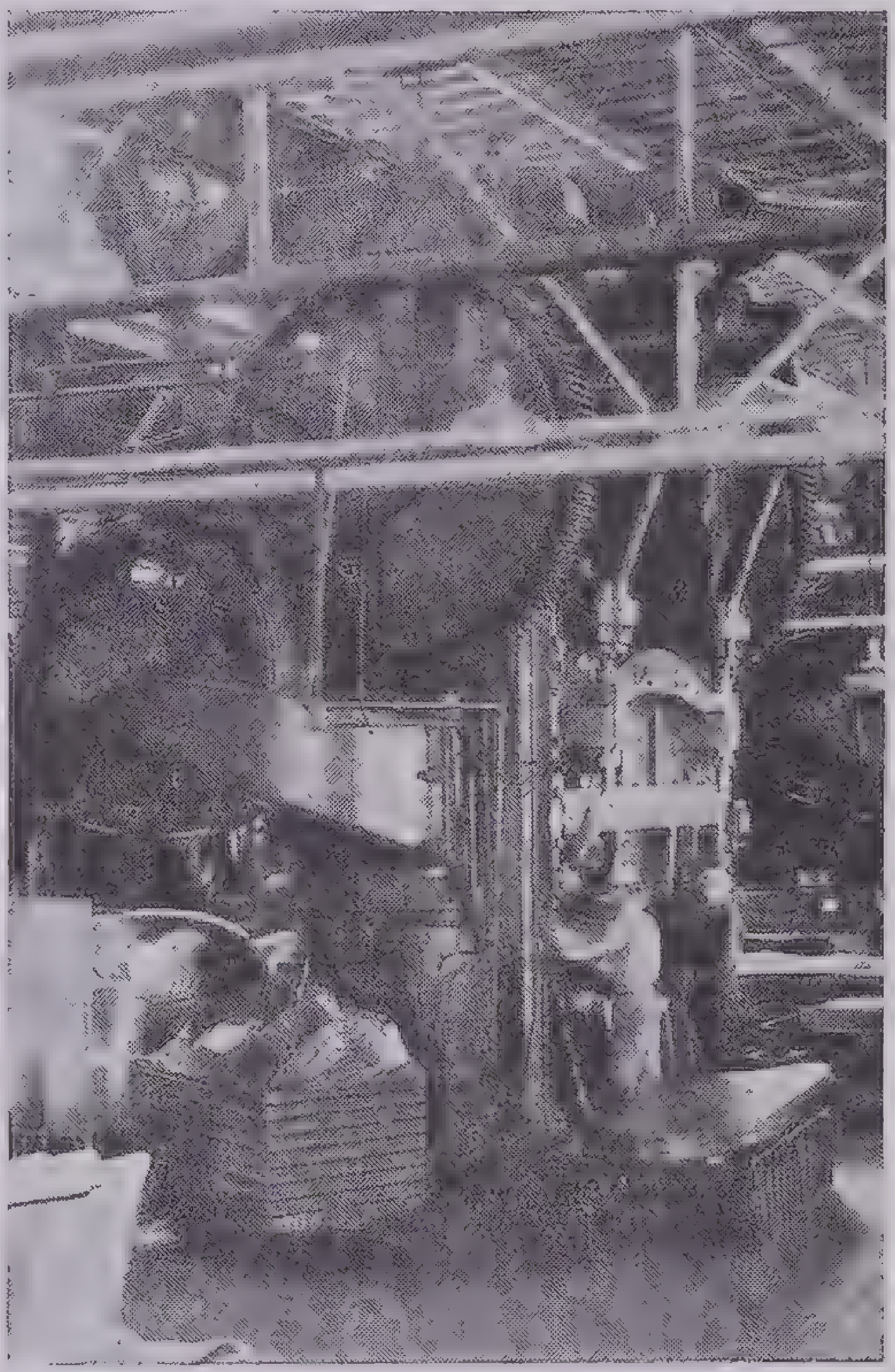
metal shaping.—The articles manufactured from metal are innumerable; their variety is bewildering, yet utterly dissimilar articles are made by basically similar methods. Battleships and wrist watches, automobiles and kitchenware, printing presses and safety razors are produced by methods that have much in common; two steps are usually involved: shaping the raw metal and assembling the various parts into the finished article.

If accuracy is relatively unimportant, *crude shaping* can be done. If the various parts are to be assembled into a smooth-working machine or a fine tool, it is necessary to grind, bore, drill or plane the crudely shaped material to a high degree of accuracy. This is known as *precision shaping.*

Crude Shaping. Crude shaping is usually done by rolling, forging, drawing or casting. *Rolling mills* are usually known by the type of product manufactured; thus there are rail mills, plate mills, sheet mills, pipe mills and merchant mills, the latter type producing a variety of small shapes. Since rolling mills cannot attain great accuracy, they belong in the class of crude shapers.

In the rolling process hot or cold metal is passed between two rolls so spaced that there is less distance between them than the thickness of the material to be rolled. The rolls squeeze the metal, make it thin and lengthen it. There are two principal types of rolls—smooth and grooved. Smooth rolls produce flat plates and sheets. Grooved rolls form irregularly shaped articles, such as I-beams or steel rails. Rolls of this type are usually in a series; the first set shapes the article roughly and each successive pair brings the product nearer its finished form.

Forging is a type of crude shaping in which the metal is given form through the use of a hammer or press. There is little fundamental difference except in force and speed of operation between a huge steam hammer and anvil and the hammer and anvil of the village blacksmith. The hammer is attached to a piston that is raised and lowered by steam pressure. By varying the pressure the operator can vary the speed and force of the hammer from a nutcracking tap to a smashing blow of several tons.



Courtesy General Motors Corporation

Shaping by Stamping

The operators feed a sheet of steel into this press; the gears revolve; a heavy crunching sound is heard, and a completely formed automobile fender is lifted out

A hand operator using a smooth-faced hammer and a smooth-faced anvil cannot, of course, turn out a series of articles all exactly alike. The problem of making exact duplicates is solved by cutting the impression or *die* of the desired article in a block and hammering plastic metal into it. Each forged article has the exact shape of the die. They are known as *drop forgings.* Sometimes the hammer itself is a die of the upper half of the article and the anvil carries the mold of the lower half.

The action of a *press* is to apply force gradually and rather slowly until the material yields, as in shearing sheet or plate metal or forcing it into a mold. The action is somewhat similar to kneading bread. Shock is reduced and the strain on the metal is not confined to the surface as in hammer forging.

Small presses are usually powered with electric motors through a series of gears, but larger ones are hydraulic. The basic principle in their operation follows a hydrostatic law: that pressure exerted on any part of the surface of a liquid is transmitted undiminished to every part of the liquid and in all directions. Such presses can exert tremendous force but move slowly.

A press that forms automobile fenders, for example, has properly shaped upper and lower dies. A flat sheet squeezed between them is in a few seconds bent into shape—an operation that would take hours of hand labor.

Drawing is the type of crude shaping by which wire is produced. A metal bar or rod is pulled through a tapering hole (die) that compresses and elongates the metal. If very fine wire is desired, it is passed through a series of dies.

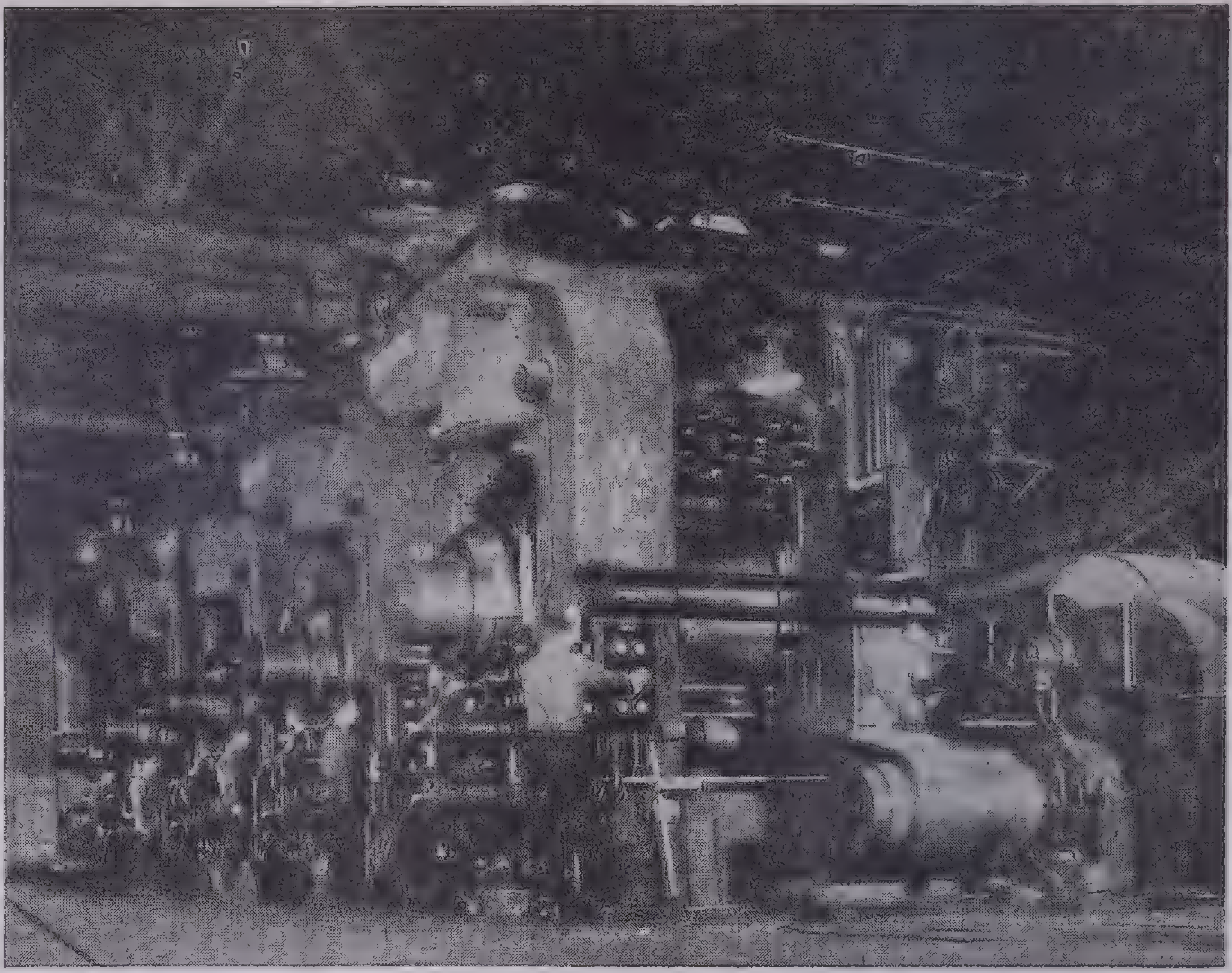
Molten metal is shaped by direct *casting* in a mold. Casting is done in foundries, most of which specialize in handling one kind of metal, as iron, steel, brass or aluminum.

Regardless of the metal used there are three principal steps in the casting process: a pattern is made; from the pattern a mold is produced; and the molten metal is poured into the mold for shaping. Molds are usually of sand or metal. The sand mold is simpler and illustrates the principle involved. A pattern is pressed into damp sand and removed. This leaves an impression in the sand the exact size and shape of the article to be made. Molten metal is then poured into the mold and occupies the space formerly filled by the pattern. When the metal cools and solidifies, the sand is knocked off and the casting is complete. Until very recent years there was no way to tell whether the castings had flaws in them until they were put into use. Today the X ray will reveal defects in castings up to 10 inches in thickness.

Among the common metal products produced by casting are pipes, radiators, machine parts, stove plates, brackets, window sash weights, numerous automobile parts (casings and cylinder blocks, for example) and a great range of miscellaneous hardware.

Precision Shaping. Metals cannot be brought to exact measurements by the above methods. Where parts are to be fitted together, for instance, it is necessary to shape them to precise dimensions with machine tools. Not all metals can be machined in the same way, but the general technique involved is somewhat similar for each one.

Machine tools are, in principle, not different from hand tools like chisels, drills, planes and so on. Machine tools are power-operated, work with great speed and accuracy and may be extremely complex mechanisms.



Courtesy West Virginia Steel Corporation

Shaping by Rolling

This monstrous machine is rolling steel into sheet metal. The flat ribbon can be seen wrapping around the spindle in the foreground. Note the size of the five rollers that do the work

Although there are many different types of machine tools, each of them consists of four main parts—a frame, a tool, a driving mechanism and auxiliary appliances. The *frame* holds firmly in place the material to be machined. Compared with the rest of the machine the frames are of great weight and rigidity. The *tool* is the part of the machine that works on the metal. It may be a chisel, a twist drill or some other simple type of tool. The *driving mechanism* conveys power to the machine by means of cams, pulleys or gears. *Auxiliary appliances* are used to hold intricate pieces of work in the machine and to guide the tools. The most important machine tools in modern industry are lathes, milling machines, drills, planers and shapers, grinders and various combinations of these.

Lathes are the oldest and most important of all machine tools. In a lathe the material to be machined is mounted between two spindles, one of which is mechanically driven and causes the article to rotate. A cutting tool is held against the revolving material and cuts away the excess metal. Lathes are made in a variety of forms and sizes. Some of them, such as those a watchmaker uses, are so small that they look like mere toys. At the other extreme are lathes 70 feet long that can rifle and polish a 16-inch naval gun.

The *milling machine* is second in importance. In principle it is like a circular saw. The cutting tool has teeth arranged around a cylindrical axle. The work is mechanically pushed against the cutter. Milling machines are particularly useful in making a series of duplicate parts and in handling irregularly shaped objects. They can be adjusted to cuttings of one one-thousandth of an inch.

Drills are a type of machine tool used to make holes in castings, plates and the like. They may be either portable or stationary. Sometimes the drill has but one bit or cutting tool. In its largest form it is the *gang drill* or *multiple drill,* which drills several holes at once; for instance, in an automobile factory, all the bolt holes in the top of a cylinder block are drilled in one operation.

Planers and *shapers* are machine tools adapted from the carpenter's plane. In the planer the cutting tool is held stationary and the work moves under it. In the shaper the cutting tool moves and the material is held stationary. The cutting tool in either case cuts in one direction only. This tool is particularly suited for making accurate flat surfaces.

The machinist usually relies on *grinders* to finish work that must be machined to very exact dimensions, such as machine parts demanding accuracy to the thousandth of an inch. The cutting tool is a grinding wheel of emery, corundum, carborundum or some other synthetic abrasive. Such a cutting tool can do extremely precise work because it can be applied with delicate pressure. Material is frequently roughly finished on a lathe and brought down to exact size on a grinder. Work as precise as that involved in honing a razor can be done on a grinder.

Assembling methods and eventual cost to the consumer are largely determined by the number of articles to be made. If only one article is wanted, it is custom-built. The various parts are brought together and, if they do not fit, are ground, filed and cut by the workmen until they do fit. Less than 50 years ago everything was made by this cut-and-try method.

Identical interchangeable parts must be used if a great many articles are to be made. The production of these so-called identical parts presents considerable difficulty. Certain limits as to size variation must be established. Ways of measuring allowable sizes must be devised. Finally exact tools for shaping and machining have to be developed. Only then can manufacturers establish and maintain standard dimensions and take advantage of interchangeable parts. Then a bolt made for a particular place on one machine can be used in a like place on a similar machine without cutting and trying.

Mass production would not have been possible without the development of *gauges* and other measuring devices that workmen can use with ease and confidence. Gauges accurate to the millionth of an inch are used in some modern industries.

Assembling. Many systems of assembling have been developed. In the automobile industry, for example, the parts of a car are carried in front of the workmen on an endless belt or chain. As these parts pass him each workman performs some operation, perhaps only screwing on two or three nuts. Assembling an automobile has been specialized and mechanized to such an extent that an entire car can be finished in a little more than 1½ hours.

Most assembly work involves considerable manual labor, but there are machines that do almost all the work automatically. The A. O. Smith Company of Milwaukee, for example, has a machine that assembles automobile frames at the rate of 7,200 a day and eliminates almost all need for workmen, except in a supervisory capacity.

In metal-using industries not all the shaping and assembling processes are necessarily carried on in one place. Rolling mills, for example, may produce the raw material for a great variety of other fabricating plants. Assembly may take place a thousand miles from where the first crude shaping was performed.

microscope, an instrument for magnifying and making visible objects that are either indistinct or so small as to be invisible to the naked eye. In the *simple microscope,* usually called a magnifying glass, only one lens is used for viewing the object. The *compound microscope* has two or more lenses; it was probably invented by Zacharias Janssen, a spectacle maker of Middleburg in the Netherlands, about 1590.

Although there are many types of compound microscopes the most elementary form consists of a convex objective lens and an eyepiece or ocular. Very tiny objects are invisible to us because our eyes can see only those things from which a relatively large amount of light is reflected. In the microscope all the light from a small object is brought to a focus by the objective lens, forming a tiny image. The image is viewed through a magnifying lens. Both lenses are held in an adjustable tube placed over the object to be viewed. When a transparent object is to be examined, a condensing lens and mirror placed under the object reflects and concentrates the outside illumination into a small pencil of light that passes through the object and lens system. When opaque objects are to be viewed, they are lighted from above and the light is reflected through the lenses.

Harvard Film Service

The World's Most Powerful Microscope

The instrument was developed by Louis C. Graton, professor of mining geology at Harvard University. At the left appears a camera for taking photomicrographs

The magnifying power of a microscope depends upon the size of the objective and eyepiece and the distance between the two. From this it would appear that there is no limit to the magnifying power that can be obtained by the use of microscopes; but both detail and sharpness of image decrease as the magnifying power increases. Ernst Abbe stated late in the 19th century that the useful magnification could not exceed 1,500 diameters. Another theory is that an object smaller than the wave length of light, which is about one 50-thousandth of an inch, cannot be brought into a sharp image. Both of these theories have been generally accepted until recently. In fact ultraviolet light has actually been used in examining small objects and the very much shorter X rays are commonly used in studying crystal structures.

On December 1, 1937, however, Louis C. Graton of Harvard University announced a microscope that has a magnification of 6,000 diameters. With this microscope it is possible to see a speck of gold so small as to be worth only the 40-millionth part of one cent. Through it a veinlet of gold one 40-thousandth of an inch wide appears to be about 6/100 of an inch wide. The instrument resembles a massive but compact lathe, weighs 1 ton and is mounted on a 15-ton concrete base to eliminate vibrations. The focusing mechanism is 100 times more sensitive than has previously been used in even the highest power standard microscopes. To change the focus of the instrument 1 millimeter would require about 25 minutes if it were done by hand, so an electric motor is used.

Microscopes are invaluable aids in medicine, bacteriology, physical and chemical research, metallurgy and innumerable other fields. In order to eliminate eyestrain binocular microscopes with double eyepieces are now quite common.

milk, a white fluid secreted by the mammary glands of female mammals. Man uses the milk of many animals but chiefly that of cows. Cows' milk is often called the perfect food, and it is an increasingly important raw material in modern industry. Typical of the change in business methods is the development of the dairy. Less than a century ago raw milk was consumed near its point of production and butter was made in the home and on the farm. Today there are centralized creameries with huge production and wide distribution of pasteurized milk and cream, butter, cheese and ice cream. Casein from milk curd has become an important raw material in the manufacture of plastics.

The factory system of handling milk and cream seems to have started in Denmark where there are now about 1,400 creameries with 200,000 dairy-farm members. About one-fifth of the separated milk is made into cheese in these creameries; the other four-fifths are sent back to the farms to feed stock. In Ireland in the 1880s the same co-operation began to be practiced—a big-scale method of economy for the benefit of the producer.

In the United States the dairy farmers have co-operated to a considerable degree, but the big-scale development of the dairy industry here has been by such distributors as National Dairy Products, with a sales volume of 300 million dollars a year, and The Borden Company with sales of 230 million a year. The manufacture of *condensed milk* begun by Gail Borden in 1857 was helped by the demands of the Union Army in the Civil War.

Condensed milk is made by heating raw milk in vacuum pans to drive off about 40 per cent of the water. The concentrated milk is then forced through apertures so small that the fat globules are finely divided and will not rise as cream. Today a total of 45 billion pounds of milk is used every year for making butter, cheese and other processed goods.

Powdered milk (dry milk) and *powdered cream*, produced by evaporation of all the moisture, are products of great importance, especially in the bakery industry.

Butter-making in dairies off the farm commenced in the '70s; in 1879 less than 30,000,000 pounds were reported by the Census; in 1926 it was 1,500,000,000 pounds, with 615,000,000 produced on farms. About 2,500 pounds of cream go into every 1,000 pounds of butter. In the large creameries butter is made in 300-gallon churns.

The U.S. Department of Agriculture for years investigated and improved Swiss methods of making cheese. The standardized processes now in use in the United States have made this country a great producer of cheese and a large consumer.

Ice cream was first sold wholesale in 1851 by Isaac Fussel, a Baltimore milk dealer. The yearly per capita consumption in the United States is now about 1½ gallons. The present big-scale production method freezes the cream in 10 seconds as it goes through a 3-inch tube in which it is stirred by revolving metal blades.

mimeograph, the trade-marked name of a duplicating machine that uses stencils and ink for producing copies, invented by Thomas A. Edison. His original patent was applied for in 1878, and although there have been many improvements since that time the fundamental principle of operation remains the same.

The stencil is a sheet of some material impervious to ink, such as tissue paper coated with wax, upon which the drawing or typewriting is done. The impact of the drawing stylus or the type breaks away the wax at the points of contact. The outline of the letter or picture is thus left wax-free on the stencil.

The most common type of mimeographing machine carries a perforated cylinder upon which the stencil is stretched. Ink is applied to the inner surface of the cylinder, whence it passes through the stencil at the points where the wax coating was cut away. As the cylinder revolves, the copy paper passes beneath it, comes in contact with the stencil and receives an impression of ink corresponding to the typing or design to be duplicated.

The mimeograph machine has become an almost indispensable appliance in offices where numerous copies of instruction sheets and the like are required, especially if they are needed quickly. Some of these machines are driven by electric motors and can produce as many as 5,000 copies per hour. Stencils can be filed away and used over and over again when repeated duplications are needed, although there is some deterioration with repeated use.

motion pictures depend for their effect upon the fact that an impression made upon the human eye persists for a short time after the object has been removed from the field of vision. This phenomenon is called *persistence of vision.* If the same picture is flashed before the eye at a constant rate about 24 times or more a second, the impression will be the same as if the picture were continuous. If a series of pictures representing the successive positions of an object in motion are flashed before the eye at this same rate, the impression is that of an object in continuous motion.

Persistence of vision was first discussed by Peter Mark Roget in 1824 after watching a baker's cart through the slats of a Venetian blind. It led to the invention of the zoetrope, a device in which a chronological sequence of drawings were mounted on a disc or cylinder and viewed while in motion. In 1853 the disc device was combined with a magic lantern for projecting the pictures upon a screen. These pictures were merely drawings, since photography was still in its infancy.

Photographic motion pictures had to wait upon the development of camera shutters that would open and close quickly enough to arrest the motion, and photographic materials that would take impressions in this short period of time. Probably the first successful use of photography for securing a record of rapid motion in this way was in the experiment of Eadweard Muybridge at Palo Alto, Calif., in 1872. He wished to investigate the motions of a horse while it was running, and he set up a number of cameras along the track. The camera shutters were controlled in such a way that the cameras operated in succession as the horse came within their range. Muybridge was interested only in recording the positions of the horse and not in reproducing the illusion of motion. It happened, however, that Jean Louis Meissonier, the French painter, was at the time involved in a controversy regarding the postures of certain horses in his paintings. He heard of the Muybridge pictures, secured them, mounted the transparent plates upon a rotating wheel and then projected the pictures upon a screen to prove his contentions. This suggested the possibility of photographed motion pictures.

It was impractical to use the old-fashioned glass plates for motion pictures because the necessarily large number could not be handled so rapidly. Thomas A. Edison tried to produce a flexible photographic film, but before he could find one that was satisfactory, George Eastman brought out his celluloid film in August, 1889. As soon as Edison heard of the new film, he secured a 50-foot roll and on October 6, 1889, he was able to demonstrate the first complete motion-picture equipment ever built.

If in a motion-picture camera the film should pass continuously through the camera at the rate of 24 pictures per second, the pictures would be badly blurred. There must be a mechanism that will not only pass the film through at the proper rate but will also stop it 24 times per second and open and close the shutter for exposure while the film is stationary. This is now done with sprockets that operate in holes near the two edges of the film, and the intermittent motion of that section of the film that is being exposed is usually controlled by means of a feeding claw.

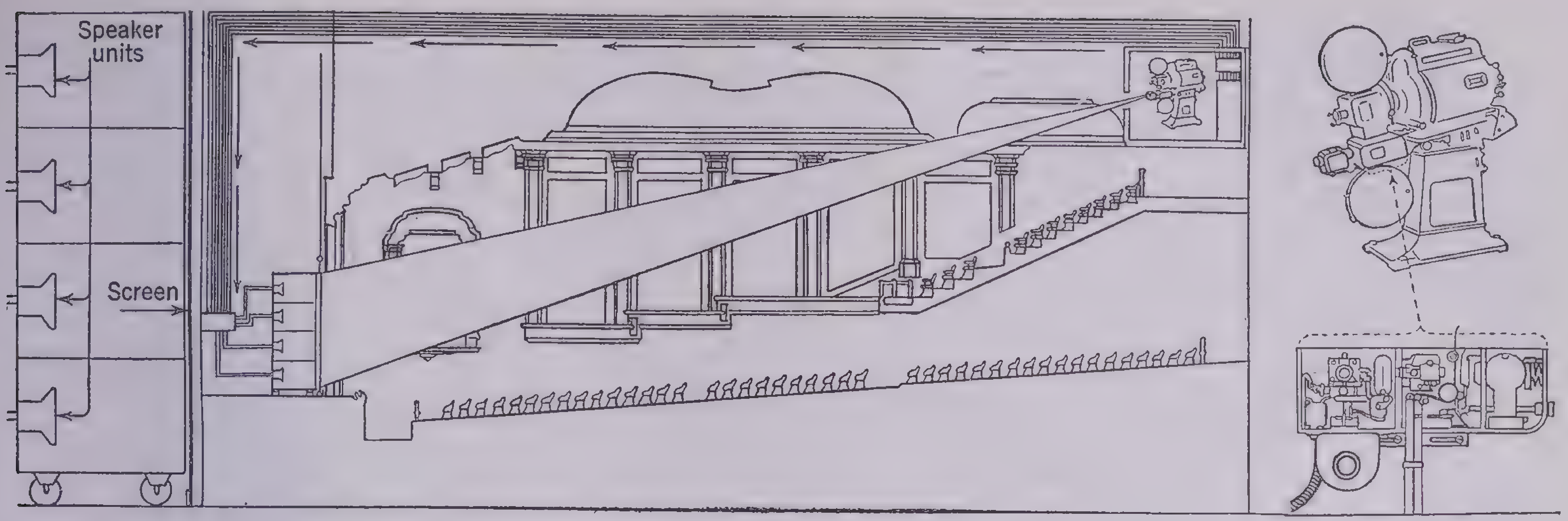
Pictures are projected upon a screen by passing light from a high-intensity source, such as an arc lamp or incandescent lamp, through the film and then through a suitable lens system and upon the screen.

Here again, the motion of the film must be intermittent, and a shutter interrupts the passage of light while the film is in motion, in order to prevent blurring of the pictures on the screen.

The successful use of motion pictures in theaters depends on the fact that they can be enlarged a great many times in projecting them upon a screen, for the picture on the standard moving-picture film is only about 1 inch wide and ¾ inch high. Incidentally the same dimensions are used today as were adopted by Edison for his original machine.

If the film passed through the projector were the one on which the original pictures were taken, the pictures appearing on the screen would be negatives rather than positives; that is, parts of the picture that should appear dark would be light and vice versa. This makes it necessary to print a new film from the original, in which the high lights and shadows are interchanged. A large number of films can be made from the same original, so that the same picture can be shown simultaneously in a number of theaters. In home motion-picture outfits, however, the same film can be used both for taking the pictures and projecting them, the process of developing being such that those parts of the film that would ordinarily be dark are light and vice versa.

Sound pictures are connected with a loud-speaking system, so that the words and music have a definite relationship to the picture. If the sound effects consist merely of musical accompaniment, phonographic record discs driven by a motor synchronized with the projection machine are satisfactory. It was practically impos-



Behind the Scenes at the Movies

At the upper right is a modern projection machine; below it is a close-up of the sound equipment which, by the use of the electric eye, translates a wavering black streak at the edge of the film into electrical impulses. In the center picture the projector is again shown in its proper place in the booth; behind it is the amplifier which picks up the current from the sound equipment, magnifies it and sends it through wires to the sound reproducing panel behind the screen (shown at extreme left). There the speaker units change the currents back into sound again. Each of the four units is tuned to a part of the whole range of sound frequencies so that any sound, no matter what its pitch, can be faithfully reproduced

sible, however, to keep the two machines at the correct relative speed, and sound and picture often got out of step.

This difficulty led to the development of sound-on-film systems, which are now almost universally used. In order to record the sound on the film at the time the pictures are taken, the variations of sound must be translated into variations of light. This is done by directing the sound upon a microphone and using the variations of current in the microphone circuit either to operate a shutter between a light source and the film or else to vary the intensity of the light source. The sound record appears at one side of the film as a narrow line of varying width or of varying intensity, depending upon which recording method is used. In either case it is called the *sound track.*

To reproduce the sound from the film a beam of light is passed through the sound track and directed upon a photoelectric cell. This is a device that produces electric current varying in strength in proportion to the amount of light that strikes it. These variations are then conducted to the loud speaker where the sound is reproduced in the same manner as in a radio loud speaker.

motion-picture industry.—The vast organization of this important industry reaches all sections of the United States and extends beyond national boundaries. It employs about 300,000 people and is a large consumer of raw materials.

Although motion pictures are known and enjoyed almost everywhere in the world, 90 per cent of the world's motion pictures are made in the United States and the entire industry centers in two cities—Los Angeles, Calif. (Hollywood), and New York city. Los Angeles is the production center and New York is the commercial and business headquarters.

Studios are located in or near Los Angeles for several reasons. Production first started in the East, but in 1903 a search for new scenery took a company to Santa Monica, Calif. When the picture was completed, the photography of the scenes taken in California was found to be much the best. The clarity of the atmosphere was responsible for the good results, and so more and more producers sought out California. The clear air was not the only advantage; the weather was dependable, there was a great variety of scenery nearby—everything from sandy wastes to snow-capped mountains within a few hours of one another, and an abundant labor supply could easily be recruited because the region was so attractive as a place to live. Although some of the disadvantages of the East have been overcome by technical improvements in cameras, lighting effects and the like, the huge amount of money invested in equipment in California has tended to anchor the industry there.

New York controls the commercial side of the industry, largely because it has certain advantages over other cities. No city equals New York in mail and express services, important items to consider in distributing films. The films are distributed from New York to some 30 key cities throughout the country, where the pictures are usually shown first, and from which the films move to all exhibitors in each key city's territory. The key cities are chosen because they have good railway connections, and because they reflect the popular taste in their territory.

New York is the chief key city in the motion-picture industry. It offers the largest local market of any place in the United States, it is centrally located in the most populous section, and it is the banking center. Since most movies are produced on borrowed capital, contact with the big banking houses is advantageous to the producer.

Big figures typify the motion-picture industry in all its branches. The total investment in motion-picture properties in the United States is more than 2 billion dollars; about 500 pictures a year are made at a cost of 135 million dollars. There are in the world something over 97,000 motion-picture theaters, with 18,200 of them in the United States.

naphtha, a mixture of hydrocarbons obtained as a by-product in petroleum refining. It is one of the lighter fractions, boiling at 80° F., next after gasoline. Naphtha is used as a cleaning fluid, as a solvent of rubber and fatty oils and in the manufacture of illuminating gas.

neon lighting, a type of lighting produced by passing electric current through neon gas contained in a glass tube. Strictly speaking only those lights that are red in color and filled with the rare neon gas are really neon lights. To produce different colors other rare gases, such as xenon and krypton, are used in combination with neon or in place of it. In addition to this colored glass tubing is often used to screen out the colors not wanted. The common bluish-white colored light is usually produced by mercury vapor, the mercury being chiefly in liquid form when the tube is not in use.

Although gas-filled glass tubes were used for lighting as far back as 1893, these early tubes, called *Moore tubes,* were filled with common gases, such as nitrogen and carbon-dioxide, and did not possess very desirable operating characteristics. In 1910, however, Georges Claude displayed his first commercial neon sign at the Grand Palais in Paris. Now the estimated annual business in signs of this type is over 30 million dollars.

Neon light has several advantages over incandescent bulbs for sign lighting. Tubes can be bent into artistic shapes, and the light intensity is the same along the whole length of the tube; whereas incandescent signs must be made of large numbers of bulbs, and the lighting is discontinuous. If one of the incandescent bulbs burns out, which happens frequently, the effectiveness of the whole sign is impaired until the bulb is replaced.

The neon tubes do not go out of service so frequently, and when they do, a whole tube involving a large section of the sign goes out, which is usually repaired as quickly as possible, to put the sign back in good condition. The light produced by neon-filled tubes contains a large proportion of red light, which is more noticeable than white light and penetrates to greater distances, particularly in a foggy atmosphere. An important advantage is the efficiency of this type of light; its output of red light for a given amount of power used is several times that of incandescent light.

Neon signs depend for their operation on the fact that a discharge of electric current passing through gas ionizes the gas (makes it a conductor of electricity) and causes it to give off light. Lightning is a similar phenomenon, but a lightning discharge giving off a high intensity of light requires enormous power. This is not true in the lighting tube because neon gas is easily excited electrically, and because the gas is at a very low pressure—only about 1/76th as great as ordinary atmospheric pressure.

In making a neon sign a glass tube is bent into the required shape and fitted with an electrode at either end. A high vacuum is produced in the tube by heating it while the air is pumped out. Then the proper amount of neon is very carefully introduced and the tube is sealed off.

Neon tubes are operated by alternating current. If direct current were used, the light intensity would not be the same throughout the length of the tube, on account of the unlike polarities of its two ends. Since the polarity of a given electrode reverses 120 times per second in the ordinary A.C. system, no variation is noticed. Other reasons for the use of A.C. are its general availability and the fact that the voltage can be very easily stepped up by transformers to the high values required for neon lighting. Electrical potentials varying from 5,000 to 15,000 volts are used, and because such voltages are extremely dangerous to life, neon sign circuits should always be well insulated.

There has been some experimentation with gas-filled tubes for home lighting. This is not likely to succeed, for such tubes give off only restricted wave lengths. Such light would be irritating to human beings, as their eyes are adapted to the full range of wave lengths as given off by the sun and other incandescent bodies.

nitrates, the salts of nitric acid, the chief use of which is in fertilizers. For this purpose the nitrates of calcium, sodium and potassium are commonly used, as are also ammonium salts.

oats, a grain widely used as human and animal food and an important source of straw. Oats are a well-balanced food but are not particularly good as a bread grain. They grow well in cool moist climates and require better soil than rye but yield fairly good returns on soil too poor for wheat or corn. Because they are bulky and relatively perishable, oats do not enter widely into world trade. Practically all farmers, especially in stock-raising centers, produce enough oats for their own needs. The United States crop is 790 million bushels a year with a value of 395 million dollars.

ohmmeter, a device that indicates the resistance of an electrical circuit. As the resistance is equal to the voltage divided by the current, it would be possible to use an ordinary ammeter whose scale was calibrated in ohms, if it could be used with a battery whose electromotive force would remain constant at the value with which the instrument was calibrated. Standard cells have very constant voltages in ordinary use; but not when they must supply the amount of current required for such devices.

For this reason ohmmeters are usually so constructed that their deflection is independent of the voltage used. They work on the principle that for a given resistance any increase in voltage produces a proportional increase in current. This calls for an instrument with two coils, one of which responds to the voltage in the circuit and the other to the current flowing. The construction is somewhat similar to that of the dynamometer-type ammeter; but the stationary and movable coils are not connected in series: one coil is connected across the voltage being impressed on the circuit, and the other is in series with the circuit whose resistance is being measured, so that it carries the same current as that flowing in the circuit. The two coils are usually set approximately at right angles to each other in the presence of a permanent magnetic field, and no restoring spring is used in the construction.

If the resistance of the circuit is very high, very little current flows in the current coil; the greater part of the force acts on the voltage coil and tends to force it out of the magnetic field. If the resistance of the circuit is low, a heavy current flows in the current coil and tends to force it out of the magnetic field. Thus there is a given position of the indicator (carried by the coils) for each value of resistance. The construction of an ohmmeter is complicated; many highly technical problems have to be taken into account.

olive oil, a valuable vegetable oil obtained by pressing the fruit of the olive tree. The prinicipal area of production is in the Mediterranean countries. The character of the soil frequently influences the quality of the fruit grown. The soils of Italy, for example, yield an olive particularly good for oil; the soil of Seville, Spain, favors the production of the best pickling olives. Very little olive oil is used in manufacturing, largely because it is expensive. Most of the world's olive oil is used for salad oil or as a butter substitute in cooking.

paint, a prepared liquid composed of pigment for coloring; a vehicle, usually an oil, in which the pigment is suspended; a thinner to increase fluidity; and a drier, usually metallic salts, to hasten the drying process. Paint is used to form a protective and decorative coating on walls, furniture and the like.

The use of paint is almost as old as man himself. Thousands of years ago cavemen used colored pigments in their rock-wall paintings. Their materials are still basic in the modern paint industry—red and white lead compounds, yellow ochre, iron oxide, vermilion, lampblack—mostly earth materials found in nature; and until recently the methods used in preparing paint were little different from the cavemen's.

Until 1860, when ready-to-use paints first came on the market, all materials were imported into the United States from England and were mixed by the painter.

The best *white pigments* are lead carbonate (white lead), zinc oxide, lithopone (zinc sulphide and barium sulphate) and the newest one, titanium dioxide. Each of these has its own advantages. The best *colored* pigments are still the natural earth materials, of which iron oxides are the most important. These occur in many forms and give all the colors of the spectrum. Others are compounds of lead, mercury, cobalt and chromium. Artificial coloring pigments, produced chemically, are really dyes. For use in paint finely ground clay is stained with them and used as a pigment.

The commonly used *vehicles* are linseed oil (from flaxseed), tung oil (from the nuts of the tung tree of China and the Gulf states), used in waterproof paints, perilla oil (from perilla seeds from Japan), the oil from soy beans and fish oils, used in heat-resistant paints. The oils gradually dry and harden by oxidation. Artificial vehicles are coming into wider use; they are synthetic resins dissolved in some solvent.

The *thinner* generally used is turpentine or some form of naphtha or benzene. It merely thins out the pigment-oil mixture to make it easier to apply and soon evaporates.

The *driers*—usually compounds of lead, manganese and cobalt—stimulate oxidation of the oil and make it dry quicker.

Varnish has the same ingredients as paint, except that much less pigment may be used, and gums and resins are added. These resins are usually tree gums, either fresh or fossilized, but such natural products are rapidly being displaced by the new synthetic resins from the chemists laboratory.

Enamel is the same as paint except that varnish is used as a vehicle instead of oil. For that reason enamels are harder and glossier than paint. Quick-drying enamels have synthetic resins instead of natural gums in the varnish.

The manufacturing process for all these products is very simple; it consists of grinding the pigments in the oil and mixing in the other ingredients. In the case of varnish the gums must be melted rather carefully. The most important new development in the industry is the fact that the chemist has taken it over. Chemistry can produce basic materials cheaply and abundantly, whereas supplies of natural materials are uncertain. New artificial materials have made paints, varnishes and the like much more effective and beautiful and have aided and simplified many industrial processes.

This is especially true of the *lacquers* that chemistry has produced through the use of artificial resins. Such products are now used as acidproof lining in factory equipment; in other places they furnish heatproof or sunproof or alkaliproof coatings or linings. The sale of beer in cans, for example, had to wait for the development of a lacquer for lining the cans. Lacquers are the result of intricate chemical actions by unfamiliar chemicals. Their basis is the same transformed cellulose that is also used to make rayon for fabrics, cellophane for wrappings and plastics for a multitude of manufactured articles.

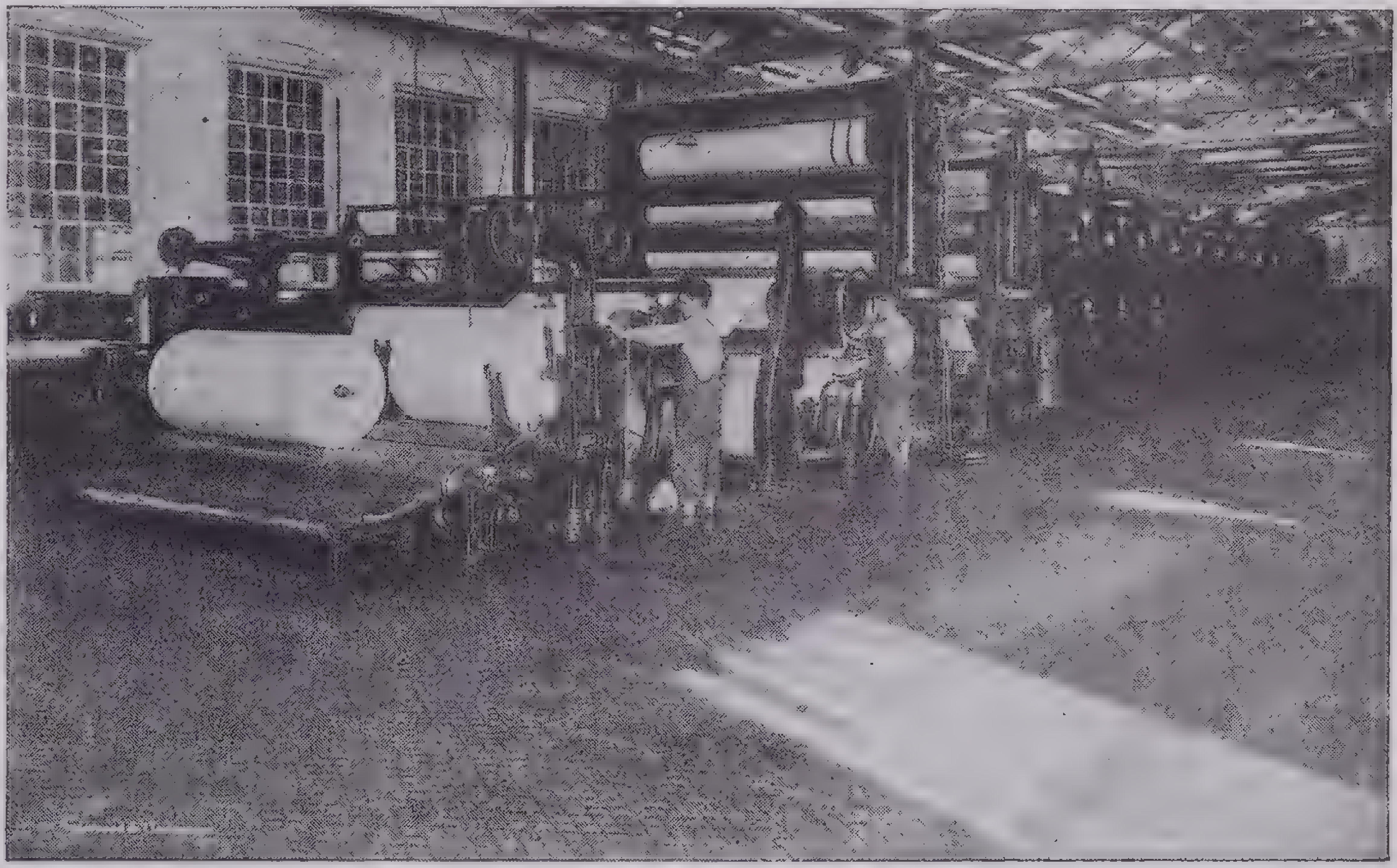
Today more than 1,000 firms are making paints and varnishes, and the value of their products is well over 400 million dollars a year.

paper, thin, compact sheets made by matting cellulose fibers. Paper was invented by the Chinese about 105 A.D. Before that time clay, stone, brass and bronze slabs, papyrus and parchment were used for written records. A sort of paper was made by the Egyptians 4,000 years ago by pressing together fibers of the papyrus reed that grew along the banks of the Nile River. Our word paper is derived from the name of the reed. Parchment is a strong leathery material made from the skins of goats, calves or sheep. It is still used for special documents, such as college diplomas.

Paper was first made in America by William Rittenhouse, who built a paper mill in 1690 near Philadelphia. All of it was produced by hand until 1798. At that time a Frenchman, Nicholas Robert, invented a machine for making paper, later improved by the Fourdrinier brothers in England. This machine, with subsequent improvements, made possible the manufacture of paper on a much larger scale.

Of the innumerable kinds of paper some are developed for special purposes or are useful because of one characteristic—tissue paper for delicacy; brown wrapping paper for strength; blotting paper for its ink-absorbing qualities; writing paper because it does not absorb ink; artist's board for its rough surface. The qualities of a paper depend on the materials used and variations in the manufacturing process.

Almost any woody fiber will make paper of some sort. Raw cotton makes excellent paper, but it is seldom used because it is expensive. Light-colored rags and scraps from textile mills go into the highest-grade papers; dark rags, mixed with cheaper materials, give strength to papers used in building (for heat and cold insulation) and the like. Linen is used almost entirely for paper money and stock and bond certificates. Straw makes good paper, especially where stiffness is desired, but it cannot compete with wood pulp, which is cheaper. Esparto grass from southern Europe and northern Africa is widely used in Britain and France for fine printing paper, but the United States imports very little. Manila stock (old rope, bagging and burlap) makes extremely strong paper, but it cannot be whitened without sacrificing strength, so it is used in dark-colored envelopes, containers and the like. Sugar cane, corn stalks, saw grass and many other plants could be used in papermaking, but none can compete in price with pulpwood. They are, however, valuable in making bulky cardboard, wallboard and the like. The manufacturing process is much the same no matter what the material, but most paper is made from wood pulp.


Courtesy West Virginia Pulp & Paper Company

A Papermaking Machine

This is the "dry end" of a Fourdrinier machine. The newly made paper is shown coming off the machine in huge rolls. A few minutes before, this paper was a pulp-and-water mixture at the "wet end" of the long machine

When the logs (usually spruce, hemlock, pine, poplar or balsam fir) arrive at the mill, they are cut into short lengths and soaked in hot water to clean them and loosen the bark. Then the bark is removed mechanically, and the wood is changed to pulp by either the mechanical or the chemical process.

In the *mechanical process* the logs are simply ground fine by large grindstones. This is a cheap process, but the paper so made is not strong. Most newsprint is produced by the mechanical process, as are other papers intended to last only a short time.

In the *chemical process* the logs are first chipped to flakes and then treated in one of three ways with chemicals:

(1) The chips are cooked with bisulphite of lime at high temperatures, leaving a mass of pure cellulose after 10 hours cooking. Paper from unbleached sulphite pulp makes cheap printing paper, wallpaper and catalogue paper; mixed with mechanical pulp it makes newsprint; bleached, it makes writing, bond and ledger paper; mixed with other fibers, it makes book paper.

(2) The soda process is much the same, except that caustic soda is used instead of the sulphite. Short-fibered woods not usable by other methods can be pulped with soda. The pulp is chiefly used as a filler to mix with other pulps for book papers.

(3) In the sulphate process sodium sulphate is mixed with caustic soda. This makes a pulp of great strength, from which come the kraft papers so widely used for wrapping and containers.

The transformation of the pulp into paper begins in the beating room. Here large machines reduce the irregular lumps of pulp into a gelatinous mass of fibers of uniform length and consistency. It is during this stage that coloring matter is added; or clay to give a smooth surface; or resin to resist penetration of ink or water. From the beating machines the pulp goes to the *Jordan engine,* where the beating process is carried forward until the pulp goes to the felting or Fourdrinier paper machine.

In the *Fourdrinier machine* the actual conversion of the pulp into paper takes place. One end of the machine receives the wet pulp from the Jordan engine. At the dry end the finished paper comes out faster than 13 miles an hour. At the wet end of the machine an endless belt of fine wire (70 to 304 inches wide) receives the slushy pulp. As this belt moves forward it shakes, interlocking the fibers. The water drips through the meshes of the wire. The matted pulp, still very fragile, is transferred to a felt belt that carries it to the first set of rolls. These rolls squeeze out some of the water and further the matting process. The paper is now sufficiently strong to support its own weight and it passes next to the driers, a series of iron, steam-heated cylinders that dry the paper. The paper is next passed through rolls called *calenders* to give it a smoother *finish*. It is then cut in sheets or wound in rolls for use on modern presses.

The only other important paper-making machine has the wire mesh in the form of a cylinder instead of an endless belt. The cylinder, revolving partly submerged in a pulp vat, picks up a layer of fibers on the outside and the water drains off. A single thickness produces tissue paper, but if the thin sheet is carried around a series of cylinders, a thick pasteboard is built up.

Americans are now using nearly 200 pounds of paper per capita a year—ten times the consumption in other countries. The four principal kinds are board, newsprint, wrapping and book paper. In the United States there are about 600 mills, which make well over twelve million tons of paper every year—more than half the production of the whole world.

peanuts, the underground nut of a plant of the bean family; peanuts are used as human food, as hog feed and as an important source of an oil used principally as a lard substitute in cooking. Most of the United States' production is in the southern states. West Africa and India are important producers. The annual American crop amounts to 1⅓ billion pounds, valued at more than 44 million dollars.

Peanut butter is produced by grinding the roasted nuts.

petroleum, an oily liquid mixture of hydrocarbons that occurs in underground deposits; it is indispensable to our modern machine age. It supplies power, lubricates bearings, provides road-building and roofing materials and is a source of drugs, chemicals, disinfectants and scores of other useful products.

Since earliest times petroleum has been known to man in the form of oil springs and surface seepage. In Bible days it was used as a binder in making mortar. American Indians valued it for supposed medicinal properties—indeed, less than a 100 years ago its only use by white Americans was as a liniment.

The modern petroleum industry did not begin until 1859 when the first oil well was drilled by Col. Edwin L. Drake in Titusville, Pa. The purpose was to get oil that might possibly replace the expensive oils then obtained by distilling coal and shale. Such oils, used for lighting, lubrication and the like, found a ready market because the supply of whale oil was declining rapidly. Petroleum oils found immediate favor once it was discovered that they could be obtained by distillation processes much the same as those then used with coal.

In the early days of the industry little was known of the origin of oil or the location of oil pools. Many of the wells were found by accident. Often petroleum appeared in wells being drilled for salt; this was considered a calamity. Today oil companies employ geologists to help locate oil pools. Their judgment is not infallible, but they can eliminate sites where oil is not likely to be found. Since it costs from $20,000 to $190,000 to drill a well, the services of such experts are extremely valuable.

Petroleum is thought to be formed by great pressure and heat acting on the dead bodies of sea creatures. Heat and pressure are produced by overlying material, movements of the earth and volcanic activity. The resulting petroleum will evaporate and run away unless there is a natural storage place. An ideal holder is porous sandstone, with leakproof layers of shale above and below to prevent the oil's escape. The condition is somewhat better if these layers are folded upward into a domelike structure.

The geologist cannot tell whether a dome contains oil; but he studies the rock formations and kinds of rock in a dome and decides whether they are favorable to oil accumulation. He is aided by scientific instruments that help to indicate the subsurface structure.

Areas of Production. Crude petroleum is found in every continent, but only a few areas have enough for commercial production; the principal oil fields are in North America, northern South America, southeastern Europe, southwestern Asia and the East Indies. The United States is by far the leading producer and consumer of petroleum and its products, with Russia second. Many fields outside the United States are under the commercial domination of American oil companies. It is estimated that the United States controls about 70 per cent of the world's oil.

The first American field to be developed was the so-called eastern district, centering in Pennsylvania. For a long time this section was the leading producer, but today the mid-continent district (composed of parts of Texas, Kansas, Oklahoma and Arkansas) is the most important and accounts for about 65 per cent of the total. The Gulf coast district (which includes parts of Texas and Louisiana) furnishes about 9 per cent of the total. In this section some of the wells are sunk into the sea bottom from floating barges or from artificial islands. The Rocky Mountain district (Montana, Wyoming, Colorado and New Mexico), although it produces only about 2 per cent of the total at the present time, apparently contains large reserves. The last area of importance is in California, and from this field comes about 19 per cent of the United States' total production.

The United States produces about 60 per cent of the total world production of petroleum. Russia is second with more than 10 per cent, and Venezuela ranks third with about 8 per cent, which is more than twice as much as the next producer, Rumania.

Trade. Petroleum is so essential to modern civilized life that in spite of its bulk quantities of it are transported over great distances. The principal movement of petroleum is from the United States to the industrial countries of northwest Europe. On land petroleum is transported by pipe lines and tank cars, and on water by tankers—boats specially constructed to carry liquid cargo. In the United States crude oil is usually pumped through pipe lines from the wells to the large centers of population and there refined into its various products for local use. There are 100,000 miles of such lines in the United States, and some of them run halfway across the continent. Pumping stations are spaced every 20 to 40 miles along the pipe line.

Conservation. The wise utilization of oil resources is an important problem, since oil once used is gone forever. Overproduction is a serious problem. Oil can be conserved by drilling fewer wells, by more efficient consumption, better production methods and wider use of the various by-products obtained in the refining process.

Supplementary Petroleum and Substitutes. Some petroleum is still obtained from oil shale and coal. It is more expensive than oil obtained from natural pools. As a substitute for gasoline alcohol can be made from grain; lubricating oils, from cottonseed and palms; gas, from the destructive distillation of straw and other wastes. Almost without exception, however, these substitute products are either more expensive or less satisfactory than those obtained from natural petroleum.

petroleum refining, breaking down crude oil into its many components by distillation. This process has in the past grown through many stages, depending on what products were in greatest demand, the composition of the crude oil available and technical progress in refining.

Up to 1900 kerosene was the product most desired. Only a crude refining process was needed to drive off the lighter gases and gasoline as waste products and separate the kerosene from the heavier oils. After 1900 the increased demand for gasoline to be used in automobiles greatly influenced the industry. It led to more careful refining methods and also to the far wider use of petroleum products, for in the attempt to get more gasoline, more by-products were produced. Fortunately markets were found or made for many such products. Ships began to operate on fuel oil instead of coal, and oil-burning furnaces were installed in homes. Chemicals, medicines, roofing compounds and cleaning fluids were also developed and absorbed many of the industry's by-products. Today the value of a year's output of petroleum products in the United States is over 2 billion dollars.

All crude oil is made up of compounds of carbon and hydrogen, called hydrocarbons. Chemically there is no great difference between any of them. The differences in their properties depend on the mechanical arrangement of the molecules. When the lighter molecules are heated, they change into vapor first and can be trapped, condensed and removed before the next heavier *fractions,* as they are called, come out in vapor form. So distilling oil becomes a matter of collecting one kind of hydrocarbon after another. Among the lightest fractions is gasoline; this is followed by naphtha, kerosene, heavy oil, tar, asphalt and coke. The heavy oils become lubricating oils.

Today there are three principal methods or refining crude petroleum: skimming or topping, the straight-run process and the cracking process. *Skimming* is the oldest and most wasteful method, usually carried on only in small plants. It takes from crude oil only the gasoline easily extracted by simple distillation. No other petroleum products are separated out; all the residue is either sold as fuel oil or sent to cracking plants for further distillation.

More than half of all crude oil is refined by the *straight-run process.* This is a complete distillation, separating out all the gasoline, oils, tar and other products. It takes from the oil all the gasoline naturally present in it.

In the third process, *cracking,* some of the heavier fractions are actually made to change chemically into gasoline. In the straight-run method these fractions would come out as something between kerosene and tar. When they are distilled under great heat and pressure, they turn into the lighter hydrocarbon and leave behind a certain amount of carbon, which makes the chemical difference between gasoline and heavier oil. Refiners are now carrying on this process in the presence of hydrogen, which combines with the surplus carbon left behind and makes still more gasoline. This *hydrogenation* remains largely experimental.

In the straight-run process about 42 per cent of the petroleum becomes gasoline; by cracking a 60 per cent yield of gasoline can be obtained.

Much gasoline is produced at the oil wells from the natural gas that accompanies a petroleum deposit. Such gasoline is called *casing-head* gasoline. It is taken from the gas either by squeezing it out under high pressures or by absorbing it into light oils. It is extremely volatile and is mixed with petroleum gasoline for use in aircraft.

phonograph, a device for reproducing sound by the vibration of a diaphragm actuated by a needle that follows a formed groove in a record. Strictly speaking, the name may also be applied to the machine that makes the recording. The basic principle of the modern phonograph is the same as in that invented by Edison in 1877. Sound is merely vibration in the atmosphere. If sound waves strike a thin, flexible disk, the disk will vibrate in harmony. If the process is reversed, and the disk vibrated, it will set up air vibrations, producing sound.

In order to record sound, Edison attached a cutting needle to the center of a diaphragm and allowed it to rest against a cylinder covered with tin foil. Voice and music then created vibrations of air to which the delicately poised needle responded; the cylinder was rapidly revolved and the needle cut a spiral path around it. A strong magnifying glass would show that this path was one of humps and depressions of varying size. Then, by reversing the process, with the cylinder turning and the needle resting in the groove already cut, it reproduced in sound its own recording. Later it was found preferable to make the recording horizontally instead of vertically; that is, the groove of a modern record shows horizontal undulations instead of vertical rises and falls (hill-and-dale record).

Until about 1925 records were made by the direct impact of the sound vibrations against the diaphragm of the recording instrument. Ways of amplifying the voice electrically had not yet been devised, and the performers sang or played into a large horn, which amplified the vibrations and directed them against the diaphragm. As a result there was much distortion and lack of clarity when the sound was reproduced.

Modern records are superior largely because the sound produced by the recording artist is amplified and controlled electrically. A microphone picks up the sound and translates it into electrical impulses that actuate an electromagnet attached to a needle that makes an impression in a revolving wax disk. The recording engineer can control volume and balance the various ranges of tone. The electrical method also makes possible the reproduction of the entire range of sound frequencies; with the old method the very high and very low notes were likely to be lost.

After the wax record is made, it is coated with graphite, and a copper shell is formed over it by electroplating. The shell is strengthened and another is made from it; the first one then becomes the *master record* and is carefully stored away. From the other is made a stamping mold of nickel. In making a *double-faced* record the two stamping molds are placed face to face in a steam-heated press. They squeeze between them a layer of plastic material that faithfully takes the shape of the mold. Modern records are largely made of the artificial resins.

The phonograph waned in popularity when radio came into general use, but the industry revived when the electrical method of recording was perfected. Minor radio programs today are often merely broadcasts of a record, called in radio *electrical transcriptions.* Such records are much thicker than ordinary ones, but they are made in the same way.

phosphate, mineral rock containing compounds of phosphorus, usually calcium phosphate, which is valuable for fertilizers. The principal deposits are in Florida and northern Africa. Another important source of phosphorus compounds is slag from blast furnaces.

photoelectric devices, those in which radiant energy in the form of ultraviolet, visible or infrared light produces an electrical effect. Actually electrons are released from atoms as a result of their absorbing energy from the light rays. This photoelectric effect takes three forms:

In the *surface photoelectric effect* electrons leave the surface of a solid or liquid that is placed either in a vacuum or gas. When the emitting surface and a collecting electrode are placed in a glass envelope, the device is the photoelectric or photoemissive cell.

A *volume photoelectric effect* exists when electrons are released from the atoms within the material itself and thus become free to act as carriers of electricity. The material becomes a better conductor of electricity when exposed to light. The most common device utilizing this effect is the familiar selenium cell.

The *photovoltaic effect* refers to the production of an electromotive force in a circuit containing the photosensitive material; that is, when the device is exposed to light, a current is generated in the circuit. In the other two types a battery is needed to set up an electric current.

The first study of the *surface* photoelectric effect was begun by German scientists about 1887. They found that certain metals, such as potassium, sodium, zinc and aluminum, when they were amalgamated with mercury, became photoelectrically sensitive to visible light as well as to ultraviolet light, although other common metals, such as tin, copper and iron, remained inactive. In 1890 they constructed a glass bulb containing alkali metals or their alloys or amalgams, with an electrode for collecting the electrons emitted from the photosensitive material. When the tube was connected in a circuit with a battery and then illumined, a current flowed around the circuit. In 1892 they used such a device as a photometer for measuring the amount of ultraviolet light in sunlight and were later able to increase its sensitivity by adding a small amount of hydrogen.

The next important work was carried out in 1899 by P. Lenard in Germany and by J. J. Thomson in England, when both of these investigators were able to show that the negative carriers of electricity that were emitted as a result of the action of light were simply electrons. Continuing this research Lenard next made the astounding observation that although the number of electrons emitted was proportional to the intensity of the light falling upon the material, the energy developed by each electron depended only upon the wave length of the light. Since this could not be explained upon the basis of the wave theory of light, Albert Einstein in 1905 suggested that light could be assumed to be made up of tiny corpuscles or quanta each containing an amount of energy proportional to the frequency. From this followed Einstein's famous law for photoelectric emission that later won for him the Nobel Prize.

In recent years these studies have led to the development of a large number of commercial types of photoelectric cells that are used in control circuits, sound motion pictures, television and light-measuring equipment. Their usefulness was greatly increased when thermionic vacuum-tube amplifiers were developed; they magnify the weak currents in photoelectric cells.

Photoelectric Cells. These cells consist of an evacuated envelope, usually of glass or fused quartz, in which a metallic substance, the cathode is enclosed. When the metal is struck by light, electrons are emitted. There is also an anode; the electrons are emitted at the cathode and then drawn to the anode or plate. Since the rate of emission is proportional to the intensity of the light striking the emitting surface, the plate current will be proportional to the light intensity.

The materials most commonly used for the emitting surface are the alkali metals—sodium, potassium, rubidium and cesium. Cesium responds to different colors much as the human eye does, and cesium cells are usually used when results comparable to those obtained by visual observation are desired. Other metals are used under other conditions. Potassium, for example, is very sensitive to short wave lengths of light and is sometimes used for measuring light intensities toward the violet end of the spectrum.

In the early photoelectric cells the emitting surface was formed by allowing potassium or sodium vapor to condense on the inside of a spherical flask. A window to admit light was formed by melting away a portion of the coating. The anode usually consisted of a small metal sphere or ring at the center of the flask.

Such cells have been almost entirely replaced by types in which the light-sensitive material is deposited on a thin alloy plate, usually bent in the form of a V or a semicircular trough mounted vertically in the tube. The anode is a long, straight wire mounted in the center of the plane of the front edges of the cathode. The tubes are filled with some inert gas, such as helium or argon, which greatly increases the sensitivity.

The principal use of photoelectric cells today is in control circuits, sound motion pictures and television. Their advantages over other types of photosensitive devices are that they have a linear response—that is, the current they develop is proportional to the intensity of the light—and that the response is practically instantaneous and hence uniform over a wide band of frequencies.

Selenium Cells. These depend for operation on the fact that when the element selenium is exposed to light, it becomes a good conductor of electricity. In modern tube construction two interlocking metallic grids are bridged by a very thin layer of selenium. Their use is principally confined to experimental and industrial control, since there is an appreciable time lag before they respond to light. They cannot therefore be used in sound movies and television.

Photovoltaic Cells. There are several types of such cells. In one a thin layer of cuprous oxide is sandwiched between two electrodes. When it is exposed to light, electrons flow and a current is set up in the circuit. In another a layer of selenium on a steel plate is the electron-emitting material.

The great advantage of photovoltaic cells over the other types of light-sensitive devices is that they do not ordinarily require any external source of energy. Because they have a time lag, however, they are not applicable to sound movie and television work and can be used only for industrial control, traffic-light control and the like and for measurement of light intensities. For control work they deliver enough energy to operate small relays; for light measurement they can be mounted together with a galvanometer in a very compact unit. Units small enough to be held in the hand are used as foot-candle meters for measuring the intensity of illumination in buildings and as exposure meters for use in photography.

Photoelectric devices are now used to control automatically the illumination of factories and schools. In factories where illumination is maintained at the proper level for a certain type of work, there is an increase in production and a decrease in the number of accidents; in schools an improvement in the performance of the students always accompanies the installation of such apparatus.

photography, the forming and recording of an image through the photochemical activity of light. The light-sensitive material is in the form of a thin gelatin emulsion covering one side of a film or plate, and exposure in the camera simply produces a potential or latent image. As a result of a subsequent chemical treatment, known as *developing,* the image is brought out. Parts of the plate bear sensitive material untouched by the light; this must be removed in a process known as *fixing.*

The image obtained in this manner is usually a negative; that is, dark spots on the developed film correspond to light spots on the object and vice versa. In order to obtain positives the negative is held against a light-sensitive paper and exposed. When this paper is developed and fixed, it gives the desired result. This method of producing the positive from the original negative is called *contact printing.* Although the films themselves can be so developed as to give a positive, this is rarely done except with some of the small-sized motion-picture films for amateur use. By the printing process an unlimited number of prints can be made from a single negative.

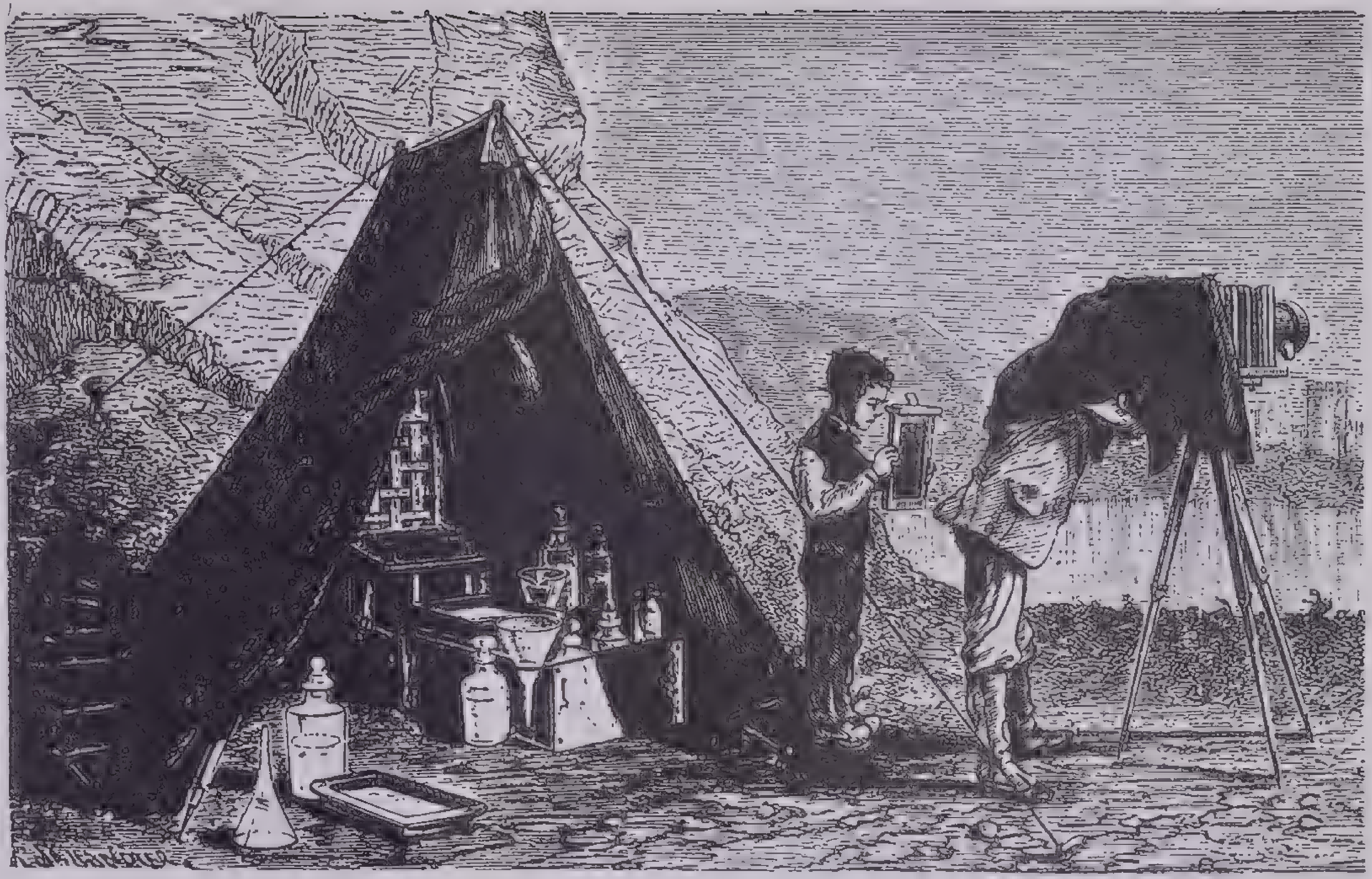
In *projection printing* the light is projected through the negative and upon paper placed some distance away so that either an enlargement or a reduction can be obtained. This method is quite commonly used in enlarging from miniature camera films. For making enlargements from larger negatives, another method has been devised, principally because lenses for large projectors would be expensive. By this method the negative is illuminated from the back with diffused light (from a high-power incandescent lamp, a photoflood lamp with a parabolic reflector or an argon-mercury-glow tube bent into the form of a close grid). The enlarger proper actually functions in much the same manner as a camera, since its lens collects a certain amount of light from the illuminated negative and brings it to a focus upon a light-sensitive paper, usually fast bromide enlarging paper.

The history of photography dates back to the year 1565, when it was observed that certain silver salts become blackened when they are exposed to air. That this phenomenon was caused by the effect of the light was not proved until 1727. This led to many early attempts at photography, unsuccessful principally because the experimenters did not know how to remove the unexposed portions and so prevent a further blackening upon subsequent exposure to light.

The next important contribution was made in 1839 by the French painter Daguerre. While he was experimenting with light-sensitive compounds, he accidentally discovered that if a highly polished silvered copper plate were held in iodine fumes, so as to form a very thin coating of silver iodide, and then exposed in a camera, a permanent image would appear if it were then fumed with mercury vapor. In his earlier attempts an exposure of several minutes was necessary even in bright sunlight, but with later refinements portraits—called *daguerreotypes*—could be obtained under favorable lighting conditions with an exposure of only a few seconds.

At about the same time Talbot in England was working on a somewhat different method that also proved successful. In Talbot's method paper was treated with a solution of silver iodide and silver nitrate; both paper and process were known as *calotype.* After exposure the film was developed with gallic acid and fixed with sodium theosulphate, resulting in a negative. A positive could then be obtained by contact printing on another piece of calotype. Although this method did not persist for long, it was the first example of contact printing and prepared the way for the development of other processes.

In 1851 both daguerreotype and calotype were replaced by the much more sensitive wet-plate process originated by Archer in England. In this an emulsion was prepared by adding a soluble iodide to a solution of pyroxylin in ether or alcohol, which was then used to coat a clean glass plate with a thin film. Just before use it was sensitized by placing it in a solution of silver nitrate in a darkroom; this resulted in the production of some silver iodide. It was then inserted into the camera while it was still wet and exposed. Development and fixing were quite similar to the calotype process.



Courtesy Eastman Kodak Company

When Photography Was Young

Before the days of the film roll and dry plate the taking of a picture required much labor and equipment. The tent, for darkness, and all the equipment shown was necessary in outdoor work. The emulsion had to be applied and the sensitized plate used while still wet. In the picture the photographer is shown focusing his subject; the boy stands ready to hand him the newly made wet plate

The *wet-plate process* was very inconvenient, and great efforts were made to develop an equally sensitive dry plate. In 1864 Sayce and Bolton successfully prepared an emulsion of silver bromide in collodion. In 1871 Maddox used an emulsion of the same light-sensitive element in gelatin, which resulted in a plate 10 to 100 times more sensitive than the wet plate. By 1879 dry plates were on the market that were comparable in speed to the slower ones today.

In 1884 the forerunner of our present-day film was invented—the gelatin emulsion was coated on a roll of paper. Eastman obtained the patent in 1885 for coating the paper in long rolls. At first roll-film cameras had to be sent back to the factory for reloading, but in 1891, 2 years after the celluloid film was developed by Eastman, daylight loading was introduced.

Other important film developments are the noncurling film in 1891; autographic films in 1913; and even more recently, orthochromatic films which are made more sensitive to yellow-green by dyeing and thus are able to give the correct shadow relation irrespective of color; panchromatic films that are sensitive to all colors and give about the same relative brightness values as the eye; panoramic and other fine-grain films for miniature camera use when there is to be a considerable amount of enlargement; and finally colored films and plates.

The basis of *color photography* was established by James Clerk Maxwell in 1861, when he showed by a series of experiments that all colors visible to the human eye can be matched by mixing the light of the three primary[1] colors—red, green and blue—in the right proportions. It would be possible, therefore, to make three separate films of the same object, through red, green and blue filters. The strength and location of the blue in the object would thus be shown on one film (in terms of black and white, of course) and the other colors on the other films. Then, if each film were stained in its respective color, and all three films were superimposed and light passed through them, the projection on a screen would be in true color. Although this method is used to some extent it is inconvenient and complicated; but it has led to the development of better processes.

In general the methods used in color photography can be divided into the *additive process* and the *subtractive process*. In the former an exposure that really consists of three separate but simultaneous exposures is made on a single film or plate. A positive is made that can be viewed by transmitted light. This process is known as additive because the different colors in the transmitted light are added together to give the desired effect. Examples of this are the Autochrome, Agfacolor, Finlay and Dufaycolor processes (these are trade names). In the subtractive process three balanced exposures are made through red, green and blue filters; the respective color proportions are recorded in black and white. Positives in their true colors are then made from these negatives, each in the color as recorded by the negatives. This is known as the subtractive process because the colors obtained subtract from the white light falling on the picture. The Kodachrome process is the most widely known example of this method.

Autochrome Process. This was perfected by the Lumière brothers in 1907 and for many years was extensively used. Starch granules are dyed red, green and blue, mixed and deposited in a single layer on a glass plate. The layer is grey in appearance. Over the starch layer is a photographic emulsion sensitive to all colors.

The plate is placed in a camera with the glass side toward the lens and exposed. Any red light from the object photographed is transmitted by the red granules and exposes the part of the emulsion where the light strikes, the amount of exposure being proportional to the intensity of the red light. A similar effect is produced by green or blue light present. The plate is then developed by the regular process and the silver dissolved. After that the plate is completely exposed to white light and redeveloped, so that any part of the emulsion not struck by a colored light will become opaque. When the processed plate is held up to the light, the picture is seen in its original colors.

The Agfacolor Plate was developed in 1923 and has been quite popular. It also uses the screen-plate process, but instead of starch a colloidal solution of dyed particles of gum arabic forms the screen.

Dufaycolor Process. This is similar to the Autochrome and Agfacolor-plate processes, except that the colored screen is in the form of a geometric pattern. Such a scheme was first suggested by Vidal in 1895 and was perfected by Dufay in 1908. In its present form the screen consists of tiny blue and green squares separated by red lines, spaced about 23 lines to the millimeter; there are about 1⅓ million squares per square inch of surface. The screen pattern is printed on the film by an engraved cylinder. Although the squares are not visible on the original film, they are quite pronounced when they are projected upon a large screen. As a result an attempt is now being made to increase the number of lines.

Finlay Process. In this method, which was developed by Clare Finlay in 1929, the screen consists of a pattern of red, green and blue-violet squares in regular sequence. It reproduces colors very accurately. This screen may be either separate from the film or a part of it.

Kodachrome Process. This consists of a three-color subtractive process in which the light is separated into three components at different depths. In order to do this the films are given five emulsion coatings. The first of these is especially sensitive to red and is deposited directly on the film or plate. This is then covered with a thin layer of dyed gelatin that acts as a filter. Above this is applied a green-sensitive layer of emulsion, which in turn is covered with another filtering layer. The last one is a blue sensitive emulsion that contains a certain amount of yellow dye. The process of development is very complicated and is carried out at the factory.

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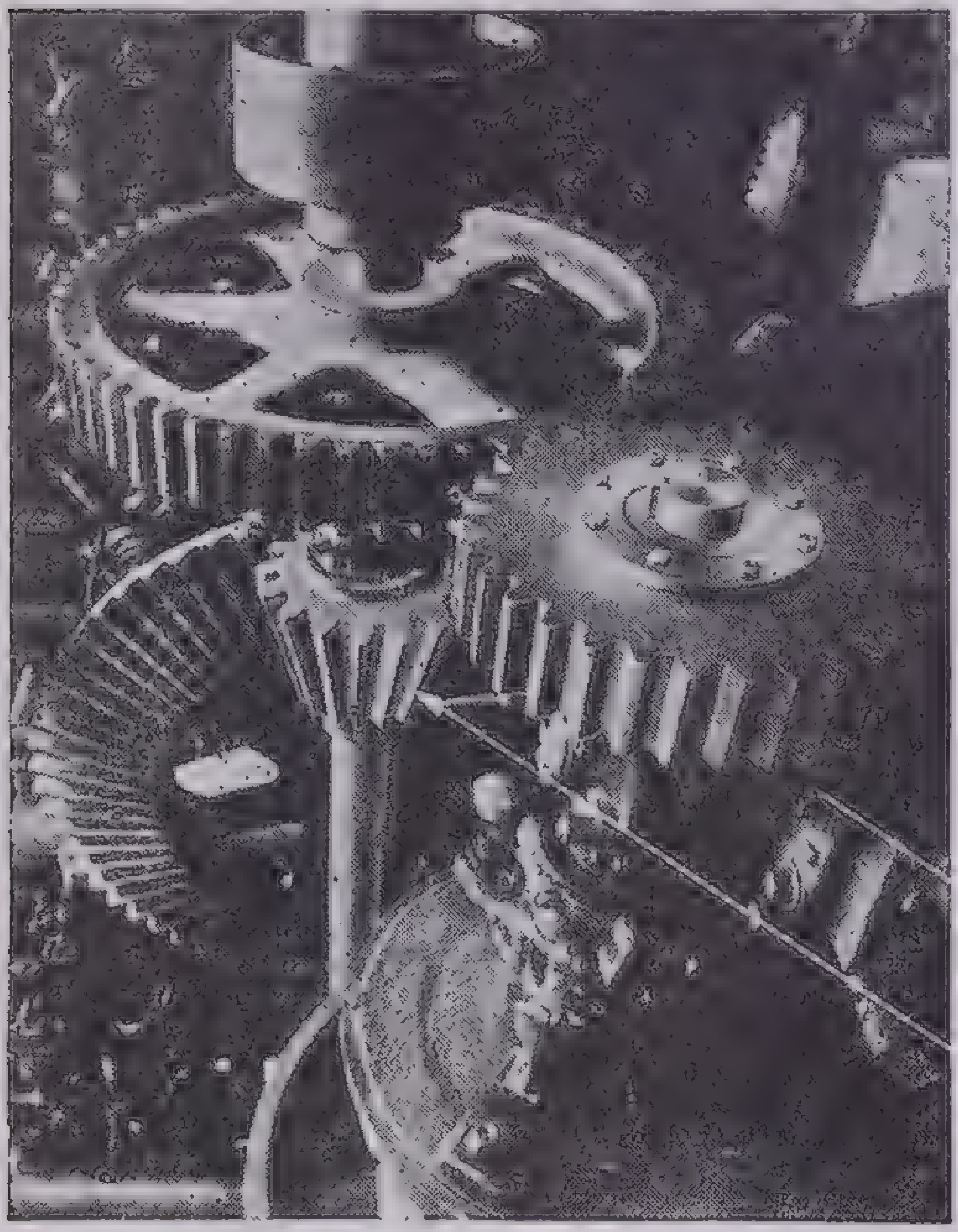
[1] There are two classes of primary colors: *subtractive* and *additive*. The *subtractive* primaries—red, yellow and blue—are the colors from which all other colors can be secured by mixing paints or inks; and these are the primary colors used in process color printing. The *additive* primaries—red, green and blue—are the colors from which all others may be secured by mixing light sources.

plastics, synthetic resinlike substances that can be molded into intricate shapes. Many plastics are important for insulation uses; many are used because they take bright colors and a high polish. Plastics can be made in so many varieties that in recent years the practice has been to devise a new formula for each highly specialized application. These materials are the first widely used, truly synthetic products devised by chemistry. Plastics were discovered more or less by accident. Some kinds were found by chemists who were seeking substitutes for natural resins; some, when they were attempting to find something entirely different.



Courtesy The Richardson Company: "Insurok"

Plastics in Industry

The gears to which the arrows point are made of laminated plastic. They absorb shock better and run more quietly than steel gears

Celluloid was the first synthetic plastic. It was invented in 1868 by John Hyatt, a printer, who was trying to find a substitute for ivory. He was competing for a $10,000 prize offered by a maker of billiard balls for such a substance. Celluloid (a trade name) is made by treating cellulose with nitric acid and dissolving the product in camphor. If more nitric acid were used in the process, the product would be nitrocellulose or guncotton. Celluloid is widely used for piano keys, knife handles, toys, combs and the like. It is highly inflammable, although improved kinds are less so.

The second plastic, *casein plastic,* appeared in 1890; it was the invention of Dr. Adolph Spitteler of Germany, who was trying to find a substance suitable for making white blackboards. Casein from sour milk, mixed with formaldehyde, becomes a hard, horny material with a high surface polish.

The third class of plastics are the *phenolics,* perhaps the most useful of all. They were discovered in the United States by Dr. Leo Baekeland, who had previously developed strip film for photographic use. By mixing formaldehyde with carbolic acid he hoped to make a substance suitable for varnish and capable of being melted by heat and soluble in alcohol. What he really made was *bakelite,* which does not melt and which is not attacked by most acids. It is an excellent insulator and is widely used in making electrical parts, such as plugs, meter cases and the like. It makes excellent varnishes, as Baekeland had hoped, but before it could be so used new kinds of solvents had to be devised.

The fourth class of plastics are the *urea* compounds, depending largely upon urea ($CO(NH_2)_2$) and formaldehyde. Such plastics are light in color and hence are especially suitable for mixing with bright-colored pigments. The urea is itself a synthetic product, derived from ammonia produced by fixing the nitrogen of the air.

Objects are molded from plastics in either powdered or molten form. While in the mold they must be seasoned, and the form fixed by holding the mold at a high temperature.

Plastic materials are often mixed with wood dust or the like to provide bulk. An important variation is to impregnate heavy fabrics with plastic in liquid form, building up a shape such as a gear blank with layers of such cloth. Gears cut from this material run more quietly and show less wear than steel gears.

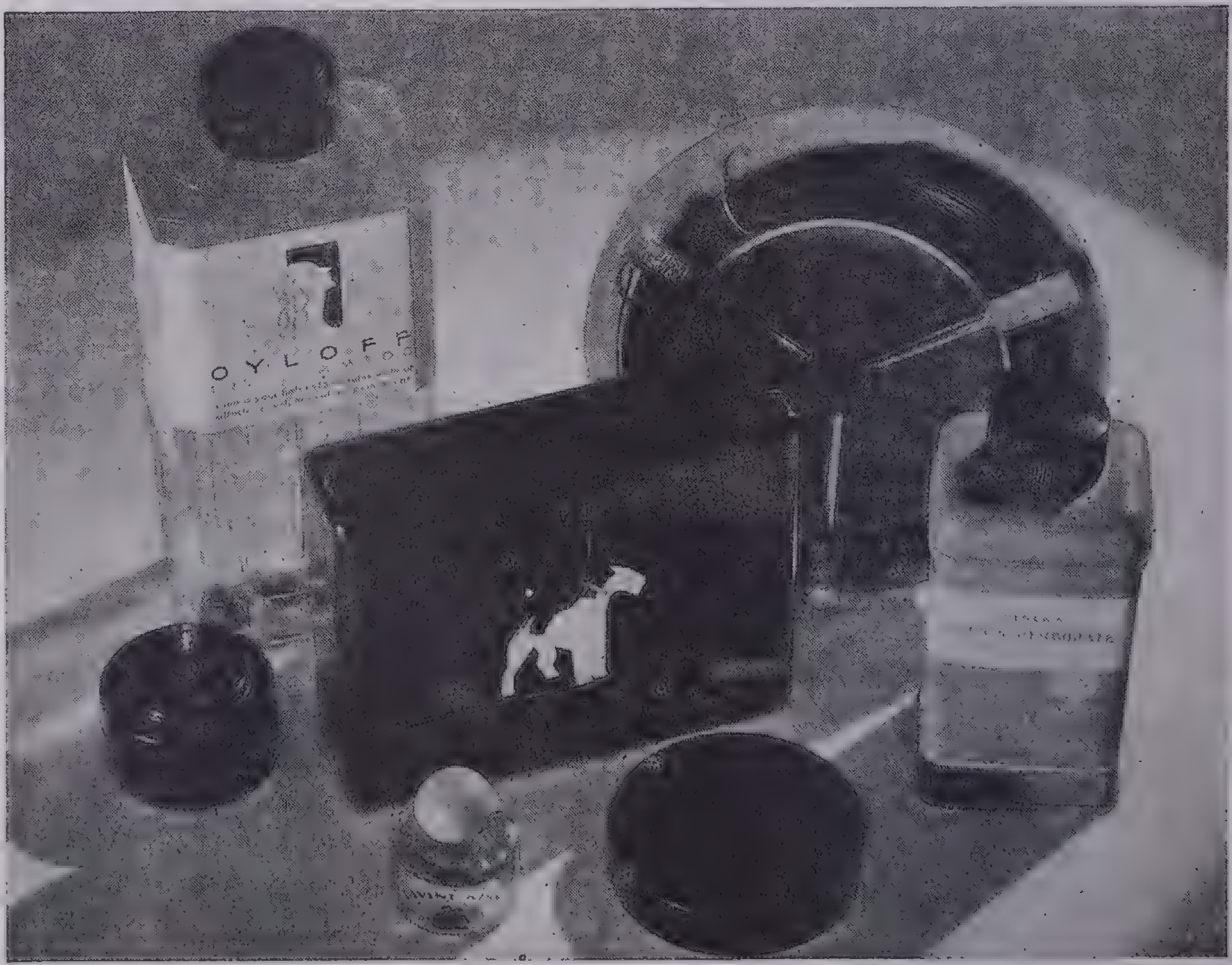
The articles made of plastics are varied and numerous; pens and pencils, bottle tops, automobile parts (such as knobs, handles and instrument panels), radio cases, ash trays, knife handles, table tops, insulation parts, linoleum, printing ink, phonograph records, artificial rubber, shatterproof glass, playing cards, soundproofing materials, dental plates, beads and other jewelry, lampshades, toothbrush handles, bathroom cups, tiles, doorknobs and the like are among them.

pneumatic dispatch, the method of transporting small articles between two points in small containers forced through tubes under air pressure. The first such system was built in London under the direction of Josiah L. Clark in 1854. It was used by the Electric International Telegraph Company to transport telegraph messages a distance of 660 feet. The most common use for these systems is the transportation of letters, cash and various office forms.

The containers are smooth closed cylinders, so constructed that they can be opened for the insertion and removal of the articles to be carried. They are usually made of metal or leather and are fitted with felt collars at the ends to make a nonleaking fit with the tube. The air in the tube is kept in motion by a suction pump at the receiving end or a compression pump at the sending end or (in long tubes carrying heavy loads) a combination of the two.

When one of the containers is inserted in the tube, it is propelled rapidly through the tube because of the greater air pressure at the back than at the front of the container. In vacuum systems the container would be drawn all the way to the suction pump, except that there is an abrupt change in the direction of air flow at the point of outlet for the container. The container is thrown by its own momentum through a trap door.

The small pneumatic dispatch sys-



Courtesy General Plastics, Inc.: "Durez"

Plastics in the Home

The new material finds many home uses besides those pictured here tems are used to a considerable extent in stores for carrying cash and sales slips from the counters to the cashier's office and returning receipted slips and change. These systems use containers about 2½ inches in diameter. Larger systems in big cities carry letters from one post office to another. One system was installed in Philadelphia in 1893 for carrying mail between the main post office and the Bourse, a distance of almost 3,000 feet. The tubes had an inside diameter of 6⅛ inches, and the containers traveled at a speed of 25 miles an hour. One of the longest systems for carrying mail was that installed in 1898 between the post offices of New York city and Brooklyn, a distance of 6.8 miles.

The advantage of pneumatic dispatch is its ability to handle a large number of parcels at a remarkable speed. Some of the containers hold 500 letters and travel at 30 miles an hour; besides there are many containers moving in the tube at the same time. In one of the tubes in New York city an average of 5 million letters is carried each day.

potash, mineral potassium salts, usually the sulphate or chloride, or a mixture of potassium and magnesium chlorides or a mixture of the chlorides and sulphates of potassium, sodium and magnesium. The chief use is in fertilizers. Before the World War Germany controlled practically all the world's supply. Some of her deposits were given to France under the Treaty of Versailles. Low-grade deposits were discovered and worked in the United States during the war, but Germany is still the world's leading producer.

pottery, objects molded or cast of clay and hardened by heat. Pottery making is one of the oldest of industries and in principle the processes today are not different from those of thousands of years ago.

A distinction is made between *porcelain* (the finer kinds of dishes, vases and the like) and *earthenware* (cheaper household articles including sanitary ware, such as washbasins). Porcelain or china is translucent and nonporous even without glaze or glassy coating. It is made largely of kaolin. Earthenware is made from commoner clays and is too porous to use without the glazed coating that makes it impervious.

There are three steps in the manufacture of all pottery: preparing the materials, forming the ware and firing. The raw materials are kaolin, clay, feldspar and quartz, with proportions depending on the kind of articles to be made. The kaolin is plastic; feldspar and quartz are not, but they serve to dilute the kaolin, to act as a cement and to prevent undue shrinkage in firing (although almost all pottery shrinks by one-sixth when fired).

After the raw material is ground and aged for some months, it is shaped in one of three ways: pressing, jiggering or casting. *Pressing* is generally used in making irregular objects, such as washbasins. The damp clay is either shaped by hand or pressed into plaster molds.

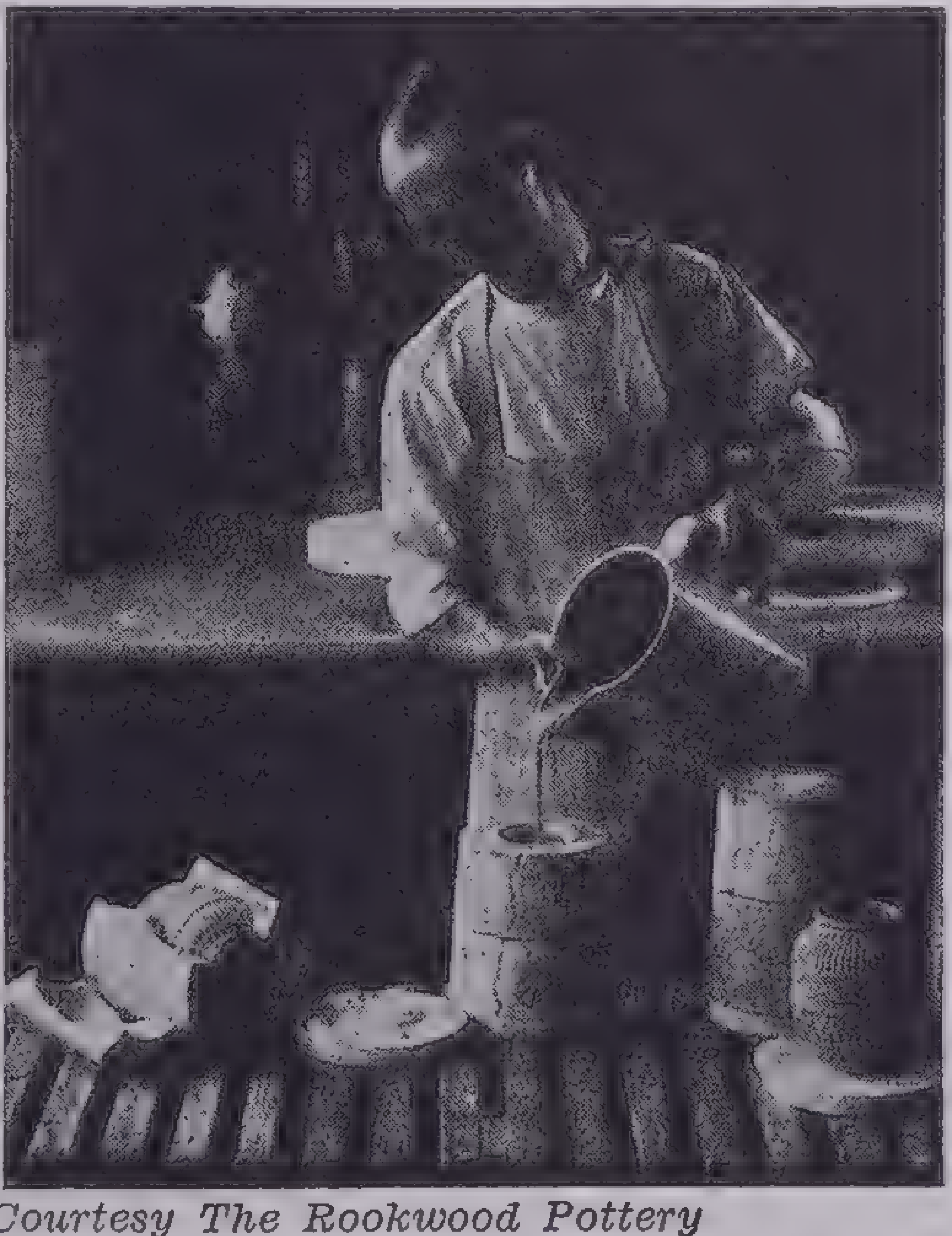
Jiggering, used in the making of symmetrical objects like bowls, cups and plates, involves the use of a *potter's wheel* or *jigger.* The potter's wheel is like a table with a large circular disk on top that revolves. The piece of pottery is placed on this revolving disk and as it turns is shaped either by hand or with shaped tools called *sweeps.* Skilled workers are needed in both methods.

Casting is a more recent process, requiring little skill and making fast output possible. Molds are made to the required shape of plaster of Paris, which absorbs much water. A watery clay pulp is poured in; the mold absorbs water and a clay sheath forms on the inside. When this is thick enough, the rest of the pulp is poured out.

When the clay form is *fired* under intense heat, it partially fuses and hardens. The firing takes place in a large ovenlike structure, a *kiln.* Except for very common ware most pottery is subjected to two firings. The first or *biscuit firing* fixes the shape of the ware; the second or *glost firing,* done after the ware has had a glaze in solution applied to it, fuses or vitrifies the glaze.

The glaze is a mixture of the same materials of which the article was made with a larger proportion of feldspar and quartz. Other materials, such as boracic acid, soda, lead carbonate, zinc oxide and salt, are added for special purposes. Coloring and painting may be done either before or after firing and glazing, depending on the effect desired. The coloring matter is often dye mixed with fusible glass.

Only the cheaper grades of pottery were made in the United States before 1850, and fine chinaware was imported. Now the industry turns out products valued at 67 million dollars a year. Some pottery is made in almost every state, but East Liverpool, Ohio and Trenton, N. J., are the chief centers. East Liverpool is noted for general ware—jugs, teapots, vases, dishes, ornaments and the like; Trenton specializes in sanitary ware, such as bathtubs, washstands and so on.



Courtesy The Rookwood Pottery

In the Casting Process Clay in Semi-liquid Form Is Poured into a Mold

Courtesy The Rookwood Pottery

This Craftsman Is Forming a Vase by Hand on the Potter's Wheel

power. Our modern industrial world is possible largely because man has found ways of multiplying his own strength. Man uses many sources of energy—in this order of importance: coal, oil, falling water, natural gas, wood, man power, animal power, wind, peat, oil shale, alcohol, internal earth heat, direct sun, tide power; but the emphasis today is on power in the form of electricity, and it will be tomorrow.

In the United States water power was used first. It was developed in Colonial times and continued in importance down to about 1815. Toward the end of the 18th century the steam engine reached a high degree of development, and this ushered in the age of steam. Electrical power was first introduced into American factories late in the 19th century and today accounts for three-fourths of the power used in industry.

Electricity is called *secondary power* because it is derived from other (primary) sources of energy; most current is produced either by burning fuel or by harnessing the power of falling water. About 115 billion kilowatt-hours of electricity are produced every year in the United States—two-thirds by fuel power, one-third by water power.

The fuels chiefly used are coal, oil and gas, with coal the most important. Every year more than 42 million tons are used in making current. A coal-burning electric plant generates steam from the heat of burning coal. The steam then drives either a steam engine or, in more modern installations, a turbine. The energy released by the burning coal is thus transformed into mechanical motion. The mechanical power is applied to a generator that transforms it into electric current.

Electric current derived from the energy of falling water is second in importance and amount only to that derived from burning fuel. The great pressure developed in a high column of water acts against turbine blades that spin rapidly, giving mechanical motion in turn to a generator. Because there are variations in the natural flow of streams, a dam is usually a part of the hydroelectric plant.

These two processes account for almost all electricity produced. Smaller amounts come from generators turned by wind power or by internal-combustion engines, such as Diesel engines.

Although fuel and water power have made current cheap and abundant, other sources may someday become important. There is direct sun power, for instance. The latent heat in coal is nothing but transformed sun power; and many scientists are working on various devices for harnessing and storing sun heat. If the sunlight that falls on 200 square miles of the Mohave Desert could be turned into electric power, it would serve all power needs in the United States the year round; and if all the summer sun that falls on the roof of a home could be so used, it would supply all that home's needs for heat and power the year around.

Experimental solar engines usually take the form of apparatus that focuses the sun's rays on some substance that will hold the heat, such as heavy oil in an insulated tank.

The ceaseless energy of the waves has been used experimentally in power production by means of a sort of battering ram (moved by the waves) that pumps water to a high tank from which it runs to a turbine. Possibilities for producing power are presented by tropical oceans, in which there is a large difference in temperature between the warm surface water and the icy deeper layers. Some scientists think the strata could be adapted to produce mechanical motion or used in connection with a low-pressure steam plant.

There are several places in the world that always have exceptionally high tides that could perhaps be harnessed to produce power. The most promising places are the Tsientang River in China; the Severn River in England; the coast of Brittany in France; Passamaquoddy Bay in Maine. In the first Franklin Roosevelt administration development was begun at Passamaquoddy.

In many places small power plants have been erected at hot springs, volcanoes and the like. At Lardarello, Italy, steam from natural wells has been trapped for many years and turns generators producing about 7,500 kilowatts. The steam is used to turn a turbine.

pump, a device for moving or lifting fluids and liquids or for removing gases from closed containers. Many ingenious but crude devices for lifting water have been used for centuries.

The pumps used on farms for lifting water from wells are of two main types; in one air is pumped out of the upper part of the pipe, creating a partial vacuum, and atmospheric pressure forces water up the pipe. In the other plungers on an endless chain fit the pipe closely, and water comes up partly through creation of a vacuum and partly by mechanical lifting by the plungers.

The *reciprocating pump* is the oldest of power-driven types. A piston moving in a cylinder pushes out the liquid admitted into the cylinder. Inlet and outlet valves control the flow. Such pumps can produce high pressures; but to handle large amounts of liquid an enormous machine is needed, requiring a great deal of power.

Centrifugal pumps are now used to handle large amounts of water. In such a pump a vaned wheel rotates rapidly in a casing. Water comes in at the center of the wheel and is thrown outward with great speed by centrifugal force. This high speed is changed to steady pressure by making the rapidly moving water act against a larger body of water at the bottom of the casing, connecting with the outgoing pipe. These pumps are enormously powerful and can handle several hundred thousand pounds of water an hour against pressure up to 1,500 pounds per square inch. Four such pumps are installed in Detroit; they discharge 325 million gallons of water a day.

Centrifugal pumps are efficient only when they run at high, steady speed. Other rotating pumps are used when speeds are variable and for low-pressure purposes. They usually consist of vanes of various forms fitting closely in the casing, and in action they sweep out the water admitted.

In one special type of pump a column of water takes the place of the piston in an internal-combustion engine; the explosion of gas drives the water from the cylinder. Another type is used to lift corrosive liquids that would attack machine parts. The lower end of a vertical pipe projects into a tank of the liquid to be elevated. Compressed air is bubbled into the bottom of the tank; the mixture of air bubbles and liquid is lighter than the solid liquid; and atmospheric pressure on the surface of the liquid in the tank forces the mixture upward.

Many ingenious machines create vacuums in closed chambers, as in exhausting air from electric-light and radio tubes or in laboratory experimentation. Air and gas can be partially taken out by sweeping with rotating pumps. In laboratories the chamber is connected to a vertical pipe in which spaced drops of mercury are falling. The air expands into the pipe and is swept out by the mercury. This scheme has also been adapted to a fast rotating pump.

For the greatest possible exhaustion *molecular pumps* are used after preliminary exhaustion by one of the above methods. They depend on this principle: if low-pressure gases expand into a passage, say of rectangular cross-section, and one wall (or more) of the passage is moving toward the axis of the passage, molecules of the gas striking the moving wall also take on motion in the same direction as that of the wall. If the passage narrows continuously, the molecules will move along it and out of the chamber.

One type of molecular pump consists of a cylinder on which two spiral grooves are cut, running right and left from the middle of the cylinder. The grooves decrease in size as they approach the end of the cylinder. The cylinder is rotated in a casing, with its middle connected to the chamber to be exhausted. The ends of the grooves are in a chamber kept at high vacuum by pumps, to prevent back pressure. The gas molecules travel along the moving grooves according to the principle described above.

In another type, the *condensation pump,* air molecules are caught in a high-velocity stream of vapor and take on the same velocity in the same direction. They are caught because the vapor molecules are heavier. The air is separated from the vapor and driven out.

quarrying, taking from the earth rock for use in construction, road building, industrial purposes or arts and crafts. Quarrying methods vary with the physical characteristics of the rock and the use to which it will be put. In quarrying building stone it is desirable to obtain large unbroken blocks that are later cut, dressed and polished to the desired dimensions. Careful cutting and blasting are necessary to avoid shattering the rock. Quarrying of the softer stones is usually done with a channeling machine. This machine cuts or saws a large block of rock from the main formation without breaking it. Such careful methods are not needed when stone is to be crushed, as for road building and making concrete or used as a flux in the steel industry. For such purposes the stone is usually broken loose with dynamite and then hoisted to the surface with a steam shovel and prepared for market.

quartz, silicon dioxide (SiO_2), a kind of silica that forms six-sided crystals. It is very abundant and forms a major part of granite, quartzite and most sand and gravel. Although quartz is abundant, large quantities of special grades are imported from France to be used in the pottery industry. Quartz gives rigidity to pottery; it makes up about 32 per cent of the clay. Decorative varieties of quartz are cut and polished to make ornaments.

quinine, a white alkaloid compound ($C_{20}H_{24}N_2O_2$), useful as a medicine. It prevents and allays fever in the body, and it is man's best defence against malaria. Quinine is extracted from the bark of the cinchona tree. Most of the present commercial production is carried on in plantations in Java.

radio communication, the transmission of signals through space by means of

Courtesy Vermont Marble Company

Quarrying and Shaping Marble

At the left the quarrymen are shown working 300 feet underground and drilling rows of holes into the solid marble, which they will split into blocks by wedging. At the right is shown a marble pillar in the making. The solid mass is turned in a lathe

electromagnetic waves. In its present-day sense in the United States the term is understood to include also the generation and reception of electromagnetic waves.

History. In 1865 James Clerk Maxwell (1831–79), famous English physicist, set forth the theory that light consists of very short electromagnetic waves. (The wave length of visible light between violet and red is now known to lie between 4,000 and 8,000 *angstrom units.* One angstrom unit is defined as a hundred-millionth of a centimeter; it was named after A. J. Ångström (1814–74), a Swedish physicist.)

Maxwell further stated that an electrostatic field in motion produces an electromagnetic field and vice versa. Although he made a profound theoretical study of electromagnetic waves, he carried out no experiments to verify the results of his work.

In 1888 Heinrich Hertz (1857–94), German physicist, described the results of his experiments with high-frequency oscillations. He observed that if a condenser, such as a Leyden jar, was discharged through a loop of wire, a spark would immediately jump across the gap formed by the terminals of a second loop that was separated by a slight distance from the first. Since the high voltage necessary to break down the gap could not be accounted for by simple electromagnetic induction, it was attributed to the effect of electromagnetic waves set up by the first coil and cutting the second coil as they traveled outward through space. Following this Hertz made an extensive study of electromagnetic waves and was able to verify the results of Maxwell's theory. In particular he found that they move with the speed of light, which is about 186,000 miles per second in free space; they can be reflected from a smooth metallic surface just as light is reflected from a mirror; they are refracted while they are passing from one medium to the other, as from air to glass; they can be polarized; in fact, they behave much like light waves in every respect, except that they do not affect the eye.

Unfortunately neither Maxwell nor Hertz apparently thought of using electromagnetic waves for signaling. Although that was suggested by Sir William Crookes (1832–1919) in 1892, credit is usually given to Guglielmo Marconi (1875–1937) as the inventor of radio. In 1895 he was able to transmit signals 1¼ miles by setting up high-frequency oscillations between a wire, which is now commonly known as the *antenna* or *aerial,* and the ground. Marconi took out the first patent on a system of radio communication in England in 1896 and by 1897 was actually able to transmit messages through a distance of 9 miles. In 1901 radio signals were sent across the Atlantic Ocean, to be followed 2 years later by a complete code message. Since then progress in radio has been very rapid. Some of the more important developments are the Fleming valve and Poulsen arc in 1903; the three-electrode vacuum tube (DeForest) in 1907; the Alexanderson and Goldschmidt high-frequency alternators; the Armstrong regenerative circuit in 1912–14, and the super-regenerative circuit in 1922; copper anode transmitting tubes in 1922; and many others of more recent date.

Radio Transmitter. This includes the entire assembly of apparatus at the transmitting station, starting with the production of the high-frequency oscillations and ending at the antenna that sets up the electromagnetic waves in space. In the earliest days of radio the transmitting sets were spark sets, that is, a condenser was periodically charged up to a high voltage through an appropriate circuit, and when this voltage became sufficient to break down a gap, a spark discharge took place through an oscillatory circuit that consisted of the condenser and a coil coupled to the antenna. This resulted in a high-frequency oscillation whose amplitude gradually decreased as the stored energy in the condenser became transformed into heat in the circuit and electromagnetic waves at the antenna. Such a discharge is known as a damped wave, and as soon as it has died away the condenser becomes charged again, thus producing another wave train and so on.

Since the rate at which energy is radiated from an antenna for a given amplitude of voltage varies as the fourth power of the frequency, the frequency must necessarily be high in order to obtain an appreciable amount of radiation. By properly adjusting the charging and discharging circuits a specified number of wave trains per second of a given frequency could be obtained. Spark systems can be used for telegraph purposes only; the dots and dashes are obtained by *keying* the power supply, and the tone is determined by the number of wave trains per second. Spark systems are now illegal in the United States because they interfere with other stations, but they were quite common up to 1920, and many special devices, such as electrolytic interruptors, quenched gaps, rotary gaps and the like, were familiar to all amateurs during that period.

Because the output of spark sets was limited, and because damped waves had undesirable characteristics (low efficiency and lack of selectivity, for instance), there were soon replaced by continuous-wave (CW) generators in large commercial radio telegraph transmitters.

Another apparatus extensively used for obtaining large amounts of radio-frequency power was a high-frequency alternating-current generator. A steel flywheel with many teeth moved through the air gaps of a large number of magnetic circuits that were excited by coils carrying direct current. As the teeth moved in and out of the air gaps of the different magnetic circuits in succession, the amount of magnetic flux set up varied in a periodic fashion; this in turn produced a generated voltage in a second set of coils. In this way it has been found possible to build alternators with frequencies as great as 200,000 cycles per second, the frequency being equal to the product of the number of teeth times the machine's speed in revolutions per second. Its use is principally confined to large long-wave transcontinental and transoceanic service.

With the development of the three-element vacuum tube or *triode* and the discovery that it could be used to generate sustained oscillations by coupling the plate and grid circuits together, all the other methods for generating radio frequency alternating currents became obsolete, except for the high-frequency alternator in long-wave transmission. It was also found that the triode could be used as a modulator; that is, to combine the signal to be transmitted and the output of the radio-frequency source so that the amplitude of the one is proportional to the amplitude of the other. This made radiotelephony and broadcasting practical, and large transmitting tubes were soon developed. These are now being made with ratings as great as 100 kw., and there is apparently no limit to the size that can be built if need develops.

Today the modern radio-broadcast transmitting system consists of the radio-frequency oscillator, pick-up system, modulator, several amplifiers and the antenna.

Vacuum-Tube Oscillators. If an electrical coupling is arranged between the grid and plate circuits of a vacuum-tube circuit, it acts as a generator of sustained oscillations; a change in plate current will produce a change in grid voltage that in turn will produce a change in plate current and so on. Consequently oscillations are set up; their frequency depends on the values of capacitance and inductance in the circuit; their amplitude depends on the characteristics of the oscillator tube.

As the tube and other devices heat up, however, there is a tendency for both the frequency and amplitude to change. This change was undesirable, because the Federal Radio Commission requires that the frequency of any broadcasting station shall not vary by more than 50 cycles per second. To overcome the difficulty special quartz-crystal-control circuits for radio-frequency oscillators have been developed; the crystal is mounted in a constant-temperature oven, where its natural frequency does not vary more than a few cycles per second.

Modulation. The amount of radiation from an antenna varies rapidly with the frequency of the voltage impressed across it; and the radiation at a frequency within the audible limit (from 20 to 10,000 cycles per second) would be negligibly small for any antenna of practical dimensions. Hence it is necessary to transmit the signal at a high frequency. This can be done by causing the amplitude of a radio-frequency wave to vary so that it is always proportional to that of the signal; the process is known as *modulation,* and the apparatus is a *modulator.*

Several modulation methods have been attempted, including some that make use of the special magnetic properties of iron, but the only one in actual use today is the vacuum-tube modulator. There are many types, but in all of them, for certain values of plate and of grid voltages, the plate current is not proportional to either the grid or plate voltages. As a result if both the radio-frequency voltage or *carrier voltage* and the signal voltage are impressed in the grid circuit, the plate current will be complex in wave form, since it will include in addition to the carrier and voice-frequency components the sum and difference of these, which are known as the *upper* and *lower sideband frequencies.*

To obtain the original voice wave at the receiving end it is necessary to transmit the carrier wave and either of the two sidebands; in commercial broadcasts both sidebands are transmitted. The transmitting set from the output of a modulator to the antenna in a broadcast transmitter must be capable of passing a band of frequencies equal to twice the highest frequency component of the voice wave. This is known as the *band width* and is usually taken as 10,000 cycles, since reasonably good quality can be obtained if everything up to 5,000 cycles is transmitted, although many people can hear frequencies as high as 10,000 cycles.

Antennas. After modulation the complete signal to be transmitted is amplified and fed into the *antenna.* The size and shape of the antenna depend on the power and purposes of the transmitting station. High-powered, long-wave-length stations use flat-topped horizontal antennas perhaps several hundred feet high. For portable installations a small umbrella type is usually sufficient. For general broadcast purposes an antenna that transmits equally well in all directions is usually desirable; but if communication is to be carried on between two stations only, it is much more effective to use a directional antenna. During the past few years directional antennas have been installed for guiding airplane pilots who must make landings in darkness or fog.

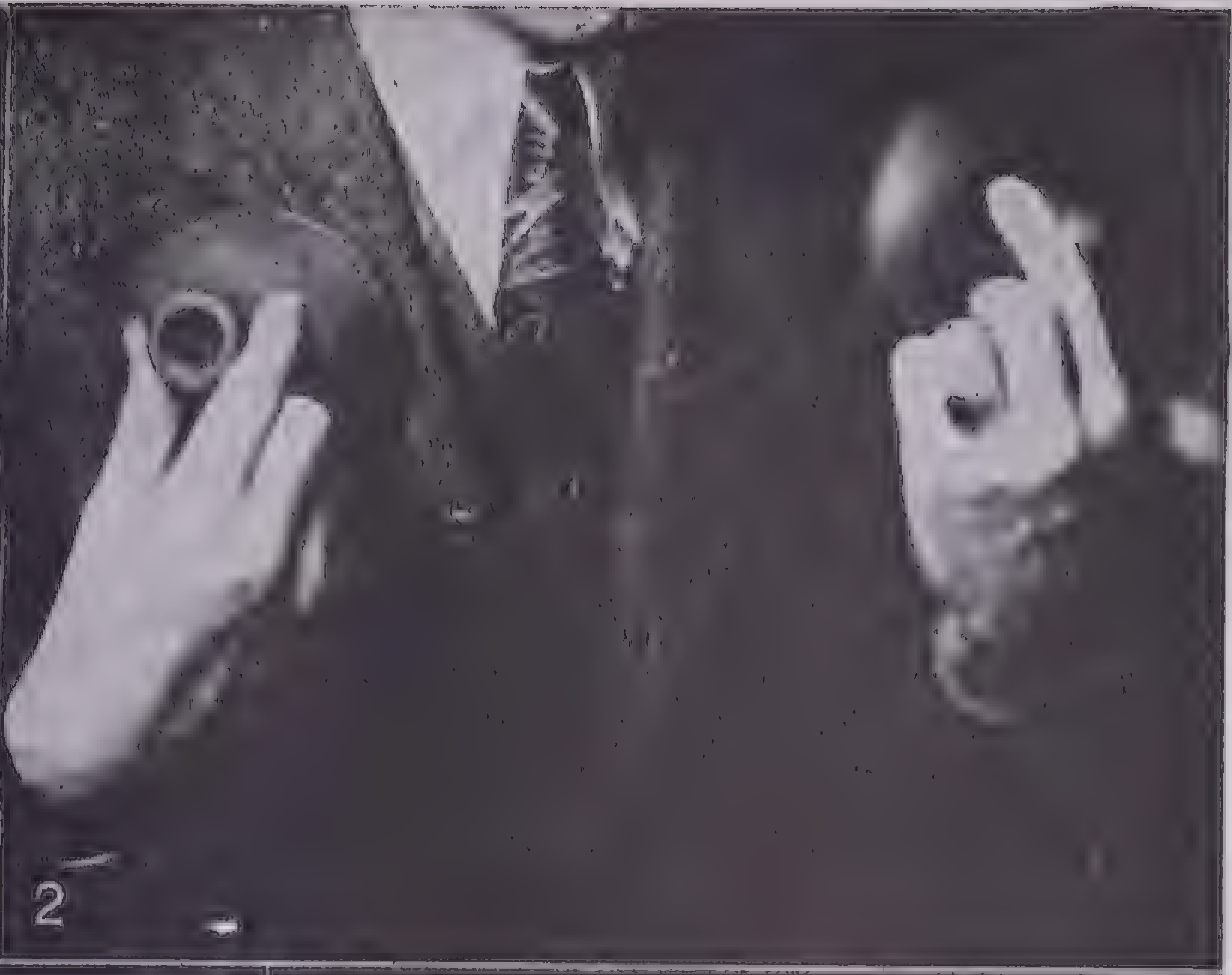
Pick-Up System. This part of the transmitting apparatus includes the microphone, audio-frequency amplifiers and all other devices lying between the microphone and modulator. In some cases this system includes telephone lines running from studio to transmitter or from station to station in coast-to-coast hookups.

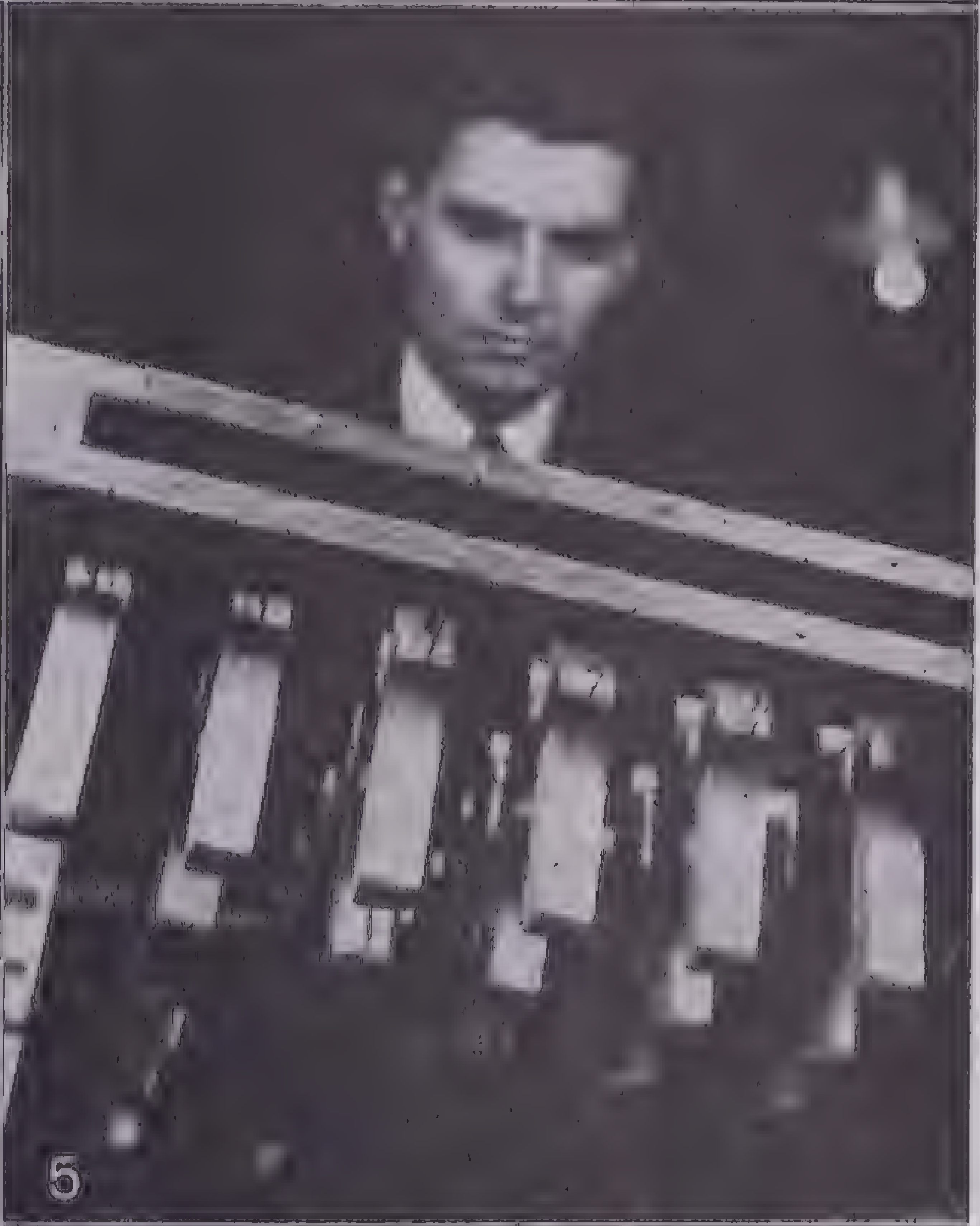
Microphones. These devices convert sound energy into electrical energy. In the early days of broadcasting microphones were much like the regular carbon button telephone transmitter. Carbon microphones have many faults, including tone distortion; the *condenser microphone* was a real improvement. It consists of a stretched aluminum diaphragm about .001 inch thick and a back electrode spaced approximately .001 inch away; together they constitute a small parallel-plate condenser in a

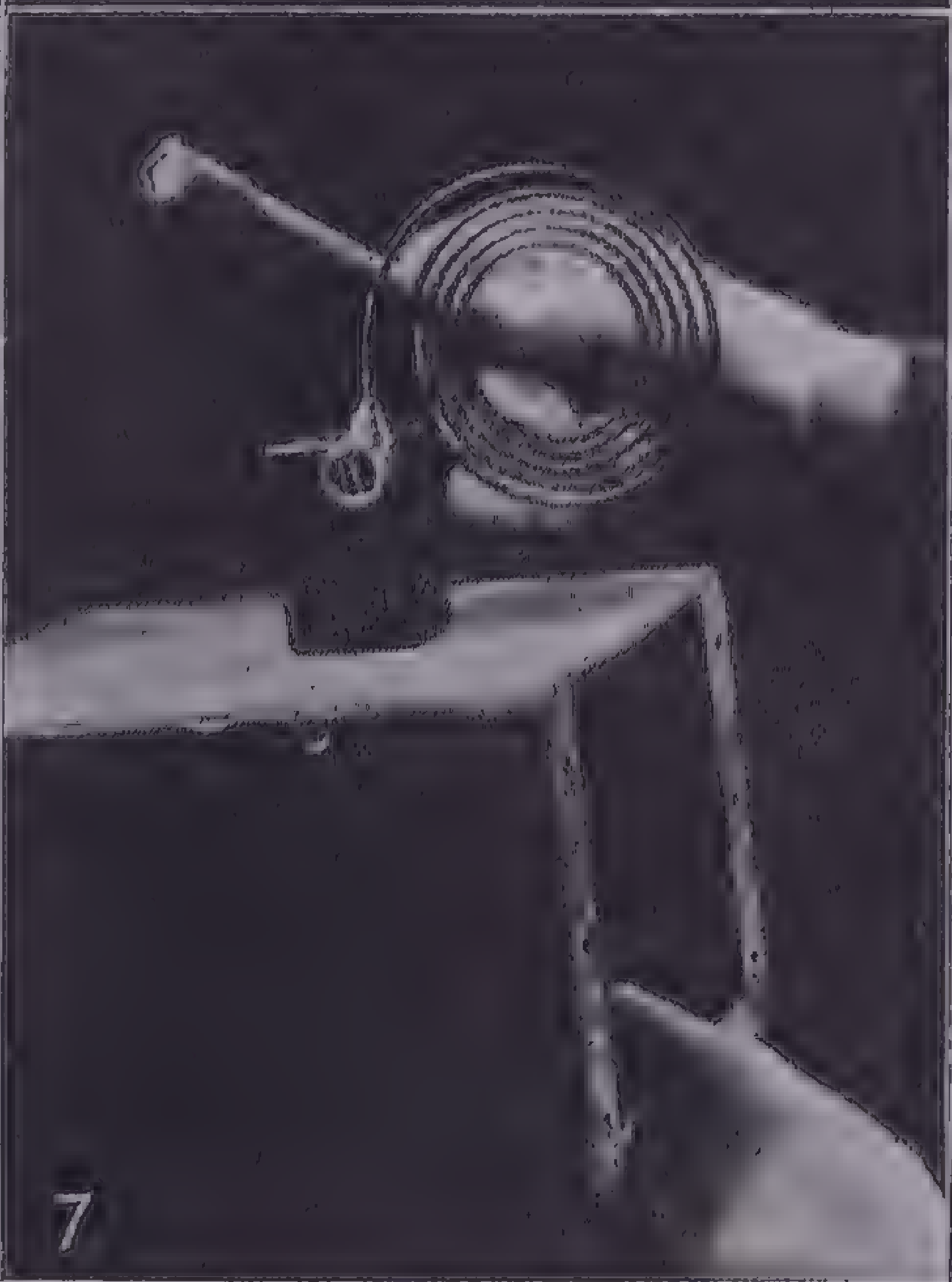
Courtesy Western Electric Company *Courtesy National Broadcasting Company*

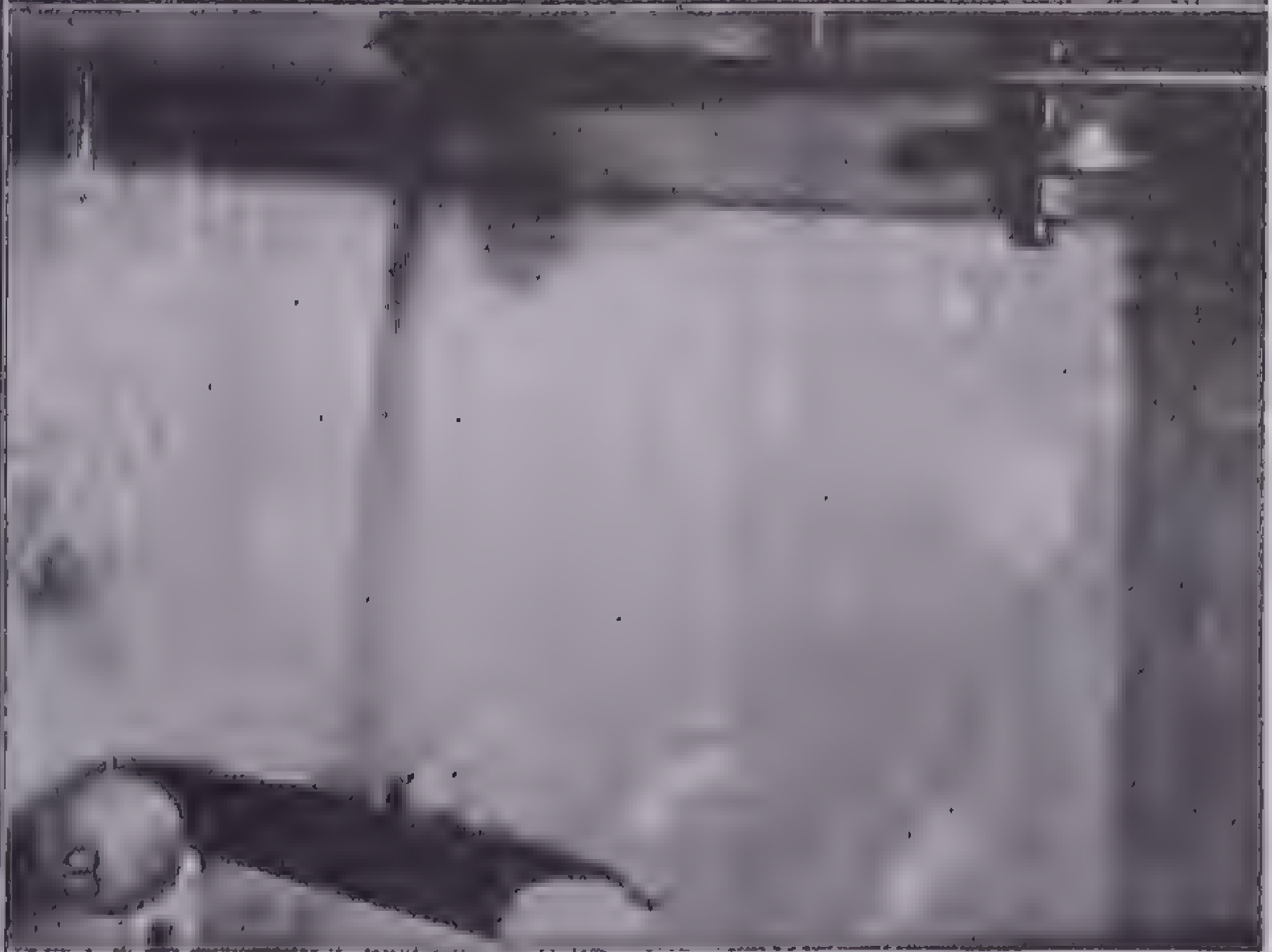
Radio as a Lifesaver

Radio has contributed much to the safety of flying. At the left a pilot is shown communicating with a ground station. At the right radiomen in a flooded city are keeping in touch with the outside world









Courtesy National Broadcasting Company

Radio Devices to Fool the Ear

1. The sound-effects expert is a vital part of most radio programs. Much equipment has been devised for making sounds that will seem natural when heard by radio. The expert is here shown waiting for his cue as he watches a radio program in rehearsal.
2. When rubber suction cups are tapped together you hear the milkman's horse clop-clopping down the street in early morning.
3. A rhinoceros charges through the underbrush! But it is only the sound-effects man squeezing straw before the microphone.
4. If the sound-effects man handles the cellophane gently, you hear bacon frying in the skillet; if he crumples it, a forest fire rages.
5. These wooden blocks are wired loosely into a framework. The whole affair is picked up and set down rhythmically to create the sound of a dancing chorus or a regiment on the march.
6. You wince when the sound-effects man strikes a piece of sponge rubber, for it sounds exactly like a hard blow to the body.
7. Seemingly the deep note of a grandfather's clock comes through the loud-speaker when this arrangement is struck.
8. Above is a whirling turntable from which birdseed falls to a tin-covered wooden block. If the turntable revolves slowly, you hear the sounds of a gentle summer rain; if it whirls swiftly, it renders the sound of a torrential downpour in the tropics.

circuit made of a direct current supply of about 200 volts and a high resistance. As the sound waves strike the diaphragm, it moves back and forth through a very small distance. If the charge on the condenser remains constant, the change in voltage across the microphone is proportional to the distance through which the diaphragm moves. Since the impressed voltage in the circuit remains constant, there will be an equal and opposite voltage change across the resistance. This can be suitably amplified and fed into the modulator.

The next development was the *moving-coil microphone,* in which the voltage is generated by the movement of a small coil in a magnetic field set up by a permanent magnet. It has about the same frequency characteristic as the condenser type but is somewhat more sensitive.

The *ribbon* or *velocity microphone* is in reality a modified moving-coil type. The moving element is a ribbon of aluminum alloy about 2 inches long, .0001 inch thick and 3/16 inch wide. It is placed between the pole pieces of either a strong electromagnet or permanent magnet. This is one of the most common types now in use in the better broadcast stations. One advantage of this microphone is that it does not readily pick up any sounds but those produced directly in front of it.

Radio Receiving. Any *radio-receiving set* must include: a *detector* for transforming the radio frequency into the audio signal—this process is known as detection; a telephone receiver or *loud-speaker* for transforming the electrical energy into sound energy. To receive the output of stations that are any appreciable distance away a large amount of amplification must be introduced. In most receiving sets there are two amplifiers: the *radio-frequency amplifier,* which amplifies the signal before it is detected; and the *audio-frequency amplifier,* which amplifies the current after it is detected. Modern radio-receiving sets also include many special features, such as tone and volume controls, automatic tuning arrangements and the like. Many modern sets no longer have antennas for pickup. The increased power of transmitting stations and the improvement in receiving sets have made them unnecessary.

Detection. The use of the term detection in radio dates back to the very first experiments of Hertz, when he detected the presence of electromagnetic waves by means of a spark produced between the terminals of a loop. Today it has a much greater significance: it means the process of reproducing the transmitted signal from the modulated radio wave. Since signals are transmitted by varying the characteristics of the carrier wave, the detection process must produce currents that are actually proportional to the amplitude characteristics of the carrier wave. Detection is never absolutely distortionless, although in the present-day receiving sets the distortion is usually unnoticeable if the set is in the proper operating condition.

All forms of detectors are inherently rectifying devices; that is, they permit more current to pass in one direction than in the other. During the development of radio various devices have been used, mechanical, electrolytic or crystalline; but none of these could amplify the incoming signal, and all were unreliable because they had a tendency to jar out of position either mechanically or as a result of static surges. They have been entirely replaced by vacuum-tube detectors in all types except small earphone sets for receiving local stations.

Radio Frequency Amplification. Since the effectiveness of most detectors varies approximately as the square of the signal strength up to a certain point, vacuum-tube radio-receiving sets are provided with amplifiers for amplifying the radio waves before detection. Besides this a great increase in power and selectivity can be obtained by the use of one or more screen-grid tubes or pentodes.

Many amplifying systems were developed as radio improved—the regenerative, neutrodyne and others. All had a serious fault: they were not equally sensitive for all wave lengths. This led to the development of the superheterodyne set. *Heterodyning* is the beating together of two frequencies to give a third frequency; that is, it is essentially frequency conversion. In the superheterodyne receiver the incoming signal (with or without previous amplification) is heterodyned with the output of a variable frequency oscillator; this gives a third frequency, which is the intermediate frequency. This process is accomplished in the vacuum tube known as the *first detector.* It then passes through a carefully designed multistage amplifier that has its resonance point at the intermediate frequency.

After amplification it is detected in the ordinary way; the detector tube in this case is known as the *second detector tube.* Thus amplification always takes place at the same frequency; the superheterodyne works equally well no matter what the wave length of the signal it receives. Today the superheterodyne principle is followed in practically all the larger home sets.

Audio-frequency Amplifiers. After the detection the signal is amplified by a suitable audio-frequency amplifier. This usually consists of two or more stages of amplification; the last stage is almost invariably a push-pull stage. In this apparatus two tubes are arranged so that when the plate current is increasing in one tube, it is decreasing in the other, and the plate circuits of the two tubes are coupled to a loud-speaker by a transformer, so that although the outputs of the two tubes are additive, most of the distortion is neutralized. In this way it is possible to design high-fidelity amplifiers with a much higher efficiency than is possible by the use of a single tube.

Loud-speakers. The earliest loud-speaker was known as the *magnetic loud-speaker* and consisted simply of a somewhat enlarged type of telephone receiver with a small horn. As the thin steel diaphragm vibrated back and forth, it set the air column in the horn in vibration. The growing demand for more volume and better quality led to the development of the *moving-armature* and *moving-coil loud-speakers,* which are commonly used in theater and public-address systems today. For faithful reproduction over a wide band of frequencies the horn must be large, so these loud-speakers are considered unsatisfactory for use in home radio-receiving sets.

For use in home sets several different styles of loud-speakers have been developed in which the sound waves are set up in the atmosphere by a paper cone that moves back and forth. The driving element, a small coil, is placed in the air gap of a powerful electromagnet or permanent magnet.

railway or **railroad,** a road made by placing on specially surfaced ground two parallel lines of rails, over which cars with flanged wheels operate. The rails are held in place by spikes driven into heavy timbers called *crossties.*

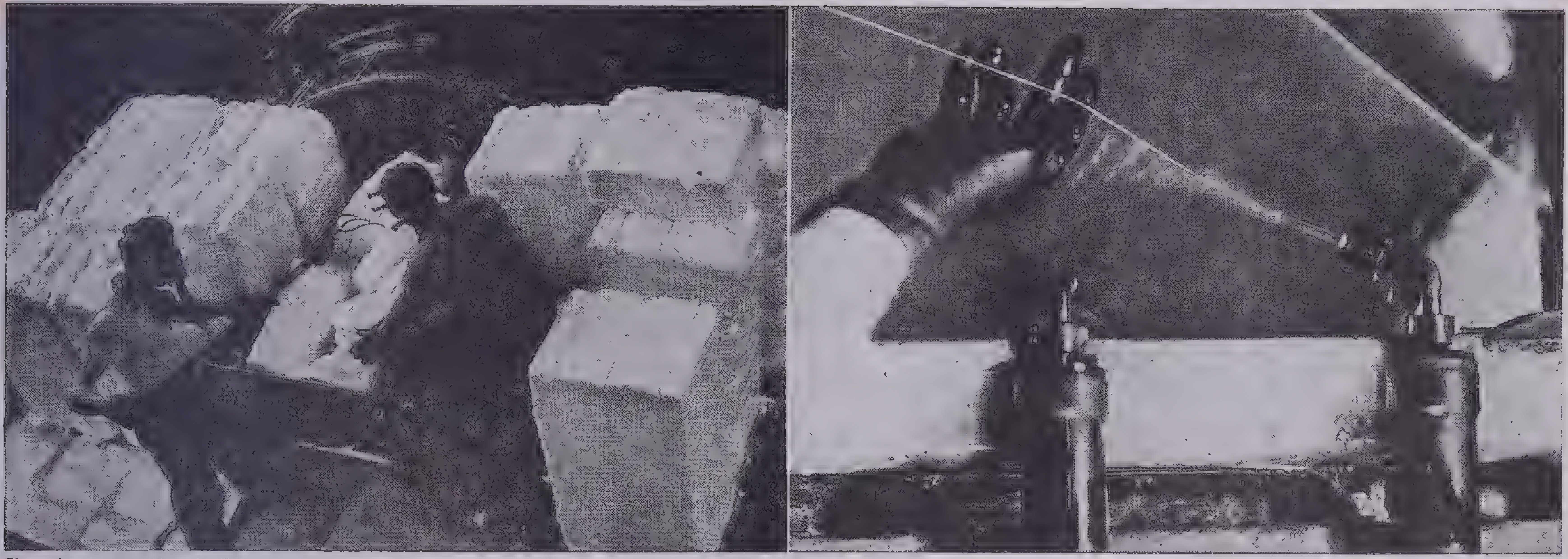
The first railway dates back to 1676, when rails were laid between coal mines and river banks in England to speed up the rolling of man- or mule-powered coal cars. Although steam-powered cars were first used on tramroads early in the 19th century, the present railway system of England dates from 1821, when the act of Parliament was passed that provided for construction of the Stockton and Darlington Railway. The Baltimore and Ohio was the first railway built in the United States, 1828-38. Building and development were very rapid, but the rail mileage in the United States—now about 240,000 miles—has not changed a great deal since 1910.

The latest important improvement in the railway itself is the new endless rail now being installed by an eastern road. Continuous rails 1,560 feet long are placed on 42 flat cars, delivered, carefully unloaded, and welded into sections 1 mile long. Trains ride much more smoothly on these rails, since there is no clicking or jarring at rail joints.

rayon (artificial silk), a synthetic textile fiber made from cellulose. The desirable qualities but high cost of natural silk led inventors to seek an artificial fiber that would have natural silk's gloss, light weight, fineness, wearing qualities and ability to absorb dyes and that could be produced at low cost.

Rayon, finally perfected, met with wide and immediate acceptance by the public. The annual output of rayon in the United States alone amounts to more than three times the world production of natural silk. The industry is concentrated in New York, Pennsylvania and New Jersey; these three states have 84 per cent of the spinning capacity and 63 per cent of the weaving looms.

The pioneer experimenter was Hilaire de Chardonnet of France, who in 1866 made an artificial silk of dissolved cellulose. The fibers were formed by spinning out the liquid in a blast of air. There has been an artificial-silk industry of sorts since 1890, but for a long time the product was not satisfactory as it softened when it was wet. By 1924 a more durable fiber was made, the name *rayon* was



Courtesy du Pont Company

How Rayon Is Made

One basic raw material of rayon is cotton linters, the cotton fuzz that escapes ginning. At the left are workmen loading linters into a vat in which chemical action will change the material into a liquid. At the right is the spinneret through which viscose is forced. The filament is here shown as it hardens in the chemical bath

adopted, and the industry began its lusty growth.

The modern rayon process merely imitates the silkworm. The worm eats cellulose (leaves), changes it to a sticky liquid inside its body and forms it into filaments by forcing it through tiny body holes to harden in the air. Precisely those processes are carried on mechanically in the modern rayon mill.

There are a number of variations in the rayon-making process, but most of them have to do only with the chemical treatment of the cellulose. About four-fifths of all rayon, however, is made by the same viscose process that makes cellophane, and such rayon differs from cellophane only in that it is a filament instead of a sheet.

The raw materials are spruce pulp or cotton linters (the short fibers that are not loosened in ginning) or both. Waste materials like straw and cornstalks serve almost as well. The pulp is soaked in a caustic soda solution and forms a compound known as *sodium cellulose.* This is then shredded, put through an aging process and treated with carbon disulphide. The resulting solution, an orange-colored sticky liquid, is called *viscose.* After aging again the liquid is pumped under pressure to the *spinnerets* (tiny holes through which the viscose is forced) and emerges as a fine thread that drops into a chemical bath where it hardens.

Other processes of making rayon are named from the chemicals used: the *pyroxylin* or *nitrate process* was used by Hilaire de Chardonnet. He used cellulose nitrate (guncotton) dissolved in ether and washed out the inflammable nitrate with alkaline chemicals. The *acetate* process uses a cellulose acetate instead of the nitrate, and the product is *celanese* (trade name). Its makers do not class it as a rayon. The *cuprammonium process* treats the cellulose with ammonia and oxide of copper.

The filaments—rayon yarn—are woven into cloth in much the same way that silk or any other yarn is woven. Rayon material takes dyes better than silk and is much cheaper but less durable. Rayon yarns are used with silk, with wool and with cotton to make a great variety of textiles and knit goods.

refrigeration, a process whereby heat is removed from an enclosed space in order to maintain the interior at a lower temperature than that of the surroundings. In all probability the earliest method of refrigeration was the cooling of water in porous earthenware crocks. Moisture seeped through to the surface of the crocks and evaporated rapidly, lowering the temperature of the water inside. Ice was made in India by exposing shallow trays of water to the cold night air. The icebox was introduced in the early part of the 19th century; but because the supply of natural ice was uncertain, there was great interest in the possibility of mechanical refrigeration.

Beginning in 1755 scientists of many nations experimented with refrigeration devices, and important contributions were made by Michael Faraday and Lord Kelvin in England. There were, however, few installations of refrigeration machines until after 1890. In that year a natural-ice shortage stimulated the development of refrigeration in the United States.

Most mechanical refrigeration depends on this physical law: a substance absorbs heat when passing from the liquid to the vapor state. The substances now in common use are ammonia, dichlorodifluoromethane, sulphur dioxide, carbon dioxide, methyl chloride, butane, ethane, ethyl chloride and propane.

The *ammonia-compression process* is typical. In its natural state ammonia is a vapor; for use as a refrigerant it is first liquefied under pressure. The liquid ammonia is passed through a special valve that reduces the pressure; this is done to hasten its change into vapor form. It immediately enters the expansion or cooling coil, which is in the space to be cooled. The low-pressure liquid ammonia evaporates in the expansion coil and in the process absorbs heat from the space around the coil. Then the vapor is again compressed to a liquid, in which it gives up the heat gained in the coil and goes back into the coil again.

The only difference between the compression and the absorption refrigerating machines is in the way the pressure is increased between the evaporating coils and the condenser. In the *absorption process* the ammonia vapor leaving the evaporating coils is absorbed by a weak solution of ammonia and water. This strong solution of ammonia is then cooled and transferred to a heat exchanger, where the ammonia in solution is driven out as the temperature increases; the ammonia flows to the condenser; the water is returned to the original container.

Refrigerating equipment is essential to preserve food, in air conditioning, in the removal of moisture in blast-furnace gas, in curing tobacco and in some surgical operations. A recent application was developed in the building of Boulder Dam, where beds of quicksand had to be excavated. To prevent sliding, refrigerating pipes were run many feet underground, and the sand was frozen solid.

reservoir, a basin, usually artificial, where water is collected and stored for flood prevention, irrigation, power generation; water storage for municipal use or navigation.

In building a reservoir a site is chosen that will allow for the collection of a large volume of water with a minimum of dam building. The dams or embankments are usually of masonry, earthwork, concrete or a combination of these.

Reservoirs are very expensive to build and are seldom built for flood control only. In discussing flood-control projects the suggestion is often made that a reservoir might be used for other purposes as well; for instance, for power generation. That is not practical, however, because a flood-control reservoir must be kept as empty as possible, so that it may serve in time of flood; for power generation and irrigation the water should be kept as high as possible and allowed to escape at a regular rate. An all-purpose reservoir can be constructed only by building it much larger than is needed for flood control; in this way the additional capacity can be used for flood-control purposes.

resin, a class of natural organic substances, typically the hardened gums from trees. Resins are usually yellow or brown, are nonconductors of electricity but take a static charge when rubbed. They are commercially valuable for making varnish, for insulation and the like.

The common resins, known as rosins, are gummy residues left behind when turpentine is distilled from pine saps. Underground deposits of fossil resins derive from trees of prehistoric times. The best-known fossil resin is *amber,* highly prized for its color and ability to take a high polish. For centuries it has been used by experimenters with electricity, for it takes a static charge when rubbed. In fact the Greek word for amber was *electron,* from which our word *electricity* comes.

Another familiar resinous substance is *shellac,* which is obtained indirectly from the juices of trees. The tiny lac insects of India feed on the sap and secrete a substance that hardens on the branches and is scraped off to form the shellac of commerce. It is widely used as a varnish and formerly was much used for electrical insulation parts and for making phonograph records. The limited supply of natural resins was one reason for the development of the modern synthetic resins or plastics.

rice, a plant of the grass family; the seeds form the principal food cereal of the densely populated sections of southeastern Asia. Most of the world's rice is raised in tropical and subtropical rainy climates under a system of very intensive agriculture with the use of much hand labor. Upland rice, grown on dry lands, sown broadcast and harvested much like wheat, is comparatively unimportant. The big volume crop is grown on moist lowlands, and through most of the period of growth the plant is partially under water.

Requirements for Growth. Rice needs high temperatures and abundant water supply. Most of the world's rice is produced in areas having 40 inches or more of rain per year. The necessary season of growth is usually about 6 or 7 months.

Because rice is raised under water, which at no time must be allowed to become stagnant, the slope of the land is important. There must be just enough slope to provide slight movement of the water. If this condition is not present naturally, it is brought about artificially.

The topsoil should be fine, porous and easily worked. The subsoil should be of a clayey nature, so that water will not readily soak through and be lost.

In southeastern Asia rice is started in a seedbed. The seeds are scattered very thickly over the surface of the seedbed and a large amount of fertilizer is added. In about a month the rice seedlings are transplanted by hand from the seedbed to the fields in rows about 1 foot apart. While the plant grows, it requires much attention. Fertilizers are added, and the plant is continuously cultivated until it is fully grown; then the fields are drained. This allows the earth to dry out and speeds ripening. Practically all operations—transplanting, cultivating and harvesting—are performed by hand.

Courtesy South Manchuria Railway Company

Rice Fields near Fushun, Manchukuo

The rice is threshed to remove the seeds. The coats of the seeds are then removed by flailing or beating, and the seeds are polished. This process removes a very important food element, vitamin B. The use of polished rice without other vitamin-B food causes *beriberi,* an Oriental disease. The bran is sold as rice feed or rice meal.

Areas of Production. Most of the world's rice is raised in southeastern Asia. China is probably the world's leading producer, although there are no accurate figures. Her annual production is estimated at 85 billion pounds. India is second with about 70 billion; Japan, third with 20 billion; and French Indo-China, fourth with 8 billion pounds.

The Occidental countries of the world raise comparatively little. The United States has an annual production of about 46,000,000 bushels, most of which is raised in the bottom lands of the lower Mississippi River and on the coastal plain of Louisiana and Texas. Some rice is grown in California in the delta of the Sacramento River.

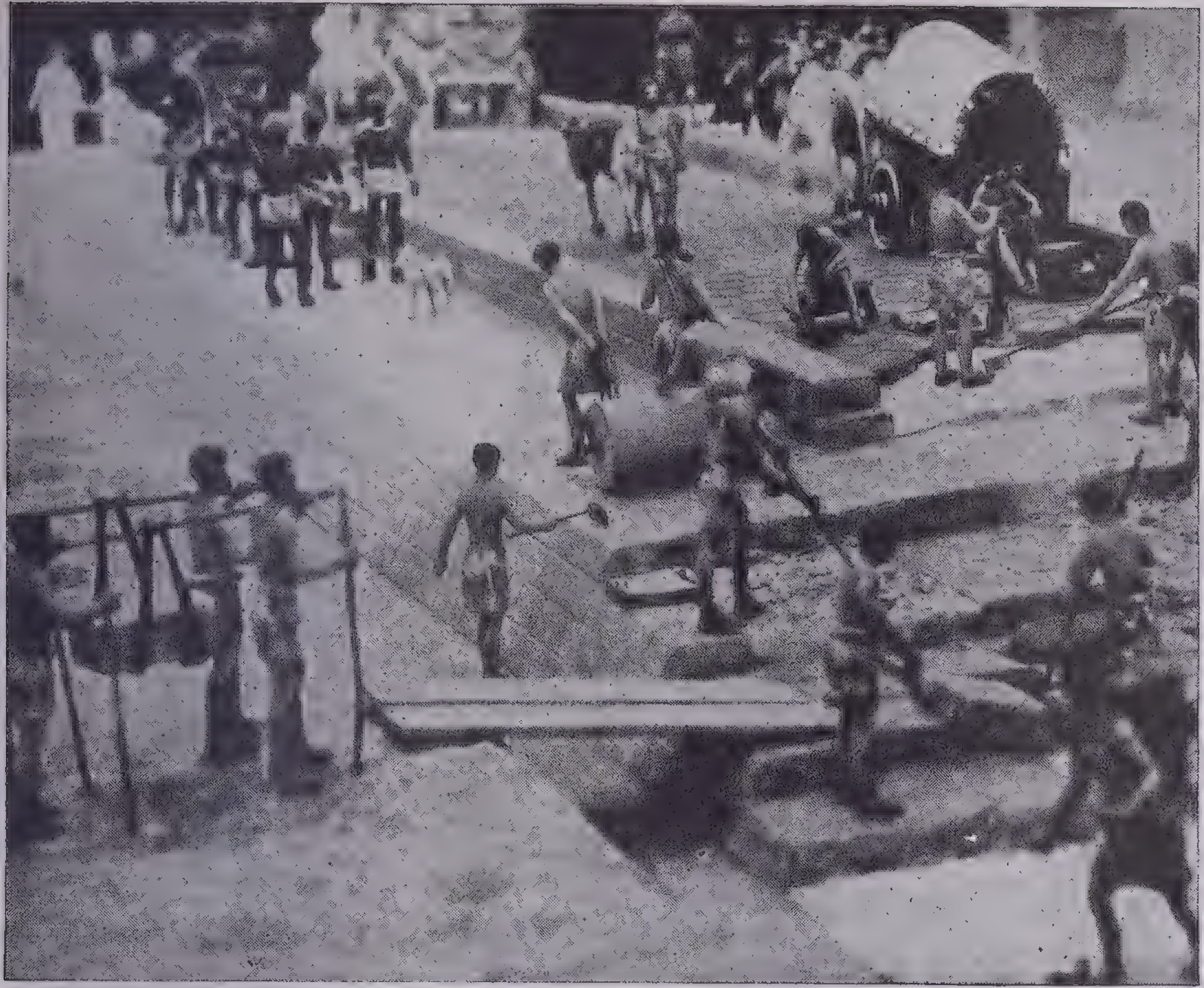
World Trade. World trade in rice is small in amount and is confined principally to the countries of southeastern Asia. India, Indo-China and Siam are the leading exporters. China is the leading importer; even the huge quantity she grows is insufficient for her needs. Germany and France are the only Occidental countries that import large quantities of rice.

Rice straw is used in paper manufacture in the Orient, but the so-called rice paper with which we are familiar is made from the pith of a tree or shrub remotely related to the English ivy. Rice straw is used in millinery and as cattle feed. *Rice powder* is the base of many face powders, and *rice starch* is used in laundries and in factories where muslin and other cloths are finished. *Rice beer* is the *sake* of Japan, usually drunk hot; much stronger liquors are made from rice in China.

roadbuilding, the construction of public thoroughfares. The building of hard-surfaced highway systems is not a development of modern times. The old Roman roads, some of which are still in use after 22 centuries, have never been surpassed in permanence; but the traffic they bore was light as compared to automobile traffic. They were built of large flat stones accurately cut and fitted together upon a bed of smaller stones and concrete about 3 feet thick. A road so built is enduring but is too rough and expensive to be suitable for 20th-century use.

Modern hard-surfaced road building began in England early in the 19th century, when John Loudon McAdam built the *macadam* roads named for him. By his process small broken stones, stone dust and water, are rolled into the road bed; the stone dust and water serve as a binder. Since the coming of the automobile age it has become customary to add tar, asphalt or some other bituminous material, especially on the surface, to withstand the increased wear and prevent dust.

Brick and concrete roads are built when traffic is heavy enough to justify the expense. A more modern development is reinforcing the concrete with iron bars; this gives greater durability



Workmen of Ancient Rome Build the Appian Way

This greatest of ancient Roman roads was built about 312 B.C. under Appius Claudius who gave it his name, the *Via Appia* or Appian Way. The road is still used today, a testament to the engineering ability of this ancient people. The picture above is from a model in the Museum of Science and Industry, New York, and shows the workmen engaged in laying the road. First, on a rammed and leveled subsoil, is spread a coating of lime-and-sand mortar (*pavimentum*). Over this, large rectangular or uncut stones, 1 or 2 feet high, are cemented in place with mortar, the *statumen*. Next is spread a layer (*rudus*) of rammed and leveled small stones. The fourth layer is one a foot or more thick consisting of sand and lime mortar, called the *nucleus*. The surface of the nucleus is crowned for drainage. On top of it a layer of pentagonal stones is fitted and cemented into place, entirely covering it. This is the *summa crusta*. In the left background is the litter of an aristocratic Roman lady, held up by the construction; in the right background is a two-wheeled cart

under heavy loads. Recently there has been some experimentation with laying heavy cotton fabric as a base for the road-building materials. It is claimed that this prevents cracking, provides better drainage and increases durability.

Roads in the United States are now divided into three main classes: Federal-aid roads, state roads and local roads. The Federal-aid roads are constructed with state and Federal funds under the direction of the state. State roads are constructed with state and local funds under the direction of the state. The county or local roads are usually the minor roadways and city streets and are built and maintained by local authorities with local funds.

The combined lengths of all roads in the United States total well over three million miles, with about 115,000 miles hard-surfaced—enough to reach four and a half times around the world. There are more than 81,000 miles of concrete roads, with asphalt and macadam each accounting for around 15,000 miles. There are about 3,000 miles of brick pavement.

rosin, a vegetable product resulting from the distillation of crude turpentine, which exudes from cuts made in the bark of several species of pine. When the crude turpentine is distilled by steam, the product is one-sixth to one-third pure turpentine and two-thirds to five-sixths rosin. When the rosin is recovered and dried, it appears as a brownish solid mass slightly heavier than water (sp. gr., 1.08) and with a slight odor resembling varnish. It becomes plastic under heat of about 80° C.

Gum rosin is derived from the gum turpentine that oozes from a slashed tree; wood rosin, from wood turpentine made by distillation from the wood itself. Rosin is used to remove the slippery quality from violin and viol strings and goes into the making of laundry soap, varnish and sealing wax. It is an ingredient in some cements, is used with solder in soldering operations and is the most common of the natural resins.

rubber, a hydrocarbon (C_5H_8) especially valuable commercially for its elasticity; it is obtained from the milk of many tropical plants. This milk, called *latex,* is inside the bark and is released by scarring the tree. The chief source of rubber is the latex of *Hevea brasiliensis,* a South American tree of the same family as the castor-oil plant and the cassava or manioc, which is the source of tapioca. The rubber tree requires about 100 inches of moisture a year and continuously hot temperatures above 70° F. Such conditions are found well within the tropics at low altitudes.

Rubber is valuable for more than its elasticity: it is waterproof; it absorbs shock; it has electrical resistance and resistance to oils and certain chemicals; it is a heat insulator; and it is highly resistant to friction when it is dry.

Rubber was named by the great scientist Joseph Priestley, from the fact that it rubbed out pencil marks. In 1823 Charles Macintosh invented a method of waterproofing cloth by putting a layer of rubber dissolved in coal naphtha between two fabrics. In 1839 Charles Goodyear, an American, discovered the hot-vulcanization process, and the number of uses to which rubber could be put was greatly increased. Unvulcanized rubber is still used for adhesive and insulating tape, rubber cements and crepe-rubber shoe soles. By 1900 there was a very great demand for vulcanized rubber, especially in the automobile industry.

At that time most rubber was taken from wild trees in the Amazon basin. It was not of uniform quality, and shipping costs were high because the region was remote from world markets. Labor was scarce and inefficient, working conditions unhealthful, and the price of rubber was kept very high.

In 1876 an Englishman, Henry Wickham (1846-1928), smuggled some *Hevea* seeds out of Brazil. They were planted in Kew Botanical Gardens near London. The trees grown there were transplanted to Sumatra and other parts of Asia about 1900, and most of the world's rubber today is produced in the East Indies, Burma and on the Malay Peninsula on carefully tended plantations. The plantations are on small islands or near the coast; and some of the world's greatest shipping routes run through this area. The labor supply is plentiful and efficient. The plantations are under the control and supervision of European planters, and their methods insure uniform quality in the product. Plantation rubber production rose rapidly. In 1900 only 4 tons of plantation rubber were produced, and about 54,000 tons came from wild rubber trees in South America and Africa. In 1910 when prices were very high the crop was 83,000 tons of wild rubber and 11,000 tons from the plantations. In 1930 the wild-rubber crop was 22,000 tons and the total of plantation rubber was 852,000 tons; and in 1934 over 1,000,000 tons were produced on plantations and only 12,500 tons from wild rubber. There is now an abundant, reliable and cheap supply of rubber.

The United States Rubber Company began to plant in the Far East in 1907. The Goodyear Tire and Rubber Company in 1916 bought 20,000 acres in Sumatra. In 1925 the Firestone Tire and Rubber Company secured a concession of 1 million acres in Liberia where wild rubber had been commercially profitable; the first shipments from the cultivated plantations in Liberia were made in 1934. Scrap rubber, of which there is an enormous supply in the United States, can be used for some grades of products; and there had been hope of discovering a feasible method of extracting rubber from Temperate Zone plants. Thomas

A. Edison made long experiments with goldenrod and guayule, a Mexican bush.

The rubber-exporting countries are the rubber-producing countries. British Malaya and Netherland India are far and away the leading producers and exporters. Approximately 60 per cent of the world's rubber is imported by the United States. Most of the remainder goes to the industrialized sections of northwestern Europe.

The price of rubber declined so much at certain periods that several efforts were made to control it. The World War upset the rubber trade. Shipments to Germany were forbidden, and the Eastern plantations could find transportation for only half their production. A voluntary decrease in production went into effect, but surplus stocks piled up—especially when tire makers in the United States stopped buying in 1920. In 1922 the Stevenson Committee reported to the English Government on the condition of the Oriental plantations in which there were large investments of English capital. The Committee urged restricted production to be governed by the price. The Netherlands Government refused to co-operate, but the British Parliament passed the Stevenson Act to regulate production in British possessions and control prices through a quota system. It was not a success.

At the end of 1925 high prices stimulated exports from countries not in the Stevenson agreement. There was bitter opposition in the United States to this British monopoly, but an even stronger force that worked against the British restriction on production was the terrific competition of unrestricted production in other countries, especially Sumatra. In 1928 all restrictions on production were removed by the British Government. In 1932 plantation production of rubber was 701,360 tons; 130,000 tons less than in 1929. Imports to the United States were reduced by an even larger amount—147,000 tons—and the price was only a quarter of what it had been when production was so much larger. Costs had been drastically reduced on the Oriental plantations. In the United States the use of reclaimed rubber had greatly increased.

The International Rubber Regulation Committee in 1934 set production quotas for the principal Oriental producing countries—for Netherland India, 400,000 long tons in 1935 and 485,000 tons in 1938; and for British Malaya, 538,000 tons in 1935 and 602,000 tons in 1938. This was by agreement between Great Britain and the Netherlands. Siam and French Indo-China also are represented on the International Rubber Regulation Committee, but their combined quota as set by the Committee is small in comparison with that of Netherland India and British Malaya. The Netherland India production is particularly difficult to control as it does not come from well-managed estates but from small native producers. What the plantations gained in scientific management and cutting production costs was sacrificed by a restrictive scheme that bound them more than it did the native producers who are not cutting costs and have no capital investment.

Synthetic rubber is a chemical or artificial substitute for natural rubber. Chemists, especially in America and Germany, have for many years searched for an artificial substitute for rubber in order to avoid the complete dependence on foreign rubber production now necessary.

Courtesy B. F. Goodrich Company

Tapping a Rubber Tree

The formula is simple enough—C_5H_8. It is easy to make a substance having that formula, called *isoprene,* from turpentine, potatoes, coal and lime or petroleum. The difference between isoprene and rubber is the fact that in rubber a number of individual molecules of C_5H_8 hang together in long chains. If isoprene is heated over metallic sodium, its molecules link up into short chains, but short-chain isoprene is not rubber; only the tree can make isoprene in long chains.

One of the most interesting yet baffling of all chemistry stories concerns the research of the English chemist Sir William Tilden (1842–1926). In 1892 he was experimenting with isoprene and had some stored in bottles. It mysteriously turned to perfect rubber in the bottles on one occasion. Although he tried to reproduce the exact conditions under which the transformation took place of its own accord, he never succeeded.

Many chemists have dropped their experiments with isoprene and have begun to work with *chloroprene,* a hydrocarbon C_3H_3 with an chlorine atom added. It is made with acetylene and hydrochloride acid. This can be *polymerized* (hooked up into chains) and can be considered a substitute for natural rubber, although it costs much more and does not have natural rubber's "snap" or tensile strength.

There are other synthetic rubbers, but all of them tend to deteriorate in air and must be preserved with suitable anti-oxidants.

Perhaps the most satisfactory synthetic rubber so far produced is the chloroprene compound called *duprene.* Tires can be made of it, as well as shoes, toys and the like. It has the limitations of all synthetic rubbers but is better than natural rubber in resisting heat and oils.

Another is *plioform,* which is actually derived from rubber but has different properties. It is very resistant to water, acids and alkalies. It is a good insulator and has excellent tone-reflecting qualities that make it useful in the sounding boards of musical instruments. *Tornesite* is also made from natural rubber. It has excellent resistance to acids, alkalies and especially to fumes in smoke. It may be sprayed on a surface to be protected. A great many products formerly made of hard rubber are now made of plastics of one kind or another.

rubber manufacturing. This is a key industry in the United States, not only because it gives employment to 100,000 workers and turns out products worth two-thirds of a billion dollars a year but also because rubber is so important in the industrial scheme. It would be difficult if not impossible to maintain our industrial and social life without rubber. Certainly the automobile could never have reached popularity and importance without it. It adds greatly to riding comfort; and cars and highways would soon wear out without rubber's cushioning effect. The electrical industry would be gravely handicapped without rubber for insulation.

No matter how small an amount of rubber is used in an article, it is always an important part. The total amount of rubber used in fire hoses, for example, is very small; but without it there would be a great difference in fire-fighting methods and even in architecture.

The first use of rubber was for making waterproof clothing—notably the mackintoshes named after their inventor, Charles Macintosh of Scotland (1766–1843), who made the first waterproof cloth in 1823. Crude rubber is greatly affected by changes in weather and so could not be widely used. Raw rubber is soft and sticky in hot weather and brittle in cold. It will stretch but does not spring back into shape. It is readily dissolved in oils and gasoline.

A successful way of fixing rubber was finally discovered by Charles Goodyear (1800–60) in 1839. By accident he dropped a mixture of rubber, sulphur and white lead on a hot stove and found that the heat brought about a chemical change that made rubber indifferent to weather changes and much more resistant to gasoline. This process, called *vulcanization,* is not yet clearly understood chemically.

Vulcanization made rubber usable in a great variety of products. The greatest new use was in automobile tires at the end of the 19th century. Today 63 per cent of all rubber manufactured is used in automobile tires and tubes; 9 per cent, for rubber boots and shoes, soles and heels; and 28 per cent, for a miscellaneous array of goods such as bathing apparel, flooring and medical and surgical supplies. Rubber is also used for roofing, conveyor and transmission belts, wire insulation, linemen's gloves, electrical apparatus, hose and pipe lining, chemical tank linings, steam hose and valve discs.

The Manufacturing Process. In transforming crude rubber into finished products five major steps are involved: refining, compounding, shaping, curing and finishing.

Refining is a milling and washing process that removes all the impurities. *Compounding* involves combining the crude rubber with the chemicals needed for vulcanizing and also with other ingredients to make special-purpose rubber. Such ingredients are oils, waxes, tars, asphalts, fibers, mineral powders and the like. *Shaping* is done by spreading, dipping, frictioning or molding. *Spreading* is the simplest method. The rubber is dissolved in benzine or benzol and then spread over the fabric. The solvent evaporates and leaves a thin coating of rubber. In the *dipping* process a solution of rubber is prepared and a metal form is dipped into it. A thin coating adheres to the metal. This coating is then vulcanized and removed. Rubber gloves and toy balloons are made in this manner. In the *frictioning* method raw rubber is pressed into a fabric by passing it between two rollers under pressure. In this way the frictioned cords of many automobile tires are made. If the *molding* process is used, rubber is pressed into metal molds that are clamped together during the vulcanizing process. Rubber heels, solid rubber balls and pipe stems are a few of the articles manufactured in this way.

Some articles, such as tires, are cured or vulcanized by applying heat and pressure in the mold that shapes them. Other kinds of rubber goods are first shaped and then cured in the open with steam. *Finishing,* the final step, includes trimming, washing and inspecting.

An increasingly large amount of scrap or used rubber is being reprocessed. Such reclaimed rubber cannot be used for heavy-service articles, such as tires, but is mixed with raw rubber in making inexpensive articles like toys. By using scrap rubber manufacturers can make many articles of rubber instead of some less suitable material.

rural electrification. Only about one-fifth of the farms in the United States are supplied with electricity. Efforts to increase rural electrification are carried on for three reasons: to improve living conditions on the farm, to eliminate hand labor from many farm operations and to stimulate the sale and use of electrical goods.

Rural electrification progresses slowly when it is left to develop by itself, or when it is pushed only by the power companies; but the Rural Electrification Administration, set up in 1936 by the Federal Government, makes loans to individuals, groups or companies to finance wiring and equipment. The Government's own power-producing projects, such as that in the Tennessee Valley, are also important factors.

There are several reasons why more farms were not electrified in the past. About 50 per cent of the farms are mortgaged, and the owner is not ordinarily in a position to increase his debt by having electricity installed, unless it will increase the earning power of the farm. About 40 per cent of all farms are operated by tenants, who are not willing to pay for wiring a property not their own. Power companies will not extend their lines into sparsely settled communities; the limited use of current would not justify the expense.

Courtesy Rural Electrification Administration

Electricity Comes to the Farm

This dairyman has an electric milk cooler into which he puts his milk as soon as it comes from the barn. Milk so cooled has a lower bacteria count, makes better butter and brings the farmer a higher price at the creamery

On 90 per cent of the farms electric service would be of little use except for lighting and pumping. The remaining 10 per cent can use large quantities of electric energy because they are specialized: poultry farms, dairy farms, fruit farms and truck farms. Since the major part of farm operations cannot be performed electrically, the power companies' revenue must come from the operation of high-consumption household appliances, such as stoves, irons, sweepers and washing machines. In order to use these appliances the farmer's income must be increased or other essentials sacrificed. As long as the electric rates are at present levels the electrification of the average farm home will remain a luxury for some time to come, even though REA loans are easy to get and repay.

Power companies could afford to reduce rates if more current were consumed. This means that the average farm must purchase and use the costly high-consumption appliances, which is out of the question at present. One more difficulty is the fact that it takes many years to change the habits of a people. Electricity supplanted gas only after 35 years, and it will take a long time to substitute electric service for the artificial illuminants now in use on many farms.

The future of farm electrification depends on the work of the co-operating agencies, Federal Government and public utilities. The social value of electricity on the farm has been proved, but the economic problems have not been solved. There are many special appliances of particular interest to farmers. Small electric motor-operated cultivators and tractors are used in concentrated agriculture, such as small truck farming. Electric milk coolers are available; and there are many electrical applications to poultry-raising equipment.

rye, a bread grain second in importance only to wheat; it is most widely used in areas where wheat cannot be grown or imported cheaply. Rye is frequently grown on poor soils, because it gives a relatively high yield per acre under adverse conditions. Rye can also be produced in areas too cool or too wet for wheat.

Most of the world's rye (more than 90 per cent) is grown in that vast plain of Europe stretching from Belgium into Russia. Russia is by far the leading producer with an annual production of around 865 million bushels. Poland is second with about 255 million bushels. Rye production in the United States is comparatively unimportant; the annual crop amounts to about 32 million bushels. The principal area of production extends from the Dakotas and Minnesota and Wisconsin through Michigan and Indiana into Pennsylvania.

There is little world trade in rye. Most of the movement of the grain is between the various countries of northwest and central Europe. Rye is not extensively used for bread in the United States. The so-called rye bread is really wheat bread with a rye flavor. In the United States rye is used as a cover crop to reduce soil erosion, as green manure, as fodder and in the manufacture of whisky. Rye straw is long and very tough and is extensively used for packing. Diseased rye yields ergot, a drug.

safes, sturdily constructed receptacles for the protection of papers and valuable property. The term *safe* is usually used of a movable iron or steel receptacle having a door equipped with a reliable lock; those built as a part of the structure where they are located are called *vaults* or strong rooms.

The first safes were made of hard wood and banded with iron. Among early metallic safes, merely sheet-iron boxes, are those built by Thomas Milner of Sheffield, England, in 1830. In 1834 William Marr patented a construction using nonconducting linings to protect the contents from fire. In 1860 Thomas Chatwood patented the double-body construction, in which the walls of the safe consisted of two sheets of iron usually separated by plates of ferromanganese alloy as protection against fire. The total thickness of the walls was about 2 inches.

One of the shortcomings of *sheet-iron safes* was their flexibility. Burglars could force a wedge between the door and its frame in such a way as to free the lock. To avoid this safes made of solid steel plates, with flanges to increase the rigidity, were brought out in 1888.

Modern safes must be sufficiently rigid to withstand a fall from a considerable height—in a burning building a safe might fall several stories; they must be sufficiently well fireproofed to withstand fire for several days because they may be buried in smoldering ruins for considerable periods of time; they must also be burglarproof. The ingenuity of burglars in opening safes has necessitated a number of changes in safe construction. The introduction of oxyacetylene blowpipes made it possible to cut away sections of safe doors so that they could be swung open. For this reason the bolts are distributed over as great an area as possible, so that a very large section must be cut away before the door will open. Certain ferrous alloys that are difficult to cut in this way have been developed for use in safes.

Perhaps the best construction is that used in the vault of the Mitsui Bank Building in Tokyo. The door has a solid plate of copper 12 inches thick. It is very difficult to cut through such a plate of copper with a flame, because the copper conducts the heat away very rapidly. Another advantage of the copper construction is its ductility; copper bends and stretches but does not readily shatter, so most explosives are ineffective. The development of high explosives has necessitated the use of close-fitting doors to prevent the introduction of explosives into the cracks.

salt, a crystalline compound with the chemical name, *sodium chloride.* Salt is necessary in the human diet, since it governs and regulates certain exchanges of fluids in the body. It is essential to health in other ways; in the Napoleonic Wars and the American Civil War the troops could not get enough salt, and as a result wounds did not heal normally, and the slightest scratches became infected.

Primitive man did not eat salt as such because he ate raw meat, which contains some; but when men began to cook meat and so cook the salt out of it, they had to look about for other sources. Sea salt was used, and natural outcroppings of salt in inland regions became valuable. Trade in salt to inland countries was an important part of commerce.

Since antiquity, salt has played an important part in religions and popular beliefs, partly because it was scarce and desirable and partly because it was a symbol of immortality, since its value in preserving meats was known.

Today salt is essential not only as a food seasoning but also in industry. It is used directly in many processes, such as the manufacture of glass. When broken down chemically by electrolysis it is the source of such important chemicals as hydrochloric acid, chlorine, caustic soda and bleaching powder.

New uses to preserve human health are being discovered for salt. A saline solution pumped into the blood stream after a surgical operation counteracts the effect of shock. Workers in hot places, like foundries, now take a salt tablet several times a day and no longer suffer from heat cramps.

Today salt is obtained by evaporation of sea water, by mining from underground beds and by pumping water into similar beds and bringing the resulting brine up to the surface for evaporation. Some of the mines in Europe have been in use for many centuries and now resemble underground cities, with railroads, restaurants, churches and the like. In the United States fine-grade salt is obtained by the pumping method from deposits in Michigan, New York, Ohio and Louisiana. Production in the United States is around 8 million tons a year, nearly half of which is used in industry.

sand, hard, granular, pulverized rock material, indispensable to many industries and for processes, such as making pottery, glass and concrete. Coastal plains, such as those of southern New Jersey, and sandstone formations, such as those of the Ohio Valley, are among the principal sources of

Courtesy International Salt Company

Saltmaking is Large-Scale Business

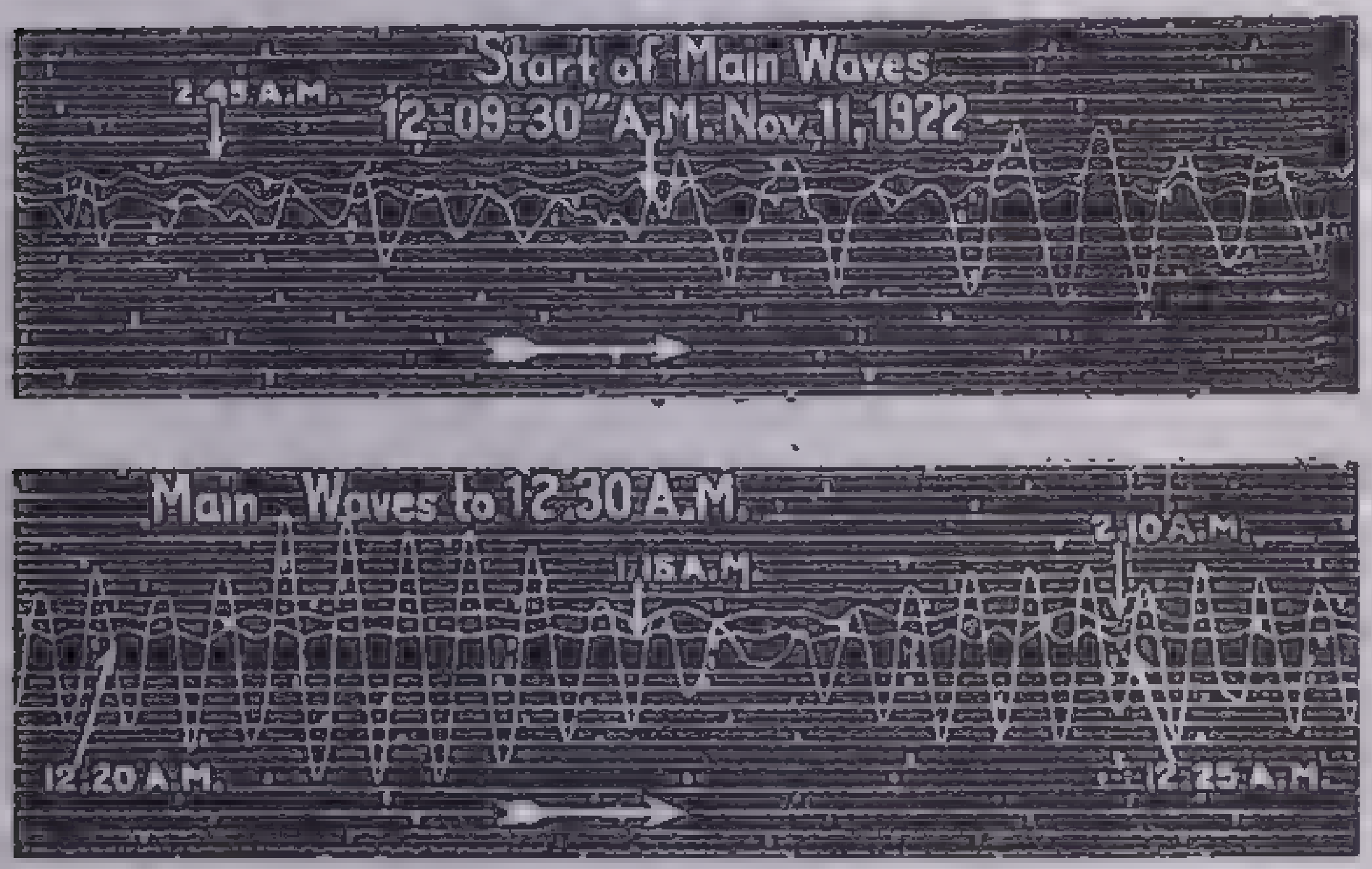
In the New York mine shown at the left the solid salt is blasted down and hauled on underground railways by the same methods used in mining coal. The huge vacuum pans shown at the right, each 42 feet high, turn brine into salt. They are built like the kitchen double boiler sand for glass manufacturing in the United States.

sandstone, a rock made up of particles of sand (mostly quartz sand) cemented together naturally with silica and some such material as iron oxide. It is the oxidation of this iron content of the rock that gives sandstone its reddish or brownish color on being exposed to the weather. It is widely used as a building stone.

seismograph, an instrument used for detecting, measuring and recording the magnitude and direction of an earthquake. A *seismometer* differs only in that it makes no record. A *seismoscope* is a much simpler instrument and detects only the fact that a shaking has occurred. The seismoscope was invented by a Chinese scholar, Chang Heng, and dates back as far as the year 132 A.D. J.D. Forbes invented the first instrument that could properly be called a seismometer in 1880.

It is essential that some part of a seismograph shall remain at rest, or as nearly so as possible, during an earth tremor; for this, most instruments rely on a pendulum, but every pendulum has its own period of vibration, and if the period of the earth oscillation approaches that of the pendulum, the vibrations will be erroneously magnified on the record. In order to overcome this disadvantage a damping device is used, such as the resistance of a liquid, the resistance of a confined air space or electromagnetic reactions.

When the earth shakes, therefore, all the machine except the pendulum will shake, and so a record can be made of this difference in the condition of the two parts of the machine. The actual recording is done by a mechanical method, as when a fine point traces the movement on a soot-covered sheet of paper, or by a photographic method, in which a pencil of light passes to a sensitive plate through a hole in the pendulum or is reflected from a mirror connected to it.



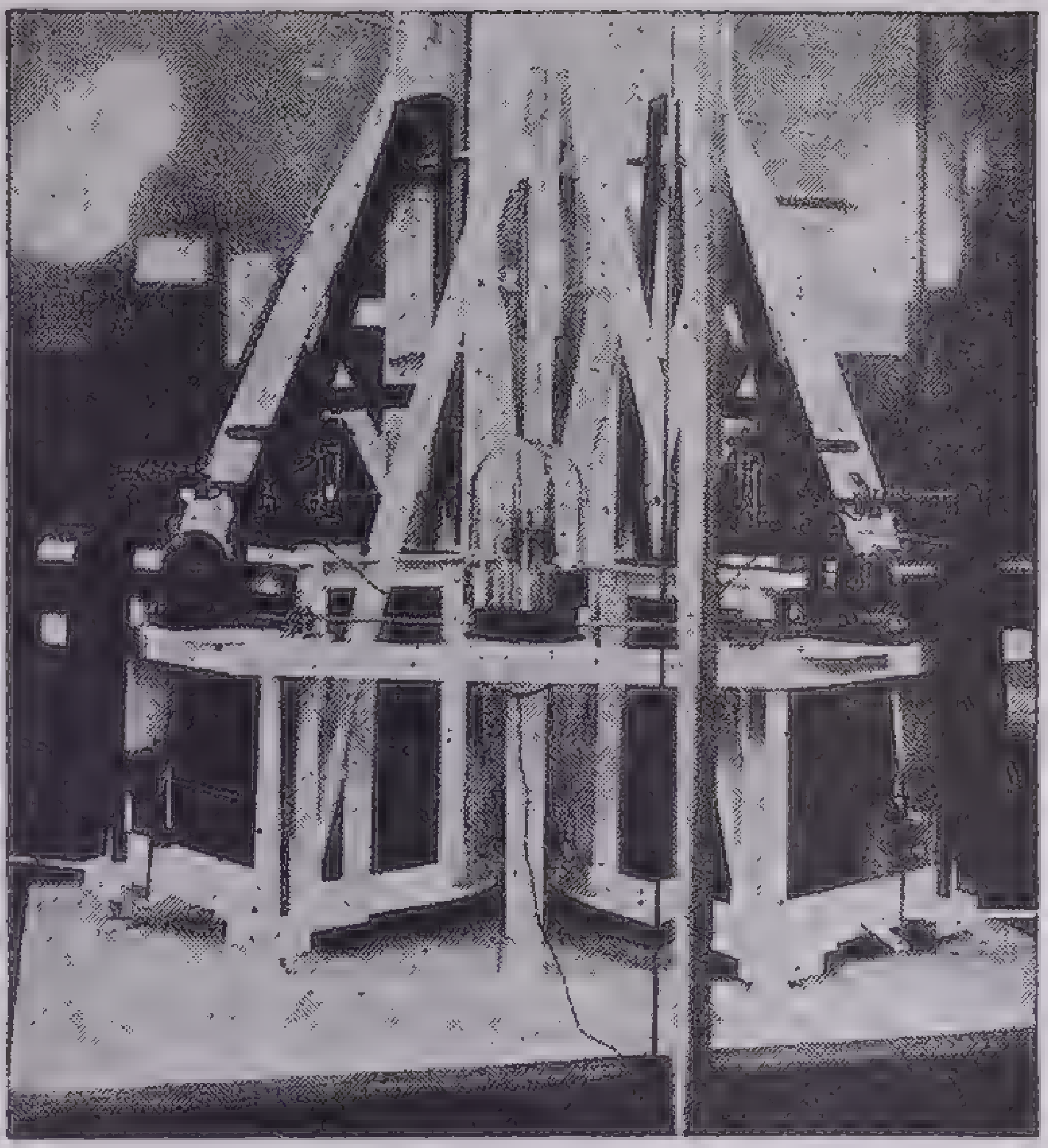
Courtesy American Museum of Natural History

An Earthquake Record

How the seismograph tape recorded the most severe shocks in the Chilean earthquake of November 10 and 11, 1922

The three general types of pendulums used in seismographs for determining the horizontal components of an earthquake are the common pendulum, the horizontal pendulum and the vertical pendulum.

In the first type a heavy mass is suspended by a wire. A stylus placed on the lower end of the bob traces any earth movement in a thin layer of sand. This particular type has always been favored in Italy. The inverted pendulum seismograph usually consists of a vertical rod carrying a heavy mass at its upper end. A pencil in the top of the vertical rod is pressed by a spring against paper. The horizontal pendulum is nothing more than a horizontal rod carrying a heavy mass. There are some complex seismographs that employ two different types of pendulums in the same apparatus.



Courtesy American Museum of Natural History

Seismograph

The machine is made up of two halves, one of which records the horizontal component of earth tremors and the other the vertical component. Earth movements are traced on the two black strips passing over rollers at left and right of the picture. The glass dome in the center houses a governor that regulates the speed of the apparatus

The instruments previously described measure only the horizontal components of an earth tremor. During an earthquake the earth shakes vertically as well as horizontally. Instruments used for measuring the vertical displacements of earthquakes are based on a principle that was first recognized in 1881 by Professor T. Gray. The Gray instrument consists of a horizontal beam carrying a heavy mass at one end. The opposite end of the beam is supported by a fulcrum about which it can rotate. Two long adjustable springs acting between the fulcrum and weight support the beam in a horizontal position. The lengths of the springs are adjusted so that the movement of the force of the springs with respect to the fulcrum as the center of movements is equal to the movement of the heavy mass about the same point. A long vertical rod fastened to the heavy mass records any vertical movement.

The direction from which the quake comes can be determined accurately in double seismographs: that is, two pendulum arrangements set at right angles to each other. Experts read the record on each pendulum and can determine directions by calculations based on the principle of resolution of forces.

separator, cream, a machine used on dairy farms for removing cream from whole milk by centrifugal force. That cream is lighter than skim milk is demonstrated by the familiar rising of cream to the top of a container of whole milk. The mechanical separator merely speeds up this natural separation, *throwing* the heavier skim milk out of the mixture by whirling it rapidly and taking advantage of the tremendous centrifugal forces.

The earliest suggestion of a centrifugal device for separating milk seems to have come from Professor Fuchs of Germany in 1859; he suggested swinging test tubes holding samples of milk as a way of testing their richness. Though many variations of this design were tried out by various inventors, it was not unil 1876 that the next significant step was taken with the demonstration by Winstrup of a drum-type separator. This machine (only a single vessel was used) is cylindrical in form and rotates about its own axis. As the axis of the cylindrical drum is vertical, spinning the drum would cause the milk to rise and assume the form of a hollow cylinder, the cream accumulating on the inner surface due to the action of centrifugal force. This single-chamber type of construction has since been retained on all successful cream separators.

The chief limitation of the plain-drum type of machine was the fact that so much time was required to bring it up to speed and to stop it. The machine had to be stopped each time the cream and skim milk were drained off, and new milk was added. This problem was solved when Houston and Thompson, in Philadelphia, filed application for a patent on a continuously operating machine, into which could be introduced the whole milk and from which could be withdrawn the skim milk and cream in continuous streams.

This is accomplished by introducing the whole milk through an opening along the axis of the bowl at its top; the cream and skim milk are thrown out of the bowl through holes that are carefully arranged in regard to position and size. The hole for cream is near the axis of rotation; that for the skim milk is nearer the outside, since the heavier skim milk is thrown outward by the rotation. One of the most successful and most widely used machines is the De Laval, in which the use of conical discs in the separating bowl was introduced in 1890. This separates the milk and cream into thin layers, thus increasing the skimming efficiency and practically doubling the separating capacity of the machine.

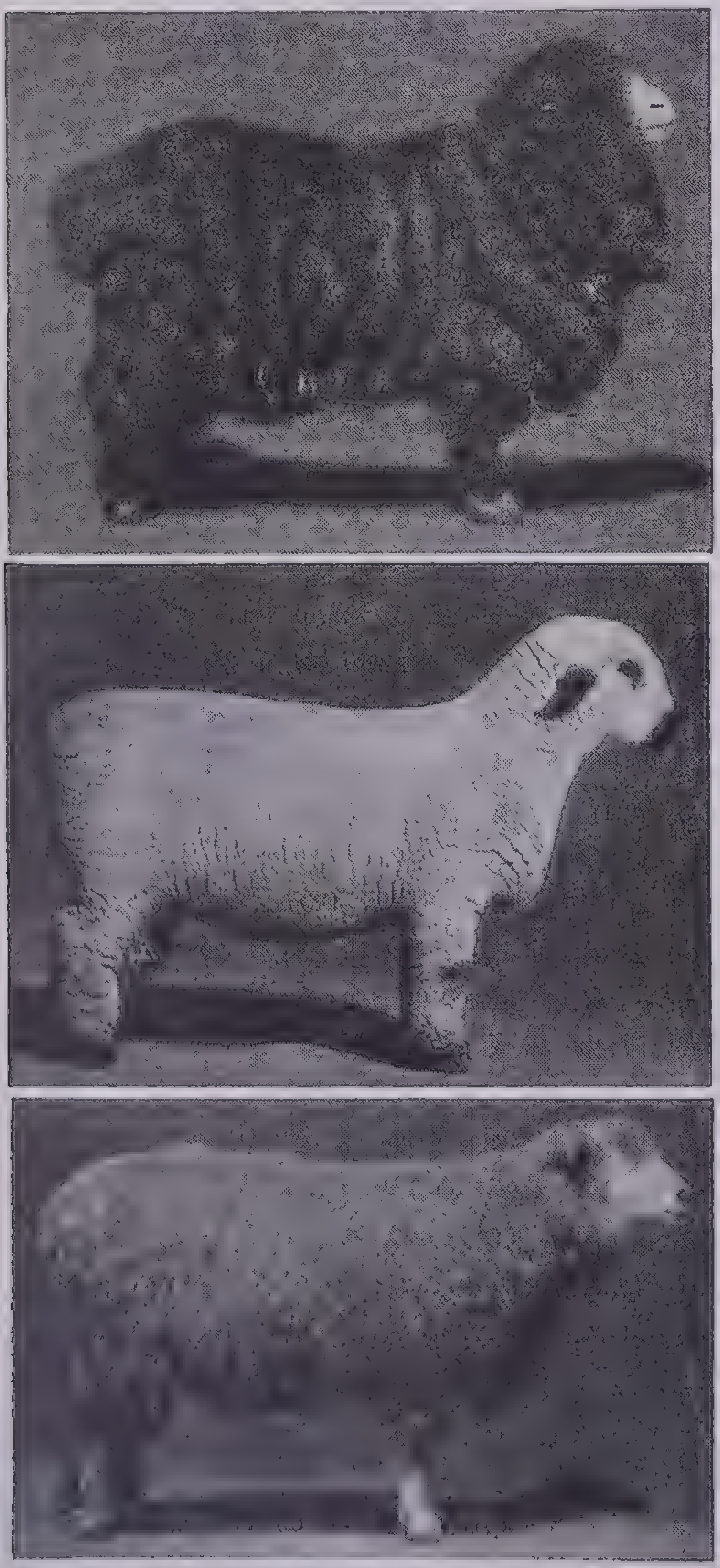
sewing machine. As long ago as 1790 an Englishman, Thomas Saint, patented a machine that embodied most of the features of the modern chain-stitch sewing machine, which uses only one thread; but a serious disadvantage is that, when the seam begins to ravel, the whole seam is undone by a slight pull on the thread.

The invention of the lock-stitch principle made the sewing machine really efficient. An eye-pointed needle pushes a loop of thread through and beneath the fabric, where a bobbin carries a separate thread through the loop. A seam so formed cannot ravel. The first such machine was built by Walter Hunt of New York in about 1832. He sold his invention to a blacksmith, but they neglected to apply for a patent. About 11 years later, Elias Howe began work on a sewing machine and was led to the same discoveries as those of Hunt. His patent, issued in 1846, became the most important patent having to do with sewing machines and made him famous and wealthy. It disclosed the same things that had been used 12 years earlier, but Hunt had no patent claim upon them because he had abandoned them.

Many patents have since been issued, but they deal mostly with auxiliary improvements. One of the most notable of the later inventors was A. B. Wilson, who invented the machine using a rotary hook-and-bobbin combination. He invented also the four-motion feed for moving the work between stitches. His work was thus very important in speeding up the operation of sewing machines and in improving the quality of their work.

In recent years a great many special machines have been developed, especially for mass-production use in factories. Most are motor driven and run at extremely high speeds. Some machines are even equipped with a number of needles for sewing as many as seven seams at the same time.

sheep, ruminant animals of the genus Ovis, man's most important domesticated animal from the standpoint of numbers. There are in the world today 735 million sheep (52½ million in the United States), as against 686 million cattle and 279 million swine.



Courtesy U. S. Dept. of Agriculture

Breeds of Sheep

From top to bottom: the Merino, raised chiefly for wool; the Hampshire, valuable for both wool and mutton; the Lincoln, produced primarily for mutton

Sheep are of two general types. Some are raised primarily for meat and others chiefly for wool. The so-called English breeds produce high-grade meat but rather poor wool; the Merino has fine silky wool but inferior meat. In some areas these two breeds have been crossed, resulting in a type with fairly good meat and wool.

At least three-fifths of the world's sheep are raised in the Southern Hemisphere. Abundant and cheap land (suited to grazing) and a sparse population combine to make this section admirably suited for the sheep-raising industry. Australia, with 113 million sheep, is the leading producer and exporter of wool; and New Zealand is the leading exporter of mutton. Argentina and Uruguay in South America and the Union of South Africa also are important.

High-grade mutton sheep are raised in England and Scotland. In the countries around the Mediterranean, where the climate is too dry or the slopes too rugged for crops, sheep are raised in large numbers for meat and milk, since they produce a rather poor grade of wool. It was in this section (the semiarid plateau of central Spain), however, that the Merino sheep was developed.

The United States ranks second only to Australia in the number of sheep raised. The wool type predominates in the West, but in the East the mutton type is more numerous. The most important states are Texas, with 7 million sheep; Montana, 4 million; Wyoming, 3½ million; California, 2¾ million; Colorado, Utah, Ohio and Oregon, each with about 2½ million.

shipbuilding. A shipyard is really a whole group of factories combined in one. There must be steel mills, plumbing shops, carpenter shops, machine shops and a great many others. They make the parts of the ship in as nearly finished a form as possible and send them to the scene of construction. The actual assembling of the ship takes place on the *ship way,* which is as near as possible to the water's edge. Each yard usually has a number of such ways, so that more than one ship can be built at the same time. It is not practical to construct ships indoors, although in some yards the ways are covered with sheds as protection from the weather. A ship is made up of a multitude of separate parts, each of which is designed in detail by a naval architect and blueprints are made for them. An almost unbelievable number of blueprints are required for a single ship.

The workers who bend, punch and drill the steel do not, however, generally work directly from blueprints, but lay out and test their work with templates—full-sized wooden or paper patterns previously made in the *mold loft,* a large room with a floor large enough to permit laying out in full size any of the structural parts of the ship. From the blueprints the mold-loft workers actually outline the full-sized shape on the floor and then make templates to correspond, complete even to drilled holes to show the exact position of holes to be drilled or punched in the finished pieces. The most satisfactory material for templates is wood, although heavy paper is sometimes used. From the mold loft the templates are taken to the steel mill, where the steel is selected, cut, bent, punched and drilled exactly as shown by the template. The part is marked for identification, and lines may be drawn on it to show where other parts are to join it. Now it is ready to be built into the ship or perhaps joined with other pieces to make a pre-assembled part before it is taken to the ways.

The major structural members of a steel ship may be divided into two classes: those that run lengthwise of the ship; and those that are set at right angles to its length. The chief function of the transverse frames is to withstand the pressure of the water. If a ship had adequate transverse frames and could always operate under ideal conditions in which there were no wind or waves and the load could always be properly distributed, the longitudinal framework would not have to be very strong. Actually, however, much of the ship's weight may be supported by small areas along its length, as when it rides across a wave or when bow and stern are lifted together by two waves. This produces enormous stresses tending to cause the ship to sag or *break its back.*

So the most important structural member of a ship is perhaps its *keel,* the backbone of the ship, designed to provide longitudinal strength. It runs from stem to stern at the bottom of the vessel and is usually built up of heavy steel plates to form a continuous structure from one end to the other. Extending upward from the keel to the upper deck the full length of the vessel is a strong steel framework, called the *keelson.* Together keel and keelson form a structure very similar to a bridge and so provide much of the longitudinal strength of the ship. Other longitudinal members on both sides of the central keelson also add strength, as do the steel plates of the hull.

The first step in the actual construction of a ship is the preparation of the *berth* or bed upon which it rests during the building. This must be very solid and strong in order to support the enormous weight. First wooden blocks, called *keelblocks,* are laid down the way on a slope that has been found from experience to be satisfactory for launching the ship. Along these blocks is run a line to determine the position of the keel, the first part of the ship itself to be assembled. It is made of steel plates, brought in from the mills and already cut to the proper length, with holes at the proper places. The first plates are laid flat and are connected at their ends by steel straps. Then more plates are erected edgewise upon the flat-plate keel, and all the parts are bolted together.

The next step is the erection of a bulkhead frame across the middle of the keel. This is the main transverse structure of the ship. Many other transverse frames are then spaced at other points along the keel. All the steel and other materials are brought in by overhead cranes that run on elevated tracks on both sides of the ways. They not only transport the heavy parts but also hold them in the exact positions desired until they can be bolted into place. Bolting holds the parts only temporarily, until it is possible to rivet them firmly into position. As soon as the erection of transverse frames is well under way, the work of fitting the shell plates is begun. Riveting, installing more frames, putting in machine parts, calking and other steps in construction then go on simultaneously until the ship is completed.

When the part is lowered into position in the ship, it is not at once riveted. If the work in the mold loft and the steel mill has been accurate, the holes in this piece will line up with those in the piece against which it fits, but some slight variation may be expected. When two corresponding holes are approximately in line, the new piece is brought into exact position by driving a tapered pin, called a *drift pin,* through the holes in the two pieces. A bolt is then inserted in a nearby hole to hold them. This process is continued at other points until all holes are lined up.

The bolts must be drawn tight before beginning the riveting to draw the parts close together. In general rivets do not draw the members together, but rather tend to swell in the space between them and hold them apart. Since some of the holes fail to line up perfectly, this is corrected with a reamer, shaped so as to taper the hole and provide for countersinking the rivet. This results in a more watertight construction.

Rivets are usually heated in a small portable forge burning coal or coke. Just before a rivet is hot enough to throw off sparks, it is taken from the fire and passed to a riveter's helper, who quickly inserts it in the hole. Another helper holds a heavy hammer, called a *dolly,* against the head of the rivet, while the riveter hammers the other end down tight either by hand or with a pneumatic or electric riveting hammer. As many as 650,000 rivets may be used in the construction of a single ship.

Placing of the external steel plating of a ship requires considerable skill. Each plate as delivered is marked to indicate the exact position it should occupy on the hull. The plate setters first study the position to be occupied by a particular plate and select a point where it seems best to begin attaching it. At this point a bolt is put through a hole in the plate and the corresponding hole in the frame. The workers then proceed from this point, drawing the plate into shape by means of bolts and drift pins until it occupies the exact position in which it is to be riveted. This often involves using several different-sized bolts consecutively in a given hole. Tapered steel pieces called *liners* are inserted at each joint to aid in making the hull watertight.

After the plates have been put in place and riveted into position the joints between them must be made watertight by *calking,* which consists of deforming the metal at the edge of the plates in such a way that it is forced very tightly against adjoining plates. The calking tool cuts a narrow groove in the plate a fraction of an inch back from its edge at a depth such that the material left projecting beyond it can be bent against the other plate. In some cases oakum or some other waterproofing compound is forced into the joint to avoid slow leaks.

Many other joints within the ship must also be made watertight; for example, the deck plates must be calked to act as a roof for the inner parts of the ship, and the bulkheads (watertight partitions separating one part of the ship from another) must be calked to confine the water to a particular section of the ship in case of damage to the hull. Besides there are many tanks (for carrying fuel, water and various types of liquid cargoes) that also must be made watertight.

Courtesy Bethlehem Steel Co.

Building An Oil Tanker

Some of the side plating is already in place. The bulkhead or transverse wall was assembled in the shops and lowered into position in one piece. The rectangular opening below is the space between the double bottoms

Because the salt in sea air is corrosive, it is important that all exposed parts be painted with special paints. Asphalt paints are used to a considerable extent. The exterior parts of the hull are usually given a base coat of red lead. Painting the ship goes on at the same time as the construction work, a given section being painted as soon as it is completed.

A ship is not fully completed on the ways; only the most massive equipment is set into the hull while it is in the yard. Control equipment, machinery and the like are installed after the vessel has been launched.

There remains now the problem of transporting the mammoth vessel from the yard into the water. This *launching* is perhaps the most fascinating of all shipbuilding processes. While the steel workers have been busy with the ship itself, the carpenters have been constructing the ways for the launching. The term *ways* is loosely used to designate the space in which a ship is built, but strictly speaking the ways are forms upon which the ship rides into the water. The *sliding ways* (timbers running most of the length of the ship, free to move with it and support its weight during launching) move upon the *ground ways,* which are stationary and perform in a general way like rails in a railroad system; and the sliding ways take the place of wheels.

When the ship is ready for launching, the first job is to transfer the weight from the keelblocks to the ways. A structure called a *cradle* is built upon the sliding ways at each side of the ship. It is made of wood timbers to fit the shape of the side of the ship near the bottom. The two cradles are prevented from spreading apart by stout wire cables passing beneath the ship. After the complete cradle is in position a large number of wedges are driven between it and the sliding ways. This gradually lifts the weight of the ship from the keelblocks and transfers it to the ways. Enough of the timbers supporting the ship are left in position to prevent its starting down the incline toward the water until the time of launching arrives, when the rest of the timbers are sawed off or knocked away.

Usually, when all the weight of the ship has been transferred to the ways, it is sufficient to start the vessel on its trip down to the water, but this is not taken for granted; often large hydraulic presses are mounted behind the ends of the launching cradles to *break loose* the ship if necessary. The cradles and sliding ways are carried with the ship out into the water and are retrieved later.

Shipbuilding is one of America's oldest industries. The early settlers needed ships for fishing and for trade with Europe and coastwise trade. Their first ships were small. In 1607, long before the *Mayflower* arrived, the *Virginia,* a vessel of only 30 tons, was built on the coast of Maine. It crossed the Atlantic Ocean many times.

The advantages of iron and steel for shipbuilding, as it provided greater strength and more cargo space, were conceded by many shipbuilders; but at first iron was scarce and builders were not certain as to how to use it. A small steel river boat was built in the United States (1876), and in 1877 the British built two steel ships, the *Iris* and the *Mercury.* For a long time thereafter England led America in iron-ship construction, partly because England had plenty of iron and America plenty of wood. In 1904, 58 per cent of American vessels were of wood, and virtually no wooden vessels had been constructed in England for a number of years.

ships. Probably the first boat was merely a log on which a swimmer partially supported himself while he propelled it by movements of his hands and feet in the water. Gradually he must have learned that a flat stick thrust into the water was a more effective means of propulsion. This led to the use of paddles and oars.

Dugouts, made by hollowing out logs, seem to have been known almost all over the world at an early date. The next step was tying parts together to form larger craft, but it was not until sewing was introduced that boats of considerable size could be made. Flexible bands were drawn tightly through holes made in adjacent planks, as in the birchbark canoes of the American Indian. Gradually this gave way to the use of dowel pins, dovetails and nails.

Early boats were usually propelled by both oars and sails; for larger craft, very long oars, called *sweeps,* usually operated by more than one man, were used until about 1700. The most famous ships propelled by both sails and sweeps were the Scandinavian viking ships. One of them found in 1880 was 80 feet long, 16½ feet wide and almost 7 feet deep. Its mast was 140 feet high, and it used 16 oars on each side. The lines of such ships are a challenge even to ship designers of today.

There is controversy as to who invented the steamboat. As a matter of fact it was a development to which a number of different people contributed. One of the earliest power-driven boats, operated by a power-driven pump, was built on the Potomac River by James Rumsey. In 1790 John Fitch constructed a boat in which oars were pulled by a steam engine. The paddle-wheel construction was brought out by Symington in Scotland in 1801; but credit for the first successful steamboat is usually given to Robert Fulton. He studied the developments of the other experimenters and adopted such features as seemed to him most practical. In 1807 his first steamboat, the *Clermont,* was launched on the Hudson River. It had a paddle-wheel driven by a steam engine and was so satisfactory that it was operated for a long time in passenger service on the Hudson River. Although the paddle-wheel construction is still found to a very large extent on river boats, it has been superseded in large ships by the screw propeller, which runs entirely submerged and operates at a better efficiency.

The application of internal-combustion engines to watercraft began at about the same time as the invention of the automobile. Such engines were not at first looked upon as competitors of steam engines because their fuel cost was so high. This difficulty was overcome by the invention of the Diesel engine, an internal-combustion engine that burns low-grade fuel oils. The first large ship to be Diesel-driven was the *Wandal,* built in 1903. Today well over half of all ships built are *motor ships.*

One of the chief problems in the design of ships is the matter of transmitting power from engine to propeller. In small vessels a shaft can be run from the engine directly to the propeller, if the engine can be run at the proper speed, but if the engine cannot run at the proper speed, the shaft must go through a gearing system. Such an arrangement is not very practical in large modern ships, however, since the propellers are located near the stern of the vessel, and the best location for the engines is near the center.

The most satisfactory and most widely used mechanism for large ships is *electric drive,* in which electric motors in the stern of the vessel drive the propellers, and a generator placed with and driven by the engine generates the power. This eliminates the need for a straight shaft running from engine to propeller, and the electrical power is transmitted through conductors that may be located in whatever position is most convenient. With such a drive it is not necessary that the propeller and the engine run at the same speed. In fact the engine may be kept at a constant and efficient speed, and the speed of the propeller is changed by control of the motor.

Modern transatlantic passenger ships are marvels of speed and comfort, largely because of the keen competition among the steamship companies and the maritime nations. Among English ships the *Queen Mary,* and among the French, the *Normandie* were built as the utmost in luxury liners. The *Queen Mary* was launched September 26, 1934, and in the next year the *Normandie,* 10 feet longer, was put into service.

The Pilgrims who sailed the Atlantic in the *Mayflower* in 1620 would be amazed to see the shipbuilding progress. Instead of the tiny *Mayflower,* they would find the *Queen Mary* with a length of 1019 feet and the *Normandie* with a length of 1029 feet. Whereas the *Mayflower* had a tonnage of about 180, the tonnage of the *Normandie* is 79,280 tons—almost 500 times as much. Instead of the bare necessities of navigation and existence, they would find as many luxuries and conveniences as are to be found in a modern hotel. They would also find these ships traveling at almost unbelievable speeds. In her maiden run, the *Normandie* crossed the ocean in 4 days, 11 hours, and 42 minutes, and covered a distance of approximately 3,191 nautical miles.

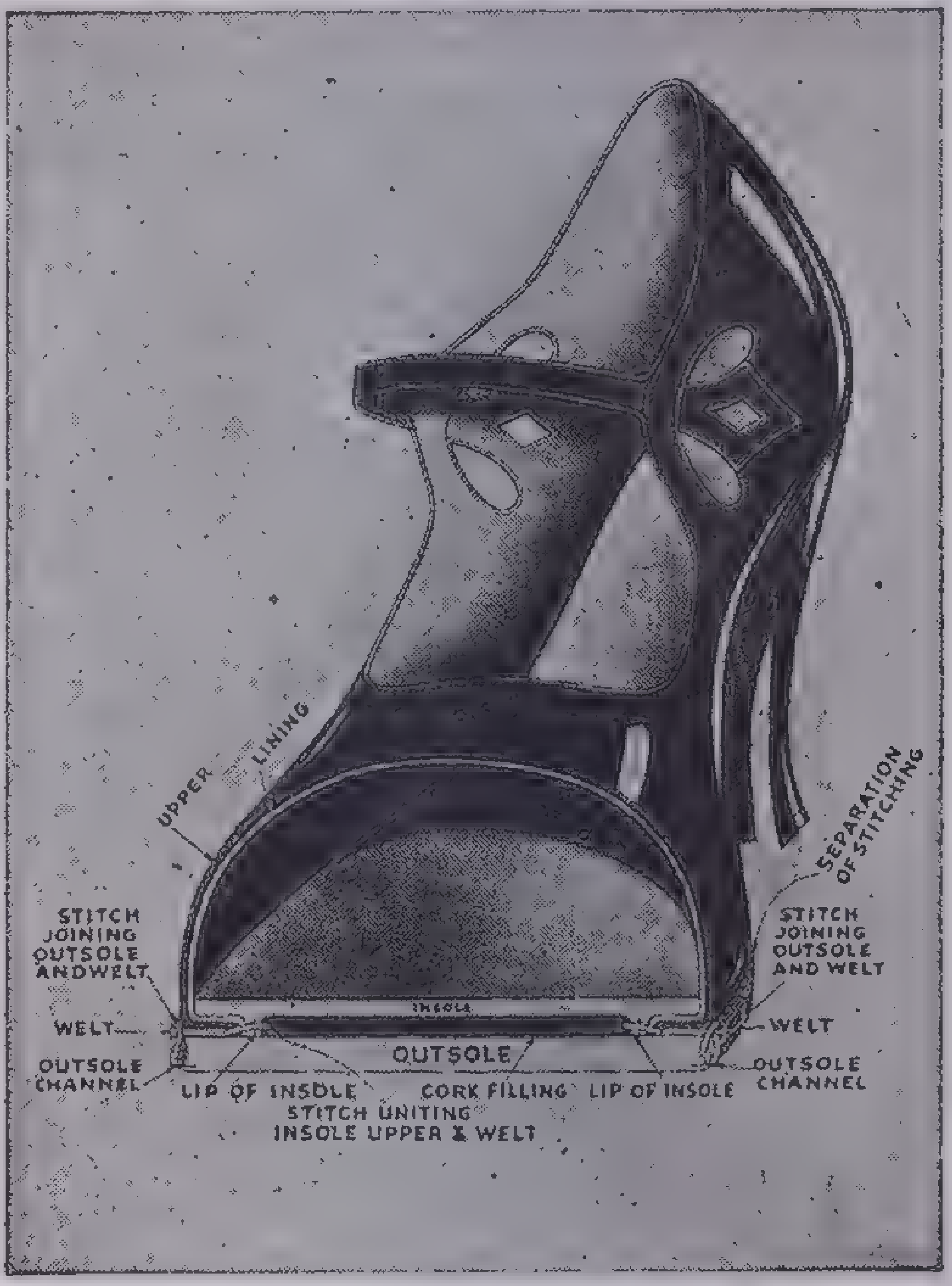
shoe industry. When the manufacture of leather shoes in the United States began in 1629, most of the shoes were made by hand in small shops. Today the industry is highly specialized and almost completely mechanized. The shift to the machine came in the half-century between 1850 and 1900. The shoe industry is now represented by 1,100 establishments, employs 202,000 workers and has an annual output worth $644,000,000.

Although shoe manufacturing is widely scattered, three states—Massachusetts, New York and Missouri—produce half of the nation's output. Lynn, Brockton and Haverhill, Mass., are famous shoe-manufacturing towns. New York and Brooklyn are important centers in the production of custom-made shoes. Rochester and Binghamton also are large producers. In Missouri the industry centers around St. Louis.

There is a wide range in the size of shoe companies. Some employ only five or six workers and turn out a few dozen pairs of shoes a day; other factories include tanneries, box factories and retail chain stores, and carry on the complete process from tanning the leather to selling the shoes to the final customers. Some of the larger factories can produce 75,000,000 shoes a year.

Manufacturing Process. Shoe manufacturing is a complex industry, since an average shoe passes through 200 different processes, about 150 machines and 100 different pairs of hands.

Today most factories specialize in two ways: they make only one kind—men's, women's or children's shoes; and they use one of three main processes. The principal differences characteristic of the various types of shoes are in the methods by which the outsole is attached to the upper. In the *Goodyear welt type,* a machine with a curved needle sews the shoe upper to the insole without going inside the shoe. The heavy outsole is then stitched to the welt (strip between the edges of inner and outer sole). One-third of the shoes made in the United States are of this type. It is the most durable and comfortable, and the outsole can be removed easily.



Courtesy United Shoe Machinery Corp.

Goodyear Welt Shoe

A cross section showing the rather complicated construction of this type of shoe

In the *McKay type,* tacks are used to hold the sole in place; stitches are then run from the outsole through the insole, and a line of stitches and tacks is left inside the shoe. This method is generally used for the cheaper and medium-priced shoes. The McKay method accounts for another one-third of all shoes made. The only other type of major importance is the *standard screwed shoe,* in making which tacks used in lasting are driven all the way in and clinched. The heavy outsole is tacked in place and fastened by means of screws. This method produces a strong but stiff shoe; it is used in about 17 per cent of the American output. Any shoes not made by one of these three methods are either hand made or manufactured by some less widely used method.

Careful preparation must be made for the manufacture of a newly designed shoe. First a model is prepared from which lasts are made. A *last* is a metal or wooden form on which the shoe is shaped. The wooden last has an iron heel plate as a base for nailing on the heel. If the last is for a McKay shoe, an iron plate covers the entire bottom of the last, because the whole sole will be nailed on. Lasts come in all the different lengths and widths of the finished shoe.

The upper part of the shoe is made from a pattern, originally cut from sheet iron by hand and then reproduced in sheet iron or cardboard by pattern machines. The first model pattern is always made in size 7 for men's shoes and size 4 for women's. In making patterns the iron model is clamped to the bed of the pattern-making machine, which operates by a system of levers. By lengthening or shortening the levers, sizes above and below the model are produced. The pattern maker produces such quantities in each size as may be desired in the factory. The pattern is then stamped with numbers indicating size, width and style. The various parts of the shoe are then cut and assembled, by one of the methods mentioned above.

shovel, power, a mechanical scoop for lifting and digging. The first power shovel, operated by steam, was patented by an American named Otis in 1840. Although the first machines were clumsy and crude, they soon proved to be indispensable in construction work requiring removal of large quantities of dirt. Many improvements were made, and by 1865 power shovels came into general use, especially on account of the railroad-building boom of that period.

The first shovels were mounted on large wide wooden frames that were supported on small wheels. When a machine had to be moved, it was necessary to dismantle it, forward the parts and re-erect it at the site of the new work. In modern shovels the unit is usually placed on a self-propelling mechanism.

Although power shovels differ in types and makes, the principal parts are the same. The platform that supports the operating machinery and structure is called the *car frame* and is constructed of steel beams and castings. The A-frame is the structural unit that supports the boom and is mounted on the front end of the deck; it is usually inclined forward. Jack arms are extensions of the A-frame that stabilize the car and prevent it from tipping sidewise. The boom supports the dipper handle; one end of it is pivoted in front of the A-frame and the upper end is supported by guys fastened to the A-frame. It is usually inclined at an angle of about 40 degrees. The dipper handle is connected to the boom by a rack and pinion; this permits an up-and-down movement of the handle. To the lower end of the dipper handle is fastened the dipper or scoop, usually with a hinged door at the bottom for dropping the load. The forward edge of the scoop, which pushes into the earth, is usually furnished with wear-resisting manganese-steel prongs. The power unit may be a steam, electric, compressed-air or internal-combustion engine.

In the central part of the United States many beds of rich soft coal lie so close to the surface that the conventional method of shaft mining has been replaced by open-pit mining, which was introduced about 1887 but did not become a competitor of shaft mining until about 1900 because it cost too much and there was no suitable equipment. Power shovels then were small (5-cubic-yard capacity) and removing the upper layers of earth was costly. About 1910 large shovels were introduced. Today a shovel of 20-cubic-yard capacity is not uncommon. In typical open-pit mining large shovels have a working radius of 100 feet and are capable of dumping 70 feet above the ground level.

In spite of the size of these shovels, each is handled by one man, and each is capable of completing a digging cycle in about 50 seconds. A 16-cubic-yard dipper in service in Illinois weighs 32,000 pounds, although aluminum replaces steel wherever possible. A shovel in a coal-stripping mine at Duquoin, Ill., has a boom 120 feet long and an 82-foot dipper handle. When the load is heaped up, this shovel has a capacity of from 18 to 20 cubic yards. Another shovel having a capacity of 16 cubic yards weighs over 800 tons and is mounted on caterpillar tracks. The bucket and arm of this machine weigh more than 20 tons.

silk, a textile fiber obtained from the cocoon of the silkworm, the immature form of a white-winged moth, *Bombyx mori.*

In commercial production the moth is encouraged to lay eggs on sheets of paper. The eggs are very tiny (about 40,000 of them to an ounce). They are hatched in the sun or in an incubator and produce larvae or immature, wingless creatures, like caterpillars, that feed on mulberry leaves and consume several thousand times their original weight.

Feeding continues for about 42 days, as preparation for the next life stage. Two sacs, one on either side of the worm's body, have been filling with a sticky fluid, the material from which the worm forms the silk fiber. When the worm is ready to begin spinning, it stops eating, and two tiny streams of fluid, one from either sac, then issue from the lower lip through openings known as *spinnerets.* The fluid hardens as it passes through these spinnerets. The worm then joins the two tiny filaments together into a *thread* and winds this about itself, describing a figure 8 in so doing.

If man is going to use the silk, the life cycle must be stopped at this point by killing the worm, usually by suffocating it with steam or hot air. If this is not done, the moth will eat its way out of the cocoon in about 15 days; male and female moths would mate; the female would lay eggs and the whole life cycle described above would be repeated. If the cocoon is allowed to produce a moth, the silk fiber is damaged beyond use.

The worm requires four days to spin its cocoon, which in size and shape is much like an extra-thick peanut shell, white and with a rough quilted surface.

Tracing the history of 1 ounce of silk-moth eggs, we find that about 30,000 eggs hatch into healthy worms. They eat a ton of mulberry leaves during the feeding period and grow from 1/12 of an inch to 3 inches long. Their cocoons will weigh 130 to 140 pounds, but only 12 pounds of raw silk can actually be reeled. There are 300 to 600 cocoons to the pound, but only one-sixth of the weight is silk, and half of the silk cannot be reeled.

The cocoons are immersed in warm water to loosen the fibers, which are pulled off with great care by hand, and the threads from 4, 6 or 8 cocoons are twisted together. These are then wound upon a wheel (or reel) into skeins—the raw silk of commerce. Several thousand larvae must die in order to produce enough silk for one dress.

Tradition says that silk was discovered as a textile 4,500 years ago by the Chinese Empress Si-Ling-Shi, who learned of its use by studying the worms. The Chinese learned to make cloth of silk and kept the secret for many centuries. In 330 B.C. according to old stories Alexander the Great in one of his raids brought silk to Europe for the first time. Finally, however, the secret was learned. One story is that two monks from Constantinople traveled in China, learned the process and smuggled eggs to the Emperor Justinian in the 6th century. Another is that the in 4th century the Japanese kidnaped four Chinese girl silk workers and learned the secret from them. At any rate the industry flourished in France as early as the 13th century.

Today about 75 per cent of the world's silk is produced in Japan, where there is abundant and cheap labor to care for the cocoons, eggs and worms and to do the silk reeling. China, once the only producer, is second in importance with about 20 per cent of the world's total production. The same conditions of cheap labor favor China, but Japan has forged ahead largely because of the greater amount of care to produce silk of uniform quality. The rest of the world's silk is produced in Italy, France, Syria and a few other scattered districts. Many experiments have been made with a view to establishing a silk industry in the United States. The worms will grow, but the high cost of labor is an important drawback.

Many moths other than *Bombyx mori* produce silk, but it is not so fine or long-fibered. Tussah silk, however, is of some importance. It is made by a wild silk moth that feeds on oak leaves in northern China. Tussah silk is brown-tan in color and coarser than the silkworm's. The Cecropia moths and the beautiful Luna produce a good quality silk.

silk manufacturing, a process of converting raw silk into a luxury textile, commanding a price ten times as high as cotton and twice as high as wool. Most silk is consumed in areas with high living standards. The United States, with about 6 per cent of the world's population, uses 65–75 per cent of all the silk produced, an annual consumption amounting to 70–80 million pounds.

Silk has characteristics that make it especially desirable for certain uses. It has a rich luster or sheen. It is exceedingly fine. One pound of the fiber, if in a single strand, would reach 1,700 miles, the approximate distance between New York city and Denver, Col. Silk, like wool, is very elastic. It will stretch by a third of its length and return to shape. It is a poor conductor of heat and possesses high tensile strength.

Like most other textiles, silk passes through three stages in the manufacturing process: (1) preparation of the yarn, (2) weaving or knitting, (3) finishing.

Two different types of yarn are produced by the silk manufacturer—thrown and spun. Thrown yarn is made by combing or twisting together several tiny filaments furnished by the cocoon of the silkworm. These filaments vary in length from 300 to 700 yards. This part of the manufacturing process is usually carried on in the areas of raw silk production. The *raw silk,* when it is received at the factory, is soaked in soap and water to soften it and remove the coating of natural wax. Two or more strands (made up of 4, 6 or 8 filaments) are then twisted together. The mills where this is done, called *throwing plants,* produce different types of yarn for various uses. The difference between the various types is largely a matter of the amount of twist given to the strands.

Silk strands, as they come from the cocoon, taper at each end. The central portion is, therefore, thicker and stronger than the ends, which cannot be used to make thrown silk yarn. The ends with odd lengths of strand from broken cocoons are made into *spun silk* by ordinary drawing and twisting methods. Spun silk is used for linings, thread and the like. But thrown silk is far the more important form, both in quantity and in value.

Silk yarn is measured by *deniers.* One denier is the size of silk yarn if 450 meters weigh 0.05 gram.

Silk weaving is quite similar to other weaving, except that the looms are operated more slowly. An operator is able to care for only two to six looms at a time.

Pennsylvania is the chief area of thrown silk production and of the weaving of broad and narrow silks. New Jersey, Connecticut and Massachusetts are also important silk-manufacturing centers.

sisal or **henequen,** a fiber produced almost exclusively in the Yucatan district of Mexico. Its principal use is in the manufacture of cheap cordage such as binder twine. Most of it is exported to the United States and northwest Europe.

slate, a soft stone, easily split into layers. When clay is compressed into rock by nature, it forms shale. In turn, shale subjected to great heat and pressure becomes slate. Consequently, most slate is found in mountainous areas where, in past ages, tremendously high heat and pressure developed when the mountains were formed. Pennsylvania and Vermont are two important producers in the United States. Slate is used for roofing material, for insulation and for blackboards. The annual value of the slate output in the United States is 5½ million dollars.

soap, a cleansing agent; the sodium or potassium salts of fatty acids.

Why does soap clean? Most dirt on body or clothing is somewhat greasy. Such dirt is picked up by the soap solution because the surface tension between grease and soap is low. It is not redeposited on the fabric because it is held in suspension by the soap. Another action of soap is to *lubricate* dirt particles, which makes them easily removable by rubbing.

Soap is made of so many kinds of fats that processes differ widely. One method of making soap is to boil fat in a kettle, adding caustic soda. Saponification continues until there is an excess of alkali (caustic soda). A strong salt solution is then added. This, because soap is insoluble in salt or caustic soda, causes the soap to separate into large curds. The soda, salt and glycerol, being heavier than soap, settle to the bottom of the kettle. The soap is then boiled again and again in much the same way until an almost pure soap remains. (Glycerin, C_3H_5, is a valuable by-product in soapmaking. It is the basis of many modern explosives.)

Ordinary laundry soaps are made by mixing soda with hot fats and oils, letting the mixture cool and then cutting it into cakes. Toilet soap, once made, is cut into chips and some of the moisture evaporated. Perfume, color and other ingredients are added, and the mass is rolled out and cut into flakes several times. This milling produces a soap of uniform texture.

Cheap soaps are made with kitchen grease, bone fat, linseed oil, cotton seed oil or coconut oil. Transparent toilet soaps, for instance, are made quickly and cheaply with coconut oil, but the soap is inferior. Ordinary soaps are not soluble in salt water, but soaps made with coconut and palm oils are soluble in salt water and so are in demand for marine use. Hardwater soaps are similar. Shaving soap has a tallow base, mixed with a gum that stiffens the bubbles and makes them last longer. Floating soap is made by beating air bubbles into melted soap. Liquid soaps are merely solutions of soap in water or in water and alcohol.

spices, aromatic or fragrant vegetable products, pungent to the taste. Their chief use is for flavoring food, but almost all spices have other uses, as in medicines and dyes and as perfumes in soap or incense. Most spices are raised on plantations throughout the tropics, although cool climates produce coriander, caraway, mustard, sage, thyme, peppermint and spearmint.

Allspice is the dried unripe fruit of a tropical American evergreen tree. It is so called because it tastes and smells like a mixture of cinnamon, cloves and nutmeg.

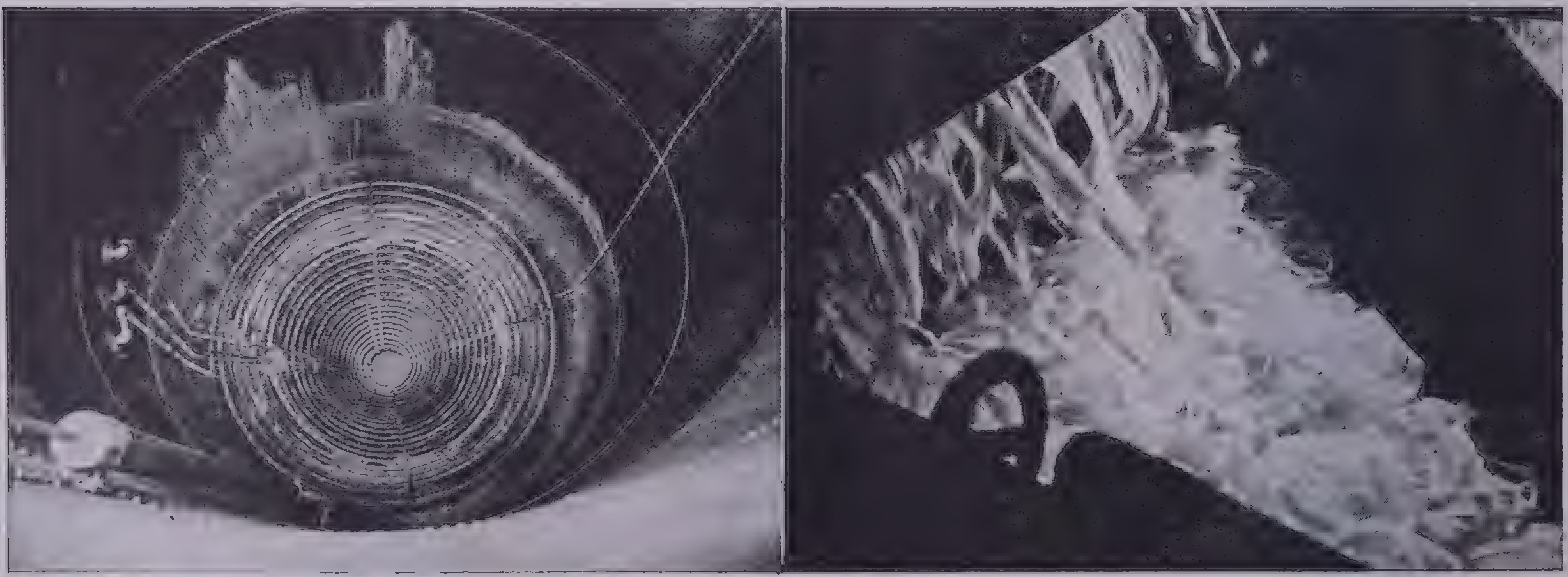
Anise is the seed of an herb of the carrot family. It has been used for centuries and is mentioned in the Bible.

Bay is the leaf of the laurel tree.

Caraway seeds are also from an herb of the carrot family.

Cinnamon is the bark of an evergreen of the laurel family, a native of Ceylon.

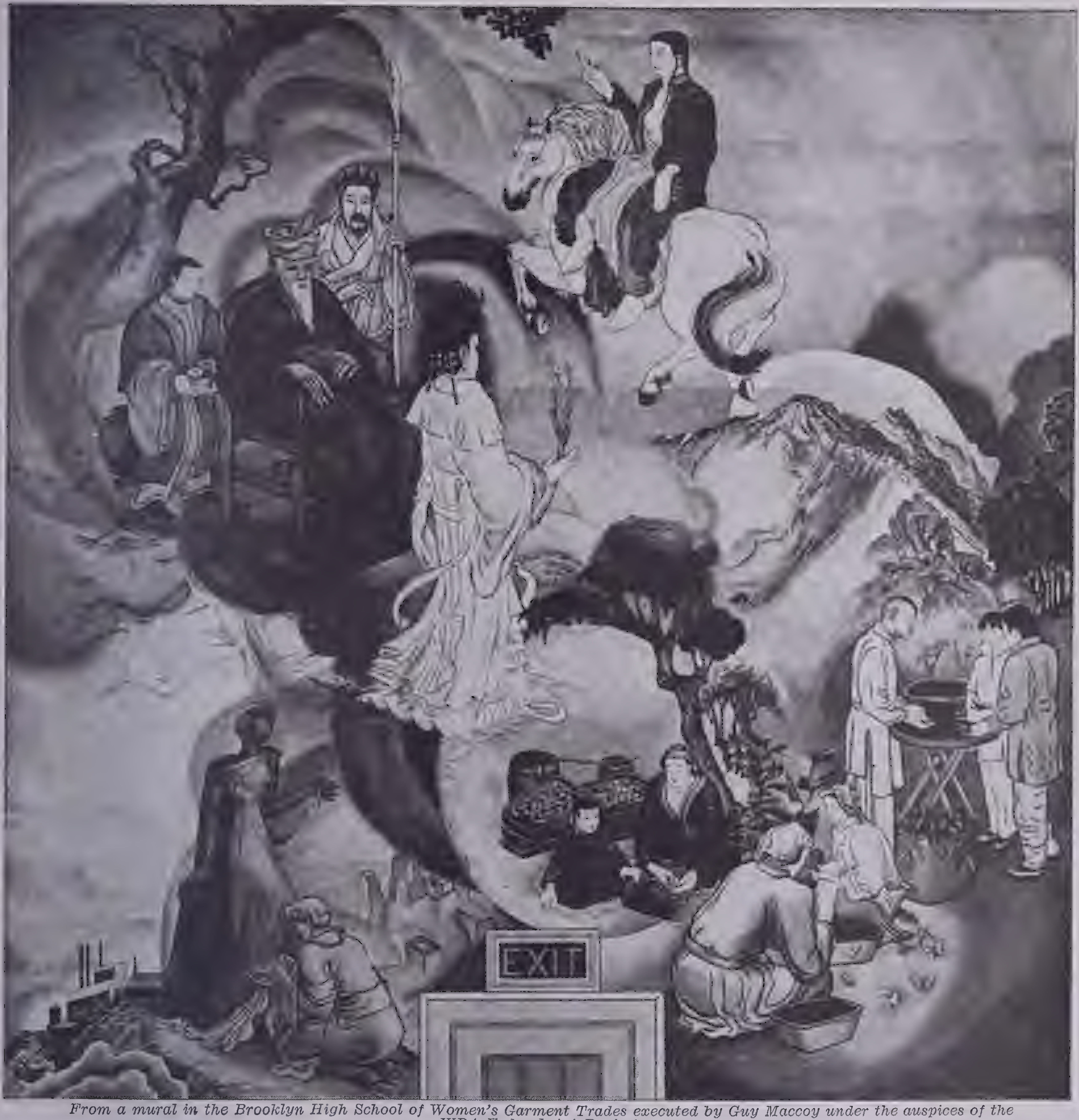
Clove is the dried and unripe bud of



Courtesy Procter and Gamble Company

How Soap Is Made

At the left we look down into a giant kettle three stories high. The coiled pipes are perforated; from them will come the steam to boil the soap mixture that will fill the tank. The picture at the right shows the making of soap flakes. The ribbons of soap are being scraped off a chilled roller which has picked up a film of semiliquid soap from a tank and solidified it



From a mural in the Brooklyn High School of Women's Garment Trades executed by Guy Maccoy under the auspices of the WPA Federal Art Project

Important Women in the Silk Industry

In the upper center is an important mythological figure riding a large white stallion. She is known as Tisn Nu. She has existed far back in the history of silk, probably before the Emperor Huang ti who ruled China about 2640 B.C. Today Tisn Nu is prayed to for the prosperity of the mulberry tree and the silkworm.

The large standing figure in the center is Si-ling-Chi, known and worshipped today as the goddess of the silkworm. She is shown dressed in the grayed yellow robe of the ruling class. She is holding a branch of the white mulberry tree from which the silkworms feed. She is standing in recognition of her superior, the deity, Tisn Nu.

To the left of Si-ling-Chi is her husband, Huang ti. To his right is a guard holding a spear to show that he ruled all China with might, and to his left is another wife with fruit and wine to show the wealth and prosperity of his nation. Huang ti ruled with great severity and success, but he wished that his wife Si-ling-Chi should also be remembered by his subjects, so he encouraged her to study the silkworm. Si-ling-Chi raised, fed and developed the silkworm, teaching the people its proper care and how to reel the thread from the cocoon.

In the center circle below Si-ling-Chi are a Chinese mother and child with baskets, traveling from tree to tree of the wild white mulberry, gathering the cocoons for making silk. Below them to the right are Chinese women gathering the tender young leaves that will be fed to the silkworms. The work is very tedious and great care must be taken to find proper leaves for better grades of silk. Women have proven themselves superior to men in this work.

Above this group and to the right is another group of Chinese workers in the process of selecting the healthier silkworms and placing them in matted baskets in which they will make their cocoons. The silkworms are very sensitive to any unusual sounds or quick movements. Skilled handling and extreme cleanliness are required of the workers. Back of this group are the white mulberry groves in the foothills of distant mountains.

In the lower left-hand corner is a mannequin being draped with silken material by a modern American designer. To the right and to the left are the money and the machinery which are part of the silk industry of today.

a tree of the myrtle family; most cloves come from Zanzibar.

Garlic is the bulb of a member of the lily family.

Ginger, most of which comes from Jamaica, India and China, is the root of a plant.

Licorice comes from the root of a tropical plant.

Mace is the red fibrous coating of the nutmeg.

Mustard comes from the seeds of the mustard plant.

Nutmeg is the seed of a tree of the East and West Indies.

Paprika is the Hungarian name for red pepper; commercial paprika is usually made from larger peppers.

Black pepper is the unripe dried berry of a climbing plant from India and the East Indies.

White pepper is the same berry, but ripe and with an outer coating removed.

Red pepper comes from the West Indies and Central America; it is a relative of the tomato.

Peppermint, like *spearmint,* is the leaf-oil of a plant of the mint family. Most of the world's peppermint comes from Michigan.

Saffron is made from part of the flower of the crocus family.

Sage is the leaf of a plant of the salvia family.

Vanilla, from Malaya, Madagascar and Mexico, is the bean of a climbing orchid.

From the Middle Ages to the 15th century spices were more costly and important than they are now. Since no fodder crops were raised, all cattle had to be killed in the fall. Since refrigeration methods were very crude, the meat did not keep well and was highly spiced to hide the taste. Spices also helped to relieve a monotonous diet.

Many exploring voyages, such as those of Columbus and Cabot, were undertaken to find new spice countries or new routes to known ones and to avoid spice monopolies then held by a succession of strategically placed seaports, such as Venice, Constantinople and the Red Sea ports.

spinning, binding together individual fibers, as of cotton, wool or silk, into one strand or thread that will be strong enough to stand the strain of knitting or weaving.

The first step is to remove from the mass of raw fiber such foreign material as twigs, burrs, stones and grease. Next the individual fibers are separated, and short fibers are removed by a method very similar to brushing one's hair.

The final step involves a series of operations known as drawing and twisting, much like pulling taffy—pulling out and doubling over until the strands are of uniform texture. A strand of fiber 1 inch or more in diameter is pulled out until it is ½ inch in diameter. Two of these ½-inch strands are combined, and the drawing out process is repeated. This is continued until there is a uniform distribution of the individual fibers throughout the strand. This is then gradually reduced to the final size, and during this final drawing out the strand is twisted to add strength.

Spinning Methods. The simplest possible method of spinning was one used by some American Indians. They simply removed any foreign material present in the wool and then rolled the fibers into a strand between the palm of the hand and the thigh.

The first implement used for spinning was devised in prehistoric times—a slender shaft of wood known as a *spindle.* The spinner squatted on the ground and placed the spindle at right angles across his thigh or rested the point on a hard surface. With one hand he fed the loose fibers to the spindle, which he twirled with the other hand. In some cases the loose material was fastened on a pole or *distaff.* One hand pulled the material from the distaff and the other twirled the spindle between the thumb and forefinger.

The *spinning wheel* was the first mechanically driven spindle. A foot treadle drove a large wheel that by means of a belt turned the spindle. This left both hands free to draw out the fibers. The spindle, moreover, rotated at a constant rate, and this helped in making yarn of uniform quality.

The methods used today in modern factories were evolved from these early devices. Modern textile mills use two principal types of machines, the *frame* and the *mule,* although the frame leads the mule by seven to one.

Frame Spinning. Although there are three kinds of frame spinning—ring, cap and flyer—the ring type, developed in 1829 and practically unchanged today, is by far the most important. Consequently, it alone will be discussed.

Ring spinning can be more readily understood if we think of the mechanism as performing three distinct operations: (1) it draws out the fibers; (2) it twists the individual fibers together; (3) it winds the finished yarn.

The drawing is done by a series of three pairs of rollers. Each pair is driven faster than the preceding pair. This develops a pronounced pull that elongates the fiber.

The twist is imparted by a unique feature of the machine; the ring. This is a tiny C-shaped steel ring called the *traveler.* It is attached to a circular flanged track on which it moves freely. As the yarn leaves the last roller and before it is wound on the spindle it passes through this ring. The spindle is made to revolve at such a speed that there is a slight tension or pull on the yarn as it passes through the ring. The ring is dragged around the circular track by the whirling strand of yarn. This imparts the twist to the yarn. The amount of twist can be very accurately controlled by regulating the speed of the rollers and the speed of the spindles.

It was found long ago that this scheme does not work unless the spindles turn very rapidly—between 8,000 and 9,000 revolutions a minute. So other inventions had to be made that would allow speeding up other parts of the process at the same rate. As a result the process is a very fast one, and this makes it all-important in the industry today.

Mule Spinning. The mule was invented in 1779 as a hybrid of two earlier machines, hence the name *mule.* On this machine the strands are drawn out on rollers as in frame spinning. The spindles are mounted on a movable carriage that travels about 10 or 12 feet away from the rolls. As it travels out it draws and twists the yarn. As the carriage returns the yarn is wound on the spindle. The mule process is much slower than the other, but it produces a softer yarn.

sprinkler, an automatic device for combating fires in buildings. A system of water pipes is placed in the ceiling, with regularly spaced nozzle outlets projecting from it. The nozzles are plugged with an alloy metal that melts out when the temperature reaches 150° F., releasing a spray of water. The units are so located that every part of the area to be protected will be covered by a shower of water. In buildings where the temperature is below freezing, the lines feeding the sprinklers are usually filled with air under pressure. When the plug melts, the air discharges from the sprinklers, and the drop in pressure in the line operates a device that turns on the main water valves.

steam, water in a gaseous state. It is invisible; the perceptible mist issuing from the spout of a teakettle is not steam, but a cloud of tiny drops of water produced when the steam from inside the kettle condenses in the cold air of the room.

At every pressure there is a fixed temperature at which water can be converted into steam by the addition of heat. For normal atmospheric pressure the conversion temperature or saturation temperature is 212° F. If the vaporization is incomplete, small particles of water remain in the vapor, and *wet steam* is the result. After complete vaporization, if the steam continues to absorb heat, and the pressure remains constant, the temperature of the vapor will increase above that of the saturation temperature for the given pressure. Whenever steam is at a higher temperature than that of a saturated vapor as the same pressure, it is called *superheated.*

The expansive force of steam was turned to use probably about 130 B.C., according to the records of the Greek experimenter Hero. He described a unique device of his own for opening the doors of a temple. A fire was kindled on a hollow altar. The altar chamber was connected to a sphere filled with water, which in turn was connected to a bucket by means of a siphon. As the air in the hollow altar became heated, it expanded and forced the water out of the sphere into the bucket. The water bucket was connected to hoisting drums by means of cables. The weight of the water bucket as it filled with water caused the hoisting drum to revolve and actuated the door-moving mechanism.

In 1125 an Englishman named Gilbert built an organ that was operated by compressed air. The compressed air was blown from a vessel partially filled with water. As the water became heated, the air was forced out. Leonardo da Vinci in the 15th century described a gun operated by steam. Blasco de Garay in 1543 attempted to move a ship by means of a steam-driven paddle wheel. Giovanni Battista della Porta in Italy and Salomon de Caus in France contributed various ideas relative to the use of steam in the early 17th century. On January 21, 1630, the first English patent was issued to David Ramseye for a fire engine, as steam engines were called. From this early period of development, the uses of steam have been many and varied, and we shall probably continue to use it as a working medium for many generations.

However, it is recognized that water is not an ideal fluid for such purposes. The ideal fluid should have the following characteristics: slight variation in saturation pressure over the entire temperature range, low specific heat, large latent heat of vaporization. It should be noncorrosive, nonpoisonous, noninflammable, resistant to decomposition and have the property of *wetting* the heating surfaces.

Engines using mercury instead of water have proved highly successful, and more and more are being installed. Other fluids such as diphenyl, diphenyl oxide and zinc ammoniate have been tried, but none has been as efficient as mercury.

stock ticker, a printing telegraph for transmitting stock quotations from the Stock Exchange in New York city to all parts of the country. Various standardized abbreviations and symbols are used to designate the names of various stocks so that a large number of quotations can be given in a short period of time.

The first important development work of Thomas A. Edison had to do with stock-ticker systems. He had been a telegraph operator, and when he was assigned to work on the stock-ticker system, his work became so outstanding that it earned for him the financial backing necessary to devote his time to research.

The sender for the stock-ticker system is a keyboard very similar to that of a typewriter. The receivers, located at various points over the country, type out the quotations received on a narrow strip of paper in one continuous line. The various letters and characters are located around the rim of a wheel, the position of which is controlled by the number of electrical impulses received from the sending mechanism. A coded system of impulses similar to that used in teletypewriters is used so that no more than five impulses need be sent in order to transmit a given letter. These instruments are used chiefly for transmitting coded quotations, but it is possible to transmit complete messages. They are rapidly being displaced by the teletypewriter.

submarine, a vessel that can be submerged and propelled under water. It is armed with torpedoes that can be fired from tubes by compressed air. An instrument called a periscope is used for making observations and aiming the torpedoes while the boat is under water. Modern submarines are also equipped with guns for use when on the surface.

In 1620 Cornelius van Drebel built the first submarine for King James I of England; it stayed under water for several hours at a depth of about 13 feet. The first recorded use of a submarine in war was in 1776, when an American submarine constructed by David Bushnell made an unsuccessful attempt to sink an English warship anchored off New York. During the American Civil War the Union vessel Housatonic was sunk by a submarine in February 1864 during the blockade of Charleston—the first boat to be destroyed by a submarine. Up to 1880 many types had been proposed in America and abroad, but none was really successful.

John Phillip Holland, an Englishman living in the United States, in 1877 constructed a wooden vessel that was used to prove the principles of submersibility and control. He persevered in spite of ridicule and failures and in 1898 constructed a successful submarine torpedo boat, the Holland, which was purchased by the United States in 1900.

Holland died in 1914, one year before submarines first came into extensive use. On January 30, 1915, Germany opened its program of relentless submarine warfare. By the end of the war German submarines had sunk 5,408 ships, a total of 11,189,000 gross tons. The allies in turn sank 203 German submarines.

Submarines submerge by filling large tanks with sea water. To rise, compressed air admitted into the tanks blows out the water and restores buoyancy. The *Narwhal* in 1900 took 25 minutes to submerge; today a submarine can dive in less than 2 minutes.

With one exception all submarines rely on Diesel engines for surface propulsion. The British *K 26* is the only steam-propelled submarine in service. The large openings required for the gases leaving a steam boiler and the intense heat in the boiler room while the vessel is submerged are important disadvantages in the use of steam. The average surface speed of modern submarines is about 17 to 20 knots.

The vessel is driven under water by electric motors powered from batteries that are charged by generators driven by the Diesels while the submarine is on the surface. Although battery-driven units can maintain a speed of 2 to 3 knots for 30 hours, full speed cannot be maintained for more than 1 to 1½ hours.

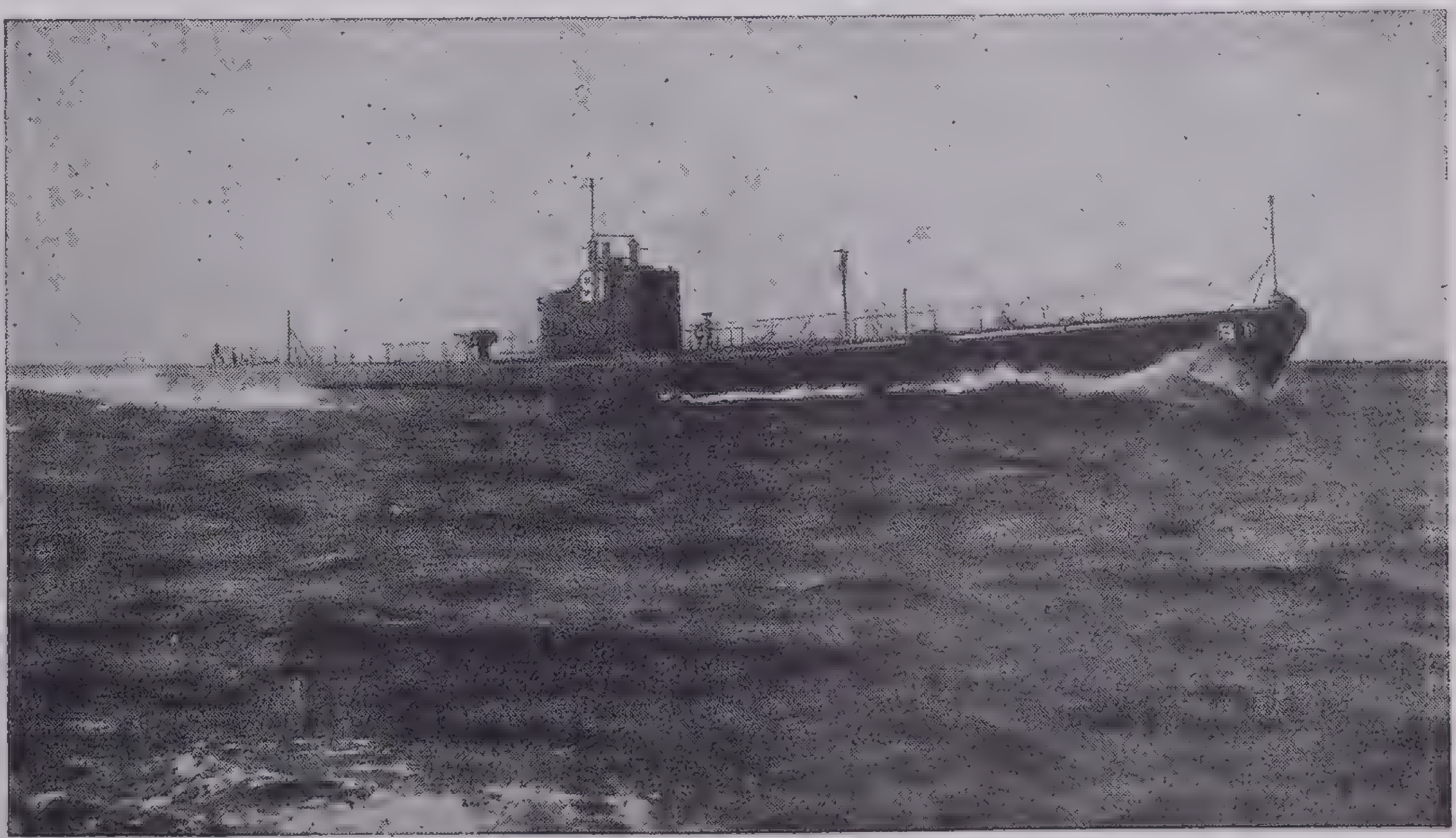
The submarine is primarily an instrument of war, with as much effect on naval warfare as any other step in the entire history of naval development. During the World War the German submarines attempted to carry on transoceanic trade, but it did not prove satisfactory. The *Deutschland* made two trips to the United States in 1916 as a cargo-carrying vessel.

sugar, a sweet granular carbohydrate, obtained principally from sugar cane, a tropical product, and from sugar beets, which are raised in temperate climates. Many other plants yield some sugar, but they are relatively unimportant.

Sugar cane is a native plant of India, in appearance much like the cornstalk. It thrives best in a climate that has two seasons—one hot and moist, the other hot and dry. The heat and rain promote rapid growth, and the hot dry period increases the sugar content of the cane. In such climates cane is planted in the wet season and harvested in the dry. However, there are varieties that mature in 9 months and others that are allowed to grow for 2 years before cutting.

Since cane, once cut, spoils very quickly, the sugar factory—or *central*—is located near the fields. As soon as cane is cut it must be taken there for the first stage in the refining process. The factory produces a light yellowish-brown product that is shipped to the refinery for further processing.

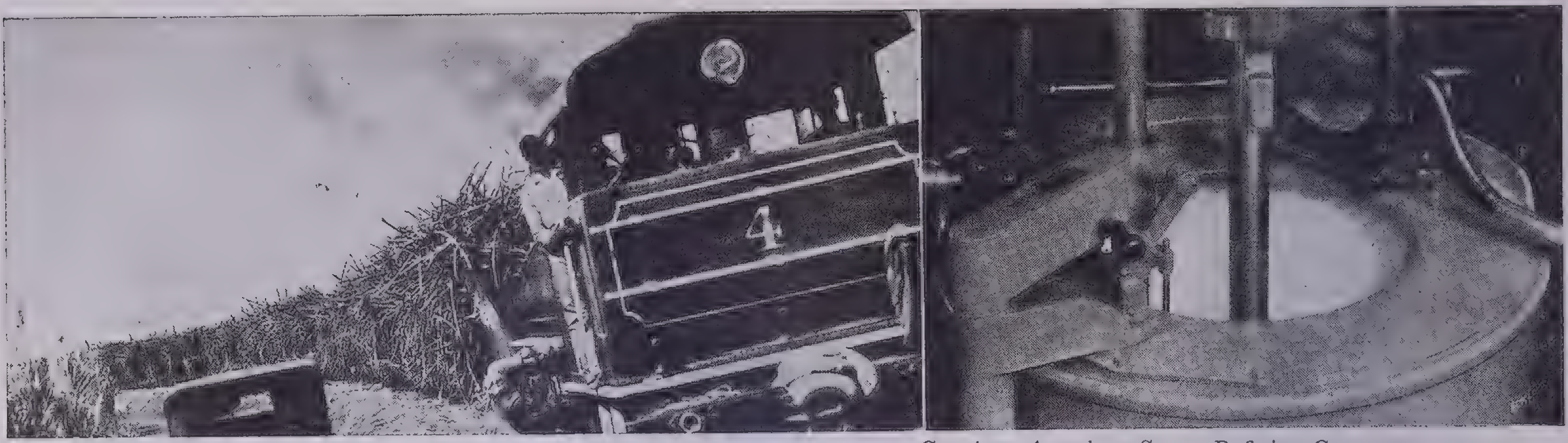
The sugar beet industry is an outgrowth of the Napoleonic Wars. Andreas Marggraf, a German chemist, had discovered in 1747 that temperate-zone beets contained large amounts of sugar, but the beets themselves had to be improved over many years before the extracting process could be practical. Factories were set up in



Official U. S. Navy Photograph

U.S.S. ***Salmon***

The *Salmon* is one of Uncle Sam's modern underwater fighters. She is 298 feet long at the waterline and 26 feet 1 inch in beam at the widest point



Pan-Pacific Press photo *Courtesy American Sugar Refining Company*

A Trainload of Sweetness and a Sugar-Making Machine

A private railroad is part of the equipment of this enormous sugar plantation in Hawaii, here shown hauling a load of cane from the fields to the *central*. At the right is shown one of the final steps in the refining process. Sugar, crystallized out of solution, goes into this centrifugal machine, a cylindrical basket with fine screen sides. When the basket is spun at high speed the syrup is thrown through the openings, leaving the white sugar adhering to the sides of the basket

Prussia, beginning in 1802, but the rest of the world paid little attention until 1811. In that year the blockade of French ports by British warships cut off France's supply of tropical sugar. Napoleon ordered that a beet sugar industry be set up in France, and many other nations soon followed France's example.

After the wars the sugar beet again met competition from its tropical rival and nearly passed out of use. The industry did survive, though, and by careful seed selection and better extracting methods it developed into a strong competitor to cane.

Beets thrive best in an area that has warm, sunny days and a growing season at least 5 months long. They need a moderate amount of rainfall well distributed throughout the growing season. Where rainfall is insufficient, the crop is raised under irrigation. The soil should be a rich sandy loam with a high lime content. If the soil is not particularly good, farmers can afford to use fertilizers, because the sugar beet is a very valuable crop. Sugar beets require much attention and care, but since the work is not heavy, the labor of women and children is frequently used.

The United States is one of the few countries that produce both cane and beet sugar. A small amount of cane is raised in Louisiana. The leading beet sugar-producing state is Colorado, followed by California, Michigan and Nebraska. The United States production amounts to about 397,000 tons of cane and about 1,480,000 tons of beet sugar per year. It is doubtful whether the sugar industry in the United States could exist without the protective tariff. It costs about 3½ cents per pound to raise sugar in Cuba, as compared with 5½ to 6 cents in the United States.

Several European countries are very important as beet sugar producers. Germany with an average production of 1,641,000 short tons, Russia with 1,536,000, France with 1,104,000 and Czechoslovakia with 697,000 are the leading producers. World production of sugar is about 31⅓ million tons a year, of which over 20 million tons is cane sugar.

Most of the world's cane sugar that enters into world trade is produced in the West Indies (principally Cuba and Puerto Rico), Hawaii and the East Indies. The world's leading sugar producer is India, but practically all of its production is used locally. In fact India finds it necessary in most years to import sugar. India's production averages 5,535,000 short tons. Cuba is the second most important producer with an average production of 2,667,000 short tons. Cuba could expand her production tremendously, if economic and political conditions in the country were somewhat more stable.

The leading importers of sugar are the United States and the United Kingdom. The United States imports 3¼ million tons annually, nearly all of it from Cuba, Hawaii, the Philippines and Puerto Rico. The leading exporters are Cuba and Netherland India, especially Java, where the average yield per acre under intensive cultivation is about three times as great as in Cuba, although cost of production is about the same in the two countries.

Sugar production was particularly affected by the World War, which stopped production of beet sugar in central Europe and hindered shipments from Java and Cuba. This induced all countries with any sugar production to increase it after the War in an effort to be independent of remote production that might again be cut off. In May 1931 the principal sugar production countries (both beet and cane) agreed to reduce production in an attempt to stabilize prices. This agreement was called the *Chadbourne Plan* from the American lawyer Thomas Lincoln Chadbourne (1871–1938) who planned it. Increased production in countries that were not in the agreement wrecked the Chadbourne Plan. Subsidies for sugar beets and protective tariffs in almost all parts of the world make the production of sugar uneconomic and continue a state of confusion and uncertainty of prices.

sugar refining. The first step in refining cane sugar takes place at the *central* near the cane fields. Sugar cane contains sugar, water, cellulose and impurities. Since the impurities cause the sugar to ferment, it is necessary to begin the refining process as soon as the cane is cut. It is first crushed between large rollers to extract the juice, which is then heated to about 210° F. and run into tanks where lime is added to neutralize the acids and purify the juice. As much as three-quarters of the water is then removed by boiling, and the syrup is placed in pans where it crystallizes. The sugar is still moist and must be further dried. This is done by placing the sugar in a swiftly whirling machine where by centrifugal force a large amount of the molasses is thrown off, and the so-called *centrifugal* or raw sugar remains. This is the product that is shipped to refineries for further processing. It contains some impurities and is brown in color.

At the refinery the raw sugar is poured into centrifugal machines and the crystals washed with water to remove more molasses. The washed sugar is removed from the machine, melted in hot water and then pumped into tanks called *blow-ups*. Here acids naturally present are neutralized with limewater, and the liquid is put through a series of filters.

Slight stains and impurities give the liquid a yellowish color, which is removed by running it through a column of bone-black, a charcoal made from animal bones. Such columns may be 10 feet across and 20 feet high.

The liquid, now colorless, goes to evaporators and is condensed to almost 68 per cent solid form. The whole is then transferred to vacuum tanks where it is boiled until crystals of the desired size are formed. The crystals are put into centrifugal machines that remove the remaining syrup. The sugar is then washed and dried by heating. It is then ready to be screened to remove lumps and oversize crystals and packed.

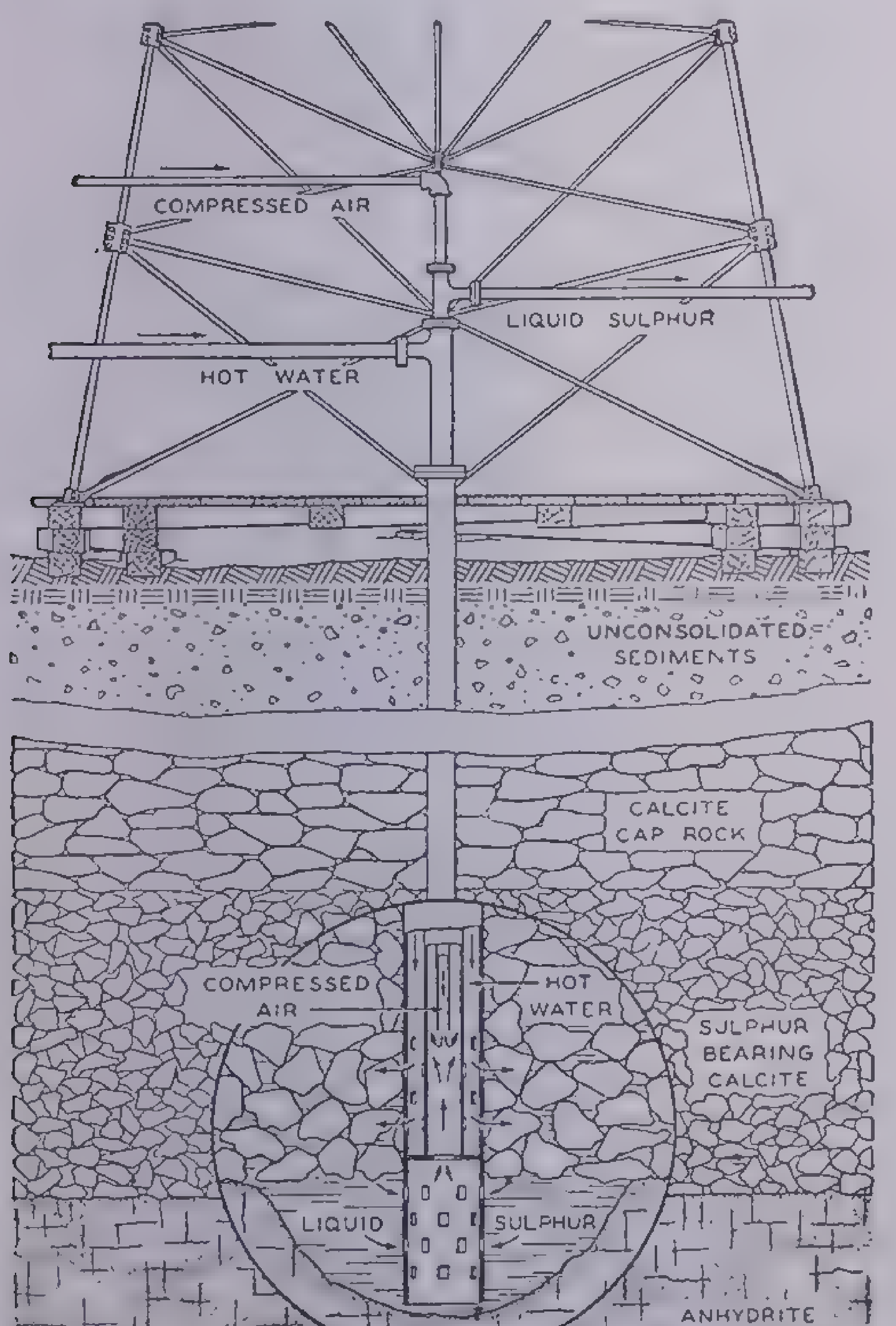
Except in the first stages of the process, beet sugar refining is very similar. The first step is to slice the beets into long thin pieces called *cosettes*. The cosettes are placed in tanks, and hot water is percolated through them, extracting the juice. The liquid is then bleached with sulphur dioxide gas, and after that the water is evaporated off until a near-solid results. The rest of the refining process is like that used in the cane-sugar industry.

Because much of the cane sugar refined in the United States is imported, most cane-sugar refining is done at or near the sea coasts. Boston, New York, Philadelphia and Baltimore are the most important centers, and others are located along the Gulf Coast and on the Pacific Coast. Beet sugar is refined where the beets are grown. This belt extends from Ohio and Michigan through Wisconsin to the Rocky Mountain and Pacific Coast states. Colorado is the leading producer and refiner.

Far more cane than beet sugar is consumed in the United States. The beet-sugar industry is of relatively recent development but is increasing in importance. In 1905 the industry supplied a little over 8 per cent of the sugar requirements of the American people; by 1937 the percentage had increased to almost 25 per cent. The annual consumption of sugar in the United States is more than 6 million tons or about 92 pounds for every man, woman and child.

sulphur, a yellow nonmetallic element abundant in the mineral kingdom and found sparingly in the vegetable and animal kingdoms. Sulphur in some form enters into the making of practically every manufactured article. It has been said that "the civilization of a country may be gauged by the extent of its use of sulphuric acid."

Sulphur occurs in large deposits near volcanoes, particularly in Sicily; in underground beds in many parts of the world; and combined in the form of sulphides with metals and other elements. Until 1907 the United States imported almost all of its sulphur from Sicily, where it was mined by pick-and-shovel methods. About 1896 the American chemist Herman Frasch (1852–1914) perfected the Frasch process of mining sulphur and began producing from beds in Louisiana. By 1914 all domestic needs were being filled by American sulphur. This country now supplies 85 per cent of the world's sulphur.



Courtesy Texas Gulf Sulphur Company

Sketch Showing Sulphur-Well Piping

United States production amounts to more than two million long tons a year, of which about one-fourth is exported. Texas supplies about 85 per cent of all, the rest coming from Louisiana, California and Utah.

Frasch's Process consists of pumping superheated water down a shaft into the sulphur beds. The melted sulphur pumped up is 99.5 per cent pure. Sulphur can thus be taken from beds as much as 1,200 feet deep more cheaply than from underground or open-pit mines with quarrying methods. The Sicilian producers, whose sulphur is impure, can no longer compete.

Sulphur in some form finds important use in making paper, rubber, munitions, matches, fertilizer, rayon, sugar, fabrics, insecticides and chemicals such as sulphuric acid.

sulphuric acid, H_2SO_4 (vitriol), a colorless oily liquid heavier than water. It is so widely used as a reagent and as a raw material that modern industry is in great measure based upon it.

Sulphuric acid was known to the ancients, but before 1746 it could be produced only in small quantities by laboratory methods. In that year commercial production became possible by the development of the *chamber method* that is still widely used today.

Sulphur dioxide, air, steam and gaseous nitrogen oxides are brought together in a lead-lined chamber, often the size of a large room. A rain of moderate-strength sulphuric acid falls to the floor. A recent improvement in this process is the use of cheap, electrically produced ammonia instead of nitric acid to produce the nitrogen oxides required.

Around 1900 another process was developed, the *contact process*, one advantage of which is that it produces acid of the greatest possible strength. It, too, involves the formation of sulphur trioxide from sulphur dioxide, so that water (H_2O) combined with sulphur trioxide (SO_3) will form sulphuric acid (H_2SO_4). In the contact process no nitric acid or steam is needed, for the union of the extra oxygen atom is brought about by the presence of spongy platinum, which acts as a catalyzer. Furthermore, the product is oleum, sulphuric acid holding in solution quantities of sulphur trioxide, which absorbs water to form more acid. This accounts for the great concentration of the product.

The sulphur dioxide used in both processes is obtained in one of three ways: by burning raw sulphur; by burning iron pyrites (FeS_2) or by using the sulphur dioxide that forms as a by-product in smelting copper or zinc. The latter is recovered largely by the chamber process. The contact process can use sulphur dioxide only from the burning of pure sulphur, as the smelter gases "poison" the platinum and make expensive purification necessary.

The first large use for sulphuric acid was in dissolving phosphates to make fertilizers, and this still demands nearly half of all the acid made. The next greatest use is in purifying the products of petroleum refining, and this, of course, has grown by leaps and bounds. Other services of this highly essential acid are in the making of chemicals and drugs, making explosives, textiles, paint, glue and dye; "pickling" and galvanizing steel; taking metals such as copper from their ores; and as the electrolyte in storage batteries.

surveying instruments, devices used to determine the size and shape of parts of the surface of the earth. The data thus secured are usually represented on a map or chart drawn to scale. Two fundamental types of measurement, linear and angular, must be made with surveying instruments.

Chains and tapes are used to measure linear distances. There are two common types of surveying chains: engineers' chains with links 1 foot long and Gunter's chains with links 0.66 feet long, each chain having 100 links. Gunter's chains are of this length to permit measuring in acres—10 square chains equal 1 acre. Chains were used exclusively in years gone by but are now considered too inaccurate except for preliminary work. They have been replaced by steel tapes, usually made of *invar,* a nickel-steel alloy that does not expand or contract much with temperature changes.

The *level* is essentially a telescope, equipped with cross hairs and mounted on a tripod with a spirit level or a horizontal cross-bar and plumb line, so that the telescope's axis can be adjusted to a true horizontal line. It is used with a leveling rod to measure various elevations of the earth's surface. A leveling rod is merely a straight rod plainly marked in feet. In measuring the difference in elevation between points A and B, the level is set up at some point between them. The rod is held vertically at point A and the line of sight through the horizontal telescope strikes it at, say, the 4-foot marking. When the rod is placed at Point B the telescope reading is 6 feet. The difference in elevation is thus determined as 2 feet.

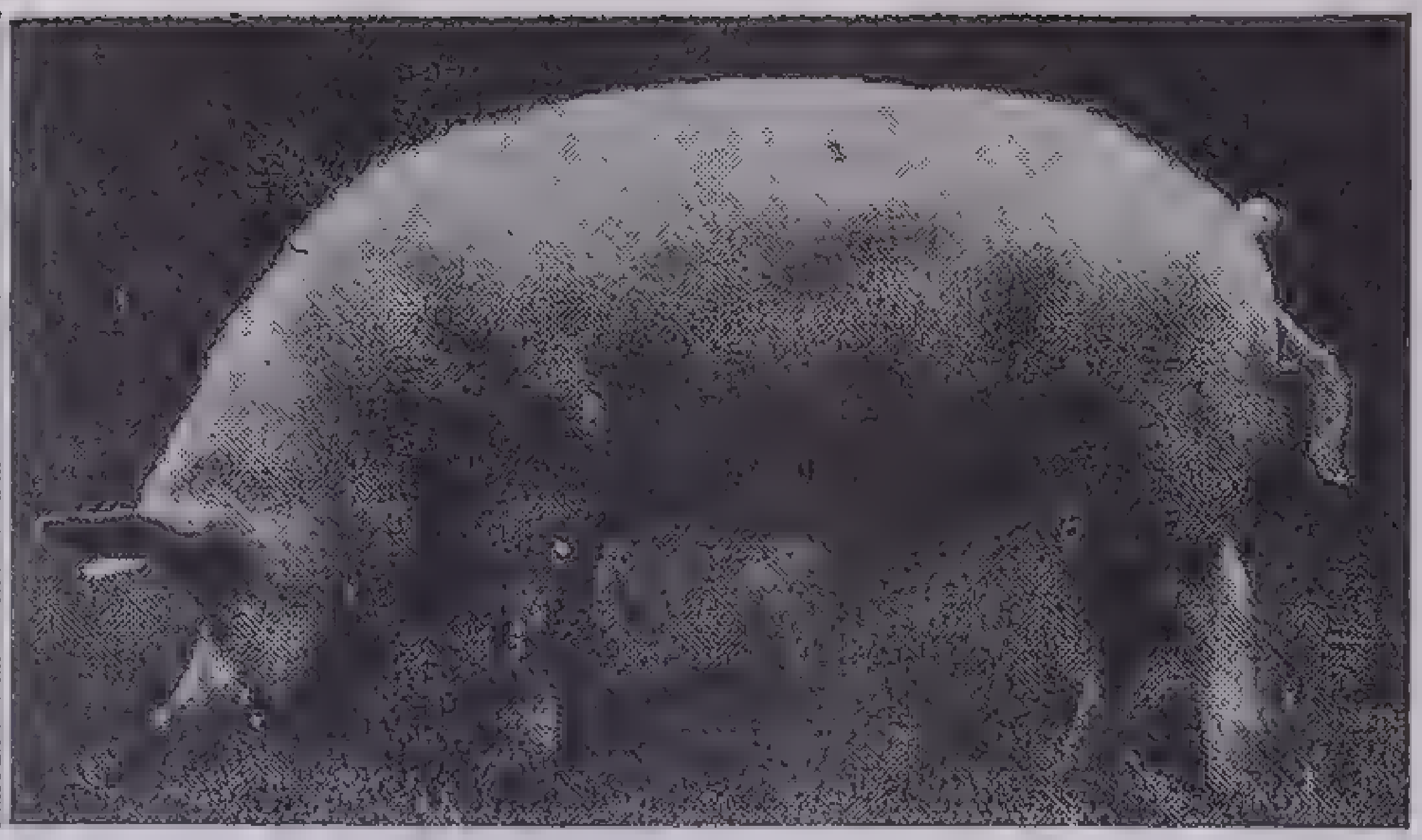
The *transit* is the most universally used surveying instrument. It is a telescope equipped with cross-hairs, mounted on a tripod in such a way that it can be turned through various angles, with means of measuring the angles accurately. To determine the angle between two lines, the transit is set up at their intersection. A reading is taken with the telescope's line of sight down first one line and then the other. Transits are usually equipped with spirit levels so that they can be used as levels also.

Sextants also are used for measuring angles. By the use of one fixed and one movable mirror, two objects can be sighted at the same time—the sun and the horizon, for instance. Then, by moving one mirror, the two objects can be made to appear to coincide. The reading is then shown by the relative position between the fixed and the movable mirror. The essential feature of a sextant is the fact that, since the two objects are sighted simultaneously, it need not be maintained in a fixed position, and readings can be taken with the instrument held in the hand. It is used

Courtesy U. S. Department of Agriculture

Hampshire Hog

An example of the lard type



Yorkshire Hog

An example of the bacon type

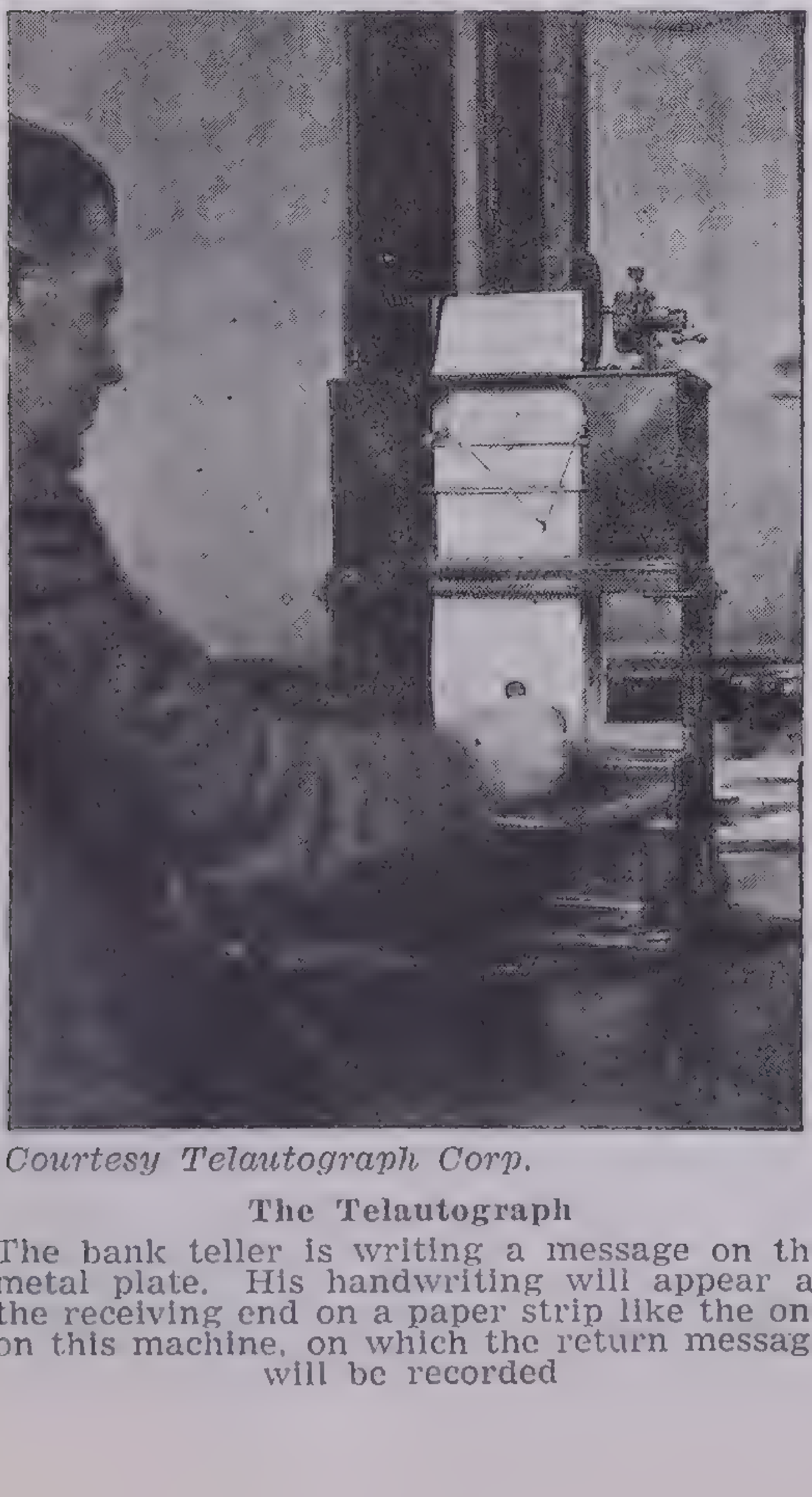
chiefly by mariners to find the latitude and longitude of a ship's position. With the sextant the navigator finds the angle between the horizon and some heavenly body, and from this he can calculate his position.

Many miscellaneous instruments used by surveyors might be mentioned. Plane-tables are essentially drawing boards set up in the field for making rough charts, a telescope and vertical arc being mounted on the straightedge used in drawing the lines; barometers are used for determining approximate altitudes; planimeters take readings from maps in terms of area.

swine, a domesticated form of wild hog. They require little care and will do well in almost any type of climate. China, the United States and northwest and central Europe are the principal swine-producing areas.

In the United States the most important section of production is in the corn belt. Over half of the 43 million hogs in the United States are raised in this section, which produces great quantities of corn on which the hogs can be fattened and prepared for market.

China has more swine than any other nation: her 95 millions act as scavengers, eating the few scraps, garbage and refuse of the Chinese farmer.



Courtesy Telautograph Corp.

The Telautograph

The bank teller is writing a message on the metal plate. His handwriting will appear at the receiving end on a paper strip like the one on this machine, on which the return message will be recorded

In northwest and central Europe swine are, in a way, a part of the dairy industry. Out of every 100 pounds of milk only 4 pounds are used to make butter; the rest is skimmed milk that is used as hog feed.

The United States and Denmark are the principal exporters of pork and pork products. Great Britain and Germany are the principal importers.

tea, an Oriental evergreen shrub whose leaves are brewed to make a beverage. Tea was used for thousands of years in southeastern Asia before it was introduced into Europe in the middle of the 17th century. The tea bush (really a tree that has been pruned) grows in warm rainy areas of the tropics and subtropics. The soil must be well drained but does not need to be particularly fertile. Since the bush requires much attention, and the picking of the leaves is a tedious, painstaking task, large numbers of cheap and skilled laborers are essential. Tea would grow in the United States, as far as climate goes, but the labor problem presents considerable difficulty.

Most tea is one of two types—black or green. If the leaves, after picking, are allowed to dry and wither, the product is black tea. If green tea is desired, the leaves are heated immediately after picking to prevent fermentation.

China is the world's leading producer of tea, but comparatively little of it enters into world trade. The areas of chief commercial production are in the Assam valley of northeastern India, Ceylon, Sumatra and Java.

telautograph, a communication system by means of which messages written in longhand at a sending station are simultaneously reproduced at one or more receiving stations. It operates upon the principle of rectangular coordinates; that is, the position of a pencil at any point on a piece of writing paper can be described by stating its distance from one edge and its distance from the top of the paper. The operation of the telautograph depends on two electric currents whose strengths are proportional to these two distances.

The stylus with which the operator writes is connected by mechanical linkage to the contacts of two rheostats, in such a way that the electrical resistance of one will depend upon the vertical position of the stylus and that of the other upon its horizontal position. This causes the currents in the two circuits to vary in accordance with the position of the stylus.

At the receiving station two electromagnets are actuated by these two currents. One of these moves a plunger to the right and left across the paper, the other up and down, the extent of their motion depending upon the strength of the current received from moment to moment. A mechanical linkage similar to that at the sending station moves a pencil over the paper and reproduces the message written at the sending end. Other electromagnets turn the paper to expose a fresh line for writing. The operator at the sending station controls this by closing a special circuit. Such systems can be set up to reproduce the writing at as many as one hundred stations simultaneously.

telegraph, an apparatus for sending and receiving messages, in the form of coded electrical impulses, over a wire between stations.

In 1745 shortly before Benjamin Franklin made his famous kite experiment, it was shown that electricity could be transmitted through a long piece of wire. In 1753 a writer whose name is not now known suggested a scheme that may be considered the forerunner of the telegraph. His plan was to join two distant points by 26 wires, one for each letter of the alphabet and each marked with its own letter. Below each wire was to be located a pith ball, to be moved by the attraction of an electric charge in the wire. If the sender wished to indicate the letter E, he would charge the sending end of the corresponding wire with electricity, whereupon the person at the receiving end would observe movement of the pith ball corresponding to the letter E. Such a system would have been very cumbersome.

The first major improvement seems to have been suggested in 1787. This was a proposal that only one wire be used, the alphabet being made up of a code of motions. For instance, the letter E, being the fifth letter in the alphabet, might be indicated by attracting the pith ball five times in succession.

The development of early systems was hampered by the fact that there were no very satisfactory sources of electricity nor any very suitable device for indicating the presence of the electricity at the receiving station. The first of these limitations was eliminated by Alessandro Volta's introduction of the electric battery in 1800; the second was solved in 1825 when the electromagnet was invented.

In 1835 Samuel F. B. Morse brought out the first successful combination of a battery, an electromagnet and a telegraphic code. He also devised a mechanism by which the message could be completely set up in code before any of it was sent out over the wire. Pins were stuck into holes in a board similar in appearance to a cribbage board, the number and spacing of the pins being determined by the letters in the message to be transmitted. In sending the message, the board was moved at a uniform speed beneath an electrical contact in such a way that the circuit was closed whenever a pin passed through, and an electrical impulse was sent over the wire.

Another refinement was a recording

receiver, in which the electric impulses actuated electromagnets in such a way as to move a pen, pencil or inked wheel into contact with a moving strip of paper, thus producing a written record of the message. In 1837 it was discovered that the clicking of the electromagnets could be heard by the ear, and soon the familiar dot-and-dash code made its appearance. By 1838 the telegraph was so well developed that the United States government appropriated money to set up an experimental system, and in less than 15 years 50 separate companies in the United States were using Morse telegraph equipment.

Because the electric impulse weakened as it passed through the wire, the distance over which a signal could be transmitted in a given circuit was limited. Morse overcame this difficulty with a very important invention. In place of a receiving sounder at the end of the line, he substituted a device called a relay, in which the movement that normally produced the sound acted instead to close and open the electrical contacts in a second circuit. The strong second circuit then produced a vigorous signal, no matter how weak the incoming impulse might be. By using a number of these repeaters in the same line the effective distance of the telegraph signal was many times multiplied.

Even in the early days of the telegraph, efforts were made to send more than one message over a given wire at the same time. The first such scheme, known as duplex telegraphy, made it possible to send messages in both directions simultaneously on a given line. This was accomplished by arranging the electric circuits so that current flowing from the sending station would not operate the sounder at that station, whereas incoming current would. There were two common methods of doing this, both too highly technical to be discussed here. By an ingenious combination of these methods, Thomas A. Edison was further able to produce a system in which two messages could be transmitted in each direction over a given wire at the same time. This is known as quadruplex telegraphy. These refinements have been very important factors in the commercial development of telegraph systems because they have effected very great saving in the cost for wires.

In recent years a new scheme for increasing the usefulness of telegraph lines has come into use. The older systems used only direct current—that is, one that flows continuously in only one direction during a given signal; but in the more modern systems alternating current, which reverses its direction many times a second, is introduced into the same lines. Such alternating currents are called *carrier currents.* It is possible by equipping the various receivers with different arrangements of electrical coils and condensers, known as filter circuits, to cause a given unit to respond to only those currents of a given range of frequency. Thus a relay circuit that had been set for a frequency of 500 cycles per second might be carrying a number of different currents of various frequencies at the same time, but the relay would close only when a 500-cycle current passed through the circuit. In this way, 10 or 12 messages may be sent over a given wire simultaneously.

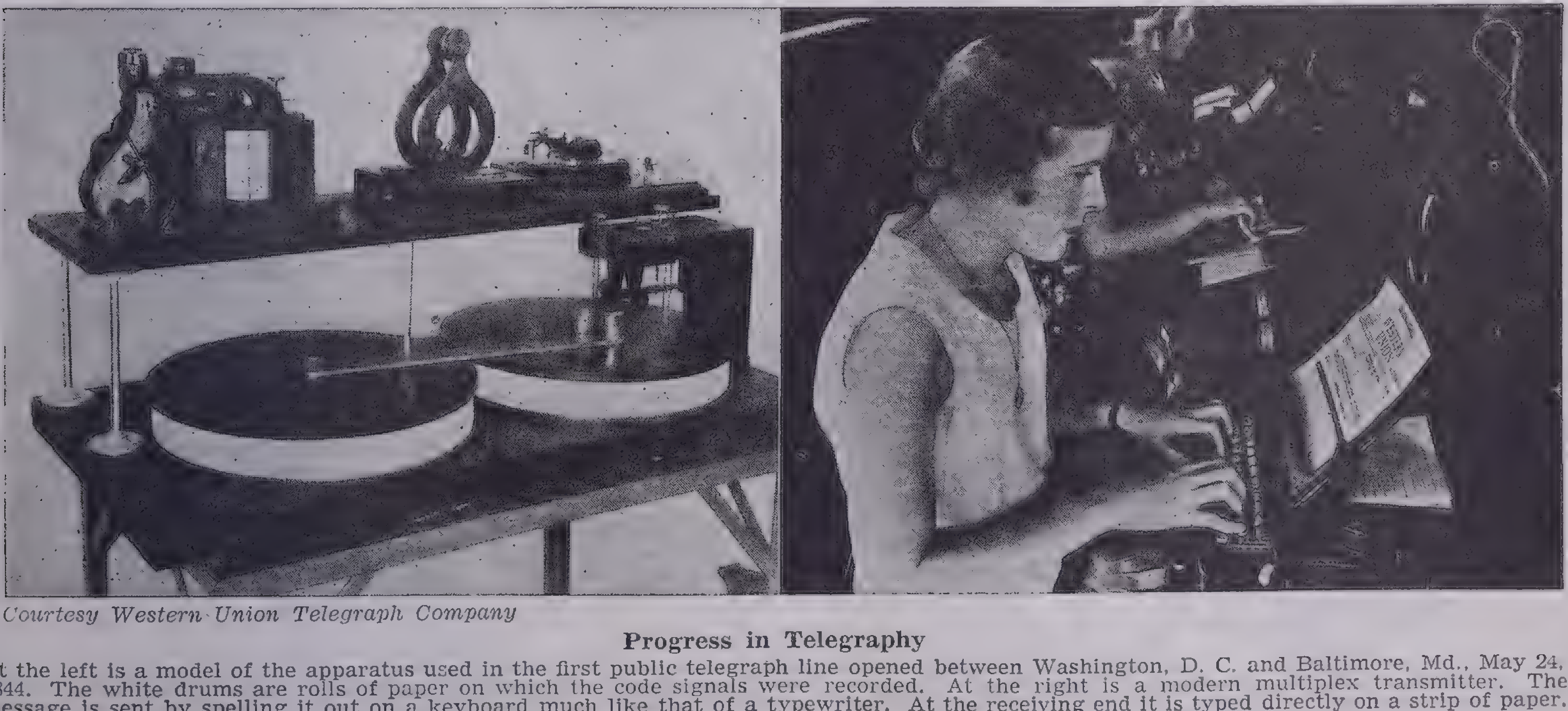
The pioneers were naturally eager to lay underwater telegraph cables between continents. One of the major problems, insulating the electrical conductors from the water, was solved by coating them with gutta-percha. In 1850, the first ocean cable was laid between France and England. In 1858, the first successful connection between Europe and America was established with the laying of cable between Valencia, Ireland and Hearts Content, Newfoundland.

Today the operator's sending key and receiving sounder are being rapidly replaced by automatic devices that transmit and record the messages mechanically. Three types of equipment are in use: those that record the signals in code; those that record a facsimile of the writing done at the sending end (telautograph); and those that reproduce the message in printed form. Of these, the last (teletypewriter) is in widest use. Practically all ocean messages and about 70 per cent of land messages are now handled by machine methods.

telephone, apparatus in which sound is translated into electrical impulses transmitted over a wire and re-translated into sound at the receiving station. The patent issued in 1876 to Alexander Graham Bell for his invention of the telephone has often been called the most valuable single patent ever issued in any country. It is a great improvement over the telegraph in that it does not require a skilled operator. It can be used by anyone after a few moments of instruction; and it will transmit not only his words but the personality of his voice as well.

The telephone was not an accidental discovery. The telegraph had stimulated many people to attempt long-distance transmission of speech. For instance, 21 years before Bell's invention, Charles Bourseul wrote: "I have, for example, asked myself whether speech itself may not be transmitted by electricity—in a word, if what is spoken in Vienna may not be heard in Paris." He described an apparatus that included a flexible disc to be vibrated by the sound of the human voice; electrical contacts to be made and broken by the movement of the disc; a battery and electrical circuit to be controlled by the contacts; and, finally, a receiving disc located at a distance and so arranged as to reproduce the vibrations.

Six years later, such an instrument was actually built by Philipp Reis (1834-74), an instructor in science at Garnier's Institute in Germany. While it would transmit sounds, it could not reproduce speech, because it failed to take into account the complex nature of the sounds in the spoken word. A pure note, such as is produced by plucking a violin string, consists of a



Courtesy Western Union Telegraph Company

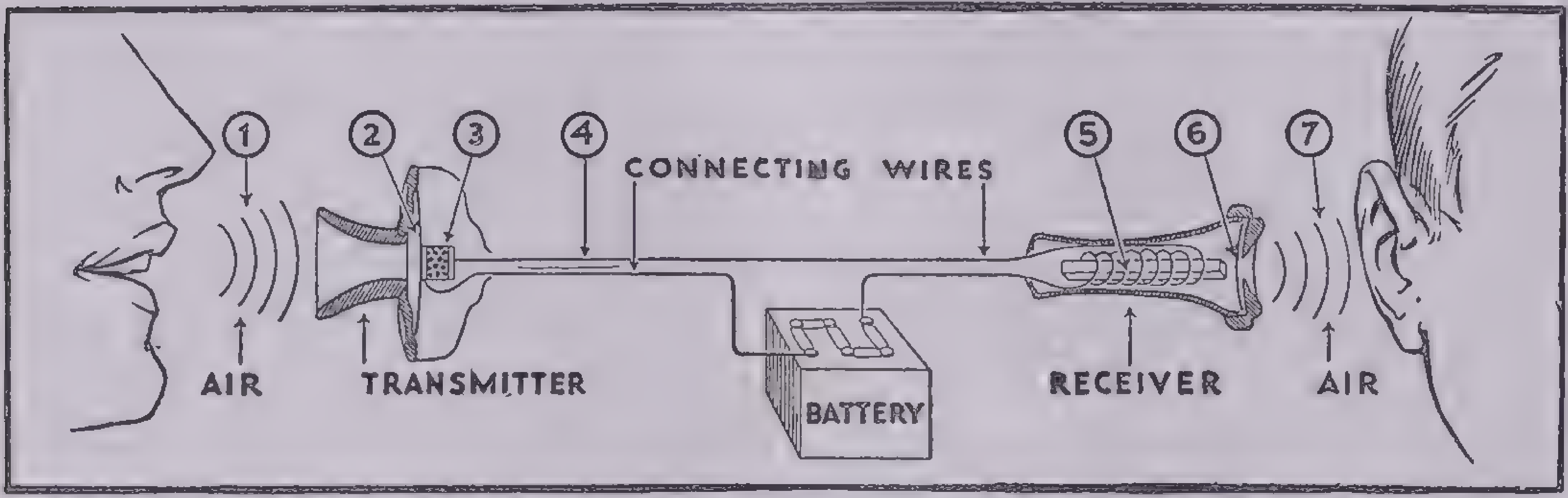
Progress in Telegraphy

At the left is a model of the apparatus used in the first public telegraph line opened between Washington, D. C. and Baltimore, Md., May 24, 1844. The white drums are rolls of paper on which the code signals were recorded. At the right is a modern multiplex transmitter. The message is sent by spelling it out on a keyboard much like that of a typewriter. At the receiving end it is typed directly on a strip of paper. By this system eight messages can be sent over the same wire at the same time definite number of vibrations per second. The sound of the human voice, however, is a complex combination of vibrations, containing an indefinite number of pure notes ranging from about 50 cycles per second to about 15,000 cycles per second. Reis's apparatus could respond to only one note at a time, reproducing only the fundamental vibration that gives only the pitch of the sound and rejecting the harmonics that determine quality and clarity.

Alexander Graham Bell understood the nature of electricity and the nature of sound. Most of his early life was spent in trying to teach deaf mutes to speak. He had developed an apparatus that made visible to the deaf the vibrations that affect normal ears as sound. This led him to the use of tuning forks and the discovery that vowel sounds could be produced by vibrating certain tuning forks simultaneously. He learned that Helmholtz, the great German physicist, had done the same thing and had achieved better results than his by vibrating the tuning forks electrically.

This led Bell into a study of electricity and telegraphy, for already he had in mind the possibility of transmitting sounds over a distance. At first his idea was to transmit a number of different tones at the same time, thus sending a number of telegraph messages over a given wire simultaneously, but he could not transmit the number of tones that theory indicated he should. Understanding the nature of sound, he soon came to the conclusion that what was required was not an arrangement in which the circuit would be alternately made and broken, such as Philipp Reis had used, but one in which the current would vary continuously in accordance with the variations of the sound wave. He quickly perceived that the solution of this problem would lead to the possibility of the transmission of the human voice.

Bell knew that an electrical voltage could be generated by causing a magnet to move in a coil. This led him to construct a magnetized steel reed, fixed at one end and surrounded by a coil, the coil being connected to a similar arrangement located some distance away. The reed's vibrations, produced by sounds impinging upon it, made an undulatory current in the circuit and caused the distant reed to vibrate in the same way. It was the first time in history that a complete sound had been transmitted over a wire.



How the Telephone Works

A simplified diagram of the telephone circuit. The following diagrams will explain what happens at the numbered points

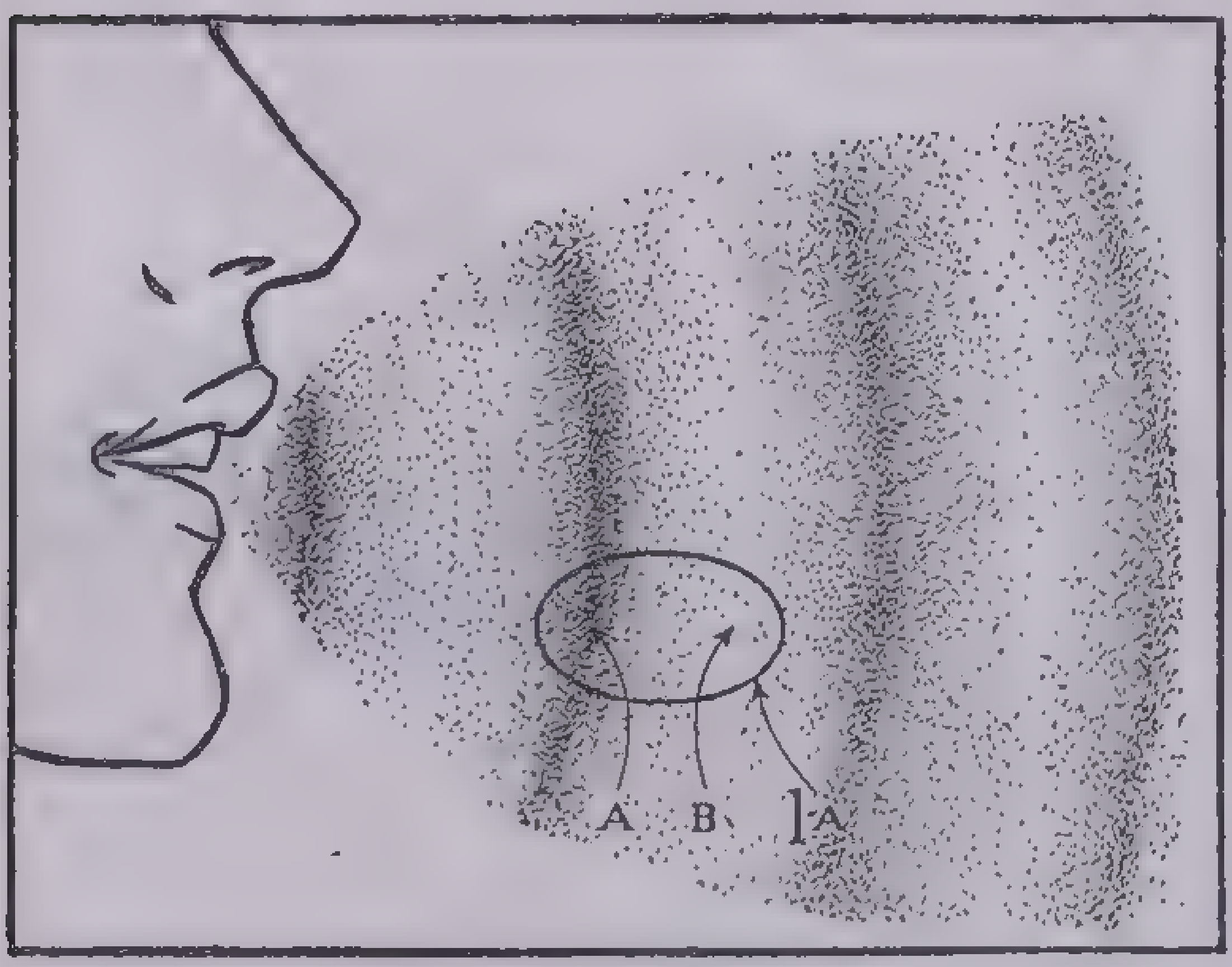


Fig. 1

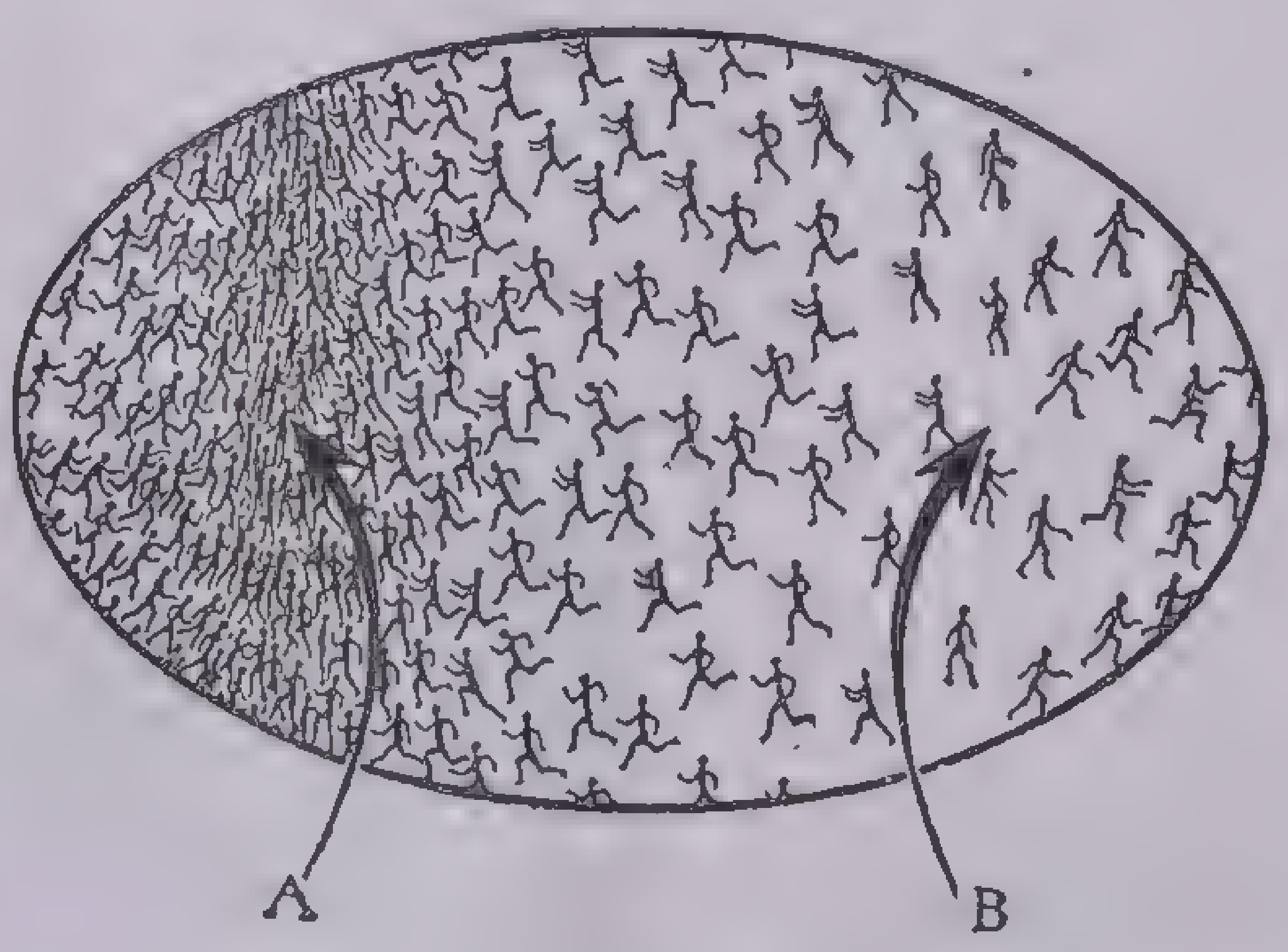


Fig. 1-A

The human voice sets up vibrations or waves in the air, as shown at the left. This may be represented as shown at the right, where air molecules shown as tiny beings rush toward point A and away from point B. The concentration of molecules at A is what is called a *sound wave*

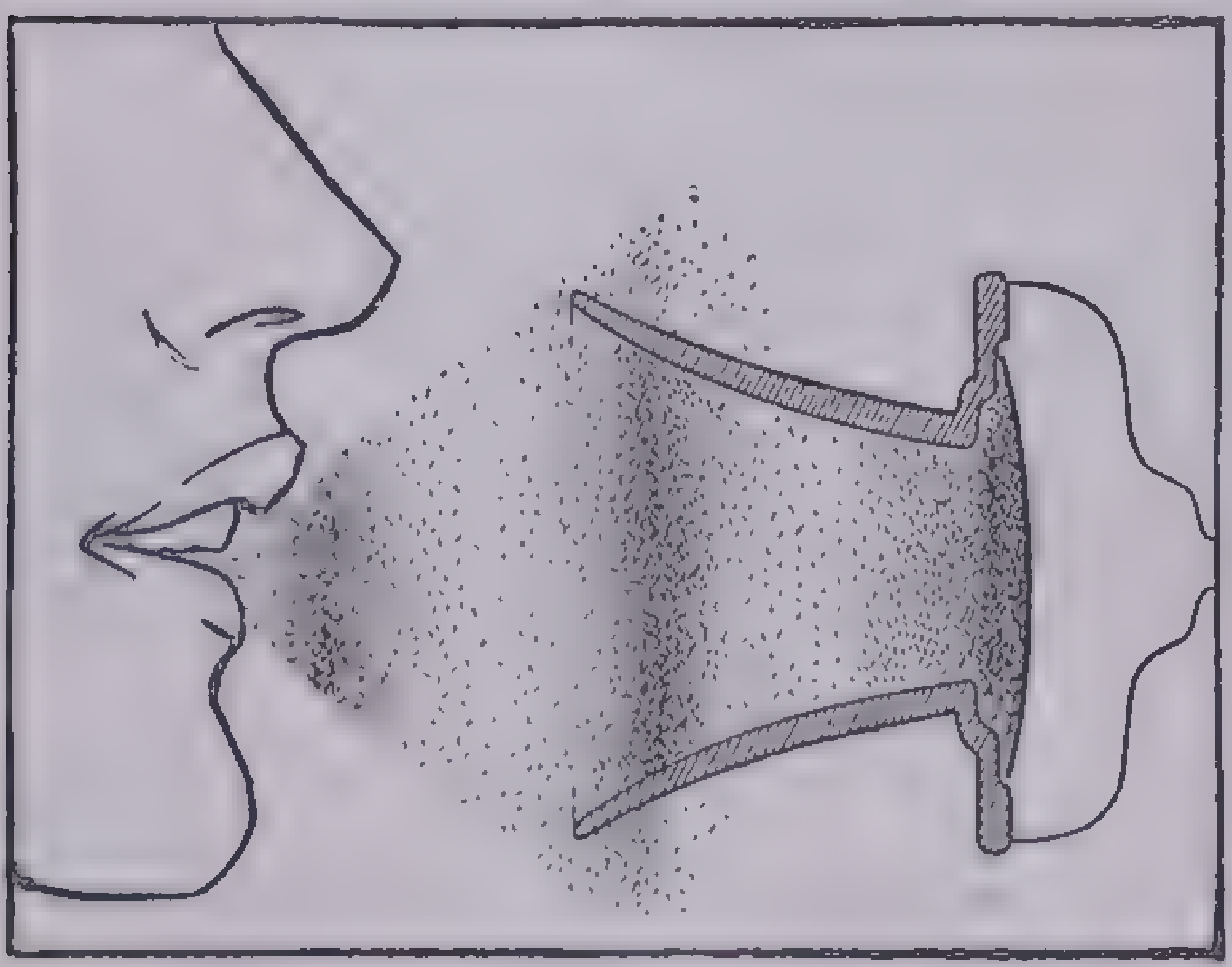


Fig. 2

When the molecule concentrations strike the flexible diaphragm of the telephone transmitter, it is bent in. It springs back between the waves. The vibration is extremely rapid; a soprano voice produces as many as 800 vibrations a second

(All drawings by courtesy of the American Telephone and Telegraph Company)

This device, however, did not yet constitute a complete telephone. Though the impact of the sound waves of the human voice would easily vibrate the reed, it would respond only to sound waves of a given pitch, depending upon the length of the reed. But Bell understood that many sounds could be made up of a relatively small number of frequencies, for he had done just that in his device for the use of the deaf. For the single reed he substituted a set of reeds of lengths that his former experiments had shown him to be correct. This led to the discovery that the complex pattern of vibrations could be produced in a flexible iron diaphragm instead of the reeds. Early in the year 1876, the first telephone message was transmitted by Bell to his assistant, using diaphragms both for transmitting and for receiving.

The modern telephone receiver is quite similar in operation to that used by Bell in 1876, but the transmitter usually consists of a cell filled with carbon granules, one side of the cell being a thin flexible diaphragm, arranged in the instrument so that the user's voice is directed against it. A battery or other source of power is connected in series with the carbon, in a circuit that includes the telephone line and the coils of the receiver. The pressure of the sound waves against the diaphragm causes it to move inward, momentarily packing the granules of carbon closer together. This reduces the resistance of the carbon to electric currents flowing through it, and a stronger current flows for an instant. The next tone of the voice might be stronger or weaker, sending a current of corresponding strength through the circuit. Thus a current of constantly changing strength flows from the transmitter to the receiver, the strength of the current depending upon the intensity of the sound striking the diaphragm.

The receiver is a diaphragm mounted close to the poles of an electromagnet. The coils of the electromagnet carry the current from the transmitter, which causes the pull of the magnet upon the diaphragm to vary with the changes in current through the transmitter and receiver circuit. The diaphragm thus vibrates in the same way as that in the transmitter and gives off sounds that reproduce those directed against the transmitting diaphragm.

If each telephone subscriber wished to communicate with only one other phone, the telephone system would be simple. The usefulness of the telephone depends to a large extent, however, upon the ability of the subscriber to communicate with any of a large number of people. This requires a central station, to which each subscriber's line is connected, and in which it can be connected to any one of the other lines. The first central station was built in New Haven, Conn., in 1878. It

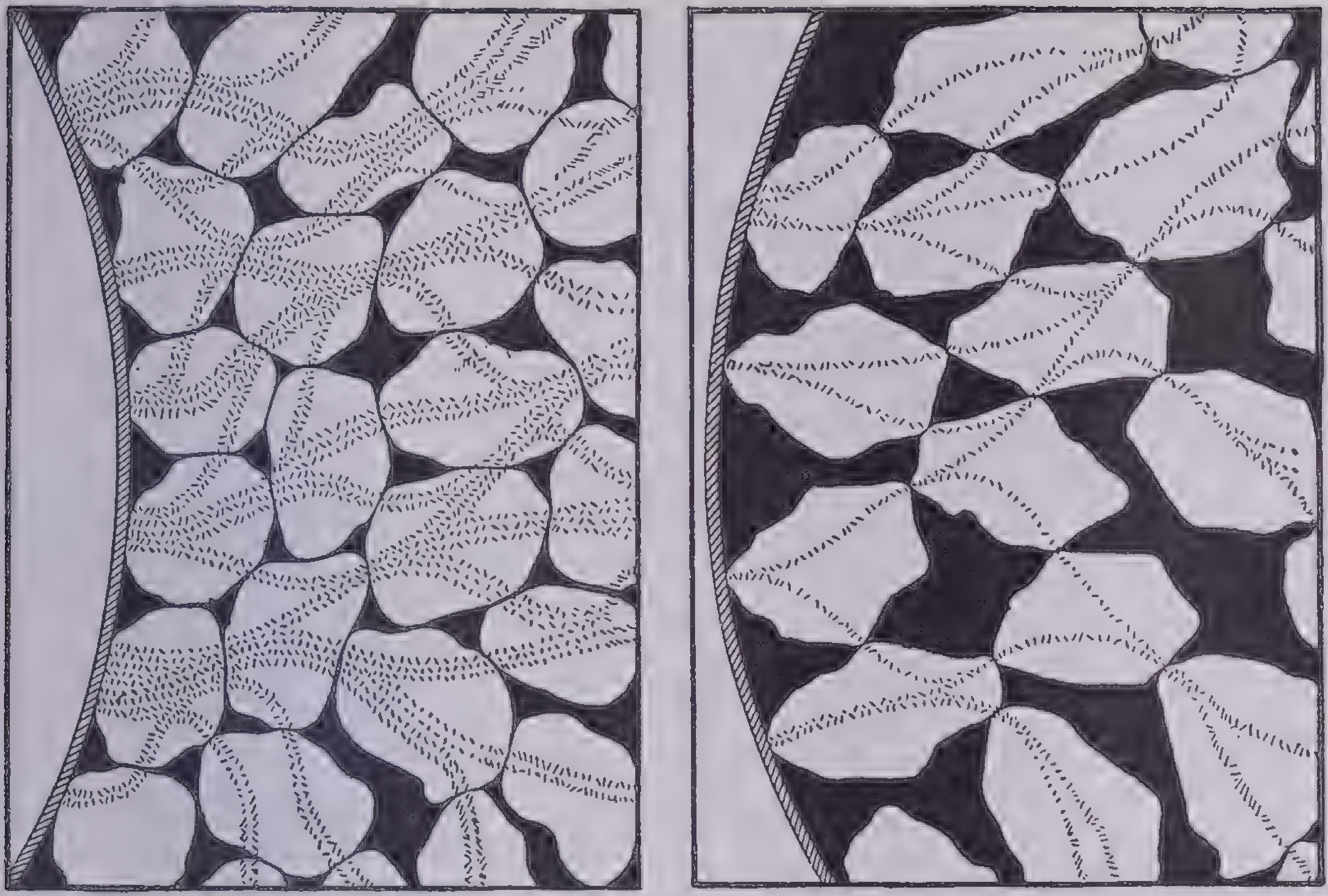


Fig. 3

These drawings show the carbon grains in a telephone transmitter, enlarged about 50 times. When the diaphragm is bent in by sound waves (left), the grains are packed together and electrons (electrical particles) can pass through. At the right the diaphragm has sprung back, the carbon grains have separated, and fewer electrons find a path to pass through

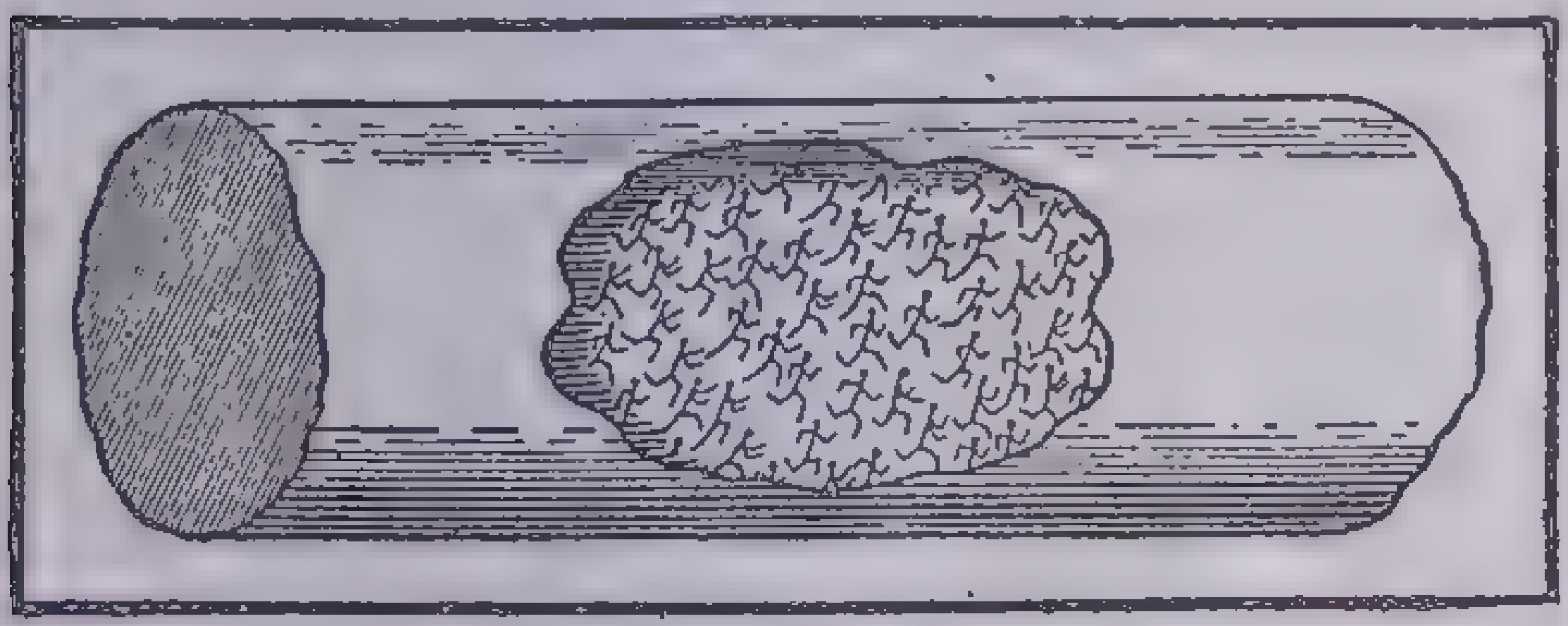


Fig. 4

Inside the copper wire the electrons, having found a path through the carbon grains, move along the wire. This is what is called *current*

served 21 telephone lines. Modern central stations have as high as 20,000 connected phones. It is now possible to reach approximately 93 per cent of the 39 million telephones in the world from any telephone in the Bell System.

Central stations were all manually operated until 1921, when the first dial system was installed. By 1935 more than 40 per cent of the 19,450,000 telephones in this country were served by means of dial switching equipment. There are several different central station mechanisms used with dial telephones; they are too complicated to be discussed here.

One of the most important of recent developments in the field of telephony has been the improvement of transmission. This was done by improving instruments and the lines themselves, and by the use of repeater stations about 50 miles apart on long lines. These are stations in which the signals are stepped up by means of vacuum tube amplifiers, in much the same way as the feeble radio signals are stepped up in a radio set. Thus it is possible to increase the distance of transmission and also to reduce the size of wires used. The old open lines weighed over 400 pounds per mile of wire; but the wires in some of the modern cables weigh about 4 pounds per mile.

One of the favorite projects of telephone engineers has been that of increasing the number of messages that can be transmitted over a given pair of wires. The first step in this direction was the introduction of the *phantom circuit* in 1902, which allowed transmission of three messages over two pairs of wires. Next came the *carrier current* systems, the first of which was applied commercially in 1918. In these, messages are transmitted by modulated alternating currents instead of the usual direct currents. By sending different messages at different ranges of frequencies, it is possible to carry on a number of conversations over a given wire at the same time. The receiving apparatus selects the signals to which it is tuned, rejecting all others in much the same way as a radio set rejects all radio waves except those of the station to whose frequency it is tuned. This makes possible the use of a given wire for as many as 10 or 12 conversations at the same time.

The most recent development is the coaxial cable. It consists of a wire carried at the center of a metallic tube and separated from it by insulating washers. This scheme is still in the experimental stage, but it is expected to permit the sending of 200 messages at once over the single line.

telephotography, the system of transmitting pictures or designs telegraphically. As early as 1881 Bidwell, in London, was able to transmit pictures electrically, but the first commercially successful system was set up in 1925 by Ives and other Bell Telephone System engineers.

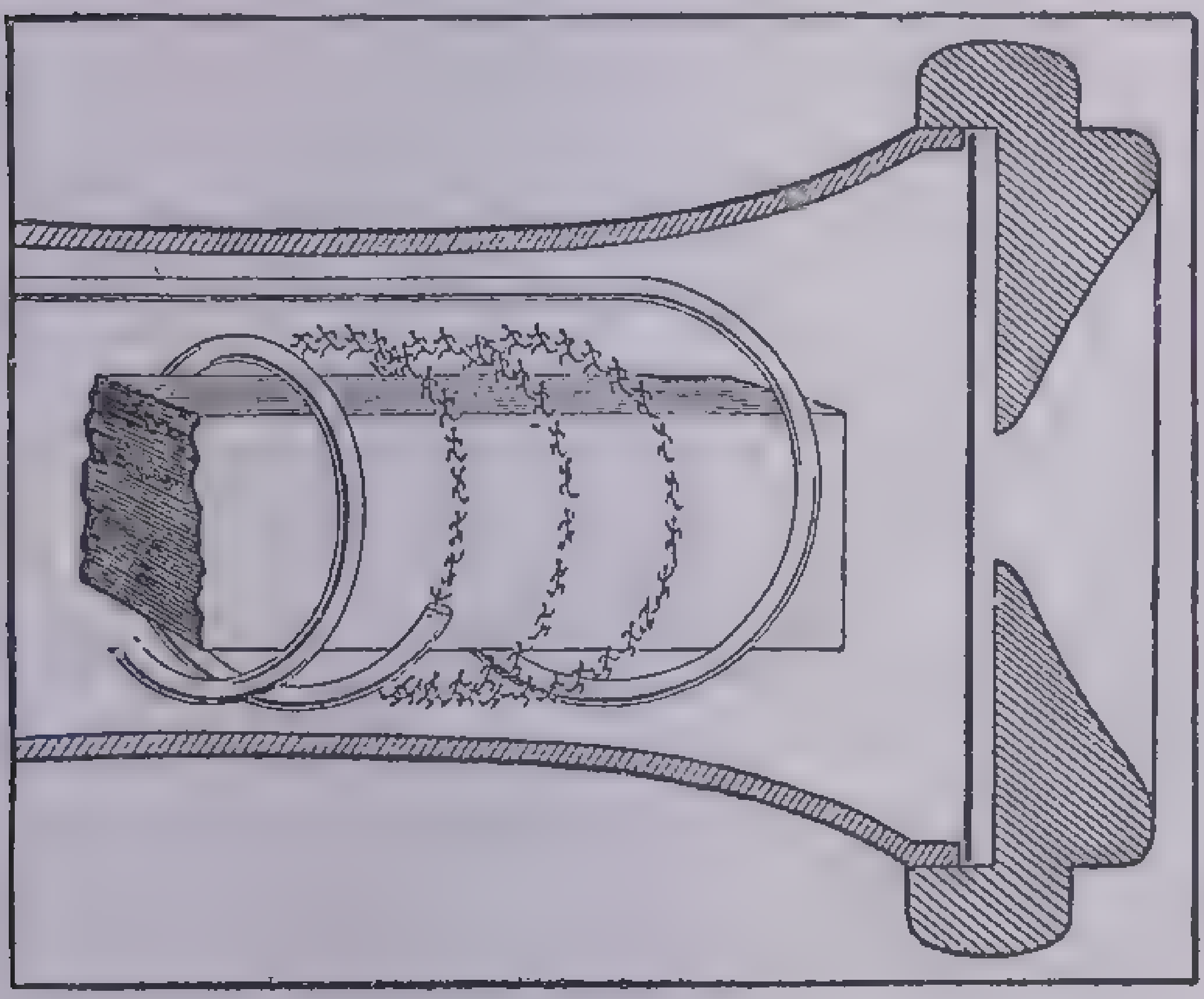


Fig. 5

In the receiver, when electrons move through a coil of wire around a metallic core, the core becomes a strong magnet and pulls the diaphragm toward it. In the intervals between electron concentrations the diaphragm springs back again

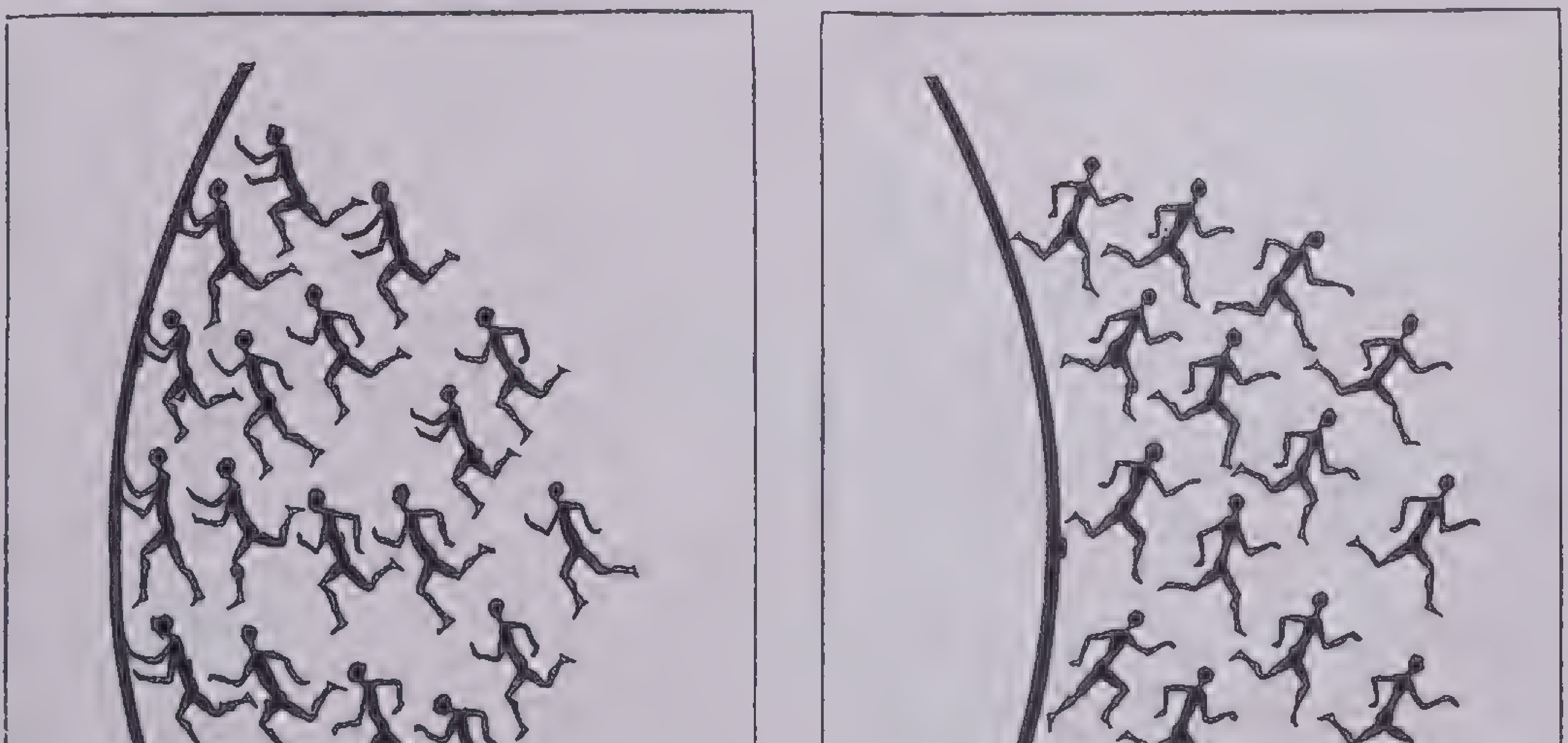


Fig. 6

The vibrations of the diaphragm set up air vibrations or sound waves. Thus the air molecules rush back and forth just as they did in Fig. 2. The same kinds of sound waves that pushed the transmitter diaphragm are now reproduced by the receiver diaphragm, and we hear the sounds created at the other end of the circuit

(All drawings by courtesy of the American Telephone and Telegraph Company)

Each of the various methods now in use must perform the same three successive operations. First, the picture or design must be broken up into a large number of parts that are viewed successively. This operation is called *scanning*. Second, electrical signals must be transmitted from the sending station to the receiving station, their nature being such as to indicate the intensity of that segment of the picture to which they refer. Third, the picture must be reconstructed at the receiving station by a process that is, in general, the reverse of the scanning process. It is important in all systems that the sending and receiving devices synchronize, so that the signal transmitted from a given segment of the original picture will be reproduced in exactly the corresponding position on the picture at the receiving station.

It will be found upon examination that a picture printed in a newspaper is not made up of continuously varying shades, but rather of a large number of small dots whose density determines the depth of the picture. This picture, called a half-tone, illustrates the breaking up of a photograph for telephotography. Each of the tiny dots corresponds to the small section of a photograph that is scanned, translated into an electrical impulse and sent over the wire.

The coarsest newspaper half-tone contains 60 dots per inch, or 3,600 dots in each square inch. Fine magazine work may contain as high as 250 dots per inch; the limits for facsimile transmission are approximately the same. This means that, in sixty-mesh work, 3,600 separate signals must be transmitted for each square inch of picture. As a result, the speed at which pictures can be sent telegraphically is limited by the ability of the telegraph lines to transmit the signals.

Pictures can be transmitted from a photographic film or plate by placing the light source behind it and passing the scanning beam *through* the transparent background. If a finished and printed picture is used, the light is reflected from it. Using the film or plate produces the stronger signal and is the more widely used.

In either case, a beam of light of constant intensity is brought to focus, by lenses, upon a very small spot on the picture. This light is interrupted from one signal to the next, while the next small section of the picture is brought into place. The intensity of the light emerging from the picture varies, depending on how dark or light the picture segment is, the darker segment absorbing the larger portion of the light. This light is then directed upon a phototube, which is the essential part of the electrical system. It sends out electrical impulses whose strength varies with the intensity of light falling upon it. These impulses, being very weak, must be amplified by a vacuum tube amplifier before being delivered to the telegraph line.

The mechanical system usually consists of a cylindrical drum to which the picture is attached. The drum is rotated by an electric motor, and the optical system is transferred slowly from one end of the drum to the other by a system of gearing.

At the receiving end the picture is usually reconstructed by photographic means (although there are other less common methods.) A light-sensitive photographic film is exposed to a light that varies in accordance with the signal received. This film is mounted on a drum that revolves at the same rate of speed as the sending drum because the two are held together (or synchronized) by auxiliary signals sent from the transmitting station. The picture may be enlarged by using a receiving drum with a diameter greater than that of the sending drum, but it is customary to have these drums identical in size. The picture is built up by exposing small segments of the film in succession, in the same order as they are scanned by the sending apparatus.

Since the exposure of a given segment of film depends on the total light falling upon it, this exposure may be controlled by varying either the intensity of the light or the time of exposure. Both systems are in use. In the former a special lamp is used whose brilliance varies instantaneously with the intensity of the incoming signal. In the latter a lamp of constant intensity produces a light beam that is modulated by a mechanical shutter whose opening is controlled by the strength of the signal. After the film has been exposed in this manner, it is developed and the picture is printed by the regular photographic processes.

It is possible to connect a large number of receiving machines to the same transmitter and to reproduce the same picture at a large number of widely separated points. In 1935 a nation-wide telephotographic service operating in this way was put into service. Its chief application is the transmission of pictures for newspapers. In this system, pictures of any size up to 11″ x 17″ can be transmitted in 17 minutes. The usefulness of the system is greatly enhanced by the fact that any station can send to or receive from any other station.

telescope, an optical device for magnifying distant objects and bringing them within range of the human eye.

The eye sees clearly or dimly according to the amount of light, reflected from the object viewed, that enters the eye. Light passes through the pupil and registers the image on the retina. Since the pupil is only about one-tenth of an inch across, the amount of light that passes through it is limited. A telescope, however, has a much larger diameter and so can encompass much more light. A 20-inch telescope will transmit 40,000 times the light that passes through the pupil. The light transmitted by a telescope is condensed before it enters the eye and consequently the brightness of the object is greatly increased. Without the aid of a telescope about 5,000 stars are visible, but millions are visible through a telescope.

In 1600 Hans Lippershey, a spectacle maker of Holland, invented the first refracting telescope, and in 1608 Galileo of Italy also made one. He was without doubt the first person to use a telescope for astronomical research. In the same century Huygens of Holland constructed several refracting telescopes and while using one discovered the largest satellite of Saturn. In 1655 he discovered the nature of Saturn's rings. The reflecting telescope was discovered by Sir Isaac Newton.

The two types of telescopes are the reflecting and the refracting. In both types the incoming parallel rays of light from the object are brought to a focus by an "objective." The focused image is small, but since it is made up of concentrated light, is very brilliant. The observer sees the image through a magnifying lens.

In the refracting telescope the objective is a glass lens that receives the rays of light and bends them properly so that they focus at a certain point where the image is seen through a magnifying lens. The quality of the image depends on many things: the accurate curvature of the lens, the kind of glass of which it is made, freedom of the lens from imperfections of any kind. Since it is impossible to make a large perfect lens, refracting telescopes are limited in size.

Remembering that the usefulness of a telescope depends on the amount of light it can gather, which in turn depends upon the diameter of the objective, it is clear that a larger telescope is better than a small one. Since the size of the refracting type is limited, large telescopes today are built on the reflecting principle, which does not depend on a large glass lens.

In the reflecting telescope, the objective is a highly polished mirror so curved that when the parallel rays of light fall upon it they are *reflected* to a focus, rather than bent by a lens as in the other type. Here too the image is seen by the observer through a magnifying lens. The introduction of photography to astronomical work has further emphasized the advantages of the reflecting instrument. It is especially well adapted for use in photographic work because it is free from the color aberration of the lens.

Dr. George Ellery Hale built the 40-inch Yerkes, the 60-inch and 100-inch telescopes at Mt. Wilson and the recently constructed 200-inch telescope of the California Institute of Technology. The last is the largest in the world. The mirror has a curved surface that has been ground to a final accuracy of one-millionth of an inch.

teletypesetter, a machine for setting type mechanically by electrical impulses in several places simultaneously by an operator at a distance. The trademarked name of the machine applies to three units: one for sending, which perforates code characters on a paper strip and sends by telegraph or radio impulses that produce similar perforations in the receiving unit; the receiving unit with the paper strip to be perforated in code; and the actual typesetter, which translates the code perforations into type matter.

teletypewriter, an apparatus by which messages typewritten at one station are automatically transmitted electrically to another and there automatically typewritten again. These systems are rapidly replacing telegraphy.

The receiving instrument is especially interesting, as it appears to be operated by an invisible typist. All the operations of typing, including return of the carriage, spacing of lines and operation of the type bars, go on automatically without even requiring the attention of an operator except for such routine matters as taking typed messages from the machine and providing it with new paper.

The first printing telegraphs were relatively simple in operation. They consisted of a circular type carriage on which were placed in sequence the 26 letters of the alphabet. Each letter could be brought to the printing position by rotating the type carriage. The extent of rotation was controlled by the number of electrical impulses sent from the transmitting station. Thus, if the letter *A* were to be transmitted, one impulse might be sent out, advancing the letter *A* to the printing position. If the letter *E* were to be transmitted, five successive impulses would be required. Such a system would necessarily be slow in operation. The letter *Z*, for instance, would require sufficient time for the transmission of 26 impulses.

Courtesy Western Electric Company

Teletype Machine

Printed on the long strip of paper is a day's complete broadcasting program, sent by New York radio headquarters and received instantly and simultaneously by stations all over the country

The scheme that was finally adopted requires the transmission of only five impulses or less for any one letter. The receiving typewriter is equipped with five separate electromagnets, any of which may be in either the open or closed position during the transmission of a letter. A very ingenious mechanical arrangement in the receiving machine makes it possible to use various combinations of open and closed positions of the different electromagnets and to operate all of the typewriter keys with the five magnets.

The most ingenious feature of the system is the means by which a given impulse is routed to its proper electromagnet. A system employing five different telegraph wires would be too expensive to be practical. Instead, the five impulses are sent over the same wire in quick succession. This requires that the current be distributed among the various electromagnets at the receiving end in the proper order. That is, an impulse intended for electromagnet number 1 must never find its way to any other electromagnet. A distributor much like that in an automobile is used at each end of the line. It consists of a motor-driven movable contact and five stationary electrical contacts arranged in a circle. Each electromagnet is connected to only one contact. Furthermore, the driving motors at the two ends of the line run at the same speed and occupy positions with relation to each other such that the electrical connection to contact number 1 is made at the same instant at both ends of the line.

In practice it is found that the five impulses can be transmitted in a time corresponding to only a fraction of a revolution of the motor, thus leaving the telegraph line idle for the remainder of the time. It is obvious that during this idle period the line could be used to transmit other messages. This is done by synchronizing other motors in the same system, the angular position of their contacts being arranged so that they transmit signals only when the first motors are not making contact. The contacts for each occupy only a part of the circle, and each is connected to its own separate typewriter. In practice, from two to five messages are transmitted simultaneously in each direction over a given wire.

It is common practice to connect a number of receiving machines to a given line so that the same message is received at a number of widely separated stations. This is particularly useful in distributing news dispatches to a large number of newspapers simultaneously.

television, the simultaneous transmission and reception of pictures over a distance; in modern popular usage the term refers only to motion pictures transmitted by radio. Inventors have worked on the idea for more than a century—ever since the development of the telegraph in 1837. Many methods have been proposed but none had any chance of success until the vacuum tube was invented, which permits great amplification of the weak currents on which television apparatus works.

All television, so far, depends upon some process for dividing a picture into a great number of small sections. Every picture is just a combination of different shades of lightness and darkness. Suppose now that a photograph is ruled off into a hundred squares. Each square contains only a few different values of light and dark. If all the values of the whole picture had to be described in some manner, it would now be much easier, since the few values in each square could be described one at a time.

If now the hundred squares are still further divided, for example into 10,000 squares, each square would be so small that it would hardly be large enough to contain more than one shade of light. Describing the picture now becomes easy, since it is only necessary to pass from one tiny square to the next, in orderly fashion, describing the light intensity in each until the whole picture is covered and the complete mosaic built up.

The shade of each square could be described according to the amount of lightness in it. Thus, in describing a picture of a face, a tiny square representing part of a tooth would have a value of 10, for there is much light in that square because a tooth is white. A square on a lip would have a value of 6, for less light would come from the red surface. A square on the dark hair would have a value of only 2.

The whole process of subdividing a picture is illustrated by a half-tone reproduction of a photograph in a newspaper. It is divided so finely that each dot consists of only one intensity of lightness.

If we have a device of some sort that will automatically look at one small part of a picture at a time and will be able to judge the light intensity of that spot and send out an electrical signal with a corresponding strength, then we have a television transmitter.

This rapid succession of signals must be picked up and broadcast; and there must be a device at the receiving end that can pick up the radio signals and reverse the sending process, turning the signals back into light and recreating the picture by flashing the light impulses in the proper order on each tiny section of a screen.

All the various methods that have been proposed fall into two main groups: those in which all of the small sections into which the picture is subdivided are transmitted simultaneously; and those in which these picture elements are transmitted in rapid succession, depending on the phenomenon of *persistence of vision* to give the impression of simultaneity.

The idea behind methods of the first group was to imitate the human eye. It was known that the eye consists of an objective lens that forms an image upon a mosaic of minute photosensitive elements. Each of these cells transmits an impression to the brain through its own particular nerve, resulting in the perception of the image and its record upon the memory. G. R. Carey in 1875 was the first to propose its application to television. It was his plan to arrange a myriad of small selenium cells connected by individual

Courtesy Columbia Broadcasting System

Television Today

This picture was made directly from the television screen. Clarity and sharpness have been much improved, but the size of the picture is still measured in inches electric lines to an equal number of minute electric lamps. The large number of such units necessary for the satisfactory transmission of even a small picture made the arrangement excessively complicated and expensive.

In the second main group belong all of the methods that have actually been found to be practical. The picture is covered in some regular fashion by a small spot of light of constant size and intensity. The smaller the spot of light, the better the picture. Currents proportional to the light reflected from the illuminated spots are produced in rapid succession by means of a single photoelectric cell, which in turn is used to modulate either a telephone or wireless carrier current.

At the receiving end the signal is detected and used to control a light source with a nearly instantaneous response, such as a neon tube, electric spark or some similar arrangement. To obtain a reproduction of the original picture it is necessary to pass this light source in the form of a beam across the screen, just as the beam passed across the picture in the transmitter. This is called *scanning,* and of course both the transmitting and receiving scanners must synchronize perfectly.

The quality of the picture depends upon the number of complete pictures transmitted per second and the number of spots covered in each picture. The number transmitted must be at least as great as 15 or 20 per second to create the illusion of motion as in moving pictures; and the number of spots covered may be in the order of magnitude of some tens of thousands or more for pictures of especially good quality.

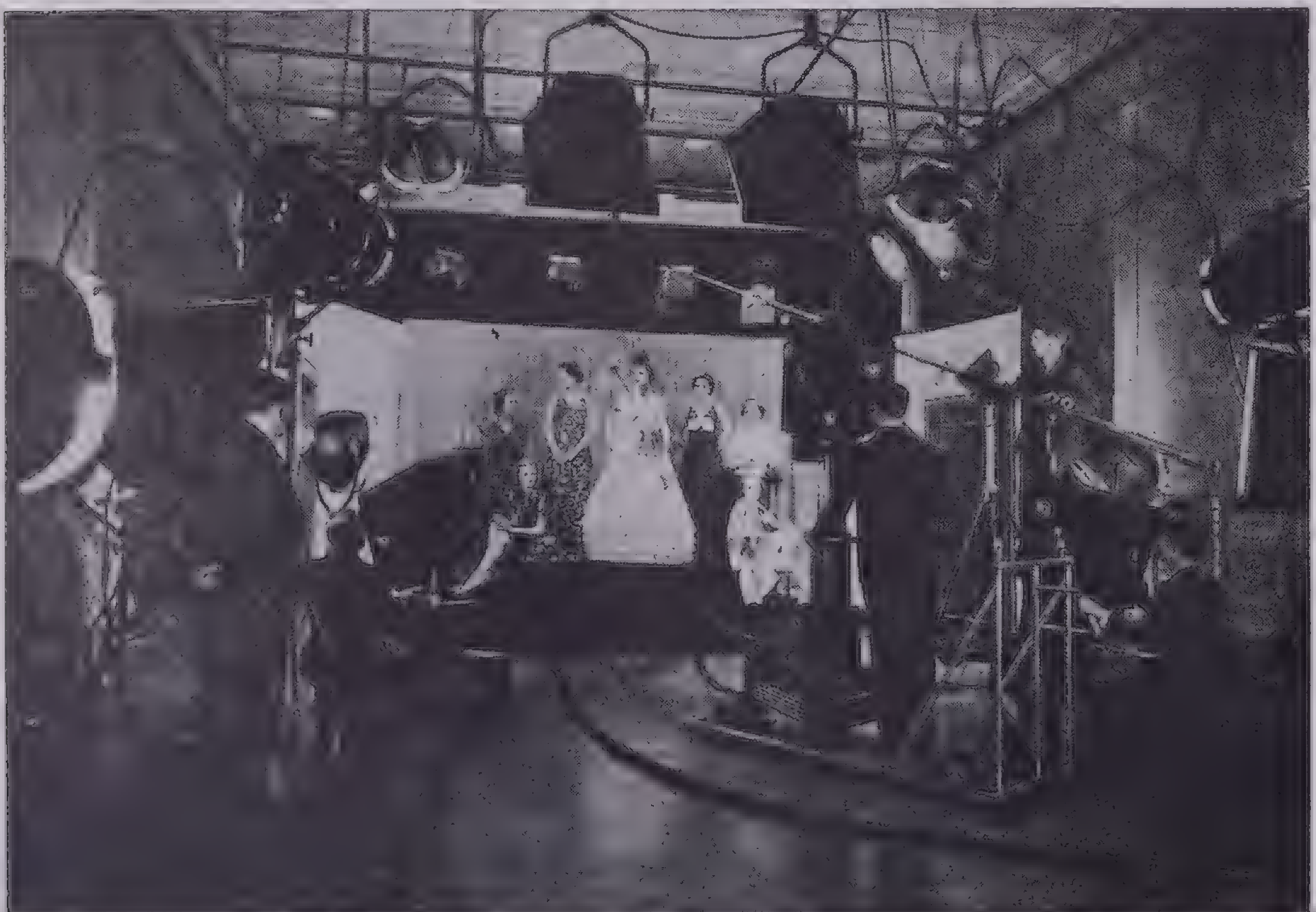
The first of such mechanical methods was known as *Nipkow's Electric Telescope,* and was studied in a very complete manner by P. Nipkow in Germany in 1884. The scanner was a rotating disk perforated with holes arranged in a spiral between the picture and a photoelectric element. If a similar disk was placed between a source of light controlled by the photoelectric current and the observer, the picture could then be reproduced at the receiving end if the two disks were in exact synchronism. In 1923 in England John L. Baird (1888–) scanned and reproduced the image by means of Nipkow disks whose small holes were replaced by large converging lenses. This resulted in a very great increase in the brilliancy of the transmitted picture. About the same time in this country, Jenkins scanned with glass disks whose edges were formed into prisms, a rotating shutter being placed in the path of the light projected onto the object. Later he equipped a disk with a system of lenses that also had a much greater light output. It is of interest to note that this was one of the few mechanical television receivers that has ever been actually manufactured and placed on the market in this country. The difficulties involved in securing perfect synchronism between two distant mechanical devices have effectually prevented the final adoption of this method.

In order to remove the above difficulties, two Germans, Dieckmann and Glage, in 1906 conceived the idea of using a mechanical arrangement at the transmitter and a stationary one at the receiver, such as the cathode ray tube invented in 1906 by Karl Friedrich Braun (1850–1918) and subsequently perfected by J. J. Thomson and others. This plan was carried out and was the method in general use up to the time of the recent development of the *iconoscope* by Zworykin. The mechanical scheme for scanning, or analyzing, permits easy adjustment, but at the same time it is cumbersome and noisy in contrast to the light and quiet cathode ray tube receiver.

Courtesy National Broadcasting Company

"Mike and Ike"

The microphone, for sound, and iconoscope, for vision, nicknamed "Mike and Ike" in the studios, are the heart of television equipment



Courtesy National Broadcasting Company

Television Studio

To "televise" a scene requires as much equipment as to produce a motion picture. The large cameralike boxes are the television apparatus. The man second from the right is maneuvering the microphone at the end of a long boom. It must be kept out of camera range

The first method that did not involve moving parts at either the transmitter or receiver was first suggested by Campbell-Swinton in 1908. It was his idea that perfect synchronism could be obtained by use of a cathode ray tube at each end, the simultaneous movements of the beams being brought about by pairs of deflecting coils, the corresponding coils at the two stations carrying the same current. Thus the apparatus would consist of two special Braun tubes: one for transmitting, which would play the part of a light-sensitive contactor, and one for receiving. In the scheme actually proposed, the image was projected onto a screen mounted inside the transmitting tube. This screen was a honeycomb of insulated cells covered with a light-sensitive alkali metal, so that each cell would function as a minute photoelectric cell. An experimental model was actually constructed in which the mosaic was replaced by a continuous screen of selenium. The results were not encouraging, due principally to the lack of sensitivity and amplification. The importance of this proposal should not be underestimated, however, since it served as the basis for the development of the iconoscope, which is similar in operation.

Television progress in the United States has been rapid in the past few years, largely through the research carried on by major broadcasting networks. Several stations in this country now broadcast either regular or experimental television programs. Although there are very few receiving sets on the market in this country at the present time, there are a large number of home-assembled sets of various types scattered throughout the entire country. As soon as a satisfactory broadcast scheme has been worked out, it is certain that receivers will be available.

In England television broadcasting on an elaborate scale was begun in November 1936. Although present methods cannot cover a radius greater than 50 miles, a system using coaxial cables is being developed for transmitting the programs by wire to provincial stations for rebroadcast. At present about 8,000 television sets are in use, and the number being purchased is on the increase, although the cost of the set is still about $300. Aside from this, experiments are being carried out to adapt television for military purposes. Although most of this work is kept secret, it is known that television has been used successfully in "spotting" artillery fire. In telephony, an attempt is being made to enable subscribers to see each other while they are talking. One of the greatest obstacles is that the coaxial cable costs about $5,000 per mile.

thermionic vacuum tube, an apparatus in which electrons are produced and controlled. Such a tube depends for operation upon the fact that a hot electrode emits a stream of negatively charged electrical particles called electrons. They are emitted by *thermionic action,* which may be compared to the emission of steam from boiling water.

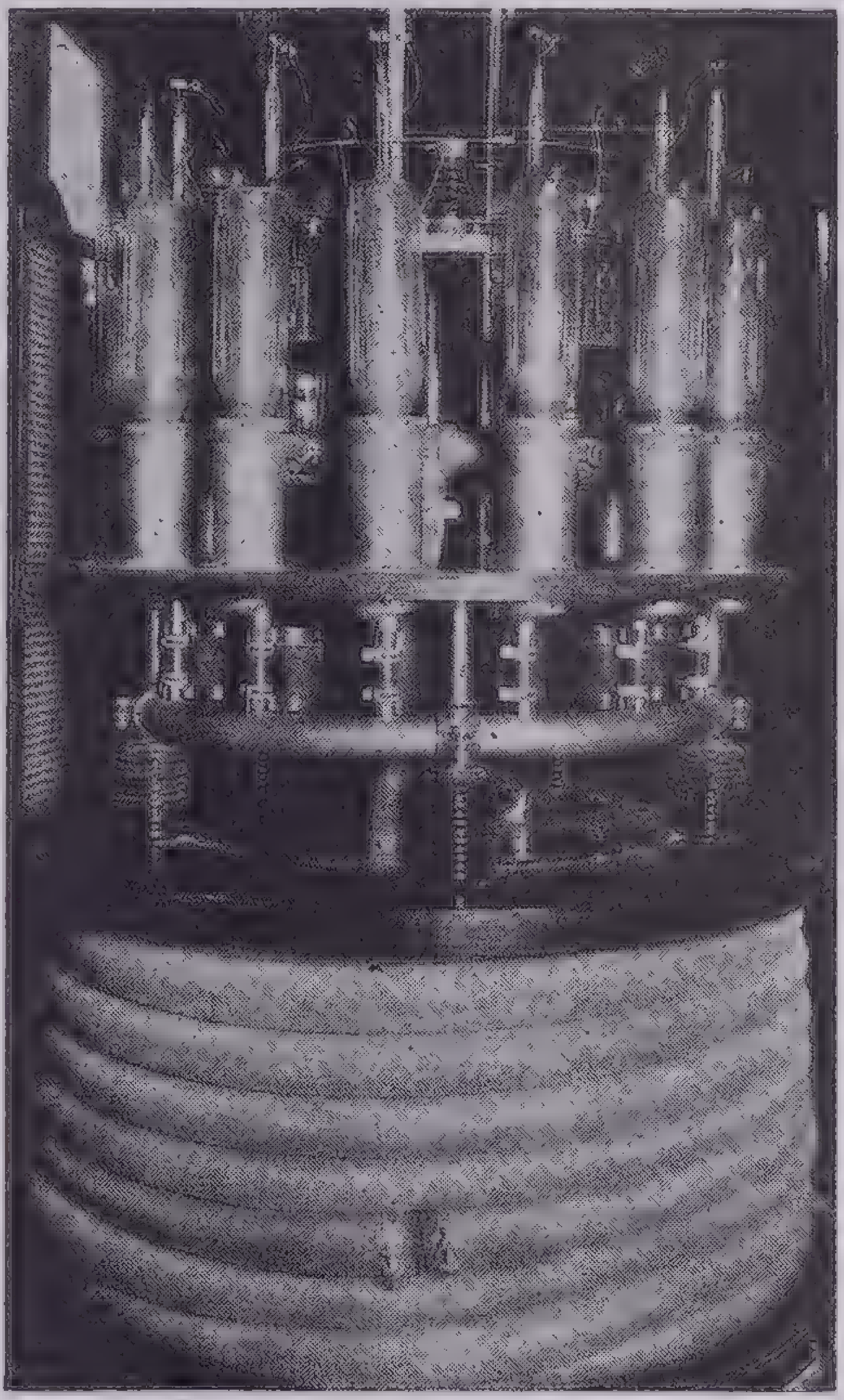
The tube consists of a hot electrode —the cathode or negative electrode that emits the electrons; an anode or positive electrode, to which the electrons are drawn; and there may be one or more other current-carrying elements that control the flow of electrons from cathode to anode. These three elements are known respectively as *filament, plate* and *grid.*

The whole assembly is mounted in a glass or metal envelope from which air must be thoroughly exhausted. Elaborate methods have been developed to remove most of the air within the enclosed space and to drive out and remove the air and other gases contained in the electrodes and envelope.

Vacuum tubes are usually classified according to the number and types of their electrodes. The *diode* is a two-element (anode and cathode) vacuum tube used mostly for changing alternating current to direct. This tube was originally discovered by Thomas A. Edison in 1884 while he was developing the incandescent lamp. At that time he noticed a blackening of the inside of the glass envelope, which he explained as being caused simply by the condensation of carbon evaporating from the hot filament. But there was a clear line on the glass, as if one side of the filament cast a shadow. To study this strange phenomenon, Edison sealed a rectangular, flat plate in the bulb for the combined purpose of seeing whether or not it would produce the same shadowing effect and to determine the charge of the carbon particles, if any. During the course of this experiment he made the startling discovery that when the plate and filament were connected by a wire outside the tube, a current flowed through it, in spite of the gap between plate and filament in the tube.

This became known as the *Edison effect,* and in 1899 J. J. Thomson was able to show that the electric current flowing through the space within the lamp was due to electrons emitted from the hot filament. Although Edison took out a patent on his invention and recognized that such a device could be used to convert alternating current into direct current since it would conduct current in only one direction, he paid little attention to its possible commercial importance, probably because there was little need for a rectifier at that time.

In 1905 Sir John Ambrose Fleming (1849-) of England constructed a two-element tube and used it as a detector of radio signals. It was not very satisfactory, since methods of thoroughly exhausting tube envelopes had not been developed and although it could detect a radio signal, it could not amplify. At about the same time A. R. B. Wehnelt in Germany found that if a fine platinum ribbon was coated with barium, calcium or strontium oxides, a comparatively large amount of electrons could be emitted at a fairly low temperature. Today oxide-coated cathodes are becoming common, especially since relatively cheap alloys have been developed to take the place of platinum.


Courtesy American Tel. & Tel. Co.
Amplifying Tubes
This bank of 15 tubes is used in the transatlantic telephone system. It amplifies the voice current to a strength sufficient to carry across the ocean

Today two-element vacuum tubes rectify current for radio transmitters and receivers. Other specialized forms are X-ray and cathode-ray tubes.

Triode, or *Three-Element Vacuum Tube.* In 1907 while the American Dr. Lee De Forest (1873-) was investigating the internal action of the diode, he accidently discovered that a third element in the form of a grid of wires placed between the filament and plate, and itself carrying current, would act as a sort of valve, shutting off electrons or allowing them to pass, depending on the grid circuit. Furthermore, the presence of the grid brought about a much higher voltage in the plate current.

Radio transmitting and receiving tubes are of this kind, and the action of the tubes is best explained in terms of radio. In a microphone the characteristics of a voice are translated into variations in an electric current. If this current is fed into the grid, the result is a current flowing in the plate circuit that has the same wave form as the voice circuit. Equally important is the fact that the plate current is much stronger than the original current and can be built up in a series of tubes to the strength required for broadcasting.

At the receiving end the weak incoming signal fed into the grid of a tube brings about a corresponding strong current that operates the loud speaker.

But long before the days of radio broadcasting, in 1912, the Bell Telephone System purchased certain rights from Dr. De Forest and proceeded with the development of the triode. So rapid was the progress made that the year 1914 saw three-element vacuum tube amplifiers installed in long-distance-telephone lines to boost the weakening current from time to time and give it another push along the wires.

In 1922 the vacuum tube industry received a mighty stimulus when radio broadcasting was established. Small receiving tubes are now being manufactured at the rate of some hundreds of thousands weekly, together with enormous water-cooled transmitting tubes with ratings ranging as high as 100 kilowatts.

Since the development of the three-element tube other elements have been added. A *tetrode* or four-element tube has a shielding screen around the plate. This neutralizes certain disturbing electrical influences and makes the plate circuit yield even higher multiplication of voltage. Four-element tubes are also used as meters for measuring extremely small currents—as small as one hundred-million-billionth of an ampere. Such weak currents are measured in the study of cosmic rays, for example.

Five-element tubes (*pentodes*) are still newer. The fifth element is another grid between plate and screen. Pentodes are coming into use as amplifiers.

The action of any tube can be improved by bringing the electrons to a sharp focus as they pass from cathode to anode. This is already done in some cathode-ray tubes, and it is prophesied that ordinary radio tubes will be so constructed in the future.

Tubes of more and more complicated construction are being built every day for various purposes. It is possible to include all the elements for a number of tubes in one envelope; it may soon be possible to increase the efficiency of the tube so much that all radio receivers will be one-tube sets.

Gas-filled Tubes. There is a considerable drop in voltage between cathode and anode in a two-element vacuum tube. Since the electrons are negatively charged there is mutual repulsion between them. Such forces tend to make the electrons disperse on their way to the anode, and some may even return to the cathode.

If the tube is filled with some inert gas, such as neon, argon, helium or mercury vapor, the efficiency of the tube increases tremendously. Electrons moving from the cathode knock off other electrons from the atoms of gas, and the new electrons also move on toward the anode. Thus, when in an ordinary tube the electron stream is weakening, in a gas-filled tube it is being strengthened.

The reduced atom is now positive in charge, since it has lost a negative electron. Therefore it moves back slowly to the cathode, where it picks up a new electron from the source of supply and returns to its original state.

Since they pass current only in one direction and are much more efficient than a vacuum tube, gas-filled tubes are often used to change alternating current to direct.

Such a tube with a grid added as a third element becomes a very sensitive instrument. The grid controls the *starting* of a discharge, but after that has practically no effect on the plate current. Thus they can be used as *relays*—devices for setting up a strong current by means of a very weak one.

Tubes so arranged are now used in many control devices, such as for traffic signals, illumination systems, factory motors and the like. For instance, suppose that there is an automatic system for keeping a room at constant heat. A thermocouple sends out a tiny current when temperature changes. This current is picked up by a tube and is used to release a current strong enough to turn valves or the like. New uses are being found every day for such tubes. They are becoming as important in industry as the vacuum tube is in communication.

tin, a bluish-white metallic element valuable chiefly because it is not affected by air and is not attacked by most acids, especially those in fruits and vegetables. It is pliable and melts at a low temperature. These characteristics make it ideal for coating iron or steel sheets to make tin cans and other containers for foods.

The sheets are carefully cleaned by *pickling* in sulphuric acid and are then dipped in tanks of molten tin, after which they pass through rolls to remove excess tin and to brighten the surface. *Terne plate* is sheet iron or steel coated with an alloy of four parts of lead to one part of tin. It is used for roofing and for lining packing cases. *Pewter* is a mixture of tin and lead in varying proportions, perhaps with zinc, bismuth, antimony or copper added. The greatest use of pewter is in making tableware. *Babbitt metal,* widely used for bearing surfaces, is made of tin, antimony and copper, with tin predominating in a variety of proportions for different uses.

The tin container industry in the United States is carried on in 200 or more plants, with an output worth 300 million dollars a year. However, it is entirely possible that various substitutes will soon displace tin. Aluminum or iron or steel sheets coated with lacquer may take the place of tin cans as food containers, and ball and roller bearings are being used increasingly instead of Babbitt metal.

Tin smelting requires large quantities of coal. Consequently a large supply of cheap fuel is important. Singapore, an important ocean trade route center with cheap coal available, has developed a rather important tin smelting industry. Most of the world's tin, though, is smelted in England. The tin mines and smelters of Cornwall in southwestern England were famous more than 2,000 years ago when Phoenician traders came there for tin. These deposits are now nearly exhausted, but the tin smelting industry continues to be important.

No tin is produced or smelted in the United States. Almost two-thirds of the total output comes from southeastern Asia—more than a third from the British Federated Malay States and almost a fifth from Netherland India. The other big producer—almost a quarter—is Bolivia. Nigeria in West Africa, a British possession, is fourth with about 1/16 of the total. The Asiatic production is low cost because it is mostly in deposits worked by opencast, quarrylike methods and reworked by dredges. In Bolivia the tin lies in underground seams and is much more expensive to extract.

When tin prices dropped from the World War high, the British and Netherland governments bought a surplus stock of 17,000 tons (worth probably 17 million dollars) to protect the market. In 1928 and 1929 there was great over-production because the price had been high ($1500 a ton) in 1927. An association of producers—not including the Netherlanders who had not increased production—agreed to cut production about 20 per cent. In 1931 an international agreement between the British and Netherland governments cut production to 78 per cent of 1929 output, and in 1932 to 33 per cent. The restriction was successful. The outside producers came in on the agreement. In 1934 the output was jumped to 40 and then to 50 per cent of 1929's high production; and in 1936 the restriction was set at 90 per cent.

This governmental control of tin up to 1937 seemed far more effective than efforts to stabilize other industries by limiting their output. Probably the method would not have worked if any substitute for tin could easily have been produced. For a time it saved the high-cost producers (Bolivia, for example) from the natural results of competition with low-cost producers.

The quota for the first quarter of 1937 was set at 100 per cent of standard tonnages, and the price rose so rapidly that the quota was jumped to 110 per cent for the rest of the year—but then only Malaya produced its quota, Bolivia reached only 55 per cent and other countries in arrears joined Bolivia in transferring part of their allotment to Netherland India, Malaya and Nigeria. The production for the year was below the quota set and was 20,000 tons (197,671 produced; 177,443 consumed) greater than world consumption. In spite of the completeness of agreement under the rulings of the International Tin Committee, the control arrangement now seems incapable of holding together on the same basis the mines with economical production and those that operate at higher costs.

tire, on a vehicle wheel, the outermost part, which makes contact with the ground or roadbed. It is usually made of material that will resist wear and at the same time offer a minimum amount of rolling resistance.

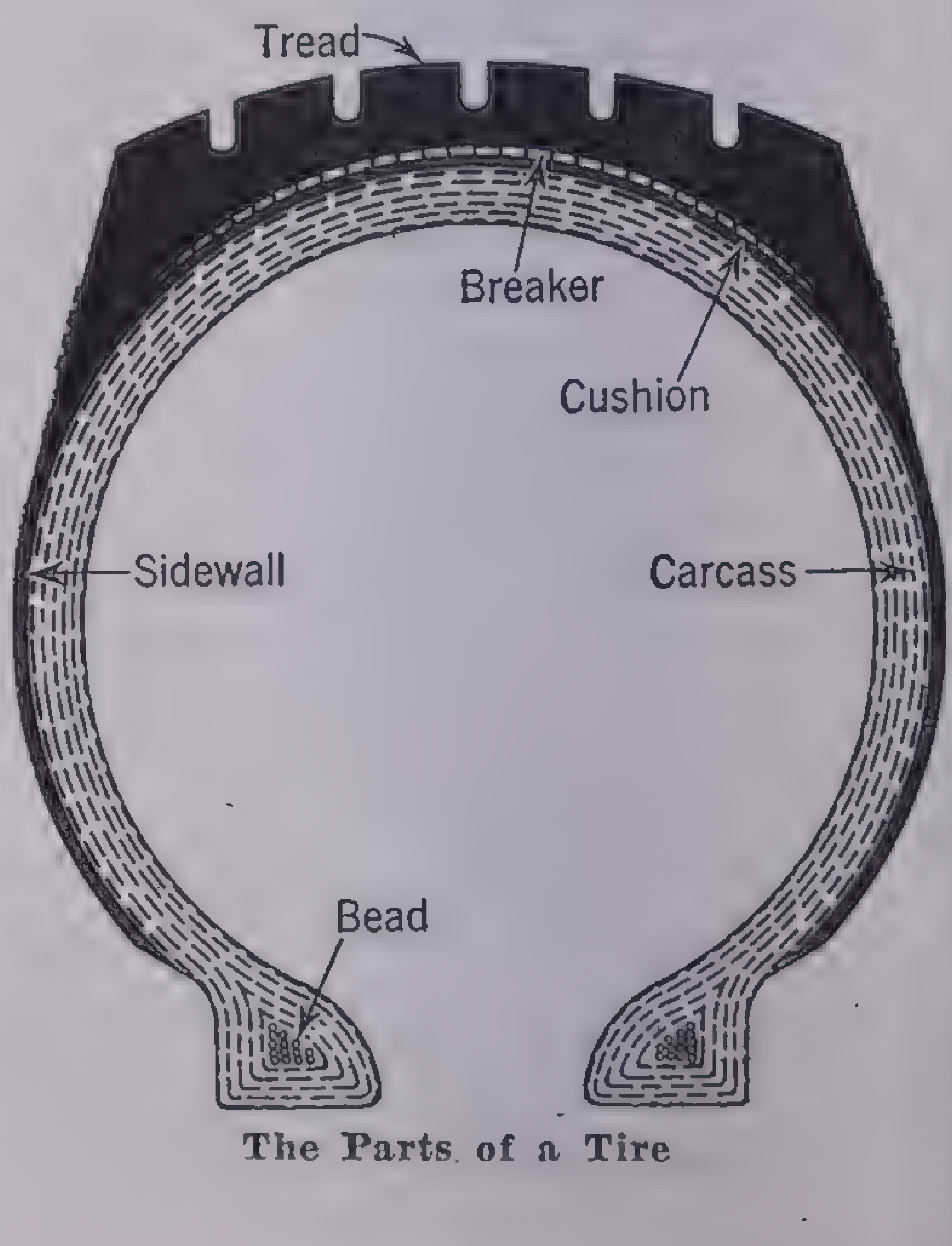
In a locomotive drive wheel the tire is a flat steel hoop. The outside diameter of the wheel of a locomotive driver is larger than the inside diameter of the tire, which is expanded by heating and then slipped on. As the tire cools it contracts and grips the wheel. Wagon-wheel tires serve the double purpose of holding the parts of the wheel together and providing a wearing surface. Such tires may be heated and slipped over the wheels, or may be made slightly larger than the wheels and simply riveted or bolted into position.

In order to improve the riding qualities of bicycles, motorcycles, automobiles and airplanes, tires are either solid rubber or the pneumatic rubber type, which consists of an outer wear-resisting cover and an inner tube filled with air under pressure.

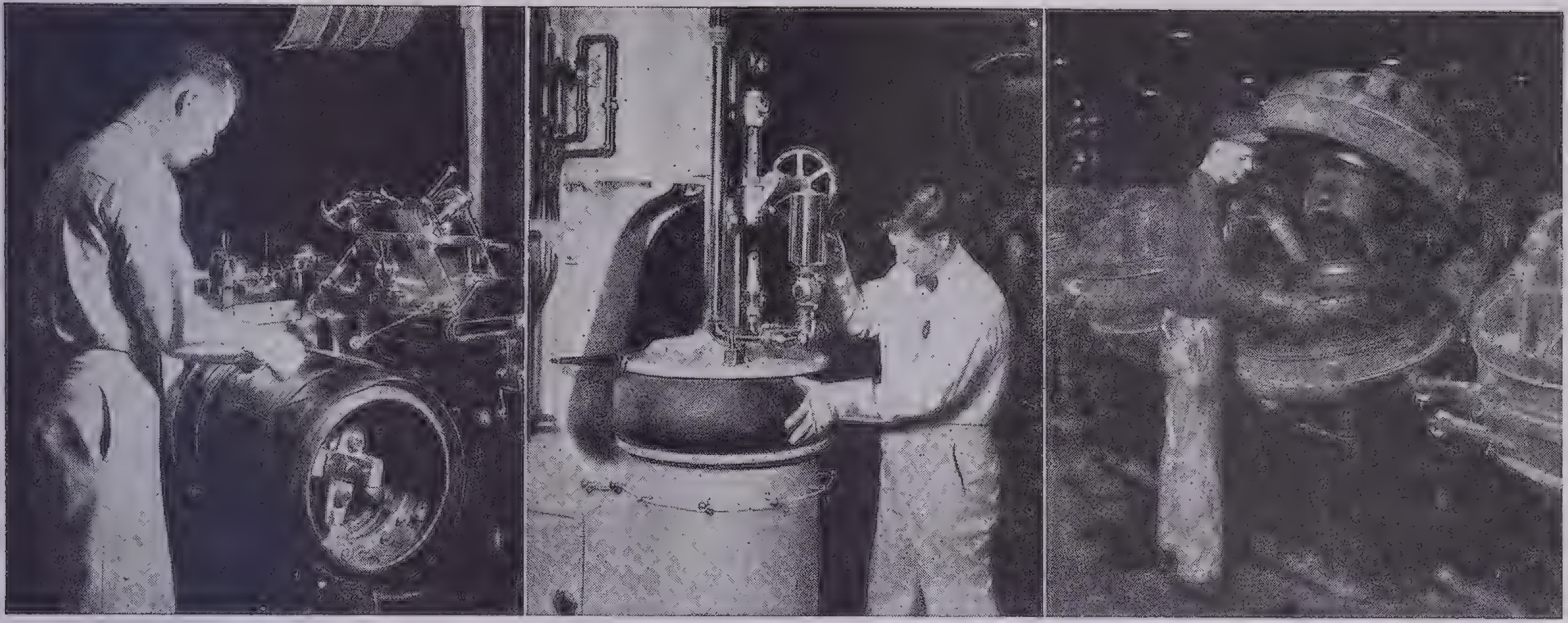
Robert William Thompson patented the pneumatic tire in England in 1845. His patent practically covers the pneumatic tire of today. John Fullerton Palmer in England invented the thread or cord tire. Michelin and Company, a French firm, applied the first pneumatic tires to automobiles. All early pneumatic tires had plain treads.

The automobile tire industry has been developed almost entirely since the World War. The reasons, of course, are the increased number and use of passenger cars and the great increase of bus and truck transportation. In 1914 only 9 million tires were made in this country; now the annual output is nearly 80 million, valued at nearly half a billion dollars. This tremendous output is necessary in spite of the fact that tires now have a life of at least 10,000 miles, as against the 1,200-mile life considered exceptional years ago.

Tire production in the United States accounts for about three-fourths of the dollar value of all rubber manufac-



The Parts of a Tire



Courtesy Firestone Tire and Rubber Company

Courtesy U. S. Rubber Products Inc.

Making an Automobile Tire

At the left the plies or strips of rubberized fabric, as well as the beads and tread, are assembled on a revolving drum. The next picture shows the tire after the air bag has been inserted and the tire more fully shaped. At the right is the finished tire as it is removed from the curing mold

tured. The industry is centered at Akron, Ohio, where the Goodrich rubber factory was located in 1870. One large concern (U.S. Rubber Co.) is in New York. There are a few factories in New England, where the rubber industry was important before tires became the major product. The five leading American manufacturers have Canadian factories, and two have European plants.

The automobile tire is an assembled product built up from different parts and materials that must be prepared before final assembly. The principal parts of a tire are the carcass, the beads, the tread, the breaker, the side walls and the cushion. These parts and their relation to one another are illustrated in the accompanying diagram.

The actual construction of the tire is divided into two major operations —building and shaping—with little difference in general principles between high pressure and low pressure (or balloon) tires.

Several plies or layers of bias-cut strips of rubberized cord fabric are placed loosely on a drum, one on top of the other with the cords of successive layers at right angles to each other. The beads are placed between the second and third plies and the end of the plies are turned in over the beads. This locks them into the carcass without tension. Following the application of the last ply, the cushion, breaker strip and tread are put into place. This wide, flat band of material, which in no way resembles a tire, is removed from the drum and taken to the shaping room.

Shaping is a very simple operation. The band of material is placed in a vacuum box with the exact shape of a finished tire. An inflated air or water bag is placed inside the band. When the air is withdrawn from the vacuum box, the tire band encircles the water or air bag and is drawn into the tire compartment. This gives the band of material the desired tire shape.

The tire is now ready for vulcanizing or curing. This process is of extreme importance. It matters little how well built the tire is, or how fine the materials used may be, if the tire is not properly vulcanized. If it is overcured, the tire will be hard and lifeless. If it is undercured, it will not be tough and resilient.

One method of vulcanizing is to put the tire into a mold of two parts. These parts are forced together by hydraulic pressure, pressing the soft gum of the tread into the nonskid pattern that has been cut into the interior of the metal mold. The molds are placed in large retort ovens or vulcanizers and heated to about 245° F. for from 1 to 3 hours. The tire is then taken from the vulcanizer, inspected, cleaned and wrapped and is ready for the market.

tobacco, an annual plant of the nightshade family, whose leaves are used for smoking, chewing and snuffing. Tobacco was a native tropical American plant, but is now grown in many parts of the world. Settlers and explorers quickly learned about tobacco from the Indians, and it was introduced into Spain in 1558 and some years later into England. Its use became so widespread that tobacco was the principal cash crop of the Virginia colonists, and is today one of the most valuable of crops.

Tobacco is raised under a variety of conditions, all of which bring about changes in the quality or type of tobacco. Even from the same plant many grades and kinds of tobacco are obtained. Part of the plant may be used for pipe or chewing tobacco, another part for cigars, and yet another for cigarettes. In the best grades, individual leaves are taken off the plant as they ripen, but ordinarily the whole plant is cut when the middle leaves are ready.

The tobacco is then variously treated or cured. This is necessary to allow fermentation, which brings about chemical changes improving color and aroma. Some is hung in large barns, allowing free circulation of air, for six weeks. Some is heated by fires as it hangs. By far the greatest amount is hung in flues and subjected to gradually rising heat for three to five days. There may be combinations of all three processes.

The tobacco is aged for several years before being manufactured into cigarettes.

Certain areas specialize in growing certain types of tobacco. Connecticut, Massachusetts and Pennsylvania produce a wrapper leaf (the outside portion of a cigar.) Cuba is famous for high-grade filler tobacco (the inside of a cigar.) Virginia, North Carolina and Kentucky specialize in cigarette tobaccos. The so-called Turkish tobacco comes from Turkey and other countries at the eastern end of the Mediterranean. Very few kinds of tobaccos are used straight; they are usually blended with others to produce a particular flavor. Most American cigarettes, for example, are a blend of Turkish and domestic tobaccos.

The United States and India vie for first place as the world's leading tobacco producer. These two countries produce around 1,200 to 1,300 million pounds per year. Almost all of India's tobacco is used locally. The United States, the leading exporter, sends about ⅓ of her total production to other countries. The U.S.S.R. is the third most important producer, producing about ⅓ as much as either the United States or India.

North Carolina with an average production around 500 million pounds per year is the leading producer in the United States. Kentucky with close to 350 million pounds and Virginia and Tennessee, each producing around 100 million pounds, are also important tobacco producers.

transformer, a stationary apparatus for raising or lowering the voltage of electrical energy by transferring it from one circuit to another.

An Important Step in the Preparation of Tobacco

From the tightly packed hogsheads tobacco is separated into *hands* and hung on poles. In the background the hands are seen entering a drying machine, from which they will go into storage to age for 2 or 3 years before being used

Current can be transmitted over distributing lines only at high voltages if transmission is to be economical and efficient. But the current is actually used at relatively low voltages. The transformer is therefore a highly important device, since it brings about the necessary voltage changes very efficiently with little loss of power.

The transformer will not work with direct current; in fact, alternating current is supplanting direct current largely because transformers can be used in alternating-current circuits.

The transformer, invented in 1886, depends for operation upon the fact that the flux in an iron core set up by a coil carrying alternating current is continually changing in value and will therefore generate an alternating voltage in any other coil wound around the core. The voltage generated depends upon the number of turns of wire in the second coil. Where it is desired to transform from a high voltage to a low voltage, the power is brought in through a coil having a large number of turns and is taken away from a coil having a small number of turns.

Transformers are inexpensive and exceptionally efficient; efficiencies of 99 per cent are common in large ones. They require no attention and are very reliable since they have no moving parts. At the power plant transformers step up the voltage to the value best for long-distance transmission, and others at the receiving end step the voltage down to the value best for actual use of the power.

The power in a given system may pass through a number of transformations. A typical system is one in which power is generated at 12,500 volts, transmitted over a cross-country line at 133,000 volts to substations, reduced to 2,300 volts for distribution through city streets and further reduced to 115 volts for use in the home by transformers usually mounted on poles.

A transformer consists essentially of two windings linked with a single magnetic circuit. The two windings are known as the primary or input and the secondary or output. Sometimes a third winding is placed on the same core, and this is known as a tertiary winding. If the two windings are insulated from each other, the transformer is an ordinary or two-winding transformer; if some portion of the windings on the core form a part of both the primary and secondary circuits, it is an auto-transformer. The magnetic material for the core is usually thin, soft iron or alloy steel laminations.

In the operation of a transformer, power is supplied to the primary winding, which sets up a magnetic flux around the core. This flux generates a counter electromotive force in the primary and thus limits the current that is drawn from the power supply. Since the same flux also links with the secondary winding, an electromotive force is generated in this winding, the ratio of the two generated electromotive forces at no load being equal to the ratio of the numbers of turns on the two windings. If a load is now connected across the secondary terminals, current will flow through it that will be accompanied by a proportionate increase in the primary current. Hence power will be transferred from the primary to the secondary because of this electromagnetic action.

Constant-potential transformers have a ratio of secondary to primary terminal voltages that is nearly constant at all loads. They are generally used in power lines for either raising or lowering voltage, in which case they are termed *step-up* and *step-down* transformers, respectively.

Constant-current transformers are those in which the secondary current is automatically maintained nearly constant with the load when the primary is connected to a supply of essentially constant voltage. In these the secondary winding is suspended by cables and counterbalanced so that when the load current tends to increase, the secondary winding is repelled farther away from the primary. As a result, less flux cuts the secondary, which in turn reduces its generated electromotive force and thus tends to maintain the local current constant. The principal use of constant-current transformers is to supply power to street-lighting systems, and they have been built in comparatively large numbers for that purpose.

Single-phase transformers are those used for single-phase operation. When they are grouped together to operate in a polyphase system, however, the entire assembly is known as a polyphase bank of transformers.

Polyphase Transformers. These are used for operation in polyphase systems and consist of a single transformer with several sets of primary and secondary windings arranged on separate branches of the core. Although they are more economical than the corresponding polyphase bank, they are less flexible since a failure in one of the windings requires that the entire transformer be removed for repairs; whereas when a polyphase bank is used, it is only necessary to replace a single transformer.

Distribution transformers are those that supply the power to small loads, such as in homes and small industries. They are invariably two-winding, step-down transformers and are usually mounted on poles in close proximity to the load. The most common distribution voltage for residential districts is 2,300 volts. The secondary voltage is ordinarily 230 volts with a center tap, thus making it possible to use the three-wire, 115-volt system for supplying the load.

Auto-Transformers. In these, a portion of the windings constitute a part of both the primary and secondary circuits of the transformer. The auto-transformer is invariably more efficient than the corresponding two-winding transformer, but there is a hazard in its use because the two windings are not insulated from each other. Auto-transformers are therefore never used for distribution purposes but are occasionally used in power lines. They are also commonly used to supply reduced voltages to A.C. motors during the starting period.

Instrument Transformers. Inasmuch as it is often necessary to measure voltage, current, power and other quantities in high voltage A.C. circuits in which large currents are flowing, some means must be provided for both reducing the quantities to be measured and to insulate the instruments from the line. This has led to the development of potential and current transformers that are known as instrument transformers.

Potential transformers are connected directly across the line and a voltmeter, wattmeter, or watthour potential coils, relay coils and other devices may be connected across the secondary. Since there is some error due to the voltage losses in the windings, and since these increase with the magnitude of the secondary current, this current should be kept as low as possible.

Direct current transformers. One of the advantages of A.C. as compared to D.C. is the fact that it can be easily and efficiently transformed from one voltage to another by means of the transformer; whereas a corresponding transformation of D.C. has required the use of a motor-generator set. With the development of the grid-controlled mercury arc rectifier tube, however, it is now possible to carry out a D.C. transformation with stationary apparatus. The apparatus consists of, first, a tube inverter circuit that transforms the D.C. into A.C.; an A.C. transformer to transform the voltage; and a tube converter or rectifier to transform the A.C. back to D.C. Although this is a comparatively new idea and its number of commercial applications have been limited, such D.C. transformers will probably become of increasing importance as time goes on, especially if D.C. power transmission is adopted.

tube, radio, see *thermionic vacuum tube.*

tung oil, vegetable oil pressed from the nuts of the tung tree. Most tung oil is produced in southern China, but the raising of tung trees is becoming an important industry of the Gulf states.

It is used as a drying oil in the manufacture of paints and is particularly valuable because it does not shrink when dried. In former years its value was known, but it was not widely used because it had to be used with great care to keep it from solidifying when it was heated. Then the discovery was made that a mixture with 45 per cent of soy bean oil will not solidify, dries just as well, will stand higher heat and makes a better paint. The United States now imports about 150 million gallons of tung oil a year.

tunnel, a subterranean passageway, usually horizontal and open at both ends, driven through a hill or below a river. Tunnels are built for the passage of trains or motor vehicles or to accommodate the pipes of water-supply or sewerage systems.

When solid rock is met, as in mountain tunneling, it is usually removed by drilling and blasting. Depending on the nature of the rock, the bore may or may not be lined and supported afterward with concrete or steel reinforcements.

Tunneling technique has so greatly improved that today little notice is paid to such an engineering feat as driving a vehicular tunnel under a river. In such work most of the material to be removed is sand, mud and soft earth, and the chief problem is to hold back the water and mud from the bore as the work progresses. This is done by the *pneumatic shield,* a cylindrical steel structure with a diameter equal to that of the bore of the tunnel. Air, compressed sometimes to 30 pounds to the square inch, blows the water and mud from the face of the shield, which is pushed forward mechanically. The walls of the bore are quickly lined and supported behind the shield. When hard material requiring excavation is encountered, men can work in the compressed air area at the face of the shield. Excavated material is removed through the tunnel.

FAMOUS TUNNELS

Apennine, an electrified-railroad tunnel under the Apennine range in Italy on the short line railroad serving Florence. Completed in 1930 and put into use in 1934, it is 11.3 miles long and cost $100,000,000.

Arlberg, a railroad tunnel under the Alps from Langen to St. Anton, 6¾ miles long, was opened in 1884 and cost $7,500,000.

Arthur's Pass, a railroad tunnel in South Island, N. Z., has a total length of 5.38 miles. Completed in 1912, the approximate cost was $3,000,000.

Baltimore tunnels. The Baltimore and Ohio railroad was the first to use electric motive power in this country, in 1895 at Baltimore, Md. The main line of this railroad passes under the city through tunnels which were completed in 1894. The main tunnel is over 7,000 ft. long.

Belmont tunnel, New York city, lies under the East River from New York to Long Island City. Construction was completed on January 1, 1908.

Blackwell, a freight tunnel under the River Thames in England, a mile and a half in length, was opened in 1897.

Brooklyn-Manhattan Transit tunnel in New York city extends from Manhattan to Brooklyn. The length between bulkhead lines is 3,900 ft., and the inside minimum diameter is 15 ft. The tunnel was opened on August 1, 1920.

Busk-Ivanhoe tunnel, 9,600 ft. long, built for a railroad but now used for an automobile road, lies under the Continental Divide in the Rockies of Colorado.

Cascade, an electrified-railroad tunnel running through the Cascade Mountains in Washington, was opened in 1929. It is the longest mountain tunnel in the United States, 41,152 ft. (7.8 miles).

Catskill Aqueduct, covering 92 miles to New York city, and 35 miles of distributing tunnels deep under the city itself, was completely opened in 1917. The Shandaken tunnel, a part of the Catskill water-supply system, is used to deliver the water of Schoharie Creek to the Ashokan Reservoir. It is 18.1 miles long.

Chatsworth railroad tunnel on the line from Los Angeles to San Francisco, Calif., 1.4 miles long, was opened in 1887.

Clark Street Tube, New York city, consists of twin tubes underneath the East River. They were completed and put in operation in 1919. They are 5,047 ft. long, with an outside diameter of 17 ft. 6 in. and inside diameter of 15 ft.

Cleveland Waterworks tunnel is a tube 10 feet in diameter extending 16,088 feet (3.05 miles) under Lake Erie, lying from 50 to 75 feet below the lake bottom. It was finished in 1917.

Connaught, a double-track railroad tunnel running through the Selkirk Mountains, lies under Rogers Pass, British Columbia. Five miles long, its approximate cost was $6,500,000. Operations were completed in 1916.

Croton Aqueduct, carrying water 33⅛ miles to New York city, was opened in 1888.

Detroit-Canada. A railroad tunnel under the Detroit River from Detroit, Mich., to Windsor, Ont., is 1.6 miles in length and was opened in 1910. Cost $10,000,000.

Detroit-Canada. A vehicular tunnel, was opened between Detroit and Windsor in November, 1930. It is 5,135 ft. long, the river section being 2,200 ft. with a 22-ft. roadway.

Fourteenth Street, East, a rapid-transit (subway) tunnel in New York city from Manhattan to Williamsburg. The length between bulkheads is 3,050 ft., diameter inside 15 ft. and diameter outside 18 ft. It was opened June 30, 1924.

Gallitzin tunnel, a 3,600 ft. bore extending through the Allegheny Mountains at Gallitzin, Pa., was built in 1854, for two tracks of the Pennsylvania Railroad.

Giovi railway tunnel in Italy is 5.13 miles long.

Gravehals, a railroad tunnel on the line between Oslo and Bergen, Norway, 3.3 miles long, was built between 1904–1909.

Grenchenberg, a railroad tunnel in the Jura Mountains, Switzerland, 5.3 miles in length, was completed in 1915 at the approximate cost of $3,500,000.

Gunnison, an aqueduct in Montrose, Colo., 6 miles long, was built between 1905 and 1909 at the approximate cost of $2,170,000.

Hetch Hetchy, an aqueduct in San Francisco, 18 miles in length, was built between 1920 and 1923.

Holland Vehicular Tunnel includes twin tubes under the Hudson River, 9,250 ft. in length, extending from Manhattan to Jersey City. Opened to traffic November 13, 1927. Each tube is 29 ft. 6 in. external diameter, with interior roadway width of 20 ft. and clearance height of 13 ft. 6 in.

Hoosac, a railroad tunnel running through the Hoosac Mountains, Mass., is 4.75 miles in length and was built between 1856 and 1873 at the approximate cost of $11,000,000.

Hudson and Manhattan Railroad north tunnels lie under the Hudson River from Jersey City to New York. There are two single-track tubes, inside diameter of 15 ft. 3 in. The length is approximately 5,700 ft.

Interborough Rapid Transit tunnel. The first of the tubes under the East River from New York to Brooklyn, connecting the subways, was in operation in 1908. There are two tubes 6,784 ft. long, with an inside diameter of 15 ft. 6 in.

Jungfrau, a railroad tunnel in the Swiss Alps, 4.47 miles in length, was built between 1897 and 1912 at a cost of $1,375,000.

Kaiser Wilhelm tunnel near Kochem, Germany, is the longest in that country. Built for a railway, it is 2.6 miles long.

Khojak Pass, a railroad tunnel extending from Quetta to Landabar, India, 2.44 miles in length, was opened in 1891.

Liberty vehicular tunnel under Mt. Washington in Pittsburgh, Pa., is 5,889 ft. long. It was opened in 1924.

Lincoln vehicular tunnel under the Hudson River, connects New York to Weehawken, N. J. It is a twin-tube tunnel, each tube having an outside diameter of 31 ft. It is 8,000 ft. long, and one tube was opened to traffic in 1937.

Loetschberg, a railroad tunnel running through the Alps in Oberland, Switzerland, 9½ miles long, was opened in 1913, its cost approximating $10,000,000.

Marianopoli, railway tunnel in Sicily is 4¼ miles long.

Mersey tunnel, connecting Liverpool and Birkenhead, England, is a vehicular tunnel with six traffic lanes under the Mersey River. It is 2.13 miles long and was opened for traffic in 1934.

Moffat, a tunnel piercing the Rocky Mountains at the Continental Divide in Colorado. It is on the line of the Denver and Salt Lake Railway. The bore, 39,560 ft. long, was opened in February, 1928. The tracks at the eastern end are 9,198 ft. above sea level. The dimensions of the main tunnel are 24 ft. high by 16 ft. wide.

Mont Cenis, a railroad tunnel running from France to Italy under the Col de Frejus, practically 8 miles long, was opened in 1871. The approximate cost was $15,000,000. The line is electrified.

Mont d'Or, a railroad tunnel through the Jura Mountains between France and Switzerland, is 3.8 miles in length and was completed in 1915. It cost approximately $4,060,000.

Mt. Royal, a railroad tunnel in Montreal, Canada, 3.22 miles long was begun in 1910 and completed 6 years later.

Nice-Cuneo tunnel, under the Alps, was opened for rail traffic in 1928. There are two tunnels: one of 5,939 meters, at the Col de Braus; one of 3,888 meters under Mont Grazian. The entire route is 76½ miles in length.

Norden, railroad tunnel in the Sierra Nevada of California, built in 1925, is 10,325 ft. long.

Pennsylvania Railroad tunnels under the Hudson River extend from the Pennsylvania Railroad Station, New York, to Weehawken, N. J. Work was completed in 1910. There are two tubes of cast-iron rings, comprising a 23 ft. outside diameter and 21 ft. 2 in. inside diameter. The portion under the river is 6,118 ft. long.

Otira, a tunnel in New Zealand, is 5½ miles long. It traverses Arthur Pass and forms a short railway route between the east and west coasts of the south island.

Ricken, a tunnel in the Swiss Alps, 5.35 miles in length was completed in 1910, at an approximate cost of $2,500,000.

Rothschönberg, a mine drainage tunnel in Freiberg, Sax., 18 miles in length; was built between 1844 and 1887.

Rove tunnel is the southern section of the Marseille-Rhone Canal in France. It was formally opened in April, 1927. The underground canal, passing through a rocky ridge for a distance of 4½ miles, cost about 135,000,000 francs. Its greatest width is 72½ ft., and the width of the water channel is 60 ft. The roof is 37½ ft. above the water.

Samport, a railway tunnel in the Pyrenees Mountains, 4 miles long, extending from Pau, France, to Canfranc, Spain, was opened in 1928.

Severn, a railway tunnel extending under the Severn River from Monmouthshire, Wales, to Gloucestershire, England, 4½ miles long, was opened in 1886.

Shandaken, an aqueduct between Gilboa and Allaben, N. Y., is 18 miles long. It was finished in 1923 at an approximate cost of $12,138,000.

Shimizu tunnel in Japan is approximately 6 miles long. It was opened in 1930 for railway use.

Simplon, a railroad tunnel running through the Alps between Switzerland and Italy is 12½ miles long. It was built between 1898 and 1905, at a cost of $21,000,000. A twin tunnel was opened in 1921; both are electrified.

Snoqualmie, a railroad tunnel in the Cascade Mountains, Wash., 2.25 miles in length, was completed in 1915, and cost $2,000,000.

Spiral. The tunnels on the Canadian Pacific Railway, between Hector and Field, B.C. consist of two spiral tubes, one 3,255 ft. long and the other 2,921 ft. long.

Stampede, a railroad tunnel in the Cascade Mountains, Wash., 1.83 miles long, was completed in 1888.

Standridge, railroad tunnel in England is 3.08 miles long.

St. Clair, a railway tunnel under the St. Clair River from Sarnia, Ont., to Port Huron, Mich., 2 miles long, was opened in 1891.

St. Gothard, a tunnel running through the Alps, connecting Goschenen with Airolo in Switzerland, is 9½ miles long. It was opened in 1881, cost approximately $11,500,000, and has since been electrified.

Sutro, a mine drain tunnel for the Comstock Lode in Nevada, 4½ miles long, was opened in 1879.

Tanna tunnel in Japan was opened in 1934. It is for railway use and is approximately 5 miles long.

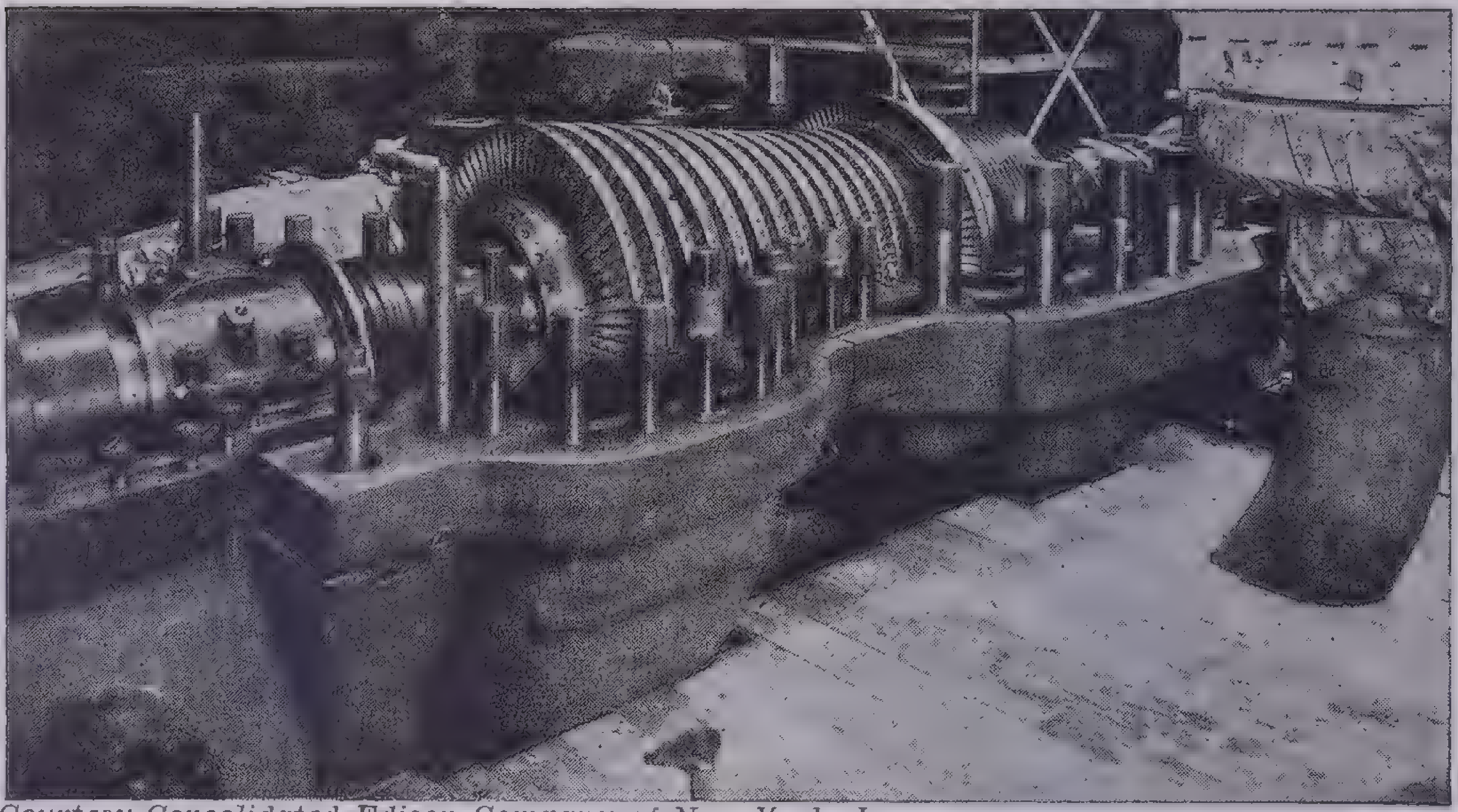
Tauern, a railroad tunnel in the Austrian Alps, 5.31 miles in length, was completed in 1909 at an approximate cost of $6,063,000.

Trans-Andine Railway tunnel, extending from Chile to Argentina, 2 miles long and 10,512 ft. above sea level, affords direct communication between Valparaiso and Buenos Aires. It was opened in 1910.

Vosges tunnel in the Vosges Mountains forms a short railway connection from France into Alsace. It is approximately 7 miles long, and was opened in 1937.

Wasserfluh, a tunnel in the Alps between Bunnadern and Lichtensteig in Switzerland, 2 miles in length, was opened in 1909.

Zion Park tunnel was opened in 1931. It is a part of a scenic automobile highway in Zion National Park, Utah. 5,600 ft. in length, it is lighted by galleries cut into the face of the cliff that it traverses.



Courtesy Consolidated Edison Company of New York, Inc.

Steam Turbine

Steam at a pressure of 1,200 pounds per square inch and a temperature of 900° F. turns this turbine at 3,600 revolutions per minute. The turbine turns a generator that produces 53,000 kilowatts of electricity. After whirling this turbine the steam still has a pressure of 200 pounds per square inch and is used to turn other machines that produce still more current

turbine, a mechanism in which steam acts against blades arranged around an axis for rotation, thus transforming the energy of the steam into mechanical motion.

A steam turbine is in principle no different from an old-fashioned waterwheel. The blades are curved—approximately C-shaped in cross-section—and the steam enters at the side of the blade. Steam comes from the nozzle at a speed of perhaps 3,000 feet a second, and the force of it turns the wheel at half that speed. Such turbines can revolve at 30,000 revolutions a minute.

Much energy remains in the steam after it has driven the wheel. Turbines are therefore built with a number of such bladed wheels side by side on the same shaft, the steam escaping from one wheel to drive the next and so on until it has lost working pressure.

But between each two wheels is another ring of blades that does not revolve. The purpose of these blades is to redirect the steam efficiently against the next revolving wheel.

There are two kinds of turbines, *impulse* and *reaction* turbines, but the difference between them is not important to the layman. In impulse turbines each revolving wheel revolves in its own cell or compartment. The stationary stage (each ring of blades is called a stage) into which the steam escapes is really a set of nozzles that directs the steam into the next wheel. Reaction turbines are much the same except that the wheels do not revolve in compartments.

Turbines must be very carefully built, almost as precisely as watches, to guard against leakage and loss of power. The blades are very precisely shaped to use the steam's force to best effect. They are used widely to turn generators in power houses, and modern warships and other vessels are turbine-driven. That is, steam drives turbines, which in turn drive generators supplying power to the motors that actually do all the driving of the propellers.

For production of electric power, turbines usually rotate at 3,600 revolutions a minute.

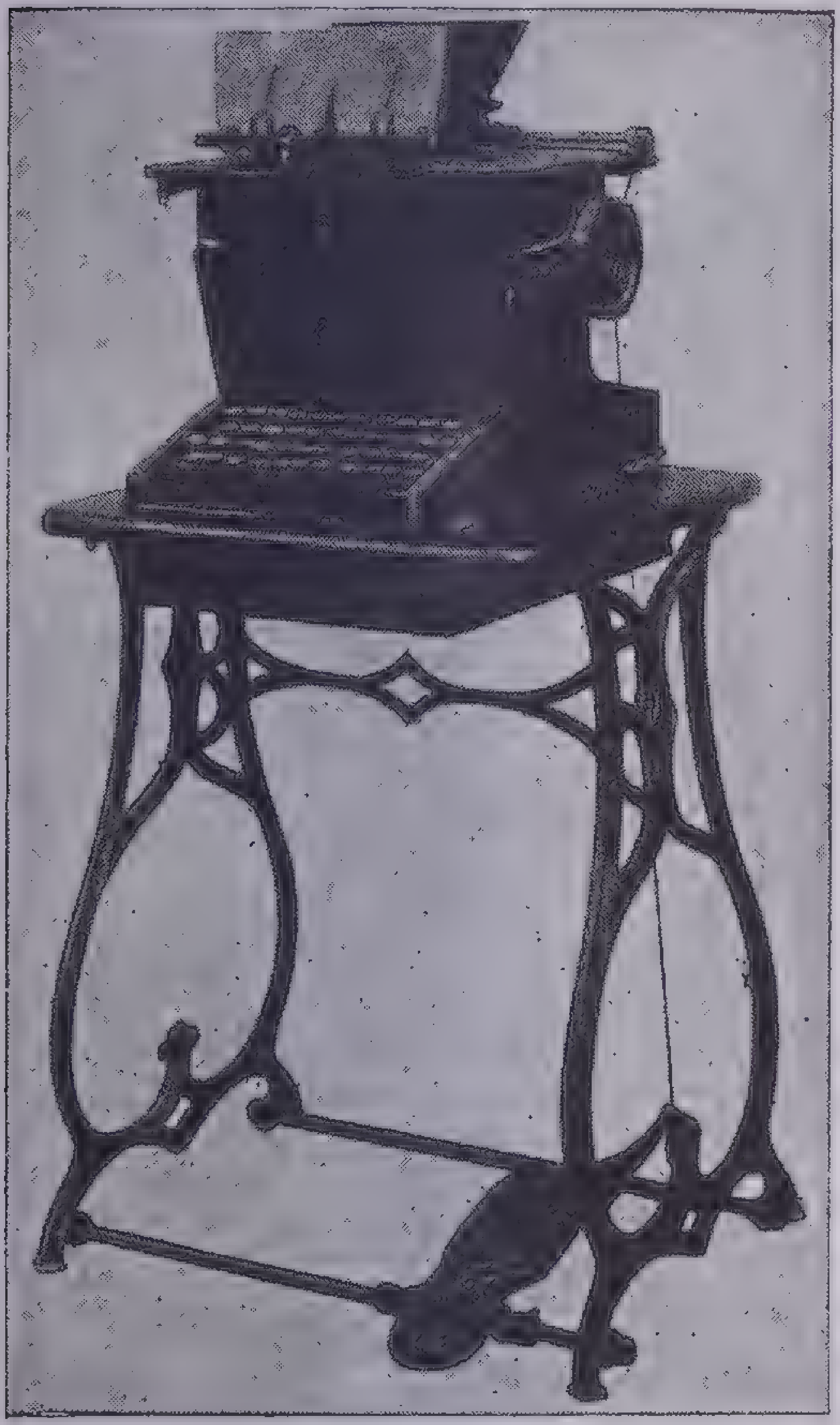
Probably the first mechanism employing the reaction principle was described by Hero of Alexandria about 150 B.C. This device was more of a curiosity than a useful machine. Modern turbines are a result of improvements made on the original ideas of Carl Gustav DeLaval, Charles A. Parsons, Charles A. Curtis and A.C.E. Rateau. Carl Gustav DeLaval, while trying to develop a machine for operating large centrifugal cream separators, decided to build a machine based on the old idea of Hero. After experimenting for years, DeLaval developed a turbine capable of operating at 30,000 revolutions per minute. It is interesting to note that the United States Patent Office refused at first to grant him a patent on the grounds that the machine would not work. Charles A. Parsons, in 1883, when he was only 29, developed a turbine wherein the steam expanded only in the moving blades. By 1889 he was actually engaged in constructing marine turbines in his own factory. Charles A. Curtis of Brooklyn, New York, began in 1895 to experiment with the idea of combining the impulse and reaction principles, now the basis of machines made by the General Electric Company.

Development and experimentation in turbine design and construction still continues. Today turbines are in operation that have a capacity of 200,000 horsepower. Turbines have been developed for use with mercury vapor.

typewriter, a machine that produces printed characters by operation of a manual keyboard, as a substitute for handwriting. The first recorded attempt to produce a writing machine seems to have been that of Henry Mill of England, who in 1714 received a patent for his description of a crude device, but whether a machine was actually built is not known.

The first important development that carries forward into machines of the present day appears to be that devised by Xavier Progin of France in 1833. He used type bars operating upon a common center. This is, of course, an essential of any typewriter. It is necessary also to have some means of moving part of the mechanism to provide a clear space on the paper for succeeding characters. This feature was provided by Charles Thurber of Worcester, Mass., when he secured a patent in 1843 on a machine in which the typing was done on a cylinder or platen that moved each time a letter was made. He also described the escapement mechanism by means of which the spacing of letters was accomplished.

Shortly after this there was a renewed interest in typewriting, and many patents were taken out, mostly having to do with details. The first complete machine capable of competing with hand-writing, however, was built in 1867 by Christopher Sholes, Samuel Soulé and Carlos Glidden in Milwaukee. Sholes and Glidden made a number of models and entered into a contract with E. Remington and Sons, the gun makers, to commercialize the typewriter. The name of the machine was changed to Remington, and in 1874 the first commercial machine was built. It embodied most of the fundamental features of the modern typewriter, including the cylindrical platen and the spacing escapement of Thurber, the common center principle of Progin, as well as such miscellaneous improvements as a line-spacing mechanism, key levers connected with the type bars by means of wires and an inked ribbon that was pressed against the paper by the type bars for making an impression on the paper. With this machine it was possible to write more rapidly and more legibly than by hand.



Courtesy Remington Rand Inc.

The First Commercial Typewriter

This is the Remington machine built on the Sholes and Glidden patents, first demonstrated to the public in 1876. It was mounted on a sewing machine stand, and the carriage return was operated by the foot pedal

The earliest typewriters used capital letters only. To include both capital and lower-case letters required almost double the number of keys, but many such machines were made and sold. In 1878 a machine was put on the market having a shifting mechanism as in present-day machines. Both the capital and lower-case characters of a given letter were on the same type bar, one above the other, the shift key raising the paper carriage into such a position that the type for one letter pressed against the ribbon while the other did not. But the old double-keyboard typewriter was not immediately displaced, and for a time both kinds of machines were made and sold. But with the advent of the touch method of typing, the double-keyboard type of machine quickly fell into disfavor because it was so cumbersome to use.

Not long ago a shift mechanism was developed that moves the type bars instead of the carriage. This requires less effort on the part of the operator and diminishes noise and vibration.

One of the most recent improvements is the noiseless machine. In ordinary typewriters the type bars are fairly heavy and the impression upon the paper is made by the impact of the type bars as they strike the ribbon. The type bars on the noiseless machines are relatively small and light. Instead of striking the paper a sharp blow they move up more slowly into contact with it and then are struck by a weight from behind to provide the pressure necessary to make the impression. This eliminates much of the noise.

Many attempts have been made to build electrically-driven typewriters in which a mere touch on a key actuates mechanism that throws the type bar up into contact with the ribbon, moves the carriage and elevates the shift mechanism. Such machines usually operate from a motor-revolved cylinder that is really a many-toothed cam with which the type bars are thrown into engagement by pressing the keys. Though such machines can be operated easily and swiftly, they cannot as yet be considered perfected. The sharp and sudden action of the cam results in excessive wear of the light parts necessary in so compact and accurate a machine.

vacuum tube, see *thermionic vacuum tube.*

vegetables. Vegetables are essential to a balanced human diet and are an important industrial raw material. They are not very exacting in their soil or climatic requirements. They will grow in a wide variety of areas. Since they are usually intensively cultivated, many handicaps may be overcome by fertilizing or irrigating.

Most vegetables for commercial purposes are grown in one of three types of areas. Some are raised near the market, as along the coastal plain of the eastern seaboard. Some are raised during the winter months in areas having a mild winter to supply out-of-season demands of northern markets. Examples are the Gulf Coast states, Arizona and California. Some areas produce vegetables primarily for canning. Wisconsin peas and Maine sweet corn, for example, are grown especially for canning.

Besides serving directly as food, certain vegetables provide industrial raw material. The common white potato is an outstanding example: it is used for the manufacture of starch, flour (for bread) and alcohol. Alcohol production from potatoes is an important chemical industry in Germany. Certain tropical vegetables are also important industrial raw materials. Arrowroot, obtained from a perennial root of the West Indies and Ceylon, yields a starch that is easily digested. It is used in hospitals and by people requiring special diets. The roots of the cassava plant, produced commercially in Brazil and British Malaya, are an important source of starch and tapioca.

Some idea of the importance of vegetables is given by these tables, which give figures for a year's output in the United States.

Vegetables Grown for Direct Use

Asparagus	6 million crates
Lima beans	745,000 bushels
Snap beans	12 million bushels
Beets	2 million bushels
Cabbage	1 million tons
Cantaloupe	13 million crates
Carrots	13.5 million bushels
Cauliflower	7.2 million crates
Celery	9.3 million crates
Cucumbers	3.7 million bushels
Lettuce	21.8 million crates
Onions	17.3 million sacks
Peas	9.1 million bushels
Green peppers	4 million bushels
Potatoes	36 million bushels
Spinach	13.1 million bushels
Tomatoes	20.3 million bushels
Watermelons	63.3 millions

Vegetables for Canning

Asparagus	19,870 tons
Lima beans	59,110 tons
Snap beans	70,600 tons
Beets	42,400 tons
Cabbage (for kraut)	105,070 tons
Sweet corn	605,100 tons
Cucumbers (pickles)	6,314,000 bushels
Peas	187,380 tons
Pimientos	13,880 tons
Spinach	63,500 tons
Tomatoes	1,700,200 tons

veneer, thin sheets of decorative wood or other material used as a facing over cheaper woods to give a pleasing appearance to the whole. Veneers are most commonly used in making furniture. Veneered furniture is not less durable than solid wood; in fact, veneered wood is less liable to warp.

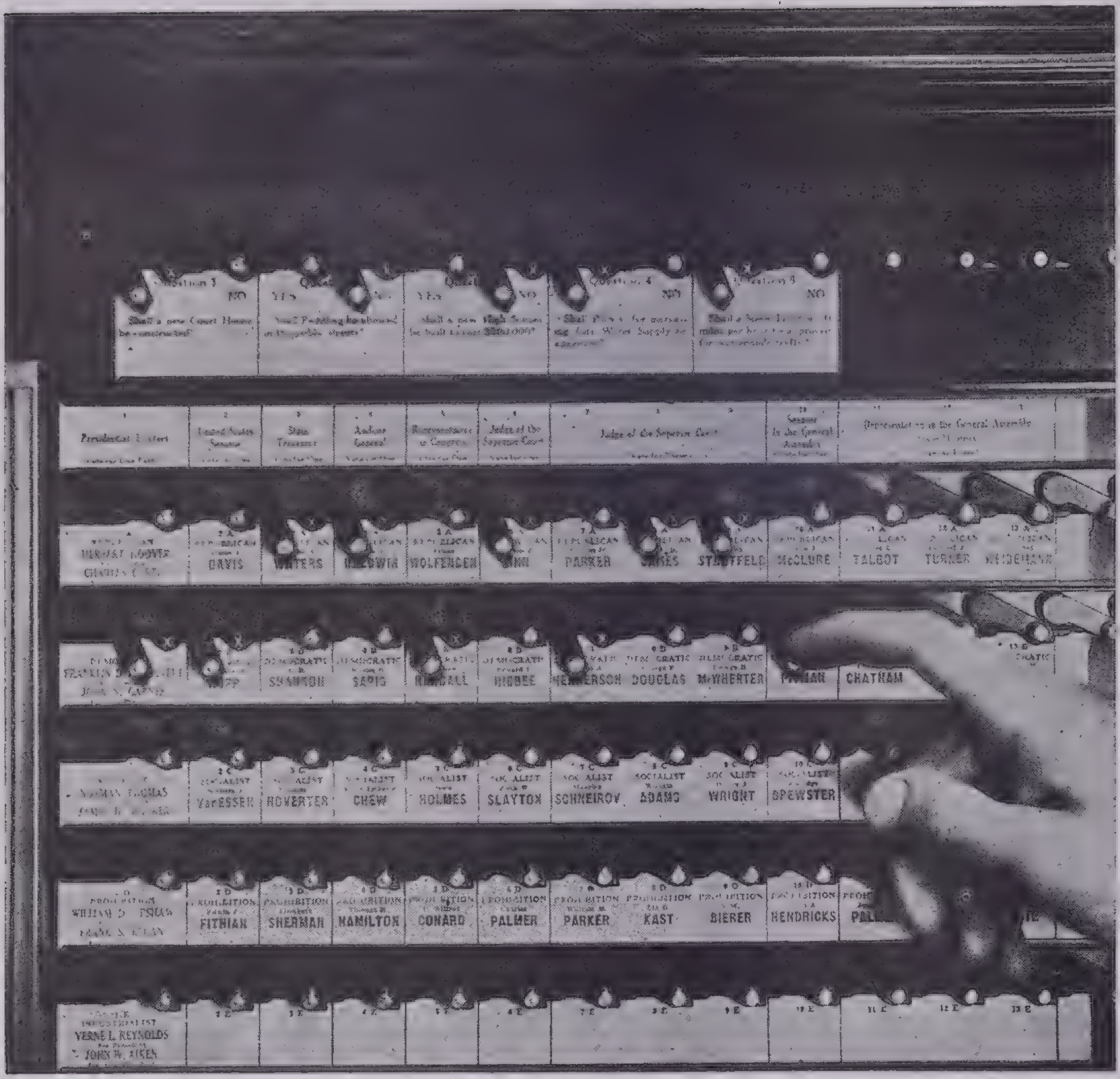
Veneer is usually cut direct from the solid log. The log is steamed and then cut by knives or saws. Sometimes flat slices are taken off, and sometimes the log is turned on a lathe and an unbroken peeling taken from it. Mahogany, rosewood, walnut and maple are the woods most commonly used. The veneer, sometimes only 1/16 of an inch thick or less, is glued to the solid wood.

viscose (so called from its viscosity or stickiness), a non-fibrous, uniform-textured solution of cellulose. It is made by treating wood pulp or cotton first with sodium hydroxide (caustic soda) and then with carbon disulphide and dissolving this product in water. The sticky mass may now be shaped into threads to make rayon or into sheets to make cellophane.

voting machine, a device for automatically registering and totaling the choices of electors. Such machines are of very recent development, but their use is spreading rapidly.

Paper ballots marked by the voter have many disadvantages: they can be manipulated by unscrupulous politicians, who can misinterpret and throw out votes; they must be counted after the polls close, and this leads to delay, fraud and often to recounting and expensive litigation. Voting machines overcome these evils in that they allow votes to be cast in absolute privacy; their records cannot be misinterpreted; it is difficult if not impossible to cast a vote improperly; the votes are automatically added, and the totals are ready to be reported as soon as the polls close.

The first such devices used balls as recording devices. A separate receptacle was provided for each candidate's votes, and the voter placed balls in the receptacles according to his choice.



Courtesy Automatic Voting Machine Corporation

Voting Machine

Here the voter is pushing down the levers to indicate his choices. His vote will be recorded when he opens the curtains on leaving the booth

These were not very successful in public elections. In a strict sense they are not voting machines at all, since the counting still remains to be done after the polls are closed.

The real problem in the development of voting machines was the interlocking of the various parts in such a way that a voter could not vote for more than one candidate for a particular office nor more than once for a particular candidate. The Keipers roller interlock, which appears to be the only completely satisfactory device for accomplishing this, was patented in 1912. When the patent on it expired in 1929 and the device became generally available, the development of voting machines was greatly stimulated.

A modern voting machine is a complicated mechanism with a large number of parts. Some machines make provision for 9 different parties with 70 candidates in each party and for 35 amendments or questions to be voted upon.

When the voter approaches the machine, it is locked in such a way that no votes can be recorded. He pulls a large lever that closes a curtain around him, provides secrecy and at the same time unlocks the machine for use. The names of all the candidates of a particular party are listed in the same row across the face of the machine, and over each name is a small movable lever. Pulling down a lever over a particular name prepares the machine to cast a vote for that candidate. At one side of the machine and in line with the names of the party candidates are levers designating each of the parties. If the voter wishes to vote for all the candidates of a particular party, he merely pulls the lever designating that party. But if he does not intend to vote a straight ticket, then he must pull down a lever at each name of his choice. When he has finished, the various levers on the face of the machine should point to the names of all the candidates for whom he wishes to vote.

Provision is made for the voter who wishes to *write in* a name and cast his vote for individuals other than those whose names appear on the machine. At the top of the machine, paper is exposed whereon the name of the candidate can be written opposite the office concerned. The mechanism is so arranged that this section of the paper disappears into the machine when voting is completed, and a fresh section appears for the use of the next voter.

When the voter has completed his selection of candidates, he opens the curtain with the big lever. This also registers the vote in the counting mechanism and restores the voting levers to their original positions.

The results of an election can be determined very accurately and very quickly when voting machines are used. The machine is opened in the presence of the election board, and the number of votes cast for each candidate is read directly from the totalizing devices. Not only is the vote for each candidate registered but also the total number of votes cast. In one large city where these machines were used, the complete results of the election were known within 90 minutes after the closing of the polls.

water softeners, processes or chemicals to remove mineral impurities from water. Water that drops from the clouds as rain is relatively free from mineral impurities. As it seeps through the ground, however, a certain amount of mineral salt is dissolved in it. Most of the water from springs and streams contains a considerable quantity of these salts in solution. Such water is called *hard water.* If hard water is boiled, some of the minerals are precipitated and attach themselves to the walls of the vessel in the form of a crust. Such vessels are hard to keep clean and, if the crust is permitted to accumulate, do not transmit the heat properly from flame to water. Hard water is furthermore unsatisfactory for washing purposes. More soap is needed to form a lather, and an undesirable precipitate appears.

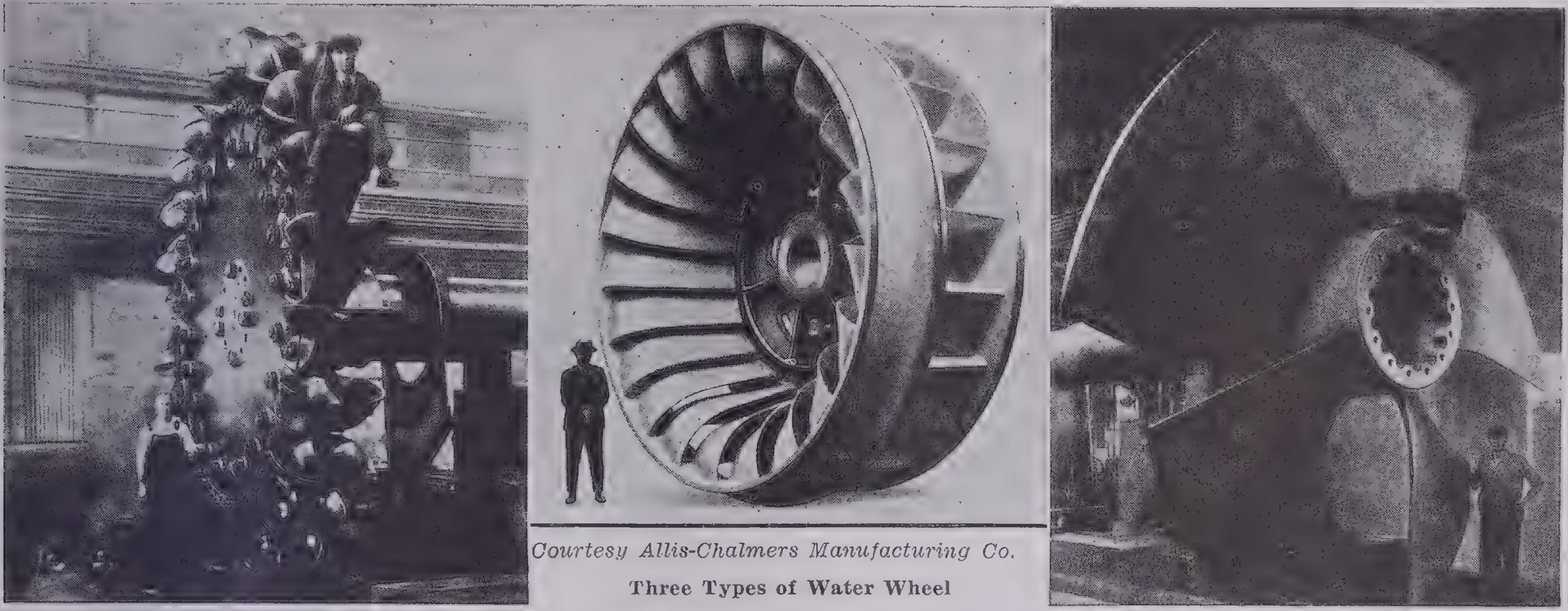
The mineral salts most commonly found in hard water are calcium carbonate and magnesium carbonate, especially the former. Sometimes sulphates are present that are very difficult to remove. The carbonates, however, can be eliminated with less trouble. Addition of milk of calcium to the water takes carbon dioxide from the calcium salts and precipitates them out.

Another method is to use certain hydrous silicates called *zeolites.* Sodium compounds have the rather remarkable property of exchanging sodium for calcium when water containing calcium salts is filtered through them. This is the type commonly used in domestic water softeners. They have the additional advantage that the sodium can be restored by subjecting them for a short period to another salt solution.

water wheel, apparatus for using the weight or velocity of water to produce rotary mechanical motion. More than 20 centuries ago the Chinese and Egyptians placed wheels fitted with flat paddles into moving streams. Thus the velocity of the water was used to turn a wheel capable of doing useful work. Later it was realized that a wheel would deliver more power if both the weight and the velocity of water could be used. Buckets were substituted for the flat paddles, and water struck the wheel from above, filling the buckets and turning the wheel.

From these early devices were developed the high-speed water turbines that produce much of our electric power. There are three types of wheels in use today: the *impulse* wheel developed by Pelton in 1884; the *reaction* wheel invented by Francis in 1849; the *propeller* type of recent years.

Impulse wheels depend on the velocity of the water and are used only where water is under great pressure, equal at least to that of a column of water 500 feet high. The buckets are shaped like clamshells and each bucket is divided in the middle by a



Courtesy Allis-Chalmers Manufacturing Co.

Three Types of Water Wheel

At the left is a huge impulse or Pelton wheel now operating in southern California under a 2,200-foot head. In the center is a reaction or Francis runner. It is 176 inches in diameter, weighs 100,000 pounds and is in service at Niagara Falls under a head of 214 feet. At the right is the propeller type of water wheel. This one weighs 40,000 pounds and is now in use in Kentucky, operating on a head of 37 feet

ridge. The stream of water, striking the bucket, imparts its energy to the wheel. The water strikes the ridge and splits in two, each half following the curve of the half-bucket and leaving the wheel. Thus the weight of the water does not enter into the operation, since it remains in the bucket only long enough to transmit its energy.

Reaction turbines are used where water pressure is lower. In this type the water remains in the casing of the wheel, and its weight helps to give motion to the buckets, which are not divided as are those of the impulse wheel.

Propeller wheels are only adaptations of the reaction turbine wheel and are used under similar conditions. They are formed much like the propeller of a steamship.

The first hydroelectric plant producing electricity from generators turned by water wheels was installed in 1882 at Appleton, Wis. The plant generated about one horsepower and operated 250 lamps. In the United States today hydroelectric plants produce 16 million horsepower of energy. If all suitable water power sources in the country were harnessed, they would deliver 80 million horsepower.

watt-hour meters, instruments that measure the amount of electric power passing per unit of time. The bills sent out by power companies are based upon the number of kilowatt-hours of electric energy used. A kilowatt is 1,000 watts. If a lamp consuming 1,000 watt burns for 1 hour, it uses 1 kilowatt-hour of electrical energy, as does a 100-watt lamp burning for 10 hours.

The meter commonly installed by power companies in residences consists essentially of a small electric motor driving a train of gears upon which are mounted pointers and dials for totalizing the number of revolutions the motor has made in a given period. This motor is so designed that its speed is directly proportional to the power passing through the circuit.

The construction of the motor is quite different from that of a motor used to drive household appliances. The moving parts carry no coils of wire whatsoever, but a metal disk, usually of aluminum, rotates in a magnetic field. The currents flowing in it, which cause it to move, are produced by voltages induced within the disk itself. The voltages are caused by alternations of a magnetic field passing through the disk, and this flux is set up by coils of wire wound on an iron core close to the disk. This is similar to the manner in which a voltage is induced in the secondary of a transformer. (Transformers operate only on alternating-current circuits, and for this reason this type of meter cannot be used with direct currents.) The current set up in the disk reacts with the magnetic field to produce a driving force for turning it.

Since the speed of the motor must be proportional to the power consumed, power being the product of voltage and current, there must be two coils used in setting up the magnetic field, one connected across the line, like a voltmeter, and the other connected in series, like an ammeter. Various special devices must be used in the meter to make sure that speed will really be proportional to the amount of power consumed. The dials, marked with figures, interact in much the same way as the gears in an automobile speedometer.

wattmeter, an instrument to measure electric power in watts. Power in a direct-current circuit is usually determined by means of readings of a voltmeter and an ammeter, power being the product of the two. In an alternating-current circuit, however, this relationship is not true, and it is necessary to include an additional factor, called the *power factor,* since, at certain instants, the current may be flowing in one direction while the voltage is acting in the opposite direction. Therefore it is necessary to have either the reading of a power factor meter with that of a voltmeter and ammeter or that of a wattmeter, which indicates power directly. The latter is the method ordinarily followed.

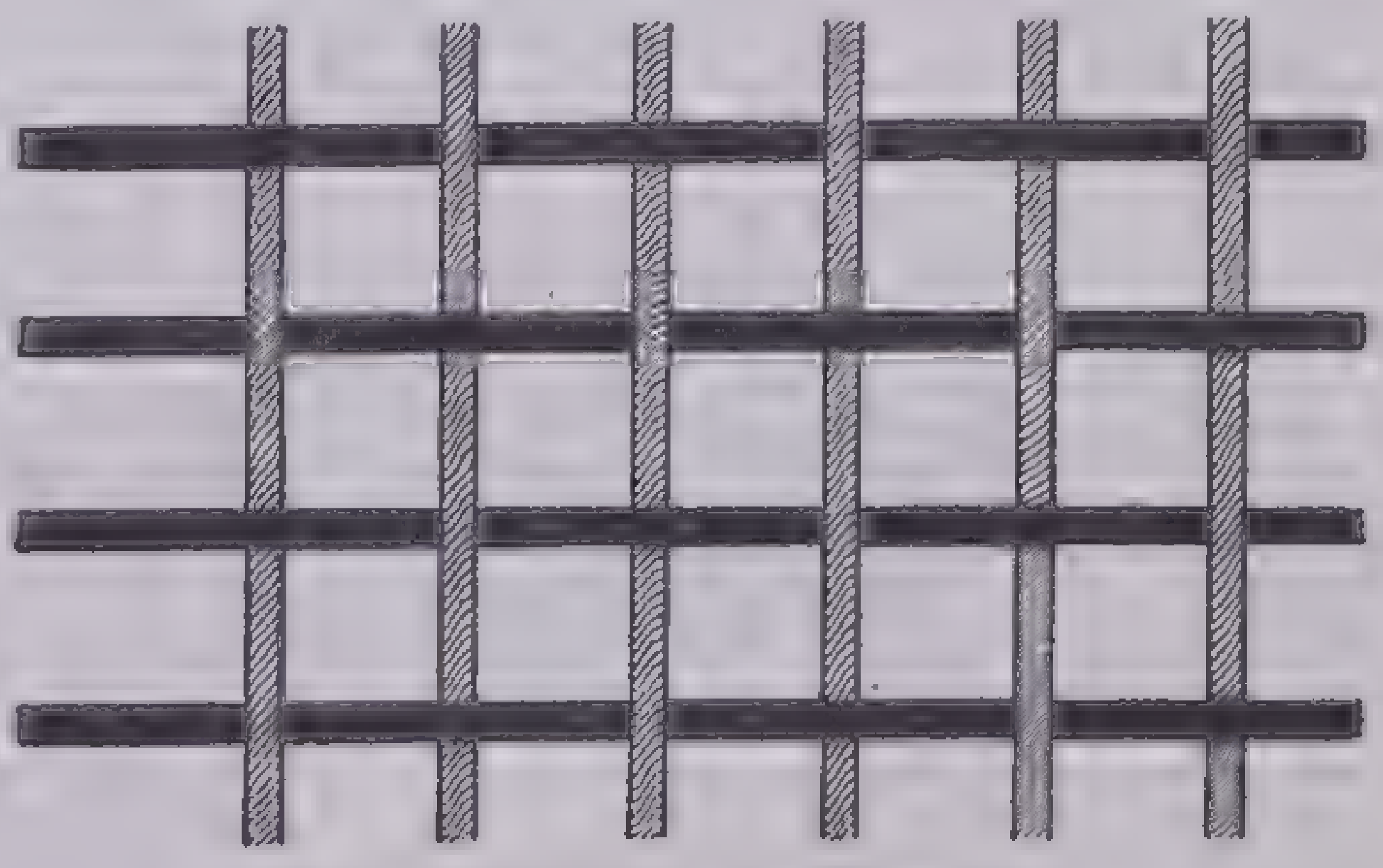
Since power depends upon both current and voltage, the wattmeter must combine the functions of both an ammeter and a voltmeter. The construction is very similar to that of a dynamometer-type of ammeter with a stationary coil for producing the magnetic field and a movable coil for reacting with it. One of these coils is connected across the line as a voltmeter, and the other is connected in series with the electrical load as an ammeter. Thus an increase in either the current or the voltage will increase the deflection of the instrument, just as an increase in either of these quantities represents an increase in power. The construction of the instrument is such that any variation in power factor automatically affects its deflection. The scale is calibrated in watts by connecting the instrument in a circuit whose power consumption is known for various conditions and marking corresponding points on the scale of the new instrument.

weaving, the interlacing of strands of yarn at right angles in such a manner as to form a fabric. The parallel threads that run the length of the cloth are called the *warp.* The crosswise threads that intersect the warp constitute the *filler* or *weft.*

All types of weaving, whether by hand or by a complicated machine, involve three operations:

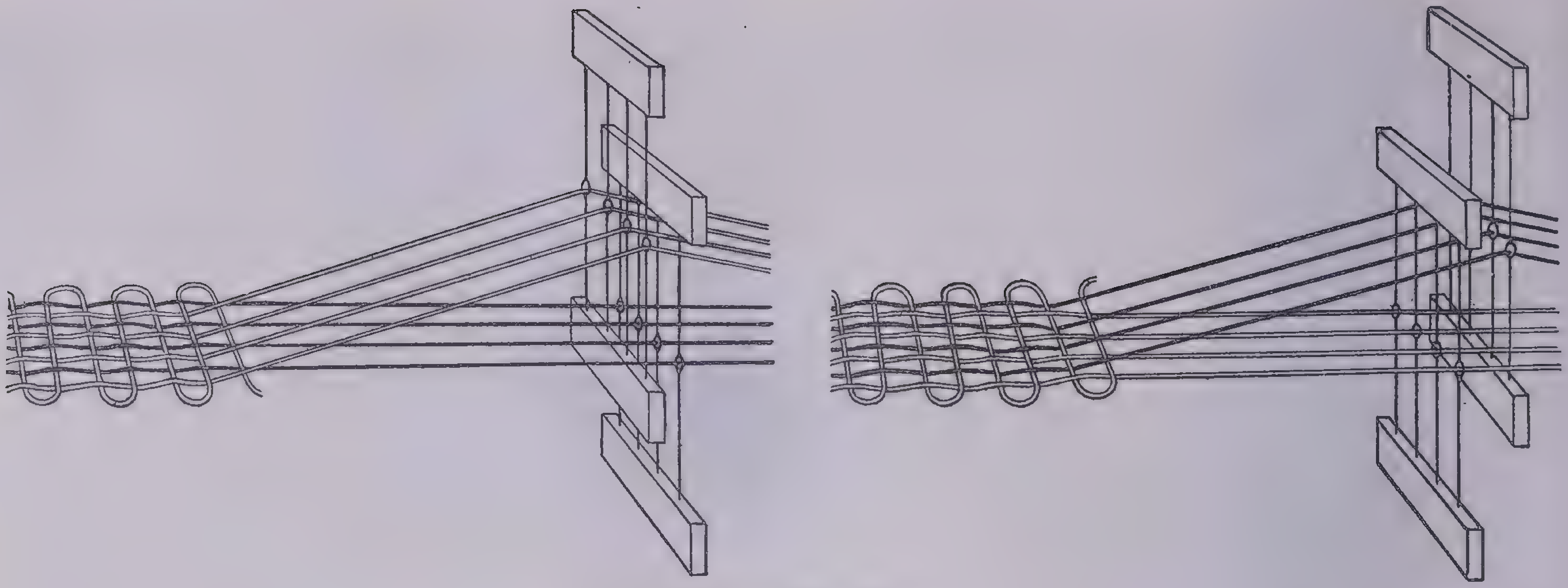
(1) *shedding,* raising the alternate threads of the warp as 1 and 3, or 2 and 4.

(2) *picking* or placing the filler



The Principle of Weaving

The white threads are the warp, the crossing black threads the weft or filler. This is the simplest possible pattern; more elaborate designs may be achieved by raising warp threads on the loom in varying combinations



The Principle of the Loom

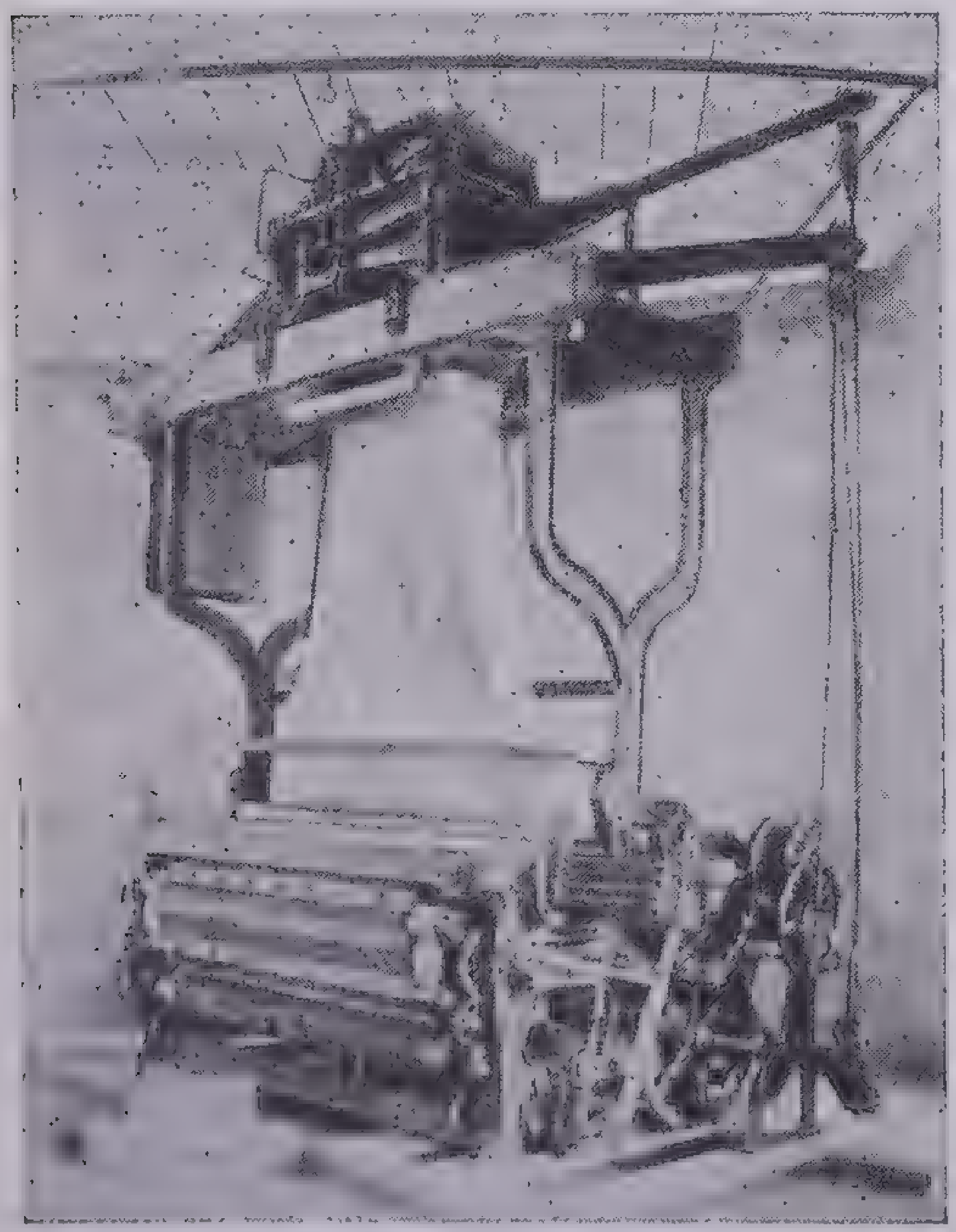
To distinguish the two sets of warp threads, they are shown in this sketch in black and in white. At the left the heddle frame carrying the white threads is raised, and a *shed* is made through which the shuttle holding the weft can pass. At the right the two heddles have reversed position: now the black threads are raised, the warp threads have crossed and tightened upon the newly laid weft, and a new path is made for the return of the shuttle

threads between the threads of the warp.

(3) *beating up* or pushing the filler threads close together.

Unless the warp strands are stretched and held parallel, it is impossible to interlace the weft threads. In very primitive looms a pole was suspended parallel to the ground between two upright forked poles or trees. The warp threads were wound around the horizontal pole. At the bottom the threads were tied to another pole. The weight of the bottom pole held the threads taut. As the weaving progressed, the finished cloth was wound around the bottom pole, and new warp threads were unwound from the top.

The task of raising alternate threads for the weaving was slow and laborious. A stick had to be inserted between alternate threads to make a *path* or *shed* for the filler threads. Instead of inserting the filler with the fingers, the yarn was wound around a small stick, and this was thrown across the cloth through the path provided by the inserted stick. This simple device was the forerunner of the *shuttle*.



Courtesy Crompton & Knowles Loom Works

Jacquard Loom

This loom is automatically weaving a complex pattern in silk. The finished fabric may be seen at the lower left. Note the complicated mass of threads being fed into the machine from above

Improvements led to the development of the hand loom of the type used in Colonial times. The greatest improvement was the development of *heddle* frames for *shedding* (lifting alternate warp threads). In simple weaving (where only alternate threads are to be lifted) two heddles are necessary. A heddle is a frame the same width as the cloth to be woven, with eyelets in the center through which a certain number of the warp strands are run. In simple weaving, each heddle has half the warp threads: in one, threads 1, 3, 5, 7, and the other odd-numbered threads are laced; in the other, threads 2, 4, 6, 8, and the other even-numbered threads. Thus, alternate warp strands are controlled by separate heddle frames.

In weaving one heddle frame is either raised or lowered, and this movement separates the two halves of the warp threads so that the shuttle containing the weft can be passed through. Then the other heddle is moved, reversing the position of the two sets of warp threads, and the shuttle is passed through from the other direction. Thus one cross-thread is added to the fabric for each movement of the heddles.

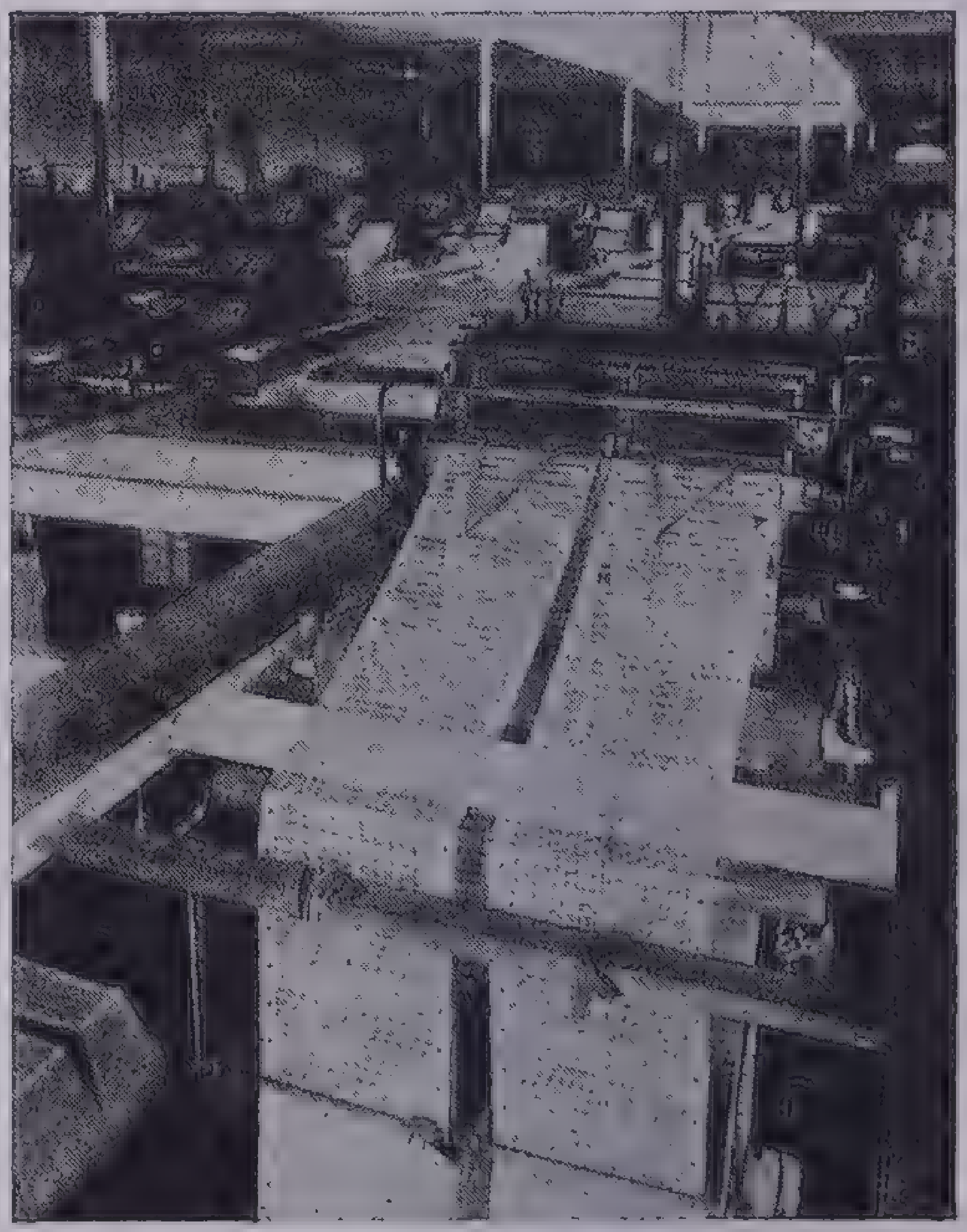
For more complex weaving patterns more heddle frames come into action, each holding certain of the warp threads. By moving them in different combinations the weft can be made to cross more than one warp thread, and definite patterns can be worked out in the weave.

Each time a weft thread is placed it must be pushed snugly against the preceding row. This is done with a combing arrangement called a *reed*.

Modern power looms are the same in principle as the simple loom just described, except that they are power driven and almost entirely automatic in action. Variations in weaves are obtained by increasing the number of heddles and by using different types and colors of yarns.

Prehistoric examples of woven materials are very rare, but in all probability weaving was one of man's early accomplishments. Fragments of loom-woven linen cloth have been discovered in the ruins of the lake dwellings of Switzerland, dating from the Neolithic or later Stone Age. Pictures of the loom appear on the ancient vase paintings of Greece. A few crude stone carvings of simple looms have been found on the walls of Egyptian tombs, and remains of linen fabrics woven 4,000 or 5,000 years ago are found with mummies.

About the time the people of the



Courtesy The Esmond Mills

The "Brains" of the Loom

These perforated cards govern the action of the Jacquard loom. The holes are punched in various patterns depending upon the design to be created in the blanket that is being woven. As the card passes through the machine mechanical fingers feel for the holes. Where a hole occurs, the finger passes through it and in turn raises or lowers a group of warp threads

Stone Age in Europe were weaving flax fiber into coarse cloth, the Chinese were making improvements in their weaving methods in order to adapt them to the weaving of silk. In the early part of the 18th century, weaving reached a high point of perfection in England, France and Italy. However, the happy and prosperous condition of the 18th-century weaver was turned to one of misery in the 19th with the introduction of steam as a motive power, subdivision of labor and the substitution of iron for wood. In all probability the first indication of the change came in 1687, when Joseph Mason invented devices for helping the weaver in some of the minor tasks.

In 1801 a machine for weaving intricate patterns was invented by Joseph Marie Jacquard of France. This invention marked the beginning of a new period in the art of figure weaving. It was not until 1786 that a practical power-operated loom for plain weaving was invented by Dr. Edmund Cartwright. Several of his looms were purchased by a Manchester firm and proved to be satisfactory, but the factory was burned by an infuriated mob of hand-loom weavers.

welding, the joining of metallic objects by fusion—either surface fusion of the objects themselves or by flowing between them melted metal from an outside source. Welding as an important industrial process dates from the World War, when it was developed to save time in assembling metal parts. In the beginning only small pieces were welded, but today the possibilities seem unlimited. The leading welding processes are arc welding, forge welding, gas welding, resistance welding and thermit welding.

Arc Welding. There are several variations of process in welding with an electric arc. In *uncoated electrode* welding, an arc is struck between the electrode and the pieces of metal to be united. The heat energy of the arc melts the metal to be welded along with the metal of the electrode itself, which is deposited at the weld. Direct current or alternating current can be used in this type of welding. In order to reduce oxidization of metal at the weld, the electrodes are sometimes coated with oxides. The coating forms a protective vapor around the arc, shutting out the oxygen.

In *atomic hydrogen* welding a stream of hydrogen is introduced between two electrodes and because of the intense heat of the arc breaks up into atoms. After passing through the arc the atoms recombine into molecules and give to the arc the energy absorbed during the dissociation. As a result, a jet of hydrogen burns in a surrounding filled with hydrogen. A rod of metal is fused in the flame and made to deposit at the weld. This type of welding insures sound welded joints because there is no oxidation of metal.

In the *reducing gas flame* type of welding, a gas is made to surround the electrode and acts in the same way as a coated electrode in reducing oxidization.

Carbon arc welding involves an arc struck between a carbon electrode and the work to be welded. A rod of metal melts in the arc and joins the pieces.

Forge Welding. The parts to be joined are placed in a forge or furnace and heated until the surfaces fuse; then they are hammered or rolled together. Until 1890 this was the only known method of welding metals. The skill of the welder plays a very important part in forge welding, which accounts in part for the uncertainty of forge welds. Large pieces cannot be conveniently welded in this way.

Gas Welding. The material at the joint and the welding rod are fused by the heat of burning acetylene in the presence of oxygen. The temperature of the resulting flame is about 5500° F.

Resistance Welding. The pieces are placed together and a large current passed through them at a small spot or along a line. Since the resistance at the contact point is higher than that of the metal, the heat generated at the contact surface raises the temperature of the metal up to the welding point, and the weld is made by pressing the pieces firmly together. This method is commonly used for welding thin pieces.

Thermit Welding. Thermit is the trade name given to a mixture of iron oxide and finely divided aluminum. At a temperature of 2800° F., this mixture reacts in such a way that the oxygen unites with the aluminum, liberating an immense amount of heat that heats the iron until it becomes a highly superheated fluid. This material is used for welding by preheating the pieces—such as the ends of two railroad rails—to a bright red heat and allowing the liquid iron formed in the reaction to flow into the weld.

wheat, the principal bread cereal of the more highly civilized peoples of the world. It is a better balanced food than any of the other cereals except oats, which are coarser and spoil more readily. Wheat, for most people, is the most palatable of the cereals.

Climate, topography and soil, as with all agricultural products, determine the area in which wheat can be grown. Within these natural limits, though, not all suitable land is devoted to wheat. Other crops compete for the arable land. Customs, economic conditions, location and many other factors are important in explaining the distribution of any crop.

Wheat is hardy and can be produced in a variety of climates. The ideal climate has a rather cool moist season followed by a dry hot period. During the moist weather the seed germinates, and plant growth begins. As the plant reaches maturity, the hot, dry, sunny season brings about ripening. However, special types of wheat have been developed that can be grown where conditions are quite different from the ideal. Some of these wheats are highly drought-resistant; others are rust-resisting and can be raised in rather humid areas. Still others reach maturity very quickly and so can be raised in areas with a short growing season. Wheat today is found within the tropics and as far north as 66° N. latitude in Alaska. Its poleward expansion is largely restricted to those portions of the earth having at least 3 months of the year in which the temperature averages at least 57° F.

Wheat cannot be raised in climates where conditions are too humid or too dry. The time of year in which precipitation occurs and the rate of evaporation modify conditions considerably. An area possessing a low evaporation rate might have conditions too humid for wheat, whereas another area with the same amount of precipitation but with a high evaporation rate would be suitable. In cool areas—areas with a low evaporation rate—more than 40 inches of rain is too much for wheat. In hot areas—with a high evaporation rate—wheat will grow satisfactorily with as much as 70 inches of rain. In setting the dry limits for wheat the reverse conditions obtain. Cool areas can get along with about 10 inches of rain; hot areas need at least 20 inches.

A region may be suitable for wheat from the standpoint of moisture and temperature, but its topography may prevent efficient farming. A great deal of machinery is used in cultivation, and if slopes are too steep, it is difficult or impossible to use the machines. In some over-crowded sections of the world wheat is grown on relatively steep slopes, but these conditions are far from desirable.

Wheat grows best in a loamy soil. In cool wet areas sandy soils are satisfactory. Clay soils can be used in warm, dry sections of the world.

Courtesy International Harvester Company

Large-Scale Wheat Farming

Here are shown 12 huge *combines* or reaper-threshers harvesting wheat on a western farm. So high a degree of mechanization is not efficient except when used on very large tracts

Certain world areas have specialized in wheat production. Europe produces about half the world's total (excluding China for which there are no accurate statistics). Spain, France, Belgium, the Netherlands, Italy, the Balkans, Hungary and north of the Black Sea in the Ukraine district of the U.S.S.R.—these are the principal European areas. Extensive areas are devoted to wheat in India, China, Australia, the United States, Canada and the Argentine.

The states most important for wheat production are Kansas, North Dakota, Nebraska, Oklahoma, Montana, Washington, Texas, South Dakota, Ohio, Minnesota and Illinois.

Wheat can be grown in so many different countries and in such a variety of climates largely because there are two kinds, *winter* wheat and *spring* wheat. Winter wheat is generally planted in the fall and harvested in the early summer. Spring wheat is usually planted in the spring and harvested in the late summer. The climatic requirements for each type are quite similar, but the conditions come at different seasons of the year. In places where winters are severe and long, winter wheat cannot be grown. It becomes necessary to plant the crop in spring or early summer.

The United States raises both winter and spring wheat. Kansas, Nebraska, Oklahoma and most eastern sections produce winter wheat. Minnesota and North Dakota and South Dakota are important spring wheat areas. Western Europe raises winter wheat, as do India, parts of China, Australia and the Argentine. Canada and the northern portions of the wheat belt of the U.S.S.R. are devoted primarily to spring wheat. Winter wheat is far more important than spring wheat, representing three-quarters of the world's total supply.

Although more than 40 countries each produce more than a million bushels of wheat per year, only five of them are important exporters. The others consume most of their own crop. The exporters are, for the most part, newly settled areas with a sparse population or countries with large areas of relatively dry land. India, although an old and densely peopled section of the world, produces its export wheat in a newly opened irrigated section in the northwestern part of the country. Her exportable surplus varies from nothing to several million bushels. The importing countries are great industrial nations with restricted agricultural resources and dense populations. The chief exporting nations are Canada, Argentina, Australia, United States and U.S.S.R. The chief importers are the United Kingdom, France, Belgium, China and Italy.

windmill, a machine for translating the energy of the wind into mechanical motion. Windmills were used in Germany, the Netherlands and the surrounding countries as early as the 8th century and had become quite common for pumping water and grinding grain by the 12th century.

Early windmills were massive, slow-speed affairs; the wheel usually had four sails and was as much as 40 feet in diameter. The shaft on which the wheel was mounted was tilted at an angle of 10 to 15 degrees with the horizontal, because it was thought that in this position it would catch the maximum amount of wind. The power was used mostly for grinding grain, pumping water and sawing wood. In the German windmills the tower was totally enclosed and free to turn about the vertical pole that acted as support for the entire structure, whereas in the Dutch mills only the roof of the tower was free to rotate. They were turned into the wind by a number of mechanisms, including the vane familiar to us.

In the United States large European-type windmills were prevalent up to about 1850, when an American type was developed. Instead of a huge wheel with a few large sails, the American wheel is 8 to 12 feet in diameter and has a large number of narrow blades. There are vanes and other devices to keep the wheel pointing into the wind and to regulate its speed.

Another type of windmill that is now being developed in this country has two to four blades shaped like an airplane propeller and is used to drive electric generators on airplanes or to charge storage batteries for farm lighting. This type has a comparatively high efficiency but only at high speeds.

wireless communication, the transmission of signals by electricity without the use of interconnecting wires between the sending and receiving stations. Although this is done exclusively at the present time by means of electromagnetic waves, three other methods have been attempted in the past: conduction of electric currents through moist earth or water; electromagnetic induction between electric circuits; electrostatic induction between metallic plates or conductors.

Conduction or Dispersion Method. On December 16, 1842, Samuel F. B. Morse, the inventor of the telegraph, carried out what was probably the first successful attempt at electrical telegraphy without the use of wires between two stations. This was done by stretching two wires along the opposite banks of a canal 80 feet wide in Washington, D.C. The ends of each wire were connected to plates that dipped down into the water of the canal. When batteries were connected in series with one set of plates, a current was set up between them that spread outward through the water, and some of it passed to the other bank. As a result, a sensitive galvonometer connected in series with the other set of plates was deflected. In this way it was possible to transmit telegraph signals from one side of the canal to the other, for the water served as a conductor of electricity. Although such a method might be used either on land or water, its range would be very limited due to the spreading out of the current and the high resistance of the path.

Electromagnetic Induction Method. Wireless telegraphy by electromagnetic induction is based upon the fact that when an electric current is sent through a coil of wire a magnetic field is set up in the space surrounding the coil. As a result, if a second coil is placed some distance from the first, a change in the current in the first coil will result in a voltage being induced in the second coil, due to the change in the magnetic field. However, there is a rapid decrease in the intensity of the field as the coils are moved farther apart, so this method cannot be used when messages are to be transmitted over appreciable distances.

Electrostatic Induction Method. In 1882 Professor Dolbear of Tufts College obtained a patent on a system of wireless telegraphy that operated upon the principle of electrostatic induction. In this, a single plate was elevated some distance above ground at both the sending and receiving stations. When a difference in potential was introduced between one plate and ground, it was found that a smaller potential difference was induced between the other plate and ground. Like the other two methods, the possible range of reception of this method was too limited for it to be of any commercial importance. Although it would be possible to introduce amplification, at the present time it would be found that stray fields and currents would cause too much interference at long distances.

wool, animal hair used in making textiles. In contrast to cotton, it is a special-purpose fiber, having certain properties that give it unusual usefulness for special purposes. One of these properties is great elasticity: wool can be stretched out to half again its original length and will return to exactly its former size. It is also highly resistant to wear. These qualities make wool extremely desirable for rugs, carpets and upholsteries. Wool is a very poor conductor of heat and is therefore particularly suitable for clothing, since it keeps body heat from escaping into the air. Another advantage of the fiber is that it will felt or mat. The wool fiber has jagged edges; if the fibers are pressed together, tiny, sawlike teeth lock themselves into a firm structure. This is a great help in spinning and weaving and improves the usefulness of the finished product.

Converting wool into yarn and thence into cloth is basically the same as any other spinning and weaving. Each fleece must be sorted by skilled workers into its several classes of fibers. No way has ever been discovered of doing this by machinery. The next step is to wash and clean the fleece. Different types of wool are then blended to give special qualities to the finished cloth or to reduce the cost by mixing expensive with cheaper, though not necessarily inferior, wool. From this point forward the industry splits into two major branches. One branch deals with short-fibered wool and the other with long-fibered.

The short-fibered material becomes woolen yarn, which goes into the making of blankets, broadcloth, flannels and tweeds. The long fibers become *worsted* yarn, for such fabrics as serge and in general the type of cloths used in men's suiting materials. The difference between the two is that wool yarn is rather loose and fluffy; worsted yarn is dense and is often twisted to a hard surface.

A wool weaver may operate from 4 to 12 looms, whereas many times that number may be tended by a cotton weaver. The same looms can be and are used for woolens, worsteds or combined fabrics, such as worsted warp and woolen filler or cotton warp and worsted filler.

When wool-yarn fabrics come off the loom they are loose and sleazy and must be shrunk and solidified into a firm fabric. This is not necessary with worsteds.

Dyeing and finishing complete the process in either case. There are many ways of finishing cloth to give a desired appearance. A common one is pulling out individual fibers from the surface in machines with many sharp wires. This gives the surface a *nap* comparable to velvet. The nap is then sheared off to an even height with a machine that operates like a lawn mower.

The use of wool in the United States has not increased greatly in the past 20 years. There are several reasons: neither men nor women need dress so warmly, since buildings, automobiles and such places are well heated; style and public opinion permit the wearing of fewer clothes; new fabrics, like light cottons and rayons, have become popular.

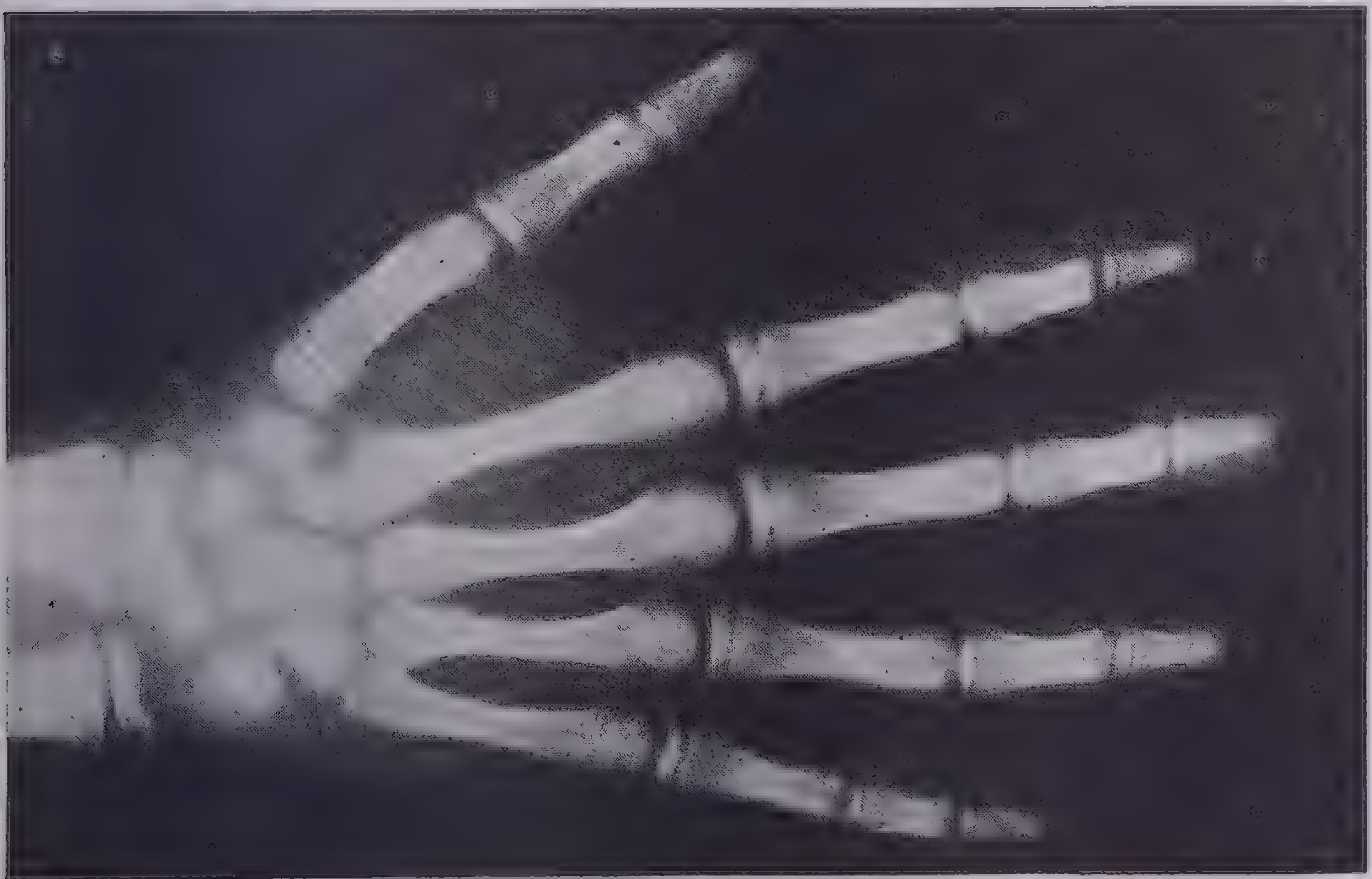
The value of woolen goods in the United States is well over 500 million dollars a year. More than nine-tenths of the spindles in the industry are concentrated in the New England states, New York, New Jersey and Pennsylvania.

X rays, high-frequency electromagnetic waves of great penetrating power, used for examining the body internally and in many industrial applications. If a high voltage source is connected to two electrodes sealed in a glass tube from which the air has been removed, the negative electrode will send out a stream of negatively charged particles called cathode rays. Cathode rays, like light, can be focused, and if these rays are focused on the other electrode, the metal becomes very hot and gives off rays known as *X rays.* X rays or Roentgen rays are electromagnetic waves that have a very high frequency. They are capable of passing through a number of opaque substances and produce many important effects.

X rays were discovered in 1895 by Wilhelm Konrad Roentgen, of Germany, who gave them that name because at that time their nature was not understood. Besides taking radiographs (a picture taken with X rays is called a *radiograph*) of bones, he radiographed a compass card inclosed in a metallic box. In 1913 the Coolidge cathode-ray tube was announced; this type of tube made possible for the first time the absolute control of both the intensity and penetrating power of X ray.

X rays are extensively used in fluoroscopic work for examining parts of the human body. A fluoroscope usually consists of a black box that contains a screen coated with platino-barium cyanide and an X-ray tube. Whenever the X rays strike the screen, it becomes luminous. If a man is suitably placed between the source of X rays and the screen, a shadow of the chest is cast upon the screen that shows the ribs as dark bands and the lungs bright. The heart is seen expanding and contracting rhythmically.

X rays are widely used in medicine and dentistry. Bone fractures can be examined; diseases of the stomach and the alimentary canal and tuberculosis of the lungs can now be diagnosed with certainty. Radiographs are very important in the dental profession, since the condition of the teeth and the nearby bone structure can be seen and examined. Objects that have been swallowed can be detected by X-ray examination. During the World War radiographs were indispensable for the location of bullets and shell fragments in the body. X rays are now used in the treatment of cancer, inflamed glands, blood and skin diseases.



Courtesy Westinghouse X-Ray Company, Inc.

X-Ray Picture of a Child's Hand

The bones of this hand are normal. Can you feel the corresponding bones in your own hand and wrist? Can you name the bones? (See the picture on page 1256.)

In industry hidden defects, cracks, blow holes and slag intrusions are easily found in metal castings by X-ray examination. It is now common practice to examine welds in order to determine if any blow holes, pin holes or slag intrusions are present.

Recently fruit growers have begun to examine oranges, lemons and grapefruit by X ray to insure against packing fruit that has been frozen or otherwise damaged.

Little was known about the structure of matter before the discovery of the diffraction of X rays by crystals. From our knowledge of diffraction we now know the position of the atoms in a number of substances. It is possible to determine whether the atoms lie at the corners of cubes or hexagons or some other formation.

zinc, a bluish-white, hard, lustrous metallic element, very resistant to corrosion and oxidation by the elements. Its importance is much greater than is indicated by the annual output of half a million tons, valued at 50 million dollars.

Nearly half of all zinc is used to galvanize or form a rust-proof coating on iron and steel sheets, pipes and screen. Zinc oxide is an essential in rubber manufacture and is a white pigment for paints, oil cloth, tile, glass and ink. Other zinc compounds go into wood preservatives and medicines. Metallic zinc also is needed for brass, roofing, dry batteries and articles made by casting. It makes innumerable things, from shoelace tips to organ pipes. Zinc plates are used in engraving and in lithography.

The earliest zinc mining was in eastern states, New York, New Jersey, Virginia and Tennessee still being important. Later deposits were found in the Mississippi valley and the far west. Half the domestic supply now comes from the region where Missouri, Kansas and Oklahoma come together.

Zinc usually occurs with other metals, especially lead, and the method of concentrating the ore by flotation is described under *Lead.* From this point, however, zinc is produced by methods differing widely from those used in obtaining most other metals. It is either distilled or dissolved by acids and precipitated by electrolysis.

In the first method, either native or concentrated ore is roasted to produce zinc oxide. This is mixed with powdered coal in clay retorts, fired by glass flames. The coal, in burning, takes the oxygen from the oxide, leaving free zinc at a temperature higher than its boiling point. The metallic vapor is collected and condensed to solid form just as in any other distilling process. The residue contains much lead, gold, silver and cadmium, a very profitable by-product.

The second method uses much electric current, so must be established near a hydroelectric plant where power is plentiful and cheap. The roasted ore is treated with sulphuric acid, which dissolves out the zinc. This is filtered and purified and placed in electrolytic cells in which upon passage of a current the zinc deposits on the cathode. A fourth of the total output is produced in this way. Electrolytic zinc is extremely pure.

INDUSTRIAL STATISTICS

Most of the figures in these tables are 5-year averages.

ALUMINUM-SMELTER PRODUCTION
(thousands of metric tons)

Countries	Amounts
United States	55.1
Germany	47.9
Canada	19.6
France	18.7
Norway	15.7
United Kingdom	13.8
Italy	13.9
Switzerland	10.3
U. S. S. R.	15.0

BARLEY
(millions of bushels)

Countries	Amounts
Producers	
U. S. S. R.	320
United States	200
Germany	154
India	111
Spain	107
Rumania	62
Japan	74
Exporters	
Rumania	18.1
U. S. S. R.	19.5
Argentina	17.8
Canada	7.6
United States	7.2
Poland	11.3
Importers	
United Kingdom	36.0
Germany	12.5
Netherlands	17.1
Belgium	18.6

CACAO
(thousands of quintals)

Countries	Amounts[1]
Gold Coast	2,450
Brazil	1,045
Nigeria	650*
Ivory Coast	350*
Dominican Republic	221*
Trinidad and Tobago	187*
Cameroons	186*
Ecuador	162*
Venezuela	154*

[1] Production figures used when available. Figures with asterisks are for exports.

BEEF—WORLD TRADE
(millions of pounds)

Countries	Amounts
Exporters	
Argentina	1,004.5
Australia	257.5
Uruguay	204.7
New Zealand	159.6
Netherlands	33.1
United States	79.1
Brazil	90.2
Importers	
United Kingdom	1,521.7
Germany	58.8
France	41.5
Belgium	40.4
Japan	47.4

CATTLE
(millions of cattle)

Countries	Number
India	202.3
United States	68.3
U. S. S. R.	56.5
Brazil	47.4
Argentina	31.5

COAL PRODUCTION
(millions of metric tons—
Bituminous and Anthracite)

Countries	Amounts
United States	384.3
United Kingdom	219.5
Germany (includes Saar)	134.9
France	46.4
Japan (includes Karafuto and Taiwan)	36.8
Poland	28.7
Belgium	25.4
British India	21.4
U. S. S. R.	87.3 (figure includes lignite)

COFFEE
(thousands of pounds)

Countries	Amounts
Exporters	
Brazil	1,981,264
Colombia	424,014
Netherlands Indies	168,533
Salvador	116,905
Venezuela	134,309
Guatemala	184,824
Importers	
United States	1,622,019
France	412,459
Germany	314,866
Sweden	102,118
Belgium	100,319
Netherlands	98,745
Italy	86,744

COPPER[1]
(thousands of metric tons)

Countries	Amounts
United States	299.2
Chile	207.1
Spain	35.5
U. S. S. R.	42.4
Germany	28.3
Yugoslavia	34.7
Canada	158.9
Japan (includes Chosen and Taiwan)	76.7
Belgian Congo	84.5
North Rhodesia	137.9

[1] These figures show where the copper is mined, rather than where it is smelted.

CORN
(millions of bushels)

Countries	Amounts
Producers	
United States	2,334
Argentina	333
U. S. S. R.	154
India	87
Java and Madura	78
Mexico	77
Hungary	73
Manchuria	65
Italy	104
Danube Basin	475
Brazil	223
Union of S. Africa	60
Exporters	
Argentina	234.9
Rumania	43.8
Yugoslavia	17.8
Union of S. Africa	13.5
Indo-China	14.1
United States	4.2
Importers	
United Kingdom	120.0
Netherlands	43.4
France	29.0
Belgium	31.3
Denmark	14.0
Irish Free State	12.2
Italy	7.5
Germany	13.4

COTTON
(thousands of 500-lb. bales)

Countries	Amounts
Producers	
United States	11,722
India	4,498
China	3,072
U. S. S. R.	2,098
Egypt	1,619
Brazil	1,279
Exporters	
United States	7,119
British India	2,610
Egypt	1,626
Brazil	404
Importers	
Japan	3,512
United Kingdom	2,636
Germany	1,562
France	1,297
China	595
Italy	884

FLAX FOR SEED
(millions of bushels produced)

Countries	Amounts
Argentina	66.8
U. S. S. R.	29.5
India	16.0
United States	8.9

FLAX FOR FIBER
(millions of pounds produced)

Countries	Amounts
U. S. S. R.	1,174
Poland	65
Lithuania	47
Belgium	38
Japan	38
Latvia	33

HOGS
(thousands of hogs)

Countries	Number
United States	54,777
China	95,000
Brazil	22,099
Germany	23,424
Russia	15,616

HOGS AND HOG PRODUCTS
(millions of pounds)

Countries	Amounts
Exporters	
United States	508.8
Denmark	564.1
Netherlands	144.1
Poland	74.3
Irish Free State	69.0
Canada	117.7
Sweden	44.0
Importers	
United Kingdom	1,251.4
Germany	175.3
Mexico	36.5
Czechoslovakia	28.3

IRON-ORE PRODUCTION
(millions of metric tons)

Countries	Amounts
United States	26.6
France	31.0
United Kingdom	9.2
Sweden	4.7
Luxemburg	3.8
Germany	3.4
Spain	1.9
U. S. S. R.	20.5
China	2.3
British India	1.8

PIG-IRON PRODUCTION
(millions of gross tons)

Countries	Amounts
United States	22.8
U. S. S. R.	12.2
Germany	12.0
France	3.7
United Kingdom	6.6
Belgium	3.0
Canada	.6
Alsace-Lorraine	2.2

LEAD-SMELTER PRODUCTION
(thousands of metric tons)

Countries	Amounts
United States	283.2
Australia	203.0
Canada	138.3
Germany	117.7
Spain	76.6
India	73.2
Belgium	69.2
Italy	37.4
Mexico	162.0

OATS
(millions of bushels)

Countries	Amounts
Producers	
United States	902
Germany	417
Canada	358
France	325
Poland	177
British Isles	152
U. S. S. R.	1,024
Exporters	
Argentina	27.1
U. S. S. R.	7.4
Canada	13.6
Importers	
United Kingdom	17.5
Switzerland	14.4
Italy	10.6
Netherlands	4.0
Belgium	2.3

POTATOES
(millions of bushels)

Countries	Amounts
Producers	
Germany	1,610.3
Poland	1,184.6
France	538.4
United States	358.1
Czechoslovakia	311.8
United Kingdom	169.0
Exporters	
Netherlands	11.0
Belgium	3.4
Italy	4.4
Spain	3.8
Importers	
United Kingdom	12.2
France	4.9
Germany	1.3
United States	.4

RICE
(billions of pounds)

Countries	Amounts
Producers	
China	84.1
India	67.1
Japanese Empire	19.3
French Indo-China	7.8
Java and Madura	9.1
Siam	6.6
Exporters	
British India	3.9
Indo-China	3.8
Siam	3.9
Importers	
China	2.5
British Malaya	1.6
Ceylon	1.0
France	1.0
Netherlands Indies	.6
Germany	.6

RUBBER EXPORTS[1]
(thousands of metric tons)

Countries	Amounts
British Malaya	439
Netherlands Indies	287
Ceylon	63
North Borneo and Sarawak	21
French Indo-China	18
South America (chiefly Amazon Basin)	5

[1] Exports are practically same as production.

RYE
(millions of bushels)

Countries	Amounts
Producers	
U. S. S. R.	863
Germany	313
Poland	257
Czechoslovakia	69
United States	32
France	32
Hungary	30
Exporters	
U. S. S. R.	4.8
Poland	20.1
Germany	6.3
Argentina	6.0
Hungary	11.1
Importers	
Denmark	9.0
Netherlands	6.1
Norway	5.3
Finland	2.1

SHEEP
(millions of sheep)

Countries	Number
Australia	111.4
U. S. S. R.	53.3
United States	53.2
Union of South Africa	45.0
Argentina	38.6
India	43.6
New Zealand	28.7
United Kingdom	26.0
Spain	18.0
China	26.0

MINERAL PRODUCTION OF THE STATES

State	Rank	Principal Mineral Products in Order of Importance	Value of All Minerals
Alabama	21	coal, iron ore, cement, clay	$ 31,772,042
Alaska	30	gold, copper, coal, platinum	18,811,544
Arizona	18	copper, gold, silver, molybdenum	38,848,203
Arkansas	31	petroleum, coal, bauxite, natural gas	17,608,569
California	3	petroleum, natural gas, gold, natural gasoline	360,178,680
Colorado	15	coal, gold, molybdenum, silver	44,413,477
Connecticut	43	stone, clay, sand and gravel, lime	2,656,207
Delaware	50	clay, stone, sand and gravel	229,904
Dist. of Columbia	49	clay, stone	479,256
Florida	34	phosphate rock, stone, cement, fuller's earth	11,447,052
Georgia	36	stone, clay, cement, fuller's earth	7,440,226
Idaho	28	silver, lead, gold, zinc	21,364,029
Illinois	10	coal, clay, petroleum, cement	96,483,558
Indiana	16	coal, cement, clay, stone	42,512,613
Iowa	27	coal, cement, gypsum, clay	21,709,817
Kansas	9	petroleum, natural gas, coal, zinc	96,905,947
Kentucky	8	coal, natural gas, petroleum, clay	98,486,090
Louisiana	7	petroleum, natural gas, sulphur, salt	107,544,710
Maine	44	stone, cement, clay, sand and gravel	2,559,648
Maryland	35	coal, clay, sand and gravel, cement	10,035,751
Massachusetts	38	stone, clay, sand and gravel, lime	5,650,148
Michigan	11	iron ore, petroleum, cement, salt	77,149,256
Minnesota	13	iron ore, sand and gravel, cement, manganese	57,313,256
Mississippi	42	natural gas, clay, sand and gravel, petroleum	3,092,609
Missouri	19	lead, clay, coal, cement	35,800,213
Montana	14	copper, silver, petroleum, natural gas	52,096,553
Nebraska	41	cement, sand and gravel, clay, stone	3,228,856
Nevada	29	gold, copper, silver, zinc	20,987,749
New Hampshire	47	clay, stone, sand and gravel, feldspar	693,988
New Jersey	24	clay, zinc, sand and gravel, stone	28,514,673
New Mexico	20	petroleum, natural gas, coal, potassium salts	33,502,362
New York	12	petroleum, stone, clay, cement	58,408,999
North Carolina	37	clay, stone, bromine, feldspar	6,774,649
North Dakota	45	coal, clay, sand and gravel, stone	2,543,910
Ohio	6	clay, coal, natural gas, petroleum	126,133,670
Oklahoma	4	petroleum, natural gas, natural gasoline, zinc	251,700,898
Oregon	39	gold, cement, stone, sand and gravel	5,596,484
Pennsylvania	2	coal, natural gas, petroleum, cement	520,575,611
Rhode Island	48	stone, sand and gravel, lime, clay	570,520
South Carolina	46	stone, clay, sand and gravel, gold	1,843,476
South Dakota	26	gold, sand and gravel, cement, stone	32,209,554
Tennessee	25	coal, cement, stone, phosphate rock	25,743,471
Texas	1	petroleum, natural gas, sulphur, natural gasoline	528,069,238
Utah	17	copper, silver, gold, coal	41,881,265
Vermont	40	stone, slate, talc, lime	5,097,295
Virginia	22	coal, stone, zinc, clay	30,923,115
Washington	32	coal, stone, cement, sand and gravel	13,688,083
West Virginia	5	coal, natural gas, clay, petroleum	245,402,124
Wisconsin	33	stone, clay, sand and gravel, iron ore	11,815,933
Wyoming	23	petroleum, coal, natural gas, natural gasoline	30,669,658

MUTTON AND LAMB

(millions of pounds)

Countries	Amounts
Exporters	
New Zealand	414.0
Argentina	128.5
Australia	174.8
Uruguay	17.5
Netherlands	5.8
Importers	
United Kingdom	771.6
France	18.3
United States	6.4

WOOL

(millions of pounds)

Countries	Amounts
Producers	
Australia	1,009.3
United States	431.0
Argentina	364.8
New Zealand	293.3
Union of South Africa	268.3
U. S. S. R.	166.0
Uruguay	110.9
United Kingdom	113.1
Exporters	
Australia	819.3
Argentina	298.4
Union of South Africa	231.6
New Zealand	254.9
Uruguay	86.4
Importers	
France	541.0
United Kingdom	598.6
Germany	323.8
United States	163.6
Belgium	204.4
Japan	222.9
Italy	168.2

SILK PRODUCTION[1]

(millions of pounds)

Countries	Amounts
Japan	95
China	11
Italy	7
Chosen (Korea)	4
U. S. S. R.	3

[1] The United States is the leading importer with imports averaging about two-thirds of world's total production. Japan exports about three-fourths of world's total.

SUGAR—CANE AND BEET

(thousands of short tons)

Countries	Amounts
Producers	
India	5,944
Cuba	2,772
Germany*	1,679
U. S. S. R.*	1,536
United States	1,702
Java	993
France*	1,082
Taiwan	995
Hawaii	989
Brazil	916
Czechoslovakia	675
Exporters	
Cuba	2,533
Netherlands Indies	1,208
Philippine Islands	1,009
Dominican Republic	346
Czechoslovakia	206
Peru	370
Importers	
United States	2,942
United Kingdom	2,228
British India	283
China	281
Canada	425
France	434

*Beet sugar.

TEA

(thousands of pounds)

Countries	Amounts
Exporters	
British India	348,392
Ceylon	224,933
Netherlands Indies	131,974
China	89,899
Japan	32,001
Importers	
United Kingdom	453,689
United States	88,488
U. S. S. R.	189,742
Australia	46,787
Canada	38,386
Netherlands	29,566
Irish Free State	23,096

TIN ORE—METAL CONTENT

(thousands of metric tons)

Countries	Amounts
Federated Malay States	38.8
Bolivia	21.4
Netherlands Indies	20.0
Siam	10.4
China	7.6

TOBACCO

(millions of pounds)

Countries	Amounts
Producer	
India	1,434
United States	1,186
U. S. S. R.	348
Brazil	215
Japan	143
Java, Madura and Sumatra	61
Italy	99
Philippine Islands	96
Greece	107
Turkey	78
Bulgaria	53
Exporters	
United States	421
Netherlands Indies	113
Greece	87
Brazil	61
Bulgaria	48
Philippine Islands	42
Cuba	31
British India	35
Algeria	29
Importers	
United Kingdom	207
Germany	191
France	81
China	55
Netherlands	68
Spain	63
Belgium	45

MANUFACTURING—SELECTED INDUSTRIES—UNITED STATES

Industry	Number of Establishments	Number of Workers (thousands)	Value of Product (millions of dollars)	Wages Paid (millions of dollars)	Principal States Mfg. Product
Agricultural implements	241	52.8	291.2	64.3	Ill., Ind., Wis.
Aluminum mfg.	170	19.2	104.0	20.3	Ohio, Wis.
Beverages (nonalcoholic)	3,175	16.7	159.2	17.3	Ill., N. J., N. Y., Pa., Tex.
Boots, shoes (other than rubber)	1,024	202.1	643.8	171.3	Mass., Mo., N. Y.
Canning, preserving (not fish)	2,744	116.2	649.6	70.6	Calif., Md., N. Y.
Cement	153	20.6	120.4	20.9	Calif., Mich., N. Y., Pa.
Chemicals	570	65.8	668.6	80.4	Ill., Mich., N. J., N.Y.
Chocolate, cocoa (not candy)	44	8.2	93.0	7.9	N. Y., Pa.
Cigars, cigarettes	775	80.4	957.9	51.8	N. C., Va.
Clothing, Men's	3,602	215.6	787.0	180.6	Ill., Md., Mass., N. Y.
Clothing, Women's	8,233	243.4	1,202.6	230.6	Calif., Ill., Mass., N. Y., Pa.
Coke-oven products	88	16.6	238.7	21.5	Ill., Ohio, Pa.
Cotton goods	1,223	383.0	1,030.7	247.8	Ga., Mass., N. C., Pa., S. C.
Dyeing, finishing textiles	523	71.3	223.6	66.2	Mass., N. J., Pa., R. I.
Elec. machinery and apparatus	1,393	179.6	960.4	198.0	Ill., N. J., N. Y., Ohio, Pa.
Engines, turbines, tractors, etc.	149	22.0	99.9	26.8	Ill., Mich., Wis.
Fertilizers	670	17.4	140.3	10.9	Fla., Ga., Md., N. C., Va.
Flour, grain, mill products	2,193	26.4	853.2	27.1	Kans., Minn., N. Y.
Foundry and machine shop products	4,277	172.3	668.5	195.9	Ill., Mich., N. Y., Ohio, Pa.
Furniture	3,035	130.7	434.4	113.8	Ill., Ind., Mich., N. Y.
Gas mfg.—Illum., heating	520	19.7	345.9	27.6	Ill., N. J., N. Y., Pa.
Glass	213	67.1	283.9	71.4	Ind., Ohio, Pa., W. Va.
Iron, steel—Blast furnaces	72	15.1	374.6	18.9	Ill., Ind., Ohio, Pa.
Iron, steel—Steel works, rolling mills	396	359.6	1,931.3	439.6	Ill., Ind., Ohio, Pa.
Knit goods	1,852	219.7	606.7	184.4	N. Y., N. C., Pa.
Leather	384	50.8	308.7	55.6	Ill., Mass., N. J., N. Y., Pa.
Lumber, timber products	5,931	255.2	551.6	183.0	Ala., Ga., Miss., Wash., Oreg.
Machine tools	990	52.3	218.6	71.6	Conn., Mass., Ill., N. Y.
Meat packing (wholesale)	1,223	116.6	2,362.3	136.4	Ill., Iowa, Kans., N. Y.
Motor vehicles—Bodies, parts	825	240.7	1,550.9	328.3	Mich., Ohio
Motor vehicles (except cycles)	121	147.0	2,391.0	217.0	Mich., Ohio
Nonferrous metal alloys and products (not aluminum)	1,098	62.9	393.2	72.0	Conn., Ill., Mich., N. J., N. Y.
Oil cake, meal, cottonseed	458	13.2	187.8	5.9	Miss., Tex.
Oil cake, meal, linseed	31	3	116	16	Minn.
Paints, varnishes	1,082	27.6	416.2	32.1	Ill., N. J., N. Y., Ohio, Pa.
Paper, pulp products	591	103.3	711.7	110.2	Me., Mass., Mich., N. Y. Wis.
Petroleum refining	395	77.4	1,838.6	109.6	Calif., N. J., Tex.
Pottery	257	28.8	66.7	28.0	N. J., Ohio
Rayon	32	50.5	185.1	50.6	Pa., Va., Tenn.
Rubber goods (not tires or footwear)	412	40.3	178.4	39.3	Ohio, Pa.
Silk, rayon	1,105	125.9	355.2	95.4	N. J., N. Y., Pa.
Smelting, refining copper	26	16	802	78	Ariz., N. J.
Smelting, refining lead	18	6	228	25	Utah
Smelting, refining zinc	27	12	113	38	Ill., Pa.
Soap	238	13.9	239.1	15.3	Calif., Ill., N. Y., Ohio
Sugar, Beet	77	9.2	95.1	9.3	Calif., Colo., Idaho, Ohio, Mich., Utah
Sugar, Cane	18	13.8	377.2	13.9	N. Y., La., Pa., Calif,
Tires, tubes	42	57.1	446.0	78.2	Ohio, Pa.
Wire	77	23	202	75	Ill., Ind., Mass.
Woolen goods	323	64.9	246.9	60.4	Me., Mass., Pa.
Worsted goods	158	71.4	335.0	65.5	Mass., Pa., R. I.

WHEAT
(millions of bushels)

COUNTRIES	AMOUNTS
Producers	
U. S. S. R.	1,003
United States	617
India	351
Canada	302
France	313
Italy	267
Argentina	232
Germany	177
Australia	160
Exporters	
Canada	218.2
Argentina	137.6
Australia	112.1
United States	28.9
U. S. S. R.	21.8
Hungary	15.9
Importers	
United Kingdom	217.7
France	34.5
Belgium	43.4
China	27.9
Italy	19.2
Brazil	33.5
Germany	20.1
Netherlands	23.8
Japan	17.1

ZINC-SMELTER PRODUCTION
(thousands of metric tons)

COUNTRIES	AMOUNTS
United States	324.8
Belgium	157.5
Canada	111.6
Poland	87.5
Germany	84.9
Australia	62.0
France	50.1
Norway	43.5
United Kingdom	51.6

WATER POWER
(millions of horsepower)

COUNTRIES	DEVELOPED	POTENTIAL
United States	17.1	33.5
Canada	7.9	25.5
Italy	6.0	5.4
France	5.2	6.0
Japan	4.2	7.2
Germany	2.5	2.0
Norway	2.9	16.0
Switzerland	2.8	3.6
U. S. S. R.	1.4	78.0

FOREIGN TRADE OF THE UNITED STATES

Year	*Imports*	*Exports*
1910	1,556,947	1,744,985
1911	1,527,226	2,049,320
1912	1,653,265	2,204,322
1913	1,813,008	2,465,884
1914	1,893,926	2,364,579
1915	1,674,170	2,768,589
1916	2,391,635	5,482,641
1917	2,952,468	6,233,513
1918	3,031,213	6,149,088
1919	3,904,365	7,920,426
1920	5,278,481	8,228,016
1921	2,509,148	4,485,031
1922	3,112,747	3,831,777
1923	3,792,066	4,167,493
1924	3,609,963	4,590,984
1925	4,226,589	4,909,848
1926	4,430,888	4,808,660
1927	4,184,742	4,865,375
1928	4,091,444	5,128,356
1929	4,399,361	5,240,995
1930	3,060,908	3,843,181
1931	2,090,635	2,424,289
1932	1,322,774	1,611,016
1933	1,449,559	1,674,994
1934	1,655,055	2,132,800
1935	2,047,485	2,282,874
1936	2,422,592	2,455,978

MANUFACTURING BY STATES

STATES	NUMBER OF ESTABLISHMENTS	WAGE EARNERS	VALUE OF MFG. PRODUCTS (in millions of dollars)	WAGES PAID (in millions of dollars)
New England				
Maine	1,203	69,273	274.8	58.9
New Hampshire	788	54,212	209.3	48.3
Vermont	672	19,486	82.6	18.3
Massachusetts	8,316	442,649	2,095.3	445.8
Rhode Island	1,425	101,316	418.8	94.9
Connecticut	2,840	224,086	906.4	227.7
Middle Atlantic				
New York	33,638	895,991	6,094.3	1,017.2
New Jersey	7,468	377,078	2,439.4	397.1
Pennsylvania	13,050	841,234	4,291.8	848.6
East North Central				
Ohio	9,191	587,450	3,685.4	676.7
Indiana	3,964	254,113	1,672.6	265.6
Illinois	12,090	537,783	3,818.2	598.6
Michigan	5,592	535,864	4,020.9	697.3
Wisconsin	6,330	200,893	1,334.9	209.5
West North Central				
Minnesota	3,738	81,600	765.7	84.7
Iowa	2,512	59,230	586.0	59.0
Missouri	4,408	162,144	1,205.8	159.5
North Dakota	329	2,905	42.9	3.2
South Dakota	409	4,421	56.3	4.4
Nebraska	1,154	20,052	255.4	21.3
Kansas	1,508	34,295	468.6	36.5
South Atlantic				
Delaware	343	17,333	86.4	17.1
Maryland	2,697	119,675	757.8	111.4
District of Columbia	493	8,917	74.0	13.2
Virginia	2,283	121,867	719.8	96.5
West Virginia	1,045	77,550	373.3	80.3
North Carolina	2,632	229,534	1,111.9	152.0
South Carolina	1,137	109,842	300.9	67.5
Georgia	2,858	142,968	523.2	85.5
Florida	1,920	53,412	162.6	33.4
East South Central				
Kentucky	1,637	67,456	470.9	62.6
Tennessee	2,011	116,624	531.3	86.7
Alabama	1,730	97,710	364.3	64.8
Mississippi	1,062	36,852	121.9	19.9
West South Central				
Arkansas	1,072	30,511	122.4	18.9
Louisiana	1,622	62,864	436.2	46.4
Oklahoma	1,345	25,128	282.6	25.5
Texas	4,191	104,792	1,072.5	97.1
Mountain				
Montana	486	9,539	124.7	11.7
Idaho	459	10,537	67.5	11.9
Wyoming	212	4,243	45.2	5.7
Colorado	1,175	23,161	176.5	24.4
New Mexico	199	3,545	15.3	3.0
Arizona	279	4,965	55.9	5.3
Utah	543	11,524	115.9	11.1
Nevada	85	1,501	15.9	2.0
Pacific				
Washington	2,865	81,780	478.3	86.7
Oregon	1,722	52,216	265.4	53.0
California	10,383	246,223	2,159.4	275.3
United States—Total	169,111	7,378,344	45,757.40	7,542.00

United States Manufacturing by Groups of Related Industries

INDUSTRIAL GROUP	NUMBER OF ESTABLISHMENTS	NUMBER OF WORKERS (in thousands)	VALUE OF MFG. PRODUCTS (millions of dollars)	WAGES PAID (millions of dollars)
Food, kindred products	48,936	797.4	9,510.7	799.9
Textiles and their products	22 847	1,687.7	6,060.8	1,371.2
Forest products	16,127	579.0	1,662.2	438.4
Paper, paper products	2,945	235.6	1,523.2	235.7
Printing, publishing, etc.	22,606	304.8	2,165.0	446.4
Chemicals, allied products	7,419	276.4	2,837.3	285.9
Products of petroleum and coal	1,208	116.1	2,464.3	161.5
Rubber products	466	114.6	677.7	133.7
Leather, its manufactures	3,506	310.7	1,224.4	278.7
Stone, clay, glass	5,722	233.2	946.5	226.1
Iron and steel (not machinery)	6,441	775.9	4,265.3	877.9
Nonferrous metals (not aluminum)	5,411	214.9	1,668.6	232.6
Machinery (not transportation equipment)	11 778	790.6	3,816.3	913.3
Transportation equipment (air, land, water)	1,868	480.8	4,305.6	656.3
Railroad repair shops	675	155.3	420.1	206.3
Miscellaneous	11,156	305.2	2,211.7	280.3
Total (all groups)	169,111	7,378.2	45,235.40	7,468.80

TABULATIONS ON AGRICULTURE, HORTI-

TABLE I.

Crop	Soil	Planting Date	Seed to Acre	Normal Yield per Acre	Origin and Brief History	Use
Alfalfa *Medicago sativa* Linn. *Leguminosæ*	Deep, well-drained, nonacid, fertile, with deep, permeable subsoil	May–August, north March–May, Aug.-Oct. south	20–25 pounds broadcast 15–20 pounds drilled	4–5 tons	Is native to southwestern Asia and was in use centuries before Christian era. Spread from Media to Greece about 480 B.C., Italy first century A.D., Spain 8th century, Mexico and South America 16th century. Was introduced from Chile into California in 1854. Came from Mexico to Texas early part of 19th century	Stock feeding Pasture Soiling Soil improvement
Barley *Hordeum sativum* Jessen. *Gramineæ*	Old, well-subdued land, not soggy. Rich clay loam best	April–May north March–April, September–March, south	1.5–2.5 bushels	25 bushels	Supposed to be native of western Asia and widely grown before Christian era. Use as bread-plant universal throughout Europe, Asia and Africa to close of 15th century. Perhaps the most adaptable of all cereals to new environments	Malting purposes Hay and grain Food for domestic animals Human diet Malt-sprouts and brewers' grains are by-products A nurse crop
Buckwheat *Fagopyrum esculentum* Mœnch. *Polygonaceæ*	Rather light, well-drained and not over rich. Will grow on wide range, including poor land	May–July 15	3–5 pecks	18–20 bushels	Native of Europe and northern Asia. Has been cultivated for centuries in all grain-growing countries. Is found wild in China and Siberia and has been grown in China for food from time immemorial	Flour for human food Honey plant Grain for poultry Middlings a by-product for stock feeding Smother crop
Clover, Alsike *Trifolium hybridum* Linn. *Leguminosæ*	Deep clay loam. Will do well on moist and cool land	March–August	8–15 pounds alone 4–6 pounds on wheat or rye in spring	1.5 tons hay 4 bushels of seed	Takes its name from parish in South Sweden. From there probably introduced into England. Is found in Europe, northern Africa, western Asia. Reached America from Great Britain or Scandinavia	Hay Pasture Silage Honey plant Soil improvement
Clover, Crimson *Trifolium incarnatum* Linn. *Leguminosæ*	Warm, sandy, well-drained	March–October	15–20 pounds alone	1.5 tons hay 5–10 bushels of seed	Native to southern Europe. Introduced early into England and brought to America by colonists	Pasture Hay Soiling Soil improvement
Clover, Red *Trifolium pratense* Linn. *Leguminosæ*	Slightly alkaline medium clay loam, underlaid with moderately porous clay subsoil	March–August	15 pounds alone 8–14 pounds on small grain in spring	1.5 tons hay 3–6 bushels of seed	Probably native to Europe. Introduced into England early in 17th century. Doubtless introduced into America by early colonists	Hay Pasture Soiling Silage Soil improvement
Clover, White *Trifolium repens* Linn *Leguminosæ*	Light clay loam, slightly alkaline	March–August	10–12 pounds alone 2–4 pounds in mixtures	1.5 tons hay 2.5–6 bushels of seed	Indigenous to Europe, northern America and probably western Asia. Grown in every country in Europe and throughout America. Best in moderately cool, moist climate	Lawn grass Pasture Honey plant Short hay Soil improvement
Corn *Zea mays* Linn. *Gramineæ*	Fertile, medium loam	May–June north Late March, south	4–8 quarts 9–11 quarts for silage	20–35 bushels 8–12 tons silage	Originated in Mexico. Found in cultivation and principal food of Indians by first explorers of North America. Is related botanically to a native Mexican grass, teosinte (*Euchlæna mexicana*)	Human food Stock feeding Silage Grain for poultry For manufacture of glucose, dextrine, alcohol, starches, grits, hominies, oil, etc.
Cotton *Gossypium hirsutum* and *G. barbadense* *Malvaceæ*	Fertile clay or sandy loam, with a clay subsoil at a depth of about two feet	April–May 15	½–1 bushel	0.5–1 bale	Origin antedates recorded history. Supposed to have originated in India or possibly China. Found in various countries of southern Asia and Africa, and Columbus and other explorers found it native in West Indies, South America and Mexico. First cultivated in United States in colony of Virginia, 1621	Manufacture of cloth, thread and yarn Cottonseed oil Cottonseed meal, oil cake and hulls for stock feed Cellulose products, such as rayon, camera film, cellophane, explosives
Cowpea *Vigna unguiculata* Walp. *Leguminosæ*	Wide range, sandy and loamy soils preferred	May–June north May–July south	1–1.5 bushels 3 pecks for seed	1.5 tons 10 bushels of seed	Native of India and region northwestward to southern part of trans-Caspian district. Has been cultivated more than 2,000 years. Reached West Indies latter part of 17th century, and mainland of America later	Soil improvement Forage Seed food for man and domestic animals To fit land for sod Cover crop
Flax *Linum usitatissimum* Linn. *Linaceæ*	Moist, deep clay loam	May–June	2–4 pecks for seed 4–6 pecks for straw	10–20 bushels	Cultivated in prehistoric times; the chief fiber plant until replaced in the 19th century by cotton. Brought to the United States by the early colonists	Linseed oil Fiber (linen)
Lespedeza *Lespedeza striata* Hook. *Leguminosæ*	Moist clay or loam; very adaptable	March–April in south	10–20 pounds	2–3 tons	Long grown in China and Japan and rapidly spreading in southern United States	Hay Pasture Soil improvement
Mangels *Beta vulgaris* Linn. *Chenopodiaceæ*	Wide range, deep alkaline loam preferable. Good preparation of seed-bed essential	April–May	5–8 pounds	24 tons	Considered direct descendant of chard, used as vegetable by Greeks 300 B.C. Use of root for cattle feeding recorded in 16th century. Beets introduced in America by early colonists	Stock feed
Millet Many groups and varieties *Gramineæ*	Fertile, mellow clay loam	April–July	1–3 pecks drilled.	1.5 tons	Cultivated in China since 2800 B.C. Still largely grown in oriental countries as food grain and forage. In America, usually grown as supplementary or catch-crop	Hay. Forage Soiling. Silage Pasture Seed for stock feed

CULTURE AND ANIMAL HUSBANDRY

FIELD CROPS

Fertilizers	Plant Diseases and Enemies	Remedies	Bulletins*
Lime to correct acidity, well-rotted manure Commercial fertilizer containing phosphoric acid and potash	Dodder	Close cutting, removal of stalks, burning, close pasturing	Farmers' Bulletins Nos. 194, 215, 339, 373, 636, 637, 649, 741, 757, 865, 944, 982, 1021, 1094, 1185, 1229, 1283, 1467, 1528, 1539, 1630, 1642, 1722, 1731 Most experiment stations have issued bulletins
	Leaf spot	Mowing	
	Anthracnose	Mowing, and application of nitrate fertilizer	
	Root rot	Plowing under	
	Webworm, army worm, caterpillars, hoppers	Mowing, fall disking	
Barnyard manure 200–500 pounds of complete commercial fertilizer	Rust and mildew	No effective remedy	
	Closed smut	Formaldehyde treatment: 1 pint formaldehyde into 20 gallons water in barrel. Submerge sacks of barley 10 minutes in solution, then empty on platform to dry. Preferably, cover drying seeds with blanket for two hours	Wisconsin Experimental Station Reports Nos. 20, 21, 22, 23 Farmers' Buls. 968, 1464, 1599, 1732
	Loose smut	Hot water treatment, which is effective also against closed smut: Grain in gunny sacks submerged 12 hours in cold water; then drained 1 hour; then submerged in water at *constant* temperature of 130° F. for not over 6 minutes. Seed should be sown same or following day	Yearbooks of the U. S. Dept. Agr.
Fertilizer seldom needed Light applications barnyard manure or moderate dressing of complete fertilizer on poor soil. 100 pounds of low-grade fertilizers, especially if sown late	Relatively free from diseases and insects Birds may cause loss		Yearbooks of the U. S. Dept. Agr. Farmers' Bul. 1062 Cornell Bulletin No. 238
Lime Carbonate of lime Stable manures Commercial fertilizers containing potash and phosphoric acid	Clover failure	Lime and manure. The addition of potash may aid	U. S. Dept. Agr. Plant Industry Bulletins Nos. 31, 59, 66, 123 Farmers' Bulletins Nos. 123, 237, 260, 323, 676, 730, 737, 942, 971, 1151, 1215, 1365, 1484, 1510, 1741, 1770
	Flower midge	Feed off or mow first crop just before timothy heads out. Pasturing or clipping back to delay blooming 10 days useful	
	Seed fly	No practicable remedy known	
	Root borer	Crop rotation	
See alsike clover	See alsike clover	See alsike clover	See alsike clover. Farmers' Buls. 646, 1142, 1411
See alsike clover	See alsike clover	See alsike clover	See alsike clover Farmers' Buls. 455, 1339
See alsike clover	See alsike clover	See alsike clover	See alsike clover Farmers' Buls. 797, 820, 836, 1005, 1653
10–20 tons farm manure each year or two Phosphoric acid, nitrogen and potash Plow under large quantities of vegetable matter, preferably legumes and grasses	Root worm	Crop rotation and fall plowing	U. S. Dept. Agr. Office of Experiment Stations, Bulletin No. 57 Farmers' Bulletins Nos. 32, 41, 81, 174, 199, 229, 253, 292, 298, 303, 313, 317, 501, 537, 634, 729, 733, 773, 872, 875, 891, 915, 948, 950, 1025, 1029, 1046, 1124, 1149, 1175, 1176, 1236, 1294, 1310, 1548, 1562, 1595, 1634, 1651, 1662, 1681, 1701, 1714, 1715, 1744
	Webworm	Crop rotation and fall plowing	
	Cutworm	Early fall plowing. Sprinkling bran mixed with Paris green and molasses in proportion of 30 pounds bran, 1 pound Paris green, 2 quarts molasses, enough water to moisten the bran	
	Chinch bug	Trap in dusty furrows. Destroy in furrows by kerosene. Strip of coal tar will prevent passage	
	Grasshoppers		
Acid phosphate kainit Muriate of potash Nitrate of soda Cottonseed meal Barnyard manure	Crows. Smut	Burn affected plants and rotate crops	U. S. Dept. Agr. Office of Experiment Stations, Bulletin No. 33 Bureau Plant Industry Bulletin No. 62 Division of Statistics Bulletin No. 16 Yearbooks Farmers' Bulletins Nos. 36, 48, 217, 302, 314, 326, 625, 648, 733, 802, 831, 890, 1098, 1179, 1187, 1329, 1384, 1432, 1465, 1661, 1686, 1688, 1745, 1748
	Webworm and cotton-square borers	Dust with Paris green	
	Plant lice	Plow under host plants in fall or winter, or spray with whaleoil soap, kerosene emulsion or tobacco solution	
	Cutworms. Cotton worm	Place about fields bunches of grass immersed in Paris green; or destroy by winter cultivation	
	Cotton bollworm	Apply Paris green to plants	
	Mexican cotton boll weevil. Wilt	Mature crop early and destroy immediately all rubbish. Fumigate seed with carbon bisulphide before planting	
	Sore-shin or damping off	Plant disease-resistant seed; burn infested plants; rotate crops	
	Root knot	Lime and cultivate to keep surface mulch dry	
Acid phosphate 200–400 pounds and muriate of potash or kainit, 160 pounds per acre	Wilt	Bordeaux mixture. Iron variety practically immune	U. S. Dept. Agr. Bureau of Plant Industry, Bulletin No. 25 U. S. Dept. Agr. Agrostology Bulletin No. 64, Circular No. 24
	Mildew and leaf spot	Seldom extensive damage	Farmers' Buls. 1148, 1153, 1308 Most experiment stations have issued bulletins
	Nematode worms	Iron variety practically immune	
Barnyard manure Straw from threshing	Flax wilt	Clean seed and spray with formalin solution	Farmers' Buls. 669, 785, 1328, 1650, 1728, 1747
	Flax rust	Use of resistant varieties	
Rich soils generally used	Little affected	Little affected	Farmers' Buls. 1143, 1724
10–12 tons manure in fall 300–500 lbs. fertilizer rich in nitrogen	See sugar beet	See sugar beet	New York (Cornell) Bulletins Nos. 243, 244 See sugar beet
Manures to be determined by local needs	Smut	Formaldehyde or hot water treatments. See under barley	Farmers' Bulletins Nos. 168, 793, 1162 Division of Botany Bulletin No. 23 Kentucky Experiment Station Bulletin No. 98 Kansas Bulletin No. 102
Requires plant food near surface	Chinch bug	Crop rotation. See under oats	

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*The bulletins herewith mentioned may be had upon application to the director of the respective agricultural experiment station or college publishing the same, or to the United States Department of Agriculture. The older publications, often out of print, may be consulted at libraries.

TABLE I. FIELD

Crop	Soil	Planting Date	Seed to Acre	Normal Yield per Acre	Origin and Brief History	Use
Oats *Avena sativa* Linn. *Gramineæ*	Not specially fertile. Clay loam preferable	April–May north February–March, September–December south	2–3 bushels	30–45 bushels	Probable nativity Tartary in western Asia, or possibly eastern Europe. Largely north temperate zone crop, but grown in Australia, Africa and South America. Has been cultivated in America since advent of first settlers	Food for animals Human food Forage crop Pasture
Rice *Oryza sativa* Linn. *Gramineæ*	Rich, moist, well-drained clay loam	March 15–June 15	55–80 pounds	25–30 bushels	Existed in India in early historic times, and doubtless indigenous there. Introduced into America soon after settlement of Virginia. Introduced accidentally into lower Carolina in 1694	Human food Stock feed Starch Wine
Rye *Secale cereale* Linn. *Gramineæ*	Light, with little clay Well-drained, will grow on poor soil	April–May or September–November	3–4 pecks, early 6–8 pecks, late	15.7 bushels 1 ton of straw	Original home was between Austrian Alps and Caspian Sea. Culture more than 2,000 years old. Seems to be of decreasing importance	Grain for animal and human food Fall pasture Soiling Cover-crop and green manure Flour Alcoholic liquors
Sorghum *Sorghum vulgare* Pers. *Gramineæ*	Rich, well-drained, sandy or clay loam	March–June	1.5–2 bushels broadcast 6 pounds to 0.5 bushel for silage drilled	3–6 tons fodder 8–20 tons green forage	Originated in tropical or subtropical regions of old world, and in cultivation as human food for many centuries, long before Christian era. Tropical Africa generally considered birthplace	Pasture for hogs Hay Fodder Silage Sirup
Soybean *Glycine hispida* Maxim. *Leguminosæ*	Well-drained sandy, loam or clay soil	May–June	2–3 pecks in drills 1–1.5 bushels broadcast	12–20 bushels	Native of southeastern Asia. Thought to be derived from wild *Glycine soja* of Japan. Grown extensively in China and Japan	Animal grain feed Silage Soiling Hay Cover-crop and soil improvement Human food
Sugar Beet *Beta vulgaris* Moq. *Chenopodiaceæ*	Clay loam, or medium light sandy loam.	May, north January–May south	8–12 pounds	11.5 tons	Known at least 3 centuries before Christian era. Sugar first extracted about middle of 18th century by Marggraf. First attempt to grow beets for sugar in U. S. in 1830	Stock feeding Sugar manufacture
Sugar Cane *Saccharum officinarum* Linn. *Gramineæ*	Well-drained soil of good average character	March 21–May 20	4 tons of cane	8–25 tons	Origin lost in antiquity. Cultivation probably among first undertaken by tropical peoples. Early use almost exclusively for eating raw. As source of sugar it stood practically alone until beginning of last century	Manufacture of sugar and molasses
Timothy *Phleum pratense* Linn. *Gramineæ*	Deep clay loam, moist and fertile	March–October	8–16 pounds; with clover 10 pounds	1.5 tons	Native of Europe and extensively cultivated in cooler parts of North America as a forage plant. Introduced to America from England in 1720	Hay Pasture
Tobacco *Nicotiana tabacum* Linn. *Solanaceæ*	Rich, friable sandy loam in seed-bed, well fertilized each spring with fertilizer containing ammonia, phosphoric acid and potash	February 1 to March 1 in seed-bed April–June in field	1 tablespoonful to 100 square yards of seed-bed, to set out 6 acres	800–1,000 pounds	Of American origin. Pipes and other means for smoking tobacco were found in prehistoric mounds of the United States, Mexico and Peru. Columbus found natives using tobacco for smoking, chewing and snuff. In 1558, Jean Nicot, French ambassador to Portugal, sent a supply of tobacco seed to Queen Catherine de' Medici	Disinfectant Smoking and chewing purposes Stalks for making of paper
Vetch *Vicia* spp. *Leguminosæ*	Wide range Used on poor sandy or gravelly soils to improve them Prefers moist clay loam	April–June September–December	1 bushel	1.5–3 tons	Common spring vetch is native in Europe and western Asia. Was cultivated by Romans. Reached America 100 years ago	Cover-crop Stock feed Soil improvement Pasture
Wheat *Triticum sativum* Lam. *Gramineæ*	Light clay and glacial drift soils	September–October (winter wheat) April–May (spring wheat)	6–8 pecks	15–25 bushels.	Wheat cultivation antedates recorded history. Monuments more ancient than Hebrew scriptures depict its cultivation established. Chinese grew wheat 2700 B.C. Cultivation in America prior to discovery by Columbus not known	Flour for human food Grain for stock feeding Straw Bran, shorts and middlings are by-products for stock-feeding

TABLE II. ORCHARD

Crop	Climate	Soil	Planting Time, Plants or Seed per Acre	Diseases	Remedies
Apple *Pyrus malus* Linn. *Rosaceæ*	Temperate	Clay loam to sandy loams, with variety preferences	Fall or spring, fall preferable.—27–33	Scab	Spray thoroughly with lime-sulphur, 1–40, or Bordeaux, 3–3–50, 3 times: (1) Just before blossoms open, (2) just as blossoms fall, (3) 10–14 days after blossoms fall
				Fire blight	Cut out and destroy diseased parts. Wash wound with corrosive sublimate 1 part to 1,000 of water. Paint wound with gas tar or lead paint
				N. Y. apple tree canker	Spray before buds start with lime-sulphur, 1–12, or Bordeaux, 10–10–50; soak body and limbs when making first application for scab. Cut out cankers and treat wound as for fire-blight

CROPS—Concluded

Fertilizers	Plant Diseases and Enemies	Remedies	Bulletins
Fertilizers must be used sparingly Barnyard manure, 10–25 loads per acre on poor soils Fertilizer containing 10–20 pounds each of ammonia and potash, and 30–60 pounds of phosphoric acid per acre	Closed and loose smut	Formaldehyde or hot water treatments of seed. See under barley	Farmers' Bulletins Nos. 250, 395, 420, 424, 892, 1119, 1581, 1583, 1611, 1640, 1659 Ohio Experiment Station Bulletins Nos. 101, 138 Kansas State Bd. Agr. 14th Report
	Orange leaf rust	Plant resistant and early maturing varieties	
	Black stem rust		
	Chinch bugs	Plow furrow to prevent spread. Scatter tar in furrow. In extreme cases burn one field to save another.	
	Army worms		
Rich soils generally used	Rice weevil	Carbon bisulphide	Farmers' Bulletins 110, 673, 688, 1086, 1092, 1141, 1195, 1212, 1420, 1543 U. S. Dept. Agr. Office of Experiment Station Bulletin No. 113 Louisiana Experiment Station Bulletins
	Rice worm	Draw off water and allow field to dry for few days	
	Rice grub	Water	
	Chinch bug	Thorough flooding	
	White blast	Application of lime to soil	
	Smut	See under barley	
250 pounds per acre of dissolved phosphate rock	Black rust of stems	Burn infested stubble—rotate crops	Pennsylvania Agr. Experiment Station Bulletin No. 52 U. S. Dept. Agr. Yearbooks Farmers' Buls. 756, 894, 1358, 1540, 1607
	Orange rust of leaves		
	Smut	Formaldehyde or hot water treatment. See under barley	
	Ergot	Clean seed on clean land	
	Chinch bug	Burn rubbish nearby. Rotate crops. Plow deep trenches and use tar strips	
	Hessian fly	Resistant varieties, late seeding, burning stubble, sowing early wheat trap crop	
Barnyard manure and leguminous green manures	Grain smut	Rotation and seed selection. Hot water and formaldehyde treatments. See under barley	Farmers' Bulletins Nos. 37, 50, 90, 135, 174, 246, 288, 686, 724, 827, 965, 972, 1137, 1158, 1389, 1566, 1577, 1619, 1764. Bureau of Chemistry Bulletins Nos. 14, 20, 26, 34
	Whole-head smut		
	Chinch bugs and green aphis	Seldom serious. Avoid continuous cropping on same area	
200–300 pounds highgrade acid phosphate. 50 pounds muriate or sulphate of potash per acre	Sclerotium	Fatal	Farmers' Bulletins Nos. 58, 121, 372, 886, 931, 973, 1520, 1605, 1617 Many state experiment station bulletins
	Nematode root worms		
	Rabbits	No treatment	
	Grasshoppers	Not specially serious	
	Reddish-brown hairy caterpillar		
Green fertilizers, generally alfalfa Stable manures Complete commercial fertilizers	Leaf spot	Bordeaux mixture and crop rotation	Division of Entomology Bulletins Nos. 19, 23, 29, 33, 40, 43 Bureau of Chemistry Bulletins Nos. 27, 96 Farmers' Bulletins Nos. 52, 92, 772, 1248, 1514, 1637, 1645, 1718
	Curly top	Seldom occurs in two successive seasons in same locality	
	About 150 insect enemies	See entomology bulletins in next column	
Stable manure Nitrogenous fertilizers, dried blood, fish refuse in small quantities Lime extensively	Root diseases, rind disease, sereh, pineapple disease, red top, top rot, smut, rust	Burn over, use quicklime as soil fungicide	Bulletins of Hawaiian Sugar Planters Experiment Station, Louisiana, Cuba and Puerto Rico Experiment Stations Farmers' Bul. 1034
	Rats	Burn over or poison. Mongoose will destroy	
	Borers	Hand pick, rotate crops, use trap crops, or rest land	
	Innumerable insects	Fought by introduction of parasites	
	Parasitic nematodes on roots	Expose soil to air and sunlight	
Top dressing with barnyard manure and complete fertilizer	Rust		Farmers' Bulletins 111, 677, 838, 946, 956, 977, 987, 990, 1720 Division of Agrostology, U. S. Dept. Agr., Bulletins Nos. 7, 14, 17, 20
	Grasshoppers		
In field, 1,000 pounds cottonseed, 1,000 pounds cottonseed meal, 300 pounds carbonate of potash, 700 pounds fine ground bone, and 800 pounds of lime to acre Cow manure at rate of 20–25 loads per acre	Root rot	Sterilize soil with heat or formalin before seed sown	Farmers' Bulletins Nos. 60, 82, 83, 120, 343, 416, 571, 819, 846, 867, 996, 1352, 1356, 1489, 1494, 1531, 1580, 1629. Plant Industry Bulletin Nos. 18, 51, 91, 96 Bulletins from experiment stations, particularly Connecticut, Maryland, North Carolina, Kentucky
	Sore skin	Lime	
	Wilt	Plant disease-resistant seed; burn infected plants; crop rotation	
	Angular leaf spot	Grow vigorous plants	
	Pole burn	Apply heat carefully and ventilate sheds to reduce humidity	
	Flea beetle and hornworm	Light spray of Paris green, 1 pound Paris green, 1 pound quicklime, 100 gallons water, stirred constantly while in use	
	Tobacco worm	Dust or spray with Paris green, 1 pound to 160 gallons water	
	Cutworms	Sow along rows bran and Paris green, 1 pound Paris green, 50 pounds bran	
	Bud worm	Hand pick or dust or spray with Paris green	
Seldom needed. On poor land, complete fertilizer, and especially phosphoric acid and potash, may be required			Farmers' Bulletins Nos. 18, 102, 147, 515, 967, 1206, 1740 Division of Agrostology Circular No. 6 Alabama Experiment Station Bulletins
Barnyard manure Complete commercial fertilizer 200–400 pounds of a 4-12-4 fertilizer commonly used	Hessian fly	Late seeding, burning stubble	Farmers' Bulletins Nos. 132, 250, 616, 640, 678, 680, 732, 833, 855, 885, 895, 1006, 1041, 1047, 1058, 1063, 1213, 1224, 1226, 1280, 1281, 1301, 1303, 1304, 1305, 1323, 1340, 1414, 1440, 1540, 1545, 1585, 1599, 1607, 1621, 1706, 1707, 1708, 1711 U. S. Dept. Agr. Division of Physiology and Pathology Nos. 16, 24, 29 Plant Industry Bulletins
	Chinch bug	Clean tillage, crop rotation	
	Rust	Plant resistant varieties	
	Loose smut	No satisfactory treatment	
	Stinking smut or bunt	Formalin, 1 pound to 50 gallons water. Sprinkle the wheat and cover with cloths soaked in the solution, or immerse the sacks 30 minutes; or blue stone, 1 pound to 5 gallons water. Immerse sacks 10 minutes, then drain and dry. Apply the solution to all utensils and machinery used	

AND GARDEN CROPS

Insect and Other Enemies	Insecticides and Remedies	Time to Bear	Yield per Acre	Bulletins on Culture
Bud moth	Applications of either 1 lb. Paris green or 4 lbs. arsenate of lead in 100 gals. water (1) when leaf tips appear and (2) just before blossoms open	3–6 years from planting. Good crop in 10–15 years	Tree 30 years old 20–30 bus.	Cornell Bul. 272 Geneva Buls. 163 and 185 Cornell Buls. 93, 124, 143 Geneva Buls. 262, 296, 306, 320 Geneva Circular 9 Farmers' Buls. 938, 1065, 1080, 1160, 1270, 1284, 1360, 1380, 1457, 1478, 1479, 1687, 1695, 1752
Canker worms	Spray once or twice before blossoms open with 1 lb. Paris green, or 4 lbs. arsenate of lead in 100 gals. water. Repeat after blossoms fall. Use sticky bands or wirescreen traps to prevent ascent of wingless females			
Codling moth	Use burlap bags on trunk, and kill caterpillars under them every 10 days from July 1 to Aug. 1, and once later			
Oyster-shell scale	Spray with kerosene emulsion diluted with 6 parts of water or whale-oil soap, 1 lb. to 4 or 5 gals. water, in May or June when young white lice appear			

TABLE II. ORCHARD AND

Crop	Climate	Soil	Planting Time, Plants or Seed per Acre	Diseases	Remedies
Apricot *Prunus Armeniaca* Linn. *Rosaceæ*	Temperate; sheltered from frosts	Deep, dry loam; loose subsoil	Spring—120–140	Shot-hole fungus	Regular application of standard fungicides containing copper
Asparagus *Asparagus officinalis* Linn. *Liliaceæ*	Temperate	Warm, well-drained loam, deep, rich, fertile and moist	Early spring, April preferable for seed.—5,445–14,520. 1 oz. of seed to 400 plants. Rows 8 ft. apart, plants 1 ft. in row; or rows 4 ft. apart, plants 2 ft. in rows, 5,445. Rows 2 ft. apart, plants 18 inches in row, 14,520	Rust	During cutting season, permit no plants to mature. Fertilize liberally and cultivate thoroughly. Late in the fall burn all infected plants. Spray with Bordeaux, 5–5–50, containing a sticker of resin, sal soda, soap. Spray when shoots are 8–10 inches high after cutting, and repeat once or twice a week
Beans (bush) *Phaseolus vulgaris* *Leguminosæ*	Warm temperate	Good warm loam	May–June—1 qt. of seed to 100 ft. of drill. In drills 2 ft. apart plants 12 inches in row. In hills, 18x20 inches, 3 plants per hill	Anthracnose or red spot	Plant clean seed Hand spray with Bordeaux mixture, 5–5–50, (1) when plants break through ground, (2) when first pair of leaves are expanded, (3) when pods have set
Beans (lima) *Phaseolis lunatus* *Leguminosæ*	Warm temperate	Warm, very rich loam	See Beans (pole). 45–60 lbs. per acre	See Beans (pole)	See Beans (pole)
Beans (pole) *Phaseolus vulgaris* *Leguminosæ*	Warm temperate	Warm fertile soil	Late spring, after danger of frost. After ground becomes warm.—1 qt. seed to 200 hills. Hills 4x4 ft., one plant per hill. Should be at least 5 plants per pole	Blight	Spray with Bordeaux as for anthracnose
Beets *Beta vulgaris* Linn. *Chenopodiaceæ*	Temperate	Loose, light, fresh, clean rich soil	April–June—Seed 5–6 lbs. per acre. In drills 12x6 inches	Scab, rust, rot, spot diseases	Avoid following potatoes with beets. Practice clean culture and proper rotations. Spray with Bordeaux mixture for leaf diseases
Blackberry *Rubus nigrobaccus* Bailey *Rosaceæ*	North temperate. Cool, northern exposure	Strong loam, retentive of moisture and tending toward clay	Spring preferably, or fall—900–1550	Anthracnose and leaf rust	Cut out bearing canes as soon as they are through fruiting
				Orange rust	Dig up and burn infected bushes as soon as detected
Cabbage *Brassica oleracea* Linn. *Cruciferæ*	Cool, moist climate	Well-drained, rich, friable loam	April–May to June–July—7,000–20,000. 1 oz. seed to 3,500 plants	Club root or club foot	Practice crop rotation. Set only healthy plants. Do not use manure containing cabbage refuse. Lime the seed bed at least as early as fall before
				Black rot	Practice crop rotation. Soak seed 15 minutes in solution made by dissolving one corrosive sublimate tablet in pint of water
Cauliflower *Brassica oleracea* Linn. var. *botrytis* D. C. *Cruciferæ*	Temperate, cool and moist	Richest land, strong, moist loam best	April–July in seed bed. July in field.—7,000–10,000. 1 oz. seed to 3,000 plants	Same as cabbage	See cabbage
Celery *Apium graveolens* Linn. *Umbelliferæ*	Temperate	Moist peaty soil or muck; any highly fertilized land	January–April in seed bed. May–August in field—20,000–30,000. 1 oz. seed to 10,000 plants.	Cerospora or early blight	Spray with ammoniacal copper carbonate, 6–3–45, making 5 to 8 applications. Begin while still in seed bed. Bordeaux 5–5–50 may be used for earlier application
				Septoria or late blight	Same treatment as for early blight, but continue till harvest
Cherry *Prunus avium* and *Prunus cerasus* Linn. *Rosaceæ*	*Sweet* 39–44° latitude *Sour* 35–45° latitude	Elevated, light, dry, loamy, retentive soil	Spring or fall—Sweet 48, sour 134	Brown rot	Plant resistant varieties. Prune trees to let in sunlight and air. Spray with self-boiled lime-sulphur, 8–8–50, to which add 2 lbs. arsenate of lead to 50 gals. Spray (1) about time young fruit sets, (2) 2–3 weeks later, (3) 1 month before fruit ripens, omitting the arsenate
				Black knot	Cut out and burn all knots before leaves appear
				Leaf spot; powdery mildew	Spray with lime-sulphur or Bordeaux. Dust with sulphur or spray with potassium sulphide, 1 oz. to 3 gals. water, or lime-sulphur as for leaf spot
Corn, Sweet *Zea saccharata* Sturt. *Gramineæ*	Temperate	Warm rich loam	May 15–June 15. — 14,000 hills with 2–4 seed in each	Smut	Destruction of infected plants. No chemical remedy known
				Yellow wilt	Destruction of infected plants. No chemical remedy known
Cucumber *Cucumis sativus* *Cucurbitaceæ*	Temperate	Warm, sandy, well-fertilized	May 15–June 1 in field; hothouse forcing is common.—2,400 hills, 3 plants to hill	Blight	Spray with Bordeaux; 3 or 4 applications to keep protected until plants mature
Currant *Ribes rubrum* Linn. *Saxifragaceæ*	Cool temperate climate	Cool, moist and rich soil	Fall or spring—2,178	Cane blight or wilt	Begin when plants are small, go over 3 or 4 times every summer and cut out and burn all diseased canes
				Leaf spot and anthracnose	Upon first appearance of currant worms spray with Bordeaux and Paris green, 1 lb. to 100 gals., or arsenate of lead, 4 lbs. to 100 gals. Repeat if second brood of worms appears
Gooseberry *Ribes* spp. *Saxifragaceæ*	Cool and shady north temperate	Moist, but not soggy, clay loams. Rich, cool, bottom lands	Fall or early spring—2,178	Powdery mildew	Cut away drooping branches. Keep ground free from weeds. Spray with potassium sulphide, 1 oz. to 2 gals. Commence when buds are breaking and repeat every 7 to 10 days until fruit is gathered
Grape *Vitis* spp. *Vitaceæ*	Warm. The location must provide frost drainage	Gravel or clay	In spring. Completed by last of May—605	Black rot	Remove all mummies and diseased leaves. Rake all refuse into furrows and cover. Use surface cultivation and keep down weeds and grass. Keep vines well sprouted. Spray with Bordeaux, 4–4–50, till middle of July, after that with ammoniacal copper carbonate. Spray first when third leaf shows. Foliage should be protected by coating of spray *before* every rain. Make 4 applications of Bordeaux, 50 to 60 gals. of spray to acre.
				Downy mildew	Apply Bordeaux as for black rot.
Lettuce *Lactuca sativa* Linn. *Compositæ*	Cool temperate	Open, loose rich loam	April–June or Aug.–Sept.—1 oz. seed to 3,000 plants. Rows 2 ft. apart, plants 1 ft. in row equals 21,780 plants	Rot or drop	Steam sterilization of soil to depth of 2 inches or more; or use fresh soil for every crop
Muskmelon *Cucumis melo.* Linn. *Cucurbitaceæ*	Hot, bright temperate climate	Light and quick warm soil. Sandy loam	May–June—1 oz. seed to 50 hills. Plants 6x6 ft. (preferable). Plants 5x5 ft.	Downy mildew	No effective method of control
				Wilt	Spray with Bordeaux, 5–5–50. Gather and destroy all wilted leaves and plants

GARDEN CROPS—Continued

Insect and Other Enemies	Insecticides and Remedies	Time to Bear	Yield per Acre	Bulletins on Culture
Curculio	Spray with 2 lb. arsenate of lead mixed with 50 gals. self-boiled lime-sulphur. Apply 2 and 4 weeks after petals fall	3 years	5–10 tons	California Buls. Also see Plum
Asparagus beetle	Chickens and ducks will destroy Close cutting of young shoots early in season Use fresh air-slacked lime or arsenites dusted on dew-wet plants after cutting period	Seed 3–4 years. Plants 1–3 years	2000 bunches of 3½ in. diameter	Geneva Buls. 75, 188 California Buls. 165 and 172 New Jersey Reports 1896, 1898 Farmers' Buls. 61, 1646 Massachusetts Bul. 61 Iowa Bul. 53 Missouri Bul. 34
Weevil	Use bisulphide of carbon as for pea bug	45–65 days from seed	75–120 bus.	Cornell Bul. 239 New Jersey Bul. 151 Geneva Bul. 48 See Beans (pole)
Japanese beetle Mexican beetle	See Beans (pole)			
Weevil	Use bisulphide of carbon as for pea bug	65–70 days from seed	75–100 bus. dry beans	See Beans (pole)
Japanese beetle Mexican beetle	See Beans (pole)			
Japanese beetle Mexican beetle	Acid lead arsenate spray; metal traps; parasitic wasps	70–90 days from seed	75–125 bus.	Cornell Buls. 87, 115 New Hampshire Bul. 62 Farmers' Buls. 1074, 1275, 1276, 1407, 1509, 1624, 1692
Not often damaged by insects. Flea beetles occasionally attack	Spray if required with Bordeaux mixture, Paris green or arsenate of lead	65–150 days	400–700 bus.	Cornell Bul. 163 Farmers' Bul. 618
Sawfly	Spray with Paris green or arsenate of lead, or apply hellebore	1 year. Good crops in 2 and 3 years	50–200 bus.	Cornell Bul. 99 Central Experimental Farm, Ottawa, Can., Bul. 56 Farmers' Buls. 643, 1399, 1488
Cane borer	In midsummer cut off and destroy the drooping tips			
Cabbage worm	If plants not heading, spray with kerosene emulsion or Paris green to which sticker has been added. If heading, apply hellebore	90–150 days	7,500 heads	New Jersey Bul. 98 Geneva Buls. 232, 251, 302 Cornell Bul. 78 Farmers' Buls. 433, 925, 1351, 1423, 1439, 1461
Cabbage aphis	Before plants begin to head spray with kerosene emulsion diluted with 6 parts water; whale-oil soap, 1 lb. in 6 gals. water; or one of tobacco extracts			
Same as Cabbage	See cabbage	110 days from seed	125–200 barrels, 18–30 heads per barrel	See cabbage
No widespread or serious insect pests		120–150 days	120–160 crates	Cornell Bul. 132 Michigan Bul. 102 Geneva Bul. 51 Farmers' Bul. 1269
Aphis	Spray with kerosene emulsion diluted with 6 parts of water or with one of tobacco extracts	3 years. Commercial crops 4–6 years according to variety	2½ tons	Cornell Buls. 81, 98, 235 Geneva Bul. 98 U. S. Dept. Agr. Bureau of Entomology Circular 120 Farmers' Buls. 776, 1053
Plum curculio	Spray just after blossoms fall with arsenate of lead, 6–8 lbs. in 100 gals. water and repeat in about a week. After fruit has set, jar trees daily over sheet or curculio catcher			
San José scale	See apple			
Over 200 known insects attack corn	Crop rotation and shallow fall plowing check spread of pests	60–90 days	3–4 tons	Farmers' Buls. 1236, 1634 See Corn under Field Crops
Ear-worm and cut-worm are most abundant	Spraying each week after silk shows with dust of 50–50 arsenate of lead and lime			
Cucumber striped beetle	Strong arsenate of lead spray; or dust with flour containing 1 teaspoon Paris green to each 2 lb.	7–8 weeks	50,000–100,000 cucumbers	Farmers' Buls. 1038, 1320, 1322, 1563, 1620
Currant worm	When worms first appear, spray with 1 lb. Paris green or 4 lbs. arsenate of lead in 100 gals. of water. Ordinarily the poison should be combined with Bordeaux. After fruit is half-grown use hellebore	1 year. Good crops in 2 and 3 years	100 bus.	Geneva Buls. 167, 199 Iowa Bul. 30 Farmers' Buls. 1024, 1398
Currant worm	See currant	1 year. Good crops in 2 and 3 years	100 bus.	Geneva Buls. 114, 133, 161 See currant
Steely beetle or flea beetle	When buds begin to swell, cover with arsenate of lead, 8 lbs. in 100 gals. of water. To kill larvae add 1 lb. Paris green or 4 lbs. arsenate of lead to every 100 gals. of Bordeaux mixture	Fair crop in 4 years	3–5 tons	Cornell Buls. 157, 208, 224, 235, 254, 266 Farmers' Buls. 471, 1220, 1454, 1558, 1689
Root worm	Spray latter part of June with 6 lbs. arsenate of lead in 100 gals. water. Repeat in 7 to 10 days. Cultivate thoroughly in June, close to vines, to kill pupae			
Leaf hopper	Spray underside of leaves with whale-oil soap, 1 lb. in 10 gals. water, about July 1. Repeat in a week or 10 days			
Rose chafer	Spray with 10 lbs. arsenate of lead in 100 gals. water			
Little troubled by insects		65 days from seed	400–800 half-bushel baskets, 600 baskets good average	Massachusetts Bul. 69 Farmers' Buls. 1418. 1609
Striped cucumber beetle	Plant early squashes as trap crop. Spray with Bordeaux. Dust with tobacco dust or snuff, or land plaster with a little kerosene or turpentine	120–140 days from seed	3,000–7,000 melons	Cornell Bul. 95 Farmers' Buls. 1145, 1468
Aphis	Spray with kerosene emulsion diluted with 6 parts water or use one of tobacco extracts. Burn vines after harvest, and keep down weeds			

TABLE II. ORCHARD AND

Crop	Climate	Soil	Planting Time, Plants or Seed per Acre	Diseases	Remedies
Onion *Allium cepa* Linn. *Liliaceæ*	Temperate	A rich, moist, but not wet, loam with subsoil of clay	April–May—1 oz. to 100 ft. of drill. 4–5 lbs. per acre. In drills, 14–20 in. apart, seed 5–6 lbs.; sets 6–12 bus.	Mildew Smut	Spray with Bordeaux, 5–5–50, when plants show 3 leaves. Repeat every 10 days till harvest Crop rotation. Drill into rows when planting seed, 100 lbs. sulphur and 50 lbs. air-slacked lime to acre
Pea (garden) *Pisum sativum* Linn. *Leguminosæ*	Temperate	Rich, friable soil, not over-rich in nitrogen	April–May or July–Aug.—1 quart of seed to 100 ft. of drill, or 2 bus. per acre. Dwarf 12x1 in.; tall, double rows 3 ft. apart	Powdery mildew	Fungicidal spray
Peach *Prunus persica* Sieb. & Zucc. *Rosaceæ*	Warm and sunny. In north near body of water	Light and sandy loam	Spring preferable—134	The yellows Leaf curl Brown rot	Dig out and burn diseased trees as soon as discovered Spray trees once *before buds swell* with Bordeaux, 5–5–50, or lime-sulphur mixtures used for San José scale Plant resistant varieties. Prune trees to let in air and sunlight. Thin fruit well. Spray with self-boiled lime-sulphur, 8–8–50, and arsenate of lead 2 lbs. to 50 gals. water. Spray (1) when shucks are shedding from young fruit, (2) 2 to 3 weeks later, (3) 1 month before fruit ripens, omitting the arsenate
Pear *Pyrus communis* Linn. *Rosaceæ*	Temperate. Best near large bodies of water	Strong loam of moderate depth overlying a porous subsoil	Spring or fall—48–108 standard plants. 193 dwarf plants	Fire blight Scab	Prune out blighted branches, cutting 6 to 8 inches below diseased part. Disinfect with corrosive sublimate solution, 1 to 1,000. Clean out limb and body cankers. Disinfect all large wounds and cover with coat of paint or gas tar. Plant resistant varieties Spray three times with lime-sulphur, 1–50, or Bordeaux, 3–3–50, as for apple scab
Plum *Prunus domestica* Linn. *Rosaceæ*	Temperate	Clay loam. Some varieties on light moist soils	Spring or fall—108–134	Black knot Brown rot Leaf spot	Cut out and burn all knots before leaves appear in spring See peach Two or three applications of self-boiled lime-sulphur or Bordeaux, 3–3–50. First application about 10 days after blossoms fall Japan plums should not be sprayed with Bordeaux
Potato *Solanum tuberosum* Linn. *Solanaceæ*	Moist, cloudy climate. Sensitive to frost	Warm, rich, sandy or loamy soil	March–May—8–10 bus. seed. Early, rows 18 in. apart; late, 3 ft. x 18 in. or 3 ft. x 3 ft.	Blight and rot Scab	Spray with Bordeaux, 5–5–50. Commence when plants are 6 to 8 in. high and repeat every 10 to 14 days during season. Use 40 to 100 gals. per acre each application Treat tubers before cutting by soaking in formalin solution, 1 pint to 30 gals. water, for 2 hours, or in corrosive sublimate, 1 oz. to 7 gals., for 1½ hours. Plant in clean soil
Quince *Cydonia vulgaris* Pers. *Rosaceæ*	Temperate	Heavy, moist, retentive clay loam, well-drained	Spring or fall—200	Leaf and fruit spot	Spray three times with Bordeaux as for apple and pear scab
Radish *Raphanus sativus* Linn. *Cruciferæ*	North temperate	Rich, light, loose; one that drains rapidly	March–Sept.—1 oz. seed to 100 ft. of drill. Rows, in garden, 12–18 in. apart	Relatively free from diseases	
Raspberry *Rubus strigosus* Michx. (red) *R. occidentalie.* Linn. (black) *Rosaceæ*	Cool temperate	Deep, moist soil. Lighter loams for red, heavier loams for black	Fall or spring, the latter preferable for black-caps—Black 2,420; red, 2,904.	Anthracnose Cane blight or wilt Red rust	Remove all old canes and diseased new ones as soon as fruit is gathered. Spray with Bordeaux, 5–5–50, when new canes are 6 to 8 inches high and follow with two more at intervals of 10 to 14 days No successful treatment known. For new settings use only plants from healthy plantations Dig up and destroy infected plants
Spinach *Spinacia oleracea* Linn. *Chenopodiaceæ*	Cool season plant. Grown in fall and spring	Abundance of available plant-food, particularly nitrogen. Any good soil	March and Aug.–Sept.—1 oz. seed to 100 ft. drill or 10–12 lbs. per acre; rows 12–15 in. apart	Mildew, anthracnose, leaf blight	Burn all affected parts. Practice crop rotation. Treat soil with mixture of flowers of sulphur and air-slacked lime
Squash *Cucurbita pepo*, var. *Conensa* Linn. *Cucurbetaceæ*	Temperate	Warm and quick soil. Sandy loams best	Summer, April–May; winter, May–June—1 oz. seed for 25 hills, or 4 lbs. per acre. Summer, hills 4x4 ft.; winter, hills 8x10 ft.	Mildews	Bordeaux mixture or ammoniacal carbonate of copper
Strawberry *Fragaria chiloensis*, var. *ananassa* *Rosaceæ*	Cool season plant	Rich, rather moist, sandy soil	Aug. or spring—10,000 to 14,000	Leaf spot, rust, or leaf blight	In setting new plantations, remove all diseased leaves before plants are taken to field. Spray newly set plants with Bordeaux, 5–5–50, as soon as growth begins. Repeat three or four times during season. The following spring, spray just before blossoming and again 10 to 14 days later. Plant resistant varieties
Sweet Potato *Ipomaea batatas* Poir. *Convolvulaceæ*	Warm	Sandy or loose loam; rich in plant food	March 15 to May.—2–4 bus.	Root rot	Crop rotation; clean and disinfect storage house; destroy all infected growths
Tomato *Lycopersicum esculentum*, var. *vulgare* *Solanaceæ*	Warm climate, long season, sunny, open position	Warm soil, light, porous and well-drained	Start plants in hot bed Feb. or March; transplant May–June—1 oz. to 3,000 plants	Septoria, leaf-spot Mildew Black rot Bacterial blight	Spray with Bordeaux, 5–5–50, as soon as plants are set out. Spray underside of leaves. Repeat every week or 10 days Spray with Bordeaux Crop rotation Crop rotation, destruction of affected vines and contiguous vegetable matter
Turnip *Brassica rapa* Linn. *Cruciferæ*	Cold weather plants. North temperate	Loose, moist soil	April, or July–Aug.—1 oz. seed to 100 ft. of drill. Rows 18 in. apart, or broadcast. Rutabaga, rows 2 ft., plants 10 inches in row	Club root Soft rot	See cabbage Plant on soils free from disease. Plant resistant varieties
Watermelon *Citrullus vulgaris* Schrad. *Cucurbitaceæ*	Warm and sunny climates. Southern temperate	Light, quick, warm, sandy soil, with strong clay subsoil	May–June—1 oz. seed for 30 hills, or 4–5 lbs. per acre. Hills 8x10 ft.	Free from any vital disease	

GARDEN CROPS—Concluded

Insect and Other Enemies	Insecticides and Remedies	Time to Bear	Yield per Acre	Bulletins on Culture
Onion fly or maggot	See cabbage-root maggot	135–150 days from seed	500 bus.	Geneva Bul. 182 Michigan Bul. 31 Farmers' Bul. 354, 1060
Thrips	Kerosene emulsion, diluted with 6 parts water; tobacco decoction; whale-oil soap, 1 lb. to 4 gals. water			
Pea weevil or pea bug	Fumigate seed stock with carbon bisulphide. Place seed in tight vessel or room and expose to fumes for 2 or 3 days. One pound of bisulphide for 100 bushels of peas	50–80 days	100–150 bus. green in pod	Cornell Bul. 67 Florida Bul. 36 New Jersey Report 14 Delaware Bul. 49 Farmers' Buls. 45, 1253, 1255, 1275, 1735
Pea moth or worm	Early planting of early varieties			
Pea aphis or louse	Plant seed in drills and use cultivator to bury aphides after they have been brushed from vines			
Peach borer	Dig out borers in June and mound up trees. Apply gas tar or coal tar to trunk from roots up to a foot or more above surface of ground	2 years. Good crop in 4–5 years	5–10 bus. per tree in full bearing	Cornell Buls. 176, 192, 276 Farmers' Buls. 917, 1246, 1266, 1527, 1557, 1702
Curculio	Spray just after blossoms fall with arsenate of lead, 6 to 8 lbs. in 100 gals. water and repeat in a week. After fruit has set, jar tree daily over a sheet and destroy beetles			
San José scale	See apple	3 or 4 years. Fair crop in 6–12 years. Dwarfs in 5–7 years	A tree 20–25 years old from 6–15 bus.	Cornell Buls. 108, 142, 145, 272 Geneva Buls. 67, 84 Farmers' Buls. 1056, 1687, 1739
Pear psylla	After blossoms fall, spray with kerosene emulsion diluted with 6 parts water or whale-oil soap, 1 lb. in 4 or 5 gals. water, or one of tobacco extracts. Repeat every 3 to 7 days			
Leaf blistermite	Spray with lime-sulphur wash in fall or spring, or with concentrated lime-sulphur solutions, 1 gal. in 10 gals. water	3 years. Good crop in 5 or 6 years	3–8 bus. per tree	Cornell Buls. 38, 81, 131, 235 Geneva Buls. 98, 117 Farmers' Bul. 1372
Pear slug	Spray with 1 lb. Paris green or 4 lbs. arsenate of lead in 100 gals. of water			
Plum curculio	Spray just after blossoms fall with arsenate of lead, 6 to 8 lbs. in 100 gals. water and repeat in about a week. After fruit has set, jar trees daily over sheet and destroy the beetles			
Colorado potato beetle	Spray with Paris green, 2 lbs., or arsenate of lead, 4 lbs., in 100 gals. water, or arsenite of soda combined with Bordeaux mixture	80–140 days	100–300 bus.	Geneva Buls. 101, 123, 221, 241, 264, 267, 279, 290, 311 Farmers' Buls. 533, 847, 953, 1050, 1064, 1091, 1190, 1205, 1225, 1316, 1317, 1332, 1349, 1367, 1436, 1578, 1639
Flea beetles	Bordeaux mixture as applied for potato blight			
Quince curculio	When adults appear, jar them from tree onto sheets or curculio catchers and destroy them	2 years. Good crop in 4 years	100–300 bus.	Maine 141
San José scale	See apple			Cornell Buls. 80, 145, 148
Round-headed apple-tree borer	See apple			
Maggots	Cover soil just after planting with a heavy dressing of unleached wood ashes. Inject bisulphide of carbon into earth about plants	30–45 days from seed	2,800–3,500 bunches	
Sawfly	See blackberry	1 year. Good crop in 2 and 3 years	50–100 bus.	Geneva Buls. 124, 226 Farmers' Buls. 887, 1286, 1488
Cane borer	See blackberry			
Leaf miner	Seldom serious	30–60 days	200 barrels	Rhode Island Bul. 41 Geneva Buls. 70, 99 Farmers' Bul. 1189
Striped cucumber beetle	See muskmelon	Summer, 60–80 days; winter 125–160 days	10–15 tons, winter	N. Y. State Exp. Station Report 6th New Jersey Bul. 94 Geneva Buls. 75, 113, 156, 158 Ohio Bul. 105 Cornell Bul. 31 Farmers' Bul. 668 Cornell Bul. 79
Squash-vine borer	Plant a few early squashes between rows of late varieties as trap crop. As soon as early crop is harvested, remove and burn vines			
Aphis	Spray with kerosene emulsion diluted with 6 parts water or use one part of tobacco extract. Burn vines after fruit harvest and keep down weeds			
Squash stinkbug	Trap adults under boards in spring. Kill nymphs with kerosene emulsion			
White grubs	Dig out grubs from beneath infested plants. Destroy pupæ by early fall cultivation of land	1 year. Heavier crop usually in 2 years	75–250 bus.	Farmers' Buls. 1026, 1027, 1028, 1043, 1458, 1560
Seldom affected	Arsenical or Paris green spray	120–180 days	100–150 bus.	Farmers' Buls. 970, 999, 1020, 1059, 1267, 1442
Boll worm	Hand picking. Use of corn as a trap crop. Destruction of wormy fruit	150 days from seed	8–16 tons	Cornell Buls. 32, 61 Michigan Buls. 19, 31 Florida Bul. 48 Connecticut Bul. 115 Farmers' Buls. 1233, 1291, 1338, 1431
Tobacco worm	Hand picking			
Nematode galls	Crop rotation and preventing contiguity of host plants, notably cowpeas			
Root maggots	Inject bisulphide of carbon into soil about roots before grubs have burrowed deeply into tissues. Crop rotation	60–70 days from seed	600–1,000 bus.	Geneva Report 6th
Flea beetle	Spray with Bordeaux or sprinkle with Paris green diluted with land plaster (1 part by bulk of Paris green to 50 of plaster)			
Melon worm	Spray with Paris green, 4 ounces to 50 gals. water. Two or three sprayings a week apart	120–180 days	400–500 melons	Georgia Bul. 38 Farmers' Bul. 1394
Melon louse	Spray with a 1 to 20 mixture of kerosene and water, or kerosene emulsion, or whale-oil soap, 1 lb. to 1 gal.			
Striped cucumber beetle	See muskmelon			
Flea beetle	Hand picking and thorough spraying with Bordeaux mixture and Paris green			

Best Breeds	Characteristics	Uses	Brief Breeding Rules
HORSES **American Saddle Horse**	Head rather small and clean cut. Eyes wide apart, full, clear and prominent. Ears pointed. Long upright neck, sloping shoulders. Deep chest, short, strong back. Barrel ribbed well back. Strong coupling, quarters level, strongly muscled. Pasterns long and sloping. Bones of leg broad and flat, strong tendons. Height about 15 hands 2 inches. Weight about 1,000 pounds	Saddle horse for pleasure, as a gaited horse, hunter, cavalry or commercial purposes. A light harness horse also	1. Age of puberty 12 to 24 months 2. Best age for breeding 2 to 3 years 3. Period of heat, 9 days after delivery and each 2 or 3 weeks thereafter; duration of heat, 2 to 3 days
Belgian Draft	Short body set on short legs. Tendons of legs large. Head good size. Eyes small, neck short, thick and well crested. Shoulders heavily muscled. Chest deep and wide, good barrel. Back short, broad and inclined to sag. Loins wide, short and very thick. Flank low and full. Hindquarters short, very wide, muscular. Lower thighs very wide, well muscled. Hocks round and meaty. Colors, chestnut, roan, brown and bay	Draft and crossing, especially on grade draft mares	4. Period of gestation 11 to 12 months 5. Proper rations and sufficient exercise important during pregnancy 6. Fecundity favored by (a) Warm climate (b) Abundance of exercise (c) Generous supply of nutritious food, regularly given (d) Crossing (e) Heredity (f) Full maturity of animal
Clydesdale	Weight 1700 to 2000 pounds for stallions, 1500 to 1800 pounds for mares. Height, 16 to 16½ hands. Colors, bay, brown, black or chestnut, with white markings on face and legs. Head intelligent. Shoulder good, which gives a free, easy, long stride. High withers. Arm well muscled. Feathering on leg is fine, silky and long. Quarters and croup muscular. Springy, strong pastern. Front action free and snappy	Draft and crossing on native draft mares	7. Variation in type caused by (a) Changed conditions of life (b) Heredity—union of two animals with diverse qualities (c) Habit or use or disuse of parts (d) Food
French Coach	Height 16 hands. Weight 1000 to 1400 pounds. Rather upstanding. Smooth and symmetrical, fine quality, clean cut, intelligent head, long graceful neck, closely ribbed body, muscular quarters. Legs well set and fine. High free knee action, regular uplifting hock action. Colors, bay, brown or black	Coach and carriage horse, cavalry and fast saddle purposes. Crossing on common brood mares for production of grade coach horses for general city purposes	8. Selection is of two kinds— (a) Natural. Survival of those possessing greatest ability to live and get food under particular conditions (b) Methodical. Favoring and fixing of characters especially useful to mankind
German Coach	Colors, bay, brown or black. Height 16 to 16½ hands. Weight 1350 to 1450 pounds. Deep round body well proportioned, close ribs, neck long and high set on shoulders, neat head, intelligent face. Back short and strong, smooth at coupling, plump rounded quarters, strongly muscled limbs, strong hock, good feet. Colors, bay, brown or black	Saddle, carriage and draft. The horse-of-all-work	9. Heredity—like produces like. Offspring resemble parents in stature, form and feature. Normal and abnormal characters are inherited. Predisposition to diseases is subject to laws of heredity. Characters that have appeared regularly through many generations transmitted with greatest force. Variations also transmitted
Hackney	Considerable substance, very smooth, gracefully curved outlines, rather short legs, head well proportioned, full bright eyes, well-developed neck, shoulders long, sloping, well muscled. Body deep and round-ribbed. Muscular loins and quarters, strong hocks, distinctive high knee action. Colors, brown, bay or chestnut, with white markings. Height 15.2 to 16 hands	Heavy-harness horse. A desirable cross on common mares of much quality	10. Correlation of parts. Whole organism so closely interwoven that change in one organ or set of organs almost certain to result in disturbance of the balance of other qualities and produce a change of other organs. Certain characters are normally correlated
Percheron	Height 15.25 to 16.5 hands. Weight 1500 to 2000 pounds. Colors, dappled gray and black. Active temperament, intelligent head, deep body, wide muscular croup, clean-cut legs, joints clean and hard; legs show abundance of quality. Good action	Draft and crossing to produce grade draft mares	11. Atavism, or reversion to characteristics of remote ancestors, may occur. Leading causes are change of environment and crossing
Shetland Pony	Height 10 hands 2 inches. Weight 325 to 375 pounds. Compact, hardy build, deep body, heavy muscular quarters, short legs, short broad back, deep full chest, muscular neck, small head and ears, prominent eyes, docile disposition. Colors, brown, black and bay. Long shaggy coats, heavy, long mane and tail	Child's pony and light driving	12. Inheritance of acquired characters. Acquired character is gained as result of action, nonaction or reaction from environment. Such characters may be inherited 13. Determination of sex. Many theories have been advanced, but in the present state of our knowledge it is not practicable to attempt to control the sex among the mammalian animals
Shire	Conformation low, broad and stout. Heavy in build, slow in movement. Large girth, deep and strongly coupled with broad back, quarters heavily muscled, legs strong, feet large. Feathering on legs below knees and hocks. Weight 2200 pounds. Height 17 hands. Colors, brown, bay or black with white markings on face and legs	Draft and crossing to produce grade draft horses	14. Prenatal influences of doubtful consequence. Pregnant animals should be kept quiet and free from causes which might produce extreme nervous shock. They should have normal exercise
Standard-Bred Trotter	Head well proportioned, clean cut, neck long and muscular, crested in stallions. Shoulders well muscled, chest low, foreleg long from elbow to knee, short from knee to fetlock. Pasterns sloping, feet moderate in size, oily in appearance. Back and loin well muscled, hindquarters and croup well muscled and smooth. No fixed colors. Height 16 hands. Weight for mares 900 pounds, stallions 1150 pounds	Racing, driving as a roadster, and breeding. Also heavy-harness horse. Much used in breeding "cow ponies"	15. Four methods of breeding (a) Cross-breeding. A union of different breeds or races or breeding together of different strains of families within the same breed. Increases fertility, size and restores constitution, vigor and thrift. Breaks up established types, and destroys prepotency of the breed. Not certain to produce improvement
Suffolk Punch	Low-set, short legs, deep body, muscular, durable feet. Head clean cut, with full forehead and Roman nose, neck full, with strong crest, chest deep and wide. Barrel deep, round-ribbed, and well let down on hind flank. Legs and hindquarters muscular. Height 16½ hands. Weight 2000 pounds. Color chestnut	Heavy draft and crossing on range mares	(b) Grading. Breeding of unimproved females to males of well-established breeds will invariably improve stock (c) Inbreeding. Breeding together of close relations. Will fix desirable qualities. Likely to diminish size, weaken constitution, impair fecundity
Thoroughbred	Very deep, narrow chest, long legs. Refinement and clear definition of feature. Large nostrils, full, clear eyes, broad forehead, neck long and straight, sloping shoulder, muscular hindquarters, sharp withers, well marked superficial blood vessels, silky skin and hair. Colors, bay, brown or chestnut, more or less white in face and limbs. Height 15 to 16 hands. Weight 900 to 1050 pounds	Racing, sporting, breeding. Influence felt in all but draft breeds	(d) Line-breeding. Union of animals more or less closely related. Favors fixation of characters, but may result in too great refinement and weakness of constitution
Welsh Pony	Good shoulders, strong back, neat head, best of legs and feet. Height 12 to 13 hands. Colors, bay or brown, gray or black. Great strength and endurance	Child's pony and for hack and tradesmen's purposes	16. Pedigree and individual excellence should both enter into choice of breeding animals. Neither alone sufficient

SHEEP AND SWINE

Best Foods	Diseases and Symptoms	Treatment	Bulletins
For the trotter. When not in training, feed should be reduced at least one-half. Good oats and clean sweet timothy should constitute bulk of ration. Also a few carrots and a bran mash occasionally. In spring, when shedding, bran mash may be given more often to keep bowels open When horse goes into training, strength of food should be gradually increased. At first may have all hay he will consume. Later it may be necessary to limit it. No carrots. Bran mash once or twice a week if constipated. Oats gradually increased	*Big-head.*—Symptoms: Loss of vitality, irregular appetite or other digestive disturbance. Tendency to stumble. Then intermittent or migratory lameness. Swelling of bones of face and jaw. Animal becomes thin, coat rough, and skin tight	Place animal under new conditions. Give lime, one peck slacked in a cask of water, more water being added from time to time. Give a tablespoonful of powdered bone meal in each feed, with free access to a large piece of rock salt. Feeds containing mineral salts, such as beans, cowpeas, oats and cottonseed meal are good. Animal should not work during active stage or be used for breeding	Best references to breeds in stud-books issued by breed societies
	Glanders.—Symptoms: Fever, enlargement and hardening of glands under lower jaw, running sores on lining of nose, producing a foul, sticky discharge. Sometimes small skin ulcers form, also exuding foul discharge	A very contagious disease for which no successful cure is known. Disease may be chronic, developing for months before symptoms become serious, or acute, with rapid fatal results. Best identification of disease in early stages is laboratory test for bacteria. Suspected cases should be segregated carefully to protect other animals, and known cases should be killed and carcass buried, as required by law in many localities	
	Hives.—Symptoms: Eruption of swellings from ½ to 2 inches in diameter on skin. The edges of swellings cut off sharply from surrounding tissue	Withhold feed for 24 hours. Then give bran mashes and small quantities of hay. Cleanse digestive tract by quart or linseed oil or 1½ pounds epsom salts. To relieve itching, apply alkaline solutions, 1 tablespoonful sodium bicarbonate to 1 quart of water, or a weak solution of ammonia	Report of Kansas State Board of Agriculture, 1899
	Heat stroke.—Symptoms: Horse stops sweating, appears droopy, drags along, soon falls unconscious. Breathing rapid, pulse weak, body temperature high	Treatment energetic. Apply ice bags to head and pour cold water over body. Give ½ pint whisky, followed by tincture of digitalis in 1 dram doses by mouth or ½ dram doses subcutaneously to stimulate heart. Continue cold water until temperature is reduced to 102° or 103° F. Rub limbs briskly. Recovery is gradual, over week or two	
For the driving horse.—Oats lead among the grains. Bran mash for constipation. When horse is not taken from stable during day, the concentrates should be reduced by one-third. Laxative foods, such as clover or alfalfa hay or bran, in too large quantities should be guarded against	*Moon blindness.*—Symptoms: Great irritation in eyeball, excessive flow of tears; eye kept closed; mucous membrane on inside of eyelid inflamed and swollen; eyeball enlarged and cloudy, very sensitive to light	Keep animal in the dark and wash off eye several times daily with a 4 per cent solution of boric acid. A few drops may be dropped in eye. Ice poultices may be used 3 or 4 days, after which warmth should be applied by covering eye with cotton soaked in warm water. One or two drams of potassium iodide daily have been recommended	Farmers' Buls. 170, 619, 779, 803, 952, 1146, 1295, 1298, 1368, 1419, 1493
	Lampers (Lampas). — Symptoms: Mucous membrane of mouth becomes congested with blood and protrudes below incisor teeth	May be relieved by making a few shallow punctures in mucous membrane with a sharp knife that has been thoroughly sterilized. Such treatment demands expert care	
	Rheumatism.—Symptoms: Animal becomes stiff and lame, followed by rise of temperature (104° F). A painful swelling appears around joints of legs. Location may change and attacks be intermittent	Administer a cathartic, aloes balls containing 7 drams of aloes. Thoroughly rub affected joints with a stimulating liniment, as camphor or chloroform liniment. Follow cathartic with salicylates given in form of sodium salicylate. 6 to 8 drams may be given 2 or 3 times daily in food. Keep horse in dry place and give plenty of fresh air	North Carolina Bulletin No. 189
For the work horse.—In general, horse should have over 2 pounds of provender daily for each 100 pounds of weight. Of this about two-thirds should be grain, depending on heaviness of work. Morning meal should be rather light, mostly of grain. Midday ration should not be large. Heavy feeding at night. In cold weather a more carbonaceous ration may be used. Equal parts of corn and oats better than larger proportion of oats	*Colic.*—Symptoms: Animal lags or stops in harness or walks around stall restlessly. Looks around at side, kicks at belly, may grit teeth. Tail gets a peculiar crook and is held extended. May lie down, roll, kick or make violent movements, as slamming head against floor or biting at self or manger. Attacks may be intermittent	Give animal plenty of room. To allay pain, cannabis indica, 1 to 2 ounces, may be given, or morphine sulphate, 5 to 7 grains, given subcutaneously. Larger doses of either dangerous. An excellent prescription is fluid extract cannabis indica, 4 drams; tincture opium, 6 drams; sulphuric ether, 1 ounce; sweet spirits of niter, 1 ounce. Give in 1 dose and repeat if necessary in an hour. To stimulate intestines, 8 drams of aloes or 1 pint of linseed oil. Injections of lukewarm water into rectum good. In fermentation, colic tapping is quickest and surest method. This requires expert surgery	Florida Bulletin No. 72
	Heaves. — Symptoms: Distressing dry cough that often occurs in paroxysms. A double respiration present. Expired air comes from nose in 2 jets, with pause between them	Condition incurable. Greatest benefit from regulation of diet. All dusty hay should be withheld and small quantities of best timothy given sprinkled with lime or molasses water. Nutritious concentrated foods best: corn, oats and bran with carrots and turnips or apples mixed in	
For the brood mare.—Much the same as for work horse with the addition of more protein foods, as bran and oilmeal. If constipated, give bran mash. After foaling, a hot bran mash fed once a day has a cooling and laxative effect. To stimulate milk flow, good pasture grass best, but oats or wheat bran with equal weight of corn-and-cob meal is good	*Bots.*—Symptoms: Cause irritation of walls of stomach and intestines and obstruction of passage between stomach and intestines	Best treatment preventive. Eggs should be removed from hair before 10th day. If occasional bots noticed in manure, animal should be starved for 12 hours, allowing only water, after which give 2 teaspoonfuls of tartar emetic in water as a drench. Repeat in 4 hours; 8 or 12 hours later give a drench of 1 pint to 1 quart of linseed oil	Iowa Bulletin No. 18
	Worms.—Symptoms: Presence of worms in feces the only sure sign	Give animals no food for 12 to 18 hours. Then give tartar emetic in 2-dram doses every 4 hours until 3 doses are given. Follow in 3 or 4 hours with 1¼ pints of linseed oil	
	Curb.—Symptoms: A rupture of the ligament on posterior surface of hock with swelling and heat, often lameness. Leg shows bulging backward below point of hock	In acute inflammation cold water should be applied for 10 to 12 hours daily in constant stream. If lameness persists after a week, a blister of biniodide of mercury 1 part to vaseline 8 parts should be applied and animal should rest for 2 to 4 weeks	
For the foal.—Should begin to nibble grain from mother's box at 2 months, and at 5 to 6 months be eating well. Should have more protein than work horse. Oats, shorts, peas and perhaps corn, may constitute the grain. Alfalfa, clover and mixed hays may constitute the roughage. Abundant exercise important	*Founder.*—Symptoms: Onset sudden with fever from 102.5 to 106° F., rapid respiration, increased pulse, intense pain in feet. Animal stands with hind feet well under body	Give tincture of aconite in 10-drop doses every 2 hours during first day. Allow animal to stand with affected feet in soaking-tub of cold water, or in puddle of soft clay, water to be kept cold by addition of ice. Give 2-ounce doses of saltpeter in a pint of water 3 times daily for 1 week. Case may need expert attention	New Jersey Bulletin No. 92
	Bone spavin.—Symptoms: Onset gradual. Lameness most marked when horse is first brought out of stable and disappears on warming up. Bony enlargement on hock joint	Proper shoeing will assist in removing lameness. 4 to 6 weeks rest with repeated blisters may give temporary relief. Most successful treatment requires assistance of a veterinarian	
For the stallion.—During breeding season, grain ration should consist mainly of good sound oats, varied by ration of corn, corn-and-cob meal, or barley. Wheat bran is valuable. The roughness should be clean, sweet hay, timothy or timothy and clover mixed	*Ringbone.*—Symptoms: Onset gradual with lameness. Local heat, swelling and pain in joint. Presence of bony enlargement about joint	Foot should be properly dressed and shod. If lameness is marked, prolonged rest and repeated mercurial blisters (1 part biniodide of mercury to 8 of vaseline) should be applied. If this is not successful, call veterinarian	Special Report on Diseases of the Horse, Bureau of Animal Industry, U. S. Dept. Agr.
	Splint. — Symptoms: Lameness. Pressure over splint will cause animal to flinch. Skin will show increase of temperature and there may be some edema. New bony growth may be seen or felt on front of internal splint bone	For acute inflammation, let cold water run over part for several hours each day for a week. Hair should be clipped, then apply blister of one dram benzoid of mercury to one ounce of petrolatum. Animal should rest 3 to 4 weeks. In severe cases, call veterinarian	

Best Breeds	Characteristics	Uses	Best Foods
CATTLE **Aberdeen-Angus**	Black color, polled heads, rotund compact type, smoothness of conformation, short legs, evenness of flesh when fat, deep, full hindquarters. Beef breed	Beef. Very valuable in crossing and grading. Little value for milk	*For dairy cattle* 1. The dairy calf.—Avoid fattening feeds. Choose such as tend to develop a vigorous muscular system. Gradually substitute skimmed milk for full milk after first few days. A small quantity of some concentrated feed, as shorts, linseed meal or flaxseed meal boiled into a jelly with water (1 part meal to 6 of water) is fed daily with the skimmed milk. Milk should be at blood heat unless calf is accustomed to cold milk. At 6 or 8 weeks other feeds are given, preferably oats, wheat middlings, or a mixture of both. For older calves, mill feeds, oil-meal, barley, malt sprouts, etc., are desirable. Keep fine quality of early-cut hay before calves 2. Dairy heifer.—As time of parturition approaches, feeding should be plain, good clean hay from clover or mixed grasses, corn fodder, corn silage (not to exceed 25 to 30 pounds a day) or roots. Both dry and succulent roughage is fed, and small amounts of bran, ground oats, shorts, gluten feed and perhaps corn. Shortly before calving, feeding of all grains except about 2 pounds of bran is discontinued and dry roughage and roots are fed till cow freshens. Directly after calving a warm thin slop of oatmeal, bran or shorts is given or warm water only. Until danger of fever is over, feed should be very light and gradually increased for 2 or 3 weeks until cow is on full feed. Corn meal good for a heavy milking heifer. 3. Dairy cow.— (a) Summer.—Ample pasturage. Later in the season add soiling crops, such as corn, alfalfa, peas and oats, rye, rape, etc. Summer silage: corn, red or other clover and alfalfa. 30 pounds of soiling crop or silage average allowance for dairy cows on poor pastures, to be increased as conditions demand. In case of heavy milkers or very short pasture, add few pounds of wheat bran or wheat bran and oats, throughout season (b) Winter.—Succulent feeds should be provided during entire lactation period. Silage and roots are main available feeds. Best results from not over 40 pounds silage fed daily, and fed with some dry roughage, hay or corn fodder. Protein feeds, as clover hay, wheat bran or oil-meal should be fed with corn silage or fodder. Clover hay or hay of other legumes stands first for dairy cows. Pure timothy, especially if late cut, is a poor cow feed. Other kinds of hay are millet, oat, sorghum, alfalfa and pea. Common concentrates are the cereals and mill refuse, starch or glucose factory refuse, brewery and distillery feeds and oil-meals. Good rule is to feed as many pounds of grain feeds a day as cow produces pounds of butterfat during week and to feed as much roughage as cow will eat up clean. Should give variety of feeds containing liberal amount of easily digestible substances. Feeding must be regular 4. Dairy bull.—Ground oats, wheat bran, gluten meal, oil-meal, silage, clover hay; grain ration not to exceed 5 or 6 pounds per day for 1,000-pound animal. Keep animal vigorous, not fat and lazy *For beef cattle* Baby beeves (10 to 16 months).—Require heavy grain feeding. Corn depended on largely, fed with a food rich in protein, as oil-meal or gluten feed. Oats and bran may be added if not too expensive. Good ration is 5 pounds corn, 2 pounds oats, ½ pound oil-meal, plenty of good clover or alfalfa hay. Corn silage is valuable. Daily ration must be increased as fast as calves can handle it Long yearlings (18 to 23 months).—When calves are born in spring they are given little or no grain before or after weaning. Through summer and fall depend on grass. In winter a liberal feed of hay with small allowance of grain. Pasture without grain following summer and full feed of grain next fall and winter. If roughage is largely alfalfa, clover or cowpea hay, the grain ration may consist of corn alone. If other roughage used, supplement corn with equal weight of bran, or one-third to one-half of that weight of oil-meal. In the second fall feed close-grown corn fodder, shelled corn, alfalfa, clover or cowpea hay. If non-legume roughage used make night grain ration one-fifth to one-fourth oil-meal, gluten or cottonseed meal Short two-year-olds.—Finish by feeding grain in connection with spring and summer pasture. With this system a light grain ration is fed the first winter and less than half feed of grain second winter. Soaked shell corn is effective for spring and summer feeding Fall feeding two-year-olds.—Corn fodder on pasture. May begin about September 15 and continue in field for 3 months. Begin with 3 pounds of corn a day and increase till cow's capacity is reached. 3 pounds bran and 1 pound oil-meal or cottonseed meal per steer per day will greatly increase gains Winter feeding range two-year-olds.—Cattle which have had no grain during summer and fall. Snapped corn most used early in feeding with alfalfa, clover or cowpea hay. Field-cured stalks with alfalfa equally good. After 6 to 8 weeks begin shelled corn gradually to replace snapped corn. If non-leguminous hays used, supplement corn with about 2 pounds per day of bran, oil-meal, gluten or cottonseed meal. On full feed will take 20 to 25 pounds grain per day, plus all roughage desired Range three-year-olds.—Require smaller proportion of protein foods than above, but consume a larger proportion of grain to hay
Ayrshire	Medium size, standard weight for cows 1000 pounds, bulls 1500 pounds or more. A little smoother than Jersey or Holstein but from behind wedge shape is evident. Tips of ears notched, horns white with black tips and curve outward and upward. Body large and deep, ribs well sprung, hindquarters often heavy. Udder shows high development of form and setting. Color variable through red, white and brown in patches. Mild but active disposition. Dairy breed	Milk, butter and cheese. Crossing to improve grade herd	
Brown-Swiss	Weight for cows 1200 pounds and bulls 1800 pounds. Colors shade from light to dark chestnut brown. Light tuft of hair between horns, on inside of ears, and a narrow line along back. Nose black, mouth surrounded with meal-colored band. Horns with black tips, medium size. Face dishing, large, full eye; ribs well sprung. Hoofs and tongue black, udder large, extending well up in front and rear. Teats large, well placed. Short legs. Dairy breed	Milk for condensing and butter and cheese making	
Galloway	Low, blocky animal, with long, soft, shaggy coat of black hair, hornless, well sprung in the ribs, resembling barrel in shape, which is evenly covered with juicy lean flesh. Head short and wide, forehead broad, face clean, nostrils large. Eye large and prominent. Neck short, clean. Shoulders broad, joining body smoothly. Hindquarters long wide, well filled. Rump straight, wide, carrying width of body out uniformly, well filled with flesh. Thighs broad and thick. Legs short and clean. Beef breed	Beef, hides and crossing. Very prepotent	
Guernsey	Clean-cut, lean face, long, thin neck, backbone rising well between shoulder blades, pelvis arching and wide, rump long, abdomen large and deep, udder full in front, of large size and capacity. Teats well apart, and of good even size. Hair a shade of fawn with white markings, cream colored nose, horns amber, small, curved and not coarse. Mature cows about 1050 pounds. Bulls 1,200 to 1,500 pounds. Dairy breed	Milk, cream and butter. Cross-breeding	
Hereford	Color, red and white. Head, including jaws and throat, white, white under neck, down the breast, under belly and on legs. Bush of tail white, white strip on top of neck to top of shoulders, remainder of body red. Head short, forehead broad, eyes full, horns rather strong and of whitish-yellow color, free from black tips, more or less drooping, neck short and thick. Hide heavy and loose and covered with dense soft coat of hair. Breast broad and full, free from loose dewlap. Shoulders broad on top. Ribs well sprung and extending well backward. Rump bones wide apart. Legs short, straight and set well apart. Line of back straight and level. Quarters full and rounded. Beef breed	Beef, especially early or "baby" beef	
Holstein-Friesian	Color, black and white piebald. Head, broad between eyes, eyes large and bright, horns small, tapering toward tips, neck long, chest moderately deep and low, barrel long and wedge shaped, large abdomen, legs rather short and nearly straight and wide apart. Hair fine, soft and furry. Udder very capacious, extending well forward in front; teats well formed and wide apart. Dairy breed	Milk, butter and cheese. Fair beef qualities	
Jersey	Small head, muzzle black or dark in color surrounded by light or mealy strip of light skin and hair. Eyes prominent, bright and wide apart. Horns crumpled, small, often black tipped. Neck fine, clean and small. Legs short, fine boned and small. Body well rounded, large and deep. Skin mellow, loose, yellow, with short fine silky hair. Udder large, not pendulous. Teats medium size, placed far apart. Back straight from shoulder to tail. Movement light and graceful. Cows 800 to 1000 pounds, bulls 1200 to 1500 pounds. Dairy breed	Milk and butter	
Red Polled	Weight for bulls 1800 to 2000 pounds, cows 1300 to 1500 pounds. Color red. Nose flesh color. Switch of tail and udder white. Head medium length, wide between eyes. Poll well defined and prominent, neck of medium length, clean cut, straight from head to top of shoulder. Chest broad and deep, back long, straight and level, hips wide and well covered, legs short and straight. Udder full and flexible. Teats well placed and wide apart. Hide, loose, mellow, with full coat of soft hair. Dual purpose breed	Beef, milk and butter	
Shorthorn	Head wide between eyes, short from eyes to nostril. Horns short, curved forward, waxy white with dark tips. Neck short and fine. Back straight, level and broad and deeply covered with flesh. Thighs wide, deep and long, well filled down in the twist. Body deep, squarely built. Flanks well let down, underline nearly straight. Legs medium length. Colors, pure red, pure white, a mixture of these colors or roan. Beef breed	Beef, crossing, grading. Fair results for milk, butter and cheese	

SHEEP AND SWINE—Continued

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
1. Age of puberty 4 to 18 months	*Caked udder.*—Part of all of udder becomes enlarged and firm. Cow is depressed and there may be a slight rise of temperature. Gland is sensitive to pressure and flow of milk is lessened. Milk is watery and may be tinged with blood	Give sparingly of milk-producing food. Massage udder with hand and rub in camphorated oil or tincture of iodine 1 part, alcohol 8 parts. Then severe warmth should be applied by sponges wrung out of hot water and held against udder. In case of development of abscess or gangrene expert assistance will be needed	Herdbooks of all breeding and registration societies. Special Report on Diseases of Cattle and Cattle Feeding, U. S. Department of Agriculture, Bureau of Animal Industry
2. Best age for breeding beef cattle, 20 to 27 months, dairy cattle 18 to 24 months	*Chapped teats.*—Symptoms: Apparent on teats. May cause great difficulty in milking	In fresh cows wean calf as soon as possible. See that teats are dry before cow goes out into the cold or wet weather. Bland antiseptic ointment, as a 10 per cent ointment of calomel in petrolatum should be applied after milking. Yellow oxide of mercury in a 5 per cent ointment is also good. Care must be taken to prevent milk becoming contaminated. In very bad cases milk should be withdrawn for few milkings with tube and udder massages. End of teat and milking tube must be sterilized before inserting. Astringent applications, as lead water with laudanum or tannic acid ointment, are good when there is considerable discharge from the sores	Bureau Animal Industry Circular No. 51 Same, Bulletin No. 108 Same, 15th Annual Report
3. Period of heat, 40 to 60 days after delivery, if suckling the calf, and 20 to 30 days if calf is taken away at birth. Period recurs each 3 weeks thereafter. Duration 12 to 24 hours	*Milk fever.*—Symptoms: Attack usually comes on within 2 days after calving. Cow is restless, staggering gait, especially in hind legs, weakening of knees and fetlocks in front. This increases until paralysis becomes general, and animal goes down. Cow takes very characteristic position—head turned round to side, usually left, rests against chest, causing peculiar arching of neck. If head drawn out straight, immediately flops back to above position. Animal quiet and insensible	Because of paralysis of the throat, great care should be taken in administration of medicines by the mouth. Patient should be kept in an upright position on the breastbone, and not on her side. Only successful treatment is the injection into the udder of atmospheric air, which requires the assistance of a surgeon	Farmers' Bulletins Nos. 55, 205, 346, 612, 1018, 1057, 1066, 1218, 1361, 1379, 1395, 1422, 1443, 1549, 1584, 1592, 1600, 1626, 1769 Connecticut Reports, 1893–1901 Cornell Bulletins Nos. 268, 269 Florida Bulletin No. 96
4. Period of gestation 9 to 9½ months (285 days)	*Sore tongue.*—Inability to eat, frequent movement of lips with formation of froth on their margin, driveling of saliva. Ulcers occur on gums around teeth, inside lips and on tip of tongue. Muzzle dry and parched, and crusts and scabs form over the parts. The thin skin in clefts between jaws may become fissured and eroded, causing a slight swelling with pain. Animal takes position with back arched and feet propped under body	Remove herd from pasture to barn or corral and feed on soft nutritious food, such as bran mashes, ground feed and gruels. Keep clear cool water in manger. Dissolve 2 heaping tablespoonfuls of borax or one tablespoonful potassium chlorate in each of first 2 buckets of water taken during day. Astringents, such as ½ tablespoonful alum, borax or chlorate of potash, should be placed on tongue Feet may be treated with a 2 per cent solution of carbolic acid or of creolin. Fissures or lesions of skin benefited by carbolized vaseline or zinc ointment	Georgia Bulletin No. 49 Illinois Bulletin No. 142 Indiana Bulletins Nos. 129, 130, 136, 137; Circulars Nos. 12, 14
Breeder should work toward a certain standard or ideal and should choose parents that approach that ideal. The parents, especially the male, should have known ancestry of approved type, as there is less danger of undesirable variations in the offspring	*Indigestion.*—Symptoms: When stomach and small intestines affected, loss of appetite and rumination, coated tongue and emaciation. Constipation is usual, although diarrhea may be present. Fecal matter contains imperfectly digested food and more or less mucus. When large intestine involved, appetite may not be affected. Diarrhea marked, droppings coated with mucus. No undigested food present. Animal will lose flesh and become hidebound	In constipation, 1 quart of castor oil should be given. Easily digested and nutritious food should be given in small quantities. Green food best or hot bran mashes, with small amount of good sweet hay. In diarrhea and fermentation a mixture of bismuth subnitrate 1 dram and creosote ½ dram shaken up with milk or given as a drench twice daily for 2 or 3 days is beneficial. For a tonic powder, nux vomica 1 dram, reduced iron ½ dram, powdered gentian root 1 ounce, should be given in the feed 2 or 3 times daily for a few weeks	Kansas Bulletin No. 81 Louisiana Bulletins Nos. 104, 115 Maryland Bulletin No. 84 Massachusetts Report, 1908 Michigan Bulletins Nos. 149, 257; Circular No. 4
	Choking.—Symptoms: Champing of jaws, driveling of saliva, ceasing to chew and choking movements, head extended, eyes bulging, inability to swallow	When obstruction is in pharynx, a block of wood should be placed in mouth between back teeth, and object removed with hand. If in gullet, small amount of olive oil should be given at frequent intervals to lubricate the esophagus and allow object to pass into stomach. If this fails, the probang, a long, hollow, flexible tube, may be used. It is oiled. By means of probang, foreign body gradually forced into stomach	Mississippi Bulletins Nos. 70, 121 Missouri Bulletins Nos. 53, 58
The feeding and environment are important if best results are desired	*Cough.*—Symptoms: Chilly sensations or a chill followed by rise of temperature to 103 to 105° F., loss of appetite and rumination, dry muzzle, constipation, rapidity of pulse and respiration. Cough at first dry, harsh and painful. Later cough becomes moist and there is nasal discharge	Animal should be placed in light, comfortable stall and given plenty of clear water. Keep bowels open with 1 pound of Glauber's salts. Feed green succulent materials if possible or bran mashes and moistened hay. An electuary consisting of extract of belladonna leaves 5 grains, morphine sulphate 3 grains, powdered licorice-root 4 drams and sufficient sirup to make an electuary, should be given on tongue 4 times daily. If cough persists after the secretion ceases a mixture of ammonium chloride 1 dram in ½ ounce of brown mixture should be given 4 or 5 times daily	New York (Geneva) Bulletin No. 317 Ohio Bulletin No. 193 Oregon Bulletin No. 102 Pennsylvania State Board of Agriculture Bulletin No. 16
	Warts.—Symptoms: Appear as grayish or grayish-red projections of skin or mucous membrane. Favorite location is udder and teats, sides of head and neck, on lips and belly	May be removed with scissors or fingers, or ligatured by rubber band or horsehair. Roots should be cauterized with tincture of iron, glacial acetic acid or lunar caustic. Acids should not be used around eyes or mouth. When Warts are found in large numbers, arsenic in form of Fowler's solution should be given in 1 teaspoonful doses twice a day for a 6-months calf	Pennsylvania Bulletin No. 88; Report, 1908
The various breed associations have established standards of excellence that serve as guides to breeders in choice of parents	*Mange.*—Symptoms: Contagious disease. Points of redness, pimples, vesicles and formation of scabs. Intense itching that becomes unbearable at night in hot stables or when exposed to sun. Animals scratch, rub and bite themselves. Hair falls out and skin is bloody. In worst stages skin moist and bloody, ulcerated, scabby, thickened and wrinkled	A good combination of drugs for killing parasites is flowers of sulphur 1 ounce, vaseline (or lard) 10 ounces. Best method is to dip animal in a vat containing flowers of sulphur 24 pounds, unslaked lime 12 pounds, water 100 gallons. This should be repeated in 10 days to 2 weeks	Rhode Island Bulletin No. 77 South Carolina Bulletin No. 67 Tennessee Press Bulletin No. 1900
For additional breeding rules, see horses	*Ringworm.*—Symptoms: Formation of circular patches on skin that soon becomes denuded of hair. Outer layer of skin is inflamed and vesicles form that exude a gummy liquid. Scaly crusts are formed, usually on head and neck	Remove crusts by washing with soap and water, then apply acetic acid, 10 per cent sulphur ointment, tincture of iodine, or nitrate of mercury ointment once daily. Cleanse and whitewash stable to destroy spores scattered by crusts	Texas Bulletin No. 110 Wisconsin Bulletins Nos. 33, 38, 116, 117, 151

HORSES, CATTLE,

Best Breeds	Characteristics	Uses	Best Foods
SHEEP **Cheviot**	Medium size, hornless, face and legs white, body closely covered with wool of soft fiber and pure white. Head bold and broad. Fleece forms almost a ruff about face. Deep and large in breast, back wide and straight. Short legs set well apart, hoofs black. Mature rams 200 pounds, ewes 150 pounds	Mutton. Not superior as a wool producer. Wool of good quality, but light	A clean and dry feeding place is necessary. Regularity in feeding imperative. Ordinarily best to feed sheep twice a day. Sheep need to have access to salt and water at all times
Cotswold	Large, high-standing breed with heavy fleece of long white, lustrous wool. Ample topknot often covering eyes. Bold upright carriage. Head moderately small, face white or mixed with gray, eyes prominent, neck short, thick and strong, shoulders broad and full, back broad, breast broad and well forward, quarters long and full, mutton quite down to hock. Weight of ram 250 pounds, ewe 200 pounds	Mutton and wool, the latter especially. Crossing on native and merino sheep	*Feeding lambs.*—When ewe has a single lamb, not necessary to feed any grain until near weaning time. When a ewe has two lambs, they should get some grain. If lambs are to be sold before weaning, grain feeding must begin as early as possible. A mixture of three-fourths corn meal and one-fourth bran is satisfactory. Right after weaning it is well to have fresh pasture, or rape or other succulent feed. In addition, lambs should be fed liberally on grain For fattening, corn is best, combined with peas and bran. Grain feeding must come gradually. For fattening mature lambs during fall, good grass pasturage and rape or rutabagas with a mixture of corn and oats, is most satisfactory For final fattening, lambs should be confined in yard. During winter dry succulent fodder with grass will give good results; for dry fodders, alfalfa or clovers; for succulence, corn silage or roots; for grain, corn, oats, bran and oil-meal or cottonseed meal To fatten lambs in a short period give preparatory feeding on rape or roots for about 6 weeks. Should have pasture before going on rape, which must be restricted in quantity. For grain, begin with bran or oats. Give one-fourth pound per head daily at start. Increase quantity slowly. At end of a month about 1 pound per head, which should consist of ½ corn and ½ bran or oats, given in 2 feeds. For fodder, clover hay, corn stalks or pea-straw. Increase amounts gradually
Dorset-Horn	Face and legs pure white, flesh-colored nose. Both sexes have horns. Eyes prominent, neck short and symmetrical, shoulders broad and full. Chest full and deep, quarters wide and full with mutton extending down to hock. Fleece medium grade, of even quality, extending over belly and well down on legs. Short stoutlegs. Weight for rams 200 pounds, ewes 160 pounds	Mutton breed. Early breeder, valuable for production of hothouse or winter lambs. Fleece light	
Hampshire Down	Black face, head large, well covered with wool on forehead and cheeks, nostrils wide. Ears large and drooping, eyes prominent and lustrous, legs well under outside of body, straight, almost black. Chest deep and full with breast prominent and full, back straight, quarters long and deep in thigh. Ewes prolific and heavy milkers. Weight for rams 250 pounds, ewes 185 to 195 pounds	Mutton and production of early market lambs. Fleece inferior	
Leicester	Hornless, large size, rectangular form of body on clean legs, bare faces or carrying a very scant topknot. Head long, tapering toward muzzle, face wedge-shaped, covered with fine white hairs, eyes large and prominent, neck strong and moderately short. Breast deep, broad and full. Back broad and well fleshed. Legs of moderate length. Fleece fine, uniform, curly, with bright luster	Crossing purposes to get early lambs for market. For wool especially, and mutton	
Lincoln	Large size with heavy fleece of long wavy or curly wool and moderate tuft of wool on face. Color white, head large, without horns, body deep, back wide and straight. Legs broad and set well apart. Weight for rams 250 pounds, ewes 200 pounds.	Wool. Crossing, especially on merino stock	
Merino	Distinguished by its very fine wool, usually delicately crimped. Wool generally short and dense. Grows to tips of ears and hoofs of feet. Form, when shorn, angular, shoulders narrow, back not usually so straight or strong as English breeds, legs less straight and neck more slender. Ram usually has horns. Very enduring and resistant. *The American merino* has 3 to 5 heavy folds on neck, and folds on arm and sides and across hips. Fleece covers entire sheep except tip of nose and hoofs. Eyes hidden by wool. Outside of fleece a dirty brown, but inside white. Ewes 80 to 100 pounds, rams 100 to 175 pounds. *Delaine merinos* have smoother bodies than the American, and fewer folds and wrinkles. Mature ewes 100 to 150 pounds, rams 140 to 200 pounds. *Rambouillet merinos* have large bodies, usually smooth and free from wrinkles, except perhaps on neck. Fleece fine and white. Rams usually have large spirally curved horns, ewes hornless. Legs long. Rams 175 to 185 pounds, ewes 140 to 160 pounds	Wool. Fleece especially fine, strong and heavy. Used for crossing to increase wool production. Delaine merino mutton of fair quality	
Oxford Down	Largest of down breeds. Nearly straight on underline. Long and coarse fleece. Very stately appearance. Color of face and legs brown, which is often flecked with gray. Ewes very prolific and heavy milkers. Not hardy under American climatic conditions. Rams 250 to 350 pounds, ewes 180 to 275 pounds	Representative mutton breed. Fleece long and coarse	*Breeding ewes.*—Fond of clover hay, alfalfa, alsike, pea-straw, shredded corn fodder and oat hay. A ewe weighing 100 to 150 pounds will eat 2 to 3 pounds of such fodders daily during winter. May need to supplement pasture with small grain, as oats. Just before lambing time, ewes should be fed liberally on variety of roughage. Some succulent food, as corn silage and roots, will help to produce good flow of milk. After lambing they should receive some wheat bran or oats, unless they can go on good pasture
Shropshire Down	Dark brown face and legs. Broad head, short face, thick muscular neck, body somewhat barrel shaped, except that it is straight on back. Body, head and legs to knees covered with fleece of even length and quality. Weight for rams 225 pounds, ewes 175 pounds	Mutton and wool	
South Down	Smallest of down breeds, but the model in form. Short straight legs, wide apart; broad level back thickly fleshed; long broad hips; neck short, thick at shoulder; head small, forehead full, face short, eyes prominent, ears small. Face and legs uniform reddish brown. Hindquarters carry down very heavy; breast broad and prominent. Fleece compact, long and close wool, white and carrying some yolk. Best weight for rams 200 pounds, ewes 150 pounds	Mutton breed: used for crossing to produce early lambs. Wool of good quality	*Feeding rams.*—For ram lambs, clean, heavy oats and pasture are best. In winter, clover hay and corn fodder, roots or silage, should constitute the ration. During breeding season, bran, oats, roots and clover hay should be fed liberally
Suffolk Down.	Large, rangy sheep, black-faced, hornless, with long clean, black legs. Wool is of good quality and mutton is excellent. A good feeder and very prolific	Mutton breed; used also for crossing. Wool is short	

Best Breeds	Characteristics	Uses	Best Foods
SWINE **Berkshire**	Rather more than medium size. Snout of medium length, face dished. Ears nearly erect, well carried. Jowl heavy. Neck short with considerable crest. Shoulder, back and rump of good width. Body deep. Ham thickly meated, strong constitution. Color black with a white mark on face. White on each foot and on tip of tail	Lard and pork. Meat lean and of high quality	*Breeding boar.*—Should not be overfed, but given just what he will eat up clean. Ration needs to be varied and have bulk and always contain a succulent food. Young boars should be fed more concentrated foods than older animals. Boar should be fed more liberally during breeding season, than remainder of year. Food should consist of grain (finely ground oats with one-third to one-half ration of wheat middlings or wheat bran), skimmed milk, succulent food (roots, finely cut second-crop clover or alfalfa leaves).
Cheshire	Medium size. Body has good length. Shoulders and hams well developed. Face slightly dished. Ear small and erect. Bone fine and of fair quality. Color white. Black spots often occur on skin.	Lard, pork and bacon	
Chester-White	Medium size, face straight or very slightly dished. Ear droops and is somewhat loosely attached to head. Color white, hair in many specimens wavy or curly. Neck wide, deep and short. Jowl smooth, neat and firm. Shoulders broad, deep and full. Chest large, deep, full in girth. Sides full, smooth, deep; ham broad, full, long, wide and deep. Back broad on top, straight or slightly arched, legs short and straight. Coat fine. Weight of boars 2 years old 500 pounds, sows 450 pounds	Lard and pork. Crossing, especially with Poland-China	*Breeding sows and young.*—Good pasture (blue-grass, clover, field-pea, alfalfa, cowpea, soybean) is essential and cheap. Mature sows need little except good pasture in August and September. In October about 2 pounds per head of corn should be given. After sows are bred they should have pasture and some grain, preferably equal parts of corn and oats at the rate of 3 or 4 pounds to 300 or 400 pound sows, until late December. Then substitute daily 5 or 6

SHEEP AND SWINE—Continued

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
Age of puberty 6 to 10 months Best age for breeding 18 to 20 months	*Stomach worm.*—Symptoms: Sheep become unthrifty, dull and lose flesh and strength. A soft non-inflammatory swelling appears under the jaws. Diarrhea appears	Change flock to high, well-drained land that has not been occupied by sheep for some time. Feed generously and provide plenty of salt. Mix 10 drams of coal-tar creosote in a gallon of water and give to lambs 4 to 6 tablespoonfuls, and to yearlings and older sheep 8 to 10 tablespoonfuls every other day until 3 doses have been given. Feed should be withheld for 12 hours before and 3 hours after medicine	Best breed information found in flockbooks published by the various breed societies. Experiment station records will reveal innumerable experiment station bulletins.
Period of heat, regularly during spring and autumn months. At other seasons period is irregular and often absent. Duration 2 to 3 days	*Tapeworms.*—Symptoms: Slow development. Weakness and loss of flesh. Flanks are drawn up or distended with gas. Unsteady on feet. Excessive diarrhea may develop	Fringed tape worm difficult to control by medicine. For broad tapeworm, give every sheep in flock ½ to 1 dram of extract of male fern in 2 to 4 ounces of castor oil, or 1 to 1½ drams of kamala. Withhold feed night before and in the morning of the day in which the medicine is given and give no water for 5 or 6 hours after medicine	
Period of gestation 5 months (21 weeks)	*Bloating.*—Symptoms: Abdomen becomes bloated and distended, filling with gas. Feeding falls off, animal shows stupidity, and respiration is difficult	Surgical treatment is necessary	Arizona Bulletin No. 60, Report, 1908
One ram to 30 to 50 ewes. Ram may be allowed to run with flock at night. In north, breed in October to December to get lambs in March–May; in South breed in August or September. Ewes have passed greatest usefulness at 7 to 8 years	*Liver rot or fluke disease.*—Symptoms do not appear until disease is far advanced. Rapid loss of condition and weakness, wool becomes dry and may drop off. Eyes and lips become bloodless. Appetite falls off. Bowels irregular	Remove sheep to high, dry pastures and separate the sick from the well. Give nourishing food and plenty of salt. Infested pastures and pools should be drained and should be used for other purposes until clean. Snails should be destroyed. Drugs have little effect	Farmers' Buls. 798, 840, 1134, 1181, 1199, 1330, 1710 Illinois Bulletin No. 129, Circular No. 125
	Gid, staggers or sturdy.—Symptoms: Animal moving in a circle, swaying, reeling, running forward with head elevated, turning about sharply, showing lack of control. Animal may be stupid. Eyes becoming staring, sight lost	Animals in advanced stage should be slaughtered. Carcasses of infested sheep should be completely disposed of so that dogs cannot get at them. As precaution, give dogs that have run of place 1 or 2 teaspoonfuls of castor-oil, followed 12 to 24 hours later by 25 minims of extract of male fern, followed with another dose castor-oil in 2 hours. Keep dog tied and burn all discharges	Michigan Bulletin No. 178
Lambs may be allowed to run with mother 3 to 4 months. Should be weaned by 4 months. To get hot-house lambs, have rams and ewes in good physical condition, not overfat. Use a young ram and keep him well fed while in service. Give ewes abundance of succulent food and some corn. If ewe was not shorn in fall, shear as early as safe. Have ram with ewes not earlier than March 15 nor later than May 15	*Scab.*—Symptoms: Sheep scratch, rub and bite infested places. Little blisters form which rupture and exude a yellowish liquid which dries on skin and forms scab. Mites may be found in margin of scab. Wool mats and falls out. Shoulders, sides, back and rump most affected	Shear all sheep and confine for 2 to 4 weeks. Then dip in a mixture that will kill the mange mites. Lime and sulphur dip is very good. Repeat 7 to 10 days later. Each sheep must be kept in dip 2 minutes and head dipped at least once	Missouri Board of Agriculture, Missouri Bulletin 7 (1909), No. 2
	Sheep Ticks.—Symptoms: Animals show itching and pain caused by ticks and bite and scratch themselves	Dip flock in lime and sulphur mixture or in a kerosene emulsion. Dip twice with an interval of 2 weeks. Pens and resting places must be thoroughly cleaned before animals are returned	
	Foot rot.—Symptoms: Lameness is apparent. Foot reveals red, moist spot in cleft just above the horny part. A sticky offensive discharge from hole in horn of hoof follows. Just above hoof there is swelling, accompanied by heat and sensitiveness	Treat feet of healthy sheep with a solution of 1 pound chloride of lime to 12 quarts water or 1 pound carbolic acid crystals to 4 gallons water. Remove sheep to clean fields. To treat diseased sheep, cut away all loose or undermined horn and all proud flesh, and stand sheep for 10 minutes in solution containing 4 pounds copper sulphate in 5 gallons water. When disease has reached deeper, area should be washed with a solution containing 1 ounce carbolic acid crystals in 20 ounces water, then dusted with a powder of equal parts boric acid and oxide of zinc and covered with soft bandage	Missouri Station, Circular Information No. 25 Nevada Bulletin No. 63
For additional breeding rules see *Horse*	*Paper-skin or lung-worm disease.* — Symptoms: A fitful or spasmodic cough leaving animal almost suffocated. Discharge accompanies cough. In final stages skin becomes dry and papery. Appetite falls off, resulting in weakness and decline	Separate the infested animals from the whole flock. Remove flock to clean inclosures and give nourishing feed, plenty of salt and pure water. Fumigation is best, using a mixture of flowers of sulphur and alcohol in a deep vessel floating in pan of water. Place in tight room and ignite. Attendant should remain to see that none suffocate. A mixture of 1 part salt to 25 parts of copperas should be kept constantly before sheep	New York (Cornell) Bulletin No. 285
	Sore feet and sore mouth.—Symptoms: Lameness and difficulty in eating. Ulcers appear on skin of leg above hoof and in membrane lining the lips	Remove scabs and wash twice daily with solution of 1 tablespoonful creolin in 1 quart of water. Then paint infected parts only with Lugal's solution of iodine	Oklahoma Report, 1908
	Garget.—Symptoms: Udder is swollen and hot. Milk contains streaks of blood or clumps of pus	Give 5 ounces of epsom salts dissolved in a pint of water, as purgative. Bathe udder often with warm water and rub with camphorated oil and keep udder milked out clean	Tennessee Bulletin No. 84 Wisconsin 23d Report
	Grass staggers.—Symptoms: Failing appetite, constipation, abdominal pain, fever, restlessness, unsteadiness, delirium, running against objects aimlessly	Affected animals should receive a strong laxative. Then give 2 tablespoonfuls, twice a day, of following mixture in a half pint of linseed tea: Aromatic spirits of ammonia 1½ ounces, alcohol 2½ ounces, fluid extract of nux vomica ½ dram	Virginia Bulletin No. 178 Wisconsin Report, 1907
	Scours.—Symptoms: Offensive diarrhea, loss of appetite, distended abdomen, abdominal pain. Depression and weakness	2 teaspoonfuls castor-oil containing 2 or 3 drops of creolin should be given at once and followed by 1 tablespoonful of following mixture 3 times daily: Paregoric 1 dram, subnitrate of bismuth 2 drams, sherry wine 3 drams, salol ½ dram, mucilage of acacia 5 ounces	Wyoming Bulletins Nos. 79, 81, Report 1908

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
1. Age of puberty 3 to 7 months 2. Best age to breed 8 to 12 months	*Mange.*—Symptoms: The crusts about eyes and ears are often the first evidence of disease. Disease spreads until it may cover entire body. Marked itching. Sometimes loss of flesh and decline	Crusts may be removed by scrubbing with soap and water followed by application of a 3 per cent solution of creolin or an ointment made of sulphur 2 drams, resorcin 1 dram and vaseline to make an ounce. Continue daily until all parasites are killed. When large numbers are affected, dipping in lime and sulphur dip (described under mange in cattle) is necessary. Dipping should be repeated after 6 days	Best breed information found in herdbooks published by various breed associations Bureau of Animal Industry Bulletin No. 48
	Verminous bronchitis.—Symptoms: Bronchial tubes inflamed, very severe coughing. Growth stunted. Caused by a small round worm in bronchial tubes	Kill adult pigs. Give young pigs 1 teaspoonful of turpentine in swill 3 times daily	Farmers' Buls. 331, 780, 1085, 1244, 1263, 1437, 1455, 1487, 1490, 1504 Colorado Bulletin No. 146. Report 1907
3. Period of heat, 3 days after weaning the pigs and every 9 to 12 days thereafter. Duration 1 to 3 days	*Paralysis.*—Symptoms: Hind legs affected first, gradually extending over entire body	Surgical treatment requiring extreme care is necessary	Illinois Circulars Nos. 126, 133
4. Period of gestation 112 to 116 days	*Rickets or rachitis.*—Symptoms: Animals stunted and poorly nourished. Lameness appears and bones about joints swell. Bones may become very weak and body fall over	Feed concentrated and nutritious food rich in proteids. Milk, middlings, bran and ground bone meal are good. Lime water should be given. Sunlight, fresh air, clean quarters and exercise must be provided. Precipitated phosphate of calcium in 1 dram doses 2 or 3 times daily in the feed, with oil of phosphorus in 1 drop doses is helpful	Indiana Bulletins Nos. 100, 126 Iowa Bulletin No. 106 Mississippi Bulletin No. 107

HORSES, CATTLE,

Best Breeds	Characteristics	Uses	Best Foods
SWINE—Conc'd **Duroc-Jersey**	Medium size, fine bone. Snout medium length, face slightly dished, ear drooped, jowl heavy, body wide and deep set on short legs. Ham heavily fleshed. Cherry red the popular color, but yellowish red and chestnut are often seen. Weight of boars 2 years old 600 pounds, sows 500 pounds	Lard and pork Crossing, especially with Berkshire and Poland-China	pounds of ration, ground oats 2 parts, ground corn 2 parts and bran 1 part. Skimmed milk is especially recommended for mixing grain ration. In winter give liberally of clover, alfalfa or pea-hay
Hampshire or **Thin-Rind Swine**	Medium size, face straight, ear inclined forward, but does not droop. Jowl light, as is also shoulder and ham. Back of medium width. Legs of medium length and bone of good quality. Color, black extremities with a white belt 4 to 12 inches wide encircling body and including fore-legs, which should also be white. Weight, boars 2 years old 450 pounds, sows 400 pounds	Bacon and pork Almost general purpose	For first 24 hours after pigs are born, give sow no food. Then give light ration of ¼ ground corn, ½ shorts, ¼ ground oats mixed with 3 to 5 pounds skimmed milk to 1 of grain. Pigs should be given a little feed at 3 weeks, using same ration as for sow. Feed liberally to 3 months of age
Large Yorkshire or **Large White Swine**	One of the largest breeds. Snout of medium length, with little or no dish. Moderate dish in face. Jowl of good width and muscular. Ears rather large, firmly attached, fringed with fine hair. Shoulders and back of medium width. Side long. Ham lighter than that of lard type with flesh carried well round inside of thigh. Legs medium length. Bone fairly heavy, clean and flinty. Color, white	Bacon. Valuable for crossing on Poland-China, Berkshire and Chester-White	*The bacon hog.*—Best feeds are mixed peas, barley, oats, shorts and skimmed milk. Barley, ground or soaked over night is feed most used. Oil-meal or tankage may be added advantageously. Summer feeding on pasture of clover, alfalfa or rape
Poland-China	Medium size. Face slightly dished. Jowl full and heavy. Ears fine, firmly attached; about one-third of ear droops. Neck short, thick and heavily arched on top. Shoulder heavy. Side short. Back wide. Ham very wide and deep. Legs short, bone fine. Black, with 6 white points on face, feet and tip of tail. Weight of boars 2 years old 600 pounds, sows 500 pounds	Lard and pork Valuable in crossing	*The lard hog.*—Principal source of food the undigested food in droppings of steers. Follow steers with equal number of pigs of about 6 months of age, and give them ¼ to ⅓ pound of tankage every day. For the last 4 or 5 weeks of fattening they should be removed from steer lots and fed as much corn as they will consume. Method will vary according to method of feeding the steers. Pigs that do not follow steers are fattened on pasture, clover or alfalfa or June-grass being best. Corn alone or abundant clover pasture is excellent ration
Tamworth	Should have golden-red hair on a flesh-colored skin, free from black. Snout long and straight. Ear large. Jowl narrow and light. Neck and shoulder are light; back and loin of medium width, side of good length, moderately deep. Rather deficient in ham. Legs long and strong	Bacon. Crossing, especially with Berkshire	

CHICKENS, TURKEYS,

Best Breeds	Characteristics	Uses	Best Foods
CHICKENS **Bantam**	Ornamental birds of many varieties: Sebright, rose-comb, booted white, Brahma, Cochin, Japanese, Polish, game, black-breasted red Malay	Many fancy and ornamental varieties	A good ration must contain sufficient digestible nutrients to meet needs of animal. Animal's appetite is safest guide as to amount of food needed
Brahma	Two varieties, light and dark. Show heavy leg and toe feathering, thick, close plumage. General color of light Brahma, white with black tail and black center stripes in both hackle and saddle feathers. In dark Brahma, wings of cock crossed by heavy black bar, and entire breast, body, leg and toes black. Back, wings, body and breast of female have a basis of gray on which are distinct dark pencilings. Weight for dark cocks 11 pounds, hens 8½ pounds; for light cocks 12 pounds, hens 9½ pounds	Meat breed Brown egg	
Cochin	Four varieties, buff, partridge, white, black. Peculiarity is an appearance of massiveness and fluffiness. Heavy, short feathering is piled high on back and extends wide at sides. Excessive thigh and shank feathering. Combs single, low, close on head and evenly serrated with five distinct points. Cocks weigh 11 pounds, hens 8½ pounds	Meat breed Brown egg	*Balanced ration.*—For egg production, 1 part protein to 4.6 parts carbohydrates For fattening, 1 part protein to 7 or 8 parts carbohydrates For raising young chickens, 1 part protein to 4 parts carbohydrates The ration should consist of foods which the fowl likes. The following grains are preferred by fowls in order named: wheat, corn, oats, peas, barley, buckwheat, rye The ration should provide a good variety and sufficient bulk to aid digestion. Wheat, bran, clover and alfalfa meal provide bulk in ration. The ration should contain easily digested foods, as whole grain and part ground feed. Feed at least one-third ground grain, as wheat or bran middlings, ground oats, corn meal and very small quantities of gluten meal. Wheat is most desirable of grains. Corn should be used largely because it is cheaper. Heavy oats rank next. Meat in some form, as beef scrap or green cut bone or skimmed milk should be included in every ration. It should form at least 10 to 15 per cent of total food consumed each day. Green food in form of cabbage, roots or cut clover should be given each day. Grit in form of cracked oyster shells or mortar is indispensable. Because of cost, wheat bran and middlings, and buckwheat middlings may be much used. Chickens should be fed according to age and season of year, giving the more heat producing foods in winter. The lighter and more active breeds can be fed a wider ration than the heavy and more sluggish breeds The ration should be balanced in such a way that the appetite is kept good, the needs of egg production met, and the fowls prevented from becoming too fat
Dorking	Three varieties, colored, white and silver-gray. Body long and deep. Carries abundance of flesh. Skin white. Colored largest cocks weigh 9 pounds and hens 7 pounds. White cocks weigh 7½ pounds, hens 6 pounds. Silver-gray variety is between these two. All have a fifth toe	General purpose, meat especially Egg of very light color	
Hamburg	Six varieties, golden spangled, silver spangled, golden penciled, silver penciled, white and black. About size of the Leghorn	Egg and fancy breed White egg	
Houdan	Color black and white evenly broken in alternate splotches throughout entire plumage. Head ornaments of crest and beard. White skin. Carry fifth toe on each foot. Cocks weigh 7 pounds, hens 6 pounds	General breeding purposes White egg	
Indian	Two varieties, Cornish and white. Beaks and shanks yellow. Bird of strong proportions. Back and wings of cock mixture of red and black, tail and breast black. Hen's back, wings, breast and body a rich bay penciled with black. Cocks weigh 9 pounds, hens 6½ pounds	Meat breed Tinted egg	
Leghorn	Eight varieties, single-comb and rose-comb brown, single-comb and rose-comb white, single-comb and rose-comb buff, single-comb black and single-comb silver duckwing. Characterized by early maturity and great activity. Large combs on top of head	Egg production White egg	
Minorca	Three varieties, single-comb black, rose-comb black, single-comb white. Long body, carried rather upright, deep at breast with back tapering sharply toward tail, which is long and carried rather low. Comb large. Ear lobes large and pure white. Cocks of rose-comb weigh 8 pounds, hens 6½ pounds. Single-combs weigh 1 pound heavier	Egg breed White egg	
Orpington	Three varieties, buff, black and white. Long body, abundant plumage, white skin. Short heavy shanks. Tendency to feathering on shanks. Cock weighs 10 pounds, hen 8 pounds	General purpose Egg tinted	
Plymouth Rock	Three varieties, the barred, white and buff. Back and body rather long, breast broad and deep. Single combs, yellow shanks. Cocks weigh 9½ pounds and hens 7½ pounds	General purpose, for both meat and eggs. Brown egg	

SHEEP AND SWINE—Concluded

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
Boars do not show best form before 4 or 5 months old and should not begin service under 10 months. Give best service 2 to 5 years old. Sows should be prolific and good milkers. For pork breed sows any time after 8 months of age but for pure-bred breeding stock 12 months of age better. Should breed twice a year, to get 1 litter in early spring (April to May), the second in September or October. Pigs may run with sows 8 to 10 weeks	*Sore mouth.*—Symptoms: Aversion to food and saliva dripping from mouth. Gums become congested and later necrotic patches develop, especially about front teeth and tusks. Offensive odor to mouth. Jaws are swollen, lips and mouth often cracked and covered with scabs. Rapid decline and prostration	Affected animals should be separated from well animals and pens thoroughly disinfected. Wash mouth with 2 per cent warm creolin solution to remove patches. Then a 10 per cent ointment of salicylic acid may be applied in severe cases. Treat daily until ailment is cured	
	Cottonseed poisoning.—Symptoms: Loss of appetite accompanied by thumps. Animal drops over, kicks and squeals for a few minutes and dies	Complete elimination of cottonseed meal from ration is the only positive prevention. Given in proper quantities it is normally safe, but its use demands special precautions	Ohio Bulletins Nos. 209, 213 Oklahoma Bulletin No. 80 Pennsylvania Bulletin No. 95 South Dakota Bulletin No. 105 Wisconsin Bulletin No. 184; Report 1907
	Catarrhal rhinitis or snuffles.—Symptoms: Animal more quiet than usual and may experience slight chills. Eyes are red, appetite lessened and constipation is present. Watery discharge from nostrils, which later thickens and makes breathing difficult	Keep animal warm and provide clean, well-lighted pen. Liquid foods should be warmed, 1½ ounces of castor oil should be given. Fumigation by burning tar in close room may help. To lessen nasal discharge, tincture of belladonna leaves in ½-teaspoonful doses twice daily may be added to feed	
	Thumps.—Symptoms: Sets in suddenly with a jerking or twitching movement of flanks, which may become excessive, producing a thumping. Animal keeps quiet and has a poor appetite. May fall off in weight	If caused by worms, give dried sulphate of iron in swill once a day for 7 or 8 doses, ¼ pound sulphate for 40 pigs. If caused by indigestion, give less food and allow access to charcoal and wood ashes. Exercise should be allowed also on free pasture. In first stages give every 4 hours a physic of 2 ounces raw linseed oil followed with 3 to 10 drops of tincture of opium in a little oil	
For additional breeding rules see *Horse*	*Hog cholera.*—Symptoms: Continuous fever and discoloration of skin. Animals lack spirit and lie huddled together. Refuse to move when disturbed	Demands expert and immediate care	
	Swine plague.—Symptoms: Aversion to food. Much coughing, back arched, groin sunken, eyes reddened and skin in front takes reddish tinge	Demands expert and immediate attention	

DUCKS AND GEESE

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
Very close inbreeding tends to produce chicks that are weak and fall an easy prey to disease or are infertile. Line breeding is better. Mate offspring of a pair with father and mother rather than brother and sister	*Simple canker.*—Symptoms: Appears as yellowish or whitish patches in mouth or throat. Surrounded by inflamed mucous membrane	Dust powdered boric acid on sores or apply pure creolin with soft cotton cloth. Fifteen grains boric acid in 1 ounce water may be used freely as a wash	Ontario Department of Agriculture Bulletin No. 151
	Lice.—Symptoms: May be found under wings and on skin about feather roots, on abdomen, back, neck and head	Dust thoroughly with pure fresh Persian insect powder. Work well down to skin. Repeat in 10 days	Farmers' Bulletins Nos. 41, 51, 64, 177, 182, 200, 234, 287, 355, 357, 528, 624, 801, 1067, 1070, 1221, 1331, 1337, 1347, 1376, 1377, 1413, 1427, 1506, 1508, 1524, 1538, 1541, 1554, 1614, 1652, 1727, 1753
Grandchildren of original father may be mated to those of original mother	*Mites.*—Symptoms: Red, black and gray. Breed in cracks and crevices of building or under droppings	Keep roost clean. Use abundance of mixture of 1 quart kerosene and 1 fluid ounce creolin or good liquid lice killer for painting roosts and droppings-board	Bureau of Animal Industry Bulletin No. 110; Same Circular No. 140
Selection involves the careful inspection of the individuals of any generation and preservation for breeding of only the best	*Diphtheria.*—Symptoms: Fowl becomes suddenly ill and loses appetite; legs are hot, comb hot and deep red. Difficult breathing and sharp cough. Inflammation of throat. Legs and wings may become paralyzed	Segregate sick fowl and preferably kill and burn. May give fowl four times daily a 0.01 grain tablet of biniodide of mercury. Cleanse mouth and throat often with strong peroxide of hydrogen, or 1 tablespoonful creolin in 4 fluid ounces of water	Arizona Bulletin No. 60 Connecticut Bulletins Nos. 52, 55
	Scaly leg.—Symptoms: Rough grayish or whitish scales and crusts on shanks and feet	Apply ointment made by mixing 1 teaspoonful creolin in 1 cupful melted lard. Stir until cool and apply daily until scales and crusts drop off	Kansas Bulletins Nos. 162, 164 Maine Bulletins Nos. 157, 159, 165, 166, 168 (contains bibliography).
Hybridization involves the crossing of two strains, varieties, or races in order to combine the favorable qualities of the two. Sex control seems at present beyond human power	*Colds.*—Symptoms: Sneezing, watery eyes, discharge from nostrils and swollen face. Bubbles or drops form in corners of eyes	Sleeping quarters should be well ventilated. Give condition powders or tonic in food or drinking water, or season mashes with ginger and red pepper. Following mixture will usually cure if taken at start: 20 to 30 drops spirits of camphor with a tablespoonful granulated sugar. Dissolve in pint of drinking water and allow birds access to no other drink	Maryland Bulletin No. 138 Missouri Board of Agriculture Missouri Bulletin No. 6 (1908), No. 12 New York (Cornell) Bulletins Nos. 212, 258, 274, 277, 282, 284 Oregon Bulletin No. 100; Circular No. 4
Period of incubation is 19 to 24 days, average 21	*Catarrh* (contagious) *or roup.*—Symptoms: Peculiar, strong offensive odor. A glairy water-white or yellowish discharge from nostrils and under eyelids. Legs hot. Comb and wattles hot and deep red. Characteristic roup smell always present	Kill and burn all very sick birds. Segregate in an open shed all that show symptoms. Use creolin dip—1 teaspoonful pure creolin in 1 pint water and dip heads in solution, using fresh solution for each 6 birds—and make fowl inhale creolin vapor by spraying over with the same solution. Thoroughly cleanse head, mouth, eyes, nostrils and throat with this disinfectant, and keep fowls in wide open, fresh pens	Pennsylvania Bulletin No. 87 Rhode Island Bulletin No. 126, Report 1908
To get early market poultry mate late in fall. Brahma and Cochin pullets begin to lay at 7 to 9 months. Leghorns and other small breeds 4 to 6 months. Plymouth Rock and Wyandottes, 5 to 7 months. Mate breeding hens 2 to 6 weeks before earliest date for hatching. Hens should have few weeks rest before breeding season, for high-class stock. Breeding stock should have free range, or, if confined, be not crowded and fed green feed and meat scrap in addition to that given laying stock. Hold eggs for hatching in cool, dry place, at temperature of 40 to 55° F. Hen for setting should be in fair condition, should feel hot to hand when handled, and should allow herself to be handled freely	*Worms.*—Symptoms: Will appear in the excrement	Allow no food for 12 hours. Then give in 1 dose a mixture of 2 teaspoonfuls oil of turpentine and 1 tablespoonful sweet oil. Administer directly into crop through rubber tube passed down throat. May be necessary to repeat in 12 to 24 hours	
	Gapes.—Symptoms: Difficult breathing and characteristic gaping attitude. Caused by a parasitic worm which attaches itself to mucous lining of windpipe	Remove worms by a loop of horsehair or a wire gapeworm extractor dipped in a weak solution of creolin. Stretch fowl's neck forward and introduce extractor into windpipe. Carefully twist it as withdrawn. Immediately disinfect extractor bearing worms	
	Diarrhea.—Symptoms: Looseness of bowels. Discharges yellowish, greenish, dark or watery	Give bird dry grain with abundance of charcoal, and do not allow any meat food. Scalded milk, thickened with well-boiled flour and seasoned with ginger, makes a desirable food and remedy	
	Contagious diarrhea.—Symptoms: Thirst, little appetite, stupidity, bowel discharge loose and watery, often dark or bluish green, sometimes blood streaked. Comb and wattles dark red or purplish, and legs hot	Segregate affected birds. Disinfect and remove excrement. Give calomel in 0.01 of a grain dose 3 times daily. For difficult cases dissolve 12 tablets of mercury bichloride, 0.001 of a grain drug strength each, in 1 quart of drinking water and allow no other drink. This medicine should be given less frequently as soon as improvement appears	

Best Breeds	Characteristics	Uses	Best Foods
CHICKENS—Conc'd			
Rhode Island Red	Two varieties, single comb and rose-comb. Tail color black. Rhode Island Red has a red surface of body plumage, with a red under color, free from slate Buckeye breed surface color is dark, rich garnet, and under color allows a bar of slate-color next to surface. Body of both long, Rhode Island Reds level. Buckeye body shows slight elevation in front. Weight of Rhode Island Red cocks 8½ pounds, hens 6½ pounds, Buckeye cocks 9 pounds, hens 6 pounds	General purpose Brown egg	
Wyandotte	Eight standard varieties, white, buff, black, silver, golden, silver penciled, partridge and Columbian. A bird of curves, back short and broad, body deep and round, breast broad and deep, with a low-set keel. Shanks short, strong and carried well apart. Colors silver, white, black, buff and mixtures. Close-fitting rose combs. Abundant fluffy, close-fitting plumage. Weight 8½ pounds for cocks, 6½ pounds for hens	General purpose, for both meat and eggs. Brown egg	

Best Breeds	Characteristics	Uses	Best Foods
TURKEYS			
Bronze	Largest and hardiest of all varieties for the market. Adult cock 36 pounds, hen 20 pounds	Meat	The young must be fed with care at first, allowing only bread and milk mixed with ¼ pot cheese and a little chopped onion, given 2 or 3 times a day. Once or twice a day feed finely cracked corn, wheat and oatmeal mixed in equal parts. After second week, bread and milk should be decreased and grains and pot cheese increased. Fine grit and charcoal should be available. Water should be provided in such a way that young turkeys cannot become wet. When turkeys graze in fields during day they should be fed grain at night, corn, wheat, oats or peas During breeding season, one feeding a day of mixture of equal parts by weight of wheat middlings, wheat bran, corn meal, ground oats and meat scraps, stirred up with skimmed milk, should be given In fattening turkeys for market they should be fed all the whole corn they will eat at night. In morning a mixture of 6 parts corn meal, 3 parts wheat middlings, 1 part beef scraps, mixed as thick paste with sour skimmed milk may be given Turkeys do best on free range
Narraganset	Plumage bronze and black with a mixture of white. Second in size to bronze. Cock 30 pounds, hen 18 pounds. General color gray	Meat	
Buff	Feathers a reddish buff, the wing flights being white	Meat	
Slate	Plumage of a bluish slate shade. Cock 27 pounds, hen 18 pounds	Meat	
Black	Plumage pure black. Otherwise same as above	Meat	
White Holland	Plumage pure white throughout; has pinkish white shanks. Cocks 28 pounds, hens 18 pounds	Meat	
Bourbon Red	A kindred variety to the buff, having deep reddish-buff plumage	Meat	

Best Breeds	Characteristics	Uses
DUCKS		
Rouen	Largest and most popular of all colored market varieties. Weight 9 pounds for drakes, 8 pounds for ducks	Meat
Black Cayuga	Largest solid black duck known. Mature pair weighs 15 pounds. Body of good length	Meat. A fair layer
Pekin	Largest white duck in existence. Specimens weigh as high as 10 or 12 pounds. Head and beak long and of good size, beak orange-yellow, back, breast and body long, broad and deep, with deep keel. Creamy white	Meat. A good layer
Crested White	Medium-sized white duck with large white crest or topknot, about two-thirds the size of Pekin, which it resembles in color and shape of body, except crest	Meat. A fair layer
Indian Runner	Head long and flat, light fawn in color, cap and cheek markings light fawn, bill straight, green with black bean at tip, eyes hazel, neck white from head to beginning of breast markings, back, light fawn or gray, breast light fawn, body light fawn, rear half white. Shanks and feet orange-yellow. Carriage very erect. Small size	Meat. The best layer
Colored Muscovy	Good size, black and white in color, black predominating. Side of head and region around eye are without feathers and are carunculated or corrugated and scarlet. Builds her nest and never scatters her eggs. Never quacks. Active on wing	Meat
White Muscovy	Same as colored muscovy except that it is pure white	Meat

Best Breeds	Characteristics	Uses
GEESE		
African	Large head with pronounced black knot and heavy gray dewlap under throat. Neck long, back broad and flat, breast full and round, body large and upright, thighs short and plump. Shanks medium length and dark orange color. Wings of good size, close fitting. General color, gray. Mature gander 20 pounds, goose 18 pounds	Meat and feathers
Embden	Color white. Square, compact body. Neck long and massive appearing, large head. Medium-size orange-colored bill. Back slightly arched, breast round, deep and full. Shanks short, stout, deep, orange color, thighs strong, wings large, tail short. Eyes bright blue. Mature gander 20 pounds, goose 18 pounds	Meat and feathers
Toulouse	Blue-gray in color, marked with brown. Head large but short, bill short and stout, neck medium long, body compact, medium length, deep, belly almost touching ground, back broad, slightly arched, breast broad and deep, wings large, strong, close fitting, tail short. Adult gander 20 pounds, goose 18 pounds	Meat and feathers
White and Brown Chinese	Bodies plump and round, covered with coat of soft feathers and fine down. Medium size, mature specimens weighing 10 to 14 pounds. Long arch necks, with large round knob at base of beak. Short erect body and carriage	Meat and feathers. Much in demand for ornamental purposes

DUCKS AND GEESE—Concluded

Brief Breeding Rules	Diseases and Symptons	Treatment	Bulletins
Set fresh eggs from vigorous stock having the qualities particularly desired. Eggs should not be more than 1 week old and must be clean	*Fowl cholera.*—Symptoms: A yellowish discoloration of part of droppings usually white. Fowl becomes unsteady on legs, feathers rumpled, wings droop, head drawn down, comb and wattles pale, legs hot. Food repulsive	Use mercury bichloride as for contagious diarrhea. 1 per cent solution carbolic acid in drinking water and cayenne pepper in food are recommended. Treatment seldom satisfactory	
For Asiatic breeds, mate 1 male to 6 to 10 females; for Americans, 1 male to 15 to 20 females; for Mediterraneans, 1 male to 20 to 25 females. In selecting breeding stock, pedigree, appearance, condition and performance are of first importance in the parents. Strong, constitutional vigor and early maturity essential	*Pip.*—Symptoms: Mucous membrane of mouth dries and a hard horny scale is formed on end of tongue. The hard scale or pip will in time fall off of its own accord	Apply equal parts of glycerine and water freely or wash mouth frequently with a solution of 15 grains boracic acid in 1 ounce of water	
	Bronchitis.—Rattling in throat and difficult loud breathing	Remove fowl to comfortable fresh-air pen, protected from drafts. Give nourishing, bracing food. Use 12 tablets arsenite of antimony, 0.001 of a grain each, to each pint of drinking water and allow bird no other drink	

Brief Breeding Rules	Diseases and Symptoms	Treatment	Bulletins
Select big, strong, vigorous, healthy, well-matured stock, not closely related. Constitutional vigor of first importance. Introduce new blood into flock. Males should be unrelated to females, as inbreeding weakens flock. Medium-sized male with good, fair-sized females of strong constitutional vigor and mature age will give best results. Have 4 or 8 females to 1 male. Hen lays 20 to 40 eggs in a season, beginning March or April. 1 mating sufficient to fertilize entire batch of eggs. Hen will lay 15 to 20 eggs before becoming broody and if broken up then will lay another batch	*Blackhead.* — Symptoms: Turkeys look pinched, shrunken and purple about head. Feathers rough. Diarrhea present with bright yellow excrement. Birds have little life and drag about	Kill and burn affected birds, and thoroughly disinfect coops, buildings, feeding and drinking troughs, etc. Pepper, ginger and something sour in food aid in prevention	See chicken references Farmers' Buls. 200, 791, 1409, 1697
	Colds.—See under chickens		
	Roup.—See under chickens		
	Gapes.—See under chickens		
Period of incubation 26 to 30 days. Old birds in good condition, not overfat, best breeders. Birds of either sex may be used for breeding until 8 or 10 years old. Laying generally begins in March or April	*Tapeworms.*—Symptoms: Presence of worms in feces	Freshly powdered kuosso, tansy and pumpkin seeds are recommended. Turpentine in small doses has given success	
	Diarrhea	Mix 2 ounces sulphuric acid and ½ pound copperas in 2 gallons water, and give 1 teaspoonful of mixture in each quart of drinking water	

Brief Breeding Rules	Best Foods	Diseases and Symptoms	Bulletins
Mate only standard specimens. Select meaty birds, deep keeled and strong in bone. Attention must be given to pedigree, appearance, condition and performance. Quick growth is important. Better ducklings result from eggs from old ducks, but young ducks lay a month earlier than old ones, and their eggs may be used for early hatching. Laying period December to June. Usually 1 male to 5 females till June, then to 10 females. Birds are kept in flocks of 25 to 40 of both sexes. Laying season extends from January to August	When breeding birds have free range and water-run, they may be fed either whole corn, wheat, oats or barley, or a mixture. If eggs are desired, supply good beef scrap. The birds may be allowed to help themselves When confined and heavy egg production desired, soft food should be fed morning and night and a light feed of hard grains in middle of day. Corn meal, low-grade flour, wheat bran, meat scrap and some green food, as turnips, cabbage, cut clover or alfalfa, make a valuable mixture. Drinking water should always be within reach	Ducks are remarkably free from disease and there are no diseases peculiar to them. Ducks running with other fowls may contract diseases, which should be treated as for other fowls. Lameness may result from damp quarters. Ducks having colds, as shown by frothy scum over eyes, should have eyes washed with warm water containing a little carbolic acid. Treat as for cold	See chicken references
Period of incubation 25 to 32 days	Begin to feed ducklings when 40 to 48 hours old. Start with mixture of two-thirds wheat bran and one-third corn meal, moistened with water or milk; a raw egg stirred in with each quart of grain is good addition, as is also a little sand or prepared grit. Keep before ducklings for 2 days if it remains sweet. Otherwise renew		Farmers' Buls. Nos. 64, 697
Ducks are poor sitters and eggs generally hatched by hen or incubator	When ducklings 1 week old, they may take 0.05 beef scrap, 3 parts wheat bran, 2 parts corn meal, 4 feedings a day. Gradually increase proportion of corn meal so that at 6 weeks the meal and bran are equal, and the beef scrap is 0.15 of the whole. At 6 weeks feed 3 times daily. If this feed too laxative, reduce the beef scrap. Excess green food likely to make skin yellow. Abundance of grit and fresh water must be constantly available		
For general breeding notes see chickens			

Brief Breeding Rules	Best Foods	Diseases and Symptoms	Bulletins
Choose bright, active goose and gander of good parentage, 2 to 5 years old. Mate in fall or early winter. Gander and geese 1 to 4 in number, should be put together and isolated till they become acquainted. Young ganders often take but 1 goose. Hens may be placed on the eggs. Goose will usually lay 2 litters. Wild ganders do not mate until 2 to 3 years old and frequently will not mate first year in captivity. Period of incubation 27 to 33 days	Geese graze freely and in this way pick up much of their food. In winter, supply a little grain and liberal allowance of succulent food, as roots and cabbage. At laying time the feed should be increased. A liberal ration, as prepared for ducks, containing considerable animal food, should be given twice a day	Geese are almost wholly free from disease, and the grower is seldom troubled in this respect	See chicken references
Laying season is very short, beginning about February 1. Will lay 20 to 50 eggs per year	Water and grit should always be accessible. In finishing grass-fed geese for market, feed corn meal with 10 per cent of beef scrap, scalded or wet with cold water. Once a day give whole corn		
Geese not fully mature until 1 year old, and first year eggs frequently infertile. Best laying is from second year on. Ganders are most valuable at 3 to 7 years. Goose becomes broody after laying about 18 to 20 eggs. If the eggs are taken away and the goose is shut up for few days she will then lay another batch, and with similar treatment a third batch. Eggs for hatching should be held at 50 to 60 degrees and turned each day For general breeding notes, see chickens	Keep goslings in warm place, and first 2 or 3 days feed a little soaked bread and water. Gradually let them out, and in a week they may go free. Will need nothing but a little stale bread first 5 weeks, if on good free range. After 5 weeks a mash of one-third corn meal, two-thirds bran should be given. After 6 weeks give equal parts of corn and bran, to fatten		Farmers' Buls. Nos. 64, 767

ECONOMICS OF PLANTS, ANIMALS AND MINERALS

The most important commercial products are summarized in the following pages. The materials are grouped according to their sources: thus all the many products of the cotton plant are treated under one head; and since cotton fiber is the most important product of this plant, it is placed under the general heading of vegetable fibres, even though it supplies oil, cattle food and other articles. Only the principal countries of production are mentioned.

FOODSTUFFS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Wheat is the fruit of a grass (*Triticum sativum*)	Its commercial varieties, hard, soft, red, white, etc., differ in percentage of starch and gluten The whole grain is ground into *graham flour*, made into *breakfast foods* and used in brewing From parts of the grain are prepared *whole wheat flour, white flour, middlings, bran, wheat grits, wheat starch, macaroni, spaghetti*, etc. Wheat straw is plaited into braids (Leghorn, etc.) for hat making and is used like the straw from other grains for packing material and as bedding for animals	Grows in temperate climates, the largest crops being raised in United States (especially in Kansas, Nebraska, Minnesota, North Dakota, Ohio, South Dakota and Washington); Central Europe, India, Argentina, Canada and Australia. The area of wheat production is steadily increasing in newly developed countries, such as parts of British America, Australia and Manchuria The United States is the principal user of white flour	Wheat flour may be said to be the standard foodstuff of modern civilized man In the modern flour mill, heavy rollers of steel or porcelain have replaced the old-style millstones. The bran, middlings and flour are separated by sieves, the finest being of silk bolting cloth Macaroni is made from special varieties of hard, glutinous wheat The principal countries exporting wheat are United States, Russia, Argentina, Canada, Rumania, India and Australia Straw braids come largely from Italy, China and Japan
Barley is the seed of a grass (*Hordeum sativum*, variety *vulgare*, etc.)	It is used chiefly in brewing and for horse feed; also in soups *Pearl barley, barley flour, malt, beer* and *alcohol* are its chief products	Cultivated chiefly in north and central Europe, the colder parts of Asia and North America	Malt is made by moistening barley and allowing it to sprout in a dark room. During germination the starch is converted into dextrine and maltose. On fermentation, maltose produces alcohol Pearl barley is prepared by removing the hard outer coats of the grain
Rye is the seed of a grass (*Secale cereale*)	It is used in the form of *rye flour* and for distilling whiskey and vodka Rye straw is plaited into *hat braids*	Cultivated in the cold climates of northern Europe, especially in Russia. Only small amounts are grown in the United States, principally in Minnesota and North Dakota	Rye flour is the chief breadstuff in parts of Russia, Scandinavia and Germany Whisky is distilled from fermented rye and corn
Oats is the fruit of a grass (*Avena sativa*)	Used chiefly for horse feed and in lesser amounts for making *oatmeal* and breakfast foods	Grown in largest amounts in Russia and the United States (especially Illinois and Iowa). Cultivated throughout the temperate parts of the civilized world	The manufacture of oatmeal is a relatively static industry, since many new breakfast cereals, made from corn or wheat, compete with it
Corn, Maize or **Indian Corn** (*Zea mays*) belongs to the grass family. Flint, dent, sugar, soft and pop corn differ in percentage of starch and gluten, and the grain may be white, yellow, red or black in color	Among the dozens of useful products made from corn are *corn meal, corn grits, hominy, breakfast foods, beer, whisky, alcohol, cologne spirits, cornstarch, dextrine, glucose, grape sugar, corn sirup, corn oil, soap* and *cattle foods* A special variety of corn is raised to make *cob pipes*. Compressed *corn pith* is used for insulation. Corn husks are used in *mattresses*, and *paper* is made in very limited amount from the leaves and stalks. Large amounts of *popcorn* are eaten in the United States. Green corn *stalks* are stored in silos for winter cow food	Corn is the most valuable farm crop of the United States. The chief corn growing states are Illinois, Iowa, Ohio, Nebraska and Indiana. The bulk of the world's production of maize is grown in this country, although it is an important crop in Hungary, Italy, Egypt, South Africa and other parts of the world	Corn is of primary importance as a food for live stock, enormous quantities being used to fatten cattle and swine The manufacture of starch and other products from corn is an industry of increasing magnitude. The chief starch derivatives are *dextrine* and *glucose* or *grape sugar* (used in brewing beer and as a substitute for true sugar) Corn oil may be called a by-product in starch manufacture, yet the annual value of corn oil is greater than that of cornstarch produced in the United States. It is used in soap and paints
Rice is the fruit of a grass (*Oryza sativa*)	*Rough rice* and *clean rice* are the common commercial articles. *Rice polish, saké* or rice wine and *rice straw* are of lesser importance. Rice is the staple cereal food of China, India and Japan	It is usually grown in swampy land or else on irrigated fields. In most countries rice is grown in the most primitive fashion. Immense irrigating plants and modern agricultural machinery make possible the large production in parts of the United States It is the chief crop in southeastern Asia, from India through Indo-China, a great part of China, southern Japan and many islands of the Pacific. Rice of excellent quality is raised in Texas, Louisiana, Arkansas and South Carolina	It is estimated that one-third of the people of the world live principally on rice Rough rice or paddy (rice in the hull) is first hulled by machinery and then the grains are polished or whitened. The *rice polish*, which consists of the powdered outer coats, is a very nourishing cattle food. *Saké*, the national drink of Japan, is a weak alcoholic liquor brewed from rice. Rice straw is of enormous use in Asia, being employed for hundreds of purposes
Millet and **Sorghum** are cultivated grasses of many genera (*Panicum, Setaria, Andropogon*, etc.)	Guinea corn, kaffir corn, broom corn and other names are employed to distinguish the different kinds	These grains are grown in practically all parts of the world. In Europe and America they are important chiefly as fodder plants, although in many other parts of the world the seeds are used as human food	In some places the juice of sorghum is boiled down to make sirup or sugar. Common brooms are made of the tops of one variety of sorghum (broom corn) These grains are mainly of local importance
Buckwheat (*Fagopyrum esculentum*) is used like wheat, rye and other grains	The seeds are ground into buckwheat flour. Buckwheat fields are especially attractive to bees and a fairly important source of honey	Buckwheat cultivation has decreased in recent years. New York and Pennsylvania produce the greater part of the crop in the United States. Abroad it is raised chiefly in Russia, France and Japan	Buckwheat flour is less used than formerly Very little of this grain enters into foreign trade
Hay is made from many grasses and leguminous plants	Timothy, clover and alfalfa are the chief sources of hay in the United States	It is produced almost exclusively in temperate climates. Its yearly value in the United States is almost equal to that of the wheat crop. While cultivated in the United States and Europe, it is raised wild in all parts of the world	Hay is most important in the cattle raising sections of the world. It is too bulky to be shipped long distances
Starch is prepared from many seeds and roots. The common starches are from corn, wheat, rice, potatoes, cassava, tapioca, arrowroot and the pith of the sago palm tree	Starches appear on the market in powder, lump, flake and pearl forms. Starch grains differ in size and shape according to their source Glucose, dextrine and alcohol are made from starch	For industrial purposes starch is prepared chiefly from potatoes in Europe and from corn and potatoes in the United States Cassava is a very important foodstuff in almost all parts of the tropics Many starches are of great local importance, such, for example, as taro in Hawaii. Comparatively few enter into general commerce	In general, starches are separated from roots or seeds by grating them and washing with water. The starch grains are carried off in suspension and later separated from the water Starch and starchy foods are of the greatest importance to men and animals. Aside from the manufacture of glucose, dextrine and alcohol, starch is used for sizing yarn, cloth and paper Tapioca comes on the market chiefly from Brazil and Straits Settlements. Arrowroot starch is produced in Bermuda, St. Vincent and Jamaica

FOODSTUFFS—Continued

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Vegetables of an almost infinite variety are used in all parts of the world. Many of these are roots, some seeds, some leaves or other parts of plants	The bulk of the crop is consumed fresh, although beans, peas, etc., are dried and enormous quantities of vegetables are canned or otherwise preserved, especially tomatoes, corn, peas and beans	The largest cultivation of fresh vegetables is as a rule near great cities, where truck farming is an important industry. Large areas are devoted to growing vegetables for canning, and small plots for local use are cultivated the world over	Vegetables are so heavy in proportion to value that they are not normally shipped long distances. Potatoes and onions, being least perishable, are most important in general commerce In the United States, fresh vegetables from Florida, Texas and California are shipped in volume to northern markets in the winter months
Sugar is obtained from the juice of the sugar cane and from the juice of the sugar beet. Maple sugar is from the juice of the sugar maple tree. Sugar and sirup are made also from the juice of several palm trees	Pure cane and beet sugar are in every way identical Raw cane sugar, brown to yellowish in color, produced by evaporation of the juice in open pans and crystals from vacuum pans are both important commercially. The price of raw sugar is determined by its purity as shown on chemical analysis. A fairly good indication of purity is found in color *White sugar*, granulated, loaf and pulverized, as commonly sold, is more nearly chemically pure than most other articles of commerce *Molasses*, from cane juice boiled in open pans, is palatable for human food and, like all cane molasses, is fermented and distilled to make *rum* *Molasses* from vacuum pans (whether from cane or beet juice) is not pleasant in taste but is an important food for cattle and is distilled to make alcohol *Bagasse*, the dry residue left when the sugar is extracted from the cane, is used in making wall board and insulation	Sugar cane is grown in India, Cuba, Hawaii, Java, Brazil, Mauritius, Louisiana and other parts of tropics and subtropics. India's large production is consumed locally and enters little into export trade. Sugar beets are grown most extensively in Germany, Russia, France and United States. More than half of the world's supply of sugar (exclusive of India) now comes from the sugar beet Economical modern processes necessitate the building of enormous mills and the manufacture of sugar on a very large scale A factor of great importance in the industry has been the production of sugar from beets, grown on the farms of the temperate zone, close to the point of consumption. Here the refuse or pulp from the beets, along with the molasses, is promptly used for stock food	After harvesting, sugar cane is carried promptly to the mill, where the juice is pressed out. Modern mills have rollers arranged in sets. The trash, or bagasse, is almost dry when it leaves the last rollers. The juice is boiled down, generally in vacuum pans heated by steam, and the sugar crystals which form are separated from the molasses in centrifugals Sugar beets are sometimes stored for several months before being used. The juice is commonly extracted by diffusion; that is, the beets are sliced and soaked in warm water. The sweet liquid is then treated in practically the same way as cane juice Raw sugar is refined or purified by dissolving it in water, treating it with lime, filtering and recrystallizing The large sugar refineries are located in the United States and Europe Sugars from the maple and the palm are produced only in small amounts and are only of local value. Sugar of milk is of some importance medicinally and industrially
Alcohol is formed as a result of the fermentation of sugar and is therefore obtainable from practically any fruit or from any starchy matter through conversion of the starch into sugar	Alcohols differ in chemical composition according to the source. Grain alcohol, denatured alcohol and wood alcohol are the chief commercial types. Grain alcohol is used in many industries as a solvent, and finds its way into most extracts, perfumes, antiseptics and fluid medicines sold for the home Denatured alcohol and wood alcohol are deadly poisons never used in food products Alcoholic drinks are made in large quantities in all parts of the world. Whiskey, wine, brandy and beer are the most common varieties	All parts of the world make and use alcoholic liquors. Distilled liquors contain more alcohol than fermented drinks. Wood alcohol and denatured alcohol are finding an increasing use for many industrial purposes in Europe and America, largely because of the lessened tax on their production	Grain alcohol is distilled from fermented grain, chiefly Indian corn, in the United States Potatoes are the most important source of alcohol in Germany. For industrial purposes it is denatured, or rendered unfit for use in beverages, by the addition of substances which give it an objectionable taste, odor or color. Alcohol is employed in the manufacture of artificial silk, ether, paints, varnishes, photographic film, perfumes, drugs and hundreds of other products
Tea, as it appears in commerce, is the prepared leaves of a bush or small tree (*Thea sinensis*)	Teas are classed commercially according to the district of production as China, Ceylon, India, Assam, Japan, Formosa, Java; according to the method of preparation giving sun-dried, pan-fired, basket-fired; (*a*) green—Gunpowder, Imperial, Hyson, Caper, etc.; (*b*) black—Pekoe, Oolong, Souchong, Congou, etc., and according to the quality, dependent chiefly on the age of the leaf *Brick tea* is commonly of low grade and is made from tea dust and sweepings. It has a large sale in Tibet and Russia	Tea is grown chiefly in hilly country throughout eastern and southern Asia. China, Ceylon, India, Japan and Java are the chief producing countries. The cultivation of the tea plant requires great care to produce leaves of perfect quality, young, tender and fragrant. The very youngest leaves and leaf buds, when properly prepared, sell for the highest price. In some places tea is picked only once or twice a year, while in other countries, where the climate is favorable to rapid growth of new shoots, the pickings are very frequent	Green and black teas are made from leaves of the same species of plant. For black tea the leaves are allowed to wither and ferment slightly before being dried, usually over a charcoal fire Green teas are prepared by drying the leaves more quickly and not allowing them to ferment Tea is popular because of its pleasant taste and stimulating quality (due to the theine, or caffeine, which it contains). Outside of tea-producing countries, the chief consumers are English-speaking people. The United Kingdom buys from Ceylon, Assam and Bengal. The United States uses green tea coming from Japan, Formosa and China. Much Chinese tea is exported overland to Russia
Coffee is the seed of a small tree. The world's supply of coffee is produced chiefly by the species of tree which was originally native in Abyssinia and cultivated in Arabia (*Coffea arabica*)	The commercial varieties of coffee are named according to the districts of production, and to a very considerable extent these names when so applied indicate flavor (Mocha, Java, La Guayra, Santos, Rio, etc.) *Coffee extract* is prepared for sale to only a small amount The popularity of coffee is due to the fact that, like tea and chocolate, it contains caffeine, a mild stimulant	Coffee is cultivated in many parts of the tropics. Brazil is by far the greatest producer, the coffee district being mainly in the states of Sao Paulo, Rio de Janeiro, Minas Geraes and Espirito Santo. Much coffee is grown in the mountains of northwestern South America, Central America and the West Indies. Coffee is grown in Java and other parts of the East Indies, as well as in smaller quantities in Arabia, Africa and Australia	Two beans are usually contained in each red coffee berry. The berries are dried in the sun and then cleaned by machinery to separate the beans from the several coats which cover them. Coffee is roasted before use and people in some parts of the world prefer a much darker roast than others. Coffee is but little adulterated at the present time, but there are various substitutes on the market, such as chicory, roasted barley, etc. The United States uses more coffee than any other part of the world
Cacao Beans are the seeds of a rather small tree (*Theobroma cacao*). (This species is absolutely distinct from the cocoanut palm and from coca, the leaves of which yield cocaine.)	Cacao beans are classified commercially according to the place of origin and according to the method of drying as fermented (rotted) or unfermented *Cocoa* and *chocolate* in its many forms, bitter, sweet, milk, candy, etc., are increasingly used for food and drink. They are superior to both tea and coffee in supplying nutriment (oil, starch and albuminoids) in addition to the same stimulant principle *Cocoa butter* is added to some of the finest candies and enters into the manufacture of cosmetics, pomades and salves	Cacao trees are grown in warm moist climates, usually in the shade of larger trees. Brazil, Ecuador and the island of Sao Thomé in the Gulf of Guinea, Venezuela, Trinidad, Mexico, Central America, Ceylon and the East Indies produce cacao. The beans grow in pods 6 to 10 inches long, each of which contains, perhaps, 50 seeds. These, after removal from the rind, are dried, generally in the sun, on especially prepared floors. It is customary to allow them to ferment slightly before drying, to develop the flavor	Chocolate is made by grinding cacao beans which have first been cleaned, roasted, crushed and separated from the thin skin or shell which covers each. Sugar, vanilla or other ingredients are added to make sweet chocolate, etc. Cocoa or cocoa powder is made by pressing the ground-up beans in a powerful machine to remove some of the oil, and then pulverizing the remaining mass. Because it contains less fat than chocolate some people find it easier of digestion Cocoa butter is the solid oil or fat removed in making cocoa Great factories in the United States, Holland, France, Switzerland, England and Germany use most of the crop

FOODSTUFFS—Concluded

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Yerba Maté or Paraguay tea, the dried leaves of a tree (*Ilex paraguayensis*)	These leaves contain caffeine and are used like tea	The tree grows wild in Paraguay and adjoining regions of Argentina and Brazil. The leaves are not selected but entire branches are taken	After drying, the leaves and twigs are broken up and packed for sale. Maté is a common beverage in many parts of South America
Olives are the fruit of a tree (*Olea europea*)	*Pickled olives* are usually the unripe fruits prepared and bottled in salt water *Olive oil* (sweet oil) is the most popular oil for table purposes	The tree, which lives to a great age, grows in Mediterranean countries, California and Australia. Only limited districts produce olives fit for bottling. Most olives are grown for the production of oil	Olives for pickling are soaked in lye to remove bitterness and often spices are added to the pickle to give an aromatic flavor. Olive oil is pressed from the ripe fruit. The poorer grades of oil are used in lubricating and for soap-making
Fruits, like vegetables, are produced in great variety in all temperate and tropical climates. Most are used only locally. Those entering into commerce include **Apples, Bananas, Berries** (chiefly Blackberries, Cranberries, Raspberries and Strawberries), **Cherries, Citrus Fruits** (chiefly Grapefruit, Lemon, Lime and Orange), **Dates, Figs, Grapes, Guavas, Peaches, Pears, Pineapples** and **Plums**	Fresh fruits are taking larger places in world diets Canned fruits, especially peaches, pears, pineapples and apricots, are put up on a large scale Jellies and preserves are made commercially from most common fruits Large quantities of dried and evaporated apples, peaches, apricots, plums (prunes), figs and grapes (raisins) are sold Wines and brandies are made from grapes and to a less extent from berries and other fruits Vinegar, especially from apples, is used in large amounts	Different fruits thrive in different climates. *Apples* are widely raised in temperate regions, the largest production being in the northern United States and parts of Canada. New York, Virginia, Oregon and Washington have large commercial orchards Most *berries* are grown in temperate climates. Cranberries are raised in New Jersey and Massachusetts, most of the others throughout the United States *Cherries* are grown in Europe and the United States, especially Michigan and California *Citrus fruits* are grown in sub-tropical countries. In Europe Italy and Spain and in the United States Florida and California, are the chief districts *Dates* come from northern Africa, Asia Minor and California *Figs* grow in all sub-tropical climates, in the United States in Texas, Arizona and California *Grapes* are raised in temperate climates. Italy and France in Europe and New York and California in the United States grow great quantities for the table, for jellies, and for wine production *Peaches, pears* and *plums* are grown in mild climates. California produces large quantities *Pineapples* grow throughout the tropics. The industry thrives in Hawaii *Bananas* and *guavas* are tropical. The West Indies and Central America are the principal producers	Refrigerator cars and special steamers make possible the shipment of fresh fruits to parts of the world distant from the region of production. There is a large export of green, ripe and dried apples from the United States and Canada to England and the Continent. Australia and South Africa are increasing their export of apples and other fresh fruit. European markets are also supplied from the Canary Islands and North Africa. Prunes, raisins and other dried fruits are shipped from California, Italy and Spain Tropical fruits are exported from the West Indies, Central America and Hawaii. The banana trade is especially well developed, with shiploads going on regular schedule to the United States and western Europe Citrus fruits are shipped fresh to most parts of the world, in Europe from Italy, Spain and north Africa, and in America from Florida, Texas and California Fruit juices and jellies, wines and brandies are made where the crops are produced, then shipped. Almost every country has its own distinctive wines
Nuts are the seeds of various plants. Locally used as foods in all parts of the world, those most important in trade include **Peanuts, Walnuts, Almonds, Pecans, Brazil nuts** and **Coconuts**	The food nuts are sold and used generally in their hulls, just as gathered and dried The meat of the coconut is shredded mechanically and sold thus Oils useful for food, both for humans and livestock, and in the industries, are obtained from the meats of nuts by pressure	Nuts suitable for food are grown in all parts of the world. The *walnut* is raised in largest quantities in northern Europe and the United States. The wild black walnut and the cultivated English walnut are the main varieties. *Almonds* are grown in California and Italy and north Africa. *Brazil nuts* grow wild in South America. *Coconuts* grow throughout the tropics and are sometimes cultivated. *Pecans* are grown in large groves in southern United States. *Peanuts* grow on vines and are raised in the eastern states, especially Virginia	As very rich natural foods, nuts are eaten as grown or used in candies, cakes, ice cream and other food products. They are shipped to all centers of population in bulk from the growing districts. Peanuts are generally roasted, then sold either in the hull or hulled and salted. Coconut oil is used to a large extent in cooking; peanut oil and other nut oils may be used in mixing foods for livestock and fowls
Spices and **Condiments** are produced in many varieties. Those entering trade include:		Most spices are natives of Asia and the East Indies and are cultivated in the tropics and subtropics	All industrial nations import spices from the tropics. The desire to find new supplies led to many discoveries of new lands
Allspice	A common spice, whole or ground	West Indies, especially Jamaica	Berries are dried in the sun
Anise	Seed for spice; oil for flavorings	Mild temperate climates; a garden herb	Seed is dried or pressed to yield the oil
Caraway	Seed and oil for flavoring	A garden herb in temperate climes	Same as anise
Cinnamon	Bark, generally ground; oil is distilled from it	Best is from Ceylon. Inferior grades, called *Cassia*, from China and India	Bark, stripped from twigs, may be ground or distilled
Cloves	A spice, whole or ground; it yields a useful oil	Grown in both the East and West Indies	Flower buds are picked, dried or distilled The oil is used in medicine and as a flavoring in industry
Ginger	Root, powder and preserved forms are sold. Ginger ale is a popular beverage	Grown in tropical countries, most in the East Indies, Puerto Rico and Jamaica	Ground, candied or preserved. Ginger ale requires the importation of large quantities into the United States
Mustard	Seed for spice; prepared mustard for the table	Cultivated in Europe, the United States, all temperate climates	The most used spice, both dry and in preparations
Nutmeg	Both kernel and seed coat, called *mace*, are spices	East Indies	Whole kernels are sold untreated
Pepper	*Black pepper* consists of the dry, unripe berries, while *white pepper* is the ripe fruits with the outer skin removed. *Red (Cayenne) Pepper* is a different form. *Paprika* is from a sweet red pepper	The black variety is a vine grown in the East Indies. The red forms are grown in all subtropical regions, especially Mexico and the West Indies	In quantity and value pepper is the leading spice imported into the United States
Turmeric	Powdered as a spice, or in the prepared condiment, *curry*	Grown in southeastern Asia and the East Indies	Ground stems yield the spice, also a minor dye
Vanilla	Alcoholic extract of the bean	Mexico, West and East Indies grow the plant, an orchid	A popular flavor for candy, ice cream and home cooking. A synthetic substitute is available
Salt is a natural mineral	See Mineral Products		See Mineral Products

BIRD PRODUCTS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Production	Manufacture, Uses and Trade
Eggs are chiefly from the domestic fowl	Aside from their use as food, eggs supply *egg albumen.* Large numbers are preserved by cold storage	Raised in all parts of the world. See the Table of Chickens, Turkeys, Ducks and Geese	Eggs are used in preparing tanned leather for gloves, etc.; and egg albumen in photographic paper, clarifying sugar, etc.
Feathers and bird skins are from many kinds of wild and tame birds	Ostrich, cock, goose, duck, turkey, pheasant, heron, grebe and many wild birds furnish *plumes* for decorative purposes	Ostrich feathers are obtained by killing wild birds in central Africa and from ostrich farms in South Africa, Argentina and California Down, for pillows and feather beds, is from the domestic goose	The United States imports feathers and down chiefly from Europe. The greater part of the supply of ostrich feathers comes from South Africa and from California ostrich farms
Guano is the accumulated excrement of birds and bats	A valuable fertilizer. Refuse from fish canneries and oil factories goes under the name of fish guano	From dry islands and caves	Exported mainly from islands in the Pacific

INSECT PRODUCTS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Silk is from the cocoons of the cultivated silkworms (*Bombyx mori*). Pongee and other wild silks are produced by insects of different species (*Antherœa*)	*Silk cocoons* are reeled to obtain *raw silk.* The unreelable parts of the cocoons are *silk waste,* which is converted into *spun silk.* Raw silk is "thrown" or twisted giving *tram* and *organzine* for weaving	Silkworms are reared and cocoons produced commercially in China, Japan, India and Mediterranean countries, particularly Italy and southern France. Here, cheap labor can be obtained as in no other part of the world where the climate is favorable. The reeling of the raw silk from the cocoon is largely conducted in modern factories	China, Japan and Italy export most of the raw silk of commerce The United States leads the world in the quantity of silk manufactured. France makes fabrics of high grade. Much of the raw silk imported into the United States comes from Japan. We import silk fabrics from Europe
Honey and **Beeswax** are produced by the honey bee (*Apis mellifica*)	*Honey* is sold either in the comb or extracted. *Beeswax* is obtained by melting the comb. Beeswax is largely replaced now by paraffin, stearine and vegetable waxes. Wax is used for candles, waxing floors and thread, artificial plants, salves, etc.	Honey and wax are produced in northern Europe and the United States	Much honey is shipped from California to other parts of the United States and to Europe. Beeswax is imported from Europe and South America
Lac is a resinous substance formed on twigs by the lac insect (*Tacchardia lacca*)	*Stick lac* is the crude material as gathered from the trees. *Seed lac* and *button lac* are partly purified. *Orange shellac* is bleached to make white shellac	From forests of northern India and Indo-China	Dissolved in alcohol to make varnishes. Used in sealing wax, putty, for sizing paper, stiffening felt hats, etc.
Cochineal consists of the dried bodies of insects (*Coccus cacti*)	Used as a red dye for wool	Raised on cactus plants in Mexico, Central America and the East Indies	Of little present importance due to the extensive use of dyes from coal tar

MINERAL PRODUCTS

METALS

Metals	Ores and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Aluminum is the lightest metal in common use	*Bauxite* (aluminum hydrate) is the chief ore *Cryolite* (fluoride of aluminum and sodium), a mineral mined only in Greenland, was formerly used as an ore but is now utilized in the manufacture of alum and soda *Alum* (a sulphate) is made from cryolite or clays	Bauxite is mined in France, Ireland, Germany, Arkansas, Alabama and Georgia. Aluminum is refined by electric processes, the largest works in America being located near Niagara Falls and in Quebec	Bauxite is used as an addition to iron and steel, preventing bubbles and waste in castings. Pure aluminum is used in electrical work, and for purposes where a light, strong metal is necessary, as in certain machinery, hulls for small boats, etc. Household utensils, decorative building material and airplane parts are the principal industrial uses. Refineries are located in Switzerland, France and Great Britain
	Corundum (aluminum oxide) is, next to diamond, the hardest natural mineral. *Sapphire* and *ruby* are transparent forms suitable for gems *Emery* is an impure form of corundum	Canada, North Carolina, Alabama and India have mines of corundum. Emery is produced chiefly in Greece and Asia Minor Rubies and sapphires are found in Ceylon, India and Montana	Corundum and emery are powdered for use as abrasives in wheels, sharpening stones, polishing powder and cloth
	Feldspar is a silicate of aluminum with other metals. It is found in most common soils	Mined in Canada, North Carolina, New York, Maine and Norway	Ground up for use in pottery making
	Clay is chiefly silicate of aluminum and other metals. *Kaolin* is its purest form. The properties of clay vary with its composition, as china clay, fire clay, pipe clay, brick clay, etc.	Clays are found in all parts of the world as a result of the decomposition of other rocks. For many purposes they are freed from sand and grit by washing with water, the clay being carried away in suspension. Later it is allowed to settle and gathered up in the form of mud	The location of manufacturing centers of pottery of all kinds and of bricks, is dependent on clay deposits. In pottery making, Ohio, New Jersey and Pennsylvania lead the United States. Abroad, fine china is made in France, Germany, England, Japan and China. All of these countries export chinaware
Antimony and Bismuth	*Stibnite* (antimony sulphide) is the chief ore of antimony. Bismuth occurs in small amounts in a pure state and also combined with sulphur These metals form many alloys such as *type metal, anti-friction metals, white metal, babbit metal, fusible metals,* etc. *Tartar emetic* and other antimony compounds are used in medicine and dyeing	Antimony is produced in Sweden, Borneo, Germany, United States, Japan and other countries Bismuth comes mainly from Bolivia and Australia. Some is produced in Saxony and England	While the total amounts of these metals in use are relatively small, they are of high importance due to their peculiar properties. Our imports of antimony are mainly in the form of regulus or metal. Bismuth is used in fire alarm devices and to make bronzes for salt water machinery.

MINERAL PRODUCTS—Continued

METALS	ORES AND CHIEF PRODUCTS	LOCALITY AND PREPARATION	MANUFACTURE, USES AND TRADE
	Chromite (oxide of chromium and iron) is the only ore *Bichromate of potash* is the most important compound	Mined in Asia Minor, Greece, Canada, New Caledonia, California, etc. Salts are prepared in the chemical laboratory	Bichromate of potash and chromic acid are used in tanning soft leather. A small percentage of the metal added to steel makes it very hard and suitable for burglar-proof safes, tools, etc. Salts of chrome are used for dyes and pigments (chrome yellow, chrome green). The metal is used in large quantities for plating other metals, as on automobiles and store fixtures
Copper is, next to iron, the most important metal in use	There are many ores. *Chalcopyrite*, and *bornite*, (sulphides of copper and iron) are widely distributed *Chalcocite* (copper sulphide) is mined in Montana, *malachite* and *azurite* (carbonates of copper) in Arizona and metallic copper in Michigan *Copper matte* is the crude metal as it comes from the smelter *Brass* and *bronze* are alloys of copper with zinc, tin, aluminum, etc. *Copper sulphate* (blue vitriol) is the most important chemical compound of copper	The greatest production is in the United States, in Arizona, Montana, Michigan and Utah. Chile, Belgian Congo, Mexico, Australia and Germany produce smaller amounts. The metal is purified by smelting and refined, often by electrolytic methods	The value of copper has increased within recent years, due to its enormous use in electrical work. Aside from this, copper is employed in large amount in the various alloys into which it enters, and in coins, utensils, printing plates, etc. Copper sulphate is extensively used in electrical apparatus, dyes, chemical work and as an antiseptic Large amounts of manufactured copper are exported to Europe. Smaller quantities of ores, matte and regulus are imported from Mexico, South America and other countries. Copper wire and copper parts are the main components of electrical generating and transmission apparatus
Gold is the standard precious metal	Gold ores are usually gravels or beds of quartz rock in which the metal occurs in small particles. *Chloride of gold*, used in photographic work, is its only important compound. Pure gold is called 24 carats fine. A smaller figure indicates that the metal is alloyed to harden it	Found in nearly all parts of the world. South Africa, Canada and the United States are the leading producers. Australia, South America and parts of Europe possess important gold fields. Gold is separated from gravel (placer mines) by washing with water. The particles of metal, being heavy, sink and can be collected. Rock containing gold is crushed to fine powder and the gold combined with mercury (amalgamation). Low-grade ores are treated with a solution of cyanide of potassium which dissolves the gold and the metal is later separated	Gold is used for jewelry, gold leaf (gilding) and in dentistry. It is almost always alloyed with copper and silver. Gold is the world's accepted standard of value. Shipments of gold go from one country to another chiefly to balance international business dealings. Government treasuries and bank vaults are the chief storehouses for gold, either as bullion or coin
Iron is the most useful metal. With the addition of carbon and often small amounts of other elements, iron is made into **Steel**	*Hematite* (sesquioxide of iron) is the ore which supplies three-fourths of the iron of commerce. *Limonite* is a hydrous oxide and furnishes nearly one-fourth of the world's supply of the metal. Magnetite and siderite are less common ores. *Pig iron* is the crude form of the refined metal and is transformed into *cast iron*, *wrought iron* and *steel* in their multitudinous forms. These three forms of iron differ in hardness, strength, elasticity, malleability, etc., according to the amounts of carbon, sulphur, phosphorus, manganese and other elements *Ochers* and metallic paints are iron oxides. *Prussian blue* and *copperas* are iron compounds. *Pyrite* (iron pyrites or fool's gold) is a sulphide of iron, useless as an iron ore	The United States, Germany, Great Britain, Spain and France are the greatest producers of iron. Its ores occur in almost all parts of the world. Hematite is mined in Minnesota, Michigan, Alabama and other parts of the United States and in Germany, England, France, Spain, Russia, etc. Limonite is also widely distributed. Pig iron is made by smelting iron ore in a blast furnace. The ore, mixed with limestone, is melted by burning coke, coal or charcoal Pyrite is found in Spain and many other parts of the world and is valuable in the preparation of sulphuric acid (oil of vitriol)	The United States manufactures more iron and steel than any other country. Almost half of the production is in Pennsylvania. Cast iron appears in many articles but is weaker than other forms of iron. Wrought iron contains less impurity and is used for bars, plates, wire, structural material and parts of machinery. Steel (Bessemer, Siemens-Martin, open hearth, etc.) contains more carbon than wrought iron, possesses both strength and hardness and is used for rails, structural material, machinery, tools, wire rope, sheet steel, etc. Its hardness may be increased by tempering and by alloying with small amounts of other metals. The United States imports iron ore from Cuba and Spain, pig iron from the United Kingdom and exports large quantities of manufactured iron and steel
Lead is the softest, heaviest, most malleable and most easily melted of the common metals	*Galena* (lead sulphide) is the only important ore; it often carries a considerable percentage of silver. Carbonates and sulphates of lead are less common. *Solder* and *type metal* are alloys of lead with tin and antimony. *White lead* is a carbonate, *red lead* and *litharge* are oxides. *Chrome yellow* and *orange mineral* are lead compounds used as pigments	Ores are found in many countries but the main supply is from the United States, Spain, Germany and Mexico. The chief lead mines of the United States are in Missouri, Idaho, Utah, Oklahoma and Kansas. Much lead bullion is a by-product from smelters where silver ores are reduced	The chief use of metallic lead is in piping, sheet lead, shot and alloys. Large amounts of ore are transformed not into metallic lead but into white lead for use in paints and in rubber manufacture. Lead ores and lead bullion are imported from Mexico. England is the greatest importer of lead and lead ores.
Mercury (or quicksilver) is a heavy metal which is liquid at ordinary temperatures	*Cinnabar* (sulphide of mercury) is the source of the metal, although a little is found in nature in the pure state *Vermilion* (artificially prepared cinnabar) is used in paints *Calomel* and *corrosive sublimate* are used in medicine and *fulminates* of mercury in explosives	Produced in Spain, the United States, Germany, Italy and Russia. California supplies most of this country's quota. Obtained by distillation of the ore	Used principally in the extraction of gold and silver from their ores by amalgamation. Employed in thermometers and barometers, silvering mirrors and in making amalgams for dental work. Much of the mercury produced in this country is exported
Nickel and **Cobalt** usually occur together	*Garnierite* (a silicate of nickel and magnesium) is the common ore. Magnetic iron pyrite (*pyrrhotite*) often carries several per cent of nickel. Sulphides and other compounds, usually containing arsenic, are the chief sources of cobalt. *German silver* contains nickel, copper and zinc. Both nickel and cobalt are used in many other alloys	In Ontario, Canada, nickel is found in pyrrhotite. Garnierite is mined in Spain and New Caledonia. Norway produces other ores. Canada produces most of the world's supply of both metals, and only small amounts are found in the United States	France and Germany refine nickel from imported ore, chiefly from New Caledonia. Nickel steel, being especially hard and tough, is used for armor plate, special machinery and wire rope Nickel is extensively used for electroplating Nickel and nickel oxide are exported from the United States and ores and matte are imported from Canada
Platinum is a rare metal	Found with gold, iridium and other rare metals in placer mines	Chiefly from Russia. Smaller amounts from Colombia, California, Canada and Australia	Used in chemical and electrical apparatus. Also employed by jewelers and dentist.

MINERAL PRODUCTS—Continued

Metals	Ores and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Silver is the common precious metal	*Argentiferous galena* (lead ore) is the commonest ore of silver. The amount of silver per ton varies greatly. Zinc and copper ores often carry silver. Many sulphides of silver (argentite, pyrargyrite, etc.) are found, as well as chlorides and bromides (cerargyrite and bromyrite). Many compounds of silver are used in photography	Silver is produced in greatest amount in the Rocky mountains and the Andes. The United States, Mexico, Australia, Bolivia, Chili, Peru and Germany furnish nearly the entire supply. Montana, Idaho, Arizona, Nevada and Utah lead in silver production in the United States. The ores are usually smelted and refined to purify the metal	Manufactured into innumerable articles for household use and personal adornment. The cheapest are not solid (sterling) but are electrically plated with a very thin coating of silver. Silver coins form the bulk of the currency of the world
Tin is less abundant than most of the common metals	*Cassiterite* (tin oxide) is the only important ore. This mineral is commonly found as pebbles (stream tin) in gravel *Tinplate* and alloys containing tin are of enormous importance in the arts. Of these, *bronze* is chief. *Gun metal, pewter, solder, type metal* and *britannia metal* are other alloys. Salts of tin are used in dyeing, glass making, etc.	The Malay peninsula and nearby islands (Banca and Billiton) produce over half the tin ore of the world. The remainder is mined in Bolivia, Australia, Tasmania and Cornwall, England. Small deposits occur in the United States Tin melts at a low temperature and is easily refined	England and the United States are the principal makers and users of tin Tinplate, used for tin cans, roofing and kitchen utensils, is made by dipping sheet iron or steel in a bath of melted tin, thus covering it with a thin layer of tin. Tinplate is manufactured in the United States and imported from England. Tin metal is imported from England and Straits Settlements
Zinc is one of the most useful metals	*Sphalerite* or blende (zinc sulphide) is the chief ore. Carbonates, silicates and oxides of zinc are found Crude zinc (*spelter*) is distilled from roasted ore *Brass, German silver* and other alloys contain zinc. *Galvanized iron* consists of a coating of zinc on sheet iron. *Zinc oxide* (zinc white) resembles white lead and is used in paints and rubber compounding	Germany, United States and Belgium supply most of the zinc. In this country, Oklahoma, New Jersey and Kansas lead in zinc production	Used in electric batteries, making hydrogen, zinc etchings, etc. The greatest amount of zinc is used in alloys and zinc compounds. Zinc and zinc ores are both imported and exported by the United States, the imports exceeding the exports. Zinc oxide is shipped in larger amount than any other form

MINERAL PRODUCTS—Continued
IMPORTANT COMPOUNDS OF METALS NOT USED PURE

Metals	Ores and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Arsenic	*Arsenopyrite* (arsenic and iron sulphide), *orpiment* and *realgar* (sulphides of arsenic) are the sources of arsenic *Arsenic* (white arsenic, arsenious acid or oxide of arsenic), *Paris green* and other compounds and salts are prepared	Germany, England, Canada, the United States and Spain produce the ores. Chemical laboratories transform them into the useful compounds	Sheep dip, rat poison, insecticides, embalming fluid, pigments and dyes are prepared with arsenic compounds. Arsenic salts are used in preparing certain coal-tar colors
Barium	*Barytes* or barite is a heavy white mineral (barium sulphate)	Mined in the United States, in Missouri, California, Georgia and Tennessee and in Germany	A substitute for white lead in paints and used in making sugar and paper
Calcium has no commercial use in the metallic state. Its compounds, both natural and artificial, are of great economic importance	*Limestone* (calcium carbonate) is a very common rock used for building. It may be of almost any color and coarse or fine in texture. *Marble* is a name applied to limestones suitable for polishing or ornamental work. *Mexican onyx* is translucent. *Chalk* is of peculiar soft texture; *whiting* is prepared chalk used to make putty and paints; *precipitated chalk* is similar *Lime* is made by burning (calcining) common limestone. *Portland* and *hydraulic cements* are prepared by burning a mixture of limestone and clay	Limestones are found and utilized in all parts of the world. In the United States, Pennsylvania, Illinois, Ohio, Indiana, New York and Missouri are large producers. Fine marbles are quarried in Italy, Egypt, France, Spain and Greece. Vermont, Georgia, Tennessee and New York supply the greater part of the marble used in the United States. Hydraulic and Portland cements are of enormous commercial importance, being used in concrete construction work. Europe and the United States produce large quantities. Pennsylvania is the leading state in this industry	As building material, limestone is used everywhere. Lime is used in chemical industries and mortar Handsome marbles are imported from Carrara, Italy, and other parts of Europe. Mexican onyx is also imported. Chalk comes mainly from the south of England Buildings and engineering works such as dams, bridges and highways are extensively constructed of cement, usually reinforced by iron rods
	Chloride of lime (or bleaching powder), *acetate of lime, calcium carbide* and many other compounds are of industrial value	These compounds are made in all industrial countries	Chloride of lime is used industrially as a bleaching or drying agent and to make chlorine. Calcium carbide is used to make acetylene
	Gypsum (hydrous calcium sulphate) is used in fertilizers (*land plaster*). *Plaster* is prepared by calcining (burning) gypsum. *Plaster of Paris* is its purest form. *Alabaster* is compact white gypsum	A common mineral mined in many parts of the world. Michigan, Kansas, New York, Ohio and other states produce it	Fertilizers and plaster use up large quantities of this mineral. Plaster of Paris is used for casts, decorative plaster work, cement, etc. Gypsum is the base for wall boards and partition blocks for buildings
	Fluorite (calcium fluoride) is a less common mineral	Mined in England, Kentucky and Illinois	Used in chemical manufacture and as a flux for ores
	Phosphate rock (chiefly calcium phosphate) is important in the preparation of fertilizers and chemicals containing phosphorus	Found in deposits of organic origin in South Carolina, Florida, Tennessee, the West Indies, Canada, Spain, France, Germany and England	The natural phosphates are treated with sulphuric acid as a first step in the manufacture of phosphatic fertilizers. Exported in large amount to Germany, England and other countries
Magnesium	The metal is used in flash powders for photographic use *Magnesite* (magnesium carbonate) is used in making carbon dioxide gas and *epsom salts* and for preparing *magnesia* (calcined magnesia)	Chiefly mined in Germany and Greece. Michigan and Oklahoma produce most of the United States output	Used in chemical manufacture, in fireproofing and lining furnaces. Imported into the United States
	Dolomite (magnesium calcium carbonate) is common limestone, used for building	Found in many parts of the world	Calcined dolomite is used for lining iron furnaces
	Talc (hydrous magnesium silicate), soapstone or steatite, is a soft mineral	Mined in Maryland, Virginia, North Carolina, etc., and in Europe	Made into laundry tubs, firebrick, hearthstones, griddles, slate and tailor's pencils, gas tips, etc.
	Meerschaum or sepiolite (magnesium silicate)	From Asia Minor and New Mexico	Easily carved. Made into pipes and cigar holders in Germany and France
	Asbestos is a fibrous variety of serpentine (a magnesium silicate). Mineral *wool* is an artificial fibrous mineral	Mined in Quebec, Canada. Another variety of asbestos comes from Italy. Similar minerals have been discovered in Wyoming	A fireproofing material. This mineral fiber is spun and woven into fireproof fabrics for theater curtains or made into felt building paper, pipe covering, etc.

MINERAL PRODUCTS—Concluded

Metals	Ores and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Potassium (or potash), an alkaline metal	Chlorides, sulphates, etc., are found in Germany. Wood ashes and sugar beet refuse furnish much of the world's potash	Stassfurt, Germany, possesses the most productive large deposit of natural potash salts but the United States has large resources in Utah, California and Texas	These salts are the source of potash in many chemical industries and in fertilizers. Exported in large amount from Germany to England, France and America
Sodium is the most important alkaline metal	*Salt* (rock salt, sea salt, lake salt, halite or sodium chloride) is the commonest natural compound of sodium. Important for food and in chemical manufacture	Rock salt is mined in Germany, Spain, England, Louisiana, Kansas, India and other parts of the world. Obtained by evaporating salt water from wells in England, Michigan, New York, Ohio and China, or by evaporating salt water in the West Indies, Great Salt Lake, etc.	Used for meat packing, curing fish, in silver refining, and the preparation of hydrochloric acid, soda ash, carbonate of soda, etc. The foreign trade in salt does not represent very large values because of its abundance and low cost
	Soda niter (nitrate of sodium) is a very easily soluble mineral	Found in quantity only in the deserts of northern Chile	Exported in large amounts to Europe and America for fertilizer and the manufacture of nitric acid and other chemicals
	Borax (hydrous sodium borate) occurs in nature in an impure form	Borates are found in Italy and Central Asia, in large quantities in California and Nevada and in South America	Borax and boracic acid are used in pottery manufacture, for the preservation of meat, in dyeing and in medicine
Strontium	*Strontianite* (strontium carbonate) and *celestite* (strontium sulphate) contain this element	Found in Germany, Scotland, Texas and New York	Strontium salts are used in sugar refining and making red fire
Rare Metals.—Tungsten, molybdenum, vanadium, uranium	The ores of these metals are unusual minerals	Found in Colorado, Arizona, Germany, England and Sweden	Used in making special high grades of steel. Their salts are used in dyeing
Thorium, cerium, lanthanum and yttrium	Monazite, samarskite, thorite and other rare minerals contain these elements	Found in North Carolina, Norway, Brazil and Ceylon	Used in preparing the mantles for incandescent gas lights
Lithium	Lithium silicates are the source of this element	Principally from South Dakota, California and Sweden	In chemical laboratories converted into lithium carbonate for medicinal tablets and mineral waters
Radium	Occurs with ores of uranium	A very rare mineral; Colorado, northern Canada and Russia yield small amounts	The salts have peculiar medicinal properties and are used chiefly by physicians.

NONMETALLIC MINERALS

	Ores and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Sulphur	*Sulphur* or *brimstone* is found in a pure state or associated with gypsum and limestone. *Pyrite* (sulphide of iron) is also a source of sulphur compounds	Sicily, Italy, Japan and Utah have mines of native sulphur and Cuba and Spain of pyrites, but the chief sources of supply are on the coast of Louisiana and Texas	Used in manufacturing sulphuric acid, gunpowder, matches, as a disinfectant, for bleaching and vulcanizing rubber Blue vitriol, green vitriol and alum are sulphates
Quartz (silica) is of many varieties, crystalline to amorphous	*Rock crystal* is employed for lenses. Many semiprecious stones are varieties of quartz, as *agate, moss agate, onyx, sard, chalcedony, chrysoprase, jasper*, etc. *Rock flint, flint* and *quartz sand* are used in making glass and pottery *Sandstones* of various colors are chiefly quartz	Rock flint is mined in Connecticut and Pennsylvania. Flint comes from the chalk cliffs of England and France Sandstones are quarried and used for building in almost all parts of the world. Pennsylvania, Ohio and New Jersey supply the greatest quantities in the United States. Honestones and whetstones are mostly sandstone, and in this country are largely quarried in Arkansas, Michigan and New Hampshire	Outside of building stones, quartz is used in greatest amount in making glass and pottery. For glass it is melted with alkali (soda ash) and either lime or lead oxide. Glass is either blown or molded. Belgium, Germany, France, Great Britain and the United States manufacture glassware. Pennsylvania, Ohio, Indiana and New Jersey are the leading states in its production
Gems of many kinds are found in nature	These are nearly all transparent stones having brilliancy or beauty of color. Aside from diamond, corundum and varieties of quartz, the following are important:—*topaz, emerald, aquamarine, tourmaline, olivine, spinel, moonstone, opal, turquoise, amethyst* and *garnet*	Produced in many parts of the world. Siberia, Russia, Ceylon, India, Brazil, North Carolina and Montana are all important	Cut and polished for use in jewelry. Much of this work is done abroad especially in the Netherlands The high value of these stones is due to their scarcity
Mica is a common mineral found in rocks in many parts of the world	Several varieties occur (*muscovite, biotite*, etc.). Valuable only when found in large sheets which can be split smoothly	Mined in India, Canada, North Carolina and South Dakota	Transparent sheets are used for lamp chimneys and stove doors. It is a valuable insulator in electrical work. Imported from India
Building Stones	*Granite, syenite, gneiss, basalt* and other hard or durable rocks For *limestone* and *marble*, see Calcium compounds in the preceding table	Quarried for local use in all parts of the world	Only stone of exceptional beauty is shipped to a great distance. Scotland, Norway, the New England states and other localities produce fine stones.

CARBON AND CARBON COMPOUNDS

Mineral	Forms and Chief Products	Locality and Preparation	Manufacture, Uses and Trade
Coal is the most important fuel	*Peat*, *lignite* and *brown coal* are poor in quality, retaining much appearance of vegetable origin. *Bituminous coal*, coking coal, cannel coal, cherry coal, splint coal, gas coal, steam coal, etc., are all varieties of soft coal and contain a considerable percentage of volatile matter. *Anthracite coal* is almost pure carbon By distillation, bituminous coal yields *gas*, *ammonia*, *coal tar* and *coke*. Coal tar products are numbered by the thousand. Among them are *naphtha*, *benzene*, *perfumes*, *flavors*, *drugs*, *saccharine*, *aniline* and other dyes, *phenol*, *salicylic acid*, *naphthalene*, *photographic developers*, *creosote*, *oils*, *tar* and *pitch*	Coal is a result of the alteration of vegetable matter. Deposits occur in almost all parts of the world but many are almost entirely undeveloped; as, for example, the coal fields of China. The largest production is in the United States, Wales, England, Germany, Russia and Australia. Mines are worked in India, Japan, Mexico, South America, South Africa, China and the Philippines. Pennsylvania, Ohio, West Virginia, Alabama, Indiana, Illinois, Kentucky and many other states mine coal in great amount. Pennsylvania produces nearly all of the anthracite and a large quantity of bituminous coal	Bituminous coal is still the most used fuel for the factories, railways and steamships of the world. The distillation of coal tar and the utilization of its numerous by-products is one of the best examples of modern industrial practice, where a common crude material is converted into useful products and large profits. Anthracite is used mostly for domestic heating The United States exports coal, both bituminous and anthracite, to Canada and ships bituminous coal to Mexico, Cuba and other countries. Some coal is imported from British America. Great Britain has a large export trade in coal, much of it in the form of briquettes made by mixing small coal with tar and pressing it into shape
Petroleum (or crude oil)	Petroleum in its crude state is a dark-colored liquid. It yields by distillation, first, light oils, *gasoline*, *naphtha*, *benzine;* second, *kerosene*, etc.; third, *lubricating oils*, *machine oil;* fourth, *petroleum residuum* (for asphalt paving) and *coke*. *Petrolatum*, *vaseline* and *paraffin wax* are by-products in petroleum refining. The yield of gasoline is increased by the *cracking process*, which converts the heavier products (as lubricating oil) into motor gasoline	Obtained from wells in the United States, Russia, Dutch East Indies, Venezuela, Mexico and other countries. More than half of the world's output is from the United States, the leading districts being Texas, Oklahoma, California, Louisiana, Kansas, Wyoming and Pennsylvania. Crude oil is transported from the wells for hundreds of miles through pipe lines to the refineries	Probably no modern industry is more effectively organized than the petroleum business. There is no waste in the distillation and no part for which uses have not been found. American kerosene oil is exported to all parts of the globe. Crude oil is also exported as well as other petroleum products. The partly refined fuel oils are used to power ships, locomotives and industrial and home heaters. Much the most important petroleum product is motor gasoline
Asphaltum (or mineral pitch)	A bituminous mineral substance found more or less pure, in some localities *Rock asphalt* consists of sandstone or limestone impregnated with asphalt. Much asphalt is produced in refining certain grades of petroleum—such as those obtained in California and Texas	The pitch lake of Trinidad and the Bermudez Lake at the mouth of the Orinoco in Venezuela are the largest known deposits of asphalt. Smaller deposits of high grade occur in Utah and Cuba Rock asphalts are mined in France, Switzerland, Sicily, California, Kentucky and Oklahoma	For paving, rock asphalts are much used in Europe. Trinidad and Venezuelan asphalts are exported in large quantities to the United States and Europe. For paving, these lake asphalts are mixed with broken stone, sand and petroleum residuum Pure varieties (gilsonite, marjak, glance pitch) are made into black varnish, used for insulating, etc.
Graphite is almost pure carbon	*Plumbago* or *black lead* is used in making crucibles, lead pencils, lubricants for heavy machinery, stove polish, foundry facings, paint, etc. *Artificial graphite* is made from coal or coke by an electric process	Produced in Ceylon, Madagascar, Mexico and the United States. The deposits in Ceylon are the largest in the world. Much of that mined in New York and Alabama is of very high grade	Powdered graphite is mixed with fine clay and then molded and baked to form crucibles and lead for pencils. Graphite is imported from Ceylon to the United States
Diamond is pure crystallized carbon. The hardest known substance	Many diamonds are transparent, colorless stones. Some are blue or yellow. Some stones (*bort* and *carbonado*) are unfit for gems but valuable for polishing or in diamond drills	South Africa produces the bulk of the world's supply. These deposits are in rock. In Brazil and India a few diamonds are found in gravel. Most of those from Brazil are opaque and dark colored (carbonado)	The beauty of a diamond is largely due to cutting. The diamond cutting industry is centered in Amsterdam and Antwerp. Diamonds are imported to the United States mainly from Holland and Belgium after cutting. Carbonado is used in diamond drills. Diamonds are used in cutting glass and for grinding and polishing
Carborundum	Carbide of silicon. Harder than any known substance but the diamond	Manufactured at Niagara Falls, by electrically heating a mixture of coke, sand and salt	Used for making polishing powder, in grinding wheels, sharpening stones, abrasive cloth, etc.

COMMERCIAL WOODS

SOFT WOODS OR NEEDLE-LEAVED

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Pine Wood is from various species of coniferous trees (*Pinus strobus*, *P. palustris*, etc.)	Soft pines are of several kinds, chiefly *white pine*, *western white pine*, *sugar pine* and *red pine*. Hard or *yellow pines* are more numerous and include *longleaf*, (*Georgia*, *hard* or *southern*) *pine*, *shortleaf* (*bull*, *spruce*, *Cuban*, *slash*, *pitch* or *loblolly*) *pine*, *western yellow pine* and *European* (*northern*) *pine*, called also *yellow deal* and *Scotch fir*. *Turpentine* (*spirits of turpentine*) and *rosin* (*colophony*) are prepared from the sap of certain species of yellow pine trees *Tar*, *pitch*, *charcoal* and other products are obtained by distilling yellow pine wood	Soft pine forests yield lumber in the northern United States and Canada and in the Rocky Mountains. White pine was formerly the common timber in the Appalachians, but the supply is almost exhausted Yellow pine is cut in large amount in the forests from North Carolina to Texas, and other hard pines come from the middle and far west, as well as from Mexico and the West Indies. Scotch fir is one of the most important woods of northern Europe Turpentine is distilled from the sap of pines in Georgia and adjacent states, Russia, Austria, France and India	Pine is the most important construction wood in use. Very little of the great area formerly covered with white pine now remains in this country. The yellow pine is being cut rapidly but reforestation projects are conserving the supply
Spruce (*Picea*)	These are known by many names and there are several botanical species of each *Black*, *white*, *red*, *tideland* and *Norway spruces*, *Douglas fir* and *European silver fir* (*Swiss pine*) are most important	The spruces are common in Canada, northern Europe and on the northern Pacific coast of America and Asia. Hemlock is cut in northern United States, Canada, Japan and Siberia. Fir is found in the same general region as spruce	The United States exports soft woods, chiefly pine, spruce and hemlock, to Europe, the West Indies, South America, Hawaii and Africa. Canada exports large quantities of spruce and pine to the United States and England. Russia and Sweden supply great quantities of soft woods to Europe, although the forests of Sweden are being rapidly cut away These woods are the chief source of paper Northern Japan and eastern Siberia contain forest areas rich in soft woods, which are beginning to be developed
Hemlock (*Tsuga* spp.), and **Fir** (*Abies* or *Pseudotsuga* spp.) are coniferous soft woods of great importance.			

COMMERCIAL WOODS—Concluded

HARD WOODS OR BROAD-LEAVED WOODS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
California Redwood comes from a coniferous tree (*Sequoia sempervirens*)	A soft, straight-grained, durable wood. Much used in shingles	One of the largest trees of the world. Found only on the Pacific coast	
Cedar and **Cypress** are of many species	*Bald cypress, yellow cypress, Indian cypress, white cedar, juniper, red cedar* and dozens of other woods have more or less similarity	These woods are widely distributed and extensively used, but are not marketed in such large amounts as the pines, spruces and firs	Cypress is particularly valued for use in exposed places because of its great resistance to moisture
Tulip tree and **Carolina Poplar** (*Populus deltoides*) are large trees	*Tulip tree* (*whitewood*) and Carolina poplar (*cottonwood*), although classed in the trade as hard woods, are almost as soft as pine	Both are from large trees in the eastern and central United States	These are soft, light, comparatively cheap woods, extensively used for general construction
Linden comes from the basswood or lime tree (*Tilia* spp.)	*Linden, basswood* and *whitewood* are the names used in America. *Linden, lime* or *lin* are European names. The bark supplies a useful bast fiber for ropes and mats	Common in southern Canada, central United States and Europe, growing to be trees of fairly large size	Similar to Carolina poplar
Maple (*Acer* spp.), **Birch** (*Betula* spp.), **Beech** (*Fagus* spp.), **Sycamore** (*Platanus* spp.). These are among the important hard woods in common use	*Sugar maple, silver maple, rock maple, black birch, cherry birch* and many other names are employed. Peculiarities of the grain are known as bird's-eye and curly, in the trade	All of these are obtained from the hardwood forests of central United States and Europe. In some European forests the trees have been carefully planted and scientifically tended	These are close-grained hard woods, suitable for furniture and cabinet work Birch is the wood commonly used in imitation of mahogany The silver maple and the Japan maple are highly valued as shade and ornamental trees
Oak is from many species (*Quercus alba, Q. rubra, Q. robur*, etc.)	*White oak, chestnut oak, live oak, red oak, black oak, swamp oak, willow oak* and many other varieties are found in the lumber trade *Oak bark* is used in tanning leather *Cork* is the bark of one species (*Q. suber*) found in Portugal, Algeria and Spain	Chiefly from eastern and central United States and Europe. Oaks are found also in many other parts of the world	An open-grained hard wood of great strength and durability. When cut parallel to the medullary rays (quartered oak) it exhibits a beautiful grain valued highly for cabinet work
Chestnut (*Castanea* spp.) is a large tree	American and European chestnut woods are very similar. The nuts are popular for food. An extract from wood and bark is used in tanning	Formerly a very common tree in the northern United States	The wood is used extensively for cabinet work. It is open-grained, softer and much less strong than oak
Ash (*Fraxinus*, spp.), **Elm** (*Ulmus* spp.), **Hickory** (*Carya* spp.)	These woods are of much commercial value. Hickory nuts are marketed	The trees are found in the central United States, some on the west coast. Ash and elm grow also in Europe and Asia	Valuable for their toughness and elasticity. Used for tool handles, carriage and wagon building and furniture
Walnut (*Juglans* spp.)	*American* black walnut, *English, Italian, French* and *Circassian* walnut are commercial varieties. The nuts are exported from southern Europe	Formerly a very abundant tree in the central United States. Has now become scarce and high-priced. Grown in many parts of Europe	Used for gun stocks, cabinet work and veneering. A highly decorative wood which has gone out of style in the United States because it is difficult to obtain
Cherry is from the wild black cherry tree (*Prunus serotina*)		Native in the eastern United States	Valued on account of its red color. Like walnut, cherry has become scarce and high priced
Sweet Gum is from a common tree (*Liquidambar styraciflua*)	The wood is called *gum, red gum, hazel* or *bilsted*	Native in the United States and Mexico. Cut chiefly in the Southern states	A cheap cabinet wood, used to some extent in building

IMPORTED WOODS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Mahogany is the wood of a tropical tree (*Swietenia mahagoni*)	*Santo Domingo, Cuban* and other kinds are named from the locality of production. Honduras *bay wood* is of inferior quality. Nearly all of the wood with a beautiful grain, or figure, is cut into thin veneers	A wild tree in tropical forests of the West Indies, Mexico, Central and South America. African mahogany (*khaya*) comes from the west coast	One of the most sought for of all cabinet woods. Largely imported into Europe and America. Particularly useful because of its beautiful color, grain and durability
Teak is from a large tree (*Tectona grandis*)	Especially valuable for shipbuilding because it is practically indestructible	Chiefly from Burma. Grows in southeastern Asia and adjacent islands	A very important export from farther India
Ebony (*Diospyros* spp. and other tropical trees) and **Rosewood** (*Dalbergia* or *Machoeium* sp.)	*Cocobolo, tulip, amaranth, padauk, satinwood* and many others are used for cabinet work and fancy articles	Nearly all of these hard woods of beautiful colors are from tropical forests	*Lignum vitæ* is especially useful for making pulleys and caster wheels These woods are obtained in only limited quantity and many of them are sold by weight rather than measure
Cork	See Oak, above		
Balsa (*Ochromo lagopus*)	Unique for its light weight and buoyancy	Tropical South America	The lightest wood known; used in life preservers, rafts and airplane construction
Sandalwood (*Santalum* spp.)	A cabinet wood of fine properties	Southern Asia mountain sides	Fragrant, beautifully grained and relatively rare. Preferred for carving

GUMS, RESINS AND EXTRACTS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Gum Arabic is from small thorny trees (*Acacia* spp.) **Gum Tragacanth** is similar	*Kordofan gum*, *Senegal gum*, *Barbary gum*, *Cape gum* and *wattle gum* are all of similar nature	The trees grow wild in sandy regions in Africa and Australia	These gums are soluble in water. Used for making mucilage, confectionery, etc., and in stiffening and printing silk and cotton fabrics
Copal is resin produced by trees of many species	Copals are named usually from their locality as *Zanzibar* (the hardest), *Mozambique*, *Sierra*, *Angola*, *South American*, *Manila*, etc. *Kauri* is from the kauri pine tree of New Zealand	These resins are mostly gathered from the trunks and branches of living trees. The best and hardest varieties, like Zanzibar and kauri, are found underground, having been partly fossilized	Used for making varnishes by dissolving them in spirits of turpentine and oil and in the production of linoleum These substances are commercially important
Dammar, Sandarach, Benzoin, Asafetida, Myrrh, Olibanum, Aloes, Guiac, Dragon's blood, Kino, Peru Balsam, Tolu, Copaiba, Storax and **Gamboge** are resins, gum resins or extracts from the juices of plants	Gum resins and resins of many kinds are used in varnishes, medicines, incense, etc.	Such forest products are gathered in nearly all countries	Not of much relative commercial importance as synthetic processes have replaced them in many industries
Rubber is the milky juice (latex) of many trees and vines of the tropics and subtropics. (*Hevea*, *Manihot*, *Ficus*, etc.)	Crude india rubber, or *caoutchouc*, has dozens of commercial varieties differing greatly in quality according to the nature of the plant and the process of preparation (*Para*, *African*, *Ceylon*, *plantation*, etc.). Crude rubber is treated with sulphur (vulcanized) to make elastic and waterproof articles, as well as hard rubber goods (*vulcanite* and *ebonite*)	The largest supplies of rubber come to market from the East Indies. The latex is coagulated often by simple drying in the air and frequently by chemical or mechanical processes. Mexico and Central America, Africa and the Philippines furnish small amounts Most of the world's supply comes from plantations, and much of this is of very fine grade and brings the highest market price	Rubber has, within a very few years, become an important article in the world's commerce Factories in Europe and America make automobile tires, rubber bands, elastic cloth, toys, shoes, tubing, hose, waterproof cloth, stoppers, erasers, etc., as well as articles of hard rubber, such as combs, buttons, surgical and chemical appliances. Rubber is used in floor cloths, cements and varnishes
Gutta-Percha is from the milky juice of a tree (*Palaquium gutta*) **Balata** is similar	Similar in some ways to rubber	From the East Indies	Used to insulate submarine cables and for making golf balls Singapore is the chief port of shipment
Chicle or *Sapodilla* is from the milky juice of a tree (*Achras sapota*)	Chicle is called also *gum chicle*, or *crude chewing gum*	Chiefly from Yucatan	Used in chewing gum

OILS, FATS AND WAXES

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
(See **Cotton, Corn, Olive, Flax, Hemp, Cocoanut, Cacao** for other oils. See also various animal oils and petroleum)	Vegetable oils are of two important types, *fixed* or *fatty oils* and *volatile* or *essential oils*. Fixed oils are either *drying oils* like linseed or *nondrying* like olive	Fixed oils are obtained from seeds by pressure in powerful machinery or by chemical processes. The oil-cake remaining is used for cattle food and fertilizer	Drying oils are used in paints and varnishes, preparing leather etc. Nondrying oils are used for table purposes, cooking, illuminating, lubricating, soap and candle making etc. *Glycerine* is a by-product in soap making
Castor Oil is from the seeds of the castor plant (*Ricinus communis*)	The cold drawn or cold pressed oil is used in medicine	The largest production is in India Grown in the tropics and warm temperate climates	Used in soap making, lubricating, preparing artificial leather and celluloid
Palm Oil is from the pulp and seeds of a palm (*Elaeis* spp.)	Palm oil is from the pulp; palm kernel oil from the seeds	From the coast of the Gulf of Guinea, West Africa	For making soap and candles, and used in the preparation of tinplate
Peanut Oil, *sunflower*, *almond*, *sesame*, *poppy*, *rape seed*, *kapok*, *soy bean* and various other oils are used		Seeds for oil production are little cultivated in the United States with the exception of flaxseed, cotton and corn	Marseille, Rotterdam and several other European cities have great mills for the production of vegetable oils of this character
Essential Oils are made chiefly from flowers and leaves of plants	*Attar of roses*, *patchouli*, *lavender*, *violet*, *geranium*, *cedar*, *wintergreen*, *cloves*, *lemon*, *orange*, *sassafras*, *peppermint*, *citronella*, *lemon grass*, *cinnamon*, *bay*, *almond*, *eucalyptus* and many others are prepared	Fragrant oils are prepared in large amount for the perfumery trade in France, Italy Germany and Bulgaria, from roses, violets and other cultivated plants. Peppermint oil is produced in the United States, and it, as well as menthol, comes from Japan	These oils are obtained by distillation of the plant with water or else by absorbing the fragrance in lard or oil (enfluerage). They are used in perfumery, for flavoring and in medicine
Camphor is from the wood of the camphor tree (*Cinnamomum camphora*)	Although called *gum camphor*, this is strictly a volatile or essential oil	From Formosa, Japan, China and Borneo. Prepared by distilling the wood with water	Nine-tenths of the world's supply is exported from Formosa. Its production is a monopoly of the Japanese government. Used in making celluloid and smokeless powder, in medicine and as a protection against insects
Vegetable Waxes are from myrtleberries (*Myrica* spp.), Japanese waxberries (*Rhus* spp.) or the leaves of the carnauba palm (*Copernicia cerifera*)	*Myrtleberry* or *Bayberry wax*, *Japan wax* and *carnauba wax* are much like beeswax in their nature and uses	Japan wax is produced only in Japan. Carnauba wax is from Brazil	These waxes are found in commerce but are not of great importance

DYESTUFFS AND TANNING MATERIALS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Logwood (*Hoematoxylon campechianum*), **Brazil wood** (*Coesalpinia* spp.), **Fustic, Young Fustic, Sappan, Cam, Bar, Peach** and other woods	Handled commercially in logs, chips, or very commonly in the form of extract	From the forests of tropical America and the West Indies	Aniline and other coal-tar dyes have lessened the demand for these, as well as almost all other vegetable dyes. There is still a fairly large trade in logwood
Indigo, Madder, Annatto, Safflower, Quercitron, Turmeric, Turnsole, Persian Berries, Saffron, Archil, Cudbear, Litmus, Woad and many other vegetable substances are used as dyes	Powders or infusions used as dyes for special purposes	Cultivated or wild plants from many parts of the world, especially the tropics	Now almost entirely replaced by synthetic dyes usually made from coal tar
Tanbarks are from many species of trees	*Hemlock, white oak, wattle, mangrove, larch* and *willow* are used	Obtained mostly as by-products of lumber industry. In the United States, hemlock is most important	Extracts from the bark are usually prepared and the material is found in commerce in this form
Tanning extracts are prepared from many woods, fruits, leaves, roots and galls	*Oak, chestnut, quebracho* and *cutch* are extracts from wood. *Myrobalans, valonia, divi-divi* and *algarobilla* are fruits yielding tannin. *Sumac* and *gambir* leaves, and oak and sumac galls are employed	Obtained in nearly all parts of the world	Different substances or extracts are employed in preparing different qualities of leather. Mineral tanning with metallic salts has replaced vegetable tanning for all but heavy leathers

ANIMAL PRODUCTS

Animal	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Cattle are of several important types. The most abundant is the domestic ox (*Bos taurus*). See the Table of Horses, Cattle, Sheep and Swine for further details.	*Beef*, fresh, dried, salted, canned or otherwise preserved is the most valuable of all cattle products *Hides* (including kips and calf-skins) are second only to beef in importance *Milk* is sold fresh, condensed, evaporated, or is made into butter, cheese, *casein* and *sugar of milk*. Horns, hoofs and bones are used for buttons, handles for knives, brushes, umbrellas and fancy articles, or made into *geldtine* and *glue* *Tallow* from beef fat is used in food, soap, candles and lubricants. *Oleo oil* and *stearine* are from tallow and are used in making oleomargarine or butterine. *Neat's-foot oil* is a lubricant. *Dried blood* is used in purifying sugar, clarifying wines and in dyeing. *Cow hair* is mixed in plaster. *Pepsin* and *rennet* are made from the stomach. All waste parts go into *fertilizers*	The United States, Russia, India, Argentina, Germany, Hungary, France and Australia are the greatest cattle-raising countries. In this country more than half of the beef cattle are now found in Texas, Iowa, Missouri, Kansas, Nebraska, Colorado and Wyoming. They are fattened in the corn belt (Illinois, Iowa, Nebraska, Kansas) and killed in the slaughter houses of Chicago, Kansas City, St. Louis and Omaha. The by-products of slaughtering are very numerous and the industry is conducted so economically that, in the great slaughter houses, no part of the animal is wasted. In some parts of the world hides and tallow are the chief products of the cattle industry on account of the difficulty of transporting the meat	The United States, Argentina and Australia are the greatest exporters of live cattle and beef. Great Britain buys the greater part of the cattle products exported by the United States. Refrigerator cars and cold storage in steamships make possible the shipment of fresh meat to long distances Fresh meat is a growing export from Argentina, Australia, New Zealand and South Africa to Europe The dairy industry is of growing importance and New Zealand exports butter and cheese to England. Denmark, Sweden, Holland, Switzerland, Canada and Australia export dairy products. Notwithstanding the large production of hides in the United States, our tanning industry is so large that millions of dollars worth are annually imported, chiefly from South America. Sole leather is made from cattle hides. Leather is split and finished in a great number of styles
Sheep (*Ovis aries*) are of a great number of breeds (Merino, Lincoln, Leicester, Southdown, Highland, etc.). See details in the Table of Horses, Cattle, Sheep and Swine.	*Wool* is the most valuable product of the sheep. The grades of wool are named according to the breed of sheep, the locality and the use to which they may be put. Clothing wools are fine and comparatively short, carpet wools are long and coarse *Meat* (mutton and lamb) is of less importance than beef and pork *Sheep* and *lamb skins* are used with the wool on, for rugs and furs (Persian lamb, broadtail, Astrakhan, Tibet). *Skins* (roans) are tanned for morocco and fancy leather. *Chamois* is usually oil-tanned sheepskin. *Catgut* is made of sheep intestines, *tallow* from the fat, *cheese* from the milk and *fertilizer* of all waste	Raised chiefly in temperate countries, in largest numbers in Australia, Argentina, Uruguay, Russia and the United States. The finest wools are raised in Germany, Argentina, Australia, South Africa and the United States. Carpet or native wools are produced in Russia, Asia Minor and China from sheep of unimproved breed. Sheep raising is an industry appropriate to a fairly open, temperate country which is sparsely settled. For this reason it has prospered in the western United States, Argentina, Australia, New Zealand and South Africa, where good breeds of sheep have been introduced	Within the past hundred years, cotton has displaced wool as the most important commercial textile fiber Wool is carded and spun into woolen yarns or combed and spun into worsted yarns. Woolens and worsteds are the two types of wool fabrics. Cotton is very largely mixed with wool to cheapen the product. The United Kingdom, Germany and France supply the world with woolen and worsted fabrics. The United States mills supply mainly the home market. Nearly all the factories are in New England and the Middle states. Live sheep and frozen mutton are exported in refrigerator ships from New Zealand, Australia, Canada, the United States and Argentina to Europe
Swine are of many breeds (*Sus scrofa*). See details in the Table of Horses, Cattle, Sheep and Swine	The *meat* is by far the most valuable product. It is sold fresh, salted, pickled and smoked and in the form of ham, bacon and sausage *Lard, lard oil, stearine*, and other fats and oils are obtained from the fat. The *skins* are made into leather and all waste parts are utilized in *fertilizers* or converted into *prussiate* (cyanide) of *potash* *Bristles* come chiefly from China and Russia, where pigs have not been improved by breeding	Pigs are raised in almost all parts of the world, but the hog-raising industry is greatest in the United States. Corn is the food which is most important in fattening the animals for market	Chicago, Kansas City and Omaha are the chief pork packing centers. Probably in no other industry is every by-product more completely utilized. Hog products constitute one of the most valuable of this country's exports, greatly exceeding the value of even cattle products
Goats are less varied in their breeds than many other domestic animals (*Capra* species)	*Angora* and *Cashmere* are breeds which produce exceptional qualities of hair. The hair from the common goat is coarse and is used in making carpets and blankets *Goat* and *kid skins* are the most valuable products of these animals	The greatest number of goats are raised in western Asia. There are many in southern Europe and northern Africa. Angora goats are raised in Asia Minor, South Africa, Texas and Australia. In Switzerland they are raised for their milk, and cheese made from it	Large numbers of goat and kid skins are imported into the United States, chiefly from the East Indies, Mexico and South America. These are largely tanned with chrome to make glazed kid and soft leathers. By other processes morocco and glove leather are prepared

ANIMAL PRODUCTS—Concluded

Animal	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Camels (*Camelus* species) are of two types, the one-humped or dromedary, and the two-humped or Bactrian	*Camel hair* is the only product which enters into general commerce. Locally the flesh, milk and hide are utilized	Camels are found throughout central Asia and northern Africa. Camel hair comes chiefly from interior Asia	The hair or wool is soft and suitable for making hosiery, underwear and shawls The camel is an important beast of burden in its native habitat
Alpaca is an animal similar to the camel (*Lama huanacos*)	The wool of this animal is used to make dress goods	Raised in Peru	Imported into Europe and United States
Horses are chiefly beasts of burden (*Equus caballus*)	*Horsehair* is from manes and tails. *Hides* are tanned to make leather	Horsehair is exported chiefly from Russia, Argentina and Germany	The hair is used for making haircloth and brushes, for stuffing mattresses and furniture
Wild Animals of many kinds are killed for the sake of their skins	Important *furs* are obtained from the sable, fox, weasel, marten, ermine, mink, skunk, raccoon, bear, otter, beaver, muskrat, seal, nutria, squirrel, chinchilla, mole, monkey, rabbit, etc.	Good furs come mostly from Siberia, Russia and British America, with the exception of skins of the monkey and cat families	London and Leipzig in Europe and St. Louis in the United States are great fur markets Skins of the domestic cat and the rabbit are dyed and dressed to resemble more costly fur. Great numbers of rabbit skins from Australia and New Zealand are used in making felt hats. Nutria fur is used for the same purpose
Other Animals furnish products of value	*Ivory* is chiefly from the tusks of African and Indian elephants *Deer horns* for knife handles, etc., come from many parts of the world. *Deer skins* are tanned for leather *Musk*, a perfume, comes from the musk ox of Asia		
Whales are of several species (*Balœna, Physeter*)	*Whale oil* (sperm oil) is drained from the blubber. *Whalebone* is from the mouth, *spermaceti* from cavities in the head and *ambergris* from the intestines	Whales are now rare and are caught commercially only in remote Arctic and Antarctic waters	Whale oil is used in leather dressing, soap making and lubricating. Spermaceti is used in candle making and for waxing cartridge covers; and ambergris in perfumes
Sponges are the skeletons of peculiar animals (*Spongidœ*)	The qualities differ with the species and locality	Obtained in the Mediterranean and West Indies and off the west coast of Florida	Used in the home and in industry because of their unique capacity for taking up water and ejecting it when squeezed
Fish are of hundreds of species but there are comparatively few that are of great commercial importance	Of the food fish, cod, haddock, herring, sardines, mackerel and salmon are handled in large quantities fresh, canned, salted or otherwise cured *Caviar* is the prepared roe of sturgeon *Isinglass* is a pure gelatine made from the swimming bladders of sturgeon and other fish	The great fisheries of the world are the "Grand Banks" off Newfoundland, the North Sea and the coast of Norway Salmon are canned on the northwest coast of America and on a smaller scale in Japan, Siberia and Norway Portugal, Spain and France lead in canning sardines *Oils*, made from menhaden and other fish, are used in preparing leather, in paints, oiling ropes, etc. *Cod liver oil* is used in preparing chamois and other leather and in pharmacy	Canned salmon leads in value our exports of fish products and goes mainly to England. We import herring, etc., in oil from Europe and considerable quantities of fresh or canned lobsters from Nova Scotia and Newfoundland *Fertilizers* are prepared from the refuse from fish canneries and from fish which are not otherwise useful
Oysters are the most valuable shellfish. (*Ostrea, Meleagrina*, etc.) **Clams, lobsters, shrimp,** are popular foods	Oysters are gathered on the coasts of Europe and America. Some are canned but the greater amount are consumed fresh Pearl oysters (*Meleagrina*) supply *mother of pearl* and occasionally true pearls Abalone (*Haliotis*) and various mussel shells are also used	Pearl oysters are found off the coasts of Ceylon, Society Islands, northern Australia, Panama, in the Gulf of California, the Red Sea and the Persian Gulf. Abalone shells come from the shores of the Pacific	Pearl shell is used for buttons, knife handles, etc. Mother of pearl is imported largely from the South Pacific

FIBERS

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Manila Hemp is a fiber obtained from the leaf stalk of the abaca (*Musa textilis*)	The strongest rope fiber in common use, especially desirable for marine cordage. The finest fibers are used by natives for weaving cloth	Produced commercially only in the Philippine Islands. Practically all of this fiber is cleaned by hand	The bulk of the production is sent to the United States and England, where it is made into binder twine, rope and paper
Sisal (or sisal hemp) is a hard, strong fiber from the leaves of a century plant (*Agave sisalana*) Many similar fibers are obtained from the leaves of other species of *agave* plants	Sisal is very important for making rope and twine. All of these fibers are used locally for making mats, ropes, etc.	Sisal is cultivated in Yucatan and the Bahamas. The home of the agave plants is Mexico and Central America and this part of the world produces most of these fibers	On modern plantations machines clean the fiber. Sisal is the chief product of Yucatan and its greatest export. The bulk of the production is used in the United States in making rope, twine and sacking
Willow is a tree or shrub, yielding pliable twigs, or withes (*Salix* spp.)	Willow is used in basketry and for light, easily movable furniture	The willow is native to many parts of the world, occurring as a shrub in cold regions and as a tree in temperate and warm climates	Willow furniture is an important product. The pictures on the preceding page depict this use of the tough, pliable willow shoots
New Zealand Flax (or New Zealand hemp) is a fiber from the leaves of a plant (*Phormium tenax*)	Used in rope making	A wild plant in New Zealand. Prepared by scraping away the pulpy part of the leaf	An important cordage fiber

FIBERS—Concluded

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Flax is the bast fiber of an annual herb (*Linum usitatissimum*)	Flax or linen fiber and linseed oil are the chief products of the plant *Linseed oil* is used in paints, varnishes, printer's ink, oilcloth and linoleum. *Linseed oil-cake* is a valuable cattle food. *Flax seeds* find limited use in medicine	Flax is grown for fiber in Russia, Belgium, Italy, France, Holland, Ireland and the United States. Plants for fiber production are straight stemmed, while the varieties grown for seed have many branches. Flax seeds are produced in Russia, India, Argentina and the United States. Plants harvested for fiber are pulled up by the root. The fiber is separated from the stalk by retting, a process of partial decay, breaking and scutching and hackling	Flax yarns are used in making rope, twine, bagging and coarse unbleached fabrics. Linen yarns are made into products of the better grade, including fine linens, cambrics, laces, etc. Linen rags are the stock for the best qualities of paper The United States imports flax fiber mainly from Europe, as well as large quantities of linens, laces, etc.
Hemp is the bast fiber from a tall plant (*Cannabis sativa*) Other fibers of different origin and qualities are called by such names as manila hemp, sisal hemp, etc.	The commercial fiber is longer, coarser and less strong than flax. It cannot be bleached perfectly white, although used in so-called coarse linens. Italian hemp is the finest, Kentucky the strongest *Hemp oil* is pressed from the seeds. The dried leaves (*bhang*) are smoked or made into a drink in India and used, as is an extract (*hasheesh*), as an intoxicant	Cultivated in Russia, the warm countries of Asia, the shores of the Mediterranean, Kentucky, Missouri, Illinois and California. The fiber is extracted by rotting, cleaning and combing	Russia produces more hemp fiber than all the rest of the world. Russia and Italy are large exporters. The United Kingdom uses a very large amount of the fiber in making binder twine and bagging. Hemp is considerably used in carpet manufacture Hemp oil is used in paints, varnishes and soap. The oil-cake is a cattle food
Jute is the bast from a tall plant (*Corchorus sp*)	The commercial fibers are long, but softer and weaker than hemp. It does not bleach well and is less durable than hemp, especially when exposed to dampness. Extensively employed in cordage, burlap, bagging, carpets, etc. *Jute butts*, or rejections, are an important paper stock	Grown in large quantities in the Ganges Valley, India, and in lesser amount through other parts of southeastern Asia The stalks are rotted and treated like flax and hemp	Its chief use is in making burlap and gunny sacks Calcutta is the great shipping port for jute fiber. There are large jute mills making burlap, etc., in India, the United States and other countries. Paper factories use jute butts for making wrapping papers
Ramie is the bast fiber from a plant (*Boehmeria nivea*)	Usually strong and silky in appearance but difficult to clean and bleach	Cultivated chiefly in China. Produced in Indo-China, India and on a small scale in Mediterranean countries	Used largely in China for weaving grass cloth, or Canton linen. In the United States it is woven into a fabric for gas mantles
Bast Fibers from other plants are of some importance	Sunn hemp is similar to jute in its qualities and uses. Linden bast or Russian bast is made into mats, ropes and the like		These fibers are not used on a large scale. Cuba bast is woven into ladies' hats and used for tying bundles of cigars
Coconut Palm.—This tree (*Cocos nucifera*) yields a great variety of useful products	*Coco fiber* is obtained from the outer husk of the nut. The shells are made into cups. The milk is a nourishing drink. The kernel or meat of the nut is used for food. Dried coconut meat (*copra*) is pressed to make *coconut oil* for soap and candle making and cooking. The *oil-cake* is a valuable cattle food *Palm sugar* is made from the juice collected from the flower spathe or this juice is fermented to make alcoholic drinks (*toddy, tuba, arrack*)	The coconut palm grows in coast regions throughout the tropics. It is commonly cultivated, but frequently its products are of only local use. Plantations in nearly all parts of the world supply some articles for export	Coconut fiber is made into matting, ropes and brushes, and the poorer grades are used in upholstery. Coco fiber comes chiefly from Ceylon and India. Much is imported into the United States Coconut oil and copra are obtained from islands in the Pacific and Indian oceans and in smaller quantities from other parts of the tropics. Coconut oil is manufactured and used in Europe and the United States. Fresh coconuts come to this country largely from the West Indies and northern South America
Cotton consists of the seed hairs of a plant (*Gossypium*)	The chief commercial types of cotton are American upland, sea island, Egyptian, Indian, Brazilian and Peruvian. These differ in the length of the individual fibers (staple) Cotton fiber is spun into *yarn* and made into *thread*, *muslin*, *calico* and hundreds of other cotton or part cotton fabrics. *Mercerized yarn* is prepared by treatment with strong caustic alkali. *Cotton linters* are used in cheap yarns, cotton batting, mattresses, and the manufacture of celluloid, photographic film, rayon, cellophane, high explosives, etc. *Cottonseed oil* is used for table purposes, for packing sardines, for cooking, making soap, candles, etc.	Cotton is one of the most valuable farm crops of the United States. A majority of all the cotton produced in the world is grown in the south Atlantic and gulf states. The remainder comes mostly from India, Egypt, China, Brazil and Asiatic Russia. The area of cotton production is spreading in the United States as well as in foreign countries The cotton fiber, attached to the seeds, is picked by hand from the plants in the field. The seeds and fiber (or lint) are separated by machines (cotton gins) and the cotton is pressed into bales. Cotton seeds are subjected to heavy pressure in machines in order to extract the oil. The oil-cake is a valuable cattle food and the hulls are used for fuel or for paper making	The greatest centers of cotton manufacture are in England, New England, the Carolinas and Georgia. Germany, Russia, India and Japan are among the important manufacturing nations Modern cotton mills are of immense size. The bales are opened, the cotton cleaned, carded and twisted into slivers, rovings and finally into yarn. Raw cotton, cotton yarn and cotton fabrics are all important in trade. Much of the crop of the United States is exported in bales to be manufactured in other countries. Egyptian cotton has a long staple. Some is imported into the United States. It is also raised in Arizona England has an enormous foreign trade in cotton fabrics. The United States exports chiefly unbleached muslin, more of which goes to China than to any other country
Kapok consists of the seed hairs of a large tree (*Ceiba pentandra*)	*Kapok* or *ceiba* is the commonest vegetable silk in commercial use. Similar fibers from other sources are called *balso*, *pochote* and other names	Kapok comes chiefly from Java, although the tree is common in many parts of the tropics. The crop is principally from wild trees	These fibers can not be spun satisfactorily and are therefore used for stuffing mattresses and pillows and life preservers
Raffia is peeled from the large leaflets of a palm tree (*Raphia pedunculata*)	Madagascar raffia is the only important grade. A similar soft fiber used locally is produced in West Africa	From a very common wild tree	Exported from Madagascar and used by gardeners for tying plants. Used for making mats and basketry and in kindergartens
Rattan is the stem of a climbing palm (*Calamus* species)	Rattan cane is used whole or peeled. Split rattan is the bark that is removed from the peeled rattan	Rattan vines grow wild in tropical forests of southeastern Asia. The thorny leaves and branches are cleaned away from the stems and the outer skin is removed	Used for a multitude of purposes in the east. In Europe and America for making furniture, baskets, whips, etc. Split rattan is used for chair seats and peeled rattan for brushes and basketry. Exported largely from Singapore and Java
Bamboo is the stem of the largest plant of the grass family (*Bambusa* spp.)	One of the most useful plants in the world. Whole stems and split bamboo are both important commercially	Grows in tropical countries. Most common in southern Asia and the East Indies	In the east, large bamboo serves for house construction, furniture, utensils, agricultural implements, fishing rods, canes and hundreds of other purposes. The young shoots are eaten as a fresh vegetable Split bamboo is woven in basketry, mats, etc., and used in stiff brushes Imported from the East Indies

NARCOTICS AND MEDICINES

Name of Raw Material	Chief Commercial Articles Produced	Habitat and Cultivation	Manufacture, Uses and Trade
Tobacco is the prepared leaf of a plant (*Nicotiana tabacum, N. rustica,* etc.)	Commercial grades are named from the locality of production as Havana, Sumatra, Mexican, Turkish, Virginia, etc. Certain grades are appropriate for use as cigar wrappers and others for fillers and are so named in the trade *Cigars, cigarettes, chewing tobacco, smoking tobacco* and *snuff* are extensively used. The stems and ribs of the leaves are employed in *sheep-dip* and for fumigating greenhouses	More tobacco is raised in the United States than in any other country; Kentucky, North Carolina and Virginia yield large amounts. India is a large producer, and the central European countries raise some. Turkey, Cuba, Puerto Rico, Mexico, Central and South America, China, Java, Sumatra, Philippines, Ceylon, Syria and Cape Colony are important producers The many grades of tobacco are due to the varieties of the plant, as well as to soil, climate and cultivation. The curing of the leaf is of the utmost importance. It includes a period of slight fermentation and drying in well-ventilated barns	In the United States most cigars and all cigarettes are manufactured by machinery. Nearly all plug tobacco is flavored with molasses, vanilla, licorice or other substances The United States exports over half of the tobacco raised, chiefly to England in the form of leaf tobacco. Few cigars are exported, but cigarettes and plug tobacco go to the East Indies, China and Australia Leaf tobacco is imported from Cuba, Sumatra and Turkey and manufactured cigars are brought from Cuba Large revenues are raised in most countries from the taxation of tobacco, and in several the tobacco business is a government monopoly
Hops are the dried fruits of the hop vine (*Humulus lupulus*)	Hops are employed chiefly in brewing beer and malt liquors	They are cultivated in almost all parts of Europe, especially in England, Germany, and in the northern United States	Hops are added to the malt, liquor or wort, before fermentation and give a bitter flavor to malt liquors. Hops are not exported on a large enough scale to be an important item in commerce
Opium is the dried juice of the white poppy (*Papaver somniferum*)	Opium is used as a narcotic because of the morphine and other alkaloids it contains. *Laudanum* is a tincture of opium and alcohol Paregoric is a common preparation in which opium is an ingredient	Opium culture is an important industry in northern India, China, Persia, Asiatic Turkey and Egypt. In China the government has greatly restricted the cultivation of the poppy The juice is obtained by scratching the seed capsule and collecting the little drops that exude on it. The juice is then further dried in the sun	Opium for smoking is exported to China from India. It is used in the form of pills in Mohammedan countries like Persia and Turkey. The United States imports opium for medicinal purposes chiefly from Turkey
Quinine is the bark of a tree (*Cinchona sp.*)	A drug of great importance, much used in the form of sulphate of quinine or other salts	Originally native in the Andes and hence called Peruvian bark. The world's supply now comes from plantations in Java. Produced also in South America, Ceylon and India	The principal market is Batavia, Java, whence it is shipped to all parts of the world
Coca is the leaf of a small tree or bush (*Erythroxylon coca*)	*Cocaine,* an alkaloid that produces local anesthesia, is the important constituent	Cultivated chiefly in steep valleys in the Andes of Peru and Bolivia, in smaller quantities in India, Ceylon and Java	The Indians of the Andes chew the leaves on account of the stimulating effect. Its medicinal use is declining
Medicinal Plants and drugs are numbered by the hundred. Among the most important are:	These are used in the form of extracts, tinctures and other pharmaceutical preparations	Many grow wild, but the tendency of modern medicine is to use material from carefully selected plants cultivated for the purpose or synthetic preparations of similar properties	The preparation of medicines is carried on in all parts of the world
Rhubarb, a genus of plants belonging to the family *Polygonaceae*	Its root has long been recognized as of medicinal value owing to its astringent properties	The best comes from China	Rhubarb possesses more or less purgative and astringent properties; this is essentially the case with the roots, and hence these are largely used in medicine
Sarsaparilla, the dried roots of several plants of the genus *Smilax*	The roots yield an extract	There are two special varieties obtained from Jamaica and Lima respectively. The roots are very long, of the thickness of a quill, dark brown in color and bitter in taste	Sarsaparilla is valued in medicine. Various decoctions made from the roots are used as tonics and diuretics
Aconite is a hardy herbaceous plant, of the family *Ranunculaceae*	An alkaloid contained in the leaves of monkshood. It is one of the most powerful poisons known	The plants are natives of Europe, Asia, and North America	They are remarkable for their poisonous properties and medicinal qualities, being used internally as well as externally
Ipecacuanha, the dried root of several plants of the family *Rubiaceae*	The best is the annulated, yielded by the *Cephaelis ipecacuanha*	It is a native of Brazil, and the dried root is exported	It is the root that is valuable. The cases in which ipecacuanha is used are mainly dysentery, asthma and coughs
Belladonna, a plant, *Atropa belladonna,* or deadly nightshade	The inspissated juice is commonly known by the name of extract of belladonna	A plant that has narcotic and poisonous berries, a native of Europe produced in all temperate climates	The extract of the plant is used medicinally for soothing pain, and by oculists for the purpose of dilating the pupil of the eye
Nux Vomica, the fruit of a species of *Strychnos*	The two alkaloids strychnine and brucine are obtained from the berries	The plant is chiefly found in Cochin China and the East Indies	The very powerful and poisonous alkaloids are extracted from the dried seeds
Castor, the name of the plant *Ricinus communis*	The beans and the oil made therefrom	It is a native of India, but its cultivation is now very widespread	The oil is obtained from the seeds by bruising and pressing. Castor oil is used medicinally as a mild but efficient purgative
Areca, a genus of lofty palms with a fruit inclosed in a fibrous rind	It produces nuts and fibers	The tree grows in various parts of the East Indies and is cultivated on account of its nuts. One species is the *Areca catechu,* also known as the betel-nut palm	With lime and the leaves of the betel pepper, the areca-nuts when green form the celebrated masticatory of the east. They are an important article in eastern trade
Aloe, a plant of which there are many species	From the juice of the leaves a drug is obtained of value in medicine. *Aloe fiber* is made into coarse fabrics, ropes, etc.	The principal drug-producing species are the Socotrine aloe, the Barbadoes aloe, the Cape aloe, etc.	Some of the larger kinds are made into cordage, fishing nets and lines, cloth, etc. The juice of several species is used in medicine, under the name of *aloes*
Kola, the seeds or fruit of the *Sterculia acuminata*	Nuts and alkaloids	A native of Africa, the tree is cultivated in Brazil and the West Indies	The nuts are used medicinally and the extract is employed in beverage manufacture
Angostura Bark, obtained chiefly from *Galipea officinalis*	Chiefly valuable for its bitter aromatic bark	The tree is 10 to 20 feet high, and grows in the tropical regions of South America	The bark is valuable as a tonic and febrifuge and is also used for a kind of bitters

ECONOMICS

ITS NATURE AND FIELD

The word *economics* is from a Greek word, oikonomika, which meant household management. In the 4th century B.C. Xenophon wrote a book *Oeconomicus* ("The Home Manager"). The field of economics today, however, is much broader than home management. It deals with all the problems that arise from man's efforts to get a living. If everything was abundant or people had no desires or only the very simple wants of the South Sea islanders, there would be no economic problems. Because we want many things, because the things we want are scarce, because the only way to get them is by working the land, building houses, manufacturing goods and exchanging goods with each other—for these reasons we face economic problems. The subject matter of economics is the best means of carrying on our individual activities and of working with other individuals in society to satisfy these many wants.

In early times economic life was very simple. The tribe or the clan was the largest group. Hunting and fishing, pasturing flocks and later on primitive agriculture were the chief means of getting a living. Money was not needed, for there was little trading or exchange, and what there was was *barter,* the mere trading of goods for goods. Examples of this simple economic life are seen in the early trade of the whites with the American Indians, for example, the purchase of Manhattan Island not for a few dollars but for a few dollars' worth of goods.

Economic problems have grown very complex and difficult to solve as clans have given way to nations, and as manufacturing, trade, commerce, money and credit have developed. Today to satisfy our need for goods there is an elaborate and complex mechanism. It includes systems of production (our manufacturing organization), of credit and exchange (our money and banking organizations), of transportation (our railroad, bus and shipping industries), of marketing and distribution (our wholesale and retail organizations) and even a type of government that directs or co-operates in carrying on activities too expensive or too large for individuals to undertake and makes rules for individuals or organizations in the different parts of the varied economic structure.

DIVISIONS OF ECONOMICS

Our economic organization has become so complex, and we have so many fields of specialized activity to enable us to carry on all the necessary phases of economic life, that the study of economics divides into several phases.

First comes the study of production, the creation of goods and utilities to satisfy our wants. Under this division, the problems that arise from the different types of business organizations are studied; for example, large and small scale enterprises, the advantages and disadvantages of the specialization and mass production that are exemplified in the automobile and meat-packing industries; the growth of the corporation; the different types of factories; the problems of agricultural production as compared to manufacturing.

Today, most goods that are produced are not bartered but are sold for a price. So an important problem of economics is analyzing the way in which *prices* are determined.

The welfare of each individual depends on the price he gets for the service he performs, whether he is a laborer, an investor, a farmer or landowner, a manager of a plant or director of a corporation. So another division of economics is concerned with the way that different workers are paid for their work or services. This is the problem of *distribution*—how wages, interest, rent and profits are determined.

The government plays an important part in economic affairs, and in order to carry on its activities it collects money from the citizens either through taxation or by issuing bonds or notes. What type of taxes are best? Do taxes discourage production? These are some of the problems that are studied under the head of *taxation.*

Other governmental activities have an economic effect, and an important part of economics is concerned with the growing role of government in business and all economic matters through its power of regulation, taxation, tariff making and making laws that direct or limit the economic life of the individual whether he is a farmer, a wage earner, the manager of a store or a stockholder in a corporation. *Government in business* is a major problem in modern economics.

Finally, there are many people who wish to change or reform certain phases of our economic organization. There are some who would change it completely and substitute other systems—Communism in Russia, Fascism in Italy, Nazism in Germany. Economics attempts to analyze the reasons why these social reform movements have arisen and what is likely to be the effect of introducing the changes they propose. Our economic organization does not work smoothly all the time, and there still exists too much poverty in our midst. Why do we have periods of prosperity and periods of depression? Why do we have periods of rising prices followed by periods of falling prices or vice versa? Is it necessary to change our economic system completely in order to remove or lessen these evils? What can the government do to assist in conquering these shortcomings? What can business do? The question of our future economic setup forms an important part of economics.

ECONOMIC LAWS AND PRINCIPLES

Looking at the different parts of our economic organization, the economist draws some general conclusions what the effect of certain kinds of action are likely to be. He states these conclusions as economic laws or principles. We speak of the *law of supply and demand.* If the supply of anything is increased, the price is likely to fall. If the demand for anything increases, and its supply remains the same, the price is likely to increase. This is true whether the demand is for labor, for land or for goods.

If only 1,000 copies of a book are printed, it may cost $10 to print each book. But if several thousand are printed, the cost of producing each book will be decreased. This tendency of costs to decrease with increased production is called the principle or *law of decreasing cost.* It is this characteristic that has made it possible for such mass production industries as automobile manufacture to expand very rapidly and to reduce the cost of their product with increased production. But when increased production is sought in agriculture or in mining, it is necessary to use poorer grades of soil or to sink shafts deeper, and then a smaller return is secured for the same investment. The economist calls this an illustration of the *law of diminishing returns or increasing cost.*

Attempts have often been made to control demand and supply and make these laws of economics work in the way that special interests desire. Brazil, for many years, tried to keep up the price of coffee by burning part of the coffee supply or having the government buy up part of the supply and keep that off the market in order to hold up the price of coffee in the market. But other countries immediately increased their coffee output, and the total production increased instead of declining.

In some industries there have been attempts to gain complete control of supply and sales (monopoly) so that they could raise prices. Crop control plans have been urged for farm products—again to raise prices. Wage earners have combined in unions and have sought to establish the "closed shop" where only union men would be employed—so that wages would be higher. Does controlling the supply of goods or services always make it possible to increase the price? What we call the law of supply and demand is not as universal and exact in its operation as the laws of gravitation or other physical laws. All attempts to control or regulate demand or supply must be studied by the economist. This is an important field of economics.

ECONOMIC HISTORY, PROBLEMS AND THOUGHT

The economic and business organizations of today are really very young. They have existed for less than three centuries. Before the 17th century the basis of economic life was agriculture with a very limited amount of trade or commerce. Whatever manufacturing was done was by hand, either in the home or in small shops. A short survey of these earlier economic systems and their economic problems will help us to understand our own economic problems much better.

Early Times and Problems.—In ancient Egypt life depended on the Nile. When the Nile overflowed its banks, it covered the land with rich loam and kept it fertile. In years when the Nile did not overflow, there were periods of famine and suffering. The Pharaohs, the military class and the priests were the ruling classes; the land was cultivated by the peasants or fellahin, who were serfs of the state or who worked on the land owned by the priests or nobles. There was little possibility in this period for the mass of the people to get much out of life except hard work and a bare subsistence. The Pharaohs and their armies protected the country from invasion and made war on neighboring countries. The Pharaohs built themselves huge tombs, the pyramids, which sometimes took 10 to 20 years to finish and provided some employment for the peasants during the off-seasonal periods. But the pyramids are not the best examples of how to deal with unemployment.

The Babylonians developed an economic life centering around the Tigris and Euphrates rivers. We have some evidence of the economic life of these people in the great Code of Hammurabi, one of the rulers. The Babylonians, like the Egyptians, depended mostly on agriculture but had a more extensive commercial life. The Code of Hammurabi regulated very thoroughly almost all the details of the economic life of the different classes among the Babylonians; government control was almost as complete as in modern Germany and Italy.

Greek and Roman Economic Life.—Greece was a small country, divided up into a number of city-states, such as Athens, Sparta, Thebes and the like. In both Greece and Rome slavery played a considerable part in the economic life of the country. Slaves performed a large part of the work, and Greek citizens were not supposed to engage in manual labor. Gentleman farming or soldiery were the only two occupations that such great Greek philosophers as Aristotle and Plato felt were at all proper for freemen.

Many of the Greek and Roman economic problems seem strikingly similar to our own. The Greek farmers got into debt and sought to have laws passed that would make payments of debt easier. Dictators or tyrants seized the power in many Greek cities and sought to keep the favor of the people by public works, lavish expenditure and foreign wars. In Roman times, huge estates (*latifundia*) grew up and were cultivated by slaves. Many impoverished farmers drifted into the cities where they lived on "bread and circus"—doles, relief and amusement paid for by the emperors to keep the people contented. But Rome was steadily weakened by struggles between the rich and the poor, by constant wars and by reliance upon slave instead of free labor; and eventually Rome could not resist the invasions of the barbarians.

The Middle Ages.—For five centuries after the fall of the Roman Empire most of Europe was under the feudal system. The land was held by nobles and was cultivated by serfs or villeins, bound to the soil. Each farm or manor was independent, and practically all the goods it needed were made on the manor itself. There was little exchange, therefore, and trade was through barter, rather than the use of money.

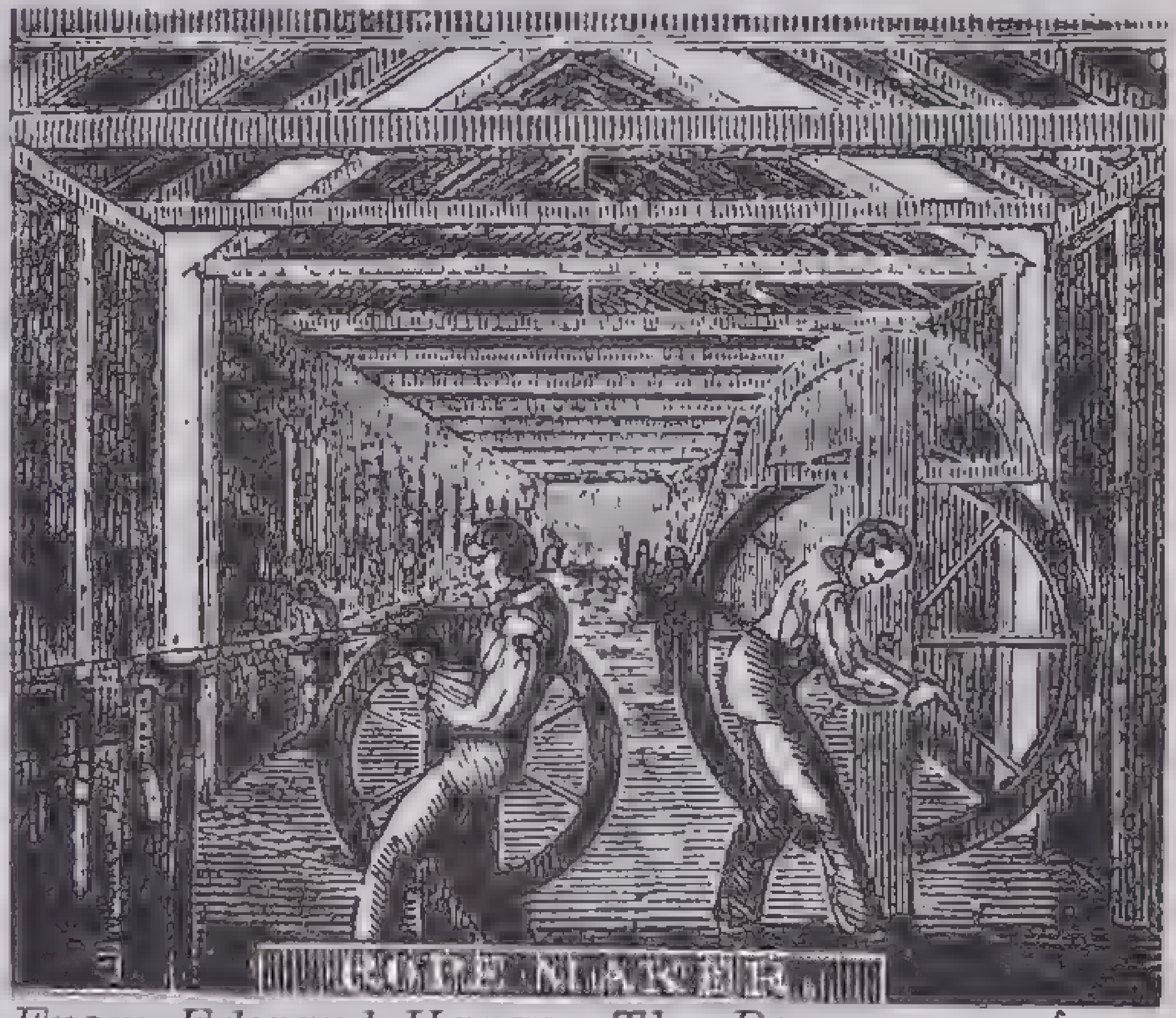
The Greek philosophers and the Fathers of the Church (notably St. Thomas Aquinas) opposed the attempt of any individual to accumulate wealth and grow rich. The Greek philosophers felt that the ideal life was one of neither great wealth nor poverty but the golden mean. The Church Fathers made poverty the ideal and urged the people to look to another world rather than to material wealth for their happiness. As a matter of fact material wealth was beyond the reach of nearly everyone under the simple agricultural system of the time. The masses could expect only a bare subsistence living as a result of a life of hard work. Only a few large landholding nobles could live in moderate comfort.

Development of the Modern Economic Structure.—The entire economic outlook was changed by the rise of monarchies and great national states, such as England, France and Holland, the discovery of America, new trade routes, the development of commerce and trade and finally the introduction of the inventions of Hargreaves, Crompton and Cartwright into the textile industry and of power-driven machinery into other industries in the course of the 18th and 19th centuries. Our modern capitalist, factory, machine system grew up and displaced the old simple, agricultural, feudal, handicraft system.

The merchant and trading class grew in importance with the development of towns, of new trade routes and of commerce in the necessities of life instead of luxuries as was characteristic of early trade. Trade and exchange took the place of the simple barter system of the feudal period. One reason was that the merchants were interested in having a wide market in which to sell their goods; and another reason was that the kings needed money to pay their standing armies, to overthrow the power of the feudal lords and to build up a strong national state.

The new economic policies that were put into effect as a result of the growth of commerce and the struggle of the kings with the nobility were known as *mercantilism.* In the preceding period, manufacture had grown up in the towns, and this was in the hands of *guilds,* associations of workers and employers that monopolized the production of goods, limited the output and regulated the prices of the products.

The *mercantilist* policies helped to break up these local monopolies and establish free trade and competition inside the country. Mercantilism became a state policy in France under Colbert in the middle of the 17th century, and France became a great power at home and abroad. In foreign trade, the mercantilists advocated a tariff policy that would enable them to sell more to foreign countries than they bought from abroad. In England and France heavy import duties were placed on goods coming into the country. This seemed a good way for countries that had no gold mines to get a *favorable balance of trade,* that is, an excess of exports over imports, and to secure the balance owing them in an inflow of gold and silver. This policy was supported by the kings because it supplied them with money to pay their soldiers. The increase in money supply served to speed up the establishment of a money economy in place of the old barter system of feudalism. This helped to lessen the power of the feudal nobility.



From Edward Hazen: The Panorama of Professions and Trades, 1836

Trades in the 1800s: The Ropemaker

The mercantilist policy had resulted in increasing the power of the state over all phases of economic life. Laws were passed forbidding labor to move from one locality to another. The state tried to keep control over the business man and the laborer alike.

These restrictions on business and trade became a great handicap with the development of the modern manufacturing system that was made possible as a result of the great inventions of the 18th century. The new manufacturing class, eager to build factories, expand industry and create new wealth, found that the mercantilist policies stood in their way. A new economic policy of freedom of enterprise, free trade and noninterference of the state became necessary for the rapid expansion of industry under the industrial revolution.

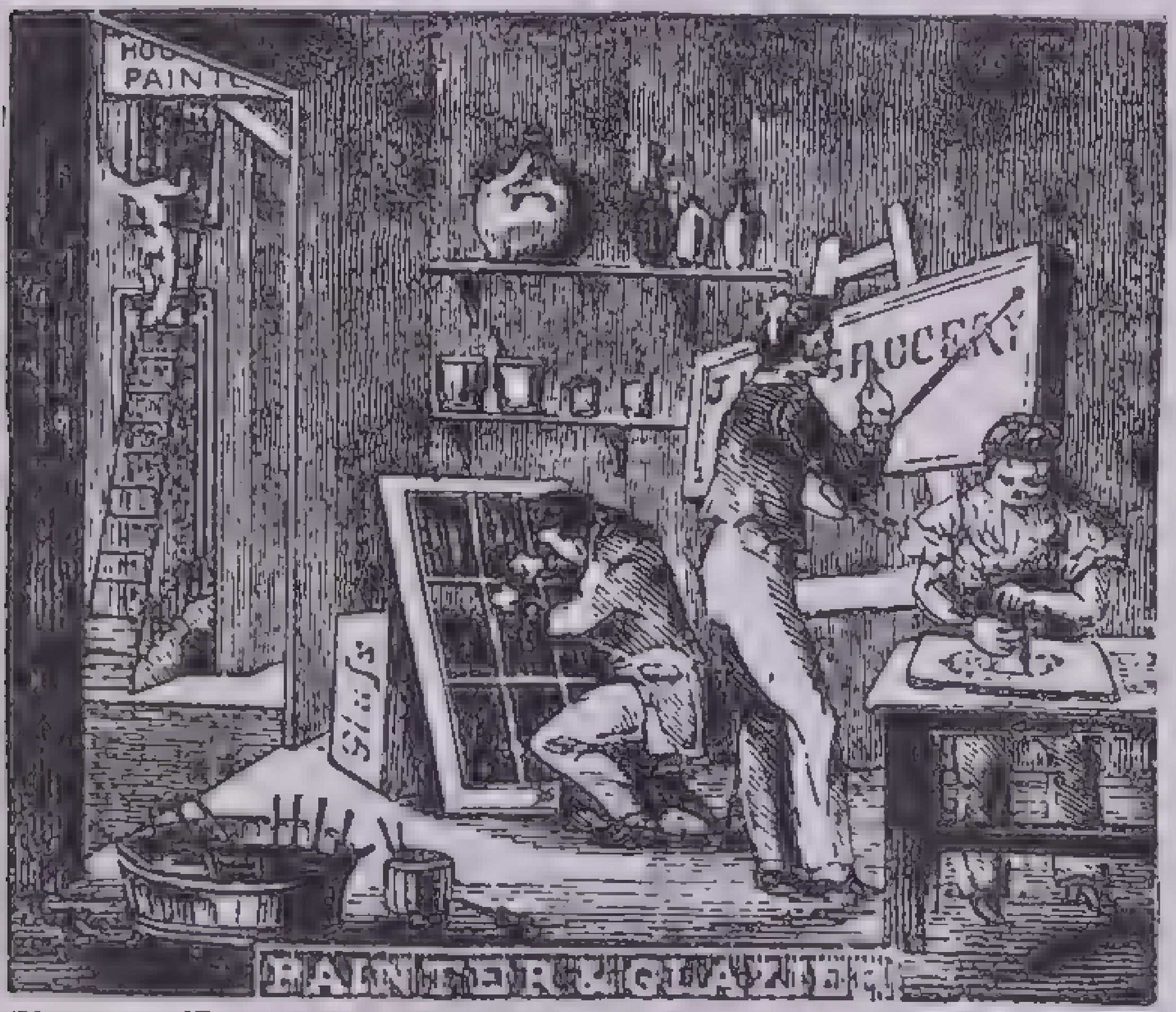
This policy of free competition was advocated by Adam Smith in his book *The Wealth of Nations.* This book appeared in 1776, the same year as the American Declaration of Independence, and by many is thought to have exercised as profound an effect on thinking and social policy as did the Declaration of Independence.

Smith, who is frequently referred to as the founder of modern economic thought, felt that the most important problem in promoting the welfare of mankind is the increase in wealth. The ability of industry to increase the amount of goods produced depends (says Smith) on the division of labor and economic freedom.

By *division of labor* he meant specialization, each laborer or each industry devoting itself to doing one thing, carrying out one part of a whole operation instead of the entire operation. For example, in the manufacture of pins one person making the entire pin could make only a dozen pins a day, but by division of labor, it was possble to increase the production many thousand times.

A second important factor necessary to the promotion of wealth is *economic freedom.* Smith felt that in economic matters the individual was a better judge than the state of what was good for him. The state should restrict its interference in the life of the individual to such matters as maintaining law and order, defense against attack, promoting education and such cultural policies. In industry, said Smith, the state should pursue a policy of *laissez-faire* or let-alone.

If economic liberty is assured the individual, he will be led in the pursuit of profits to increase his production as much as possible, and the competition of his fellow producers will compel him to keep his prices as low as possible. In this way, said Adam Smith, every person in the pursuit of his own selfish economic interests will be led, as though by an "invisible hand," to promote the general welfare.



From Edward Hazen: The Panorama of Professions and Trades, 1836

Trades in the 1800s: The Painter and the Glazier

Smith was opposed to the mercantilist policies because they restricted economic freedom and thus tended to prevent the fullest development of individual initiative and the greatest possible division of labor.

Smith's economic ideas were supported by many succeeding economic thinkers—David Ricardo, Thomas Malthus, John Stuart Mill. The political policy of England gradually changed when Sir Robert Peel, the great prime minister, and other leaders were converted to the economic ideas of Smith and his followers. Eventually, the mercantilist policies were reversed, and Smith's ideas were adopted. The Corn Laws, which had placed heavy duties on the import of grains into England and had increased the price of foodstuffs to the English worker, were repealed, and England turned to the establishment of an economic system of free enterprise and free trade.

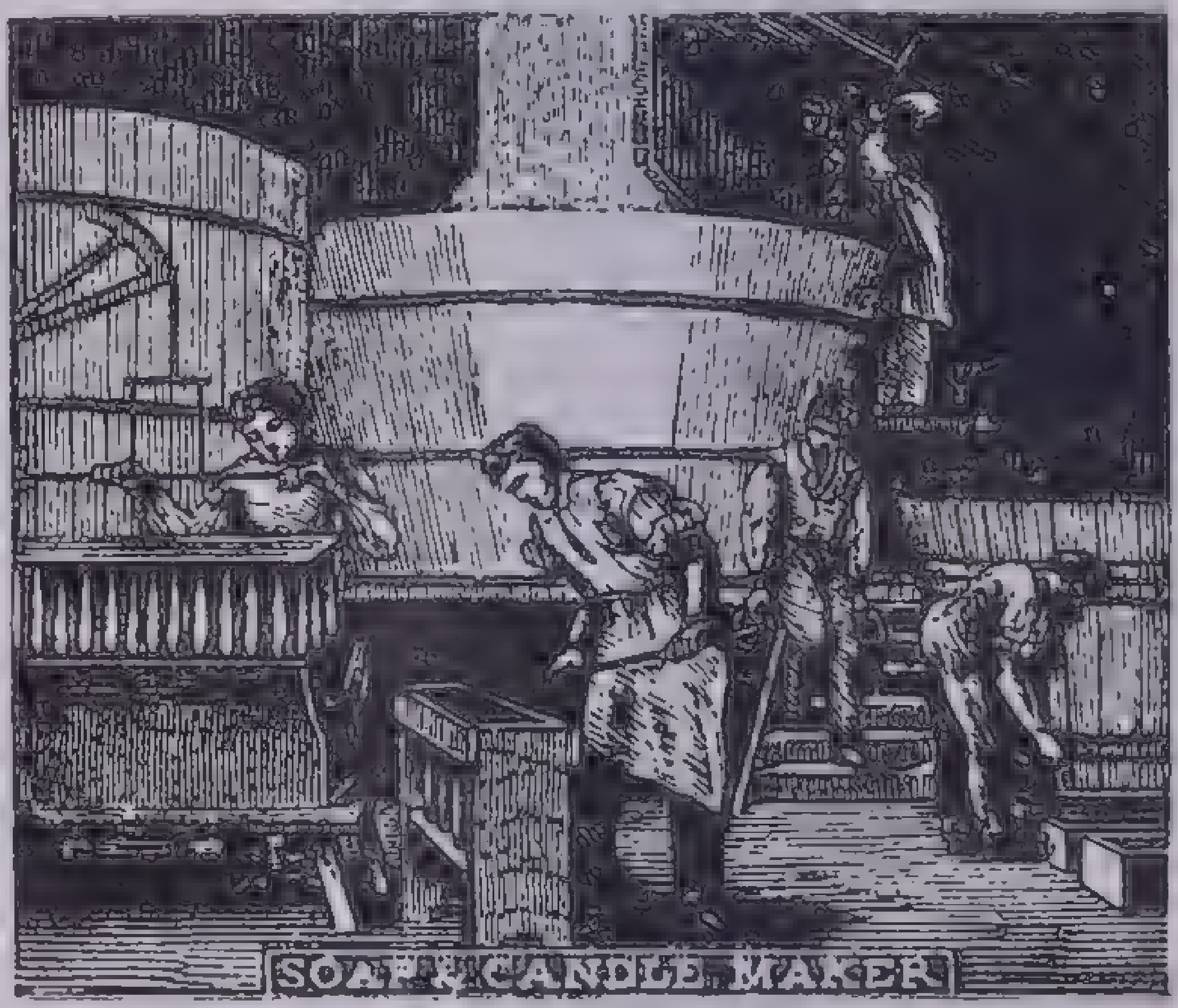
The competition, individualism and economic liberty described in Adam Smith's *The Wealth of Nations* has been the economic system prevailing in England and the United States from the early part of the 19th century to the present time. Many modifications have been made in the details of its working. There is less *laissez faire,* more government in business. There is labor legislation to regulate the conditions of work of women and children in factories. Laws have been passed to prevent the growth of monopoly. Administrative bodies have been established—such as the Interstate Commerce Commission and state public utility commissions—to regulate railroad and public-utility rates. Besides these external changes, the industrial system has changed internally through the growth of large scale production, the development of corporations and the rise of trade unions. The average number of employees in a factory has increased enormously. Trade and commerce are on a wider and wider scale now that the market is a world market. Increased specialization has made us more dependent on each other. This growth in size and scale of production has made it possible to increase production many fold; but it has also made our economic organization more dependent upon the close co-operation of each factor.

Capitalism: Our Economic Organization Today.—Though many such modifications have been brought about in our economic and business organization, in the main the fundamentals of our economic organization today are the same as those described by Adam Smith. We rely upon private ownership with industry controlled and organized by individuals and led by a desire to make profits; and we expect this system to secure the most satisfactory development of our resources, to increase the production of goods of the kind and quantity desired and to make possible the fullest employment of labor. This private ownership of the means of production, with competition and the stimulus of profits as the motive force, is called *private capitalism.*

Socialism and communism are systems in which the means of production, the land, factories and stores are controlled by the state, and competition and the profit system are abolished. The United States, England and France are countries in which private capitalism is the form of economic organization. Soviet Russia is the only country at present trying out a socialistic system.

Opponents of Capitalism.—Although this system of free competition and private ownership has been generally accepted as the most desirable economic system for the last 150 years, it has often been criticized and attacked. There have been many individuals or groups who have desired to change it greatly or to substitute an altogether different type of economic system for it.

Some of the substitutes date back long before the establishment of private capitalism as we know it. Plato, the Greek philosopher of the 4th century B.C., was one of the first to propose a society in which economic and political life would be planned by the state. He described in his book *The Republic* an ideal society with several definite economic classes, each performing that type of work outlined for them. At the top of this society was a governing body, the *Guardians.* To be sure that they would not have any thought except for the state, Plato suggested that they should not be allowed to own anything individually but should practice complete communism. Since the time of Plato many other idealists have tried to outline societies that would function perfectly and would have none of the shortcomings of our actual life. Such a planned ideal society is called a *Utopia,* a name used by Sir Thomas More, for the ideal government he described in a book written in 1516. Utopia means literally "Nowhere Land."

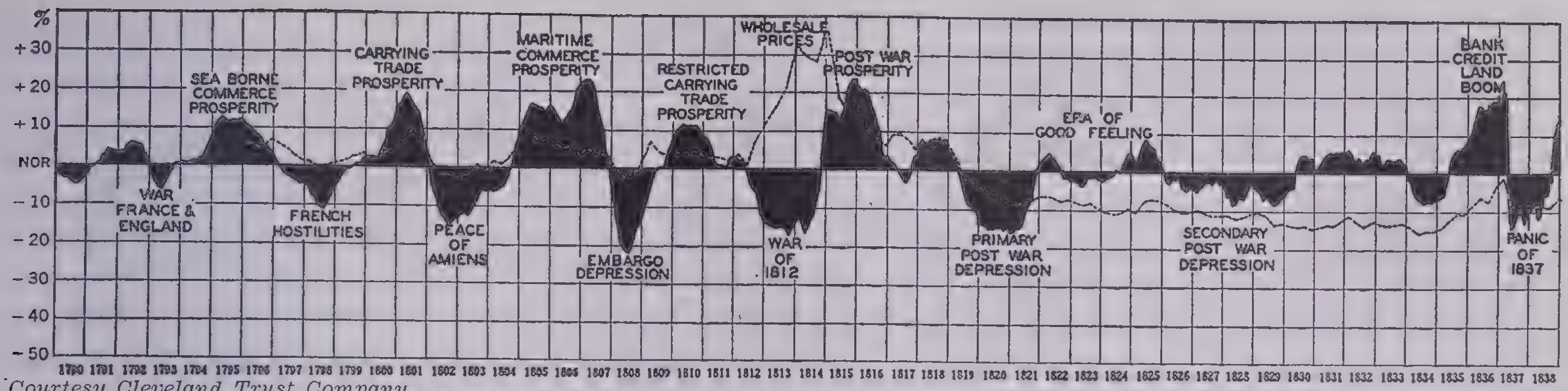


From Edward Hazen: The Panorama of Professions and Trades, 1836

Trades in the 1800s: The Soap Boiler and Candlemaker

In the first half of the 19th century there was much poverty in England, cities were overcrowded, and the laborers worked long hours for little pay. A group called *Utopian Socialists* arose. They felt that capitalism had been a failure. Robert Owen (1771–1858), English cotton spinner, and the Frenchmen Charles Fourier (1772–1837) and the Comte de Saint-Simon (1760–1825) proposed to establish ideal colonies in which co-operation and communism would take the place of capitalist competition. Many such colonies were established in America in the first half of the 19th century, but although several lasted for a generation or so, all were failures.

A more serious attack on the economic system was made by Karl Marx and Friedrich Engels, who founded the modern socialist and communist movements. In his book *Kapital,* Marx attempted to prove that the capitalist system meant increased poverty for the masses of people, growing concentration of wealth, more severe depressions and finally a complete collapse of the economic system. Marx and Engels (who completed his book) proposed to organize the laborers



Courtesy Cleveland Trust Company

American Business Activity, 1790–1838

into a revolutionary movement that would seize control, abolish private capitalism and establish a socialist economic system. The Bolshevik Party in Russia accepted the teachings of Marx and has been attempting to put them into effect in Russia. Many socialist or communist movements have grown up in the other important industrial countries of the world, based at least in part upon the teachings of Marx.

PRESENT-DAY PROBLEMS AND ECONOMIC THOUGHT

Many serious economic problems face our industrial system today. It is important that we analyze these problems carefully so that we may study the effect of the changes made or suggested for the improvement of economic organization.

The most important economic problems of today are:

(1) The problem of balancing production and consumption or the problem of the business cycle;

(2) The problem of insuring a satisfactory distribution of wealth, of sufficient wages to insure purchasing power, of capital to continue production, of income to reduce or eliminate poverty:

(3) The problem of unemployment;

(4) Foreign relations—the problem of war and peace, our economic relations in international affairs, the control of raw materials necessary to the production of manufactured products, the sale of our manufactured goods abroad, the control of colonies.

The Business Cycle.—The depression that broke out in 1929 made us all familiar with the existence of business cycles or periods of depression and prosperity in business. There were other depressions in the United States before 1929 (in 1873, 1893, 1920–21), but the world-wide nature of the depression of 1929, its prolonged effect and the long series of measures passed by the New Deal Administration to bring about recovery have raised new questions about the causes of the cycle, how it can be prevented and the means of either preventing it from occurring again or lessening its severity.

Many explanations have been suggested of the causes back of the business cycle. Panics and depressions are related to sunspots, some theorists say. Periods of optimism and pessimism naturally succeed each other and lead to changes in business—so some psychologists think. All the different sides of these business disturbances are being thoroughly studied, but there is no general agreement on the main cause of the business cycle. Some groups emphasize production, the great efficiency of our economic system that leads to a more rapid increase in production of goods than can be sold on the market at a reasonable price. Others stress lack of purchasing power on the part of consumers. Still others stress monetary factors, which cause a rise or decline in price, failure of credit or too rapid expansion of loans.

It is clear that the problem of the business cycle is the best balance of production and consumption. As long as we have private capitalism, the business man wants assurance of a reasonable profit on his production if he is to step up production.

There must be fair wages and employment in industry if the consumers are going to be able to purchase the goods that are produced. Otherwise, even if people may need many things, they will not have the money to buy them with.

The Brookings *Study of America's Capacity to Produce* shows that even in 1929 American production was not more than 80 per cent of full capacity. Other studies have shown that though we have the highest standard of living in the world, an important number of American families do not live in satisfactory houses, do not have an abundance of food or clothing and are not assured of sufficient employment to bring in a satisfactory yearly wage.

It is not possible to detail the steps necessary to prevent business depressions from taking place or to promote the most rapid recovery. But it is evident that more production rather than less is needed. Economic measures that promote employment in private industry, large scale production at low prices, high minimum wages, co-operation between labor and capital, the maintenance of reasonable prospects for profits in industry—all these tend to assure recovery and a balance of continued production and consumption.

Distribution: Wealth and Poverty.—There exists a considerable amount of inequality of wealth among the inhabitants of the United States and of other industrial countries. Large fortunes exist side by side with a large amount of poverty. This seems the more disturbing because this poverty exists in the midst of plenty, and because our machine production can so easily produce enough for everybody.

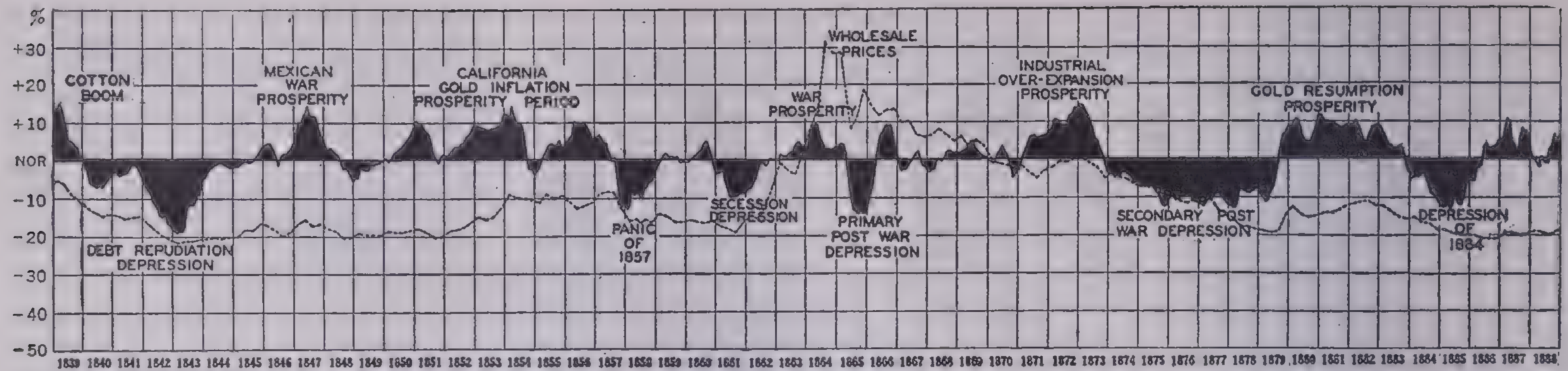
Some economic and political movements have arisen proposing to solve the problem of inequality by a *share-the-wealth* plan or by plans to tax the higher incomes or large inheritances out of existence. Wealth exists in the form of factories, railroads, farms, homes, food, manufactured goods and the like. This is the real wealth of the country. Share-the-wealth plans confuse money wealth with the real wealth that cannot be divided in any simple fashion such as these movements propose.

It may be desirable to reduce the present inequality of wealth in the United States, but plans of taxation that aim to do this are not sufficient to provide a comfortable living for all the people of the United States. It is necessary to produce more goods, increase the stock of real wealth available for distribution and make our economic system function more effectively in adding to the store of goods.

Unemployment.—One of the most difficult problems that has faced the country for the last few years has been unemployment. In such prosperous periods as 1929 there were about 1,200,000 unemployed. Probably there were from 12,000,000 to 16,000,000 unemployed at the lowest point of the depression. The economic loss in goods produced is only one aspect of unemployment. There is a decline in the morale of workers who cannot find work, a loss in training of those who are out of work and a decline in purchasing power that affects all business.

People used to say that anybody who really wanted work could find a job, but it is now recognized that in times of depression most unemployment is the result of general business conditions and not the fault of the worker. To restore employment it is necessary to restore business to full activity.

Some economists now think that even if business employs all the workers necessary to carry on full production, it will be impossible to put back to work as many as really are willing and able to work; and that a large permanent body of unemployed will have to live on a dole or be employed by the government. This situation, they believe, is caused by the inven-



Courtesy Cleveland Trust Company

American Business Activity, 1839–1888

tion and adoption of laborsaving machinery that enables the employer to use machinery instead of labor. Technological unemployment, as it is called, is almost certain to increase.

There is not enough evidence to enable us to conclude what the final effect of new inventions will be on the number of laborers that can be employed in industry. Unemployment means loss of buying power. Though one employer may gain by cutting down his labor force and reducing labor costs, industry as a whole loses purchasing power if this is done generally.

It is quite possible for labor through trade-unions or through maximum-hour laws to raise the wages of individual laborers or to see that the wages are distributed to more laborers. But unless the total income of the nation is increased, this will not mean a general increase in the real income of all the workers. The Government in recent years has taken care of many of the unemployed through the Works Progress Administration and the Public Works Administration, but the unemployment problem cannot be solved permanently through such agencies. The major burden of employing the 50,000,000 wage earners in the United States must come through an expansion of industry.

International Economic Problems.—Nations today are dependent upon each other for markets, for food supplies, for raw materials. Even the United States lacks some necessary raw materials, though it is much more independent than almost any nation except Russia. Though the foreign trade of the United States has been only 10 per cent of our total trade, it has been important for some industries, such as cotton and farm products, which have suffered severely when the foreign market was lost.

Some countries of Europe are trying to make themselves completely self-sufficient and independent in time of war by keeping out imports in order to build up home industries. Germany has introduced a four-year military plan intended to accomplish this result.

The result of these policies of isolation or economic nationalism, as they are called, has been that our foreign trade in agricultural products has fallen off. It does not seem likely that we will ever again recover this foreign market, and in this field it is necessary for us to limit our production more and more to the demands of the domestic market.

Before the World War the United States was a debtor nation, that is, it owed European countries for investments made in this country. The war changed the United States into a creditor nation. The debts that the United States owed the European countries were paid back, and in addition money was lent by the Government and by individuals to the Allies so that they could buy munitions and food in the United States.

Most of the European governments that are in debt to the United States have stopped paying either interest or the principal of the debts—another upsetting factor in international economic affairs.

As the United States is a great manufacturing nation, it is interested as far as possible in promoting trade with other countries. In the present international situation, however, any increase in American investments abroad ties up American economic interests with these countries. It is important for us to decide how far these economic interests will involve us in case a general European war should break out.

Europe has become divided into two groups of nations: England, France and Russia on the one hand have all the land and colonies they desire; but Italy and Germany, the Fascist countries, are seeking to expand, to take possession of more territory or (in the case of Germany) to regain lost colonies. Economically, this may be described as a struggle between the *have-nots* and the *haves.*

England, France and Russia have generally pursued a peaceful policy, intent on avoiding war; but the Fascist countries have been more aggressive, insisting on the necessity of expanding to assure themselves of outlets for their population or control over the sources of raw material.

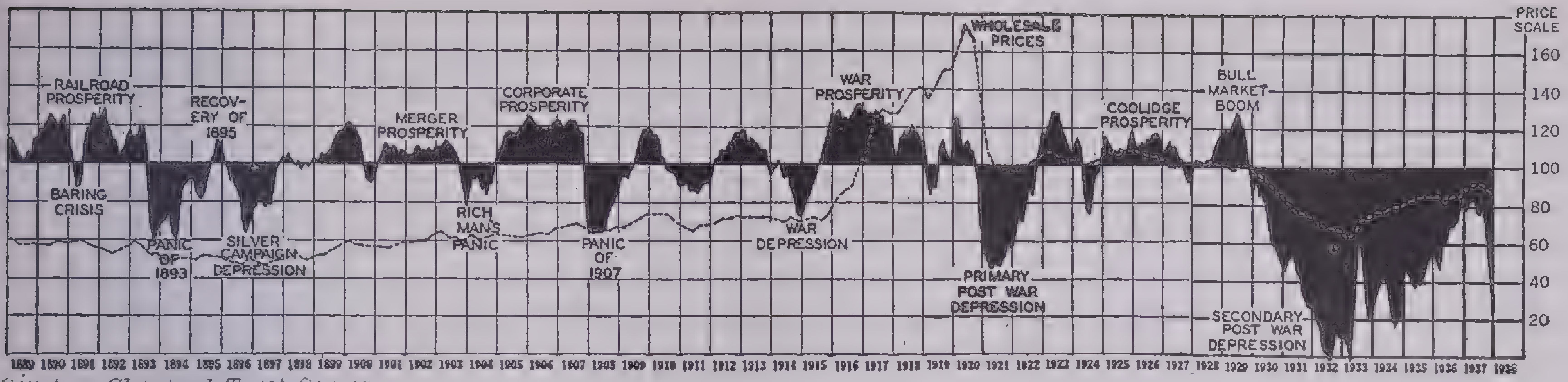
The danger of international war is one of the most important economic and political problems today. The future of our economic system depends on how much we increase our own population and wealth. Would a war help restore prosperity in this country by enabling us to sell more goods abroad? That would only mean that more of our goods were going out of the country to be used in destruction, and there would be no increase in our own real wealth to be distributed to our own workers.

Suggested Solutions.—The economic system today has changed greatly from the time when Adam Smith wrote *The Wealth of Nations.* Economic problems have grown so complex that many economists despair of solving them under the present economic organization. Can they be solved in any other way? Consider *first* proposals to adopt a new political and economic system; and *second* proposals to change or modify the present system.

Fascism and Nazism.—Italy and Germany have adopted economic and political dictatorships. The Fascist system in Italy proposes a system in which the state rules completely over the individual. The individual is not supposed to have any other life than that of working for the interests of the state. He must completely subordinate his own life to the desires of the state and must be prepared to make every possible sacrifice that the state calls for. This is referred to as a *totalitarian* state, that is, the state is everything—is supreme over the individual.

In both Germany and Italy the state is ruled by a dictator and a single political party—Hitler and the National Socialist Party in Germany and Mussolini and the Fascist Party in Italy. The old trade-unions have been broken up in these countries, strikes are forbidden and employers and employees both are compelled to belong to new associations or corporations, which the state assists to determine wages, production, prices and other economic matters. This organization of workers, employers and representatives of the state in associations to govern economic relations is called the *corporate state.* Fascism and Nazism have three fundamental characteristics: dictatorship, nationalism and the corporate organization of industry. Fascism differs from socialism or communism in that it proposes to permit private ownership and profits but intends to regulate them in the interests of the state. The danger of Fascism is that it may eventually lead to international war.

Socialism and Communism.—There are many varieties of Socialists and a number of varities of Communists, but all have one thing in common. They intend to change the economic order from one of private ownership and profit making to state or community ownership and operation of factories, farms, stores and other means of production. They believe that private capitalism is wasteful, results in



Courtesy Cleveland Trust Company

American Business Activity, 1889–1938

poverty, causes depressions and eventually results in international wars. Capitalism, they believe, results in a class struggle between labor and capital that can be ended only by the laborers' taking over the economic system.

The Socialists believe that this overthrow of the economic system or revolution can come peacefully through the ballot. The Communists maintain that even though there is a majority vote for socialism, it will be necessary to take away the factories from the present owners by force of arms.

Another important difference between Socialism and Communism is that the Communists believe that a period of dictatorship such as exists in Russia must come before it will be possible to reach a final stage of socialism or communism. This dictatorship will break up any remaining opposition to socialism and will introduce socialism as fast as the people are ready for it. The Socialists want a more democratic government from the beginning.

Although there are strong Socialist parties in a number of countries—England, for example, where the British Labour Party, which has a socialist program, controlled the government for a time—the only country that has had the chance to try out socialism has been Russia.

The Russian Bolshevik or Communist Party, in control of Russia since the Revolution in 1917, has been attempting to establish a communist society in Russia. The Russian Communists consider Russia is not yet ready for complete Communism—wealth is not so abundant there that it would be possible for each individual to give according to his ability and receive according to his needs. A dictatorship is still necessary, they contend, to control the country and enforce the steps that will lead to Communism.

The Bolsheviks have attempted to carry out their plans through a series of *Five-Year Plans.* As they were finishing the second Five-Year Plan they were preparing to start on a third. The main purpose of the first two plans has been to make Russia a strong industrial nation, to build up her military power and to establish complete control of the state over all forms of industry and agriculture. Later plans will attempt to produce more manufactured articles and to raise the standard of living of the Russian people, which is as yet extremely low.

Changing or Modifying Our Present System.—In the United States, though Socialist parties have existed for 50 years and there has been a Communist Party since the Russian Revolution, these movements have not secured enough backing from the voters to make them significant political factors. But the New Deal and the depression raised the important question: How much is it necessary to change or modify our economic system in order to make it serve most effectively?

The economic measures of the New Deal must be considered in two classes: those intended to bring about *recovery;* and those intended to *reform* or change our economic system in some significant manner.

Under the heading of *recovery* come the establishment of relief measures and the setting up of public works, through the WPA and the PWA; the National Recovery Administration, which set up codes to prevent unfair competition and to establish minimum wages; the Agricultural Adjustment Act to aid the farmers by limiting production and so increasing prices; and the Devaluation Act, which reduced the value of the gold dollar in an effort to increase prices.

Reform measures of the New Deal include the new banking laws that guaranteed bank deposits up to a certain amount, separated investment and commercial banks and gave the Federal Government increasing control over money and credit. Other reform measures have been the Tennessee Valley Authority (TVA) and similar activities in building huge dams and power plants to provide flood control over certain regions for land reclamation and to produce cheap electric power; and the Labor Relations Act, which set up a National Labor Relations Board to insure collective bargaining between labor and employer.

The New Deal has no intention of abolishing private ownership and establishing socialism, but it is extending the power of the Federal Government over industry.

One important aim of the New Deal is establishing a *balanced economic system.* This means that some economic groups will have their power and income increased—and some will have both decreased. The Administration considered that the agricultural and laboring classes are at a disadvantage compared to the manufacturing or industrial. The Agricultural Adjustment Act and the Labor Relations Act tried to strengthen the power of farmers and laborers by reducing the supply of agricultural products and raising their prices and by encouraging trade-unions and collective bargaining.

What effect have the New Deal measures had on recovery? The answers disagree. The program has been criticized because it led to scarcity by reducing crops when more production was needed. Another criticism is that the New Deal was interested in reform rather than recovery. The expenditures for relief have been attacked on the grounds that many of the projects have been wasteful and have resulted in an increased public debt being piled up. It has been urged that a balanced Federal budget should be arrived at at the earliest possible moment.

The Administration defends its increased debt and the unbalanced budget by saying that until industry employs the workers, the Government must provide employment or relief. Besides, Federal expenditures have provided additional purchasing power to be spent at the stores. These expenditures have served in some measure to prime the pump and get private industry back on its feet.

Many foreign countries with economic policies quite different from those of the United States—England, the Scandinavian countries, Germany and Italy, for instance—have recovered to a considerable extent from the depression. So it is impossible to tell how effective any particular method has been in promoting recovery.

Far more important than measures necessary to promote recovery are measures necessary to maintain recovery and to prevent the return of another depression as severe as the last one. These divide into two groups.

At one extreme, critics say that the New Deal measures have not proceeded far enough and that instead of concentrating on recovery, it is necessary to proceed further with measures of reform. Reform measures that are suggested by these radicals include: Increased taxation, especially of the higher incomes, to lessen the degree of inequality; government competition in industry (especially public utilities) through such means as the

TVA; a more extensive employment program by the government; the development of consumer co-operative movements such as exist in Norway and Sweden; government ownership of natural resources such as the mines; establishing shorter hours and higher minimum wages for labor; and a vast housing program to build cheap houses for the lower-income groups.

At the other extreme, critics of the New Deal contend that the responsibility for the return of prosperity and employment must be placed on business, and that a growing body of laws controlling business will lead to regimentation, destroy business incentive and discourage industry from enlarging production; they make the following points:

(1) No lasting prosperity can be built up on a scarcity basis, and the Government has gone far enough in this direction. The fundamental aim should be to lower costs, increase production and lower prices instead of increasing them.

(2) The measures proposed by the New Deal are uncertain and indefinite so that industry does not know exactly what is going to be required of it, nor what regulation will be extended to it.

(3) The general trend of the New Deal measures is to proceed toward increasing control by the Federal Government over business.

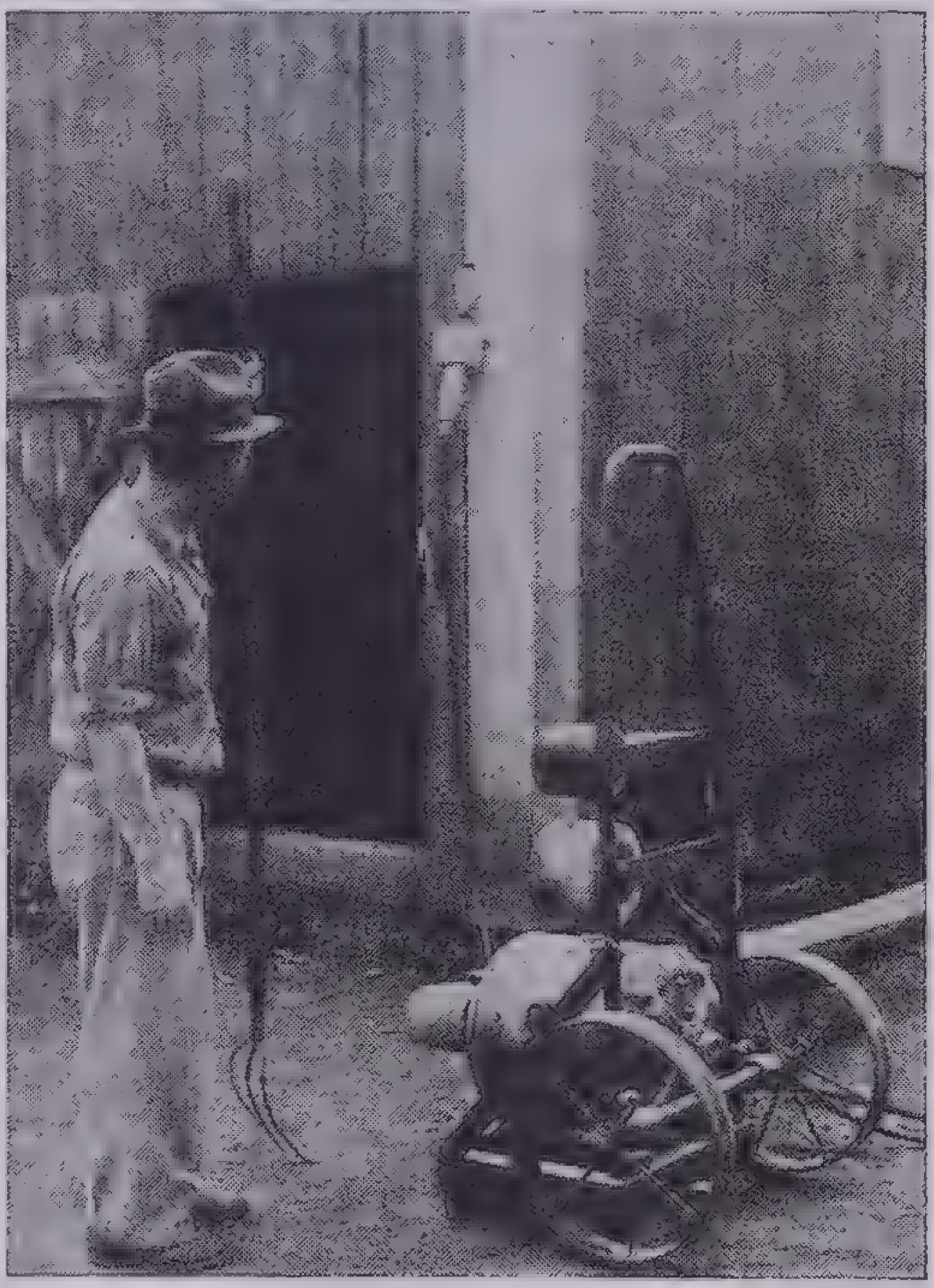
The New Deal advocates insist that they do not intend to introduce socialism or regimentation over business, but that it is necessary to bring about a greater measure of control by the Federal Government over the problems that are too big for individuals or states to handle. For a time it is necessary, they urge, to increase some prices or the wages of some of the economic groups in order to provide "balanced abundance."

GENERAL SUMMARY

Even though economic problems today are much more complex than ever before, the fundamentals of these problems remain the same. The general aim of all effort must be to increase the number and variety of goods and services that can be produced and to make it possible for people to have leisure and enjoyment as a result of their economic efforts. Any economic program can be tested by learning if it tends to accomplish either or both of these fundamental aims.

After the depression of 1920-21 industry revived and quickly reached greater heights of prosperity than ever before. One of the important factors in this recovery was the automobile industry, which in a relatively short period of time became one of the largest industries in the United States with a very wide-spreading influence on other industries. All through the depression that began in 1929 a cure was expected from the fortunate development of some new industry that would give employment to many workers and would create new markets. But this hoped-for savior of the situation did not appear, and many people have felt discouraged and have reached the conclusion that the United States has passed the point of its greatest economic development.

The development of new industries is still not beyond the possibilities of the next few years. But even if this does not take place, a brief study will show that there is still room in the United States for an enormous development of our present resources to make it possible to add billions of dollars to our wealth and to employ many millions more of workers. For example, in the field of housing there is room for a program of building that will aim to provide better homes and lower-cost housing for millions of the American people who now live in slums or in homes that are not up to the American standard of living.



Courtesy Rural Electrification Administration

A General-Purpose Farm Motor

With this portable motor the farmer can save time and labor in such tasks as cutting ensilage, sawing wood and threshing

The development of electric power is another field in which the economic possibilities are almost unlimited. In spite of the fact that our electrical resources have been extended very rapidly in the last decades, most of the farms in the United States are still without any great amount of electric equipment and use very little electric power. Cheap electricity is a second possible great industrial development awaiting the next generation.

Other industries that are in process of development may very easily call for great capital expenditures and the increased use of labor in the next few years—for example, air conditioning, television and commercial airplanes.

It is economically desirable that there should be a fair distribution of our wealth to the different groups that engage in production, the farmer, the laborer, the manufacturer, the retailer, wholesaler, the professional classes. But even more important than redistributing wealth is the necessity of increasing and adding to our wealth. Although the United States has a greater national income than any other country, it is far from sufficient to insure all the people in the nation a satisfactory income. It is equally necessary to organize production in such a way as to assure an ever-rising standard of wealth and income. More goods must be produced and they must be sold at lower prices. However necessary a temporary rise in prices may be, the mass of people do not gain from the high cost of living. One individual or a group of individuals may be benefited by scarcity because it increases the demand for their goods or services in relation to the supply and so raises prices. But increased production and low prices rather than scarcity and high prices in the long run represent a sound economic program.

One of the most important economic developments of the last few years has been the growth of labor organizations. The Federal Labor Relations Act requires employers to recognize the right of labor to bargain collectively, that is, to have their own representatives to speak for them instead of acting as individuals. Strikes and labor disputes are costly to both the employer and the employee.

At present there are two main labor organizations, the American Federation of Labor (AFL) and the Committee for Industrial Organization (CIO). The Federation organizes labor mainly along craft lines, that is, in separate trade-unions for each trade in each industry, such as carpenters, electricians, machinists. The CIO has a very different policy and method: in such industries as the automobile, steel and other mass-production industries, the CIO tries to organize all the workers in the industry regardless of their craft so that they can bargain as one group with the corporation, such as General Motors or U. S. Steel.

A sound labor policy is very important for industry to establish. Continual strife between labor and capital serves to injure both as well as the general public. In Italy and Germany, in order to prevent this strife, the government has broken up the trade-unions. It is improbable that the United States will resort to such measures, and so it is very necessary here to use collective bargaining and conciliatory or peaceful methods rather than strikes and picketing.

Business cannot think of labor solely in terms of costs. High wages and efficient labor are much more satisfactory than low-paid labor and low purchasing power for the mass of workers. It is important, however, that with increased wages there should develop responsible unions and increased general production.

Problems Raised by International Developments.—Though our most important economic problems are concerned with making our domestic economic organization secure, the international developments of recent years, particularly the rise of the Fascist movements in Italy and Germany and the Communist government of Russia, have raised the questions: Is the best economic policy for us to follow a national or international one? Should we concentrate more of our attention on producing and extending our domestic market? Or should we try to restore our foreign markets? If we become heavily involved with investments and trade in foreign countries, we shall find it difficult to avoid getting into any war that breaks out. Our foreign investments may be lost if we do not interfere. But a complete isolation is difficult to pursue; and it could lose us the opportunity of selling some of our surplus goods abroad or getting in exchange many goods that can be produced more effectively in foreign countries than they can at home.

Democratic Processes.—Fascist and Communist governments can draft four-year and five-year plans and put them into effect immediately—which is quite impossible in a democracy. The United States has no general economic plan, and there would be serious obstacles to the speedy execution of such a plan if there were one.

Plans are made by each business, each corporation, each wage earner, each investor; and these plans are individual ideas of what is economically best for the individual. It is urged that instead of these individual plans, there should be one national economic plan, worked out by a central body, and this should then be established for the whole country to follow.

Successful general economic planning means that much more control would be exercised over our economic life than exists at present. Business and labor would be organized and directed; competition would be eliminated or greatly restricted, and prices and output would be minutely directed. Could any extensive general economic planning be established without setting up some form of dictatorship?

It is possible that if all our economic system were run along the lines of a dictatorship with a central economic plan we should move faster economically. Democratic ways are slower at times and even more troublesome. It is important, therefore, for us to decide whether we want to improve our democratic means of economic improvement—or sacrifice democracy to gain speed in economic improvement.

If we decide in favor of democratic control, it seems certain that economic progress will be slow and uneven. It will be interrupted by discussions and disputes between labor and capital—too much will be produced of some goods and too little of others.

Will these temporary failures in some economic fields be offset by the greater development of individual initiative, by the encouragement of willingness to take risks and venture into new lines? Would a completely planned economic system that went faster at first slow down eventually through bureaucratic control and the lack of initiative?

If the United States is to maintain a democratic economic system, the nation and its people must be more awake than ever before and more willing to be tolerant and adjustable. Economic policies must be adopted because they are likely to benefit the whole community or nation, not because they will promote the interests of certain economic groups.

An economic program that is sound and democratic will recognize these facts:

First, that real wealth and income consist of goods and services, and that the only way in which the community as a whole can be enriched is by increasing the number of these goods and services that are available.

Second, that although the United States is very rich compared to other nations, it has not reached the maximum development of its economic possibilities.

Third, that rising wages and incomes and increased efficiency of labor are the most effective labor policies; and that democratic processes require that every group should be entitled to organize and work out its problems and point of view collectively and to present this point of view through representatives of its own.

Fourth, that as long as private initiative and industry are recognized as our fundamental institutions, industry should take over the chief responsibility for extending production and providing employment for labor.

Fifth, that these economic aims should be carried out through the extensions of democratic means of consultation and co-operation.

ECONOMICS AND BUSINESS DICTIONARY

absentee ownership, the ownership and derivation of income from land or a business that the owner does not personally oversee. This was an evil in France before the Revolution when the owners of great estates lived in Paris and left the supervision of their lands to agents. The land owners had no interest in the misery of the peasants who farmed the land but merely demanded their income regardless of the impoverishment this caused the peasants.

Ireland suffered greatly from absentee English landlords during the 18th and 19th centuries until the exploitation was ended by the Irish Land Settlement of 1885.

The dangers of absentee ownership exist today in all our great corporations. The stock in these corporations is owned by thousands of people scattered over the United States and even some living abroad. The owner of a small business usually directs it himself, knows the employees and ordinarily has an interest in their welfare. But in a great corporation the stockholders never see the factory and know nothing about the working conditions there; instead they demand that profits be made—which may mean low wages and inhuman working conditions.

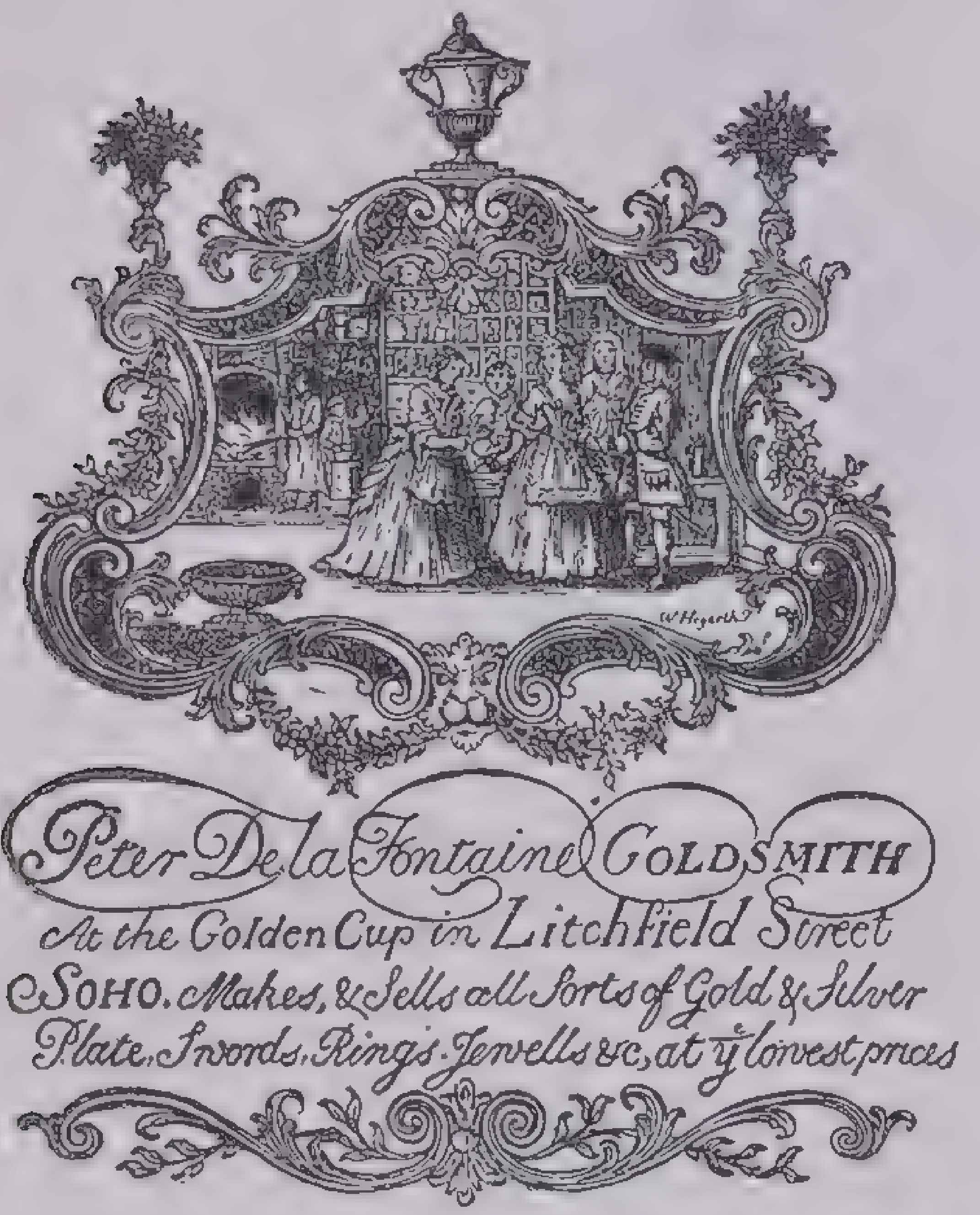
These undesirable conditions are now largely prevented by laws and by labor unions that seek to advance the interests of the workers.

account, bookkeeping term for the record of business transactions entered under one heading in a ledger. A *current account* is one in which settlements are made at short regular intervals, usually every 30 or 60 days, although they may run as long as a year. *Cost accounts* are special accounts carried in the Factory Ledger under special classifications for the purpose of determining costs of production; and the same cost-accounting methods may be used to analyze costs of any other part of a business, costs of selling, for example, or the different items in selling cost.

actuary, an official in an insurance company who calculates the probabilities involved in any risk for which insurance is issued and the rate to be charged for such insurance. In England an actuary was formerly a court clerk. Then the word came to mean the manager of a joint-stock company, later the manager of an insurance company and finally the present position. Statistical tables have been worked out from experience showing, for example, the number of houses that will burn in a year or the number of people who will die in a year, and it is on the basis of the probabilities shown in these tables that insurance rates are charged. Of course, the insurance company does not know which house will burn down or what persons will die, but they do know that under certain conditions for every 100,000 houses that they have insured a certain number will have fire losses; and that out of every 100,000 persons aged 50, for example, a certain number will die during the year.

ad valorem duty, a tax levied on imports. The amount of the tax is determined by a percentage of the value of the commodity. This is one of the two common methods of assessing a tariff, the other being a *specific duty*—a stated amount levied on each unit of the particular commodity brought into the country. China, prior to 1929, agreed by treaty to limit her tariff to a 5 per cent ad valorem duty. This meant that if $100 worth of cotton was brought into the country a tax of $5.00 would be levied. Great Britain and Germany use only specific duties. France and Italy use both types, but the majority are specific. The United States uses both types and also a mixed class.

advertising, any paid form of nonpersonal presentation of goods, services or ideas to a group that is openly sponsored by the advertiser. It is essential that the sales message be multiplied as distinct from a single sales letter. So advertising did not come into being in its present form and meaning until there were certain mechanical methods of multiplying the presentation or message, such as newspapers, magazines and radio. And modern advertising is dependent on modern methods of distribution, notably the mails, railways, motor trucks, airplanes and radio broadcasting.


W Hogarth
Peter De la Fontaine GOLDSMITH
At the Golden Cup in Litchfield Street
SOHO. Makes, & Sells all Sorts of Gold & Silver
Plate, Swords, Rings, Jewells &c, at ye lowest prices

Shopbill Designed by William Hogarth

What the advertiser of today calls a "throwaway" reached, in the 17th and 18th centuries, a high degree of perfection. Noted artists and engravers were employed in their design

agricultural credit, the provision of loans to meet the needs of the farmers. This has long been a difficult problem. The credit needs of agriculture are different from those in commerce and industry. The farming unit is smaller, and loans are generally made on a basis of the wealth of the farmer so that a tenant or a young farmer has difficulty in obtaining credit. There is a slow turnover in agriculture: the farmer must buy his seeds, fertilizer, feed and equipment in the spring, pay all his living expenses and labor costs for the spring, summer and fall and get along without income until the crops are sold in the fall. The element of risk is of major importance. During the decade 1909–19 almost 29 per cent of the wheat crop was lost, 32 per cent of the corn, 24½ per cent of the oats and 35½ per cent of the cotton.

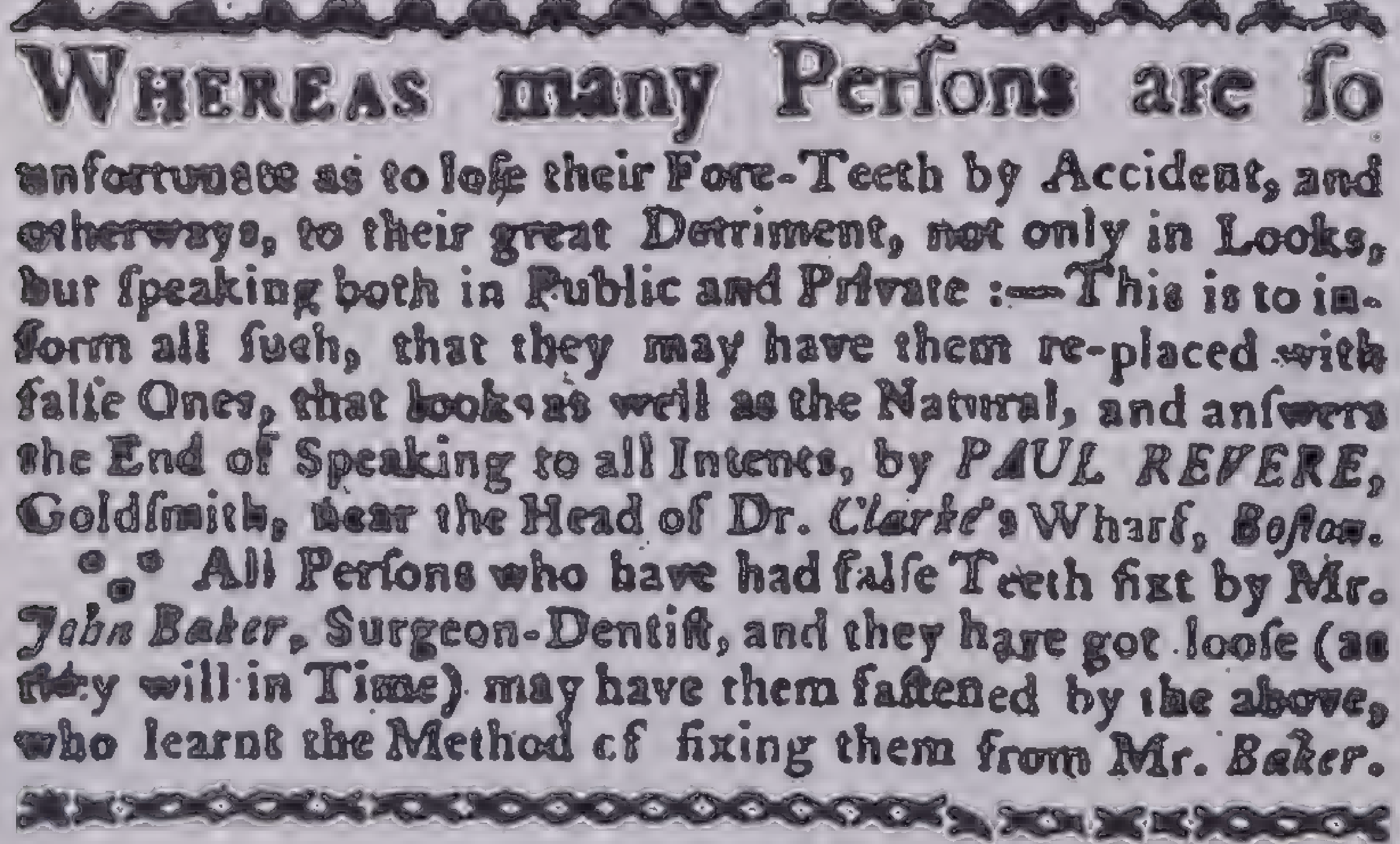
Commercial banks are not equipped to meet the special needs of agriculture. As long ago as 1875 the Greenback Party was formed by farmers in the West and South who wanted more liberal credit, and this demand has existed ever since. The Farm Credit Administration Act was approved in 1916, and its scope was greatly enlarged by various acts during the New Deal. The purpose of the Farm Credit Administration is to provide a complete and co-ordinated credit system for agriculture by making available to farmers long-term and short-term credit.

It also provides credit facilities for farmers' marketing co-operatives, purchasing co-operatives and other farm-service organizations. Under the Farm Credit Administration are the Federal Land Banks, one in each of the 12 districts, making long-term low-interest-rate amortized loans to individuals on the security of first mortgages; the Land Bank Commissioner who makes loans of an emergency nature; the Federal Intermediate Credit Banks that do not make direct loans to farmers but operate as banks of discount for institutions making loans to agriculture; Production Credit Corporation and Associations that make short-term loans; Banks for Co-operatives, making loans to farmers' co-operatives; and emergency crop and feed loans.

American Federation of Labor, a federation of trade unions primarily in the United States but also including unions in Canada, Puerto Rico, Alaska and Hawaii. The trade-union conference in Pittsburgh in 1881, attended by various labor-union leaders and representatives of the National Labor Union, Knights of Industry and the Knights of Labor, formed the American Federation of Organized Trades and Labor Unions of the United States and Canada. In 1886 this group united with the Federation of Trades and Labor Unions, and the American Federation of Labor was formed. However, the American Federation of Labor claims the year 1881 as the date of its organization.

The Federation is organized on the basis of local unions that are usually craft unions. The local unions form central unions in cities and state federations that are formed into national and international unions. The purpose of the Federation is essentially to conduct inter-union matters and act for labor in national affairs, but as time has passed there has been a gradual concentration of power in the central organization. Samuel Gompers, who had grown prominent in the Cigarmakers Union in New York city, was made the first president of the American Federation of Labor in 1886 with a salary of $1,000 a year, and with the exception of the year 1895 Gompers remained the president and dominant figure in the American labor movement until his death in 1924, when he was succeeded by William Green. The American Federation of Labor consists of 103 national and international unions, 4 departments, 1,305 directly affiliated local unions, 49 state branches and 745 city central bodies. The Federation has a president, secretary-treasurer and 15 vice-presidents. These 17 officials constitute the Executive Council, which is the managing body of the organization. The revenues of the Federation are derived from a per capita tax paid by national and international unions of one cent per member per month; monthly dues from directly affiliated federal unions of 35 cents for each member; flat annual dues from state federations of labor and central labor bodies of $10; initiation fees and various special assessments. The receipts for the year ending August 31, 1937, were $1,184,479.99.

Annual conventions are held to which the various affiliated unions send representatives. National and international unions have one vote for each hundred dues-paying members, and delegates from city and state federations have one vote. This annual convention is the supreme law and policy-making body of the Federation, but the proposals of the executive officials carry great weight. The Federation has always rejected radical

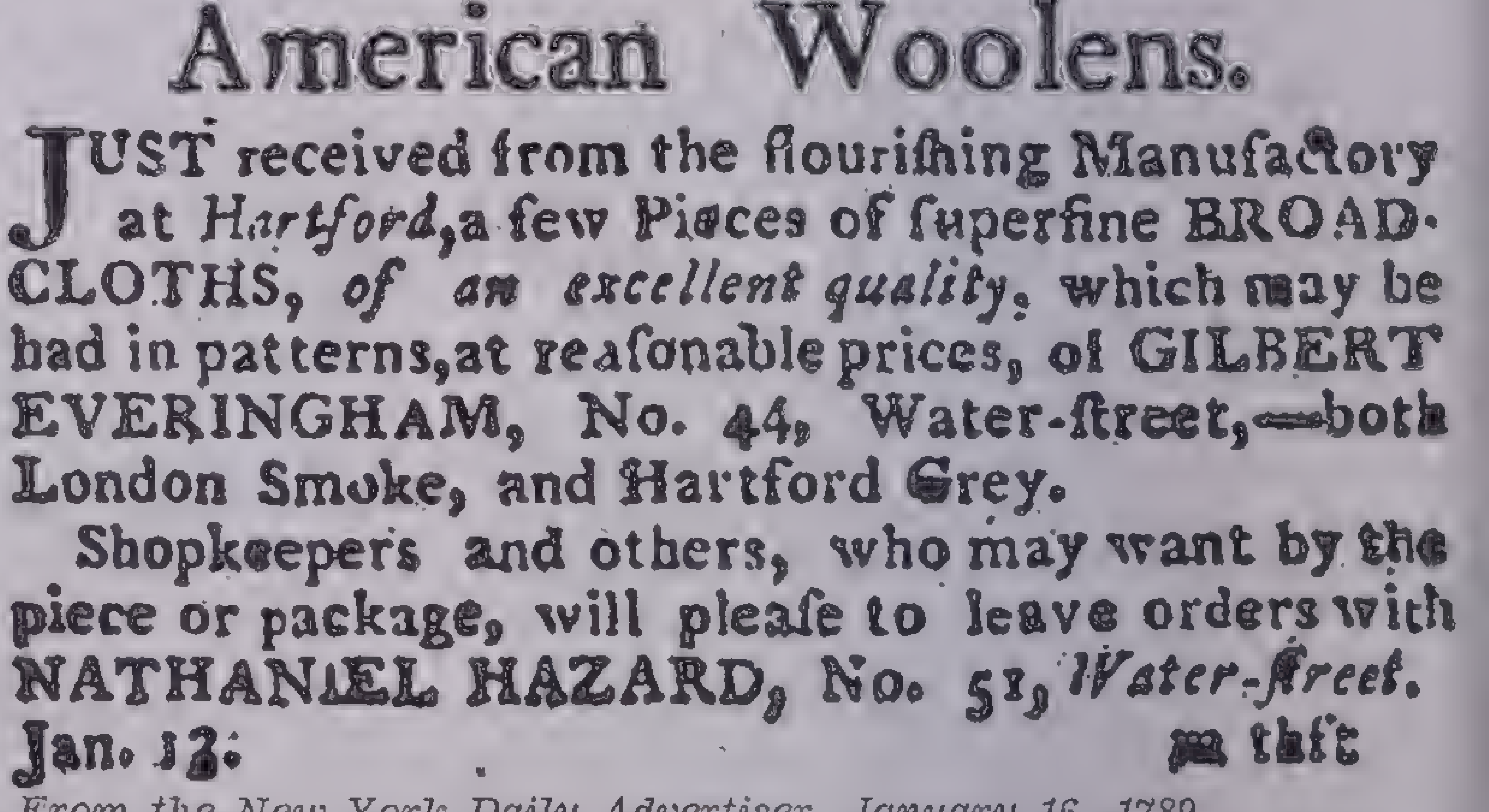


WHEREAS many Perſons are ſo unfortunate as to loſe their Fore-Teeth by Accident, and otherways, to their great Detriment, not only in Looks, but ſpeaking both in Public and Private:—This is to inform all ſuch, that they may have them re-placed with falſe Ones, that looks as well as the Natural, and anſwers the End of Speaking to all Intents, by *PAUL REVERE*, Goldſmith, near the Head of Dr. *Clarke's* Wharf, *Boſton.*

⁂ All Perſons who have had falſe Teeth fixt by Mr. *John Baker*, Surgeon-Dentiſt, and they have got looſe (as they will in Time) may have them faſtened by the above, who learnt the Method of fixing them from Mr. *Baker.*

From the Boston Gazette, September 5, 1768

Paul Revere, the goldsmith and silversmith, also conducted a dental laboratory. He inserted this advertisement nearly 7 years before his famous ride from Charlestown to Lexington April 18, 1775



American Woolens.

JUST received from the flouriſhing Manufactory at *Hartford*, a few Pieces of ſuperfine BROAD-CLOTHS, *of an excellent quality*, which may be had in patterns, at reaſonable prices, of GILBERT EVERINGHAM, No. 44, Water-ſtreet,—both London Smoke, and Hartford Grey.

Shopkeepers and others, who may want by the piece or package, will pleaſe to leave orders with NATHANIEL HAZARD, No. 51, *Water-ſtreet.*

Jan. 13. tf

From the New York Daily Advertiser, January 16, 1789

This early advertisement caught the eye of General George Washington, who answered it, January 29, 1789, with a letter requesting enough of the "superfine American Broad Cloths" to make him a "suit of cloaths." In the letter the first President also included Mrs. Washington's order for "as much of what is called (in the Advertisement) London Smoke as will make her a riding habit."

Advertiser and Buyer in the American Colonies and the New Republic

economic doctrines and has always been nonpartisan, believing that it can secure more favorable legislation through the support of friends of labor than by organizing a particular political party.

The American Federation of Labor claims that through the trade agreements that it has negotiated the average working week was reduced from 63 hours to 58 hours between 1880 and 1890, and by 1930 the average working week had been reduced to 48 hours. The Federation claims that from 1880 to 1930 average wages were increased from 19 cents an hour to 72 cents, which in terms of buying power of weekly wages meant an increase from $21.50 to $34.75 per week. The Federation was active in securing the creation of a national Department of Labor (1913), compensation laws in the various states and numerous other laws protecting labor and improving working conditions. In the early days of its life the American Federation of Labor was engaged in a struggle with the Knights of Labor. In November 1935, with the formation of the Committee for Industrial Organization, the ranks of labor were split, and the American Federation faced a battle for existence.

amortization, the satisfaction, liquidation or reduction of a debt, usually by a sinking fund. Paying off a mortgage by installments, paying off a certain number of bonds each year and meeting a debt by paying the money into a sinking fund are different methods of amortization. Private corporations or governments with limited credit usually amortize their obligations, but a government with good credit usually issues another bond issue and with the money received from the sale of the bonds pays off the old obligations. The term is also used in calculating the value of securities when they are sold for more or less than their face value, and the difference is charged off over the life of the security. In certain types of businesses with wasting assets (such as a coal mine, where the assets of the corporation, consisting of the coal, will no longer exist after the coal is mined), profits are amortized by treating a part of the dividends as a repayment of capital.

annuities, yearly or other periodic payments of a sum of money for a specified time or beginning and ending with the happening of certain events. Annuities were used in ancient China, India, Babylon and Egypt; in the European countries during the middle ages; and in France and England during the 18th and 19th centuries. The old form of annuity was a payment of a certain sum chargeable to personal property; it is no longer used, and now annuities are used almost entirely in connection with life insurance. An annuity becomes sort of a pension that the insurance company agrees to pay to the insured every year until his death in return for the payment of a certain premium. For example, for a certain sum paid to an insurance company the company will agree to pay the insured $5,000 a year until the insured dies. Under this plan the insured would know that he has an income of $5,000 each year as long as he lives. There are innumerable modifications of this general plan, and the costs are calculated on the basis of various considerations, including the age of the person when the premium is paid, the age at which the annuity payments are to begin and the expectancy of life of the insured. In recent years the annuity has been gaining in popularity, and in 1926 the insurance companies had a quarter of a billion dollars in reserves for annuity payments.

appreciation, the gradual increase in the value of property due to extrinsic circumstances. For example, if a piece of property is purchased in a farming section and then by an extension of the city the property becomes valuable for residential purposes, the increase in the value is called *appreciation.*

arbitration, the settling of disputes by referring the matter to impartial adjudicators. There are three general types of arbitration—industrial, commercial and international.

Industrial arbitration is the settlement of a dispute between employers and workers by referring the matter to impartial experts, the parties having agreed to abide by the decision of the experts. This arbitration may come about through the voluntary agreement of the parties, as is frequently the case in modern labor disputes, and a provision for arbitration is often inserted in general wage and hour agreements between employers and unions. The usual method is to agree that each of the parties select one expert, and then the two experts select a third. These three experts constitute a board before which the parties to the dispute present their cases and arguments, and then the board makes its decision. Industrial arbitration may be compulsory, that is, made obligatory by law. Such laws have been in operation in Australia and New Zealand and in Italy and other European countries. A compulsory arbitration law in Kansas was declared unconstitutional by the United States Supreme Court in 1922.

Commercial arbitration involves the settlement of business disputes by arbitration. In important business contracts there is frequently an agreement to arbitrate differences arising under the contract. At common law the courts would not enforce such agreements because they denied the parties of the benefit of the courts, but by statute in various states (including New York, New Jersey, Pennsylvania, Massachusetts, Oregon and Louisiana) these arbitration agreements can now be enforced by the courts.

The advantages of commercial and industrial arbitration are that litigation in the courts is avoided; the settlement is made quickly and inexpensively and without going through all the legal red tape required by a trial; and when a matter is arbitrated, it is considered by specially selected experts who are familiar with the problems and make a decision on the merits of the case, whereas a judge is frequently unfamiliar with the particular matter and must make his decision on the basis of legal precedents alone.

assessment, a demand by a corporation to its stockholders for the payment of a specified sum for each share of stock owned. When a corporation is organized, the stock is frequently issued for a fraction of the par value but subject to future assessments by the corporation as the need for additional capital arises. When a corporate reorganization takes place, shareholders frequently agree to an assessment to provide necessary working capital so that the corporation can continue operations.

assets, the property or resources of a business; the value of the things the business owns or has owed to it in contrast to the liabilities or amounts owed to others. The assets are carried on the left-hand side of a balance sheet, and the liabilities are carried on the right-hand side, and the excess of assets over liabilities is called the *net worth.*

Wasting assets are those assets in a particular type of business where the use and sale of the assets are the principle purpose of the business, and the asset can not be replenished as it is used. A typical example is a coal mine. Here the main purpose is to mine and sell the coal, and as the business is carried on, the asset is depleted and cannot be replenished, and finally when all the coal is mined, the mine that was once an asset is worth nothing.

Frozen assets are assets that cannot be turned into cash or liquidated within a short time without great loss. In times of depression investments in land are frequently frozen since they cannot be converted into cash without an undue loss.

association, a union of persons in a company, society or some other group with the object of carrying on some common purpose. Association is a general term and includes nonprofit organizations such as hospitals, trade unions and literary societies as well as organizations for profits, whether organized as partnerships, joint-stock companies or corporations.

Trade Associations are groups of competitors in industry or commerce united for the common benefit and for the interchange of information and certain statistics.

auction, a public sale of goods to the highest bidder. Forced sales to reimburse creditors are almost always at auction. A few types of manufactured goods are offered by the mill at auction, notably carpets and rugs; and the early cotton-goods mills of New England often sold their output at auction.

audit, an examination and verification of accounts by a person who has had no part in their preparation. The accountant records the facts of a business, and the auditor goes over these accounts to determine if all the items shown actually exist, to see that the amounts charged are correct and generally to verify the records and to determine whether the conclusions drawn from the records are valid and whether the transactions are legal; for example, to see if the stock and bond issues have been authorized. Corporation charters are frequently granted upon the condition that a licensed auditor make an annual check of the company accounts. In addition an audit is frequently made at the request of an owner, manager, creditor, investor or government regulatory body.

The circulation of magazines and newspapers is audited by the Audit Bureau of Circulations so that advertisers may have accurate and unbiased figures on which to base their judgment of the sales and distribution of the publication and its value as an advertising medium.

balance sheet, a statement of the assets and liabilities of a business at a particular time. A balance sheet can only be made from a double-entry bookkeeping system, and the books must have been closed and the accounts summarized. The purpose of a balance sheet is to show the financial status of the business and to some extent indicate what profits have been made. The balance sheet gives a cross section of the business at a particular time. A *trial balance* is merely a totalling of the various accounts for the purpose of determining if errors have been made in the entries.

bank, an institution with the chief function of receiving deposits of money and making loans, the profits being derived from the interest on the loans made. A bank also borrows funds on its own account, issues currency under certain conditions, administers funds placed with it, and as a whole banks act as the administering unit of the entire financial system of the nation. National banks are federally incorporated under the National Bank Act and may include the word national in the title of the bank. State banks are incorporated under the laws of the state and regulated by the state government. The New York State banking law defines a bank as: "Any moneyed corporation authorized by law to issue bills, or notes, or other evidences of debt for circulation as money, or to receive deposits of money, and commercial paper, and to make loans thereon; and to discount bills, notes, or other commercial paper, and to buy and sell gold and silver bullion or foreign coins, or bills of exchange." Any national bank, state bank or trust company may become a member of the Federal Reserve System. Savings banks are primarily banks of deposit, paying interest to depositors, and are not required to keep a reserve. Trust Companies are state incorporated and in addition to their general banking functions also act as administrators and trustees either under the voluntary trust of a living person or as the executor of a will.

The first depositories for money were the temples of ancient Greece, Egypt, Babylonia and India. In medieval times the Jews dominated the trade and were later joined by the Lombard goldsmiths and money changers. The first bank to transfer credit on its books backed by a coin reserve was in Barcelona in 1401. But in China banking was developed even earlier, and by the 8th century there were negotiable *flying notes* and *exchange bills* that were similar to our present bills of exchange and checks. Modern bank notes were first developed in England, after Charles I in 1640 had attached the deposits of the London merchants in the royal mint. The Bank of England was established in 1694 with an initial government loan and became the first modern bank of issue combined with a transfer and commercial bank. The first bank in the United States was the Bank of North America, founded at Philadelphia in 1781. The first Bank of the United States was established in 1791. Its charter expired in 1812, and the second Bank of the United States was chartered in 1816; when its charter expired in 1836, it was not renewed. From then until 1863 there were only state banks, but in that year the National Banking Act was passed and by a 10 per cent tax on state-bank notes drove them out of circulation and substituted national-bank notes. The Federal Reserve System was established in 1914.

Underwood & Underwood

The Bank of England

Affectionately nicknamed the *Old Lady of Threadneedle Street*

bank examiner, a governmental official who makes periodical examinations of the assets, liabilities, papers, books and affairs of a bank for the purpose of auditing the bank statement.

bank holiday, a secular day on which the banks are closed. In England since 1871 the banks have been closed on Christmas, Good Friday, the first Monday in August, Boxing Day (December 26), Easter Monday, Whitmonday and other days observed by the king's proclamation or through custom. Similar bank holidays are called *legal holidays* in the United States and vary in different states. The main legal holidays are: New Year's Day, in all states; Inauguration Day, January 20, beginning 1937 and every 4th year thereafter, in District of Columbia only; Lincoln's Birthday, 28 states and by proclamation i Massachusetts; Washington's Birthday, all states; Good Friday, 9 states Memorial Day, all states except 8 i the South; July 4, all states; Octobe 12, 35 states; Election Day (firs Tuesday after the first Monday i November), in all but 6 states an with various special local provisions Armistice Day, in all states, mad a national legal holiday in 1938 Thanksgiving Day, all states; Christmas Day, all states.

The term bank holiday is also use to mean those days on which all th banks are closed in time of financia panics. Bank holidays in 1933 bega in Michigan, where the governo ordered all banks closed on Februar 14 for 8 days. All banks in the Unite States were closed by proclamation o President Roosevelt on March 6, 1933 and were gradually reopened beginning March 9.

barter, the exchange of one article fo another; an exchange of goods without the use of money or credit. I primitive societies before money ha come into use as a medium of exchange, the common method of obtaining desired articles was by tradin something that is owned for the thing desired. In modern times international trade, considered as a whole, i a system of barter, for there is no international money, and the import and exports of a country tend t balance.

bear, a dealer on a stock or produce exchange who believes that the stock o commodities are going to fall in price The bear attempts to make a profi out of the falling market by shor sales.

A *bull* is a dealer or broker who believes that the market is going up an attempts to make a profit by buyin the stock or commodities at the present price and holding them fo sale later when he expects the price will be higher.

bid, a statement, usually in writing, o an amount of money for which the bidder will do a certain thing or sel a specified amount of a product. Whe the government wants to buy certai goods or wants a certain structure built, specifications of the thing wanted are made public, and the concerns desiring the contract give seale bids, usually accompanied by a certified check to guarantee the bid. At a agreed time the bids are opened, an the contract is awarded to the lowes reputable bidder. In an auction the bid is the oral or indicated statemen of the price that the bidder is willin to pay for the article offered for sale

bill of exchange or **draft,** a written orde requiring the person to whom it i addressed to pay a specified sum to a third person or his order, on deman or at a specified future time. Bills o exchange are primarily used in foreig trade and greatly facilitate the settlement of international balances b enabling the bank to set off or counterbalance the debts between individual in two countries. For example, Mr Jones in the United States owes Mr Wang in China $100, and Mr. Fu i China owes $100 to Mr. Smith in th

United States. Instead of Mr. Jones paying Mr. Wang and Mr. Fu paying Mr. Smith, this double transfer of money can be balanced through the use of bills of exchange, the banks making the arrangement so that Mr. Jones pays Mr. Smith and Mr. Fu pays Mr. Wang, and no international transfer of funds is necessary.

A *check* is merely a bill of exchange drawn on a bank. The depositor orders the bank to pay his creditor from the funds on deposit in the bank.

A *certified check* is one that is certified as good by the bank on which it is drawn and authenticated by the signature of an officer of the bank.

bimetallism, a monetary system in which both gold and silver are used as the standard money, and both are coined in unlimited quantities at a ratio fixed by law. This ratio is expressed in terms of weight, for example 16 ounces of silver equals 1 ounce of gold, a ratio of 16 to 1. The United States, following the example of the countries of Europe, adopted bimetallism in 1792, the ratio being set at 15 to 1. This standard was abandoned in 1873, but in 1878 a modified form was adopted. In the presidential campaign of 1896 the question of a free coinage of silver was paramount, but Bryan and his "free silver" followers were defeated, and the policy was settled by the Gold Standard Act of 1900. England gave up bimetallism by the Acts of 1798 and 1816, but bimetallism kept favor with other European nations until the latter part of the 19th century.

Interest in bimetallism is now purely historic. The argument that it was necessary to have both gold and silver coined to provide sufficient credit no longer has any validity under modern methods of finance. Furthermore, the bimetallic standard never worked out in practice because the market ratio between the two metals constantly changes, and the overvalued money always drives the undervalued money out of circulation—according to the principle known as *Gresham's Law.*

Monometallism is a monetary system where one metal, gold or silver, is the standard money. The gold standard was the accepted one after the abandonment of bimetallism until the economic depression of 1929, which caused all the nations of the world to adopt some sort of a government-managed currency.

black list, a list of persons not to be employed or to be discriminated against in other ways. The most common use of the black list has been by employers against workers. An employee who belonged to a union or who engaged in other activities thought to be objectionable was discharged and his name sent to other employers who would refuse him employment. Sometimes union workmen black-list certain employers by agreeing not to buy their products. There have long been laws against black-listing in practically every state, but they were difficult to enforce when the employer could hire and dismiss any worker he chose. New Deal legislation favorable to labor, especially the National Labor Relations Act of 1935, and the growing power of the labor unions made black-listing much less common.

bond, a device for borrowing money, issued as an evidence of indebtedness by a corporation or individual, bearing interest at a stipulated rate and having a certain number of years to run before it is to be redeemed. It is essentially a promissory note of the corporation that is not to be paid for a period of years. Bonds of corporations or individuals (but not of governments) are usually backed by some security, such as a mortgage on the property that gives the owner of the bond the right to obtain repayment of his loan from a sale of the property if the corporation does not repay him. *Debenture bonds* do not have any security, and their repayment is from the general assets of the corporation. The value of any bond depends largely upon the success of the business, for in case of bankruptcy the sale of the property frequently does not provide sufficient funds to pay the bonds in full. Machines or a plant that may be worth a great deal to a going business cannot be sold at a forced sale for more than a fraction of the earlier value because usually no one wants to enter a business that has just failed. *Baby bonds* are merely bonds issued in small denominations. *Convertible bonds* are bonds that give the owner the right to exchange the bond for some other security of the corporation, usually stock. *Government bonds* do not have any property as security. Their value depends upon the credit of the government, and they are paid from the taxes or by issuing new bonds.

bookkeeping, the keeping of systematic, concise and convenient records of the financial transactions of a business in such a manner that they will show what the transactions were, when they took place and the amounts and sources of the gains and losses. Double-entry bookkeeping is the modern system—with two entries for each transaction, one a debit and the other a credit. The essential books are the journal and the ledger, but for purpose of convenience in large establishments these books are divided to facilitate the handling of the entries. Single-entry bookkeeping is a simpler method, practical only in very small businesses, and only one entry is made for each transaction.

boom, a sudden period of great prosperity, frequently caused by an outburst in speculation in land, commodities or securities that causes a rapid rise in prices and very large profits during the boom period. A boom is always followed by an equally rapid recession (called a *panic*) accompanied by large losses. The series of changes from boom through recession to boom again are called a *business cycle.*

boycott, a method by which a group of persons seeks to achieve the adoption of some program by refusing to have business or social relations with the persons opposing this program. The word is derived from the name of Captain Charles Cunningham Boycott (1832-97), an English land agent of Lord Erne in Ireland. For Captain Boycott's ruthless ejection of tenants he was ostracized by his neighbors, and they even refused to sell him food and clothing. A recent well-known boycott was that occasioned by Mahatma Gandhi and his followers in India when they refused to buy British products. Large groups of people in various countries who strongly objected to the Hitler regime in Germany and especially his persecution of the Jews boycotted German products. A similar boycott against Japan was organized during the Japanese invasion of China in 1937 and 1938.

The boycott has been frequently used by laborers as a weapon against employers. The courts generally held the boycott to be illegal. Some courts distinguished between a primary (or direct boycott) and a secondary boycott, which involved third persons, and held that only the secondary boycott was illegal. Boycotts were widely used until 1908 when the courts decided that the union could be sued for damages for a boycott. Since then they have not been very widely or very openly used.

branch store, a retail store that is owned and operated by an established retail concern but carries a less complete line of merchandise than the parent store. Metropolitan department stores often have branches in nearby suburbs, and the suburban branch is more like a specialty shop. Sometimes the branch is not near the parent store but in a season resort like Florida or some winter sports resort.

brand, defined by the Marketing Teachers Association, as "a word, letter, group of words, or letters composing a name, a design or a combination of these that identifies the goods or services of one seller or group of sellers and/or distinguishes them from those of competitors. A brand may include a brand name, a trade-mark or both. A brand that does not meet the technical requirements of a trade-mark will on the grounds of unfair trading be protected within certain limits by the courts from general use of competitors."

A *brand name* is a name that meets the specifications of this definition and that can be pronounced—"the utterable quality" in the brand. A brand name in distinctive type is a brand.

broker, one who acts as a middleman negotiating the sale of an article between two others. Ordinarily the broker does not possess the goods sold nor does he receive the goods purchased. The broker does not take any financial risk. He receives his profit from the commission paid by the party who first engages the services of the broker, although the payment of the commission is subject to any contractual arrangement desired by the parties. Customs brokers are not really brokers but merely aid importers in estimating duties and making the arrangements for clearing the customs. Brokers are usually free lances in their relations with manufacturers, whereas selling agents or manufacturers' agents have continuous and permanent relations with the manufacturers for whom they sell.

bucket shop, a fraudulent stock-broker office that purports to make stock purchases for a customer but in reality never makes the purchases and while the shop is solvent pays out of capital the customer's profits from the increase of stock prices. The shop makes its profits from the losses of the customer and from commissions for purported service of purchasing the stock. In effect a bucket shop is a place where bets are placed on the rise or fall of the quotations of stocks.

budget, in private business as in government, money in a designated sum set apart for a particular purpose, such as an advertising budget, sales budget, construction budget and so forth. An appropriation is a more specific grant than a budget. The budget is a general plan or program or the specific part of such a plan that applies to a certain department or specific activity.

building and loan association, a co-operative association for the purpose of saving money, on which a relatively high rate of interest is paid, and obtaining loans that can be paid off at regular intervals. For each share subscribed to by a member of the association, $1 is paid in monthly. The share matures in about 12 years depending upon the financial success of the association, and at maturity the member is paid $200 for his share. Loans may be obtained by members on security of a mortgage, which is paid off through the subscription to shares in the association, or loans are extended on the paid-in value of the share.

bull, see *bear.*

business cycle, the recurrent changes in business conditions from depression to prosperity and then back again to depression. The depression that began in 1929 attracted great attention to this phenomenon, but business cycles have existed throughout history and in their present form since the Industrial Revolution. In the United States business cycles of more or less severity have recurred about every 10 years since the War of 1812.

The main phases of the business cycle are revival, prosperity, crisis and depression. The first sign of a business *revival* is a general feeling of optimism among business men. At the same time there is a slow expansion of business activity. Various concerns that have been closed are opening again. Businesses that have been using up their stock of raw materials and other supplies begin to place more orders and buy more materials. Increased business activity brings increased employment and an improvement in the buying power of the workers. Prices begin to rise, and rising prices bring increasing profits to industry.

This brings a period of *prosperity.* Prices continue to rise, business activity is at its height, wages are high, and unemployment is cut to a minimum. But this prosperity does not last. High profits bring careless management in industry. Mistakes involving huge losses are made by business leaders. Costs of production rise rapidly and cut into profits. Interest rates are high and credit becomes more difficult to obtain. Many businesses are overexpanded. Then comes a slowing down of orders, and increased competition makes sales more difficult.

All these conditions born out of prosperity cause a business *crisis.* This crisis, which always comes, sooner or later, is usually marked by the restriction of loans. Some banks and business men, more cautious than the rest, begin to call in their loans and announce that loans will not be renewed. Since much of the expansion of business in the time of prosperity is built entirely upon credit, it becomes impossible for some of the least stable concerns to continue, and they fail. These failures immediately attract attention, and more and more loans are called in. Orders are cut down, and there is a further restriction of profits. There are various signs of the crisis. In 1929 the great break in the stock market was the obvious and strong expression of the crisis. At other times national calamities have marked the crisis.

Although there are usually some abortive revivals, they do not continue for any length of time, and the *depression* or *recession* begins. Business concerns slow down their operations more and more, and some close. The decrease in sales decreases profits, and then prices begin to fall. Falling prices mean business losses, for raw materials and equipment that have been bought at high prices now fall in value and are sold at a loss. A large number of workers are out of employment, and their buying power is restricted, further reducing business activity.

Then gradually the bottom of the depression is reached. Surplus stocks are used up, costs of production are low, the less efficient concerns have been eliminated and competition has been reduced. Loans have been liquidated, and interest rates are low. Then the business revival begins and the cycle carries on through prosperity to the crisis and depression.

This is only a general outline of the business cycle; every cycle is different and there are innumerable complicating factors and variations to the process.

In recent years the government has played an increasing part in the business cycle. Public works and government spending have increased the buying power of the workers and aided the revival. Government financial transactions have made credit available for business. All sorts of expedients have been adopted to bring prosperity. Some of these have helped, and others have hindered. But the activities of the government have come to be a primary factor in the business cycle, and much of the course and the intensity of the cycle depends upon government policies.

business industrial goods, goods used in producing consumers' goods, other business or industrial goods and services; and those used in aiding operation. Examples are land and buildings used for business purposes, factory or office equipment, operating supplies, raw materials and fabricated materials.

buying in, the purchase of stock for the purpose of returning borrowed stock. In the case of a short sale the stock is borrowed for delivery to the buyer, and when the seller desires to complete the transaction, he buys in the stock and gives this stock for the stock that he previously borrowed.

At a public sale, when the property offered is bought in order to protect the buyer's investment or other interest in the property, the property is said to be *bought in.*

call, see *put.*

capital, produced goods intended for future production. A farmer's plow is capital, since it is an article that cannot be directly consumed but is used to aid in the production of crops that can be consumed. Sometimes the same thing may be either capital or consumers' goods depending on its use. Wheat used for food is consumers' goods; but if it is kept as seed and used to grow more wheat, then it is capital. In the economic sense capital is measured in terms of money. So when it is said that a business has $50,000 worth of capital, it means that the business owns various goods used for production that are valued at $50,000.

Capital is classified in various ways. It can be divided on the basis of durability. *Durable* or *fixed capital* is capital that is not used up in a single process but lasts for a long time, such as machinery, a house, a typewriter or a truck. *Nondurable* or *circulating* capital is consumed in a single process, such as coal, paper, ink or electrical power. Capital is sometimes classified on the basis of the number of uses to which it can be put. If it can be used in many productive operations, it is called *free capital.* Coal and other forms of power are the best examples of free capital. But if the use of the capital is limited, then it is termed *specialized capital.* A shoe-making machine or a metal-punching machine are examples of specialized capital.

In ordinary business usage capital merely means money that is invested so as to bear interest.

capitalism, an economic system characterized by the domination of a relative few who own large amounts of capital; by the profit motive; by private property and by the freedom of the individual to engage in any business he may desire. Capitalism is a vague term covering a multitude of practices, and it is constantly developing and changing. Perhaps it is best described by saying that it is the economic system we have in the United States. Capitalism had its beginning about 1500, but it did not assume its modern form until the Industrial Revolution during the 18th century when the profits from factory production made possible large accumulations of capital. The great regulating force of capitalism is *competition.* It is competition that forces the capitalist to serve society in order to serve his own interest and make profits. But experience has shown that competition is not a sufficient regulating force. Profits can be made by selling an inferior product, by cheating as to the weight and content of an article and by exploiting labor, as well as by increased efficiency and producing a superior article. For these reasons and because the capitalistic system tends toward monopolies that eliminate the regulating force of competition, it has been necessary for the government to regulate the capitalistic system in many ways. But there is no question that the capitalistic system and the profit motive have made great contributions to the progress of our civilization, especially in the days when our country was being developed.

apitalization, the conversion of income into a capital sum or to compute the present value of a periodic payment. For example, if the rent from a property is $100 a year, and the current interest rate is 5 per cent, to find the capital value of the property divide the rent by the interest rate; the capitalization is $2,000.

arloadings, the total number of freight cars in the country loaded with revenue-paying freight during a certain period, usually a week. Freight-car loadings are one of the most important indications of general business conditions and an important item in the calculation of business activity. Business market reports usually contain figures on freight-car loadings.

artage, charge made by a carrier for the transportation of goods to docks for reshipment or to their destination.

ash, currency and ready money. The term is sometimes extended to include negotiable paper that can quickly be turned into cash. The *cash book* is a subsidiary journal in which payments or receipts of currency are recorded.

ash on delivery, collect on delivery or **C.O.D.,** a method of shipping goods in which the carrier collects the payment for the goods at the time of delivery and remits the payment to the seller. If there is a large amount of goods, it is customary for the carrier to allow a reasonable time for the buyer to inspect the goods before collection is made.

ertificate, a formal written statement evidencing a certain matter and made by a person with authority and with a knowledge of the truth of the matter. A *certificate of incorporation* or a charter is an official statement by the proper state or federal authority of the incorporation of the concern.

ertified check, see *bill of exchange.*

hain store, one of several retail stores under the same management and selling the same type of goods. Central management and centralized buying have made many chain stores models of retail efficiency with low costs and low prices. More and more the chain-store organizations have been attacked by independent retailers unable to compete with the big-volume operations of the chains. Absentee ownership has been assailed on the ground that "the profits do not stay in the communities." State legislatures are taxing chain stores very heavily; often the tax per store is progressively greater for chains with more stores in the state; and sometimes the state tax is based on the total number of stores in the national chain, including those outside the state when the tax is levied.

chambers of commerce, organizations of business men representing the views of commercial, industrial and financial interests. The first Chamber of Commerce in the United States was in New York in 1768, followed soon afterwards by chambers in Philadelphia, Charleston and New Haven. At present there are about 920,000 members of the 1,655 local organizations affiliated with the United States Chamber of Commerce. The work of the organization is to perform various technical and administrative services, to express to the government the opinions and suggestions of the commercial class and to influence the Government to adopt these measures. In the United States the Chamber of Commerce has been an important factor in persuading the Government to undertake various technical services for business, to adopt the Transportation Act (1920), the Budget Act (1921) and to defeat the proposed quota for Mexican immigration (1928). The chambers are opposed to all social movements inimical to the interests of business. Radicals, liberals, certain union labor activities and the Federal regulation of child labor have been strongly opposed.

Chambers of commerce have also been formed in many of the countries of Europe (often on a semi-official basis), in Brazil, China and Japan. In 1920 the International Chamber of Commerce was established with a permanent staff in Paris to improve the conditions of business between nations and to encourage international understanding.

charter, see *certificate.*

cheap money, money that has depreciated in value due to inflation or other similar processes. It is called *cheap money* because it is worth less in terms of the amount of commodities it will buy.

check, see *bill of exchange.*

child labor, originally the working of very young children but now extended to include the laboring of children under 18 years of age and the attendant social evils of such an economic system. The problem was not recognized until the introduction of the factory system where tasks were simplified and could be performed by children as well as adults. The English cotton factories in Yorkshire and Lancashire were worked by pauper children brought in cartloads and literally worked to death. The first reform act was passed in 1802 but related only to cotton mills. It prohibited binding out children under 9 years of age, working more than 12 hours a day and night work. Similar evils arose in New England and Middle Atlantic states when textile factories were first established. In 1832 it was estimated that two-fifths of all the persons employed in New England factories were from 7 to 16 years of age. In 1842 Massachusetts passed a law prohibiting the labor of children under 12 in textile factories for more than 10 hours a day. Somewhat similar laws were passed in Connecticut and Pennsylvania but were never strictly enforced.

Child labor has continued to be a problem down until the present time. All but two states have adopted a minimum of 14 years for full-time employment in industrial plants. The first Federal Act, passed in 1916, prohibited the shipment in interstate and foreign commerce of products of mines and quarries in which children under 16 were employed and of articles produced in manufacturing establishments where children under 14 years of age were employed or in which children between 14 and 16 years of age worked more than 8 hours a day or 6 days a week or between seven o'clock in the evening and six o'clock in the morning. The United States Supreme Court declared this act unconstitutional in 1918. The Act of 1919 attempted to achieve the same purpose by imposing a tax on profits of businesses violating the standards of the Act of 1916. This act also was declared unconstitutional by the Supreme Court in 1922. Two years later a proposed constitutional amendment was passed by Congress giving it the power to "limit, regulate and prohibit the labor of persons under 18 years of age." However, the ratification of the necessary number of states has not been secured to put this amendment into effect.

Child labor is objected to because it deprives adults of employment, and because it prevents the proper education and training of children, warps their minds and bodies and prevents them from growing into constructive citizens.

circulation, the amount of money in active use at a particular time. The circulation of money is a business index. The circulation of a bank is the total amount of the bank's outstanding note issue. Banks are required to give a semiannual statement of average circulation, which is used as a basis of the tax on circulation.

The circulation of a newspaper, magazine or other periodical may be either gross or net. *Gross* circulation is the number of copies printed. *Net* circulation (or *net paid*) is the total number of copies sold. The circulation (sales) of an advertising medium is important to the advertiser, and most newspapers and magazines have their sales audited by the Audit Bureau of Circulations (ABC). This Bureau counts as paid any sale in which not less than 50 per cent of the advertised price of the periodical has been paid or if the payment for the subscription is not more than 6 months in arrears.

clearinghouse, an association for facilitating the settlement of claims between various members, especially in banking. Before the establishment of a clearinghouse each bank sent a messenger to every other bank against which it had claims. This necessitated an unnecessary amount of work and a large exchange of currency. To facilitate this settlement a central clearinghouse was established to which the representatives of all the banks come and where claims are presented and balanced; a single payment by the clearinghouse is made to each bank and this settles all its claims against other banks. This method is easier, quicker, less expensive and involves the transfer of only about 3 to 7 per cent as much currency as under the other system. The New York Clearinghouse clears three times each day. Claims on banks in other cities are cleared through the Federal Reserve Banks by daily telegraphic transfers. The first clearinghouses in the United States were in New York (1853), Boston (1855), Philadelphia, Baltimore and Cleveland (1858). There are now about 350 clearinghouses in addition to the Federal Reserve Banks for interdistrict settlements. Stock and commodity securities and railway tickets are cleared in the same way. The Bank for International Settlements, established in Switzerland as part of the Young Plan, was intended to act as an international clearinghouse, but this function was never assumed by the bank, and clearings between nations take place through the ordinary channels.

closed shop, a place of employment where the employer agrees to employ union workers only. An *open shop* is a place of employment where the employer does not agree to employ union men only. In an open shop a number of policies toward labor may be adopted. The employer may engage both union and nonunion men, he may give a preference to either the union or nonunion men, or he may employ nonunion men only.

Since these terms have come to be slogans in the controversies between labor and capital, and there is a certain amount of stigma attached to the idea of a closed shop, labor leaders have urged the substitution of the terms *union shop* and *nonunion shop.* Labor unionists justify the closed shop or union shop on two grounds. They claim that only the workers who support the union through membership and financial contributions are entitled to the advantages secured by the union through collective bargaining. They argue that if the open shop is permitted, the union will be weakened, for the employers will favor the nonunionists to weaken the workers' collective bargaining, and workers will not pay dues to the union if they get the advantages without membership. Various unions have adopted different policies regarding the union or closed shop. For example, the Amalgamated Clothing Workers Union have open shop agreements in Rochester, preferential agreements (giving union labor a preference) in the Chicago district and closed shop agreements in New York city. In Massachusetts the courts have generally condemned a strike for a closed shop, especially when the discharging of nonunion workers is involved. In New York the courts have been more liberal and have permitted such strikes if they are not designed to give the union a monopoly in the community. In other states there have been fewer cases, and where the issue has been squarely decided, the courts have divided between the Massachusetts and the New York views.

coinage, the process of making legally authorized coins by combining pure metal and alloy in the stipulated proportions. All coinage in the United States is done by the U.S. mint, which was authorized by Congress in 1792. The first mint was opened in Philadelphia in 1793. Branches of the mint have been established in Denver, San Francisco and New Orleans.

collateral, property that is pledged as security for the repayment of a loan. Collateral usually consists of stocks, bonds, negotiable instruments, warehouse receipts, negotiable bills of lading or trust receipts, although physical goods are frequently accepted. Ordinarily possession of the collateral is given to the lender together with the promissory note. If the loan is not repaid, the lender may sell the collateral and use the proceeds to repay the loan. If there is any excess it is returned to the borrower; but if the proceeds from the sale of the collateral are not sufficient to repay the loan in full, the borrower is still responsible for the unpaid balance.

collective bargaining, the process by which the employees, as a group acting through their representatives, bargain with their employers for union recognition, wages, hours, conditions of employment and allied matters. The power to bargain depends largely upon the power to withhold something that is desired by the other party. The employer has the power to withhold the work, and the employee has the power to withhold his services. But under modern conditions a single worker does not have anything like equal bargaining power with an employer. If the worker refuses to work, the employer can get someone else to fill his place. Collective bargaining necessitates some type of organization among the workers that is independent of the employer's control, such as a labor union.

The advantage in bargaining power has not always been on the side of the employer. After the Black Death swept through Europe in the 14th century killing from one-quarter to three-quarters of the population, the workers were in a better position to bargain than the employers, but statutes were passed compelling the laborers to work for the same wages as were paid before the Black Death.

In this bargaining process today the employers use as their weapons the lock-out, black list, injunction and damage suits. The workers use the strike, the sit-down strike, the boycott and picketing. The government attitude toward collective bargaining has passed through the stages of prohibition and toleration to encouragement and in some places intervention. In the United States such labor policies of the New Deal as the National Labor Relations Act (1935) certainly encouraged collective bargaining. The ultimate step in the government attitude is intervention, and this has been adopted in Australia. This attitude rests upon the assumption that labor disputes are warfare, and the orderly and sensible way to settle the disputes is by arbitration. In addition all labor disputes that involve a stoppage or injury to industrial production are economically wasteful, and so the Australian government considers that the public has a right to interfere because its interests are being harmed. In the United States compulsory arbitration has been held unconstitutional since it interferes with the freedom of the laborers and employees.

Agricultural supplies and equipment are sometimes bought for a cooperative group by a representative or several representatives, and this method is (rarely) called collective bargaining.

collectivism, a planned economic system under government control, such as socialism or communism; or more specifically the general movement away from the *laissez-faire* doctrine and rugged individualism. In all forms of society there has been more or less social control of business activity, but during the 19th century there was a trend toward the *laissez-faire* policy of no interference with business by government, as elaborated by Adam Smith in his *Wealth of Nations* (1776). From the beginning of the 20th century there has been an increasing movement toward a government-controlled economic order. In Russia this movement has been complete. In Italy and to a lesser extent in Germany the government almost completely controls business, even though the government does not own business. In the United States this movement has been slow, but under the New Deal the government engaged in many new lines of economic control and collectivism. There is no reason to believe that this movement toward collectivism will take the same form as it has in any foreign nation, for it has not taken the same form in all different foreign countries, and probably it will assume an entirely different pattern in the United States.

combination, a business union or alliance of different organizations, ranging from a complete unification of two or more corporations to loose agreements regarding general policies. The phrase *combination in restraint of trade* immediately suggests that the term often means an illegal agreement.

Industrial combinations may be of three general types: merger, unified control and cartel agreement. In the case of a merger there is a complete unification of the enterprises, and a single new entity is formed. A merger may be either *horizontal* or *vertical.* A horizontal merger includes enterprises of the same type and same stage of production. For example, if three shoe factories form one new corporation, this is a horizontal merger. A *vertical* merger is the unification of businesses representing various stages in production. If a leather tannery, a shoe factory and a retail shoe store merge, that is a vertical merger.

In combinations for unified control the purpose is usually to secure financial and commercial co-ordination. Frequently such combinations are made in order to secure a co-ordinated production program and to eliminate price competition. This arrangement is usually secured through a holding company that has a sufficient stock ownership in each of the operating companies to direct an adoption of the desired plans. In these combinations giving unified control the old companies still retain their independent form and do not become a single new enterprise as in the case of a merger. Combinations giving unified control may be either horizontal or vertical.

A cartel agreement is an agreement between entirely independent enterprises in which they mutually contract to follow certain procedures with respect to the sale or manufacture of certain products. In some cases a special organization is set up to supervise the execution of the agreement. The cartel agreement has been especially important in Germany, but in the United States its use has been limited by antitrust legislation forbidding combinations in restraint of trade.

commercial credit company, an organization that relieves installment sellers of collecting deferred payments. The credit company advances to the seller cash to pay for the product bought on installments and receives from the buyer an assignment of ownership in the product subject to a sales contract signed by the buyer. The credit company collects the payments or, if they are not paid, repossesses the article that was sold. Some credit companies are owned by the manufacturer or the group of manufacturers whose product they finance. This method of selling has been particularly successful with automobiles, oil burners and electric refrigerators.

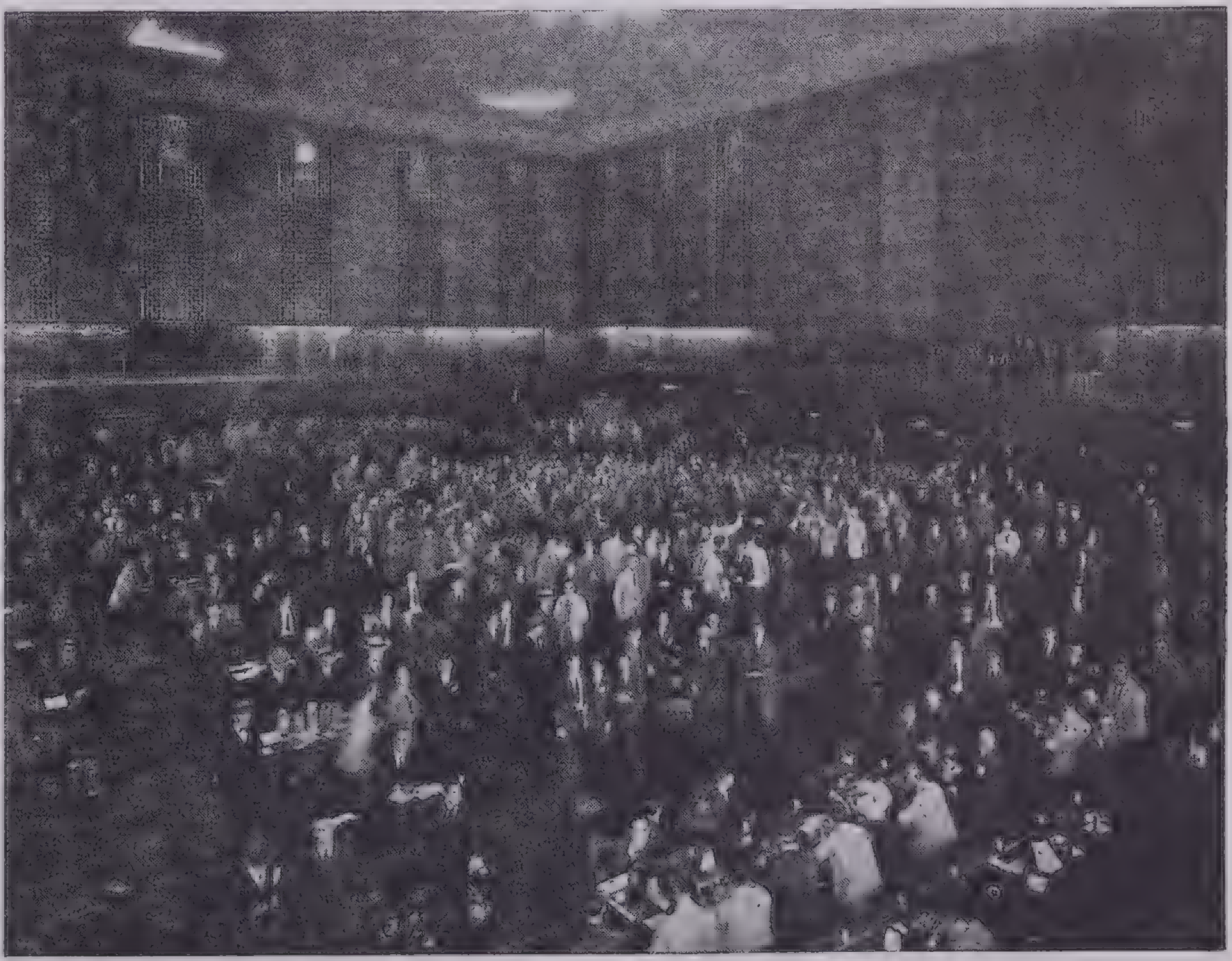
commercial paper, all kinds of negotiable instruments, including bills of exchange, drafts, checks, acceptances, warehouse receipts, bills of lading, money orders, express orders and orders for the delivery of goods. Commercial paper is for a short term, generally calls for the payment of money and can be used for collateral.

commissary store or company store, a retail store owned and operated by a company or governmental unit to sell primarily to its employees. Such establishments are usually found only in communities where there are no employees other than those of the concern owning the store, such as an army post, a mining town or an industrial village owned by the industry. This method of distribution puts the employee at the mercy of his employer, for there is nowhere else for the workman to trade, and there is no competition. Workmen were often paid in orders on the commissary store —an additional abuse.

Committee for Industrial Organization, (CIO) an American labor organization formed November 1935 and based on the principle of industrial unionism as distinct from craft unions. The CIO arose out of the dispute within the American Federation of Labor caused by the failure of the Federation to launch a campaign for unionizing the mass-production industries. The CIO was organized by the leaders of eight industrial unions that were then affiliated with the Federation: John L. Lewis of the United Mine Workers, Charles P. Howard of the International Typographical Union, Sidney Hillman of the Amalgated Clothing Workers, David Dubinsky of the International Ladies Garment Workers, Thomas F. McMahon of the United Textile Workers, Harvey C. Fremming of the Oil Workers and Thomas H. Brown of the Mine, Mill and Smelter Workers. Lewis was elected chairman; Howard, secretary; and John Brophy, director. The purpose of the committee as declared is: "To encourage and promote organization of the workers in the mass production and unorganized industries of the nation and affiliation with the American Federation of Labor." In spite of the claim that it was not a dual movement and had no quarrel with craft unions, a serious split developed, and these two organizations were unable to get together even after a series of conferences in 1937. The aggressive policies of the CIO resulted in greatly increased labor organization in the steel, textile, automobile, electrical appliances and radio, city transportation and rubber industries; a series of bitterly contested strikes and general victories for labor usually resulted in these industries. The CIO then had to prove itself capable of enforcing contracts before its gains could be consolidated and made permanent.

commodity exchange, an organized center for trading in certain commodities. The membership of the exchange is closed, and to obtain a membership one must be elected and also purchase a *seat,* the price of which varies according to the particular exchange and according to business conditions. A seat on the Chicago Board of Trade sold for $62,000 in the fall of 1929 and for $15,000 the following April. The purpose of an exchange is to make the buying and selling of the commodity open and freely competitive, to concentrate information, to facilitate trading and to announce a market price. The trading is carried on by samples and standard grades, and the transfer of a warehouse receipt is treated as delivery. The first commodity exchange in the United States was the Chicago Board of Trade (1848). Other important exchanges at the present time include the New York Produce Exchange, New York Cotton Exchange, Chicago Mercantile Exchange, New York Burlap and Jute Exchange, New York Cocoa Exchange, New York Coffee and Sugar Exchange, New York Hide Exchange, New York Metal Exchange, National Raw Silk Exchange, Rubber Exchange of New York and the Memphis Merchants Exchange.

A *cash* or *spot market* in the exchange is where trading takes place for immediate or very early delivery. The *to-arrive* market is for trading in commodities in the process of shipment or about to be shipped. The *futures* market (the pit or ring) is a market for trading in contracts to deliver the commodity at a specified future time. The *call* market is a market for bids and offers for certain grades of the commodity. In produce markets the call business is usually



Trading Floor of the Chicago Board of Trade. The *Wheat Pit* Is Shown in the Foreground the most important. The Grain Futures Administration, organized to carry out the Grain Futures Act (1922), publishes comprehensive information as to the market and acts to prevent illegal and discriminatory practices.

company union, a labor union organized and practically dominated by the employers and set up for the purpose of combating independent unions. In Germany and England attempts at company-union organization never gained much headway, but in the United States the number of company unions grew rapidly after the World War, partly as the result of the shop committees set up by the War Labor Board. It has been estimated that about a thousand concerns, employing about a million and a half workers, have the company-union form of employee representation. The company union generally operates through elected representatives who confer with representatives of the management.

In some cases the company union has shown some independence and really worked as an agency of the workers, but this is rare. In most cases the company union does not and cannot act as an effective collective-bargaining agency. The matters discussed by the union are generally limited to minor matters and the adjustment of grievances; such questions as wages, hours and working conditions are outside the scope of the organization's functions. The company union's representative, since he must be an employee of the company, usually lacks the training and experience in bargaining that a trade-union negotiator has. Of course the company union does not have affiliated unions to aid it in case of a strike. The right of employers to organize company unions was unquestioned until the Railway Labor Act, which the United States Supreme Court interpreted as prohibiting company unions in railway companies since these interfered with the free choice by employees of their representatives for collective-bargaining purposes. The provision of the National Labor Relations Act (1935) that lists as prohibited unfair practice "to dominate or interfere with the formation or administration of any labor organization or contribute financial or other support to it" is aimed at the company union.

compensated or **managed currency,** a monetary plan by which the gold content of the dollar would be changed in accordance with any change in the price level. Thus the gold represented by a gold certificate would always purchase the same amount of goods. The compensated dollar is one of the many plans proposed to cure the evils of inflation and deflation. This plan has never been adopted, and since the world has generally abandoned the gold standard, there is little chance of its adoption, for the scheme requires a 100 per cent gold reserve.

competition, struggle with others for a prize. Competition is found in all forms of life and in all social organizations. It is the basis of the survival of the fittest. The prize for which men compete may be wealth, power, prestige, security or the vague achievement that we call success. In all economic systems competition serves as a driving force. Under capitalism the prize for which men compete is usually wealth and the power and prestige that wealth brings with it. Under communism competition is either for a recognition of merit in having served the state or for the power and prestige that come from an important position. The experience of Russia seems to show that some sort of a financial prize is necessary, at least in the nature of a wage differential. The important and basic nature of competition is hardly challenged, but there are many who believe that new rules should govern competition and that different prizes should be offered. In the United States the belief in the importance of competition as a driving and regulating force in economic activity has resulted in antitrust legislation such as the Sherman Act, the Clayton Act and the Trade Commission Acts. These laws have aimed at the maintenance of competition through the destruction of monopolies, but their enforcement has been difficult due to the general trend of the capitalistic system toward monopolies.

consols, abbreviation for *consolidated annuities.* The various British government obligations were consolidated between 1750 and 1757 into annuity stocks, most of which bore 3 per cent interest. The consols had no maturity date. Interest was paid by the Bank of England, which held the stock, and if market conditions justified it, premiums were paid in addition to the fixed rate of interest. In 1888 the interest was reduced to 2¾ per cent and in 1903 to 2½ per cent. The consols represented most of the national debt up to the time of the World War and were regarded as an index of the national credit.

consortium, a group of representatives of various nations or private individuals in various nations bound together by an agreement to aid another nation, usually by extending loans or underwriting the government securities of the nation to be aided.

consumer, one who consumes, buys or employs goods or services. *Consumers' goods* are distinguished from *industrial goods,* which are bought for manufacture or remanufacture, and from *resale goods,* which are bought (by a retailer, for example) for resale.

consumer's co-operative store, a retail store owned and directed by its own associated customer membership.

Such stores are found largely in industrial communities, where the groups of workers are homogeneous in nature and where the incentive or necessity for saving is rather great, and in smaller communities for the purchase of feed and other farm supplies.

Co-operative stores are operated not for profit but for the benefit of the members of the co-operative association owning them. Some co-operative stores have at times returned savings direct to the members at time of purchase—through a policy of selling at lower prices than similar co-operative stores. However, the majority of successful co-operative stores use the *patronage-dividend* plan. By this method the prices charged are quite similar to those at other stores of the neighborhood; but at the end of the year (or other accounting period) any profits remaining after the deductions for interest, sinking fund (if any), surplus account and so forth are paid back to the members pro rata on the amount of their purchases. Thus the individual or family who purchases a thousand dollars worth of goods from the store automatically receives a larger share of its profits than does the one purchasing only two or three hundred dollars worth. The control of these co-operative stores, like the ownership, in most cases rests in the members. Many grocery stores and a few general merchandise stores are so operated in industrial sections of our cities. Students in several American colleges operate bookstores on a similar basis.

convenience goods, consumers' goods that are usually purchased frequently, immediately and with the minimum of effort; distinguished from *shopping goods,* which are bought after comparing and considering the offerings of various retailers. Examples of convenience goods are tobacco products, soap, most drug products, newspapers and magazines, chewing gum, small packaged confections, many grocery products and in general many advertised brands of various products in constant use.

conversion privilege, the right to exchange one type of security for another, usually in the same or an affiliated corporation. Bonds may carry the privilege of conversion into common or preferred stock, and junior priority stock sometimes carries the privilege of conversion into a senior security. This conversion privilege is part of the security contract.

co-operative, an association for any desired business interest, organized and operated for the benefit of the members as a whole.

The first and most famous of the early co-operatives was formed in Rochdale, England, in 1844. A group of weavers each subscribed £1 and started a grocery store that sold goods at the market price and then returned the profits to the members in proportion to their purchases. From this small beginning the co-operative movement has spread throughout the world, and there are now co-operatives in some 36 countries with 75 to 85 million members. The basic principles of any co-operative organization are: each member has only one vote regardless of his capital contribution or the amount of his purchases; only a legal rate of interest is paid on capital; the surplus, after a fund for interest on capital stock and reserve is set aside, is returned to the members in proportion to their patronage. Co-operatives include retail stores, wholesale buying establishments, manufacturing, housing, transportation, mining, insurance, milk distributives, credit co-operatives and all sorts of agricultural producing, distributing and purchasing co-operatives.

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Courtesy The Co-Operative League
Co-operatives Own Modern Equipment
This oil truck carries the message of the co-operative movement

corporation, a form of organization that enables a group of individuals to carry on a business under a common name. Corporations are usually organized for profit, although there are many charitable corporations. The corporation originated in ancient times; was used by the Romans, the Anglo-Saxons and the medieval towns; and began in its modern form as the great joint-stock trading companies chartered by the kings to exploit newly discovered lands.

The modern corporation is one of the bases of modern capitalism, for through the sale of corporate stocks and bonds corporations have been able to amass huge sums of capital for various business purposes. The corporation represents a concentration of wealth and power that is comparable to that of the state itself. One great corporation, the American Telephone & Telegraph Company, in 1930 had assets of almost five billion dollars, 454,000 employees and 567,649 stockholders. We can appreciate the extent of this corporation when it is realized that if there were 100 companies of this size, they would control the whole wealth of the United States and would employ all the gainfully employed persons in the country; and if there were no duplication of stockholders, shares would be owned by almost every family in the entire nation.

The main advantages of the modern business corporation are: that they make possible the accumulation of capital; they limit the liability of a stockholder to the amount he contributed for the purchase of the stock —with some exceptions, such as national banks, where there is a double liability; they make possible the transference of stock ownership; and the corporation continues independent of the life of the individual. On the other hand there are disadvantages to society in the corporate form of organization. It has an impersonal nature, with great power and a divided responsibility among the directors and shareholders; it creates class distinctions and the evils of absentee ownership.

Corporation charters in the United States have been granted primarily by the states. The Federal Government has granted corporate charters in a few instances—to the First Bank of the United States (1791–1811), the Second Bank of the United States (1816–1830), the Emergency Fleet Corporation, certain railroads during the Civil War and the World War, companies of American citizens residing in China and to the numerous government agencies and authorities of the New Deal and prior administrations, including the Tennessee Valley Authority, Reconstruction Finance Corporations and so forth. At first the state charters were granted by individual acts of the legislature, but after the New York law of 1911 gave the secretary of state the power to grant charters, that became the general policy. Corporation charters were frequently perpetual or without any time limit. But after the United States Supreme Court in the Dartmouth College case (1819) held that a charter was a contract between the state and the individual that could not be altered or amended by the state without the approval of the party to whom the charter was granted, the states granted charters for a limited period or specifically reserved the right to revoke a charter. The requirements for incorporation vary in different states and are much easier in some states than in others. New Jersey was formerly the most lenient, but since 1913 Maryland, Delaware and Maine have been most lenient. A company incorporated in one state can do business in any other state if it complies with the local registration provisions.

cost of living, the money expenditures necessary for the usual goods and services of a certain class of society in a specific region. The United States Bureau of Labor Statistics in 1890 made the first attempt to gather data on the cost of living. During the World War and afterwards many employers established wage systems on the basis of the cost of living. The theory is that if prices rise a worker should have a higher wage in order for him to purchase the same goods and services, and if prices fall, then the worker is just as well off with a lower wage. The General Electric Company, for example, has announced that it will grant wage increases up to 10 per cent as corresponding increases are shown by the United States Department of Labor Index, but that it will not cut wages below the October 1936 levels. In estimating the cost of living various items such as food, clothing, rent, light, heat, fuel, amusements and medical care are included, each item being weighted according to its importance. An index number of 100 is taken for an estimated normal cost of living, and rises or falls in living costs are expressed in terms of this index number.

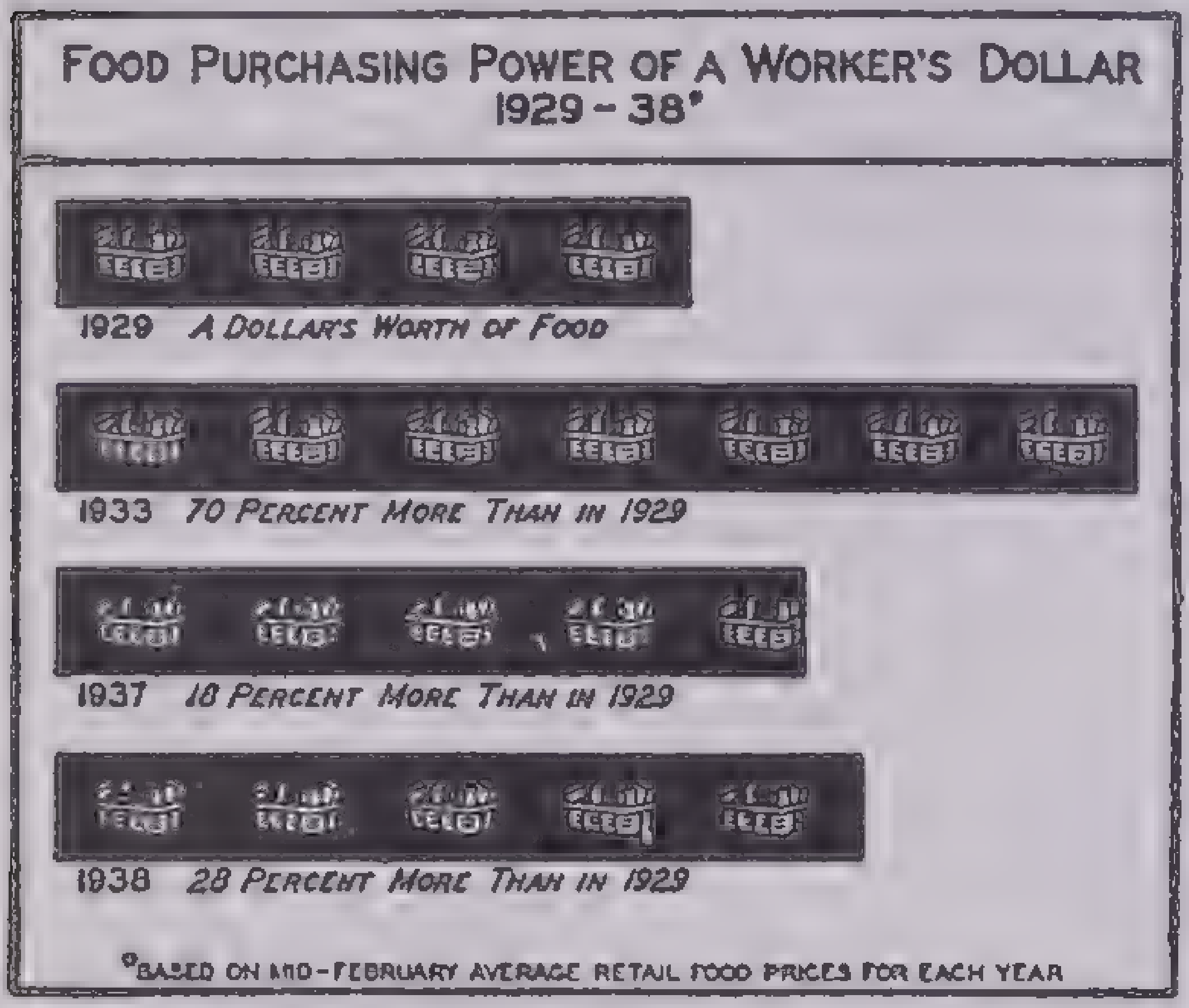
cost plus, a price or a bid consisting of the cost of producing the article or doing the work plus a percentage of the total cost, which is the profit. If a contractor bids on the construction of a building "cost plus 10 per cent," this means that he will be paid the total cost of materials and wages plus 10 per cent of the total cost as the contractor's profit. The cost-plus bid is highly desirable when costs are subject to sudden fluctuations and when the construction involves a particular type of work the cost of which is difficult to estimate. For example, if the foundation of a bridge or large building is to be laid and experimental drillings have shown some rock and some quicksand, and it is impossible to determine just what the conditions will be, it is mutually advantageous to the parties to work on a cost-plus basis. Many builders and contractors prefer a cost-plus basis for all work. Of course this plan can be satisfactory only if the contractor is absolutely honest and competent.

costs, the value or physical effort expended to produce something or to secure it from someone else. Thus the cost of digging a ditch includes the physical effort expended by the workman and the wear and tear on the tools used. Producing steel involves the costs of mining the iron, transporting it to a mill, burning coal to melt the iron ore, the human labor and engineering and the various other expenditures that must be made to secure the finished product.

Just what constitutes cost and its relation to price is one of the most difficult questions in economics, and a thoroughly satisfactory theory of costs has never been formulated. The English economist J. A. Hobson stresses *human costs* such as degradation and the loss of self-respect that comes from menial tasks, the impairment of physical and moral health, the loss of esthetic appreciation and other such factors. Other economists have stressed the monetary costs, costs of production and reproduction and *opportunity cost*. The notion of opportunity cost is that the cost of producing any commodity is the amount of another commodity that might be produced with the same expenditures.

Fixed costs are those that remain constant regardless of an increase or decrease in production. In a factory fixed costs would include such items as depreciation, insurance, cost of maintaining the building, salaries of executives and the interest payments on bonds. *Variable costs* are those that do change with increase or decrease in production. They include such items as raw materials, labor, fuel, transportation costs and clerical expenses. It is often advantageous for a business to operate for a short time at a loss rather than close the plant if the net income covers the variable costs. Since the fixed costs must be paid whether the factory operates or not, any income that pays the variable costs and a part of the fixed costs cuts the amount of loss and keeps the working force and equipment intact. Of course the business is still operating at a loss, and this cannot be done after the surplus is exhausted, but for a short time this operation will mean a smaller loss than closing up.

Production is said to operate under *constant costs* when the cost of production per unit does not change with an increase or decrease in the total production. Industries operate under constant costs when raw materials and capital play a relatively small part in the production, and labor is the important item. Custom-made clothes, hand-painted pictures, hand-embroidered handkerchiefs are all made at about constant costs since the unit cost of production will not vary greatly whether 100 units or 1,000 units are produced. Production takes place under *decreasing costs* when the unit cost decreases when more goods are produced. Industries in which capital is the most important factor usually operate under decreasing costs. An automobile plant, a steel mill, a cotton factory, a railroad, all have decreasing unit costs as they increase their production. *Increasing costs* take place when land is the most important factor of production. In mining and farming as the production is increased, it costs more for each unit, since coal must be obtained from less accessible places, and crops must be grown on inferior land, on fertilized land or with special care.



Courtesy U. S. Department of Labor

The Cost of Living

Variations in the purchasing power of money lead to fear and uncertainty among low-income groups

coupon (French *couper,* meaning to cut), a note or certificate of interest due attached to a bond. The coupon is cut from the bond when the interest is due and is then presented for payment. When a bond is sold *coupons off* it means that the coupon for the currently due interest payment has been detached from the bond. If the bond is sold *coupons on* it means that the coupon for the current interest payment is attached to the bond. A bond sold with *coupons attached* has attached coupons for past due interest payments, and their value depends upon the condition of the business and the prospect of the past interest being paid.

craft union, a labor union of skilled workmen belonging to the same trade. In the early history of labor unions it was the skilled workmen who organized, and they joined to improve the status of their own small group. Contrasted with the craft union is the *industrial union,* which organizes all the workmen of an industry into a group and carries the idea of labor solidarity much farther than the craft union. The American Federation of Labor (AFL) was organized on the basis of craft unions. The Committee for Industrial Organization (CIO) broke away from the Federation because the Committee planned to organize industrial unions.

credit (Latin *credere,* trust, believe), trust or confidence in a business transaction in which a debt is created. The one to whom the debt is owed is the *creditor,* the one who extends credit. Every time that an article is sold, a debt is created. If the price is immediately paid, then the debt is extinguished. If the debt is not paid immediately, we say that the seller has extended credit to the buyer. Where two parties are each buying from the other, they may each extend credit to the other, and at the end of a certain period the settlement will be for the net balance. But this relationship is unusual between the same individuals, and banks act as a general agent to balance the credits extended by various individuals. The modern system of bank checks makes possible a payment to the bank by those who owe and then a payment by the bank to those who gave credit. Besides the banks extend credit by lending money, and this money is obtained from the depositors who are in reality lending their money to the banks. Collateral is usually required by the bank when credit is extended. Thus a business man may desire to buy 1,000 bales of cotton and yet have only enough cash to pay for half of that amount. If his credit is good, he can go to the bank and obtain a loan of the necessary amount by pledging the cotton as collateral. This gives the bank the right to sell the cotton to obtain the repayment of the loan.

If the amount of credit is being increased, and more credit has been extended than the community can pay, the condition is called *inflation.* If the amount of credit is being decreased, and there is insufficient credit, the condition is called *deflation.*

crisis, see *business cycle.*

debenture, an unsecured promise to pay by a corporation. It differs from a promissory note mainly in that the debenture is for a longer term.

deflation, see *inflation.*

demand, the total desire for the possession of a commodity of the individual members of the community. *Effective demand* is a desire for possession of an article by those who have sufficient money to make the purchase. Demand is accurately defined as "the entire complex of conditions, except price, which determines the amount of a commodity salable in a given market at a named price."

The terms *supply* and *demand* do not have parallel meanings. Demand means the relation between the amount of goods that will be sold and the price of the commodity; but supply means only the amount of goods that will be brought into the market. The quantity of a commodity that will be sold is determined by the price (the demand side), but the quantity that will be supplied at a particular time is not determined in a parallel sense by the price. The demand at any particular time depends upon various factors: the value placed upon the particular commodity by the buyers, the purchasing power of the buyers and the prices at which substitute and complementary goods are then available.

Demand for an article is said to be *elastic* if the change in the consumption is greater than the change in price. Luxury articles generally have an *elastic demand.* For example, if the price of candy is raised, then a great deal less candy will be purchased. But if the price of bread is raised, almost the same amount will be purchased. This is said to be an *inelastic demand* since the change in consumption is less than the change in price. This inelasticity of demand makes any attempt at price control exceedingly difficult and frequently impossible. For example, the demand for agricultural products is generally inelastic, and approximately the same amount is consumed regardless of price changes.

Thus it is seen that even a small overproduction results in ruinously low prices; and if the prices are raised by artificial government action and there is any increase in the production due to this price rise, then the original price increase quickly becomes nullified or even reversed. For this reason, efforts to control the price of agricultural commodities by the government have included controlling the amount of production.

demonstrating, an aid to selling that consists in showing the product and showing how to use it to the best advantage. In the early days of the development of agricultural machinery Cyrus McCormick demonstrated his reaper in actual harvest fields. In modern marketing many manufacturers of appliances place their own paid demonstrators in department stores and specialty shops to sell the product by demonstration and showmanship.

department store, a retail store that is organized into separate departments for purposes of promotion, service, accounting and control or regulation.

The departmental organization is well defined; accounting records are kept by departments; and occasionally departments are leased, so that all parts of the store are not strictly under the same management.

The usual distinction between a department store and a specialty shop is that the department store carries more varied lines, and that dry goods are a main part of its stock. Department stores in large cities often have suburban branch stores that are specialty shops.

depression, see *business cycle.*

devaluation, giving a new and lower legal value to the monetary unit and ordering that all contract obligations shall be settled with the new monetary unit. Devaluation is usually accomplished by an act of the legislature. In most cases the name of the old monetary unit is maintained, but the bullion content is lowered. Devaluation is a method of stabilizing the currency and increasing foreign trade by reducing the costs of commodities in terms of foreign money. Devaluation reduces the legal value of money and is thus in a sense a forced loan to the government. The same result may be reached by increasing the amount of paper money, which reduces the value of the old money through a price rise. After the World War there was a great deal of devaluation, and as the result of the economic depression of 1929 nearly every country had to devaluate its currency.

diminishing return, a general principle of productivity and a fundamental concept in economics: that increased effort and increased investment will not bring corresponding increase in production or profit beyond a certain point. The principle of diminishing return was first applied only to agriculture, and although it is now applied to all phases of production, it can best be explained in terms of agriculture. If increasing amounts of capital or labor are applied on a given unit of land, there finally comes a point in the production where the returns from the application of added amounts gives a smaller return per unit. Or it may be stated that increased resources applied to land will yield increasing returns for a time but after a certain point will yield decreasing returns per unit of the other resources used. For example, a farmer may apply 30 pounds of fertilizer to an acre of land and get a yield of 14.9 bushels of wheat. If he applies 60 pounds of fertilizer he may get 17.3 bushels of wheat, and 90 pounds of fertilizer may increase the production to 18.7 bushels. However, although the total output is increasing, the increase for each 30 pounds of fertilizer is decreasing; the first 30 pounds caused in increase of 4.3 bushels of wheat, an additional 30 pounds only gave an additional 2.4 bushels, and the third additional 30 pounds only added 1.4 bushels to the yield. It is important to understand clearly that this does not depend upon the declining fertility of the soil or the weather. The diminishing return is an economic phenomenon that occurs in any sort of production, agricultural or industrial.

director, a member of the board of a corporation elected by the voting stockholders to manage and direct the general affairs of the business. Directors are usually elected annually, but the terms of office are for more than one year and are arranged so that only a minority of the directors come up for election each year —which insures a continuity of the board. The board of directors selects the officers of the corporation.

discount, an amount taken off, either as a charge for a service or returned as a rebate.

A *bank discount* is a fee charged by banks for lending money and deducted from the loan at the time the loan is made. When a bill of exchange or a promissory note is discounted at a bank, the right to obtain payment on the instrument is transferred to the bank for the present value of the note less a fee charged by the bank for this service. Discounting a note is practically selling it to the bank for its present value. Rediscounting by the Federal Reserve System is merely discounting a note for a banker. It is called *rediscounting*—discounting again—because the note has already been discounted once—when the individual brought it to the bank. When securities are sold at less than par, they are said to be sold at a discount.

A *trade discount* is a rebate or reduction in the price of the article.

discrimination, an unfair or unjust distinction, especially in charging higher rates to one person than another for a similar service. An unjustified or unfair price discrimination is considered as an unfair trade practice and is forbidden by law. Common carriers are not permitted to discriminate between individuals for the same service.

dishonor, the refusal or failure to pay a promissory note, draft or bill of exchange when it is due or when it is duly presented for payment; the failure to accept a draft or bill of exchange when it is presented for acceptance.

distribution, the division of economic theory that deals with the analysis of the forces that govern the apportionment of goods produced and their value among those who perform services or provide the different necessary factors of production. The man who contributes his capital to production receives a return that we call *interest;* the man who uses his land for production receives rent for the land; and the man who gives his labor in the productive process receives wages. The problem of distribution is to determine why the worker receives the amount of wages that he does, why the capitalist receives the interest that he does, and why the landowner receives the amount of rent that he does. What are the forces that determine how much of the total product shall be paid for each factor of production? As is the case with many economic problems, economists are not in agreement as to the theory of distribution. The marginal theory has had wide acceptance, but it has been widely criticized and must certainly be modified by a consideration of the bargaining power of the owners of the various factors of production.

In ordinary business usage the term *distribution* means the same as marketing and includes selling, sales promotion and the purely physical task of conveying goods produced from the point of production to the place of consumption. The National Association of Marketing Teachers has urged that *distribution* should not be used in this sense.

dividend (Latin, what is to be distributed), a distribution of the profits of a corporation to its stockholders, a specified amount being paid for each share owned. Dividends may not be paid out of capital. Dividends are declared by the board of directors of the corporation, and stockholders cannot compel the declaration of a dividend except by electing new directors. In England a dividend can be paid only in cash, but in the United States a dividend may be in cash, in property, stock of the corporation or another corporation, bonds or scrip. Preferred stock is usually preferred as to dividends, and dividends of a stipulated amount must be paid to the preferred stockholders before any dividends are paid to the owners of common stock. If dividends are cumulative, the preferred stockholders have the right to back dividends for years in which no dividends were declared before any paymens are made to the common stockholders. A stock is said to be sold *cum-dividend* when the ownership of the stock carries with it the right to receive a dividend that has recently been declared. Stock is sold *ex-dividend* when the prior-declared dividend that is not yet paid goes to the former owner.

division of labor, see *specializaton.*

draft, see *bill of exchange.*

drawback, the refund of part of an amount paid. A drawback of some of the import duty is paid if the goods are subsequently exported. A drawback of freight payments is permitted only if there has been a mistake in the amount paid.

dumping, selling goods in a foreign country at a loss or at less than the domestic price. The usual purpose of dumping is to get rid of a large surplus without disturbing the price in the home market. Another purpose may be to destroy a new industry in the foreign country. It is claimed that the early American fine china pottery industry, set up before the Revolution, was destroyed by English dumping.

Sometimes this dumping is practiced so that the benefits of large-scale production may be enjoyed without causing lower prices in the domestic market. Before the World War dumping was extensively practiced by the German cartels (or trusts), by Canada, England, France, Belgium, Japan and by such American companies as United States Steel, Standard Oil Company and the International Harvester Company. Dumping is objected to because it disturbs the market and often ruins legitimate business concerns within the country. Canada was the first nation to pass antidumping legislation (1904). It has been followed by Great Britain, United States, Australia, New Zealand, Japan, Germany and the Union of South Africa.

entrepreneur (French), one who undertakes, the enterpriser, one who organizes the business, takes the risks and receives the profits or losses of the business. The entrepreneur need not own the means of production; he may borrow capital, rent the land and employ others to do the work. The entrepreneur was once dominant in economic life, but now his place has been taken by the corporation or in some cases the partnership. Henry

Ford is one of the few great entrepreneurs in modern industry.

excess-profits tax, a levy on business profits that are in excess of a fixed standard. Georgia imposed the first such tax in the United States in 1863, levying 5 to 25 per cent taxes on corporation profits in excess of 8 per cent of the capital stock. Although the tax was productive, it was soon repealed. The excess-profits tax came into use again during the World War in the British Empire, Austria, Germany, France, Greece, Italy, Hungary, the Netherlands, Russia, Switzerland, Spain, Japan and the United States. The object of these taxes was to secure revenue by taking a large part of the corporation profits that were above pre-war standards. Great Britain in 1917–18 imposed a tax of 80 per cent on current profits in excess of the average profits of any 2 of the 3 years before the war. In the United States the tax rates were from 30 to 65 per cent of the excess over "normal" profits or the excess over 80 per cent of war profits, whichever amount was larger. This tax was highly successful, and during the 3 years 1917 to 1919 the average yield was almost two billion dollars, being the largest governmental revenue aside from borrowings. But in times of peace the tax was not well received, and by 1921 it was repealed.

Another excess-profits tax in the United States was enacted as part of the National Industrial Recovery Act and modified by subsequent revenue bills. It taxed at 6 per cent of the adjusted declared value of the capital stock if the profit was between 10 and 15 per cent; if the net income was in excess of 15 per cent of the adjusted declared value of the capital stock, the tax was 12 per cent.

The advantage of the excess-profits tax is that it is based on ability to pay, and that it levies on business with extraordinary profits but spares those business undertakings that are developing or only moderately successful. The objections to such a tax are based on its complexity, unfair discrimination and excessive administration costs. In the long run the tax falls mainly on businesses with fluctuating profits, taking a large part of the profits in good years but making no allowance for bad years; and invested capital cannot accurately be measured on the basis of the original investment.

exchange, the voluntary mutual transfer of goods and services of an equivalent value. Economics is frequently divided into three parts: production, exchange and distribution. Exchange with its problems of value, price, money, credit and marketing is one of the central concepts of economics. In primitive society exchange takes place through barter. But barter is inconvenient, for in order to barter you must find someone who wants what you have to exchange and who has what you want, and the articles must have an equal value. As specialization develops within the community, money develops as a medium to facilitate exchange. Under our present economic system exchange does not take place directly between individuals but rather between enterprises. An individual works for a corporation or other enterprise and receives a salary for his services. The enterprise owns the article that is made, and this article is sold to another enterprise that in turn sells the article to the individual.

exclusive agency or **exclusive agent,** an agent or agency that has the sole selling rights to a certain product for a designated territory. Manufacturers grant exclusive agencies either to retailers or wholesalers. Joint exclusive agencies limit distributors to a certain small number in a designated territory.

expense, any expenditure made in the course of business that is reasonably necessary for the administration and conduct of the business. Expenses in bookkeeping are classified under various headings, such as administrative expense, operating expense, selling expense, general expenses.

exploitation, unfairly or unjustly benefiting from the labor of others or at the expense of others. Early socialist writers regarded all wealth taken by the owners of capital as an unjust deprivation of the laborers. The social reformers believed that exploitation was due to the ignorance and unethical conduct of the capitalists. Other writers regarded exploitation as an inherent evil in the economic system and proposed new systems to remedy the evil. Most of the economic theory of Karl Marx is built around the exploitation of labor as explained by his surplus-value theory (see *surplus value*). Socialists use the concept of exploitation as a basis for urging government control and supervision of industry.

factor, a commission merchant who advances funds to the consignor and who differs from a broker in having physical possession of the goods to be sold. The consignor to the factor of agricultural products is the grower himself or a country buyer or merchant acting as a middleman. Textile factors are specialized commercial bankers performing the function of financing for the textile mills and in some cases combining this function with that of selling.

fiat money, paper money with no other backing, made legal tender by a fiat or decree of the government. Fiat money has no intrinsic value in itself and is not redeemable in any other kind of money or valuable metal. The Revolutionary War was financed largely with promissory notes of the Continental Congress. Although these notes were supposed to be redeemable in coin there was no coin for the purpose, and so they were genuine fiat money. Eventually this fiat money declined in value so that people were unwilling to accept it. After the adoption of the Constitution this fiat money was redeemed at the rate of one cent for each dollar. The Civil War was largely financed by the issue of fiat money called *greenbacks,* but beginning on January 1, 1879, the greenbacks were redeemed in gold.

foreign exchange, the mechanism by which payments are made between individuals in two nations that have different monetary units. In a more specific sense foreign exchange means foreign bills of exchange, either written or telegraphed. The rate of foreign exchange is the price of a foreign monetary unit in terms of local currency. When the rate is $4.86 for one pound sterling, $4.86 in United States money must be paid for a pound sterling in English money. At this rate a person who wishes to pay a debt of £100 in England would have to pay $486 in United States currency plus commission charges by the banker. Foreign exchange is practically the only way in which debts abroad can be paid, and the mechanism operates much as a clearing house between banks with the important difference that the banks are all using the same currency, and in foreign exchange different currencies are used, and their relative values are constantly changing. The various classes of exchange rates are: bankers' demand drafts, called *sight drafts* because they are payable on sight or demand; bankers' long bills, commercial long bills and cables. The sight bills are generally the basic rate, and the others are calculated from it adding the interest charges before payments, commissions and risk. London is the main world market for foreign exchanges, and New York, Paris and the main cities of powerful nations are also important.

The classical theory of foreign exchange is that if a nation exports more than it imports, the foreign exchanges will react favorably, specie will flow in, and prices will rise, checking exports and stimulating imports, until an equilibrium has been restored. Under modern conditions, when capital and services are transferred as well as commodities, and tariffs and numerous other restrictions are placed upon foreign trade and foreign exchange by the governments, this classical theory must be decidedly modified to meet actual conditions.

foreign trade, see *international trade.*

free coinage, the right to have any amount of metal made into coin by the government. The word *free* refers to the unlimited amount and does not mean that there is no charge.

free on board (F.O.B.), all shipping and cartage expenses paid for getting the property to the carrier at the designated place and putting it on the carrier. If the price of an automobile is given F.O.B. Detroit, all freight and cartage charges have been paid up to the placing of the automobile on the carrier in Detroit. The automobile is *free on board* the carrier, but further freight charges must be paid by the buyer.

free trade, the commercial policy that does not restrict imports by tax levies. It is the opposite of protection, which restricts imports by placing high taxes on them. Until the 18th century trade barriers in Europe were common even within a nation, and goods passing from one section of the country to another had to pay taxes to the local authorities. Free trade was advocated by Adam Smith in England and the physiocrats in France. The landed gentry in England, fearing the competition of foreign grain, strongly opposed the repeal of the Corn Laws, which were import duties on grain. The repeal of the Corn Laws was a long and heated battle in English politics, and Sir Robert Peel, though he had been elected to resist free trade, secured the repeal of the Corn Laws in 1846. Free trade in England was established by Gladstone in 1869. British manufacturing and trade prospered and faced relatively little competition until the rise of industry in Germany and the United States. After the World War England was forced to adopt a protective tariff to compete with other nations.

The argument for free trade is that each section should produce those products that can be grown or manufactured most cheaply and best and should exchange its products for others that it is not equipped to produce. Thus the total production of goods will be increased. The objections to free trade are generally that it does not aid local industry or make the nation self sufficient as a war precaution, and that it does not prevent unfair trade practices of other nations, such as dumping.

freight, the charge made for the transportation of goods by a carrier; the goods that are carried. A freight tariff is a schedule of the charges made by the carrier for the transportation of goods between various points. If the carrier is engaged in interstate commerce, the tariff must be approved by the Interstate Commerce Commission and made public if anyone desires to inspect it. The freight tariffs of intrastate carriers are subject to the regulation of the individual state.

funds, money or securities that can quickly be turned into cash. In business, funds usually refers to money only. In the singular the term refers to a particular sum of money or a bookkeeping account for a special purpose, such as an accident fund, retirement fund, redemption fund, sinking fund, endowment fund and guarantee fund.

future, a contract to deliver specified goods or securities at a certain time. An important part of a commodity market, especially grain exchanges, consists in dealings in futures.

general store, a retail store that is not departmentized but carries a variety of nonrelated goods, usually operating in small towns, villages and rural regions but sometimes in the suburbs and industrial sections of large cities. Hardware, dry goods and groceries are the lines most commonly carried.

good will, the immaterial assets of a business, consisting of the value of the business connections and the value of the probability that present customers will continue to buy from the same business or continue to buy an article bearing the trade name of the business. Good will is a proper accounting item and may be sold for large amounts. However, the accountant should be careful to limit carefully the amount carried on the books as good will.

Gresham's Law, the general truth that where two kinds of legal money of unequal value are in circulation and both are available for payments, the bad money tends to drive the good money out of circulation. This law is named after the commercial adviser to Queen Elizabeth, Sir Thomas Gresham, who was credited with having discovered the law. But it is now known that he was not the first to formulate it, and in ancient Greece Aristophanes pointed out a similar phenomenon. The explanation of this is very simple, merely that the people naturally prefer the good money and keep it, but any of the bad money that comes into their possession is spent at the first opportunity. As everyone is trying to keep the good money, this good money will disappear from circulation, and the bad money will become the general currency. The good money will be hoarded, or it may be desired for payments abroad. If the good money is metal, it will be profitable to melt it down for the metal.

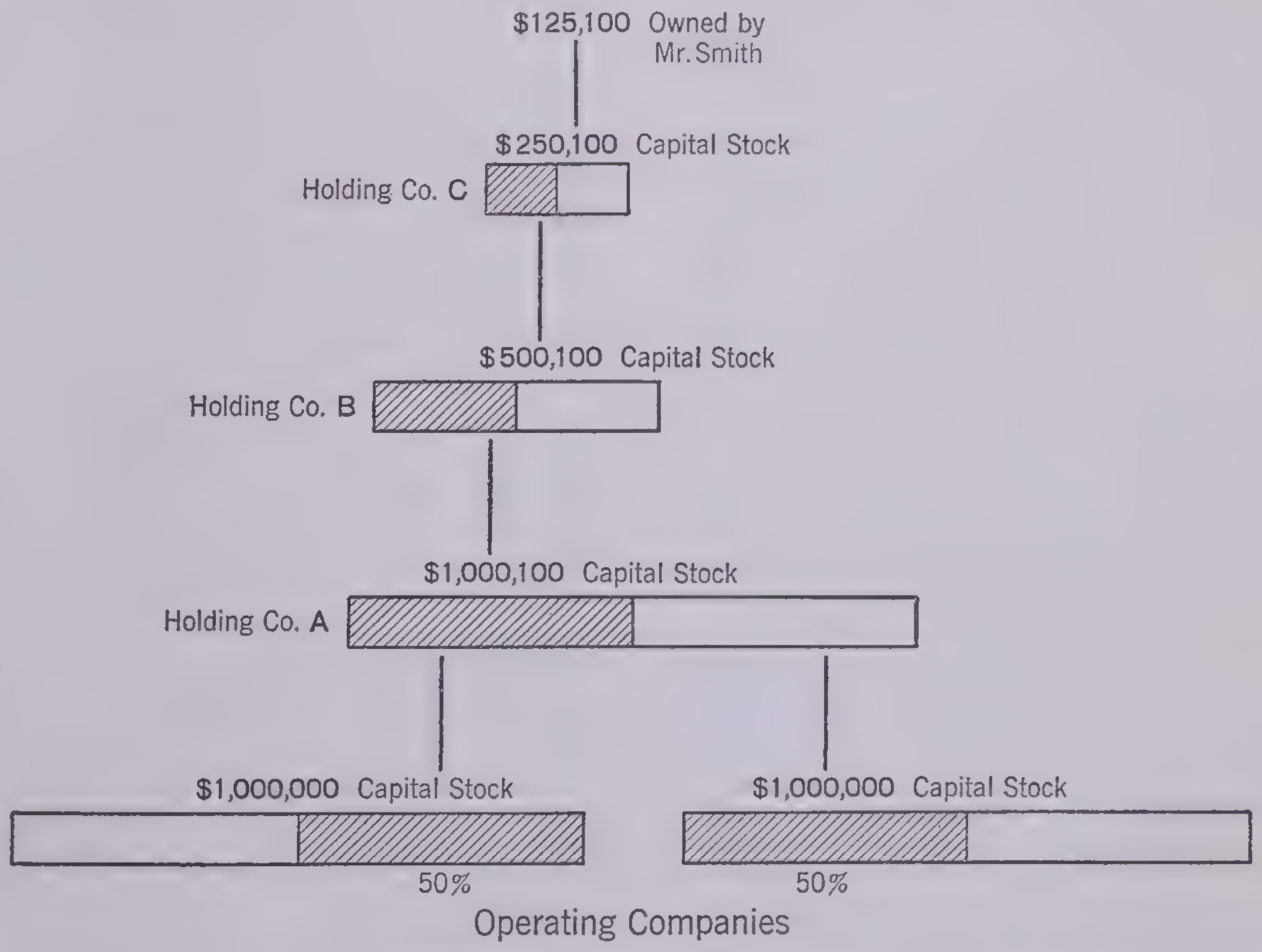
group insurance, see *insurance*.

hedging, buying and selling at the same time with different dates of delivery, usually to guard against loss from a change in price. Hedging is a form of future trading in commodities, especially grain and most particularly cotton. Profits in the cotton-manufacturing business in the United States have often been described as being derived more from fortunate hedging in the market than from efficient production methods.

holding company, a company with share capital that owns securities of one or more other companies. A *pure holding company* is one whose assets consist almost entirely of the securities of other companies. The general purpose of a holding company is to acquire a controlling interest in other corporations. A holding company is usually a corporation, but in Massachusetts it is a trust.

By statute in New York (1811), Illinois (1849), Maryland (1860) and Pennsylvania (1874) the power to own stock in other corporations was expressly excluded in company charters, although some companies had received the power to hold stock in others by special legislative action. In 1888 New Jersey made possible the formation of a holding company, and by 1929 39 states had expressly authorized intercorporate stockholding. Of 573 active corporation securities listed on the New York Stock Exchange in 1928, 92 were pure holding companies, 395 were both holding and operating companies, and 86 were purely operating companies.

The holding company attempts to acquire control of an operating com-



Pyramiding of Holding Companies

A diagram showing the possibilities of control of two large operating companies through the comparatively small investment of $125,100 by Mr. Smith. Since any amount over 50 per cent of the voting stock is sufficient to control a company, Holding Company A is organized with a capital of $1,000,000 and with this capital 50 per cent of the stock of each of the operating companies is purchased. Thus Holding Company A can control the two operating companies. Since ownership of 50 per cent of the stock of Holding Company A is sufficient to control it, Holding Company B is organized with a capital of $500,100, which is used to purchase 50 per cent of the stock of Holding Company A, so that Holding Company B now controls Holding Company A, which in turn controls the operating companies. Then Holding Company C can be organized to hold the 50 per cent of the stock of Holding Company B. If Mr. Smith then buys half of the stock of Holding Company C with his investment of $125,100, he can then control Holding Company C, which in turn controls Holding Company B, which controls Holding Company A, which controls the operating companies. Thus with an investment of $125,100 and the proper organization Mr. Smith can control two operating companies with a combined capital of $2,000,000 pany with the least possible cash investment. The cash investment can be lessened by pyramiding holding companies, that is, by creating one holding company to hold the stock of one or more operating companies and then a second holding company to control the first holding company. Suppose, for example, that there is $1,000,000 worth of voting stock in the operating company. To control this company, $500,100 would have to be invested to give enough votes to insure the election of the desired directors. If a holding company is created with $500,100 of voting stock, this holding company can be controlled by a cash investment of $250,100. Then the holding company buys the $500,100 worth of stock in the operating company and controls it, and the $250,100 investment in the holding company gives the control of the holding company and through it the control of the operating company. If a second holding company is created to control the first, only $125,100 need be invested. Thus by an investment of $125,100, the million-dollar operating company can be controlled. Since all the stockholders do not vote, an even smaller proportion of the stock need be owned for control, and the actual investment in the second holding company may be even less than $125,100.

Some holding companies have been scrupulous not to take advantage of their powers, but others have used them as a means of unscrupulous manipulation. Often there have been sales of assets from one subsidiary to another to create a profit benefiting the holding company, routings of profitable business to one subsidiary in preference to another, concealment of losses or the creation of nonexistent deficits. The interests of minority stockholders are not too well protected in any corporation, but through the holding company setup the rights of the minorities in the operating companies become almost nonexistent.

hypothecation, a pledge as security for an obligation without title or possession or right to title or possession but merely the right to have the property sold upon default to satisfy the claim. The most frequent case of hypothecation is where a ship is pledged for the future payment of a loan for the use of the ship.

improvements, changes in property to render it more useful, pleasant or valuable. Improvements include buildings or structures on the land, roads, curbs, sidewalks, drainage ditches or drains, sewage systems, gardens and water mains.

income, the benefits derived from wealth and the services of others. Income includes the cash dividend received through the ownership of a share of stock, the shelter and comfort received from a home, the services rendered by a teacher and the services given by a railroad. The value of the income is the sum of the values of these various benefits and services received, and for practical purposes it is usually expressed in money. Income in the economic sense is sometimes called *real income* in contrast to *money income*. Money income consists of the dollars received, but real income is the goods and services that can be bought with the money income. If the cost of living should go up and a worker receives the same wage, then his real income is lower, for with the same amount of money he is able to buy less goods and services.

increasing return, a condition where increased production results in increased profits on each unit because the cost of producing each unit has decreased.

independent, in retailing a store controlled by its own individual management as distinct from a chain store or a branch store. In production the same term is used of a manufacturer, miner or oil producer who is not connected with a dominant group.

index number, a figure showing the change or variation in a certain activity or relationship. One of the first of such indices was a price index showing the rise and fall in prices. Index numbers are now prepared to show changes in employment, business activity, cost of living, the production of various important industries and so forth. An index number is usually based on an estimated normal that is called 100. A general decrease in activity would be shown by a proportionally lowered index number, and a general increase would be shown by a proportionally higher index number. For example, if the prices of all commodities increased 20 per cent over a normal base, the index number would be 120.

individualism, a doctrine stressing the rights, desires and needs of the individual in contrast to those of the state or the people as a whole. The word itself and the idea that it stands for is modern and came with the Industrial Revolution. The physiocrats in France and Adam Smith in England urged that business be let alone and that the government should not interfere with it. However, the government has always had some hand in business activity, especially through taxes, tariffs and labor and industrial regulation. With the development of the modern economic structure, governments have been forced to take an increasing part in the regulation and control of business.

industrial union, see *union* and *craft union.*

inflation and deflation, the increase of the money in circulation beyond the needs of business and the decrease below the needs of business. Inflation results in a rise in the price level, and in terms of commodities money becomes worth less. Deflation has just the opposite result, and prices fall. Major instances of inflation are connected with government finance in France and Germany during the World War and after. In both of these cases of rapid inflation, after the beginning of the process prices rose more rapidly than the increase in the currency, and the price changes became largely the cause of the inflation rather than a result. There is no doubt of the evils of rapid inflation. Although at first there is a stimulation of business activity, if the rapid inflation continues, the result is financial collapse. If the inflation is mild, then those with more or less fixed money incomes suffer because their money buys fewer commodities as the inflation continues. A rapid deflation also results in hardship because it lowers prices and contracts business activity.

instalment selling, a transaction on credit that gives the buyer immediate possession of a purchase before payment is complete under a contract that provides for future payment. Usually ownership is withheld until the payments are all made. The *partial-payment* or *deferred-payment* plan has played a great part in the introduction and wide sale of expensive units such as automobiles, residences, electric refrigerators, oil burners and encyclopedias. Furniture, wearing apparel and many other lines of goods are sold on instalments, often by distributors who specialize in this method with or without financing by commercial credit companies.

insurance, the elimination of the risk of a large loss by the payment of a small known cost. This is done by having a large number of individuals who are exposed to similar risks contribute premium payments to a common fund sufficient to indemnify the individual for his loss. For example, anyone engaged in shipping faces the risk of having his ship sink and thus incurring a large loss. If all the shippers contribute to a common fund a sufficient amount to indemnify the owner for a ship that is lost, then every ship owner will have an annual small cost—the premium—instead of the possible large loss that would result if his ship sank and was not insured. For an insurance system to work there must be a large number of individuals incurring the risk, and the risk must be of such a nature that the probabilities of its occurrence can be accurately determined.

Marine insurance was the earliest form of insurance, and the first known policy was issued in 1583. From this type life insurance and fire insurance developed and were the only forms down until recent times. *Life insurance* has as its purpose the protection of a man's family and makes provision for them in case of the man's death. *Fire insurance* is merely insurance against loss from fire. *Group insurance* is insurance taken out by an employer for the benefit of his employees, both parties usually contributing a part of the premium. Group insurance generally insures against death and sickness and also provides for old-age pensions. In recent years this type of insurance has been taken over by the Government, especially under the provisions of the Social Security Act. In order to meet modern business conditions insurance against all sorts of risks and numerous modifications of the principal older types of insurance have been developed.

integrated stores, large-scale retailers, each with many parts closely related and under unit control. The general term includes:

(a) department stores, because each department is in essence a shop in itself, and the departments are integrated in one location and under one control;

(b) the retail stores owned and managed by certain large mail-order houses, for example, Sears, Roebuck & Co. or Montgomery Ward;

(c) chain stores with centralized purchasing and control of personnel, policy and stock.

The integrated stores have the advantage of specialization and division of labor, large-scale operations that make possible the employment of high-grade executives, large purchasing power and other buying superiority, opportunity for research and more economical financing. The big-scale operations have certain disadvantages—notably, heavy expense for service and nonselling employees in department stores and overmechanized operation in chain stores.

interest, a payment made for the use of capital and usually calculated as a percentage of the principal or amount borrowed. The reason that interest can be paid is that capital is productive, and the borrower of capital expects to produce enough through the use of this added capital to pay the interest charge and also make a profit. A widely accepted theory of interest, formulated by the Austrian School, is called the *time-preference* theory or *agio* theory (from an Italian word *aggio,* exchange or ease). It is based upon the fact that people prefer present goods to future goods, and therefore the owners of capital must receive some premium to persuade them to lend capital and put off its enjoyment until some future time. Many additional factors of the problem have been suggested, and numerous modifications have been made in the basic theory. The supply of capital in a community will depend upon such factors as the general surplus of production over consumption, the distribution of the wealth in the community, the social habits of saving and the rate of interest being paid in the community. The demand for capital in the community will depend upon the wants of the people, the rate of industrial and agricultural development and the interest rate that is being demanded.

Gross interest or interest as used in the general business sense includes two elements besides the economic interest that has just been described. One element is *risk.* If there is a risk that the loan will not be repaid, the interest rate will be increased accordingly; and if the credit of the borrower is so good that there appears to be no chance of default, the rate of interest will be lower. The other element is that of administrative costs. The interest rate charged must also include the cost of investigating and collecting the loan, the cost of the bookkeeping and various other administrative costs.

international trade, trade between individuals of different nations or in some cases, in the Soviet Union, for example, the trade between different nations. International trade as it has generally been carried on is merely an extension of the trade within a nation.

There are some differences, however, for in international trade there are variations in the monetary systems used, in languages and customs and in the mobility of the factors of production. International trade enables us to obtain articles that can be produced cheaper abroad and other articles that cannot be produced at all in the United States. The tendency for a nation to import those goods that other nations can produce more cheaply is called the *law of comparative costs.* For example, cotton textiles can be produced cheaper abroad, and there is the tendency for us to import them. The United States can produce automobiles cheaper than foreign nations, and there is the tendency for the foreign nations to import our automobiles. This situation is subject to tariff restrictions, for if there is a high tariff, it may more than account for the difference in the cost of production. The tendency for a nation to import those goods that it cannot produce itself is called the *law of absolute costs.* Thus the United States imports such articles as silk, tea and coffee that it cannot produce at home.

International trade does not consist only of merchandise, which is called a visible item, but also of many invisible items, which generally consist of international financial transactions. Movements of capital and the payment of interest on capital, remittances from persons living abroad to persons in their home country, international specie movements, expenditures of tourists abroad and intergovernmental loans constitute the principal invisible items of international trade.

If a nation exports more goods to other nations than it imports, that nation is said to have a *favorable balance of trade.* But if a nation imports more goods than it exports, it is said to have an *unfavorable balance of trade.* These terms refer only to merchandise, and it would be more correct to say favorable and unfavorable merchandise balances. When we include the visible and the invisible items in international trade, a nation's trade must balance, because for all the things going out there must be something coming in to pay for them, even if it is only a payment in the form of credit extended. Under conditions of free trade and gold standards, even the visible items of trade must balance over a period of time. The general theory is that if a nation exports more than it imports, this excess will be paid for in specie. Specie flowing into the country will tend to increase prices and costs and therefore restrict exports and stimulate imports. This process will be carried on until a balance is established.

The general economic theories of international trade have all been formulated on the premise of free competition between countries and free competition within a country. This condition does not exist and never has existed. Tariffs create a barrier to international trade and are erected for the specific purpose of encouraging the home industry and keeping out foreign products. The development of government trading in Russia and to a lesser extent in Germany creates conditions entirely different from those assumed in economic theory. Where governments trade as units on behalf of their nationals they do not necessarily buy according to the laws of comparative or absolute costs, more often they pursue political and national economic interests.

Since the World War the efforts of almost all Powers to be nationally self-sufficient have greatly decreased the volume and the importance of international trade.

inventory, the raw materials, partially finished goods and manufactured products of a business that are intended for sale; or the bookkeeping statement listing these articles and their value. The value of the goods in the inventory is usually carried at cost or market value, whichever is lower.

investment, the act of directing the employment of funds into capital or claims on income. Investment includes the use of funds to build or maintain capital, such as loaning money to a manufacturing company to buy new machinery; and it also includes the purchase of durable consumptive goods, such as a picture or piece of sculpture. Investment also includes the idea of future benefit. A man who loans his money is depriving himself of its use at the present time, in order that he may have both the money invested and an additional sum at some future time.

The amount of funds that a community has available for investment is the excess of income over consumption. All this fund may not be invested, as some individuals may prefer to hoard their funds rather than invest them. The general considerations in making an investment are the yield that will be received, the ease with which the investment can be sold and the safety of the investment. But it is not possible to realize all of these, for when the safety of an investment is high, the return is usually low; and when the yield on an investment is high, it is generally not a very safe investment.

The complexity of the modern business structure has led to the rise of investment banks whose function is to receive funds from individuals and make various investments with these funds. In order to protect investors the government has passed a large number of regulations and has established the Securities and Exchange Commission.

invoice, a statement of the amount, type, quality and price of goods delivered, usually sent to the buyer with the goods. Invoice is merely another form of the word *envoi,* a sending. The invoice is not a bill or a request for payment, it is merely a statement as to the goods delivered. Foreign invoices should be certified "True and Correct." An invoice register is a book in which the invoices of goods received are registered.

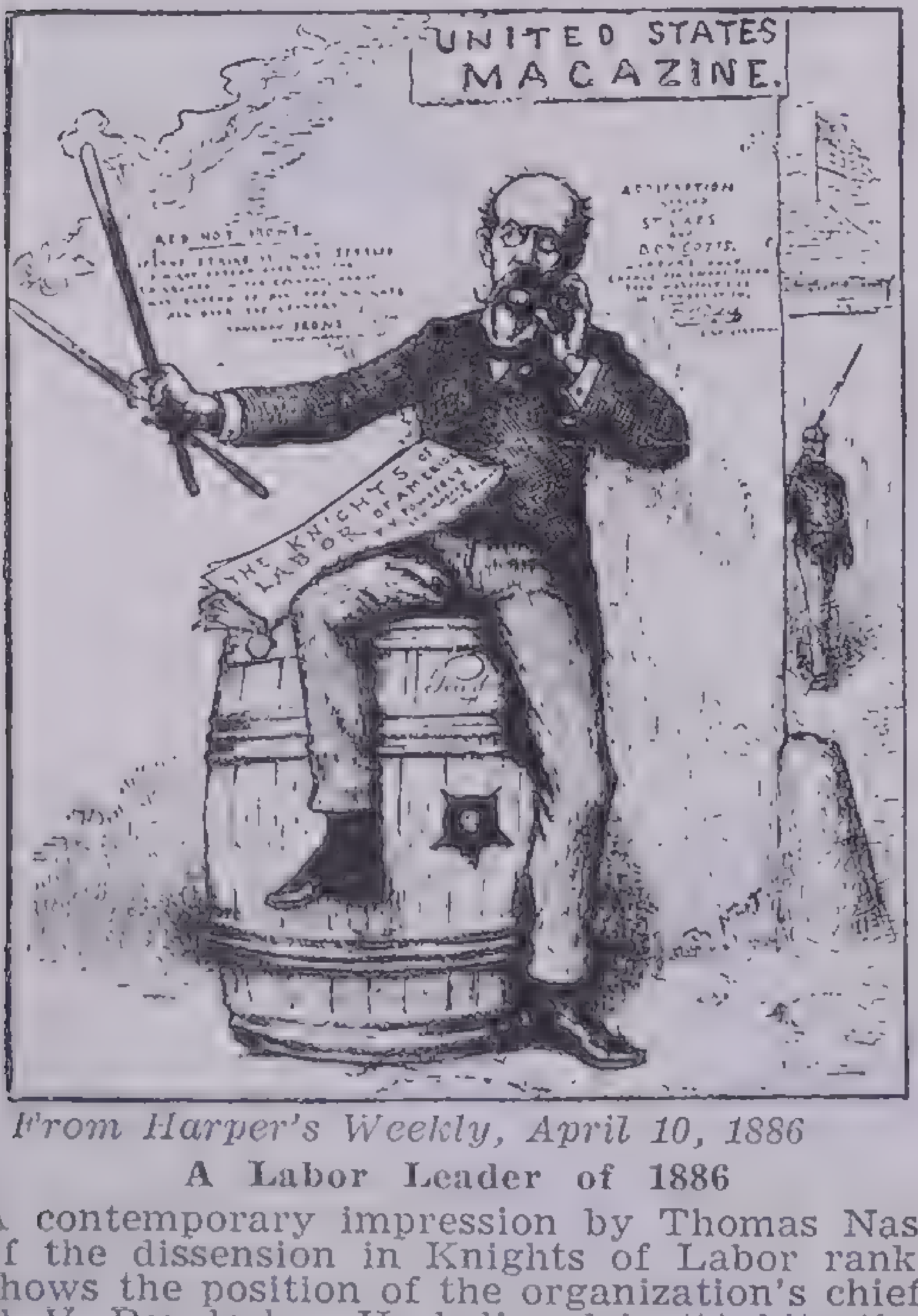
I. O. U., an abbreviation for the words "I owe you." When sufficient additional information is added and signed, the I. O. U. operates as an admission of the debt or memorandum of the obligation. The I. O. U. is not negotiable, does not carry interest and does not come under the Negotiable Instruments Law since it is not an unconditional promise to pay.

jettison, throwing overboard a part of the cargo or the ship in order to save the rest. It is sometimes necessary to jettison some of the cargo when the ship must be lightened to weather a storm or to get off a shoal. The loss due to jettison is born proportionally by the owners of the ship and the cargo.

jobber, a middleman who buys from importers or large producers and sells to retailers. On the London Stock Exchange a jobber is one who deals only with members of the Exchange. Originally the word meant dealer in odd or job lots. Now it means almost the same as wholesaler.

journal, the book of original entry from which the accounts are posted into the ledger. The entry in the journal is a detail description of the transaction. In modern bookkeeping the tendency has been to dispense with the journal and make the entries directly into the ledger. The custom of making a formal and lengthy entry of the transaction in the journal has largely disappeared.

Knights of Labor, an American labor organization important in the last quarter of the 19th century and founded upon the principle of "one big union" rather than independent trade unions. The Knights of Labor included all classes of workers, all races and creeds, farmers, shop foremen and even business men who were sympathetic with labor. In place of the existing isolated craft unions, the Knights of Labor attempted to organize one solid union. It was organized in Philadelphia in 1869, and Uriah S. Stephens was its early leader. At first it was a secret organization, but after secrecy was abandoned in 1891, the Knights grew rapidly. The Knights of Labor aided various groups whether they were organized or not and gained great prestige in winning important strikes on the Union Pacific in 1884 and the Wabash railroad in 1885. But it lost the Missouri Pacific strike in 1886, and this blow was the beginning of its fall. By 1894 the Knights of Labor was of little importance although the organization continued until 1917. The Knights of Labor never gained the support of the locally organized unions in the skilled trades, for these wished to retain their independence and gave their support to the American Federation of Labor.



From Harper's Weekly, April 10, 1886

A Labor Leader of 1886

A contemporary impression by Thomas Nast of the dissension in Knights of Labor ranks shows the position of the organization's chief, T. V. Powderly. He believed in "Arbitration instead of Strikes and Boycotts—Labor's only chance for emancipation," while most of his followers wanted more direct methods

labor, productive work, physical or mental. Labor is one of the main factors of production. Although the machine is replacing human labor in industry, still there can be no production without human labor at some stage of the process. In early stages of civilization labor is looked down upon as fitting only for slaves and women, but in our modern society labor has become almost a privilege. Some schools of economic thought have considered labor as a mere commodity, no different from other commodities or other factors in the productive process, such as capital and land. However, labor is completely different and unique because those who labor are human beings. They are not lifeless objects without feeling or power. Since the whole purpose of the economic process is to benefit man, the welfare of labor must receive primary consideration, and labor must be regarded in terms of human beings.

laissez-faire (from the French *laissez-faire, laissez-passer,* literally, let it go, let it pass), noninterference by government, letting business alone. The expression was probably first used in France by the Sieur de Gournay (1712–59), one of the founders of the physiocrats, and it became a central idea with the physiocrats in the 18th century. The physiocrats rebelled against the system of regulation of industry and argued that since manufacture and commerce do not produce wealth but are only instruments of distribution, they should not be taxed or hindered. This physiocratic idea that a free and unhindered economic system was in accord with the natural order of the universe was adopted and elaborated by Adam Smith. He did not use the term *laissez-faire,* but it was paramount in his doctrine. Adam Smith argued (1776) that the individual working for his own gain would strive to produce the best and most useful articles. Competition would force the individual to do this in order to survive and prosper. Therefore, the greatest production of useful goods would result when each individual was allowed to follow his own dictates. Smith declared that this was in harmony with the natural order. J. S. Mill in his writings (1848) gave wide currency to the term *laissez-faire,* and more recently it was associated with the Manchester School in England.

The *laissez-faire* doctrine at first applied not only to government intervention but also to combinations of enterprises that aimed at a control of prices or production. This application of the doctrine was soon abandoned, and with the development of the modern economic system the *laissez-faire* doctrine has broken down in many particulars. Tariff barriers are direct government aids to industry and contrary to the noninterference idea. The development of large industrial organizations, powerful enough to exert a considerable control over prices and production, has provoked a demand for state intervention. The opponents of *laissez-faire* insist that Adam Smith was wrong, for the greatest profit does not always result from serving the community. A high profit may result from the high-pressure selling of an inferior article, from the creation of an uneconomic demand or from the exploitation of labor. Today the advocates of the *laissez-faire* doctrine oppose the attempts of government to control and regulate business activity.

land, all the natural resources not produced by man. To the economist the term *land* includes not only the soil on the earth's surface but the rivers and lakes; the natural resources under the surface, such as iron ore, coal and petroleum; the climatic conditions; and the animals and game on the land. Although some economists do not classify land separately but regard it as a type of capital, land is generally regarded as one of the factors of production. Land is the basis of all production; and when it is combined with labor and capital, the world's wealth is produced.

landlord, an owner of land and improvements who rents them to others. The landlord pays the taxes and assessments, but repairs are a matter of agreement between the parties.

layout, a rough sketch or plan, especially in advertising, used to show the general arrangement of the advertisement and give a working plan to the printer.

ledger, the essential book in double-entry bookkeeping in which are kept the records of the business transactions classified into various accounts. Under the system of double-entry bookkeeping each transaction of the business is shown by two entries in the ledger—one a credit under a certain account and the other a debit under another account. The ledger does not have to be a bound book; it is often a loose-leaf book or a card file.

letter of advice, a letter containing notice or special information, usually from a consignor to a consignee, from an agent to a principal or from a drawer to a drawee of a bill of exchange. It is customary for the drawer of a foreign bill of exchange to send a letter of advice to the drawee giving notice of the drawing of the bill and often containing other instructions or explanatory matter.

letter of credit (L/C), a letter from a bank, banker or mercantile house, addressed to an agent or correspondent, requesting that credit be extended to the bearer for a certain or unlimited amount. The amount advanced is charged to the account of the drawer of the letter, or some other arrangements for payments are made in the letter of credit. Letters of credit are commonly used by travelers. The traveler pays the specified sum to the bank, and a letter of credit is issued for the amount paid. When he is traveling, the holder of this letter of credit presents it to agents or correspondents of the issuing bank, the requested funds are given, and the amount is noted on the letter of credit. A small percentage of the amount of the letter of credit is paid to the issuing bank for the service.

liabilities, the amounts owing or the debts of a business or individual. The liabilities are carried on the right-hand side of the balance sheet in contrast to the assets, which are carried on the left side. *Contingent liabilities* are obligations that will only arise under certain conditions. For example, if a manufacturer sells machinery with a guarantee, under ordinary circumstances there will be no obligation connected with this transaction; but if the machine should be defective, the proprietor will have to repay the buyer. The usual method of providing for contingent liabilities is for the accountant to set up a special reserve for contingencies.

limited company, a business association in which the liability of the stockholders is limited. This liability is limited to the amount paid for the stock, but in the case of "limited" banks of issue only the unpaid portion of the shares is limited, and the liability of the shareholders is unlimited in respect to the notes issued. In contrast a company of unlimited liability is one in which the owners are unlimitedly liable, and their entire personal estates may be taken to satisfy the debts of the company. English companies that are limited usually have the abbreviation "Ltd." as a part of their official style after the name of the company. In the United States similar companies are called corporations.

liquidation, the process of converting property or securities into cash. A business in liquidation is being closed, and its property and good will are being converted into cash for distribution to creditors and owners. In a stricter sense the term is used for the process of finding the actual value of uncertain obligations.

Lloyd's Register, in full, "Lloyd's Register of British and Foreign Shipping," a publication containing the names and description of all British and certain foreign ships with a classification according to seaworthiness of the ship. Ships intended for classification in the register are built under the inspection of Lloyd's surveyors. A fee is charged for listing in the register.

loan, anything given to another on the condition of return or repayment. If money or fungible (that is replaceable) goods, such as grain, are borrowed, the identical property is not returned but similar goods or a similar amount of money. When other kinds of property are the loan, the exact same article is returned unless it is stipulated otherwise. In medieval times personal loans for consumptive purposes were made without any interest charge because the Church opposed interest as being usury. Today loans are made at a stipulated rate of interest.

Call loans are payable on demand. *Bank loans* to individuals are regulated by the government in many particulars, and it is commonly the law that a bank may not lend to any one person an amount more than 10 per cent of the bank's capital stock, subject to certain exceptions.

lockout, a suspension of work ordered by the employer, usually for the purpose of forcing the employees to agree with the management in an industrial dispute. The lockout is like a strike in its effect, but it differs in its cause: the suspension of work is caused by the employer in a lockout, and it is caused by the workers in a strike. Lockouts have been used in only a very few cases of industrial disputes: from 1916 to 1921, when separate records were kept, there were lockouts in only 3 per cent of the industrial disputes recorded. The employer can usually achieve better results in a labor dispute by dismissing the leaders of the workers or, if there is a strike, by a publicity campaign to bring the workers back to their jobs.

Lombard Street, a street in London on which many banks are located, the banking center of Great Britain. Lombard Street in London occupies a similar position to Wall Street in New York. The Jews of Lombardy (north Italy) were famous as bankers early in the 9th century. At the beginning of the 14th century many Lombard Jew goldsmiths and bankers had settled in London, and this street was named for them.

long and short haul, carrying freight over long and short distances. Proportionally unfair charges for long and short hauls on railroads and other common carriers, discriminating against the shippers for short distances, led to the passage of the Mann-Elkins Act in 1910 forbidding greater charge for a short haul than for a long haul and giving the Interstate Commerce Commission additional powers.

luxury, an excess of the consumption of goods or an excess of money expenditures. Luxury has been condemned by Christian teachings and by cultures as far apart as that of ancient Sparta and modern Japan.

Some economists see a social usefulness in luxury consumption because it brings money to the people. But most economists deny that luxury has any social usefulness, and Alfred Marshall's distinction between *artificial wants* or luxuries and wants that are creative of new activities is a basic idea in his economic principles. Under present conditions much luxury expenditure is not as socially productive as it should be. If a millionaire builds a $5,000,000 yacht, it brings employment to a large number of workers. But from the point of view of society this $5,000,000 could be much more advantageously spent if it were used to build a hospital, a library or a new apartment in a slum-clearance project. These buildings would provide employment, and in addition they would be socially useful as well.

The demand for luxuries was formerly confined primarily to the wealthy classes, but with the mass production of luxury goods the use of luxuries has spread to all classes. In many cases an article that is a luxury in one generation becomes a necessity in the next. Electric lights, running water and telephones have all passed from the luxury class to the necessity class in a few years. The arts as a general class are luxuries, and their support in the past has depended upon the wealthy classes. With the restriction of wealth on one hand and the growing demand for luxuries by the common people on the other, the support of the arts is gradually becoming the province of the Government. In a communistic state, such as the Soviet Union, the arts are completely supported by the Government. In the United States the Government has supported painters, sculptors, actors, authors and various other classes contributing to the arts; the theater, art galleries, musical concerts and art schools. It remains to be seen whether the support of the arts by the Government will be more socially useful than support by the wealthy classes.

mail-order house, a commercial establishment, retail or wholesale, that receives its orders and makes its sales by mail. Many retail stores secure a part of their orders by mail but do most of their business over the counter. During the last generation several mail-order houses (notably Sears, Roebuck & Co. and Montgomery Ward) have added to their operations by mail a system of chain stores. The tendency is away from mail-order selling as an adequate and profitable method by itself.

The typical mail-order retailer secures orders through the distribution of catalogues in which goods for sale are described and pictured. Money-back guarantees are a fundamental of mail-order selling, and this practice built up a strong confidence in the mail-order houses, especially among patrons in rural districts where there were poor distribution facilities. The growing use of the automobile to carry rural buyers to fair-sized trade centers somewhat hindered the marvelous advance of the mail-order houses. They benefit by their huge purchasing power and by large-scale efficiency methods in handling orders with great speed and mechanical accuracy. The mail-order business for the most part has been on a cash basis, but in recent years installment selling has been introduced for more expensive units of purchase, especially those that are sold on time payments through other channels of trade—electric refrigerators, oil burners and such goods.

managed currency, see *compensated dollar.*

manufacturer's agent, a broker who sells for one manufacturer or more, handling related but noncompeting lines of goods, usually on contract and in an exclusive territory. Sometimes the selling agents sell all the production of their principal, but usually the manufacturer's agents (as distinct from the selling agent) do not handle the entire output of the manufacturers or mills that they represent; they are limited in their selling territory and in their power to set prices and terms. Unlike factors the manufacturer's agents do not finance the mills, nor do they perform any other function outside of selling.

margin, the partial payment of cash or securities for a purchase of stock made for the client. Speculators are frequently unable or unwilling to pay in full for the stock purchased. They can pay a part of the price to the broker—the margin—and the broker buys the stock and himself lends the remainder to the client from his own funds or goes to the bank and borrows the necessary amount, pledging the stock that has been purchased for the customer as security. The minimum amount of margin required is set by the Securities and Exchange Commission, but brokers may require an additional amount depending on the lack of stability of the market or the stock and the credit of the client. There is a similar practice on the commodity markets.

marginal utility, a basic economic doctrine that explains price on the basis of use-value, which is in turn dependent on scarcity. The key to the whole doctrine is the common fact that commodities are valuable in inverse relation to their available supply. Gold is more valuable than iron because it is scarcer. If gold were discovered or produced in great quantities without any change in the demand, then the value of gold would decline. Earlier economists discarded this use-value because it did not seem to explain the difference in value between water and diamonds, which was the famous example used by Adam Smith. These earlier writers declared that the value was determined by the labor cost of production. Although many writers had been aware of the marginal-utility doctrine, the founders of the modern utility school of thought were the Englishman, W. Stanley Jevons (1835–82), the German, Karl Menger (1840–1921) and the Frenchman, Leon Walras (1834–1910), who all wrote about the same time but worked independently and belonged to different European cultures. The chief American exponents of the doctrine of marginal utility have been J. B. Clark, Simon Patten, Frank A. Fetter and Irving Fisher.

The marginal unit is the least important unit that is employed in production; and since all units are the same, and the most important unit can be replaced by a least important unit, both units will have the same value as the least important unit. This concept of the use-value of the single unit of a commodity, determined by the least important unit that is used, is now generally referred to as marginal utility.

market, an ideal area within which there is free competition and complete knowledge of buying and selling conditions so that the forces of supply and demand can converge to establish a single price. The market may be a single place in a small village, or it may cover the entire world. Under present conditions the market for securities on the New York Stock Exchange is practically world-wide, since the prices paid for securities are telegraphed throughout the world, and the order of a man in London, Shanghai or Capetown can be executed in a few minutes. The theory of price based on a perfect market fails to express present-day conditions. The seller is not only anxious to sell his goods but he is also eager to maintain the price for future sales. Salesmanship and advertising not only facilitate the flow of goods but also create a changed demand for the future. Monopoly conditions cause an entirely different situation from the theoretical perfect market. Monopoly interests tend to set the price at a point that will return the greatest profit and they may even destroy goods or dump them in a foreign country in order to prevent a lowering of the price in the home market. Even the market for agricultural products, which has been a relatively perfect market in the economic sense, has recently changed with the development of farmers' marketing co-operatives and government regulation.

market index, a figure that indicates the relative capacity of different districts or regions (markets) to purchase and consume any goods or service.

marketing, all business activities involved in the flow of goods and services from production to consumption. *Selling* and *buying,* sometimes called *distribution* by businessmen, are only two of these marketing activities. The other activities are: transportation, storage, financing, risk bearing, standardization and market information. The whole world has a lively interest in marketing—or at least is vitally concerned in its operations.

The *producers* of goods, all manufacturers, farmers and others engaged in any form of processing, are financially interested in disposing of their products at a profit. All *consumers* are interested in getting the goods they want at the lowest possible price considering the services secured. Every producer is also a consumer—and so is every middleman. The middleman stands between the producers of goods on one hand and the consumers on the other and is the main factor in marketing. Even more than producer and consumer (if that is possible), the middleman's life, his livelihood and his living depend on marketing.

marketing research (or *market analysis,* a less satisfactory term), the study of all problems relating to the transfer and sale of goods and services from producer to consumer, including all the activities enumerated as parts of marketing in the definition of that term—see *marketing.* Advertising agencies, publishers of periodicals carrying advertising, commercial and industrial organizations—all were drawn perforce into marketing research. The U. S. government, especially the Department of Commerce through its Census of Business, various regional and state organizations and many universities and colleges are making constant contributions to the data of marketing study and to its technique. During the last generation several research organizations and foundations and many independent marketing counselors have developed the scope of marketing research by specific investigations.

mercantilism, a body of economic doctrine that arose after the decline of feudalism and influenced the government policy in France and England during the 17th century. Although mercantilism was attacked and discredited by Adam Smith (1776) and the followers of the *laissez-faire* doctrine, some of its ideas still survive today. Mercantilism seeks to have a nation sell more goods than it buys and through this so-called "favorable balance of trade" to increase the amount of bullion within the country, because, according to the mercantilists, this will increase the wealth of the nation. This economic school of thought supported a national economic policy as against the individual; favored free trade within the nation and tariffs to prevent the importation of foreign products. Adam Smith devoted about one-quarter of his *Wealth of Nations* (1776) to an attack on the mercantile policy, and the doctrine of *laissez-faire* largely supplanted the teachings of the mercantilists. Fundamentally, the mercantilists were in error, because it is impossible for a nation to sell more than it buys over a period of time, and because an increased amount of bullion within a nation would cause a rise in prices and act as a stimulation of imports and a check on exports.

merchandising, co-ordination between production or purchase for resale on the one hand and selling on the other. In large retail stores, especially department stores, a *merchandise manager* supervises the activities of buyers for each line of goods and sees to it that the quantity, quality and price range of goods bought are such as to assure maximum profits. From retailing the notion of merchandising—the function of buying (or producing) goods that can be sold quickly and profitably—has been extended to other branches of business.

merger, see *combination.*

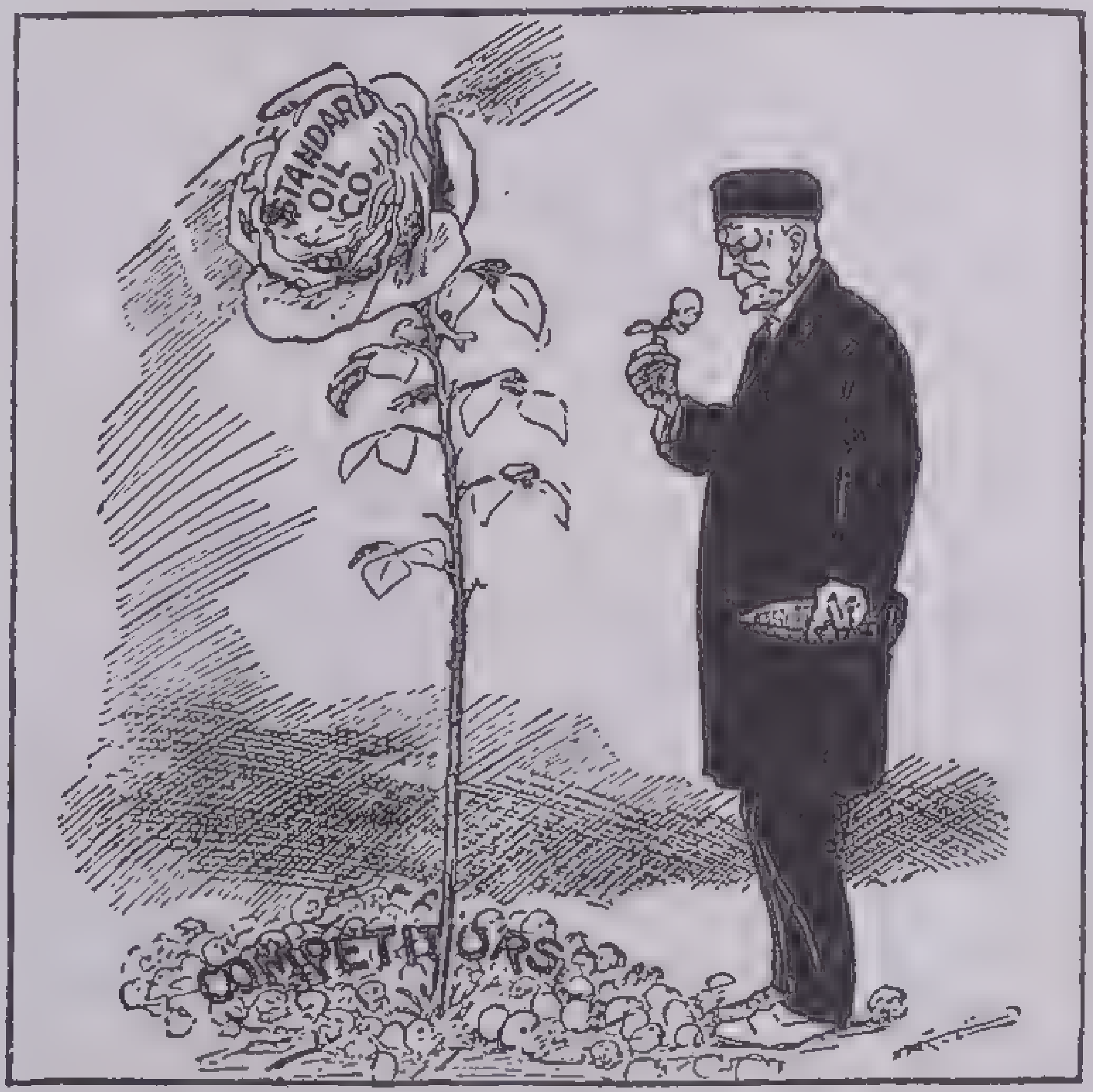
middleman, the person or business enterprise that intervenes in the process of sale either between the producer and the consumer or between a producer of an article and a manufacturer who does further work on the article to prepare it for consumption. The middleman is a salesman who buys an article not for his own use but in order to sell the article to the consumer. At the time of the rise of the capitalistic system the middleman was attacked as a parasite who rendered no economic service but merely forced himself between the producer and the consumer and added an unnecessary cost to the product that had to be paid by the consumer. In spite of this opposition the middleman continued to function, and it is now recognized that he does render an economic service. He does not make the article, but it is just as important to the consumer to have the article readily available for purchase as to have it manufactured. The typical middleman is the grocer who buys numerous groceries and performs a service to the community by having them available for sale. But the system is still condemned because it adds unnecessarily to consumers' costs. Sometimes two or three middlemen intervene between the manufacturer and the consumer. To simplify distribution and reduce its costs there has been a trend in certain industries toward selling direct to the consumer, and consumers have formed co-operative-buying associations to eliminate the middleman's profit.

money, any article that is generally acceptable as a medium of exchange by the people of a community. The earliest forms of money were commonly used articles of merchandise, such as cattle, grain, skins of animals, special kinds of shells, knives, bricks of tea, pieces of wampum. Precious metals such as gold and silver have been widely used throughout the world for money. As economic society progressed, the form of money changed and is still in the process of being changed. Old forms of money have become unsatisfactory, and new forms have taken their place. There are certain recognized attributes of good money. It must be generally acceptable as money. It must be small in size so that it can be easily carried from place to place. It must be uniform. It must be easily recognized. It must be durable and not wear out with handling. It must be easily divisible. It should also possess a stability of value. All these attributes of money are difficult to satisfy, and it has been almost impossible to find a money that has stability of value over long periods of time.

In addition to being a medium of exchange, money has other functions. It serves as a measure of value, a standard of deferred payments, a basis of credit and a store of value. Furthermore, there are different kinds of money. *Standard money* consists of articles such as gold or silver that are valuable in themselves and will be readily accepted by the community. *Representative* money stands for or represents the actual coin. If gold is deposited with the government, and paper money is issued to the extent of the gold deposited, and the right is given to exchange the paper money for the gold at any time, this paper money is representative money. *Convertible fiduciary paper money* is paper money backed partly by a deposit of gold or silver and partly by credit. If instead of the 100 per cent backing as in the case of representative money there is a smaller percentage, for example 60 per cent specie backing and a 40 per cent credit backing, and the holder of the paper money has the right to redeem the paper money for the specie at any time, that is convertible fiduciary paper money. Another type of money, the type in common use today, is inconvertible paper money or fiat money. This paper money cannot be converted into specie and is backed entirely or partially by the credit of the government.

Questions of monetary policy constitute some of the most important governmental and economic problems of the day. There is first the question whether the government should attempt to control various monetary matters, such as the price level and a stability of the value of money; and then there is the question how this can be done. These problems are exceedingly complex with possibilities of economic disaster, and they require the services of experts. However, nearly all governments are now attempting to control the economic destinies of the nation through monetary policy.

monopoly (from the Greek, alone selling, sole seller), unified control over supply or distribution so complete that it makes possible the regulation of price; an exclusive right, power or privilege of engaging in a particular business.



From the Literary Digest, May 6, 1905

Monopoly—A Full-Blown Rose

A cartoon based on a statement by John D. Rockefeller, Jr., that "The American Beauty rose can be produced in all its splendor only by sacrificing the early buds that grow up around it." This was a defence of the senior Rockefeller's policy of eliminating or absorbing smaller competitors in the petroleum industry

The essential feature of a monopoly is the elimination of competition. To obtain a monopoly or the advantages that come from a monopoly it is not necessary to be the sole seller or to have complete control. The required amount of control necessary to give monopolistic advantages varies in different industries and different situations. Monopolies are as old as recorded history. The Book of Genesis tells how Pharaoh, acting on the advice of Joseph, secured a monopoly of grain in Egypt. *Public monopolies* are a large class. They are enterprises that are considered to be so affected with public interest that they are regulated by governmental agencies for the public benefit. In order for these special enterprises to operate most efficiently competition is prohibited by law. Public monopolies are divided into two groups, *natural* and *legal.*

Natural public monopolies include the general public utilities—transportation, communication, water, electricity and gas supply. In these industries a natural monopolistic condition results from the necessity for a large capital expenditure and the operation of the industry on decreasing costs. For example, in the construction of a railroad the greatest part of the cost is in the purchase of land, construction of the roadbed and the stations. Once the railroad is completed there is comparatively little difference in the total cost whether one or 100 trains a day are run over the line. If 100 trains a day are operated, the cost of operating each train will be considerably less than if only one train a day is operated. It would be much more costly to have two parallel and competing railroads each operating 50 trains a day than to have one road operating 100 trains a day. This situation makes most public utilities natural monopolies, and for the public interest the government has taken over the responsibility of regulating and controlling these natural public monopolies.

Legal monopolies are those that are created and maintained by the government primarily for the purpose of obtaining revenue. Legal monopolies are created and enforced by decree of the legislature. In some states in America (Pennsylvania, for instance) the government has a monopoly of the liquor business. Some European governments have created legal monopolies in tobacco, cigarette paper, alcohol, matches and salt. In some cases legal monopolies are created for the general benefit and are operated at a loss by the government. The postoffice system is an example of such a public monopoly.

Industrial monopolies come into existence through controlling the supply (the control of the supply of oil gave rise to the Standard Oil Company), through agreements between various enterprises or through the accumulation of a great amount of capital. Although monopolies were generally encouraged in Europe before the World War, in the United States they have generally been opposed. Monopolies have abused their power by limiting production, keeping prices high and using unfair price-cutting methods to ruin competitors. Since by their nature they eliminate competition (which is generally held to be desirable), the government has passed various statutes in an effort to prevent industrial monopolies. These statutes have met with only a moderate amount of success in accomplishing their objective, mainly because the courts have adopted the doctrine that the law prohibits only *unreasonable* restraint of trade. Monopolies are extremely difficult to destroy. Many economists believe that they should not be destroyed. Competition itself leads to monopoly since it eliminates the unfit, and only the strongest survive.

A special kind of monopoly is that conferred by the government in the form of a *patent*. An inventor is protected by the government in a monopoly of his new invention for a limited time. The purpose of patent granting by governments is to stimulate invention. In some instances, however, patent laws have been used to prevent the development of inventions that might render invested capital obsolete.

Monopoly *price* is generally set to bring the highest return possible. This may mean that the production is limited, and only a few of the articles are sold; but these are sold at such a high price that they bring a greater total profit.

moratorium (Latin, delaying), an emergency act of a legislature or other official body suspending the payment of debts for a limited period. Moratoriums are enacted during times of financial crisis or panic and are always special emergency measures. On June 20, 1931, President Hoover proposed a moratorium on intergovernmental debts for one year beginning July 1. This moratorium took effect by agreement of the nations concerned.

national brand, a manufacturer's or producer's brand that has wide distribution as distinct from a private brand sold only locally or in a limited area.

note, see *promissory note.*

odd lot, a fractional amount of a security; less than 100 shares of stock or less than $1,000 in bonds.

open price, a price submitted to competitors before it is made known to customers. The intent was to prevent undue price cutting, which would injure all competitors in a trade association that exchanged price information. The courts have held open pricing illegal.

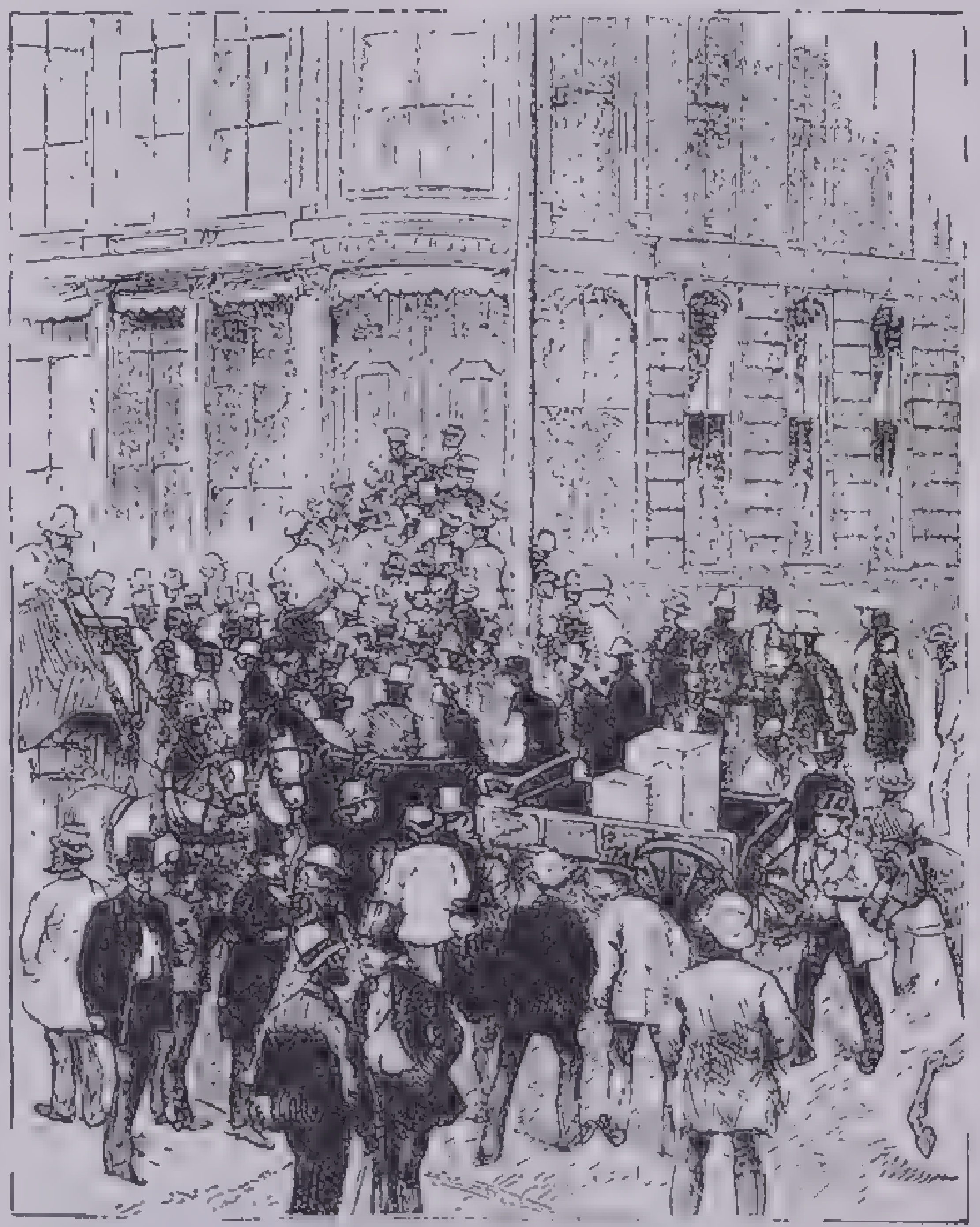
open shop, see *closed shop.*

option, an agreement to buy (receive) or sell (deliver) certain property or named securities on specified terms within a stated period of time. An agreement by the owner of a certain farm, that for $100 paid the owner will sell the farm to the other party for $10,000 at any time during the next year, is a typical option.

order, a direction or request made in business; specifically a direction to a stock broker to buy or sell certain securities or any instructions to transfer or deliver goods.

overhead costs, costs of production that cannot be traced directly to particular units in the productive process. In a textile mill the costs of raw materials and of labor can be directly traced to units of production, and it can easily be calculated just how much raw material and how much labor was necessary to manufacture a certain amount of cloth. But such costs as the clerical staff, insurance on the plant, salaries of executives, interest paid on securities, taxes, rent and advertising cannot be directly apportioned to units of cloth produced and are called *overhead costs.* Overhead costs should not increase proportionately as operation is increased to full capacity. If production can be increased 10 per cent and overhead costs increase only 3 per cent, then the resulting profit from the business will be increased.

overproduction, a volume of production too great to be consumed. From the social point of view there can be no overproduction as long as any person that desires the article manufactured is without it. In this scale there can never be an overproduction of shoes as long as there is any person who lacks shoes, there can never be an overproduction of wheat as long as anyone is hungry, there can never be an overproduction of houses as long as anyone needs a home. But from the business point of view overproduction exists when there is an excess of actual production over actual consumption. This point of view does not consider whether people need the article but whether they buy it. Overproduction results when there are more goods produced than can be sold. In this sense overproduction is closely related to the business cycle and is one of the factors that brings on the stages of crisis and depression. Overproduction may be caused by unusually good crops, cultivation of additional land, more intensive cultivation, the expansion of industries and the invention of new processes. Or consumption may be decreased by a change of fashion, a saturation of the demand, emigration from the locality, excessively high prices and a loss in purchasing power of the people.



From Harper's Weekly, October 11, 1873

A Run on a Bank

This old drawing describes one of the phases of the panic of 1873

panic, a sudden widespread financial fright in which there is a wild effort to convert all securities into cash and to withdraw all deposits from the banks. A panic is generally the result of some commercial or business crisis and arises from the fear that banks will fail, and that securities will become practically worthless and should be converted into cash no matter what the loss. Famous panics in United States history have been: "Black Friday," September 24, 1869, caused by the effort of the Gould-Fisk group to corner the gold supply, which was broken by the sale of $4,000,000 worth of gold by the Government; the panic of 1873, started by the failure of Jay Cooke & Co. on September 18 and resulting in the suspension of trading on the New York Stock Exchange from September 20 to 30; the panic of 1884 when Grant & Ward failed; that of May 3, 1893; May 9, 1901, precipitated by the battle between the Harriman-Kuhn-Loeb interests and the Hill-Morgan group to gain control of the Northern Pacific Railroad; July 31, 1914, when the Stock Exchange was closed as a result of the outbreak of the World War; and in 1929, when stock-market prices broke late in October and declined $15,000,000,000 in value by the end of the year.

paper, see *commercial paper.*

par value, the nominal value of a security; the amount printed on the security. The par value of a share of stock is usually $100, and the par value of a bond is usually $1,000. In most states no-par-value stock may be issued, which is merely stock without any par value printed on the certificate. The par value of a share of stock is not the market value and usually bears no relation to the amount that the stock is sold for. The par value of a bond is more important; for when the bond is repaid, the par value is the amount given to the owner of the bond by the company unless it has not sufficient assets to repay the bonds in full.

physiocrats, those in general agreement with the economic doctrines of François Quesnay (1694–1774) and Jean Claude Marie Vincent, sieur de Gourney (1712–59), which were based upon the concept that agriculture alone is truly productive. At the time of the formulation of the physiocratic doctrines, France was primarily an agricultural country with a large area of fertile soil, ruled by rich nobles who owned great estates. It was natural that agriculture should be looked upon as the basis of wealth and that private property should be regarded as an almost sacred institution. The importance of capital as an indispensable aid to agricultural production was clearly recognized, and the physiocrats pointed out the need for annual advances for seeds and the expenses of cultivation, advances for clearing land and constructing farm buildings and advances for livestock and various agricultural implements. They advocated the removal of all internal tariff barriers and the stimulation of domestic consumption so that the price of farm products would be considerably in excess of the cost of production. Taxes on industry and commerce were opposed since it was argued that these taxes would only be passed on to agriculture, the truly productive agent. In spite of the fallacies of the physiocrats' doctrines and their failure to recognize the value of labor and the productivity of manufacture and commerce, they created the first modern economic doctrine.

picketing, see *strikes.*

policy, a written contract between the insurer and the insured, setting forth the various terms of the contract and the rights and obligations of the parties. Insurance contracts are long and technical, and failure to read and understand the provisions has often resulted in unexpected hardship to the insured or the beneficiaries of the policy. Uniform insurance policies have been recommended and adopted in some states. In case of an ambiguity the terms of the policy are construed against the insurer, but expert draftsmanship by the insurer seldom leaves any ambiguity.

pool, an agreement between business concerns to follow some special policy of prices, output or division of territory. Such agreements cannot be enforced at law and are considered unfair trade practices or agreements in restraint of trade.

The clubbing together of retailers in group buying, especially in voluntary chains, and the group buying and the group selling of agricultural cooperatives are both called pooling.

A *pool car* is a combination shipment by a manufacturer or distributor who gets a carload rate on small shipments, each less than carload, sent out together and broken up at the point where the first cargo is removed from the car.

population, the number of people living in a country or an area. Various social problems arise from the quantity and quality of populations. For centuries men have pointed out the dangers of having too many people and expressed the idea that the number of people was increasing so fast that soon there would not be enough food to go round. Han Fei-tsu, the great Chinese philosopher who lived in the 4th century B.C., declared that the economic ills of China at that time were caused by the rapid increase in population, and he estimated a ratio of population increase somewhat similar to that of Malthus. Aristotle, the great Greek philosopher (384–322 B.C.) commented on the inconsistency of equalizing property and not regulating the number of people. Benjamin Franklin in America and a large number of European writers discussed theories of population, but none of them received much attention.

An English clergyman and professor of political economy, Thomas Robert Malthus (1766–1834), in 1798 formulated the population theory that bears his name. Malthus developed his theory of population in a discussion with his father concerning the then radical doctrine of the "perfectibility" of man. Malthus argued that economic conditions must get worse and worse because "the power of population is infinitely greater than the power in the earth to produce food for man." Malthus illustrated this natural law by saying, "Taking the whole earth, the human species would increase as the numbers 1, 2, 4, 8, 16, 32, 64, 128, 256 and substance as 1, 2, 3, 4, 5, 6, 7, 8, 9. In two centuries the population would be to the means of subsistence as 256 to 9, in three centuries as 4096 to 13, and in two thousand years the difference would be almost incalculable." In his first edition Malthus admitted only positive checks on the population growth, such as war, famine, disease and misery, but in his second edition he admitted the possibility of "moral restraint," which breaks down the logic of his whole argument. Prince Petr Kropotkin (1842–1921), the great anarchist geographer, declared that man's use of the resources of the earth is so far below what is possible that there need be no food shortage. Besides, the Malthusian theory has been disproved by the facts of population growth. In the western countries after the Industrial Revolution there was a fall in the rate of population increase. Modern theories take into consideration the potential operation of the natural law of population growth but primarily consider the entire cultural situation in each particular nation. There is no universal law of population. The situation differs with each country, and the set of factors affecting population growth in China is entirely different from that in the United States. In the western nations the problem of population is more concerned with distribution than with production, especially the distribution of population in relation to raw materials and the possibilities of trade between industrial and agricultural centers.

price cutting, selling goods at a price below what is recognized as a standard price. Price cutting has been a common means of attracting custom to most chain stores, some department stores and many mail-order houses. Sometimes the retailer actually takes a loss on well-known brands—buying trade in this way and expecting to recoup his loss on other transactions with the buyer of the price-cut goods. Sometimes the large-scale retailer can actually afford to sell at cut prices because he has bought in large quantities and received a far greater quantity discount than his smaller competitors. Price cutting is usually on nationally advertised goods, on standardized convenience goods and on staples sold in stores that handle little but shopping goods. Price cutting is made more and more difficult by state laws to maintain retail prices set by manufacturers.

Printer's Ink model statute, a uniform law enacted in 30 or more states to prevent false advertising by making it a misdemeanor to offer an advertisement that is false, deceptive or misleading. The law is named from *Printer's Ink,* an advertising periodical in which this model law was first suggested.

priority, a preference in the right to have credit claims satisfied or to receive other benefits. A creditor who has priority has the right to have his claims satisfied in full before the claims of others are paid at all. A first mortgage has priority over a second or subsequent mortgage, and when the property is sold to satisfy the mortgage, the proceeds are used to satisfy the first mortgage. If anything is left, it goes to the second mortgage holder and on down the line. Stocks with priority rights may have a preference as to the receipt of dividends or a preference in a share of the assets upon the liquidation of the business.

private brand, the brand used on goods made for middlemen, wholesalers and retailers as distinct from manufacturers' brands. Groceries, especially chain stores, do a large business in private brands; many voluntary chains are backed by wholesalers and must carry the wholesalers' lines. The movement for price maintenance (in the interest of the advertised brands) has driven many wholesalers and a few large retailers to a much wider use of private brands on goods made to specifications to compete with national brands.

produce exchange, see *commodity exchange.*

production, the creation of utilities. Anything that is done to create an economic good or to make it more useful is regarded as production. The economic process of society is directed toward obtaining things from nature and getting them to the consumer in a form ready to be used. All the steps in this process are regarded as productive if they add utility to the article. The farmer who grows food is creating a utility. The man who transports the food to the market is creating a utility. The warehouseman who stores food until it is wanted is creating a utility. The shopkeeper who sells the food to the consumer is creating a utility. The doctor, the lawyer, the teacher, the actor, the clergyman, the scientist all create utilities when they render their particular services. All these instances of the creation of a utility are examples of production. The essential factors of production are land, labor, capital and business enterprise. It is the working together of some or all of these factors that makes production possible.

profit, the payment for his services made to the business enterpriser. The business enterpriser is the directing factor in production. He is the one who manages the business and makes decisions as to the general policies of the enterprise. Profits are the reward for these particular services, as distinct from wages, interest or rent, which are the payments for other factors of production. Profits have three principal sources: risk bearing, friction in the working of the competitive economic system and business ability. The matter of risk is closely associated with economic changes. If the business enterpriser had a knowledge of all the facts relating to the business, always made correct predictions and never made a wrong decision, then there would never be a loss. But since no business man can always make the proper decisions, losses result; and when the correct decisions are made, profits result. Certain other risks, such as fire or explosion, can be largely eliminated through insurance. The competitive system does not work perfectly, and owing to this imperfect competition, to monopolies and to special circumstances, profits or losses result. Profits result from superior business ability also. If one business enterpriser can produce an article cheaper than another with the same advantages as to raw materials and costs of the factors of production, then the one who produces the article cheaper will gain a profit.

profit sharing, "an agreement freely entered into, by which the employees receive a share, fixed in advance, of the profits" (according to the International Congress on Profit Sharing, Paris, 1889). Profit sharing in Europe was the result of a general movement for social reform. Though there are instances of profit sharing in every European nation and especially in France, it is not of major importance. In the United States, bonus payments and stock ownership plans have generally been referred to as profit sharing, although these systems do not necessarily have any relation to profits. Actual profit sharing in the United States began about 1880, but a survey 50 years later of 4,409 enterprises employing 419,000 workers showed that only one per cent had any form of profit-sharing plan. Experience has shown that this labor policy is usually satisfactory only in a small concern, and even there it must be closely integrated with some general plan for social-welfare work. Profit sharing has not been considered generally satisfactory to labor because it does not take into consideration the wage earner's needs, and it is difficult to work out in practice because it is hard to determine just what constitutes profits.

One object of profit sharing, winning the loyalty and interest of the employee for the concern that employs him, is partly attained in some corporations by voting to employees the right to buy corporation stock on special terms—so that they are, in a different sense, profit sharers.

promissory note, a written promise to pay a sum of money. Under the terms of the Uniform Negotiable Instruments Law a promissory note to be negotiable must be in writing and signed by the maker, must contain an unconditional promise to pay a certain sum in money, must be payable on demand or at a fixed or determinable future time and must be payable to order or to the bearer.

promoter, one who promotes the organization of a corporation or similar enterprise by assisting in the organization, securing the necessary capital and aiding in the beginning of the work. The promoter is usually paid with stock of the new company for his services and for any property that he may have sold to the corporations.

protest, a formal written statement, usually sworn to before a notary public, that a note or draft was dishonored when it was presented for payment and giving other material facts regarding the note. The protest is sent to the maker and indorsers, and they become liable on the instrument.

publicity, any form of promotion, including paid advertising in newspapers and magazines and on the air, but particularly news articles with concealed propaganda and no indication whose interest is served by what seems to be merely information. In this limited sense publicity is usually free; those who secure its insertion in public prints do not pay for the insertion.

public utilities, those enterprises so affected with public interest that the government has taken over their regulation or ownership. Public utilities include those enterprises that supply water, gas, electricity, telephone and railway and bus transportation. This classification is not fixed or final. The list has been growing with the different economic needs of the community, and it changes from time to time and depends upon special circumstances. Some businesses are classed as affected with public interest on the basis of the old common-law distinctions that granted certain rights and imposed certain special liabilities on the enterprises as common carriers. Other public utilities are so considered as the result of legislative action or judicial determination in recent times. The distinguishing factor in most public utilities is the public interest and the fact that they are natural monopolies because they operate on the principle of decreasing costs, and it has been found to be economically wasteful to force or even allow competition between public utilities. Because this monopolistic privilege has been given to the public utilities, the government regulates them, usually to the extent of fixing the rates that these public utilities may charge.

put, an option to sell certain securities at a certain price within a specified time. The other party to the contract promises to buy the securities as agreed. A *call* is the opposite of a put and is an option to buy, the other party agreeing to sell the specified securities at a certain price within a specified time if called upon to do so. A *spread* is a combined option of both putting and calling. A *straddle* is a special type of spread.

pyramiding, using the unrealized profits on stock that has been purchased and held as the margin for the further purchase of securities. It is one of the most speculative methods of dealing in securities. Pyramiding as a means of gaining control in holding companies is described under the heading *holding company.*

quantity theory of money, a theory of the relationship between the amount of money in circulation and the price of commodities. The theory is usually stated that if the velocity of the circulation of money and the quantity of goods remain the same, any increase in the quantity of money will show a proportional increase in the price of goods. The theory is also stated in the form of the equation $MV = PQ$, where M is the amount of money, V is the velocity of circulation or the number of times money is used in a certain period, P is the price, and Q is the total quantity of goods in the community. If we imagine an island on which the total amount of money is $100, and each dollar is only used once in a period of time, and the total amount of goods is 100 bushels of wheat, then the price of each bushel would be $1. If the amount of money were doubled, then we should expect the price of wheat to go up to $2. If the velocity of money is doubled, it will have the same effect as doubling the amount of money. This theory in the simple form expressed is no longer accepted as an adequate explanation of price changes in our complex economic order. It fails to take into consideration the important factor of savings and the function of credit. Furthermore prices can not be controlled by simply changing the amount of money in circulation, because the other factors do not remain constant, the velocity of circulation is practically impossible to control, and the change in the velocity may offset any increase or decrease in the amount of money in circulation.

quotation, a notification by a seller to buyers or the general public that certain goods are for sale at the price specified. A quotation is not necessarily a legal offer and is usually considered as a mere invitation to negotiate. In banking and security transactions a quotation is the published price at which securities have been sold or are offered for sale. Stock quotations are in eighths of 1 per cent, and the quotation units in the various commodity exchanges vary according to custom.

ratio, the numerical relation between two like quantities. The ratio is generally found by dividing the smaller quantity by the larger and is expressed in a percentage. Ratios are used in accounting to analyze statements. For example, the ratio of current assets to liabilities is found by dividing the current assets by the liabilities and indicates the liquidity of the company. The operating ratio of a railroad is determined by the relation between gross revenues and maintenance expenditures.

rebate, a return of part of the purchase price to the buyer by the seller. The Interstate Commerce Law of 1887 prohibited rebates of freight rates because they extended an unfair business advantage to one class or one person over competitors. If one coal company had a rebate on all the coal shipped, it would have a lower cost and could undersell other competitors in the market. A rebate or drawback based on a bona-fide mistake is perfectly legal.

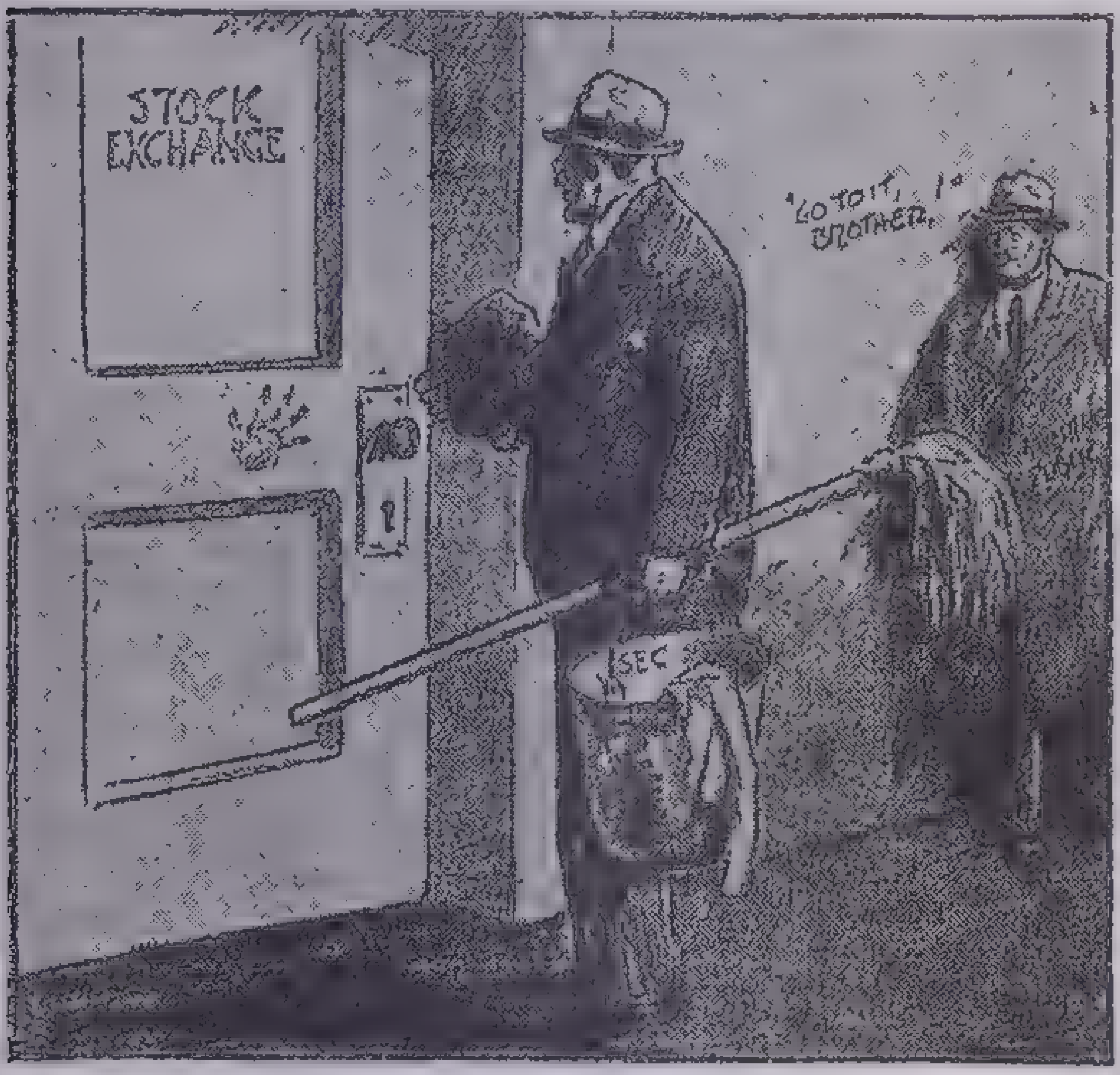
Rebates on insurance premiums are sometimes given by insurance agents who let the insured have a part of the agents' commission. This is illegal.

receipt, a written acknowledgment that money has been paid or goods or property have been received.

recession, see *business cycle.*

regulation, control or guidance of business for the general public benefit. Even if there is little doubt of the necessity to regulate business, the problem is to choose the method of control that shall be used. There are at least three possible types of regulation: (1) regulation through competition and the price system, (2) regulation by business itself through contractual agreements or ethical standards and (3) regulation by the government through general legislative enactments administered by specially constituted boards.

Regulation through competition and the price system is the traditional type of regulation that was recommended by the classical economists and the *laissez-faire* school, which considered that this regulation was in conformity with natural law and would work out to the best interests of all. Antitrust legislation and the general program of destroying monopolies attempt to strengthen this general principle by preventing monopolistic organization so that business may be regulated by competition and the price system.



From the New York World-Telegram, November 26, 1937

"The Cleaning Man Is Here"

The cartoonist Rollin Kirby presents a contemporary impression of the influence of the Securities Exchange Commission on the New York Stock Exchange

Regulation of business by business itself was the general policy of the National Industrial Recovery Act, and this plan has also been adopted in certain business organizations such as the New York Stock Exchange and by some trade associations.

The best example of government regulation has been in the field of public utilities. In these special enterprises the government has granted a monopoly, imposed certain obligations and generally has administered the regulation through special boards whose most important function is to fix the rates that the utilities may charge the public. The answer to the question "What type of regulation shall be used?" depends on the particular industry, the particular circumstances and past experience regarding the regulation of that industry. Where the enterprise is satisfactorily regulated by competition and the price system, there seems no need to interfere. If business can satisfactorily regulate itself, there is likewise no need to interfere. But when the public feels that these two types of regulation have failed, then it becomes necessary for the government to take some action to further regulate the industry.

rehypothecation, the repledging of collateral security by the pledgee. Rehypothecation is the usual procedure when stocks are purchased on margin. The stock that is purchased is given to the stockbroker as a pledge for the amount loaned. Then the broker borrows from the bank using this stock pledged with him as security. This borrowing by the broker on the pledged stock is termed *rehypothecation.* Rehypothecation is illegal in most states without the agreement of the original pledger. Before a stockbroker will execute an order on margin, the customer is required to sign an agreement permitting the broker to rehypothecate the stock.

rent, payment for the use of land. In the economic sense rent is the payment for the use of natural resources produced without the assistance of man's labor. *Commercial rent,* as it is generally used in business, is payment for the use not only of land but also of buildings, irrigation, fertilizer and numerous other things that are properly capital.

Rent may be *explicit* or *implicit.* If a farmer is actually a tenant and pays rent to the landlords, this is explicit rent. However, if the farmer owns the land, the farmer pays the rent to himself, and this is called *implicit* rent. The classical theory of rent as defined by Ricardo (1772–1823) was that rent is "That portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil." But modern discussion has fairly well destroyed the older idea that rent was different from payment for the use of capital or other commodities. The distinction between land and capital is artificial, for they are essentially the same.

reorganization, reforming a corporation that is insolvent or threatened with insolvency. The interests of the bondholders, creditors and the stockholders are adjusted by agreement, means of obtaining new capital are determined, and the new corporation takes over the franchise and business of the old corporation.

reserve, a special account set up on the books from profits or surplus for a specific purpose. Usually a reserve is set up to counteract losses that may be reasonably expected. The commonest accounts of this sort are reserves for bad debts, depreciation, depletion and obsolescence. A funded reserve is a reserve invested in interest-bearing securities.

retailer, a middleman who sells mainly to the ultimate consumer and in small quantities. The retailer usually buys the goods he sells from a wholesaler or jobber, but some large-scale retailers, such as big department stores and chain stores with central buying offices, secure stock direct from manufacturers.

risk, the chance of loss or injury to the subject matter of an insurance contract. By the terms of an insurance policy the insurer agrees to compensate the insured in money for the loss or to rebuild the property damaged. In life insurance the risk is death. In fire insurance the risk is loss from fire, but the term *risk* is also used to mean the property covered by the insurance.

Risk in a general business sense is only partly coverable by insurance. Style changes, overstocking, unfortunate selection of goods—all introduce risks in a small retail business that illustrate the fact that financing a business is largely risk taking.

royalty, a payment of a share of the profits to the owner of property for its use or exploitation. Royalties are commonly paid to the owners of coal mines, oil wells, forests and patented articles and to authors of books. A royalty is usually set as a percentage of the profits or gross receipts. The payment by a publisher to the author of a book of 10 per cent of the gross receipts from the sale of a book is a royalty.

Originally a royalty was a payment to the Crown for use of royal lands; *seigniorage,* the payment for coining money at the royal mint, was one kind of royalty.

sale, the transfer of ownership of property from seller to buyer. Possession of the property does not have to pass at the time of the sale and may take place before or after the sale.

salesmanship, a personal presentation of goods, services or ideas to prospective purchasers.

sales management, the direction and control of all sales and sales-promotion activities and particularly personal salesmanship in the field. Sometimes the sales manager controls advertising; sometimes there is an advertising manager. In either case the sales manager selects, recruits, trains and equips the salesmen; and sets quotas, allots territories and decides sales policies.

sales promotion, organizing all aids to sales and profits, particularly co-ordinating advertising efforts and the work of salesmanship. Sales engineering, consumer engineering and merchandising have almost identical meanings with sales promotion.

sales tax, a tax imposed on the sale of commodities or services. A sales tax may be levied generally, or it may affect only specific types of goods. It may be levied on retail sales alone or on all sales except retail. A sales tax was used in ancient Egypt, Greece and Rome. A few nations adopted the sales tax before the World War, but the financial difficulties of that period led to its adoption by many countries. In 1933 about 30 nations, including nearly every great power in the world, had adopted some form of sales tax. The Federal Government of the United States has repeatedly refused to adopt a sales tax, but beginning with Pennsylvania in 1821 many states and municipalities have levied sales taxes. Sales taxes are usually 1 or 2 per cent and may be paid with tokens, stamps or in cash. Certain articles are usually exempted from the tax, such as essential foods, farmers' supplies and exports. The sales tax has the advantage of being easy to collect and involving a minimum of administrative costs. The main objection to it is that it falls most heavily on the poorest people and is a tax on those least able to pay. The modern doctrine is that taxes should be in proportion to the ability to pay. When the sales tax cannot be shifted to the consumer, it results in an unequal burden on business. The sales tax has proved productive and practical under certain conditions, but it is generally believed that its use should be limited to times of emergency and that in the regular fiscal policy it should be replaced by a graduated income tax.

saving, putting off consumption until a later time. The primitive farmer who decided not to eat all his crop but to keep some for seeds and plant them the next season was saving and converting consumers' goods into capital. A person who does not spend all his income but keeps part of it for use some other time is putting off consumption, and that is saving. Willingness to save is largely a matter of social habit; the ability to save and the amount and distribution of wealth are closely related. Obviously there must be some surplus to make saving possible. In certain parts of Asia there is hardly any saving because so little food is produced that all of it is needed to keep the inhabitants from starving. The distribution of wealth has an important bearing on saving. The wealthy classes receive more than they can spend, and automatically the surplus is saved. The middle classes save not because their income is more than they can spend but because they want to provide for old age and periods of economic stress. Among the poor there is practically no saving because all their income is needed for consumers' goods. The interest paid on savings is an incentive to saving but is not of primary importance.

A large part of savings is converted into capital, but often money or gold and silver is hoarded. Even money deposited in a bank does not become capital until the bank invests it. If the bank or individual makes a loan for consumptive purposes, the savings do not become capital.

scarcity, the principal item in use-value. A great deal of economic theory is based on the concept of the scarcity of the factors of production, land, labor and capital. Economics is largely a study of man's efforts to satisfy his needs and desires from the scarce elements provided. This makes the problem one of knowledge. If there is a scarcity of land, man must learn to make more productive use of the land he has, or he must learn to grow food in chemicals without the use of land. If there is a scarcity of workers, man must learn to build machines to do the work. If there is a scarcity of capital, man must learn how to create more capital.

Many recent economists have pointed out that we have passed from an economy of scarcity to an economy of surplus or abundance. From time immemorial the problem of economics was to produce enough to go around; but now we have learned how to produce enough to go around, and we must learn how to distribute it.

scientific management, the theory and practice of various principles directed toward a more efficient and rational method of production in industry. Scientific management is based upon research, investigation, experimentation and analysis of each operation in the factory; then it co-ordinates and plans the entire activities of all the departments in the factory. Frederick W. Taylor (1856–1915) was the pioneer in this field and was primarily responsible for the development of scientific management. In 1880 Taylor as an assistant foreman in the machine shop of the Midvale Steel Company made special operation studies with a stop watch. After a series of experiments with the men and the machines, he worked out the most productive methods for each operation. These studies made possible a two- or threefold increase in output without any additional effort on the part of the workers. He developed similar principles for the entire plant. Scientific management first received wide publicity in the Interstate Commerce Commission hearing of 1910.

In Europe the name commonly used is *rationalization*. Under the Russian Five-Year Plan efforts to improve production roused workers to find new methods, and there were striking examples of scientific management devised by workers and not by managers. Improved methods of coal mining introduced by a miner named Stakhanov gave the name *Stakhanoffism* to this Russian workers' variety of scientific management.

securities, evidences of debt or property; all forms of stocks, bonds or negotiable instruments. Securities include mortgages, bonds, debenture bonds, stocks, bills of exchange, drafts, promissory notes, bills of lading, warehouse receipts and certificates of ownership.

security, safety from risk, the main objective of economic man. Under the present system nearly everybody is constantly faced with the risk of losing his job, of seeing the entire industry that employs him suddenly collapse or of being incapacitated and unable to learn a living. Insurance against these risks and contributions toward the establishment of security have come from many quarters. The industrialist in many cases endeavors to run his plant so that there will be a minimum of layoffs and shut downs, but often the matter is beyond the control of an individual enterpriser or even a large group of enterprisers. Numerous insurance plans have been formulated so that the worker may prepare to meet some unexpected difficulty. The government has enacted compulsory insurance and provisions for the needy aged and unemployed in the Social Security Act and in various state laws. Workmen's compensation laws have been passed to provide for the worker in case of injury. But the whole problem is not solved, and there is still a widespread lack of security, especially in the laboring classes.

seigniorage, profit made by the government from the coinage of metals. This profit results from the difference between the value of the coins made from the bullion and the value of the bullion plus the cost of minting.

selling, "the personal or impersonal process of assisting and/or persuading a prospective customer to buy a commodity or a service or to act upon an idea which has commercial significance to the seller" (Committee on Definitions of National Association of Marketing Teachers).

selling agent, a type of broker under extended contract with a mill or manufacturer to sell the entire output of his principal, usually with full authority on prices and terms. Selling agents are usually paid a commission as they are in business for themselves and often represent one or more manufacturers. The selling agent often helps to finance the production of mills he represents.

share, see *stock.*

shopping goods, consumers' goods purchased after considerable comparison (shopping rather than quick buying), such as millinery, furniture, dress goods, men's and women's ready-to-wear, shoes, jewelry and residential real estate.

short sale, see *stock exchange.*

simplification, standardization, especially by reducing the items in a line or in stock carried. The *model-stock* system, carrying only lines, sizes and styles for which there is considerable demand, is a retailer's simplification, and some manufacturers have devised model stocks of their own lines for the guidance and convenience of retailers—and to economize in the manufacturers' own production.

Simplification in marketing does away with waste motion, extra steps in distribution and other profit-consuming methods. Selective distribution, that is, giving a line to a few large retail outlets in trade centers of considerable size, is one method of simplifying distribution.

sinking fund, a fund specially set aside at regular intervals to provide means for paying off a funded debt. The usual method is to pay annually a stipulated sum of money to sinking fund trustees who invest the principal and allow it to accumulate at compound interest until the time when the bonds mature, and then the bonds will be paid with the assets in the sinking fund. Sinking funds were first used in government finance, and Great Britain set up the first sinking funds after the Peace of Utrecht (1713–14).

The United States Government has often used the sinking-fund method of amortizing bonds, for example, the United States Victory Loan Sinking Fund for World War loans. The sinking fund may be derived from profits or from surplus, although in the latter case it is properly called a *sinking fund reserve*. The general purpose of a sinking fund is to prevent a misuse of assets that should be held to redeem outstanding bonds. But sinking funds have frequently been badly managed, especially in the case of municipalities, and many writers have urged that a serial-bond method is preferable to the sinking fund and provides the maximum security with the minimum cost. About half of the states have made compulsory the use of either serial or amortization bonds.

social insurance, government measures to provide relief or compensation to low-income classes for injuries or losses due to the ordinary hazards of industrial life. Social insurance includes industrial-accident insurance, workmen's compensation, industrial-disease insurance, old-age, invalidity and unemployment insurance; and the term is often extended to include direct relief given by the government. Social insurance is a middle way between the socialist demand for complete support and responsibility by the government and the individualist's demand for private and voluntary relief. Because it is a middle ground, social insurance is criticized by the radicals as being a sop to the workers to divert them from their goal and is criticized by the individualists on the ground that it interferes with the natural law of wages and general business. However, social insurance has been forced upon governments by the breakdown of private relief and in order to compensate for the injuries and suffering caused by the modern economic system.

specialization or **division of labor,** the organization and division of the process of production so that certain persons do a certain type or kind of work. Specialization has been divided into three main types: social specialization, geographical or territorial specialization and technical specialization.

Social specialization involves a division of labor according to social classes. In early primitive cultures the men were generally engaged in occupations that took them away from the camp, such as hunting and fishing, and in making the implements for these activities. The women were more closely confined to the camp, caring for the children, gathering wild foods, tending the crops and generally doing the arduous work. This social specialization has continued down to modern times. In addition to specialization between the sexes, which has become less important with the change in the status of women in society, there has developed the division of labor by trades and professions.

Geographical specialization means the specialization of production according to geographical or territorial sections. Nature herself is a specialist, and certain parts of the world are better adapted to the growing of certain foods than others, and certain natural resources are found only in particular parts of the world. Nearness to raw materials and to sources of power and the development of native skill have created special centers for producing certain goods. This geographical division of labor cannot develop without commerce, and the geographical division of labor is the basis of international trade.

Technical division of labor means splitting the making of a commodity into a number of fractional operations and having each operation performed by a worker who does nothing else. Technical specialization is the most important type, and the term *specialization,* as it is commonly used, refers to it. This type began in the handicraft stage, but it reached its important development only in the industrial stage in large factories using mass-production methods. One of the most characteristic features of modern industry is specialization. The classical illustration of this type of specialization, given by Adam Smith in his *Wealth of Nations* (1776), was the making of pins. Perhaps the best illustration of it at the present time is in the automobile industry, where one worker may do nothing but put a single bolt in the engine or a few tacks in the upholstery.

The advantage of technical specialization is that it has resulted in increased production at a lower cost. The disadvantage is mainly in the monotony of the work and the possibility of increased exploitation of labor through speeding up the work. Increased production and decreased human work are results of specialization that are both desirable and permanent, but special adjustments and safeguards to protect labor must be taken.

specialty goods, those consumers' goods that are not staple or common and are different in quality or some other respect from goods of the same general class; high-grade goods that the consumer prefers and that he will make a special effort to secure.

specialty store, a retail store that carries specialty goods or a limited variety of goods in a single line. Millinery stores, men's hat shops and hosiery stores are examples of single-line specialty stores. Some specialty stores have departments—but not so many as the typical department store and with a much more limited range in style and prices.

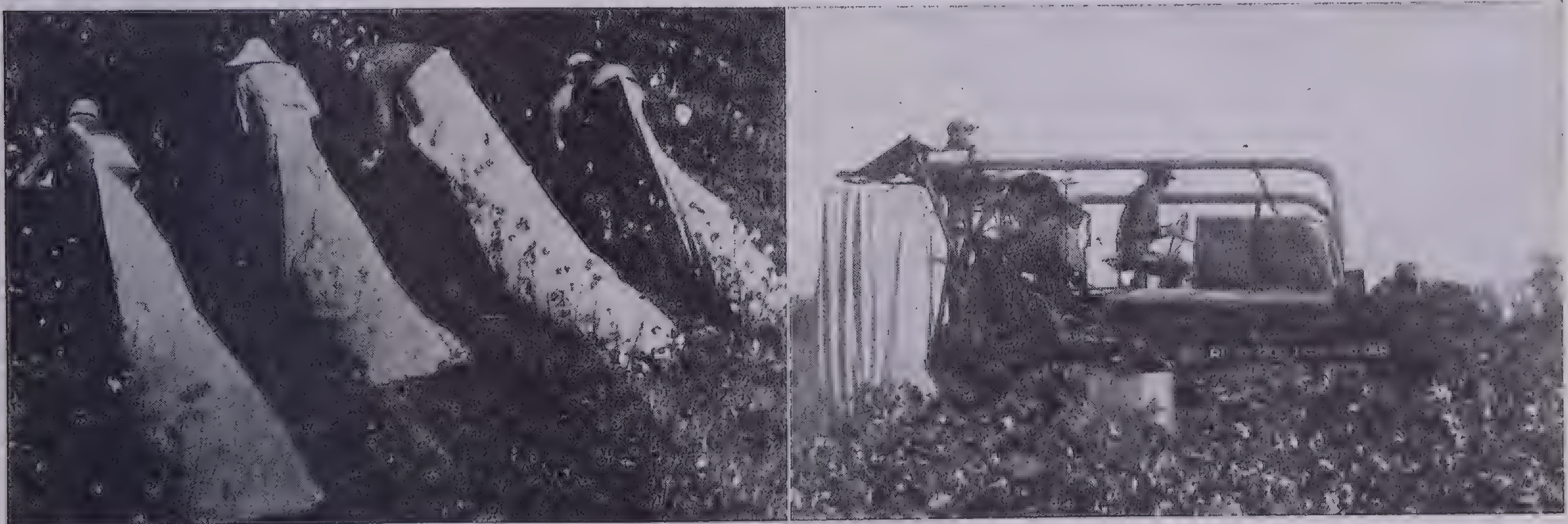
speculation, assuming an unusually great financial risk with the hope of making a profit, usually from changes in price. There are two general types of speculation: investment in an enterprise that involves more than the usual risk, such as the purchase of gold-mine stock or an interest in a new invention; and the buying and selling of commodities, land or securities with the expectation of making a profit on a change in price. Speculation has been widely criticized, especially in times of business depression, and it is claimed that the speculator performs no useful function. On the other hand speculation is an integral part of the capitalistic system, and speculation serves in many cases to aid the operation of the system.

spot, a contract to be carried out immediately and for cash. Spot transactions are an important part of the trading on commodity markets. *Spot cash* is immediate payment without any discount.

spread, a combined option of putting and calling. The term is also applied to a hedging operation in commodities that are sold on exchanges.

stabilized dollar, see *compensated currency.*

standardization, finding fundamental qualifications or grades for goods produced and establishing economical and efficient model processes for production, distributing and selling goods and services. The mass sales messages of modern advertising and specifically the use of trade names, brands and trade-marks tend to standardize many goods—the trade-mark is a short-cut summary of certain specifications.

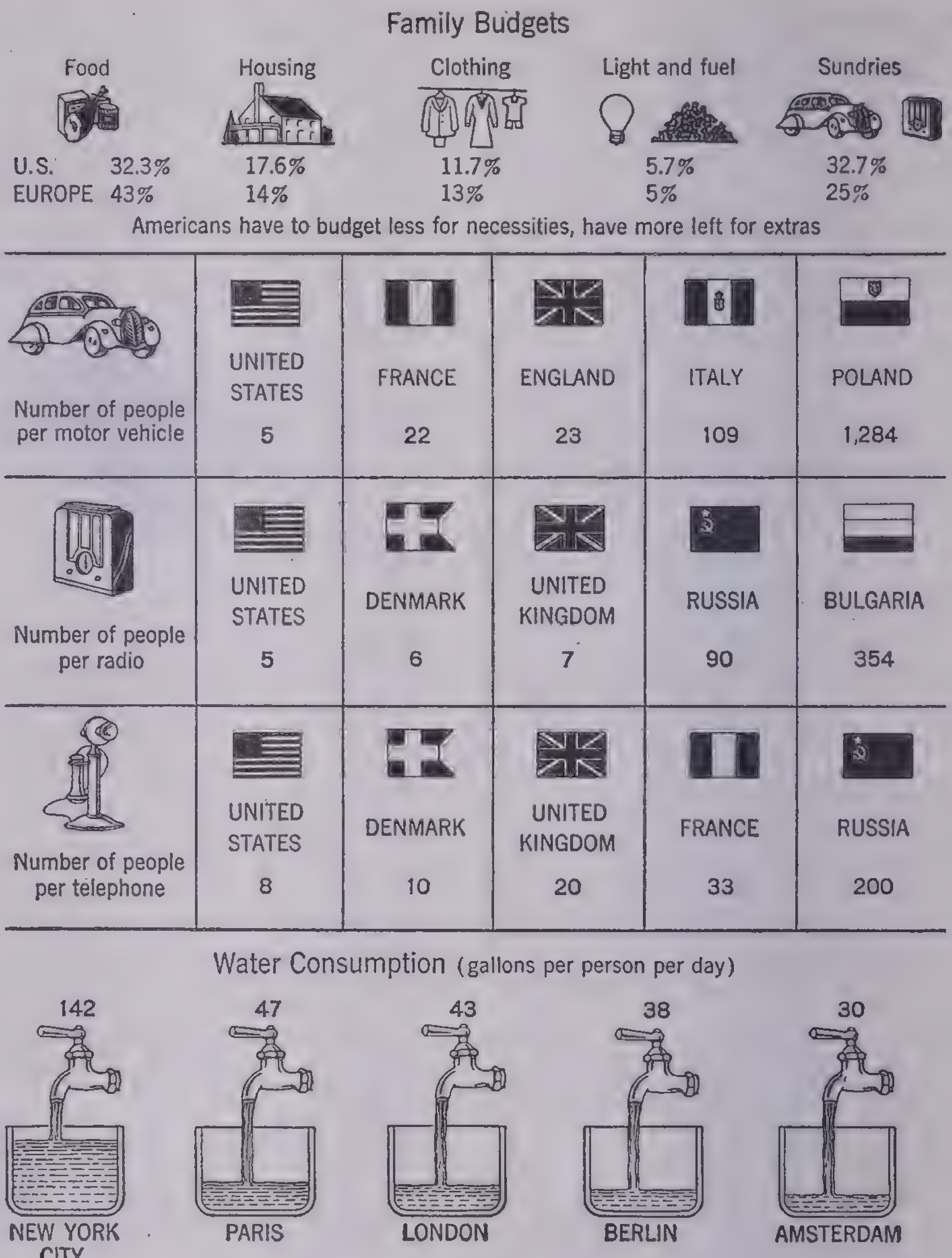


From the Farm Security Administration film, The River *Courtesy Rust Cotton Picker Company*

Human Fingers Versus Mechanical Fingers

The average field worker in the South, picking cotton by hand, can pick about 200 pounds a day. Many inventors have tried to devise machines to do the work, but the Rust Cotton Picker invented by John and Mack Rust, shown at the right, is the first successful design. It can cover an acre an hour and has picked as much as 6,500 pounds of cotton in one day

standards of living, the minimum of goods required by an individual or class to keep it in its usual status. A standard may allow merely physical necessities of life, or it may allow for physical comforts and certain other needs, such as education and entertainment. The trend has been to consider the type of standard that demands both physical comfort and cultural opportunities as the desirable minimum standard. The recognized standard of living is constantly changing and progressing, and what is a rare luxury in one generation becomes a necessity in the next. Efforts to improve social conditions include the endeavor to make the minimum standard available to all and to raise this minimum standard. Advertising and all the promotional methods of modern capitalism tend to change living standards by making requirements more complex and elaborate. So living standards in America are higher than they were two generations ago—and higher than they are in many other countries today.



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American and European Living Standards

This chart is based on statistics from the first five ranking European countries and from all of the United States

stock, a share in the ownership of a corporation, evidenced by a certificate. When stock is purchased, the buyer is really investing his money in the corporation and becomes a part owner of the corporation with the right to share in the profits and usually with a right to exercise some control over the corporation's policies through the election of directors. Just what the stock means to its owner depends upon the terms of the contract with the corporation written on the stock certificate, the powers of the corporation in the charter the corporation received from the state and the actual method of management of the corporation.

Stock is usually divided into two classes, common and preferred. *Common stock* is the lowest ranking for stock, and dividends are paid to the common stockholders only after all other claims have been satisfied. But common stock frequently is the only class of stock that has voting power, and common stockholders often have a right to all the remaining profits of the corporation after prior claims have been satisfied. Common stock is sometimes issued without voting privileges and with only a limited claim to dividends.

Preferred stock usually has priority over common stock as to dividends or the distribution of assets or both. Preferred stock may be *participating*, that is, it shares with the common stock in the distribution of assets after a specified amount has been paid to the preferred and common shareholders. For example, if the preferred stock was 6 per cent participating, and the corporation decided to distribute earnings amounting to 15 per cent, the first 6 per cent would be paid to the preferred stockholders; the next 6 per cent would be paid to the common stockholders, and the remaining 3 per cent would be divided between the common and preferred stockholders. If the preferred stock was nonparticipating, then this 3 per cent would go to the common stockholders. Preferred stock may be *cumulative* or *noncumulative*. If it is cumulative, then unpaid dividends continue as prior claims and must be paid before any dividends are paid to the common stock. For example, if a certain corporation has 6 per cent cumulative preferred stock outstanding and did not pay any dividend for 2 years, then a total of 12 per cent would have to be paid to the preferred stockholders before any dividends were paid to the common stockholders. In the United States about 75 per cent of the corporation stock is owned by individuals, and the remainder is owned by institutions, such as banks, corporations, insurance companies, schools, hospitals and endowment funds. Most of the individuals owning stock are in the higher income groups, and before the 1929 depression it was estimated that 90 per cent of the gainfully employed persons in the United States owned no stock.

stock exchange, an organized market for securities, where members buy and sell listed securities in accordance with established rules. The primary purpose of the stock market is to bring together all buyers and sellers and increase the marketability of the listed securities. Stock exchanges were first informal meeting places—in London at Jonathan's and Garraway's coffee houses and in New York under a great old buttonwood tree on Wall Street. The importance of these meeting places grew with the development of corporate financing through securities, and now practically every country of importance has one or more formally organized exchanges with special buildings, special rules and procedures and a limited membership.

The London stock exchange is the greatest international market in the world. The New York stock exchange is one of the most important in the world, but it deals almost entirely in American stocks and lists few foreign securities. The stock exchanges in France and Germany are under rigid government control. The London exchange is a private organization managed by the members. The stock exchanges in the United States were privately managed until the Securities Exchange Act of 1934 brought the exchanges practically under the control of the government. Members of the New York stock exchange deal on

1938 High	1938 Low	Stock and div. in $	Sales	Open	High	Low	Last	Net chge.	Closing Bid	Closing Ask
10⅜	6¼	Adams Exp	300	8	8⅛	8	8	+ ¼	7⅝	8⅜
2⅜	1⅝	Advance Rumely	100	2⅜	2⅜	2⅜	2⅜	....	2⅜	2½
58¼	40	Air Reduction (1a)....	500	46¼	47	46¼	47	....	47	48
13⅜	8¾	Alaska Juneau (.60a)..	4900	10¾	11⅛	10¾	10⅞	+ ¼	10⅞	11⅛
1⅝	⅞	Alleghany Corp	100	⅞	⅞	⅞	⅞	....	⅞	1
17⅞	6½	Alleg pf $30 ww	200	6¾	6¾	6⅝	6⅝	— ¼	6½	6⅞
176½	124	Allied Chem & Dye (6)	100	149	149	149	149	....	147½	149
9⅜	4½	Allied Stores	1100	5¾	6	5¾	5⅞	+ ⅛	5¾	5⅞
53½	38	Allied Stores pf (5)...	100	41¼	41¼	41¼	41¼	— ¼	42¼	43
51¾	34¼	Allis-Ch Mfg (¾e)....	1100	39¾	41	39¾	40⅝	+ ¾	40½	40⅞
72½	55	Amerada Corp (2)	200	60½	61	60½	61	+ 2	60¼	62
66	49	Am Agri Ch Del (2¼e)	100	52	52	52	52	+ 1½	51¼	53
17¼	10	Am Bank Note (.60e)..	200	16⅛	16¼	16⅛	16¼	— ¼	16	16½
42½	23¼	Am Brake Shoe (½e)..	600	29	29½	28⅝	29	+ ½	29	29½
125½	114	†Am Br Shoe pf (5¼)	30	122	122	122	122	....	121¾	122
91½	70¾	Am Can (4)..........	300	87	87	87	87	— ¼	86¾	88
27½	12⅝	Am Car & Fdy	100	16	16	16	16	— ¼	16	17
17⅝	9½	Am Ch & Cable (.40e).	400	11½	11½	11¼	11¼	— ¼	11	11⅝
110	88½	Am Chicle (4a)	200	108½	108½	107¾	107¾	+ 1¾	106	109

How to Read a Daily Stock Report

The day's prices of all stocks traded in on the New York Stock Exchange are published daily in most newspapers. The prices are quoted in dollars per share, but sales are made in 100-share lots. The first two columns show the high and low prices for the current year. The column headed "Sales" shows the number of shares of stock bought and sold on the day of the report. The next column, headed "Open," gives the price at which the first sale of the day was made. The next two columns give the high and low prices for the day. The column headed "Last" (in many reports "Close") shows the price at which the last transaction for the day was made. The column "Net chge." (net change) gives the difference between today's last price and yesterday's last price. It is marked + if the stock has gone up; — if the stock has gone down. "Closing bid and ask[ed]" shows the last price offered and the last price demanded. The figures in parentheses after the names of the stocks indicate the annual dividends being paid on the stocks. Special notations are usually explained in footnotes

their own account and also for their clients. Settlements are usually made on the business day following the sale, although they may be made on the day of the sale, or the settlement may be postponed for several days.

There are two general types of sales on the exchange, *ordinary sales* and *short sales*. The *ordinary sale* consists of selling a security that is actually owned. The *short sale* consists of selling a security that is not owned. The settlement is made by borrowing the stock from someone and this borrowed stock is delivered to the buyer. The short seller expects the price of the stock to fall, and if it does, he is able to buy in the stock at a later date for a lower price, return this stock for the borrowed stock and make a profit because the price fell. In 1938 the Securities and Exchange Commission prohibited short sales at a price lower than the last prior sale price of the stock.

Buying stock *on margin* means that part of the funds for the purchase of the stock have been loaned by or through the stockbroker. The stockbroker uses the stock purchased as security on which to borrow from the bank, and in case the stock falls in price, the owner must pay more of the purchase price, or the broker can sell the stock to recover the amount loaned. The Securities and Exchange Commission has the power to fix the amount of margin required. Only securities that are officially listed on the exchange can be bought and sold; and certain information must be filed with the Securities and Exchange Commission, and approval of the exchange must be secured before a stock can be listed. The stock exchange has become one of the most important institutions in every modern capitalistic nation, and it enables the securities of the government and private corporations to be distributed throughout the world and to remain readily marketable.

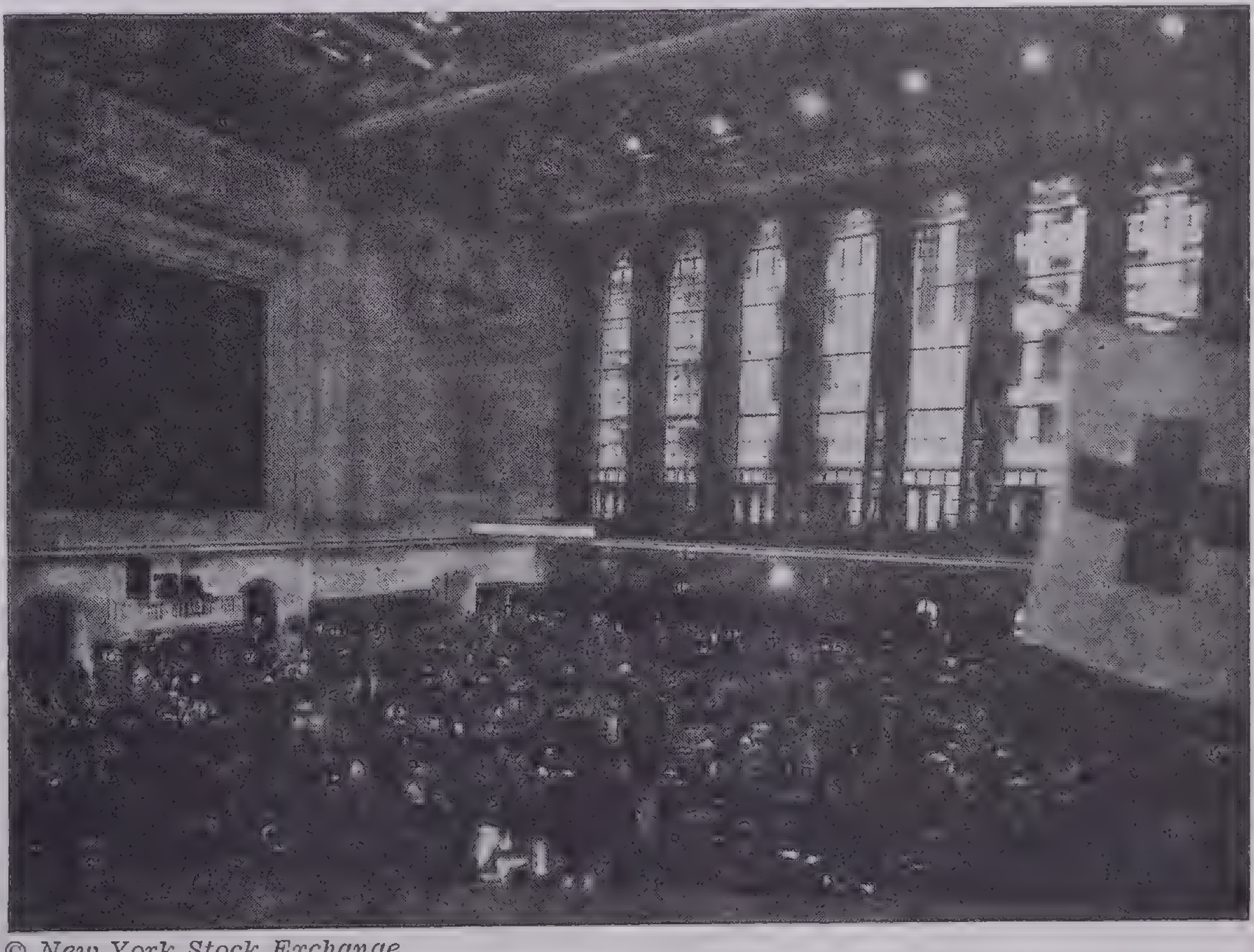
straddle, a double option of putting or calling, similar to a spread, but only one price is named in it, and the stock may be bought or sold at this price. The straddle is practically a bet that the security will fluctuate more than the price paid for the straddle, for in order to realize a profit the stock must go up or down more than the amount paid for the straddle.

strike, a concerted suspension of work by a group of employees for the purpose of forcing a satisfactory settlement of an industrial dispute. The strike is labor's most powerful weapon in industrial warfare, but it is warfare and brings great economic loss to the community and to the employers and employees and frequently great suffering to the laborer and his family. Strikes are usually for the purpose of obtaining the right to bargain collectively or to obtain higher wages, shorter hours and better working conditions.

Sympathetic strikes have the purpose of aiding workers in another industry or plant. Sympathetic strikes amounted to only 2 per cent of the total strikes in the United States from 1916 to 1932.

A *general strike* is a strike of all the workers of many trades in a certain area. There was a general strike in England in 1926, but it was not successful and has since been prohibited by law.

The frequency of strikes varies through the business cycle. In the period of prosperity when business conditions are improving and prices are going up more rapidly than wages, there are many industrial disputes; but in the period of depression when unemployment is increasing and prices are falling faster than wage cuts, then there are fewer strikes. When a strike has been called, the labor leaders have two main problems: to maintain the enthusiasm of the strikers and to prevent other workers from operating the plant. A large financial backing is necessary, and it is usually obtained from the union's "war chest" and by contributions from sympathetic unions. This fund is used for publicity, for managerial expenses and for necessary food and shelter for workers who have no income or resources during the strike. The main method of preventing other workers from operating the plant is by *picketing*. The strikers and sympathizers in lines outside the plant attempt by persuasion or force to prevent others from enter-



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Market Place for the Nation's Securities

Millions of dollars' worth of securities are traded on the floor of the New York Stock Exchange by members acting for themselves or as brokers for others

No
TARRYTOWN
AUTO WORKERS
DEMAND
BARGAINING
Down with
LABOR
SPIES
FOR
AUTO
WORKERS

International News Photo

Picketing: A Weapon of Employees on Strike

ing the plant, to persuade other workers to join the strike and also to bring the strike before the public. A recently developed technique to prevent others from coming in and filling the positions of the strikers is the *sit-down* strike, in which the workers remain at their places in the factory but refuse to do any work. This makes it impossible for the factory owners to bring in other workers or to operate the plant at all.

The employer generally tries to operate his plant with new workers, to persuade the old workers to abandon the strike and to make the public believe that the strikers' demands are impossible, that most of the employees are not in sympathy with the strike and that the patriotic thing to do is to have the strike called off.

A strike may be settled by default, by direct negotiations between the parties or by outside intervention. A settlement by default occurs when the strikers give up and return to work without securing any of their demands. Settlement by direct negotiations between representatives of the employers and employees may result in a victory for either party or a compromise, depending upon the strength shown by the workers and the employers. Intervention by the government may take the form of compulsory arbitration (as in Australia, Germany, Italy and until 1932 in New Zealand) or merely an offer of specially trained experts to mediate in the dispute as in the United States. During the period from 1916 to 1932 in the United States, 37 per cent of strikes were won by the employers, 34 per cent by the employees, and the remaining 29 per cent were compromised.

supercargo, one who goes on a ship in charge of the cargo, its sale at ports of call and the purchase of additional cargo. He does not have any authority to interfere with the management of the ship. A supercargo may be the owner of the cargo or an agent of the owner.

supplies, goods necessary for the operation of an enterprise that do not become a part of the physical product and that are continually being used up, such as fuel, lubricants, belting and office stationery.

supply, the rate of flow of a commodity into the market. The terms supply and demand do not have parallel meanings. *Demand* refers to the amount of goods that will be purchased in a market and at the price; *supply,* to the rate of flow of the article into the market to be offered for sale. Since goods must be produced in advance of sale, the price at which the articles can be sold does not exert the same influence on sales as price does upon demand. This lag of the effect of price on supply is one of the main difficulties in the analysis of the forces of supply and demand. In the long run the supply will depend upon the costs of production. These costs will be the amounts that a producer must pay for the factors of production to prevent their use by other producers.

surcharge, an overcharge either by adding an additional amount to the fixed charge or by a failure to allow discounts; a legal remedy for the correction of mistakes or frauds in accounts. Under certain conditions a trustee may be surcharged for his failure to properly administer the trust. Whether or not a trustee may be surcharged depends primarily upon the wording of the instrument creating the trust.

surplus, the excess of assets over the combined total of capital and liabilities; undivided profits at the time of settlement.

surplus value, the famous theory of Karl Marx regarding the exploitation of labor. The basis of this theory is that labor is the only source of value and that therefore all returns taken in the form of profits, rent and interest are wrongfully taken from labor. Marx declared that the chronic oversupply of labor gives employers a monopoly advantage, and they can therefore deprive the laborer of what is justly due him. For example, if an employer hired a worker to build a boat that was sold for $100 over the value of the materials used in the construction, and then the employer paid the worker $50, the other $50 retained by the employer would be surplus value created by the worker and wrongfully kept from him by the employer. This theory has been abandoned even by communistic economists, for the basic idea that all value is created by labor is not tenable. Value depends upon the utility of the article and its scarcity in relation to the demand for it. Furthermore, the other factors of production—land, capital and business enterprise—are now recognized to be productive as well as labor.

surrender value, the amount that will be paid by the insurer to the insured upon the surrender of an insurance policy. The surrender value of a life-insurance policy is a stipulated percentage of the reserve value. The surrender value of a property-insurance policy consists of the unearned premium less the customary short-term charges for the length of time that the policy has been in force.

sweating system or **sweatshops,** a system of production operating through industrial homework and small shops in which the wages are so low that the producer is said to make his profit from the "sweat" of the workers. In the sweating system the capitalist merchant usually gives out the work to contractors, who in turn distribute it to laborers who work in their homes or small shops. This method of production antedates the factory system, and before modern capitalism it was the usual method of production. In Japan a large part of the total production is still carried on in the homes and small shops. In the United States sweating methods have been especially prominent in making cigars, artificial flowers and toys and in finishing garments. The manufacturer of the partly finished garments delivers them to a contractor who takes the garments to a slum section of the city and distributes them in various homes. In each household the women, children and unemployed men finish the garments and then turn them back to the contractor. Little capital is needed to run a sweat-system industry and it is especially useful to the producer where the demand fluctuates seasonally. All the workers necessary can be secured when there is work to be done, and the workers are discharged when the demand falls off. The sweating system always means low wages, long hours and poor working conditions. Women, children, semi-invalids and the aged are the groups exploited in the sweating system. The first law dealing with the

Courtesy U. S. Department of Labor

Sweated Garmentworkers Earn Below-Standard Wages in Crowded Shops

evil was passed in New York. This law prohibited the manufacture of cigars and cigarettes in tenement houses in large cities but was declared unconstitutional in 1884. In 1892 a licensing system was substituted, and since then 15 states have passed laws regulating industrial homework in some manner.

syndicate, an association of bankers joined together for the purpose of carrying out some large financial plan. The commonest form is an underwriting syndicate formed for the purpose of insuring the sale of a complete stock or bond issue. The syndicate buys the entire issue at a price under the estimated market value and then sells the securities to the public. Any of the issue that is not sold must be taken by the members of the syndicate. In Germany syndicates of manufacturers have been formed for regulating output and organizing its sale, so that the syndicate is a special form of combination or cartel.

tare, the allowance made for the weight of the case, bag, chest or other article in which goods are packed. Average tare is usually 10 per cent of the bulk weight and is allowed when the articles are packed in a large number of different-sized containers.

trade cycle, see *business cycle.*

trade-mark, "an emblem, device, diagram, picture, word, or group of words; figure or group of figures; or a combination of these elements, used to indicate the origin of a product. In the case of nonregistered trade-marks, this protection is given under the common law while for registered trade-marks it is given in accordance with the provisions of the Federal Trade-mark Registration Act. In the final analysis a trade-mark in any specific case is what the court in that case decides to regard as a trade-mark." (Definition from Agnew, Jenkins and Drury, *Outline of Marketing,* McGraw-Hill, 1936.)

trade name, an identifying name for a product, coined by the manufacturer, used in his advertising of the product and on the package or container. Often the trade name and trade-mark are identical. The trade name is the designed and planned method of identifying the product and the means by which the purchasing public may ask for it briefly, conveniently and without danger of being misunderstood.

trade route, the route along which commercial products move. It has existed since the earliest dawn of civilization, being created on account of the unequal distribution of the earth's resources and the necessity of moving raw materials that are abundant in one region to regions where they are scarce and are desired for manufacturing. A trade route likewise sprang up between the manufacturing center or place of production and the market center or place of consumption or processing for further distribution.

The three types of trade routes are: land, water and air. The direction of land routes is affected by favorable climate; by the distribution of trade centers; by military exigencies, particularly in Europe; and by topography—mountain passes and water gaps, for instance always have played an important part since time immemorial in overcoming the obstacles that mountains presented. Rivers and lakes also have been utilized since earliest times as inland arteries of transportation. Those rivers that have the highest rating for navigability have generally been improved by: dredging so as to correct insufficient depth or length; straightening the channel and meandering courses; removal of shifting sandbars at the mouth; and building canals and locks so as to circumnavigate rapids and falls.

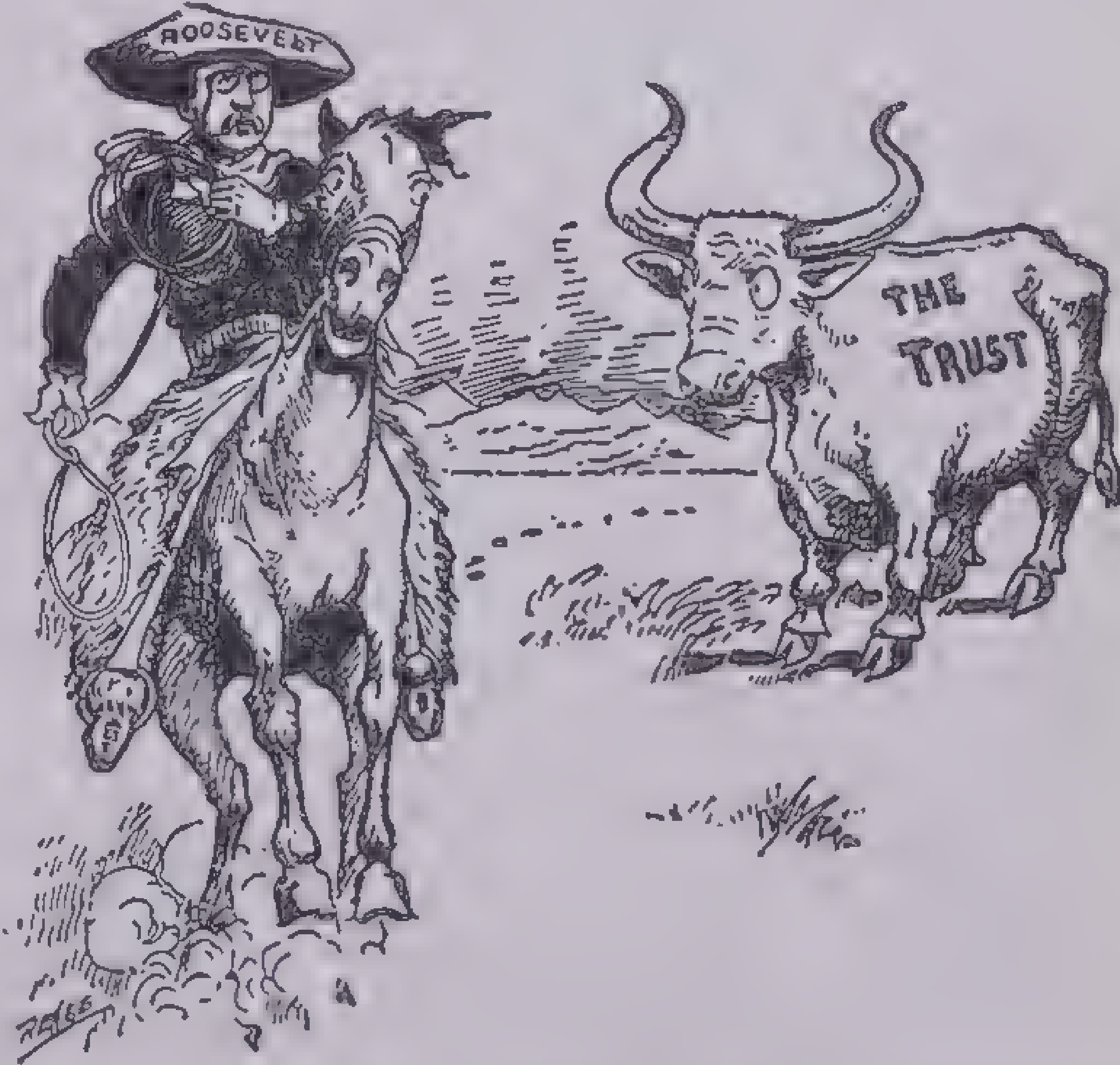
Oceanic routes have been largely determined from surveys that revealed the wind systems of the earth, particularly in stormy areas, and the topography of the ocean floor, so as to avoid navigational hazards and the advantage of a shortened route in following great circle paths. The Atlantic Ocean carries nearly one-fourth of the tonnage of all merchant vessels, and the Pacific is yearly growing in importance.

The direction and altitude of aerial routes are likewise greatly affected by topographical and weather circumstances and from experiments already made via transpolar routes show a preference for great circle paths. As a means of connecting trade centers much quicker than can be done by rail or steamship this method of transportation has been especially adopted by the smaller European countries, such as Denmark and the Netherlands. The U.S.S.R. has found aerial navigation a means of unifying its vast country. Between North and South America air transport has proved to be one of the most successful methods of intercourse.

trade union, see *union.*

trading area, a region that is a unit for marketing purposes, composed of a center (trading center or trade center) and the center's contributing territory from which buyers come to make their purchases. In theory no one living in a trading area buys anywhere except at its center (or centers); and trade is self-contained in the area—no one living outside the area enters it to buy.

trust, in popular language, any large company or combination of companies that is able to exercise effective control over markets or shut out competition through its great financial power. Originally a trust was



From the St. Paul Pioneer Press, October, 1901

Will TR Rope the Trust Steer?

Big business, in the early years of the century, kept a close eye on President Roosevelt, whose antitrust views were known and feared an organization formed to act as a *trustee,* that is, to act for the joint benefit of its individual members. See *combination* and *monopoly.*

turnover, the rate at which goods are sold, the movement of goods into a store and out of it. Merchandise turnover is the number of times that new merchandise must be purchased to replace the merchandise sold. If the entire stock of a storekeeper is disposed of twice a month, his merchandise turnover is twice a month. The higher merchandise turnover is, the better the business.

Labor turnover is the number of times that positions in the business have to be refilled during a certain period (usually a year). The higher labor turnover is in a factory, the greater are labor costs because it is necessary to train new workers, and there are losses from inexperience and slow work.

underwriter, the company or individual who makes an insurance contract guaranteeing indemnity for loss if certain events occur; the insurer. In the early days of marine insurance at Lloyds of London the name of the boat that was to be insured was written on a board, and any person who agreed to take part of the insurance wrote his name and amount under the name of the boat.

In finance the underwriter is the person or corporation that guarantees the sale of certain securities by agreeing to purchase them on a set date and at a set price. Usually an investment-banking house buys new securities at a slight discount in return for their service of distributing the securities to other corporations and the investing public.

unearned increment, a gain in the value of property not due to any act of the owner. For example, if farm land around a city or town becomes valuable for residential purposes through the growth of the city, this increased value of the land is unearned increment since the increase in the value of the property has not resulted from any act of the owner. The term is generally applied to increase in land values, but economists have shown that the concept may be applied to almost any field of economic activity. John Stuart Mill (1806–73) formulated the concept of unearned increment, basing it upon the Ricardian theory of rent. Mill declared that the unearned increment was realized from the fertility of the soil or from advantageous location; that other forms of income were earned from services rendered—but the landlords "grow richer, as it were, in their sleep, without working, risking or economizing." Mill pointed out that the unearned increment from land was due to the monopolistic nature of the land, and later writers extended the concept of unearned income to other forms of economic activity where there was a monopoly involved. Marx elaborated this idea, applying it to labor and reasoning his "surplus value" theory from the premise that the entrepreneurs had a monopoly of the labor market and were able to pay the workers less than the value of their labor. Marx looked upon this concept as a basic explanation of exploitation in the capitalistic system, but Mill and his followers regarded it as an exceptional situation in an otherwise fair and just economic system. This distinction of unearned increment has more than a theoretical importance, for this concept was used as a basis of the argument that since the owner did not do any act to earn this increase in value, it belonged to the people generally and should be taken by the state either directly or through taxation. The Single Tax plan, advocated in the United States by Henry George (1839–97), urged the taxation of unearned increment as the sole source of revenue for the government. The main objection to these plans lies in the practical difficulty of determining how much of the increase in value is unearned increment and what is rent and interest. Such taxes as excess-profits taxes are based on an extension of the theory of unearned increment to unusual profits made from a fortuitous market condition or some national emergency such as war.

union (labor union or trade union), an organization of workers to secure various benefits through united action. The regulator of the capitalistic system is competition operating through the price system. In this bargaining process the individual laborer is at an obvious disadvantage in bargaining with the employer. If a single laborer refuses to work at a certain wage, the employer can easily get someone else to fill the position. The essence of bargaining is the power to withhold something, and though the individual worker has only the power to withhold his services, the employer can withhold the position and the resulting income to the worker. But if workers unite and together make a demand on the employer, they have a much greater bargaining power. If the group is strong enough, it can prevent the operation of the factory and inflict economic losses on the owners. It is in order to gain this power in bargaining that laborers have formed together and organized unions. Before the 1880s the union movement in the United States was not powerful. It was confined to a limited number of local craft unions. Immigration, negro workers and the opportunities of the frontier all worked against a strong labor organization. In addition there were legal barriers to union activities growing out of the old English law that made it a criminal offense for workers to agree together to seek a higher wage. The laws were gradually changed, and under New Deal legislation labor finally received the right to bargain collectively without undue legal restrictions. The total union membership in the United States was about 447,000 in 1897 and grew to a peak of over 5,000,000 members in 1920 but declined to 3,298,000 in 1931. Then under the impetus of favorable legislation the union membership grew rapidly so that by 1938 the unions claimed a membership of over 7,000,000.

usury, an excessive or illegal rate charged for the use of money. In the United States the maximum legal interest rate in each state is fixed by the legislature, and a rate that is higher than the legal interest rate is called *usury.* In England the rate is not fixed by the legislature, but the courts determine whether the rate is injurious. Originally usury meant use and applied to all payments for the use of capital and carried no moral stigma. Later the term came to be applied only to the charging of excessive rates. Taking payment for a loan was condemned by the Greek philosophers and the Jewish and Christian churches. The church restrictions applied only to loans within the groups. The general doctrine was that money was not productive and did not produce other money; therefore taking payment for the loan of money was contrary to the law of nature. Although the church prohibited the taking of interest or usury during the Middle Ages, there were usually methods to get around the prohibition. At first the lender was allowed to collect a fine if the money was not repaid; then there came to be a penalty clause inserted in the loan agreement by which the borrower was given a short gratuitous loan and then required to pay a fine if he kept the money longer than this period. The next step was to allow charging interest, if the lender could show that he had to forgo a potential profit by making the loan. Finally Cardinal Cajetan (1470–1534) laid down the modern doctrine of the Church, denouncing the concept of the sterility of money and indicating something of the modern idea of the productivity of capital. The change of the type of loans was an important influence in the point of view of the Church. In the earlier days loans were almost entirely for consumptive purposes, like a loan to a neighbor so that he could buy necessary food or shelter, and it was natural that charging interest for this sort of loan should be deemed unethical. As loans for business purposes developed, the productivity of the loan to the borrower became evident, and this type of transaction was regarded differently.

value and price. The value of an article may be defined as the power of that article to command other goods in exchange. The value of a table may be two chairs or ten meals. Price is merely an expression of value in terms of money. It greatly facilitates matters to have a common denominator of value, so that instead of saying that the value of a table is two chairs we can say that the value of the table is $10 and the value of a chair is $5. In speculating on the subject of value and price, the ancient Greeks distinguished two kinds of value, use-value or utility and cost. Adam Smith and the classical economists dismissed the idea of use-value as a cause of price. Using the famous illustration of water and diamonds, Smith declared that there was no relation between the utility of these two articles and their price: water, by far the more useful commodity, can be secured for nothing, but diamonds command a high price. The classical economists explained price on the basis of the labor cost of the article. The high cost of diamonds, they said, was due to the labor involved in obtaining them, and the low cost of water was due to the fact that no labor was involved in producing it. This theory has been generally abandoned, and modern economists have shown the importance of marginal utility, based on use-value that is dependent upon scarcity. The competition of various enterprises for the same factors of production causes the cost of labor in one factory to be determined by the amount that another factory manager is willing to pay the same laborer for his services in aiding in the production of another product.

Further factors in the question of price are the numerous conditions and prejudices that cause a buyer to purchase one article rather than another. In addition any limitation of supply will influence price, and under monopoly conditions the price may be set arbitrarily at the point that will give the greatest returns. From the point of view of money, prices change in relation to the value of the commodities. High prices are related to cheap money, and low prices are related to dear money.

The price system is the general coordinating factor in our economic system. It encourages the enterprises that society desires and discourages those that society does not want. Paying the price for an article is like casting a ballot for that article and against other competing articles, for by the gain on the sale the one producer is given a basis to continue in business, and competing producers are restrained.

variety store, a retail store that handles a wide assortment (variety) of goods all of low unit price, generally from 5 cents to a dollar. Examples: the 5 and 10 cent store, the up-to-a-dollar store.

In variety stores clerks are actually not salespeople but mere change makers and package wrappers. Sales are made by counter display—exposing the goods to the consumer. Novelty goods are most likely to be sold in variety stores.

vested interest, an activity in which a large amount of capital has been put or which has been carried on for such a long period that the courts will not deprive the owner of the interest except for the public good or by compensating him. The Century Dictionary definition is: "an interest completely assured and constituting such a right as a change in the law generally ought not to take away except for public use and upon compensation." For example, when a corporation has built a factory and operated it for years under the protection of a high tariff, the corporation has acquired a vested interest; to lower the tariff and admit foreign-made goods would destroy the business and cause a loss of the investment in the factory. In some cases the law will protect a vested interest, and in other cases it will not. When the Prohibition amendment was passed, it destroyed the vested interests of all the breweries and liquor producers, but this destruction was deemed desirable in the interests of society. The decision becomes a balance of interests between the individual and society as a whole. Where the benefit to society is small, and the injury to the individual is great, the vested interest should be protected; but where the change will greatly benefit society, then the individual must give way.

voluntary chain, a group of independent retailers acting together in buying, advertising or centralized control. Often the group is brought together and aided by a wholesaler or manufacturer whose products the voluntary chain features. Some retail groups now own wholesale establishments. Grocery stores have been the type that has most successfully used this form of co-operation. From 1930 to 1936 the number of groups of voluntary chains increased from 550 to 800, and the number of retailers in these groups from less than 60,000 to more than 107,000.

wages, the price paid for the service of labor in a unit period of time. Wages are contractual and are made by an agreement between the employer and employee. Various theories of wages have been proposed from time to time, and economic understanding of the factors influencing the wage rate is still developing.

The first important theory of wages was developed in France during the 18th century. From the observation of the conditions of labor at that time the *subsistence* theory was formulated. The *subsistence* or *iron law* of wages held that the amount of wages is determined by what it costs the workers to keep alive. The basis of this theory is that under the wage system labor is bought and sold like a commodity, and the sole determinant of the value of labor is the cost of producing the labor supply. This cost of production was said to consist of the commodities—food, clothing and shelter—that the laborer needs to exist plus the cost of keeping up the labor supply; that is, the cost of rearing children to the working age. They believed that if the peasants received more than a bare living, then there would be an increase in the population, and the added numbers would again drag down the wages to a bare subsistence. But if the laborers received less than a bare subsistence, some of the workers will die, and this shortage of labor would raise wages to the subsistence level again. Experience has shown that this theory of wages is no longer applicable to conditions in western nations. The population has not increased when wages were raised.

A modern and widely accepted theory of wages has been that of *marginal productivity*: under perfect competition the laborer receives in wages an amount equal to the productivity of the least productive laborer in that type of work. The amount that the least productive worker adds to the total products is called the *marginal product*. It is not because the marginal worker is the least efficient, but because the law of diminishing returns operates, that the marginal worker adds the least to the total product. To determine the marginal product, imagine that one worker is withdrawn; the decrease in the total product of all the workers caused by the withdrawal of this one worker is the marginal product. The employer will pay wages up to the value of the marginal product because there is this much added value in production. This marginal theory of wages has been widely criticized because it is based on the assumption of a perfect competition that does not exist; because production is due to an organic union of the various factors of production and the loss due to the withdrawal of one worker may be much greater than the marginal productivity assigned the worker; and because the theory does not take into consideration the relative bargaining power of the employer and the employee.

Wages cannot be any lower than the amount necessary to sustain the life of the worker, nor can the worker be paid more than his marginal productivity. These are the minimum and maximum levels of wages, and between these two limits wages are largely determined by the relative bargaining power of the employer and employee. Although many economists have claimed that labor from an economic point of view is not different from other factors of production, such as land and capital, it is important to remember that labor is provided by human beings with physical and legislative powers as well as needs. Since the well-being of society is the aim of the economic system, and laborers constitute the major proportion of society, the welfare of the worker is a primary consideration in economics.

Wall Street, a street in the financial district of New York city. The term is used in a general sense to refer to the large financial interests of the country that have their offices in the financial section of New York city.

warehouse, a building in which property is stored. A public warehouse is one that will accept goods offered for storage by anyone who pays the charges. The public interest in warehouses has brought them under government regulation. A *bonded warehouse* is one under the supervision of the government in which goods may be stored without the payment of customs duties. Goods brought into the country and intended for export are stored in bonded warehouses to avoid the payment of import duties.

A *warehouse receipt* is a certificate listing and describing goods in warehouse. It must be surrendered to secure delivery of the goods. While the goods remain in storage, the receipt is negotiable.

watered stock, stock issued by a corporation without receiving full value for it. One of the common methods of watering stock is to issue stock for

Underwood & Underwood

Wall Street, New York

Trinity Church, facing the west end of Wall Street, is framed by the skyscrapers of the financial district. At the right is the statue of Washington which stands before the United States Subtreasury

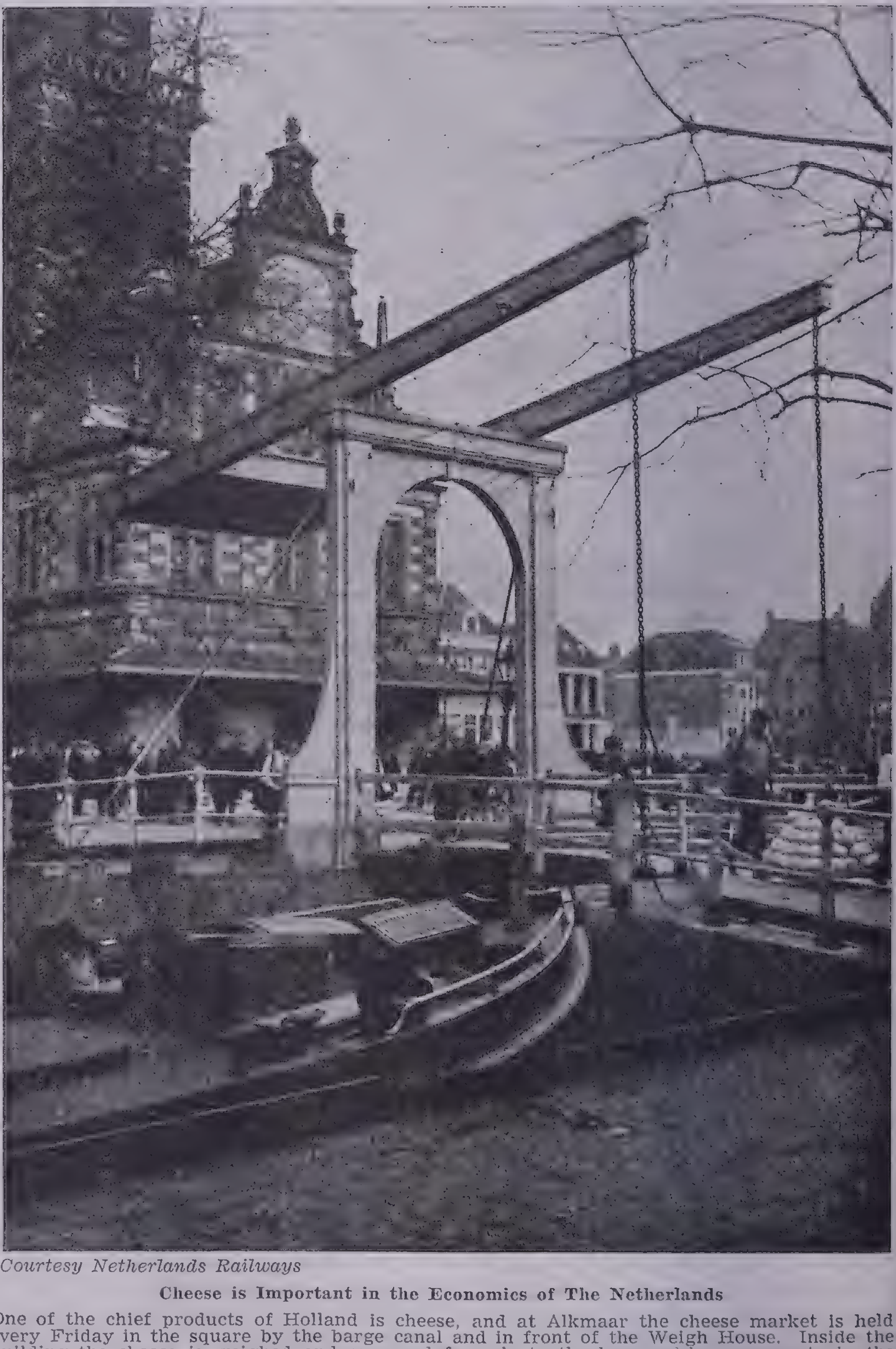
property or services that are overvalued. If a corporation sells 1,000 shares of stock at $100 a share to investors and then gives another 1,000 shares of stock in payment for property and services really worth only $50,000, the stock is said to be watered, for the corporation has issued $200,000 worth of stock and has only received $150,000 worth of assets in return. The essence of watering stock is the overvaluation of assets, and it may be done innocently or with intent to defraud.

wealth, something that has exchange value. In order for a thing to be considered wealth in the economic sense, it must have four attributes: it must have *utility,* that is, it must be desired to satisfy human wants or needs; it must be *scarce,* which means that it must not exist in such abundance that anyone can have as much of it as he likes—air is not scarce and therefore not wealth; it must be *material or concrete* in nature; and it must be *transferable* so that it can be given to another person or its ownership can be transferred to another person. Money is not wealth because it is not useful in itself. A paper dollar has no use except that it can be exchanged for something that is useful. Therefore, if a nation increases the amount of money in circulation, it does not increase the wealth of the nation.

white list, a detailed list of all the stock and bond transactions on the New York Stock Exchange. It is issued daily, printed on white paper and divided into three sections: sales from 10 A.M. to 12 noon, sales from 12 to 2 P.M. and sales from 2 to 3 P.M.

wholesaler, any middleman who is not a retailer, that is, does not sell to the consumer. Wholesalers sell goods for resale or for manufacture or remanufacture. In present usage *jobber* means the same as wholesaler, though originally it meant one who owned and sold odd lots or job lots.

yellow-dog contract, a contract of employment by which an employee agrees as a condition of his employment that he will not join a labor union. This type of contract has been a strong weapon of employers against union organization. The employer does not sue the worker for damages for breach of the contract, but uses the contract as a basis for securing an injunction against a labor organization that is active among the employer's workmen on the ground that the labor organizer is attempting to persuade the employees to breach their contract not to join the union. In 1915, 13 states had passed laws making the use of yellow-dog contracts criminal, but these laws were held unconstitutional by the Supreme Court of the United States. By 1930, 19 states had passed a new type of statute, which did not declare the yellow-dog contract criminal but made it unenforceable in the courts. The Norris-LaGuardia Act of 1932 contained a similar provision. The National Labor Relations Board in 1937 declared the yellow-dog contract an unfair labor practice.



Courtesy Netherlands Railways

Cheese is Important in the Economics of The Netherlands

One of the chief products of Holland is cheese, and at Alkmaar the cheese market is held every Friday in the square by the barge canal and in front of the Weigh House. Inside the building the cheese is weighed and arranged for sale to the buyers who congregate in the square, after which it is shipped down the canal to its next destination. A load of round cheeses is being carried across a lift bridge in the canal

MONETARY SYSTEM OF THE UNITED STATES

I. Gold, Silver and Minor Coins

	Gold Coin	Standard Silver Dollars	Subsidiary Silver Coin	Minor Coin
Weight	13.7 grains to the dollar.	412.5 grains.	385.8 grains to the dollar.	5 cent piece; 77.16 grains, 75 per cent copper, 25 per cent nickel. 1 cent piece; 48 grains, 95 per cent copper, 5 per cent tin and zinc.
Fineness	900–1000.	900–1000.	900–1000.	
Ratio to gold		30 to 1.	28.14 to 1.	
Limit of issue	Discontinued, 1934.	Coinage ceased in 1905, resumed in 1921.	Needs of the people.	Needs of the people
Denominations	$20, $10, $5, $2½.	$1.	50 cents, 25 cents, 10 cents.	5 cents, 1 cent.
Legal tender	Use of gold coin was made illegal in 1934. All gold money (except rare coins) is stored by the Treasury.	Unlimited, unless otherwise contracted.	Not to exceed $10.	Not to exceed 25 cents.
Receivable		For all public dues	For all dues up to $10.	For all dues up to 25 cents.
Exchangeable		For silver certificates and minor coin.	For minor coin.	
Redeemable			In lawful money at the Treasury in sums or multiples of $20.	In lawful money at the Treasury in sums or multiples of $20.

Paper Currency

	Gold Certificates	Silver Certificates	United States Notes	Treasury Notes of 1890	National Bank Notes	Federal Reserve Notes	Federal Reserve Bank Notes
Limit of Issue	Not issued since gold coins became illegal in 1934.	Unlimited except by stock of silver dollars or bullion in treasury.	$346,681,016.	No further issues; volume steady diminishing by redemption in silver dollars.	Issue discontinued 1934 and most have been retired.	Unlimited, not to exceed collateral deposited.	Unlimited, not to exceed collateral deposited.
Denominations	$10,000, $5,000, $1,000, $500, $100, $50, $20, $10.	$100, $50, $20, $10, $5, $2, $1.	$1,000, $500, $100, $50, $20, $10, $5, $2, $1.	$1,000, $500, $100, $50, $20, $10, $5, $2, $1.	$100, $50, $20, $10, $5.	$10,000, $5,000, $1,000, $500, $100, $50, $20, $10, $5.	$1,000, $500, $100, $50, $20, $10, $5, $2, $1.
Legal tender	Possession by private individuals illegal since 1934.	Not a tender.	For all debts, public and private, except customs and interest on public debt.	Unlimited, unless otherwise contracted.	Not a tender.	Unlimited.	Unlimited.
Receivable		For all public dues.	For all public dues.	For all public dues.	For all public dues except customs.	For all public dues.	For all public dues except customs.
Exchangeable		For silver and minor coin.	For subsidiary and minor coin.	For silver and minor coin.	For subsidiary silver and minor coin.	For subsidiary and minor coin.	For subsidiary silver and minor coin.
Redeemable		In silver dollars at the treasury.	In lawful money at the treasury.	In lawful money at the treasury.	In lawful money at the treasury, or at bank of issue.	In gold at the treasury or at any Federal Reserve Bank.	In lawful money at the treasury, or at the bank of issue.

COINAGE OF THE UNITED STATES

Denomination	Pieces	Values
GOLD		
Double eagles	174,105,606	$3,482,112,120.00
Eagles	57,683,485	576,834,850.00
Half eagles	78,911,869	394,559,345.00
Three-dollar pieces (coinage discontinued under act of September 26, 1890)	539,792	1,619,376.00
Quarter eagles	20,216,590	50,541,475.00
Dollars (coinage discontinued under act of September 26, 1890)	19,499,337	19,499,337.00
Dollars, various commemorative issues	375,417	375,417.00
Total gold	351,545,358	$4,526,218,477.00
SILVER		
Dollars (coinage discontinued, act of Feb. 12, 1873, resumed act of Feb. 28, 1878)	855,611,127	$855,611,127.00
Trade dollars (discontinued, act of Feb. 19, 1887)	35,965,924	35,965,924.00
Dollars (Lafayette souvenir, act of March 3, 1899)	50,026	50,026.00
Half dollars	483,613,712	241,806,856,00
Half dollar, various commemorative issues	10,710,033	5,355,016.50
Quarter dollars	738,692,393	184,673,098.25
Quarter dollars (Columbian souvenir)	40,023	10,005.75
Twenty-cent pieces (coinage discontinued, act of May 2, 1878)	1,355,000	271,000.00
Dimes	1,512,992,797	151,299,279.70
Half dimes (coinage discontinued, act of February 12, 1873)	97,604,388	$4,880,219.40
Three-cent pieces (coinage discontinued, act of Feb. 12, 1873)	42,736,240	1,282,087.20
Total silver	3,779,371,663	$1,481,204,639.80
MINOR		
Five-cent pieces, nickel	1,674,329,765	$ 83,716,488.25
Three-cent pieces, nickel (coinage discontinued, act of September 26, 1890)	31,378,316	941,349.48
Two-cent pieces, bronze (coinage discontinued, act of September 26, 1890)	45,601,000	912,020.00
One-cent pieces, copper (coinage discontinued, act of February 21, 1857)	175,850,744	1,758,507.44
One-cent pieces, nickel (coinage discontinued, act of April 22, 1864)	200,722,000	2,007,720.00
One-cent pieces, bronze	6,326,587,683	63,265,876.83
Half-cent pieces, copper (coinage discontinued, act of February 21, 1857)	7,985,222	39,926.11
Total minor	8,462,504,730	$ 152,641,888.11
Total coinage	12,593,421,751	$6,160,065,005.41

Silver-dollar coinage under acts of April 2, 1792, $8,031,238; February 28, 1878, $378,166,793; July 14, 1890, $187, 027, 345; March 3, 1891, $5,078,472—total $578,303,848.

BIBLIOGRAPHY

Maud and Miska Petersham, *Story Book* series, Winston, Phila., 60¢ each:
- *Things We Use,* 1933
- *Food,* 1933
- *Houses,* 1933
- *Clothes,* 1933
- *Gold,* 1935
- *Rice,* 1935
- *Wheels,* 1935
- *Ships,* 1935
- *Trains,* 1935
- *Aircraft,* 1935
- *Iron and Steel,* 1935
- *Oil,* 1935
- *Sugar,* 1936
- *Wheat,* 1936

F. G. Carpenter, *How the World is Fed,* American Book Co., N. Y., 1928, 96¢

F. G. Carpenter, *How the World is Housed,* American Book Co., N. Y., 1930, 96¢

F. G. Carpenter, *How the World is Clothed,* American Book Co., N. Y., 1929, 96¢

H. H. Webster and A. R. Pollinghorne, *What the World Eats,* Houghton Mifflin, Boston, 1938, $2.50

Agnes Repplier, *To Think of Tea,* Houghton Mifflin, Boston, 1932, $2.75

Franklin M. Reck, *Automobiles from Start to Finish,* T. Y. Crowell, N. Y., 1935, $2.00

Archibald Black, *Story of Bridges,* Whittlesey House, N. Y., 1936, $2.50

George E. Bock, *What Makes the Wheels Go Round,* Macmillan, N. Y., 1931, $2.50

Susan Meriwether, *Story of the Telephone,* Harpers, N. Y., 1927, $1.25
Frances Rogers and A. Beard, *Heels, Wheels and Wire,* Stokes, N. Y., 1935, $1.75
T. W. Van Metre, *Trains, Tracks and Travels,* Simmons-Boardman, N. Y., 1936, $3.00
H. B. Lent, *Wide Road Ahead,* Macmillan, N. Y., 1934, $2.00
H. B. Lent, *Clear Track Ahead,* Macmillan, N. Y., 1932, $2.00
H. B. Lent, *Full Steam Ahead,* Macmillan, N. Y., 1933, $2.00
H. B. Lent, *Diggers and Builders,* Macmillan, N. Y., 1933, $2.00
Archibald Black, *Story of Tunnels,* McGraw-Hill, N. Y., 1937, $2.50
Mary R. Parkman, *Conquests of Invention,* Appleton-Century, N. Y., 1921, $2.00
L. M. Bryant, *The Children's Book of Celebrated Bridges,* Appleton-Century, N. Y., 1925, $2.50
Floyd L. Darrow, *Masters of Science and Invention,* Harcourt, Brace, N. Y., 1923, $2.25
M. Ilin, *What Time is It?,* Lippincott, Phila., 1932, $1.50
W. D. Binger, *What Engineers Do,* Norton, N. Y., 1928, $2.75
Marjorie Bruce, *The Book of Craftsmen,* Dodd, Mead, N. Y., 1937, $2.75
Susan Smith, *Made in America,* Knopf, N. Y., 1929, $2.00
Susan Smith, *Made in Mexico,* Knopf, N. Y., 1930, $2.00
Susan Smith, *Made in England,* Nelson, N. Y., 1932, $2.00
Susan Smith, *Made in Sweden,* Putnam, N. Y., 1924, $2.00
William C. White, *Made in Russia,* Knopf, N. Y., 1932, $2.00
Ellison Hawks, *Boys' Book of Remarkable Machinery,* Dodd, Mead, N. Y., 1928, $2.50
W. B. Kaempffert, *Modern Wonder Workers: A Popular History of American Invention,* Blue Ribbon, N. Y., 1931, $1.00
W. H. Witcomb, *All About Mining,* Longmans, Green, N. Y., 1937, $2.50
Eric Hodgins and F. A. Magouin, *Behemoth, The Story of Power,* Doubleday, Doran, Garden City, N. Y., 1932, $2.50
R. S. Holland, *Historic Inventions,* Macrae Smith, N. Y., 1911, $2.00
A. P. Usher, *History of Mechanical Inventions,* McGraw-Hill, N. Y., 1929, $5.00
John Goldstrom, *A Narrative History of Aviation,* Macmillan, N. Y., 1930, $4.00
W. H. Meadowcroft, *Boys' Life of Edison,* Harpers, N. Y., 1921, $2.00
Archibald Williams, *Engineering Feats: Great Achievements Simply Described,* Nelson, N. Y., 1930, $3.50
S. P. Core, *Trails of Progress,* Putnam, N. Y., 1925, $1.75
A. F. Collins, *Aviation and All About It,* Appleton-Century, N. Y., 1929, $2.00
Charles Boff, *The Boys' Book of Flying,* E. P. Dutton, N. Y., 1937, $2.00
M. V. Charnley, *Boy's Life of the Wright Brothers,* Harpers, N. Y., 1928, $2.00
John McMahon, *The Wright Brothers —Fathers of Flight,* Little, Brown, Boston, 1930, $1.00
C. B. Allen and Lauren Lyman, *The Wonder Book of the Air,* Winston, Phila., 1936, $2.50
C. C. Fraser, *The Story of Aircraft,* T. Y. Crowell, N. Y., 1933, $2.50
Capt. Burr Leyson, *American Wings,* E. P. Dutton, N. Y., 1938, $2.00
John J. Floherty, *Moviemakers,* Doubleday, Doran, Garden City, N. Y., 1935, $2.00
John J. Floherty, *On the Air,* Doubleday, Doran, Garden City, N. Y., 1937, $2.00
R. S. Henry, *Trains,* Bobbs-Merrill, Indianapolis, 1934, $2.50
M. E. Gilchrist, *Rolling Along through the Centuries,* Longmans, Green, 1937, $1.25
O. Kuhler and R. S. Henry, *Portraits of the Iron Horse,* Rand McNally, Chicago, 1937, $2.00
John A. Miller, *Master Builders of Sixty Centuries,* Appleton-Century, N. Y., 1938, $3.50
Augustus Pigman, *A Story of Water,* Appleton-Century, N. Y., 1938, $1.50
G. F. Kunz, *The Magic of Jewels and Charms,* Lippincott, Phila., 1915, $8.50
Stewart H. Holbrook, *Holy Old Mackinaw* (lumbering), Macmillan, N. Y., 1938, $2.50
Mary D. Carter, *The Story of Money,* Farrar & Rinehart, N. Y., 1932, $1.25
Charles A. Lindbergh, *We,* Putnam, N. Y., 1928, $2.50
Eric Hodgins and F. A. Magouin, *Sky High, A History of Aviation,* Little, Brown, Boston, 1935, $2.75
John Langdon-Davies, *Radio,* Dodd Mead, N. Y., 1935, $2.00
G. G. Jackson, *The World's Aeroplanes and Airships,* Lippincott, Phila., 1930, $2.50
C. C. Fraser, *Heroes of the Air,* T. Y. Crowell, N. Y., 1936, $2.50
C. C. Fraser, *Heroes of the Sea,* T. Y. Crowell, N. Y., 1924, $1.75
Archibald Williams, *Conquering the Air,* Nelson, N. Y., 1930, $1.50
Laura B. Harvey, *The Skycraft Book,* Macrae Smith, N. Y., 1932, $2.00
Grover Loening, *Our Wings Grow Faster,* Doubleday, Doran, Garden City, N. Y., 1935, $2.50
Eric Hodgins and F. A. Magouin, *A History of Aircraft,* McGraw-Hill, N. Y., 1931, $4.00
General William Mitchell, *Skyways,* Lippincott, Phila., 1931, $3.00
Juan de la Cierva and Don Rose, *Wings of Tomorrow, the Story of the Autogiro,* Harcourt Brace, N. Y., 1931, $2.50
E. W. Teale, *The Book of Gliders,* E. P. Dutton, N. Y., 1930, $1.00
Ethel Lewis, *The Romance of Textiles,* Macmillan, N. Y., 1938, $4.00
H. E. Jacobs, *Coffee, the Epic of a Commodity,* Viking, N. Y., 1935, $3.50
William H. Ukers, *The Romance of Tea,* Knopf, N. Y., 1936, $3.00
G. L. Apperson, *The Social History of Smoking,* Putnam, N. Y., 1916, $2.00
Pan American Union, *Rubber,* Pan American Union, Washington, 1932, 5¢
J. Martin, *Romance of Rubber,* U. S. Rubber Co., N. Y., free
G. F. Kunz and C. H. Stevenson, *Book of the Pearl,* Appleton-Century, N. Y., 1908, $15.00
M. D. C. Crawford, *The Heritage of Cotton,* Grosset & Dunlap, N. Y., 1924, $1.95
Duncan C. Heyward, *Seed from Madagascar* (rice), Univ. of North Carolina, Chapel Hill, N. C., 1937, $3.50
S. Moseley and H. McKay, *Television: a Guide for the Amateur,* Oxford, N. Y., 1936, $3.00
J. G. Glover and W. B. Cornell, *The Development of American Industry,* Prentice-Hall, N. Y., 1932, $6.00
H. T. Warshow (editor), *Representative Industries in the United States* (automobile, banking, chemical, cotton, electric, lumber, meat, metallurgical, rubber, *et al.*) Holt, N. Y., 1928, $4.00
G. F. Warren, *Elements of Agriculture,* Macmillan, N. Y., 1926, $1.00
Harry Scherman, *The Promises Men Live By,* Random House, N. Y., 1938, $3.00
Leo Huberman, *Man's Worldly Goods,* Harpers, N. Y., 1936, $2.50
Alexander D. Noyes, *The Market Place,* Little, Brown, Boston, 1938, $3.50
Miriam Beard, *A History of the Business Man,* Macmillan, N. Y., 1938, $5.00
Dorothy M. Vaughan, *Buyers and Makers,* Longmans, Green, N. Y., 1929 80¢
E. L. Bogart, *Economic History of the American People,* Longmans, Green, N. Y., 1935, $3.50
H. G. Wells, *Work, Wealth and Happiness of Mankind,* Doubleday, Doran, Garden City, N. Y., 1931, $7.50
Mervyn Crobaugh, *Economics for Everybody,* Morrow, N. Y., 1937, $2.50
Warren C. Waite, *Economics of Consumption,* McGraw-Hill, N. Y., 1937, $3.00
James P. Warbasse, *Co-operative Democracy through Voluntary Association of the People as Consumers,* Harpers, N. Y., 1936, $2.50
Bertram B. Fowler, *Consumer Co-operation in America,* Vanguard, N. Y., 1936,
Marquis W. Childs, *Sweden the Middle Way,* Yale Univ., New Haven, 1936, $2.50
Frederic C. Howe, *Denmark, the Cooperative Way,* Coward-McCann, N. Y., 1936, $2.50
Horace M. Kallen, *The Decline and Rise of the Consumer,* Appleton-Century, N. Y., 1936, $2.75
Harriet Bunn and Mabie Falk, *Co-operative Life and Business,* Grosset & Dunlap, N. Y., 1936, $1.00
Frederick J. Allen, *Lords of Creation,* Harpers, N. Y., 1936, $3.00
Mitchell Broadus, *General Economics,* Holt, N. Y., 1937, $3.00
Charles S. Wyand, *The Economics of Consumption,* Macmillan, N. Y., 1937, $2.50
Sydney R. Elliott, *The English Cooperatives,* Yale Univ., New Haven, 1937, $3.00
Upton Sinclair, *Co-op,* Farrar & Rinehart, N. Y., 1937, $2.00
John Daniels, *Cooperation: an American Way,* Covici-Friede, N. Y., 1938, $3.00
H. E. Agnew, R. B. Jenkins and J. C. Drury, *Outline of Marketing,* McGraw-Hill, N. Y., 1936, $2.75

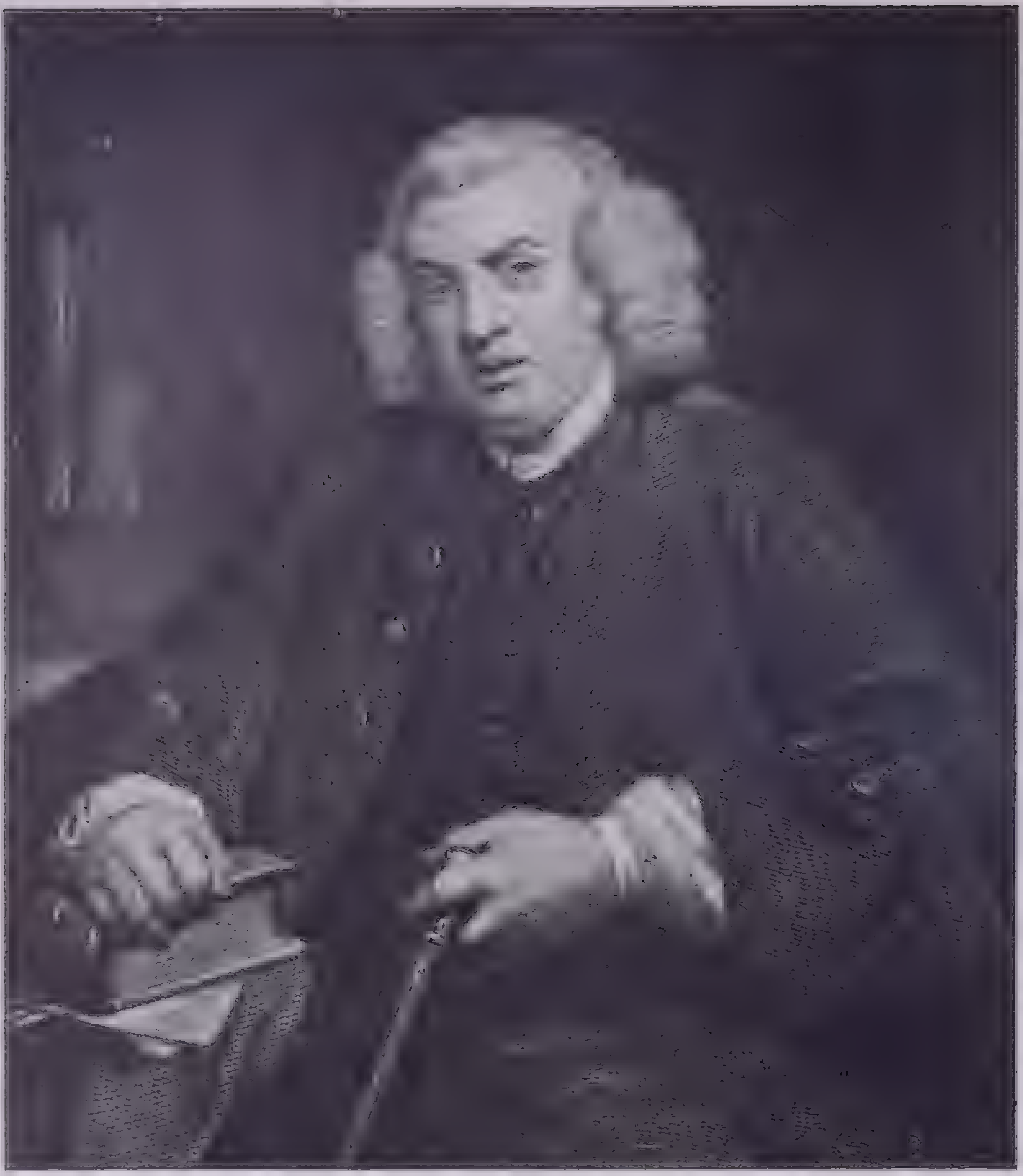
· Book · XIII ·

MULTIPLEX DICTIONARY

A General Dictionary, Giving Compact and Concise Definitions, Synonyms (with examples showing their correct use), Antonyms, Simplified Pronunciation, Syllabication and Part of Speech of Every Word; and Calling Special Attention to Words Frequently Mispronounced

A Useful Dictionary Ably Supplemented by Numerous Special and Technical Dictionaries throughout the Entire Volume Library

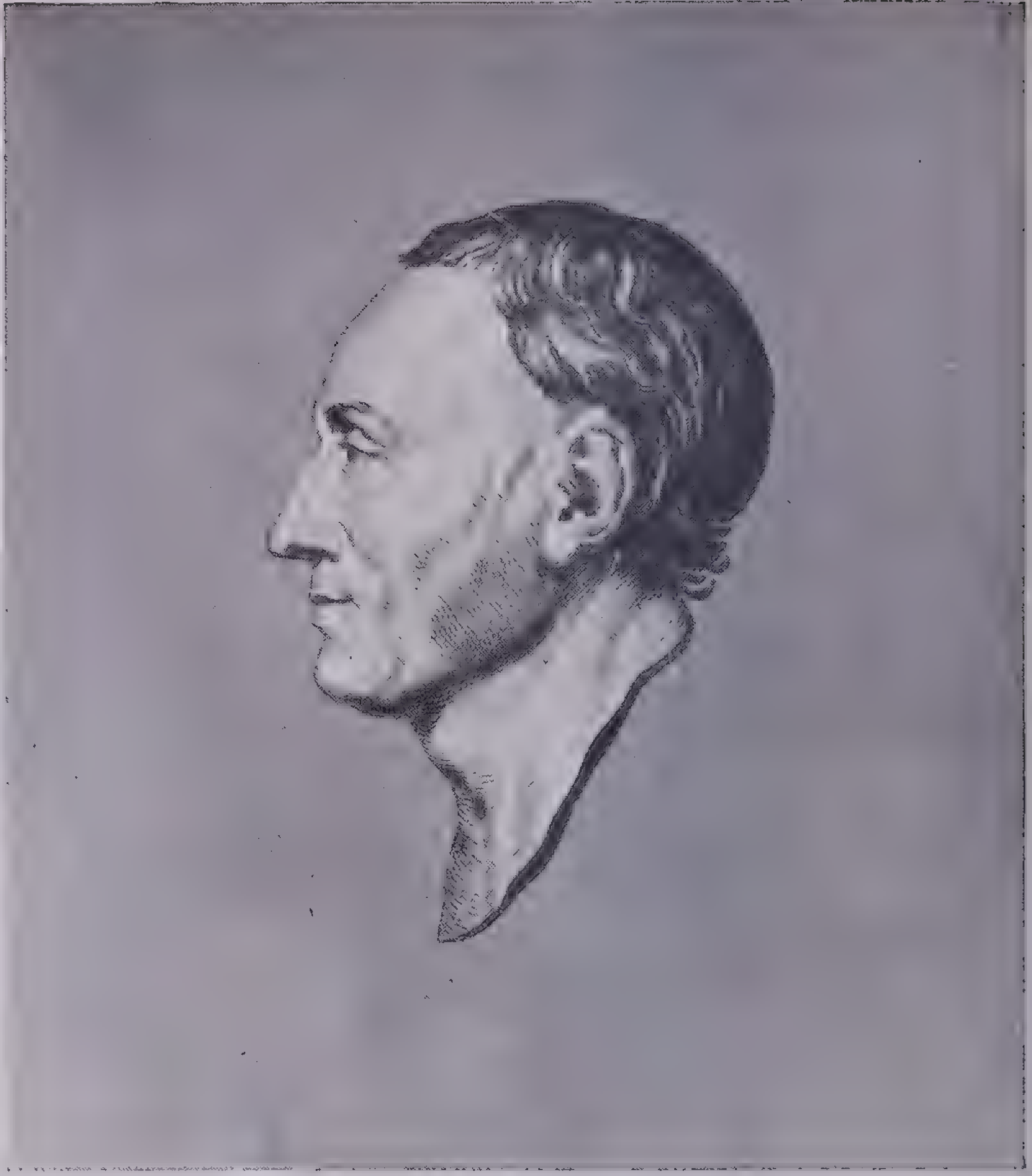
Page 1845



From the portrait by Sir Joshua Reynolds

Dr. Samuel Johnson (1709-84)

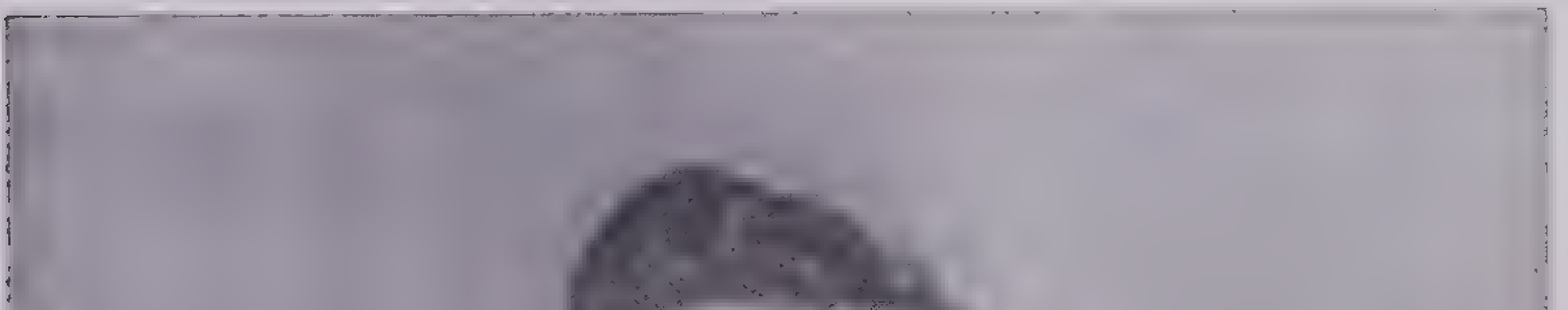
Samuel Johnson, the 18th-century poet, critic, oracle and wit, was the author of *A Dictionary of the English Language* published in two folio volumes in 1755. It was the first complete dictionary of the English language. As was the custom of the time, Johnson addressed his work to a wealthy nobleman, the earl of Chesterfield, who, contrary to the generous behavior of other patrons of literary men, rewarded this homage with hardly more than kind words. Although Johnson lacked a scholar's knowledge of derivations, his definitions were clear, precise and humorous, and he was the first to illustrate the meanings of words by use of literary quotations



From an engraving

Denis Diderot (1713-84)

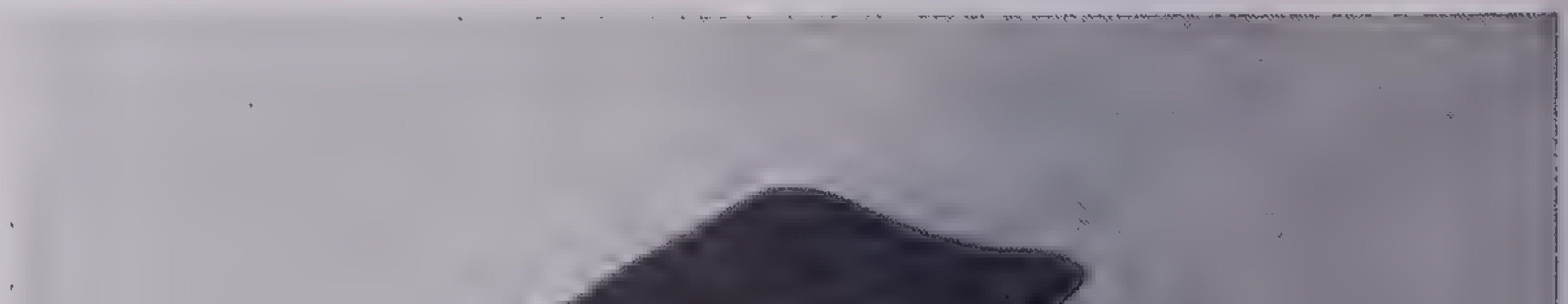
The monumental French *Encyclopédie* issued in 28 volumes from 1751-80 is not a dictionary, but in any list of makers of great reference works, Diderot's name assuredly has a place. The *Encyclopédie* had an extraordinary influence on his time. It was a practical work treating science, industry and agriculture in the factual style of modern scholarship. The reactionary governing class was angered that his treatment of philosophic and religious subjects did not follow the conventional manner of the time, and the *Encyclopédie* was formally suppressed, but this did not halt Diderot from completing his enormous task alone, working in secret after his colleagues deserted.



From the portrait by S. F. B. Morse

Noah Webster (1758-1843)

In the years following the setting of the new republic, the books that Americans read and studied were almost all imported from England. Webster saw America's need for books and especially for a dictionary for Americans. His brief *Compendious Dictionary of the English Language* (1806) was preparation for his great work, *The American Dictionary of the English Language* (1828). He had spent the intervening years in study of English and foreign languages. Webster introduced encyclopaedic features into his dictionary, established the practice of recording nonliterary words and defined words of purely American origin that he considered worthy



Courtesy Oxford University Press

Sir James A. H. Murray (1837-1915)

In modern times scientific organization is applied to scholarship when the work of many minds is co-ordinated to produce a dictionary. Several hundred eminent scholars selected and transcribed the 1,827,306 illustrative quotations for use of words that resulted in *The New English Dictionary on Historical Principles.* This great work in 13 volumes published 1884-1928 is often called the *Oxford English Dictionary* because it was produced in close association with the scholars and resources of the English university. Sir James A. H. Murray was the guiding genius of this largest and most complete of English dictionaries, although he died before the work was finished

Four Men Who Pioneered in Compiling Works of Reference

BOOK XIII: MULTIPLEX DICTIONARY

PRONUNCIATION

The key to the pronunciation in the Volume Library has been simplified to the utmost. For those who do not wish or need to go into the intricacies and technicalities of pronunciation—shades of sound, time values, the difference of a breath or half a breath—this key is adequate. The symbols used do not differ in meaning from those of other dictionaries. The only difference is that there are fewer of them.

Short vowels are not marked, and the difference between stressed and unstressed vowels (that is, between those in accented and unaccented syllables) is not marked, for this distinction takes care of itself in pronunciation; for example, the short unstressed *a* in fīn′ al is naturally given its correct value if the first syllable is stressed. Similarly the *a* in afford′ is given its correct value as a short unstressed vowel if the last syllable is stressed. The pronunciation of the *e* in nov′ el, the two short *i's* in illūm′ ināte, the second *o* in om′ icron and the short *u* in fō′ cus are taken care of in the same fashion. The following examples show the difference between stressed and unstressed vowels:

a in *a*bsolute and in *a*bsurd
o in hist*o*rical and in hist*o*ry
e in *e*ven and in *e*vent
u in m*u*le and in em*u*late

Stress in a sentence makes similar differences, as the student will see by pronouncing these sentences and noting the pronunciation of the vowel in question.

In the word *has*:

He has the book. He has found the book.

In the word *could*:

How could you? I could have gone.

These differences in vowel values are learned by *hearing* English sentences and phrases, not by looking up a single word in the dictionary. A detailed key to the pronunciation of words in the dictionary and other parts of the Volume Library follows. A brief key occurs at the bottom of each page, containing words so chosen and marked as to make constant turning back to the full key unnecessary.

* **Entries** preceded by a star are words often mispronounced or pronounced in different ways by different authorities.

Key to Pronunciation

a
- ā: māke, lāte, sāy, abrogate (ab′ rō gāt).
- â: bâre, pârent, where (hwâr).
- a: at, map, fat, afford, elephant, vocal.
- ä: färm, fäther, cär, psälm.
- ȧ: ȧsk, dȧnce, laugh (lȧf).
- *a*: sof*a*, banan*a*, pajam*a*, Cub*a*.

c
- s: cereal (sēr′ ē-al).
- k: cat (kat), cabbage (kab′ ij).

ch
- ch: chat, charm, cherub.
- *ch*: lo*ch*, i*ch*, Cu*ch*ulain.

e
- ē: ēqual, feet (fēt), see (sē), mēre, cēr′ ē al, edition (ē di′ shun).
- e: let, bend, elect, violent, novel.
- ẽ: fingẽr, racẽr, thẽ (usually not stressed).

f: fun, phosphorus (fos′ fō-rus).

g
- g: go, grand.
- j: gem (jem), edge (ej).

i
- ī: bīte, fīre, mīght.
- i: it, pin, only (onli), him.

j: jelly, jury, judge (juj).

k: cat (kat); quake (kwāk).

n: seañce (sā ä*n*s).
ng: song, uncle (ung′ kl).

o
- ō: gō, coat (kōt), vōte, sew (so), sōlarium (sō lâr′ i um).
- ô: ôrder, all (ôl), hôrse, dôg, gône, lôft, bought (bôt).
- o: lot, not, knock, romp, what (hwot), om′ i cron.
- oi: oil, voice.
- o͞o: no͞on, do (do͞o), ro͞ot.
- oo: good, foot, could (kood).
- ou: out, sound.

s
- s: so, sell, silly, ceiling (sēl′ ing).
- sh: she, nation (nā′ shun), sure (sho͞or).
- z: is (iz), surprise (sûr prīz′), dogs (dôgz).

th
- *th*: *th*ere, brea*th*e.
- th: thin, thorough.

u
- ū: ūse, mūte, few (fū), execūte.
- û: tûrn, her (hûr), cûrse, permanent (usually stressed).
- u: up, but, abrupt, under, focus, nation (nā′ shun).
- ü: menü.

x
- gs: exist (egs-ist′).
- ks: execute (eks′ ē cūt).
- z: Xenophon (zen-)

zh: usual (ū′ zhū al), rouge (ro͞ozh), measure (mezh′ ẽr).

′ : primary accent or stress.

The dictionary that follows gives the spelling, pronunciation and definition of the words in most common use in English. The Index to the Volume Library, arranged in alphabetical order like a dictionary, gives the precise whereabouts of information to supplement what is in this dictionary; and many proper names are pronounced in the Index.

Proper names and certain technical terms are treated elsewhere under their appropriate special classes in the Volume Library.

Other Vocabularies

See the *Dictionary of Literary Allusions* (p. 237) for brief résumés of famous books, names of literary characters and the meaning of literary terms.

See the *Dictionary of Mythology, Legend and Folklore* (p. 267) for names of mythical and legendary characters and for terms in myth and fable.

See *Books, Persons and Places of the Bible* (p. 296) for identification of the people and places of the Bible.

See the *Geographical Dictionary* (p. 359) for countries, cities, islands, rivers, lakes and mountains and for definitions of geographical terms.

See the *Historical Dictionary* (p. 714) for the names of countries, treaties, wars and other historical places and events.

See the *Governmental and Legal Dictionary* (p. 1375) for definitions and explanations of legal and political phrases and terms.

See the dictionary of *Biography* (p. 1443) for names of real persons.

See the *Industrial Dictionary* (p. 1623) for explanations and definitions of the mechanics of industry and trade.

See the *Economics and Business Dictionary* (p. 1807) for information on the ordinary vocabulary of economists, businessmen and bankers.

See the *Dictionary of Given Names* (p. 2235) for their origin and meaning.

There are special alphabetical lists of words with definitions and explanations in

many other parts of the VOLUME LIBRARY:
Words and Phrases Frequently Misused (p. 158)
Dictionary of Abbreviations, (p. 179)
Dictionary of Prepositions (p. 181)
Dictionary of Sobriquets and Pseudonyms (p. 307)
National Monuments (p. 601)
National Parks (p. 605)
National Forests (p. 606)
Tunnels (p. 1755)
Bridges (p. 1644)
Dams (p. 1669)
Table of Chemical Elements (p. 1073)
Astronomical Dictionary (p. 1097)
Mineralogy (p. 1119)
Terms in Meteorology (p. 1123)
Biological Terms (p. 1143)
Zoological Dictionary (p. 1156)
Botanical Dictionary (p. 1194)
Dictionary of Peoples (p. 1236)
Sociological Terms (p. 1249)
Dictionary of Music Terms (p. 2116)
Dictionary of Printer's Terms (p. 2169)

List of Abbreviations Used in the Multiplex Dictionary

adj. adjective
adv. adverb
Ant. antonym
comp. comparative
conj. conjunction
etc. and so forth
interj. interjection
n. noun
pl. plural
prep. preposition
pron. pronoun
p.p. past participle
pr. p. present participle
p.t. past tense
sing. singular
superl. superlative
Syn. synonym
U. S. United States
v.i. intransitive verb
v.t. transitive verb
* this word is often mispronounced or pronounced in different ways

A

a (ā), *indef. art.* one; any; used before words beginning with a consonant or the sound of *h*.

aback (a bak′), *adv.* backward; pressed back against the mast; taken aback, taken by surprise.

***abacus** (ab′ a kus), *n.* a Chinese counting device consisting of beads or balls which slide on wires within a frame.

abandon (a ban′ dun), *n.* lack of restraint.

abandon (a ban′ dun), *v.t.* to give up; to desert; to forsake utterly.
Syn. Abdicate, desert, forego, renounce, surrender. The crew *abandoned* the sinking ship; a king *abdicates* his throne; a coward *deserts* his family; we *forego* pleasures; the monk *renounces* the world; the bereaved often *surrender* to grief.
Ant. Maintain, hold, retain.

abandoned (a ban′ dund), *adj.* given up entirely; deserted; also, unrestrained.
Syn. Depraved, discarded, forsaken, uncontrolled. We speak of *depraved* characters; *discarded* ideas; *uncontrolled* laughter.
Ant. Controlled, kept, moderate, scrupulous.

abase (a bās′), *v.t.* to humble or degrade; to dishonor; to reduce.
Syn. Debase, degrade, disgrace, dishonor, mortify, shame. These words are usually applied to persons only. *Debase* and *reduce,* however, have other applications; metal may be *debased;* weight may be *reduced.*
Ant. Advance, dignify, honor, raise.

abasement (a bās′ ment), *n.* the act of abasing; humiliation.

abash (a bash′), *v.t.* to put to confusion; to make ashamed by consciousness of guilt or error; to overawe.
Syn. Confuse, confound, embarrass.
Ant. Animate, embolden, encourage, exalt, reassure.

abate (a bāt′), *v.t.* to put an end to; to suppress; *v.i.* to decrease; to moderate; to subside.
Syn. Decline, decrease, diminish, lessen, recede, sink, slacken, wane.
Ant. Augment, foment, rage.

abatement (a bāt′ ment), *n.* the act of abating; the state of being abated; diminution.

A battery (ā bat′ ēr i), *n.* in early radio receiving sets, an electric battery used for heating the cathode filament of an electron tube.

***abattoir** (ab a twär′), *n.* a public slaughterhouse.

abbacy (ab′ *a* si), *n.* the office and jurisdiction of an abbot.

***abbé** (a bā′), *n.* an abbot.

abbess (ab′ es), *n.* a mother superior.

abbey (ab′ i), *n.* [pl. abbeys (-biz)], a monastery or convent; the church connected with a monastery.

abbot (ab′ ut), *n.* the head of a monastery.

abbreviate (a brē′ vi āt), *v.t.* to shorten, especially words, as we *abbreviate* avenue to ave.
Syn. Reduce, shorten.
Ant. Amplify, enlarge, lengthen.

abdicate (ab′ di kāt), *v.t.* and *v.i.* to renounce, as kingly power.

***abdomen** (ab dō′ men), *n.* the part of the body containing the digestive organs and intestines.

abdominal (ab dom′ i nal), *adj.* pertaining to the abdomen.

abduct (ab dukt′), *v.t.* to carry off by stealth or force; to kidnap.

abductor (ab duk′ tēr), *n.* a kidnaper; in physiology, a certain kind of muscle.

abeam (a bēm′), *adv.* at right angles to the keel of a ship.

abed (a bed′), *adv.* in bed, to bed.

***aberrant** (ab er′ ant), *adj.* departing from the usual path, type or standard.

aberration (ab ēr ā′ shun), *n.* departure from the normal, in mental, moral or physical matters.

abet (a bet′), *v.t.* to encourage, incite, aid, especially in connection with wrong action.
Syn. Assist, back, countenance, foment, second, support, sustain, further. The bad official *abets* crime.
Ant. Deter, disapprove, discourage, frustrate, forbid.

abettor (a bet′ ēr), *n.* one who aids or abets.

abeyance (a bā′ ans), *n.* state of being held, kept back or held over; a state of suspension.

***abhor** (ab hôr′), *v.t.* to be strongly averse to; to loathe; to detest.
Syn. Abominate.
Ant. Admire, crave, esteem, love.

abide (a bīd′), *v.t. and v.i.* to dwell, reside; to wait for something; to endure, tolerate.
Syn. Sojourn, live, inhabit. *Abide* is to make a partial stay. *Sojourn* signifies to pass a certain portion of one's time in a place. *Dwell* implies residence, which is expressed in common discourse by the word *live. Reside* conveys the full idea of settling down. *Inhabit* signifies to have or occupy for a permanency.
Ant. Depart, move, reject, resist.

ability (a bil′ i ti), *n.* power to perform; possession of enough strength or skill to accomplish a given task.
Syn. Capability, competence, aptitude, faculty. *Ability* means the power of doing in general; *capability* combines the idea of fitness to do with the power to do; *competence* carries the idea of entire fitness to do; *aptitude* implies a natural tendency as well as *ability* to do; a *faculty* is a natural gift or talent.
Ant. Inability, incapability.

***abject** (ab′ jekt), *adj.* fallen to a low estate; cringing; servile; beggarly.

abjure (ab joor′), *v.t.* to renounce upon oath; to forswear allegiance to; to repudiate or recant.

ablative (ab′ la tiv), *n.* in Latin grammar a noun case expressing chiefly separation and agency, used to signify *from, in, by.*

ablaze (a blāz′), *adv.* or *adj.* on fire; well alight; in a blaze; eager; resplendent.

able (ā′ bl), *adj.* possessed of power, means or ability; qualified, competent.

ablebodied (-bod′ id), *adj.* possessed of physical strength; capable or efficient for duty.

abloom (a bloom′), *adj.* in bloom, in flower.

***ablution** (ab lū′ shun), *n.* a cleansing of the body by water; the washing of sacred vessels used in religious ceremonies.

abnegate (ab′ nē gāt), *v.t.* to refuse or deny; reject.

abnegation (ab nē gā′ shun), *n.* self-denial.

abnormal (ab nôr′ mal), *adj.* irregular; deformed; unnatural; departing from a type or standard.

aboard (a bōrd′), *adv.* on or in a ship or train, as the passengers were all *aboard.*

aboard (a bōrd′), *prep.* on or in a conveyance, as we went *aboard* the airplane.

abode (a bōd′), *n.* a place of continued residence.

abolish (a bol′ ish), *v.t.* to do away with entirely; to cancel; to annul.
Syn. Abrogate, cancel, nullify, repeal. *Abolish* refers to the permanent ending of established human institutions, as we *abolished* slavery. *Abrogate* refers to the setting aside of laws or treaties by a high executive. To *cancel* is to set aside written contracts. *Nullify* refers to the making void of a Federal law by a state; *repeal* refers to the recalling of an enactment by the same legislative body that made it.
Ant. Establish, enforce, maintain.

abolition (ab ō lish′ un), *n.* the act of abolishing; state of being abolished; in American history, the ending of slavery.

abominable (a bom′ i na bl), *adj.* hateful; odious; offensive.

abominate (a bom′ i nāt), *v.t.* to abhor; regard with disgust or hatred.

abomination (a bom i nā′ shun), *n.* detestation; that which causes abhorrence; anything vile.

aboriginal (ab ō rij′ i nal), *adj.* original; primitive; dating from earliest history.

***aborigine** (ab ō rij′ i nē), *n.* one of the first inhabitants of a region.

abortion (a bôr′ shun), *n.* untimely birth; anything that fails to be completed.

abortive (a bôr′ tiv), *adj.* futile, incomplete.

abound (a bound′), *v.i.* to exist in plenty, as fish *abound* in a river; to have in generous measure, as the river *abounds* in fish.

about (a bout′), *adv.* around; on all sides, as bushes *about* the house; nearly, as *about* a mile; intending, as I was *about* to do it; in alternation, as turn *about* is fair play.

about (a bout′), *prep.* concerning: I will tell you all *about* it.

above (a buv′), *adv.* overhead, in the heavens.

above (a buv′), *prep.* over; on top of; higher than.

aboveboard (a buv′ bōrd), *adj. and adv.* in open sight; without trickery.

abrade (ab rād′), *v.t.* to wear or rub away, to remove as by friction.

abrasion (ab rā′ zhun), *n.* the act of rubbing or wearing away; a chafe.

abreast (a brest′), *adv.* side by side; in line with.

abridge (a brij′), *v.t.* to curtail, shorten, condense, epitomize.

abridgment (a brij′ ment), *n.* the state of being contracted or curtailed; an epitome.
Syn. Compendium, epitome. An *abridgment* is the reduction of a large work into a smaller compass. A *compendium* is a boiled-down, concise presentation of any whole subject, as geography or astronomy. An *epitome* is a brief summary of all the substantial parts of a subject or treatise.
Ant. Enlargement; expansion.

abroad (a brôd′), *adv.* far and wide; in foreign lands or beyond customary limits.

abrogate (ab′ rō gāt), *v.t.* to abolish, annul or repeal by official action.

abrupt (ab rupt′), *adj.* precipitous, as a cliff; sudden, jerky, as movements; short, terse, as speech.

abscess (ab′ ses), *n.* [*pl.* abscesses (-ez)] a collection of diseased matter in the body tissues.

abscond (ab skond′), *v.i.* to run away secretly, especially with stolen goods or funds.

absence (ab′ sens), *n.* the state of being absent, period of being absent.

absent (ab′ sent), *adj.* not present, away; wanting; abstracted.

absent (ab sent′), *v.t.* to retire or keep away from.

***absentee** (ab sen tē′), *n.* one who is not present.

***absinthe** (ab′ sinth), *n.* a liquor made of brandy and wormwood.

***absolute** (ab′ sō lūt), *adj.* free as to condition; perfect in itself; unlimited in power.

Syn. Arbitrary, supreme, utter. Anything *absolute* is complete and without qualification or question. *Absolute* power is independent of and superior to all other power. *Arbitrary* power might be despotic; an *arbitrary* judgment might be final and decisive yet unreasonable or based on personal caprice. *Supreme* refers to the highest or utmost of anything. *Utter* means complete or extreme, as *utter* joy.

Ant. Qualified, relative, partial.

absolute scale (ab′ sō lūt skāl), a scale of temperature with its zero at –273° centigrade.

absolution (ab sō lū′ shun), *n.* the act of freeing or state of being free from the consequences of sin.

***absolutism** (ab′ sō lū tizm), *n.* in government, freedom from limits to power.

absolutist (ab′ sō lū tist), *n.* a supporter or advocate of despotic or absolute government.

***absolve** (ab solv′), *v.t.* to free from obligation; to clear of guilt; to forgive or remit.

Syn. Acquit, clear, discharge, exculpate, exempt, exonerate, forgive, free, liberate, pardon, release. To *absolve* is to *set free* from any bond. One may be *absolved* from a promise by a breach of faith on the part of one to whom the promise was made. To *absolve* from sins is formally to remit their condemnation and penalty, regarded as a bond upon the soul. To *acquit* of sin or crime is to *free* from the accusation of it; the innocent are rightfully *acquitted;* the guilty may be mercifully *absolved.*

Ant. Accuse, blame, condemn, impeach.

***absorb** (ab sôrb′), *v.t.* to drink in, imbibe; to suck or swallow up; to engross or engage wholly.

Syn. Engross, assimilate. The boy was *engrossed* in the examination of the engine. The body *assimilates* food.

Ant. Emit, radiate.

absorbent (ab sôrb′ ent), *adj.* having the capacity for taking up or assimilating, as a blotter is *absorbent.*

absorption (ab sôrp′ shun), *n.* the act or process of absorbing; reduction of power in a radio due to a variety of causes.

abstain (ab stān′), *v.t.* to forbear, refrain; to hold aloof, keep away from.

***abstemious** (ab stē′ mi us), *adj.* temperate in eating and drinking.

abstergent (ab stûr′ jent), *n.* that which cleanses or purges.

abstergent (ab stûr′ jent), *adj.* possessing cleansing or purging properties.

abstinence (ab′ sti nens), *n.* the act or practice of abstaining; self-denial.

abstinent (ab′ sti nent), *adj.* refraining from indulgence, especially of any appetite; temperate.

abstract (ab′ strakt), *n.* an epitome; a summary comprising the essence or principal parts of a larger work.

abstract (ab′ strakt), *adj.* considered or conceived apart from any concrete or material nature; ideal; general.

abstract (ab strakt′), *v.t.* to take or draw away; to separate; to purloin or steal; (ab′-strakt), epitomize.

Syn. Separate. We *abstract* what we wish to regard particularly and individually; we *separate* what we wish not to be united.

Ant. Add, append, combine, expand, restore.

abstracted (ab strak′ ted), *adj.* separated; mentally absent.

Syn. Absent-minded, absorbed, inattentive, oblivious, preoccupied. *Absorbed, abstracted* and *preoccupied* refer to lack of attention to the immediate environment; *absent-minded* implies an unintentional wandering of the thoughts but an *absent-minded* man may be *oblivious* of his surroundings because he is *preoccupied* with other thoughts.

Ant. Alert, prompt, thoughtful, wide-awake.

abstraction (ab strak′ shun), *n.* the act of separating or drawing away; mental state of being abstracted.

***abstruse** (ab stro͞os′), *adj.* difficult to apprehend; obscure.

***absurd** (ab sûrd′), *adj.* contrary to reason or sense.

Syn. Anomalous, chimerical, foolish, irrational, ludicrous, nonsensical, paradoxical, preposterous, ridiculous, senseless, unreasonable, wild. Anything *absurd* is contrary to the first principles of reasoning; anything *paradoxical* appears at first thought contradictory or *absurd* though it may be really true; *irrational* qualifies that which is clearly contrary to sound reason, *foolish* means contrary to practical good sense, *silly* indicates petty folly, *erroneous* suggests error that vitiates the result, *unreasonable* indicates something so extremely illogical as to be *absurd. Monstrous* and *preposterous* refer to what is overwhelmingly *absurd.* The *ridiculous* or the *nonsensical* are worthy only to be laughed at.

Ant. Demonstrable, established, logical, sagacious, sound, true, wise.

absurdity (ab sûr′ di ti), *n.* [*pl.* absurdities (-tiz)] the state of being absurd; that which is absurd.

abundance (a bun′ dans), *n.* plenteousness; an overflowing quantity; affluence.

abundant (a bun′ dant), *adj.* plentiful; abounding.

***abuse** (a būs′), *n.* mistreatment; misuse of anything; revilement.

***abuse** (a būz′), *v.t.* to illtreat; to address with insulting language.

Syn. Aggrieve, defame, disparage, malign, maltreat, misuse, molest, revile, victimize, vilify, vituperate, wrong. Everything is *abused* which receives any sort of *injury;* it is in *disuse* if not used at all; *misused* if turned to a wrong use. It is possible to *abuse* a man without *harming* him, as when the criminal *vituperates* the judge; or to *harm* a man without *abusing* him, as when the witness tells the truth about the criminal. *Defame, malign, revile, slander, vilify,* and *vituperate* are used always in a bad sense.

Ant. Applaud, cherish, consider, favor, praise, protect, respect, uphold.

abut (a but′), *v.i.* [*p.t. and p.p.* abutted, *pr.p.* abutting] to border upon; to touch at some point.

abutment (a but′ ment), *n.* that which abuts upon something else.

abuzz (a buz′), *adv.* filled with or emitting buzzing sounds.

abysm (a bizm′), *n.* an abyss.

abysmal (a biz′ mal), *adj.* pertaining to an abyss; bottomless; indeterminably deep.

abyss (a bis′), *n.* a bottomless pit, a chasm; anything immeasurable in space or time.

academic (ak *a* dem′ ik) or **academical** (′-i kal), *adj.* having to do with school or college; scholarly; theoretical rather than practical.

***academician** (a kad e mish′ an), *n.* a member of an academy.

***academy** (a kad′ e mi), *n.* a school for higher branches of education, as the Naval Academy of the United States; a high school; an association of learned men to promote literature, science or the arts.

acanthus (a kan′ thus), *n.* a plant with sharp-toothed leaves; ornamentation used in the capitals of the Corinthian and Composite orders.

accede (ak sēd), *v.i.* to come or attain; to agree or yield: used with *to.*

***accelerate** (ak sel′ ẽr āt), *v.t.* to cause to move faster.

acceleration (ak sel ẽr ā′ shun), *n.* the act of moving faster; the state of going faster; in physics, the ratio of time to increase of velocity.

accelerator (ak sel′ ẽr ā tẽr), *n.* the gas-control pedal regulating the flow of gasoline and the speed of an automobile.

***accent** (ak′ sent), *n.* stress laid by the voice upon a particular syllable or word; emphasis placed upon certain notes of a bar of music.

accent (ak′ sent), *v.t.* to stress a syllable or musical note.

accentual (ak sen′ tū al), *adj.* belonging to accent; rhythmical.

accentuate (ak sen′ tū āt), *v.t.* to stress, emphasize.

accept (ak sept′), *v.t.* to take or receive with approbation; to agree to; to take as true.

acceptable (ak sep′ t*a* bl), *adj.* fit to be accepted, welcome.

acceptance (ak sep′ tans), *n.* the act of accepting; the fact of being accepted; a draft which the seller draws against the buyer and which the buyer endorses with the word *accepted* and his signature.

***access** (ak′ ses), *n.* admittance or approach to a person or place; means of approach or admission.

accessible (ak ses′ i bl), *adj.* capable of being reached; attainable.

accession (ak sesh′ un), *n.* entrance or attainment; an increase or addition.

accessory (ak ses′ ō ri), *n.* [*pl.* accessories (-rēz)] one who without being present agrees to or contributes to an action or enterprise, especially a crime; a small, separate article or part, as automobile *accessories.*

accessory (ak ses′ ō ri), *adj.* aiding; contributing to some result or effect.

accident (ak′ si dent), *n.* a mishap, commonly one causing injury, damage or loss.

Syn. Calamity, mishap, misfortune. An *accident* is always an unforeseen or unintentional happening. A *calamity* is a great disaster; a *mishap* is an unlucky accident. Since the unforeseen is often feared, *accident* tends to signify *calamity* or *disaster,* unless the contrary is expressed, as when we say a fortunate or happy *accident. Misfortune* is a general word embracing all these others.

accidental (ak si den′ tal), *adj.* happening by chance.

accidental (ak si den′ tal), *n.* a musical symbol, such as a flat, sharp or natural altering the pitch of a single note.

accidentally (ak si den′ tal li), *adv.* by chance; unintendedly.

acclaim (a klām′), *n.* a shout of joy or praise.

acclaim (a klām′), *v.i.* to shout applause.

acclamation (ak la mā′ shun), *n.* applause with shouts of joy or approval; a vote by voice in an assembly.

***acclimate** (a klī′ mit), *v.t. and v.i.* to accustom to a foreign climate; to become used to a new climate.

accommodate (a kom′ ō dāt), *v.t.* to make fit or suitable; to adjust, as conflicting interests; to do a favor for; to provide quarters for.

accommodation (a kom ō dā′ shun), *n.* that by, with or through which one is accommodated: *accommodations,* lodgings.

***accompaniment** (a kum′ p*a* ni ment), *n.* something that goes with the principal thing; in music, a supplementary part supporting the main part, vocal or instrumental.

accompanist (a kum′ p*a* nist), *n.* one who renders an accompaniment.

accompany (a kum′ p*a* ni), *v.t.* to keep company with; escort; join in movement or action; play an accompaniment for.

accomplice (a kom′ plis), *n.* an associate or companion in crime.

accomplish (a kom′ plish), *v.t.* to bring to completion; to achieve an end.

Syn. Achieve, do, effect, execute. To *accomplish* is to *do* or finish something by dint of perseverance or skill. To *effect* is to *do* or finish in spite of resistance. To *achieve* is to *accomplish* something difficult or important. To *execute* is to put into effect formally, as to *execute* a law.

Ant. Leave, neglect.

accomplished (a kom′ plisht), *adj.* finished. completed; attained; proficient.

accomplishment (a kom′ plish ment), *n.* full performance; achievement; something acquired by study and practice that contributes to social qualification.

accord (a kôrd′), *n.* agreement, harmony.

accord (a kôrd′), *v.t. and v.i.* to be in agreement with; to reconcile; to agree; to give; to grant; to concede.

according (a kôrd′ ing), *adj.* agreeing, conforming: *according to*, in agreement with, as *according to* the records.

accordingly (a kôrd′ ing li), *adv.* consequently; correspondingly.

accordion (a kôr′ di un), *n.* a musical instrument, with bellows, keyboard and metal reeds.

accordion plaits (plēts) *n.* folds made in the goods like the creases in the bellows of an accordion.

accost (a kost′), *v.t.* to speak to before being spoken to.

account (a kount′), *n.* a record or reckoning.

account (a kount′), *v.i. and v.t.* to make a reckoning, as of finances; to consider as, as I *account* you my friend; to explain, as to *account* for an absence.

accountable (a kount′ a bl), *adj.* answerable; responsible; liable to be called to account.

accountant (a kount′ ant), *n.* one whose business it is to check up on accounts kept by others.

***accouterments** (a kōō′ tẽr ments), *n.* a soldier's equipment, apart from arms and uniform.

accredit (a kred′ it), *v.t.* to give credit to; to assign with credentials, as a diplomatic agent to a foreign country.

accretion (a krē′ shun), *n.* increase by natural growth; the addition of external parts; that which is added.

***accrue** (a krōō′), *v.i.* to come, to happen or result to naturally as an increment, as of profit or loss.

accumulate (a kū′ mū lāt), *v.t. and v.i.* to collect or bring together, amass; to heap up, to increase in quantity or number.

accumulation (a kū mū lā′ shun), *n.* the process of collecting or amassing; things accumulated, regarded collectively.

accumulator (a kū′ mū lā tẽr), *n.* one who or that which, accumulates; an apparatus for equalizing pressure or storing energy.

accuracy (ak′ ū ra si), *n.* detailed correctness; exactness.

***accurate** (ak′ ū rit), *adj.* exact; without error.

***accursed** (a kẽr′ sed), *adj.* under or subject to a curse.

accusation (ak ū zā′ shun), *n.* a charge of wrongdoing.

accusative (a kū′ za tiv), *n.* the objective case or a noun in that case.

accuse (a kūz′), *v.t.* to charge with wrongdoing or guilt.

Syn. Charge, arraign. We *accuse* a person directly. To *charge* is formally to lay the weight of wrongdoing on someone. We may *accuse* a man of taking money; but we formally *charge* him with theft when the law is called in. To *arraign* means to bring a person before a court or a judge to answer to a *charge*.

accustom (a kus′ tum), *v.t.* to habituate or familiarize by usage.

ace (ās), *n.* [*pl.* aces] a unit; a die or domino marked with a single spot; a narrow margin, as within an *ace*; a flier who has brought down five or more enemy planes.

***acerbity** (a sûr bi ti), *n.* bitterness; severity.

***acetanilide** (as et an′ i lid), *n.* a powder used to relieve pain, derived from aniline and acetic acid.

acetate (as′ ē tāt), *n.* a salt of acetic acid.

***acetic acid** (a sē′ tik as′ id), a sour-tasting, sharp-odored liquid, the acid constituent of vinegar.

acetify (a set′ i fī), *v.t.* to convert into vinegar.

***acetose** (as′ ē tōs), *adj.* of the nature of vinegar; sour; causing acetification.

***acetylene** (a set′ i lēn), *n.* a gas that burns with an extremely hot flame, used in welding and in cutting metals, as armor plate, structural steel and rails.

ache (āk), *n.* pain, more or less continuous.

ache (āk), *v.i.* to suffer, or be in, pain; as my head *aches*.

achieve (a chēv′), *v.t.* to perform; carry out; accomplish, especially something difficult.

achievement (a chēv′ ment), *n.* accomplishment; something achieved.

achromatic (ak rō mat′ ik), *adj.* transmitting light without breaking it up, as a prism does, into the colors of the spectrum, as an *achromatic* lens.

acid (as′ id), *n.* a sour substance that makes litmus turn red.

acidification (a sid i fi kā′ shun), *n.* the process of becoming or changing to acid.

acidify (a sid′ i fī), *v.t.* [*p.t. and p.p.* acidified, *pr.p.* acidifying] to make acid.

acidimeter (as i dim′ e tẽr), *n.* an instrument or a solution for measuring acid strength.

acidity (a sid′ i ti), *n.* the quality of being acid or sour.

acidosis (as i dō′ sis), *n.* an acid condition of the body.

acid test (as′ id test), a specially severe test of a person's merit or quality; probably from the practice of testing gold with acids.

acidophilus (as i dof′ i lus), *n.* a bacterium used in fermenting milk: *acidophilus milk* is used to tone the intestinal system.

acidulate (a sid′ ū lāt), *v.t.* to render slightly acid.

aciform (as′ i fôrm), *adj.* needle-shaped.

acknowledge (ak nol′ ej), *v.t.* to recognize as true or valid; accept as a fact; to admit receipt of, as a check; confess, as a fault.

acknowledgment (ak nol′ ej ment), *n.* admission or recognition of the truth or validity of anything; in law, a certified declaration; in business, a receipt or recognition of an obligation.

acme (ak′ mē), *n.* the highest point; perfection.

acne (ak′ nē), *n.* a skin disease caused by clogging of oil glands and marked by eruption of pimples.

***acolyte** (ak′ ō līt), *n.* one holding the highest of the four minor orders in the Roman Catholic Church; a boy who serves a priest at mass.

aconite (ak′ ō nīt), *n.* the plant wolfsbane or monkshood; a medicine made from this plant, used in reducing fever.

***acorn** (ā′ kôrn), *n.* the fruit of the oak.

***acoustics** (a kōōs′ tiks), *n. pl.* the science of sound; the architectural conditions affecting the hearing of sounds throughout a room or hall.

acquaint (a kwānt′), *v.t.* to familiarize, especially through experience, as to *acquaint* oneself with Latin; to inform, as to *acquaint* him with the news.

acquaintance (a kwān′ tans), *n.* the state of knowing a person or subject; a person known somewhat less than intimately.

Syn. Association, companionship, familiarity, intimacy, knowledge. *Acquaintance* between persons supposes that each knows the other; there may be *association* in business without *intimacy* or *friendship*. *Friendship* includes *acquaintance* with some degree of *intimacy*, and ordinarily *companionship*; *fellowship* involves not merely *acquaintance* and *companionship*, but mutual interests as well.

Ant. Ignorance, unfamiliarity.

acquiesce (ak wi es′), *v.i.* to agree tacitly; to accept, as to *acquiesce* in the plans.

acquiescence (ak wi es′ ens), *n.* silent assent.

acquire (a kwīr′), *v.t.* to get possession of.

acquirement (a kwīr′ ment), *n.* the act of gaining or attaining; that which is attained.

acquisition (ak wi zish′ un), *n.* the act of acquiring; that which is attained or secured, as a material possession.

acquit (a kwit′), *v.t.* to declare free of guilt; to discharge or perform; as the singer *acquitted* himself well in the new role.

acquittal (a kwit′ al), *n.* a court decision freeing an accused person of the charge of an offense.

acre (ā′ kẽr), *n.* a surface measure of land containing 4,840 square yards.

acreage (ā′ kẽr ij), *n.* extent of land measured by the acre; land bought and sold by the acre, not in front-foot lots.

acrid (ak′ rid), *adj.* sharp or biting to the taste; pungent; irritating; stinging.

acridity (a krid′ i ti), *n.* state or condition of being acrid.

acrimonious (ak ri mō′ ni us), *adj.* bitter; caustic; stinging.

acrimony (ak′ ri mō ni), *n.* sharpness of temper or language.

Syn. Acerbity, asperity, tartness. *Acrimony* springs from a sharp, satirical temper and is expressed in biting, bitter speech. *Asperity* implies quick irritability and the sudden expression of it. *Acerbity* is the expression of a sour nature. *Tartness* implies acidity of tongue and temper, but carries also the idea of a pleasing sprightliness of speech or idea.

Ant. Amiability, gentleness, mildness.

acrobat (ak′ rō bat), *n.* one who does skilful and daring feats of aerial gymnastics or tumbling.

acropolis (a krop′ ō lis), *n.* the citadel of an ancient Greek city: *the Acropolis*, citadel of ancient Athens.

across (a krôs′), *adv.* from one side to the other; over, as to run *across*.

across (a krôs′), *prep.* from one side of anything, as a road or stream, to the other side.

***acrostic** (a kros′ tik), *n.* a composition, usually in verse, in which the first or last letters of the lines or other letters taken in order form a motto, phrase, name or word.

act (akt), *n.* an action; process of doing; a decree, edict or enactment; the judgment of a court; a statute resulting from passage of a bill.

acting (ak′ ting), *n.* performing on the stage, for radio or motion pictures; pretense, as your limp is mere *acting*.

acting (ak′ ting), *adj.* performing on the stage; substituting, as an *acting* secretary.

actinic (ak tin′ ik), *adj.* chemically effective by reason of radiant or radioactive energy.

actinium (ak tin′ i um), *n.* a radioactive element.

action (ak′ shun), *n.* doing; something done, a deed; in a play or story, the things done by the characters; a suit at law; the working of mechanical parts; an engagement with the enemy.

actionable (ak′ shun i bl), *adj.* giving grounds for an action at law.

active (ak′ tiv), *adj.* endowed with or exercising the power or quality of action; using motion or force to produce an effect; moving quickly; given to working, busy; designating that voice of a verb that represents the subject as the doer of the action: opposite of *passive*.

Syn. Agile, brisk, nimble. Quickness, energy and constancy of action are implied in *active*; *agile* refers to skilful and easy use of one's body; *brisk* implies energetic sprightliness, as a *brisk* gait; *nimble* implies lightness and great speed of action.

Ant. Dull, idle, inert, lazy, latent.

actor (ak′ tẽr), *n.* one who acts or performs; one who portrays a character on stage or screen or for radio.

actress (ak′ tres), *n.* a woman who acts a part.

***actual** (ak′ tū al), *adj.* real, existing; present.

actuality (ak tū al′ i ti), *n.* [*pl.* actualities (-tiz)] the state of being real; a reality.

actuary (ak′ tū er i), *n.* [*pl.* actuaries (-riz)] a registrar or clerk of a court; an insurance statistician.

actuate (ak′ tū āt), *v.t.* to move or incite to action.

***acumen** (a kū′ men), *n.* quickness of perception; penetration; discrimination.

acute (a kūt′), *adj.* sharp-pointed; intellectually sharp; quick of perception; severe, as pain.

Syn. Keen, shrewd. In the original sense sharpness and pointedness are predominant in the word *acute*, and cutting or a fitness for cutting, in the word *keen*. The *shrewd* man is clever in practical affairs. *Keen* means sharp and probing, as a *keen* analysis of a subject.

Ant. Blunt, dull, slow-witted.

acute accent (a kūt′ ak′ sent), a diacritical mark indicating emphasis.

acute angle (a kūt ang′ gl), an angle of less than 90°.

adage (ad′ ij), *n.* an ancient proverb or pithy saying.

adamant (ad′ *a* mant), *n.* a substance of extreme hardness; formerly, a diamond.

adamant (ad′ *a* mant), *adj.* very hard; unyielding, as an *adamant* decision.

***adamantine** (ad *a* man′ tin), *adj.* made of adamant; impenetrable.

adapt (a dapt′), *v.t.* to make to correspond; to fit by alteration, adjust.

adaptation (ad ap tā′ shun), *n.* the act of adjusting; the state of being adjusted.

add (ad), *v.t.* to join, unite, sum up; to increase; to affix.

Syn. Affix, amplify, annex, append, attach, augment, enlarge, extend, increase, subjoin. To *add* is to *increase* by *adjoining* or *uniting;* to *augment* is to *increase* by any means; but we *enlarge* a house, a farm or an empire; *extend* influence or dominion; *augment* riches, power or influence; *attach* or *annex* a building; *affix* a seal or a signature.

Ant. Decrease, deduct, detract, diminish, lessen, remove, subtract.

addendum (a den′ dum), *n.* [*pl.* addenda (-d*a*)] something to be added to something else.

adder (ad′ ĕr), *n.* a snake, especially a certain viper.

***addict** (ad′ ikt), *n.* one who is governed by a habit, as of using drugs.

addict (ad ikt′), *v.t.* to devote or give oneself up to.

addition (a dish′ un), *n.* the act or process of adding together; something added, increase.

addle (ad′ l), *v.i. and v.t.* to spoil or become spoiled, as an egg; to confuse or become confused, as a mind.

addleheaded (ad l hed′ ed) or **addlepated** (ad l pā′ ted), *adj.* stupid; weak-brained; muddled.

***address** (a dres′), *n.* a speech; (ad′ res), indication of the place where one lives, city, street, house number.

***address** (a dres′), *v.t.* to direct speech or writing to; to place an address on, as an envelope.

Syn. Accost, apostrophize, appeal, approach, court, greet, hail, salute. *Address* is slightly more formal than *accost* or *greet;* one may *address* another at considerable length or in writing, he *accosts* orally and briefly; to *accost* is to speak first, to friend or stranger; *greet* and *hail* may imply but a passing word; *greeting* may be altogether silent; to *hail* is to *greet* in a loud-voiced and commonly hearty and joyous way; to *salute* is to *greet* with special token of respect, as a soldier his commander; to *apostrophize* is to solemnly *address* some person or personified attribute; to *appeal* is strictly to call for some form of help or support.

Ant. Avoid, ignore, overlook, shun.

addressograph (a dres′ ō graf), *n.* a machine for addressing envelopes or cards: a trade name.

***adduce** (a dūs′), *v.t.* to bring forward or cite as for proof or substantiation.

adducible (a dūs′ i bl), *adj.* capable of being cited.

adductor (a duk′ tĕr), *n.* a muscle that draws toward the center of the body.

adenoid (ad′ ē noid), *adj.* like a gland.

adenoids (ad′ ē noidz), *n. pl.* a swelling of lymphoid tissues in the nose-to-throat passage.

***adept** (ad′ ept), *n.* one who is highly skilled.

***adept** (a dept′), *adj.* well skilled.

adequacy (ad′ ē kwa si), *n.* sufficiency for a particular purpose.

adequate (ad′ ē kwit), *adj.* equal to a certain requirement or occasion; fully sufficient.

adhere (ad hēr′), *v.i.* to stick fast, become firmly attached, cling; to be devoted, as to *adhere* to a friend or a faith.

adhesion (ad hē′ zhun), *n.* the state or act of sticking fast; something that adheres.

***adieu** (a dū′; French, äd yū) *n.* [*pl.* adieus, adieux (a dūz′); French (äd yû)] good wishes at parting; farewell.

adipose (ad′ i pōs), *n.* animal fat.

adipose (ad′ i pōs), *adj.* pertaining to fat; fatty, as *adipose* tissue.

adit (ad′ it), *n.* an entrance or passage; an entrance to a mine more or less horizontal.

adjacent (a jā′ sent), *adj.* near, close to, neighboring; bordering.

Syn. Abutting, adjoining, contiguous. *Adjacent* farms may not be connected; if *adjoining,* they meet at the boundary line; *contiguous* means touching along one side; *abutting* implies some point of contact, as a lot *abuts* on a road or one building *abuts* against another.

Ant. Distant, far, remote.

adjective (aj′ ek tiv), *n.* a word used with a substantive or noun to express a quality or attribute of the thing named.

adjoin (a join′), *v.t. and v.i.* to be or be put next to some other thing.

adjourn (a jûrn′), *v.t.* to put off to another day, defer; to dissolve; to close.

adjournment (a jûrn′ ment), *n.* the act of postponing.

adjudge (a juj′), *v.t.* to decide according to law; to sentence.

adjunct (aj′ ungkt), *n.* something added to another thing, but not an essential part of it.

***adjuration** (a joo rā′ shun), *n.* the solemn charging on oath.

adjure (a joor′), *v.t.* to command on oath; to charge solemnly.

adjust (a just′), *v.t.* to fit or make exact; to make correspondent or accurate; to bring into harmony.

adjutant (aj′ oo tant), *n.* a regimental staff officer who assists the commanding officer.

adjutant general (aj′ oo tant jen′ ĕr al) [*pl.* adjutants general], *n.* the chief executive staff officer of an army corps, division or brigade.

administer (ad min′ is tĕr), *v.t.* to manage as chief agent or minister, as a king or president; to conduct, as a business; to adjust and settle, as an estate.

administration (ad min is trā′ shun), *n.* the act or process of managing; management; the executive department of a government or business; the executive officials; the length of time certain officials are in power.

***administrator** (ad min is trā′ tĕr), *n.* one who administers affairs; one who settles an estate.

***admirable** (ad′ mi r*a* bl), *adj.* worthy of admiration; excellent.

admiral (ad′ mi ral), *n.* the commander of a fleet; in most of the world's navies, the highest ranking grade of officer.

admiralty (ad′ mi ral ti), *n.* the department of a government having authority over naval affairs.

admiration (ad mi rā′ shun), *n.* a feeling of enjoyment, appreciation, delight, caused by beauty or excellence.

admire (ad mīr′), *v.t.* to regard with approval; to honor; to esteem.

Syn. Esteem, honor, revere.

Ant. Abhor, despise, dislike, hate, loathe.

admissible (ad mis′ i bl), *adj.* worthy or capable of being admitted, conceded or allowed.

admission (ad mish′ un), *n.* the power, permission or right to enter; the price paid for the privilege of entering; confession, as of a fault; concession or granting, as of an argument.

admit (ad mit′), *v.t.* to permit to enter; to acknowledge or concede.

admittance (ad mit′ ans), *n.* the power or permission to enter.

Syn. Admission. *Admittance* is used to mean literal entrance, as *admittance* to a building or place. *Admission* implies privilege or rights, as *admission* to citizenship, club membership or a social group.

admix (ad miks′), *v.t.* to add by mixing.

admixture (ad miks′ tūr), *n.* that which is added by mixing.

admonish (ad mon′ ish), *v.t.* to reprove gently; warn; to command by warning, as to *admonish* obedience.

admonition (ad mō nish′ un), *n.* friendly reproof or warning.

admonitory (ad mon′ i tō ri), *adj.* conveying reproof or warning.

ado (a dōō′), *n.* bustle, trouble.

***adobe** (a dō′ bi), *n.* unburnt brick dried in the sun, used for building in the southwestern United States, Central America and Mexico.

adolescence (ad ō les′ ens), *n.* the period of life between childhood and maturity; youth.

adolescent (ad ō les′ ent), *adj.* in process of growing to maturity.

adopt (a dopt′), *v.t.* to choose or take to oneself, as a child, an opinion or a course of action.

adoption (a dop′ shun), *n.* the act of adopting; the state of being adopted.

adorable (a dōr′ *a* bl), *adj.* worthy of worship.

adoration (ad ō rā′ shun), *n.* act of worship; deep reverence.

adore (a dōr′), *v.t.* to worship as divine; to honor highly; to love intensely.

adorn (a dôrn′), *v.t.* to beautify; trim with ornaments, embellish.

adornment (a dôrn′ ment), *n.* decoration.

adrenal (ad rē′ nal), *adj.* near, of or from the kidneys.

adrenalin (ad ren′ al in), *n.* a drug made from the extract of the suprarenal glands: used to stimulate heart action.

adrift (a drift′), *adj. and adv.* floating at the mercy of wind, tide or circumstances.

***adroit** (a droit′), *adj.* having skill; dexterous; clever.

adulation (ad ū la′ shun), *n.* obsequious praise; flattery.

***adult** (a dult′), *adj.* grown up to full age, size and strength.

adulterant (a dul′ tĕr ant), *n.* an inferior ingredient mixed with one of better grade or greater strength.

adulterate (a dul′ tĕr āt), *v.t.* to corrupt or make poorer by baser admixture.

adulteration (a dul′ tĕr ā′ shun), *n.* the debasing by admixture.

adultery (a dul′ tĕr i), *n.* [*pl.* adulteries (-iz)] violation of the marriage vow.

***adumbrate** (ad um′ brāt), *v.t.* to represent by mere outline or indicate vaguely; to foreshadow.

advance (ad vȧns′), *n.* a forward movement; progress; an improvement.

advance (ad vȧns′), *v.i. and v.t.* to go forward; further; make a payment of beforehand.

advancement (ad vȧns′ ment), *n.* furtherance; progress; promotion.

advantage (ad vȧn′ tij), *n.* superiority in position, condition or skill, as the enemy has the *advantage;* any condition or opportunity resulting in success or benefit, as the *advantages* of an education.

advantageous (ad van tā′ jus), *adj.* beneficial, profitable.

advent (ad′ vent), *n.* a coming or arrival.

Advent (ad′ vent), *n.* the period including the four Sundays before Christmas.

adventitious (ad ven tish′ us), *adj.* happening by chance; casual; fortuitous.

***adventure** (ad ven′ tūr), *n.* an event the issue of which is determined by chance; an unusual or thrilling experience.

adventuresome (ad ven′ tūr sum) or **adventurous** (ad ven′ tūr us), *adj.* inclined to incur risk.

adverb (ad′ vûrb), *n.* a word used to modify a verb, adjective or another adverb.

adversary (ad′ vĕr ser i), *n.* [*pl.* adversaries (-riz)] an opponent.

***adverse** (ad′ vûrs′), *adj.* opposed to; unfavorable.

adversity (ad vûr′ si ti), *n.* misfortune, hardship: opposite of *prosperity.*

advert (ad vûrt′), *v.i.* to turn the attention; to refer, allude, as *advert* to yesterday's testimony.

***advertise** (ad′ vĕr tīz), *v.t.* to turn the attention of the public to, especially through print, as in newspapers or magazines, by radio and on cards or billboards.

***advertisement** (ad vûr′ tiz ment), *n.* a notice of something for sale or something about to happen in public print; any public notice.

advice (ad vīs′), *n.* an opinion given for the practical direction of conduct.

advisable (ad vīz′ a bl), *adj.* good to do; expedient, wise or appropriate.

advise (ad vīz′), *v.t.* to give an opinion to; to counsel.

advised (ad vīzd′), *adj.* considered, deliberated, as *well-advised, ill-advised.*

advisedly (ad vīz′ ed li), *adv.* upon advice; with forethought and judgment.

advisement (ad vīz′ ment), *n.* consideration, deliberation, as to take or keep a matter under *advisement.*

advisory (ad vī′ zō ri), *adj.* having power to advise.

advocacy (ad′ vō k*a* si), *n.* the act of pleading for or supporting.

advocate (ad′ vō kāt), *n.* one who pleads for or defends a cause or a person.

advocate (ad′ vō kāt), *v.t.* to plead or argue for; to support, as a policy.

adz or **adze** (adz), *n.* a cutting tool having a curved blade at right angles to the handle;

adz-plane, a tool for molding and rabbeting.

Aeolian harp (ē ō′ li an härp), a flat, boxlike instrument whose strings produce musical tones when the wind stirs them.

***aeon** or **eon** (ē′on), *n.* a period of immense duration.

NOTE.—Many *aero* words with the advance in aviation are taking the English form *air-: aeroplane, airplane; aeroview, air view.*

***aërate** (ā′ ẽr āt), *v.i.* to combine or charge with carbonic-acid gas or air; to expose to the air, as water.

aërated bread (ā′ ẽr ā ted bred), bread raised by charging the dough with carbonic-acid gas.

aëration (ā ẽr ā′ shun), *n.* the act of aerating.

***aërial** (ā ē′ ri al), *n.* a radio antenna.

***aërial** (ā ē′ ri al), *adj.* pertaining to air; of or like air; airy.

aerie (ā′ ẽr i), *n.* an eagle's nest; a brood of eagles or hawks; eerie.

***aërification** (ā ẽr i fi kā′ shun), *n.* the state of being made aëriform or being charged with air.

aërify (ā′ ẽr i fī), *v.t.* [*p.t. and p.p.* aërified, *pr.p.* aërifying], to infuse or combine with air.

aërobatics (ā ẽr ō bat′ iks), *n.* stunt flying.

aërodrome (ā′ ẽr ō drōm), *n.* an airport; an airdrome.

aërodynamics (ā ẽr ō di nam′ iks), *n.* the science that treats of air in motion and its action under force and in producing force.

aërogram (ā′ ẽr ō gram), *n.* a message conveyed by means of aircraft or radio; airgram.

aërolite (ā′ ẽr ō līt), *n.* a meteorite.

aëromechanics (ā ẽr ō mē kan′ iks), *n.* the science that treats of air, either in motion or still, as affecting operation of aircraft.

***aërometer** (ā ẽr om′ ē tẽr), *n.* an instrument for weighing air and other gases or measuring their density.

***aëronaut** (ā′ ẽr ō nôt), *n.* an aerial navigator in airship or balloon.

aëroplane (ā′ ẽr ō plān), *n.* an airplane.

aërostatics (ā ẽr ō stat′ iks), *n.* the science which treats of the equilibrium of bodies sustained in air.

aesthetic or **esthetic** (es thet′ ik), *adj.* pertaining to aesthetics.

aesthetics or **esthetics** (es thet′ iks), *n.* the science or theory of the beautiful.

afar (a fär′), *adv.* at, to or from a distance.

affable (af′ *a* bl), *adj.* easy to approach, friendly; courteous.

affair (a fâr′), *n.* that which is done or is to be done, any matter or proceeding: *affairs,* business.

affect (a fekt′), *v.t.* to produce an effect upon; to influence.

affectation (af ek tā′ shun), *n.* a manner which is not one's own; artificial speech or mannerism.

affected (a fek′ ted), *adj.* unnatural, assumed, artificial.

affection (a fek′ shun), *n.* tender attachment; fondness, warm regard.

affectionate (a fek′ shun it), *adj.* showing or feeling fondness; loving.

***afferent** (af′ ẽr ent), *adj.* conveying inward, as a nerve stimulus to the brain: opposite of *efferent.*

affiance (a fī′ ans), *n.* trust; a marriage contract.

affiance (a fī′ ans), *v.t.* to betroth.

affianced (a fī′ anst), *adj.* betrothed; pledged.

affidavit (af i dā′ vit), *n.* a sworn statement in writing.

affiliate (a fil′ i āt), *v.i.* to join or unite, as to *affiliate* two railroad companies, *affiliate* oneself with a society; to trace, as to *affiliate* French to Latin; to join or become connected, as to affiliate with a political party.

affinity (a fin′ i ti), *n.* [*pl.* affinities (-tiz)] close kinship, relationship; close structural connection, as the *affinity* between animals or languages; the special chemical attraction that causes certain atoms to combine with others.

affirm (a fûrm′), *v.t. and v.i.* to assert strongly; in law, to make a declaration for record without oath.

affirmation (af ẽr mā′ shun), *n.* an averment; a statement before a court but not under oath.

affirmative (a fûr′ ma tiv), *n.* that which affirms; in a debate, the side that defends the proposition being argued.

affix (a fiks′), *v.t.* to fix to or attach, as a seal; to add, as a signature.

afflatus (a flā′ tus), *n.* inspiration, especially from a supernatural source.

afflict (a flikt′), *v.t.* to cause prolonged pain to body or mind; to distress.

affliction (a flik′ shun), *n.* prolonged pain of body or mind; state of distress; that which causes pain or grief.

Syn. Grief, sorrow. *Sorrow* is a general term embracing *grief,* which arises from a definite cause, such as bereavement or remorse, and *affliction,* which is great physical or mental distress arising from loss or disaster.

Ant. Happiness, joy, well-being.

affluence (af′ lū ens), *n.* an abundant supply, as of thoughts, words, riches; wealth.

affluent (af′ lū ent), *n.* a tributary stream.

affluent (af′ lū ent), *adj.* flowing abundantly; wealthy.

afford (a fōrd′), *v.t.* to supply; to produce; to yield; to be capable of bearing the expense of.

affray (a frā′), *n.* the fighting of two or more persons in a public place.

affront (a frunt′), *n.* an insult.

affront (a frunt′), *v.t.* to offend or insult intentionally.

afghan (af′ gan), *n.* a crocheted or knitted soft wool blanket or carriage robe.

afield (a fēld′), *adv.* to, in or on the field; astray.

aflame (a flām′), *adj. and adv.* in flames; on fire.

afloat (a flōt′), *adj. and adv.* floating; in circulation.

afoot (a foot′), *adv.* on foot; astir.

afraid (a frād′), *adj.* frightened.

afresh (a fresh′), *adv.* again, anew.

aft (ȧft), *adj. and adv.* toward or at the stern of a ship.

after (ȧf′ tẽr), *adj.* next; subsequent; later.

after (ȧf′ tẽr), *adv.* behind in time or place.

after (ȧf′ tẽr), *prep.* next following; later than; concerning, as to look *after* the house; returning in search of, as to go back *after* supplies; in imitation of, as he takes *after* his father.

afterclap (af′ tẽr klap), *n.* an unexpected event happening after an affair is supposed to be at an end.

afterdamp (af′ tẽr damp), an unbreathable gas found in coal mines after an explosion of firedamp, consisting of carbon dioxide and nitrogen.

aftermath (af′ tẽr math), *n.* a second mowing or crop; consequences.

afternoon (af′ tẽr nōōn), *n.* the part of the day between noon and evening.

afterward (af′ tẽr wẽrd) or **afterwards** (-wẽrdz), *adv.* at a later time; subsequently.

***again** (a gen′), *adv.* a second time; in return; further; anew.

***against** (a genst′), *prep.* upon; opposite to; in opposition to; contrary to; in preparation for, as save *against* need or a rainy day.

***agape** (a gāp′), *adj. and adv.* gaping.

agate (ag′ it), *n.* variegated quartz, a variety of chalcedony; a small size of type, 5½ point.

age (āj), *n.* a particular period of time in life or in history; time.

aged (ā′ jed), *adj.* very old; (ā jd), having reached a certain number of years, as *aged* 21.

agency (ā′ jen si), *n.* action, as we cook through the *agency* of heat; an office where agents transact business.

agenda (a jen′ d*a*), *n.* a program of things to be done, as at a meeting.

agent (ā′ jent), *n.* one who acts for another; an active power or cause.

agglomerate (a glom′ ẽr āt), *v.t.* to gather into a heap; accumulate.

agglomeration (a glom ẽr ā′ shun), *n.* a mass or heap.

agglutinate (a glōō′ ti nāt), *v.t.* to glue or fasten together.

***aggrandize** (ag′ ran dīz), *v.t.* to make great or greater, as in power or honor.

aggrandizement (a gran′ diz ment), *n.* exaltation; advancement.

aggravate (ag′ r*a* vāt), *v.t.* to make worse or increase; to intensify.

aggravation (ag r*a* vā′ shun), *n.* the act of making worse; anything that increases the seriousness of a burden, illness, offense or the like.

aggregate (ag′ rē gāt), *n.* the total, a mass or sum: *in the aggregate,* collectively.

aggregate (ag′ rē gāt), *adj.* formed into a whole.

aggregate (ag′ rē gāt), *v.t.* to bring together; to form into a whole.

aggregation (ag rē gā′ shun), *n.* a collection of particulars.

aggression (a gresh′ un), *n.* unprovoked attack; any first act of enmity.

aggressive (a gres′ iv), *adj.* assuming the offensive without cause; self-assertive, pushing.

aggressor (a gres′ ẽr), *n.* one who attacks.

aggrieve (a grēv′), *v.t.* to afflict with pain or sorrow; to oppress.

aghast (a gȧst′), *adj.* struck with sudden astonishment or terror.

***agile** (aj′ il), *adj.* moving easily; active and nimble in body.

agitate (aj′ i tāt), *v.t.* to put or keep in motion, stir violently; to stir up, excite, disturb.

agitated (aj i tāt′ ed), *adj.* excited, disturbed.

agitation (aj i tā′ shun), *n.* the act of agitating; excitement.

agitator (aj′ i tā tẽr), *n.* one who starts or keeps up a political or other agitation.

aglow (a glō′), *adj.* in a glow; glowing.

***agnostic** (ag nos′ tik), *n.* one who, while he does not deny the existence of God, believes there is no proof of a Supreme Being: sometimes confused with *atheist.*

agog (a gog′), *adj.* in a state of expectancy; eager.

agonize (ag′ ō nīz), *v.i.* to suffer anguish; to make desperate efforts.

agony (ag′ ō ni), *n.* [*pl.* agonies (-niz)] extreme pain; anguish.

agrarian (a grâr′ i an), *adj.* relating to land, or to land tenure.

agrarianism (a grâr′ ian izm), *n.* the principle of a uniform division of land.

agree (a grē′), *v.i.* to harmonize physically, mentally or morally; to accord.

Syn. Accede, concur, coincide, acquiesce. To *agree* is the general term and implies formal consent. We *accede* by becoming a party to a thing; those who *accede* yield up an opinion to the point of agreement; one objects to that to which one does not *accede;* we *concur* by expressing a definite agreement in opinion or action; ideas or opinions *coincide* if they are identical; to *acquiesce* is quietly to admit or agree to.

Ant. Differ, disagree, object, refuse.

agreeability (a grē *a* bil′ i ti), *n.* agreeableness.

agreeable (a grē′ *a* bl), *adj.* pleasing to the mind or senses.

agreement (a grē′ ment), *n.* harmony of opinions or feelings; in grammar, correspondence of words in number, person, case or gender.

agriculture (ag′ ri kul tūr), *n.* the science and art of cultivating the soil or raising livestock; farming.

aground (a ground′), *adj. and adv.* on the ground; of a boat or ship, stranded.

ague (ā′ gū), *n.* a malarial fever marked by a chill that alternates with the fever.

ahead (a hed′), *adv.* in the front; forward.

aheap (a hēp′), *adv.* in a heap.

ahoy (a hoi′), *interj.* a call used in hailing, as a vessel.

aid (ād), *n.* help; assistance.

aid (ād), *v.t.* to assist; to support.

aide-de-camp (ād′ dē kamp), *n.* [*pl.* aides-de-camp (ādz)] an officer who assists a general.

***aigrette** (ā gret′), *n.* an egret; a plume of certain herons used as a headdress, or any artificial head ornament resembling it.

ail (āl), *v.i. and v.t.* [*p.t. and p.p.* ailed, *pr.p.* ailing] to feel pain; to be afflicted with pain or illness; to cause pain: what *ails* you?

aileron (ā′ lẽr on), *n.* a small, hinged plane surface operated by the pilot of an airplane as a stabilizer.

***ailment** (āl′ ment), *n.* a slight disorder of the body; sickness.

aim (ām), *v.i.* [*p.t. and p.p.* aimed, *pr.p.* aiming] to strive for; to point or direct at something.

air (âr), *n.* the atmosphere.

air (âr), *v.t.* to expose to the air; to dry, as clothes; to exhibit ostentatiously.

air base (âr bās), *n.* a service station for airplanes.

air brake (âr brāk), *n.* a brake worked by means of compressed air.

air-conditioned (âr con dish′ und), *adj.* having air cleansed and regulated as to humidity.

aircraft (âr′ krȧft), *n.* an airplane, glider or dirigible balloon.

air cushion (âr koosh′ un), *n.* a shock absorber operating by means of confined air.

airdrome (âr′ drōm), *n.* an airport.

airfoil (âr′ foil), *n.* any surface, as of wing or rudder of an airplane, used to control or direct flight by pressure of the air.

air gas (âr gas), an illuminating gas made by charging air with the vapor of gasoline or similar substance.

air gun (âr gun), a gun discharged by the elastic force of compressed air.

airiness (âr′ i nes), *n.* the state of being airy; gaiety.

airing (âr′ ing), *n.* exposure to air; a walk, ride or drive in the open air.

air lane (âr lān), *n.* a path of invariable winds, which makes flying easy.

air line (âr līn), *n.* a straight line, drawn as if through the air.

air line (âr līn), *n.* a system of transport by aircraft, which are spoken of as *air liners*.

air mail (âr māl), *n.* letters and packages transported in aircraft; the service that handles this mail.

airplane (âr′ plān), *n.* a heavier than air, motor-driven form of aircraft, supported by the action of air against the wing planes.

air pocket (âr pok′ et), *n.* a condition of the atmosphere that makes an airplane drop suddenly.

airport (âr′ pōrt), *n.* a station for aircraft.

air pump (âr pump), a machine for exhausting the air from a closed space or to force air through or into something.

airs (ârz), *n.* affectation, pretense, as to put on *airs*.

airship (âr′ ship), *n.* a lighter than air, motor-driven form of aircraft.

airtight (âr′ tīt), *adj.* tight enough to prevent entrance or passage of air.

airway (âr′ wā), *n.* a charted route for aircraft.

airworthy (âr′ wûr thi), *adj.* in fit condition for flying.

airy (âr′ i), *adj.* exposed to, like or composed of air; breezy; unsubstantial, unreal.

***aisle** (īl), *n.* a passageway between blocks of seats in a meeting room or between display counters in a store.

ajar (a jär′), *adj.* slightly turned or opened, as a door; out of harmony.

akimbo (a kim′ bō), *adv.* with hands on hips and elbows turned outward.

akin (a kin′), *adj.* related by blood; allied by nature.

***alabaster** (al′ *a* bas tẽr), *n.* a white, marble-like mineral, a form of gypsum.

à la carte (ä lä kärt′), by the card or bill of fare; said of a meal charged for by separate items.

alack (a lak′), *interj.* an exclamation of blame, sorrow or surprise.

alacrity (a lak′ ri ti), *n.* eager readiness; joyous activity; briskness.

a la mode (ä *la* mōd′), *adj.* in fashion.

alarm (a lärm′), *n.* sudden fear of danger; a warning signal.

alarm (a lärm′), *v.t.* to arouse to a sense of danger; to give a warning signal.

alarmist (a lärm′ ist), *n.* one who is easily and needlessly excited over public questions and seeks to excite others.

alas (a lȧs′), *interj.* an exclamation expressive of unhappiness or pity.

albatross (al′ b*a* trôs), *n.* a very large sea bird allied to the petrel.

albeit (ôl bē′ it), *conj.* although; even though; notwithstanding.

***albino** (al bī′ nō), *n.* a person or animal with white skin and hair and pink eyes.

album (al′ bum), *n.* a blank book for autographs, photographs, stamps.

***albumen** (al bū′ men), *n.* the white of an egg.

albumenize (al bū′ men īz), *v.t.* to coat (paper) with an albuminous solution.

***albumin** (al bū′ min), *n.* a protein substance in meat, milk, eggs.

alchemy (al′ kē mi), *n.* a science of the Middle Ages that tried to change baser metals into gold and to make a compound that would cure all disease and extend life indefinitely.

alcohol (al′ kō hôl), *n.* a colorless and inflammable liquid produced by fermentation and distillation.

alcoholism (al′ kō hôl izm), *n.* a diseased condition caused by excessive use of alcoholic liquors.

alcove (al′ kōv), *n.* a recess in a room or a garden.

alder (ôl′ dẽr), *n.* a genus of trees and shrubs growing in moist land and related to the birch.

alderman (ôl′ dẽr man), *n.* [*pl.* aldermen] a member of a city government who represents a district.

ale (āl), *n.* a liquor made from an infusion of malt by fermentation.

alee (a lē′), *adv. and adj.* on the lee or sheltered side.

alert (a lẽrt′), *adj.* on the watch, active.

alfalfa (al fal′ fa), *n.* a hay and forage plant, deep-rooted, fast-growing and having leaves like those of the clover.

***algae** (al′ jē), *n.* a group of plants including nearly all salt-water seaweeds, similar plants that form scum on fresh-water ponds or grow on moist ground.

***algebra** (al′ jē bra), *n.* the science of treating the properties of numbers by means of general symbols.

***algebraic** (al jē brā′ ik) or **algebraical** (-i kal), *adj.* occurring in or dealing with algebra.

***alias** (ā′ li as), *n.* [*pl.* aliases] an assumed name.

***alias** (ā′ li ȧs), *adv.* otherwise named.

alibi (al′ i bī), *n.* an accused person's plea of or fact of his having been elsewhere when the alleged act was done.

***alien** (āl′ yen), *n.* a foreign-born nonnaturalized resident of a country.

***alien** (āl′ yen), *adj.* foreign; differing from, as ideas *alien* to ours.

alienate (āl′ yen āt), *v.t.* to estrange, as the affections; to transfer to another, as property.

alienist (āl′ yen ist), *n.* a specialist in mental diseases.

alight (a līt′), *adj.* lighted, kindled; lighted up, as with emotion.

alight (a līt′), *v.i.* to dismount; to descend and settle; to come upon accidentally.

align or **aline** (a līn′), *v.t. and v.i.* to arrange into or fall into line.

alike (a līk′), *adj.* similar, not different.

alike (a līk′), *adv.* in the same way, as to treat all *alike*.

***aliment** (al′ i ment), *n.* food; the necessaries of life generally.

alimentary (al i men′ t*a* ri), *adj.* pertaining to nutrition; nutritious.

alimentary canal (al i men′ t*a* ri k*a* nal′), the great duct which conveys food to the stomach and carries off waste matter.

alimentation (al i men tā′ shun), *n.* the act of giving nourishment or method of being nourished.

alimony (al′ i mōn i), *n.* means of living; an allowance made by decree of court to a wife out of her husband's income or to a husband from his wife's income after a divorce or separation.

alive (a līv′), *adj.* having life; in a state of action or existence; sprightly; thronged; as *alive* with people.

alkali (al′ k*a* li), *n.* [*pl.* alkalis or alkalies] one of a class of bases, as soda or potash, that neutralize acids and form salts.

***alkaline** (al′ k*a* līn), *adj.* pertaining to or having the properties of an alkali.

alkaloid (al′ k*a* loid), *n.* a body or substance containing alkaline properties found in nature in plants and animals.

alkanet (al′ k*a* net), *n.* a plant the root of which yields a rich red dye.

all (ôl), *n.* the whole of anything, as I give you my *all*.

all (ôl), *adj.* the whole quantity or number of; as *all* oaks are trees.

all (ôl), *adv.* completely, as *all* gone.

allay (a lā′), *v.t.* to quiet or calm, assuage, appease; to relieve.

Syn. Alleviate, mitigate. To *allay* is to lessen, especially any physical or mental disturbance, as pain, fever or fear; to *alleviate* is to decrease something enough to make it more endurable; to *mitigate* is to make milder or less severe, as punishment or grief.

Ant. Aggravate, arouse, intensify.

allegation (al ē gā′ shun), *n.* the act of alleging; something alleged.

allege (a lej′), *v.t.* to state positively, but not under oath and without proof; to affirm.

Syn. Adduce, advance. To *allege* is to state as true or capable of proof, without proving; to *adduce* is to bring forth the evidence of what has been *alleged*. When an *alleged* criminal is brought to trial the counsel *advance* a theory and *adduce* evidence in its support.

***allegiance** (a lē′ jans), *n.* the obligation of a subject or citizen to his sovereign or government; loyalty to a person, principle or organization commanding respect.

allegoric (al ē gor′ ik) or **allegorical** (′-i kal), *adj.* in the nature of allegory; figurative.

allegory (al′ ē gō ri), *n.* [*pl.* allegories (-riz)] a story in which symbols are used to present moral truths, as in *Pilgrim's Progress*.

allergy (al′ ẽr ji), *n.* disease resistance as affected by inoculation.

alleviate (a lē′ vi āt), *v.t.* to lighten, lessen, make easier, mitigate.

alley (al′ i), *n.* [*pl.* alleys (-liz)] a passageway or narrow back street between two rows of buildings; a long, narrow space for bowling.

Allhallows (ôl hal′ lōz), *n. pl.* All Saint's Day, celebrated on November 1.

alliance (a lī′ ans), *n.* the state of being allied; a group of governments or other units combining for some special purpose, as defense.

alligator (al′ i gā tẽr), *n.* a large thick-skinned water reptile closely resembling the crocodile but having a shorter and broader nose.

alligator pear (pâr), *n.* a pearlike fruit, the avocado.

alliteration (a lit ẽr ā′ shun), *n.* the repetition of the same initial letter or the same initial sound in closely succeeding words.

alliterative (a lit′ ẽr ā tiv), *adj.* pertaining to or characterized by alliteration.

allocate (al′ ō kāt), *v.t.* to assign or allot, distribute.

***allopathy** (a lop′ *a* thi), *n.* a method of treating disease by inducing an action opposite to that of the disease.

allot (a lot′), *v.t.* [*p.t. and p.p.* allotted, *pr.p.* allotting] to distribute or divide, as by lot; to assign.

allotropy (a lot′ rō pi), *n.* the existence of a chemical element in two or more different forms.

allow (a lou′), *v.t.* to grant, yield, admit; to deduct.

allowance (a lou′ ans), *n.* admission, concession; a credit given on a purchase.

alloy (a loi′), *n.* a compound or fusion of two or more metals.

alloy (a loi′), *v.t.* to combine with another metal, as to *alloy* tin with copper to make pewter.

all-round (ôl round′), *adj.* versatile, useful for many purposes.

allspice (ôl′ spīs), *n.* a spice made from the dried berry of a West Indian tree.

all told (ôl tōld), literally, all counted; including everything; in toto.

allude (a lūd′), *v.i.* to refer to; to mention incidentally.

Syn. Hint, refer, suggest. *Allude* is not quite so direct as *refer* but is more clear and positive than *hint* or *suggest*. We *allude* to something by indirect suggestion; we *refer* to an event by expressly naming it; we *hint* at something by implying a hidden meaning; we *suggest* an idea by leading up to it indirectly and concluding without positive statement.

allure (a lūr′), *v.t.* to tempt, entice.

allusion (a lū′ zhun), *n.* indirect mention; a casual reference.

alluvium (a lū′ vi um), *n.* [*pl.* alluvia] a deposit of mud, sand or gravel made by a stream.

*__ally__ (a-lī′), *n.* [*pl.* allies] a person or nation joined with another by treaty, especially for war against a common foe; any associate or helper.

ally (a lī′), *v.t. and v.i.* [*p.t. and p.p.* allied, *pr.p.* allying] to unite for a common purpose.

alma mater (alm*a* mā′ ter), the school or college in which one is or has been a student.

almanac (ôl′m*a* nac), *n.* a book containing a calendar for a full year, with facts about the weather, the heavenly bodies, tides.

almighty (ôl mī′ ti), *adj.* possessing all power, omnipotent, as the *almighty* God.

*__almond__ (ä′ mund), *n.* the nut or fruit of the almond tree.

almond (ä′ mund), *adj.* resembling an almond in shape or taste.

almoner (al′ mun ēr), *n.* one who gives out alms to the poor for another.

almost (ôl′ mōst), *adv.* nearly, just about, not quite.

alms (ämz), *n.* money given and distributed for relief of the poor and needy.

almshouse (ämz′ hous), *n.* a house where charity is dispensed and poor persons are cared for.

aloe (al′ ō), *n.* a plant with thickly clumped basal leaves, related to the lily.

aloes (al′ ōz), *n.* a medicinal substance made from the thickened juice of aloe plants.

aloft (a lôft′), *adv.* on high; in the upper rigging of a ship.

aloha (ä lō′ hä), *interj.* a Hawaiian exclamation of greeting or farewell.

alone (a lōn′), *adj. and adv.* without company, escort or associates, as to walk *alone;* only, as that *alone* is the answer; exclusively.

along (a lông′), *prep.* parallel to the length of; lengthwise of; beside, as *along* a wall, *along* a road.

along (a lông′), *adv.* onward, as pass this *along;* together, as to study art *along* with music.

alongside (a lông sīd′), *adv.* at the side of; side by side with.

aloof (a lo͞of′), *adv.* at a distance but in sight; apart in interest or feeling.

aloud (a loud′), *adv.* audibly.

alpaca (al pak *a*′), *n.* a South American wool-bearing animal; cloth made from its wool.

alphabet (al′ f*a* bet), *n.* the letters of a language.

already (ôl red′ i), *adv.* previously; before some specified time.

also (ôl′ sō), *adv.* too, in addition to.

altar (ôl′ tēr), *n.* a raised place for the offering of sacrifices or burning of incense or for worship in churches.

alter (ôl′ tēr), *v.t. and v.i.* to effect some change in; to become different.

alteration (ôl tēr ā′ shun), *n.* the act of altering or changing; a change or variation.

*__altercation__ (ôl tēr kā′ shun), *n.* a dispute, wrangle.

*__alternate__ (ôl′ tēr nāt), *v.i. and v.t.* to take turns; to follow in turn, as summer and winter *alternate;* to cause to happen by turns.

*__alternate__ (ôl′ tēr nit), *adj.* alternating, as each second one in a series.

*__alternate__ (ôl′ ter nit), *n.* one who takes another's place, a substitute.

alternately (ôl′ tēr nit li), *adv.* first one, then the other.

alternating current (ôl′ tēr nāt ing kûr′ ent), an electric current that reverses its direction at fixed intervals of time.

alternation (ôl tēr nā′ shun), *n.* the act of alternating; state of being alternate.

*__alternative__ (ôl tûr′ n*a* tiv), *n.* a choice between two things; either one of two things between which choice is to be made.

Syn. Choice, option. A *choice* may be made among many things; an *alternative* is a choice between two; *option* is the right or privilege of choosing.

although (ôl thō′), *conj.* even if, notwithstanding; supposing that.

altimeter (al tim′ ē tēr), *n.* an instrument for measuring altitude.

altitude (al′ ti tūd), *n.* height.

alto (al′ tō), *n.* in music, the lower range of the female voice, a part lower than soprano; also called *contralto;* high, relief carving.

altogether (ôl too ge*th*′ ēr), *adv.* completely, entirely, including all or everything.

*__altruism__ (al′ tro͞o izm), *n.* unselfish consideration of others.

alum (al′ um), *n.* a mineral salt used in medicine.

*__aluminum__ (a lū′ mi num), *n.* a bluish-white, light-weight, durable metal which does not rust.

alumna (a lum′ n*a*), *n.* [*pl.* alumnae] a girl or woman graduate of a school or college.

alumnus (a lum′ nus), *n.* [*pl.* alumni] a boy or man who has graduated from a school or college.

always (ôl′ wāz), *adv.* constantly, all the time.

amain (a mān′), *adv.* with force and suddenness.

amalgam (a mal′ gam), *n.* any metallic mixture or alloy of which mercury is the chief constituent; any mixture or blend.

amalgamate (a mal′ g*a* māt), *v.i.* to mix, combine; to mingle, as one race with another.

amalgamation (a mal g*a* mā′ shun), *n.* an alloy of mercury with another metal; a mingling, as of races, or a consolidation, as of business bodies.

amanuensis (a man ū en′ sis), *n.* one who writes for another, copying or taking dictation.

amaranth (am′ a ranth), *n.* an imaginary flower that never fades; any of several cultivated plants with green, purple or crimson blossoms.

amass (a mas′), *v.t. and v.i.* to collect, accumulate in great quantity.

*__amateur__ (am *a* tūr′), *n.* one who engages in art or sport on a nonprofessional basis.

amatory (am′ *a* tō ri), *adj.* relating to or expressive of love.

amaze (a māz′), *v.t.* to cause fear or astonishment; to surprise, bewilder.

ambassador (am bas′ *a* dēr), *n.* the highest ranking diplomatic representative of one government to another.

amber (am′ bēr), *n.* a yellowish fossil resin found chiefly on the shores of the Baltic.

amber (am′ bēr), *adj.* made of amber; having the yellowish color of amber.

*__ambergris__ (am′ bēr grēs), *n.* a waxlike substance obtained from the carcasses of sperm whales and used in making perfume.

ambidextrous (am bi dek′ strus), *adj.* able to use either hand equally well.

ambiguity (am bi gū′ i ti), *n.* uncertainty or vagueness of meaning; an expression that can be taken two ways.

ambiguous (am big′ ū us), *adj.* capable of more than one interpretation; not clearly stated.

ambition (am bish′ un), *n.* desire for advancement, wealth, honor or power.

ambitious (am bish′ us), *adj.* eager for success, honor or fame; determined to succeed.

amble (am′ bl), *n.* a gentle gait; a slow pace of horses with two legs of one side raised at the same time.

*__ambrosia__ (am brō′ zhi *a*), *n.* the food of the gods; anything exquisitely pleasing to the taste.

ambrosial (am brō′ zhi al), *adj.* delicious, sublime; fit for the gods; captivating to the sense of taste or smell.

ambulance (am′ bū lans), *n.* a vehicle for the sick or wounded; a mobilized field hospital.

ambulation (am bū lā′ shun), *n.* the act of walking about.

ambuscade (am bus kād′), *n.* a strategic disposition of troops in ambush.

ambush (am′ boosh), *n.* a lying in wait to attack by surprise; the troops lying in wait.

*__ameba__ (a mē′ b*a*), *n.* [*pl.* amebas] a one-celled animal of microscopic size, found in stagnant water; one of the simplest forms of life.

*__ameliorate__ (a mēl′ yō rāt), *v.t. and v.i.* to make better or grow better; to improve.

amen (ā men′), *interj.* so be it.

amenability (a mē n*a* bil′ i ti), *n.* tractableness.

*__amenable__ (a mē′ n*a* bl), *adj.* easily led, reasonable, docile.

amend (a mend′), *v.t.* to free from fault; to make better.

Syn. Emend, mend. To *amend* signifies to improve by removing faults or defects, as to *amend* a law; to *emend* is to make corrections or suggest improvements in a literary work; to *mend* is to repair something broken, torn or otherwise impaired.

Ant. Impair, spoil.

amendment (a mend′ ment), *n.* the removal of faults; the altering of a bill, act or other formal papers.

amends (a mendz′), *n. pl.* reparation for loss or injury; compensation, as he made *amends* for his rudeness.

amenity (a men′ i ti), *n.* [*pl.* amenities] pleasantness, as of demeanor, genialty: *amenities,* courtesies and civilities of social life.

amerce (a mûrs′), *v.t.* to punish by arbitrary fine.

amethyst (am′ ē thist), *n.* a violet-purple variety of quartz or rock crystal.

amiability (ā mi *a* bil′ i ti), *n.* good nature, friendliness.

amiable (ā′ mi *a* bl), *adj.* sweet-tempered, kind-hearted, agreeable, as an *amiable* person.

amicable (am′ i k*a* bl), *adj.* from or showing friendliness, as an *amicable* remark.

amid (a mid′), *prep.* in the middle of, among.

amir or **ameer** (a mēr′), *n.* a Mohammedan noble.

amiss (a mis′), *adj.* wrong, faulty.

amiss (a mis′), *adv.* wrongly.

amity (am′ i ti), *n.* friendly relations, friendship.

ammeter (am′ mē tēr), *n.* an instrument for measuring the intensity of an electric current in amperes.

ammonia (a mō′ ni *a*), *n.* a transparent, pungent, volatile gas used in fertilizers and in making ice; this gas dissolved in water, used as a household cleaning fluid.

ammunition (am ū nish′ un), *n.* powder, balls, cartridges and shells, used in charging pistols, guns, cannon.

amnesia (am nē′ zi *a*), *n.* loss of memory.

amnesty (am′ nes ti), *n.* a general pardon; an official forgetting, as of a debt.

among (a mung′), *prep.* mixed in with; surrounded by; amidst.

amorous (am′ ō rus), *adj.* fond of the opposite sex; loving.

amorphous (a môr′ fus), *adj.* shapeless, formless.

amortize (a môr′ tīz), *v.t.* to arrange for paying a future debt or obligation by making periodic contributions to a fund that will discharge it when it comes due.

amount (a mount′), *n.* a sum, aggregate, any quantity.

amount (a mount′), *v.i.* to mount up; be equivalent or equal.

amperage (am pēr′ ij), *n.* strength of an electric current measured in amperes.

ampere (am′ pēr), *n.* the unit for measuring the force of an electric current; named for André Ampère, French physicist.

amphibian (am fib′ i an), *n.* an animal or plant able to live on land and in water; an airplane that can take off and alight either on land or on water.

amphibious (am fib′ i us), *adj.* able to live either on land or in water, as a frog.

amphitheater (am′ fi thē′ *a* tēr), *n.* a round or oval structure with tiers of seats surrounding an arena or stage.

ample (am′ pl), *adj.* large; sufficient.

amplification (am pli fi kā′ shun), *n.* the act of amplifying; something enlarged.

amplifier (am′ pli fī ēr), *n.* a mechanism to magnify electric impulses and add to the volume of sound.

amplify (am′ pli fī), *v.t.* [*p.t. and p.p.* amplified, *pr.p.* amplifying] to enlarge; increase in scope or volume.

amputate (am′ pū tāt), *v.t.* to cut off, as an arm.

amputation (am pū tā′ shun), *n.* the operation of cutting off a limb.

amuck (a muk′) or **amok** (a mok′), *adv.* in a state of frenzy; as he ran *amuck.*

amulet (am′ ū let), *n.* a luck charm, talisman.

amuse (a mūz), *v.t.* to entertain, divert.

an (an), *indef. art.* one, any: used before words beginning with a vowel or the sound of a vowel, as *an* egg, *an* hour.

anachronism (a nak′ rō nizm), *n.* an error with respect to the time of some event, custom, costume or other occurrence or procedure; any inconsistency in the matter of time.

anaconda (an *a* kon′ d*a*), *n.* a large nonvenomous snake that crushes its prey.

anaglyph (an′ *a* glif), *n.* a work of art carved in relief, as a cameo.

anagram (an′ *a* gram), *n.* a word or sentence constructed out of another word or sentence by transposing.

analgesia (an al jē′ zi *a*), *n.* insensibility to pain in any part of the body.

analgesic (an al jēs′ ik), *adj.* counteracting pain.

***analogous** (a nal′ ō gus), *adj.* resembling, corresponding to another thing on certain points, as a bird's claws are *analogous* to human fingers.

analogue (an′ *a* lôg), *n.* an object which bears analogy to something else.

***analogy** (a nal′ ō ji), *n.* [*pl.* analogies (-jiz)] agreement, resemblance or correspondence in relations between different objects.

analysis (a nal′ i sis), *n.* [*pl.* analyses (-sēz)] reduction of anything into its parts; the examination of anything to determine its make-up; a statement of the process or the examination, point by point.

analytic (an *a* lit′ ik) or **analytical** (-i kal), *adj.* relating to or characterized by the method of analysis.

analyze (an′ *a* līz), *v.t.* to separate or resolve into elementary parts.

anapest (an′ *a* pest), *n.* a metrical foot in poetry of two unaccented syllables and one accented syllable.

anaplasty (an′ *a* plas ti), *n.* repairing wounds by transplanting healthy tissue.

***anarchist** (an′ ar kist), *n.* one who believes in or promotes anarchy.

***anarchy** (an′ ar ki), *n.* lack of governmental rule: a chaotic state resulting from the overthrow of government.

anathema (a nath′ ē ma), *n.* [*pl.* anathemas (-maz)] the curse accompanying excommunication; any solemn curse; a person or thing distasteful.

anathematize (a nath′ ē ma tīz), *v.t.* to pronounce a decree of excommunication against; to curse.

anatomic (an *a* tom′ ik), *adj.* relating to anatomy, pertaining to the structure of the body.

anatomist (a nat′ ō mist), *n.* one possessing a knowledge of bodily structure, a specialist in anatomy.

anatomy (a nat′ ō mi), *n.* [*pl.* anatomies (-miz)] the science of the bodily structure of animals and plants; dissection.

ancestor (an′ ses tẽr), *n.* a forefather or progenitor.

ancestry (an′ ses tri), *n.* the line of one's descent traced from a period more or less remote.

***anchor** (ang′ kẽr), *v.i. and v.t.* to make fast with an anchor, as we *anchored* the boat; to cast anchor.

anchor (ang′ kẽr), *n.* a metal implement that holds a floating vessel in a particular place by connecting it with the bottom. **Sea anchor,** a canvas float that keeps a vessel's head into the wind.

anchorage (ang′ kẽr ij), *n.* a suitable or customary place for anchoring vessels; a charge for anchoring in a harbor.

anchorite (ang′ kō rīt), *n.* one who voluntarily secludes himself from society and lives a solitary life, a hermit.

***anchovy** (an chō′ vi), *n.* [*pl.* anchovies (-viz)] a diminutive fish abounding in Mediterranean waters.

ancient (ān′ shent), *adj.* of or pertaining to the early history of the world; of past times or remote ages; very old.

ancilliary (an′ si lẽr i), *adj.* auxiliary, accessory, subservient.

and (and), *conj.* also; in addition to; besides: used between words, phrases, clauses and sentences of equal importance.

andirons (and′ ī ẽrnz), *n. pl.* metal standards used for open fires to support the logs, firedogs.

androgynous (an droj′ i nus), *adj.* combining both sexes in one, as certain flowers.

anecdote (an′ ek dōt), *n.* a brief narrative of an entertaining character, usually about some notable person or event.

***anemia** (a nē′ mi *a*), *n.* deficiency or low count of red corpuscles in the blood.

***anemone** (a nem′ ō nē), *n.* [*pl.* anemones (-nēz)] a plant of the buttercup family having white, star-shaped blossoms, often with colored sepals; windflower.

aneroid (an′ ẽr oid), *adj.* containing no liquid.

aneroid barometer (b*a* rom′ ē tẽr), *n.* a barometer which contains no liquid but is operated by atmospheric pressure working upon a metal box or tube, causing a pointer to move.

***anesthesia** (an es thē′ zi *a*), *n.* a partial or entire loss of sensation.

anesthetic (an es thet′ ik), *n.* any substance, usually a gas or drug, that causes partial or entire loss of sensation, as novocaine or ether.

anesthetize (an es′ thē tīz), *v.t.* to bring under the influence of an anesthetic.

aneurism (an′ ū rizm), *n.* a local swelling or dilation of an artery.

anew (a nū′), *adv.* afresh, over again.

angel (ān′ jel), *n.* a messenger of God, a heavenly being.

angelic (an jel′ ik) or **angelical** (-i kal), *adj.* like an angel.

anger (ang′ gẽr), *n.* strong resentment of injury or wrong, wrath.

Syn. Fury, indignation, ire, rage, wrath. *Anger* is a sudden, keen displeasure aroused by injury or injustice and usually accompanied by desire to punish; *indignation* is intense *anger* awakened by anything unworthy, as cruelty or meanness; both *wrath* and *ire* are literary terms for *anger; rage* is a vehement expression of anger; and *fury* is an excess of rage.

Ant. Gladness, pleasure, satisfaction.

angiology (an ji ôl′ ō ji), *n.* the branch of anatomy that treats of the blood vessels and lymphatics.

angle (ang′ gl), *n.* the figure formed by the intersection of two straight lines or planes.

angle (ang′ gl), *v.i.* to fish with rod and line; to try to get something indirectly, as a favor.

angleworm (ang′ gl wôrm), *n.* an earthworm: so called because used as bait in fishing with rod and line.

***Anglicism** (ang′ gli sizm), *n.* an idiom or mannerism peculiar to England or the English people or language.

anglicize (ang′ gli sīz), *v.t. and v.i.* to make or to become like English in manner or language.

Angora (ang-gō′ r*a*), *n.* cloth made from Angora wool.

Angora cat (kat), a long-haired domestic cat.

Angora goat (gōt), a domestic goat with long, silky hair.

Angora wool (wool), the wool of the Angora goat, mohair.

angostura bark (ang gos tū′ r*a* bärk), a bitter, aromatic bark of a South American tree, used as a tonic.

angry (ang′ gri), *adj.* extremely resentful or indignant, provoked; sore and inflamed, as a festering wound.

anguish (ang′ gwish), *n.* intense pain or grief.

angular (ang′ gū lẽr), *adj.* possessing an angle or angles.

anhydrous (an hī′ drus), *adj.* lacking water.

***aniline** (an′ i lin), *n.* a colorless, oily liquid used in making dyes and obtained from coal tar.

***animadversion** (an i mad vûr′ shun), *n.* reproof, censure.

animadvert (an i mad vûrt′), *v.i. and v.t.* to make critical remarks, express censure.

animal (an′ i mal), *n.* an organized living body with powers of instinct or thought, feeling, sensations and ability to move at will.

animal husbandry (an′ i mal huz′ band ri), the part of agriculture that deals with the breeding and care of livestock.

animate (an′ i māt), *adj.* alive.

animate (an′ i māt), *v.t.* to impart life to, inspire with energy or action, enliven.

animated (an′ i māt ed), *adj.* vivacious, lively.

animation (an i mā′ shun), *n.* the act of giving life or spirit; liveliness, vivacity.

animosity (an i mos′ i ti), *n.* hostility, hatred, active enmity.

animus (an′ i mus), *n.* any actuating spirit or impulse; a hostile spirit or purpose.

anise (an′ is), *n.* a plant native to Egypt, yielding the aniseed of commerce.

ankle (ang′ kl), *n.* the joint connecting the foot with the leg.

anklet (ang′ klet), *n.* an ornament or support for the ankle.

ankylosis (ang ki lō′ sis), *n.* consolidation of bony parts formerly or normally separate, by means of bony growth.

annalist (an′ al ist), *n.* a compiler of annals; a historian.

annals (an′ alz), *n. pl.* chronological history of events, each being identified by its year; periodically published records of scientific, historical and other societies.

anneal (a nēl′), *v.t.* to heat or fix by heat.

annex (an′ neks), *n.* that which is added; an addition.

annex (a neks′), *v.t.* to add or join one thing to another, especially for use or ownership, as a nation *annexes* territory.

annexation (an eks ā′ shun), *n.* the act of annexing; that which is annexed.

***annihilate** (a nī′ i lāt), *v.t.* to reduce to nothing, destroy.

annihilation (a nī i lā′ shun), *n.* obliteration.

anniversary (an i vẽr′ s*a* ri), *n.* [*pl.* anniversaries (-riz)] the yearly recurrence of the date of an event.

annotate (an′ ō tāt), *v.t.* to mark or note; to furnish with explanatory notes, as a book.

annotation (an ō tā′ shun), *n.* the act of noting or commenting upon; the notes made; a note or commentary.

announce (a nouns′), *v.t.* to proclaim or make publicly known.

Syn. Declare, proclaim. To *announce* is to make known for the first time, as to *announce* an engagement; to *declare* is to make known specifically and formally, as to *declare* one's plans; to *proclaim* is to *announce* to a national or world audience, as to *proclaim* war or peace or the abolition of slavery.

Ant. Conceal, suppress.

announcement (a nouns′ ment), *n.* a notice either of something about to happen or that has happened.

annoy (a noi′), *v.t.* [*p.t. and p.p.* annoyed (-noid), *pr.p.* annoying] to vex or trouble by repeated acts; harass or discompose by petty injury or opposition.

annoyance (a noi′ ans), *n.* the state of being vexed; that which vexes.

annual (an′ ū al), *adj.* once in twelve months; yearly; of or belonging to a year.

annuitant (a nū′ i tant), *n.* one who receives an annuity.

annuity (a nū′ i ti), *n.* [*pl.* annuities (-tiz)] a sum of money to be paid yearly, either in a lump sum or by instalments.

annul (a nul′), *v.t.* [*p.t. and p.p.* annulled, *pr.p.* annulling] to make void, abolish or obliterate.

annular (an′ ū lẽr), *adj.* ringlike.

annulment (a nul′ ment), *n.* the act of rendering null and void.

anode (an′ ōd), *n.* the positive pole of an electric source; the terminal by which an electric current enters a conductor on its way to the other pole: opposite of *cathode.*

anodyne (an′ ō dīn), *n.* medicine that relieves pain.

anoint (a noint′), *v.t.* to pour oil upon, as in a religious ceremony.

***anomalous** (a nom′ *a* lus), *adj.* deviating from the common order; abnormal.

anomaly (a nom′ *a* li), *n.* deviation from the natural order; that which deviates.

anon (a non′), *adv.* soon, again.

anonymity (an ō nim′ i ti), *n.* the state of bearing no name.

anonymous (a non′ i mus), *adj.* bearing no name; of unknown authorship.

another (a nuth′ ẽr), *adj. and pron.* one more; not the same.

answer (an′ sẽr), *n.* a reply; response, by word or act.

Syn. Reply, rejoinder, response. An *answer* is given to a question; a *reply* is made to an assertion; a *rejoinder* is made in terms of a statement by another. We *answer* either for the purpose of affirmation, information or contradiction; we always *reply* or *rejoin,* in order to explain or confute; *responses* are apt to be made by way of assent or confirmation.

Ant. Charge, question.

answer (an′ sẽr), *v.t. and v.i.* to reply, respond.

answerable (an′ sẽr *a* bl), *adj.* capable of being answered; responsible.

ant (ant), *n.* a small social insect noted for its industrious habits.

antacid (ant as′ id), *n.* an alkaline remedy for acidity.

antacid (ant as′ id), *adj.* counteracting acidity.

antagonism (an tag′ ō nizm), *n.* active opposition or resistance.

antagonist (an tag′ ō nist), *n.* an opponent, contender, adversary.

antagonize (an tag′ ō nīz), *v.t. and v.i.* to oppose, arouse opposition.

*__antarctic__ (ant ärk′ tik), *n.* the south polar regions.

antarctic (ant ärk′ tik), *adj.* pertaining to the south polar regions: opposite of *arctic.*

ant bear (ant bâr), the great anteater of South America that is like a diminutive bear.

anteater (ant′ ēt tẽr), *n.* one of a group of quadrupeds that feed upon ants.

antecede (an tē sēd′), *v.t.* to precede in time or space.

antecedence (an tē sēd′ ens) or **antecedency** (an tē sēd′ en si), *n.* precedence.

*__antecedent__ (an tē sēd′ ent), *n.* the noun to which a relative or personal pronoun refers; anything that goes before: *antecedents,* one's previous history or ancestry.

antecedent (an tē sēd′ ent), *adj.* preceding.

antechamber (an′ tē chām bẽr), *n.* an apartment next the principal room.

antedate (an′ tē dāt), *v.t.* to precede in time.

antediluvian (an tē di lū′ vi an), *adj.* of or pertaining to the world before the Flood.

antelope (an′ tē lōp), *n.* an Old World animal resembling a deer but with hollow horns tilted upward and backward.

antemeridian (an tē mē rid′ i an), *adj.* preceding noon.

antenna (an tėn′ *a*), *n.* [*pl.* antennae (-ē)] the jointed horns or feelers upon the heads of insects and crustaceans; a radio receiving aerial.

*__antepenult__ (an tē pē′ nult), *n.* the syllable third from the end of a word.

anterior (an ter′ i ẽr), *adj.* more to the front; former.

anteroom (an′ tē rōōm), *n.* a room forming an entrance to another.

anthem (an′ them), *n.* a composition from the Scriptures or liturgy set to sacred music; a national hymn.

anther (an′ thẽr), *n.* the top of the stamen of a flower containing the pollen or fertilizing dust.

*__anthology__ (an thol′ ō ji), *n.* a collection of songs, poems or selected prose, generally grouped according to style or period.

anthracite (an′ thr*a* sīt), *n.* hard coal.

anthrax (an′ thraks), *n.* a carbuncle or malignant boil; an infectious bacterial disease of cattle and sheep sometimes communicated to man.

*__anthropoid__ (an′ thrō poid), *n.* one of the higher apes resembling man.

*__anthropoid__ (an′ thrō poid), *adj.* resembling man.

anthropology (an thrō pol′ ō ji), *n.* the science that deals with the physical and cultural development of mankind; a book that treats this subject.

anthropomorphism (an thrō pō mor′ fizm), *n.* ascription of human form and qualities to God or to anything not human.

antiaircraft (an ti âr′ kraft), *adj.* used for protection from enemy aircraft.

antichristian (an ti kris′ chan), *adj.* opposed to or denying Christ or Christianity.

anticipate (an tis′ i pāt), *v.t.* to deal with by previous action, as to *anticipate* an examination with study; to forestall; to expect; to look forward to; to foresee and provide for, as to *anticipate* need.

anticipation (an tis i pā′ shun), *n.* the act of anticipating, expectation.

anticlimax (an ti clī′ maks), *n.* a weakening of action and interest where a dramatic rise is needed or expected in a play or story; any occurrence in a series that is ludicrously less significant than the one that immediately preceded it.

anticoherer (an ti kō hēr′ ẽr), *n.* a device in wireless telegraphy for increasing resistance under the action of electric waves.

antics (an′ tiks), *n.* clownish pranks.

antidote (an′ tī dōt), *n.* a counteractive to the effects of poison or disease; a remedy for anything evil.

antimony (an′ tī mō ni), *n.* a white lustrous metal, one of the chemical elements used in making alloys.

*__antinomy__ (an tin′ ō mi), *n.* [*pl.* antinomies (-miz)] opposition of one rule or law to another; a rule or law opposing another; a contradiction.

*__antipathy__ (an tip′ *a* thi), *n.* [*pl.* antipathies (-thiz)] a feeling of aversion, intense dislike.

Syn. Aversion, disgust, repugnance. *Antipathy* is an instinctive recoil from connection or association with a person or thing; *aversion* is a deep and permanent *dislike,* usually expressed in avoidance of the disliked person or thing; *repugnance* implies active opposition; *disgust* is the reaction of outraged taste or feeling.

Ant. Fondness.

antiphlogistic (an ti flō jis′ tik), *adj.* efficacious in counteracting fever or inflammation.

antiphon (an′ ti fon), *n.* a chant or hymn rendered alternately by two choirs.

*__antiphonal__ (an tif′ ō nal), *adj.* characterized by antiphony, responsive.

antiphony (an tif′ ō ni), *n.* [*pl.* antiphonies (-niz)] the alternate or responsive rendering of psalms or chants by a dual choir.

antiphrasis (an tif′ r*a* sis), *n.* use of words in a sense contrary to their true meaning.

antipodes (an tip′ ō dēz), *n. pl.* two portions of the earth's surface which are exactly opposite to each other; direct opposites.

antiquary (an′ ti kwẽr i), *n.* one who collects or deals in objects of great age and rarity; a student of ancient times and objects.

antiquated (an′ ti kwāt ed), *p. adj.* long out of date, outmoded.

antique (an tēk′), *n.* something old and rare, especially furniture and glass.

antique (an tēk′), *adj.* of a former age, ancient.

Syn. Antiquated, old-fashioned, superannuated. *Antique* refers to age, *antiquated* to anything outmoded. We speak of *antique* furniture and *antiquated* customs, an *old-fashioned* fireplace, a *superannuated* person, incapacitated by reason of age.

Ant. Modern.

antiquity (an tik′ wi ti), *n.* [*pl.* antiquities (-tiz)] great age; early ages.

antiscorbutic (an ti skôr bū′ tik), *adj.* counteracting scurvy.

anti-Semitism (an ti sem′ it izm), *n.* antagonism to the Jewish race.

antiseptic (an ti sep′ tik), *adj.* destructive to the germs of disease or putrefaction.

antislavery (an ti slā′ vẽr i), *adj.* opposed to slavery.

antisocial (an ti sō′ shal), *adj.* opposed to or destructive of human society.

*__antistrophe__ (an tis′ trō fē), *n.* the alternating part immediately following the strophe in the ancient Greek chorus.

antithesis (an tith′ ē sis), *n.* [*pl.* antitheses (-sēz)] direct opposition, contrast, as of ideas, shown by close, contrasting words.

antithetic (an ti thet′ ik) or **antithetical** (-i kal), *adj.* in direct opposition.

*__antitoxin__ (an ti toks′ in), *n.* a substance formed in the blood that neutralizes the disease or poison that produced it; serum thus formed in certain animals, used hypodermically to counteract the same disease in human beings.

antitrades (an′ ti trādz), *n.* predominant westerly winds in middle latitudes; tropical winds blowing steadily in a direction opposite to that of the trade winds.

antizymotic (an ti zī mot′ ik), *adj.* preventing fermentation.

antler (ant′ lẽr), *n.* a deer's horn or one of its branches.

ant lion (ant lī′ un), an insect whose larva constructs a pitfall for ants and other insects.

antonym (an′ tō nim), *n.* a word opposite to another in meaning, as bad is the *antonym* of good.

anvil (an′ vil), *n.* an iron block on which metal pieces are shaped by hammering.

anxiety (ang zī′ e ti), *n.* [*pl.* anxieties (-tiz)] a condition of mental uneasiness arising from fear, solicitude or apprehension.

Syn. Care, concern, solicitude, trouble, worry. *Anxiety* is great disquiet referring to future uncertainty; *care* implies disquiet because of burden or oppression; *concern* is anxious thought arising from interest; *solicitude* is greater than *concern* and usually implies tender caring; *worry* is unnecessary *anxiety* or *solicitude.*

Ant. Indifference, unconcern.

anxious (angk′ shus), *adj.* deeply concerned, desiring earnestly, solicitous, apprehensive.

any (en′ i), *adj. and pron.* one, indeterminately, unlimited; some; an indefinite number, quantity or amount.

anybody (en′ i bod′ i), *pron.* any person.

anyhow (en′ i hou), *adv.* in any way; haphazard.

anyway (en′ i wā), *adv.* in any manner, nevertheless.

*__aorta__ (ā ôr′ t*a*), *n.* [*pl.* aortae (-tē)] the chief artery or main trunk of the arterial system.

apace (a pās′), *adv.* quickly, at a fast pace, speedily.

apache (a päsh′), *n.* a ruthless criminal who frequents the streets of Paris at night.

apart (a pärt′), *adv.* separately, aside, asunder.

apartment (a pärt′ ment), *n.* a set or suite of two or more rooms of a house set apart as lodgings.

apathetic (ap *a* thet′ ik) or **apathetical** (ap *a* thet′ i kal), *adj.* devoid of feeling or emotion.

apathy (ap′ *a* thi), *n.* [*pl.* apathies (-thiz)] lack of feeling, want of passion or emotion.

ape (āp), *n.* a tailless monkey.

ape (āp), *v.t.* to imitate.

apeak (a pēk′), *adv.* vertical in position or nearly so.

*__aperient__ (a pēr′ i ent), *n.* a food or medicine with mild laxative effect.

aperient (a pēr′ i ent), *adj.* gently laxative.

*__aperture__ (ap′ ẽr tūr), *n.* an opening, gap.

*__apex__ (ā′ peks), *n.* [*pl.* apexes (ā′ pek sez) and apices (ap′ i sēz)] the point, tip or summit of anything.

*__aphasia__ (a fā′ zhi *a*), *n.* a brain condition involving loss of ability to use or comprehend ordinary speech.

*__aphelion__ (a fē′ li on), *n.* [*pl.* aphelia (-li *a*)] that point in the orbit of a planet or comet which is farthest from the sun.

*__aphid__ (ā′ fid), *n.* a plant louse.

*__aphorism__ (af′ ō rizm), *n.* a concise statement of a rule or precept; a maxim.

apiary (ā′ pi ẽr′ i), *n.* [*pl.* apiaries (-riz)] a place where bees are kept; a beehouse; a group of hives or bee colonies.

apiculture (ā′ pi kul tūr), *n.* beekeeping.

apiece (a pēs′), *adv.* to or for each; severally.

aplomb (a plom′), *n.* self-possession; assurance.

apocalypse (a pok′ *a* lips), *n.* a disclosure, revelation; (A-), the last book of the New Testament.

Apocrypha (a pok′ ri f*a*), *n. pl.* certain writings received by some Christians as an authentic part of the holy Scriptures but rejected by others.

*__apodosis__ (a pod′ ō sis), *n.* the consequent or concluding clause of a conditional sentence.

apogee (ap′ ō jē), *n.* that point in the orbit of the moon or a planet which is most distant from the earth; culmination.

apologetic (a pol ō jet′ ik) or **apologetical** (-i kal), *adj.* offering an excuse; acknowledging, commonly with regret.

apologetics (a pol ō jet′ iks), *n.* the defense and vindication of the principles and laws of the Christian belief.

apologize (a pol′ ō jīz), *v.i.* to offer an excuse; to acknowledge a fault or offense with regret.

apologue (ap′ ō lôg), *n.* a very short moral fable or allegory.

apology (a pol′ ō ji), *n.* [*pl.* apologies (-jiz)] an expression of regret for something said or done; acknowledgment and explanation; a makeshift.

apoplectic (ap ō plek′ tik) or **apoplectical** (-i kal), *adj.* caused by apoplexy; afflicted with apoplexy.

apoplexy (ap′ ō plek si), *n.* sudden loss of consciousness and motive power due to a ruptured blood vessel or blood clot in the brain.

aport (a pōrt′), *adv.* on or toward the port or left side of a ship.

apostasy (a pos′ t*a* si), *n.* [*pl.* apostasies (-siz)] the forsaking of what one has hitherto professed or adhered to.

apostate (a pos′ tāt), *n.* one who has forsaken his faith or party.

***apostle** (a pos′ l), *n.* one charged with a high mission; (A-), one of the twelve persons specially selected by Christ to spread his teachings.

apostolic (ap os tol′ ik) or **apostolical** (-i kal), *adj.* of or pertaining to an apostle.

***apostrophe** (a pos′ trō fē), *n.* a breaking off in a speech to address directly a person or thing that may or may not be present; the mark used in writing and print to indicate omission of letters or figures and as the sign of the possessive case.

apostrophize (a pos′ trō fīz), *v.t.* to address by a rhetorical aside.

apothecaries' weight (a poth′ ē ker iz wāt), the scale of weights used for compounding drugs.

apothecary (a poth′ ē ker i), *n.* [*pl.* apothecaries (-riz)] one who prepares and dispenses medicines and drugs for profit.

apothegm (ap′ ō them), *n.* a pithy saying embodying a wholesome truth or precept.

***apotheosis** (a poth ē ō′ sis), *n.* [*pl.* apotheoses (-sēz)] deification, glorification.

appall (a pôl′), *v.t.* [*p.t. and p.p.* appalled, *pr.p.* appalling] to frighten; to horrify.

***apparatus** (ap *a* rā′ tus), *n.* [*pl.* apparatus) an outfit of tools, utensils or instruments for any kind of work.

apparel (a par′ el), *n.* clothing, vesture, garb.

apparel (a par′ el), *v.t.* [*p.t. and p.p.* appareled, *pr.p.* appareling] to clothe, supply with clothing.

apparent (a par′ ent), *adj.* open to view, capable of being readily perceived or understood; seeming.

Syn. Clear, evident, obvious, manifest, seeming.

Ant. Hidden, actual.

apparition (ap p*a* rish′ un), *n.* a ghost, specter.

appeal (a pēl′), *n.* a request for help; a plea; removal of a law case to a higher court for reconsideration.

appeal (a pēl′), *v.t.* to transfer or refer to a superior court or judge; to request, as help or advice,

appear (a pēr′), *v.i.* to be or become visible; to come before some tribunal, as to plead a cause; seem.

appearance (a pēr′ ans), *n.* the act of becoming visible; the object seen; look, aspect; seeming, as the *appearance* of compliance.

appease (a pēz′), *v.t.* to allay, assuage, quiet, satisfy, pacify.

***appellant** (a pel′ ant), *n.* one who appeals to a higher court.

***appellate** (a pel′ āt), *adj.* pertaining to appeals.

appellation (ap e lā′ shun), *n.* a name or nickname.

appellative (a pel′ *a* tiv), *n.* a common noun.

appellative (a pel′ *a* tiv), *adj.* serving to distinguish, as a name or denomination of a group or class.

append (a pend′), *v.t.* to attach, add, annex or affix.

appendage (a pen′ dij), *n.* something attached to a larger thing as a part.

***appendicitis** (a pen di sī′ tis), *n.* inflammation of the vermiform appendix.

appendix (a pen′ diks), *n.* [pl. appendixes (-dik ses) and appendices (-di sēz)] that which is added as a supplement; a tube admitting gas into a balloon or dirigible. The small worm-shaped tube 3 or 4 inches long (called the *vermiform appendix*) attached to the blind sac of the large intestine.

appertain (ap ēr tān′), *v.i.* to belong or pertain.

appetite (ap′ ē tīt), *n.* the desire for gratification of some want, craving or passion.

appetizer (ap′ ē tī zēr), *n.* something that excites or whets the appetite.

applaud (a plôd′), *v.t.* to praise, express approval loudly, as by hand clapping.

applause (a plôz′), *n.* the expression of approval by hand clapping or cheers.

apple (ap′ l), *n.* the round, fleshy fruit of the apple tree.

appliance (a plī′ ans), *n.* the act of applying; any small mechanical apparatus designed to perform a particular task.

applicable (ap′ li k*a* bl), *adj.* capable of being applied; suitable, to the point.

applicant (ap′ li kant), *n.* one who applies.

application (ap li kā′ shun), *n.* the act of applying, putting to or on; something applied, as a poultice.

applied (a plīd′), *adj.* put to concrete use, as *applied* science; opposite of *theoretical.*

***appliqué** (ap′ li kā′), *n.* a method of ornamentation in which cut-out figures of one material are applied on another.

apply (a plī′), *v.i.* to ask for; to have a bearing upon.

apply (a plī), *v.t.* [*p.t. and p.p.* applied, *pr.p.* applying] to place one to another, lay on; to put into practice, as rules.

appoint (a point′), *v.t.* to fix, select; to name for an office.

appointment (a point′ ment), *n.* the act of appointing; the assigning to an office or trust; the office to which one is appointed; an engagement, as to meet someone at a certain place and time: *appointments,* equipment, as for a restaurant or dentist's office.

apportion (a pōr′ shun), *v.t.* to distribute in shares or parts, portion out, allot.

***apposite** (ap′ ō zit), *adj.* proper; appropriate.

apposition (ap ō zish′ un), *n.* the act of placing or state of being placed side by side; relation of one noun or pronoun to another which it explains or characterizes, as God, the Father.

appraisal (a prāz′ al), *n.* the act of appraising; an estimate of value or the value estimated.

appraise (a prāz′), *v.t.* to set a price upon; to estimate the value of.

appreciable (a prē shi *a* bl), *adj.* large enough or sufficient to be perceived, recognizable.

appreciate (a prē′ shi āt), *v.i. and v.t.;* to grow in value; to value, enjoy with gratitude; have a sensitive understanding of.

appreciation (a prē shi ā′ shun), *n.* the just valuation of worth or merit; advance in value.

apprehend (ap rē hend′), *v.t.* to understand; to anticipate fearfully; to seize or arrest.

apprehension (ap rē hen′ shun), *n.* the act of seizure or laying hold, arrest; anticipation of something feared, dread; mental conception, understanding.

Syn. Foreboding, misgiving. *Apprehension* is the dread of future evil. *Misgiving* is such great *apprehension* as to affect courage and action; *foreboding* is not only dread but conviction of coming evil.

apprentice (a-pren′ tis), *n.* one bound by agreement to learn some trade or craft.

approach (a prōch′), *n.* act of drawing near, advance; an approximation.

approach (a prōch′), *v.i.* to draw near; to approximate.

approbation (ap rō bā′ shun), *n.* approval, commendation.

appropriate (a prō′ pri āt), *v.t.* to take for one's own use; to designate and set aside for some special use.

appropriation (a prō pri ā′ shun), *n.* the act of appropriating, especially to oneself; a sum of money set aside for a specified purpose.

approval (a pro͞ov′ al), *n.* approbation, sanction.

approve (a pro͞ov′), *v.t.* to favor, accept, think favorably of.

***approximate** (a proks′ i māt), *v.t.* to come near to, approach, especially in number.

approximate (a proks′ i mit), *adj.* nearly but not exactly the same, as *approximate* figures.

approximately (a proks′ i mit li), *adv.* very nearly but not absolutely.

approximation (a proks i mā′ shun), *n.* a near approach; something almost but not exactly correct.

appurtenance (a pur′ tē nans), *n.* that which belongs or relates to something else.

***apricot** (ā′ pri kot), *n.* the orange-colored fruit of a tree allied to the peach and the plum.

April (ā′ pril), *n.* the fourth month of the year.

apron (ā′ prun), *n.* a garment of cloth, leather or other material, worn in front to protect the clothing; a paved space in front of an airplane hangar.

apse (aps), *n.* [*pl.* apses (-ez)] a polygonal or semicircular recess, usually arched or domed, at the end of a church behind the choir space.

apt (apt), *adj.* suitable, pertinent, appropriate; inclined, as *apt* to stutter; quick, skilful, as an *apt* speller or workman.

aptitude (ap′ ti tūd), *n.* ability to learn, special fitness.

***aqua** (ak′ wa), *n.* a term used in pharmacy in the abbreviated form aq., and denoting water.

***aqua fortis** (ak w*a* fôr′ tis), a weak, commercial grade of nitric acid.

***aquamarine** (ak w*a* m*a* rēn′), *n.* a bluish-green variety of beryl.

***aquaregia** (ak w*a* rē′ ji *a*), a mixture of nitric and hydrochloric acids capable of dissolving gold.

***aquarium** (a kwâr′ i um), *n.* [*pl.* aquariums (-umz) and aquaria (-*a*)] a tank or globe for the keeping and cultivation of aquatic plants and creatures.

aquatic (a kwat′ ik), *adj.* pertaining to water; living in water.

aquatint (ak′ w*a* tint), *n.* a species of etching with aqua fortis resembling a watercolor or India-ink drawing.

***aqua vitae** (vī′ tē), unrectified alcohol; brandy and other ardent spirits.

***aqueduct** (ak′ wē dukt), *n.* a conduit or artificial channel to bring water from a distance.

***aqueous** (a′ kwē us), *adj.* of the nature of water; abounding in water.

aquiline (ak′ wi līn), *adj.* belonging to or resembling an eagle; hooked like an eagle's beak, as an *aquiline* nose.

arabesque (ar *a* besk′), *n.* the style of Arabic decorative art which consists of the painting, inlaying or carving in low relief of figures of plants, fruits, flowers and foliage, variously combined or fantastically grouped.

***Arabic numerals** (ar′ *a* bik nū′ mēr alz), the figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

arable (ar′ a bl), *adj.* fit for cultivation, especially with the plow.

arbiter (är′ bi tēr), *n.* an umpire or judge.

arbitrament (är bit′ r*a* ment), *n.* a decision; the right or power to decide.

arbitrary (är′ bi trer i), *adj.* depending on will or whim; imperious; self-willed.

arbitrate (är′ bi trāt), *v.i. and v.t.* to act as arbiter; to settle, as a dispute.

arbitration (är bi trā′ shun), *n.* the settlement of a dispute by a neutral agency; the policy of referring disputed matters to arbitrators.

arbitrator (är′ bi trā tēr), *n.* a person or court empowered by disputants to give judgment on their claims or contentions.

arbor (är′ bēr), *n.* a bower; a shaded nook.

Arbor Day (är′ bēr dā), a day legally set apart in certain states for planting trees.

***arboretum** (är bō rē′ tum), *n.* [*pl.* arboreta (-t*a*) and arboretums (-tumz)] a place in which trees are cultivated and exhibited.

arboriculture (är′ bō ri kul tūr), *n.* the cultivation of trees and shrubs.

***arbor vitae** (är′ bẽr vī′ tē), an evergreen tree extensively cultivated in gardens.

arc (ärk), *n.* a segment of a circle.

arcade (är kād′), *n.* an arched gallery or promenade, usually lined with shops.

arcanum (är kā′ num), *n.* [*pl.* arcana (′*na*)] a secret, a mystery.

arch (ärch), *n.* a curved structure of brick or masonry made of wedge-shaped parts having their joints at right angles to the curved line; any doorway or passage topped by such a construction.

arch (ärch), *adj.* coy and playful; chief, as in *arch*deacon.

archaic (är kā′ ik) or **archaical** (-i kal), *adj.* antiquated; long out of use.

archangel (ärk ān′ jel), *n.* an angel of the highest order.

***archbishop** (ärch bish′ up), *n.* a chief bishop.

archdeacon (ärch dē′ kn), *n.* a dignitary ranking next below a bishop.

archduchess (ärch duch′ es), *n.* the wife of an archduke.

archduchy (ärch duch′ i), *n.* [*pl.* archduchies (′-iz)] the territory or rank of an archduke.

archduke (ärch dūk′), *n.* a prince of the former imperial house of Austria.

archeology or **archaeology** (ăr kē ol′ ō ji), *n.* scientific study of the relics of ancient civilizations.

archer (är′ chẽr), *n.* a bowman.

archery (är′ chẽr i), *n.* the art of using the bow and arrow.

***archetype** (är′ kē tīp), *n.* the original type, pattern or model of anything.

arching (är′ ching), *adj.* curving like an arch.

***archipelago** (är ki pel′ *a* gō), *n.* [*pl.* archipelagoes (-gōz)] any sea or body of salt water interspersed with numerous islands; also the group of islands.

***architect** (är′ ki tekt), *n.* one who makes plans for buildings and bridges and supervises their erection.

***architectural** (ar ki tek′ chūr al), *adj.* pertaining to the art of building, especially the planning of buildings.

architecture (ar′ ki tek chūr), *n.* the science or art of building; a certain method or style of building, as Roman *architecture;* building in general, as fine *architecture.*

***architrave** (är′ ki trāv), *n.* the block or beam at the top of a column on which any superstructure rests directly.

archives (är′ kīvz), *n. pl.* public records; the place where public records and documents are stored.

archly (ärch′ li), *adv.* roguishly, waggishly, coyly.

archness (ärch nes), *n.* shyness, coyness.

arc lamp (ärk lamp), a lamp having a luminous bridge or arc.

arc light (līt), *n.* a light produced by a current of electricity passing between two carbon points.

***arctic** (ärk′ tik), *adj.* relating to the north polar regions; frigid, polar.

arctic circle (sûr′ kl), an imaginary circle parallel to the equator and distant 23° 30′ from the north pole.

ardent (är′ dent), *adj.* hot, eager.

ardor (är′ dẽr), *n.* heat, warmth of affection or passion; eagerness, zeal, enthusiasm.

arduous (är′ dū us), *adj.* steep, hard to climb, difficult.

***area** (ā′ rē *a*), *n.* [*pl.* areas (-as)] any plane surface having bounds; the extent of such a surface in units of square measure.

arena (a rē′ n*a*), *n.* [*pl.* arenas (-naz)] the central inclosed space of a Roman amphitheater; area of combat or competition, as in war or sport.

Argand lamp (är′ gand lamp), a lamp having a hollow circular wick to permit the passage of air inside and outside the flame.

argent (är′ jent), *adj.* silvery; white and shining.

argentiferous (är jen tif′ ẽr us), *adj.* bearing silver.

argil (är′ jil), *n.* potter's clay or earth.

argol (är′ gol), *n.* crude tartar from which cream of tartar is prepared.

argon (är′ gon), *n.* a gaseous element associated with nitrogen and forming one of the constituents of the air.

argosy (är′ gō si), *n.* [*pl.* argosies (-siz)] a large, richly freighted merchant vessel; a fleet of ships.

argue (är′ gū), *v.t. and v.i.* to discuss a proposition, as in a debate; to reason for or against; to reason, dispute.

argument (är′ gū ment), *n.* that which is advanced in support or proof, reasoning; discussion.

argumentation (är gū men tā′ shun), *n.* the act of arguing; disputation.

argumentative (är gū men′ ta tiv), *adj.* exhibiting or fond of controversy.

argyrol (är′ ji rōl), *n.* a silver salt used in a water solution as an antiseptic, especially for the eyes and throat.

***aria** (ä′ ri *a*), *n.* an air; a melody or tune for single voice with accompaniment.

arid (ar′ id), *adj.* dry, parched, barren.

aridity (a rid′ i ti), *n.* dryness, barrenness.

aright (a rīt′), *adv.* rightly; in a right way or form.

arise (a rīz′), *v.i.* [*p.t.* arose, *p.p.* arisen, *pr.p.* arising] to mount up or ascend; to come into existence or to notice; to originate.

aristocracy (ar is tok′ r*a* si), *n.* [*pl.* aristocracies (-siz)] the nobility or best persons in a state; any government by a minority supposedly best qualified to rule; any state so governed; those superior in rank, wealth or intellect; a privileged class.

***aristocrat** (a ris′ tō krat), *n.* a personage of rank and noble birth; a person who possesses traits supposed to characterize the nobility.

arithmetic (a rith′ mē tik), *n.* the science of numbers.

arithmetical (ar ith met′ i kal), *adj.* of or pertaining to arithmetic.

ark (ärk), *n.* the repository of the Covenant, or Tables of the Law, in the Jewish tabernacle; the vessel in which Noah and his family were preserved during the deluge; a place of safety.

arm (ärm), *v.i. and v.t.* to arm oneself, prepare for battle; to supply with arms for military service; to fortify mentally.

arm (ärm), *n.* the limb of the human body that extends from the shoulder to the hand; the forelimb of a quadruped; an inlet of the sea; the armrest of a chair.

arm (ärm), *n.* a weapon; a branch of an active army.

***armada** (är mā′ d*a*), *n.* a fleet of armed vessels.

armament (är′ m*a* ment), *n.* a nation's total equipment for war; the act of supplying the means of war.

armature (är′ m*a* tūr), *n.* a piece of soft iron connecting the poles of a magnet; the conductors in a motor that move when an electric current passes through them.

armchair (ärm′ châr), *n.* a chair with side pieces on which one may rest his arms.

***armistice** (är′ mis tis), *n.* a temporary cessation of hostilities; a truce.

armlet (ärm′ let), *n.* a bracelet, an elastic or ornamental band for the upper arm.

armor (är′ mẽr), *n.* any defensive covering; protective plates of steel or other metal for the body of a warrior or the hull of a ship.

armor-clad (-klad), *adj.* ironclad, as a war vessel protected by steel plating.

armored concrete (är′ mẽrd kon krēt′), concrete reinforced with metal rods about which it hardens; reinforced concrete.

armorer (är′ mẽr ẽr), *n.* a maker of arms or armor; one in charge of arms.

armorial (är mō′ ri al), *adj.* pertaining to armor or to the arms or escutcheon of a family.

armory (är′ mẽr i), *n.* [*pl.* -ries (-riz)] a place where arms are kept, often containing a big space for the assembly of soldiers.

armpit (ärm′ pit), *n.* the hollow beneath the joining of the arm and shoulder.

arms (ärmz), *n. pl.* weapons of offense or defense; the military service; a design symbolic of a family or nation.

army (är′ mi), *n.* [*pl.* armies (′-miz)] a body of men trained and equipped for war on land, composed of a headquarters, two or more corps and auxiliary troops.

army worm (är′ mi wûrm), a caterpillar that travels over the land destroying grass and grain.

arnica (är′ ni k*a*), *n.* a genus of perennial herbs; a remedy for bruises made from the roots.

***aroma** (*a* rō′ m*a*), *n.* [*pl.* aromas] perfume, fragrance, pleasing odor, scent.

aromatic (ar ō mat′ ik), *adj.* having, giving out or containing an agreeable odor; pungent, spicy, fragrant.

around (a round′), *adv.* in a circle; on every side; roundabout.

around (a round′), *prep.* encircling, as run *around* the house; enveloping, as pull the blanket *around* you; about, almost, as *around* the end of the year, it cost *around* $5.

arouse (a rouz′), *v.i. and v.t.* to stir to action; to awaken.

***arraign** (a rān′), *v.t.* to summon, as a prisoner at the bar of a court to answer to a charge; to call to account.

arraignment (a rān′ ment), *n.* a summons to a prisoner to defend himself in court; an accusation.

arrange (a rānj′), *v.t. and v.i.* to put in proper order or sequence; to classify; to arrive at an agreement or settlement.

arrangement (a rānj′ ment), *n.* the act of putting in proper form or order; preparation and provision for future happenings; plan, order, disposition.

arrant (ar′ ant), *adj.* confirmed; unmitigated.

arras (ar′ as), *n.* tapestry.

array (a rā′), *n.* a grouping of men or things in orderly arrangement; rich attire.

array (a rā′), *v.t.* [*p.t. and p.p.* -ed, *pr. p.* -ing] to place or dispose in order, marshal; to deck or dress.

arrear (a rēr′), *n.* that which is overdue, delinquent in payment; *in arrears:* in debt.

arrest (a rest′), *n.* the act of stopping motion or action; seizure by officers of the law.

arrest (a rest′), *v.t.* to stop or stay; to check or hinder, as action or motion; to seize; to take by legal authority.

arresting (a res′ ting), *adj.* commanding attention; remarkable.

arrival (a rī′ val), *n.* the act of coming to a place; attaining an objective; a person or thing that has arrived, as new *arrivals* at a hotel.

arrive (a rīv′), *v.i.* to come to or reach.

arrogance (ar′ ō gans), *n.* an undue degree of self-importance.

arrogant (ar′ ō gant), *adj.* making exorbitant claims to dignity or estimation; haughty.

arrogate (ar′ ō gāt), *v.t.* to assume or lay claim to unduly; to usurp.

arrow (ar′ o), *n.* a slender, missile weapon shot from a bow, usually feathered and barbed; a mark used to indicate direction.

arrowhead (-hed), *n.* the head or barb of an arrow.

arsenal (ār′ sē nal), *n.* a building for the making, repairing and storing of military weapons.

***arsenic** (är′ sē nik), *n.* a metallic element of steel-gray color and brilliant luster and exceedingly brittle; a poisonous salt of this metal, especially arsenic trioxide.

arson (är′ sn), *n.* the malicious burning of another person's property; intentional burning of one's own property.

art (ärt), *n.* skill in doing obtained from experience or study; the skilful adaptation and application to some human purpose or use of knowledge acquired from nature; creation of beauty in literature, painting, music, dancing.

arterial (är tēr′ i al), *adj.* pertaining to an artery or the arteries: contained in an artery.

arterial highway (är tēr′ i al hī′ wā), a main or trunkline for vehicular traffic.

artery (är′ tẽr i), *n.* [*pl.* arteries (-iz)] one of a system of tubes or vessels which convey the blood from the heart to all parts of the body.

artesian well (är tē′ zhan wel), a well formed by boring to reach stores of water between strata of rock, the water being forced up by pressure from below.

artful (ärt′ ful), *adj.* cunning, crafty.

artichoke (är′ti chōk), *n.* a plant with thistle-like foliage and bearing large terminal flower heads, eaten as a vegetable.

article (är′ ti kl), *n.* a distinct portion or member; a single clause, item or particular, as in a formal agreement or treaty; a prose composition complete in itself, as in a newspaper or magazine; a part of speech, a word limiting a noun and showing that it is a definite (*the* is the definite article) or indefinite (*a* and *an* are indefinite articles) person or thing.

articulate (är tik′ ū lāt), *v.t. and v.i.* to joint; to form, as words; to utter in distinct syllables; to fit together by means of a joint; to speak.

articulate (är tik′ ū lāt), *adj.* jointed; possessing the power of speech; clear and distinct.

articulation (är tik ū lā′ shun), *n.* the act of jointing; the act of speaking distinctly.

*__artifice__ (är′ ti fis), *n.* an artful or crafty device; an ingenious expedient.

artificial (är ti fish′ al), *adj.* made or contrived by art; produced by human skill or labor not by nature; synthetic; unnatural, affected.

artificiality (-fish i al′ i ti), *n.* the quality of being unreal or unnatural; affected manners.

artificially (-fish′ i al li), *adv.* by human skill or contrivance.

artillery (är til′ er i), *n.* cannon; mounted guns; the army service that uses them.

artisan (är′ ti zan), *n.* one skilled in any art or trade.

artist (är′ tist), *n.* one skilled in any fine art.

artistic (är tis′ tik) or **artistical** (-ti kal), *adj.* pertaining to art or to artists; characterized by taste or skill in one of the arts; having esthetic feeling or appreciation.

artless (ärt′ les), *adj.* lacking art; natural; unskilful.

as (az), *adv.* to the same extent or degree, as Tom sings *as* well as Bob; for instance.

as (az), *conj.* in the same manner, as speak *as* I do; while, as run *as* you read; since, as let's not go, *as* it is raining.

*__asafetida__ (as *a* fet′ i d*a*), *n.* the ill-smelling gum of several Oriental plants, used in medicine.

*__asbestos__ (as bes′ tos), *n.* a fibrous variety of hornblende, incombustible and a nonconductor of heat, used for fireproofing and insulation.

ascend (a send′), *v.i. and v.t.* to take an upward direction; to mount, go up, rise; to climb, as to *ascend* a hill.

ascendant (a sen′ dant), *n.* dominant position; ruling influence.

ascendant (a sen′ dant) or **ascendent** (-dent), *adj.* rising, superior, predominant; above the horizon.

ascendancy (a sen′ dan si) or **ascendency** (′den si), *n.* a governing or controlling power or influence; domination.

ascension (a sen′ shun), *n.* the act of moving upward, a rising.

Ascension Day (dā), a feast to commemorate Christ's ascension into heaven, the Thursday 40 days after Easter.

ascent (a sent′), *n.* the act of rising, an upward movement or slope.

ascertain (as ẽr tān′), *v.t.* to find out for certain.

*__ascetic__ (a set′ ik), *n.* one who renounces the pursuit of pleasure; a hermit, recluse.

*__ascetic__ (a set′ ik), *adj.* rigid in the exercise of religious duties and mortification of worldly desires; austere.

ascribe (as krīb′), *v.t.* to attribute, impute or assign, as to *ascribe* success to hard work.

ascription (as krip′ shun), *n.* the act of attributing or imputing.

aseptic (a sep′ tik), *adv.* free from germs of disease or putrefaction.

ash (ash), *n.* a tree of the olive family; its tough and elastic wood, suitable for many uses.

ash (ash), *n.* [*pl.* ashes (-ez)] the remains of matter after burning; the color of ashes.

ashamed (a shāmd′), *adj.* affected or touched by shame; fearful of reproach.

ashen (ash′ n), *adj.* pertaining to the ash tree; made of ash; of the color of ashes, pale.

aside (a sīd′), *n.* a remark not meant to be heard by all present.

aside (a sīd), *adv.* at, to or on one side; apart.

asinine (as′ i nīn), *adj.* silly, like an ass, stupid; obstinate.

ask (ȧsk), *v.t. and v.i.* to request; to question; to inquire; to invite.

Syn. Inquire, interrogate, request, beg. We perform all these actions in order to get information. To *ask* is the general term for to question; to *inquire* is purely to seek information. People *ask* of one another whatever they wish to know; learners *inquire* the reasons for things which are new to them; a magistrate *interrogates* criminals formally and systematically. To *request* is to ask formally and politely; to *beg* is to ask very respectfully. It is a convention of politeness, as I *beg* your pardon, I *beg* you will come.

askance (a skans′), *adv.* sideways, obliquely, awry; with suspicion or disdain.

askew (a skū′), *adv.* crookedly; awry.

askew (a skū′), *adj.* set to one side, as my hat is blown *askew*.

aslant (a slȧnt′), *adv. and adj.* obliquely at an angle.

asleep (a slēp′), *adj.* sleeping; numb.

asp (asp), *n.* a small venomous snake of Egypt.

asparagus (as par′ a gus), *n.* a plant having tender edible stalks.

aspect (as′ pekt), *n.* appearance to the eye or mind; look, mien, air; outlook or prospect.

aspen (as′ pen), *n.* a species of poplar tree whose leaves tremble when the air stirs.

asperity (as per′ i ti), *n.* [*pl.* asperities (-tiz)] roughness, harshness; bitterness of temper.

aspersion (as pẽr′ shun), *n.* slander.

asphalt (as′ fôlt), *n.* a compact, brittle variety of native bitumen, used in paving, roofing or cementing.

asphodel (as′ fō del), *n.* a European plant of the lily family.

*__asphyxia__ (as fik′ si *a*), *n.* suffocation, due to lack of oxygen.

asphyxiate (as fik′ si āt), *v.t.* to suffocate.

*__aspirant__ (as pīr′ ant), *n.* one who seeks to attain something, as an office.

aspirate (as′ pi rāt), *v.t.* to pronounce with a full breathing; to pronounce the sound of the letter *h*.

aspiration (as pi rā′ shun), *n.* ambition; an aspirated sound, a breath.

aspire (as pīr′), *v.i.* to seek ambitiously; to desire with great longing.

aspirin (as′ pi rin), *n.* a drug derived from salicylic acid used to relieve pain.

ass (ȧs), *n.* a quadruped resembling the horse but smaller and having longer ears, a shorter mane and a tufted tail.

assail (as sāl′), *v.t.* to fall upon or attack with vehemence.

assassin (a sas′ in), *n.* one who kills treacherously or by covert assault.

assassinate (a sas′ i nāt), *v.t.* to kill by secret or treacherous means.

assault (a sôlt′), *n.* an attack with violence by physical means; an onslaught.

assay (a sā′), *n.* the act or process of determining by analysis the quantity or proportion of any one or more metals in a metallic compound.

assay (a sā′), *v.t. and v.i.* to analyze a compound of metals; to estimate a value by analyzing.

assemblage (a sem′ blij), *n.* the act of meeting or gathering together; a large group.

assemble (a sem′ bl), *v.i. and v.t.* to collect or gather together in one place or body.

assembly (a sem′ bli), *n.* [*pl.* assemblies (-bliz)] a collection or company of persons brought together in one place.

assemblyman (-man), *n.* a member of a legislative body, usually the Lower House.

assent (a sent′), *n.* agreement, concurrence.

assent (a sent′), *v.i.* to admit as true; to concede.

Syn. Consent. *Assent* respects the understanding. We *assent* to what we admit to be true. *Consent* respects the will; we *consent* to what we allow to be done.

Ant. Disagree, dissent.

assert (a sûrt′), *v.t.* to maintain, declare positively or with assurance.

Syn. Maintain, vindicate. We *assert* anything to be true; we *maintain* it by adducing proofs, facts or arguments; we *vindicate* our own conduct or that of another when it is called in question.

Ant. Deny.

assertion (a sûr′ shun), *n.* the act of asserting; that which is asserted, statement.

assertive (a sûr′ tiv), *adj.* positive; dogmatical.

assess (a ses′), *v.t.* to fix or determine, as damages; to appraise for taxation, as property.

assessor (a ses′ ẽr), *n.* one appointed to assess property or persons for taxation.

*__assets__ (as′ ets), *n. pl.* the property or effects of an insolvent debtor; the entire property of an individual, partnership or corporation.

asseverate (a sev′ ẽr āt), *v.t.* to affirm or aver positively or with great earnestness.

assiduity (as i dū′ i ti), *n.* [*pl.* assiduities (-tiz)] close application or unremitting attention to a task; perseverence.

assiduous (a sid′ ū us), *adj.* constant in application, diligent, persistent.

assign (a sīn′), *v.t.* to appoint, mark out, apportion, make over; to fix; to designate for a specific purpose.

*__assignee__ (as i nē′), *n.* one to whom an assignment of anything is made.

assignment (a sīn′ ment), *n.* a setting apart, allotment or appointment; a transfer of legal title or of an interest in a property or business.

assigner (a sīn′ ẽr) or **assignor** (-ôr), *n.* one who assigns or transfers an interest.

assimilate (a sim′ i lāt), *v.t.* to bring to conformity or agreement with something else; to digest.

assimilation (a sim i lā′ shun), *n.* the absorption of nutritive elements; transformation of food into body tissues.

assist (a sist′), *v.t. and v.i.* to help, aid, give support to.

assistance (a sis′ tans), *n.* help, aid.

assistant (a sis′ tant), *n.* one who helps; an aid of any kind.

assistant (a sis′ tant), *adj.* helping, lending aid.

*__assize__ (a sīz′), *n.* [*pl.* assizes (-sī′ zez)] a court session for the trial by jury of civil or criminal cases.

associate (a sō′ shi āt), *n.* a companion; confederate; ally; colleague.

associate (a sō′ shi āt), *v.i. and v.t.* to join; to co-operate; to be intimate; to join or combine, as things or thoughts, as we *associate* the idea of water with swimming.

associate (a sō′ shi āt), *adj.* joined with, as in business.

*__association__ (a sō si ā′ shun), *n.* the act of associating or state of being associated; union.

*__assonance__ (as′ ō nans), *n.* resemblance of sound.

assort (a sôrt′), *v.t.* to divide or separate into lots according to arrangement.

assorted (a sôr′ ted), *adj.* consisting of different varieties.

assortment (a sôrt′ ment), *n.* the act of assorting; a collection of different varieties.

*__assuage__ (a swāj′), *v.t.* to soften, mitigate.

assume (a sūm′), *v.t.* to take to oneself; to take in or into; to take upon oneself; to take for granted.

assumption (a sump′ shun), *n.* the act of assuming; that which is assumed.

assurance (a shoor′ ans), *n.* a pledge, promise; confidence, self-reliance; insurance.

assure (a shoor′), *v.t.* to make sure or certain; to inspire confidence by declaration or promise.

assuredly (a shoor′ ed li), *adv.* certainly, with assurance, surely.

aster (as′ tẽr), *n.* a genus of flowering plants with rosette-shaped flowers; any plant of the genus aster.

asterisk (as′ tẽr isk), *n.* the mark (*) used in printing as a reference to a footnote or to indicate omission of letters or words (***).

astern (a stẽrn′), *adv.* at or toward the hinder part of a ship.

asteroid (as′ tẽr oid), *adj.* starlike; star-shaped.

asthma (az′ m*a*), *n.* a respiratory disease, chronically recurrent and attended by difficulty of breathing.

astigmatism (a stig′ m*a* tizm), *n.* a defect in the structure of the eye, causing a blur in parts of the field of vision.

astir (a stûr), *adj.* on the move, active.

astonish (as ton′ ish), *v.t.* to strike with sudden wonder, amaze.

astonishment (as ton′ ish ment), *n.* surprise, amazement.

astound (as tound′), *v.t.* to stun or bewilder with amazement.

***astrakhan** (as′ tr*a* kan), *n.* the skins of young karakul lambs with curly fur; a cloth made to resemble it.

astral (as′ tral), *adj.* pertaining to the stars; starry.

astray (a strā′), *adv.* out of the right way.

astride (a strīd′), *adv.* with the legs straddling, as to ride *astride.*

astringent (as trin′ jent), *adj.* binding, contracting.

astrologer (as trol′ ō jẽr), *n.* one who professes to forecast events by means of the stars.

astrology (as trol′ ō ji), *n.* the pseudo science of prediction by means of the stars.

astronomer (as tron′ ō mẽr), *n.* one who studies or is versed in astronomy.

astronomic (as trō nom′ ik) or **astronomical** (-i kal), *adj.* pertaining to astronomy or according to astronomical laws.

astronomy (as tron′ ō mi), *n.* the study of the heavenly bodies.

astrophotography (as trō fō tog′ r*a* fi), *n.* photography of the heavenly bodies.

astrophysical (as trō fiz′ i kal), *adj.* pertaining to the physical structure of heavenly bodies.

***astute** (as tūt′), *adj.* shrewd, keenly penetrating, sagacious, cunning, crafty.

asunder (a sun′ dẽr), *adv.* apart; into parts.

asylum (a sī′ lum), *n.* [*pl.* asylums (-lumz)] an institution for the care or relief of the aged, destitute, insane or otherwise afflicted; a refuge, protection.

***asymmetrical** (a si met′ ri kal), *adj.* without symmetry.

at (at), *prep.* in, on or near in place or time, as *at* school, *at* one o'clock; to or toward, as look *at* that, aim *at* a mark; by, as come in *at* the door; in a state of, as *at* war, *at* a disadvantage; for, as to sell *at* $1.; assuming, as *at* best.

***atavism** (at′ *a* vizm), *n.* the reversion or tendency to revert to a primitive type; the appearance in an individual of the traits of a remote ancestor.

***ataxia** (a taks′ i *a*), *n.* lack of muscular coordination.

atheism (ā′ thē izm), *n.* disbelief in the existence of God.

atheist (ā′ thē ist), *n.* one who disbelieves or denies the existence of God.

***athlete** (ath′ lēt), *n.* a competitor in sports; one trained to great physical skill and strength.

athletic (ath let′ ik), *adj.* pertaining to athletes or their performances.

athletics (ath let′ iks), *n. pl.* athletic games and sports in general.

athlete's foot (ath′ lētz foot), an infection of the skin of the foot; ringworm.

athwart (a thwôrt′), *prep.* across, from one side to the other.

atlas (at′ las), *n.* [*pl.* atlases (-ez)] a collection of maps in a volume.

atmosphere (at′ mos fēr), *n.* the air enveloping the earth; the kind of air prevailing in any place, as a foggy *atmosphere;* the tone of a work of art; any permeating influence, as the *atmosphere* of school life.

atmospheric pressure (at mos fer′ ik presh′ ẽr), the pressure exerted in every direction upon a body by the atmosphere; equivalent to 14.7 lbs. on the sq. in. at sea level.

atoll (at′ ol), *n.* an outer ring of coral surrounding a basin or lagoon.

atom (at′ um), *n.* a particle of matter, until recently considered the smallest part into which an element could be divided.

atomic (a tom′ ik) or **atomical** (-i kal), *adj.* pertaining to or consisting of atoms.

atomic number (num′ bẽr), the number of positive electric charges carried by an atom.

atomizer (at′ um īz ẽr), *n.* an instrument for spraying a liquid, as a gargle or perfume.

atone (a tōn), *v.i.* [*p.t. and p.p.* atoned, *pr.p.* atoning] to make reparation or amends.

atonement (a tōn′ ment), *n.* reparation or expiation; the recompense for sin typified by the sufferings and death of Christ.

atrocious (a trō′ shus), *adj.* wicked in the highest degree, outrageous.

atrocity (a tros′ i ti), *n.* [*pl.* atrocities (-tiz)] an act of barbarism or cruelty, as the bombing of a hospital in war.

***atrophy** (at′ rō fi), *n.* a wasting or withering, as of a part of the body.

***atrophy** (at′ rō fi), *v.i.* [*p.t. and p.p.* atrophied, *pr.p.* atrophying] to waste away, to dwindle.

attach (a tach′), *v.t.* to fasten or affix.

attachment (a tach′ ment), *n.* the act of attaching; something attached, a connection; affection, devotion.

attack (a tak′), *n.* an assault; a hostile act; injurious criticism; seizure, as of disease.

attack (a tak′), *v.t.* to assault; to censure; to start upon, as a task.

attain (a tān′), *v.t.* to achieve, gain, compass.

attainder (a tān′ der), *n.* the depriving a criminal of civil rights; disgrace, dishonor.

attainment (a tān′ ment), *n.* the act of attaining; accomplishment.

attaint (a tānt′), *v.t.* to taint, corrupt; to judge a person guilty of a crime that forfeits civil rights; to disgrace.

attempt (a tempt′), *n.* a trial, effort.

attempt (a tempt′), *v.t.* to make an effort to accomplish, try, endeavor to perform.

attend (a tend′), *v.t. and v.i.* [*p.t. and p.p.* attended, *pr.p.* attending] to wait upon; to accompany or be present with or at; to take care of, as *attend* a furnace; to pay attention, listen, mind, as *attend* to your own business.

attendance (a ten′ dans), *n.* the act of attending; waiting on; presence; the persons present, as at a meeting.

attendant (a ten′ dant), *n.* one who accompanies or serves another; that which follows upon or accompanies.

attention (a ten′ shun), *n.* the act of applying the mind to anything; consideration or regard for any person or thing.

attenuate (a ten′ ū āt), *v.t.* to make thin or slender; to weaken or reduce; to thin out by dilution; to rarefy.

attest (a test′), *v.t.* to bear witness to; to certify as being genuine or true.

attic (at′ ik), *n.* the top floor of a house directly under the roof and generally unfinished; a garret.

***attire** (a tīr′), *n.* clothing; apparel.

attire (a tīr), *v.t.* to dress, clothe, array.

attitude (at′ i tūd), *n.* bodily position; disposition toward.

***attorney** (a tûr′ ni), *n.* a lawyer; one empowered to act for another in matters of business.

attract (a tract′), *v.t.* to draw to or toward; to arouse attention and interest.

attraction (a trak′ shun), *n.* the act or power of attracting; charm; anything that draws onlookers or an audience.

attribute (at′ ri būt), *n.* a characteristic; essential quality.

attribute (a trib′ ūt), *v.t.* to ascribe, as to a cause; to give credit for.

attributive (a trib′ ū tiv), *n.* a word that denotes a quality or characteristic of something; an adjective or adjectival phrase standing before its noun.

attrition (a trish′ un), *n.* a wearing away by rubbing or friction.

attune (a tūn′), *v.t.* to tune; bring into harmony; to adjust.

auburn (ô′ bẽrn), *adj.* reddish brown.

auction (ôk′ shun), *n.* a public sale at which the highest bidder becomes the buyer.

auction (ôk′ shun), *v.t.* to sell by taking bids.

auction bridge (ôk′ shun brij), a kind of bridge introduced in 1907. It differs from ordinary bridge in that the declaration of trump lies with each player in turn, the dealer bidding first. The player who makes the trump suffers a severe penalty if he does not make good on his bid.

auctioneer (ôk shun ẽr), *n.* a person authorized to sell by taking bids.

audacious (ô dā′ shus), *adj.* bold, daring; impudent.

audacity (ô das′ i ti), *n.* boldness, daring; impudence.

audible (ô′ di bl), *adj.* capable of being heard.

audience (ô′ di ens), *n.* an assemblage of persons listening or looking on; an interview; hearing.

audit (ô′ dit), *n.* official examination of claims or accounts.

audit (ô′ dit), *v.t.* to check accounts or claims.

audition (ô dish′ un), *n.* a test hearing of a speaker or musician for professional engagement.

auditor (ô′ di tẽr), *n.* a person whose business it is to check and adjust claims and accounts.

auditorium (ô di tō′ ri um), *n.* a building or hall in which an audience gathers.

auditory (ô′ di tō′ ri), *adj.* having to do with the sense of hearing or the organs of hearing.

auger (ô′ gẽr), *n.* a tool for boring holes.

aught (ôt), *n.* anything; a cipher.

***augment** (ôg ment′), *v.i. and v.t.* to enlarge; to increase.

augur (ô′ gẽr), *v.i. and v.t.* to predict from signs or omens.

augur (ô′ ger), *n.* an ancient Roman diviner or prophet; a soothsayer.

augury (ô gū′ ri), *n.* prediction by interpretation of signs; divination.

august (ô gust′), *adj.* impressive; having great dignity; majestic.

August (ô′ gust), *n.* the eighth month of the year.

auk (ôk), *n.* a diving bird of the Arctic regions.

***aunt** (änt), *n.* the sister of one's father or mother.

***aura** (ô′ r*a*), *n.* an invisible radiation from the body, supposed to surround it like an atmosphere and to influence others.

aural (ô′ ral), *adj.* having to do with the ear.

***aureole** (ô′ rē ōl), *n.* a halo or radiance represented in art as encircling the figures of Christ, the Virgin and the saints; a shining area surrounding the sun, visible at total eclipse or through fog.

***auricle** (ô′ ri kl), *n.* the outer part of the ear; one of the upper chambers of the heart that receives blood from the veins.

auriform (ô′ ri fôrm), *adj.* ear-shaped.

aurochs (ô′ roks), *n.* a shaggy-coated breed of bison of which the surviving specimens are carefully protected in Lithuania and the Caucasus.

auscultation (ôs-kūu tā′ shun), *n.* listening; detection of organic conditions by listening, as to the beat of the heart with a stethoscope.

***auspice** (ôs′ pis), *n.* omens or signs, especially those used by ancient Roman augurs; patronage, as under the *auspices* of.

auspicious (ôs pish′ us), *adj.* having promise of success; favorable, propitious.

austere (ôs tēr′), *adv.* harsh, severe; unadorned.

austerity (ôs ter′ i ti), *n.* severity of manner or of way of living.

authentic (ô then′ tik), *adj.* genuine, as an *authentic* signature; duly authorized, as information.

authenticate (ô then′ ti kāt), *v.t.* to show to be genuine; to give authority to.

authenticity (ô then tis′ i ti), *n.* genuineness.

author (ô′ thẽr), *n.* an originator, especially, the writer of a book.

authoritative (ô thôr′ i tā tiv), *n.* having authority; commanding.

authority (ô thôr′ i ti), *n.* the power or right to command; one whose judgment is accepted as decisive; anything cited as proof, as the dictionary is my *authority: the authorities,* those in power or command.

authorize (ô′ thẽr īz), *v.t.* to give authority to; to sanction; to approve.

***autobiography** (ô tō bī ŏg′ r*a* fi), *n.* the story of a person's life as told by himself.

***autocracy** (ô tôk′ r*a* si), *n.* absolute, unlimited power in government; a state having the government vested in one supreme individual.

autodyne (ô′ tō dīn), *n.* in radio, a receiving system with a vacuum tube serving both as oscillator and as detector.

autogiro (ô tō jī′ rō), *n.* an aircraft moved up or down by horizontal vanes over the fuselage.

autograph (ô′ tō grȧf), *n.* a person's own, handwritten signature.

autograph (ô′ tō grȧf), *v.t.* to write one's signature in, as a book, or on, as a picture.

autointoxication (ô tō in tok si kā′ shun), *n.* poisoning from matter produced within one's own body.

automat (ô′ tō mat), *n.* a self-operating device, as for service of food in a restaurant.

automatic (ô tō mat′ ik), *adj.* self-operating.

automaton (ô tom′ *a* ton), *n.* a self-operating mechanism that moves in imitation of a live body.

***automobile** (ô tō mō bēl′), *n.* a vehicle moved by power produced within it, and not limited to operation on rails; a motor car: also called *auto*.

autonomous (ô ton′ ō mus), *adj.* self-governing.

autonomy (ô ton′ ō mi), *n.* self-government.

***autopsy** (ô′ top si), *n.* a post-mortem examination to determine the cause of death.

autumn (ô′ tum), *n.* the season that comes between summer and winter; fall of the year, from about September 21 to about December 21 in the Northern Hemisphere.

***auxiliary** (ôg zil′ ya ri), *n.* a helper; anything that helps, as an *auxiliary* engine; a verb used in forming the different moods and tenses of other verbs. *Shall, will, can, must* are some of the *auxiliary* verbs in English.

auxiliary (ôg zil′ ya ri), *adj.* helping; subsidiary.

avail (a vāl′), *v.i. and v.t.* to be of use or service; to help, as subterfuge will not *avail* you.

available (a vāl′ *a* bl), *adj.* usable; at hand, ready for use.

***avalanche** (av′ a lȧnch), *n.* the slide of a mass of loose earth, rock or snow and ice down a mountainside; impact of a sudden crushing weight, as of grief or disaster.

avarice (av′ *a* ris), *n.* greed; inordinate desire for wealth.

avaricious (av *a* rish′ us), *adj.* greedy for wealth; mean; grasping.

***avast** (a väst′), *v.t. and v.i.* stop: used only in imperative, as *avast* hauling.

***avaunt** (a vônt′), *interj.* begone.

avenge (a venj′), *v.t.* to inflict punishment or exact satisfaction for wrong done.

Syn. Punish, retaliate, revenge. To *avenge* is to inflict punishment in order to vindicate the righteous; to *revenge* is to inflict suffering upon another through personal anger and resentment; to *avenge* is unselfish; to *revenge* is selfish; to *retaliate* may be necessary for self-defense.

***avenue** (av′ ē nū), *n.* a broad roadway; wide city street; an approach to something desired; means of attainment.

***aver** (a vûr′), *v.t.* to affirm positively.

average (av′ ẽr ij), *n.* an arithmetical mean, the result obtained by dividing a sum by the number of its separate constituent parts; an ordinary specimen or type; something between what would be too much and what would be too little, or between very good or large and very bad or small.

average (av′ ẽr ij), *v.t. and v.i.* to find the average of a number of things; to do or get an average number or amount, as profits *average* $5 per day.

average (av′ ẽr ij), *adj.* typical; medium.

averse (a vûrs′), *adj.* unwilling; not favorable to.

***aversion** (a vur′ zhun), *n.* dislike; an object of dislike.

avert (a vûrt′), *v.t.* to turn something aside.

***aviary** (ā′ vi er i), *n.* an enclosure for keeping live birds.

***aviation** (ā vi ā′ shun), *n.* the art of flying, especially in heavier-than-air machines.

***aviator** (ā vi ā′ tẽr), *n.* one who operates an airplane.

***avid** (av′ id), *adj.* greedy; very eager.

avigation (av i gā′ shun), *n.* air navigation.

***avocado** (av ō kä′ dō), *n.* the alligator pear; also, the tree that bears it.

avocation (av ō kā′ shun), *n.* a subordinate or occasional occupation; diversion.

avoid (a void′), *v.t.* to keep away from; to shun.

avoidance (a void′ ans), *n.* the act of shunning; the act of annulling or making void.

***avoirdupois** (av ẽr du poiz′), *n.* a system of weights based on a 16–ounce pound.

avouch (a vouch′), *v.t.* to affirm openly; to vouch for.

avow (a vou′), *v.t.* to declare openly; to acknowledge.

avowal (a vou′ al), *n.* an open declaration.

await (a wāt′), *v.t.* to wait for; to look for or expect.

awake (a wāk′), *v.i.* to arouse from sleep.

awake (a wāk′), *adj.* not sleeping.

awaken (a wāk′ en), *v.t. and v.i.* to arouse from sleep.

award (a wôrd′), *n.* a decision between contestants; a prize of honor given as the result of such a decision.

award (a wôrd′), *v.t.* to assign to one of two or more contestants, as a prize or an honor.

aware (a wâr′), *adj.* conscious; informed.

away (a wā′), *adv.* absent; at a distance; apart from.

awe (ô), *n.* reverential fear; the emotion inspired by contemplation of the sublime.

awful (ô′ fool), *adj.* arousing deep fear or fearful reverence; appalling.

awhile (*a* hwīl′), *adv.* for a short time.

awkward (ôk′ wẽrd), *adj.* clumsy; unskilful; puzzling; embarrassing.

awl (ôl), *n.* a tool to make holes, as in heavy cloth or leather.

awning (ôn′ ing), *n.* a covering, as of canvas, stretched over a frame to provide shade, as at a window or door.

awry (a rī′), *adj. and adv.* twisted; turned to one side.

ax (aks), *n.* a steel head on a long handle, with a wedgelike cutting edge, for chopping wood.

axial (ak′ si al), *adj.* having to do with an axis.

***axiom** (ak′ si om), *n.* a self-evident truth.

axis (ak′sis), *n.* the straight line, real or imaginary, passing through a body and upon which it revolves or is imagined to revolve.

axle (ak′ sl), *n.* the bar on which a wheel hub turns.

axle tree (ak′ sl trē), the bar on which a pair of carriage wheels or wagon wheels turn.

aye (ā), *adv.* always; ever.

aye (ī), *adv.* yes.

***azalea** (a zāl′ ya), *n.* a flowering plant of the rhododendron family.

***azure** (azh′ ẽr), *n.* the clear blue of the sky.

azure (azh′ ẽr), *adj.* blue, like the clear sky.

B

Babbitt metal (bab′ it met′ l), an alloy of tin with other metals used to decrease friction in bearings and journals.

babble (bab′ l), *n.* chatter; prattle; a confusion of gentle, meaningless sounds.

babble (bab′ l), *v.i.* to produce indistinct sounds; to prattle.

babe (bāb), *n.* an infant; baby.

baboon (ba bōōn′), *n.* an African and Asiatic ape with a face somewhat resembling that of a dog.

baby (bā′ bi), *n.* an infant; a very young child.

baby (bā′ bi), *v.t.* to treat like a baby.

baby bond (bond), a bond with face value of less than $100.

***baccalaureate** (bak *a* lô′ rē āt), *n.* the bachelor's degree given by colleges and universities to graduates in arts and sciences.

baccalaureate (bak *a* lô′ rē āt), *adj.* relating to the degree of bachelor: *baccalaureate sermon*, an address to a graduating class.

***baccarat** (bak *a* rä′), *n.* a French gambling game played with cards.

bachelor (bach′ e lẽr), *n.* a man who is not and has not been married; a college graduate with a bachelor's degree.

***bacillus** (ba sil′ us), *n.* a microscopic, rod-shaped organism, one of a class of bacteria found in hay, soil, water or milk and often producing disease.

back (bak), *n.* the hinder part of the body in man; in quadrupeds, the upper part of the body from neck to rump; the rear part of anything.

back (bak), *v.t.* to furnish with a back or backing; to finance; to support; to move something backward, as a car.

back (bak), *adj.* located at the rear, as a *back* door; overdue or out of date, as *back* pay, *back* numbers of a magazine.

back (bak), *adv.* toward the rear; in reverse direction, as to be held *back*, to look *back*; in return, as to expect a letter *back*; hidden, as to keep the news *back*.

backbite (bak′ bīt), *v.t.* to say mean things about a person who is not present.

backbone (bak′ bōn′), *n.* the spine; courage; firmness; spunk.

backfire (bak′ fīr), *n.* a blaze started in the path of a forest fire or grass fire to check its advance; a reverse explosion of gas in an automobile engine or of powder in a gun.

***backgammon** (bak′ gam un), *n.* a game for two players, in which dice are thrown to govern the moving of the pieces on an especially marked board.

background (bak′ ground), *n.* the setting against which a picture is made; the further part of a landscape; a person's past experience and training.

backhand (bak′ hand), *n.* writing that slopes to the left instead of the right.

backhanded (bak′ han′ ded), *adj.* made or done with the hand in a reversed position, as a *backhanded* stroke in tennis.

backing (bak′ ing), *n.* something placed behind to strengthen; financial support; aid given to any person or cause, encouragement.

backlog (bak′ lôg), *n.* a log at the back of a fireplace, before which a fire is built; an accumulation of unfilled business orders held in reserve against a slack period.

backslide (bak slīd′), *v.i.* to slide back; fail to keep a resolution, slip from virtue or religion.

backward (bak′ wẽrd), *adj.* turned toward the back; reluctant; undeveloped, retarded.

backward (bak′ wẽrd), *adv.* toward the rear or on the back, as to fall *backward*; in reverse direction.

backwash (bak′ wosh), *n.* water thrown back, as by the paddles of a moving steamboat.

backwater (bak wô′ tẽr), *n.* slack water at the side of a stream, apart from the main current.

backwoods (bak′ woodz′), *n.* forests or partially cleared lands remote from towns.

bacon (bā′ kun), *n.* the meat of the back or sides of a pig, salted and smoked.

***bacteria** (bak tēr′ i *a*), *n.* microscopic, one-celled vegetable bodies, found in and causing fermentation, soil fertilization, decay of organic matter and many diseases.

***bacteriology** (bak tēr i ol′ ō ji), *n.* the scientific investigation or study of bacteria.

bacterium (bak tēr′ i um), *n.* singular of *bacteria*.

bad (bad), *adj.* evil; wicked; wrong: the opposite of *good*.

badge (baj), *n.* a token of membership in some organization, commonly pinned to one's clothing.

badger (baj′ ẽr), *n.* an animal, about 2 feet long, thick-bodied, strong and aggressive, that burrows, eats flesh, prowls at night, and has coarse hair used in making brushes.

badger (baj′ er), *v.t.* to tease; torment; harry with questions.

badinage (bad i nazh′), *n.* teasing; banter.

baffle (baf′ l), *v.t.* to foil; to balk; to confuse and hinder.

bag (bag), *n.* a pouch; sack; valise; a day's take of game.

bag (bag), *v.t. and v.i.* to place in a bag; to take by shooting or trapping, as game; to swell or bulge.

***bagatelle** (bag *a* tel′), *n.* a game played with balls or marbles and a cue on a board; a trifle.

baggage (bag′ ij), *n.* a traveler's bags, trunks; luggage.

bagging (bag′ ing), *n.* coarse cloth used in making bags.

baggy (bag′ i), *adj.* loose; flabby; ill-fitting; hanging like a bag.

bagpipe (bag′ pipe), *n.* a primitive musical instrument, of shrill tone, consisting of a leather windbag, a tube with stops and several pipes.

bail (bāl), *n.* money deposited or property pledged as security for the appearance of a prisoner for trial; a scoop used in bailing a boat; the semicircular handle of a pail.

bailiff (bāl′ if), *n.* a sheriff's assistant, who serves papers; a court attendant.

bait (bāt), *n.* anything used to lure fish to the hook or animals to the trap; anything used to lure that which is to be caught.

bait (bāt), *v.t.* to put bait in or on, as a trap or hook; to harass, provoke.

baize (bāz), *n.* a coarse woolen material with a nap on one side, used to cover pool tables.

bake (bāk), *v.t.* to cook in an oven with dry heat.

bakelite (bā′ ke līt), *n.* a synthetic resin used as a substitute for hard rubber or celluloid.

baker (bāk′ ẽr), *n.* one whose business it is to make and often to sell bread, cake and pastry.

bakery (bāk′ ẽr i), *n.* a place where baking is done; a baker's shop.

baking powder (bāk′ ing pou′ dẽr), a white powder (a mixture of cream of tartar and soda) used to make dough rise faster than it does when yeast is used.

baking soda (bāk′ ing sō′ da), bicarbonate of soda.

balance (bal′ ans), *n.* equilibrium; evenness of disposition; poise; a pair of scales for weighing; the amount by which one side of an account exceeds the other or which it would require to make them balance evenly.

balance (bal′ ans), *v.t. and v.i.* to bring into equilibrium; to set one thing off against another; to make equal; to be equal in weight, amount or value, as scales *balance*, gains and losses *balance*.

***balcony** (bal′ kō ni), *n.* a platform projecting from a wall and enclosed with a balustrade; in a theater, an upper section of seats overlooking the pit and with a railing across the front.

bald (bôld), *adj.* lacking hair on the head; bare.

baldric (bôl′ drik), *n.* a broad ornamented belt worn about the waist or over one shoulder and down across the body to hold a sword or bugle.

bale (bāl), *n.* a bundle of goods bound with cord or wire ready for shipping, especially hay or cotton.

bale (bāl), *n.* woe; evil.

bale (bāl), *v.t.* to make up into a bale or bales.

baleful (bāl′ ful), *adj.* woeful; of deadly or malign influence.

balk (bôk), *n.* a heavy squared timber; a strip or ridge of land left unplowed; in baseball, a false motion in delivering the ball; a check or hindrance.

balk (bôk), *v.i. and v.t.* to shy at a jump; to refuse to go; to baffle; to hinder, obstruct, thwart.

ball (bôl), *n.* a round body; a game played with a ball; in baseball, a pitched ball that does not pass over the plate at the required height; a formal dance.

ball (bôl), *v.i. and v.t.* to form into a ball.

ballad (bal′ ad), *n.* a sentimental song; a short narrative poem.

ballast (bal′ ast), *n.* heavy materials carried by a ship or a balloon to insure stability; broken stone between the rails of a railroad.

ball bearing, a bearing in which friction is reduced by means of metal balls.

***ballet** (bal′ ā), *n.* a dance performed by a group on the stage, generally one that tells a story or presents a theme; the group of dancers performing a ballet.

balloon (ba lo͞on′), *n.* a bag inflated with gas lighter than air, having a basket attached in which aeronauts go aloft; a small, similar bag used as a toy.

balloon tire (tīr), an extra large rubber tire inflated to a low pressure and efficient in absorbing shocks.

ballot (bal′ ut), *n.* a printed form which a voter fills in to express his choice between candidates in an election.

balm (bäm), *n.* the aromatic sap of certain trees, used for healing or soothing; anything that soothes.

balmy (bäm′ i), *adj.* like balm; having the qualities of a balm; soft and fragrant.

***balsam** (bôl′ sam), *n.* a certain flowering plant; an oily, aromatic, resinous substance yielded by certain trees and used in medicine and perfume making.

baluster (bal′ us tẽr), *n.* a post that supports a handrail.

***balustrade** (bal′ us trād), *n.* a handrail with balusters on a stairway or balcony.

bamboo (bam bo͞o′), *n.* a tropical tree with a hollow stem that grows in jointed sections, used in making furniture, walking sticks and fishing rods.

ban (ban), *n.* a decree of excommunication; a curse; an order forbidding an action.

ban (ban), *v.t.* to forbid; to put under a curse.

***banal** (bā′ nal), *adj.* commonplace; trite.

banana (ba nan′ *a*), *n.* a tropical fruit, growing in heavy clusters on a plant resembling a palm tree.

band (band), *n.* that which binds together; a strip of binding material; a company of musicians; a group of persons united by a common purpose.

band (band), *v.i. and v.t.* to unite; to fasten with a band.

bandage (ban′ dij), *n.* a strip of soft cloth for dressing wounds.

bandage (ban′ dij), *v.t.* to cover and protect a wound with a strip of soft cloth.

bandbox (band′ boks), *n.* a small box or case to hold light articles of clothing, such as hats.

bandit (ban′ dit), *n.* an outlaw; highwayman.

bandoleer (ban dō lēr), *n.* a cartridge belt worn over the shoulder and down across the breast.

band wagon (band wa′ gun), *n.* the high, gaudy wagon on which the musicians ride in a circus parade; an imaginary wagon supposedly carrying the leaders of a popular cause.

band saw (band sô), *n.* a saw constructed on an endless belt that runs on pulleys.

bandy (ban′ di), *v.t.* to toss back and forth; to give and take, as to *bandy* words.

bandy-legged (ban′ di-leg ed), *adj.* bowlegged.

bane (bān), *n.* a cause of ruin, especially poison.

baneful (bān′ fool), *adj.* poisonous; ruinous.

bang (bang), *n.* a sudden, explosive noise, as of a sharp blow or explosion; a sharp blow or whack.

bang (bang), *v.i. and v.t.* to make a noise like that of a heavy blow; to strike such a blow.

bangs (bangz), *n.* hair cut straight across the forehead so as to form a fringe.

banish (ban′ ish), *v.t.* to send into exile.

Syn. Exile, expatriate, expel. One may be *banished, exiled* or *expatriated* from a country, but *expatriated* only from his own. One may *expatriate* himself; he is *banished* by others. One may *banish* disturbing thoughts; care may *banish* sleep. To *expel* is to drive out with violence or rudeness.

banister (ban′ is tẽr), *n.* a baluster: *banisters,* a balustrade.

banjo (ban′ jō), *n.* a musical instrument resembling a guitar, with strings and a circular body covered with tightly stretched parchment.

bank (bangk), *n.* a ridge of earth; the land at the edge of a stream; a rise in the bottom of a stream or the sea, making shoal water, as a *sandbank,* the *banks* of Newfoundland; a mass, as of snow or clouds; an establishment where money is kept or loaned.

bank (bangk), *v.i. and v.t.* to engage in the business of banking; to place money in a bank; to heap up in a mound or ridge like a bank; to build or drive as if on the side of a bank of earth, incline, as to *bank* a road or an airplane; to cover a fire with ashes to make it burn more slowly.

bankbook (bangk′ bo͝ok), *n.* a small book in which a record of deposits and withdrawals of money is kept.

bank note (bangk′ nōt), *n.* a bank's promise to pay, which circulates as money.

bankrupt (bangk′ rupt), *n.* one legally declared insolvent, unable to meet his debts.

bankrupt (bangk′ rupt), *adj.* having liabilities in excess of assets and subject to legal action as an insolvent debtor; stripped of resources.

bankruptcy (bangk′ rupt si), *n.* legal insolvency; an utter lack of any specified quality.

banner (ban′ ẽr), *n.* an ensign, standard or flag of a country, state or organization.

banner (ban′ ẽr), *adj.* worthy to carry the standard; leading, surpassing, as a *banner* year.

banns (banz), *n.* the proclamation in church of an intended marriage.

***banquet** (bang′ kwet), *n.* an elaborate, formal dinner; sumptuous entertainment or feast.

bantam (ban′ tam), *n.* a diminutive breed of domestic fowl; a small, active person.

bantam weight (-wāt), a boxer or wrestler weighing not more than 118 pounds.

banter (ban′ tẽr), *n.* good-natured teasing.

banyan (ban′ yun), *n.* fig tree of India with spreading branches that send down shoots which take root and produce new trees.

baptism (bap′ tizm), *n.* a ceremony in which water is used as a symbol of purification, initiating a person into the visible church of Christ.

baptistery (bap′ tis tẽr i), *n.* a part of a church in which the rite of baptism is administered.

baptize (bap tīz′), *v.t.* to administer the rite of baptism; to christen; to consecrate.

bar (bär), *n.* a piece of wood or metal, long in relation to its thickness; a barrier; a sandbank at the entrance to a harbor; a counter where drinks are sold; a place of justice; the legal profession; a vertical line dividing the musical staff into measures or the space between two such lines.

bar (bär), *v.t.* to fasten with a bar; to obstruct; to exclude; to prohibit.

barb (bärb), *n.* a sharp point projecting backward, as on an arrowhead or fishhook.

barbarian (bär bâr′ i an), *n.* an uncivilized person.

barbaric (bär bar′ ik), *adj.* pertaining to or like primitive peoples, as *barbaric* customs, *barbaric* ornaments.

barbarism (bär′ ba rizm), *n.* an uncivilized condition of life; in grammar, an expression not in good use.

barbarity (bär bar′ i ti), *n.* savageness; cruelty.

barbarous (bär′ ba rus), *adj.* not pure, as language; merciless, cruel.

barbecue (bär′ bē kū), *n.* an ox or other animal roasted whole for a feast; a feast at which animals are roasted whole.

barbed wire (bär′ bd wīr), wire for fences with barbs at regular intervals.

barber (bär′ bẽr), *n.* one whose business it is to cut hair and shave beards.

bare (bâr), *adj.* uncovered; naked; unadorned.

bare (bâr), *v.t.* to uncover; to expose; to reveal.

barely (bâr′ li), *adv.* hardly, scarcely, as *barely* enough to eat.

***bargain** (bär′ gin), *n.* an agreement for a transaction in business; something bought at low price.

bargain (bär′ gin), *v.i.* to make an agreement; to discuss the terms of a purchase or sale; to haggle.

barge (bärj), *n.* a large, flat-bottomed boat.

***baritone** or **barytone** (bar′ i tōn), *n.* a male voice between tenor and bass; a man having such a voice.

***baritone** or **barytone** (bar′ i tōn), *adj.* intermediate between bass and tenor.

bark (bärk), *n.* the outside layer of woody stems or tree trunks; the sharp, sudden sound made by a dog; a three-masted ship, square-rigged on fore and main masts, fore-and-aft rigged on the mizzenmast; also spelled *barque.*

bark (bärk), *v.i. and v.t.* to utter the sound of a bark; to take the bark off a tree or log; to scrape the skin, as to *bark* one's shins.

barley (bär′ li), *n.* a grain used as a cereal and for making malt liquors.

barley corn (bar′ li kôrn), *n.* a grain of barley: *John Barleycorn,* a humorous name for strong drink.

barn (bärn), *n.* a farm building where hay, tools, wagons are kept and livestock stabled.

barnacle (bär′ n*a* kl), *n.* a small shellfish which fastens onto rocks, hulls of ships and under water; a hanger-on.

barograph (bar′ ō grȧf), *n.* a barometer that registers automatically.

barometer (b*a* rom′ ē tẽr), *n.* an instrument that measures the pressure of the atmosphere.

baron (bar′ un), *n.* the title of an English peer of the lowest rank; in early English history, one who held an estate conferred on him by the king for military services; an American industrial magnate, as a coal *baron.*

baronet (bar′ ō net), *n.* an English title below a baron and above a knight; one who holds this title.

baronetcy (bar′ on et si), *n.* the rank and honors of a baronet.

baronial (b*a* rō′ ni al), *adj.* relating to a baron or barony.

barony (bar′ ō ni), *n.* the rank and honors of a baron; a baron's estate or domain.

baroque (b*a* rōk′), *adj.* odd or fantastic in shape and design; designating or like an overdecorated style of architecture.

baroscope (bar′ ō skōp), *n.* an instrument that indicates changes in the pressure of the atmosphere.

barouche (b*a* rōōsh′), *n.* a carriage with four wheels and a folding top having a driver's seat in front and two inside facing seats.

barracks (bar′ raks), *n.* buildings in which soldiers are housed at an army post or cantonment.

barrage (b*a* räzh′), *n.* a screen of gunfire covering the advance of troops.

barrel (bar′ el), *n.* a bulging cylindrical container made of wooden staves bound together by hoops; the tube of a firearm through which the bullet passes; the case containing the mainspring of a watch.

barrel roll (rōl), *n.* a flying stunt in which the aviator rolls his plane completely over on its long axis, sideways.

barren (bar′ en), *n.* sterile; unable to reproduce its kind; unproductive, as land or plans.

barricade (bar i kād′), *n.* a barrier set up to block a hostile advance.

barricade (bar i kād′), *v.t.* to block a passageway with barriers.

barrier (bar′ i ẽr), *n.* anything that prevents or obstructs passage or advance.

barrow (bar′ ō), *n.* a frame covered with boards and having handles at one end or both ends, as in a wheel*barrow;* a mound of earth or stones over a grave.

barter (bär′ tẽr), *n.* exchange of goods; trading without use of money.

*__basalt__ (b*a* sôlt′), *n.* a greenish-black rock of volcanic origin.

base (bās), *n.* the part of an object on which it stands or rests; a foundation; a center of operations or supplies, as for a military unit; in chemistry, that which combines with an acid to form a salt.

base (bās), *v.i. and v.t.* to rest upon a base; to provide a base for; to found, establish.

baseball (bās′ bôl′), *n.* a game played by teams of nine players each, in which runs are scored by a runner making his way around a diamond formed by three bases and a home plate; the ball used in this game.

baseless (bās′ les), *adj.* unfounded; not supported by facts.

basement (bās′ ment), *n.* the lowest floor of a building next below the ground floor.

bashful (bash′ fool), *adj.* diffident, shy.

basic (bā′ sik), *adj.* relating to a base; fundamental.

*__basilica__ (b*a* sil′ i k*a*), *n.* a Roman oblong hall having rows of pillars along the sides; a church of similar design.

basin (bā′ sn), *n.* a shallow vessel for holding a liquid; the region drained by a river.

basis (bā′ sis), *n.* the groundwork or fundamental principle of anything; the statement or assumption on which an argument rests.

bask (bȧsk), *v.i.* to lie in warmth; to enjoy or revel in pleasant conditions.

basket (bȧs′ ket), *n.* a container made of interwoven splints; the amount a basket will hold, as two *baskets* of apples.

basketball (bȧs′ ket bôl), *n.* a game played on a court, in which points are scored by throwing the ball into basket goals.

bass (bas), *n.* an American gamefish.

bass (bās), *n.* the deepest-toned part of a musical score; a male voice of the deepest range.

bass (bās), *adj.* in music, deep in tone.

bast (bast), *n.* the inner fiber of certain trees; a cord or matting made from its fibers.

baste (bāst), *v.t.* to drip some of its own grease on meat while it is roasting; to fasten temporarily with long stitches.

bastille (bas tēl′), *n.* a prison; especially a fortress used as a prison by a government.

*__bastion__ (bas′ chun), *n.* an angular projection from a fortification, affording crossfire on attackers.

bat (bat), *n.* a heavy stick or club, such as is used in baseball; a night-flying, insect-eating mammal with arms and legs connected by a membrane and used as wings.

bat (bat), *v.i. and v.t.* to use a bat; to strike something with a bat.

batch (batch), *n.* a quantity of anything produced or handled at one time or by one operation, as a *batch* of dough, a *batch* of papers.

bate (bāt), *v.t.* to lessen; to moderate; to deduct something, as from a bill.

bath (bȧth), *n.* the act of washing the body by immersion; immersion of anything; a tub or tank filled with water for bathing; a solution in which a photographic film is immersed.

bathe (bā*th*), *v.i. and v.t.* to take or give a bath.

bath tub (bȧth tub), any tub used for bathing, but especially a body-length tub of porcelain or metal, with faucets for hot and cold water.

bathysphere (bath′ i sfēr), *n.* a diving bell for deep-sea observation.

batik (bä′ tēk), *n.* a method of dyeing designs into fabrics by coating with wax the parts not to be colored; the design or the fabric thus dyed.

batiste (b*a* tēst′), *n.* a fine fabric of cotton.

*__baton__ (b*a* tôn′), *n.* a staff used as a badge of office or to beat time for an orchestra.

battalion (b*a* tal′ yun), *n.* a military unit composed of a headquarters and two or more companies; any large portion of an army acting together.

batten (bat′ n), *n.* a strip of wood for fastening edges, as of a tarpaulin to a deck.

batten (bat′ n), *v.i. and v.t.* to make or become fat; to thrive, usually at someone else's cost; to fasten down with battens.

batter (bat′ ẽr), *n.* a mixture of ingredients beaten together, as for making cake; one who uses a bat.

batter (bat′ ẽr), *v.i. and v.t.* to strike with blow after blow; to beat, pound.

battery (bat′ ẽr i), *n.* the act of beating, as in assault and *battery;* a group of guns, with men and equipment; a group of machines, as a *battery* of linotype machines; a group of cells converting chemical energy into electric current; in baseball, the pitcher and catcher.

batting (bat′ ing), *n.* wool or cotton prepared in sheets.

battle (bat′ l), *n.* combat between armed forces in the field of war; fighting.

battlement (bat′ l ment), *n.* a parapet with openings through which defenders fire.

battleplane (bat′ l plān), *n.* an airplane carrying guns.

battleship (bat′ l ship), *n.* the heaviest and most heavily armed kind of warship.

bauble (bô′ bl), *n.* a trifling piece of finery; worthless trinket.

bauxite (bôks′ īt), *n.* a sort of clay from which aluminum is obtained.

bawl (bôl), *v.i.* to cry loud and long.

bay (bā), *n.* a body of water partly enclosed by land; the long, deep cry of a hunting dog; the state of a hunted creature when it turns on its pursuers, as at *bay.*

bay (bā), *v.i.* to utter a deep-toned, prolonged bark, as that of a hound in the chase.

bayonet (bā′ ō net), *n.* a thrusting weapon fixed to the barrel of a rifle.

*__bayou__ (bī′ ōō), *n.* a sluggish inlet from a gulf, lake or river, especially in the southern states.

bazaar (bȧ zär′), *n.* an Eastern market place; a sale of foods or handwork to aid a charity.

B battery (bat′ ẽr i), in electricity, the battery producing current from the plate to the filament in an electron tube; a plate battery.

be (bē), *v.i.* [*p.t.* was, *p.p.* been, *pr. p.* being], to exist, as there *is* a time for all things, there *are* no ghosts; to equal, as 2 and 2 *are* 4; to occupy a certain place, as a coat *is* on a hook, France *is* in Europe; to belong in a certain category, as an ant *is* an insect; to experience a certain condition, as to *be* at war, I *am* happy; to represent, as let's *be* Romeo and Juliet. As an auxiliary verb to *be* is used to form the passive voice of other verbs, as we *were* attacked; and the progressive form, as I *am* reading.

beach (bēch), *n.* a sandy shore; a strand.

beach (bēch), *v.t.* to run, as a boat, up on a beach.

beacon (bē′ kun), *n.* a signal fire or light.

bead (bēd), *n.* a little ball with a hole through it, for stringing; a knob or notched plate at the end of a gun barrel, for use in aiming.

beagle (bē′ gl), *n.* a small breed of hound used in hunting rabbits.

beak (bēk), *n.* a bird's bill; anything shaped like a beak, as the lip of a pitcher.

beam (bēm), *n.* a long timber; a ray of light; a radio ray; the greatest width of a ship.

beam (bēm), *v.i.* to send out rays of light; to glow, as with pleasure.

bean (bēn), *n.* the smooth, kidney-shaped seed of many leguminous plants.

bear (bâr), *n.* a large animal with heavy fur: the brown *bear,* grizzly *bear,* polar *bear;* a dealer in stocks who tries to send market prices down for his own profit.

bear (bâr), *v.i. and v.t.* to be in a productive state, as the orchards are *bearing* well this year; to support, as this beam *bears* great weight; to bring forth, as to *bear* a child; to follow a certain direction, as *bear* to the east.

beard (bērd), *n.* the hair that grows on the chin.

beard (bērd), *v.t.* to confront; to defy.

bearing (bâr′ ing), *n.* carriage; behavior; meaning, point, as the *bearing* of an argument.

beast (bēst), *n.* a quadruped; a vile person.

beat (bēt), *n.* a recurring stroke; pulsation or throb; a route repeatedly traversed, as a policeman's *beat.*

beat (bēt), *v.i. and v.t.* to throb; to pulsate; to strike repeatedly; to thrash; to defeat in a contest; to range over, as woods, in quest of game; to mix by striking many times in swift succession, as with a spoon.

beatific (bē *a* tif′ ik), *adj.* blissful.

beatify (bē at′ i fī), *v.t.* to bless; to enroll among the saints.

beatitude (bē at′ i tūd), *n.* blessedness: *Beatitudes,* the verses of the Sermon on the Mount telling what deeds bring blessing.

beauty (bū′ ti), *n.* a combination of graces and charms pleasing to the eye or gratifying to the esthetic sense; physical or mental loveliness.

beaver (bē′ vẽr), *n.* a fur-bearing animal with flat oval tail and webbed feet that lives in and beside ponds and builds dams.

becalmed (bē kämd′), *adj.* prevented from sailing by lack of wind.

beckon (bek′ un), *v.i. and v.t.* to summon by a nod or gesture, signal.

become (bē kum′), *v.i. and v.t.* to pass from one state to another, as warm things *become* cool; to befit; accord with, as his manner *becomes* a king.

becoming (bē kum′ ing), *adj.* fit, suitable, appropriate.

bed (bed), *n.* an article of furniture on which to sleep, usually a wooden frame containing springs and mattress; a portion of ground prepared for plants, as a strawberry *bed;* the bottom of something, as the *bed* of a river; a layer, as of rock.

bedeck (bē dek′), *v.t.* to decorate, adorn.

bedlam (bed′ lum), *n.* a lunatic asylum; any scene of confusion.

bedridden (bed′ rid n), *adj.* confined to bed.

bee (bē), *n.* a four-winged insect that lives in colonies and gathers honey; a gathering of persons to help in some kind of work, such as building a house or to complete in a test, as a spelling *bee.*

beech (bēch), *n.* a tree related to the oak, with smooth gray bark and triangular, edible nuts.

beef (bēf), *n.* the meat of cattle.

beehive (bē′ hīv), *n.* a box for bees, where they live and store honey.

beeline (bē′ līn), *n.* a straight course from one point to another, such as a bee follows when flying with honey to its hive.

beer (bēr), *n.* a beverage made from malt, barley and hops.

beet (bēt), *n.* a plant with a thick edible root; the beet root, used as a vegetable and in making sugar.

beetle (bē′ tl), *n.* an insect having four wings, the inner pair being protected by the outer pair, which are hard like thin horn; a heavy wooden mallet, used to drive wedges.

beetle (bē′ tl), *v.i.* to project; overhang, as a cliff.

befall (bē fôl′), *v.i. and v.t.* to happen; to come to pass.

befit (bē fit′), *v.t.* to be worthy of or suitable to, as conduct that *befits* a king.

befog (bē fog′), *v.t.* to bewilder.

before (bē fōr′), *adv.* in front, as go *before;* formerly, as you said that *before.*

before (bē fōr′), *prep.* in front of, as to bow *before* an idol; preceding in time, as March comes *before* April; preceding in rank or worth, as a captain comes *before* a lieutenant, value happiness *before* wealth.

before (bē fōr′), *conj.* previous to the moment when, as think *before* you speak; rather than, as I'd die *before* I'd betray him.

befriend (bē frend′), *v.t.* to be a friend to; to help.

beg (beg), *v.i. and v.t.* to beseech; ask for.

beget (bē get′), *v.t.* to procreate, to father; to cause, as one lie *begets* another.

beggar (beg′ ẽr), *n.* one who begs; one who lives by asking alms.

begin (bē gin′), *v.i. and v.t.* to start; to come into being; to commence, found.

beginning (bē gin′ ing), *n.* the start of anything; time or place of origin.

***begonia** (bē gō′ ni *a*), *n.* a house plant with ornamental leaves and small flowers, pink, red or white.

begrudge (bē gruj′), *v.t.* to envy; to wish to withhold.

beguile (bē gīl′), *v.t.* to deceive by guile; to tempt; to delude; to charm.

behalf (bē hȧf′), *n.* help; defense; interest: used with prepositions, as *in behalf* of the poor, *on behalf* of the owner.

behave (bē hāv′), *v.t. and v.i.* to conduct or comport (oneself), as the child *behaved* herself at the table; to conduct oneself or itself, act, as the horse *behaves* well on the road.

behavior (bē hāv′ yẽr), *n.* manner of behaving; conduct.

behead (bē hed′), *v.t.* to cut off the head of.

behest (bē hest′), *n.* a command.

behind (bē hind′), *adv.* to or at the rear, as left *behind.*

behind (bē hind′), *prep.* at the back of, as *behind* the lines.

behold (bē hōld′), *v.t.* to look at; to see.

behold (bē hōld′), *interj.* look! see!

beholden (bē hōl′ dn), *adj.* indebted.

behoof (bē hōōf′), *n.* advantage, interest, as in your *behoof.*

***behoove** (bē hōōv′), *v.t.* to be necessary or right for, as it *behooves* you to go.

being (bē′ ing), *n.* existence; life; a living person.

belabor (bē lā′ bẽr), *v.t.* to beat soundly.

belated (bē lā′ ted), *adj.* tardy, delayed.

belch (belch), *v.i. and v.t.* to bring up violently, as gas from the stomach, ashes from a volcano, smoke from a chimney.

beleaguer (bē lē′ gẽr), *v.t.* to besiege; to surround, as a city with an army.

belfry (bel′ fri), *n.* a bell tower.

belie (bē lī′), *v.t.* to give the lie to, misrepresent; to be false to.

belief (bē lēf′), *n.* intellectual acceptance of anything as true; the act of believing.

believe (bē lēv′), *v.t.* to accept as true; to have faith in, trust.

belittle (bē lit′ l), *v.t.* to underestimate; to depreciate; to make seem smaller.

bell (bel), *n.* a hollow metal cup-shaped instrument that gives forth a clear resonant note when struck by a clapper.

bell (bel), *v.t.* to put a bell on.

belladonna (bel *a* don′ *a*), *n.* the deadly nightshade or a drug made from its roots and leaves.

belle (bel), *n.* a beautiful girl or woman.

bellicose (bel′ i kōs), *adj.* warlike; pugnacious.

***belligerence** (be lij′ ẽr ens), *n.* the act of making war or state of being at war.

belligerent (be lij′ ẽr ent), *n.* a nation engaged in a war.

bellow (bel′ ō), *n.* a bull's roar; a sound similar to that call.

bellows (bel′ ōz), *n.* an instrument that folds like an accordion, taking in air and expelling it with force, used to fan a fire or supply a current of air for a pipe organ.

bellwether (bel′ we*th* ẽr), *n.* the male leader of a flock of sheep, having a bell hung on its neck.

belly (bel′ i), *n.* [*pl.* bellies (-liz)] part of the body between the ribs and the hips; the abdomen; in quadrupeds, the under part of the body.

belong (bē lông′), *v.i.* to be part of, owned by, or proper to, as it *belongs* to me, I *belong* to the club.

belonging (bē lông′ ing), *n.* a possession.

below (bē lō′), *adv.* in a lower place; further down, beneath.

below (bē lō′), *prep.* lower than, as on the shelf *below* the top one; unbefitting, as such conduct is *below* your station.

belt (belt), *n.* a band, as of leather, worn around the waist; a leather strip running over wheels in machinery; a zone or region, as the corn *belt.*

belt (belt), *v.t.* to encircle; to put a belt on.

belted (bel′ ted), *adj.* wearing a belt indicative of rank; having its coat of fur or feathers marked by a stripe like a belt.

belting (bel′ ting), *n.* material from which belts are made; a system of belts, as in a machine shop.

bench (bench), *n.* a long seat, which may or may not have a back; the judges' seat in a court; judges collectively; a ledge in a formation of rock; a raised level river bank.

bend (bend), *v.i. and v.t.* to curve in its course, as a road or stream; to force something straight into a curved line.

bend (bend), *n.* a curve, as in a road or stream.

beneath (bē nēth′), *adv.* in a lower position.

beneath (bē nēth′), *prep.* below; under (something else); unworthy of.

benediction (ben ē dik′ shun), *n.* a blessing.

benefaction (ben ē fak′ shun), *n.* the conferring of a benefit; a benefit conferred.

benefactor (ben′ ē fak tẽr), *n.* one who confers a benefit, renders a service, does a favor; a kindly helper.

beneficence (bē nef′ i sens), *n.* active goodness; charity.

beneficent (bē nef′ i sent), *adj.* actively good.

beneficiary (ben′ ē fish′ i er i), *n.* one who benefits by something; the one to whom insurance is payable.

benefit (ben′ ē fit), *n.* advantage or profit; a public entertainment of which the proceeds are pledged to charity.

benefit (ben′ ē fit), *v.i. and v.t.* to profit by; to be helpful to.

benevolence (bē nev′ ō lens), *n.* the disposition to do good; charitableness.

Bengal light (ben′ gol līt), a firework producing a steady blue light, used for signaling at sea.

benighted (bē nī′ ted), *n.* lost in darkness; in the darkness of ignorance.

***benign** (bē nīn′), *adj.* of kind or gentle disposition.

***benignant** (bē nig′ nant), *adj.* kind; gracious.

benignity (bē nig′ ni ti), *n.* graciousness.

bent (bent), *n.* tendency; a strong liking, as a *bent* for music.

benzene (ben′ zēn), *n.* a volatile, highly inflammable liquid distilled from coal tar and used in the manufacture of dyes, for illuminating and as a motor fuel.

***benzine** (ben′ zēn), *n.* a liquid derived from petroleum, used in cleaning textiles.

***benzoin** (ben′ zō in), *n.* sap of an aromatic tree of the Malay lands, used in making perfumes and as a remedy for bronchitis.

***bequeath** (bē kwē*th*′), *v.t.* to bestow by will.

bequest (bē kwest′), *n.* a legacy.

berate (bē rāt′), *v.t.* to scold, chide.

bereave (be rēv′), *v.t.* to deprive; to make desolate by loss, especially death.

bereavement (bē rēv′ ment), *n.* loss, especially of a loved one by death.

bereft (bē reft′), [*p.t. and p.p.* of *bereave*] deprived, robbed, as *bereft* of joy or faith.

berry (ber′ i), *n.* a small juicy fruit such as the blackberry; a fruit with pulpy flesh containing seeds, as the tomato, cranberry and grape.

berth (bûrth), *n.* a sleeping bunk on a ship or railroad car; a ship's mooring place: *give a wide berth,* pass at sufficient distance to allow to swing at anchor, hence, avoid.

beryl (ber′ il), *n.* a precious stone of various colors but commonly green or greenish blue.

beseech (bē sēch′), *v.i. and v.t.* to entreat, implore earnestly.

beseem (bē sēm′), *v.t.* to be suitable to, as the act does not *beseem* a king.

beset (bē set′), *v.t.* to attack, besiege; to stud, as with gems.

beside (bē sīd′), *prep.* at the side of, as *beside* the hearth; compared with, as he seems cowardly *beside* you; wide of, as *beside* the point.

besides (bē sīdz′), *adv.* in addition, also.

besiege (bē sēj′), *v.t.* to surround with armed forces, beset; to harass.

besmirch (bē smûrch′), *v.t.* to soil; to smear with slander.

bespeak (bē spēk′), *v.t.* to ask for in advance; to foretell.

bespoken (bē spōk′ en), *adj.* previously claimed or promised.

Bessemer steel (bes′ e mẽr stēl), steel made by forcing air through the melted iron to remove silicon and carbon.

best (best), *adj. and adv.* good in the highest degree; in the most desirable manner.

***bestial** (best′ yal), *adj.* like a beast.

bestow (bē stō′), *v.t.* to confer, give.

bet (bet), *n.* a wager or stake given; that which is wagered on, as a fast horse is a good *bet.*

bet (bet), *v.i. and v.t.* to wager; to stake, as money, on a contention or contingency.

***beta rays** (bē′ t*a* rāz), the most important of three kinds of rays given out by radioactive substances, consisting of negatively charged electrons. These rays have great penetrating powers and are used in treatment of bodily ills.

bethel (beth′ el), *n.* a hallowed spot; a chapel for seamen.

betide (bē tīd′), *v.t.* to happen to.

betimes (bē tīmz′), *adv.* in good season; speedily.

betoken (bē tō′ ken), *v.t.* to indicate by signs, portend.

betray (bē trā′), *v.t.* to make a breach of trust, deliver over to an enemy, through treachery; to deceive and lead into evil.

***betrothal** (bē troth′ al), *n.* a marriage engagement.

better (bet′ ẽr), *adj. and adv.* more good or desirable; in a more excellent manner.

between (bē twēn′), *prep.* in the interval of time or space separating, as *between* the chair and the table, *between* Monday and Tuesday; from one to another, joining, as love *between* brothers; by the interaction of, as they caught 10 fish *between* them, war *between* tribes.

bevel (bev′ el), *n.* a tool for setting surfaces at an angle; any angle not a right angle between planes or lines.

***bevel** (bev′ el), *v.t. and v.i.* to impart a sloping edge to; to have a sloping edge, slant.

beverage (bev′ ẽr ij), *n.* any prepared drink.

bevy (bev′ i), *n.* a flock of birds, as quail; a group of girls.

bewail (bē wāl′), *v.i. and v.t.* to lament; to weep for.

beware (bē wâr), *v.i. and v.t.* to be on guard, to guard against.

bewilder (bē wil′ dẽr), *v.t.* to disturb and confuse.

bewitch (bē wich′), *v.t.* to cast a spell upon; to charm.

beyond (bē yond′), *adv.* further along.

beyond (bē yond′), *prep.* on the other side of; past some given mark or measure.

bezel (bez′ el), *n.* the part of a finger ring that holds fast the stone.

biannual (bī an′ ū al), *adj.* occurring twice a year.

bias (bī′ as), *n.* a cut or seam oblique to the texture of a fabric; prejudice.

bias (bī′ as), *v.t.* to foster prejudice.

biased (bī′ ast), *adj.* prejudiced.

bib (bib), *n.* a cloth placed under a child's chin; an upper section added to an apron.

bibliography (bib li og′ r*a* fi), *n.* the history of books with their dates, authors, editions, printings, manufacture; a list of books by one author or of books on a given subject.

***bibliophile** (bib′ li ō fīl), *n.* one who loves books.

bicameral (bī kam′ ẽr al), adj. having two legislative branches.

***bicentenary** (bī sen′ tē nẽr i), *n.* a 200th anniversary.

biceps (bī′ seps), *n.* the front muscle of the upper arm.

bicker (bik′ ẽr), *v.i.* to wrangle; quarrel.

biconcave (bī kon′ kāv), *adj.* curving in on both surfaces.

bicuspid (bī kus′ pid), *n.* a two-pointed tooth.

bicycle (bī′ sik l), *n.* a two-wheeled vehicle propelled by pedals working on a crank shaft.

bid (bid), *v.i. and v.t.* to make an offer; to name a price in competition with other bidders, for privilege, goods or work; to invite; to command.

bid (bid), *n.* an offer to give a certain price; the price named; an invitation.

bide (bīd), *v.t.* to wait, as *bide* your time.

biennial (bī en′ i al), *adj.* happening once in two years.

bier (bēr), *v.* a stand on which a coffin rests.

bifurcation (bī fẽr kā′ shun), *n.* division into two branches.

big (big), *adj.* large, of great size.

bigamy (big′ *a* mi), *n.* the crime of contracting a marriage while a previous marriage is still legally in effect.

bight (bīt), *n.* a loop or bend of a rope; a bend in a shore line forming a bay.

bigot (big′ ut), *n.* one who is blindly attached to a particular creed and intolerant of the beliefs and practices of others.

bilateral (bī lat′ ẽr al), *adj.* having two sides.

bile (bīl), *n.* a yellowish-green fluid secreted by the liver.

bilge (bilj), *n.* the broadest part of a ship's bottom; the bulge of a cask.

bilge water (bilj wô′ tẽr), water that collects in the bottom of a ship.

***bilious** (bil′ yus), *adj.* having too much bile; bad-tempered.

bill (bil), *n.* a statement of money owed and request for payment; a banknote or government promise to pay, as a dollar *bill;* a list of available items, as a *bill* of fare; a proposed act of legislation, as a labor *bill;* a bird's beak; a kind of hatchet with a hook-shaped blade, also called *billhook.* NOTE: The noun *bill* is used in the sense of *certificate, document,* as *bill of entry, bill of exchange, bill of health, bill of lading, bill of sale.*

bill (bil), *v.t.* to state an account and request payment; to charge, as to *bill* a man for a hat; to advertise or announce by posters.

billboard (bil′ bōrd),*n.* a structure on which posters are displayed.

billet (bil′ et), *n.* a written notice to a householder that he must provide lodgings for soldiers; lodgings for soldiers in private houses; a stick of firewood.

billet (bil′ et), *v.t.* to lodge, as the army *billeted* soldiers on the townspeople.

billhead (bil′ hed), *n.* a sheet of paper with a dealer's name and address at the top, on which a bill is presented.

billiards (bil′ yẽrdz), *n.* a game played with ivory balls and a cue on an oblong, cloth-covered table.

billion (bil′ yun), *n.* in the U. S., a thousand millions (1,000,000,000); in Great Britain, a million millions (1,000,000,000,000).

billow (bil′ ō), *n.* a great rolling wave of water.

billposter (bil′ pōs tẽr), *n.* one whose occupation is pasting posters on billboards.

bimanual (bī man′ ū al), *adj.* done with both hands.

bimetalism (bī met′ al izm), *n.* use of both gold and silver as money, with a fixed scale of relative values.

bimonthly (bī munth′ li), *adj.* occurring once in two months.

bin (bin), *n.* a box or compartment used for storing such things as flour or coal.

bind (bīnd), *v.t. and v.i.* to fasten together with or as with a cord; to confine or restrain, hold together; to cause to cohere; to bandage, as to *bind* up a cut; to fasten together and put a cover on, as to *bind* a book; to protect or strengthen with a band, as to *bind* a hem; to hold by force of duty, love or law, as a promise or a contract *binds;* to cohere.

bindery (bīn′ dẽr i), *n.* a place where books are bound.

binding (bīn′ ding), *n.* that which binds; the cover of a book.

binding (bīn′ ding), *adj.* having obligatory force.

binnacle (bin′ *a* kl), *n.* a box containing a ship's compass and a night light.

***binocular** (bin ok′ ū lẽr), *n.* a glass, as a fieldglass or telescope having lenses for both eyes.

***binomial** (bī nō′ mi al), *n.* an algebraic expression of two terms, connected by a plus or minus sign.

binomial theorem (thē′ ō rem), the formula by which a binomial may be raised to any power without a series of multiplications.

***biography** (bī og′ r*a* fi), *n.* the written story of a person's life.

biology (bī ol′ ō ji), *n.* the science of life in its various forms.

bipartite (bī pär′ tīt), *adj.* divided into two parts.

biped (bī′ ped), *n.* a two-footed animal.

biplane (bī′ plān′), *n.* an airplane with two pairs of wings, one above the other.

birch (bûrch), *n.* a tree having valuable hardwood and sometimes bark that can be stripped off in thin layers.

bird (bûrd), *n.* a warm-blooded, feathered vertebrate that flies.

birdlime (bûrd′ līm), *n.* sticky stuff prepared from holly and smeared on twigs to catch birds.

birdman (bûrd′ man), *n.* an aviator.

bird's-eye (bûrdz′ ī), *adj.* seen from above, as if by a flying bird; so marked as to resemble the eye of a bird, as *bird's-eye* maple.

biretta (bi ret′ *a*), *n.* a square cap worn by priests.

birth (bûrth), *n.* the act of being born or coming into existence; origin; descent, as a man of noble *birth.*

birth rate (rāt), the number of births to every 100 or 1,000 people in a given territory in a stated time.

birthright (bûrth′ rīt′), *n.* any privilege to which one is entitled by birth.

biscuit (bis′ kit), *n.* a small baked unsweetened cake of raised dough; a small baked cake of unleavened dough, a cracker.

bisect (bī sekt′), *v.t.* to cut or divide into two parts, usually two equal parts.

bishop (bish′ up), *n.* a church officer having charge of a diocese or other church district.

bishopric (bish′ up rik), *n.* the office of a bishop; the diocese or district over which he presides.

bismuth (biz′ muth), *n.* a metallic element used in alloys, medicine and the manufacture of cosmetics.

***bison** (bī′ sn), *n.* the buffalo of the North American plains.

bisque (bisk), *n.* a thick, rich soup; an unglazed white porcelain, used in making statuettes.

bit (bit), *n.* a tool for boring; the metal mouthpiece of a bridle; the part of a key that enters the lock and acts on the tumblers; a small piece of anything.

bite (bīt), *n.* a mouthful bitten off a piece of food; a nibble by a fish; the sting of an insect; a wound made with the teeth; a stinging sensation; the grip of a tool on the substance being worked.

bite (bīt), *v.i. and v.t.* to seize with the teeth; to sting or cause a smarting sensation; to eat into, as acid; to take hold, as a boring tool.

bitingly (bīt′ ing li), *adv.* in a sarcastic manner, sharply.

bitt (bit), *n.* a wooden or iron post aboard ship to which cables are made fast.

bitter (bit′ ẽr), *adj.* having a sharp, generally disagreeable taste; painful, as a *bitter* experience; severe, as *bitter* cold; cruel, stinging, as *bitter* words.

bittern (bit′ ẽrn), *n.* a wading bird of the heron family.

bitters (bit′ ẽrz), *n.* liquor in which bitter herbs or roots have been steeped.

bitumen (bi tū′ men), *n.* mineral pitch, asphalt; any of various other inflammable mineral substances, as petroleum or naphtha.

bituminous coal (bi tū′ mi nus kōl), soft coal.

bivalve (bī′ valv), *n.* any shellfish, such as the oyster, having two sections of shell hinged together.

***bivouac** (biv′ oo ak), *n.* an encampment of soldiers in the open for one night or a very short time.

biweekly (bī wēk′ li), *adj.* occurring once in two weeks.

biyearly (bī yēr′ li), *adj.* occurring twice in one year.

bizarre (bi zär′), *adj.* grotesque, odd or incongruous.

blab (blab), *v.i. and v.t.* to reveal or give away, as a secret; to tattle.

black (blak), *n.* complete lack of light or color or the darkest of all colors: opposite of *white;* a person belonging to a dark-skinned race.

black (blak), *adj.* of the darkest possible hue; without light, very dark, as a *black* night; gloomy, discouraging, as a *black* view of things; dressed in black, as the *Black* Prince; having a dark skin, as a Negro; sullen, inimical, as a *black* look.

blackball (blak′ bôl), *v.t.* to vote against a candidate for membership in an organization.

blacken (blak′ en), *v.t.* to make black.

***blackguard** (blag′ ärd), *n.* a fellow of low character, a scoundrel.

blackguard (blag′ ärd), *v.t.* to revile in coarse terms.

blacking (blak′ ing), *n.* a black polish for shoes or stoves.

blackjack (blak′ jak′), *n.* a small, leather-covered club with a weighted head and a flexible handle.

black list (blak′ list), a list of persons under suspicion, in disfavor or to be punished.

black-list (blak′ list), *v.t.* to place on a black-list.

blackmail (blak′māl), *n.* extortion by means of intimidation.

blackmail (blak′ māl), *v.t.* to force a person to pay money to avoid scandal.

blacksmith (blak′ smith), *n.* one whose calling is to hammer iron into various shapes on an anvil.

blackthorn (blak′ thôrn), *n.* a thorny European tree or shrub having white flowers and small plumlike fruits or sloes.

bladder (blad′ ẽr), *n.* a thin, elastic, membranous sac in animals, in which a fluid is collected.

blade (blād), *n.* the cutting part of an edged tool or weapon; a leaf of a grass or cereal plant; anything resembling a leaf or blade, as the *blade* of a paddle.

blame (blām), *n.* censure; responsibility for error or wrongdoing.

blame (blām), *v.t.* to censure; to reproach; to hold responsible.

Syn. Censure, reprove, reproach, upbraid. To *blame* is simply to ascribe a fault to; to *censure* is to express disapprobation; the former is less personal than the latter. The thing more than the person is *blamed;* the person more than the thing is *censured.* A person may be *blamed* for his good nature, and *censured* for his negligence; *reprove* is even more personal than *censure.* A *reproof* passes from one individual to another, or to a certain number of individuals; *reproaching* and *upbraiding* are as much the acts of individuals as *reproving,* but the former denote the expression of personal feelings and may be just or unjust; the latter is presumed to be divested of all personal feeling.

Ant. Approve, commend, praise.

blanch (blȧnch), *v.t. and v.i.* to whiten by taking out color; to turn pale with emotion.

bland (bland), *adj.* mild, soft, gentle.

blandishment (blan′ dish ment), *n.* flattering, persuasive expressions or actions; artful caresses.

blank (blangk), *n.* a paper on which there is no writing or print; an empty space, a void.

blank (blangk), *adj.* without writing or print; empty; confused, bewildered, as a *blank* answer; lacking variety or incident.

blanket (blang′ ket), *n.* a soft, loosely woven woolen bed cover; a heavy covering, as of snow.

blank verse (blangk vûrs), verse without rhyme, especially in lines of 10 syllables with five accents.

blare (blâr), *v.i.* to give forth a loud sound like that of a trumpet.

***blaspheme** (blas fēm′), *v.i.* to speak irreverently of God or sacred things; to curse.

blasphemy (blas′ fē mi), *n.* impious speech.

blast (blȧst), *n.* a sudden gust of wind; an explosion.

blast (blȧst), *v.t.* to break up by means of an explosion, as rock.

blast furnace (blȧst fûr′ nis), a furnace in which the heat is intensified by air currents, used for reducing oil and melting metal.

blaze (blāz), *n.* a body of flame; intense light and heat; an outburst of passion; a mark made on a tree by cutting off a piece of the bark.

blaze (blāz), *v.i. and v.t.* to burst into flame; to shine; to mark, as a trail, with blazes.

blazon (blā′ zn), *v.t.* to display ostentatiously or conspicuously.

bleach (blēch), *v.t.* to whiten by removing color.

bleachers (blēch′ ẽrz), *n.* unroofed seats in the stands of an athletic field.

bleak (blēk), *adj.* bare and desolate; piercing, as a wind; cheerless, as a *bleak* point of view.

bleat (blēt), *n.* the cry of a sheep or goat.

bleed (blēd), *v.i. and v.t.* to lose blood; to lose sap, as a tree; to experience sorrow or pity, as one's heart *bleeds* for the poor; to shed blood, as to *bleed* a patient.

blemish (blem′ ish), *n.* a defect, flaw, any disfigurement, as a spot or scar.

Syn. Defect, flaw. A *blemish* is superficial and mars the appearance of something; a *defect* is a lack of something necessary or expected in a perfect thing; a *flaw* is an imperfection, as a crack or a fissure, in the essential texture of something, as a *flaw* in a diamond.

blemish (blem′ ish), *v.t.* to mar, injure.

blench (blench), *v.i.* to flinch, quail, grow pale.

blend (blend), *n.* a mixture; a product of mixing, as a *blend* of coffee.

blend (blend), *v.t.* to mix into a new entity.

bless (bles), *v.t.* to make happy; to consecrate.

blessing (bles′ ing), *n.* an invocation of happiness; a benediction.

blight (blīt), *v.t.* to cause to wither and decay.

blight (blīt), *n.* a disease in plants that causes them to stop growing and wither; an insect that causes plant disease; anything that destroys or ruins hopes or aims.

blimp (blimp) *n.* a small dirigible airship.

blind (blīnd), *adj.* without sight; unreasoning, rash, as a *blind* choice; lacking understanding, undiscerning, as *blind* to beauty; hidden, as a *blind* seam; closed at one end, leading nowhere, as a *blind* alley, a *blind* chase; done without seeing, as *blind* flying.

blind (blīnd), *n.* anything intended to obstruct sight, as a window shade or a screen; anything intended to mislead or deceive; a ruse; a decoy.

blind (blīnd), *v.t.* to make sightless, as the accident *blinded* him; to dazzle, as the sun *blinds* me; to darken the mind, as prejudice *blinds* him.

blinder (blīnd′ ẽr), *n.* a flap of leather on a horse's bridle to keep him from seeing objects at the side.

blink (blingk), *v.i.* to wink repeatedly and fast; to half-shut one's eyes to, as to *blink* against the sun; to overlook an offense.

blinker (blingk′ ẽr), *n.* a leather flap on a bridle, to prevent a horse from seeing in any direction but straight ahead; a traffic light that goes on and off at short, regular intervals.

bliss (blis), *n.* a continuing state of extreme happiness.

blister (blis′ ter), *n.* a thin sac containing water, on the skin of the body, or a painted surface.

***blithe** (blī*th*), *adj.* joyous, gay, mirthful.

blizzard (bliz′ erd), *n.* a furious, sustained wind with light, fine, drifting snow.

bloat (blōt), *v.t. and v.i.* to cause to puff up; to cure or dry, as a herring, in smoke; to swell.

bloater (blōt′ ẽr), *n.* a herring smoked, salted and half-dried.

block (blok), *n.* a solid mass of wood or metal; a set of pulleys in a frame; the distance from one street intersection to the next; a square of streets.

block (blok), *v.t.* to obstruct; to impede passage.

blockade (blok ād′), *n.* the closing of a port by enemy forces.

blockhouse (blok′ hous), *n.* a log fort.

block system (blok′ sis′ tem), in railroading, a system of traffic regulation with signals preventing a train from entering one section or block until the train ahead is clear of it.

blond (blond), *adj.* fair-skinned, with light-colored hair: fem. *blonde.*

blood (blud), *n.* the red fluid circulating in the arteries and veins.

blooded (blud′ ed), *adj.* of pure blood, thoroughbred; having a certain kind of blood, as royal-*blooded.*

blood pressure (blud presh′ ẽr), the pressure of blood in the arteries, varying with body conditions and with age.

blood vessel (blud ves′ l), any tube in which blood circulates in an animal body.

bloom (blo͞om), *n.* the state of flowering; a blossom; a flourishing condition, as when knighthood was in *bloom.*

bloom (blo͞om), *v.i.* to flower; to be bright with health.

blossom (blos′ um), *n.* a flower.

blossom (blos′ um), *v.i.* to bloom or flower; to flourish.

blot (blot), *n.* a spot or stain, as of ink; blemish.

blot (blot), *v.t.* to spot with ink; to dry a wet blot with soft paper.

blotch (bloch), *n.* a large, irregular spot or stain.

blotter (blot′ ẽr), *n.* a sheet of soft absorbent paper, to take up wet ink.

***blouse** (blouz), *n.* a light, loose overgarment; the jacket of a uniform.

blow (blō), *n.* a hard stroke, as with the hand, fist or a club; a sudden affliction or misfortune; a gale; a shock.

blow (blō), *v.i.* to move, as air; to force a current of air, as from the mouth; to brag; to blossom.

blowfly (blō′ flī), *n.* any species of fly that deposits eggs upon animal flesh.

blowout (blō′ out), *n.* the bursting of a pneumatic tire; the hole thus made in the tire.

blow pipe (blō′ pīp), *n.* a tube through which a current of air or gas is blown upon a flame.

blubber (blub′ ẽr), *n.* the layer of fat under a whale's hide.

bludgeon (bluj′ un), *n.* short, thick club.

bludgeon (bluj′ un), *n.* a short club with one thick heavy end.

blue (blo͞o), *n.* the color of the clear sky.

blue blood (blo͞o blud), a person of aristocratic lineage.

bluebottle (blo͞o′ bot l), *n.* any of several steel-blue flies that buzz; a blowfly.

bluegrass (blo͞o′ grȧs), *n.* a grass bearing a small blue flower, common in Kentucky and typical of that state.

blueprint (blo͞o′ print), *n.* a print in white lines on blue paper used for maps and architectural plans.

bluff (bluf), *n.* a high, steep bank.

bluff (bluf), *v.i.* to try to deceive through a bold manner.

bluff (bluf), *adj.* rising steeply, as a cliff; blunt and hearty in manner.

bluing (blo͞o′ ing), *n.* a preparation of indigo used in washing clothes.

blunder (blun′ dẽr), *n.* a gross mistake or error.

blunder (blun′ dẽr), *v.i.* to make stupid mistakes; to bungle.

blunderbuss (blun′ dẽr bus), *n.* an old-fashioned firing arm with a large muzzle.

blunt (blunt), *adj.* thick-edged, not sharp; plain-spoken.

blur (blûr), *n.* a smudge or smear; indistinct appearance; dimmed vision.

blur (blûr), *v.i. and v.t.* to appear indistinctly; to make obscure or indistinct.

blurt (blûrt), *v.t.* to speak without reflection; to divulge unadvisedly.

blush (blush), *n.* a reddening of the face as from shame, embarrassment or confusion.

bluster (blus′ tẽr), *v.i.* to blow noisily and violently; to talk windily or threateningly.

***boa** (bō′ *a*), *n.* a huge serpent of South America; neck wrap of fur or feathers.

boa constrictor (bō a kon strik′ tẽr), a great boa, sometimes 12 feet long, that coils about its victims and crushes them.

boar (bōr), *n.* the male of swine.

board (bōrd), *n.* a piece of timber long and wide in proportion to its thickness; regular supply of meals, for pay.

board (bōrd), *v.t.* to buy meals by the day or week; to go upon, as a ship or train.

boardwalk (bōrd′ wôk′), *n.* a promenade along a beach.

boast (bōst), *v.i.* to speak vaingloriously, brag.

boat (bōt), *n.* a small open vessel propelled either by oars or sail.

***boatswain** (bō′ sn), *n.* a petty officer of a ship.

bob (bob), *n.* a jerky movement; a float on a fishline; a short haircut for a woman.

bob (bob), *v.i. and v.t.* to move up and down jerkily; to cut short.

bobbin (bob′ in), *n.* the spool that holds the thread in a sewing machine.

bobolink (bob′ o lingk), *n.* an American songbird.

bobsled (bob′ sled), *n.* a short sled joined to another by a long plank; the conveyance thus formed.

bob tail (bob′ tāl), *adj.* having the tail cut short.

bode (bōd), *v.i. and v.t.* to portend, foreshow by signs.

bodice (bod′ īs), *n,* a close-fitting waist.

bodkin (bod′ kin), *n.* a pointed instrument for punching holes, as in cloth.

body (bod′ i), *n.* the physical structure of a human being or other animal; matter in a unit mass, as a heavenly *body,* a *body* of water; the main part, as the *body* of a car.

Syn. Carcass, clay, corpse, dust, form, frame, remains, system, trunk. *Body* denotes the structure considered as a whole; *form* looks upon it as a thing of shape and outline; *frame* regards it as supported by its framework; *system* views it as an assemblage of many related and harmonious organs. *Body form, frame* and *system* may be either dead or living, *clay* and *dust* are sometimes figuratively so used, *corpse* and *remains* are used only of the dead, *carcass* applies only to the *body* of an animal.

Ant. Mind, soul, spirit.

bog (bog), *n.* a stretch of wet, spongy ground.

bog (bog), *v.i. and v.t.* to sink or cause to stick in a bog.

bogus (bō′ gus), *adj.* false.

bohemian (bō hē' mi an), *n.* a person of free and easy life, generally literary or artistic.

***boil** (boil), *n.* the state of boiling, as to bring to a *boil;* an inflamed, festering sore on the skin.

boil (boil), *v.i. and v.t.* to bubble with heat; to be agitated, as with anger; to cook in boiling water.

boiler (boil' er), *n.* a vessel in which water is boiled for cooking or washing; a tank in which water is boiled to make steam for heating.

boisterous (bois' tẽr us), *adj.* noisy, rough.

bold (bōld), *adj.* venturesome; prominent, as a head land; impudent; requiring or evincing daring, as a *bold* deed.

Syn. Fearless, intrepid, undaunted. *Boldness* is a positive characteristic of the spirit; *fearlessness* is a negative state of the mind, that is, simply an absence of fear. A person may be *bold* through *fearlessness,* but he may be *fearless* without being *bold;* he may be *fearless* where there is no apprehension of danger or no cause for apprehension, but he is *bold* only when he is conscious or apprehensive of danger, and prepared to encounter it. A man is *intrepid* who has no fear where the most *fearless* might tremble; he is *undaunted* whose spirit is unabated by that which would make the stoutest heart yield.

Ant. Cowardly, dastardly, fearful.

bold face (bōld' fās'), *n.* a printing type with heavy black lines.

bole (bōl), *n.* the trunk of a tree.

***boll** (bōl), *n.* a round pod or capsule of a plant containing seeds, as of cotton.

***boll weevil** (bōl wē' vl), an insect pest that feeds on cotton bolls.

bologna (bō-lō' nya), *n.* a type of sausage.

bolster (bōl' stẽr), *n.* a long pillow.

bolster (bol' stẽr), *v.t.* to prop up.

bolt (bōlt), *n.* a sliding bar to fasten a door; a metal pin, generally threaded at one end, to hold a nut for fastening metal parts together; a discharge of lightning; a sudden break into speed; a roll of cloth.

bolt (bōlt), *v.i. and v.t.* to fasten with a bolt; to run away; to swallow food fast without chewing; to sift flour from bran.

***bomb** (bom), *n.* a hollow shell filled with explosive, set off by a time fuse or by impact from being hurled.

bombard (bom' bärd), *v.t.* to attack with cannon fire.

***bombast** (bom' bast), *n.* pompous, extravagant talk.

bomber (bom' ẽr), *n.* an aircraft used to drop bombs.

bona fide (bō' n*a* fī' dē), in good faith.

bonanza (bō nan' z*a*), *n.* a rich strike of ore, especially silver; any lucky strike.

bond (bond), *n.* anything that binds; a pledge under seal by which one binds himself to an obligation; an interest-bearing certificate of debt issued by a corporation or government; *bonds,* fetters.

bondage (bon' dij), *n.* slavery; any enforced subjugation.

bondsman (bondz' man), *n.* one who binds himself as security for another.

bone (bōn), *n.* one of the pieces of an animal's skeleton, the framework of the body; something made of bone, as dice.

bone (bōn), *v.t.* to take the bones from; to put bones in, as a corset.

bonfire (bon' fīr), *n.* a fire built in the open.

bonnet (bon' et), *n.* a piece of headgear for women and children, generally brimless and having strings.

bonus (bō' nus), *n.* a sum paid in excess of what is actually due for service rendered.

booby (bo͞o' bi), *n.* a dunce; stupid person.

book (book), *n.* blank, written or printed sheets of paper bound together inside a cover; a volume containing a literary or musical composition or a series of compositions.

bookish (book' ish), *adj.* fond of reading; pedantic.

bookkeeping (book' kēp ing), *n.* the business of making accurate records of transactions.

bookworm (book' wûrm), *n.* an insect larva that eats holes in books; a person devoted to study.

boom (bo͞om), *n.* a deep, reverberating sound; a spar at the bottom of a fore-and-aft sail; a string of floating logs; a sudden outburst of business activity and prosperity.

***boomerang** (boom' ẽr ang), *n.* a native Australian wooden club, curved or angled, that can be hurled so that it will return to the thrower; anything that turns against the originator.

boon (bo͞on), *n.* a gift; favor; great benefit.

boon (bo͞on), *adj.* convivial, cheerful, merry.

boor (boor), *n.* a rough, rustic person.

boost (bo͞ost), *v.t.* to push or lift from underneath; to raise, as prices.

boot (bo͞ot), *n.* high-topped footgear, covering the calf of the leg and sometimes the thighs; something additional, offered as an inducement to a buyer or trader as *to boot.*

***booth** (bo͞oth), *n.* a rough house or shelter; a stall, as a telephone *booth,* a sound *booth.*

bootleg (bo͞ot' leg), *v.i. and v.t.* to make, transport or sell liquor illegally.

booty (bo͞o' ti), *n.* plunder, especially supplies taken from an enemy.

boracic (bō ras' ik), *adj.* of or containing boron.

boracic acid, boric acid.

***borax** (bō' raks), *n.* a salt compounded of sodium, boron and oxygen.

border (bôr' dẽr), *n.* an edge; boundary; a strip along the edge, as of a garden.

border (bôr' dẽr), *v.t. and v.i.* to put a border on; to lie along the edge or boundary of.

bore (bōr), *n.* a hole made by boring; a long tunnel or tube; a tiresome person or thing.

bore (bōr), *v.t.* to make a hole through; to weary others by dullness.

boric acid, any acid obtained from boron trioxide, used as an antiseptic: also called *boracic acid.*

born (bôrn), *adj.* brought into life by birth or as if by birth; naturally gifted, as a *born* horseman, a *born* singer.

***boron** (bō' ron), *n.* a nonmetallic element occurring in borax.

borough (bûr' ō), *n.* an incorporated town; a separately organized unit in a city.

***borrow** (bor' ō), *v.t.* to procure in the form of a loan with promise of return to the owner.

***bosom** (booz' um), *n.* the breast; the part of a garment that covers the breast.

bosom (booz' um), *adj.* cherished, intimate.

boss (bos), *n.* a circular knob; a superintendent; foreman; one who gives orders.

botany (bot' *a* ni), *n.* the science of plants, dealing with their structure, growth and varieties.

botch (boch), *v.t.* to mend or patch in a clumsy manner, to bungle or mar.

both (bōth), *pron. and adj.* each of two.

bother (bo*th*' ẽr), *n.* fuss, annoyance, inconvenience.

bother (bo*th*' ẽr), *v.i. and v.t.* to concern oneself; pester, tease, annoy.

bothersome (bo*th*' ẽr sum), *adj.* annoying, troublesome.

bottle (bot'l), *n.* a glass container for liquids, with a neck and closed with a cork.

bottom (bot' um), *n.* the lowest part; the earth under a body of water.

bottoms (bot' umz), *n.* low land along a river; bottomlands.

***boudoir** (bo͞o' dwär), *n.* a small room elegantly furnished for a lady's use.

bough (bou), *n.* a branch of a tree.

***bouillon** (bo͞o yong'), *n.* beef tea; any clear soup made by boiling and straining stock.

boulder (bōl' dẽr), *n.* a big stone worn by the action of water or weather.

***boulevard** (bo͞o' le värd), *n.* a wide avenue in a city, usually lined with trees; a wide, main highway.

bounce (bouns), *n.* a rebound, as of a ball striking some hard surface when thrown or dropped.

bound (bound), *v.t.* to limit; to enclose in boundaries.

bound (bound), *n.* a limit; boundary.

bound (bound), *v.i.* to leap easily, spring.

bound (bound), *adj.* determined; headed for, destined.

boundary (boun' d*a* ri), *n.* the limiting line about a surface.

boundless (bound' les), *adj.* unlimited.

bounteous (boun' tē us), *adj.* giving generously; plenteous.

bounty (boun' ti), *n.* liberality in bestowing gifts; a grant from a government to encourage business.

***bouquet** (bo͞o kā'), *n.* a bunch of flowers; the aroma of wine.

***bourgeois** (boor zhwä'), *n.* in France, a citizen of the mercantile class; in printing, a size of type.

bourgeois (boor zhwä'), *adj.* pertaining to the middle class.

***bourgeoisie** (bo͞or zhwȧ zē'), *n.* the middle class.

***bourse** (boors), *n.* an exchange; money market.

bout (bout), *n.* a contest, as in boxing.

***bovine** (bō' vīn), *adj.* pertaining to the ox or cattle in general.

bow (bou), *n.* a forward and downward movement of the head and shoulders; the forward part of a boat or ship.

bow (bō), *n.* a bend or curve; something curved; a weapon for shooting arrows; a looped knot, as of ribbon; the staff, strung with horsehair, used in playing the violin.

bowel (bou' el), *n.* an intestine.

bower (bou' ẽr), *n.* a shady shelter; arbor; an anchor carried at the bow of a ship.

***bowie** (bo͞o' i), *n.* a long strong knife for cutting and stabbing.

bowl (bōl), *n.* a circular vessel, bigger than a cup, of wood, china or other material and generally without handles, for holding liquids, much used in kitchen work; the ball used in bowling.

bowl (bōl), *v.i. and v.t.* to hit with a rolling ball; to take part in a game of bowling; to roll the ball down an alley or over a bowling green.

bowling (bōl' ing), *n.* a game played on a wooden alley or a smooth bit of turf in which the object is to knock over wooden pins.

***bowsprit** (bou' sprit), *n.* a spar running out from the stem of a sailingship, to which rigging is attached.

box (boks), *n.* a case, generally of wood or metal, for holding things; a compartment in a theater; a little wooden house in which a sentry finds shelter; the oblong space in which a baseball pitcher, batter or coach stands; a slap on the ear; a small evergreen shrub used in making hedges.

box (boks), *v.i. and v.t.* to place in a box; to spar.

boy (boi), *n.* a male child.

***boycott** (boi' kot), *v.t.* to refuse to buy goods from or trade with.

brace (brās), *n.* a support; a pair; a handle for a boring tool.

brace (brās), *v.t.* to furnish with supports; to strengthen.

bracelet (brās' let), *n.* an ornamental band or chain worn on the wrist.

bracing (brās' ing), *adj.* invigorating, stimulating.

bracket (brak' et), *n.* a projecting piece to support something, as a shelf; a square-cornered parenthesis mark.

bracket (brak' et), *v.t.* to enclose in brackets; to pair.

brackish (brak' ish), *adj.* salty, as water.

brad (brad) *n.* a thin nail with a very small head.

brag (brag), *v.i.* to boast.

braggart (brag' ẽrt), *n.* a boaster.

braid (brād), *n.* a narrow strip or plaited band used for trimming or edging on fabrics or garments.

brain (brān), *n.* the nerve tissue within the skull; *brains,* intelligence.

***braise** (brāz), *v.t.* to stew meat in a covered pan.

brake (brāk), *n.* a device for curbing the speed of a moving vehicle or slowing down a machine; a thicket; an instrument for separating the fiber of flax or hemp from the stem.

bramble (bram′ bl), *n.* the English blackberry bush; any tangle of prickly vines or bushes.

bran (bran), *n.* the coarse husks of grain separated from the flour by bolting.

branch (branch), *n.* a limb of a tree; any offshoot from a main stem, as the *branch* of a stream, a family, or a bank.

brand (brand), *n.* a burning piece of wood; a trademark; a certain make of anything; an identifying mark burned in, as the *brand* of the ranch was Cross and Star.

brand (brand), *v.t.* to put a trademark on; to mark with a hot iron, as range cattle; to mark, as to *brand* one as a traitor.

brandish (bran′ dish), *v.t.* to wave or flourish, as a flag or a club.

brandy (bran′ di), *n.* an ardent alcoholic liquor distilled from wine.

brass (bras), *n.* an alloy of copper and zinc.

***bravado** (br*a* vä′ dō), *n.* make-believe courage; defiance.

brave (brāv), *n.* a North American Indian warrior.

brave (brāv), *adj.* courageous, daring, valiant, dauntless.

bravery (brāv′ ẽr i), *n.* courage, intrepidity, fortitude.

Syn. Courage, boldness, gallantry, valor, heroism. *Courage* is a general term implying fearlessness in the presence of danger; *bravery* implies daring and defiance often in spite of fear. *Boldness* is the opposite of timidity; gallantry is spectacular, adventurous *courage; valor* is the lack of personal caution in the presence of danger; *heroism* is completely selfless and implies a scorn of danger inspired by devotion.

Ant. Cowardice, fear.

***bravo** (brä′ vō), *interj.* well done!

brawl (brôl), *n.* a disorderly quarrel; a small riot.

brawl (brôl), *v.i.* to quarrel noisily and violently.

brawn (brôn), *n.* muscle, strength; boar's flesh.

brawny (brôn′ i), *adj.* big and strong, husky.

bray (brā), *v.i. and v.t.* to beat or pound fine and small; to utter a harsh cry, as of a jackass or make a noise resembling it.

braze (brāz), *v.t.* to cover with brass; solder with brass.

brazen (brā′ zn), *v.t.* to face a situation or meet a charge with impudent swagger.

brazen (brā′ zn), *adj.* made of brass or resembling brass; impudent, shameless.

brazier (brā′ zhẽr), *n.* a pan in which charcoal is burned.

breach (brēch), *n.* a break, as in a wall; violation of a law, contract or other agreement, as a *breach* of faith.

Syn. Cleft, chasm, gap; infringement; quarrel, dispute.

breach (brēch), *v.t.* to break an opening through, as a wall.

bread (bred), *n.* a staple food made from ground grain, especially wheat or rye flour.

bread (bred), *v.t.* to cover, as a chop or cutlet, with bread crumbs before cooking.

bread line (bred līn), a line of persons to whom food is given in charity.

breadstuff (bred′ stuf), *n.* any grain, flour or meal from which bread is made.

breadth (bredth), *n.* distance across, from side to side; width; liberality of thought.

break (brāk), *n.* a breach; rupture; interruption; a sudden drop in prices, as in the stock market; a lucky change in the tide of battle, as a *break* in a ball game; an untimely remark or action, as to make a bad *break.*

break (brāk), *v.i. and v.t.* to separate with violence; to fail to honor, as a law or a promise; to tame or train, as a horse or dog; to begin suddenly, as a storm.

Syn. Burst, crack, split. To *break* does not specify any particular manner or form of action; what is *broken* may be *broken* in two or more pieces, *broken* short or lengthwise, and the like; to *burst* is to break suddenly and with violence, frequently also with noise. To *crack* and *split* are modes of breaking lengthwise, the former in application to hard or brittle objects, as clay, or the things made of clay; the latter in application to wood. [See *breach.*]

Ant. Attach, bind, join, mend, unite.

breakage (brāk′ ij), *n.* loss due to breaking.

breakdown (brāk′ doun), *n.* a collapse; failure.

breaker (brāk′ ẽr), *n.* a wave that breaks on a beach; anything that breaks things up.

breakfast (brek′ fast), *n.* the first meal of the day, breaking the night's fast.

breakneck (brāk′ nek), *adj.* involving danger of a broken neck, as *breakneck* speed.

breakwater (brāk′ wô tẽr), *n.* a structure protecting a shore or harbor from the pounding of waves.

breast (brest), *n.* the fore part of the human body, between neck and abdomen; a gland in women that secretes milk for the young.

breastplate (brest′ plāt), *n.* that part of a suit of armor which covers the upper front section of the body.

breastwork (brest′ wûrk), *n.* a low defensive wall of earth or stone, often temporary.

breath (breth), *n.* air drawn into the lungs and expelled.

breathe (brē*th*), *v.i. and v.t.* to inhale and exhale; to let out, as a secret: don't *breathe* it to anyone.

breathless (breth′ les), *adj.* out of breath, as from exercise or emotion; lifeless.

***breech** (brēch), *n.* the buttocks; the hind end of anything; the rear end of the barrel of a gun or bore of a cannon, of which the other end is the muzzle.

***breeches** (brich′ ez), *n.* trousers, a garment worn by men, covering the legs and hips.

breeching (brich′ ing), *n.* the heavy strap in a harness that passes over the hindquarters of a horse, enabling it to hold back the vehicle to which it is hitched.

breechloader (brēch′ lōd′ ẽr), *n.* a gun loaded at the breech, not the muzzle.

breed (brēd), *n.* a race or strain of animals or fowl.

breed (brēd), *v.i. and v.t.* [*p.t.* and *p.p.* bred, *p.pr.* breeding] to engender or produce young, as rabbits *breed* fast; to raise, as he *breeds* white Leghorns; to bring up, train, foster, as a well-*bred* child.

breeding (brēd′ ing), *n.* the raising of plants or animals; bringing up, education; knowledge of or training in the social niceties.

breeze (brēz), *n.* a gentle wind; waste ashes and coke dust, used in baking brick.

breezy (brēz′ i), *adj.* moderately windy; lively in manner.

breve (brēv), *n.* the mark over a vowel used to indicate a short sound; a note equal to two whole notes, or the sign indicating that the note is to be thus prolonged.

***brevet** (bre vet′), *n.* an advancement in rank in the army without change of duties or increase in pay.

***breviary** (brē′ vi er i), *n.* a book containing the daily prayers of the Roman Catholic Church.

brevity (brev′ i ti), *n.* shortness of time; conciseness of speech.

brew (brōō), *n.* the action, process or product of brewing.

brew (brōō), *v.i. and v.t.* to make liquors from malt; to make by infusion, as tea; to grow in force, as a storm is *brewing;* to bring about, as to *brew* mischief.

brewer (brōō′ ẽr), *n.* one whose business it is to make beer or ale.

brewery (brōō′ ẽr i), *n.* a building where beer or ale is made commercially.

bribe (brīb), *n.* money or other reward offered as inducement to betray a trust, as of public office.

bribery (brīb′ ẽr i), *n.* the giving or taking of money or gifts in return for betrayal of trust.

***bric-a-brac** (brik′ *a* brak′), *n.* small objects of art, in a collection; knickknacks.

brick (brik), *n.* a block of baked clay, used in building and paving; anything shaped like a brick.

brickkiln (brik kil′), *n.* a furnace in which brick is baked.

bricklayer (brik′ lā ẽr), *n.* one whose occupation is to pave or build with bricks.

bridal (brīd′ al), *n.* a wedding.

bridal (brīd′ al), *adj.* pertaining to a bride or to a wedding.

bride (brīd), *n.* a woman being or about to be married; one recently married.

bridegroom (brīd′ grōōm′), *n.* a man being or about to be married or one newly married.

bridesmaid (brīdz′ mād), *n.* a woman who acts as an attendant of the bride at a wedding.

bridge (brij), *n.* a structure that carries a roadway across a river, a railroad or another road; a structure above the deck of a ship for the navigating officer; any of various things resembling a bridge, as the arched part of the nose; certain games of cards, as *bridge* whist, auction *bridge.*

bridge (brij), *v.t.* to build a bridge over or across.

bridgehead (brij′ hed), *n.* a fortified position at the end of a bridge facing the enemy's position.

bridle (brī′ dl), *n.* the part of a horse's harness that fits on the head and to which the bit and reins are attached.

brief (brēf), *n.* a synopsis of a law case.

brief (brēf), *adj.* short; concise.

brief case (brēf kās), *n.* a flat leather bag in which loose papers are carried.

brier or **briar** (brī′ ẽr), *n.* a thorn; a thorny shrub; a smoking pipe made from brier root.

brig (brig), *n.* a sailing vessel with two square-rigged masts.

brigade (bri gād′), *n.* a military unit composed of a headquarters and two to four regiments, itself a unit in a corps or division.

***brigadier** (brig *a* dēr′), *n.* an officer commanding a brigade, a brigadier general.

***brigand** (brig′ and), *n.* a bandit, especially one who travels in bands.

***brigantine** (brig′ an tēn), *n.* a two-masted sailing vessel, square-rigged on the foremast and mainmast, except for a fore-and-aft mainsail.

bright (brīt), *adj.* shining, sunny, as a *bright* day; lively, gay; clever, as a *bright* child.

brighten (brīt′ n), *v.i. and v.t.* to grow bright; to make bright.

brilliant (bril′ yant), *adj.* sparkling; witty; talented.

brilliant (bril′ yant), *n.* a small size of type; a gem cut with many facets so as to bring out its sparkle.

brim (brim), *n.* the rim of a cup; the flat rim of a hat; the edge of anything.

brim (brim), *v.i. and v.t.* to fill or be filled to the brim.

brimstone (brim′ stōn), *n.* sulphur.

brindled (brin′ dld), *adj.* streaked with black or brown against a tawny background.

brine (brīn), *n.* the salt water of the sea; water strongly salted, for use in pickling.

bring (bring), *v.t.* [*p.t.* and *p.p.* brought, *p.pr.* bringing], to come, convey (a person or thing) from one place to another by carrying or leading, as *bring* me a book, *bring* Tom to the party; to persuade, as your plea *brought* him to relent; to sell for, as a rare object *brings* a high price; to cause, as wrongdoing *brings* grief; to win or attract, as an orator *brings* cheers from the crowd.

Syn. Fetch. To *bring* usually indicates to come or carry with; to *fetch* implies to go and get and come back with.

brink (bringk), *n.* the edge, margin, brim, the very edge.

brisk (brisk), *adj.* lively, active, swift, vivacious.

brisket (bris′ ket), *n.* that part of an animal's breast where the ribs join the breastbone; meat from that part.

***bristle** (bris′ l), *n.* a short, stiff, coarse hair, especially of swine; such a hair used in a brush.

bristle (bris′ l), *v.i. and v.t.* to cause to stand up like bristles; to furnish with bristles; to show anger, as if by raising bristles.

***Bristolboard** (bris′ tl bōrd), *n.* a thick, smooth, white pasteboard.

brittle (brit′ l), *adj.* easily broken, as by snapping.

broach (brōch), *n.* a boring tool; reamer.

broach (brōch), *v.t.* to make public; to bring up for discussion; to open a keg of wine.

broad (brôd), *adj.* wide; spacious, as the *broad* heavens; coarse, as a joke; liberal, tolerant, as a *broad* view of something; clear, as *broad* daylight, a *broad* hint; said with the throat open, as the a in father is *broad* a.

broadcast (brôd′ kȧst), *n.* anything transmitted by radio, as news or a musical program.

broadcast (brôd′ kȧst), *v.t.* to send by radio over the air, as news or programs.

broadcloth (brôd′ klôth), *n.* a fine woolen, cotton or silk cloth with a smooth-finished surface.

broaden (brôd′ n), *v.t.* to make broad or comprehensive.

broad jump (brôd jump), a jump for distance, not height.

broadside (brôd′ sīd), *n.* a volley from all the guns on one side of a ship; a large sheet of paper with print on one side only.

broadsword (brôd′ sōrd), *n.* a cutting sword with a wide blade.

brocade (brō kād′), *n.* a silk fabric with raised figures.

***brochure** (brō shūr′), *n.* a pamphlet.

***brogue** (brōg), *n.* a dialect of English, especially with an Irish pronunciation; a heavy shoe.

broil (broil), *n.* a noisy quarrel; a brawl.

broil (broil), *v.t.* to cook on a gridiron.

broken (brō′ ken), *adj.* in pieces, fractured; of language, incorrectly spoken; of land, hilly; of ground, plowed; of health, impaired; of a promise, not kept.

broker (brō′ kẽr), *n.* one whose business it is to buy for another, on commission, as a stock *broker*, real estate *broker*.

brokerage (brō′ kẽr ij), *n.* the business of a broker; his percentage on a transaction.

bromic acid (brō′ mik as′ id), *n.* a compound of bromine and oxygen.

***bromide** (brō′ mīd), *n.* a compound of bromine, used to induce sleep.

***bromine** (brō′ mēn), *n.* a nonmetallic element.

bronchi (brong′ kī), *n. pl.* the two main tubes branching off from the windpipe.

bronchia (brong′ ki *a*), *n. pl.* the lesser tubes into which the bronchi divide.

bronchial tubes (brong′ ki *a*l tūbz), the tubes that carry air from the windpipe to the lungs.

***bronchitis** (brong kī′ tis), *n.* inflammation of the bronchial tubes.

broncho (brong′ kō), *n.* a small, hardy horse widely used in herding cattle.

bronze (bronz), *n.* an alloy of copper and tin; a statue or medal made of that metal.

***brooch** (brōch), *n.* an ornamental dress clasp; breastpin.

brood (bro͞od), *n.* the young birds hatched at one time; one mother's offspring.

brood (bro͞od), *v.i. and v.t.* to sit on eggs or hover over young birds, as the mother bird does, covering them with her wings; to incubate or hatch, as eggs; to dwell upon, sorrowfully or with regret.

brook (brook), *n.* a small stream.

brook (brook), *v.t.* to put up with, stand for.

***broom** (bro͞om), *n.* a brush with a long handle used in sweeping; a flowering shrub.

broomstick (bro͞om′ stik), *n.* a broom handle.

broth (brôth), *n.* a thin soup.

brother (br*uth*′ ẽr), *n.* a male person having the same parents as another.

brotherhood (br*uth*′ ẽr hood), *n.* the state of being a brother; a group or society of men united by some common interest; a fraternity.

brother-in-law (br*uth*′ ẽr in lô), *n.* the brother of one's husband or wife; the husband of one's sister.

brow (brou′), *n.* the arch of hair over the eye; edge of a cliff or hill.

browbeat (brou′ bēt), *v.t.* [*p.t.* browbeat, *p.p.* browbeaten, *pr.p.* browbeating], to bully.

brown (broun), *n.* a dark color, which may lean toward red or yellow.

brown (broun), *v.i. and v.t.* to become brown; make brown.

brown (broun), *adj.* having brown coloring.

browse (brouz), *v.i.* to graze; to read at random.

bruin (bro͞o′ in), *n.* a bear.

bruise (bro͞oz), *n.* a flesh injury; contusion.

bruise (bro͞oz), *v.t.* to inflict a hurt upon without breaking the skin or surface.

bruit (bro͞ot), *v.t.* to noise abroad, start rumors.

brunet or **brunette** (bro͞o net′), *adj.* having a dark complexion and dark hair and eyes.

brunt (brunt), *n.* the shock of an onslaught; the heaviest or hardest part, as the *brunt* of battle.

brush (brush), *n.* a bristled implement for cleaning clothes, furniture, for shining shoes and stoves or for applying paint; undergrowth in the woods; a fox's tail; a collection of thin plates or rods of metal that connect with a commutator, collector or slip ring and conduct electric current.

brush (brush), *v.t.* to go over an object with a brush, to clean it, apply paint or smooth it.

brush discharge (brush dis chärj′), a luminous electrical discharge from a highly charged conductor, looking somewhat like a brush.

***brusque** (brusk), *adj.* blunt, brisk, abrupt in manner.

brutal (bro͞o′ tal), *adj.* like a brute, savage, cruel.

brutality (bro͞o tal′ i ti), *n.* cruelty; a cruel act.

brute (bro͞ot), *n.* any animal; not a human being; a person who acts without reason; a cruel person.

brutish (bro͞o′ tish), *adj.* like a brute, stupid, gross.

bubble (bub′ l), *n.* a small globule filled with air or gas in a liquid; anything unreal or delusive.

bubble (bub′ l), *v.i.* to form bubbles, foam.

***buccaneer** (buk *a* nẽr′), *n.* a pirate.

buck (buk), *n.* the male of the deer, goat or rabbit; a gay fellow; a support for wood to be sawed; a sudden spring of a horse from the ground in trying to throw off a rider; in football, a short, sharp play straight at the opposing line.

buck (buk), *v.i. and v.t.* to leap suddenly into the air, as a horse in trying to dismount a rider; to aim a play straight at the opposing line in football.

buckboard (buk′ bōrd), *n.* a light four-wheeled wagon with long limber boards set on the axles instead of springs.

bucket (buk′ et), *n.* a pail; the scoop of a dredging machine; as much as a bucket will hold, as a *bucket* of water.

buckeye (buk′ ī), *n.* a tree related to the horsechestnut tree.

buckle (buk′ l), *n.* a metal clasp, as on a belt, with a movable tongue or catch; a bend or warp.

buckle (buk′ l), *v.i. and v.t.* to fasten with a buckle; to apply oneself to work; to become bent or warped; to sag, crumple.

buckler (buk′ lẽr), *n.* a round shield, generally of wood covered with leather.

***buckram** (buk′ ram), *n.* a coarse cotton or linen fabric stiffened with dressing, used in binding books.

bucksaw (buk′ sô), *n.* a saw set in a frame and worked with both hands.

buckshot (buk′ shot), *n.* shot of a large size used in hunting game.

buckwheat (buk′ hwēt), *n.* a plant cultivated for its seeds, which are ground into meal and used for food.

bud (bud), *n.* a little swelling on the stem of a plant or on a branch of a tree, which opens into leaf or flower.

budge (buj), *v.i. and v.t.* to move or cause to move from one's position.

budget (buj′ et), *n.* an estimated schedule for expenditure of money in proportion to income; a collection of news items.

budget (buj′ et), *v.t.* to make an itemized and proportioned plan for spending, as to *budget* one's income.

buff (buf), *n.* a soft, thick leather; its color, a brownish yellow; a stick covered with soft leather for polishing.

buff (buf), *v.t.* to polish with a buff.

buffalo (buf′ *a* lō), *n.* any of several wild oxen of India and Africa; the North American bison.

buffer (buf′ ẽr), *n.* any contrivance serving to deaden the shock when two bodies come violently together.

buffet (buf′ et), *n.* a blow with the open hand, a slap.

***buffet** (boo fā′), *n.* a sideboard; a counter for refreshments.

buffet (buf′ et), *v.t. and v.i.* to strike, fight; to strive as if by fighting, as to *buffet* one's way through life.

***buffoon** (bu fo͞on′), *n.* a clown; a professional jester.

buffoonery (bu foon′ ẽr i), *n.* clownish fooling; prank-playing.

bug (bug), *n.* loosely, any crawling insect; especially certain flat crawling insects with sucking mouths, as bedbugs or lice.

buggy (bug′ i), *n.* a light four-wheeled carriage.

bugle (bū′ gl), *n.* a military wind instrument; a huntsman's horn.

build (bild), *v.i. and v.t.* [*p.t.* and *p.p.* built, builded, *p.pr.* building] to construct; to form by putting parts and materials together according to a plan; to be a builder.

building (bild′ ing), *n.* the act or business of constructing; a structure; edifice, as a house, office *building*.

building and loan association, an organization that sells shares to members as an investment or to finance the building of homes.

bulb (bulb), *n.* a thick root formed of layers of thick leaflike pieces, from which grow plants like the onion, dahlia or lily; anything shaped like a bulb, as an electric light bulb.

bulbous (bulb′ us), *adj.* shaped like a bulb, as a *bulbous* tumor; growing from a bulb, as certain plants.

bulge (bulj), *n.* an outward swell as in the side of a keg or ship.

bulge (bulj), *v.i.* to swell outward.

bulk (bulk), *n.* volume; cubic size; the main mass of an object.

bulkhead (bulk′ hed), *n.* a partition, in a ship, separating spaces, as watertight compartments; in mining, a wall to hold back water or landslides.

bulky (bul′ ki), *adj.* big, massive.

bull (bool), *n.* the male of any kind of cattle; a dealer in stocks who rides with a rising market; a papal decree bearing a leaden seal, the bulla; a ludicrous inconsistency in language.

bullet (bool′ et), *n.* a lead ball fired from a gun.

bulletin (bool′ e tin), *n.* an official report; a pamphlet published periodically reporting the activities of a society; a brief statement issued to the public, as by doctors reporting on the illness of a prominent person.

bullfinch (bool′ finch), *n.* a songbird.

***bullion** (bool′ yun), *n.* gold or silver to be coined.

bullock (bool′ uk), *n.* an ox or steer.

bull's-eye (boolz′ ī), *n.* the center of a target; a shot that hits it.

bully (bool′ i), *n.* a cowardly brow beating ruffian.

bully (bool′ i), *v.t.* to threaten and torment a weaker person.

bulrush (bool′ rush), *n.* a tall waterside weed.

***bulwark** (bool′ wẽrk), *n.* a rampart; the side of a ship projecting above the deck.

bumblebee (bum′ bl bē), *n.* a big bee that hums as it flies.

bump (bump), *n.* a collision; a swelling caused by a blow.

bump (bump), *v.t. and v.i.* to hit against something, collide with or cause to collide, as to *bump* one's head, two cars *bump*.

bumper (bump′ ẽr), *n.* something to absorb the shock of a bump, as on an automobile.

bumpy (bump′ i), *adj.* characterized by bumps; causing jerks or jolts, as a *bumpy* road.

bun (bun), *n.* a small sweet cake, sometimes with icing or with nuts or raisins mixed in the dough, and often spiced.

bunch (bunch), *n.* a group or collection of like things collected as a new unit, as a *bunch* of flowers, a *bunch* of grapes.

***buncombe** or **bunkum** (bung' kum), *n.* idle or showy speech; empty promises of a politician seeking votes.

bundle (bun' dl), *n.* a number of things bound together; a roll or package.

bundle (bun' dl), *v.t.* to put together or tie in a bundle.

bung (bung), *n.* a wooden stopper for the hole in a keg.

bungalow (bung' *ga* lō), *n.* a one-story cottage.

bungle (bung' gl), *v.i. and v.t.* to do clumsily; botch.

bunion (bun' yun), *n.* a sore swelling at the base of the big toe.

bunk (bungk), *n.* a bed built against a wall; a berth in a ship or car.

bunker (bungk' ẽr), *n.* a large stowing space, as for coal aboard ship.

bunt (bunt), *n.* a grain fungus; in baseball, a ball hit lightly, inside the diamond.

bunt (bunt), *v.t. and v.i.* to butt with horns, as a goat; to hit a ball lightly.

bunting (bunt' ing), *n.* a small bird of the finch family; a light woolen fabric used for flags.

***buoy** (bōō' i), *n.* a floating object moored in shallow water as a warning or guide to navigators.

buoy (bōō' i), *v.t.* to support, sustain: generally with *up*, as to *buoy* one up; to place buoys in a channel.

buoyancy (bōō' yan-si), *n.* ability to stay afloat; lightness on the water; elasticity of spirits.

bur (bûr), *n.* the rough, prickly seed case of certain weeds; a throaty rendering of the sound of *r*.

burden (bûr' dn), *n.* a heavy load; a weight of trouble.

burdensome (bûr' dn sum), *adj.* oppressive, heavy.

burdock (bûr' dok), *n.* a large, coarse weed with broad leaves and burlike flowers.

***bureau** (bū' rō), *n.* [*pl.* bureaus or bureaux] a chest of drawers in which light clothing is kept; a writing table with drawers; an office, as of a governmental unit or an agency.

***bureaucracy** (bū rok' *ra* si), *n.* a system of government with many subdivisions and a large staff of bureau chiefs.

burg (bûrg), *n.* a borough or an English town having Parliamentary representation.

burgess (bûr' jes), *n.* a member of a borough council; chief administrative officer of a borough.

burgher (bûr' gẽr), *n.* a citizen of a borough or burg.

***burglar** (bûr' glẽr), *n.* one who breaks in to rob.

burglary (bûr' gla ri), *n.* the crime of breaking into a building to rob or commit a felony.

Burgundy (bûr' gun di), *n.* a wine made in Burgundy, or a wine of the same type made elsewhere.

***burial** (ber' i al), *n.* the act of placing a body underground; interment.

burlap (bûr' lap), *n.* a coarse fabric of jute or hemp, used in making bags or wrapping bales.

***burlesque** (bûr lesk'), *n.* coarse or ridiculous caricature; a cheap, vulgar show.

burley (bûr' li), *n.* a kind of tobacco grown in Kentucky.

burn (bûrn), *n.* an injury caused by burning; Scotch word for brook or stream.

burn (bûrn), *v.i. and v.t.* [*p.t. and p.p.* burned or burnt, *pr.p* burning] to consume or injure, be consumed or injured, by fire; to be on fire; to set afire.

burner (bûrn' ẽr), *n.* the part of a lamp or gas jet where the flame emerges: *oil burner,* a furnace in which oil is used as fuel.

burnish (bûr' nish), *v.t.* to polish by friction.

burro (bûr' o), *n.* a small donkey.

burrow (bûr' ō), *n.* a hole or passageway dug in the ground by an animal, as a fox or rabbit, for shelter or to live in.

burrow (bûr' ō), *v.i. and v.t.* to make a burrow in; to dig a hole or passageway in the ground.

***bursar** (bûr' sẽr), *n.* the treasurer of a college; one who has charge of funds.

burst (bûrst), *n.* a sudden outburst or spurt of something, as a *burst* of applause or speed, a *burst* of flame.

burst (bûrst), *v.i. and v.t.* to break open with violence; yield to internal force or pressure.

***bury** (ber' i), *v.t.* to place in the ground.

bus (bus), *n.* [*pl.* busses or buses] a vehicle for public passenger transportation, usually a large automobile with seats on either side of a central aisle.

bush (boosh), *n.* a thick shrub; uncleared woodland.

bushel (boosh' el), *n.* a unit of dry measure; 4 pecks, 32 quarts.

bushing (boosh' ing), *n.* a removable metal lining to reduce friction.

business (biz' nes), *n.* employment; trade; profession; something to be transacted.

businesslike (biz' nes līk), *adj.* systematic, orderly.

buskin (bus' kin), *n.* a laced high boot worn by actors in old Greek tragedy.

bust (bust), *n.* the chest; the head, neck, shoulders and breast, represented in sculpture.

bustard (bus' tẽrd), *n.* a cranelike European game bird.

***bustle** (bus' l), *n.* haste; commotion, confused movement.

Syn. Tumult, uproar. *Bustle* has most of hurry in it; *tumult* most of disorder and confusion; *uproar* most of noise; the hurried movements of one or many cause a *bustle;* the disorderly struggles of many constitute a *tumult;* the loud elevation of many opposing voices produces an *uproar; uproar* is the consequence either of general anger or mirth.

Ant. Calm, peace, quiet.

busy (biz' i), *n.* actively employed.

busybody (biz' i bod' i), *n.* a meddling, officious person.

but (but) *prep.* except, as we are all here *but* Tom.

but (but) *conj.* on the contrary, yet, as willing *but* unable; that not, as not so sick *but* he can eat; except, as he would have drowned *but* for you; that, as there is no question *but* war will come.

but (but), *adv.* only, as *but* a child; to stay *but* a minute; no more or no less than, as she can *but* say no.

***butcher** (booch' ẽr), *n.* one who kills animals for food; one who sells meat.

butcher (booch' ẽr), *v.t.* to kill animals for food; to kill men brutally; to botch.

butchery (booch' ẽr i), *n.* the business of a butcher; wanton killing; slaughter.

butler (but' lẽr), *n.* a manservant who has charge of the dining room and is usually head of the house servants.

butt (but), *n.* a push with the head; the thick end, as of a rifle or billiard cue; a large cask; an embankment behind a target or a pit in front of a target to shelter those checking hits.

butt (but), *v.t.* to push with the head.

butte (būt), *n.* an abrupt isolated height in the midst of a level region.

butter (but' ẽr), *n.* a solid, fatty substance obtained from cream or milk by churning; anything having the texture of butter, as apple *butter,* peanut *butter.*

buttercup (but' ẽr kup), *n.* a plant with yellow flowers shaped something like a shallow cup.

butterfly (but' ẽr flī), *n.* an insect with wide, colored wings.

buttermilk (but' ẽr milk), *n.* the liquid remaining after the butter has been separated from the cream or milk in churning.

butternut (but' ẽr nut), *n.* the North American white walnut tree, bearing sweet, oily nuts.

buttery (but' ẽr i), *n.* a pantry.

button (but' n), *n.* a small disk used to fasten a garment.

button (but' n), *v.t.* to fasten with buttons.

buttonwood (but' n wood), *n.* the plane tree.

buttress (but' res), *n.* masonry or brickwork built against a wall to strengthen it; any support.

buttress (but' res), *v.t.* to supply with buttresses; to support, strengthen.

buxom (buk' sum), *n.* plump, healthy, jolly.

buy (bī), *v.t.* to purchase, get for a price; bribe, as to *buy* a lawyer.

buzz (buz), *v.i.* to make a continuous humming noise.

buzzard (buz' ẽrd), *n.* an American vulture.

buzz saw (buz sô), a circular saw.

by (bī), *prep.* near, alongside of, as a tree *by* a brook; along, through or over, as come *by* the lower road, travel *by* sea; not later than, as she will be here *by* noon; during, as work *by* day, sleep *by* night; through the means of, as cook *by* gas, cured *by* a new treatment; concerning, regarding, as to do right *by* a friend.

bylaw (bī lô), *n.* a secondary law or rule.

by-product (bī prod' ukt), *n.* an incidental product in manufacture.

byword (bī wûrd), *n.* a proverb, a word or phrase often used; an object of ridicule or derision.

C

cab (kab), *n.* a closed public vehicle; the covered space for the engineer in a locomotive.

***cabal** (*ka* bal'), *n.* a combination of persons for carrying out some secret design; intrigue.

cabalistic (kab' *a* lis' tik), *adj.* pertaining to the cabala, a secret Jewish doctrine.

***cabaret** (kab *a* rā'), *n.* a restaurant where customers are entertained with dancing and vaudeville acts.

cabbage (kab' ij), *n.* a vegetable plant with closely folded succulent leaves.

cabin (ka' bin), *n.* a small, rude house; a sleepingroom aboard ship for officers or passengers.

cabinet (kab' i net), *n.* a group of official advisers to a nation's chief executive; a piece of furniture with shelves and drawers.

cabinetmaker (kab' i net māk' ẽr), *n.* one whose occupation is the making of fine furniture.

cable (kā' bl), *n.* a large, strong rope or chain, for mooring ships, towing or hanging suspension bridges; an insulated bundle of wires enclosing an electric line; a cabled message, cablegram.

cable (kā' bl), *v.i. and v.t.* to send a message by cable or submarine telegraph.

cablegram (kā' bl gram), *n.* a message sent by submarine telegraph.

caboose (ka bōōs), *n.* a little car for trainmen's use, at the end of a freight train.

***cacao** (*ka* kä' ō), *n.* a tropical tree from the seeds of which cocoa and chocolate are made.

***cache** (kash), *n.* a hiding place for food and supplies for future use, used by explorers; anything hidden in such a place.

cackle (kak' l), *n.* the cry of a hen after laying an egg.

cactus (kak' tus), *n.* a fleshy desert plant with spines in place of leaves.

cad (kad), *n.* a vulgar, ill-bred fellow.

***cadaver** (*ka* dav' ẽr), *n.* a corpse.

cadaverous (*ka* dav' ẽr us), *adj.* resembling a corpse, pale, haggard.

caddie (kad' i), *n.* one who carries a golf player's clubs.

caddy (kad' i), *n.* a can in which tea is kept.

cadence (kā' dens), *n.* rhythm in music; the rise and fall of the human voice in speech.

cadet (*ka* det'), *n.* a student in a military school.

cafe (kȧ fā'), *n.* a coffeehouse or restaurant; a barroom.

cafeteria (caf e tēr' i *a*), *n.* a restaurant where patrons serve themselves.

cage (kāj), *n.* a structure with bars where birds or animals are kept.

cage (kāj), *v.t.* to shut up in a cage.

***cairn** (kârn), *n.* a heap of stones as a monument or landmark.

***caisson** (kā' sun), *n.* an ammunition wagon; a box in which workmen work under water.

caitiff (kā' tif), *n.* a base, despicable person.

*__cajole__ (k*a* jōl'), *v.t.* to coax or persuade with flattery.

cake (kāk), *n.* a small mass of dough, sweetened and baked on all surfaces; a small amount of batter or other materials fried on both sides, as pan*cakes*, fish*cakes*; any substance molded into small flattened form, as a *cake* of soap.

cake (kāk), *v.i. and v.t.* to form into a small, flattened mass.

*__calabash__ (kal' *a* bash), *n.* a large gourd.

calaboose (kal' *a* bōōs), *n.* a jail.

calamity (k*a* lam' i ti), *n.* a great misfortune, ruin.

Syn. Disaster. A *calamity* is a great misfortune with far-reaching personal or public consequences; a *disaster* is an unforeseen misfortune bringing ruin, sometimes but not always brought about through one's own fault.

*__calcimine__ (kal' si mīn), *n.* a white or colored wash for walls.

calcium (kal' si um), *n.* a soft white metal found combined with lime, marble, bone and other substances.

calculate (kal' cū lāt), *v.t.* to compute; to design or plan.

Syn. Reckon. To *calculate* denotes any numerical operation in general, but is particularly applicable to the abstract science of figures; the astronomer *calculates* the motions of the heavenly bodies; the mathematician makes algebraic *calculations;* to *reckon* is to enumerate and set down things in detail; tradesmen keep their accounts by *reckoning;* children learn to *reckon* by various simple processes. *Calculation* is therefore the science, *reckoning* the practical use of numbers.

calculation (kal cū lā shun), *n.* reckoning by numbers; computing.

*__caldron__ (kôl' drun), *n.* a kettle, boiler.

calendar (kal' en dẽr), *n.* a register of the days, weeks and months of the year.

calender (kal' en dẽr), *n.* a machine with rollers in which cloth or paper is pressed.

calender (kal' en dẽr), *v.t.* to press between rollers, as cloth or paper, to make smooth and glossy.

calf (käf), *n.* the young of cattle and certain other animals, as the elephant or whale.

caliber (kal' i bẽr), *n.* the diameter of a tube, especially of a gun barrel.

calico (kal' i kō), *n.* [*pl.* calicoes] cotton cloth with a design printed on one side.

calipers (kal' i pẽrz), *n.* compasses for measuring degrees on a circle.

*__caliph__ (kā' lif), *n.* a Mohammedan ruler; a sultan of Turkey.

*__calisthenics__ (kal is then' iks), *n.* physical exercises.

calk (kôk), *n.* the projecting piece at the ends of a horseshoe; a plate with projections on the sole of a shoe to prevent slipping on icy walks.

calk (kôk), *v.t.* to fill the seams of a boat with something like tarred hemp to make them watertight.

call (kôl), *n.* a cry for attention, a shout; a summons; a telephone ring; a formal visit.

call (kôl), *v.t. and v.i.* to summon, as to *call* someone to breakfast; to name, as *call* the pup Rover; to announce or command, as to *call* a meeting or a strike; to communicate with by telephone; to make formal demand for payment of, as to *call* a loan; to consider as, as we *call* it a daisy; to cry aloud or shout; to pay a short visit.

calling (kôl' ing), *n.* an occupation, profession; an invitation or summons.

*__callous__ (kal' us), *adj.* thickened and hardened, as skin; hard-hearted, indifferent to the sufferings of others.

callow (kal' ō), *adj.* of a bird, unfledged; of a person, young, inexperienced.

callus (kal' us), *n.* a growth of thick, hard, dry skin, as on the palms of the hand.

calm (käm), *n.* stillness; tranquillity.

calm (käm), *v.t.* to soothe; to pacify; to make still, peaceful, quiet.

calm (käm), *adj.* peaceful; quiet; undisturbed.

Syn. Tranquil, serene, placid. *Calm* refers usually to weather and means the opposite of *stormy,* hence the opposite of any kind of agitation; *tranquil* implies a calm that never is or was disturbed, as convent life is *tranquil; serene* denotes a calm too great to be discomposed, as a mind *serene* in spite of trouble; *placid* implies a contentment apparent in the appearance or temper, as a *placid* face, a *placid* remark.

*__calomel__ (kal' ō mel), *n.* a compound of chlorine and mercury used in medicine.

*__caloric__ (k*a* lor' ik), *adj.* relating to heat.

calorimeter (k*a* lo rim' ē tẽr), *n.* a heat-measuring device.

*__calorie__ (kal' ō ri), *n.* a unit for measuring the heat-value of food.

*__calumet__ (kal' ū met), *n.* the North American Indian peace pipe or ceremonial pipe.

calumniate (k*a* lum' ni āt), *v.t.* to bring false, malicious accusation against; to slander.

calumny (kal' um ni), *n.* slander.

calve (käv), *v.i.* to bring forth a calf.

*__calyx__ (kā' liks), *n.* the cuplike collection of sepals that sheathe the petals of a flower.

cam (kam), *n.* a projecting part on a wheel or shaft to govern the motion of a roller, pin or valve with which it comes in contact.

camber (kam' bẽr), *n.* a convex curving of an upper surface; a slight arching, as of timbers in a ship's deck or the wing of a plane.

cambric (kām' brik), *n.* a fine thin white linen, or a cotton imitation of it.

camel (kam' el), *n.* a large cud-chewing animal native to Asia and Africa, used as a beast of burden. The Arabian camel, or *dromedary,* has a one-humped back; the Bactrian camel has two humps on its back.

*__camellia__ (k*a* mel' ia), *n.* a tropical shrub with red or white flowers.

camelopard (k*a* mel' ō pärd), *n.* the giraffe.

cameo (kam' ē ō), *n.* a stone such as onyx or agate on which designs are carved in relief, for use as personal ornament in rings or brooches.

*__camera__ (kam' ẽr *a*), *n.* an apparatus for taking pictures by means of a lens through which rays of light pass to a sensitive plate or film inside a lightproof box.

camion (kȧ' myôn), *n.* a motor truck used to transport cannon.

camomile (kam' ō mīl), *n.* an herb of which the leaves are used in medicine.

camouflage (kam' oo fläzh), *n.* the art of concealing a military position or disguising a ship or airplane; pretense; false appearance.

camp (kamp), *n.* a group of tents or shelters for troops or hunters; the ground on which these shelters stand.

camp (kamp), *v.i.* to make or live in a camp; encamp.

campaign (kam pān'), *n.* a series of military operations with a single, final objective; a series of political speeches, meetings and appeals for votes preliminary to an election; a planned series of business operations for a stated purpose.

*__campanile__ (kam p*a* nē' lē), *n.* a bell tower.

camphor (kam' fẽr), *n.* the aromatic resin of an Asiatic evergreen.

camp meeting (kamp mēt ing), an outdoor religious gathering, generally extending over several days.

campus (kam' pus), *n.* the grounds of a school or college.

can (kan), *n.* a small, generally cylindrical metal container for liquids, as oil, milk, soup or for preserving solid foods, as meat.

can (kan), *auxiliary verb* [*p.t.* could], to be able or have the power to, as he *can* read, he *can* overcome difficulties.

canal (k*a* nal'), *n.* a made waterway for navigation or irrigation; any tube in an animal body through which food or fluids pass, as the alimentary *canal;* any channel.

canard (k*a* närd'), *n.* an absurd or false story or report intended to deceive the public.

canary (k*a* nâr' i), *n.* a yellow songbird; a light yellow color; wine from the Canary Islands.

cancel (kan' sel), *v.t.* to cross off, put a line through, as to *cancel* a word or passage of a composition; to nullify, as a legal document; to revoke or recall, as an order or meeting.

cancer (kan' sẽr), *n.* a malignant tumor.

*__candelabrum__ (kan de lä' brum), *n.* a branching candlestick.

candid (kan' did), *adj.* sincere, frank; unreserved, straightforward; unbiased, impartial.

Syn. Frank, open, plain. *Candid* refers specifically to a lack of prejudice or partiality; we can have *candid* friends, give a *candid* account of something or express a *candid* opinion. *Frank* refers to a lack of reserve in stating opinions or expressing feelings; *open* refers to a lack of concealment; *plain* describes a manner of speaking or a temperament free from affectation.

candidate (kan' di dāt), *n.* one who seeks office; one nominated for office; a contestant for any public honor.

candied (kan' did), *adj.* preserved in sugar; coated with sugar in cooking.

candle (kan' dl), *n.* a cylindrical piece of tallow or wax with a wick running through it that can be burned to give light.

candle (kan' dl), *v.t.* to test by the light of a candle, as eggs for freshness.

candle power (kan' dl pou' ẽr), illuminating power, measured with the light of one candle as the base unit.

candlestick (kan' dl stik), *n.* a holder for a candle, generally with a traylike base to catch the melted grease.

candor (kan' dẽr), *n.* fairness, impartiality; frankness, sincerity of speech.

candy (kan' di), *n.* confectionery; sweetmeats.

cane (kān), *n.* a walking stick; the stem of certain palms and grasses as rattan, sugar*cane* or bamboo.

canebrake (kān brāk), *n.* a thicket of cane.

cane sugar (kān shoog' ẽr), sugar made from cane, not beets.

*__canine__ (kā' nīn), *n.* a dog; a pointed tooth.

canine (kā' nīn), *adj.* of or pertaining to dogs or the dog family; like a dog.

canister (kan' is tẽr), *n.* a metal case holding tea or spice; a case filled with bullets, that breaks open when fired from a cannon.

*__canker__ (kang' kẽr), *n.* an ulcerous sore; a cankerworm.

canna (kan' *a*), *n.* a large-leaved plant with red or yellow flowers.

canned (kand), *adj.* preserved in sealed tins.

cannel coal (kan' el kōl), bituminous coal containing much gas and burning with a candlelike flame.

cannery (kan' ẽr i), *n.* an establishment where foods are canned.

cannibal (kan' i bal), *n.* a human being who eats human flesh.

cannon (kan' un), *n.* a piece of artillery; a large gun, mounted either on a fixed base or on wheels.

canny (kan' i), *adj.* knowing; shrewd, especially in practical matters.

canoe (k*a* nōō'), *n.* a small light boat propelled by paddles.

*__canon__ (kan' un), *n.* a rule or law, as of a church; a standard for judgment, as the *canons* of art; the authorized books of the Bible; a bishop's assistant.

canonize (kan' un īz), *v.t.* to enroll in the list of saints.

*__canopy__ (kan' o pi), *n.* a covering usually framed, over a bed or throne; an overhead shelter in front of buildings; any overhead covering, as, a *canopy* of stars.

cant (kant), *n.* hypocritical speech; the terms used by some particular group or class of people; a slope, as of a roof.

cant (kant), *v.t.* to cause to slope, as a roof.

*__cantaloupe__ (kan' t*a* lōp), *n.* a kind of musk melon, with an especially delicate flavor.

cantankerous (kan tang' kẽr us), *adj.* ill-natured; contentious.

*__cantata__ (kan tä' t*a*), *n.* a choral composition in dramatic form.

canteen (kan tēn'), *n.* a drinking flask used by troops on the march; a shop at a military post.

canter (kan' tẽr), *n.* an easy gallop.

cant hook (kant hook), a movable hook at the end of a long handle, used to turn over floating logs.

*__cantilever__ (kan' ti lē' vẽr), *n.* one of the long trusses used in building a cantilever bridge.

cantilever bridge (kan′ ti lē vẽr brij), a bridge built by running two long trusses out from piers till they meet and are joined to form the span.

cantle (kan′ tl), _n._ the raised part at the back of a saddle.

canto (kan′ to), _n._ a chief division of a long poem.

canton (kan′ ton), _n._ one of the districts into which Switzerland is divided; the rectangular section in a corner of a coat of arms or a flag.

Canton flannel (kan′ ton flan′ el), a strong cotton cloth with a long nap.

*__cantonment__ (kan ton′ ment), _n._ the quarters of troops in training, or of an army not in active service.

canvas (kan′ vas), _n._ a coarse, heavy cloth of hemp or flax, used for making tents, sails or awnings.

canvasback (kan′ vas bak), _n._ a North American wild duck.

canvass (kan′ vas), _n._ a call upon all persons of a certain district for votes or orders for goods.

canvass (kan′ vas), _v.i. and v.t._ to go through a district with some request to each person in it, as for votes.

canyon (kan′ yun), _n._ a deep gorge with almost perpendicular sides.

*__caoutchouc__ (kōō′ chook), _n._ the sap of certain tropical trees, as the rubber tree; raw rubber.

cap (kap), _n._ a covering, as for the head or a bottle; a pinch of gunpowder wrapped in paper; a size of paper.

cap (kap), _v.t._ to cover with a cap; to mark the peak of, as a column; to match or outdo, as to _cap_ the climax.

capable (kā′ pa bl), _adj._ having the power, skill or ability to do something.

capacious (ka pā′ shus), _adj._ roomy; spacious.

capacity (ka pas′ i ti), _n._ the power of receiving or containing; the amount that can be received or contained, content, as the _capacity_ of a barrel; mental ability, knowledge; position, as in the _capacity_ of manager.

*__caparison__ (ka par′ i sun), _n._ ornamental trappings, as for a horse.

cape (kāp), _n._ a headland; a covering for the shoulders.

caper (kā′ pẽr), _n._ to skip and leap about, like a goat.

caper (kā′ pẽr), _n._ a prancing leap, a skip; a prank, as to cut _capers._

*__capillary__ (kap′ i ler i), _n._ a very small blood vessel.

capillary (kap′ i ler i), _adj._ like a hair, slender.

capillary attraction (kap′ i ler i a trak′ shun), the power of a small tube to draw up fluids.

capital (kap′ i tal), _n._ a chief city, as the _capital_ of a state; principal for investment; a large letter used to begin a proper name or a sentence; the top of a pillar or column.

capital (kap′ i tal), _adj._ principal; excellent.

capitalism (kap′ i tal izm), _n._ a system of economics in which private ownership of resources is permitted, along with the right to transact business for personal profit: opposite of socialism.

capitalize (kap′ i tal īz), _v.t._ to start with a capital letter; to convert into capital or supply with capital.

capital levy (lev′ i), a tax on capital in addition to other taxes.

capital punishment (kap′ i tal pun′ ish ment), the death penalty for crime.

capitulate (ka pit′ ū lat), _v.i. and v.t._ to surrender on fixed terms.

capric acid (kap′ rik as′ id), a fatty acid occurring in butter or cocoanut oil, united with glycerine.

*__caprice__ (ka prēs′), _n._ a whim.

*__capricious__ (ka prish′ us), _adj._ ruled by whim.

capsicum (kap′ si cum), _n._ a pepper-producing plant.

capsize (kap sīz′), _v.i. and v.t._ to overturn, as a boat.

capstan (kap′ stan), _n._ an upright drum or cylinder worked by bars or levers, to raise an anchor or wind a cable.

capsule (kap′ sūl), _n._ a case enclosing a seed; a case made of gelatin enclosing a dose of medicine.

captain (kap′ tin), _n._ a commander or leader, as of an athletic team; an army officer ranking next below a major; the commanding officer of a ship.

caption (kap′ shun), _n._ a heading over an article, a chapter or other section of a book; subtitle in a movie.

captious (kap′ shus), _adj._ ready to criticize, find fault or take offense.

captivate (kap′ ti vāt), _v.t._ to charm, fascinate.

captive (kap′ tiv), _n._ one captured; a prisoner.

captive (kap′ tiv), _adj._ made prisoner; held in duress, as a _captive_ animal, a _captive_ balloon.

captivity (kap tiv′ i ti), _n._ the state of being held in bondage or confinement.

captor (kap′ tẽr), _n._ one who captures.

capture (kap′ tūr), _n._ the act of capturing; the thing or person captured.

capture (kap′ tūr), _v.t._ to take as a prisoner; to seize by force.

car (kär), _n._ any wheeled vehicle, as a carriage, railroad car or automobile.

caramel (kar′ a mel), _n._ burnt sugar, used in cooking for coloring and flavoring; candy made of sugar, butter and other ingredients.

carat (kar′ at), _n._ the unit of weight, 3.086 grains troy measure, used in weighing diamonds and other precious stones.

caravan (kar′ a van), _n._ a company of travellers, merchants or pilgrims, associated together for safety on the road.

*__caravansary__ (kar a van′ sa ri), _n._ an Eastern inn with a yard in which caravans may put up for the night.

caraway (kar′ a wā), _n._ a biennial plant with pleasantly flavored seeds, which are used for flavoring.

*__carbide__ (kär′ bīd), _n._ a compound of carbon with other elements, as _calcium carbide_ which is used in making acetylene gas.

carbohydrate (kär′ bō hī′ drāt), _n._ a compound of carbon with hydrogen and oxygen, such as sugar, starch, cellulose.

carbolic acid (kär bol ik as′ id), an acid obtained from coal tar by distillation, a poisonous antiseptic and a disinfectant.

carbon (kär′ bon), _n._ an elementary substance found in all organic compounds and in some minerals; an identical copy of written or typewritten matter made with carbon paper; a piece of hard carbon used in an electric arc light.

carbonic acid (kär bon′ ik as′ id), an acid composed of hydrogen, oxygen and carbon.

carbon monoxide (kär′ bon mon ok′ sīd), a colorless, odorless, deadly gas formed from incompletely consumed carbon and occurring in the exhaust of an automobile engine.

carbon paper (kär′ bon pā′ pẽr), paper treated with coloring matter that comes off under pressure on a second sheet, making an identical copy of written or typewritten matter.

carborundum (kär bō run′ dum), _n._ a certain compound of carbon with silicon, extremely hard, and used for sharpening edged tools.

carboy (kär′ boi), _n._ a large bottle, generally protected with an outside case as of wickerwork, for holding acids.

carbuncle (kär′ bung kl), _n._ a gem of deep red color; an inflamed sore of the skin and neighboring flesh, with pus.

*__carburetor__ (kär′ bū ret ẽr), _n._ a device for combining air with the vapor of liquid fuel to explode it, as in the engine of an automobile.

carcass (kär′ kas), _n._ the dead body of an animal.

card (kärd), _n._ a piece of pasteboard printed or engraved with the name and address of an individual or a business firm, with an invitation, greeting or picture, as a calling _card,_ a post card; one with symbols used in games of cards; a wire brush for cleaning wool, cotton or hair.

card (kärd), _v.t._ to comb and clean wool with a card.

cardiac (kär′ di ak), _adj._ having to do with the heart.

cardigan jacket (kär′ di gan jak′ et), a knitted wool jacket.

cardinal (kär′ di nal), _n._ a prince of the Roman Catholic Church next in rank and dignity to the Pope.

cardinal (kär′ di nal), _adj._ of chief importance; chief, as _cardinal numbers, cardinal points_ of the compass, _cardinal signs_ of the zodiac, _cardinal virtues._

cardinal bird (bûrd), an American crested songbird with brilliant red feathers.

cardinal flower (flou ẽr), an American lobelia with brilliant red flowers.

care (kâr), _n._ anxiety, concern, trouble or a cause of trouble; charge, oversight, as the _care_ of a child; caution, as take _care_ on the stairs.

care (kâr), _v.i._ to feel anxiety or concern; to look after; to be fond of; to mind, as he doesn't _care_ if he falls.

careen (ka rēn′), _v.i. and v.t._ to heel over, as a ship; to tip over on one side or incline, as to _careen_ a ship so as to scrape it.

career (ka rēr), _n._ a free course, full speed; a life's work and achievement; success in some certain profession.

carefree (kâr′ frē), _adj._ without responsibilities; happy.

careful (kâr′ fool), _adj._ acting with care; done with care.

Syn. Cautious, discreet, wary. _Careful_ means taking pains or being alert under any circumstances, not necessarily in the presence of danger; _cautious_ means being alert or on guard against danger; _wary_ implies expectation of danger; _discreet_ means careful in speech and conduct.

Ant. Careless, negligent.

careless (kâr′ les), _adj._ heedless; negligent.

caress (ka res′), _n._ an act or gesture of affection.

*__caret__ (kar′ et), _n._ a mark indicating omission.

cargo (kär′ gō), _n._ a ship's load of freight.

caribou (kar′ i bōō), _n._ the North American reindeer.

caricature (kar′ i ka tūr), _n._ a take-off; a drawing that exaggerates the characteristics of its subject.

*__caries__ (kā′ ri ēz), _n._ decay of a bone or tooth.

*__carillon__ (kar′ i lon), _n._ a set of bells, hung usually in a tower and operated either by hand or mechanically.

carilloneur (kar′ i lo nûr), _n._ one who plays a carillon.

carload lot (kär lōd lot), a shipment of goods amounting to the minimum number of tons officially required to obtain carload rates.

*__carminative__ (kär min′ a tiv), _n._ a medicine for colic.

*__carmine__ (kär′ min), _n._ a rich purplish red; the essential coloring principle of cochineal.

carnage (kär′ nij), _n._ slaughter.

Syn. Massacre. _Carnage_ usually refers to a heap of bloody, slaughtered bodies; _massacre_ is wholesale slaughter including the slaying of non-resistants.

carnation (kär nā′ shun), _n._ a variety of clove pink with spicy odor.

carnelian (kär nēl′ yan), _n._ a red gem.

carnival (kär′ ni val), _n._ a festival; riotous merry making.

*__carnivore__ (kär′ ni vor), _n._ an animal that eats flesh.

carnivorous (kär niv′ ō rus), _adj._ flesh-eating.

carol (kar′ ul), _n._ a song or hymn of joy or praise, as Christmas _carols._

*__carom__ (kar′ um), _n._ a shot in which the billiard cue ball hits two other balls; in other games, a shot that strikes its mark after hitting something else imposed as an obstacle.

carom (kar′ um), _v.i._ to rebound from one impact so as to make another which is desired; to rebound off an edge or obstacle.

*__carotid__ (ka rot′ id), _n._ one of the two principal arteries on either side of the neck.

carouse (ka rouz′), _v.i._ to engage in noisy revelry.

carp (kärp), _n._ a freshwater foodfish with coarse scales.

carp (kärp), _v.i._ to find fault; complain.

carpal (kär′ pal), _adj._ pertaining to the wrist.

carpenter (kär′ pen tẽr), *n.* one who works in wood.

carpet (kär′ pet), *n.* a heavy fabric used to cover floors, usually made in strips.

carpetbag (kär′ pet bag), *n.* a satchel made of carpeting.

carriage (kar′ ij), *n.* the act of carrying or transporting; a vehicle in which persons are carried; manner of carrying oneself, bearing.

carrier pigeon (kar′ i ẽr pij′ un), a homing pigeon, trained to carry messages.

carrion (kar′ i un), *n.* decayed or decaying flesh.

carron oil (kar′ un oil), linseed oil and limewater, used for healing burns.

carrot (kar′ ut), *n.* a plant with a reddish yellow root that is used as a vegetable; a reddish-yellow color.

*__carrousel__ (kar oo zel′), *n.* a merry-go-round.

carry (kar′ i), *v.t. and v.i.* to transport, convey by hand, in a vehicle or by any means, as to *carry* the baby upstairs, a train *carries* mail, the wind *carries* dust or sound, telegraph wires *carry* messages, letters *carry* news, *carry* the words in your head; to win, as our troops *carried* the day, Roosevelt *carried* the election; to support, as two piers *carry* the bridge; keep for sale, as drugstores *carry* soap; to wear or have with one, as to *carry* arms; to conduct or hold, as to *carry* oneself with dignity; to bear or convey, as to fetch and *carry* for an hour; to reach to a distance, as your voice *carries*.

cart (kärt), *n.* a small, stout wagon, generally on two wheels; a light two-wheeled vehicle, hand-pushed, for carrying small loads.

cart (kärt), *v.t.* to transport in a cart.

*__cartel__ (kär′ tel), *n.* a formal written arrangement between governments for exchange of prisoners; a union of producers to fix prices for their goods; a trust.

cartilage (kär′ ti lij), *n.* The firm elastic tissue that makes up the skeleton of the embryos and the young of vertebrates, changing to bone in adults; gristle.

cartilaginous (kär ti laj′ i nus), *adj.* of or like cartilage, gristly.

cartography (kär tog′ r*a* fi),*n.* the making of maps.

carton (kär′ ton), *n.* a cardboard container.

cartoon (kär tōōn′), *n.* a satirical or funny drawing of a public person or event, intended to mold public opinion.

cartridge (kär′ trij), *n.* a case of metal or cardboard holding a bullet or charge of shot for a gun or revolver.

carve (kärv), *v.t.* to shape by cutting; to cut and serve meat at table.

carving (kärv′ ing), *n.* a carved ornament.

*__caryatid__ (kar i at′ id), *n.* a column carved in the form of a woman.

cascade (kas kād′), *n.* a small waterfall; a series of electric condensers or amplifiers.

*__cascara__ (kas kâr′ *a*), *n.* a drug made from the bark of the California buckthorn.

case (kās), *n.* something in which an object is enclosed; a state of things; the subject of a suit or trial at law; the relation of a noun or pronoun to other words, as the nominative, possessive, objective *cases*.

*__casein__ (kā′ se in), *n.* an acid substance produced in curdled milk.

*__casement__ (kās′ ment), *n.* a window sash hinged at the side.

cash (kash), *n.* money, coins, especially ready money.

cash (kash), *v.t.* to give cash for, as to *cash* a check.

cashbook (kash′ book), *n.* a book recording cash transactions in a store or business.

cashier (kash ẽr′), *n.* an officer of a firm or bank having charge of the handling of money.

cashmere (kash′ mēr), *n.* a soft woolen fabric for shawls; a shawl made of it.

cask (kȧsk), *n.* a wooden keg bound with metal hoops.

casket (kȧs′ ket), *n.* a jewel chest; coffin.

*__cassava__ (ka sä′ v*a*), *n.* a tropical shrub (genus *Manihot*) with starchy roots from which tapioca is made.

casserole (kas′ e rōl), *n.* a porcelain, glass or earthenware dish in which food is both cooked and served.

*__cassimere__ (kas′ i mēr), *n.* a thin twilled woolen cloth used for men's garments.

cassock (kas′ uk), *n.* a long, close-fitting garment worn by clergymen and choristers.

cassowary (kas′ o wer i), *n.* a large Australian bird resembling the ostrich.

cast (kȧst), *n.* the actors in a play; a throw, as of dice or a stone; an object shaped in a mold, as a plaster *cast* of a figure to be made in sculpture; the peculiar shape or design of a thing; a suggestion of color, as a greenish *cast*.

cast (kȧst), *v.i. and v.t.* to make any kind of a cast, as to *cast* a stone, a glance, an aspersion, a vote or a play.

castanet (kas′ t*a* net), *n.* a clapperlike musical instrument used especially in Spanish dances.

*__caste__ (kȧst), *n.* a class of society; social standing.

caster (kȧs′ tẽr), *n.* a small bottle for food seasonings, a cruet; a small swivelled wheel or roller used under heavy objects to facilitate moving.

castigate (kas′ ti gāt), *v.t.* to punish; to chastise.

casting (kȧst′ ing), *n.* something shaped in a mold.

cast iron (kȧst ī′ ẽrn), *n.* iron melted and run into molds.

castle (kȧs′ l), *n.* a fortified building, especially a nobleman's residence, fortress.

*__casual__ (kazh′ ū al), *adj.* happening by chance; careless.

casualty (kazh′ ū al ti), *n.* an accident resulting in loss of life: *casualties*, losses of men in war by death or wounds.

casuistry (kazh′ ū is tri), *n.* the science or doctrine of settling matters of conscience; clever but false reasoning on matters of morals.

cat (kat), *n.* a small carnivorous domestic animal, often a household pet; any of the feline species, as a lion or leopard.

*__cataclysm__ (kat′ *a* klizm), *n.* a catastrophe that changes the earth's surface, especially a devastating flood; any great upheaval in the social order.

*__catacomb__ (kat′ *a* kōm), *n.* an underground gallery with niches in the side used as tombs.

catalog or **catalogue** (kat′ *a* log), *n.* an itemized list of names or articles arranged in alphabetic order or classified; a book containing such a list.

catamaran (kat *a* m*a* ran′), *n.* a raft of logs lashed together and propelled by paddle or sail; any vessel with two parallel hulls.

catamount (kat′ *a* mount), *n.* any wild animal of the cat family, especially a cougar or lynx.

catapult (kat′ *a* pult), *n.* an ancient war engine for hurling large stones.

catapult (kat′ a pult), *v.t.* to launch an airplane from the deck of a ship.

cataract (kat′ *a* rakt), *n.* a large waterfall; a disease of the eye in which the lens becomes opaque.

catarrh (k*a* tär′), *n.* inflammation of a mucous membrane, increasing the output of mucus.

catastrophe (k*a* tas′ trō fē), *n.* a great disaster.

catbird (kat bûrd), *n.* a dark-gray American songbird that makes a cry like a cat's.

*__catch__ (kach), *n.* anything caught, as a *catch* of fish; a device for fastening, as on a door or a garment.

catch (kach), *v.t. and v.i.* [*p.t.* and *p.p.* caught, *p. pr.* catching] to intercept in flight, as to *catch* a ball; to get to in time, as to *catch* a train; to surprise in the act, as to *catch* a liar; to attract, as red *catches* the eye; to pursue and overtake; to seize and hold, as briers *catch* at my dress; to take hold and stay fastened, as a lock *catches*.

catching (kach′ ing), *adj.* contagious, as a disease; alluring, as a manner.

*__catchup__ (kach′ up), *n.* a sauce for food, as tomato *catchup;* also written *catsup, ketchup*.

catchy (kach′ i), *adj.* attractive, taking the fancy, as a song; tricky, intended to trap, as a *catchy* problem.

catechism (kat′ ē kizm), *n.* an elementary manual in the principles of a religion.

categorical (kat ē gor′ i kal), *adj.* absolute, positive.

*__category__ (kat′ ē gō ri), *n.* a class, kind or division, as birds, beasts and fish are some of the *categories* into which the animal world is divided.

cater (kā′ tẽr), *v.i.* to furnish food, as for a banquet: *cater to*, to try to please; to pamper.

caterpillar (kat′ ẽr pil ẽr), *n.* the wormlike larva of a butterfly or moth.

catfish (kat′ fish), *n.* a freshwater fish with feelers around the mouth, such as the bullhead.

catgut (kat gut), *n.* cord made from the intestines of animals, especially sheep, and used in stringing musical instruments.

cathedral (k*a* thē′ dral), *n.* the chief church of a diocese.

*__cathode__ (kath′ ōd), *n.* the negative pole of an electrolytic cell or vacuum tube: opposite of *anode*.

catholic (kath′ ō lik), *adj.* universal, general, liberal.

Catholic (kath′ ō lik), *adj.* pertaining to the Church of Rome or any other universal church.

catnip (kat nip), *n.* a strong-scented perennial herb of the mint family, which cats like.

cattalo (kat′ *a* lō), *n.* a cross between buffalo and domestic cattle.

cattle (kat′ l), *n.* bulls, cows, calves, oxen, steers; sometimes any livestock, as sheep, goats, horses, hogs.

catwalk (kat′ wôk), *n.* a plank path along a bridge or along the keel of a dirigible.

*__caucus__ (kô′ kus), *n.* a preliminary meeting of representatives of a political party to select candidates or fix upon a policy for a campaign.

caudal (kô′ dal), *adj.* pertaining to a tail.

cauliflower (kô′ li flou ẽr), *n.* a garden variety of cabbage with a solid head of white flower clusters.

cause (kôz), *n.* any person or thing that produces a result, as disease is often the *cause* of death; a reason, as *cause* for laughter; any principle or question supported by a person or party, as the *cause* of freedom, *cause* of social justice.

Syn. Reason, motive. A *cause* is anything that produces a result; a *reason* explains a result; a *motive* is anything that prompts an action.

cause (kôz), *v.t.* to bring about; to make happen.

*__causeway__ (kôz′ wā), *n.* a raised roadway through a marshy region.

caustic (kôs′ tik), *adj.* able to destroy by chemical action, as lye, burning, corrosive; sarcastic, sharp, as *caustic* remarks.

*__cauterize__ (kô′ tẽr īz), *v.* to burn or sear with a hot iron or with a caustic substance, as to *cauterize* a wound.

caution (kô′ shun), *n.* a warning heedfulness; prudence in regard to danger.

caution (kô′ shun), *v.t.* to warn, as against danger.

cautious (kô′ shus), *adj.* exercising caution; heedful, wary.

cavalcade (kav al kād′), *n.* a procession of persons on horseback.

cavalry (kav′ al ri), *n.* horsemen, especially mounted military troops.

cave (kāv), *n.* a hollow opening in the earth.

cave-in (kāv in), *n.* collapse; the act of caving in or collapsing, as of the walls of a mine.

cavern (kav′ ẽrn), *n.* a very large cave.

cavernous (kav′ ẽr nus), *adj.* hollow like a cavern.

*__caviar__ (kav′ i är), *n.* sturgeon roe, prepared as a relish.

*__cavil__ (kav′ il), *v.i.* to find flaws in; to raise captious or frivolous objections.

cavity (kav′ i ti), *n.* a hollow space, as in a tooth.

*__cavort__ (k*a* vôrt′) *v.* to prance about, caper, as horses.

caw (kô), *n.* the cry of a crow.

caw (kô), *v.i.* to make a harsh sound like the caw of a crow.

***cayenne pepper** (kī en′ pep′ ẽr), a very hot powder made from the dried and ground seeds or fruits of different peppers.

C battery (bat′ ẽri), an electric battery between the grid and the filament of an electron tube, to govern the amount of average plate current.

cease (sēs), *v.i. and v.t.* to come to an end; to stop; to discontinue.

Syn. Discontinue, stop. *Stop* refers to the ending of specific action, *cease* to the end of states of activity, as we *stop* playing the piano, but the music *ceases;* to *discontinue* is to interrupt the activity of something or to stop doing something habitual.

Ant. Begin, commence, continue, start.

cedar (sē′ dẽr), *n.* an evergreen tree with fragrant wood valued in building because of its great durability.

cede (sēd), *v.t.* to grant, as territory.

ceiling (sēl′ ing), *n.* the overhead finish of a room; the top altitude an airplane can reach under specified conditions.

celebrate (sel′ ē brāt), *v.i. and v.t.* to commemorate, observe joyfully, as an anniversary; to observe with formal rites, as Mass; to honor, praise.

Syn. Commemorate. Any person or thing, past or present, is *celebrated* that is observed with outward ceremony, but nothing is *commemorated* but what is past and can be brought to memory.

Ant. Despise, forget.

celebrity (sē leb′ ri ti), *n.* fame, renown; one who is famous.

***celerity** (sē ler′ i ti), *n.* promptness, speed.

celery (sel′ ẽr i), *n.* a plant with long leafstalks that are blanched for food.

***celestial** (sē les′ chal), *adj.* pertaining to the sky; heavenly, divine.

***celibacy** (sel′ i *ba* si), n. the state of being unmarried, especially single life followed from religious conviction or vows.

cell (sel), *n.* a small room for either voluntary or involuntary confinement, as in a monastery or a prison; the tiny unit of plant or animal tissues.

cellar (sel′ ẽr), *n.* the underground floor of a house.

***cello** (chel′ ō), *n.* [*pl.* cellos] contraction of *violoncello.*

cellophane (sel′ ō fān), *n.* a transparent waterproof tissue made from wood pulp.

cellular (sel′ ū lẽr), *adj.* consisting of cells.

celluloid (sel′ ū loid), *n.* an inflammable compound of camphor and pyroxylin, usually resembling ivory.

cellulose (sel′ ū lōs), *n.* a white substance found in the cell walls of plants, used in the manufacture of paper and rayon.

***cement** (sē ment′), *n.* a mixture of lime, clay and water used while soft in building, for lining walls, making cellar floors; any substance which, applied while soft, hardens and causes two bodies to cohere, as glue or mortar.

cement (sē ment′), *v.t.* to fasten, line or cover with cement; to bind firmly.

***cemetery** (sem′ ē ter i), *n.* a burial place; graveyard.

cenotaph (sen′ ō tȧf), *n.* an empty tomb, or a monument, in memory of one buried elsewhere.

censer (sen′ sẽr), *n.* a vessel for burning incense.

***censor** (sen′ sẽr), *n.* an ancient Roman magistrate who imposed taxes and regulated public morals; a modern official who examines books and plays to suppress the publication of objectionable works; one empowered to examine private correspondence and delete passages opposed to the public good; one who censures.

censorious (sen sō′ ri us), *adj.* harshly critical.

***censure** (sen′ shẽr), *n.* blame; harsh criticism.

censure (sen′ shẽr), *v.t.* to condemn, criticize severely.

Syn. Blame, condemn. To *censure* is in the main to criticize adversely; to *blame* is to find fault with or guilt in; to *condemn* implies thoughtful though adverse judgment.

census (sen′ sus), *n.* an official count of population.

cent (sent), *n.* one one-hundredth of a dollar.

centenarian (sen tē nâr′ i an), *n.* a person a hundred years old.

***centenary** (sen′ tē ner i), *n.* a hundred years; a celebration of a 100th anniversary.

centennial (sen ten′ i al), *n.* a hundredth anniversary or its celebration.

centennial (sen ten′ i al), *adj.* pertaining to a hundred years.

center (sen′ tẽr), *n.* the middle point of anything; that around which things form or toward which they move or tend; any place in the midst of activity, as a manufacturing *center,* a *center* of learning.

centerboard (sen′ tẽr bōrd), *n.* a board that can be raised or lowered through a slot in the keel of a boat or yacht.

center of gravity (grav′ i ti), body that is the center of balance.

centigrade (sen′ ti grād), *adj.* separated into 100 degrees, as the scale of a *centigrade* thermometer.

centigram (sen′ ti gram), *n.* a unit of weight equal to one one-hundredth of a gram.

***centimeter** (sen′ ti mē tẽr), *n.* a unit of length equal to one one-hundredth of a meter.

centipede (sen′ ti pēd), *n.* a long-bodied worm-shaped animal with many joints and a pair of legs at each.

central (sen′ tral), *adj.* pertaining to the center; at or near the middle; chief.

central (sen′ tral), *n.* a telephone exchange; a telephone operator.

centralize (sen′ tral īz), *v.i. and v.t.* to make central; to bring to a center; in government or business, to concentrate powers of direction.

***centrifugal** (sen trif′ ū gal), *adj.* tending away from the center, as a *centrifugal* force.

***centripetal** (sen trip′ ē tal), *adj.* tending toward the center, as a *centripetal* force.

centurion (sen tū′ ri on), *n.* an ancient Roman officer commanding 100 men.

century (sen′ tū ri), *n.* a period of 100 years.

century plant (sen′ tū ri plȧnt), the American aloe, supposed to bloom once in 100 years.

***cephalic** (sē fal′ ik), *adj.* pertaining to the head.

***ceramics** (sē ram′ iks), *n.* the art of making pottery.

cereal (sēr′ ē al), *n.* any grass that yields an edible grain, as wheat, oats, rice, rye; any such grain prepared for food.

cereal (sēr′ ē al), *adj.* pertaining to grains and the plants that produce them.

cerebellum (ser′ ē bel′ um), *n.* the lower back part of the brain, consisting of two lobes situated behind and above the medulla: called the *little brain.*

cerebral (ser′ ē bral), *adj.* pertaining to the brain.

***cerebrum** (ser′ ē brum), *n.* the major part of the brain, in front of and above the cerebellum, consisting of the two hemispheres that occupy the upper portion of the skull.

cerements (ser′ ē ments), *n.* burial clothing.

ceremony (ser′ ē mō ni), *n.* a rite or formality; formal procedure.

***cerise** (se rēz′), *n.* cherry color.

certain (sûr′ tin), *adj.* fixed, specified, as a *certain* time, *certain* species; sure, reliable, as a *certain* cure; sure in mind, as to be *certain* of one's facts.

Syn. *Certain* and *sure* are almost interchangeable. *Sure* implies, however, mere assurance; *certain* implies surety founded on definite proof.

Ant. Doubtful, uncertain.

certainty (sûr′ tin ti), *n.* the state of being sure; any sure and established fact.

***certificate** (sûr tif′ i kit), *n.* written testimony to the truth of any fact, as a health *certificate.*

certify (sûr′ ti fī), *v.t.* to attest; to guarantee; to testify in writing.

certitude (sûr′ ti tūd), *n.* certainty; assurance.

***cerulean** (sē ro͞o′ lē an), *adj.* sky-blue.

cervical (sûr′ vi kal), *adj.* pertaining to the neck.

cervix (sûr′ viks), *n.* the neck, especially the back part of the neck.

cessation (se sā′ shun), *n.* the act of ceasing or discontinuing; a stop.

cession (sesh′ un), *n.* the giving up of territory; deeding of property; yielding a point in argument.

***cetacean** (sē tā′ shun), *n.* a marine mammal, as the whale.

chafe (chāf), *v. i. and v. t.* to make or become sore by rubbing; to warm by rubbing, as cold feet; to fret and fume.

***chaff** (chȧf), *n.* grain-husks; teasing, banter.

chaff (chȧf), *v.t.* to tease, to make fun of good-naturedly.

chaffinch (chaf′ inch), *n.* a songbird.

chafing dish (chāf′ ing dish), a pan with a handle, heated by alcohol or electricity, for cooking at the table.

***chagrin** (shȧ grin′), *n.* distress caused by disappointment or humiliation; mortification.

chain (chān), *n.* a series of joined rings or links usually of metal; series of anything linked together, as a *chain* of mountains, telephone centrals or events; anything that binds or fetters.

chain (chān), *v. t.* to fasten or bind with a chain.

chain store (chān stōr), one of a group of retail stores under one ownership and selling the same kind of goods.

chair (châr), *n.* a movable seat with legs and a back; a position of honor or authority, as a professor's *chair: the chair,* a chairman.

chair rail (châr′ rāl), a molding on a wall to protect it from being worn by the backs of chairs.

chairman (châr′ man), *n.* the head of a committee; one who presides at a meeting.

***chaise** (shāz), *n.* a two-wheeled carriage for two persons; any light carriage for pleasure driving.

***chalcedony** (kal sed′ ō ni), *n.* a variety of pale-blue or gray quartz.

***chalice** (chal′ is), *n.* a drinking cup, especially the cup used at the Lord's Supper.

chalk (chôk), *n.* a soft white kind of limestone; a stick of chalklike material used for drawing on a blackboard.

chalk (chôk), *v.t.* to write on or mark with chalk.

challenge (chal′ enj), *n.* a defiance; a call to combat; a sentry's demand for the countersign.

challenge (chal′ enj), *v.t.* to defy, call to combat; to demand the countersign; to dispute the accuracy of, as a statement.

***challis** (shal′ i), *n.* a light woolen fabric.

chamber (chām′ bẽr), *n.* a room in a house, especially a bedroom; a councilroom; the council itself.

chamber of commerce (chām′ bẽr ov kom′ ûrs), a group of people organized to promote local welfare, especially in business.

chamberlain (chām bẽr lin), *n.* an officer who has charge of the private apartments of a sovereign or nobleman.

***chameleon** (ka mē′ lē on), *n.* a lizard that can change its color according to its environment.

***champagne** (sham pān′), *n.* an effervescent wine.

champaign (sham pān′), *n.* flat, open country.

champion (cham′ pi un), *n.* best of his or its class in a competition; one who defends the cause of another.

champion (cham′ pi un), *v.t.* to advocate and work or fight for, as a cause; to contend for the rights of another.

chance (chȧns), *n.* the unforeseeable way things happen; a happening; fortune, luck; lot; opportunity; a risk or gamble; a possibility; an imaginary power, fate.

chance (chȧns), *v. i.* to happen unforseeably or accidentally.

chance (chȧns), *adj.* happening by accident, unintended; casual, as a *chance* meeting.

chancel (chȧn′ sel), *n.* the space in a church in which the altar stands; the space reserved for the clergy or choir.

chancellor (chan′ sel ẽr), *n.* a judge of a court of equity or chancery; the title of the head of some universities.

***chancery** (chȧn′ sẽr i), *n.* a court judging cases on the simple principles of justice.

chandelier (shan de lẽr′), *n.* a hanging support for a cluster of lights.

chandler (chȧn′ dlẽr), *n.* one who makes and sells candles; a small merchant; retailer.

change (chānj), *n.* movement from one state of being to another; variation; small money; the balance returned to a customer when he offers more than is due.

change (chānj), *v. i. and v. t.* to progress from one state of being to another, as a grub *changes* to a beetle; to become different, vary, as the colors of a sunset *change;* to pass from one phase to another, as the moon; to alter, wake different, as to *change* the spelling of a word; to substitute one thing for another, as to *change* one's clothes; to give or receive the equal of something in smaller units, as to *change* $5.

changeable (chān′ ja bl), *adj.* able to undergo change, variable.

channel (chan′ el), *n.* the bed of a river; a deep passage through shallow waters; a grooved course; that through which anything flows, any passage.

chant (chȧnt), *n.* a solemn song; an intoned song.

chant (chȧnt), *v. i. and v. t.* to intone.

***chaos** (kā′ os), *n.* a state of complete confusion; disorder.

chap (chap), *n.* a crack in the skin.

chap (chap), *v. i.* to crack, as the skin.

***chaparral** (chap′ a ral), *n.* a dense thicket of evergreen oaks or thorny bushes.

chapel (chap′ el), *n.* a place of worship smaller than a church; a room set apart for worship in a cathedral, school or college.

***chaperon** (shap′ ẽr ōn), *n.* an older woman who accompanies young ladies to the theater, dances or houseparties for the sake of propriety.

chaplain (chap′ lin), *n.* a clergyman serving as such in the army, navy or some institution.

chaplet (chap′ let), *n.* a wreath or garland worn on the head; a string of beads for counting prayers one third as long as a rosary.

chaps (chaps), *n. pl.* chaparejos; cowboys' leather breeches.

chapter (chap′ tẽr), *n.* a principal division of a book; a branch of a society.

char (chär), *v. t.* to scorch; to convert into charcoal.

character (kar′ ak tẽr), *n.* a sign or mark on an object to show ownership or origin, a brand or stamp; written or printed symbols, as letters or figures; a distinguishing quality, as the *character* of cats is to hunt birds; one's moral strength; a description of a person's qualities, as they gave him a good *character;* a person in literature, as Rowena is one of the *characters* in Ivanhoe.

characteristic (kar ak tẽr is′ tik), *n.* a special, identifying quality or mark.

characteristic (kar ak tẽr is′ tik), *adj.* representative, typical.

characterize (kar′ ak tẽr īz), *v.t.* to describe by peculiar qualities of; to typify or distinguish.

***charade** (sha rād′), *n.* a game in which several of the players dramatize the syllables of words for the others to guess.

charcoal (chär′ kōl), *n.* wood partially burned.

charge (chärj), *n.* a price; an accusation; a sudden attack; a load, as of a gun; custody.

charge (chärj), *v.i. and v.t.* to advance in attack, to lay upon with authority, as I *charge* you with this trust; to make liable, as I *charge* you with a dollar's worth of goods; to accuse, as I *charge* him with burglary; to load, as a gun.

charger (chärj′ ẽr), *n.* a cavalry horse; a contrivance used in charging a storage battery.

chariot (char′ i ut), *n.* an ancient two-wheeled vehicle for war or racing.

charity (char′ i ti), *n.* kindness; benevolence; giving to the poor.

***charlatan** (shär′ la tan), *n.* a quack; pretender to knowledge not possessed.

charm (chärm), *n.* allurement; fascination; a magic spell; a small ornament, as a watch *charm.*

charm (chärm), *v. i. and v. t.* to cast a spell, use magic power, bewitch; to fascinate, attract, delight.

chart (chärt), *n.* a map; diagram; a graph.

chart (chärt), *v.t.* to show on a map or diagram.

charter (chär′ tẽr), *n.* a grant of rights.

charter (chär′ tẽr), *v.t.* to grant specified rights to; to empower to engage in business under certain conditions.

***chary** (châr′ i), *adj.* cautious; sparing.

chase (chās), *n.* pursuit; the hunting of game.

chase (chās), *v.t.* to pursue, put to flight; to hunt.

chasm (kazm), *n.* a yawning gap in the earth; a deep separation.

***chassis** (shas′ i), *n.* the frame and springs of a motor car; also, all other parts of the car, including the wheels.

chaste (chāst), *adj.* modest; pure.

***chasten** (chās′ n), *v.t.* to punish with the purpose to reform.

Syn. Chastise, punish. To *chasten* is to afflict or distress for the sake of discipline or to develop the character, as whom the Lord loveth, He *chasteneth.* To *chastise* is to punish in anger to reform; to *punish* is to inflict a penalty upon for specific wrongdoing.

***chastise** (chas tīz′), *v.t.* to punish, especially to inflict corporeal punishment, for the sake of discipline.

chastity (chas′ ti ti), *n.* the state of being chaste; purity.

chat (chat), *v.i.* to talk lightly.

chattel (chat′ l), *n.* any piece of personal property.

chattel mortgage (chat′ l môr′ gij), a mortgage on personal removable property.

chatter (chat′ ẽr), *n.* meaningless prattle, idle talk.

chatter (chat′ ẽr), *v.i.* to make meaningless sounds, as a monkey; to talk rapidly and idly.

***chauffeur** (shō fûr′), *n.* one who earns his living by driving cars for others.

cheap (chēp), *adj.* low-priced; miserable; mean.

cheat (chēt), *n.* a fraud or sham; a deceiver, a swindler.

cheat (chēt), *v.i. and v.t.* to practice dishonesty, as to *cheat* in business; to defraud, swindle.

Syn. Defraud, trick. One *cheats* by direct and gross falsehood or artifice; one *defrauds* by a settled plan or contrivance; one *tricks* by taking advantage of the credulity of others.

check (chek), *n.* that which holds something back, impedes progress, puts a pause or stop to; a written order to a bank to pay out a depositor's money; a pattern in squares; an examination, comparison or verifying; that with which something is compared, a standard; a mark to show that something has been verified.

check (chek), *v.t.* to stop, repulse, hinder; to test or examine, as to *check* a list; to mark with a check; to deposit for convenience or safety, as *check* your hat at the door.

checkers (chek ẽrz), *n.* a game played by two persons with 24 disks on a board marked off in squares.

checkmate (chek′ māt), *n.* the winning move in a game of chess that makes it impossible for the opponent to move his king beyond attack.

cheek (chēk), *n.* one side of the face; impudence.

cheer (chēr), *n.* a happy state of mind; a cry of applause.

cheer (chēr), *v.i. and v.t.* to applaud; to give comfort and reassurance to.

Syn. Encourage, comfort. To *cheer* regards the spirits; to *encourage* the resolution. The sad need to be *cheered,* the timid to be *encouraged.* To *cheer* expresses more than to *comfort;* the former signifies calling forth hope or happiness, the lessening of pain.

Ant. Dishearten, dismay.

cheerful (chēr′ fool), *adj.* joyous; in good spirits.

cheese (chēz), *n.* a food made of solidified milk curds.

***cheetah** (chē′ ta), *n.* a wild cat of Asia and Africa resembling a leopard, often trained to hunt.

***chef** (shef), *n.* a head cook; professional cook.

chemical (kem′ i kal), *n.* a substance used in chemistry.

chemical (kem′ i kal), *adj.* having to do with chemistry.

chemist (kem′ ist), *n.* one skilled in chemistry.

chemistry (kem′ is tri), *n.* the science of the composition of matter and its changes under certain influences.

***chenille** (she nēl′), *n.* a tufted silk or worsted cord; a fabric made from it.

cherish (cher′ ish), *v.t.* to hold dear; to treat tenderly; to protect; to cling to, as to *cherish* one's wrath.

Syn. Foster, harbor. To *cherish* is both to hold dear and to treat as dear. To *foster* is to maintain and care for, to promote the growth of; to *harbor* is to entertain in the mind something like resentment or evil designs.

cherry (cher′ i), *n.* a small round fruit with a smooth stone; the tree that bears it.

chess (ches), *n.* a game played by two persons with 16 pieces each on a board divided into 64 squares.

chest (chest), *n.* a large box with a lid, especially for holding valuables; the part of the body within the ribs and breastbone, the thorax.

chestnut (ches′ nut), *n.* a nut within a bur, or the tree that produces it; the rich reddish brown color of the nut.

cheval glass (shē val′ glȧs), a full-length mirror in a swinging frame.

cheviot (chev′ i ut), *n.* a cloth made from the wool of cheviot sheep.

chevron (shev′ run), *n.* a V-shaped bar on the uniform coat of a non-commissioned army officer or policeman, indicating rank or service.

chew (cho͞o), *v.t.* to masticate, grind with the teeth.

chicanery (shi kān′ ẽr i), *n.* trickery; subterfuge.

chicken (chik′ en), *n.* a domestic fowl; its flesh used as food.

chicken pox (chik′ en poks), a disease of children, characterized by an itching rash.

***chicle** (chēk′ l), *n.* a gum obtained from a tropical tree, used in making chewing gum.

chicory (chik′ ō ri), *n.* a perennial plant with bright-blue flowers, and a root sometimes roasted as a substitute for coffee.

chide (chīd), *v.t.* to rebuke, scold.

chief (chēf), *n.* a commander or leader; the head of any organization.

Syn. Chieftain, commander, leader. A *chief* usually inherits his position as *chief* of a tribe or clan; as a government title, *chief* is used for civil rather than military offices, as a fire *chief.* *Chieftain* is limited to the leader of a robber band. *Commander* is a military or naval title. A political party has a *leader,* as does also a revolution, a cause, or any great social movement.

chief (chēf), *adj.* principal, most important; highest in rank.

***chiffon** (shif′ on), *n.* a gauzy silk fabric.

***chiffonier** (shif′ ō nēr), *n.* a high chest of drawers.

chilblain (chil′ blān), *n.* a sore on the hands or feet caused by damp cold.

child (chīld), *n.* a young person between babyhood and youth; a son or daughter.

chill (chil), *n.* a small degree of coldness, as the *chill* of a cellar; a feeling of cold accompanied by shivering; a check upon enthusiasm or high spirits.

chime (chīm), *n.* the music of tuned bells; a set of bells musically tuned.

chime (chīm), *v.i. and v.t.* to ring in a musical way, as bells *chime;* to ring or play, as to *chime* bells; to indicate with chimes, as a clock *chimes* the hour.

***chimerical** (kī mer′ i kal), *adj.* imaginary; fantastic.

chimney (chim′ ni), *n.* [*pl.* chimneys] a structure, usually of brick, enclosing flues from a fireplace, stove or furnace, to carry off gases and smoke.

***chimpanzee** (chim′ pan zē), *n.* an African ape.

chin (chin), *n.* the fore part of the lower jaw, under the mouth.

china (chī′ *na*), *n.* a fine kind of porcelain.

***chinch bug** (chinch bug), a small, black and white insect that destroys grain crops.

chinchilla (chin chil′ *a*), *n.* a small South American rodent with soft, gray fur.

***chine** (chīn), *n.* the backbone; a cut of meat from an animal or fish containing the backbone and surrounding flesh.

chink (chingk), *n.* a long narrow opening; a sharp metallic sound, the clink of metal objects shaken together.

chintz (chints), *n.* a cotton cloth, usually glazed, printed in various colors.

chip (chip), *n.* a small piece cut or broken off, as in chopping wood.

chipmunk (chip′ mungk), *n.* a small American squirrel with striped back.

chipper (chip′ ẽr), *adj.* active, lively, pert.

***chirography** (kī rog′ *ra* fi), *n.* handwriting.

***chiropodist** (kī rop′ ō dist), *n.* one who treats foot troubles.

chirp (chûrp), *n.* a short, cheerful sound, as of a bird or cricket.

chirp (chûrp), *v.i.* to make a short, sharp sound, as a bird or cricket.

chisel (chiz′ l), *n.* a metal tool with a blade having a sharp-edged end, used for cutting wood, stone or metal.

chisel (chiz′ l), *v.t.* to cut with a chisel.

chivalrous (shiv′ al rus), *adj.* valorous; gallant; courteous.

***chivalry** (shiv′ al ri), *n.* the spirit and manners of knighthood; courteous, gallant conduct.

chive (chīv), *n.* a perennial herb related to the leek and the onion.

chloral (klō′ ral), *n.* an oily, pungent liquid made by the action of chlorine on alcohol.

***chloride** (klō′ rīd), *n.* a compound of chlorine with another element.

chloride of lime (klō′ rīd ov līm), a compound of a chloride with lime, used in bleaching.

***chlorine** (klō′ rēn), *n.* a greenish-yellow suffocating gas possessing great bleaching powers.

***chloroform** (klō′ rō fôrm), *n.* a liquid compound that yields a gas which dulls pain and causes unconsciousness.

chloroform (klō′ rō fôrm), *v.t.* to administer chloroform to.

***chocolate** (chok′ ō lit), *n.* a powder made by grinding roasted cacao nuts; a beverage made of it.

chocolate (chok′ ō lit), *adj.* flavored with or the color of chocolate.

choice (chois), *n.* the act of choosing; preference; any person or thing chosen, as this is my *choice;* the best part or thing.

choice (chois), *adj.* worthy of being chosen; especially good.

choir (kwīr), *n.* a group of singers in a church; the space reserved for them.

choke (chōk), *n.* a device to check the flow of anything, as the valve in a carburetor that regulates the intake of air.

choke (chōk), *v.i. and v.t.* to suffocate; to be obstructed; to obstruct by clogging, as dead leaves *choke* a drain; to hinder the growth of, as weeds *choke* a flower bed.

chokecherry (chōk′ cher i), *n.* a wild cherry.

chokedamp (chōk′ damp), *n.* a mine gas consisting mostly of carbon dioxide.

***choler** (kol′ ẽr), *n.* anger; bad temper.

cholera (kol′ ẽr *a*), *n.* a disease of the digestive tract, of which the symptoms are vomiting, diarrhea and cramps.

choose (cho͞oz), *v.i. and v.t.* to make a choice; to select one from two or more; to see fit, please, as I do not *choose* to go.

chop (chop), *n.* a small cut of meat off the loin or rib; *chops,* the jaws and the flesh around them.

chop (chop), *v.t.* to cut with an ax or hatchet.

choppy (chop′ i), *adj.* short, rough: said of waves.

choral (kō′ ral), *adj.* pertaining to a chorus or choir.

chord (kôrd), *n.* a combination of harmonious tones sounded together; a straight line connecting the ends of an arc in a geometric figure.

chores (chōrs), *n.pl.* the daily routine work of a farm or household.

***chorister** (kor′ is tẽr), *n.* a member of a choir; a choir leader

***chorus** (kō′ rus), *n.* a number of persons singing together, or expressing the same opinion; a refrain at the end of each verse of a song.

chow (chou), *n.* a breed of dogs originally from China, having a heavy coat, bluish tongue and a tail curled over the back.

chowchow (chou′ chou), *n.* chopped mixed pickles in a mustard sauce.

chowder (chou′ dẽr), *n.* a savory stew of fish or clams with salt pork and sometimes vegetables.

***christen** (kris′ n), *v.t.* to baptize; to give a name to.

chromatic (krō mat′ ik), *adj.* relating to color; written or sounded in half-tones of the diatonic scale.

chrome (krōm), *n.* chromium.

chromium (krō′ mi um), *n.* a metallic element, steel-gray and rust-resisting.

chromo (krō′ mō), *n.* a colored lithographic print.

***chromolithography** (krō mō li thog′ *ra* fi), *n.* the art of printing in colors from stone.

chronic (kron′ ik), *adj.* continuing a long time or recurring: said of a disease.

chronicle (kron′ i kl), *n.* a record of events in the order of their occurrence; a history.

chronological (kron ō loj′ i kal), *adj.* in order of time.

***chronology** (krō nol′ ō ji), *n.* the recording of events in the order of their occurrence.

chronometer (krō nom′ ē tẽr), *n.* any instrument for measuring off time; a ship's clock, safeguarded against irregularities due to change in temperature.

***chrysalis** (kris′ *a* lis), *n.* the pupa of an insect in the shell or cocoon from which it emerges as a fully developed insect; the shell or cocoon of the pupa.

***chrysanthemum** (kris an′ thē mum), *n.* a plant of the aster family with showy flowers that bloom in autumn.

chubby (chub′ i), *adj.* plump; fat and round.

chuck (chuk), *n.* the part of a beef carcass between the neck and the shoulder blade; a contrivance for holding a tool or a piece of material on which work is being done, as in a lathe.

chuck (chuk), *v.t.* to toss, as a ball; to pat under the chin.

chuckle (chuk′ l), *v.i.* to laugh in a quiet, suppressed way.

chum (chum), *n.* an intimate friend.

chunk (chungk), *n.* a short, thick piece.

chunky (chungk′ i), *adj.* short and thick.

church (chûrch), *n.* a building devoted to worship; a religious system, including houses of worship, clergy and members; a christian denomination, as the Methodist *church.*

church warden (chûrch wôr′ dn), a church officer having charge of church property and supervising care for the poor; a long-stemmed clay smoking pipe.

churl (chûrl), *n.* a peasant; a surly person.

churn (chûrn), *n.* a vessel in which milk and cream are agitated to make butter.

churn (chûrn), *v.i. and v.t.* to work a churn to get butter; to make, as butter, by agitating milk and cream; to agitate violently, as a thrashing fish *churns* the water.

chute (sho͞ot), *n.* a slide down which things are moved from any high place to a lower one; a flume.

***cicada** (sī kā′ *da*), *n.* a large, four-winged insect of which the male produces a prolonged chirping sound: often called a *locust.*

cider (sī′ dẽr), *n.* apple juice, used as a drink and for making vinegar.

***cigar** (si gär′), *n.* a roll of tobacco leaves, for smoking.

cigarette (sig *a* ret′), *n.* tobacco rolled in paper, for smoking.

cilia (sil′ i *a*), *n.pl.* the eyelashes; hairlike fuzz on plants and wings of insects.

cinch (sinch), *n.* a saddle girth secured by loop and knots.

***cinchona** (sin kō′ *na*), *n.* a Peruvian bark from which quinine is obtained.

cinder (sin′ dẽr), *n.* a piece of burnt matter not reduced to ashes.

cinema (sin′ ē *ma*), *n.* a motion picture or a motion picture theater.

cinnamon (sin′ *a* mun), *n.* a spice made from the inner bark of an East Indian tree.

cipher (sī′ fẽr), *n.* zero; something without value; a secret code in which messages are sent.

cipher (sī′ fẽr), *v.i.* to figure; to express in cipher.

circle (sûr′ kl), *n.* a curved line of which every point is equally distant from a point within called the center.

circle (sûr′ kl), *v.t.* to go all the way around anything, as if following a circular course, as to *circle* the city.

***circuit** (sûr′ kit), *n.* a boundary line enclosing any space; the space enclosed; the act of going around anything; a route from place to place followed by a preacher or a judge in the course of his duties; the entire line of an electric current.

circuitous (sûr kū′ i tus), *adj.* roundabout, indirect.

circular (sûr′ kū lẽr), *n.* a piece of printed matter for general distribution.

circular (sûr′ kū lẽr), *adj.* in a circle; like a circle.

circularize (sûr′ kū lẽr īz), *v.t.* to make into a circle; send circulars to.

circulate (sûr′ kū lāt), *v.i. and v.t.* to make available to the reading public; to go around a specified course and return to the starting place, as the blood *circulates.*

circulation (sûr kū lā′ shun), *n.* the act of circulating; state of being circulated; the measure of distribution of a newspaper by number of copies issued.

circumference (sûr kum′ fẽr ens), *n.* the perimeter or boundary line of a circle; the distance around a circle.

circumflex (sûr′ kum fleks), *n.* an accent mark over a letter to indicate how it is to be sounded, with rising then falling tone.

circumlocution (sûr kum lō kū′ shun), *n.* an indirect expression; a roundabout way of speaking.

circumnavigate (sûr kum nav′ i gāt), *v.t.* to sail all the way around something, as an island or the earth.

circumscribe (sûr kum skrīb), *v.t.* to enclose within fixed bounds.

circumspect (sûr′ kum spekt), *adj.* watchful on all sides; cautious; prudent.

circumstance (sûr′ kum stans), *n.* any factor, as a condition or incident, accompanying a fact or event; an essential or a nonessential detail; an incident: *circumstances,* material environment, as brought up in good *circumstances;* all the factors of any situation, as he did well, under the *circumstances.*

circumvent (sûr kum vent′), *v.t.* to gain an advantage by stratagem or deception.

circus (sûr′ kus), *n.* a show with many entertaining features, as acrobatics, trained animals, clowns, and the like; a level oblong space having tiers of seats on three sides where ancient Roman games and chariot races were held.

cistern (sis′ tẽrn), *n.* a lined pit for holding water; a small reservoir.

citadel (sit′ *a* del), *n.* the fortified part of a city.

citation (sī tā′ shun), *n.* a quotation or the citing of a passage in a book; special mention, especially for heroism in military papers.

cite (sīt), *v.t.* to summon for an appearance in court; to refer to as an authority.

Syn. Quote. To *cite* is to bring forth an author or his writings as authority for something; to *quote* is to repeat exactly in speech or writing someone else's words.

citizen (sit′ i zen), *n.* one owing allegiance to a state.

***citrate** (sit′ rāt), *n.* a salt of citric acid.

citric acid (sit′ rik as′ id), an acid obtained from lemons, oranges, currants and other citrus fruits.

citron (sit′ run), *n.* a lemonlike fruit, but larger and less acid than the lemon, having a thick rind used in cooking.

city (sit′ i), *n.* a large town; an incorporated municipality.

civic (siv′ ik), *adj.* having to do with a city or a citizen, as *civic* duties.

civics (siv′ iks), *n.pl.* science of government.

***civil** (siv′il), *adj.* relating to the ordinary life of citizens; not military; between citizens of the same country, as *civil* war; maintained for benefit of citizens, as *civil* service; polite; good-mannered.

Syn. Polite, courteous. *Civil* describes the minimum of good manners and implies a mere forebearing from actual rudeness; *polite* describes actions and speech prompted by consideration of others; *courteous* means not only considerate but dignified.

civilian (si vil′ yan), *n.* one engaged in the pursuits of civil life, a person not in the army or navy.

civility (si vil′ i ti), *n.* civil behaviour; a polite act or speech.

civilization (siv i li zā′ shun), *n.* the state or process of becoming civilized, as the *civilization* of a savage tribe; social progress and culture; a certain period or type of social culture, as Egyptian *civilization;* the whole enlightened or civilized world, as cannibalism is abhorrent to *civilization.*

civilized (siv′ il īzd), *adj.* of a country, having enlightened customs and government; of a person, versed in the arts and refinements of civilized life.

clack (klak), *n.* a sudden sharp sound; chatter.

claim (klām), *n.* a thing claimed; something demanded as a right; demand made on the grounds of right; land staked out by a miner.

claim (klām), *v.t.* to demand as one's right or due, as to *claim* the victory; to acknowledge or own, as to *claim* a child; to attract or win, as heroism *claims* our admiration.

clam (klam), *n.* an edible, bivalve shellfish.

clammy (klam′ i), *adj.* cold, soft, wet, like a clam.

clamor (klam′ ẽr), *n.* continuous outcry.

clamor (klam′ ẽr), *v.i.* to shout, with confusion; make clamor.

clamp (klamp), *n.* a device used to hold things together.

clamp (klamp), *v.t.* to fasten together with a clamp.

clan (klan), *n.* a tribe; association of families.

***clandestine** (klan des′ tin), *adj.* secret; under cover.

clang (klang), *n.* a loud, sharp, ringing metallic sound.

***clangor** (klang′ gẽr), *n.* constant clanging; continued outcry and uproar.

clank (klangk), *n.* a sharp metallic sound, not reverberant like a clang, as the *clank* of chains.

clannish (klan′ ish), *adj.* holding together like the members of a clan.

clap (klap), *n.* a noise made by striking two things together, as the hands in applauding; a sharp sudden noise, as a *clap* of thunder.

clap (klap), *v.t.* to applaud by clapping the hands.

***clapboard** (klap′ bōrd), *n.* a light, narrow board, generally having one of the long edges thicker than the other, for weatherboarding a house.

clapper (klap′ ẽr), *n.* one who or that which claps; the tongue of a bell; one of two sticks held between the fingers and clapped in time with music.

claret (klar′ et), *n.* a dark red table wine.

clarify (klar′ i fī), *v.t.* to make clear; free of impurities.

***clarinet** (klar i net′), *n.* a wood-wind musical instrument, flaring at the end and having one reed.

***clarion** (klar′ i un), *n.* a small shrill trumpet.

clarion (klar′ i un), *adj.* loud and clear.

clash (klash), *n.* the noise of contact between hard objects; a conflict of ideas or interests.

clash (klash), *v.i. and v.t.* to strike together hard; to conflict, as ideas or personalities.

clasp (klȧsp), *n.* a fastening, as a catch or hook, by which things are fastened together, as the *clasp* of a bracelet; an embrace.

clasp (klȧsp), *v.t.* to fasten with a clasp; to embrace; to grasp, as to *clasp* hands.

***class** (klȧs), *n.* a number of things or persons with a common characteristic; a group of students to be promoted or graduated at the same time; a group of students studying the same subject, as a history *class;* social rank.

class (klȧs), *v.t.* to assign to a class, to classify.

classic (klas′ ik), *n.* a work of literature or art of highest standard and lasting merit: *classics,* the literature of ancient Greece and Rome.

classical (klas′ i kal), *adj.* pertaining to the classics, as a *classical* course in college.

classification (klas i fi kā′ shun), *n.* division into classes.

classify (klas′ i fī), *v.t.* to arrange in classes systematically.

clatter (klat′ ẽr), *n.* a continuing confusion of noises, as the *clatter* of dishwashing.

clatter (klat′ ẽr), *v.i.* to make a confusion of noises.

clause (klôz), *n.* a group of words forming part of a compound or complex sentence, having a subject and predicate of its own; a section of a document, as a constitution or law.

clavicle (klav′ i kl), *n.* the collarbone.

claw (klô), *n.* a sharp hooked nail in the foot of a bird or animal.

claw (klô), *v.t.* to scratch, scrape, dig or tear with or as if with a claw.

clay (klā), *n.* thick, plastic earth; anything easily molded.

clean (klēn), *adj.* free of dirt; unsoiled; pure.

Syn. Clean, cleanly, pure. *Clean* expresses a freedom from dirt or soil; *cleanly* the disposition or habit of being clean. A person who keeps himself *clean* is *cleanly. Pure* is used in a moral sense; the heart should be *pure.*

clean (klēn), *v.t.* to make clean; to remove stains; to purify.

***cleanly** (klen′ li), *adj.* neat; tidy; of clean habits.

cleanse (klenz), *v.t.* to make clean; to purify morally.

clear (klēr), *n.* open space.

clear (klēr), *v.i. and v.t.* to make clear; to brighten; to render evident; to free of obstructions.

clear (klēr), *adj.* free from darkness; to free from doubt or blame; to free from obstructions or entanglement, as the ropes are *clear,* the road is *clear;* easily heard, distinct, as a *clear* voice; able to understand, as a *clear* mind; net, as *clear* profits.

Syn. Lucid. *Clear* means free from doubt or any kind of obstruction, plain and understandable. One has a *clear* conscience, sees one's way *clear,* gives a *clear* account of something. *Lucid* means sane or normal when it applies to a person or his mind; it means orderly and very easily understood when it applies to style of writing or speech.

clearance (klēr′ ans), *n.* removal of obstructions or hindrances; exchange of financial paper through a clearinghouse; a certificate from the customhouse permitting a ship to sail; the distance by which one object clears another, as the space between a bridge and the road or water below.

clearing (klēr′ ing), *n.* a piece of land cleared of timber.

clearly (klēr′ li), *adv.* in a clear or distinct manner.

clearness (klēr′ nes), *n.* the quality of being clear; distinctness.

cleat (klēt), *n.* a projecting piece of leather on the sole of a shoe to give a better grip; a strip of wood or metal on a floor to give a foothold; a wedge-shaped or two-armed device of wood or metal around which to make fast a rope.

cleat (klēt), *v.t.* to furnish with cleats.

cleave (klēv), *v.t.* to split apart.

cleave (klēv), *v.i.* to cling to.

cleaver (klēv′ ẽr), *n.* a butcher's square-bladed knife for cutting joints or chopping meat.

cleek (klēk), *n.* a golf club with iron head, narrow-faced.

cleft (kleft), *n.* a fissure, a crevice.

cleft (kleft), *adj.* split; cleaved.

***clematis** (klem′ *a* tis), *n.* a perennial plant of the crowfoot family.

***clemency** (klem′ en si), *n.* mercy; mildness.

clement (klem′ ent), *adj.* gentle; forbearing.

clergy (klûr′ ji), *n.* a body of men trained for religious service, as priests and ministers.

clergyman (klûr′ ji man), *n.* a minister of a church.

clerical (kler′ i kal), *adj.* pertaining to the clergy; pertaining to clerks, as a *clerical* department.

clerk (klûrk), *n.* one who keeps accounts; a salesman in a store.

clever (klev′ ẽr), *adj.* quick and smart with the mind or hand; skilful; exhibiting skill, as a *clever* stunt.

Syn. Smart. *Clever* describes intellectual quickness, often implying a lack of intellectual value. *Smart* means witty or even pert.

clew (klōō), *n.* a fact that is or may be helpful in solving a mystery.

click (klik), *n.* a quick sharp sound as of two small bodies striking each other, like needles in knitting or two billiard balls.

click (klik), *v.i.* to come together with a clicking sound.

client (klī′ ent), *n.* one for whom a lawyer acts; a person who employs another's services; a patron of a store.

***clientele** (klī en tel′), *n.* a group of clients, as of a doctor or lawyer; a following.

cliff (klif), *n.* a high and steep rocky bank.

***climacteric** (klī mak′ tẽr ik), *n.* a period in human life when great changes in the bodily constitution take place.

climate (klī′ mit), *n.* the typical temperature and weather conditions of a region.

climax (klī′ maks), *n.* the summit; peak; culminating point.

climb (klīm), *v.t. and v.i.* to make one's way up or down with the hands and feet, as to *climb* a ladder, *climb* down a precipice; to ascend, as to *climb* a hill; to slope upward, as the road *climbs* for a mile; to rise in rank or honor, as to *climb* to be captain.

clime (klīm), *n.* a climate or a region in respect to its climate.

clinch (klinch), *v.i. and v.t.* to come to grips; to fasten firmly, as with nails, or by doubling over a projecting part, as of a nail; to prove beyond doubt, as an argument.

cling (kling), *v.i.* to hold tightly, as by an embrace or twining; to stick, as wet clothes *cling* to the body.

clinic (klin′ ik), *n.* free treatment of patients or performance of operations in the presence of students; a place for free or cheap medical service to the public.

clink (klingk), *n.* a slight ringing sound as when glass strikes glass.

clinker (klingk′ ẽr), *n.* a mass in coal ashes formed by the melting of metallic elements in the coal; a piece of slag.

clip (klip), *n.* an amount of wool sheared; a clasp to hold papers together; a pace or gait.

clip (klip), *v.t.* to shear wool or hair from; to fasten together with a clip.

clipper (klip′ ẽr), *n.* one who clips; an instrument for clipping; formerly, a specially built fast sailing ship; now, a fast commercial airplane.

***clique** (klēk), *n.* a coterie; exclusive group.

cloak (klōk), *n.* a long, loose over garment.

cloak (klōk), *v.t.* to cover with a cloak; to conceal; to disguise.

clock (klok), *n.* a piece of machinery in a case for measuring off the passage of time.

clod (klod), *n.* a chunk of earth or clay.

clog (klog), *n.* a load or weight to hinder motion; a shoe with a wooden sole.

clog (klog), *v.t. and v.i.* to obstruct, choke up; to hinder; to become stopped up, as drains *clog.*

cloister (klois′ tẽr), *n.* a place of religious retirement.

close (klōz), *n.* the end.

close (klōz) *n.* an enclosed space.

close (klōz), *v.t. and v.i.* to shut, as to *close* a door; to end, as to *close* a debate or a business deal; to shut, as a door *closes;* to come near or together, grapple, as wrestlers *close.*

Syn. Conclude, end, finish. To *close* is the opposite of to *open,* hence the idea of open is presupposed whenever the word *close* is used. We *close* an open door, an open argument, or the wrestlers, as they grapple, close the open space between them. To *end* implies absolute finality; a road *ends,* a war *ends,* we *end* a sentence with a period. To *conclude* is a formal word used for the ending of speeches or documents. To *finish* is to complete something already started, as to *finish* a day's work.

close (klōs), *adv.* near, as stand *close* together.

close (klōs), *adj.* near, as a *close* neighbor; tight, as a *close* fit; secretive; stingy; oppressive, unventilated, as *close* weather, a *close* room; following an original exactly, accurate, as a *close* translation, a *close* imitation; dear, intimate, as a *close* friend; nearly equal, as a *close* score; strict, as to keep a *close* watch.

closed shop (klōzd shop), a shop in which only one kind of labor, as union or nonunion, is employed.

closet (kloz′ et), *n.* a little room off a larger one for storing clothes.

closure (klō′ zhẽr), *n.* that which encloses; a parliamentary rule by which debate may be ended to permit a vote being taken.

clot (klot), *n.* a lump formed by coagulation or thickening of a liquid, as the blood.

clot (klot), *v.i. and v.t.* to form or be formed into clots.

cloth (klôth), *n.* a woven fabric of some fibrous material; a piece of cloth for some special use, as a table*cloth.*

clothe (klō*th*), *v.t.* to put clothes on; to cover as if with clothing.

***clothes** (klō*th*z), *n. pl.* garments; bedclothes.

clothier (klō*th*′ yẽr), *n.* one who makes or sells clothing.

clothing (klō*th*′ ing), *n.* garments in general; any covering.

cloud (kloud), *n.* a mass of visible vapor in the sky; anything like a cloud, as a *cloud* of dust.

cloud (kloud), *v.i. and v.t.* to make dark or become dark as if with clouds.

cloudburst (kloud′ bûrst), *n.* a violent downpour of rain over a limited area.

clout (klout), *n.* a piece of cloth or leather, as a breech*clout;* the white center of a target in archery; a center shot; a blow of the hand.

clove (klōv), *n.* the flower bud of a tropical tree, dried and used as a spice.

cloven (klō′ ven), *n.* cleft; divided into sections, as a cow's hoof.

clover (klō′ vẽr), *n.* a low-growing forage plant, valuable for hay and pasture.

clown (kloun), *n.* a buffoon.

cloy (kloi), *v.t.* to fill to repletion; to surfeit.

club (klub), *n.* a heavy stick; a suit of cards marked with a trefoil; an association of persons for a common purpose, social, educational or commercial.

club (klub) *v.t.* to strike with a club; to combine, for a common cause.

clubfoot (klub′ foot), *n.* a deformity of the foot.

cluck (kluk), *n.* a hen's call to her chicks.

clump (klump), *n.* a thick cluster of trees; a heavy tread.

clumsy (klum′ si), *adj.* awkward; poorly done.

cluster (klus′ tẽr), *n.* a number of like objects grouped or growing together, as a flower *cluster.*

clutch (kluch), *n.* a tight, greedy grip; a set of eggs to be hatched; a device for throwing machinery into gear.

clutch (kluch), *v.t.* to grasp eagerly or greedily.

coach (kōch), *n.* a large, closed, four-wheeled carriage; a railroad passenger car; an automobile with two seats and only two doors; one who teaches a team in some form of sport.

coach (kōch), *v.t.* to tutor; to teach a team in athletics the fine points of a game or sport.

***coadjutor** (ko aj′ oo tẽr), *n.* an official assistant.

coagulate (ko ag′ ū lāt), *v.i. and v.t.* to clot, congeal or curdle; to cause to clot.

coal (kōl), *n.* mineralized vegetable matter, used as fuel; an ember.

coal (kōl), *v.t.* to supply with coal, as to *coal* a ship.

***coalesce** (kō *a* les′), *v.i.* to come, grow or be brought together as one; to fuse.

coalition (kō *a* lish′ un), *n.* an alliance of individuals, organizations or states for a common purpose.

coal oil (kōl oil), petroleum, especially kerosene.

coal tar (kōl tär), a thick opaque liquid distilled from soft coal: used in making dyes, explosives and some medicines.

coarse (kōrs), *adj.* comprised of large particles, as *coarse* sand; large in texture; made of rough parts; rude, vulgar, unrefined.

coast (kōst), *n.* the strip of land along a large body of water; seashore.

coast (kōst), *n.* to travel along the coast; to run by momentum, as a vehicle, or a sled.

coastwise (kōst wīz), *adv.* along a coast.

coat (kōt), *n.* an outer garment covering the upper part of the body; a thin layer, as a *coat* of paint.

coat (kōt), *v.t.* to cover.

coax (kōks), *v.t.* to wheedle; to cajole.

cob (kob), *n.* a corncob; a strong, stocky horse.

***cobalt** (kō′ bôlt), *n.* a silver-white metallic element resembling nickel.

cobble (kob′ l), *n.* a paving stone.

cobble (kob′ l), *v.t.* to mend shoes.

cobbler (kob′ lẽr), *n.* one whose business it is to mend shoes.

***cobra** (kō′ br*a*), *n.* a deadly poisonous snake of India, having a neck that expands into a hood.

cobweb (kob′ web), *n.* a spider's web; an accumulation of dust on a ceiling in fine threads like a spider's web.

coca (kō′ k*a*), *n.* a powerful tonic made of the dried leaves of a South American shrub.

***cocaine** (kō kān′), *n.* a drug made from the leaves of the coca plant and used to deaden pain.

***coccyx** (kok′ siks), *n.* the last bone in the spinal column.

***cochineal** (koch i nēl′), *n.* a scarlet dye made from the dried bodies of the females of a certain Mexican insect.

cock (kok), *n.* a male of birds, especially of the domestic breeds of fowl; a small conical heap of hay; the hammer of a gun; a faucet.

cockerel (kok′ ẽr el), *n.* a young rooster.

cocker spaniel (kok′ ẽr span′ yel), a small breed of dog used as a pet or for retrieving birds.

cockle (kok′ l), *n.* a weed that grows in grainfields; an edible European shellfish; a kiln for drying hops.

***cockney** (kok′ ni), *n.* a native Londoner of the East End; the dialect peculiar to East End Londoners.

cockpit (kok′ pit), *n.* a pit or ring in which gamecocks fight; a space for care of the wounded on a warship; in small sailboats and yachts, a space slightly lower than the run of the deck; the space in which the pilot of an airplane sits.

cockroach (kok′ rōch), *n.* an insect pest infesting houses and ships.

cocoa (kō′ kō), *n.* powdered seeds of the cacao tree; a beverage made from this powder.

coconut (kō′ kō nut), *n.* the fruit of the coco palm.

cocoon (ko ko͞on′), *n.* the silky oblong case enveloping the larvae of some insects, as caterpillars or silkworms in which they develop to the adult stage.

cod (kod), *n.* a large saltwater fish.

coddle (kod′ l), *v.t.* to pet and pamper; to simmer in water, as eggs.

code (kōd), *n.* a system of rules; system of signals, as a cipher *code.*

***codicil** (kod′ i sil), *n.* an appendix to a will.

coeducation (kō ed ū kā′ shun), *n.* the education of boys and girls together in the same institution.

coefficient (kō e fish′ ent), *n.* in algebra, a number or a symbol prefixed to another number or group of symbols as a multiplier.

***coerce** (ko ûrs′), *v.t.* to force or compel to act, enforce; to restrain by force.

***coffee** (kof′ i), *n.* the seeds from the fruit of a tropical tree, roasted and ground; the drink made from this substance.

coffer (kof′ ẽr), *n.* a casket or chest for valuable things; a kind of caisson or floating dock: *coffers,* treasure, funds.

cofferdam (kof′ ẽr dam), *n.* a watertight enclosure protecting workmen building underwater structures.

coffin (kof′ in), *n.* a case in which a dead person is placed for burial.

cog (kog), *n.* a tooth or projection on the circumference of a wheel, engaging with one on another wheel or shaft, to transmit motion in machinery.

cogent (kō′ jent), *adj.* clear, forceful, convincing.

cogitate (kog′ i tāt), *v.i. and v.t.* to think over, plan.

cognate (kog′ nāt), *n.* a blood relation.

cognate (kog′ nāt), *adj.* related by blood; of the same stock or origin, as languages or words.

cognizance (kog′ ni zans), *n.* knowledge, perception; notice.

***cognomen** (kog nō′ men), *n.* a surname.

cohere (kō hēr′), *v.i.* to stick together, as paste; to be logically consistent.

coherence (kō hēr′ ens), *n.* logical consistency.

cohesion (kō hē zhun), *n.* the state or act of sticking together.

cohort (kō′ hôrt), *n.* the tenth part of an ancient Roman legion; an armed band or group of followers.

***coiffure** (kw*a*′ fûr), *n.* arrangement of the hair; a headdress.

coil (koil), *n.* a series of rings or one ring in a series; anything wound in spirals, as a *coil* of rope.

coil (koil), *v.t.* to wind in a spiral, as rope.

coin (koin), *n.* a piece of minted money.

***coin** (koin), *v.t.* to make metal into money; to invent, as a verbal expression.

coincide (kō in sīd′), *v.i.* to occupy the same space at the same time, as lines or angles *coincide;* to correspond exactly, as ideas.

coincidence (kō in′ si dens), *n.* occurrence of events simultaneously, by chance.

coke (kōk), *n.* the residue of coal or petroleum after the gases have been expelled, used as fuel.

***colander** (kul′ an dẽr), *n.* a pan or basin with perforated bottom.

cold (kōld), *n.* lack of heat; low temperature; an ailment of nose and throat, with sneezing and coughing.

cold (kōld), *adj.* lacking heat: opposite of *hot;* unemotional, unfeeling, as a *cold* heart; not warm enough for comfort, as the poor dog is *cold;* discouraging.

cold chisel (kōld chis′ l), a chisel of highly tempered steel for cutting metals.

coleslaw (kōl′ slô), *n.* cabbage salad.

colic (kol′ ik), *n.* an acute pain in the abdomen or bowels.

***collaborate** (ko lab′ o rāt), *v.i.* to work together, especially in literature or art.

***collapse** (ko laps′), *n.* a breakdown.

collapse (ko laps′), *v.i.* to break down, fall apart, cave in.

collar (kol′ ẽr), *n.* a band around the neck.

collar (kol′ ẽr), *v.t.* to take by the collar; to put a collar on.

*****collate** (ko lāt′), *v.t.* to compare critically, as two manuscripts.

collateral (ko lat′ ẽr al), *n.* property deposited as security for a loan.

collateral (ko lat′ ẽr al), *adj.* subordinate, auxiliary; parallel; coincident, as events; of the same ancestral stock, but not in the line of descent.

collation (ko lā′ shun), *n.* a light meal.

*****colleague** (ko lēg′), *n.* an associate in office.

collect (ko lekt′), *n.* a short, opening prayer.

collect (ko lekt′), *v.t. and v.i.* to assemble; to bring things or people together; to obtain payment of bills or taxes; to gather specimens of, as to *collect* butterflies; to assemble or accumulate, as a crowd *collects*, dust *collects* on unused books.

collection (ko lek′ shun), *n.* the act of collecting; a group of articles of similar nature, as coins or stamps, books or pictures; the taking up of voluntary contributions, as at a church service.

collective (ko lek′ tiv), *adj.* formed by collecting, gathered into one unit, as the *collective* knowledge of medical science; relating to a group, as *collective* aims.

collective noun (ko lek′ tiv noun), a singular noun with a plural meaning, usually taking a singular verb, as *group, army, herd, flock* are *collective nouns.*

college (kol′ ej), *n.* an institution of higher learning; a society of learned or powerful men, as the electoral *college.*

collide (ko līd′), *v.i.* to crash together.

collier (kol′ yẽr), *n.* a coal miner; a ship that carries cargoes of coal.

collision (ko lizh′ un), *n.* a violent impact of two moving bodies, as vehicles.

*****collocation** (kol ō kā′ shun), *n.* the act of placing things together; a number of things relatively arranged, as words.

*****collodion** (ko lō′ di un), *n.* a solution of pyroxylin in ether and alcohol, used to make a protective coating over a wound or a photographic film.

colloquial (kō lō′ kwi al), *adj.* used in common speech.

*****colloquy** (kol′ ō kwi), *n.* a conversation.

collusion (ko lū′ zhun), *n.* a secret agreement for a fraudulent or evil purpose.

colon (kō′ lon), *n.* a mark of punctuation (:); the large intestine.

colonel (kûr′ nel), *n.* a military officer ranking above a lieutenant colonel and below a brigadier general.

colonial (ko lō′ ni al), *adj.* relating to a colony.

colonize (kol′ ō nīz), *v.t. and v.i.* to form colonies in, as to *colonize* America; to establish in a colony, as to *colonize* surplus population; to go to and settle in a far country; to found a colony.

colonnade (kol on ād′), *n.* a series of columns in connection with a building.

colony (kol′ ō ni), *n.* a body of people moved from one land and settled in another but remaining under the jurisdiction of the country from which they emigrated; a group of people isolated from the general public to follow common interests, as a religious *colony.*

color (kul′ ẽr), *n.* the quality of things resulting from their property of reflecting some light rays and absorbing others; any of the hues of the rainbow; pigment.

colors (kul′ ẽrz), *n.* a national flag; aboard ship or at a military post, the salute to the flag as it is hoisted or taken down.

*****colossal** (kō los′ sal), *adj.* gigantic, huge.

colt (kōlt), *n.* the young of the horse, ass or zebra.

*****column** (kol′ um), *n.* a round pillar to support or adorn a building; a vertical division of a page of print; a line of marching troops; a vertical arrangement of figures to be added; a permanent space in a daily newspaper given over to a special feature.

*****columnist** (kol′ um nist), *n.* the writer of a signed column in a newspaper.

coma (kō′ m*a*), *n.* prolonged unconsciousness due to disease or injury.

*****comatose** (kom′ *a* tōs), *adj.* lethargic.

comb (kōm), *n.* a toothed instrument to untangle and order or adorn the hair; the crest of a fowl or a wave; the wax celled casing in which bees enclose their honey, honeycomb.

comb (kōm), *v.t.* to run a comb through; to go through carefully in search for something; to break in a line of foam, as waves.

*****combat** (kom′ bat), *n.* a battle, struggle, hand-to-hand contest.

*****combat** (kom′ bat), *v.i. and v.t.* to struggle contend, as to *combat* against a habit; to battle with, resist, as to *combat* disease.

combination (kom bi nā′ shun), *n.* a joining of things; things combined; an association of persons for a common purpose.

combine (kom bīn′), *v.i. and v.t.* to join together; to unite.

*****combine** (kom′ bīn), *n.* association of persons or corporation for common purpose, especially in restraint of trade; a threshing and harvesting machine that performs both operations.

combustible (kom bus′ ti bl), *n.* an inflammable substance.

combustible (kom bus′ ti bl), *adj.* inflammable.

*****combustion** (kom bus′ chun), *n.* the act of burning.

come (kum), *v.i.* [*p.t.* came, *p.p.* come, *pr.p.* coming] to move toward, draw near, as *come* here; to arrive, as the train *comes* at noon, May *comes* after April; to reach, as in space, as her hair *comes* to her shoulders; to reach, as an amount or condition, as the bill *comes* to $5, a liar *comes* to grief at last; to originate or develop, as to *come* of a royal line, a chicken *comes* from an egg; to be available, as diamonds *come* at a high price.

comedian (ko mē′ dian), *n.* an actor in a comedy or a writer of comedies; a comical person.

comedy (kom′ e di), *n.* an entertaining drama with a happy ending.

*****comely** (kum′ li), *adj.* of pleasing person and manner.

comet (kom′ et), *n.* a luminous body moving through the heavens and following an orbit about the sun.

comfort (kum′ fẽrt), *n.* ease of body and mind; consolation, solace; any person or thing that ministers to material ease or gives moral support.

comfort (kum′ fẽrt), *v.t.* to console, give hope or moral strength to.

Syn. Console, solace. To *comfort* is to relieve pain or distress by substituting cheer, hope or strength; to *console* is to lessen grief or trouble with imparting actual cheer; to *solace* is to lessen loneliness or melancholy rather than something as sharp as grief or pain.

comic (kom′ ik), *adj.* exciting mirth.

comity (kom′ i ti), *n.* politeness, courtesy, friendliness, especially between governments.

comma (kom′ *a*), *n.* a punctuation mark (,), used to separate words, phrases and clauses.

command (ko månd′), *v.t.* to order with authority; to be chief officer of, as troops or a ship; to overlook, as a mountain peak *commands* the valleys.

Syn. Order, enjoin. *Command* is the formal and official word; a general *commands* his army, a captain *commands* his ship. To *order* is a more personal word and sometimes implies being peremptory in the use of authority, as to *order* someone off the grass. To *enjoin* means to command or order, but carries the idea of warning or admonition, as to *enjoin* obedience.

command (ko månd′), *n.* an order; that which one commands, as a body of troops: authority; control.

commander (ko mån′ dẽr), *n.* a naval officer next lower in rank than a captain.

commandment (ko månd′ ment), *n.* an order; one of the Ten Commandments.

commemorate (ko mem′ ō rāt), *v.t.* to honor the memory of; to observe; to celebrate, as a national triumph.

commence (ko mens′), *v.i. and v.t.* to start; to begin; to set under way.

commencement (ko mens′ ment), *n.* a beginning; the graduation of a class in school or college.

commend (ko mend′), *v.t.* to praise; to name as worthy.

*****commensurate** (ko men′ shoo rit), *adj.* reducible to a common measure; equal in measure; in proportion.

comment (kom′ ent), *n.* critical or explanatory statements; a remark.

comment (kom′ ent), *v.i.* to say or write something about a person, thing, action or event.

*****commentary** (kom′ en ter i), *n.* a body of explanatory notes, to accompany a text or document.

commerce (kom′ ûrs), *n.* trade, especially interchange of goods between traders in different states or lands.

commingle (ko ming′ gl), *v.t. and v.i.* to mix, blend, mingle together.

*****commiserate** (ko miz′ er āt), *v.t.* to feel or express sympathy or pity for.

*****commissary** (kom′ i ser i), *n.* an army officer in charge of provisions and supplies; a store selling food and other supplies, as in a mining camp.

commission (ko mish′ un), *n.* a group of persons appointed to perform some public duty; the act of doing or committing, as *commission* of an errand, *commission* of a crime; the delegation of a responsible task to someone; a certificate of rank in the army or navy; the pay of an agent, generally on a percentage of his sales.

commission (ko mish′ un), *v.t.* to give a commission to, as an officer; to put into active service, as a ship; to empower to act, as an agent.

commit (ko mit′), *v.t.* to do (something specified), as to *commit* a crime; to give into custody or care, as to *commit* a man to prison, I *commit* the child to you; to entrust or consign, as to *commit* a poem to memory or paper.

committee (ko mit′ i), *n.* a group of persons appointed to attend to some particular activity of an organization.

*****commodious** (ko mō′ di us), *adj.* roomy and comfortable.

*****commodity** (ko mod′ i ti), *n.* an article of commerce, especially a profitable article of commerce; goods, merchandise.

common (kom′ un), *n.* a tract of public land.

common (kom′ un), *adj.* belonging to all of a group; ordinary; coarse and vulgar.

common law (kom′ un lô), the unwritten law of England based on immemorial usage; the general law of any country.

common noun (kom′ un noun), a word used to name any individual of a group or class, as apple, man, dog, merchant, tub are *common nouns;* opposite of *proper noun.*

commonplace (kom′ un plās), *adj.* ordinary, trite.

commonsense (kom′ un sens), *adj.* sensible; characterized by ordinary, every day sense.

commonwealth (kom′ un welth), *n.* the whole body of people under a government; a state.

commotion (ko mō′ shun), *n.* excitement and confusion.

communicate (ko mū′ ni kāt), *v.i. and v.t.* to exchange ideas through speech, writing or signal; to join, as rooms *communicate;* to impart, as to *communicate* the news of the day.

communications (ko mū ni kā′ shun), *n. pl.* a military system of maintaining contacts as by messenger, telephone, telegraph or wireless, and for keeping troops and supplies going forward.

communion (ko mūn′ yun), *n.* religious fellowship; the Lord's Supper, the Eucharist; the sharing or interchange of ideas.

*****communiqué** (ko mū ni kā′), *n.* an official bulletin from the scene of activities, as in war.

communism (kom′ ū nizm), *n.* a social system that puts property, capital and industry under the control of the community, and strives toward equal distribution of benefits.

communist (kom′ ū nist), *n.* one who advocates or supports communism.

community (ko mū′ ni ti), *n.* a body of people having common interests or living in one locality; possession of things or ideas in common.

commutation (kom ū tā′ shun), *n.* a substitution of one kind of payment for another; the amount paid in substitutions; the reduction of a severe penalty to a lesser one.

commutation ticket (kom ū tā′ shun tik′ et), a ticket for transportation at a reduced rate for frequent journeys.

commute (ko mūt′), *v.i. and v.t.* to travel back and forth regularly, as between one's home and the place where one works, on a commutation ticket; to reduce the severity of, as to *commute* a court's sentence.

compact (kom′ pakt), *n.* an agreement or covenant; a small case in which women carry mirror, powder and rouge.

compact (kom pakt′), *adj.* closely packed, solid; terse; concise.

companion (kom pan′ yun), *n.* a comrade; close associate; one who accompanies another.

company (kum′ p*a* ni), *n.* an assemblage; visitors in a home; a group of persons associated in business with legal standing as a unit; a military unit commanded by a captain.

***comparable** (kom′ p*a* r*a* bl), *adj.* capable of being compared; worthy of being compared.

comparative (kom par′ *a* tiv), *n.* an adjective or adverb in the comparative degree.

comparative (kom par′ *a* tiv), *adj.* estimated or studied by comparison; not positive, not exact, relative.

compare (kom pâr′), *v.i. and v.t.* to be like, as this *compares* favorably with that; to analyze one thing in terms of another to discover resemblances and differences; to inflect an adjective or adverb, giving the forms that express different degrees.

***comparison** (kom par′ i sun), *n.* the act of comparing; an estimate of resemblances and differences; the change in form of an adjective or adverb to show difference in degree; a simile.

compartment (kom pärt′ ment), *n.* a division made by a partition inside a closed space, as a *compartment* in a desk or in a railroad passenger car.

compass (kum′ pȧs), *n.* an instrument indicating the directions, north, south, east, west, by means of a magnetic needle; an instrument for drawing circles.

compass (kum′ pȧs), *v.i. and v.t.* to bring about a desired result; to encircle; to comprehend.

compassion (kom pash′ un), *n.* sorrow for the sufferings of others; pity.

compatible (kom pat′ i bl), *adj.* congruous, harmonious; able to get along together.

***compatriot** (kom pā′ tri ut), *n.* a fellow countryman.

compel (kom pel′), *v.t.* to drive, take or restrain by force.

compendium (kom pen′ di um), *n.* an abridgement of a text, a summary.

***compensate** (kom′ pen sāt), *v.i. and v.t.* to recompense; to make amends for; to bring to a balance.

compensation (kom pen sā′ shun), *n.* recompense; amends for damage of any kind; pay for services or work.

compete (kom pēt′), *v.i.* to strive or contend against the opposition of others, as for a prize.

***competence** (kom′ pē tens), *n.* fitness, ability; a moderate fortune, enough to live on.

competent (kom′ pē tent), *adj.* fit, able, capable.

competition (kom pē tish′ un), *n.* rivalry; a match; effort to outdo a rival in business or sport.

competitor (kom pet′ i tẽr), *n.* one who competes; a rival.

compile (kom pīl′), *v.t.* to put existing materials together in fresh form, as a book; to assemble data.

complacence (kom plā′ sens), *n.* contentment; self-satisfaction.

complacent (kom plā′ sent), *adj.* contented, self-satisfied; exhibiting self-satisfaction.

complain (kom plān′), *v.i.* to express pain, sorrow or dissatisfaction; to find fault; to make a formal legal accusation.

complaint (kom plānt′), *n.* an expression of discontent; faultfinding; a formal charge; ailment.

***complaisance** (kom plā′ zans), *n.* desire to please; obligingness.

***complement** (kom′ plē ment), *n.* that which completes; the full number or amount to complete a set; the whole personnel of a vessel.

complete (kom plēt′), *v.t.* to bring to full number or accomplishment; to fill out; to supply a deficiency; to finish.

complete (kom plēt′), *adj.* lacking no part; finished; thorough.

complex (kom′ pleks), *n.* in psychology, a group of associated ideas affecting the emotions and behavior.

***complex** (kom pleks′), *adj.* consisting of a number of parts or elements; intricate, not simple.

complex fraction (kom′ pleks frak′ shun), a fraction in which either numerator or denominator is itself a fraction.

complexion (kom plek′ shun), *n.* the coloring of the skin, especially of the face.

complexity (kom plek′ si ti), *n.* intricacy; any complicated thing.

compliance (kom plī′ ans), *n.* a yielding; consenting.

compliant (kom plī′ ant), *adj.* yielding, disposed to oblige.

complicate (kom′ pli kāt), *v.t.* to make intricate or difficult.

complicated (kom′ pli kāt ed), *adj.* having many intricate parts; confusing, hard to solve, separate or analyze.

complication (kom pli kā′ shun), *n.* the state of being complicated, entangled, intricate; that which complicates or causes confusion or difficulty; a confusing set of circumstances; a disease existing with and making more serious another disease.

complicity (kom plis′ i ti), *n.* association in wrongdoing; a taking part in something, especially a crime.

***compliment** (kom′ pli ment), *n.* an expression of praise or appreciation: *compliments,* formal greetings, as *compliments* of the author.

***complimentary** (kom pli men′ t*a* ri), *adj.* conveying an expression of regard or appreciation; presented free, as a *complimentary* copy of a book.

comply (kom plī′), *v.i.* to yield or assent; to agree; to conform.

***component** (kom pō′ nent), *n.* an elementary part, ingredient.

component (kom pō′ nent), *adj.* forming a necessary part, helping to constitute.

***comport** (kom pōrt′), *v.t. and v.i.* to conduct, behave, as to *comport* oneself with dignity; to agree.

compose (kom pōs′), *v.t.* to form by combination of units or parts; to write, as poems or music; to calm, as to *compose* one's self; to constitute, make up, as the parts *compose* the whole; to reconcile, as differences of opinion; to set type. The parts *compose* the whole; the whole *comprises* the parts.

composed (kom pōzd′), *adj.* calm, cool, self-contained.

***composite** (kom poz′ it), *n.* a compound or combination.

composite (kom poz′ it), *adj.* compounded, made up of various parts.

composition (kom pō zish′ un), *n.* the act or result of composing or compounding; a work of literature, painting, sculpture, music, in which various elements are brought together; setting of type.

compositor (kom poz′ i tẽr), *n.* one who composes, especially one who sets type.

***compost** (kom′ pōst), *n.* a rotted mixture of leaf mold, manure and lime, used as a fertilizer.

composure (kom pō′ zhẽr), *n.* calmness, coolness.

compound (kom′ pound), *n.* the product of the mixture or union of parts.

***compound** (kom pound′), *v.t.* to unite into a whole, combine.

compound (kom′ pound), *adj.* made of several different parts, composite.

comprehend (kom prē hend′), *v.t.* to include, contain or take in; to grasp with the mind, understand.

comprehension (kom prē hen′ shun), *n.* mental grasp, understanding, ability to understand; inclusion.

comprehensive (kom prē hen′ siv), *adj.* extensive, including much; able to understand.

compress (kom pres′), *v.t.* to press together; to condense.

compression (kom presh′ un), *n.* condensation, pressing together.

comprise (kom prīz′), *n.* to take in, include, consist of.

compromise (kom′ prō mīz), *n.* a settlement by mutual concession; a half-way thing or measure.

compromise (kom′ prō mīz), *v.i. and v.t.* to adjust by mutual concession; to expose to risk or suspicion; to reach an agreement by concession, as the two nations *compromised.*

compulsion (kom pul′ shun), *n.* force; constraint.

compulsory (kom pul′ sō ri), *adj.* obligatory, enforced, required, as *compulsory* education.

compunction (kom pungk′ shun), *n.* self-reproach, remorse; regret.

computation (kom pū tā′ shun), *n.* the act or result of calculating; a calculation or reckoning.

compute (kom pūt′), *v.t.* to reckon, calculate.

***comrade** (kom′ rad), *n.* a friend, companion.

con (kon), *v.t.* to study carefully; to memorize.

***concatenation** (kon kat e nā′ shun), *n.* connection as by links, in a chain; a series of things linked as if by a chain.

concave (kon kāv′), *adj.* hollow and curved, like the inner surface of a sphere: opposite of *convex.*

conceal (kon sēl′) *v.t.* to hide; to keep secret, to withhold, as information.

concede (kon sēd′) *v.t.* to yield or allow; to admit or acknowledge; to grant, as a point in debate.

conceit (kon sēt′), *n.* exaggerated self-esteem, vanity; a quaint fancy.

conceivable (kon sēv′ *a* bl), *adj.* capable of being thought of or understood; imaginable.

conceive (kon sēv′), *v.t. and v.i.* to think of, imagine or understand; to become pregnant; to think, have an idea.

***concentrate** (kon′ sen trāt), *v.t.* to bring to a center; to center attention on; to condense into a smaller but stronger quantity.

concentration (kon sen trā′ shun), *n.* act or process of concentration; mental application.

***concentric** (kon sen′ trik), *adj.* having the same center, as *concentric* circles.

concept (kon′ sept), *n.* a thought or idea; a mental image.

conception (kon sep′ shun), *n.* the act of forming an idea; understanding; beginning, especially the beginning of life in an ovum.

concern (kon sûrn′), *n.* something about which one cares or in which he is interested; interest in or regard for; a business company.

concern (kon sûrn′), *v.t.* to relate or belong to; affect, interest or engage; to implicate.

concerning (kon sûrn′ ing), *prep.* relating to, regarding.

***concert** (kon sûrt′), *v.t.* to contrive, devise or arrange in co-operation.

concert (kon′ sûrt), *n.* a musical entertainment; harmony; co-operation.

concession (kon sesh′ un), *n.* the act of yielding or that which is yielded; a privilege granted, as for mining or doing business in a certain place.

***conch** (kongk), *n.* a large, spirally shaped seashell.

***concha** (kong′ k*a*), *n.* the outer ear, shaped like a conch.

***conciliate** (kon sil′ i āt), *v.t.* to reconcile; to win the favor or good opinion of.

concise (kon sīs′), *adj.* terse; condensed; short.

conclave (kon klāv′), *n.* a secret meeting; the meeting of cardinals to elect a pope.

conclude (kon klo͞od′), *v.i. and v.t.* to come to an end; to bring to an end; to draw an inference.

conclusion (kon klo͞o′ zhun), *n.* the end; an inference drawn; a final determination.

conclusive (kon klo͞o′ siv), *adj.* decisive, final.

concoct (kon kokt′), *v.t.* to cook things together; to prepare by mixing; to devise, as a plan or scheme.

concomitant (kon kom′ i tant), *n.* something attendant upon another thing; an attendant circumstance, as snow is not always a *concomitant* of cold weather.

concomitant (kon kom′ i tant), *adj.* accompanying, attending.

***concord** (kon′ kôrd), *n.* harmony; agreement.

concordance (kon kôrd′ ans), *n.* agreement; an index of words, with reference to the places where they occur in a text.

***concordat** (kon kôr′ dat), *n.* a compact or agreement, especially between the pope and a state.

concourse (kon′ cōrs), *n.* a coming together, as of many people; a place where many roads or paths meet.

***concrete** (kon′ krēt), *n.* a hard mass formed by mixing gravel or broken stone with sand, cement and water.

concrete (kon krēt′), *adj.* real; definite; made of concrete.

concur (kon kûr′), *v.i.* to acquiesce; to coincide or happen at the same time; to unite in opinion or action.

concurrent (kon kûr′ ent), *adj.* existing or running together, as *concurrent* sentences for two or more crimes; acting jointly, as *concurrent* action by House and Senate.

concussion (kon kush′ un), *n.* the shock of two objects in collision; a jarring, as of the brain, by a shock or blow.

***condemn** (kon dem′), *v.t.* to pronounce guilty; to declare forfeited from private to public use, as land; to declare unfit for use, as a building; to disapprove, as a policy of action or a person's conduct.

condensation (kon den sā′ shun), *n.* reduction in size or amount, as a synopsis is a *condensation* of a book or article; the process or product of changing from gaseous or vaporous form to liquid form.

condense (kon dens′), *v.t. and v.i.* to compress; to reduce in size or volume and pack into smaller space; to change from gaseous or vaporous to liquid form.

***condescend** (kon dē send′), *v.i.* to stoop or descend to a less formal state; to be gracious to inferior persons; deign.

condiment (kon′ di ment), *n.* a relish; seasoning.

condition (kon dish′ un), *n.* a state of being, as healthy or sick, rich or poor, good or bad; a requirement for the doing of something, a stipulation; a qualification; external circumstances, as to work under bad *conditions.*

condole (kon dōl′), *v.i. and v.t.* to express sympathy, to grieve with another.

***condolence** (kon dō′ lens), *n.* sympathy; a message of sympathy.

condone (kon dōn′), *v.t.* to find excuses for; to overlook, as a fault.

condor (kon′dēr), *n.* a South American vulture.

***conduce** (kon dūs′), *v.i.* to tend; to help bring about.

conducive (kon dū′ siv), *adj.* helping to bring about, as a result or condition, as health is *conducive* to happiness.

conduct (kon′ dukt), *n.* personal behavior; management or direction, as of a business.

conduct (kon dukt′), *v.t.* to guide; to lead; to manage.

conductor (kon duk′ tēr), *n.* one who or that which conducts, leads or guides; one who has charge of a public vehicle, as a train, bus or street car; a body or material through which an electric current can pass.

***conduit** (kon′ dit), *n.* a tube or pipe through which water passes or in which wires are laid.

cone (kōn), *n.* a solid figure with a circular base, tapering upward to a sharp point; the cone-shaped fruit of certain evergreen trees; a hollow cone-shaped biscuit used to hold ice cream.

confection (kon fek′ shun), *n.* anything conserved or compounded with sugar.

confectionery (kon fek′ shun er i), *n.* candy; a candy shop.

confederacy (kon fed′ ēr *a* si), *n.* an alliance or league for mutual support or action.

confederate (kon fed′ ēr āt), *v.i. and v.t.* to unite or become united in a league of states or in a conspiracy.

confederate (kon fed′ ēr it), *adj.* associated in a confederacy.

confer (kon fûr′), *v.t. and v.i.* to grant; to bestow upon, as a prize, a gift or a favor; to consult together, to engage in discussion.

conference (kon′ fēr ens), *n.* a consultation; a meeting for discussion of affairs.

confess (kon fes′), *v.i. and v.t.* to make confession; to admit or acknowledge, as a fault, sin or crime; to assert belief in, as a religious faith.

confessional (kon fesh′ un al), *n.* the cabinet in which a priest sits while hearing confessions.

confessor (kon fes′ ēr), *n.* one who confesses; a priest who hears confessions.

confetti (kon fet′ tē), *n. pl.* little pieces of colored paper used to toss into the air at a carnival or other festival.

***confidant** (kon′ fi dant), *n.* one to whom secrets are entrusted; a person in whom one confides or has faith.

confide (kon fīd′), *v.i. and v.t.* to have faith in, to trust; to entrust; to tell in confidence.

confidence (kon′ fi dens), *n.* trust; assurance of one's own ability or fitness; a secret told in confidence.

confident (kon′ fi dent), *adj.* self-assured; sure of.

confidential (kon fi den′ shal), *adj.* revealed in confidence; to be kept secret.

configuration (kon fig ū rā′ shun), *n.* outline, contour, shape.

confine (kon′ fīn), *n.* a boundary or limit.

confine (kon fīn′), *v.t.* to restrict within limits; to imprison.

confirm (kon fûrm′), *v.t.* to strengthen, as faith; to ratify or verify, as news; to receive into the church.

***confiscate** (kon′ fis kāt), *v.t.* to adjudge forfeited and seize, because of violation of law; to appropriate for public use.

confiscatory (kon fis′ k*a* tō ri), *adj.* characterized by or attended by confiscation.

***conflagration** (kon fl*a* grā′ shun), *n.* a great destructive fire.

conflict (kon′ flikt), *n.* a fight or struggle for mastery; a clash of opinions or interests; an inner moral struggle.

conflict (kon flikt′), *v.i.* to clash; to fight for supremacy; to come into opposition.

confluence (kon′ floo ens), *n.* the junction of two streams; the point at which they meet.

conform (kon fôrm′), *v.i. and v.t.* to be in or bring into agreement; to comply.

conformable (kon fôrm′ a bl), *adj.* in agreement or harmony, as this is *conformable* to your designs; compliant.

conformation (kon fôr mā′ shun), *n.* adaptation; formation, structure.

conformity (kon fôrm′ i ti), *n.* agreement, correspondence, compliance.

confound (kon found′), *v.t.* to confuse, dismay; to astonish; to damn.

confront (kon frunt′), *v.t.* to stand face to face with hostilely, as to *confront* an enemy; to put one face to face with, as to *confront* a critic with facts.

confuse (kon fūz′), *v.t.* to perplex, as to *confuse* a student; to bewilder, to mix, jumble together, as to *confuse* facts.

confusion (kon fū′ zhun), *n.* disorder, turmoil, as *confusion* in the streets; mental agitation, bewilderment; embarrassment.

confute (kon fūt′), *v.t.* to prove false, as to *confute* previous arguments; to prove (a person) to be in error, as to *confute* the judge.

congeal (kon jēl′), *v.i. and v.t.* to convert or be converted from a liquid to a solid state by freezing.

***congenial** (kon jēn′ yal), *adj.* having similar tastes, ideas and ideals; suitable to one's needs or desires, as a *congenial* environment.

congenital (kon jen′ i tal), *adj.* existing since birth.

congested (kon jest′ ed), *adj.* crowded, obstructed, as streets with traffic.

congestion (kon jes′ chun), *n.* a crowded condition; an excessive accumulation of blood in some part of the body.

***conglomerate** (kon glom′ ēr it), *adj.* gathered into a mixed mass.

congratulate (kon grat′ ū lāt), *v.t.* to felicitate; to greet or address with pleasure because of some fortunate happening.

***congregate** (kon′ grē gāt), *v.i.* to assemble, as in a church.

congregation (kon grē gā′ shun), *n.* an assemblage, especially in a church.

congregationalism (kon grē gā′ shun al izm), *n.* self-rule by a congregation.

congress (kon′ gres), *n.* an assembly of representatives of state, especially of a republic.

***congruity** (kong′ gro͞o i ti), *n.* agreement of things, harmony.

congruous (kon gro͞o′ us), *adj.* fitly combining; in agreement, as facts one with another; consistent.

***conic** (kon′ ik), *adj.* shaped like a cone.

conjectural (kon jek′ tūr al), *adj.* not certain, but surmised.

conjecture (kon jek′ tūr), *n.* a guess; surmise.

conjecture (kon jek′ tūr), *v.i.* to guess; to surmise.

conjoin (kon join′), *v.i. and v.t.* to join together, combine.

conjoint (kon joint′), *adj.* associated.

***conjugal** (kon′ joo gal), *adj.* pertaining to marriage.

conjugate (kon′ joo gāt), *v.t.* to inflect a verb or state its moods, tenses, voices, numbers, persons.

conjugation (kon joo gā′ shun), *n.* an orderly statement of the inflectional forms of a verb, as its different tenses, moods, voices, numbers, persons.

conjunct (kon jungt′), *adj.* joined together.

conjunction (kon jungk′ shun), *n.* a part of speech connecting words, phrases and clauses; the apparent meeting of heavenly bodies.

***conjure** (kon joor′), *v.i. and v.t.* to cast spells; to practice magic; to put a spell on.

connect (ko nekt′), *v.i. and v.t.* to associate or be associated; to join; to bring together; to form a line between.

connection (ko nek′ shun), *n.* the act of connecting or state of being connected; relation, in thought or logic; a person associated with one in business or related by blood or marriage; boat and train transference in traveling; a hook-up of one telephone with another.

conning tower (kon′ ing tou′ ēr), an armored pilothouse on a warship, having observation slits.

connivance (ko nīv′ ans), *n.* passive co-operation, especially in a crime or fault; collusion.

connive (ko nīv′), *v.i.* to close the eyes to, pretend not to see, as to *connive* at a prisoner's escape; to be in secret understanding with.

***connoisseur** (kon i sûr′), *n.* an expert judge or critic, as of art.

connote (ko nōt′), *v.t.* to imply, suggest or point to a meaning in addition to the literal meaning.

connubial (ko nū′ bi al), *adj.* matrimonial; pertaining to marriage or to a husband or wife.

***conquer** (kong′ kēr), *v.t. and v.i.* to vanquish, subdue, overcome by force; to be victorious.

conqueror (kong′ kēr ēr), *n.* one who conquers, a victor.

***conquest** (kong′ kwest), *n.* the act of conquering, or that which is conquered; triumph.

conscience (kon′ shens), *n.* the moral sense which distinguishes right from wrong.

***conscientious** (kon shi en′ shus), *adj.* guided by conscience, scrupulous.

conscious (kon′ shus), *adj.* aware; self-conscious; mentally active; intentional.

consciousness (kon′ shus nes), *n.* the full knowledge of what is in one's own mind; awareness.

conscript (kon′ skript), *n.* one enrolled for compulsory military or naval service.

conscript (kon skript′), *v.t.* to draft into the army or navy.

conscription (kon skrip′ shun), *n.* the system of drafting men for military service.

consecrate (kon′ sē krāt), *v.t.* to set apart as sacred; to dedicate to God.

consecutive (kon sek′ ū tiv), *adj.* following in order, successive; moving without interruption of thought, as a narrative.

consensus(kon sen′ sus), *n.* general agreement; representative trend, as of opinion.

consent (kon sent′), *n.* voluntary acceptance of a proposition or demand; approval; permission, as you have my *consent.*

consent (kon sent′), *v.i.* to comply, yield; to give permission or approval.

consequence (kon′ sē kwens), *n.* that which follows, a result; importance.

consequent (kon′ sē kwent), *adj.* following naturally or logically as a result.

consequential (kon sē kwen′ shal), *adj.* self-important; following as a logical result.

conservation (kon sēr vā′ shun), *n.* the act of preserving resources from decay, loss or injury.

conservative (kon sûrv′ *a* tiv), *n.* one who opposes sudden changes in government or policy; a believer in things as they are.

conservative (kon sûrv′ *a* tiv), *adj.* cautious, prudent, moderate; opposed to great or sudden changes, supporting the existing regime, believing in established principles; not risky, as a *conservative* investment.

conservatory (kon sûrv *a* tō ri), *n.* a greenhouse; a school of music, drama or oratory.

***conserve** (kon sûrv′), *n.* a preparation of fruits in sugar.

conserve (kon sûrv′), *v.t.* to husband, as resources; to handle with care and safeguard against destruction.

consider (kon sid′ ēr), *v.i. and v.t.* to deliberate; to ponder; to give attention to; to regard as.

considerable (kon sid′ ēr *a* bl), *adj.* notable as in size or value.

***considerate** (kon sid′ ēr it), *adj.* ready to consider and act for the welfare of others.

consideration (kon sid ēr ā′ shun), *n.* study; kindliness; a fact to be taken into account; a reward or inducement.

consign (kon sīn′), *v.t.* to entrust; to set apart for special use or for use by some particular person; to ship goods to.

***consignee** (kon sīn ē′), *n.* the person to whom goods are shipped.

consignment (kon sīn′ ment), *n.* a shipment of goods; commitment of property to another than the owner for sale or safekeeping.

consist (kon sist′), *v.i.* to be made or composed of.

consistency (kon sis′ ten si), *n.* the degree of density or thickness of a fluid; logical agreement, as between precept and practice or between two or more statements.

consistent (kon sis′ tent), *adj.* free from self-contradiction; in harmony with.

console (kon sōl′), *v.t.* to comfort, in sorrow.

consolidate (kon sol′ i dāt), *v.i. and v.t.* to make or become solid, united; to join two or more business concerns.

consommé (kon so mā′), *n.* a clear soup made by prolonged boiling of meats.

***consonance** (kon′ sō nans), *n.* agreement, harmony, especially of sounds.

consonant (kon′ sō nant), *n.* a letter not a vowel.

consonant (kon′ sō nant), *adj.* agreeing, consistent; having a sound like a consonant; having similar sounds, as *consonant* words.

consort (kon′ sôrt), *n.* an associate; a husband or wife; a ship escorting another.

consortium (kon sôr′ shium), *n.* an arrangement made by banking interests of two or more nations to give financial assistance to another nation.

conspectus (kon spek′ tus), *n.* a general view of a subject; survey.

conspicuous (kon spik′ ū us), *adj.* showing prominently, very noticeable; outstanding.

***conspiracy** (kon spir′ *a* si), *n.* a plot; combination of persons for an evil purpose.

conspirator (kon spir′ *a* tēr), *n.* a plotter; one who engages in a conspiracy.

conspire (kon spīr′), *v.i.* to plot together; to combine secretly for an unlawful purpose.

***constable** (kun′ st*a* bl), *n.* an officer of the law comparable to a sheriff but of lower standing and working in a smaller field.

constabulary (kon stab′ ū ler i), *n.* constables collectively; a police force, as the mounted *constabulary* of a state.

constancy (kon′ stan si), *n.* steadfastness; stability.

Syn. Fidelity, faithfulness. *Constancy* is steadfastness, especially in love or friendship. *Fidelity* is unchanging adherence, sometimes to a person, but also to a trust or a cause. *Faithfulness* implies warm personal devotion.

constant (kon′ stant), *adj.* steadfast, firm; not variable, as a *constant* light; continuous, as a *constant* drip of water.

constellation (kon ste lā′ shun), *n.* a group of fixed stars to which a group name has been given.

consternation (kon stur nā′ shun), *n.* dismay; confused fright.

constipation (kon sti pā′ shun), *n.* inactivity of the bowels.

constituency (kon stit′ ū en si), *n.* a body of followers; all the voters of a public officer's electoral territory.

constituent (kon stit′ ū ent), *n.* a component part; one who follows and votes for an elected officer of the state.

constituent (kon stit′ ū ent), *adj.* necessary or serving as a part or element of a compound; empowered to elect.

constitute (kon sti tūt′), *v.t.* to compose or make up; to appoint, as to an office; to establish, as a law.

constitution (kon sti tū′ shun), *n.* the composition or make-up of anything, as of the human body or the state; the system of fundamental laws of a nation or society.

constitutional (kon sti tū′ shun al), *n.* a walk taken for the health.

constitutional (kon sti tū′ shun al), *adj.* pertaining to a constitution, as *constitutional* law; in keeping with the constitution.

constrain (kon strān′) *v.t.* to compel; to confine by force.

constraint (kon strānt′), *n.* compulsion or restraint; confinement; repression; embarrassment.

constrict (kon strikt′), *v.t.* to bind; to cramp.

construct (kon strukt′), *v.t.* to build; to put together.

construction (kon struk′ shun), *n.* the act of building; a building; style of building; interpretation; the arrangement of words in a sentence or of sentences in paragraph.

constructive (kon struk′ tiv), *adj.* helping to build up, not destructive; helpful, as *constructive* suggestions.

***construe** (kon strōō′), *v.t.* to analyze the grammatical structure of a sentence; to interpret, as law.

consubstantial (kon sub stan′ shal), *adj.* of the same substance, essence or nature.

***consul** (kon′ sul), *n.* one of two chief magistrates of the ancient Roman republic; an officer commissioned by a government to reside in a foreign country to promote trade and safeguard the interests of his compatriots living or trading in the country to which he is sent.

consular (kon′ sū lēr), *adj.* pertaining to a consul or his duties and functions.

consulate (kon′ sū lāt), *n.* the office and residence of a consul.

consult (kon sult′), *v.i. and v.t.* to confer with; to ask advice of, as to *consult* a physician; to have regard for, as to *consult* a friend's wishes; to refer to, as to *consult* a dictionary.

consultation (kon sul tā′ shun), *n.* a conference for exchange of views, as of doctors in connection with a case of sickness.

consume (kon sūm′), *v.t.* to use up; to destroy, as by fire; to engross and waste, as passion *consumed* him.

consumer (kon sūm′ ēr), *n.* one who buys goods for his own use.

***consummate** (kon′ su māt), *v.t.* to complete; to finish.

***consummate** (kon sum′ it), *adj.* perfect; complete.

consummation (kon su mā′ shun), *n.* completion; attainment of a desired end.

consumption (kon sump′ shun), *n.* a disease that wastes the body; use of goods removing them from the market.

consumptive (kon sump′ tiv), *adj.* causing destruction or waste; afflicted with tuberculosis.

contact (kon′ takt), *n.* a coming together of two objects so that they touch; close relations, as of a salesman with a possible customer; the junction of two electrical conductors.

contact (kon′ takt), *v.t. and v.i.* to be or get in touch with; to touch.

contagion (kon tā′ jun), *n.* transmission of disease by contact, which may be direct or indirect; the transmission of a mood, as the *contagion* of enthusiasm.

contagious (kon tā′ jus), *adj.* catching, conveyed by contact, as a *contagious* disease, a *contagious* laugh.

contain (kon tān′), *v.t.* to hold within a certain space; to have capacity for; to include, as this book *contains* pictures; to control, as he could hardly *contain* his mirth.

container (kon tān′ ēr), *n.* a box, jar or carton that holds something or in which a thing is sold and carried away.

contaminate (kon tam′ i nāt), *v.t.* to pollute; to make impure; to defile.

Syn. Defile, pollute, taint, corrupt. Whatever is impure *contaminates;* what is gross and vile in the natural sense *defiles* and in the moral sense *pollutes;* what is contagious or infectious *corrupts,* and what is corrupted may *taint* other things.

Ant. Clean, clear, purify, whiten.

***contemn** (kon tem′), *v.t.* to despise; to hold in contempt.

Syn. Despise, scorn, disdain. *Contemn* signifies to stigmatize as worthless and worthy of contempt; to *despise* is to look down upon, which is an act of contempt; to *scorn* is to strip of all honors and expose to derision; to *disdain* is to hold altogether unworthy.

Ant. Admire, adore, esteem.

contemplate (kon′ tem plāt), *v.t. and v.i.* to meditate on; to regard thoughtfully; to intend; to think over carefully.

Syn. Meditate, muse. Different species of reflection are marked by these terms. We *contemplate* what is present or before our eyes; we *meditate* on what is past or absent. The heavens are for us to *contemplate;* on the ways of Providence we may fitly *meditate.* One *muses* on events or circumstances which have been just passing.

***contemplative** (kon tem′ pl*a* tiv), *adj.* thoughtful.

contemporaneous (kon tem pō rā′ nē us), *adj.* happening or existing at the same time; contemporary.

contemporary (kon tem′ pō rer i), *n.* a person living at the same time as another; a person about the same age as another.

contemporary (kon tem′ pō rer i), *adj.* happening or existing at the same time; having the same age.

contempt (kon tempt′), *n.* scorn; disdain; deliberate disregard for the orders or dignity of a court.

contemptible (kon tempt′ i bl), *adj.* deserving scorn; despicable.

contemptuous (kon tempt′ ū us), *adj.* manifesting contempt; disdainful.

contend (kon tend′), *v.i.* to strive in opposition; to assert; to present as an argument.

content (kon′ tent), *n.* that which is contained, as the *contents* of a box; size or capacity for holding, as the *content* of this basket is a quart; meaning, subject matter, as the *content* of a text; contentment.

content (kon tent′), *adj.* satisfied with what one has; assenting, as to a vote.

contention (kon ten′ shun), *n.* strife; conflict; that which one contends in argument or debate.

contentious (kon ten′ shus), *adj.* quarrelsome; argumentative; causing contention.

contentment (kon tent′ ment), *n.* the state of being satisfied with what one has.

contest (kon′ test), *n.* a struggle to demonstrate superiority; rivalry for a prize.

Syn. Conflict, combat, fight. A *contest* is any rivalry, friendly rivalry, as an athletic *contest*, or hostile rivalry to win something. A *conflict* is a close fight. *A combat* is always an armed fight. A *fight* is usually a fist fight, but the word is also used of inner moral struggle.

contest (kon test′), *v.i. and v.t.* to take part in a struggle, as to *contest* against odds; to challenge the rightness or validity, as of a will; to struggle to hold or win, as a race or territory.

contestant (kon tes′ tant), *n.* one who takes part in any kind of a contest.

context (kon′ tekst), *n.* that part of a written discourse in which a certain word, phrase or passage appears, necessary to point the meaning, as it is hard to tell the exact meaning of a word out of *context.*

contiguity (kon ti gū′ i ti), *n.* nearness; contact.

***contiguous** (kon tig′ ū us), *adj.* touching; near.

continence (kon′ ti nens), *n.* self-restraint, especially restraint in indulgence of the appetites.

continent (kon′ ti nent), *n.* one of the six greatest divisions of the earth's land surface.

contingency (kon tin′ jen si), *n.* something that may happen but of which there is no assurance; a chance.

contingent (kon tin′ jent), *n.* a quota, as of troops.

contingent (kon tin′ jent), *adj.* possible but not certain; accidental; depending, conditional, as success is *contingent* upon effort.

continual (kon tin′ ū al), *adj.* uninterrupted; incessant.

Syn. Continuous, constant, perpetual. *Continual* describes almost unbroken recurrence in time, as *continual* questions, *continual* noise; *continuous* means unbroken and unceasing in both time and space, as a *continuous* line, *continuous* rain for three days; *constant* means persistent, as *constant* pain, *constant* hope; *perpetual* means unceasing, lasting, endless, as *perpetual* motion.

continuation (kon tin ū ā′ shun), *n.* resumption after an interruption, as of a serial story.

continue (kon tin′ ū), *v.i. and v.t.* to keep going; to persist; to resume after interruption; to prolong, as a line.

***continuity** (kon tin ū′ i ti), *n.* uninterrupted advance or succession; dramatic sequence, the oneness of the plot and action; the filling in by a radio announcer of spaces between program items.

continuous (kon tin′ ū us), *adj.* uninterrupted, unceasing.

contort (kon tôrt′), *v.t.* to twist; to wrench, make awry, as anger *contorted* his features.

contortion (kon tôr′ shun), *n.* a twisting, writhing.

contour (kon′ toor), *n.* an outline of some figure.

contour map (kon′ toor map), a map showing outlines only, or a diagram showing relative heights of land.

***contraband** (kon′ tr*a* band), *n.* goods forbidden by law to be exported or imported; smuggled merchandise.

contraband (kon′ tr*a* band), *adj.* illegal and subject to confiscation.

contract (kon′ trakt), *n.* a formal agreement, as to supply goods or do work.

***contract** (kon trakt′), *v.i. and v.t.* to shrink into smaller space; to shorten; to make a contract; to incur, as an obligation.

contract bridge (kon′ trakt brij), a card game in which a player undertakes or contracts to take a stated number of tricks on his declaration of trumps.

contraction (kon trak′ shun), *n.* a short form of something; a word shortened by omitting letters.

contradict (kon tr*a* dikt′), *v.i. and v.t.* to reply with an opposite or contrary statement; to deny the truth of, gainsay.

Syn. Deny. To *contradict* is literally to say the opposite or contrary of something; to *deny* is to declare or reject as untrue.

contradiction (kon tr*a* dik′ shun), *n.* the act of denying the truth of something, or stating the opposite of something; an inconsistency.

contradictory (kon tr*a* dik′ tō ri), *adj.* not in agreement, inconsistent, as statements or views; presented in denial, as *contradictory* evidence; habitually contrary, as a *contradictory* pupil.

contradistinction (kon tr*a* dis tingk′ shun), *n.* differentiation by contrasting qualities.

***contrariety** (kon tr*a* rī′ e ti), *n.* variance.

***contrary** (kon′ trer i), *n.* one of two opposite things, beliefs or conditions, as to assert the *contrary.*

contrary (kon′ trer i), *adj.* opposite or different in meaning or effect; against, as *contrary* to orders; opposing, unfavorable, as *contrary* winds.

contrast (kon′ trast), *n.* a striking difference, dissimilitude; a person or thing strikingly different from another.

***contrast** (kon trast′), *v.i. and v.t.* to show difference, as black *contrasts* with white; to bring together so as to show difference.

contravene (kon tr*a* vēn′), *v.t.* to infringe, violate, as a law; to oppose.

contravention (kon tr*a* ven′ shun), *n.* infringement, violation.

contribute (kon trib′ ut), *v.i. and v.t.* to give something to a common cause or fund, as personal effort or money; to write for a periodical publication; to share in producing a result.

contribution (kon tri bū′ shun), *n.* the act of contributing, or that which is contributed, as work, money, an article in a newspaper or magazine.

***contrite** (kon trīt′), *adj.* penitent, thoroughly sorry.

contrition (kon trish′ un), *n.* repentence; regret for fault or error.

contrivance (kon trīv′ ans), *n.* a device or invention; a scheme or plot.

contrive (kon trīv′), *v.i. and v.t.* to plot, scheme; to devise, invent.

control (kon trōl′), *n.* the act or power of regulating, guiding or restraining; authority; rule or management; method of checking.

control (kon trōl′), *v.t.* to restrain, regulate, dominate; to check, as payments, costs, process in arithmetic.

controller (kon trōl′ ẽr), *n.* an officer who checks up on and verifies accounts.

***controversial** (kon trō vûr′ shal), *adj.* subject to argument, disputable; contentious.

controversy (kon′ trō vûr si), *n.* disputation; a clash of views or purposes, with debate and argument.

***controvert** (kon′ trō vûrt), *v.t.* to oppose, as an argument or a claim, refute; to refuse, as a belief.

contumacious (kon tū mā′ shus), *adj.* defiant of authority; insubordinate, disobedient.

***contumacy** (kon′ tū m*a* si), *n.* insubordination, defiance.

Syn. Rebellion. *Contumacy* implies only occasional resistance; *rebellion* is systematic resistance. One engaged in acts of *contumacy* opposes the individual; one engaged in *rebellion* sets himself up against authority itself.

contumelious (kon tū mē′ li us), *adj.* insolent, rude, contemptuous.

***contumely** (kon′ tū mē li), *n.* haughty and contemptuous language; insolence.

contusion (kon tū′ zhun), *n.* a bruise, without breaking of the skin.

conundrum (kō nun′ drum), *n.* a kind of riddle requiring a pun for an answer; a puzzle.

convalesce (kon v*a* les′), *v.i.* to recover health after an illness; to improve in health.

convalescent (kon v*a* les′ ent), *n.* one who is recovering from illness.

convalescent (kon v*a* les′ ent), *adj.* recovering; regaining health and strength.

convalescence (kon v*a* les′ ens), *n.* a period of gradual recovery.

convene (kon vēn′), *v.i. and v.t.* to come together; to cause to assemble.

convenience (kon vēn′ yens), *n.* suitability, fitness; freedom from discomfort, ease; that which gives ease and comfort or lightens labor, as domestic *conveniences.*

***convenient** (kon vēn′ yent), *adj.* suitable to one's circumstances or to an occasion; handy.

convent (kon′ vent), *n.* a nunnery.

convention (kon ven′ shun), *n.* a formal gathering of representatives of a group or profession; a meeting of political delegates; any fixed and generally accepted and followed custom.

conventional (kon ven′ shun al), *adj.* in accord with general custom or a widely accepted rule.

conventionality (kon ven shun al′ i ti), *n.* an acceptance of and following of common custom; formality.

converge (kon vûrj′), *v.i.* to tend toward one point.

***conversant** (kon′ vẽr sant), *adj.* aware of; familiar with; proficient in.

conversation (kon vẽr sā′ shun), *n.* informal or familiar talk; oral discourse between persons.

Syn. Dialogue, conference, colloquy. A conversation is talk, the oral interchange of ideas or sentiments between two or more persons; a *dialogue* is confined to two persons. A *conference* is a formal exchange of opinions and advice between two or more persons. A *colloquy* is talk or conversation usually on a certain subject, as a *colloquy* on the law.

converse (kon vûrs′), *v.i.* to talk, take part in a conversation.

converse (kon′ vûrs), *adj.* opposite, as a *converse* opinion; turned around, reversed in position or relation.

***conversely** (kon vûrs′ li), *adv.* on the other hand.

conversion (kon vûr′ shun), *n.* change from one state to another, as *conversion* of coal to ashes; substitution of one thing for another, as *conversion* of bonds into cash; a spiritual experience involving drastic change in belief.

***convert** (kon′ vûrt), *n.* one who is won over to a new belief or to a cause.

***convert** (kon vûrt′), *v.t.* to change from one state or form to another; to persuade to allegiance to something.

convertible (kon vûr′ ti bl), *adj.* capable of being converted, as heat is *convertible* into power.

convex (kon′ veks), *adj.* curving outward like the outside of a globe: opposite of *concave.*

convey (kon vā′), *v.t.* to carry from one place to another, as a railroad train *conveys* freight and passengers; to impart, as an idea; to transfer, as a title to property.

conveyance (kon vā′ ans), *n.* any vehicle in which persons or things are carried; a transfer of property ownership.

convict (kon′ vikt), *n.* one who has been adjudged guilty of crime and sentenced.

convict (kon vikt′), *v.t.* to find guilty, as of a crime.

conviction (kon vik′ shun), *n.* the act of convicting; state of being found guilty or of being convinced; strong belief.

convince (kon vins′), *v.t.* to cause to believe; to satisfy by evidence or persuade by argument.

convivial (kon viv′ ial), *adj.* pertaining to a feast, festive; given to fellowship, gay.

convocation (kon vō kā′ shun), *n.* the act of calling an assembly together; an assembly of clergymen.

***convoke** (kon vōk′), *v.t.* to call together for a meeting; to summon to a meeting or session as of a lawmaking body.

convolution (kon vō lū′ shun), *n.* the state of being wrapped or wound together; a fold in a surface, as of the brain.

***convoy** (kon′ voi), *n.* a ship or squadron of ships or airplanes escorting another ship or ships; a convoyed ship, train, fleet or group of people.

convoy (kon voi′), *v.t.* to accompany, escort, as one ship another.

convulse (kon vuls′), *v.t.* to agitate violently, shake, as with spasms.

convulsion (kon vul′ shun), *n.* agitation; an upheaval, as by a volcano; a muscular spasm.

coo (ko͞o), *n.* the sound uttered by doves and pigeons, or a similar sound.

coo (ko͞o), *v.i.* to make a sound like a dove or pigeon.

cook (kook), *n.* one who prepares food for eating.

cook (kook), *v.i. and v.t.* to prepare food with heat; to bake, boil, roast or stew, as to *cook* meat.

cookery (kook′ ẽr i), *n.* art or practice of cooking.

cooky (kook′ i), *n.* a small, flat, sweet cake.

cool (ko͞ol), *adj.* moderately cold.

cool (ko͞ol), *n.* coolness, as in the *cool* of the evening.

cool (ko͞ol), *v.i. and v.t.* to lose heat or ardor; to make moderately cold.

cooler (ko͞ol′ ẽr), *n.* a refrigerator or a receptacle in which anything is kept cool.

coolie (ko͞ol′ i), *n.* in the Far East, an unskilled laborer.

coon (ko͞on), *n.* a raccoon.

coop (ko͞op), *n.* a pen or enclosure, especially for chickens.

coop (ko͞op), *v.t.* to put in a coop, or confine in an enclosure, as a cage.

cooped up (ko͞opt up), confined.

cooper (ko͞op′ ẽr), *n.* one who makes and repairs barrels and casks.

cooperage (ko͞op′ ẽr ij), *n.* a barrel factory.

***co-operate** (kō op′ ẽr āt), *v.i.* to work or act together, as for a common purpose.

co-operation (kō op ẽr ā′ shun), *n.* the act of working jointly; helpfulness.

***co-operative** (kō op′ ẽr ā tiv), *n.* an organization of producers and sellers for mutual benefit in marketing.

co-operative (kō op′ ẽr ā tiv), *adj.* working together; helpful.

co-ordinate (kō ôr′ din āt), *n.* a person or thing of the same order or rank as another.

co-ordinate (kō ôr′ din āt), *v.t.* to place in the same class or order; to bring to harmonized action, as to *co-ordinate* eye and hand.

co-ordinate (kō ôr′ din āt), *adj.* having the same rank or authority.

coot (ko͞ot), *n.* a certain short-tailed water bird of the rail family.

copal (kō′ pal), *n.* the hard clear resin of certain tropical trees used in making varnish.

cope (kōp), *n.* a cape or cloak worn by priests.

cope (kōp), *v.i.* to strive or contend.

coping (kōp′ ing), *n.* the layer of masonry capping or topping a wall.

coping saw (kōp′ ing sô), a narrow-bladed saw, heavier than a scrollsaw, used for cutting curves.

copious (kō′ pi us), *adj.* abundant, plentiful.

copper (kop′ ẽr), *n.* a reddish, workable metal, used especially to conduct electricity.

copperhead (kop′ ẽr hed), *n.* a venomous snake of the eastern U. S.

copra (kop′ *ra*), *n.* the dried pulp of the coconut, from which coconut oil is obtained.

***copse** (kops), *n.* a thicket, as of trees and bushes, a coppice.

copy (kop′ i), *n.* a reproduction, as of a text or a picture; one of many things made from one original, as a *copy* of a book.

copy (kop′ i), *v.t.* to reproduce; to transcribe; to imitate.

copyright (kop′ i rīt), *n.* the exclusive right, usually held by an author, artist or publisher, to reproduce, publish or sell for a certain number of years, a book or work of art.

***coquet** or **coquette** (kō ket′), *v.i.* to flirt or trifle, as with love.

coquetry (kō′ ket ri), *n.* flirting or trifling.

coquette (kō ket′), *n.* a flirt, especially a woman who seeks to win a man's attention without intention of any return of affection.

***coral** (kor′ al), *n.* the calcareous skeletons of certain marine animals, found in many shapes in tropical seas; the bright-red color of some of these animals.

coralline (kor′ a lin), *adj.* made of or like coral; of the colors of coral.

cord (kôrd), *n.* a string; something like string, as the spinal *cord;* a binding influence, as the *cords* of love; a stack of firewood, four feet by four by eight.

cordage (kôr′ dij), *n.* cords collectively, especially the ropes used in rigging a ship.

cordate (kôr′ dat), *adj.* heart-shaped.

cordial (kôr′ jal), *n.* an aromatic, sweetened spiritous liquor.

cordial (kôr′ jal), *adj.* hearty, sincere.

cordiality (kôr jal′ i ti), *n.* heartiness; warm friendliness.

cordite (kôr′ dīt), *n.* a powerful, smokeless explosive in which nitroglycerin is used.

cordon (kôr′ don), *n.* a cord or ribbon worn as the sign of membership in an order or honorary society; an extended line of troops, forts or ships; a line or circle of persons, as a *cordon* of bandits.

corduroy (kôr′ du roi), *n.* a thick, ribbed, durable cloth; a road made of logs laid crosswise.

cordwood (kôrd′ wood), *n.* firewood sold by the cord.

core (kōr), *n.* the heart or innermost part of anything, as an apple or a mystery.

core (kōr), *v.t.* to remove the core from.

coreopsis (kō rē op′ sis), *n.* a plant of the aster family with daisylike, brightly colored flowers.

corespondent (kō re spon′ dent), *n.* a joint defendant, especially in a divorce suit.

cork (kôrk), *n.* the light and porous bark of the cork oak tree; a stopper for a bottle, commonly made of cork.

corkscrew (kôrk′ scro͞o), *n.* a tool with spiral threads for removing corks from bottles.

***cormorant** (kôr′ mō rant), *n.* a large, greedy, fish-eating sea bird.

corn (kôrn), *n.* any cereal grain, especially maize; a hard and painful callus on the toe.

corncob (kôrn′ kob), *n.* the hard, woody center of an ear of corn; a smoking pipe made from it.

cornea (kôr′ nē *a*), *n.* the transparent membrane of the eyeball.

corner (kôr′ nẽr), *n.* the point at which two lines or surfaces meet, an angle; the intersection of two streets; a monopoly of a commodity, as wheat, to force the price up.

corner (kôr′ nẽr), *v.t.* to put or drive into a corner, as to *corner* a rat; to force into a difficult position, as in an argument; to obtain control of stocks or commodities and compel buyers to pay the price demanded.

cornerstone (kôr′ nẽr stōn), *n.* a stone at the corner of two walls; especially such a stone set in place with ceremony, and holding papers commemorating the occasion; any act or event of prime importance.

cornet (kôr′ net or kôr net′), *n.* a small brass-wind instrument resembling a trumpet.

cornice (kôr′ nis), *n.* the highest or crowning course of a wall.

cornstarch (kôrn′ stärch), *n.* starch made from Indian corn.

cornucopia (kôr nū kō′ pi*a*), *n.* a cone-shaped holder for flowers or candy; a symbol of plenty.

***corolla** (kō rol′ *a*), *n.* the inner envelope of a flower around the sporophylls; all the petals of a flower.

***corollary** (kor′ o ler i), *n.* an additional deduction from a demonstrated proposition; a proposition following inevitably from one already proved.

corona (kō rō′ na), *n.* a crownlike object; the flat projecting part of a cornice; a halo surrounding a heavenly body.

coronation (kor ō nā′ shun), *n.* the ceremonial act of crowning a sovereign.

coroner (kor′ ō nẽr), *n.* an officer who inquires into cases of sudden or accidental death by holding an inquest before a jury.

coroner's inquest (kor′ ō nẽrz in′ kwest), the inquiry conducted by a coroner to determine whether a death is due to natural causes or to acts criminal or criminally negligent.

***coronet** (kor′ ō net), *n.* a small crown worn by nobles.

corporal (kôr′ pō ral), *n.* the lowest noncommissioned officer in a company, leading a squad of eight men.

corporal (kôr′ pō ral), *adj.* pertaining to the body, as *corporal* punishment.

corporate (kôr′ pō rit), *adj.* legally associated for transaction of business; incorporated.

corporation (kôr pō rā′ shun), *n.* a legally formed business company.

corporeal (kôr pō′ rē al), *adj.* possessing a physical body.

***corps** (kōr), *n.* a body of men in a common service; two divisions of an army and auxiliary troops.

corpse (kôrps), *n.* a dead body.

corpulence (kôr′ pū lens), *n.* excessive fatness or fleshiness.

***corpuscle** (kôr′ pus l), *n.* a minute particle of matter; a cell of protoplasm in the blood or lymph.

***corral** (ko ral′), *n.* a fenced enclosure for livestock.

correct (ko rekt′), *v.t.* to make right; to remove errors from, as to *correct* a manuscript; to reprove, as to *correct* a child; to amend, as to *correct* a bad habit.

correct (ko rekt′), *adj.* right, lacking fault or error; exact, accurate; proper, as *correct* behavior.

Syn. Accurate, exact. *Correct* means without fault according to a standard, as *correct* speech, a *correct* form of greeting. *Accurate* implies careful conformity to fact or truth, as an *accurate* account of what happened. *Exact* implies the very strictest conformity to fact or truth, as to quote the *exact* lines of a poem.

correction (ko rek′ shun), *n.* the act of setting right; an act of discipline.

corrective (ko rek′ tiv), *adj.* tending to set things right.

***correlate** (kor′ e lāt), *v.i. and v.t.* to have reciprocal relation; to bring into systematic relation, as to *correlate* physical and intellectual training.

***correlative** (ko rel′ *a* tiv), *n.* one of two or more things in relationship; one of two words that are incomplete unless associated, as *if* and *then, whether* and *or.*

correspond (kor ē spond′), *v.i.* to be adequate or fit, as the donation *corresponds* to the need; to agree or match, as his appearance *corresponds* to your description of him; to communicate by exchange of letters.

Syn. Answer, suit. Things that *correspond* must be alike in size, shape, color and every minute particular; those that *answer* must be fitted for the same purpose; those that *suit* must have nothing disproportionate or discordant. In the moral application, actions are said not to *correspond* with professions; the success of an undertaking does not *answer* the expectation; particular measures do not *suit* the purpose of individuals.

correspondence (kor ē spon′ dens), *n.* resemblance; similarity; exchange of letters.

correspondent (kor ē spon′ dent), *n.* one who writes letters, or sends news regularly to a periodical.

***corridor** (kor′ i dor), *n.* a passage or hallway in a building, with rooms opening off from it.

corroborate (ko rob′ ō rāt), *v.t.* to confirm, make certain.

corroboration (ko rob ō rā′ shun), *n.* confirmation.

corrode (ko rōd′), *v.i. and v.t.* to become worn or eaten away gradually; to wear away, eat away, as by chemical process.

corrosion (ko rō′ zhun), *n.* the process of being worn away, as metal by rust or morals by decay; the result of such a process, as rust is a *corrosion.*

***corrosive** (ko rō′ siv), *n.* that which causes corrosion.

***corrosive** (ko rō′ siv), *adj.* eating away, wearing away, corroding.

***corrugate** (kor′ ū gāt), *v.t.* to form in wrinkles or folds.

corrupt (kor upt′), *v.i. and v.t.* to become rotten or putrid; to induce decay in something originally clean and sound; to deprave.

corruption (ko rup′ shun), *n.* decay; contamination; impurity.

***corsage** (kôr säzh′), *n.* a bunch of flowers to be worn on a woman's dress, usually at the waist or shoulder.

corset (kôr′ set), *n.* a stiff, hooked or laced undergarment worn by women, covering the waist and hips.

cortex (kôr′ teks), *n.* bark; the outer layer of gray matter of the brain.

corundum (kō run′ dum), *n.* a mineral next to the diamond in hardness, designated by color, as ruby, sapphire, emerald, amethyst, topaz.

***coruscate** (kor′ us kāt), *n.* to sparkle and flash.

cosmetics (koz met′ iks), *n. pl.* creams, powders and the like, used for beautifying the skin or hair.

***cosmic** (koz′ mik), *adj.* pertaining to the universe and the laws that govern it; vast and orderly.

cosmopolitan (koz mō pol′ i tan), *n.* a citizen of the world; one who is at home anywhere.

cosmopolitan (koz mō pol′ i tan), *adj.* common to all the world.

cosmos (koz′ mos), *n.* the universe as a system: opposite of *chaos;* order, harmony.

cost (kost), *n.* the price paid for a thing, as money or work and suffering; loss, as at the *cost* of a limb.

Syn. Price, charge. The *cost* is what is actually paid for anything; the *price* is that which is asked in exchange for articles; the *charge* is that which is asked in exchange for services.

cost (kost), *v.i. and v.t.* to have a price; to be bought or sold for a certain price; to cause expenditure either in money or in other values.

costal (kos′ tal), *adj.* pertaining to the ribs.

costive (kos′ tiv), *adj.* constipated.

***costume** (kos′ tūm), *n.* dress in general; clothing worn at one time; the special dress of a period, people or class; a masquerade outfit.

cot (kot), *n.* a cottage; a light, movable bed.

***cote** (kōt), *n.* a shelter for sheep or doves.

***coterie** (kō′ te ri), *n.* a select clique or congenial social group.

cottage (kot′ ij), *n.* a small dwelling; a small suburban or country house.

cotton (kot′ n), *n.* a plant bearing seeds enclosed in a soft fibrous ball of hairy material from which a cloth is made; the cloth made from cotton bolls.

cotton gin (kot′ n jin), a machine for separating seed hulls from cotton fiber.

couch (kouch), *n.* a piece of furniture, a sofa or lounge, used for sleeping.

***cougar** (ko͞o′ gẽr), *n.* a large wild animal of the cat family native to the American continents: also called *catamount, puma, panther, mountain lion.*

cough (kof), *n.* a sudden expulsion of the breath with a characteristic vocal sound; this act and sound repeated incessantly as a symptom of disease.

could (kood), *auxiliary v.* [past tense of *can*] was able to, as he *could* sing when he was young; should be or would be able to, as he *could* sing if he were taught.

coulee (ko͞o′ li), *n.* a deep dry gulch with steep sides.

council (koun′ sil), *n.* a group of persons assembled for consultation; the administrative or legislative body of a town or city government or of an institution.

councilman (koun′ sil man), *n.* a member of a town or city council.

counsel (koun′ sel), *n.* advice; a lawyer hired to give legal advice or argue a case for his client, or the lawyers collectively on one side of a case.

counsel (koun′ sel), *v.i. and v.t.* to give advice or advise; to recommend, as a course of action.

count (kount), *n.* a reckoning; the number found by counting; an item in an indictment, as to be indicted on three *counts;* a European nobleman of a certain rank.

count (kount), *v.i. and v.t.* to reckon by units in order to find a total; to name the numerals in proper order; to matter, play a part, as your vote will *count.*

countenance (koun′ tē nans), *n.* the face, especially the expression of the face; favor, approval, as to give *countenance* to an act.

countenance (koun′ tē nans), *v.t.* to approve.

counter (koun′ tẽr), *n.* one who counts; something used for counting; a table on which goods are shown in a shop.

counter (koun′ tẽr), *adj.* adverse, contrary.

counterfeit (koun′ tẽr fit), *v.t. and v.i.* to imitate in order to deceive, to forge, as to *counterfeit* money or a signature; to make fraudulent imitations, especially of money.

counterpane (koun′ tẽr pān), *n.* a bed coverlet.

counterpart (koun′ tẽr pärt), *n.* a closely corresponding or matching part or thing.

countersign (koun′ tẽr sīn), *n.* a watchword.

***countersign** (koun′ tẽr sīn), *v.t.* to add a second person's signature to the first, as on a business paper.

countess (koun′ tes), *n.* the wife of an earl or count.

countinghouse (kount′ ing hous), *n.* an establishment where accounts of a business concern are kept.

countless (kount′ les), *adj.* innumerable, too many to be counted.

country (kun′ tri), *n.* the territory of a nation; a region, as farming *country;* the rural sections, in contrast to towns and cities.

county (koun′ ti), *n.* a political subdivision of a state with a government of its own inferior to that of the state but with some powers over municipalities within it.

coup (ko͞o), *n.* a blow; a sudden brilliant move or act.

***coupé** (ko͞o pā′), *n.* a four-wheeled two-seated closed carriage; a closed motor car smaller than a sedan or coach, with two doors and a single seat.

couple (kup′ l), *n.* two of the same kind; a pair; a man and woman considered together, especially married, paired as in dancing or engaged.

couple (kup′ l), *v.t.* to join two things together, as to *couple* railroad cars.

couplet (kup′ let), *n.* two consecutive rhyming lines of verse.

***coupon** (ko͞o′ pon), *n.* a part of a printed sheet of paper to be torn off, filled in and used in sending an order or for some similar purpose; a detachable certificate on a bond to be cut off and presented as evidence of interest due.

courage (kûr′ ij), *n.* fearlessness; valor.

courageous (ku rā′ jus), *adj.* brave, fearless.

***courier** (koor′ ier), *n.* a special messenger.

course (kōrs), *n.* the line followed by an object in motion, as the *course* of a river or a comet; career; the part of a meal served at one time; a layer of brick or blocks in masonry; the ground traversed in a race or in certain games, as golf; a series, as of lectures or lessons, as a *course* in French; a series of acts or events, as the *course* of a life; a method, as a certain *course* of action.

court (kōrt), *n.* a hall of justice where accused persons are tried; the residence of a king or other noble; a level plot for games like tennis; a yard surrounded by walls; homage, as to pay *court* to a sovereign.

court (kōrt), *v.t.* to woo; to seek to attract or win, as to *court* favors, *court* disaster.

***courteous** (kûr′ tē us), *adj.* polite, formally well-mannered.

***courtesy** (kûr′ te si), *n.* formal politeness; favor instead of right, as in the bestowal of honors, as to hold a *title* by courtesy.

courtly (kōrt′ li), *adj.* refined, elegant.

court-martial (kōrt′ mär′ shal), *n.* court composed of army or navy officers to try cases of offense against the laws of the service.

court-martial (kōrt′ mär′ shäl), *v.t.* to try an accused person in a military court.

courtship (kōrt′ ship), *n.* the process or time of wooing.

***cousin** (kuz′ n), *n.* the son or daughter of one's uncle or aunt.

cove (kōv), *n.* a small sheltered inlet or bay.

covenant (kuv′ e nant), *n.* an agreement formally made.

covenant (kuv′ e nant), *v.i. and v.t.* to make a formal agreement; to pledge oneself, as to performance of one's part in a pact.

cover (kuv′ ẽr), *n.* that which rests over anything or enwraps it; a lid; concealment, as under *cover* of darkness; underbrush in which game hides.

cover (kuv′ ẽr), *v.i. and v.t.* to overspread; to enwrap; to put a lid or cover on; to hide; to go over completely.

coverage (kuv′ ẽr ij), *n.* in business, complete arrangements for a deal of protection as by insurance.

covert (kuv′ ẽrt), *n.* a thicket, a hiding place for game.

covert (kuv′ ẽrt), *adj.* hidden, concealed; furtive.

covet (kuv′ et), *v.t.* to desire enviously that which belongs to another.

***covey** (kuv′ i), *n.* a small flock of birds, especially of partridges.

cow (kou), *n.* the mature female of any breed of cattle, or of certain other animals, as the elephant.

cow (kou), *v.t.* to intimidate.

coward (kou′ ẽrd), *n.* a timid, fearful person; one who lacks courage.

cower (kou′ ẽr), *v.i.* to sink down, trembling with fear.

cowl (koul), *n.* a monk's hood; a cover for a chimney; the hood over the engine of an automobile.

coy (koi), *adj.* bashful, coquettishly shy.

***coyote** (kī′ ōt), *n.* the American prairie wolf.

***cozen** (kuz′ n), *v.t.* to cheat, especially in a small way.

cozy (kō′ zi), *adj.* snug, warm and comfortable.

C. Q., in radio a general call directing attention to signals from a radiotelegraph station.

crab (krab), *n.* a crustacean with flat body, ten legs, and the abdomen curled or folded under the body.

crack (krak), *n.* a chink or fissure; a sharp noise, as of something cracking; the report of a rifle.

crack (krak), *v.i. and v.t.* to break without being divided into separate parts; to split on the surface; to break or become harsh, as a voice *cracks;* to cause to make a sharp noise, as to *crack* a whip; to say cleverly, as to *crack* a joke; to crack up or crash, as an airplane.

cracker (krak′ ẽr), *n.* a thin, brittle biscuit.

crackle (krak′ l), *n.* a repeated rustling or snapping noise, as paper; a lacework of fine lines like little cracks in the glaze of certain pottery and chinaware, made intentionally as decoration.

crackle (krak′ l), *v.i. and v.t.* to become covered with a network of fine fissures, as chinaware; to make repeated snapping, rustling sounds, as a fire or a paper; to cause something, as a sheet of paper, to make such sounds.

cradle (krā′ dl), *n.* a baby's bed on rockers; a wooden or iron framework for holding a ship; a frame attached to a scythe to catch the grain as it is cut; a frame on rockers in which earth is washed for ore.

craft (krȧft), *n.* cunning; guile; manual skill; a trade in which manual and mechanical skill are needed; a ship or airship.

craftsman (krȧfts′ man), *n.* a skilled artisan.

crag (krag), *n.* a rough, jutting rock.

cram (kram), *v.i. and v.t.* to stuff; to crowd.

cramp (kramp), *n.* an iron bar, bent at the ends, to brace blocks of stone or timbers; a tool with a tightening screw to hold things together; a painful tightening of a muscle.

__cramp__ (kramp), *v.i. and v.t.* to contract painfully, as muscles; to fasten or hold with a clamping device; to restrain, hamper.

__cranberry__ (kran′ ber i), *n.* the tart red berry of a plant that grows in bogs.

__crane__ (krān), *n.* a long-legged, long-necked wading bird; a machine on wheels that moves a load vertically or horizontally; a traveling horizontal beam with a hoist; a metal arm on which cooking vessels are supported in a fireplace.

__crane__ (krān), *v.i. and v.t.* to stretch out the neck, as a crane.

__cranial__ (krā′ ni al), *adj.* pertaining to the cranium or skull.

__cranium__ (krā′ ni um), *n.* the skull.

__crank__ (krangk), *n.* a device for turning rotary motion into back-and-forth motion, or vice-versa; a bent handle, fixed or detachable, for turning things, as the *crank* of an automobile engine; a crotchety person; one who is almost fanatically absorbed in an idea.

__crankcase__ (krangk kās), *n.* case enclosing a crank shaft.

__crankshaft__ (krangk shȧft), *n.* a shaft that drives a crank or is driven by one.

__cranky__ (krangk′ i), *n.* crotchety, cross; easily upset, as a boat.

__cranny__ (kran′i), *n.* a crack, as in a wall.

__crape__ (krāp), *n.* a crinkly fabric of wool, silk or cotton; a piece of black crape used to symbolize mourning.

__crash__ (krash), *n.* a smashing noise or the sound of large bodies in collision; a collision; complete failure of a business enterprise; a big break in the stock market; a coarse linen fabric.

__crash__ (krash), *v.i. and v.t.* to collide; to sound with a great noise; to come down out of control and smash on the ground, as an airplane; to fail in business; to force noisily.

*__crass__ (kras), *adj.* dull, stupid; gross, coarse.

__crate__ (krāt), *n.* a wickerwork hamper; a box made of slats with open spaces between.

__crate__ (krāt), *v.t.* to pack, as for shipment, in a crate.

__crater__ (krā′ tẽr), *n.* the opening of a volcano.

*__cravat__ (kra vat′), *n.* a neckcloth, a necktie.

__crave__ (krāv), *v.t.* to desire greatly, long for; to beg, as to *crave* a favor; to need.

__craven__ (krā′ ven), *n.* a coward.

__craven__ (krā′ ven), *adj.* cowardly, base.

__craw__ (krô), *n.* a bird's crop.

__crawl__ (krôl), *n.* a creeping motion; a swimming stroke in which the swimmer lies face down, uses an overhand stroke with the arms and kicks up and down with his legs.

__crayfish__ (krâ′ fish), *n.* a small freshwater shellfish resembling a lobster.

*__crayon__ (krā′ on), *n.* a stick or pencil of charcoal or colored chalk, used in drawing; a drawing made with crayon.

__craze__ (krāz), *n.* a flaw in the glaze of pottery; a fad, as the *craze* for antiques.

__creak__ (krēk), *n.* a harsh sound like that of a rusty hinge.

__creak__ (krēk), *v.i.* to make a squeaky sound like unoiled parts of a working machine.

__cream__ (krēm), *n.* the rich, oily part of milk: the best of anything, as *cream* of the crop.

__cream__ (krēm), *v.i. and v.t.* to turn into cream; to skim cream from or put cream in; to make creamy.

__creamery__ (krēm′ ẽr i), *n.* a place where cream and butter are kept or sold, or where butter and cheese are made.

__cream of tartar__ (krēm ov tär′ tẽr), crystallized tartar, used in baking powder and in medicine.

__creamy__ (krēm′ i), *adj.* like cream, rich in cream.

__crease__ (krēs), *n.* a mark made by wrinkling or folding.

__crease__ (krēs), *v.i. and v.t.* to become marked by wrinkles or folds; to put a crease in.

__create__ (krē āt′), *v.t.* to bring into existence.

__creation__ (krē ā′ shun), *n.* the act of creating or that which is created; the universe.

__creator__ (krē ā′ tẽr), *n.* one who creates: *the Creator,* God.

*__creature__ (krē′ tūr), *n.* anything created, especially an animal.

*__credence__ (krē′ dens), *n.* belief, faith, trust.

__credentials__ (krē den′ shalz), *n. pl.* business references or recommendations; government papers attesting the authority of one appointed to a diplomatic position.

*__credible__ (kred′ i bl), *adj.* believable.

__credit__ (kred′ it), *n.* an item in an account in one's favor; time allowed for payment of a debt; deposits in a bank against which one may draw; the amount to which a person or firm can borrow; one who adds to the standing of some one or something, as Tom is a *credit* to his teacher and his college.

__credit__ (kred′ it), *v.t.* to believe, as to *credit* a story; to attribute to, as I *credit* you with intelligence; to give credit for, as a payment.

__credulity__ (krē dū′ li ti), *n.* ready trust or belief.

*__credulous__ (kred′ ū lus), *adj.* inclined to trust or believe too easily; easily deceived.

__creed__ (krēd), *n.* a brief authoritative statement of religious faith; any confession of religious belief.

*__creek__ (krēk), *n.* a stream smaller than a river; an inlet from the sea.

__creep__ (krēp), *v.i.* to crawl; to grow along a surface, as a vine.

*__cremate__ (krē′ māt), *v.t.* to burn to ashes, as a dead body.

*__crematory__ (krē′ ma tō ri), *n.* a place where the dead are cremated instead of being buried in a cemetery.

__creosote__ (krē′ ō sōt), *n.* a heavy oily liquid distilled from wood tar, having a smoky smell and used as an antiseptic and to preserve wood, as the underground part of posts.

__crescent__ (kres′ ent), *n.* the new moon, or something shaped like it.

__crest__ (krest), *n.* the comb of a fowl; a tuft of feathers on a bird's head; the ridge of a mountain or wave; a coat of arms.

__crestfallen__ (krest′ fôl en), *adj.* dejected, dispirited.

*__cretaceous__ (krē tā′ shus), *adj.* like chalk or full of chalk.

*__cretonne__ (krē ton′), *n.* a cotton fabric with colored patterns printed on one or both sides.

*__crevasse__ (kre vas′), *n.* a deep fissure in a glacier.

__crevice__ (krev′ is), *n.* crack, a narrow opening caused by a split.

__crew__ (kroo͞), *n.* a ship's company; a group of men working together on a job; rowing as a college sport, as to go out for *crew;* the oarsmen and coxswain of a racing shell.

__crib__ (krib), *n.* a child's bed with high sides; rack or manger for horses and cattle; a slat-sided storage bin for corn; a frame of timber to prevent a cave-in; a translation, as of a foreign text, used by students as an aid to study.

__crib__ (krib), *v.i. and v.t.* to plagiarize; to put into a crib, as to *crib* grain; to equip with cribbing, as a mine.

__cribbage__ (krib′ ij), *n.* a card game consisting of skill in securing number combinations, scored by pegs in a board.

__cricket__ (krik′ et), *n.* a small, leaping insect noted for the shrill chirping sound made by the males when they rub together parts of the forewings; a game played by two teams of eleven men each with a ball, bats and wickets.

__crime__ (krīm), *n.* an act that violates the law.

Syn. Vice, sin. A *crime* is a social offense; a *vice* is a personal offense; every action which does injury to others, either individually or collectively, is a *crime;* that which does injury to ourselves is a *vice. Crime* consists in a violation of human laws; *vice* is a violation of the moral law; *sin* is a violation of the divine law.

__criminal__ (krim′ i nal), *n.* one who commits crime.

__criminal__ (krim′ i nal), *adj.* having to do with crime.

__crimp__ (krimp), *v.t.* to bend or twist into ridges and folds, as hair.

__crimson__ (krim′ zn), *n.* a deep red color; also any of various colors shading from red to purplish red.

__cringe__ (krinj), *v.i.* to bend or crouch from fear or in servility; to flinch, as from pain.

*__crinoline__ (krin′ ō lin), *n.* haircloth or other textile used to stiffen or shape clothes; a hoop skirt or stiff under skirt.

__cripple__ (krip′ l), *n.* a lame or partially disabled person.

__crisis__ (krī′ sis), *n.* a turning point; a point in illness at which the patient becomes definitely either better or worse; an emergency.

__crisp__ (krisp), *n.* a state of crispness, as to bring to a *crisp.*

__crisp__ (krisp), *v.i. and v.t.* to come or bring to a crisp.

__crisp__ (krisp), *adj.* brittle; terse, curt.

__crisscross__ (kris′ krôs), *adj.* intersecting.

__criterion__ (krī tēr′ i un), *n.* a standard of criticism or judgment.

Syn. Standard. The *criterion* is employed only in matters of judgment; the *standard* is used in the ordinary concerns of life. The former serves for determining the characters and qualities of things; the latter for defining quantity and measure.

__critic__ (krit′ ik), *n.* one who analyzes things and forms a judgment on their value.

__critical__ (krit′ i kal), *adj.* having to do with critics or criticism; given to analysis; quick to find fault; of the nature of a crisis, as the *critical* moment.

__criticism__ (krit′ i sizm), *n.* the art of analyzing and estimating worth, as of literature or art; an unfavorable comment or faultfinding.

__criticize__ (krit′ i sīz), *v.t.* to examine sharply and form a judgment; to find fault.

*__critique__ (kri tēk′), *n.* a careful analysis, especially of something written.

__croak__ (krōk), *n.* a deep, hoarse throaty sound like that made by a raven or frog.

*__crochet__ (krō shā′), *v.i. and v.t.* to knit with one hooked needle; to make by that method, as to *crochet* a cap.

__crock__ (krok), *n.* an earthen jar; coloring matter that rubs off from dyed goods; soot on a kettle; a broken down horse.

__crockery__ (krok′ ẽr i), *n.* earthenware.

__crocodile__ (krok′ ō dīl), *n.* a large long-tailed amphibian reptile having a long head and pointed snout, native to Africa, Asia, Australia and the Americas.

__crocus__ (krō′ kus), *n.* a flowering bulbous plant of the iris family.

__crone__ (krōn), *n.* an age-withered old woman.

__crony__ (krō′ ni), *n.* a pal.

__crook__ (krook), *n.* a shepherd's bent staff; a professional criminal; a bend, as the *crook* of the knee.

__crook__ (krook), *v.t.* to bend, as the elbow.

__crooked__ (krook′ ed), *n.* not straight; dishonest.

__croon__ (kroo͞n), *v.i. and v.t.* to sing softly or plaintively.

__crop__ (krop), *n.* a season's production of any growing thing, a harvest; a bird's craw; a riding whip with a leather loop.

__crop__ (krop), *v.i. and v.t.* to reap or gather from the fields; to plant seeds for a later yield; to cut an animal's hair, ears or tail short; to graze; to appear unexpectedly, as to *crop* up.

__croquet__ (krō kā′), *n.* a lawn game played with wooden balls and mallets.

__croquette__ (krō ket′), *n.* a fried ball or cake of previously cooked minced food, including meat.

__cross__ (krôs), *n.* an ancient instrument of punishment consisting of an upright stake with a crosspiece, to which a person was fastened and left to die: *the Cross,* the cross on which Christ was crucified; any representation of this; a crucifix; a badge or ornament in the shape of a cross; the intersection of two straight lines; a mixing of breeds or varieties, as of animals or plants.

__cross__ (krôs), *v.i. and v.t.* to intersect, as two roads *cross;* to move or pass from one side to the other, as to *cross* over a brook; to interbreed; to make the sign of the cross upon, as to *cross* oneself; to lay athwart, as to *cross* one's fingers; to lie athwart, as railroads *cross* the continent; to travel over, as to *cross* the ocean, *cross* the continent; to intersect, as 5th Ave., *crosses* 42d St.; to cause to interbreed, as plants or animals.

cross (krôs), *adj.* crossing, as a *cross* street; contrary, as *cross* purposes; crotchety, peevish.

crosscut (krôs′ kut), *adj.* used to cut across the grain, as a *crosscut* saw.

cross-examine (krôs eg zam′ in), *v.t.* to question a witness with the purpose of revealing flaws in previous testimony.

cross-grained (krôs grānd′), *adj.* having an irregular grain or fiber, and hard to cut.

cross reference (krôs ref′ ẽr ens), a note directing a reader's attention to something else.

cross section (krôs sek′ shun), a cut at right angles to the length of an object; a representative group of persons or things showing the nature of the whole.

crosswise (krôs′ wīz), *adv.* in the form of a cross; athwart.

crossword puzzle (krôs′ wûrd puz′ l), an arrangement of black and white squares in which letters are to be written making words that fill in the vertical and horizontal squares, crossing each other, definitions of the words to be guessed furnishing the clues to the letters to put in the squares.

crotch (kroch), *n.* a forking into two parts.

*__crotchety__ (kroch′ e ti), *adj.* whimsical; eccentric.

*__crouch__ (krouch), *v.i.* to stoop low or cower, as in fear, or as an animal about to spring.

croup (kro͞op), *n.* a disease of the throat, with painful coughing.

croup (kro͞op), *n.* the rump, as of a horse.

crow (krō), *n.* a large glossy black bird; the cry of the cock; a crowbar.

crow (krō), *v.i.* to make the loud, shrill cry of the cock; to brag, boast, exult noisily.

crowbar (krō′ bär), *n.* an iron bar, wedge-shaped at one end, used as a pry or lever, to move heavy objects.

crowd (kroud), *n.* a number of persons or things collected in small space.

crowd (kroud), *v.i. and v.t.* to collect in large numbers; to shove or push; to squeeze something into small space.

crown (kroun), *n.* a royal headdress, symbol of sovereignty; top of the head; something like a crown, as the *crown* of a hill.

crown (kroun), *v.t.* to place a crown on the head of; to top off, furnish a finishing part.

crow's-foot (krōz′ foot), *n.* a wrinkle around the eye; a decorative element shaped like a bird's footprint.

crow's-nest (krōz′ nest), *n.* a lookout on the mast of a vessel.

*__crucial__ (kro͞o′ shal), *adj.* cross-shaped; decisive, as a *crucial* moment.

crucible (kro͞o′ si bl), *n.* a pot of earthenware in which metals and ores are melted.

crucifix (kro͞o′ si fiks), *n.* a representation of Christ on the Cross.

crucifixion (kro͞o si fik′ shun), *n.* the act of crucifying or being crucified: *Crucifixion,* the execution of Christ.

crucify (kro͞o′ si fī), *v.t.* to put to death by hanging on a cross.

crude (kro͞od), *adj.* in a natural state, as *crude* oil; bare, undisguised, as the *crude* facts; tactless, ungraceful, rude, as a *crude* remark.

crudity (kro͞o′ di ti), *n.* crudeness; rawness; a crude saying or action.

*__cruel__ (kro͞o′ el), *adj.* without mercy or pity; ready to give pain to others.

Syn. Brutal, inhuman, savage. A person is *cruel* who is indifferent to the suffering of others or who takes pleasure in inflicting or beholding pain and suffering; he is *inhuman* if he withholds the common manifestations of tenderness and kindness; he is *brutal* or *savage* according to the manner in which he performs cruel acts.

cruelty (kro͞o′ el ti), *n.* the state of being cruel, ruthlessness; a cruel act; pitiless treatment.

cruet (kro͞o′ et), *n.* a small bottle for holding seasonings and relishes for table use; a caster.

cruise (kro͞oz), *n.* a voyage with no set destination.

cruise (kro͞oz), *v.i.* to sail about with no set destination, or touching at coastwise ports.

cruiser (kro͞oz′ ẽr), *n.* a warship less heavily armed and faster than a battleship.

crumb (krum), *n.* a little piece, a mere fragment.

crumble (krum′ bl), *v.i. and v.t.* to break into small pieces or crumbs.

crumple (krum′ pl), *v.i. and v.t.* to press into wrinkles, rumple.

crunch (krunch), *v.t.* to crush and chew with the teeth; to press through with noise, as wheels *crunch* through snow.

crupper (krup′ ẽr), *n.* the loop in a horse's harness that passes under the tail.

crusade (kro͞o sād′), *n.* one of the seven medieval expeditions to the Holy Land to take it from the Mohammedans; any enthusiastic undertaking, as for reform.

*__cruse__ (kro͞os), *n.* an earthen pot or dish; a vessel to hold water or oil.

crush (krush), *n.* a crowd causing pressure.

crush (krush), *v.t.* to press between two hard bodies; to squeeze out of shape.

crust (krust), *n.* the crisp outside of a loaf of bread; a dry piece of bread; the covering of a pie; the hard frozen surface of snow.

crust (krust), *v.i. and v.t.* to form into a crust; to encrust.

*__crustacean__ (krus tā′ shun), *n.* a class of animals, usually aquatic, having a horny, crust-like shell, as barnacles, crabs, lobsters, shrimps and wood lice.

crusty (krus′ ti), *adj.* crisp, like a crust; having a crust.

crutch (kruch), *n.* a staff with a crosspiece at the top to fit under the arm, to help cripples in walking.

crux (kruks), *n.* a cross; anything difficult to explain; an important or critical point.

cry (krī), *n.* a loud call or utterance expressing fear, joy, surprise, pain or prayer; a prayer or appeal; an announcement or proclamation; public opinion expressed; the characteristic sound of a bird or animal; a weeping spell.

cry (krī), *v.i. and v.t.* to weep, shed tears; to make a loud call, as in prayer, pain, fear, anger or joy; to shout, proclaim, as to *cry* one's wares.

crying (krī′ ing), *adj.* demanding notice, as a *crying* injustice.

crypt (kript), *n.* a subterranean cell or vault.

cryptic (krip′ tik), *adj.* hidden, secret, mysterious.

*__cryptogram__ (krip′ tō gram), *n.* something written in cipher.

cryptography (krip tog′ r*a* fi), *n.* the art of writing in cipher.

crystal (kris′ tal), *n.* transparent quartz; an inorganic body having plane surfaces that give it a certain geometrical form, as a snow *crystal,* a *crystal* of salt.

crystal (kris′ tal), *adj.* consisting of crystals; resembling a crystal; clear.

crystallize (kris′ tal īz), *v.i. and v.t.* to form in or into crystals.

cub (kub), *n.* a young fox, bear, wolf, lion.

cube (kūb), *n.* a solid body with six equal square faces or sides; the third power of a number.

cubic (kūb′ ik), *adj.* having the form of a cube; calculated or measured by cube-shaped units.

cubism (kūb′ izm), *n.* an artistic theory that endeavored to express abstract form in geometrical figures, without regard for beauty or realistic representation.

cubit (kūb′ it), *n.* an ancient linear measure of about 18 inches.

cuboid (kū′ boid), *adj.* approximately cubic in shape.

*__cuckoo__ (kook′ o͞o), *n.* a European bird noted for its unpleasant habit of depositing its eggs in another bird's nest to be hatched; the American black-billed and yellow-billed cuckoo that raise their own young; the characteristic love call of the cuckoo.

cucumber (kū′ kum bẽr), *n.* the long juicy fruit of a creeping plant cultivated as a vegetable and used in making pickles.

cud (kud), *n.* food brought back from the first stomach to the mouth of certain animals, as all cattle, sheep, goats, deer, camels and giraffes, to be chewed and swallowed again.

cudgel (kuj′ el), *n.* a short thick club.

cudgel (kuj′ el), *v.t.* to beat with a club.

cue (kū), *n.* a catchword; a billiard stick.

cuff (kuf), *n.* the folded back part of a sleeve; a band worn over the wrist, as a part of the clothing; a blow with the open hand.

cuff (kuf), *v.t.* to strike with the open hand.

*__cuisine__ (kwē zēn′), *n.* a place where cooking is done; a style of cookery.

*__culinary__ (kū′ li ne ri), *adj.* pertaining to the kitchen or to cooking.

cull (kul), *n.* something worthless or inferior that is to be discarded.

cull (kul), *v.t.* to pick over and pick out the unfit of, as to *cull* apples.

culminate (kul′ mi nāt), *v.i.* to reach the highest point; to come to a climax.

culmination (kul mi nā′ shun), *n.* attainment of the peak or acme.

culpable (kul′ p*a* bl), *adj.* deserving blame, faulty.

culprit (kul′ prit), *n.* a guilty person; one arraigned in court.

cult (kult), *n.* a particular ritual of worship of a god or goddess, as the *cult* of Venus; the devotees of a person or an idea or an intellectual fad; a sect.

cultivate (kul′ ti vāt), *v.t.* to work, as land in raising crops; to foster the growth of by labor and care; refine, as to *cultivate* one's mind; foster, cherish, as to *cultivate* good will.

cultivation (kul ti vā′ shun), *n.* the act of cultivating, tillage; culture, refinement; development, as of the mind.

*__culture__ (kul′ tūr), *n.* tillage; the training or refining of the moral or intellectual faculties: the enlightenment and refinement acquired by such training; education; all the knowledge, crafts, art, literature, beliefs and customs of a people, as Greek *culture,* primitive *culture.*

culvert (kul′ vẽrt), *n.* an arched drain of masonry under a road or railroad.

cumber (kum′ bẽr), *v.t.* to hinder; to overload.

cumbrous (kum′ brus), *adj.* burdensome, large and troublesome, as a *cumbrous* package.

cumulative (kū′ mū lā tiv), *adj.* formed or growing by additions; to be added, if not paid when due, as interest or dividends, to the principal.

*__cuneiform__ (kū nē′ i form), *adj.* wedge-shaped; like early Assyrian and Babylonian inscriptions.

cunning (kun′ ing), *n.* guile; skill.

cunning (kun′ ing), *adj.* made with skill, clever; crafty, sly; cute.

cup (kup), *n.* a small drinking vessel; anything shaped like a cup, as the *cup* of a flower.

*__cupboard__ (kub′ ẽrd), *n.* a small closet with shelves.

cupidity (kū pid′ iti), *n.* greedy desire for wealth.

*__cupola__ (kū′ pō l*a*), *n.* a rounded roof; a small structure, like a room with windows on all sides, on a roof.

cupreous (kū′ prē us), *adj.* coppery; containing copper.

cur (kûr), *n.* a mongrel dog.

*__curate__ (kū′ rāt), *n.* any clergyman; one who assists a vicar or rector.

*__curator__ (kū rā′ tẽr), *n.* the superintendent of a museum; a custodian, guardian.

curb (kûrb), *n.* anything that restrains, a check; a strap or chain increasing the pressure of the bit; a stone edging along a street.

curd (kûrd), *n.* the coagulated part of milk.

curdle (kûr′ dl), *v.i. and v.t.* to thicken; to form curds.

cure (kūr), *n.* the act of healing; state of being healed; that which removes disease or evil; a remedy.

cure (kūr), *v.t.* to heal; to restore to health.

Syn. Heal, remedy. To *cure* is employed for what is out of order; to *heal* for that which is broken; diseases are *cured,* wounds are *healed.* To *remedy,* in the sense of applying remedies, has a moral application; an omission, a deficiency or a mischief can be *remedied.*

curfew (kûr′ fū), *n.* an order in medieval times that fires be put out at a certain evening hour at the ringing of a bell; the ringing of a bell as a signal for children to go in from the streets.

curiosity (kū ri os′ i ti), *n.* inquisitiveness; anything curious or rare.

curious (kū′ ri us), *adj.* inquisitive; eager to learn; strange, odd or rare.

curl (kûrl), *n.* a spiral lock of hair; anything that curls, as a *curl* of smoke; a plant disease that causes the leaves to *curl* up.

curl (kûrl), *v.i. and v.t.* to become curled; to form in or into curls; to form into curves and coils.

currant (kûr′ ant), *n.* the acid berry of several shrubs used to make jelly and jam; a small seedless raisin.

currency (kûr′ en si), *n.* money in circulation; the state of being current; commonly accepted, as *current* custom.

current (kûr′ ent), *n.* the flow of anything in a stream, as the *current* of a river, a *current* of air, an electric *current.*

current (kûr′ ent), *adj.* prevalent, as *current* styles; circulating, as *current* rumors; now passing or happening, as the *current* year.

curriculum (ku rik′ ū lum), *n.* a course of study; all the courses of study given in an educational institution.

curry (kûr′ i), *n.* a spiced condiment from India; a stew seasoned with curry.

curry (kûr′ i), *v.t.* to comb, as the hair of a horse; to dress leather; to seek by flattery, as to *curry* favor.

curse (kûrs), *n.* a prayer for evil; an oath; a cause of great evil.

curse (kûrs), *v.i. and v.t.* to swear profanely; to invoke evil upon.

cursory (kûr′ sō ri), *adj.* hasty; superficial.

curt (kûrt), *adj.* abrupt.

curtail (kûr tāl′), *v.t.* to cut short, abridge.

curtain (kûr′ tin), *n.* a hanging screen, especially one that can be drawn up and let down or fastened to one side.

*__curtsy__ (kûrt′ si), *n.* a bow performed by girls and women by bending the knees so as to lower the body, as a gesture of respect or reverence.

*__curvature__ (kûr′ v*a* tūr), *n.* a curving, as *curvature* of the spine.

curve (kûrv), *n.* a bending without an angle; a curved line; in baseball, a pitched ball that curves in toward or out from the batter.

cushion (koosh′ un), *n.* a soft pillow or pad; a chamber, as of air, to reduce shock.

cusp (kusp), *n.* a pointed end, as a tooth; the horn of a crescent.

custard (kus′ tẽrd), *n.* a sweetened mixture of eggs and milk, baked.

custodian (kus tō′ di an), *n.* a keeper, guard.

custody (kus′ tō di), *n.* guardianship; imprisonment.

custom (kus′ tum), *n.* common usage or practice: *customs,* taxes on imports to a country.

Syn. Habit, practice. *Custom* is the fact of repetition; it carries the authority of long standing and public acceptance; it stands in the place of law, and regulates the conduct of men in the most important concerns of life. *Habit* is a settled tendency to repeat a certain thing because it has been done repeatedly before. Biting one's nails is a *habit;* sending Christmas cards is a *custom.* *Practice* is the repeated doing of something or the way of doing something.

cut (kut), *n.* an opening made with an edged instrument, as a knife; an excavated channel; a piece cut off, as a *cut* of meat; a sharp blow, as a *cut* of the whip.

cut (kut), *v.i. and v.t.* to operate as an edged tool, as this saw *cuts* clean; to be easily severed, as this wood *cuts* without much trouble; to cleave or sever with an edged instrument; to cause pain, as your words *cut* him to the quick; to reduce, as to *cut* prices; to hurt, as ridicule *cut* him to the heart.

*__cutaneous__ (kū tā′ nē us), *adj.* pertaining to the skin.

cute (kūt), *n.* shrewd, clever; attractive because of a certain charm, as a *cute* puppy.

cuticle (ku′ ti kl), *n.* the epidermis; outer layer of the skin.

cutlery (kut′ lẽr i), *n.* edged or cutting instruments, regarded collectively.

cutlet (kut′ let), *n.* a slice of meat to be broiled or fried.

cutoff (kut′ ôf), *n.* a road that provides a short cut; a mechanism to stop the flow of steam, water or gasoline.

cutout (kut′ out), *n.* a device to let the exhaust from an internal combustion engine pass directly into the air instead of through the muffler.

*__cyanide__ (sī′ *a* nīd), *n.* a compound of cyanogen with an element.

*__cyanogen__ (sī an′ ō jen), *n.* a chemical radical composed of carbon and nitrogen.

cycle (sī′ kl), *n.* a complete series of events, coming back to a starting point as if having completed a circle, as the *cycle* of the seasons; an age, eon; the full round of values of an alternating electric current.

cyclecar (sī′ kl kär), *n.* a light three or four-wheeled vehicle of narrow gauge propelled by a motor.

*__cyclic__ (sī′ klik), *adj.* pertaining to or moving in cycles.

cyclone (sī′ klōn), *n.* a storm with high winds that blow spirally about a calm center; a hurricane.

*__cyclopedia__ (sī clō pē′ di *a*), *n.* an encyclopedia, a brief systematic treatment of all knowledge or of one special field.

*__cyclorama__ (sī clō rä′ m*a*), *n.* a series of pictures extended circularly so as to appear in natural perspective to one standing in the center.

*__cygnet__ (sig′ net), *n.* a young swan.

cylinder (sil′ in dẽr), *n.* a body, either solid or hollow, with equal circular top and bottom, as a round tin can is a *cylinder;* the piston chamber of an engine.

cylindrical (si lin′ dri kal), *adj.* having the form of a cylinder.

cymbal (sim′ bal), *n.* one of a pair of brass disks which when struck together produce a ringing sound.

cynic (sin′ ik), *n.* one of an ancient Greek school of philosophy that first sought virtue in self-control, later vehemently decried existing social evils; hence, a sarcastic, pessimistic person.

Syn. Misanthrope, pessimist. A *cynic* is one who sneeringly professes disbelief in sincerely good motives and altruistic conduct. A *misanthrope* has dislike for his fellow men and shuns their society. A *pessimist* distrusts all seeming good.

*__cynosure__ (sī′ nō shoor), *n.* an object of general attention.

cypress (sī′ pres), *n.* a symmetrical cone-bearing evergreen tree, or its wood.

cyst (sist), *n.* a closed sac containing fluid or viscous diseased matter.

*__cystectomy__ (sis tek′ tō me), *n.* the cutting away of a cyst.

czar (zär), *n.* formerly, an emperor of Russia.

czarina (zär ē′ n*a*), *n.* an empress of Russia, or the wife of a czar.

D

dab (dab), *n.* a soft, gentle pat; a small, soft lump, as a *dab* of cold cream; a small portion, as a *dab* of butter.

dab (dab), *v.i. and v.t.* to strike softly; to put on in spots, as to *dab* a surface with paint.

dabber (dab′ ẽr), *n.* one who dabs, or something used for dabbing, as a printers' pad for applying ink to certain surfaces.

dabble (dab′ l), *v.t.* to dip repeatedly; paddle or splash gently in water, as the feet or hands; to do things without earnest effort, as to *dabble* at music.

dace (dās), *n.* a freshwater fish of the carp family.

*__dachshund__ (däks′ hoont), *n.* a small German hound with elongated body and short legs, first used for hunting badgers.

*__dactyl__ (dak′ til), *n.* a metrical foot consisting of one long or accented syllable and two short ones.

daddy longlegs (dad′ i lông′ legz), a cranefly, a harvestman.

dado (dā′ dō), *n.* the solid block forming the body of a pedestal; the lower part of the walls of a room when finished differently from the upper part; strip of wall between baseboard and chair rail.

daffodil (daf′ ō dil), *n.* a species of narcissus with yellow flowers, single or double.

daft (dȧft), *adj.* simple, silly, soft-minded.

dagger (dag′ ẽr), *n.* a short weapon, pointed, for stabbing; in printing, a reference mark [†]

*__daguerreotype__ (d*a* ger′ ō tīp), *n.* one of the earliest kinds of photographs, produced upon a silvered plate.

*__dahlia__ (däl′ y*a*), *n.* a tuberous rooted plant with brilliantly colored large flowers.

daily (dā′ li), *n.* a newspaper published every day.

daily (dā′ li), *adj.* happening every day.

Syn. Diurnal. *Daily* is used to distinguish daytime happenings from those that occur at night; *diurnal* is used for astronomical happenings. *Daily* is the simple word; *diurnal* the more poetic.

Ant. Nocturnal.

dainty (dān′ ti), *n.* something choice or delicious; a delicacy.

dainty (dān′ ti), *adj.* of delicate beauty or charm; fastidious.

Syn. Delicate, exquisite. A *dainty* thing or person is slight and elegant; *delicate* implies fineness and sometimes fragility; *exquisite* carries the sense of fineness in character or workmanship.

Ant. Coarse, gross, crude.

dairy (dâr′ i), *n.* a place where milk is kept, to be made into butter and cheese; place where dairy products are sold.

dairy farm (dâr′ i färm), a farm on which cattle are raised for production of milk.

dairying (dâr′ i ing), *n.* the business of running a dairy.

dais (dā′ is), *n.* a raised platform at the end of a room or hall.

daisy (dā′ zi), *n.* a plant of the aster family, having long petals like rays surrounding a colored center.

dale (dāl), *n.* a glen, a vale or valley.

*__dalles__ (dalz), *n. pl.* rapids, especially racing through a rocky gorge; the steep walls of a canyon.

daillance (dal′ i ans), *n.* trifling; flirtatious play.

dally (dal′ i), *v.i.* to trifle, play, linger, fool time away.

dam (dam), *n.* a barrier across a watercourse; female parent, especially of a quadruped.

dam (dam), *v.t.* to check the flow of, with a dam, as to *dam* a stream or the mouth of a lake.

damage (dam′ ij), *n.* injury or harm to person or property.

damages (dam′ ij ez), *n.* reparation in money for loss caused or damage done.

damage (dam′ ij), *v.t.* to cause damage to, injure, harm.

*__damask__ (dam′ ȧsk), *n.* a rich silk fabric woven with elaborate patterns; a fine figured linen used for table cloths and napkins.

dame (dām), *n.* a matron, an elderly woman.

damn (dam), *v.t. and v.i.* to condemn as illegal or immoral; to doom to punishment; to swear at by saying *damn;* to curse.

damp (damp), *n.* moisture; gas formed in coal mines and other underground borings.

damp (damp), *v.t.* to choke, as a fire; stifle; check, restrain, as action; to make damp or moist.

damp (damp), *adj.* moist, humid.

dampen (damp′ en), *v.t.* to make moist; depress; stifle; deaden.

damsel (dam′ zel), *n.* a maiden or girl.

*__damson__ (dam′ zun), *n.* a small dark-purple plum, originally from Damascus.

***dance** (dȧns), *n.* a rhythmic stepping in time to the beat of music; a social gathering for dancing; music written for dancing.

dance (dȧns), *v.i. and v.t.* to move rhythmically, as in time to music; cause to dance; to cause by dancing: he *danced* me off my feet.

dandelion (dan′ dē lī un), *n.* a plant with bright yellow flowers that grows among grass.

dander (dan′ dẽr), *n.* anger.

dandle (dan′ dl), *v.t.* to fondle.

dandruff (dan′ druf), *n.* scurf on the scalp.

dandy (dan′ di), *n.* a fop, a dude.

danger (dān′ jẽr), *n.* hazard, peril, risk.

Syn. Jeopardy, hazard, peril, risk. *Danger* is harm or pain in the offing; *peril* is instant danger; *jeopardy* is exposure to danger; *hazard* is chance danger that can but may not occur; *risk* is the conscious taking of an adverse chance.

dangle (dan′ gl), *v.i. and v.t.* to hang or swing loosely; to hang about; to cause to dangle.

dank (dangk), *adj.* unpleasantly damp, as a *dank* hollow.

dapper (dap′ ẽr), *adj.* slight, spruce and trim.

dappled (dap′ ld), *adj.* colored in spots or patches, as a horse.

dare (dâr), *n.* a challenge.

dare (dâr), *v.i. and v.t.* [*p.t.* dared, durst, *p.p.* dared, *pr.p.* daring] to have enough courage to do something; to venture to do; to challenge.

daring (dâr′ ing), *n.* courage; venturesomeness.

dark (därk), *n.* absence of light; nightfall.

dark (därk), *adj.* having little or no light; approaching black, as a *dark* shade of blue; wicked, as *dark* doings; gloomy, as a *dark* view of life; obscure, as a *dark* saying; unenlightened, as the *Dark* Ages.

Syn. Dim, obscure, opaque. *Dark* means partly or wholly without light in all physical, and mental senses. *Dim* means not bright, as a *dim* light, or not distinct, as a page looks *dim*. *Obscure* implies not enough light or the interposition of something that shuts off light, as fog makes the view *obscure*, or big words often make one's meaning *obscure*. *Opaque* means impervious to light; wood is *opaque* because light will not shine through it.

darling (där′ ling), *n.* one dearly beloved; a favorite.

darn (därn), *n.* a place that has been mended with interweaving stitches.

darn (därn), *v.t.* to mend a hole in torn fabric with interlacing stitches.

dart (därt), *n.* a sharp-pointed missile, as a javelin or arrow; a short seam bringing together the edges of a fabric where a V-shaped piece has been cut out of the goods; a quick darting motion.

dart (därt), *v.i.* to move suddenly and swiftly; to shoot out suddenly, as a flame *darts*.

dash (dash), *n.* a small quantity thrown into or over anything, as a *dash* of seasoning in food; a mark of punctuation used to indicate a break in the run of a sentence (—); a short running race, as the 100-yard *dash;* spirited action, as he works with a fine *dash*.

dash (dash), *v.i. and v.t.* to rush, as to *dash* out the door; to throw with violence, as to *dash* a plate on the floor; to wreck or shatter, as hopes; to perform quickly, as to *dash* off a letter.

dashboard (dash′ bōrd), *n.* a screen on the front of a vehicle to prevent the driver being splashed with mud; the instrument board of an automobile.

dastard (das′ tẽrd), *n.* a coward; poltroon.

***data** (dā′ t*a*), *n.* plural of *datum*.

date (dāt), *n.* the fruit of an African and Asian palm tree; the day, month and year of a happening; an engagement to meet someone at a stated time.

date (dāt), *v.i. and v.t.* to belong to a certain period; to put a date upon; to make an engagement with.

datum (dā′ tum), *n.* [*pl.* data (dā′ t*a*)] something accepted as a base for inference; a fact on which reasoning is based.

***daub** (dôb), *n.* a smear; material applied by smearing, as plaster.

daub (dôb), *v.t.* to apply by smearing; to paint unskillfully.

daughter (dô′ tẽr), *n.* the female offspring of human parents.

***daunt** (dônt), *v.t.* to intimidate, frighten.

***dauntless** (dônt′ les), *adj.* fearless, undismayed.

***davit** (dav′ it), *n.* one of a pair of curving arms with tackle for raising or lowering a boat to or from a ship's deck.

davy (dā′ vi), *n.* a miner's safety lamp, a Davy lamp.

dawdle (dô′ dl), *v.i.* to move slowly; waste time.

dawn (dôn), *n.* daybreak; beginning, as the *dawn* of a new era, *dawn* of an idea.

dawn (dôn), *v.i.* to begin, as the day; rise, as the sun; come to mind, as an idea.

day (dā), *n.* the period, 24 hours, of the earth's revolution on its axis; the period from dawn to sunset; a time in history, as in Washington's *day*.

daybook (dā′ book), *n.* the book in which a day's transactions in a business are recorded.

daybreak (dā′ brāk), *n.* the dawn.

daydream (dā′ drēm), *n.* a reverie; a happy illusion.

daylight-saving time (dā′ līt sāv′ ing tīm), time an hour ahead of standard, giving an extra hour of daylight in the evening.

daystar (dā′ stär), *n.* the morning star; also the sun.

daze (dāz), *n.* a confused mental state.

daze (dāz), *v.t.* to stupefy, with or as with a blow, as he was *dazed* with grief.

dazzle (daz′ l), *v.t.* to blind momentarily with a blaze of light; to bewilder with any kind of brilliance.

deacon (dē′ kun), *n.* a church lay officer who assists a minister; a cleric ranking next below a priest.

dead (ded), *adj.* without life, after being alive; without life, motion, or activity of any kind; dull; quiet; tasteless; lusterless; not valid.

deaden (ded′ en), *v.t.* to reduce the force or effect of, as to *deaden* pain.

dead letter (ded let′ ẽr), an undeliverable letter lacking proper address.

deadly (ded′ li), *adj.* capable of causing death.

dead reckoning (ded rek′ un ing), the method of finding a ship's position without astronomical observation, by a mere record of distances and courses.

dead spot (ded spôt), an area of poor radio reception as contrasted with that of neighboring areas.

dead weight (ded wāt), any weight like that of a lifeless body; the weight of a vehicle apart from that of its load.

deaf (def), *adj.* lacking, or deficient in the sense of hearing.

deal (dēl), *n.* an act of buying and selling; the process, in card games, of handing cards to the players; a single round of a card game.

deal (dēl), *v.i. and v.t.* to have relations, do business; be concerned or engaged, as to *deal* in real estate; to conduct oneself, as he *dealt* kindly with the prisoner; to hand out one by one, as cards; to administer, as a blow.

dean (dēn), *n.* the head of a chapter of church canons; a member of a college faculty with administrative duties; the oldest or senior member of a body of men, as the *dean* of a diplomatic corps.

dear (dēr), *n.* a dear one.

dear (dēr), *adj.* precious, beloved; valued; high-priced.

dear (dēr), *adv.* dearly; at a high price, as he paid *dear* for his whistle.

dearth (dûrth), *n.* scarcity; famine; lack of enough.

death (deth), *n.* the end of life.

death rate (deth rāt), the proportion of deaths per hundred or thousand people within a given time and area.

death's-head (deths′ hed), *n.* a skull as emblematic of death.

deathwatch (deth′ woch), *n.* a vigil beside a dying person; a certain small beetle noted for its ticking noise and thought to predict death.

debacle (dē bä′ kl), *n.* spring freshet; sudden collapse; stampede.

debar (dē bär′), *v.t.* to shut out; exclude.

debark (dē bärk′), *v.i. and v.t.* to disembark; land from a ship, dirigible or airplane.

debase (dē bās′), *v.t.* to bring to a lower level of value or conduct; degrade.

debatable (dē bāt′ a bl), *adj.* open to question, disputable; fit to be debated.

debate (dē bāt′), *n.* a disputation or argument; discussion in arguments; a competitive presentation of arguments by two sides or teams.

debate (dē bāt′), *v.i. and v.t.* to discuss controversially, argue; maintain a proposition by reasoning against arguments presented by an opponent; deliberate; consider a question from various approaches.

Syn. Deliberate. To *debate* a question is to argue it out with another; to *deliberate* is to work it out in one's own mind.

debauch (dē bôch′), *v.i. and v.t.* to engage in acts of sensual pleasure; to corrupt in morals and principles.

debauchery (dē bôch′ ẽr i), *n.* marked intemperance in the indulgence of any appetite; corruption of another's virtue.

***debenture** (dē ben′ tūr), *n.* a certificate in acknowledgment of a debt.

debenture bonds (dē ben′ tūr bondz), bonds issued by a corporation as evidence of debt and secured by a pledge of property.

debilitate (dē bil′ i tāt), *v.t.* to weaken.

debilitated (dē bil′ i tāted), *adj.* run down, weakened.

debility (dē bil′ i ti), *n.* weakness from a run-down condition.

Syn. Infirmity. *Debility* is a constitutional condition, affecting the whole body, with its organic functions; *infirmity* is accidental, resulting from sickness or injury. *Debility,* as the word is commonly used, implies a general condition; *infirmity* is more commonly used to denote a localized condition, though it may quite properly apply to the body as a whole.

debit (deb′ it), *n.* an entry in an account of an item owed.

debit (deb′ it), *v.t.* to charge.

***debonair, debonaire** (deb ō nâr′), *adj.* courteous, gracious and gay.

debouch (dē bo͞osh′), *v.i. and v.t.* to march from cover into open ground, as soldiers; emerge.

debris (de brē′), *n.* fragments, litter left after a smash; rubbish.

debt (det), *n.* that which is owed; the state of owing, as in *debt*.

debtor (det′ ẽr), *n.* one who owes.

***debut** (dā bü′), *n.* a first appearence in formal society or on the stage.

decade (dek′ ād), *n.* a group of ten; a period of ten consecutive years.

***decadence** (dē kā′ dens), *n.* a state of decay or decline.

decagon (dek′ *a* gon), *n.* a figure with ten sides.

Decalogue (dek′ a lôg), *n.* the Ten Commandments.

decamp (dē kamp′), *v.i.* to break camp and depart secretly; to run away.

decant (dē kant′), *v.t.* to pour gently so as not to stir up the dregs.

decanter (dē kant′ ẽr), *n.* a vessel used to hold decanted liquors.

decapitate (dē kap′ i tāt), *v.t.* to behead.

decapod (dek′ *a* pod), *n.* one of an order of crustaceans having ten legs and eyes on stalks, as lobsters, crabs and shrimps.

decathlon (dē kath′ lon), *n.* an athletic competition in which each entrant performs in ten track or field events.

decay (dē kā′), *n.* the process of wasting away; corruption; rottenness.

decay (dē kā′), *v.i.* to waste away; rot.

Syn. Deteriorate, decompose, putrefy, wither, waste. *Decay* indicates a change from a sound to an unsound state. To *decay* is natural to all things existing in time. To *decay* or to *decompose* is to disintegrate, without necessarily repulsive conditions. To *putrefy* implies foulness. To *rot* may or may not imply offensive conditions. Where *decay* suggests moving from one condition to another, to *rot* is to decay in stagnation.

decease (dē sēs′), *n.* death.

decease (dē sēs′), *v.i.* to die.

deceit (dē sēt′), *n.* effort or willingness to deceive; a fraud.

Syn. Deception, duplicity, guile, chicanery. *Deceit* is habitual intentional fraud or betrayal; a *deception* is the act of deceiving or the fraud practised. *Duplicity* is double-dealing. *Guile* implies subtletly and art in deceiving. *Chicanery* is trickery, especially in legal practice.

deceive (dē sēv′), *v.i. and v.t.* to practice fraud or deceit, mislead, cheat.

deceiver (dē sēv′ ẽr), *n.* a cheat.

Syn. Impostor. A *deceiver* is one who practices any kind of deception; an *imposter* is one who studiously undertakes to pass himself off for what he is not.

decelerate (de sel′ ẽr āt), *v.i. and v.t.* to slow up, move with decreasing speed.

decency (dē′ sen si), *n.* [*pl.* decencies] the state or quality of being decent in words and conduct; that which is proper or seemly.

***decennial** (dē sen′ i al), *adj.* happening once in ten years, or lasting ten years.

***decennium** (dē sen′ i um), *n.* a ten-year period.

decent (dē′ sent), *adj.* clean-spoken and right-acting; clean and neat; observing the proprieties; respectable; fairly good, as a *decent* share.

deception (dē sep′ shun), *n.* the act of deceiving or state of being deceived; that which deceives or is done with intent to deceive; fraud.

decide (dē sīd′), *v.i. and v.t.* to make up one's mind; bring to a conclusion; give a judgment; arbitrate.

decided (dē sīd′ ed), *adj.* free from doubt or misgiving; determined.

Syn. Determined, resolute. A man who is *decided* has made up his mind; one who is *determined* is uninfluenced by the doubts, questions or arguments of others; one who is *resolute* is uninfluenced by fear.

decidedly (dē sīd′ ed li), *adv.* positively, emphatically.

***deciduous** (dē sid′ ū us), *adj.* having leaves that fall off in autumn, as certain trees; falling off at certain seasons or stages of growth, as the horns of deer.

decimal (des′ i mal), *n.* a decimal fraction.

decimal (des′ i mal), *adj.* pertaining to or based upon the number 10; numbered by tens.

decimal fraction (des′ i mal frak′ shun), a fraction having as denominator 10 or some multiple of 10, indicated by a point to the left of the numerator.

decimal point (des′ i mal point), a period separating a decimal fraction from a whole number.

decimal system (des′ i mal sis′ tem), a system of reckoning or measuring by 10 or powers of 10.

decimate (des′ i māt), *v.t.* to destroy one tenth of; to destroy a considerable part of.

decipher (dē sī′ fẽr), *v.t.* to read secret writing or translate it into readable writing; to solve, unravel.

decision (dē sizh′ un), *n.* the act of deciding; a conclusive judgment; the conclusion arrived at; determination, firmness, as this matter calls for *decision.*

Syn. Determination, resolution. *Decision* is the power of making up one's mind easily, usually as to action; *determination* is the quality of sticking to something obstinately; *resolution* is the quality of not being deterred by danger.

decisive (dē sī′ siv), *adj.* final, conclusive; having the power of deciding; showing promptness.

deck (dek), *n.* the flooring of a ship; a pack of cards.

deck (dek), *v.t.* to array, adorn; to make a deck for, as to *deck* a ship.

deckle edge (dek′ l ej), the rough edge of a sheet of paper left by the deckle or frame used in papermaking to form the border of a hand mold.

declaim (dē klām′), *v.i. and v.t.* to speak in rhetorical style, recite a selection.

***declamation** (dek l*a* mā′ shun), *n.* the act or art of reciting; a reading or recitation of a literary selection before an audience.

declaration (dek l*a* rā′ shun), *n.* the act of declaring an announcement, anything declared or proclaimed; also the document containing the proclamation.

***declarative** (de klar′ *a* tiv), *adj.* affirmative, making a statement.

declare (dē klâr′), *v.t.* to make known openly, proclaim; to make an itemized statement of, as goods to pass through the customs.

Syn. Announce; proclaim. To *declare* means to make known plainly, publicly and formally; to *announce* is to make something known for the first time or to make known publicly beforehand something that is going to happen. To *proclaim* is to make known to the general public or to the world.

declension (dē klen′ shun), *n.* the act of declining; a downward slope; the changes in the form of nouns and pronouns, showing their relation to the rest of a sentence, the case forms of nouns and pronouns.

declination (dek lin ā′ shun), *n.* the act of deviating; a polite refusal.

decline (dē klīn′), *n.* a falling off, a wasting away, as of the mind or body; a downward slope; decay, as the *decline* of an empire.

decline (dē klīn′), *v.i. and v.t.* to turn aside, deviate; draw to an end, fail; refuse, reject; to inflect a noun or pronoun by stating its case forms.

declivity (dē kliv′ i ti), *n.* a sloping, descending surface.

decoct (dē kokt′), *v.t.* to prepare by boiling, condense.

decoction (dē kok′ shun), *n.* an extract made by boiling in water.

decode (dē kōd′), *v.t.* to translate a message from code into ordinary words.

decompose (dē kom pōs′), *v.i. and v.t.* to resolve into separate elements; to decay or rot.

decomposition (dē kom po zish′ un), *n.* act of decomposing; state of rottenness or decay.

decorate (dek′ ō rāt), *v.t.* to ornament, adorn; to give a badge of honor to.

decoration (dek ō rā′ shun), *n.* the act of adorning; ornament; a mark of honor, as a medal worn on the clothing.

***decorous** (de kō′ rus), *adj.* marked by propriety; seemly, proper.

decorum (dē kō′ rum), *n.* propriety, conformity to social standards; decency.

decoy (dē koi′), *n.* a fowl, real or artificial, used to lure wild birds within gunshot.

decoy (dē koi′), *v.t.* to lead or allure into a place of danger.

decrease (dē krēs′), *n.* the process of becoming less; amount by which anything is diminished.

decrease (dē krēs′), *v.i. and v.t.* to grow less; diminish in size or volume; abate.

decree (dē krē), *n.* an order with high authority, an edict.

decrepit (dē krep′ it), *adj.* enfeebled by age or infirmity.

decrepitate (dē krep′ i tāt), *v.i. and v.t.* to crackle as moist salt does when heated; to calcine salt in a strong heat.

***decrepitude** (dē krep′ i tūd), *n.* physical infirmity.

***decretal** (dē krē′ tal), *n.* a decree, especially a papal decree.

decry (dē krī′), *v.t.* to blame publicly, cry down.

decumbent (dē kum′ bent), *adj.* lying on the ground, as the stems of certain plants.

dedicate (ded′ i kāt), *v.t.* to consecrate with formal ceremonies; to set apart for a special use; to inscribe or address to someone as an honor, as to *dedicate* a book to John Smith.

Syn. Devote, consecrate, hallow. To *dedicate* is to set apart for any special use; to *devote* is to set apart wholly and exclusively, as to *devote* one's time to study. To *consecrate* is to set apart as being sacred; to *hallow* is to declare or make sacred.

dedication (ded i kā′ shun), *n.* the act of dedicating; lines in the front of a book addressing it in honor to someone.

deduce (dē dūs′), *v.t.* to gather by reasoning; infer.

***deduct** (dē dukt′), *v.t.* to take from; subtract.

deduction (dē duk′ shun), *n.* the act or process of deducing or deducting; that which is arrived at by reasoning, a conclusion; that which is taken away.

deed (dēd), *n.* that which is done; exploit; a document conveying ownership of real estate.

deem (dēm), *v.i. and v.t.* to judge, consider as, suppose.

deep (dēp), *n.* deep water, the ocean; the middle; profundity.

deep (dēp), *adj.* extending far below the surface, extending far within, as a *deep* cut; coming from far within; profound, hard to understand; wise, also sly; absorbed, as *deep* in a book; rich and dark, as *deep* red; low-toned, as a *deep* voice.

deer (dēr), *n.* a family of wild, cud-chewing animals of which the male has antlers, which are shed annually.

***deface** (dē fās′), *v.t.* to mar, disfigure, remove important features of.

Syn. Disfigure, deform. To *deface* is to mar the face of something, as a poster or a wall; to *disfigure* is to inflict a deeper injury than to *deface;* to *deform* is to distort in structure.

***defacto** (dē fak′ tō), in fact; distinguished from *de jure,* by right.

***defalcate** (dē fal′ kāt), *v.i.* to embezzle.

***defamation** (def *a* mā′ shun), *n.* the act of injuring a person's reputation for honesty or virtue; calumning.

defame (dē fām′), *v.t.* to slander; injure the good name of.

default (dē fôlt′), *n.* a failure in duty or obligation, especially failure to pay a debt.

default (dē fôlt′), *v.i.* to fail to keep an agreement or meet an obligation, especially a financial obligation.

defaulter (dē fôl′ tẽr), *n.* one who fails to render proper account of money held in trust.

***defeasance** (dē fē′ zans), *n.* act of rendering null and void, as a deed.

defeat (dē fēt′), *n.* failure to win in strife; overthrow; frustration.

defeat (dē fēt′), *v.t.* to overcome, vanquish.

***defect** (dē fekt′), *n.* an imperfection, fault.

defection (dē fek′ shun), *n.* failure, voluntary failure in duty; desertion.

defective (dē fek′ tiv), *adj.* faulty, imperfect; having flaws or shortcomings.

defend (dē fend′), *v.t.* to guard, protect, hold against danger or attack; maintain against opposition, as a city or an argument.

Syn. Guard, protect. To *defend* is to intervene in any case of present danger or attack; to *protect* is to safeguard something against danger, present or future; to *guard* is to keep watch against danger or to keep safe from harm.

defense (dē fens′), *n.* the act of resisting attack; that which wards off or protects from attack or danger; a guard; a defendant's answer or plea in a law case.

defer (dē fẽr′), *v.t.* to put off, postpone.

***deference** (def′ ẽr ens), *n.* the act of deferring; heed for the wishes of another.

defiance (dē fī′ ans), *n.* the act of defying; a challenge.

deficiency (dē fish′ en si), *n.* shortage, lack.

deficiency disease (dē fish′ en si dis zēz′), an ailment caused by lack of needed elements in the diet.

deficient (dē fish′ ent), *adj.* lacking in some essential quality or element.

***deficit** (def′ i sit), *n.* a shortage in amount, especially of money.

defile (dē fīl′), *v.t.* to make unclean; to dishonor or tarnish, as a reputation.

defile (dē fīl′), *v.t. and v.i.* to march in a line.

***defile** (dē fīl′), *n.* a narrow pass, as between cliffs or mountains.

definable (dē fīn′ *a* bl), *adj.* capable of being defined.

define (dē fīn′), *v.t.* to fix the boundaries of; state the meaning of.

definite (def′ i nit), *adj.* defined; having fixed limits; precise; exact.

definition (def i nish′ un), *n.* the act of defining; a statement of meaning, as of a word.

***definitive** (dē fin′ i tiv), *adj.* conclusive, final; serving to define.

deflate (dē flāt′), *v.t. and v.i.* to reduce by letting out air or gas, as to *deflate* a balloon; to collapse, as a tire *deflates*.

deflect (dē flekt′), *v.t.* to turn from a straight line or course, as to *deflect* rays of light.

deflector (dē flek′ tẽr), *n.* an instrument for deflecting, averting, turning aside anything, as a ray of light.

deforest (dē for′ est), *v.t.* to clear of growing trees.

deform (dē fôrm′), *v.t.* to spoil the shape of.

deformity (dē fôr′ mi ti), *n.* a distortion, disfigurement; physical malformation.

defraud (dē frôd′), *v.t.* to deprive of a right or interest by trickery and deceit.

defray (dē frā′), *v.t.* to pay, as expenses.

deft (deft), *adj.* dextrous, skillful.

defunct (dē fungkt′), *adj.* dead; extinct.

defy (dē fī′), *v.t.* to challenge, dare.

degeneracy (dē jen′ ẽr *a* si), *n.* deterioration.

degenerate (dē jen′ ẽr āt), *v.i.* to become inferior or depraved; to pass from a higher to a lower condition or type.

degenerate (dē jen′ ẽr it), *adj.* degraded, deteriorated.

deglutition (dē glo͞o tish′ un), *n.* the act of swallowing food.

degradation (deg r*a* dā′ shun), *n.* a lowering in rank or position, disgrace, as the *degradation* of an officer; degeneration.

degrade (dē grād′), *v.t.* to reduce in grade or rank, deprive of office or dignity, disgrace; to corrupt.

degree (dē grē′), *n.* a step or grade in any series; the 360th part of a circle; relative quantity or intensity, as of heat or cold; a division marked on a thermometer; a rank which college and university students attain on graduation; one of the three grades of an adjective or adverb, as the positive, comparative and superlative *degrees*.

degustation (dē gus tā′ shun), *n.* the act of tasting.

deification (dē i fi kā′ shun), *n.* the act of recognizing, worshiping or proclaiming as a god.

deify (dē′ i fī), *v.t.* to worship as a god, as to *deify* the sun; to proclaim as a god, as to *deify* an emperor.

***deign** (dān), *v.i.* to condescend.

deity (dē′ i ti), *n.* divine nature or rank; a god or goddess.

dejection (dē jek′ shun), *n.* lowness of spirits; the state of being downcast.

Syn. Melancholy, sadness. *Sadness* is the all-inclusive term for lowness of spirits; *dejection* implies discouragement; *melancholy* is a chronic depression of the mind and spirit.

delay (dē lā′), *n.* postponement; detention.

delay (dē lā′), *v.t. and v.i.* to put off; postpone; hinder or detain temporarily; move slowly, linger.

delectable (dē lek′ t*a* bl), *adj.* pleasing; delightful.

***delectation** (dē lek tā′ shun), *n.* delight; pleasure.

delegate (del′ ē gāt), *n.* one empowered to act for another, a representative.

delegate (del′ ē gāt), *v.t.* to commission to act for one, send as one's representative; to commit to the care of, as I *delegate* this job to you.

delegation (del ē gā′ shun), *n.* a body of delegates sent to represent others.

delete (dē lēt′), *v.t.* to cross off, strike out, erase.

***deleterious** (del ē tẽr′ i us), *adj.* harmful.

deliberate (dē lib′ ẽr āt), *v.i. and v.t.* to ponder, reflect, weigh in the mind.

deliberate (dē lib′ ẽr it), *adj.* carefully considered; slow in making up one's mind.

deliberation (dē lib ẽr ā′ shun), *n.* calm and careful consideration.

delicacy (del′ i k*a* si), *n.* a luxury or dainty, as food; fineness in form or texture, as the *delicacy* of lace; frailty, weakness; nicety, sensitiveness, as to have too much *delicacy* to be rude.

delicate (del′ i kit), *adj.* nicely appreciative; mild, as a flavor; pleasing because of fineness; refined, considerate; finely made; marked by skill, as a *delicate* carving.

delicious (dē lish′ us), *adj.* exquisitely pleasing to the taste.

delight (dē līt′), *n.* that which delights; great joy, extreme pleasure; capacity of giving pleasure.

delight (dē līt′), *v.t. and v.i.* to give pleasure, please, as music *delights* me; to be greatly pleased.

delightful (dē līt′ fool), *adj.* pleasing, charming.

delineate (dē lin′ ē āt), *v.t.* to show in outline, as by sketch or diagram; to describe accurately.

delinquency (dē ling′ kwen si), *n.* a shortcoming, failure in duty; a wrongdoing, an offense.

delinquent (dē ling′ kwent), *n.* one who offends or neglects duty or the law.

delinquent (dē ling′ kwent), *adj.* offending, failing in duty.

***deliquesce** (del i kwes′), *v.i.* to dissolve and become liquid by absorbing liquid from the air.

***delirious** (dē lir′ i us), *adj.* having delirium, out of one's head, raving.

delirium (dē lir′ i um), *n.* temporary mental confusion or hallucination, often the result of high fever; extravagant enthusiasm.

deliver (dē liv′ ẽr), *v.t.* to rescue from danger, set free, release; to hand over to an addressee or purchaser, as a letter or package; to surrender, as to *deliver* oneself to the law; to utter, render in words, as to *deliver* an oration.

Syn. Release, discharge, free. To *deliver* means to set free from actual bondage or save from imminent or future danger; to *release* is to free from restraint; to *discharge* is to release or dismiss legally, as from custody; to *free* is to liberate in any sense, sometimes specifically to grant freedom, as Lincoln *freed* the slaves.

Ant. Bind, confine, imprison, restrain.

deliverance (dē liv′ ẽr ans), *n.* the act of delivering; state of being delivered.

***delivery** (dē liv′ ẽr i), *n.* rescue, release; a handing over or transfer, as the *delivery* of a telegram; manner of speaking or singing, as the lecturer had excellent *delivery*.

dell (del), *n.* a small secluded valley.

delta (del′ t*a*), *n.* the triangular mouth of a river, formed by deposits of alluvium.

deltoid (del′toid), *adj.* triangle-shaped; formed like the Greek letter delta (Δ).

***delude** (dē lūd′), *v.t.* to deceive, mislead mentally.

***deluge** (del′ ūj), *n.* a flood; a great rush of anything, as a *deluge* of words.

delusion (dē lū′ zhun), *n.* a misleading of the mind; a false belief.

delusive (dē lū′ siv), *adj.* deceptive, misleading.

delve (delv), *v.i.* to dig, especially with a spade.

demagogue (dem′ *a* gôg), *n.* a popular orator; a speaker who seeks personal success by appealing to common prejudice.

***demand** (dē mȧnd′), *n.* the call for something; market for a commodity; the act of claiming something as due; an imperative call.

demand (de mȧnd′), *v.t.* to claim as a right; request imperatively; require, as this situation *demands* study.

Syn. Require. We *demand* that which is owing and should be given or paid; we *require* that which we need. The creditor *demands* payment; we *require* food in order to live. To *demand* also means to call for with authority, as the police can *demand* entrance to a house; to *require* is to ask and expect as rightfully due, as to *require* honesty of a servant.

***demarcation** (dē mär kā′ shun), *n.* the act of marking by limits or bounds; separation, especially by a boundary line.

demean (dē mēn′), *v.t.* to behave (oneself).

demean (dē mēn′), *v.t.* to lower or degrade, as he wouldn't *demean* himself by lying.

demeanor (dē mēn′ ẽr), *n.* behavior.

dementia (dē men′ shi *a*), *n.* insanity; any form of mental decay.

demigod (dem′ i god), *n.* a lesser deity.

demijohn (dem′ i jon), *n.* a glass jug commonly encased in wickerwork.

***demise** (dē mīz′), *n.* transfer of property, as by lease; transfer of sovereignty, by death and inheritance; death.

demobilize (dē mō′ bi līz), *v.t.* to disband, as an army.

democracy (dē mok′ r*a* si), *n.* rule by the people; a community so governed; the quality of being democratic.

democrat (dem′ ō krat), *n.* one who advocates or supports democratic government.

democratic (dem ō krat′ ik), *adj.* pertaining to democracy.

demolish (dē mol′ ish), *v.t.* to overthrow, destroy.

demolition (dem ō lish′ un), *n.* destruction, ruin.

demon (dē′ mun), *n.* an evil spirit, a devil.

***demonetize** (dē mon′ ē tīz), *v.t.* to deprive of value, as money; to withdraw from use, as money.

***demoniac** (dē mō′ ni ak), *adj.* devilish, ruled by a demon.

***demonstrable** (dē mon′ str*a* bl), *adj.* capable of being demonstrated or proved.

***demonstrate** (dem′ un strāt), *v.t.* to prove true by reason or example.

demonstration (dem un strā′ shun), *n.* proof; manifestation; a public parade or meeting of protest.

***demonstrative** (dē mon′ str*a* tiv), *adj.* exhibiting; quick to express feeling or display emotion.

demoralize (dē mor′ al īz), *v.t.* to corrupt; disorganize; ruin the courage or discipline of.

demountable (dē mount′ *a* bl), *adj.* detachable, as an automobile wheel rim.

demur (dē mûr′), *v.i.* to object, take exception; to delay.

Syn. Hesitate, falter. To *hesitate* is the general term for all uncertain or undecided action; to *demur* is definitely to take exception or object to something; to *falter* is to weaken or waver.

demure (dē mûr′), *adj.* serious, grave; affectedly modest.

***demurrage** (dē mûr′ ij), *n.* detention of a ship or railroad freight car beyond the time agreed upon; the charge for such detention.

demurrer (dē mûr′ ẽr), *n.* an issue on a point of law.

den (den), *n.* the lair of a wild beast; an evil resort, as a *den* of thieves; any snug, private little room.

denaturalize (dē nat′ ū ral īz), *v.t.* to deprive of citizenship.

***denatured** (dē nā′ tūrd), *adj.* changed in nature or character, as by chemical action, as *denatured* alcohol.

denial (dē nī′ al), *n.* refusal to grant or acknowledge; rejection of a request; limitation in indulging the appetites.

denim (den′ im), *n.* cotton drilling used for overalls, or in a finer grade, for coverings and curtains.

denizen (den′ i zen), *n.* an inhabitant; a naturalized citizen.

denominate (dē nom′ i nāt), *v.t.* to designate, name.

denominate (dē nom′ i nāt), *adj.* naming a definite number or quantity, as differentiated from an abstract number, as 10 is an abstract number or quantity, 10 miles a *denominate* quantity.

denomination (dē nom in ā′ shun), *n.* a class name; a group having a name; a sect; one of a series of units separately named, as the *denominations* of money.

denominator (dē nom i nā′ tẽr), *n.* the part of a simple fraction that shows into how many parts a thing is divided.

denote (dē nōt′), *v.t.* to indicate, mark out plainly.

***denouement** (dā nōō′ mä*n*), *n.* the outcome of a plot; the outcome of any complicated situation.

denounce (dē nouns′), *v.t.* to threaten or accuse publicly; to give notice of intention to cancel a treaty.

dense (dens), *adj.* thick; crowded together; stupid.

density (den′ si ti), *n.* compactness; the relation of weight to volume.

dent (dent), *n.* a small depression in a surface.

dent (dent), *v.t.* to put a dent in.

dental (den′ tal), *adj.* pertaining to the teeth.

***dentine** (den′ tēn), *n.* the hard tissue which forms the body of a tooth.

dentist (den′ tist), *n.* one trained to treat and extract teeth and make artificial teeth.

dentistry (den′ tis tri), *n.* the profession of treating and caring for teeth.

dentition (den tish′ un), *n.* the process or period of cutting the teeth; the number, kind and arrangement of the teeth.

denture (den′ tūr), *n.* a set of artificial teeth.

denude (dē nūd′), *v.t.* to make bare or naked.

***denunciation** (dē nun si ā′ shun), *n.* the act of denouncing; a public accusation.

deny (dē nī′), *v.t.* to declare untrue; refuse to believe or admit; reject, as a request; to disclaim, as to *deny* one's child.

Syn. Contradict, refute. To *deny* is merely to declare untrue or to reject as untrue; to *contradict* is to state the contrary; to *refute* is to prove untrue.

deodorant (dē ō′ dẽr ant), *n.* anything that counteracts offensive odors.

deodorize (dē ō′ dẽr īz), *v.t.* to remove offensive odors.

depart (dē pärt′), *v.i.* to leave, go away.

department (dē pärt′ ment), *n.* a subdivision, as of a business establishment or government; a special field of action or study.

department store (de pärt′ ment stōr), a retail store selling a great variety of goods, arranged in departments.

departure (dē pär′ tūr), *n.* the act of going away; deviation from a set course.

depend (dē pend′), *v.i.* to hang down; rely for support; to be based upon or decided by, as the answer *depends* on the question; to rely, trust.

dependence (dē pen′ dens), *n.* the act of hanging, or state of being in suspension; support; reliance; that on which one relies.

dependency (dē pen′ den si), *n.* a dependent territory.

dependent (dē pen′ dent), *n.* one who looks to another for support.

dependent (dē pen′ dent), *adj.* hanging down; relying on something else for support.

depict (dē pikt′), *v.t.* to represent by a picture, portray.

deplete (dē plēt′), *v.t.* to empty, exhaust.

depletion (dē plē′ shun), *n.* act of emptying; state of being emptied or exhausted, as the *depletion* of resources.

***deplorable** (dē plōr′ a bl), *adj.* regrettable, lamentable.

deplore (dē plōr′), *v.t.* to lament; grieve for.

Syn. Lament. To *deplore* is to regret very deeply; to *lament* is to express regret or sorrow.

deploy (dē ploi′), *v.i. and v.t.* to go into more open formation, extend the front, as troops.

depone (dē pōn′), *v.i.* to testify under oath.

deponent (dē pō′ nent), *n.* one who testifies under oath, often in writing.

depopulate (dē pop′ ū lāt), *v.t.* to deprive of inhabitants.

deport (dē pōrt′), *v.t.* to behave; to banish.

deportment (dē pōrt′ ment), *n.* conduct, behavior.

depose (dē pōs′), *v.t.* to deprive of office; to affirm under oath, as by affidavit.

deposit (dē poz′ it), *n.* anything that is laid down; money left in a bank subject to order; the natural occurrence of mineral in the earth, as a *deposit* of gold, oil or gas.

***deposition** (dep ō zish′ un), *n.* the act of deposing, as the *deposition* of a king from the throne; testimony under oath; sediment.

depositor (dē poz′ i tẽr), *n.* one who makes a deposit, as of money in a bank.

***depository** (dē poz′ i tō ri), *n.* a place where things are deposited for safekeeping.

***depot** (dē′ pō), *n.* a warehouse; a place where military supplies are stored; a railroad station.

deprave (dē prāv′), *v.t.* to make bad; corrupt.

depraved (dē prāvd′), *adj.* corrupt, debased.

***depravity** (dē prav′ i ti), *n.* the state of being depraved; corruptness; a depraved act.

Syn. Corruption. *Corruption* is merely the loss of a former soundness or virtue; *depravity* is an unnatural falling away from normal soundness or purity.

deprecate (dep′ rē kāt), *v.t.* to pray against; to speak disapprovingly of.

depreciate (dē prē′ shi āt), *v.i. and v.t.* to lessen either in price or in value; to belittle.

depredate (dep′ rē dāt), *v.i. and v.t.* to plunder, pillage, lay waste.

depress (dē pres′), *v.t.* to lower, press down; to sadden.

depression (dē presh′ un), *n.* the act of depressing or state of being depressed; a sunken surface; lowness of spirits; a reduction of trade; a period of dull business.

***deprivation** (dep ri vā′ shun), *n.* the act of taking away; loss.

deprive (dē prīv′), *v.t.* to take from; compel to do without.

depth (depth), *n.* that which is deep, especially sky or water; distance below the surface; profoundness; the middle, as the *depth* of night.

Syn. Profundity. *Depth* is indefinite in its signification, and *profundity* is a great degree of depth. *Depth* is used in both material and mental senses. The sea has *depth,* a well has *depth;* there are *depths* of wisdom, mind or philosophy; but *profundity* is confined to mental or moral matters.

deputation (dep ū tā′ shun), *n.* delegation; a delegation.

depute (dē pūt′), *v.t.* to appoint as an agent or deputy.

deputize (dep′ ū tīz), *v.t.* to depute.

***deputy** (dep′ ū ti), *n.* one appointed to act for another.

derail (dē rāl′), *v.t.* to cause to leave the rails.

derange (dē rānj′), *v.t.* to throw into disorder and confusion.

derby (dûr′ bi), *n.* a stiff felt hat with a rounded crown.

***derelict** (der′ e likt), *n.* anything voluntarily abandoned, especially a ship abandoned at sea; a social outcast.

derelict (der′ e likt), *adj.* abandoned.

dereliction (der e lik′ shun), *n.* default of duty; shortcoming; failure.

deride (dē rīd′), *v.t.* to mock.

***derision** (dē rizh′ un), *n.* the act of deriding; contemptuous laughter; scorn.

derisive (dē rī′ siv), *adj.* expressing derision.

derivation (der i vā′ shun), *n.* that from which a thing is derived; the origin, as of a word.

derivative (dē riv′ *a* tiv), *n.* a thing taken or derived from another.

derive (dē rīv′), *v.i. and v.t.* to proceed, as from a source; to deduce; to receive, as from a source; to trace the origin or descent of.

Syn. Deduce, trace. The act of *deriving* is immediate and direct; that of *tracing* is a gradual process; that of *deducing* is a process of reasoning. We discover sources and causes through *deriving;* we discover the history of things by *tracing;* we discover the grounds and reasons of things by *deducing.*

derma (dûr′ m*a*), *n.* the true, inner skin: also called *dermis.*

dermatology (dẽr ma tol′ ō ji), *n.* the science that treats of the skin.

dermis (dûr′ mis), *n.* the derma.

derogate (der′ ō gāt), *v.t.* to detract from; to disparage; to take something away from.

derogatory (dē rog′ *a* tō ri), *adj.* detracting, as from honor or reputation.

derrick (der′ ik), *n.* a hoisting apparatus consisting of a beam with tackle; the framework over a hole, as an oil well, supporting the tackle used in drilling or hoisting.

***descant** (des kant′), *v.i.* to discourse at length.

descend (dē send′), *v.i. and v.t.* to move from a higher to a lower position; to come down, as from a source, as to be *descended* from kings; to make a sudden attack, as to *descend* upon the enemy; to go down, as a mountain or ladder.

descendant (dē sen′ dant), *n.* one directly descended from an ancestor.

descendent (dē sen′ dent), *adj.* descending; moving downward.

descent (dē sent′), *n.* change from higher to lower position, rank, grade; origin, lineage; a downward step, as from honor or in value; a downward slope.

describe (dē skrīb′), *v.t.* to represent or image in words; to draw the outline of, as a circle.

description (dē skrip′ shun), *n.* a word picture; class or kind, as furniture of any *description.*

***descry** (dē skrī′), *v.t.* to discover or spy with the eye, especially at a distance.

desecrate (des′ ē krāt), *v.t.* to violate the sanctity of; to divert from a sacred use.

***desert** (dē zûrt′), *v.i. and v.t.* to abandon; to quit military service or leave a post of duty without permission.

***desert** (dē zûrt′), *n.* merit; worthiness; what one deserves, a reward or punishment.

Syn. Merit, worth. *Desert* is the quality of deserving or earning either just reward or just punishment; *merit* is a quality that deserves reward; *worth* is the sum of all the qualities that make a thing excellent or valuable.

desert (dez′ ẽrt), *n.* a barren tract of land; sandy waste.

***deserve** (dē zûrv′), *v.t.* to earn; to be entitled to or worthy of.

***desiccate** (des′ i kāt), *v.i. and v.t.* to dry up; to preserve by drying, as fish.

***desideratum** (dē sid ẽr ā′ tum), *n.* anything desired as being essential.

design (dē zīn′), *v.i. and v.t.* to make designs or plans; to draw a plan for, as to *design* a cathedral; to make as a pattern; to intend, set apart, as *designed* for a doctor.

design (dē zīn′), *n.* a plan; pattern; purpose.

Syn. Aim, intention, purpose. A *design* is something skilfully and methodically planned; it requires time and study. A *purpose* is something previously decided upon. An *intention* is something one means to do, not necessarily what one is determined to do; an *aim* is a direct objective toward which one strives.

***designate** (dez′ ig nāt), *v.t.* to indicate, show; to name; to set apart for a specified purpose.

designing (dē zin′ ing), *adj.* scheming, artful.

desire (dē zīr′), *v.t.* to long for; to ask for.

Syn. Wish, want. To *desire* indicates strength or intensity of wanting; to *wish* is less intense, consisting often of a strong inclination; one often *wishes* for the impossible. To *want* implies need, as to *want* a drink.

desirous (dē zīr′ us), *adj.* full of or governed by desire; covetous.

***desist** (dē zist′), *v.i.* to cease, stop.

desk (desk), *n.* a table for reading or writing, either open or with closable top, and usually having drawers.

desolate (des′ ō lāt), *v.t.* to lay waste; to make wretched.

desolate (des′ ō lit), *adj.* without inhabitants, deserted; gloomy; sad and lonely.

desolation (des ō lā′ shun), *n.* the state of being laid waste; loneliness.

despair (dē spâr′), *n.* hopelessness; that which causes hopelessness.

Syn. Desperation, despondency. *Despair* is the complete collapse of all hope; *desperation* is despair expressed in violent action; *despondency* is a state of mind resulting from discouragement or a partial hopelessness.

***desperado** (des pẽr ā′ dō), *n.* an utterly reckless criminal or outlaw.

fāte fat final câre färm ȧsk sof*a*; mē met novel fingẽr; līne pin; gō ôrder not nōōn good; ūse but tûrn menü; thin *th*en.

desperate (des′ pẽr it), *adj.* without hope; taking no heed of danger; reckless.

*__despicable__ (des′ pik *a* bl), *adj.* contemptible.

despise (dē spīz′), *v.t.* to hold in contempt, to scorn.

despite (dē spīt′), *n.* spite; an act of spite or abuse; an injury.

despite (dē spīt′), *prep.* in spite of.

despoil (dē spoil′), *v.t.* to pillage, rob.

despond (dē spond′), *v.i.* to be downcast or disheartened.

despot (des′ pot), *n.* an absolute ruler; tyrant.

dessert (di zûrt′), *n.* a course of sweets, pastry or the like served at the end of a meal.

destination (des tin ā′ shun), *n.* purpose for which something is designed; the goal of a journey, the place to which anything is sent.

*__destine__ (des′ tin), *v.t.* to appoint to a specific use, ordain, intend; to be bound, as a train *destined* for Chicago.

destiny (des′ ti ni), *n.* fate, doom.

Syn. Fate, doom. *Destiny* is that which is irrevocable; death is the *destiny* of man; *fate* implies lot fixed without reason, but also irrevocable; *doom* is always final and usually calamitous.

destitute (des′ ti tūt), *adj.* impoverished, lacking, in want, as *destitute* of food or hope.

destitution (des ti tū′ shun), *n.* great poverty.

destroy (dē stroi′), *v.t.* to tear down, ruin; to abolish; to kill.

Syn. Annihilate, demolish. *Destroy* is the inclusive word for any kind of ruin; to *demolish* is to tear down a structure, as to *demolish* a building, a city, a government or an argument; to *annihilate* is to put out of existence.

destruction (dē struk′ shun), *n.* the act of destroying or state of being destroyed; ruin; death.

destructive (dē struk′ tiv), *adj.* causing destruction; intended to ruin; deadly.

*__desultory__ (des′ ul tō ri), *adj.* passing from one thing to another without logical connection; aimless.

detach (dē tach′), *v.t.* to disconnect.

detachment (dē tach′ ment), *n.* something detached from a main body, as troops; aloofness; isolation; abstraction.

*__detail__ (dē tāl′), *n.* a minute portion; item; a man or body of men assigned to a particular task: *details,* all the parts, as the *details* of a plan; *in detail,* circumstantially, item by item.

*__detail__ (dē tāl′), *v.t.* to relate with minute particularity; to assign to a special task.

detain (dē tān′), *v.t.* to hold back, restrain; to delay.

detect (dē tekt′), *v.t.* to discover; to bring to light, especially something hidden or obscure.

Syn. Discover. To *detect* is to uncover something hidden; to *discover* is to learn or bring to light something hitherto unknown. We *detect* a person in a lie; we *discover* a new cure for a deadly disease, or a new road leading somewhere.

detection (dē tek′ shun), *n.* the act of detecting; discovery.

detective (dē tek′ tiv), *n.* one whose business it is to detect crime and run down criminals.

detector (dē tek′ tẽr), *n.* in radio a device for changing high-frequency electrical oscillations into a pulsating direct current which may be checked by telephone, as a crystal *detector,* a vacuum-tube *detector.*

detention (dē ten′ shun), *n.* the act of detaining or withholding; delay due to force.

deter (dē tûr′), *v.t.* to prevent by fear or discouragement, as one failure need not *deter* your efforts.

detergent (dē tûr′ jent), *n.* a cleansing agent, as soap.

*__deteriorate__ (dē tēr′ i ō rāt), *v.i. and v.t.* to grow worse; to make worse.

determinant (dē tûr′ mi nant), *n.* that which determines.

determination (dē tûr mi nā′ shun), *n.* the state of being determined; the act of bringing to an end or coming to an end; resolution, persistence, mental decision and firmness.

determine (dē tûr′ min), *v.i. and v.t.* to come to an end; to bring to an end; to resolve, decide; to give reason or impetus to, as circumstances *determine* the course of events.

*__deterrent__ (dē ter′ ent), *n.* anything that deters or prevents.

deterrent (dē ter′ ent), *adj.* tending to hinder or prevent.

detest (dē test′), *v.t.* to abhor, loathe.

detestation (dē tes tā′ shun), *n.* extreme dislike; abhorrence.

dethrone (dē thrōn′), *v.t.* to depose, as a sovereign.

*__detonate__ (det′ ō nāt), *v.i. and v.t.* to explode with a great noise.

detonation (det ō nā′ shun), *n.* a loud explosion.

*__detour__ (dē toor′), *n.* a deviation from a straight course; a diversion of traffic into side roads when a main road is closed off, as for repairs.

detract (dē trakt′), *v.i. and v.t.* to take away a part of, to defame; to subtract.

detraction (dē trak′ shun), *n.* the taking away of reputation; a discrediting assertion, a disparagement.

detriment (det′ ri ment), *n.* that which injures; damage.

detrimental (det ri men′ tal), *adj.* harmful, injurious.

deuce (dūs), *n.* the two-spot of a suit of cards; a certain tie score in tennis, 40-all.

devastate (dev′ as tāt), *v.t.* to lay waste, plunder.

devastation (dev as tā′ shun), *n.* the act of devastating or laying waste.

develop (dē vel′ up), *v.t. and v.i.* to advance to a more complete or complex form; to unfold gradually; to advance toward completion; to form by growth; to grow, evolve.

deviate (dē′ vi āt), *v.i.* to turn aside from a course; to wander, as to *deviate* from the subject.

Syn. Wander, swerve, stray. To *deviate* is to leave a direct path; to *wander* is to move without a set course. To *swerve* is to turn aside suddenly, as a car *swerves* when a curve is too sharp or the driver loses control of the wheel. To *stray* is to move aimlessly, get lost. Men *swerve* from their duty to serve some selfish interest; the young *stray* from the paths of rectitude.

deviation (dē vi ā′ shun), *n.* the act of deviating; departure from the straight line or set course.

device (dē vīs′), *n.* anything made from a design, a contrivance; stratagem: *devices,* will or pleasure, as to be left to one's own *devices.*

devil (dev′ l), *n.* an evil spirit, a demon.

devious (dē′ vi us), *adj.* departing from the straight line; crooked or winding.

devisable (dē vīz′ *a* bl), *adj.* capable of being bequeathed; capable of being devised.

devise (dē vīz′), *v.t.* to design; to contrive; to leave by will.

devoid (dē void′), *adj.* destitute, without, as *devoid* of honor.

devolve (dē volv′), *v.i. and v.t.* to pass or transfer from one to another.

devote (dē vōt′), *v.t.* to dedicate or consecrate; to give up entirely, as to *devote* oneself to reading.

devotion (dē vō′ shun), *n.* religious piety; strong affection; loyalty; the act of devoting, as *devotion* of time to music.

devour (dē vour′), *v.t.* to eat up greedily; to destroy as if by eating; to take in eagerly, as to *devour* a book.

devout (dē vout′), *adj.* pious, religious; sincere, as this is my *devout* wish.

*__dew__ (dū), *n.* moisture from the air condensed on the earth or any object that has cooled off, especially at night.

dewclaw (dū′ klō), *n.* the little inner claw on a dog's hind foot.

dewlap (dū′ lap), *n.* the hanging fold of skin under the neck of certain animals, especially cattle.

dewy (dū′ i), *adj.* of or like dew; wet with dew.

dexterity (deks ter′ i ti), *n.* adroitness, skill, especially with the hands.

dexterous (deks′ tẽr us), *adj.* skillful, quick.

*__diabetes__ (dī *a* bē′ tēz), *n.* a disease characterized by too much sugar in the urine.

diabolic (dī *a* bol′ ik), *adj.* devilish, fiendish.

*__diacritical__ (dī *a* krit′ i kal), *adj.* serving, as an accent mark or other symbol, to show how a word is pronounced.

diadem (dī *a* dem), *n.* a crown; tiara.

*__diagnose__ (dī ag nōs′), *v.i. and v.t.* to recognize or ascertain by symptoms.

diagnosis (dī ag nō′ sis), *n.* analysis of conditions, physical or mental, as a means of recognizing disease.

diagonal (dī ag′ ō nal), *n.* a line running from corner to corner.

diagonal (dī ag′ ō nal), *adj.* extending from corner to corner of a rectangle; oblique.

diagram (dī′ *a* gram), *n.* a line drawing, a plan or chart, as a *diagram* of a park; an outline of a sentence showing the relation of the words to each other.

diagram (dī′ *a* gram), *v.i. and v.t.* to make a plan, outline or graphic analysis.

dial (dī′ al), *n.* the face of a watch or clock; a small plate inscribed with letters or numbers, used to make connections on telephones and radios: *sun dial,* a surface on which time is indicated by the shadow cast by the sun.

dial (dī′ al), *v.t. and v.i.* to connect with, as by a telephone or radio dial; to work a dial.

dialect (dī′ *a* lekt), *n.* a regional form of a language, differing from the standard.

dialectal (dī *a* lek′ tal), *adj.* pertaining to dialect.

dialectics (dī *a* lek′ tiks), *n.* the branch of logic that teaches the art of argument and of discerning truth and error.

*__dialogue__ (dī′ *a* lôg), *n.* a written or actual conversation between two persons.

diameter (dī am′ ē tẽr), *n.* a line passing through the center of any object or figure, especially a circle; the length of this line.

diametric (dī *a* met′ rik), *adj.* pertaining to, or having the nature of, a diameter; directly opposite, as a *diametric* argument.

*__diamond__ (dī′ *a* mund), *n.* a precious stone of crystallized carbon, noted for its hardness and for its brilliancy when cut in facets; any plane figure with straight sides and two acute and two obtuse angles; in baseball, the infield.

*__diapason__ (dī *a* pā′ zun), *n.* the entire tone compass of a voice or musical instrument; one or two chief foundation stops in an organ.

diaper (dī′ *a* pẽr), *n.* a white linen or cotton fabric having a certain weave; this fabric used as an infant's breechcloth.

*__diaphanous__ (dī af′ *a* nus), *adj.* so dainty as to be translucent or transparent.

*__diaphragm__ (dī′ *a* fram), *n.* a partition or dividing membrane, especially the muscular partition separating the chest from the abdomen; the vibrating disk of a telephone, as the receiving *diaphragm* and the transmitting *diaphragm* of the telephone.

diarrhea (dī *a* rē′ *a*), *n.* persistent looseness of the bowels.

diary (dī′ *a* ri), *n.* a daily record; a blank-book for entering such a record.

diatonic (dī *a* ton′ ik), *adj.* of or designating a major or minor scale having eight tones to an octave.

diatribe (dī′ *a* trīb), *n.* a prolonged discussion; an abusive denunciation.

dibble (dib′ l), *n.* a pointed instrument for making holes in the ground for seeds or plants.

dice (dīs), *n.* small cubes marked with spots from one to six, used in gambling.

dichotomize (dī kot′ ō mīz), *v.i. and v.t.* to cut or separate into two parts.

dichotomy (dī kot′ ō mi), *n.* the act of cutting in two, or division into two parts.

dichromatism (dī krō′ m*a* tizm), *n.* the state of being able to perceive only two of the fundamental colors.

dicker (dik′ ẽr), *v.i.* to bargain; to barter.

*__dicotyledon__ (dī kot i lē′ dun), *n.* a plant having two cotyledons or seed leaves.

dictaphone (dik′ t*a* fōn), *n.* a phonographic instrument for recording and reproducing dictation; originally a trade name.

***dictate** (dik′ tāt), *v.t. and v.i.* to say, for another to write; to impose or require authoritatively, as to *dictate* the terms of surrender; to give orders.

dictation (dik tā′ shun), *n.* the act of dictating, or that which is dictated.

***dictator** (dik′ tā tẽr), *n.* one who dictates, especially one holding supreme authority; an absolute ruler of a state.

dictatorship (dik′ tā′ tẽr ship), *n.* rule by a dictator.

dictatorial (dik t*a* tō′ ri al), *adj.* overbearing; imperious.

diction (dik′ shun), *n.* choice and use of words; manner of speaking or writing.

dictionary (dik′ shun er i), *n.* a book giving the words and the meanings of the words in a language, often including etymology, pronunciation and notes on usage.

Syn. Lexicon, vocabulary, glossary, nomenclature. A *lexicon* is a dictionary of the dead languages; *dictionary* applies to the words of a modern, living language. A *vocabulary* is a special and partial kind of dictionary, giving the words used in a special branch of learning or science. A *glossary* commonly serves to define difficult terms; a *nomenclature* is a system of naming.

dictograph (dik′ tō grȧf), *n.* an instrument like a telephone with a mechanism for increasing the sound so that the usual mouthpiece is not needed and it can be used for getting evidence or for interoffice conversation; originally a trade name.

dictum (dik′ tum), *n.* an authoritative saying; judicial ruling on a certain point.

***didactic** (dī dak′ tik), *adj.* instructive, intended to teach, as *didactic* poetry; apt to moralize, as a *didactic* person.

die (dī), *n.* [*pl.* dies] an engraved metal stamp used to make coins or medals or to emboss paper; a tool for cutting threads in screws; any of various other tools used to cut, shape and impress objects or substances.

die (dī), *n.* [*pl.* dice] a small cube, as of food, meat is often cut into *dice;* a small cube marked with 1 to 6 spots, used in gambling; chance: *the die is cast,* the course or event is irrevocably decided.

die (dī), *v.i.* to come to the end of life; to perish; to pass out of existence; to vanish or fade, as popularity *dies.*

Syn. Expire. To *die* is to become dead or cease to exist; living things *die,* old customs *die.* To *expire* is to come to an end, to breathe the last breath, or to terminate, as a lease.

***dieresis** (dī er ē′ sis), *n.* a mark (¨) placed over the second of two vowels standing side by side in a word, to show that each is separately pronounced.

***Diesel engine** (dē′ zel en′ jin), an internal-combustion engine, with oil as fuel, which operates at high compression.

diet (dī′ et), *n.* daily fare of food and drink; selection of food with reference to health; a plan of feeding to correct a disease.

diet (dī′ et), *v.i. and v.t.* to select foods for health; to eat according to a laid-out system of diet; to prescribe a diet.

dietetic (dī e tet′ ik), *adj.* pertaining to or regulating diet.

differ (dif′ ẽr), *v.i.* to be unlike; to disagree.

difference (dif′ ẽr ens), *n.* the state of being unlike; disagreement; a mark of distinction; what remains after subtracting one sum from another.

Syn. Distinction. *Difference* is unlikeness in material fact; *distinction* is unlikeness mentally perceived. We can see the *difference* between black and white; we make a *distinction* between good and evil.

Ant. Likeness, similarity.

different (dif′ ẽr ent), *adj.* unlike.

differential (dif′ ẽr en shal), *adj.* pertaining to or showing a difference according to outward circumstances, as a *differential* thermometer, a *differential* tariff; pertaining to the difference of two or more mechanical motions, as *differential* gear.

differentiate (dif ẽr en′ shi āt), *v.t. and v.i.* to distinguish between; to become different.

difficult (dif′ i kult), *adj.* hard to do, make, understand or deal with.

difficulty (dif′ i kul ti), *n.* a thing that can be done or understood only through much effort.

Syn. Hindrance, obstacle, obstruction. *Difficulty* is the general term for anything that takes exceptional skill to do or effort to understand or overcome. A *hindrance* is anything that checks movement or advance; an *obstacle* is some fixed thing that stands in the way; an *obstruction* is something that is put in the way to hinder or impede.

diffidence (dif′ i dens), *n.* bashfulness, timidity.

diffraction (di frak′ shun), *n.* the bending or breaking up of a ray of light as it passes the edge of an opaque body.

diffuse (di fūs′), *adj.* poured out, spread around; wordy.

diffuse (di fūz′), *v.t.* to spread in all directions, disseminate.

diffusion (di fū′ zhun), *n.* prolixity, as of speech.

dig (dig), *v.t. and v.i.* to use a spade or other implement or the hands to turn or take up earth; to bring up out of the earth, as to *dig* gold; to make by removing earth, as to *dig* a well; to delve.

digest (dī′ jest), *n.* information classified and condensed, as a *digest* of news, a *digest* of a book.

***digest** (di jest′), *v.t. and v.i.* to convert food in the digestive tract into absorbable form; to classify, arrange and condense, as news; to think over; to become changed to absorbable form, as milk *digests* easily.

digestible (di jes′ ti bl), *adj.* capable of being digested.

digestion (di jes′ chun), *n.* the process of dissolving and changing food by chemical action of the digestive tract into substances that can be absorbed by the body.

digit (dij′ it), *n.* any of the Arabic numerals; a finger or toe.

***digitalis** (dij i tā′ lis), *n.* a drug derived from the leaves of the common foxglove, used to stimulate the heart and circulation.

dignify (dig′ ni fī), *v.t.* to confer dignity or honors upon.

dignitary (dig′ ni ter i), *n.* a person of exalted rank.

dignity (dig′ ni ti), *n.* nobleness of character, excellence; elevated rank, office or position; formality and reserve of manner.

***digress** (di gres′), *v.i.* to turn aside, especially from the topic in speech or writing.

Syn. Deviate. Both *digress* and *deviate* mean turning out of a set course. To *digress* is essentially to depart from the straight line of a discourse; to *deviate* is to turn aside from a line of action.

dike (dīk), *n.* a levee; bank of earth thrown up as a barrier against water.

dilapidated (di lap′ i dāt ed), *adj.* fallen into ruin.

dilapidation (di lap i dā′ shun), *n.* a state of disrepair or partial ruin.

***dilate** (dī lāt′), *v.i. and v.t.* to enlarge upon, as to *dilate* upon a subject; to expand in size, extend.

dilatory (dil′ *a* tō ri), *adj.* causing delay or intending to delay; slow.

dilemma (di lem′ *a*), *n.* an argument having two or more propositions, each equally adversely conclusive; a situation calling for decision between two equally bad alternatives; hence, any difficult choice.

***dilettante** (dil e tan′ ti), *n.* one who pursues the arts superficially; a trifler.

diligence (dil′ i jens), *n.* close application, perseverance.

diligent (dil′ i jent), *adj.* hard-working, industrious.

Syn. Assiduous, busy, industrious. *Diligent* means earnest in application, as a *diligent* student; *assiduous* means unceasing and untiring, as to give *assiduous* care to a garden; *busy* means actively occupied, temporarily or habitually; *industrious* means devoted to working.

dillydally (dil′ i dal′ i), *v.i.* to loiter, trifle.

***dilute** (di lūt′), *v.t.* to thin or make more liquid, as to *dilute* soup with water.

dilution (di lū′ shun), *n.* a liquid weakened or thinned by admixture with another, especially water.

dim (dim), *v.i. and v.t.* to become dim; to make dim.

dim (dim), *adj.* not bright, dull; faint, as sound; having poor vision, as *dim* eyes.

dime (dīm), *n.* a silver coin equal to one-tenth of a dollar.

dimension (di men′ shun), *n.* measure in height, length and breadth.

diminish (di min′ ish), *v.i. and v.t.* to become smaller; make smaller.

diminution (dim i nū′ shun), *n.* lessening; decrease.

diminutive (di min′ ū tiv), *adj.* very small, of less than average size.

dimity (dim′ i ti), *n.* [*pl.* dimities] a thin corded cotton cloth, often having figures.

dimple (dim′ pl), *n.* a slight hollow on cheek or chin or elsewhere on the surface of the body.

din (din), *n.* an uproar, clamor, great noise.

dine (dīn), *v.i. and v.t.* to have dinner; to give a dinner to.

diner (dīn′ ẽr), *n.* a dining car on a railroad or a restaurant in a small building resembling a railroad car.

dingy (din′ ji), *adj.* grayish and grimy.

dinner (din′ ẽr), *n.* the chief meal of the day, eaten either at midday or evening; a formal feast, as to give a *dinner* for an honored guest.

***dinosaur** (dī′ nō sôr), *n.* any of various birdlike and lizardlike reptiles, varying in size from 2 to 90 feet, extinct since the Mesozoic age and known only through fossil remains.

dint (dint), *n.* a mark left by a blow or pressure; force, power, as by *dint* of hard work.

***diocese** (dī′ ō sēs), *n.* the church district under authority of a bishop.

dioxide (dī oks′ īd), *n.* an oxide with two atoms of oxygen in each molecule.

dip (dip), *n.* the act of immersing and emerging rapidly, as a *dip* of a paddle, a quick downward movement of an airplane with an immediate turn to a higher elevation.

dip (dip), *v.i. and v.t.* to immerse and emerge quickly; to take up with a ladle, as to *dip* milk or gravy.

***diphtheria** (dif thēr′ i *a*), *n.* a feverish infectious disease of the throat.

***diphthong** (dif′ thông), *n.* a union of two vowels in one sound, as *oi* in oil is a diphthong.

***diploma** (di plō′ m*a*), *n.* a certificate that a school or college course has been completed.

diplomacy (di plō′ ma si), *n.* the art of conducting negotiations between governments; tact.

diplomat (dip′ lō mat), *n.* one skilled or employed in intergovernmental negotiations.

dipper (dip′ ẽr), *n.* a vessel used for dipping, a ladle.

dire (dīr), *adj.* dreadful, overwhelming, fatal.

direct (di rekt′), *v.t.* to put an address on, as a letter; to address, as to *direct* a speech to the laboring class; to cause to turn or follow, as to *direct* the eyes to a page, *direct* the attention to what is said; to manage, guide or lead, as to *direct* a business or an orchestra; to order with authority, as a judge *directs* a jury.

direct (di rekt′), *adj.* straight, not crooked, as a *direct* line between two points; straightforward, to the point, as a *direct* question; personal, as *direct* contact; immediate, not second-hand, as *direct* knowledge; lineal, as a *direct* descendant.

direct current (di rekt′ kûr′ ent), in electricity, a current that flows in one direction only.

direction (di rek′ shun), *n.* guidance, management; an order or command; the course along which something moves or points, as to sail in a northerly *direction.*

director (di rek′ tẽr), *n.* one who directs, superintends, manages or guides.

directorate (di rek′ tō rit), *n.* the office of a director; a body of directors.

directory (di rek′ tō ri), *n.* [*pl.* directories] a book of names and addresses.

dirge (dûrj), *n.* a funeral hymn; a poem or musical composition expressing grief.

***dirigible** (dir′ ij i bl), *n.* a motor-driven airship having a cigar-shaped balloon.

dirigible (dir′ ij i bl), *adj.* capable of being steered.

dirk (dirk), *n.* a dagger.

dirt (dirt), *n.* loose earth, mud or dust; anything foul; uncleanness.

dirty (dir′ ti), *adj.* defiled, soiled; base.

disability (dis *a* bil′ i ti), *n.* incompetence, inability; lack of physical or mental ability.

disable (dis ā′ bl), *v.t.* to make unable, to cripple.

disabuse (dis *a* būz′), *v.t.* to undeceive.

disaffect (dis *a* fekt′), *v.t.* to alienate in feeling or loyalty; to fill with discontent.

disaffection (dis *a* fek′ shun), *n.* disloyalty; discontent; ill will.

disagree (dis′ *a* grē), *v.i.* to differ, be unlike; to differ in opinion, quarrel; to be unsuitable, as eggs *disagree* with the baby.

disagreeable (dis *a* grē′ *a* bl), *adj.* not pleasing, offensive; ill-tempered.

disappear (dis a pēr′), *v.i.* to pass out of sight or existence; to vanish.

disappearing carriage (dis a pēr′ ing kar′ ij), a mechanism for raising a cannon or big defense gun to fire it and lowering it to reload.

disappoint (dis a point′), *v.t.* to frustrate hope, fail to meet an expectation or hope.

disarm (dis ärm′), *v.i. and v.t.* to lay aside weapons; to take away weapons.

disarmament (dis är′ m*a* ment), *n.* the act of disarming; formal reduction of military establishment.

disarray (dis *a* rā′), *v.t.* to throw into disorder; to undress.

disaster (di zȧs′ tēr), *n.* a calamity, sudden misfortune.

disband (dis band′), *v.i. and v.t.* to break up, as an organization.

disbar (dis bär′), *v.t.* to deprive (a lawyer) of his professional standing.

disbelief (dis bē lēf′), *n.* lack of belief.

Syn. Unbelief. *Disbelief* is the actual rejection of something as untrue. *Unbelief* is a mere lack of belief.

disburden (dis bûr′ den), *v.t.* to free from a burden; to unload; to relieve.

disburse (dis bûrs′), *v.t.* to expend, pay out.

discard (dis kard′), *v.t.* to cast aside as useless.

***discern** (di zûrn′), *v.t. and v.i.* to distinguish with the eye or mind, detect; to understand a distinction.

discernible (di zûrn′ i bl), *adj.* perceptible.

discharge (dis chärj′), *n.* the act of discharging or of unloading; firing, as of guns; release, as from an obligation; release, acquittal; a flowing out, as a *discharge* of water; dismissal from employment.

discharge (dis charj′), *v.t. and v.i.* to relieve of a charge or burden; to permit or cause issuance of a liquid; to fire, as a gun; to unload, as a ship *discharges* cargo; to get rid of, as a debt or a duty; to release from service; to dismiss from employment; to go off, as a gun; to unload, as a ship *discharges.*

disciple (di sī′ pl), *n.* a pupil; follower who accepts the doctrine of his teacher, as in art, philosophy or religion.

discipline (dis′ i plin), *n.* training that strengthens; correction, punishment; control or order maintained; a system of rules for conduct.

disclaim (dis klām′), *v.t.* to disown; repudiate; deny knowledge of or responsibility for.

Syn. Disown. To *disclaim* is to throw off a claim; to *disown* is to refuse to admit as one's own.

disclose (dis klōz′), *v.t.* to uncover, reveal.

discolor (dis kul′ ēr), *v.t.* to change from the natural color; to stain.

discomfiture (dis kum′ fi tur), *n.* defeat; frustration.

discommode (dis ko mōd′), *v.t.* to inconvenience.

discomposure (dis kum pō′ zhēr), *n.* the state of being perturbed.

disconcert (dis kon sûrt′), *v.t.* to throw into disorder; to confuse.

disconsolate (dis kon′ sō lit), *adj.* hopeless, sad, without cheer.

discontent (dis con tent′), *n.* lack of contentment, dissatisfaction.

discontinue (dis kon tin′ ū), *v.t.* to break off, stop.

discord (dis′ kôrd), *n.* disagreement, lack of harmony in opinion or sound; conflict.

Syn. Strife. *Discord* means general lack of harmony or agreement in opinion, specific lack of harmony in sound. *Strife* is active conflict.

Ant. Concord, harmony, unity.

discount (dis′ kount), *n.* a deduction from a total sum or bill; a deduction made for interest on a bill or note; also the rate of interest charged.

***discount** (dis′ kount), *v.t.* to deduct from a note not yet due for interest for the specified period; to lessen the effect of by considering in advance; to make allowance, as for exaggeration in a story.

discourage (dis kûr′ ij), *v.t.* to lessen the courage of, dishearten.

***discourse** (dis kōrs′), *n.* conversation; formal written or spoken composition, as a *discourse* in physics.

discourse (dis kōrs′), *v.i.* to talk; to speak on a subject.

discover (dis kuv′ ēr), *v.t.* to bring to light; to learn, find or see for the first time.

Syn. Invent. To *discover* is to find for the first time; to *invent* is to make for the first time. Gold was *discovered* in California but it had existed there for centuries unknown to men. Watt *invented* the steam engine, a device entirely new.

discovery (dis kuv′ ēr i), *n.* the act of discovering, or that which is brought to light or knowledge.

discredit (dis kred′ it), *n.* loss of credit or honor.

discreet (dis krēt′), *adj.* prudent, cautious, especially in speech.

discrepancy (dis krep′ an si), *n.* inconsistency, variance.

discretion (dis kresh′ un), *n.* free, individual judgment, as use your own *discretion;* prudence, reserve, especially in speech.

discriminate (dis krim′ i nāt), *v.t. and v.i.* to distinguish; to make a distinction; to treat differently, as to *discriminate* between social classes.

discrimination (dis krim i nā′ shun), *n.* the power of making careful distinctions; a difference in treatment or favor, especially an unfair difference.

discursive (dis kûr′ siv), *adj.* digressive, rambling.

discuss (dis kus′), *v.t.* to debate, argue in detail.

Syn. Argue, debate. To *discuss* is to present and consider all the arguments for and against; to *argue* is to bring forth proofs and reasons in support of one's own issue; to *debate* is to argue formally and in public.

discussion (dis kush′ un), *n.* a debate; argument pro and con.

disdain (dis dān′), *n.* contempt, scorn.

disdain (dis dān′), *v.t.* to view with scorn, consider unworthy.

***disease** (di zēz′), *n.* illness; any departure from health, either of mind or of body.

disfigure (dis fig′ ūr), *v.t.* to mar or deform the figure of.

disfranchise (dis fran′ chīz), *v.t.* to deprive of the rights of citizenship, especially the vote.

disgorge (dis gorj′), *v.t.* to force out of the mouth or stomach; to give up unwillingly, as by force.

disgrace (dis grās′), *n.* the state of being in dishonor, shame; anything that brings dishonor or shame, as littered streets are a *disgrace* to a town.

disguise (dis gīz′), *n.* anything that conceals the identity or nature of a person or thing; especially garments intended to misrepresent.

disguise (dis gīz′), *v.t.* to change the appearance of so as to conceal; to hide or mask.

disgust (dis gust′), *n.* a feeling of strong aversion or repugnance.

dish (dish), *n.* a wide, concave or slightly concave vessel, bowl or platter for food; food served in a dish, as a *dish* of potatoes.

dish (dish), *v.t.* to put into a dish; to make concave, as to *dish* a wheel.

dishearten (dis här′ tn), *v.t.* to discourage.

dishonest (dis on′ est), *adj.* devoid of honesty, untrustworthy.

dishonor (dis on′ ēr), *v.t.* to deprive of honor; to refuse to cash, as a check.

dishonorable (dis on′ ēr *a*bl), *adj.* lacking honor, disgraceful.

disillusion (dis i lū′ zhun), *v.t.* to free from a false belief, especially in the fineness of a person or thing.

disinfect (dis in fekt′), *v.t.* to free of infection by using some germ-killing substance.

disinherit (dis in her′ it), *v.t.* to deprive of an inheritance.

***disintegrate** (dis in′ tē grāt), *v.i. and v.t.* to break into parts, to crumble; to destroy the unity of.

disjoin (dis join′), *v.t.* to sunder, disunite, detach.

disjunctive (dis jungk′ tiv), *adj.* serving or tending to disjoin.

disk (disk), *n.* a flat circular plate, or anything resembling it.

dislike (dis līk′), *n.* repugnance, aversion.

dislike (dis līk′), *v.t.* to regard with repugnance or distaste.

***dislocate** (dis′ lō kāt), *v.t.* to put out of joint; disarrange.

dislodge (dis loj′), *v.t.* to drive from a place of rest or hiding.

disloyalty (dis loi′ al ti), *n.* faithlessness; falseness to duty or allegiance.

dismal (diz′ mal), *adj.* cheerless, depressing.

dismantle (dis man′ tl), *v.t.* to strip of furniture and equipment, as a house or ship.

dismay (dis mā′), *n.* terrified surprise, consternation.

dismay (dis mā′), *v.t.* to strike with fear, terrify; discourage, as the amount of work *dismays* me.

Syn. Daunt, appall. To *dismay* is to crush the spirit with sudden fear; to *daunt* is to frighten or turn aside, as with something insurmountable; to *appal* is to overcome with awe, horror or fear.

dismember (dis mem′ bēr), *v.t.* to tear limb from limb; to cut into parts.

dismiss (dis mis′), *v.t.* to cause or permit to go, as to *dismiss* a class; to send away; to banish.

disorder (dis ôr′ dēr), *n.* lack of order; confusion; derangement of the physical system or the mind.

Syn. Disease. *Disorder* is a general term; one can have a *disorder* of some part of the body without *disease; disease* is an impairment of health, specifically a sickness caused by microorganisms.

Ant. Order.

disparage (dis par′ ij), *v.t.* to speak slightingly of, depreciate, belittle.

disparity (dis par′ i ti), *n.* inequality; difference in age, rank, character or social or professional standing.

dispassionate (dis pash′ un it), *adj.* not ruled by passion; calm and cool.

dispatch (dis pach′), *n.* a message sent; act of putting to death; speed, haste.

dispatch (dis pach′), *v.t.* to send, as a message or a messenger; to put to death; to dispose of, as business, with speed.

dispel (dis pel′), *v.t.* to drive away; to scatter.

Syn. Disperse. To *dispel* is to drive away without violence something intangible, as fears, hopes, grief; to *disperse* is to scatter in different directions, as to *disperse* a crowd.

dispensable (dis pen′ s*a* bl), *adj.* that may be spared.

dispensation (dis pen sā′ shun), *n.* the act of dispensing; that which is appointed or bestowed by a higher power.

dispense (dis pens′), *v.t. and v.i.* to deal out in portions; to distribute; to administer, as laws; to do without, as to *dispense* with the details.

Syn. Distribute. To *dispense* is an indiscriminate action; to *distribute* is to give to particular individuals. We *dispense* of all, collectively; we *distribute* to each, separately.

disperse (dis pûrs′), *v.i. and v.t.* to scatter in different directions.

dispirited (dis pir′ it ed), *adj.* disheartened, discouraged.

displace (dis plās′), *v.t.* to put out of place; to take the place of.

displacement (dis plās′ ment), *n.* the volume or weight of a liquid displaced by a floating body, as a ship.

display (dis plā′), *n.* exhibition; ostentatious show.

display (dis plā′), *v.t.* to exhibit; show conspicuously.

displease (dis plēz′), *v.i. and v.t.* to fail to please; to offend.

displeasure (dis plezh′ ẽr), *n.* annoyance, vexation; an offense.

Syn. Anger. *Displeasure* is a mild feeling compared to *anger* which is intense displeasure at an injury or injustice and is usually accompanied by the desire to punish.

disport (dis pōrt′), *v.i. and v.t.* to divert oneself; to make merry.

disposal (dis pōz′ al), *n.* arrangement; bestowal.

Syn. Disposal carries the idea of authority or power to deal with or settle a matter; *disposition* is the arrangement and ordering of things according to a plan.

disposition (dis pō zish′ un), *n.* the ordering or managing of things; power to control and arrange things; state of being arranged; inclination, mood, temper; the fixed qualities of one's nature or character.

Syn. Temperament. *Disposition* is a natural habit of mind; one has a happy or a gloomy *disposition; temperament* is more constitutional; one has a sanguine or a nervous *temperament.*

disprove (dis pro͞ov′), *v.t.* to demonstrate as false.

***disputable** (dis′ pū ta bl), *adj.* capable of being argued, debatable.

disputant (dis′ pū tant), *n.* one who argues with another.

dispute (dis pūt′), *n.* a verbal controversy; a quarrel.

disquisition (dis kwi zish′ un), *n.* an elaborate essay inquiring into a subject.

disregard (dis rē gärd′), *v.t.* to pay no heed to.

Syn. Neglect, slight. To *disregard* is merely to pay no attention to, as unimportant; to *neglect* is to fail in duty or care. We may *disregard* advice or discomfort, but to *neglect* to feed the dog is inexcusable. To *slight* is to disregard intentionally or scornfully.

disruption (dis rup′ shun), *n.* forcible separation, a rending asunder.

***dissect** (di sekt′), *v.t.* to cut into separate parts for examination, as to *dissect* an animal or plant.

dissemble (di sem′ bl), *v.t. and v.i.* to hide under a false appearance, pretend, feign; to conceal by pretense.

disseminate (di sem′ i nāt), *v.t. and v.i.* to scatter, as seed; to spread, as knowledge.

dissension (di sen′ shun), *n.* strong disagreement in opinion.

dissent (di sent′), *v.i.* to differ in opinion, disagree.

dissentient (di sen′ shient), *adj.* disagreeing, dissenting.

dissertation (dis ẽr tā′ shun), *n.* a long, written treatise on a certain subject; a thesis.

dissever (di sev′ ẽr), *v.i. and v.t.* to cut apart; to disunite.

dissimulate (di sim′ ū lāt), *v.i. and v.t.* to dissemble; to pretend.

dissimulation (di sim ū lā′ shun), *n.* pretense.

dissipate (dis′ i pāt), *v.i. and v.t.* to live intemperately; to scatter, dispel, drive away, as sunlight *dissipates* darkness, faith *dissipates* fear; to squander, as money; to waste, as strength.

dissipation (dis i pā′ shun), *n.* intemperance; wasteful extravagance; dispersion, diffusion.

***dissociate** (di sō′ shi āt), *v.i. and v.t.* to disjoin; to separate, disunite.

***dissoluble** (di sol′ ū bl), *adj.* capable of being dissolved.

dissolute (dis′ ō lūt), *adj.* loose in morals, profligate.

dissolution (dis ō lū′ shun), *n.* the act of dissolving or of breaking up; disintegration; ruin.

***dissolve** (di zolv′), *v.i. and v.t.* to separate or be separated into particles and absorbed in a liquid; to break or cause to break into component parts, as a partnership.

dissonance (dis′ ō nans), *n.* discord.

dissuade (di swād′), *v.t.* to advise against; divert from a purpose by argument or persuasion.

dissuasion (di swā′ zhun), *n.* the act of turning from a purpose by persuasion.

***dissyllabic** (dis i lab′ ik), *adj.* having two syllables.

distaff (dis′ tȧf), *n.* [*pl.* distaffs] the staff from which flax is drawn in spinning.

distance (dis′ tans), *n.* the space between two objects, or an interval of time; a far region, as to see hills in the *distance.*

distance (dis′ tans), *v.t.* to outrun; to surpass.

distant (dis′ tant), *adj.* remote, far off, away.

Syn. Far, remote. *Distance* is the opposite of *close* and means apart in space or time; *far* is the opposite of *near* and means a great way off; *remote* is very far removed from contact.

Ant. Close, near.

distasteful (dis tāst′ fool), *adj.* unpleasant to the taste; displeasing to the feelings; offensive.

distemper (dis tem′ pẽr), *n.* an illness or malady, especially a serious, contagious disease of young dogs.

distend (dis tend′), *v.i. and v.t.* to stretch or cause to stretch out in all directions; to swell; to inflate; to bloat.

distention (dis ten′ shun), *n.* swelling; inflation.

distil (dis til′), *v.i. and v.t.* to fall or cause to fall in drops; to vaporize and condense, as in making brandy from wine.

distinct (dis tingkt′), *adj.* plain, clear; unmistakably separated from anything else.

distinction (dis tingk′ shun), *n.* the act of distinguishing; that by which things are distinguished one from another; the state of being distinguished from others, as socially or professionally; high standing or special quality.

distinguish (dis tin′ guish), *v.t.* to separate from others by some mark or special quality.

distinguished (dis ting′ gwisht), *adj.* eminent.

Syn. Conspicuous, noted, eminent, illustrious. A man is *distinguished* in proportion as he is distinct or separate from others; he is *conspicuous* in proportion as he is easily seen among his fellow men; *noted* in proportion to the extent of his renown; *eminent* as he stands out among rivals; *illustrious* as his name and fame may shine before the world.

distort (dis tôrt′), *v.t.* to twist out of natural shape, as things or facts.

distract (dis trakt′), *v.t.* to divert, as attention.

distraught (dis trôt′), *adj.* bewildered; confused; distracted.

distress (dis tres′), *n.* affliction; adversity.

Syn. Anxiety, anguish, agony. *Distress* is great physical or mental pain; *anxiety* involves uncertainty and has regard for the future. *Anguish* is almost torture of mind or body; *agony* is anguish so intense as to cause writhing.

distress (dis tres′), *v.t.* to afflict; to cause pain or suffering.

distribute (dis trib′ ūt), *v.t.* to deal out; to apportion; to allot.

distribution (dis tri bū′ shun), *n.* the act of distributing, apportionment, allotment; that which is distributed; manner of distributing.

***district** (dis′ trikt), *n.* a part of a municipality or state set apart as for administrative purposes.

distrust (dis trust′), *n.* lack of confidence or faith.

Syn. Suspicion, diffidence. We may look upon either ourselves or others with *distrust;* we can have *suspicion* only of others. *Distrust* of another makes one regard his words or acts with *suspicion. Distrust* of one's own powers may cause *diffidence.*

Ant. Assurance, confidence, conviction, certainty.

disturb (dis tûrb′), *v.t.* to trouble; to vex.

ditch (dich), *n.* a trench cut in the earth, as for drainage.

ditto (dit′ ō), *n.* the same as before or above: expressed by two small marks (") and used in bills, accounts and lists to save repetition of items.

diurnal (dī ûr′ nal), *adj.* daily, happening every day: opposite of *nocturnal.*

dive (dīv), *n.* a plunge into water or the downward swoop of a bird or an airplane.

dive (dīv), *v.i.* [*p.t.* either dived or dove, *pr.p.* diving] to plunge head first into water; to plunge forward and down, as an airplane.

***diverge** (dī vûrj′), *v.i.* to go in different directions from a given point; to break away from a set course.

divergence (dī vûr′ jens), *n.* a moving of two things in different directions from a given point; deviation, as from a standard.

divers (dī′ vẽrz), *adj.* several, various, as *divers* kinds of wares for sale.

diverse (dī vûrs′), *adj.* different, unlike; varied.

diversify (dī vûr′ si fī), *v.t.* to make different.

diversity (dī vûr′ si ti), *n.* difference, variety.

***diversion** (di vûr′ shun), *n.* a turning aside; amusement.

divert (di vûrt′), *v.t.* to turn aside from its course or away from a center, as to *divert* one's attention; to amuse.

***divest** (dī vest′), *v.t.* to strip; to deprive of, as rights.

divide (di vīd′), *v.i. and v.t.* to separate; to break apart; to apportion.

Syn. Separate, part. We *divide* something thought of as a whole; we *separate* or *part* parts that have been joined.

Ant. Join, unite.

divide (di vīd′), *n.* a height of land forming a ridge between two drainage basins.

dividend (div′ i dend), *n.* a number that is divided; a sum of money, earned profits, to be divided, as among shareholders.

divination (div i nā′ shun), *n.* the art of foretelling events.

divine (di vīn′), *v.t.* to foretell; to detect, through reasoning or intuition.

divine (di vīn′), *adj.* pertaining to God; godlike.

divinity (di vin′ i ti), *n.* the quality of divineness; a god; Divinity, God.

division (di vizh′ un), *n.* the act of dividing; state of being divided; one of the parts into which anything is divided; a U. S. army unit commanded by a major general and consisting of a headquarters, two infantry brigades, a light-artillery brigade and other troops.

divisor (di vī′ zẽr), *n.* the number by which another number is divided.

divorce (di vōrs′), *n.* a legal dissolution of the marriage contract; separation of two things previously associated.

divorce (di vōrs′), *v.t.* to separate from a husband or wife through legal action ending a marriage; to disunite.

***divulge** (di vulj′), *v.t.* to tell, reveal, as to *divulge* a plan.

dizzy (diz′ i), *adj.* [*comp.* dizzier, *superl.* dizziest] having or causing vertigo; confused and giddy.

do (do͞o), *v.i. and v.t.* [*p.t.* did, *p.p.* done, *pr.p.* doing] to act; to perform; to accomplish; to finish; to achieve; to exert; to work at.

docile (dos′ il), *adj.* easy to teach, manageable.

docility (dō sil′ i ti), *n.* tractableness.

dock (dok), *n.* a landing place for boats, a wharf; a weed with a long taproot.

dock (dok), *v.i. and v.t.* to come to or be moored to a dock; to cut off or curtail, as wages or a horse's tail.

docket (dok' et), *n.* a list of cases due for trial; a bill tied to a shipment of goods; a label.

doctor (dok' tẽr), *n.* one learned or skilled in any particular branch of knowledge, especially a physician or surgeon; one who has a degree given for highest learning or attainment in some special field of knowledge or science.

doctor (dok' tẽr), *v.t. and v.i.* to treat wounds or sickness of body or mind as a physician; to practice medicine.

doctrine (dok' trin), *n.* the principles or dogma of any branch of knowledge, especially of a sect or party; a belief held or taught.

Syn. Dogma, tenet. A *doctrine* is any body of teachings offered to others as true and practicable; *dogma* is doctrine presented with authority, especially laid down by the authority of a church; a *tenet* is a doctrine held to as true.

document (dok' ū ment), *n.* a formal or official paper.

dodge (doj), *v.i. and v.t.* to evade, as a blow or a duty.

doe (dō), *n.* a female deer, antelope or hare.

doff (dof), *v.t.* to take off, as a hat: opposite of *don.*

dog (dôg), *n.* a domesticated animal, related in ancestry to the wolf, the companion and helpmate of man since prehistoric times; a male dog and the male of certain animals, as the fox; an andiron.

dog (dôg), *v.t.* to trail or follow closely; to worry.

dogged (dôg' ed), *adj.* persevering.

doggerel (dôg' ẽr el), *n.* silly verse.

dogma (dôg' ma), *n.* definite religious or theological doctrine; a tenet.

dogmatic (dôg mat' ik), *adj.* authoritative; stating or holding opinion for fact.

dogmatize (dôg' ma tīz), *v.i.* to make dogmatic, positive assertions.

dogwood (dôg' wood), *n.* the wild cornel.

doily (doi' li), *n.* a small ornamental table mat.

dole (dōl), *n.* charitable distribution of food or money; money from a public fund dealt out to the unemployed and needy.

dole (dōl), *v.t.* to deal out sparingly.

doleful (dōl' fool), *adj.* sorrowful, dismal.

doll (dol), *n.* a child's toy baby, a puppet.

dollar (dol' ẽr), *n.* a monetary unit of the United States and Canada, worth a hundred cents.

dollar bill (dol' ẽr bil), a government note or banknote, backed by a hundred cents' worth of metal money.

dollar diplomacy (dol' ẽr di plō' ma si), diplomacy intended to advance a state's commercial interests in another country.

***dolorous** (dol' ẽr us), *adj.* sad, sorrowful.

dolphin (dol' fin), *n.* a sea mammal akin to the whale but much smaller: often called *porpoise.*

dolt (dōlt), *n.* a dull, stupid fellow.

domain (dō mān'), *n.* possession of land; land possessed and ruled over; lordship over a region; any sphere of action or thought, as within the *domain* of science.

dome (dōm), *n.* a hemispherical roof or anything with a similar shape.

domestic (dō mes' tik), *n.* one who does housework for pay.

domestic (dō mes' tik), *adj.* pertaining to the house or home.

domesticate (dō mes' ti kāt), *v.t.* to make suitable for use or a place in the home; to tame.

domesticity (dō mes tis' i ti), *n.* the state of being suited to or devoted to home life.

***domicile** (dom' i sil), *n.* a dwelling or residence, a place of abode.

dominant (dom' i nant), *adj.* ruling, controlling; chief, predominating.

dominate (dom' i nāt), *v.t.* to govern, rule, control; to exercise chief power.

domineer (dom i nẽr'), *v.i. and v.t.* to exercise authority arrogantly or tyrannically.

dominical (dō min' i kal), *adj.* pertaining to Christ as Lord or to Sunday.

dominion (dō min' yun), *n.* supreme authority; a territory subject to such authority as part of an empire but with much power of self-rule in local matters.

domino (dom' i nō), *n.* a costume of hood and a half mask used in a masquerade; an oblong piece of wood marked with dots with which the game *dominoes* is played.

don (don), *v.t.* to put on: opposite of *doff.*

donate (dō' nāt), *v.t.* to give, contribute.

donkey (dong' ki), *n.* the ass; a stupid person.

***donor** (dō' nẽr), *n.* a giver.

doom (do͞om), *n.* fate; a sentence of punishment.

doom (do͞om), *v.t.* to pronounce judgment upon; to sentence.

doomsday (doomz' dā), *n.* the Day of Judgment.

door (dōr), *n.* a hinged or sliding frame by which an opening into a building, room or piece of furniture is closed.

dormant (dôr' mant), *adj.* sleeping; inactive.

dormer (dôr' mẽr), *n.* a window set vertically in a sloping roof.

***dormitory** (dôr' mi tō ri), *n.* a sleeping room with a number of beds; a room or building in an institution in which the inmates sleep.

dormouse (dôr' mous), *n.* [*pl.* dormice] a small European squirrellike rodent.

dorsal (dôr' sal), *adj.* pertaining to, or located on, the back, as a *dorsal fin.*

dory (dō' ri), *n.* a flat-bottomed rowboat with a sharp prow and triangular stern.

dose (dōs), *n.* the quantity of medicine taken at one time.

dot (dot), *n.* a small point or speck.

***dotage** (dōt' ij), *n.* feebleness of mind, especially as due to old age.

dotard (dō' tẽrd), *n.* a person in his dotage.

dote (dōt), *v.i.* to be in dotage; to be foolishly fond of, as to *dote* on a pet cat.

double (dub' l), *n.* twice the quantity, size or amount; a duplicate; an understudy for an actor or singer.

double (dub' l), *v.t. and v.i.* to increase to twice the size, value or amount; to duplicate; to clench, as to *double* the fists to fold over, make of two thicknesses, as to *double* cloth; to retrace a course, as a fox *doubles* to confuse the scent; to substitute, as he *doubles* for Tom in that role.

double (dub' l), *adj.* twofold; folded over; deceitful.

doubt (dout), *n.* mental indecision, uncertainty; misgiving.

Syn. Distrust, suspicion. *Doubt* is lack of certainty about a fact or theory; *distrust* is lack of trust or confidence in a person or thing; *suspicion* is specific, active, sometimes unfriendly, and often unfounded, *distrust.*

Ant. Belief, faith.

doubt (dout), *v.i. and v.t.* to waver in opinion or belief; to question, distrust.

doubtful (dout' fool), *adj.* having doubts, uncertain.

douche (do͞osh), *n.* a jet of water or vapor; an instrument used to throw a jet of water or vapor.

dough (dō), *n.* a soft mass of flour paste, especially for bread.

doughy (dō' i), *adj.* doughlike, pasty.

dour (do͞or), *adj.* severe, stern, obstinate.

douse (dous), *v.t.* to plunge into a liquid.

dove (duv), *n.* any bird of the pigeon family, as the turtledove or mourning dove.

dovecot (duv' kot), *n.* a pigeonhouse.

dovetail (duv' tāl), *v.t.* to fasten with a joint resembling the spread out tail of a pigeon.

dowdy (dou' di), *adj.* untidy.

dowel (dou' el), *n.* a joint made by fitting a pin into a hole in another piece, as of wood.

dower (dou' ẽr), *n.* a woman's life-share in her dead husband's estate.

down (doun), *n.* the soft feathers on young birds and beneath the stiff feathers on grown birds; anything resembling this, as the first hair on the human face or the fuzz on certain plant leaves.

down (doun), *n.* a sandy hill along a shore; an open upland region.

down (doun), *v.t.* to put down.

down (doun), *adj.* descending, as a *down* slope.

down (doun), *adv.* toward a lower position, as he was going *down;* to the utmost, as loaded *down;* from the past, as handed *down* from father to son.

down (doun), *prep.* along something in a descending line, as *down* the hill, *down* the ladder.

downcast (doun' kȧst), *adj.* dejected.

down-lead (doun' lēd), *n.* that part of the antenna of a radio connecting the elevated part with the transmitting or receiving instruments.

downright (doun' rīt), *adj.* thorough; blunt, informal.

***dowry** (dou' ri), *n.* [*pl.* dowries] the property or money a woman brings to her husband when she marries.

doxology (doks ol' ō ji), *n.* one of several short hymns or chants of praise to God, as "Praise God from whom all blessings flow."

doze (dōz), *v.i.* to sleep lightly or fitfully.

dozen (duz' n), *n.* a collection of twelve articles.

drab (drab), *n.* a kind of dull-brown or yellowish-brown woolen cloth.

draft or **draught** (drȧft), *n.* an order for money to be paid from an account; the depth of water a boat or ship draws when loaded; a current of air; a preliminary sketch.

drag (drag), *n.* a dredge; slow, difficult motion; anything that drags.

drag (drag), *v.i. and v.t.* to trail; to lag; to haul over the ground; to search for with something that drags, as a hook.

dragon (drag' un), *n.* a fabulous huge serpent or lizard with wings.

dragonfly (drag' un flī), *n.* an insect with a long slender abdomen, large eyes and four wings, valued because it destroys mosquitoes, flies and gnats.

dragoon (dra go͞on'), *n.* a mounted soldier.

drain (drān), *n.* that through which liquid is drained off, as a sewer or gutter.

drain (drān), *v.i. and v.t.* to flow off gradually; to be carried off, as water; to become empty because of the flowing off of water, as a sink *drains* to empty of water, as a valley *drains* into a river; to draw off, as to *drain* water from a pond; to draw off water from, as to *drain* the pond.

drainage (drān' ij), *n.* the act, means or result of draining.

drake (drāk), *n.* a male duck.

dram (dram), *n.* 1-18th of an ounce, troy measure; 1-16th of an ounce, avoirdupois measure.

***drama** (drä' ma), *n.* a play in prose or verse depicting life or character.

dramatic (dra mat' ik), *adj.* pertaining to drama; theatrical; vivid, moving the emotions.

dramatize (dram' *a* tīz), *v.t.* to show in the form of a drama; to turn into a play, as a novel.

drape (drāp), *v.t.* to cover with curtains; to hang, as a curtain.

draper (drāp' ẽr), *n.* formerly, one who made cloths; now, a dealer in cloth.

drapery (drā' pẽr i), *n.* textiles; hangings for a room or window, as curtains.

drastic (dras' tik), *adj.* acting fast and hard; severe.

draw (drô), *v.t.* to drag or pull; represent in a picture or a lined figure.

Syn. Drag, haul, pull, pluck, tug. To *draw* is to put a body in motion toward oneself; to *drag* is to pull against resistance; to *haul* is to oppose still greater resistance; to *pull* may or may not be to move a thing, as horses may pull hard before they draw a load up a hill. To *pluck* is to pull with a sudden twitch; to *tug* is to pull with mighty effort.

drawback (drô' bak), *n.* resistance to a pull; in business, a rebate; a hindrance or loss of advantage.

drawbridge (drô' brij), *n.* a bridge having a section that may be raised to permit passage of watercraft.

drawer (drô' ẽr), *n.* one who or that which draws; (drôr) a sliding box in a desk or bureau: *drawers* (drôrz), undergarments for the lower part of the body and the legs.

drawing (drô′ ing), *n.* the act of one who draws; something drawn; a picture or diagram made with crayon, chalk, pen or pencil.

drawing room (drô′ ing rōōm), a room for reception of company.

drawl (drôl), *n.* slow, lazy utterance.

drawl (drôl), *v.i. and v.t.* to speak or utter in a slow, lazy way.

dray (drā), *n.* a stout cart or truck.

dread (dred), *n.* great fear, especially of evil to come; reverence, awe.

dread (dred), *v.t.* to fear greatly, be afraid of.

dreadful (dred′ fool), *adj.* causing fear or awe; shocking, horrible.

dreadnought (dred′ nôt), *n.* a battleship having big guns of 12 to 15 caliber.

dream (drēm), *n.* thoughts and images experienced in sleep; any imaginary vision.

dream (drēm), *v.i.* to experience thoughts and images in sleep; to have daytime visions.

dreary (drēr′ i), *adj.* tiresome, monotonous; dismal, depressing.

dredge (drej), *n.* a machine for scraping the bed of a body of water or for digging a channel; a sifter, as for flour.

dredge (drej), *v.t.* to scrape, as the bed of a channel; to sprinkle with a sifted substance, as flour.

dregs (dregz), *n.* the sediment of liquors, grounds, lees; the worthless remains of anything.

drench (drench), *v.t.* to wet thoroughly.

dress (dres), *n.* costume or attire in general; a lady's gown.

dress (dres), *v.i. and v.t.* to attire, clothe, array; to arrange in line, as soldiers; to prepare for use, as to *dress* poultry; to prepare for display, as to *dress* a shop window; to treat and bandage, as a wound.

dresser (dres′ ẽr), *n.* cupboard, bureau.

dressing (dres′ ing), *n.* the act of putting on clothes; forcemeat; the stuffing of fowl for roasting; anything spread over land, as manure, broken rock or top-*dressing*.

dribble (drib′ l), *v.i. and v.t.* to fall or cause to fall, drop by drop, or in a slow stream.

driblet (drib′ let), *n.* a small bit of anything.

drift (drift), *n.* the slow movement of water or air, or of anything carried by them; the motion of a ship or plane apart from that which is controlled by engine or rudder; drifting matter.

drift (drift), *v.i.* to be carried along by a current of water or air.

drill (dril), *n.* an instrument for boring holes; any exercise, physical or mental, repeated with regularity; the training of soldiers in the manual of arms; a light furrow in which seed is sown; a heavy linen or cotton cloth.

drill (dril), *v.i. and v.t.* to go through a drill, as soldiers; to put through a drill, as to *drill* troops; to bore a hole; to make with a drill, as to *drill* a hole; to instruct or discipline, as to *drill* a student in algebra.

drink (dringk), *n.* any liquid to be swallowed the amount drunk at one time.

drink (dringk), *v.i. and v.t.* to swallow a liquid; to swallow, as to *drink* milk; to receive through the senses, as to *drink* in beauty.

drip (drip), *n.* fall or escape of liquid in drops.

drip (drip), *v.i. and v.t.* to fall or let fall in drops.

drive (drīv), *n.* the act of driving; a ride in a vehicle; a road for driving; a collection of logs floating down a stream; a mechanical device for giving motion to a machine; organized promotion of a project, as a *drive* to raise money or votes; a planned offensive advance of infantry troops against an enemy.

drive (drīv), *v.i. and v.t.* to rush with force; to impel, as a ball; to bore, as a tunnel; to direct, as a horse.

drizzle (driz′ l), *n.* a light fall of rain.

droll (drōl), *adj.* amusing, odd, comical.

drollery (drōl′ ẽr i), *n.* buffoonery; humor, a jest.

***dromedary** (drom′ ē der i), *n.* the Arabian one-humped camel.

drone (drōn), *n.* one who does no work; the male bee, especially of the honeybee, which does no work; a dull, monotonous tone, as of the bagpipe.

drone (drōn), *v.i. and v.t.* to make a monotonous sound; to read or speak in a low, dull tone.

droop (drōōp), *v.i.* to hang down or bend, as with hunger or fatigue; to be depressed; to languish.

drop (drop), *n.* a globule of moisture; a fall, descent.

drop (drop), *v.i. and v.t.* to fall in drops or drip; to fall, as an apple *drops* to the ground; to let fall, as to *drop* a cup.

dropsy (drop′ si), *n.* an abnormal accumulation of fluid in a cavity of the body.

dross (drôs), *n.* the scum or slag of melted metal; waste matter; refuse.

***drought** (drout), *n.* prolonged absence of rain.

drove (drōv), *n.* a group of cattle or sheep brought together for driving.

drown (droun), *v.i. and v.t.* to perish or to kill by suffocation in water.

drowsy (drou′ si), *adj.* sleepy.

drudge (druj), *n.* one who does dull routine work.

drudge (druj), *v.i.* to work hard at dreary tasks.

drug (drug), *n.* a substance used as medicine, especially a narcotic preparation.

drug (drug), *v.t.* to dose with drugs; to stupefy with, or as if with a narcotic, as *drugged* with sleep.

druggist (drug′ ist), *n.* a dealer in drugs.

drum (drum), *n.* a musical instrument consisting of a cylinder with a head of stretched skin, beaten with sticks.

drunk (drungk), *adj.* intoxicated with, or as if with, strong drink.

dry (drī), *v.i. and v.t.* to make or become dry.

dry (drī), *adj.* free from moisture, not wet or damp.

dual (dū′ al), *adj.* composed of two, twofold, double.

duality (dū al′ i ti), *n.* the state of being twofold.

dub (dub), *v.t.* to bestow knighthood or any title upon; to call, name.

dubious (dū′ bi us), *adj.* doubtful; of uncertain result, as a *dubious* game; causing doubt.

duchess (duch′ es), *n.* the wife or widow of a duke; a woman who rules a duchy.

duchy (duch′ i), *n.* the territory controlled by a duke or duchess.

duck (duk), *n.* a flat-billed swimming bird with short legs and neck.

duckpin (duk′ pin), *n.* a short thick pin used in bowling; tenpins played with such pins.

duct (dukt), *n.* a tube by which a fluid is conveyed, as a tear *duct*.

***ductile** (duk′ til), *adj.* capable of being drawn out into threads or hammered thin; tractable.

due (dū), *adj.* owed or owing, as *due* honors; owed as a debt; ascribable, caused by, as *due* to weather conditions.

duel (dū′ el), *n.* a combat between two persons with deadly weapons.

duet (dū′ et), *n.* a vocal or instrumental rendering of a musical selection by two performers; a composition for such rendering.

dugout (dug′ out), *n.* a canoe made by hollowing a log; a rough shelter dug in a hillside; a hole dug in a hillside or wall of a trench and roofed over, to protect troops; the covered place where baseball players sit when not in action.

duke (dūk), *n.* one of the British or European nobility of highest rank next to a prince.

dulcet (dul′ set), *adj.* sweet-sounding, melodious.

***dulcimer** (dul′ si mẽr), *n.* a musical instrument with metal strings, played with two hammers.

dull (dul), *v.t.* to make dull, as paper *dulls* scissors.

dull (dul), *adj.* stupid, sluggish, as a *dull* pupil, *dull* wits; slow-acting, listless; not sharp, as a *dull* knife; dim, as a *dull* star; not resounding, as a *dull sound;* cloudy, as *dull* weather; boring, as a *dull* book.

duly (dū′ li), *adv.* in a fit and becoming manner, in due time.

dumb (dum), *adj.* incapable of speech, either permanently or momentarily; unusually stupid or unintelligent.

dumbbell (dum′ bel), *n.* one of a pair of weights used for exercise, each consisting of two wooden or metal spheres joined by a short bar.

dumdum (dum′ dum), *n.* a soft-nosed bullet that expands when it hits, causing lacerated wounds.

dump (dump), *n.* a place where rubbish is deposited.

dump (dump), *v.t.* to unload by tipping, as a truck; to empty a container by throwing its contents out in a mass, as to *dump* coal; to sell excess products abroad more cheaply than in the home market, to keep domestic prices up.

dumpling (dump′ ling), *n.* a ball or cake of dough boiled in a soup or stew.

dun (dun), *n.* one who insistently demands payment; an urgent demand for payment.

dun (dun), *v.t.* to press for payment.

dun (dun), *adj.* dull brown in color.

dunce (duns), *n.* a stupid, ignorant person.

dune (dūn), *n.* a heap or hill of drifted sand.

dungeon (dun′ jun), *n.* a dark cell, especially one underground.

duodecimal (dū ō des′ i mal), *adj.* consisting of, or counted by, twelves.

duodecimo (dū ō des′ i mō), *n.* a sheet of paper folded into twelve leaves; a book printed on paper so folded.

duodenum (dū ō dē′ num), *n.* the upper part of the small intestine.

duotone (dū′ ō tōn), *n.* a picture printed in two tones of one color.

duotype (dū′ ō tīp), *n.* a picture resulting from two halftone plates of the same negative differently etched.

dupe (dūp), *n.* one easily deceived; a victim of deception.

duplex (dū′ plex), *adj.* double, twofold.

duplex house (dū′ plex hous), a two-family house, divided vertically or horizontally.

duplicate (dū′ pli kāt), *n.* the exact match of anything; a reproduction or facsimile.

duplicate (dū′ pli kāt), *v.t.* to make a duplicate of; to match; to repeat; to double.

duplicity (dū plis′ i ti), *n.* deceit, double-dealing.

durable (dū′ ra bl), *adj.* lasting, enduring.

Syn. Lasting, permanent. *Durable* means able to endure wear and tear; *lasting* means continuing long, sometimes forever; *permanent* is the opposite of *temporary.*

Ant. Fragile, fleeting, temporary.

durance (dūr′ ans), *n.* imprisonment.

duration (dū rā′ shun), *n.* continuance in time; the period of time a thing continues.

***duress** (dū res′), *n.* restraint; confinement, imprisonment.

during (dūr′ ing), *prep.* in the time of.

dusk (dusk), *n.* twilight or the darker part of dawn.

dust (dust), *n.* fine dry particles of earth suspended in the air or settled upon an object; any fine powder.

dutiable (dū′ ti *a* bl), *adj.* subject to duty or tariff.

***duty** (dū′ ti), *n.* [*pl.* duties] obligatory service; moral obligation, as respect and obedience due to parents or superiors; that which is required by one's station or office; a tax on imports.

Syn. Obligation. *Duty* has to do with the conscience; an *obligation* arises from specific circumstances, and is a species of *duty.* He who guarantees payment of a sum of money assumes an *obligation;* he who marries contracts new *duties.*

duvetyn (dōō′ vē tēn), *n.* a soft fabric, as of wool or silk, with a long, velvety nap.

dwarf (dwôrf), *n.* a human being, plant or animal of much less than average size.

dwarf (dwôrf), *v.t.* to prevent from growing to natural size; to diminish in proportions, either real or apparent.

dwarfed (dwôrfd), *adj.* stunted.

dwell (dwel), *v.i.* to abide; to reside; to linger.

dwindle (dwin′ dl), *v.i.* to become gradually less.

dye (dī), *n.* material used for coloring, a dyestuff.

dye (dī), *v.t.* to stain or color, especially by saturating with a dyestuff.

dynamic (dī nam′ ik), *adj.* active, having energy and force.

dynamics (dī nam′ iks), *n.* the division of mechanical science that treats of bodies in motion and forces that produce or change such motion.

***dynamite** (dī′ n*a* mīt), *n.* a powerful explosive made by impregnating a porous, absorbent material with nitroglycerin.

dynamo (dī′ n*a* mō), *n.* an electrical machine for converting mechanical energy into electric energy.

***dynasty** (dī′ nas ti), *n.* a line or succession of sovereigns from one family.

dyne (dīn), *n.* the force which, acting upon a gram one second, generates a velocity of one centimeter per second.

dysentery (dis′ en ter i), *n.* a tropical disease akin to diarrhoea.

dyspepsia (dis pep′ sh*a*), *n.* indigestion, disordered digestion.

E

each (ēch), *adj.* every one of two or more, as *each* child in the procession carried a flag.

each (ēch), *pron.* every one of a number of persons or things.

each (ēch), *adv.* apiece, as apples are two cents *each*.

eager (ē′ gẽr), *adj.* keenly desirous to do or obtain; ardent.

Syn. Ardent, burning, desirous.

Ant. Dull, indifferent.

eagle (ē′gl), *n.* a bird of prey noted for its size, strength, sharp sight and swift flight; a ten-dollar gold coin of the U. S.

ear (ēr), *n.* the organ of hearing; the external part of that organ.

earl (ûrl), *n.* an Irish or British nobleman ranking next below a marquis and above a viscount.

early (ûr′ li), *adj.* coming relatively near the start of a period or series, as *early* American literature; happening before the usual or set time, as an *early* arrival; not late.

early (ûr′ li), *adv.* in the first stages or period, as *early* in American history; ahead of set time, as to arrive *early*.

earmark (ēr′ märk), *n.* a mark of identification on an animal's ear; any distinguishing mark.

earmark (ēr′ märk), *v.t.* to mark an animal's ear, as a sign of ownership; to designate or mark for a particular purpose or use, as this gold bullion is earmarked for the Bank of France.

earn (ûrn), *v.t.* to deserve as proper recompense for labor or service; to get by labor, as to *earn* $5.

earnest (ûr′ nest), *n.* a pledge; an intent state of mind, as in *earnest*.

earnest (ûr′ nest), *adj.* characterized by seriousness of purpose.

earnings (ûr′ ningz), *n.* money received as compensation for work or services.

earring (ēr′ ring), *n.* a ring passing through the lobe of the ear, worn as an ornament; any ornament worn on or hung from the ear.

earth (ûrth), *n.* the terrestrial globe on which mankind lives; soft ground, as distinguished from stone; land, as distinguished from air or water; the burrow of an animal, as the fox took to *earth*.

earthen (ûr′ then), *adj.* made of earth, as an *earthen* pot.

earthquake (ûrth′ kwāk), *n.* a localized trembling of the surface of the earth, due to disturbances in the rocky underground structure.

earthwork (ûrth′ wûrk), *n.* in military usage, a sheltering ditch with the dug dirt thrown up in front; any embankment of earth.

earthworm (ûrth′ wûrm), *n.* the ordinary burrowing worm found in damp soil.

earthy (ûrth′ i), *adj.* of the earth; like earth; worldly.

earwax (ēr′ waks), *n.* waxlike secretion of the passages of the ear; cerumen.

ease (ēz), *n.* comfort; freedom from pain, distress or embarrassment.

Syn. Comfort. *Ease* is relaxation from toil or release from pain or distress; *comfort* is active enjoyment or content.

Ant. Discomfort, uneasiness.

easel (ē′ zl), *n.* a frame to support a painter's canvas.

east (ēst), *n.* the direction toward the rising sun.

easterly (ēst′ ẽr li), *adj.* toward or from the east, as an *easterly* direction, an *easterly* storm.

eastern (ēs′ tẽrn), *adj.* of or toward the east.

easterner (ēs′ tẽr nẽr), *n.* one who lives in the east especially the eastern part of the U. S.

eastward (ēst′ wẽrd), *adj.* moving or looking toward the east, as an *eastward* window.

eastward (ēst′ wẽrd), *adv.* toward the east, as to look *eastward*.

easy (ēz′i), *adj.* [*comp.* easier, *superl.* easiest] free from pain or worry; not hard to do.

Syn. Calm, manageable.

Ant. Uneasy, tense, difficult.

eat (ēt), *v.i. and v.t.* [*p.t.* ate, *p.p.* eaten, *pr.p.* eating] to take food; to chew and swallow; to destroy, wear away, as if by eating, as rust *eats* iron.

eaves (ēvz), *n. pl.* the overhanging edges of a roof.

eavesdrop (ēvz′ drop), *v.i.* to listen secretly to others' talk.

ebb (eb), *n.* the flow of a tide back to the sea; a low state, as of health or fortune.

ebb (eb), *v.i.* to flow back, as a tide to the sea; to decline, as health or fortune.

***ebony** (eb′ un i), *n.* a hard, durable black wood.

***ebullient** (ē bul′ i ent), *adj.* boiling up.

ebullition (eb u lish′ un), *n.* the act of boiling or bubbling up.

***eccentric** (ek sen′ trik), *n.* a circle not having the same center as another circle with which it partly coincides; an erratic person; a disk mounted on an axis which does not pass through the center and serves to change circular motion into a thrusting motion.

eccentric (ek sen′ trik), *adj.* out of center; of persons, erratic, freakish.

eccentricity (ek sen tris′ i ti), *n.* [*pl.* eccentricities] state of being eccentric; any oddity or deviation from what is usual.

***ecclesiastic** (e klē zi as′ tik), *n.* a clergyman.

ecclesiastic (e klē zi as′ tik), *adj.* pertaining to the church.

echo (ek′ ō), *n.* [*pl.* echoes] repetition of a sound, caused by reflection of the sound waves; any repetition of words or meaning, as this verse is an *echo* of Longfellow.

echo (ek′ ō), *v.i. and v.t.* to give an echo, send back or repeat as a sound; to repeat or imitate, as he *echoes* his big brother.

***éclat** (ā klä′), *n.* brilliant performance, showy actions; glory.

eclectic (ek lek′ tik), *adj.* selecting; choosing from different sources, as *eclectic* teachings.

***eclipse** (ē klips′), *n.* total or partial obscuration of a heavenly body by intervention of another; any overshadowing or disappearance, as the glory of the empire is in *eclipse*.

eclipse (ē klips′), *v.t.* to overshadow, obscure.

Syn. Obscure. The passing of one heavenly body between an observer and a second heavenly body *eclipses* the first heavenly body; anything that makes the appearance of a body less clear *obscures* it, as clouds *obscure* the sun.

Ant. Discover, reveal.

ecliptic (ē klip′ tik), *n.* the apparent path of the sun through the heavens in a year.

eclogue (ek′ lôg), *n.* a pastoral poem, an idyl.

***economic** (ē kō nom′ ik), *adj.* pertaining to the management of public affairs in connection with the accumulation, distribution and use of goods and money.

***economical** (ē kō nom′ i kal), *adj.* thrifty in handling wealth.

***economics** (ē kō nom′ iks), *n.* the science treating of the production and management of public wealth.

economize (ē kon′ ō mīz), *v.i.* to manage with care and frugality.

***economy** (ē kon′ ō mi), *n.* management of the affairs of a household or community; thrifty management, frugality.

***ecru** (ek′ ro͞o), *n.* a fabric having the color of raw silk or linen; the color beige.

ecru (ek′ ro͞o), *adj.* beige-colored.

ecstasy (ek′ st*a* si), n. [*pl.* ecstasies] a state of deep, especially joyous, emotion; rapture.

ecstatic (ek stat′ ik), *adj.* causing or caused by ecstasy; rapturous.

ecumenical (ek ū men′ i kal), *adj.* general, universal.

***eczema** (ek′ zē m*a*), *n.* an itching, scaly disease of the skin.

eddy (ed′ i), *n.* a current of air or water moving contrary to the main stream; a body of air or water moving in a circle; a whirl pool.

eddy (ed′ i), *v.i.* to move in a circle, as a current of air or water.

edge (ej), *n.* the thin, working side of a cutting instrument; the extreme border, as of a precipice or a body of water.

edge (ej), *v.i. and v.t.* to furnish with an edge; to move by degrees, as *edge* in.

edge tool (ej to͞ol), a tool with a cutting edge, as a chisel.

edging (ej′ ing), *n.* material that forms a border.

edible (ed′ i bl), *n.* anything fit to be eaten.

edible (ed′ i bl), *adj.* fit to be eaten, eatable.

***edict** (ē′ dikt), *n.* a public proclamation or decree.

edification (ed i fi kā′ shun), *n.* improvement, instruction, as for the *edification* of the public.

edifice (ed′ i fis), *n.* a large, fine building or structure.

edify (ed′ i fī), *v.t.* to build up mentally or morally; to teach, improve.

edit (ed′ it), *v.t.* to revise and prepare for publication, as a manuscript; to direct the policies of, as a magazine or newspaper.

***edition** (ē dish′ un), *n.* the number of copies of a literary work put out at one time; a text as prepared by an editor, as Bentley's *edition* of Horace; any single printing of a newspaper, as the 10 o'clock *edition*.

editor (ed′ i tẽr), *n.* one who prepares a literary work for publication; one who directs the policies and selects material for a publication.

editorial (ed i tō′ ri al), *n.* an article in a magazine or newspaper commenting on a current topic or presenting the policies of a publication.

editorial (ed i tō′ ri al), *adj.* pertaining to the functions of an editor.

educate (ed′ ū kāt), *v.t.* to develop or train the mind of, teach; to prepare for a special profession or vocation.

education (ed ū kā′ shun), *n.* moral and mental discipline gained by study and instruction; the process of acquiring this.

Syn. Training, discipline. *Education* is the general term for all schooling; *training* is the practise of something to gain skill or ease. *Education* embraces many subjects; one takes *training* in a specific subject; *discipline* is systematic training to gain strength or effectiveness.

educator (ed′ ū kā tẽr), *n.* one who educates, a teacher.

educe (ē dūs′), *v.t.* to draw forth; to evolve.

eel (ēl), *n.* a long snakelike fish without scales or pelvic fins.

e'en (ēn), contraction of *even* and *evening*, as in *Hallowe'en*.

***e'er** (âr), contraction of *ever*.

eerie or **eery** (ē′ ri), *adj.* weird, uncanny.

***efface** (e fās′), *v.t.* to erase, rub or strike out; to obliterate, destroy.

effect (e fekt′), *n.* the result of action; purport, as he spoke to the *effect* that—; a clear impression produced by an utterance or work of art.

effect (e fekt′), *v.t.* to cause, produce, bring about.

Syn. Execute, accomplish. To *effect* is to bring about often in spite of resistance; to *execute* is to effect formally, as a law; to *accomplish* is to complete, as a task.

effective (e fek′ tiv), *adj.* able to produce a particular result; efficient; in effect, as a law; impressive, as an *effective* remark.

***effects** (e fekts′), *n.* personal property.

*__effectual__ (e fek′ tū al), *adj.* producing an effect.

effeminacy (e fem′ i n*a* si), *n.* the quality, in a man, of being womanish.

effeminate (e fem′ i nit), *adj.* womanish, unmanly.

*__efferent__ (ef′ ẽr ent), *adj.* bearing out or away, as certain blood vessels are *efferent*.

effervesce (ef ẽr ves′), *v.i.* to bubble and hiss, as a fermenting liquid; to be gay, merry, bubbling over with fun.

effervescent (ef ẽr ves′ ent), *adj.* bubbling.

effete (e fēt′), *adj.* no longer fertile or productive, as animals or plants; worn out, spent, as *effete* customs.

efficacious (ef i kā′ shus), *adj.* producing a desired effect.

efficacy (ef′ i k*a* si), *n.* the power of producing effects.

efficiency (e fish′ en si), *n.* easy and quick production of desired results; skill and capability; the ratio of energy expended to power produced in a machine.

efficient (e fish′ ent), *adj.* producing desired results easily; capable, skilful.

effigy (ef′ i gy), [*pl.* effigies] a representation of a person.

effluvium (e flōō′ vi um), *n.* disagreeable exhalations from decaying matter.

effort (ef′ ẽrt), *n.* exertion of power, physical or mental; an attempt; endeavor.

effrontery (e frun′ tẽr i), *n.* impudence, insolent boldness.

effulgence (e ful′ jens), *n.* radiance of light.

effulgent (e ful′ jent), *adj.* giving out light; shining.

effusion (e fū′ zhun), *n.* the act of pouring out; gushing speech.

effusive (e fū′ siv), *adj.* pouring forth; extravagant, gushing.

egg (eg), *n.* the oval or round body laid by birds from which their young are produced.

eggplant (eg′ plȧnt), *n.* a plant with large ovoid fruit, used as a vegetable.

*__eglantine__ (eg′ lan tīn), *n.* the sweetbrier; also the honeysuckle.

*__ego__ (ē′ gō), *n.* the conscious self.

*__egoism__ (ē′ gō izm), *n.* the doctrine that self-development is the end and motive of all action; hence, selfishness.

*__egotism__ (ē′ gō tizm), *n.* vanity, conceit.

*__egregious__ (ē grē′ jus), *adj.* remarkable, in a bad sense.

egress (ē′ gres), *n.* departure; a way out, an exit.

*__egret__ (ē′ gret), *n.* any of certain herons that bear long plumes during the breeding season; one of the plumes: also called *aigrette*.

eider (ī′ dẽr), *n.* a large sea duck.

eider down (ī′ dẽr doun), the down of the eider duck with which the female lines her nest.

eight (āt), *adj.* one more than seven.

eighteen (ā tēn′), *adj.* one more than seventeen.

eighteenth (ā tēnth′), *adj.* next after 17th.

eighth (ātth), *adj.* next after seventh.

eightieth (ā′ ti eth), *adj.* next after 79th.

eighty (ā′ ti), *n.* one more than 79.

*__either__ (ē′ *th*ẽr), *adj.* one or the other of two, as wear *either* hat; one and the other of two, each, as the gate has a post at *either* side.

either (ē′ *th*ẽr), *pron.* one of two, as choose *either* of the hats.

either (ē′ *th*ẽr), *conj.* on one or the other supposition: correlative of *or*, as she is *either* laughing or crying.

either (ē′ *th*ẽr), *adv.* any more than, also: used with *not*, as I am not hungry or thirsty *either*.

*__ejaculate__ (ē jak′ ū lāt), *v.t.* to utter suddenly.

ejaculation (ē jak ū lā′ shun), *n.* an exclamation.

eject (ē jekt′), *v.t.* to throw out; to drive out, expel.

ejection (ē jek′ shun), *n.* act of throwing out or of being driven out.

elaborate (ē lab′ ō rāt), *v.t.* to work out in detail, perfect.

*__elaborate__ (ē lab′ ō rit), *adj.* carefully worked out, painstaking; complicated.

elapse (ē laps′), *v.i.* to slip away, as time.

elastic (ē las′ tik), *n.* any fabric having India rubber woven into it; a rubber band.

elastic (ē las′ tik), *adj.* capable of returning or springing back to shape after being stretched.

elasticity (ē las tis′ i ti), *n.* the ability to return to shape after being stretched.

elate (ē lāt′), *v.t.* to raise the spirits of.

elation (ē lā′ shun), *n.* exaltation.

elbow (el′ bō), *n.* the joint of the arm; any bend resembling it.

elder (el′ dẽr), *n.* an older person; a certain church officer.

elderly (el′ dẽr li), *adj.* getting to be old.

Syn. Aged, old. The *elderly* man has passed the meridian of life; the old man is fast approaching the end of life; the *aged* man has already reached or passed the average expectation of life.

Ant. Young, youthful.

elect (ē lekt′), *n.* one who is chosen and set apart, as the *elect*.

elect (ē lekt′), *v.t.* to choose, set apart; to choose by vote.

elect (ē lekt′), *adj.* chosen, set apart; elected to office but not yet officiating, as president *elect*.

election (ē lek′ shun), *n.* the act of electing, as by votes; the taking of a public vote.

electioneer (ē lek′ shun ẽr), *v.i.* to work for, as one candidate or ticket, in an election.

*__elective__ (ē lek′ tiv), *n.* a college course chosen by a student, not required by the administration.

elective (ē lek′ tiv), *adj.* subject to choice.

elector (ē lek′ tẽr), *n.* one who is qualified to vote.

electoral college (ē lek′ tẽr al kōl′ ej), the body of electors that actually elects the presidential choice of the voters.

*__electorate__ (ē lek′ tẽr it), *n.* the whole body of persons entitled to vote.

electric (ē lek′ trik), *adj.* pertaining to electricity; containing, caused by or run by, electricity.

electrician (ē lek trish′ un), *n.* one skilled in the science of electricity; one who works with or on electrical apparatus.

*__electricity__ (ē lek tris′ i ti), *n.* an imponderable and invisible force of nature, used by man to produce light, heat and power.

electric steel (ē lek′ trik stēl), steel from the electric furnace, also called *electro-steel*.

electrify (ē lek′ tri fī), *v.t.* to charge with electricity; to place, as a railroad line, under a system of electrical operation.

electrocute (ē lek′ trō kūt), *v.t.* to put to death by an electric current.

electrode (ē lek′ trōd), *n.* either terminal of an electric source, an anode or a cathode.

electrodynamics (ē lek trō dī nam′ iks), *n.* the science of electric currents and their interaction.

electrodynamometer ē(lek trō di n*a* mom′ ē tẽr), *n.* an instrument for measuring the strength of an electric current.

electrokinetics (ē lek trō ki net′ iks), *n.* the branch of electrodynamics that treats of the laws of distribution of electric current: distinct from electrostatics.

electrolier (ē lek trō lēr′), *n.* an ornamental bracket supporting a group of electric lights.

*__electrolysis__ (ē lek trol′ i sis), *n.* the decomposition of a chemical compound by electricity.

electromagnet (ē lek trō mag′ net), *n.* a coil of wire around a soft iron metal core rendered magnetic by passage of an electric current through the wire.

electron (ē lek′ tron), *n.* a minute particle of matter charged with the smallest known quantity of negative electricity: opposite of *proton*.

electroplate (ē lek′ trō plāt), *v.t.* to plate, as with silver, through electrolytic process.

electrotype (ē lek′ trō tīp), *n.* a facsimile plate made by electroplating a wax impression.

*__eleemosynary__ (el ē mos′ i ner i), *adj.* pertaining to alms or the giving of alms.

elegance (el′ ē gans), *n.* refinement, polish.

elegant (el′ ē gant), *adj.* characterized by refinement and good taste, fastidious.

*__elegiac__ (el ē jī′ ak), *adj.* pertaining to or suitable for elegies.

elegy (el′ ē ji), *n.* a poem of lament, especially for the dead.

element (el′ ē ment), *n.* a first or fundamental principle, as the *elements* of mathematics; one of four primary substances formerly believed to constitute the universe: earth, air, fire, water; any chemical substance that cannot be divided into other substances or ingredients, as gold, silver, oxygen; the natural or suitable environment of a person or thing, as to be in one's *element: elements*, the forces of nature as manifested in the weather.

elemental (el ē men′ tal), *adj.* pertaining to one of the four primary elements of nature, as an *elemental* storm; fundamental, essential.

elementary (el ē men′ t*a* ri), *adj.* primary, fundamental; rudimentary.

elephant (el′ ē fant), *n.* a very large mammal, native to Asia and Africa, having a thick, nearly hairless hide, tusks and a trunk.

*__elephantiasis__ (el ē fan tī′ *a* sis), *n.* a disease in which the skin becomes thick and cracked.

*__elephantine__ (el ē fan′ tin), *adj.* like an elephant, huge, unwieldy.

elevate (el′ ē vāt), *v.t.* to raise, in physical position or in rank and standing.

elevation (el ē vā shun), *n.* the act of lifting or raising up; height, as of a hill or of rank.

elevator (el′ ē vā′ tẽr), *n.* a hoisting machine for freight or passengers; an airplane airfoil used to make the craft rotate about its lateral axis.

eleven (ē lev′ en), *adj.* one more than 10.

eleventh (ē lev′ enth), *adj.* next after the 10th.

elf (elf), *n.* [*pl.* elves] a sprite, fairy.

elfin (el′ fin), *adj.* pertaining to elves.

*__elicit__ (ē lis′ it), *v.t.* to draw out, educe.

elide (ē līd′), *v.t.* to omit, as the final letter or syllable of a spoken word.

eligibility (el i ji bil′ i ti), *n.* the state of being fit to be chosen; suitability.

eligible (el′ i ji bl), *adj.* fit to be chosen, suitable; meeting the requirements, as for office.

eliminate (ē lim′ i nāt), *v.t.* to remove, get rid of, exclude; to ignore as unimportant.

elision (ē lizh′ un), *n.* a cutting off or suppression; the dropping of a vowel before another vowel in a line of poetry to save a syllable, as *th′ eternal*.

*__elixir__ (ē lik′ sẽr), *n.* a tincture, essence or cordial.

elk (elk), *n.* the largest deer of Europe and Asia with broad antlers; the American wapiti.

ell (el), *n.* a measure formerly used for cloth, varying from 27 to 48 inches; an addition to a house at right angles, like an L, to the main structure.

*__ellipse__ (e lips′), *n.* the figure made by a plane cutting through a cone on a slant.

ellipsis (e lip′ sis), *n.* the omission of one or more words grammatically necessary but easily supplied by the reader; a printer's mark, as an asterisk, indicating omission of matter.

elliptic (e lip′ tik), *adj.* having the nature of an ellipsis.

elm (elm), *n.* a shade tree noted for its symmetry.

elocution (el ō kū′ shun), *n.* the art of declaiming.

elongate (ē lông′ gāt), *v.t.* to make longer, stretch out.

elope (ē lōp′), *v.i.* to run away with a lover.

eloquence (el′ ō kwens), *n.* fluency and persuasiveness in speaking.

else (els), *adj.* other, additional, as give me something *else*; different, as nothing *else* to say.

else (els), *adv.* otherwise, as study *else* you fail.

elsewhere (els′ hwâr), *adv.* in another place.

*__elucidate__ (ē lū′ si dāt), *v.i. and v.t.* to explain, to make clear.

*__elude__ (ē lūd′), *v.t.* to avoid or evade.

elusive (ē lū siv), *adj.* adroitly evading.

elusory (ē lū′ sō ri), *adj.* evasive.

*__emaciate__ (ē mā′ shi āt), *v.t.* to make lean through loss of flesh.

emanate (em′ *a* nāt), *v.i.* to issue from, as a source.

emancipate (ē man′ si pāt), *v.t.* to set free.

emancipator (ē man′ si pā tẽr), *n.* a liberator.

emasculate (ē mas′ kū lāt), *v.t.* to deprive of masculine vigor, to weaken.

***embalm** (em bäm′), *v.t.* to prepare a body for burial, as with oils, to prevent decay.

embankment (em bangk′ ment), *n.* a bank of earth, as to hold water back.

embargo (em bär′ go), *n.* a government ban on shipping through a port; a governmental act forbidding commerce with another nation.

embark (em bärk′), *v.i. and v.t.* to go aboard a ship for a voyage; to place aboard a ship; to launch upon a venture.

embarrass (em bar′ as), *v.t.* to hinder or impede; to disconcert; to involve in money difficulties.

Syn. Abash, disconcert. To *embarrass* is to put a restraint on freedom and ease of any kind; one may be *embarrassed* by too much baggage or by a question one is unwilling to answer. To *abash* is to destroy self-possession; to *disconcert* is momentarily to disturb the poise.

Ant. Compose, relieve.

embassy (em′ bə si), *n.* [*pl.* embassies] the position, business and responsibility of an ambassador; an embassador or group of envoys; the official residence of an ambassador.

embattled (em bat′ ld), *adj.* furnished with battlements; drawn up in battle order.

embed (em bed′), *v.t.* to place in a bed or as in a bed.

embellish (em bel′ ish), *v.t.* to adorn, decorate; to enrich, as a story with detail.

ember (em′ bẽr), *n.* a small, smoldering piece of coal or wood from a fire: *embers,* the smoldering bits of a dying fire.

embezzle (em′ bez′ l), *v.t.* to appropriate to one's own use that which has been entrusted to one for safekeeping.

embitter (em bit′ ẽr), *v.t.* to make bitter.

emblazon (em blā′ zn), *v.t.* to mark with heraldic devices; to decorate in bright colors.

emblem (em′ blem), *n.* a symbol; something that stands for an idea, as the crescent is the *emblem* of Mohammedanism.

emblematic (em ble mat′ ik), *adj.* symbolic.

embodiment (em bod′ i ment), *n.* union into a whole; a visible example of something, as he is the *embodiment* of all the virtues.

embody (em bod′ i), *v.t.* to typify, represent, as to *embody* the spirit of patriotism; to give expression to, as to *embody* ideas in a speech.

embolden (em bōl′ den), *v.t.* to encourage.

embolism (em′ bō lizm), *n.* the closing or obstruction of a blood vessel by a clot.

embosom (em booz′ um), *v.t.* to hold in the bosom.

emboss (em bôs′), *v.t.* to ornament with bosses; to print in raised letters, as if by upward pressure from the under side of the sheet of paper.

embrace (em brās′), *n.* the act of putting one's arms around another; a hug.

embrace (em brās′), *v.t.* to clasp in the arms, hug; to adopt, include.

embracery (em brās′ ẽr i), *n.* the act of attempting to corrupt a jury or a court.

***embrasure** (em brā′ zher), *n.* an opening in a wall from which guns may be fired.

embrocation (em brō kā′ shun), *n.* a lotion or liniment.

embroider (em broi′ dẽr), *v.i. and v.t.* to do fine needlework; to decorate with fine needlework.

embroidery (em broi′ dẽr i), *n.* the art of embroidering; needlework ornamenting fine fabrics.

embroil (em broil′), *v.t.* to throw into strife.

embryo (em′ bri ō), *n.* the young of an animal in the first stages of life before being born or hatched; the young plant contained in a seed.

emend (ē mend′), *v.t.* to correct, especially to alter or correct, as faults in a written text; to improve.

***emendation** (ē men dā′ shun), *n.* alteration or correction, as of a text.

emerald (em′ ẽr ald), *n.* a precious stone of a deep shade of green; the color of an emerald.

emerge (ē mûrj′), *v.i.* to come out from anything, as a train *emerges* from a tunnel, a man from a house or from a state of unconsciousness.

emergency (ē mûr′ jen si), *n.* [*pl.* emergencies] an unforeseen situation calling for immediate action; a crisis.

emery (em′ ẽr i), *n.* an especially hard variety of carborundum, used for grinding and polishing.

emetic (ē met′ ik), *n.* anything swallowed to cause vomiting.

***emigrant** (em′ i grant), *n.* one who quits his own country to settle in another.

emigrate (em′ i grāt), *v.i.* to move from one country to another.

Syn. Immigrate. *Emigrate* and *immigrate* both come from *migrate,* which means to move from one country to another. To *emigrate* is to move out; to *immigrate* is to move in. Wandering tribes of men *migrate,* as do birds, in their seasonal flights.

eminence (em′ i nens), *n.* a height, as of land; high standing, as in social or professional life.

eminent (em′ i nent), *adj.* high; distinguished.

emissary (em′ i ser i), *n.* a person sent on a mission in which he represents another, as a government; specifically, a secret agent.

emission (ē mish′ un), *n.* the act of sending out; that which is sent out.

emit (ē mit′), *v.t.* to send out or give forth.

***emollient** (ē mol′ i ent), *n.* a soothing application that softens the skin.

emollient (ē mol′ i ent), *adj.* softening, soothing.

emolument (ē mol′ ū ment), *n.* profit or compensation from office or employment; remuneration for labor or services.

emotion (ē mō′ shun), *n.* a strong feeling, as pleasure, joy, anger, pain, fear or sorrow.

emotional (ē mō′ shun al), *adj.* easily moved, as an *emotional* child; arousing emotion, as *emotional* music.

***empennage** (ä*n* pe nȧzh′), *n.* the tail of any aircraft used to aid in preserving equilibrium.

***emperor** (em′ pẽr ẽr), *n.* the ruler of an empire.

***emphasis** (em′ fə sis), *n.* stress upon a spoken word; any stress or importance, as to lay the *emphasis* in speed in giving directions.

emphasize (em′ fə sīz), *v.t.* to stress, accentuate.

emphatic (em fat′ ik), *adj.* emphasized, forceful; given to decisive speech or action, as an *emphatic* personality.

empire (em′ pīr), *n.* a group of states under the rule of a single monarch; control of wide regions.

Syn. Reign, dominion. *Empire* refers essentially to the lands and peoples ruled by an emperor; *reign,* to the act of ruling, hence essentially to the ruler, the one who reigns. *Dominion* has a wide field of meaning, and may be applied to man's rule over the beasts, to the power of the passions or to political overlordship.

***empirical** (em pir′ i kal), *adj.* based on experiment or experience, as *empirical* knowledge.

empiricism (em pir′ i sizm), *n.* the philosophical theory that all knowledge springs from experience; quackery, unscientific practice, as of medicine.

employ (em ploi′), *n.* employment.

employ (em ploi′), *v.t.* to hire, as a man to do work; to use, as to *employ* drastic measures.

Syn. Hire. We *employ* whatever we take into our service or cause to subserve our convenience; we *hire* anyone to whom we pay wages.

employment (em ploi′ ment), *n.* the state of being employed; that at which one is employed; an occupation.

emporium (em pō′ ri um), *n.* a trade center; any big department store.

empower (em pou′ ẽr), *v.t.* to confer power upon, authorize.

empress (em′ pres), *n.* the wife of an emperor; a woman who rules over an empire.

empty (emp′ ti), *v.i. and v.t.* to become empty; to make empty by removing the contents; to discharge, as a river.

empty (emp′ ti), *adj.* without contents, void, vacant.

***empyrean** (em pi rē′ an), *n.* the highest heaven.

empyrean (em pi rē′ an), *adj.* celestial; ethereal.

***emu** (ē′ mū), *n.* a large Australian bird, resembling the ostrich.

emulate (em′ ū lāt), *v.t.* to strive to equal or excel.

emulsion (ē mul′ shun), *n.* a fatty or oily medical preparation of the color and consistency of milk, for use as food or tonic; globules of one liquid suspended in another liquid.

enable (en ā′ bl), *v.t.* to make able, empower; to make possible or easy.

enact (en akt′), *v.t.* to represent on the stage; to make into law.

enactment (en akt′ ment), *n.* that which is enacted; a law.

enamel (en am′ el), *n.* a smooth, tough, opaque substance used in coating surfaces of glass, porcelain, metal; a varnish with the qualities of enamel.

enamel (en am′ el),*v.t.* [*p.t.* and *p.p.* enameled, *pr.p.* enameling] to apply enamel.

encamp (en kamp′), *v.i.* to make and go into a camp.

encampment (en kamp′ ment), *n.* a camp.

enchain (en chān′), *v.t.* to bind with chains; to hold fast, as with a chain.

enchant (en chȧnt′), *v.t.* to captivate; to put a spell upon.

encircle (en sûr′ kl), *v.t.* to enclose in, or as if in, a circle; to surround; to move all the way round, as to *encircle* the globe.

encomium (en kō′ mi um), *n.* [*pl.* encomiums] high, formal praise.

Syn. Eulogy; panegyric. We bestow *encomiums* upon both persons and things. A *eulogy* is warmer and more personal praise than an *encomium.* A *panegyric* is often extravagant, and publicly addressed.

Ant. Abuse, defamation.

encompass (en kum′ pȧs), *v.t.* to surround, enclose; to contain.

***encore** (äng kōr′), *n.* the call from an audience for repetition of a part of a program.

encounter (en koun′ tẽr), *n.* a hostile meeting, armed clash, combat, battle.

encounter (en koun′ tẽr), *v.t.* to come upon suddenly; to meet face to face, especially as enemies.

encourage (en kûr′ ij), *v.t.* to inspire with courage or hope.

encroach (en krōch′), *v.i.* to enter gradually or by stealth; to trespass; to invade, as the rights of another.

encumber (en kum′ bẽr), *v.t.* to impede, retard; to load down, burden.

encumbrance (en kum′ brans), *n.* that which encumbers, a hampering burden or load; in law, liability attaching to a property to be sold or transferred.

encyclical (en sī′ kli kal), *n.* a letter sent out by the Pope.

encyclical (en sī′ kli kal), *adj.* addressed to all members of a class or community; general.

***encyclopedia** (en sī klō pē′ di *a*), *n.* a work made up of articles, often alphabetically arranged, covering all branches of knowledge or devoted to a certain branch of knowledge.

***encyclopedic** (en sī klō pē′ dik), *adj.* covering a very wide range of subjects.

end (end), *n.* the final part or point, as the *end* of a road or a book; termination or conclusion; a purpose to be accomplished, an aim.

end (end), *v.i. and v.t.* to come to an end; to finish.

endanger (en dān′ jer), *v.t.* to expose to danger, imperil.

endear (en dēr′), *v.t.* to make dear or loved.

endearment (en dēr′ ment), *n.* a caress; words of affection.

endeavor (en dev′ ẽr), *n.* effort; an attempt.

endeavor (en dev′ ẽr), *v.i.* to strive or work.

Syn. Try. To *try* is the general term. To *endeavor* is to try or exert effort always with a specific end in view, as to *endeavor* to finish a lesson, *endeavor* to please.

endless (end′ les), *adj.* lasting forever; eternal; joined at the ends, as an *endless* belt in a machine.

endorse (en dôrs′), *v.t.* to sign, as a check, on the back so that another may collect it; to approve, commend, sponsor.

endow (en dou′), *v.t.* to furnish with a permanent source of income.

endowment (en dou′ ment), *n.* money or property settled upon an individual or an institution as a permanent source of income; a natural talent.

endue (en dū′), *v.t.* to clothe, as to *endue* with a talent or grace.

endurable (en dūr′ *a* bl), *adj.* bearable.

endurance (en dūr′ ans), *n.* ability to endure or strength to bear.

endure (en dūr′), *v.i. and v.t.* to continue unchanged; to bear, as pain or suffering.

enemy (en′ ē mi), *n.* [*pl.* enemies] one hostile to another, a foe; anything harmful, as dissipation is an *enemy* to health.

enemy (en′ e mi), *adj.* of or belonging to an enemy, as an *enemy* camp.

energetic (en ẽr jet′ ik), *adj.* possessing energy, forceful; vigorous, active.

energy (en′ ẽr ji), *n.* effective force; vigor; activity.

Syn. Power, strength, vigor, force. *Power* is the general word. *Energy* is power as measured in work done or that can be done. *Strength* is the power that a living creature possesses of itself. *Vigor* is strength as indicated in the exercise of mind or body; *force* is power used against resistance.

***enervate** (en′ ẽr vāt), *v.t.* to weaken, physically or morally; to deprive of nervous force and vigor.

enfeeble (en fē′ bl), *v.t.* to make weak.

***enfilade** (en fi lād′), *n.* military fire that passes lengthwise of trenches or lines of troops.

enforce (en fōrs′), *v.t.* to compel; to put into effect, as a law.

enfranchise (en fran′ chīz), *v.t.* to liberate, set free; to grant a franchise to; to admit to citizenship, with a right to vote.

engage (en gāj′), *v.t.* to put under pledge; to secure the services of; to employ; in mechanics, to come into gear with.

engagement (en gāj′ ment), *n.* betrothal; an appointment; a battle; in mechanics, the state of being in gear.

engender (en jen′ dẽr), *v.t.* to beget; to bring forth; to produce.

engine (en′ jin), *n.* a machine by which power is applied for doing work; a railroad locomotive.

engineer (en jin ẽr′), *n.* one who runs an engine; one who is especially skilled in any branch of mechanical science, as a civil *engineer,* an electrical *engineer.*

engineer (en jin ẽr′), *v.t.* to superintend, as the execution of a plan.

engineering (en ji nẽr′ ing), *n.* the science and art of making and using machinery, building roads, bridges, canals, developing water power and mineral resources; skilful management, as in industry.

engrave (en grāv′), *v.t.* to cut deeply, as in stone or metal; to print from metal plates so cut.

engross (en grōs′), *v.t.* to write in a large round hand; to engage or occupy completely, as the attention.

enhance (en hans′), *v.t.* to augment; to intensify; to raise in esteem.

enharmonic (en här mon′ ik), *adj.* pertaining to tones differentiated in theory but rendered identically on a musical instrument, as C♯ and D♭ are *enharmonic.*

***enigma** (ē nig′ ma), *n.* a riddle; a puzzling problem.

***enigmatic** (ē nig mat′ ik), *adj.* puzzling.

enjoin (en join′) *v.t.* to command; to direct with authority; to prohibit, forbid.

enjoy (en joi′), *v.t.* to experience with pleasure; to derive pleasure from; to have the use or benefit of, as to *enjoy* good health.

enlarge (en lärj′), *v.i. and v.t.* to become larger; to make larger in size or capacity; to extend; to reproduce in a larger size, as a photograph; to amplify, as a written composition.

Syn. Increase. To *increase* means to make more in value or number, greater in intensity, longer in time, as to *increase* wages or weight, *increase* one's fears. To *enlarge* is to increase the capacity or scope of, as to *enlarge* a room, *enlarge* the membership of a club.

Ant. Decrease, lessen, diminish.

enlighten (en līt′ en), *v.t.* to inform, shed light upon in the way of truth or knowledge.

enlist (en list′), *v.i. and v.t.* to enroll, as in military service; to sign for service, as to *enlist* in the army; to win over, as to a cause.

enliven (en līv′ en), *v.t.* to make vigorous, active or more vivacious.

enmity (en′ mi ti), *n.* animosity, hostility.

Syn. Animosity, hostility. *Enmity* lies in the heart; it is a feeling of hatred. *Hostility* is enmity expressed in action; *animosity* is ill will, often bitterly or resentfully expressed. *Enmity* often lies concealed in the heart and does not betray itself by any act of *hostility.*

Ant. Friendship.

ennoble (e nō′ bl), *v.t.* to elevate to a place among the nobility; to raise to a loftier plane of character.

***ennui** (än′ we), *n.* the state of being bored; listlessness.

enormity (ē nôr′ mi ti), *n.* the state of being huge; a horrible or atrocious offense.

enormous (ē nôr′ mus), *adj.* immense; far larger than the normal size or extent; atrocious.

Syn. Immense, huge, vast. *Enormous* means abnormally large in size or abnormally great in degree; *immense* is larger than average; *huge* is great in bulk; *vast* is great in extent.

***enough** (ē nuf′), *n.* a sufficiency, adequate quantity.

enough (ē nuf′), *adj.* sufficient.

Syn. *Adequate. Enough* is sufficient to satisfy a wish or a need; *adequate* means in proportion to a specific requirement, as the sum is *adequate* for the trip.

Ant. Inadequate, scanty.

enrage (en rāj′), *v.t.* to throw into a rage, make angry.

enrapt (en rapt′), *adj.* enraptured, fascinated.

enrapture (en rap′ tūr), *v.t.* to transport with delight.

enrich (en rich′), *v.t.* to make rich; to make fertile, as soil.

enroll (en rōl′), *v.t.* to put on record in a register; to enlist.

en route (än ro͞ot), on the way.

ensanguine (en sang′ gwin), *v.t.* to make bloody, smear or mark with blood.

ensconce (en skons′), *v.t.* to fix securely; to hide, guard.

enshrine (en shrīn′), *v.t.* to place in, or as in, a shrine; to consider as sacred.

enshroud (en shroud′), *v.t.* to cover with, or as if with, a shroud; to hide.

ensign (en′ sīn), *n.* a flag; the rank in the U. S. Navy between midshipman and junior grade lieutenant.

ensilage (en′ si lij), *n.* fodder stored in a silo.

enslave (en slāv′), *v.t.* to make a slave of; to bring into a state of slavery.

ensnare (en snâr′), *v.t.* to catch in a snare or trap; to entrap; to inveigle.

ensue (en-sū′), *v.i. and v.t.* to follow as a consequence; to spring from, as a result.

entablature (en tab′ l*a* tūr), *n.* the parts between a column and a cornice.

entail (en tāl′), *n.* an estate settled upon a certain person and his descendants.

entail (en tāl′), *v.t.* to restrict an estate to a certain succession of heirs.

entangle (en tang′ gl), *v.t.* to involve, tangle.

***entente** (än tänt′), *n.* an understanding, as between states; a league or alliance of nations.

enter (en′ tẽr), *v.i. and v.t.* to go into; to inscribe, as to *enter* a name on a roll; to make a start in, as to *enter* college.

enterprise (en′ tẽr prīz), *n.* an undertaking involving action or energy; business activity; active, progressive spirit.

entertain (en tẽr tān′), *v.t.* to give pleasure to; to amuse; to receive as a guest; to consider or hold in the mind, as to *entertain* an idea.

enthrall (en thrôl′), *v.t.* to enslave; to fascinate.

enthrone (en thrōn′), *v.t.* to place upon a throne.

enthusiasm (en thū′ zi azm), *n.* zeal; intense interest.

enthusiastic (en thū zi as′ tik), *adj.* full of enthusiasm and intense interest.

entice (en tīs′), *v.t.* to allure by waking hope or desire; to tempt.

entire (en tīr′), *adj.* complete, whole, undivided.

entirety (en tīr′ ti), *n.* completeness, wholeness.

entitle (en tī′ tl), *v.t.* to give a name or title to; to confer a legal right to; to give a right to, qualify, as age *entitles* him to respect.

entity (en′ ti ti), *n.* a separate being; anything having reality in fact.

entomb (en to͞om′), *v.t.* to place in a tomb; to be a tomb for, as the fields of France *entomb* many Americans.

***entomology** (en tō mol′ ō ji), *n.* the science that treats of insects and their ways of living.

***entourage** (än too räzh′), *n.* surroundings, especially followers and attendants.

entrails (en′ trālz), *n. pl.* the intestines.

entrain (en trān′), *v.i. and v.t.* to go or put aboard a train.

entrance (en′ trans), *n.* the act of entering; the way by which anything enters; admittance, as to *demand* entrance.

entrance (en trans′), *v.t.* to put or throw into a trance; to delight, as the tale *entranced* me.

entrap (en trap′), *v.t.* to take in a trap; to catch by trickery.

entreat (en trēt′), *v.t.* to beg, beseech, plead.

entreaty (en trēt′ i), *n.* [*pl.* entreaties] an earnest petition, a supplication.

***entree** (än′ trā), *n.* entrance, especially to a social group; a dish served at the beginning of a dinner, or between courses.

entry (en′ tri), *n.* the act of entering; a place where one enters or goes in; the entering or recording of an item in a business account.

entwine (en twīn′), *v.i. and v.t.* to twine around or twine together.

enumerate (ē nū′ mẽr āt), *v.t.* to count separately, name one by one.

***enunciate** (ē nun′ shi āt), *v.i. and v.t.* to speak or pronounce distinctly.

enunciation (ē nun si ā′ shun), *n.* articulation of speech; clear pronunciation.

envelop (en vel′ up), *v.t.* to surround or cover; to enclose in.

***envelope** (en′ ve lōp), *n.* a wrapper; a gummed paper folded to hold a letter.

envenom (en ven′ um), *v.t.* to make poisonous; to fill with poison.

enviable (en′ vi *a* bl), *adj.* exciting or deserving envy.

envious (en′ vi us), *adj.* feeling or showing envy.

***environ** (en vī′ run), *v.t.* to surround; to encircle; to enclose.

***environment** (en vī′ run ment), *n.* surroundings; especially the conditions and influences under which one lives.

***environs** (en vī′ runs), *n. pl.* the surrounding region of a town or city.

***envoy** (en′ voi), *n.* a diplomatic representative ranking between an ambassador and a minister.

envy (en′ vi), *n.* discontent because of the possessions or good fortune of another; covetousness.

envy (en′ vi), *v.t.* to begrudge, covet.

enwrap (en rap′), *v.t.* to place in a wrapping.

enzyme (en′ zīm), *n.* any of a class of organic substances, such as amylose and pepsin, that aid in certain transformations of material, as in the digestion of foods in plant and animal bodies; a ferment.

***eon** (ē′ on), *n.* an age in the earth's history, a geological age.

***epaulet** (ep′ o let), *n.* an ornamental strap worn on the shoulder by officers of the army or navy.

ephemeron (e fem′ ẽr on), *n.* [*pl.* ephemera or ephemerous] that which exists but for a day.

***ephemeral** (e fem′ ẽr al), *adj.* existing for a day; quickly passing away, short-lived.

epic (ep′ ik), *n.* a narrative poem commemorating heroic deeds written in an exalted style.

***epicure** (ep′ i kūr), *n.* a person devoted to luxury.

***epicurean** (ep i kū rē′ an), *adj.* luxurious; following a certain old Greek philosophy.

epidemic (ep i dem′ ik), *n.* any disease that spreads unchecked through a community.

epidemic (ep i dem′ ik), *adj.* attacking many at the same time, as an *epidemic* disease.

epidermis (ep i dûr′ mis), *n.* the outer layer of skin; cuticle.

epiglottis (ep i glot′ is), *n.* the leaf-shaped cartilage that covers the glottis at the upper part of the windpipe.

epigram (ep′ i gram), *n.* a short witty or satirical verse; a witty thought tersely expressed.

epigraph (ep′ i gráf), *n.* an inscription on a building or a monument.

epilepsy (ep′ i lep si), *n.* a chronic nervous disease attended by fits and temporary unconsciousness.

epileptic (ep i lep′ tik), *n.* a person afflicted with epilepsy.

epilogue (ep′ i lôg), *n.* a speech at the end of a play.

episcopacy (ē pis′ kō p*a* si), *n.* church rule by bishops; the office of a bishop.

***episode** (ep′ i sōd), *n.* an incident in a story or play.

***epistle** (ē pis′ l), *n.* a formal letter.

epistolary (ē pis′ tō ler i), *adj.* relating to letters; recorded in letters.

***epitaph** (ep′ i táf), *n.* a memorial inscription.

epithet (ep′ i thet), *n.* an adjective or phrase expressing a quality of a person or thing; as, Maine is known as the *pine tree* state.

***epitome** (ē pit′ ō mē), *n.* a concise summary.

epitomize (ē pit′ ō mīz), *v.t.* to describe briefly; to condense, as a text.

epizootic (ep i zō ot′ ik), *adj.* affecting many animals of one kind at once, epidemic.

***epoch** (ep′ ok), *n.* a point of time or a great event from which succeeding time is measured; a period of history marked by great events, as the *epoch* of invention.

***equability** (ek w*a* bil′ i ti), *n.* evenness of temperament.

***equable** (ek′ w*a* bl), *adj.* even-tempered; uniform.

equal (ē′ kwal), *n.* a person or thing of the same size, age, strength or rank; an equal number.

equal (ē′ kwal), *adj.* the same in amount, degree, value or quality; equivalent; adequate, as *equal* to the undertaking.

Syn. Equivalent, identical. *Equal* means the same in degree, quantity, number, value, rank, age; *equivalent* means practically the same; *identical* means complete and absolute agreement; two copies of the same book are *identical,* no human faces are *identical.*

***equality** (ē kwol′ i ti), *n.* the state of being equal.

equalize (ē′ kwal īz), *v.t.* to make equal or uniform.

***equanimity** (ē kw*a* nim′ i ti), *n.* evenness of temper or mind; composure.

***equation** (ē kwā′ zhun), *n.* a statement of equality between two mathematical expressions, as $2 + 2 = 4$ is an *equation.*

equator (ē kwā′ tẽr), *n.* the imaginary circle dividing the earth into two equal parts, the northern and southern hemispheres.

equatorial (ē kw*a* tō′ ri al), *adj.* on or near the equator, characteristic of the regions near the equator, as *equatorial* plants.

equestrian (ē kwes′ tri an), *n.* one who rides horseback.

equestrian (ē kwes′ tri an), *adj.* pertaining to horses or to horsemanship; mounted.

equidistant (ē kwi dis′ tant), *adj.* equally distant from two points.

equilateral (ē kwi lat′ ẽr al), *adj.* having all sides equal.

equilibrium (ē kwi lib′ ri um), *n.* balance between two opposite weights or forces.

***equine** (ē′ kwīn), *adj.* pertaining to or like horses.

***equinoctial** (ē kwi nok′ shal), *adj.* pertaining to the time when day and night are equal; pertaining to the time when the sun crosses the equator.

equinox (ē′ kwi noks), *n.* one of the two times in the year when the sun crosses the equator and day and night are equal: March 21 and September 23.

equip (ē kwip′), *v.t.* to furnish with things needed for a purpose, as arms for military service, education for a career.

equipment (ē kwip′ ment), *n.* furnishings for any undertaking, service or career.

equipoise (ē′ kwi poiz), *n.* equilibrium.

***equitable** (ek′ wi t*a* bl), *adj.* impartial, fair, just.

equity (ek′ wi ti), *n.* [*pl.* equities] fairness; justice or right dealing.

***equivalent** (ē kwiv′ *a* lent), *n.* that which is practically the same as something else in value or effect.

equivalent (ē kwiv′ *a* lent), *adj.* practically equal in value, size or effect.

equivocal (ē kwiv′ ō kal), *adj.* ambiguous; doubtful.

Syn. Ambiguous, enigmatic. A statement that is *ambiguous* can be understood in more than one way; an *equivocal* statement also conveys more than one clear meaning, but is apt to be presented with intent to deceive, while an *ambiguous* statement may be only accidentally double in meaning. That which is *enigmatical* has to be guessed at.

Ant. Straightforward, frank, clear.

equivocate (ē kwiv′ ō kāt), *v.i.* to use words of doubtful meaning in order to deceive.

***era** (ē′ r*a*), *n.* a period of history, especially as reckoned from a certain date.

eradicate (ē rad′ i kāt), *v.t.* to destroy; to exterminate, root up.

erase (ē rās′), *v.t.* to obliterate by rubbing.

eraser (ē rās′ ẽr), *n.* a piece of rubber used for rubbing out marks.

***erasure** (ē rā′ zhẽr), *n.* the act of erasing; something erased.

erect (ē rekt′), *v.t.* to raise upright; to rear, as a structure; to set up for use.

erection (ē rek′ shun), *n.* the act of building or rearing; that which is erected.

erg (ûrg), *n.* a unit of energy or work.

***ermine** (ûr′ min), *n.* a weasel common to both hemispheres whose coat turns white in the winter except for the black tail tip; the white winter fur of the ermine; state robes lined with ermine.

erode (ē rōd′), *v.t.* to wear away, as water *erodes* rock; to eat away, as rust *erodes* iron.

erosion (ē rō′ zhun), *n.* wear by water or rust.

***err** (ûr), *v.i.* to make a mistake; to go astray; to sin.

errand (er′ and), *n.* a mission on which one is sent; a trip made to attend to some business.

errant (er′ ant), *adj.* roving, wandering.

erratic (e rat′ ik), *adj.* deviating from a course, eccentric; irregular, unreliable; queer.

***errata** (e rā′ t*a*), *n. pl.* errors made in printing.

erroneous (e rō′ nē us), *adj.* wrong, marked by error.

error (er′ ẽr), *n.* false belief; a mistake.

Syn. Mistake, blunder. Every deviation from what is right may be called an *error;* a *mistake* is a misunderstanding or an oversight, not to be harshly judged; a *blunder* is an error arising from stupidity.

***erudite** (er′ oo dīt), *adj.* learned.

***erudition** (er oo dish′ un), *n.* learning derived from the study of books.

eruption (ē rup′ shun), *n.* a sudden bursting forth, as the *eruption* of a volcano or of war.

Syn. Explosion. *Eruption* is a sudden coming into view, a bursting forth; *explosion* is a bursting forth with loud noise. We speak of an *eruption* of flames, the *explosion* of gunpowder.

***erysipelas** (er i sip′ e las), *n.* a disease marked by inflammation of the skin and fever.

escapade (es k*a* pād′), *n.* a prankish adventure; freakish stunt.

escape (es kāp′), *n.* the act of escaping; a means of escape, as a fire *escape.*

escape (es kāp′), *v.i. and v.t.* to avoid harm or evil; to break loose from captivity or restraint.

escapement (es kāp′ ment), *n.* the mechanism in a watch by which regular movement is achieved.

escarpment (es kärp′ ment), *n.* a long, steep cliff; a steep slope before a fortification.

***escheat** (es chēt′), *v.i.* to be forfeited through failure of heirs.

***eschew** (es chōō), *v.t.* to shun, avoid.

escort (es′ kôrt), *n.* one who accompanies another, for purposes of protection; an armed body of men acting as a guard; a ship sailing along with another to guard it.

esculent (es′ kū lent), *adj.* eatable.

***escutcheon** (es kuch′ un), *n.* a shield-shaped surface on which a coat of arms is emblazoned.

esophagus (ē sof′ *a* gus), *n.* the tube between mouth and stomach through which food and drink are swallowed.

***esoteric** (es ō ter′ ik), *adj.* pertaining to and known to only a secret circle; secret, private.

especial (es pesh′ al), *adj.* chief, particular.

especially (es pesh′ al li), *adv.* chiefly, in particular.

***espionage** (es′ pi ō nij), *n.* the practice of spying; a system of spying.

***esplanade** (es pl*a* nād′), *n.* a level walk or drive, especially on the seashore; a level open space in front of a fortification where attackers are open to fire.

espouse (es pouz′), *v.t.* to marry; to adopt or sponsor, as a cause.

espy (es pī′), *v.t.* [*p.t. and p.p.* espied, *pr.p.* espying] to see at a distance; to discover, as something hidden.

esquire (es kwīr′), *n.* formerly a knight's attendant; now used as a respectful form of address.

essay (es′ ā), *n.* an attempt; a literary composition, generally confined to a single or personal phase of a subject.

***essay** (e sā′), *v.t.* to try.

essence (es′ ens), *n.* the fundamental characteristic of anything; substance; a concentrated extract, as *essence* of wintergreen.

essential (e sen′ shal), *adj.* necessary, indispensable; absolute, perfect, as *essential* joy.

establish (es tab′ lish), *v.t.* to set up, settle; to ordain, as laws; to found, as a colony; to gain recognition of, as to *establish* a reputation.

establishment (es tab′ lish ment), *n.* the act of establishing; an organized undertaking, as a household or domestic *establishment,* a store or business *establishment,* an army and navy or national military *establishment.*

estate (es tāt′), *n.* one's condition in life; a person's property and possessions.

esteem (es tēm′), *n.* regard, respect, favorable opinion.

esteem (es tēm′), *v.t.* to set high value upon, respect, prize; to think, as I would *esteem* it a favor.

estimable (es′ ti m*a* bl), *adj.* worthy of respect; capable of being estimated or calculated.

***estimate** (es′ ti māt), *n.* an appraisal; a calculation, as of probable cost; a judgment or opinion.

estimate (es′ ti māt), *v.t.* to appraise; to form an opinion of; to calculate approximately.

Syn. Appreciate, value. To *estimate* is to determine in one's mind an approximate figure; to *appreciate* is to perceive the exact worth of something; to *value* is to prize highly.

estimation (es ti mā′ shun), *n.* the act of estimating or calculating; the result of estimating or calculating; an approximate judgment, an opinion; esteem, high regard.

estrange (es trāng′), *v.t.* to alienate; to keep at a distance; to cause to change to indifference or dislike, as to *estrange* a friend.

estuary (es′ tū er i), *n.* [*pl.* estuaries] the mouth of a tidal river.

etch (ech), *v.t.* to engrave by biting out with an acid the design previously drawn with an etching needle.

etching (ech′ ing), *n.* a picture or design etched on metal or glass.

eternal (ē tûr′ nal), *adj.* everlasting; without beginning or end.

Syn. Endless, everlasting. *Eternal* applies to duration of time and means specifically without beginning or end; immortal, imperishable, as the *eternal* God; *everlasting* applies to future time and means enduring, without carrying the idea of no beginning; *endless* applies both to material length and duration of time.

Ant. Ephemeral, passing, temporary.

eternity (ē tûr′ ni ti), *n.* [*pl.* eternities] infinite duration; immortality.

ether (ē′ thẽr), *n.* an extremely fine element lighter than air, supposed to pervade all space; a colorless liquid used to produce unconsciousness and insensibility to pain.

***ethereal** (ē thēr′ e al), *adj.* like the ether, light; exquisite, delicate.

ethical (eth′ i kal), *adj.* right, according to the principles of ethics.

ethics (eth′ iks), *n.* the science of human behavior; the systematized principles of morally correct conduct.

ethnic (eth′ nik), *adj.* racial, as *ethnic* differences; ethnological.

ethnology (eth nol′ ō ji), *n.* the science which treats of the characteristics, origins and relations of different races of men.

***ethyl** (eth′ il), *n.* a compound of lead used in motor fuels.

ethylene (eth′ i lēn), *n.* a colorless gas, one of the ingredients of coal gas, explosive on contact with air.

etiquette (et′ i ket), *n.* the conventional rules for correct behavior.

etymology (et i mol′ ō ji), *n.* the branch of philology that treats of the origin of words.

Eucharist (ū′ k*a* rist), *n.* the Holy Communion; the consecrated elements.

euchre (ū′ kẽr), *n.* a card game.

eulogy (ū′ lō ji), *n.* an oration in praise of a person or thing, especially a dead person; any high praise.

euphemism (ū′ fem izm), *n.* a mild or inoffensive word or expression substituted for one deemed coarse, inelegant or improper.

euphonic (ū fon′ ik), *adj.* pleasant-sounding.

***euphony** (ū′ fōn i), *n.* [*pl.* euphonies] sweet sound; the sound of words arranged so as to please the ear.

euphuism (ū′ fū izm), *n.* an affected style of speaking and writing; artificially elegant diction.

eustachian tube (ū stā′ ki an tūb), a passage leading from the middle ear to the pharynx.

euthenics (ū then′ iks), *n.* the science that seeks improvement of mankind through improvement of living conditions.

evacuate (ē vak′ ū āt), *v.t.* to make empty; to vacate; to withdraw from, as a fort or city.

***evade** (ē vād′), *v.t.* to elude; to dodge, as a question.

Syn. Elude. We *evade* a question by artfully turning the subject aside or skilfully distracting the attention of the inquirer; to *elude* is to avoid, slip away or baffle, but with less contrivance.

evanescent (ev *a* nes′ ent), *adj.* disappearing, vanishing, fleeting.

***evangelical** (ē van jel′ i kal), *adj.* pertaining to the Gospels.

evangelism (ē van′ jel izm), *n.* preaching of the gospel.

evangelist (ē van′ jel ist), *n.* one who brings the gospel; a traveling revivalist or minister without a fixed charge.

evaporate (ē vap′ ō rāt), *v.i. and v.t.* to pass off in vapor or give off vapor; to change to vapor; to remove moisture from, as to *evaporate* fruits.

evaporation (ē vap ō rā′ shun), *n.* conversion of liquid into vapor.

evasion (ē vā′ zhun), *n.* the act of evading; the dodging of a question or a problem.

evasive (ē vā′ siv), *adj.* seeking to evade, elusive, not frank.

eve (ēv), *n.* the evening before a holiday or anniversary, as Christmas *eve;* the period preceding some important event, as the *eve* of battle; short for *evening.*

even (ē′ ven), *v.i. and v.t.* to be even; to make even; to make equal or level.

even (ē′ ven), *adj.* equal; level; regular; smooth; steady.

even (ē′ ven), *adv.* fully; quite: *even if,* although.

***evening** (ēv′ ning), *n.* the last hours of the day and first of the night.

evenly (ē′ ven li), *adv.* in an even, equal or regular manner; smoothly.

evenness (ē′ ven nes), *n.* smoothness; uniformity; regularity.

event (ē vent′), *n.* an occurrence; anything that happens, especially a noteworthy occurrence.

Syn. Incident, occurrence. *Occurrence* is the general term for anything that happens; an *event* is an important occurrence; an *incident* is trivial or unimportant.

eventful (ē vent′ fool), *adj.* crowded with events; momentous.

eventual (ē ven′ tū al), *adj.* ultimate, final.

eventuality (ē ven tū al′ i ti), *n.* [*pl.* eventualities] a possible occurrence, an outcome.

eventuate (ē ven′ tū āt), *v.i.* to come about finally, result.

ever (ev′ ẽr), *adv.* at any time; at all times.

everglade (ev′ ẽr glād), *n.* a swampy tract of land.

evergreen (ev′ ẽr grēn), *n.* a tree or plant which retains its foliage all year.

everlasting (ev ẽr lȧs′ ting), *adj.* perpetual, eternal, endless.

evermore (ev ẽr mōr′), *adv.* forever.

every (ev′ ẽr i or ev′ ri), *adj.* all, taken one by one; each of a group.

evict (ē vikt′), *v.t.* to put out; to expel, by legal process.

***evidence** (ev′ i dens), *n.* testimony; that which furnishes proof or gives ground for belief.

evident (ev′ i dent), *adj.* plain, clear.

evidential (ev i den′ shal), *adj.* based upon evidence.

evil (ē′ vl), *n.* anything that causes harm or injury; misfortune; wickedness.

evil (ē′ vl), *adj.* morally bad; wicked, as *evil* ways.

evince (ē vins′), *v.t.* to manifest, make evident.

***eviscerate** (ē vis′ ẽr āt), *v.t.* to remove the intestines from, disembowel.

evoke (ē vōk′), *v.t.* to call forth.

evolution (e vō lū′ shun), *n.* development from one form of life to another; a gradual unfolding, as the *evolution* of a flower from the bud; that which is developed from a stated beginning, as baseball is an *evolution* from rounders.

evolve (ē volv′), *v.i. and v.t.* to develop from one state or stage of being to another.

ewe (ū), *n.* a female sheep.

ewer (ū′ ẽr), *n.* a wide-mouthed pitcher or jug.

***exact** (eg zakt′), *v.t.* to demand with authority; to require, call for.

Syn. Elicit. To *exact* is to draw forth by demand or force or authority, especially something considered rightfully due, as the teacher *exacts* obedience from a class; to *elicit* is to draw forth without force, as free discussion *elicits* truth.

exacting (eg zakt′ ing), *adj.* making severe or unreasonable demands.

exaction (eg zak′ shun), *n.* the act of exacting; that which is exacted; extortion.

exactness (eg zakt′ nes), *n.* accuracy, precision.

***exaggerate** (eg zaj′ ẽr āt), *v.i. and v.t.* to overstate; to see or represent as more than actually is the fact.

***exalt** (eg zôlt′), *v.t.* to elevate in rank, station or dignity.

examination (eg zam in ā′ shun), *n.* investigation; critical or analytical study; careful inquiry; a test to measure knowledge of a subject or fitness for employment or service.

examine (eg zam′ in), *v.t.* to investigate; to inquire into; to study, with analysis; to test for knowledge or fitness.

***example** (eg zȧm′ pl), *n.* a sample or specimen, one or a part used to show the quality of all; something to be followed or copied, a pattern or model; a problem in arithmetic; a warning.

Syn. Sample, specimen, instance. An *example* is a typical case of something, as a kind act is an *example* of courtesy; a *sample* is a piece or portion that shows the nature or quality of the whole, as a *sample* of lace; a *specimen* is one of a class, as a *specimen* of a butterfly; an *instance* is a fact or occurrence illustrating another, as this theft is an *instance* of his repeated stealing.

***exasperate** (eg zas′ pẽr āt), *v.t.* to irritate; to make angry.

***excathedra** (eks k*a* thē′ dr*a*), with the authority of office or position.

excavate (eks′ k*a* vāt), *v.t.* to hollow out; to make by digging, as to excavate a cellar; to reveal by digging, as to *excavate* a buried city.

excavation (eks k*a* vā′ shun), *n.* a hollow formed, as in the earth, by digging.

exceed (ek sēd′), *v.i. and v.t.* to be more than, or to surpass, something stated; excel, in size or quality.

exceedingly (ek sēd′ ing li), *adv.* extraordinarily.

excel (ek sel′), *v.i. and v.t.* to surpass in good qualities; to outdo.

excellence (ek′ sel ens), *n.* great merit.

excellent (ek′ sel ent), *adj.* of great virtue or high quality, extremely good.

***excelsior** (ek sel′ si ôr), *adj.* higher; upward.

excelsior (ek sel′ si ôr), *n.* fine wood shavings used in upholstering or for packing fragile articles.

except (ek sept′), *v.i. and v.t.* to enter an objection; to exclude one from a number of things presented together, omit.

except (ek sept′), *prep.* with exclusion of.

except (ek sept′), *conj.* unless.

exception (ek sep′ shun), *n.* that which is excepted or excluded; an omission; an objection or complaint.

exceptionable (ek sep′ shun *a* bl), *adj.* objectionable.

***excerpt** (ek′ sûrpt), *n.* an extract or passage copied from a text or book.

***excess** (ek ses′), *n.* that which goes beyond usual or proper bounds or limits; intemperance; a remainder, the amount by which one number or quantity exceeds another.

Syn. Redundancy, superfluity. *Excess* is more than enough or too much of anything; the word may be used either in a favorable or in an unfavorable sense. A *superfluity* is more than is needed, implying a running into waste; a *redundancy* is an overabundance, implying more than necessary, but not implying waste.

Ant. Deficiency, lack, need, want.

excessive (ek ses′ iv), *adj.* extreme; immoderate; unreasonable.

exchange (eks chānj′), *n.* the act of giving or taking anything in return for something else; the place where brokers gather to do business, as the stock *exchange.*

exchange (eks chānj′), *v.t.* to give or take one thing for another, trade; to substitute one thing for another.

exchequer (eks chek′ ẽr), *n.* a national treasury.

***excise** (ek sīz′), *n.* a tax on the making, selling or consuming of goods within a country, as distinguished from import duties.

excise (ek sīz′), *v.t.* to cut out, remove.

excision (ek sizh′ un), *n.* the act of cutting off, or state of being cut off.

***excitant** (ek sīt′ ant), *n.* something that excites, a stimulant.

excite (ek sīt′), *v.t.* to agitate; to arouse to action or feeling, stimulate.

Syn. Incite, provoke. To *excite* is to work upon the feelings or passions; to *incite* is to urge to external action; to *provoke* is to do either or both.

Ant. Calm, quiet, soothe.

excitement (ek sīt′ ment), *n.* the state of being excited; agitation; commotion.

exclaim (eks klām′), *v.i.* to ejaculate; to cry out in surprise, wonder, anger, joy.

exclamation (eks kl*a* mā′ shun), *n.* an ejaculation; an abrupt cry of pain, delight or surprise.

exclamatory (eks klam′ *a* tō ri), *adj.* having the nature of an exclamation, using or expressing an exclamation.

exclude (eks klo͞od′), *v.t.* to shut out or keep out, as to *exclude* a person from a place or a privilege.

exclusion (eks klo͞o′ zhun), *n.* the act of shutting out or debarring; rejection.

exclusive (eks klo͞o′ siv), *adj.* tending to exclude outsiders, limited to a chosen few, as an *exclusive* club; not sociable; not taking into account, as 10 oranges *exclusive* of the bad one.

excogitate (eks koj′ i tāt), *v.t.* to discover or work out by thinking.

excommunicate (eks ko mū′ ni kāt), *v.t.* to expel from membership in the church.

excoriate (eks kō′ ri āt), *v.t.* to strip off the skin of, to flay.

excrescence (eks kres′ ens), *n.* an unnatural outgrowth.

excretion (eks krē′ shun), *n.* ejection of waste matter from the body.

*__excruciate__ (eks kro͞o′ shi āt), *v.t.* to torture.

*__exculpate__ (eks′ kul pāt), *v.t.* to free from blame, exonerate.

*__excursion__ (eks kûr′ zhun), *n.* an expedition; a pleasure trip.

Syn. Journey, tour, trip, jaunt. An *excursion* takes one out of his wonted courses, and usually involves more than one person; a *journey* involves extensive traveling and a specific destination; a *tour* is a more or less circuitous course, involving stops at various places; a *trip* is a short journey; a *jaunt* is a walk or ride taken gaily for pleasure.

excuse (eks kūs′), *n.* a reason presented for a default in duty, as an *excuse* for absence from school; a defense; an apology; a pretext.

excuse (eks kūz′), *v.t.* to offer or accept a reason or apology for default in duty or for real or seeming neglect of an obligation to; to dismiss, as a student from attendance on classes.

Syn. Pardon. We *excuse* small faults and errors; we *pardon* serious offenses or crimes; we *forgive* a personal offense.

execrate (ek′ sē krāt), *v.t.* to call down evil upon, curse.

execration (ek sē krā′ shun), *n.* the act of execrating; the curse uttered; that which is execrated, a detested or accursed thing.

execute (ek′ sē kūt), *v.i. and v.t.* to perform completely; to carry into effect; to write, sign and make effective, as a legal instrument; to put to death under a legal sentence.

Syn. Administer, enforce. To *execute* is to bring about or carry through to a stated end; to *administer* is to go through the process of carrying out; to *enforce* is to compel the execution of something, as a law.

execution (ek sē kū′ shun), *n.* performance; capital punishment.

*__executive__ (eg zek′ ū tiv), *n.* an administrative officer.

executive (eg zek′ ū tiv), *adj.* pertaining to the execution of plans, projects or business enterprise.

*__executor__ (eg zek′ ū tẽr), *n.* the administrator of a will.

*__exegesis__ (ek sē jē′ sis), *n.* a critical analysis, exposition or interpretation, especially of passages in the Bible.

exemplar (eg zem′ plẽr), *n.* a person or thing worthy of imitation; a model or ideal pattern.

*__exemplary__ (eg zem′ pl*a* ri), *adj.* worthy of imitation; serving as a type or example.

exemplify (eg zem′ pli fī), *v.t.* to serve as an example of; to show by an example or sample.

*__exempt__ (eg zempt′), *v.t.* to free from an obligation, release from liability; to except, excuse.

exempt (eg zempt′), *adj.* free of responsibility or liability, as from some form of civic service.

exercise (ek′ sẽr sīz), *n.* activity for training the mind or improving the physical condition; a drill in study: *exercises,* a program including songs and speeches to observe an event, as commencement.

exercise (ek′ sẽr sīz), *v.i. and v.t.* to drill, practice, train; to use, as powers of mind and body.

exert (eg zûrt′), *v.t.* to put forth, as power or strength.

exertion (eg zûr′ shun), *n.* effort; endeavor; use of strength.

*__exhalation__ (eks h*a* lā′ shun), *n.* an exhaling or breathing out; that which is exhaled or breathed out.

*__exhale__ (eks hāl′), *v.i. and v.t.* to breathe out; to emit, as vapor.

exhaust (eg zôst′), *n.* the escape, as of used steam, from an engine; the steam or gas carried off after use; the device by which it escapes.

exhaust (eg zôst′), *v.t.* to use up completely, as to *exhaust* one's bank account or one's strength; to let out the contents of wholly, as to *exhaust* a boiler; to develop or discuss completely, as the speaker *exhausted* his subject.

exhaustion (eg zôs′ chun), *n.* the act of using up completely; state of being completely used up; utter weariness, fatigue.

exhibit (eg zig′ it), *v.t.* to show, display; to reveal by outward sign, as to *exhibit* anger.

exhibition (ek si bish′ un), *n.* the act of showing or displaying; state of being displayed; that which is shown or displayed.

exhilarate (eg zil′ a rāt), *v.t.* to make joyous, gladden, enliven

exhort (eg zôrt′), *v.t.* to incite or urge; to warn earnestly.

*__exhume__ (eks hūm′), *v.t.* to take out of the ground; to disinter.

exigency (ek′ si jen si), *n.* [*pl.* exigencies] something that demands immediate action or attention; a pressing necessity; emergency.

Syn. Emergency. *Exigency* stresses the idea of pressure and necessity; an *emergency* is a sudden and unexpected exigency.

*__exile__ (ek′ sīl), *n.* the state of separation, either voluntary or enforced, from one's country; one thus separated from his native land.

*__exile__ (ek′ sīl), *v.t.* to banish or expel from one's native land or the country of one's citizenship or allegiance.

exist (eg zist′), *v.i.* to be, have reality, to live.

existence (eg zis′ tens), *n.* the state of being; life.

exit (ek′ sit), *n.* the act of leaving or going out; the place at or through which one leaves.

exonerate (eg zon′ ẽr āt), *v.t.* to free from blame, clear, as of a charge or accusation.

Syn. Exculpate. To *exonerate* is to lift the burden of blame; to *exculpate* is merely to free from blame.

exorbitant (eg zôr′ bi tant), *adj.* going beyond justified limits, excessive.

*__exorcise__ (ek′ sôr sīz), *v.t.* to drive out, as an evil spirit or a demon.

exordium (eg zôr′ di um), *n.* the opening part of a speech or address.

*__exotic__ (eks ot′ ik), *adj.* not native, from a foreign land, as an *exotic* plant.

expand (eks pand′), *v.i. and v.t.* to reach out or grow in all directions; to become larger, swell; to spread out, distend or enlarge.

expanse (eks pans′), *n.* a wide area.

expansion (eks pan′ shun), *n.* the state of expanding; that which is expanded or spread out.

expatiate (eks pā′ shi āt), *v.i.* to expand upon a subject in speech or writing.

*__expatriate__ (eks pā′ tri āt), *v.t. and v.i.* to banish, exile, drive out of one's own country; to withdraw from one's own country.

expect (eks pekt′), *v.t.* to look for, anticipate, await.

expectant (eks pek′ tant), *adj.* waiting; anticipating; looking forward.

expectation (eks pek tā′ shun), *n.* the act of expecting, anticipation; that which is looked for, as exceeding all *expectations.*

expectorate (eks pek′ tō rāt), *v.i. and v.t.* to spit; spit out.

expediency (eks pē′ di en si), *n.* that which serves one's purpose; the policy of working for one's own immediate advantage; suitability to an end or purpose.

*__expedient__ (eks pē′ di ent), *n.* suitable means for achieving or attaining a purpose or end.

Syn. Resource. An *expedient* is any means that serves to accomplish a certain end; a *resource* is anything in which one depends for support or aid in doing something. A man of *resources* has great natural ability; a man resorts to *expedients* in lieu of better means.

expedient (eks pē′ di ent), *adj.* of immediate advantage; convenient; suitable to a certain end, proper.

expedite (eks′ pē dīt), *v.t.* to hasten, facilitate.

expedition (eks pē dish′ un), *n.* haste, speed, promptness; a march or voyage by a number of persons, as an army, for a set purpose.

expeditious (eks pē dish′ us), *adj.* speedy and efficient in action, quick.

expel (eks pel′), *v.t.* to drive or force out; to deprive of membership or privileges, as to *expel* a child from school.

expend (eks pend′), *v.t.* to spend or use up, as money or strength.

expenditure (eks pen′ di tūr), *n.* the laying out of money; expense.

expense (eks pens′), *n.* expenditure; the amount spent, outlay; a cause of spending, as a car is an *expense.*

expensive (eks pen′ siv), *adj.* costly.

experience (eks pēr′ i ens), *n.* the actual living through of events and emotions; skill or wisdom gained by actually doing things; knowledge gained by trial and practice.

experience (eks pēr′ i ens), *v.t.* to undergo; to know or learn through one's own actions and reactions.

experiment (eks per′ i ment), *n.* a trial, to test a theory or belief; a test.

expert (eks′ pûrt), *n.* one who has special knowledge of a subject or special skill in a field of action.

*__expert__ (eks pûrt′), *adj.* skilled.

expiate (eks′ pi āt), *v.t.* to atone for.

*__expiration__ (ek spi rā′ shun), *n.* termination, end; death; anything breathed out, as air or a sound.

expire (ek spīr′), *v.i.* to breathe out, as air from the lungs; to come to an end; to die.

explain (eks plān), *v.t.* to expound; to make clear; to tell how and why.

explanation (eks pl*a* nā′ shun), *n.* the act of explaining or making clear; a statement that explains, an interpretation.

explanatory (eks plan′ *a* tō ri), *adj.* serving to explain; offering an explanation.

*__expletive__ (eks′ plē tiv), *n.* an extra word, syllable or phrase, used to fill a line of verse, but not essential to the meaning; an oath.

*__explicable__ (eks′ pli k*a* bl), *adj.* capable of being explained.

explicit (eks plis′ it), *adj.* clear and definite in language; outspoken, not disguised.

explode (eks plōd′), *v.i. and v.t.* to break forth with sudden noise and violence; to cause to burst with noise.

*__exploit__ (eks′ ploit), *n.* a feat or deed of skill or courage.

exploit (eks ploit′), *v.t.* to use, especially to one's own advantage.

exploitation (eks ploi tā′ shun), *n.* the act of getting full value out of anything, as mineral deposits; selfish or unfair use of persons or resources, regardless of public interest.

exploration (eks plō rā′ shun), *n.* the act of exploring, especially of unknown geographic regions; careful research; careful examination, as the *exploration* of a wound or an infected region.

explore (eks plōr′), *v.t.* to search into or examine thoroughly; to go through strange regions, taking observations and making maps.

*__exponent__ (eks pō′ nent), *n.* one who explains or interprets the principles of something; one who represents, as the *exponent* of a political party.

export (eks' pōrt), *n.* that which is exported or sent out of a country in international trade.

export (eks pōrt'), *v.t.* to carry or send abroad for trade.

expose (eks pōz'), *v.t.* to lay open, as to attack or criticism; to uncover; to subject to any influence, as to *expose* a film to light, *expose* an invalid to a draft.

exposition (eks pō zish' un), *n.* an explanation; a written explanation or setting forth of a difficult subject; a public exhibition, as of paintings.

expositor (eks poz' i tẽr), *n.* one who expounds or explains.

expostulate (eks pos' tū lāt), *v.i.* to remonstrate.

Syn. Remonstrate. We *expostulate* in a tone of friendly authority; we *remonstrate* in a tone of protest or reproof. He who *expostulates* conveys earnest remonstrance; he who *remonstrates* presents reasons against something.

expound (eks pound'), *v.t.* to explain or interpret in detail.

express (eks pres'), *n.* a system of transportation of goods, luggage, money; a fast train or other passenger conveyance stopping only at important points.

express (eks pres'), *v.t.* to utter; to make known in words or by actions; to send by express.

expression (eks presh' un), *n.* presentation or representation in language; any word, phrase, pose or gesture that represents a thought or feeling, as a kiss is an *expression* of affection; a facial aspect or a tone of voice indicating feeling.

expressive (eks pres' iv), *adj.* containing force or feeling, as an *expressive* voice; indicative, significant.

expulsion (eks pul' shun), *n.* a driving out, as the *expulsion* of the French by the English.

expulsive (eks pul' siv), *adj.* serving to drive out, as *expulsive* force.

expunge (eks punj'), *v.t.* to strike out, blot out, obliterate.

*__expurgate__ (eks' pẽr gāt), *v.t.* to clear a text of offensive, objectionable or incorrect material.

*__exquisite__ (eks' kwi zit), *adj.* finely worked or made, as *exquisite* carving; keen and appreciative, as an *exquisite* ear for music; intense, as *exquisite* torture; pleasing because of beauty or daintiness.

extant (eks' tant), *adj.* still existing.

extemporaneous (eks tem pō rā' nē us), *adj.* unpremeditated, unstudied, extemporary.

extemporary (eks tem' pō rer i), *adj.* composed or delivered without preparation, impromptu, as an *extemporary* speech.

extemporize (eks tem' pō rīz), *v.i. and v.t.* to make or speak impromptu; to improvise.

extend (eks tend'), *v.i. and v.t.* to stretch or reach, as our lands *extend* 10 miles; to stretch or draw out, lengthen, prolong; to enlarge, broaden.

extension (eks ten' shun), *n.* the act of extending or state of being extended; an enlargement; additional section; an extra allowance of time for payment.

extensive (eks ten' siv), *adj.* having great extent, broad, far-reaching.

extent (eks tent'), *n.* the space or amount to which a thing is extended; area, length, width, degree.

extenuate (eks ten' ū āt), *v.t.* to weaken, underestimate, excuse, as to *extenuate* an error.

exterior (eks tēr' i ẽr), *n.* the outside surface or part of anything; outward conduct or appearance, as to be careful about *exteriors*.

exterior (eks tēr' i ẽr), *adj.* external, outward.

exterminate (eks tûr' mi nāt), *v.t.* to destroy, kill off.

external (eks tûr' nal), *adj.* outward, outer; material, visible, as distinguished from mental, as *external* evidence; superficial, as *external* gratitude.

extinct (eks tingkt'), *adj.* extinguished; no longer in existence, as the dodo is an *extinct* bird.

extinguish (eks ting' gwish), *v.t.* to put out, as a light; to destroy.

*__extirpate__ (ek' stẽr pāt), *v.t.* to root up; to destroy.

*__extol__ (eks tol'), *v.t.* [*p.t.* and *p.p.* extolled, *pr.p.* extolling] to praise highly.

extort (eks tôrt'), *v.t.* to obtain by threat or force.

extortion (eks tôr' shun), *n.* the offense of obtaining money or valuables not due by threat or force.

extortionate (eks tôr' shun āt), *adj.* characterized by extortion; excessively demanding, oppressive.

extra (eks' tr*a*), *adj.* additional, beyond what is due or usual.

extract (eks' trakt), *n.* a selected passage from a text, a quotation; something taken from a substance by distilling or drawing out, as *extract* of vanilla.

extraction (eks trak' shun), *n.* that which is extracted or drawn out; lineage.

extradite (eks' tr*a* dīt), *v.t.* to surrender, as an accused person, to the government of another country, for trial.

extraneous (eks trā' nē us), *adj.* not essential or to the point, as an *extraneous* argument; external; foreign.

Syn. Extrinsic. That which is *extraneous* is foreign and definitely external; *extrinsic* means not inherently belonging, unessential.

*__extraordinary__ (eks trôr' di ner i), *adj.* out of the common or ordinary order or way, unusual, remarkable.

extravagance (eks trav' *a* gans), *n.* excess in anything, especially in the expenditure of money.

extravagant (eks trav' *a* gant), *adj.* wasteful; exceeding reasonable limits, excessive, as *extravagant* praise.

Syn. Excessive, exorbitant. *Excessive* is the general term describing whatever exceeds the usual amount or degree; *extravagant* means not only prodigal in spending, but exceeding the bounds of usual use or propriety; *exorbitant* applies to price and means unduly or unfairly excessive.

Ant. Moderate, temperate.

extreme (eks trēm'), *n.* the last limit of anything, the utmost: *extremes,* things utterly different and far removed from each other, as the *extremes* of joy and grief, or good and evil; first and last term in a proportion: opposite of *mean.*

extreme (eks trēm'), *adj.* last, final; radical, as *extreme* social ideas; farthest, as the *extreme* boundary; very great, as *extreme* joy.

extremity (eks trem' i ti), *n.* [*pl.* extremities] an end; the utmost degree; great need or danger.

extricate (eks' tri kāt), *v.t.* to free, as from difficulties; to release, as from entanglements.

extrinsic (eks trin' sik), *adj.* external, unessential.

extrorse (eks trôrs'), *adj.* facing outward.

*__extrude__ (eks trōōd'), *v.t. and v.i.* to thrust or stick out, protrude.

extrusion (eks trōō' zhun), *n.* expulsion; protrusion.

*__exuberance__ (eg zū' bẽr ans), *n.* superabundance, as of good spirits.

exuberant (eg zū' ber ant), *adj.* copious, plenteous.

*__exude__ (eks ūd'), *v.i. and v.t.* to discharge or be discharged from the body through the pores, as sweat.

exult (eg zult'), *v.i.* to rejoice triumphantly.

eye (ī), *n.* the organ of sight; something resembling an eye, as the *eye* of a needle; vision, the ability to see, as an *eye* for a fine horse.

eye (ī), *v.t.* to look at; to watch closely.

eyeball (ī' bôl), *n.* the globe of the eye.

eyebrow (ī' brou), *n.* the hairy arch over an eye.

eyelash (ī' lash), *n.* a hair growing from the edge of the eyelid.

eyelid (ī' lid), *n.* the shutter of skin that closes the eye.

eyesore (ī' sōr), *n.* anything that offends the sight.

eyetooth (ī' tōōth), *n.* [*pl.* eyeteeth] an upper canine tooth.

F

fable (fā' bl), *n.* a short fictitious narrative conveying a moral, especially one in which animals are personified.

fabric (fab' rik), *n.* a structure, as the *fabric* of a story; texture; manufactured cloth, woven or knit.

fabricate (fab' ri kāt), *v.t.* to construct; to weave, as textiles; to build in the imagination; to lie.

fabrikoid (fab' ri koid), *n.* a waterproof fabric resembling leather, used in binding of books, for luggage and upholstery.

fabulous (fab' ū lus), *adj.* like a fable; fictitious; stretching belief.

*__facade__ (f*a* säd'), *n.* the front of a building.

face (fās), *n.* the front part of the head, containing eyes, nose, mouth, cheeks, forehead, chin; the countenance; the expression of the countenance, as a cheerful *face;* the amount expressed on a bank note or bond; the front or principal side, as the *face* of a building; the side inscribed or printed for a certain use, as the *face* of a clock or of a playing card.

face (fās), *v.t.* to meet face to face; to confront; to stand with the face toward, as a house *faces* east; to oppose, resist, as to *face* the enemy; to contemplate with courage, as *face* the truth.

*__facet__ (fas' et), *n.* a small face or surface, as of a cut stone.

facetious (f*a* sē' shus), *adj.* humorous, jocular.

Syn. Witty. A *facetious* remark is jocular, pleasant and laughable; *witty* means quick, cleverly *facetious.*

facial (fā' shal), *adj.* pertaining to the face.

facile (fas' l), *adj.* easily done; quick and sure, expert; easily persuaded, compliant.

facilitate (f*a* sil' i tāt), *v.t.* to make easy.

facility (f*a* sil' i ti), *n.* [*pl.* facilities] ease, dexterity resulting from skill or practice; anything that adds to ease of action, use or performance, as *facilities* for writing.

facing (fās' ing), *n.* a covering for the front of anything.

*__facsimile__ (fak sim' i lē), *n.* an exact duplicate.

fact (fakt), *n.* anything actually done or existing.

faction (fak' shun), *n.* a group or clique within a party or state; also, party spirit or dissension.

factious (fak' shus), *adj.* given to faction or dissension.

factitious (fak tish' us), *adj.* artificial, sham; not natural.

factor (fak' tẽr), *n.* an agent; steward of an estate; any element contributing to a result; any of the numbers or symbols which, multiplied together, form a product.

factory (fak' tō ri), *n.* a building or buildings equipped to manufacture.

factotum (fak tō' tum), *n.* a man of all work.

faculty (fak' ul ti), *n.* [*pl.* faculties] a physical or mental power, as the *faculty* of sight or memory; the teaching staff of a school or college.

fad (fad), *n.* a custom followed temporarily with exaggerated zeal; a hobby.

fade (fād), *v.i.* to lose color or distinctness.

fading (fād' ing), *n.* a variation in the intensity of received radio waves, while adjustments of sending and receiving devices remain unchanged.

*__fagot__ (fag' ut), *n.* a bundle of sticks bound together; an ornamental stitch in sewing and embroidery.

fail (fāl), *v.i. and v.t.* to fall short of an end or purpose; to be unsuccessful; to waste away, decay; to be wanting or deficient in.

failing (fāl' ing), *n.* a fault or weakness.

failure (fāl' ūr), *n.* the act of failing; omission to perform or do; want of success; bankruptcy; a person who has failed.

faint (fānt), *n.* a swoon.

faint (fānt), *v.i.* to swoon; to lose courage.

faint (fānt), *adj.* feeble; weak, as in color; lacking distinctness.

fair (fâr), *n.* a meeting of buyers and sellers at a stated time and place; an exhibition of local arts and products, as a county *fair;* a showing of goods for sale, for charity, as a church *fair.*

fair (fâr), *adj.* pleasing to the eye; free from blemishes; light in hue, as a *fair* skin; neither very good nor very bad; honest and impartial, as a *fair* decision; of the weather, clear.

Syn. Impartial. *Fair* means not unjust; *impartial* means not swayed by preference or prejudice.

Ant. Unjust.

fairy (fâr′ i), *n.* [*pl.* fairies] an imaginary being in human form, graceful and diminutive.

faith (fāth), *n.* religious belief; a doctrine believed; trust and confidence in another; fidelity, loyalty.

faithful (fāth′ fool), *adj.* trusting; loyal; trustworthy; true, accurate, as a *faithful* story.

faithless (fāth′ les), *adj.* lacking faith; given to breaking promises; untrustworthy.

Syn. Inconstant. *Faithless* means deceitful and treacherous, *inconstant* merely means changeable. An *inconstant* friend may turn to other interests or friends; a *faithless* friend may betray and deceive one.

Ant. Faithful, loyal.

***falcon** (fôl′ kun), *n.* a hawk with long wings, swift in flight and sometimes trained to hunt birds.

fall (fôl), *n.* the act of falling or tumbling; overthrow, as of a besieged city; that which falls, as a *fall* of rain; autumn; decrease in prices; the rope on which one pulls in hoisting with a tackle; the distance anything drops, as a *fall* of ten feet.

fall (fôl), *v.i.* to drop in space or degree, as to *fall* out of bed, temperature *falls;* to be *sounded,* as music *falls* on our ears; to die, as men *fall* in battle; to pass into a certain condition or activity, as to *fall* into unconsciousness, *fall* to reminiscing; to happen, as Easter *falls* on Sunday, it *fell* upon a day in spring; to be arranged or divided, as Gaul *falls* into three parts.

fallacious (fa lā′ shus), *adj.* based on a fallacy, misleading; delusive.

Syn. Misleading, deceitful, deceptive, fraudulent. *Fallacious* means deluding in appearance or because of false reasoning; what is *misleading* leads one to wrong judgments or conclusions; *deceptive* describes material things; *deceitful* applies usually to persons; *fraudulent* carries the idea of intentional deceit or trickery.

fallacy (fal′ a si), *n.* [*pl.* fallacies] false appearance; false reasoning; a mistaken assumption.

fallible (fal′ i bl), *n.* liable to error; not absolutely sure or reliable.

fallow (fal′ ō), *adj.* plowed and harrowed but not seeded.

false (fôls), *adj.* untrue, wrong; faithless, disloyal; artificial, as *false* teeth.

falsehood (fôls′ hood), *n.* a lie, an untruth.

falsetto (fôl set′ ō), *n.* a tone of male voice pitched higher than the normal voice.

falsify (fôl′ si fī), *v.i. and v.t.* to misrepresent; to make false statements; to change, as figures in a bill or report, fraudulently.

falsity (fôl′ si ti), *n.* [*pl.* falsities] the quality of being false; a falsehood, a lie.

falter (fôl′ tẽr), *v.t. and v.i.* to speak or act with hesitation and timidity; to waver, give way, as troops *falter* before a sudden attack.

fame (fām), *n.* public reputation; wide renown.

Syn. Reputation. *Fame* is widespread; it usually refers to honor and glory, but also pertains to the much talked of; *reputation* is whatever the public thinks of one, good or bad.

familiar (fa mil′ yẽr), *adj.* intimate; informal; having detailed knowledge of, as to be *familiar* with Latin.

familiarity (fa mil i ar′ i ti), *n.* [*pl.* familiarities] a state of intimate acquaintance, intimacy; anything done or said in an easy, informal manner, sometimes in excess of strict propriety; the taking of liberties.

***family** (fam′ i li), *n.* a group composed of parents and children; a household group; a tribe or clan, lineage; a classification of animals or plants larger than a genus but less than an order.

famine (fam′ in), *n.* general lack of food; a dearth of anything, as a paper *famine.*

famish (fam′ ish), *v.i. and v.t.* to starve; to suffer or die of extreme hunger; to destroy or weaken with hunger.

famous (fā′ mus), *adj.* renowned, celebrated.

Syn. Notorious. *Famous* and *notorious* both mean widely celebrated; *famous* is used in the honorable sense; *notorious* is used in the bad sense.

fan (fan), *n.* a light, flat, wide object used to move air against the face, for cooling; any instrument with constantly moving surfaces that agitate the air.

fan (fan), *v.i. and v.t.* to use a fan; to winnow grain with a fan; to make a fire blaze up by directing a current of air into it, as with a fan.

fanatic (fa nat′ ik), *n.* one who is exaggeratedly zealous for a belief or cause.

***fanaticism** (fa nat′ i sizm), *n.* exaggerated, unreasoning zeal.

fancied (fan′ sēd), *adj.* imaginary, not real.

fanciful (fan′ si fool), *adj.* guided by or based upon fancy rather than upon reason, whimsical; imaginary, not real.

Syn. Fantastic. *Fanciful* means indulging in, based on, or expressing whims or fancies rather than adhering to standards of taste or judgment; *fantastic* means extravagantly fanciful.

***fancy** (fan′ si), *n.* capricious imagination; whim; a liking based on caprice instead of reason, as to have a *fancy* for rainy days; an idea.

fancy (fan′ si), *v.i. and v.t.* [*p.t.* and *p.p.* fancied, *pr.p.* fancying] to imagine; to have a liking for.

fancy (fan′ si), *adj.* decorated, ornamented, not plain; beyond reason, as *fancy* prices.

fancywork (fan′ si wûrk), *n.* decorative needlework, as embroidery or crocheting.

fandango (fan dang′ go), *n.* a lively Spanish dance.

***fanfare** (fan′ fâr), *n.* a flourish of trumpets; outward display.

fang (fang), *n.* an animal's long, sharp tooth; the long, hollow tooth of a poisonous snake.

fantail (fan′ tāl), *n.* a variety of pigeon; a structural part resembling a spread fan.

***fantasia** (fan ta zē′ a), *n.* a fanciful musical composition unrestricted in form.

fantastic (fan tas′ tik), *adj.* fanciful, whimsical; odd, grotesque.

far (fär), *adj.* remote in distance or time, as *far* places, the *far* future; more in degree, as *far* better.

far (fär), *adv.* to a great distance, as throw the ball *far;* very much, as you sing *far* better than I.

farad (far′ ad), *n.* the unit of electrical capacity.

farce (färs), *n.* a comedy in which human traits and situations are satirized or made laughable; a ridiculous state of affairs.

farcical (fär′ si kal), *adj.* unreal; ludicrous, laughable.

fare (fâr), *n.* provision, nourishment, sustenance; money paid for transportation.

fare (fâr), *v.i.* to experience, as good fortune or bad; to go or travel, as to *fare* forth.

farewell (fâr wel′), *n.* a parting salutation; wishes for another's welfare at parting.

Syn. Adieu, good-bye, valedictory. *Good-bye* is the homely and hearty word at parting; *farewell,* the formal one. A *valedictory* is a farewell address to a group, as a school or college graduating class.

farfetched (fär fecht′), *adj.* strained, forced.

***farina** (fa rē′ na), *n.* a meal or flour made from cereal grain or nuts.

***farinaceous** (far i nā′ shus), *adj.* consisting of or made of meal or flour.

farm (färm), *n.* a piece of land devoted to raising of crops or livestock, or devoted to any specific agricultural project, as a dairy *farm.*

farm (färm), *v.i. and v.t.* to cultivate land; to run a farm.

farmer (färm′ ẽr), *n.* one who owns, runs or works on a farm.

farming (färm′ ing), *n.* agriculture.

faro (fâr′ o), *n.* a gambling game played with cards.

***farrier** (far′ i ẽr), *n.* one who shoes horses, a blacksmith.

farrow (far′ ō), *n.* a litter of pigs.

farrow (far′ ō), *v.i. and v.t.* to give birth to pigs.

farsighted (fär sīt′ ed), *adj.* seeing to a great distance; sagacious; always looking ahead.

farther (fär′ *th*ẽr), *adj. and adv.* [*compar.* of *far*] to or at a greater distance, as *farther* lands, to go *farther.*

farthing (fär′ *th*ing), *n.* a British coin worth one-fourth of a penny.

fasces (fas′ ēz), *n. pl.,* a bundle of rods symbolizing the power of government.

fascinate (fas′ i nāt), *v.i. and v.t.* to charm; to captivate, as by pleasing personality and manners.

fascination (fas i nā′ shun), *n.* the act of fascinating or charming or state of being charmed; the quality of charm.

***Fascism** (fash′ izm), *n.* the Fascist movement in Italy, founded in 1919, a patriotic nationalistic movement organized to counteract all radical and communistic tendencies: now identified with the state government of Italy.

fashion (fash′ un), *n.* a prevailing mode or style, as in clothes; conventional custom.

fashion (fash′ un), *v.t.* to make; to shape or form.

fashionable (fash′ un a bl), *adj.* modish, in style; conforming to the customs of the time.

fast (fȧst), *v.i.* to abstain from food.

fast (fȧst), *adj.* speedy, swift, as a *fast* horse; firmly fixed; ahead of the correct time, as my watch is *fast;* dissipated, dissolute.

fast (fȧst), *adv.* with speed, rapidly, as the train went *fast.*

***fasten** (fȧs′ n), *v.t.* to fix securely, as by locking; to join, as to *fasten* two pipe lengths together.

fastidious (fas tid′ i us), *adj.* squeamish, fussy, hard to please.

fat (fat), *n.* oily or greasy animal tissue.

fat (fat), *adj.* corpulent, fleshy; greasy, oily.

fatal (fā′ tal), *adj.* causing death, mortal, as a *fatal* wound.

fatalism (fā′ tal izm), *n.* the doctrine that all things are preordained and determined by fate.

fatalist (fā′ tal ist), *n.* one who believes in fatalism.

fatality (fā tal′ i ti), *n.* [*pl.* fatalities] determinism; anything decreed by fate; an accident resulting in death.

fate (fāt), *n.* destiny; one's predestined course of life.

fateful (fāt′ fool), *adj.* charged with fate, momentous; inevitable.

father (fä′ *th*ẽr), *n.* a male parent.

father (fä′ *th*ẽr), *v.t.* to beget, be father to; to be the author of, or responsible for, as a writing or cause.

fathom (fa*th*′ um), *n.* a measure of length equal to six feet, used to measure ropes, cables, depth of water or the like.

fathom (fa*th*′ um), *v.t.* to measure by sounding; to get to the bottom of, as to *fathom* a mystery.

fatigue (fa tēg′), *n.* weariness.

Syn. Weariness, lassitude. *Fatigue* is an exhaustion of either physical or mental powers; *weariness,* a wearing out of the strength or breaking of the spirits; *lassitude,* a general relaxation of the body.

fatten (fat′ n), *v.i. and v.t.* to grow fat; to make fatter; to enrich.

fatty (fat′ i), *adj.* having fat or the quality of fat.

fatuity (fa tū′ i ti), *n.* stupidity.

***fatuous** (fat′ ū us), *adj.* stupid, silly, inane.

***fauces** (fô′ sēz), *n. pl.* the narrow passage from the mouth to the pharynx.

faucet (fô′ set), *n.* a device on a pipe for drawing off liquids in regulated flow; a tap.

fault (fôlt), *n.* a slight offense; blemish; defect; an irregularity in the formation of subterranean strata, caused by a mass of rock slipping from its location.

faulty (fôl′ ti), *adj.* imperfect.

fauna (fô′ nȧ), *n.* [*pl.* faunas or faunae] the animals characteristic of a given region or period.

favor (fā′ vẽr), *n.* kindness; support; good will; an act of graciousness or kindness.

favor (fā′ vẽr), *v.t.* to regard with favor; to show partiality toward.

favorable (fā′ vẽr ȧ bl), *n.* propitious; demonstrating approval.

favored (fā′ vẽrd), *adj.* regarded with favor or partiality; gifted; having certain features or appearance, as an ill *favored* nag.

favorite (fā′ vẽr it), *n.* one held in special favor.

favorite (fā′ vẽr it), *adj.* preferred; specially esteemed.

favoritism (fā′ vẽr it izm), *n.* readiness to favor one more than another; partiality.

fawn (fôn), *n.* a young deer.

fawn (fôn), *v.t.* to seek favor by servile demeanor.

fawning (fôn′ ing), *n.* gross or servile flattery.

fay (fā), *n.* an elf or fairy.

***fealty** (fē′ al ti), *n.* loyalty; faithfulness to those having authority over one.

fear (fēr), *n.* alarm; apprehension of danger; awe or reverence for God.

fear (fēr), *v.i. and v.t.* to feel fear, be afraid; to be afraid of; have reverential regard for, as to *fear* God.

fearful (fēr′ fool), *adj.* afraid; causing fear, as a *fearful* experience.

Syn. Dreadful, frightful, horrible, terrible are all more or less interchangeably used. To be *fearful* is to have fear about something external, as *fearful* of the consequences; *afraid* means feeling fear.

fearless (fēr′ les), *adj.* without fear; bold, daring.

feasible (fē′ zi bl), *adj.* practicable, possible.

feast (fēst), *n.* a sumptuous repast; a festival, especially of the church.

feast (fēst), *v.i. and v.t.* to have or enjoy a feast; to give a feast to.

feat (fēt), *n.* a deed; a notable achievement involving skill or courage.

feather (fe*th*′ ẽr), *n.* a unit of the exterior covering of a bird: *feathers,* plumage.

feather (fe*th*′ ẽr), *v.t.* to put a feather on, as an arrow; in rowing, to turn (an oar) after a stroke so that the blade is horizontal with the water and will not catch wind.

featherweight (fe*th*′ ẽr wāt), *n.* a boxer or wrestler of a certain weight, not over 115 pounds.

feathery (fe*th*′ ẽr i), *adj.* having or resembling feathers.

feature (fē′ tūr), *n.* a prominent part of a make-up, as the *features* of the face, a *feature* in a newspaper, magazine or program of entertainment.

feature (fē′ tūr), *v.t.* to play up prominently, as in a periodical publication or a program of entertainment.

febrifuge (feb′ ri fuj), *n.* a remedy for fever.

***febrile** (fē′ bril), *adj.* feverish.

***fecund** (fē′ kund), *adj.* fruitful, fertile.

***fecundate** (fē′ kun dāt), *v.t.* to make fruitful, fertilize.

***federal** (fed′ ẽr ȧl), *adj.* pertaining to a union of states.

federalism (fed′ ẽr al izm), *n.* the doctrine or support of federal organization of government.

federalize (fed′ ẽr al īz), *v.t.* to put under a central government, as a union of states.

federation (fed ẽr ā′ shun), *n.* a union of several states under a central government; the act of bringing states together under a central government; a union of organizations under a central agency of control, as a labor *federation.*

fee (fē), *n.* a charge for professional services; a legally fixed charge for public services or privileges, as a license *fee.*

feeble (fē′ bl), *adj.* weak in mind or body.

feeble-minded (fē′ bl mīn′ ded), *adj.* incapable of mental development; mentally deficient, but not to the point of idiocy.

feed (fēd), *n.* that which is eaten, especially fodder for cattle or food for livestock.

feed (fēd), *v.i. and v.t.* to take food; to give food to.

feel (fēl), *n.* the sense of touch; feeling.

feel (fēl), *v.t. and v.i.* to sense by touching, as to *feel* an object; to be aware of, experience, as to *feel* joy; to be aware of being, as to *feel* cold.

feeler (fēl′ ẽr), *n.* that which feels or touches, as the antennae of certain insects; a trial remark or action designed to draw comment.

feeling (fēl′ ing), *n.* the experience of one who feels something, as an object or an emotion; a physical sensation; an emotional state.

feelings (fēl′ ingz), *n. pl.* one's general state of emotional reaction or susceptibility, as you hurt my *feelings.*

***feign** (fān), *v.i. and v.t.* to make believe, pretend.

Syn. Assume, pretend. To *feign* is to invent and represent by sham, as one might *feign* sickness as an excuse for not keeping an engagement. To *assume* is to take upon oneself, as to *assume* an innocent air; to *pretend* is to profess as true something false, as he *pretends* to be a doctor.

feint (fānt), *n.* a pretended blow taking an adversary off guard and opening the way for a real stroke, as in boxing, fencing or war; a pretended blow or attack upon a point where the attack is not to be made, exposing the point at which it actually is later to be directed.

***feldspar** (feld′ spär), *n.* a group name for various crystalline minerals.

felicitate (fē lis′ i tāt), *v.t.* to congratulate, wish well.

Syn. Congratulate. To *felicitate* is to make formal expression of good wishes; to *congratulate* is the common word for spontaneous and sincere well wishing.

felicitous (fē lis′ i tus), *adj.* happily or aptly expressed.

felicity (fē lis′ i ti), *n.* happiness; that which causes happiness.

***feline** (fē′ līn), *n.* any animal of the cat family.

feline (fē′ līn), *adj.* catlike, sly.

fell (fel), *n.* a moor; a down; a skin or hide.

fell (fel), *v.t.* to hew down, as a tree.

fell (fel), *adj.* sinister, cruel.

fellow (fel′ ō), *n.* an individual; a companion, comrade; a college graduate receiving an allowance to support him in postgraduate study; a member of an incorporated literary or scientific society.

fellowship (fel′ ō ship), *n.* companionship; an endowment to support a graduate student in college.

***felly** (fel′ i), *n.* [*pl.* fellies] the wooden rim of a wheel into which the outer ends of the spokes fit: sometimes written *felloe.*

felon (fel′ un), *n.* one who is guilty of felony; a painful abscess on a finger or toe near the nail.

felonious (fē lō′ ni us), *adj.* of the nature of felony.

felony (fel′ ō ni), *n.* a crime more serious than a misdemeanor.

felt (felt), *n.* an unwoven fabric of wool or fur compressed in manufacture, used for hats.

female (fē′ māl), *n.* one of the female sex, a woman or girl; also an animal of the female sex.

female (fē′ māl), *adj.* of the sex that bears offspring; characteristic of the female sex: opposite of *male.*

Syn. Womanly, womanlike, wonanish, effeminate. *Female* applies to the sex of persons, animals and plants; *feminine* is the opposite of *masculine* and applies to things characteristic of women, as *feminine* frills, *feminine* intuition; *womanly* applies to certain fine characteristics thought of as belonging especially to women, as *womanly* tenderness, devotion, pity; *womanlike* applies to certain undesirable characteristics typical of the weaknesses or faults of women, as a *womanlike* inconsistency; *womanish* is a scoffing word, as *womanish* fears; *effeminate* is an uncomplimentary word applied to men and means unmanly.

***feminine** (fem′ i nin), *adj.* pertaining to or characteristic of the female sex: opposite of *masculine.*

***femoral** (fem′ ō ral), *adj.* pertaining to the femur, or thigh.

***femur** (fē′ mẽr), *n.* the thighbone.

fen (fen), *n.* low marshland, a moor.

fence (fens), *n.* a barrier about a field to prevent the straying, as of animals, in or out.

fence (fens), *v.i. and v.t.* to practice fencing; to debate, exchanging thrusts and parries of argument, as if fencing; to enclose with a fence.

fencing (fens′ ing), *n.* the art of thrusting and parrying with foil or sword; material used in making fences.

fend (fend), *v.t.* to ward off, as a blow.

fender (fen′ dẽr), *n.* that which wards off blows; a cushion on the side of a boat to prevent injury by collision with other boats or a dock; a wheelguard of an automobile.

fenestration (fen es trā′ shun), *n.* the arrangement of windows on a building.

fennel (fen′ el), *n.* an aromatic perennial herb of the carrot family.

feral (fē′ ral), *adj.* untamed, wild; savage, like a wild animal.

***ferment** (fûr′ ment), *n.* any of certain living organisms, as yeasts or bacteria, or any enzyme that causes fermentation; tumult, agitation.

ferment (fûr ment′), *v.i. and v.t.* to undergo fermentation, to work, as cider *ferments;* to cause fermentation, as yeast *ferments* dough; to agitate.

fermentation (fûr men tā′ shun), *n.* the chemical change that takes place in an organic substance caused by certain fungi, bacteria and enzymes, and accompanied by effervescence.

fern (fûrn), *n.* a flowerless seedless plant with broad or feathery fronds or leaves, and reproducing by means of spores.

fernery (fûr′ nẽr i), *n.* [*pl.* ferneries] a place where ferns are cultivated.

ferocious (fē rō′ shus), *adj.* fierce, savage.

ferocity (fē ros′ i ti), *n.* fierceness, wildness.

ferret (fer′ et), *n.* an animal of the weasel family, native to Africa, but bred in western countries to hunt rabbits and rats.

ferret (fer′ et), *v.i. and v.t.* to hunt like a ferret; to hunt with ferrets; to search relentlessly.

ferrotype (fer′ ō tīp), *n.* a photograph taken on a sensitized iron plate.

ferrous (fer′ us), *adj.* pertaining to or derived from iron.

ferruginous (fē ro͞o′ ji nus), *adj.* brownish red, like iron rust.

***ferrule** (fer′ il), *n.* a metal cap on the end of a walking stick, umbrella or tool handle to prevent splitting.

ferry (fer′ i), *n.* [*pl.* ferries] a place where passengers, vehicles or freight are carried across a river or harbor for pay; a ferryboat.

ferry (fer′ i), *v.t.* to carry across a body of water, as a river, on a ferryboat.

fertile (fûr′ til), *adj.* productive, fruitful; rich, as *fertile* ground.

fertility (fẽr til′ i ti), *n.* the state of being fertile, the power to produce offspring.

fertilization (fûr ti li zā′ shun), *n.* enrichment, as of soil, to make it more productive.

fertilize (fûr′ ti līz), *v.t.* to enrich, as soil, so as to increase productiveness.

fertilizer (fûr′ ti līz ẽr), *n.* that which fertilizes, as commercial products sold for the purpose.

***ferule** (fer′ o͞ol), *n.* a rod used for chastisement.

fervency (fûr′ ven si), *n.* ardor, warmth of feeling.

fervent (fûr′ vent), *adj.* ardent, warm, intense.

fervid (fûr′ vid), *adj.* fiery; zealous.

fervor (fûr′ vẽr), *n.* intensity of heat, feeling or expression.

Syn. Ardor. *Fervor* is the boiling over, the expression of intense feeling; *ardor* is itself the intense feeling.

Ant. Coolness, indifference.

festal (fes′ tal), *adj.* pertaining to a feast, or holiday, festive.

fester (fes′ tẽr), *n.* a small, suppurating sore.

fester (fes′ tẽr), *v.i.* to produce pus; to cause soreness; to rankle.

festival (fes′ ti val), *n.* a feast or joyous celebration; a periodical celebration.

festive (fes′ tiv), *adj.* joyous, gay, as befits a time of feasting.

festivity (fes tiv′ i ti), *n.* [*pl.* festivities] social gayety at an entertainment or feast.

festoon (fes to͞on′), *n.* a wreath or garland hanging in a curve.

festoon (fes to͞on′), *v.t.* to form in festoons; to decorate with festoons.

fetch (fech), *v.t.* to go and get and bring.

***fête** (fāt), *n.* a festival, especially an elaborate outdoor celebration.

fête (fāt), *v.t.* to honor with a festival.

***fetid** (fet′ id), *adj.* giving forth an offensive smell.

***fetish** (fē′ tish), *n.* an object supposed to possess powers of magic, such as curing the diseases of the owner.

fetlock (fet′ lok), *n.* a tufted pad on the back of a horse's leg just above the hoof.

fetter (fet′ ẽr), *n.* a chain or shackle for the feet; any restraint.

fettle (fet′ l), *n.* good condition, readiness, as in fine *fettle*.

***feud** (fūd), *n.* a quarrel between families, carried from one generation to another; a fief.

feudal (fū′ dal), *adj.* pertaining to a feud or quarrel; pertaining to the feudal system in Europe in the Middle Ages: *feudal system,* the social organization of medieval Europe in which vassal rendered to lord military support, money and homage in return for tenure of lands.

fever (fē′ vẽr), *n.* a diseased condition of the body attended by marked rise in temperature.

feverish (fē′ vẽr ish), *adj.* having fever, having heat and thirst; excited and fitful, as *feverish* talk.

few (fū), *adj.* not many, as *few* children could answer the question.

few (fū), *n.* a small number, as a *few* knew the answer.

fez (fez), *n.* a brimless close-fitting felt hat, generally red with a black tassel, formerly worn by all Turkish men.

***fiancé** (fē än sā′), *n.* a betrothed man.

fiancée (fē än sā′), *n.* a betrothed woman.

***fiasco** (fē as′ kō), *n.* a complete or ludicrous failure.

***fiat** (fī′ at), *n.* a preemptory order or decree.

fiat money (fī′ at mun′ i), paper currency that has no backing in specie made legal by law.

fiber (fī′ bẽr), *n.* a slender threadlike part of an organic tissue.

***fibrin** (fī′ brin), *n.* a whitish fibrous protein substance that exists in the blood and causes coagulation.

fibrous (fī′ brus), *adj.* having fibers or threadlike parts; composed of or resembling fibers.

fibula (fib′ ū l*a*), *n.* [*pl.* fibulae] the outer and smaller of the two bones of the hind leg below the knee.

fichu (fish′o͞o), *n.* a light three-cornered cape or collar worn by women.

fickle (fik′ l), *adj.* inconstant, capricious.

fiction (fik′ shun), *n.* an invented story or narrative, especially a novel.

Syn. Figment, fabrication. *Fiction* is the creation of imagination, and does not necessarily imply an intent to deceive; *fiction* is the opposite of fact; a *fabrication* is definitely meant to deceive; a *figment* is something imaginary which the one who utters it may or may not believe to be true.

Ant. Fact, truth.

fictitious (fik tish ′us), *adj.* imaginary, invented; unreal.

fid (fid), *n.* a square bar of wood or iron supporting a topmast.

fiddle (fid′ l), *n.* a violin.

fiddle (fid′ l), *v.i. and v.t.* to play a violin; to play something on a violin; to trifle.

fiddlestick (fid′ l stik), *n.* a bow for playing on the violin.

fidelity (fī del′ i ti), *n.* faithfulness, loyalty; accuracy, as fidelity to a text.

fidget (fij′ et), *v.i.* to move uneasily, restlessly.

fidgety (fij′ e ti), *adj.* restless, uneasy.

***fiduciary** (fi dū shi er i), *n.* [*pl.* fiduciaries] a trustee.

fiduciary (fi du′ shi er i), *adj.* of the nature of a trust.

fief (fēf), *n.* land held in fee, as to an overlord.

field (fēld), *n.* a piece of land for tillage or pasture, which may or may not be fenced in; a stretch of land with a single outstanding characteristic, as a coal *field;* the place where a battle is fought, a battle*field;* a certain department of study, as in the *field* of history; range or reach, as the *field* of vision.

field artillery (fēld är til′ ẽr i), guns mounted for use in the open.

field glass (fēld glȧs), a small telescope, often double.

field marshal (fēld mär′ shal), in some armies, an officer ranking next below the commander in chief.

fiend (fēnd), *n.* a diabolical person; a demon.

fiendish (fēnd′ ish), *adj.* like a fiend, wicked and cruel.

***fierce** (fērs), *adj.* intense in anger; raging, as a *fierce* fire.

***fiery** (fī′ ri), *n.* [*comp.* fierier, *superl.* fieriest] pertaining to, consisting of or resembling fire, hot, burning; spirited, passionate.

fife (fīf), *n.* a shrill-toned musical instrument of the flute class.

fifteen (fif tēn′), *n.* one more than fourteen.

***fifth** (fifth), *n.* one of five equal parts.

fifth (fifth), *adj.* next after the fourth.

fiftieth (fif′ ti eth), *n.* one of 50 equal parts.

fiftieth (fif′ ti eth), *adj.* next after the 49th.

fifty (fif′ ti), *n.* one more than 49.

fig (fig), *n.* the edible pear-shaped fruit native to southwestern Asia.

fight (fīt), *n.* a physical struggle, a contest.

fight (fīt), *v.i. and v.t.* [*p.t.* and *p.p.* fought, *pr.p.* fighting] to contend with blows of the fist or with weapons; to oppose in order to defeat or destroy; to war against, as to *fight* an enemy; to gain by fighting, as to *fight* one's way.

figment (fig′ ment), *n.* an invention of the mind, a fiction.

figurative (fig′ ūr *a* tiv), *adj.* representing by a figure or symbol, symbolic; not literal, metaphorical.

figure (fig′ ūr), *n.* the shape or form of an object; the general conformation of one's body; a numerical symbol, as the *figure* 3; a drawing or diagram accompanying printed text.

figure (fig′ ūr), *v.i. and v.t.* to cipher; to calculate with numbers or symbols; to represent by a drawing or diagram.

figured (fig′ ūrd), *adj.* adorned with figures or patterns.

figurehead (fig′ ūr hed), *n.* a carved figure at the prow of a ship; a nominal head of an organization, one holding office but not wielding power.

filament (fil′ *a* ment), *n.* a fine thread; the thread of metal in an incandescent tube.

filbert (fil′bẽrt), *n.* the edible nut of the hazel, a hazelnut.

filch (filch), *v.t.* to pilfer, steal.

file (fīl), *n.* a piece of steel with ridged surface for shaping metals by abrading; a systematic collection of papers, as business correspondence or records; a row of soldiers, one behind another, or of objects so arranged.

file (fīl), *v.i. and v.t.* to march or stand in a row, one behind another; to place in a cabinet or folder in a certain order, as papers; to abrade with a file.

***filial** (fil′ i al), *adj.* pertaining to, or proper to, a son or daughter.

filibuster (fil′ i bus tẽr), *n.* a freebooter, an irregular military adventure; an attempt to delay the action of a legislative assembly by speakers holding the floor against the opposing side.

filibuster (fil′ i bus tẽr), *v.i.* to act as a military freebooter; to delay action in a legislature by prolonging speeches or discussion.

filigree (fil′ i grē), *n.* ornamental work of gold or silver wire.

filing (fīl′ ing), *n.* a fragment of metal rubbed off by a file.

filing cabinet (fīl′ ing kab′ i net), a case in which papers are filed.

fill (fil), *n.* a filled place, as in roadbuilding; a supply, as a *fill* for a pipe, to eat one's *fill.*

fill (fil), *v.i. and v.t.* to become full; to make full by putting or pouring, as to *fill* a hole with rocks; to occupy all of, as sugar *fills* a barrel; to raise the level of a low place, as in the land, by dumping something into the depression; to treat substances, such as cloth, wood, paper, with other substances in order to close the pores.

filler (fil′ ẽr), *n.* something used to plug or stop up a space, as a crack in wood; the tobacco used inside the wrapper of a cigar; an article used in a newspaper or other publication to take up spare space, as at the bottom of a column.

fillet (fil′ et), *n.* a narrow band worn around the forehead to hold the hair in order; a piece of lean meat, sometimes rolled and tied for cooking.

filling (fil′ ing), *n.* something used to fill an empty space or to replace lost matter.

filly (fil′ i), *n.* [*pl.* fillies] a female colt.

film (film), *n.* a thin coating; a flexible thin sheet of cellulose nitrate treated for use in photography; a motion picture.

filmy (fil′ mi), *adj.* having or resembling a film; delicately clouded, misty.

filter (fil′ tẽr), *n.* an apparatus or substance used for straining liquid to remove foreign substances.

filter (fil′ tẽr), *v.t.* to run through a filter, to strain.

filth (filth), *n.* foul matter; moral corruption.

filthy (fil′ thi), *adj.* [*comp.* filthier, *superl.* filthiest] foul; nasty; unclean, physically or morally.

filtration (fil trā′ shun), *n.* the process of straining.

fin (fin), *n.* a membranous attachment to the body of a fish resembling a wing or a paddle, which enables it to hold its balance and to move through the water; anything resembling a fin, as a *fin* keel on a boat or a small secondary plane on an airplane for balancing or for directing flight.

final (fī′ nal), *adj.* coming at the end, last; conclusive.

Syn. Last, ultimate. *Final* means the last of a series, as the *final* event in a tournament, a *final* exam; that which is *last* comes at the end of others of like sort, as the *last* child in the row, the *last* page of a book; *ultimate* describes an end attained, as *ultimate* success.

***finale** (fē nä′ lā), *n.* the closing scene of a drama or opera; the last number on a program; the close or end.

finality (fī nal′ i ti), *n.* completion; the act or state of coming to an end; conclusive decision.

***finance** (fi nans′), *n.* the science of managing money; the actual management of monetary matters, as of a government or corporation.

financial (fi nan′ shal), *adj.* pertaining to finance.

Syn. Fiscal, monetary, pecuniary. *Monetary* relates to actual money, coin, currency, as in the expression the *monetary* system. *Pecuniary* refers to that in which money is involved, as *pecuniary* interests. *Financial* applies especially to governmental revenues and expenditures, or to corporation management.

***financier** (fin an sēr′), *n.* one skilled in the administration of money matters on a large scale.

finch (finch), *n.* any of various small singing birds, as sparrows, linnets, buntings.

find (fīnd), *n.* something found.

find (fīnd), *v.t.* [*p.t.* and *p.p.* found, *pr.p.* finding] to discover; to obtain by searching; to learn by study or experiment, as we *find* that insects have six legs.

finder (fīn′ dẽr), *n.* an instrument for finding, as focus for a camera or range for a gun.

finding (fīn′ ding), *n.* the verdict of a jury, court or arbitrator: *findings,* equipment for an artisan, such as tools or materials.

fine (fīn), *n.* money paid as a penalty.

fine (fīn), *v.t.* to impose a fine or money penalty.

fine (fīn), *adj.* delicate, as *fine* lace; sensitive, as a *fine* ear for music; not coarse, perfected, refined, as *fine* gold.

fine-drawn (fīn drôn), *adj.* spun very fine; subtle.

finery (fīn′ er i), *n.* [*pl.* fineries] personal adornment, as fine or showy clothes.

***finesse** (fi nes′), *n.* artifice or stratagem; delicate skill; a certain play in card games.

finger (fing′ gẽr), *n.* one of the four digits of the hand, as distinguished from the thumb.

finger (fing′ gẽr), *v.t.* to handle with the fingers; to perform (on a musical instrument) with the fingers.

fingering (fing′ gẽr ing), *n.* manipulating with the fingers; the manner of using the fingers in playing a musical instrument.

fingerprint (fing′ gẽr print), *n.* an impression of a finger, or more commonly, a thumb, showing the characteristic lines of the skin, used as a means of identification.

fingerprint (fing′ gẽr print), *v.t.* to take fingerprints of.

finical (fin′ i kal), *adj.* fastidious, fussy.

***finis** (fī′ nis), *n.* the end, as of a play or book.

finish (fin′ ish), *n.* the end or conclusion; the final part of the process of making, that which completes or perfects, as to put a *finish* on a written article, the table has a shiny *finish;* social refinement.

finish (fin′ ish), *v.i. and v.t.* to come to an end; to bring to an end, as to *finish* a song; to put the last touches on, as to *finish* a dress; to complete, as to *finish* one's schooling.

finished (fin′ isht), *adj.* concluded, complete; polished, in physical fact or in manner.

finite (fī′ nīt), *adj.* having limits: opposite of *infinite.*

Syn. Limited. This world is *finite;* space is *infinite.* The power of a government is *limited;* the powers of mankind are *finite.*

Ant. Infinite, unlimited.

***fiord** (fyôrd), *n.* a long narrow inlet of the sea between high, rocky banks.

fir (fûr), *n.* a certain evergreen tree related to the pine; also its wood.

fire (fīr), *n.* combustion, with heat, flame and light; anything burning; something resembling fire, as the *fire* of your eye, the *fire* of a diamond.

fire (fīr), *n.* discharge of firearms, as the enemy's *fire* grew heavier.

fire (fīr), *v.i. and v.t.* to become ignited; to ignite; to keep a fire in, as to *fire* a furnace; to temper with heat, bake, as to *fire* pottery; to inflame, as to *fire* the passions; to discharge, as firearms.

firearms (fīr′ ärmz), *n. pl.* guns; weapons discharged by means of explosive loads: usually small guns.

firebox (fīr′ boks), *n.* the space in a furnace or stove that holds the fire.

firebrand (fīr′ brȧnd), *n.* a piece of burning wood; an incendiary; one who inflames the passions of others.

firebrick (fīr′ brik), *n.* nonfusible brick, used for lining fireboxes.

firebug (fīr′ bug), *n.* an incendiary.

fire clay (fīr klā), a clay that withstands extreme heat, used in making firebrick.

firedamp (fīr′ damp), *n.* a combustible gas formed in coal mines.

firedog (fīr′ dôg), *n.* an andiron.

fire-eater (fīr′ ēt ẽr), *n.* a juggler who pretends to eat fire; a defiant person.

fire engine (fīr en′ jin), an engine and pump on wheels for throwing streams of water on a fire.

fire escape (fīr′ es kāp′), a device, as a ladder, for use in getting out of a burning building.

firefly (fīr′ flī), *n.* a small winged beetle which gives forth an intermittent luminous glow in the darkness.

fireman (fīr′ man), *n.* one who serves in a a fire-fighting department; one who fires furnaces.

fireproof (fīr′ pro͞of), *adj.* practically unburnable; proof against fire.

fireproof (fīr′ pro͞of), *v.t.* to make fireproof.

fire ship (fīr ship), a ship loaded with combustibles, ignited and sent to drift among the ships of an enemy.

fireside (fīr′ sīd), *n.* the hearth; hence, domestic life and comfort.

fire test (fīr test), a test to discover the burning temperature of a lubricating oil; any other test by means of heat.

firetrap (fīr′ trap), *n.* a non-fireproof building without proper provision for escape in case of fire.

firewarden (fīr′ wôrd en), *n.* a public officer who has authority to order preventive measures against forest fires and to direct the work of extinguishing them.

fireworks (fīr′ wûrks), *n. pl.* a pyrotechnic show; devices in which gunpowder and chemicals are used to produce a display of lights and varied explosions, on the ground or in the air.

firing (fīr′ ing), *n.* the methodical feeding of fuel into a furnace; exposure, as of pottery to extreme heat, to harden or glaze a surface; discharge of firearms, as the *firing* became heavier.

firkin (fûr′ kin), *n.* a small wooden tub for holding butter or lard.

firm (fûrm), *n.* a business establishment or commercial house; a partnership.

firm (fûrm), *v.t.* to make compact, fix or set firmly.

firm (fûrm), *adj.* set solidly; compressed to hardness; unyielding; determined, as a *firm* voice.

Syn. Hard, solid. *Firm* means fixed, strong or steady in spite of pressure or shaking, as jelly is *firm,* a bridge is *firm; hard* means resisting pressure, impenetrable, as rocks; *solid* means compact and dense.

Ant. Loose, unstable.

firmament (fûr′ m*a* ment), *n.* the arch of the sky.

first (fûrst), *n.* the beginning, as the *first* of a book; anything that leads, as he is the *first* in his class.

first (fûrst), *adj.* preceding all others, as *first* choice, he was the *first* one here.

first (fûrst), *adv.* before all others in space, time or value, as you go *first.*

first-born (fûrst′ bôrn′), *n.* the child born first in a family.

first-class (fûrst′ klȧs′), *adj.* of highest excellence.

firsthand (fûrst′ hand′), *adj.* obtained directly from the producer or original owner.

first-rate (fûrst′ rāt′), *adj.* of supreme excellence, as a *first-rate* performance.

firth (fûrth), *n.* a narrow arm of the sea: also called *frith.*

fiscal (fis′ kal), *adj.* pertaining to the handling of public revenues, as in the *fiscal* year; financial, as *fiscal* affairs.

fish (fish), *n.* [*pl.* fish, fishes] a vertebrate animal living only in water, and having gills, fins and a long, slender, scale-covered body ending in a broad tail fin; the meat of fish used as food; a plate or strip of wood or metal strengthening the joint of two spars.

fish (fish), *v.i. and v.t.* to try to catch fish; to drag for submerged things; to try to get by indirect means, as to *fish* for compliments; to fasten, as spars, with a fish or fishplate.

fishbolt (fish′ bōlt), *n.* a special bolt for securing a fishplate.

fisherman (fish′ ẽr man), *n.* one whose calling it is to catch fish for the market; one who fishes for sport.

fishery (fish′ ẽr i), *n.* [*pl.* fisheries] the business of catching fish for the market; the waters in which it is carried on.

fish ladder (fish lad′ ẽr), steps constructed in a dam to enable fish to get upstream to spawn.

fishplate (fish′ plāt), *n.* a metal plate used to join two pieces, as spars or rails.

fishy (fish′ i), *adj.* like fish, as this tastes *fishy;* incredible, as it sounds *fishy.*

***fissile** (fis′ il), *adj.* capable of being split.

***fission** (fish′ un), *n.* the act of cleaving apart or splitting.

fissure (fish′ ẽr), *n.* a cleft or crack.

fist (fist), *n.* the hand closed with fingers curved tightly into the palm.

fistula (fis′ tū l*a*), *n.* an ulcerous opening in the body.

fit (fit), *n.* that which fits or is fitting, as the coat is a good *fit.*

fit (fit), *n.* a paroxysm characteristic of certain bodily disorders, as an epileptic *fit,* a *fit* of coughing.

fit (fit), *v.i. and v.t.* to conform in size and shape, as the suit *fits* well; to make fit or suitable, as *fit* your expenses to your income.

fit (fit), *adj.* appropriate, proper, as food *fit* for a king; ready, prepared, as *fit* for action.

Syn. Proper, suitable. *Fit* means adapted or qualified for a purpose, or able, as *fit* to work; *suitable* means in harmony or in accord with, as garments *suitable* for a bride; *proper* means correct or appropriate, as to have *proper* manners, a *proper* greeting.

fitful (fit′ fool), *adj.* capricious, spasmodic, impulsive, unstable.

fitting (fit′ ing), *n.* making to conform in size and shape; trying on partly finished apparel; necessary part, as the *fittings* of a gymnasium.

fitting (fit′ ing), *adj.* suitable, appropriate.

five (fīv), *n.* the number one more than 4.

fivefold (fīv fōld′), *adj. and adv.* in fives; five times as much or as great.

fix (fiks), *n.* a predicament, as I'm in a fine *fix.*

fix (fiks), *v.i. and v.t.* to become fixed or fastened; to make fast, secure or stable; to adjust, arrange; to repair.

fixation (fiks ā′ shun), *n.* the act of making permanent or state of being made permanent, as the *fixation* of a chemical substance so that it will not undergo further change; concentration of gaze; arrested development; formation of a habit.

fixed (fikst), *adj.* firm, lasting, settled, permanent.

fixedly (fik′ sed li), *adv.* steadily, firmly.

fixity (fiks′ i ti), *n.* stability, permanence.

fixture (fiks′ tūr), *n.* that which is firmly established; an article of furniture or equipment, taken as a permanent part of a house, as an electrical *fixture.*

fizz (fiz), *n.* a hissing noise, as of an effervescing liquid; a drink that fizzes.

fizz (fiz), *v.i.* to effervesce, with a hissing sound.

flabby (flab′ i), *adj.* without firmness; feeble; loose, lax.

***flaccid** (flak′ sid), *adj.* limp, flabby; soft and weak.

flag (flag), *n.* a piece of bunting on which a device is shown, as the emblem of nationality; a plant of the iris family; a flat paving stone.

flag (flag), *v.i. and v.t.* to hang loose, droop; to lose vigor; to signal with a flag, as to *flag* a train.

***flagellate** (flaj′ ė lāt), *v.t.* to whip, flog.

***flageolet** (flaj′ ō let), *n.* a small musical wind instrument of the flute class.

flagging (flag′ ing), *n.* a pavement of flagstones.

***flagitious** (fl*a* jish′ us), *adj.* atrocious, wicked.

***flagon** (flag′ un), *n.* a large drinking vessel having a handle and sometimes a lid.

flagrant (flā′ grant), *adj.* openly wicked, outrageous.

flagship (flag′ ship), *n.* the ship carrying the commander of a fleet and flying his flag.

flagstaff (flag′ stȧf), *n.* the staff or pole on which a flag is hoisted and flown.

flagstone (flag′ stōn), *n.* a flat stone used in paving, as for a sidewalk.

flail (flāl), *n.* an instrument for threshing grain.

flair (flâr), *n.* discernment by instinct, special aptitude; interest, bent.

flake (flāk), *n.* a loose, thin mass or scale of anything, as a *flake* of snow or soap.

flake (flāk), *v.i. and v.t.* to form into flakes or scales.

flaky (flāk′ i), *adj.* formed in or like flakes, scales or tiny layers.

***flambeau** (flam′ bō), *n.* a flaming torch.

***flamboyant** (flam boi′ ant), *adj.* ornate; marked by wavy, flamelike curves.

flame (flām), *n.* the blaze of combustion; a blaze; a flamelike glow, as of temper or passion.

flame (flām), *v.i.* to burn with a flame or blaze, glow like a flame, burst into a blaze.

***flamingo** (fl*a* ming′ gō), *n.* a tropical aquatic bird with very long legs and neck and a bill that is bent downward.

***flange** (flanj), *n.* a raised or projecting rim to prevent a wheel from leaving a track.

flank (flangk), *n.* the side of an animal between ribs and hip; the side of anything; the right or left side of a military or naval force.

flank (flangk), *v.t.* to guard or strengthen the flank or side of, to attack or pass the side of; to be beside, border, as clumps of iris *flank* the pool.

flannel (flan′ el), *n.* a soft, loosely woven woolen cloth.

flap (flap), *n.* an overlapping surface; anything flat and limp that hangs loose; the motion of anything flat, wide or limp that hangs loose; the sound made by such motion.

flap (flap), *v.i. and v.t.* to beat or move loosely, as the bird's wings *flap;* to move with a beating motion, as a bird *flaps* its wings.

flare (flâr), *n.* a glaring light coming up suddenly and spreading; a blaze used for a signal; a sudden outburst, as a *flare* of temper.

flare (flâr), *v.i.* to burn with a flare; to give out a sudden, spreading blaze of light; to burst out, as her anger *flared* up; to spread outward, as a vase *flares* at the top.

flash (flash), *n.* a sudden, quickly passing emission of light; an outburst, as of wit.

flash (flash), *v.i. and v.t.* to break forth in a sudden or momentary flame; to act or speak with suddenness; to send out as if by flashes, as to *flash* the election returns.

flashlight (flash′ līt), *n.* a portable electric light.

flask (flȧsk), n. a small usually flattened bottle of glass, metal or leather, used to carry liquids or powder.

flat (flat), *n.* a level surface; the flat part of anything, as the *flat* of a sword blade, the *flat* of the hand; a suite of rooms on one floor of a building.

flat (flat), *adj.* level and horizontal, as *flat* lands; level and smooth, as a *flat* surface; spread out, prostrate; broad and thin, as a pancake; positive, unqualified, as a *flat* refusal; fixed, unvarying, as a *flat* rate; dull, monotonous, as a *flat* voice, a *flat* story; below the true pitch of a tone, minor.

flatten (flat′ n), *v.t. and v.i.* to make flat or become flat in position, shape or quality.

flatter (flat′ ẽr), *v.t.* to praise or gratify the vanity of, especially in self-interest; to over praise.

flatterer (flat′ ẽr ẽr), *n.* one who flatters or blandishes or beguiles unduly.

flattery (flat′ ẽr i), *n.* [*pl.* flatteries] insincere complimentary speech.

flatulence (flat′ ū lens), *n.* distention of the abdomen by gases.

***flaunt** (flônt), *v.i. and v.t.* to wave ostentatiously; to display defiantly.

flavor (flā′ vẽr), *n.* distinctive taste, or odor; also, a distinguishing characteristic; as, his landscapes have the *flavor* of the western plains.

flavor (flā′ vẽr), *v.t.* to impart a distinctive taste or odor to.

flaw (flô), *n.* a defect, blemish.

flax (flaks), *n.* a plant cultivated for its seeds and for its fiber, which is spun into linen.

flaxen (flaks′ n), *adj.* made of flax, like flax; having the light straw color of flax.

flaxseed (flaks′ sēd), *n.* the seed of flax, used in medicine and in making linseed oil.

flay (flā), *v.t.* [*p.t.* and *p.p.* flayed, *pr.p.* flaying] to strip off the skin of; to criticize scathingly.

flea (flē), *n.* a hard-bodied wingless bloodsucking insect with extraordinary power of jumping.

fleck (flek), *n.* a spot; particle.

flection (flek′ shun), *n.* a bend; a part that is bent.

fledge (flej), *v.i.* to acquire feathers necessary for flight.

fledgling (flej′ ling), *n.* a young bird, just fledged.

flee (flē), *v.i. and v.t.* [*p.t.* and *p.p.* fled, *pr.p.* fleeing] to run away; to run away from.

fleece (flēs), *n.* the wool coat of a sheep; the amount of wool shorn from a sheep at one time.

fleece (flēs), *v.t.* to shear (sheep); to strip, plunder, as to *fleece* a man of money.

fleecy (flēs′ i), *adj.* woolly.

fleer (flēr), *v.i. and v.t.* to laugh at, jibe, mock.

fleet (flēt), *n.* a group of warships under central command.

fleet (flēt), *adj.* swift, quickly passing away.

flesh (flesh), *n.* the muscular parts of an animal's body; the human body as distinguished from soul.

fleshly (flesh′ li), *adj.* pertaining to the body, as distinguished from the spirit or soul.

fleshy (flesh′ i), *adj.* [*comp.* fleshier, *superl.* fleshiest] corpulent, gross.

***fleur-de-lis** (flûr de lē′), *n.* the iris, conventionalized in heraldry and used as an emblem by the former royal family of France.

flexible (flek′ si bl), *adj.* easily bent; compliant; yielding to persuasion.

Syn. Pliable, supple. *Flexible* is used in both the physical and moral sense; it means easily bent or adaptable to change of shape or opinion; *pliable* also means easily bent, but carries the added idea of being workable, as wax is *pliable; supple* implies ease of motion in any direction, as an acrobat has to be *supple.*

Ant. Rigid, stiff, unyielding.

flexor (flek′ sẽr), *n.* a muscle that acts in bending a limb at a joint, as the elbow: opposite of *extensor.*

***flexure** (flek′ shẽr), *n.* a bending or being bent; a bend or fold.

flick (flik), *n.* a light, quick stroke, as the *flick* of a whip.

flick (flik), *v.t.* to snap or jerk as with a quick, light stroke.

flicker (flik′ ẽr), *n.* a brief, momentary wavering brightness, as the lamp gave a *flicker;* any brief stirring, as a *flicker* of the eyelid, a *flicker* of breeze, a *flicker* of interest.

flicker (flik′ ẽr), *n.* the North American golden-winged woodpecker.

flicker (flik′ ẽr), *v.i.* to flutter, as wings; to waver, like a dying flame.

flight (flīt), *n.* the act of flying; a number of things passing through the air at once, as a *flight* of arrows; a series of steps in a staircase from one landing to the next.

flighty (flī′ ti), *adj.* [*comp.* flightier, *superl.* flightiest] having or indicating flights of fancy, imagination or humor; capricious; mildly insane.

flimsy (flim′ si), *adj.* unsubstantial, frail.

flinch (flinch), *v.i.* to shrink or draw back, as from a blow.

fling (fling), *n.* a throw; a lively dance; indulgence, as to have one's *fling.*

fling (fling), *v.t.* [*p.t.* and *p.p.* flung, *pr.p.* flinging] to throw or hurl.

flint (flint), *n.* a hard kind of quartz that strikes a spark from steel.

flinty (flin′ ti), *adj.* of or like flint, hard; hard and unkind, as a *flinty* look.

flip (flip), *n.* a flick, toss or jerk, as with a finger.

flip (flip), *v.t.* to give a fillip to with the fingers, as to *flip* a coin.

flippancy (flip′ an si), *n.* the quality of being light and pert.

flippant (flip′ ant), *adj.* pert; regarding serious things lightly.

flipper (flip′ ẽr), *n.* a broad limb used in swimming, as of the seal, walrus or whale.

flirt (flûrt), *n.* a quick throw; one who trifles with love.

flirt (flûrt), *v.i. and v.t.* to move jerkily or suddenly; to coquet; to make love insincerely, trifle with love; to move back and forth with swift action, as a fan.

flit (flit), *v.i.* to dart one way and another in short flights.

flitch (flich), *n.* the side of a hog salted and cured, as a *flitch* of bacon.

float (flōt), *n.* something that floats; a vehicle without side boards, used for display in a parade; a tool for smearing and smoothing, like a plasterer's trowel.

float (flōt), *v.i. and v.t.* to lie on a liquid without sinking; to drift; to be or move suspended in air, as a balloon *floats;* to put on the market, as an issue of stocks; to cause to float.

***flocculent** (flok′ ū lent), *adj.* woolly; covered with a waxy fuzz resembling wool, as some aphids are *flocculent.*

flock (flok), *n.* a group of birds or animals of the same kind moving about together; woolen or cotton refuse used as padding in upholstery; a lock of hair or wool; short fibers of wool used to surface paper or weight textiles.

flock (flok), *v.i.* to move in flocks; to crowd together.

floe (flō), *n.* a large flat mass of floating ice.

flog (flog), *v.t.* to whip.

flood (flud), *n.* an abnormal flow of water, overrunning customary bounds; an inundation; deluge; any superabundance, as a *flood* of light, a *flood* of mail.

flood (flud), *v.t.* to overflow or inundate, as a river *floods* the land.

floodgate (flud′ gāt), *n.* a movable barrier in a waterway to control the flow, a sluice.

flood tide (flud tīd), the incoming tide: opposite of *ebb tide.*

floor (flōr), *n.* a surface in a structure on which one walks, as the *floor* of a room, the *floor* of a bridge; any bottom surface, as the ocean *floor;* the part of a legislative chamber in which the legislators sit; also the right to speak from one's seat in this space, as to have the *floor.*

floor (flōr), *v.t.* to furnish with a floor; to knock down, defeat in fight or argument, as to *floor* an opponent.

flooring (flōr′ ing), *n.* material for floors.

flop (flop), *n.* the act or sound of coming down with a jerk or slap.

flop (flop), *v.i. and v.t.* to turn over with a jerky motion and come down with a slap, as the fish *flopped* in the boat; to cause to flop.

flora (flō′ ra), *n.* the plants of a region or period.

***floral** (flō′ ral), *adj.* pertaining to or like flowers.

florescence (flō res′ ens), *n.* the flowering of a plant; the state of being in bloom.

floriated (flō′ ri ā tēd), *adj.* ornamented with floral designs.

***floriculture** (flō′ ri kul tūr), *n.* the cultivation of ornamental flowering plants.

***florid** (flor′ id), *adj.* flowery, as *florid* speech; flushed, as a *florid* face.

***florist** (flōr′ ist), *n.* one who grows and sells flowers.

floss (flôs), *n.* waste fibers of silk; an untwisted, soft silk thread, used in embroidery.

flossy (flôs′ i), *adj.* like floss, downy, smooth and silky.

flotilla (flō til′ *a*), *n.* a small fleet, or a fleet of small vessels.

flotsam (flot′ sam), *n.* floating wreckage at sea.

flounce (flouns), *n.* a narrow strip of goods sewed to the bottom of a skirt and along one edge only, so as to spread; a deep ruffle; an impatient movement of the whole body.

flounce (flouns), *v.i. and v.t.* to move the bodv impatiently, as she *flounced* out of the room; to put a flounce on, as the dress was *flounced.*

flounder (floun′ dẽr), *n.* a flat-bodied sea fish.

flounder (floun′ dẽr), *v.i.* to struggle awkwardly or with futile effort, as in trying to extricate oneself from any difficult situation.

flour (flour), *n.* finely ground grain meal, particularly of wheat.

flourish (flûr′ ish), *n.* a fancy stroke, as with a pen; a waving motion, as with a wand; a threatening motion, as with a sword or stick; in music, a fanfare; any swaggering or challenging gesture.

flourish (flûr′ ish), *v.i. and v.t.* to prosper; to embellish; to brandish.

flout (flout), *n.* a jeer, insult.

flout (flout), *v.t.* to mock, treat contemptuously.

flow (flō), *n.* the motion of water, as in a stream; the measure of liquid passing through a certain channel in a set time.

flow (flō), *v.i.* to run or spread, as water; to rise, as the tide *flows.*

flower (flou′ ẽr), *n.* the bloom of a plant, the part that produces the seed; the best part of anything, as the *flower* of youth.

flower (flou′ ẽr), *v.i. and v.t.* to produce flowers or blooms, to blossom; to adorn with flowers or with a floral design.

fluctuate (fluk′ tū āt), *v.i.* to move, as a wave, go up and down or back and forth; to waver, vary, change.

Syn. Waver. To *fluctuate* is to move with irregular motion; to *waver* is to hesitate or falter. One's moods *fluctuate* from gay to sad; prices *fluctuate* between high or low; one *wavers* in purpose; courage *wavers.*

flue (flo͞o), *n.* a pipe or passage to carry off smoke.

fluency (flo͞o′ en si), *n.* readiness of speech; smooth, easy flow.

fluent (flo͞o′ ent), *adj.* flowing; easy; ready in the use of words, smooth as *fluent* writing.

fluff (fluf), *n.* a light down or the nap from cotton or fur.

fluffy (fluf′ i), *adj.* fluff-covered; light and downy.

***fluid** (flo͞o′ id), *n.* anything that flows, either a liquid or a gas.

fluidity (flo͞o id′ i ti), *n.* the quality of being fluid or flowing readily.

fluke (flo͞ok), *n.* the flat pointed end of an arm of an anchor; the somewhat similarly shaped part of a whale's tail; a flounder or flatfish.

flume (flo͞om), *n.* a channel, usually built of wood, to direct the flow of water down an incline.

***fluorescence** (flo͞o ō res′ ens), *n.* the quality, in some transparent substances, of colored luminosity, the special light thus produced.

***fluorine** (flo͞o′ ō ren), *n.* a gaseous element related to chlorine found in the mineral fluorite, which combines with all elements except oxygen.

***fluoroscope** (flo͞o′ ō rō skōp), *n.* an instrument for observing and showing fluorescence.

flurry (flûr′ i), *n.* a sudden stirring of the air; a sudden fall of rain or snow; any nervous flutter.

flurry (flûr′ i), *v.t.* to agitate, excite, confuse.

flush (flush), *n.* a sudden rush, as of water; a rush of blood into the face, a blush; vigor, as in the *flush* of life.

flush (flush), *v.i. and v.t.* to flow and spread freely; to blush, glow; to wash with a sudden spreading flow of water.

flush (flush), *adj.* level with a surface or brim; brimful; vigorous, full of life.

fluster (flus′ tẽr), *v.t.* to confuse, agitate.

flute (flo͞ot), *n.* a musical wind instrument; a decorative curved groove, as in architecture.

fluted (flo͞ot′ ed), *adj.* ornamented with series of grooves; clear and flutelike, as *fluted* sounds.

fluting (flo͞ot′ ing), *n.* in architecture, decoration with grooves.

flutter (flut′ ẽr), *n.* a quick and irregular movement, as of wings; a state of mental and nervous agitation.

flutter (flut′ ẽr), *v.i. and v.t.* to agitate the wings without flying; to make similar motions, as a flag in a light breeze; to be agitated and nervous; to flap rapidly, as to *flutter* the wings, *flutter* a handkerchief.

fluvial (flo͞o′ vi al), *adj.* pertaining to rivers; growing in or produced by a river.

flux (fluks), *n.* a continuous flowing or passing; a mixture that helps produce fusion, as lime is a *flux* in metallurgy.

fly (flī), *n.* [*pl.* flies] a two-winged insect of many varieties, especially the common housefly; canvas stretched over the top of a tent, like an extra roof; a flap on a garment covering a row of buttons; an artificial fly on a hook, used in fishing; the space over a stage from which scenery is handled; a flywheel.

fly (flī), *v.i. and v.t.* [*p.t.* flew, *p.p.* flown, *pr.p.* flying] to move through the air with wings, as a bird; to move through the air by means of any aircraft; to soar aloft, as a flag or kite; to wave or show, as to *fly* the colors; to flee from.

flying boat (flī′ ing bōt), a seaplane, capable of floating on water.

flying buttress (flī′ ing but′ res), an arched brace strengthening and supporting a part of a building.

flying fish (flī′ ing fish), a fish with side fins like wings, able to move some distance through the air over the water.

flying squirrel (flī′ ing skwûr′ el), a squirrel with membranes between the legs on each side, enabling it to make long leaps as if flying.

flyleaf (flī′ lēf), *n.* a blank leaf at the front of a book.

flywheel (flī′ hwēl), *n.* a heavy wheel in machinery to steady its motion.

foal (fōl), *n.* the young of any of the horse family, a colt or filly.

foam (fōm), *n.* the white froth formed on a liquid by agitation or fermentation.

foam (fōm), *v.i.* to form foam, effervesce frothily.

fob (fob), *n.* a small watch-pocket in men's trousers; a short ribbon or chain attached to a watch to hold a charm.

focal (fō′ kal), *adj.* pertaining to a focus.

focalize (fō′ kal īz), *v.t.* to bring to a focus.

focus (fō′ kus), *n.* [*pl.* focuses or foci] the point where rays of light, sound or heat come to a point after being refracted; the adjustment necessary in eyes or lenses to obtain clear vision; any central point of activity or attention.

focus (fō′ kus), *v.i. and v.t.* to center the vision upon; to bring to a focus; to set so as to form a perfectly clear image, as the lenses of eyeglasses, a telescope or a camera.

fodder (fod′ ẽr), *n.* coarse food for horses and cattle, as dried cornstalks.

foe (fō), *n.* an enemy, especially in war; an opponent, as a *foe* of democracy.

fog (fog), *n.* condensed water vapor in the air; a heavy mist; mental confusion.

fog (fog), *v.i. and v.t.* to become obscured as if with fog; to be or make misty.

fogbank (fog′ bangk), *n.* a dense mass of fog at sea.

foggy (fog′ i), *adj.* like fog; filled with fog; misty; mentally confused; indistinct.

fogy (fō′ gi), *n.* a dull, old-fashioned, superconservative person.

foible (foi′ bl), *n.* a minor weakness of character.

foil (foil), *n.* a contrast, to set something off to advantage; metal hammered out into thin leaves, as gold *foil,* tin *foil;* a long thrusting weapon without point, used in fencing for sport.

foil (foil), *v.t.* to frustrate, baffle.

foist (foist), *v.t.* to pass off as genuine (that which is not genuine).

fold (fōld), *n.* a doubling over, as of cloth; an enclosed yard for sheep; the sheep in a fold.

fold (fōld), *v.i. and v.t.* to form a fold, double over or form in folds; to enclose sheep in a yard.

folder (fōl′ dẽr), *n.* one who or that which folds; a heavy sheet of paper folded so as to hold lighter sheets; a circular with several leaves that are not stitched or bound.

***foliaceous** (fō li ā′ shus), *adj.* having leaves, or like a leaf or leaves.

***foliage** (fō′ li ij), *n.* leafage; the whole leaf system of a plant or tree.

foliation (fō li ā′ shun), *n.* the act of forming leaves or of forming a substance into leaves.

folio (fō′ li ō), *n.* a sheet of paper folded over once; a book of the largest size, composed of sheets of paper folded only once, having 4 pages to a sheet; a leaf in a book or manuscript.

folk (fōk), *n.* a group of kindred people, a tribe or nation; that great group of people within a nation that preserves its language and culture; the common people of any nation: *folks,* the plural, relations, family, people—a colloquial use, as the old *folks* at home.

folklore (fōk′ lōr), *n.* all the accumulated traditions, culture, beliefs, tales and learning of a people.

folk song (fōk′ sông), a song created by and traditional among the common people.

follow (fol′ ō), *v.i. and v.t.* to go or come after in time or distance, as May *follows* April, the pup *follows* his master; to spring from, as sickness *follows* exposure; to accept and apply, as to *follow* advice.

Syn. Succeed, ensue. Either persons or things may *follow* or *succeed;* only things or ideas *ensue.* To *follow,* as said of persons, is to go in order, one after another; to *succeed* is to be in the same place as another after he has left it. To *ensue* is to follow as a result.

Ant. Lead, precede.

following (fol′ ō ing), *n.* a body of followers or dependents.

folly (fol′ i),*n.* [*pl.* follies] foolishness; lightmindedness; reckless action.

foment (fō ment′), *v.t.* to apply a warm lotion to, bathe with hot water; to stir up, incite, as to *foment* civic disorders.

fond (fond), *adj.* affectionate; foolishly doting.

fond (fo*n*′), *n.* foundation, background. base, especially the main material of a cooked dish.

fondle (fon′ dl), *v.t.* to caress.

***font** (font), *n.* a stone receptacle holding the water used in baptizing; any fountain, spring or source.

food (fo͞od), *n.* nutriment; solid edibles, as distinguished from liquids; anything that nourishes or strengthens.

fool (fo͞ol), *n.* a person who lacks judgment; a simpleton; a professional buffoon or jester.

fool (fo͞ol), *v.i. and v.t.* to act like a fool; to deceive.

foolhardy (fo͞ol′ här di), *adj.* having courage without judgment; recklessly bold.

Syn. Adventurous, rash. The *foolhardy* man ventures because of his foolish recklessness; the *adventurous* man ventures for the love of daring and thrill; the *rash* man ventures without stopping to think.

Ant. Cautious, wary.

foolproof (fool′ pro͞of), *adj.* strong enough and simple enough to be handled or operated by a fool without damage or hindrance.

foolscap (fo͞olz′ kap), *n.* paper measuring 13 or 14 by 16 or 17 inches.

fool's paradise (fo͞olz par′ *a* dis), a state of pleasure built on false expectations.

foot (foot), *n.* [*pl.* feet] the end part of the leg, on which an animal stands; that which covers the foot, as the *foot* of a sock; that on which anything stands, as the *foot* of a chair; the end opposite the top, as the *foot* of a mountain; a unit of measure equal to 12 inches; a certain group of syllables, the unit of meter, within a line of verse.

foot (foot), *v.i. and v.t.* to tread or dance to music; to go by foot, as to *foot* it; to dance through, as to *foot* a measure; to sum up, as the numbers in a column.

footage (foot′ ij), *n.* length expressed in feet, as the *footage* of a fence.

football (foot′ bôl), *n.* an inflated ball, to be kicked in play; a field game played by two teams of 11 men each in which one side scores by kicking or carrying the ball across the opponents' goal line.

footboard (foot′ bōrd), *n.* a plank to stand on; a board at the end of a bed opposite the headboard.

footfall (foot′ fôl), *n.* the sound of a footstep.

footgear (foot′ gẽr), *n.* shoes, stockings, boots, slippers, rubbers.

foothold (foot′ hōld), *n.* a hold for the feet, a solid footing.

footing (foot′ ing), *n.* ground or support for the feet, as an uncertain *footing,* a foothold; a relationship, as a friendly *footing.*

footman (foot′ man), *n.* [*pl.* footmen] a liveried servant who attends a carriage or assists a butler.

footpad (foot′ pad), *n.* a highwayman afoot.

foot-pound (foot′ pound′), *n.* the amount of power needed to raise a weight of 1 pound 1 foot.

footstep (foot′ step), *n.* the sound of a footfall; a tread; the track of a foot, a footprint.

footstool (foot′ stōōl), *n.* a stool on which to rest the feet.

footworn (foot′ wōrn), *adj.* tired from standing or walking.

foozle (fōō′ zl), *v.t. and v.i.* to bungle, mismanage.

fop (fop), *n.* a dandy.

for (fôr), *prep.* instead of, in place of, as Tom recited *for* John; on account of, in behalf of, as do it *for* me; to the extent of in space or time, as to walk *for* a mile, study *for* an hour; as being, as I took him *for* you; at the price of, as to sell *for* $5; suited to, as medicine *for* a cold; because of, as he could not talk *for* laughing; by the lack of, as to be embarrassed *for* funds; in support of, as cheer *for* our side; in spite of, as she can't sing, *for* all her efforts; considering, as tall *for* his age; intended or intending to reach or win, as to leave *for* Boston, try *for* a prize.

for (fôr), *conj.* because, since.

forage (for′ ij), *n.* food for horses and cattle.

forage (for′ ij), *v.i.* to hunt for provisions.

foray (for′ ā), *n.* a sudden raid for spoils, as in war.

foray (for′ ā), *v.i.* to ravage for spoils, pillage, make a raid in war.

forbear (fôr bâr′), *v.i. and v.t.* [*p.t.* forbore, *p.p.* forborne, *pr.p.* forbearing] to refrain, hold back; to do without.

forbearance (fôr bâr′ ans), *n.* the act of forbearing; use of patience.

forbid (fôr bid′), *v.t.* [*p.t.* forbade, *p.p.* forbidden, *pr.p.* forbidding] to prohibit.

forbidding (fôr bid′ ing), *adj.* repellent, disagreeable; repelling approach.

force (fōrs), *n.* strength, power; use of strength or power; violence; a body of men in readiness for action, as the fire-fighting *force;* the cause that changes bodies from a state of rest to motion or from motion to rest.

Syn. Violence. *Force* is a general term and means any physical power, as used in persons or things; *violence* is undue or unjust force, often accompanied by injury.

forceps (fôr′ seps), *n.* [*pl.* forceps] a pair of pincers used in surgical operations and by dentists or watchmakers.

forcible (fōr′ si bl), *adj.* brought about by using force or violence; characterized by physical or mental power, as a *forcible* personality.

ford (fōrd), *n.* a shallow place in a stream where it may be crossed.

ford (fōrd), *v.t.* to cross, as a stream at a shallow or passable place.

fore (fōr), *n.* the front, the front part.

fore-and-aft *adj.* lengthwise of a vessel, as *fore-and-aft* sails.

forearm (fōr′ ärm), *n.* the part of the arm between wrist and elbow.

***forebode** (fōr bōd′), *v.t.* to foretell, presage; to expect misfortune.

forecast (fōr′ kȧst), *n.* a prediction or prophecy; prevision, foresight.

***forecast** (fōr kȧst′), *v.t.* to predict, as to *forecast* the weather.

***forecastle** (fōk′ sl), *n.* the part of a ship's upper deck forward of the foremast, where the crew has its living quarters.

foreclose (fōr klōz′), *v.t.* to call for payment, as a mortgage when due, and cut off the further right of redemption.

foreclosure (fōr klō′ zher), *n.* legal proceedings to end a mortgagor's right to redeem a mortgaged property.

forefather (fōr′ fäth ēr), *n.* an ancestor.

***forehead** (for′ ed), *n.* the part of the face between the eyes and the hairline.

foreign (for′ in), *adj.* situated or belonging outside of one's own country, as a *foreign* city; alien, not belonging to, as *foreign* to the argument; not normally or organically related, as a cinder is a *foreign* body in the eye.

forelock (fōr′ lok), *n.* a lock of hair growing on the front part of the head.

foreman (fōr′ man), *n.* the head man of a shop; spokesman of a jury.

foremost (fōr′ most), *adj.* chief.

forensic (fō ren′ sik), *adj.* having to do with courts of law or with public debate; rhetorical.

foresight (fōr′ sīt), *n.* the act or power of foreseeing; care for the future.

forest (fōr′ est), *n.* trees growing densely over a large area.

forestall (fōr stôl′), *v.t.* to obstruct, hinder or prevent by something done or said in advance; to get ahead of, outguess and outdo.

forestry (for′ est ri), *n.* the science and art of cultivating and caring for forests.

foretaste (fōr′ tāst), *n,* anticipation.

foretell (fōr tel′), *v.t.* to predict, phophesy.

Syn. Prophesy, forecast, prognosticate. One may *foretell* coming events without being able to *prophesy* the future. One *foretells* by a simple calculation; to *prophesy* is to foretell by supernatural revelation; to *forecast* is really to guess ahead rather than to know what will happen; to *prognosticate* is to foretell from symptoms; it is an act of the understanding; a physician *prognosticates* the crisis of a disorder through scientific knowledge.

forethought (fōr′ thôt), *n.* thinking beforehand, prudence.

forever (for ev′ ēr), *adv.* eternally; incessantly.

foreword (fōr′ wûrd), *n.* a word spoken ahead of time; a preface to a book.

***forfeit** (fôr′ fit), *n.* a fine or penalty; that which is forfeited or lost through offense, neglect or failure.

forfeit (fôr′ fit), *v.t.* to lose through offense, neglect or failure.

forge (fôrj), *n.* a furnace or a place with a furnace where metals are shaped by heating and hammering on an anvil; a smithy.

forge (fôrj), *v.t.* to shape by heating and hammering; to imitate falsely, especially to counterfeit, as a signature.

forgery (fôr′ jer i), *n.* the crime of altering or counterfeiting written papers especially signatures.

forget (for get′), *v.i. and v.t.* [*p.t.* forgot, *p.p.* forgotten, *pr.p.* forgetting] to be unable to recall to mind; to fail to hold in memory.

forgetful (for get′ fool), *adj.* of poor memory, heedless.

forget-me-not (for get′ mē not), *n.* a perennial plant with small bright blue flowers.

forgivable (for giv′ *a* bl), *adj.* easily forgiven.

forgive (for giv′), *v.t.* [*p.t.* forgave, *p.p.* forgiven, *pr.p.* forgiving] to pardon, as to *forgive* an enemy; to cease to feel resentment for, as to *forgive* an offense.

Syn. Pardon, condone. Individuals *forgive* each other personal offenses; we *pardon* offenses against law and morals. To *condone* is to forgive without comment, overlook as unimportant.

forgo (for gō′), *v.t. and v.i.* to do without, give up; refrain, forebear.

fork (fôrk), *n.* an implement with prongs or tines, for use in eating, digging, pitching hay; a branch in a stream or road where it divides into two or more separate streams or roads; a crotch in a tree from which branches grow in different directions.

fork (fôrk), *v.i. and v.t.* to break into separate branches, as a road *forks;* to raise, throw or dig with a fork.

forked (fôrkt), *adj.* branching; shaped like a fork.

forlorn (for lorn′), *adj.* deserted, forsaken, alone; wretched.

form (fôrm), *n.* the shape, figure or structure of a thing; a variety or kind, as seaweed is a *form* of algae; a conventional standard of conduct or ritual; a mold in which a substance is shaped, as a *form* for butter.

form (fôrm), *v.i. and v.t.* to take form, arise; to give form to; to develop, as to *form* a friendship; to make up, comprise, as oxygen and hydrogen *form* water.

Syn. Fashion, mold, shape. A thing is *fashioned* when it is *formed* in some particular way. God *formed* man out of the dust; He *fashioned* him after His own image. A thing is *molded* when it is shaped to a pattern. It is *shaped* in a way that makes it visibly different from other things.

formal (fôr′ mal), *adj.* according to fixed forms and rules; stiffly conventional.

***formaldehyde** (fôr mal′ dē hīd), *n.* a gas obtained by the partial combustion of methanol, used as a disinfectant.

formality (fôr mal′ i ti), *n.* strict observance of rule; precise conventionality.

formation (fôr mā′ shun), *n.* the process of shaping; that which is shaped or formed.

formative (fôr′ m*a* tiv), *adj.* giving form or shape to, plastic, as childhood is a *formative* period.

former (fôr′ mēr), *adj.* earlier; preceding; foregoing.

formerly (fôr′ mēr li), *adv.* in earlier times, previously.

***formidable** (fôr′ mi d*a* bl), *adj.* alarming; forbidding; awe inspiring; unapproachable.

form letter (fôrm let′ ēr), a general letter written to send unchanged to numerous individuals whose names are on a list.

formula (fôr′ mū l*a*), *n.* a definite set of words used in a ceremony; any set form, method or established rule; a general mathematical rule expressed in symbols.

formulate (fôr′ mū lāt), *v.t.* to reduce to or express in a formula; to state definitely, as to *formulate* an idea.

forsake (for sāk′), *v.t.* to abandon; give up; desert.

forsaken (for sāk′ n), *adj.* abandoned; deserted; forlorn.

fort (fōrt), *n.* an enclosed, strengthened place, armed for defense.

forte (fōrt), *n.* a special talent or strong point.

forth (fōrth), *adv.* onward in time, place or order of occurrence; out, as to send *forth* a messenger.

forthcoming (fōrth kum′ ing), *adj.* about to appear.

***forthwith** (fōrth wi*th*′), *adv.* immediately, at once.

fortieth (fôr′ ti eth), *n.* one of 40 equal parts.

fortieth (fôr′ ti eth), *adj.* next in order after the thirty-ninth.

fortification (fôr ti fi kā′ shun), *n.* the act of building defensive works; a place strengthened for military defense, a fort.

fortify (fôr′ ti fī), *v.t.* to strengthen against attack; to invigorate; to encourage.

fortitude (fôr′ ti tūd), *n.* spiritual strength for the endurance of hardships, courageous endurance.

***fortnight** (fôrt′ nīt), *n.* two weeks, 14 days.

fortress (fôr′ tres), *n.* a place permanently fortified for defense.

fortuitous (fôr tū′ i tus), *adj.* happening by chance.

fortuity (fôr tū i ti), *n.* [*pl.* fortuities] an accidental occurrence.

***fortunate** (fôr′ tū nit), *adj.* happening by good luck; favored by fortune, lucky.

***fortune** (fôr′ tūn), *n.* the things, good or bad, that happen to one; chance, luck.

forty (fôr′ ti), *n.* one more than 39.

forum (fō′ rum), *n.* [*pl.* forums] a public meeting place; tribunal; a public meeting at which topics of interest are discussed by leaders and audience.

forward (fôr′ wērd), *adj.* of or near the front; eager, also bold.

forward (fôr′ wērd), *adv.* onward, as to go *forward.*

fossil (fos′ il), *n.* any trace of a prehistoric animal or plant preserved in the earth or in rocks; an old fogy.

foster (fôs′ tēr), *v.t.* to nourish, cherish, sustain.

Syn. Cherish, harbor. To *foster* is to keep with care and promote the welfare of; to *cherish* is to hold dear; to *harbor* is to give shelter to, especially the mind, as he *harbors* resentment.

Ant. Deaden, kill.

foster child (fôs′ tēr chīld), a child reared by one who is not its parent.

foul (foul), *n.* a blow or a play in a game that is not fair.

foul (foul), *v.t. and v.i.* to make dirty; to make an unfair play; to become entangled, as a rope.

foul (foul), *adj.* offensive; dirty; impure; tangled, as a rope.

*__foulard__ (fo͞o lärd′), *n.* a light silk fabric with satin finish.

found (found), *v.t.* to establish, as to *found* a colony or a university; to cast, or melt and mold, metals.

foundation (foun dā′ shun), *n.* that on which a structure rests, as the masonry supporting the walls of a house; a fund to support an institution; endowment; the premise on which a structure of argument rests.

Syn. Base, basis. *Foundation* means the solid groundwork supporting anything, as the *foundation* of a building, a system of government or an argument. *Base* is a material word; it is the bottom upon which anything stands, as the *base* of a column or a monument; *basis* is used figuratively to mean that on which anything is built up, as a rumor may have no *basis,* experiment is the *basis* of scientific knowledge.

founder (foun′ dẽr), *n.* one who establishes something; one who founds or casts metals.

founder (foun′ dẽr), *v.i.* to stumble and go lame, as a horse; to fill and sink, as a ship.

foundling (found′ ling), *n.* a child found after being deserted by its parents.

foundry (foun′ dri), *n.* [*pl.* foundries] a mill where metals are cast.

fount (fount), *n.* a fountain; a spring; source.

fountain (foun′ tin), *n.* an artificial, usually ornamental, jet or spray of water.

fountain pen (foun′ tin pen), a pen with a reservoir for ink in the holder.

four (fōr), *n.* the sum of three and one.

fourfold (fōr′ fōld), *adj.* consisting of four parts; four times as much as a given quantity.

four-cycle (fōr sī′ kl), in an internal combustion engine, a cycle of four strokes, intake, compression, explosion and exhaust, in two revolutions of the crank shaft.

fourscore (fōr′ skōr), *adj.* eighty, four times 20.

fourteen (fōr tēn′), *n.* the sum of 13 and one.

fourth (fōrth), *n.* one of four equal parts.

fourth (fōrth), *adj.* next after the third.

four-way (fōr′ wā), *adj.* permitting passage of water or electric current any one of four different ways, as a *four-way* valve.

fowl (foul), *n.* [*pl.* fowl] a large edible bird, either game or domestic, as the ordinary chicken; the flesh of the domestic chicken used as food, especially the meat of the mature chicken.

fox (foks), *n.* a wild animal of the dog family, sly and crafty, smaller than a wolf.

fox terrier (foks ter′ i ẽr), a small, active dog bred for use in hunting foxes.

foxy (fok′ si), *adj.* like a fox, wily.

*__foyer__ (fwä yā′), *n.* the lobby of a theatre.

*__fracas__ (frā′ kas), *n.* a noisy quarrel, a brawl.

fraction (frak′ shun), *n.* a part broken off, a fragment; a part of a unit; one or more of a specified number of equal parts of a whole, as one-fifth, three-eighths are *fractions.*

fractious (frak′ shus), *adj.* unruly, irritable.

fracture (frak′ tūr), *n.* a break, as of a bone.

fracture (frak′ tūr), *v.t.* to break, as a bone.

*__fragile__ (fraj′ il), *adj.* easily broken.

Syn. Frail, brittle. *Fragile* means so delicately made as to be easily broken, marred or destroyed, as a *fragile* piece of glassware, a fragile flower; *frail* means weak; *brittle* means easily snapped.

Ant. Hard, strong, tough.

*__fragment__ (frag′ ment), *n.* a part detached, as by breaking, from the whole.

fragmentary (frag′ men ter i), *adj.* composed of pieces broken off; incomplete, lacking some parts.

fragrance (frā′ grans), *n.* sweetness of smell; a sweet odor.

fragrant (frā′ grant), *adj.* sweet-smelling.

frail (frāl), *adj.* weak, physically or morally.

frame (frām), *n.* a structure composed of fitted parts; an open case in which something is hung, as a door *frame,* a picture *frame;* a state, condition or disposition, a mood, as a gay *frame* of mind.

frame (frām), *v.t.* to shape, fashion; compose, plan, as to *frame* a constitution; to express, as to *frame* a sentence; to provide with or enclose in a frame, as to *frame* pictures; to be a surrounding edge or frame for, as trees *frame* the view.

framework (frām′ wûrk), *n.* the frame that encloses or supports anything; the structure about which a more complete structure is to be built.

franc (frangk), *n.* a silver coin, the French monetary unit.

*__franchise__ (fran′ chīz), *n.* a constitutional right, especially the right to vote; a particular right or privilege granted by a government to an individual or a corporation, as a street car *franchise.*

frank (frangk), *n.* the identifying mark on a telegram, or package that is to go free of postage or charge.

frank (frangk), *v.t.* to send at public expense, as the mail of a Congressman.

frank (frangk), *adj.* outspoken; candid; ingenuous.

*__frankincense__ (frangk′ in sens), *n.* a fragrant resin burned as incense.

frankness (frangk′ nes), *n.* candor.

frantic (fran′ tik), *n.* distracted, frenzied.

*__frappé__ (frȧ pā), *adj.* chilled with crushed ice; frozen.

*__fraternal__ (frȧ tûr′ nal), *adj.* brotherly, as a *fraternal* greeting; designating a group of men bound together as brothers, as a *fraternal* society.

fraternity (frȧ tûr′ ni ti), *n.* brotherhood, actual or in a formal association, as a college *fraternity.*

*__fraternize__ (frat′ ẽr nīz), *v.i.* to associate together in brotherly or friendly fashion.

*__fratricide__ (frat′ ri sīd), *n.* the crime of killing one's brother; one who kills his brother.

fraud (frôd), *n.* deliberate deceit; deception planned and executed with intent to deprive another of property or rights.

fraudulent (frôd′ ū lent), *adj.* characterized by cheating and deceit; obtained by dishonest means.

fraught (frôt), *adj.* laden, charged, freighted.

fray (frā), *n.* a fight, a turbulent commotion.

fray (frā), *v.i. and v.t.* to wear by rubbing; to ravel.

freak (frēk), *n.* a whim, caprice; an abnormal animal or plant.

freakish (frēk′ ish), *adj.* whimsical, capricious; queer, abnormal.

freckle (frek′ l), *n.* a brownish spot on the skin, caused by exposure to the sun.

freckle (frek′ l), *v.t. and v.i.* to mark with freckles; to become freckled.

free (frē), *v.t.* to set at liberty; disengage of fastenings or entanglements.

free (frē), *adj.* [*comp.* freer, *superl.* freest] not subject to restraint; at liberty; independent; self-deciding; without obstruction; without charge.

freebooter (frē′ bo͞ot ẽr), *n.* one who goes about plundering and pillaging; a pirate.

freeborn (frē′ bôrn), *adj.* not born in bondage or slavery.

freedman (frēd′ man), *n.* [*pl.* freedmen] one who has been emancipated from slavery.

freedom (frē′ dum), *n.* the state of being free; independence; liberty; lack of restraint; abuse of familiarity.

Syn. Liberty. *Freedom* means absence of restraint; *liberty* is freedom from previous restraint; we value our *freedom* of speech in America; prisoners are set at *liberty.*

Ant. Captivity, bondage, slavery.

freedwoman (frēd′ woom an), *n.* a woman who has been emancipated from slavery.

free lance (frē lȧns), a writer who finds his own market for his product; one who acts on his own responsibility.

freeman (frē′ man), *n.* [*pl.* freemen] one who has political and civil liberty; a citizen.

Freemasonry (frē mā sn ri), *n.* the principles and fellowship of the secret societies called *Masons;* (*without cap.*) natural friendliness and mutual understanding.

free port (frē pōrt), a port where the goods of all nations are admitted without duty or reshipped free of duty.

freethinker (frē thingk′ ẽr), *n.* one who refuses to accept dictated beliefs or formal creeds; an agnostic.

free trade (frē trād), commerce unrestricted by tariffs or customs duties.

free verse (frē vûrs), verse with irregular rhythms and little rhyme and not using the old conventional forms.

free will (frē wil′), the doctrine that man is free to exercise his will for good or evil.

freewill (frē wil′), *adj.* voluntary, as a *freewill* offering.

freeze (frēz), *v.i. and v.t.* [*p.t.* froze, *p.p.* frozen, *pr.p.* freezing] to be hardened or solidified into ice, congeal, as water *freezes;* to die with cold; to be stiff and formal; to form into ice or a congealed solid, as winter *freezes* a pond, we *freeze* ice cream; to kill with cold, as a plant; to repel with formality.

freezing point (frēz′ ing point), the temperature, zero centigrade, 32° above zero Fahrenheit, at which water becomes ice; the solidifying temperature of any other liquid.

freight (frāt), *n.* goods carried in bulk by ship, train or truck, cargo; the charge for such conveyance; a freight train.

freight (frāt), *v.i. and v.t.* to ship by freight; to load with goods for transportation.

frenzy (fren′ zi), *n.* [*pl.* frenzies] violent agitation of the mind; delirious emotion; madness.

frequency (frē′ kwen si), *n.* [*pl.* frequencies] the repeated occurrence of anything at brief intervals; the number of repeated operations of a mechanical part in a unit of time, as in vibration or revolution; the number of cycles per second produced by the generator of an alternating electric current.

frequent (frē′ kwent), *adj.* happening repeatedly at short intervals.

*__frequent__ (frē kwent′), *v.t.* to visit often or habitually.

Syn. Haunt. To *frequent* is to visit or be in often and habitually, as a man may *frequent* a club or restaurant; to *haunt* is to visit continually and persistently, as a beggar *haunts* a rich man's door.

fresco (fres′ kō), *n.* [*pl.* frescos or frescoes.] a painting in water colors done on fresh plaster or on any plaster.

fresh (fresh), *adj.* new, recent; not previously used; unfaded, as *fresh* roses; in good condition, not stale, as *fresh* fish; clearly remembered, as a *fresh* impression; pure and cool, as air; not salt; brisk, strong, as a breeze.

freshen (fresh′ en), *v.i. and v.t.* to become brighter or fresher in appearance; to become stronger, as the wind freshens; to refresh, revive.

freshet (fresh′ et), *n.* any sudden flood, especially one caused by melting snow.

freshman (fresh′ man), *n.* [*pl.* freshmen] a first-year student in high school or college.

fret (fret), *v.i. and v.t.* to be fussily irritated; to injure by rubbing, corrode; to tease, irritate.

fretwork (fret′ wûrk), *n.* elaborate ornamental openwork.

friable (frī′ *a* bl), *adj.* easily crumbled or reduced to a powder.

friar (frī′ ẽr), *n.* a man belonging to a religious order, especially a mendicant order.

*__fricassee__ (frik *a* sē′), *n.* a dish of meat, as chicken, cut into small pieces and stewed in gravy.

friction (frik′ shun), *n.* the act of rubbing; resistance of one surface to the motion of another surface rubbing over it; irritation caused by difference in views.

friend (frend), *n.* a person to whom one is attached by affection; an intimate acquaintance; one well inclined toward a cause, as a *friend* of democracy.

friendly (frend′ li), *adj.* like a friend; affable and amicable, as a *friendly* manner.

friendship (frend′ ship), *n.* intimacy and mutual attachment; a friendly relationship, especially one of long standing.

***frieze** (frēz), *n.* the middle part of an entablature, between the architrave and the cornice, usually ornamented with sculpture; a coarse woolen cloth.

frigate (frig′ it), *n.* a three-masted, square-rigged sailing vessel equipped for war, not in use since 1870.

fright (frīt), *n.* a state of sudden fear; alarm; anything that causes sudden fear; an ugly or displeasing appearance.

frighten (frīt′ n), *v.t.* to terrify, alarm.

Syn. Intimidate, scare. The danger that is sudden and unexpected *frightens;* to *intimidate* is to hinder by a show of violence; *scare* is a colloquial word for *frighten.*

frightful (frīt′ fool), *adj.* terrible, alarming, shocking.

frigid (frij′ id), *adj.* excessively cold; lacking friendliness, stiffly formal.

frill (fril), *n.* a plaited or crimped edging to a garment; *frills,* showy but useless mannerisms or adornments.

frilling (fril′ ing), *n.* gathered trimming or edging for garments.

fringe (frinj), *n.* an ornamental border of loose threads or cords; any border or edge resembling fringe, as a *fringe* of woods.

frippery (frip′ ẽr i), *n.* [*pl.* fripperies] cheap, tawdry ornament.

frisk (frisk), *v.i.* to gambol or dance in frolic.

frisky (frisk′ i), *adj.* lively, frolicsome.

***frith** (frith), *n.* a bay, a firth.

fritter (frit′ ẽr), *n.* a small cake made of batter and fried in deep fat.

fritter (frit′ ẽr), *v.t.* to waste, scatter.

frivolity (fri vol′ i ti), *n.* [*pl.* frivolities] levity; a trifling act or thought.

frivolous (friv′ ō lus), *adj.* trifling, trivial; not serious, given to undue levity.

frizz (friz), *n.* something frizzed, as hair.

frizz (friz), *v.i. and v.t.* to curl or crisp, as hair; to form into tiny burs, as the nap of cloth.

frizzle (friz′ l), *v.i. and v.t.* to cook with a sputtering sound; to curl tightly, as hair.

fro (frō), *adv.* away from, back, as *to and fro.*

frock (frok), *n.* the loose garment worn by monks and friars; a dress or gown; a frock coat.

frock coat (frok kōt), a straight-bodied coat for men reaching to the knees.

frog (frog), *n.* a small amphibious animal, web-footed and tailless; the tender pad in the middle of a horse's hoof; an oblong covered button fastening into a loop of cord; the plate that guides the wheels of railroad cars where tracks cross, as in a switch.

frolic (frol′ ik), *n.* merrymaking; a prank.

frolic (frol′ ik), *v.i.* [*p.t.* and *p.p.* frolicked, *pr.p.* frolicking] to play pranks; to make merry.

from (from), *prep.* forth, out of as a starting point, as to go *from* Chicago to Boston, come *from* the north, a mile *from* here; out of as an origin or source, as to come *from* a royal family, translated *from* the Latin; on account of, with, as dying *from* thirst.

***frond** (frond), *n.* the leaf of a fern, palm or seaweed; a leaflike growth not separated into stem and leaf.

front (frunt), *n.* the fore part of anything, as a building; the field of operation in war; a shirt.

front (frunt), *v.i. and v.t.* to face; to face toward; to confront.

front (frunt), *adj.* pertaining to or situated at the fore part of anything, as a *front* door.

frontage (frunt′ ij), *n.* extent of front, as of a plot of land along a street, road or river.

***frontal** (frun′ tal), *n.* a decorative covering for the front of an altar; an ornament on the forehead.

***frontal** (frun′ tal), *adj.* pertaining to the front especially to the forehead.

***frontier** (frun tẽr′), *n.* the border of a country toward another country or toward an unsettled region.

***frontispiece** (frun′ tis pēs), *n.* an illustration facing the title page of a book.

frost (frôst), *n.* frozen dew; minute frozen particles of moisture on a surface; a temperature that causes freezing.

frost (frôst), *v.t.* to form frost on; to give the appearance of frost; to injure or kill, as a plant, by frost.

frosted (frôst′ ed), *adj.* covered with frost or with something that looks like frost; injured or killed by frost.

frosting (frôst′ ing), *n.* a preparation, as of fine sugar and beaten white of egg, spread over a cake; a certain finish of metal or glass without luster.

***froth** (frôth), *n.* the foamy mass of bubbles formed on the surface of a liquid by agitation or fermentation.

frothy (frôth′ i), *adj.* [*comp.* frothier, *superl.* frothiest] having froth, foamy; light, frivolous, unsubstantial.

froward (frō′ wẽrd), *adj.* wilful, wayward, obstinate.

frown (froun), *n.* a contraction of the brow or wrinkling of the forehead, as in doubt, deep thought or anger, a scowl.

frown (froun), *v.i.* to contract the brows sternly, scowl; to regard with disapproval, as to *frown* upon frivolity.

frowzy (frouz′ i), *adj.* untidy.

frozen (frō′ zn), *adj.* excessively cold; transformed into ice, congealed.

***fructify** (fruk′ ti fī), *v.i. and v.t.* to bear fruit; to make fruitful.

***frugal** (fro͞o′ gal), *adj.* thrifty, economical, saving.

frugality (fro͞o gal′ i ti), *n.* thrift, economy, providence.

Syn. Economy, miserliness, parsimony. *Frugality* is the opposite of wastefulness; *economy* is a wise and careful management of one's resources; *parsimony* is excessive economy; *miserliness* is the denial of ordinary comforts for the sake of hoarding.

fruit (fro͞ot), *n.* any product of a plant useful to man, as cotton or vegetables; a seed or seeds and the surrounding envelope, as a walnut or a bean pod, especially the edible pulp around a seed or seeds, as of an apple; any result, as the *fruits* of toil, the *fruits* of laziness.

fruitful (fro͞ot′ fool), *adj.* prolific; producing results.

fruition (fro͞o ish′ un), *n.* the bearing of fruit; realization, as of a plan or enterprise.

frustrate (frus′ trāt), *v.t.* to baffle; to defeat in a purpose; to prevent from accomplishing.

frustum (frus′ tum), *n.* [*pl.* frustums or frusta] the part of a cone or pyramid left when the top is truncated or cut off.

fry (frī), *v.t.* [*p.t.* and *p.p.* fried, *pr.p.* frying] to cook in hot fat in a pan.

fuchsia (fū′ sh*a*), *n.* a garden plant of the evening-primrose family, with drooping flowers.

fuel (fū′ el), *n.* combustible material to feed a fire, as coal, wood or oil; anything that starts or sustains the fires of passion.

fugitive (fū′ ji tiv), *n.* one who flees from danger or the law.

fugitive (fū′ ji tiv), *adj.* fleeing, as from danger; not fixed, temporary, evanescent.

fugue (fūg), *n.* a musical form combining several themes.

***fulcrum** (ful′ krum), *n.* [*pl.* fulcrums or fulcra] the point on which a lever turns.

fulfill (fool fil′), *v.t.* to carry to completion, as a plan; to keep, as a promise; to realize, as a purpose.

fulfillment (fool fil′ ment), *n.* accomplishment; completion.

full (fool), *n.* the highest measure, as the *full* of the moon, I enjoyed it to the *full.*

full (fool), *v.t.* to thicken, as cloth, by damping, heating and pressing; to scour and thicken in a mill.

full (fool), *adj.* filled; having no empty space; complete, as a *full* load, a *full* moon; deep and strong, as a *full* tone.

full (fool), *adv.* entirely; completely, as *full*-fledged; very, as *full* often.

full dress (fool dres), the costume required for formal or ceremonial occasions.

fuller (fool′ ẽr), *n.* one who fulls cloth in a mill.

fuller's earth (fool′ erz ûrth), a soft clay used to take dirt and grease out of wool and to scour other materials.

full fashioned (fool fash′ und), made to conform to the bodily shape: said of hosiery and underwear.

fulminate (ful′ mi nāt), *n.* a detonating salt of fulminic acid.

fulminate (ful′ mi nāt), *v.i. and v.t.* to detonate; to thunder; to issue forth, as decrees or orders, with threats.

fulminous (ful′ mi nus), *adj.* resembling thunder and lightning.

***fulsome** (fool′ sum), *adj.* extravagant; elaborate; insincere; as, *fulsome* compliments.

fumble (fum′ bl), *v.i. and v.t.* to grope about awkwardly; to handle awkwardly.

***fume** (fūm), *n.* vapor or smoke, as the *fumes* of incense; a stifling smoke or gaseous substance, as the *fumes* of formaldehyde.

fume (fūm), *v.i.* to fuss and fret; to give forth smoke or vapor.

fumigate (fū′ mi gāt), *v.t.* to disinfect by the action of smoke or vapor.

fun (fun), *n.* sport, mirth, amusement, play.

function (fungk′ shun), *n.* normal and characteristic action, as the *function* of the liver; special purpose or duty, as the *functions* of a judge.

function (fungk′ shun), *v.i.* to fulfill a normal activity, work normally; to perform the the duty of an office.

functionary (fungk′ shun er i), *n. pl.* functionaries one charged with certain official duties.

fund (fund), *n.* money set apart for some special purpose; an accumulation or store, a supply: *funds,* money available for use.

fundamental (fun d*a* men′ tal), *n.* a principle used as the basis of a system, a law; an essential part.

fundamental (fun d*a* men′ tal), *adj.* pertaining to a foundation or basis; essential; elementary.

fundamentalism (fun d*a* men′ tal izm), *n.* a religious movement emphasizing certain historical beliefs as fundamental and opposing modernism.

***funeral** (fū′ nẽr al), *n.* the ceremony of burying the dead, with a procession of mourners.

funereal (fū nẽr′ e al), *adj.* pertaining to or suitable for a funeral; sad; mournful.

***fungous** (fung′ gus), *adj.* like a fungus.

***fungus** (fung′ gus), *n.* [*pl.* funguses or fungi] a plant growth that reproduces by spores, as molds, mildews, rusts, mushrooms.

funnel (fun′ el), *n.* a wide-mouthed conical vessel terminating in a spout for pouring liquids; the chimney of a steamship or steam engine.

funny (fun′ i), *adj.* [*comp.* funnier, *superl.* funniest] laughable, amusing, comical.

funny bone (fun′ i bōn), the point of the elbow over which passes a nerve that tingles when struck.

fur (fûr), *n.* the soft thick hair of certain animals; a furry hide dressed for use in clothing.

furbelow (fûr′ bē lō), *n.* a flounce on a woman's dress; any fancy or fussy adornment.

furbish (fûr′ bish), *v.t.* to brighten by rubbing; to polish, burnish; to renovate.

furious (fū′ ri us), *adj.* raging with anger, frantic; tempestuous, rushing, violent, as a *furious* flood or wind.

furl (fûrl), *v.t.* to roll up and make fast, as a flag or sail.

***furlong** (fûr′ lông), *n.* a measure of length equal to one-eighth of a mile.

***furlough** (fûr′ lō), *n.* leave of absence.

furnace (fûr′ nis), *n.* an enclosed structure in which fuel is burned to make heat, as for warming a house or making steam in an engine.

furnish (fûr′ nish), *v.t.* to supply with needed things; to fit out; to equip.

furnishings (fûr′ nish ingz), *n.* furniture, fixtures.

***furniture** (fûr′ ni tūr), *n.* the necessary equipment for a house.

***furor** (fū′ rôr), *n.* a great outburst of excitement; a rage, craze or fad.

furrier (fûr′ i ẽr), *n.* one who prepares or sells furs.

furrow (fûr′ ō), *n.* the trench made in the ground by a plow; a groove; wrinkle.

furrow (fûr′ ō), *v.t. and v.i.* to plow; to make grooves in.

furry (fûr′ i), *adj.* covered with fur; like fur.

further (fûr′ *th*ẽr), *v.t.* to promote, as plans or enterprises.

further (fûr′ *th*er), *adj.* [*no positive; superl.* furthest] more remote; additional, as *further* places, *further* facts.

further (fûr′ *th*ẽr), *adv.* at or to a greater distance or degree, as to go *further.*

furtherance (fûr *th*ẽr ans), *n.* advancement.

furthermore (fûr′ *th*ẽr mōr), *adv.* moreover, besides.

furthermost (fûr′ *th*ẽr mōst), *adj.* most remote.

furtive (fûr′ tiv), *adj.* secret, sly, stealthy.

fury (fū′ ri), *n.* [*pl.* furies] violent rage; great anger.

furze (fûrz), *n.* a hardy, spiny, evergreen shrub of Europe with yellow flowers, gorse.

***fuse** (fūz), *n.* a tube or cord filled or saturated with combustible substances and used for setting off explosives; a fusible plug in an electric system that melts when the current exceeds the limit of safety.

fuse (fūz), *v.t. and v.i.* to liquefy by means of heat, melt; to melt and run together or blend, as metals.

fuselage (fū′ ze lij), *n.* the body of an airplane, with a seat for the pilot and containing the engine and controls.

fusel oil (fū′ zel oil), an oily, colorless, poisonous liquid found in raw or insufficiently distilled liquors, as corn whiskey; amyl alcohol.

fusible (fū′ zi bl), *adj.* capable of being fused or melted.

***fusillade** (fū zi lād′), *n.* a simultaneous discharge of firearms.

***fusion** (fū′ zhun), *n.* the act or process of melting metals by heat; union by melting; a uniting of political parties or factions for a campaign.

fuss (fus), *n.* unnecessary activity, confusion.

fuss (fus), *v.i.* to worry, be bothered about trifles.

fussy (fus′ i), *adj.* given to fussing, too particular; requiring much care, as a *fussy* job.

fustian (fus′ chan), *n.* a kind of coarse twilled cotton cloth; corduroy.

fustian (fus′ chan), *adj.* made of fustian; pompous in manner but lacking ability; cheap.

***futile** (fū′ til), *adj.* ineffectual, useless; trifling.

futility (fū til′ i ti), *n.* uselessness.

***future** (fū′ tūr), *n.* time yet to come.

future (fū′ tūr), *adj.* still to happen.

fuzz (fuz), *n.* fine light particles of down, fluff.

G

***gabardine** (gab ẽr dēn′), *n.* a woolen or cotton fabric resembling serge but having a ribbed appearance on only one side.

gabble (gab′ l), *n.* meaningless chatter; the noise made by geese.

gabble (gab′ l), *v.i.* to talk fast; to jabber; to utter inarticulate sounds fast, as a goose.

gable (gā′ bl), *n.* the triangular part of a wall of a building between the edges of a sloping roof; the end wall of a building, as distinguished from the front or side.

***gad** (gad), *n.* a pointed metal bar used in breaking up or loosening ore; a goad for oxen.

gad (gad), *v.i.* to go about aimlessly.

gadfly (gad′ flī), *n. pl.* gadflies; a fly that bites and torments cattle; a horsefly.

gaff (gaf), *n.* a pole with a sharp hook on one end for landing big fish; a steel spur on the leg of a gamecock; a spar supporting the upper edge of a fore-and-aft sail.

gaff (gaf), *v.t.* to land or strike with a gaff, as a fish.

gag (gag), *n.* something thrust into the mouth to prevent speech or sound; any rule or subterfuge that prevents debate; a tool for straightening rails.

gag (gag), *v.t. and v.i.* [*p.t.* and *p.p* gagged, *pr.p.* gagging] to restrain from speech by force or authority, as the dictator *gags* the press; to retch, strain, as in violent nausea.

gage (gāj), *n.* something given as security for the fulfillment of an obligation or pledge; a cap or glove thrown upon the ground as a challenge.

gage, see *gauge.*

gaiety (gā′ e ti), *n.* [*pl.* gaieties] the state or quality of being merry, liveliness, vivacity, jollity.

gaily (gā′ li), *adv.* merrily, blithely, gleefully; with fine display, as the city was *gaily* decked with flags.

gain (gān), *n.* advantage, profit, advancement, increase.

gain (gān), *v.i. and v.t.* to increase, as to *gain* in health; to obtain; to advance, as he *gained* on his pursuer; to win, as he *gained* his point.

***gainsay** (gān sā′), *v.t.* [*p.t.* and *p.p.* gainsaid, *pr.p.* gainsaying] to contradict, dispute, oppose, deny.

gait (gāt), *n.* the manner of walking or running, as an easy *gait.*

gaiter (gā′ tẽr), *n.* a legging; spat.

***gala** (gā′ la), *adj.* festive.

gala day (gā′ la dā), a festival; holiday.

***galaxy** (gal′ ak si), *n.* an assemblage of brilliant persons: *Galaxy,* the Milky Way.

gale (gāl), *n.* a strong wind, slightly less violent than a hurricane; an outburst, as a *gale* of laughter.

galena (ga lē′ na), *n.* native lead sulphide, the chief ore of lead.

galipot (gal′ i pot), *n.* a crude turpentine obtained from certain European pines.

***gall** (gôl), *n.* the bile; the gall bladder; anything bitter to experience; rancor.

gall (gôl), *n.* a sore on the skin, caused by chafing, especially on a horse's back.

gall (gôl), *n.* a protective growth on the leaves or bark of trees and plants, especially oak trees, surrounding insect larvae developing from eggs deposited in a wound made by the parent insect.

gall (gôl), *v.i. and v.t.* to become sore as the result of chafing; to make sore by chafing; to irritate, harass.

***gallant** (gal ant′), *n.* a beau; a man of fashion who makes a point of paying small attentions to women.

***gallant** (gal′ ant), *adj.* brave; dashing, chivalrous; stately, as a *gallant* ship.

gallantry (gal′ an tri), *n.* bravery; elaborate politeness to women.

gall bladder (gôl blad′ ẽr), the sac in which bile is stored in the body.

***galleon** (gal′ ē un), *n.* a broad-beamed, high-sterned ship of the 15th and later centuries having three or four decks.

***gallery** (gal′ ẽr i), *n.* [*pl.* galleries] a corridor; a section of seats built out from the wall of a theater or church; a room used for the showing of works of art.

galley (gal′ i), *n.* a single-decked vessel of medieval times, propelled by both sails and oars; a large rowboat; the kitchen quarters of a ship; a long tray in which type is placed when set; a proof of a galley of type on a long strip of paper called *galley* proof.

galling (gôl′ ing), *adj.* chafing, irritating.

***gallivant** (gal i vant′), *v.i.* to play the gallant; to gad about with women; to roam for pleasure.

gallnut (gôl′ nut), *n.* a gall on plant or tree, especially an oak tree.

gallon (gal′ un), *n.* a liquid measure equal to four quarts.

gallop (gal′ up), *n.* the springing gait of a horse at full speed; the act of riding at this gait.

gallop (gal′ up), *v.i. and v.t.* to run or ride at full speed; to put to this pace, as to *gallop* a horse.

***gallows** (gal′ ōz), *n.* a wooden structure used for hanging condemned criminals.

gallstone (gôl′ stōn), *n.* a hard lump of matter formed in the bladder or the bile duct.

***galop** (gal′ up), *n.* lively dance music; the 19th-century dance for which such music was written.

galore (ga lōr′), *adv.* in great abundance.

galosh (ga losh′), *n.* a rubber overshoe, especially one with a high top.

galvanic (gal van′ ik), *adj.* relating to a direct electrical current, especially one from a battery; stimulating, arousing.

***galvanism** (gal′ va nizm), *n.* the branch of electrical science that treats of currents arising from the chemical action of certain bodies placed in contact or of acid on metal.

galvanize (gal′ va nīz), *v.t.* to cause to undergo the action of electric currents; to plate or coat with metal through application of an electric current; to stimulate or arouse, as if by an electric current.

galvanometer (gal va nom′ ē tẽr), *n.* an instrument for detecting the presence or direction of a small electric current and measuring its force.

gambier (gam′ bẽr), *n.* a vegetable extract used medicinally and in tanning and dyeing.

gambit (gam′ bit), *n.* a chess opening in which the first player gives his opponent a piece or pawn to gain an advantage in position.

gamble (gam′ bl), *n.* any act accompanied by risk of loss.

gamble (gam′ bl), *v.i. and v.t.* to play a game for money; to risk money on uncertain gain.

gambler (gam′ blẽr), *n.* one who plays games of chance, especially as a profession.

***gamboge** (gam bōj′), *n.* a reddish-yellow color; the orange-red tree gum from which this color is made.

gambol (gam′ bul), *n.* a frolic; act of dancing or frisking about.

gambol (gam′ bul), *v.i.* [*p.t. and p.p.* gamboled, *pr.p.* gamboling] to skip about sportively, frolic.

gambrel (gam′ brel), *n.* the hock of a horse; a gambrel roof.

gambrel roof (gam′ brel ro͞of), a ridged roof, with only a modified slant in the upper section and a sharper slope in the lower section forming pentagonal gables.

game (gām), *n.* a contest of strength, skill or chance, for sport or for a stake; a scheme or plan; animals hunted for sport.

game (gām), *adj.* plucky.

gamin (gam′ in), *n.* a child of the streets; a street Arab.

gaming (gām′ ing), *n.* the playing of games for stakes; gambling.

***gamut** (gam′ ut), *n.* the entire range or extent, as of a musical scale.

gander (gan′ dẽr), *n.* a male goose; a simpleton.

gang (gang), *n.* a number of persons banded together in a common pursuit, as of crime; a group of workers under one boss; a set of tools or implements arranged to work together, as the shares of a *gang* plow.

***ganglion** (gang′ gli un), *n.* [*pl.* ganglia or ganglions] a collection of nerve cells forming a nerve center.

gangplank (gang′ plangk), *n.* a movable bridge of cleated planks by which to board or leave a ship at its dock.

***gangrene** (gang′ grēn), *n.* mortification of tissue in a living body.

gangster (gang′ stẽr), *n.* a member of an organization of criminals.

gantlet (gônt′ let), *n.* formerly a military punishment in which the partially naked offender ran between two lines of soldiers who struck at him with clubs; a series of difficult tests.

gangway (gang′ wā), *n.* space in which to pass.

***gaol** (jāl), *n.* a jail.

gap (gap), *n.* an opening; cleft; a pass, as a *gap* in the mountains.

***gape** (gāp), *n.* the act of opening the mouth and staring in amazement or surprise; a yawn.

gape (gāp), *v.i.* [*p.t.* and *p.p.* gaped, *pr.p.* gaping] to open the mouth wide, as in astonishment; to yawn; to stare stupidly.

Syn. Stare, gaze. *Gape* connotes stupid wonder; to *stare* implies impertinence or absent-mindedness; to *gaze* is to look with astonishment, pleasure or admiration.

***garage** (ga räzh′), *n.* a building in which an automobile is sheltered; an automobile repair shop.

fāte fat final câre färm ȧsk sof*a*; mē met novel fingẽr; līne pin; gō ôrder not no͞on good; ūse but tûrn menü; thin *th*en.

garb (gärb), *n.* dress, particularly of a special kind, as nurses' *garb.*

garbage (gär′ bij), *n.* kitchen or market refuse.

garble (gär′ bl), *v.t.* to select only such parts as will serve a purpose; to mutilate, misrepresent, as to *garble* a story.

garden (gär′ dn), *n.* a piece of ground given up to the cultivation of flowers, fruits and vegetables.

gardenia (gär dēn′ ia), *n.* a plant cultivated for its fragrant, showy flowers.

gargle (gär′ gl), *n.* an antiseptic liquid used for washing the throat or mouth.

gargle (gär′ gl), *v.i. and v.t.* to use a gargle; to take a liquid in the mouth and agitate it by expelling air slowly from the lungs.

gargoyle (gär′ goil), *n.* a grotesquely carved stone waterspout usually projecting from the upper part of a building.

garish (gâr′ ish), *adj.* gaudy, dazzling, flashy.

garland (gär′ land), *n.* a chaplet or wreath of flowers.

garlic (gär′ lik), *n.* a plant with onionlike root, having pungent taste and odor, used in cooking.

garment (gär′ ment), *n.* any article of clothing.

garner (gär′ nẽr), *n.* a storehouse for grain.

garner (gär′ nẽr), *v.t.* to gather up and store.

garnet (gär′ net), *n.* a precious and semiprecious mineral used as a gem; the deep red color of the precious stone.

garnish (gär′ nish), *n.* an ornament, decoration; something laid around a steak or fish on a platter, as a *garnish* of parsley.

garnish (gär′ nish), *v.t.* to decorate, adorn.

garnishee (gär nish ē′), *n.* one who holds the property of another pending its final disposal by a court with regard to the claims of a third person.

garnishee (gär nish ē′), *v.t.* to attach property pending court decision as to its disposal.

garnishment (gär′ nish ment), *n.* a legal proceeding to attach property pending issuance of a court order for its final disposal.

*__garniture__ (gär′ ni tũr), *n.* embellishment.

garret (gar′ et), *n.* the top floor of a house, generally unfinished, an attic.

garrison (gâr′ i sun), *n.* a body of troops stationed in a fort; a fortified place where such troops are stationed.

garrison (gâr′ i sun), *v.t.* to furnish troops for a fortification.

garrulity (ga ro͞o′ li ti), *n.* incessant talk, loquacity.

garrulous (gar′ ū lus), *adj.* talkative, loquacious.

garter (gär′ tẽr), *n.* an elastic band or strap to hold up a stocking.

garter snake (gär′ tẽr snāk), a small, harmless American snake.

gas (gas), *n.* [*pl.* gases] an airlike liquid without definite shape or volume, tending to expand indefinitely when unconfined; any combustible gaseous vapors used for light and heat; any vapor used to induce anesthesia; a vaporous substance used to make breathing painful or to cause death, as in warfare; gasoline.

gas (gas), *v.t.* [*p.t.* and *p.p.* gassed, *pr.p.* gassing] to attack with a deadly vapor, as in war.

gas bomb (gas bom), a shell used in trench fighting, charged with poison gas that is released when the shell bursts.

gas engine (gas en′ jin), an engine run by the burning of a mixture of gas and air within the engine cylinder.

*__gaseous__ (gas′ ē us), *adj.* having the nature of gas.

gas furnace (gas fûr′ nis), a furnace in which gas is used for fuel; a furnace for distilling gas from coal.

gash (gash), *n.* a deep cut with gaping edges.

gash (gash), *v.t.* to make a deep cut in.

gasify (gas′ i fī), *v.i. and v.t.* [*p.t.* and *p.p.* gasified, *pr.p.* gasifying] to become gas; to convert a substance into gas.

gasket (gas′ ket), *n.* a flat cord by which furled sails are fastened to a spar; a strip of braided material, such as tow or hemp, for packing a piston; a thin piece of rubber or metal placed between two surfaces to make a tight joint.

gas mask (gas mȧsk), a covering for the face containing a respirator, used as protection against poison gas.

*__gasoline__ (gas′ ō lēn), *n.* a liquid distilled from petroleum, used as a fuel, for cleaning and as a source of power in internal combustion engines.

*__gasometer__ (gas om′ ē tẽr), *n.* a device for holding and measuring gas.

gasp (gȧsp), *n.* a convulsed, painful effort to catch the breath.

gasp (gȧsp), *v.i.* to breathe with pain and difficulty, with the mouth open.

gastric (gas′ trik), *adj.* pertaining to the stomach.

gastric juice (gas′ trik jo͞os), a fluid secreted in the stomach that acts as chief agent in digestion.

*__gastritis__ (gas trī′ tis), *n.* inflammation of the stomach.

gastronomic (gas trō nom′ ik), *adj.* pertaining to the art of good eating.

gastronomy (gas tron′ ō mi), *n.* the art of good eating, epicurism.

gate (gāt) *n.* a frame of wood or metal on hinges to open and close a passageway, as through a fence.

gather (ga*th*′ ẽr), *v.i. and v.t.* to congregate, as a crowd *gathered;* to generate pus, as a boil; to increase, as storm clouds *gathered;* to bring together, collect, as grain; to draw together in folds, as cloth; to summon, as courage; to accumulate, as to *gather* wealth; to infer, as to *gather* an idea.

Syn. Collect. To *gather* is to bring things together in one place; to *collect* implies selection resulting in a more orderly whole. Pebbles are *gathered* in a heap; people *collect* stamps.

Ant. Disperse, scatter.

gathering (ga*th*′ ẽr ing), *n.* the act of assembling; an assemblage; an abscess.

gatling gun (gat′ ling gun), a machine gun composed of a cluster of barrels revolved by a crank and fired in rapid succession.

gaudy (gôd′ i), *adj.* [*comp.* gaudier, *superl.* gaudiest] showy; gay or fine in a vulgar way.

gauge or **gage** (gāj), *n.* a standard of measurement; the distance between the rails of a railroad; a measuring instrument.

gauge or **gage** (gāj), *v.t.* to measure; to calculate the contents of, as a barrel; to bring into conformity with a standard.

*__gaunt__ (gônt), *adj.* pinched and lean; forbidding, desolate, as a *gaunt* landscape.

*__gauntlet__ (gônt′ let), *n.* a mailed glove; a glove with a long wristpiece.

*__gauze__ (gôz), *n.* a very thin, light, transparent fabric of silk, cotton or linen; a fabric resembling such material, as wire.

gauzy (gôz′ i), *adj.* thin and light, semitransparent, like gauze.

gawk (gôk), *n.* an awkward dull person.

gawky (gôk′ i), *adj.* awkward, clumsy.

gay (gā), *adj.* lively and merry.

gaze (gāz), *n.* a steady, intent look.

gazelle (g*a* zel′), *n.* a small, graceful and swift antelope with large, lustrous eyes.

gazette (g*a* zet′), *n.* a newspaper; an official journal giving news of honors, bankruptcies and public notices.

gazette (g*a* zet′), *v.t.* to publish in an official journal.

*__gazetteer__ (gaz e tẽr′), *n.* a dictionary of geographical names; one who writes or is appointed to publish news.

gear (gẽr), *n.* apparatus, equipment, clothing, tackle, tools; an accessory part of machinery that performs a special function, as the steering *gear* of an automobile; the engagement of revolving parts with each other, as in *gear;* a wheel or cogwheel having teeth.

gear (gẽr), *v.t.* to put in gear, equip with gears.

gearing (gẽr′ ing), *n.* the parts of a machine that transmit motion from one section to another.

gee (jē), *interj.* a call directing a team of oxen to turn to the off side or to the right, away from the driver: opposite of *haw.*

*__gelatin__ or **gelatine** (jel′ a tin), *n.* a translucent substance derived from animal tissues such as cartilage and hoofs by prolonged boiling, used in making foods and medicines.

gem (jem), *n.* a precious or semiprecious stone; any perfect specimen of its kind, as this essay is a *gem;* a light muffin.

*__gendarme__ (zhä*n*′ därm), *n.* a member of a police body, armed and drilled as a soldier, especially in France.

gender (jen′ dẽr), *n.* one of three classifications into which English nouns and pronouns naturally fall (masculine, feminine and neuter); as the noun *boy* is in the masculine *gender, box* is neuter *gender, she* is feminine *gender, it* is neuter *gender.*

*__genealogy__ (jen ē al′ ō ji), *n.* [*pl.* genealogies] a chronological record tracing the descent of a person or family from an ancestor; lineage, pedigree.

general (jen′ ẽr al), *n.* a general principle as distinguished from a particular; the highest rank of a commissioned officer in the army.

general (jen′ ẽr al), *adj.* pertaining to a whole; pertaining to all, as a *general* order; not specific, vague, as a *general* statement; pertaining to the typical, as it is the *general* thing to have two eyes; prevailing, as it is the *general* custom to dine at seven; not specialized, as a *general* store; signifying superiority in rank, as attorney *general.*

Syn. Universal. What is *general* applies to all or nearly all; what is *universal* applies to all, without exception.

Ant. Local, limited.

generalize (jen′ ẽr al īz), *v.i. and v.t.* to draw general and sweeping deductions from specific instances; to derive a general principle or inference from; to make generally applicable, as to *generalize* a law.

*__generally__ (jen′ ẽr al i), *adv.* commonly, in most instances, as a rule, in a broad sense.

generalship (jen′ ẽr al ship), *n.* the office or term of office of a general; skill in command, tactical and strategical ability.

general strike (jen′ ẽr al strīk), a strike by workmen of many or all trades over a considerable area or of all workers in one industry.

generate (jen′ ẽr āt), *v.t.* to beget, as children; to produce, as heat, power, ideas.

generation (jen ẽr ā′ shun), *n.* the act or process of producing; all the individuals of any one genealogical period; one stage in a line of descent, as father and son are of different *generations;* the period of time between parent and child, considered to be about 33 years.

generator (jen′ ẽr ā tẽr), *n.* anyone or anything that causes or originates; a machine by which steam, gas or electric power is produced.

*__generic__ (je ner′ ik), *adj.* pertaining to a genus; general: opposite of *specific.*

generosity (jen ẽr os′ i ti), *n.* [*pl.* generosities] the quality of being liberal; benevolence, unselfishness.

*__generous__ (jen′ ẽr us), *adj.* liberal in action or ideas; openhanded, magnanimous; abundant, as a *generous* crop.

*__genesis__ (jen′ ē sis), *n.* the beginning, origin.

genial (jēn′ yal), *adj.* kindly, sympathetic, cordial; pleasingly warm and friendly, as a *genial* atmosphere.

genius (jēn′ yus), *n.* extraordinary aptitude for creative artistic work; a person of marked ability in any field, as science and invention, literature or the arts; a person who exerts great influence over another, as an evil *genius.*

genteel (jen tēl′), *adj.* polite, well bred: now used only humorously or sarcastically.

gentian (jen′ shan), *n.* a plant valued for its deep blue flowers; the roots of the yellow gentian, used as a tonic.

gentility (jen til′ i ti), *n.* [*pl.* gentilities] noble birth; good breeding; courtesy, dignity, good manners.

gentle (jen′ tl), *adj.* wellborn; mild, kindly, docile, soft, soothing, as a *gentle* voice; moderate, as a *gentle* breeze.

Syn. Tame. Any unbroken horse might be *gentle* by nature, but not *tame;* a horse that is broken in will be *tame,* but may not be *gentle*. *Gentle* connotes natural disposition; *tame*, having been brought under subjection.

Ant. Tempestuous, severe, violent.

***gentleman** (jen′ tl man), *n.* [*pl.* gentlemen] a well-bred and honorable man.

gentlewoman (jen′ tl woom an), *n.* [*pl.* gentlewomen] a woman of good birth and breeding.

gentry (jen′ tri), *n.* people of good birth and education; those next in standing to the nobility in England, as the landed *gentry*.

***genuflection** (jen ū flek′ shun), *n.* a bending of the knee in worship or homage.

***genuine** (jen′ ū in), *adj.* real, unadulterated; sincere.

genus (jē′ nus), *n.* [*pl.* genera] a classification between family and species and including a number of species, as the *genus Felis* includes the lion, tiger and cat; class, kind, order.

***geocentric** (jē ō sen′ trik), *adj.* pertaining to or measured from the center of the earth; relating to or taking the earth as a center.

geodesy (jē od′ ē si), *n.* the branch of mathematics used to determine positions of points and figures and measure the areas of vast sections of the earth's surface; the branch of surveying that takes the curvature of the earth into account.

geography (jē og′ *ra* fi), *n.* [*pl.* geographies] the science that deals with the surface of the earth, its natural divisions, mountain ranges, rivers, climatic conditions, plant and animal life, agriculture and commerce; the natural features of a specific area, as the *geography* of Cuba.

geology (jē ol′ ō gi), *n.* the science that deals with the structure of the earth and its physical changes, especially as recorded in the rocks.

geometry (jē om′ ē tri), *n.* the branch of mathematics treating of the measurement and relationships of lines, angles, planes and solids.

***georgic** (jôr′ jik), *n.* a poem on agriculture.

geranium (jē rā′ ni um), *n.* a plant cultivated for its brilliant red flowers.

germ (jûrm), *n.* the rudimentary form of an organism; a bud, seed; that from which anything springs, as the *germ* of an idea.

germane (jûr mān′), *adj.* related or relevant, appropriate.

germicide (jûr′ mi sīd), *n.* any substance used to destroy disease germs.

germinal (jûr′ mi nal), *adj.* pertaining to a germ or seed bud; incipient, leading to, as the *germinal* idea.

germinate (jûr′ mi nāt), *v.i. and v.t.* to develop, sprout, bud; to cause to develop or sprout.

germination (jûr mi nā′ shun), *n.* the beginning of development in a seed, bud or germ.

***gerrymander** (ger′ i man dẽr), *v.t.* to divide voting districts so as to give an advantage to one political party over the other.

gerund (jer′ und), *n.* the present participial form of a verb used as a noun, as being is a *gerund* in the sentence, your being here is a joy to me.

gesticulate (jes tik′ ū lāt), *v.i.* to make motions to attract attention or gestures to emphasize a meaning.

***gesture** (jes′ tūr), *n.* a movement, as of the limbs, body or face to express emotion or to emphasize an assertion; something said or done for effect, as his offer of help was just a *gesture*.

get (get), *v.i. and v.t.* [*p.t.* got, *p.p.* got or gotten, *pr.p.* getting] to arrive at or bring oneself into a certain state or condition, as to *get* free; to become, as to *get* tired; to acquire, as property; to procure, obtain, as to *get* help; to learn, as a lesson; to understand, perceive, as an idea; to prepare, as a meal; to contract, as a cold.

getaway (get′ *a* wā), *n.* the act of getting started, as a car.

***gewgaw** (gū′ gô), *n.* a showy trifle.

***geyser** (gī′ zẽr), *n.* a hot spring intermittently throwing a jet of hot water and steam into the air.

***ghastly** (gȧst′ li), *adj.* horrible; gruesome; haggard, pale, ghostlike in appearance.

***gherkin** (gûr′ kin), *n.* a small cucumber used for pickling.

ghetto (get′ ō), *n.* the Jewish quarter of a city.

ghost (gōst), *n.* the spirit of a dead person; apparition; specter or phantom; a faint approximation, as the *ghost* of an idea.

ghostly (gōst′ li), *adj.* pertaining to or like a ghost; supernatural.

ghost writer (gōst rīt′ ẽr), one whose services may be engaged for the writing of articles or other literary work for which another receives credit.

***ghoul** (gōōl), *n.* an evil spirit that robbed the dead and fed on corpses; a grave robber; one whose pursuits or interests are repulsive.

giant (jī′ ant), *n.* an imaginary person of great size and power; a person, plant or animal of unusual size; a person of extraordinary ability, as an intellectual *giant*.

giant (jī′ ant), *adj.* like a giant; huge; of great height or bulk, as a *giant* rock.

***gibber** (jib′ ẽr), *v.i.* to speak incoherently.

***gibberish** (jib′ ẽr ish), *n.* fast, incoherent talk; senseless chatter.

***gibbet** (jib′ et), *n.* a gallows.

gibbet (jib′ et), *v.t.* to hang on a gibbet; to expose to public score or ridicule.

gibbous (gib′ us), *adj.* curved, protuberant: said of the moon in the second quarter between half-moon and full moon; hunchbacked.

***gibe** (jīb), *n.* a taunt; sneering or sarcastic comment.

gibe (jīb), *v.i. and v.t.* to scoff, taunt.

giblet (jib′ let), *n.* any of the edible internal parts of poultry, as heart or gizzard.

gid (gid), *n.* a disease of sheep affecting the brain and causing staggers.

giddy (gid′ i), *adj.* [*comp.* giddier, *superl.* giddiest] dizzy; having a whirling sensation; light-headed; producing dizziness, as a *giddy* height.

gift (gift), *n.* something given; a present; a natural talent, as a *gift* for writing.

Syn. Donation, aptness, bent. A *gift* implies ability expressed without difficulty; *aptness* implies natural or potential ability; *bent* expresses a tendency of mind or disposition; *donation* suggests a contribution, especially to a public institution.

gig (gig), *n.* a light, two-wheeled open carriage drawn by one horse; a ship's boat for use of the captain; a fish spear; a gang of hooks used in fishing among a school of fish; a whirling thing, as a top.

gigantic (jī gan′ tik), *adj.* huge, immense.

giggle (gig′ l), *n.* a silly, nervous laugh.

giggle (gig′ l), *v.i.* to laugh in a foolish, nervous manner; to titter.

***gigolo** (jig′ ō lō), *n.* a man who serves as escort or dancing partner to women for pay.

gild (gild), *v.t.* to cover with a thin coating of gold; to color with gold.

gilding (gild′ ing), *n.* an overlay of gold or something that looks like gold.

gill (gil), *n.* the breathing organ of fish and animals that live in water.

***gill** (jil), *n.* one-fourth of a pint.

***gillyflower** (jil′ i flou ẽr), *n.* a garden plant; stock; wallflower.

gilt (gilt), *n.* gilding; a covering of gold or of something resembling gold.

gilt (gilt), *adj.* gilded.

***gimbals** (jim′ balz), *n.* a device for suspending something, as a ship's compass, so that it will remain level.

gimcrack (jim′ krak), *n.* a thing that is showy but of no use; gewgaw.

gimlet (gim′ let), *n.* a small tool for boring holes.

gimp (gimp), *n.* a narrow twisted trimming used on furniture or clothing.

gin (jin), *n.* a liquor distilled from grain and flavored with juniper berries.

gin (jin), *n.* a machine for separating the seeds from cotton fiber; a trap.

gin (jin), *v.t.* [*p.t.* and *p.p.* ginned, *pr.p.* ginning] to clear of seeds by a gin, as cotton.

ginger (jin′ gẽr), *n.* a tropical herb; a plant cultivated for its spicy rootstalk; the scraped and ground root of this plant, used as a spice or medicine.

gingerbread (jin′ jẽr bred), *n.* a dark-colored cake sweetened with molasses and flavored with ginger; a cheap, vulgar ornamentation, as on a house.

gingerly (jin′ jẽr li), *adv.* in a cautious, fearful manner.

gingersnap (jin′ jẽr snap), *n.* a thin brittle molasses cooky, flavored with ginger.

gingham (ging′ am), *n.* a cotton cloth usually having stripes or checks, dyed in the yarn before it is woven.

ginseng (jin′ seng), *n.* an Oriental plant with scarlet berries; its dried roots used as medicine in China.

***giraffe** (ji râf′), *n.* an African ruminant animal, the tallest of the quadrupeds, with an extraordinarily long neck; the camelopard.

***gird** (gûrd), *v.t.* [*p.t.* and *p.p.* girded, girt, *pr.p.* girding] to bind with a girdle or flexible band; to encircle; to equip; to prepare, as to *gird* oneself for battle.

girder (gûrd′ ẽr), *n.* a spanning beam supporting the joists of a floor.

girdle (gûr′ dl), *v.t.* to encircle; to bind with, or as if with, a belt; to cut the bark of a tree entirely around.

girl (gûrl), *n.* a female child; a young woman.

girth (gûrth), *n.* the circumference; the band by which a saddle is kept secure on a horse.

***gist** (jist), *n.* the essence of a matter, as the *gist* of an argument.

give (giv), *v.t. and v.i.* [*p.t.* gave, *p.p.* given, *pr.p.* giving] to bestow, as to *give* support; to deliver, as to *give* a message; to administer, as an oath of office; to pronounce, as an opinion; to supply, as the furnace *gives* heat; to furnish, as entertainment, as to *give* a party; to proffer, as the hand; to present for consideration, as to *give* a reason; to cause to have, as a disease; to contribute, as he *gave* generously; to yield under pressure, as the door *gave* under the force of his blow.

given (giv′ n), *adj.* addicted to, disposed, as *given* to boasting; fixed, stated, as a *given* time.

gizzard (giz′ ẽrd), *n.* the second stomach of a bird, having thick walls for grinding food.

***glacial** (glā′ shal), *n.* pertaining to a glacier; pertaining to ice or its action; frozen, icy.

***glacier** (glā′ shẽr), *n.* a vast accumulation of ice and snow, formed in cold regions, that moves slowly down a slope or covers Arctic regions with an ice sheet.

glad (glad), *adj.* joyous, cheerful, gay, pleased; causing joy, as *glad* news.

gladden (glad′ n), *v.t.* to make glad or joyful.

glade (glād), *n.* an open space in a forest.

***gladiator** (glad′ i ā tẽr), *n.* one who fought with a sword in public in ancient Rome as an entertainment for the people.

***gladiolus** (glad i ō′ lus), *n.* a bulbous plant of the iris family, with long, erect leaves and spikes of showy flowers.

gladsome (glad′ sum), *adj.* joyous; pleasing.

glair (glâr), *n.* the white of egg or a size made from it, as in bookbinding; viscous matter.

glairy (glâr′ i), *adj.* smooth, slick, viscous, slimy.

***glamor** (glam′ ẽr), *n.* enchantment, delusive charm, fascination.

***glance** (glȧns), *n.* a quick look or view; an oblique movement; ore with a metallic luster.

glance (glȧns), *v.i.* to look quickly; to strike on a slant and fly off, as the bullet *glanced*.

gland (gland), *n.* an organ secreting a fluid to be used in, or eliminated from, the body, as saliva.

glanders (glan′ dẽrz), *n.* a contagious disease of horses characterized by swelling of the lower jaw and discharge of mucus from the nose.

glandular (glan′ dū lẽr), *adj.* pertaining to glands, or having to do in any way with glands, as a *glandular* secretion.

glare (glâr), *n.* a dazzling light; a fierce, piercing look; a slippery surface, as a *glare* of ice.

glare (glâr), *v.i.* to shine dazzlingly; to look piercingly.

glaring (glâr′ ing), *adj.* giving a dazzling light; conspicuous, flagrant, as a *glaring* fault or error; fierce, furious, as a *glaring* eye.

Syn. Barefaced. *Glaring* characterizes the thing; *barefaced,* the one who does it. A *glaring* lie is one that flashes forth as a falsehood; a *barefaced* lie marks the effrontery of him who utters it.

***glass** (glȧs), *n.* a hard, brittle substance, usually transparent, formed by fusing silica, an alkali and some other base; anything made of glass; the quantity that fills a drinking glass, as a *glass* of milk.

glasses (glȧs′ ez), *n.* eyeglasses, spectacles.

glassful (glȧs′ fool), *n.* the amount a glass holds.

glassware (glȧs′ wâr), *n.* articles made of glass.

glaze (glāz), *n.* a vitreous coating, as on pottery; a smooth, glossy surface or finish; a film over the eye.

glaze (glāz), *v.t.* to fit, furnish or equip with glass, to give a glossy finish to, as to *glaze* pottery.

***glazier** (glā′ zhẽr), *n.* one whose business is to fit panes of glass into window and door frames.

glazing (glāz′ ing), *n.* the act of setting glass; a coating of glass or a glasslike substance; the act of applying glaze.

gleam (glēm), *n.* a faint, brief flash of light; anything resembling it, as a *gleam* of hope.

gleam (glēm), *v.i.* to send forth rays of light; to become suddenly visible, flash, as lights *gleamed* in the darkness.

glean (glēn), *v.t. and v.i.* to gather after the reapers, as grain; to assemble, collect, bit by bit, as facts.

glebe (glēb), *n.* land belonging to a parish church or assigned to a minister as his pay; fertile or cultivated land in general.

glee (glē), *n.* exuberant joy; a musical composition for unaccompanied voices in harmony.

glee club (glē klub), a group of persons organized to sing songs in harmonized parts.

glen (glen), *n.* a narrow, secluded valley; a shady nook in the woods.

glib (glib), *adj.* smooth-spoken, plausible.

glide (glīd), *v.i.* to slide smoothly; to drop down obliquely without a motor, as an airplane or motorless aircraft.

glider (glīd′ ẽr), *n.* a form of aircraft resembling an airplane but having no motor.

glimmer (glim′ ẽr), *n.* a faint light; a faint perception, as a *glimmer* of hope.

glimmer (glim′ ẽr), *v.i.* to shine in a faint, unsteady manner.

glimpse (glimps), *n.* a quick, passing view; a vague idea, inkling.

glimpse (glimps), *v.t.* to see quickly; to catch a fleeting view of.

Syn. Glance. A *glimpse* connotes a swift, passing appearance; a *glance* implies the action of the eye seeking the object. One catches a *glimpse* of an object and casts a *glance* at it.

glint (glint), *n.* a gleam of light; reflected light.

glint (glint), *v.i. and v.t.* to flash, gleam, glitter.

***glissade** (gli säd′), *n.* a slide down a glacial slope; a gliding side-step in ballet dancing.

***glisten** (glis′ n), *v.i.* to sparkle with light; to shine with a soft luster, gleam.

glister (glis′ tẽr), *n.* glitter.

glitter (glit′ ẽr), *n.* brilliancy, dazzling brightness.

glitter (glit′ ẽr), *v.i.* to sparkle with light, as a diamond.

gloaming (glōm′ ing), *n.* twilight.

gloat (glōt), *v.i.* to gaze fixedly; to feast the eyes or mind; to rejoice over with cruel satisfaction.

globe (glōb), *n.* a sphere; a ball-shaped object; a representation of the shape of the earth, covered with maps; the earth itself.

globe-trotter (glōb trot′ ẽr), *n.* one who travels extensively.

***globular** (glob′ ū lẽr), *adj.* shaped spherically, like a globe; consisting of globelike particles.

globule (glob′ ūl), *n.* a small spherical body; a round drop.

glockenspiel (glok′ en-spēl), *n.* an instrument composed of a series of metal bars tuned to the chromatic scale, played with hammers.

glomerate (glom′ ẽr āt), *adj.* gathered into a mass, clustered together.

gloom (glo͞om), *n.* partial darkness, obscurity; a melancholy state.

gloomy (glo͞om′ i), *adj.* [*comp.* gloomier, *superl.* gloomiest] dismal, melancholy.

glorify (glō′ ri fī), *v.t.* to honor, reverence, adore, as to *glorify* God, to give radiance, as her smile *glorified* her face, to make glorious, elevate by praise, as to *glorify* the commonplace.

glorious (glō′ ri us), *adj.* honored, illustrious; resplendent.

***glory** (glō′ ri), *n.* great honor, popular praise, renown; splendor, as the *glory* of the hills; that in which one glories.

glory (glō′ ri), *v.i.* [*p.t.* and *p.p.* gloried, *pr.p.* glorying] to rejoice in, exult.

***gloss** (glôs), *n.* a smooth, glistening finish; deceptive appearance.

gloss (glôs), *v.t.* to make smooth and shiny; to furnish with comments, as a book; *to gloss over,* to conceal defects with specious representations.

glossary (glôs′ *a* ri), *n.* [*pl.* glossaries] a special list of words, with definitions; a vocabulary explaining special uses of words.

glossy (glôs′ i), *adj.* [*comp.* glossier, *superl.* glossiest] polished, shining; lustrous.

glottis (glot′ is), *n.* the small oblong opening at the top of the windpipe.

glove (gluv), *n.* a hand covering with a separate compartment for each finger; a padded leather protector for the hand used in boxing and baseball.

glover (gluv′ ẽr), *n.* one whose business it is to make or sell gloves.

glow (glō), *n.* shining heat; warmth of color, as the *glow* of health; warmth of body, as in a *glow;* ardor.

glow (glō), *v.i.* to throw out heat and light without flame; to be moved by eagerness or zeal; to be warm and flushed, as to *glow* from healthy exercise.

***glower** (glou′ ẽr), *v.i.* to stare with a threatening expression.

glowworm (glō′ wûrm), *n.* the larvae of certain fireflies and fire beetles and the adult, wingless females that emit light at night.

gloze (glōz), *v.t.* to gloss over, as a mistake; to cause to appear less offensive.

glucose (glo͞o′ kōs), *n.* a form of sugar occurring in fruits and honey; a sirup containing natural glucose and other ingredients.

***glue** (glo͞o), *n.* a hard gelatin derived from the boiled and jellied skins, hoofs and bones of animals, used for fastening things together, as pieces of wood, broken articles.

glue (glo͞o), *v.t.* [*p.t.* and *p.p.* glued, *pr.p.* gluing] to unite or fasten with glue.

glum (glum), *adj.* gloomy, moody, sullen.

glut (glut), *n.* an oversupply, superabundance.

glut (glut), *v.t.* to overload, as a market; to oversupply; to fill to repletion, satiate.

gluten (glo͞o′ ten), *n.* a nutritious substance in certain grains, especially wheat.

glutinous (glo͞o′ ti nus), *adj.* sticky, viscous.

glutton (glut′ n), *n.* a greedy eater; one who eats to excess.

***glycerin or glycerine** (glis′ ẽr in), *n.* a clear, almost colorless liquid used in medicine and in making explosives.

***gnarl** (närl), *n.* a knot in wood; a large knot on the bark of a tree.

gnarled (närld), *adj.* full of knots, twisted.

gnash (nash), *v.t.* to strike or grind together, as the teeth.

gnat (nat), *n.* a tiny, stinging winged insect.

gnaw (nô), *v.t.* [*p.t.* and *p.p.* gnawed, *pr.p.* gnawing] to bite at, slowly, repeatedly, persistently; to wear away with the teeth.

***gneiss** (nīs), *n.* a close-grained crystalline rock, hard like granite but composed in layers.

***gnome** (nōm), *n.* a dwarf supposed to be the guardian of treasures buried in the earth, the guardian spirit of miners.

***gnomon** (nō′ mon), *n.* any object having a shadow whose position or length serves as an indicator, especially of the time.

***gnu** (no͞o), *n.* an African antelope with an oxlike head, a mane, flowing tail and downward-curving horns.

go (gō), *v.i.* [*p.t.* went, *p.p.* gone, *pr.p.* going] to depart, as they *went* away yesterday; to proceed, move, advance, as to *go* home from school, a letter *goes* by air mail; to be relinquished or abolished, as graft must *go;* to operate, work, as the clock *goes;* to pass, as a week *goes* quickly; to extend, reach or lead, as this path *goes* through the woods; to be in a certain condition, as to *go* in rags; to become, as to *go* deaf; to have a certain tune or phrasing, as the song *goes* like this; to put oneself, as to *go* to trouble; to belong, as the bread *goes* in the breadbox; to harmonize, suit, as yellow *goes* well with brown; to have recourse to, as to *go* to law; to make a special sound, as cows *go* moo.

goad (gōd), *n.* a pointed stick used to make oxen go faster; a prod.

goad (gōd), *v.i. and v.t.* to use a goad; to drive with a goad; to urge to greater activity.

goal (gōl), *n.* the final aim in a contest; a marking on each side of an athletic field, in some games, toward which the players attempt to propel the ball in order to score; ultimate object of endeavor.

goat (gōt), *n.* a ruminant, hollow-horned quadruped.

goatee (gōt ē′), *n.* a tuft of hair on the chin, trimmed to a point.

gobble (gob′ l), *n.* the cry of the male turkey.

gobble (gob′ l), *v.i. and v.t.* to make a noise like a turkey; to eat fast.

go-between (go′ bē twēn), *n.* an intermediary.

goblet (gob′ let), *n.* a drinking glass with a base and stem.

goblin (gob′ lin), *n.* a mischievous sprite.

god (god), *n.* a being with divine powers; an idol.

God (god), *n.* the Supreme Being; the Creator.

godchild (god′ chīld), *n.* one for whom another is sponsor at baptism.

goddess (god′ es), *n.* a female deity.

godlike (god′ līk), *adj.* superb; magnificent; fit for or like a god; superlatively good.

godly (god′ li), *adj.* devout, pious.

godsend (god′ send), *n.* unexpected good fortune.

goggle (gog′ l), *n.* a rolling of the eyes.

goggle (gog′ l), *v.i.* to roll the eyes; to stare.

goggles (gog′ lz), *n. pl.* glasses to protect the eyes from dust.

goiter (goi′ tẽr), *n.* an enlargement of the thyroid gland, causing a swelling in the neck.

gold (gōld), *n.* a metallic element, dense, soft, ductile and malleable, resisting rust and tarnish, used in making jewelry and in coinage.

golden (gōl′ den), *adj.* made of gold; like gold; having the color of gold, valuable, precious, as *golden* moments.

goldenrod (gōl′ den rod), *n.* a tall plant with yellow flowers that blooms in the summer and fall.

golden rule (gōl′ den ro͞ol), the principle of treating others as we would wish them to treat us: *Matt.* vii. 12.

goldfinch (gōld′ finch), *n.* a songbird with yellow body and black wings, tail and crown.

goldfish (gōld′ fish), *n.* an orange-hued freshwater fish prized for aquariums.

goldsmith (gōld′ smith), *n.* a worker in gold.

gold standard (gōld stan′ dẽrd), use of gold alone as the basis for a system of coinage.

golf (golf), *n.* a game played with a small resilient ball and long-handled clubs over a course called *links,* won by the player taking the fewest strokes to put the ball into a series of widely-spaced holes.

***gondola** (gon′ dō l*a*), *n.* a long, narrow Venetian pleasure boat, propelled with one oar; a flat, open-sided freight car; in aviation, a long narrow car hung under a dirigible balloon.

gondolier (gon dō lēr′), *n.* the oarsman of a gondola.

gong (gông), *n.* a piece of metal like a shallow dish, struck with a mallet to give a bell-like signal.

good (good), *adj.* [*comp.* better, *superl.* best] suitable for a purpose, as *good* to eat; considerable, as a *good* deal; having excellent qualities, as a *good* mother; agreeable, pleasant, as *good* company; beneficial, as *good* counsel; proper, becoming, as a *good* rule to follow; reliable, as *good* material; admirable, as a *good* book; of unquestioned standing, as a *good* Republican; commercially sound, as a *good* risk.

goods (goodz), *n. pl.* possessions; merchandise.

good will (good wil), benevolence, kindly feeling, friendly disposition; the value of a business establishment over and above its cash assets and material property.

goody (good′ i), *n.* a sweetmeat; anything good to eat.

goose (gōōs), *n.* [*pl.* geese] a web-footed, flat-billed bird, like a large duck or a short-necked swan; a silly, gooselike person.

***gooseberry** (gōōz′ ber i), *n.* [*pl.* gooseberries] a plant with a prickly, hairy, acid berry; the shrub that bears this berry.

goose flesh (gōōs′ flesh), *n.* a temporary roughness of the skin caused by cold or fright.

goose step (gōōs′ step), a style of marching in which the knees are not bent; the straight-legged parade step used by the German infantry.

***gopher** (gō′ fēr), *n.* a North American burrowing rodent.

gore (gōr), *n.* clotted blood.

gore (gōr), *n.* a triangular piece sewn into a dress or sail; a wedge-shaped piece used in making the dome of an umbrella.

gorge (gôrj), *n.* a narrow ravine between hills; an obstruction in a channel such as is caused by a jammed float of logs; the throat.

gorge (gôrj), *v.i.* to swallow greedily; to stuff oneself with food.

***gorgeous** (gôr′ jus), *adj.* glittering, splendid, magnificent.

gorilla (gō ril′ *a*), *n.* an African manlike ape, very large and powerful.

goshawk (gos′ hôk), *n.* a fierce, short-winged hawk.

***gosling** (goz′ ling), *n.* a young goose.

gospel (gos′ pel), *n.* good tidings; something accepted as true: *the Gospels,* the story of Christ's life as told in the books of Matthew, Mark, Luke and John.

gossamer (gos′ *a* mēr), *n.* a film of cobwebs; a thin, soft, filmy gauze; a thin waterproof cloak.

gossip (gos′ ip), *n.* idle talk about other people's affairs; one who discusses the private affairs of others.

gossip (gos′ ip), *v.i.* to go about telling idle tales about others.

***gouge** (goug), *n.* a chisel with a concave blade used for cutting grooves or holes in wood.

***gouge** (goug), *v.t.* to scoop out with, or as with, a gouge.

***goulash** (gōō′ läsh), *n.* a highly seasoned stew of beef or veal.

***gourd** (gōrd), *n.* a plant bearing a fruit resembling a pumpkin or melon; the dried rind often used as a dipper.

gourmand (goor′ mand), *n.* a gluttonous eater; one who enjoys luxurious food, an epicure.

gourmet (gōōr′ mā), *n.* a connoisseur of food and drink.

gout (gout), *n.* a painful inflammatory disease of the joints or extremities, especially the great toe.

govern (guv′ ērn), *v.i. and v.t.* to exercise authority; to rule; to direct and control; to determine; to require to be in, as a transitive verb *governs* the objective case.

Syn. Rule, conduct, supervise. To *govern* is to rule with judgment and knowledge. To rule is to use a more unqualified degree of power. A king *governs* his people by wise laws and an upright administration; a despot *rules* by arbitrary decision. *Conduct* has the idea of management; *supervise* that of overseeing.

governess (guv′ ēr nes), *n.* a woman who trains and teaches children in their own home.

government (guv′ ērn ment), *n.* the act of governing; administration of public affairs.

Syn. Administration. *Government* implies *administration,* and *administration* involves a degree of *government.* But *government* includes every exercise of authority, while *administration* covers only that exercise of authority which consists in applying certain rules and laws.

governor (guv′ ēr nēr), *n.* one who administers affairs, as a member of the Board of *Governors;* the highest executive officer in a state of the United States; an automatic device for regulating the speed of an engine.

gown (goun), *n.* a woman's dress, especially one for formal wear; a loose robe worn as part of an academic costume.

grab (grab), *v.i. and v.t.* to make a sudden motion of grasping; to seize suddenly and with force.

grab (grab), *n.* a sudden and forceful seizure.

grace (grās), *n.* ease, charm, attractiveness in form or manner; sense of propriety, as to have the *grace,* to do what is proper; favor relief from an obligation, as thirty days' *grace;* a blessing asked at meals.

Syn. Mercy. *Grace* implies spontaneous favor; *mercy,* compassionate treatment of the suffering.

graceful (grās′ fool), *adj.* easy and beautiful in form or motion.

gracious (grā′ shus), *adj.* showing kindness or mercy; polite, charming.

gradation (grā dā′ shun), *n.* the act of arranging in rank according to some set requirement, as size; a regular arrangement; progress step by step; gradual change, as *gradations* in color.

grade (grād), *n.* a step or degree in rank, dignity, quality, order; the proportion of rise in a road or railroad to a certain horizontal distance; a division of a school course covering a year's work; the pupils in such a division; a rating in school work, as a good *grade.*

grade (grād), *v.t.* to arrange in an orderly series, class, sort; to level, as a lawn, road or railroad roadbed; to give a mark to, as to *grade* compositions.

***gradual** (grad′ ū al), *adj.* proceeding by degrees; slow but steady in progress, as *gradual* improvement.

graduate (grad′ ū āt), *n.* one who has completed a course in school or college and received a diploma.

graduate (grad′ ū āt), *v.i. and v.t.* to pass the final tests of a course in school or college; to mark with degrees, as on a scale.

graduate (grad′ ū āt), *adj.* for graduates, as a *graduate* school.

graduation (grad′ ū ā shun), *n.* the act of receiving a diploma testifying that the student has completed a certain course; the ceremony attending the giving of diplomas; division into degrees, as of a thermometer; a line or mark that divides a scale.

graft (gráft), *n.* a small cutting from one plant or tree inserted into a slit in the stem or trunk of another plant or tree, of which it becomes a growing part; a piece of living skin transplanted from one part of the body to another.

graft (gráft), *n.* the acquisition of money by questionable means, as the use of official position for personal gain.

graft (gráft), *v.t.* to insert a cutting from one plant in the stem of another; to transplant living skin, bone or tissue from one part of the body to another or from one body to another.

grail (grāl), *n.* a chalice, cup, especially the Holy Grail, used by Jesus at the Last Supper.

grain (grān), *n.* a small, hard particle of matter; collectively, the seed of cereal plants such as wheat; a small unit of weight in avoirdupois and troy measures; the texture of things, as wood or stone; the natural disposition or instincts of a person, as that goes against the *grain.*

graining (grān′ ing), *n.* the process of finishing material in imitation of the grain of wood or marble.

gram (gram), *n.* the unit of weight in the metric system.

grammar (gram′ ēr), *n.* the science that deals with classes of words and their relation to each other; the use of words with reference to custom and rules; a book on this subject.

grammarian (gr*a* mâr′ i an), *n.* one who specializes in the study of the form and use of words.

grammatical (gra mat′ i kal), *adj.* pertaining to grammar; in accordance with the rules of grammar.

gramophone (gram′ ō fōn), *n.* an instrument for recording and reproducing sound: originally a trade name.

grampus (gram′ pus), *n.* a sea mammal allied to the blackfish; the killer whale.

granary (grān′ *a* ri), *n.* [*pl.* granaries] a storehouse for grain.

grand (grand), *adj.* superior in rank or dignity, foremost; large, main, as the *grand* ballroom; magnificent, sumptuous, as entertaining on a *grand* scale; impressive, as scenery; distinguished, as a *grand* old man.

grandchild (grand′ chīld), *n.* the child of one's son or daughter.

grandfather (grand′ fä*th* ēr), *n.* a father's or mother's father.

grandparent (grand′ pâr′ ent), *n.* a parent's father or mother.

***grandeur** (gran′ dūr), *n.* greatness in size or dignity, eminence, magnificence, majesty.

grandiloquent (gran dil′ ō kwent), *adj.* speaking pompously, bombastic.

grandiose (gran′ di ōs), *adj.* impressive, magnificent; assuming a false splendor.

grange (grānj), *n.* a farm with its buildings; a local branch of the national organization of farmers.

granite (gran′ it), *n.* a hard rock composed of quartz and orthoclase or microline.

granivorous (gra niv′ ō rus), *adj.* grain-eating; living on seeds.

grant (gránt), *n.* something conferred, as land or rights.

grant (gránt), *v.t.* to give or confer, as land or rights; to concede, as a point in argument.

granular (gran′ ū lēr), *adj.* composed of grains; like grains.

granulate (gran′ ū lāt), *v.i. and v.t.* to form grains; to make into or cover with grains or crystals.

granule (gran′ ūl), *n.* a small grain, or grainlike particle.

grape (grāp), *n.* the fruit of the grapevine, a smooth-skinned, juicy berry growing in clusters and used as table fruit or in making wine; a cluster of small iron balls used as ammunition for cannons, grapeshot.

grapeshot (grāp′ shot), *n.* small shot that scatters when fired from a cannon.

graph (gráf), *n.* a diagram having lines, dots or other conventional symbols to show relative size or importance or the change over a period of time.

graphic (graf′ ik), *adj.* pertaining to the art of writing; describing vividly; of or pertaining to those arts, as painting, drawing, engraving, that express ideas by means of marks or lines on a flat surface.

graphite (graf′ īt), *n.* a soft, black carbon used in pencils.

grapnel (grap′ nel), *n.* a small anchor with several claws, used for small boats and for balloons; a grappling iron.

grapple (grap′ l), *n.* a close hold, as in wrestling; a device for gripping.

grapple (grap′ l), *v.i. and v.t.* to use a grappling iron; to struggle at close quarters; to lay fast hold of, as in a fight or wrestling match.

***grasp** (grásp), *n.* the act of seizing with the hand; power of understanding.

grasp (grásp), *v.i. and v.t.* to try to seize, as to *grasp* at anything; to seize, grip, clasp and hold; to lay hold of mentally, as to *grasp* an idea.

grass (grȧs), *n.* herbage having hollow stalks, jointed, long, narrow and spear-shaped blades and seeds like grain.

grate (grāt), *n.* a framework of iron bars to hold a coal fire.

grate (grāt), *v.i. and v.t.* to scrape and make a harsh noise; to grind, with harsh sounds, as metals scraping together; to have an irritating effect, as to *grate* on one's nerves; to pulverize by rubbing against a rough surface, as to *grate* cheese.

grateful (grāt′ fool), *adj.* thankful; giving pleasure, welcome.

grater (grāt′ ẽr), *n.* a kitchen utensil having a rough surface for rubbing off small portions of anything, as a nutmeg *grater*.

gratification (grat i fi kā′ shun), *n.* the act of pleasing or state of being pleased; that which gratifies.

gratify (grat′ i fī), *v.t.* to give pleasure or satisfaction to, indulge, as to *gratify* a whim.

Syn. Indulge, humor. To *gratify* is to give pleasure to, to *indulge* implies a yielding of the will, sometimes through weakness; to *humor* is, commonly, to make concessions to the whims and idiosyncracies of others.

grating (grāt′ ing), *n.* an open framework or lattice of bars.

grating (grāt′ ing), *adj.* harsh, irritating.

*__gratis__ (grā′ tis), *adv.* without charge, as a favor.

gratitude (grat′ i tūd), *n.* gratefulness, thankful appreciation.

gratuitous (gra tū′ i tus), *adj.* freely bestowed, without recompense; voluntary.

gratuity (gra tū′ i ti), *n.* [*pl.* gratuities] a free gift; a reward for minor services, as a tip.

*__gravamen__ (gra vā′ men), *n.* [*pl.* gravimina] the material part of a legal grievance or charge.

grave (grāv), *n.* an excavation for burial of a dead person.

grave (grāv), *v.t.* to cut or carve as with a chisel, engrave; to impress or fix indelibly.

grave (grāv), *adj.* serious, important, momentous, as a *grave* decision; solemn, sedate, as a *grave* manner.

Syn. Serious, solemn, earnest. *Grave* implies austerity as if from consideration of weighty matters; *serious*, deep thought or reflection; *solemn*, extreme gravity; *earnest*, restrained eagerness and always connotes sincerity.

gravel (grav′ el), *n.* fragments of rock, coarser than sand; pieces of hard matter in the bladder or kidneys.

gravel (grav′ el), *v.t.* to cover with gravel.

gravel-blind (grav′ el blīnd), *adj.* having very dim sight; a humorous variation of sand-blind, originally semi-blind.

gravitate (grav′ i tāt), *v.i.* to be acted upon by the force of gravity; to be attracted toward, as political job seekers *gravitate* toward Washington.

gravitation (grav i tā′ shun), *n.* the force that attracts bodies toward each other.

gravity (grav′ i ti), *n.* the force that tends to draw all bodies toward the center of the earth; seriousness.

gravy (grā′ vi), *n.* [*pl.* gravies] a sauce for food, as chicken *gravy*; the juice that drips from meat while it is cooking, often serving as a base for such sauce.

gray (grā), *n.* a color resulting from blending black and white; an animal of this color, as the horse was a *gray*.

gray (grā), *adj.* having the color of white mixed with black, as *gray* cloth; turning white, as *gray* hair; dismal, as a *gray* day.

graze (grāz), *v.i. and v.t.* to feed on growing grass; to put cattle out in pasture to feed on growing herbage; to scrape in passing, as the bullet barely *grazed* its mark.

*__grease__ (grēs), *n.* soft animal fat; oily matter used for lubrication.

*__grease__ (grēs), *v.t.* to apply grease to; to lubricate with oily matter.

*__greasy__ (grēs′ i), *adj.* [*comp.* greasier, *superl.* greasiest] like grease; smeared or spotted with grease.

great (grāt), *adj.* large in size, number or quantity, as a *great* sum of money; eminent, able and honored, as a *great* man; of extraordinary magnitude or intensity, as a *great* flood; long continued, as for a *great* many years; more remote by one generation, as *great*-grandchild.

Syn. Large, big. *Great* expresses degree; *large* connotes breadth, scope, generosity; *big* expresses size, bulk or extent.

greed (grēd), *n.* avarice, cupidity, inordinate desire, as *greed* for power.

greedy (grēd′ i), *adj.* [*comp.* greedier, *superl.* greediest] inordinately desirous, as of wealth, avaricious; ravenous.

green (grēn), *n.* a color uniting blue and yellow; a grass plot, as the square of turf about a hole in a golf course.

green (grēn), *adj.* having the color made by blending blue and yellow; fresh and flourishing, as *green* memories; unripe, as *green* fruit; inexperienced, as a *green* worker; not seasoned, as *green* lumber; having an unhealthy color.

greenback (grēn′ bak), *n.* a piece of paper money printed on the back with green ink.

greenhorn (grēn′ hôrn), *n.* an inexperienced person, a novice.

greenhouse (grēn′ hous), *n.* a glass-roofed building in which plants are grown.

greenroom (grēn′ ro͞om), *n.* a waiting room for actors in old theaters.

greens (grēnz), *n.* evergreen branches used for decoration, especially at Christmas; vegetable leaves, as of spinach or turnips, used as food.

greensward (grēn′ swôrd), *n.* a stretch of good turf.

greet (grēt), *v.t.* to welcome; to salute in friendly, hospitable manner; to appear before, as a strange sight *greeted* our eyes.

greeting (grēt′ ing), *n.* a salutation, welcome; a written salutation sent to, or received from, someone absent.

*__gregarious__ (grē gâr′ i us), *adj.* associating in herds or companies.

*__grenade__ (grē nād′), *n.* an explosive shell, with a time fuse, thrown by hand or fired from a rifle; a flask filled with chemicals, thrown upon a fire to extinguish it.

grenadier (gren *a* dēr′), *n.* an infantryman who throws grenades; a member of a special corps or company in the army.

grenadine (gren *a* dēn′), *n.* a dress fabric of thin, gauzy silk, wool or cotton; a sirup made from pomegranates or red currants.

greyhound (grā′ hound), *n.* a slender, long-bodied, fast-running dog with keen sight, used extensively for hunting and racing.

grid (grid), *n.* a gridiron or grated iron implement used for broiling; a lead plate used in a storage battery; an electrode controlling the current between plate and filament of an electron tube.

griddle (grid′ l), *n.* a metal plate for cooking pancakes.

griddlecake (grid′ l kāk), *n.* a thin battercake usually of wheat or buckwheat flour and cooked on each side, a pancake.

gridiron (grid′ ī ẽrn), *n.* a grated iron utensil for broiling meat or fish; anything marked with parallel lines resembling a gridiron, as a football field.

grid leak (grid lēk), *n.* a resistor used with an electron tube.

grief (grēf), *n.* great sorrow, affliction; that which causes sorrow; misfortune, as to come to *grief*.

Syn. Sadness, woe, anguish. *Grief* is acute mental pain resulting from a definite cause; *sorrow* is sadness over loss or disappointment; *woe* is inconsolable misery; *anguish* is excruciating distress of mind or body.

Ant. Joy, happiness, delight.

grievance (grēv′ ans), *n.* a sense of wrong; a cause of annoyance and resentment.

grieve (grēv), *v.i. and v.t.* to feel sorrow or grief; to cause sorrow and grief.

grievous (grēv′ us), *adj.* causing pain or sorrow; serious, as a *grievous* wrong.

griffin (grif′ in), *n.* a fabulous animal with the body and legs of a lion, the wings and beak of an eagle.

grill (gril), *n.* a gridiron; an apparatus for broiling; a dish of broiled meat, as a mixed *grill*.

grill (gril), *v.t.* to cook on a grill, broil; to subject to cross-examination, as a witness or accused person.

grille (gril), *n.* a wrought iron or bronze grating in a window or gateway.

grillroom (gril′ ro͞om), *n.* a room especially equipped for the serving of broiled food, as in a hotel.

grim (grim), *adj.* [*comp.* grimmer, *superl.* grimmest] of forbidding aspect, unyielding, relentless; repellent, as a *grim* duty; ghastly, as a *grim* tale.

*__grimace__ (gri mās′), *n.* a facial distortion, wry face; a twisting of the face, as in pain.

grimace (gri mās′), *v.i.* to make a face.

grime (grīm), *n.* dirt, soot.

grimy (grīm′ i), *adj.* covered with dirt.

grin (grin), *n.* a broad smile.

grin (grin), *v.i.* to smile broadly.

grind (grīnd), *n.* the act of grinding; tiresome work, dreary routine.

grind (grīnd), *v.t. and v.i.* to rub together, as to *grind* the teeth; to reduce grain to meal by rubbing between hard surfaces, as to *grind* corn; to operate by turning a crank; to polish or sharpen, whet, as to *grind* scissors.

grindstone (grīnd′ stōn), *n.* a circular stone turning on an axle, on which tools are ground and sharpened.

grip (grip), *n.* a firm grasp with the hand; a mechanical device for taking hold of something firmly; force of hold, either physical or mental, as the *grip* of disease, a good *grip* on the problem; strength of the hand, as he has a mighty *grip*.

grip (grip), *v.t.* to seize strongly with the hand; to hold firmly; to give a handclasp to; to hold fixed in rapt attention, as the speaker's words *gripped* the audience.

gripe (grīp), *n.* a pain in the intestines; distress, hardship, as the *gripe* of poverty.

grippe (grip), *n.* a heavy cold accompanied by fever and pain in the joints, influenza.

gripping (grip′ ing), *adj.* intensely interesting, so as to catch and hold attention to the end, as a gripping story or dramatic situation.

grisly (gris′ li), *adj.* [*comp.* grislier, *superl.* grisliest] ghastly, hideous, gruesome.

grist (grist), *n.* grain for grinding; ground corn.

gristle (gris′ l), *n.* a tough, rubberlike, translucent substance in animal tissue, cartilage.

gristmill (grist′ mil), *n.* a mill where grain or corn is ground.

grit (grit), *n.* rough, hard particles, as of sand; courage.

grits (grits), *n. pl.* grain coarsely ground, as corn.

gritty (grit′ i), *adj.* of or like small, hard particles of sand; brave, plucky.

grizzly (griz′ li), *n.* [*pl.* grizzlies] the grizzly bear, a large, fierce bear of the western North American mountain regions.

grizzly (griz′ li), *adj.* streaked with gray, as hair.

groan (grōn), *n.* a sound uttered in pain and sorrow and sometimes intentionally to manifest ridicule.

Syn. Moan. A *groan* is a deep, often spasmodic sound indicating acute distress; a *moan* is a plaintive, sustained sound.

groan (grōn), *v.i.* to utter a moaning sound, as in great pain, sorrow, or to express ridicule.

grocer (grō′ sẽr), *n.* one whose business it is to sell foodstuffs, as tea, coffee, sugar, fruits.

grocery (grō′ sẽr i), *n.* [*pl.* groceries] a shop selling food commodities.

groceries (grō′ sẽr iz), *n. pl.* things sold by grocers, as tea, coffee, sugar, spices.

grog (grog), *n.* a mixture of spirits and water without sweetening; any intoxicating drink.

groggery (grog′ ẽr i), *n.* a grogshop, barroom.

groggy (grog′ i), *adj.* tipsy; dazed, as if by drink.

grogshop (grog′ shop), *n.* a liquor saloon.

groin (groin), *n.* the part of the body between the thigh and the abdomen; the curve made by the intersection of two arches.

grommet (grom′ et), *n.* a metal ring for receiving a cord or rope, as on sails or mailbags.

groom (grōōm), *n.* one who has charge of horses.

groom (grōōm), *n.* a man about to be married or recently married.

groom (grōōm), *v.t.* to curry and feed a horse and keep it in good condition: *well groomed,* glossy, sleek, as a horse; neat in appearance, well dressed, as a person.

groomsman (grōōmz′ man), *n.* a man who attends the groom at a wedding.

groove (grōōv), *n.* a channel or furrow, especially when cut in something by a tool; habit, routine.

groove (grōōv), *v.t.* to make grooves in.

grope (grōp), *v.i.* to feel one's way in the dark with the hands; to feel about for something, physically or mentally, as to *grope* for an idea.

grosbeak (grōs′ bēk), *n.* a big-beaked songbird related to the finches.

***grosgrain** (grō′ grain), *n.* a stout, double-corded silk.

***gross** (grōs), *n.* twelve dozen; the entire amount.

gross (grōs), *adj.* large and coarse, unrefined; total, as of earnings; flagrant, as *gross* neglect.

grotesque (grō tesk′), *adj.* fantastic, bizarre, incongruous.

grotto (grot′ ō), *n.* a natural cavern in the earth; an artificial place of retreat resembling a cave.

grouch (grouch), *n.* one who is habitually cross and sulky.

grouch (grouch), *v.i.* to grumble, complain, as he always has something to *grouch* about.

ground (ground), *n.* the earth underfoot; land; foundation for belief, good reason; extent to be covered; the bottom, as of a body of water; contact of an electric conductor with the earth, as in *ground* wire; *grounds,* sediment, dregs; foundation, cause, reason.

ground (ground), *v.t. and v.i.* to bring down to or cause to touch the earth, as an airplane; to found, establish; to instruct in the first principles of anything; to connect with the earth, making a complete electrical circuit; to have a basis; to run aground, strike bottom, as the ship *grounded;* to light upon the ground.

ground (ground), *adj.* having been reduced to particles through a process of grinding; relating to the ground, as *ground* water; near the earth, as the *ground* floor.

ground hog (ground hog), a thickset, North American burrowing rodent; woodchuck.

groundless (ground′ les), *adj.* without reason, not founded in fact.

ground plan (ground plan), the floor plan of a building.

ground swell (ground swel), a heavy rolling of the sea, as after a storm.

groundwork (ground′ wûrk), *n.* the foundation for an enterprise, preparation.

group (grōōp), *n.* a small assemblage of things having some relation; cluster, as of buildings.

group (grōōp), *v.i. and v.t.* to form in a group; to organize a group.

***grouse** (grous), *n.* a game bird, with a plump body and reddish-brown plumage.

***grout** (grout), *n.* coarse meal; mortar or cement mixed with gravel; plaster for ceilings.

grove (grōv), *n.* a group of trees; a small wood; a group of cultivated trees, as an orange *grove.*

grovel (grov′l), *v.i.* to lie face downward; to creep on the ground; to crawl and cringe, as in submission or appeal.

grow (grō), *v.i. and v.t.* [*p.t.* grew, *p.p.* grown, *pr.p.* growing] to increase in size through natural processes; to flourish; to change by degrees, increase in any way, as to *grow* older and wiser; to cultivate, as to *grow* corn.

growl (groul), *n.* a deep angry, throaty noise, as of a dog.

growl (groul), *v.i.* to utter a growl; to grumble.

growth (grōth), *n.* the gradual development of a plant or animal; increase in size or amount; something that grows, as the hill was covered with green *growth;* a tumor or cancer.

grub (grub), *n.* the thick, wormlike larva of some insects, as beetles.

grub (grub), *v.i. and v.t.* to dig with effort; to uproot, as tree stumps; to drudge; to clear by digging.

grudge (gruj), *n.* secret ill will in resentment of a real or fancied wrong.

grudge (gruj), *v.t.* to grant with visible reluctance; to give with regret.

gruel (grōō′ el), *n.* thin porridge.

gruesome (grōō′ sum), *adj.* ghastly, inspiring horror.

gruff (gruf), *adj.* blunt, rough, surly, hoarse and rough, as a *gruff* voice.

grumble (grum′ bl), *n.* a subdued murmur, complaint.

grumble (grum′ bl), *v.i.* to find fault, complain.

grumpy (grump′ i), *adj.* surly, cross, ill-tempered.

grunt (grunt), *n.* the guttural noise a pig makes; an inarticulate sound expressing indifference or contempt.

grunt (grunt), *v.i.* to make a guttural sound, as a pig.

***guano** (gwä′ nō), *n.* the droppings of sea birds found in large deposits especially off the coast of Peru and used as fertilizer.

***guarantee** (gar an tē′), *n.* anything that assures a certain thing will happen or be done; a solemn statement that a thing is as it is represented to be, a guaranty.

guarantee (gar an tē′), *v.t.* to give assurance that a thing is as represented, especially when reparation for defects is provided; to be legally responsible for.

guarantor (gar′ an tôr), *n.* one who guarantees; one who assumes legal responsibility for the debt or default of another.

***guaranty** (gar′ an ti), *n.* assumption of responsibility for meeting of obligations by another; property pledged as security for fulfilment of an obligation.

guard (gärd), *n.* one who watches over and protects; a protecting part, as a mud*guard,* a watch*guard;* act of guarding: *on guard,* on the watch, as in military service.

guard (gärd), *v.t. and v.i.* to watch over; to check, restrain, keep under control, as to *guard* one's speech; to be cautious, prudent, as to *guard* against want.

Syn. Safeguard, shelter, curb. To *guard* is to stand watch over and maintain in safety; to *safeguard* is to provide means of protection from danger; to *curb* is to restrain.

***guardian** (gär′ di an), *n.* one who has the care of another's property or person or both, especially a custodian appointed by law.

***guava** (gwä′ v*a*), *n.* a tree of tropical America, yielding a pear-shaped fruit, used in making jelly; the fruit of this tree or the jelly made from it.

***gubernatorial** (gū bẽr n*a* tō′ ri al), *adj.* pertaining to a governor or the governorship, as a *gubernatorial* campaign.

gudgeon (guj′ un), *n.* a small European fresh-water fish; a person easily imposed upon.

gudgeon (guj′ un), *n.* an iron pin or shaft on which a wheel revolves; a socket in which a turning pin rests, as in a hinge or the rudder setting of a small boat.

guernsey (gûrn′ zi), *n.* a close-fitting knitted woolen shirt.

***guerrilla** (ge ril′ *a*), *n.* one of an irregular band of raiders, not a regular part of an army.

guerrilla (ge ril′ *a*), *adj.* pertaining to irregular warfare.

guess (ges), *n.* a conjecture, surmise, opinion not founded on evidence.

guess (ges), *v.i. and v.t.* to form an opinion without evidence to give it support; to work out by conjecture, as to *guess* the answer to a riddle.

Syn. Conjecture, surmise, divine, fancy. To *guess* is to attempt to hit upon the correct answer at random or without sufficient evidence; to *conjecture* is to form an opinion on what is acknowledged as insufficient data; to *surmise* is to infer on still slighter grounds; to *divine* is to perceive through sympathy or intuition; to *fancy* is to believe without being sure.

guest (gest), *n.* one who is entertained at the house or table of another; a lodger or boarder at a hotel or inn.

guffaw (gu fô′), *n.* a rude, boisterous laugh.

guidance (gīd′ ans), *n.* the act of directing; supervision.

guide (gīd), *n.* one who leads or directs; a small book containing information for travelers, a guidebook; the end man on a line of soldiers.

guidebook (gīd′ book), *n.* a handbook for the direction of tourists.

guild or gild (gild), *n.* an association of persons engaged in a common trade or calling, for mutual advantage and protection.

guile (gīl), *n.* deceit, duplicity, treachery.

***guillotine** (gil′ ō tēn), *n.* an apparatus for beheading condemned persons by means of a heavy knife sliding between uprights.

guilt (gilt), *n.* the state of having committed an offense or crime; the fact of having violated a law.

guiltless (gilt′ les), *adj.* innocent, free from guilt.

guilty (gilt′ i), *adj.* [*comp.* guiltier, *superl.* guiltiest] justly chargeable with an offense or crime; not innocent, as a *guilty* mind.

***guimpe** (gamp), *n.* a women's sleeveless undergarment; a decorative, detachable vestee.

guinea fowl (gin′ i foul), a barnyard fowl having grayish blue feathers with white dots, originally imported from Guinea.

guinea pig (gin′ i pig), a small rodent having short ears and tail; a cavy.

***guise** (gīz), *n.* external appearance, dress; cloak, mask, pretense.

***guitar** (gi tär′), *n.* a six-stringed musical instrument played with the fingers.

gulch (gulch), *n.* a gully, ravine.

gulf (gulf), *n.* an arm of the sea extending into the land and larger than a bay; an abyss.

gull (gul), *n.* a web-footed sea bird with long wings; a person easily deceived or cheated.

gull (gul), *v.t.* to deceive, cheat.

gullet (gul′ et), *n.* the tube that leads from the mouth to the stomach, the throat.

gullible (gul′ i bl), *adj.* easily deceived or imposed upon.

gully (gul′ i), *n.* [*pl.* gullies] a dry channel or groove in the earth, worn by water.

gulp (gulp), *n.* the act of swallowing hastily; a large amount swallowed at once.

gulp (gulp), *v.i. and v.t.* to catch the breath, as if by swallowing; to swallow eagerly or greedily.

gum (gum), *n.* a sticky substance that exudes from certain trees; a preparation of elastic substances flavored and used for chewing; the tissue of the jaws in which the teeth are set.

gum (gum), *v.i. and v.t.* [*p.t.* and *p.p.* gummed, *pr.p.* gumming] to turn into gum, make into gum; to fasten with gum.

gumbo (gum′ bō), *n.* the okra plant or its pods; a soup thickened with okra pods.

gummy (gum′ i), *adj.* consisting of, containing or producing a sticky substance; covered with a sticky substance.

gum resin (gum rez′ in), a dried mixture of gum and resin.

gun (gun), *n.* a weapon consisting of barrel, hammer, trigger and stock, discharged by an explosive and carrying a charge of shot or a bullet.

guncotton (gun′ kot n), *n.* cotton or other vegetable fiber treated with acids and used as an explosive.

gunman (gun′ man), *n.* an armed thief or murderer.

gun metal (gun′ met′ l), an alloy of copper and tin, formerly used in making cannon; a dark-gray color having a bluish-red tinge.

gunner (gun′ ẽr), *n.* one who works a gun; a warrant officer in charge of ordnance on a ship; one who hunts game with a gun.

gunnery (gun′ ẽr i), *n.* the science of artillery.

gunpowder (gun′ pou dẽr), *n.* an explosive substance composed of saltpeter, sulphur and charcoal.

*__gunwale__ (gun′ el), *n.* the upper part of a boat where topsides and deck meet.

gurgle (gûr′ gl), *n.* a bubbling sound or the sound of water flowing from a narrow-necked bottle or jug.

gurgle (gûr′ gl), *v.i.* to flow in a broken, rushing stream; to make a bubbling sound.

*__gush__ (gush), *n.* a sudden strong flow of liquid from an enclosed space; an outburst, as of words.

gush (gush), *v.i.* to flow forth suddenly, strongly and in volume.

gusher (gush′ ẽr), *n.* an oil well with voluminous, natural flow.

gusset (gus′ et), *n.* a triangular piece of cloth inserted in a garment to enlarge or reinforce it.

gust (gust), *n.* a sudden blast or puff of wind; an outburst, as of anger.

*__gustatory__ (gus t*a* tō ri), *adj.* pertaining to the taste.

gusto (gus′ tō), *n.* zest, relish.

gut (gut), *n.* an intestine; a narrow channel.

gut (gut), *v.t.* to remove the intestines from; to destroy the inside of, as fire *gutted* the building.

gutta-percha (gut′ *a* pûr′ ch*a*), a white-to-brown, rubberlike substance obtained from evergreen trees of the Malay Archipelago, used in commerce and industry.

gutter (gut′ ẽr), *n.* a channel for carrying away water, as from the streets or from the eaves of a house.

*__guttural__ (gut′ ẽr al), *adj.* pertaining to the throat; sounded in the throat, as a *guttural* tone.

guy (gī), *n.* a rope or chain for steadying anything, as a pole or mast; a queer-looking or oddly dressed person.

guzzle (guz′ zl), *v.i. and v.t.* to drink greedily and immoderately.

*__gymnasium__ (jim nā′ zi um), *n.* [*pl.* gymnasiums] a building or room for athletic exercises; a European high school, especially in Germany.

gymnast (jim′ nast), *n.* one who excels in gymnastics.

gymnastics (jim nas′ tiks), *n. pl.* physical exercises with weights or on bars, fixed or swinging, and various apparatus requiring strength and skill in their use.

*__gynecology__ (jin′ ē kol ō ji), *n.* the branch of medical science that treats of the physical functions and diseases of women.

*__gypsum__ (jip′ sum), *n.* calcium sulphate, used in making plaster of Paris.

gypsy (jip′ si), *n.* a member of a dark-skinned, wandering race of Oriental origin.

gypsy moth (jip′ si môth), a European moth prevalent in New England since about 1870 and having caterpillars that destroy fruit and other trees.

gyral (jī′ ral), *adj.* rotatory, whirling.

gyrate (jī′ rāt), *v.i.* to revolve around a central point, rotate.

gyration (jī rā′ shun), *n.* the act of turning or whirling around a center.

*__gyrocompass__ (jī′ rō kum p*a*s), *n.* a type of continuously driven gyroscope, so constructed that the axis always points to the true north.

*__gyroplane__ (jī rō plān), *n.* an aircraft whose balance and support depend upon swiftly rotating horizontal or slightly inclined planes.

*__gyroscope__ (jī′ rō skōp), *n.* an instrument with a flywheel revolving about a movable axis, used for stabilizing airplanes, monorail cars, ships, compasses.

H

*__habeas corpus__ (hā′ be as kôr′ pus), a Latin expression meaning *you have the body;* a legal writ directing that a person be brought to court, especially the prerogative writ to determine whether he is lawfully under restraint.

haberdasher (hab′ ẽr dash ẽr), *n.* a dealer in small goods, ribbons, needles, thread; in the U. S., a dealer in men's furnishings.

haberdashery (hab′ ẽr dash ẽr i), *n.* a store selling men's furnishings, as socks, ties, collars.

habiliments (h*a* bil′ i ments), *n. pl.* dress, costume, garb.

habilitate (h*a* bil′ i tāt), *v.t.* to clothe; to fit out for work, equip, as a mine.

habit (hab′ it), *n.* dress, clothing for special use or occasion, as a riding *habit;* a characteristic produced by constant repetition of an action.

habitable (hab′ i t*a* bl), *adj.* fit to live in.

*__habitat__ (hab′ i tat), *n.* the region in which an animal or plant naturally lives.

*__habitation__ (hab i tā′ shun), *n.* a dwelling place.

Syn. Home, residence, domicile. A *habitation* is merely a place of abode; a *residence* is a permanent dwelling place; a *home* is a dwelling endeared as the scene of domestic ties and family life.

*__habitual__ (h*a* bit′ ū al), *adj.* done by habit, customary.

habituate (h*a* bit′ ū āt), *v.t.* to accustom oneself to certain conditions or actions through constant use or repetition.

habitué (h*a* bit ū ā′), *n.* one who frequents a certain place, as he is a *habitué* of this restaurant.

hack (hak), *n.* a carriage let out for hire; a literary drudge, doing odd jobs of writing; a short, dry cough; a tool for breaking up surfaces of land; a gash inflicted by a sharp instrument.

hack (hak), *v.t. and v.i.* to cut unevenly, gash, as to *hack* a tree; to give a short, dry cough, as he *hacks* continually.

hackle (hak′ l), *n.* the neck feathering of a fowl; a certain feathered fly for angling.

hackle (hak′ l), *v.t.* to clean flax or hemp by combing.

hackney (hak′ ni), *n.* [*pl.* hackneys] a breed of horses for riding and driving; a hack, a carriage for hire.

hackney (hak′ ni), *v.t.* [*p.t.* and *p.p.* hackneyed, *pr.p.* hackneying] to wear out by constant use.

hackneyed (hak′ nid), *adj.* worn, commonplace, as a *hackneyed* expression.

hack saw (hak′ sô), a narrow, close-toothed saw, set in a frame, used for cutting metal.

haddock (had′ uk), *n.* an edible sea fish similar to the cod but smaller.

*__haft__ (hȧft), *n.* the handle of a tool or knife, a hilt.

hag (hag), *n.* a witch; an ugly old woman.

haggard (hag′ ẽrd), *adj.* worn, gaunt, lean and hollow-eyed.

hail (hāl), *n.* frozen rain; anything scattered in abundance, as a *hail* of bullets; a salutation.

hail (hāl), *v.i. and v.t.* to pour down small, icy particles; to shower down with force; to greet with a cry of salutation, as I *hailed* my friend; to call after.

hair (hâr), *n.* a threadlike growth from the skin of an animal; the entire growth of hair on an animal or on a human head; a very small distance, as to miss by a *hair.*

hairbreadth (hâr′ bredth), *n.* a minute distance.

hairsplitting (hâr′ split ing), *n.* the act of drawing very fine distinctions.

hairspring (hâr′ spring), *n.* an extremely delicate spring regulating the movement of a watch.

hair trigger (hâr trig′ ẽr), a gun trigger so delicately adjusted that the slightest touch fires the gun.

hairy (hâr′ i), *adj.* covered with hair; like hair.

*__halcyon__ (hal′ si un), *adj.* peaceful, happy, calm.

hale (hāl), *adj.* physically sound, healthy.

hale (hāl), *v.t.* to move a person by force, as to *hale* him to court.

*__half__ (häf), *n.* [*pl.* halves] one of two equal parts.

half (häf), *adj.* consisting of half.

half (häf), *adv.* to the extent of one-half, as *half* past four; partly, as I was *half* drowned.

half blood (häf blud), *n.* one whose parents are of different races, a half-breed.

half-breed (häf′ brēd), *n.* a person of mixed blood; especially in the U. S., the offspring of an American Indian and a member of the white race.

*__halibut__ (hal′ i but), *n.* a large, flat sea fish, prized as a food fish.

halitosis (hal i tō′ sis), *n.* disagreeable breath.

hall (hôl), *n.* a large room; a corridor or passage; a vestibule; a college building.

hallmark (hôl′ mark), *n.* an official mark attesting the quality of gold and silver articles; any proof or mark of genuineness.

hallow (hal′ ō), *v.t.* to consecrate, devote to sacred purposes.

hallucination (h*a* lū si nā′ shun), *n.* belief in something purely imaginary and nonexistent as though it were real, a delusion.

halo (hā′ lō), *n.* a ring of light appearing to encircle a luminous body; the bright ring shown in works of art around the heads of holy persons; the glory that surrounds a person or thing idealized.

halt (hôlt), *n.* a stop in marching; a break in any progress; lameness.

halt (hôlt), *v.i. and v.t.* to stop in marching; to bring to a stop; to check any progress, as to *halt* proceedings.

halt (hôlt), *adj.* lame, crippled.

halter (hôl′ tẽr), *n.* a rope on a headstall for leading or holding an animal, as a horse; a hangman's rope; an article of clothing worn by girls and women, tied around the neck and waist, leaving the shoulders bare.

halting (hôl′ ting), *adj.* lame, limping, hesitant, as *halting* speech.

halve (häv), *v.t.* to divide into two equal parts.

*__halyard__ (hal′ yẽrd), *n.* a rope or tackle for hoisting a flag or sail.

ham (ham), *n.* the back part of the thigh of an animal, especially of a pig; a hog's thigh, salted and smoked.

hame (hām), *n.* one of the two curved bars on a draft horse's harness to which the traces are attached.

hamlet (ham′ let), *n.* a small village.

hammer (ham′ ẽr), *n.* a tool with a handle and an iron head for driving nails; anything of similar construction, as the *hammer* of a gun, the *hammer* or padded mallet striking the wires in a piano, the weight on a handle used in throwing the *hammer.*

hammer (ham′ ẽr), *v.i. and v.t.* to strike heavy blows; to pound or drive with a hammer.

hammerhead (ham′ ẽr hed), *n.* a kind of shark with a hammer-shaped head.

hammock (ham′ uk), *n.* a swinging couch, usually of network or canvas; a hummock or ridge.

hamper (ham′ pẽr), *n.* a wicker basket usually having a cover, as a clothes *hamper.*

hamper (ham′ pẽr), *v.t.* to impede, obstruct.

hamstring (ham′ string), *v.t.* [*p.t.* and *p.p.* hamstrung, *pr.p.* hamstringing] to lame by cutting the tendons at the back of the leg.

hand (hand), *n.* the part of the body with which one grasps; the broad flat member at the lower end of the arm, connected with it by the wrist and divided into thumb, fingers and palm; anything resembling a hand in appearance, structure or use, a pointer, as the *hands* of a clock; a measure of 4 inches; style of penmanship, as to write a good *hand;* cards dealt to one player in one round of the game; a manual worker, as a farm*hand;* assistance, as to lend a *hand;* ability, as try your *hand* at this; direction, side, as on the right *hand;* source, as first*hand* knowledge; any part in an action, as I had a *hand* in that.

hand (hand), *v.t.* to give or pass with the hand, as *hand* me that book.

hand (hand), *adj.* associated with or done by the hand, as *hand*work.

handcuff (hand′ kuf), *n.* a manacle, a metal ring that can be locked around the wrist, used to fetter criminals.

handicap (han′ di kap), *n.* a hindrance, disadvantage; a disadvantage (or advantage) to a contestant to make the match more even, as in a race.

handicraft (han′ di krȧft), *n.* an occupation requiring manual skill; expertness in working with the hands.

handiwork (han′ di wûrk), *n.* work done by hand; the product of personal effort, as that bookcase is my own *handiwork.*

*__handkerchief__ (hang′ kẽr chif), *n.* a square of cloth for wiping the eyes, face or nose; a similar square worn about the neck, a neckerchief.

handle (hand′ l), *n.* the part of anything made and meant for grasping with the hand.

handle (hand′ l), *v.t.* to touch or feel with the hand; to manage, manipulate, control, as I will *handle* that business.

handmaid (hand′ mād), *n.* a female personal attendant.

***handsome** (han′ sum), *adj.* good-looking, as a *handsome* person; considerable, generous.

handspike (hand′ spīk), *n.* a wooden lever for moving heavy weights; a capstan bar.

handy (hand′ i), *adj.* [*comp.* handier, *superl.* handiest] skilled in using the hands; convenient, nearby.

hang (hang), *v.t. and v.i.* [*p.t.* and *p.p.* hung or hanged, *pr.p.* hanging] to suspend, to fasten to something above, as to *hang* curtains; to hold or carry in a lowered position, as to *hang* the head; to suspend by the neck until dead, as to *hang* a murderer; to dangle, be suspended, as the fruit *hung* just out of reach; to threaten, hover, as misfortune *hangs* over him.

***hangar** (hang′ ẽr), *n.* a shed for aircraft.

hanger (hang′ ẽr), *n.* that by which something is suspended, a form upon which an article of clothing is hung; one who suspends, as a paper hanger.

hangings (hang′ ingz), *n. pl.* draperies, curtains and wall decorations.

hangman (hang′ man), *n.* [*pl.* hangmen] a public executioner.

hangnail (hang′ nāl), *n.* a small piece of skin hanging from the root of a fingernail.

hank (hangk), *n.* two or more skeins of silk or yarn fastened together.

hanker (hang′ kẽr), *v.i.* to desire keenly, as to *hanker* for ice cream.

haphazard (hap haz′ ẽrd), *adv.* by chance, at random.

hapless (hap′ les), *adj.* unfortunate, unlucky.

happen (hap′ en), *v.i.* to occur, come about, befall.

Syn. Chance. To *happen* is to take place or occur; to *chance* is to occur by accident.

happily (hap′ i li), *adv.* fortunately; joyously.

happiness (hap′ i nes), *n.* the state of being happy, joyousness.

happy (hap′ i), *adj.* [*comp.* happier, *superl.* happiest] enjoying life, contented; causing joy or happiness, as a *happy* chance; expressing joy, as a *happy* smile; apt, as a *happy* reply.

harangue (h*a* rang′), *n.* a ranting public speech.

***harass** (har′ *a*s), *v.t.* to annoy, vex, weary; to pillage, raid, lay waste.

***harbinger** (här′ bin jẽr), *n.* a forerunner, messenger, as birds are *harbingers* of spring.

harbor (här′ bẽr), *n.* a port or haven for ships, a sheltered arm of a large body of water, with docks and piers.

harbor (här′ bẽr), *v.t.* to shelter or protect; to cherish; to entertain, indulge, as to *harbor* ill will.

hard (härd), *adj.* compact and solid; difficult to pierce or break; difficult to do; stern, unyielding.

Syn. Difficult, arduous. That is *hard* which will not yield to a compressing force; a *difficult* task is one that requires skill; *arduous* suggests wearisome exertion.

hard coal (härd kōl) anthracite.

harden (här′ dn), *v.i. and v.t.* to become hard or harder, as mortar *hardens;* to make hard or harder, as to *harden* the heart.

hardheaded (härd hed′ ed), *adj.* obstinate.

hardhearted (härd här′ ted), *adj.* cruel, unsympathetic.

hardihood (här′ di hood), *n.* physical endurance; effrontery.

hardly (härd′ li), *adv.* laboriously; scarcely.

Syn. Scarcely. *Hardly* means with difficulty; *scarcely* means with scant margin.

hardship (härd′ ship), *n.* privation; anything hard to bear.

hardware (härd′ wâr), *n.* metal manufactured articles, as tools, utensils, nails.

hardy (här′ di), *adj.* vigorous, sturdy, strong; bold, brave.

hare (hâr), *n.* a rodent with long ears, short tail and hind legs well developed for jumping, larger than a rabbit, timid, herbivorous.

harebrained (hâr′ brānd), *adj.* heedless, flighty.

harelip (hâr′ lip), *n.* a malformation of the upper lip, dividing it in the middle, like a hare's lip.

***harem** (hā′ rem), *n.* the apartments in a Mohammedan home for women and children; the women of a Mohammedan family.

***haricot** (har′ i kō), *n.* a kind of stew; the kidney bean; a climbing string bean.

hark (härk), *v.i.* to listen.

hark (härk), *interj.* listen!

***harlequin** (här′ lē kwin), *n.* the buffoon in a pantomime.

harm (härm), *n.* injury, damage.

harm (härm), *v.t.* to hurt, injure, damage.

harmonic (här mon′ ik), *adj.* having concord of sounds; pertaining to harmony as distinguished from melody and rhythm.

harmonica (här mon′ i k*a*), *n.* a mouth organ.

harmonics (här mon′ iks), *n. pl.* the science of musical sounds.

harmonious (här mō′ ni us), *adj.* concordant, adapted one to another; peaceful.

harmonize (här′ mō nīz), *v.i. and v.t.* to produce harmony; to bring into harmony.

harmony (här′ mō ni), *n.* [*pl.* harmonies] concordance of sounds; the science treating of musical composition in chords; agreement and co-operation.

harness (här′ nes), *n.* the working gear of a horse; equipment.

harness (här′ nes), *v.t.* to put harness on.

harp (härp), *n.* a large musical instrument of triangular shape, wired, and played with the fingers; any object or contrivance resembling a harp.

harp (härp), *v.i.* to dwell upon a subject with tedious repetition: used with *on* or *upon,* as she *harps* on his faults.

harpoon (här po͞on′), *n.* a long, barb-headed spear having a line attached to the shaft, used in hunting whales.

harpoon gun (här po͞on′ gun), a gun that discharges a harpoon.

harpsichord (härp′ si kôrd), *n.* a stringed instrument with a keyboard, an early form of the piano.

harpy (här′ pi), *n.* a greedy, covetous, grasping person; one resembling the Harpies of classical mythology.

harrow (har′ ō), *n.* an agricultural implement with teeth, drawn over plowed land to break up clods of earth and smooth the soil.

harrow (har′ ō), *v.t.* to run a harrow over, as plowed land; to torment and torture, as it *harrows* my very soul.

harrowing (har′ ō ing), *adj.* agonizing, as a *harrowing* experience.

harry (har′ i), *v.t.* [*p.t.* and *p.p.* harried, *pr.p.* harrying] to annoy greatly, harass.

harsh (härsh), *adj.* discordant, hard-toned, rough; austere.

hart (härt), *n.* the male of the red deer, a stag.

***hartshorn** (härts′ hôrn), *n.* a volatile preparation of ammonia.

harvest (här′ vest), *n.* the reaping season; the gathering in of crops; that which is reaped and gathered.

harvest (här′ vest), *v.i. and v.t.* to reap and gather, as a crop; to win, as a reward or gain from service or investment.

harvest home (här′ vest hōm), an autumn festival celebrating the gathering of the crops.

harvest moon (här′ vest mo͞on), the full moon coming nearest to the autumn equinox.

hash (hash), *n.* a dish of chopped meat and vegetables; a jumble or botch.

hash (hash), *v.t.* to cut up and mix; to botch, as a job: *hash* over, to go over and over the same ground in discussion.

hasp (håsp), *n.* a small bar secured by a padlock.

***hassock** (has′ uk), *n.* a mat or cushion on which to kneel; a tuft of coarse grass in swampy land.

haste (hāst), *n.* quick action, speed, impatient hurrying.

Syn. Precipitancy, hurry, bustle. *Haste* denotes rapidity and urgency; *hurry* implies confusion and flurry; *bustle* denotes commotion; *precipitancy* is headlong, excessive or rash haste.

haste (hāst), *v.i. and v.t.* to hurry, cause to go faster, hasten.

hasten (hās′ n), *v.i. and v.t.* to cause to make haste; to expedite; to hurry, as he *hastened* into the building.

hasty (hās′ ti), *adj.* [*comp.* hastier, *superl.* hastiest] hurried, fast, impetuous, impulsive, rash.

hasty pudding (hās′ ti pood′ ing), corn meal mush.

hat (hat), *n.* an article of clothing worn on the head, especially one with a crown and brim.

hatband (hat′ band), *n.* a ribbon worn around the hat.

hatch (hach), *n.* an opening in a floor, deck or roof, as at the top of a ladderway, with a flat, removable covering or lid; the lower half of a divided door.

hatch (hach), *n.* the brood of young birds leaving the eggs at one time.

hatch (hach), *n.* one of the fine, crossed lines used in a drawing or etching to shade the picture.

hatch (hach), *v.t. and v.i.* to produce, as from eggs, as to *hatch* chickens; to produce young, as the eggs *hatched* this morning.

hatch (hach), *v.i.* to mark with fine cross lines, as a drawing.

hatchery (hach′ ẽr i), *n.* a place where eggs are hatched artificially, as by incubators.

hatchet (hach′ et), *n.* a small ax.

hatchway (hach′ wā), *n.* a rectangular opening in a ship's deck for passage by men or goods.

hate (hāt), *n.* intense dislike, detestation, hatred.

hate (hāt), *v.t.* to dislike intensely, detest.

Syn. Detest, abhor, abominate, loathe. To *hate* is a general term signifying intense aversion, especially accompanied by ill will; to *abhor* implies deep-rooted antagonism or repugnance; to *abominate* is to detest in the highest degree; to *loathe* is to regard with utter disgust.

Ant. Love.

hateful (hāt′ fool), *adj.* malignant, obnoxious, extremely offensive.

Syn. Odious, obnoxious, offensive. *Hateful* implies something that excites actual aversion; *odious* something exceedingly disagreeable; *obnoxious* implies something objectionable; *offensive* applies to that which is displeasing or insulting, as an *offensive* odor; an *offensive* attitude.

hatred (hā′ tred), *n.* bitter aversion, malevolence, sustained hostility of feeling.

haughtiness (hô′ ti nes), *n.* the quality of being haughty.

Syn. Disdain, arrogance. *Haughtiness* is founded on a high opinion of oneself; *disdain,* on a low opinion of others. *Arrogance* combines the two feelings. *Haughtiness* and *disdain* are essentially mental states; *arrogance,* a mode of action springing from a state of mind.

Ant. Humility, meekness, modesty.

***haughty** (hô′ ti), *adj.* [*comp.* haughtier, *superl.* haughtiest] proud, overbearing, disdainful.

haul (hôl), *n.* a strong pull, as I gave it a *haul;* distance traversed by something pulled, as a long *haul;* things obtained by means of a pulling action, as a *haul* of fish in a net.

haul (hôl), *v.t.* to pull; to move by pulling, as to *haul* a train.

***haunch** (hônch), *n.* the leg and loin of an animal taken together; this part used as meat.

haunt (hônt), *n.* a place to which one frequently resorts.

***haunt** (hônt), *v.t.* to frequent, as a place; to appear and reappear, as a ghost; to fill the mind constantly, as the idea *haunts* me.

***hauteur** (hō tûr), *n.* a disdainful manner or bearing, air of conscious superiority.

have (hav), [*p.t.* and *p.p.* had, *pr.p.* having] to hold, as I *have* a pen in my hand; to own, possess, as he *has* a farm, to *have* fears, I *have* an idea; to experience, as to *have* fun;

to enjoy, as every dog *has* his day; to give birth to, as to *have* a baby; to be under obligation or compulsion, as we *have* to leave soon; to cause to be or do, bring about, as we *had* the garden weeded; *have* nothing to do with dishonest practices. As an auxiliary verb *have* is used to form the present perfect, past perfect and future perfect tenses of other verbs, as I *have* walked, I *had* walked, I shall *have* walked.

haven (hā' ven), *n.* a harbor; a port or shelter for ships; any place of refuge.

haversack (hav' ẽr sak), *n.* a canvas bag in which rations are carried.

havoc (hav' uk), *n.* destruction, devastation, ruin, waste.

haw (hô), *interj.* a driver's call to a draft animal or team directing it toward the driver or to the left: opposite of *gee.*

hawk (hôk), *n.* a fast-flying, strong bird of prey.

hawk (hôk), *v.t.* to peddle, as wares by crying them in the street.

hawsehole (hôz' hōl), an opening in a ship's bow through which a hawser or cable passes.

***hawser** (hô' zẽr), *n.* a thick rope or cable used in towing, mooring or anchoring a ship.

hawthorn (hô' thorn), *n.* a prickly shrub or tree of the rose family.

hay (hā), *n.* grass, clover, alfalfa, cut and dried for use as fodder.

haycock (hā' kok), *n.* a conical pile of hay in a field.

hay fever (hā fē' vẽr), catarrh, with sneezing and high temperature, usually suffered in spring or late summer and caused by pollen in the air, to which the sufferer is sensitive.

***hay mow** (hā mou), a hay loft, the part of a barn in which hay is stored.

hazard (haz' ẽrd), *n.* a risk; something risked as in a gamble.

hazard (haz' ẽrd), *v.t.* to risk; to stake on a chance, as money.

Syn. Risk, venture. One *hazards* an opinion; he *hazards* money in a card game; *hazards* his life in a battle. One *risks* his life in trying to save another. He *ventures* (money) in business, taking the chance of losing in order to be in line for profits.

hazardous (haz' ẽrd us), *adj.* risky, perilous, chancy.

haze (hāz), *n.* a slight fog or mist; dimness of sight; mental confusion.

hazel (hāz' el), *n.* a shrub or tree bearing an edible nut.

hazel (hāz' el), *adj.* made of hazel wood; having a soft reddish-brown color.

hazy (hā' zi), *adj.* misty; obscure.

he (hē), *pron.* [*pl.* they] the man mentioned; anyone, as *he* who runs may read: the masculine pronoun of the third person, singular.

head (hed), *n.* the highest part of the human body, holding the brain and the face, with eyes, nose and mouth in front, the ears on the sides; the principal part of anything, as the *head* of a hill; a leader, commander or chief executive; the top part or upper end of anything, as the *head* of a cane, a bed, a line of persons, a *head* of cabbage, the *head* of an article in a newspaper; the *head* of a boil; intellect, as a good *head* for figures; the source, as the *head* of a stream; an individual, as 20 *head* of cattle, $5 a *head.*

head (hed), *v.t. and v.i.* to lead, to stand at the head of, as to *head* a line; to supply with a heading, as to *head* a newspaper article; to form a head, as cabbage *heads* heavily.

head (hed), *adj.* principal or chief, as the *head* man; coming from in front, as a *head* wind; leading, as the *head* horse.

heading (hed' ing), *n.* a headline or set of headlines over an article.

headland (hed' land), *n.* a promontory; a strip of unplowed land at the sides of a field.

headlight (hed' līt), *n.* a lamp at the front of a locomotive or automobile; a masthead light.

headline (hed' līn), *n.* a line of type at the top or head of a page or column in a book, newspaper, magazine, giving a title.

headlong (hed' lông), *adv.* headfirst.

headphone (hed' fōn), *n.* a receiver for telephone or radio held over the ear by a hand worn around the head.

headquarters (hed' kwôr tẽrz), *n.* a central establishment, as the *headquarters* of a business enterprise, *headquarters* of a brigade; the quarters of a high commanding officer.

headstrong (hed' strông), *adj.* ungovernable, self-willed.

headway (hed' wā), *n.* the momentum of a vehicle; distance run after power is shut off; progress; the interval, especially of time, between two trains or the like running in the same direction; any kind of progress, as we are making good *headway;* clearance, as under a bridge.

heady (hed' i), *adj.* precipitate; intoxicating.

heal (hēl), *v.i. and v.t.* to become well or sound, as the wound *heals* slowly; to make well or sound, as the doctor *healed* me quickly.

health (helth), *n.* mental, physical or moral soundness; freedom from disease.

healthful (helth' fool), *adj.* promoting health, salubrious.

healthy (helth' i), *adj.* [*comp.* healthier, *superl.* healthiest] sound and well, free from disease.

Syn. Wholesome, salubrious, salutary, healthful. The outdoor life keeps one *healthy.* Good food is *wholesome.* Fresh air is *salubrious.* That which serves to remove a disorder is *salutary.* Exercise is *healthful.*

Ant. Delicate, diseased, frail, sick.

heap (hēp), *n.* a number of things or quantity of one thing thrown together in a mass.

heap (hēp), *v.t.* to form into a heap; to pile up.

hear (hēr), *v.t. and v.i.* [*p.t.* and *p.p.* heard, *pr.p.* hearing] to listen to, perceive through the ear; to heed; to have the sense of hearing.

hearing (hēr' ing), *n.* the sense by which sounds are perceived; a judicial investigation in which principals and their witnesses are heard.

hearken (här' ken), *v.i.* to listen, listen attentively to something.

hearsay (hēr' sā), *n.* common report.

hearsay (hēr' sā), *adj.* heard at second hand, as *heresay* evidence.

hearse (hûrs), *n.* a vehicle for carrying the dead to the grave.

heart (härt), *n.* the organ, in animals, by which the blood is pumped through the system; the core or center of anything, as the *heart* of the city, the *heart* of a melon; tenderness, sympathy, sweetness of character, one of a suit of cards marked with red hearts.

heartbroken (härt brō' ken), *adj.* borne down by sorrow, overwhelmed with grief.

heartburn (härt' bûrn), *n.* a burning sensation in the stomach caused by indigestion.

hearten (här' tn), *v.t.* to encourage.

***hearth** (härth), *n.* an open fireplace; the family circle.

hearty (här' ti), *adj.* [*comp.* heartier, *superl.* heartiest] cordial, sincere, warm, kindly; vigorous, strong, as a *hearty* laugh.

Syn. Warm, sincere, cordial. A man should be *hearty;* his heart should be *warm;* his talk should be *sincere;* his reception of others *cordial.*

Ant. Cold, distant, formal.

heat (hēt), *n.* the sensation produced by near approach to or contact with a hot body; high temperature; ardor.

heat (hēt), *v.t.* to make hot, increase the temperature of.

heated (hēt' ed), *adj.* excited, animated, as a *heated* discussion.

heath (hēth), *n.* a tract of land covered with a growth of heather.

***heathen** (hē *th*en), *n.* a pagan, idolator.

heathenish (hē' *th*en ish), *adj.* irreligious, ignorant, unenlightened.

***heather** (heth' ẽr), *n.* a low evergreen shrub.

***heave** (hēv), *n.* an effort in moving or throwing a heavy object.

heave (hēv), *v.t. and v.i.* to hoist or lift up; to throw a heavy object with great effort, as to *heave* a boulder; to bring up from inside, as to *heave* a sigh; to rise and fall alternately, as his shoulders *heaved.*

heaven (hev' en), *n.* the abode of God and the blessed; the sky; a state of bliss.

heavenly (hev' en li), *adj.* blissful.

heavy (hev' i), *adj.* [*comp.* heavier, *superl.* heaviest] having much weight, as a *heavy* load; dejected, as a *heavy* heart; dull, as a *heavy* discourse; of more than the usual amount, as a *heavy* fall of snow.

***hebdomadal** (heb dom' a dal), *adj.* weekly, every seven days.

heckle (hek' l), *v.t.* to bait; to harass, bother, as by questions or taunts.

hectic (hek' tik), *adj.* pertaining to the wasting away of animal tissues, as in consumption, as a *hectic* flush.

hectograph (hek' tō gråf), *n.* an apparatus for reproducing letters or drawings.

hector (hek' tẽr), *v.t.* to bully, domineer.

hedge (hej), *n.* a fence of bushes or shrubs, closely grown.

hedgehog (hej' hog), *n.* a small, insectivorous animal having quills on its back; a porcupine.

***hedonism** (hē' don izm), *n.* the doctrine that pleasure is the chief end of life.

heed (hēd), *n.* close attention.

heed (hēd), *v.i. and v.t.* to give attention; to take notice of; to listen to and accept, as to *heed* a warning.

heedful (hēd' fool), *adj.* attentive, mindful.

heel (hēl), *n.* the hinder part of a foot or of an article of footgear, as a shoe or stocking.

heel (hēl), *v.i. and v.t.* to supply with a heel, as to *heel* a shoe; to follow at one's heels, as a dog; to tilt or incline, as a sailboat.

heft (heft), *n.* weight.

heft (heft), *v.t.* to raise; to try the weight of; to try to lift.

hefty (hef' ti), *adj.* heavy, as a *hefty* load.

***heifer** (hef' ẽr), *n.* a young cow.

***height** (hīt), *n.* the measure of anything from bottom to top; stature; elevation; an elevated piece of land; the topmost reach, as the *height* of folly.

heighten (hīt' n), *v.t. and v.i.* to give more height to; to intensify; to rise in height, increase.

***heinous** (hā' nus), *adj.* hateful, atrocious, flagrant.

Syn. Flagrant, flagitious, atrocious. A crime is *heinous* that seriously offends against the laws of man; a sin is *heinous* that seriously offends against God's will; an error is *flagrant* that is glaring and inexcusable; *flagitious* is that which is villainous, scandalous or corrupt; a crime is *atrocious* when it is accompanied by inhumane conduct.

heir (âr), *n.* one who succeeds to a title or inherits property.

heiress (âr' es), *n.* a female heir.

heirloom (âr' lōōm), *n.* a piece of personal property handed down from one generation to another.

helical (hel' i kal), *adj.* spiral in shape, like the thread of a screw.

helicopter (hel' i kop tẽr), *n.* a flying machine that rises by means of horizontal propellers.

***heliograph** (hē' li ō gråf), *n.* an apparatus to give signals by flashing sunlight from a mirror.

helioscope (hē' li ō skōp), *n.* a telescope so made as to protect the eyes when observing the sun.

heliotherapy (hē li ō ther' *a* pi), *n.* treatment of bodily ills with sun baths.

***heliotrope** (hē' li ō trōp), *n.* a plant with dainty flowers that turn toward the sun; the purplish color of its flowers.

***helium** (hē' li um), *n.* a very light and noninflammable gas used for inflating the gasbag of a dirigible.

hell (hel), *n.* the place of punishment for the wicked after death.

hello (he lō'), an exclamation used in informal greeting, calling the attention, answering a telephone.

helm (helm), *n.* the rudder of a boat or ship with the tiller or wheel by which the helmsman controls it; a post of command.

helmet (hel′ met), *n.* a piece of leather or metal armor for the head; any protective covering for the head, in sport or war.

help (help), *n.* aid, assistance, support, succor; relief; a portion of food; servants or assistants collectively.

help (help), *v.t. and v.i.* to aid, as to *help* a friend; to render aid; to give assistance to; to serve food, as at the table.

Syn. Assist, aid, succor, relieve. To *help* is to do good to; to *assist* is to place oneself beside another to give him strength; to *aid* is to promote another's effort toward an end; to *succor* is to go to the help of anyone; to *relieve* is to alleviate. We *succor* one who is in danger; *relieve* one who is in distress.

Ant. Hinder, hamper, weaken.

hem (hem), *n.* the edge of a garment doubled and sewn, to prevent fraying.

***hematin** (hem′ *a* tin), *n.* the bluish-black substance in the blood, formed by the decomposition of the coloring matter in the red blood corpuscles.

hemisphere (hem′ is fēr), *n.* half a globe; half the earth, as the eastern and western *hemispheres.*

hemlock (hem′ lôk), *n.* a large evergreen tree of the pine family; a wild poisonous plant of the carrot family.

hemorrhage (hem′ o rij), *n.* a strong flow of blood.

hemorrhoids (hem′ o roidz), *n. pl.* bleeding piles.

hemp (hemp), *n.* a tough-fibered plant from which rope and certain coarse fabrics are made.

hemstitch (hem′ stich), *n.* a particular kind of ornamental stitching.

hen (hen), *n.* the female of the domestic fowl and other birds.

hence (hens), *adv.* from here; for this reason.

henceforth (hens fōrth′), *adv.* from this time on.

henchman (hench′ man), *n.* [*pl.* henchmen] a follower, as in politics.

hepatic (hē pat′ ik), *adj.* pertaining to the liver.

hepatica (hē pat′ i k*a*), *n.* a plant of the crowfoot family.

***heptagon** (hep′ t*a* gon), *n.* a figure having seven sides and seven angles.

heptarchy (hep′ tär ki), *n.* a government by seven men; the group of seven Saxon kingdoms in old England.

her (hûr), *pron.* objective and possessive case, singular, of *she.*

herald (her′ ald), *n.* an official who proclaims messages from a sovereign; a messenger, forerunner, one who brings tidings.

herald (her′ ald), *v.t.* to proclaim, announce, usher in.

***heraldic** (he ral′ dik), *adj.* pertaining to the science of armorial bearings.

heraldry (her′ ald ri), *n.* the art or science of armorial bearings and coats of arms.

herb (ûrb), *n.* a plant with a soft stem that produces seed and then withers; a plant with commercial uses, especially medicine.

***herbage** (ûr′ bij), *n.* grasses; foliage and young stems of plants.

***herbarium** (hûr bâr′ ium), *n.* [*pl.* herbariums or herbaria] a place where dried plants are classified and kept for study.

herbiferous (hûr bif′ ēr us), *adj.* producing herbs and grasses.

herbivorous (hûr biv′ ō rus), *adj.* feeding on herbs and grasses.

herd (hûrd), *n.* a group of cattle; a crowd, mob.

herd (hûrd), *v.i. and v.t.* to go together; to form into a herd.

here (hēr), *adv.* in this place; at this point.

hereafter (hēr àf′ tēr), *n.* the future; the life after this one.

hereafter (hēr àf′ tēr), *adv.* after this moment or time; henceforth.

hereby (hēr bī′), *adv.* by virtue of this or by means of this.

hereditary (hē red′ i ter i), *adj.* inheritable; inherited, acquired by inheritance.

heredity (hē red′ i ti), *n.* the transmission of physical or mental qualities from one generation to another; the tendency of any living thing to reproduce the characteristics of its ancestors.

herein (hēr in′), *adv.* in or into this.

heresy (her′ e si), *n.* [*pl.* heresies] a belief contrary to that which is commonly accepted or maintained by authority.

heretic (her′ e tik), *n.* one who rejects the commonly accepted beliefs.

heretofore (hēr too fōr′), *adv.* up to the present; until now.

herewith (hēr wi*th*′), *adv.* with this.

***heritage** (her′ i tij), *n.* an estate acquired through birthright, an inheritance.

hermetic (hûr met′ ik), *adj.* sealed and airtight.

hermit (hûr′ mit), *n.* one who lives apart from human companionship.

hermitage (hûr′ mi tij), *n.* a secluded residence; the home of one who has retired from the world.

hernia (hûr′ nia), *n.* a rupture.

***hero** (hē′ rō), *n.* [*pl.* heroes] a man of extraordinary courage; one who performs great deeds; the principal figure in a story or play.

heroic (hē rō′ ik), *adj.* like a hero; marked by great courage; larger than lifesize.

heroic verse (hē rō′ ik vûrs), iambic pentameter.

***heroine** (her′ ō in), *n.* a female hero.

***heroism** (her′ ō izm), *n.* the assembled qualities of a hero; splendid courage.

heron (her′ un), *n.* a wading bird with long neck and legs.

heronry (her′ un ri), *n.* a place where herons breed.

herpetology (hûr pē tol′ ō ji), *n.* the study of snakes and other reptiles.

***herring** (her′ ing), *n.* an edible sea fish that moves in great schools.

herringbone (her′ ing bōn), *n.* a pattern made up of rows of parallel lines sloping at opposite angles like a herring's backbone.

hers (hûrz), *pron.* the possessive form of she, used alone, as the book is *hers.*

herself (hûr self′), *pron.* a form of the pronoun for the feminine third person singular used for emphasis, as she *herself* told me; reflexive form of her, as she hurt only *herself;* her normal or true self, as wait until she is *herself* again.

hesitancy (hez′ i tan si), *n.* hesitation; indecision.

***hesitate** (hez′ i tāt), *v.i.* to pause in doubt, speak with a stammer.

Syn. Falter, demur. To *hesitate* is to be undecided; to *falter* suggests unsteadiness, wavering, flinching, as his courage *faltered;* to *demur* is to delay because of some objection.

***heterodox** (het′ ēr ō doks), *adj.* differing from accepted standards of belief: opposed to *orthodox.*

heterodoxy (het′ ēr ō dok si), *n.* [*pl.* heterodoxies] an unorthodox belief.

***heterogeneous** (het ēr o jē′ nē us), *adj.* dissimilar, composed of unlike parts.

hew (hū), *v.i. and v.t.* [*p.t.* hewed, *p.p.* hewn or hewed, *pr.p.* hewing] to use an ax; to cut or shape, with or as with, an ax.

hexagon (hek′ s*a* gon), *n.* a plane figure having six sides and six angles.

hexameter (heks am′ ē ter), *n.* a verse with six feet or metrical divisions, especially the Greek and Latin heroic verse, dactylic hexameter.

***hiatus** (hī ā′ tus), *n.* a break, interruption of continuity, a gap.

***hibernal** (hī bûr′ nal), *adj.* wintry.

hibernate (hī′ bēr nāt), *v.i.* to den up and sleep for the winter as a bear; to pass the winter season, without vegetating, as the spores and winter buds of various plants.

***hiccough** (hik′ up), *n.* a sound like a sharp gasp, with sudden drawing in of breath, caused by convulsive contraction of the diaphragm and throat.

hickory (hik′ ō ri), *n.* [*pl.* hickories] an American nut-bearing tree with very hard wood; the wood of this tree.

hide (hīd), *n.* the skin of an animal.

hide (hīd), *v.i. and v.t.* [*p.t.* hid, *p.p.* hidden, *pr.p.* hiding] to conceal oneself; to conceal some object; to make a secret of, as to *hide* the facts.

hidebound (hīd′ bound), *adj.* having a tight skin, as an animal, or bark, as a tree; narrow-minded, prejudiced, obstinate.

***hideous** (hid′ ē us), *adj.* ugly, horrible, repulsive.

hie (hī), *v.i.* [*p.t.* and *p.p.* hied, *pr.p.* hieing] to hurry.

***hierarchy** (hī′ ēr är ki), *n.* the clergy of a church, according to rank.

***hieroglyphic** (hī′ ēr ō glif′ ik), *n.* a symbol or picture used as writing by the ancient Egyptians.

high (hī), *adj.* elevated, as *high* land; strong, as *high* winds.

highhanded (hī han′ ded), *adj.* arbitrary, overbearing.

high mass (hī mas), a mass accompanied with singing and incense.

highroad (hī′ rōd), *n.* a main road.

high-speed steel (hi spēd stēl), an especially hard, tough steel retaining its hardness at high degrees of heat and therefore used in making tools to cut metal at high speed.

high tide (hī tīd), the furthest reach of the incoming tide.

highway (hī′ wā), *n.* a public road.

highwayman (hī′ wā man), *n.* one who robs those who travel on a public road.

***hilarious** (hi lâr′ i us), *adj.* noisily merry.

***hilarity** (hi lar′ i ti), *n.* [*pl.* hilarities] noisy merriment.

hill (hil), *n.* a natural elevation of land not as great as a mountain; a small stack of dirt, as an ant*hill,* or a *hill* of potatoes.

hill (hil), *v.t.* to form into a hill; to draw earth around, as to *hill* potatoes.

hillbilly (hil′ bil i), *n.* a Southern mountaineer or backwoodsman.

hillock (hil′ uk), *n.* a small hill.

hilly (hil′ i), *adj.* [*comp.* hillier, *superl.* hilliest] abounding in hills; steep.

hilt (hilt), *n.* a handle of a sword or dagger.

him (him), *pron.* the objective case of *he,* as I asked *him.*

himself (him self′), *pron.* a form of the pronoun for the masculine third person singular, used for emphasis; as a simple objective, as he bought it for *himself;* in apposition, as John *himself* did it; reflexively, as he cut *himself.*

hinder (hīn′ dēr), *adj.* belonging to or constituting the back or rear.

***hinder** (hin′ dēr), *v.t.* to prevent; to obstruct, thwart, impede.

hindmost (hīnd′ mōst), *adj.* furthest from the front; in the extreme rear.

hindrance (hin′ drans), *n.* an obstruction, impediment, obstacle to progress.

hinge (hinj), *n.* the joint on which a door, gate or lid turns or swings; a natural joint, as of an oyster shell.

hinge (hinj), *v.i. and v.t.* to turn upon, as the argument *hinges* on this fact; to furnish with hinges.

hint (hint), *n.* an indirect allusion or suggestion.

hint (hint), *v.i. and v.t.* to suggest indirectly.

hinterland (hin′ tēr land), *n.* back country, the land lying back of that bordering a seacoast or river; a district remote from metropolitan centers.

hip (hip), *n.* the upper fleshy part of the thigh; the joint of two sloping parts of a roof.

hippodrome (hip′ ō drōm), *n.* a course for chariot races, surrounded with tiers of seats; any arena.

***hippopotamus** (hip ō pot′ *a* mus), *n.* [*pl.* hippopotamuses or hippopotami] a huge thick-skinned amphibious animal that lives in and along African rivers.

hip roof (hip rōōf), a roof with two sloping ends and sides.

hire (hīr), *n.* the act of hiring; wages paid for personal work; that which is paid for use of anything belonging to another.

hire (hīr), *v.t.* to employ for wages; to engage for temporary use, as to *hire* an automobile; to place at another's service, temporarily, for pay.

hireling (hīr′ ling), *n.* one who serves for hire; one who will sell his honor for personal gain.

*__hirsute__ (hûr′ sūt), *adj.* hairy.

his (hiz), *pron.* the possessive form of *he,* adjective or pronoun, as it is *his* book; this book is *his.*

hiss (his), *n.* a whistling noise made by forcing the breath between the tongue and the upper teeth.

hiss (his), *v.i. and v.t.* to express disapproval by means of a hiss; to utter with a hiss; to condemn by hissing, as they *hissed* him off the stage.

histology (his tol′ ō ji), *n.* the scientific study of plant and animal tissues.

historian (his tō′ ri an), *n.* a writer or student of history.

historic (his tor′ ik), *adj.* having a history, as a *historic* place.

*__historical__ (his tor′ i kal), *adj.* pertaining to history, as *historical* studies.

*__history__ (his′ tō ri),*n.* [*pl.* histories] a full account of the past, as of a nation or country, with interpretive and explanatory comment that distinguishes it from mere annals or chronicles; a history text; any narrative or story; a historical drama.

histrionic (his tri on′ ik), *adj.* pertaining to acting, to actors or to the stage in a general way; theatrical.

histrionics (his tri on′ iks), *n. pl.* dramatic presentations; theatrical affectation.

hit (hit), *n.* a stroke or blow; a success, as the play was a *hit.*

hit (hit), *v.i. and v.t.* [*p.t.* and *p.p.* hit, *pr.p.* hitting] to collide; to strike; to deliver a blow.

hitch (hich), *n.* a sudden jerk; a limp, as to walk with a *hitch;* an obstacle, impediment, as a *hitch* in the plans; a temporary noose, loose knot or other means of connecting two things.

hitch (hich), *v.i. and v.t.* to become entangled; to move jerkily, as he *hitched* forward; to fasten or tie, as *hitch* your horse to the tree; to pull with a jerk, as *hitch* up your socks.

hither (hi*th*′ ẽr), *adj.* on the side toward the speaker, as the *hither* side.

hither (hi*th*′ ẽr), *adv.* to this place, as come *hither.*

hitherto (hi*th* ẽr too͞′), *adv.* up to this time; until now.

hive (hīv), *n.* a house for bees; the bees that live in it; any place crowded with busy workers.

hive (hīv), *v.i. and v.t.* to gather in a hive; to place in a hive, as bees; to store up, as honey.

hives (hīvz), *n. pl.* a skin disease with itching blotches, caused by inability to digest certain foods, as shellfish and strawberries.

hoar (hōr), *n.* white frost.

hoar (hōr), *adj.* gray or white with age, ancient.

hoard (hōrd), *n.* a secret store or treasure.

hoard (hōrd), *v.t. and v.i.* to accumulate secretly, and store, as to *hoard* gold; to amass money, as to *hoard* for the future.

hoarding (hōrd′ ing), *n.* a temporary board fence in front of a building under construction; a billboard.

hoarfrost (hōr′ frôst), *n.* white particles of frozen dew.

hoarse (hōrs), *adj.* rough and harsh in sound, as the voice when one has a bad cold.

hoax (hōks), *n.* a mischievous deception, especially of the public, by means of an imaginary story presented as true.

hoax (hōks), *v.t.* to deceive with a trick.

hob (hob), *n.* the flat part of a grate on which things are set to be kept warm; the peg at which quoits are thrown.

hobble (hob′ l), *v.i. and v.t.* to walk with a limp; to cause to limp, lame, as to *hobble* a horse; to fetter.

hobby (hob′ i), *n.* [*pl.* hobbies] a favorite pursuit or object, as collecting coins is his *hobby.*

hobgoblin (hob′ gob lin), *n.* a sprite of fearful appearance.

hobnail (hob′ nāl), *n.* a short thick nail with a heavy head for studding shoe soles.

hobnob (hob′ nob), *v.i.* to associate in an intimate, free-and-easy way.

hobo (hō′ bō), *n.* a worker who travels from place to place; a tramp.

hock (hok), *n.* the hind ankle of a horse; a cut of pork just above the foot.

hockey (hok′ i), *n.* a game played on ice or turf, with sticks and a puck.

hocus-pocus (hō′ kus pō′ kus), *n.* a juggler's word; a juggling trick; tomfoolery.

hod (hod), *n.* a wooden trough on a long handle, held over the shoulder, for carrying mortar and bricks.

hodcarrier (hod kar′ i ẽr), *n.* one who carries bricks and mortar in a hod.

hodgepodge (hoj′ poj), *n.* a mixture of different things, a disorderly collection, jumble.

hoe (hō), *n.* an implement with a flat blade and a long handle, for use in weeding or loosening the soil about plants.

hoe (hō), *v.i. and v.t.* [*p.t.* and *p.p.* hoed, *pr.p.* hoeing] to work with a hoe; to cultivate by hoeing.

*__hog__ (hog), *n.* a swine; a greedy, gluttonous person.

*__hog__ (hog), *v.i.* to become buckled or curved like a hog's back, as a ship's bottom when strained.

hogshead (hogz′ hed), *n.* a liquid measure; a large cask.

*__hoist__ (hoist), *n.* an apparatus for lifting things; a tackle; an elevator.

hoist (hoist), *v.t.* to lift, as with tackle.

hold (hōld), *n.* the cargo space in the interior of a ship.

hold (hōld), *n.* a firm grip; a place where prisoners are held, as a jail; a fortified place, strong*hold.*

hold (hōld), *v.t. and v.i.* to have possession of; to retain; to contain; to harbor, as to *hold* a grudge; to carry on or join in, as to *hold* a meeting; to maintain in a specified state, as to *hold* oneself prepared; to remain steadfast or faithful, cleave, as to *hold* to an ideal; to persist, as the law still *holds.*

holding (hōl′ ding), *n.* anything held or owned, as stocks and bonds or a farm.

hole (hōl), *n.* an opening through something, as a coat or a wall; a pit; cavity; a metal cup sunk in the ground, into which a golf ball must be struck.

holiday (hol′ i dā), *n.* a day of celebration of some great event in the past; a day off from work.

holiness (hō′ li nes), *n.* the quality of being consecrated to the worship of God; freedom from sin: *His Holiness,* the Pope.

Syn. Sanctity, righteousness. *Holiness* suggests an inherent quality; *sanctity,* an acquired state, often implying sacredness and inviolability as well; *righteousness* denotes unswerving obedience to the divine law rather than complete spiritual purity and freedom from sin.

holland (hol′ and), *n.* a fine unbleached linen or cotton.

hollow (hol′ ō), *n.* a cavity; an unfilled space; a lower space between hills.

hollow (hol′ ō), *v.t. and v.i.* to make hollow, excavate, scoop out; to become hollow.

hollow (hol′ ō), *adj.* having a void space within, as a *hollow* tree; insincere; superficial; muffled, deep sounds, as if coming from a hollow body.

holly (hol′ i), *n.* a stubby tree with prickly, shiny leaves and red berries.

hollyhock (hol′ i hok), *n.* a tall plant of the mallow family, with large flowers of various colors.

*__holocaust__ (hol′ ō kôst), *n.* complete destruction by fire.

holster (hōl′ stẽr), *n.* a leather case for a pistol, worn at the belt or carried on a saddlebow.

holy (hō′ li), *adj.* [*comp.* holier, superl. holiest] morally and spiritually perfect; sinless; consecrated.

*__homage__ (hom′ ij), *n.* respect manifested in external action, deference, reverence.

home (hōm), *n.* one's place of residence; the dwelling place of a family; a benevolent institution providing a dwelling place for persons without homes of their own.

home (hōm), *adj.* pertaining to one's dwelling place, as *home* ties, or to one's country, as *home* industries; domestic.

home (hōm), *adv.* to or at home, as to go *home.*

homely (hōm′ li), *adj.* [*comp.* homelier, *superl.* homeliest] simple, plain, comfortable; plain of feature, not handsome.

*__homeopathy__ (hō mē op′ *a* thi), *n.* the medical system which seeks to cure diseases by giving the patient, in minute doses, drugs producing results similar to the symptoms of the disease, on the theory that the symptoms reveal nature's effort to combat the disease.

home rule (hōm ro͞ol), self-government of a dependent country; in the U. S., power of the electorate of a municipality to decide certain matters of public policy for itself.

homesick (hōm′ sik), *adj.* having an intense longing for home.

homestead (hōm′ sted), *n.* dwelling and land of a family, especially of early settlers in the West.

homestead law (hōm′ sted lô), a law that exempts a homestead from attachment or sale in payment of the owner's debts; any law giving special privileges to the owner of a homestead.

*__homicide__ (hom′ i sīd), *n.* the killing of one human being by another, whether by intention or not; manslaughter, murder or justifiable homicide, as in self-defense.

homiletics (hom i let′ iks), *n.* the branch of theology that treats of sermons and their composition.

homily (hom′ i li), *n.* [*pl.* homilies] a formal public sermon; a formal private discourse on religious topics.

homing pigeon (hōm′ ing pij′ un), a pigeon trained to carry messages and to find its way home from great distances; a carrier pigeon.

hominy (hom′ i ni), *n.* hulled corn, coarsely ground.

*__homogeneity__ (hō mō jē nē′ i ti), *n.* the quality of being similar, uniformity.

*__homogeneous__ (hō mō jē′ nē us), *adj.* composed of similar parts, uniform throughout.

*__homonym__ (hom′ ō nim), *n.* one of two or more words with identical pronunciation but different spelling and meaning, as *rain, rein, reign.*

*__hone__ (hōn), *n.* a fine whetstone for sharpening razors.

hone (hōn), *v.t.* to sharpen on a whetstone, as to *hone* a razor; to long or yearn, as he *honed* for his friends.

*__honest__ (on′ est), *adj.* trustworthy, true, as *honest* measure; frank, sincere and open, as an *honest* manner.

honesty (on′ es ti), *n.* the quality of being truthful.

honey (hun′ i), *n.* a thick, sweet substance that bees make from nectar collected from flowers and store in wax cells.

honeybee (hun′ i bē), *n.* the common hive bee.

honeycomb (hun′ i kōm), *n.* the wax framework in which bees store their honey.

honeycomb (hun′ i kōm), *v.t. and v.i.* to fill with holes or passages; to become full of holes or passages.

honeycomb coil (hun′ i kōm koil), a coil of wire wound in the form of a lattice for concentrating radio inductance.

honeydew (hun′ i dū), *n.* a sweet deposit left on leaves by plant lice and on which ants, bees and other insects feed; a kind of canteloupe with a smooth rind and very sweet, greenish pulp.

honeymoon (hun′ i mo͞on), *n.* the first month after marriage; a journey by a newly married couple.

honeysuckle (hun′ i suk l), *n.* a climbing plant with sweet flowers.

*__honor__ (on′ ẽr), *n.* a fine sense of what is just and right with readiness to apply it to one's own conduct in relation to others; great respect; wide and good reputation; any token of recognition for distinguished services or high merit.

honor (on′ ẽr), *v.t.* to treat with respect, revere; to bestow honors upon; to recognize, as a business obligation and meet it, as to *honor* a claim; to recognize as correct and pay, as to *honor* a draft.

Syn. Respect, esteem. To *honor* is an outward act; to *esteem* is to hold in high regard, appreciate, prize.

honorable (on′ ẽr *a* bl), *adj.* guided by the sense of honor; worthy of being honored; upright, straightforward and honest: used also as a title of distinction, as the *Honorable* John Smith.

***honorarium** (on ō râr′ i um), *n.* a fee paid to a professional man for services, where professional ideals forbid the setting of a price.

honorary (on′ ẽr er i), *adj.* done, or conferred, as an honor, as an *honorary* degree.

hood (hood), *n.* a soft, loose covering for the head; an ornamental fold on the back of an academic gown.

hoodlum (hōōd′ lum), *n.* a rowdy.

hoodwink (hood′ wingk), *v.t.* to deceive; to impose upon.

hoof (hōōf), *n.* [*pl.* hoofs or hooves] the foot of certain animals, as the horse, cow, deer, hard and horny.

hoofbound (hōōf′ bound), *adj.* suffering from a disease in which the hoof dries and contracts painfully.

hook (hook), *n.* a curved piece with which to catch hold of things; a cape of which the end points inland or toward a mainland, as Sandy *Hook*.

hook (hook), *v.i. and v.t.* to have the shape of a hook, as the cape *hooks* inward; to catch with a hook, as to *hook* a fish; to fasten with a hook, as she *hooks* her cape together.

hook-up (hook-up), *n.* the arrangement for the putting together of radio parts used in sending or receiving; the union of many stations for a single broadcast, as a national *hook-up*.

hoop (hōōp), *n.* a circular band holding something together, as a barrel; a ring for the finger; a circular piece of wood or metal rolled along the ground by children for sport.

hoopskirt (hōōp′ skûrt), *n.* a woman's skirt stretched over a framework of hoops, as worn in Civil War times.

hoot (hōōt), *n.* the cry of an owl, or a sound resembling it; a jeer.

hoot (hōōt), *v.i. and v.t.* to make a sound like the owl's cry; to jeer.

hop (hop), *n.* a vine whose pistillate cones are used in making medicine and to give a bitter taste to malt liquors.

hop (hop), *n.* a jump taking off and landing with the same foot; the leap of a frog, in which all the feet leave the ground and come down at once; a flight by airplane.

hop (hop), *v.t. and v.i.* to jump or leap about or over, as to *hop* a wall; to jump, as the bird *hopped*.

hop off (hop ôf), to start an airplane flight.

hope (hōp), *n.* the desire and expectation of good, anticipation; the act of hoping; that for which one hopes, as my *hope* is that you may succeed.

hope (hōp), *v.i.* to desire, with expectation of fulfilment, as to *hope* for the best.

hope chest (hōp chest), a collection of clothes and linens accumulated by a young woman in anticipation of her marriage.

hopeful (hōp′ fool), *adj.* full of hope; inspiring hope and promising success, as a *hopeful* outlook, a *hopeful* sign.

hopper (hop′ ẽr), *n.* a wooden funnel through which grain passes into the grinding machinery of a mill; a railroad freight car that can be unloaded through a chute in the bottom; a barge with an opening in the bottom through which garbage can be dumped into the sea.

horde (hōrd), *n.* a multitude.

horehound (hōr′ hound), *n.* a bitter mint plant with whitish fuzzy leaves used for coughs and colds or as flavoring in candy.

***horizon** (hō rī′ zn), *n.* the circular line where the sky seems to meet the earth or sea; the limit of vision, physical or mental.

horizontal (hor i zon′ tal), *adj.* related to the horizon, level, not vertical.

hormone (hôr′ mōn), *n.* a chemical substance or secretion which when it is carried by the blood from the organ in which it originates to another, stimulates the second organ.

horn (hôrn), *n.* a pointed process or growth on the head of a hoofed animal, as the bull or deer; something resembling such a growth or something made of horn; the substance of which horns are composed; a wind instrument, originally made of hollow horns.

hornblende (hôrn′ blend), *n.* a common hard mineral, dark green or black, composed of silicate of magnesium and calcium and often iron and manganese.

hornet (hôr′ net), *n.* a wasp with a fierce sting.

hornpipe (hôrn′ pīp), *n.* a lively dance.

horologe (hōr′ ō lōj), *n.* a mechanism for marking the hours, as a clock or sundial.

horoscope (hor′ ō skōp), *n.* a representation of the heavens at any given time, by which astrologers profess to foretell the future of persons born at that time.

horrible (hor′ i bl), *adj.* terrible, dreadful.

***horrid** (hor′ id), *adj.* hideous; dreadful.

horrify (hor′ i fī), *v.t.* [*p.t.* and *p.p.* horrified, *pr.p.* horrifying] to fill with horror, strike with horror.

horror (hor′ ẽr), *n.* the greatest fear or dread.

hors de combat (ôr de koɴ bȧ′), disabled, as from fighting.

hors d'oeuvres (ôr dû′ vr), a small portion of food, especially something tart, served as an appetizer before meals.

horse (hôrs), *n.* a four-footed, solid-hoofed animal, used for riding or for pulling loads; a framework to support things, as a saw*horse*.

horsefly (hôrs′ flī), *n.* a large fly that sucks blood from animals.

horsepower (hôrs′ pou ẽr), *n.* a unit of mechanical power equal to the power needed to raise 33,000 pounds at the rate of one foot per minute.

horse-radish (hôrs rad′ ish), *n.* a plant with a long root having a pungent flavor, ground and used as a relish.

horseshoe (hôrs′ shōō), *n.* a U-shaped bar of metal nailed upon a horse's hoof for protection.

horticulture (hôr′ ti kul tūr), *n.* the art or science of growing trees or plants.

hose (hōs), *n.* coverings for the legs, stockings.

hose (hōs), *n.* a flexible tube for carrying water or other fluids.

hosiery (hō′ zher i), *n.* stockings.

***hospitable** (hos′ pi ta bl), *adj.* generous and warm hearted in receiving and entertaining visitors.

hospital (hos′ pit al), *n.* a medical institution for the care of the sick.

hospitality (hos pit al′ i ti), *n.* the practice of entertaining visitors with kindness.

host (hōst), *n.* one who entertains another; the proprietor of an inn; an organism giving nourishment to a parasite.

host (hōst), *n.* the consecrated bread of the Eucharist.

***hostage** (hos′ tij), *n.* one held by an enemy as a pledge for fulfilment of certain stated conditions.

***hostile** (hos′ til), *adj.* pertaining to an enemy; showing ill will, unfriendly.

hostility (hos til′ i ti), *n.* [*pl.* hostilities] the state of being an enemy; an act of enmity.

hostler (hos′ lẽr), *n.* one who takes care of horses.

hot (hot), *adj.* [*comp.* hotter, *superl.* hottest] having great heat; burning, fiery, passionate, furious; having a sharp taste, as highly spiced food.

Syn. Fiery, burning, ardent. A temper is said to be *hot* or *fiery;* the mind is *ardent* in pursuit of an object. Zeal may be *hot, fiery, burning* and *ardent.*

Ant. Cold, indifferent.

hotel (hō tel′), *n.* an establishment that provides lodging and meals for pay.

hothouse (hot′ hous), *n.* glass-roofed, heated building for cultivation of plants out of season.

hound (hound), *n.* a hunting dog.

hound (hound), *v.t.* to pursue, with dogs or as if with dogs; to track down; to pursue relentlessly.

hour (our), *n.* one twenty-fourth of a day, 60 minutes; an appointed time.

hourglass (our′ glȧs), *n.* a device for measuring time, by running sand from one bulb to another; a sandglass that marks off one hour.

house (hous), *n.* a building for residence; one of the divisions of a legislative body; a business establishment.

house (houz), *v.t.* to furnish with a house; to shelter.

household (hous′ hōld), *n.* a group of persons who live together; a family in one home.

***hovel** (huv′ el), *n.* a shed; a mean home, shack.

***hover** (huv′ ẽr), *v.i.* to flutter over or about; to settle over, as a hen her chicks.

how (hou), *adv.* in what manner, as *how* do you do that? to what degree or extent, as *how* far are you going?

however (hou ev′ ẽr), *adv.* in whatever manner or degree; nevertheless; notwithstanding.

howitzer (hou′ it sẽr), *n.* a short cannon for dropping shells into a defensive fortification.

howl (houl), *n.* a prolonged cry, like that of a wolf; the whistle of the wind.

howl (houl), *v.i.* to utter a mournful cry; to make a cry of pain or distress.

hoyden (hoi′ dn), *n.* a boisterous girl, tomboy.

hub (hub), *n.* the turning point of a wheel; a central part; the peg used in pitching quoits.

hubbub (hub′ ub), *n.* uproar.

huckaback (huk′ *a* bak), *n.* a rough linen used for towels.

huckleberry (huk′ l ber′ i), *n.* [*pl.* huckleberries] a low-growing shrub with a seedy, berrylike fruit; the fruit of this shrub.

huckster (huk′ stẽr), *n.* a peddler, one who sells a variety of small goods, as from a cart.

huddle (hud′ l), *n.* a crowd; a group of persons in close contact.

huddle (hud′ l), *v.i.* to crowd together.

***hue** (hū), *n.* a shade of color.

huff (huf), *n.* a fit of petulance.

huff (huf), *v.i. and v.t.* to puff; to bully; to remove a piece that has failed to jump in a game of checkers.

hug (hug), *n.* a close embrace.

hug (hug), *v.t.* to embrace; to stay close to, as the sailboat *hugged* the shore.

huge (hūj), *adj.* very large.

hulk (hulk), *n.* the body of a ship, especially when old and disabled.

hulking (hulk′ ing), *adj.* unwieldy, clumsy, as a *hulking* fellow.

hull (hul), *n.* the outer covering or husk of a seed; the body of a ship.

hullabaloo (hul′ *a* ba lōō), *n.* an uproar.

hum (hum), *n.* the noise made by bees and other insects in flying; the sound of distant machinery or a plane aloft.

hum (hum), *v.i.* to make a noise like that of a bee in heavy flight; to make a noise like the sustained sound of *m,* or sing with the lips closed, as to *hum* a tune; to bring about great activity, as to make things *hum.*

***human** (hū′ man), *adj.* pertaining to mankind.

humane (hū mān′), *adj.* kind, merciful.

Syn. Charitable, compassionate, sympathetic, tender hearted. Whereas *human* indicates the ordinary attributes of humanity, *humane* denotes what may rightly be expected of mankind at its best. The *compassionate* man sympathizes with and desires to relieve suffering.

Ant. Cruel, harsh, ruthless, merciless.

humanism (hū′ man izm), *n.* humanity; culture derived from classical training; a system, attitude or mode of thought based on human interests and ideals rather than naturalistic or religious principles.

humanitarian (hū man i târ′ i an), *n.* a philanthropist.

humanitarian (hū man i târ′ i an), *adj.* philanthropic.

humanity (hū man′ i ti), *n.* [*pl.* humanities] mankind; the qualities of kindness and sympathy.

***humble** (hum′ bl), *adj.* modest, unassuming.

Syn. Lowly. A man is *humble* from a sense of his imperfections; he is *modest* inasmuch as he sets little value on his qualifications and acquirements.

Ant. Proud, arrogant, haughty.

humbug (hum′ bug), *n.* a fraud; an impostor.

humbug (hum′ bug), *v.t.* to cheat or impose upon.

humdrum (hum′ drum), *adj.* dull, monotonous, commonplace.

humerus (hū′ mẽr us), *n.* [*pl.* humeri] the bone of the upper arm, from the shoulder to the elbow.

humid (hū′ mid), *adj.* damp, moist.

humidity (hū mid′ i ti), *n.* dampness, especially with reference to the condition of the air.

humiliate (hū mil′ i āt), *v.t.* to bring low, humble, put to shame, as he *humiliated* me publicly.

humility (hū mil′ i ti), *n.* modesty, mildness, freedom from pride.

hummingbird (hum′ ing bûrd), *n.* a small, long-beaked bird whose wings make a humming noise in flight.

hummock (hum′ uk), *n.* a small mound; a ridge or pile of ice on an ice floe.

***humor** (hū′ mẽr), *n.* the quality in anything that appeals to a sense of the comic and provokes mirth; the faculty that makes it possible to discover, appreciate and express things that are funny; a mood, as in a good *humor;* any fluid of the human body or other organism.

humor (hū′ mẽr), *v.t.,* to indulge, gratify, as to *humor* one's whims.

hump (hump), *n.* a rounded protuberance, especially that formed by a deformed spine.

humpback (hump′ bak), *n.* a person with a deformed spine, making a hump at the shoulders.

humus (hū′ mus), *n.* a black or brown substance found in soil, formed by decaying animal or vegetable matter.

hunch (hunch), *n.* a hump.

hunch (hunch), *v.t.* to round, as he *hunched* his shoulders.

hundred (hun′ dred), *n.* one more than 99.

hundredth (hun′ dredth), *n.* one of a hundred equal parts.

hundredth (hun′ dredth), *adj.* following the 99th.

hundredweight (hun′ dred wāt), *n.* the 20th part of a ton.

hunger (hung′ gẽr), *n.* keenness of appetite; desire for food.

hunger (hung′ gẽr), *v.i.* to long for; to be hungry.

hunger strike (hung′ gẽr strīk), an attempt on the part of a prisoner to obtain freedom by refusing to eat.

hungry (hung′ gri), *adj.* [*comp.* hungrier, *superl.* hungriest] wanting food.

hunt (hunt), *n.* the act of pursuing, a chase.

hunt (hunt), *v.i. and v.t.* to seek, as I *hunted* everywhere; to pursue, as game or wild animals; to search for.

hurdle (hûr′ dl), *n.* a barrier to be jumped in a race.

hurdy-gurdy (hûr′ di gûr di), *n.* any instrument for street music that is played by turning a crank, a hand organ.

hurl (hûrl), *v.t.* to throw with violence; to overthrow; to utter with violence, as to *hurl* accusations.

hurly-burly (hûr li′ bur li), *n.* great confusion.

hurricane (hûr′ i kān), *n.* a cyclone, usually accompanied by rain, thunder and lightning.

hurricane deck (hûr′ i kān dek), the highest deck of a steamship.

hurry (hûr′ i), *n.* [*pl.* hurries] haste, as to go in a *hurry.*

hurry (hûr′ i), *v.i. and v.t.* to hasten; to cause to make haste.

hurt (hûrt), *n.* an injury; pain of body or mind.

hurt (hûrt), *v.i. and v.t.* to feel pain; to cause pain or damage; to cause physical pain to, as the blow *hurt* him; to wound the feelings of, as his words *hurt* her.

hurtful (hûrt′ fool), *adj.* injurious, harmful.

hurtle (hûrt′ l), *v.t. and v.i.* to fling, with force; to clash; to clatter; to move rapidly or rush suddenly.

husband (huz′ band), *n.* a man who has a wife.

husband (huz′ band), *v.t.* to manage economically, as to *husband* one's resources; to *husband* one's strength.

husbandman (huz′ band man), *n.* [*pl.* husbandmen] a farmer.

hush (hush), *n.* a silence.

hush (hush), *v.t.* to conceal, as a fact, by keeping silent.

hush (hush), *interj.* be still!

husk (husk), *n.* the dry outer covering, as of an ear of corn.

husking bee (husk′ ing bē), a social gathering to assist in husking corn.

husky (husk′ i), *adj.* [*comp.* huskier, *superl.* huskiest] like husks; rough, as a voice; burly, strong.

hussar (hoo zär′), *n.* a member of the cavalry of a European army.

***hussy** (huz′ i), *n.* [*pl.* hussies] a worthless woman; saucy girl.

***hustle** (hus′ l), *v.t. and v.i.* to push roughly; to jostle.

hut (hut), *n.* a cabin, shanty.

hutch (huch), *n.* a bin, box or chest for storing things, as grain; a coop or pen for animals, as a rabbit *hutch.*

hyacinth (hī′ *a* sinth), *n.* a handsome bulbous flowering plant of the lily family.

hyaline (hī′ *a* lin), *adj.* transparent, like glass.

hybrid (hī′ brid), *n.* an animal or plant produced by crossing two separate varieties.

***hydrangea** (hī dran′ jē *a*), *n.* a shrub with showy flowers.

hydrant (hī′ drant), *n.* a vertical pipe through which water is drawn from a main, as for use in flooding streets or fighting fire.

hydrate (hī′ drāt), *n.* a chemical compound containing water.

hydrate (hī′ drāt), *v.t. and v.i.* to combine with water.

hydraulic (hī drô′lik), *adj.* pertaining to water or other fluids in motion; operated by water.

***hydraulics** (hī drô′ liks), *n. pl.* the science of fluids in motion.

***hydride** (hī′ drīd), *n.* a compound of hydrogen with another element.

hydrocarbon (hī drō kär′ bon), *n.* a compound of hydrogen and carbon.

hydrogen (hī′ drō jen), *n.* a colorless, gaseous, inflammable substance, the lightest element known.

hydrometer (hī drom′ ē tẽr), *n.* a metal or glass tube that floats in a vertical position, used to determine specific gravities.

***hydropathy** (hī drop′ *a* thi), *n.* the cure of disease by treatment with water.

hydroplane (hī′ drō plān), *n.* an airplane that is constructed so that it can rise from and alight upon water.

hydrophobia (hī drō fō′ bi a), *n.* abnormal fear of water; a disease caused by the bite of a mad dog; rabies.

hydrophone (hī′ drō fōn), *n.* an instrument for listening to sound transmitted through water, used in detecting submarines in wartime.

hydrostatics (hī drō stat′ iks), *n.* the branch of physics that treats of fluids at rest, their pressure and equilibrium.

hydrotherapy (hī drō ther′ *a* pi), *n.* treatment of disease with water.

hydrous (hī′ drus), *adj.* containing water; watery.

hyena (hī ē′ na), *n.* a carnivorous animal of Asia and Africa, with bristly mane and resembling the wolf.

***hygiene** (hī′ jēn), *n.* the science of health; sanitary living.

hygrometer (hī grom′ ē tẽr), *n.* a device for measuring the degree of moisture in the atmosphere.

hymn (him), *n.* a sacred song expressing adoration.

hymnal (him′ nal), *n.* a church songbook.

***hyperbole** (hī pûr′ bō lē), *n.* a figure of speech, obviously exaggerating.

hyphen (hī′ fen), *n.* a mark (-) joining two words compounded, or separating syllables, as at the end of a line of print.

***hypnotism** (hip′ nō tizm), *n.* a method of inducing a trancelike sleep.

***hypochondriac** (hī pō kon′ dri ak), *n.* a person affected with extreme, morbid melancholy, especially with regard to the condition of his health.

***hypocrisy** (hi pok′ ris i), *n.* the act of pretending to be what one is not.

hypocrite (hip′ ō krit), *n.* an insincere person; one who pretends to be what he is not.

***hypodermic** (hī pō dûr′ mik), *adj.* inserted under the skin.

***hypotenuse** (hī pot′ ē nūs), *n.* the side of a right-angled triangle opposite the right angle; formerly spelled *hypothenuse.*

***hypothesis** (hī poth′ ē sis), *n.* [*pl.* hypotheses] something assumed for the purpose of argument.

hypothetical (hī pō thet′ i kal), *adj.* assumed for the purpose of argument.

***hysteria** (his tēr′ i *a*), *n.* a nervous affection characterized by emotional excitement and lack of control, especially in fits of alternate laughing and crying.

I

I (ī), *pron.* [*pl.* we] nominative singular of the first personal pronoun; the person speaking.

***ibex** (ī′ beks), *n.* a wild goat, especially of the Swiss and Italian mountains, having large backward-curving horns.

***ibis** (ī′ bis), *n.* a wading bird of the heron family with a long curved beak.

ice (īs), *n.* frozen water; a frozen dessert not containing cream, as sherbet, orange *ice;* a substance resembling ice, as camphor *ice.*

ice (īs), *v.t.* to cool with ice; to cover with frosting, as a cake.

ice age (īs āj), the era in which the earth's surface was covered with ice or glaciers.

iceberg (īs′ bûrg), *n.* a floating mass of ice at sea, broken off from a glacier.

iceblink (īs′ blingk), *n.* a white streak near the horizon at sea, caused by the reflection of light from ice not yet within the field of vision.

iceboat (īs′ bōt), *n.* a frame mounted on runners like skate blades and propelled over the ice by sails; a strong, heavy steamboat with a sharp prow used to break a way through ice in rivers and harbors; also called *icebreaker.*

icebox (īs′ boks), *n.* a refrigerator.

ice floe (īs flō), a floating field of ice at sea.

ice pack (īs pak), a field of broken and drifting ice; a rubber bag filled with cracked ice, used to bring down a swelling or fever.

ichthyology (ik thi ol′ ō ji), *n.* the branch of zoology that treats of fishes.

***icicle** (ī′ sik l), *n.* a hanging cone of ice formed by water freezing as it drips.

icily (ī si li), *adv.* in a cold, repelling manner.

icing (īs′ ing), *n.* a coating of fine sugar, white of egg and sometimes a flavoring, spread over a cake.

***icon** (ī′ kon), *n.* [*pl.* icons] a sacred image.

***iconoclast** (ī kon′ ō klast), *n.* a breaker of images; one who opposes cherished beliefs.

icy (ī′ si), *adj.* [*comp.* icier, *superl.* iciest] pertaining to or like ice; covered with ice; cold; frosty, as an *icy* window pane; cold in manner.

idea (ī dē′ *a*), *n.* a mental picture or pattern, as my *idea* of a whale; a plan, an intention, as my *idea* is to start on Tuesday; notion, an indefinite fancy.

***ideal** (ī dē′ al), *n.* a mental picture of perfection as a model toward which to strive; a supreme standard; a person thought of as perfect enough to be imitated.

Syn. Pattern. An *ideal* is a standard of perfection, either real or mentally conceived; a *pattern* is something by which something else is made or something thought of as worthy of imitation.

ideal (ī dē′ al), *adj.* existing in the mind or in imagination only: opposite of real; conforming to a standard of perfection, as an *ideal* day to go fishing.

idealism (ī dē′ al izm), *n.* pursuit of perfection in life or art; the quality of seeing things as we wish they were instead of as they are: opposite of *realism;* the philosophical doctrine that mind and spirit are the only realities.

idealist (ī dē′ al ist), *n.* one who believes that reality is mental; one who in art or literature shows things as they should be instead of as they are; one who strives for perfection; a dreamer.

idealize (ī dē′ al īz), *v.i. and v.t.* to form ideals; to adopt as a standard of perfection; to attribute perfection to, as she *idealizes* her sister.

identical (ī den′ ti kal), *adj.* same, as this *identical* book; precisely alike, as fingerprints are never *identical.*

identify (ī den′ ti fī), *v.t.* [*p.t.* and *p.p.* identified, *pr.p.* identifying] to prove that something is the thing meant or involved, as in a case at law; to prove that something is one's own, as a piece of stolen property.

identity (ī den′ ti ti), *n.* sameness; a state of exact likeness; distinctive individuality, as to conceal one's *identity.*

***ideology** (id ē ol′ ō ji), *n.* the science of ideas; the philosophy that holds that ideas are derived only from experience; the system of beliefs characteristic of a person or of a school of thought.

idiocy (id′ i ō si), *n.* a permanent condition of lack of intelligence due to an undeveloped brain or an abnormal condition of the brain.

idiom (id′ ium), *n.* a turn of expression peculiar to a language or to an individual writer or speaker.

idiomatic (id i ō mat′ ik), *adj.* expressed in idioms; characteristic of a language, as an *idiomatic* expression.

***idiosyncrasy** (id i o sing′ kr*a* si), *n.* [*pl.* idiosyncrasies] a marked peculiarity of a person's nature or temperament.

idiot (id′ i ut), *n.* a person born without the capacity to develop intelligence.

idle (ī dl), *adj.* unemployed; lazy; futile; groundless, as an *idle* rumor.

Syn. Lazy, indolent. An *idle* person is one who is not busy, not actively occupied. *lazy* is a disparaging term and means not inclined or willing to work or to make an effort; *indolent* means fond of ease and not fond of exertion.

Ant. Active, busy, industrious.

idle (ī′ dl), *v.i.* to waste time by doing nothing; to saunter; to run slowly in neutral, as an automobile engine.

***idol** (ī′ dul), *n.* an image of a god; an object of worship or devotion.

idolater (ī dol′ *a* tẽr), *n.* an idol-worshiper.

idolatry (ī dol′ *a* tri), *n.* the worship of idols or images; any excessive devotion.

idolize (ī′ dul īz), *v.t.* to make an idol of; to adore with exaggerated reverence, as to *idolize* a hero.

***idyl** or **idyll** (ī′ dil), *n.* a short description of rural scenes in poetry or prose.

idyllic (ī dil′ ik), *adj.* like an idyl; picturesquely rural or rustic; charming in simplicity.

if (if), *conj.* providing, on condition that, as I'll go *if* John goes; supposing that, as you will like the book *if* you read it; although, as the speech was witty *if* short; whether, as see *if* you can lift that rock.

igloo (ig′ lo͞o), *n.* an Eskimo house, usually dome-shaped and made of snow or blocks of ice.

igneous (ig′ nē us), *adj.* pertaining to fire; caused by the action of fire and heat within the earth, fused, as *igneous* rocks.

ignite (ig nīt′), *v.i. and v.t.* to take fire; to set fire to, kindle.

ignition (ig nish′ un), *n.* the act of kindling or the state of being kindled; the device for exploding the charge of gasoline in an automobile engine.

ignoble (ig nō′ bl), *adj.* of low birth or station; of mean character.

***ignominious** (ig nō min′ i us), *adj.* disgraceful; dishonorable, humiliating.

***ignominy** (ig′ nō min i), *n.* [*pl.* ignominies] public disgrace or dishonor.

***ignoramus** (ig nō rā′ mus), *n.* a hopelessly ignorant person.

ignorance (ig′ nō rans), *n.* the state of being without knowledge.

ignorant (ig′ nō rant), *adj.* destitute of knowledge; knowing little or nothing, uninformed; unaware, as I was *ignorant* of your arrival.

Syn. Illiterate. An *ignorant* person is one lacking in education or knowledge; *illiterate* means definitely deficient in primary schooling, unable to read and write. A learned man may be *ignorant,* without knowledge, of many things outside his special field; the *iliterate* persons may have much knowledge of practical things yet not be able to read or write.

Ant. Learned, wise.

ignore (ig nōr′), *v.t.* to disregard; to treat as though unknown.

iliac (il′ i ak), *adj.* relating to the upper portion of the hipbone.

ilium (il′ i um), *n.* the upper bone of the hip.

ill (il), *n.* an evil, a misfortune; an injurious fact, condition or influence; disease.

ill (il), *adj.* sick; unprofitious, as an *ill* wind; faulty, not proper as *ill* manners; bad, disagreeable, as an *ill* temper.

ill (il), *adv.* badly, poorly, as an *ill* done task, *ill* furnished.

illegal (il lē′ gal), *adj.* contrary to law.

illegible (il lej′ i bl), *adj.* undecipherable; hard to read, as *illegible* writing.

illegitimate (il lē jit′ i mit), *adj.* unlawful; born out of wedlock; illogical, as an *illegitimate* excuse.

illiberal (il lib′ ẽr al), *adj.* not broadminded, bigoted; ungenerous.

***illicit** (il lis′ it), *adj.* forbidden, contrary to law or rule; improper, as *illicit* pleasures.

illimitable (il lim′ it *a* bl), *adj.* without limits, immeasurable.

illiteracy (il lit′ ẽr *a* si), *n.* lack of learning, especially inability to read and write.

illiterate (il lit′ ẽr it), *adj.* unable to read and write, uneducated.

illness (il′ nes), *n.* the condition of being ill, sickness, disease.

illogical (il loj′ i kal), *adj.* not logical, not correctly reasoned.

illuminate (i lūm′ i nāt), *v.t.* to light up, give light, enlighten; to throw light on, as to *illuminate* an obscure problem.

Syn. Illumine, enlighten. We *illuminate* by means of artificial lights; the sun *illuminates* the world with its own light. Preaching and instruction *enlighten* the minds of men. *Illumine* is a poetic variation of *illuminate.*

Ant. Darken, obscure.

illumination (i lū mi nā′ shun), *n.* a lighting up; decoration with lights; intellectual or spiritual enlightenment.

illusion (i lū′ zhun), *n.* a deceptive or unreal appearance; hallucination; a belief based on faulty reasoning.

***illusory** (i lū′ sō ri), *adj.* misleading, deceiving.

***illustrate** (il′ us trāt), *v.t.* to make clear, explain by examples; to adorn, as a book, with pictures.

illustration (il us trā′ shun), *n.* explanation by example; ornamentation with pictures; a picture or diagram accompanying written or printed material; an instance of explanation, an example.

***illustrative** (i lus′ tr*a* tiv), *adj.* tending to elucidate or explain; serving as an example or picture.

illustrious (i lus′ tri us), *adj.* distinguished, famous, eminent.

***image** (im′ ij), *n.* an imitation of a person or object, as a picture or statue; an exact likeness, as she is the *image* of her mother; a figure of speech.

***imagery** (im′ ij ri), *n.* [*pl.* imageries] representation by images; use of figures of speech in writing or talking; mental pictures, the result of memory or imagination.

imaginable (i maj′ i n*a* bl), *adj.* capable of being imagined or pictured in the mind.

imaginary (i maj′ i nẽr i), *adj.* existing only in the mind, unreal, fancied.

imagination (i maj i nā′ shun), *n.* the power of the mind to form pictures; a mental image or conception; creative mental power.

***imaginative** (i maj′ i nā tiv), *adj.* having the power to create images in the mind; full of fancies.

imagine (i maj′ in), *v.i. and v.t.* to make mental images; to form a mental picture of; to fancy; to surmise.

***imbecile** (im′ bē sil), *n.* a person of feeble, simple mind, but not an idiot or moron.

***imbecile** (im′ bē sil), *adj.* mentally feeble.

imbecility (im bē sil′ i ti), *n.* [*pl.* imbecilities] feeblemindedness.

imbibe (im bīb′), *v.t.* to drink in; to take in as if by drinking, as to *imbibe* knowledge.

imbrication (im bri kā′ shun), *n.* overlapping of edges, as of shingles on a roof.

imbue (im bū′), *v.t.* to saturate with; to dye; to cause to be permeated, as the mind with ideas.

imitate (im′ i tāt), *v.t.* to produce a likeness of, as to *imitate* another person's mannerisms; to take as a model, copy, mimic; to resemble.

imitation (im i tā′ shun), *n.* act of copying or mimicking; a copy.

imitation (im i tā′ shun), *adj.* not genuine, artificial, as *imitation* silk.

immaculate (i mak′ ū lit), *adj.* spotless, pure; excessively clean, as *immaculate* linens.

immanent (im′ *a* nent), *adj.* indwelling, inherent, subjective.

immaterial (im m*a* tēr′ i al), *adj.* not composed of matter, spiritual; irrelevant, unimportant.

immature (im *a* tūr′), *adj.* not full-grown; unripe; crude, childish.

immeasurable (i mezh′ ẽr *a* bl), *adj.* beyond possibility of being measured, limitless.

immediate (i mē′ di it), *adj.* next, not separated in time or space; close, with nothing intervening; direct, as *immediate* causes; belonging to the present moment, present, as *immediate* needs; nearest in relation, as one's *immediate* family.

***immemorial** (im mē mō′ ri al), *adj.* extending back beyond the range of memory or record; very ancient.

immense (i mens′), *adj.* very large, vast, huge.

immensity (i men′ si ti), *n.* [*pl.* immensities] vastness; huge bulk or wide extent.

immerse (i mûrs′), *v.t.* to plunge into and under water; to baptize by submerging the entire body; to engross, as to be *immersed* in one's work.

immigrant (im′ i grant), *n.* a native of one country who enters another to settle permanently.

immigrate (im′ i grāt), *v.i.* to enter a country of which one is not a native with the intention of establishing permanent residence.

immigration (im i grā′ shun), *n.* the act of entering a country of which one is not a native to make one's home there; the whole inflow of such settlers into a country in a given period, as the *immigration* is less than it was before the World War.

imminent (im′ i nent), *adj.* promising or threatening to happen at once, as *imminent* misfortune.

Syn. Impending. *Imminent* means about to happen immediately. *Impending* excludes the idea of the instant; it means hanging over indefinitely or accumulating. One may be in *imminent* danger of death; financial ruin may be *impending* for months.

immobility (im ō bil′ i ti), *n.* the state of being fixed, stable, not in motion.

immoderate (im mod′ ẽr it), *adj.* excessive, intemperate, extravagant, extreme.

immodest (im mod′ est), *adj.* bold, forward.

immolate (im′ ō lāt), *v.t.* to offer as a sacrifice, kill in a sacrificial ceremony.

immoral (im mor′ al), *adj.* not guided by the commonly accepted ideas of rightness in conduct, unprincipled.

immortal (i môr′ tal), *n.* one of imperishable fame.

immortal (i môr′ tal), *adj.* deathless, imperishable.

immortelle (im ôr tel′), *n.* a plant producing flowers that can be dried without losing their form and color; an everlasting.

immune (i mūn′), *adj.* exempt, free, as *immune* from taxation; protected from a disease, as by vaccination or innoculation.

immune (i mūn′), *n.* one who is not subject to a certain disease.

immunity (i mū′ ni ti), *n.* [*pl.* immunities] exemption from ordinary duties and burdens; the state of not being subject to a disease.

immure (i mūr′), *v.t.* to enclose within walls, imprison; to shut up as if within walls.

***immutable** (i mū′ t*a* bl), *adj.* unchanging, unalterable.

imp (imp), *n.* a little devil, a goblin; a mischievous child.

impact (im′ pakt), *n.* a collision; a forcible striking together that sets the struck body in motion.

impair (im pâr′), *v.t.* to weaken, damage; to lessen in quality.

Syn. Injure. To *impair* is to employ a progressive mode of injuring. To *injure* is to damage either through slow, sustained action or through an instantaneous act. Straining of the eyes *impairs* the sight; a blow *injures* rather than *impairs* the eye.

impale (im pāl), *v.t.* to transfix, as with a stake.

impalpable (im pal′ p*a* bl), *adj.* imperceptible to the touch; unsubstantial.

impanel (im pan′ el), *v.t.* [*p.t.* and *p.p.* impaneled, *pr.p.* impaneling] to list or enroll for jury service; to select a jury from a list.

impart (im pärt′), *v.t.* to give a share of, bestow; to make known, disclose, as to *impart* knowledge or news.

***impartial** (im pär′ shal), *adj.* fair to all concerned, showing no favoritism, just.

impasse (im pȧs′), *n.* an unpassable road; anything that blocks advance; an unescapable predicament.

impassioned (im pash′ und), *adj.* moved by, or showing strong or deep feeling, ardent.

impassive (im pas′ iv), *adj.* lacking emotion, apathetic, indifferent, serene.

***impatient** (im pā′ shi ent), *adj.* restless under stress, as of pain or opposition; eager, restless, hasty.

impeachment (im pēch′ ment), *n.* the arraignment of a public officer for misconduct in office; a challenge to the credibility or validity, as of testimony.

impeccable (im pek′ *a* bl), *adj.* faultless.

impecunious (im pē kū′ ni us), *adj.* having no money; habitually poor.

impede (im pēd′), *v.t.* to obstruct, hinder, prevent the progress of.

impediment (im ped′ i ment), *n.* anything that hinders or obstructs; an organic defect that hinders a function, as an *impediment* of speech.

impel (im pel′), *v.t.* [*p.t.* and *p.p.* impelled, *pr.p.* impelling] to drive forward; to force constrain, as duty *impels* me.

impend (im pend′), *v.i.* to hang over and be or seem ready to fall; to be at hand or about to happen.

impenetrable (im pen′ ē tr*a* bl), *adj.* not to be entered, as a dense forest, pierced, as a wall, or solved, as a mystery; closed to argument, as a mind, or to sympathy, as a heart.

impenitence (im pen′ i tens), *n.* absence of regret for faults or misdeeds.

imperative (im per′ *a* tiv), *n.* the mood of a verb expressing command.

imperative (im per′ *a* tiv), *adj.* expressing command, authoritative; obligatory, compulsory.

***imperceptible** (im pẽr sep′ ti bl), *adj.* beyond perception by the senses or the mind.

imperfect (im pûr′ fekt), *adj.* incomplete, defective; denoting action continuing in the past, but not completed, as in the sentence he was doing his chores, was doing is in the *imperfect* tense.

imperial (im pēr′ i *a*l), *adj.* pertaining to an empire or an emperor; supreme, as *imperial* power; designating the system of weights and measures used in the United Kingdom, as an *imperial* gallon.

imperialism (im pēr′ i *a*l izm), *n.* the policy of territorial expansion and development as a world power.

imperil (im per′ il), *v.t.* to place in danger, jeopardize.

imperious (im pēr′ i us), *adj.* domineering, overbearing; urgent, as *imperious* necessity.

Syn. Imperative, peremptory. *Imperious* always means arrogant and overbearing; *imperative* means commanding, especially commanding with authority; *peremptory* means admitting of no denial or refusal.

imperishable (im per′ ish *a* bl), *adj.* indestructible; not subject to decay; permanently enduring.

impermeable (im pûr′ mē *a* bl), *adj.* not permitting passage through, especially not permitting liquids to pass through.

impersonal (im pûr′ sun al), *adj.* without personality; not referring to any particular person; not expressing the action of a person or thing, having *it* for a subject, as an *impersonal* verb.

impersonate (im pûr′ sun āt), *v.t.* to give personality to, personify; to imitate and mimic the appearance and mannerisms of another person.

impertinence (im pûr′ ti nens), *n.* unfitness, as of words to an occasion or a subject; incivility; sauciness.

imperturbable (im pẽr tûr′ b*a* bl), adj. not easily disturbed or agitated, calm.

impervious (im pûr′ vi us), *adj.* impenetrable.

***impetuous** (im pet′ ū us), *adj.* hasty or rash in action, as a person, impulsive; rushing violently, as a stream.

***impetus** (im′ pē tus), *n.* [*pl.* impetuses] a driving force; impulse to motion; incentive for action.

impiety (im pī′ e ti), *n.* [*pl.* impieties] ungodliness, irreverence.

impinge (im pinj′), *v.i.* to strike, dash or collide; to come into close contact.

***impious** (im′ pi us), *adj.* not pious, profane, irreverent.

***implacable** (im plā′ k*a* bl), *adj.* not to be appeased, relentless.

implant (im plȧnt′), *v.t.* to cause to take root, as a plant in the ground, a principle in the mind.

implement (im′ plē ment), *n.* an instrument or tool for doing something.

implicate (im′ pli kāt), *v.t.* to involve, bring into connection.

Syn. Involve. To *implicate* is literally to fold something into something else; to *implicate* therefore means to entangle and often to incriminate; to *involve* means to draw into, as one becomes *involved* in a quarrel, *implicated* in an accusation.

Ant. Extricate, remove.

implication (im pli kā′ shun), *n.* an entanglement; something implied, from which an inference can be made.

implicit (im plis′ it), *adj.* implied; understood but not expressed, as an answer is often *implicit* in a question; complete, utter, as *implicit* faith.

implore (im plōr′), *v.t.* to entreat, supplicate, pray.

imply (im plī′), *v.t.* [*p.t.* and *p.p.* implied, *pr.p.* implying] to suggest in a manner justifying an inference, without direct statement, to hint, to involve, as learning *implies* study.

impolite (im pō līt′), *adj.* ill-mannered, rude.

impolitic (im pol′ i tik), *adj.* contrary to good policy, unwise.

***import** (im′ pōrt), *n.* meaning; significance: *imports,* merchandise brought into a country from abroad.

import (im pōrt′), *v.t.* to bring in from abroad, as goods to be sold; to imply; to suggest.

important (im pôr′ tant), *adj.* of much import or significance, momentous.

***importune** (im pôr tūn′), *v.t.* to address with repeated appeals, to request or urge persistently.

impose (im pōz′), *v.i. and v.t.* to take advantage, presume, as to *impose* on someone's hospitality; to place, inflict, lay, as to *impose* a burden on a friend, a tax on the public; to lay out, as pages of type, in order and lock up in the frame for printing.

imposing (im pōz′ ing), *adj.* impressive in size or power.

imposition (im pō zish′ un), *n.* a laying on, as of hands in ordination or confirmation; the act of laying, charging or inflicting, as a burden or a tax; a levy, a tax; an unwarranted request or requirement; a deceitful trick.

impossible (im pos′ i bl), *adj.* not capable of happening, being or being done; objectionable, as an *impossible* person.

impost (im′ pōst), *n.* that which is imposed or levied, as a tax or duty, especially a customs duty.

***impostor** (im pos′ tẽr), *n.* one who deceives others by presenting himself in an assumed character or pretending to knowledge he does not possess; a swindler.

***imposture** (im pos′ tūr), *n.* deception through pretending to be what one is not; a fraud.

***impotence** (im′ pō tens), *n.* feebleness of mind or body, weakness.

impound (im pound′), *v.t.* to shut up in a pen, as stray dogs; to seize and hold by law, confiscate; to collect (water) for irrigation.

impoverish (im pov′ ẽr ish), *v.t.* to make poor, reduce to poverty; to exhaust, as land.

impracticable (im prak′ ti k*a* bl), *adj.* unworkable, unusable; not feasible.

imprecation (im prē kā′ shun), *n.* the invoking of evil, a curse.

impregnable (im preg′ n*a* bl), *adj.* not to be captured, unconquerable, as a fortress; unassailable, as an argument.

***impregnate** (im preg′ nāt), *v.t.* to make pregnant, get with young; to saturate, imbue, as the mind with principles.

impress (im′ pres), *n.* an impression; a mark produced by means of pressure.

impress (im pres′), *v.t.* to mark, as with a die; to affect deeply, as your letter *impressed* me.

impression (im presh′ un), *n.* the mark made by a die or stamping machine; an image in the mind, an effect of sensation or influence; a vague notion or memory.

impressionable (im presh′ un *a* bl), *adj.* easily impressed or influenced.

imprint (im′ print), *n.* a mark caused by pressure; the publisher's name and address on the title page of a book.

imprint (im print′), *v.t.* to mark by means of pressure; to fix deeply upon the mind.

imprison (im priz′ n), *v.t.* to put in prison; to confine in any way.

improbable (im prob′ *a* bl), *adj.* unlikely to be or to occur; not easy to believe or expect.

***improbity** (im prō′ bi ti), *n.* lack of rectitude, as in business.

impromptu (im promp′ tū), *adj.* without preparation, extemporaneous, as an *impromptu* speech.

impromptu (im promp′ tū), *adv.* without preparation, on the spur of the moment, as he spoke *impromptu.*

improper (im prop′ ẽr), *adj.* unsuitable, as garments *improper* for a wedding; not in accord with conventional conduct or good taste; indecent; incorrect, as the *improper* use of a word: *improper fraction,* a fraction having a numerator larger than the denominator, as 7/4.

impropriety (im prō prī′ e ti), *n.* [*pl.* improprieties] the quality of being improper; an improper act; a mistake in grammar or usage.

improve (im prōōv′), *v.i. and v.t.* to grow better; to make better; to increase the value of, as a piece of land, by erecting buildings on it.

improvement (im prōōv′ ment), *n.* anything that contributes to betterment; the state of becoming better, as in health or value: *improvements,* buildings enhancing the value of land, or permanent fixtures added to a house.

improvidence (im prov′ i dens), *n.* lack of foresight or forethought, lack of thrift.

***improvise** (im′ prō vīz), *v.i. and v.t.* to compose extemporaneously; to make or do on the spur of the moment, as to *improvise* a shelter.

imprudent (im pro͞o′ dent), *adj.* indiscreet, unwise, not cautious.

impudent (im′ pū dent), *adj.* boldly forward, pert, insolent, saucy.

***impugn** (im pūn′), *v.t.* to assail with arguments; to attack or challenge as false.

impulse (im′ puls), *n.* the act of driving onward; sudden force causing motion forward; any incitement to unconsidered action, as the *impulse* to laugh; a motive or instinctive tendency, as a man of inexplicable *impulses.*

impulsive (im pul′ siv), *adj.* acting on impulse or feeling; caused by feeling, as an impulsive word; having power to impel or move forward.

impunity (im pū′ ni ti), *n.* [*pl.* impunities] freedom from punishment or painful consequences.

impure (im pūr′), *adj.* mixed with extraneous matter or with some inferior substance, adulterated; dirty, unwholesome, as *impure* water.

impurity (im pū′ ri ti), *n.* [*pl.* impurities] the state of not being clean or of being mixed with inferior substances; a defect in physical composition or moral character.

imputation (im pū tā′ shun), *n.* the making of insinuations; an insinuation.

impute (im pūt′), *v.t.* to ascribe or charge, as to *impute* a mistake to ignorance.

in (in), *prep.* not beyond the limits of in space or time, within, as London is *in* England, a bird *in* a cage, *in* 1895 A.D.; during, as it happened *in* the spring, *in* parting, let me say; after, at the end of, as come back *in* an hour; within an enclosing substance, as dressed *in* velvet, wrapped *in* paper, soaked *in* milk; within as a condition or activity, as *in* fear, rule *in* splendor, live *in* ease, be *in* publishing; within the scope of, as not *in* the memory of man; within the ability of, as it is *in* her to succeed; uttered or written according to, as a letter *in* cipher, a book *in* English; by way of, as *in* apology.

in (in), *adv.* to or toward the inside, as come *in,* the ship is headed *in.*

in (in), *adj.* incoming, as the *in* traffic.

inaccurate (in ak′ ū rit), *adj.* not strictly correct, inexact, having error.

inactive (in ak′ tiv), *adj.* inert; sluggish, indolent; idle.

inadequate (in ad′ ē kwit), *adj.* not enough; not equal to a need.

inadvertent (in ad vûr′ tent), *adj.* done without attention, inattentive, unintentional.

inalienable (in āl′ yen *a* bl), *adj.* not to be removed or transferred, as *inalienable* rights.

***inane** (in ān′), *adj.* empty, pointless, meaningless.

inanimate (in an′ i māt), *adj.* without life, as a chair is an *inanimate* object; dull, not animated, as an *inanimate* expression.

inanity (in an′ i ti), *n.* [*pl.* inanities] senselessness; emptiness, as of speech; an empty pointless saying.

***inappreciable** (in a prēsh′ i *a* bl), *adj.* too small to be perceived; of no importance.

inarticulate (in är tik′ ū lāt), *adj.* not uttered clearly or so as to be understood; unable to speak, dumb, as *inarticulate* animals; lacking joints, as certain animals.

inasmuch (in az much′), *adv.* in like degree; insofar: *inasmuch as,* because, since.

inaudible (in ô′ dibl), *adj.* too low or distant to be heard.

inaugural (in ô′ gū ral), *adj.* pertaining to an inauguration, as an *inaugural* address.

inauguration (in ô′ gū rā′ shun), *n.* formal induction into office; any ceremonious beginning.

inauspicious (in ôs pish′ us), *adj.* ill-omened, unfavorable, unpromising.

inborn (in′ bôrn), *adj.* natural, innate.

inbred (in′ bred), *adj.* natural, innate; born of related parents.

incalculable (in kal′ kū l*a* bl), *adj.* too great or too numerous to be reckoned.

incandescent (in kan des′ ent), *adj.* glowing with heat, so as to give light.

incandescent lamp (in kan des′ ent lamp), a light in a vacuum inside a glass bulb, produced by a filament resisting the passage of electric current.

incantation (in kan tā′ shun), *n.* a magical formula spoken or sung.

incapacitate (in ka pas′ i tāt), *v.t.* to deprive of ability to act or function.

incapacity (in ka pas′ i ti), *n.* [*pl.* incapacities] lack of power; legal disqualification.

incarcerate (in kär′ sēr āt), *v.t.* to imprison.

incarnation (in kär nā′ shun), *n.* assumption of flesh; embodiment in human form.

incautious (in kô′ shus), *adj.* unwary, reckless.

***incendiary** (in sen′ di er i), *n.* [*pl.* incendiaries] a person guilty of arson; one who inflames public passions.

incendiary (in sen′ di er i), *adj.* pertaining to deliberate setting afire of property; tending to inflame the passions of the people.

***incense** (in′ sens), *n.* any aromatic substance burned for fragrance, as during religious ceremonials.

incense (in sens′), *v.t.* to make angry.

incentive (in sen′ tiv), *n.* a motive for action.

inception (in sep′ shun), *n.* the beginning, as of an idea, institution or custom.

incessant (in ses′ ant), *adj.* unceasing, continual.

inch (inch), *n.* the twelfth part of a foot in linear measure.

***inchoate** (in kō′ it), *adj.* just begun, incomplete, rudimentary.

incidence (in′ si dens), *n.* the act of falling upon or affecting, as a ray of light upon a surface.

incident (in′ si dent), *n.* an occurrence.

incident (in′ si dent), *adj.* appertaining to, as duties *incident* to office; impinging upon, as an *incident* ray.

incidental (in si den′ tal), *adj.* constituting a minor element of some action or occurrence, casual.

incinerate (in sin′ ēr āt), *v.t.* to burn to ashes.

incipient (in sip′ i ent), *adj.* beginning to be or appear.

***incise** (in sīz′), *v.t.* to cut lines or characters into the surface of; to engrave.

incision (in sizh′ un), *n.* a cut, as in surgery.

***incisive** (in sī′ siv), *adj.* cutting, sharp; trenchant, as words.

incite (in sīt′), *v.t.* to rouse to action; to stir up, as to *incite* to rebellion.

incivility (in si vil′ i ti), *n.* [*pl.* incivilities] the quality of impoliteness; a rude act.

inclement (in klem′ ent), *adj.* harsh; merciless; stormy, as the weather.

inclination (in kli nā′ shun), *n.* a slant; a leaning or tendency of the mind; propensity.

Syn. Tendency, propensity, proneness. All these terms are used to designate the state of the will toward an object. *Inclination* denotes the first movement in that direction; a *tendency* is a continuing *inclination. Propensity* and *proneness* both designate, etymologically, a downward direction, and therefore refer commonly to that which is bad or low; one has a *propensity* or *proneness* to lying.

Ant. Disinclination, repulsion.

***incline** (in′ klīn), *n.* a slope; a slanting flat surface.

incline (in klīn′), *v.i. and v.t.* to lean or slope; to cause to lean or slope; to have a mental tendency, as to *incline* toward business.

inclose (in klōz′), *v.t.* to shut in, as with a fence; to insert with something else, as a card is *inclosed* with a letter; to enclose.

include (in klo͞od′), *v.t.* to contain as a part; to class with; to inclose.

***inclusive** (in klo͞o′ siv), *adj.* inclosing; including all, as the 15th to the 21st *inclusive.*

incoherence (in kō hēr′ ens), *n.* lack of cohesion; the state of not holding together; lack of logic, in speech or writing; inconsistency.

incombustible (in kom bus′ ti bl), *adj.* not to be consumed by fire.

***incommensurable** (in ko men′ shoo r*a* bl), *adj.* having no common measure.

incommensurate (in ko men′ shoo rit), *adj.* out of proportion to; inadequate.

***incommunicable** (in ko mū′ ni k*a* bl), *adj.* not able or fit to be told.

***incomparable** (in kom′ p*a* r*a* bl), *adj.* beyond compare; without an equal.

incompatible (in kom pat′ i bl), *adj.* incapable of harmonious relations; incongruous.

incompatibles (in kom pat′ i blz), *n. pl.* persons or things incapable of harmonious association.

incompetent (in kom′ pē tent), *adj.* deficient in ability or fitness; not legally qualified; inadmissible, as evidence.

incomplete (in kom plēt′), *adj.* not finished, lacking some part, imperfect.

incomprehensible (in kom prē hen′ si bl), *adj.* not to be grasped by the mind; beyond belief.

inconceivable (in kon sēv′ *a* bl), *adj.* incapable of being conceived or pictured by the mind, unthinkable.

***inconclusive** (in kon klo͞o′ siv), *adj.* leading to no final settlement; unconvincing.

***incongruity** (in kong gro͞o′ iti), *n.* [*pl.* incongruities] lack of mutual fitness; something that is unsuitable to a situation.

***incongruous** (in kong′ groo us), *adj.* reciprocally disagreeing; not associating harmoniously.

inconsequent (in kon′ sē kwent), *adj.* not springing logically from preceding acts or statements; lacking logical connection with the subject.

inconsiderable (in kon sid′ ēr *a* bl), *adj.* not worth considering, unimportant.

inconsiderate (in kon sid′ ēr it), *adj.* lacking proper regard for the comfort, welfare or feelings of others.

inconsistent (in kon sis′ tent), *adj.* illogical; self-contradictory.

inconsolable (in kon sōl′ *a* bl), *adj.* not to be comforted.

inconspicuous (in kon spik′ ū us), *adj.* too small or unimportant to attract notice or attention; not standing out in the surroundings.

inconstant (in kon′ stant), *adj.* unstable, subject to change, fickle, variable.

incontestable (in kon tes′ t*a* bl), *adj.* beyond dispute; incontrovertible.

incontrovertible (in kon trō vûr′ ti bl), *adj.* not admitting of controversy, argument or debate.

***inconvenience** (in kon vēn′ yens), *n.* the state of not being convenient; that which causes discomfort or annoyance.

inconvenience (in kon vēn′ yens), *v.t.* to go against another's comfort and ease; to cause discomfort or annoyance, to trouble.

Syn. Annoy, molest. We *inconvenience* others by causing them trouble and bother. We *annoy* or *molest* by doing that which is positively irritating, painful or harmful. We may be *inconvenienced* by another's absence, or *annoyed* by his presence. To *molest* is to cause injury or seriously to disturb.

inconvertible (in kon vûr′ ti bl), *adj.* not to be changed into something else or exchanged for something else.

***incorporate** (in kôr′ pō rāt), *v.i. and v.t.* to unite with another body, forming a new unit, as in business; to unite, as individuals, groups, organizations or firms, into a new legally recognized unit.

incorporation (in kôr pō rā′ shun), *n.* the act of incorporating; the result of such action, or the new entity so formed: also called *corporation.*

incorporeal (in kôr pō′ re al), *adj.* having no material or bodily existence.

incorrect (in ko rekt′), *adj.* having error; inaccurate; improper, as *incorrect* behavior.

***incorrigible** (in kor′ i ji bl), *adj.* too hopelessly bad to be corrected.

incorruptible (in ko rup′ ti bl), *adj.* incapable of physical decay; not subject to moral contamination; not to be influenced by offers of bribes.

increase (in′ krēs), *n.* growth in size or number; the amount by which anything is enlarged.

increase (in krēs′), *v.i. and v.t.* to grow in size or number; to augment.

Syn. Grow. To *increase* is to become larger either by instantaneous act or by gradual process; to *grow* is to enlarge only through the latter method.

Ant. Decrease, fade, decline.

incredible (in kred′ i bl), *adj.* beyond belief.

incredulity (in krē dū′ li ti), *n.* the act of withholding belief, unbelief.

incredulous (in kred′ ū lus), *adj.* indicating disbelief or unbelief; not credulous, doubting, skeptical.

increment (in′ krē ment), *n.* an increase; an added amount, as the *increment* of money at interest.

incriminate (in krim′ i nāt), *v.t.* to charge with a crime, indicate guilt, accuse.

incrust (in krust′), *v.t.* to cover with a crust.

incrustation (in krus tā′ shun), *n.* a crusty covering.

incubate (in′ kū bāt), *v.i. and v.t.* to sit, as a hen, on eggs; to hatch, as eggs, by sitting on them; to keep eggs or young in the condition of heat necessary to promote or maintain life.

incubator (in′ kū bā tẽr), *n.* an apparatus for hatching eggs artificially or for maintaining the life of a premature or delicate baby.

incubus (in′ kū bus), *n.* [*pl.* incubuses or incubi] a nightmare; an oppressive weight or burden.

***inculcate** (in kul′ kāt), *v.t.* to plant in the mind, as principles, by constant admonition.

inculpate (in kul′ pāt), *v.t.* to blame; to incriminate; to accuse.

incumbent (in kum′ bent), *n.* the present holder of an office.

incumbent (in kum′ bent), *adj.* imposed as a duty, as it is *incumbent* on me to go.

incur (in kûr′), *v.t.* [*p.t.* and *p.p.* incurred, *pr.p.* incurring] to become subject to, as to *incur* displeasure; to contract, as a debt.

incurable (in kūr′ *a* bl), *n.* a person diseased beyond hope of recovery.

incurable (in kūr′ *a* bl), *adj.* beyond possibility of cure.

incursion (in kûr′ zhun), *n.* an inroad, raid, invasion.

indebted (in det′ ed), *adj.* resting under obligation.

Syn. Obliged. We are *indebted* to one who renders an essential service, *obliged* to one who confers any service. A man is *indebted* to one who saves his life; *obliged* to another for an ordinary act of civility.

indecent (in dē′ sent), *adj.* not decent; unfit to be seen or heard; offensive to the common standards of propriety.

***indecision** (in dē sizh′ un), *n.* a wavering, faltering state of mind, irresolution.

***indecisive** (in dē sī′ siv), *n.* not leading to a decision, inconclusive.

***indecorous** (in dē ko′ rus), *adj.* contrary to the dictates of good manners.

indecorum (in dē kō′ rum), *n.* a violation of propriety or good manners.

indeed (in dēd′), *adv.* in fact, just so, truly.

indefatigable (in dē fat′ i g*a* bl), *adj.* not to be wearied, tireless.

indefeasible (in dē fēz′ ibl), *adj.* not to be annulled or made void, as an *indefeasible* title.

indefensible (in dē fen′ si bl), *adj.* not capable of being convincingly defended or excused.

indefinable (in dē fīn′ *a* bl), *adj.* incapable of being accurately described or explained.

indefinite (in def′ i nit), *adj.* inexact; not precise; having no defined limit; vague.

indelible (in del′ i bl), *adj.* not to be erased, as from paper or the mind.

indelicacy (in del′ i k*a* si), *n.* [*pl.* indelicacies] lack of refinement; an act or a word of a coarse nature.

indemnify (in dem′ ni fī), *v.t.* to compensate for damage done or loss caused.

indemnity (in dem′ ni ti), *n.* [*pl.* indemnities] compensation for damage done or loss caused an individual, corporation or nation.

indent (in dent′), *v.t.* to make a notch or notches in the edge of; to set a line of writing or printing in from the margin.

indentation (in den tā shun), *n.* a small depression of a surface caused by a blow, a dent.

indention (in den′ shun), *n.* the act of setting a line of writing or printing in from the margin; the space left by this act, as at the beginning of a paragraph; distance in from an outside measure, as the edge of the type page.

indenture (in den′ tūr), *n.* a covenant or deed; in former times, a contract binding an apprentice or servant to an employer or master.

indenture (in den′ tūr), *v.t.* to bind by written agreement.

independence (in dē pen′ dens), *n.* freedom from assistance by others or from rule by others.

independent (in dē pen′ dent), *n.* one who will not adhere to an organization, as a party or established church.

independent (in dē pen′ dent), *adj.* free, uncontrolled by another, as an *independent* store, contrasted with a chain, an *independent* mind, an *independent* income; self-reliant, as too *independent* to take relief: opposite of *dependent.*

indestructible (in dē struk′ ti bl), *adj.* incapable of being destroyed.

indeterminate (in dē tûr′ mi nāt), *adj.* not definitely fixed, not precise or distinct, vague.

index (in′ deks), *n.* [*pl.* indexes or indices] something that points out, as the *index* finger; an alphabetical list of references to the contents of a book.

India ink (in′ di *a* ink), a strong black ink used in drawing.

India paper (in′ di*a* pā′ pẽr), very light, opaque paper used in books to reduce the bulk.

India rubber (in′ di *a* rub′ ẽr), Caoutchouc, made from the milky juice of a tropical plant.

indicate (in′ di kāt), *v.t.* to point out; to suggest.

***indicative** (in dik′ *a* tiv), *n.* the mood of the verb that declares or affirms or asks a direct question.

indicator (in′ di kā tẽr), *n.* a device that points, especially a device to show speed of an engine, pressure of steam.

***indict** (in dīt′), *v.t.* to charge formally with an offense or a crime.

***indictment** (in dīt′ ment), *n.* a formal, official charge against an accused person.

indifference (in dif′ ẽr ens), *n.* lack of concern or interest; absence of favor or opposition.

indifferent (in dif′ ẽr ent), *adj.* unconcerned, not caring how things go, apathetic; neutral.

Syn. Unconcerned. One who is *indifferent* has no interest, choice or feeling about a matter. One who is *unconcerned* feels no anxiety.

Ant. Interested, anxious.

indigence (in′ di jens), *n.* poverty.

***indigenous** (in dij′ ē nus), *adj.* native; innate, inborn.

***indigent** (in′ di jent), *adj.* destitute, needy, poor.

indigestion (in dē jes′ chun), *n.* inability to digest food; dyspepsia.

indignant (in dig′ nant), *adj.* justly angry.

indignation (in dig nā′shun), *n.* angry scorn for acts of an unworthy, dishonorable or unjust nature.

indignity (in dig′ ni ti), *n.* [*pl.* indignities] an offense against the personal dignity of another.

indigo (in′ di gō), *n.* a blue dyestuff; the plant from which it is obtained; a deep violet blue color.

***indirect** (in di rekt′), *adj.* oblique, circuitous; not straightforward, misleading; remotely not immediately connected, as an *indirect* result.

indiscreet (in dis krēt′), *adj.* imprudent, injudicious.

indiscrete (in dis krēt′), *adj.* not separated; grown together; homogeneous.

indiscretion (in dis kresh′ un), *n.* imprudence; an imprudent act.

indiscriminate (in dis krim′ i nit), *adj.* without discrimination or distinction; promiscuous; miscellaneous.

indispensable (in dis pen′ s*a* bl), *adj.* absolutely necessary.

indisposition (in dis pō zish′ un), *n.* a slight ailment.

***indisputable** (in dis′ pū t*a* bl), *adj.* beyond argument, unquestionable.

***indissoluble** (in dis′ ō lū bl), *adj.* not capable of being dissolved or annulled.

indistinct (in dis tingkt′), *adj.* not clear; vague; faint, to hearing or sight.

indistinguishable (in dis ting′ gwish *a* bl), *adj.* not clearly enough outlined to be identified.

indite (in dīt′), *v.t.* to compose, write.

individual (in di vid′ ū al), *n.* a single person or thing considered separately from the class or group.

individual (in di vid′ ū al), *adj.* pertaining to or characteristic of a single person or thing; for use by one person, as *individual* cups.

individuality (in di vid ū al′ i ti), *n.* [*pl.* individualities] existence as an individual; distinctive character.

indivisible (in di viz′ i bl), *adj.* not capable of being separated into parts.

indolence (in′ dō lens), *n.* love of ease; laziness.

indomitable (in dom′ i t*a* bl), *adj.* untamable, invincible.

indorse (in dôrs′), *v.t.* to sign on the back, as a check; to support with approval.

***indubitable** (in dū′ bi t*a* bl), *adj.* not to be doubted or questioned, too plain or true to be doubted.

Syn. Unquestionable, indisputable, incontrovertible. When a fact is supported by such evidence as admits of no doubt, it is *indubitable.* The character of a man whose integrity cannot be impeached establishes his assertions as of *unquestionable* authority. A fact of universal acceptance must be regarded as *indisputable,* and arguments that have never been controverted are fairly to be termed *incontrovertible.*

Ant. Doubtful, debatable.

induce (in dūs′), *v.t.* to influence to action, prevail upon, bring on, cause.

inducement (in dūs′ ment), *n.* that which induces, a motive; that which provides a missing incentive.

induct (in dukt′), *v.t.* to install in office.

induction (in duk′ shun), *n.* the formal establishment of a person in an office; the process of reasoning from particular instances to general conclusions; a conclusion reached by that method; electric or magnetic influence without contact.

inductive (in duk′ tiv), *adj.* proceeding from or reached by the logical method of generalizing from instances; in electricity, produced by induction.

indue (in dū′), *v.t.* to clothe or invest, furnish; to assume, put on.

indulge (in dulj′), *v.i. and v.t.* to gratify tastes and desires; to gratify, as desires; to humor, favor, as to *indulge* a child.

indulgence (in dul′ jens), *n.* gratification, especially self-gratification; the act of gratifying or humoring; a favor.

indurate (in′ dū rāt), *v.i. and v.t.* to grow hard; to make hard.

industrial (in dus′ tri al), *adj.* pertaining to production of goods for trade.

industrious (in dus′ tri us), *adj.* hard-working.

***industry** (in′ dus tri), *n.* [*pl.* industries] steadiness in toil; the whole establishment of productive enterprise in a country; the part of it devoted to production of one kind of goods, as the automobile *industry.*

inebriate (in ē′ bri āt), *n.* a habitual drunkard.

ineffable (in ef′ *a* bl), *adj.* inexpressible; too sacred for utterance.

ineffective (in ē fek′ tiv), *adj.* not producing the desired action or result; incompetent.

ineffectual (in ē fek′ tū al), *adj.* unavailing, useless, futile.

inefficient (in e fish′ ent), *adj.* not producing the desired effect; not capable or proficient.

inelegant (in el′ ē gant), *adj.* offensive to good taste, unrefined.

ineligible (in el′ i ji bl), *adj.* not qualified, as to vote or be voted for.

inept (in ept′), *adj.* not fitting, unsuitable, awkward, as a remark.

inequality (in ē kwol′ i ti), *n.* [*pl.* inequalities] a difference in favor of one over another; disparity; unevenness of surface.

***inequitable** (in ek′ wi t*a* bl), *adj.* not according to equity or fairness.

inequity (in ek′ wi ti), *n.* [*pl.* inequities] injustice or an instance of injustice.

inert (in ûrt′), *adj.* without power to move, act or resist.

***inertia** (in ûr′ sh*a*), *n.* lack of energy or activity; the property by which matter, either at rest or in motion, tends to continue in the same state unless acted upon by an outside force.

inestimable (in es′ ti m*a* bl), *adj.* not computable; beyond specific mensuration or valuation.

inevitable (in ev′ i t*a* bl), *adj.* unavoidable.

inexact (in eg zakt′), *adj.* not precise, not accurate.

inexcusable (in eks kūz′ *a* bl), *adj.* not to be excused, unpardonable.

***inexhaustible** (in ek zôs′ ti bl), *adj.* too great to be used up; tireless.

***inexorable** (in ek′ sō r*a* bl), *adj.* not to be moved by entreaty, unyielding.

***inexpedient** (in eks pē′ di ent), *adj.* not prudent, practicable or advisable.

inexpiable (in eks′ pi *a* bl), *adj.* not to be atoned for.

***inexplicable** (in eks′ pli k*a* bl), *adj.* not capable of being explained or accounted for.

inexpressible (in eks pres′ i bl), *adj.* beyond the power of words to express.

inextinguishable (in eks ting′ gwish *a* bl), *adj.* not to be quenched, as a fire.

***inextricable** (in eks′ tri k*a bl*), *adj.* too snarled to be disentangled.

infallible (in fal′ i bl), *adj.* unerring, certain.

***infamous** (in′ f*a* mus), *adj.* having a bad reputation, notoriously bad, scandalous.

infamy (in′ f*a* mi), *n.* [*pl.* infamies] public disgrace, loss of reputation, ignominy; an infamous or evil act.

infancy (in′ fan si), *n.* the first years of life; the early, formative period of anything, as a custom or institution.

infant (in′ fant), *n.* a baby, a very young child; a person not yet old enough to vote.

***infantile** (in′ fan tīl), *adj.* pertaining to infants or the period of infancy; very childish.

infantry (in′ fan tri), *n.* foot soldiers as distinguished from cavalry and artillery forces.

***infatuate** (in fat′ ū āt), *v.t.* to inspire with foolish passion.

infect (in fekt′), *v.t.* to poison, as a wound, with disease germs or bacteria; to contaminate, taint.

infection (in fek′ shun), *n.* a disease caused by the presence or spreading of disease germs.

infectious (in fek′ shus), *adj.* communicated by, or bearing, germs; tending to spread; catching, as an *infectious* laugh.

infelicitous (in fē lis′ i tus), *adj.* not appropriate, as an *infelicitous* remark.

infelicity (in fē lis′ i ti), *n.* [*pl.* infelicities] an ill-timed, inappropriate remark or act; the state of being unhappy.

infer (in fûr′), *v.i. and v.t.* to derive by reasoning from facts; to conclude.

inference (in′ fẽr ens), *n.* the act of judging one thing by another; a logical conclusion from first facts.

inferential (in fẽr en′ shal), *adj.* derived by reasoning from data.

inferior (in fẽr′ i ẽr), *adj.* lower in grade or quality, mediocre; set below the type line in printing.

inferiority (in fẽr i or i ti), *n.* the state of being lower in grade, quality or office.

inferiority complex (in fẽr i or i ti kom′ pleks), a feeling of inferiority, which manifests itself in various ways.

infernal (in fûr′ nal), *adj,* related to or resembling hell; devilish.

infest (in fest′), *v.t.* to overrun; to plague persistently.

infidel (in′ fi del), *n.* one who rejects a faith, as Christianity.

infidelity (in fi del′ i ti), *n.* [*pl.* infidelities] faithlessness; disloyalty.

infiltrate (in fil′ trāt), *v.i. and v.t.* to percolate; to pass through the pores of; to filter into or through.

infinite (in′ fi nit), *adj.* extending immeasurably or inconceivably.

infinitesimal (in fi ni tes′ i mal), *adj.* infinitely small; less than any assigned quantity, as the *infinitesimal* calculus.

infinitive (in fin′ i tiv), *n.* the verb form expressing the general sense without limitation in person or number; used with *to,* as *to read.*

infinity (in fin′ i ti), *n.* [*pl.* infinities] unlimited time or space, boundlessness; eternity.

infirm (in fûrm′), *adj.* feeble, weak; not stable.

infirmary (in fûr′ m*a* ri), *n.* [*pl.* infirmaries] an institution for care of the sick or injured, especially a school or college hospital.

infirmity (in fûr′ mi ti), *n.* [*pl.* infirmities] a weak or sick condition; any particular form of weakness or sickness.

inflame (in flām′), *v.t.* to set afire; to kindle, as to *inflame* anger; to excite.

inflammable (in flam′ a bl), *adj.* easily ignited; easily excited.

inflammation (in fl*a* mā′ shun), *n.* a diseased condition of any part of the body accompanied by pain, redness, heat and swelling.

inflammatory (in flam′ *a* tō ri), *adj.* causing inflammation; tending to arouse passions or cause tumultuous uprisings.

inflate (in flāt), *v.i. and v.t.* to puff up; to fill with air or gas.

inflation (in flā′ shun), *n.* an artificial stimulus to circulation of money.

inflect (in flekt′), *v.t. and v.i.* to modulate, as the voice; to change the form of for different grammatical relations, as to *inflect* a verb or noun; to be modified in form, as this verb *inflects* thus.

inflection (in flek′ shun), *n.* rising and falling of the voice; change in the form of nouns and verbs to indicate number, person, mood and tense.

inflexible (in flek′ si bl), *adj.* incapable of being bent, rigid; firmly fixed, as in purpose.

inflict (in flikt′), *v.t.* to cause to be suffered or endured, as pain; to impose, as a punishment.

***influence** (in′ floo ens), *n.* that which tends to produce results by invisible means; power springing from rank, station or office; ability to secure favors from those in power.

influence (in′ floo ens), *v.t.* to affect by any invisible power; to affect, as the conduct or condition of persons or things, as the weather *influences* the crops.

influential (in floo en′ shal), *adj.* having or exerting power; effective toward an end.

influenza (in floo en′ za), *n.* an epidemic disease resembling a severe cold and characterized by inflammation of the throat, headache and dull pains in the muscles.

influx (in′ fluks), *n.* an inflow, a pouring in.

inform (in fôrm′), *v.t.* to give form to; to give information, knowledge, news; to tell.

informal (in fôr′ mal), *adj.* unceremonious.

informality (in fôr mal′ i ti), *n.* [*pl.* informalities] departure from regular custom or from the strict rules of etiquette; any particular instance of such departure.

information (in fôr mā′ shun), *n.* communicated knowledge or news.

infraction (in frak′ shun), *n.* a violation or breach, as of the law or a treaty.

infrangible (in franj′ i bl), *adj.* unbreakable, not capable of being separated into parts; not to be violated.

infrequent (in frē′ kwent), *adj.* happening not often but at long and irregular intervals; rare, uncommon.

infringe (in frinj′), *v.i. and v.t.* to encroach, as to *infringe* upon the rights or property of another; to break, as a law.

infuriate (in fū′ ri āt), *v.t.* to enrage.

infuse (in fūz′), *v.t.* to pour in, as a liquid; to instill, as principles; to steep without boiling.

infusion (in fū′ zhun), *n.* that which is poured in or instilled, a mixture; the process of steeping a substance in water to draw out its essential qualities; the liquid thus obtained.

***ingenious** (in jēn′ yus), *adj.* endowed with great skill, inventive; cleverly contrived.

ingenuity (in jē nū′ i ti), *n.* cleverness in designing or contriving.

Syn. Wit. *Ingenuity* comprehends invention; *wit* is of the imagination, which forms new and sudden conceptions of things. One is *ingenious* in matters either of art or of mechanics; one is *witty* only in matters of intellect.

***ingenuous** (in jen′ ū us), *adj.* frank, open, sincere, artless, candid.

inglorious (in glō′ ri us), *adj.* obscure, humble; disgraceful, shameful.

ingot (ing′ got), *n.* a cast mass of metal.

ingrained (in grānd′), *adj.* worked into the fabric, as dye in woolen yarns; deeply rooted, as *ingrained* honesty.

ingratiate (in grā′ shi āt), *v.t.* to insinuate (oneself) into the favor of another.

ingratitude (in grat′ i tūd), *n.* absence of gratefulness; failure to appreciate kindness.

ingredient (in grē′ di ent), *n.* a component part; an element in a mixture.

***ingress** (in′ gres), *n.* entrance, the way in.

inhabit (in hab′ it), *v.t.* to live in, as a house or country.

inhalant (in hāl′ ant), *n.* something to be breathed in, as medicated vapor.

inhale (in hāl′), *v.i. and v.t.* to draw air or smoke into the lungs; to breathe in, as to *inhale* air.

***inherent** (in hēr′ ent), *adj.* existing as part of the nature of anything, inborn.

inherit (in her′ it), *v.i. and v.t.* to acquire through heirship; to come into possession of through the death of the owner or holder, as an estate or a title; to acquire the characteristics of, as an ancestor.

inheritance (in her′ i tans), *n.* that which is handed down to offspring by birth or law; that which is bequeathed to an heir.

inhibit (in hib′ it), *v.t.* to restrain; to forbid; to repress.

***inhospitable** (in hos′ pi t*a* bl), *adj.* not cordial to strangers or guests; affording no shelter.

inhuman (in hū′ man), *adj.* lacking the good qualities of mankind; cruel.

***inimical** (in im′ i kal), *adj.* hostile, adverse.

inimitable (in im′ i t*a* bl), *adj.* defying imitation; matchless.

iniquitous (in ik′ wi tus), *adj.* wicked.

iniquity (in ik′ wi ti), *n.* [*pl.* iniquities] state of wickedness; a wicked act; great injustice.

initiate (i nish′ i āt), *v.t.* to instruct in the elements of anything; to set something going, as to *initiate* a custom; to introduce into a secret society with rites, as a new member.

initiative (i nish′ i ā tiv), *n.* the ability to originate; courage and energy for new undertakings; a right of the people under certain governments to pass laws directly without the aid of the legislature.

inject (in jekt′), *v.t.* to throw or force in.

injector (in jek′ tẽr), *n.* apparatus for injecting water into a steam boiler.

injudicious (in jōō dish′ us), *adj.* imprudent, unwise.

injunction (in jungk′ shun), *n.* an order, especially from a court.

injure (in′ jẽr), *v.t.* to hurt or damage.

injurious (in joor′ i us), *adj.* hurtful; detrimental.

injury (in′ jẽr i), *n.* [*pl.* injuries] that which causes harm or damage; the damage or hurt done.

injustice (in jus′ tis), *n.* the quality of being unfair; a wrong.

Syn. Wrong. *Injustice* is the opposite of whatever is fair and just; a *wrong* is a deeper thing; a *wrong* is an actual violation of personal rights.

ink (ingk), *n.* a fluid used for writing; a paste used in printing.

ink (ingk), *v.t.* to put ink upon, mark with ink.

inkling (ingk′ ling), *n.* an intimation or hint.

inland (in′ land), *adj.* back from the coast.

***inlay** (in lā′), *v.t.* [*p.t.* and *p.p.* inlaid, *pr.p.* inlaying], to ornament the surface of an object by setting in pieces of ivory, hard wood, metal.

inlet (in′ let), *n.* a small bay or creek; an opening by which water is admitted, as to a tank.

inn (in), *n.* a tavern.

***innate** (in′ nāt), *adj.* inborn, not acquired.

inner (in′ ẽr), *adj.* internal; pertaining to the mind or spirit, as an *inner* experience.

innocent (in′ ō sent), *adj.* without guilt, sinless; inexperienced in the ways of the world.

innocuous (i nok′ ū us), *adj.* harmless.

innovation (in ō vā′ shun), *n.* a change from established custom; a new thing or method.

***innoxious** (i nok′ shus), *adj.* not injurious.

innuendo (in ū en′ dō), *n.* [*pl.* innuendos or innuendoes] an indirect expression of derogation, an insinuation.

***innumerable** (i nū′ mēr *a* bl), *adj.* without number; too great a number to be counted.

inoculate (in ok′ ū lāt), *v.t.* to inject the virus of a disease into as an immunizing measure.

inoperative (in op′ ēr ā tiv), *adj.* not working; without effect.

inordinate (in ôr′ di nit), *adj.* immoderate, excessive.

inorganic (in ôr gan′ ik), *adj.* not belonging to the animal or vegetable kingdoms, inanimate, as rocks.

inquest (in′ kwest), *n.* a judicial inquiry, especially by a coroner into the cause of a death.

inquire (in kwīr′), *v.i. and v.t.* to ask a question; to investigate, examine; to ask about.

***inquiry** (in kwī′ ri), *n.* [*pl.* inquiries] a question; investigation.

inquisitive (in kwiz′ i tiv), *adj.* given to asking questions, curious.

inroad (in′ rōd), *n.* an invasion; encroachment.

***insane** (in sān′), *adj.* mentally deranged; absolutely senseless.

insanity (in san′ i ti), *n.* derangement of mind; utter folly.

***insatiable** (in sā′ shi *a* bl), *adj.* not capable of being satisfied or appeased, as an *insatiable* appetite.

inscribe (in skrīb′), *v.t.* to write upon or engrave; as to *inscribe* a book or memorial tablet; to address to a person or group, as a poem; to draw one figure within another with certain specified contacts, as in geometry.

inscription (in skrip′ shun), *n.* that which is written; a dedication.

inscrutable (in skro͞o′ t*a* bl), *adj.* beyond understanding; incomprehensible to the human mind, as an *inscrutable* Providence.

insect (in′ sekt), *n.* one of a class of invertebrate animals, often having wings but always having bodies composed of head, thorax and abdomen, with three pairs of jointed legs.

insensate (in sen′ sāt), *adj.* lacking sensation, inanimate, as *insensate* rocks; lacking sense, foolish; without feeling, brutal.

insensibility (in sen si bil′ i ti), *n.* want of physical feeling or of emotion.

insensible (in sen′ si bl), *adj.* by nature destitute of feeling or sensation or having possessed and lost those powers; unconscious; apathetic.

inseparable (in sep′ *a* r*a* bl), *adj.* incapable of being separated; always together, as *inseparable* friends.

insert (in′ sûrt), *n.* something inserted or put in, as extra paper or an additional paragraph in a text.

***insert** (in sûrt′), *v.t.* to thrust or place in; to introduce.

insertion (in sûr′ shun), *n.* the act of inserting or being put in, as the advertisement is to have two *insertions;* that which is put in, especially trimming put in between pieces of plain material in making a dress.

inshore (in′ shōr), *adj.* located near the shore or moving toward the shore, as an *inshore* current.

inshore (in shōr′), *adv.* toward the shore, as steer a bit more *inshore.*

inside (in′ sīd′), *n.* the inner part, as the *inside* of a box.

inside (in′ sīd′), *adj.* interior, as the *inside* lining; confidential and supposedly authoritative, as *inside* information.

inside (in′ sīd′), *adv.* within, as go *inside.*

inside (in′ sīd′), *prep.* within, as *inside* the house.

***insidious** (in sid′ i us), *adj.* sly, crafty, working in secret, treacherous.

insight (in′ sīt), *n.* perception of the inner nature of things; keen understanding; mental vision, intuition.

***insignia** (in sig′ ni a), *n. pl.* distinguishing marks; symbols of office or of rank or membership in an organization, as the army.

insignificant (in sig nif′ i kant), *adj.* having little importance or meaning.

insincere (in sin sēr′), *adj.* not absolutely honest; not frank and open, hypocritical.

insinuate (in sin′ ū āt), *v.t.* to work in or penetrate by slow or artful means; to suggest indirectly or in derogation; to hint.

Syn. Ingratiate. A person who *insinuates* himself into favor does so with persistence and smooth, sly easiness; he who *ingratiates* himself works his way to favor by special, not always dignified, attentions.

insipid (in sip′ id), *adj.* flavorless, dull, as *insipid* talk, an *insipid* beverage.

insist (in sist′), *v.i.* to demand, urge persistently.

Syn. Persist. To *insist* is to take a stand and stick to it; to *persist* is to move actively for fulfilment of one's aims. We *insist* on something by constantly maintaining it; we *persist* in a thing by continuing to do it.

Ant. Desist, leave, abandon.

insistent (in sist′ ent), *adj.* urgent, compelling notice.

insolent (in′ sō lent), *adj.* haughtily contemptuous, extremely disrespectful.

insoluble (in sol′ ū bl), *adj.* not to be solved, as a problem; impossible to dissolve, as a substance.

insolvency (in sol′ ven si), *n.* bankruptcy.

Syn. Failure, bankruptcy. *Insolvency* is a state; *failure* an act flowing from that state; *bankruptcy,* the result of that act. *Insolvency* is inability to meet one's financial obligations; *failure* is a cessation of business for want of means with which to carry it on; *bankruptcy* is a legal surrender of one's remaining assets into the hands of one's creditors.

Ant. Solvency, success, prosperity.

insomnia (in som′ ni a), *n.* sleeplessness.

***insouciance** (in so͞o′ si ans), *n.* indifference, unconcern, lack of interest.

inspect (in spekt′), *v.t.* to examine critically, as for defects; to test officially.

inspiration (in spi rā′ shun), *n.* inbreathing; that which stirs the creative impulse in art; that which is created by this impulse.

inspire (in spīr′), *v.i. and v.t.* to breathe in, inhale; to imbue with ideas and ambitions; to arouse the creative impulse in art.

instability (in st*a* bil′ i ti), *n.* lacking firmness and steadiness; the state of being easily moved or upset; changeability of character or mood.

install (in stôl′), *v.t.* to induct into office, as with ceremonial exercises; to put in place, as machinery.

instalment (in stôl′ ment), *n.* one of a series of scheduled payments; one of the parts in which a serial story is published.

instance (in′ stans), *n.* an example or typical case: *for instance,* by way of example.

instant (in′ stant), *n.* a moment or even smaller unit of time.

instant (in′ stant), *adj.* now present, urgent, as the *instant* need.

instantaneous (in stan tā′ nē us), *adj.* acting or occurring in a moment or at a given moment.

instate (in stāt′), *v.t.* to put in office or in place, as to *instate* oneself in another's favor.

instead (in sted′), *adv.* in its place, as I want this *instead;* in the place of, as I will go *instead* of him.

instep (in′ step), *n.* the arched upper surface of the forward part of the human foot.

instigate (in′ sti gāt), *v.t.* to urge on, incite.

instill (in stil′), *v.t.* [*p.t.* and *p.p.* instilled, *pr.p.* instilling] to pour in by drops; to introduce, as good principles, gradually: sometimes *instil.*

***instinct** (in′ stingkt), *n.* any natural impulse that takes the place of thinking and reasoning; a sense of things apart from any process of reasoning, as the *instinct* of self-protection.

***institute** (in′ sti tūt), *n.* a maxim or principle within a defined field; a learned organization; an organization devoted to pursuit of specialized learning.

institute (in′ sti tūt), *v.t.* to establish; to originate, as a custom.

***institution** (in sti tū′ shun), *n.* the act of establishing or that which is established; a fixed custom; a society devoted to special works.

instruct (in strukt′), *v.t.* to teach; to direct.

instrument (in′ stroo ment), *n.* that by means of which something is done, a means; a device for making musical sounds; a tool or implement.

instrumentality (in stroo men tal′ i ti), *n.* [*pl.* instrumentalities] an agency or means.

insubordinate (in su bôr′ di nit), *adj.* refusing to recognize authority, mutinous.

insubstantial (in sub stan′ shal), *adj.* not material; frail and flimsy.

insufferable (in suf′ ēr *a* bl), *adj.* unendurable.

insufficient (in su fish′ ent), *adj.* not enough, deficient.

***insular** (in′ sū lēr), *adj.* pertaining to an island; dwelling on an island; isolated; narrowminded, limited.

insulate (in′ sū lāt), *v.t.* to prevent passage of electricity or heat from one body to another by covering the conductors with nonconducting material.

insulin (in′ sū lin), *n.* a substance obtained from the pancreas of cattle or sheep, used in cases of diabetes: originally a trade name.

insult (in′ sult), *n.* an affront; a remark or act offensive to the feelings or dignity of its object.

insult (in sult′), *v.t.* to treat with insolence or rudeness.

insuperable (in sū′ pēr *a* bl), *adj.* not to be overcome, insurmountable, as a difficulty.

insurance (in shoor′ ans), *n.* a system in which individuals pay premiums to build up funds from which themselves or their beneficiaries are compensated when death, loss or disability occurs.

***insure** (in shoor′), *v.i. and v.t.* to make certain, assure; to provide for indemnity against loss, as by death, fire, flood.

insurgent (in sûr′ jent), *n.* a rebel; a member of a political party who joins with other members in opposing policies adopted by the party.

insurgent (in sûr′ jent), *adj.* rebellious against constituted authority.

insurrection (in su rek′ shun), *n.* an uprising in resistance to constituted authority; rebellion.

inswept (in′ swept), *adj.* having the front end narrower than the rear, as some automobile bodies.

intact (in takt′), *adj.* unbroken, undamaged, whole after a blow or shock.

***intaglio** (in tal′ yō), *n.* [*pl.* intaglios or intagli] a gem stone with a design cut into the surface: opposite of *cameo.*

intake (in′ tāk), *n.* the place at which a pipe or channel takes in a fluid.

intangible (in tan′ ji bl), *adj.* not perceptible through touch; vague, difficult to define.

***integer** (in′ tē jēr), *n.* a whole number.

***integral** (in′ tē gral), *adj.* complete or necessary to completion.

integrate (in′ tē grāt), *v.t.* to bring parts together to make a whole.

integrity (in teg′ ri ti), *n.* uprightness, soundness of character, moral wholeness.

integument (in teg′ ū ment), *n.* an external covering or skin.

intellect (in′ te lekt), *n.* the mind, the power to reason as distinguished from the power to feel.

Syn. Intelligence, mind. *Mind* is the general term that embraces both *intelligence* and *intellect. Intelligence* is a quickness to understand; *intellect* is great mental power.

intelligence (in tel′ i jens), *n.* ability to apply the mind effectively to any situation, study or problem; clear thinking plus good judgment; news or knowledge.

intelligence test (in tel′ i jens test), a set of questions and problems designed to indicate the mental age or intellectual capacity of a person.

intelligentsia (in tel i jent′ si a), *n.* the educated classes.

intelligible (in tel' i jib l), *adj.* easily understood, clearly stated.

intemperance (in tem' pēr ans), *n.* lack of self-restraint, overindulgence.

intend (in tend'), *v.t. and v.i.* to have in mind as a purpose, to plan or purpose; to have an aim or intention; to mean to do.

intense (in tens'), *adj.* developed to high degree, as *intense* anxiety, *intense* light; ardent; strained.

intensify (in ten' si fī), *v.t.* [*p.t.* and *p.p.* intensified, *pr.p.* intensifying] to render more intense, heighten, aggravate.

intensive (in ten' siv), *adj.* giving more force to; thorough, deep, concentrated, as *intensive* study; increasing production per unit of land, as *intensive* farming.

intent (in tent'), *n.* a purpose or aim.

intent (in tent'), *adj.* giving concentrated attention.

intention (in ten' shun), *n.* purpose; meaning.

inter (in tûr'), *v.t.* to bury.

intercede (in tēr sēd), *v.i.* to mediate, plead in behalf of another.

intercept (in tēr sept'), *v.t.* to stop and seize on the way, cut off, block.

intercession (in tēr sesh' un), *n.* the act of interceding, mediation.

interchangeable (in tēr chān' j*a* bl), *adj.* capable of being substituted one for the other.

intercourse (in' tēr kōrs), *n.* communication; relations between individuals or groups.

***interdiction** (in tēr dik' shun), *n.* a ban, a decree forbidding something.

***interest** (in' ter est), *n.* concern in a thing; command of attention, as this story holds my *interest;* money paid for the use of money; money earned by capital loaned or invested.

interfere (in tēr fēr), *v.i.* to interpose or meddle in the affairs of others; to strike one foot against the opposite foot or ankle in walking or running, said especially of horses.

interference (in tēr fēr' ens), *n.* a confusion of received radio signals, or that which causes such confusion.

interim (in' tēr im), *n.* an intervening period of time, an interval, the meantime.

interior (in tēr' iēr), *n.* the inside part of anything; the inland part of a country.

interior (in tēr' iēr), *adj.* inner, internal.

interjection (in tēr jek' shun), *n.* an exclamation.

interlinear (in tēr lin' ē ēr), *adj.* written or printed between lines on a page; having matter written or printed between the lines, as an *interlinear* translation.

***interloper** (in' tēr lōp ēr), *n.* an intruder.

interlude (in' tēr lūd), *n.* a short entertainment between acts of a play in the early days of the theater; a short passage played between major sections of a musical rendition; any interval of time between events.

intermediary (in tēr mē' di er i), *n.* one who stands or acts between, a mediary.

interment (in tûr' ment), *n.* burial.

interminable (in tûr' mi n*a* bl), *adj.* endless.

intermittent (in tûr mit' ent), *adj.* coming and going, alternating; ceasing for brief periods and then recurring, as an *intermittent* fever; unsustained, as *intermittent* effort.

intern (in tûrn'), *v.t.* to force to stay in one place, as men or ships of a belligerent, discovered in neutral territory.

intern (in tûrn'), *n.* a doctor serving a period of residence and practice in a hospital.

internal (in tûr' nal), *adj.* pertaining to, from or on the inside.

internal combustion (in tûr' nal kom bus' chun), generation of power in an engine by means of explosions in the cylinders.

internal combustion engine (in tûr' nal kom bus' chun en' jin), an engine producing power through explosion of fuel in the cylinders, as gasoline.

international (in tēr nash' un al), *adj.* relating to or affecting two or more nations at once.

interpolate (in tûr' pō lāt), *v.t.* to insert, as new matter in a text; to alter or corrupt thus.

interpose (in tēr pōz'), *v.i. and v.t.* to be between; to place between.

interpret (in tûr' pret), *v.t.* to translate, explain, construe.

interregnum (in tēr reg' num), *n.* the period between two reigns or governments.

interrogation (in ter ō gā' shun), *n.* a questioning; the act of questioning.

***interrupt** (in te rupt'), *v.t. and v.i.* to break into, as a sentence; to stop a speaker by breaking in with a remark of one's own.

intersect (in tēr sekt'), *v.i. and v.t.* to cross, as two lines; to cut across, as one line *intersects* another.

intersperse (in tēr spûrs'), *v.t.* to set here and there among other things, as to *intersperse* shrubs among trees; to adorn or moderate with (something) scattered here and there, as to *intersperse* a tragedy with comic scenes.

***interstice** (in tûr' stis), *n.* a narrow space between two things, a crevice, a chink.

interurban (in tēr ûr' ban), *adj.* between cities, as an *interurban* trolley line.

interval (in' tēr val), *n.* time between events or space between objects.

intervene (in tēr vēn'), *v.i.* to come, be or happen in between; to pass, as time; to come between in order to hinder, as to *intervene* in a fight.

intervention (in tēr ven' shun), *n.* a coming between, mediation; any interference.

interview (in' tēr vū), *n.* a formal conference or meeting; a meeting with a news reporter or the published account of the conversation.

interview (in' tēr vū), *v.t.* to converse with, exchanging questions and answers, especially to acquire material for a press article.

intestate (in tes' tāt), *adj.* dying without a will; not disposed of by will, as property.

intestinal (in tes' ti nal), *adj.* pertaining to the bowels.

intestine (in tes' tin), *adj.* internal; within a country, domestic, as an *intestine* war.

intestines (in tes' tinz), *n. pl.* the bowels.

intimacy (in' ti m*a* si), *n.* [*pl.* intimacies] close friendship, familiarity.

intimate (in' ti māt), *n.* a close friend or associate.

intimate (in' ti māt), *v.t.* to make known in an indirect manner, hint, indicate.

intimate (in' ti mit), *adj.* in close association, familiar, as he is my *intimate* friend; confidential, personal, as an *intimate* communication; detailed, gained by close study, as *intimate* knowledge.

intimation (in ti mā' shun), *n.* an indirect suggestion, a hint, as he gave no *intimation* of his plans.

intimidate (in tim' i dāt), *v.t.* to make afraid, frighten.

into (in' tōō), *prep.* from without to within in space, occupation or condition, as go *into* the house, go *into* politics, change sorrow *into* rejoicing.

intolerable (in tol' ēr *a* bl), *adj.* unendurable.

intolerance (in tol' ēr ans), *n.* lack of forbearance, narrowmindedness with regard to the opinions and beliefs of others; inability to endure, as *intolerance* of noise.

intolerant (in tol' ēr ant), *adj.* bigoted; unable to endure: used with *of.*

intonation (in tō nā' shun), *n.* the act or manner of intoning or sounding musical notes, chanting; the rise and fall in the tones of the human speaking voice.

intone (in tōn'), *v.t. and v.i.* to utter in prolonged tones, chant, as in some religious observances; to recite in a monotone.

intoxicant (in tok' si kant), *n.* that which makes drunk.

intoxicant (in tok' si kant), *adj.* intoxicating.

intoxicate (in tok' si kāt), *v.t.* to make drunk, as alcoholic liquor; to overstimulate; to excite the sensations or passions.

intractable (in trak' t*a* bl), *adj.* unmanageable, hard to control.

intractile (in trak' til), *adj.* incapable of being drawn out in the form of a wire.

intransitive (in tran' si tiv), *adj.* unable to have an object, as the verbs *to live, to glow.*

intrench (in trench'), *v.i. and v.t.* to go into the trenches, as troops in war; to make trenches or furrows in; to fortify with trenches or ditches; to encroach: used with *upon.*

intrepid (in trep' id), *adj.* daring, bold, fearless.

***intricacy** (in' tri k*a* si), *n.* [*pl.* intricacies] entanglement, complication.

intricate (in' tri kit), *adj.* complicated, complex, entangled, elaborately interwoven, as an *intricate* plot.

***intrigue** (in trēg'), *n.* secret scheming, a plot.

***intrigue** (in trēg'), *v.i. and v.t.* to plot or scheme in secret; to interest greatly, puzzle, arouse the curiosity of by a baffling quality.

intrinsic (in trin' sik), *adj.* inherent; part of the nature of a person or thing, as *intrinsic* merit: opposite of *extrinsic.*

introduce (in trō dūs'), *v.t.* to bring in; to bring into acquaintance; to present in formal manner, as a resolution.

introduction (in trō duk' shun), *n.* the act of introducing or state of presenting or being presented, as the *introduction* of a bill in the legislature, an *introduction* into society; the preliminary text explaining the nature and purpose of a book.

introspection (in trō spek' shun), *n.* the act of looking within one's own mind, self-analysis.

intrude (in trōōd'), *v.i. and v.t.* to enter without invitation or without being wanted; to force upon.

Syn. Obtrude. To *intrude* is to force one's way without right, unasked or unwanted; to *obtrude* is to impose oneself or one's opinions unnecessarily, as don't *obtrude* personal matters into a general conversation.

intrusion (in trōō' zhun), *n.* the act of trespassing, invasion.

intuition (in tū ish' un), *n.* instinctive knowledge, perception of facts or conditions without reasoning; instantaneous comprehension.

intuitive (in tū' i tiv), *adj.* having instinctive comprehension, perceived without process of reasoning.

***inundate** (in' un dāt), *v.t.* to cover with water or as with water, to flood, overflow.

inure (in ūr'), *v.t.* to make accustomed to, harden, as Eskimos are *inured* to low temperatures.

invade (in vād'), *v.t.* to enter with hostile intentions, as a foreign land; to infringe upon, as the rights of another.

invalid (in' v*a* lid), *n.* a sick or disabled person.

invalid (in val' id), *adj.* null and void.

invalid (in' v*a* lid), *adj.* sickly; adapted for the sickly, as *invalid* diet.

invalidate (in val' i dāt), *v.t.* to make null and void; to deprive of force and effect.

invaluable (in val' ū *a* bl), *adj.* beyond valuation, priceless.

invariable (in vâr' i *a* bl), *adj.* unchanging, constant, uniform.

invasion (in vā' zhun), *n.* the act of entering a foreign land with hostile intention; infringement.

invective (in vek' tiv), *n.* bitter denunciation, wordy abuse.

***inveigh** (in vā'), *v.i.* to speak bitterly; to reproach: used with *against.*

***inveigle** (in vē' gl), *v.t.* to coax, persuade with flattery.

invent (in vent'), *v.t.* to devise, discover or contrive, as to *invent* a good excuse, *invent* a machine.

invention (in ven' shun), *n.* the act of inventing or the thing invented; creative imagination; a fabrication or falsehood.

inventor (in vent' ēr), *n.* one who invents, as Edison was a great *inventor.*

inventory (in' ven tō ri), *n.* [*pl.* inventories] stocktaking, an itemized list of goods and their value.

***inverse** (in vûrs'), *adj.* contrary in direction or effect.

***inversion** (in vûr' shun), *n.* reversal of position, order or relation.

invert (in vûrt'), *v.t.* to turn inside out, upside down, or so as to face the other way; to reverse in order or relation, as to *invert* a sentence or phrase.

invertebrate (in vûr' tē brāt), *n.* an animal that has no backbone.

invertebrate (in vûr' tē brāt), *adj.* having no backbone; lacking character.

fāte fat final câre färm ȧsk sof*a*; mē met novel fingēr; līne pin; gō ôrder not nōōn good; ūse but tûrn menü; thin *th*en.

invest (in vest′), *v.t.* to clothe, as with office, power or dignity; to surround, as a fort; to besiege; to put money into in expectation of profit, as an enterprise.

Syn. Endue, endow. One is *invested* with that which is external; *endued* with that which is internal. We *invest* a person with an office or a dignity; he is *endued* with good qualities. To *endow* is but a variation of to *endue*. We may say a person is either *endued* or *endowed* with a good understanding, but of the imagination we say that it *endues* things with properties.

investigate (in ves′ ti gāt), *v.t.* to examine in a systematic manner; to ascertain by careful inquiry.

investiture (in ves′ ti tūr), *n.* vestment; the act of installing in office.

investment (in vest′ ment), *n.* the act of laying out money in expectation of profit; the sum so placed.

inveterate (in vet′ ẽr it), *adj.* deep-rooted, as hatred; habitual, fixed in a habit.

***invidious** (in vid′ i us), *adj.* likely to lead to ill will, offensive; discriminating unfairly.

invigorate (in vig′ ẽr āt), *v.t.* to impart new vigor to, strengthen, enliven.

invincible (in vin′ si bl), *adj.* unconquerable.

inviolable (in vī′ ō la bl), *adj.* not to be profaned, as church premises; not to be broken, as a promise.

invisible (in viz′ ibl), *adj.* incapable of being seen; out of sight.

invisible ink (in viz′ i bl ingk), a writing fluid that cannot be seen on the paper until exposed to heat or acid influence.

invitation (in vi tā′ shun), *n.* a request to attend, do or belong; the spoken or written words in which one is invited; an enticement.

invite (in vīt′), *v.t.* to request the attendance of at a certain place and time; to tempt or attract, as his manner *invites* rebuke.

inviting (in vīt′ ing), *adj.* attractive, alluring, as an *inviting* prospect.

invoice (in′ vois), *n.* a notice that goods have been shipped with itemized statement of their nature, quality and prices.

invoke (in vōk′), *v.t.* to call upon in supplication or prayer; to call upon for aid; to call up, as evil spirits, conjure.

involuntary (in vol′ un tẹr i), *adj.* not done willingly or by choice.

involution (in vō lū′ shun), *n.* the act of folding in or around; the state of being complicated or entangled.

involve (in volv′), *v.t.* to infold, complicate, entangle; to contain or include by implication or necessity, as success *involves* work.

invulnerable (in vul′ nẽr a bl), *adj.* incapable of being wounded, having no weak point; unassailable.

inward (in′ wẽrd), *adj.* on the inside, situated within, internal; mental or spiritual, as *inward* joy; toward the inside, ingoing, as *inward* traffic.

inward (in′ wẽrd), *adv.* toward the inside; within the mind, as look *inward.*

***iodine** (ī′ ō dīn), *n.* a nonmetallic element found in mineral springs and seaweed.

***iodoform** (ī ō′ dō fôrm), *n.* a crystalline compound of iodine.

***ion** (ī′ on), *n.* an electrically charged particle that enables electricity to pass through air and solutions.

iota (ī ō′ ta), *n.* the Greek letter corresponding to English *i;* an insignificant amount.

***ipecac** (ip′ ē kak), *n.* a South American creeping plant; a tincture from its roots used in medicine.

***irascible** (ī ras′ i bl), *adj.* easily angered.

***irate** (ī′ rāt), *adj.* wrathful, angry.

ire (īr), *n.* anger, wrath.

iridescence (ir i des′ ens), *n.* a shimmering play of rainbow colors, as in a sunlit bubble.

iris (ī′ ris), *n.* [*pl.* irises] a perennial plant with large, many-colored flowers and sword-shaped leaves: also called *flag* or *fleur-de-lis;* the colored part of the eye about the pupil.

irk (ûrk), *v.t.* to trouble, annoy, vex; to weary, bore.

iron (ī′ ẽrn), *n.* the most common and useful of the metals; an instrument made of iron, especially one for smoothing or pressing cloth: *irons,* fetters.

iron (ī′ ẽrn), *v.t. and v.i.* to smooth or press cloth or clothes with a flatiron; to iron clothes.

iron (ī′ ẽrn), *adj.* made of iron, as an *iron* bar; strong, unbending, as an *iron* will.

ironclad (ī′ ẽrn klad), *adj.* protected by a covering of iron plates.

ironical (ī ron′ i kal), *adj.* meaning the opposite of what is said; having the nature of light ridicule, humor or mockery.

***irony** (ī′ rō ni), *n.* subtle sarcasm or humor implying the opposite of what is expressed.

irradiate (i rā′ di āt), *v.t.* to throw rays of light upon, to brighten; to shed or diffuse, as to *irradiate* light or joy; to treat with radiant heat or ultraviolet rays, as to *irradiate* foods.

irrational (ir rash′ un al), *adj.* without the power to reason, as an animal; lacking reason, unreasonable, as an *irrational* request.

Syn. Unreasonable. *Irrational* means contrary to reason and therefore foolish, as to have *irrational* hopes; *unreasonable* means contrary to reason and therefore impracticable and carries the idea of excessiveness, as *unreasonable* expenses.

irreclaimable (ir rē klām′ a bl), *adj.* incapable of being recovered or restored.

***irrefutable** (ir ref′ ū ta bl), *adj.* incapable of being refuted or proved incorrect.

irregular (ir reg′ ū lar), *adj.* not straight or even, not uniform in shape or order; not conforming to established law, method or usage; not following the normal rules of grammatical inflection or conjugation, as an *irregular* verb.

***irreparable** (i rep′ a ra bl), *adj.* damaged beyond possibility of repair.

irresistible (ir rē zis′ ti bl), *adj.* not to be successfully withstood.

irresolute (i rez′ ō lūt), *adj.* lacking determination, wavering.

irrespective (ir rē spek′ tiv), *adj.* regardless, independent, as *irrespective* of rank or station.

irresponsible (ir rē spon′ si bl), *adj.* not to be trusted; not answerable for consequences; insolvent.

irrevocable (i rev′ ō ka bl), *adj.* not capable of being recalled or undone, as *irrevocable* words, an *irrevocable* mistake.

irrigate (ir′ i gāt), *v.t.* to supply with water or liquid by artificial means, as land or a wound.

irritable (ir′ i ta bl), *adj.* easily provoked or exasperated, impatient.

irritate (ir′ i tāt), *v.t.* to provoke, annoy, cause impatience or anger.

irritation (ir i tā′ shun), *n.* the state of being annoyed or impatient, exasperation; an oversensitive condition of an organ or part of the body.

irruption (i rup′ shun), *n.* a bursting in, as of a flood of water or throng of persons.

isinglass (ī zing glȧs), *n.* a semitransparent form of gelatin prepared from the air bladder of the sturgeon, cod; mica in thin sheets.

island (ī′ land), *n.* a body of land surrounded by water; anything detached from a main body or resembling an island in its isolation.

isle (īl), *n.* a small island: used in poetry.

***isolate** (ī′ sō lāt), *v.t.* to place alone, to set apart from others.

isolation (ī sō lā′ shun), *n.* the state of being set apart from others; seclusion.

***isosceles** (ī sos′ e lēz), *adj.* having two equal sides, as an *isosceles* triangle.

issue (ish′ ū), *n.* that which flows or passes out; offspring; an edition of a publication; a point of contention.

***issue** (ish ū), *v.i. and v.t.* to come or flow forth; to send forth; to put out of circulation, as a newspaper or money.

***isthmian** (is′ mi an), *adj.* relating to an isthmus.

***isthmus** (is′ mus), *n.* a narrow neck of land connecting two larger bodies of land.

itch (ich), *n.* a feeling of irritation in the skin; a constant desire, as an *itch* for adventure.

itch (ich), *v.i.* to be afflicted with an irritated condition of the skin; to have a constant desire for something, as he simply *itches* for excitement.

item (ī′ tem), *n.* a separate unit in a list; a particular article in a newspaper, as a short note; a sum entered in an account.

iteration (it ẽr ā′ shun), *n.* repetition.

itinerant (ī tin′ ẽr ant), *adj.* wandering.

itinerary (ī tin′ ẽr er i), *n.* the route of a journey.

ivory (ī′ vō ri), *n.* the hard, white substance of the tusks of an elephant or walrus.

ivory (ī′ vō ri), *adj.* made of, resembling or the color of ivory.

ivy (ī′ vi), *n.* a climbing or creeping woody vine with shiny, ornamental leaves.

J

jab (jab), *v.i. and v.t.* [*p.t.* and *p.p.* jabbed, *pr.p.* jabbing] to make a sudden thrust with something sharp; to poke; to stab an object with a thrusting motion or with something sharp.

jabber (jab′ ẽr), *n.* talk that is incoherent or unintelligible.

jabber (jab′ ẽr), *v.i.* to talk fast and indistinctly, chatter.

jack (jak), *n.* the male of some animals, as the rabbit or the ass; the knave of any suit in a pack of playing cards; any of various kinds of levers, lifts or similar mechanical devices; a man of the common people; often written *Jack.*

jack (jak), *v.t.* to raise with a jack, as to *jack* up a rear wheel.

***jackal** (jak′ ôl), *n.* a wild carnivorous animal of the dog family that hunts at night and in packs.

jackass (jak′ ȧs), *n.* the male ass; a blockhead.

jackdaw (jak′ dô), *n.* a European bird of the crow family.

jacket (jak′ et), *n.* a short, tailless coat.

jade (jād), *n.* an old, worn-out horse; a saucy young woman; a hard semiprecious stone used for ornament and in jewelry.

jagged (jag′ ed), *adj.* having irregular, notched or sharp edges.

***jaguar** (jag′ wär), *n.* a large wildcat marked like the leopard, found in the southwestern U. S. and in South America.

jail (jāl), *n.* a prison, especially one for those guilty of lesser offenses and sentenced to comparatively short terms.

jam (jam), *n.* a dense crowding of persons or things; a conserve of fruit boiled with sugar.

jam (jam), *v.i. and v.t.* to become squeezed or crushed together; to stick or become unworkable by wedging; to crowd together or stick in tightly, as to *jam* clothing in a trunk; to block, as to *jam* traffic.

jamb (jam), *n.* an upright piece forming the side of an opening, as of a door.

jangle (jang′ gl), *n.* a sound like that of untuned bells ringing together; a noisy quarrel.

jangle (jang′ gl), *v.i. and v.t.* to make discordant sounds; to cause something to make such sounds; to wrangle.

janitor (jan′ i tẽr), *n.* one who serves as caretaker of a building.

japan (ja pan′), *n.* a hard glossy varnish, Japanese lacquer; articles finished with this kind of varnish.

japan (ja pan′), *v.t.* [*p.t.* and *p.p.* japanned, *pr.p.* japanning] to cover with hard, brilliant varnish or lacquer.

japonica (ja pon′ i ka), *n.* the camellia; the Japanese quince.

jar (jär), *n.* an approximately barrel-shaped, broad-mouthed vessel of earthenware or glass; as much as a jar will hold, as to cook a *jar* of cherries.

jar (jär), *n.* a sudden shaking or jolt; a mental shock; a clash of opinions; a discordant sound.

jar (jär), *v.i. and v.t.* to shake with vibration; to clash, produce a harsh sound, as it *jars* on my ears; to cause to shake, to jolt, as the shock *jarred* the house.

***jardiniere** (jär di nēr′), *n.* an ornamental stand or pot for flowers or plants; a large, fancy flower pot.

jargon (jär′ gon), *n.* confused, unintelligible talk; the special speech or vocabulary of a group or class, as of technicians, artists, thieves.

***jasmine** (jas′ min), *n.* a shrub of the olive family with fragrant flowers; perfume made from jasmine flowers.

jasper (jas′ pēr), *n.* a variety of quartz stained red, brown, green or yellow, polished and used for ornament.

***jaundice** (jôn′ dis), *n.* a disease marked by yellow coloring of the eyeballs and skin, caused by the blood taking up bile.

jaunt (jônt), *n.* a short walk or ride for pleasure.

***jaunt** (jônt), *v.i.* to go for a walk, ride or short excursion.

***jaunty** (jôn′ ti), *adj.* gay; sprightly and nonchalant; dashingly gallant.

javelin (jav′ lin), *n.* a light spear to be thrown by hand.

jaw (jô), *n.* the upper or lower part of the bony framework of the mouth in which the teeth are set; anything that resembles a jaw, as a mechanical contrivance for gripping.

jay (jā), *n.* a bird related to the crow, especially the blue *jay.*

jaywalker (jā′ wôk ēr), *n.* one who crosses streets carelessly or at the wrong places.

jazz (jaz), *n.* a type of American music of Negro origin, developed from ragtime and characterized by subtle syncopations and eccentric contrasts in orchestration, used especially for dance music.

jealous (jel′ us), *adj.* characterized by anxiety, envy, distrust; fearing faithlessness in love; suspicious.

jealousy (jel′ us i), *n.* envy; suspicion; the demand for exclusive affection or attention.

***jean** (jēn), *n.* a twilled cotton cloth: *jeans,* clothes made of this cloth, especially overalls.

jeer (jēr), *n.* a sneer, taunting mockery.

jeer (jēr), *v.i. and v.t.* to sneer, scoff, ridicule.

jelly (jel′ i), *n.* [*pl.* jellies] a semitransparent, semisolid substance obtained by the prolonged boiling of fruit juices or meats; a food preparation of such nature.

jelly (jel′ i), *v.i. and v.t.* to become jelly; to make into jelly.

jenny (jen′ i), *n.* a machine used in spinning; the female of certain animals, as the ass; an airplane used for training fliers for military service.

***jeopardize** (jep′ ēr dīz), *v.t.* to expose to hazard or risk.

jeopardy (jep′ ēr di), *n.* a state of risk or hazard, peril.

jerk (jûrk), *n.* a sudden pull or twist, spasmodic movement.

jerk (jûrk), *v.i. and v.t.* to move as in a spasm; to push, pull or twist suddenly and sharply.

jerkin (jûr′ kin), *n.* a short, tight jacket, often of leather, worn by men in the 16th and 17th centuries.

jersey (jûr′ zi), *n.* a knitted fabric, as of wool; a shirtlike garment made of it.

jest (jest), *n.* a joke, a quip.

jest (jest), *v.i.* to make jokes; to make fun of, make light of.

jet (jet), *n.* a sudden gush of liquid or gas through a narrow opening; a spout for emission of a stream of liquid or gas, as a gas *jet.*

jet (jet), *n.* a velvety-black form of anthracite coal, polished and used in making ornaments, as buttons.

jet (jet), *v.i. and v.t.* to shoot forth in a sudden stream, as a liquid or gas; to cause to spurt or shoot out, as to *jet* steam.

jet (jet), *adj.* made of, or having the color and appearance of jet.

jetsam (jet′ sam), *n.* pieces of cargo thrown overboard to lighten a vessel in distress; such goods washed ashore.

jettison (jet′ i sun), *v.t.* to throw overboard or abandon goods in time of peril.

jetty (jet′ i), *n.* [*pl.* jetties] a wall run out from shore into the water to furnish protection against the wash of the waves, as in a harbor.

***jewel** (jōō′ el), *n.* a valuable ornament, a cut and mounted precious stone; a valuable piece of hard substance used to make a bearing in a watch.

jeweler (jōō′ el ēr), *n.* one who makes or sells jewels.

***jewelry** (jōō′ el ri), *n.* jewels collectively; personal ornaments, especially those set with jewels, as bracelets, necklaces, pins.

jib (jib), *n.* a triangular sail rigged from the head of the foremast to the jib boom; the arm of a crane from which the load is suspended.

jib (jib), *v.i.* to move sideways or backward, shift or swing around.

jibe (jīb), *v.i. and v.t.* to shift from one side of a vessel to the other, as a sail *jibes;* to change a vessel's course so that such a shift occurs; to tack.

jiffy (jif′ i), *n.* a moment.

jig (jig), *n.* a quick, lively dance or the music for it; a mechanical device for jolting up and down.

jig (jig), *v.i. and v.t.* to dance a jig; to use a jig.

jilt (jilt), *n.* a person who discards a suitor previously accepted.

jilt (jilt), *v.t.* to discard a lover.

jimmy (jim′ i), *n.* a short crowbar used by burglars.

jingle (jin′gl), *n.* a sharp tinkling metallic sound as the *jingle* of sleighbells; a short verse with a simple, repeated rhyme.

jingle (jing′ gl), *v.i. and v.t.* to make or cause to make a sharp, tinkling, metallic sound, as the bells *jingled,* he *jingled* the coins in his pocket.

jingo (jing′ gō), *n.* one who talks war, boasts of his country's prowess in war or advocates warlike policies.

***jinrikisha** (jin rik′ shä), *n.* a small, Japanese two-wheeled passenger vehicle drawn by a man.

job (job), *n.* a piece of work; regular employment, as to have a good *job;* any scheme for private gain.

job (job), *v.t.* to buy and sell odd lots of goods.

job (job), *adj.* done by the piece, as *job* work; bought, sold or considered as a total, as a *job* lot.

jobbery (job′ ēr i), *n.* the act of scheming or trading for one's own gain at public expense, graft.

jockey (jok′ i), *n.* one who makes a profession of riding horses in races.

jockey (jok′ i), *v.i. and v.t.* to cheat; to deceive; to play for position in a contest or for advantage in a business deal.

jocose (jō kōs′), *adj.* given to joking, jolly, humorous.

jocular (jok′ ū lēr), *adj.* making jokes or done as a joke.

jocularity (jok ū lar′ i ti), *n.* merriment.

***jocund** (jok′ und), *adj.* jolly, gay, playful.

***jodhpurs** (jōd′ poorz), *n.* riding breeches that fit tightly from knee to ankle.

jog (jog), *n.* a slight shake or push; a slow trot; a slight turning aside, as a *jog* in a road.

jog (jog), *v.t. and v.i.* to push or shake slightly; to trot slowly; to make a slight turn, as the road *jogs* left.

join (join), *v.i. and v.t.* to come together; to bring together, to unite; to become a member, as to *join* a club; to engage in, as *join* battle.

joint (joint), *n.* a uniting place, a junction; the hinge where two bones of an animal body meet, as knee, hip or elbow; one of the large pieces into which a carcass is cut, as a *joint* of beef.

joint (joint), *adj.* united; shared; held in common, as *joint* stock, *joint* effort.

jointure (join′ tūr), *n.* a settlement by which a wife agrees to accept a specified inheritance on her husband's death instead of a life interest or dower right in his entire estate.

***joist** (joist), *n.* a floor timber or beam, running parallel from wall to wall.

joke (jōk), *n.* something that is said or done to excite laughter, a jest, a witticism.

joke (jōk), *v.i.* to jest, make merry.

jollification (jol i fi kā′ shun), *n.* merrymaking.

jollity (jol′ i ti), *n.* the state of being merry or jolly, gaiety.

jolly (jol′ i), *adj.* lively, merry, gay.

jolt (jōlt), *n.* a sudden jerk or shock; a knock or a blow.

jolt (jōlt), *v.i. and v.t.* to bump, as the wagon *jolted* along; to push or jar, as the blow *jolted* him.

***jonquil** (jong′ kwil), *n.* a bulb-rooted plant with fragrant white or yellow flowers.

joss (jos), *n.* a Chinese household idol.

***jostle** (jos′ l), *v.t.* to push against; to push with the elbow.

jot (jot), *n.* a small particle, as not a *jot* or tittle.

jot (jot), *v.t.* to note in writing, make a memorandum of, as to *jot* it down in a notebook.

jounce (jouns), *v.t. and v.i.* to jolt, shake up and down, especially by rough riding.

journal (jûr′ nal), *n.* a daily record of events, as a newspaper, diary, or legislative minutes; a commercial entry book for daily business transactions.

journal (jûr′ nal), *n.* the part of a mechanical rotating shaft or spindle that turns on a bearing.

journal box (jûr′ nal boks), a box or bearing for a journal.

journalism (jûr′ nal izm), *n.* the occupation of editing and writing for newspapers and magazines.

journalist (jûr′ nal ist), *n.* one who writes for or edits a newspaper.

journey (jûr′ ni), *n.* travel from one place to another, a trip.

journey (jûr′ ni), *v.i.* to travel.

***joust** (just) *n.* a combat between two mounted knights with lances in medieval times.

***jovial** (jō′ vi al), *adj.* convivial, merry.

joy (joi), *n.* gladness, happiness, rejoicing, bliss.

Syn. Pleasure, delight, gladness. *Pleasure* is the general term for any emotion aroused by gratification; *delight* is keen pleasure; *gladness* is happiness, especially as apparent in facial expression or bearing; *joy* is a deep and spiritual experience.

Ant. Sorrow, grief, pain, displeasure.

joyful (joi′ fool), *adj.* full of happiness, causing happiness, as *joyful* tidings.

joyous (joi′ us), *adj.* causing happiness; blithe, gay, lighthearted, as a *joyous* child.

jubilation (joo bi lā′ shun), *n.* a shouting for joy; declaration of triumph.

jubilee (jōō′ bi lē), *n.* the 50th (or 25th) anniversary of any event; any occasion of joyousness.

judge (juj), *n.* the presiding officer of a court; a person presiding over a competition such as a debate and deciding which side wins; one competent to draw critical conclusions on the merit of an artistic production, as a *judge* of music; an arbitrator.

judge (juj), *v.i. and v.t.* to consider a case and pass sentence; to form an opinion about, as to *judge* a point at issue; to make a critical estimate of, as to *judge* a work of art.

judgment (juj′ ment), *n.* the pronouncing of a formal opinion or decision; the decision made; ability to make right decisions, as he has good *judgment.*

Syn. Discretion, prudence. *Judgment* is conclusive; it decides by positive inference, it enables a person to discover the truth. *Discretion* is intuitive; it discerns or perceives what is in all probability right. *Prudence* guards against the chance of evil.

Ant. Heedlessness, recklessness.

judicial (jōō dish′ al), *adj.* pertaining to judges, courts or decisions or to the administration of justice.

***judiciary** (jōō dish′ i eri), *n.* judges collectively.

judicious (jōō dish′ us), *adj.* prudent, based on good judgment, wise.

jug (jug), *n.* an earthenware vessel with narrow neck and a handle.

juggle (jug′ l), *v.i. and v.t.* to do sleight-of-hand tricks; to perform tricks with, as to *juggle* Indian clubs.

***jugular** (jug′ ū lẽr), *n.* any of certain veins on the side of the neck, especially one of the two large veins that returns blood from the head.

***jugular** (jug′ ū lẽr), *adj.* relating to the throat or neck, as the *jugular* vein.

juice (jo͞os), *n.* the fluid part of plant or animal tissues, as apple *juice*, meat *juices*.

juicy (jo͞os′ i), *adj.* full of juice, succulent.

jumble (jum′ bl), *n.* disorder; a disordered collection of things; a kind of cookie.

jumble (jum′ bl), *v.t.* to assemble or mix in a disordered collection.

jump (jump), *n.* a leap; the space or thing leaped over, as a *jump* of 10 feet.

jump (jump), *v.i. and v.t.* to leap; to spring up suddenly; to leap over, as to *jump* a fence; to cause to leap, as to *jump* a horse over a hurdle.

jump spark (jump spärk), ignition by an electric spark traversing an arc between separated poles, contrasted with a *make-and-break spark*.

junction (jungk′ shun), *n.* the act of joining; the state of being joined; the meeting place of two lines of any kind, as a railroad *junction*, the *junction* of two rivers.

juncture (jungk′ tūr), *n.* the point or line formed by two bodies being joined together; an occasion formed by a grouping of circumstances, as at this *juncture*.

jungle (jung′ gl), *n.* a dense tropical forest.

junior (jo͞on′ yẽr), *adj.* younger in age or service or of lower standing, as a *junior* partner; a student in high school or college in the third year of the course, one year below the senior class.

juniper (jo͞o′ ni pẽr), *n.* a tree or shrub of the pine family with aromatic blue fruits resembling berries and having a pungent flavor.

junk (jungk), *n.* discarded articles of all kinds, waste.

junk (jungk̅), *n.* a high-sterned Chinese sailing vessel.

junk (jungk), *v.t.* to discard, scrap.

junket (jung′ ket), *n.* a dish made of sweetened milk jellied by the action of rennet; a feast or outing, especially at public expense.

junta (jun′ ta or Spanish ho͞on′ tä), *n.* a legislative assembly or council in Latin countries.

junto (jun′ tō), *n.* [*pl.* juntos] a secret council of state, faction, cabal.

juridical (joo rid′ i kal), *adj.* pertaining to law and the administration of justice.

jurisdiction (joor is dik′ shun), *n.* legal power or authority; extent of authority and power.

***jurisprudence** (joor is proo′ dens), *n.* the science of law; the system of laws of a country.

jurist (joor′ ist), *n.* one who is skilled in the science of law.

***juror** (joor′ ẽr), *n.* one who serves on a jury.

***jury** (joor′ i), *n.* a group of persons, usually 12, sworn to listen to the evidence at a trial and pronounce a true verdict; a group of persons selected to award prizes, as in an art competition.

just (just), *adj.* conformable to law, human and Divine; impartial, fair, honest in dealing with others.

just (just), *adv.* exactly, as placed *just* to the left; only, as *just* lately; very recently, as I have *just* heard the news; barely, as it *just* missed the mark.

justice (jus′ tis), *n.* the quality of being just; the principle or practice of dealing justly with others, fairness; administration of law, as a court of *justice;* a judge or magistrate.

***justifiable** (jus′ ti fī a bl), *adj.* excusable, demonstrably right, defensible.

justification (jus ti fi kā′ shun), *n.* the act of justifying; that which justifies, vindication.

justify (jus ti fī), *v.t.* to prove just or right; to prove or pronounce blameless; to space type so that lines end evenly.

jut (jut) *v.i.* to project beyond a main body, as the cape *juts* to the east.

jute (jo͞ot), *n.* the fiber of an East Indian plant used in making ropes, twine or burlap.

***juvenile** (jo͞o′ ve nil), *adj.* young; suitable for children, as *juvenile* books.

juvenile court (jo͞o′ ve nil kōrt), a court that deals with cases of juvenile delinquency, giving private hearings, with personal guidance by the judge.

juxtaposition (juks t*a* pō zish′ un), *n.* the act of placing side by side or state of being so placed.

K

kale (kāl), *n.* a kind of cabbage with open, curled leaves: also spelled *kail.*

***kaleidoscope** (k*a* lī′ dō skōp), *n.* a cylinder containing loose pieces of colored glass, and mirrors that show the pieces in ever-changing patterns as the cylinder is turned in the hand.

kangaroo (kang ga ro͞o′), *n.* an Australian leaping animal with short forelegs, long, powerful hind legs, a muscular tail and (in the female) a pouch for carrying the young.

***kaolin** (kā′ ō lin), *n.* a pure white clay used in making porcelain.

kapok (kā′ pok), *n.* silky fibers from the seed pods of a tropical tree, used in stuffing mattresses and in making certain fabrics.

karakul (kar′ a kul), *n.* a sheep of Asia; the curly black coat of the new lambs of this breed, used as fur.

karat (kar′ at), *n.* a unit of weight for precious stones; one twenty-fourth, used in measuring the fineness of gold: also spelled *carat*.

***kayak** (kī′ ak), *n.* an Eskimo canoe made of sealskin stretched over a frame and decked over.

***keel** (kēl), *n.* the lengthwise foundational timber or metal structure of a ship, extending from stem to stern at the bottom of the hull; the corresponding part of an airplane body serving to maintain balance.

keel (kēl), *v.i. and v.t.* to turn bottom up, as to *keel* over; to furnish with a keel; to turn up the bottom of, as to *keel* up a boat.

keelhaul (kēl′ hôl), *v.t.* to drag under water from one side of a ship to the other, a former punishment for violations of discipline in the British navy; to reprimand sharply.

keen (kēn), *n.* a wailing lamentation for the dead.

keen (kēn), *v.i. and v.t.* to lament for the dead with wailing.

keen (kēn), *adj.* sharp, cutting, acute, as a *keen* edge on a knife, a *keen* or cutting wind, *keen* criticism.

keep (kēp), *v.i. and v.t.* to continue, as to *keep* happy, *keep* going, the fruit *keeps* well; to maintain, as to *keep* a horse; to preside over, as to *keep* house, *keep* a store; to observe or honor, as to *keep* the Sabbath, *keep* a promise; to detain, as to *keep* a pupil after school.

Syn. Preserve, save. The idea of having in one's possession is common to all these terms. The elementary meaning of *keep* is to retain in one's possession. To *preserve* is to *keep* with care, and free of all injury. To *save* something is to *keep* it laid up in a safe place.

Ant. Relinquish.

keepsake (kēp′ sāk). *n.* something kept as a souvenir of the giver.

keg (keg), *n.* a small, heavy barrel of 10 gallons or less.

kelp (kelp), *n.* a large coarse brown seaweed; ashes of seaweed from which iodine is obtained.

ken (ken), *n.* knowledge, comprehension, as beyond my *ken.*

kennel (ken′ el), *n.* a house for a dog: *kennels,* a place where dogs are raised or kept.

kennel (ken′ el), *v.i. and v.t.* to live in a kennel; to keep in a kennel.

kerchief (kûr′ chif), *n.* a piece of cloth, usually square, worn as a head covering, around the neck or for ornament; a handkerchief.

kernel (kûr′ nel), *n.* a grain or seed; the inner part of a nut or fruit pit; a whole grain of wheat or corn; the essence or core, as of a plan or an argument.

kerosene (ker′ ō sēn), *n.* refined petroleum, also distilled from bituminous shale and called *coal oil.*

kersey (kûr′ zi), *n.* [*pl.* kerseys] a coarse woolen cloth of light weight, either smooth or ribbed.

ketchup (kech′ up), *n.* a table sauce made of tomatoes and other ingredients; catsup or catchup.

kettle (ket′ l), *n.* a metal vessel in which liquids are boiled, especially a tea*kettle.*

key (kē), *n.* a metal instrument used to operate a lock; a lever producing the desired action in an instrument, as a piano *key,* a typewriter *key;* the clue to the solution of a problem or riddle, or the deciphering of a code; a device for opening and closing an electric circuit, as a telegraph *key;* a pitch or tone of voice; a system of musical tones based upon a certain note, the *key*note.

key (kē), *n.* a low island or reef.

key (kē), *v.i. and v.t.* to lock with a key; to regulate the pitch and tone of, as in music.

keynote (kē′ nōt), *n.* the first or tonic note of a scale; a fundamental idea, as the *keynote* of a speech.

keystone (kē′ stōn), *n.* the topmost stone in an arch, wedge-shaped and holding the entire structure solidly in place.

***khaki** (kä′ ki), *n.* olive drab or brown cloth used in making uniforms.

***khan** (kän), *n.* a prince, lord or governor in Persia, Afghanistan and other Asiatic countries.

khan (kän), *n.* a roadside inn of the Far East.

***khedive** (ke dēv′), *n.* title of the Turkish viceroy of Egypt from 1867 to 1914.

kick (kik), *n.* a blow with the foot; recoil, as of a gun.

kick (kik), *v.i. and v.t.* to strike out with the foot; to strike something with the foot; to recoil, as a gun.

kid (kid), *n.* the young of the goat; the flesh, fur or skin of a kid.

kidnap (kid′ nap), *v.t.* to carry away, as a person, against his will and hold for ransom; to abduct.

kidney (kid′ nĕ), *n.* [pl. kidneys] one of two oblong, flattened organs that separate waste from the blood, passing it off as urine; anything shaped like a kidney, as a *kidney bean;* temperament or constitution, sort or kind, as one of that *kidney.*

kill (kil), *v.t.* to deprive of life; to weaken or destroy, as to *kill* the flavor of; in printing and editing, to order withheld from publication.

***kiln** (kil), *n.* an oven in which things are dried or hardened, as a brick*kiln.*

kilocycle (kil′ ō sī kl), *n.* a unit, 1,000 cycles per second, used in measuring the frequency of an alternating current.

kilogram (kil′ ō gram), *n.* a unit of weight and mass in the metric system equal to 1,000 grams or 2.2046 pounds avoirdupois.

kilometer (kil′ ō mē tẽr), *n.* a unit of distance in the metric system equal to 1,000 meters or 3,280.8 feet, about 5/8 of a mile.

kilowatt (kil′ ō wot), *n.* a unit of electrical power equal to 1,000 watts.

kilowatt hour (kil′ ō wot our), a unit of electric energy equal to that of a one-kilowatt working for one hour.

kilt (kilt), *n.* a knee-length, plaited skirt of tartan cloth worn by men in the Scottish Highlands.

***kimono** (ki mō′ nō), *n.* a dressing gown made like the loose outer robe worn by the Japanese.

kin (kin), *n.* a group of persons of the same stock or family; relatives collectively.

kind (kīnd), *n.* a natural group, class or division; sort, as this *kind* of candy; nature, character, quality.

kind (kīnd), *adj.* benevolent, indulgent, sympathetic and considerate.

***kindergarten** (kin′ dẽr gär tn), *n.* a school for very young children in which they are taught by means of simple and entertaining songs, toys and games.

kindle (kin′ dl), *v.i. and v.t.* to catch fire; to set fire to; to inflame.

kindling (kin′ dling), *n.* any easily lighted material used to start a fire.

kindly (kīnd′ li), *adj.* humane, benevolent, kind.

kindly (kīnd′ li), *adv.* in a kind manner, graciously.

kindness (kīnd′ nes), *n.* the quality of being benevolent and well-disposed; a kind act.

kindred (kin′ dred), *n.* relationship, kinship; persons related by birth or marriage, relations.

kindred (kin′ dred), *adj.* related; alike in nature or character.

***kinematics** (kin ē mat′ iks), *n.* the science of pure motion.

***kinetic** (ki net′ ik), *adj.* pertaining to motion; imparting motion.

kinetics (ki net′ iks), *n.* the science that treats of the action of forces in producing changes of motion.

***kinetoscope** (ki-net′ ō skōp), *n.* a machine by means of which a series of single pictures of a changing scene travels across a magnifying glass and is seen like a moving picture.

king (king), *n.* a male sovereign; a card in each suit of a pack of playing-cards carrying a picture of a king; a piece in checkers that can be moved in any direction; the principal piece in chess.

kingdom (king′ dum), *n.* a land ruled by a king; one of the three great divisions of existence, as the animal, vegetable and mineral *kingdoms.*

kingfisher (king′ fish ẽr), *n.* a fish-catching bird with bright blue, slate-blue and white plumage.

kingly (king′ li), *adj.* befitting or like a king, royal, noble, regal.

kink (kingk), *n.* a twist, curl or loop in a rope or string; an odd whim.

kink (kingk), *v.i. and v.t.* to form twists or loops, as this thread *kinks;* to form into twists or curls, as to *kink* the hair.

kinsfolk (kinz′ fōk), *n.* relatives.

kipper (kip′ ẽr), *n.* a salmon or herring, cleaned, salted and smoked.

kiss (kis), *n.* a caress with the lips.

kiss (kis), *v.i. and v.t.* to caress with the lips.

kit (kit), *n.* an outfit of equipment, as a tool *kit.*

***kitchen** (kich′ en), *n.* a room set apart for cooking.

kitchenette (kich e net′), *n.* a small kitchen; an alcove in apartments used as both kitchen and pantry.

kite (kīt), *n.* a bird of prey of the hawk family; a light frame of wood covered with paper or cloth, to be flown in the air.

kith (kith), *n.* friends and acquaintances.

kitten (kit′ n), *n.* a young cat.

kleptomania (klep tō mā′ ni *a*), *n.* a form of neurotic weakness marked by irresistible desire to steal.

kleptomaniac (klep tō mā′ ni ak), *n.* a person afflicted with kleptomania.

klieg light (klēg līt), a brilliant arc light used in motion picture photography.

knack (nak), *n.* adroitness, dexterity, a special gift for doing something, as he has the *knack* of making people feel at ease.

knapsack (nap′ sak), *n.* a case to hold personal articles and carried on the back, as by soldiers.

knave (nāv), *n.* a dishonest person, a rascal; a card in each suit of a pack of playing cards with the picture of a servant on it, a jack.

knavery (nāv′ ẽr i), *n.* [*pl.* knaveries] dishonesty; action befitting a knave.

knead (nēd), *v.t.* to mix by working with the hands, as dough; to massage; to mold into shape with the hands, as clay.

knee (nē), *n.* the joint uniting the leg and thigh bones; anything resembling a knee, as a bent piece of timber used in boatbuilding.

kneecap (nē′ kap), *n.* the flat, oval, movable bone at the front of the knee, the patella; a protective covering worn over the knee.

kneel (nēl), *v.i.* [*p.t.* and *p.p.* knelt or kneeled, *pr.p.* kneeling] to bend the leg and stoop forward so as to rest the weight of the body on a knee or the knees.

kneepan (nē′ pan), *n.* the patella.

knell (nel), *n.* the sound of a bell, especially when tolled for a funeral; anything that indicates death or failure.

knickerbockers (nik′ ẽr bok ẽrz), *n. pl.* wide breeches gathered at or below the knee.

knickknack (nik′ nak), *n.* an ornamental trifle.

knife (nīf), *n.* [*pl.* knives] a sharp-edged steel blade set in a handle; a cutting instrument with several blades that hinge into a case used as a handle.

knife (nīf), *v.t.* to stab or cut with a knife.

knight (nīt), *n.* one who holds non-hereditary rank next below a baronet in Great Britain; a member of any of certain orders or societies, as the *Knights* of Columbus; a certain chess piece.

knight-errant (nīt er′ ant), *n.* a knight of the Middle Ages who fared forth in quest of adventure to test his skill and courage in combat.

knit (nit), *v.i. and v.t.* to weave yarn into a fabric with needles; to make something by knitting; to draw together and unite closely.

knob (nob), *n.* a rounded handle, as of a door or a cane; a round protuberance; a hill or mountain.

knock (nok), *n.* a stroke with something hard and heavy; a rap with the knuckles, as on a door; a sound in machinery caused by a defect.

knock (nok), *v.i. and v.t.* to strike a blow with something hard; to rap on a door; to give a blow to; to make a pounding noise, as an engine.

knockout (nok′ out), *n.* a mechanical device used to throw out finished work; a blow that produces unconsciousness.

knoll (nōl), *n.* a rounded small hill.

knot (not), *n.* an arrangement of cords or ropes in such a way that they will hold together, or hold something without slipping or loosening; an entanglement or difficulty; a tough spot in a board caused by hard fibers that grew around the joining of a branch with the trunk; a unit of measure of a ship's speed, equal to a nautical mile (6080.20 ft.), as to make 8 *knots* per hour.

knot (not), *v.i. and v.t.* to make a knot or knots; to tie in a knot; to fasten with knots.

knothole (not′ hōl), *n.* a hole in a tree or in lumber caused by the falling out of a knot.

knotty (not′ i), *adj.* [*comp.* knottier, *superl.* knottiest] full of knots; tangled; difficult, as a *knotty* problem.

know (nō), *v.i. and v.t.* [*p.t.* knew, *p.p.* know, *pr.p.* knowing] to have knowledge; to be certain of; to recognize; to have acquaintance or experience with, as to *know* a thing is so, to *know* Latin, to *know* how to do something, to *know* the way home, to *know* someone, to *know* sorrow.

knowledge (nol′ ej), *n.* clear perception of a truth, fact or subject; that which is known; information gained and preserved; learning.

Syn. Wisdom, science, information. *Wisdom* is the understanding and insight that come from experience; *science* is precise and classified knowledge; *information* is knowledge gained from books or instruction.

Ant. Ignorance.

knuckle (nuk′ l), *n.* the projecting joint at the base of a finger; the knee joint of a calf or pig.

knurl (nûrl), *n.* a hard twisted knot or protuberance, as on a tree; one of the ridges on the edge of a coin, a nut or a screwhead.

knurl (nûrl), *v.t.* to bead, ridge or mill, as the edges of a coin.

knurly (nûr′ li), *adj.* [*comp.* knurlier, *superl.* knurliest] knarly.

***kumquat** (kum′ kwot), *n.* a small citrus fruit of China, used in making preserves.

L

label (lā′ bel), *n.* a small piece of paper, cloth or metal attached to anything to show ownership, contents, destination and the like; a catch phrase or descriptive word.

label (lā′ bel), *v.t.* [*p.t.* and *p.p.* labeled or labelled, *pr.p.* labeling or labelling] to attach a label to; to classify, as if with a label.

***labial** (lā′ bi al), *n.* a sound formed by the lips; a letter representing such a sound, as *p, b, m, f, v.*

labial (lā′ bi al), *adj.* pertaining to the lips; formed by the lips, as a *labial* sound.

labor (lā′ bẽr), *n.* work, toil; exertion or effort, either physical or mental; those who work for wages, especially in industrial establishments, or engineering works or in the trades; childbirth.

labor (lā′ bẽr), *v.i. and v.t.* to toil; to struggle; to have heavy going of it, advance with difficulty, as a wagon *labors* over a muddy road or a ship *labors* in heavy seas.

***laboratory** (lab′ ō ra tō ri), *n.* [*pl.* laboratories] a building or room in which scientific experiments are conducted, or where drugs, chemicals, explosives are tested and compounded.

laborious (*la* bō′ ri us), *adj.* difficult, toilsome, involving much effort.

labor union (lā′ bẽr ūn′ yun), an organization of workers to advance their common interests.

labyrinth (lab′ i rinth), *n.* an intricate arrangement, as of paths in a garden or halls and rooms in a building; a maze.

labyrinthine (lab i rin′ thin), *adj.* intricate; puzzling.

lace (lās), *n.* an ornamental fabric of fine thread, woven in patterns; braid used on uniforms, as gold *lace;* a cord run through eyelets to hold things together, as a shoe*lace.*

lace (lās), *v.t.* to adorn with lace; to fasten with a lace; to lash or whip.

lacerate (las′ ẽr āt), *v.t.* to mangle, tear, wound with jagged cuts; to harrow the feelings.

laceration (las ẽr ā′ shun), *n.* the act of mangling; a jagged cut; deep injury to the feelings.

***lachrymal** (lak′ ri mal), *adj.* pertaining to tears.

***lachrymose** (lak′ ri mōs), *adj.* tearful; inclined to weep.

lack (lak), *n.* deficiency, need; the thing needed or wanting.

lack (lak), *v.i. and v.t.* to be deficient in or in want of; to be destitute of.

***lackadaisical** (lak *a* dā′ zi kal), *adj.* affectedly pensive or sentimental; languishing; listless.

lackey (lak′ i), *n.* a menial attendant; footman.

laconic (*la* kon′ ik), *adj.* using few words, concise, terse, pithy.

lacquer (lak′ ẽr), *n.* a transparent varnish; Chinese or Japanese woodwork finished with a hard, heavy varnish.

lacquer (lak′ ẽr), *v.t.* to finish with lacquer.

***lacrosse** (*la* krôs′), *n.* a game played by teams of 12 players with a small ball and a netted bat with which the ball is tossed from player to player in the attempt to throw it into the opponents' goal.

lacteal (lak′ tē al), *adj.* milky; of or like milk.

lad (lad), *n.* a boy or youth.

ladder (lad′ ẽr), *n.* a framework having two long parallel side-pieces with parallel cross-pieces called rounds, regularly spaced, used in climbing; any similar device for climbing or scaling, as shrouds and ratlines on a ship or a fish ladder.

lade (lād), *v.t.* [*p.t.* laded, *p.p.* laded or laden, *pr.p.* lading] to load; to scoop up and throw out, as to *lade* water out of a tub.

lading (lād′ ing), *n.* the act of loading; the act of bailing; a load or cargo.

ladle (lād′l), *n.* a deep long-handled spoon, a scoop.

ladle (lād′ l), *v.t.* to dip or serve liquid with a ladle or dipper.

lady (lād′ i), *n.* [*pl.* ladies] a well-bred woman; a titled woman.

ladybird (lā′ di bûrd), *n.* a red and black speckled beetle, *ladybug.*

lag (lag), *n.* a retardation of movement, as in machinery; a stave of a cask.

lag (lag), *v.i.* to move slowly, fall behind.

laggard (lag′ ẽrd), *n.* a slow or sluggish person, loiterer.

laggard (lag′ ẽrd), *adj.* slow-moving.

lagoon (*la* gōōn′), *n.* a shallow lake formed at the mouth of a river.

***lair** (lâr), *n.* the den of a wild animal.

*****laity** (lā' i ti), *n.* the people as distinguished from the clergy; all people outside a stated profession.

lake (lāk), *n.* a large inland body of water.

lake (lāk), *n.* a coloring matter made of insoluble metallic compounds; a deep red color.

lama (lä' m*a*), *n.* a Buddhist priest of Tibet.

lamb (lam), *n.* a young sheep.

lambent (lam' bent), *adj.* playing over a surface, as flame; flickering softly, as light.

*****lambrequin** (lam' bre kin), *n.* a festooned drapery over the upper part of a window or doorway.

lambskin (lam' skin), *n.* the skin of a lamb dressed with the fleece on; leather made from it.

lamb's wool (lams wool), the wool of seven or eight month old lambs or a fabric made from it; a beverage.

lame (lām), *adj.* crippled or disabled in the limbs; not sound or convincing, as a *lame* excuse.

lame (lām), *v.t.* to cripple.

lament (l*a* ment'), *n.* an expression of sorrow; an elegy.

*****lament** (l*a* ment'), *v.i. and v.t.* to feel sorrow, mourn; to express sorrow for.

*****lamentable** (lam' en t*a* bl), *adj.* deplorable; sorrowful.

lamp (lamp), *n.* a vessel in which oil is burned through a wick to give light; any electrical or gas device for producing artificial light or heat, as an arc *lamp,* a sun *lamp.*

lampblack (lamp' blak), *n.* fine soot from the smoke of highly carbonaceous substances, used in paint and printer's ink.

lampoon (lam po͞on'), *n.* a satire designed to bring a person into contempt or ridicule.

lampoon (lam po͞on'), *v.t.* to ridicule a person in a satire.

*****lance** (lȧns), *n.* a weapon consisting of a shaft with a sharp metal head, wielded by thrusting.

lance (lȧns), *v.t.* to pierce with a lance; to cut with a lancet.

lancet (lȧn' set), *n.* a pointed, two-edged surgical instrument.

land (land), *n.* the portion of the earth's surface not covered by water; ground, earth; a national territory; the country as set apart from the city, as back to the *land;* tracts of ground, as public *land,* to inherit *land.*

Syn. Country, ground. The term *land* in its elementary sense does not include the idea of habitation; the term *country* is not centered upon the land as land but conveys the idea of a region under one government. We speak of the *land* as rich or poor according to what it yields; of a *country* as rich or poor according to what its people possess. Ground means earth or soil as distinguished from water.

land (land), *v.i. and v.t.* to come ashore from a ship or to earth from an airship, to alight; to set ashore, as a ship's or airship's passengers; to bring to land, as a fish; to take or win, as to *land* a prize.

*****landau** (lan' dô), *n.* a closed automobile with folding rear top.

landgrabber (land' grab ẽr), *n.* one who acquires possession of public land through fraud.

landing (land' ing), *n.* the coming or putting ashore of passengers or goods from a vessel; the alighting on earth, as of an airplane; also a place where passengers or cargo are discharged; a small level platform at the top or at a turn in a staircase.

landlocked (land' lokt), *adj.* entirely or nearly surrounded by land, as a harbor.

landlubber (land' lub ẽr), *n.* a sailor's term for one who is not a sailor.

landmark (land' märk), *n.* any object on land easily seen from sea, that guides a pilot; any object that serves as a guide.

landscape (land' skāp), *n.* a view of a section of country; a picture representing such a view.

lane (lān), *n.* a narrow road; a little-traveled path; a regular route, as air *lanes,* ocean *lanes,* traffic *lanes.*

*****language** (lang' gwij), *n.* human speech; the speech of one people as distinguished from that of others; specialized words and phrases of a certain trade, profession or subject, as scientific *language,* the *language* of baseball, of the turf, of the movies.

languid (lang' gwid), *adj.* deficient in energy, spiritless, apathetic.

languish (lang' gwish), *v.i.* to become weak or spiritless, droop, pine.

*****languor** (lang' gẽr), *n.* lack of physical or mental energy; listlessness.

lank (langk), *adj.* lean, slender.

lanky (langk' i), *adj.* tall, thin and loose-jointed.

lansdowne (lanz' doun), *n.* a fine fabric of silk and wool.

lantern (lan' tẽrn), *n.* a transparent case to protect a lamp from the weather, sometimes portable or sometimes stationary, as the glassed room enclosing a lighthouse beacon.

lantern-jawed (lan' tẽrn jôd), *adj.* having a long, thin face.

lap (lap), *n.* the part of the body from waist to knees of a seated person; the margin by which one surface extends beyond another, as the *lap* of shingles; one length of a course which has to be passed over more than once in a race.

lap (lap), *n.* the act of lapping; as much liquid as can be taken with one lick of the tongue, as a *lap* of milk.

lap (lap), *v.t.* and *v.i.* to gain a lap in a race on a circular track, to take up liquid with the tongue, as a cat *laps* milk; to lay together so that one projects over the other, as to *lap* shingles; to project over another, as the shingles *lap.*

lap dog (lap dôg), *n.* a small pet dog.

lapel (la pel'), *n.* the turned over part of a coat, from the collar to the front of the body part.

*****lapidary** (lap' i der i), *n.* [*pl.* lapidaries] an artificer who cuts and sets precious stones.

lappet (lap' et), *n.* a hanging fold of a garment; a flap of flesh, as a bird's wattle.

lapse (laps), *n.* steady, as of time; a slip or fault, as a *lapse* of memory, a *lapse* from virtue.

lapwing (lap' wing), *n.* a crested plover of the Old World.

larceny (lär' se ni), *n.* theft.

larch (lärch), *n.* a coniferous, deciduous tree of the pine family; its tough wood.

lard (lärd), *n.* hog's fat, melted and cooled.

lard (lärd), *v.t.* to smear with lard; to enrich by inserting strips of pork or bacon before roasting, as meat.

larder (lär' dẽr), *n.* a pantry; a supply of household provisions.

large (lärj), *adj.* of great size; extensive as a *large* forest; of more than average power or scope; *at large,* unconfined, as the murderer is still *at large;* representing a whole state or section, not a single district, as a representative *at large.*

Syn. Great, bulky, big, ample. A *large* house is the opposite of a small house; a *great* house is so large or magnificent as to cause wonder or be famous; a *bulky* package is not only large but unwieldy. *Big* refers to physical size or volume, as a *big* dog, a *big* voice, or to mental or spiritual largeness, as a *big* heart. An *ample* meal is large enough to be plentiful or sufficient; an *ample* dress is overlarge.

Ant. Little, mean, narrow, small.

*****largess** (lär' jes), *n.* a gift or bounty.

lariat (lar' i at), *n.* a rope or leather thong with a running noose to lasso horses or cattle, or to picket grazing animals.

lark (lärk), *n.* a European songbird; a frolic.

larkspur (lärk' spûr), *n.* a plant with showy blue, pink or white flowers having spurs like the claws of a lark.

larva (lär' va), *n.* [*pl.* larvae or larvas] an insect in the early, wingless, wormlike stage of its development after it leaves the egg and before it becomes a chrysalis; the early stage in the changes of other animals that pass through several phases of development.

*****laryngeal** (la rin' jē al), *adj.* pertaining to the larynx.

*****laryngitis** (lar in jī' tis), *n.* inflammation of the larynx.

*****larynx** (lar' ingks), *n.* [*pl.* larynges] a formation of cartilage and muscles in the throat, containing the vocal cords.

lash (lash), *n.* the thong of a whip; one of the hairs that grow out from the eyelid.

lash (lash), *v.t.* to strike with a whip; to scourge with satire.

lass (las), *n.* a girl or young woman.

lassitude (las' i tūd), *n.* weariness, languor.

*****lasso** (las' ō), *n.* a rope or rawhide cord with a noose used in catching horses or cattle.

last (lȧst), *n.* a wooden or metal block on which shoes are shaped.

last (lȧst), *n.* the end; the final stage, as this is the *last* of it.

last (lȧst), *v.i.* to remain in existence or operation, endure.

last (lȧst), *adj.* coming after all others in time, place or order; final, conclusive.

last (lȧst), *adv.* after all others, as you come *last.*

lasting (lȧst' ing), *adj.* durable, continuing.

latch (lach), *n.* the catch of a door that holds it closed.

latch (lach), *v.t.* to secure or fasten with a latch.

late (lāt), *adj.* [*comp.* later, *superl.* latest] after the usual or set time; tardy; recently deceased.

late (lāt), *adv.* after a set time, as you came *late;* recently.

*****latent** (lā' tent), *adj.* present but not apparent, as *latent* energy.

lateral (lat' ẽr al), *adj.* having to do with the side, as equi*lateral;* situated on the side, as *lateral* wings.

latex (lā' teks), *n.* a milky juice of certain plants, as the rubber tree.

*****lath** (lȧth), *n.* any of the thin, narrow strips of wood nailed to the timbers of a house to afford a hold for wall plaster; metal sheets used for the same purpose; laths collectively.

*****lathe** (lā*th*), *n.* a machine in which pieces of wood or metal are shaped by turning against a cutting tool.

lather (la*th*' ẽr), *n.* a thick foam made by moistening soap; foam caused by profuse sweating, as on a horse's hide.

lather (la*th*' ẽr), *v.t.* to apply soapy foam to, as to *lather* the face before shaving.

latitude (lat' i tūd), *n.* distance, in degrees, north or south of the equator; freedom from close restrictions; liberality of thought.

latter (lat' ẽr), *adj.* the second of two things mentioned; recent, as in *latter* times; toward the end, as the *latter* part of the year.

*****lattice** (lat' is), *n.* a crisscross openwork of wood or metal strips.

laud (lôd), *v.t.* to praise highly.

laudable (lôd' *a* bl), *adj.* praiseworthy.

*****laudanum** (lô' d*a* num), *n.* a preparation of opium.

laudatory (lôd' *a* tō ri), *adj.* expressing praise.

laugh (läf), *n.* the sound caused by and expressing merriment.

*****laugh** (läf), *v.i. and v.t.* to express merriment by convulsive sounds accompanied by opening of the mouth and wrinkling of the face; to produce an effect by means of laughter, as we *laughed* him out of it.

laughable (läf' *a* bl), *adj.* ludicrous, comical.

laughingstock (läf' ing stok), *n.* a person who is the object of ridicule.

laughter (läf' tẽr), *n.* the act or sound of laughing.

*****launch** (lônch), *n.* an open pleasure boat, usually propelled by steam, gas or electricity; the largest boat carried by a warship.

*****launch** (lônch), *v.t.* to cause to slide into the water, as a newly built ship; to hurl, as a spear; to initiate, as an enterprise.

*****laundress** (lôn' dres), *n.* a woman who washes and irons clothes.

*****laundry** (lôn' dri), *n.* [*pl.* laundries] a place where clothes are washed and ironed; clothes to be washed.

laureate (lô rē āt), *n.* one crowned with laurel; one honored, especialy for poetry: *poet laureate,* the official title of a poet appointed by the king of England to compose poems celebrating national occasions.

laureate (lô' rē āt), *adj.* crowned with laurel as a symbol of honor or praise.

****laurel** (lô′ rel), *n.* an evergreen shrub; a symbol of fame.

laurels (lô′ relz), *n. pl.* honors, distinctions.

***lava** (lä′ v*a*), *n.* melted rock thrown from a volcano; this fluid in solid form.

lavaliere (lav *a* lēr′), *n.* a flat, round or oval ornament worn on a chain around the neck.

lavatory (lav′ *a* tō ri), *n.* [*pl.* lavatories] a washroom or washbasin.

lave (lāv), *v.i. and v.t.* to bathe or wash.

lavender (lav′ en dēr), *n.* a fragrant plant of the mint family; the perfume made from it; the pale purplish color of its flowers.

lavish (lav′ ish), *adj.* profuse, extravagant.

lavish (lav′ ish), *v.t.* to bestow with profusion; to squander.

law (lô), *n.* a rule of action sustained by authority; a statute; a rule or axiom of science or art.

lawful (lô′ fool), *adj.* comformable to law; sanctioned by law.

lawless (lô′ les), *adj.* heedless of the law, in violation of law.

lawn (lôn), *n.* a carefully kept plot of grass, closely mown; fine cotton or linen fabric.

lawsuit (lô′ sūt), *n.* an action at law, a case in a court.

lawyer (lô′ yer), *n.* one learned or skilled in the law; one who practices professionally in the law courts.

lax (laks), *adj.* loose, vague, weak; slack.

laxative (lak′ s*a* tiv), *n.* a mildly purgative or cathartic medicine.

laxative (lak′ s*a* tiv), *adj.* loosening, relaxing; gently cathartic.

lay (lā), *n.* a lyric; a short narrative poem.

lay (lā), *v.t.* [*p.t.* and *p.p.* laid, *pr.p.* laying] to cause to lie; to put down or place in a certain position or order, as a hen *lays* an egg, we *lay* a carpet, a floor, a cable or a line of rails; to effect a change in the condition of something, as an invader *lays* a country waste; to suppress or calm, as rain *lays* dust; to fell, as a blow *laid* him low; to impose, as a government *lays* taxes; to place or impute, as we *lay* the blame on someone; to set in a certain place or period, as a scene; to spread, as cement.

Syn. Put, place, calm, appease, impose.

layman (lā′ man), *n.* [*pl.* laymen] one of the people as distinguished from the clergy; one not of a stated profession.

lazy (lā′ zi), *adj.* [*comp.* lazier, *superl.* laziest], disinclined to work, indolent.

***lea** (lē), *n.* grassland; a meadow.

leach (lēch), *v.t.* to wash with water in order to separate some soluble element from, as to *leach* wood ash to obtain lye; to obtain by this process, as to *leach* lye from wood ashes.

lead (led), *n.* a soft, heavy, easily melted, malleable metal of bluish white color, used in making water pipes and in many alloys and compounds; a thin metal strip used to separate lines in printing.

lead (led), *adj.* made of lead.

lead (led), *v.t.* to furnish with lead for some particular use, as to *lead* type by separating the lines with thin bars of type metal.

lead (lēd), *v.t. and v.i.* to guide or conduct by going first, as he *led* the party home; to go or be first, as Tom *led* up the hill, Tom *leads* in spelling; to guide by influence, as to *lead* someone astray; to direct, as he *leads* the orchestra; to act as guide or director, as she *leads* at choir practice; to be the best among, as Tom *leads* his class; to conduct oneself in the course of, as to *lead* a merry life; to take a certain course, as the road *leads* to Boston; to begin a card game or hand with, as *lead* trumps; to play first, as in a game of cards.

Ant. Rebuff, repel.

leaden (led′ n), *adj.* of or like lead; sluggish.

leadin lēd′ in), *n.* a down-lead from the antenna to the receiving set in a radio.

leaf (lēf), *n.* [*pl.* leaves] a unit of the foliage of a plant; anything flat and thin, as a page or the movable part of a table top; a very thin sheet of metal, as gold *leaf.*

leaf roll (lēf rōl), a disease of the potato plant which causes the leaves to curl up and lessens the production of tubers.

league (lēg), *n.* an alliance to promote mutual interests; a confederation.

league (lēg), *v.i. and v.t.* to form an alliance; to join together.

league (lēg), *n.* a measure of distance, about three miles.

leak (lēk), *n.* an opening that lets something as a gas or a liquid, in or out accidentally, as in a boat or a pipe.

leak (lēk), *v.i. and v.t.* to let a liquid or other substance in or out accidentally through a crack or hole, as a tank or boat *leaks;* to lose by leaking, as this barrel *leaks* oil; to escape accidentally through an opening, as sugar *leaks* out of a bag; to become gradually or secretly spread about, as news *leaks* out.

leakage (lēk′ ij), *n.* that which leaks in or out; the quantity of that leaks in or out.

lean (lēn), *adj.* not fat, as meat; thin, gaunt; poor, unproductive, as to fall on *lean* days.

lean (lēn), *v.i. and v.t.* [*p.t.* and *p.p.* leaned, *pr.p.* leaning] to deviate or cause to deviate from an upright position; to rest one's weight, as to *lean* on a gate; to cause to rest, as to *lean* a broom against a wall; to look to for support, as to *lean* on a friend for help; to be in sympathy with, to incline to, as to *lean* towards Communism.

leaning (lēn′ ing), *n.* a tendency or inclination of the mind, as a *leaning* toward mathematics.

leap (lēp), *n.* a jump; the distance covered in a jump, as a *leap* of 20 feet.

leap (lēp), *v.i. and v.t.* [*p.t.* and *p.p.* leaped, *pr.p.* leaping] to jump or spring; to pass over by leaping, as to *leap* a ditch or fence.

leap year (lēp yēr), a year of 366 days, the extra day being February 29; any year of which the number can be divided evenly by 4, except those which are divisible by 100 but not by 400, as 2000 is a leap year, 1900 was not.

***learn** (lûrn), *v.t. and v.i.* [*p.t.* and *p.p.* learned, *pr.p.* learning] to gain knowledge of, or skill in, as to *learn* history or knitting; to assimilate facts or information, as to *learn* quickly.

learning (lûrn′ ing), *n.* knowledge acquired through study and instructions; scholarship.

lease (lēs), *n.* a written contract for the letting of property for a stated term of time and at a fixed price.

lease (lēs), *v.t.* to let property to or rent it from another.

leash (lēsh), *n.* a thong or cord by which an animal is held.

leash (lēsh), *v.t.* to hold or control with a thong or cord.

least (lēst), *adj.* [*superl.* of little] smallest in degree, size, value, importance.

least (lēst), *adv.* in the lowest or smallest degree, as the *least* desirable house.

leather (le*th*′ ēr), *n.* the tanned and curried skin or hide of an animal.

leathern (le*th*′ ērn), *adj.* made of leather.

leave (lēv), *n.* permission, as you have my *leave* to go; departure, as to take one's *leave;* a furlough, as *leave* of absence.

leave (lēv), *v.i. and v.t.* [*p.t.* and *p.p.* left, *pr.p.* leaving] to go away, depart, as to *leave* home; to bequeath, as he *left* a fortune; to cause to remain behind, as *leave* a tip, *leave* the dog home.

Syn. Quit, forsake. To *leave* merely means to go away; to *quit* means to *leave* with no intention of returning. *Forsake* carries the idea of *leaving* in the lurch.

Ant. Remain, stay.

leaven (lev′ en), *n.* a substance that causes fermentation, especially in dough or liquids, as yeast; any influence working silently and unseen that brings about fundamental changes.

leaven (lev′ en), *v.t.* to produce fermentation in, literally or figuratively.

lectern (lek′ tērn), *n.* the reading desk from which, in certain churches, the Scripture lessons are read or chanted.

lecture (lek′ tūr), *n.* a formal discourse on a set subject; a wordy reprimand.

lecture (lek′ tūr), *v.i. and v.t.* to deliver a discourse; to address a discourse to, as an audience; to reprove with many words.

ledge (lej), *n.* a shelflike projection from a wall or the side of a building, as a window *ledge,* a horizontal projection from a wall of rock or a hillside.

ledger (lej′ ēr), *n.* the principal account book of a business establishment, containing the credits and debits.

lee (lē), *n.* shelter from the wind, given by some intervening object, as in the *lee* of a high wall; the side away from the wind.

lee (lē), *adj.* away from the wind, as the *lee* side of a ship; in the same direction as the wind blows, as a *lee* tide.

leech (lēch), *n.* a flat bloodsucking worm that lives in water and was formerly used by doctors to bleed patients.

leek (lēk), *n.* a bulbous plant resembling the onion.

leer (lēr), *n.* a sly sidelong look expressing malice or evil.

leer (lēr), *v.i.* to look sideways with an expression of sly malice or evil thought.

***leeward** (lē′ wērd), *adj. and adv.* away from the wind, as the *leeward* side, steer to *leeward.*

leeway (lē′ wā), *n.* the sideways drift of a ship from the course on which it is headed; an extra allowance of space or time, as give me a little *leeway* on this lesson.

left (left), *adj.* the side which, as one faces north, is to the west: opposite of *right.*

left-handed (left han′ ded), *adj.* using the left hand better than the right; insincere or indirect, as a *left-handed* compliment.

leg (leg), *n.* one of the limbs by means of which animals stand and walk; anything resembling a leg in form or function, as the *leg* of a chair; the length of one tack covered by a vessel in sailing; either side of a triangle, distinguished from the base.

legacy (leg′ *a* si), *n.* [*pl.* legacies] money or property left to one by a will; something inherited, as a *legacy* of character.

legal (lē′ gal), *adj.* pertaining to law; in accordance with or permitted by law.

legality (le gal′ i ti), *n.* [*pl.* legalities] lawfulness; technical interpretation of law.

legalize (lē gal īz), *v.t.* to make lawful.

***legate** (leg′ it), *n.* a person who represents his country in a foreign land.

legation (lē gā′ shun), *n.* an envoy and his associates; the official establishment of a diplomatic representative, especially an ambassador.

***legend** (lej′ end), *n.* any story coming out of the past, based on history but not verifiable; the inscription on a monument, descriptive lines under an illustration in a book.

***legerdemain** (lej ēr dē mān′), *n.* sleight of hand.

leggings (leg′ ingz), *n. pl.* long gaiters; extra covering for the legs.

***leghorn** (leg′ hôrn), *n.* a dark, unbleached straw made in Leghorn (Livorno), Italy; a hat made from this straw.

legible (lej′ i bl), *adj.* easy to read; readable.

***legion** (lē′ jun), *n.* a division of the ancient Roman army; a military force; a multitude.

legionnaire (lē jun âr′), *n.* legionary.

legionary (lē′ jun er i), *n.* [*pl.* legionaries] a member of a legion.

legionary (lē′ jun er i), *adj.* pertaining to legions; multitudinous.

legislate (lej′ is lāt), *v.i. and v.t.* to enact a law; to effect by means of laws, as to *legislate* industrial improvement.

legislation (lej is lā′ shun), *n.* the act of making laws; the laws made by a representative body.

***legislator** (lej′ is lā tēr), *n.* a lawmaker; a member of a lawmaking assembly.

***legislature** (lej′ is lā tūr), *n.* the lawmaking body of a state of the U. S.

legitimacy (lē jit′ i m*a* si), *n.* accordance with law; lawfulness of birth.

***legitimate** (lē jit′ i mit), *adj.* according to the law or accepted standards; born in wedlock; reasonable, as a *legitimate* argument.

***legume** (leg′ ūm), *n.* a two-valved seed vessel having a row of seeds attached along the seam where the parts join, as in a pod of peas.

***leisure** (lē' zhẽr), *n.* spare time; free time.

leisure (lē' zhẽr), *adj.* free from the pressure of work and responsibilities, as *leisure* hours.

lemon (lem' un), *n.* the small acid fruit of a tropical citrus tree; its light yellow color.

lemon (lem' un), *adj.* having the flavor or the color of a lemon.

lemonade (lem un ād'), *n.* a drink made of water, sugar and lemon juice.

lend (lend), *v.i. and v.t.* [*p.t.* and *p.p.* lent, *pr.p.* lending] to make a loan; to turn over to another for temporary use; to provide, as to *lend* assistance.

***length** (length), *n.* measure from end to end; duration of time: as *length* of a string, a road, a meeting, life, time; a *length* of rope: *at length,* at last, after a long time.

lengthen (leng' then), *v.i. and v.t.* to become or make longer, as the days *lengthen,* to *lengthen* a dress.

lengthy (leng' thi), *adj.* [*comp.* lengthier, *superl.* lengthiest] long; long and tiresome, as a *lengthy* discourse.

***lenient** (lē' ni ent), *adj.* mild; merciful; not severe.

***lenity** (len' i ti), *n.* gentleness; mildness.

lens (lenz), *n.* [*pl.* lenses] a piece of glass having one or more curved surfaces used to change the course of rays of light so as to focus the view; the crystalline structure of the eye, which focuses light on the retina.

Lent (lent), *n.* the fast season of 40 week days from Ash Wednesday to Easter Eve, observed in some Christian churches.

lentil (len' til), *n.* a plant of the pea family, with edible seeds.

***leonine** (lē' ō nīn), *adj.* lionlike.

leopard (lep' ẽrd), *n.* a large flesh-eating cat of Asia and Africa, with yellow coat spotted with black.

leper (lep' ẽr), *n.* a person afflicted with leprosy.

leprosy (lep' rō si), *n.* [*pl.* leprosies] a skin disease characterized by ulcers and white, scaly scabs.

lesion (lē' zhun), *n.* injury; a change in any organ or bodily tissue due to injury or disease.

less (les), *n.* a smaller amount, as you have little, but I have *less.*

less (les), *adj.* [comp. of little] not so large, many or much; fewer.

less (les), *prep.* minus, as five *less* two equals three.

lessee (les ē'), *n.* a tenant holding a lease.

lessen (les' n), *v.i. and v.t.* to grow or make smaller in quantity or degree; to diminish.

lesser (les' ẽr), *adj.* smaller, inferior.

lesson (les' n), *n.* an assignment for study; that which is taught and learned at one time; anything learned, through instruction or experience, as that sickness gave me a *lesson.*

***lessor** (les' ôr), *n.* an owner who leases property to a tenant.

lest (lest), *conj.* so that not; for fear that, as judge not, *lest* ye be also judged.

let (let), *v.t. and v.i.* [*p.t.* and *p.p.* let, *pr.p.* letting] to permit, as *let* him go; to lease to a tenant, or from an owner, as we *let* a house to or from some one; to be leased, as the house *lets* for $100 a month.

***lethal** (lē' thal), *adj.* deadly; fatal.

***lethargic** (lē thär' jik), *adj.* morbidly drowsy; sluggish, dull.

lethargy (leth' ẽr ji), *n.* morbid drowsiness, deep sleep; sluggishness; apathy, indifference.

letter ((let' ẽr), *n.* a symbol for a certain sound; a character in the alphabet; a communication in writing; exact meaning, as the *letter* of the law.

letter (let' ẽr), *v.t.* to inscribe with letters.

lettergram (let' ẽr gram), *n.* a long telegram sent at low rates because it is held until the lines are comparatively free.

letterhead (let' ẽr hed), *n.* a sheet of writing paper with a printed form at the top giving the name and address of the writer.

letterpress (let ẽr pres), *n.* typed text as distinguished from illustrations.

letters (let' ẽrz), *n. pl.* learning; literature.

***lettuce** (let' is), *n.* a garden plant with crisp leaves, used as a salad.

***levee** (lev' ē), *n.* formerly, an assembly held in the morning by a monarch; a morning reception; an official reception.

levee (lev' ē), *n.* an artificial embankment to hold a river in its channel in time of flood.

levee (lev' ē), *v.t.* to line a river course with embankments to check the spread of flood waters.

level (lev' el), *n.* a horizontal plane or line; even altitude, as the top of this table is *level* with that; a carpenter's instrument having one bubble of air in a glass tube nearly full of alcohol or ether, used to determine whether a surface is horizontal or inclined by centering the bubble.

level (lev' el), *v.t.* to make even or equal in elevation.

level (lev' el), *adj.* smooth and flat; horizontal.

level off (lev' el ôf), to fly horizontally over the ground before landing, as an airplane.

***lever** (lē' vẽr), *n.* a bar turning on a fixed point called the fulcrum, used to transmit power.

***leverage** (lē vẽr ij), *n.* the power gained by using a lever; power of influence.

leviathan (lē vī' *a* than), *n.* a large unidentified ocean mammal, mentioned in the Bible; anything huge.

levity (lev' i ti), *n.* buoyancy; lightness in conduct; frivolity, lack of seriousness.

levy (lev' i), *n.* [*pl.* levies] the act of raising money or men for service by drafting; the amount or number so raised.

levy (lev' i), *v.t.* [*p.t.* and *p.p.* levied; *pr.p.* levying] to draft men or money; to impose a tax.

***lewd** (lūd), *adj.* vulgar, impure, lustful.

lexicographer (lek si kog' r*a* fẽr), *n.* one who engages in the writing or editing of a dictionary.

lexicon (lek' si kon), *n.* a dictionary, especially of an ancient language.

liability (lī *a* bil' i ti), *n.* [*pl.* liabilities] susceptibility, as to sickness; responsibility, as for debts; *pl.,* debts of a business house as opposed to *assets.*

liable (lī' *a* bl), *adj.* susceptible, as to a disease; responsible, as for payment of debt: distinguished from *likely.*

***liaison** (lē ā zôn'), *n.* a linking together of the operations of different forces, as separate divisions of an army; co-operation, intercommunication.

liar (lī ẽr), *n.* one who tells lies.

libation (lī bā' shun), *n.* the act of pouring out wine or oil in honor of a god; the liquid that is poured.

libel (lī bel), *n.* defamation, especially in writing or print; publication of matter unjustly injurious to someone's reputation.

libel (lī' bel), *v.t.* [*p.t.* and *p.p.* libeled or libelled, *pr.p.* libeling or libelling] to state, write or publish matter unjustly injurious to another's reputation.

liberal (lib' ẽr al), *n.* one who is progressive in thinking or principles.

liberal (lib' ẽr al), *adj.* openhanded, generous; broadminded, especially as to religious or political ideas.

liberality (lib ẽr al' i ti), *n.* [*pl.* liberalities] generosity; broadmindedness.

liberate (lib' ẽr āt), *v.t.* to set free.

liberty (lib' ẽr ti), *n.* [*pl.* liberties] freedom.

librarian (lī brâr' i an), *n.* a person in charge of a library.

***library** (lī brer i), *n.* [pl. libraries] a collection of books; a room or building in which a collection of books is kept.

license (lī' sens), *n.* a legal permit to engage in a certain activity or carry on a certain business; abuse of freedom.

license (lī' sens), *v.t.* to authorize by legal permit.

***licentiate** (lī sen' shi āt), *n.* one who is licensed by the proper authorities to preach or to practice a profession.

licentious (lī sen' shus), *adj.* disregardful of law or the principles of morality; dissolute.

***lichen** (lī' ken), *n.* a flowerless plant without leaves that grows on tree bark, fences and rocks.

lick (lik), *n.* a small quantity; a saline deposit to which animals go to get salt.

lick (lik), *v.t.* to stroke with the tongue; to lap up; to make a sudden flickering movement, as a tongue of flame *licks* wood.

licorice (lik' ō ris), *n.* the root or thickened juice of a certain tropical plant.

lid (lid), *n.* a movable cover for the opening of a box or other container; the eye*lid.*

lie (lī), *v.t.* [*p.t.* lay, *p.p.* lain, *pr.p.* lying] to rest in or take a reclining position, as to *lie* down; to be or remain in a flat or prostrate position on some surface, as the book *lies* on the table; to be situated, as Boston *lies* north of New York; to extend, as all life *lies* before you; to be, as health *lies* in right living.

lie (lī), *v.i.* [*p.t.* and *p.p.* lied, *pr.p.* lying] to utter a falsehood.

lie (lī), *n.* a falsehood, an untruth.

lief (lēf), *adv.* gladly, willingly, as I should as *lief* have that one.

***liege** (lēj), *n.* a vassal; a lord or sovereign.

liege (lēj), *adj.* entitled to loyalty and devotion, as a lord; bound to give service as to a lord; loyal.

***lien** (lē' en), *n.* a legal claim upon property to cover an unpaid debt made with the property as security, as for work done.

***lieu** (lū), *n.* place; stead, as in *lieu* of.

***lieutenant** (lū ten' ant), *n.* one who acts for another of higher standing; in the army, an officer next below a captain; in the navy, an officer next below a lieutenant commander.

life (līf), *n.* animate existence; the time between birth and death; animation, spirit, zest; living beings in general, as plant *life,* insect *life,* human *life;* a biography, as a *life* of Lincoln; period of usefulness, as the *life* of a machine.

lift (lift), *n.* the act of raising, also the load raised; a ride given to a pedestrian, hence, help; an elevator; a hoisting apparatus.

lift (lift), *v.i. and v.t.* to rise, as the fog *lifted* slowly; to raise with steady pulling or a heave; to hold up, as *lift* your head.

Syn. Raise, hoist, elevate. To *raise* means to *lift* something into an upright position or to its original position. To *lift* is to pick something up from its original position. We *lift* a chair from the floor. We *raise* a flagpole or a fallen people. *Hoist* implies an exceptionally heavy weight or the use of tackle in lifting it. To *elevate* is to raise above the usual position in place or diquity.

Ant. Lower, drop.

ligament (lig' *a* ment), *n.* a strong tissue connecting the ends of bones in the body or supporting some internal organ.

ligature (lig' *a* tūr), *n.* something narrow that binds, as a bandage, or a thread for tying blood vessels together; two letters cast on one type body; a curving mark placed over two letters to show they are to be printed as a single character.

light (līt), *n.* that quality of environment that makes vision possible, the opposite of darkness; rays issuing from some illuminating body, as the sun, fire or a lamp; anything used for illumination, as a lamp or candle, as bring a *light;* daylight; a window pane; the condition of being seen or known, public knowledge, as graft brought to *light;* that which gives mental illumination or understanding, as this throws *light* on the problem, in the *light* of history.

light (līt), *v.i. and v.t.* [*p.t.* and *p.p.* lit or lighted; *pr.p.* lighting] to shine, to be bright, as the sky *lights* up; to make bright, as a lamp *lights* a room; to kindle, as a fire; to guide with or as with a light, as the moon *lighted* us home.

light (līt), *adj.* illuminated; bright; clear and shining; not heavy; gay and carefree.

lighten (līt' n), *v.t.* to illuminate.

lighten (līt' n), *v.t.* to make less heavy.

lighter (līt' ẽr), *n.* a barge used in loading and unloading vessels lying offshore.

light-fingered (līt fing' gẽrd), *adj.* handy, skilful; thievish, deft at picking pockets.

light-footed (līt foot′ ed), *adj.* stepping or walking lightly, nimble.

light-headed (līt hed′ ed), *adj.* delirious; heedless; frivolous.

light-hearted (līt här′ ted), *adj.* carefree, cheerful.

lighthouse (līt′ hous), *n.* a structure on a shore or coast with a powerful light at the top to guide ships.

lightning (līt′ ning), *n.* a sudden flash of electricity as it passes from cloud to cloud or from the clouds to the earth.

lightning arrester (līt′ ning a rest′ ẽr), a device to protect radio receiving sets by carrying lightning discharges into the ground.

lightning rod (līt′ ning rod), a metal rod on the outside of a building to conduct lightning into the ground.

lightship, *n.* a moored vessel with lights to protect shipping.

ligneous (lig′ nē us), *adj.* like wood, woody.

like (līk), *n.* that which resembles another, as its *like* does not exist.

like (līk), *v.t.* to have a taste for, be fond of, enjoy.

like (līk), *adj.* resembling in appearance or quality; equal or nearly so, as a *like* quantity; characteristic of, as it is *like* you to laugh; having the indications of, as it looks *like* a storm.

like (līk), *prep.* similar to, as you look *like* him; in the manner of, as sing *like* her; befitting, as speak up *like* a man.

liken (līk′ n), *v.t.* to compare.

likeness (līk′ nes), *n.* similarity; a portrait, copy; semblance, guise.

Syn. Resemblance, similarity, semblance. *Likeness* is used to indicate a very close sameness. *Similarity* indicates that things are somewhat alike. *Resemblance* is used of external similarity. *Semblance* indicates only a seeming *likeness*.

Ant. Difference, dissimilarity, unlikeness.

likewise (līk′ wīz), *adv.* in like manner; also.

lilac (lī′ lak), *n.* a shrub with pale purple or white flowers in heavy clusters; a pale purple color.

lilt (lilt), *n.* a lively, merry tune; cadence.

lily (lil′ i), *n.* a plant with bulbous root and showy flowers.

lily of the valley (lil′ i ov the val′ i), a small perennial herb with white, bell-shaped flowers growing on little stems at intervals along the stalk.

***limb** (lim), *n.* a jointed part of the body; a leg or arm; a branch of a tree.

limber (lim′ bẽr), *n.* the detachable front part of a gun carriage.

limber (lim′ bẽr), *v.i. and v.t.* to become or to make flexible.

limber (lim′ bẽr), *adj.* flexible, supple.

***lime** (līm), *n.* a white, powdery substance obtained by the action of heat upon limestone, used to sweeten land and in making cement.

lime (līm), *n.* a small sour fruit resembling the lemon and orange.

lime (līm), *n.* the linden tree.

limelight (līm′ līt), *n.* a strong light thrown upon the stage in a theater; publicity.

limestone (līm′ stōn), *n.* a rock having carbonate of lime as the basis of its composition.

limit (lim′ it), *n.* a boundary; the furthest extent.

limit (lim′ it), *v.t.* to restrict; to hold within fixed bounds.

limitation (lim i tā′ shun), *n.* restriction; that which qualifies something.

***limn** (lim), *v.t.* to paint or draw a picture of; to depict.

***limousine** (lim oo zēn′), *n.* a motor car with a large closed body and a separate open but roofed seat for the driver.

limp (limp), *n.* a halt in one's gait.

limp (limp), *v.i.* to walk with a halting gait, walk lamely.

limp (limp), *adj.* lacking stiffness; lacking character.

limpet (lim′ pet), *n.* a clinging shellfish.

limpid (lim′ pid), *adj.* clear, transparent, as the water in a pool.

linage (līn′ ij), *n.* amount of advertising measured in agate lines, that is one-twelfth of an inch in depth and one column in width, as this paper has more *linage* than that.

linchpin (linch′ pin), *n.* a piece of iron passed through the end of an axle to keep the wheel in place.

linden (lin′ den), *n.* a tree with heart-shaped leaves and small clusters of cream-colored flowers.

line (līn), *n.* a distinct mark made by pen, pencil, chalk or the like, having length but little breadth; a drawn mark representing a true mathematical line; an extended rope, wire, piping, rail or row of objects, as telegraph *lines,* a railroad *line,* a water *line,* a *line* of boys; a measure of length, the twelfth part of an inch; a unit of print or poetry; a wrinkle, as the *lines* of a face; a series of ancestors, as to come from a long *line* of poets; a boundary, as crossing the *line* into Mexico; the equator; a limit, as we draw the *line* at murder; *lines,* a role in a play, as he knows his *lines.*

line (līn), *v.i. and v.t.* to form in line; to make lines in or on; to put a lining in, as a coat.

***lineage** (lin′ ē ij), *n.* an ancestral line of descent.

lineal (lin′ ē al), *adj.* in direct descent from an ancestor.

***lineament** (lin′ ē *a* ment), *n.* a feature, as of the face; outline.

linear (lin′ ē ẽr), *adj.* pertaining to lines or composed of lines; pertaining to length, as *linear* measure.

linen (lin′ en), *n.* a thread or cloth made from flax; articles made of linen, as household *linen.*

linen (lin′ en), *adj.* made of linen.

linger (ling′ gẽr), *v.i.* to delay, tarry; to hesitate.

Syn. Loiter. To *linger* is to remain in a place or at an occupation or to be slow in quitting or departing. We may *linger* from reluctance. To *loiter* is to delay from idleness, or aimlessness, especially in a place.

Ant. Hasten, hurry, speed.

***lingerie** (lan zh re′), *n.* women's underwear; any linen goods.

lingo (ling′ gō), *n.* a special language, dialect or vocabulary as used by some particular class of persons; jargon, as sailors' *lingo.*

lingual (ling′ gwal), *adj.* pertaining to or formed by the tongue, as the letters *t, d* or *s.*

linguist (ling′ gwist), *n.* a student of languages, one who knows several languages.

liniment (lin′ i ment), *n.* a thin medicated liquid to be rubbed into the skin.

lining (lī′ ning), *n.* an inside covering, as the *lining* of a coat, the *lining* of a furnace.

link (lingk), *n.* a single division of a chain; in surveying, a measure of 7.92 inches; a connection.

link (lingk), *v.i. and v.t.* to be connected; to connect with or as with the links of a chain.

links (lingks), *n.* a golf course.

linoleum (li nō′ lē um), *n.* a floor-covering made of ground cork and oxidized linseed oil applied to a burlap or canvas back.

linotype (līn′ ō tīp), *n.* a machine that sets and casts type in line units and is operated by means of a keyboard.

linseed (lin′ sēd), *n.* the seed of flax.

linseed oil (lin′ sēd oil), an oil pressed from the seed of flax and used in paints, linoleum and printer's ink.

lint (lint), *n.* scrapings of linen used in dressing wounds; cotton fiber; raw cotton.

lintel (lin′ tel), *n.* the horizontal top piece over a door or window.

linter (lin′ tẽr), *n.* short fibers that stick to the cotton seed; a machine to remove these short fibers.

lion (lī′ un), *n.* a large, powerful carnivorous animal native to Africa and southern Asia; a famous person sought after in social circles.

lionize (lī′ un īz), *v.t.* to treat as a celebrity at social gatherings.

lip (lip), *n.* one of the two borders of the mouth; an edge that resembles a lip, as the *lip* of a pitcher.

lipstick (lip′ stik), *n.* rouge for the lips put up in stick form.

liquefaction (lik wē fak′ shun), *n.* the process of transforming or being transformed from a solid to a liquid state.

liquefy (lik′ wē fī), *v.i. and v.t.* to become liquid; to convert a solid into a liquid.

liquid (lik′ wid), *n.* a substance that is neither solid nor gas.

liquid (lik′ wid), *adj.* readily flowing, like water; neither solid nor gaseous; smooth and flowing like the sounds of *l* and *r.*

liquidate (lik′ wē dāt), *v.i. and v.t.* to pay debts; to pay off, as a debt; to settle the affairs of a business establishment, as in bankruptcy.

***liquor** (lik′ ẽr), *n.* any liquid substance, especially any alcoholic beverage.

lisle (līl), *n.* a fine cotton thread or a fabric made of it.

lisp (lisp), *n.* imperfect pronunciation of *s* and *z.*

lisp (lisp), *v.i. and v.t.* to pronounce *s* and *z* as *th;* to say or recite something in a lisping manner.

list (list), *n.* a catalog, roll or register or the series of names or items therein, as a passenger *list;* the edge or selvage of cloth; a ridge thrown up alongside a furrow in plowing.

list (list), *n.* a sidewise leaning, as of a ship.

list (list), *v.t.* to place in a list, as a catalog, inventory, roll or register; to cover with strips of cloth; to plow in such a way as to turn up ridges between the furrows.

list (list), *v.i.* to tilt to one side, as a ship.

***listen** (lis′ n), *v.i.* to attend closely so as to hear.

listening post (lis′ ning pōst), an advanced position from which military observers can hear the sounds of enemy activities.

listless (list′ les), *adj.* languid, apathetic; without energy.

litany (lit′ *a* ni), *n.* a solemn responsive form of prayer, especially in a church service.

***liter** (lē′ tẽr), *n.* a measure of capacity in the metric system equal to 61.026 cubic inches, .0981 dry quarts or 1.0567 liquid quarts.

literal (lit′ ẽr al), *adj.* consisting of letters; pertaining to letters; according to the exact words, precise, not exaggerated.

***literary** (lit ẽr er i), *adj.* pertaining to literature; versed literature or engaged in its production.

literate (lit′ ẽr it), *adj.* knowing letters, able to read and write.

***literature** (lit′ ẽr *a* tūr), *n.* the best writings; the best books of a country or a period; the collective writings upon a given subject or in a particular field, as the *literature* of sport; any kind of printed matter, as the advertising *literature* of a wholesale house.

***lithe** (līth), *adj.* supple, pliant.

lithograph (lith′ ō gràf), *n.* a print reproduced from a drawing on stone or, by the same process, from a drawing on zinc or aluminum.

lithograph (lith′ ō gràf), *v.t.* to draw on stone and transfer to paper.

litigate (lit′ i gāt), *v.i. and v.t.* to engage in a lawsuit; to contest in a court of law.

litmus (lit′ mus), *n.* a purple dye obtained from certain lichens, which turns red in the presence of acids and turns blue in the presence of alkalis.

litmus paper (lit′ mus pā′ pẽr), paper saturated with litmus used in testing for acids and alkalis.

litter (lit′ ẽr), *n.* a stretcher on which a sick or wounded person is carried; a confusion of things, scattered odds and ends; a bedding, as of straw, for animals; the young of certain animals produced at one birth, as a *litter* of puppies.

litter (lit′ ẽr), *v.i. and v.t.* to bring forth young: said of animals; to scatter things about, as in a room; to put down bedding for horses or cattle.

little (lit′l), *n.* a small quantity, as a *little* of this or that.

little (lit′l), *adj.* [*comp.* less, *superl,* least] small; unimportant; petty: as a *little* man, a *little* space of time, a *little* mistake, a *little* soul.

Syn. Small, diminutive, tiny. *Small* and *little* are often used interchangeably. *Little* is definitely the opposite of *big, small* often indicates less than what is usual or expected in reference to amount, quantity or number. *Little* often carries an implication of tenderness or charm, as a sweet *little* song. *Diminutive* is smaller than *little*. *Tiny* is exceedingly *little*.

Ant. Great, large, broad, noble.

little (lit′ l), *adv.* in a small degree, as he *little* knows.

liturgy (li tûr′ ji), *n.* [*pl.* liturgies] the prescribed forms or rites for public worship, especially in certain Christian churches.

live (liv), *v.i. and v.t.* to be alive, exist; to reside, as I *live* here; to pass or experience, as to *live* a good life; to put into practice, as he *lived* what he taught.

live (līv), *adj.* having life; burning, charged with electricity, as a *live* coal, a *live* wire; brilliant, as a *live* color; spirited, as a *live* argument.

livelihood (līv′ li hood), *n.* means of living.

livelong (liv′ long), *adj.* entire, long, as the *livelong* day.

lively (līv′ li), *adj.* [*comp.* livelier, *superl.* liveliest] full of life; brisk, animated; alert, as *lively* interest.

live oak (līv ōk), an evergreen oak that grows in the southern states of the U. S., with tough wood much used in shipbuilding.

liver (liv′ ẽr), *n.* a glandular organ that secretes bile.

livery (liv′ ẽr i), *n.* [*pl.* liveries] uniforms worn by servants; the keeping of horses for pay or the business of hiring out horses and vehicles.

livid (liv′ id), *adj.* discolored by a bruise; pale as ashes.

living (liv′ ing), *n.* the state of being alive; the means of keeping alive, maintenance, as to earn a *living*.

lizard (liz′ ẽrd), *n.* a small, long-tailed scaly-bodied reptile usually having four short legs, each with five toes and claws.

llanos (lä′ nōz), *n.pl.* the grassy plains of South America.

lo (lō), *interj.* behold!

load (lōd), *n.* a burden; as much as can be carried at one time, as a wagon *load;* the charge of a gun; a mental burden.

load (lōd), *v.t.* to put a load on or into, as to *load* a ship or freight car; to place a charge in, as a gun; to burden, weigh down.

loadstone or **lodestone** (lōd′ stōn), *n.* a magnetic ore of iron; anything that strongly attracts.

loaf (lōf), *n.* a formed mass of bread, cake or sugar.

loaf (lōf), *v.i.* to idle time away.

loam (lōm), *n.* rich vegetable mold mixed with earth; earth consisting of clay, vegetable matter and enough sand to loosen it.

loan (lōn), *n.* anything borrowed or lent, especially a sum of money put out at interest.

loan (lōn), *v.i. and v.t.* to lend.

loath (lōth), *adj.* reluctant.

loathe (lō*th*), *v.t.* to hold in detestation, dislike intensely.

lobby (lob′ i), *n.* [*pl.* lobbies] a small hall or waiting room; the part of a legislative hall to which the public has access; a group of persons trying to influence legislation.

lobby (lob′ i), *v.i.* [*p.t.* and *p.p.* lobbied, *pr.p.* lobbying] to put pressure on legislators in order to secure passage of a bill.

lobbyist (lob′ i ist), *n.* one who makes a practice of lobbying.

lobe (lōb), *n.* any rounded projection or subdivision of an organ, as a *lobe* of the brain or ear.

lobster (lob′ stẽr), *n.* a large edible crustacean that lives in the sea and has five pairs of legs, the front pair having powerful pinching claws; the meat of the lobster used as food.

local (lō′ kal), *n.* a branch of a labor union whose members live in or near the city where its headquarters are; a railroad train making all stops; a newspaper item of strictly neighborhood interest.

local (lō′ kal), *adj.* pertaining to place or a particular place.

locality (lō kal′ i ti), *n.* [*pl.* localities] a region, section or neighborhood.

localize (lō′ kal īz), *v.t.* to fix in a stated place; to confine to a particular place.

***locate** (lō′ kāt) *v.i. and v.t.* to settle or take up residence in a place; to place something; to find the position of, as to *locate* buried treasure.

location (lō kā′ shun), *n.* place or situation; a place, not in a studio, where a moving picture (or part of it) is being filmed.

lock (lok), *n.* a mechanical device with spring and bolt used to fasten a door, box lid or safe, operated by a key or a secret combination; an arrangement of gates by which boats are raised or lowered from one level to another in a dock or canal.

lock (lok), *v.i. and v.t.* to fasten a lock; to fasten with a lock, as *lock* the box; to shut in or out; to make immovable by the interlinking of parts, as to *lock* wheels, *lock* horns.

locker (lok′ ẽr), *n.* a compartment that may be locked, such as is provided for individual use for pupils in a school or workers in a shop.

locket (lok′ et), *n.* a small gold or silver case for a photograph or other token and worn on a necklace or chain as a charm.

lockjaw (lok′ jô), *n.* a kind of tetanus in which the lower jaw is drawn shut and becomes rigidly fixed.

lockout (lok′ out), *n.* the shutting of a factory by an employer who refuses to reopen it until the workers accept his terms of employment.

locksmith (lok′ smith), *n.* one who makes or mends locks.

locomotion (lō kō mō′ shun), *n.* the act or power of moving from place to place.

locomotive (lō kō mō′ tiv), *n.* a steam or electric engine to haul railroad cars.

locust (lō′ kust), *n.* a migratory and destructive winged grasshopper; a tree of North America with yellowish white drooping flowers.

locution (lō kū′ shun), *n.* a special style of speech; a particular phrase.

lode (lōd), *n.* a deposit of mineral ore running in a vein or rock fissure.

lodestar (lōd′ stär), *n.* any star used to steer by, especially the North Star.

lodestone, see *loadstone*.

lodge (loj), *n.* a small house in the woods for hunters; a gatekeeper's or gamekeeper's dwelling on an estate; the meeting place of a secret society; the society itself.

lodge (loj), *v.i. and v.t.* to live in rented rooms; to fall and come to rest; to furnish with a temporary place of residence.

loft (lôft), *n.* a room directly under a roof; an upper floor in a storehouse; a floor or gallery above the main floor, as a hay*loft,* or organ *loft*.

lofty (lôf′ ti), *adj.* [*comp.* loftier, *superl.* loftiest] very high, exalted.

log (log), *n.* an undressed piece of timber; a device for measuring the speed of a ship; a book in which a ship's daily record is kept.

loganberry (lō′ gan ber i), *n.* a plant obtained by crossing the red raspberry with the blackberry; the fruit of this plant; also a variety of dewberry.

logarithm (lôg′ *a* ri*th* m), *n.* the exponent, or index of the power to which a fixed number, the base, must be raised in order to produce a given number.

loggerhead (lôg′ ẽr hed), *n.* an iron tool used hot to melt pitch; a large sea turtle; *at loggerheads,* quarreling.

***loggia** (lo′ ji *a*), *n.* a covered outside gallery or portico.

logic (loj′ ik), *n.* the science of reasoning.

logical (loj i kal), *adj.* according to the rules of logic, correctly reasoned.

logician (lō jish′ an), *n.* one who is skilled in logic.

logrolling (lôg′ rōl ing), *n.* exchange of support by two political groups in order to obtain what each wants.

loin (loin), *n.* the lower part of the back of a quadruped or man.

loiter (loi′ tẽr), *n.* to linger along a way, hang about, waste time.

loll (lol), *v.i.* to lounge at ease.

lone (lōn), *adj.* solitary, without company.

lonely (lōn′ li), *adj.* [*comp.* lonelier, *superl.* loneliest] deserted, unfrequented; depressed because lacking companionship.

lonesome (lōn′ sum), *adj.* without companionship; depressed because of solitude.

long (lông), *adj.* extended to great length in time or space: the opposite of *short;* taking more time to pronounce than a shorter sound, as the *a* in fate is long in comparison to the short *a* in fat.

long (lông), *adv.* to a great extent in time or space, as all day *long,* make the dress *long*.

long (lông), *v.i.* to desire intensely: used with *for,* as I long for a vacation.

***longevity** (lon jev′ i ti), *n.* great length of life.

longhand (lông′ hand), *n.* ordinary handwriting, as distinguished from shorthand.

longitude (lon′ ji tūd), *n.* distance measured in degrees east or west from the zero meridian.

longshoreman (lông shōr′ man), *n.* a laborer on wharves and docks, a stevedore.

look (look), *n.* the act of looking; appearance; facial expression.

look (look), *v.i. and v.t.* to direct the eyes so as to see, as to *look* at a book; to appear, as you *look* well; to observe, examine, as *look* this over.

loom (lo͞om), *n.* a frame or machine used in weaving cloth.

loon (lo͞on), *n.* a large diving bird of the northern hemisphere.

loop (lo͞op), *n.* a doubling or fold of a string; or rope; a ring or circular figure resembling such a doubling, as in a railroad; an airplane maneuver.

loop (lo͞op), *v.i. and v.t.* to make a loop; to form into loops or fasten with loops.

loophole (lo͞op′ hōl), *n.* a narrow opening to look through or shoot through; a means of evasion or escape.

loose (lo͞os), *adj.* not held fast or fitting tightly, as a *loose* knot, *loose* clothes, a *loose* tooth; vague, as *loose* thinking; lax, as *loose* morals; not compact, as *loose* as ashes.

loose (lo͞os), *v.t.* to let fly, as *loose* an arrow; to set free, undo, disengage, untie; to relax.

loosen (lo͞os′ n), *v.t. and v.i.* to make loose or become less tight; to free from tightness, restraint or tension.

loot (lo͞ot), *n.* plunder.

loot (lo͞ot), *v.t.* to pillage and plunder, as a captured city.

lop (lop), *v.i. and v.t.* to hang limply; to cut off.

lop-sided (lop sīd′ ed), *adj.* heavier on one side than on the other.

loquacious (lō kwā′ shus), *adj.* talkative.

lord (lôrd), *n.* a ruler or governor; a British nobleman.

lord (lôrd), *v.i.* to rule; to domineer; often used with *it* as to *lord* it over others.

lore (lōr), *n.* learning; a body of tradition or knowledge of some particular subject or field, or possessed by a certain group, as folk*lore,* animal *lore*.

lose (lo͞oz), *v.i. and v.t.* [*p.t.* and *p.p.* lost, *pr.p.* losing] to be deprived of, fail to keep, as we may *lose* money, health or *lose* our way; to waste, as to *lose* time or a chance; to fail to follow mentally, as to *lose* the point of an argument, *lose* track of something; to fail to win, as a battle or a game; to forget the identity of, as to *lose* oneself in a book.

Syn. Miss, forfeit, mislay. What one *loses* may be gone forever; what one *misses* may be temporarily out of sight or merely unobserved; what one *forfeits* is lost through fault or error. To *mislay* is to lose something by forgetting where it was put.

Ant. Gain, find.

loss (lôs), *n.* the fact of losing or state of having been lost; that which is lost, waste; failure to obtain or to keep; defeat.

losses (lôs' ez), *n.pl.* the number of soldiers lost to active service, including the dead, the wounded and those captured by the enemy; the summed up excess of expenses over intake in a business deal.

lot (lot), *n.* fortune or fate, as one's *lot* in life; a piece of land, as a building *lot;* any object or counter used to make a choice or decision by chance, as to draw *lots;* a number of articles handled as one, as this *lot* of goods.

lotion (lō' shun), *n.* a medicated fluid for the skin.

lottery (lot' ẽr i), *n.* [*pl.* lotteries] a distribution of prizes by drawing lots.

lotus (lō' tus), *n.* a plant of the waterlily family, held sacred by the early Egyptians.

loud (loud), *adj.* high or full sounding; noisy; conspicuous, as *loud* clothing.

loud-speaker (loud spēk' ẽr), *n.* a device for increasing sounds received by a telephone receiver, used in radio receiving sets and for magnifying sound in concerts and public speeches.

lounge (lounj), *n.* an upholstered couch or sofa; a comfortably furnished waiting room in a hotel or clubhouse; a lazy gait in walking.

lounge (lounj), *v.i.* to walk or behave in leisurely manner; to loll; to waste time.

louse (lous), *n.* [*pl.* lice] a parasitic wingless insect living on the bodies of animals or plants.

lout (lout), *n.* a clumsy, awkward fellow.

lovable (luv' *a* bl), *adj.* worthy of or inspiring love.

love (luv), *n.* a strong and deep feeling of attachment, great affection; passionate attraction and ardent affection, especially for one of the opposite sex; fondness, as *love* of books.

Syn. Affection, attachment, charity. *Affection* is usually applied only to a feeling for living or responsive beings, but one may have an *attachment* for an old hat. *Attachment* also implies unchanging devotion to a person, whereas *affection* may be a mere fondness. *Love* is the strongest word; it connotes passionate, ardent devotion. *Charity* is benevolent love for mankind in general or a merciful attitude towards an individual.

lovely (luv' li), *adj.* [*comp.* lovelier, *superl.* loveliest] beautiful.

low (lō), *adj.* having little elevation; below standard level; vulgar; cheap; of sounds, not loud: opposite of *high.*

lower (lō' ẽr), *v.i.* to have a threatening look, as a *lowering* sky; to scowl.

lower (lō' ẽr), *v.t.* to lessen or bring down; to weaken; to reduce.

lowermost (lō' ẽr mōst), *adj.* lowest.

lowing (lō' ing), *n.* the bellowing of cattle.

lowland (lō' land), *adj.* pertaining to a low or level region.

lowlands (lō' landz), *n.pl.* a low, flat country.

lowly (lō' li), *adj.* [*comp.* lowlier, *superl.* lowliest] humble; of low rank.

low-pressure (lō presh' ẽr), *adj.* using or needing only a small amount of steam pressure.

loyal (loi' al), *adj.* faithful, as to one's country, duty or friend.

***lozenge** (loz' enj), *n.* an equilateral figure with two acute and two obtuse angles, a rhomb; a candy made in rhomb shape.

lubber (lub' ẽr), *n.* one who is clumsy or lazy; an incompetent sailor.

***lubricant** (lū' bri kant), *n.* a substance, as an oil, used to reduce friction in the moving parts of a machine.

***lubricate** (lū' bri kāt), *v.t.* to act as a lubricant, as oil *lubricates* machinery; to supply with a lubricant to reduce friction, as to *lubricate* an engine.

lucid (lū' sid), *adj.* shining; transparent; clear; easy to understand.

lucifer (lū' si fẽr), *n.* a match ignited by means of friction.

luck (luk), *n.* whatever happens by chance, fortune, as good *luck,* bad *luck.*

lucky (luk' i), *adj.* [*comp.* luckier, *superl.* luckiest] having good luck; fortunate.

***lucrative** (lū' kr*a* tiv), *adj.* profitable.

***lucubration** (lū kū brā' shun), *n.* close, hard study.

***ludicrous** (lū' di krus), *adj.* ridiculous.

lug (lug), *v.t.* to carry or drag with effort or inconvenience.

luggage (lug'ij), *n.* baggage.

***lugubrious** (lū gū' bri us), *adj.* mournful; dismal; doleful.

lukewarm (lūk' wôrm), *adj.* moderately warm; indifferent.

lull (lul), *n.* a calm interval in a storm, or a momentary cessation of noise or activity.

lull (lul), *v.i. and v.t.* to become quiet, calm down; to soothe and make quiet.

lullaby (lul' *a* bī), *n.* [*pl.* lullabies] a cradle song.

lumbago (lum bā' gō), *n.* rheumatism of the loin muscles.

lumbar (lum' bẽr), *adj.* pertaining to the region of the loins.

lumber (lum' bẽr), *n.* timber sawed and dressed for use in building; rubbish.

***luminary** (lū' mi ner i), *n.* [*pl.* luminaries] a body emitting light, especially a heavenly body.

luminous (lū' mi nus), *adj.* emitting or radiating light, shining; enlightening, intelligent.

lump (lump), *n.* a small shapeless mass; a swelling.

lump (lump), *v.i. and v.t.* to form in lumps; to place together in a mass or a new unit, as to *lump* the charges.

lumpy (lump' i), *adj.* [*comp.* lumpier, *superl.* lumpiest] full of lumps; covered with choppy waves, as a *lumpy* sea.

lunacy (lū' n*a* si), *n.* [*pl.* lunacies] mental unsoundness; foolish behavior.

lunar (lū' nẽr), *adj.* pertaining to the moon; measured by the moon, as a *lunar* month.

lunatic (lū' n*a* tik), *n.* an insane person.

lunatic (lū' n*a* tik), *adj.* crazy, as *lunatic* actions; for the insane, as a *lunatic* asylum.

lunch (lunch), *n.* a light meal usually the meal between breakfast and dinner; luncheon.

***luncheon** (lun' chun), *n.* a light meal, a lunch.

lung (lung), *n.* one of the two organs for breathing in air-breathing animals.

lunge (lunj), *n.* a sudden thrust, as with a sword; a plunge or leap forward.

lunge (lunj), *v.i.* to make a sudden thrust; to plunge forward.

lurch (lûrch), *n.* a sudden roll to one side, as of a ship; a stumbling, staggering motion.

lurch (lûrch), *v.i.* to roll suddenly sidewise, as a ship; to stagger.

***lure** (lūr), *n.* anything used to attract; a decoy; artificial bait for fish.

lure (lūr), *v.t.* to entice.

***lurid** (lūr' id), *adj.* pale, wan; having the look of flame seen through a cloud of smoke; vivid, shocking, as *lurid* headlines.

lurk (lûrk), *v.i.* to lie in secret hiding; to linger around stealthily; to sneak about.

***luscious** (lush' us), *adj.* extremely sweet; delicious.

lush (lush), *adj.* juicy; rich in vegetation, as *lush* land.

lust (lust), *n.* strong desire to possess or enjoy, as the *lust* for money; sensuous desire.

luster (lust' ẽr), *n.* brightness; splendor.

lusty (lus' ti), *adj.* [*comp.* lustier, *superl.* lustiest] robust; vigorous.

***lute** (lūt), *n.* a stringed musical instrument.

***luxuriant** (luks ū' ri ant), *adj.* growing vigorously; profuse or florid, as *luxuriant* writing.

***luxuriate** (luks ū' ri āt), *v.i.* to live in luxury; to indulge unrestrainedly, as to *luxuriate* in music.

***luxurious** (luks ū' ri us), *adj.* indulging in or contributing to luxury.

***luxury** (luk' shoo ri), *n.* [*pl.* luxuries] indulgence in costly or easy living; any rare or costly object that contributes to fine living.

lyceum (lī sē' um), *n.* a course of instruction by means of lectures, concerts or performances; a building used for such a course of instruction.

lyddite (lid' īt), *n.* a high explosive used as a bursting charge for shells.

lye (lī), *n.* an alkaline solution made from wood ashes, used in washing and making soap.

***lymph** (limf), *n.* a colorless, sticky fluid in animal bodies.

lynch (linch), *v.t.* to kill, in mob excitement, a person supposed to be guilty of a crime without permitting him to have a legal trial.

lynch law (linch lô), the practice by unconstituted mob authority of punishing a person without a legal trial.

lynx (links), *n.* [*pl.* lynxes] a fierce wildcat with short tail and tufted ears.

***lyre** (līr), *n.* a stringed, harplike musical instrument of ancient times.

***lyric** (lir' ik), *n.* originally a song meant to be sung to the lyre; now, any short, emotional, personal poem.

lyric (lir'ik), *adj.* pertaining to song or to a short, musical poem.

M

macadamize (mak ad' am īz), *v.t.* to fill in and pack a roadbed with crushed stone and roll so as to form a smooth hard surface, the so-called macadam or *macadamized* road.

***macaroni** (mak *a* rō' nī), *n.* a food made by forming a fine wheat paste into long thin tubes; a buffoon.

macaroon (mak *a* ro͞on'), *n.* a small cake made with ground almonds or coconut.

***mace** (mās), *n.* a heavy-headed staff carried before an official to symbolize authority; a mace-bearer.

mace (mās), *n.* a spice made of the hulls of the nutmeg.

macerate (mas' ẽr āt), *v.t.* to soften by soaking; to cause to waste away.

***machination** (mak i nā' shun), *n.* plotting; a plot, especially an evil plot.

***machine** (m*a* shēn'), *n.* a contrivance to apply mechanical energy to the doing of work; the working organization of a political party.

machinery (m*a* shēn' ẽr i), *n.* engines and machine tools in general; the working system of any organization, as the *machinery* of government.

machine gun (m*a* shēn' gun), a small, mounted automatic gun designed to fire small ammunition continuously and rapidly.

machine tool (m*a* shēn' to͞ol), a tool operated by means of mechanical power, as a lathe.

machinist (m*a* shēn' ist), *n.* one who is skilled in the principles and use of machinery.

***mackerel** (mak' ẽr el), *n.* an ocean food fish.

mackinaw (mak' i nô), *n.* a double-breasted jacket of heavy woolen material.

mackintosh (mak' in tosh), *n.* a waterproof overcoat made of thin rubber-coated cloth.

macrocosm (mak' rō kozm), *n.* the whole universe: opposite of *microcosm.*

***macron** (mā' kron), *n.* the short, straight horizontal line (¯) placed over a vowel to indicate that it is pronounced with a long sound.

mad (mad), *adj.* mentally disordered, insane; having rabies, rabid, as a *mad* dog; crazy, as a *mad* enterprise; disorderly, as a *mad* rush; enraged, angry, as to be *mad* at injustice.

madam (mad' am), *n.* a complimentary title or form of courteous address to a lady.

***madame** (mad' am), *n.* [*pl.* mesdames] the French word from which English *madam* comes.

madden (mad' n), *v.t.* to make mad, as if crazy with fury, infuriate, enrage.

***mademoiselle** (mȧd mwȧ zel'), *n.* a title of courtesy given in France to a young woman; miss.

madness (mad' nes), *n.* insanity; folly.

Syn. Frenzy, rage, fury. *Madness* is a confirmed derangement in the organ of thought; *frenzy* is a temporary derangement, coming from the violence of a disease or passion. *Rage* refers more immediately to the anger or agitation that exists within the mind; *fury,* to that which shows itself outwardly. A person contains or stifles his *rage,* but his *fury* breaks into some form of open violence, in word or act.

Madonna (ma don′ a), *n.* [*pl.* Madonnas] a representation of the Virgin Mary, usually with the infant Christ; (*not cap.*) madame, my lady.

maelstrom (māl′ strom), *n.* a whirlpool, a turmoil; any destructive far-reaching influence.

***magazine** (mag *a* zēn′), *n.* a warehouse; place for storing military supplies, especially ammunition; a chamber in a gun; a periodical publication.

***magenta** (m*a* jen′ t*a*), *n.* a red dye obtained from coal tar; the purplish red color of this dye.

maggot (mag′ ut), *n.* the grublike larva of certain insects, as the housefly, especially one that hatches in decaying matter, as meat.

magic (maj′ ik), *n.* the art of producing results through the help of superhuman beings or the occult forces of nature, sorcery, witchcraft.

magic (maj′ ik), or **magical** (maj′ i kal), *adj.* relating to or produced by supernatural means; exercising magic; charming, bewitching.

magician (ma jish′ an), *n.* one skilled in magic, a sorcerer; one who does sleight-of-hand tricks in a public performance.

magic lantern (maj′ ik lan′ tērn), a machine which by means of lenses and a light throws pictures on a screen in a darkened room.

magisterial (maj is tēr′ i al), *adj.* pertaining to a master or a magistrate.

***magistracy** (maj′ is tr*a* si), *n.* [*pl.* magistracies] the office or dignity of a magistrate; magistrates collectively.

magistrate (maj′ is trāt), *n.* a civil officer invested with certain judicial and executive powers; a justice of the peace.

magma (mag′ m*a*), *n.* the molten or fused mass from which igneous rocks were formed.

magnanimity (mag n*a* nim′ i ti), *n.* a combination of fine qualities of mind and soul; freedom from petty ways of thinking and acting.

magnanimous (mag nan′ i mus), *adj.* great-minded; liberal, generous.

***magnate** (mag′ nāt), *n.* a person prominent and influential in a major industry, as a steel *magnate.*

***magnesia** (mag nē′ sh*a*), *n.* a white tasteless earthy substance, oxide of magnesium, used to correct acid conditions in the body and in making asbestos.

magnesium (mag nē′ shi um), *n.* a silvery white metallic element, used in signaling and photography because of the powerful light with which it flares.

***magnet** (mag′ net), *n.* the loadstone, a kind of iron ore that has the power to attract iron; a piece of steel or iron artificially endowed with this property.

magnetic (mag-net′ ik), *adj.* pertaining to a magnet or magnetism; having the power to attract iron; having great powers of attraction, winning, as a *magnetic* personality.

magnetism (mag′ net izm), *n.* the property possessed by various materials, as loadstone and steel, of attracting and repelling each other accrding to certain physical laws; any kind of attraction or power to attract; mesmerism.

magnetize (mag′ ne tīz), *v.t.* to endow with the power to attract iron; to make a magnet of.

magneto (mag nē′ tō), *n.* a dynamo generating current for the ignition in an internal combustion engine.

magnification (mag ni fi kā′ shun), *n.* the apparent enlargement obtained by viewing through a magnifying lens; the state of being magnified or exalted.

magnificence (mag nif′ i sens), *n.* grandeur, splendor of appearance or surroundings.

Syn. Splendor, pomp. *Magnificence* lies not only in the number and extent of the objects presented, but in the degree of richness as to their coloring and quality. *Splendor* is but a characteristic of magnificence, attached to such objects as dazzle the eye by the quantity of light, or the beauty and strength of coloring. *Pomp* signifies formality and ceremony.

magnificent (mag nif′ i sent), *adj.* grand in appearance, splendid; exalted, noble.

magnify (mag′ ni fī), *v.t.* to increase the apparent size of, as by viewing through a lens; actually to enlarge; to exaggerate.

magniloquent (mag nil′ ō kwent), *adj.* pompous in speech, bombastic.

magnitude (mag′ ni tūd), *n.* size, greatness of bulk or extent; importance.

***magnolia** (mag nō′ li *a*), *n.* a tree with handsome foliage and large pink or white flowers.

magpie (mag′ pī), *n.* a black and white chattering bird of the crow family.

mahogany (m*a* hog′ *a* ni), *n.* a tree of tropical America with very hard dark reddish brown wood; the wood of this tree.

maid (mād), *n.* a young unmarried woman; a female servant.

maiden (mād′ n), *n.* an unmarried girl or woman.

maiden (mād′ n), *adj.* pertaining to or like a maiden, unused; first, as a ship's *maiden* voyage.

maidenhair (mād′ n hâr), *n.* a handsome and delicately leafed fern.

maidenly (mād′ n li), *adj.* like, or suitable to, a maiden, modest.

mail (māl), *n.* defensive body armor of steel, either in plates or in network.

mail (māl), *n.* a government system of conveying letters and packages; the matter thus carried.

mail (māl), *v.t.* to post or send by mail.

maim (mām), *v.t.* to cripple or mutilate.

main (mān), *n.* the ocean; the essential point; strength or power, as with might and *main;* the principal pipe in a water system.

main (mān), *adj.* principal, as a *main* line; sheer, as by *main* strength.

mainmast (mān′ mȧst), *n.* the principal mast in a sailing vessel; in vessels having more than two masts, the *mainmast* is the second from the bow.

mainsail (mān′ sāl), *n.* the big sail on the mainmast of a fore-and-aft rigged vessel; the lowest and largest sail on the mainmast of a square-rigged vessel.

mainstay (mān′ stā), *n.* the stay or big rope from the maintop to the foot of the foremast; any main support, as her son is the *mainstay* of her old age.

maintop (mān′ top), *n.* the square platform at the head of the lower mainmast of a ship.

maintain (mān tān′), *v.t.* to support, sustain.

***maintenance** (mān′ tē nans), *n.* sustenance, support; defense; means of sustenance; upkeep.

maize (māz), *n.* Indian corn.

majestic (m*a* jes′ tik), *adj.* having great dignity of person or mien; stately, grand.

majesty (maj′ es ti), *n.* [*pl.* majesties] sovereignty; a king or queen, emperor or empress; grandeur, nobility: *Majesty,* the title of address of a sovereign, as Your *Majesty,* His *Majesty.*

***majolica** (m*a* jol′ i k*a*), *n.* a fine decorative kind of pottery with ornamental glazed coating.

major (mā′ jēr), *n.* an army officer next in rank above a captain; a course of study in which a high school or college student specializes.

major (mā′ jēr), *adj.* greater in number, amount, extent, rank or importance.

major general (mā′ jer jen′ ēr al), an army officer next in rank below a lieutenant general and next above a brigadier general.

majority (m*a* jor′ i ti), *n.* a number greater than half of a given number; the difference between this number and the remainder of the total, as a *majority* of 189; the status of legal age, 21 years; the rank and office of a military major.

***make** (māk), *n.* shape or style of construction; brand or manufacturing source, as this *make* of shoe; character, disposition.

make (māk), *v.i. and v.t.* to move or tend, as peace *makes* for prosperity; to create, fashion or compose, as to *make* dresses or poems; to gain, as to *make* friends or profits; to establish in position, as his courage will *make* or break him; to come to, arrive at, as to *make* the harbor; to constitute, amount to, as 60 minutes *make* an hour.

makeshift (māk′ shift), *n.* a temporary expedient.

makeshift (māk′ shift), *adj.* temporarily usable.

maladjustment (mal *a* just′ ment), *n.* lack of fitness or harmony; unsuitability to environment or situation.

***maladroit** (mal a droit′), *adj.* unskilful, clumsy, awkward.

malady (mal′ *a* di), *n.* [*pl.* maladies] any illness of mind or body.

***malapropos** (mal ap rō pō′), *adj.* inappropriate.

malapropos (mal ap rō pō′), *adv.* inappropriately.

***malaria** (m*a* lâr′ i *a*), *n.* a disease produced by the bite of a certain mosquito and accompanied by great exhaustion, sweats and intermittent chills and fever.

malcontent (mal′ kon tent), *n.* one who is always discontented with things as they are.

malcontent (mal′ kon tent), *adj.* dissatisfied, especially with the established order, rebellious.

male (māl), *n.* a person, plant or animal of the male sex.

male (māl), *adj.* belonging to the sex that begets young: opposite of *female;* made up of men, as a *male* quartet.

***malediction** (mal ē dik′ shun), *n.* the act of calling evil upon anyone, a curse: opposite of *benediction.*

malefaction (mal ē fak′ shun), *n.* the doing of evil; an evil deed.

malefactor (mal′ ē fak tēr), *n.* a doer of evil, criminal.

***malevolence** (m*a* lev′ ō lens), *n.* ill will; desire to injure others.

malevolent (m*a* lev′ ō lent), *adj.* malicious; wishing evil to others.

Syn. Malicious. To be *malevolent* is to have evil so deeply rooted in the character as to color one's intentions and influence; *malicious* means full of hate and spite. *Malicious* acts and sayings are petty and may express only a temporary spite; but a *malevolent* man wishes evil and radiates evil.

***malfeasance** (mal fē′ zans), *n.* a wrong doing, especially an illegal act performed by one in public office.

malice (mal′ is), *n.* spite, ill will.

malicious (m*a* lish′ us), *adj.* spiteful; done or said from spiteful or mischievous motives.

malign (m*a* līn′), *v.t.* to speak evil of, slander, defame.

malignant (m*a* lig′ nant), *adj.* maliciously disposed; tending to cause death, virulent, as a *malignant* tumor.

malignity (m*a* lig′ ni ti), *n.* the state of being malignant, virulence.

***mall** (môl), *n.* a mallet used in the game of pall-mall, played in an alley; a shady public walk.

malleable (mal′ ē *a* bl), *adj.* capable of being extended, shaped or worked by hammering or rolling.

mallet (mal′ et), *n.* a short-handled wooden-headed hammer, used for driving a chisel; a long-handled stick with a hammerlike head, used to play croquet.

mallow (mal′ ō), *n.* a genus of plants with large five-petaled showy flowers.

malnutrition (mal nū trish′ un), *n.* undernourishment, due either to lack of food, want of certain necessary elements in the diet or poor assimilation.

malodorus (mal ō′ dēr us), *adj.* having a bad smell.

malpractice (mal prak′ tis), *n.* wrong treatment of a case by a physician or surgeon, or neglect in caring for a patient; illegal action by one engaged in a profession.

***malt** (môlt), *n.* barley or other grain prepared for use in brewing and distilling.

maltreat (mal trēt′), *v.t.* to handle roughly, abuse.

malversation (mal vēr sā′ shun), *n.* fraudulent practices, especially those committed by one in an office of trust.

mammal (mam′ al), *n.* a member of the highest class of vertebrate animals, including man, that nourish their young with milk.

mammon (mam′ un), *n.* worldly gain.

mammoth (mam′ uth), *n.* an extinct species of huge hairy elephant; anything unusually large.

man (man), *n.* [*pl.* men] a human being, especially a mature male human being; the human race, mankind.

man (man), *v.t.* to furnish with men, as to *man* a ship.

manacle (man′ *a* kl), *n.* a handcuff.

manacle (man′ *a* kl), *v.t.* to put handcuffs on.

manage (man′ ij), *v.i. and v.t.* to get along, as I can manage; to administer, conduct, as to *manage* a business.

manageable (man′ ij *a* bl), *adj.* easily controlled.

management (man′ ij ment), *n.* the act of managing or directing; the directing staff of any enterprise or institution.

manager (man′ ij ẽr), *n.* one who directs or conducts anything, as a business.

*__mandamus__ (man dā′ mus), *n.* a writ directing performance of some act, addressed to an individual by a court or by a superior court to a lower court.

mandate (man′ dāt), *n.* an order or command issued upon high authority; an order by a court; the placing or entrusting of a small conquered country's affairs in the hands of a major Power by the League of Nations; tacit instructions to a political party implied in its being voted into power, as Roosevelt's re-election seemed a *mandate* for social legislation.

*__mandatory__ (man′ d*a* tōr i), *adj.* required by authority; obligatory.

mane (mān), *n.* the long hair on the back of a horse's neck, or about the neck of a lion.

*__maneuver__ (m*a* nōō′ vẽr), *n.* an adroit, swift movement of troops or ships in war; any artful course of action; a stratagem.

maneuver (m*a* nōō′ vẽr), *v.i. and v.t.* to contrive and execute swift movements of troops or ships in war; to manage with skill, as to maneuver a battle; to handle or cause to make certain movements, as to *maneuver* troops.

manful (man′ fool), *adj.* sturdy, brave.

*__manganese__ (mang′ g*a* nēz), *n.* a hard, brittle, gray-colored metallic element.

*__mange__ (mānj), *n.* a skin disease of dogs and other animals with hairy coats.

manger (mān′ jẽr), *n.* a feeding trough for horses and cattle.

mangle (mang′ gl), *n.* a machine with rollers to iron clothes.

*__mangle__ (mang′ gl), *v.t.* to lacerate, cut or bruise; to mutilate, to make a botch of.

mangle (mang′ gl), *v.t.* to smooth in a mangle.

mango (mang′ gō), *n.* the yellowish-red fruit of a tropical tree, with thick rind and juicy pulp.

mangosteen (mang′ gō stēn), *n.* a fruit grown in East India and the Philippines, having a thick rind and juicy flesh.

*__mangrove__ (mang′ grōv), *n.* a tropical tree with spreading branches that send down roots which rapidly grow into a dense thicket.

mangy (mān′ ji), *adj.* afflicted with mange.

manhood (man′ hood), *n.* the state of being a man; the qualities that befit a man, as strength and courage.

*__mania__ (mā′ ni *a*), *n.* violent insanity; a craze, as a *mania* for writing.

maniac (mā′ ni ak), *n.* a madman.

*__maniacal__ (m*a* nī′ *a* kl), *adj.* affected with mania, insane, mad.

manicure (man′ i kūr), *n.* one who makes a business of taking care of hands and fingernails; the care of the hands; a treatment to care for the hands.

manicure (man′ i kūr), *v.t.* to treat and care for the hands and fingernails.

manifest (man′ i fest), *n.* a detailed description of a ship's cargo to be shown to the customs officials; an invoice.

manifest (man′ i fest), *v.t.* to show, make clear; to show the list of, as a ship's cargo.

manifest (man′ i fest), *adj.* obvious, apparent, clear to the sight or understanding.

manifesto (man i fes′ tō), *n.* a proclamation by a government or a body of persons concerning political measures or intentions.

manifold (man′ i fōld), *n.* a copy of a paper made by a duplicating machine; a pipe with several outlets for connecting with other pipes.

manifold (man′ i fōld), *v.t.* to make numerous copies of at one time; to multiply.

manifold (man′ i fōld), *adj.* having many sides or phases; multiplied.

manikin (man′ i kin), *n.* a dwarf; a model of the human body for anatomical study; a lay figure used by artists or dressmakers; a mannequin or live model for displaying clothes.

manila (m*a* nil′ *a*), *n.* a Philippine cigar or cheroot; a hemplike fiber obtained from a Philippine tree, used in making ropes, textiles and paper.

manipulate (m*a* nip′ ū lāt), *v.t.* to operate by means of the hands; manage in a clever way so as to bring about a desired effect.

manipulation (m*a* nip ū lā′ shun), *n.* the act of doing things with the hands; clever management of affairs to attain one's ends.

mankind (man kīnd′), *n.* the human race; men in general as distinguished from women in general.

manly (man′ li), *adj.* [*comp.* manlier, *superl.* manliest] having the qualities proper to a man, courageous, resolute.

Syn. Masculine, male. *Masculine* is the opposite of *feminine* and is applied to what is characteristic of men, as *masculine* clothes, *masculine* reasoning; *manly* is applied to a man's fine qualities and means strong, brave, worthy of a fine man; *male* is the opposite of *female* and refers to sex.

manna (man′ *a*), *n.* the food miraculously supplied to the Israelites in the wilderness; the sap and juice of the flowering ash, used in medicine.

manner (man′ ẽr), *n.* method, mode of action; kind, as what *manner* of man is this; style in literature or art, as in the *manner* of Rubens: *manners,* deportment, social conduct.

mannequin (man′ e kin), *n.* an artist's, tailor's or dressmaker's dummy or lay figure; a woman employed as a model to display clothes.

mannerism (man′ ẽr izm), *n.* a peculiarity of style, action or bearing, especially if it is affected.

man-of-war (man ov wär), *n.* a large fighting ship.

*__manor__ (man′ ẽr), *n.* the district over which a lord held authority in medieval England; a tract of land held by tenants in fee to a landlord.

*__mansard roof__ (man′ särd rōōf), a roof which has on all sides two slopes, the lower being steeper than the upper.

manse (mans), *n.* the residence of a Presbyterian minister in Scotland; any parsonage.

mansion (man′ shun), *n.* a large and stately dwelling house.

manslaughter (man′ slô tẽr), *n.* the killing of a human being, done without malice or premeditation.

mantel (man′ tl), *n.* a narrow ornamental slab above a fireplace.

mantle (man′ tl), *n.* a long cloak; a conical network that becomes incandescent when heated.

mantle (man′ tl), *v.i. and v.t.* to blush; to take on a covering, as of scum; to overspread, as a blush *mantled* her brow; to cover with a cloak; to disguise, conceal.

manual (man′ ū al), *n.* a handbook.

manual (man′ ū al), *adj.* relating to the hands; done by the hands.

manufactory (man ū fak′ tō ri), *n.* [*pl.* manufactories] a place where goods are made by machines and labor; a factory.

manufacture (man ū fak′ tūr), *n.* the conversion of raw materials into goods ready for use; anything manufactured.

manufacture (man ū fak′ tūr), *v.t.* to convert, especially by the use of machinery, raw materials into goods ready for use.

manure (m*a* nūr′), *n.* fertilizer, especially waste matter from stables.

manuscript (man′ ū skript), *n.* a text written by hand, whether with pen, pencil or typewriter; writing as distinguished from print.

manuscript (man′ ū skript), *adj.* written by hand.

many (men′ i), *n.* a large number; a multitude of people.

many (men′ i), *adj.* [*comp.* more, *superl.* most] numerous, consisting of a great number.

manzanilla (man z*a* nil′ *a*), *n.* a kind of small olive usually stuffed with pimentos when pickled.

map (map), *n.* a representation on a flat surface, as paper, of all or part of the surface of the earth, showing land outlines, continents, seas, mountain ranges and rivers, countries, states and cities; a chart of the heavens.

map (map), *v.t.* to delineate in a map; to plan, as to *map* out a tour.

maple (mā′ pl), *n.* a tree valued for its shade, its wood and in some varieties for its sap, from which maple sugar is made; the wood of this tree used in making furniture.

mar (mär), *v.t.* to disfigure, damage.

*__marabou__ (mar′ *a* bōō), *n.* a large African stork with soft feathers used on women's clothing; the long soft feathers of this bird, collectively.

*__maraschino__ (mar *a* skē′ nō), *n.* a cordial made from the fermented juice of the marasca, a small bitter cherry.

marasmus (m*a* raz′ mus), *n.* emaciation.

marathon (mar′ *a* thon), *n.* a footrace of 26 miles, 385 yards; any of various endurance competitions, as in dancing.

maraud (m*a* rôd′), *v.i. and v.t.* to wander in search of plunder, raid; to make a raid upon.

marble (mär′ bl), *n.* a hard limestone, white or colored, and taking a fine polish; a sculpture in marble; a small clay, stone or glass ball used by boys in a game.

marble (mär′ bl), *v.t.* to stain in imitation of marble.

marble (mär′ bl), *adj.* made of or resembling marble; cold and hard like marble.

marbles (mär′blz), *n. pl.* a boys' game played with small balls of clay or glass.

marcel wave (mär sel′ wāv), a style of waving the hair in tiers.

march (märch), *n.* a movement of persons arranged in rank and file and walking in step, as soldiers; the distance traversed in marching from one stopping place to another; a steady onward movement, as the *march* of time; a musical composition timed for marching.

march (märch), *n.* a border or frontier; a country or territory.

march (märch), *v.i. and v.t.* to move with regular steps and all in step, as soldiers; to make march, as he *marched* his men down the road.

*__marchioness__ (mär′ shun es), *n.* the wife or widow of a marquis; a woman holding the rank of a marquis.

marconigram (mär kō′ ni gram), *n.* a message sent by the Marconi system of wireless telegraphy.

mare (mâr), *n.* the female of the horse, donkey or zebra.

margin (mär′ jin), *n.* an edge, a border; the unused edge of a printed page; the difference between the amount of net sales and the cost of goods sold, as a *margin* of profit; an extra amount of time or money allowed, as a *margin* of ten minutes to catch a train.

marginal (mär′ ji nal), *adj.* relating to a margin or edge; placed in the margin, as *marginal* notes.

marigold (mar′ i gōld), *n.* a garden plant with showy flowers, usually golden yellow.

marimba (m*a* rim′ b*a*), *n.* a musical instrument resembling the xylophone.

marine (m*a* rēn′), *n.* a soldier assigned to duty on a warship; a member of the U. S. Marine Corps, under the Navy Department, serving in foreign lands and moving from port to port on warships; the collective shipping of any country; a picture of a scene at sea.

marine (m*a* rēn′), *adj.* relating to the sea.

mariner (ma′ rin ẽr), *n.* a sailor.

marionette (mar i ō net′), *n.* a puppet, a doll made to move and act by strings.

marital (mar′ i tal), *adj.* pertaining to marriage.

***maritime** (mar′ i tīm), *adj.* pertaining to the sea; situated near the sea; relating to navigation or to trade at sea; nautical, as a *maritime* phrase.

marjoram (mär′ jō ram), *n.* a genus of aromatic plants of the mint family, especially the *sweet marjoram,* used as flavoring in cooking.

mark (märk), *n.* a visible sign by which anything is known, as a brand or trade-mark; a distinguishing feature, as a *mark* of genius; a fixed standard; a line or an object that indicates position; a target; any aim or goal; a line or written symbol, as to make *marks* on a page; an ancient gold or silver coin; the German monetary unit; a border, a march, a territory.

mark (märk), *v.i. and v.t.* to make a mark; to notice; to make marks on, as to *mark* a wall; to correct and grade by symbols, as the teacher *marks* the papers; to characterize, show up, as chatter *marks* the fool.

market (mär′ ket), *n.* a public place for the buying and selling of goods; a possible field for the selling of any particular line or kind of goods, as Russia is a *market* for American machinery.

market (mär′ ket), *v.i. and v.t.* to buy or sell in a public place; to put up for sale or to sell in a market.

marksman (märks′ man), *n.* [*pl.* marksmen] one who shoots well, one skilled in hitting the mark.

marksmanship (märks′ man ship), *n.* skill in shooting.

***marline** (mär′ lin), *n.* a small two-stranded cord used for binding cable ends in splicing.

marlinespike (mär′ lin spīk), *n.* a pointed piece of iron used to separate the strands of a rope in splicing.

marmalade (mär′ ma lād), *n.* a jamlike preserve made from the juice, pulp and rind of fruits, as oranges, pineapple, grapefruit.

maroon (ma rōōn′), *v.t.* to leave on a desert island; to leave alone and helpless.

maroon (ma rōōn′), *n.* a rich deep red color.

***marquis** (mär′ kwis), *n.* a nobleman ranking next below a duke and above an earl.

marquise (mär kēz′), *n.* the wife of a marquis; a marchioness.

marquisette (mär kwis et′), *n.* a sheer cloth of cotton or silk.

marriage (mar′ ij), *n.* the state of being legally wedded; the wedding ceremony; any close union.

marrow (mar′ ō), *n.* the soft substance that fills the hollow of a bone; the essence of anything.

marry (mar′ i), *v.i. and v.t.* [*p.t.* and *p.p.* married, *pr.p.* marrying] to wed; to perform the ceremony of uniting a man and woman in wedlock; to espouse, take as husband or wife.

marsh (märsh), *n.* a swampy stretch of land.

marshal (mär′ shal), *n.* an official who directs ceremonies of state; one who organizes and leads a parade; an officer of the law whose duties resemble those of a sheriff; in some European armies, the chief field officer.

marshal (mär′ shal), *v.t.* to arrange in order, as a parade; to set in order for use in argument or debate, as data; to lead.

marsupial (mär sū′ pi al), *n.* an order of mammals, including the kangaroos, bandicoots and opossums, of which the females have a pouch or pocket in the abdomen in which to carry the young.

mart (märt), *n.* a market.

marten (mär′ ten), *n.* a small fur-bearing animal that lives in trees.

martial (mär′ shal), *adj.* warlike.

Syn. Warlike, military. *Martial* describes the pomp, verve and ceremonies of war, as *martial* music, to walk with a *martial* air, *martial* law; *warlike* means literally like war, fond of war, easily provoked to war, or it characterizes the tools and activities of war; *military* describes soldiers and all that pertains to them or to the conduct of war on land.

martin (mär′ tin), *n.* any of various insect-eating birds of the swallow family.

martingale (mär′ tin gāl), *n.* a broad strap passing from the noseband to the girth of a horse, between its forelegs; a part of a ship's rigging, the stay to relieve strain on the stays to the jib boom.

martyr (mär′ tēr), *n.* one who dies rather than give up his faith; one who sacrifices life or possessions for any cause.

martyr (mär′ tēr), *v.t.* to put to death or to cause to suffer for adherence to a belief.

martyrdom (mär′ tēr dum), *n.* the death or sufferings of a martyr.

marvel (mär′ vel), *n.* something extraordinary and astonishing; a prodigy.

marvel (mär′ vel), *v.i.* to feel surprise, wonder or astonishment.

marvelous (mär′ vel us), *adj.* occasioning surprise and wonder; almost incredible, astonishing.

mascot (mas′ kot), *n.* any person or thing supposed to bring good luck.

masculine (mas′ kū lin), *adj.* characteristic of, suitable for or used by men; virile.

mash (mash), *n.* a soft pulpy mass; a mixture of bran and water fed to livestock.

mash (mash), *v.t.* to crush into a soft, pulpy state.

mask (mȧsk), *n.* a complete or partial cover for the face to disguise or protect the wearer, as a gas *mask,* a fencing-*mask;* a cast of the face after death, a death *mask;* a masquerade festival; a masquerader; any pretense or subterfuge.

mask (mȧsk), *v.i. and v.t.* to masquerade; to cover or conceal, as one's face or true feelings and intentions, or a battery of guns.

mason (mā′ sn), *n.* one who works in stone or brick.

masquerade (mȧs kēr ād′), *n.* a festive gathering at which everybody wears a mask; concealment of one's true feelings or intentions; pretence of being what one is not.

masquerade (mȧs kēr ād′), *v.i.* to attend a party where everyone wears a mask; to make a false appearance.

Mass (mas), *n.* celebration of the Eucharist.

mass (mas), *n.* a quantity of matter concentrated as a single body; a number of things taken together as a unit; bulk.

mass (mas), *v.i. and v.t.* to come together in a solid unit; to make into a lump or unit.

masses (mas′ ez), *n.* the people.

***massacre** (mas′ a kēr), *n.* cruel and indiscriminate slaughter of many human beings; butchery.

massacre (mas′ *a* kēr), *v.t.* [*p.t.* and *p.p.* massacred, *pr.p.* massacring] to kill human beings in great numbers with great cruelty.

***massage** (ma säzh′), *n.* a rubbing and kneading of the body to tone the muscles, improve the circulation and promote physical well-being, frequently with remedial purpose and effect.

massage (ma säzh′), *v.t.* to rub and knead the body for remedial or hygienic effect.

***masseur** (ma sûr′), *n.* [*fem.* masseuse (ma sûz′)] one who applies massage.

massive (mas′ iv), *adj.* bulky, weighty; impressive in size.

mast (mȧst), *n.* a long round tapering timber of wood or steel rising from the keel of a ship through the decks, to support the rigging and sails, a spar.

master (mȧs′ tēr), *n.* one who commands others; a director, as of a school; one who has the upper hand in a contest; an artist of supreme eminence, as the old *masters;* in university rating, one between a bachelor and a doctor, as *Master* of Arts.

master (mȧs′ tēr), *v.t.* to subdue, overcome, as to *master* a lion or a habit; to learn thoroughly, as to *master* a lesson or a language.

master (mȧs′ tēr), *adj.* showing the power or skill of a master, as a *master* builder, *master* mechanic, a *master*piece.

masterful (mȧs′ tēr fool), *adj.* having the qualities, as skill or power, of a master; inclined to use power, domineering.

mastery (mȧs′ tēr i), *n.* command of a situation; art or skill; conquest.

masthead (mȧst′ hed), *n.* the top of a mast, especially the top of a lower mast.

mastic (mas′ tik), *n.* a tree that produces a valuable resin; the resin of the mastic tree, used in varnishes and drugs.

***masticate** (mas′ ti kāt), *v.t.* to chew.

***mastiff** (mȧs′ tif), *n.* a large smooth-coated dog, esteemed as a watchdog.

mastodon (mas′ tō don), *n.* a prehistoric extinct animal resembling an elephant, with long tusks and molar teeth peculiar for their projections; anything huge and monstrous.

mat (mat), *n.* a flat piece of heavy woven fabric; such a piece of fabric laid in a doorway on which to wipe the feet; a small piece of knitted or woven material, used for ornament or for hot dishes; anything closely woven as a tangle of weeds; a matrix for producing stereotypes.

mat (mat), *v.i. and v.t.* to twist, weave or form into a mat; to cover or furnish with mats.

matador (mat′ *a* dōr), *n.* the man picked to kill the bull in a bullfight.

match (mach), *n.* anything that is exactly like another; an equal, as he has never met his *match;* a contest; marriage.

match (mach), *n.* a small piece of wood or heavy paper tipped with a substance easily ignited by friction.

match (mach), *v.i. and v.t.* to be exactly alike, as these ribbons *match* in color; to equal, as his income *matches* mine; to find or supply something like, as *match* this material; to arrange a contest for, as they *matched* him against the champion.

matchless (mach′ les), *adj.* unequalled, without a rival, peerless.

matchmaker (mach′ māk ēr), *n.* one who manufactures matches, brings about a marriage or arranges contests as in sport.

mate (māt), *n.* a companion or associate; a husband or wife; an officer ranking next below the captain on merchant vessels; a petty naval officer, as a gunner's *mate;* one of a pair, as the *mate* to a stocking.

mate (māt), *n.* in chess, a checkmate, winning the game, or stalemate, making it a draw.

mate (māt), *v.t.* to marry; to pair, as animals, for breeding.

mate (māt), *v.t.* in chess, to place the opponent's king in a position under attack and from which he cannot escape.

material (ma tēr′ ial), *n.* the substance of which anything consists; data, subject matter, as *material* for a book; fabric, as *material* for a dress.

material (ma tēr′ i al), *adj.* consisting of matter, not spiritual; essential, as it is a *material* point in my argument; pertaining to physical existence, as *material* needs.

materialism (ma tēr′ i al izm), *n.* the doctrine that all phenomena are phases of physical existence; a tendency to emphasize physical or business considerations and neglect those of the mind and soul.

maternal (ma tûr′ nal), *adj.* motherly.

maternity (ma tûr′ ni ti), *n.* the state of being a mother; character or relationship of a mother.

mathematical (math ē mat′ i kal), *adj.* relating to mathematics; done by means of mathematics; exact, precise.

mathematics (math ē mat′ iks), *n. pl.* the science of quantities and magnitudes, the relations between them, and the methods by which unknown quantities can be found from those known or supposed, expressed or calculated in numbers or other symbols.

matin (mat′ in), *adj.* pertaining to the morning.

matins (mat′ inz), *n. pl.* morning prayers; prayers for the morning, said at midnight.

***matinee** (mat i nā′), *n.* a reception, concert or dramatic performance in the afternoon.

***matriarch** (mā tri ärk), *n.* a woman who is head of a tribe, clan or family.

***matricide** (mā′ tri sīd), *n.* the murder of one's mother; one who murders his mother.

matriculate (ma trik′ ū lāt), *v.i.* and v.t. to register as a successful applicant for admittance to college; to record on the college rolls as admitted.

matrimonial (mat ri mō′ ni al), *adj.* pertaining to marriage.

matrimony (mat′ ri mō ni), *n.* marriage.

***matrix** (mā′ triks), *n.* [*pl.* matrices] a cavity in which anything is formed or cast; a mold in which type is cast for a typesetting machine; a mold or mat, usually of papier mâché, for making a stereotype.

***matron** (mā′ trun), *n.* a married woman, especially one who has had children; a woman who does the housekeeping in an institution, such as a hospital.

matted (mat′ ed), *adj.* covered with mats or matting; tangled, as *matted* hair.

matter (mat′ ẽr), *n.* that which occupies space and is perceptible by the senses; substance: the opposite of mind or spirit; anything sent through the mail; affair, as it's a small *matter;* difficulty, as what's the *matter;* an instance or occasion, as no laughing *matter, matter* for thought; pus.

matter (mat′ ẽr), *v.i.* to signify; to be of importance.

matting (mat′ ing), *n.* mats collectively; material of which mats are made.

mattock (mat′ uk), *n.* a pickax with one end flat for use in grubbing.

***mattress** (mat′ res), *n.* a case made of heavy cloth and stuffed with soft materials and used to sleep upon or to make a bed comfortable; a frame covered with heavy material and filled with springs, for the same purpose.

***mature** (ma tūr′), *adj.* full-grown; ripe; perfected, as a *mature* plan; pertaining to full development, as a *mature* person.

mature (ma tūr′), *v.i. and v.t.* to reach full growth; to become ripe; to become due, as a note; to hasten the growth or ripening of.

maturity (ma tu′ ri ti), *n.* [*pl.* maturities] the state of being full-grown or ripe; the period of full growth and development; ripeness; time for payment of principal, as on insurance or an issue of bonds.

***matutinal** (ma tū′ ti nal), *adj.* pertaining to the morning; happening early in the day.

maudlin (môd′ lin), *adj.* easily moved to tears; weakly sentimental.

maul (môl), *n.* a large hammer or mallet used in driving spikes.

***mausoleum** (mô sō lē′ um), *n.* a stately tomb.

***mauve** (mōv), *n.* a soft lilac, violet or purple color.

maw (mô), *n.* the stomach of an animal: sometimes used to denote the jaws, gullet and stomach together.

mawkish (môk′ ish), *adj.* affectedly or sickishly sentimental.

maxim (mak′ sim), *n.* an established principle or general truth; a wise or proverbial saying.

maximum (mak′ si mum), *n.* the greatest possible or attainable number or quantity: opposite of *minimum.*

may (mā), *v. aux.* [*p.t.* might] to be possible, as it *may* happen; to be permitted, as you *may* have it; would that, as *may* it happen soon.

maybe (mā′ bē), *adv.* perhaps.

mayonnaise (mā o nāz′), *n.* a sauce of oil and egg yolk used on salads.

***mayor** (mā′ ẽr), *n.* the chief administrative officer of a municipality.

***mayoralty** (mā ẽr al′ ti), *n.* the status or the term of office of a mayor.

maze (māz), *n.* a labyrinth; a bewildering tangle of lines or ideas.

mead (mēd), *n.* a meadow.

meadow (med′ ō), *n.* a tract of rich pasture land; grassland; low land near water, covered with coarse growths of grasses, as salt *meadows.*

meager (mē′ gẽr), *adj.* lean, thin, poor, barren.

meal (mēl), *n.* coarsely ground grain; a repast; the food eaten at one time, as at breakfast, lunch or dinner.

mealy (mēl′ i), *adj.* [*comp.* mealier, *superl.* mealiest] consisting of coarsely ground grain, or resembling it.

mean (mēn), *n.* the middle point or situation; an approximate or adjusted average.

mean (mēn), *v.i. and v.t.* to be disposed, as to *mean* well; to intend, as he *means* trouble; to design, as he *meant* it as a compliment; to imply, as money *means* power; to signify, as the German ja *means* yes, what he said *means* nothing.

mean (mēn), *adj.* lacking in position, power, dignity, character or generosity, as a *mean* station in life, a *mean* manner, *mean* with his money.

meaning (mēn′ ing), *n.* significance, as the words yes and yea have the same *meaning.*

means (mēnz), *n. pl.* methods; ways of doing, as there are many *means* for acquiring wealth; middle terms in a proportion, as in 2:4=6:8 the product of the *means* equals the product of the extremes; resources, substance, as his *means* were limited.

meander (mē an′ dẽr), *v.i.* to flow in a winding course; to wander aimlessly.

meantime (mēn′ tīm), *n.* an intervening space of time, as in the *meantime.*

meantime (mēn′ tīm), *adv.* in the intervening time, as *meantime* I shall be considering the matter.

measles (mē′ zlz), *n. pl.* an infectious disease, with fever, and small red spots on the skin.

***measure** (mezh′ ẽr), *n.* the standard by which the size, extent or volume of anything is found and expressed; the extent or dimensions of anything; any device used to find size, extent or capacity, as a foot rule or a quart *measure;* a system of measuring, as linear *measure;* a limit, as the *measure* of life is 70 years; a legislative enactment, as a reform *measure;* rhythm in poetry or music.

measure (mezh′ ẽr), *v.i. and v.t.* to ascertain the dimensions or volume, as it's better to *measure* than to guess; to compute the extent or quantity of, as to *measure* a board.

meat (mēt), *n.* the flesh of animals used as food; gist, as the *meat* of an argument.

meaty (mēt′ i), *adj.* [*comp.* meatier, *superl.* meatiest] containing meat, like meat, nourishing; substantial, pithy, as a *meaty* essay.

***mechanic** (mē kan′ ik), *n.* a skilled workman in machinery; an artisan.

mechanical (mē kan′ i kal), *adj.* operated by machinery; done in a machinelike way or acting in a machinelike way; interested in machinery, as he has a *mechanical* turn of mind.

mechanics (mē kan′ iks), *n. pl.* the science of the action of forces on bodies and the application of the laws of motion to the working of machines.

mechanism (mek′ a nizm), *n.* the make-up of a machine or of machinery; a mechanical apparatus; an equipment of machinery.

medal (med′ l), *n.* a coin-shaped piece of metal impressed with a device or an inscription commemorating some distinguished event or person.

medallion (mē dal′ yun), *n.* a large medal, or a tablet with a design in relief.

meddle (med′ l), *v.i.* to interfere without right or necessity; to interpose officiously or impertinently.

meddlesome (med′ l sum), *adj.* inclined to meddle, officious.

median (mē′ di an), *n.* a median number, point or line.

median (mē′ di an), *adj.* being intermediate; indicating a relation between higher and lower items; having the nature of an average but not as exact.

mediate (mē′ di āt), *v.i. and v.t.* to be judge or peacemaker between other parties as equally interested in each; to bring about by acting as peace maker in a quarrel or war, as to *mediate* an agreement.

mediation (mē di ā′ shun), *n.* intercession, peacemaking.

medicable (med′ i ka bl), *adj.* capable of being treated with medicine.

medical (med′ i kal), *adj.* pertaining to medicine or its use.

***medicinal** (mē dis′ i nal), *adj.* having the properties of medicine, curative or healing.

medicine (med′ i sin), *n.* any preparation used to cure disease; the science of curing disease.

***medieval** (mē di ē′ val), *adj.* pertaining to the Middle Ages.

***mediocre** (mē′ di ō kẽr), *adj.* of medium excellence, ordinary.

meditate (med′ i tāt), *v.i. and v.t.* to reflect, ponder, as to *meditate* on repentance; to think upon, plan, consider, as to *meditate* a change.

meditation (med i tā′ shun), *n.* sustained contemplation.

medium (mē′ di um), *n.* that which rests between extremes; an intervening substance through which force acts; agency; a person claiming to receive communications from the dead.

medium (mē′ di um), *adj.* occupying a position between extremes; average; ordinary, as a *medium* grade of goods.

medley (med′ li), *n.* a confused mixture of unlike ingredients; parts of tunes put together to make a new tune.

medulla (mē dul′ a), *n.* the lowest part of the brain that connects with the spinal cord: also called *medulla oblongata.*

meed (mēd), *n.* recompense; reward of merit.

meek (mēk), *adj.* modest, mild, submissive.

***meerschaum** (mẽr′ shum), *n.* a light claylike mineral substance found in Spain and Asia Minor; a pipe with a bowl made of this substance.

meet (mēt), *n.* a gathering, meeting, as a hunt *meet,* a track *meet.*

meet (mēt), *v.i. and v.t.* to come upon, in approaching from opposite directions; to come face to face with; to be introduced to; to confront in battle; to pay, as a bill; to conform to, as to *meet* the rules.

***megalomania** (meg a lō mā′ nia), *n.* a craze of personal greatness, delusions of grandeur; strong tendency to exaggeration.

megaphone (meg′ a fōn), *n.* a large funnel used to speak through in order to magnify sound.

melancholy (mel′ an kol i), *n.* despondency; a state of meditative sadness.

melancholy (mel′ an kol i), *adj.* depressed; feeling or causing or arising from a feeling of sadness, as a *melancholy* person, a *melancholy* poem.

melee (mā lā′), *n.* a confused fight between many hand to hand combatants.

melinite (mel′ i nīt), *n.* an explosive.

***meliorate** (mēl′ yō rāt), *v.i. and v.t.* to grow better; to cause to improve; to make more tolerable.

mellifluous (me lif′ lū us), *adj.* honey-sweet; smooth-flowing, as speech.

mellow (mel′ ō), *v.i. and v.t.* to become soft and tender, to ripen; to become sweetened with age.

mellow (mel′ ō), *adj.* soft and tender because ripe; mature, sweet because mature.

melodious (mē lō′ di us), *adj.* having or making melody, musical.

***melodrama** (mel ō drä ma), *n.* a sensational play; any literary composition marked by sensational characters and incident.

melody (mel′ ō di), *n.* [*pl.* melodies] a song or tune; the principal part in a harmonized composition.

melon (mel′ un), *n.* a trailing plant with juicy fruit, as the musk*melon* and water*melon.*

melt (melt), *v.i. and v.t.* to change, or cause to change, from a solid to a liquid state; to soften, as the story *melted* his heart.

member (mem′ bẽr), *n.* a limb or organ of the body; a single part; one who belongs to an association.

membrane (mem′ brān), *n.* a thin fold or layer of animal tissue forming a covering for some part or organ.

memento (mē men′ tō), *n.* [*pl.* mementos] a souvenir, a token.

***memoir** (mem′ wär), *n.* a history written from personal experience, knowledge and memory.

***memorable** (mem′ ō ra bl), *adj.* worthy of being remembered.

memorandum (mem ō ran′ dum), *n.* a note of something to be remembered.

memorial (mē mō′ ri al), *n.* something intended to preserve a person or event in the people's memory; a written statement addressed to a government, or by one government to another, often containing a petition.

memorial (mē mō′ ri al), *adj.* of or pertaining to memory; said or done in remembrance, commemorative.

memorize (mem′ ō rīz), *v.t.* to commit to memory, learn by heart.

***memory** (mem′ ō ri), *n.* [*pl.* memories] the power of remembering or recalling to the mind things that are past; something remembered, as a happy *memory.*

Syn. Remembrance, recollection, reminiscence. *Memory* is the general term for any mental recalling of experience; *remembrance* is the state of recalling or keeping in mind; *recollection* is the result of consciously recalling things past; *reminiscence* is a looking back on personal experiences.

Ant. Forgetfulness.

menace (men′ is), *n.* a threat, an impending danger.

menace (men′ is), *v.i. and v.t.* to threaten.

***menagerie** (mē naj′ ẽr i), *n.* a place where animals are kept for exhibition; a collection of wild or strange animals.

mend (mend), *n.* improvement, as on the *mend;* a repair, as he made a good *mend.*

mend (mend), *v.i. and v.t.* to repair as to *mend* a shoe; to improve, reform, as *mend* your ways.

mendacious (men dā′ shus), *adj.* false; given to falsehood.

mendicant (men′ di kant), *n.* a beggar.

mendicant (men′ di kant), *adj.* begging.

***menial** (mē′ ni al), *n.* a servant.

menial (mē′ ni al), *adj.* pertaining to servants; servile.

***meningitis** (men in jī′ tis), *n.* inflammation of the membranes enclosing the brain and spinal cord.

***mensuration** (men shoo rā′ shun), *n.* the act of measuring; a system of measurement; the branch of mathematics that deals with length, area and volume.

mental (men′ tal), *adj.* pertaining to the mind.

mentality (men tal′ i ti), *n.* mental capacity; mind as a part of one's individuality.

***menthol** (men′ thōl), *n.* a crystalline substance derived from oil of peppermint, used in medicines and toilet preparations.

mention (men′ shun), *n.* passing notice; incidental reference.

mention (men′ shun), *v.t.* to speak of very briefly; to name.

***mentor** (men′ tẽr), *n.* a wise and loyal counsellor.

***menu** (mē nū′ or men′ ū), *n.* a bill of fare.

***mercantile** (mûr′ kan til), *adj.* commercial; pertaining to trade or to merchants.

Syn. Commercial. *Mercantile* activities have to do with the actual buying and selling of goods; *commercial* relates to the theory and practice of commerce. We speak of a *mercantile* house, a *mercantile* situation, but of a *commercial* education, a *commercial* people.

mercenary (mûr′ sē ner i), *n.* [*pl.* mercenaries] a soldier hired into the service of a foreign country; one who serves only for pay.

mercenary (mûr′ sē ner i), *adj.* acting always and only for gain; springing from greed for gain, as a *mercenary* crime.

***merchandise** (mûr′ chan dīz), *n.* goods bought and sold; articles of trade.

merchant (mûr′ chant), *n.* a trader; one who carries stocks of goods for sale.

merchant marine (mûr′ chant ma rēn′), all the vessels of a nation engaged in commerce or trade; the personnel of these vessels.

merciful (mûr′ si fool), *adj.* showing mercy, lenient, compassionate.

merciless (mûr′ si les), *adj.* without mercy, unfeeling, cruel.

mercurial (mûr kū′ ri al), *adj.* having the properties of mercury or quicksilver; fickle, changeable.

***mercury** (mûr′ kū ri), *n.* quicksilver, a heavy silver-white metallic element, liquid at ordinary temperatures.

mercy (mûr′ si), *n.* [*pl.* mercies] the disposition to forgive, spare or pity; compassion; an act of clemency; compassionate treatment.

Syn. Clemency, leniency, lenity. *Mercy* is expressed in compassionate and forgiving treatment of offenders and pity and help for those undergoing suffering; *clemency* is a weaker word than *mercy;* it means *mildness* especially in meting out penalties; *lenity* is very mild; *leniency* is an easygoing avoidance of severity.

Ant. Cruelty, harshness.

mere (mēr), *adj.* [*superl.* merest] such and no more, simple, nothing but, as a *mere* child.

merge (merj), *v.i. and v.t.* to unite; to unite with; to blend; to join together.

merger (mer′ jẽr), *n.* combination of several business concerns under central control.

***meridian** (me rid′ i an), *n.* an imaginary circle about the earth, passing through the poles; a line on a map representing such a circle.

meridian (me rid′ i an), *adj.* pertaining to midday.

***meringue** (mē rang′), *n.* a frosting made of sugar and the beaten white of egg.

merino (me rē′ nō), *n.* [*pl.* merinos] a breed of sheep with a fine wool.

merit (mer′ it), *n.* excellence; worthiness of commendation or reward.

meritorious (mer i tō′ ri us), *adj.* having merit; worthy of commendation or reward.

mermaid (mẽr′ mād), *n.* a fabled marine creature having the upper part like a woman and the lower part like a fish.

merriment (mer′ i ment), *n.* fun, gaiety.

***merry** (mer′ i), *adj.* [*comp.* merrier, *superl.* merriest] full of mirth and good humor; jolly.

merry-go-round (mer′ i gō round), *n.* a circular, revolving frame fitted with wooden animals or seats on which to ride.

mesh (mesh), *n.* an opening between threads of a net; the engagement of the teeth of gears.

mesh (mesh), *v.i. and v.t.* to engage, as gear teeth; to entangle, as if in a net.

mesmerize (mes′ mẽr īz), *v.t.* to induce an abnormal state of the nervous system in which the thoughts and acts of the patient are controlled by the will of the operator, to hypnotize.

mess (mes), *n.* a number of persons who eat together, especially in the military and naval services; the meal for which they assemble; a state of disorder and confusion; a disagreeable mixture of things.

message (mes′ ij), *n.* a communication, written or oral; a formal communication from a chief executive to a legislative body, as the President's *message* to Congress.

messenger (mes′ en jẽr), *n.* one who carries messages.

***metabolism** (me tab′ ō lizm), *n.* the process by which the cells or tissues of a living body transform food materials into their own vital substance.

metacarpus (met *a* kar′ pus), *n.* the part of the hand between the wrists and the fingers.

metal (met′ l), *n.* a substance, usually an element and usually heavy and solid, having any of certain characteristics, such as luster, ductility, malleability, fusibility by heat, conduction of electricity, as gold, silver, iron, tin, brass are *metals;* platinum is a precious *metal.*

***metal** (met′ l), *adj.* made of metal.

metallic (mē tal′ ik), *adj.* pertaining to, consisting of, or like metal.

***metallurgy** (met′ l ûr ji), *n.* the art or process of separating metals from their ores and of using metals and alloys in manufacture; metalworking.

metamorphose (met *a* môr′ fōz), *v.t. and v.i.* to change the form or structure of; to change in form or structure.

***metamorphosis** (met *a* môr′ fō sis), *n.* change of form or structure; transformation, as of a caterpillar into a butterfly.

metaphysics (met *a* fiz′ iks), *n. pl.* mental philosophy, dealing with the nature and causes of being and knowing.

***metempsychosis** (mē temp si kō′ sis), *n.* the passage of a soul from one body into another at time of death; transmigration of souls.

***meteor** (mē′ tē ẽr), *n.* a celestial body entering the earth's atmosphere with great speed and becoming hot and glowing with the friction of its passage through the air, as a shooting star.

meteoric (mē tē or′ ik), *adj.* pertaining to, caused by or like a shooting star; momentarily dazzling and wonderful.

***meteorite** (mē′ tē ẽr īt), *n.* a stony or metallic mass which has fallen upon the earth out of space.

***meteorology** (mē tē ẽr ol′ ō ji), *n.* the science that treats of atmospheric conditions and phenomena, the science of the weather.

meter (mē′ tẽr), *n.* an instrument that registers the measurement of currents that pass through it, as a water *meter,* electric *meter,* gas *meter.*

meter (mē′ tẽr), *n.* rhythm, the measured arrangement of syllables in a line of verse, with certain stresses or lengths of sound; rhythm and time.

meter or **metre** (mē′ tẽr), *n.* the unit of length in the metric system, equal to 39.37 inches.

methane (meth′ ān), *n.* an odorless, gaseous hydrocarbon, rising from decomposing matter in marshes and mines.

methinks (mē thingks′), *impersonal v.* [*p.t.* methought] it seems to me.

method (meth′ ud), *n.* a systematic arrangement of things or ideas; a way of doing.

methodical (mē thod′ i kal), *adj.* systematic.

methyl (meth′ il), *n.* the hydrocarbon radical of which methane is the hydride.

methyl alcohol (meth′ il al′ kō hôl), a poisonous alcohol obtained by the distilling of wood; methanol.

metric (met′ rik), *adj.* involving measurement; pertaining to the decimal system of weights and measures, which uses the meter as a measure of length and the gram as a measure of weight.

metrical (met′ ri kal), *adj.* pertaining to rhythm; pertaining to measure, metric.

metrograph (met′ rō gråf), *n.* an apparatus to register the mileage run by a locomotive and the number and time of its stops.

***metronome** (met′ rō nōm), *n.* an instrument that beats time for music by means of a pendulum run by clockwork.

metropolis (mē trop′ ō lis), *n.* a chief city, in size and activity.

metropolitan (met rō pol′ i tan), *adj.* pertaining to a metropolis.

mettle (met′ l), *n.* the general quality of a man's character, ardor, spirit.

mettlesome (met′ l sum), *adj.* high-spirited.

mew (mū), *n.* a sea gull.

mew (mū), *n.* a cage in which hawks are confined while they are molting, or fowl while they are being fattened.

mew (mū), *n.* the cry of a cat.

mew (mū), *v.i.* to utter a cry like a cat.

mews (mūz), *n. pl.* stables opening upon a court.

***mezzanine** (mez′ *a* nēn), *n.* a mid-floor between two ordinary floors, as the gallery between the main floor and second floor is the *mezzanine.*

***mezzotint** (med′ zō tint), *n.* a variety of copper engraving, producing soft tones in the print.

***mica** (mī′ ka), *n.* a mineral silicate that forms into thin, transparent leaves.

***microbe** (mī′ krōb), *n.* a minute organism, especially a disease-causing germ.

***microcosm** (mī′ krō kozm), *n.* a miniature world, especially mankind as representing the universe.

micrometer (mī krom′ ē tẽr), *n.* an instrument to measure accurately minute distances.

microorganism (mī krō ôr′ gan izm), *n.* a minute organism that can be seen only through the microscope, such as bacteria and protozoa.

microphone (mī′ krō fōn), *n.* a device used in radio broadcasting stations to receive and transmit sounds.

***microscope** (mī′ krō skōp), *n.* an optical instrument that magnifies minute objects so that they can be studied.

mid (mid), *adj.* [*superl.* midmost] middle: usually in combination, as *midday, midnight, mid*-ocean.

middle (mid′ l), *n.* a portion equally distant from the extremes, as in the *middle* of his speech.

middle (mid′ l), *adj.* equally distant from the extremes; being between two others, as the *middle* one of three houses.

middleman (mid′ l man), *n.* one operating between producer and consumer, a jobber, wholesaler, commission merchant or retailer.

middling (mid′ ling), *adj.* of medium size or quality.

middlings (mid′ lingz), *n.* the coarser part of ground wheat flour and bran.

midget (mij′ et), *n.* a very small person, a dwarf.

midriff (mid′ rif), *n.* the diaphragm.

midnight (mid′ nīt), *n.* twelve o'clock at night.

midshipman (mid′ ship man), *n.* one ranking next below a commissioned officer in the U. S. Navy.

midst (midst), *n.* the middle; the very central part thought of as being surrounded, as in the *midst* of danger, in the *midst* of the battle or the feast.

***mien** (mēn), *n.* general appearance, air, manner, bearing.

might (mīt), *n.* great strength, power, force.

might (mīt), *v.i.* past tense of *may.*

***mignonette** (min yun et′), *n.* a garden plant with fragrant greenish-white flowers.

migrate (mī′ grāt), *v.i.* to move from one place to another, or from one country to another, to establish new residence; to move or pass from one region or climate to another, as certain birds and animals do.

mikado (mi kä′ dō), *n.* the title given to the Emperor of Japan by foreigners.

milch (milch), *adj.* yielding milk, as a *milch* cow.

mild (mīld), *adj.* of gentle disposition; moderate, as *mild* weather.

mildew (mil′ dū), *n.* any of certain minute fungi that grow on plants or decaying matter; a disease of plants produced by these fungi; mold growing on cloth, leather and other substances when damp, due to these fungi.

mildew (mil′ dū), *v.t. and v.i.* to cause mildew or become mildewed.

mile (mīl), *n.* a measure of length equal to 5,280 feet, also called the *statute mile;* the *sea mile* or *nautical mile,* 6080.2 feet.

mileage (mīl′ ij), *n.* distance traversed, measured in miles; an allowance of so much per mile to legislators, salesmen for traveling expenses.

militant (mil′ i tant), *adj.* warlike or engaged in war, fighting; aggressive.

militarism (mil′ i t*a* rizm), *n.* the maintenance of a strong army and navy as a national policy; the idealizing of warlike spirit and martial virtues; government by the military class.

military (mil′ i ter i), *adj.* pertaining to soldiers, armies or warfare.

militate (mil′ i tāt), *v.i.* to fight, to be effective, as his past record *militated* against him.

militia (mi lish′ *a*), *n.* a body of civilians enrolled as a military force, drilled and trained for defense, but called into active service only in times of emergency.

milk (milk), *n.* the white fluid produced by female mammals to feed their young; any white fluid resembling milk, as the juice of the *milk*weed, the *milk* of the coconut, *milk* of magnesia.

milksop (milk′ sop), *n.* an effeminate man, a molly coddle.

mill (mil), *n.* a machine that grinds; a building equipped with grinding machinery; a manufacturing plant in other industries, as a steel *mill* or cotton *mill.*

mill (mil), *v.i. and v.t.* to move aimlessly in circles, as cattle; to subject to such operations as are commonly done in a mill, like sawing timber, crushing ore, rolling steel.

millennium (mil len′ i um), *n.* a thousand years: *the millennium,* the 1000 years referred to in Rev. 20: 1-7 as the time when Christ will rule on earth; a period of perfection.

miller (mil′ ēr), *n.* one who operates a mill, especially a flour mill; a moth with wings dusted as if with flour.

milliner (mil′ i nēr), *n.* one who makes and sells women's hats.

***millinery** (mil′ i ne ri), *n.* women's headgear; the business of making and selling women's hats.

million (mil′ yun), *n.* a thousand thousand.

***millionaire** (mil yun âr′), *n.* a man of great fortune, having a million or more dollars.

millrace (mil′ rās), *n.* a swift current of water driving the machinery of a mill.

millstone (mil′ stōn), *n.* one of two flat-faced cylindrical stones between which grain is ground.

mimic (mim′ ik), *n.* one who imitates.

mimic (mim′ ik), *v.t.* [*p.t.* and *p.p.* mimicked, *pr.p* mimicking] to imitate, ape; to ridicule by imitating.

mimicry (mim′ ik ri), *n.* the act of one who mimics.

minaret (min *a* ret′), *n.* a tall, slender turret, from which a muezzin or crier calls Mohammedans to prayer.

mince (mins), *v.t. and v.i.* to cut or chop fine; to utter with voluntary moderation, tone down, as to *mince* words; to walk or talk affectedly and primly.

mincemeat (mins′ mēt), *n.* meat chopped fine and mixed with suet, lemon peel, raisins, to be used as filling for mince pie.

mind (mīnd), *n.* the intellectual reasoning, thinking, remembering and conscious faculty.

mind (mīnd), *v.i. and v.t.* to obey; to be troubled; to be careful, as *mind* your step; to heed; to object to; to obey; to watch or tend, as to *mind* a baby.

mindful (mīnd′ fool), *adj.* bearing in mind, attentive.

mine (mīn), *n.* an excavation in the earth from which minerals are taken; a tunnel dug under a fort or position of enemy troops containing explosives; the explosives planted in a mine; explosives moored at sea, slightly submerged, to destroy enemy ships.

mine (mīn), *v.i. and v.t.* to make a mine; to dig up metals or ores; to set explosives under land or water to damage an enemy; to dig into for ores, as to *mine* a region; to get by digging, as to *mine* coal.

mine (mīn), *possessive form of the personal pronoun I*: belonging to me, as that hat is *mine.*

mineral (min′ ēr al), *n.* any inorganic chemical substance existing naturally; ore; anything not animal or vegetable in nature, though sometimes (coal, for instance) organic in origin.

mineral (min′ ēr al), *adj.* pertaining to, consisting of or impregnated with minerals, as *mineral* water.

mineralogy (min ēr al′ ō ji), *n.* the science that treats of minerals.

mingle (ming′ gl), *v.i. and v.t.* to intermix.

***miniature** (min′ i *a* tūr), *n.* a very small painting, especially a portrait on ivory.

miniature (min′ i *a* tūr), *adj.* diminutive, represented or existing on a very small scale.

minim (min′ im), *n.* the smallest liquid measure, a sixtieth of a fluid dram, about equal to a drop.

minimize (min′ im īz), *v.t.* to reduce to a minimum; to underestimate; to understate.

minimum (min′ i mum), *n.* [*pl.* minima] the least possible quantity: opposite of *maximum.*

mining (mīn′ ing), *n.* the act of making mines or working them.

minion (min′ yun), *n.* a servile attendant or flattering dependent, a favorite; a size of type (7 point).

minister (min′ is tēr), *n.* a clergyman; a diplomatic agent, of lower rank than an ambassador; the head of a governmental department.

minister (min′ is tēr), *v.i.* to serve; to serve as pastor of a church; to *minister* to, to give aid.

ministerial (min is tēr′ i al), *adj.* pertaining to ministry of any kind.

ministry (min′ is tri), *n.* the position of a minister; the clergy collectively.

ministry (min′ is tri), *n.* [*pl.* ministries] a government department presided over by a minister; all the heads of government departments, particularly those forming the cabinet.

mink (mingk), *n.* a carnivorous animal allied to the weasel, yielding a valuable fur.

minnow (min′ ō), *n.* a small freshwater fish.

minor (mīn′ ēr), *n.* a person less than 21 years old.

minor (mīn′ ēr), *adj.* less; smaller; inferior.

***minority** (mi nor′ i ti), *n.* [*pl.* minorities] the smaller of two groups within a total; the party casting less than half the votes in a two-party election.

minority (mi nor′ i ti), *n.* the state of being a minor; the period of life before attaining legal age.

minstrel (min′ strel), *n.* a wandering medieval entertainer who sang songs and accompanied them with harp or lute; a member of a blackface troupe, entertaining audiences with songs and jokes.

mint (mint), *n.* a place where money is coined by government authority.

mint (mint), *n.* an odoriferous plant yielding a pungent essential oil, as the pepper*mint.*

mint (mint), *v.t.* to coin, as money, in a mint.

***minuet** (min ū et′), *n.* a slow stately dance; the music for it.

minus (mī′ nus), *n.* the sign (—) of subtraction.

minus (mī′ nus), *adj.* less, decreased by, as 5 *minus* 4 is 1.

minute (min′ it), *n.* the 60th part of an hour equal to 60 seconds; the 60th part of the degree of an arc; *minutes,* memoranda; the detailed record of the proceedings of a formal meeting, as of a business organization, society or legislative body.

***minute** (mi nūt′), *adj.* small; insignificant; noting what is small, as a *minute* account of the game.

minutiae (min ū′ shi ē), *n. pl.* [*sing.* minutia] small or trivial details.

minx (mingks), *n.* a pert girl.

miracle (mir′ *a* kl), *n.* any occurrence that cannot be explained by the laws of nature; a marvel.

miraculous (mi rak′ ū lus), *adj.* supernatural, wonderful.

***mirage** (mi räzh′), *n.* an optical atmospheric illusion by which the image of a distant object is seen as if inverted; any deceptive appearance or illusion.

mire (mīr), *n.* deep mud.

mire (mīr), *v.i. and v.t.* to sink in mud; to cause to sink in mud; to dirty with or as if with mud.

mirror (mir′ ēr), *n.* a looking glass; any smooth, reflecting surface.

mirror (mir′ ēr), *v.t.* to reflect, as if in a mirror.

mirth (mirth), *n.* merriment, jollity, especially with laughter.

misadventure (mis ad ven′ tūr), *n.* a misfortune, mishap, mischance.

misalliance (mis *a* lī′ ans), *n.* an undesirable or unhappy marriage.

***misanthrope** (mis′ an thrōp), *n.* a hater of mankind.

misapprehend (mis ap rē hend′), *v.t.* to misunderstand.

miscarry (mis kar′ i), *v.i.* to turn out badly; to be unsuccessful.

miscellaneous (mis e lā′ nē us), *adj.* made up of many different things, kinds or parts; mixed.

***miscellany** (mis′ e lā ni), *n.* [*pl.* miscellanies] a mixture of various kinds of things, especially literary material.

mischance (mis chȧns′), *n.* a mishap, bad luck.

mischief (mis′ chif), *n.* harm; damage; action intended to vex or annoy.

***mischievous** (mis′ chiv us), *adj.* causing injury or damage; playing pranks intended to annoy.

misconceive (mis kon sēv′), *v.t.* to misunderstand, misjudge, interpret wrongly.

misconception (mis kon sep′ shun), *n.* a false opinion; a wrong understanding.

***misconstrue** (mis kon strōō′), *v.* to interpret wrongly.

miscreant (mis′ krē ant), *n.* a villain, wretch.

miscreant (mis′ krē ant), *adj.* villainous, unscrupulous.

misdemeanor (mis dē mēn′ ēr), *n.* a crime of less degree than a felony.

miser (mī′ zēr), *n.* one who hoards money for its own sake and not for use.

miserable (miz′ ēr *a* bl), *adj.* unhappy; worthless.

misery (miz′ ẽr i), *n.* pain; distress; great unhappiness.

misfit (mis fit′), *n.* anything too large or too small, as this shoe is a misfit; a person out of place in his environment.

misfortune (mis fôr′ tūn), *n.* adversity, bad luck; a calamity.

misgiving (mis giv′ ing), *n.* doubt about the future; a premonition of evil.

mishap (mis′ hap), *n.* an unfortunate accident.

mislay (mis lā′), *v.t.* to put in the wrong place; to lose for a time.

misnomer (mis nō′ mẽr), *n.* a wrong name, especially misnaming some one in a legal document.

*__misogynist__ (mis oj′ i nist), *n.* one who hates women.

misplace (mis plās′), *v.t.* to put in the wrong place.

misrepresent (mis rep rē zent′), *v.t.* to report incorrectly.

miss (mis), *n.* a failure to hit, reach or attain.

miss (mis), *n.* an unmarried girl or woman.

miss (mis), *v.i. and v.t.* to fail of a mark; to fail to hit; to feel the loss or absence of.

missal (mis′ al), *n.* the book containing everything said or sung in the Roman Catholic Mass for every day of the year.

missile (mis′ il), *n.* anything to be thrown or hurled as a spear, arrow, bomb, bullet.

mission (mish′ un), *n.* the act of sending or state of being sent with certain powers, especially to propagate religion; a body of persons sent to represent an organization or a government for a special purpose.

missionary (mish′ un er i), *n.* a person who is sent to propagate religion.

missionary (mish′ un er i), *adj.* pertaining to missions.

missive (mis′ iv), *n.* a letter or message.

mist (mist), *n.* a visible watery vapor in the atmosphere; fog.

mistake (mis tāk′), *n.* an error.

mistake (mis tāk′), *v.i. and v.t.* [*p.t.* mistook, *p.p.* mistaken, *pr.p.* mistaking] to err in judgment or opinion; to identify wrongly, as I *mistook* you for John.

*__mistletoe__ (mis′ l tō), *n.* an evergreen plant, parasitic on the oak tree, with waxy white berries.

mistress (mis′ tres), *n.* a woman who exercises authority, as the female head of a family or school.

misunderstand (mis un dẽr stand′), *v.t.* to take in a wrong sense; to mistake the meaning of.

misuse (mis ūs′), *n.* wrong use, abuse.

misuse (mis ūz′), *v.t.* to use in a wrong way, mistreat.

mite (mīt), *n.* a minute animal of the spider family often infesting cheese and other stored foods; a very small quantity; a tiny object or person.

miter (mī′ tẽr), *n.* a headdress made in two sections, worn by church officers.

miter (mī′ tẽr), *n.* the joining of two surfaces at a 45-degree angle.

mitrailleuse (mē trā ûz′), *n.* a machine gun made of several barrels that may be fired at once or one after another.

mix (miks), *v.i. and v.t.* to mingle with; to unite or blend into one mass.

Syn. Mingle, blend, confound. To *mix* is here a general and indefinite term, signifying simply to put together; we may *mix* two or several things. We *mingle* several objects. Things *mixed* lose all distinction; but they may be *mingled* and yet retain their individuality. To *blend* is only partially to *mix,* as colors *blend* which fall into each other. To *confound* is to confuse.

mixture (miks′ tūr), *n.* the product of mixing; a compound or mass formed by mixing; a blend.

*__mnemonics__ (nē mon′ iks), *n.* the art or science of developing the power of memory.

moan (mōn), *n.* a low, prolonged sound of the voice, expressing sorrow or pain; a sound resembling this, as the *moan* of the wind.

moan (mōn), *v.i.* to utter a low, prolonged sound expressing pain or grief.

moat (mōt), *n.* a deep, wide, water-filled ditch around the rampart of a castle or fortress, forming a protection against invaders.

mob (mob), *n.* a rough and disorderly crowd; people in general, as he writes for the *mob.*

mob (mob), *v.t.* to attack, in a disorderly rabble, as they *mobbed* the jail.

*__mobile__ (mō′ bil), *adj.* easily moved; changing expression, as a *mobile* face.

*__mobilize__ (mō′ bi līz), *v.t.* to assemble and make ready for active service, as to *mobilize* troops.

moccasin (mok′ *a* sin), *n.* a soft deerskin foot-covering worn by the North American Indians and now used by hunters and campers; a poisonous American snake.

*__mocha__ (mō′ k*a*), *n.* a fine coffee that came originally from Mocha in Arabia.

mock (mok), *v.t.* to ridicule; to mimic; to jeer at.

mockery (mok′ er i), *n.* the act of ridiculing; a sham, as it's a hollow *mockery.*

*__mode__ (mōd), *n.* method, form, custom; in grammar, the mood of a verb in expressing the manner of being or doing.

*__model__ (mod′ l), *n.* a pattern of something to be made or reproduced; an example worthy of imitation.

model (mod′ l), *v.t. and v.i.* to make a figure of, as to *model* a head; to form objects out of clay; to serve as a subject for an artist or sculptor, to try on clothes and exhibit them to prospective customers, as she *modeled* for a Paris dressmaker.

model (mod′ l), *adj.* serving as a pattern; worthy of being imitated or followed.

moderate (mod′ ẽr it), *n.* one of conservative views and action.

moderate (mod′ ẽr āt), *v.i. and v.t.* to become less intense, as cold, or more mild, as the weather; to lessen, as to *moderate* a pressure.

moderate (mod′ ẽr it), *adj.* reasonable, mild, calm, not extreme or violent.

modern (mod′ ẽrn), *adj.* pertaining to recent or present time.

modernism (mod′ ẽr nizm), *n.* a religious movement stressing ethical and critical values rather than theological creeds and dogmas.

modest (mod′ est), *adj.* not boastful, unassuming, retiring, unpretentious; virtuous.

modification (mod i fi kā′ shun), *n.* a slight reduction, as in statement; alteration.

modify (mod′ i fī), *v.t.* [*p.t.* and *p.p.* modified, *pr.p.* modifying] to change the form of, slightly, qualify, as to *modify* rules; limit, reduce; to restrict the meaning of, as an adjective *modifies* a noun.

*__modiste__ (mō dēst′), *n.* a fashionable dressmaker.

*__modulate__ (mod′ ū lāt), *v.i. and v.t.* to pass from one musical key to another by using tones related to both keys; to vary the tone of, as the voice; to regulate amplitude and frequency of, as an electric current.

*__moiety__ (moi′ et i), *n.* a small portion or share.

*__moire__ (mwär), *n.* a fabric of wavy-lined silk or mohair.

*__moiré__ (mwȧ rā′), *adj.* having a watered or cloudy appearance.

*__moist__ (moist), *adj.* containing liquid, as *moist* earth; damp, humid.

moisture (mois′ tūr), *n.* a moderate degree of dampness; that which makes damp.

Syn. Humidity, dampness. *Moisture* is any small degree of infusion of a liquid into a substance or body. *Humidity* is the same thing expressed with more scientific limitation, referring especially to the air. *Dampness* is that species of *moisture* which arises from gradual accumulation of water in bodies capable of containing it; we find *dampness* in cellars.

molar (mō′ lẽr), *n.* a double, grinding tooth.

molar (mō′ lẽr), *adj.* pertaining to grinding; adapted to grinding.

molar (mō′ lẽr), *adj.* relating to matter considered in a mass, not in its molecular nature.

molasses (mō las′ ez), *n.* the thick sirup left after refining cane sugar; treacle.

mold (mōld), *n.* a fuzzy, exterior fungus growth on damp or decaying animal or vegetable matter; a hollow form in which anything is poured for shaping, as a pudding *mold;* distinctive character, as a man of that *mold.*

mold (mōld), *v.t.* to form in or as in a mold; to knead into a required consistency or shape.

molder (mōl′ dẽr), *v.i.* to crumble away in decay.

molding (mōl′ ding), *n.* a strip of material used as ornamental edging in building.

mole (mōl), *n.* a dark-colored spot or growth on the skin; a small, soft-furred burrowing animal with minute eyes; a breakwater at the mouth of a harbor.

*__molecule__ (mol′ ē kūl), *n.* the smallest quantity of an element or compound which can exist separately.

molehill (mōl′ hil), *n.* a small mound of earth left by the burrowing mole; a trifling annoyance or obstacle, as to make mountains out of *molehills.*

molest (mō lest′), *v.t.* to annoy or interfere with, harass, pester.

mollify (mol′ i fī), *v.t.* to soothe, calm, as to *mollify* a person.

mollusk (mol′ usk), *n.* one of various soft-bodied animals, most of which have protective shells, as slugs, snails, clams, oysters.

mollycoddle (mol′ i kod l), *n.* a pampered person, especially a man or boy having feminine traits.

molt (mōlt), *v.i.* to shed the feathers, horns, hair or skin.

molten (mōl′ ten), *adj.* melted; made by melting and casting.

moment (mō′ ment), *n.* an instant of time; import or importance, as news of great *moment.*

*__momentary__ (mō′ men ter i), *adj.* lasting only for an instant; done in an instant; quickly passing, not lasting.

momentous (mō men′ tus), *adj.* very important.

*__momentum__ (mō men′ tum), *n.* the measure of motion in a body found by multiplying mass by velocity, impetus.

*__monad__ (mon′ ad), *n.* an atom; a minute, simple organism or organic unit.

*__monarch__ (mon′ ẽrk), *n.* a supreme ruler, sovereign.

monarchy (mon′ ẽr ki), *n.* [*pl.* monarchies] a form of government with a king or emperor as supreme head; a country so governed.

*__monastery__ (mon′ as ter i), *n.* [*pl.* monasteries] a secluded residence for persons under religious vows, especially monks.

monastic (mō nas′ tik), *adj.* pertaining to monasteries or monks.

*__monetary__ (mon′ ē ter i), *adj.* pertaining to money.

monetize (mon′ ē tīz), *v.t.* to give a standard value to, as a metal for use in coin.

*__money__ (mun′ i), *n.* gold, silver or other metal coined and issued by a government as a medium of exchange; standardized medium of exchange and measure of value; anything that represents cash, as any form of bank credit.

moneyed (mun′ id), *adj.* wealthy.

mongoose (mong′ gōōs), *n.* a small, ferretlike animal of India and Egypt that attacks and kills poisonous snakes.

*__mongrel__ (mung′ grel), *n.* anything of mixed breed or kind; especially a dog of mixed breed.

*__monism__ (mon′ izm), *n.* the doctrine that there is only one kind of substance or final reality, as mind or matter.

monition (mō nish′ un), *n.* warning, notice, caution.

monitor (mon′ i tẽr), *n.* one who warns or advises; a pupil appointed to oversee younger ones, as on a playground; the earliest type of armor-clad warship, with a revolving turret on an open deck.

*__monk__ (mungk), *n.* a man who devotes himself exclusively to a religious life and lives in a monastery, under church discipline.

monkey (mung′ ki), *n.* [*pl.* monkeys] one of the primates, especially one of the long-tailed forms smaller than the ape.

monkey wrench (mung′ ki rench), a wrench with a straight handle and an adjustable jaw for turning nuts and bolts.

monkish (mungk' ish), *adj.* like a monk; monastic.

monocle (mon' ō kl), *n.* an eyeglass for one eye.

***monocular** (mō nok' ū lẽr), *adj.* having only one eye; adapted for use by one eye, as a *monocular* telescope.

***monogamy** (mō nog' *a* mi), *n.* marriage of one wife only.

***monogram** (mon' ō gram), *n.* a character formed by uniting two or more letters, as one's initials.

***monograph** (mon' ō grȧf), *n.* a treatise closely limited to one subject or phase.

monolith (mon' ō lith), *n.* a pillar or column formed of a single block of stone.

***monologue** (mon' ō lôg), *n.* a long speech by one person.

***monomania** (mon ō mā' ni a), *n.* mental derangement in regard to one subject only.

monoplane (mon' ō plān), *n.* an airplane with only one main supporting surface.

monopolist (mō nop' ō list), *n.* one who has a monopoly or complete control, especially of an industrial or commercial field.

monopolize (mō nop' ō līz), *v.t.* to acquire control of, as the entire product or service in some special field, so as to regulate the market; to keep all or practically all to oneself, as to *monopolize* a conversation.

monopoly (mō nop' ō li), *n.* complete control of a market by a single manufacturer or distributor.

monorail (mon' ō rāl), *n.* a railway in which the cars run on a single rail, being kept in place by means of gyroscopes.

monosyllable (mon' ō sil *a* bl), *n.* a word of one syllable.

monotheism (mon' ō thē izm), *n.* the doctrine or belief that there is only one god.

monotone (mon' ō tōn), *n.* speech in unchanging tone; utterance all on one note.

monotony (mō not' ō ni), *n.* unbroken uniformity, dull repetition; continuance of tone.

***monsieur** (mē syû'), *n.* [*pl.* messieurs] a French title of courteous address equivalent to *mister.*

***monsoon** (mon so͞on'), *n.* a periodic wind in the Indian Ocean and southern Asia.

monster (mon' stẽr), *n.* an animal, plant or thing that departs from the customary course of nature in its kind; an ugly or cruel person.

monstrosity (mon stros' i ti), *n.* [*pl.* monstrosities] anything hideously abnormal or deformed.

monstrous (mon' strus), *adj.* deformed, hideous; huge; horrible.

month (munth), *n.* one of the twelve major divisions of the year: *lunar month,* the period from one new moon to another, not quite 30 days.

monument (mon' ū ment), *n.* a memorial structure; any conspicuous and enduring example, as a *monument* of genius.

monumental (mon ū men' tal), *adj.* preserving the memory of a person or event; large and lasting, as a *monumental* work.

moo (mo͞o), *n.* [*pl.* moos] the lowing sound made by a cow.

***mood** (mo͞od), *n.* style; state of mind; the change in form of a verb to indicate manner of being or doing.

moody (mo͞od' i), *adj.* [*comp.* moodier, *superl.* moodiest] given to changes in the state of mind.

***moon** (mo͞on), *n.* the satellite that revolves about the earth in monthly cycles.

moon (mo͞on), *v.i.* to wander and look about in an abstracted manner.

moonshine (mo͞on' shīn), *n.* moonlight; idle talk, empty show; liquor made illegally.

moonstone (mo͞on' stōn), *n.* a translucent, semiprecious stone of yellowish color.

moon-struck (mo͞on' struk), *adj.* lunatic.

***moor** (moor), *n.* a tract of waste land, especially one covered with heather.

moor (moor), *v.i. and v.t.* to secure in a certain place, as a ship; to fasten to, as a dock, with a cable.

mooring (moor' ing), *n.* the act of securing a vessel in a particular place; the place where a ship is moored.

moorings (moor' ingz), *n. pl.* the cables, anchors and other equipment used in securing a ship to a dock or anchorage.

***moose** (mo͞os), *n.* a large, North American deer resembling the European elk.

moot (mo͞ot), *adj.* debatable, as a *moot* question.

mop (mop), *n.* an implement for washing floors, having a bundle of cloth or yarn at the end of a long handle; an abundant head of hair, as a *mop* of hair.

mop (mop), *v.t.* to wash or dry, as to *mop* a floor; to swab or wipe up, as to *mop* the water on the floor.

mope (mōp), *v.i.* to go about with a drooping air; to be silent, dull, dispirited.

moraine (mō rān'), *n.* a ridge of rocks and gravel deposited by a glacier.

***moral** (mor' al), *adj.* conforming to generally accepted ideas of what is right and just in human conduct.

***morale** (mō rȧl'), *n.* the mental state that makes it possible to sustain courage, determination and endurance in times of test and trouble.

morality (mō ral' i ti), *n.* [*pl.* moralities] right living, virtue; conformity to generally accepted standards of conduct.

moralize (mor' al īz), *v.i.* to present a lecture on right conduct; to render right and just.

morals (mor' alz), *n. pl.* right conduct in an inclusive sense; the principles of good behavior.

morass (mō ras'), *n.* a swamp, bog.

morbid (môr' bid), *adj.* diseased, unhealthy; mentally unwholesome; gloomy, as she has a *morbid* nature.

mordant (môr' dant), *n.* a substance that eats into a surface, a corrosive.

mordant (môr' dant), *adj.* biting, as an acid; sarcastic, keen, as a *mordant* wit.

more (mōr), *n.* a greater quantity or number, as I wanted *more.*

***more** (mōr), *adj.* [*comp.* of many and much] being greater in number, volume or extent.

more (mōr), *adv.* in or to a greater degree or extent; again.

moreover (mōr ō' vẽr), *adv.* besides, furthermore.

morganatic (môr g*a* nat' ik), *adj.* pertaining to the marriage of a man of royal rank with a woman of inferior degree, whose children are legitimate but cannot inherit their father's rank or fortune.

morgue (môrg), *n.* a public establishment where the bodies of unknown dead are held for identification.

***moribund** (mor' i bund), *adj.* dying.

morning (môr' ning), *n.* the early part of the day; forenoon.

morning (môr' ning), *adj.* relating in any way to the early part of the day.

morning-glory (môr' ning glō' ri), *n.* a twining plant with white, purple or pink blossoms.

morocco (mō rok' ō), *n.* a fine-grained leather of goatskin.

***moron** (mō' ron), *n.* a person who is deficient in mental ability.

morose (mō rōs'), *adj.* sullen, gloomy.

morphia (môr' fi a), *n.* the narcotic principle of opium.

***morphine** (môr' fēn), *n.* an alkaloid of opium, used in medicine.

morphinism (môr' fin izm), *n.* a morbid state induced by excessive use of opium.

morphology (môr fol' ō ji), *n.* the science of forms in the organisms of plants and animals.

morris (mor' is), *n.* an English country dance of Moorish origin.

morrow (mor' ō), *n.* the day following any day specified, tomorrow.

***morsel** (môr' sel), *n.* a small piece; a mere bite, as a *morsel* of food.

***mortal** (môr' tal), *n.* a being subject to death, a human being.

mortal (môr' tal), *adj.* subject to death; causing death, fatal, as a *mortal* wound; deadly, as a *mortal* enemy.

mortality (môr tal' i ti), *n.* [*pl.* mortalities] the condition of being subject to death; number of deaths in proportion to population.

mortar (môr' tẽr), *n.* a vessel in which substances are pounded with a pestle; a cement of lime, sand and water, used in building; a short, stubby cannon used to fire shells at a high angle, dropping them on a mark.

***mortgage** (môr' gij), *n.* a legal paper pledging property to cover a debt, as he holds a *mortgage* on my house.

mortgage (môr' gij), *v.t.* to pledge as security, as to *mortgage* a house.

mortification (môr ti fi kā' shun), *n.* self-denial, discipline; humiliation, chagrin; gangrene.

mortify (môr' ti fī), *v.t. and v.i.* to deaden; to discipline by self-denial, as to *mortify* the flesh; to humiliate, embarrass, as her child's behavior *mortified* her; to lose vitality and organic structure, to gangrene, as the flesh *mortified.*

mortise (môr' tis), *n.* a hole or hollowed-out space in a timber, in which to insert a tenon.

mortise (môr' tis), *v.t.* to join with mortise and tenon, as timbers.

mortmain (môrt' mān), *n.* tenure of land by a corporation.

mortuary (môr' tū er i), *n.* [*pl.* mortuaries] a building for the dead pending burial, a morgue.

mosaic (mō zā' ik), *n.* a design made by inlaying pieces of material of different colors.

mosque (mosk), *n.* a Mohammedan place of worship.

mosquito (mus kē' tō), *n.* [mosquitoes] a two-winged insect, the females of which puncture the human skin with a proboscis, causing irritation and in some species carrying the germs of malaria or yellow fever.

moss (môs), *n.* a small, leafy plant that grows like a thick mat in crevices, on trees, rocks and damp ground.

most (mōst), *n.* the greatest number, quantity or value.

most (mōst), *adj.* [superl. of more] greatest in number, quantity or degree.

mote (mōt), *n.* a very small particle.

***moth** (môth), *n.* a night-flying insect with four wings, related to the butterfly; any of several small, yellowish or buff-colored insects whose larvae eat woolen fabrics and furs, as the clothes *moth.*

mother (mu*th*' ẽr), *n.* a female parent.

mother-in-law (mu*th*' ẽr in lô), *n.* the mother of one's husband or wife.

mother-of-pearl (mu*th* ẽr ov pûrl), *n.* the hard silvery-tinted inner layer of certain shells.

motif (mō tēf'), *n.* the central idea or theme of a work, as in music, art or literature; a melody that may be repeated many times with variations throughout a musical composition.

motion (mō' shun), *n.* the act of moving; passage from one place to another; a gesture; a formal proposal in a deliberative assembly.

motion picture (mō' shun pik' tūr), a moving picture, photoplay.

motive (mō' tiv), *n.* that which leads to action; an incentive; the animating idea, as in a work of music, art or literature; a motif.

motive power (mō tiv pou' ẽr), any source of energy, such as steam or electricity, used to drive a machine or produce desired motion.

motley (mot' li), *n.* [*pl.* motleys] a mixture, as of colors.

motley (mot' li), *adj.* consisting of or clothed in different colors; composed of varying elements, as a *motley* gathering.

motor (mō' tẽr), *n.* an engine that produces motion, as a gas or electric *motor.*

motor (mō' tẽr), *adj.* producing motion; driven by a motor, as a *motor*boat.

motor (mō' tẽr), *v.i. and v.t.* to travel by motor car; to transport by automobile or motor truck.

mottle (mot' l), *v.t.* to color in blotches.

mottled (mot' ld), *adj.* dappled, spotted.

motto (mot' ō), *n.* [*pl.* mottoes] a word, phrase or expression inscribed on anything to set forth its guiding principle, character or use; adage, maxim.

mound (mound), *n.* a hillock; an artificial hill.

mount (mount), *n.* a hill or mountain.

mount (mount), *n.* a riding horse; a structure on which anything is permanently set, as a *mount* for a cannon or a picture.

mount (mount), *v.i. and v.t.* to rise, as prices; to climb, as we *mounted* the hill with effort; to seat oneself on, as to *mount* a horse.

***mountain** (moun' tin), *n.* a great height of land that projects above its surroundings.

mountaineer (moun ti nēr'), *n.* one who lives in a mountain region; one who climbs mountains.

mountebank (moun' tē bangk), *n.* one who sells quack medicines; a charlatan.

***mourn** (mōrn), *v.i. and v.t.* to grieve, as she *mourned* for years; to grieve for, as the dog *mourned* his master.

mournful (mōrn' fool), *adj.* expressing sorrow, overborne by grief, sad.

mourning (mōrn' ing), *n.* expression of grief; the dress of one who has lost a friend or relative; tokens of public loss by death, as black draperies in public buildings or flags at half mast.

mouse (mous), *n.* [*pl.* mice] a small rodent of the fields or one that infests houses, granaries.

mousse (mo͞os), *n.* a frozen dessert or salad of flavored whipped cream.

***mouth** (mouth), *n.* the opening of the head in animals through which they take food and utter sounds.

***mouth** (mou*th*), *v.t. and v.i.* to utter in a pompous fashion; to rant; to speak affectedly or with grimaces.

mouthful (mouth' fool), *n.* [*pl.* mouthfuls] the amount required to fill the mouth.

mouthpiece (mouth' pēs), *n.* the part of a wind instrument to which the lips are applied; a spokesman.

movable (mo͞ov' *a* bl), *adj.* capable of being moved.

move (mo͞ov), *v.i. and v.t.* to change place or position, as I tried to take a picture but she *moved;* to cause to change place or position, as *move* the chair over here; to offer a motion or resolution in a deliberative assembly.

moving (mo͞ov' ing), *adj.* changing place or posture; affecting the feelings.

Syn. Affecting, pathetic. That which is *moving* excites the emotions, as a *moving* appeal; *affecting* is a more general term applying to anything that stirs the feelings; that which is *pathetic* arouses sympathy, pity and sorrow.

moving picture (mo͞ov' ing pik' tūr), a series of pictures taken so actions photographed as static are projected with such rapidity that the characters seem to move as if alive.

***mow** (mou), *n.* the space in a barn where hay or grain is stored.

mow (mō), *v.t.* to cut down, as grass or wheat.

much (much), *n.* a great quantity, as I don't want *much.*

much (much), *adj.* [*comp.* more, *superl.* most] great in quantity, as *much* money.

much (much), *adv.* to a great degree or extent, as I don't want it *much.*

***mucilage** (mū' sil ij), *n.* a gummy substance used in medicine and as an adhesive.

muck (muk), *n.* heavy, moist earth, especially mixed with manure.

mucous (mū' kus), *adj.* pertaining to the thick fluid secreted by the mucous membranes; resembling mucus; secreting mucus, slimy.

mucous membrane (mū' kus mem' brān), the moist, glandular lining of certain cavities and canals of the body, as the nose.

mucus (mū' kus), *n.* the thick fluid secreted by the mucous membranes.

mud (mud), *n.* soft wet earth, mire.

muddle (mud' l), *n.* a confused state.

muddle (mud' l), *v.i. and v.t.* to be confused or aimless; to confuse or stupefy; to handle in a bungling way.

mud gun (mud gun), a device in metal industries to force stiff mud into an opening, as in closing the tap hole of a blast furnace in making iron.

muff (muf), *n.* a warm soft cover, as of fur, to keep the hands warm; a bungling attempt, especially a ball player's failure to catch a ball.

muff (muf), *v.t.* to bungle; to fail, especially to drop a ball one is trying to catch.

muffin (muf' in), *n.* a quick bread or biscuit baked in a cup-shaped tin.

muffle (muf' l), *v.t.* to wrap up warmly; to deaden the sound of by covering, as to *muffle* a bell.

mug (mug), *n.* an earthenware or metallic drinking cup with a handle.

muggy (mug' i), *adj.* [*comp.* muggier, *superl.* muggiest] warm, damp, close, as a *muggy* day.

mugwump (mug' wump), *n.* a voter belonging to a party but not always following its lead or voting for its candidates; an independent.

***mulatto** (mū lat' ō), *n.* [*pl.* mulattoes] a person one of whose parents is white and the other a Negro.

mulberry (mul' ber i), *n.* [*pl.* mulberries] the sweet dark purple fruit of a tree of the genus *Morus;* a tree of this genus with whitish berries on which the silkworm feeds.

mulch (mulch), *n.* a collection of straw, used to protect the roots of plants in winter.

mulch (mulch), *v.t.* to protect with mulch.

***mulct** (mulkt), *n.* a fine.

mulct (mulkt), *v.t.* to punish with a fine; to deprive of by fraud, as they *mulcted* him of five dollars.

mule (mūl), *n.* the offspring of a male ass and a mare.

mull (mul), *n.* a thin, soft muslin.

mull (mul), *v.t.* to warm, spice and sweeten, as ale.

multigraph (mul' ti gråf), *n.* a small cylinder printing press for form letters.

multiplane (mul' ti plān), *n.* an airplane with more than two main planes superimposed.

multiple (mul' ti pl), *n.* a number or quantity which contains another an exact number of times, without a remainder.

multiplex (mul' ti pleks), *adj.* combining many in one, as this dictionary combines definitions, pronunciations, spellings, synonyms and antonyms.

***multiplication** (mul ti pli kā' shun), *n.* the act or process of multiplying.

multiplicity (mul ti plis' i ti), *n.* the quality of being multiplex, manifold or various; a great number, as a *multiplicity* of reasons.

multiply (mul' ti plī), *v.i. and v.t.* to increase in number or extent, as the number of cases *multiplies* rapidly; to find the number equal to a given number taken a specified number of times, as to *multiply* 2 by 5.

multitude (mul' ti tūd), *n.* a great number, crowd, assembly; people in general.

multitudinous (mul ti tū' din us), *adj.* consisting of a great number.

mum (mum), *adj.* silent.

mumble (mum' bl), *v.i. and v.t.* to speak indistinctly, as to *mumble* to oneself; to utter indistinctly, as to *mumble* one's words.

mummery (mum' ēr i), *n.* [*pl.* mummeries] masquerading with buffoonery.

mummy (mum' i), *n.* [*pl.* mummies] a dead body embalmed after the manner of the ancient Egyptians.

mumps (mumps), *n.* a contagious disease with fever and a swelling of the glands of the neck.

munch (munch), *v.i. and v.t.* to chew slowly or noisily, as he was *munching;* the children *munched* the candy.

***municipal** (mū nis' i pal), *adj.* pertaining to a city or town as an incorporated, self-governing political unit.

municipality (mū nis i pal' i ti), *n.* [*pl.* municipalities] a corporate town, borough or city.

***munificence** (mū nif' i sens), *n.* great generosity, lavishness in giving.

munitions (mū nish' unz), *n. pl.* military stores of materials.

mural (mū' ral), *n.* a painting on a wall.

mural (mū' ral), *adj.* relating in any way to a wall.

murder (mûr' dẽr), *n.* homicide with malice aforethought.

murder (mûr' dẽr), *v.t.* to kill a person unlawfully with malice aforethought.

***murk** (mûrk), *n.* darkness, as lost in the *murk.*

murky (mûrk' i), *adj.* [*comp.* murkier, *superl.* murkiest] dark, gloomy, obscure.

murmur (mûr' mer), *n.* a low, indistinct sound, like that of a running stream or of voices at a little distance.

murmur (mûr' mẽr), *v.i. and v.t.* to make a sound like that of a running stream or the hum of bees at a distance; to utter in a murmuring tone.

***murrain** (mûr' in), *n.* an infectious and fatal disease of cattle.

***muscle** (mus' l), *n.* a highly contractile organ of fibrous tissue by which movement is effected in an animal body; bodily strength.

muscular (mus' kū lẽr), *adj.* relating to muscles; equipped with muscles; strong-bodied.

muse (mūz), *n.* any of the nine goddesses who presided over the arts and sciences.

muse (mūz), *v.i.* to ponder, meditate.

museum (mū zē' um), *n.* a collection of natural, scientific or literary curiosities or works of art; the building in which such a collection is kept.

mush (mush), *n.* boiled corn meal; anything soft and thick like mush.

mushroom (mush' ro͞om), *n.* an edible fungus.

mushroom (mush' ro͞om), *adj.* having a quick growth and decay, as *mushroom* towns of the early West.

music (mū' zik), *n.* the art or science of harmonic sounds; harmony or melody; printed representation of notes to be sung or played.

musician (mū zish' an), *n.* one who knows the science or art of music; one who sings or plays a musical instrument.

musk (musk), *n.* a strong-scented substance obtained from a certain deer; an artificial product resembling musk in odor.

musket (mus' ket), *n.* the firearm formerly used by infantry, a gun like a rifle, but having a smooth bore.

muskrat (musk' rat), *n.* an aquatic rodent having a long, scaly tail, webbed hind feet and dark, glossy brown fur, sometimes called Hudson seal.

***muslin** (muz' lin), *n.* a fine, thin cotton fabric.

muss (mus); *n.* confusion and disorder.

muss (mus), *v.t.* to disorder, as clothing.

mussel (mus' l), *n.* a bivalve found either in the sea or in fresh water.

must (must), *v.i.* to be obliged or compelled, as he *must* do it; to be required; to be logically necessary, as this *must* be what you want.

***mustache, moustache** (mus täsh'), *n.* the growth of hair on the upper lip.

mustang (mus' tang), *n.* the small, tough, half-wild horse of the western prairies.

mustard (mus' tẽrd), *n.* a plant with seeds that are ground and used as seasoning; a hot condiment made of these ground seeds, for use on meats.

muster (mus' tẽr), *n.* an assembly of troops, for review or for active service; a register, as of troops.

muster (mus' tẽr), *v.t.* to assemble, as troops; to gather together, as to *muster* all one's resources.

musty (mus' ti), *adj.* [*comp.* mustier, *superl.* mustiest] moldy, spoiled by age, as *musty* cheese; stale, as a *musty* proverb.

mutability (mū t*a* bil' i ti), *n.* the quality of being subject to change, instability.

mutable (mū' t*a* bl), *adj.* capable of or susceptible to change; inconstant.

mute (mūt), *n.* a person who lacks the power of speech; a letter that is not pronounced; a consonant pronounced with breath stopping—*p, b, t, d, k, g;* a device to soften the tone of a musical instrument.

mute (mūt), *v.t.* to muffle the tone of, as a musical instrument.

mute (mūt), *adj.* lacking the power of speech; dumb; silent.

mutilate (mū' ti lāt), *v.t.* to disfigure or maim, as by cutting off a limb or essential part; to mangle and cut, as a text.

mutilation (mū ti lā' shun), *n.* the act of mutilating; a serious disfigurement or injury through cutting off some essential part.

mutineer (mū ti nēr'), *n.* one who is guilty of mutiny.

mutinous (mū′ ti nus), *adj.* partaking of the nature of mutiny; inclined to mutiny; engaging in mutiny.

mutiny (mū′ ti ni), *n.* insurrection against or forcible resistance to constituted authority, especially among troops or aboard ship.

mutter (mut′ ẽr), *n.* a low, indistinct utterance, generally ill-natured; a growl.

mutter (mut′ ẽr), *v.i. and v.t.* to utter in a low, indistinct tone and generally in a surly manner; to grumble.

mutton (mut′ n), *n.* the flesh of sheep.

***mutual** (mū′ tū al), *adj.* reciprocal, shared in common.

muzzle (muz′ l), *n.* snout; the end of a firearm from which the missle emerges; a device to keep a dog or horse from biting, by covering its muzzle.

muzzle (muz′ l), *v.t.* to put a muzzle on.

my (mī), *pron.* possessive form of me, as that is *my* hat.

myriad (mir′ i ad), *n.* ten thousand; any very large number, as he has a *myriad* of friends.

myriad (mir′ i ad), *adj.* consisting of a very great number, innumerable.

***myrrh** (mûr), *n.* the aromatic, gummy resin of an Oriental plant.

myself (mī self′), *pron.* [*pl.* ourselves] an emphasized form of the pronoun for the first person singular, as I *myself* heard it; as a reflexive, as I cut *myself*.

mysterious (mis tẽr′ i us), *adj.* partaking of the nature of mystery; not clear to the understanding, baffling.

Syn. Abstruse, cabalistic, dark, enigmatical, hidden, unfathomable, inexplicable, inscrutable, mystic, mystical, obscure, occult, recondite, secret. That is *mysterious* which excites and at the same time baffles; That is *mystic* or *mystical* which has some *hidden* or *abstruse* meaning. That is *inscrutable* which is *unfathomable* and incapable of interpretation.

***mystery** (mis′ tẽr i), *n.* [*pl.* mysteries] something secret, obscure or unexplainable; that which is beyond human comprehension.

mystic (mis′ tik), *adj.* mysterious, related to divine revelation, baffling, puzzling, incomprehensible.

mystification (mis ti fi kā′ shun), *n.* the act of baffling; the state of being baffled or puzzled.

mystify (mis′ ti fī), *v.t.* [*p.t.* and *p.p.* mystified, *pr.p.* mystifying] to involve in mystery, baffle, puzzle.

myth (mith), *n.* a story rooted in the most ancient religious beliefs and institutions of a people, usually dealing with gods, goddesses or natural phenomena; an imaginary thing.

***mythology** (mi thol′ ō ji), *n.* [*pl.* mythologies] the scientific study of myths; a collection of myths.

N

nabob (nā′ bob), *n.* a native governor of a province in India, under the Mogul empire; a very wealthy man.

***nadir** (nā′ dẽr), *n.* the part of the heavens directly under the place where one stands: opposed to *zenith*.

nag (nag), *n.* a small horse, pony; any horse.

nag (nag), *v.i. and v.t.* to scold constantly, as she *nags* continually; to find fault with, as she *nags* her husband.

nail (nāl), *n.* the horny protective plate at the end of a finger or toe, as finger*nail,* toe*nail;* the claw of a bird or other animal.

nail (nāl), *n.* a pointed piece of metal, usually with a broad head, that can be driven into wood to fasten pieces together.

nail (nāl), *v.t.* to fasten with a nail; to clinch, as to *nail* a bargain; to expose, as to *nail* a lie.

nainsook (nān′ sook), *n.* a fine, plain or striped muslin.

***naive** (nä ēv′), *adj.* artless, ingenuous, unaffectedly simple, unsophisticated.

***naiveté** (nä ēv tā′), *n.* artlessness; unaffected naturalness.

***naked** (nā′ ked), *adj.* unclothed, bare, unassisted, as the *naked* eye; plain, as the *naked* truth.

namby-pamby (nam′ bi pam′ bi), *adj.* weakly sentimental, insipid, as *namby-pamby* writing.

name (nām), *n.* that by which a person or thing is called; fame, as he has a great *name* in radio; something thought of as having lost its real existence, as chivalry has become a *name*.

Syn. Designation, denomination, appellation, title. *Name* is a general term; *appellation* suggests a descriptive name, as one *appellation* of Maine is the Pine Tree State; a *designation* is a specific name; *denomination* denotes a class or division; a *title* indicates rank, office or distinction.

name (nām), *v.t.* to give a name to; to call by name, mention by name; to set, as *name* the price.

namesake (nām′ sāk), *n.* one having the same name as another or named for another.

nankeen (nan kēn′), *n.* a buff-colored cotton cloth, originally made in Nanking, China.

nap (nap), *n.* a short slumber, a brief doze.

nap (nap), *n.* the downy, fuzzy surface of some fabrics.

nap (nap), *v.i.* to sleep lightly and for a short time.

nape (nāp), *n.* the back of the neck.

napery (nāp′ ẽr i), *n.* table linen.

***naphtha** (naf′ th*a*), *n.* a clear, volatile, inflammable liquid distilled from coal tar, used in dry cleaning and making varnish and as a fuel.

napkin (nap′ kin), *n.* a small piece of cloth, especially one on which to wipe the hands and lips.

narcosis (När kō′ sis), *n.* stupefaction from the effects of a drug.

narcotic (när kot′ ik), *n.* a drug that alleviates pain and induces sleep.

narcotic (när kot′ ik), *adj.* producing coma or torpor.

***narrate** (na rāt′), *v.t.* to tell, as a story.

narration (na rā′ shun), *n.* a story; the telling of a story, a recital of events.

narrative (nar′ *a* tiv), *n.* a story of a recital of events.

narrative (nar′ *a* tiv), *adj.* pertaining to story-telling, as a good *narrative* sense.

narrow (nar′ ō), *adj.* having little width, of small dimension from side to side; lacking breadth of view; with little to spare, as a *narrow* escape; limited, as in a *narrow* sense.

narrow (nar′ ō), *v.i. and v.t.* to become less broad; to lessen the width of.

narrows (nar′ ōz), *n. pl.* a narrow passage connecting two large bodies of water.

***nasal** (nā′ zal), *adj.* pertaining to the nose; pronounced, as the letters *m* and *n,* through the nose.

***nascent** (nas′ ent), *adj.* beginning to be, just coming into existence, as a *nascent* idea.

nasturtium (n*a* stûr′ shum), *n.* a garden plant with spicy stem and seeds and showy red and yellow flowers.

nasty (nȧs′ ti), *adj.* [*comp.* nastier, *superl.* nastiest] disgustingly dirty; mean; indecent; serious, as a *nasty* cut.

***natal** (nā′ tal), *adj.* pertaining to birth, as one's *natal* day.

natation (nā tā′ shun), *n.* the art of swimming.

natatorial (nā t*a* tō′ ri al), *adj.* pertaining to swimming.

natatorium (nā t*a* tō′ ri um), *n.* a swimming pool, especially indoors.

nation (nā′ shun), *n.* a race, the people of one country under one government.

***national** (nash′ un al), *n.* a citizen of a country, member of a nation.

***national** (nash′ un al), *adj.* pertaining to a nation.

nationalism (nash′ un al izm), *n.* devotion to one's own country; support of national independence; a policy that advocates state ownership and control of industries.

***nationality** (nash un al′ i ti), *n.* the state of belonging to or being a member of a nation; the state of being a nation.

nationalize (nash′ un al īz), *v.t.* to make a nation of; to naturalize, admit to citizenship; to place under governmental control, as to *nationalize* railroads.

native (nā′ tiv), *n.* one born in a stated country or place.

native (nā′ tiv), *adj.* born in a stated country or place; growing naturally in a stated region; not acquired, as a *native* gift for languages.

Syn. Indigenous, natural, original. *Native* means inborn and increases the contrast between what is natural and artificial; *natural* is that which belongs to something by nature; *indigenous* is that which grows or lives naturally in a certain country or climate, as cotton is *indigenous* to America; *original* signifies that which precedes all others in its category, as the *original* inhabitants of a continent.

nativity (nā tiv′ i ti), *n.* [*pl.* nativities] time, place and manner of birth.

***natural** (nat′ ū ral), *adj.* pertaining to nature; inborn, not artificial or acquired; conforming to the customary sequence or character of things and events.

natural history (nat′ ū ral his′ tō ri), the study of zoology, botany and mineralogy.

naturalist (nat′ ū ral ist), *n.* one who makes a special study of animals and plants.

naturalism (nat′ ū ral izm), *n.* the doctrine that scientific laws account for all phenomena, materialism; realism in art and literature.

***naturalize** (nat′ ū ral īz), *v.t.* to confer the rights, privileges and duties of a native citizen upon, as to *naturalize* an immigrant.

***nature** (nā′ tūr), *n.* the universe; the forces or powers that animate and regulate it; the sum of an individual's personality and character; any marked characteristic, as he has a scholarly *nature*.

naughty (nô ti), *adj.* [*comp.* naughtier, *superl.* naughtiest] mischievous, disobedient.

***nausea** (nô′ shē a), *n.* sickness of the stomach, especially seasickness, accompanied by desire to vomit; great disgust.

***nauseous** (nô′ shus), *adj.* disturbing to the stomach; disgusting.

nautical (nô′ ti kal), *adj.* having to do with ships and navigation.

nautical mile (nô′ ti kal mīl), a geographical mile, in the U. S., 6,080.2 feet, in Great Britain, 6,080 feet.

nautilus (nô′ ti lus), *n.* [*pl.* nautiluses *or* nautili] a mollusk with a spiral shell.

naval (nā′ val), *adj.* pertaining to a navy.

nave (nāv), *n.* the cross-shaped central part of a church between the aisles.

nave (nāv), *n.* the central block of a wheel, the hub.

navel (nā′ vel), *n.* the depression in the middle of the lower part of the abdomen; the umbilicus.

navigable (nav′ i g*a* bl), *adj.* capable of being passed over by boats or ships; steerable, as a *navigable* balloon.

navigate (nav′ i gāt), *v.i. and v.t.* to sail a ship; to travel by water; to direct the course of.

navigation (nav i gā′ shun), *n.* the science of directing ships' courses; act of laying out a ship's course and keeping her on it.

navy (nā′ vi), *n.* a nation's entire equipment for war at sea, including ships, yards, stations, trained officers and men and supplies; especially the ships.

nay (nā), *n.* a negative vote; a negative voter.

nay (nā), *adv.* no; not this merely, but also, as I believe, *nay* I know.

neap (nēp), *adj.* lowest, as *neap* tide.

neap tide (nēp tīd), the smallest high tide of the lunar month, when the moon is at first or third quarter.

near (nēr), *v.i. and v.t.* to approach, as the time *nears,* the ship *nears* port.

near (nēr), *adj.* not distant in time or space, close; intimate, as a *near* friend; missing by little, as a *near* escape; of draft animals, the one on the driver's side, as the *near* horse; stingy, close-fisted.

near (nēr), *adv.* almost; closely.

near-by (nēr′ bī′), *adv.* and *adj.,* at hand, close.

neat (nēt), *n.* cattle, cows, bulls, oxen, as distinct from horses and sheep.

neat (nēt), *adj.* bovine, as *neat* cattle.

neat (nēt), *adj.* tidy, trim, as a *neat* person; adroit, as a *neat* reply.

neat's foot oil (nēts foot oil), an oil, pale yellow, obtained by boiling cows' feet and shinbones and used for lubrication and in dressing leather.

neb (neb), *n.* a bird's beak.

nebula (neb′ ū la), *n.* [*pl.* nebulas *or* nebulae] a faint misty patch of light in the heavens, produced by clustered stars or by masses of diffused gaseous matter.

nebulous (neb′ ū lus), *adj.* pertaining to a nebula; faint and vague, indistinct, as the plan is still *nebulous.*

necessary (nes′ e ser i), *n.* [*pl.* necessaries] something essential or indispensable: *necessaries,* requisite things, as the *necessaries* of life.

***necessary** (nes′ e ser i), *adj.* indispensable; inevitable, as a *necessary* result.

necessitate (nē ses′ i tāt), *v.t.* to make necessary; to require; to compel, as the situation *necessitates* immediate action.

necessity (nē ses′ i ti), *n.* [*pl.* necessities] something that is indispensable, as food is a *necessity;* that which is unavoidable; great need, as call me in case of *necessity;* poverty.

neck (nek), *n.* the part of the body between the head and trunk; a long narrow part of an object, as the *neck* of a vase; a narrow strip, as a *neck* of land; the part of a garment that covers or fits about the neck, as the *neck* of a dress.

neckerchief (nek′ ẽr chif), *n.* a piece of cloth or decorative handkerchief worn about the neck.

necklace (nek′ lis), *n.* a string of beads or ornaments, worn around the neck, as pearls.

necktie (nek′ tī), *n.* a scarf or narrow band passed around the collar and tied in front.

***necrology** (ne krol′ ō ji), *n.* a list or register of deaths within a certain period, as the *necrology* of 1937.

***necromancy** (nek′ rō man si), *n.* the pretended power to foretell the future by communicating with the dead, magic.

nectar (nek′ tẽr), *n.* the wine of the gods; any especially delicious drink; the sweet fluid of flowers from which bees make their honey.

***nectarine** (nek′ tẽr ēn), *n.* a variety of peach having a smooth skin.

nee (nā), *adj.* born: used in giving the maiden name of a married woman, as Mrs. Chester, *nee* Barton.

need (nēd), *n.* necessity, lack of anything requisite or useful; poverty.

need (nēd), *v.i. and v.t.* to be obliged, as you *need* not take it; to be in want; to stand in want of, require, as the car *needs* gas.

needle (nēd′ l), *n.* a small sharp-pointed piece of steel with an eye through which a thread is passed, used in sewing; anything resembling a needle, in appearance or use, as a pine *needle,* the *needle* of a compass.

needle point (nē′ dl point), *n.* lace made with a needle on a paper or parchment pattern.

needless (nēd′ les), *adj.* unnecessary.

needs (nēdz), *adv.* necessarily, as they *needs* must fight.

needy (nēd′ i), *adj.* poverty-stricken; in dire want.

***ne'er** (nâr), *adv.* a contraction of never.

ne'er-do-well (nâr′ dōō wel), *n.* one who fritters away his time; a good-for-nothing.

nefarious (nē fâr′ i us), *adj.* extremely wicked, infamous.

negation (nē gā′ shun), *n.* denial, as he shook his head in *negation.*

negative (neg′ *a* tiv), *n.* a denial, as his answer was a *negative;* the side of a debate that tries to refute what the opposite side tries to prove, as we had the *negative;* a photographic film or plate for printing positive pictures.

negative (neg′ *a* tiv), *v.t.* to prove the contrary of; to deny or refuse; to vote down.

negative (neg′ *a* tiv), *adj.* expressing negation, as a *negative* reply; deficient in positive qualities, as she is a *negative* person; expressing opposition, as a *negative* vote: opposite of positive, as *negative* electricity.

***neglect** (neg lekt′), *n.* failure to attend to business or meet obligations; lack of care, as the house was in a state of *neglect.*

neglect (neg lekt′), *v.t.* to omit performance of, as a duty; to fail to care for, as he *neglects* his home; to disregard, as he *neglected* my principal argument.

Syn. Disregard, slight. To *neglect* is to fail to give proper attention to some duty or obligation; to *disregard* is to neglect intentionally; to *slight* is to treat with indifference and often contempt.

***negligee** (neg li zhā′), *n.* a loosely fitting gown; informal dress, as she was in *negligee.*

negligence (neg′ li jens), *n.* carelessness, indifference.

negligent (neg′ li jent), *adj.* careless, neglectful.

negligible (neg′ li ji bl), *adj.* of little moment; unworthy of attention, as it was a *negligible* loss.

***negotiable** (nē gō′ shi *a* bl), *adj.* capable of being negotiated, transferred or exchanged.

negotiate (nē gō′ shi āt), *v.i. and v.t.* to treat with others in business or in public or private affairs, as they *negotiated* for many weeks; to bring about by conferring, as to *negotiate* a treaty; to sell, convert into cash, as to *negotiate* bonds.

***negotiation** (nē gō shi ā′ shun), *n.* the discussion preliminary to the signing of a contract or a treaty.

***neigh** (nā), *n.* the cry of a horse, whinny.

neigh (nā), *v.i.* to utter the cry of a horse, whinny.

***neighbor** (nā′ bẽr), *n.* a person living nearby, as a next-door *neighbor.*

neighbor (nā′ bẽr), *adj.* near-by.

neighborhood (nā′ bẽr hood), *n.* the adjacent district; the state of being neighbors.

Syn. Vicinity. *Neighborhood* is employed in reference to the inhabitants, to denote nearness of persons to each other or to things in general; *vicinity* denotes place only.

neighborly (nā′ bẽr li), *adj.* friendly, kind.

***neither** (nē′ *th*ẽr), *pron.* not the one or the other, as *neither* is a trustworthy person.

***neither** (nē′ *th*ẽr), *adj.* not either, as *neither* hat will do.

***neologism** (nē ol′ ō jizm), *n.* a new word or phrase introduced into a language, a coined word; an old word used in a new and different sense.

***neophyte** (nē′ ō fīt), *n.* a novice, a beginner; a new member, convert.

***nephew** (nef′ ū), *n.* the son of one's brother or sister.

***nephritis** (ne frī′ tis), *n.* inflammation of the kidneys.

***nepotism** (nep′ ō tizm), *n.* favoritism to relatives.

nerve (nûrv), *n.* one of the cordlike fibers that convey sensation from all parts of the body to the brain; coolness in action.

nerve (nûrv), *v.t.* to give vigor and courage to.

***nervine** (nûr′ vēn), *n.* any tonic for the nerves.

nervous (nûr′ vus), *adj.* pertaining to the nerves in any way; having weak nerves; restless, uneasy, irritable and excitable.

nervy (nûr′ vi), *adj.* [*comp.* nervier, *superl.* nerviest] showing coolness and courage; bold, self-assured.

nest (nest), *n.* the dwelling place of a bird, where it lays its eggs and rears its young; a structure made by an insect as a hatching place, as a wasp's *nest;* a set of bowls, tables or boxes that fit one inside another.

nest (nest), *v.i.* to build a nest; to live in a nest.

***nestle** (nes′ l), *v.i. and v.t.* to lie close and snug; to cherish, cuddle, as she *nestled* the puppy in her arms.

nestling (nest′ ling), *n.* a young bird that has not left the nest.

net (net), *n.* a meshed fabric used in catching fish, birds, butterflies; any meshed fabric, as a hair *net;* a snare; a ball hit into a tennis net.

net (net), *v.t.* to take with a net; to capture by trick; to hit a ball into a tennis net.

net (net), *v.t.* to take as clear profit, as to *net* $1,000 on a transaction.

net (net), *adj.* clear, remaining after all expenses and costs are deducted, as a *net* income or profit.

***nether** (ne*th*′ ẽr), *adj.* lying beneath, as the *nether* garments; lower, as the *nether* regions.

Ant. Upper.

netting (net′ ing), *n.* nets in general; material of which nets are made; any network, as mosquito *netting.*

nettle (net′ l), *n.* a coarse herb having stinging hairs.

nettle (net′ l), *v.t.* to sting, irritate.

network (net′ wûrk), *n.* a fabric or structure of crossed threads, cords or wires.

neural (nū′ ral), *adj.* belonging to a nerve.

***neuralgia** (nū ral′ ja), *n.* acute pain in a nerve.

***neurasthenia** (nū ras thē′ ni a), *n.* exhaustion of the nervous system.

neuritis (nū rī′ tis), *n.* inflammation of a nerve or nerves.

***neurosis** (nū rō′ sis), *n.* a disturbance of the bodily system springing from disordered nerves.

neurotic (nū rot′ ik), *adj.* pertaining to the nervous system; having a disorder of the nerves; hysterical, as a *neurotic* person.

***neuter** (nū′ tẽr), *adj.* neither masculine nor feminine, as a *neuter* noun.

***neutral** (nū′ tral), *adj.* supporting or favoring neither party in a dispute; without bias; lacking strong character, as a *neutral* color.

neutrality (nū tral′ i ti), *n.* the state or quality of remaining unprejudiced in favor of one side or the other in a dispute, as she always maintains her *neutrality.*

neutralize (nū′ tral īz), *v.t.* to counteract; to make of no effect; to destroy the peculiar properties of, as a chemical.

never (nev′ ẽr), *adv.* at no time; in no degree, as *never* mind.

nevermore (nev ẽr mōr′), *adv.* at no future time, never again.

nevertheless (nev ẽr *th*ē les′), *adv.* notwithstanding; in spite of that.

***new** (nū), *adj.* of recent origin; young, as the *new* year; fresh, as a *new* start.

Syn. Novel, modern, fresh, recent. *New* expresses the idea of having existed or been known only a short time; *novel* implies something different from the usual; the *modern* is the thing of today; *fresh* denotes something just made, done or received; *recent* suggests something lately formed, created or developed.

Ant. Old, familiar, usual, common.

new (nū), *adv.* lately; newly.

newel (nū′ el), *n.* the upright pillar or post in a winding staircase about which the steps turn in their course; the post at the foot or landing of a stairway.

newfangled (nū fang′ gld), *adj.* newly made, novel: usually used disparagingly, as *newfangled* ideas.

***news** (nūz), *n.* a report of recent events, tidings; something unknown to the listener or reader, as that's *news* to me.

Syn. Tidings, intelligence. *News* is a general term; *tidings* is now rarely used except in poetic or elevated speech; *intelligence* implies news more or less formally communicated.

newspaper (nūz′ pā pẽr), *n.* a paper published periodically, usually either daily or weekly, containing the most recent available reports of events.

newsprint (nūz′ print), *n.* a wood-pulp paper used for newspapers.

newt (nūt), *n.* a small salamander, eft.

next (nekst), *adj.* immediately following or preceding, as *next* in line; nearest in time, as the *next* hour; nearest in place, as the *next* house; nearest in rank or degree.

nib (nib), *n.* a point, as of a pen; a handgrip on the shaft of a scythe.

nib (nib), *v.t.* to furnish with a nib; to sharpen a point.

nibs (nibz), *n. pl.* crushed beans of cocoa or or coffee.

nibble (nib′ l), *n.* a small bite.

nibble (nib′ l), *v.i. and v.t.* to bite off in little bits; to make successive small bites, as a fish *nibbles* at the bait.

niblick (nib′ lik), *n.* a heavy, iron-headed golf club with slanting face, used to loft the ball.

*****nice** (nīs), *adj.* fastidious, precise; pleasing, well-mannered, as a *nice* child; discriminating, as a *nice* ear for music.

*****nicety** (nī′ se ti), *n.* [*pl.* niceties] a minute distinction, as the *niceties* of argument; exactness of perception; accuracy, as the proportions were calculated to a *nicety.*

*****niche** (nich), *n.* a recess in a wall, especially one to hold a statue.

nick (nik), *n.* a notch or broken place in any surface, as the vase has a *nick;* an exact point of time, moment of crisis, as you arrived in the *nick* of time.

nick (nik), *v.t.* to make nicks in, chip, as to *nick* a plate.

nickel (nik′ el), *n.* a silver-white ductile metal, tough and noncorrosive; a five-cent coin made of a nickel and copper alloy.

nickel-plate (nik′ el plāt), *n.* a thin layer of nickel spread over a metal surface by means of electrolysis, to improve its appearance or to prevent rusting.

nickel-plated (nik′ el plāt′ ed), *adj.* coated with a layer of nickel.

nickel silver (nik′ el sil′ vēr), German silver, an alloy of copper, zinc and nickel, usually in proportion 3, 1 and 1.

nickel steel (nik′ el stēl), steel with a percentage of nickel, harder and stronger than carbon steel, used in building automobiles.

nickname (nik′ nām), *n.* a shortened form of a given name, as Bob for Robert; a name given in derision, as Horseface, Fatty.

*****nicotine** (nik′ ō tēn), *n.* a colorless, poisonous oil contained in tobacco, used as an insecticide.

nidus (nī′ dus), *n.* the nest of spiders and insects.

*****niece** (nēs), *n.* the daughter of one's brother or sister.

niggard (nig′ ērd), *n.* a stingy person.

niggard (nig′ ērd), *adj.* stingy, covetous.

niggardly (nig′ ērd li), *adj.* miserlike; meanly small, as a *niggardly* allowance.

niggardly (nig′ ērd li), *adv.* in the manner of a niggard; stingily, meanly.

nigh (nī), *adj.* near; on the side toward the driver, as the *nigh* horse.

nigh (nī), *adv.* almost; near in time, place, relationship, likeness or course of events.

nigh (nī), *prep.* near to.

night (nīt), *n.* the time between sunset and sunrise; the close of the day.

nightingale (nīt′ in gāl), *n.* a bird of the thrush family about six inches long, noted for the male's song at night.

nightjar (nīt′ jär), *n.* a night-flying insectivorous bird.

night letter (nīt let′ ēr), a long telegram sent at reduced rates after a certain hour in the evening.

nightmare (nīt′ mâr), *n.* a dreadful dream accompanied by physical uneasiness.

nightshade (nīt′ shād), *n.* any of several plants including the potato plant, eggplant and bittersweet, especially the poisonous or medicinal varieties.

*****nihilism** (nī′ i lizm), *n.* the doctrine that the present social organization is so bad that it should be destroyed even if it cannot be improved; terrorism.

*****nihilist** (nī′ i list), *n.* one who advocates or supports the theory that destruction of the present order is desirable; an anarchist.

nimble (nim′ bl), *adj.* active, as a *nimble* mind; quick; lively, as *nimble* fingers.

nimbus (nim′ bus), *n.* the halo of light surrounding the heads of divinities and saints.

nine (nīn), *n.* one more than 8.

nineteen (nīn tēn′), *n.* one more than 18.

ninety (nīn′ ti), *n.* one more than 89.

ninny (nin′ i), *n.* a simpleton.

ninth (nīnth), *n.* one of 9 equal parts.

ninth (nīnth), *adj.* next after the 8th.

nip (nip), *n.* a pinch between the fingers; sudden, sharp cold, as the *nip* of the wind; a tang, as in strong cheese.

nip (nip), *v.t.* to pinch between the fingers, as to *nip* off a flower; to bite lightly, as your dog *nipped* me; to blight, as frost *nipped* the peach buds.

nipper (nip′ ēr), *n.* one who or that which pinches; a horse's front tooth; the claw of a crab.

nippers (nip′ ērz), *n.* pincers.

nipple (nip′ l), *n.* the protuberance of the female breast through which a baby or young animal draws milk; the rubber mouthpiece of a nursing bottle.

*****nirvana** (nir vä′ n*a*), *n.* complete renunciation; freedom from desire, hate and false belief; sinless calm.

nit (nit), *n.* the egg of a parasitic insect such as a flea or louse; the young insect.

niter (nī′ tēr), *n.* a white salt, potassium nitrate or saltpeter, used in making gunpowder.

nitrate (nī′ trāt), *n.* a salt of nitric acid; especially of potassium or sodium used as fertilizer.

nitric acid (nī′ trik as′ id), a liquid with strong corrosive quality used in the manufacture of explosives.

*****nitrogen** (nī′ trō jen), *n.* a colorless, tasteless and odorless gaseous element that forms a large part of the atmosphere.

nitrogenous (nī troj′ ē nus), *adj.* pertaining to the colorless and odorless gaseous element that forms a large part of the atmosphere; containing this element.

*****nitroglycerin** or **nitroglycerine** (nī trō glis′-ēr in), *n.* a highly explosive, oily liquid prepared by subjecting glycerin to the action of nitric and sulphuric acids.

nitrous (nī′ trus), *adj.* resembling a white, crystalline salt, potassium nitrate; obtained from this salt or impregnated with it.

no (nō), *n.* [*pl.* noes] a denial, as my *no* was emphatic; a negative vote: *noes,* the voters in the negative, as the *noes* have it.

no (nō), *adj.* not any; as he has *no* sense; not one, as there is *no* chance.

no (nō), *adv.* not so: opposite of *yes.*

nobility (nō bil′ i ti), *n.* the quality of being noble, fine character; the peerage or aristocracy.

noble (nō′ bl), *n.* a member of the titled aristocracy.

noble (nō′ bl), *adj.* [*comp.* nobler, *superl.* noblest] of high character; of great excellence or worth; grand, imposing; of the aristocracy.

nobleman (nō′ bl man), *n.* a member of the titled aristocracy, a peer.

nobody (nō′ bod i), *n.* [*pl.* nobodies] a person of no importance.

nobody (nō′ bod i), *pron.* not anybody.

nocturnal (nok tûr′ nal), *adj.* pertaining to night.

nod (nod), *n.* a quick and slight inclination of the head.

nod (nod), *v.i. and v.t.* to incline the head; to express by a quick, slight inclination of the head, as to *nod* assent; to bend or incline the upper part forward, as the flowers *nodded* in the wind; to make a mistake, as even Homer sometimes *nods.*

*****node** (nōd), *n.* a knot, knob, swelling; the knotty formation on a plant stem from which a leaf springs.

*****nodule** (nod′ ūl), *n.* a small knot or lump.

nog (nog), *n.* a block of wood set in masonry as a place for nailing; one of the square logs used in a pile to support the roof of a mine; a mixed drink, as egg*nog.*

nogging (nog′ ging), *n.* brickwork for filling in the spaces between timbers in a wooden frame.

noils (noilz), *n. pl.* combings or waste of wool or silk.

noise (noiz), *n.* loud sound; confusion of sounds; clamor.

*****noisome** (noi′ sum), *adj.* noxious; injurious to health; foul.

noisy (noiz′ i), *adj.* [*comp.* noisier, *superl.* noisiest] full of confused sounds; boisterous.

*****nomad** (nō′ mad), *n.* one who wanders from place to place.

nomad or **nomadic** (nō′ mad, nō mad′ ik), *adj.* wandering, unsettled.

no man's land (nō manz land), the area between two confronting lines in war; unowned or unclaimed land.

*****nom de plume** (nom′ dē plo͞om), a pen name; an assumed name under which an author writes.

*****nomenclature** (nō′ men klā tūr), *n.* the names or technical terms used in any art or science.

nominal (nom′ i nal), *adj.* pertaining to a name or to names; in name only, negligible, trifling, as a *nominal* sum.

nominate (nom′ i nāt), *v.t.* to propose for office, name as a candidate, appoint.

Syn. Name. To *nominate* and to *name* are both to mention by name, but to *nominate* is to mention for a specific purpose, to *name* may be for any purpose or no purpose beyond simple identification.

*****nonage** (non′ āj), *n.* minority; the first 21 years of living.

*****nonagenarian** (non *a* jē nâr′ i an), *n.* a person between the ages of 90 and 100 years.

*****nonce** (nons), *n.* the time being, as say no more for the *nonce.*

*****nonchalance** (non′ sh*a* lans), *n.* indifference; lack of interest or enthusiasm: airy unconcern.

nonchalant (non′ sh*a* lant), *adj.,* unconcerned, indifferent.

*****noncombatant** (non kom′ b*a* tant), *n.* one whose military duties do not include taking an active part in fighting, as a member of an ambulance corps.

noncommittal (non ko mit′ al), *adj.* concealing one's purposes and opinions; not committing oneself to any action.

nondescript (non′ dē skript), *n.* a person or thing not easily described.

nondescript (non′ dē skript), *adj.* unclassified or unclassifiable; having no distinctive features, as a *nondescript* hat.

none (nun), *pron.* not any, as I have *none.*

none (nun), *adv.* in no way; not at all, as *none* the worse for wear.

nonentity (non en′ ti ti), *n.* [*pl.* nonentities] the state of not existing, or existing only in the imagination; a person or thing absolutely unimportant.

*****nonfeasance** (non fē′ zans), *n.* neglect or omission of an official or legal duty.

*****nonpareil** (non p*a* rel′), *n.* a person or thing without an equal, peerless; a size of type.

nonpareil (non p*a* rel′), *adj.* having no equal, peerless.

nonplus (non′ plus), *v.t.* to puzzle; to perplex completely, as my reply *nonplused* him.

nonsense (non′ sens), *n.* that which is without meaning; words or language without meaning; anything absurd; trifles.

nonstop (non′ stop), *adj.* without a break, especially in aviation, as a *nonstop* flight.

nonsuit (non′ sūt), *n.* a decision against the plaintiff in a law suit because he has not prosecuted his case or established sufficient cause of action; a dismissal of complaint.

nonunion shop (non ūn′ yun shop), a shop where no union workers are employed.

noodle (no͞o′ dl), *n.* a narrow strip of dried dough, often used in soup.

*****nook** (nook), *n.* a secluded recess or corner.

noon (no͞on), *n.* the middle point of the day, midday.

noonday (no͞on′ dā), *adj.* pertaining to midday.

noose (no͞os), *n.* a running knot that holds more tightly as it is subjected to weight or pull.

noose (no͞os), *v.t.* to catch or snare in a noose.

nor (nôr), *conj.* likewise not, and not; or not: a negative connecting word after neither or not used to complete the meaning, as neither the man *nor* the child saw the approaching automobile, not by word *nor* look did she betray herself.

norm (nôrm), *n.* an established standard, rule, pattern.

normal (nôr′ mal), *adj.* according to standard or rule, regular, natural, customary, as *normal* procedure.

north (nôrth), *n.* one of the four points of the compass, the point directly opposite to the south and to the left of a person facing due east; the northern part of any country, as the *north* of Europe.

north (nôrth), *adj.* situated in the north, as the *North Pole;* facing or proceeding north, as the *north* passage of a ship; coming from the north, as a *north* wind.

north (nôrth), *adv.* to, in or toward the north, as the ship will proceed *north* from Panama.

northeast (nôrth ēst'), *n.* the point of the compass halfway between due north and due east.

northern (nôr' *th*ērn), *adj.* having to do with the north, as the *northern* part of the state.

northerner (nôr' *th*ēr nēr), *n.* a person living in the northern section of the United States, as distinguished from a southerner.

northern lights (nôr' *th*ērn līts), the aurora borealis.

northwest (nôrth west'), *n.* the point of the compass halfway between due north and due west.

nose (nōz), *n.* the organ of smell; snout; anything resembling a nose, as the *nose* of a torpedo.

nose (nōz), *v.i. and v.t.* to sniff, as the dogs *nosed* about; to rub with the nose, as the horses *nosed* each other; to find, detect, as to *nose* out a secret.

nose bag (nōz' bag), a feeding bag for horses, hung over the muzzle.

nose dive (nōz dīv), a swift downward plunge as by an airplane.

***nosology** (nō sol' ō ji), *n.* the classification of diseases.

***nostalgia** (nos tal' ji *a*), *n.* homesickness.

nostril (nos' tril), *n.* one of the two open passages of the nose.

nostrum (nos' trum), *n.* a quack medicine, cure-all.

***notable** (nō' ta bl), *adj.* worthy of notice, memorable.

notary (nō' *ta* ri), *n.* [*pl.* notaries] one permitted by law to attest legal documents.

notation (nō tā' shun), *n.* the practice of recording by marks or symbols; a method of using symbols instead of words; the act of noting or making a note.

notch (noch), *n.* a nick or cut in the edge of something; a narrow way between two mountains.

notch (noch), *v.t.* to mark with notches; to cut notches in.

note (nōt), *n.* a memorandum; a brief explanatory comment, as the *notes* to a text; a paper promising to pay money owed in a certain time; renown, as a man of *note;* a musical sound, or a sign representing one; a tone, as a *note* of joy in the voice; a short letter, as a *note* of acceptance.

note (nōt), *v.t.* to mark down, make a memorandum of; to mention, as to *note* in passing; to pay attention, as *note* what I say.

noted (nōt' ed), *adj.* celebrated.

nothing (nuth' ing), *n.* no thing, not anything, a nonentity.

nothing (nuth' ing), *adv.* not at all, as *nothing* loath.

notice (nō' tis), *n.* observation by mind or eye, attention; an announcement, as *notice* of a meeting; an order, as *notice* to vacate; critical comment, as a *notice* of a play.

notice (nō' tis), *v.i. and v.t.* to take note of, as I did not *notice;* to observe, perceive, give attention to, as she failed to *notice* my presence; to mention, as he *noticed* the book in his column.

Syn. Remark, observe. To *notice* is a more cursory action than to *remark.* We may *notice* a thing by a single glance, but to *remark* is to react with the mind. We *observe* things in order to judge of them or draw conclusions from them.

noticeable (nō' tis *a* bl), *adj.* capable of being seen, conspicuous, as a *noticeable* limp; worthy of observation.

notification (nō ti fi kā' shun), *n.* the act of making known or of giving notice; a notice given; a document by which a legal information is conveyed.

notify (nō' ti fī), *v.t.* [*p.t.* and *p.p.* notified, *pr.p.* notifying] to give notice to; to inform of.

notion (nō' shun), *n.* an idea or conception of something; a belief; inclination, as I have a *notion* to go.

notoriety (nō tō rī' e ti), *n.* the state of being publicly known in an unfavorable way.

notorious (nō tō' ri us), *adj.* noted, famous; widely discussed in an unfavorable or scandalous way; as he is a *notorious* gambler.

notwithstanding (not with stan' ding), *adv.* nevertheless, however, yet.

notwithstanding (not with stan' ding), *prep.* in spite of, as *notwithstanding* your opposition.

notwithstanding (not with stan' ding), *conj.* although.

nougat (nōō' gat), *n.* a sweet candy made of almonds, pistachio and other nuts.

nought (nôt), *n.* nothing; a worthless thing or person; zero, the mathematical symbol *0,* a cipher.

noun (noun), *n.* the name of a person, place or thing.

nourish (nûr' ish), *v.t.* to feed, support; to maintain; to promote the growth of, as sunshine *nourishes* plants.

***novel** (nov' el), *n.* a long fictitious prose narrative with a plot.

novel (nov' el), *adj.* recently introduced or discovered, new, strange or unusual.

novelist (nov' el ist), *n.* one who writes books of fiction.

novelty (nov' l ti), *n.* [*pl.* novelties] newness and strangeness; something that is new and strange.

***novice** (nov' is), *n.* a beginner; a monk or nun on probation.

novitiate (nō vish' i āt), *n.* the state of being a beginner; a period of testing and training before final admission to a religious order.

now (nou), *adv.* at this time; at that time; immediately, as I must go *now;* under the present circumstances, as *now* what shall we do?

now (nou), *conj.* since; seeing that, as *now* that you have brought up the matter I may as well confess.

nowadays (nou' *a* dāz), *adv.* in these times.

nowise (nō' wīz), *adv.* in no way, manner or degree.

***noxious** (nok' shus), *adj.* harmful, deadly, pernicious.

nozzle (noz' l), *n.* a spout, as of a hose, teapot, teakettle.

***nuance** (nū ans'), *n.* a slight variation; a small gradation, as a delicate *nuance* of color or tone.

***nucleus** (nū' klē us), *n.* the central mass around which matter accumulates or grows; anything that serves as a center of development, as the *nucleus* of the army was this regiment.

nude (nūd), *adj.* naked, bare.

nudge (nuj), *v.t.* to push gently, as I *nudged* him with my elbow.

***nugatory** (nū' ga tō ri), *adj.* insignificant, useless.

nugget (nug' et), *n.* a lump, as of native gold; any small thing of much value; as *nuggets* of wisdom.

***nuisance** (nū' sans), *n.* anything that causes vexation or annoyance.

null (nul), *adj.* having no legal force or effect, invalid, void, not binding.

nullification (nul i fi kā' shun), *n.* the act of nullifying.

nullify (nul' i fī), *v.t.* [*p.t.* and *p.p.* nullified, *pr.p.* nullifying] to annul or render void, make ineffective.

nullity (nul' i ti), *n.* the quality or condition of being without force or effect.

***numb** (num), *v.t.* to deprive of feeling.

numb (num), *adj.* without power of feeling.

number (num' bēr), *n.* the total count of aggregated units, the symbol that stands for this amount; a certain numeral that serves to identify a person or thing from others, as I noted down the *number* of the bus; a considerable company, as a *number* of people; a single one of a series, as the June *number* of a magazine.

number (num' bēr), *v.t.* to count; to put a number on, as a house.

numberless (num' bēr les), countless, innumerable.

numeral (nū' mēr al), *n.* a symbol or word that expresses a number.

numeral (nū' mēr al), *adj.* pertaining to numbers; denoting a number.

numeration (nū mēr ā' shun), *n.* the act of numbering; the art of reading numbers.

numerator (nū' mēr ā tēr), *n.* the number above the line in fractions, indicating the number of fractional units taken, as two is the *numerator* in the fraction two-thirds.

numerical (nū mer' i kal), *adj.* pertaining to or expressed in numbers.

numerous (nū' mēr us), *adj.* consisting of a great number of persons or things; many.

***numismatics** (nū miz mat' iks), *n. pl.* the study of coins and medals.

numskull (num' skul), *n.* a blockhead.

nun (nun), *n.* a woman devoted to a religious life and usually living in a convent under vows.

***nuncio** (nun' shi o), *n.* a papal ambassador.

nunnery (nun' ēr i), *n.* [*pl.* nunneries] a convent.

***nuptial** (nup' shal), *adj.* pertaining to marriage.

nuptials (nup' shalz), *n.* a marriage ceremony.

nurse (nûrs), *n.* a woman who cares for infants; one who tends the sick.

nurse (nûrs), *v.i. and v.t.* to do nursing; to suck milk from a mother; to nourish and suckle, as a baby; to tend the sick; to treat, as to *nurse* a fever; to foster, as to *nurse* a grievance.

nursery (nûr' sē ri), *n.* a room in a house set aside for the care and play of young children; a place where trees, shrubs and vines are grown for transplanting.

nurseryman (nûr' sē ri man), *n.* a man who grows plants for sale.

nurture (nûr' tūr), *n.* nourishment; education, training.

nurture (nûr' tūr), *v.t.* to rear, care for and educate, foster.

nut (nut), *n.* the fruit of certain trees, consisting of a kernel in a shell; a threaded head for a bolt.

nutcracker (nut' krak ēr), *n.* an instrument for cracking nuts.

nutmeg (nut' meg), *n.* the aromatic kernel of the fruit of an East Indian tree, grated and used as spice.

***nutrient** (nū' tri ent), *adj.* promoting growth, nourishing

nutriment (nū' tri ment), *n.* nourishment, food; that which promotes development.

nutrition (nū trish' un), *n.* that which nourishes, food; the process by which plants and animals absorb and utilize nourishment.

nutritious (nū trish' us), *adj.* affording nourishment.

nutritive (nū' tri tiv), *adj.* pertaining to or having the quality of nutrition.

nuzzle (nuz' l), *v.t. and v.i.* to rub or snuff with the nose, as the horse *nuzzled* its master's hand; to nestle, lie close.

***nymph** (nimf), *n.* a goddess of nature inhabiting the mountains, woods or streams; an insect in the pupa stage of development.

O

oaf (ōf), *n.* a dull-witted person, simpleton, dolt.

oak (ōk), *n.* a tree that bears a one-celled fruit, called an acorn, set in a scaly cup; its hard wood.

oaken (ōk' en), *adj.* made of or like oak.

oakum (ō' kum), *n.* loose hemp obtained by untwisting old ropes and used aboard ship with pitch, to calk seams.

***oar** (ōr), *n.* a wooden shaft with a broad blade at one end, for use in rowing a boat.

oar (ōr), *v.t.* to row.

***oasis** (ō ā' sis), *n.* [*pl.* oases] a fertile spot in the midst of a desert.

oaten (ōt' n), *adj.* made of oats or oatmeal.

oats (ōtz), *n.* a grain used as feed for livestock and its meal ground and used as a breakfast cereal.

oath (ōth), *n.* [*pl.* *oaths, pronounced ōthz] a solemn declaration of intention to tell the truth; a holy name used profanely, as in anger.

***obduracy** (ob' dū ra si), *n.* stubbornness.

***obdurate** (ob' dū rāt), *adj.* not to be moved by argument or appeal; intractable, inflexible, unyielding.

***obedience** (ō bē' di ens), *n.* submission to authority; the act of obeying.

obedient (ō bē' di ent), *adj.* submissive to authority, yielding, compliant.

Syn. Yielding, compliant, dutiful, obsequious. *Obedient* implies willing submission to control; *compliant* and *yielding* suggest ready and sometimes weak, conformance with another's wishes; *dutiful* implies obedience from a sense of obligation, as to a parent; *obsequious* carries the suggestion of servility and fawning.

***obeisance** (ō bā' sans), *n.* a bow or a bend of the knee indicating submission or homage.

***obelisk** (ob' e lisk), *n.* a high, four-sided pillar of stone tapering as it rises, and having a pyramidal top; a printing mark (†) in a text referring the reader to a footnote similarly marked.

obese (ō bēs'), *adj.* corpulent.

***obesity** (ō bēs' i ti), *n.* excessive fatness.

obey (ō bā'), *v.i. and v.t.* to do as bidden, as the child *obeyed* instantly; to yield to the authority of, as to *obey* one's parents.

***obfuscate** (ob fus' kāt), *v.t.* to darken, obscure; to confuse, bewilder; to dim, as his vision was *obfuscated*.

***obituary** (ō bit' ū er i), *n.* [*pl.* obituaries] a printed notice of a death; an article about one who has very recently died.

object (ob' jekt), *n.* anything that can be perceived by the senses; a person or thing toward whom or which an act or feeling is directed, as the *object* of a campaign, an *object* of pity; a word or clause naming that which receives the action indicated by a verb, as in the sentence, he climbed the steps, steps is the *object* of climbed.

object (ob jekt'), *v.i. and v.t.* to regard with disfavor, as I *object;* to offer in opposition, as I *object* that the house is too old.

Syn. Oppose. To *object* to a thing is to propose or start something against it; to *oppose* it is to set oneself steadily and actively against it.

Ant. Favor, further.

objection (ob jek' shun), *n.* the act of objecting; the argument brought forth in opposition, as my *objection* is that the distance is too great.

objectionable (ob jek' shun *a* bl), *adj.* not fit for acceptance; reprehensible, offensive.

objective (ob jek' tiv), *n.* the end toward which action is directed, as success is his *objective;* the accusative case.

objective (ob jek' tiv), *adj.* serving as a goal; existing outside the mind; detached, impersonal, as an *objective* point of view: opposite of *subjective;* accusative, as the verb governs a pronoun in the *objective* case.

***objurgate** (ob' jẽr gāt), *v.t.* to chide, reprove.

objurgatory (ob jûr' *ga* tō ri), *adj.* having the nature of reproof.

***oblate** (ob' lāt), *adj.* flattened at the poles, as the earth is an *oblate* spheroid.

***oblate** (ob' lāt), *n.* one devoted to the monastic life or to some special mission.

***oblation** (ob lā' shun), *n.* a religious offering or sacrifice; any offering to a church or charity.

obligate (ob' li gāt), *v.t.* to put under legal or moral indebtedness, as he obligates me by his continued kindness.

obligation (ob li gā' shun), *n.* the binding power of a promise or contract; the state of being indebted for a favor.

***obligatory** (ob lig' *a* tō ri), *adj.* binding, imposing a duty.

oblige (ō blīj'), *v.t.* to put under obligation, constrain; to do a favor for, as the singer *obliged* the audience with an encore.

obliging (ō blīj' ing), *adj.* ready to do favors.

***oblique** (ob lēk'), *adj.* between the horizontal and the vertical, slanting, as a line; deviating from the perpendicular; indirect, as *oblique* methods.

obliquity (ob lik' wi ti), *n.* [*pl.* obliquities] the state of being neither horizontal nor vertical, lack of perpendicularity; deviation from correct principles.

obliterate (ob lit' ẽr āt), *v.t.* to blot out, efface.

oblivion (ob liv' i un), *n.* the state of forgetting completely or of being completely forgotten.

oblivious (ob liv' i us), *adj.* forgetful; not noticing, as *oblivious* of his surroundings.

***oblong** (ob' lông), *n.* a right-angled figure with more length than breadth.

oblong (ob' lông), *adj.* having right angles and being more long than broad.

***obloquy** (ob' lō kwi), *n.* [*pl.* obloquies] reproachful language; the condition of being censured or held in contempt.

obnoxious (ob nok' shus), *adj.* offensive, odious.

***oboe** (ō' bō), *n.* [*pl.* oboes] a slender, woodwind musical instrument having a double reed and producing a thin, plaintive tone; an organ stop producing the tone of an oboe.

***obscene** (ob sēn'), *adj.* indecent, offensive to modesty, lewd.

***obscenity** (ob sen' i ti), *n.* [*pl.* obscenities] an act or expression of indecent nature.

obscure (ob skūr'), *adj.* dim, indistinct, clouded; hard to understand, vague, as an *obscure* paragraph; humble, lowly, as he rose from an *obscure* position.

obscurity (ob skū' ri ti), *n.* [*pl.* obscurities] indistinctness; state of being without fame.

obsecrate (ob' sē krāt), *v.t.* to entreat.

obsecration (ob sē krā' shun), *n.* an earnest entreaty; a petition in the Roman church litany beginning with the word *by*.

***obsequies** (ob' sē kwiz), *n. pl.* funeral rites.

***obsequious** (ob sē' kwi us), *adj.* servile, fawning.

observance (ob zûr' vans), *n.* the act of conforming to or heeding, as laws and customs.

observant (ob zûr' vant), *adj.* watchful; taking notice.

observation (ob zûr vā' shun), *n.* the act of taking notice; something noticed; a remark.

Syn. Observance. *Observation* now commonly applies to that which is carefully considered, as a patient is under *observation* so that his physician may study his symptoms; *observance* implies conformance with laws and customs, as he is strict in his *observance* of traffic regulations.

observatory (ob zûr' va tō ri), *n.* [*pl.* observatories] a place fitted up with telescopes for studying the sky and stars; a high place that affords an extensive view.

observe (ob zûrv'), *v.t. and v.i.* to keep in view; to take notice of; to comply with, as to *observe* rules; to celebrate, as to *observe* a holiday; to take notice; to comment.

observing (ob zûr' ving), *adj.* quick to notice, as an *observing* person.

obsess (ob ses'), *v.t.* to beset, haunt or harass, as the threat of war *obsesses* him.

obsession (ob sesh' un), *n.* the state of being ruled by one idea or desire; a ruling idea, a mania.

obsolescent (ob sō les' ent), *adj.* going out of use.

obsolete (ob' sō lēt), *adj.* out of use, discarded, as an *obsolete* word or custom.

obstacle (ob' sta kl), *n.* an obstruction, impediment, that which stands in the way, as an obstacle to progress.

obstetrics (ob stet' riks), *n.* the branch of medicine that pertains to childbirth.

obstinacy (ob' sti na si), *n.* [*pl.* obstinacies] the state or quality of being stubborn; unreasonable adherence to a purpose or opinion; a stubborn attitude or act.

obstinate (ob' sti nit), *adj.* pertinaciously adhering to one's opinions or purposes; stubborn; not yielding to treatment, as a *stubborn* disease.

Syn. Obdurate, inflexible, headstrong, willful, dogged, stubborn, pertinacious, intractable; refractory. *Obstinate* implies not yielding to argument, persuasion or pleading; *dogged* denotes a tenacious and sometimes sullen pursuit of a certain course or idea; *stubborn* usually indicates native perseverance; *pertinacious* connotes an irritating persistence, as a *pertinacious* salesperson; *intractable* and *refractory* imply resistance to control, although an *intractable* child usually resists less actively than a *refractory* one.

Ant. Yielding, pliant, docile, tractable.

obstreperous (ob strep' ẽr us), *adj.* clamorous, turbulent, unruly.

obstruct (ob strukt'), *v.t.* to block up, impede as the passage of something; to retard; to cut off, as to *obstruct* the view.

***obtain** (ob tān'), *v.i. and v.t.* to be established in custom or use, as the custom *obtains* in that country, to get possession of, gain, acquire, win, procure, as to *obtain* permission.

***obtrude** (ob tro͞od'), *v.i. and v.t.* to force oneself upon others; to thrust in or upon.

***obtrusive** (ob trū' siv), *adj.* inclined to push forward.

***obtuse** (ob tūs'), *adj.* not acute, as an *obtuse* angle; not having keen sensibilities, dull, stupid, as an *obtuse* person.

***obverse** (ob' vûrs), *n.* a front surface, especially the head or date side of a coin: opposite of *reverse*.

obverse (ob' vûrs), *adj.* facing the observer; having the base narrower than the top, as an *obverse* leaf.

obviate (ob' vi āt), *v.t.* to meet and dispose of; to clear away, remove, as that will *obviate* the necessity of writing.

obvious (ob' vi us), *adj.* evident, plain.

***occasion** (o kā' zhun), *n.* occurrence; cause, as that was the *occasion* of the trouble; a favorable opportunity, as when the *occasion* arises; opportunity; a special event or ceremony.

Syn. Occasion, cause. *Occasion* implies something that directly or indirectly provides an opportunity to act, as I seized the *occasion* to tell him; the *cause* is that which actually makes something happen, as he was the *cause* of the misunderstanding.

occasional (o kā' zhun al), *adj.* occurring at intervals, as an *occasional* week end in the country; referring to some special event, as an *occasional* poem; incidental, as *occasional* comments.

occasionally (o kā' zhun al i), *adv.* now and then, as we see each other *occasionally*.

***occident** (ok' si dent), *n.* the west: opposite of *orient*.

occipital bone (ok sip' i tal bōn), the bone at the lower part of the back of the skull.

occiput (ok' si put), *n.* [*pl.* occipita] the back of the skull or head.

***occlude** (o klo͞od'), *v.i. and v.t.* to shut up, to close or obstruct; to shut in or out as by closing a passage, as to *occlude* light.

***occult** (o kult'), *adj.* pertaining to magic, astrology and other arts using divination or incantation; mysterious.

occupancy (ok' ū pan si), *n.* the act of living in, as a house; act of holding in possession; the term during which one occupies premises.

occupant (ok' ū pant), *n.* one living in a house, a tenant.

occupation (ok ū pā' shun), *n.* the act of occupying; one's business or calling.

occupy (ok' ū pī), *v.t.* to dwell in; to devote to or apply oneself to, as to *occupy* one's time or oneself with work; to take up, fill, as the estate *occupies* many acres of ground.

occur (o kûr'), *v.i.* to happen, as it must not *occur* again; to come to mind, as it suddenly *occurred* to me.

occurrence (o kûr' ens), *n.* something that happens, an event, incident.

ocean (ō' shun), *n.* the vast expanse of salt water covering nearly three fourths of the globe; one of the major divisions of this expanse, as the Pacific *Ocean*.

ocher (ō' kẽr), *n.* an earthy, yellow or red ore, used as a pigment in paints.

***octagon** (ok' ta gon), *n.* a plane figure having eight sides and eight angles.

***octave** (ok' tāv), *n.* the harmonic combination of two musical tones eight diatonic degrees apart; the whole series of tones that they comprise.

***octavo** (ok tā′ vō), *n.* [*pl.* octavos] a book made by folding a sheet into eight leaves or 16 pages.

***octopus** (ok′ tō pus), *n.* [*pl.* octopuses, octopodes or octopi] a sea mollusk having eight arms projecting from a saclike body and ending in suckers with which it grasps and holds its prey.

ocular (ok′ ū lẽr), *adj.* pertaining to the eyes or to sight.

oculist (ok′ ū list), *n.* one who treats diseases of the eye.

odd (od), *adj.* not paired or matched with another; extra; peculiar, queer.

oddity (od′ i ti), *n.* [*pl.* oddities] strangeness, eccentricity, a queer or peculiar person or thing.

odds (odz), *n.pl.* inequality, advantage, as the *odds* are in his favor; an advantage in an amount wagered to compensate for smaller chances of winning, as 4 to 1 *odds.*

***ode** (ōd), *n.* a formal poem in exalted style, generally written in commemoration of some great event or in honor of some distinguished person.

***odious** (o′ di us), *adj.* hated or abhorred, offensive.

odium (o′ di um), *n.* hatred, dislike.

odor (ō′ dẽr), *n.* smell, scent, that which affects the sense of smell, as the *odor* of newly baked bread, the *odor* of burning rubber.

odoriferous (ō dẽr if′ ẽr us), *adj.* giving out an odor.

odorous (ō′ dẽr us), *adj.* having a scent.

of (ov), *prep.* from, indicating separation; source, as *of* noble birth; from as cause, as he died *of* pneumonia; by, as the novels *of* Galsworthy; with, as means or material, as it is made *of* glass; about, relating to, as to talk *of* the past; distinguished by, as a time *of* fear; from, amongst, out of, as to give *of* one's time, some *of* the crowd; belonging to, connected with, as the right *of* the owner; during, as *of* recent years.

off (ôf), *adj.* being absent or away, as he is *off* to the country; removed, as his coat is *off;* inaccurate, as he is *off* in his figures; below standard, as an *off* season; more removed or distant, as on the *off* side.

off (ôf), *adv.* so as to move away, out from a place or position, as to push *off;* from, so as not to be on, as take *off* your coat; so as to end or be rid of, as the pain passed *off;* so as to decrease, as inquiries fell *off;* away from work, as a day *off;* at a distance, as he stood a block *off.*

off (ôf), *prep.* not on; away from, as take it *off* the table; distant from, as a mile *off* shore; temporarily freed from, as *off* duty; below the standard, as *off* one's game.

off (ôf), *interj.* begone! away with you!

***offal** (of′ al), *n.* the waste parts of a butchered animal, carrion, refuse.

offend (o fend′), *v.t. and v.i.* to cause to feel hurt, make angry, as he *offended* his best friend; to transgress a moral or divine law, sin; to displease.

offender (o fend′ ẽr), *n.* one who breaks a law or causes displeasure.

offense (o fens′), *n.* an affront; a transgression, as an *offense* against the law; the feeling of injury, as to take *offense;* the attacking side; the act, plan or system of attack.

offensive (o fen′ siv), *n.* the attacking side; system of attack.

offensive (o fen′ siv), *adj.* displeasing, disagreeable.

offer (ôf′ ẽr), *n.* the act of proposing a deal, as to make an *offer;* naming of price, as fifty dollars is my *offer.*

offering (ôf ẽr ing), *n.* the act of making a proposal; that which is offered; a gift.

offertory (ôf′ ẽr tō ri), *n.* the offering to God of bread and wine in the sacrament; a hymn or prayer at this time; the collection of money at a religious service.

offer (ôf′ ẽr), *v.i. and v.t.* to occur or present itself for acceptance or rejection, as opportunity *offers;* to place before one for acceptance or rejection, as to *offer* money; to propose, as to *offer* a solution; name, as a price; to do, make or give, as to *offer* resistance; to proffer, as to *offer* advice.

offhand (ôf hand′) *adv.* without preparation; casually.

office (ôf′ is), *n.* a position of trust and authority; a place of public or private business; a duty or service, as he tendered his good *offices;* any prescribed religious service, as the *office* of the dead.

officer (ôf′ i sẽr), *n.* a person commissioned to perform stated public duties, as an *officer* of the law; one elected to manage the affairs of an organization, as an *officer* of a bank; one who holds a position of authority in the army or navy.

***official** (o fish′ al), *n.* one who holds office.

official (o fish′ al), *adj.* pertaining to an office, as *official* duties; having proper authority.

***officiate** (o fish′ i āt), *v.i.* to perform the duties of an office, as the minister *officiated.*

***officious** (o fish′ us), *adj.* meddling, intrusive.

offing (ôf′ ing), *n.* the deep sea, far offshore; distance, as in the *offing.*

***offset** (ôf set′), *v.t.* to make up for, balance, as the beauty of the place *offset* the gray weather.

offset (ôf′ set) *n.* something that counterbalances or sets off; an offshoot; a smudged impression from a printed sheet to another sheet; a method of lithography.

offshoot (ôf′ sho͞ot), *n.* a shoot or branch from a main stem.

offshore (ôf′ shore), *adj.* coming, moving or directed away from the shore, as an *offshore* breeze; situated away from the shore.

offspring (ôf′ spring), *n.* one's child or children; descendants; the young of animals: a result.

Syn. Progeny, issue. *Offspring* is applicable to one or many children in a family. *Progeny* is employed only in referring collectively to a number. *Issue* is used in an indefinite manner without regard to number.

***often** (ôf′ en), *adv.* many times, frequently.

***ogle** (ō′ gl), *n.* an amorous glance.

ogle (ō′ gl), *v.t.* to look at fondly with amorous glances.

ohm (ōm), *n.* the unit of electrical resistance.

oil (oil), *n.* an inflammable and greasy liquid obtained from various animal, vegetable and mineral substances and used for lighting, lubrication, medicine.

***oil** (oil), *v.t.* to lubricate with oil.

oilcloth (oil′ klôth), *n.* canvas coated with linseed oil and used for covering floors, tables, shelves.

oilskin (oil′ skin), *n.* cloth treated with oil and used for waterproof garments.

oily (oil′ i), *adj.* containing or like oil, greasy.

ointment (oint′ ment); *n.* an oily preparation applied to wounds; a salve used to make the skin smooth and soft.

***okra** (ō′ kr*a*), *n.* a West Indian plant with seedpods valued for use in soups, stews and pickles.

old (ōld), *adj.* advanced in years, no longer young; long in use, as an *old* hat; belonging to the distant past, as an *old* spinning wheel.

old-world (ōld wûrld), *adj.* relating to ancient times or the ancient world, and (usually with caps.) especially the Eastern Hemisphere, as *Old-World* customs.

olden (ōld′ n), *adj.* ancient; bygone, as *olden* times.

oleaginous (ō lē aj′ i nus), *adj.* oily, greasy, unctuous.

***oleander** (ō lē an′ dẽr), *n.* a poisonous evergreen shrub with handsome, fragrant flowers.

***oleomargarine** (ō lē ō mär′ j*a* rēn), *n.* imitation butter made from animal or vegetable fats.

***olfactory** (ol fak′ tō ri), *adj.* pertaining to or used in smelling.

***oligarchy** (ol′ i gär ki), *n.* [*pl.* oligarchies] rule by a few; a government in which all power is in the hands of a few persons.

olive (ol′ iv), *n.* an Old-World evergreen tree; the oily fruit of this tree; the dull green color of this fruit before it ripens.

olive (ol′ iv), *adj.* having a greenish-yellow or yellowish-brown color, as an *olive* skin.

olive branch (ol′ iv brȧnch), a branch of the olive tree, as an emblem of peace.

***omega** (ō mē′ g*a*), *n.* the last letter of the Greek alphabet; the last thing, the end, as he knows his subject from alpha to *omega.*

***omelet** (om′ e let), *n.* a dish made of eggs and milk (or water), beaten and cooked in a pan.

omen (ō′ men), *n.* a sign of some future event, portent.

Syn. Prognostic, presage. The *omen* and the *prognostic* are both drawn from external objects; the *presage* is drawn from one's own feelings.

omen (ō′ men), *v.t. and v.i.* to foretell by signs, prognosticate; to forebode.

ominous (om′ i nus), *adj.* foreboding evil, inauspicious, threatening.

omission (ō mish′ un), *n.* the act of leaving out of account or neglecting to do; a thing omitted.

omit (ō mit′), *v.t.* to leave out, neglect to do, fail to mention.

omnibus (om′ ni bus), *n.* a public vehicle carrying passengers over a fixed route.

omnipotence (om nip′ ō tens), *n.* unlimited power: *Omnipotence,* the Diety.

omnipotent (om nip′ ō tent), *adj.* having unlimited power, all-powerful.

omnipresence (om ni prez′ ens), *n.* universal presence; the state of being everywhere at once.

***omniscient** (om nish′ ent), *adj.* knowing all things; infinitely wise, as the *omniscient* God.

omnivorous (om niv′ ō rus), *adj.* eating all kinds of food, animal and vegetable alike.

on (on), *prep.* over and in contact with, as the hat lies *on* the shelf; in connection or activity with, as he is *on* the staff; with, as a basis or ground of action or opinion, as I have it *on* good authority; at, in the region that is toward, as the ocean lies *on* the east; during, as *on* Monday; upon the occasion of, as cash *on* delivery; in a state of, as *on* sale; towards, to the account of, as fortune smiled *on* him; in relation to, as to agree *on* a plan.

on (on), *adv.* not off; onward, forward.

on (on), *adj.* in progress, as the race is *on;* open, as the switch is *on.*

***once** (wuns), *adv.* at one time, formerly; one time, as I went only *once.*

one (wun), *n.* the number 1 or its symbol; a person.

one (wun), *adj.* single in number.

***onerous** (on′ ẽr us), *adj.* burdensome, weighty, oppressive.

one-way (wun wā), *adj.* moving or permitting motion in one direction only, as a *one-way* street, *one-way* traffic.

***onion** (un′ yun), *n.* a plant with a bulbous root that is used as food.

onlooker (on′ look ẽr), *n.* a spectator.

only (ōn′ li), *adj.* sole, single, as this is the *only* one I have.

only (ōn′ li), *adv.* exclusively, singly, as I have *only* this one.

***onomatopœia** (on ō mat ō pē′ y*a*), *n.* the formation or putting together of words to resemble the sounds made by the thing signified, as buzz.

onrush (on′ rush), *n.* a rushing onward, as the child was frightened by the *onrush* of the crowd.

onset (on′ set), *n.* an assault, attack; the first stage, as the *onset* of a disease.

onslaught (on′ slôt), *n.* a furious attack.

ontology (on tol′ ō ji), *n.* the branch of metaphysics that deals with the essential nature, properties and relations of things; the science of reality.

onus (ō′ nus), *n.* a duty, a responsibility, burden of proof (Latin *onus probandi*), as the *onus* falls on you.

onward (on′ wẽrd), *adv.* forward.

***onyx** (on′ iks), *n.* a variety of quartz in layers of various colors.

***oolong** (o͞o′ long), *n.* a Chinese tea.

ooze (o͞oz), *n.* soft mud or slime; an almost imperceptible flow.

ooze (o͞oz), *v.i. and v.t.* to flow almost imperceptibly; to exude as through pores.

opacity (ō pas′ i ti), *n.* the quality of being impervious to light.

***opal** (ō′ pal), *n.* a precious stone of milky hue, exhibiting in the light a play of various colors.

opalescent (ō pal es′ ent), *adj.* resembling opal in its play of colors under changing light.

***opaque** (ō pāk′), *adj.* not transparent, impervious to light.

***open** (ō′ pen), *n.* wide space, clear of obstructions to the view, as out in the *open.*

***open** (ō′ pen), *v.i. and v.t.* to unclose; to unfold, as a flower; to make a first move; to unclose, as a door; to clear, as to *open* a road blocked by snow; to inaugurate, as to *open* the season, *open* a show.

***open** (ō′ pen), *adj.* not closed, as an *open* door; clear of obstruction, as *open* country; uncovered, as an *open* boat; frank, unconcealed, as *open* criticism; undecided, as an *open* question; free to all, as an *open* meeting.

***opening** (ō′ pen ing), *n.* an aperture; cavity; beginning, as of a play.

openly (ō′ pen li), *adv.* without concealment, as *openly* jealous.

openwork (ō′ pen wûrk), *n.* any work made so as to show open spaces in its pattern, especially embroidery.

opera (op′ ēr *a*), *n.* a musical drama.

operate (op′ ēr āt), *v.i. and v.t.* to produce a certain effect; to run, conduct, as to *operate* a machine, to *operate* a business.

operatic (op ēr at′ ik), *adj.* having to do with opera; resembling opera.

operation (op ēr ā′ shun), *n.* the act, method or result of operating; regular action, as the factory is in *operation;* a surgery on the living body.

operative (op′ ēr *a* tiv), *adj.* working, effective.

operetta (op ēr et′ *a*), *n.* a light musical play with slight plot and spoken dialogue.

***ophthalmia** (of thal′ mi *a*), *n.* inflammation of the eyeball.

***ophthalmic** (of thal′ mik), *adj.* pertaining to the eye.

***opiate** (ō′ pi āt), *n.* a medicine compounded with opium to induce sleep or dull the sense of pain.

***opinion** (ō pin′ yun), *n.* belief or judgment, estimation, as my *opinion* of him is good.

opinionated (ō pin′ yun āt ed), *adj.* firm or obstinate in one's opinions.

opium (ō′ pi um), *n.* a drug made from the dried juice of the poppy.

opossum (ō pos′ um), *n.* a gray-furred American animal that lives in trees and feigns death in moments of danger; a similar Australian animal.

***opponent** (o pō′ nent), *n.* an adversary, antagonist.

opponent (o pō′ nent), *adj.* in opposition.

***opportune** (op′ or tūn), *adj.* well timed, seasonable, suitable.

opportunist (op or tū′ nist), *n.* one who takes advantage of circumstances.

opportunity (op or tū′ ni ti), *n.* [*pl.* opportunities] a favorable opening for moves to one's own advantage; a convenient time or occasion.

***oppose** (o pōz′), *v.t.* to act against, as to *oppose* a measure; to contend against; to set up in opposition or contrast.

opposite (op′ ō zit), *adj.* placed over against, fronting, as the *opposite* side; contrary, adverse, antagonistic, as an *opposite* opinion.

opposition (op ō zish′ un), *n.* the act of placing one thing in contrast to or against another; that which is so placed; resistance, as the plan met with *opposition.*

oppress (o pres′), *v.t.* to burden, crush by hardship or severity, as the monarch *oppressed* his subjects; to lie heavily upon, as discouragement *oppressed* him.

oppressive (o pres′ iv), *adj.* unjustly severe; burdensome, as *oppressive* heat.

***opprobrium** (o prō′ bri um), *n.* disgrace that follows wrongdoing, infamy.

***oppugn** (o pūn′), *v.t.* to assail with argument.

optic (op′ tik), *adj.* pertaining to vision.

optician (op tish′ an), *n.* one who makes or sells eyeglasses and other instruments for the eyes.

optics (op′ tiks), *n.* the science of the properties of light and vision.

optimism (op′ ti mizm), *n.* the doctrine that all is for the best; the habit of looking at the brighter side of life.

optimist (op′ ti mist), *n.* one who believes that things are all right and takes a cheerful and hopeful view of life: opposite of *pessimist.*

option (op′ shun), *n.* power or right of choosing, a choice; privilege of buying or selling at a certain figure within a set time, as I have an *option* on the house.

optional (op′ shun al), *adj.* subject to choice, as an *optional* or elective course in college.

optometrist (op tom′ ē trist), *n.* one who examines the eyes for the purpose of prescribing glasses.

opulence (op′ ū lens), *n.* great wealth.

opulent (op′ ū lent), *adj.* rich, wealthy, as an *opulent* person; profuse; luxuriant.

***opus** (ō′ pus), *n.* a work, especially a musical composition.

or (ôr), *conj.* else, otherwise.

oracle (or′ *a* kl), *n.* the response of a deity to some inquiry; one who speaks with inspiration or authority; the answer or judgment given by an oracle.

oracular (ō rak′ ū lēr), *adj.* like an oracle; dogmatically magisterial.

***oral** (ō′ ral), *adj.* spoken, not written, as an *oral* examination.

***orange** (or′ enj), *n.* a tree with a golden-colored, round juicy fruit; the fruit; the color of the fruit, yellow with a slight tinge of red.

***orangutan** (ō′ rang o͞o tan), *n.* a large manlike (anthropoid) ape found in Borneo and Sumatra.

oration (ō rā′ shun), *n.* a formal speech, especially one prepared for an important occasion.

orator (or′ *a* tēr), *n.* one who speaks eloquently in public.

***oratorio** (or *a* tō′ ri ō), *n.* a musical composition with a sacred theme.

***oratory** (or′ *a* tō ri), *n.* the art of public speaking, eloquence; part of a chapel; a society of priests.

orb (ôrb), *n.* a sphere; heavenly body, especially a major one, as the sun or moon; the eye.

orbicular (ôr bik′ ū lēr), *adj.* orb-shaped.

orbit (ôr′ bit), *n.* the path of a planet in space; the bony cavity in which the eye is set.

orchard (ôr′ chērd), *n.* a large piece of land on which fruit trees, nut-bearing trees or sugar maples are cultivated; the trees on such a piece of land.

***orchestra** (ôr′ kes tr*a*), *n.* a group of musicians playing together, as in a theater; the space in which they perform; the main floor of a theater.

orchestration (ôr kes trā′ shun), *n.* arrangement of music for an orchestra, instrumentation.

orchid (ôr′ kid), *n.* a plant having showy blossoms with three petals, one of which varies greatly from the others in shape and is often spurred; a blue-red color.

ordain (ôr dān′), *v.t.* to admit to the ministry or priesthood; to establish by decree or law; to destine, as fate *ordained* her beauty.

***ordeal** (ôr dē′ *a*l), *n.* a severe trial or test of fortitude; an ancient method of determining guilt or innocence.

order (ôr′ dēr), *n.* regular arrangement, as the house is in good *order;* state of being arranged systematically, as in numerical *order;* a group of persons, as a fraternal *order;* a zoological classification larger than a family and smaller than a class, as an *order* of plants or animals; command or authority, as by *order* of the President; public peace, as law and *order;* working conditions, as out of *order;* a direction to buy, sell or supply goods, as to place an *order.*

order (ôr′ dẽr), *v.t.* to command, as to *order* a person to appear in court; to manage, as the President *orders* the affairs of the nation; to give an order for, as to *order* supplies.

orderly (ôr′ dēr li), *n.* [*pl.* orderlies] a soldier who attends an officer; a male hospital attendant.

orderly (ôr′ dēr li), *adj.* in good order, well arranged, tidy.

ordinal (ôr′ di nal), *n.* a number noting order of position in a series, as first, second, third.

ordinal (ôr′ di nal), *adj.* noting order, as an *ordinal* number.

***ordinance** (ôr′ di nans), *n.* that which is ordained; a rule or law.

***ordinary** (ôr′ di ner i), *adj.* usual, customary, according to general rule or common experience; commonplace.

ordination (ôr di nā′ shun), *n.* the act of conferring holy orders or state of being ordained, the ceremony of admission to the ministry.

***ordnance** (ôrd′ nans), *n.* artillery.

***ore** (ōr), *n.* metal in its raw state as extracted from the earth.

organ (ôr′ gan), *n.* that part of a living body by which some special function is discharged; a musical wind instrument; a means of accomplishing something; a newspaper speaking semiofficially for a government or a party.

organdy (ôr′ gan di), *n.* a fine, thin muslin having a stiff finish.

organic (ôr gan′ ik), *adj.* pertaining to bodily organs, as an *organic* disease; pertaining to or derived from living bodies, as plants or animals.

organism (ôr′ gan izm), *n.* a living body.

organist (ôr′ gan ist), *n.* one who plays an organ.

***organization** (ôr gan i zā′ shun), *n.* act or process of bringing together or arranging related parts into a whole; an association, business or society, as a charity *organization;* organic structure.

organize (ôr′ gan īz), *v.i. and v.t.* to get together for action, as the workers *organized;* to bring together for action, as we *organized* a glee club; to arrange related parts into a unified whole, as to *organize* a business.

***orgy** (ôr′ ji), *n.* [*pl.* orgies] a drunken revel.

***oriel** (ō′ riel), *n.* a bay window, especially on an upper floor.

orient (ō′ ri ent), *n.* the east, especially the countries of Asia or in the eastern part of the Mediterranean.

orient (ō′ ri ent), *v.t.* to set facing the east; to place in correct position or relation to, as to *orient* oneself to unfamiliar surroundings.

orientation (ō ri en tā′ shun), *n.* adjustment; getting one's bearings; being set in correct relation to some standard.

orifice (or′ i fis), *n.* a mouth or aperture.

origin (or′ i jin), *n.* the beginning of anything; place and time of beginning; cause.

original (ō rij′ i nal), *n.* that from which anything is copied; the language in which a book is first written, as he read it in the *original.*

original (ō rij′ i nal), *adj.* first in a series, as an *original* inhabitant; not a copy, as an *original* painting; not translated; new, as an *original* idea; inventive, creative, as an *original* writer.

originally (ō rij′ i na li), *adv.* at first, as *originally* the organization occupied only one floor; in a new and arresting manner.

originality (ō rij i nal′ i ti), *n.* the ability to invent or create something unusual.

originate (ō rij′ i nāt), *v.i. and v.t.* to begin to exist, as the river *originates* in the mountains; to bring into being, as he *originated* the idea.

***oriole** (ō′ ri ōl), *n.* a bird, yellow or orange and black, that builds a hanging nest.

ormolu (ôr′ mo lo͞o), *n.* brass ornament for furniture, imitating gold.

***ornament** (ôr′ n*a* ment), *n.* anything that adorns.

ornament (ôr′ n*a* ment), *v.t.* to furnish with ornaments or ornamentation; to adorn, as to *ornament* a Christmas tree.

ornamentation (ôr n*a* men tā′ shun), *n.* the act of ornamenting; that which adorns.

***ornate** (ôr nāt′), *adj.* elaborately adorned, or embellished.

ornithology (ôr ni thol′ ō ji), *n.* the scientific study of birds and bird life.

***orotund** (ō′ rō tund), *adj.* of clear, smooth sound, as if spoken with rounded lips; as an *orotund* voice; pompous.

orphan (ôr′ fan), *n.* a child either or both of whose parents is dead.

orphanage (ôr′ fan ij), *n.* a home for children having no parents.

orthodox (ôr′ thō doks), *adj.* holding, or in accordance with, established belief, especially in connection with religion; approved, accepted, as she does all the *orthodox* things.

orthodoxy (ôr′ thō dok si), *n.* conformity to conventional belief.

***orthoëpy** (ôr′ thō e pi), *n.* correct pronunciation.

orthography (ôr thog′ r*a* fi), *n.* correct spelling.

orthopedics (ôr thō pē′ diks), *n.* the correction or treatment of deformities in young children.

oscillate (os′ i lāt), *v.i.* to swing back and forth like a pendulum; to waver, as between two opinions.

oscillation (os i lā′ shun), *n.* the act of swinging back and fourth, wavering, indecision.

osculate (os′ kū lāt), *v.i. and v.t.* to kiss.

***osier** (ō′ zhẽr), *n.* a kind of willow tree of which the twigs are used in making baskets and furniture; the twig or rod used for basket making.

ossification (os i fi kā′ shun), *n.* the process of turning into bone.

ossify (os′ i fī), *v.t. and v.i.* to turn into bone; to become callous, hard.

ostensible (os ten′ si bl), *adj.* apparent, professed, specious, as *ostensible* friendship often conceals a bitter hostility.

ostentation (os ten tā′ shun), *n.* outward show, vulgar display.

ostentatious (os ten tā′ shus), *adj.* fond of display, gaudy.

osteology (os tē ol′ ō ji), *n.* the science of the structure and diseases of bones.

osteopath (os′ tē ō path), *n.* one who treats bodily ailments by manipulating bones, joints and nerve centers.

osteopathy (os tē op′ *a* thi), *n.* a system of treating bodily ailments through manipulation of the bones, joints and nerve centers.

ostracize (os′ tr*a* sīz), *v.t.* to banish by vote; to bar from favor.

***ostrich** (os′ trich), *n.* a flightless bird of Africa, with long legs and having wing and tail feathers that are valuable in commerce.

***other** (u*th*′ ẽr), *pron.* the opposite one of two, as one or the *other* of you.

other (u*th*′ ẽr), *adj.* being the remaining, as her *other* sons; additional, as without *other* source of income; not the same, different, as I have *other* things to do; second, alternate, as every *other* one was drafted.

otherwise (u*th*′ ẽr wīz), *adv.* in a different way.

otherwise (u*th*′ ẽr wīz), *conj.* else, as I am afraid it would spoil your enjoyment, *otherwise* I would tell you the story.

ought (ôt), *auxiliary v.* to be obliged by duty or conscience, as I *ought* to write two letters; to be forced by necessity or expediency, as we *ought* to dress warmly in winter; to follow naturally as a result, as this *ought* to be the mate to this shoe; to need, as this hole *ought* to be darned.

***ounce** (ouns), *n.* a measure of weight, 1/16th of a pound avoirdupois, 1/12 of a pound troy.

our (our), *pron.* belonging to us, as that is *our* dog.

***oust** (oust), *v.t.* to eject, put out, as they *ousted* him from power.

out (out), *adv.* away from the inside, as to stay *out;* not within the limits, as *out* of town; abroad, away from home, as to send a suit *out* to be pressed; not in a state or condition, as *out* of form; forth, as the sun came *out;* in bloom, as my roses are *out;* into the open, as the news is *out;* in error, as your figures are *out;* clear of obstruction, as to clean *out* a desk; loudly, as to cry *out.*

outboard (out′ bōrd), *adj.* attached to the outside of a boat, as an *outboard* motor.

outbreak (out′ brāk), *n.* an eruption, as an *outbreak* of disease, an *outbreak* of disorder.

outburst (out′ bûrst), *n.* a violent outbreak, as of anger.

outcast (out′ kȧst), *n.* one who is cast out, an exile.

outcast (out′ kȧst), *adj.* driven forth, rejected.

outclass (out klȧs′), *v.t.* to excel or surpass in quality or skill, as the new boat outclassed all its rivals.

outcome (out′ kum), *n.* result, consequence.

outcrop (out′ krop), *n.* the projection of layers of rock above ground.

outcrop (out′ krop), *v.i.* to come to the surface.

outcry (out′ krī), *n.* clamor, tumult.

outdo (out′ do͞o), *v.t.* to excel.

outlaw (out′ lô), *n.* one who has lost his legal rights; a dangerous criminal at large; a fugitive.

outlaw (out′ lô), *v.t.* to deprive of legal standing; as to *outlaw* a rule.

outlay (out′ lā), *n.* expenditure.

outlet (out′ let), *n.* a vent, a means of escape; a stream emptying a lake; a means of distribution, as of goods.

outline (out′ līn), *n.* a line that bounds or defines a figure; a first draft of a literary composition.

outline (out′ līn), *v.t.* to sketch in contour; to give the plan of.

outlive (out liv′), *v.t.* to live longer than, survive.

outlook (out′ look), *n.* a view from a point of vantage; prospect for the future.

***outrage** (out′ rāj), *n.* wanton wrong done to others, a gross violation of what is commonly regarded as right and decent.

outrageous (out rā′ jus), *adj.* atrocious, grossly violating standards of decency.

outrigger (out′ rig ẽr), *n.* any spar or projecting beam run out as from a ship's mast to serve as a support, to act as a means for extending sails or to prevent upsetting.

outright (out rīt′), *adv.* completely and without reservation; at once, as he was killed *outright.*

outside (out sīd′), *n.* the external surface of anything, apart from the interior.

outside (out sīd′), *adj.* external.

outside (out sīd′), *adv.* beyond an enclosure, as to go *outside;* on the exterior, as decorated *outside.*

outstanding (out stan′ ding), *adj.* prominent, as an *outstanding* achievement; due and unpaid, as debts.

outward (out′ wẽrd), *adj.* external; visible.

outwit (out wit′), *v.t.* to surpass in wisdom; to defeat by superior skill or cunning, as to *outwit* an adversary.

outwork (out′ wûrk), *n.* a defense constructed beyond the main body of a fort.

outwork (out wûrk′), *v.t.* to do more work than.

outworn (out′ wōrn), *adj.* out-of-date.

***oval** (ō′ val), *n.* anything shaped like an egg.

oval (ō′ val), *adj.* shaped like an egg.

ovation (ō vā′ shun), *n.* a hearty demonstration of favor by a crowd or audience.

oven (uv′ en), *n.* a chamber in a stove used for baking; a similar space used for heating substances in course of manufacture.

over (ō′ vēr), *adv.* beyond or away from the perpendicular, as to fall *over;* so as to face oppositely, as to turn *over;* across the brim, as running *over;* in excess of a certain quantity, as children of nine years or *over;* again, as to do the work *over.*

over (ō′ vēr), *prep.* above; in authority, power, dignity, value; more than or better than in quality or degree; upon the surface of, as to wander *over* the earth; along the course of, as to drive *over* a new road; across, as to jump *over* a puddle; during, as to keep *over* night.

overalls (ō′ vẽr ôlz), *n. pl.* loose trousers of coarse material worn over other clothes while one is working.

overawe (ō vẽr ô′), *v.t.* to restrain by awe.

overbearing (ō vẽr bâr′ ing), *adj.* arrogant.

overboard (ō′ vẽr bōrd), *adv.* over the side of a ship.

overflow (ō′ vẽr flō), *n.* water or other liquid that runs over after filling a receptacle.

overflow (ō vẽr flō′), *v.i. and v.t.* to run over, as a liquid after filling a receptacle; to flood, as a region.

overhead (ō′ vẽr hed), *n.* costs and expenses that cannot be charged to any one part of a business, as rent taxes, insurance, heating, lighting.

overhear (ō vẽr hēr′), *v.i. and v.t.* to hear by accident.

overpower (ō vẽr pou′ ẽr), *v.t.* to crush by superior force.

overproduction (ō vẽr prō duk′ shun), *n.* production in excess of demand.

***overseer** (ō′ vẽr sē ẽr), *n.* a superintendent.

***overt** (ō′ vẽrt), *adj.* open, public.

overtake (ō vẽr tāk′), *v.t.* to catch by pursuit; to come upon as punishment.

overthrow (ō vẽr thrō′), *v.t.* to push or throw over, defeat.

overturn (ō vẽr tûrn′), *v.t.* to upset.

overwhelm (ō vẽr hwelm′), *v.t.* to crush or destroy; to overcome with emotion.

overweening (ō vẽr wēn′ ing), *adj.* unduly confident, arrogant.

***oviparous** (ō vip′ *a* rus), *adj.* producing young by laying and hatching eggs.

ovoid (ō′ void), *adj.* shaped like an egg.

owe (ō), *v.t.* to be indebted to; to be under obligation to pay or make, as to *owe* an apology.

owl (oul), *n.* a bird of prey that flies by night.

own (ōn), *v.i. and v.t.* to admit; to possess rightfully.

own (ōn), *adj.* belonging to.

ox (oks), *n.* [*pl.* oxen] a domesticated bovine beast of burden.

***oxide** (ok′ sīd), *n.* a compound of oxygen and a base.

oxidize (ok′ si dīz), *v.i. and v.t.* to take up oxygen or combine with it; to convert into an oxide.

***oxygen** (ok′ si jen), *n.* a gas without color or smell, essential to all life, animal and vegetable.

***oyer** (ō′ yẽr), *n.* a hearing or trial of legal causes.

oyer and terminer (ō′ yer tûr′ mi nẽr), a higher criminal court.

***oyez** (ō′ yes), *interj.* hear ye, attention; a word three times called in a courtroom to secure silence and attention.

***oyster** (ois′ tẽr), *n.* a sea mollusk with a two-leaved, hinged shell, used as food.

***ozone** (ō′ zōn), *n.* a gas resembling oxygen, occurring in the air.

P

pace (pās), *n.* one step in walking; rate of speed, gait; a certain gait of a horse.

pace (pās), *v.i. and v.t.* to walk with long, even steps; to move with the feet on the same side simultaneously, as a horse; to measure off by steps; to set the speed for, as a runner in a race.

pachyderm (pak′ i dûrm), *n.* an animal having very thick skin, as the elephant or rhinoceros.

pacific (p*a* sif′ ik), *adj.* conciliatory, peaceful, mild.

***pacification** (p*a* sif i kā′ shun), *n.* the act of making peace between combatants.

***pacifist** (pas′ i fist), *n.* one who opposes war and advocates the settling of disputes by arbitration.

pacify (pas' i fī), *v.t.* to calm, quiet, reconcile; to bring out of a state of anger.

pack (pak), *n.* a bundle tied up to be carried; a set, as a *pack* of cards; a number of animals hunting together.

pack (pak), *v.i. and v.t.* to press together into a mass, as snow *packs;* to form into a bundle; to put together, as clothes in a trunk; to press into a mass, as *pack* the dirt well; to crowd, as into a space, as to *pack* passengers into a subway train.

package (pak' ij), *n.* a bundle of goods, parcel.

packet (pak' et), *n.* a small bundle, as of papers; a ship sailing on schedule between two ports, carrying freight and passengers.

pact (pakt), *n.* an agreement.

pad (pad), *n.* a soft cushion; the cushionlike part of the feet of some animals; a block of sheets of paper.

pad (pad), *v.t.* to add extra material, as to *pad* the shoulders of a coat, *pad* an essay.

padding (pad' ing), *n.* material used for stuffing; unnecessary material used to expand writing.

paddle (pad' l), *n.* a short broad-bladed oar used without leverage to propel and steer a canoe; an instrument of similar shape used in stirring and mixing.

paddle (pad' l), *v.i. and v.t.* to wade in shallow water; to propel with a paddle, as a canoe.

paddock (pad' uk), *n.* a space where horses are exercised; a small field used for pasture.

padlock (pad' lok), *n.* a lock with a link to be passed through the staple of a hasp, or the links of a chain.

padlock (pad' lok), *v.t.* to fasten with a padlock.

pagan (pā' gan), *n.* a heathen, one having no religious beliefs.

pagan (pā' gan), *adj.* heathen, irreligious.

page (pāj), *n.* one side of a leaf of a book or manuscript.

page (pāj), *n.* a boy servant; a male attendant on a legislative body; in the days of chivalry, a young fellow serving a knight as the first stage of training for his own knighthood.

page (pāj), *v.t.* to number the pages of, as a book or manuscript.

page (pāj), *v.t.* to call by means of a page, as in the lobby of a hotel.

***pageant** (paj' ent), *n.* a display or procession of persons in costume representing a past period, frequently with re-enactment of historic scenes; mere show and pompous display.

***pageantry** (paj' ent ri), *n.* the art of preparing and putting on historical pageants; pomp; brilliant display.

***pagoda** (pa gō' da), *n.* a sacred temple or tower of the Far East.

***pail** (pāl), *n.* a metal or wooden open vessel, with a handle over the top, used to carry liquids.

pain (pān), *n.* physical or mental suffering; a penalty, as on *pain* of death; *pains,* labor, careful and diligent effort, as she took great *pains* with the work.

pain (pān), *v.i. and v.t.* to suffer, give pain; to cause suffering to, to hurt or distress.

paint (pānt), *n.* pigment mixed with oil or water and applied to a surface with a brush.

paint (pānt), *v.i. and v.t.* to apply paint; to spread paint on; to make a picture with paint; to depict.

Syn. Depict. To *paint* is to represent figures on canvas, or, figuratively, to describe in words. To *depict* is to use words alone to make the mental picture.

painter (pān' tẽr), *n.* one whose occupation is to paint; an artist skilled in depicting subjects in colors.

pair (pâr), *n.* two things of a kind, similar in form, suited to each other and associated.

pajamas (pa jä' maz), *n.* a sleeping costume consisting of coat and loose trousers.

***palace** (pal' is), *n.* the residence of a sovereign or of a bishop; any magnificent house or building.

palatable (pal' it *a* bl), *adj.* agreeable to the taste; savory.

palatal (pal' *a* tal), *n.* a sound formed with the blade of the tongue almost touching the hard palate, as the sound of *ch* in chin is a *palatal.*

palatal (pal' *a* tal), *adj.* pertaining in any way to the palate.

palate (pal' it), *n.* the roof of the mouth, including the hard, bony front part or the *hard palate,* and the soft back part, called the *soft palate* or the *velum.*

***palatial** (pa lā' shal), *adj.* suitable to a palace; like a palace.

***palaver** (pa lav' ẽr), *n.* chatter, talk; conference.

pale (pāl), *n.* a fence picket; a district or territory shut in as if by a fence.

pale (pāl), *adj.* lacking color, faint; wan, white, ashen.

pale (pāl), *v.i.* to turn white, lose color.

paleobotany (pā lē ō bot' *a* ni), *n.* the science of fossil plants.

***paleolithic** (pā lē ō lith' ik), *adj.* characterizing the period of human development when chipped stone tools were used; belonging to the earlier part of the Stone Age.

***paleontology** (pā lē on tol' ō ji), *n.* the science of fossil remains.

***palette** (pal' et), *n.* a thin oval plate of wood or porcelain (usually with a thumb hole) on which an artist mixes colors; a set or range of colors.

palfrey (pôl' fri), *n.* a horse.

***palimpsest** (pal' imp sest), *n.* a sheet on which the original writing has been erased to make room for new writing.

palindrome (pal' in drōm), *n.* anything that reads the same backwards and forward—like Madam, I'm Adam.

palisade (pal i sād'), *n.* a fence or fortification formed of stakes driven into the ground and pointed at the top; *palisades,* a line of high barrierlike cliffs.

***pall** (pôl), *n.* a cloak or mantle; a covering for a coffin; anything likened to it, as a *pall* of smoke.

pall (pôl), *v.i.* to become insipid and tiresome.

palladium (pa lā' di um), *n.* a rare grayish metallic element belonging to the platinum group.

pallet (pal' et), *n.* a small rough bed.

***palliate** (pal' i āt), *v.t.* to lessen, reduce, as to *palliate* a sickness; to excuse, as an offense against the law.

palliative (pal' i ā tiv), *n.* that which tends or is intended to cloak guilt or lessen pain.

palliative (pal' i ā tiv), *adj.* tending or intended to cloak guilt or lessen pain.

pallid (pal' id), *adj.* pale, wan.

pallor (pal' ẽr), *n.* paleness.

***palm** (päm), *n.* the inner part of the hand; the part of a glove that covers it; anything with a broad flat shape, as an oar or an antler.

palm (päm), *n.* a tropical tree with a straight high slender unbranching trunk with long leaves clustered at the top; a leaf of the palm tree as a symbol of victory.

palm (päm), *v.t.* to conceal in the hand; to impose fraudulently; to pass by trickery.

palmetto (pal met' ō), *n.* a species of palm tree of the West Indies and southern United States; the leaves of this tree used for weaving.

***palmistry** (päm' is tri), *n.* the art of foretelling the future or analyzing character by reading the lines in the palm of the hand.

palpable (pal' pa bl), *adj.* perceptible by or as if by touch, tangible, visible, audible; plain, obvious, as a *palpable* error.

palpitate (pal'pi tāt), *v.i.* to beat or throb fast, flutter.

palpitation (pal pi tā' shun), *n.* a rapid, irregular beat, as *palpitation* of the heart.

***palsy** (pôl' zi), *n.* paralysis, especially with a trembling of the limbs.

palsy (pôl' zi), *v.t.* [*p.t.* and *p.p.* palsied, *pr.p.* palsying] to paralyze.

paltry (pôl' tri), *adj.* worthless; contemptible.

pamper (pam' pẽr), *v.t.* to treat with excessive indulgence.

pamphlet (pam' flet), *n.* a small unbound book, usually on some current topic or containing propaganda.

pan (pan), *n.* a broad shallow vessel used in cooking, mining or manufacture; anything of similar shape.

pan (pan), *v.i. and v.t.* to appear in a miner's pan, as gold; to cook in a pan, as fish; to wash in a pan, as gravel for gold.

***panacea** (pan *a* sē' *a*), *n.* a cure-all.

pancake (pan' kāk), *n.* a thin cake of batter fried on a griddle, a griddlecake; a sudden landing, as of an airplane.

***pancreas** (pan' krē as), *n.* a large fleshy gland situated under and behind the stomach, secreting a digestive fluid; it is called the sweetbread when it is used as food.

pancreatic (pan krē at' ik), *adj.* pertaining to the pancreas.

pancreatin (pang' krē *a* tin), *n.* an albuminoid principle in the fluid of the pancreas.

pandemonium (pan dē mō' ni um), *n.* a place of wild disorder; confused uproar.

pander (pan' dẽr), *v.i.* to cater to the desires of others.

pane (pān), *n.* the sheet of glass in a section of a window or door.

***panegyric** (pan ē jir' ik), *n.* a eulogy; a formal literary or oratorical expression of high praise.

panel (pan' el), *n.* a rectangular section of cloth or wood in a structure; a division of a wall or ceiling; a light section set in a heavier frame, as in a door; a movable part bolted to the main structure of a wing of an airplane; the list from which a jury is drawn; a painting on a thin board.

panel (pan' el), *v.t.* [*p.t.* and *p.p.* paneled or panelled, *pr.p.* paneling or panelling] to form in panels; to furnish with panels.

pang (pang), *n.* a sudden sharp thrust of pain; mental agony.

panic (pan' ik), *n.* a sudden and general fright; a sudden loss of business confidence by the public.

***pannier** (pan' yẽr), *n.* a basket carried on the back of a pack animal, usually slung in pairs; a frame to spread a skirt at the hips.

panoply (pan' ō pli), *n.* a complete suit of armor; any complete protective covering.

***panorama** (pan ō rä' m*a*), *n.* a view in all directions; a scene that moves before one's eyes; a great painting of scenes made to move past the onlooker.

pansy (pan' zi), *n.* [*pl.* pansies] a garden plant with velvety-petaled flowers of brilliant mixed colors.

pant (pant), *v.i. and v.t.* to breathe fast and hard, as after exertion: to long, desire, as we pant for life; to pronounce breathlessly, as the runner panted a single word.

pantaloon (pan t*a* lo͞on'), *n.* a buffoon in pantomime: *pantaloons,* trousers.

pantheism (pan' thē izm), *n.* belief that God is in all things; worship of all gods indiscriminately.

***pantheon** (pan thē' on), *n.* a temple to all the gods.

panther (pan' thẽr), *n.* a leopard; a large American wildcat, also called *cougar* or *puma.*

***pantomime** (pan' tō mīm), *n.* a representation in a dumb show; a play without words.

pantry (pan' tri), *n.* [*pl.* pantries] a small room where kitchen supplies are kept and from which food is served.

pap (pap), *n.* any soft food for infants; juicy pulp of certain fruits.

***papacy** (pā' pa si), *n.* the office and authority of the Pope; the popes collectively.

***papal** (pā' pal), *adj.* pertaining to the Pope.

paper (pā' pẽr), *n.* a material made in thin sheets from rags, wood pulp and other materials, used for writing and printing, covering walls and wrapping packages; a newspaper; a literary composition, as he read a *paper* on woman suffrage.

paper (pā' pẽr), *v.t.* to cover with paper.

paper (pā' pẽr), *adj.* made of paper; on paper only and not existing in reality, as *paper* profits.

***papier-mâché** (pā' pẽr mash ā'), *n.* a substance made of paper pulp.

papoose (pa po͞os′), *n.* a North American Indian baby or small child.

*__papyrus__ (pa pī′ rus), *n.* [*pl.* papyri] a species of Egyptian reed from which the ancients made paper; a manuscript on papyrus.

par (pär), *n.* a fixed standard from which values are measured, as the *par* of stocks; equality, as to be on a *par* with others; in golf, the number of strokes figured as a perfect score for a hole or over an entire course.

parable (par′ a bl), *n.* a short story carrying a clear moral.

parabola (pa rab′ ō la), *n.* in geometry, the figure formed by the intersection of a cone with a plane parallel to its side.

parachute (par′ a sho͞ot), *n.* an umbrella-shaped apparatus in which aviators drop from a plane to the ground in emergency.

parade (pa rād′), *n.* a formal march or procession; any ostentatious display, as a *parade* of learning.

parade (pa rād′), *v.i. and v.t.* to march in a parade; to form and lead in display, as he *paraded* his regiment; to march through, as to *parade* the avenue; to make ostentatious display of, as to *parade* one's talents before the public.

*__paradise__ (par′ a dīs), *n.* the Garden of Eden; heaven.

paradox (par′ a doks), *n.* something apparently absurd or incredible, yet possibly true.

paradoxical (par a dok′ sik al), *adj.* of the nature of a paradox; apparently self-contradictory, yet possibly true.

*__paraffin__ (par′ a fin), *n.* a waxy substance without taste, color or odor, obtained by distillation from wood, coal, or from crude petroleum and used in candlemaking, as waterproofing material, in sealing preserve jars.

paragon (par′ a gon), *n.* a model or pattern of perfection.

paragraph (par′ a grȧf), *n.* a subdivision of a written text, containing sentences dealing with one topic.

parallel (par′ a lel), *n.* one of two or more equidistant lines or planes; something closely resembling another; a statement of similarity, as to draw a *parallel* between mathematics and music; an imaginary circle about the earth equidistant at all points from the equator.

parallel (par′ a lel), *v.t.* to state a likeness as to *parallel* mathematics and music; to be literally equidistant from at all points, as to *parallel* the equator; to resemble, as to *parallel* another's line of reasoning.

parallel (par′ a lel), *adj.* equally distant, as one line or plane to another, at all points; having the same course; having close resemblance.

parallelogram (par a lel′ ō gram), *n.* a four-sided figure with two pairs of opposite equal sides.

paralysis (pa ral′ i sis), *n.* loss of the powers of sensation and of movement.

paralyze (par′ a līz), *v.t.* to deprive of sensation or the power of movement; to unnerve; to render inactive.

*__paramount__ (par′ a mount), *adj.* superior to all others; eminent or chief, as the *paramount* issue in a political campaign.

*__paranoia__ (par a noi′ a), *n.* mental disorder marked by delusions of persecution or grandeur.

parapet (par′ a pet), *n.* a low wall along the edge of a roof, a bridge, balcony; a protective wall or rampart in a fortification; breastwork, as a bank of earth or sandbags along the forward edge of a trench.

paraphernalia (par a fẽr nā′ lia), *n. pl.* ornaments of dress generally; articles of equipment; trappings.

paraphrase (par′ a frāz), *n.* a free translation; statement of the same thing in other words.

paraphrase (par′ a frāz), *v.t.* to translate freely, not word for word but giving the sense; to say the same thing in other words.

parasite (par′ a sīt), *n.* an animal or plant nourished by another to which it attaches itself; a person who does no work but lives at the expense of others.

parasitic (par a sit′ ik), *adj.* of the nature of a parasite; doing no work, rendering no useful service but living at the expense of others.

*__parasol__ (par′ a sôl), *n.* a sunshade.

parboil (pär′ boil), *v.t.* to boil partially.

*__parcel__ (pär′ sel), *n.* a small package; a plot, as a *parcel* of land.

parcel (pär′ sel), *v.t.* to divide, distribute.

parcel post (pär sel pōst), a service established in 1912 in connection with the U.S. Post Office for the distribution of packages.

parch (pärch), *v.i. and v.t.* to dry with heat, as the skin *parches* during fever, the sun *parches* the grass; to scorch.

parchment (pärch′ ment), *n.* the skin of a sheep or goat dressed and prepared for writing; a document, as a diploma, on parchment.

pardon (pär′ dn), *n.* forgiveness; the act of an executive in freeing a convicted person from the legal penalty; the remission of penalty.

pardon (pär′ dn), *v.t.* to forgive; to release from a legal penalty.

pardonable (pär′ dn a bl), *adj.* forgivable, excusable.

*__pare__ (pâr), *v.t.* to cut away little by little, as to *pare* a horse's hoofs; to reduce, as to *pare* profits in order to make a sale; to cut off a skin or rind, as to *pare* potatoes.

paregoric (par ē gor′ ik), *n.* a tincture of opium used to ease pain.

paregoric (parē gor′ ik), *adj.* relieving pain.

*__parent__ (pâr′ ent), *n.* a father or mother; the source of a living thing, as the *parent* of a plant.

*__parentage__ (pâr′ en tij), *n.* the relationship of parent to child; descent, as of good *parentage*.

parental (pa ren′ tal), *adj.* pertaining to parents or parenthood; resembling a parent, as *parental* care of a foundling.

parenthesis (pa ren′ thē sis), *n.* [*pl.* parentheses] an explanatory word or clause inserted in a sentence; the marks that set it off, ( ).

parenthetic or **parenthetical** (par en thet′ i kal), *adj.* expressed in a parenthesis; inserted in a sentence.

*__paresis__ (pa rē′ sis), *n.* incomplete paralysis.

parietal (pa rī′ e tal), *n.* one of two bones of the skull, wall bones.

parietal (pa rī′ e tal), *adj.* pertaining to a wall or side; forming the wall or side, as the *parietal* bones of the head.

parish (par′ ish), *n.* district under the particular charge of a clergyman; a unit of local government, the equivalent of a county in Louisiana.

parishioner (pa rish′ un ẽr), *n.* one who belongs to a parish.

parity (par′ i ti), *n.* equality; likeness; equivalence in currency.

park (pärk), *n.* an area of ground set aside for public use; a city square with walks, lawn and seats.

park (pärk), *v.i. and v.t.* to leave standing idle, as an automobile; to arrange artillery when not in use.

parking place (pärk′ ing plās), an area reserved for automobiles to park in; a commercially operated building or yard for this purpose.

parlance (pär′ lans), *n.* conversation; discourse or debate; a special way of speaking, diction.

parley (pär′ li), *n.* a conference, especially with an enemy, with a view to making peace.

parley (pär′ li), *v.i.* to confer, especially with an enemy.

*__parliament__ (pär′ li ment), *n.* a representative legislative assembly.

parliamentarian (pär li men târ′ i an), *n.* one who is versed in the law and usages of public meetings and legislatures.

parliamentary (pär li men′ ta ri), *adj.* according to the rules and customs of deliberative assemblies, as *parliamentary* law.

parlor (pär′ lẽr), *n.* a reception room; a drawing room; any shop fitted out for the comfort and ease of patrons and with some show of elegance, as a beauty *parlor*.

parlor car (pär′ lẽr kär), a railroad car with individual chairs instead of double seats, and more luxurious than a passenger coach.

parochial (pa rō′ ki al), *adj.* pertaining to a parish, as a *parochial* school; narrow-minded, as if with no concern for things outside one's own parish.

parody (par′ ō di), *n.* [*pl.* parodies] a burlesque imitation of a serious composition.

parody (par′ ō di), *v.t.* [*p.t.* and *p.p.* parodied, *pr.p.* parodying] to use as subject for burlesque imitation.

*__parole__ (pa rōl′), *n.* a word of honor, as given by a prisoner of war conditionally released; the system of releasing prisoners from jail under condition of good behavior and periodical reports to the authorities.

parole (pa rōl′), *v.t.* to release conditionally, as prisoners of war or persons convicted of breaking laws.

paroxysm (par′ ok sizm), *n.* a sudden spasm or fit of acute pain.

*__parquet__ (pär kā′), *n.* a flooring made of wooden inlay; the floor space of a theater between the orchestra rail and the parquet circle.

parquet circle (pär kā′ sûr′ kl), in a theater, the space under the balcony, back of the parquet.

parquetry (pär′ ket ri), *n.* wooden inlay for floors; mosaic flooring.

parricide (par′ i sīd), *n.* the murder of one's father, mother or other close relative; one who commits such a murder.

parrot (par′ ut), *n.* a tropical bird with a hooked bill, brilliant plumage, and ability to imitate human speech.

parry (par′ i), *n.* [*pl.* parries] a turning aside of a thrust or blow, as in fencing or boxing; a defensive argument repelling attack in a debate.

parry (par′ i), *v.i. and v.t.* to make a parry; to ward off, as a thrust, blow or argument.

parse (pärs), *v.i. and v.t.* to be in agreement with the rules of grammar, as this sentence *parses* correctly; to analyze according to the rules of grammar, telling the parts of speech and the syntax, as *parse* this sentence.

parsimonious (pär si mō′ ni us), *adj.* frugal to a fault; miserly.

parsimony (pär′ si mō ni), *n.* [*pl.* parsimonies] stinginess, excessive thrift; an act of stinginess.

parsley (pärs′ li), *n.* a garden plant with leaves used as a garnish and as flavoring.

parsnip (pärs′ nip), *n.* a garden plant with an edible root, like that of the carrot, but white instead of yellow.

parson (pär′ sn), *n.* the incumbent of a parish; a clergyman, a preacher.

parsonage (pär′ sn ij), *n.* the residence of a clergyman in charge of a parish; the home provided for a parson by his parish.

part (pärt), *n.* something less than the whole, as take only *part* of it; a piece or portion; the representation of a character in a play, as to play the *part* of Macbeth; a share, as in a business or enterprise, as I'll have no *part* in it.

Syn. Piece, portion, fragment. A *part* is an essential piece or section of a whole; a *portion* is a piece or section separated from a whole to be allotted or assigned to a person or a purpose, as a *portion* of pie, one's *portion* of the day's work; a *piece* is a part detached from some larger source and regarded as a thing in itself, as a *piece* of string; a *fragment* is a piece broken off.

part (pärt), *v.i. and v.t.* to separate; to take leave; to divide into portions, as *part* the apple between you two, *part* your hair on the side.

partake (pär tāk′), *v.i.* [*p.t.* partook, *p.p.* partaken, *pr.p.* partaking] to take or receive a share in common with others, as to *partake* of food or shelter.

partial (pär′ shal), *adj.* pertaining to a part, incomplete, not entire; showing favoritism, biased.

*__partiality__ (pär shi al′ i ti), *n.* [*pl.* partialities] favoritism, bias.

participant (pär tis′ i pant), *n.* one who takes part, one who shares.

participate (pär tis′ i pāt), *v.i.* to take part, share with others, as to *participate* in a game.

***participle** (pär′ ti si pl), *n.* a part of a verb that partakes of the nature both of verb and of adjective.

particle (pär′ ti kl), *n.* the smallest possible separable amount of anything; a word without inflection, as an article, a preposition or conjunction, or a word used alone, as an interjection.

parti-colored (pär′ ti kul ērd), *adj.* having various colors.

***particular** (pēr tik′ ū lēr), *n.* an individual thing or point or quality, as in this *particular*.

***particular** (pēr tik′ ū lēr), *adj.* distinct from others; peculiar or unusual; exact; fussy.

Syn. Individual, special. *Particular* means specifically one and only one out of many others like it, as I want this *particular* puppy; *individual* means belonging to one only or very characteristic of one person or thing, as one's *individual* beliefs, an individual manner of speech; *special* means unusual, as this is a *special* favor.

particularity (pēr tik u lar′ i ti), *n.* [*pl.* particularities] circumstantiality; minute exactness; fussiness.

particularize (pēr tik′ ū lēr īz), *v.i. and v.t.* to be attentive to single things or details; to give the particulars of.

parting (pär′ ting), *n.* separation; the place of separation, as the *parting* of the ways; leavetaking, as *parting* is such sweet sorrow.

***partisan** (pär′ ti zan), *n.* one who takes sides; an adherent of a political party or of one side in a dispute.

partisan (pär′ ti zan), *adj.* pertaining to a party, as in politics; favoring one side or party, as in politics or a dispute.

partition (pär tish′ un), *n.* the act of dividing; state of being divided; a dividing wall apart from those in the original construction of a building.

partition (pär tish′ un), *v.t.* to divide into parts or shares; to subdivide by adding walls.

partner (pärt′ nēr), *n.* one who is associated with another or with several others in an enterprise; one who teams with another against an opposing team of partners in certain games.

partridge (pär′ trij), *n.* a game bird related to the quail and pheasant.

party (pär′ ti), *n.* a number of persons organized for a special purpose, as in politics; a social gathering; a participator, as the *parties* in a case at law, or the *party* of the first part in a contract, as for the purchase of property.

party wall (pär′ ti wôl), a common wall separating two properties.

***pasha** (pa shä′), *n.* a Turkish title formerly given to high officials: sometimes spelled *bashaw*.

***pass** (pȧs), *n.* a narrow way, as between mountains; a permit for free transportation or admission, as a *pass* to the ball park; a state of affairs, as things have come to a bad *pass;* a movement of the hand as by one person mesmerizing another or a *pass* made by a juggler to cover his real action.

pass (pȧs), *v.i. and v.t.* to meet and go by, as the cars *passed* here; to be promoted from one class to another or go through an examination successfully, as I *passed;* to elapse or go by, as time *passes* slowly; to move from one to another, hand, as please *pass* the salt; to *pass* bad money; to approve, as the Senate *passed* the bill; to be approved by, as the bill *passed* the Senate.

***passage** (pas′ ij), *n.* the act of moving from one place to another or of changing from one condition to another; progress, as of time; a voyage; a way by which one passes, as my room is down the *passage;* enactment, as *passage* of laws; a portion, as of an essay or speech, as he quoted this *passage*.

passenger (pas′ en jēr), *n.* one who travels in a public conveyance, as a railroad train, ship or bus.

passing (pȧs′ ing), *n.* the act of going or of going by; death.

passing (pȧs′ ing), *adj.* temporary, casual.

passion (pash′ un), *n.* violent agitation of mind in anger; intense desire; suffering.

passionate (pash′ un it), *adj.* emotional, ardent, intense, as a *passionate* desire.

passive (pas′ iv), *adj.* submissive; suffering without resistance; the form of a verb indicating that the subject does not act but is acted upon; the condition of an aircraft not under its own power or without power of its own.

passport (pȧs′ pōrt), *n.* a license to travel in a foreign country.

password (pȧs′ wûrd), *n.* a secret word by which friends are distinguished from enemies, as in military usage, or members from nonmembers, as the *password* of a secret society.

past (pȧst), *n.* time gone by; a person's life history to date.

past (pȧst), *adj.* having been, as *past* times; gone by, as this *past* hour; former, as a *past* president; expert, as a *past* master.

past (pȧst), *adv.* near or by, as the train just went *past*.

past (pȧst), *prep.* by or beyond, as the train went *past* the station, it is *past* noon.

paste (pāst), *n.* a wet and sticky mixture for fastening things together, such as cloth or paper; any sticky, moist substance.

paste (pāst), *v.t.* to fasten with paste; to stick things together.

pasteboard (pāst′ bōrd), *n.* thick, stiff paper; cardboard.

pastel (pas tel′), *n.* a colored crayon; a picture made with this kind of crayon in delicate colors.

pastel (pas tel′), *adj.* soft-toned, pale and highly brilliant, as pastel shades or colors.

***pasteurize** (pas′ tēr īz), *v.t.* to sterilize by heating to 131°–158° F. for 30 minutes, as milk.

pastille (pas tēl′), *n.* a small cone of aromatic paste, burned slowly to fumigate a room; a medicated lozenge.

pastime (pas′ tīm), *n.* diversion, sport, pleasant occupation, recreation.

***pastor** (pȧs′ tēr), *n.* a minister having charge of a church and its congregation.

pastoral (pȧs′ tō ral), *n.* a poem or play showing the lives of shepherds and shepherdesses; a literary composition or a painting depicting country life.

pastoral (pȧs′ tō ral), *adj.* pertaining to shepherds or to simple country life.

pastry (pās′ tri), *n.* [*pl.* pastries] pies, tarts and other baked products, made of rich crust with various fillings.

pasture (pȧs′ tūr), *n.* grassland on which cattle graze; grass or other fodder eaten by grazing cattle.

pasture (pȧs′ tūr), *v.i. and v.t.* to graze; to put in grassland to graze.

***pasty** (pas′ ti), *n.* a pie, usually of meat, with a crust all around it.

pasty (pās′ ti), *adj.* like paste in consistency or color, as a *pasty* mess, a *pasty* skin.

pat (pat), *n.* a quick light caressing touch with the hand; a small lump, as a *pat* of butter.

pat (pat), *v.t.* to touch lightly with the hand, as in a caress, as to *pat* a dog.

pat (pat), *adj.* apt, exact, as a *pat* answer.

pat (pat), *adv.* aptly, as he spoke *pat* and to the point.

patch (pach), *n.* a piece of material applied over a hole; a plot of ground; a small area differing from its surroundings, as a *patch* of trees, a *patch* of white on a black cat.

patch (pach), *v.i. and v.t.* to repair with a patch; to put a patch on; to mend clumsily.

pate (pāt), *n.* the crown of the head.

patella (pa tel′ *a*), *n.* the kneecap.

paten (pat′ en), *n.* a thin round metal plate; the plate used for the bread in the Eucharist.

***patent** (pat′ ent), *n.* a right or privilege granted to an inventor by the government to make or use a particular invention for a term of years without competition by other users of the same thing; a grant of land by a government; the certificate evidencing such a grant.

patent (pat′ ent), *v.i. and v.t.* to issue or receive a grant of special rights to the use of an invention or a tract of land.

patent (pā′ tent), *adj.* apparent, obvious, as a *patent* excuse.

patent (pat′ ent), *adj.* covered by a patent; high grade, as *patent* flour.

paternal (pa tûr′ nal), *adj.* relating in any way to a father or to the state of being a father.

paternity (pa tûr′ ni ti), *n.* [*pl.* paternities] fatherhood; male parentage; authorship.

path (pȧth), *n.* a footway; a course of conduct, as the right *path*.

pathetic (pa thet′ ik), *adj.* evoking sorrow and sympathy, touching.

pathological (path ō loj′ i kal), *adj.* pertaining to the science of diseases, as a *pathological* lecture; diseased, as a *pathological* organ.

pathology (pa thol′ ō ji), *n.* [*pl.* pathologies] the science of diseases; a book treating any phase of this science.

***pathos** (pā′ thos), *n.* the quality in an experience or in a literary description of an experience that arouses sympathy.

***patience** (pā′ shens), *n.* calm endurance without complaint; forbearance.

patient (pā′ shent), *n.* a sick person under the care of a doctor or nurse.

patient (pā′ shent), *adj.* enduring calmly, uncomplaining; forbearing; persevering.

patois (pat′ wä), *n.* a dialect; local or provincial speech.

patriarch (pā′ tri ärk), *n.* the founder or head of a family; a venerable old man; a bishop or archbishop in the Oriental Church.

patrician (pa trish′ an), *n.* a member of the ancient Roman aristocracy; any aristocratic person.

patrician (pa trish′ an), *adj.* of aristocratic birth: opposite of *plebeian*.

patrimony (pat′ ri mō ni), *n.* [*pl.* patrimonies] an estate that has descended through a family line.

***patriot** (pā′ tri ut), *n.* one who is devoted to his country.

***patriotic** (pā tri ot′ ik), *adj.* devoted to one's own country and ready to serve it.

***patriotism** (pā′ tri ut izm), *n.* devotion to one's country; national loyalty.

***patrol** (pa trōl′), *n.* a guard that goes the rounds; the act of moving about a district to guard it; a group of men on guard duty.

patrol (pa trōl′), *v.i. and v.t.* to be on guard duty; to walk back and forth or around to guard and protect, as a policeman *patrols* a neighborhood.

patrolman (pa trōl′ man), *n.* a policeman on a beat.

***patron** (pā′ trun), *n.* a guardian or protector; a regular customer, as patron of a shop; a man who gives his support to a social or charitable undertaking.

patron (pā′ trun), *adj.* aiding or guarding, as a *patron* saint.

***patronage** (pā′ trun ij), *n.* aid, support; condescension; the power to control political nominations.

***patronize** (pā′ trun īz), *v.t.* to act as a guardian toward; to be a customer of, frequent, as a restaurant or a shop; to treat with condescension.

***patronymic** (pat rō nim′ ik), *n.* a name derived from an ancestor.

***patronymic** (pat rō nim′ ik), *adj.* derived from the name of an ancestor; denoting ancestry.

patter (pat′ ēr), *n.* a quick, steady succession of light sounds, as the *patter* of raindrops, the *patter* of children's feet.

patter (pat′ ēr), *n.* rapid empty talk.

patter (pat′ ēr), *v.i.* to move with quick, light steps; to strike with a swift steady succession of light blows, as the child *pattered* down the stairs, the rain *patters* on the roof.

pattern (pat′ ērn), *n.* a model to be copied; a design from which to work, as a *pattern* for a dress; the design of a fabric, as lace or a rug.

fāte fat final câre färm ȧsk sof*a*; mē met novel fingēr; līne pin; gō ôrder not nōōn good; ūse but tûrn menü; thin *th*en.

pattern (pat′ ẽrn), *v.i. and v.t.* to follow after, copy; to form in a pattern; to design.

patty (pat′ i), *n.* [*pl.* patties] a pastry shell filled with food, as an oyster *patty.*

***paucity** (pô′ si ti), *n.* smallness of number or quantity; fewness; scantiness, insufficiency.

***paunch** (pônch), *n.* the belly, abdomen.

pauper (pô′ pẽr), *n.* one deep in poverty, especially so poor as to require support at public expense.

pauperize (pô′ pẽr īz), *v.t.* to make a pauper of, to impoverish completely.

pause (pôz), *n.* a momentary or brief stop or suspension of activity; an interruption of progress.

pause (pôz), *v.i.* to stop for a moment; to hesitate.

pave (pāv), *v.t.* to cover with stones, brick or wood, as to *pave* streets; to make smooth and easy, as to *pave* the way to success.

pavement (pāv′ ment), *n.* a paved roadway or sidewalk.

paving (pāv′ ing), *n.* materials for making a pavement.

pavilion (p*a* vil′ yun), *n.* a large open-sided tent or shelter.

***paw** (pô), *n.* the foot of a quadruped with claws, as distinguished from a hoof.

paw (pô), *v.i. and v.t.* to scrape with the forefoot; to handle awkwardly.

***pawn** (pôn), *n.* the chess piece of least value, representing a foot soldier.

pawn (pôn), *n.* something deposited as security on a loan; the state of being pledged, as my ring is in *pawn.*

pawn (pôn), *v.t.* to place in pawn; to deposit as security.

pawnbroker (pôn′ brō kẽr), *n.* one who lends money on articles deposited with him as security; the proprietor of a pawnshop.

pawnshop (pôn′ shop), *n.* a place where money is lent on articles deposited as security for repayment.

***pay** (pā), *n.* money received for work done, services rendered or goods sold.

pay (pā), *v.i. and v.t.* to make recompense in money, as we *pay* on Friday; to give money for work, services or goods; to be profitable, as it *pays* to do right; to *pay* out, let run, as a rope.

paymaster (pā′ mȧs tẽr), *n.* one whose duty it is to distribute wages or salaries.

pea (pē), *n.* [*pl.* peas or pease] a pod-bearing vine and its edible seed.

peace (pēs), *n.* a state of tranquillity; absence of war; a pact to end a war; freedom from disorderly disturbances; freedom from fears or worries.

Syn. Quiet, calm, tranquillity. *Peace* brings exemption from private quarrels or from war. *Quiet* goes with freedom from noise or interruption. *Calm* is a species of *quiet;* it predicates the absence of violent motion as well as of noise. *Tranquillity* marks either a situation of the present moment or the permanent condition of immovable objects.

Ant. Agitation, excitement, contention, war.

peaceable (pēs′ *a* bl), *adj.* not disposed to war or quarreling, calm.

peaceful (pēs′ fool), *adj.* at peace; free from war or disturbance; tranquil, calm.

peach (pēch), *n.* a tree with downy-skinned juicy fruit; the fruit of this tree.

peacock (pē′ kok), *n.* a bird with handsome tail feathers marked with iridescent spots.

peak (pēk), *n.* a sharp summit; a mountain jutting up among others or standing alone; the edged or pointed end of anything, as the *peak* of a mast or a roof; the highest development or point of anything, as the *peak* of a man's career, the *peak* of production; the highest value of an alternating electric current.

peaked (pēkt), *adj.* pointed, as a *peaked* cap.

peaked (pēk′ ed), *adj.* sharp-featured, thin, sickly.

***peal** (pēl), *n.* a loud and prolonged sound, as a *peal* of thunder; a set of tuned bells.

peal (pēl), *v.i. and v.t.* to give forth loud or solemn sounds, as the organ *pealed* forth; to cause to sound forth, as to *peal* a bell.

peanut (pē′ nut), *n.* a plant of tropical origin with underground nuts in shell-like pods; the groundnut.

pear (pâr), *n.* an orchard tree with juicy thin-skinned fruit; the fruit of this tree.

***pearl** (pûrl), *n.* a hard, smooth, grayish-white iridescent gem formed in the shell of the oyster; anything very choice or valuable, as a pearl of girlish beauty.

pearly (pûr′ li), *adj.* [*comp.* pearlier, *superl.* pearliest] containing, made with or resembling pearls; clear.

***peasant** (pez′ ant), *n.* a rustic laborer, farmer or countryman.

***peat** (pēt), *n.* decayed vegetable matter, resembling turf, cut from bogs for fuel.

pebble (peb′ l), *n.* a small rounded stone, worn smooth by the action of the elements.

***pecan** (pē kan′), *n.* a species of North American hickory; the nuts produced by this tree.

peccability (pek *a* bil′ i ti), *n.* the state of being subject to sin.

peccadillo (pek *a* dil′ ō), *n.* a trifling fault.

peccary (pek′ *a* ri), *n.* an American wild hog.

peck (pek), *n.* a unit of dry measure, a quarter of a bushel.

peck (pek), *n.* a quick sharp stroke with or as with the beak of a bird.

peck (pek), *v.i. and v.t.* to pick up food with the beak; to strike with the beak, as birds do; to strike with a pointed instrument, such as an icepick.

***pectin** (pek′ tin), *n.* a substance occurring in various fruits, which aids in the formation of jelly, used in making preserves.

pectoral (pek′ tō ral), *n.* a remedy for diseases of the chest; an ornament worn on the breast; a priest's or an abbot's cross or breastplate.

peculate (pek′ ū lāt), *v.i.* to appropriate public money to one's own use; to embezzle.

***peculiar** (pē kūl′ yẽr), *adj.* one's own; distinctive; odd.

***peculiarity** (pē kū li ar′ i ti), *n.* [*pl.* peculiarities] something distinctively characteristic.

***pecuniary** (pē kū′ ni er i), *adj.* pertaining to money; monetary.

***pedagogue** (ped′ *a* gog), *n.* one who teaches children; a schoolmaster.

***pedagogic** (ped *a* goj′ ik), *adj.* pertaining to a teacher or to teaching.

***pedagogy** (ped′ *a* gō ji), *n.* the science of teaching; the profession of teaching.

***pedal** (ped′ al), *n.* a treadle or foot lever, as on a bicycle or organ.

pedal (ped′ al), *v.i. and v.t.* to use a treadle or foot lever; to operate by means of a treadle or foot lever, as to *pedal* a bicycle.

pedal (ped′ al), *adj.* pertaining to the foot.

***pedant** (ped′ ant), *n.* one who makes an ostentatious display of his learning; one who pursues knowledge for its own sake rather than for its uses.

pedantic (pē dan′ tik), *adj.* airing or showing off learning.

pedantry (ped′ ant ri), *n.* [*pl.* pedantries] an ostentatious display of learning.

peddle (ped′ l), *v.i. and v.t.* to travel about selling small wares; to sell in small quantities, especially from door to door.

peddler (ped′ lẽr), *n.* one who peddles, a hawker.

pedestal (ped′ es tal), *n.* the base of a column or statue.

pedestrian (pē des′ tri an), *n.* one who goes afoot.

pedestrian (pē des′ tri an), *adj.* going afoot; slow-moving; dull.

pedigree (ped′ i grē), *n.* lineage, family tree, line of descent; a certificate showing the ancestors by name, as the pedigree of a dog or horse.

pedigreed (ped′ i grēd), *adj.* having known lineage.

***pedometer** (pē dom′ ē tẽr), *n.* a watch-shaped instrument to record distances in walking.

peek (pēk), *v.i.* to look with the eye half closed; to peep or pry.

peel (pēl), *n.* the skin or rind of certain fruits and vegetables, as orange *peel.*

peel (pēl), *v.t.* to remove the skin or rind from, as to *peel* an orange, *peel* the bark off a birch tree.

peep (pēp), *v.i.* to chirp, as young birds; to look through a crevice or out from a hiding place.

peer (pẽr), *n.* one of the same rank, an equal; a nobleman.

peeress (pẽr′ es), *n.* the wife of a peer; a noblewoman.

peerless (pẽr′ les), *adj.* without an equal, matchless.

peevish (pē′ vish), *adj.* fretful, irritable.

peg (peg), *n.* a small pointed wooden pin; a piece of wood projecting from a wall on which to hang things.

pelf (pelf), *n.* wealth, especially stolen goods; lucre, gain.

pelican (pel′ i kan), *n.* a large aquatic bird with a huge pouched bill in which it catches fish.

***pellagra** (pe lā′ gra), *n.* a disease due to faulty diet.

pellet (pel′ et), *n.* a little ball, as of food or medicine.

pell-mell (pel mel′), *adv.* in wild confusion, headlong.

***pellucid** (pe lū′ sid), *adj.* perfectly clear; easily understood.

Syn. Transparent. Anything *pellucid* is pervious to light, and the eye can penetrate into it. *Transparent* things are bright throughout their substance. A stream is *pellucid;* it admits light, but it is not *transparent* for the eye.

pelt (pelt), *n.* the undressed skin of an animal with a furry coat.

pelt (pelt), *v.i. and v.t.* to beat down, as hail; to strike repeatedly with missiles.

pelvis (pel′ vis), *n.* the bone-enclosed cavity in the lower part of the abdomen.

pemmican (pem′ i kan), *n.* lean meat, dried, pounded and pressed into cakes.

pen (pen), *n.* a small inclosure for animals or fowl; the animals or birds so confined, as a *pen* of Plymouth Rocks.

pen (pen), *n.* a split-pointed piece of metal used in a holder for writing with ink.

pen (pen), *v.t.* to confine in a pen or coop; to write with a pen, as to *pen* a letter.

***penal** (pē′ nal), *adj.* relating to punishment for crime; punitive.

penalty (pen′ al ti), *n.* punishment for any crime or offense; a fine; anything paid or forfeited for breaking a rule, as in a game.

***penance** (pen′ ans), *n.* suffering or self-sacrifice as an expression of sorrow for having sinned.

pence (pens) *n.* the plural of penny in quoting a price in British pennies.

***penchant** (pän chän′), *n.* a taste, a liking, as he has a *penchant* for art.

pencil (pen′ sil), *n.* graphite or colored chalk inside a stick of wood, used in writing and drawing.

pencil (pen′ sil), *v.t.* to write or draw with a pencil.

pend (pend), *v.i.* to await settlement, to be undecided, as the case is *pending.*

pendant (pen′ dant), *n.* a hanging ornament.

pendent (pen′ dent), *adj.* hanging; overhanging or jutting; awaiting settlement, undecided.

pending (pen′ ding), *adj.* hanging; imminent, as *pending* evil; unsettled, as a *pending* lawsuit.

pending (pen′ ding), *prep.* during, through, as *pending* the suit; until, while one is waiting for, as *pending* the final settlement of the estate.

***pendulum** (pen′ dū lum), *n.* a body suspended from a fixed point so that it may swing back and forth.

penetrable (pen′ ē tra bl), *adj.* capable of being entered or pierced.

penetrate (pen′ ē trāt), *v.i. and v.t.* to pass in; to pierce something; to enter into, pierce.

penetrating (pen′ ē trāt ing), piercing; sharp; shrill, as a *penetrating* sound.

penetration (pen ē trā′ shun), *n.* the act of entering or piercing; mental acuteness, insight.

*__penguin__ (pen′ gwin), *n.* a large sea bird of the Southern Hemisphere with rudimentary wings used in swimming.

peninsula (pen in′ sū l*a*), *n.* a projecting piece of land almost cut off from the mainland by water.

peninsular (pen in′ sū lẽr), *adj.* pertaining to or resembling a peninsula.

penitence (pen′ i tens), *n.* repentance, sorrow for sins or faults.

penitent (pen′ i tent), *n.* one who repents.

penitent (pen′ i tent), *adj.* repentant, feeling sorrow for sins or faults.

penitentiary (pen i ten′ sh*a* ri), *n.* [*pl.* penitentiaries] a prison, house of correction.

penknife (pen′ nīf), *n.* a small pocketknife.

penmanship (pen′ man ship), *n.* the art of writing with a pen; skill in writing with a pen; a special style of writing.

pennant (pen′ ant), *n.* a long narrow flag or streamer, flown on a vessel; a triangular flag; any flag used as a symbol of victory in an athletic contest, especially the *pennant* of professional baseball.

penny (pen′ i), *n.* [*pl.* pennies or pence] a British coin equal to 1-12th of a shilling; one cent in U. S. money.

pennyweight (pen′ i wāt), *n.* a weight equal to 24 grains troy measure or 1/20 of an ounce.

penology (pē nol′ ō ji), *n.* the scientific study of punishment for crime, of the management of penal institutions and the reformation of criminals.

*__pension__ (pen′ shun), *n.* an allowance paid for past services after retirement, by a government or a private employer.

pension (pän syôn′), *n.* a boarding house; a boarding school.

pension (pen′ shun), *v.t.* to grant a pension to.

pensive (pen′ siv), *adj.* quietly thoughtful.

pentagon (pen′ t*a* gon), *n.* a plane figure with five sides and five angles.

pentameter (pen tam′ ē tẽr), *n.* a verse having five metrical feet.

*__pentathlon__ (pen tath′ lon), *n.* an athletic contest in the modern Olympics in which each entrant takes part in five events and total scores are counted.

penthouse (pent′ hous), *n.* a shed with slanting roof projecting from the side of a building; a dwelling built on the roof of a tall city building.

*__penult__ (pē′ nult), *n.* the next to last syllable of a word.

penultimate (pē nul′ ti mit), *adj.* last but one.

penumbra (pē num′ br*a*), *n.* a partial shadow around the rim of the total shadow of the moon or earth in an eclipse; the half-shadow along the edge of any shadow.

penurious (pē nū′ ri us), *adj.* miserly, grudging, stingy.

Syn. Parsimonious, stingy. *Parsimonious* means exceedingly sparing; *penurious* means grudgingly and meanly sparing; *stingy* is the general term that means grudging of any expense whatsoever.

Ant. Generous, liberal, openhanded.

penury (pen′ ū ri), *n.* want of the necessaries of life; poverty.

*__peony__ (pē′ ō ni), *n.* a perennial plant with handsome flowers.

people (pē′ pl), *n.* [*pl.* peoples] a race or a nation, inhabitants, as the French *people;* human beings, men, women and children; relatives, ancestry, as to come of fine *people;* all the voters of a nation, as to take the issue to the *people.*

pepper (pep′ ẽr), *n.* a hot pungent spice made of the ground berries of an East Indian plant and called *black pepper;* the ground seeds of the same plant, called *white pepper;* capsicum, red pepper.

peppermint (pep′ ẽr mint), *n.* an aromatic herb; a cordial prepared from it; a candy flavored with it.

*__pepsin__ (pep′ sin), *n.* a nitrogenous ferment contained in the gastric juices; a preparation made from the stomach of a pig, sheep or calf to aid the human digestive system.

per (pûr), *prep.* through, by, as know *per* this document; for each, as 60 miles *per* hour, a dollar *per* dozen.

perambulation (pẽr am bū lā′ shun), *n.* the act of walking about, especially to inspect a tract or property.

perambulator (pẽr am′ bū lā tẽr), *n.* an instrument used by surveyors to measure distances; a baby carriage.

perceive (pẽr sēv′), *v.t.* to obtain knowledge of through the senses; to understand; to discern.

per cent (pẽr sent), *literally,* per centum, by the hundred; so many to each hundred, as 80 *per cent* is 80 to each hundred.

percentage (pẽr sen′ tij), *n.* a portion calculated in hundredths of the whole; a commission calculated as a stated per cent of the amount involved in a transaction.

perceptible (pẽr sep′ ti bl), *adj.* capable of being perceived.

perception (pẽr sep′ shun), *n.* awareness, consciousness; knowledge obtained through the senses.

perceptive (pẽr sep′ tiv), *adj.* having the faculty of perceiving; quick to understand.

perch (pûrch), *n.* a freshwater fish.

perch (pûrch), *n.* a measure of length equal to 5½ yards, a rod; a measure of surface equal to 30¼ square yards, a square rod; a cubic measure used in masonry, usually 24¾ cubic feet.

perch (pûrch), *n.* a pole or bar for birds to roost on; any high seat.

perch (pûrch), *v.i. and v.t.* to alight and rest on something, as a bird on a perch; to place or set on a perch.

perchance (pẽr chȧns′), *adv.* perhaps.

*__percolate__ (pûr′ kō lāt), *v.i. and v.t.* to seep through small spaces; to pass boiling water through coffee; to prepare coffee by filtering boiling water through it.

percussion (pẽr kush′ un), *n.* violent collision; the impact of a gun hammer on the cap that holds the powder; tapping, as the chest, to discover internal conditions; producing tone by a stroke or blow, as the piano and drum are instruments that produce tone by *percussion.*

perdition (pẽr dish′ un), *n.* total destruction; ruin; loss of the hope of happiness in a future life.

peregrination (per ē gri nā′ shun), *n.* the act of going about; journeying; a journey.

*__peremptory__ (pẽr emp′ tō ri), *adj.* positive, final; arrogant, as a *peremptory* command.

perennial (pẽr en′ i al), *n.* a plant that lives from year to year.

perennial (pẽr en′ i al), *adj.* lasting all year; living from year to year, as *perennial* plants.

*__perfect__ (pûr′ fekt or pûr fekt′), *v.t.* to make perfect; to complete or finish.

perfect (pûr′ fekt), *adj.* complete; without defect or blemish.

perfectible (pẽr fek′ ti bl), *adj.* capable of being perfected.

perfection (pẽr fek′ shun), *n.* the state of being without defect, flaw or blemish.

*__perfidious__ (pẽr fid′ i us), *adj.* not true to a trust, treacherous, faithless.

perfidy (pûr′ fi di), *n.* [*pl.* perfidies] betrayal of a trust; treachery.

perforate (pûr′ fō rāt), *v.t.* to pierce through; to make holes through.

perforation (pûr fō rā′ shun), *n.* the act of perforating; a hole made by boring or piercing.

perforce (pẽr fōrs′), *adv.* by necessity.

perform (pẽr fôrm′), *v.i. and v.t.* to act a part; to effect, execute, do; to carry out, as a vow.

performance (pẽr fôrm′ ans), *n.* the carrying out of something, as a vow; a deed; a presentation of a play, rendition of a musical composition or presentation in public of an act of entertainment, as of gymnastics or sleight of hand.

*__perfume__ (pûr′ fūm), *n.* fragrance, as of a flower; a substance, usually a liquid, used to give fragrance to things.

*__perfume__ (pẽr fūm′), *v.t.* to impart fragrance to; to fill with a fragrant odor.

perfumery (pẽr fūm′ er i), *n.* [*pl.* perfumeries] perfumes in general; a place where perfumes are made.

perfunctory (pẽr fungk′ tō ri), *adj.* done carelessly, done merely to discharge a duty without interest in the process or result; careless.

*__perhaps__ (pẽr haps′), *adv.* possibly, maybe.

*__pericardium__ (per i kär′ di um), *n.* [*pl.* pericardia] the membrane that surrounds the heart.

*__perihelion__ (per i hē′ li on), *n.* [*pl.* perihelia] the point in the orbit of a heavenly body nearest the sun.

peril (per′ il), *n.* danger, jeopardy; risk of damage, injury or loss.

perilous (per′ i lus), *adj.* full of danger, hazardous.

perimeter (pe rim′ ē tẽr), *n.* the outer boundary of any plane figure; the distance around a circle or total lengths of all the sides of an angular figure.

*__period__ (pēr′ i ud), *n.* a cycle; interval of time; a dot used in punctuation (.).

periodical (pēr i od′ i kal), *n.* a publication issued at stated intervals.

*__periodic__ or **periodical** (pēr i od′ ik, -ik al), *adj.* occurring at regular intervals of time.

periodicity (pēr i ō dis′ i ti), *n.* [*pl.* periodicities] the quality of happening at regular intervals of time; having periodic quality.

periosteum (per i os′ tē um), *n.* [*pl.* periostea] the vascular nervous membrane that covers the bones.

peripatetic (per i p*a* tet′ ik), *adj.* walking about.

*__periphery__ (pe rif′ ẽr i), *n.* [*pl.* peripheries] the circumference of any curved figure, plane or solid.

periptery (pe rip′ tẽr i), *n.* [*pl.* peripteries] the region about an aircraft in which there are circular or whirling movements in the air.

*__periscope__ (per′ i skōp), *n.* a vertical arrangement of mirrors and a tube to see objects horizontally, used especially for observing things on the sea surface from a partially submerged submarine or to observe the enemy from the trenches in land warfare.

perish (per′ ish), *v.i.* to die; to be destroyed.

perishable (per′ ish *a* bl), *adj.* liable to decay or death; easily spoiled, as fruits or vegetables.

peristaltic (per i stal′ tik), *adj.* pertaining to the wormlike movement of the muscles of the intestines.

peritoneum (per i tō nē′ um), *n.* [*pl.* peritonea] the serous membrane that lines the abdominal wall.

*__peritonitis__ (per i tō nī′ tis), *n.* acute inflammation of the peritoneum.

periwig (per′ i wig), *n.* a wig, a peruke.

periwinkle (per′ i wing kl), *n.* a creeping plant; a small sea snail.

perjure (pûr′ jẽr), *v.t.* to cause (oneself) to swear falsely by lying while under oath to tell the truth.

perjury (pûr′ jẽr i), *n.* [*pl.* perjuries] deliberate falsehood under oath.

permanence (pûr′ m*a* nens), *n.* the state or quality of being enduring or fixed.

permanency (pûr′ m*a* nen si), *n.* [*pl.* permanencies] a thing that lasts a very long time.

permanent (pûr′ m*a* nent), *adj.* lasting indefinitely; continuing in the same state.

Syn. Abiding, constant, durable, fixed, immutable, invariable, lasting, perpetual, stable, steadfast. *Durable* applies to material substances that resist wear. *Lasting* may apply to either physical or spiritual things. A thing that is *permanent* is not subject to change. *Immutable* applies to that which resists both time and change.

Ant. Perishable, evanescent, changeful.

permeable (pûr′ mi *a* bl), *adj.* capable of being passed through or penetrated.

permeate (pûr′ mē āt), *v.t.* to penetrate and pass through the pores of; to saturate, pervade.

permissible (pẽr mis′ *a* bl), *adj.* fit to be permitted, allowable.

permission (pẽr mish′ un), *n.* the act of allowing; consent.

***permit** (pẽr mit′), *v.t.* to allow; to give leave; to tolerate.

permute (pẽr mūt′), *v.t.* to interchange things in a series, so as to obtain all the possible combinations.

pernicious (pẽr nish′ us), *adj.* harmful in the extreme, destructive, deadly.

peroration (per ō rā′ shun), *n.* the concluding part of a speech; the summing up of an argument.

peroxide (pẽr ok′ sīd), *n.* that oxide of a base which contains the largest proportion of oxygen; hydrogen peroxide, used for bleaching, as the hair.

perpendicular (pûr pen dik′ ū lẽr), *n.* a line at right angles to another line or surface.

perpendicular (pûr pen dik′ ū lẽr), *adj.* at right angles to a horizontal line or plane; upright, vertical.

perpetrate (pûr′ pē trāt), *v.t.* to do; to perform; to commit, as to *perpetrate* a crime.

***perpetual** (pẽr pet′ ū al), *adj.* never ceasing, not temporary, endless.

perpetuate (pẽr pet′ ū āt), *v.t.* to make perpetual, give lasting existence to, preserve.

perpetuity (pûr pet ū′ i ti), *n.* [*pl.* perpetuities] lasting existence, duration or worth; endless time; anything that lasts forever.

perplex (pẽr pleks′), *v.t.* to puzzle, embarrass, confuse.

perplexity (pẽr plek′ si ti), *n.* [*pl.* perplexities] the state of being perplexed, as I am in great *perplexity;* that which puzzles and embarrasses, as the situation has many *perplexities.*

perquisite (pûr′ kwi zit), *n.* a gain in addition to regular pay arising from one's position, as *perquisites* of office.

persecute (pûr′ sē kūt), *v.t.* to harass and oppress, particularly because of differences in religion.

persecution (pûr sē kū′ shun), *n.* the act of persecuting or state of being afflicted and continuously harassed.

perseverance (pûr sē vẽr′ ans), *n.* steadiness in seeking a goal; persistent effort.

persevere (pûr sē vẽr′), *v.i.* to persist in any undertaking.

***persiflage** (pûr′ si fläzh), *n.* banter, raillery, light talk.

persimmon (pẽr sim′ un), *n.* the pulpy plumlike fruit of an American tree, puckery until completely ripe or frosted.

***persist** (pẽr sist′), *v.i.* to continue steadily in any course of action; to apply oneself with unrelaxing effort and attention.

persistence (pẽr sis′ tens), *n.* uninterrupted effort in an undertaking or purpose.

persistent (pẽr sis′ tent), *adj.* persevering, as a *persistent* student; tenacious, enduring, as *persistent* superstitions; constantly recurring, uninterrupted, as *persistent* questions.

person (pûr′ sn), *n.* an individual human being; bodily presence, as he will be here in person.

personal (pûr′ sun al), *adj.* pertaining to a particular person, private, as *personal* beliefs, *personal* affairs; direct, not delegated, as a *personal* welcome; pertaining to the individual appearance or character, as to have *personal* charm; relating to an individual's appearance or affairs, especially familiar, as a *personal* question.

***personality** (pûr su nal′ i ti), *n.* [*pl.* personalities] existence as a person; the assemblage of qualities, physical, mental and moral, that set one apart from others; distinctive individuality, as he is a man of strong *personality;* a too intimate, or offensive remark about a person, as don't indulge in *personalities.*

personate (pûr′ sun āt), *v.t.* to pretend to be, especially in order to defraud.

personification (pẽr son i fi kā′ shun), *n.* representation or endowment of an abstract quality with an individual character, as Cupid is the *personification* of love; embodiment, as he is the *personification* of honor.

personify (pẽr son′ i fī), *v.t.* to be a marked example of, as he *personifies* honor; to attribute personality to, as to *personify* nature.

personnel (pûr so nel′), *n.* the persons employed in a business establishment, government service or other group.

***perspective** (pẽr spek′ tiv), *n.* the art of depicting objects on a plane so as to show three dimensions and indicate distance away from the observer.

perspicacity (pẽr spi kas′ i ti), *n.* acuteness of mental vision, quick, clear understanding.

perspicuity (pẽr spi kū′ i ti), *n.* clearness of thought and expression.

***perspiration** (pûr spi rā′ shun), *n.* sweat.

***perspire** (pẽr spīr′), *v.i.* to excrete waste matters, in liquid form, through the pores of the skin, to sweat.

persuade (pẽr swād′), *v.t.* to influence to believe or do, prevail upon by means of argument, advice, entreaty; to convince; to win over; to urge.

persuasion (pẽr swā′ zhun), *n.* the act of urging, or state of being won over; belief, especially religious belief, as I am of the Christian *persuasion.*

Syn. Belief, conviction. A *persuasion* is an opinion or belief to which one has been won over and of which one is assured; a *belief* is that to which one assents; a *conviction* is an unshakable belief.

Ant. Skepticism.

***persuasive** (pẽr swā′ siv), *adj.* having power to persuade, convince, influence.

pert (pûrt), *adj.* saucy, bold.

pertain (pẽr tān′), *v.i.* to relate, belong, be a part.

***pertinacious** (pûr ti nā′ shus), *adj.* obstinately persistent.

pertinent (pûr′ ti nent), *adj.* fitting or appropriate; to the point.

perturb (pẽr tûrb′), *v.t.* to agitate, disturb, disquiet, especially in the mind.

***peruse** (pē ro͞oz′), *v.t.* to read with careful attention.

pervade (pẽr vād′), *v.t.* to be in or pass through every part of, permeate.

pervasive (pẽr vā′ siv), *adj.* passing through, permeating.

perverse (pẽr vûrs′), *adj.* obstinate, persistent in wrong, deviating from the normal, right or true.

Syn. Contrary, factious, fractious, froward, intractable, obstinate, petulant, stubborn, wayward. *Perverse* signifies willfully wrong. The *stubborn* or *obstinate* person will not do what another desires or requires. The *petulant* person frets. The *perverse* individual is willfully *intractable.* The *wayward* person has a *perverse* disregard for morality and duty.

Ant. Conscientious, dutiful, yielding.

***perversion** (pẽr vûr′ zhun), *n.* a turning from truth or from the proper use or meaning; misrepresentation, corruption, as a *perversion* of the story.

perversity (pẽr vûr′ si ti), *n.* [*pl.* perversities] an act of perversion; the quality of being perverse.

pervert (pûr′ vẽrt), *n.* one who has turned from the right to the wrong, especially to abnormal vice.

pervert (pẽr vûrt′) *v.t.* to turn from the true end or proper purpose; to misapply.

pervious (pûr′ vi us), *adj.* penetrable; receptive, accessible, as to new ideas.

pesky (pes′ ki), *adj.* annoying.

pessimism (pes′ i mizm), *n.* the tendency to exaggerate in thought the evils of life: opposite of *optimism.*

pessimist (pes′ i mist), *n.* one who looks on the worst side of everything.

pest (pest), *n.* a plague; anything that annoys.

pester (pes′ tẽr), *v.t.* to annoy.

pestiferous (pes tif′ ẽr us), *adj.* conveying pestilence; noxious; annoying.

pestilence (pes′ ti lens), *n.* plague; an infectious or contagious disease.

pestilent (pes′ ti lent), *adj.* obnoxious, physically or mentally.

pestilential (pes ti len′ shal), *adj.* pertaining to or producing a pestilence; pernicious.

***pestle** (pes′ l), *n.* an instrument with which to pound or grind things in a mortar.

pet (pet), *n.* a tame animal that is fondled; a favorite person.

pet (pet), *n.* a spell of peevishness.

pet (pet), *v.t.* to fondle; to be indulgent to.

***petal** (pet′ l), *n.* one of the separate parts of the corolla of a flower.

***petard** (pē tärd′), *n.* a case filled with explosives and attached to a wall or gate to blow it open; a kind of firecracker.

***petition** (pē tish′ un), *n.* an earnest supplication; a document addressed to someone in authority or to a governing agency containing a request for action and signed by many persons.

petition (pē tish′ un), *v.t.* to supplicate; to present a petition.

petit jury (pet′ i joo′ ri), a trial jury as distinguished from a grand jury.

***petrel** (pet′ rel), *n.* a web-footed, strong-winged sea bird.

petrifaction (pet ri fak′ shun), *n.* the process by which animal and vegetable matter becomes stone.

petrify (pet′ ri fī), *v.i. and v.t.* to become stone; to change, as organic matter, into stone; to paralyze, make rigid, as with fear or amazement.

petroleum (pē trō′ lē um), *n.* crude oil, refined by distillation to yield gasoline, naphtha, benzine, kerosene and lubricating oils.

petticoat (pet′ i kōt), *n.* a loose underskirt.

pettifogger (pet i fog′ ẽr), *n.* a lawyer who takes mean cases and conducts them in a more or less unscrupulous manner.

pettish (pet′ ish), *adj.* peevish, fretful.

***petty** (pet′ i), *adj.* small; trifling; minor, as a *petty* offense; small-minded.

petulant (pet′ ū lant), *adj.* cross, irritable, querulous.

***petunia** (pē tū′ ni *a*), *n.* a garden plant of the nightshade family with handsome funnel-shaped flowers.

pew (pū), *n.* a long seat in a church; formerly an inclosed space with seats for a group of persons, as a family.

pewter (pū′ tẽr), *n.* an alloy of tin and lead or tin and copper; articles made of this alloy.

***phalanx** (fā′ langks), n. [*pl.* phalanges] a close formation of heavily armed ancient Greek foot soldiers; any close, compact body of individuals operating together for a common purpose: *phalanges,* the small bones of the fingers and toes.

phantasm (fan′ tazm), *n.* a vision or specter, a figment of the imagination, a fantasy.

phantom (fan′ tum), *n.* an apparition, a ghost.

phantom (fan′ tum), *adj.* having appearance without substance, as a *phantom* horse.

phantom circuit (fan′ tum sûr′ kit), an additional telephone circuit obtained without use of additional wires.

pharisaical (far i sā′ i kal), *adj.* hypocritical, self-righteous.

***pharmaceutics** (fär m*a* sū′ tiks), *n.pl.* the science of preparing and using drugs.

pharmacist (fär′ m*a* sist), *n.* a person skilled in pharmacy, a druggist.

pharmacy (fär′ m*a* si), *n.* [*pl.* pharmacies] the art of preparing, compounding and dispensing medicines; a drugstore.

***pharynx** (far′ ingks), *n.* [*pl.* pharynges] the cavity or passage at the upper end of the esophagus.

***phase** (fāz), *n.* an aspect that changes; a stage in development.

***pheasant** (fez′ ant), *n.* a game bird with showy feathering.

phenix (fē′ niks), *n.* a fabulous bird of the Arabian desert, supposed to live 500 years and after death by fire to rise to new life; a symbol of immortality.

phenomenal (fē nom′ ē nal), *adj.* having the nature of a phenomenon; very extraordinary, unusual.

phenomenon (fē nom′ ē non), *n.* [*pl.* phenomena] a very extraordinary occurrence; anything that is known through the physical senses.

phial (fī′ al), *n.* a small glass bottle.

***philanthropic, philanthropical** (fil an throp′ik, -i kal), *adj.* well disposed toward all mankind, benevolent.

philanthropist (fi lan′ thrō pist), *n.* one who loves and seeks to benefit mankind.

***philanthropy** (fi lan′ thrō pi), *n.* [*pl.* philanthropies] love of mankind; benevolence.

***philatelist** (fi lat′ e list), *n.* one who collects and studies postage stamps.

philippic (fi lip′ ik), *n.* a speech of vehement invective.

***philology** (fi lol′ ō ji), *n.* the scientific study of languages, including their structure, development, history and relationships; linguistics.

***philoprogenitiveness** (fil ō prō jen′ i tiv nes), *n.* the instinctive love of offspring.

philosopher (fi los′ ō fẽr), *n.* a student of philosophy; one noted for calm judgment and practical wisdom.

philosophic (fil ō sof′ ik), *adj.* pertaining to philosophy; calm, wise and thoughtful.

philosophize (fi los′ ō fīz), *v.i.* to reason like a philosopher.

***philosophy** (fi los′ ō fi), *n.* [*pl.* philosophies] study of the causes and relations of things and ideas; the serene wisdom that comes from calm contemplation of life and the universe.

philter (fil′ tẽr), *n.* a magic potion used as a love charm.

***phlegm** (flem), *n.* mucus secreted especially in the air passages of the throat.

***phlegmatic** (fleg mat′ ik), *adj.* sluggish, dull, apathetic, calm.

phobia (fō′ bi *a*), *n.* a morbid fear that has no reasonable basis and cannot be controlled.

phonetic (fō net′ ik), *adj.* relating to the voice or to sounds in speech; representing sounds of speech, as *phonetic* spelling.

phonetics (fō net′ iks), *n. pl.* the science of sounds in speech.

***phonics** (fon′ iks), *n. pl.* the science of sounds; acoustics.

***phonogram** (fō′ nō gram), *n.* a symbol used to represent a word, syllable or sound; a phonograph record.

phonograph (fō′ nō gráf), *n.* an instrument to record and reproduce sounds, as speech or music.

phonography (fō nog′ r*a* fi), *n.* a description of sounds uttered by the human voice; a system of shorthand writing.

phosphate (fos′ fāt), *n.* a salt of phosphoric acid; a carbonated drink.

phosphorescence (fos fō res′ ėns), *n.* emission of light without heat.

phosphorescent (fos fō res′ ent), *adj.* luminous, without heat.

phosphoric (fos for′ ik), *adj.* pertaining to, resembling or obtained from phosphorus.

***phosphorous** (fos′ fō rus), *adj.* containing phosphorus.

phosphorus (fos′ fō rus), *n.* a yellowish, waxlike, non-metallic poisonous element, luminous in the dark.

photochromy (fō′ tō krō mi), *n.* the art or process of photographing objects in their natural colors.

photograph (fō′ tō gráf), *n.* a picture made by exposing sensitive film to the action of light.

photograph (fō′ tō gráf), *v.t.* to take a photograph of.

***photography** (fō tog′ r*a* fi), *n.* the art of making pictures by exposing sensitized film to the action of light.

***photogravure** (fō tō gr*a* vūr′), *n.* the process of producing by photography an incised engraved metal plate from which impressions may be printed; called roto or rotogravure when the plate is curved for a cylinder press.

phrase (frāz), *n.* a group of two or more words without subject or predicate, usually introduced by a preposition, and having the force of a single part of speech, as an *adverbial* phrase; a brief expression packed with meaning; diction, phraseology.

phrase (frāz), *v.t.* to put into words, as to *phrase* an idea.

phraseology (frā zē ol′ ō ji), *n.* style of expression; peculiarity of expression or selection of words.

***phrenology** (frē nol′ ō ji), *n.* the reading of character through the conformation of the skull.

***phthisis** (thī′ sis), *n.* tuberculosis of the lungs; consumption.

phylactery (fi lak′ tẽr i); *n.* [*pl.* phylacteries] a charm or talisman, an amulet; a small leather box containing slips inscribed with Scriptural passages.

phylum (fī′ lum), *n.* one of the large, primary divisions into which plants and animals are divided, ranking below a kingdom and above an order.

***physic** (fiz′ ik), *n.* a cathartic.

physic (fiz′ ik), *v.t.* to administer cathartics.

physical (fiz′ i kal), *adj.* relating to the body: opposite of *mental;* pertaining to nature, material, natural; pertaining to the science of physics or the laws and forces of physics, as *physical* computations.

Syn. Bodily, corporal, corporeal. *Bodily* means definitely of or belonging to the body, as *bodily* ills; it is the opposite of *mental; physical* also means bodily, but embraces everything in the material world; it is the opposite of *spiritual* or *physical; corporal* means bodily, but is used to describe infliction, as *corporal* punishment; *corporeal* means having a body; it is the opposite of *immaterial.*

Ant. Mental, spiritual, immaterial.

***physician** (fi zish′ an), *n.* a doctor of medicine.

***physicist** (fiz′ i sist), *n.* a student of physics or the natural sciences.

physics (fiz′ iks), *n. pl.* the science of matter, motion and energy.

***physiognomy** (fiz i og′ nō mi), *n.* [*pl.* physiognomies] the face; facial expression of character; the art of identifying qualities of mind through interpretation of facial characteristics.

physiology (fiz i ol′ ō ji), *n.* [*pl.* physiologies] the science that treats of the vital functions performed by the organs of animals and plants; a book on this science.

***physique** (fi zēk′), *n.* the whole physical constitution of a person.

pi (pī), *n.* a jumble of type that has been set and upset; the letter π denoting the ratio of the circumference of a circle to its diameter, or 3.1416.

***pianist** (pi an′ ist), *n.* one who plays the piano.

***piano** (pi an′ ō), *n.* [*pl.* pianos] a musical instrument played by striking keys which in turn cause hammers to strike wires of various lengths and tensions.

***pianoforte** (pi an ō for′ tē), *n.* a piano.

***piazza** (pi az′ *a*), *n.* a plaza; an open space surrounded by buildings; a veranda.

***pica** (pī′ k*a*), *n.* a size of type, 12 point; a unit of type measure 1/6 inch, to measure column width or the length of a line of type.

***picayune** (pik *a* yōōn′), *n.* a certain small silver coin of old times; anything of trifling value.

picayune (pik *a* yōōn′), *adj.* of little value, paltry.

piccalilli (pik′ *a* lil i), *n.* a relish of finely chopped vegetables with hot spices and vinegar.

piccolo (pik′ ō lō), *n.* [*pl.* piccolos] a small flute sounding an octave higher than the ordinary flute.

pick (pik), *n.* a tool for loosening earth or breaking stone, consisting of a curved iron bar with two sharp ends set on a stout wooden handle.

pick (pik), *n.* choice, as take your *pick.*

pick (pik), *v.t.* to strike with a pick or as if with a pick; to open with a pointed tool, as to *pick* a lock; to pluck, as to *pick* apples; lift, as *pick* it up; to choose or select, as *pick* the one that will do the most good; to rob, as *pick* pockets.

pickax (pik′ ax), *n.* a pick, with one end of the iron bar bladed for chopping, the other pointed for picking.

pickerel (pik′ ẽr el), *n.* a freshwater foodfish of the pike family, smaller than a pike.

picket (pik′ et), *n.* a fence paling; a stake to which a horse is tethered; a patrol of union workers before a shop where nonunion labor is employed or where the practices are unfair to the workers, as during a strike; a military guard stationed outside the lines to give warning of the approach of an enemy.

picket (pik′ et), *v.i. and v.t.* to act as a picket; to tether, as a horse; to place a picket guard; to place pickets outside a shop in time of strike; to patrol in front of such a shop.

pickle (pik′ l), *n.* brine for preserving food; anything preserved in brine or vinegar, especially a small cucumber.

picnic (pik′ nik), *n.* a short pleasure trip by a party carrying its own food to be eaten outdoors.

picnic (pik′ nik), *v.i.* [*p.t.* and *p.p.* picnicked, *pr.p.* picnicking] to go on or hold a picnic; to eat as informally as when on a picnic.

pictorial (pik tō′ ri al), *adj.* having pictures; told in pictures, as a story.

picture (pik′ tūr), *n.* a painting, drawing or photograph depicting something, as persons, objects, landscapes; a mental image or representation; an embodiment, as he is the *picture* of health; a scene suitable for reproduction in a painting or drawing, as isn't that child a *picture.*

***picture** (pik′ tūr), *v.t.* to depict; to represent in a painting or drawing, or in descriptive words, as who could *picture* that scene.

picturesque (pik tūr esk′), *adj.* like a picture, vivid, striking, colorful.

pie (pī), *n.* a food dish consisting of filling made of meat, fruit, custard or the like, baked between two pastry crusts or in one bottom crust.

piebald (pī′ bôld), *adj.* having patches of different colors.

***piece** (pēs), *n.* a separated part; fragment; division, as a *piece* of land; a quantity used as a unit in manufacture, as a *piece* of goods; one of a set, as each *piece* in this set of dishes, a *piece* in a chess set; a unit of work, as we hire them to work by the *piece;* a coin, as a 50-cent *piece;* a literary or musical composition, as that was a pretty *piece* you played.

piece (pēs), *v.t.* to patch; to put together, piece by piece.

piecemeal (pēs′ mēl), *adv.* piece by piece, gradually.

piecework (pēs′ wûrk), *n.* work done and paid for by the piece or job, not by the hour or day.

***pied** (pīd), *adj.* variegated, spotted, piebald.

***pier** (pēr), *n.* a mass of masonry supporting an arch, as of a bridge; a projecting wharf or dock.

***pierce** (pērs), *v.t.* to penetrate, especially with a pointed instrument, to perforate; to thrust into or through, to stab; to break through, as an enemy's lines in war.

piercing (pērs′ ing), *adj.* shrill and sharp, as a cry.

piety (pī′ eti), *n.* [*pl.* pieties] the quality of being pious; reverence for God and a sense of duty toward Him; a pious act.

pig (pig), *n.* the young of swine; a swine; a mass of molten metal poured into a mold to cool and harden.

***pigeon** (pij′ un), *n.* a bird of the dove family, often domesticated.

pigeonhole (pij′ un hōl), *n.* a compartment in a desk for papers.

pigeon-toed (pij′ un tōd), *adj.* having the toes turned inward like a pigeon's.

pigheaded (pig hed′ ed), *adj.* stubborn, obstinate; hard to reason with.

pigment (pig′ ment), *n.* coloring matter; the coloring matter in animals and plants.

pike (pīk), *n.* a voracious freshwater fish.

pilaster (pi las′ tẽr), *n.* a rectangular column or pillar, partly built into a wall.

pile (pīl), *n.* a large beam or pointed stake driven into the ground to make a foundation, ferry slip, wharf wall or similar structure.

pile (pīl), *n.* a mass or heap, a large building or group of buildings.

pile (pīl), *n.* close-set, high-standing threads or fibers of a thick fabric like velvet or a heavy carpet; standing hairs of fur.

pile (pīl), *v.t.* to heap up.

pilfer (pil′ fẽr), *v.t.* to steal in small quantities.

pilgrim (pil′ grim), *n.* one who travels; especially one who goes to a distant place to pay homage at a shrine.

pill (pil), *n.* a small ball of medicinal substance.

pillage (pil′ ij), *n.* the act of plundering; spoil, booty.

pillage (pil′ ij), *v.t.* to despoil; to rob, plunder and lay waste.

pillar (pil′ ẽr), *n.* a supporting column; a monumental shaft.

Syn. Column. The word *pillar* is the general term and carries the idea of strength and support; *column,* on the other hand, is used only in connection with fine architecture and usually refers to a type or order, as a Doric *column.*

pillion (pil′ yun), *n.* a cushion fastened behind a horse's saddle for a woman or child to ride on.

pillory (pil′ ō ri), *n.* [*pl.* pillories] a wooden frame supported by an upright post, having holes through which the head and hands of a person to be exposed to public disgrace were passed and secured.

pillory (pil′ ō ri), *v.t.* [*p.t.* and *p.p.* pilloried, *pr.p.* pillorying] to place in a pillory, to expose to public disgrace.

pillow (pil′ ō), *n.* a case filled with feathers or some soft stuffing material, used as a head rest.

pillow (pil′ ō), *v.t.* to rest on a pillow or as on a pillow, as to *pillow* one's head; to furnish with a soft cushion.

pilot (pī′ lut), *n.* one who steers a ship or aircraft; the cowcatcher of a locomotive; a mechanical device regulating action or motion.

pilot (pī′ lut), *v.t.* to guide, steer, direct on a course.

pilot balloon (pī′ lut ba lo͞on′), balloon used to test the direction of air currents.

***pimento** (pi men′ tō), *n.* [*pl.* pimentos] allspice; pimiento.

***pimiento** (pē myen′ tō), *n.* [*pl.* pimientos] a variety of sweet pepper used in salads and as a flavoring for cheese.

pimpernel (pim′ pẽr nel), *n.* a plant of the primrose family with blooms that close when bad weather is coming.

pimple (pim′ pl), *n.* a small pustule.

pin (pin), *n.* a short, sharp-pointed piece of wire, with a head, used for fastening pieces of cloth or paper together; any kind of a peg to hold parts together, as in a machine.

pin (pin), *v.t.* to fasten together with any kind of a pin.

pinafore (pin′ *a* fōr), *n.* a loose apron.

***pincers** (pin′ sẽrz), *n. pl.* an instrument with which to grip and hold, having two handles and two grips working on a hinged fulcrum.

pinch (pinch), *n.* a squeeze or nip, as he gave me a *pinch,* a *pinch* of salt; an emergency, as in a *pinch.*

pinch (pinch), *v.t.* to squeeze or nip; to economize.

pine (pīn), *n.* a cone-bearing evergreen tree with needlelike leaves; the wood of this tree.

pine (pīn), *v.i.* to waste away, as from grief or anxiety.

pineapple (pīn′ apl), *n.* a tropical plant; its cone-shaped, edible fruit.

pine needle (pīn nē′ dl), the leaf of the pine.

pinion (pin′ yun), *n.* the last joint of a bird's wing; a wing; a feather.

pinion (pin′ yun), *n.* the smaller of two geared wheels.

pinion (pin′ yun), *v.t.* to bind or secure, as by binding the wings or arms; to confine.

pink (pingk), *n.* a color made by mixing red and white; a pale red.

pink (pingk), *n.* a garden flower with spicy fragrance.

pink (pingk), *v.t.* to punch small round holes into; to scallop the edge of, as cloth, in dressmaking.

pinnacle (pin′ *a* kl), *n.* a small turret on the top of a building, generally with a spire; the peak or summit of anything, as the *pinnacle* of fame.

pint (pīnt), *n.* one-eighth of a gallon, liquid measure.

pioneer (pī ō nēr′), *n.* an early settler in a frontier land; one who builds roads in advance of an army on the march; one who is first in experiments or exploration, as Marconi was the *pioneer* of radio broadcasting.

pioneer (pī ō nēr′), *v.i. and v.t.* to settle early in a frontier region; to lead the way in any advance or development; to open up, as new unbroken country.

***pious** (pī′ us), *adj.* dutiful to God, reverent, religious.

pip (pip), *n.* a small seed, as of an apple; a disease of poultry; a spot on a playing card or a domino.

pipe (pīp), *n.* a long hollow tube; a tube with a bowl at one end for smoking tobacco, opium or the like; a musical instrument having a tube or tubes of wood, reed or metal.

pipe (pīp), *v.i. and v.t.* to make a shrill sound; to whistle a tune; to equip with pipes, as to *pipe* a house; to carry through tubes, as to *pipe* gas into a city; to call with a pipe, as to pipe all hands on deck.

pippin (pip′ in), *n.* a variety of apple.

***piquancy** (pē′ kan si), *n.* [*pl.* piquancies] the quality of being agreeably stimulating to the palate or provoking to the mind.

***piquant** (pē′ kant), *adj.* pleasantly sharp to the taste; stimulating or provocative, as *piquant* comment; keen and clever, as *piquant* wit.

***pique** (pēk), *n.* resentment, offense, wounded pride.

pique (pēk), *v.t.* to wound the pride of, sting the feelings of.

piracy (pī′ r*a* si), *n.* [*pl.* piracies] robbery of vessels on the high seas; infringement of a copyright on a literary work or of a patent.

pirate (pī′ rit), *n.* one who plunders ships on the high seas; one who infringes a copyright or a patent.

pirate (pī′ rit), *v.i. and v.t.* to practice robbery; to publish a literary work in infringement of a copyright; to take without permission or compensation.

***pirouette** (pir oo et′), *n.* a dancer's whirl on the toes; a comparable whirl by a horse.

pirouette (pir oo et′), *v.i.* to whirl on the toes.

***piscatorial** (pis k*a* tō′ ri al), *adj.* relating to fish or to fishing.

***pismire** (pis′ mīr), *n.* an ant.

***pistachio** (pis tä′ shi ō), *n.* an old-world tree bearing a large fruit; the seed or stone of its fruit, called a nut and used in flavoring; a green color like that produced by the pistachio nut in cookery or confectionery.

pistil (pis′ til), *n.* the seed-bearing organ in the center of a flower.

pistillate (pis′ ti lāt), *adj.* having pistils.

pistol (pis′ tl), *n.* a small short-barreled hand gun.

piston (pis′ tun), *n.* a small disk or cylinder fitting exactly and moving up and down in the barrel of a pump or the cylinder of an engine; a sliding valve in a musical wind instrument.

piston rod (pis′ tun rod), the rod which connects a piston with the wheels, as of a locomotive, or pushes the piston back and forth in the cylinder.

pit (pit), *n.* a deep hole in the earth; a hollowed part of the body, as the arm*pit;* a depression in the skin, like the *pits* left by smallpox; a depressed space in which a contest of animals is held, as a cock*pit;* the shaft of a mine; the lowest part of a theater; part of a commodity exchange for special trading, as the grain *pit.*

pit (pit), *v.t.* to mark with hollows or holes; to match in a contest, as to *pit* my wits against yours; to place in a pit; to remove the pits of fruit.

pitch (pich), *n.* the solid black resinous stuff that remains after coal tar is distilled; a slope or plunge forward or down, as the *pitch* of a roof; a degree, as a high *pitch* of feeling; the height or depth of a tone, determined by the speed of vibration.

pitch (pich), *v.i. and v.t.* to slope; to plunge; to hurl or throw; to set up, as to *pitch* a tent; to set the key for, as to *pitch* the voice high or low.

pitchblende (pich′ blend), *n.* a black lustrous mineral used in coloring glass a pale sea-green, and valuable as a source of radium and uranium.

pitcher (pich′ ẽr), *n.* an earthen or metal vessel having a handle and a spout, used to pour liquids.

pitchfork (pich′ fôrk), *n.* a tined fork with a long handle for tossing hay or straw.

pitchfork (pich′ fôrk), *v.t.* to move or toss with a pitchfork.

pitchy (pich′ i), *adj.* [*comp.* pitchier, *superl.* pitchiest] full of pitch, like pitch or smeared with pitch.

piteous (pit′ ē us), *adj.* exciting pity; showing pity.

Syn. Doleful, woeful, rueful. *Piteous* is applicable to one's external expression of body or to one's state of mental pain. A child makes *piteous* lamentations when it suffers from hunger or has lost its way. *Doleful* applies to those sounds which convey the idea of pain; there is something *doleful* in the tolling of a funeral bell or in the sound of a muffled drum. *Woeful* applies to the circumstances and situations of men; a scene is *woeful* in which we witness a family of young children suffering from sickness and want. *Rueful* applies to the outward manifestations of inward sorrow depicted in the looks or countenance.

Ant. Happy, cheerful, joyous.

pitfall (pit′ fôl), *n.* a pit lightly covered over so that wild beasts may fall into it; any unrecognized source of danger, as the pitfalls of life in a great city.

pith (pith), *n.* the soft spongy substance inside a plant stem; marrow; quintessence, substance, force.

pithy (pith′ i), *adj.* [*comp.* pithier, *superl.* pithiest] having the nature of, or being filled with, pith; forcible, terse and pointed, as a *pithy* remark.

pitiable (pit′ i *a* bl), *adj.* commanding or worthy of pity; insignificant.

pitiful (pit′ i fool), *adj.* moving to compassion; full of pity; worthy of contempt, pitiable.

pitiless (pit′ i les), *adj.* without pity or compassion, merciless.

pittance (pit′ ans), *n.* a small allowance, portion or wage.

pity (pit′ i), *n.* [*pl.* pities] sympathy for those in distress; compassion; a cause for distress, something to be regretted, as it's a *pity.*

Syn. Compassion, sympathy. *Pity* is excited principally by the distress, weakness or degraded condition of another; *compassion* is deep sympathy for the sufferings of another; *sympathy* is the fellow feeling for the pain or distress of another.

pivot (piv′ ut), *n.* a point on which something turns or revolves.

pivot (piv′ ut), *v.i. and v.t.* to turn on a pivot; to supply with a pivot.

***placability** (plā k*a* bil′ i ti), *n.* the quality of being easily pacified or appeased.

***placable** (plā′ k*a* bl), *adj.* easy to appease or satisfy.

***placard** (plak′ ärd), *n.* a card shown in public, giving notice of some forthcoming event or advertising something.

***placard** (pl*a* kärd′), *v.t.* to announce or advertise with placards.

***placate** (plā′ kāt), *v.t.* to appease or pacify.

place (plās), *n.* a special spot, location or locality; a city square; situation; site; station in life, as he knows his *place.*

place (plās), *v.t.* to put in any situation; to recognize, as I don't *place* you; to arrange, as to *place* a loan; to repose, as to *place* faith or trust.

***placer** (plas′ ẽr), *n.* a surface mineral deposit, distinguished from a vein of ore.

placer mining (plas′ ẽr mīn′ ing), mining by washing loose surface soil instead of digging into the ground.

placid (plas′ id), *adj.* calm, peaceful.

***plagiarism** (plā′ ji *a* rizm), *n.* literary theft, passing off as one's own the words or ideas of another.

plagiarist (plā′ ji *a* rist), *n.* one who steals the ideas, words or phrases of another and passes them off as his own.

plagiarize (plā′ ji *a* rīz), *v.i. and v.t.* to use without giving credit, as ideas, themes, words or music.

***plague** (plāg), *n.* a malignant epidemic; anything exceedingly troublesome or annoying.

plaguy (plā′ gi), *adj.* [*comp.* plaguier, *superl.* plaguiest] vexatious.

***plaid** (plad), *n.* a checkered woolen cloth; the distinctive checkered pattern of Scottish tartans.

plain (plān), *n.* a stretch of level ground.

***plain** (plān), *adj.* level, flat; smooth; simple; clear, evident.

plain-clothes man (plān clōz man), [*pl.* plain-clothes men] a detective or policeman who does not wear a uniform while he is on duty.

plaint (plānt), *n.* lamentation; complaint.

plaintiff (plān′ tif), *n.* the complainant in a suit at law.

plaintive (plān′ tiv), *adj.* mournful; expressing grief or sorrow.

***plait** (plēt), *n.* a flat fold of cloth doubled over upon itself; a pleat.

plait (plat), *n.* a braid of hair.

plait (plēt), *v.t.* to double over in folds, as cloth.

plait (plat), *v.t.* to braid, as hair.

plan (plan), *n.* a drawing on paper showing the outline and construction of anything, as a house; a scheme or project.

plan (plan), *v.t.* to design; to form a plan for.

plane (plān), *n.* a flat surface; a flat supporting surface of an airplane.

plane (plān), *n.* a broad-leaved tree, one variety of which is the sycamore.

plane (plān), *n.* a carpenter's tool for smoothing a wooden surface, making it flat and even.

plane (plān), *v.t.* to smooth with a plane.

***planet** (plan′ et), *n.* a heavenly body revolving around the sun.

planetary (plan′ e ter i), *adj.* having to do in any way with the being or nature of a planet.

plank (plangk), *n.* a long, heavy board; an item in a political party platform.

plant (plȧnt), *n.* any vegetable organism; the machinery or fixtures, with buildings, of a business, enterprise or institution.

plant (plȧnt), *v.t.* to place in the ground to grow; to establish, as an idea or an institution; to stock, as to *plant* a river with trout.

***plantain** (plan′ tin), *n.* a tropical tree yielding an edible fruit similar to the banana; a common weed that grows almost everywhere.

plantation (plan tā′ shun), *n.* a large estate where cotton, sugar, tobacco or rubber is grown on a large scale; any planted place; a new settlement or colony.

planter (plȧn′ tēr), *n.* one who plants; the owner of a plantation.

***plaque** (plak), *n.* a thin, flat plate of metal or other substance, carved or ornamented.

plash (plash), *n.* a small pool of water; the sound of water splashing.

plash (plash), *v.i. and v.t.* to splash; to dash with water; to interweave the twigs of, as to *plash* a hedge.

***plasma** (plaz′ m*a*), *n.* the colorless fluid of the blood in which the red corpuscles float; the fluid in muscle; protoplasm.

plaster (plȧs′ tēr), *n.* a composition of lime, sand and water to coat a wall: a substance with healing qualities spread on cloth and applied to an affected part of the body to ease the pain and cure the disease.

plaster (plȧs′ tēr), *v.i. and v.t.* to spread plaster; to spread like a plaster; to spread with a plaster.

plastic (plas′ tik), *adj.* capable of being formed or molded in desired shapes, as wax is *plastic;* easily impressed, as a *plastic* nature: formative, creative.

plastic (plas′ tik), *n.* sculpture, the art of modeling; a product of synthetic chemistry, like celluloid or bakelite, that can be molded or pressed.

plat (plat), *n.* a braid; a plot of ground.

plate (plāt), *n.* a thin flat piece of hard substance, as metal, porcelain, wood or glass; a shallow round dish from which to eat; a plateful, as a *plate* of food; dishes and utensils, especially those made of precious metals; a metal surface engraved for reproduction.

plate (plāt), *v.t.* to coat, as a metal, with another metal, especially by electrolysis; to make a duplicate printing plate from an original.

***plateau** (pl*a* tō′), *n.* [*pl.* plateaux] a tableland; a stretch of high, flat land.

plate circuit (plāt sûr′ kit), the electric circuit in radio that includes both plate and filament of an electron tube.

plate current (plāt kûr′ ent), the current that flows between the plate and filament of an electron tube.

plate glass (plāt glȧs), a fine kind of glass cast in thick plates, used for mirrors and large windows.

platen (plat′ n), *n.* the flat part or bed of a printing press where the paper is pressed down on the type; the roller around which the paper passes in a typewriter.

plate voltage (plāt vōl′ tij), the voltage of a radio B-battery.

platform (plat′ fôrm), *n.* a flat floor of wood or stone raised above the ground; a political party's declaration of policy.

platinum (plat′ i num), *n.* a grayish-white metal, very hard and ductile, resisting rust, hard to melt and highly valued in the making of chemical utensils and settings for jewelry.

platitude (plat′ i tūd), *n.* insipidity; dullness; a stale, trite remark.

platitudinous (plat i tū′ di nus), *adj.* commonplace, trite.

platoon (pl*a* to͞on′), *n.* a body of soldiers, consisting of four squads of 8 men each; a similar squad in the organization of a police system.

platoon school (pl*a* to͞on′ sko͞ol), a school organized in two general divisions, so that one half may use rooms for study and ordinary classwork while the other half is engaged in vocational, laboratory, or gymnasium work. The two divisions then reverse the arrangement, thus using the equipment fully.

platter (plat′ ēr), *n.* a large flat dish from which food is served.

plaudit (plô′ dit), *n.* applause, clapping, approval.

***plausible** (plô′ zi bl), *adj.* specious; seeming true, but not proved true; easily believed but possibly not meriting belief.

play (plā), *n.* sport; light, quick, irregular motion, as the *play* of light over a surface; freedom for action, as the *play* of a steering wheel; action or use, as to bring all one's powers into *play.*

play (plā), *v.i. and v.t.* to have fun, as in a game; to run and frolic, as the children are *playing;* to move lightly, flicker, as light *plays* over a surface; to imitate for fun, as to *play* soldiers; to act the character of, as to *play* Macbeth; to take part in, as a game, as to *play* ball; to make music on, as to *play* the piano.

player piano (plā′ ēr pi an′ ō), an automatic piano containing a mechanism that plays the instrument without pressing the keys.

playful (plā′ fool), *adj.* sportive; gay and lively, full of fun.

***plaza** (plä′ z*a*), *n.* an open square or marketplace.

plea (plē), *n.* [*pl.* pleas] an excuse or apology; urgent entreaty; legal pleading, as court of common *pleas.*

plead (plēd), *v.i. and v.t.* to argue before a court of law; to supplicate; to discuss or defend by arguments; to offer as an excuse, as I can only *plead* illness.

pleasant (plez′ ant), *adj.* grateful to the senses or the mind; delightful; cheerful.

Syn. Agreeable, pleasing. *Pleasant* are those qualities in a person or thing that gives pleasure; *pleasing* describes the effect the pleasant person or thing has upon us; *agreeable* means harmonious to the taste or wish.

Ant. Disagreeable, unpleasant.

pleasantry (plez′ ant ri), *n.* [*pl.* pleasantries] a merry trick or joke; a good-natured quip.

please (plēz), *v.i. and v.t.* to have the wish, as if you *please;* to give pleasure to; to gratify.

pleasure (plezh′ ēr), *n.* gratification; agreeable emotions or sensations; delight; enjoyment; diversion, recreation.

***plebeian** (plē bē′ yan), *adj.* pertaining to the common people.

***plebiscite** (pleb′ i sīt), *n.* the vote of the common people, especially the direct vote of all the people of a region on a question of public policy.

pledge (plej), *n.* a promise; anything placed as security.

pledge (plej), *v.i. and v.t.* to make a promise or pledge; to place as security.

***plenary** (plē′ n*a* ri), *adj.* full; complete; absolute, as *plenary* powers.

***plenipotentiary** (plen i pō ten′ shi er i), *n.* [*pl.* plenipotentiaries] an agent sent abroad with full power to represent his government.

plenipotentiary (plen i pō ten′ shi er i), *adj.* having full power.

***plenitude** (plen′ i tūd), *n.* fulness, abundance.

***plenteous** (plen′ tē us), *adj.* abundant; amply sufficient.

plentiful (plen′ ti fool), *adj.* existing in great quantity; yielding abundantly.

plenty (plen′ ti), *n.* [*pl.* plenties] abundance; a sufficiency, as that is *plenty.*

pleonasm (plē′ ō nazm), *n.* use of extra, unnecessary words in speaking or writing.

***plethora** (pleth′ ō r*a*), *n.* overabundance, as a *plethora* of blood.

pleura (ploor′ *a*), *n.* [*pl.* pleurae] a delicate serous membrane covering the interior of the thorax and the surface of each lung.

***pleurisy** (ploor′ i si), *n.* inflammation of the pleura.

pleuropneumonia (ploor ō nū mō′ ni *a*), *n.* inflammation of the pleura and the lungs; pleurisy and pneumonia together.

plexus (plek′ sus), *n.* [*pl.* plexus or plexuses] a network, as of blood vessels or nerves.

pliability (plī *a* bil′ i ti), *n.* the quality of being pliable or bending easily, flexibility.

pliable (plī′ *a* bl), *adj.* easily bent; easily influenced.

pliant (plī′ ant), *adj.* easily bent or bending, flexible; yielding readily to moral suasion.

pliers (plī′ ērz), *n. pl.* small pincers used for seizing and bending wires and like articles.

***plight** (plīt), *n.* an unfavorable situation or distressed condition, as a sorry *plight.*

plight (plīt), *v.t.* to pledge, as to plight troth, one's hand, one's honor.

plinth (plinth), *n.* the lowest square part of the base of a column or pedestal.

plod (plod), *v.i.* to travel laboriously; to drudge, toil slowly and patiently, as he *plods* through his lessons.

plot (plot), *n.* a small, marked off piece of ground; a scheme or secret plan; the plan of a story or play, with complications to be worked out at the end.

plot (plot), *v.i. and v.t.* to scheme or plan; to conspire; to make a plan or map of; to contrive complications for a story or play.

***plover** (pluv′ ēr), *n.* a shore bird resembling the sandpiper but having a shorter bill and plumper, more compact body.

***plow, plough** (plou), *n.* a farm implement for turning the soil over before planting; a similar implement for turning packed substances aside, as a snow*plow.*

plow (plou), *v.t.* to turn or move with a plow, as to *plow* a field, *plow* a path through the snow.

plowshare (plou′ shâr), *n.* the blade of a plow, the part that cuts the soil.

pluck (pluk), *n.* courage; the heart, liver and lungs of an animal or fowl.

pluck (pluk), *v.t.* to pick or gather, as fruit or flowers; to twitch, twang, as the strings of an instrument, as to *pluck* a guitar; to take the feathers from, as *pluck* this chicken.

plucky (pluk′ i), *adj.* [*comp.* pluckier, *superl.* pluckiest] having plenty of courage.

plug (plug), *n.* a piece of wood or other substance to stop a hole.

plug (plug), *v.t.* to stop, as a hole, with a plug.

plum (plum), *n.* a fruit tree; its fruit, smooth-skinned, juicy, and having a stone or pit; a prize; something worth struggling for.

plumage (plo͞om′ ij), *n.* the feathering of a bird.

***plumb** (plum), *n.* a heavy body, usually a lump of lead, suspended at the extremity of a line to test the perpendicularity of something, as a post or wall; a similar weight on a line to measure the depth of water; perpendicular position, as out of *plumb.*

plumb (plum), *v.t.* to test with a plumb line; to measure the depth of with a plumb line; to penetrate, as depths; to solve, as a mystery.

plumb (plum), *adv.* vertically, perpendicularly, exactly.

plumber (plum′ ẽr), *n.* one who engages in the business of installing or repairing water and gas pipes, cisterns and other fixtures.

plumbing (plum′ ing), *n.* the occupation of putting gas pipes, water pipes and sanitary fittings into a building and of repairing such fittings; the equipment of pipes and fittings in a building.

plumcot (plum′ kot), *n.* a fruit resulting from crossing the plum and the apricot.

plumb line (plum līn), a line with a weight at one end used to test for perpendicularity.

plume (plūm), *n.* a feather; crest.

plume (plūm), *v.t.* to adjust the feathers of, as a bird *plumes* itself; to preen; to take pride in, as he *plumes* himself on his ability to write verse.

plummet (plum′ et), *n.* a lead weight attached to a line and used for sounding water depths or determining a true vertical.

plump (plump), *adj.* round and sleek.

plump (plump), *adv.* suddenly, heavily, directly, as he fell *plump* into the lake.

plump (plump), *v.i. and v.t.* to drop or fall heavily; to drop, cast or plunge all at once or suddenly and heavily, as to *plump* oneself or another down.

plumy (plo͞om′ i), *adj.* [*comp.* plumier, *superl.* plumiest] feathered; adorned with feathers.

plunder (plun′ dẽr), *n.* pillage, loot.

plunder (plun′ dẽr), *v.t.* to loot, take by force, as in war.

plunge (plunj), *n.* a sudden dive; a headlong fall; a forward rush.

plunge (plunj), *v.i. and v.t.* to dive or leap forward; to throw or push into a liquid.

pluperfect (plo͞o′ pûr fekt), *adj.* denoting an action completed prior to some other past action, as I was there early, but the car *had gone:* also called *past perfect.*

***plural** (ploor′ al), *n.* the form of a word denoting more than one, as men is the *plural* of man.

plural (ploor′ al), *adj.* consisting of more than one, as *plural* marriage.

plurality (ploo ral′ i ti), *n.* [*pl.* pluralities] the state of consisting of more than one; in a two-party contest, the majority; in a three-party election, the greatest number of votes for one ticket; the margin of one vote over another, as A had a *plurality* of 937 over B.

***plus** (plus), *n.* the sign (+) indicating that addition is to be performed: opposite of *minus.*

plus (plus), *adj.* indicating addition, as the *plus* sign; positive, not negative.

***plush** (plush), *n.* a heavy cloth with a pile longer and softer than velvet.

***plutocracy** (plo͞o tok′ r*a* si), *n.* [*pl.* plutocracies] rule by the rich.

plutocrat (plo͞o′ tō krat), *n.* one who has influence or power through his great wealth.

ply (plī), *n.* [*pl.* plies] a fold or twist, as in fabrics: frequently used in combination to show the number of folds, as three-*ply.*

ply (plī), *v.i.* [*p.t.* and *p.p.* plied, *pr.p.* plying] to run on schedule between two ports.

ply (plī), *v.t.* [*p.t.* and *p.p.* plied, *pr.p.* plying] to work at, as to *ply* a trade; to wield, as to *ply* an ax.

plywood (plī′ wood), *n.* two or more layers of wood glued together, usually with the grain of one layer at right angle to the other to strengthen the wood and prevent warping.

***pneumatic** (nū mat′ ik), *adj.* pertaining to air; inflated with air, as a rubber tire; operated by air pressure, as a machine.

pneumatics (nū mat′ iks), *n.* the science that treats of the physical properties and phenomena of air.

***pneumonia** (nū mō′ ni *a*), *n.* acute inflammation of the lungs.

***poach** (pōch), *v.i.* to trespass; to hunt on another's posted property.

poach (pōch), *v.t.* to cook in boiling water or other liquid, especially a dropped egg.

pock (pok), *n.* a pustule on the skin containing eruptive matter.

pocket (pok′ et), *n.* a bag worked permanently into an article of clothing, as coat, trousers or skirt, to hold small articles; any cavity to hold things; a deposit of ore apart from the main vein; a space where the density of the air differs from that in the surrounding region.

pocket (pok′ et), *v.t.* to put into a pocket; to conceal, suppress, as to pocket one's pride.

pocketbook (pok′ et book), *n.* a small case for money, papers and other valuables; a purse.

pod (pod), *n.* the covering of certain seeds, as of the pea and bean, holding the seeds in a row.

pod (pod), *v.i. and v.t.* to form into pods; to remove from the pod.

podiatry (pō dī′ *a* tri), *n.* the science and care of diseases of the feet.

***poem** (pō′ em), *n.* a verse composition, with meter and with or without rhyme, expressing fine thoughts in a beautiful manner.

poet (pō′ et), *n.* one who writes verse.

poetic (pō et′ ik), *adj.* having the form or spirit of poetry; suitable for expression in a poem.

poetry (pō′ et ri), *n.* the art of writing poems; expression of fine thought in metrical forms.

***poignancy** (poin′ yan si), *n.* the quality of being keen, piercing.

***poignant** (poin′ yant), *adj.* keen, stinging, as *poignant* wit; painfully affecting, as *poignant* grief.

***poinsettia** (poin set′ i *a*), *n.* a Central American plant with showy flowers.

point (point), *n.* a sharp end, as the *point* of a needle; a projection of land into water; an outstanding feature, as he has good *points;* a special application, as the *point* of a story; a mark of punctuation; an exact spot, as the *point* where roads meet; an exact condition, as indicated by a degree on a scale, as the freezing-*point;* the position of a dog when marking down game, as the dog came to a *point;* a unit in scoring in certain games.

point (point), *v.i. and v.t.* to indicate by directing a finger toward; to indicate in words, as to *point* out a fact; to aim, as to *point* a gun; to sharpen, as to *point* a pencil; to indicate the presence of game, as a dog does by assuming a certain pose.

point-blank (point blangk), *adj.* going straight to the mark, as a shot; direct, unqualified, as a *point-blank* refusal.

point-blank (point blangk), *adv.* directly; without mincing words, as he asked the question *point-blank,* the gun was fired *point-blank.*

pointed fox (poin′ ted foks), the common fox pelt, interspersed with white hairs in imitation of silver fox.

pointer (poin′ tẽr), *n.* something that indicates position; a large hunting dog trained to stop and show the place where game is hidden.

pointing (point′ ing), *n.* punctuation; the filling in of crevices in masonry with mortar.

***poise** (poiz), *n.* equilibrium, balance, as mental *poise.*

poise (poiz), *v.i. and v.t.* to be in a state of equilibrium; to balance.

Syn. Balance. To *poise* is properly to keep the weight from pressing on either side; to *balance* is to keep the balance even. The idea of bringing to an equilibrium is common to both these terms, but a thing is *poised* as respects itself, *balanced* as respects other things.

poison (poi′ zn), *n.* anything noxious or destructive by chemical action to the life or health of a living body into which it is introduced.

Syn. Venom. *Poison* usually connotes something taken or administered in food or drink; *venom* is the *poison* secreted by certain serpents, spiders and scorpions that makes their bite injurious and sometimes fatal.

poison (poi′ zn), *v.t.* to administer an injurious or deadly substance to, as to *poison* a dog; to infuse with poison, as to *poison* food; to corrupt, as to *poison* one's morals.

poisonous (poi′ zn us), *adj.* having the qualities of poison, deadly, injurious to health.

poke (pōk), *n.* a thrusting or pushing motion, as he gave me a *poke* with his cane; a projecting rim on the front of a woman's bonnet; a wooden collar with a stick hanging down from it, to prevent cattle from leaping fences.

poke (pōk), *v.i. and v.t.* to dawdle along; to prod, as with a stick; to thrust or push.

poker (pōk′ ẽr), *n.* a metal bar for stirring up a fire.

poker (pōk′ ẽr), *n.* a card game with a pool of bets on their cards made by the players.

poky (pōk′ i), *adj.* [*comp.* pokier, *superl.* pokiest] cramped, shabby; dull, slow.

polar (pō′ lẽr), *adj.* pertaining in any way to either pole of the earth.

polar front (pō′ lẽr frunt), the boundary between the cold air of polar regions and the warmer air of more temperate latitudes.

polarity (pō lar′ i ti), *n.* the property possessed by certain bodies, by which they exert forces in opposite directions, with a positive pole having power to attract and a negative pole having power to repel.

pole (pōl), *n.* a long staff or rod, as a bean *pole;* a unit in land measure.

pole (pōl), *n.* either extremity of the axis of the earth; the region in a magnetized body where the greatest force of attraction or repulsion is exerted.

polecat (pōl′ kat), *n.* a skunk, a ferret.

polemic, polemical (pō lem′ ik, -i cal), *adj.* controversial.

polemics (pō lem′ iks), *n.* the art of disputation, especially in matters of theology.

polestar (pōl′ stär), *n.* the North Star; a directing principle.

***police** (pō lēs′), *n.* an organized force of civil officers to preserve order in a municipality.

police dog (pō lēs′ dog), a dog trained to help the police, usually a German shepherd dog.

policy (pol′ i si), *n.* [*pl.* policies] management of affairs in the interest of the civic body; a particular course of action planned by a governing body in public relations or administration of government; course of conduct, as it is good *policy* to keep one's own counsel.

policy (pol′ i si), *n.* [*pl.* policies] a contract of insurance.

polish (pol′ ish), *n.* the act of making smooth or glossy by rubbing; the fine finish obtained by rubbing; a substance used in polishing; fine manners.

polish (pol′ ish), *v.t.* to make smooth or glossy by friction.

polite (pō līt′), *adj.* well-bred, refined, courteous.

Syn. Gentle, genteel. *Polite* implies culture and refinement; *gentle* denotes good or aristocratic birth; *genteel* has come to mean vulgar affectation of the qualities associated with good breeding.

Ant. Crude, coarse, boorish.

***politic** (pol′ i tik), *adj.* shrewd, expedient, wise in policy.

political (pō lit′ i kal), *adj.* pertaining to government.

political economy (pō lit′ i kal ē kon′ ō mi), the science that treats of wealth, its nature, production and distribution: now commonly called economics.

politician (pol i tish′ an), *n.* one skilled in government or actively engaged in some branch of it; a person closely affiliated with a political party.

politics (pol′ i tiks), *n.* the art or science of government; matters connected with the selection of officers of government and their administration of office after being elected.

polity (pol′ i ti), *n.* [*pl.* polities] the form or constitution of the civil government of a state; constitution of any organization similarly administered; political constitution.

polka (pōl′ ka), *n.* a gay round dance Bohemian in origin.

***poll** (pōl), *n.* the head, especially the top and back parts, covered by hair; a register of qualified voters; a voting place; an election.

***poll** (pōl), *v.t.* to lop, clip or shear; to cast, as a ballot; to count the individual votes of, as to *poll* a jury; to receive votes, as he *polled* a large majority.

pollard (pol′ ẽrd), *n.* a tree lopped back to the trunk to stimulate growth of foliage; a stag or ox without horns.

pollen (pol′ en), *n.* the fertilizing powder in the cell of a flower anther.

polliwog (pol′ i wog), *n.* a tadpole.

poll tax (pōl taks), a tax on each person, as if on each head.

pollute (po lūt′), *v.t.* to defile, render unclean, taint, corrupt.

pollution (po lū′ shun), *n.* the act of defiling or state of being defiled; that which taints or causes impurity.

polo (pō′ lō), *n.* a game resembling hockey but played on horseback, with long-handled mallets.

poltroon (pol trōōn′), *n.* a skulking coward.

polyandry (pol′ i an dri), *n.* the practice of having more than one husband at the same time.

polychrome (pol′ i krōm), *adj.* in many colors, as polychrome statues.

***polygamy** (pō lig′ *a* mi), *n.* the practice of having more than one wife at the same time.

polyglot (pol′ i glot), *adj.* written in several languages; knowing many languages.

polygon (pol′ i gon), *n.* a plane closed figure having many angles.

***polysyllabic** (pol i si lab′ ik), *adj.* having more than two syllables.

polytechnic (pol i tek′ nik), *adj.* giving instruction in a number of arts and sciences with special regard for their use in making a living, as a *polytechnic* school or institute.

polytheism (pol′ i thē izm), *n.* the belief that there are many gods.

***pomade** (pō mād′), *n.* a perfumed ointment to dress the hair.

***pomato** (pō mā′ tō), *n.* a plant produced by grafting tomato buds or shoots on potato plants. The fruit is tomatolike, and is usually eaten raw in salads.

***pomegranate** (pom′ gran it), *n.* a tree yielding a reddish berry about the size of an orange, with many seeds in a crimson pulp, and a pleasant, acid flavor.

pomelo (pom′ e lō), *n.* the grapefruit or shaddock.

***pommel** (pum′ el), *n.* the knob on a sword hilt; the high part of a saddle-bow.

pommel (pum′ el), *v.t.* to beat and bruise.

pomology (pō mol′ ō ji), *n.* the science of cultivating fruit trees.

pomp (pomp), *n.* ceremonious display, magnificence.

pompadour (pom′ pa dōr), *n.* a manner of dressing the hair by brushing it straight back from the forehead without a part.

pompon (pom′ pon), *n.* an ornamental ball of silk or feathers worn on a woman's costume or a soldier's uniform; a small buttonlike chrysanthemum.

pompous (pomp′ us), *adj.* self-important, ostentatious.

poncho (pon′ chō), *n.* a loose, Spanish-American cloak consisting of a blanket with a hole in the middle for the head; a similar cloak of rubber or other waterproof material.

pond (pond), *n.* a small lake.

ponder (pon′ dẽr), *v.t.* to deliberate; to weigh mentally, as to *ponder* a question.

ponderable (pon′ dẽr *a* bl), *adj.* capable of being weighed.

ponderous (pon′ dẽr us), *adj.* very heavy, dull.

pone (pōn), *n.* bread made of corn meal: also called corn *pone*.

pongee (pon jē′), *n.* a soft, light silken fabric.

***poniard** (pon′ yẽrd), *n.* a small dagger.

pontiff (pon′ tif), *n.* a bishop; the Pope.

***pontifical** (pon tif′ i kal), *adj.* pertaining to a bishop, especially the Pope.

***pontoon** (pon tōōn′), *n.* a small, flat-bottomed boat; a buoyant, flat-bottomed structure supporting a floating military bridge; a buoyant structure on a hydroplane, used in coming down on water.

pony (pō′ ni), *n.* [*pl.* ponies] a small horse.

***pool** (pōōl), *n.* a small body of still water, a pond.

pool (pōōl), *n.* a game resembling billiards.

pool (pōōl), *n.* a sum of money consisting of stakes put up by a number of persons betting together; a combination of natural competitors to control a market.

pool (pōōl), *v.t.* to form a common fund; to put into a common fund, as to *pool* resources.

poop (pōōp), *n.* the raised deck in the stern of a ship.

***poor** (poor), *adj.* needy, having small means; deficient in quality, unsatisfactory, as a *poor* substitute; scanty, inadequate, as a *poor* harvest.

pop (pop), *n.* a short, snapping sound, as the *pop* of a firecracker; a soft drink.

pop (pop), *v.i.* to make a snapping sound; to burst open, like popcorn; to burst into sight, as he *popped* in on us.

popcorn (pop′ kôrn), *n.* a variety of Indian corn or maize with hard kernels that expand and pop when heated dry.

pope (pōp), *n.* a priest of the Greek church: *the Pope,* the head of the Roman Catholic Church.

popinjay (pop′ in jā), *n.* a fop, much given to parroty chatter.

poplar (pop′ lẽr), *n.* a fast-growing tree with light wood.

poplin (pop′ lin), *n.* a fabric of silk and worsted.

popover (pop′ ō vẽr), *n.* a hotbread made of batter, milk and eggs that becomes a hollow shell when baked.

poppy (pop′ i), *n.* a plant with showy flowers, one species of which yields opium.

populace (pop′ ū lis), *n.* the common people.

***popular** (pop′ ū lẽr), *adj.* pertaining to the common people; in general favor.

popularity (pop ū lar′ i ti), *n.* the state of being liked by many people.

popularize (pop′ ū lẽr īz), *v.t.* to render popular, establish in general favor.

populate (pop′ ū lāt), *v.t.* to furnish with inhabitants; to inhabit.

population (pop ū lā′ shun), *n.* total number of inhabitants; the inhabitants collectively.

***populous** (pop′ ū lus), *adj.* thickly peopled.

***porcelain** (pōr′ se lin), *n.* a fine, white glazed earthenware; articles made of it.

***porch** (pōrch), *n.* an open but roofed vestibule; a veranda.

porcupine (pôr′ kū pīn), *n.* a rodent having spines or quills in its hairy coat that it uses as weapons of defense in time of danger.

***pore** (pōr), *n.* a minute hole in the skin through which perspiration passes.

pore (pōr), *v.i.* to read studiously: used with *over*.

***pork** (pōrk), *n.* the flesh of swine used as meat.

porosity (pō ros′ i ti), *n.* the quality of having pores; the state of being permeable by liquids.

porous (pō′ rus), *adj.* having pores; permeable by liquids.

porphyry (pôr′ fi ri), *n.* [*pl.* porphyries] a hard fine-grained stone embedded with small crystal grains.

***porpoise** (pôr′ pus), *n.* the sea hog, an animal of the whale family from 5 to 8 feet long; the bottle-nosed dolphin.

porridge (por′ ij), *n.* oatmeal boiled slowly in water until it thickens.

porringer (por′ in jẽr), *n.* a small dish for porridge, broth or similar foods.

port (pōrt), *n.* a place where ships come in, unload, reload and depart; a harbor; a place of refuge, as any *port* in a storm.

port (pōrt), *n.* a round window in the side of a ship.

port (pōrt), *n.* the left side of a ship as one faces the bow.

port (pōrt), *n.* a wine originally made in Portugal; a wine resembling it.

port (pōrt), *v.t.* to place so that the upper end is to the left, as a rifle, as *port* arms; to turn to the left, as a ship, as *port* your helm.

portable (pōr′ t*a* bl), *adj.* able to be carried; easy to carry.

portage (pōr′ tij), *n.* the carrying of boats and supplies overland from one navigable body of water to another.

portal (pōr′ tal), *n.* a gate or entrance, especially an archway.

porte-cochere (pōrt kō shâr′), *n.* a large gateway allowing room for vehicles to drive into a courtyard.

***portent** (pōr′ tent), *n.* an omen, especially of impending evil.

portentous (pōr ten′ tus), *adj.* ominous, threatening.

porter (pōr′ tẽr), *n.* the keeper of a door or gate; one whose occupation is to carry baggage for passengers or do errands for pay, as for guests at a hotel; one who serves passengers on sleeping cars.

***portfolio** (pōrt fō′ li ō), *n.* [*pl.* portfolios] a portable case for loose papers; the office or duties of the head of a governmental department.

porthole (pōrt′ hōl), *n.* a round opening in the side of a ship, as for a window.

***portico** (pōr′ ti kō), *n.* [*pl.* porticos] a structure like a porch, with a roof supported by columns.

portiere (pōr tyâr′), *n.* a curtain or piece of drapery hung across a doorway.

***portion** (pōr′ shun), *n.* a piece or part, a share; a helping of food.

portly (pōrt′ li), *adj.* dignified in bearing; corpulent.

***portmanteau** (pōrt man′ tō), *n.* [*pl.* portmanteaus or portmanteaux] a bag or small trunk to carry clothes when traveling.

***portrait** (pōr′ trāt), *n.* a painting of a person; a fine photograph of a person's face or whole figure; a word picture of a person.

***portraiture** (pōr′ trāt tūr), *n.* the art of making portraits; the art of describing persons in words that produce clear pictures.

portray (pōr trā′), *v.t.* to paint or draw the likeness of, depict, delineate.

***pose** (pōz), *n.* attitude or position of the body; an assumed mental attitude, affectation, as his interest in the common people is only a *pose*.

pose (pōz), *v.i. and v.t.* to assume a particular attitude or position, as to *pose* for a photograph; to fix in place, as to *pose* a subject for a painting; to present as a proposition or puzzling question.

***poser** (pōz′ ẽr), *n.* one who or that which presents a puzzle, as your question is a *poser*.

***position** (pō zish′ un), *n.* the state of being set or placed; the place where a person or thing is set, in relation to others; an attitude of mind or body, as his *position* in the debate was untenable; employment; the placement of troops; the ground to be held against attack.

Syn. Posture, attitude, pose. The *position* is that in which a body is placed in respect to other bodies, as standing with one's back toward another is a *position*. A *posture* is that *position* which a body assumes with respect to itself, as a sitting or reclining *posture; attitude* is posture consciously or unconsciously expressive of a mood or feeling; *pose* is an attitude deliberately assumed.

positive (poz′ i tiv), *adj.* clearly expressed; strongly affirmative; having a clear, strong character of its own; not subject to change, as *positive* instructions; having as the elementary unit the proton, having on its surface more protons than electrons.

***positive** (poz′ i tiv), *n.* that which is affirmative, active, effective in any sense; a photographic plate, film or slide reproducing the light and shade of the original: more than zero, as a positive number; opposite of *negative*.

positivism (poz′ i tiv izm), *n.* the philosophy of Auguste Comte that excludes everything but the natural phenomena or properties of knowable things.

positron (poz′ i tron), *n.* a particle produced in the breaking up of atoms, like an electron with positive instead of negative charge.

***posse** (pos′ ē), *n.* a force of men brought together by a sheriff for special duty, as to hunt down a criminal.

***possess** (po zes′), *v.t.* to own, to have and keep; to enter into and control, as the passion for wealth *possessed* him.

possession (po zesh′ un), *n.* ownership; occupancy; anything possessed: frequently in the plural, as his *possessions* are great.

***possessive** (po zes′ iv), *adj.* denoting ownership or a desire to own, as a *possessive* nature or manner.

possessor (po zes′ ẽr), *n.* owner, one who possesses.

posset (pos′ et), *n.* a drink of hot milk curdled with wine or ale and spiced.

possibility (pos i bil′ i ti), *n.* [*pl.* possibilities] the state of being possible; something that is possible; potentiality, as the plan has great *possibilities*.

possible (pos′ i bl), *adj.* capable of happening or being done.

post (pōst), *n.* an upright piece, as of timber, supporting a structure.

post (pōst), *n.* the system of carrying mail.

post (pōst), *n.* a place where one is stationed in the line of duty; a place of trust; a military station.

post (pōst), *v.t.* to publish, as if by nailing a placard to a post; to place on a list; to mail; to transfer from journal to ledger, as an entry in bookkeeping; to station at a post of duty, as a soldier.

postage (pōs′ tij), *n.* the charge for carrying in the mail; the sum paid for such carriage.

postal (pōs′ tal), *adj.* of or pertaining to the post office or mail service, as *postal* rates.

post chaise (pōst shāz), a carriage having four wheels, a closed body and space for from two to four passengers, formerly used in transporting mail.

poster (pōs′ tẽr), *n.* a large advertising placard.

***posterior** (pōs tēr′ i ẽr), *adj.* subsequent in time or place; hinder.

posterity (pos ter′ i ti), *n.* [*pl.* posterities] succeeding generations; descendants.

postern (pōs′ tẽrn), *n.* a small gate, a private entrance.

postgraduate (pōst grad′ ū āt), *adj.* of or pertaining to studies pursued after graduation from a school or college.

postgraduate (pōst grad′ ū āt), *n.* one who is studying after receiving an academic degree.

posthaste (pōst hāst′), *adv.* with great speed.

***posthumous** (pōs′ tū mus), *adj.* born after the death of the father; published after the death of the author; occurring after one's death, as *posthumous* fame.

***postilion** (pōs til′ yun), *n.* the rider on the near-side leader of a four-horse team.

postmaster (pōst′ mȧs tẽr), *n.* the superintendent of a post office.

postmaster general (pōst′ mȧs tẽr jen′ ẽr al), the head of the whole system of mail carriage, a Cabinet officer in the U.S.

postmeridian (pōst mē rid′ i an), *adj.* after noon.

post-mortem (pōst môr tem), *adj.* occurring, made or done after death, as a *post-mortem* examination.

***postpone** (pōst pōn′), *v.t.* to put off, delay, defer.

postponement (pōst pōn′ ment), *n.* the act of deferring to a future time.

***postscript** (pōst′ skript), *n.* matter added to a letter or document after the writer has signed it.

postulate (pos′ tū lāt), *n.* a self-evident proposition, accepted without requirement of proof.

postulate (pos′ tū lāt), *v.t.* to assume without requirement of proof.

posture (pos′ tūr), *n.* attitude; the placing or position of parts of the body; physical carriage, bearing; a mental attitude.

postwar (pōst wôr′), *adj.* after the war, especially the World War.

posy (pō′ zi), *n.* [*pl.* posies] a flower or a bunch of flowers, bouquet.

pot (pot), *n.* a metal vessel for holding liquids or boiling them; an earthenware vessel, as a bean *pot*, tea*pot*, flower*pot*.

pot (pot), *v.t.* to put in a pot, as to *pot* a plant; to preserve in a pot, as to *pot* ham.

potash (pot′ ash), *n.* a powerful alkali obtained from wood ashes.

potassium (pō tas′ ium), *n.* a silvery-white metallic element found in soils and mineral deposits and in various compounds, and used in photography, electroplating and tanning.

potation (pō tā′ shun), *n.* a draft or drink; the act of drinking, especially liquor.

potato (pō tā′ tō), *n.* [*pl.* potatoes] the edible tuber of a widely cultivated plant, one of mankind's staple foods.

potent (pō′ tent), *adj.* powerful; having great authority.

potentate (pō′ ten tāt), *n.* one who possesses great power; a mighty ruler.

***potential** (pō ten′ shal), *adj.* possible; not actually existing, but imaginable or expectable; latent.

pothook (pot hook), *n.* an S-shaped hook for hanging pots and kettles over an open fire; an iron rod having a hook for lifting pots or lids; a written character resembling a pothook, as in shorthand.

***potion** (pō′ shun), *n.* a draft or drink.

potluck (pot luk), *n.* whatever may be provided for a meal; informal hospitality.

potpie (pot′ pī), *n.* a meat pie cooked in a pot, especially with dumplings.

***potpourri** (pō po͞o rē′), *n.* a dish composed of various kinds of meats and vegetables; a medley.

pot shot (pot shot), an unsportsmanlike shot to secure food.

pottage (pot′ ij), *n.* a stew or rich soup of meat and vegetables.

potter (pot′ ẽr), *n.* a maker of earthenware.

potter's field (pot′ ẽrz fēld), a burial ground for criminals, unidentified dead and paupers.

pottery (pot′ ẽr i), *n.* [*pl.* potteries] earthenware of all kinds; a place where it is made.

***pouch** (pouch), *n.* a small bag or pocket.

poultice (pōl′ tis), *n.* a soft mixture applied to a sore or inflamed part of the body.

***poultry** (pōl′ tri), *n.* domestic fowl.

pounce (pouns), *v.i.* to swoop upon and seize, as a cat *pounces* upon a mouse.

pound (pound), *n.* a measure of weight, 16 ounces avoirdupois, 12 ounces troy; a British unit of money, equal to 20 shillings; an inclosure to hold stray cattle or dogs.

pound (pound), *v.t. and v.i.* to beat, as with a hammer; to tamp, as earth; to move or come down heavily, as with the feet, as he *pounded* up the stairs; to beat heavily, as the waves *pounded* against the rocks.

***pour** (pōr), *v.i. and v.t.* to rush out, as water from a broken tank; to cause to flow from, as to *pour* water from a pitcher; to discharge in a continuous stream.

pout (pout), *n.* any of several fresh-water catfish; an eel*pout*.

pout (pout), *n.* a pushing out of the lips, as when sulky.

pout (pout), *v.i.* to push the lips out, as in a sulky fit.

pouter pigeon (pout′ ẽr pij′ un), a pigeon that puffs out its crop.

poverty (pov′ ẽr ti), *n.* the state of being poor, indigence, great need; lack, as a *poverty* of ideas.

powder (pou′ dẽr), *n.* a dry substance reduced to fine particles.

powder (pou′ dẽr), *v.i. and v.t.* to use powder, as for cosmetic purposes, as she *powders* too much; to reduce to powder, as by pounding; to dust with powder, as she *powders* her face.

powder horn (pou′ dẽr hôrn), an antique container for gun powder.

power (pou′ ẽr), *n.* the faculty of doing or performing; energy, force, strength; authority; one who possesses power, as he is a *power* in the community; with capital initial letter, a great nation, as the U.S. is a world *Power*.

power amplifier (pou′ ẽr am′ pli fī ẽr), a radio amplifier that increases power.

powerboat (pou′ ẽr bōt), *n.* a boat propelled by means of an engine.

powerful (pou′ ẽr fool), *adj.* having power, mighty, strong; efficacious.

Syn. Potent, puissant. *Powerful* applies to whatever is capable of producing great effect, as a *powerful* engine, a *powerful* athlete, a *powerful* corporation; *potent* suggests some inherent quality that works out its effect with certainty, as a *potent* drug, a *potent* medicine; *puissant* refers chiefly to persons, especially princes and potentates, and connotes the outward aspects of power, as a *puissant* monarch.

Ant. Powerless, feeble, weak, impotent.

powerless (pou′ ẽr les), *adj.* weak, lacking in force or energy; unable to bring about a desired effect.

power plant (pou′ ẽr plȧnt), an industrial building used to house a plant for generating power; engines and other parts that generate power in aircraft, boats or automobiles.

pox (poks), *n.* an eruptive disease, causing pustules or pocks on the skin, as small*pox* or syphilis.

practicability (prak ti ka bil′ i ti), *n.* the state of being practicable or feasible.

practicable (prak′ ti ka bl), *adj.* capable of being done, feasible.

practical (prak′ ti kal), *adj.* capable of being put to use; useful.

practically (prak′ ti kal i), *adv.* really, virtually, as *practically* useless.

practice (prak′ tis), *n.* frequent or customary action; pursuit of a profession, as the *practice* of law or medicine; drill as a means of acquiring skill.

practitioner (prak tish′ un ẽr), *n.* one engaged in the practice of a profession.

pragmatic (prag mat′ ik), *adj.* of or pertaining to civil affairs, as *pragmatic* sanction; dealing with events so as to show their relation; practical, springing from experience, not theory; officious, meddlesome, opinionated.

pragmatism (prag′ ma tizm), *n.* the philosophy that makes results the test of truth.

***prairie** (prâr′ i), *n.* an extensive tract of level or slightly undulating land without trees and covered with tall, coarse grass.

praise (prāz), *n.* commendation, approbation.

praise (prāz), *v.t.* to commend; to approve and give credit for merit.

***prance** (prȧns), *v.i.* to spring or bound; to step high and gaily.

prank (prangk), *n.* a playful trick.

***prate** (prāt), *v.i.* to talk idly, chatter.

prattle (prat′ l), *n.* childish talk.

pray (prā), *v.i. and v.t.* to ask earnestly; to say prayers, especially to God; to entreat, implore; to beg for, as he *prayed* forgiveness.

***prayer** (prâr), *n.* a solemn address to the Supreme Being; act of praying; an earnest entreaty.

***preach** (prēch), *v.i. and v.t.* to proclaim, to deliver a sermon; to recommend earnestly, as to *preach* economy.

preamble (prē′ ambl), *n.* an introductory passage affixed to a document of state, a legal enactment or a petition; any introduction to a speech or writing.

precancel (prē kan′ sel), *v.t.* to cancel before use, as postage stamps.

precarious (prē kâr′ i us), *adj.* depending on the will of another or on chance; uncertain, risky, hazardous, as a *precarious* perch.

precaution (prē kô′ shun), *n.* a measure employed to prevent disaster or misfortune.

precede (prē sēd′), *v.t.* to go before in time, place, rank or importance.

***precedence** (prē sēd′ ens), *n.* priority.

precedent (pres′ ē dent), *n.* a parallel case in the past, especially as a guide for present action or ground for decision, as she did not intend to establish a *precedent* by giving her permission.

precedent (pre sē' dent), *adj.* going before.

precept (prē' sept), *n.* a rule of action or moral conduct, a maxim.

precession (prē sesh' un), *n.* the act of preceding others, going before; the slow but continual shifting of the equinoctial points along the ecliptic from east to west; *precession of the equinoxes.*

***precinct** (prē' singkt), *n.* an inclosed district, as a police *precinct,* a voting *precinct.*

***precious** (presh' us), *adj.* of great value, prized.

***preciosity** (presh i os' i ti), *n.* overcareful use of words; overrefinement.

***precipice** (pres' i pis), *n.* a steep descent, an almost vertical cliff.

precipitant (prē sip' i tant), *n.* a chemical agent that causes the indissoluble elements in a liquid to separate and settle to the bottom of the container.

precipitant (prē sip' i tant), *adj.* falling or rushing headlong, hasty.

***precipitate** (prē sip' i tāt), *n.* a chemical substance that separates in solid form when the other elements dissolve.

precipitate (prē sip' i tāt), *v.t.* to throw headlong; to hasten a crisis.

precipitate (prē sip' i tāt), *adj.* impulsive, hasty, rash.

precipitous (prē sip' i tus), *adj.* like a precipice, steep; rash; hasty.

***precise** (prē sīs'), *adj.* exact, strict, accurate, definite.

***preclude** (prē klo͞od'), *v.t.* to shut out from access or consideration; to prevent.

preclusion (prē klo͞o' zhun), *n.* the act of being shut out or the state of being shut out or prevented by anticipation.

***precocious** (prē kō' shus), *adj.* prematurely developed, especially mentally, as a *precocious* child.

precocity (prē kos' i ti), *n.* the state of being developed before the normal time; especially premature mental development in a child.

preconceive (prē kon sēv'), *v.t.* to form, as an opinion, in advance, as I *preconceived* the idea that I would not like her.

preconception (prē kon sep' shun), *n.* a prejudice; an opinion formed without knowledge.

precursor (prē kûr' sẽr), *n.* a forerunner, omen.

predatory (pred' *a* tō ri), *adj.* rapacious, plundering; living by preying upon others, as a *predatory* animal.

***predecessor** (pred ē ses' ẽr), *n.* one who has preceded another in the same office or position.

predestination (prē des ti nā' shun), *n.* the doctrine that whatever comes to pass was ordained long in advance.

***predicable** (pred' i k*a* bl), *adj.* capable of being affirmed.

***predicament** (prē dik' *a* ment), *n.* an unpleasant, unfortunate or puzzling situation.

***predicate** (pred' i kāt), *n.* that part of a sentence which makes a statement about the subject.

***predicate** (pred' i kāt), *v.t.* to affirm or assert.

predict (prē dikt'), *v.t.* to foretell, prophesy.

***predilection** (prē di lek' shun), *n.* preference beforehand, partiality.

predispose (prē dis pōz'), *v.i. and v.t.* to incline oneself beforehand; to influence others in advance of an event or situation, as a courteous manner in people *predisposes* us in their favor.

predominant (prē dom' i nant), *adj.* having superior strength or influence, controlling.

predominate (prē dom' i nāt), *v.i.* to be superior in strength, authority or influence; to prevail, as tragedy usually *predominates* in opera.

pre-eminent (prē em' i nent), *adj.* superior to all others, especially in excellence.

pre-empt (prē empt'), *v.t.* to establish a right or claim to before others make a claim.

preen (prēn), *v.t.* to clean and smooth, as with a beak, as a bird *preens* his feathers.

***preface** (pref' is), *n.* preliminary matter explaining the nature and purpose, as of a book; an introduction.

preface (pref' is), *v.t.* to introduce, explain what is coming.

prefatory (pref' *a* tō ri), *adj.* introducing and explaining.

***prefect** (prē' fekt), *n.* a civil magistrate in ancient Rome; the governor of a department in modern France; a student with some of a teacher's authority, a monitor.

prefecture (prē' fek tūr), *n.* the office, jurisdiction or official quarters of a prefect.

prefer (prē fûr'), *v.t.* to regard or esteem more than something else.

***preferable** (pref' ẽr *a* bl), *adj.* more to be desired, as I think the black hat is *preferable.*

preferably (pref' ẽr *a* bli), *adv.* rather than something else, by choice, as come to see me soon, *preferably* this week.

preference (pref' ẽr ens), *n.* the act of preferring or the thing preferred; choice of one rather than another.

preferential (pref ẽr en' shal), *adj.* giving or receiving preference.

preferment (prē fûr' ment), *n.* promotion to a higher position; a high post of honor, dignity or advantage, especially in the church.

prefix (prē' fiks), *n.* a letter, word or syllable at the beginning of a word that gives a new shade of meaning.

pregnant (preg' nant), *adj.* about to have offspring; fertile; teeming, as with ideas.

prehensile (prē hen' sil), *adj.* adapted for holding or grasping.

prehistoric (prē his tor' ik), *adj.* pertaining to or existing before historical records.

prejudice (prej' oo dis), *n.* premature judgment, bias.

Syn. Bias, partiality, prepossession, presumption. A *prejudice* or *prepossession* is grounded often on feeling, fancy, associations. A *prejudice* against foreigners is very common in retired communities. A *prepossession* is always favorable, a *prejudice* always unfavorable, unless the contrary is expressly stated.

prejudicial (prej oo dish' al), *adj.* damaging, as to a case or cause.

***prelate** (prel' it), *n.* a dignitary of the church, as a bishop or archbishop.

preliminary (prē lim' i ner i), *n.* [*pl.* preliminaries] an introductory act or exercise.

preliminary (prē lim i ner i), *adj.* preceding, introductory.

***prelude** (prel' ūd), *n.* a short piece of music played as an introduction to a longer composition.

***premature** (prē m*a* tūr'), *adj.* arriving, occurring or done before the set or proper time.

premeditate (prē med' i tāt), *v.t.* to design or plan beforehand.

***premier** (prē' mi ẽr), *n.* a prime minister.

premier (prē' mi ẽr), *adj.* first, chief; earliest in time.

***premise** (prem' is), *n.* a proposition assumed in advance of argument.

premise (prē mīz'), *v.t.* to explain in advance of discussion.

premises (prem' is ez), *n.* real estate; a house and lot on which it stands.

premium (prē' mi um), *n.* a reward, bonus, something given free to a purchaser of goods to encourage buying; the amount by which the value of a stock market security exceeds par value; the periodic payment on an insurance policy.

premonition (prē mō nish' un), *n.* a sense of impending events, a foreboding.

premonitory (prē mon' i tō ri), *adj.* giving warning in advance of the event.

preoccupied (prē ok' ū pīd), *adj.* having the attention fixed upon other matters.

preordain (prē ôr dān'), *v.t.* to decree or order beforehand.

***preparation** (prep *a* rā' shun), *n.* the act of making ready for use, a mixture prepared for a particular use, as a medical *preparation;* the state of being prepared, as *preparation* for war.

preparatory (prē par' *a* tō ri), *adj.* serving to make ready or fit.

prepare (prē pâr'), *v.t. and v.i.* to fit for a special purpose, make ready, as to *prepare* a room for occupancy; to make mentally ready, as to *prepare* a person for bad news; to make things or oneself ready, as to *prepare* for winter, to *prepare* for an ordeal.

***preparedness** (prē pâr' ed nes), *n.* the state of being ready, especially for national defense in case of war.

prepense (prē pens'), *adj.* premeditated, as malice *prepense.*

prepay (prē pā'), *v.t.* to pay charges upon in advance, as to *prepay* a package.

preponderant (prē pon' dẽr ant), *adj.* outweighing.

preponderate (prē pon' dẽr āt), *v.i.* to outweigh; to exceed in power and influence: with *over.*

preposition (prep ō zish' un), *n.* a word placed before a noun or pronoun to indicate its relation to some other word in the sentence.

prepossessing (prē po zes' ing), *adj.* charming, attractive.

prepossession (prē po zesh' un), *n.* an opinion, usually favorable, formed in advance of meeting its object; prior possession or occupancy.

preposterous (prē pos' tẽr us), *adj.* contrary to nature or reason, beyond belief.

prerogative (prē rog' *a* tiv), *n.* an exclusive or special privilege.

presage (pres' ij), *n.* a foreboding, presentiment.

***presage** (prē sāj'), *v.t.* to forebode, predict.

presbyter (prez' bi tẽr), *n.* an elder, minister or priest.

***presbytery** (prez' bi ter i), *n.* [*pl.* presbyteries] a court composed of the pastors and ruling elders of a group of Presbyterian churches in a given district; the group of churches ruled by such a body and forming with other presbyteries a synod; the part of a cathedral between the choir and altar.

preschool (prē sko͞ol'), *n.* a school for children under regular school age, devoted mainly to social, educational and habit-forming training.

***prescient** (prē' shi ent), *adj.* knowing in advance.

prescribe (prē skrīb'), *v.i. and v.t.* to write medical directions, as to *prescribe* for a person; to order authoritatively; to order the use of, as a medicine.

prescription (prē skrip' shun), *n.* the act of prescribing; that which is prescribed; a doctor's written directions for the preparation of a medicine.

presence (prez' ens), *n.* the state of being present; immediate neighborhood, as in the presence of the enemy; the appearance and person of a man, as he has a good *presence*: *presence of mind,* quickness in understanding and dealing with a situation.

present (prez' ent), *n.* a gift; the immediate moment, as there's no time like the *present.*

present (prē zent'), *v.t.* to offer, introduce; to exhibit, as to *present* a play; to aim or point.

present (prez' ent), *adj.* at hand, as the *present* moment, I was *present* at the meeting.

presentable (prē zent' *a* bl), *adj.* suitable to be offered, given or introduced; fit to be seen.

***presentation** (prez en tā' shun), *n.* the act of introducing formally; the act of exhibiting to the public, as a theatrical *presentation;* the act of bestowing, as the *presentation* of awards.

***presentiment** (prē zen' ti ment), *n.* a foreboding of things to happen.

presently (prez' ent li), *adv.* shortly, before long, as I will see him *presently.*

presentment (prē zent' ment), *n.* something set forth for examination; a statement by a grand jury.

preservation (prez ẽr vā' shun), *n.* the act of keeping or state of being kept from injury or decay.

preservative (prē zûr' v*a* tiv), *n.* that which prevents injury and keeps intact.

preservative (prē zûr' v*a* tiv), *adj.* having the power of keeping from injury or decay.

preserve (prē zûrv'), *n.* fruit cooked with sugar and put up in various ways to keep it for future use: commonly used in the plural.

preserve (prē zûrv′), *v.t.* to keep from injury; to protect; to maintain, as to *preserve* silence; to put up for future use, as food.

*__preside__ (prē zīd′), *v.i.* to direct, as a meeting.

president (prez′ i dent), *n.* one who presides, as over an organization or a republic.

press (pres), *n.* a machine for printing; a machine to form things by means of pressure; periodical print, as the power of the *press;* crowding, with pressure one against another; a closet for storage, as a clothes *press;* urgent demands, as the *press* of work.

press (pres), *v.i. and v.t.* to bear down heavily; to push forward; to squeeze or crush; to urge as to *press* a person for an answer; to make smooth by pressure, commonly with heat, as to *press* clothes.

pressing (pres′ ing), *adj.* urgent, as a *pressing* need.

pressman (pres′ man), *n.* one who operates or works about a printing press.

pressure (presh′ ẽr), *n.* a weight or burden, as of distress; weight of influence or authority, as *pressure* was brought to bear; urgent demand, as financial *pressure;* force exerted on a body, tending to change its shape or volume.

*__prestidigitation__ (pres ti dij i tā′ shun), *n.* sleight of hand, legerdemain.

*__prestige__ (pres tēzh′), *n.* high standing due to past actions, renown, reputation.

presto (pres′ tō), *adv.* quickly, suddenly.

presume (prē zūm′), *v.i. and v.t.* to venture without actual authorization; to take for granted; to imply, as promotion *presumes* merit.

presumption (prē zump′ shun), *n.* something taken for granted; that which encourages belief, without proof, as the *presumption* is that he will accept; unwarranted assurance; unjustified assumption, as I dislike his constant *presumption.*

presumptive (prē zump′ tiv), *adj.* based on supposition, apparent but not proved, as the *presumptive* heir to a throne.

*__presumptuous__ (prē zump′ tū us), *adj.* arrogant; bold; overconfident.

Syn. Arrogant, insolent. One is *presumptuous* who encroaches beyond the bounds of good taste and takes undue liberties; one is *arrogant* who makes exorbitant claims to importance; *insolent* suggests offensive disregard for the feelings of others.

presuppose (prē su pōz′), *v.t.* to take for granted; to require as antecedent, as action *presupposes* an agent.

*__pretend__ (prē tend′), *v.i. and v.t.* to make believe; to present a claim, as to a title; to simulate, as he *pretended* good will.

pretender (prē ten′ dẽr), *n.* one who claims what is not rightfully his; one who makes a claim, especially a false claim, to anything.

*__pretense__ (prē tens′), *n.* a false or hypocritical profession, as under *pretense* of friendliness; sham, pretext, claim, as without pretense of accuracy.

Syn. Sham, affectation, subterfuge. A *pretense* applies to that which is deceitfully held out as true, as a *pretense* of honesty; a *sham* usually applies to a substitution, imitation or counterfeit purporting to be the real thing; *affectation* denotes something consciously assumed and insincere; *subterfuge* suggests a deliberate deception for the sake of escape from punishment or an awkward situation.

pretension (prē ten′ shun), *n.* a claim that is doubtful or false; unwarranted appearance of power, influence.

pretentious (prē ten′ shus), *adj.* assuming an air of superiority.

*__pretext__ (prē′ tekst), *n.* an ostensible motive put forward to conceal the real one.

*__pretty__ (prit′ i), *adj.* [*comp.* prettier, *superl.* prettiest] pleasing to the eye, without being beautiful; pleasing to the mind, as a *pretty* sense of humor; moderately large, as a *pretty* inheritance; fine, as a *pretty* thing to do.

pretty (prit′ i), *adv.* fairly, moderately, as *pretty* good.

*__pretzel__ (pret′ sel), *n.* a brittle biscuit, twisted like a knot, glazed and crusted with salt.

*__prevail__ (prē vāl′), *v.i.* to succeed, gain mastery, rule, as truth shall *prevail;* to urge successfully, as we *prevailed* upon him to accept.

*__prevalence__ (prev′ *a* lens), *n.* preponderance; the state of being widely distributed or generally accepted, as the *prevalence* of patriotic spirit.

prevalent (prev′ *a* lent), *adj.* widespread, predominant.

prevaricate (prē var′ i kāt), *v.i.* to evade the truth, equivocate.

*__prevent__ (prē vent′), *v.t.* to stop from being done or coming to pass; to hinder, obstruct.

Syn. Preclude, avert. *Prevent* is a general term for hindering, stopping or obstructing; to *preclude* is to prevent by anticipative action; to *avert* is to forestall some threatened evil.

prevention (prē ven′ shun), *n.* the act of hindering or obstructing; a hindrance or obstruction.

preventive (prē ven′ tiv), *n.* that which tends to stop undesired things from happening; something that keeps disease away, as *preventive* medicine.

preventive (prē ven′ tiv), *adj.* tending to prevent.

*__previous__ (prē′ vi us), *adj.* going before, preceding.

Syn. Earlier, foregoing, former. *Previous* indicates anything that has gone before, especially in time; *foregoing* applies almost exclusively to preceding statements; *former* applies to that which precedes in time, place or order.

prewar (prē wôr′), *adj.* before the war, especially before the World War.

prevision (prē vizh′ un), *n.* foresight; foreknowledge.

*__prey__ (prā), *n.* any creature which another creature seizes to kill or eat; act of seizing to eat; a person who is the victim of any hostile or injurious person or thing.

prey (prā), *v.i.* to plunder; to seize and devour or destroy; to wear down, as grief *preys* upon one's mind.

price (prīs), *n.* cost, value, amount of money asked for something to be sold.

priceless (prīs′ les), *adj.* without price; invaluable.

prick (prik), *n.* a sharp-pointed instrument; the stinging sensation caused by a jab with such an instrument or something likened to it, as a pin*prick* or the *prick* of conscience.

prick (prik), *v.t.* to pierce or puncture with a sharp-pointed instrument; to annoy, as his conscience *pricked* him.

prickle (prik′ l), *n.* a small, sharp point; a spine or thorn on a plant.

prickle (prik′ l), *v.i. and v.t.* to tingle; to cause a stinging sensation in the skin.

prickly (prik′ li), *adj.* [*comp.* pricklier, *superl.* prickliest] full of prickles; causing a stinging, tingling sensation.

prickly heat (prik′ li hēt), a rash caused by heat.

pride (prīd), *n.* inordinate self-regard; a proper feeling of esteem for one's own qualities or achievements; that which one prizes, as my record is my *pride.*

Syn. Arrogance, egotism, superciliousness, haughtiness, disdain, vainglory, vanity, conceit. *Pride* is an absorbing sense of one's own greatness. *Haughtiness* thinks highly of itself and poorly of others. *Arrogance* claims much for itself and concedes little to others. *Disdain* sees contemptuously the inferiority of others to itself. *Vanity* is eager for admiration and praise, is elated if they are rendered, and pained if they are withheld. *Conceit* is offensive and overweening self-confidence; *Vainglory* is more pompous and boastful than *vanity.*

Ant. Humility, meekness, diffidence, modesty.

*__priest__ (prēst), *n.* one who acts in sacred offices; an ordained member of the Christian ministry; one ranking between a bishop and a deacon.

*__prig__ (prig), *n.* one who poses or is overprecise in manners, speech, morals.

*__prim__ (prim), *adj.* precise, neat, sedate and fastidious.

primacy (prī′ m*a* si), *n.* [*pl.* primacies] the state of being first in rank; the office and dignity of an archbishop.

*__prima donna__ (prē′ m*a* don′ *a*), the leading lady in an opera.

primal (prī′ mal), *adj.* primary; principal; original, early.

*__primary__ (prī′ mer i), *n.* [*pl.* primaries] a meeting of voters to name candidates for office.

primary (prī′ mer i), *adj.* original, first in time or importance; elementary.

primary cell (prī′ mer i sel), **primary battery** (prī′ mer i bat′ ẽr i), an electrical cell that produces a current by an irreversible chemical reaction.

primary colors (prī′ mer i kul′ ẽrz), the principal colors of the spectrum, red, green and blue, by mixing of which other colors are made.

*__primate__ (prī′ mit), *n.* the highest dignitary in a national church; a creature belonging to the highest order of mammals (plural, *primates,* pronounced prī mā′ tēs).

prime (prīm), *n.* the first stage of full development, as the *prime* of life.

prime (prīm), *v.t.* to prepare for firing, as a gun, by placing a firing-charge; to prepare for operation by some preliminary act, as to *prime* a pump by pouring water into it; to prepare, as to *prime* one who is to testify in a case at court.

prime (prīm), *adj.* first in order of time, primitive; first in rank or importance; first in quality; primary as opposed to derivative, as a *prime* cause.

prime number (prīm num′ bẽr), a number not divisible without remainder by any number but itself and 1.

*__primer__ (prīm′ ẽr), *n.* that which primes, as the fulminating powder used to set off a gun or explosive charge.

*__primer__ (prim′ ẽr), *n.* a manual of elementary instruction; a size of type, 10-point or 18-point.

*__primeval__ (prī mē′ val), *adj.* relating in any way to the earliest time; very ancient.

priming (prīm′ ing), *n.* the first coat of paint; powder used to set off a main charge of explosive, as the *priming* of a gun.

primitive (prim′ i tiv), *n.* a word not derived from another; a line, figure or number from which another is derived; anything with the characteristics of early times or an original state.

primitive (prim′ i tiv), *adj.* pertaining to the beginning or early times; extremely old-fashioned; simple, crude, as *primitive* living conditions.

primogeniture (prī mō jen′ i tūr), *n.* seniority of birth; in older times, in English law, the eldest son's exclusive right of inheritance.

primordial (prī môr′ di al), *adj.* existing from the beginning, original.

primp (primp), *v.i. and v.t.* to deck oneself in a prim or affected manner; to fuss over one's appearance.

primrose (prim′ rōz), *n.* an early spring flower, generally reddish-yellow.

prince (prins), *n.* a ruler; a son of a sovereign; a leader, as a merchant *prince.*

*__princess__ (prin′ ses), *n.* the daughter of a sovereign; wife of a prince.

principal (prin′ si pal), *n.* a person in first authority; the head of a school; a person of first concern in a business transaction; one of the makers of a contract; a capital sum put out at interest.

principal (prin′ si pal), *adj.* chief; essential.

principality (prin si pal′ i ti), *n.* [*pl.* principalities] the domain of a prince.

principally (prin′ si pal i), *adv.* chiefly.

principle (prin′ si pl), *n.* a rule or law of action or conduct; the essential characteristic, as the *principle* of the thing; uprightness, as he stands by his *principles.*

Syn. Rule. *Principle* emphasizes the idea of that which exercises governing or guiding influence; *rule* implies more limited and specific regulation.

prink (pringk), *v.i.* to dress up in fussy, showy fashion; to primp.

print (print), *n.* a mark made by impression, as a foot*print;* reading matter produced from type passed through a press, as I saw it in *print;* a picture made by impression of a plate, especially of a wood block.

print (print), *v.i. and v.t.* to write in letters resembling type; to make impressions from type or plates; to stamp, as with a pattern.

printer (prin′ tẽr), *n.* one whose trade is the setting of type or putting it through the press.

printing (print′ ing), *n.* the art of producing from type matter to be read, including setting type and putting it through the press.

prior (prī′ ẽr), *n.* the head of a religious house or group of monks; the coadjutor of an abbot.

***prior** (prī′ ẽr), *adj.* earlier, previous.

priorate (prī′ ẽr it), *n.* the office and dignity of a prior.

prioress (prī′ ẽr es), *n.* a woman heading a religious house of nuns; one ranking next below the abbess.

priority (prī or′ i ti), *n.* precedence; the state of being first in rank or time of service.

priory (prī′ ō ri), *n.* [*pl.* priories] a religious establishment of monks or nuns next in dignity to an abbey.

***prism** (prizm), *n.* a solid whose bases are similar, equal and parallel to each other, and whose sides are parallelograms; a refracting optical instrument.

prismatic (priz mat′ ik), *adj.* relating to a prism; resembling a prism; formed like a prism; exhibiting the colors seen when a ray of light passes through a transparent prism.

prison (priz′ n), *n.* a place or state of restraint; a public building in which criminals are confined.

***pristine** (pris′ tēn), *adj.* pertaining to a very early period, original.

prithee (prith′ ē), *interj.* I beg you: short for I pray thee.

***privacy** (prī′ va si), *n.* [*pl.* privacies] a state of retirement, seclusion, freedom from interruption by others.

Syn. Retirement, seclusion, solitude. *Privacy* implies freedom from the observation and association of others; *retirement* implies a withdrawing from public life, although the person who retires may still enjoy friendly intercourse; he who goes into *seclusion* shuts himself away from the world, usually seeing only the members of his household and intimate friends; *solitude* usually implies the presence of no other person, as a hermit lives in *solitude.*

Ant. Company, society, association, companionship, fellowship.

private (prī′ vit), *n.* an enlisted man in an army.

private (prī′ vit), *adj.* peculiar to oneself, personal, not public.

privateer (prī v*a* tẽr′), *n.* a privately owned ship licensed by a government to attack the ships of an enemy.

***privation** (prī vā′ shun), *n.* the state of lacking something; poverty, hardship.

***privative** (priv′ *a* tiv), *n.* a syllable that changes the sense of a word from positive to negative, as in unwilling; a quality that is due only to lack of possession of another quality, as whiteness is due to absence of color.

privet (priv′et), *n.* an evergreen shrub for hedges.

privilege (priv′ i lij), *n.* a favor or right granted to one with exclusion of others; a right granted by a constitutional government to its citizens, as the *privilege* of assembly, prerogative.

privy (priv′ i), *adj.* for private use, not public, as the *privy* purse; secretly aware, as to be *privy* to a conspiracy.

prize (prīz), *n.* a reward gained in competition with others.

prize (prīz), *n.* a lever, leverage, means of prying up, as a weight.

prize (prīz), *v.t.* to place high value on, esteem greatly.

prize (prīz), *v.t.* to move with a lever, pry.

pro (prō), *adv.* on the affirmative side, as they argued *pro* and con.

probability (prob *a* bil′ i ti), *n.* [*pl.* probabilities] that which is likely to happen; the state of being likely to happen, as it is a *probability,* in all *probability.*

***probate** (prō′ bāt), *n.* the official proof of wills; the official copy of a will, with certificate of its legal proof.

probate (prō′ bāt), *v.t.* to prove legally, as a will.

probation (prō bā′ shun), *n.* test or trial of character and responsibility; the period over which such a test extends, as I am employed on *probation.*

***probe** (prōb), *n.* a surgical instrument to examine a wound; a close inquiry.

probe (prōb), *v.t.* to explore or examine with a probe; to conduct a searching inquiry into affairs or conditions.

***probity** (prob′ i ti), *n.* integrity, honesty.

problem (prob′ lem), *n.* a question for solution; a difficult matter requiring settlement; an exercise for students to work out.

problematic, problematical (prob lem at′ ik, -i kal), *adj.* having the nature of a problem; hard to work out, puzzling, uncertain.

***proboscis** (prō bos′ is), *n.* [*pl.* proboscises or proboscides] the elongated snout of certain animals, as the elephant; the projecting mouth parts of some insects.

***procedure** (prō sē′ dūr), *n.* a manner of taking action; way of conducting, as a case at law, as the correct *procedure.*

***proceed** (prō sēd′), *v.i.* to advance; to go ahead; to get on with, as *proceed* as you are, *proceed* according to rule.

***proceeds** (prō′ sēdz), *n. pl.* the profits from a transaction or public performance, as the *proceeds* will go to charity.

***process** (pros′ es), *n.* a progressive course; a series of acts aimed at a single end; an outgrowth from a body, as a horn is a *process* on the head of an animal.

procession (prō sesh′ un), *n.* orderly progress; a number of persons organized for a formal march.

processional (prō sesh′ un al), *n.* a hymn sung or organ music rendered while clergy and choir or members of the congregation are taking their places.

***proclaim** (prō klām′), *v.t.* to announce or declare officially.

proclamation (prok l*a* mā′ shun), *n.* an official announcement to the public, an edict.

proclivity (prō kliv′ i ti), *n.* [*pl.* proclivities] an inclination, tendency.

procrastinate (prō kras′ ti nāt), *v.i.* to put off action from time to time, delay.

procreation (prō krē ā′ shun) *n.* the production of young.

proctor (prok′ tẽr), *n.* one employed to enforce discipline or keep a watch on classes taking examinations in college.

procurable (prō kūr′ *a* bl), *adj.* obtainable.

procurator (prok′ ū rā tẽr), *n.* one who manages affairs for another, especially legal interests.

***procure** (prō kūr′), *v.t.* to get, obtain.

prod (prod), *n.* a goad; a punch with a goad, as he gave me a *prod* with his cane.

prod (prod), *v.t.* to poke with a pointed stick; to urge on; to stimulate, as to *prod* one's memory.

prodigal (prod′ i gal), *n.* a spendthrift, a wasteful person.

prodigal (prod′ i gal), *adj.* reckless with money, wasteful, lavish.

prodigality (prod i gal′ i ti), *n.* [*pl.* prodigalities] wastefulness; extravagance.

***prodigious** (prō dij′ us), *adj.* enormous; amazing.

***prodigy** (prod′ i ji), *n.* [*pl.* prodigies] an extraordinary person, as an infant *prodigy;* a wonder; a freak of nature.

produce (prod′ ūs), *n.* that which is yielded or brought forth, as farm *produce.*

***produce** (prō dūs′), *v.i. and v.t.* to yield or bring forth; to bring to view; to place before the public, as a play.

***product** (prod′ ukt), *n.* that which is produced, as the *product* of the fields, *product* of one's labors.

production (prō duk′ shun), *n.* the act of bringing forth; that which is brought out by nature or through man's wit and toil; a play on the stage.

Syn. Performance, work. The term *production* cannot be employed without reference to the source from which the thing in question is produced, as the *production* of art, a *production* of the mind. A *performance* cannot be spoken of without some reference to the agent, as we speak of this or that person's *performance.* We speak either of the *work* of one's hands or of a *work* of the imagination.

productive (prō duk′ tiv), *adj.* having the power of yielding or bringing forth; fruitful, fertile.

***profanation** (prof a nā′ shun), *n.* the act of treating sacred things with disrespect.

***profane** (prō fān′), *v.t.* to desecrate.

profane (prō fān′), *adj.* not sacred, secular; irreverent, blasphemous.

profess (prō fes′), *v.i. and v.t.* to make an avowal; to make open declaration of.

profession (prō fesh′ un), *n.* the act of avowing, as *profession* of faith; that which is declared; a vocation that requires learning rather than work with the hands.

professional (prō fesh′ un al), *n.* one who engages in a learned vocation; one who engages in sport for pay.

professional (prō fesh′ un al), *adj.* pertaining in any way to any kind of learned vocation.

professor (prō fes′ ẽr), *n.* one who makes an avowal, as of faith; a college teacher of the highest grade.

proffer (prof′ ẽr), *v.t.* to offer something that may be accepted or declined; to tender, as to *proffer* aid.

proficiency (prō fish′ en si), *n.* skill in any branch of knowledge, science, business or art.

proficient (prō fish′ ent), *adj.* skilled, expert.

***profile** (prō′ fil), *n.* the outline of anything seen from the side, as a face, a hill.

profit (prof′ it), *n.* pecuniary gain; benefit from an act done, business transacted or investment made.

profitable (prof′ it *a* bl), *adj.* yielding gain or advantage; bringing returns, as an investment; bringing in more than goes out, as a business.

profiteer (prof i tẽr′), *n.* a person who makes excessive profits, especially in time of war.

profiteer (prof i tẽr′), *v.i.* to make excessive profits, especially in time of war.

profligacy (prof′ li g*a* si), *n.* dissolute living.

profligate (prof′ li gāt), *adj.* dissolute; living in vice.

Syn. Abandoned, reprobate. A *profligate* man has given himself up to vice. An *abandoned* person has yielded completely to passion. The *reprobate* is one who has become insensible to reproof and is beyond reform.

Ant. Virtuous, controlled.

profound (prō found′), *adj.* deep, as *profound* depths of the ocean; penetrating, as *profound* thought; reaching the depths of one's nature, as *profound* grief.

profundity (prō fun′ di ti), *n.* [*pl.* profundities] great depth, as *profundity* of feeling.

***profuse** (prō fūs′), *adj.* very liberal; too liberal; lavish, abundant, as *profuse* flowering.

profusion (prō fū′ zhun), *n.* a lavish outpouring, abundance.

progenitor (prō jen′ i tẽr), *n.* an ancestor, forefather.

progeny (proj′ e ni), *n.* offspring; descendants.

prognosticate (prog nos′ ti kāt), *v.i. and v.t.* to predict, foretell, especially the weather.

***program** (prō′ gram), *n.* a schedule of events; plan of action; a list of items in an entertainment, with names of the speakers, singers, actors.

***progress** (prog′ res), *n.* forward movement, advance, development.

***progress** (prō gres′), *v.i.* to move onward, advance, develop.

progression (prō gresh′ un), *n.* advancement; mathematical series.

progressive (prō gres′ iv), *n.* a person or a party favoring changes and reforms in policy or administration.

progressive (prō gres′ iv), *adj.* moving forward; interested in improvement or advance.

***prohibit** (prō hib′ it), *v.t.* to forbid; to interdict by authority.

prohibitionist (prō i bish′ un ist), *n.* one who favors forbidding manufacture or traffic in alcoholic liquors.

prohibitive (prō hib′ i tiv), *adj.* tending to put a stop to; having the nature of a ban.

***project** (prŏj′ ekt), *n.* a plan or design; school work planned by student and teacher together to test the student's ability to make practical use of his knowledge.

***projectile** (prō jek′ til), *n.* an object thrown through the air by hand or a gun, as a spear or a bullet.

projection (prō jek′ shun), *n.* that which juts out; representation on a plane surface of a three-dimensional object, as a flat map of the earth is a *projection* of the globe.

projector (prō jek′ tẽr), *n.* an appliance made to throw a picture on a screen by reflecting light.

prolapse (prō laps′), *n.* a falling forward out of place.

***proletarian** (prō lē târ′ i an), *n.* a member of the common people; one of the lowest class.

***proletarian** (prō lē târ′ i an), *adj.* pertaining to the common people.

***proletariat** (prō lē târ i at), *n.* the lowest class of society; those who work for daily wages and have no capital.

proliferous (prō lif′ ẽr us), *adj.* producing new plants by budding; developing buds from flowers or fruit.

prolific (prō lif′ ik), *adj.* productive, fertile, fruitful.

***prolix** (prō liks′), *adj.* tedious and verbose; long drawn out, as a *prolix* speech.

***prologue** (prō′ lôg), *n.* an introduction, especially to a play.

prolong (prō lông′), *v.t.* to lengthen, extend.

prolongation (prō lông gā′ shun), *n.* an extension in time or in space.

***promenade** (prom ē näd′), *n.* a public place for walking; a walk for pleasure; a school or college dance.

promenade (prom ē näd′), *v.i.* to walk merely for pleasure and in a leisurely way.

prominence (prom′ i nens), *n.* the state of being outstanding; a projection.

prominent (prom′ i nent), *adj.* outstanding, projecting, conspicuous; distinguished.

Syn. Conspicuous, salient, signal. What is *prominent* stands out in such a way as to attract attention; what is *conspicuous* is plainly visible to the eye or mind; what is *salient* immediately arrests the attention, as the *salient* point in an argument; what is *signal* is out of the ordinary, as a *signal* honor.

Ant. Obscure, inconspicuous.

promiscuous (prō mis′ kū us), *adj.* mingled, indiscriminate.

promise (prom′ is), *n.* an engagement to do or not to do something; ground for expectation of good things in the future, as he is a young man of great *promise.*

Syn. Engagement, pledge, word. *Promise* is a general term; *engagement* implies a binding agreement, carrying certain definite obligations, a *pledge* denotes a solemn *promise* or guarantee of performance.

promise (prom′ is), *v.t. and v.i.* to engage to do, make or obtain, as I *promised* the work by Friday; to make a promise of, as to *promise* a book; to give one's promise to, as I *promised* her my support; to make a promise; to afford hopes, give grounds for expecting much, as the weather *promises* well.

promissory (prom′ i sō ri), *adj.* containing a pledge to pay, as a *promissory* note.

promissory note (prom′ i sō ri nōt), a written and signed pledge to pay a certain sum at a certain time in consideration of value received.

promontory (prom′ un tō ri), *n.* [*pl.* promontories] a high cape, a point of land jutting out into the sea.

promote (prō mōt′), *v.t.* to advance, push forward; to contribute to the development of; to pass a student to the next higher class.

promoter (prō mōt′ ẽr), *n.* one who organizes and starts new companies, especially by raising funds; one who encourages or fosters.

promotion (prō mō′ shun), *n.* advancement to a higher standing or stage of development; the act of bringing about such advancement; the act of organizing and advancing, as an industry or commercial project.

prompt (prompt), *v.t.* to urge to action; to cause an action, inspire; to supply the next words to a speaker or actor who has forgotten them.

prompt (prompt), *adj.* ready and quick to act as occasion demands; done without delay.

prompter (promp′ tẽr), *n.* one whose business it is to help actors who forget their lines.

promptitude (promp′ ti tūd), *n.* quickness of decision and action, readiness.

***promulgate** (prō mul′ gāt), *v.t.* to make known to the public, announce.

prone (prōn), *adj.* lying with the face downward; mentally inclined, as *prone* to error.

proneness (prōn′ nes), *n.* the state of being mentally inclined; propensity.

prong (prông), *n.* a sharp-pointed piece of metal, as the *prong* of a pitchfork; a point of a deer's antler.

pronominal (prō nom′ i nal), *adj.* pertaining to or used as a pronoun.

pronoun (prō′ noun), *n.* a word referring to or used in place of a noun.

***pronounce** (prō nouns′), *v.t.* to articulate the sounds of, as words; to utter formally, as to *pronounce* the benediction, to *pronounce* sentence upon a convicted criminal.

pronounced (prō nounst′), *adj.* strongly marked; decided, as *pronounced* features, in a *pronounced* manner.

***pronunciation** (prō nun si ā′ shun), *n.* the act of uttering words; manner of uttering, as in giving letters the correct sound, placing the accent correctly.

proof (pro͞of), *n.* testimony or convincing evidence; a demonstration of correctness; a trial printing on which errors are marked for correction before the final impression is made.

proofreader (pro͞of′ rēd ẽr), *n.* one whose business it is to read trial impressions of printed matter and mark errors for correction.

prop (prop), *n.* a support or stay to hold up something that sags.

prop (prop), *v.t.* to sustain or support, as we shall have to *prop* the shed roof.

***propaganda** (prop *a* gan′ d*a*), *n.* methods and measures for spreading doctrines, principles, printed matter or speeches, for the purpose of promoting a cause, political, religious or military.

propagate (prop′ *a* gāt), *v.i. and v.t.* to have offspring; to cause to increase in number, as plants; to disseminate, as news; to extend through space, as light.

***propel** (prō pel′), *v.t.* [*p.t.* and *p.p.* propelled, *pr.p.* propelling] to drive forward, as an automobile or boat.

propeller (prō pel′ ẽr), *n.* a screw, with broad blades, driving a ship or airplane with power coming from the engines.

propensity (prō pen′ si ti), *n.* [*pl.* propensities] a natural tendency, inclination.

proper (prop′ ẽr), *adj.* denoting a particular person or thing, as a *proper* noun; fitting or appropriate to, as the *proper* thing to do.

property (prop′ ẽr ti), *n.* [*pl.* properties] that which is owned by exclusive right; a special quality, as the *properties* of iron; things used in a play except scenery and costumes.

***prophecy** (prof′ ē si), *n.* [*pl.* prophecies] a prediction of something that is to happen; the power or act of predicting the future.

***prophesy** (prof′ ē sī), *v.i. and v.t.* [*p.t.* and *p.p.* prophesied, *pr.p.* prophesying] to predict.

prophet (prof′ et), *n.* one who foretells future events; one under divine inspiration as a teacher of God's will to the people, as a Biblical *prophet.*

***prophylactic** (prō fi lak′ tik), *n.* a medicine to prevent disease or protect against it.

prophylactic (prō fi lak′ tik), *adj.* guarding or protecting against disease.

propinquity (prō ping′ kwi ti), *n.* nearness in time or place or relationship; kinship.

***propitiate** (prō pish′ i āt), *v.t.* to conciliate; to make favorable.

propitious (prō pish′ us), *adj.* favorable; favorably inclined.

proportion (prō pōr′ shun), *n.* comparative relation in size or degree; ratio; a fair share or return, as you will be paid in *proportion* to service rendered.

proportionate (prō pōr′ shun it), *adj.* adjusted to something else according to a certain rate of common valuation.

Syn. Commensurate, adequate. *Proportionate* is a term of general use; the others are particular terms, employed in a similar sense, in regard to particular objects. That is *proportionate* which is in conformity with the assumed or expected proportions of something else, as returns *proportionate* to expenses; that is *commensurate* which exactly equals something else in measure or degree; that is *adequate* which is sufficient for a requirement.

Ant. Disproportionate, inadequate, unequal.

proposal (prō pōz′ al), *n.* that which is offered for consideration or acceptance; an offer of marriage.

propose (prō pōz′), *v.t.* to bring forward for consideration; to make an offer of marriage.

proposition (prop ō zish′ un), *n.* the presentation of a topic for debate; statement of a problem for solution; that which is offered for consideration.

propound (prō pound′), *v.t.* to offer for consideration.

proprietary (prō prī′ e ter i), *n.* [*pl.* proprietaries] one who possesses in his own right; a body of proprietors.

proprietary (prō prī′ e ter i), *adj.* under exclusive ownership; made under exclusive ownership, as a proprietary medicine may be made and sold only by the patent owner.

proprietor (prō prī e tẽr), *n.* a legal owner.

propriety (prō prī′ e ti), *n.* [*pl.* proprieties] the state of being fit and appropriate; conformity to established custom.

propulsive (prō pul′ siv), *adj.* having power to drive forward.

***pro rata** (prō rā′t*a*), in proportion.

prorogue (prō rōg′), *v.t.* to discontinue for an indefinite period, as the king *prorogued* Parliament.

***prosaic** (prō zā′ ik), *adj.* commonplace, dull.

***proscenium** (pro sē′ ni um), *n.* [*pl.* prosceniums or proscenia] the part of a stage between the curtain and the orchestra.

proscribe (prō skrīb′), *v.t.* to punish by outlawing; to condemn, prohibit.

prose (prōz), *n.* ordinary spoken or written language, composition without metrical form.

prosecute (pros′ ē kūt), *v.i. and v.t.* to go to law; to accuse of a crime before a legal tribunal; to pursue or carry on, as to *prosecute* an enterprise; to bring legal proceedings against, as to *prosecute* a swindler.

prosecution (pros ē kū′ shun), *n.* pursuit; the institution and carrying on of a suit at law; the side in a criminal case representing the public against an accused person.

prosecutor (pros′ ē kū tẽr), *n.* one who brings suit against another; the officer of the state who represents the public in criminal cases.

***proselyte** (pros′ ē līt), *n.* a convert to some religion or belief; one who has been won over from one belief or party to another.

proselyte (pros′ ē līt), *v.t.* to try to convert to a different belief or party.

***prosody** (pros′ ō di), *n.* the part of grammar that treats of quantity, accent and the laws of versification.

prospect (pros′ pekt), *n.* a view of the country; expectation; a possible customer or client.

prospect (pros′ pekt), *v.i. and v.t.* to explore for minerals, as to *prospect* for gold; to examine the possibilities of.

prospective (prō spek′ tiv), *adj.* looking forward; acting with foresight; expectable.

prospector (pros′ pek tẽr), *n.* one who searches for valuable ores and minerals.

prospectus (pros pek′ tus), *n.* [pl. prospectuses] an outline of plans for a project or institution whose establishment is desired.

prosper (pros′ pẽr), *v.i. and v.t.* to succeed, as the business *prospered;* to flourish, as fruit *prospers* in that climate; to render successful, as God prospered his servant.

prosperity (pros per′ i ti), *n.* success; good fortune; state of thriving.

prosperous (pros′ pēr us), *adj.* successful, thriving.

***prostrate** (pros′ trāt), *adj.* lying stretched out; lying flat; overthrown.

prostrate (pros′ trāt), *v.t.* to bow low, as in supplication, as to *prostrate* oneself before an altar; to break down, as sickness *prostrated* him.

***prosy** (prōz′ i), *adj.* [*comp.* prosier, *superl.* prosiest] dull, tiresome.

***protean** (prô tē an), *adj.* readily assuming different shapes.

protect (prō tekt′), *v.t.* to guard against danger; to shield from harm; to defend through high tariff, as domestic products.

protection (prō tek′ shun), *n.* the act of safeguarding; that which shields from harm; defense of domestic products through high tariffs against competition by cheap imports.

protectionist (prō tek′ shun ist), *n.* one who advocates high tariffs on imports that compete with domestic products.

protector (prō tek′ tēr), *n.* one who or that which guards and defends; one ruling in place of a king not yet come of age.

protectorate (prō tek′ tēr it), *n.* an arrangement by which a great and powerful nation assumes responsibility for the safety of a small one; government by a regent, as the protectorate of Cromwell.

***protégé** (prō′ te zhā), *n.* one who is under the care or patronage of another.

***protein** (prō′ tē in), *n.* one of a class of nitrogenous compounds, as albumin, fibrin, casein, which form animal tissue; the gelatinous, semitransparent substance obtained from albumin, fibrin or casein, the essential principle of food.

protest (prō′ test), *n.* an earnest declaration of opinion against some act or condition, statement of disapproval; notice that a note or check has been presented and payment refused.

***protest** (prō test′), *v.i. and v.t.* to object; to express disapproval and dissent; to declare dishonored, as a check or note; to assert solemnly, as he *protested* his sincerity.

***protestation** (prot es tā′ shun), *n.* a declaration of dissent; an earnest affirmation.

protocol (prō′ tō kol), *n.* a preliminary official memorandum serving as the basis for a final treaty or convention.

proton (prō′ ton), *n.* the smallest unit of positive electricity.

protoplasm (prō′ tō plazm), *n.* a semifluid, albuminous substance, regarded as the ultimate basis of physical life, from which all living organisms are developed.

prototype (prō′ tō tīp), *n.* the original from which others are copied, or in likeness to which they are formed.

***protozoon** (prō tō zō′ on), *n.* [*pl.* protozoa] a member of the first or lowest division of the animal kingdom, containing animals of the simplest type of organization, consisting of a single cell and reproducing by spontaneous division of the body into two or more parts.

protract (prō trakt′), *v.t.* to prolong in time or space.

protractor (prō trak′ tēr), *n.* a mathematical instrument for making and measuring angles on a sheet of paper.

protrude (prō tro͞od′), *v.i. and v.t.* to project; to thrust forward.

protrusion (prō tro͞o′ zhun), *n.* the act of thrusting forward or state of being thrust forward, a projection.

protuberant (prō tū′ bēr ant), *adj.* swelling, bulging.

proud (proud), *adj.* haughty; properly self-respecting; giving cause for pride.

prove (pro͞ov), *v.t.* to test; to demonstrate, with argument; to supply evidence; to make a trial impression of, as in printing.

proven (pro͞ov′ en), *adj.* demonstrated, established, as not proven—a verdict in Scot's law, the only correct use of *proven;* in all other uses *proved* is correct.

provender (prov′ en dēr), *n.* dry feed for horses and cattle, such as hay.

proverb (prov′ ûrb), *n.* a short, pithy saying, adage.

proverbial (pro vûr′ bi al), *adj.* pertaining to adages; well-known.

provide (prō vīd′), *v.i. and v.t.* to take care of, as the Lord will *provide;* to furnish supplies, as we *provided* food.

Syn. Procure, furnish, supply. To *provide* and to *procure* are both actions that have a special reference to the future. To *furnish* and to *supply* are actions of immediate concern. One *provides* a dinner in expectation that it will be eaten. He *procures* help in the belief that it will be needed. We *furnish* or *supply* things that are definitely needed now.

Ant. Neglect.

provided (prō vīd′ ed), *conj.* on condition that.

providence (prov′ i dens), *n.* preparation for meeting future needs; foresight; prudence; economy.

Providence (prov′ i dens), *n.* God's care for mankind.

provident (prov′ i dent), *adj.* thoughtful in arranging to meet future needs; economical.

providential (prov i den′ shal), *adj.* springing from divine care for mankind; fortunate, as a *providential* meeting.

province (prov′ ins), *n.* a division of an empire or state; a dependent country; a sphere of influence or field of responsibility; country or small city, contrasted with a metropolis.

provincial (prō vin′ shal), *n.* one who belongs to a province; one who lives far from the big cities; a countryman.

provincial (prō vin′ shal), *adj.* pertaining to or characteristic of life in the dependencies; not possessing the metropolitan qualities; narrow in outlook, limited.

provision (prō vizh′ un), *n.* the act of preparing in advance; accumulation of stores and supplies.

provisional (prō vizh′ un al), *adj.* conditional; temporary.

provisions (prō vizh′ unz), *n.* food.

***proviso** (prō vī′ zō), *n.* [*pl.* provisos] a conditional stipulation; a clause, as in a statute or deed, introducing a condition.

***provocation** (prov ō kā′ shun), *n.* that which causes anger; the act of angering or state of being angered; that which stirs emotion, thought or action, a challenge.

***provocative** (prō vok′ *a* tiv), *n.* that which produces a state of anger or irritation.

provocative (prō vok′ *a* tiv), *adj.* producing a state of anger or vexation; producing a responsive emotion, thought or action, as a *provocative* glance, a *provocative* remark.

***provoke** (prō vōk′), *v.t.* to make angry, irritate; to excite, arouse.

***provost** (prov′ ust), *n.* a superintendent; an official head; the chief magistrate of a Scottish city.

provost guard (prō vō′ gärd), military police, assisting the civil authorities in keeping order near a post.

provost marshal (prō vō′ mär′ shal), an officer of the army or navy serving as chief of military police.

provost sergeant (prō vō′ sär′ jent), a soldier in charge of prisoners.

***prow** (prou), *n.* the bow of a ship; the nose of an airplane fuselage or of a dirigible.

prowess (prou′ es), *n.* bravery, valor; skill.

***prowl** (proul), *v.i.* to creep about stealthily.

proximate (prok′ si mit), *adj.* nearest, either preceding or following.

proximity (proks im′ i ti), *n.* nearness in time or place.

proxy (prok′ si), *n.* [*pl.* proxies] one who is authorized to vote or act for another; the certificate of such authorization.

***prude** (pro͞od), *n.* an exaggeratedly proper person.

***prudence** (pro͞o′ dens), *n.* wisdom in practical affairs; care and caution.

prudent (pro͞o′ dent), *adj.* wise in practical affairs; careful, cautious.

prudential (pro͞o den′ shal), *adj.* characterized by care and caution; springing from practical wisdom.

prune (pro͞on), *n.* a dried plum.

prune (pro͞on), *v.t.* to trim trees, bushes or vines by cutting off twigs and branches; to cut down or reduce, as to *prune* expenses.

prunella (pro͞o nel′ *a*), *n.* a woolen fabric used in making gaiters.

***prussic acid** (prus′ ik as′ id), hydrocyanic acid, a deadly poison.

pry (prī), *v.i. and v.t.* to examine inquisitively, *pry* into; to prize or move with a lever, *pry* up or *pry* loose.

***psalm** (säm), *n.* a sacred song.

***psalmody** (sal′ mō di), *n.* [*pl.* psalmodies] the singing of sacred songs or the writing of them; a book of sacred songs.

***pseudonym** (sū′ dō nim), *n.* a fictitious name.

psychic (sī′ kik), *n.* a spiritualistic medium.

psychical (sī′ kik al), *adj.* pertaining to the soul or spirit; pertaining to the mind.

***psychological** (sī kō loj′ i kal), *adj.* pertaining to the mind or the science of the mind.

***psychology** (sī kol′ ō ji), *n.* [*pl.* psychologies] the science of the mind; mental philosophy; a book on the science of the mind.

***psychopathic** (sī kō path′ ik), *adj.* afflicted with mental disorder.

***psychophysics** (sī kō fiz′ iks), *n.* the science that treats of the relations between mind and matter.

***ptomaine** (tō′ mān), *n.* an alkaloid of a highly poisonous nature, originating in decaying matter such as food.

public (pub′ lik), *n.* the people; a special following among the people, as an author needs a large *public.*

public (pub′ lik), *adj.* belonging to the people, as a *public* library; known to almost everybody; affecting the people in general, as a *public* disgrace.

publication (pub li kā′ shun), *n.* the business of printing and selling; something printed for sale, as a book or newspaper; the act or process of making anything public.

publicist (pub′ li sist), *n.* one who writes upon affairs, as international relations, political science and current events of national concern.

publicity (pub lis′ i ti), *n.* the state of being a subject of common knowledge; circulation of printed matter advertising a business, institution or cause; notoriety.

public-spirited (pub lik′ spir′ i ted), *adj.* having the interests of the community at heart.

publish (pub′ lish), *v.t.* to make known by announcing or proclaiming; to print and put on sale, as books, newspapers and magazines.

Syn. Promulgate, divulge, reveal, disclose. To *publish* is the most general of these terms, conveying the idea of making known; but it is in many respects indefinite. We may *publish* to many or few, but to *promulgate* is always to make known to many. We may *publish* that which is a domestic or a national concern; we *promulgate* properly only that which is of general interest. We *divulge* things mostly not to be known. We *divulge* the secrets of another. We *reveal* the secret or the mystery of a transaction. We *disclose* the whole affair from beginning to end.

Ant. Conceal, hide, hush, suppress.

publisher (pub′ lish ēr), *n.* a person or firm engaged in the business of printing books, magazines or newspapers and offering them for sale.

puck (puk), *n.* a hard, rubber disk used in the game of ice hockey.

pucker (puk′ ēr), *n.* a small fold or wrinkle.

pucker (puk′ ēr), *v.t. and v.i.* to gather into small folds; to wrinkle; to become drawn up into small folds, as the cloth *puckered.*

puckery (puk′ ēr i), *adj.* having a tendency to wrinkle easily, as *puckery* material; contracting to the tissues inside the mouth as a *puckery* fruit.

***pudding** (pood′ ing), *n.* a soft food, made of flour, milk, eggs and various flavorings, principally a sweetened dish used as a dessert.

puddle (pud′ l), *n.* a little pool of muddy water on a sidewalk or in a road; clay and sand kneaded when wet to make a mixture impervious to water; a heavy tamp used in packing ballast on a railroad track.

puddle (pud′ l), *v.t.* to work clay into a waterproof mixture; to line with kneaded clay; to make iron in a reverberatory furnace.

puddle iron (pud′ l ī′ ērn), iron made by subjecting pig iron and oxidizing elements to intense heat in a reverberatory furnace.

puddling (pud′ ling), *n.* the method of turning melted pig iron into wrought iron in a reverbatory furnace with oxidizing elements to remove impurities.

pudgy (puj′ i), *adj.* short and fat, as a *pudgy* figure.

***pueblo** (pweb′ lō), *n.* [*pl.* pueblos] a community dwelling place of the Pueblo Indians in the Southwest of the U. S., built of adobe and arranged in terraces.

***puerile** (pū′ ēr il), *adj.* childish.

puerility (pū ēr il′ i ti), *n.* [*pl.* puerilities] childishness; a childish act.

puff (puf), *n.* a single sudden emission of breath or gust of wind; a whiff, as a *puff* of smoke; a fungous ball filled with dust, also called *puff*ball; any of various small round objects formed as if inflated, such as a powder *puff;* a light sort of cake formed in a hollow sphere and filled with some creamlike mixture, as a cream*puff;* empty praise, especially that in a newspaper, as the drama critic gave the new actress quite a *puff.*

puff (puf), *v.i. and v.t.* to emit air, smoke, breath, in single gusts; to breathe fast and hard, as after exertion; to inflate with air or with importance, as to *puff* up with pride; to blow out in whiffs, as to *puff* smoke.

puffy (puf′ i), *adj.* [*comp.* puffier, *superl.* puffiest] distended or inflated; coming in gusts, as a *puffy* breeze; having an inflated style, as a *puffy* sort of essay.

pug dog (pug′ dôg), *n.* a small dog with face and nose like a bulldog's, and a tightly curled tail.

pugging (pug′ ing), *n.* the operation of working up clay for pottery or bricks.

***pugilism** (pū′ ji lizm), *n.* the art of boxing; prize fighting.

***pugnacious** (pug nā′ shus), *adj.* always ready to fight, quarrelsome.

pugnacity (pug nas′ i ti), *n.* readiness to fight, quarrelsomeness.

***puissant** (pū′ i sant), *adj.* powerful, strong; mighty, as a *puissant* ruler.

puling (pūl′ ing), *adj.* whining; infantile.

pull (pool), *n.* a haul, as it was a long *pull* up that hill; something operated by tugging, as a bell*pull;* the state of having influence with those in power, as in politics.

pull (pool), *v.i. and v.t.* to cause motion toward a compelling force; to drag, haul, tug.

pullet (pool′ et), *n.* a young hen.

pulley (pool′ i), *n.* [*pl.* pulleys] a turning wheel over which a rope, belt or chain runs in doing work, as in lifting weights, transmitting power to machinery.

***pulmonary** (pul′ mō ner i), *adj.* pertaining to or affecting the lungs.

***pulmotor** (pul′ mō tēr), *n.* a machine for producing artificial respiration in cases of asphyxiation.

pulp (pulp), *n.* a soft, wet mass, as the *pulp* of an orange, or the *pulp* of ground cloth or wood, from which paper is made.

pulpit (pool′ pit), *n.* an inclosed elevated reading desk in a church, from which the sermon is spoken.

pulpwood (pulp′ wood), *n.* wood that is made into a soft mass for manufacturing purposes, especially making paper.

pulpy (pul′ pi), *adj.* [*comp.* pulpier, *superl.* pulpiest] consisting of a soft, wet mass.

pulsate (pul′ sāt), *v.i.* to throb or beat.

pulsation (pul sā′ shun), *n.* a throb or beat.

***pulse** (puls), *n.* the rhythmic throb of an artery as the blood passes through, matching the beat of the heart.

pulverize (pul′ vēr īz), *v.t.* to reduce to powder.

***pumice** (pum′ is), *n.* a hard, light spongy volcanic stone, used for cleaning and polishing, as a *pumice* stone.

pump (pump), *n.* a machine to raise water or other liquids or to move gases, as an air *pump.*

pump (pump), *v.t.* to raise or move fluids by means of a machine; to seek information through persistent questioning, as I *pumped* the news out of him.

***pumpkin** (pump′ kin), *n.* a plant of the gourd family with large, round, yellow or orange-colored fruit.

pun (pun), *n.* a play upon words, exploiting similarity in sound with difference of meaning.

punch (punch), *n.* a tool for stamping or perforating; a blow with the closed hand; a drink made from fruit juices.

punch (punch), *v.t.* to make a hole or impression with a stamping or perforating tool; to strike with the fist.

punctilio (pungk til′ i ō), *n.* [*pl.* punctilios] a fine point in behavior or ceremony; fastidious preciseness.

***punctilious** (pungk til′ i us), *adj.* attentive to the fine points of etiquette or conduct.

***punctual** (pungk′ tū al), *adj.* in exact agreement with appointed time; on time.

punctuality (pungk tū al′ i ti), *n.* the characteristic of being on time.

punctuate (pungk′ tū āt), *v.i. and v.t.* to mark with points indicating breaks in the run of a sentence, as the comma or period; to interrupt, as his speech was *punctuated* with applause.

punctuation (pungk tū ā′ shun), *n.* the act or art of pointing sentences with commas, semicolons and other marks.

puncture (pungk′ tūr), *n.* a small hole made by a sharp instrument, as a *puncture* in a pneumatic tire.

puncture (pungk′ tūr), *v.t.* to make a hole in.

***pungent** (pun′ jent), *adj.* sharp and stinging to taste or to smell; sarcastic; keen, as a *pungent* wit.

***punish** (pun′ ish), *v.t.* to cause loss or pain to, as a penalty for fault or crime; to chastise, correct.

punishable (pun′ ish *a* bl), *adj.* liable to penalty.

punishment (pun′ ish ment), *n.* the act of chastising; a penalty for a crime or a fault.

punitive (pū′ ni tiv), *adj.* done as a measure of chastisement; having the nature of chastisement.

punk (pungk), *n.* decayed wood that is useful for tinder.

puny (pū′ ni), *adj.* [*comp.* punier, *superl.* puniest] inferior in strength or size; weak, as a *puny* man makes *puny* efforts.

pup (pup), *n.* a young dog, puppy.

pupa (pū′ pa), *n.* the intermediate stage in the life of an insect, after the larval stage, chrysalis.

***pupil** (pū′ pl), *n.* a young student; the dark center of the eye, the apple of the eye.

puppet (pup′ et), *n.* a small doll or image, especially one used in a mock drama, and moved by hands, wires or strings; a person controlled by another and having no initiative.

puppy (pup′ i), *n.* [*pl.* puppies] a young dog.

purblind (pûr′ blīnd), *adj.* seeing obscurely, nearly blind.

purchase (pûr′ chis), *n.* something bought; a good hold or grip on an object to lift or move it, leverage.

purchase (pûr′ chis), *v.t. and v.i.* to buy, as to *purchase* a hat; to obtain, as for a price, as to *purchase* one's freedom; to apply a mechanical device for raising or moving to; to make a purchase, as that is the suit I *purchased* last week.

***pure** (pūr), *adj.* free from physical or moral defilement; without admixture; sheer, as *pure* folly; genuine, as *pure* kindness.

purgation (pûr gā′ shun), *n.* the act of cleansing, as of physical impurities, or clearing, as of guilt.

purgatory (pûr′ g*a* tō ri), *n.* in the Roman Catholic Church, the state of purification through suffering after death from venial sins done in this life; any state of misery.

purge (pûrj), *n.* that which cleanses; removal of elements of population not desired by the governing class.

purge (pûrj), *v.i. and v.t.* to become or make free of impurities; to rid of unfriendly elements, as Hitler *purged* the Nazi party.

purify (pū′ ri fī), *v.t.* [*p.t.* and *p.p.* purified, *pr.p.* purifying] to free from corruptions or barbarisms.

purist (pūr′ ist), *n.* one who is scrupulously exact in choice of words and style of expression.

puritan (pū′ ri tan), *n.* a person who is extremely strict in his religious life and morals; one who urges a reform of the Church.

purity (pū′ ri ti), *n.* the quality of being free of blemishes and without admixture.

***purl** (pûrl), *n.* an embroidered border; a reversed knitting stitch, producing a ribbed appearance.

purl (pûrl), *n.* a small swirl of water; the sound of a murmuring stream.

purl (pûrl), *v.i. and v.t.* to invert the stitches in knitting.

purl (pûrl), *v.i.* to make a sound like the murmur of a flowing stream.

***purlieus** (pûr′ lūz), *n. pl.* environs, the outskirts of a city.

purloin (pûr′ loin), *v.t.* to steal.

purple (pûr′ pl), *n.* the color obtained by blending blue and red.

***purport** (pûr′ pōrt), *n.* meaning, signification.

purport (pûr pōrt′), *v.t.* to mean or seem to mean; to be intended for understanding in a certain way; to profess.

purpose (pûr′ pus), *n.* design, intention, a desired end.

purpose (pûr′ pus), *v.t.* to intend; to propose to oneself as an end.

purposely (pûr′ pus li), *adv.* intentionally, deliberately, as he *purposely* ignored her comment.

purr (pûr), *n.* the murmuring sound made by a cat that is comfortable and content.

purse (pûrs), *n.* a small holder for money, to be carried in the pocket or hand; a sum of money offered as a prize.

purse (pûrs), *v.t.* to pucker or wrinkle, as the lips.

purser (pûr′ sēr), *n.* a clerk on a passenger steamer having charge of tickets, accounts, freight.

pursuant (pēr sū′ ant), *adj.* acting or done in consequence of or according to.

***pursue** (pēr sū′), *v.t.* to chase; to follow, as an occupation; to seek, as to *pursue* pleasure.

***pursuit** (pēr sūt′), *n.* the act of chasing; an occupation.

purulent (pū′ roo lent), *adj.* consisting of or containing pus.

purvey (pûr vā′), *v.i. and v.t.* to procure or provide, as food.

purveyance (pûr vā′ ans), *n.* the procuring of food; the food provided.

purview (pûr′vū), *n.* extent or scope, as of a statute; sphere of authority, as a *purview* of a court.

***pus** (pus), *n.* matter secreted in sores.

push (poosh), *n.* a shove; pressure or the exertion of pressure; a major forward movement, as of military forces.

push (poosh), *v.i. and v.t.* to press against with continuing force; to shove; to promote, with steady endeavor; to dun, as to *push* a debtor.

***pusillanimity** (pū si l*a* nim′ i ti), *n.* [*pl.* pusillanimities] cowardice; a cowardly act.

***pusillanimous** (pū si lan′ i mus), *adj.* cowardly; mean-spirited.

***pustule** (pus′ tūl), *n.* a small swelling in the skin, containing pus.

put (poot), *v.t. and v.i.* to place, as to *put* the papers in the desk; to cause to be in a certain condition, as to *put* the house in order; to set, as to *put* a price on something; to express, as to *put* thoughts into words; to hurl with an overhand motion of the arm, as to *put* the shot; to betake oneself, as to *put* to sea.

Syn. Place, lay, set. One *puts* things generally, but to *put* does not define the manner of the action. We may *put* a thing here or there, but to *place* it is to *put* in a specific manner, and for a specific purpose. To *lay* and to *set* are still more specific than to *place,* the former being applied only to such things as can be made to lie, and the latter only to such things as can be made to stand. A book is *laid* on a table when *placed* in a flat position, but *set* on a shelf when *placed* upright on one end.

***putative** (pū′ ta tiv), *adj.* supposed, reputed, as the putative father of the baby.

putrefaction (pū trē fak′ shun), *n.* the process of decomposition; rottenness.

putrefy (pū′ trē fī), *v.i. and v.t.* to decay; to cause to rot.

putrescent (pū tres′ ent), *adj.* decaying, rotting.

putridity (pū trid′ i ti), *n.* rottenness.

putsch (pooch), *n.* an unsuccessful uprising against the government, especially in Germany.

putt (put), *n.* a short, careful stroke in golf to place the ball in or near the hole.

putter (put′ ẽr), *n.* a golf club used for playing a short, careful stroke.

putty (put′ i), *n.* a compound of whiting and linseed oil used to fasten glass in sashes and frames and to fill holes in wood or plaster.

puzzle (puz′ l), *n.* something that tries the ingenuity or perplexes; a riddle.

puzzle (puz′ l), *v.i. and v.t.* to think hard, as to *puzzle* over a problem; to confuse and perplex, as the situation *puzzles* me.

pygmy (pig′ mi), *n.* a very small person or thing, a dwarf: **Pygmy,** one of a dwarf people in Central Africa.

***pylorus** (pī lō′ rus), *n.* [*pl.* pylori] the opening of the stomach into the intestines.

***pyramid** (pir′ *a* mid), *n.* a solid body having triangular sides rising to an apex: *the Pyramids,* huge stone structures built as tombs for the kings of ancient Egypt.

***pyramidal** (pi ram′ i dal), *adj.* having triangular sides rising to an apex.

pyre (pīr), *n.* a funeral pile for burning the corpse.

***pyrites** (pī rī′ tēz), *n.* a native compound of sulphur with iron or copper.

***pyrography** (pī rog′ r*a* fi), *n.* the art of decorating materials, such as wood and leather, by burning designs into their surface with a hot iron.

pyromania (pī rō mā′ ni a), *n.* an insane longing to set fire.

***pyrometer** (pī rom′ ē tẽr), *n.* an instrument to measure extremely high degrees of heat, as in furnaces, and for measuring the expansion of substances under great heat.

***pyrotechnics** (pī rō tek′ niks), *n.* the art of making and handling fireworks; fireworks.

***python** (pī′ thon), *n.* a large nonvenomous serpent, the boa or anaconda.

***pyx** (piks), *n.* the box in which the consecrated wafer is kept; the box in which coins are tested in the British mint before being placed in circulation.

Q

quack (kwak), *n.* the cry of the duck; a pretender to medical skill or to skill of any kind.

quack (kwak), *v.i.* to make a noise like the cry of a duck.

quackery (kwak′ ẽr i), *n.* claim to medical skill not actually possessed; imposture.

***quad** (kwod), *n.* a quadrangle or court of a college; a block of metal used to space between type letters.

quadrangle (kwod′ rang gl), *n.* a plane figure with four angles and four sides; an open square surrounded by buildings.

quadrangular (kwod rang′ gū lẽr), *adj.* having four sides and four angles.

***quadrant** (kwod′ rant), *n.* the fourth part of a circle, contained within an angle of 90°: an arc of 90°; an instrument with which the altitude of heavenly bodies is measured, used in navigating ships.

quadrate (kwod′ rāt), *adj.* having four equal sides and four right angles.

quadratic (kwod rat′ ik), *adj.* involving the square but no higher power of an unknown quantity, as a *quadratic* equation.

quadratics (kwod rat′ iks), *n.* the part of algebra that deals with equations involving the square but no higher power of an unknown quantity.

quadrature (kwod′ r*a* tūr), *n.* the act of squaring or of determining areas: *quadrature* of a circle, the attempt to discover a formula for finding the side of a square with the same area as a given circle.

quadrennial (kwod ren′ i al), *adj.* occurring once in four years; consisting of four years, as a *quadrennial* term of office.

quadrilateral (kwod ri lat′ ẽr al), *n.* a four-sided plane figure.

***quadrille** (kwo dril′), *n.* a dance by four couples; the music for it.

quadrillion (kwod ril′ yun), *n.* the number expressed by 1 followed by 15 ciphers in France and the U. S., by 1 with 24 ciphers in Great Britain.

quadroon (kwod ro͞on′), *n.* the offspring of a white person and a mulatto; a person of quarter negro blood.

quadruped (kwod′ roo ped), *n.* a four-footed animal.

quadruped (kwod′ roo ped), *adj.* four-footed.

***quadruple** (kwod′ roo pl), *adj.* fourfold.

quadruple (kwod roo′ pl), *v.i. and v.t.* to increase fourfold; to multiply by 4.

***quadruplet** (kwod′ roo plet), *n.* a group of four of one kind; four offspring of one mother born within a few minutes of each other.

***quaff** (kwȧf), *v.t. and v.i.* to drink copiously of, as he *quaffed* the water in great swallows; to drink deeply, as he *quaffed* thirstily.

***quagmire** (kwag′ mīr), *n.* a bog; a stretch of soft, wet ground.

quail (kwāl), *n.* a bird related to the partridge; the bob white.

quail (kwāl), *v.i.* to shrink from danger, cower.

quaint (kwānt), *adj.* pleasingly old-fashioned; attractively unusual in looks or ways.

quake (kwāk), *n.* a shaking or trembling, especially an earthquake.

quake (kwāk), *v.i.* to tremble or shake; to quiver with agitation.

qualification (kwol i fi kā′ shun), *n.* the act of proving oneself fit or worthy; that which demonstrates fitness; a limitation, as to meaning of a word; fitness, as for office.

Syn. Ability, aptitude, capability, competency, skill. *Qualification* denotes the state of being fit for a special task; *ability* signifies physical or mental power to perform; *aptitude* denotes both fitness and natural disposition, as an *aptitude* for figures; *capability* refers especially to intellectual capacity; *competency* indicates the fulfillment of all requirements; *skill* usually denotes knowledge and proficiency, especially technical proficiency.

***qualify** (kwol′ i fī), *v.i. and v.t.* to be fit or to prove one's fitness for any particular service, office or employment; to make limiting statement or restricting condition about; to describe, limit or modify, as an adjective *qualifies* a noun, an adverb a verb.

qualitative (kwol′ i tā tiv), *adj.* pertaining to peculiar properties; determining the nature of component parts.

quality (kwol′ i ti), *n.* [*pl.* qualities] any peculiar power or property; essential nature, attribute, characteristic; degree of excellence, as a material of fine *quality.*

***qualm** (kwäm), *n.* a sudden fit of sickness, nausea; compunction; sudden fear.

***quandary** (kwon′ d*a* ri), *n.* [*pl.* quandaries] a state of difficulty or perplexity.

quantitative (kwon′ ti tā tiv), *adj.* pertaining to bulk, amount or number.

***quantity** (kwon′ ti ti), *n.* [*pl.* quantities] any indeterminate or measurable bulk, weight or number; a large portion, sum or mass; the length or duration of a sound, as in music or in distinguishing between short and long vowels.

quantum (kwon′ tum), *n.* the smallest amount of energy radiated or absorbed by matter, varying as the frequency of the vibration associated with the ether wave.

***quarantine** (kwor′ an tēn), *n.* the time during which a vessel suspected of carrying germs of disease is prohibited from intercourse with the shore; the place at which such vessels are held; an enforced restriction placed on a person or place because of contagious disease, as the house is in *quarantine.*

***quarrel** (kwor′ el), *n.* an angry dispute.

Syn. Feud, dispute, altercation, squabble, brawl, broil. A *quarrel* signifies an angry dispute often resulting in a broken friendship; a *feud* usually implies a quarrel of long standing, as between families or clans; *dispute* and *altercation* both denote a heated exchange of words, often over some trivial matter; a *brawl* implies a noisy quarrel, especially in a public place; a *broil* is a more general public disturbance.

quarrel (kwor′ el), *v.i.* to dispute angrily; to wrangle.

quarrelsome (kwor′ el sum), *adj.* inclined to wrangle; contentious.

quarry (kwor′ i), *n.* [pl. quarries] a place where building stone is dug out of the earth.

quarry (kwor′ i), *n.* [*pl.* quarries] game; anything hunted.

quarry (kwor′ i), *v.t.* [*p.t.* and *p.p.* quarried, *pr.p.* quarrying] to take stone from; to excavate, as to *quarry* land.

***quart** (kwôrt), *n.* a unit of liquid measure, two pints or one-fourth of a gallon; a unit of dry measure equal to one-eighth of a peck.

quarter (kwôr′ tẽr), *n.* one of four equal parts of anything; a silver coin worth one-fourth of a dollar, 25 cents; one of the four major points of the compass, as which *quarter* does the wind blow from; one of the four limbs of an animal, with the surrounding parts, for use as meat; mercy to a wounded enemy, as the victors gave no *quarter;* a section or district, as the Latin *quarter* of Paris.

quarter-deck (kwôr′ tẽr dek), *n.* the part of a ship's upper deck aft of the mainmast.

quarterly (kwôr′ tẽr li), *n.* [*pl.* quarteries] a publication issued every three months.

quarterly (kwôr′ tẽr li), *adj.* happening every three months.

quarterly (kwôr′ tẽr li), *n.* [*pl.* quarterlies] a quarter of the year.

quartermaster (kwôr′ tẽr mȧs tẽr), *n.* an officer whose function is to find food and supplies for a regiment; a petty officer of the navy who assists the navigator.

quarters (kwôr′ tẽrz), *n.* lodgings, especially for troops.

quartet (kwôr tet′), *n.* any group of four; a musical composition in four parts; the four singers or players who perform it.

quarto (kwôr′ tō), *n.* [*pl.* quartos] the size of a book or its page made by folding each sheet into four leaves with a page about 9½ by 12½ inches.

quarto (kwôr′ tō), *adj.* having four leaves to a sheet.

quartz (kwôrts), *n.* a crystalline form of silica, the commonest solid mineral, occurring in granite and many other kinds of stone.

***quash** (kwosh), *v.t.* to put down, as a rebellion; to set aside, make void, as to *quash* an indictment.

***quassia** (kwosh′ i *a*), *n.* a South American tree yielding excessively bitter bark and wood, from which a tonic is made.

***quaternion** (kw*a* tûr′ ni un), *n.* a set of four parts, things or persons.

quatrain (kwot′ rān), *n.* a stanza having four lines, which usually rhyme alternately.

quaver (kwā′ vẽr), *n.* a vibration, as of the voice.

quaver (kwā′ vẽr), *v.i.* to shake or tremble; to vibrate.

***quay** (kē), *n.* a wharf at which ships load and unload cargo.

queen (kwēn), *n.* a female ruler; consort of a king.

queenly (kwēn′ li), *adj.* [*comp.* queenlier, *superl.* queenliest] of, like, or suitable to a king's consort.

queen olive (kwēn ol′ iv), a fine, large olive grown in Spain.

queen post (kwēn pōst), one of two vertical timbers in a roof truss at equal distances from the tie beam.

queen regnant (kwēn reg′ nant), a queen in her own right.

***queer** (kwēr), *adj.* odd, singular, droll, strange.

queer (kwēr), *v.t.* to interfere with, as to *queer* one's chances.

quell (kwel), *v.t.* to crush, put down, as a riot or rebellion; to calm, allay, as rage or a fever.

quench (kwench), *v.t.* to extinguish, as a fire; to allay, as thirst.

quercine (kwûr' sin), *adj.* pertaining to the oak tree.

quern (kwern), *n.* a primitive hand mill to grind grain.

querist (kwēr' ist), *n.* one who asks a question.

***querulous** (kwer' ū lus), *adj.* fretful, complaining.

***query** (kwēr' i), *n.* [*pl.* queries] a question.

query (kwēr' i), *v.t.* to question; to challenge the correctness of.

quest (kwest), *n.* a search.

***question** (kwes' chun), *n.* an inquiry, interrogation; subject discussed.

question (kwes' chun), *v.t. and v.i.* to inquire of, query, as to *question* a witness; to dispute, challenge, as to *question* a decision; to inquire.

Syn. Ask, inquire, interrogate. To *question* or *interrogate* means to ask repeated questions in order to ascertain certain facts; to *ask* is the general term for putting a question; to *inquire* is to request information, as we *inquired* the way.

questionable (kwes' chun a bl), *adj.* open to inquiry; subject to suspicion.

questionnaire (kwes chun âr'), *n.* a set of questions to be submitted to a number of persons to acquire data for a general survey or report.

queue (kū), *n.* the tail of a wig; a braid of hair hanging down the back; a waiting line, as of people or vehicles.

***quibble** (kwib' l), *n.* a petty argument advanced to evade the truth; a diversion from the point under discussion.

quibble (kwib' l), *v.i.* to evade the truth by intruding petty arguments; to cavil, as to *quibble* over the meaning of a word.

quick (kwik), *adj.* lively, animated, active, brisk, ready, hasty.

quicken (kwik' en), *v.i. and v.t.* to act or move with more speed, as the story *quickens;* to cause to act or move more rapidly, as you should *quicken* the action in your story; to refresh, as the cool breeze *quickened* me.

quicklime (kwik' līm), *n.* lime burned and unslaked.

quicksand (kwik' sand), *n.* a bed of wet sand so loose and mobile that any heavy body sinks into it.

quicksilver (kwik' sil vẽr), *n.* mercury; an amalgam of tin and mercury.

quick time (kwik tīm), a marching rate, in the U. S. army, of 128 30-inch steps per minute.

quick-witted (kwik wit' ed), *adj.* mentally alert, as a *quick-witted* answer.

quiddity (kwid' i ti), *n.* [*pl.* quiddities] the essence of anything; a trifling nicety.

quidnunc (kwid' nungk), *n.* one who is curious about what goes on around him, a gossip.

quiescent (kwī es' ent), *adj.* inactive, still.

***quiet** (kwī' et), *n.* absence of noise, stillness, silence, peace.

quiet (kwī' et), *adj.* noiseless; tranquil; not conspicuous, as *quiet* colors.

quiet (kwī' et), *v.i. and v.t.* to become silent; to calm or pacify; to still, hush, tranquillize.

quietude (kwī' e tūd), *n.* a state of stillness, repose, tranquillity.

***quietus** (kwī ē' tus), *n.* that which causes suspension or cessation of action; death; final settlement of an account.

quill (kwil), *n.* a large feather of a bird's wing or tail; the hollow stem of a feather; one of the long sharp spines of the porcupine; a feather with the end of the shaft sharpened to use as a pen; a plectrum or pick for a stringed instrument, made from the shaft of a feather.

quilt (kwilt), *n.* a bed covering with a layer of soft material between two pieces of cloth.

quilt (kwilt), *v.i. and v.t.* to work at the making of a quilt; to interline, in the same way that a quilt is made.

quilting (kwilt' ing), *n.* the making of quilts; the material from which quilts are made.

quilting bee (kwilt' ing bē), a social gathering at which quilts are made.

***quince** (kwins), *n.* a small, tough tree with hard yellow-skinned fruit, sometimes used in making jelly.

***quinine** (kwī' nīn), *n.* an alkaline substance obtained from the bark of the cinchona tree used as a tonic and as a remedy for malaria.

quinquennial (kwin kwen' i al), *adj.* occurring every five years; lasting five years.

quinsy (kwin' zi), *n.* a severe soreness of the throat and tonsils with inflammation, swelling and pus.

quint (kwint), *n.* a set or sequence of five.

quintessence (kwint es' sens), *n.* concentrated essence; typical example.

***quintessence** (kwint es' ens), *n.* the concentrated essence of anything; a typical embodiment, as he is the *quintessence* of patriotism.

quintillion (kwin til' yun), *n.* a thousand quadrillions, 1 followed by 18 ciphers, in France and the U.S.; a million quadrillions, 1 followed by 30 ciphers, in Great Britain.

quintet (kwin tet'), *n.* a musical composition for five voices or instruments; the five performers; any set of five.

quintuple (kwin' tū pl), *adj.* fivefold, multiplied by five.

quintuplets (kwin' tū plets), *n.* five offspring of the same mother born within a few minutes of each other.

quip (kwip), *n.* a sarcastic remark, clever retort.

quire (kwīr), *n.* a unit of measure of paper, one-twentieth of a ream or 24 sheets; formerly, four sheets folded to make eight leaves.

quirk (kwûrk), *n.* a quick twist or flourish of the pen; a quick play of fancy; a quip, quibble, clever evasion.

***quit** (kwit), *v.i. and v.t.* to cease; to desist from; to resign; to discharge a debt.

quite (kwīt), *adv.* wholly, completely, entirely.

quits (kwits), *adj.* on even terms, all square.

quittance (kwit' ans), *n.* discharge of a debt.

quitter (kwit' ẽr), *n.* one who gives up a task before it is finished, a shirk.

quiver (kwiv' ẽr), *n.* a case to hold arrows; a tremor.

quiver (kwiv' ẽr), *v.i.* to tremble, shake.

***quixotic** (kwiks ot' ik), *adj.* chivalrous to the point of being ridiculous; queer, eccentric.

quiz (kwiz), *n.* a test, as of a class, by questions; an enigma or obscure question designed to puzzle.

quiz (kwiz), *v.t.* to puzzle with odd questions; to make fun of; to test, as a class in school, with questions.

quizzical (kwiz' i kal), *adj.* having fun while pretending to be serious, bantering, teasing, as a *quizzical* look.

***quoin** (koin), *n.* an exterior angle of a building, or one of the shaped stones used to make it; a wedge-shaped printing device used to lock type in a frame.

***quoit** (kwoit), *n.* a flat, iron ring pitched at a peg in the game called *quoits.*

***quorum** (kwō' rum), *n.* the number of members whose presence is required before a meeting can legally take action.

quota (kwō' t*a*), *n.* the part or share assigned to each, either in work to be done, money to be collected or advantages reaped.

quotation (kwō tā' shun), *n.* the act of repeating the words of another; that which is repeated; current price in a market.

quote (kwōt), *v.t. and v.t.* to repeat or copy a passage from another's speech or writing; to state the current price of in a market.

***quoth** (kwōth), *v.i.* said: an archaic form, usually followed by the subject noun or pronoun.

***quotient** (kwō' shent), *n.* the number resulting from division of one number by another.

R

rabbet (rab' et), *n.* a cut in one piece of wood to permit joining with another piece; a joint made in this way.

rabbet (rab' et), *v.t.* to join two pieces of wood by making cuts in one or both.

***rabbi** (rab' ī), *n.* [*pl.* rabbis] a Jewish interpreter and teacher of the law.

rabbit (rab' it), *n.* a small burrowing rodent related to the hare, with long ears and a short fluffy tail; *Welsh rabbit,* a dish of melted or toasted cheese on toast or crackers, sometimes called *rarebit.*

rabble (rab' l), *n.* an iron bar to stir hot metal in puddling.

rabble (rab' l), *n.* a mob, a noisy crowd: *the rabble,* the riffraff element in the common people.

rabid (rab' id), *adj.* furious, raging; fanatic; having rabies or pertaining to rabies, as a *rabid* sympton, a *rabid* dog.

***rabies** (rā bi ēz), *n.* a fatal disease of the nervous system, especially of dogs and other carnivorous animals, transmitted only by the bite of an infected animal; hydrophobia.

raccoon (ra ko͞on'), *n.* a small, arboreal, carnivorous animal of North America with a bushy ringed tail; the fur of this animal.

***race** (rās), *n.* a swiftly coursing channel of water, as a mill*race;* a contest of speed; the groove holding the balls in a ball bearing.

race (rās), *n.* a division of mankind having traits that set it apart as a distinct human type, as the white *race;* a tribe, people or group of peoples or a nation descended from the same common stock or having the same root language or culture, as the Latin *race;* family, lineage, as to come of a royal *race.*

race (rās), *v.i. and v.t.* to run swiftly; to take part in a contest of speed, as time *races,* the stream *races,* life *races* away; horses *race.*

racial (rā' shal), *adj.* pertaining to stock or lineage.

rack (rak), *n.* a mass of high, broken clouds.

rack (rak), *n.* a framework on which to hang clothes; a barred grating on a manger to hold fodder; a framework on a hay wagon; a bar with teeth that mesh with those of a geared wheel.

rack (rak), *n.* an old-time apparatus to inflict torture by stretching the body; anguish, physical or mental.

rack (rak), *v.t.* to strain, stretch or exert; to torture.

racket (rak' et), *n.* noise of a confused kind; a confusion of noises.

racket (rak' et), *n.* an organized criminal operation systematically exacting tribute from legitimate business and thus from the public in general.

racket (rak' et), *n.* a frame filled with network of catgut used to strike the ball in tennis and other games.

racy (rās' i), *adj.* [*comp.* racier, *superl.* raciest] lively, stimulating, colorful, colloquial, as a *racy* style of writing.

raddle (rad' l), *n.* a structure, as a hedge, hurdle, gate, fence or door, made by intertwining sticks or branches.

raddle (rad' l), *n.* red ocher.

raddle (rad' l), *v.t.* to paint red.

radial (rā' di al), *adj.* spreading, like rays of light; pertaining to the radius, the bone of the forearm.

radial engine (rā' di al en' jin), an internal combustion engine with cylinders attached arranged like spokes in a hub.

radiance (rā' di ans), *n.* brilliant brightness.

Syn. Brilliancy. *Radiance* denotes the emission of rays, and is, therefore, peculiarly applicable to bodies naturally luminous, like the heavenly bodies. *Brilliancy* denotes the whole body of light emitted, and may, therefore, be applied equally to natural and artificial light.

***radiant** (rā' di ant), *adj.* emitting rays of light or heat; shining, brilliant, as *radiant* beauty; beaming with joy, love or hope, as a *radiant* face.

***radiate** (rā' di āt), *v.i. and v.t.* to emit rays of light or heat; to give forth, diffuse, as to *radiate* courage.

radiation (rā di ā' shun), *n.* the emission of rays of light or heat.

radiator (rā' di ā tẽr), *n.* a coil or drum throwing out heat; any appliance used to cool by spreading water or air, as the *radiator* of an automobile.

radical (rad′ i kal), *n.* a simple root word or the root of a word; a fundamental; a root in mathematics; the sign of the extraction of a root in mathematics; an extremist, especially one who advocates complete political or social reforms.

radical (radi′ kal), *adj.* fundamental; going to the roots of anything; revolutionary.

radicate (rad′ i kāt), *v.i. and v.t.* to take root; to plant, establish.

radio (rā′ di ō), *n.* [*pl.* radios] a system of sending and receiving signals, messages, speeches, music and other sounds, by electric waves without the use of connecting wires; radiotelegraphy and radiotelephony; a radio receiving set.

radioactive (rā′ di ō ak′ tiv), *adj.* emitting rays of energy or rays of electrified particles; exhibiting the properties possessed by radium.

radio beacon (rā′ di o bē′ kun), a transmitting station that sends out special signals to serve as direction finders for ships at sea and aircraft aloft.

radio-frequency (rā di ō frē′ kwen si), *n.* a succession of vibrations too fast to be perceived by the ear, more than 15,000 per second.

radiogram (rā′ di ō gram), *n.* a message sent by radiophone or by wireless telegraphy.

radiograph (rā′ di ō grȧf), *n.* a picture made on a photographic plate by means of radiation other than light; an X-ray photograph.

radiography (rā′ di og′ rȧ fi), *n.* the process of making radiographs.

radiometer (rā di om′ ē tẽr), *n.* an instrument to measure radiant energy.

radiophone (rā′ di ō fōn), *n.* a wireless telephone.

*__radiotelegraphy__ (rā di ō tē leg′r*a* fi), *n.* wireless telegraphy.

radiotherapy (rā di ō ther′*a* pi), *n.* the use of radioactivity to treat disease.

radish (rad′ ish), *n.* a garden plant with a pungent fleshy root which is eaten without cooking.

radium (rā′ di um), *n.* a rare metallic element, found in pitchblende and possessing strong radioactivity with no apparent loss of energy or weight from giving out actinic rays.

*__radius__ (rā′ di us), *n.* [*pl.* radii] a straight line from the central point of a circle or sphere to its circumference or surface; one of two bones of the human forearm or of the front leg of higher vertebrates.

radix (rā′ diks), *n.* a root; the root or first form of a word; the base of a system of logarithms.

radon (rā′ don), *n.* a heavy gaseous element resembling argon, but radioactive.

raff (raf), *n.* a jumbled heap; the rabble, as in riff*raff*.

raffle (raf′ l), *n.* a drawing for a prize to be won by one of the individuals who collectively provide it.

raffle (raf′ l), *n.* rubbish, waste.

raffle (raf′ l), *v.t.* to put up as a prize on which chances are sold.

*__raft__ (rȧft), *n.* a floating platform, made of logs, planks or metal supported by buoyant cylinders, to carry a load by water or for use as a life*raft* at a bathing beach.

raft (rȧft), *v.i.* to work on a float of logs; to transport by float.

rafter (rȧf′ tẽr), *n.* one of the sloping beams in a roof.

rag (rag), *n.* an old piece of cloth: *rags,* old, worn and tattered clothes, he was in *rags* and tatters.

ragamuffin (rag′ *a* muf in), *n.* a ragged, mischievous loafer.

rage (rāj), *n.* anger, fury.

ragged (rag′ ed), *adj.* worn out; tattered; dressed in tatters.

*__ragout__ (ra gōō′), *n.* a highly seasoned stew.

ragtime (rag′ tīm), *n.* rhythm marked by syncopation of the melody; music having a syncopated melody standing out against a regular rhythmic accompaniment.

*__raid__ (rād), *n.* a hostile or predatory incursion; an attack by airplanes, or a night attack on the enemy's trenches; a forced entrance by police upon premises where gambling or other offenses are going on.

*__raid__ (rād), *v.t.* to attack suddenly and return quickly; to enter and make arrests in enforcing the law.

rail (rāl), *n.* a horizontal bar in a fence; a horizontal bar along the side of a deck, stairway or balcony, to protect those passing; one of a series of long flanged steel bars forming a track for trains.

rail (rāl), *n.* a wading bird related to the cranes; a marsh-hen or crake.

rail (rāl), *v.t.* to equip with rails, to fence.

rail (rāl), *v.i.* to scold or scoff, address with bitter, scornful language.

railhead (rāl′ hed), *n.* the furthest point to which a track has been laid in construction of a railroad.

railing (rāl′ ing), *n.* material for rails; a fence made of posts and rails.

*__raillery__ (rāl′ ẽr i), *n.* [*pl.* railleries] satire touched with pleasantry, kindly ridicule, banter.

railroad (rāl′ rōd), *n.* a line of track consisting of two parallel lines of heavy steel rails laid on ties over a ballasted roadbed, on which cars are drawn by steam or electric engines; a system of such trackage, with equipment, as rolling stock, stations, roundhouses, shops, signals.

railway (rāl′ wā), *n.* a railroad carrying lighter traffic, as a trolley *railway.*

raiment (rā′ ment), *n.* clothing, garments.

rain (rān), *n.* water in drops discharged from the clouds; anything likened to rain with its countless drops, as a *rain* of bullets.

rain (rān), *v.i. and v.t.* to fall in drops from the clouds; to fall like rain; to cause to occur as if in showers, as to *rain* compliments upon one.

rainbow (rān′ bō), *n.* the bow or arc formed in the sky opposite the sun by sunlight shining through raindrops or mist and showing the colors of the spectrum.

rainfall (rān′ fôl), *n.* the amount of rain that falls upon a given area in a given time.

rainy (rān′ i), *adj.* [*comp.* rainier, *superl.* rainiest] abounding with rain, as a *rainy* region, a *rainy* day.

raise (rāz), *v.t.* to cause to rise; to lift up; to cause to grow, as to *raise* a crop; to collect, as to *raise* a fund; to build, erect, as to *raise* a building; to bring up from below, as to *raise* a sunken ship; to put on a higher level, as to *raise* prices.

raisin (rā′ zn), *n.* a dried grape of a special variety.

rake (rāk), *n.* a farmer's or gardener's toothed implement with a long handle, sometimes mounted on wheels, and used to smooth the soil or collect loose hay, leaves or litter from the ground.

rake (rāk), *n.* a dissolute man.

rake (rāk), *n.* inclination from the perpendicular, as the slant of a mast or funnel.

rake (rāk), *v.i. and v.t.* to use a rake; to gather or smooth with a rake, as to *rake* a lawn; to gather with a rake, as to *rake* leaves.

rake (rāk), *v.i.* to slant, as a ship's mast.

rake (rāk), *v.t.* to direct gunfire lengthwise, as our guns *raked* the deck of the ship.

rake (rāk), *v.t.* to cut a wing tip of an airplane back at an angle so that the after part is wider than the forward part.

rally (ral′ i), *n.* [*pl.* rallies] a recovery from disorder or depression, as the team made a *rally* on the goal line, there was a strong *rally* in stocks; a mass meeting, as there will be a football *rally* tonight.

rally (ral′ i), *v.i. and v.t.* to recover after disorder or depression; to reassemble, as troops in retreat; to revive, as you must *rally* your drooping spirits.

ram (ram), *n.* a male sheep; an apparatus for battering; the plunger of a force pump; the pounding weight used in a pile driver.

ram (ram), *v.t.* to force down by heavy impacts; to drive against, hard.

ramble (ram′ bl), *n.* aimless wandering from place to place; an idle stroll.

ramble (ram′ bl), *v.i.* to roam about; to go from place to place idly; to wander in thought; to talk or write without progress toward a definite conclusion.

rambling (ram′ bling), *adj.* wandering; low and spread out, as a *rambling* house; not sticking to the point, digressive, as a *rambling* speech.

ramification (ram i fi kā′ shun), *n.* a division or separation into branches, a subdivision, as the subject has many *ramifications.*

ramify (ram′ i fī), *v.i. and v.t.* to spread out into branches; to separate into divisions.

*__ramose__ (rā′ mōs), *adj.* branched, branching, having branches.

ramp (ramp), *n.* a slope connecting two levels for vehicles or pedestrians.

rampage (ram′ pāj), *n.* a state of great excitement, as he is on the *rampage.*

rampage (ram pāj′), *v.i.* to storm and rage; to be furious.

rampant (ram′ pant), *adj.* overleaping restraint or natural bounds; rearing on the hind legs with one foreleg raised above the other, as a lion *rampant* in a coat of arms.

rampart (ram′ pärt), *n.* a mound or wall surrounding a fortified place; anything interposing between a threatened person and the source of the threat, as wealth is a *rampart* against need.

ramrod (ram′ rod), *n.* a rod used to push down the charge of a muzzle-loading gun.

ramshackle (ram′ shak l), *adj.* dilapidated, rickety.

*__ranch__ (ranch), *n.* a large cattle, horse or sheep farm; a large plantation of one crop, as a fruit *ranch.*

rancid (ran′ sid), *adj.* having the rank smell or taste of spoiled fat, as this butter is *rancid.*

*__rancor__ (rang′ kẽr), *n.* deep and spiteful dislike; implacable enmity.

rancorous (rang′ kẽr us), *adj.* malignant, spiteful.

random (ran′ dum), *n.* a haphazard course; lack of definite purpose, as at *random.*

random (ran′ dum), *adj.* without definite aim, haphazard.

range (rānj), *n.* a line or row, a series, as a mountain *range;* an area over which livestock may roam or feed; compass, reach, scope, as the *range* of prices, the *range* of a voice, the gun has a long *range;* line or direction, as to keep in *range* with a buoy; the whole region in which a plant or animal is naturally found; a place for target shooting, as a rifle *range;* a kitchen stove.

*__range__ (rānj), *v.i. and v.t.* to wander widely and freely; to differ within limits, as the prices *range* from $5 to $10; to set in rows; to place in a certain order.

ranger (rān′ jẽr), *n.* a rover; the keeper of a royal English park or forest; one of a body of mounted men who patrol an extensive area; a forest guard.

rangy (rān′ ji), *adj.* [*comp.* rangier, *superl.* rangiest] long-limbed and lank.

*__rank__ (rangk), *n.* a row of objects or men; station or position in life or in an organization; a grade of official position, as the *rank* of major.

rank (rangk), *v.i. and v.t.* to hold a certain position, as he *ranks* high in the organization; to rate, as I *rank* him high among those in his profession.

rank (rangk), *adj.* coarse and abundant in growth, as *rank* vegetation; strong and offensive, as a *rank* odor.

rankle (rang′ kl), *v.i.* to fester; to irritate, as the remark *rankled.*

*__ransack__ (ran′ sak), *v.t.* to search minutely; to plunder.

ransom (ran′ sum), *n.* money asked or paid for release of a captive.

ransom (ran′ sum), *v.t.* to free from captivity by payment of money.

rant (rant), *n.* noisy, empty declamation.

rant (rant), *v.i.* to bluster; to be noisily wordy; to shout and gesture.

rap (rap), *n.* a quick, sharp, light blow.

rap (rap), *v.t.* to strike with a quick blow.

*__rapacious__ (r*a* pā′ shus), *adj.* given to plundering; seeking prey; grasping.

Syn. Greedy, ravenous, voracious. *Rapacious* carries the idea of violence; it describes the quality that characterizes a beast of prey. *Greedy* means having an over-keen appetite for food or gain; *ravenous* describes a savage manner of eating; *voracious* means consuming in great quantities and ceaselessly, as sea gulls are *voracious* eaters, he is a *voracious* reader.

rape (rāp), *n.* a taking by force, robbery.

rape (rāp), *v.t.* to seize and take by force.

rapid (rap′ id), *adj.* fast-moving, very swift.

rapids (rap′ idz), *n.* a part of a river where the water rushes in a swift descent generally over a rocky stretch.

rapier (rā′ pi ẽr), *n.* a long slender-bladed sword for thrusting.

***rapine** (rap′ in), *n.* pillage and destruction.

***rapprochement** (ra prôsh′ män), *n.* a state of agreement; an understanding, as between two governments.

rapscallion (rap skal′ yun), *n.* a rascal.

rapt (rapt), *adj.* transported with delight.

rapture (rap′ tūr), *n.* ecstasy, great joy.

rare (râr), *adj.* [*comp.* rarer, *superl.* rarest] uncommon; precious because scarce; not cooked thoroughly, as meat.

Syn. Curious, extraordinary, infrequent, precious, scarce, strange, unique. That which is *rare* is *infrequent* of its kind; that which is *unique* is alone of its kind. Great poems are *rare;* "Paradise Lost" is *unique. Rare* has the added sense of *precious,* as a *rare* gem. *Extraordinary* is a neutral word, and we may have *extraordinary* virtue or *extraordinary* wickedness.

Ant. Common, ordinary, plentiful.

rarebit (râr′ bit), *n.* a Welsh rabbit, a dish of toasted or melted cheese on toast or crackers.

rare earth (râr ûrth), **rare earth metal** (met′ l), one of a group of metals with properties common to all the group, occurring in various minerals; as cerium, terbium and yttrium are *rare earth metals.*

***rarefaction** (râr ē fak′ shun), *n.* the act of rendering less dense.

***rarefy** (râr′ ē fī), *v.i. and v.t.* to make or become thin or less dense.

rarely (râr′ li), *adv.* seldom.

***rarity** (rar′ i ti), *n.* [*pl.* rarities] thinness; scarceness; excellence.

***rascal** (ras′ kal), *n.* a mean fellow; a tricky person.

rascality (ras′ kal′ i ti), *n.* [*pl.* rascalities] the state of being mean and tricky; an act such as is to be expected from such a person.

rash (rash), *n.* an eruption of red spots on the skin.

rash (rash), *adj.* hasty; reckless, lacking caution and prudence.

rasher (rash′ ẽr), *n.* a thin slice as of bacon or ham.

***rasp** (ràsp), *n.* a coarse file.

rasp (ràsp), *v.i. and v.t.* to grate; to make a grating noise; to grind with a coarse file.

***raspberry** (raz′ ber i), *n.* [*pl.* raspberries] a bramble or prickly shrub of the rose family with juicy fruit, usually red or black.

rat (rat), *n.* an animal like the mouse but larger and more voracious.

ratable (rāt′ *a* bl), *adj.* subject to taxation; capable of being rated or estimated.

ratchet (rach′ et), *n.* a hinged piece that goes over the teeth of a geared wheel as it moves but drops in behind each tooth as it passes and prevents reverse revolution.

ratchet wheel (rach′ et hwēl), a toothed wheel with a ratchet to prevent reverse revolution.

rate (rāt), *n.* ratio or proportion; price, according to a scale or standard, as *rates* at a hotel, postage *rates;* the amount or degree of one thing measured in terms of another, as a *rate* of miles per hour.

rate (rāt), *v.i. and v.t.* to belong in a certain class, have a certain standing or rank; to appraise, value, fix the value or degree of, as I *rate* studiousness high among the virtues.

***rather** (ràth′ ẽr), *adv.* more willingly, preferably as I would *rather* stay home; instead, as take me *rather* than another; somewhat, as come *rather* early.

ratification (rat i fi kā′ shun), *n.* the act of confirming, as the *ratification* of the 18th Amendment came in wartime.

ratify (rat′ i fī), *v.t.* to express formal approval and acceptance of; to confirm, as to *ratify* a treaty.

***ratio** (rā′ shō), *n.* [*pl.* ratios] the relation or proportion of one quantity to another.

***ratiocination** (rāsh i os i nā′ shun), *n.* the process of thinking a thing to a conclusion, reasoning.

***ration** (rā′ shun), *n.* an allowance, especially a daily allowance of food in the army or navy.

***ration** (rā′ shun), *v.t.* to furnish with an allowance of food or other supplies, distribute, as *ration* it out among the men.

***rational** (rash′ un al), *adj.* according to reason.

***rationale** (rash un ä′ lē), *n.* a reasoned exposition; the underlying principles or reason.

rationalism (rash′ un al izm), *n.* a doctrine which makes the basis for interpreting the universe human reason rather than sense perceptions or divine revelation.

rationality (rash un al′ i ti), *n.* the power or practice of reasoning.

rationalize (rash′ un al īz), *v.t.* to explain in terms of human reasoning, justify according to reason; to divest of all unreasonable or unexplainable elements, as to *rationalize* a miracle; to standardize by scientific management.

ratline (rat′ lin), *n.* a rope forming one of the rounds of a ladder in a ship's rigging, strung between shrouds.

***rattan** (ra tan′), *n.* a climbing palm with long, smooth, reedlike stems; a stem from such a palm; a walking stick made from this stem; wickerwork made of these flexible stems.

rattle (rat′ l), *n.* a swift, continuous succession of short, sharp sounds, as the *rattle* of hail on a roof; a child's toy that makes a clattering sound.

rattle (rat′ l), *v.i. and v.t.* to make a continuous clattering sound; to cause to make such a sound, as to *rattle* a stick on a picket fence; to move with such a sound, as the cart *rattled* over the rough road.

rattler (rat′ lẽr), *n.* one who or that which rattles; a rattlesnake.

rattlesnake (rat′ l snāk), *n.* a venomous snake with hard bony rings on its tail that produce a rattling sound.

raucous (rô′ kus), *adj.* rough sounding, harsh, hoarse.

ravage (rav′ ij), *v.i. and v.t.* to cause ruin; to lay waste, pillage and burn.

ravage (rav′ ij), *n.* pillage and destruction; havoc; waste, as the *ravages* of disease.

rave (rāv), *v.i.* to talk like a madman; to wander mentally; to be delirious.

ravel (rav′ l), *v.i. and v.t.* to become unwoven or unwound; to fray.

raven (rā′ ven), *n.* a glossy black bird of the crow family.

raven (rav′ en), *v.i. and v.t.* to seek and devour prey; to devour greedily.

***ravenous** (rav′ en us), *adj.* rapacious and voracious; greedy for food.

ravine (ra vēn′), *n.* a deep gully worn by the action of a stream or torrent.

***ravish** (rav′ ish), *v.t.* to seize and carry away by force; to transport with delight or joy.

***raw** (rô), *adj.* uncooked; unprepared, in the natural state, as *raw* materials.

rawboned (rô bōnd′), *adj.* with the bones sticking out; very lean, gaunt.

rawhide (rô′ hīd), *n.* untanned skin; a cowhide whip.

ray (rā), *n.* a line of light proceeding from a radiant point; a beam of energy from a central source, as a heat *ray;* a line of radiation; a glimmer, as a *ray* of understanding.

rayon (rā′ on), *n.* a fiber resembling silk made from cellulose by forcing it through small holes and drying the threads thus formed; the cloth made from these fibers.

raze (rāz), *v.t.* to level to the ground, tear down, as a building.

razor (rāz′ ẽr), *n.* a sharp blade in a handle for cutting hair smooth to the skin.

reach (rēch), *n.* the distance within which one can touch anything; the act of stretching out to touch or grasp, as it took a long *reach* to get the apple, within *reach;* a straight-ahead stretch, as a long *reach* of the river; the bar that connects the rear axle of a wagon with the front; the distance a ship sails on one tack.

reach (rēch), *v.i. and v.t.* to stretch out in order to touch, as he *reached* for it; to arrive at, as we *reached* our first stopping place that night.

react (rē akt′), *v.i.* to act in return, have a return influence, rebound; to respond to a stimulus.

reaction (rē ak′ shun), *n.* return action, an opposite tendency, as conservatism is the *reaction* to radicalism; response, as honesty is the *reaction* to trust, one's *reaction* to good news.

read (rēd), *v.i. and v.t.* [*p.t.* and *p.p.* read (*red*), *pr.p.* reading] to take the meaning of written or printed words through the eye and the mind; to peruse.

readable (rēd′ *a* bl), *adj.* fit to be read; easy to peruse; entertaining.

reader (rēd′ ẽr), *n.* one who reads; a book used in teaching young pupils how to read.

readiness (red′ i nes), *n.* the state of being prepared; promptness; willingness.

reading (rēd′ ing), *n.* perusal of books; printed matter; a rendition of a prose, poetical or dramatic composition; what is registered by a gauge or meter, as the *reading* of the speedometer was 65 miles.

ready (red′ i), *adj.* [*comp.* readier, *superl.* readiest] prepared; in condition for immediate action or use; prompt, quick, as a *ready* answer; willing, as *ready* to work; available, as *ready* cash.

Syn. Apt, prompt. *Ready* is in general applied to that which has been intentionally prepared for a given purpose; *prompt* is applied to that which is done with alacrity; *apt* is applied to that which is fit, or from its nature has a tendency to produce effects.

Ant. Unready, slow.

***real** (rē′ al), *adj.* actually existing, not fictitious or imaginary, genuine, true; fixed, immovable, as *real* property is distinct from personal.

real estate (rē′ al es tāt′), lands and all appertaining to them, as buildings.

***realism** (rē′ al izm), *n.* the representation in art and literature of things as they actually are: opposite of *idealism* and *romanticism.*

realistic (rē al is′ tik), *adj.* true to nature and fact, as *realistic* literature.

reality (rē al′ i ti), *n.* [*pl.* realities] that which has actual existence; fact, truth; an actual person or thing.

***realization** (rē al i zā′ shun), *n.* perception of the true nature of anything; accomplishment of a plan; turning of hope or expectation into actual happening.

realize (rē′ al īz), *v.t.* to bring into actual existence, as to *realize* a hope; to perceive, understand, as to *realize* the truth; to sell and turn into cash, as to *realize* on real estate.

***really** (rē′ al i), *adv.* actually, in truth.

realm (relm), *n.* a kingdom or empire; a domain, as the *realm* of poetry.

realty (rē′ al ti), *n.* real estate.

ream (rēm), *n.* a measure of quantity in paper: 20 quires, or 480 sheets; a printer's ream, 516 sheets.

reap (rēp), *v.i. and v.t.* to gather grain; to receive a reward; to gather, as grain.

rear (rēr), *n.* the back part or last part, as the *rear* of a car, the *rear* of a procession; space behind, as the henhouse is at the *rear* of the stables.

rear (rēr), *v.i. and v.t.* to rise, as the horse *rears* on its hind legs; to raise or build, as they *reared* a house.

rear admiral (rēr ad′ mi ral), a naval officer ranking next below a vice-admiral.

***reason** (rē′ zn), *n.* the mental faculty which enables man to deduce principles from facts and to distinguish between right and wrong; a motive for action, as the *reason* for my doing it was simple; sanity, sense; a sane view, as that sounds like *reason.*

reason (rē′ zn), *v.i.* to exercise the mental powers of induction and deduction; to argue; to consider both sides, debate, as let us *reason* it out.

reasonable (rē′ zn *a* bl), *adj.* able to proceed, step by step, in thought, to a proper conclusion; governed by sound sense; moderate; acceptable.

reasoning (rē′ zn ing), *n.* the process of arriving at sound conclusions through inferences and deductions; a course of argument.

***rebate** (rē′ bāt), *n.* a discount or refund.

***rebate** (rē′ bāt), *v.t.* to allow a discount on; to return part of.

***rebel** (reb′ el), *n.* one who revolts against authority.

***rebel** (rē bel′), *v.i.* to revolt against authority; to take arms against one's government or sovereign.

rebellion (rē bel′ yun), *n.* the act of resisting the government; open defiance of constituted authority; insubordination.

rebellious (rē bel′ yus), *adj.* defying lawfully constituted authority; resisting control.

***rebound** (rē bound′), *n.* the act of springing back to place after a shock or blow.

rebound (rē bound′), *v.i.* to spring back after a shock or blow.

rebuff (rē buf′), *n.* an abrupt refusal; a snub; any sharp check or repulse.

rebuff (rē buf′), *v.t.* to repel sharply; to snub; to beat back.

rebuke (rē būk′), *n.* a reprimand, reproof.

rebuke (rē būk′), *v.t.* to reprove sharply, reprimand, chide.

rebus (rē′ bus), *n.* [*pl.* rebuses] an enigmatic representation of a word, words or phrase by pictures or symbols.

rebuttal (rē but′ al), *n.* the act of answering directly an opponent's arguments in debate; giving evidence to offset evidence offered by the opposite side in a lawsuit.

***recalcitrant** (rē kal′ si trant), *adj.* refractory; stubbornly refusing to comply, obstinate.

recall (rē kôl′), *n.* the act of summoning back; a signal ordering troops back from an advance; the power of an electorate to remove from office one whom it has previously elected.

recall (rē kôl′), *v.t.* to summon back, as to *recall* a messenger; to bring back to mind, as to *recall* something that happened last year; to take back, as to *recall* an offensive remark.

recant (rē kant′), *v.i. and v.t.* to renounce opinions formerly asserted; to withdraw; to abjure.

recantation (rē kan tā′ shun), *n.* a declaration recalling and canceling a former one.

recapitulate (rē *ka* pit′ ū lāt), *v.i. and v.t.* to go over the main points of what has already been said; to summarize.

recede (rē sēd), *v.i.* to move back; to retreat.

recede (rē sēd′), *v.t.* to deed back to a former owner.

***receipt** (rē sēt′), *n.* the act of receiving or the state of being received, as on *receipt* of your letter; a written acknowledgment of payment or of a shipment's having been properly delivered; that which is taken in, as today's *receipts;* a recipe.

receipt (rē sēt′), *v.t.* to sign in acknowledgment of something paid or delivered.

receive (rē sēv′), *v.t.* to take or accept, as a gift, payment, or goods in a business transaction; to welcome and entertain, as guests.

receiver (rē sēv′ ẽr), *n.* a recipient; a person appointed by a court to manage a property in controversy, especially in bankruptcy.

receiving set (rē sēv′ ing set), apparatus for receiving radio signals, messages and programs.

recension (rē sen′ shun), n. expert revision, as of a text; a revised text.

recent (rē′ sent), *adj.* of late origin or occurrence; new.

***receptacle** (rē sep′ ta kl), *n.* something to hold other things, a container, as a pocketbook is a *receptacle* for money.

reception (rē sep′ shun), *n.* the act of receiving or taking; receipt; a formal entertainment with many guests; acceptance, as the book found wide *reception.*

receptive (rē sep′ tiv), *adj.* ready to take in and hold; quick to take in impressions, and strong in holding perceptions, as a *receptive* mind.

***recess** (rē ses′), *n.* an alcove; a secluded nook; a short intermission in work.

recession (rē sesh′ un), *n.* withdrawal.

recession (rē sesh′ un), *n.* the act of deeding a property back.

recessional (rē sesh′ un al), *n.* the hymn sung at the close of a church service while the clergy and the choir are withdrawing.

***recipe** (res′ i pē), *n.* a formula for mixing a medicine, directions for preparing a dish for the table.

recipient (rē sip′ i ent), *n.* one who receives, as the *recipient* of favors.

***reciprocal** (rē sip′ rō kal), *adj.* mutual; interchangeable.

reciprocate (rē sip′ rō kāt), *v.i. and v.t.* to repay in kind, as to *reciprocate* a favor; to give in return for.

***reciprocity** (res i pros′ i ti), *n.* [*pl.* reciprocities] an arrangement between two parties for mutual advantage, as nations in permitting each other's goods to pass the border without paying tariff.

***recital** (rē sīt′ al), *n.* narration; a statement of particulars; a musical performance by one person or from the works of one composer.

recitation (res i tā′ shun), *n.* a public reading; delivery of a composition committed to memory; the answering of a teacher's questions by pupils in class.

recite (rē sīt′), *v.i. and v.t.* to answer questions in class at school; to repeat from memory, as she *recited* the whole poem; to tell in detail, as to *recite* their many grievances.

reckless (rek′ les), *adj.* heedless, careless, venturesome.

reckon (rek′ un), *v.i. and v.t.* to rely or count on; to make a computation; to compute, calculate, as to *reckon* the cost of a journey; to consider, as to *reckon* another among one's friends.

reckoning (rek′ un ing), *n.* calculation; an accounting; itemized bill; the calculation of a ship's position at sea or a plane's position, as to fly by dead *reckoning.*

reclaim (rē klām′), *v.t.* to demand return of, as to *reclaim* a payment made in error; to reform, as to *reclaim* a criminal; to bring to usefulness, as to *reclaim* waste land.

Syn. Reform. To *reclaim* is to bring back back to its proper place that which has gone astray; to *reform* is to form anew that which has changed its form. These verbs are allied only as they apply to the moral character. A man is *reclaimed* from his vicious courses by the force of advice or exhortation; he may be *reformed* by various means, external or internal.

recline (rē klīn′), *v.i. and v.t.* to lie down to rest; to cause to lean back.

***recluse** (rē klo͞os′), *n.* one who lives in retirement, a hermit.

recognition (rek og nish′ un), *n.* the act of knowing again or state of being known again; acknowledgment, as of a brave act.

***recognizance** (rē kog′ ni zans), *n.* an agreement before a court of record to do or not to do something, with a deposit of money to be forfeited in case of default in the obligation, as a prisoner is released for a fixed period on another's *recognizance.*

***recognize** (rek′ og nīz), *v.t.* to know again someone or something previously seen or known; to give full credit, as to *recognize* merit in an action; to give the floor to, entitle to a hearing, as to *recognize* one who wishes to speak.

recoil (rē koil′), *v.i.* to retreat, as troops *recoil* before an attack; to spring back, as a spring; to react, as a lie *recoils* on the liar.

***recollect** (rek o lekt′), *v.t.* to recall to memory.

recollect (rē ko lekt′), *v.t.* to gather together again.

recollection (rek o lek′ shun), *n.* the act of calling back to the mind; something remembered; memory, as I have no *recollection* of it.

***recommend** (rek o mend′), *v.t.* to commend to another; to introduce favorably; to advise.

recommendation (rek o men dā′ shun), *n.* the act of commending to another; a favorable introduction.

recommit (rē ko mit′), *v.t.* to submit anew, as to *recommit* a bill to a committee.

***recompense** (rek′ om pens), *n.* an equivalent given in return; compensation; reward.

recompense (rek′ om pens), *v.t.* to give an equivalent to; to requite.

***reconcilable** (rek′ on sīl a bl), *adj.* capable of being restored to a state of harmony.

reconcile (rek′ on sīl), *v.t.* to restore to a state of harmony after a break in relations; to adjust harmoniously, make consistent, as to *reconcile* science and religion.

reconciliation (rek on sil i ā′ shun), *n.* renewal of friendship after a break; the act of harmonizing or making consistent, as *reconciliation* of the contradictory stories.

***recondite** (rek′ un dīt), *adj.* deep, abstruse, learned; hidden from view, concealed.

***reconnaisance** (rē kon′ i sans), *n.* the act of reconnoitering, a survey.

***reconnoiter** (rek o noi′ tẽr), *v.i. and v.t.* [*p.t.* and *p.p.* reconnoitered, *pr.p.* reconnoitering] to examine, as the surrounding country, especially before making a military movement.

reconstruct (rē kon strukt′), *v.t.* to build again, especially something that has been destroyed or fallen into decay, as to *reconstruct* an ancient temple.

***record** (rek′ ẽrd), *n.* the facts in the history of anything; a written or printed presentation of those facts; the official report of a governmental or other body of its acts preserved for future reference; the cylinder, disk or roll from which sounds are reproduced in a phonograph or similar instrument; the best performance in any sporting event.

record (rē kôrd′), *v.t.* to make a record of; to set down for future reference; to preserve for mechanical reproduction, as to *record* an opera on the phonograph.

record (rek′ ẽrd), *adj.* best or greatest of its kind to date, as a *record* jump, a *record* volume of business.

recount (rē′ kount), *n.* a second counting, as of votes in a disputed election.

re-count (rē′ kount), *v.t.* to enumerate a second time.

recount (rē kount′), *v.t.* to recite, tell in detail, as to *recount* one's adventures.

recoup (rē ko͞op′), *v.t.* to make good, as a loss; to indemnify for a loss.

***recourse** (rē kōrs′), *n.* a source of aid or protection; an appeal for assistance, as *recourse* to a court.

recover (rē kuv′ ẽr), *v.t. and v.i.* to regain, get back after losing; to get well after sickness, or regain consciousness.

Syn. Retrieve, repair, recruit. We *repair* what has been injured; we *recruit* what has been diminished; we *recover* property from those who have sought to deprive us of it; we *retrieve* our misfortunes or our lost reputation.

re-cover (rē kuv′ ẽr), *v.t.* to cover again; to put a new cover on.

recovery (rē kuv′ ẽr i), *n.* [*pl.* recoveries] the act of getting something back; restoration to any lost state, as health.

***recreant** (rek′ rē ant), *n.* a coward; deserter.

***recreant** (rek′ rē ant), *adj.* cowardly; unfaithful to a cause.

***recreation** (rek rē ā′ shun), *n.* refreshment of strength or spirit after toil; relaxation; amusement.

recrimination (rē krim i nā′ shun), *n.* the act of meeting an accusation with an accusation; a counter accusation.

***recrudescence** (rē kro͞o des′ ens), *n.* a fresh outbreak of a disease; a second attack of illness; any renewal or reopening.

***recruit** (rē kro͞ot′), *n.* one who has just been enlisted in any cause; one who has newly joined the army or navy.

recruit (rē kro͞ot′), *v.t.* to enlist new members, as for army or navy or any organization; to recover, renew, refresh, as to *recruit* one's health or one's fortune.

rectangle (rek′ tang gl), *n.* a four-sided figure with four right angles.

rectification (rek ti fi kā′ shun), *n.* the act of setting right.

rectify (rek′ ti fī), *v.t.* to set right; to correct; to remove errors from; to refine by distillation; to change from alternating to direct electric current.

***rectitude** (rek′ ti tūd), *n.* uprightness; correctness of principles and practice; honesty.

rector (rek′ tẽr), *n.* clergyman in charge of a parish; the head of a school or college.

rectory (rek′ tō ri), *n.* [*pl.* rectories] the house of a parish head.

recumbent (rē kum′ bent), *adj.* reclining; lying down.

recuperate (rē kū′ pẽr āt), *v.t. and v.i.* to regain, as health; to recover strength, health or losses; to convalesce.

recur (rē kûr′), *v.i.* to go back to; to come back to the mind; to return, as an attack of sickness.

***recusant** (rek′ ū zant), *n.* one who refuses to conform, especially to the established church; a nonconformist.

recusant (rek′ ū zant), *adj.* refusing to conform, especially to practices of established church service.

red (red), *n.* one of the primary colors.

red (red), *adj.* having the color of red.

redbreast (red′ brest), *n.* the robin.

redden (red′ n), *v.t. and v.i.* to make or become red; to blush or flush.

reddish (red′ ish), *adj.* somewhat red.

redeem (rē dēm′), *v.* to ransom from bondage; to make atonement for, as to *redeem* a fault; to free from incumbrance, as by paying a mortgage or other debt; to pay, as a note; to fulfill, as a promise.

redeemer (rē dēm′ ẽr), *n.* one who frees by paying a price: *the Redeemer,* Christ.

***redemption** (rē demp′ shun), *n.* the act of freeing or state of being freed by payment of a ransom or price.

redemptioner (rē demp′ shun ẽr), *n.* one who came to America in Colonial times by selling his labor for a certain time in exchange for passage across the Atlantic.

red letter day (red let′ ẽr dā), a day that is fortunate or auspicious: so called because holy days were marked in red on the calendar.

***redolent** (red′ ō lent), *adj.* fragrant; odorous; suggestive, as *redolent* of youth.

redoubt (rē dout′), *n.* a field work for strengthening a military position without flanks.

redoubtable (rē dout′ a bl), *adj.* formidable; valiant.

redound (rē dound′), *v.i.* to come as a result, result, turn out, as your gift *redounds* to your credit.

***redress** (rē dres′), *n.* reparation; amends.

redress (rē dres′), *v.t.* to set right, as to *redress* a wrong; to make amends to.

re-dress (rē dres′), *v.i. and v.t.* to dress again.

redsear (red′ sẽr), *v.i.* to break or crack under the hammer, as iron when hot.

red tape (red tāp), an excessive degree of official formality, permitting small matters of rule and regulation to interfere with the progress of work.

reduce (rē dūs′), *v.i. and v.t.* to become less, as the swelling is *reducing;* to lower in rank, degrade, as to *reduce* an officer to the ranks; to lessen or lower in amount, size, value or degree; to change from one state to another, as to *reduce* wood to paper or fuel to ashes; to change to a simpler form, as to *reduce* a fraction or a chemical compound.

reducible (rē dus′ i bl), *adj.* capable of being lessened, diminished or lowered in degree.

reduction (rē duk′ shun), *n.* diminution; conquest or subjugation; the changing of quantities from one denomination to another, as *reduce* 20 quarts to gallons.

redundance (rē dun′ dans), *n.* excess, superfluity; use of unnecessary words.

reduplicate (rē dū′ pli kāt), *v.t.* to redouble, repeat.

reed (rēd), *n.* a tall grass with slender stems growing in wet land; a musical pipe made of a hollow stem; a part in a weaver's loom.

reef (rēf), *n.* the part of a sail that can be taken up by means of small ropes so as to lessen the area exposed to the wind.

reef (rēf), *n.* a ridge of rock or sand, at or close to the surface of the water; a lode, vein or ledge, as a quartz-reef.

reef (rēf), *v.i. and v.t.* to shorten sail by lessening the area of canvas exposed to the wind.

reefer (rēf′ ẽr), *n.* a sailor's jacket.

reek (rēk), *n.* smoke, steam, vapor.

reek (rēk), *v.i. and v.t.* to emit smoke or fumes; to expose to smoke.

reel (rēl), *n.* a revolving frame on which cord may be wound, as a fisherman's *reel,* a hose *reel;* a bobbin; a spool of motion picture film.

reel (rēl), *n.* a lively country dance or the music for it.

reel (rēl), *v.i. and v.t.* to wind on a reel or bobbin, as he *reeled* too much line.

reel (rēl), *v.i.* to stagger; to whirl; to dance a reel.

reeve (rēv), *v.t.* to pass a rope through a block or ring.

reeve (rēv), *n.* a business agent or petty official, as a hog-reeve, a port-reeve.

refection (rē fek′ shun), *n.* a light meal.

***refectory** (rē fek′ tō ri), *n.* [*pl.* refectories] a dining hall.

***refer** (rē fûr′), *v.i. and v.t.* to allude, as I am *referring* to ancient Rome; to consult, as he *referred* to the dictionary; to submit for criticism, information or decision, as we must *refer* this matter to a higher authority.

***referable** (ref′ ẽr *a* bl), *adj.* capable of being submitted; ascribable.

referee (ref ẽr ē′), *n.* one to whom a dispute or contest is left for decision; an official who sees to it that the rules of a game are observed; one to whom legal cases of a certain kind are turned over.

referee (ref ẽr ē′), *v.i. and v.t.* to act as an arbitrator; to decide an issue for others, as to *referee* a football game or a case at law.

reference (ref′ ẽr ens), *n.* the act of submitting a question to authority or applying to a source for information; a source of information or authority, as this book is a *reference;* relation, as in *reference* to that matter; an allusion, as he made *reference* to the story; a written statement of a person's character and qualifications, as she gave her cook a good *reference.*

referendum (ref ẽr en′ dum), *n.* [*pl.* referendums or referenda] the submission of a legislative act to the people for a decisive vote.

refine (rē fīn′), *v.i. and v.t.* to become pure; to free of worthless matter and remove impurities, as to *refine* oil.

refined (rē fīnd′), *adj.* purified; cultivated, polished, as manners; subtle, as *refined* humor, *refined* cruelty.

refinement (rē fīn′ ment), *n.* the act of purifying; elegance of manner; freedom from coarseness in act, thought and speech.

refinery (rē fīn′ er i), *n.* [*pl.* refineries] a place where anything, as oil, ore, sugar, is purified.

reflect (rē flekt′), *v.t. and v.i.* to throw back, especially rays, as of light or heat; to show an image, as a mirror; to ponder, think over.

reflection (rē flek′ shun), *n.* that which is reflected, as one's *reflection* in a mirror; the backthrow of rays, as *reflection* of light from a polished surface; reproach, blame, discredit, as a *reflection* on his honesty; thought, especially of a meditative, backward-turning nature.

***reflex** (rē′ fleks), *n.* reflection; a reflection or image; involuntary action in response to a nerve impulse, as of a muscle.

reflex (rē′ fleks), *adj.* turning backward, as *reflex* thought; acting in a backward or returning direction, as a *reflex* influence.

reflexible (rē flek′ si bl), *adj.* capable of being reflected.

reflexive (rē flek′ siv), *adj.* indicating action upon the subject itself, as a *reflexive* verb, himself is a *reflexive* pronoun.

reflux (rē′ fluks), *n.* a flowing back.

***reform** (rē fôrm′), *n.* amendment of what is evil or undesirable; correction of social wrongs.

Syn. Reformation. A *reform* is a change that gives new form to things; when such a change is made, a *reformation* has been effected. *Reformation* is a change in character. The concerns of the state require occasional *reform;* those of an individual may call for his *reformation.*

reform (rē fôrm′), *v.i. and v.t.* to change for the better; to improve one's ways; to make better by removing faults or flaws.

reformatory (rē fôr′ m*a* tō ri), *n.* [*pl.* reformatories] an institution for detention of offenders in which their correction is sought rather than punishment.

refract (rē frakt′), *v.t.* to deflect from a straight line, as a ray of light.

refraction (rē frak′ shun), *n.* deflection, as of rays of light, from a straight line.

refractory (rē frak′ tō ri), *adj.* disobedient; hard to work, as a metal; obstinately resisting cure, as a disease or wound.

refractory (rē frak′ tō ri), *n.* a material that resists the action of heat or corrosion, used as a furnace lining or in crucibles.

refrain (rē frān), *n.* the phrase or verse repeated at the end of each stanza of a poem or song.

refrain (rē frān′), *v.i.* to forbear; to restrain oneself, hold oneself back, as to *refrain* from action.

refrangible (rē fran′ ji bl), *adj.* capable of being refracted.

refresh (rē fresh′), *v.* to revive, reinvigorate; to quicken, as the mind.

refreshment (re fresh′ ment), *n.* the act of reinvigorating or state of being reinvigorated; that which reinvigorates; *refreshments,* food and drink.

refrigerate (rē frij′ ẽr āt), *v.t.* to cool and keep cool.

refrigerator (rē frij′ ẽr ā tẽr), *n.* a box or room in which perishable foods are cooled and kept by ice or cold air.

***refuge** (ref′ ūj), *n.* a place of safety and shelter.

***refugee** (ref ū jē′), *n.* one who flees, especially from an attacked city or from political oppression.

refulgent (rē ful′ jent), *adj.* emitting brilliant light.

***refund** (rē fund′), *v.t.* to pay back; to arrange in a new form, as a public debt.

refusal (rē fūz′ al), *n.* rejection of a proposal; denial of a request; the right to make a final decision, as on purchase of property, before a deal is closed with others.

refuse (rē fūz′), *v.i. and v.t.* to decline to accept an offer or proposal; to be unwilling to grant, as to *refuse* permission; to decline, as to *refuse* an invitation.

Syn. Decline, reject, repel, rebuff. We *refuse* what is asked of us for want of inclination to comply; we courteously *decline* an invitation we are unable to accept; we *reject* a proposal because it does not conform to our wishes; we *repel* a too-insistent suitor; we *rebuff* a person for whom we feel contempt.

Ant. Accept, comply.

refute (rē fūt′), *v.t.* to prove false or erroneous; to disprove.

regain (rē gān′), *v.t.* to recover possession of.

regal (rē′ gal), *adj.* royal.

regale (rē gāl′), *v.t.* to entertain royally, as with feasting.

regalia (rē gā′ li*a*), *n. pl.* insignia of royalty; decorations worn on the person as symbols of rank or office.

regard (rē gärd′), *n.* close attention, consideration, respect: *regards,* good wishes.

regard (rē gärd′), *v.t.* to follow with close attention; to esteem; to relate to.

regarding (rē gärd′ ing), *prep.* about, concerning, in reference to.

regardless (rē gärd′ les), *adj.* without regard for, as he is quite *regardless* of personal danger.

regatta (rē gat′ a), *n.* a series of boat races in one program.

regency (rē′ jen si), *n.* [*pl.* regencies] the office or jurisdiction of a substitute ruler; term of service in that office.

regenerate (rē jen′ ẽr āt), *v.t.* to endow with new life and vigor; to renew spiritually.

regent (rē′ jent), *n.* one who rules in place of another, as during the minority of a king.

***regicide** (rej′ i sīd), *n.* the murder of a king; one who murders a king.

***regime** (rā zhēm′), *n.* a prevailing system of management or government, as under the present *regime* at Washington.

regimen (rej′ i men), *n.* systematic regulation, as of diet.

regiment (rej′ i ment), *n.* an army unit consisting of a certain number of companies and commanded by a colonel.

regiment (rej′ i ment), *v.t.* to form into units commanded by colonels; to organize as if in regiments; to arrange in separated classes; to control by strict rules.

region (rē′ jun), *n.* an indefinitely large area of land; a surrounding area; a part or division of the body, as the *region* of the stomach; a field of thought or study.

register (rej′ is tẽr), *n.* a record or roll or the book in which it is kept; a grated opening in a floor or wall through which heat is piped from a furnace below; correct placing of the parts of a picture or map in colors; the range of a voice or instrument.

register (rej′ is tẽr), *v.i. and v.t.* to write one's name in a book of record, as at a hotel; to enter in a book of record; to protect by recording in an official list, as to *register* a letter; to enroll or record; to indicate by pose and expression, as to *register* delight; to read or mark, as the thermometer *registers* 72°.

registrar (rej′ is trär), *n.* an official who keeps a list or record of names.

registration (rej is trā′ shun), *n.* the act of entering in a book of record, as the *registration* of voters.

registry (rej′ is tri), *n.* [*pl.* registries] the place where a record of names is kept.

***regnant** (reg′ nant), *adj.* reigning, ruling; prevailing.

regret (rē gret′), *n.* concern, as for a loss or bad conduct: *regrets,* a note politely declining an invitation.

regret (rē gret′), *v.t.* to remember with wish it had been otherwise; to deplore, as an action, and wish it could be done over and done differently.

***regular** (reg′ ū lẽr), *n.* a person who follows the rules and accepts all the principles of an organization, as a *regular* in politics; a soldier in the *regular* army.

regular (reg′ ū lẽr), *adj.* according to rule or custom; happening at set intervals; methodical.

regular army (reg′ ū lẽr är′ mi), the standing army, as distinguished from militia.

regulate (reg′ ū lāt), *v.t.* to place under fixed rules; to govern by custom; to adjust to a state of constancy, as to *regulate* a watch.

regulation (reg ū lā′ shun), *n.* act of adjusting or state of being adjusted; a rule, as the rules and *regulations* require it.

regurgitate (rē gûr′ ji tāt), *v.t. and v.i.* to throw back; to raise after swallowing; to be thrown back.

rehabilitate (rē ha bil′ i tāt), *v.t.* to restore to a former capacity, reinstate; to vindicate.

rehash (rē hash′), *v.t.* to present over again in another form, as to *rehash* old arguments.

rehearse (rē hûrs′), *v.t.* to repeat; to practice by repeating, as a part in a play.

rehearsal (rē hûr′ sal), *n.* the act of practicing in private; a private performance before something is presented to the public, as a theatrical *rehearsal.*

***reign** (rān), *n.* supreme rule; the period of a sovereign's rule.

***reign** (rān), *v.i.* to rule, as a sovereign; to prevail, as custom *reigns* here.

reimburse (rē im bûrs′), *v.t.* to pay back; to compensate, as for a loss.

***rein** (rān), *n.* one of the long straps fastened to a horse's bit by which to drive.

reincarnation (rē in kär nā′ shun), *n.* the belief that the souls of the dead return to earth in new forms or bodies.

reindeer (rān′ dẽr), *n.* a large deer of the Arctic regions.

reinforce (rē in fōrs′), *v.t.* to strengthen with new force or forces, as to *reinforce* a foundation, to *reinforce* an army.

reinforced concrete (rē in fōrst′ kon krēt′), concrete strengthened by enclosing steel rods within it while it is soft.

reins (rānz), *n.* kidneys or loins, especially as the seat of feelings and passion.

reinstate (rē in stāt′), *v.t.* to restore to a former condition or office.

reiterate (rē it′ ẽr āt), *v.t.* to repeat again and again.

reject (rē jekt′), *v.t.* to refuse to accept; to throw away, discard.

rejoice (rē jois′), *v.i. and v.t.* to feel joy; to express gladness, exult; to make glad or happy, as your news *rejoices* me.

rejoin (rē join′), *v.t. and v.i.* to join again after separation, reunite with; to answer to a reply, as for a defendant to meet the plaintiff's answer to the first defense.

rejoinder (re join′ dẽr), *n.* an answer to an answer; a retort.

rejuvenate (rē jōō′ vē nāt), *v.t.* to make young again, as the brisk, mountain air *rejuvenated* her.

rekindle (rē kin′ dl), *v.t. and v.i.* to kindle again, as to *rekindle* a fire; to catch fire again, as the coals *rekindled.*

relapse (rē laps′), *n.* a return, after apparent recovery or reform, to an earlier state of illness or vice.

relapse (rē laps′), *v.i.* to fall back into a state of illness or bad living after apparent recovery or reform.

relate (rē lāt′), *v.i. and v.t.* to refer, as my story *relates* to the war; to tell, narrate, as he *related* a strange tale.

relation (rē lā′ shun), *n.* the act of telling; a narrative or recital of facts; mutual connection, as the *relation* of heat to fire; the character of personal contact, as my *relation* with him is pleasant; a kinsman or relative.

relative (rel′ *a* tiv), *n.* a person connected by kinship; something considered in connection with something else, as a *relative* of a proposition.

relative (rel′ *a* tiv), *adj.* relating or related to, as a point *relative* to the subject in hand; not absolute, having force or meaning only in connection with something else.

relativity (rel *a* tiv′ i ti), *n.* a principle based on the assumption that our knowledge of velocity is relative, and leading to conclusions that do not agree with previously accepted principles of mechanics: also called the *Einstein Theory* from Albert Einstein, its propounder.

relax (rē laks′), *v.i. and v.t.* to become less firm or severe, as discipline *relaxes* when officers are indifferent to their duties; to slacken, as he *relaxed* his grip; to mitigate, abate, free from strain, as *relax* your mind.
  Syn. Remit. We *relax* our endeavors, *remit* our labors. We *relax* in discipline, *relax* in the severity of our conduct. We *remit* a punishment or a sentence.

***relaxation** (rē laks ā′ shun), *n.* diminution of tension; diversion or recreation.

relay (rē lā′), *n.* a new supply, as of horses for use on a long journey; the place at which new horses are ready; a race in which several runners, forming a team, take up the competition successively, each running a certain part of the distance; an arrangement by which one electrical circuit, when it is opened or closed, opens or closes another.

relay (rē lā′), *v.t.* to send by a series of carriers.

re-lay (rē lā′), *v.t.* to lay a second time, as to *re-lay* a pavement.

release (rē lēs′), *n.* liberation from restraint; deliverance from pain or distress; the giving out of a news item or first presentation of a moving picture film; the escape of used steam or the fumes of fuel from an exhaust.

release (rē lēs′), *v.t.* to set free; to let go; to permit publication of, as a news item that has been held back; to permit the showing of, as a film.

relegate (rel′ ē gāt), *v.t.* to send away, as out of a country into exile; to remove, as to *relegate* furniture to the attic; to consign to a place in the background of attention; to assign, as to a class or sphere, as to *relegate* a new species to a certain family.

relent (rē lent′), *v.i.* to become less severe in judgment or action, have pity.

relevant (rel′ ē vant), *adj.* applicable, related, pertinent.

reliable (rē lī′ *a* bl), *adj.* trustworthy.

reliance (rē lī′ ans), *n.* confidence, trust; that on which one depends, as you are my chief *reliance* in this situation.

reliant (rē lī′ ant), *adj.* trusting, relying on.

relic (rel′ ik), *n.* that which remains of something dead, ruined or destroyed; an object of reverence or worship once belonging to Christ, the Virgin or one of the Saints, especially a part of the body; a keepsake or souvenir.

relict (rel′ ikt), *n.* a widow.

***relief** (rē lēf′), *n.* that which lessens pain or distress; the state of being released from distress or pain; assistance given to the needy or unemployed from public funds; the person who takes one's place on a post of duty; sharpness of outline due to contrast, as a church spire stands out in *relief* against the sky.

relieve (rē lēv′), *v.t.* to free from distress or pain; to take the place of, as to *relieve* a sentry; to set off by contrast; to lessen, as monotony.

***religion** (rē lij′ un), *n.* a system of faith or worship; conscientious devotion to a principle or ideal, as honest dealing is his *religion.*

relinquish (rē ling′ kwish), *v.t.* to give up claim to, leave, surrender, desist from.

reliquary (rel′ i kwer i), *n.* [*pl.* reliquaries] a small box or casket for keeping or exhibiting a relic.

relish (rel′ ish), *n.* zest, enjoyment; pleasing flavor; a condiment.

relish (rel′ ish), *v.t.* to like the taste of; to enjoy.

reluctant (rē luk′ tant), *adj.* unwilling, disinclined, done or made without desire, as a *reluctant* concession.

rely (rē lī′), *v.i.* to depend upon, have confidence in, as I *rely* upon your advice.

***remain** (rē mān′), *v.i.* to stay, be left; to continue in a certain state, as to *remain* indifferent under persuasion.

remainder (rē mān′ dẽr), *n.* that which is left after anything is taken away; the quantity left after subtraction.

remains (rē mānz), *n.* things left, the body after death.

remand (rē månd′), *v.t.* to recommit or send back, as the state *remanded* him to prison.

remark (rē märk′), *n.* a brief observation or statement, comment; notice.

remark (rē märk′), *v.t. and v.i.* to take note of, observe, as we *remarked* his sad expression; to comment.

remarkable (rē märk′ *a* bl), *adj.* noteworthy, extraordinary.

remedial (rē mē′ di al), *adj.* having power to cure or correct.

***remedy** (rem′ ē di), *n.* [*pl.* remedies] a medicine, application or treatment meant to cure, as a *remedy* for a mind diseased.

remedy (rem′ ē di), *v.t.* to relieve or cure, as sickness; to correct or relieve, as a bad social, political or business condition.

remember (rē mem′ bẽr), *v.t.* to recall to mind; to keep in mind.

remembrance (rē mem′ brans), *n.* the act of recalling, as to hold in *remembrance;* recollection, as I have no *remembrance* of the affair; the extent of recollection, as the great blizzard is not within my *remembrance;* a memento, as a *remembrance* of those happy days.

remind (rē mīnd′), *v.t.* to cause to recollect, as *remind* me when the time comes, your story *reminds* me of old times.

reminiscence (rem i nis′ ens), *n.* the recalling of the past; a story of the past in which one had a part.

remiss (rē mis′), *adj.* careless or negligent in the performance of duty or meeting of obligations.

remission (rē mish′ un), *n.* the act of remitting, or that which is remitted; cancellation, discharge or annulment of a liability or debt, as the *remission* of sins is a central idea in Paul's theology.

remit (rē mit′), *v.i. and v.t.* to moderate, as the fever remits; to send money in payment; to pardon; to give up, as to *remit* a fine.

remittance (rē mit′ ans), *n.* the sending of money; the money sent.

remittent (rē mit′ ent), *adj.* moderating, abating, as a *remittent* fever.

remnant (rem′ nant), *n.* a leftover part; remainder, especially a short length of fabric at the end of a bolt after the rest has been sold, usually offered at a reduced price.

remodel (rē mod′ l), *v.t.* to make over, as to *remodel* a house.

remonetize (rē mon′ ē tīz), *v.t.* to restore to circulation as money, as to *remonetize* silver.

remonstrance (rē mon′ strans), *n.* the act of making objection or protest, expostulation, reproof.

***remonstrate** (rē mon′ strāt), *v.i.* to object, expostulate, plead, as I *remonstrated* with him.

remorse (rē môrs′), *n.* anguish caused by a sense of wrongdoing; great repentance.

remote (rē mōt′), *adj.* distant in time or space; inconsiderable, as a *remote* likelihood.

removable (rē mōōv′ *a* bl), *adj.* capable of being placed elsewhere.

removal (rē mōōv′ al), *n.* the act of taking away; the state of being taken away; dismissal.

remove (rē mōōv′), *v.i. and v.t.* to depart, go away, as they *removed* to the country; to change the location of, transfer; to dismiss from a position of responsibility.

remunerate (rē mū′ nẽr āt), *v.t.* to repay, compensate, give in money an equivalent for service.

remuneration (rē mū nẽr ā′ shun), *n.* payment for services rendered, compensation.

remunerative (rē mū′ nẽr *a* tiv), *adj.* rewarding, bringing returns in money for an outlay in service; profitable.

***renaissance** (ren e säns′), *n.* a new birth or revival of interest, especially along artistic and literary lines: *Renaissance,* the transitional movement in Europe between the 14th and 16th centuries, marked by a revival of classic influence.

***renascent** (rē nas′ ent), *adj.* returning to existence, reviving.

rend (rend), *v.t.* to tear apart, split, rip; to wrest.

render (ren′ dẽr), *v.t.* to give in, requite, as to *render* thanks; to present, as to *render* a bill; to deliver, as to *render* a decision; to furnish, as to *render* aid; to translate, as to *render* a Latin text into English, to express, interpret, perform, as to *render* a piece of music; to purify by melting, as lard.

***rendezvous** (rän′ de vōō), *n.* a place of meeting agreed upon in advance; a meeting by appointment, as I have a *rendezvous* with death.

rendezvous (rän′ de vōō), *v.i. and v.t.* to meet, or to bring together, at an appointed time or place, as troops or warships.

rendition (ren dish′ un), *n.* a version or translation, as a good *rendition* of a Latin text; style of presenting, as a fine *rendition* of the part of Macbeth.

renegade (ren′ ē gād), *n.* one who renounces his faith, an apostate, traitor.

renegade (ren′ ē gād), *adj.* traitorous.

***renew** (rē nū′), *v.t.* to restore, renovate, refresh; to resume, as to *renew* activity; to continue, as a subscription; to grant or obtain an extension of, as to *renew* a note.

renounce (rē nouns′), *v.t.* to disown, reject, repudiate; to withdraw from, as to *renounce* a pact or treaty.

renovate (ren′ ō vāt), *v.t.* to make as if new again; to restore to freshness.

renown (rē noun′), *n.* fame, distinguished standing, acclaim.

rent (rent), *n.* a rip or tear; a split, as in opinion or belief.

rent (rent), *n.* periodic payment for the use of property.

rent (rent), *v.t. and v.i.* to lease or hire from an owner; to lease or hire; to be leased or for hire, as the boat *rents* for ten dollars a day.

rental (ren′ tal), *n.* amount paid for use of property; income from property leased to tenants.

***renunciation** (rē nun si ā′ shun), *n.* the act of giving up; the act of casting off.

repair (rē pâr′), *n.* the act of restoring to good condition that which has been broken or worn by use; the state of being sound and in good order, as the car is in good *repair.*

repair (rē pâr′), *v.t.* to restore to good condition after having been broken or worn by use; to set right, as to *repair* a mistake.

repair (rē pâr′), *v.i.* to go back, as to *repair* to one's old home.

***reparation** (rep a rā′ shun), *n.* amends or compensation for loss or damage.

***repartee** (rep ẽr tē′), *n.* a quick, clever reply; a conversation containing many such replies.

***repast** (rē pȧst′), *n.* a meal.

repay (rē pā′), *v.t.* to give back an equivalent; to make a return, as to *repay* a kindness.

***repeal** (rē pēl′), *n.* the recall of a law.

repeal (rē pēl′), *v.t.* to withdraw or cancel, call back and annul, as a law.

repeat (rē pēt′), *v.i. and v.t.* to say over again, do again; to do or say a second time, as to *repeat* an order; to say over from memory, recite; to pass on, as to *repeat* gossip.

Syn. Recite, rehearse, recapitulate, reiterate. To *recite* is to *repeat* in a formal manner; to *rehearse* is to *repeat* or *recite* by way of preparation; to *recapitulate* is to *repeat* the principal heads of any discourse; to *reiterate* usually applies to words and suggests repetition again and again.

repeater (rē pēt′ ẽr), *n.* one who or that which does or says something again; a voter who casts more than one vote; a rapid-firing revolver with a reservoir of cartridges; a watch that strikes the hour when a spring is pressed; a decimal fraction with the same figure recurring, as 0.33 is a *repeater* or repetend.

repel (rē pel′), *v.t.* to drive back, as to *repel* an enemy; to resist successfully, as to *repel* an invasion; to refuse to consider, reject, as a suitor; to disgust, as the idea *repels* me.

repellent (rē pel′ ent), *adj.* resisting; repulsive, disgusting.

repent (rē pent′), *v.i.* to regret deeply anything said or done; to change one's ways because of contrition.

repentance (rē pen′ tans), *n.* contrition, penitence.

repercussion (rē pẽr kush′ un), *n.* a forcing or driving back or the state of being forced or driven back; reverberation, as of sound; a result or effect, especially indirect.

***repertoire** (rep′ ẽr twär), *n.* the list of dramas, operas and parts that an individual or a company is prepared to perform.

repetition (rep ē tish′ un), *n.* the act of doing or saying again; that which is done or said again.

repetitious (rep ē tish′ us), *adj.* characterized by repeating; given to going over the same ground more than once.

repine (rē pīn′), *v.i.* to languish; to complain, grumble, fret.

replenish (rē plen′ ish), *v.t.* to renew, as a stock of goods; to fill again.

replace (rē plās′), *v.t.* to restore to a former place or position, as to *replace* a book on the shelf; to take the place of, as my new pen *replaces* the one I lost; to provide an equivalent for, as to *replace* something broken.

replete (rē plēt′), *adj.* completely filled, abounding in or with.

***replevin** (rē plev′ in), *n.* recovery of goods alleged to have been illegally seized, on presentation of security for restoration if the seizure is sustained by a court.

***replica** (rep′ li·k*a*), *n.* an exact reproduction.

replication (rep li kā′ shun), *n.* the plaintiff's answer to the defendant's plea.

reply (rē plī′), *n.* [*pl.* replies] an answer.

reply (rē plī′), *v.i.* to answer.

report (rē pōrt′), *n.* an official presentation of facts; an account of an event, especially for publication; rumor, fame, reputation; a record of proceedings; a loud and sudden noise, as the *report* of a gun.

report (rē pōrt′), *v.i. and v.t.* to present oneself for duty; to give an account of; to state as fact; to make a charge against.

reporter (rē pōr′ tẽr), *n.* one who gives an account; one who gathers news for a newspaper; one who attends court trials and legislative debates and records proceedings.

repose (rē pōz′), *n.* the act of resting or state of being at rest, as I need *repose,* the caged lion was in *repose.*

repose (rē pōz′), *v.i. and v.t.* to lie down, rest; to lay, place, as the king *reposes* all his confidence in the prime minister.

repository (rē poz′ i tō ri), *n.* [*pl.* repositories] a place for deposit and safekeeping, as a *repository* of useful information.

reprehend (rep rē hend′), *v.t.* to censure.

reprehensible (rep rē hen′ si bl), *adj.* deserving censure, culpable.

represent (rep rē zent′), *v.t.* to give an account or picture of; to act or speak for, as he *represents* a large constituency; to impersonate; to stand for, as each letter *represents* a sound.

representation (rep rē zen tā′ shun), *n.* portrayal, a likeness; the state of being acted for by others, as our *representation* in Congress; those who thus act for others.

representative (rep rē zen′ t*a* tiv), *n.* one who acts for others, as the *Representatives* in the lower house of Congress.

representative (rep rē zen′ t*a* tiv), *adj.* acting for others; typical.

repress (rē pres′), *v.t.* to check or restrain; to hold down.

Syn. Restrain, suppress. To *repress* is to prevent the natural or normal expression of anything; to *restrain* is to check or hold back from action by physical or moral force; to *suppress* is to keep from activity, as to *suppress* a revolt, a story or one's passions.

reprieve (rē prēv′), *n.* temporary suspension of a sentence; temporary relief from pain or escape from danger.

reprieve (rē prēv′), *v.t.* to grant a delay of punishment to; to free temporarily from pain or danger.

***reprimand** (rep′ ri mȧnd), *n.* a severe reproof or rebuke.

reprimand (rep′ ri mȧnd), *v.t.* to rebuke; to censure officially and formally.

reprisal (rē prīz′ al), *n.* an act of retaliation.

reproach (rē prōch′), *n.* censure, rebuke; a cause of dishonor or the state of being in dishonor, as his conduct is a *reproach* to the family name.

Syn. Disrepute, dishonor, opprobrium, contumely. *Reproach* is a general term that may be applied to any degree of censure; *disrepute* implies a person or thing that has suffered a loss of standing; *dishonor* denotes the state of one who has fallen from favor; *opprobrium* signifies the public disgrace and bad reputation that follow shameful conduct; *contumely* is the scornful treatment and humiliation suffered by one who is in disgrace.

Ant. Credit, honor, praise, commendation.

reproach (rē prōch′), *v.t.* to censure severely, upbraid.

reproachful (rē prōch fool), *adj.* expressing rebuke, as a *reproachful* look.

reprobate (rep′ rō bāt), *n.* a depraved person, a profligate.

reprobate (rep′ rō bāt), *v.t.* to condemn strongly.

reprobate (rep′ rō bāt), *adj.* hopelessly sinful, vicious, corrupt.

reprobation (rep rō bā′ shun), *n.* condemnation.

reproduce (rē prō dūs′), *v.t.* to bring into existence again; to produce offspring; to duplicate; to make a copy of; to present or exhibit again, as a play.

reproof (rē prōōf′), *n.* censure; rebuke without bitterness.

reprove (rē prōōv′), *v.t.* to rebuke without bitterness.

***reptile** (rep′ til), *n.* a cold-blooded, air-breathing, scaly vertebrate that crawls on its belly or by means of short legs, as a snake or lizard.

republic (rē pub′ lik), *n.* a state in which the sovereign power is vested in representatives chosen by the people and responsible to them.

republican (rē pub′ li kan), *adj.* pertaining to or characteristic of government of the people through representatives of their own choosing.

republicanism (rē pub′ li kan izm), *n.* the principles of representative government; adherence to those principles.

repudiate (rē pū′ di āt), *v.t.* to refuse to recognize; to refuse to honor a debt; to disavow.

***repugnance** (rē pug′ nans), *n.* aversion, dislike.

repugnant (rē pug′ nant), *adj.* extremely distasteful, offensive.

repulse (rē puls′), *n.* the act of putting off or driving back; or state of being put off or driven back; a firm refusal, rejection.

repulse (rē puls′), *v.t.* to beat back, as to *repulse* an attack; to drive away, rebuff.

repulsion (rē pul′ shun), *n.* aversion, deep dislike.

repulsive (rē pul′ siv), *adj.* repellent, disgusting.

***reputable** (rep′ u t*a* bl), *adj.* of good standing, worthy of esteem.

reputation (rep ū tā′ shun), *n.* good standing; the opinion or regard in which one is generally held, as he has a *reputation* for honor.

repute (rē pūt′), *n.* good or bad standing; the regard in which one is held, as he is a man of good *repute*.

request (rē kwest′), *n.* the act of asking for something, as to make a *request;* that which is sought, as this is my *request;* the condition of being much sought after, as this book is in great *request*.

request (rē kwest′), *v.t.* to ask for, as to *request* a favor; to express an appeal to, as she *requested* him to hurry.

***requiem** (rē′ kwi em), *n.* a mass for repose of the soul of a dead person; a solemn hymn in honor of the dead.

require (rē kwīr′), *v.t.* to claim as a right; to demand as with authority; to need, call for.

requirement (rē kwīr′ ment), *n.* that which is needed or demanded.

requisite (rek′ wi zit), *n.* that which is indispensable.

requisite (rek′ wi zit), *adj.* necessary, indispensable.

requisition (rek wi zish′ un), *n.* a formal official demand; a formal request for things needed in work; an official order for supply of such things.

requisition (rek wi zish′ un), *v.t.* to order, as to *requisition* supplies.

requital (rē kwīt′ al), *n.* repayment of good or bad acts in the same kind, compensation, retaliation.

requite (rē kwīt′), *v.t.* to meet good or bad acts with acts of the same nature; to avenge or reward, rightly or wrongly, as to *requite* a favor with ungratefulness.

***rescind** (rē sind′), *v.t.* to annul, revoke, repeal.

***rescue** (res′ kū), *n.* the act of delivery from danger.

rescue (res′ kū), *v.t.* to save from danger or deliver from imprisonment.

***research** (rē sûrch′), *n.* deep study or investigation; the quest for new information through examination of source material.

resemblance (rē zem′ blans), *n.* likeness, similarity.

resemble (rē zem′ bl), *v.t.* to look like or to have similar character.

resent (rē zent′), *v.t.* to feel keen displeasure over; to show anger because of.

resentment (rē zent′ ment), *n.* strong displeasure, deep sense of injury.

reservation (rez ẽr vā′ shun), *n.* something held back or kept from sight or knowledge; retention for oneself, as *reservation* of all advantages from a deal; limitation or qualification, as I offer this view with some *reservations;* accommodations, as a hotel *reservation;* a tract of land set apart for some special use.

reserve (rē zûrv′), *n.* something kept back; qualification; extra supplies; restraint in manner; funds held from circulation to back credit; funds laid aside by a business concern as a safeguard against future needs; troops held in readiness to assist field forces when hard pressed.

reserve (rē zûrv′), *v.t.* to set aside or hold back for future needs.

***reservoir** (rez′ ẽr vwôr), *n.* a place where water is collected and stored; a store of anything, as the banks are *reservoirs* of wealth.

***reside** (rē zīd′), *v.i.* to live, especially for a long term, as to *reside* in one house ten years; to be inherent or vested in, as all power *resides* in the government.

***residence** (rez′ i dens), *n.* a domicile; the time during which one lives at a certain place, as during my ten years' *residence* here.

residuary (rē zid′ ū er i), *adj.* pertaining to a remainder, as a *residuary* bequest, disposing of whatever property may be left after the specific part of a will is carried out.

***residue** (rez′ i dū), *n.* remainder.

residuum (rē zid′ ū um), *n.* [*pl.* residua or residuums] that which is left after any process or operation that subtracts from an original mass or body.

***resign** (rē zīn′), *v.t. and v.i.* to surrender formally, as a position or office in government, business or a civil organization; to relinquish, as to *resign* a claim; to give up one's office or position, as the secretary *resigned*.

***resignation** (rez ig nā′ shun), *n.* the act of giving up an office voluntarily; a document stating intent to give up an office; calm acceptance of misfortune.

***resilient** (rē zil′ ient), *adj.* springing back, elastic, buoyant.

resin (rez′ in), *n.* a solid substance obtained from certain trees that exude it as gum.

***resist** (rē zist′), *v.t.* to meet any force with a contrary one, oppose; to withstand; to strive against.

resistance (rē zis′ tans), *n.* the act of opposing; that which checks progress, as a healthy child has good *resistance* to disease; that which checks motion, as an airplane has to overcome the *resistance* of the air; the opposition that substances, even conductors, offer to the passage of an electric current.

resistless (rē zist′ les), *adj.* not to be opposed successfully.

resolute (rez′ ō lūt), *adj.* firm in purpose, determined.

***resolution** (rez ō lū′ shun), *n.* constancy of purpose; a resolve; a formal expression of opinion by a deliberative body, as there is a *resolution* before the house.

***resolve** (rē zolv′), *v.t. and v.i.* to separate the constituent parts of, analyze; to make up one's mind.

resolvent (rē zol′ vent), *n.* something that has the power to break a substance up into elementary parts; a substance that causes solution.

resonant (rez′ ō nant), *adj.* resounding, rich and vibrant in sound.

***resort** (rē zôrt′), *n.* a resource, as this is my last *resort;* a much visited place, as a seaside *resort*.

resort (rē zôrt′), *v.i.* to go frequently or in great numbers; to turn to for help; to have recourse to, as to *resort* to force.

***resound** (rē zound′), *v.i.* to be filled with sound; to reverberate, as his name *resounds* throughout the land.

***resource** (rē sōrs′), *n.* a source of help or supply; *pl. resources,* wealth; the various means within a nation's possession for meeting the needs of its people, as America leads the world in natural *resources*.

respect (rē spekt′), *n.* regard, esteem; an aspect, as in some *respects;* reference, as in *respect* to.

respect (rē spekt′), *v.t.* to hold in high esteem, have regard for, as to *respect* the rights of others; to concern, as this policy *respects* national prosperity.

respectable (rē spek′ t*a* bl), *adj.* worthy of high esteem, well regarded.

respectful (rē spekt′ fool), *adj.* showing regard for; acting with proper deference.

respecting (rē spek′ ting), *prep.* in view of; with regard to.

respective (rē spek′ tiv), *adj.* relating to each of several, as our *respective* interests; relative.

respiration (res pi rā′ shun), *n.* the act of breathing; one breath, including inhalation and exhalation.

***respiratory** (rē spīr′ *a* tō ri), *adj.* pertaining to breathing, or connected with it in any way, as the *respiratory* organs.

respite (res′ pit), *n.* a period of relief, as a *respite* from pain; a temporary delay in the execution of a sentence.

resplendent (rē splen′ dent), *adj.* shining with brilliant luster, dazzling.

respond (rē spond′), *v.i.* to answer or reply; to react, as the horse *responded* to the spur.

response (rē spons′), *n.* an answer or reply; reaction; as in *response* to my urging, he yielded.

responsible (rē spon′ si bl), *adj.* answerable, as you are *responsible* to the law; fit to be trusted with the carrying out of a charge or duty; able and ready to meet obligations.

responsive (rē spon′ siv), *adj.* answering or reacting; done through responses, as *responsive* reading; easily swayed, as a *responsive* audience.

rest (rest), *n.* a state of ease; absence of motion, as I need *rest,* the machine is at *rest;* a pause from labor or exertion; repose; a support, as a book*rest*.

rest (rest), *n.* that which remains after removal of a part.

rest (rest), *v.i. and v.t.* to desist from toil; to enjoy repose; to lay, place, as *rest* your head on my shoulder, I *rest* my faith in you.

***restaurant** (res′ tō rant), *n.* a public dining place.

restitution (res ti tū′ shun), *n.* the act of restoring to the original owner, making good a loss, indemnification.

restive (res′ tiv), *adj.* impatient, uneasy.

restless (rest′ les), *adj.* uneasy, always in motion, bringing no repose, as *restless* sleep.

***restoration** (res tō rā′ shun), *n.* the act of returning to an original state or condition; the act of giving anything back to an owner; anything that has been thus returned.

***restorative** (rē stōr′ *a* tiv), *n.* a reinvigorating medicine.

restorative (rē stōr′ *a* tiv), *adj.* having power to bring back.

restore (rē stōr′), *v.t.* to return to a former owner; to bring back to a former state or condition.

Syn. Return, repay. We *restore* upon a principle of equity; we *return* upon a principle of justice and honor; we *repay* upon a principle of undeniable right. We cannot always claim what ought to be restored, but we can not only claim but enforce the claim in regard to what should be *returned* or *repaid*.

Ant. Keep, retain.

***restrain** (rē strān′), *v.t.* to check, control, restrict.

restraint (rē strānt′), *n.* the act of hindering or state of being hindered; loss of freedom in action.

restrict (rē strikt′), *v.t.* to confine or limit.

restrictive (rē strik′ tiv), *adj.* limiting, holding within fixed bounds.

***result** (rē zult′), *n.* that to which any course leads, consequence, effect of action.

result (rē zult′), *v.i.* to follow as an effect of action.

***resume** (rē zūm′), *v.t.* to begin again; to take up again after interruption, as to *resume* work; to take back, take again, reoccupy, as he *resumed* his place.

***resumption** (rē zump′ shun), *n.* the act of beginning again.

resurrect (rez u rekt′), *v.t.* to restore to life; to bring into use or view again, as to *resurrect* an old hat.

***resurrection** (rez u rek′ shun), *n.* a rising again from the dead; a rising to new life: *the Resurrection,* the rising of Christ from the dead.

resuscitate (rē sus′ i tāt), *v.t.* to revive; to restore to consciousness.

***retail** (rē′ tāl), *n.* the selling of goods in small quantities; *at retail,* in small quantities: opposite of *at wholesale*.

retail (rē′ tāl), *v.i. and v.t.* to sell in small quantities; to pass along, tell in detail, as to *retail* the news of a neighborhood.

retain (rē tān′), *v.t.* to keep possession of.

retainer (rē tān′ ẽr), *n.* one who serves a person of rank; a fee paid to counsel to engage his services later.

retaliate (rē tal′ i āt), *v.i. and v.t.* to give like for like; to repay (as a wrong), with a like thing.

retard (rē tärd′), *v.t.* to hold back, obstruct; to hinder, delay.

Syn. Delay. To *retard* means especially to delay or hinder motion; to *delay* is to keep from arriving or being completed at a certain time. Heavy snow *retards* our progress on a road; stopping to fix a tire *delays* us.

***retch** (rech), *v.i. and v.t.* to strain as in vomiting; to vomit.

retention (rē ten′ shun), *n.* the act of keeping in possession; holding in mind or memory.

retentive (rē ten′ tiv), *adj.* able to keep in possession, as a *retentive* memory.

***reticent** (ret′ i sent), *adj.* not much inclined to talk; reserved.

***reticular** (rē tik′ ū lẽr), *adj.* like a network; complicated.

***reticule** (ret′ i kūl), *n.* a lady's handbag or workbag, originally one made of network.

***retina** (ret′ i n*a*), *n.* the inner coating of the eyeball where the optic nerve ends; the part of the eye on which images of objects are reflected.

***retinue** (ret′ i nū), *n.* the attendants of a person of high station; a body of followers.

retire (rē tīr′), *v.i. and v.t.* to go to some place where one may be private; to go to bed; to give up active work and live on one's income; to take out of action, as to *retire* a worker because of age; to dismiss honorably from service, as to *retire* an army officer at a certain age; to withdraw from circulation, as to *retire* an issue of government bonds.

retirement (rē tīr′ ment), *n.* the act of withdrawing from business or public life; a state of being secluded, as he lives in *retirement.*

retort (rē tôrt′), *n.* a sharp answer to a remark; a quick, witty reply.

retort (rē tôrt′), *v.i. and v.t.* to reply sharply and cleverly or angrily.

retouch (rē tuch′), *v.t.* to work on a picture, especially a photograph, so as to improve or alter it.

retract (rē trakt′), *v.i. and v.t.* to take back something that has been said; to recall an utterance; to withdraw from a position taken in argument; to draw back or draw in, as the cat *retracts* her claws.

retractile (rē trak′ til), *adj.* capable of being drawn back or drawn in, as the turtle's head is *retractile.*

retreat (rē trēt′), *n.* retirement of troops before an enemy; the act of going back or withdrawing from a position; a place of privacy and safety; a home for nervous and insane persons; a period of withdrawing from worldly affairs and spending time in prayer and meditation.

retreat (rē trēt′), *v.i.* to retire from attack; to withdraw from a position, as I pressed him with arguments and he *retreated;* to go into seclusion and retirement, as to *retreat* from the world.

retrench (rē trench′), *v.i. and v.t.* to reduce expenses; to economize; to lessen, as to *retrench* the people's rights; to strengthen a line of defense with a second, inner line.

***retribution** (ret ri bū′ shun), *n.* a proper return for actions, particularly bad; especially just punishment, as it was a case of righteous *retribution.*

***retributive** (rē trib′ ū tiv), *adj.* rewarding for good actions and punishing for bad ones, as the case demands.

retrieve (rē trēv′), *v.i. and v.t.* to bring in game that has been shot by a hunter, as the dog soon learned to *retrieve;* to fetch, as the dog *retrieved* the bird; to recover, as I *retrieved* a large part of my loss.

retriever (rē trēv′ ẽr), *n.* a dog trained to find and bring to the hunter game which has been shot, as the water spaniel is a good *retriever.*

***retroactive** (ret ro ak′ tiv), *adj.* operating in previous time, as the law passed in 1896 was *retroactive;* suits were brought under it for offenses committed in 1893.

***retrocede** (ret rō sēd′), *v.t. and v.i.* to grant back to the original owner; to move back; to withdraw, as he *retroceded* from his first stand in the debate.

***retrograde** (ret′ rō grād), *adj.* going or moving backward; going from a better to a worse condition of body, mind or morals.

***retrogression** (ret rō gresh′ un), *n.* the act of moving back; the act of losing ground or retreating; change to a worse condition.

***retrospect** (ret′ rō spekt), *n.* a backward view or review of the past.

***retrospection** (ret rō spek′ shun), *n.* thought about things that are past; a review in the mind of things that have happened; the habit of thinking of the past.

return (rē tûrn′), *n.* the act of coming back to anything from which one has been away, as a *return* to one's native place, a *return* to happiness after trouble; recovery of something lost, as the *return* of my pocketbook will be much appreciated; profit, as the *returns* from an investment; report of results, as election *returns.*

return (rē tûrn′), *v.i. and v.t.* to go back to, as I shall *return* to my home; to come again, as robins *return* in the spring; to give back, as I am *returning* your pencil; to pay or repay, as study will *return* a profit.

reunion (rē ūn′ yun), *n.* a meeting of persons who have not been together for some time, as a class *reunion,* a family *reunion;* the act of meeting again, as I look forward to a *reunion* with you.

reunite (rē ū nīt′), *v.i. and v.t.* to come together again; to bring together again.

reveal (rē vēl′), *v.t.* to make known; to bring to light something that has been hidden; to disclose, as to *reveal* a secret.

***reveille** (rev e lē′), *n.* the signal on drum or bugle sounded about sunrise for soldiers or sailors to get up in the morning.

revel (rev′ el), *n.* noisy merrymaking, a convivial celebration, a carouse.

revel (rev′ el), *v.i.* to engage in riotous merrymaking; to take great delight in, as I *revel* in sports.

revelation (rev e lā′ shun), *n.* the act of making known something that has been a secret; the thing that is made known, as this book is a *revelation* to me, any amazing disclosure.

revenge (rē venj′), *n.* the doing of an injury in return for another; the desire to return evil for evil; a chance to get even, as you shall have your *revenge.*

revenge (rē venj′), *v.t.* to inflict pain or punishment because of, as to *revenge* a defeat: to avenge for a wrong done, as to *revenge* oneself.

revengeful (rē venj′ fool), *adj.* vindictive; anxious to get even.

revenue (rev′ e nū), *n.* the returns from investment of money; the income from property; the income of a government from public taxes, customs, duties and rents.

reverberate (rē vûr′ bẽr āt), *v.i. and v.t.* to sound and sound again, echo and re-echo, resound; to cause to give back a sound in echo; to reflect rays of heat and light.

revere (rē vēr′), *v.t.* to regard with the greatest respect; to regard with a mixture of affection and awe.

***reverence** (rev′ ẽr ens), *n.* deep respect with awe and affection; a title of respect to a priest, as your *Reverence.*

reverend (rev′ ẽr end), *adj.* worthy of deep respect: a title of respect to a clergyman, as the *Reverend* John Smith.

reverent (rev′ ẽr ent), *adj.* showing deep respect; expressing a mixture of love and awe.

***reverie** (rev′ ẽr i), *n.* the state of being lost in thought, day-dreaming; deep musing.

reverse (rē vûrs′), *n.* the opposite, as it is just the *reverse* of what you think; a mechanical gear causing the opposite motion, as the engine is in *reverse;* misfortune, check, as he met with *reverses.*

reverse (rē vûrs′), *adj.* opposite, as in the *reverse* direction.

reverse (rē vûrs′), *v.i. and v.t.* to move the other way, as I *reversed;* to cause to go or work the opposite way, as I *reversed* the engine; to turn something the other way, either backward or upside down, as he *reversed* the bucket; to change, as to let us *reverse* our positions.

reversible (rē vûr′ si bl), *adj.* capable of being turned the other way; finished on both sides, as *reversible* silk.

***reversion** (rē vûr′ shun), *n.* tendency of any growing thing, as a plant or animal, to turn back or return to an earlier form; the return of property to its former owner.

revert (rē vûrt′), *v.i.* to return; to go back, as to a former position or condition, as let us not *revert* to that subject; to return to a former owner, the estate *reverts* to his uncle.

review (rē vū′), *n.* a second view of anything; the act of repeating lessons already learned and recited, as a *review* of a month's work in history; a criticism, as a *review* of a new book; a magazine devoted to considering the news again and to noticing new books or works of art; the march of troops or movement of ships of the navy before a high officer for general inspection of their fitness for service.

review (rē vū′), *v.i. and v.t.* to look over again; to study again; to write a notice of a book; to inspect, as troops or ships.

revile (rē vīl′), *v.i. and v.t.* to use bad language; to address with abusive words.

revise (rē vīs′), *n.* a printer's proof, once corrected, showing the type as changed and presented for a second critical reading.

revise (rē vīs′), *v.t.* to review and correct, as a printer's proof; to examine and make corrections in, as to *revise* an essay or *revise* one's opinions.

revision (rē vizh′ un), *n.* the act of reading again and correcting; the composition after being corrected.

revival (rē vīv′ al), *n.* recovery, as of consciousness after being unconscious; return of life and vigor after drooping, as a plant; a meeting or a series of meetings to arouse new interest in religion in a community; new production of an old play or opera, as a *revival* of The Beggars' Opera.

revive (rē vīv′), *v.i. and v.t.* to recover consciousness and strength, as a person after sickness or injury, a plant after drooping; to bring back to normal condition; to produce again, as an old opera.

revivify (rē viv′ i fī), *v.t.* [*p.t.* and *p.p.* revivified, *pr.p.* revivifying] to bring back to life and vigor.

***revocable** (rev′ ō k*a* bl), *adj.* capable of being canceled or called back.

***revocation** (rev ō kā′ shun), *n.* the act of calling back, as an order or decree; canceling; repeal; reversal.

revoke (rē vōk′), *v.t.* to call back or repeal; to cancel; in cardplaying, to fail to follow suit when one should and is able to.

***revolt** (rē vōlt′), *n.* an uprising against those in power, rebellion.

revolt (rē vōlt′), *v.i. and v.t.* to rebel; to be disgusted; to cause disgust, as such conduct *revolts* me.

revolution (rev ō lū′ shun), *n.* motion around a center; the act of a body in moving all the way around a center; a great change in the way of doing things; a radical change in thought, government or custom; an effort to overthrow a government and set up a new one by violent means.

revolutionist (rev ō lū′ shun ist), *n.* one who believes in and works for, radical changes.

revolutionize (rev ō lū′ shun īz), *v.t.* to cause a great or complete change in, as to *revolutionize* methods of manufacture.

revolve (rē volv′), *v.i. and v.t.* to move in a circular course about a center, as the earth *revolves* about the sun; to cause to move about a center or turn on an axis.

revolver (rē vol′ vẽr), *n.* a pistol with several cartridge chambers set in a cylinder that turns so as to bring them one after the other in line with the barrel where each may be discharged.

revulsion (rē vul′ shun), *n.* a sudden and deep change of feeling; the act of drawing back from something with keen dislike.

reward (rē wôrd′), *n.* that which is given for anything received, either good or bad, but especially something given in recognition and appreciation of merit, as a *reward* for perfect attendance.

reward (rē wôrd′), *v.t.* to give something in recognition of service or merit, as to *reward* the finder for returning money to the owner.

rhapsody (rap′ sō di), *n.* [*pl.* rhapsodies] an oration or any emotional utterance or piece of writing full of exaggerated expression of feeling; an emotional musical composition irregular in form.

rheostat (rē′ ō stat), *n.* an instrument regulating the strength of an electric current by controlling the amount of resistance.

***rhetoric** (ret′ ō rik), *n.* the art of speaking or writing with correctness, clearness and strength; a textbook on this subject; fine writing, especially in prose; pretentious, artificial elegance in writing or speech.

rhetorical question (rē tor′ i kal kwes′ chun), a question presented without expecting an answer, a question asked for effect.

rhetorician (ret ō rish′ un), *n.* one skilled in the art of correct speech or one who teaches it.

***rheum** (ro͞om), *n.* a watery or mucous discharge, especially from the eyes or nose, as in catarrh.

***rheumatism** (ro͞o′ ma tizm), *n.* a painful, inflamed condition of muscles or joints, accompanied by swelling and stiffness.

***rhinoceros** (rī nos′ ēr os), *n.* a huge thick-hided animal of Asia and Africa, with one or two horns projecting from its snout.

***rhododendron** (rō dō den′ dron), *n.* one of a genus of ornamental shrubs or trees (mostly evergreen) of the heath family with large handsome flowers.

rhomboid (rom′ boid), *n.* a four-sided figure having its opposite sides equal and parallel, but the adjacent sides unequal and the angles all oblique angles.

rhombus (rom′ bus), *n.* a four-sided figure with all sides equal in length, with opposite sides parallel and with two obtuse angles and two acute right angles.

rhubarb (ro͞o′ bärd), *n.* a hardy garden plant with large leaves and a fleshy pink stalk; the stalks of this plant used for food, having, when cooked, a tart flavor; an extract from the root of a similar oriental plant, used in medicine.

rhyme or **rime** (rīm), *n.* a likeness of sound between two words, especially at the ends of lines in verse; a word that resembles another in sound, as star is a *rhyme* for far, glory, for story.

rhyme or **rime** (rīm), *v.i. and v.t.* to accord in sound, end in the same sound in one or more syllables, as motion *rhymes* with ocean; to put words that match in sound at the ends of lines in verse.

***rhythm** (ri*th*′ m), *n.* regular, repeated movement, as the *rhythm* of waves beating on a beach; cadence in written or spoken language, especially in poetry, caused by the metrical arrangement of accents and pauses; the regular flow of movement and beat in music; any certain pattern of time and accent in music, as waltz *rhythm*, two-four *rhythm*.

rib (rib), *n.* one of the curved bones attached to the spinal column and together forming a framework in which the lungs are enclosed; anything resembling or likened to one of these bones, as a *rib* of a ship's hull, the *ribs* of an umbrella; the main stem in a leaf; a fore-and-aft part of the wing structure of an airplane.

rib (rib), *v.t.* to enclose in or equip with anything resembling the bones of the chest or the ridges these bones make on the skin of the chest, as to *rib* knitting.

***ribald** (rib′ ald), *adj.* coarse and indecent, as language or conduct.

ribaldry (rib′ ald dri), *n.* [*pl.* ribladries] indecency of speech, or coarse conduct.

ribbon (rib′ un), *n.* a strip of silk or other fine fabric used for ornament; a narrow inked strip of cloth, as the *ribbon* in a typewriter; any long thin strip resembling a ribbon, as a *ribbon* of moonlight.

***rice** (rīs), *n.* a valuable cereal grass usually grown on flooded fields in tropical countries; the seed of this grass used for food.

rice paper (rīs pā′ pēr), a thin paper made from the straw of the rice plant; a lightweight paper made from the pith of an Oriental shrub and used in Chinese art.

***rich** (rich), *adj.* having more than ordinary amounts of money or possessions; expensive and fine, as *rich* clothing; abundant, as a *rich* harvest; fertile and productive, as this is *rich* soil; having plenty of, as *rich* in memories; brilliant and strong, as *rich* colors or tones.

riches (rich′ ez), *n. pl.* valuable possessions, wealth; plenty.

rick (rik), *n.* a pile or heap, especially, a heap of hay or straw carefully built up, rounded at the top and covered over.

rickets (rik′ ets), *n.* a disease of children in which the bones are softened.

rickety (rik′ e ti), *adj.* affected with bone-softening disease; loose-jointed; unsteady, shaky, as *rickety* stairs.

***ricochet** (rik ō shā′), *n.* the bound of something fired over a surface, as the *ricochet* of a stone skipped over water, the *ricochet* of a cannonball glancing off the ground.

***ricochet** (rik ō shā′), *v.i. and v.t.* [*p.t.* and *p.p.* ricocheted, *pr.p.* ricocheting] to rebound or skip on a flat surface; to strike and glance off, as the shot *ricocheted* from the wall of the fort; to cause to skip or glance from a surface, as see if I can *ricochet* this flat stone across the pond.

rid (rid), *v.t.* to free, as a burden or affliction, as to *rid* a place of vermin, *rid* a friend of his distress.

rid (rid), *adj.* freed, as at last I am rid of that cold.

riddance (rid′ ans), *n.* the act of freeing from something undesirable; the state of being delivered from annoyance, as his departure is a good *riddance*.

riddle (rid′ l), *n.* an enigma, a conundrum, especially a trick question with a puzzling answer.

riddle (rid′ l), *n.* a coarse sieve, used to sift sand or ashes.

riddle (rid′ l), *v.t.* to pierce with many holes, making the object like a sieve, as to *riddle* a car with shots; to refute, as to *riddle* another's statement with opposite arguments; to sift in a coarse sieve, as to *riddle* gravel.

ride (rīd), *n.* a journey on horseback or in any kind of conveyance; a path for saddlehorses.

ride (rīd), *v.i. and v.t.* to be carried along on the back of a horse, on a bicycle, or in a wagon, car, ship, airplane or other conveyance; to move, as the car *rides* easily; to be carried through or over, as the ship *rode* the waves; to survive, as the ship *rode* the storm; to sit on, control and proceed, as to *ride* a horse or a bicycle.

rider (rīd′ ēr), *n.* one who is carried, as a horseback *rider*, the car accommodates six *riders*; a section or clause added to a statue or enactment, generally to bring about something not included in the original purpose.

ridge (rij), *n.* any raised line on a surface, as a *ridge* of land; the line where two slopes unite, as the *ridge* of a roof.

ridge (rij), *v.i. and v.t.* to be marked with raised lines; to put raised lines in.

ridicule (rid′ i kūl), *n.* banter, mockery, derision; the act of making fun of.

ridicule (rid′ i kūl), *v.t.* to make fun of, laugh at in derision.

ridiculous (ri dik′ ū lus), *adj.* deserving to be laughed at, comical, absurd, as what a *ridiculous* argument, he cut a *ridiculous* figure.

rife (rīf), *adj.* prevalent; common; widespread; general, as suspicion was *rife* among those present, sickness is *rife* in town.

riffraff (rif′ raf), *n.* the rabble; trash, rubbish.

rifle (rī′ fl), *n.* a firearm with a long barrel, grooved spirally on the inside to give spin to the bullet, increasing the accuracy of fire.

rifle (rī′ fl), *v.t.* to groove spirally, as a gun barrel.

rifle (rī′ fl), *v.t.* to rob, pillage, plunder.

rift (rift), *n.* an opening in anything caused by splitting; a fissure; a separation into parts, as a *rift* in the clouds.

rift (rift), *v.t. and v.i.* to burst open; to split open; to separate into parts, as the clouds *rifted*.

rig (rig), *n.* a way of arranging the masts, sails and ropes of a ship; an outfit of clothing or equipment, as he wore a strange *rig*.

rig (rig), *v.t.* to fit with sails, spars and ropes, as to *rig* a ship; to fit out, equip; to dress oddly, as you should have seen the way he was *rigged*.

rigging (rig′ ing), *n.* the entire system of sails and ropes on a sailing vessel; gear and tackle in general.

***right** (rīt), *n.* that which is correct and in accordance with accepted standards of justice and truth: opposite of *wrong*, as we will fight for the *right*; that to which one has a just and proper claim, as we will fight for our *rights*; the right-hand side, as it is on your *right*; *the Right*, the conservative party in politics.

Syn. Claim, privilege. *Right*, in its full sense, is altogether an abstract thing which is independent of human laws and regulations. A *claim* or *privilege* is altogether connected with the establishments of civil society. We have often a *claim* to a thing that it is not in our power to substantiate; and on the other hand, *claims* are set up in cases which are totally unfounded on any *right*. *Privileges* are *rights* granted to individuals, depending either upon the will of the grantor or the circumstances of the receiver, or both. *Privileges* are, therefore, partial *rights* transferable at the discretion of persons individually or collectively.

Ant. Wrong, injustice, impropriety.

right (rīt), *v.t.* to put in order, as to *right* a messy lot of papers; to correct, as to *right* a wrong; to recover correct position, as the ship *righted* easily after the great wave struck her.

right (rīt), *adj.* in accordance with justice and honor, as he is a man of *right* conduct; straight, as a *right* line; made by one line perpendicular to another, as a *right* angle; suitable, as the *right* answer; pertaining to the side of the body which most people use the most: opposite of *left*.

right (rīt), *adv.* correctly, as you answered *right*; directly, as the shot went *right* to the mark; in the proper way, as do it *right*.

right angle (rīt ang′ gl), an angle of 90°, formed by one straight line perpendicular to another straight line.

***righteous** (rī′ chus), *adj.* just, equitable; ruled by what is right; blameless; upright, as a *righteous* man, a *righteous* cause, *righteous* wrath.

rightful (rīt′ fool), *adj.* having a just and proper claim, as the *rightful* owner; in accord with justice, as a *rightful* demand.

right-hand (rīt hand), *adj.* near or on the right, as the *right-hand* turn; for the right hand or foot, as a *right-hand* glove or shoe; as valuable as a right hand, chiefly relied upon, as a *right-hand* man.

right of way (rīt ov wā), the customary or lawful right of traffic to take precedence over other traffic.

***rigid** (rij′ id), *adj.* not pliant, stiff, inflexible, unyielding; strict, severely just.

rigmarole (rig′ ma rōl), *n.* a jumble of words; disconnected talk with little sense.

rigor (rig′ ēr), *n.* stiffness; severity; an act or condition of severity, as the *rigors* of a northern climate.

rigorous (rig′ ēr us), *adj.* stern, inflexible, unyielding, severe.

rill (ril), *n.* a small stream or rivulet.

rim (rim), *n.* a border, margin or edge; a raised border; brim.

rim (rim), *v.t.* to furnish with a border, especially a raised border; to serve as an edge around something, as the bowl is *rimmed* with silver.

***rime** (rīm), *n.* hoarfrost, white frost.

rime (rīm), *n.* rhyme.

rimy (rīm′ i), *adj.* [*comp.* rimier, *superl.* rimiest], frosted.

***rind** (rīnd), *n.* the thick outer skin as of an orange or squash; the outer coating, as bark of a tree.

***rinderpest** (rin′ dẽr pest), *n.* a serious and contagious disease of cattle, cattle plague.

ring (ring), *n.* a circle; something circular in form, as a finger *ring;* persons standing in a circle about a center of interest; a combination of men for a common purpose, usually a selfish or criminal one, as a political *ring,* a drug *ring;* an enclosed space for a contest or exhibit, as a boxing *ring.*

ring (ring), *n.* the sound of a bell; the sound given out by metal free to vibrate when struck; a certain quality of sound or meaning, as his statement has the *ring* of truth.

***ring** (ring), *v.t.* to encircle; to furnish or decorate with anything of circular form.

***ring** (ring), *v.i. and v.t.* to sound musically, resound, as a bell when struck; to sound a bell as a summons, as to *ring* for service, *ring* up on the phone; to resound, as his fame will *ring* throughout the land; to have a sensation as of bells sounding or a buzz, as my ears *ring;* to make resound, as to *ring* a bell; to repeat over and over, as to *ring* his praises.

ringworm (ring′ wûrm), *n.* a contagious disease of the skin marked by circular patches of scaly nature, caused by fungi.

rink (ringk), *n.* an inclosed space with a surface of ice on which to skate or play such games as hockey; a smooth floor for roller-skating.

rinse (rins), *v.t.* to wash lightly, especially without soap; to wash off with clean water to remove soap and suds, as to *rinse* dishes.

riot (rī′ ut), *n.* uproar; tumult; a disorderly outbreak; vivid confusion, as a *riot* of color or sound.

riot (rī′ ut), *v.i.* to raise an uproar; to take part in a public disturbance; to revel noisily; to act without restraint.

riotous (rī′ ut us), *adj.* turbulent, disorderly, seditious.

rip (rip), *n.* an opening made in fabric by the giving way of a seam; a saw that cuts with the grain of the wood, called a *ripsaw;* a rough area on the surface of water caused by reversing tides or currents.

***riparian** (ri pâr′ i an), *adj.* having to do in any way with the banks of a river or lake; pertaining to a shore; as those who own property along a stream have *riparian* rights.

ripe (rīp), *adj.* in a state of maturity or perfection, as *ripe* fruit, grain *ripe* for the harvest; mellow, matured, highly developed, as a *ripe* scholar; ready, as *ripe* for trouble.

ripen (rīp′ en), *v.i. and v.t.* to become matured or ready for use; to hasten the development of.

ripple (rip′ l), *n.* a small curling wave, as a *ripple* on the water, a *ripple* of hair; the sound made by wavelets, or a sound resembling it, as the *ripple* of the breeze, the *ripple* of laughter.

ripple (rip′ l), *v.i.* to become ruffled on the surface, have little curling waves, as the lake *ripples* in the breeze, her hair *ripples,* the muscles *ripple* on his arms.

riprap (rip′ rap), *n.* a loose foundation of stones especially on a soft bottom in deep water.

***rise** (rīz), *n.* the act of going up; an ascent; the extent to which anything goes up, as a *rise* of 10 percent in prices; a small hill, as a *rise* of land; the coming up, as of the sun, sun*rise;* advance in office, station or importance, as his *rise* in the world was swift.

rise (rīz), *v.i.* [*p.t.* rose, *p.p.* risen, *pr.p.* rising] to go higher; to ascend; to extend upward, as the mountain *rises* to an elevation of 1,500 feet; to get up after kneeling or lying down; to come over the horizon, as the sun *rises* late in winter; to swell up, as the dough is *rising;* to become greater or go up, as prices *rose* last week; to go up in the world, as he *rose* fast.

riser (rīz′ ẽr), *n.* one who rises; the upright front of a step or seat.

risibility (riz i bil′ i ti), *n.* [*pl.* risibilities] readiness to laugh; laughter; the sense of what is funny.

rising (rīz′ ing), *n.* the act of getting up or going up, as the *rising* of the moon; a revolt, as a *rising* of the people.

risk (risk), *n.* possibility of loss or danger; peril, as at the *risk* of his life he rescued them.

risk (risk), *v.t.* to take the chance; to imperil; to stake, hazard, as I would *risk* my life on his skill.

rite (rīt), *n.* a solemn religious act; a formal ceremony, as funeral *rites.*

ritual (rit′ ū al), *n.* the manner of performing a religious service; a book of forms for a religious service; any set form or ceremony.

rival (rī′ val), *n.* a competitor; antagonist; one who strives for the same object as another.

rival (rī′ val), *v.t.* to compete; to strive to equal or excel; to emulate.

rival (rī′ val), *adj.* competing; having similar claims; emulous.

rivalry (rī′ val ri), *n.* [*pl.* rivalries] competition; effort to equal or excel.

rive (rīv), *v.i. and v.t.* to split; to tear apart.

river (riv′ ẽr), *n.* a large running stream of water flowing into a bay, gulf, sea or another river.

rivet (riv′ et), *n.* a short metal bolt with a head on one end and hammered to a head on the other end while it is hot and after it has been passed through two plates of metal to hold them together.

rivet (riv′ et), *v.t.* to secure with a metal bolt by hammering; to put a head on a bolt by pounding; to fasten as if with bolts, as to *rivet* a friendship.

rivulet (riv′ ū let), *n.* a little stream.

roach (rōch), *n.* a freshwater fish related to the carp, found in European waters.

roach (rōch), *n.* a cockroach, an insect pest in ships and houses.

road (rōd), *n.* a public way for vehicles; a path or route to be followed, as his *road* through life was hard; an open offshore stretch of water where ships may ride at anchor.

roadbed (rōd′ bed), *n.* the foundation of a highway or a railroad line.

roadster (rōd′ stẽr), *n.* a driving horse; an open automobile with one seat for the driver and a passenger.

roam (rōm), *v.i. and v.t.* to wander about without any definite object or destination; to wander over or through, as to *roam* the woods.

roan (rōn), *n.* a horse with a coat of bay, sorrel or chestnut sprinkled heavily with white hairs; the color of such a horse.

roan (rōn), *n.* a soft grained sheepskin used in bookbinding to imitate morocco.

roar (rōr), *n.* the deep full cry of one of the larger animals, as the lion; a loud, prolonged sound, as a *roar* from the crowd, the *roar* of heavy traffic.

roar (rōr), *v.i.* to make a long deep sound like the cry of a lion, to bellow.

roast (rōst), *n.* a joint of meat to be cooked before a fire or in an oven.

roast (rōst), *v.i. and v.t.* to be cooked before an open fire or in an oven; to feel the heat severely, as I am *roasting* in this sun; to cook before an open fire, in an oven or in embers, as to *roast* a joint of beef, to *roast* corn or potatoes.

rob (rob), *v.i. and v.t.* to steal; to deprive of something rightfully owned.

robber (rob′ ẽr), *n.* a thief.

robbery (rob′ ẽr i), *n.* [*pl.* robberies] theft; the criminal act of taking money or goods belonging to another; an act of theft.

robe (rōb), *n.* a loose outer garment; the dressed hide of an animal used to cover the lap when driving, as a buffalo *robe*: *robes,* garments of state.

robe (rōb), *v.i. and v.t.* to put on a formal garment; to array in garments of state.

robot (rō′ bot), *n.* an efficient, automatic type of worker; an automaton; a word created by Karel Capek to designate artificially created mechanical workmen that appeared in his play "R.U.R."

robust (rō bust′), *adj.* hardy, strong, muscular, vigorous.

rock (rok), *n.* a large mass of stone or of stony matter; that which may wreck a person or a business, as we are on the *rocks.*

rock (rok), *v.i. and v.t.* to move to and fro or back and forth, as a cradle *rocks;* to cause to move back and forth, as to *rock* a cradle; to shake, as an earthquake *rocks* a village.

rocker (rok′ ẽr), *n.* one of the curved pieces on which a cradle or chair sways.

rocking chair (rok′ ing châr), a chair set on curved pieces on which it sways.

rocking horse (rok′ ing hôrs), a toy horse set on curved pieces on which it sways.

rocky (rok′ i), *adj.* [*comp.* rockier, *superl.* rockiest] full of big stones; resembling stone; stony.

rod (rod), *n.* a straight, slim stick of wood or metal, as a fishing *rod;* a switch used to enforce discipline among unruly children; discipline.

rod (rod), *n.* a unit of linear measure equal to 5½ yards.

rodent (rō′ dent), *n.* any of various small gnawing animals, such as mice, rats, rabbits, squirrels.

rodent (rō′ dent), *adj.* gnawing; relating to such animals as the rat, rabbit, squirrel and beaver, which gnaw.

rodeo (rō′ dē ō), *n.* a market where cattle are collected; a public exhibition featuring cowboy horsemanship and cattle roping.

roe (rō), *n.* a small deer native to Europe and Asia; the female of the red deer.

roe (rō), *n.* a mass of fish eggs.

***Roentgen rays** (rûnt′ gen rāz), rays that have the power to penetrate objects that are opaque and do not permit passage of heat rays or light rays, *X rays.*

rogue (rōg), *n.* a dishonest person, knave; a sly, mischievous person, a rascal.

roguery (rōg′ ẽr i), *n.* [*pl.* rogueries] knavish or dishonest practices; cheating; mischievous or waggish conduct.

roguish (rōg′ ish), *adj.* mischievous; dishonest in a sly way.

roil (roil), *v.t.* to stir up and make muddy, as he *roiled* the spring; to vex and harass.

***role** (rōl), *n.* a part or character in a play or an opera, as he plays the *role* of a martyr; a function or pose.

roll (rōl), *n.* the act of turning over and over or from side to side; anything turned round and round upon itself or that revolves, as a *roll* of cloth, a phonograph *roll;* a kind of biscuit doubled over; a long deep sound, as a *roll* of thunder, the *roll* of drums; a wavelike surface, as a *roll* of land.

roll (rōl), *n.* a list of names, as a class *roll.*

roll (rōl), *v.i. and v.t.* to turn over and over or from side to side, as a horse *rolls,* a ship *rolls;* to produce a long, deep sound, as thunder *rolls;* to cause to move by turning over and over, as to *roll* a log; to cause to move on wheels by pushing, as to *roll* a wheeled chair; to press down with something that turns over and over, as to *roll* turf.

roller (rōl′ ẽr), *n.* one who or that which rolls; a cylinder in a machine; a tumbling pigeon; a canary bred and trained to have a special roll or trill in its song.

rollick (rol′ ik), *v.i.* to move in a swaggering, carefree manner; to frolic.

rolling (rōl′ ing), *adj.* rotating; moving on or as if on wheels; having undulations, as *rolling* country; rumbling, as thunder.

***romance** (rō mans′), *n.* a work of fiction stressing adventure and incident; delight in what is fanciful, adventurous and picturesque.

romance (rō mans′), *v.i.* to make up stories, tell fanciful tales, fib.

romantic (rō man′ tik), *adj.* picturesque and strange; marked by the spirit of adventure and variety; fanciful, unreal.

romanticism (rō man′ ti sizm), *n.* a swing away from cold realism or classic perfection in literature and art, such as occurred late in the 18th century.

romp (romp), *n.* a young person, especially a girl, who enjoys rough play; boisterous play; a frolic.

romp (romp), *v.i.* to play in a rough or frolicking manner.

rood (ro͞od), *n.* a cross, a crucifix; *holy rood,* the cross of Christ.

rood (ro͞od), *n.* a square measure equal to one-fourth of an acre or 40 square rods.

***roof** (ro͞of), *n.* the top covering of a house or other building.

roof (ro͞of), *v.t.* to place a top cover on a house or other building; to supply with shelter, as if taking under a roof.

roof garden (ro͞of gär′ dn), a place of entertainment on the flat top of a city building.

rooftree (ro͞of′ trē), *n.* the ridgepole, against which the rafters rest; a home.

***rook** (rook), *n.* a bird of the crow family; a swindler.

rookery (rook′ ẽr i), *n.* [*pl.* rookeries] a breeding place of a colony of rooks; a breeding place of a colony of gulls or seals; a ramshackle tenement house.

***room** (ro͞om), *n.* a walled-in part of a house; a chamber; space not occupied.

room (ro͞om), *v.i.* to lodge, as he *rooms* here.

roomy (ro͞om′ i), *adj.* [*comp.* roomier, *superl.* roomiest] spacious.

roorback (roor′ bak), *n.* a false statement put out late in a political campaign to injure one of the candidates.

roost (ro͞ost), *n.* the pole or perch upon which birds rest at night.

roost (ro͞ost), *v.i.* to sit or sleep on a perch.

rooster (ro͞os′ tẽr), *n.* a male fowl, especially the domestic cock.

***root** (ro͞ot), *n.* the part of a plant that is underground, holding the plant in place and taking moisture and nourishment from the earth; the origin or source, as the *root* of a word, the *root* of the difficulty; a number or quantity that multiplied by itself gives as a product a given number, as 3 or —3 is the second or square *root* of 9, and 3 is the third root of 27.

root (ro͞ot), *v.i. and v.t.* to take hold in the ground; to implant deeply and firmly; to dig or burrow with the snout, as pigs *root: root up,* to take out of the ground.

rope (rōp), *n.* a thick cord or small cable; objects braided, twisted or strung together, as a *rope* of pearls, a *rope* of daisies; a thick thread of matter that forms in a liquid.

rope (rōp), *v.t.* to fasten with cords; to lasso, as to *rope* cattle.

ropy (rōp′ i), *adj.* [*comp.* ropier, *superl.* ropiest] like cord; viscous.

***Roquefort** (rōk′ fẽrt), *n.* a French cheese streaked with blue mold, made from the milk of ewes.

***rosaceous** (rō zā′ shus), *adj.* pertaining to roses; having several petals arranged in a circular form.

***rosary** (rō′ z*a* ri), *n.* [*pl.* rosaries] a place where roses grow; a garland of roses; a string of beads by which prayers are counted.

rose (rōz), *n.* a thorny plant or in some varieties a climbing vine, with thorny stems and fragrant flowers, red, white or other colors; the flower of this plant.

***roseate** (rō′ zē āt), *adj.* like a rose; rose-colored.

***rosemary** (rōz′ mâr i), *n.* [*pl.* rosemaries] a sweet-smelling evergreen shrub from which an aromatic water is distilled.

***rosette** (rō zet′), *n.* a cluster of ribbons arranged in the form of a rose; any ornament made in the shape of a rose.

rose window (rōz win′ dō), a circular window of stained glass with tracery radiating from the center.

rosewood (rōz′ wood), *n.* a hard, dark-red Brazilian wood used in cabinet work and to make fine furniture.

***rosin** (roz′ in), *n.* resin, the product left after distilling crude turpentine, used in varnishes and soaps and on violin bows.

rosin (roz′ in), *v.t.* to rub with rosin, as I must *rosin* this violin bow.

***roster** (ros′ tẽr), *n.* a list of officers and men enrolled for duty in the military and naval services; any list of names, as of members in a club.

rostral (ros′ tral), *adj.* having a beak; relating to a beak; resembling a beak.

rostrum (ros′ trum), *n.* [*pl.* rostrums or rostra] a platform or pulpit from which an oration may be delivered; a beak, as of a bird or a ship.

rosy (rōz′ i), *adj.* [*comp.* rosier, *superl,* rosiest] red; blushing; favorable, as *rosy* prospects.

rot (rot), *n.* decay; the process of decaying; a disease of sheep; a disease attacking plants; nonsense.

rot (rot), *v.i. and v.t.* to decay; to cause to decay, as wet weather *rots* plants.

***rotary** (rō′ t*a* ri), *adj.* turning on an axis, as a wheel; made with parts that turn on an axis, as a *rotary* printing press.

***rotate** (rō′ tāt), *v.i. and v.t.* to turn on an axis, as the wheel *rotates* more easily when greased; to cause to turn on an axis, as *rotate* that wheel in the opposite direction.

rotation (rō tā′ shun), *n.* the act of turning on an axis or hub; alternation or regular succession; the act of alternating, first one and then another, as *rotation* of crops.

rote (rōt), *n.* mechanical routine; repetition without understanding, as you know the lesson by *rote,* but do not seem to know what it really means.

***rotogravure** (rō tō gr*a* vūr′), *n.* a process by which photographs are reproduced in print with speed and fine effect from cylinder-shaped plates used in printing the picture sections of Sunday newspapers.

rotten (rot′ n), *adj.* decayed; decomposed; dirty and corrupt, as *rotten* government.

rotund (rō tund′), *adj.* plump and rounded out, as a *rotund* figure; full-toned, as he speaks in *rotund* tones; using high-sounding words, as a *rotund* style.

rotunda (rō tun′ d*a*), *n.* a circular, domed building; a large circular room with domed ceiling, as the *rotunda* of the Capitol.

***roué** (ro͞o ā′), *n.* a dissolute man, a rake.

***rouge** (ro͞ozh), *n.* a cosmetic used to redden the cheeks or lips; a red powder used for polishing gems, glass and metals.

rouge (ro͞ozh), *v.i. and v.t.* to use a cosmetic to redden the cheeks or lips; to tint with red, as to *rouge* the cheeks.

***rough** (ruf), *n.* an unfinished state, as in the *rough;* a rowdy.

rough (ruf), *v.t.* to make uneven; to do hastily and incompletely, as to *rough* out a plan; to handle without gentleness, as do not *rough* the child.

rough (ruf), *adj.* having an uneven surface; rugged; not smooth, as a *rough* road; not gentle, as *rough* play; harsh in manner; crude; hastily or only approximately made or done, as a *rough* guess, a *rough* sketch.

roughage (ruf′ ij), *n.* coarse food that cannot be completely digested and that stimulates action of the intestines.

roulette (ro͞o let′), *n.* a game of chance played with a revolving disk and a ball.

round (round), *n.* a circle or globe; a fixed course, as a policeman must make his *round* in so many minutes; a series, as a *round* of parties; a volley of sounds, as a *round* of applause; one of a series, as the *rounds* of a boxing match; a ladder rung; a certain cut of beef, as a steak off the *round.*

round (round), *v.i. and v.t.* to become curved out with fullness, as the balloon will *round* out; to give a curved form to, as *round* out this line; to pass, as the ship *rounded* the cape.

round (round), *adj.* circular; curved; complete, as a *round* hundred; going out and back, as a *round* trip; full and clear, as *round* tones.

round (round), *adv.* in all directions, as the leaves blow round; in rotation, as clock hands go *round;* so as to reach all present, as pass the candy *round;* in circumference, as 10 feet *round;* here and there, as the dog follows him *round.*

round (round), *prep.* about, so as to encircle, as pass the rope *round* the post, sit *round* the table; from behind, as peek *round* a fan; from all sides toward, as the crowd gathered *round* the bulletin board; in all directions from, as look *round* the camp.

roundabout (round′ *a* bout); *n.* a merry-go-round; a short jacket worn by sailors and boys.

roundabout (round′ *a* bout), *adj.* indirect, as that's a *roundabout* way of saying what you mean.

roundabout (round′ *a* bout), *adv.* on all sides, as the woods lay *roundabout.*

roundabout (round′ *a* bout), *prep.* on all sides of, as the woods *roundabout* the camp.

roundelay (roun′ de lā), *n.* a song or dance of old times with one strain or a simple melody frequently repeated.

roundhouse (round′ hous), *n.* a circular building in which railroad locomotives are housed.

round robin (round rob′ in), a petition with signatures written in a circle so that no one can tell who signed first.

roundsman (roundz′ man), *n.* a police officer who goes through a district to see how the patrolmen are covering their beats.

roundup (round′ up), *n.* a gathering and driving in of cattle from the range, as for branding; the men and horses that round them up; any driving or gathering together of persons or things, as a *roundup* of gangsters.

rouse (rouz), *v.i. and v.t.* to stir suddenly from sleep; to awaken or be awakened suddenly; to stir to thought or action.

roustabout (roust′ *a* bout), *n.* a deckhand on a river steamboat; one who works on the docks loading and unloading ships; one who works at odd jobs now and then and here and there.

rout (rout), *n.* total defeat and disorderly flight; a disorderly crowd; disorder.

rout (rout), *v.t.* to defeat and put to flight; to drag forth, as to *rout* out the late sleepers.

***rout** (rout), *v.i. and v.t.* to dig with the snout, as a pig; to root up; to dig out, gouge.

***route** (ro͞ot), *n.* the way or road traveled; the course of a journey; a certain course to be covered, as a newsboy's *route.*

route (ro͞ot), *v.t.* to send over a certain road or combination of roads, as to *route* a shipment of goods.

***routine** (ro͞o tēn′), *n.* a course of business, official or domestic duties regularly pursued; fixed methods of action; uniform habits or practice.

rove (rōv), *v.i. and v.t.* to wander or ramble; to roam, as we *roved* in the woods, we *roved* the woods.

row (rō), *n.* a line, file or rank of persons or things.

row (rō), *n.* a ride in a boat propelled by oars, as we had a good *row.*

row (rou), *n.* a noisy disturbance, quarrel, brawl.

row (rō), *v.i. and v.t.* to wield an oar or a pair of oars; to propel a boat with oars.

row (rou), *v.i.* to make or take part in a disturbance or quarrel.

rowdy (rou′ di), *n.* [*pl.* rowdies] a rough, riotous fellow.

rowdy (rou′ di), *adj.* [*comp.* rowdier, *superl.* rowdiest] rough and noisy.

***rowel** (rou′ el), *n.* a tiny wheel with sharp teeth on the rim, as on a spur.

rowlock (rō′ lok), *n.* a device to keep an oar from slipping on the side of a rowboat, a pair of wooden or metal pins, a notch cut in or a metal crotch: also called *oarlock.*

royal (roi′ al), *adj.* pertaining to a king; befitting or like a king; regal; pertaining to the government of a kingdom, as *royal* decrees; holding a charter from a king or queen, as a *royal* colony.

Syn. Regal, kingly. That which is *royal* belongs to a sovereign in the most general sense. That which is *regal* appertains to a king in particular application. *Kingly* signifies like or befitting a king. We speak of a *royal* carriage, residence or authority; of *regal* garments and *kingly* conduct.

royalist (roi′ al ist), *n.* an adherent of a king or advocate of rule by a sovereign.

royalty (roi′ al ti), *n.* the character, status or family of a sovereign; royal personages.

royalty (roi′ al ti), *n.* [*pl.* royalties] a percentage paid to an author, composer or inventor for use of a patent or copyright, as the author of this book receives a *royalty* of 20 cents on every copy sold by the publishers.

rub (rub), *n.* the act of passing over with friction, as give this glass a *rub;* a difficulty or hindrance, as there's the *rub.*

rub (rub), *v.i. and v.t.* to pass over or be passed over with friction, as this collar *rubs;* to clean or scour, as *rub* the glass with a wet rag; to polish.

rubber (rub′ ẽr), *n.* an elastic substance obtained from the sap of various plants that grow in tropical lands; a piece of this substance used for erasing; anything made of India rubber, as an overshoe; the decisive game in a series after a tie score.

rubbish (rub′ ish), *n.* trash; waste fragments; anything of no value.

rubble (rub′ l), *n.* rough undressed stone; builders' rubbish.

rubescent (ro͞o bes′ ent), *adj.* becoming red, reddening.

rubicund (ro͞o′ bi kund), *adj.* red or inclined to redness; ruddy, as a *rubicund* complexion.

rubric (ro͞o′ brik), *n.* the ritual forms printed in a prayerbook; the heading of a statute: so called because formerly written in red.

rubricate (ro͞o′ bri kāt), *v.t.* to mark or distinguish with red.

***ruby** (ro͞o′ bi), *n.* [*pl.* rubies] a precious stone, varying in color from carmine to crimson; a rich red color like that of this gem.

ruche (ro͞osh), *n.* frilled or plaited lace, net or silk used as an edging for a dress or as a collar.

ruche (ro͞osh), *v.t.* to adorn with a ruche.

ruching (ro͞osh′ ing), *n.* material used in making frilled edges for a dress; ruches collectively.

ruck (ruk), *n.* the ordinary crowd, especially a group of horses running far behind the winner; *in the ruck,* unimportant, undistinguished.

ruck (ruk), *v.i. and v.t.* to wrinkle or crease.

rudder (rud′ ẽr), *n.* a broad flat frame of wood or metal by which a boat, ship, airplane or dirigible is steered.

ruddy (rud′ i), *adj.* [*comp.* ruddier, *superl.* ruddiest] approaching redness; tinged with red; florid, as a *ruddy* countenance.

***rude** (ro͞od), *adj.* rough; uncultivated; uncivil; impolite; harsh.

***rudiment** (ro͞o′ di ment), *n.* a first principle; elementary stage; that which is incompletely developed.

rudimentary (ro͞o di men′ t*a* ri), *adj.* elementary; undeveloped.

rue (ro͞o), *n.* an herb of bitter taste and strong odor.

rue (ro͞o), *v.t.* to regret, be sorry for, repent of, as you shall *rue* this action.

rueful (ro͞o′ fool), *adj.* mournful, melancholy, regretful.

ruff (ruf), *n.* a large frilled collar; a thick covering of feathers or fur about the neck of a bird or animal.

***ruffian** (ruf′ i an), *n.* a rough, lawless, boisterous fellow.

ruffle (ruf′ l), *v.t.* to wrinkle, pucker or disarrange; to annoy or vex, as your conduct *ruffles* me.

ruffle (ruf′ l), *v.t.* to equip or adorn with folds or gathers.

ruffle (ruf′ l), *v.t.* to raise or make stand out, as a bird *ruffles* its feathers; to make ripples upon, as a light breeze *ruffled* the water; to rumple, as to *ruffle* one's hair.

rug (rug), *n.* a floor covering of heavy fabric usually made in one piece and not tacked down; a lap robe; a fur mat.

***rugged** (rug′ ed), *adj.* rough, shaggy, as a *rugged* beard; strongly marked, as a *rugged* range of mountains; sturdy, as a *rugged* body, a *rugged* nature.

ruin (ro͞o′ in), *n.* destruction; overthrow; downfall; complete loss, as of wealth or happiness: *ruins,* remains, as the *ruins* of an ancient city.

ruin (ro͞o′ in), *v.t.* to tear down, destroy, wreck, as you have *ruined* my happiness, the house is *ruined,* our business will be *ruined.*

ruinous (ro͞o′ i nus), *adj.* fallen into a state of destruction; decayed; consisting of surviving fragments or parts; causing destruction.

***rule** (ro͞ol), *n.* a standard or guide; a maxim or precept; a fixed course of action; controlling power or the use of it, as the king had a long *rule,* the *rules* of a game; an instrument for measuring.

rule (ro͞ol), *v.i. and v.t.* to be in command; to prevail; to govern; to decide a disputed matter, as the referee *ruled* in our favor; to mark with lines, as if with the aid of a ruler, as he *ruled* the sheet for a ledger account.

ruler (ro͞ol′ ẽr), *n.* one who governs or commands; a smooth-edged strip of wood or metal with which to draw straight lines of given lengths or to measure distances.

ruling (ro͞ol′ ing), *n.* a decision by a court or referee.

***rum** (rum), *n.* an alcoholic liquor distilled from molasses or the juice of the sugar cane.

rumble (rum′ bl), *n.* a low, heavy, continued, rolling sound; a seat or space for baggage at the back of an automobile.

rumble (rum′ bl), *v.i.* to make a long heavy rolling sound.

***ruminant** (ro͞o′ mi nant), *n.* a herbivorous animal, such as the cow, sheep, goat, deer, camel, giraffe, that swallows its food unchewed and regurgitates it in the form of a cud for chewing.

ruminant (ro͞o′ mi nant), *adj.* chewing the cud; quiet and thoughtful.

ruminate (ro͞o′ mi nāt), *v.i. and v.t.* to chew a cud; to think over again, meditate, ponder.

rumination (ro͞o mi nā′ shun), *n.* the act of chewing the cud; meditation.

rummage (rum′ ij), *v.i. and v.t.* to ransack, search through a collection of things.

rummage sale (rum′ ij sāl), a sale, especially for charity, of all sorts of discarded things.

rumor (ro͞o′ mẽr), *n.* a report passing from one person to another without evidence of truth; public gossip, hearsay.

rumor (ro͞o′ mẽr), *v.t.* to circulate a report without investigating the truth or falseness of it.

rump (rump), *n.* the hind end of an animal.

rumple (rum′ pl), *n.* an irregular fold, a wrinkle, a crease.

rumple (rum′ pl), *v.t.* to make uneven, crumple, muss, as do not *rumple* my hair.

rumpus (rum′ pus), *n.* a disturbance; a great to-do.

run (run), *n.* a pace faster than a walk; the act of running, as the dog had a good *run;* a distance covered, as by a car or train, as a 100-mile *run;* a small stream; a series of performances, as the play had a long *run;* free use, as you have the *run* of the house; the customary sort, as the general *run* of mankind; a panic, as a *run* on the bank; a long ravel in a knitted fabric.

run (run), *v.i.* [*p.t.* ran, *p.p.* run, *pr.p.* running] to go at a faster pace than a walk; to be a candidate, compete, as to *run* for mayor; to make regular trips, ply, as the steamer *runs* between New York and Savannah; to flow, as a river *runs,* the water *ran* out; to act, operate, as a watch *runs;* to dissolve and spread, as the color in that blouse *runs;* to have a certain direction, as the road *runs* north; to discharge a fluid, as my eyes *run,* his nose *runs.*

run (run), *v.t.* [*p.t.* ran, *p.p.* run, *pr.p.* running] to cause to go faster than a walk, as do not *run* that horse too hard; to do by going faster than a walk, perform, as to *run* a race; to manage or conduct, as to *run* a home or a business; to operate, as to *run* a sewing machine; to incur, as danger; to thrust, as to *run* a sword through a rival; to mark out, as to *run* a boundary line.

runabout (run′ *a* bout), *n.* a light automobile for ready service.

rune (ro͞on), *n.* a character in the ancient Teutonic alphabet of northern Europe used from the 3d century by the Anglo-Saxons and Scandinavians; a magic mark or verse: *runes,* old Finnish or old Norse poetry.

rung (rung), *n.* a round of a ladder; a crosspiece of a chair, bracing the structure; a floor timber in a ship; one of the grips on a ship's steering wheel.

runner (run′ ẽr), *n.* a racer; a messenger; the operator of an engine; one of the pieces on which a skate or sleigh passes over snow and ice; a branch of a plant that grows out over the ground, takes root and produces a new plant, as a strawberry *runner.*

runt (runt), *n.* an undersized animal; the weakest one in a brood or litter; a person of less than normal size.

***rupture** (rup′ tūr), *n.* the act of breaking apart or state of being broken apart; a break in friendly relations; a hernia or torn muscle.

rupture (rup′ tūr), *v.i. and v.t.* to break, as some tissues *rupture* more easily than others; to burst, as he *ruptured* a blood vessel; to interrupt or break off, as friendly relations.

***rural** (roor′ al), *adj.* having to do with the country or with country life, as *rural* scenes.

Syn. Rustic. *Rural* applies to all country objects except man; it is therefore often connected with the charms of nature. *Rustic* is the opposite of *urban* and applies to the crudeness of country life, as *rustic* manners.

Ant. Urban, citified.

rural free delivery (roor′ al frē dē liv′ ẽr i), a system of free delivery of mail to persons living in country districts maintained by the Federal Government.

***ruse** (ro͞oz), *n.* a trick; stratagem; action intended to mislead another.

***rush** (rush), *n.* violent motion with haste; pressure, as a *rush* of business; the hurrying of many people to a new place, as the California gold *rush.*

rush (rush), *n.* a grasslike herb growing in wet land and having round, limber hollow stems, growing to a height of 4 feet or more.

rush (rush), *v.i. and v.t.* to move forward hastily, hurry; to cause to hurry, as you are *rushing* me too fast; to attack fast and hard, as to *rush* an enemy outpost.

rusk (rusk), *n.* a light, sweetened biscuit; a sweetened bread baked dry.

russet (rus′ et), *n.* a brown color varying from a red-yellow to a more reddish red-yellow; cloth or clothes of that color; a coarse homespun cloth or garments made of it; a winter apple with a rough russet-colored skin.

Russia leather (rush′ *a* le*th*′ ẽr), a fine, strong, soft leather prepared from the hides of sheep and cattle, steeped in birch oil and used for fine bookbinding and luxurious purses, bags, slippers.

rust (rust), *n.* the reddish matter that forms on iron or steel through the action of air and moisture; a destructive disease of plants due to a fungus, which causes reddish spots on stems and leaves.

rust (rust), *v.i. and v.t.* to become coated with reddish matter, red oxide of iron, through action of air and moisture on the metal, as iron *rusts* easily; to cause such a condition, as the damp air has *rusted* these hinges; to become worn from lack of occupation, as until I can get a job I shall simply *rust.*

rustic (rus′ tik), *n.* a countryman; a peasant.

rustic (rus′ tik), *adj.* pertaining to the country or characteristic of it and its people; unpolished, unadorned.

rusticate (rus′ ti kāt), *v.i. and v.t.,* to reside for a time in the country; to send into the country, especially as a punishment, as he was *rusticated* from college for three months.

rusticity (rus tis′ i ti), *n.* [*pl.* rusticities] rural manners; the simplicity characteristic of countryfolk; awkwardness.

rustle (rus′ l), *n.* a light sound, as of dead leaves moved on the ground by one walking.

rustle (rus′ l), *v.i. and v.t.* to make a sound like that of dead leaves being moved about, as your dress *rustles* when you walk; to steal cattle on the range.

rustler (rus′ lẽr), *n.* an energetic, successful man; one who steals cattle on the range.

rusty (rus′ ti), *adj.* [*comp.* rustier, *superl.* rustiest] covered with the red matter forming on iron and steel when exposed to air and moisture; suffering from lack of use or work, as my mind is always *rusty* after a long vacation; having the reddish color of rust.

rut (rut), *n.* a deep track worn by the wheels of passing vehicles; a settled way of thinking or doing things, as do not let your mind get into a *rut.*

*__ruthless__ (rōōth′ les), *adj.* having no pity or compassion; cruel and unsparing.

rye (rī), *n.* a grain related to wheat, used to make flour and whisky and as fodder for livestock.

S

Sabbath (sab′ ath), *n.* the seventh day of the week, from sundown on Friday to sundown on Saturday, kept as a day of rest and worship by the Jews.

sabbatical (sȧ bat′ i kal), *adj.* pertaining to the Sabbath.

sabbatical year (sȧ bat′ i kal yẽr), a year's leave of absence in every 7 years, granted to professors in some universities to allow them to pursue their own studies.

saber (sā′ bẽr), *n.* a heavy cavalry sword with curving blade.

sable (sā′ bl), *n.* a small flesh-eating animal related to the marten, native to northern Europe and Siberia, and valued for its fine fur; the fur of this animal or a garment made of it; its color, black; a mourning garment.

*__sabot__ (sȧ bō′), *n.* a wooden shoe worn by the peasants of various countries of Europe.

sabotage (sab ō täzh), *n.* deliberate damage done to an employer's property, whether goods, machinery or plant; refusal to work, and interference with other workers.

sac (sak), *n.* a baglike organ in a plant or animal body, generally containing a special fluid.

saccate (sak′ āt), *adj.* having the form of a sac or pouch.

saccharin (sak′ ȧ rin), *n.* a white crystalline product of coal tar, several hundred times as sweet as cane sugar, used as a substitute for sugar in special diets.

*__saccharine__ (sak′ ȧ rin), *adj.* having the qualities of sugar; yielding sugar; extremely sweet or too sweet.

saccharize (sak′ ȧ rīz), *v.i. and v.t.* to convert into sugar or fill with sugar; to ferment.

*__sacerdotal__ (sas ẽr dō′ tal), *adj.* pertaining to priests or to the priesthood.

sachem (sā′ chem), *n.* a high chief of the North American Indians, in some tribes an office passing from father to son; any leader or ruler.

*__sachet__ (sa shā′), *n.* a small bag or cushion filled with perfumed powder.

sack (sak), *n.* a bag, especially a large one, as of burlap, to hold something heavy like grain or potatoes; a loose coat for women or children: also written *sacque;* the plundering of a captured city or town, as the *sack* of Troy.

sack (sak), *v.t.* to put into a coarse bag; to plunder, pillage, ravage a town or land.

sackcloth (sak′ klôth), *n.* a coarse material of which heavy bags are made; coarse cloth worn as a token of mourning or penitence.

sacking (sak′ ing), *n.* coarse material, like burlap, used in making sacks.

*__sacrament__ (sak′ rȧ ment), *n.* a solemn religious rite, as baptism or the Eucharist, the Lord's Supper.

sacramental (sak rȧ men′ tal), *adj.* pertaining to or constituting a religious rite; solemnly pledged.

*__sacred__ (sā′ kred), *adj.* set apart for religious use; pertaining to God or religion; consecrated; to be held in reverence.

*__sacrifice__ (sak′ ri fīs), *n.* the act of offering something to God in atonement as an act of worship; what is thus offered; the act of giving up something one has or wants for the good of others; also, self-*sacrifice;* the selling of goods at cost or under cost, involving loss; any grievous loss, as to win a war at the *sacrifice* of men.

*__sacrifice__ (sak′ ri fīs), *v.i. and v.t.* to make an offering to God; to give up, lose, renounce or destroy for a cause, as to *sacrifice* one's life for one's country; to sell at a loss, as the property was *sacrificed* for $5,000.

sacrificial (sak ri fish′ al), *adj.* relating in any way to the making of an offering made in worship or atonement, involving sacrifice or loss.

*__sacrilege__ (sak′ ri lej), *n.* the act of violating sacred things; a word or act that profanes anything sacred.

*__sacrilegious__ (sak ri lēj′ us), *adj.* violating sacred things; impious.

sacristan (sak′ ris tan), *n.* one who has the care of church vessels, vestments and the like; a sexton.

*__sacristy__ (sak′ ris ti), *n.* [*pl.* sacristies] the room in a church where the sacred vessels and vestments are kept; a vestry.

sacrosanct (sak′ rō sangkt), *adj.* very sacred, very holy, not to be profaned.

*__sacrum__ (sā′ krum), *n.* [*pl.* sacra or sacrums] the five united vertebrae at the lower end of the spinal column, connected with the pelvis.

sad (sad), *adj.* having grief or sorrow; expressing grief or sorrow; mournful; causing sorrow; somber; dark-colored.

sadden (sad′ n), *v.i. and v.t.* to become or make sorrowful; to cause sorrow to; to cause to mourn or grieve.

saddle (sad′ l), *n.* a seat, usually of leather, for one riding horseback; the hindquarters or loins of a meat carcass, as a *saddle* of mutton; the lower part of the back of a fowl resembling a saddle in shape.

saddlebow (sad′ l bō), *n.* the front, arched part of a saddle, the pommel.

saddler (sad′ lẽr), *n.* one who makes and sells fittings for riding and driving.

saddlery (sad′ lẽr i), *n.* [*pl.* saddleries] saddles and fittings for horseback riding or driving; the business or shop of a saddler.

sadiron (sad′ ī ẽrn), *n.* a flatiron, a heavy implement used for smoothing and pressing dampened cloth or clothes.

safe (sāf), *adj.* free from threat of harm, loss or danger; unharmed, having escaped injury; secure; involving no risk, as a *safe* investment; trustworthy, as a *safe* bridge.

Syn. Secure. *Safe* describes freedom or actual escape from danger, as to come home *safe* from war; *secure* means so free from danger or the possibility of danger as to have no fear or anxiety, as to sit *secure* in a tower.

Ant. Insecure, perilous, unsafe.

safe (sāf), *n.* a strong structure in which to store money, papers or valuables, generally with a secret lock and providing security against fire and burglars.

safe-conduct (sāf kon′ dukt), *n.* a guard or passport assuring one of passage without harm; an official document given by a government in time or war to provide such assurance; a passport.

safeguard (sāf′ gärd), *n.* one who or that which protects; defense; protection given by a government to one from another country.

safeguard (sāf′ gärd), *v.t.* to protect, defend, keep from harm.

safety (sāf′ ti), *n.* freedom from danger, injury or damage; the state of being protected against harm.

safety island (sāf′ ti ī′ land), an area at the center of a street crossing that is raised or marked off for the protection of pedestrians.

safety lamp (sāf′ ti lamp), a miner's lamp having the flame inclosed in a cage of wire gauze to prevent explosions.

safety match (sāf′ ti mach), a match that will light only when struck on a specially prepared surface.

safety pin (sāf′ ti pin), a pin so made that its point is held within a metal cap when it is fastened.

safety razor (sāf′ ti rā′ zẽr), a shaving implement in which the blade is inclosed in a frame that lessens the danger of cutting the skin.

safety valve (sāf′ ti valv), an automatic release on a boiler that permits escape of steam when the pressure reaches the danger point; any relief or vent for dangerous emotion.

*__saffron__ (saf′ run), *n.* a plant resembling the crocus having a bulbous root and flowers whose pistils yield a deep-yellow dye; the color of this dye.

saffron (saf′ run), *adj.* having a deep-yellow color.

sag (sag), *n.* a downward bend or depression, as a *sag* in a roof; a drop in prices.

sag (sag), *v.i.* to depart from a normal and proper line, as a towrope *sags* of its own weight, a roof *sags* because the timbers yield; to be depressed, as one's spirit *sags* under a weight of trouble.

*__saga__ (sä′ gȧ), *n.* a legend or story of an Icelandic hero or family line of medieval times; any prose or verse narrative celebrating a line of events or the history of a family.

*__sagacious__ (sȧ gā′ shus), *adj.* mentally quick and discerning, shrewd, wise.

sagacity (sȧ gas′ i ti), *n.* quick, keen judgment; ability to see promptly what should be done in a difficult situation; the quality of quick, sure decision.

sagamore (sag′ ȧ mōr), *n.* a tribal chief of certain North American Indians, ordinarily not quite so high a title as sachem.

*__sage__ (sāj), *n.* an old man of great wisdom; a profound philosopher.

sage (sāj), *n.* a plant of the mint family, genus *Salvia,* used in cookery.

sage (sāj), *adj.* wise, discerning, profound, as *sage* advice.

sago (sā′ gō), *n.* a kind of granulated food starch prepared from the pith of certain East Indian palm trees called *Sago* palms.

*__sail__ (sāl), *n.* a sheet of canvas spread to catch the wind, by means of which a vessel is driven forward in the water; a ride in a sailboat, as we had a delightful *sail.*

sail (sāl), *v.i. and v.t.* to move across water propelled by wind and sail; to travel by water on any vessel; to glide through the air, as a buzzard *sails;* to travel over in a ship, as to *sail* the seven seas; to manage and steer, as to *sail* a boat.

sailor (sāl′ ẽr), *n.* a seaman; mariner; a member of the crew of any ship but especially a sailing ship.

saint (sānt), *n.* a holy or sanctified person, especially one canonized by the Church; one who is eminent for piety and virtue.

sake (sāk), *n.* cause objective, as do this for the *sake* of law and order; welfare or benefit, as do it for my *sake.*

*__salaam__ (sȧ läm′), *n.* a salutation used in oriental lands, combining a deep bow with placing of the right palm on the forehead.

salable (sāl′ ȧ bl), *adj.* marketable; sure to find a buyer.

salacious (sȧ lā′ shus), *adj.* indecent, impure.

salad (sal′ ad), *n.* a dish of cold green vegetables dressed with vinegar or oil; any cold dish of fruit, meat, fish or vegetables served with mayonnaise or other dressing; a green herb grown for these dishes, as lettuce or endive.

salamander (sal′ ȧ man dẽr), *n.* any of various small amphibians, shaped like lizards but having a soft, scaleless skin; a mythical lizard-shaped animal fabled by the ancients to live unharmed in fire; a small stove to keep new building construction from freezing.

salamandrine (sal ȧ man′ drin), *adj.* resembling a salamander; able to resist or endure great heat.

*__salary__ (sal′ ȧ ri), *n.* [*pl.* salaries] regular yearly, monthly or weekly recompense paid for services rendered in business or the professions.

sale (sāl), *n.* exchange of goods for a price in money; offering of goods at lowered prices, as a special *sale* of kitchenware; existence of a market or demand, as there is no *sale* for these goods.

salience (sā′ li ens), *n.* the quality of standing out prominently, prominence.

***salient** (sā' li ent), *n.* a forward-bulging section of a military line, as of trenches; a projecting angle in a fortification.

salient (sā' li ent), *adj.* standing out prominently, noticeable; projecting outwardly, greater than two right angles, as the arc that measures a *salient* angle takes in more than half the circumference of a circle.

saline (sā' līn), *adj.* salty; consisting of, containing or like salt.

saliva (sa lī' va), *n.* the watery fluid secreted in the mouth; spittle.

***salivary** (sal' i ver i), *adj.* pertaining to the spittle or to the glands that produce it.

salivate (sal' i vāt), *v.t. and v.i.* to produce an excess of spittle in; to secrete saliva.

sallow (sal' ō), *n.* a small broad-leaved willow tree that grows in Europe and Asia; a twig of willow.

sallow (sal' ō), *adj.* having a pale, sickly yellow color, as he has a *sallow* complexion.

sally (sal' i), *n.* [*pl.* sallies] a rush of men from a fort or defended place to attack the forces besieging it; a swift outburst of wit or fancy, as his *sallies* of wit kept us in a roar of laughter.

sally (sal' i), *v.i.* to rush out suddenly; to set out boldly, as to *sally* forth in quest of adventure.

salmagundi (sal m*a* gun' di), *n.* a dish made of chopped meats, pickled herring, onions, oil, vinegar and pepper; any potpourri; a medley.

***salmon** (sam' un), *n.* a sea fish that swims into fresh-water rivers and streams to spawn, having silvery, black-spotted sides, highly valued as food.

salmon trout (sam' un trout), a sea trout resembling the salmon but smaller.

***salon** (sȧ lô*n*'), *n.* a fine reception room; a fashionable assemblage; a gathering, at set times, of noted persons: *the Salon,* in Paris, an annual exhibition of the work of artists of the day.

***saloon** (s*a* lōōn'), *n.* a drawing room; the main cabin of a passenger steamship; in the U. S., a barroom.

salsify (sal' si fī), *n.* the oyster plant, grown for its edible root.

***salt** (sôlt), *n.* sodium chloride, used for seasoning and preserving foods; a compound of any alkali with any acid; something that gives character or flavor, as the *salt* of wit.

salt (sôlt), *v.t.* to sprinkle, season or treat with salt, as to *salt* meat to preserve it; to supply with salt, as to *salt* livestock.

salt (sôlt), *adj.* seasoned or preserved with sodium chloride.

***saltation** (sal tā' shun), *n.* a leaping or dancing.

saltcellar (sôlt sel' ẽr), a small dish to hold salt for the table.

salt lick (sôlt lik), a deposit of sodium chloride on the ground to which animals go to satisfy their need for salt.

saltpeter (sôlt pē' tẽr), *n.* a white crystalline substance used in making gunpowder and to preserve food.

salubrious (s*a* lū' bri us), *adj.* healthful, as a *salubrious* climate.

***salutary** (sal' ū ter i), *adj.* good for the health; tending to improve; wholesome.

salutation (sal ū tā' shun), *n.* a greeting; the act of greeting.

***salute** (s*a* lūt'), *n.* a mark of military respect shown by raising the hand to the cap or by holding a rifle or sword in a prescribed position; a salvo of cannon or dipping of the flag aboard ship in honor of guests of high rank or ships of another navy.

Syn. Salutation, greeting. A *salute* may consist of either a word or an action. *Salutations* pass from one friend to another. The *salute* may be either direct or indirect; the *salutation* is always direct and personal. Guns are fired by way of a *salute;* bows are given in the way of a *salutation.* A *greeting* is frequently a particular mode of *salutation* adopted on extraordinary occasions, indicative of joy or satisfaction in those who greet.

salute (s*a* lūt'), *v.i. and v.t.* to make a formal gesture of greeting or respect; to show respect by a ceremonial act; to greet, as I *salute* you.

salvable (sal' v*a* bl), *adj.* capable of being saved.

salvage (sal' vij), *n.* the saving of a ship or its cargo from loss at sea; money paid to those who prevent such loss; any act of saving goods or property from being lost or destroyed, as *salvage* from a business that fails; the property that is saved.

salvage (sal' vij), *v.t.* to save a ship or its cargo from being lost at sea; to save something when loss of all is threatened.

salvation (sal vā' shun), *n.* the act of saving; state of being saved; the deliverance of the soul from sin and death.

***salve** (säv), *n.* a healing ointment; anything that heals or soothes, as your words are a *salve* to my hurt feelings.

***salve** (säv), *v.t.* to apply a healing substance to a wound; to soothe, as injured feelings.

***salver** (sal' vẽr), *n.* a tray on which anything is presented, as he brought the letters on a silver *salver.*

salvo (sal' vō), *n.* [*pl.* salvos] a discharge of a number of pieces of artillery as a salute; a volley of applause.

same (sām), *adj.* being one, identical, as the *same* man that was here yesterday; corresponding exactly or indistinguishably, as my hat is the *same* size as yours; equal, as to walk the *same* distance every day.

sameness (sām' nes), *n.* likeness, similarity.

***samovar** (sam' ō vär), *n.* a Russian urn of brass or copper containing a charcoal burner to keep water hot for tea.

sampan (sam' pan), *n.* a flat-bottomed boat propelled by scull and sail, used in the rivers and harbors of China and Japan.

***sample** (sȧm' pl), *n.* a specimen; a part taken to show the nature of the whole.

sample (sȧm' pl), *v.t.* to test by taking a part as representative of the whole; to show one of a series or line as an example of the others.

sampler (sȧm' plẽr), *n.* one who tests by taking representative parts of anything; a sort of needlework, so called because originally done as a test of a beginner's skill.

***sanatorium** (san *a* tō' ri um), *n.* [*pl.* sanatoriums or sanatoria] a health retreat; an institution where resident patients are treated for particular diseases, as a *sanatorium* for nervous cases.

sanatory (san' *a* tō ri), *adj.* conducive to health; contributing to a cure.

sanctify (sangk' ti fī), *v.t.* [*p.t. and p.p.* sanctified, *pr.p.* sanctifying] to set apart as holy; to consecrate.

sanctimonious (sangk ti mō' ni us), *adj.* hypocritical; pretending to be more holy than one actually is.

sanction (sangk' shun), *n.* the act of giving authority to do something or approving that which has been done: *sanctions,* provisions to assure execution of the law or performance of a pledge.

sanction (sangk' shun), *v.t.* to approve; to confirm; to ratify, as the Department of State *sanctions* the ambassador's course of action.

sanctity (sangk' ti ti), *n.* [*pl.* sanctities] holiness, sacredness; saintliness of character.

sanctuary (sangk' tū er i), *n.* [*pl.* sanctuaries] the most secluded and sacred part of a temple; a place of certain shelter, a refuge.

sanctum (sangk' tum), *n.* a sacred place; a place of utmost privacy.

sanctum sanctorum (sangk' tum sangk tō' rum), the Holy of Holies; a place of complete privacy, as my room at home is my *sanctum sanctorum.*

sand (sand), *n.* fine particles of rock that has been crushed or worn by the elements through long periods of time, heavier than dust but much finer than gravel: *sands,* a region of loose, grainy soil, a beach; loose particles of sand in an hourglass and hence moments, as the *sands* of time.

sand (sand), *v.t.* to add sand to; to sprinkle with sand.

sandal (san' dal), *n.* a kind of outer footwear consisting of a sole held by straps; a loose slipper.

sandalwood (san' dal wood), *n.* a yellowish fragrant wood of an Indo-Malayan tree, used in cabinetmaking.

sandpaper (sand pā' pẽr), *n.* heavy paper coated with sand to smooth and polish.

sandpiper (sand' pī pẽr), *n.* a wading bird resembling the plovers and living on the shores of inland rivers and ponds.

***sandwich** (sand' wich), *n.* two slices of bread with meat, cheese or the like between them.

sandy (san' di), *adj.* [*comp.* sandier, *superl.* sandiest] composed of, covered with or resembling sand.

sane (sān), *adj.* mentally sound and healthy; coming from or befitting a sound mind, as *sane* advice.

***sanguinary** (sang' gwi ner i), *adj.* attended with much bloodshed, bloody, as a *sanguinary* battle; bloodthirsty, murderous.

***sanguine** (sang' gwin), *adj.* having a warm, cheerful and hopeful nature, confident; of the color of blood, red.

sanitarian (san i târ' i an), *n.* one who advocates or promotes measures of health.

sanitarian (san i târ' i an), *adj.* pertaining to health or the laws of health.

***sanitarium** (san i târ' i um), *n.* [*pl.* sanitariums or sanitaria] an institution for the treatment and care of invalids; a sanatorium or health retreat.

sanitary (san' i ter i), *adj.* pertaining to, connected with or tending to promote health; hygienic.

sanitation (san i tā' shun), *n.* use of scientific knowledge in providing means to preserve health; use of things that contribute to hygiene and health; as good plumbing, drainage and the like.

sanity (san' i ti), *n.* soundness of mind, mental health.

sans (sanz), *prep.* without, as *sans* everything.

sap (sap), *n.* the juice of plants that circulates through them and supports them in growth; vital fluid; vitality.

***sapience** (sā' pi ens), *n.* wisdom; knowledge along with keen discernment.

sapient (sā' pi ent), *adj.* wise, sagacious.

sapling (sap' ling), *n.* a young tree; a youth.

***saponaceous** (sap ō nā' shus), *adj.* relating to or like soap; soapy, slippery.

saponify (s*a* pon' i fī), *v.i. and v.t.* [*p.t. and p.p.* saponified, *pr.p.* saponifying] to become soap; to make into soap.

***sapphire** (saf' īr), *n.* a transparent precious stone of deep-blue corundum; a pure transparent variety of corundum whitish or yellowish in color; a greenish-blue color.

sappy (sap' i), *adj.* [*comp.* sappier, *superl.* sappiest] full of sap; juicy.

saraband (sar' *a* band), *n.* a Spanish dance; the music for it.

sarcasm (sär' kazm), *n.* language that bites or taunts; a bitter, cutting style of expression.

sarcastic (sär kas' tik), *adj.* bitterly scornful; ironic in an unkind way; taunting.

sarcophagus (sär kof' *a* gus), *n.* [*pl.* sarcophagi or sarcophaguses] a stone coffin; a large coffin open to view within a tomb.

***sardine** (sär dēn'), *n.* a small food fish resembling the herring, found in European waters and preserved in oil for export.

***sardonic** (sär don' ik), *adj.* scornful and bitter; derisive, as a *sardonic* smile.

***sargasso** (sär gas' ō), *n.* a tropical seaweed from which the Sargasso Sea takes its name.

***sarsaparilla** (sär s*a* p*a* ril' *a*), *n.* a twining shrub native to Mexico, from the dried roots of which medicine and a soft drink are made; a preparation made from these dried roots.

sartorial (sär tō' ri al), *adj.* pertaining to tailors or to tailoring.

sash (sash), *n.* an ornamental band worn around the waist or over the shoulder; a frame to hold a pane of glass; windows collectively, as the house needs new *sash.*

sassafras (sas' *a* fras), *n.* a tree related to the laurel, with soft yellow wood and yellow flowers, with roots having an aromatic bark from which a medicinal preparation is made and which is sometimes used as a flavoring.

***Satan** (sā' tan), *n.* the Devil.

satanic (sā tan′ ik), *adj.* resembling Satan; diabolical, devilish.

satchel (sach′ el), *n.* a small bag in which to carry belongings; a handbag; a small valise.

*__sate__ (sāt), *v.t.* to satisfy, as the appetite; to weary by overabundance.

sateen (sa tēn′), *n.* a cotton cloth with a glossy finish resembling satin.

*__satellite__ (sat′ e līt), *n.* a heavenly body that revolves around a larger one, as the moon is the earth's *satellite;* a follower or attendant, always subordinate; any devoted follower.

*__satiate__ (sā′ shi āt), *v.t.* to fill full or gratify completely; to satisfy every need or desire of, glut.

satiate (sā′ shi āt), *adj.* filled full, satisfied, sated.

*__satiety__ (sa tī′ e ti), *n.* the state of being filled or satisfied so completely that there is no need or desire for more.

satin (sat′ in), *n.* a closely woven silk fabric with glossy surface but dull back.

satin (sat′ in), *adj.* like satin, smooth, glossy; made of satin, as a *satin* dress.

*__satire__ (sat′ īr), *n.* sarcasm, wit and irony; a composition holding vices or follies up to ridicule, as Gulliver's Travels is a *satire* on the life of its author's times.

satiric (sa tir′ ik), *adj.* of the nature of satire, sarcastic, ironical and ridiculing; severely scornful and censorious of men and manners.

satirist (sat′ ir ist), *n.* one who writes satire, holding people and customs up to ridicule.

satirize (sat′ ir īz), *v.t.* to use as the subject for satire, hold up to ridicule, attack with ridicule.

satisfaction (sat is fak′ shun), *n.* the act of satisfying or fulfilling; the state of being satisfied, gratified, fulfilled; contentment; gratification; settlement or payment, as this bill calls for *satisfaction;* reparation or apology, as he gave me *satisfaction* for the injury done.

satisfactory (sat is fak′ tō ri), *adj.* acceptable; meeting requirements.

satisfy (sat′ is fī), *v.i. and v.t.* [*p.t. and p.p.* satisfied, *pr.p.* satisfying] to give pleasure; to gratify; to make content; to settle, as an account; to discharge, as to *satisfy* a claim; to convince, as I *satisfied* him of your ability to do the job.

Syn. Please, gratify. What *satisfies* is not always calculated to *please,* and that which *pleases* may not *satisfy.* Plain food *satisfies* a hungry person but would not *please* him if he were less hungry. To *gratify* is to *please* in a high degree, to produce vivid pleasure; but we are commonly *gratified* with such things as act strongly either on the senses or on the affections.

Ant. Displease, dissatisfy.

saturate (sat′ ū rāt), *v.t.* to soak; to cause to become completely charged with something, as to *saturate* the mind with learning; to fill till it can hold or absorb no more, as to *saturate* a sponge with water; to charge with magnetism to the full extent of capacity, as a mass of iron or steel, such as the field or armature core of a dynamo.

saturation (sat ū rā′ shun), *n.* the act of filling or being filled to the limit of power to take up or absorb, as this sponge is in a state of complete *saturation.*

*__saturnine__ (sat′ ẽr nīn), *adj.* dull; gloomy; morose; sullen.

*__satyr__ (sat′ ẽr), *n.* a Greek forest deity with a man's body but the horns and legs of a goat.

*__sauce__ (sôs), *n.* a condiment or seasoning for food; pulp of fruit stewed and sweetened, as apple*sauce.*

saucer (sô′ sẽr), *n.* a small dish on which a cup is set or used for serving side dishes.

sauciness (sô′ si nes), *n.* impertinence, impudence.

*__saucy__ (sô′ si), *adj.* [*comp.* saucier, *superl.* sauciest] pert, impudent.

*__sauerkraut__ (sour′ krout), *n.* a pickle of chopped cabbage packed in layers alternating with salt and allowed to ferment.

*__saunter__ (sôn′ tẽr), *n.* a stroll, an idle walk; a leisurely, unconcerned way of walking.

saunter (sôn′ tẽr), *v.i.* to wander about idly, stroll, loiter.

sausage (sô′ sij), *n.* seasoned minced meat, sometimes smoked or cooked, stuffed into a casing or molded into cakes ready for cooking.

sauté (sō tā′), *adj.* fried quickly, with little grease in the pan.

*__savage__ (sav′ ij), *n.* a wild, uncivilized person; one who is brutal in his ways.

savage (sav′ ij), *adj.* uncivilized, wild, fierce, cruel.

savagery (sav′ ij ri), *n.* [*pl.* savageries] the state of being uncivilized; cruelty; fierceness; an act befitting an uncivilized person.

savanna (sa van′ a), *n.* an extensive open plain or meadow without trees.

*__savant__ (sa vän′), *n.* a man of great learning in some special field, a scholar.

save (sāv), *v.i. and v.t.* to be economical; to lay aside, as money, for future use; to remove from danger; to preserve from evil; to rescue.

save (sāv), *prep.* except, not including, as all is lost *save* honor.

savings (sāv′ ingz), *n. pl.* money laid away for future use.

savings bank (sāv′ ingz bangk), an institution where money may be accumulated by depositing it at interest.

savior (sāv′ yẽr), *n.* one who saves or delivers.

savor (sā′ vẽr), *n.* flavor, taste; relish; a distinguishing quality, as the *savor* of great learning is in this book; scent, as the kitchen was full of the pleasant *savor* of roasting beef.

savor (sā′ vẽr), *v.i. and v.t.* to possess a distinguishing quality, as this *savors* of rebellion; to flavor, season, as to *savor* a stew; to taste or smell with pleasure, as to *savor* one's food.

savory (sā′ vẽr i), *n.* a hardy aromatic herb of the mint family, used in cooking.

savory (sā′ vẽr i), *adj.* pleasing to taste or smell, as a *savory* meal.

*__savoy__ (sa voi′), *n.* a winter cabbage with crisp, curled leaves.

saw (sô), *n.* a saying, a proverb, a maxim.

saw (sô), *n.* a cutting instrument with a thin, flat blade having a toothed edge.

saw (sô), *v.i. and v.t.* [*p.t.* sawed, *p.p.* sawed or sawn, *pr.p.* sawing] to use a saw; to be cut with a saw, as this wood *saws* hard; to cut with a saw, as to *saw* wood.

sawyer (sô′ yẽr), *n.* one who saws logs or timber, especially either one of two workmen (top *sawyer* and bottom *sawyer*) who saw timbers over a saw pit.

saxophone (sak′ sō fōn), *n.* a brass wind instrument having a conical tube with finger keys and a clarinet reed mouthpiece.

say (sā), *n.* what one has uttered or desires to utter, as I must have my *say.*

say (sā), *v.i. and v.t.* [*p.t. and p.p.* said, *pr.p.* saying] to speak, tell, utter in words.

scab (skab), *n.* a crust formed over a wound or sore; a disease of plants in which scales form on stem or leaf; a contagious disease of sheep, resembling mange; a worker who takes the place of one who is on strike.

scabbard (skab′ ẽrd), *n.* the sheath of a sword.

scaffold (skaf′ ōld), *n.* a temporary structure for workmen to stand or walk on while putting up a building; a platform on which a condemned criminal stands to be hanged.

scaffolding (skaf′ ōld ing), *n.* the structure about a building under erection for workmen to walk on; materials for making such a structure.

scalawag (skal′ *a* wag), *n.* a scamp, a rascal.

*__scald__ (skôld), *n.* a burn or injury to the skin caused by a hot liquid or steam.

scald (skôld), *v.t.* to burn with hot liquid or steam; to heat, as a liquid, without boiling; to cleanse with boiling water.

scale (skāl), *n.* a balance on which to weigh things: *scales,* any form of weighing machine, large or small, movable or fixed.

scale (skāl), *n.* one of the small bony or horny plates covering the bodies of most fishes and reptiles; a similar but much lighter growth on the wings of some insects; any thin flaky crust on the skin of animals or the bark of trees caused by certain diseases; a metallic flake caused by oxidation, as of rust.

scale (skāl), *n.* a series, going up step by step, as a *scale* in music, the *scale* marked on a thermometer; proportion, as the map is on the *scale* of one inch to the mile and it is carefully drawn to *scale;* size, extent, as we do business on a large *scale.*

scale (skāl), *v.i. and v.t.* to come off in thin layers; to form into flakes, as rust in a boiler; to remove the hard skin plates from, as to *scale* a fish; to throw in such a way that the missile skips on the water, as to *scale* a stone across a pond; to throw a flat object in a similar way through the air.

scale (skāl), *v.t.* to climb up the side of, as to *scale* a cliff; to make according to a common standard of measurement, as to *scale* one drawing to another; to reduce by a certain ratio, as to *scale* wages up or down.

*__scalene__ (skā lēn′), *adj.* having the sides and angles unequal, as a *scalene* triangle.

*__scallop__ (skol′ up), *n.* an edible salt-water mollusk or shellfish with two ribbed or fluted shells; one of the curved sections in an edge with even round notches all along it.

scallop (skol′ up), *v.t.* to bake after thickening with crumbs and a sauce, as to *scallop* oysters; to ornament an edge by cutting a uniform series of semicircular notches all along it, as to *scallop* a cookie.

scalp (skalp), *n.* the skin on the top and back of the head on which the hair grows; the skin and hair of the head together; a part of it cut off by the American Indians in warfare as a token of victory.

scalp (skalp), *v.t.* to cut off a section of skin and hair from the head, as the Indians *scalped* many captives.

*__scalpel__ (skal′ pel), *n.* a surgeon's knife, small and very sharp.

scaly (skāl′ i), *adj.* [*comp.* scalier, *superl.* scaliest] covered with small hard plates; flaky.

scamp (skamp), *n.* a rascal, a fellow who does not amount to much.

scamp (skamp), *v.i. and v.t.* to do poor work, as you are *scamping* on the job; to do inadequately, hurriedly and carelessly, as to *scamp* a job.

scamper (skam′ pẽr), *n.* a hasty flight.

scamper (skam′ pẽr), *v.i.* to run fast and lightly; to run about in play; to run away as if in fright.

scan (skan), *v.i. and v.t.* to scrutinize; to examine carefully; to separate into units of meter, as to *scan* a line of verse.

scandal (skan′ dal), *n.* something said that is false and injurious to another; malicious gossip, slander; a cause of reproach, anything that offends or disgraces, as his conduct was a neighborhood *scandal.*

scandalous (skan′ dal us), *adj.* offending the sense of what is right and decent; causing offense or shame, as your conduct is *scandalous,* a *scandalous* situation or affair.

scant (skant), *v.t.* to stint, limit closely.

scant (skant), *adj.* not full or abundant, as *scant* measure; scarcely sufficient, as *scant* rations.

scantling (skant′ ling), *n.* a long thin narrow timber used for rough, covered work in building; a set of specifications for the plates or flooring of a ship under construction.

scanty (skan′ ti), *adj.* [*comp.* scantier, *superl.* scantiest] barely enough, meager; stingy.

scape (skāp), *n.* the shaft of a column; the shaft of a feather; a long flower stem rising from a clump of leaves or from a covered part in the ground, as the *scape* of a daffodil.

scapegoat (skāp′ gōt), *n.* one who bears the blame for the sins or faults of others.

scapegrace (skāp′ grās), *n.* an irresponsible or unprincipled fellow.

*__scapula__ (skap′ ū la), *n.* the shoulderblade.

*__scar__ (skär), *n.* a mark left on the skin after a wound heals; a marring mark on the surface of anything, as a table; the memory of an injury, as his action left *scars* on my mind.

scar (skär), *v.i. and v.t.* to heal over and leave a mark on the skin; to mar or mark.

***scarab** (skar′ ab), *n.* a certain beetle that was worshiped by the ancient Egyptians as a symbol of immortality; a gem made in the form of this beetle and inscribed with ancient Egyptian symbols.

***scarce** (skârs), *adj.* not common; not plentiful; not equal to the demand.

scarcely (skârs′ li), *adv.* barely, hardly, almost not, as I *scarcely* saw him, I *scarcely* made the train; certainly not, as we can *scarcely* suppose that this is true.

scarcity (skâr′ si ti), *n.* dearth, insufficiency.

***scare** (skâr), *n.* a sudden fright or panic.

scare (skâr), *v.i. and v.t.* to take fright, as he *scares* easily; to cause fright; to alarm, as you *scared* me.

scarecrow (skâr′ krō), *n.* something set up to frighten birds away from growing crops, especially a figure of a man to keep crows out of a cornfield; a ragged person resembling such a figure; a cause of foolish or needless terror.

scarf (skärf), *n.* [*pl.* scarfs or scarves] a neckerchief; a long wide band worn about the neck; a strip of cloth or lace to cover a bureau, sideboard or the like.

scarf (skärf), *n.* [*pl.* scarfs or scarves] a groove cut into wood; a piece of timber cut or notched so as to make a joint with another notched timber.

scarf (skärf), *v.t.* to join two timbers by notching or two metal pieces by bolting.

scarf joint (skärf joint), a union of two timbers by notching or of two metal pieces by bolting.

scarify (skar′ i fī), *v.t.* [*p.t.* and *p.p.* scarified, *pr.p.* scarifying] to scratch or cut lightly; to furrow, as the ground for planting; to hurt, as another's feelings, as if by cutting.

***scarlatina** (skär la tē′ na), *n.* scarlet fever.

scarlet (skär′ let), *n.* a brilliant red with a tinge of yellow; cloth of such a color.

scarlet fever (skär′ let fē′ vẽr), a contagious disease marked by sore throat, fever and a bright red rash, scarlatina.

scarp (skärp), *n.* the sharp, almost perpendicular inner slope of a ditch about a fortification; any steep descent.

scarp (skärp), *v.t.* to cut down almost perpendicularly, as to *scarp* the face of a rock.

scathe (skā*th*), *v.t.* to injure by fire, scorch; to denounce witheringly.

scathing (skā*th*′ ing), *adj.* damaging, withering, severe or bitter, as a *scathing* rebuke.

scatter (skat′ ẽr), *v.i. and v.t.* to disperse, as the crowd *scattered;* to strew or throw about; to cause to disperse, as the police *scattered* the crowd.

scavenge (skav′ enj), *v.t.* to cleanse, as streets, of mud and filth.

scavenger (skav′ en jẽr), *n.* a street cleaner; an animal or bird that feeds on carrion or waste matter.

***scenario** (sē nâr′ i ō), *n.* [*pl.* scenarios] a synopsis of the plot of a play or an opera, indicating scenes and the actions of the players; the outline of a play for a motion picture.

scene (sēn), *n.* the time and place in which the action of a story or play is laid, the setting; anything viewed as a whole, as the political *scene;* a view, as of a landscape; a part of a play or story presenting one episode, the parts of an act; a painting on canvas hung at the back of a stage to make the setting realistic, scenery; any extraordinary exhibition of excitement, as do not make a *scene* here.

scenery (sēn′ ẽr i), *n.* views in nature; the painted wings, backdrop and views used to give proper setting for a stage performance.

***scenic** (sēn′ ik), *adj.* pertaining to views in nature or settings on the stage.

scent (sent), *n.* the sense of smell; an odor; the odor left by a person or animal, as a hound follows the *scent* of a fleeing animal; hence any trail or track, as the clever fugitive threw his pursuers off the *scent.*

scepter, sceptre (sep′ tẽr), *n.* a staff borne by a sovereign as an emblem of royal authority.

***schedule** (sked′ ūl), *n.* a formal list or inventory; a list of things to be done in a certain order or time; a written or printed plan or statement of regularly timed events or operations, a timetable, as railroad trains run on *schedule.*

schedule (sked′ ūl), *v.t.* to place in a list of things to be done; to arrange a timetable for, as to *schedule* trains, boats, airplanes.

scheme (skēm), *n.* a plan, purpose or plot; arrangement of ideas or things in systematic order; a sketch showing arrangement of parts.

scheme (skēm), *v.* to plot; to plan; to devise: often with the suggestion of trickery.

***schism** (sizm), *n.* division or separation, especially of an organization into factions; the offense of causing a split in a church organization; a faction that breaks away from an organization.

***schismatic** (siz mat′ ik), *adj.* tending to cause factional division.

***schist** (shist), *n.* any rock that splits readily into slabs or sheets.

scholar (skol′ ẽr), *n.* a student; a person of advanced learning in a special field.

scholarship (skol′ ẽr ship), *n.* great and thorough learning, erudition; aptitude for advanced learning; a fund to assist worthy students at college.

scholastic (skol as′ tik), *adj.* relating to schools or advanced learning, academic; pedantic.

school (sko͞ol), *n.* a place where instruction is given; a schoolhouse; a body of students divided into classes; the followers of a great leader of thought or a body of persons holding to one doctrine or belief; any field or means of learning, as the *school* of hard knocks.

school (sko͞ol), *n.* a large number of fish swimming together.

school (sko͞ol), *v.t.* to teach or train; to discipline or educate, as to *school* oneself to obey, to *school* children in English.

school (sko͞ol), *v.i.* to swim together in large numbers, as fish.

schooling (sko͞ol′ ing), *n.* formal education; book learning; education from any source, as he had his *schooling* in business.

***schooner** (sko͞on′ ẽr), *n.* a sailing vessel with two or more masts fore-and-aft rigged.

***schottische** (shot′ ish), *n.* a round dance similar to the polka.

sciatic (sī at′ ik), *adj.* relating to the hip.

sciatica (sī at′ ik *a*), *n.* neuralgia of the sciatic nerve in the hip and thigh.

sciatic nerve (sī at′ ik nûrv), one of two large nerves with branches in the hips and running down the back of the thighs.

science (sī′ ens), *n.* systematized knowledge of any one department of the study of mind or matter, as the *science* of physics.

scientific (sī en tif′ ik), *adj.* pertaining to a science, as *scientific* books; following the laws and exact principles of science, as *scientific* farming; systematic, as *scientific* management.

scientist (sī′ en tist), *n.* one who seeks exact knowledge through study and experiment.

***scimitar** (sim′ i tẽr), *n.* an oriental saber with a curved blade.

***scintilla** (sin til′ *a*), *n.* a spark, an almost imperceptible trace, as not a *scintilla* of evidence.

scintillate (sin′ til āt), *v.i.* to emit sparks or fire with flash and glitter; to sparkle, as wit *scintillates.*

***scion** (sī′ un), *n.* a sprout or shoot of a plant, such as is used in grafting; a descendant, as he is the *scion* of an ancient family: also spelled *cion.*

scissors (siz′ ẽrz), *n.* a cutting instrument with two pivoted blades; small shears.

sclerosis (sklē rō′ sis), *n.* the hardening of body tissues.

scoff (skof), *n.* a jeer, an expression of contempt, mockery or derision.

scoff (skof), *v.i. and v.t.* to mock, jeer, treat with scorn, deride.

scold (skōld), *v.i. and v.t.* to chide sharply or rudely; to find fault with; to berate.

scold (skōld), *n.* one who finds fault habitually and violently.

***sconce** (skons), *n.* a wall bracket to hold a lamp or candle; a covered lantern; a small fort.

***scoop** (sko͞op), *n.* a large ladle; a deep shovel.

scoop (sko͞op), *v.i. and v.t.* to take out or up, as with a ladle.

scooter (sko͞ot′ ẽr), *n.* a toy vehicle with a footrest, hung low on two wheels, and a steering handle; a boat so made that it will sail in water or on ice.

scope (skōp), *n.* room or opportunity for free outlook or action; the extent of ability; range or field taken in, as the *scope* of knowledge, *scope* of a book.

***scorbutic** (skôr bū′ tik), *adj.* relating to scurvy.

***scorch** (skôrch), *n.* a mark caused by heat, as the iron left a *scorch* on the skirt.

scorch (skôrch), *v.t. and v.i.* to burn the surface of, as the laundry *scorched* this handkerchief; to become parched, shriveled or withered by heat, as the grass *scorches* in the sun.

***score** (skōr), *n.* a notch cut into something; an account or bill, as my *score* at the general store; a grudge, as I have a *score* to settle with him; a record of points made in a game; the notes of a musical composition; twenty.

score (skōr), *v.i. and v.t.* to keep tally, keep count of points made in a game; to make points in a game; to mark with notches or grooves; to criticize harshly.

***scorn** (skôrn), *n.* great contempt, haughty disdain; an object of contempt.

scorn (skôrn), *v.t.* to hold in contempt; to regard with disdain.

scornful (skôrn′ fool), *adj.* contemptuous, disdainful.

scorpion (skôr′ pi un), *n.* a tropical insect-eating animal resembling a spider, with pinching claws and a poisonous sting.

scotch (skoch), *n.* a cut on the surface; a score; a line on the ground in the game of hopscotch.

scotch (skoch), *n.* a wedge or block to prevent slipping or rolling.

scotch (skoch), *v.t.* to cut or wound slightly; to scratch; to disable, as to *scotch* a snake.

scotch (skoch), *v.t.* to block a wheel or log with a wedge-shaped object.

scoundrel (skoun′ drel), *n.* a man without honor or virtue.

***scour** (skour), *n.* the act of rubbing to remove dirt, as this pot needs a good *scour;* the action of a stream that clears the bed of loose stones.

scour (skour), *v.t.* to clean by washing and rubbing; to form by erosion, as a stream *scours* a channel.

scour (skour), *v.t.* to pass over swiftly as in search, to search thoroughly, as to *scour* the fields for rabbits.

***scourge** (skûrj), *n.* a whip with handle and lash; a cause of great or widespread affliction and destruction, as the *scourge* of drought.

scourge (skûrj), *v.t.* to whip severely; to cause great and widespread affliction.

***scout** (skout), *n.* a person sent out to make observations and bring back information, especially of the movements of an enemy; a member of the Boy Scouts or Girl Scouts.

scout (skout), *v.i.* to look or search about for observation and information, especially to learn the whereabouts, strength or movements of an enemy; to reconnoiter.

scout (skout), *v.t.* to mock or jeer at, to scoff at, as he *scouted* my suggestion.

scoutmaster (skout′ mȧs′ tẽr), *n.* the leader of a troop of Boy Scouts.

scow (skou), *n.* a large flat-bottomed boat with square ends.

scowl (skoul), *v.i.* to lower the brows and wrinkle the forehead in anger, sullenness or deep thought.

scrabble (skrab′ l), *n.* a scramble; a scribbled piece of writing; a rough struggle for something, as a *scrabble* for the ball.

scrabble (skrab′l), *v.i. and v.t.* to scramble, clamber on hands and knees; to scrape, scratch or paw, as to *scrabble* through coins for a penny; to scribble or scrawl, as to *scrabble* a note; to scrape together, as to *scrabble* one's toys.

scrag (skrag), *n.* anything lean and tough; a bony person or animal; a bony end of meat, as the neck.

scraggy (skrag′ i), *adj.* [*comp.* scraggier, *superl.* scraggiest] lean, bony; rough, rugged; jagged.

scramble (skram′ bl), *n.* a confused effort of a number of persons to get something that is loose, as a *scramble* for the ball.

scramble (skram′ bl), *v.i. and v.t.* to climb with hands and feet, as to *scramble* up a cliff; to struggle in confused manner, as five players *scrambled* for the ball; to mix up; to stir eggs while cooking in a pan.

***scrap** (skrap), *n.* a small detached piece; fragment: *scraps,* leftover food or odds and ends of metal.

scrap (skrap), *v.t.* to break up to obtain its metal, as to *scrap* a ship; to discard, as to *scrap* old methods.

scrapbook (skrap′ book), *n.* blank sheets bound together to hold a collection of odds and ends of printed matter or pictures.

***scrape** (skrāp), *n.* a scratchy sound; a difficulty, especially of one's own making; a narrow escape, as that was a close *scrape.*

scrape (skrāp), *v.i. and v.t.* to rub with something sharp-edged so as to make a grating sound; to rub with a sharp tool so as to remove, as to *scrape* paint; to draw a road grader over, as to *scrape* a road; to assemble little by little, as I can *scrape* up $10; to manage with difficulty, as he *scrapes* along.

***scratch** (skrach), *n.* a mark or tear on a surface, as the skin or a table, made by drawing something sharp-pointed over it; the grating sound of a pen on paper; the starting line in a race, as he started from *scratch,* the others had head starts.

scratch (skrach), *v.i. and v.t.* to make a grating sound, as a pen on paper; to mark by drawing something with a sharp edge or point over the surface of; to draw over a rough surface, as to *scratch* a match; to draw the fingernails over, as to *scratch* a mosquito bite.

***scrawl** (skrôl), *n.* a piece of careless or illegible writing.

scrawl (skrôl), *v.i. and v.t.* to write hastily and badly; to scribble, as to *scrawl* a note.

scrawny (skrô′ ni), *adj.* [*comp.* scrawnier, *superl.* scrawniest] bony; lean and lank.

***scream** (skrēm), *n.* a shrill cry, as of pain or fear; any long shrill penetrating sound, as the *scream* of a fire siren.

scream (skrēm), *v.i. and v.t.* to utter a shrill cry, as of pain or fear; to utter in loud, shrill tones.

screech (skrēch), *n.* a harsh, shrill cry, as the brakes went on with a *screech.*

screech owl (skrēch oul), a night bird of prey that utters a shrill, screeching cry.

***screed** (skrēd), *n.* a tirade, spoken or written; a long speech or an article, of a ranting nature; a long strip, as a *screed* of wood or a *screed* of plaster, put on at intervals to gauge the line of the whole surface.

***screen** (skrēn), *n.* a light structure to conceal things, shut something out or protect, as a window *screen,* a fire *screen,* a smoke *screen;* a coarse sieve; the curtain on which motion pictures are projected.

screen (skrēn), *v.t.* to conceal, shelter or protect by means of something that intervenes, as to *screen* windows, *screen* off a corner of a room; to pass through a coarse sieve, as to *screen* gravel; to show on a curtain, as motion pictures.

***screw** (skrōō), *n.* a fastening device of metal with a spiral thread; anything that works by turning in such a medium as air or water, as the propeller of a ship or airplane.

screw (skrōō), *v.i. and v.t.* to advance by turning round and round, as this peg *screws* in; to twist, as do not *screw* up your face; to fasten with threaded metal pieces, as to *screw* a lid on a box.

scribble (skrib′ l), *n.* scrawled writing, careless penmanship.

scribble (skrib′ l), *v.i. and v.t.* to write carelessly.

***scribe** (skrīb), *n.* a writer; a teacher or copyist of the Jewish law.

***scrim** (skrim), *n.* a thin fabric of cotton or linen used in upholstery, linings and window curtains.

scrimmage (skrim′ ij), *n.* a confused struggle; in football, a single play from the snapping of the ball to the moment it is downed, especially the struggle between the two lines as the play starts.

scrimp (skrimp), *v.i. and v.t.* to economize pinchingly; to hold to a small allowance.

scrip (skrip), *n.* a certificate given in place of money; a bit of paper with writing on it; a wallet or small satchel.

script (skript), *n.* handwriting; type designed to look like handwriting; manuscript; the written material of a play for the stage, radio or screen.

***scripture** (skrip′ tūr), *n.* any sacred writings: *the Scriptures,* the Old and New Testaments, the Bible, often called the *Holy Scriptures.*

***scrivener** (skriv′ nẽr), *n.* a clerk; one who draws up contracts and other business papers.

***scrofula** (skrof′ ū l*a*), *n.* a disease with swelling of the glands of the neck and inflammation of the bones and joints.

scroll (skrōl), *n.* a roll of paper or parchment with writing on it; ornamentation with spiral lines.

scrub (skrub), *n.* a vigorous rubbing; a stunted tree; a growth of dwarfed vegetation; a person who is undersized.

scrub (skrub), *v.i. and v.t.* to rub vigorously, as a floor or clothes in the wash.

scrub (skrub), *adj.* stunted; worthless, inferior; second-rate, as a *scrub* team that plays practice games with the regular team.

scruple (skrōō′ pl), *n.* 20 grains, apothecaries' measure; a minute quantity; hesitation from conscientious motives or from the desire to distinguish what is right from what is merely expedient.

scrupulous (skrōō′ pū lus), *adj.* conscientious; exact; punctilious.

scrutinize (skrōō′ ti nīz), *v.t.* to inspect or examine closely.

scrutiny (skrōō′ ti ni), *n.* [*pl.* scrutinies] close inspection, detailed critical examination, minute inquiry.

scud (skud), *n.* light clouds driven by the wind; clouds of spray or masses of foam driven by the sea winds.

scud (skud), *v.i.* to move or run fast; to be driven before the wind or run before a gale with little or no sail set.

scuff (skuf), *n.* a dragging of the feet; a rough, worn spot, as on a shoe.

scuff (skuf), *v.i. and v.t.* to drag or scrape the feet on the ground; to wear off the surface; to rub off the polish of.

scuffle (skuf′ l), *n.* a disorderly struggle; a confused contest or fight.

scuffle (skuf′ l), *v.i.* to engage in a confused, disorderly struggle.

scull (skul), *n.* an oar used in a notch at the stern of a boat with a side-to-side, twisting motion instead of a pull; one of a pair of light, broad-bladed oars less than 10 feet long.

scull (skul), *v.t.* to propel, as a boat, with a single oar over the stern worked with a back-and-forth motion.

scullery (skul′ ẽr i), *n.* [*pl.* sculleries] a room where cooking utensils are cleaned and kept.

scullion (skul′ yun), *n.* a servant in a scullery who cleans pots and pans and does kitchen chores.

sculptor (skulp′ tẽr), *n.* one who makes figures and statues by carving them from stone or wood or modeling them in soft substances such as clay and wax.

***sculpture** (skulp′ tūr), *n.* the art of carving figures from stone or modeling them in such substances as clay and wax.

sculpture (skulp′ tūr), *v.i. and v.t.* to decorate with carved or molded figures; to make such figures.

scum (skum), *n.* heavy foam on a liquid, especially on a boiling or fermenting liquid, containing the impurities of the mass; masses of tiny vegetable growths floating on stagnant water; debased persons collectively, as the *scum* of society.

scupper (skup′ ẽr), *n.* a hole in a ship's side to let deck water run off or a gutter along the edge of a deck for the same purpose.

scurf (skûrf), *n.* flakes of dead skin; dandruff; any flaky scales adhering to a surface.

scurrile (skûr′ il), *adj.* befitting a buffoon or vulgar jester.

scurrility (skûr il′ i ti), *n.* [*pl.* scurrilities] vulgar or vile joking; an abusive or obscene flow of words.

scurrilous (skûr′ i lus), *adj.* indecent, vulgar and vile; abusive, as *scurrilous* language.

scurry (skûr′i), *n.* [*pl.* scurries] hurried movement, scampering.

scurry (skûr′ i), *v.i.* [*p.t. and p.p.* scurried, *pr.p.* scurrying] to hasten, move rapidly, as the clouds *scurry* on a windy day.

scurvy (skûr′ vi), *n.* a disease caused by lack of green food (vitamin C) and marked by bleeding gums and great weakness.

scurvy (skûr′ vi), *adj.* [*comp.* scurvier, *superl.* scurviest] mean, contemptible, low.

scutch (skuch), *n.* an implement of wood used in beating flax and hemp; a bricklayer's hammer and chopper.

scutcheon (skuch′ un), *n.* a shield with a coat of arms, an escutcheon.

scuttle (skut′ l), *n.* a hatchway with a cover on the roof of a house or a ship's deck; a coal hod.

scuttle (skut′ l), *v.t.* to sink a ship by making holes in the hull.

***scythe** (sīth), *n.* an implement for mowing hay and grain having a curved long blade on a long double-curved handle.

sea (sē), *n.* the ocean; a great body of salt water smaller than an ocean; a very large inland body of water, especially salt water; a heavy swell or wave on the ocean; something covering a large area or so closely filled that it might be likened to the surface of a great body of water, as a *sea* of faces.

seaboard (sē′ bōrd), *n.* a region bordering on the sea or ocean.

seaboard (sē′ bōrd), *adj.* bordering on the sea or ocean, as *seaboard* provinces.

sea dog (sē′ dôg), *n.* a dogfish; any of certain seals, especially the harbor seal; an old experienced sailor.

seafaring (sē′ fâr ing), *adj.* engaged in sea voyages; following a mariner's life.

sea horse (sē′ hôrs), a small fish with a head like a horse and a prehensile tail, the hippocampus.

***seal** (sēl), *n.* any of various fish-eating sea mammals of the north and south cold regions, valued for their hides and oil, and in some species for their fur.

sea lion (sē lī′ un), *n.* a large seal of the Pacific Ocean, having ears and sometimes reaching a length of 12 feet.

***seam** (sēm), *n.* the line made by joining two pieces, as of cloth, plank or metal; a layer of mineral matter in the earth, as a *seam* of coal.

seam (sēm), *v.i. and v.t.* to show a line of joining or of separating into parts, as the rock *seams* right down the middle; to mark with lines, as time *seams* our faces with wrinkles; to join together in such a way as to make a line.

sea mew (sē mū), *n.* a kind of sea gull.

***seamstress** (sēm′ stres), *n.* a needlewoman; one who makes her living by sewing for others.

seamy (sēm′ i), *adj.* [*comp.* seamier, *superl.* seamiest] showing lines; showing the rougher part of stitching; the worst, as the *seamy* side of life.

***séance** (sā äns′), *n.* a sitting; a session; a meeting of persons in quest of messages from the spirit world; a demonstration by a spiritualist medium.

seaplane (sē′ plān), *n.* an airplane so devised that it can rise from or alight on the water.

seaport (sē′ pōrt), *n.* a harbor, town or city situated on a seacoast, accessible to seagoing vessels and engaged in overseas commerce.

sear (sēr), *v.t.* to burn, cauterize, as to *sear* a wound; to brown the surfaces of meat by exposing them briefly to a very hot fire, in a dry pan or broiler, so that the juices are retained during the slower cooking that follows; to harden, make callous, as wicked ways *sear* the conscience.

search (sûrch), *n.* a quest, a seeking; thorough investigation, as I have made a *search* of the records.

***search** (sûrch), *v.i. and v.t.* to seek, make a quest or inquiry; to look for.

searching (sûrch′ ing), *adj.* penetrating, thorough, as a *searching* question.

searchlight (sûrch′ līt), *n.* a powerful light with a reflector and mounted on a swivel so that it can be turned at will upon any object; a flashlight.

search warrant (sûrch wor′ ant), an official paper ordering or permitting an examination of premises where things or persons are thought to be illegally concealed.

***season** (sē′ zn), *n.* a particular time distinguished from other periods, as one of the four *seasons* of the year; a special period, as the football *season: in season,* at a good time, as you came just *in season;* able to be caught or killed legally, as trout or rabbits are *in season.*

season (sē′ zn), *v.i. and v.t.* to become dry, as lumber; to become mature; to make dry and hard, as lumber; to add relish to, as to *season* food with salt and pepper; to make less dull, dry or severe, as to *season* a discourse with wit or a censure with sympathetic kindness.

seasonable (sē′ zn a bl), *adj.* occurring in good time, fit for a certain time, timely.

seasonal (sē′ zn al), *adj.* pertaining to, happening at or influenced by certain times of the year, as *seasonal* storms.

seasoning (sē′ zn ing), *n.* that which is added to food to give it greater relish, a condiment.

seat (sēt), *n.* that on which a person sits or anything rests; the spot where anything is established, as a *seat* of learning.

seat (sēt), *v.t.* to supply a place to sit; to cause to sit; to place; to supply, as a chair, with a surface on which to sit.

seaweed (sē′ wēd), *n.* any plant that grows in the sea, especially certain algae, as kelp or dulse.

seaworthy (sē′ wûr *th*i), *adj.* fit to go to sea, sound enough to weather sea storms.

secant (sē′ kant), *adj.* cutting, as a *secant* line.

secede (sē sēd′), *v.i.* to withdraw from any fellowship, association or union, especially of political or religious nature.

secession (sē sesh′ un), *n.* the act of separating; withdrawal.

***seclude** (sē klo͞od′), *v.t.* to keep apart, isolate.

seclusion (sē klo͞o′ zhun), *n.* retirement, solitude, privacy.

seclusive (sē klo͞o′ siv), *adj.* keeping apart from others; seeking privacy.

second (sek′ und), *n.* a time unit, the 60th part of a minute; the 60th part of a degree of angular measure.

second (sek′ und), *n.* the one after the first; one who attends another, as a boxer's *second;* an article or piece of goods of inferior grade, as these gloves are *seconds.*

second (sek′ und), *v.t.* to act as an attendant or assistant, as to *second* a boxer; to give formal support to, as a motion made by another.

second (sek′ und), *adj.* following or appearing immediately after the first, as the *second* house on the right.

second (sek′ und), *adv.* in next rank or degree after the first, as you come *second.*

***secondary** (sek′ un der i), *adj.* not of the first order of importance; following the primary, as a *secondary* school; subordinate, as speed is *secondary* to accuracy in this test.

secondary color (sek′ un der i kul′ ẽr), a color produced by mixing two other colors (called primary) for painting or for color printing.

secondhand (sek′ und hand), *adj.* used before, not new, as *secondhand* clothes; derived from a source, not direct, as *secondhand* news.

secondly (sek′ und li), *adv.* in the next or second place.

secrecy (sē′ kre si), *n.* [*pl.* secrecies] an act of concealing; concealment; the habit of being reticent.

***secret** (sē′ kret), *n.* something kept in concealment; anything unrevealed or kept from the knowledge of others; a hidden cause; a mystery.

secret (sē′ kret), *adj.* hidden, concealed, withheld from the knowledge of others; private, secluded.

Syn. Covert, clandestine. *Secret* is the general term for anything hidden; *covert* means definitely or consciously covered up; *clandestine* means done in secret, especially in an evil or guilty sense.

Ant. Apparent, obvious, open, known.

***secretary** (sek′ rē ter i), *n.* [*pl.* secretaries] a person employed to assist in correspondence; one who keeps records for an organization; the head of a department of the U. S. Government, as the *Secretary* of State; a writing desk with pigeonholes and drawers and sometimes bookshelves.

secrete (sē krēt′), *v.t.* to hide or conceal; to keep, as information, to oneself; to separate from the blood of an animal body or from the sap of a plant and change into a new substance, as the liver *secretes* bile.

secretion (sē krē′ shun), *n.* the act of creating new substances out of substances separated from the blood of an animal or sap of a plant body; any substance thus produced.

secretive (sē krē′ tiv), *adj.* tending to keep secrets, especially one's affairs to oneself, reticent.

sect (sekt), *n.* a number of persons united in some particular faith or doctrine.

***sectarian** (sek târ′ i an), *n.* a member of an organization devoted to one belief or doctrine; a narrow, bigoted person.

sectarian (sek târ′ i an), *adj.* pertaining to a separated group believing a certain doctrine; prejudiced.

***section** (sek′ shun), *n.* the act of cutting; separation by cutting; a separate part or subdivision of anything, as a *mining* section, a residential *section,* a *section* of seats in the grandstand.

sectionalism (sek′ shun al izm), *n.* regard for one part of the country rather than for the whole nation; local pride at the expense of true patriotism.

sector (sek′ tẽr), *n.* the part of a circle included within two radii and the arc which they inclose.

secular (sek′ ū lẽr), *adj.* pertaining to this world and this life, earthly, not religious or spiritual; not ecclesiatical, civil; extending over ages of time.

secure (sē kūr′), *v.t.* to make safe, protect, as to *secure* a treasure; to make fast, as to *secure* a boat to a dock; to gain possession of, as to *secure* a health certificate.

secure (sē kūr′), *adj.* free from danger, safe, protected; confident.

security (sē kū′ ri ti), *n.* [*pl.* securities] the state of being safe or sure; protection; a pledge for the payment of a debt: *securities,* stocks and bonds.

***sedan** (sē dan′), *n.* a closed motor car with no separate compartment for the driver and with seats for five to seven passengers; a covered chair slung on poles and carried by two men.

***sedate** (sē dāt′), *adj.* calm, composed; quiet and dignified.

***sedative** (sed′ *a* tiv), *n.* a medicine that quickly allays pain and quiets the patient.

sedative (sed′ *a* tiv), *adj.* soothing the nerves, assuaging pain, producing calm.

***sedentary** (sed′ en ter i), *adj.* spending much of the time sitting; requiring a great deal of sitting, as a person of *sedentary* habit, a *sedentary* calling.

sedge (sej), *n.* a solid-stemmed grasslike herb that grows in wet land.

sediment (sed′ i ment), *n.* the matter that sinks to the bottom of a container full of liquid; dregs, lees.

sedimentary (sed i men′ ta ri), *adj.* consisting of or formed by matter settling to the bottom of a body of liquid.

sedition (sē dish′ un), *n.* an offense against the state in word or act, less grave than insurrection or treason; the stirring up of rebellious feelings among the people.

seditious (sē dish′ us), *adj.* tending to cause discontent among the people; fostering the spirit of rebellion.

***seduce** (sē dūs′), *v.t.* to lead into error or wrongdoing; to tempt; to cause to stray from duty or virtue.

seduction (sē duk′ shun), *n.* the act of leading astray; that which tempts to wrongdoing.

sedulous (sed′ ū lus), *adj.* persevering, hardworking, steadily industrious.

see (sē), *n.* the office and authority of a bishop, or an archbishop: *Holy See,* the Pope's court in Rome.

see (sē), *v.i. and v.t.* to have the power of sight or vision; to understand; to perceive with the eye, as I *see* the dog; to perceive meanings with the mind, understand, as I *see* the reason now; to visit, as to go to *see* him; to receive, as he will not *see* you.

Syn. Look.

seed (sēd), *n.* the small grain of a flowering plant from which a new plant may develop; that from which anything develops, origin, as *seeds* of rebellion.

seed (sēd), *v.t.* to sow, as we must *seed* the lawn again; to remove pits or seeds from.

seedling (sēd′ ling), *n.* a plant grown from seed; any young tree.

seedy (sēd′ i), *adj.* [*comp.* seedier, *superl.* seediest] full of seeds, as blackberries are *seedy;* having run to seed; shabby.

seeing (sē′ ing), *n.* the power of vision, sight.

seeing (sē′ ing), *conj.* inasmuch as, considering, since it is so, as *seeing* it is going to rain, we had better hurry.

seek (sēk), *v.t.* [*p.t. and p.p.* sought, *pr.p.* seeking] to look for, go in search of; to try to find or obtain, as to *seek* health.

seem (sēm), *v.i.* to appear to be, as there *seem* to be two ships in the distance; to give the effect of being, as the time *seems* long; to appear to oneself, as I *seemed* to be in trouble.

Syn. Appear, look. To *seem* is the general term for whatever has semblance; to *appear* is to come into the view of the eye or mind; to *look* is to appear to the eye, as it *looks* like a daisy.

seeming (sēm′ ing), *n.* appearance; surface show as differing from inner reality.

seeming (sēm′ ing), *adj.* apparent; apparent but not real, as a *seeming* interest.

seemly (sēm′ li), *adj.* [*comp.* seemlier, *superl.* seemliest] fit, suitable or becoming; decent, proper.

seep (sēp), *v.i.* to leak through small outlets slowly, ooze.

***seer** (sēr), *n.* a prophet, one who foresees.

seesaw (sē′ sô), *n.* any movement alternating more or less rhythmically up and down or back and forth; a sport in which two persons on the ends of a balanced plank move alternately up and down; the plank devised for this game.

seesaw (sē′ sô), *v.i.* to go one way, then the other; to hesitate, lack decision; to swing from one idea to another and back.

seethe (sē*th*), *v.i. and v.t.* to boil as the oil *seethes* in the caldron; to be in a violently agitated state, as the maelstrom *seethes,* emotions *seethe.*

segment (seg′ ment), *n.* a separated part, an individual piece, as the *segments* of an orange; the part of a circle inclosed between a line drawn from one point on the circumference to another and the arc between the ends of this line.

segregate (seg′ rē gāt), *v.i. and v.t.* to become separated; to cause to be separated or placed apart from others.

***seine** (sān), *n.* a fishing net with floats at the top and sinkers at the bottom, set out in a circle and drawn in to a central point so that the fish may be taken out.

***seismic** (sīz′ mik), *adj.* relating to earthquakes; like an earthquake or produced by an earthquake.

***seismograph** (sīz′ mō grȧf), *n.* an instrument to record disturbances caused by earthquakes.

***seismology** (sīz mol′ ō ji), *n.* the scientific study of earthquakes.

seizable (sēz′ *a* bl), *adj.* capable of being grasped.

seize (sēz), *v.t.* to grasp or clutch; to take by force; to arrest, as to *seize* a criminal; to confiscate, annex, as to *seize* territory.

seizure (sē′ zhẽr), *n.* the act of taking possession of by force; the sudden attack of a disease.

seldom (sel′ dum), *adv.* rarely, infrequently.

*__select__ (sē lekt′), *v.t.* to pick out, choose; to take instead of others.

select (sē lekt′), *adj.* chosen; picked; taken in preference to others; superior.

selection (sē lek′ shun), *n.* the act of choosing; the thing chosen; possibility of choice, as we have a good *selection*.

selectivity (sē lek tiv′ i ti), *n.* the ability of a radio set to respond to impulses of the frequency to which it is adjusted or tuned, and to give no response to other frequencies.

*__selenium__ (sē lē′ ni um), *n.* a nonmetallic element resembling sulphur and tellurium.

self (self), *n.* [*pl.* selves] the identity of any person or thing; one's own person; personality; personal interest; selfishness.

self-conscious (self′ kon′ shus), *adj.* aware of being a living entity; aware of one's failings to the point of losing poise, embarrassed.

self-determination (self′ dē tẽr mi nā′ shun), *n.* the decision made by the citizens of a state as to the form of government of their own state.

self-government (self′ guv′ ẽrn ment), *n.* self-control; government by the whole population of a civil unit, democratic government.

selfish (sel′ fish), *adj.* caring only for one's own needs or desires; not generous.

self-respect (self′ rē spekt′), *n.* proper pride and esteem for oneself.

self-righteous (self rī′ chus), *adj.* overconfident of one's own integrity.

selfsame (self′ sām), *adj.* identical, the very same, as we came and went the *selfsame* day.

self-service (self′ sûr′ vis), *adj.* pertaining to a type of store or restaurant where the customers help themselves to what they wish to buy, with clerks checking up before the customer pays and leaves.

self-starter (self′ stär′ tẽr), *n.* a device to put an engine, as of a motor car, into action without cranking by hand.

sell (sel), *v.i. and v.t.* to be sold, find a buyer; to make sales; to transfer to another for payment; to betray for a reward.

selvage (sel′ vij), *n.* the edge of cloth finished off in such a way as to prevent raveling.

semaphore (sem′ a fōr), *n.* a signaling apparatus that works projecting bars, flags or lights according to a code; a system of signaling by placing one's arms in different positions relative to the body.

semaphore (sem′ a fōr), *v.i. and v.t.* to signal by means of movements of mechanically moved objects or by changing the position of the arms; to express in this manner, as I shall *semaphore* your message.

semblance (sem′ blans), *n.* likeness; pretense, as a *semblance* of honesty is all he has; a picture.

semiannual (sem i an′ ū al), *adj.* issued or happening twice a year or every six months, as a *semiannual* publication, a *semiannual* convention.

semicircle (sem′ i sûr kl), *n.* half a circle; anything shaped or formed like half a circle, as a *semicircle* of spectators.

semicolon (sem′ i kō lon), *n.* a mark of punctuation (;) indicating a break next greater than that marked by a comma.

seminary (sem′ i ner i), *n.* [*pl.* seminaries] an academy or school, especially a school or college of theology; the place where anything is trained or schooled, as a *seminary* of crime.

semiprecious (sem i presh′ us), *adj.* not as valuable as precious; said of gems, such as the garnet and amethyst, as distinguished from precious stones, as the diamond and ruby.

senate (sen′ it), *n.* the upper house of a legislature; the upper house of the U. S. Congress; a council of state; a council of students in school or college having charge of some points of school management.

senator (sen′ *a* tẽr), *n.* a member of the upper house of a state legislature or the Congress.

send (send), *v.t.* [*p.t. and p.p.* sent, *pr.p.* sending] to cause to go, dispatch, as *send* a messenger, *send* it by mail.

*__senile__ (sē′ nīl), *adj.* pertaining to, characteristic of or caused by old age.

senility (sē nil′ i ti), *n.* [*pl.* senilities] feebleness of body or mind caused by old age; an act befitting an old and feeble person.

*__senior__ (sēn′ yẽr), *n.* an older person; one of longer service or higher rank than another; an old person; a member of the graduating class in a school or college.

senna (sen′ *a*), *n.* a tropical plant of the cassia family whose leaves are dried for use in medicine.

sensation (sen sā′ shun), *n.* perception by sight, taste, touch, hearing or smell; a feeling caused by such perception; any bodily feeling, an emotion.

sensational (sen sā′ shun al), *adj.* involving the physical or mental feelings; exciting interest or emotion.

sensationalism (sen sā′ shun al izm), *n.* the use of an exciting style in speaking or writing; the belief that all knowledge is derived through the senses.

sense (sens), *n.* one of the five physical faculties, sight, taste, touch, hearing and smell, by which impressions of the world outside oneself are received; discernment; understanding; mental perception; good judgment; meaning, as the *sense* of a sentence.

senseless (sens′ les), *adj.* incapable of feeling; unconscious; devoid of meaning.

sensibility (sen si bil′ i ti), *n.* [*pl.* sensibilities] the state of being able to perceive or the quality of being easily affected; delicacy of feeling.

sensible (sen′ si bl), *adj.* manifesting correct judgment; perceived or able to be perceived through the physical faculties.

sensitive (sen′ si tiv), *adj.* easily affected, excited or offended; having any of the physical faculties of perception well developed, as *sensitive* to sound; affected by light, as *sensitive* photographic film used in photography.

sensory (sen′ so ri), *adj.* pertaining to sensation or to any one of the five senses, as *sensory* experience; carrying nerve impulses from the sense organs to the brain or other nerve center.

*__sensual__ (sen′ shoo al), *adj.* relating to the physical nature; given to overindulgence of physical desires, voluptuous.

sensuous (sen′ shoo us), *adj.* relating to any of the physical faculties of perception; influenced by sense impressions, sensitive to beauty.

sentence (sen′ tens), *n.* a series of words so arranged as to present a unit of statement or thought; a final judgment made effective by imposing a penalty upon a guilty person.

sentence (sen′ tens), *v.t.* to condemn by judgment of a court and impose a penalty, as to *sentence* the murderer to life imprisonment.

sententious (sen ten′ shus), *adj.* expressing ideas in the form of proverbs, pithy; given to speaking or writing in an axiomatic, moralizing style.

*__sentient__ (sen′ shent), *adj.* having ability to feel and perceive.

*__sentiment__ (sen′ ti ment), *n.* a thought prompted by feeling, as a Christmas *sentiment;* emotional feeling or utterance; an opinion, as these are my *sentiments.*

sentimental (sen ti men′ tal), *adj.* full of, caused by or expressing emotion; mawkishly emotional.

sentinel (sen′ ti nel), *n.* one who watches or guards against the approach of enemies; a sentry.

sentry (sen′ tri), *n.* [*pl.* sentries] a soldier placed on guard to challenge any who approach his post of duty and to halt those not entitled to pass.

*__sepal__ (sē′ pal), *n.* one of the ring of leaflike growths that form the calyx of a flower, the cuplike structure surrounding the petals.

separable (sep′ *a* ra bl), *adj.* capable of being divided; capable of being taken from the whole to which it belongs.

*__separate__ sep′ *a* rāt), *v.i. and v.t.* to become detached from the whole; to draw apart; to go different ways; to divide; to break away from the whole; to keep apart, as a stream *separates* the two towns.

separate (sep′ *a* rit), *adj.* divided from the rest; disconnected; distinct.

sepia (sē′ pi *a*), *n.* a dark-brown pigment made from a secretion of the cuttlefish; the cuttlefish.

sepia (sē′ pi *a*), *adj.* made of or colored with dark-brown pigment; having that color, however produced.

sepoy (sē′ poi), *n.* a native soldier in the British army in India.

sepsis (sep′ sis), *n.* blood poisoning.

septennial (sep ten′ i al), *adj.* occurring once in 7 years or lasting 7 years, as a *septennial* event, a *septennial* period.

septet (sep tet′), *n.* a musical composition for seven voices or instruments.

septic (sep′ tik), *adj.* relating to or produced by putrefaction and poisonous decay.

*__septuagenarian__ (sep tū *a* jē nâr′ i an), *n.* a person aged 70 to 79, inclusive.

sepulcher, sepulchre (sep′ ul kẽr), *n.* a tomb, a burial vault.

sepulchral (sē pul′ kral), *adj.* suggestive of the tomb, funereal, dismal in appearance; deep, solemn and hollow-toned, as a voice.

*__sepulture__ (sep′ ul tūr), *n.* burial.

*__sequel__ (sē′ kwel), *n.* a following part, as of a story; a result.

sequence (sē′ kwens), *n.* order of succession; things or thoughts following one after another.

sequester (sē kwes′ tẽr), *v.t.* to remove property from the owner's control while a claim is being adjusted or a point of law decided; to seclude.

*__seraglio__ (sē ral′ yō), *n.* [*pl.* seraglios] the women's quarters of a Mohammedan residence, a harem.

seraph (ser′ af), *n.* [*pl.* seraphs or seraphim] an angel of the highest order.

seraphic (sē raf′ ik), *adj.* angelic.

sere (sēr), *adj.* dry, withered.

serenade (ser e nād′), *n.* evening music in the open air; music played or sung by a lover to his lady, especially under her window at night.

serenade (ser e nād′), *v.t.* to entertain with evening song; to honor with special open-air music at night, as we *serenaded* the newcomers.

serene (sē rēn′), *adj.* calm, undisturbed, placid.

serenity (sē ren′ i ti), *n.* calm, peace, undisturbed quiet.

serf (sûrf), *n.* a worker regarded in the Middle Ages as part of an estate, passing with it to any new owner; a slave.

serge (sûrj), *n.* a twilled woolen fabric.

*__sergeant__ (sär′ jent), *n.* a noncommissioned army officer ranking next above a corporal; a police officer ranking next below a captain.

sergeant major (sär′ jent mā′ jẽr), the chief noncommissioned officer of a regiment; the master sergeant at headquarters assisting the adjutant.

serial (sēr′ i al), *n.* a story issued in successive parts; any composition presented in installments in a periodical publication.

serial (sēr′ i al), *adj.* pertaining to a sequence; occurring as part of a sequence; published in successive instalments, as a *serial* story.

sericulture (ser′ i kul tūr), *n.* the business of raising silkworms for the raw silk.

*__series__ (sēr′ ēz), *n.* an arrangement of things or events in orderly succession; a sequence or a related group.

seriocomic (sēr i ō kom′ ik), *adj.* having a mixture of earnestness and fun.

serious (sēr′ i us), *adj.* thoughtful, grave in manner or disposition; not jesting, in earnest, as I am *serious* about this; gravely important, as we have suffered *serious* losses.

*__sermon__ (sûr′ mun), *n.* a public discourse delivered by a clergyman and based on a text from the Bible; any serious discourse, especially one with pious exhortation.

serous (sēr′ us), *adj.* pertaining to the secretions of certain membranes of the body, as the peritoneum; thin and watery, like these secretions.

*__serpent__ (sûr′ pent), *n.* a large snake.

*__serpentine__ (sûr′ pen tēn), *n.* a kind of rock resembling marble, often dull green and mottled like a snake's skin and taking a high polish.

*__serried__ (ser′ id), *adj.* crowded together; compact; standing in rows, like soldiers.

serum (sēr′ um), *n.* [*pl.* serums] the thin watery fluid left after any body fluid clots, as blood *serum;* the thin watery secretion of certain glands; fluid from the blood of an animal used by injection as an antitoxin to make people and other animals immune to infectious diseases like smallpox.

servant (sûr′ vant), *n.* one who is employed to do work for another, as a house *servant;* one who is devoted to something and works for it, as George Washington was a *servant* of his country.

Syn. Domestic, menial, drudge. In the term *servant* is included the idea of the service performed; in the term *domestic,* the idea of one having a place in the home. In the word *menial* is included the idea of lowly labor; in *drudge,* that of tiresome routine chores.

serve (sûrv), *v.i. and v.t.* to work for another; to be in the army or navy; to be convenient and satisfactory, as this will *serve* for the present; to work for; to provide and place before, as to *serve* a meal or a summons.

*__service__ (sûr′ vis), *n.* the performance of work done for another for hire; assistance; an organization whose members work for the public, as the civil *service* or the army and navy; the performance of duty in the army or navy; religious rites, as church *services;* provision at table, as the *service* is very good in this restaurant.

service (sûr′ vis), *v.t.* to keep in good repair, as to *service* a car.

serviceable (sûr′ vis *a* bl), *adj.* useful; fit for long, hard use.

*__servile__ (sûr′ vil), *adj.* pertaining to slaves; having a slavish spirit; submissive, cringing.

servility (sēr vil′ i ti), *n.* [*pl.* servilities] the spirit of a slave; cringing submission; an act befitting a slave.

*__servitude__ (sûr′ vi tūd), *n.* the condition of a slave; subjection.

*__sesame__ (ses′ *a* mē), *n.* a plant of India yielding flat seeds from which a valuable oil is made.

session (sesh′ un), *n.* a meeting of an assembly, such as a legislative house, a class at school or college; the term during which an assembly is in action, as a *session* of court or Congress; the governing body of a Presbyterian church, composed of the pastor and elders.

sestet (ses tet′), *n.* a verse composition of six lines; the last six lines of a sonnet.

set (set), *n.* a number of things of the same kind intended to be used together, as a *set* of dishes; a clique or social group, as the smart *set;* a young plant placed in the ground to grow; drift or course, as the *set* of the tide; the artificial scenery for an episode in a motion picture or a play.

set (set), *v.i. and v.t.* to sink below the horizon, as the sun *sets* in the west; to pass from a soft or fluid state to one of hardness, as concrete *sets* slowly; to take a certain course, as the tide *sets* in, then out; to put in a certain place or position, as *set* this chair on the porch; to put a hen on eggs to hatch them; to name or fix, as you *set* the date; to place in order, as to *set* type ready to print; to bring to a certain state or condition, as *set* your thoughts upon this lesson; to adjust or prepare, as we *set* sail, *set* the clock, *set* the table for dinner.

settee (se tē′), *n.* a long seat with a back and with or without arms.

setter (set′ ēr), *n.* a hunting dog of a breed trained formerly to crouch, now to point at game.

setting (set′ ing), *n.* the arrangement or surroundings in which anything is placed, as the house has a lovely *setting* in a grove of trees, a stage *setting;* a collection of eggs to be hatched by a hen.

settle (set′ l), *n.* a long wooden seat with a high back.

settle (set′ l), *v.i. and v.t.* to become fixed or permanent; to sink to the bottom of a liquid as sediment *settles;* to free from uncertainty; to pay, as to *settle* a bill or account; to colonize, as the Dutch *settled* New York.

settlement (set′ l ment), *n.* adjustment of affairs, as we must come to a *settlement;* colonization; a region or place newly peopled by those who intend to remain there, as the early *settlements* in the Mohawk Valley; an institution for the benefit of the people in a poor city neighborhood, giving instruction and entertainment.

settler (set′ lēr), *n.* a colonist; a pioneer who makes a home in new territory.

seven (sev′ en), *n.* the sum of one and six; the symbol representing that number.

sevenfold (sev′ en fōld), *adv.* seven times as much; having seven similar parts.

seventeen (sev en tēn′), *n.* one more than 16; the symbol representing it, 17.

seventeenth (sev en-tēnth′), *adj.* the next after the 16th.

seventh (sev′ enth), *n.* the next after the sixth; one of seven equal parts.

seventh (sev′ enth), *adj.* following the sixth.

seventieth (sev′ en ti eth), *n.* the next after the 69th; one of 70 equal parts.

seventieth (sev′ en ti eth), *adj.* immediately following the 69th.

seventy (sev′ en ti), *n.* [*pl.* seventies] one more than 69.

sever (sev′ ẽr), *v.i. and v.t.* to part from one another, as we must *sever;* to separate, keep apart; to break or divide, as it is time for us to *sever* relations with those people.

several (sev′ ẽr al), *adj.* consisting of more than two but not many, as we went *several* miles farther; taken individually, as our *several* interests in this enterprise.

severance (sev′ ẽr ans), *n.* the act of separation or state of being separated.

severe (sē vēr′), *adj.* strictly adhering to rule; harsh, hard, merciless, austere, as a *severe* manner of speaking, a *severe* person, a *severe* rebuke, a *severe* master, a *severe* headache.

severity (sē ver′ i ti), *n.* [*pl.* severities] harshness; extreme strictness.

sew (sō), *v.i. and v.t.* [*p.t.* sewed, *p.p.* sewed or sewn, *pr.p.* sewing] to work as a seamstress, as to *sew* for a living; to join together with needle and thread.

*__sewage__ (sū′ ij), *n.* waste matter carried off in underground pipes.

sewer (sū′ ẽr), *n.* a line of underground pipes to carry off waste matter.

sewerage (sū′ ẽr ij), *n.* a system of lines of underground pipe to carry off waste matter; the matter carried off.

sex (seks), *n.* the distinction between male and female; males collectively or females collectively.

*__sexagenarian__ (sek s*a* jē nâr′ i an), *n.* a person aged 60 to 69, inclusive.

sextant (seks′ tant), *n.* the sixth part of a circle; an instrument for measuring angular distance between objects, used in finding latitude at sea through the altitude of the sun.

sextet (seks tet′), *n.* a musical composition for six voices or instruments; the six persons who render it; anything consisting of six parts.

sexton (seks′ tun), *n.* a lesser official of a church who takes care of the building or has charge of funerals, vestments and sacred vessels.

shabby (shab′ i), *adj.* [*comp.* shabbier, *superl.* shabbiest] threadbare or worn; mean, despicable, as *shabby* conduct.

shack (shak), *n.* a hut or cabin; a rickety old house.

shackle (shak′ l), *n.* a fetter; handcuff; clasp to hold the arms or legs of a prisoner and prevent his escape.

shackle (shak′ l), *v.t.* to fasten fetters on; to impede; to embarrass or hinder.

shad (shad), *n.* a food fish of the sea that swims into rivers in the spring to spawn.

shade (shād), *n.* relative darkness caused by something that intercepts the rays of light, as in the *shade* of a tree; obscurity, as he is smart, but his brother puts him in the *shade;* a relative degree, as of color, tone or meaning; something that dims the light from outside, as a window *shade: shades,* the spirits of those who have died, as *shades* of my esteemed ancestors.

Syn. Shadow. *Shade* simply expresses the absence of light. *Shadow* signifies also the figure or shape of the body that intercepts the light.

shade (shād), *v.i. and v.t.* to grade off in color, as the goods *shade* nicely; to screen from strong light; to darken or obscure; to vary in blackness, as he *shades* his writing.

shadow (shad′ ō), *n.* an outlined figure of an object made when it intercepts the light; shade within limits set by the shape of that which interrupts the passing of light rays; something without substance, as dreams are the *shadows* of our waking life.

shady (shād′ i), *adj.* [*comp.* shadier, *superl.* shadiest] sheltered from the glare of the sun; questionable, avoiding the light, as a man of *shady* ways.

*__shaft__ (shȧft), *n.* a weapon with a stem, as a spear or an arrow; anything that darts and wounds like an arrow, as *shafts* of sarcasm; the long, narrow entrance to a mine; a round bar that carries power from a motor to the machinery of a mill or factory; one of the wooden pieces between which a horse is hitched to a wagon; the body of a column.

shafting (shȧf′ ting), *n.* a set of turning bars that carry power from a motor to machinery.

shag (shag), *n.* a rough-cut, coarse tobacco; rough, woolly hair; a rough nap on cloth.

shaggy (shag′ i), *adj.* [*comp.* shaggier, *superl.* shaggiest] having thick, rough hair or wool.

shagreen (sh*a* grēn′), *n.* a rough, untanned leather made in Asia from the hides of horses, camels and the like, and usually dyed green; a rough-surfaced leather of a similar nature made from the skins of sharks.

shah (shä), *n.* the title of the ruler of Persia.

shake (shāk), *n.* a combination of push and pull, as he gave me a *shake;* a movement up and down or back and forth, as a hand*shake;* a trembling or tremor, as a *shake* of the earth.

shake (shāk), *v.i. and v.t.* [*p.t.* shook, *p.p.* shaken, *pr.p.* shaking] to move as if shivering, tremble, as he *shook* with fear; to move vibratingly, as the house *shakes* in the wind; to quake, as the earth is *shaking;* to disturb greatly, as this news *shakes* me.

shakedown (shāk′ doun), *n.* a makeshift bed, as they gave me a *shakedown* on the floor.

shaky (shāk′ i), *adj.* [*comp.* shakier, *superl.* shakiest] trembling, infirm, unsteady.

shale (shāl), *n.* a soft rock that splits easily into leaves or layers.

shall (shal), *auxiliary v.* [*p.t.* should] am to, am going to, as I *shall* do it; must, imperatively or due to obligation, as you *shall* do as you are told.

shallow (shal′ ō), *n.* a shoal; a stretch of water without much depth.

shallow (shal′ ō), *adj.* having little depth, as *shallow* water, *shallow* words.

sham (sham), *n.* a fraud, a tricky thing, as this scheme is a *sham;* make-believe; a pretender, as this man is a *sham.*

sham (sham), *adj.* pretended, false, unreal, as a *sham* battle, *sham* words.

shaman (shä′ man), *n.* a priest believed to be in communication with gods and demons; also a medicine man of certain North American Indian tribes.

shamanism (shä′ man izm), *n.* the primitive religion of the Mongolian peoples from eastern Siberia to Finland; a similar religion of certain North American Indian tribes.

shamble (sham′ bl), *n.* a shuffling way of walking.

shamble (sham′ bl), *v.i.* to walk in a shuffling awkward way.

shambles (sham′ blz), *n.pl.* a slaughterhouse; any place or scene of bloodshed.

shame (shām), *n.* a painful sense of guilt or dishonor; deep regret; modesty; something that causes reproach or disgrace, as it is a *shame* to do this.

shame (shām), *v.t.* to cause disgrace to, bring reproach upon, as your conduct *shames* the whole school.

shamefaced (shām′ fāst), *adj.* bashful, shrinking, shy.

shameful (shām′ fool), *adj.* disgraceful, indecent, offensive.

shameless (shām′ les), *adj.* without shame or modesty, bold.

***shampoo** (sham po͞o′), *n.* a washing of the head and hair; a preparation used to make lather with which to wash the head and hair.

shampoo (sham po͞o′), *v.t.* to wash the head and hair, first with a lather, then with clear water to rinse.

shamrock (sham′ rok), *n.* a three-leafed plant resembling the white clover, used as the national emblem of the Irish people.

shanghai (shang′ hī), *v.t.* to drug and kidnap a sailor to get hands to man a ship.

shank (shangk), *n.* the leg from knee to ankle; the part connecting the grip and the cutting or working part, as the *shank* of a tool.

shanty (shan′ ti), *n.* [*pl.* shanties] a rude hut.

shape (shāp), *n.* the form or figure of an object or animal; a planned form, as I have my ideas in *shape* for the debate.

shape (shāp), *v.i. and v.t.* to take form, as my ideas are *shaping* in preparation for the debate; to give form to.

shapely (shāp′ li), *adj.* [*comp.* shapelier, *superl.* shapeliest] well-formed; symmetrical; gracefully formed.

share (shâr), *n.* an individual's portion or part of something divided or distributed among a number of persons; a unit of stock in a business enterprise; a fair part, as I had my *share*, I did my *share*.

share (shâr), *n.* the blade of a plow or cultivator.

share (shâr), *v.t.* to possess in common or to divide equally, as we *share* the room, we *share* the profits; to distribute in fair or equal parts, as it was *shared* between you.

shark (shärk), *n.* a large, voracious and destructive sea fish with many sharp teeth.

sharp (shärp), *n.* a sign in music indicating that a note is to be raised half a tone.

sharp (shärp), *v.i. and v.t.* to raise the pitch; to sing or play above pitch.

sharp (shärp), *adj.* having a very thin cutting edge or penetrating point; coming to an acute angle, as a *sharp* peak; keen-minded, as a *sharp* child; close and exact, as *sharp* questioning; piercing, bitter, pungent, as a *sharp* wind, a *sharp* tongue, a *sharp* taste like that of vinegar.

Syn. Acute, keen. The general property expressed by these words is that of ability to cut. *Sharp* is generic and indefinite; the two others indicate modes of sharpness differing in circumstance and degree: *acute* signifies pointedness; a knife may be *sharp;* sensibilities are *acute*. *Keen* applies to a long edge and carries the idea of exceptional sharpness; a razor is *keen,* wits are sometimes *keen*.

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sharpen (shär′ pen), *v.t.* to impart a cutting edge to; to make more keen.

sharpshooter (shärp′ sho͞ot ēr), *n.* a skilled marksman; in military rating, the next grade below expert rifleman.

shatter (shat′ ēr), *v.i. and v.t.* to break into many pieces, smash; to overthrow.

shave (shāv), *n.* the act of cutting hair close to the skin; a blade within two grips for smoothing wood; a narrow escape, as that was a close *shave*.

shave (shāv), *v.i. and v.t.* to cut the hair close to the skin; to make smooth or bare by drawing a sharp edge over; to slice thin; to reduce, as to *shave* prices in a sale.

shaving (shāv′ ing), *n.* the act of using a razor on the face; a thin paring, as of wood.

shawl (shôl), *n.* a square or oblong piece of cloth thrown over the shoulders for warmth.

she (shē), *feminine pron.* one particular woman or girl, as *she* said it; any female person or animal.

sheaf (shēf), *n.* [*pl.* sheaves] a bundle held together by a cord or band, as a *sheaf* of grain, a *sheaf* of papers.

***shear** (shēr), *v.t.* to cut or clip the hair or wool of, as to *shear* sheep; to cut or clip off, as to *shear* wool; to deprive of, strip, as they *sheared* him of all he owned.

shears (shērz), *n.pl.* a cutting instrument of two pivoted crossing blades, as a large pair of scissors; anything that works in similar fashion, like hoisting *shears*.

***sheath** (shēth), *n.* a case or scabbard for a sword; a case in which part of a plant stem is inclosed.

***sheathe** (shē*th*), *v.t.* to put into a case, as to *sheathe* a sword.

sheave (shēv), *v.t.* to gather and tie into bundles.

shed (shed), *n.* a small, low building, frequently with open front or sides; a hangar for airplanes.

shed (shed), *v.t.* to cause to flow, as to *shed* tears or blood; to discard, as a snake *sheds* its skin; to give forth, diffuse, as a lamp *sheds* light.

sheen (shēn), *n.* brightness; splendor; luster, as *sheen* of silky fabrics.

sheep (shēp), *n.* [*pl.* sheep] a cud-chewing animal prized for its meat and wool; a timid person with no initiative.

sheepcote (shēp′ cōt), *n.* a pen for sheep, a sheepfold.

sheepish (shēp′ ish), *adj.* like a sheep in timidity, awkwardly bashful or silly.

sheepshead (shēps′ hed), *n.* a food fish of the North Atlantic coast.

sheepskin (shēp′ skin), *n.* the skin of a sheep or anything made of it, as a coat or parchment; a college diploma.

sheer (shēr), *n.* a change in the course of a ship; the upward slope of a ship's build toward the bow.

sheer (shēr), *v.i.* to turn from the course, as a road *sheers* to the left, to *sheer* off, as in order to avoid collision.

sheer (shēr), *adj.* complete, absolute, as *sheer* foolishness; very thin, as *sheer* fabrics.

sheer (shēr), *adv.* steeply; almost perpendicularly, as the cliff fell *sheer* below us.

sheet (shēt), *n.* a large thin piece of anything, as a *sheet* of paper, glass or metal; a rectangular piece of linen used in making up a bed; a rope attached to a sail by which to change its position.

sheet (shēt), *v.t.* to cover, as ice *sheets* a sidewalk.

***sheik** (shēk), *n.* the head of a Bedouin family, tribe or clan; a man irresistibly fascinating to women.

***shekel** (shek′ el), *n.* an ancient Jewish coin.

shelf (shelf), *n.* [*pl.* shelves] a board set horizontally against a wall or into a bookcase or cabinet to hold things; any flat horizontal ledge as a *shelf* of rock.

shell (shel), *n.* a hard covering enclosing a nut, egg or animal body, as the *shell* of a hickory nut, a hen's egg or a turtle; the material of which such a casing is composed; a hollow case filled with explosives to be discharged from a firearm; the case in which the charge of a breech-loading gun is packed; an empty form without reality, as he is a mere *shell* of a man; a racing boat propelled by oars.

shell (shel), *v.t.* to remove from a natural case, as to *shell* peanuts; to remove from the cob, as to *shell* corn; to attack with explosive charges, as to *shell* a fort.

***shellac** (she lak′), *n.* a resinous substance found on trees in India, used in making varnish; a solution of this substance in alcohol, used as a hard varnish.

shellfish (shel′ fish), *n.* an invertebrate water animal enclosed in a shell, as a mollusk or a crustacean.

shell shock (shel shok), *n.* a nervous condition resembling hysteria caused by the strain of modern warfare.

shelter (shel′ tēr), *n.* a place of safety; cover from a storm; a refuge; protection.

shelter (shel′ tēr), *v.t.* to protect or shield, as from harm.

shelve (shelv), *v.i. and v.t.* to slope, as the bay bottom *shelves* off gradually; to equip with horizontal boards on which to set things; to lay aside or postpone, as the resolution was *shelved* until the next meeting.

shelving (shelv′ ing), *n.* material for making ledges on which to set things; shelves collectively.

***shepherd** (shep′ ērd), *n.* one who tends sheep; a pastor.

***sherbet** (shûr′ bet), *n.* a cooling beverage of water, sugar and fruit juices; a water ice with fruit flavor.

sheriff (sher′ if), *n.* the chief law-enforcing officer of a county or shire.

sherry (sher′ i), *n.* [*pl.* sherries] a white wine, originally made in Jerez, Spain.

shield (shēld), *n.* a piece of armor carried on the left arm; anything that protects by warding off harm.

shield (shēld), *v.t.* to protect, ward off danger from.

shift (shift), *n.* a change from one position to another; an effort, ways and means, as to make shift to go; an artifice; a force of workingmen or the time during which it is working, as the day *shift;* the moving of football players into a different line-up before the ball is put in play; a woman's chemise or nightgown.

shiftless (shift′ les), *adj.* not resourceful, lazy, improvident.

shifty (shif′ ti), *adj.* [*comp.* shiftier, *superl.* shiftiest] tricky; artful.

shillelagh (shil lā′ la), *n.* a club or cudgel.

shilling (shil′ ing), *n.* a British silver coin, one-twentieth of a pound—about 24 cents.

shimmer (shim′ ēr), *n.* a gleam of wavering light; the sheen of such fabrics as satin, as this material has a wonderful sheen and *shimmer*.

shin (shin), *n.* the fore part of the leg between ankle and knee.

shine (shīn), *n.* the quality of brightness in surfaces, as the *shine* of polished metal; illumination, as the *shine* of a lamp, sun*shine;* sheen, luster.

shine (shīn), *v.i. and v.t.* to emit light steadily; to have brightness; to cause to glisten, as the sun *shines,* a lantern *shines,* he has a *shining* wit; to polish, as I must *shine* my shoes before I start for school.

shingle (shing′ gl), *n.* a thin, flat piece of wood or other material used to cover roofs; the pebbles on a sea beach; a small signboard, as a doctor's *shingle*.

shingle (shing′ gl), *v.t.* to cover a roof with small, thin slabs of wood or other material in overlapping rows; to cut short, as to *shingle* hair.

shiny (shīn′ i), *adj.* [*comp.* shinier, *superl.* shiniest] diffusing light, bright; glossy, having sheen or polish.

ship (ship), *n.* any large seagoing vessel that carries freight and passengers; specifically, a full square-rigged sailing vessel with three, four and sometimes five masts.

ship (ship), *v.i. and v.t.* to go aboard a ship; to join a ship as a member of the crew; to send by ship or any conveyance carrying freight, as to *ship* goods.

ship canal (ship ka nal′), an artificial strait giving passage for large vessels from one body of water to another.

shipmaster (ship′ mȧs tēr), *n.* the captain or master of any merchant vessel.

shipmate (ship′ māt), *n.* a fellow member of a crew.

shipment (ship′ ment), *n.* the act of sending goods by any kind of conveyance, as rail *shipment,* water *shipment;* the goods sent.

shipping (ship′ ing), *n.* vessels collectively, as the *shipping* of New York Harbor.

shipshape (ship′ shāp), *adj.* well arranged, all in order.

shipwreck (ship′ rek), *n.* total or partial loss of a vessel at sea; ruin, failure, as the *shipwreck* of a business.

shipyard (ship′ yärd), *n.* a waterside establishment where ships are built or repaired.

shire (shīr), *n.* an English district or county.

shirk (shûrk), *v.t.* to shun, neglect or evade, as to *shirk* one's duty.

shirt (shûrt), *n.* a loose garment with sleeves worn by men and boys under the coat and vest; a close-fitting undergarment for the upper body.

shiver (shiv′ ēr), *n.* a trembling, as with cold or fear, as the *shivers* ran up and down me.

shiver (shiv′ ēr), *n.* a small piece or splinter broken off, as the mirror was smashed to *shivers.*

shiver (shiv′ ēr), *v.i. and v.t.* to tremble or quiver, as with cold or terror; to break into tiny fragments, as the rock *shivered* the window panes.

shoal (shōl), *n.* a great number thronging together, as a *shoal* of fish.

shoal (shōl), *v.i.* to school, as fish.

shoal (shōl), *n*, a shallow place in a body of water; a sandbank or bar less than 6 fathoms under water.

shoal (shōl), *adj.* shallow, as *shoal* water ahead.

shoat (shōt), *n.* a pig, a young hog.

shock (shok), *n.* a heavy blow; concussion; a violent disturbance of the feelings, as this news is a *shock* to me; the disturbance of the body caused by electric current passing through it.

shock (shok), *v.t.* to shake with a heavy blow; to pass an electric current through; to move with surprise or horror, as the news *shocked* me.

shock absorber (shok ab sôr′ bēr), a device to lessen jarring in automobiles or airplanes.

shocking (shok′ ing), *adj.* extremely disturbing; disgusting, horrifying.

shock troops (shok trōōps), forces trained and used for mass movements in battle.

shoddy (shod′ i), *n.* [*pl.* shoddies] cloth made of old cloth shredded; wool fibers from old cloth; cheap display.

shoddy (shod′ i), *adj.* [*comp.* shoddier, *superl.* shoddiest] made of old cloth torn into shreds; not genuine; sham; cheap and vulgar.

shoe (shōō), *n.* an outer covering for the foot, reaching little if any above the ankle; something resembling a shoe, either in the way it is used or in its position, as a brake *shoe.*

shoe (shōō), *v.t.* [*p.t. and p.p.* shod, *pr.p.* shoeing] to furnish with footgear; to put a bar or plate on a horse's hoofs for protection on hard or rough roads.

shoot (shōōt), *n.* a young branch or growth on a plant; a match at marksmanship.

shoot (shōōt), *v.i. and v.t.* to fire a gun; to move swiftly, as an arrow *shoots* through the air; to dart, as a pain *shoots* up his arm; to grow out, as the leaves will soon *shoot.*

shooting star (shōōt′ ing stär), a mass of matter entering and shooting through the earth's atmosphere, made luminous by friction with the air, a meteor.

shop (shop), *n.* a place where goods are sold at retail, a store; a place where mechanical operations are performed, as a print *shop;* one's own business, as to talk *shop.*

shop (shop), *v.i.* to go to stores to buy; to go from one store to another, looking for the most satisfactory goods or prices.

shoplifter (shop′ lif′ tēr), *n.* one who steals goods from a store while business is going on.

shore (shōr), *n.* the land adjacent to a large body of water, such as a sea, bay or lake.

shore (shōr), *n.* a heavy beam used as a prop or support.

shore (shōr), *v.t.* to support with props, as this wall will have to be *shored* up.

short (shôrt), *adj.* not long, in space or time; abrupt; not complete; crisp.

Syn. Brief, concise, succinct. We may term a stick, a letter, a discourse *short;* but speech is *brief* only in regard to its length or duration, *concise* or *succinct* in regard to its style and matter.

Ant. Long, diffuse, prolix.

shortage (shôr′ tij), *n.* less than the required amount, deficit.

shorten (shôr′ tn), *v.i. and v.t.* to lose length, become shorter, as the days *shorten* as winter comes on; to take length from, as I must *shorten* this dress; to make light and friable as piecrust.

shortening (shôr′ tn ing), *n.* any fat used to make pastry or cake light and easily broken.

shorthand (shôrt′ hand), *n.* any system of writing using characters and strokes to make for rapidity of writing, stenography.

shortly (shôrt′ li), *adv.* soon, after a little while; briefly, concisely; curtly.

shortsighted (shôrt sīt′ ed), *adj.* unable to see at a distance, nearsighted; not seeing ahead, lacking foresight.

shot (shot), *n.* the discharge of a firearm or delivery of a hand-thrown missile; the small pellets of lead with which a scattering fire is delivered from a shotgun; a marksman, as he is a good *shot;* a metal ball thrown in a contest of strength and skill; the pictures composing a single scene in motion pictures.

should (shood), *auxiliary v.* [*p.t.* of *shall*] ought to, as you *should* go; providing that, as *should* we miss the train we shall be in trouble: used in quoting a phrase originally containing *shall,* as I said I *should* go for the original statement *I shall go.*

shoulder (shōl′ dēr), *n.* the part of the human body where the arm joins the trunk; in a quadruped, the upper end of the foreleg where it joins the body; a part of anything that juts like the top of the arm, as a *shoulder* of a mountain; that which bears burdens, as the responsibility is on his *shoulders.*

shoulder (shōl′ dēr), *v.i. and v.t.* to push or jostle with the upper body, as I *shouldered* him aside; to carry across the upper part of the back or on one shoulder, as he *shouldered* the load.

shout (shout), *n.* a loud and sudden cry; an outburst of cheers from an assemblage.

shove (shuv), *n.* a strong push, as give the boat a *shove.*

shove (shuv), *v.i. and v.t.* to push, as stop *shoving, shove* that rock over.

shovel (shuv′ l), *n.* an implement consisting of a scoop with a handle, for digging or moving such things as dirt and coal.

shovel (shuv′ l), *v.t.* to dig or move with a scoop on a long handle.

show (shō), *n.* a public exhibition, as a dog *show;* demonstration or proof, as a *show* of strength; presentation of a program of entertainment; pretense or false semblance; ostentation, pomp.

show (shō), *v.i. and v.t.* to be seen or visible, as the spot on your dress *shows;* to present to the eye or attention, exhibit, as he *showed* me his toys; to explain, teach, as *show* me how to do this; to *prove,* as *show* that you are right; to manifest or bestow, as he had *shown* me great kindness.

shower (shou′ ēr), *n.* a fall of rain, a hail or snow that does not last long; good things coming in abundance, as a *shower* of blessings; a party at which gifts are made to an engaged girl, as a linen *shower.*

shower (shou′ ēr), *v.i. and v.t.* to sprinkle; to pour out; to give generously, as to *shower* with presents or kindness.

showy (shō′ i), *adj.* [*comp.* showier, *superl.* showiest] ostentatious, attracting attention, gaudy.

shred (shred), *n.* a torn-off strip; fragment; particle, as he hasn't a *shred* of kindness in his make-up.

shred (shred), *v.t.* to tear into pieces.

***shrew** (shrōō), *n.* a scolding woman.

shrew (shrōō), *n.* a small animal, resembling the mouse and related to the mole, that feeds on insects and worms.

shrewd (shrōōd), *adj.* sharp-witted, clever in practical affairs, not easily fooled.

***shriek** (shrēk), *n.* a shrill outcry, as of pain or fear.

shriek (shrēk), *v.i. and v.t.* to cry out in a shrill and piercing tone, as she *shrieked* with pain or fear.

shrift (shrift), *n.* confession by and absolution for a dying person: *short shrift,* small allowance of time for confession before death; prompt execution of a sentence.

shrill (shril), *adj.* sharp in sound, piercing, as a *shrill* tone.

shrimp (shrimp), *n.* a small edible shellfish related to the lobster.

shrine (shrīn), *n.* a case in which sacred relics are kept; a place, such as a small chapel, consecrated to a saint or some sacred relic.

shrine (shrīn), *v.t.* to keep in a hallowed place, enshrine.

shrink (shringk), *v.i. and v.t.* to diminish by contracting, as cloth *shrinks* when it is wet; to cause to diminish by wetting and drying; to draw back, as in fear or distaste, as I *shrink* from this ordeal.

shrinkage (shringk′ ij), *n.* contraction due to wetting and drying; loss due to such contraction.

shrivel (shriv′ l), *v.i. and v.t.* [*p.t. and p.p.* shriveled, *pr.p.* shriveling] to shrink and wrinkle, wither; to dry and curl up.

shroud (shroud), *n.* a dress or covering for the dead; a winding sheet.

shroud (shroud), *n.* one of the ropes rigged in sets numbering three to five to support a mast, and having crossropes called *ratlines,* forming a ladder leading to the masthead; any guy rope.

shroud (shroud), *v.i. and v.t.* to clothe for burial; to cover with a winding sheet; to veil, conceal, as the clouds *shroud* the tops of lofty mountains.

shrub (shrub), *n.* a woody plant or bush smaller than a tree, having many separate stems growing from one root in the ground.

shrubbery (shrub′ ēr i), *n.* [*pl.* shrubberies] a collection of bushes.

shrug (shrug), *n.* a raising of the shoulders to indicate indifference or doubt.

shrug (shrug), *v.i. and v.t.* to raise the shoulders as an expression of doubt or indifference.

shuck (shuk), *n.* a shell or husk, as a corn *shuck,* peanut *shucks,* oyster *shucks.*

shuck (shuk), *v.t.* to remove the shells or husks from, as to *shuck* corn, peanuts or oysters.

shudder (shud′ ēr), *n.* a trembling or shivering caused by fear or horror.

shudder (shud′ ēr), *v.i.* to shiver with fear or horror.

shuffle (shuf′ l), *n.* a scraping of the feet, as to walk with a *shuffle;* a dance in which the feet are pushed along the floor; a change in the relative positions, as a *shuffle* of playing cards; evasion, trickiness, deceit.

shuffle (shuf′ l), *v.i. nd v.t.* to scrape the feet along the ground in walking or dancing; to rearrange, as to *shuffle* cards; to evade, deceive.

shun (shun), *v.t.* to avoid, keep away from; to refrain from, as to *shun* evil ways.

shunt (shunt), *n.* a turning aside, as of a freight train from the open line to a siding; a device to divert part of an electric current.

shunt (shunt), *v.i. and v.t.* to turn off a main line to a side line; as railroad cars onto a siding; to divert, as part of an electric current.

shut (shut), *v.i. and v.t.* to close so as to prevent entrance or exit, as a door shuts; to close, as to *shut* a book.

shut (shut), *adj.* closed, not open.

shutter (shut′ ēr), *n.* an outside window cover set on hinges; a device to regulate the fall of light on the plate or film of a camera.

shuttle (shut′ l), *n.* a device to carry the weft back and forth through the threads of the warp to make cloth; a device in a sewing machine that locks the stitches; a train going back and forth on a short connecting line between two main points; the track for such a train between two main points.

shuttle (shut′ l), *v.i. and v.t.,* to move alternately back and forth.

shy (shī), *n.* [*pl.* shies] a fling, toss, trial, as let me take a *shy* at it.

shy (shī), *n.* [*pl.* shies] a sudden leap forward or to the side, as by a frightened horse.

shy (shī), *v.t.* [*p.t. and p.p.* shied, *pr.p.* shying] to fling, as to *shy* a stone.

shy (shī), *v.i.* [*p.t. and p.p.* shied, *pr.p.* shying] to leap forward or aside in fear, as a horse.

shy (shī), *adj.* [*comp.* shyer, *superl.* shyest] timid, bashful; wary.

***sibilant** (sib′ i lant), *n.* a hissing sound; a letter representing such a sound, as *s.*

sibilant (sib′ i lant), *adj.* having a hissing sound.

***sibyl** (sib′ il), *n.* a woman possessing powers of prophecy.

sick (sik), *adj.* ill; indisposed; having nausea; disgusted, as I am *sick* of this job.

Syn. Ill, sickly, diseased. *Sick* and *ill* are practically interchangeable; both denote a temporary condition; *sickly* denotes a permanent state; *diseased* means definitely having a disease.

Ant. Healthy.

sicken (sik′ en), *v.i. and v.t.* to become ill or disgusted; to make ill or disgusted.

sickle (sik′ l), *n.* a cutting tool having a small curved blade on a handle, used for cutting grass; with a hammer the symbol of the Soviets.

sickly (sik′ li), *adj.* [*comp.* sicklier, *superl.* sickliest] ailing; mawkish.

side (sīd), *n.* a straight line forming a unit in the boundary of a plane figure, as a *side* of a square; a surface forming part of the inclosure of a solid, as a *side* of a cube; one of two contrasting surfaces, as the inner and outer *sides;* one of the surfaces of a fixed cubic structure that is neither front nor back, as the *sides* of a house; the part of an animal's body that is neither front nor back, as the right or left *side;* one of two opposing forces, as which *side* am I on in the debate; a line of descent, as on my mother's *side.*

side (sīd), *v.i.* to take one part or position against another, as I *side* with you in this debate.

side (sīd), *adj.* lateral; not at the front or back, as a *side* door; along the edge, as a *side*walk along a street; minor, indirect as a *side* remark.

sideboard (sīd′ bōrd), *n.* a piece of dining-room furniture to hold dishes or silverware, a buffet.

sidecar (sīd kär), a small car attached to the side of a motorcycle.

***sidereal** (sī dēr′ ēal), *adj.* relating to the stars; measured by the stars, as *sidereal* time or ages.

sidetrack (sīd′ trak), *n.* a siding on a railroad.

sidetrack (sīd′ trak), *v.t.* to switch onto a siding, as to *sidetrack* a freight car; to switch or turn aside, as he was *sidetracked* from his purpose.

sideways (sīd′ wāz), *adj.* to or from one side, as a *sideways* motion.

sideways (sīd′ wāz), *adv.* to or from the side, as to reach *sideways;* obliquely.

siding (sīd′ ing), *n.* a short additional stretch of railroad track running off from the main line to which cars are switched or shunted to load and unload freight or to permit other trains to pass; a sidetrack.

sidle (sī′ dl), *v.i.* to move obliquely and unobtrusively, as the dog *sidled* up to me.

siege (sēj), *n.* the surrounding of a fortified place to compel its garrison to surrender because of lack of supplies; a continued effort to win something.

sienna (si en′ *a*), *n.* red or orange-yellow clay used as a pigment.

sieve (siv), *n.* a utensil for separating the finer from the coarser parts of a substance, as sand or gravel, by passing it through a network of fine or coarse meshes.

sift (sift), *v.t.* to put through a screen; to scrutinize with a view to rejecting some and retaining the rest, as to *sift* evidence.

***sigh** (sī), *n.* a long deep audible breath, expressing relief, weariness or sadness.

sigh (sī), *v.i.* to take a long deep breath with a sound of the voice expressing weariness, regret, relief; to long for, as to *sigh* for the past.

***sight** (sīt), *n.* the power or act of perceiving through the eyes; that which is thus perceived; range of vision; point of view; a device to assist in aiming, as a gun *sight;* something shocking to behold, as when they pulled him out of the river, he was a *sight;* a view of interesting things, as to see the *sights* of the big city.

sight (sīt), *v.i. and v.t.* to perceive with the eye; to aim, as to *sight* a gun.

sign (sīn), *n.* that by which anything is known or represented; a symbol, a token; a gesture used instead of speech.

Syn. Signal. The *sign* enables us to recognize an object; it is, therefore, sometimes natural. A *signal* serves to give warning or communicate something and is always arbitrary.

signal (sig′ nal), *n.* a motion with a meaning; a sound, an object or a motion used to convey an order or information; an event that moves to action, as that assassination was the *signal* for war.

signal (sig′ nal), *v.i. and v.t.* to make signs, as she *signaled* for me to come; to make signs to, as to *signal* a ship; to communicate by means of signs, motions, flags, lights, as the ship signals distress.

signal (sig′ nal), *adj.* memorable, remarkable, distinguished, as a *signal* event in the history of the state.

signalize (sig′ nal īz), *v.t.* to make prominent; to play up strongly.

signature (sig′ n*a* tūr), *n.* the name of a person written by himself; the writing of one's name to show authorship, as the *signature* on a letter.

signet (sig′ net), *n.* a seal; imprint made, as in wax, by a seal.

significant (sig nif′ i kant), *adj.* having meaning; important, as a *significant* look, a *significant* event.

signification (sig nif i kā′ shun), *n.* meaning.

signify (sig′ ni fī), *v.i. and v.t.* [*p.t. and p.p.* signified, *pr.p.* signifying] to have importance, as it does not *signify;* to indicate, as a meaning; to betoken, as this *signifies* war.

sign off (sīn ôf), to announce the end of a radio program or message.

silage (sī′ lij), *n.* fodder cut and preserved for winter use by fermentation in a silo: often called *ensilage.*

silence (sī′ lens), *n.* the absence of sound, stillness.

silence (sī′ lens), *v.t.* to cause to be quiet or still, as I *silenced* him; to hush, as to *silence* rumors.

silent (sī′ lent), *adj.* soundless, making no noise; speechless, taciturn; inactive, as a *silent* partner in a business.

***silhouette** (sil oo et′), *n.* an outline drawing filled in with solid color.

silhouette (sil oo et′), *v.i. and v.t.* to appear in outline and solid color, as his figure was *silhouetted* on the window shade.

***silica** (sil′ i k*a*), *n.* a colorless mineral substance, occurring in many forms, as quartz, crystal, opal, sand, and used in making glass and pottery.

***silicon** (sil′ i kon), *n.* a nonmetallic element found in rocks and sand.

silk (silk), *n.* a fine soft fiber spun by the silkworm in making its cocoon; thread or cloth made of this fiber; anything resembling this fiber, as corn *silk.*

silkworm (silk′ wûrm), *n.* the larva of a certain moth that spins a strong fiber to wind its cocoon.

silky (sil′ ki), *adj.* [*comp.* silkier, *superl.* silkiest] pertaining to or made of the threads of the silkworm; soft, fine and glossy, as *silky* hair.

sill (sil), *n.* a timber laid horizontally to form the base or foundation of a structure, such as a door or window.

silly (sil′ i), *adj.* [*comp.* sillier, *superl.* silliest] weak-minded; foolish, unwise, as a *silly* thing to do.

silo (sī′ lō), *n.* a storing pit or closed airtight structure for fermenting fodder into silage.

silt (silt), *n.* mud or sand deposited by a stream.

silt (silt), *v.i. and v.t.* to fill with sediment.

silver (sil′ vẽr), *n.* a soft metallic element, lustrous, malleable and ductile, one of the precious metals used in making coins, jewelry and fine ornamental wares; coins made of this metal, as I will have to pay you in *silver;* the luster of this metal.

silver (sil′ vẽr), *v.i. and v.t.* to take on a shining grayish color, as his hair is *silvering;* to cover or plate with silver.

silver (sil′ vẽr), *adj.* having the color and luster of silver, as *silver* threads among the gold.

silver print (sil′ vẽr print), a photographic positive on paper sensitized by a silver salt, often used to make a line drawing from a photograph.

silvery (sil′ vẽr i), *adj.* having the color and luster of silver; clear, as *silvery* tones.

simian (sim′ i an), *n.* an ape or monkey.

simian (sim′ ian), *adj.* like or pertaining in any way to apes or monkeys; apelike.

similar (sim′ i lẽr), *adj.* having a general likeness or correspondence; like in any quality or property.

similarity (sim i lar′ i ti), *n.* [*pl.* similarities] resemblance, likeness; a point of likeness.

***simile** (sim′ i lē), *n.* [*pl.* similes] a figure of speech in which one thing is directly likened to another, as we flew *like the wind.*

simmer (sim′ ẽr), *v.i. and v.t.* to boil gently.

simon-pure (sī′ mon pūr), *adj.* genuine, real, original.

***simony** (sim′ ō ni), *n.* the act of buying or selling places of honor in the church.

***simoom** (si mo͞om′), *n.* a hot dry sand-laden wind blowing suddenly in the desert.

simper (sim′ pẽr), *n.* an affected or silly smile.

simper (sim′ pẽr), *v.i.* to smile in an affected or silly manner.

simple (sim′ pl), *adj.* single, not complex; plain, unaffected, unadorned; natural, not artful.

Syn. Single, singular. We may speak of a *simple* circumstance as independent of anything; of a *single* instance or circumstance as unaccompanied by any other; and a *singular* instance as one that rarely has its like.

Ant. Complex, intricate, multiple.

simpleton (sim′ pl tun), *n.* a foolish or weak-minded person.

simplicity (sim plis′ i ti), *n.* [*pl.* simplicities] the state or quality of having no complex or intricate nature or construction; artlessness, lack of guile; plainness in manner of living; silliness.

simplify (sim′ pli fī), *v.t.* [*p.t. and p.p.* simplified, *pr.p.* simplifying] to make more clear and understandable, do away with complexities; to make easier.

simulate (sim′ ū lāt), *v.t.* to pretend, imitate.

simulation (sim ū lā′ shun), *n.* pretense, imitation, make-believe.

Syn. Dissimulation, hypocrisy. *Simulation* is the making oneself like what one is not; *dissimulation* is the making oneself appear unlike what one really is. *Hypocrisy* implies an insincere pretense to goodness by one whose nature and life are despicable.

***simultaneous** (sī mul tā′ nē us), *adj.* happening, done or existing at the same time.

sin (sin), *n.* offense against the laws of God; wickedness.

sin (sin), *v.i.* to break the laws of God; to transgress, do wrong.

since (sins), *adv.* from that time, as I have never been there *since.*

since (sins), *prep.* from the time of, as I have been here ever *since* the war.

since (sins), *conj.* after the time that, as *since* the war ended, the map of Europe has changed completely; because, seeing that, considering, as *since* you do not like it, I shall change it.

sincere (sin sēr′), *adj.* true, honest, without affectation or pretense, real.

sincerity (sin ser′ i ti), *n.* the state or quality of being pure, genuine, simple and unaffected, frank and honest.

***sinecure** (sī′ nē kūr), *n.* a position or office in which one is well paid and has few duties or responsibilities.

sinew (sin′ ū), *n.* a tendon; anything supplying strength or providing resources, as the *sinews* of war.

sinful (sin′ fool), *adj.* wicked, impious, unholy.

sing (sing), *v.i. and v.t.* to make musical sounds with the voice; to celebrate with verse or song, as arms and the man I *sing.*

***singe** (sinj), *n.* a slight burn on the surface.

singe (sinj), *v.t.* to burn slightly; to scorch the surface of; to remove hair from by passing over a flame.

single (sing′ gl), *adj.* consisting of or performed by one only; alone; separate; unmarried; honest, sincere.

single (sing′ gl), *v.t.* to select, as one person or thing from many, as I *singled* him out from the crowd.

singly (sing′ gli), *adv.* by ones; one at a time.

singsong (sing′ sông), *n.* a monotonous tone; speech in a monotonous tone; verse having a monotonous rhythm.

singsong (sing′ sông), *adj.* having a monotonous tone or rhythm.

***singular** (sing′ gū lẽr), *n.* the form of a word that denotes only one of a kind, as tree is the *singular* of trees; the form of a word used to denote that it is used of or with or for one person or thing, as I, he, she, it are all *singular* pronouns; has is a *singular* form of to have.

singular (sing′ gū lẽr), *adj.* not plural; not dual; having to do with only one; extraordinary, strange, as you are making a *singular* request.

singularity (sing gū lar′ i ti), *n.* [*pl.* singularities] the state of oneness; the state of being extraordinary; a special characteristic.

***sinister** (sin′ is tẽr), *adj.* inauspicious, unlucky; ill-omened, boding evil; dishonest, ill-intentioned.

sink (singk), *n.* a basin with a drain to carry off waste liquids.

sink (singk), *v.i. and v.t.* to go or fall downward as iron *sinks* in water; to decline gradually; to subside; to cause to go down, as to *sink* a ship.

sinuous (sin′ ū us), *adj.* bending, having in and out waves, winding, as the *sinuous* course of a river; erring, crooked, as *sinuous* conduct or policies.

***sinus** (sī′ nus, *n.* [*pl.* sinuses] a cavity in a bone or an air cavity in the head connecting with the nose.

sip (sip), *n.* a mere taste of a liquid.

sip (sip), *v.i. and v.t.* to take a liquid a taste at a time; to drink slowly in small amounts.

***siphon** (sī′ fon), *n.* a bent pipe or tube with one short leg and one longer one, for drawing off liquids from a higher to a lower level or from one container to another, through air pressure.

siphon (sī′ fon), *v.t.* to draw off by means of a pipe, as to *siphon* a liquid from a tub into bottles.

sir (sir), *n.* a term of respectful address to a man.

sire (sīr), *n.* a title of respect to a ruler; a father, a head of a family.

sire (sīr), *v.t.* to be the father of, beget.

siren (sī′ ren), *n.* a mythological alluring sweet-voiced creature, half woman and half bird that lured mariners to their death; a device to give warning, as of fire or the passage of a police vehicle, with a screaming whistle.

***sirloin** (sûr′ loin), *n.* a cut of beef from the upper part of the loin.

***sirocco** (si rok′ ō), *n.* [*pl.* siroccos] a hot dust-laden wind that blows from the Libyan deserts towards Italy and Sicily.

***sirup** (sir′ up), *n.* a thick, sweet liquid made from the juice of fruits boiled with sugar or from the sap of the sugar maple.

***sisal** (sī′ sal), *n.* an agave plant that grows in Central America and the West Indies; the fiber of this plant used in making rope.

sister (sis′ tẽr), *n.* the daughter of one's parents; a female member of a religious order, a nun.

sisterhood (sis′ tẽr hood), *n.* a number of women or girls, belonging to one society.

sister-in-law (sis′ tẽr in lô), *n.* [*pl.* sisters-in-law] the sister of one's husband or wife; the wife of one's brother.

sit (sit), *v.i.* to rest upon the lower part of the trunk of the body; to be in session, as the court *sits* today; to cover eggs to be hatched, as the hen *sits.*

site (sīt), *n.* a location; a plot of land set aside for special use.

sitting (sit′ ing), *n.* a session, as a *sitting* of court.

situate (sit′ ū āt), *v.t.* to fix a location for; to locate.

situation (sit ū ā′ shun), *n.* a position, location; circumstance, as in this *situation;* employment, a job.

six (siks), *n.* one more than five; the symbol 6, representing this number.

sixteen (siks tēn′), *n.* one more than 15; the symbol 16, representing this number.

sixteenth (siks tēnth′), *n.* one of 16 equal parts; the one after the 15th.

sixteenth (siks tēnth′), *adj.* next following the 15th.

sixth (siksth), *n.* one of six equal parts; the one after the fifth.

sixth (siksth), *adj.* next following the fifth.

sixtieth (siks′ ti eth), *n.* one of 60 equal parts; the one after the 59th.

sixtieth (siks′ ti eth), *adj.* next after the 59th.

sixty (siks′ ti), *n.* one more than 59.

sizable (sīz′ a bl), *adj.* of considerable magnitude, quite large.

size (sīz), *n.* magnitude, bulk or dimensions, as a house of great *size.*

size (sīz), *n.* a thin, weak glue used to glaze a surface, as of paper.

size (sīz), *v.t.* to gloss with a paste; to classify according to bulk or measure.

sizzle (siz′ l), *n.* a hissing sound.

sizzle (siz′ l), *v.i.* to give out a hissing sound or the sound of frying.

skate (skāt), *n.* a runner or blade of steel, usually fitted to a shoe, on which one glides over ice; a similar device having wheels in place of runners or blades, called a roller *skate.*

skate (skāt), *n.* a flatfish of the ray family.

skate (skāt), *v.i.* to move over ice on runners or blades attached to the shoes; to move on small wheels attached to a plate affixed to the shoes.

skein (skān), *n.* a coil of thread or yarn.

skeleton (skel′ ē tun), *n.* the framework of bones of men and animals; any framework, as the *skeleton* of a building.

skeleton key (skel′ ē tun kē), a master key that will open any ordinary lock.

***skeptic** (skep′ tik), *n.* one who doubts things commonly accepted as basic; a doubter; especially one who doubts religious theories: also spelled *sceptic.*

skeptical (skep′ ti kal), *adj.* doubting, unable or unwilling to believe, especially the theories of religion.

skepticism (skep′ ti sizm), *n.* a state of doubt or unbelief; the doctrine that all human knowledge is uncertain.

sketch (skech), *n.* an outline; a rough draft; a simple drawing rapidly made.

sketch (skech), *v.i. and v.t.* to make quick, simple drawings; to draw in outline, make an outline of.

skew (skū), *n.* a slanting motion or position; a twist or slant.

skew (skū), *v.t.* to make or set on the skew or to one side.

skew (skū), *adj.* placed obliquely or on a slant; not symmetrical.

skewer (skū′ ẽr), *n.* a pin of wood or metal to hold a roast of meat folded together.

skewer (skū′ ẽr), *v.t.* to fasten with a wood or metal pin.

***ski** (skē), *n.* [*pl.* skis] one of a pair of long narrow runners of wood attached to the shoe for gliding over snow: the Continental pronunciation is *shē.*

ski (skē), *v.i.* to slide over snow on long runners attached to the shoes.

skid (skid), *n.* a log used as a track to slide heavy objects; a slip to the side, as of automobile or airplane; one of the two sledlike runners on some kinds of aircraft to simplify landing.

skid (skid), *v.i. and v.t.* to slip sidewise, as an automobile or airplane; to haul over timbers laid as a track.

***skiff** (skif), *n.* a small light rowboat.

skilful (skil′ fool), *adj.* expert, clever, as a *skilful* artist; showing expertness, as *skilful* carving.

skill (skil), *n.* expertness; knowledge and the ability to apply it in practical ways and in art.

skillet (skil′ et), *n.* a small frying pan or stewpan.

skim (skim), *v.i. and v.t.* [*p.t. and p.p.* skimmed, *pr.p.* skimming] to glide over a surface; to remove matter from the surface of, as to *skim* milk; to read rapidly.

skimp (skimp), *v.i. and v.t.* to be stingy; to supply meanly; to do work in a slighting, negligent way.

skin (skin), *n.* the outer covering of an animal body; an outer covering of a vegetable body, as the *skin* of an apple.

skin (skin), *v.t.* to take the skin from, as to *skin* a deer.

skinflint (skin′ flint), *n.* stingy, avaricious person.

skinny (skin′ i), *adj.* [*comp.* skinnier, *superl.* skinniest] thin, lean, bony.

skip (skip), *n.* a light leap or jump; an omission.

skip (skip), *v.i. and v.t.* to caper, jump lightly; to omit, leave out.

skipper (skip′ ẽr), *n.* the master of a ship, a sea captain.

skirmish (skûr′ mish), *n.* a battle between small forces; a minor clash or part of a battle.

skirmish (skûr′ mish), *v.i.* to take part in a minor engagement in war.

***skirt** (skûrt), *n.* a woman's garment that hangs from the waist; a petticoat; the loose lower part of a man's coat; a hanging flap, as the *skirt* of a saddle.

skirt (skûrt), *v.t.* to border; to pass along the edge of.

skit (skit), *n.* a short piece of writing, satirical or humorous.

skittish (skit′ ish), *adj.* shy, easily frightened, timid and nervous.

skulk (skulk), *v.i.* to keep hidden or move about slyly, furtively.

skull (skul), *n.* the bony frame of the head.

skunk (skungk), *n.* a small animal, with dark fur and a white stripe on each side of the back, emitting an offensive odor when disturbed; the fur of this animal.

sky (skī), *n.* [*pl.* skies] the arch of the heavens overhead.

skylark (skī′ lärk), *n.* a bird that sings as it flies upward.

skylarking (skī lärk ing), *n.* merrymaking, frolicking.

sky line (skī līn), the horizon; the outline of trees, hills, buildings against the sky.

skyscraper (skī′ skrāp ẽr), *n.* a very high building.

slab (slab), *n.* a thick flat piece of stone or a thick slice of stone; a thick slice of anything, as bacon or cheese.

slack (slak), *n.* the part of anything that hangs loose, as the *slack* of a rope.

slack (slak), *v.i. and v.t.* to become or make less tight, loosen; to be negligent in work or the performance of a duty; to neglect, as work or duty.

slack (slak), *adj.* hanging loose; careless; sluggish.

slacken (slak′ en), *v.i. and v.t.* to become loose, sag; to become slower, as the pace *slackens;* to make slower, as to *slacken* speed.

slacker (slak′ ẽr), *n.* one who shirks a duty, especially in wartime.

slacks (slaks), *n. pl.* loose, wide trousers.

slag (slag), *n.* the dross of a metal; metallic waste separated from ores when melted; cinders from a blast furnace.

slake (slāk), *v.t.* to quench, extinguish, make less, as to *slake* one's thirst.

slam (slam), *n.* a banging noise, as a *slam* of a door.

slander (slan′ dẽr), *n.* a false report circulated to damage the reputation of a person.

slander (slan′ dẽr), *v.t.* to circulate false reports calculated to injure someone.

slang (slang), *n.* the use of words not approved for careful or formal written language, but which make speech colorful and vivid; inelegant, trashy word fads; the speech of a certain group, as thieves' *slang.*

slant (slȧnt), *n.* a slope, an inclined plane; obliqueness, as the road goes off at a slant.

Syn. Slope. A *slant* is small; a *slope* may be large or small. A book has a *slant* from the surface of a table by being laid down with one end resting on another book; a piece of ground has a *slope.*

slant (slȧnt), *v.i. and v.t.* to go off at an angle from a straight line; to slope.

slant (slȧnt), *adj.* lying at an angle; sloping.

slap (slap), *n.* a blow with the open hand; a blow given with anything flat.

slap (slap), *v.t.* to strike with the open hand or with any broad flat object.

slash (slash), *n.* a cut made with a sweeping stroke.

slash (slash), *v.i. and v.t.* to strike out violently and wildly with a knife or a whip; to cut with a sweeping stroke, gash.

slat (slat), *n.* a thin narrow strip of wood or metal, as a bed *slat.*

slate (slāt), *n.* a kind of rock that splits easily into thin plates; a plate of such rock for roofing or to write on.

slate (slāt), *n.* a list of candidates to represent a party in an election.

slate (slāt), *v.t.* to offer as a candidate for election, as one of a party list of candidates.

slattern (slat′ ẽrn), *n.* a careless, untidy, slovenly woman.

***slaughter** (slô′ tẽr), *n.* the killing and butchering of animals for food; great destruction of life; massacre.

slaughterhouse (slô′ tẽr hous), *n.* a place where animals are butchered.

slave (slāv), *n.* a human being held in bondage; a victim of a habit; one who drudges with small reward.

slave (slāv), *v.i.* to live a life of drudgery, to drudge or toil.

slavery (slāv′ ẽr i), *n.* the state of being subject to the will of another; the practice of holding human beings in bondage or the state of being held in bondage.

slaw (slô), *n.* sliced or chopped cabbage.

slay (slā), *v.t.* to kill, especially in a violent and sudden manner.

***sleazy** (slā′ zi), *adj.* [*comp.* sleazier, *superl.* sleaziest] flimsy; poorly woven.

sled (sled), *n.* a conveyance on runners to travel over snow and ice.

sledge (slej), *n.* a heavy sled to carry loads over snow and ice.

sledge (slej), *n.* a heavy hammer such as blacksmiths use, or such as is used to break up stone, a sledgehammer.

sleek (slēk), *v.t.* to make smooth and glossy by rubbing or brushing, as to *sleek* the hair.

sleek (slēk), *adj.* smooth, glossy.

sleep (slēp), *n.* a natural temporary period of almost complete unconsciousness, normally at night, in which the body rests, slumber; torpor.

sleep (slēp), *v.i.* to rest, in a temporary unconscious state, as at night; to repose with the mind inactive and the eyes closed.

sleeper (slēp′ ẽr), *n.* one who sleeps; a strong piece of timber, stone or metal used to support and hold in place a heavy structure, a railroad tie; a railroad sleeping car.

sleepy (slēp′ i), *adj.* drowsy; sluggish, dull; conducive to slumber.

sleet (slēt), *n.* rain freezing as it falls.

sleeve (slēv), *n.* the part of a garment that covers the arm.

***sleigh** (slā), *n.* a conveyance on runners for traveling on snow or ice; a sled with seats.

sleight (slīt), *n.* dexterity; a trick done so smoothly and fast that the eye cannot see how it is done.

slender (slen′ dẽr), *n.* small or narrow in proportion to the length or height; slim, slight.

sleuth (slo͞oth), *n.* a bloodhound; a detective.

slew (slo͞o), *v.i. and v.t.* to slide around, to twist, to veer; to slue.

slice (slīs), *n.* a piece cut off across the broad surface of a larger body; a knife with a broad blade; a spatula to spread paint or thick ink.

slice (slīs), *v.t.* to cut layers off, as to *slice* bread.

slick (slik), *adj.* smooth; slippery.

slicker (slik′ ẽr), *n.* an oilskin coat.

slide (slīd), *n.* a smooth slippery surface, as a toboggan *slide;* a slanting surface down which things may run; a fall of ice and snow down a mountainside.

***slight** (slīt), *n.* an act of neglect toward another person; a show of indifference toward another; intentional withholding of due courtesy.

slight (slīt), *v.t.* to treat with discourtesy; to neglect; to do carelessly, as you have *slighted* this lesson.

slim (slim), *adj.* slender, scant, meager; mean, sly, tricky.

slime (slīm), *n.* soft sticky mud; any moist mucuslike matter, as the *slime* on a snail.

slimy (slim′ i), *adj.* [*comp.* slimier, *superl.* slimiest] moist, sticky and resembling mucus; vile, contemptible.

sling (sling), *n.* a pouchlike piece as of leather with a cord or thong at each end, used to hurl a stone; an arrangement of ropes or chains with hooks to grip a heavy object and lift or hoist it; a loop of cloth hung from the neck to support an injured arm.

sling (sling), *v.t.* to throw or hurl; to hoist with tackle.

slink (slingk), *v.i.* [*p.t. and p.p.* slunk, *pr.p.* slinking] to go as if ashamed, furtively; to sneak.

slip (slip), *n.* a slide; a missing of one's footing; an error or fault in speech or conduct; a landing place for vessels; a space between lines of piling or piers where a ship or ferryboat docks; a cutting from a plant, to be planted; a one-piece garment worn under a dress; a loose case that goes on and off easily, as a pillow *slip;* a leash to hold a dog, as the hound was on a *slip.*

slip (slip), *v.i. and v.t.* to miss one's foothold; to make an unintentional misstatement, as my tongue *slipped;* to do something wrong without bad intention, as I *slipped* that time; to take a cutting from a plant; to put on easily, as he *slipped* the ring over her finger.

Syn. Slide, glide. To *slip* is to make an involuntary motion; to *slide* is to make a voluntary motion. Those who go on the ice with fear will *slip;* boys *slide* on it for fun. To *glide* is to execute a movement of the whole body; a person *glides* over the ice when skating; a vessel *glides* through the water.

slipper (slip′ ẽr), *n.* a low and light shoe, easily put on or taken off.

slippery (slip′ ẽr i), *adj.* smooth enough to slide on; affording no foothold; elusive, as he is a *slippery* person to deal with.

slipshod (slip′ shod), *adj.* wearing old, worn loose shoes; slovenly, careless, as a *slipshod* way of speech.

slit (slit), *n.* a long cut; a narrow opening.

slit (slit), *v.t.* to make a long cut in; to cut lengthwise in strips.

***sliver** (sliv′ ẽr), *n.* a splinter, as a *sliver* of wood.

sliver (sliv′ ẽr), *v.t.* to break or cut into long thin pieces.

slogan (slō′ gan), *n.* the war cry of a Highland clan; any rallying cry; any watchword; an expression used to draw attention and to identify, as the firm has a *slogan.*

sloop (slo͞op), *n.* a fore-and-aft rigged vessel with only one mast.

slop (slop), *n.* spilled liquid; puddles of dirty liquid spilled on a clean floor; wet swill, as *slop* for pigs; *slops,* wet waste.

slop (slop), *v.i. and v.t.* to splash dirty water; to spill mussily; to soil by splashing dirty liquid on, as don't *slop* the floor.

slope (slōp), *n.* an incline; a slanting surface; slant, as this roof should have more *slope.*

slope (slōp), *v.i. and v.t.* to slant; to cause to slant.

sloppy (slop′ i), *adj.* [*comp.* sloppier, *superl.* sloppiest] wet and muddy, as a *sloppy* road; having puddles of dirty liquid; soiled with wet and mud, as *sloppy* shoes, a *sloppy* floor.

slot (slot), *n.* a short and narrow opening, as a mail *slot* in a door.

slot (slot), *v.t.* to cut a short and narrow opening in.

***sloth** (slōth), *n.* laziness, idleness, unwillingness to work or engage in any activity, slowness.

sloth (slōth), *n.* a South American animal that lives in trees and hangs upside down on the branches.

slouch (slouch), *n.* an ungainly gait; an awkward person.

slouch (slouch), *v.i.* to walk or move in an awkward, ungainly manner, with drooping shoulders and shuffling feet.

***slough** (slou), *n.* a miry spot, a bog, a swamp; depression, gloom.

slough (sluf), *n.* a skin shed by a snake; dead tissue cast off by the skin.

slough (slou), *n.* a low spot in a prairie, either dry or miry.

slough (sluf), *v.t. and v.i.* to shed, as a snake *sloughs* its skin; to cast off dead skin tissues.

***sloven** (sluv′ en), *n.* a habitually untidy person.

slovenly (sluv′ en li), *adj.* untidy; careless of personal appearance.

slow (slō), *adj.* lacking speed; behind time, as the clock is *slow;* requiring much time, as this is *slow* work; sluggish-minded.

slue (slo͞o), *n.* a swamp, a slough.

slue (slo͞o), *v.i. and v.t.* to slide around, turn from side to side, as a car *slues* through the mud; to turn or swing about a fixed point, as to *slue* a boom around a mast.

slug (slug), *n.* a mollusk without a shell; a land creature like a snail but having no shell, as this garden is full of *slugs.*

slug (slug), *n.* a chunk of metal; a bar of type metal used between lines of type for spacing; a heavy bullet.

slug (slug), *v.i. and v.t.* to strike heavily.

sluggard (slug′ ẽrd), *n.* a person who is habitually lazy and idle.

sluggish (slug′ ish), *adj.* heavy, dull, lazy.

***sluice** (slo͞os), *n.* a gate to regulate flow of water; an artificial channel for a stream of water.

sluice (slo͞os), *v.t.* to wash ore in an artificial channel of water; to float logs down such a waterway.

slum (slum), *n.* a poor, densely populated rundown section of a city.

slumber (slum′ bẽr), *n.* sleep.

slumber (slum′ bẽr), *v.i.* to sleep.

slump (slump), *n.* a fall, as in prices; a business depression; a slouching attitude.

slump (slump), *v.i.* to be depressed, as business *slumps;* to fall, as prices; to let oneself go heavily, as he *slumped* into a chair.

slur (slûr), *n.* a disparaging remark or act; an insult; implied reproach.

slur (slûr), *v.t.* to disparage; to pronounce indistinctly by running together, as to *slur* a sound or a syllable.

slush (slush), *n.* the slop of melting snow; a greasy mixture for lubricating machines; sentimental or silly talk or writing.

sly (slī), *adj.* [*comp.* slyer or slier, *superl.* slyest or sliest] crafty; artfully cunning; deceitful; roguish.

smack (smak), *n.* a quick sharp blow or slap; a quick sharp sound as of the lips; a taste, as give me a *smack* of the jelly; a smattering, as a *smack* of science.

smack (smak), *n.* a small one-masted vessel, used by fishermen.

smack (smak), *v.i. and v.t.* to strike a sharp and sudden blow, to have the taste, flavor or character of, as this *smacks* of treason; to slap or strike.

small (smôl), *n.* the lesser part, as the *small* of the back.

small (smôl), *adj.* little in quantity or degree; of relatively inferior dimensions; mean; little-minded.

***smallpox** (smôl′ poks), *n.* a severe contagious disease with fever and pus-filled spots in the skin.

smart (smärt), *n.* a stinging sensation, as the *smart* of a wound; a pang of grief.

smart (smärt), *v.i. and v.t.* to have or to cause a sharp stinging pain.

smart (smärt), *adj.* quick-witted, sharp; brilliant, clever; stylish in dress.

smash (smash), *n.* a crash causing destruction, as that car must have been in a terrible *smash;* ruin, as the *smash* of a business concern.

smash (smash), *v.i. and v.t.* to shatter into many pieces; to go to pieces, fail, as a business; to dash violently into something; to break into pieces, as to *smash* a cup or a window.

smattering (smat′ ẽr ing), *n.* superficial knowledge, as he has but a *smattering* of Latin.

smear (smēr), *n.* a blot or stain of some greasy substance, ink, paint or the like.

smell (smel), *n.* the sense by which we perceive odors; an odor.

smell (smel), *v.i. and v.t.* to have an odor; to perceive an odor.

smelt (smelt), *v.t.* to melt, as an ore, in order to separate the metal; to refine.

smilax (smī′ laks), *n.* a delicate trailing plant with greenish blossoms.

smile (smīl), *n.* a facial expression indicating ing pleasure or amusement, or irony or derision, with the lips curled.

smile (smīl), *v.i.* to express amusement, pleasure, approval or derision through a curling of the lips.

smirch (smûrch), *n.* a smear or stain, as a *smirch* on paper or a *smirch* on one's reputation.

smirch (smûrch), *v.t.* to soil, smear; to disgrace.

smirk (smûrk), *n.* an affected smile.

smirk (smûrk), *v.i.* to smile in a self-conscious or affected manner.

smite (smīt), *v.t.* [*p.t.* smote, *p.p.* smitten, *pr.p.* smiting] to strike hard; to devastate.

smith (smith), *n.* a worker in metals, as a gold*smith*, silver*smith*, black*smith*.

smithy (smith′ i), *n.* [*pl.* smithies] a place where metals are shaped by hammering; a blacksmith's shop.

smock (smok), *n.* a long, loose garment or coat, usually washable, to protect one's clothes while working; any other loose garment.

smog (smog), *n.* a combination of smoke and fog, as Pittsburgh is famous for *smog*.

smoke (smōk), *n.* the visible fine particles that pass into the air from a burning substance; the act of using tobacco in a pipe, cigar or cigarette, as this is a good *smoke*.

smoke (smōk), *v.i. and v.t.* to give out fumes and clouds of fine particles when burning; to make fumes, as the lamp *smokes;* to burn tobacco in a pipe, cigar or cigarette, taking the vapors into the mouth and blowing them out again; to cure with smoke, as to *smoke* a ham or a fish; to drive from a retreat or hiding place, as to *smoke* out the criminals.

smoker (smōk′ ẽr), *n.* one who uses tobacco in pipe, cigar or cigarette; a mechanical device for blowing smoke; a railroad car in which the use of pipes, cigars and cigarettes is permitted; a concert or other entertainment at which guests are allowed to smoke tobacco, an informal entertainment.

smokehouse (smōk′ hous), *n.* building in which meats are cured by means of smoke.

smoke screen (smōk′ skrēn), a dense cloud of smoke to conceal ships in war.

smokestack (smōk′ stak), *n.* a chimney or pipe through which fumes pass from a factory, locomotive or the like.

smolder (smōl′ dẽr), *v.i.* to burn slowly and in a smothered manner making smoke without flames.

***smooth** (smo͞o*th*), *adj.* even-surfaced; without roughness; bland; flattering; clever and persuasive, as he is a *smooth* talker.

***smother** (smu*th*′ ẽr), *v.i. and v.t.* to suffocate; to stifle; to cover over, as a fire, so that little air reaches it; to kill by depriving of air.

smudge (smuj), *n.* a smear or stain; a dirty mark, as a *smudge* of grease on an apron; a heavy smoke made to keep off mosquitoes and gnats or to protect fruit on the trees from frost.

smudge (smuj), *v.t.* to smear, soil, stain.

smug (smug), *adj.* affectedly precise or prim; self-satisfied.

smuggle (smug′ gl), *v.i. and v.t.* to send or carry goods across a national boundary or through a port without paying customs duties; to bring foreign labor into a country against the law.

smut (smut), *n.* a spot or stain made by dirty matter; a plant disease; sooty spots or stains; obscene talk.

smutty (smut′ i), *adj.* [*comp.* smuttier, *superl.* smuttiest] spotted or stained by dirty matter, such as soot; improper, indecent, as a *smutty* joke.

snaffle (snaf′ l), *n.* a horse's bit with a joint in the middle and rings at the ends; a bit without a curb.

snag (snag), *n.* a short rough branch of a tree; a tree trunk fixed in the bed of a river; an impediment, as we have struck a *snag*.

snail (snāl), *n.* a small creeping animal, some species living on land and some in water, carrying a spiral-shaped shell into which it can withdraw and having tentacles on its head; a sluggard.

snake (snāk), *n.* a long, slender, crawling reptile having a scaly body, no legs or feet, living upon insects and small animals and, in some species, having poisonous fangs; a treacherous person.

snap (snap), *n.* a sharp, quick sound, as the *snap* of a dead twig that breaks; a sudden breaking; a device that fastens by closing with a sharp sound; a quick bite or attempt to bite, as the dog made a *snap* at my hand.

snap (snap), *v.i. and v.t.* to make a quick, sharp sound, as frosty snow *snaps* underfoot; to fasten with a sharp clicking sound, as the lock *snapped* shut; to break with a sudden sharp sound, as I *snapped* that dead twig off; to seize suddenly, as he *snapped* up my offer; to close with a sharp sound, as *snap* the lock.

snapdragon (snap′ drag un), *n.* a plant bearing showy flowers thought to resemble a dragon's face; a game in which raisins are picked from a dish of burning brandy.

snapper (snap′ ẽr), *n.* a food fish of tropical seas; a snapping turtle.

snapping turtle (snap′ ing tûr′ tl), a freshwater turtle with strong jaws, valued as food.

snare (snâr), *n.* a noose set to catch animals; anything that entangles or entraps; a cord across a drumhead to regulate the quality of the sound.

snare (snâr), *v.t.* to catch in a noose; to entangle, entrap.

snarl (snärl), *n.* a sharp harsh sound, not as deep as a growl, made by an angry animal.

snarl (snärl), *n.* a tangle as of hair or yarn, as this string is all in a *snarl;* any entanglement or complication, as this business is in a *snarl.*

snarl (snärl), *v.i.* to make a sharp harsh sound of anger, not so deep as a growl.

snarl (snärl), *v.i. and v.t.* to tangle or knot or to cause to tangle or knot; to complicate.

snatch (snach), *n.* something taken hastily, as a *snatch* of lunch.

snatch (snach), *v.i. and v.t.* to grasp at or seize something suddenly, as to *snatch* at a coin or an opportunity.

sneak (snēk), *n.* one who does things in a mean, sly and underhand way.

sneak (snēk), *v.i.* to go stealthily; to act with sly deceit.

sneer (snēr), *n.* a facial expression of contempt or derision; an utterance of contempt or scorn.

sneer (snēr), *v.i.* to show contempt or scorn by an expression of the face; to scoff, speak contemptuously.

sneeze (snēz), *n.* a sudden and violent involuntary expulsion of air usually through the nose or mouth with a sound like "a-tchoo!"

sneeze (snēz), *v.i.* to expel air involuntarily and noisily through the nose or mouth.

snicker (snik′ ẽr), *n.* a half-suppressed laugh, a giggle.

snicker (snik′ ẽr), *v.i.* to laugh foolishly and in a half-suppressed way; to giggle.

sniff (snif), *n.* the act of smelling with a quick drawing in of breath through the nose; a whiff of an odor.

sniff (snif), *v.i. and v.t.* to draw the breath in through the nose in order to catch and identify an odor; to express contempt by quick passage of air through the nostrils, as he *sniffed* at the plan.

snip (snip), *n.* a quick cut with scissors; a bit cut off; as a *snip* of cloth; an insignificant person or thing, as he is only a *snip* of a boy.

snip (snip), *v.i. and v.t.* to make swift, light cuts with shears or scissors; to cut off with scissors.

***snipe** (snīp), *n.* a shore bird with a long beak.

snipe (snīp), *v.i. and v.t.* to take a long-range shot, as at an enemy, from concealment.

snivel (sniv′ el), *n.* the act of snuffling or drawing up mucus or moisture in the nose; mucus in the nose; a hypocritical whining.

snivel (sniv′ el), *v.i.* to run at the nose; to cry in a whining way with snuffling.

snob (snob), *n.* a vulgar person who makes a pretense of fine manners; one who cringes to superiors and condescends to inferiors.

***snood** (sno͞od), *n.* a band worn about the hair; a fillet.

snoop (sno͞op), *v.i.* to pry into things, meddle.

snooze (sno͞oz), *n.* a nap, a short, light sleep.

snooze (sno͞oz), *v.i.* to take a nap, sleep for a short time lightly.

***snore** (snōr), *n.* the sound of heavy breathing, as made when sleeping deeply.

snore (snōr), *v.i.* to breathe noisily in sleep.

snort (snôrt), *v.i.* to blow air noisily through the nostrils, as the horse *snorts.*

***snout** (snout), *n.* the projecting nose of an animal.

snow (snō), *n.* crystals of frozen water vapor falling from the clouds; these crystals lying in a mass on the ground or on objects.

snow (snō), *v.i. and v.t.* to fall from the clouds in flakes or frozen crystals; to cover with snow or as if with snow; to overwhelm, as his opponent was *snowed* under in the election.

snowball (snō′ bôl), *n.* a mass of snow pressed together or rolled into the form of a ball; a shrub or tree having round, white flower clusters.

snowball (snō′ bôl), *v.i. and v.t.* to throw snowballs; to throw snowballs at.

snowflake (snō′ flāk), *n.* one of the white, delicate and intricate crystals in which snow falls.

snowplow (snō′ plou), *n.* a machine used to clear snow from roads and railroad tracks.

snowshoe (snō′ sho͞o), *n.* a wooden oval-shaped frame strung with a leather network and fastened to the foot by thongs, used for walking on the surface of soft snow.

snub (snub), *n.* an intended slight.

snub (snub), *v.t.* to check the motion of and make fast; to stop quickly by turning a rope around a post, as to *snub* a boat; to check contemptuously; to rebuff or slight intentionally.

snub (snub), *adj.* short and stubby, as a *snub* nose.

snuff (snuf), *n.* fine-ground tobacco used for sniffing into the nostrils or dipping with a small brush into the mouth.

snuff (snuf), *v.i. and v.t.* to sniff; to draw in through the nose, as pulverized tobacco.

snuffle (snuf′ l), *n.* the sound of breathing heavily through the nose.

snuffle (snuf′ l), *v.i.* to breathe heavily and noisily through the nose.

snug (snug), *adj.* fitting close, as a *snug* shirt; comfortable, cozy, as a *snug* cottage.

snuggle (snug′ gl), *v.i. and v.t.* to draw close, nestle; to hold close.

so (sō), *adv.* in like manner, as Tom can jump the fence, *so* can Bob; to such extent or degree, as *so* fat she can't run.

so (sō), *conj.* therefore, as you will not agree, and *so* I am withdrawing from the deal.

so (sō), *interj.* as you were; that's enough.

soak (sōk), *n.* the act or state of saturating or being saturated, as I gave the clothes a good *soak.*

soak (sōk), *v.i. and v.t.* to absorb moisture, lie in water till saturated, as the clothes *soaked* all morning; to wet thoroughly, as I *soaked* the clothes.

Syn. Drench, steep. A person's clothes are *soaked* in rain when the water has penetrated every thread. A person is *drenched* when the rain has penetrated to his skin. To *steep* is to employ a process of soaking as an artificial measure, as to *steep* tea.

soap (sōp), *n.* a compound of a fatty acid with an alkali, used for washing and cleansing.

soapstone (sōp′ stōn), *n.* a soft greasy sort of stone, steatite.

***soar** (sōr), *v.i.* to fly aloft; to engage in exalted thought, aspire; to fly an airplane without motor power under impetus of the wind; to rise above any level, as prices *soared.*

sob (sob), *n.* a convulsive sigh or cry with tears and catching of the breath.

sob (sob), *v.i.* to weep with audible convulsive catching of the breath.

sober (sō′ bẽr), *adj.* temperate, calm, sedate; not drunk.

sober (sō′ bẽr), *v.i. and v.t.* to become calm; to make calm.

sobriety (sō brī′ e ti), *n.* habitual temperance; the state of being calm and serious.

***sobriquet** (sō′ bri kā), *n.* a nickname.

soccer (sok′ ẽr), *n.* association football.

***sociable** (sō′ sha bl), *n.* a social gathering of an informal nature.

sociable (sō′ sha bl), *adj.* companionable, pleasant in company.

***social** (sō′ shal), *adj.* pertaining to human life; pertaining to life in a governed community; disposed to maintain orderly relations with others; flocking or living together in a community, as ants are *social* insects.

Syn. Sociable. *Social* pertains to society and human relationships; *sociable* means companiable and given to mingling with people.

Ant. Unsocial, unsociable.

***socialism** (sō′ shal izm), *n.* a theory that land, industries and goods produced should be owned, managed and distributed by a government representing the people; any system aimed to put these ideas into practical application.

socialist (sō′ shal ist), *n.* an advocate of public ownership of land and management of industries; a member of a party supporting these measures.

social service (sō′ shal sûr′ vis), aid given the dependent, defective and delinquent classes by trained workers in the effort to rehabilitate them.

***society** (sō sī′ e ti), *n.* [*pl.* societies] human beings in general taken in relation to one another; an organized community; a body of persons united for some common purpose; the more cultivated or more fashionable part of the community.

***sociology** (sō si ol′ ō ji), *n.* the science of human relations, especially those between the community and the individual.

sock (sok), *n.* a short-legged stocking.

socket (sok′ et), *n.* a hollow or opening into which something is fitted, as a *socket* for an electric-light bulb.

***sod** (sod), *n.* turf, sward; a single piece of cut turf.

sod (sod), *v.t.* to cover with cut pieces of turf fitted closely and packed down to make an even surface.

soda (sō′ da), *n.* sodium carbonate, a white powdery salt used in making soap, paper and glass; sodium bicarbonate, used in cooking; any of many compounds of soda.

soda water (sō′ da wô′ tẽr), a bubbling solution of bicarbonate of soda with an acid that produces effervescence; water charged with carbonic acid and flavored with fruit sirups, taken as a beverage.

sodden (sod′ n), *adj.* dull and heavy with dissipation, as a *sodden* face; soaked, wet and heavy, saturated; half-cooked and soggy.

sodium (sō′ di um), *n.* a white alkaline metallic element, very abundant in common salt.

***sofa** (sō′ fa), *n.* a long, upholstered seat with back and arms.

soft (sôft), *adj.* soothing and agreeable to any of the five senses; yielding easily to pressure, not hard; not loud or harsh, as a *soft* voice; easily moved, as a *soft* heart; relaxed, untrained, as *soft* muscles; free from calcium and magnesium salts, as *soft* water; not alcoholic, as ginger ale is a *soft* drink; bituminous, not anthracite, as *soft* coal.

***soften** (sôf′ en), *v.i. and v.t.* to become soft; to make soft or softer.

soggy (sog′ i), *adj.* [*comp.* soggier, *superl.* soggiest] soaked, wet and heavy, sodden.

***soil** (soil), *n.* land, earth, that part of the surface of the earth that can be dug, plowed and planted; any substance in which something grows, as *poverty* is the soil of discontent.

soil (soil), *n.* a stain or spot; anything that makes dirty.

soil (soil), *v.i. and v.t.* to become dirty, as this fabric *soils* easily; to smudge, smear, make dirty, as to *soil* one's clothes.

***sojourn** (sō′ jûrn), *n.* any temporary stay elsewhere than at home.

***sojourn** (sō jûrn′), *v.i.* to live temporarily, as to *sojourn* in a foreign land.

***solace** (sol′ is), *n.* consolation; comfort in sorrow; the source of relief or consolation.

solace (sol′ is), *v.t.* to comfort in sorrow, console.

solar (sō′ lẽr), *adj.* relating to or from the sun, as *solar* light; measured in terms of the earth's relation to the sun, as the *solar* year.

solar system (sō′ lẽr sis′ tem), the sun and the heavenly bodies that revolve around it.

solar year (sō′ lẽr yēr), the period during which the earth makes one complete revolution around the sun or 365 days, 5 hours, 48 minutes and 52 seconds.

***solder** (sod′ ẽr), *n.* a metallic alloy, commonly of tin and lead, used, when melted to join metals or mend breaks in metal objects.

***soldier** (sōl′ jẽr), *n.* a person engaged in military service; an enlisted man, a private as distinguished from an officer.

soldier (sōl′ jẽr), *v.i.* to engage in military service; to make a mere pretense of working: in the latter sense often pronounced sō′ jẽr.

***sole** (sōl), *n.* the bottom of the foot; the bottom of a shoe or boot.

sole (sōl), *n.* an edible flatfish of Europe; any of the edible flatfishes of the Pacific Coast of the U. S.

sole (sōl), *v.t.* to furnish with a flat bottom, as to *sole* shoes.

sole (sōl), *adj.* alone, only, as I am the *sole* occupant of this house; one and one only, as the *sole* survivor.

***solecism** (sol′ ē sizm), *n.* a breach of the rules of grammar or violation of the established idiom of a language.

***solemn** (sol′ em), *adj.* inspiring awe; impressive; earnest.

solemnity (sō lem′ ni ti), *n.* [*pl.* solemnities] impressiveness; deep seriousness; a religious rite or ceremony.

***solemnize** (sol′ em nīz), *v.t.* to perform with ceremony or impressive rites.

solicit (sō lis′ it), *v.i. and v.t.* to canvass; to ask for with earnestness.

solicitation (sō lis i tā′ shun), *n.* persistent asking; importunity.

Syn. Importunity. *Solicitation* is general; *importunity* is particular. *Importunity* is persistent *solicitation* for that which it is not agreeable to give.

solicitor (sō lis′ i tẽr), *n.* one who entreats; an attorney; a canvasser, especially for charity funds.

solicitous (sō lis′ i tus), *adj.* eager, anxious, concerned.

***solicitude** (sō lis′ i tūd), *n.* concern, anxiety.

solid (sol′ id), *n.* a body with fixed shape; a substance not gaseous or fluid; an object with three dimensions.

solid (sol′ id), *adj.* having fixed shape; compact; not hollow; heavy; substantial.

solidarity (sol i dar′ i ti), *n.* community of interests and responsibilities.

solidify (sō lid′ i fī), *v.i. and v.t.* [*p.t. and p.p.* solidified, *pr.p.* solidifying] to become or to make dense, firm and fixed in shape.

solidity (sō lid′ i ti), *n.* the state of being fixed in shape; firmness of character; substantial soundness, validity, as *solidity* of argument.

soliloquize (sō lil′ ō kwīz), *v.i.* to talk to oneself; to deliver a monologue.

soliloquy (sō lil′ ō kwi), *n.* [*pl.* soliloquies] a monologue; a speech with only oneself as audience.

***solitaire** (sol i târ), *n.* a game played by only one person; a gem set alone.

solitary (sol′ i ter i), *adj.* alone; separate from all others; without companions.

Syn. Desolate. *Solitary* simply denotes the absence of other beings of the same kind; *desolate* conveys the idea of a place made bare of inhabitants and all traces of habitation.

solitude (sol′ i tūd), *n.* loneliness; seclusion; a deserted place.

solo (sō′ lō), *n* [*pl.* solos or soli] a musical composition for a single voice or instrument; rendition by a single singer or player; anything performed by one person without help, as a dance or an airplane flight.

***solstice** (sol′ stis), *n.* either of the two points at which the sun is farthest from the earth's equator; the time at which the sun passes either of these points, about June 21 and December 21.

soluble (sol′ ū bl), *adj.* able to be dissolved; capable of being solved.

***solution** (sō lū′ shun), *n.* the act of dissolving in a liquid; a preparation made by dissolving any substance in another; the act of solving; the answer to a problem.

solvable (sol′ va bl), *adj.* capable of being solved.

solve (solv), *v.t.* to explain; to make clear; to find a desired answer by calculating.

solvent (sol′ vent), *n.* any liquid in which a substance can be dissolved.

solvent (sol′ vent), *adj.* able to dissolve substances; able to pay all debts.

somber (som′ bẽr), *adj.* melancholy; dark and gloomy.

***sombrero** (som brā′ rō), *n.* [*pl.* sombreros] a broad-brimmed hat, such as is worn by men in South and Central America and on the plains of the southwestern United States.

some (sum), *pron.* an indefinite quantity or number as distinguished from the rest, as *some* will come.

some (sum), *adj.* of indeterminate quantity or number, as have *some* cake.

some (sum), *adv.* approximately, as *some* 20 houses lined the street.

somebody (sum′ bod i), *n.* a person not named, as *somebody* will like it; a person of standing and importance, as he is *somebody* in this town.

somehow (sum′ hou), *adv.* in one way or another.

somersault (sum′ ẽr sôlt), *n.* an acrobatic feat in which a person turns heels-over-head in the air and comes down on his feet.

something (sum′ thing), *n.* an object, unknown or not specified.

sometime (sum′ tīm), *adv.* at an unfixed date or hour.

sometimes (sum′ tīms), *adv.* occasionally, now and then.

***somewhat** (sum′ hwot), *n.* an uncertain quantity.

somewhat (sum′ hwot), *adv.* in an uncertain degree.

***somnambulism** (som nam′ bū lizm), *n.* sleep walking, the act of walking in one's sleep.

***somnolent** (som′ nō lent), *adj.* sleepy, drowsy; tending to make one sleepy.

son (sun), *n.* a male offspring; one identified by relation to a calling, as a farmer is a *son* of the soil.

***sonata** (sō nä′ ta), *n.* a musical composition with several related movements and usually for a single instrument, as the piano, and never for more than two instruments.

song (song), *n.* vocal music; a musical composition to be rendered vocally; a lyric poem; a trifle, as the house was sold for a *song*.

son-in-law (sun′ in lô), *n.* [*pl.* sons-in-law] the husband of one's daughter.

sonnet (son′ et), *n.* a poem of 14 lines, usually arranged in two groups, one of eight lines and one of six.

***sonorous** (sō nō′ rus), *adj.* giving forth sound when struck; full-sounding and deep-toned.

***soon** (so͞on), *adv.* in a short time; quickly, without delay.

***soot** (soot), *n.* a soft greasy black substance forming in chimneys from the smoke and vapors of burning fuel and consisting largely of fine particles of carbon.

***sooth** (so͞oth), *n.* truth; reality.

***soothe** (so͞o*th*), *v.t.* to calm, quiet and reassure; to ease, as to *soothe* pain; to comfort.

***soothsayer** (so͞oth′ sā ẽr), *n.* one who foretells the future.

sop (sop), *n.* anything softened in a liquid; something given as a bribe or a conciliatory offering.

sop (sop), *v.t.* to dip in a liquid, as to *sop* toast in coffee.

***sophism** (sof′ izm), *n.* clever, formal argument containing a fallacy or intended to deceive.

***sophist** (sof′ ist), *n.* one who argues smartly but evades the truth, a fallacious reasoner; an ancient Greek teacher of rhetoric.

sophisticated (sō fis′ ti kāt ed), *adj.* wise in the ways of the world.

sophistry (sof′ is tri), *n.* subtle or deceptive reasoning.

sophomore (sof′ ō mōr), *n.* a student in the second year of high school or college.

***soporific** (sō pō rif′ ik), *n.* a preparation that tends to cause sleep; a narcotic.

***soprano** (sō prä′ nō), *n.* [*pl.* sopranos or soprani] the highest-ranging singing voice, the treble; the musical part for voices in that range; one who sings in that range.

sorcerer (sôr′ sẽr ẽr), *n.* a magician, wizard or enchanter.

sorceress (sôr′ sẽr es), *n.* a woman who practices sorcery or magic, a witch.

sorcery (sôr′ sẽr i), *n.* [*pl.* sorceries] magic; doing of tricks with pretended help from evil spirits, witchcraft.

sordid (sôr′ did), *adj.* mean, vile, base, low; dirty, muddy in color.

sore (sōr), *n.* a painfully diseased spot in or on a living body; a bruised or inflamed spot; a wound; a sorrow; a hurt feeling.

sore (sōr), *adj.* tender and sensitive; painful; severe, as *sore* trouble.

sore (sōr), *adv.* grievously; severely, as he was *sore* hurt.

sorghum (sôr′ gum), *n.* a canelike grass resembling broomcorn; sirup prepared from a species of this grass.

sorority (sō ror′ i ti), *n.* a girls′ or women′s secret society.

***sorrel** (sor′ el), *n.* a docklike plant; a reddish-brown or yellow-brown color; a horse of this color.

sorrow (sor′ ō), *n.* mental pain or affliction; grief.

***sorry** (sor′ i), *adj.* [*comp.* sorrier, *superl.* sorriest] regretful; penitent; serving its purpose poorly, as a *sorry* excuse.

***sort** (sôrt), *n.* a kind or species; class, group; quality, character.

sort (sôrt), *v.t.* to arrange in classified groups.

sot (sot), *n.* a habitual drunkard.

***sough** (suf), *n.* a sighing sound such as the wind makes in the pine trees.

***sough** (suf), *v.i.* to blow with a sound like that of sighing.

***soul** (sōl), *n.* the spiritual, nonmaterial part of man's being; the immortal part, that which survives after death of the body; the essence of anything; a human being.

sound (sound), *n.* the sensation perceived through the hearing organs; any noise; distance to which one can hear, as to be within *sound;* speech, music and all noises reproduced by radio or sound pictures.

sound (sound), *n.* a long and comparatively narrow body of water connecting large open bodies of water.

sound (sound), *v.i. and v.t.* to give or be made to give vibrations perceptible by the organs of hearing.

sound (sound), *v.i. and v.t.* to measure water depths; to ascertain the depth of.

sound (sound), *adj.* complete, whole; unbroken; free of decay; firm; safe; strong; wholesome.

Syn. Sane, healthy. All living things that are in the normal state are *sound.* To be *healthy* is to be actively well in every part, to be *sound* is to be normal in that which is essential to life. To be *sane* is to have a *healthy* mind.

Ant. Unsound, unhealthy, insane.

sounding (sound′ ing), *n.* a measurement of the depth of water taken by line or plummet; the depth measured; *soundings,* any water shallow enough to be measured with a hand line.

soup (so͞op), *n.* a liquid food generally based on meat stock with vegetables and seasoning added, served either thick or strained.

sour (sour), *adj.* having an acid, sharp taste; acid from fermentation, as milk; disagreeable; ill-natured; bitter.

source (sōrs), *n.* that from which anything originates, as the *source* of a river, a *source* of knowledge, *sources* of power.

souse (sous), *n.* anything steeped or preserved in pickle; pickled meats; a dip or plunge into water.

souse (sous), *v.t.* to steep in pickle; to dip or plunge, as I *soused* the dog in the tub.

south (south), *n.* the point of the compass directly opposite north or to the right of one facing toward the sunrise; a region lying in this direction: *the South,* that part of the U. S. below the Mason and Dixon line.

south (south), *adj.* situated on the side or in the direction away from the north; facing in that direction or coming from that direction, as a *south* wind.

south (south), *adv.* in the direction opposite to north, as he went *south.*

southeast (south ēst′), *n.* the point of the compass between east and south.

***southerly** (su*th*′ ẽr li), *adj.* pertaining to, toward or coming from the south, as to steer a *southerly* course, a *southerly* wind.

southern (su*th*′ ẽrn), *adj.* pertaining to, situated in or proceeding from the regions directly opposite the north.

southwest (south west′), *n.* the point of the compass between the west and the south.

southwester (south wes′ tẽr), *n.* a wind or storm coming from the southwest; a waterproof hat.

***souvenir** (so͞o vẽ nēr′), *n.* a memento or keepsake.

***sovereign** (sov′ ẽr in), *n.* a supreme ruler; a king or queen, emperor or empress; a British gold coin worth £1 or approximately $5.00.

sovereign (sov′ ẽr in), *adj.* royal; supreme in power; effectual and potent, as a *sovereign* remedy.

sovereignty (sov′ ẽr in ti), *n.* [*pl.* sovereignties] supreme power or dominion.

soviet (sō′ vi et), *n.* a council: *Soviet,* one of the primary organs of government in Russia.

***sow** (sou), *n.* a female hog.

***sow** (sō), *v.i. and v.t.* to scatter seed; to plant seed; to disseminate; to impart, as to *sow* knowledge.

spa (spä), *n.* a mineral spring; a resort or a sanitarium with mineral springs.

space (spās), *n.* continuous extension; the whole extent of the universe within which all matter and all bodies exist, as the stars are in *space;* room in which to move; room in which to do things or keep things, I want office *space* for myself and staff.

space (spās), *v.t.* to arrange at desired intervals, separate, as you have not *spaced* the lines in your essay neatly.

spacious (spā′ shus), *adj.* extending far and wide; roomy.

spade (spād), *n.* a tool for digging, like a shovel but with a flat blade; a black figure, heart-shaped but with a handle, on one suit in a pack of playing cards; any card of that suit; the suit bearing this figure.

spade (spād), *v.i. and v.t.* to dig with a flat-bladed shovel.

span (span), *n.* the clear stretch of an arch or bridge between supports; a matched team of horses; the wingspread of an airplane, from the tip of one wing to the tip of the other; a measure of length, about 9 inches.

span (span), *v.t.* to arch across, as the bridge *spans* the river.

spangle (spang′ gl), *n.* a small plate or boss of shining metal; any glittering ornament.

spangle (spang′ gl), *v.t.* to adorn with glittering ornaments; to sprinkle with bright objects.

***spaniel** (span′ yel), *n.* a breed of dog with broad hanging ears, long coat, short legs and short tail.

spank (spangk), *v.t.* to slap on the buttocks with the open hand.

spar (spär), *n.* any mast, yard, boom or gaff in a vessel's sailing equipment; any round timber used in rigging mechanical apparatus, as the boom in a steam scoop.

spar (spär), *n.* a shining crystalline mineral.

spar (spär), *v.i.* to box; to deliver and ward off blows in a boxing match.

spare (spâr), *n.* an extra wheel and tire for an automobile for emergency use; any emergency equipment.

spare (spâr), *v.t.* to be forgiving, show mercy to; to withhold punishment; to refrain from, as to *spare* no expense; to use frugally or rarely, as to *spare* the sugar in war time; to dispense with, as I can *spare* a dollar.

spare (spâr), *adj.* thin, gaunt; scarce, scanty.

sparerib (spâr′ rib), *n.* a cut of pork trimmed rather close to the bone.

spark (spärk), *n.* a bit of burning matter thrown off by a fire; a glowing bit of metal thrown off by a metallic body under the heat of great friction; the flash of a discharge of electric current; any tiny bit of matter that glows momentarily; anything that illuminates flashingly, as a *spark* of wit.

sparkle (spär′ kl), *v.i.* to throw off sparks; to flash and twinkle.

spark plug (spärk plug), an ignition device in automobiles operating through the firing power of an electric discharge.

sparrow (spar′ ō), *n.* a small brown bird of the finch family.

sparse (spärs), *adj.* thinly scattered or distributed, as population.

Spartan (spär′ tan), *n.* a citizen of ancient Sparta: *spartan,* a person undaunted by hardship; a person of great courage and endurance.

spartan (spär′ tan), *adj.* having courage and endurance.

spasm (spazm), *n.* a sudden, violent and involuntary contraction of the muscles; a violent emotion quickly passing, as a *spasm* of anger.

spasmodic (spaz mod′ ik), *adj.* convulsive; violent but of short duration, as *spasmodic* anger.

spatial (spā′ shal), *adj.* of or pertaining to space.

spatter (spat′ ẽr), *n.* a sprinkle, as a *spatter* of shot.

spatter (spat′ ẽr), *v.i. and v.t.* to sprinkle or scatter in drops or particles.

spatula (spat′ ū l*a*), *n.* a broad, thin, flexible blade used for spreading and for lifting things such as slices of pie or portions of fish at table.

spavin (spav′ in), *n.* a disease that causes stiffening of the hock joint in horses.

spavined (spav′ ind), *adj.* lamed by stiffening of the hock joint, as a *spavined* horse.

spawn (spôn), *n.* the eggs of fishes, oysters and the like, deposited in massy formations.

spawn (spôn), *v.i.* to deposit eggs: said of fishes and shellfish.

speak (spēk), *v.t. and v.i.* to use a certain language, as to *speak* French; to deliver an address, as he *spoke* at the meeting; to be expressive, as this scene *speaks* to humanity; to recognize, as I do not *speak* to him; to talk, utter words.

Syn. Articulate, declare, discourse, enunciate, express, pronounce, say, talk, tell, utter. To *speak* may be simply the uttering of an articulate sound; to *say* is to communicate by means of words, oral or written. To *utter* is to give forth as an audible sound, articulate or not. To *tell* is to communicate. To *talk* is to *utter* a succession of connected words; to *speak* is to give utterance to even a single word.

speaker (spēk′ ẽr), *n.* one who makes utterance; the presiding officer of a legislature, as the *Speaker* of the House.

speaking (spēk′ ing), *adj.* articulate, as man is a *speaking* animal; used for transmitting speech, as a *speaking* tube; lifelike, as the *speaking* image of a person.

spear (spēr), *n.* a weapon with a sharp head on a long shaft; a leaf or stalk, as of grass.

spear (spēr), *v.t.* to pierce with a pointed thrusting weapon; to impale upon such a weapon, as to *spear* a fish.

***special** (spesh′ al), *n.* a person or thing set aside for a particular use or service, as a train.

special (spesh′ al), *adj.* designed or set apart for a particular purpose; distinctive; uncommon, out of the ordinary.

specialist (spesh′ al ist), *n.* one who devotes himself to a particular branch of science or service, as a *specialist* in nervous diseases.

specialize (spesh′ al īz), *v.i.* to apply oneself to a particular form of service or a particular science, as he *specializes* in diseases of the nerves.

***specialty** (spesh′ al ti), *n.* [*pl.* specialties] an occupation or study restricted to one chosen department of learning or skill, as nervous diseases are his *specialty.*

specie (spē′ shi), *n.* coin; metal that has been made into coin.

***species** (spē′ shiz), *n. sing. and pl.* a group of animals or plants smaller than a genus, belonging to that genus, but differing in some details; a kind, sort or form.

specific (spē sif′ ik), *adj.* particular; relating definitely to one as distinguished from others of its kind; detailed and exact, as a *specific* program.

specification (spes i fi kā′ shun), *n.* exact statement; an item in a list of things to be done or supplied: *specifications,* itemized requirements, as the *specifications* for a building or the details of a contract.

specify (spes′ i fī), *v.t.* [*p.t. and p.p.* specified, *pr.p.* specifying] to mention in detail; to name particularly and individually or item by item.

specimen (spes′ i men), *n.* a sample; a representative individual.

***specious** (spē′ shus), *adj.* plausible; ostensible; appearing to be true, but not true.

speck (spek), *n.* a tiny spot; a tiny bit of anything.

speck (spek), *v.t.* to mark with tiny spots.

speckle (spek′ l), *v.t.* to mark with spots of a different color.

speckled (spek′ ld), *adj.* marked with spots of a different color from that of the main body, as a *speckled* hen.

spectacle (spek′ tȧ kl), *n.* an unusual sight or view; pageant; show; a painful sight, as he was a *spectacle* when he came out of the fight.

spectacles (spek tȧ klz), *n.* eyeglasses held in place by hinged bows that rest above or hold behind the ears.

spectacular (spek tak′ ū lẽr), *adj.* showy, sensational.

spectator (spek′ tā tẽr), *n.* an onlooker; one who beholds.

specter, spectre (spek′ tẽr), *n.* an apparition, a ghost, a phantom.

spectral (spek′ tral), *adj.* like a ghost; pertaining to the spectrum or scheme of primary colors.

spectrum (spek′ trum), *n.* [*pl.* spectrums or spectra] the colors of the rainbow as shown through a prism that breaks rays of light into elementary colors.

speculate (spek′ ū lāt), *v.i.* to meditate; to ponder; to guess; to take chances; to invest for quick profit; to gamble on a rising or falling market.

speculation (spek ū lā′ shun), *n.* mental or spiritual vision; the mental action of pondering and reasoning, especially about matters not physical or tested by experience; a venture in which chances are taken; purchase for future sale.

speech (spēch), *n.* the utterance of ideas in words; the act of uttering; a language; a particular way of uttering, as his *speech* was slow and mumbling.

speed (spēd), *n.* velocity; rate of progress or advance.

speed (spēd), *v.i. and v.t.* to make haste; to expedite; to cause to go faster.

speedometer (spēd om′ ē tẽr), *n.* an indicator of the rate at which a vehicle is going.

speed trap (spēd trap), a place along a highway where motorists' speed is checked by police and telephoned to police along the motorists' line of travel so that they may be arrested.

speedy (spēd′ i), *adj.* [*comp.* speedier, *superl.* speediest] going fast, swift.

spell (spel), *n.* a form of magic words; a charm, incantation; fascination, sway, as the *spell* of his personality.

spell (spel), *n.* a turn of work in relief of another, as I took my *spell* at midnight; any period of time with one characteristic, as a rainy *spell.*

spell (spel), *v.i. and v.t.* to make charms; to cast a charm upon; to represent, as a word in speech or writing letter by letter; to mean or imply, as this *spells* ruin.

spellbound (spel′ bound), *adj.* fascinated.

spelling (spel′ ing), *n.* the proper arrangement of letters to form a word; the act of representing words letter by letter.

spend (spend), *v.i. and v.t.* to pay out money; to pay out, as to *spend* money; to employ or use, as to *spend* time or effort; to wear out, use up, as to *spend* one's strength.

spendthrift (spend′ thrift), *n.* one who is prodigal or lavish with money.

spendthrift (spend′ thrift), *adj.* prodigal, lavish, extravagant.

***spermaceti** (spûr mȧ sē′ ti), *n.* a white waxy substance obtained from the head of the sperm whale.

sperm oil (spûrm oil), oil obtained from the head and blubber of the sperm whale.

sperm whale (spûrm hwāl), a whale that lives in tropical seas and has a square head with teeth in the lower jaw only, valued for sperm oil and spermaceti found in the head.

spew (spū), *v.i. and v.t.* to spit out, vomit, eject

***sphere** (sfēr), *n.* a globe or globular body; a solid every point of whose surface is equally distant from a central point; a field of action or influence, as that is not within my *sphere.*

***spherical** (sfer′ i kal), *adj.* globular; having the shape of a globe; having a rounded surface of which every point is equally distant from the point within called the *center.*

***spheroid** (sfer′ oid), *n.* a body having almost but not exactly the shape of a sphere.

sphinx (sfingks), *n.* [*pl.* sphinxes] a mythological monster with a lion's body and a human head, ram's head or hawk's head; a hawk moth; a person whose ideas cannot be guessed or whose personality is wrapped in mystery.

spice (spīs), *n.* any aromatic and pungent vegetable substance used for flavoring food; something that adds a flavor, as the *spice* of wit.

spice (spīs), *v.t.* to season or flavor with aromatic, pungent vegetable substances.

spick-and-span (spik and span), *adj.* brand new; fresh; unsoiled by wear or use.

spicy (spīs′ i), *adj.* [*comp.* spicier, *superl.* spiciest] flavored with spice; aromatic and pungent; sharp; witty, racy, as a *spicy* story.

spider (spī′ dẽr), *n.* a small invertebrate animal having eight legs and two or more pairs of spinnerets with which it spins a silky thread to make cocoons for eggs, nests to live in or webs to catch prey, such as flies and other insects.

spider (spī′ dẽr), *n.* a long-handled frying pan.

spigot (spig′ ut), *n.* a faucet in the venthole of a cask; any faucet.

spike (spīk), *n.* a very large nail with a heavy head; a projecting piece of metal on the sole of a shoe to prevent slipping.

spike (spīk), *v.t.* to equip or fasten with sharp points or large nails; to pierce with something sharp; to stop the vent of a cannon with a metal bar; to finish, end, make ineffective.

spikenard (spīk′ nẽrd), *n.* an aromatic plant from which a costly ointment was prepared by the ancients; the ointment made from this plant.

spill (spil), *n.* a slender strip of wood or a long fold of paper used in lighting lamps, or in place of matches.

spill (spil), *n.* the act of overflowing; the overflow of a dam.

spill (spil), *v.i. and v.t.* to run over, as the water *spills* over the dam; to lose by pouring or overflowing, as to *spill* the milk from a pitcher.

spin (spin), *n.* a rapid whirling.

spin (spin), *v.t. and v.i.* to draw out into threads; to cause to whirl fast, as a top; to whirl; to let an airplane descend while running on its own axis.

spinach (spin′ ich), *n.* an edible plant with pulpy leaves that are used as pot herbs.

spinal (spī′ nal), *adj.* relating to the backbone.

spinal column (spī′ nal kol′ um), the backbone.

spindle (spin′ dl), *n.* a rod in a spinning wheel for twisting the thread.

spine (spīn), *n.* the backbone; any ridge that stands out like the vertebrae.

***spinet** (spin′ et), *n.* a small keyboard musical instrument, one of the early forms of the piano.

spinning jenny (spin′ ing jen′ i), a machine with spindles on which a number of threads can be spun at one time.

spinster (spin′ stẽr), *n.* an unmarried woman, an old maid.

spiny (spīn′ i), *adj.* having thorns or prickles.

spiral (spī′ ral), *n.* a curve winding away from a center, as if going upward around the surface of a cone.

spiral (spī′ ral), *adj.* winding upward from a center like the thread of a screw.

spire (spīr), *n.* a single turn of a spiral.

spire (spīr), *n.* a high steeple; a spear of grass; a summit or peak.

***spirit** (spir′ it), *n.* the soul; personality; vivacity; the essence of anything; courage and enthusiasm; the ruling feeling, as the *spirit* of '76.

spirit (spir′ it), *v.t.* to carry off suddenly and secretly.

spirited (spir′ i ted), *adj.* full of life, animated.

spirits (spir′ its), *n. pl.* liquor; mood, as in high *spirits.*

***spiritual** (spir′ it ū al), *n.* a religious song of the American Negro.

***spiritual** (spir′ it ū al), *adj.* not material; having to do with the soul.

spiritualism (spir′ it ū al izm), *n.* the belief that the dead communicate with the living.

spiritualist (spir′ it ū al ist), *n.* a believer in communication of the dead with the living; one who professes power to communicate with the dead.

spirituous (spir′ it ū us), *adj.* containing alcohol, as *spirituous* liquors.

spit (spit), *n.* saliva.

spit (spit), *n.* a rod on which meat is impaled and roasted before a fire.

spit (spit), *n.* an image, as he is the living *spit* of his father.

spit (spit), *v.i.* to eject saliva from the mouth.

spit (spit), *v.t.* to impale, as meat, on a sharp-pointed rod; to run through as with a sword.

spite (spīt), *n.* ill will, hatred; petty malice.

spite (spīt), *v.t.* to treat with malice; to injure or annoy in a spirit of meanness.

spitfire (spit′ fīr), *n.* a quick-tempered person.

spittle (spit′ l), *n.* saliva.

splash (splash), *n.* the act of striking a liquid; the liquid thrown up by a blow or the fall of a body into it; the sound of a body falling into a liquid; an irregular spot, as a *splash* of color.

splash (splash), *v.i. and v.t.* to dash water about; to spatter with liquid.

splat (splat), *n.* a vertical slat or bar in a chair back.

splay (splā), *adj.* spread out, broad, awkward, ill-formed, as *splay* feet.

splay (splā), *n.* an opening with a slanted or beveled edge.

splay (splā), *v.t.* to dislocate, as a shoulder-bone; to slope or slant, as the sides of a door or window.

splayfooted (splā foot′ ed), *adj.* having feet spread out abnormally broad and flat.

***spleen** (splēn), *n.* an organ near the stomach the secretion of which affects the blood; ill temper, spite.

splendid (splen′ did), *adj.* magnificent, imposing, inspiring, glorious.

splendor (splen′ dẽr), *n.* magnificence, pomp, richness, conspicuous greatness.

splice (splīs), *n.* a union, as of the ends of two ropes.

splice (splīs), *v.t.* to join as two rope ends by intertwining the strands.

splint (splint), *n.* a thin piece of wood to keep a broken bone in position; a strip of wood used in making baskets and chair seats.

splinter (splin′ tẽr), *n.* a sharp piece of wood broken from a board or any timber.

splinter (splin′ tẽr), *v.i. and v.t.* to break into small pieces.

split (split), *n.* a lengthwise break; a breaking apart, as between two factions in an organization.

split (split), *v.i. and v.t.* to divide lengthwise; to break into factions.

split (split), *adj.* divided lengthwise, as *split* logs, *split* fish.

splotch (sploch), *n.* a stain; daub, as a *splotch* of ink.

***spoil** (spoil), *n.* plunder, booty, loot: *spoils,* the gains of war or political success in patronage and power, as to the victor belong the *spoils.*

spoke (spōk), *n.* one of the bars of a wheel radiating from the hub to the rim.

spoliation (spō li ā′ shun), *n.* the act of plundering.

***sponge** (spunj), *n.* the porous, elastic, fibrous framework left when certain sea creatures perish; this fibrous matter dried for use in cleaning or bathing; a person who absorbs his living from others instead of working for it.

sponge (spunj), *v.i. and v.t.* to live dependent upon another; to gather sponges; to clean with a sponge.

sponsor (spon′ sẽr), *n.* a godfather; one who vouches for something or stands back of it, as the *sponsor* of a radio program or of a new political organization.

spontaneous (spon tā′ nē us), *adj.* unforced; voluntary; done of one's own will; self-generated, as *spontaneous* combustion.

spool (spo͞ol), *n.* a cylinder on which thread is wound; a drum on which wire or cable is wound.

spoon (spo͞on), *n.* a kitchen or table utensil consisting of a bowl attached to a handle; a golf club with slanted face and short shaft.

sporadic (spō rad′ ik), *adj.* occurring irregularly, scattered, isolated.

spore (spōr), *n.* a minute particle in certain plants that acts as a seed and produces new plants.

sport (spōrt), *n.* diversion, amusement, entertainment; a pastime; a competition in athletic games.

sportive (spōr′ tiv), *adj.* frolicsome, merry, playful.

sportsman (spōrts′ man), *n.* [*pl.* sportsmen] one who hunts and fishes; a person who is fair and honest in any contest; one who can win like a gentleman and lose without whining.

spot (spot), *n.* a particular place; a stain or blot.

spot (spot), *v.t.* to mark with stains; to disgrace or blemish, as to *spot* one's record or reputation.

spotty (spot′ i), *adj.* [*comp.* spottier, *superl.* spottiest] marked with stains; irregular, uneven, inconsistent, as *spotty* work.

spouse (spouz), *n.* a husband or wife.

spout (spout), *n.* a tube or pipe through which a liquid runs off, as a rain*spout,* the *spout* of a kettle.

spout (spout), *v.i. and v.t.* to pour forth in a stream; to speak or recite in a fluent and affected fashion.

sprain (sprān), *n.* a wrench of a ligament.

sprain (sprān), *v.t.* to wrench, as the ligaments of the ankle or any joint.

sprat (sprat), *n.* a small fish resembling the herring; a young herring.

sprawl (sprôl), *n.* a relaxed, ungraceful position.

sprawl (sprôl), *v.i.* to lie with the arms and legs stretched out.

spray (sprā), *n.* a small branch bearing flowers; a slender, graceful branch of flowers.

spray (sprā), *n.* drops of water carried by the wind or blown by an atomizer or squeezed bulb.

spray (sprā), *v.i. and v.t.* to blow in drops; to blow upon in fine drops, as to *spray* the throat.

spread (spred), *n.* extension; expanse of a surface, as the *spread* of a sail; something that is extended over a surface, as a *spread* for a bed; a feast, as this is a noble *spread;* something laid over a surface, as a *spread* for a slice of bread; difference, as the wide *spread* between cost and price.

spread (spred), *v.i. and v.t.* to be extended over a surface; to distribute evenly over a surface; to circulate, as *spread* the news.

Syn. Expand, diffuse. To *spread* is to make to cover a wider space. To *expand* is to enlarge. A mist *spreads* over the earth, a flower *expands* its leaves. To *diffuse* is to pour out so as to spread in all directions.

Ant. Collect, gather.

sprig (sprig), *n.* a shoot of a tree, bush or plant; an ornament resembling a spray of leaves or flowers; a nail without a head, a brad; a lad.

sprightly (sprīt′ li), *adj.* [*comp.* sprightlier, *superl.* sprightliest] vivacious, brisk, animated, full of life and spirit.

spring (spring), *n.* a contrivance devised so as to resume its first shape on being released from distortion, used to ease shock on the axles of a vehicle and its occupants; a coil of metal to make a bed or chair resilient and more comfortable; elastic quality, recoil; a leap or a bound; a flow of water from the earth; any source of supply, as a *spring* of knowledge or joy; the season following winter when plants begin to grow, usually March, April and May in the North Temperate Zone.

***springe** (sprinj), *n.* a noose to catch animals, a spring snare.

***springy** (spring′ i), *adj.* [*comp.* springier, *superl.* springiest] giving and recovering under weight or pressure, elastic, resilient; having many springs, wet, as *springy* land; light and full of vigor, as a *springy* step.

sprinkle (spring′ kl), *n.* a light scattering of liquid in drops, as a *sprinkle* of rain.

sprinkle (spring′ kl), *v.i. and v.t.* to fall lightly, as rain; to scatter in drops; to scatter on, as to *sprinkle* a cake with sugar.

sprint (sprint), *n.* a short distance run at top speed.

sprint (sprint), *v.i.* to run a short distance at top speed.

sprocket (sprok′ et), *n.* a wheel with teeth on the outer rim to engage the links of a chain; one of the teeth or cogs on such a wheel.

sprout (sprout), *n.* a new shoot or bud on a plant or a root.

sprout (sprout), *v.i.* to put forth new shoots; to germinate, as these seeds are *sprouting.*

sprouts (sprouts), *n. pl.* the edible buds of a kind of cabbage, called *Brussels sprouts.*

spruce (spro͞os), *n.* an evergreen tree with needles and cones; the wood of this tree.

spruce (spro͞os), *adj.* smart and trim in appearance.

spry (sprī), *adj.* [*comp.* spryer or sprier, *superl.* spryest or spriest] nimble, agile, quick and active.

spunk (spungk), *n.* courage, pluck, mettle.

spur (spûr), *n.* a sharp point worn on the heel of a horseman's boot to urge or discipline a saddle horse; anything that incites to action.

spur (spûr), *v.i. and v.t.* to urge or discipline a horse with the heel; to incite to action, urge on.

spurious (spū′ ri us), *adj.* false, counterfeit, not genuine.

spurn (spûrn), *v.t.* to drive away with the foot, kick; to reject with scorn or contempt; to turn aside from with disdain.

spurt (spûrt), *n.* a sudden or forcible ejection of a liquid, a gush; a strong, brief effort.

spurt (spûrt), *v.i. and v.t.* to come forth or be forced out in a sudden stream; to jet; to make a sudden earnest effort at something.

sputter (sput′ ẽr), *n.* excited and incoherent talk, fuss; moist matter ejected in small particles; the sound of spluttering.

sputter (sput′ ẽr), *v.i.* to speak rapidly ejecting saliva in small particles from the mouth.

sputum (spū′ tum), *n.* saliva, spittle.

spy (spī), *n.* [*pl.* spies] one who secretly watches others; one who secretly observes an enemy force and reports its movements.

spy (spī), *v.i. and v.t.* [*p.t. and p.p.* spied, *pr.p.* spying] to observe in secret and by stealth; to catch sight of.

spyglass (spī glȧs), *n.* a small telescope.

squab (skwob), *n.* a young pigeon.

squabble (skwob′ l), *n.* a noisy quarrel.

squabble (skwob′ l), *v.i.* to wrangle, quarrel noisily.

squad (skwod), *n.* a small group of persons; a unit of police or of a military organization; seven infantry soldiers commanded by a corporal; any small group engaged in common effort or activity, as a football *squad,* a clean-up *squad.*

***squadron** (skwod′ run), *n.* a military unit consisting of the headquarters and two or more cavalry troops; a subdivision of a fleet of naval vessels; a division of a military air fleet consisting of three flights of three to six airplanes each.

***squalid** (skwol′ id), *adj.* very dirty; poverty-stricken.

squall (skwôl), *n.* a sudden, hard gust of wind; a screaming outcry.

***squalor** (skwol′ ẽr), *n.* wretched poverty.

squander (skwon′ dẽr), *v.t.* to spend lavishly, waste.

***square** (skwâr), *n.* a plane figure with four equal sides and four right angles; a device for measuring right angles, used by draughtsmen and builders; anything with four equal sides, as a city *square;* the product of a number multiplied by itself, as the *square* of 2 is 4.

square (skwâr), *adj.* having four equal sides and four right angles; forming a right angle; honest, fair; satisfying, sufficient, as a *square* meal.

square (skwâr), *v.i. and v.t.* to form in a right angle, as this board *squares;* to make even, as to *square* an account; to multiply a number by itself.

square-rigged (skwâr′ rigd′), *adj.* having rectangular sails on yards hung horizontally by the middle across the masts: opposite of *fore-and-aft-rigged.*

square root (skwâr ro͞ot), that number obtained when a number that is multiplied by itself is reduced to its original factors, as the *square root* of 4 is 2.

***squash** (skwosh), *n.* the fleshy edible fruit of a field or garden plant of the gourd family.

squat (skwot), *v.i.* to settle down as if sitting; to settle land either under a government lease so as ultimately to take title to it or without right or title.

squat (skwot), *adj.* short and stocky, crouching.

squatter (skwot′ ẽr), *n.* one who occupies land either without right or under government lease in expectation of acquiring ownership.

squaw (skwô), *n.* an American Indian woman.

squawk (skwôk), *n.* a harsh cry like that of a frightened fowl.

squawk (skwôk), *v.i.* to utter a harsh loud cry like that of an excited hen.

***squeak** (skwēk), *n.* a thin, sharp, penetrating sound, as the *squeak* of an ungreased wheel.

squeak (skwēk), *v.i.* to make a shrill penetrating cry or sound like that of a mouse or an unoiled hinge.

***squeal** (skwēl), *n.* a sharp, shrill cry, prolonged like that of a pig.

squeal (skwēl), *v.i.* to utter a shrill cry like that of a pig.

squeamish (skwēm′ ish), *adj.* easily shocked; easily affected with nausea; very particular.

squeeze (skwēz), *n.* a tight jam; a crowding together.

squeeze (skwēz), *v.i. and v.t.* to make one's way by pressing or crowding, as I *squeezed* in; to get by pressure, force, as to *squeeze* juice from an orange; to press or compress as to *squeeze* an orange; to press or jam, as to *squeeze* passengers into a car.

squelch (skwelch), *v.t.* to silence; to suppress; to discourage, disconcert.

squib (skwib), *n.* a kind of firework that burns with a sizzling sound or explodes with a crack; a short satirical composition.

squid (skwid), *n.* a kind of cuttlefish having a tapering body with 10 arms and two fins near the tail; bait shaped like a squid or made from squid.

squint (skwint), *n.* a sidelong look; a condition of the eyes in which they look obliquely.

squint (skwint), *v.i.* to look obliquely or with the eyes half closed.

squint-eyed (skwint′ īd′), *adj.* cross-eyed.

squire (skwīr), *n.* a knight's attendant; a justice of the peace; the proprietor or landholder of a rural English district.

squire (skwīr), *v.t.* to escort.

squirm (skwûrm), *v.i.* to wriggle, writhe.

***squirrel** (skwûr′ el), *n.* a small, agile rodent with a bushy tail.

squirt (skwûrt), *n.* a spurt of liquid; a syringe to throw a small stream of water.

squirt (skwûrt), *v.i. and v.t.* to spurt out; to eject in a small quick jet.

stab (stab), *n.* a thrust with a short, pointed weapon, as a dagger; a wound made by such a thrust; a thrust of pain or grief.

stab (stab), *v.i. and v.t.* to thrust with a dagger; to wound as with a dagger.

stability (sta bil′ i ti), *n.* firmness in position; ability to resist a force tending to overthrow; firmness of character, constancy.

***stabilize** (stā′ bi līz), *v.t.* to make steadfast, firm, dependable; to secure and keep the balance of, as to *stabilize* a boat, an airplane or a government.

***stabilizer** (stā′ bil īz ẽr), *n.* a device to steady the motion and maintain the balance of an airplane or a ship.

stable (stā′ bl), *n.* a building in which horses or cattle are kept.

stable (stā′ bl), *v.t.* to put in a barn; to supply stalls for, as horses.

stable (stā′ bl), *adj.* firmly set; resisting anything tending to overthrow; constant and reliable.

stack (stak), *n.* a large orderly pile of hay or wood; any systematically arranged pile; a pipe or chimney to carry off smoke as from a factory, steamship or locomotive.

stack (stak), *v.t.* to arrange in an orderly pile.

***stadium** (stā′ di um), *n.* [*pl.* stadiums or stadia] a structure in the shape of an oval or round bowl with seats for spectators of athletic contests held on the inclosed space; an old Greek linear measure, about 606¾ feet.

staff (stȧf), *n.* [*pl.* staves or staffs] a stick carried for use in walking or for personal defense; support.

Syn. Stay, prop, support. Bread is the *staff* of life because it supports life. A *prop* holds a thing in place for the time being; a *stay* holds it permanently. A *support* may be either a *staff* or a *stay; support* is the broader term.

***staff** (stȧf), *n.* [*pl.* staffs] a number of persons co-operating in service, as an office *staff;* a group of officers assisting a chief commander but not engaging in active field service.

staff (stȧf), *n.* [*pl.* staffs or staves] the arrangement of five lines and four spaces on which the notes of a musical composition are indicated.

stag (stag), *n.* the male of the red deer; a man attending a social function without escorting a lady; a party or entertainment for men only.

stage (stāj), *n.* the raised platform on which a theatrical performance is presented; a swinging scaffold for workmen; a float on which workers stand to paint the hull of a ship; a field of action; a section of a journey, as we proceeded by easy *stages;* a period or phase in the development of anything, as the enterprise did very well in its early *stage;* a large coach for the conveyance of passengers.

stage (stāj), *v.i. and v.t.* to be exhibited, as this play will *stage* well; to present in public, as he has *staged* two plays this season.

stagger (stag′ ẽr), *n.* a reeling or tottering: *staggers,* a disease of horses that causes them to totter and fall, sometimes called *blind staggers.*

stagger (stag′ ẽr), *v.i. and v.t.* to reel; to shock and upset, as your news *staggers* me; to arrange alternately so as to avoid crowding or congestion, as in planting trees or in traveling to or from business at different hours.

staging (stāj′ ing), *n.* a scaffold; manner of presentation of a play.

stagnant (stag′ nant), *adj.* not flowing but standing, foul from standing, as *stagnant* water; dull, as *stagnant* business.

stagnate (stag′ nāt), *v.i.* to stand without flowing, as water *stagnates* in a hollow; to become inactive and inert, as he is simply *stagnating* in that job.

stagy (stāj′ i), *adj.* artificial, theatrical.

staid (stād), *adj.* sober, sedate, steady.

stain (stān), *n.* discoloration, a spot or blot; taint or blemish on one's character.

stain (stān), *v.i. and v.t.* to discolor, as this cloth *stains* easily, I have *stained* the tablecloth; to color, as with dye or varnish.

Syn. Soil, sully, tarnish. All these terms imply a diminishing of the brightness of an object, but to *stain* is more gross than to *sully* or *tarnish.* Inferior things may be *stained,* but only things with intrinsic value are said to be *sullied* or *tarnished.* A fine picture or manuscript may be *soiled* by a mere touch of a dirty finger. A man's reputation may be *stained;* his honor may be *sullied,* or his glory *tarnished.*

***stair** (stâr), *n.* one of a series of steps leading from a lower to a higher level, as from one floor of a house to the next: *stairs,* a flight of steps, as front or back *stairs.*

staircase (stâr′ kās), *n.* a flight of steps with railings in a house.

stairway (stâr′ wā), *n.* a flight of steps.

stake (stāk), *n.* a stick of wood sharpened at one end to be driven into the ground; a post to which a person was bound to be burned alive, as he died at the *stake.*

stake (stāk), *n.* something wagered; something to be gained or won at a risk, as our whole future is at *stake.*

stake (stāk), *v.t.* to risk, wager, contend for, as I *staked* everything on his honesty; to mark the boundaries of, as he *staked* his claim.

***stalactite** (sta lak′ tīt), *n.* an iciclelike mass hanging from the roof of a cavern, formed by the drip of water with lime in it.

stalagmite (sta lag′ mīt), *n.* a cone of carbonate of lime built up on the floor of a cavern by water dripping from above.

stale (stāl), *v.i. and v.t.* to become old and flavorless; to deprive of interest.

stale (stāl), *adj.* having lost freshness, as *stale* bread; vapid, tasteless; trite, as *stale* ideas.

stalemate (stāl′ māt), *n.* a position in which a chess player cannot move without putting his king in check, a draw; a standstill, as the negotiations are now in a *stalemate.*

stalemate (stāl′ māt), *v.t.* to make a move in chess that renders it impossible for the opponent to move without putting his king in check; to bring to a standstill, preventing progress without effecting decisive action, as we have at least *stalemated* his plans.

stalk (stôk), *n.* the stem of a plant or flower, as a *stalk* of corn; the stem of an object, as a goblet.

stalk (stôk), *n.* a haughty way of stepping.

stalk (stôk), *v.t. and v.i.* to creep up on stealthily, as to *stalk* a deer; to walk in haughty manner, as to *stalk* out of the room.

stall (stôl), *n.* an inclosed space in a stable in which a horse or cow is kept; a small booth from which goods are sold; a close cover as for a hurt finger; a seat, often carved and canopied, in the choir section of a church.

stall (stôl), *v.i. and v.t.* to keep in a closed space within a stable; to lose the action of, as I have *stalled* my engine; to cause to stop by becoming stuck, as the soft sand *stalled* the car; to become stuck in mud, as the wagon *stalled* at the foot of the hill.

***stalwart** (stôl′ wẽrt), *n.* a strong person; a loyal member of a party.

stalwart (stôl′ wẽrt), *adj.* strong, sturdy, tall and well-built.

stamen (stā′ men), *n.* the organ of a flower that holds the pollen.

***stamina** (stam′ i n*a*), *n.* staying power, vitality, vigor, endurance.

stammer (stam′ ẽr), *n.* a halting manner of speech; hesitation in uttering words.

stammer (stam′ ẽr), *v.i. and v.t.* to speak in a halting way; to utter with hesitation and in a nervous manner.

stamp (stamp), *n.* a mark made by impression; an implement or machine for making such impressions on paper, cloth or in metal; a printed, gummed piece of paper sold by a government to be affixed to mail matter as evidence that postage has been paid; evidence of a distinctive quality, as the *stamp* of culture.

stamp (stamp), *v.i. and v.t.* to strike upon the ground; as the foot; to make a mark on by means of pressure; to place postage upon; to crush, as to *stamp* ore.

stampede (stam pēd′), *n.* a sudden wild rush of cattle; panicky flight or action by many persons together.

stampede (stam pēd′), *v.i. and v.t.* to rush off in a herd, as cattle in fright; to make a sudden rush in alarm, as the crowd *stampeded* when the gun was fired to cause to rush away in panic; to throw a crowd of persons into a panic.

***stanch** (stänch) or **staunch** (stônch), *v.t.* to stop the flow of, as blood from a wound.

***stanch** (stänch) or **staunch** (stônch) *adj.* firm, faithful, loyal, dependable.

stand (stand), *n.* a structure upon which things may be set; a small platform on which a witness is placed when giving testimony in a courtroom, the witness *stand;* a small structure at which goods are sold, as a fruit *stand;* a position firmly held, as I take my *stand* upon this plank of the party platform; a growth of crops in the field, as a fine *stand* of corn.

stand (stand), *v.i. and v.t.* [*p.t. and p.p.* stood, *pr.p.* standing] to be in upright position on the feet; to be a substitute for, as these letters *stand* for the company's name; to conform, as it *stands* to reason; to take sides, as I *stand* for justice; to be in a certain state, as I *stand* ready to help; to set upright, as *stand* the vase on the table.

standard (stan′ dẽrd), *n.* an established measure or model; an upright timber used as a support in building; a flag or emblem.

standard (stan′ dẽrd), *adj.* conforming to established custom, measure or style; serving as a test or measure for others.

standardize (stan′ dẽr dīz), *v.t.* to cause to conform to certain uniform specifications, as to *standardize* equipment.

standing (stand′ ing), *n.* good reputation; continuance, as a policy of long *standing.*

standing (stand′ ing), *adj.* not flowing, stagnant, as water; remaining in effect indefinitely, as a *standing* invitation.

standpoint (stand′ point), *n.* a position or standard that forms the basis of an opinion or judgment, as that is unwise from the *standpoint* of health.

standstill (stand′ stil), *n.* a cessation of motion; a definite stop.

stannary (stan′ *a* ri), *n.* [*pl.* stannaries] a tin mine or works.

stannous (stan′ us), *adj.* pertaining to tin.

stanza (stan′ z*a*), *n.* a subdivision of a poem, with several lines or verses taken as a unit.

staple (stā′ pl), *n.* a major article of commerce, universally dealt in; raw material for manufacture; a chief element; fiber of wool, cotton or flax, as cotton of long *staple.*

staple (stā′ pl), *n.* a U-shaped piece of metal with pointed ends to fasten something to wood, as use plenty of *staples* when you put up that chicken wire; a piece of wire with which sheets of paper are fastened together.

staple (stā′ pl), *v.t.* to fasten with U-shaped pieces of wire driven into wood, as *staple* that wire fence generously; to secure.

staple (stā′ pl), *adj.* regularly produced and traded in; established in commerce; standard and essential, as *staple* foods.

star (stär), *n.* a far-distant heavenly body that shines at night; anything compared to such a body; a five- or six-pointed figure; an asterisk (*) used to draw the attention of a reader, as to footnotes; a brilliant, outstanding person as this reporter is our *star,* a stage, screen or radio *star.*

star (stär), *v.i. and v.t.* to shine in one's calling; to be prominent or pre-eminent; to mark with an asterisk, as *star* this footnote; to play up strongly, as we shall *star* you in our next play.

starboard (stär′ bẽrd), *n.* the right-hand side of a ship as one faces the bow.

starboard (stär′ bẽrd), *adj.* pertaining to the right-hand side of a ship, as the *starboard* light.

***starch** (stärch), *n.* a white substance without taste or odor found in plants; a commercial product used in laundering; formality; backbone.

starch (stärch), *v.t.* to stiffen with starch, as clothes in laundering.

***stare** (stâr), *n.* a fixed look with eyes wide open.

stare (stâr), *v.i. and v.t.* to look fixedly with wide-open eyes, gaze at; to face, confront; to embarrass, as she *stared* him out of countenance.

stark (stärk), *adj.* rigid; barren, unrelieved; utter, as *stark* madness.

stark (stärk), *adv.* utterly, as *stark* mad.

starling (stär′ ling), *n.* a common black-feathered bird about 9 inches long.

start (stärt), *n.* a beginning; the beginning place; an advantage in a contest of speed, as to get a good *start* over one's opponents; a quick motion or twitch, as of one suddenly alarmed, as a *start* of surprise.

start (stärt), *v.i. and v.t.* to rise or move suddenly, as he *started* from his chair; to give a sudden, involuntary jerk, as from surprise; to move in a fixed direction, as he *started* off in pursuit; to set in motion, as to *start* a car, to *start* a rumor.

startle (stär′ tl), *v.i. and v.t.* to move suddenly, in surprise or alarm; to disturb with sudden speech or act, as you came in so quietly you *startled* me.

startling (stär′ tling), *adj.* amazing, alarming.

starvation (stär vā′ shun), *n.* long-continued unsatisfied hunger; the condition of suffering or dying from lack of food.

starve (stärv), *v.i. and v.t.* to suffer extreme hunger; to die for want of food; to withhold food from.

state (stāt), *n.* the condition in which a person or thing is; style of living, as he lives in high *state;* a nation; *state,* one of the 48 major divisions of the United States of America.

Syn. Condition, predicament, situation, plight. *State* is a general term that denotes manner of living; *condition* often refers to circumstances and immediate environment, as bad home *conditions; predicament* and *plight* indicate a distressing or unfortunate situation; *situation* refers to a combination of circumstances at a special time, as she is in a difficult *situation.*

state (stāt), *v.t.* to set forth clearly, declare, affirm.

state (stāt), *adj.* pertaining to government; ceremonial.

stated (stāt′ ed), *adj.* set, fixed, regular, as *stated* intervals.

stately (stāt′ li), *adj.* [*comp.* statelier, *superl.* stateliest] grand, majestic, dignified.

statement (stāt′ ment), *n.* the act of declaring or affirming; that which is declared or affirmed.

stateroom (stāt′ rōōm), *n.* a ship cabin; a private compartment in a Pullman or parlor car.

statesman (stāts′ man), *n.* [*pl.* statesmen] one who is skilled or experienced in the management of governmental affairs.

***static** (stat′ ik), *n.* sharp, crackling noises in a radio receiving set, caused by electrical disturbances in the air.

***static** (stat′ ik), *adj.* pertaining to bodies at rest or in equilibrium or to electric charges at rest as distinguished from electric currents.

statics (stat′ iks), *n.* the branch of mechanics that treats of bodies at rest.

station (stā′ shun), *n.* the place where a person or thing stands; position; a stopping place or terminal, as on a railroad; the headquarters of a force of men or its central working place; a radio broadcasting center, as *Station* KDKA; social standing, as he married beneath his *station.*

station (stā′ shun), *v.t.* to assign to a certain location or position.

***stationary** (stā′ shun er i), *adj.* fixed, settled in one place, not advancing in any way.

stationer (stā′ shun ẽr), *n.* one who sells paper, pencils and other writing materials.

***stationery** (stā′ shun er i), *n.* writing materials of all kinds, especially paper for correspondence.

statistical (st*a* tis′ ti kal), *adj.* pertaining to figures and numbers as they are used in classifying and explaining facts.

***statistician** (stat is tish′ un), *n.* one who makes a business of collecting and classifying numerical facts.

***statistics** (st*a* tis′ tiks), *n.* the science of numerical facts; the collection and arrangement of such facts.

statuary (stat′ ū er i), *n.* the art of making figures in stone or metal; one who engages in this art; such figures regarded collectively.

***statue** (stat′ ū), *n.* the representation of a living or symbolic figure carved in wood or stone or modeled in clay or wax and cast in metal, cement or plaster.

***statuesque** (stat ū esk′), *adj.* having the impressiveness, modeling or pose of a carved or molded figure.

statuette (stat ū et′), *n.* a small carved, modeled or cast figure.

stature (stat′ ūr), *n.* the actual natural height of an animal body; a man's size with respect to character, ability and reputation, as he is a statesman of giant *stature.*

***status** (stā′ tus), *n.* standing, condition, rank.

statute (stat′ ūt), *n.* a written law; a permanent rule adopted officially by a university.

statutory (stat′ ū tō ri), *adj.* legally enacted; deriving authority from law.

stave (stāv), *n.* a strip of wood forming a unit in the side of a cask or barrel.

stave (stāv), *v.t.* [*p.t. and p.p.* staved or stove, *pr.p.* staving] to break or break in, the side of a cask or barrel; to make a hole in by the force of a collision; to break down, as *stave* the door in; to push aside, as to *stave* off disaster.

stay (stā), *n.* a prop or support, either rigid or a rope.

stay (stā), *n.* a visit; the duration of a visit or sojourn; a postponement, as by court action.

stay (stā), *v.i. and v.t.* to tarry, wait, halt, reside temporarily; to postpone, as the court *stayed* the case; to stop the movement of, as he *stayed* his hand.

***stead** (sted), *n.* the place another might or should have, as I went in his *stead;* service, as it stood me in good *stead.*

steadfast (sted′ fȧst), *adj.* firmly fixed; resolute, unwavering.

steady (sted′ i), *v.i. and v.t.* to become or make fixed and firm.

steady (sted′ i), *adj.* [*comp.* steadier, *superl.* steadiest] stable, firmly fixed; resolute, unwavering; regular in action or movement.

steak (stāk), *n.* a thick slice across a larger cut of meat, especially beef, as a *steak* from the round.

steal (stēl), *v.i. and v.t.* [*p.t.* stole, *p.p.* stolen, *pr.p.* stealing] to commit theft; to go in secret or furtive manner, as to *steal* away; to take without right and by furtive methods.

stealth (stelth), n. *sly,* secret, underhand procedure or action; secrecy.

stealthy (stel′ thi), *adj.* furtive, secret, as *stealthy* movements.

steam (stēm), *n.* the vapor into which water is changed by boiling, invisible until it condenses in the cooler air.

steam (stēm), *v.i. and v.t.* to turn into vapor in boiling; to move by the power of water vapor in cylinders of engines; to cook or saturate by means of the vapor of boiling water.

steamer (stēm′ ẽr), *n.* a ship that is propelled by steam; a utensil for exposing articles to steam.

steam roller (stēm rōl′ ẽr), a heavy, steam-operated machine for leveling roads.

steamship (stēm′ ship), *n.* a seagoing ship propelled by steam power, as a transatlantic liner, a steamer.

steed (stēd), *n.* a horse, especially a spirited horse.

steel (stēl), *n.* iron refined and combined with carbon.

steel (stēl), *v.t.* to cover or plate with carbonized iron; to make hard and unyielding or composed, as *steel* yourself for a shock.

***steelyard** (stēl′ yärd), *n.* a balance for weighing that consists of a beam, a weight sliding on a graduated scale and hooks to hold the thing being weighed.

steep (stēp), *n.* a hillside almost perpendicular; a precipice.

steep (stēp), *v.i. and v.t.* to soak in a liquid, as tea; to imbue, as he is *steeped* in crime.

steep (stēp), *adj.* precipitous, having a sharp incline.

steeple (stēp′ l), *n.* a tower tapering to a point; a spire, as a church *steeple.*

steeplechase (stēp′ l chās), *n.* a race on horseback over open country with obstacles, such as fences and ditches or especially prepared barriers.

steeple jack (stē′ pl jak), one who climbs high structures, such as smokestacks and church spires, to paint or make repairs.

steer (stẽr), *n.* a male of the ox kind, raised for beef.

steer (stẽr), *v.i. and v.t.* to direct one's course or conduct; to hold to a set course, as to *steer* a ship.

steerage (stẽr′ ij), *n.* the least desirable quarters on a ship, available at the lowest rate for passage.

stein (stīn), *n.* a large, earthenware drinking cup or mug, with a handle, used especially for beer; the quantity of beer in such a container.

stellar (stel′ ẽr), *adj.* relating to stars, either the heavenly bodies or persons prominent in their callings, as *stellar* space, a *stellar* performance.

stellate (stel′ āt), *adj.* star-shaped; having points like the conventional figure of a star.

stellular (stel′ ū lẽr), *adj.* spangled with small stars; shaped like a small star.

stem (stem), *n.* the trunk of a tree; the corresponding part of a shrub or smaller plant; the slender stalk that connects a fruit, flower or leaf to the branch; any slender part resembling a stalk, as the *stem* of a goblet, the *stem* of a smoker's pipe; the farthest forward part of a ship, where its sides slope in to the prow; the part of a word that remains unchanged when the word is inflected; the part of a watch by which it is wound; a highway or railroad line, as this is the main *stem.*

stem (stem), *v.t.* to remove the stems from, as to *stem* cherries; to put stems on, as to *stem* artificial flowers.

stem (stem), *v.t.* to hold back, as you cannot *stem* the ocean tides; to make way against, as we had to *stem* a strong current.

stench (stench), *n.* a strong, offensive odor.

stencil (sten′ sil), *n.* a thin plate of metal, parchment or paper, with a design or letters cut out to use for marking decorations or printing addresses by applying wet color with a brush.

stencil (sten′ sil), *v.t.* to mark by means of a plate that has a cut-out design or lettering.

stenographer (ste nog′ r*a* fẽr), *n.* one who writes shorthand and transcribes the notes.

stenographic (sten ō graf′ ik), *adj.* pertaining to or written in shorthand, as *stenographic* notes.

stenography (ste nog′ r*a* fi), *n.* the art of writing shorthand and transcribing it.

stentorian (sten tō′ ri an), *n.* extremely loud, as *stentorian* tones.

step (step), *n.* a stride; the distance covered in one stride; a surface on which the foot is set in moving up or down a flight of stairs; a single act toward a desired state or situation, as a *step* toward success; a way of walking, as he has a springy *step;* a series of related foot-and-body movements in dancing, as that is an intricate *step.*

step (step), *v.i. and v.t.* to move the feet, as in walking, as *step* this way; to come into a certain position or condition without effort, as to *step* from one job into another; to push down with the foot, as to *step* on the accelerator; to set or place, as the foot, to measure the distance of, as we *stepped* off the length of the living room; to insert a pole or mast in a socket.

steppes (steps), *n.* the vast, barren plains of Siberia.

***stereopticon** (ster ē op′ ti kon), *n.* a magic lantern for showing photographic slides.

***stereoscope** (ster′ ē ō skōp), *n.* an instrument held before the eyes by which two slightly different pictures of the same object are made to appear as one, and give the illusion of having three dimensions.

***stereotype** (ster′ ē ō tīp), *n.* a printing plate made from a papier-mâché or plaster cast or mold of a form of a printing surface; anything mechanically monotonous, especially a phrase or figure of speech.

stereotyped (ster′ ē ō tīpt), *adj.* usual, dull, monotonous.

***sterile** (ster′ il), *adj.* barren, unproductive; free from disease germs; destitute of ideas, as this is a *sterile* essay.

sterility (ste ril′ i ti), *n.* barrenness, lack of fertility.

sterilize (ster′ i līz), *v.t.* to deprive of fertility; to free of disease germs.

sterling (stûr′ ling), *adj.* genuine; of high merit; guaranteed as to fineness on a scale set by the British Government, as *sterling* silver.

stern (stûrn), *n.* the afterpart of a ship.

stern (stûrn), *adj.* austere, severe, strict, harsh, forbidding.

sternum (stûr′ num), *n.* [*pl.* sternums or sterna] the breastbone.

***stethoscope** (steth′ ō skōp), *n.* an instrument used by doctors to listen to sounds in the heart and lungs, to detect any pathological condition.

stevedore (stē′ ve dōr), *n.* a person who loads and unloads ship cargoes.

stew (stū), *n.* a dish of meat and vegetables boiled slowly with only a simmering heat.

stew (stū), *v.i. and v.t.* to boil slowly, as meat and vegetables together.

***steward** (stū′ ērd), *n.* one who manages an estate for another; an employee in charge of food service in a club, hospital or ship.

stewardess (stū′ ērd es), *n.* a woman who attends female passengers aboard ship.

stick (stik), *n.* a small branch or shoot cut off a tree; a walking stick; a slender piece, as a *stick* of candy; a metal holder in which type is set by hand.

stick (stik), *v.i. and v.t.* [*p.t. and p.p.* stuck, *pr.p.* sticking] to project, as to *stick* out, *stick* through; to pierce, stab, jab, as this pin *stuck* me.

stick (stik), *v.i. and v.t.* [*p.t. and p.p.* stuck, *pr.p.* sticking] to adhere; to cause to adhere, as *stick* a stamp on the envelope; to thrust, as he *stuck* his head in the door.

stickle (stik′ l), *v.i.* to argue about things of little importance.

stickler (stik′ lēr), *n.* one who insists on matters of little importance.

sticky (stik′ i), *adj.* [*comp.* stickier, *superl.* stickiest] adhesive, glutinous, viscous.

stiff (stif), *adj.* rigid, not flexible; not fluid, as this paint is *stiff;* strong, as a *stiff* breeze; cool and formal in manner, overdignified.

stiff-necked (stif nekt′), *adj.* inflexibly obstinate, stubborn.

stifle (stī′ fl), *n.* a joint in the hind leg of a horse.

stifle (stī′ fl), *v.i. and v.t.* to suffocate; to extinguish, as *stifle* that flame; to kill by withholding air; to put out, as a fire.

stigma (stig′ ma), *n.* [*pl.* stigmas or stigmata] a mark of disgrace or dishonor; a blemish, a birthmark; the upper part of a flower pistil on which the pollen is deposited.

stigmatize (stig′ ma tīz), *v.t.* to brand as disgraceful or dishonored.

stile (stīl), *n.* a set of steps leading over a fence or wall.

stiletto (sti let′ ō), *n.* [pl. stilettos] a small dagger with a slender blade.

still (stil), *n.* an apparatus for distilling liquids.

still (stil), *n.* a picture that does not show movement, especially an individual photograph taken from a motion-picture scene and used in advertising.

still (stil), *v.t.* to hush, silence, put to rest, pacify.

still (stil), *v.t.* to make by distilling.

still (stil), *adj.* not moving or moving without excitement or disturbance, as *still* water in a pond, *still* waters run deep; silent, quiet, not noisy, as a *still* small voice, the winds were *still.*

still (stil), *adv.* nevertheless, notwithstanding, as *still,* I intend to go; to this time, as I am *still* here; continuously, as before, as he was *still* worried; in a greater degree, *still* more.

stilt (stilt), *n.* one of a pair of slender poles with a footrest on which to walk high above the ground.

stilted (stil′ ted), *adj.* artificial, formal, as *stilted* speech.

stimulant (stim′ ū lant), *adj.* serving to accelerate, as the action of the heart.

stimulant (stim′ ū lant), *n.* anything that spurs to faster, more effective or more intense action, as good reading is a *stimulant* to the mind; a medicine that increases the activity of an organ, as the heart.

stimulate (stim′ ū lāt), *v.i. and v.t.* to rouse to greater activity, spur.

stimulus (stim′ ū lus), *n.* a spur; anything that leads to greater activity or arouses, as your talk was a *stimulus* to study.

sting (sting), *n.* the sharp, poisonous weapon with which some insects are armed, as the *sting* of a bee or a mosquito; anything sharp that causes a wound to body or feelings, as your words are a *sting* to my conscience; the thrust of a poisonous, sharp weapon.

sting (sting), *v.i. and v.t.* [*p.t. and p.p.* stung, *pr.p.* stinging] to pierce or wound, as your words *sting;* to cause a sharp sensation to, as red pepper *stings* the tongue.

stingy (stin′ ji), *adj.* [*comp.* stingier, *superl.* stingiest] mean, not ready to give; meager.

stink (stingk), *n.* a strong, offensive odor.

stink (stingk), *v.i.* [*p.t.* stunk, *p.p.* stunk, *pr.p.* stinking] to emit a strong, offensive odor.

***stint** (stint), *n.* the amount of work to be done in a specified time, as my daily *stint* of study.

stint (stint), *n.* a restriction or limitation, as give without *stint.*

stint (stint), *v.i. and v.t.* to provide scantily, begrudge; to limit or restrict, as to *stint* a boy's allowance.

***stipend** (stī′ pend), *n.* a salary; an allowance paid periodically.

stipple (stip′ l), *v.t.* to engrave or draw with dots; to apply light dots of paint to, as to *stipple* a wall.

stipulate (stip′ ū lāt), *v.t.* to mention specifically, to specify as part of terms of an agreement.

stir (stûr), *n.* activity, excitement, agitation, tumult.

Syn. Bustle, fuss. *Stir* suggests brisk, energetic activity; *bustle* denotes a confused and often aimless rushing about; *fuss* implies unnecessary concern and disturbance over trifles.

stir (stûr), *v.i. and v.t.* to be in motion, especially to be busy and energetic; to put into motion, as the breeze *stirred* the leaves; arouse, as to *stir* a person to action; to instigate, as to *stir* up trouble.

***stirrup** (stir′ up), *n.* a footrest hung from the side of a saddle.

stitch (stich), *n.* a single pass of a threaded needle through material, or of knitting needles or a crochet needle; a style of sewing, knitting or crocheting; a sharp, sudden pain, especially in the side; a small part of one's dress, as she had to change every *stitch* she had on.

stitch (stich), *v.i. and v.t.* to sew.

stoa (stō′ *a*), *n.* a portico, porch or colonnade, especially in ancient Greek architecture.

stock (stok), *n.* the trunk or stem of a tree or plant; a line of family descent, ancestry; shares in the capital of a company; cattle, live*stock;* an old-fashioned formal necktie; meat juice or extract used as the base for soup; the supply of goods for sale in a store; the grip of a gun, a gun*stock;* a common flowering plant.

stock (stok), *v.i. and v.t.* to lay in supplies, as to *stock* up; to provide with supplies of goods to be sold, as to *stock* a store.

stock (stok), *adj.* kept on hand, as goods in a store, as a *stock* china pattern; frequently used, as that is one of your *stock* arguments.

stockade (stok ād′), *n.* a line of posts or timbers set closely to form a barrier and afford protection.

stockade (stok ād′), *v.t.* to defend by means of a line of close-set posts.

stocking (stok′ ing), *n.* a close-fitting covering for the foot and leg.

stocks (stoks), *n. pl.* an arrangement of boards with openings cut to receive hands or feet in which persons were formerly fastened and exposed to public gaze as a punishment.

stock-still (stok′ stil), *adj.* motionless, fixed like a set post.

stocky (stok′ i), *adj.* having a short, thick, heavy-set body.

stodgy (stoj′ i), *adj.* heavy, indigestible, as *stodgy* food; dull, commonplace, prosaic, as a *stodgy* person.

stogy (stō′ gi), *n.* a coarse rough cigar.

stoicism (stō′ i sizm), *n.* indifference to pleasure or pain; quiet endurance.

stoke (stōk), *v.i. and v.t.* to tend a fire; to furnish with fuel, as to *stoke* a furnace.

stoker (stōk′ ēr), *n.* a fire tender; one who feeds a furnace with fuel; a device to feed a furnace.

stole (stōl), *n.* a long narrow scarf with fringed ends, worn by clergymen.

***stolid** (stol′ id), *adj.* impassive, expressionless, dull, stupid.

stomach (stum′ ak), *n.* the principal organ of digestion.

***stomach** (stum′ ak), *v.t.* to put up with, endure, as I cannot *stomach* his talk.

stomacher (stum′ ak ēr), *n.* the decorative lower front part of a close-fitting garment resembling a bodice or vest, formerly worn by both men and women.

stone (stōn), *n.* hard mineral matter, rock; a piece broken off from a rock; the pit or hard seed shell of certain fruits, as a cherry *stone;* a British measure of weight equal to 14 pounds; a gem.

stone (stōn), *v.t.* to throw pieces of rock at; to remove the pits from, as to *stone* peaches; to line with rock, as a well.

stoneware (stōn′ wâr), *n.* a coarse kind of glazed pottery.

stony (stōn′ i), *adj.* [*comp.* stonier, *superl.* stoniest] rocky, hard; pitiless, as a *stony* silence, a *stony* look.

stool (stōōl), *n.* a seat without a back and often with three legs but sometimes four.

stool pigeon (stōōl pij′ un), a pigeon trained to snare other pigeons into a trap; a person used as a decoy for criminals.

stoop (stōōp), *n.* a forward bend of the upper body, as he walks with a *stoop;* a platform in front of a house door; a drinking vessel.

stoop (stōōp), *v.i.* to bend forward; to lean forward and downward, as to pick something off the ground; to condescend, as I would not *stoop* to do that.

stop (stop), *n.* a halt, pause; a station on a railroad line; an organ pipe; a punctuation mark indicating a pause to be made in reading; end, finish, as at last the lecture came to a *stop.*

stop (stop), *v.i. and v.t.* to cease moving; to cause to cease moving; to prevent passage; to keep from doing, as if you try it, I shall *stop* you.

stopgap (stop′ gap), *n.* a temporary expedient.

stopover (stop′ ō vēr), *n.* a pause or stop at an intermediate point in a journey, as a *stopover* in Chicago on the way to the Pacific coast.

***stoppage** (stop′ ij), *n.* an obstruction.

stopper (stop′ ēr), *n.* a plug or cork preventing flow from a bottle, jug or basin.

stopple (stop′ l), *n.* a plug, cork or bung.

stopple (stop′ l), *v.t.* to close with a plug, cork or bung.

stop watch (stop woch), a watch that can be started or stopped at will so that it can be set for exact timing.

***storage** (stōr′ ij), *n.* the keeping of goods in safety when not in use; the placing of such goods in a warehouse; the charge for space for such keeping.

***store** (stōr), *n.* a collection of goods or articles put away for future use; a shop.

store (stōr), *v.t.* to put away for future use; to accumulate, hoard, as to *store* up treasures.

stores (stōrz), *n.* provisions and supplies in large quantities, as aboard a ship, at an army post or camp.

stork (stôrk), *n.* a large wading bird with long legs and a long, pointed bill.

storm (stôrm), *n.* a violent disturbance of the air, with wind, snow, hail or rain; a commotion of any sort; an outburst, as a *storm* of anger, a *storm* of laughter; a violent attack.

storm (stôrm), *v.i. and v.t.* to blow and rain, hail or snow; to rage; to attack with violence, as to *storm* a fortified position.

story (stō′ ri), *n.* [*pl.* stories] a tale; a narrative, short or long; a fib; an account of experiences or explanation of something done, as I have heard his *story,* now what is yours?

story (stō′ ri), a stage of a building, the distance and space from one floor to another, as the building has three *stories,* each 9 feet high.

stout (stout), *adj.* resolute, as a *stout* heart; strong, as a *stout* string; corpulent, large-bodied; as a *stout* person.

stove (stōv), *n.* a structure (often metal) in which fuel is burned to give heat for cooking or for warming a room, as an electric *stove,* a gas *stove;* a kiln or dryer.

stow (stō), *v.t.* to put away in small space, pack tightly.

stowage (stō′ ij), *n.* space for keeping packed things; charge for packing and putting in a safe place.

stowaway (stō′ *a* wā), *n.* one who hides himself aboard a vessel to avoid paying fare.

straddle (strad′ l), *n.* a position with the legs wide apart as if in a saddle; an attempt to favor both sides of a question at once.

straddle (strad′ l), *v.i. and v.t.* to stand or walk with the legs wide apart; to sit astride of; to take both sides of a question.

straggle (strag′ l), *v.i.* to wander apart from a group of which one is supposed to be a part, stray; to spread out, as this vine *straggles.*

***straight** (strāt), *adj.* without a bend or turn, not crooked, direct.

straight (strāt), *adv.* in a direct manner, as go *straight* home.

straighten (strāt′ n), *v.t.* to take the bends and turns out of.

straightforward (strāt fôr′ wẽrd), *adj.* undeviating, honest, direct.

straightway (strāt′ wā), *adv.* at once, immediately.

***strain** (strān), *n.* stock, race, breed; a violent effort; a wrench, as of a muscle.

strain (strān), *n.* a tune or melody, as the *strains* of the national hymn.

strain (strān), *v.i. and v.t.* to make violent effort; to wrench, harm by overexertion, as to *strain* a muscle; to filter, as to *strain* a fruit juice.

strainer (strān′ ẽr), *n.* a sieve through which a liquid may be poured to separate it from solid matter, as a coffee *strainer.*

strait (strāt), *n.* a narrow passage of water connecting two seas: *straits* poverty, as in great *straits.*

strait (strāt), *adj.* narrow, confined, difficult.

straiten (strāt′ n), *v.t.* to make narrow; to confine within close limits; to subject to need.

strait jacket (strāt jak′ et), a canvas coat so made as to hold down the arms of a violently insane, delirious or unruly person.

strait-laced (strāt lāst), *adj.* very strict in manners and morals.

strand (strand), *n.* the shore of a large body of water; one of the twists of a rope; a single lock of hair, a string, as a *strand* of pearls.

strand (strand), *v.t. and v.i.* to run aground; to be reduced to a state of financial embarrassment.

strange (strānj), *adj.* not known or met before, unaccountable, surprising.

stranger (strān′ jẽr), *n.* a person with whom one is not acquainted.

strangle (strang′ gl), *v.i. and v.t.* to choke; to choke to death, as the murderer *strangled* his victims; to force back, as to *strangle* a cry of despair.

strangulation (strang gū lā′ shun), *n.* the act of choking to death.

strap (strap), *n.* a long narrow piece of leather, especially one with holes and a buckle to hold things together.

strap (strap), *v.t.* to fasten or bind with a long piece of leather or canvas fitted with holes and a buckle; to beat with a long strip of leather; to sharpen, as to *strap* a razor.

strapping (strap′ ing), *adj.* tall and well built, husky.

***stratagem** (strat′ *a* jem), *n.* a trick to deceive an enemy or opponent; a shrewd maneuver.

strategy (strat′ ē ji), *n.* [*pl.* strategies] the science of military movements; use of artifice and sometimes of deceit.

***strategic** (stra tē′ jik), *adj.* showing skilful planning, as a *strategic* move.

stratify (strat′ i fī), *v.i. and v.t.* [*p.t. and p.p.* stratified, *pr.p.* stratifying] to form or be formed into layers.

stratosphere (strā′ tō sfēr), *n.* the highest portion of the atmosphere, almost 7 miles above the earth, where the temperature changes only slightly with altitude.

***stratum** (strā′ tum), *n.* [*pl.* strata] a bed of earth or rock constituting a layer.

straw (strô), *n.* a dried stalk of grain; such stalks collectively.

strawberry (strô′ ber i), *n.* [*pl.* strawberries] a vine with a juicy, red, fruit for which it is widely cultivated.

straw vote (strô vōt′), an informal vote to determine the relative strength of a candidate or the public sentiment on a political issue.

stray (strā), *n.* a lost and wandering person or animal; a homeless waif.

stray (strā), *v.i.* to wander from a proper or natural place or way; to deviate from the path of duty.

stray (strā), *adj.* wandering, lost; incidental, as a *stray* remark.

***streak** (strēk), *n.* a line of color different from that of its background; a vein, as a *streak* of vanity; a layer, as a *streak* of fat in meat.

streak (strēk), *v.t.* to mark with stripelike lines.

stream (strēm), *n.* a current of water; anything moving along continuously, as a *stream* of talk, traffic, light, air.

Syn. Current, tide. All rivers are *streams* flowing gently or roughly according to the nature of the region through which they pass. The force of a *current* is increased when it flows down a slope or through a narrowed channel. The *tide* is high or low, strong or weak at different hours of the day.

stream (strēm), *v.i.* to flow, move steadily, as talk, traffic, light, air; to wave with the winds, as a banner.

streamer (strēm′ ẽr), *n.* a long, narrow flag or pennon; a ribbon fastened at one end; a headline running all the way across a newspaper page.

streamline (strēm′ līn), *n.* shape that offers little resistance to the air; path of a fluid.

streamline (strēm′ līn), *adj.* planned with curved contours and no sharp angles to offer resistance to air or water, as a *streamline* train.

street (strēt), *n.* a public road in a city or town.

streetcar (strēt′ kär), *n.* a passenger car on a railway in a city.

street railway (strēt rāl′ wā), a system of tracks for trolley cars in a city.

strength (strength), *n.* power, force; intensity, as the *strength* of an acid.

strengthen (streng′ then), *v.i. and v.t.* to increase in power or intensity; to reinforce.

Syn. Fortify, invigorate. We *strengthen* body or mind by exercise. We *fortify* ourselves by seeking courage to meet an emergency. To *invigorate* is to make a positive addition of power, force, vitality.

Ant. Weaken, debilitate, discourage.

strenuous (stren′ ū us), *adj.* urgent, ardent, zealous; requiring great exertion.

stress (stres), *n.* compulsion, pressure; emphasis; forces exerted against each other by two surfaces in contact, as *stress* and strain in a bridge structure.

stress (stres), *v.t.* to emphasize, give importance to, as accuracy cannot be too strongly *stressed* in statistical work.

stretch (strech), *n.* the act of drawing anything out; anything drawn out, as a long *stretch* of road.

stretch (strech), *v.i. and v.t.* to reach out; to be elastic, as this material *stretches;* to loosen the muscles, as I must *stretch* my legs; to draw out or extend; to exaggerate, as to *stretch* a story.

stretcher (strech′ ẽr), *n.* a litter to carry injured persons or dead bodies upon; a device for extending something in a desired shape, as a sweater *stretcher.*

***strew** (strōō), *v.t.* to spread by scattering, as seeds.

stricken (strik′ en), *adj.* afflicted, as with illness; incapacitated, wounded.

strict (strikt), *adj.* severe, exacting, as a *strict* law, a *strict* teacher; exact, as a *strict* translation.

Syn. Severe. He who has authority over others must be *strict* in enforcing obedience; but it is possible to be very *severe* in enforcing discipline among others and lax in performing our own duties.

Ant. Lax, lenient, gentle, mild.

stricture (strik′ tūr), *n.* censure; contraction of a tube or channel in the body, as an intestine.

stride (strīd), *n.* a long step; the length of such a step.

stride (strīd), *v.i. and v.t.* [*p.t. and p.p.* strode, *pr.p.* striding] to take long steps.

strident (strī′ dent) *adj.* harsh, shrill, grating, as a *strident* voice.

strife (strīf), *n.* struggle, conflict, discord.

Syn. Contention, conflict, struggle, dissension. *Strife* implies violent conflict; *contention* denotes heated and angry wrangling; *conflict* may indicate a physical or mental clash; *struggle* denotes great effort, either physical or mental; *dissension* refers to mental discord and disagreement, as *dissension* in the home.

Ant. Concord, co-operation.

strike (strīk), *n.* the act of hitting; stoppage of work by employees; discovery of a deposit of ore; unexpected good fortune or success.

strike (strīk), *v.i. and v.t.* [*p.t. and p.p.* struck, *pr.p.* striking] to hit; to cease working in order to bring an employer to terms; to discover, as a vein of ore; to lower, as a flag in token of surrender; to indicate by sound, as a clock *strikes* the hour; to cause to ignite, as to *strike* a match; to assume, as to *strike* a pose; to arrive at, as to *strike* a bargain.

strikebreaker (strīk′ brāk ẽr), *n.* a person employed to substitute for a striking workman.

striking (strīk′ ing), *adj.* impressive, remarkable.

string (string), *n.* a small cord or thick thread; a series of connected things, as a *string* of troubles; a group of things held by a cord, as a *string* of beads; the thread of a pod, as the string of *string* beans; a tightly stretched cord of catgut or a wire used for certain musical instruments, as the guitar, violin, mandolin.

string (string), *v.t. and v.i.* [*p.t. and p.p.* strung, *pr.p.* stringing] to put on a cord or thread, as to *string* beads; to remove the long tough fiber from a pod, as to *string* beans; to fit with cords, as to *string* a tennis racket; to form a loose line, as the cars *string* out over a mile.

string bean (string′ bēn), any of several kinds of beans having an edible pod, with tough, threadlike fibers running lengthwise.

stringed (stringd), *adj.* equipped with strings, as a *stringed* instrument.

stringent (strin′ jent), *adj.* strict, severe, rigidly enforced, binding.

stringy (string′ i), *adj.* [*comp.* stringier, *superl.* stringiest] fibrous; having many hard fibers, as *stringy* meat; lifeless and noncurling, as my hair is *stringy;* viscid.

strip (strip), *n.* a long, narrow piece, as a *strip* of cloth, wood or metal, a *strip* of road or river.

strip (strip), *v.i. and v.t.* to come off in long pieces; to undress; to take the covering from, as a hide from a carcass; to deprive of, take away, as the depression *stripped* him of every dollar; to milk dry, as to *strip* a cow.

stripe (strīp), *n.* a long, narrow band of color on a background of different color; a long narrow streak; a welt on the skin caused by a stroke with a whiplash; a color, kind or sort, as persons of that *stripe.*

stripe (strīp), *v.t.* to mark with lines or bands of different colors.

stripling (strip′ ling), *n.* a youth, a boy.

strive (strīv), *v.i.* to try hard; to struggle, as to *strive* for success, *strive* to win a race.

stroke (strōk), *n.* a blow; one of a series of movements, as the *stroke* of oars; an effort, action, as a bold *stroke* for freedom; anything happening suddenly and unexpectedly, as a *stroke* of luck, a paralytic *stroke;* the sounding of the hour by a clock, as on the *stroke* of midnight; the oarsman farthest aft in a racing shell.

stroll (strōl), *n.* a leisurely ramble for pleasure.

stroll (strōl), *v.i.* to wander afoot in leisurely manner and for pleasure.

***strong** (strông), *adj.* having physical power, muscular, full of vigor, as a *strong* fighter; forceful, as *strong* words; alcoholic, as *strong* drink; firm, as a *strong* foundation for a building or a belief; intense in degree or quality, as a *strong* mixture.

stronghold (strông′ hōld), *n.* a fortress, a well-defended place of safety.

strop (strop), *n.* a strip of leather upon which to sharpen a razor.

strop (strop), *v.t.* to sharpen on a leather strip; to strap, as a razor.

***strophe** (strō′ fē), *n.* the part of a choral dance in ancient Greek stage art in which the dancers move in a body to one side; the music played and sung during this movement; a stanza, verse.

***structure** (struk′ tūr), *n.* a building; a union of parts, as in a machine; the manner in which a machine or a body is put together.

struggle (strug′ l), *n.* a violent effort; a contest.

struggle (strug′ l), *v.i.* to try hard, strive; to contend.

strum (strum), *v.i. and v.t.* to play on a stringed instrument noisily and without expression.

strut (strut), *n.* an affected step or walk.

strut (strut), *v.i.* to walk in a manner indicating conceit or affectation.

***strychnine** (strik′ nin), *n.* a poisonous alkaloid extracted from nux vomica, used in medicine to stimulate the heart and nerves.

stub (stub), *n.* a tree stump; any short piece left after the main part has been taken away, as the *stubs* in a checkbook; a pen point that is short and blunt.

stub (stub), *v.t.* to strike, as the toes, against some projecting object underfoot.

stubble (stub′ l), *n.* the short pieces of stalk left in a field after grain or heavy grass has been cut; a short, rough growth of beard.

stubborn (stub′ ērn), *adj.* obstinate, unyielding; hard to treat, as a *stubborn* case.

stucco (stuk′ ō), *n.* [*pl.* stuccos or stuccoes] fine plaster in walls inside a building; coarser plaster as an outside covering for the walls of a house.

stucco (stuk′ ō), *v.t.* [*p.t. and p.p.* stuccoed, *pr.p.* stuccoing] to use a certain kind of plaster for decorating walls or as an outer coat for a house.

stud (stud), *n.* a large-headed ornamental nail; an upright timber in a building, to which laths are nailed; a removable ornamental button, as a shirt *stud.*

stud (stud), *n.* a group of horses kept for breeding.

stud (stud), *v.t.* to adorn with close-set knobs or ornamental points, as stars *stud* the sky.

studding (stud′ ing), *n.* joists for use in the walls of houses.

***student** (stū′ dent), *n.* a pupil in school; a member of a college body; one seeking knowledge, a scholar.

studied (stud′ id), *adj.* carefully thought out, as a *studied* compliment.

studio (stū′ di ō), *n.* a room in which an artist works; a place where motion pictures are filmed; a room having the mechanical equipment for radio broadcasting.

***studious** (stū′ di us), *adj.* devoted to the acquisition of knowledge.

***study** (stud′ i), *n.* [*pl.* studies] the act of using the mind to acquire knowledge; a branch of learning; close examination into a particular subject, as a *study* of school management; a room set apart and furnished for reading, writing and thinking; a sketch for a picture to be painted; a piece of music designed to give practice in some special field or phase; a memorizer of a theatrical part, as this actor is a very quick *study.*

study (stud′ i), *v.i. and v.t.* to apply the mind in quest of knowledge; to investigate closely, as to *study* labor conditions; to think upon closely, as to *study* a situation.

stuff (stuf), *n.* materials out of which things are made; the fundamental quality, as you have the *stuff* of a martyr; rubbish.

stuffing (stuf′ ing), *n.* the material used to fill anything; a highly seasoned filling for a roast or other dish.

stuffy (stuf′ i), *adj.* [*comp.* stuffier, *superl.* stuffiest] close, poorly ventilated; choked up, having the nasal passage closed, as from a head cold.

stultify (stul′ ti fī), *v.t.* [*p.t. and p.p.* stultified, *pr.p.* stultifying] to cause to appear foolish or absurd.

stumble (stum′ bl), *n.* a tripping as one walks or runs; a blunder.

stumble (stum′ bl), *v.i.* to trip on something when walking or running; to blunder; to find unexpectedly, as to *stumble* upon a great discovery.

stump (stump), *n.* the part of a tree or shrub left after the trunk is cut down; anything resembling it or compared to it, as the *stump* of a pencil, of an amputated limb or a tail; a political platform.

stump (stump), *v.i. and v.t.* to clump the feet in walking; to travel about making speeches, as in a political campaign; to lop off; to hinder and perplex, as this problem *stumps* me.

stumpy (stum′ pi), *adj.* [*comp.* stumpier, *superl.* stumpiest] full of tree stubs; short and thick.

stun (stun), *v.t.* to render senseless by a blow; to make numb with shock, as the news *stuns* us.

stunt (stunt), *n.* a notable feat of strength, skill or daring.

stunt (stunt), *v.i.* to perform spectacular feats of strength, skill or great daring.

stunt (stunt), *v.t.* to check the growth of, prevent development, dwarf.

stupefaction (stū pē fak′ shun), *n.* insensibility, the state of being stunned.

stupefy (stū′ pē fī), *v.t.* [*p.t. and p.p.* stupefied, *pr.p.* stupefying] to deprive of sensibility; to knock, shock or drug into a state of unconsciousness or complete stupidity.

***stupendous** (stū pen′ dus), *adj.* so vast as to benumb the senses of one who beholds; of extraordinary size or degree, completely amazing.

***stupid** (stū′ pid), *adj.* deficient in perception and understanding; dull-witted; tiresome, as a *stupid* lecture.

stupidity (stū pid′ i ti), [*n. pl.* stupidities] extreme dullness of perception or understanding, slowness of mind.

Syn. Apathy, dullness, insensibility, obtuseness, stupefaction, stupor. *Stupidity* is sometimes used loosely in the sense of temporary *dullness* or partial *stupor,* but its proper meaning is rather chronic and constitutional sluggishness of mental action or *obtuseness* of apprehension.

Ant. Alertness, intelligence.

stupor (stū′ pēr), *n.* mental numbness; lethargy; inactivity of the senses.

sturdy (stûr′ di), [*adj. comp.* sturdier, *superl.* sturdiest] hardy, robust, strong, vigorous; resolute.

***sturgeon** (stûr′ jun), *n.* a large food fish of northern waters having air bladders from which isinglass is made and producing a roe from which caviar is prepared.

stutter (stut′ ēr), *n.* hesitation in speech, with repetition of a part of a word.

stutter (stut′ ēr), *v.i.* to speak with hesitation, repeating a single part of a word.

sty (stī), *n.* [*pl.* sties] a pigpen.

sty (stī), [*n. pl.* sties] a small swelling on the edge of an eyelid with inflammation.

style (stīl), *n.* manner of doing; manner of expressing thought; fashion; the marker of a sundial; the stemlike part of a flower bearing the stigma; a title, descriptive form of address.

style (stīl), *v.t.* to make fashionable; to address or name with a descriptive title of courtesy.

stylish (stīl′ ish), *adj.* fashionable.

stylist (stīl′ ist), *n.* one who is a master of method in art; one who advises on matters of dress.

stylus (stī′ lus), *n.* a sharp-pointed writing instrument used for making carbon copies, for recording sounds or for reproducing sounds.

stymie (stī′ mi), *n.* a situation in golf when the ball nearer the hole on the putting green lies in the direct line of play of the other ball which is about to be played.

styptic (stip′ tik), *n.* a substance which when applied to a cut stops its bleeding.

suasion (swā′ zhun), *n.* persuasion; the act of convincing, as moral *suasion.*

***suave** (swäv), *adj.* smooth in manner, pleasingly polite.

***suavity** (swäv′ i ti), *n.* [*pl.* suavities] smoothness of manner, politeness.

subacid (sub as′ id), *adj.* slightly tart.

***subaltern** (sub öl tērn), *n.* a commissioned officer in the army below a captain in rank; a subordinate.

subconscious (sub kon′ shus), *adj.* pertaining to that mental activity that goes on beneath the surface of conscious thought.

***subdue** (sub dū′), *v.t.* to overcome or conquer; to tone down; to tame.

***subject** (sub′ jekt), *n.* one under the rule of another; a person or thing studied or treated in some particular way, as the *subject* of an essay, a picture or study; the part of a sentence about which a statement is made.

***subject** (sub jekt′), *v.t.* to bring under control, tame, subdue, expose to action.

subject (sub′ jekt), *adj.* under the rule of another; liable, as he is *subject* to delusions; dependent upon, as our decision is *subject* to your wishes.

subjection (sub jek′ shun), *n.* the act of subduing; state of being a subject.

subjective (sub jek′ tiv), *adj.* relating to the person who is thinking, saying or doing something rather than to the object considered.

subjugate (sub′ joo gāt), *v.t.* to subdue completely, bring under dominion, enslave.

subjunctive (sub jungk′ tiv), *n.* a verb in the mood expressing doubt or possibility.

subjunctive (sub jungk′ tiv), *adj.* expressing doubt, possibility or the state of being conditional.

sublimate (sub′ li māt), *n.* a solid deposit produced by condensing a vapor formed by heating a solid.

sublimate (sub′ li māt), *v.t.* to convert a solid into vapor by heating and then condense the vapor into another solid; to refine; to divert the energy of, as a natural impulse, to a more worth-while channel.

sublime (sub līm′), *n.* that which is exalted, majestic or solemn.

sublime (sub līm′), *adj.* exalted, majestic, solemnly grand.

sublimity (sub lim′ i ti), *n.* [*pl.* sublimities] grandeur, solemnity, exalted state or style.

submarine (sub′ m*a* rēn), *n.* a boat that can be propelled under water.

submarine (sub m*a* rēn′), *adj.* existing or operating below the surface of the sea.

submerge (sub mûrj), *v.i. and v.t.* to go below the surface, as a submarine; to place completely under water.

submission (sub mish′ un), *n.* the act of yielding; obedience to the will of another.

submit (sub mit′), *v.i. and v.t.* to surrender; to yield to the authority or will of another; to present for judgment or decision by another.

subordinate (su bôr′ di nit), *n.* one of lesser rank.

subordinate (su bôr′ di nāt), *v.t.* to assign to a lesser rank or lower position; to make second to something else in importance.

subordinate (su bôr′ di nit), *adj.* having lower rank or importance; subject to another's will or authority.

suborn (sub ôrn′), *v.t.* to induce to commit perjury, to hire or persuade to swear falsely.

subornation (sub ôr nā′ shun), *n.* the act of inducing a person to swear falsely in court.

***subpoena** (su pē′ n*a*), *n.* a court order for appearance at a named time and place with a penalty for disobedience.

***subpoena** (su pē′ n*a*), *v.t.* to serve or summon with an order to appear in court with a penalty for disobedience.

subscribe (sub skrīb′), *v.t. and v.i.* to sign one's name to; to agree to take a magazine or newspaper regularly; to pledge a contribution, to contribute; to approve formally.

subscription (sub skrip′ shun), *n.* the affixing of a signature; a contribution or the pledge of a contribution; an order for regular delivery of a magazine or newspaper.

subsequent (sub′ sē kwent), *adj.* later, following, coming after, either in time or order.

subserve (sub sûrv′), *v.t.* to advance an interest, contribute to a result, help in carrying out a purpose.

subservient (sub sûr vi ent), *adj.* acting in the interest of another; servile.

***subside** (sub sīd′), *v.i.* to sink to a lower level; to quiet down, as the *storm* subsided.

***subsidence** (sub sīd′ ens), *n.* the act of sinking or quieting down.

***subsidiary** (sub sid′ i er i), *n.* [*pl.* subsidiaries] an auxiliary, an organization maintained by another, as the *subsidiaries* of a large corporation.

subsidiary (sub sid′ i er i), *adj.* auxiliary, assisting, under higher authority.

subsidize (sub′ si dīz), *v.t.* to support or assist with a fixed schedule of financial aid, as governments *subsidize* private ships for mail carriage.

subsidy (sub′ si di), *n.* [*pl.* subsidies] a grant of public money to assist private operators in serving the public; any financial help given by one individual to another.

***subsist** (sub sist′), *v.i.* to be maintained, to live, to continue.

subsistence (sub sis′ tens), *n.* means of supporting life, maintenance.

substance (sub′ stans), *n.* matter or material; the essential part, as the *substance* of an argument.

***substantial** (sub stan′ shal), *adj.* consisting of matter, essential; actual; solid; responsible, as a *substantial* citizen; considerable, as a *substantial* gift.

***substantiate** (sub stan′ shi āt), *v.t.* to establish the truth of, with evidence; to confirm, verify.

substantive (sub′ stan tiv), *n.* a noun or a phrase or clause used as a noun.

substantive (sub′ stan tiv), *adj.* essential, real, lasting.

substitute (sub′ sti tūt), *n.* a person or thing taking the place of another; a person serving for another; a thing used instead of another.

substitute (sub′ sti tūt), *v.i. and v.t.* to take the place of another; to use instead of something else.

substitute (sub′ sti tūt), *adj.* taking the place of another person or thing.

substratum (sub strā′ tum), *n.* a layer beneath the surface, as of soil or rock, a foundation.

subterfuge (sub′ tēr fūj), *n.* an evasion or artifice, pretense to conceal a real motive.

subterranean (sub te rā′ ne an), *adj.* below the surface of the earth.

***subtile** (sub′ til or sut′ l), *adj.* subtle in the different senses of that word.

subtitle (sub tī′ tl), *n.* a subhead or secondary title; the name of a book repeated on a page after the title page; a short explanation of a coming scene on a motion-picture screen.

***subtle** (sut′ l), *adj.* artful, crafty, wily, sly, as a *subtle* opponent; delicate, elusive, as a *subtle* perfume; ingenious, as a *subtle* argument.

subtlety (sut′ l ti), *n.* mental keenness; craftiness; elusive delicacy.

subtract (sub trakt′), *v.i. and v.t.* to perform the operation of lessening by a set amount; to take away from, deduct.

subtrahend (sub′ tr*a* hend), *n.* the quantity to be taken from another quantity in the process of subtraction.

***suburb** (sub′ ûrb), *n.* a town or district adjacent to a city of which it may or may not be a part.

suburban (sub ûr′ ban), *adj.* living in or pertaining to the outlying residential districts of a city.

subvention (sub ven′ shun), *n.* a government grant or subsidy.

subversion (sub vûr′ shun), *n.* overthrow, ruin.

subvert (sub vûrt′), *v.t.* to turn upside down, overthrow, destroy.

Syn. Overturn, overthrow, upset. To *subvert* is to overthrow as if from a foundation; to *overturn* often implies throwing with force from a base or position; to *overthrow* usually denotes complete destruction, as to *overthrow* a government; to *upset* is a milder expression and more generally used, as to *upset* one's plans, to *upset* a tumbler of water.

subway (sub′ wā), *n.* an underground passage; a tunnel beneath the surface of a city street with an electric railway running through it; the railway in such a tunnel.

succeed (suk sēd′), *v.i. and v.t.* to follow, be next in order; to get what one wants and strives for; to prosper in business; to follow after, as he *succeeded* his father; to follow immediately after in time, as Tuesday *succeeds* Monday.

success (suk ses′), *n.* accomplishment of a purpose; one who has prospered or won high standing, as he is a *success* in life.

successful (suk ses′ fool), *adj.* prosperous; achieving what was desired.

succession (suk sesh′ un), *n.* the act of following in order; a number of things in a series, as a *succession* of severe winters; the act of coming into an inheritance.

successive (suk ses′ iv), *adj.* occurring in order, consecutive.

Syn. Consecutive. *Successive* and *consecutive* both apply to things that follow in regular order without interruption; but *consecutive* stresses the fact that there is no interval of time or break in the order.

***successor** (suk ses′ ēr), *n.* one who follows in the place of another.

***succinct** (suk singkt′), *adj.* tersely expressed, concise.

succor (suk′ ēr), *n.* help, relief, assistance.

succor (suk′ ēr), *v.t.* to go to the relief or assistance of.

succotash (suk′ ō tash), *n.* green corn and beans boiled together.

succulent (suk′ ū lent), *adj.* juicy, having watery tissues, as a plant; not dry or dull, as a *succulent* discourse.

succumb (su kum′), *v.i.* to yield to a greater force; to die.

such (such), *pron.* that kind of a person or thing; those who, as *such* as wish to may come.

such (such), *adj.* of that kind, as *such* questions should be more widely discussed; of the same class, as *such* composers as Mozart and Chopin.

suck (suk), *n.* the act of drawing into the mouth, as give me a *suck* of that lollypop; act of drawing in, as that pump has a strong *suck*.

suck (suk), *v.i. and v.t.* to draw milk from the mother's breast; to absorb, as this paper *sucks* ink; to draw into the mouth, as to *suck* a stick of candy.

suckle (suk′ l), *v.i. and v.t.* to nurse at the breast; to bring up, rear, foster.

suckling (suk′ ling), *n.* an unweaned child or animal.

suction (suk′ shun), *n.* the act or power of drawing up liquid.

sudden (sud′ n), *adj.* happening unexpectedly, hasty, abrupt, as a *sudden* decision.

suds (sudz), *n. pl.* soapy water, with bubbles on it or in a lathery state.

sue (sū), *v.i. and v.t.* to go to law; to plead, start legal proceedings against, as to *sue* a person for libel.

suède (swād), *n.* a soft kidskin used with the napped flesh side out, for gloves, shoes, purses and similar articles; a cloth with a similar soft surface.

suet (sū′ et), *n.* the hard fat that accumulates around the kidneys and loins of sheep, beef cattle and hogs and from which tallow or leaf lard is rendered.

suffer (suf′ ēr), *v.i. and v.t.* to have pain or distress, as he *suffered* greatly; to undergo, as to *suffer* a change; to permit, as *suffer* little children to come unto me.

sufferance (suf′ ēr ans), *n.* toleration, acceptance without having given direct permission, as we are here by *sufferance* of the authorities.

***suffice** (su fīs′), *v.i. and v.t.* to be enough; to satisfy the need.

sufficiency (su fish′ en si), *n.* adequacy, competency, as means; plenty, as I have a *sufficiency* for the present.

sufficient (su fish′ ent), *adj.* enough, adequate, satisfying present needs.

suffix (suf′ iks), *n.* a letter or syllable added at the end of a word to indicate a shade of meaning.

suffix (suf′ iks), *v.t.* to add at the end to form a new word.

suffocate (suf′ ō kāt), *v.i. and v.t.* to be choked; to perish for want of air; to stifle, smother.

suffrage (suf′ rij), *n.* the right to vote, electoral franchise.

suffragette (suf r*a* jet′), *n.* a woman who advocated and agitated for women's right to vote before that right was granted.

***suffuse** (su fūz′), *v.t.* to overspread with color, as glorious tints of sunset *suffused* the evening sky, or with mist or liquid, as eyes *suffused* with tears.

sugar (shoog′ ēr), *n.* a sweet crystalline substance chiefly obtained from sugar cane, sugar beets and maple sap.

sugar (shoog′ ēr), *v.t. and v.i.* to sweeten; to form sweet crystals, as the juice is *sugaring* fast.

sugar cane (shoog′ ēr kān), a tall, thick-stemmed grass of warm lands, which has a rich, sweet sap.

***suggest** (su jest′), *v.t.* to intimate; to bring up, as an idea, through mention of something connected or related to it; to propose, as to *suggest* a plan.

***suggestion** (su jes′ chun), *n.* a hint; that which brings one thing to mind by referring to another somehow connected with it; that which is offered for consideration.

suicidal (sū i sī′ dal), *adj.* pertaining to the taking of one's life; fatal to one's own interests or welfare.

***suicide** (sū′ i sīd), *n.* self-destruction; one who kills himself.

***suit** (sūt), *n.* a group or series of things of the same kind or used together, as a *suit* of clothes, a *suit* of playing cards; a legal action for remedy of a wrong; a courtship.

suitable (sūt′ *a* bl), *adj.* fitting, appropriate.

suitcase (sūt′ kās), *n.* a flat handbag to carry clothing.

suite (swēt), *n.* a retinue of attendants, as the monarch and his *suite;* a group of rooms, as in a hotel; a set of furniture.

suitor (sū′ tēr), *n.* one who entreats, especially one who woos a woman.

sulk (sulk), *v.i.* to be sullen, moody and silent.

sulky (sul′ ki), *n.* [*pl.* sulkies] a light vehicle with two wheels and a seat for only one person and drawn by one horse, used in trotting races.

sulky (sul′ ki), *adj.* [*comp.* sulkier, *superl.* sulkiest] silently sullen.

sullen (sul′ en), *adj.* morose, ill-tempered in a quiet, gloomy way; somber, as *sullen* skies.

sully (sul′ i), *v.t.* [*p.t. and p.p.* sullied, *pr.p.* sullying] to tarnish or soil; to stain.

sulphur (sul′ fẽr), *n.* a nonmetallic element, brittle, yellow in color and burning with suffocating fumes: also spelled *sulfur.*

sulphurate (sul fū′ rāt), *v.t.* to combine with sulphur or subject to its action.

sulphuretted (sul′ fū ret ed), *adj.* having sulphur in its composition, as *sulphuretted* hydrogen.

sulphuric (sul fū′ rik), *adj.* obtained from sulphur or containing it.

sulphurous (sul fū′ rus), *adj.* containing or resembling sulphur; fiery, blasphemous, as *sulphurous* speech.

*__sultan__ (sul′ tan), *n.* a Mohammedan ruler, especially the ruler of Turkey before the World War.

sultry (sul′ tri), *adj.* [*comp.* sultrier, *superl.* sultriest] hot, close and oppressive; heavy with moist heat, as a *sultry* day.

sum (sum), *n.* the whole, a total; an indefinite amount, as of money; the number obtained by adding.

*__sumac__ (shōō′ mak), *n.* a shrub having heavy, solid clusters of small flowers that turn into berries, and of which some varieties are used in tanning and dyeing.

summarize (sum′ *a* rīz), *v.t.* to state concisely, sum up.

summary (sum′ *a* ri), *n.* [*pl.* summaries] a briefer form of a document or composition presenting its principal features in small space.

summary (sum′ *a* ri), *adj.* concise; immediate, taking effect without delay, as a *summary* discharge from a position.

summation (sum ā′ shun), *n.* the act of forming a total; review of the arguments in a case in court.

summer (sum′ ẽr), *n.* the part of the year between spring and autumn; the hottest months, as from mid-June to the middle of September.

summit (sum′ it), *n.* the peak or highest point, as the *summit* of a mountain or a career.

summon (sum′ un), *v.t.* to order or invite to appear, send for; to call into action.

summons (sum′ unz), *n.* [*pl.* summonses] an order to appear in court.

*__sumptuary__ (sump′ tū er i), *adj.* pertaining to expense; regulating expenses, as *sumptuary* laws were passed to suppress luxurious living.

sumptuary laws (sump′ tū er i lôz), statutes limiting the expenditure of money on certain articles or regulating prices and wages.

*__sumptuous__ (sump′ tū us), *adj.* expensive, luxurious, magnificent.

sun (sun), *n.* the light-giving body around which the earth and other planets revolve; sunshine.

sun (sun), *v.t.* to bask in the open light of day; to expose to the rays of the sun.

suncup (sun′ kup), *n.* a variety of evening primrose bearing yellow flowers, found in California.

sunder (sun′ dẽr), *v.t.* to part, sever, rend.

sundial (sun′ dī al), *n.* a device that indicates the time of day by means of a shadow cast upon a dial by a pointer or style.

sundown (sun′ doun), *n.* the time of day when the sun appears to descend below the horizon.

sundries (sun′ driz), *n. pl.* items not specified individually in a statement.

sundry (sun′ dri), *adj.* various, several.

sunken (sungk′ en), *adj.* deeply depressed, as *sunken* eyes; on the bottom or under the water; on a lower level of ground, as *sunken* gardens.

sunny (sun′ i), *adj.* [*comp.* sunnier, *superl.* sunniest] bright, warm, cheerful.

sunshine (sun′ shīn), *n.* daylight.

sunstroke (sun′ strōk), *n.* prostration caused by direct exposure to the rays of the sun.

sunup (sun′ up), *n.* sunrise, the time the sun comes up.

sup (sup), *v.i. and v.t.* to have a light evening meal; to sip, take a fluid into the mouth a small amount at a time.

superannuated (su pẽr an′ ū āt ed), *adj.* too old to work.

superb (sū pûrb′), *adj.* grand, stately, magnificent.

*__supercilious__ (sū pẽr sil′ i us), *adj.* haughty, proud, overbearing, showing a sense of superiority.

superficial (sū pẽr fish′ al), *adj.* on the surface, not deep, not profound.

*__superfluous__ (sū pûr′ flū us), *adj.* more than enough, being more than is needed.

superhuman (sū pẽr hū′ man), *adj.* beyond ordinary human power or capacity, as a *superhuman* task.

superintend (sū pẽr in tend′), *v.t.* to oversee, direct, have charge of.

superintendent (sū pẽr in ten′ dent), *n.* an overseer; one directing and in charge.

superior (sū pēr′ i er), *n.* one of higher rank or greater excellence.

superior (sū pēr′ i er), *adj.* higher in station or rank; more excellent.

superlative (sū pûr′ l*a* tiv), *n.* something of the highest degree of excellence; a word indicating such a quality; the highest degree of comparison in adjectives and adverbs.

supernal (sū pûr′ nal), *adj.* celestial, heavenly.

supernatural (sū pẽr nat′ ū ral), *adj.* beyond the laws of nature; not governed or explained by mere physical laws; miraculous.

supernumerary (sū pẽr nū′ mẽr er i), *n.* [*pl.* supernumeraries] a person or thing beyond the required or customary number; an actor without a speaking part in a play.

superscription (sū pẽr skrip′ shun), *n.* the address on a letter; writing or engraving on the outside or top of anything.

supersede (sū pẽr sēd′), *v.t.* to take the place of.

*__superstition__ (sū pẽr stish′ un), *n.* belief in supernatural things; reverence founded on fear; belief in omens and signs.

superstructure (sū′ pẽr struk tūr), *n.* anything built or founded on something else; the part of a building above the foundation; part of a ship above the main deck.

supervene (sū pẽr vēn′), *v.i.* to come as something extra; to follow closely after.

supervise (sū′ pẽr vīz), *v.t.* to oversee and direct.

supervisor (sū′ pẽr vī zẽr), *n.* an overseer or superintendent.

supervisory (sū pẽr vī′ zō ri), *adj.* serving in the capacity of an overseer or superintendent.

supine (sū′ pīn), *adj.* lying on the back; indifferent, careless.

supper (sup′ ẽr), *n.* the evening meal.

supplant (su plȧnt′), *v.t.* to displace, supersede.

supple (sup′ l), *adj.* flexible, pliant, lithe; yielding; compliant.

supplement (sup′ lē ment), n. something added; an additional or extra section, as a newspaper *supplement.*

supplement (sup′ lē ment), *v.t.* to add to; to make more complete by an additional part.

suppliant (sup′ li ant), *n.* one who supplicates, one who seeks humbly.

suppliant (sup′ li ant), *adj.* humbly beseeching, entreating.

supplicate (sup′ li kāt), *v.i. and v.t.* to ask humbly and earnestly; to beg for.

supplication (sup li kā′ shun), *n.* humble and earnest entreaty or prayer.

supply (su plī′), *n.* [*pl.* supplies] the amount on hand of anything that is or may be needed.

supply (su plī), *v.t.* [*p.t. and p.p.* supplied, *pr.p.* supplying] to furnish with needed things; to provide.

support (su pōrt′), *n.* that which sustains.

support (su pōrt′), *v.t.* to sustain, bear up; to endure; to uphold; to provide for.

*__suppose__ (su pōz′), *v.i. and v.t.* to imagine; to believe without proof; to accept as true for purposes of reasoning.

*__supposition__ (sup ō zish′ un), *n.* an assumption; a hypothesis.

*__supposititious__ (su poz i tish′ us), *adj.* assumed, conjectural; false; pretended.

suppress (su pres′), *v.t.* to subdue, quell, keep down; to withhold from publication; to keep from giving expression to, as to *suppress* a smile.

suppurate (sup′ ū rāt), *v.i.* to form pus.

suppurative (sup′ ū rā tiv), *adj.* tending to form pus, as a *suppurative* wound.

supremacy (sū prem′ *a* si), *n.* the state of being over all, in quality or authority; the highest excellence.

supreme (sū prēm′), *adj.* highest in authority or power; most excellent; highest in degree, as *supreme* daring.

surcharge (sur′ charj), *n.* an overcharge; collection of more than is right; an additional printing on the face of a stamp, changing the price or value; a stamp thus overprinted.

surcingle (sûr′ sing gl), *n.* a girth in a horse's harness.

*__sure__ (shoor), *adj.* fit to be depended upon, certain, reliable, unfailing; confident, having no doubt.

sure (shoor), *adv.* undoubtedly.

surety (shoor′ ti), *n.* [*pl.* sureties] one who guarantees payment of another's obligation; something put up as a pledge to cover a future payment; assurance, certainty.

surf (sûrf), *n.* the waves of the sea breaking along the shore with roar and foam.

surface (sûr′ fis), *n.* the outer face of a solid body; the level of a body of water.

surface (sûr′ fis), *adj.* pertaining to the outer face of anything; superficial, false, as *surface* friendliness.

surfeit (sûr′ fit), *n.* excess, especially in eating or drinking.

surfeit (sûr′ fit), *v.i. and v.t.* to overeat, overindulge; to overfeed, satiate, cloy.

surge (sûrj), *n.* a billow; a great roll of anything resembling a billow, as a *surge* of emotion.

surge (sûrj), *v.i.* to rise high; to advance in volume, as the crowd *surged* forward.

surgeon (sûr′ jun), *n.* a doctor who performs operations.

surgery (sûr′ jẽr i), *n.* [*pl.* surgeries] the act and art of treating wounds or internal diseases by means of operations.

surly (sûr′ li), *adj.* [*comp.* surlier, *superl.* surliest] ill-humored, rudely cross, morose.

surmise (sûr mīz′), *n.* a conjecture, suspicion; an opinion with little evidence supporting it.

surmise (sûr mīz′), *v.t.* to guess, conjecture; to assume on small evidence.

surmount (sûr mount′), *v.t.* to rise above, overcome, conquer.

*__surname__ (sûr′ nām), *n.* a family name, last name.

surpass (sẽr pȧs′), *v.t.* to exceed; to excel.

surplice (sûr′ plis), *n.* a loose, linen vestment worn by the clergy and choir singers.

surplus (sûr′ plus), *n.* [*pl.* surpluses] an excess over requirement.

surplus (sûr′ plus), *adj.* exceeding requirements, extra.

*__surprise__ (sẽr prīz′), *n.* something that happens unexpectedly; the state of being taken unaware.

surprise (sẽr prīz′), *v.t.* to take unaware; to astonish with something unexpected.

surrender (su ren′ dẽr), *n.* the act of yielding; act of giving something up, under pressure; submission to superior force.

surrender (su ren′ dẽr), *v.i. and v.t.* to yield, give up under pressure or superior force; to relinquish possession of.

surreptitious (sûr ep tish′ us), *adj.* done by secret means, stealthy.

surrogate (sûr′ ō gāt), *n.* a substitute; a bishop's deputy; a county officer having charge of the proving of wills; a probate judge.

surround (su round′), *v.t.* to inclose on all sides, encompass.

Syn. Encircle, environ, invest. To *surround* means to inclose, envelop; to *encircle* is to pass completely around, as a gold necklace *encircled* her throat; to *environ* is to form a ring around in a larger sense, as mountains *environ* the lake; to *invest* usually applies to that which envelops in a mental sense, as he *invests* every comment with vital importance.

surroundings (su round′ ingz), *n.* the influences, circumstances and conditions that go to make up environment.

surtax (sûr′ taks), *n.* a tax in addition to a normal tax.

***surtout** (sûr to͞ot′), *n.* a wide-skirted coat reaching below the knees.

***surveillance** (sûr vāl′ ans), *n.* the act of watching; state of being watched.

***survey** (sûr′ vā), *n.* a determination of area and boundaries; a study and report, as a health *survey.*

***survey** (sẽr vā′), *v.t.* to ascertain the exact area and boundaries of; to study some particular aspect of.

surveyor (sẽr vā′ ẽr), *n.* one whose business it is to calculate areas and locate boundary lines.

survival (sẽr vīv′ al), *n.* continuance, the act of outliving another; act of outlasting; anything that comes down from earlier times.

survive (sẽr vīv′), *v.i. and v.t.* to continue living after others die; to live through, as to *survive* a battle.

survivor (sẽr vīv′ ẽr), *n.* one who outlives another; one who escapes with his life.

***susceptible** (su sep′ tị bl), *adj.* easily acted upon; impressible; sensitive or subject to, as *susceptible* to colds, *susceptible* to flattery; capable of, as *susceptible* of proof.

suspect (sus′ pekt), *n.* a person thought to be guilty.

suspect (sus pekt′), *v.t.* to believe guilty; to imagine to exist; to distrust.

suspend (sus pend′), *v.t.* to hang, as to *suspend* something from a beam; interrupt or postpone, as to *suspend* operations, *suspend* a business, *suspend* judgment.

suspenders (sus pen′ dẽrz), *n.* a pair of straps over the shoulders to support trousers; garters.

suspense (sus pens′), *n.* a state of uncertainty as to what is going to happen; eager expectancy.

suspension (sus pen′ shun), *n.* a withholding of judgment or decision; temporary dismissal, as *suspension* from school; a temporary cessation of operation.

suspicion (sus pish′ un), *n.* a belief with little or no supporting evidence; a very small amount of something; an inkling; mistrust, doubt.

suspicious (sus pish′ us), *adj.* subject to question; having doubt.

sustain (sus tān′), *v.t.* to hold up or support; to endure; to prove, as to *sustain* an accusation; to maintain, as to *sustain* a conversation; to suffer, as to *sustain* an injury.

sustenance (sus′ tē nans), *n.* that which supports life, food.

sutler (sut′ lẽr), *n.* a person who follows an army, selling things to the soldiers.

***suture** (sū′ tūr), *n.* the drawing together of the edges of a wound by sewing; the union or articulation of the bones in the skull.

***suzerain** (sū′ ze rān), *n.* a feudal lord.

***swab** (swob), *n.* a mop for cleaning floors or decks; a small piece of cotton or cloth used in applying medicine to the mouth or throat and in washing wounds and sores.

swab (swob), *v.t.* to clean with a heavy mop; to wash or apply medicine to.

swaddle (swod′ l), *v.t.* to swathe, bind with a long strip of cloth.

swagger (swag′ ẽr), *n.* a strutting, arrogant way of walking; noisy boasting.

swagger (swag′ ẽr), *v.i.* to strut with an insolent air; to brag and boast.

swain (swān), *n.* a country boy; a lover.

swallow (swol′ ō), *n.* the act of taking one mouthful of food or drink into the stomach; the mouthful thus acted upon.

***swallow** (swol′ ō), *n.* a small migratory bird with short bill, long wings and forked tail.

swallow (swol′ ō), *v.t.* to take food down the throat into the stomach; to make invisible, as the darkness *swallowed* him; to accept readily, as to *swallow* a story; to accept an insult without action.

swallowtail (swol′ ō tāl), *n.* a man's dress coat having the skirt or tail cut in two long, tapering parts.

***swamp** (swomp), *n.* an area of wet or boggy land.

swamp (swomp), *v.t. and v.i.* to sink by filling with water, as a huge wave *swamped* the boat; to overwhelm, ruin; to become submerged.

***swan** (swon), *n.* a web-footed bird with a very long, curved neck.

swan dive (swon dīv), a plunge into water with the arms spread to the sides and backward and the body arched in the air.

swan's-down (swonz′ doun), *n.* the soft feathers of the swan, used in trimming and for powder puffs.

***swap** (swop), *n.* a trade, a bargain.

swap (swop), *v.i. and v.t.* to trade, give one thing for another, barter.

***sward** (swôrd), *n.* a stretch of thick turf.

***swarm** (swôrm), *n.* a crowd or multitude in motion; a colony of bees.

swarm (swôrm), *v.i. and v.t.* to gather in great numbers; to move about in throngs: to contain a throng of people moving about, as the city *swarms* with sightseers; to fly from one hive to another, as the bees *swarmed* today; to throng, as people *swarmed* upon the beaches.

***swarthy** (swôr′ *th*i), *adj.* [*comp.* swarthier, *superl.* swarthiest] dark-hued, dark-skinned.

swash (swosh), *n.* a splashing of water against something; a narrow channel of water between a sandbank and the shore; a bar over which the waves dash and splash.

swash (swosh), *v.i. and v.t.* to dash and splash, as waves over a bar.

swashbuckler (swosh′ buk lẽr), *n.* a swaggering, boasting soldier.

***swastika** (swas′ ti k*a*), *n.* an ancient religious symbol resembling a plus sign with each point marking a right angle made by an added short, straight line, now the emblem of the Nazi party in Germany.

swat (swot), *v.t.* to hit violently, crush, as to *swat* a fly.

swatch (swoch), *n.* a sample of cloth or leather.

***swath** (swôth), *n.* the space cut by a mowing machine or scythe in one course; the path of mown grass or grain left by the mower.

***swathe** (swā*th*), *v.t.* to bind with a long strip of cloth; to wrap, as she *swathed* herself in furs.

sway (swā), *n.* a swinging motion, as the *sway* of a tree in the wind; governing power; rule, dominance.

sway (swā), *v.i. and v.t.* to swing from side to side; to cause to incline; to influence in judgment, as the speaker *swayed* his audience; to dominate.

sway-backed (swā′ bakt), *adj.* having a back that sags, as a horse.

***swear** (swâr), *v.i. and v.t.* [*p.t.* swore, *p.p.* sworn, *pr.p.* swearing] to take an oath; to make a solemn promise; to declare on oath; to speak profanely.

sweat (swet), *n.* the moisture that exudes from the pores of the skin, perspiration; any gathering of moisture in tiny drops on a surface.

sweat (swet), *v.i. and v.t.* to exude moisture in small drops, perspire; to cause to perspire, as it would be good to *sweat* that horse a little; to overwork, as in a sweatshop.

sweater (swet′ ẽr), *n.* a knitted or crocheted jacket.

sweatshop (swet′ shop), *n.* a place where people are compelled to work very hard for unfairly small pay.

sweep (swēp), *n.* the act of using a broom; a long swinging motion, as a *sweep* of the hand, the *sweep* of an oar; a long, heavy oar; one who cleans chimneys, as a chimney *sweep;* the act of getting rid of something or a state of complete accomplishment, as our party made a clean *sweep* of the election; a wide stretch, as a great *sweep* of grassland.

sweep (swēp), *v.i. and v.t.* to use a broom; to move fast, as the cars *swept* down the road; to move in a dignified manner, as she *swept* out of the room; to have wide extent, as this meadow *sweeps* to the river; to clean with a broom, as to *sweep* a floor; to range over, as searchlights *sweep* the river at night.

sweeping (swēp′ ing), *adj.* extensive, all-embracing, as a *sweeping* victory; covering much ground, as a *sweeping* statement.

sweepings (swēp′ ingz), *n.* matter gathered together by using a broom.

sweepstakes (swēp′ stāks), *n.* a race in which all the money risked may be won by a few; a race in which all the prize money goes to one contestant; a lottery of prizes based on the winner of such a race.

***sweet** (swēt), *n.* a darling or beloved person; *sweets,* candies, cakes and the like, as you mustn't eat too many *sweets.*

sweet (swēt), *adj.* tasting like sugar; not sour, as *sweet* milk; pleasing to the senses, as a *sweet* sound or smell; fresh, not salted, as *sweet* butter; pleasant, agreeable, equable, as a *sweet* disposition.

sweetbread (swēt′ bred), *n.* the pancreas or the thymus gland of a calf or lamb used as food.

sweetbrier (swēt′ brī ẽr), *n.* a thorny shrub having fragrant pink blossoms.

sweet corn (swēt kôrn), Indian corn rich in sugar; table or garden corn as distinguished from field corn for cattle or grinding.

sweeten (swēt′ n), *v.i. and v.t.* to become more sugarlike in taste; to cause to taste like sugar.

sweetening (swēt′ n ing), *n.* that which makes things taste more like sugar, as the pie needs more *sweetening.*

sweetheart (swēt′ härt), *n.* a lover; a loved one.

sweetmeat (swēt′ mēt), *n.* a confection made with sugar.

sweet potato (swēt pō tā′ tō), the edible root of a creeping vine; the yam.

sweet William (swēt wil′ yam), a kind of pink with bright flowers growing in clusters.

swell (swel), *n.* a long rolling wave; the roll of the sea far from land; a rolling ridge of land; an increase in volume of sound, as the *swell* of the organ.

swell (swel), *v.i. and v.t.* to expand or enlarge, as by inflation; to cause to rise or increase; to puff up, as to *swell* the chest.

swelter (swel′ tẽr), *n.* a hot, moist, heavy state of the atmosphere.

swelter (swel′ tẽr), *v.i.* to be oppressed by the heat.

swerve (swûrv), *n.* a swing aside from the path of progress, as the car gave a sudden *swerve.*

swerve (swûrv), *v.i. and v.t.* to make or cause to make a turn out of a course, deviate; to deflect, as you cannot *swerve* me from my purpose.

swift (swift), *n.* a bird related to the swallow, famous for its speedy flight.

swift (swift), *adj.* moving far in little time; doing much in a short time, as he is a *swift* worker; fast, rapid.

swill (swil), *n.* kitchen refuse fed to pigs.

swill (swil), *v.i. and v.t.* to drink greedily or grossly.

swim (swim), *n.* the act of propelling oneself in the water, as I had a good *swim;* a whirl, as my head is in a *swim;* a gliding motion; the full tide of life, business or society, as he is in the *swim.*

swim (swim), *v.i. and v.t.* [*p.t.* swam, *p.p.* swum, *pr.p.* swimming] to propel oneself forward in water by natural means, as by using the legs and arms, fins or the like; to float on a liquid; to be submerged in, as her eyes *swam* with tears; to become dizzy, giddy, as the blow made the fighter's head *swim;* to whirl, as the lights *swam* before my eyes; to cross by swimming, as he *swims* the cove regularly.

swimmingly (swim′ ing li), *adv.* easily, without effort; successfully, as everything went *swimmingly.*

swindle (swin′ dl), *n.* a gross fraud.

swindle (swin′ dl), *v.i. and v.t.* to defraud, obtain money under false pretenses, cheat.

swine (swīn), *n.* [*pl.* swine] a hog; hogs or pigs collectively.

swing (swing), *n.* a free back-and-forth motion; the distance through which anything suspended moves back and forth, as the pendulum has a *swing* of 4 inches; a contrivance of ropes and a seat on which to move back and forth through the air; strongly emphasized rhythm, as a marching song with a good *swing*.

swing (swing), *v.i. and v.t.* [*p.t. and p.p.* swung, *pr.p.* swinging] to hang, suspend, as by a cord, rope or chain; to sway back and forth; to turn, as on a hinge, as the gate *swung* open; to march with a long, free stride, as the soldiers *swung* down the street; to move or cause to move to and fro, as he *swung* the child for an hour; to brandish, as to *swing* a weapon; to conclude successfully, as to *swing* a big deal.

swipe (swīp), *n.* a bar or lever, as for starting an engine or working a pump.

swipe (swīp), *v.t.* to strike with a side swing, as of the arm.

swirl (swûrl), *n.* a whirling or eddying motion, as a *swirl* of water.

swirl (swûrl), *v.i. and v.t.* to move in eddies; to cause to eddy.

swish (swish), *n.* a whistling sound like that of a lash cutting through the air; a rustling sound, as of stiff silk when moved.

swish (swish), *v.i. and v.t.* to move or cause to move with a whistling noise, as to *swish* a whip.

switch (swich), *n.* a slender, flexible stick; a tress of hair used to make a woman's hair look more abundant; a device to break an electric current or transfer it to another conductor; a device for moving the rails so that cars or trains can pass from one line of track to another; a shift, as a *switch* of public opinion.

switch (swich), *v.t. and v.i.* to whip with a slender stick; to move from one track to another, as a streetcar or railroad train; to change from one opinion or policy to another; to change from one circuit to another or into or out of a circuit, as to *switch* a light on; to twitch suddenly, as a cow *switches* its tail; to alter a course suddenly.

switchboard (swich′ bōrd), *n.* a wooden panel equipped with plugs, used as a means of connecting and disconnecting electric currents, as a telephone *switchboard*.

swivel (swiv′ l), *n.* a device for coupling things together that permits either part to turn; a pivot arrangement that permits turning in all directions, as this dog leash is good because it hooks on with a *swivel*.

swivel (swiv′ l), *v.i. and v.t.* to fasten or be fastened with a coupling device that permits turning in all directions; to pivot.

swoon (swo͞on), *n.* a fainting fit.

swoon (swo͞on), *v.i.* to faint.

swoop (swo͞op), *n.* a sudden downward sweep like that of a hawk darting at its prey.

swoop (swo͞op), *v.i. and v.t.* to dart downward; to fall upon and seize, as to *swoop* a ball.

sword (sōrd), *n.* a keen-edged, long-bladed weapon for cutting and thrusting.

sycamore (sik′ *a* mōr), *n.* the buttonwood or plane tree, distinguished by the shedding of its bark, making the trunk and branches look white or gray in patches.

***sycophant** (sik′ ō fant), *n.* a flatterer; one who, to gain favors, pretends to agree with everything someone else says.

syllabication (si lab i kā′ shun), *n.* division of a word into parts: sometimes *syllabification*.

syllabify (si lab′ i fī), *v.t.* [*p.t. and p.p.* syllabified, *pr.p.* syllabifying] to divide a word into units of pronunciation.

syllable (sil′ *a* bl), *n.* the letters that represent a separately pronounced part of a word, as *syl* is the first syllable of the word *syllable;* a unit of pronunciation within a word, consisting of a vowel ordinarily combined with one or more consonants.

syllabus (sil′ *a* bus), *n.* an outline, as of a lecture; a brief statement of the main points of a discourse.

***syllogism** (sil′ ō jizm), *n.* an argument presented in logical form, with two statements called the premises leading to a conclusion, which may be either correct or false according to the correctness of the premises, as an animal lives, a tree lives, therefore a tree is an animal.

sylph (silf), *n.* an imaginary being living in the air, a kind of fairy; a slim, graceful young girl.

sylvan (sil′ van), *adj.* pertaining in any way to forests, woods or groves.

symbol (sim′ bul), *n.* an emblem or sign, as the dove is a *symbol* of peace, figures are *symbols* of number.

symbolism (sim′ bul izm), *n.* the giving of fanciful meanings to well-known objects, especially in literature and the fine arts.

symbolize (sim′ bul īz), *v.t.* to serve as a sign or emblem of; to represent, as the lion *symbolizes* courage.

symmetry (sim′ ē tri), *n.* [*pl.* symmetries] proper proportion in the arrangement of parts; correct balance between the two halves of an outline; graceful proportioning; the beauty of harmonious arrangement of parts.

sympathy (sim′ *a* thi), *n.* [*pl.* sympathies] the sharing of feelings, as of pleasure or pain; compassion, pity; likeness of disposition, as we are in *sympathy* with each other.

Syn. Compassion, commiseration, condolence. *Sympathy* has the literal meaning of fellow feeling; *compassion, commiseration* and *condolence* signify a suffering endured with others in spirit. *Compassion* is a moral feeling that makes us enter into the distresses of others.

***symphony** (sim′ fō ni), *n.* [*pl.* symphonies] harmony of sound; a musical composition fully orchestrated in sonata form; a harmony of colors, as her costume was a *symphony* of blues.

***symposium** (sim pō′ zi um), *n.* [*pl.* symposiums or symposia] a collection of utterances by different persons on one subject.

symptom (simp′ tum), *n.* a special condition of any part of the body indicating the presence of disease; any condition indicating a cause, as *symptoms* of popular discontent.

synagogue or **synagog** (sin′ *a* gog), *n.* a Jewish house of worship; the group or congregation worshiping in such a place.

***synchronism** (sing′ krō nizm), *n.* coincidence of time; the state of happening at the same time as something else.

synchronize (sing′ krō nīz), *v.t.* to cause to agree in time, as to *synchronize* two clocks.

***synchronous** (sing′ krō nus), *adj.* happening at the same time, as *synchronous* events.

syncopate (sing′ kō pāt), *v.t.* to contract a word by omitting letters from the middle of it; to write or play music in measures that start on an unaccented beat and end on an accented one.

***syncope** (sing′ kō pē), *n.* the omission of letters from the middle of a word; fainting, sudden cessation of breathing, sensation and consciousness.

syndicate (sin′ di kāt), *n.* a combination or association of persons or companies to provide larger funds for carrying on an enterprise; a company that buys manuscripts, comic strips and other special articles and sells them to a number of newspapers to be published in each on a set date.

***synod** (sin′ ud), *n.* a church council.

***synonym** (sin′ ō nim), *n.* a word of the same or almost the same meaning as another word.

synopsis (sin op′ sis), *n.* [*pl.* synopses] an outline of a literary or dramatic composition.

syntax (sin′ taks), *n.* the part of grammar that treats of the construction of sentences and the relationship of words to one another in a sentence.

synthesis (sin′ thē sis), *n.* [*pl.* syntheses] the putting of parts together to form a whole; composition or construction.

synthetic (sin thet′ ik), *adj.* made of parts or elements combined in a new form; composed artificially; produced artificially.

***syringa** (si ring′ ga), *n.* a shrub with flowers resembling orange blossoms: also called *mock orange*.

***syringe** (sir′ inj), *n.* a device with which to inject fluid, consisting of a rubber bulb to produce suction and a hose and nozzle through which the liquid passes.

system (sis′ tem), *n.* a combination of parts into a whole, as the bodily *system*, the digestive *system*, a railroad *system*, the solar *system;* orderly arrangement, as you need more *system* in your work.

systematic (sis tem at′ ik), *adj.* orderly, methodical, as *systematic* study.

T

tab (tab), *n.* a flap or tag.

***tabard** (tab′ ērd), *n.* an outer garment worn over armor by a knight; a herald's coat emblazoned with the royal arms.

tabby (tab′ i), *n.* [*pl.* tabbies] a brindled cat; any domestic cat.

tabby (tab′ i), *adj.* [*comp.* tabbier, *superl.* tabbiest] brindled, as a *tabby* cat; marked in waves, as watered silk.

***tabernacle** (tab′ ēr nak′ l), *n.* a tent, a lightly constructed dwelling; the movable, tentlike structure in which the Israelites worshiped as they wandered in the wilderness; a small receptacle for the consecrated Host in Roman Catholic churches; any place of worship.

tabes (tā′ bēz), *n.* a gradual wasting away of the body.

***table** (tā′ bl), *n.* an article of furniture with a flat, horizontal top that is set on legs; a collection of items in orderly arrangement, as a *table* of contents in a book, a railroad time*table*.

table (tā′ bl), *v.t.* to place on a table, as the card had already been *tabled;* to lay aside, as to *table* a resolution in a deliberative assembly.

***tableau** (tab′ lō), *n.* [*pl.* tableaux or tableaus] a scene represented by persons posed, motionless and silent.

tableland (tā′ bl land), *n.* a high, level area of land.

tablespoon (tā′ bl spo͞on), *n.* a large spoon for serving food; the amount such a spoon will hold, half a fluid ounce, three times as much as a teaspoon.

tablet (tab′ let), *n.* a flat surface to write on; a pad of writing paper; a flat panel fastened in a wall and carrying an inscription; medicine or candy in a small, flat disk.

tabloid (tab′ loid), *n.* a compressed tablet or pill, originally a trade name; anything that is especially brief, compact and concentrated; a newspaper with small pages and numerous photographs.

tabloid (tab′ loid), *adj.* condensed and brief, as *tabloid* news of the day.

taboo or **tabu** (ta bo͞o′), *n.* a religious (prohibition) of the Polynesians by which persons and things were rendered sacred and inviolable; a ban on anything.

taboo (ta bo͞o′), *v.t.* to forbid approach to or use of.

taboo (ta bo͞o′), *adj.* under a ban, prohibited.

tabor (tā′ bēr), *n.* a small drum shaped like a tambourine and beaten with one stick: also *tabour*.

***taboret** (tab′ ō ret), *n.* a small stool or stand, often handsomely carved or inlaid: also *tabouret*.

tabular (tab′ ū lēr), *adj.* in the form of a table or schedule, arranged in columns.

tabulate (tab′ ū lāt), *v.t.* to arrange in an orderly list.

tachometer (t*a* kom′ ē tēr), *n.* an instrument that measures and makes a record of speed.

***tacit** (tas′ it), *adj.* implied but not expressed, granted by silence, where a spoken negative might have been expected, as *tacit* consent; silent.

***taciturn** (tas′ i tûrn), *adj.* habitually silent, uncommunicative.

tack (tak), *n.* a small, sharp nail with a broad head, flat or curved; one leg of a sailing ship's course when she goes against the wind; a veering of a ship's course to take advantage of a side wind; a change in policy; new line of action.

tack (tak), *v.i. and v.t.* to change a ship's course to suit the wind; to fasten with short, broad-headed nails; to fasten lightly, as with stitches.

***tackle** (tak′ l), *n.* apparatus of blocks and ropes for lifting and lowering; implements or gear in general, as fishing *tackle*.

tackle (tak′ l), *v.t.* to grapple with; to lay hold of; to deal with or attack vigorously, as I must *tackle* this algebra lesson.

***tact** (takt), *n.* fine understanding and nice discernment with delicate skill in saying or doing the right thing; consideration for others.

tactician (tak tish′ an), *n.* one who is skilled in the science of military movements; one skilled in adroit maneuvers for the accomplishment of any purpose.

tactics (tak′ tiks), *n.* the science of military and naval operations, apart from strategy; any adroit maneuver for the accomplishment of a purpose.

***tactile** (tak′ til), *adj.* perceptible by touch.

tactual (tak′ tū al), *adj.* pertaining to the sense or organs of touch.

tadpole (tad′ pōl), *n.* a young frog or toad with gills and a long tail.

taffeta (taf′ ē ta), *n.* a fine, thin, glossy silken fabric, slightly stiff.

taffrail (taf′ rāl), *n.* the railing around the stern of a ship; the upper afterdeck.

taffy (taf′ i), *n.* candy made of molasses or brown sugar boiled down.

tag (tag), *n.* an identifying card or label attached to something, as baggage; a loose end; a children's game.

tag (tag), *v.t. and v.i.* to attach a label to; to overtake and touch; to follow closely, as I'll just *tag* along.

tag day (tag dā), a special day for contributions to a cause, each contributor receiving a badge or token.

tail (tāl), *n.* the appendage at the hind end of an animal's body, a prolongation of the backbone; anything hanging loose, as the *tail* of a kite; the rear end of anything, as the *tail* of the procession.

tailboard (tāl′ bōrd), *n.* the removable piece at the back of a truck or wagon.

tailings (tāl′ ings), *n. pl.*, refuse, waste material, as in flour manufacture, petroleum refining or ore dressing.

tail light (tāl līt), a red lamp at the rear of an automobile.

tailor (tā′ lẽr), *n.* one who makes suits and outer garments.

tail skid (tāl skid), a runner placed beneath the rear of an airplane.

tail spin (tāl spin), a spiral motion of an airplane coming down, with the rear end describing larger circles than the nose of the plane.

***taint** (tānt), *n.* a spot indicating corruption or decay; presence of undesirable foreign matter.

taint (tānt), *v.i. and v.t.* to become spoiled, as meat; to infect, poison; to defile, corrupt.

take (tāk), *n.* the act of acquiring; amount acquired, as a *take* of fish with nets; a single portion of copy to be set in type.

take (tāk), *v.t. and v.i.* [*p.t.* took, *p.p.* taken, *pr.p.* taking] to gain possession of; to grasp; to seize; to interest, attract; to select, as to *take* material from a book; to consume, as it *takes* time; to occupy, as the grand piano *takes* too much space; to endure, as to *take* punishment; to photograph; to be successful; to have the desired effect.

taking (tāk′ ing), *adj.* pleasing, as you have a *taking* personality.

***talc** (talc), *n.* a soft, greasy mineral substance: also called *soapstone.*

talcum powder (tal′ kum pou′ dẽr), a toilet preparation made of finely ground talc.

tale (tāl), *n.* a narrative or story; a count of things, as the *tale* of a day's receipts in a store; detrimental talk, gossip.

***talent** (tal′ ent), *n.* ability, special fitness for any particular occupation; an ancient unit of weight or money.

***talesman** (tā′ lēz man), *n.* one summoned to make up a deficiency in a jury.

***talisman** (tal′ iz man), *n.* a charm; a figure in metal or stone supposed to have magic qualities.

talk (tôk), *n.* speech, vocal utterance, conversation; rumor, as idle *talk.*

talk (tôk), *v.i. and v.t.* to utter words; to speak, converse; to exert influence upon, as we *talked* him into accepting; to express oneself orally in, as to *talk* French.

talkative (tôk′ a tiv), *adj.* loquacious, fond of conversing.

tall (tôl), *adj.* high in stature; lofty; exaggerated, as *tall* talk.

tallow (tal′ ō), *n.* the melted fat or suet of cattle and sheep, used in making candles, soap, oleomargarine.

tally (tal′ i), *n.* [*pl.* tallies] a count kept by marking down each unit; a record of a total, item by item.

tally (tal′ i), *v.i. and v.t.* [*p.t. and p.p.* tallied, *pr.p.* tallying] to agree in count; to keep count of by marking items down one at a time.

***tallyho** (tal i hō′), *n.* a four-in-hand coach.

tallyho (tal i hō′), *interj.* a huntsman's cry urging on the hounds.

talon (tal′ un), *n.* the claw of a bird of prey.

***talus** (tā′ lus), *n.* [*pl.* tali] the ankle bone; front slope of a fortification; a sloping deposit of small stones at the base of a cliff.

***tamale** (ta mä′ lē), *n.* a Mexican dish of minced meat and cornmeal, seasoned with red pepper, wrapped in corn husks, dipped in oil and steamed.

tamarack (tam′ a rak), *n.* the American black larch.

tamarind (tam′ a rind), *n.* a tropical tree that has yellow flowers and fruit with acid pulp.

tambour (tam′ boor), *n.* a small drum; an embroidery hoop.

tambourine (tam boo rēn′), *n.* a small hand drum with jingling disks attached to the hoop.

tame (tām), *v.t.* to subdue; to domesticate.

tame (tām), *adj.* domesticated; spiritless, dull.

tameable (tām′ a bl), *adj.* capable of being subdued.

tamp (tamp), *n.* a heavy flat-surfaced block with a handle at the upper end, used to pound down loose earth or sod.

tamp (tamp), *v.t.* to plug a blast hole with packed clay; to pack and harden with repeated blows, as to *tamp* turf.

tamper (tam′ pẽr), *v.i.* to meddle, to change objectionably, as don't *tamper* with that machine; to bribe, corrupt.

tampion (tam′ pi un), *n.* a plug stopping the muzzle of a canon when not in use.

tan (tan), *n.* the bark of certain trees, as the oak, used in dressing hides; a yellowish-brown color with a reddish tinge; the dark coloring of the skin after long exposure to the sun.

tan (tan), *v.i. and v.t.* to take on a dark color from exposure to the sun, as my skin *tans* easily; to dress hides in making leather by using vegetable, mineral or chemical compounds.

tandem (tan′ dem), *n.* two or more horses driven in single file; a bicycle for two riders, one behind the other.

tang (tang), *n.* the part of a knife or fork that fits up inside the handle; a strong, piquant flavor; a characteristic quality, as his speech has the *tang* of the mountain country.

tangent (tan′ jent), *n.* a straight line that touches a curve but does not cut it; a course leading away from its proper point, as he went off at a *tangent.*

tangent (tan′ jent), *adj.* touching; in contact at only one point.

tangerine (tan je rēn′), *n.* a small, sweet and juicy orange having a distinctly reddish skin, called a mandarin orange.

tangible (tan′ ji bl), *adj.* perceptible to the touch; evident, discernible, real.

tangle (tang′ gl), *n.* a confused mass of intertwined threads or strings, as my hair is in a *tangle;* a confusion of words or things.

tangle (tang′ gl), *v.i. and v.t.* to form in a confused, intertwining collection, as these ropes *tangle;* to knot, entangle, as I *tangled* the yarn; to confuse, as with arguments.

tango (tang′ gō), a dance originating in Spanish America; music suited for that dance.

tank (tangk), *n.* a large receptacle for liquids, as a water *tank* on a roof, a swimming *tank;* an armored motor car with caterpillar treads for cross-country operations in war.

tank (tangk), *v.t.* to place or store in a large receptacle, as we had better *tank* a lot of water.

tankard (tangk′ ẽrd), *n.* a large drinking vessel with a lid.

tanker (tangk′ ẽr), *n.* a ship equipped with large containers for transporting oil, molasses and other liquids in bulk.

tannery (tan′ ẽr i), *n.* [*pl.* tanneries] a works where hides are dressed in making leather.

tannic (tan′ ik), *adj.* pertaining to or made from bark.

tannic acid (tan′ ik as′ id), a substance obtained from bark and nutgalls used in dressing hides.

tansy (tan′ zi), *n.* [*pl.* tansies] a bitter, aromatic plant with small, yellow flowers.

tantalize (tan′ ta līz), *v.t.* to tease; to torment by raising hopes or fears that will not be realized.

tantamount (tan′ ta mount), *adj.* equivalent to in meaning or value, as your words are *tantamount* to a promise.

tantrum (tan′ trum), *n.* a sudden outburst of temper.

tap (tap), *n.* a spigot, faucet; a branch conductor leading away from a main electric circuit; a playful touch; a light knock, as a *tap* on a door.

tap (tap), *v.i. and v.t.* to rap lightly, as he *tapped* on the door; to draw liquid by opening a spigot or faucet, as to *tap* beer.

tape (tāp), *n.* a long narrow band of linen, silk or cotton; a narrow strip of paper used in a stock ticker; a long strip of stout fabric marked with a scale for measuring; a rope across a track to mark the finish line of a race.

taper (tā′ pẽr), *n.* a thin wax candle; a gradual decrease in size toward the end, as that mast has a graceful *taper.*

taper (tā′ pẽr), *v.i. and v.t.* to grow or cause to grow more slender at one end.

taper (tā′ pẽr), *adj.* growing smaller toward one end.

***tapestry** (tap′ es tri), *n.* [*pl.* tapestries] a heavy fabric of wool or silk woven with a design and used for hangings or upholstery.

tapeworm (tāp′ wûrm), *n.* a flat, ribbonlike parasite that infests the intestines of man and other animals.

***tapioca** (tap i ō′ ka), *n.* a starchy food substance obtained from the roots of the cassava.

***tapir** (tā′ pẽr), *n.* a large animal of South and Central America and Malaysia that has short legs and a flexible snout.

***tapis** (tap′ ē), *n.* carpet, tapestry; floor, as on the *tapis,* meaning under discussion.

taproot (tap′ ro͞ot), *n.* the main underground stem of a plant that strikes straight down into the earth.

taps (taps), *n.* the closing signal of the day in the army or navy, sounded by the drum, bugle or trumpet as an order to extinguish lights; this signal sounded as an honorary ceremony at the burial of a soldier.

tar (tär), *n.* a thick, dark-colored, oily substance obtained by distilling coal or wood rich in resin.

tar (tär), *n.* a sailor.

tar (tär), *v.t.* to cover with tar.

***tarantella** (tar an tel′ a), *n.* a lively dance of the people of Naples.

***tarantula** (ta ran′ tū la), *n.* a large spider of tropical or near-tropical regions, with hairy body and a painful sting.

tardiness (tär′ di nes), *n.* the state of being late or moving with slow, reluctant pace.

tardy (tär′ di), *adj.* [*comp.* tardier, *superl.* tardiest] late, behindtime; moving with slow, reluctant pace.

tare (târ), *n.* a weed that grows in grain fields; the darnel.

tare (târ), *n.* an allowance for the weight of the container, subtracted from the price charged a purchaser.

target (tär′ get), *n.* a mark shot at in practice with bow and arrow, rifle, or artillery; anything aimed at, as I am a *target* for his wit; a small shield.

tariff (tar′ if), *n.* a schedule of charges to be levied against various kinds of imported goods; the customs duty on any particular imported article, as the *tariff* on watches; any schedule of charges and rates, as for a railroad or a hotel.

tarn (tärn), *n.* a small mountain lake.

tarnish (tär′ nish), *v.i. and v.t.* to lose luster, become dull; to become discolored from the action of air and moisture; to take the brightness from, stain, as your remarks *tarnish* his reputation.

***tarpaulin** (tär′ pô lin), *n.* stout, waterproof canvas or a cover or garment made of it.

tarry (tar′ i), *v.i.* [*p.t. and p.p.* tarried, *pr.p.* tarrying] to stay behind, linger, delay.

tarsier (tär′ si ẽr), *n.* an East Indian tree-dwelling mammal with large staring eyes, long ankle bones and specialized toes ending in disks.

tarsus (tär′ sus), *n.* the ankle; the thin cartilage that stiffens the eyelid.

tart (tärt), *n.* a small shell of pastry, filled with fruit, jam, or jelly.

tart (tärt), *adj.* sharp and sour of taste, acid; severe, as *tart* speech.

tartan (tär′ tan), *n.* a plaid woolen fabric, worn especially in the Scottish Highlands; the distinctive pattern of such plaids, as the *tartan* of this clan is blue and green.

***tartar** (tär′ tẽr), *n.* an acid substance formed in fermenting grape juice; the crusty deposit that forms at the base of a tooth.

***tartaric acid** (tär tar′ ik as′ id), a substance found in the juice of grapes and berries.

tasimeter (t*a* sim′ ē tẽr), *n.* an electrical instrument to measure minute changes in length, moisture or temperature of solids produced by pressure.

***task** (tȧsk), *n.* a definite piece of work to be done.

task (tȧsk), *v.t.* to assign work to; to burden with work; to test one's strength or ability, as this problem *tasks* my mind: *to take to task,* to reprimand.

***tassel** (tas′ l), *n.* an ornament consisting of a tuft of loose threads at the end of a cord and left hanging, as from a curtain; anything thought of as resembling such an ornament, as a corn *tassel.*

taste (tāst), *n.* the sensation produced on the tongue and palate by anything taken into the mouth; that one of the five physical senses by which such a sensation is perceived; a characteristic flavor, as the *taste* of bananas; a small quantity taken into the mouth, as a *taste* of that pickle; special liking or aptitude for any art or study, as he has a *taste* for mathematics; good judgment in selecting, matching or harmonizing things, as she dresses with good *taste.*

Syn. Flavor, savor, tang. *Taste* denotes a small quantity taken as a sample; *flavor* or *savor* implies a distinctive quality in the thing tasted, as a *flavor* of peppermint, a spicy *savor; tang* may be applied to keen impressions of smell as well as taste, as the *tang* of salt air.

taste (tāst), *v.i. and v.t.* to have flavor, as this *tastes* good; to perceive through the tongue and palate, as I *taste* sugar in this coffee; to experience, as to *taste* sorrow.

tasteful (tāst′ fool), *adj.* showing refinement and good judgment.

tasty (tāst′ i), *adj.* [*comp.* tastier, *superl.* tastiest] savory, flavorful.

tat (tat), *v.t. and v.i.* to make by knotting thread wound on a shuttle, as to *tat* lace; to be occupied with such work, as she *tats* by the hour.

tat (tat), *n.* a blow, as tit for *tat.*

tatter (tat′ ẽr), *n.* a ragged, hanging piece on clothing: *tatters,* ragged clothes, hanging in shreds.

tatterdemalion (tat ẽr dē māl′ yun), *n.* a ragamuffin; a person in rags and tatters.

tatting (tat′ ing), *n.* a kind of knotted work like lace, made by hand with a shuttle.

tattle (tat′ l), *v.i. and v.t.* to talk idly, prate; to gossip, tell tales.

tattoo (ta to͞o′), *n.* a signal by drum or bugle shortly before taps for soldiers or sailors to go to their quarters at night; any continuous rattling noise, as he beat a *tattoo* on the door.

tattoo (ta to͞o′), *v.t.* to mark the body with a design by puncturing the skin with a needle and inserting a lasting stain or dye into the wounds or by scarring with cuts.

***taunt** (tônt), *n.* a bitter or sarcastic remark, a jeer or jibe.

taunt (tônt), *v.t.* to address with insulting language, jeer, jibe.

taupe (tōp), *n.* a dull yellowish-gray color like that of a mole, mole-gray.

taut (tôt), *adj.* stretched tight, as a rope.

***tautology** (tô tol′ ō ji), *n.* [*pl.* tautologies] needless repetition in different words; using a second word with the same meaning as the first and adding nothing to the statement, as *visible to the eye.*

tavern (tav′ ẽrn), *n.* an inn, a roadhouse.

taw (tô), *n.* a marble used as a shooter; a game of marbles; the line from which one shoots in this game.

***tawdry** (tô′ dri), *adj.* [*comp.* tawdrier, *superl.* tawdriest] showy, without good taste, gaudy.

tawny (tô′ ni), *adj.* [*comp.* tawnier, *superl.* tawniest] of a yellowish-brown color.

tax (taks), *n.* a charge, at a certain percentage of valuation, on income, real estate or other property, levied by a government for its own support; an imposition, as your request is a *tax* on my good nature.

tax (taks), *v.t.* to place a compulsory levy upon, as income or property, to raise funds to support governmental needs, pay for public works and the like; to subject to a strain, as his request may *tax* your good nature; to accuse.

taxable (taks′ *a* bl), *adj.* subject to a levy by government.

taxation (taks ā′ shun), *n.* the act of collecting a percentage on the valuation of private property to raise public funds; the amount thus collected.

taxi (taks′ i), *n.* [*pl.* taxis] a taxicab.

taxi (taks′ i), *v.i.* to run over water or land in taking off or coming down, as an airplane or seaplane; to ride in a hired motor vehicle, as I *taxied* downtown.

taxicab (tak′ si kab), *n.* a public motor car, especially one with a mechanical device registering the distance traveled and indicating the amount of fare due: often abbreviated to *taxi.*

taxidermist (tak′ si dûr mist), *n.* one who stuffs and mounts the skins of dead animals.

***taxidermy** (tak′ si dûr mi), *n.* the art of stuffing and mounting the skins of dead animals so as to give them a lifelike appearance.

***taximeter** (tak′ si mē tẽr), *n.* a mechanism to show a passenger in a taxicab what the fare is at any moment and for printing a card with the charge at the end of a ride.

tea (tē), *n.* the dried leaves of an oriental shrub; the beverage made by steeping such leaves in boiling water; any infusion or extract used as a medicine or beverage, as beef *tea;* an afternoon or evening meal; a social gathering at which tea and other refreshments are served.

teach (tēch), *v.i. and v.t.* [*p.t. and p.p.* taught, *pr.p.* teaching] to give instruction; to impart knowledge to; to cause to learn; to direct the development of.

Syn. Discipline, drill, educate, enlighten, inculcate, indoctrinate, inform, initiate, instill, instruct, nurture, school, train, tutor. To *teach* is simply to communicate knowledge. To *instruct* is to impart knowledge with special method and completeness. To *educate* is to draw out and develop harmoniously and in the fullest sense the mental and moral powers. To *train* is to direct to a certain result talents already existing. To *discipline* is to train under strict control and restraint. To *nurture* is to foster and *educate* in a less formal manner.

teal (tēl), *n.* a small, wild fresh-water duck.

team (tēm), *n.* two or more horses or other draft animals harnessed to the same vehicle or to a plow; a number of players on a side in an athletic contest, as a baseball *team;* any group with similar interests and aims.

team (tēm), *v.t. and v.i.* to join a group, as to *team* up with one's friends; to move or transport with horses, as to *team* the baggage to the city.

teamwork (tēm′ wûrk), *n.* united effort, efficient co-operation.

tear (tẽr), *n.* a small drop of fluid secreted by the eye.

***tear** (târ), *n.* a rent, as in a fabric or garment.

tear (târ), *v.i. and v.t.* [*p.t.* tore, *p.p.* torn, *pr.p.* tearing] to part on being pulled; to be rent; to pull apart, rend, lacerate; to move with violence, as to *tear* a door off its hinges.

tear gas (tẽr gas), an irritating vapor that causes weeping and is used in war and by the police.

***tease** (tēz), *n.* the act of plaguing someone, a person who likes to torment others.

***tease** (tēz), *v.t.* to irritate and annoy; to ask persistently; to tear apart, to comb, to unravel, as to *tease* wool or cotton fibers.

Syn. Vex, taunt, tantalize, torment. To *tease* can be applied to almost any form of baiting, whether done maliciously or in fun; to *vex* is to annoy with trifles to the point of anger; to *taunt* is to insult, mock, jeer; to *tantalize* is to tease by offering something desirable but keeping it just out of reach; to *torment* is to inflict suffering, as bad boys sometimes *torment* animals.

teasel (tē′ zl), *n.* a plant somewhat like the thistle, with prickly flower heads, used to make a nap on woolen cloth; any instrument resembling the burs of this plant and used to raise a nap.

teaspoon (tē′ spo͞on), *n.* a small spoon for general use at table, holding about one-third as much as a tablespoon.

technical (tek′ ni kal), *adj.* relating to some particular art, science or trade; having to do with the mechanical part of an art or science.

technicality (tek ni kal′ i ti), *n.* [*pl.* technicalities] an exact point in connection with some particular art, science or trade; a very strict and close interpretation of a rule.

***technique** (tek nēk′), *n.* the manner of handling details in the execution or performance of an undertaking, especially in the arts, as the pianist has a fine *technique.*

technology (tek nol′ ō ji), *n.* the science underlying industrial arts; education in the branches of learning useful in manufacture and industry.

***tedious** (tē′ di us), *adj.* wearisome, tiresome; going on drearily.

***tedium** (tē′ di um), *n.* tiresomeness, monotony.

tee (tē), *n.* the mark aimed at in quoits and curling; a small cone of sand or earth from which a ball is driven for the first stroke on each hole of a golf course; the square of turf in which this cone stands: *to a tee,* to an exact or precise point, as that is the situation *to a tee.*

tee (tē), *v.t.* to place a golf ball on a cone of sand or earth before driving it.

teem (tēm), *v.i.* to be prolific; to be full or abundantly stocked, as the river *teems* with fish.

teens (tēnz), *n.* the years of one's age from 13 to 19 inclusive.

teeter (tē′ tẽr), *v.i. and v.t.* to seesaw; to waver precariously; to cause to waver precariously, jiggle, as to *teeter* a board.

***teethe** (tē*th*), *v.i.* to cut teeth.

teething (tē*th*′ ing), *n.* the process of cutting the first set of teeth.

teetotaler (tē tō′ tl ẽr), *n.* one who uses no alcoholic beverage, a total abstainer.

teetotum (tē tō′ tum), *n.* a sort of square-sided top that has figures on the sides and is spun in certain games to determine who wins or loses.

tegmen (teg′ men), *n.* [*pl.* tegmina] a covering; the inner layer of a seed coat.

tegument (teg′ ū ment), *n.* a natural outer covering, as the skin.

telegram (tel′ ē gram), *n.* a message electrically flashed by wire in a code of dots and dashes.

telegraph (tel′ ē grȧf), *n.* a device for sending a message in code of dots and dashes by opening and closing an electric circuit.

telegraph (tel′ ē grȧf), *v.i. and v.t.* to send a message over a wire by opening and closing an electric circuit; to send a message by radio or wireless telegraphy; to send a message to, as to *telegraph* a friend.

***telegrapher** (tē leg′ r*a* fẽr), *n.* one who operates the key opening and closing the electric circuit in sending code messages of dots and dashes over a wire.

***telegraphy** (tē leg′ ra fi), *n.* the use of instruments for sending messages by electricity.

***teleology** (tel ē ol′ ō ji), *n.* the belief that natural phenomena are designed for a specific end: opposed to *mechanism.*

***telepathy** (tē lep′ *a* thi), *n.* communication without words; the transmission of thought from one mind to another without use of anything acting on or through the physical senses; thought transference.

telephone (tel′ ē fōn), *n.* an instrument that reproduces sounds, especially speech, at a distant point by means of electricity.

***telephony** (tē lef′ ō ni), *n.* the art or process of reproducing and transmitting sounds at a distance.

telephotography (tel ē fō tog′ ra fi), *n.* the art of photographing distant objects through a special lens; the transmission of pictures by reproducing them at a distance by telegraph.

telescope (tel′ ē skōp), *n.* an instrument that makes it possible to see objects at great distances, as the farther stars.

***telescope** (tel′ ē skōp), *v.i.* to slip into each other like the separate parts of a telescope; to come together with such force that one body enters another, as cars of a train in a collision, as two cars *telescoped.*

***teletypesetter** (tel′ ē tīp set ẽr), *n.* a device for printing at a distance, the keyboard at one end of the line causing perforations in a tape at the other end, from which linotype machines can be operated.

***teletypewriter** (tel′ e tīp rīt ẽr), *n.* a telegraphic device by which work done on one typewriting machine is simultaneously produced by another.

***television** (tel′ ē vizh un), *n.* the transmission and reproduction of a distant scene by means of electricity and light rays; the device by which this is done.

tell (tel), *v.t.* and *v.i.* [*p.t. and p.p.* told, *pr.p.* telling] to count, as to *tell* beads; to narrate, as to *tell* a story; to inform; to command, as I *told* him to leave; to find out, recognize, decide; to state with emphasis, as I *tell* you I did; to give an account, as he *told* of his war experiences; to have a perceptible effect, as the privation *told* on him.

teller (tel′ ẽr), *n.* one who narrates; a bank clerk who receives, pays out and counts the money banked.

telling (tel′ ing), *adj.* effective, striking.

telltale (tel′ tāl), *n.* a tattler, one who reveals secrets or maliciously reports the wrongdoing of others.

telltale (tel′ tāl), *adj.* revealing; tattling.

***tellurium** (te lū′ ri um), *n.* a rare nonmetallic element related to sulphur and selenium, usually combined with metals.

temerity (tē mer′ i ti), *n.* rashness, boldness, foolhardiness.

temper (tem′ pẽr), *n.* disposition in a general way, as he has a good *temper;* the quality of being easily angered; an angry state, as you are in a *temper;* condition of a metal with regard to toughness, as steel has a stronger *temper* than iron.

temper (tem′ pẽr), *v.t.* to give a mixture the correct degree of consistency; to harden metal; to moderate, as God *tempers* the wind to the shorn lamb.

***temperament** (tem′ pẽr *a* ment), *n.* the mixture of qualities in one's nature; characteristic traits, as he has the artistic *temperament.*

temperamental (tem pẽr a men′ tal), *adj.* excitable, subject to sudden changes of mood.

temperance (tem′ pẽr ans), *n.* moderation, self-control and restraint from overindulgence of any kind.

temperate (tem′ pẽr it), *adj.* moderate, abstemious; mild, calm.

***temperature** (tem′ pẽr a tūr), *n.* the degree of heat or cold as shown by the thermometer; the state of a body as regards heat; a high degree of bodily heat, as in fever, as he has a *temperature.*

***tempest** (tem′ pest), *n.* a violent storm with high winds; tumult.

***tempestuous** (tem pes′ tū us), *adj.* very stormy, violent, agitated, turbulent.

template (tem′ plit), *n.* a pattern or mold used by masons in laying out their work, by potters in shaping pottery and by sculptors for architectural detail; a stone or timber set over a doorway to distribute stresses; a wedge under the keel of a ship while on the ways: also spelled *templet.*

temple (tem′ pl), *n.* a building in which to worship.

temple (tem′ pl), *n.* the flat part on either side of the head above the cheekbones.

***temporal** (tem′ pō ral), *adj.* pertaining to time, especially limited time; worldly, not eternal.

***temporal** (tem′ pō ral), *adj.* belonging to the temples, as the *temporal* artery.

temporary (tem′ pō rer i), *adj.* for the time being, not permanent.

temporize (tem′ pō rīz), *v.i.* to keep putting things off; to refuse to commit oneself; to follow expedient courses.

tempt (tempt), *v.t.* to lure, entice; to try to persuade to do something wrong; to invite indulgence, as that cake *tempts* me.

temptation (temp tā′ shun), *n.* that which lures or entices; the state of being prompted to do wrong things.

ten (ten), *n.* one more than nine; the symbol (10) representing this number.

***tenable** (ten′ *a* bl), *adj.* capable of being held or defended, as either an army or a debater may be in a *tenable* position.

***tenacious** (te nā′ shus), *adj.* holding strongly; adhesive; stubborn.

Syn. Pertinacious. To be *tenacious* is to hold a thing close, refuse to let it go; to be *pertinacious* is to hold out against argument or persuasion.

tenacity (tē nas′ i ti), *n.* the quality of holding firmly, refusing to let go; cohesiveness or adhesiveness.

tenancy (ten′ an si), *n.* [*pl.* tenancies] the state of occupying a rented house or building or using rented land; the period of such occupation or use.

tenant (ten′ ant), *n.* one who rents and occupies a house; one who rents buildings or lands from the owner.

tend (tend), *v.i. and v.t.* to have a leaning toward, as the court *tends* to leniency; to have an aptitude for, as he *tends* toward mechanical work; to move in a certain direction, as here the river *tends* west; to care for; to watch over; to keep in operation, as he *tends* the furnace.

tendency (ten′ den si), *n.* [*pl.* tendencies] inclination, drift or general trend, as an increasing national *tendency* to participate in deciding important political questions; natural bent, as a studious *tendency.*

tender (ten′ dẽr), *n.* a ship carrying supplies for other ships; a car attached to a locomotive carrying fuel and water; a small boat used for communication between ship and shore.

tender (ten′ dẽr), *n.* an offer, as I accept your *tender* of assistance; that which may be offered in payment of debt, as legal *tender.*

tender (ten′ dẽr), *v.t.* to offer, as to *tender* advice, assistance or money.

tender (ten′ dẽr), *adj.* readily cut or chewed, as *tender* meat; sensitive, as a *tender* skin; sympathetic, as a *tender* heart; gentle; youthful, as a boy of *tender* years.

tenderfoot (ten′ dẽr foot), *n.* [*pl.* tenderfeet] one new to a place and unaccustomed to its ways, especially in a western mining camp or on a ranch; a Boy Scout of the lowest grade, second-class scout and first-class scout being the higher classes.

tenderloin (ten′ dẽr loin), *n.* an especially juicy cut of beef.

tendon (ten′ dun), *n.* the tough cord of fibrous tissue that connects the end of a muscle to the bone.

tendril (ten′ dril), *n.* the slender, twining part of a climbing plant with which it grips a surface or support.

tenement (ten′ ē ment), *n.* any house, building, shop or land rented by a tenant.

tenement house (ten′ ē ment hous), a building in which many families live, especially one in which families of limited means are crowded into inadequate space.

***tenet** (ten′ et), *n.* a doctrine or belief held by a group of persons or an individual.

Syn. Position. The *tenet* is that to which we hold in our own minds; the *position* is our presentation of beliefs to others.

tenfold (ten′ fōld), *adj.* 10 times as much.

tenfold (ten′ fōld), *adv.* 10 times as many; having 10 parts.

tennis (ten′ is) *n.* a game played on a marked court by striking a ball across a net with rackets; the older game of *court tennis, squash* or *rackets,* in which the ball is struck against a court wall.

***tenon** (ten′ un), *n.* the end of a timber cut to fit into a mortise on another timber.

tenon (ten′ un), *v.t.* to join timbers by means of mortise and tenon.

***tenor** (ten′ ẽr), *n.* the general tendency or drift of anything, especially talk or writing; the highest male voice; one who has such a voice.

tenpins (ten′ pinz), *n.* a game played with ten wooden pins, usually set up in triangular formation, at the end of a bowling alley.

tense (tens), *n.* the change in form of a verb to indicate time of action.

tense (tens), *adj.* drawn tightly; eagerly attentive; strained, as a *tense* situation.

tension (ten′ shun), *n.* the act of stretching tight or state of being stretched tight; stress of a pulling force on a body; mental or nervous strain.

tent (tent), *n.* a shelter, usually of canvas, supported by poles and ropes.

tentacle (ten′ ta kl), *n.* a part of certain invertebrate creatures with which they feel their way or seek food.

tentative (ten′ ta tiv), *adj.* experimental, provisional, on trial, as a *tentative* offer or measure.

tenter (ten′ tẽr), *n.* a frame for stretching cloth.

tenter (ten′ tẽr), *v.t.* to stretch on a frame, especially for drying without losing shape.

tenterhook (ten′ tẽr hook), *n.* a pin on a stretching frame to hold cloth: *on tenter hooks,* anxious, in suspense, under great nervous strain.

tenth (tenth), *n.* one of 10 equal parts.

tenth (tenth), *adj.* next in order after the ninth.

tenuous (ten′ ū us), *adj.* slender, thin; not dense; weak, unformed, as a *tenuous* idea.

***tenure** (ten′ ūr), *n.* the conditions under which rented property is held; holding, as of lands or office; the period of such holding.

tepee (tē′ pē), *n.* a tent shaped like a cone and used by the American Indians.

***tepid** (tep′ id), *adj.* lukewarm, as *tepid* water.

***tercentenary** (tûr sen′ tē ner i), *n.* [*pl.* tercentenaries] the 300th anniversary.

terebinth (ter′ ē binth), *n.* a small tree of the Old World yielding a fine grade of turpentine.

***tergiversation** (tûr ji vẽr sā′ shun), *n.* evasion, subterfuge; changeable conduct.

term (tûrm), *n.* a limit or boundary; a fixed period of time, as a school *term;* a word or expression naming something definitely.

term (tûrm), *v.t.* to designate, name, describe in a word, as I *term* his conduct disgraceful.

terms (tûrmz), *n.* the conditions of an agreement; an agreement, as they came to *terms.*

***termagant** (tûr′ ma gant), *n.* a noisy, scolding woman.

terminal (tûr′ mi nal), *n.* the end of a line, as a railroad *terminal,* an electric *terminal.*

terminal (tûr′ mi nal), *adj.* relating to the end of something.

terminate (tûr′ mi nāt), *v.i. and v.t.* to come to an end; to bring to an end.

termination (tûr mi nā′ shun), *n.* the act of ending; place of ending.

terminology (tûr mi nol′ ō ji), *n.* [*pl.* terminologies] the special words or forms of expression used in any particular science, industry or field of knowledge.

terminus (tûr′ mi nus), *n.* [*pl.* terminuses] a limit or boundary; the end of a railroad, with a main station.

ternary (tûr′ n*a* ri), *adj.* coming in threes.

***terrace** (ter′ is), *n.* a raised level space; a sloping surface of ground between two levels.

terra cotta (ter′ *a* kot′ *a*), a composition of fine clay and sand used in pottery.

terrestrial (te res′ tri al), *adj.* pertaining to the earth; living on land.

terret (ter′ et), *n.* one of the two rings on a harness pad through which the reins pass.

***terrible** (ter′ i bl), *adj.* exciting fear or awe, appalling, dreadful.

terrier (ter′ i ẽr), *n.* a breed of small dogs originally trained to hunt animals that burrow in the ground.

terrific (te rif′ ik), *adj.* fearful, dreadful, terrible, appalling.

terrify (ter′ i fī), *v.t.* [*p.t. and p.p.* terrified, *pr.p.* terrifying] to frighten or alarm exceedingly.

territory (ter′ i tō ri), *n.* [*pl.* territories] the extent of land over which a government or ruler has control; a large tract of land.

terror (ter′ ẽr), *n.* extreme fear; one who or that which excites dread; a period of great fear, as the *Terror* in the French Revolution.

terry (ter′ i), *n.* a fabric, especially cotton, with uncut loops in the weave, used for towels and beach robes.

terse (tûrs), *adj.* concise, as *terse* speech; written simply, directly and with point, as a *terse* essay.

tertian (ter′ shan), *adj.* recurring every third day, as a *tertian* fever.

***tertiary** (tur′ shi er i), *adj.* third in order of occurrence or importance.

tesselate (tes′ e lāt), *v.t.* to lay, as a floor, with squares or in a checkered pattern; to decorate with mosaic work.

test (test), *n.* that by which the nature or quality of anything is tried; a trial that shows what one knows or can do, as a *test* in mathematics; analysis to show the elements of which a substance is composed; a substance employed to show the presence of an ingredient in a compound, as litmus is a test for acids.

test (test), *v.t.* to put to the proof; to apply in order to determine whether right or wrong, as to *test* a theory by putting it in practice; to measure capacity or ability through experiment or examination.

testament (tes′ t*a* ment), *n.* a will; a covenant; the old or new covenant of the Christian Bible, as the Old and New *Testaments*.

testamentary (tes t*a* men′ t*a* ri), *adj.* pertaining to a will; set forth in a will.

testate (tes′ tāt), *adj.* having left a will, as he died *testate*.

testator (tes tā′ tẽr), *n.* one who makes and leaves a will.

testify (tes′ ti fī), *v.i. and v.t.* [*p.t. and p.p.* testified, *pr.p.* testifying] to bear witness; to state as evidence.

testimonial (tes ti mō′ ni al), *n.* a formal token of esteem; a written and signed recommendation.

testimonial (tes ti mō′ ni al), *adj.* pertaining to the giving of evidence.

testimony (tes′ ti mō ni), *n.* [*pl.* testimonies] presentation of evidence; things stated before a court as bearing upon a case under trial.

Syn. Affidavit, affirmation, deposition, evidence, proof, witness. *Testimony,* in legal as well as in common use, signifies the statements of witnesses; *deposition* and *affidavit* denote the presentation of evidence in writing; the *affidavit* is offered voluntarily and without cross-examination; the *deposition* is made under questioning.

testy (tes′ ti), *adj.* [*comp.* testier, *superl.* testiest] peevish, irritable.

***tetanus** (tet′ *a* nus), *n.* an exceedingly painful and frequently fatal infectious disease with spasmodic tension of the muscles: called *lockjaw* when limited to the muscles of the lower jaw.

***tête-à-tête** (tāt *a* tāt), *n.* a private conversation between two persons; a kind of settee that is arranged in an S-curve so as to seat two persons face to face.

tether (teth′ ẽr), *n.* a rope confining an animal as a horse to a certain space; scope, range of resources, as he is at the end of his *tether*.

***tetragon** (tet′ r*a* gon), *n.* a plane figure with four sides.

***tetrameter** (te tram′ ē tẽr), *n.* a line of verse consisting of four measures; verse written in such a meter.

***tetrarch** (tē′ trärk), *n.* a Roman governor ruling a fourth part of a province; a subordinate ruler.

tetter (tet′ ẽr), *n.* any of various skin diseases marked by itching, as eczema, ringworm and herpes.

text (tekst), *n.* a topic or theme; a verse of the Bible from which a sermon is preached; the main body of print on a page, as distinguished from notes, pictures, and other added matter; a version of a book or story, as the text differs in the two editions.

textbook (tekst′ book), *n.* a volume used in schools as a basis for instruction in a given subject.

***textile** (teks′ til), *n.* a woven fabric; cotton, linen, jute, rayon or woolen cloth of any kind.

textile (teks′ til), *adj.* capable of being woven; formed by weaving; pertaining to weaving, as *textile* machinery.

***textual** (teks′ tū al), *adj.* relating to a topic; found in or relating to the main body of a book or essay.

texture (teks′ tūr), *n.* the quality given to woven cloth by the way the threads are set, as this piece of goods has a firm *texture;* the manner in which particles are combined or arranged in a substance, as the *texture* of a piece of wood.

***than** (*th*an), *conj.* compared with, as no sooner said *than* done, this is better *than* that; except, as no other *than* yourself.

thane (thān), *n.* an attendant of an Anglo-Saxon lord, ranking above a freeman, owning land and doing military service to his lord.

thank (thangk), *v.t.* to express gratitude to.

thankful (thangk′ fool), *adj.* grateful, appreciative.

thankfulness (thangk′ fool nes), *n.* gratitude, appreciation for kindness done or service rendered.

Syn. Gratitude. Our *thankfulness* is measured by our words; our *gratitude* is demonstrated by our actions. A person may make a great show of *thankfulness,* and later indicate that he had no real *gratitude.*

thankless (thangk′ les), *adj.* ungrateful; unappreciative.

thanks (thangks), *n.* an expression of gratitude; owing to, as *thanks* to your support, we made good.

***thanksgiving** (thangks giv′ ing), *n.* the expression of gratefulness: *Thanksgiving Day,* the day set aside each year for praising God for His mercies.

that (*th*at), *demonstrative pron.* the person or thing mentioned or understood in a given situation, as *that* is the man, *that* is what I want.

that (*th*at), *relative pron.* [*pl.* those] the individual or object referred to, as the man *that* spoke, the book *that* is last on the shelf.

that (*th*at), *adj.* pointed out, as I want *that* book.

that (*th*at), *adv.* so; to such extent, as I cannot be ready *that* soon.

that (*th*at), *conj.* the fact, as I notice *that* he did not do it; I warn you *that* you may be late; for the purpose of, as eat *that* you may live; with the result, as so tired *that* I must sleep; because, as joy *that* he had won.

thatch (thach), *n.* a thick covering of reeds or straw on a stack or roof; anything compared to it, as a thick *thatch* of hair on one's head.

***thatch** (thach), *v.t.* to cover, as a roof, with straw or reeds.

***thaumaturgy** (thô′ m*a* tûr ji), *n.* the act of performing pretended miracles, magic.

thaw (thô), *n.* the melting of ice and snow as the weather grows warmer.

thaw (thô), *v.i. and v.t.* to melt, to turn to water, as ice and snow on a warm day; to become more affable, unbend; to clear of ice by applying heat, as to *thaw* frozen water pipes.

***theater, theatre** (thē′ *a* tẽr), *n.* a public building where plays are performed; a place resembling a theater with stage and seats, as the operating *theater* in a hospital; a scene of great and spectacular action, as the *theater* of war; the drama.

theatrical (thē at′ ri kal), *adj.* resembling the manner of actors, stagy; of or pertaining to the theater, as *theatrical* costumes.

theft (theft), *n.* the act of stealing, robbery; that which is stolen.

theism (thē′ izm), *n.* belief in a personal God or gods.

their (*th*âr), *possessive adj.* of or belonging to them, as *their* home.

theirs (*th*ârz), *possessive pron.* belonging to them, as the car is *theirs.*

theme (thēm), *n.* the subject of a discourse or essay; a short essay.

themselves (*th*em selvz′), *pron.* an emphatic form of they and reflexive form of them, as they *themselves* chose the play so they had no one but *themselves* to blame; plural form of *himself, herself* and *itself.*

then (*th*en), *n.* a certain time, as by *then* there was nothing left.

then (*th*en), *adj.* being at a given time, as the *then* governor.

then (*th*en), *adv.* at that time, as I was *then* away from home; next in order of time.

then (*th*en), *conj.* in that case; therefore, as *then* I must refuse.

***theocracy** (thē ok′ r*a* si), *n.* [*pl.* theocracies] a government by churchmen or priests as the representatives of God, as early Israel was a *theocracy.*

theology (thē ol′ ō ji), *n.* [*pl.* theologies] the study of the existence, nature and laws of God.

theorem (thē′ ō rem), *n.* a proposition in geometry to be proved; a demonstrated proposition in mathematics.

theoretical (thē ō ret′ i kal), *adj.* based upon a belief but not proved or put into practice.

theorize (thē′ ō rīz), *v.i.* to speculate about things without testing the resultant beliefs in practice.

theory (thē′ ō ri), *n.* [*pl.* theories] a belief not yet tested in practice; the general principles on which a science is based and built up; a hypothesis; something assumed as a starting point for scientific investigation.

***theosophy** (thē os′ ō fi), *n.* [*pl.* theosophies] any of various systems of philosophy or theology claiming to receive knowledge of God by special mystical revelation.

therapeutic (ther *a* pū′ tik), *adj.* possessing healing power or qualities.

***therapeutics** (ther a pū′ tiks), *n.* the art or science of curing disease; the science of remedies.

***there** (*th*âr), *adv.* in that place, not here, as I was *there* at the time; introducing a sentence or clause when the verb precedes the subject, as *there* was once a princess.

there (*th*âr), *interj.* so, as *there,* you have broken it.

thereafter (*th*âr ȧf′ tẽr), *adv.* after that; consequently.

thereby (*th*âr bī′), *adv.* by that means; in connection with that.

therefor (*th*âr fôr′), *adv.* for it or for that.

***therefore** (*th*âr′ fōr), *adv.* for that reason, as a result.

therein (*th*âr in′), *adv.* in or into that place, time or thing; in that respect.

thereof (*th*âr ov′), *adv.* of it or of that, as the tree and the fruit *thereof.*

thereupon (*th*âr u pon′), *adv.* upon that; therefore; thereafter.

therewith (*th*âr wi*th*′), with that.

thermal (thûr′ mal), *adj.* pertaining to heat; having heat, warm.

***thermometer** (thẽr mom′ ē tẽr), *n.* an instrument for measuring the degree of heat, commonly through a column of colored mercury expanding or contracting in a glass tube with a scale marked beside it.

***thermostat** (thûr′ mō stat), *n.* an automatic apparatus for controlling the amount of heat given by a furnace or oven; a self-operating temperature regulator.

***thesaurus** (thē sô′ rus), *n.* [*pl.* thesauri] a storehouse or treasury; a book with a treasure of information, especially as to words and their uses; a cyclopedia.

these (*th*ēz), *pron. pl.* plural of *this.*

thesis (thē′ sis), *n.* [*pl.* theses] a proposition to be maintained by the person who advances it; a long essay, especially by a candidate for a university degree.

thew (thū), *n.* a muscle, sinew.

thews (thūz), *n.* bodily strength, muscular power.

they (*th*ā), *personal pron. pl.* of *he, she* or *it.*

thick (thik), *n.* the part measuring most from side to side or around, as the *thick* of one's leg; the densest part or scene of greatest activity, as the *thick* of night, the *thick* of the battle.

thick (thik), *adj.* having the third dimension great in proportion to length and width; relatively deep from one surface to the other, as a *thick* plank; dense, as a *thick* liquid, a *thick* growth of weeds; dull-witted.

thick (thik), *adv.* densely, as bread spread *thick* with jam.

thicken (thik′ en), *v.t. and v.i.* to give more substance to, as to *thicken* soup; to grow more dense, as the clouds *thickened;* to become increasingly complicated, as the plot *thickens.*

thickening (thik′ en ing), *n.* something added to a liquid to make it less fluid, as flour or cornstarch to a custard; an increase in thickness, as thickening of the arteries in old age.

thicket (thik′ et), *n.* a dense growth of underbrush or small trees.

thickly (thik′ li), *adv.* compactly, densely; in husky or guttural tones, as he spoke *thickly.*

thickset (thik set′), *adj.* having a short, solid body; stocky; closely planted.

thief (thēf), *n.* [*pl.* thieves] one who steals.

thieve (thēv), *v.i. and v.t.* to steal.

thievery (thēv′ er i), *n.* [*pl.* thieveries] the practice of stealing.

thigh (thī), *n.* the upper part of the leg from knee to hip.

thill (thil), *n.* a wagon shaft; one of the two wooden pieces between which a horse it hitched to a wagon.

thimble (thim′ bl), *n.* a metal cover to protect the end of a finger in sewing.

thin (thin), *adj.* having little thickness in proportion to length and breadth; slim, slender; lacking in substance, as a *thin* sheet of metal, *thin* soup; lightweight, filmy, as *thin* material; slight, as a *thin* excuse.

thin (thin), *v.i. and v.t.* to become or make less thick; to make less dense, as to *thin* the paint.

thine (*th*īn), *pron.* possessive form of *thou.*

thing (thing), *n.* any individual object; any separate and distinct object of thought; a special condition or circumstance, as the *thing* did not happen again: *things,* wraps, as put on your *things;* possessions, baggage, circumstances, as *things* look more hopeful.

think (thingk), *v.t. and v.i.* [*p.t. and p.p.* thought, *pr.p.* thinking] to form a conception of, imagine; to form a judgment or estimate of, to believe as likely, as I *think* the weather will be fair; to study, analyze, meditate upon, as I *thought* the problem through; to concentrate the thoughts upon, as he *thinks* boats; to use judgment, reason, imagination as opposed to mere sense perception; to reflect, muse; to become aware of, remember, as suddenly I *thought* of my keys; to hold an opinion, as I *think* we will not have war; to intend, as I *thought* of going.

Syn. Cogitate, contemplate, muse, imagine, suppose, believe. To *think* is a general term referring to any mental effort; to *cogitate* usually implies a problem to be solved or a plan to be made; to *contemplate* is to consider or meditate upon, as to *contemplate* a change of residence; to *muse* is to reflect or ponder with absorption and sometimes to dream; to *imagine* is to picture to oneself; to *suppose* is to think probable; to *believe* is to accept as true.

third (thûrd), *n.* one of three equal parts; the one next after the second.

third (thûrd), *adj.* next after the second.

thirdly (thûrd′ li), *adv.* in the third place.

***thirst** (thûrst), *n.* the sensation of need for water; desire to drink; strong desire for anything, as a *thirst* for learning.

thirsty (thûrs′ ti), *adj.* [*comp.* thirstier, *superl.* thirstiest] having a feeling of dryness in mouth and throat; parched.

***thirteen** (thûr tēn′) *n.* one more than 12; a symbol (13) denoting that number.

thirteenth (thûr tēnth′), *n.* one of 13 equal parts; the next one after the 12th.

thirtieth (thûr′ ti eth), *n.* one of 30 equal parts; one more than the 29th.

thirty (thûr′ ti), *n.* one more than 29; a symbol (30) denoting that number.

this (*th*is), *demonstrative pron.* that which is at hand or near in locality, time or thought, as *this* is the house; *this* is the year; *this* is the plan: plural is *these.*

this (*th*is), *adj.* designating that which is at hand or near in time or space; indicating a special person or thing, as *this* book will give you the information you wish; a person or thing just indicated, as *this* man is the one whom I just mentioned.

thistle (this′ l), *n.* a plant with prickly leaves and flower heads.

thither (thi*th*′ ẽr), *adv.* to that place, as we went *thither.*

thole (thōl), *n.* a pin set in the gunwale of a boat as a brace or fulcrum for an oar in rowing.

***thong** (thông), *n.* a thin leather strap or cord, a whiplash.

thoracic (thō ras′ ik), *adj.* pertaining to the chest.

thorax (thō′ raks), *n.* [*pl.* thoraxes or thoraces] the chest, the part of the body between the neck and the abdomen, enclosed by the ribs and containing the heart and lungs.

***thorn** (thôrn), *n.* a prickle or spine on a stem or branch; a shrub with spiny stems; a source of distress, as his actions are a *thorn* in my side.

thorny (thôr′ ni), *adj.* [*comp.* thornier, *superl.* thorniest] having sharp spines on the stems or branches; full of hardships, distressing.

***thorough** (thûr′ ō), *adj.* painstaking, complete, overlooking no detail.

thoroughbred (thûr′ ō bred), *n.* an animal descended from the purest stock; a person of fine background with courage and aristocratic ways.

thoroughbred (thûr′ ō bred), *adj.* descended from the finest stock; courageous and elegant.

thoroughfare (thûr′ ō fâr), *n.* a passage open at both ends; a navigable channel; a waterway connecting two lakes; a main street or road.

thou (*th*ou), *pron.* [*pl.* ye or you] the personal pronoun of the second person singular, now superseded by the word *you.*

though (*th*ō), *adv.* however, nevertheless.

though (*th*ō), *conj.* supposing that, notwithstanding.

thought (thôt), *n.* something held in the mind; the process of reasoning; meditation; study.

thoughtful (thôt′ fool), *adj.* contemplative; solicitous for the welfare of others, considerate.

thoughtless (thôt′ les), *adj.* heedless, inconsiderate.

***thousand** (thou′ zand), *n.* one more than 999; a large number, as *thousands* will use this book.

***thousandth** (thou′ zandth), *n.* one of 1,000 equal parts; the one after the 999th.

thraldom (thrôl′ dum), *n.* a state of slavery, bondage.

thrall (thrôl), *n.* a slave or serf; bondage, as in *thrall.*

***thrash** (thrash), *v.i. and v.t.* to throw oneself about, as I *thrash* in my sleep; to beat; to thresh or flail, as grain; to argue, as we must *thrash* out this matter.

thrashing (thrash′ ing), *n.* a beating.

***thread** (thred), *n.* a very thin cord; a filament or fiber; the spiral ridge of a screw or bolt; anything likened to a string because it is continuous, as the *thread* of a discourse.

thread (thred), *v.i. and v.t.* to make one's way windingly, as we must *thread* through the crowd; to put a filament through the eye of, as to *thread* a needle; to put on a string, as to *thread* beads.

threadbare (thred′ bâr), *adj.* worn, having lost the nap, shabby; trite, hackneyed.

threat (thret), *n.* a menace; an expressed intention to injure.

threaten (thret′ n), *v.i. and v.t.* to give evidence of impending evil or danger, as the skies *threatened;* to give notice of intended reprisal or injury to, as to *threaten* a person.

three (thrē), *n.* one more than two; a symbol (3) denoting that number.

***threnody** (thren′ ō di), *n.* [*pl.* threnodies] a dirge.

***thresh** (thresh), *v.i. and v.t.* to beat grain with a flail or separate the grain from the chaff by means of machinery; to toss about; to thrash, as grain; to go over repeatedly, as to *thresh* out a matter under discussion.

***threshold** (thresh′ ōld), *n.* a doorsill, an entrance; a starting point, as we stand at the *threshold* of a great era.

thrice (thrīs), *adv.* three times; in a threefold manner.

thrift (thrift), *n.* frugality, economical management; strong growth, as of a plant.

thrifty (thrif′ ti), *adj.* [*comp.* thriftier, *superl.* thriftiest] frugal, economical, careful in management.

thrill (thril), *n.* a wave of emotion, a tremor of feeling.

thrill (thril), *v.i. and v.t.* to tingle with sensation or feeling, as I *thrilled* at sight of the flag; to cause to feel a tremor of excitement or emotion, as the sight of the flag *thrilled* me.

thrive (thrīv), *v.i.* [*p.t.* throve or thrived, *p.p.* thriven or thrived, *pr.p.* thriving] to prosper, flourish, grow vigorously, as celery *thrives* in that sort of soil.

***throat** (thrōt), *n.* the esophagus; the passage for food through the neck; the front part of the neck, containing the tonsils, vocal cords, windpipe and gullet.

throaty (thrōt′ i), *adj.* [*comp.* throatier, *superl.* throatiest] guttural.

throb (throb), *n.* a strong pulsation, a beat like that of the heart; a thrill.

throb (throb), *v.i.* to pulsate, beat like the heart; to thrill with emotion.

throe (thrō), *n.* a pang, a stab of pain, agony; great distress of mind.

throne (thrōn), *n.* a royal chair of state; kingly power.

***throng** (thrông), *n.* a multitude, a dense crowd.

throng (thrông), *v.i. and v.t.* to gather in multitudes; to crowd together, fill with people, as to *throng* the streets.

***throttle** (throt′ l), *n.* a lever operating a valve that closes the steam feed of an engine; the windpipe.

***throttle** (throt′ l), *v.t.* to choke, as by squeezing the windpipe; to shut off power, as to *throttle* an engine.

***through** (thrōō), *prep.* from end to end of, as *through* a tunnel; from one side to the other side of, as to stick a pin *through* cloth; by means of, as I succeeded *through* your help; over the whole extent of, as to read *through* a book; during, as *through* the week.

through (thrōō), *adj.* going all the way from one point to another without stop, as a *through* train.

through (thrōō), *adv.* from one end to the other, as he read the book *through;* from one side to the other, as come *through* at this gate.

throughout (thrōō out′), *prep.* in every part of, as *throughout* the argument.

throughout (thrōō out′), *adv.* in all respects, in every part, as the novel is interesting *throughout.*

throw (thrō), *n.* the act of hurling or flinging; the distance to which a thing is hurled or flung, as that was a long *throw.*

throw (thrō), *v.t.* [*p.t.* threw, *p.p.* thrown, *pr.p.* throwing] to hurl or fling; to put down, as in wrestling; to unseat, as the horse *threw* its rider.

throwback (thrō′ bak), *n.* reversion to an earlier type in race or ancestry; introduction between scenes in a motion picture of scenes from an earlier time.

thrum (thrum), *n.* a monotonous humming, strumming or tapping.

thrum (thrum), *v.i. and v.t.* to finger a stringed instrument without formal musical expression, to strum.

thrums (thrumz), *n. pl.* loose, coarse yarn waste.

*__thrush__ (thrush), *n.* any of numerous small songbirds having a brown back and brown-spotted white breast, as the song *thrush,* hermit *thrush,* wood *thrush.*

thrust (thrust), *n.* a sudden forward movement, such as the plunge of a spear or a sharp advance movement of troops; a stress in a structure tending to force parts out of place, as the *thrust* of a beam.

thrust (thrust), *v.i. and v.t.* [*p.t. and p.p.* thrust, *pr.p.* thrusting] to push forward sharply; to jab or stab, pierce.

thud (thud), *n.* a dull sound caused by a blow upon or with a yielding substance, as the *thud* of practice on a punching bag, the *thud* of a body falling on the floor.

thug (thug), *n.* a cutthroat, a ruffian.

thumb (thum), *n.* the shortest and thickest digit of the human hand; the part of a glove or mitten that covers this digit.

thumb (thum), *v.t.* to handle awkwardly; to soil by handling; to turn rapidly with the thumb, as to *thumb* the pages of a book.

thumbscrew (thum′ skro͞o), *n.* an ancient instrument of torture in which the thumbs of the victim were twisted; a screw with a wide flat head that can be turned by hand.

thump (thump), *n.* a heavy blow; a blow that makes a dull sound.

thump (thump), *v.i. and v.t.* to throb heavily, as my heart *thumps;* to strike with a dull heavy blow; to make the sound of such a blow.

thunder (thun′ dẽr), *n.* the resounding noise caused by the sudden air expansion that accompanies a flash of lightning; the boom of cannon.

thunder (thun′ dẽr), *v.i. and v.t.* to produce a roar or boom like that of the clouds when lightning flashes; to utter in a loud, imperative or threatening tone.

thunderbolt (thun′ dẽr bōlt), *n.* an electric discharge, as lightning with thunder; anything swift, sudden and effective or destructive.

thunderstruck (thun′ dẽr struk), *adj.* amazed, astounded.

thurible (thū′ ri bl), *n.* a censer used at Mass.

thurifer (thū′ ri fẽr), *n.* a priest's attendant who carries the censer at Mass.

thus (*th*us), *adv.* in this or that manner, as do it *thus;* to this extent, so; consequently, hence.

*__thwack__ (thwak), *n.* a blow with some flat instrument.

thwack (thwak), *v.t.* to strike with something flat and heavy.

thwart (thwôrt), *n.* a seat in a boat extending from side to side.

thwart (thwôrt), *v.t.* to oppose, run counter to, frustrate.

thy (*th*ī), *adj.* [possessive singular of *thou*] belonging to thee, your.

*__thyme__ (tīm), *n.* a common aromatic herb used as seasoning.

thymus (thī′ mus), *n.* a gland of the throat that disappears entirely or largely in adult human beings; the corresponding gland in lambs and calves, called neck- or throat-sweetbread when it is used for food.

thyself (*th*ī self′), *pron.* [reflexive or emphatic form of *thy*] yourself.

tiara (tē är′ *a*), *n.* the triple crown worn by the Pope; a coronet or crownlike headdress.

tibia (tib′ i *a*), *n.* the inner and larger of the two bones of the leg below the knee, the shinbone.

tic (tik), *n.* a twitching of the muscles, especially of the face.

tick (tik), *n.* a small, bloodsucking insect that gets on the skin of animals, as a sheep tick; any of numerous tiny blood-sucking spiders that get on the skin of man and other animals.

tick (tik), *n.* the stout covering of a mattress or pillow.

tick (tik), *n.* a light, repeated sound; like that of a running clock.

tick (tik), *v.i. and v.t.* to make a light, repeated, regular sound, as a running watch or clock; to measure with light, repeated, regular sounds, as a clock *ticks* the hours.

ticker (tik′ ẽr), *n.* a device that prints news or stock-market quotations on a long strip of paper telegraphically.

ticket (tik′ et), *n.* a card showing that the bearer is entitled to something, as admittance to a public performance; a political party's list of candidates, as this is the party *ticket;* a card or slip of paper containing a notice; a tag, a label.

ticket (tik′ et), *v.t.* to attach a label to.

ticking (tik′ ing), *n.* stout fabric used for making mattresses and pillows.

*__tickle__ (tik′ l), *v.t.* to touch lightly so as to produce a nervous reaction, usually laughter; to amuse in a light, pleasant way, as this letter *tickles* me.

ticklish (tik′ lish), *adj.* sensitive to light touches; precarious, difficult, as this is a *ticklish* job.

*__tidal__ (tīd′ al), *adj.* flowing and ebbing, as *tidal* waters; affected by tides, as a *tidal* river.

tidbit (tid′ bit), *n.* a choice morsel, a titbit.

tide (tīd), *n.* the alternate rise and fall of the sea along a coast; the rise and fall of events; a period of time, a season, as Yule*tide*, noon*tide*, even*tide*.

tide (tīd), *v.t.* to cause to float with a high tide, as to *tide* a stranded vessel; to carry along in time of trouble as if on a *tide,* as this will *tide* you over.

tidewater (tīd′ wô tẽr), *n.* rivers into which the sea tides enter; the land as far back as the tides enter.

tidings (tī′ dingz), *n. pl.* news.

tidy (tī′ di), *adj.* [*comp.* tidier, *superl.* tidiest] neat, orderly, as a tidy room; moderately large, as a *tidy* inheritance.

tidy (tī′ di), *n.* [*pl.* tidies] a light ornamental covering for the back or arms of a chair.

tidy (tī′ di), *v.t.* [*p.t. and p.p.* tidied, *pr.p.* tidying] to make neat, set in order.

tie (tī), *n.* a knot or fastening; something to be knotted, as a neck*tie* or a shoelace; an even score in a contest, as the game was a *tie;* a timber laid crosswise to support a structure, as a railroad *tie;* a legal obligation; a bond as of affection, duty or interest.

tie (tī), *v.i. and v.t.* to form a knot; to come to an equal score; to fasten with a knot; to attach, as friendship *ties* me to you; to restrict or limit.

tier (tēr), *n.* one row in a series of rising banks or terraces, as a *tier* of seats in a stadium.

tiff (tif), *n.* a slight quarrel; a peevish burst of temper.

*__tiger__ (tī′ gẽr), *n.* a large fierce flesh-eating animal of the cat family with striped sleek coat.

tight (tīt), *adj.* taut, not loose; fastened, held or tied securely; close-fitting, as a *tight* shoe; so closely built as to be impervious to water, as a *tight* roof, a *tight* boat.

tigress (tī′ gres), *n.* a female tiger.

tile (tīl), *n.* a thin piece of baked clay used as roofing; a hollow block of baked clay used in making inner walls; a short section of earthen pipe used in drainage.

tile (tīl), *v.t.* to cover, as a floor or roof, with blocks or slabs of baked clay.

till (til), *n.* a money drawer.

till (til), *v.t.* to prepare land for the planting of seed, cultivate.

till (til), *prep.* to the time of, as *till* next year.

till (til), *conj.* to a certain time, as do not start work *till* I give you the order.

tillage (til′ ij), *n.* cultivation of land; land under cultivation.

tiller (til′ ẽr), *n.* one who cultivates the land; a lever to turn the rudder of a vessel.

tilt (tilt), *n.* a slope or slant, an incline; a duel with lances; a thrust of a lance.

tilt (tilt), *v.i. and v.t.* to tip sidewise; to engage in a combat with lances; to slant by raising one end, as to *tilt* a board.

timber (tim′ bẽr), *n.* wood suitable for building, either in the tree or dressed and cut; a heavy piece of wood, as a beam or joist.

*__timbre__ (tim′ bẽr), *n.* quality of musical sound, tone color.

time (tīm), *n.* the measure of duration; an age or period of history; a moment or date fixed for an event, as it is *time* to go; a period characterized by some special quality or experience, as I am having a hard *time;* instance of repetition or multiplication, as I called you three *times,* 2 *times* 2 are 4; a system for identifying the moment, as solar *time* or standard *time;* the metrical arrangement of notes in music, rhythm, as three-four *time.*

Syn. Age, date, duration, epoch, era, period, season, succession. *Succession* applies to events regarded as following one another *Time* and *duration* denote something conceived of as enduring while events take place and acts are done. We can speak of infinite *duration,* but *time* is commonly contrasted with eternity.

time (tīm), *v.t.* to record the duration or speed of, as to *time* a race; to adapt or arrange to the moment, schedule, as to *time* a visit; to regulate, as a watch; to set the beat for, as to *time* an orchestra.

timeless (tīm′ les), *adj.* eternal.

timely (tīm′ li), *adj.* [*comp.* timelier, *superl.* timeliest] opportune.

timid (tim′ id), *adj.* lacking courage, fainthearted, fearful.

timorous (tim′ ẽr us), *adj.* fearful of danger; indicating fear, as a *timorous* voice.

timothy (tim′ ō thi), *n.* a tall, valuable grass grown for hay.

timpano (tim′ p*a* nō), *n.* [*pl.* timpani] a kettledrum; a percussion instrument in the orchestra: sometimes *tympano, tympani.*

tin (tin), *n.* a silver-white, soft metal easily rolled out and melted; a vessel or implement made of this metal or coated with it, especially a can to hold preserved foods.

tin (tin), *v.t.* to put in cans to preserve, as food.

*__tincture__ (tingk′ tūr), *n.* a medicinal substance dissolved in alcohol; a tinge, a small amount.

tincture (tingk′ tūr), *v.t.* to impart a shade of color to, tinge; to flavor lightly.

tinder (tin′ dẽr), *n.* any material that will ignite from a spark, formerly used in starting fires with a spark struck by steel on flint.

tine (tīn), *n.* a spike, as of a pitchfork; a prong, as of a table fork or a deer's antler.

tin foil (tin foil), tin or an alloy of it rolled into very thin sheets and used for airtight wrapping and in electrical work.

tinge (tinj), *n.* a slight degree of some color or flavor imparted to a substance.

tinge (tinj), *v.t.* to color lightly; to add a slight flavor to.

tingle (ting′ gl), *n.* a prickly or tingling sensation.

tingle (ting′ gl), *v.i.* to feel a prickly or stinging sensation, as my ears *tingle.*

tinker (tingk′ ẽr), *n.* one who mends pots and pans.

tinker (tingk′ ẽr), *v.i. and v.t.* to work as a pot and kettle mender; to work in a bungling way; to mend, especially botchily.

tinkle (ting′ kl), *n.* a small, sharp ringing sound.

tinkle (ting′ kl), *v.i.* to make or cause to make a small, sharp ringing sound.

tin plate (tin plāt), sheet iron coated with tin.

tinsel (tin′ sel), *n.* thin glittering metallic threads; a fabric ornamented with such threads.

tinsel (tin' sel), *adj.* showy but having no value.

tint (tint), *n.* a tinge of color; a light shade of a color.

tint (tint), *v.t.* to color lightly, tinge with color.

tiny (tī' ni), *adj.* [*comp.* tinier, *superl.* tiniest] very small.

tip (tip), *n.* a point or the end of anything; anything attached to the end of something, as the *tip* of an arrow.

tip (tip), *n.* a small gift as a reward for personal service; secret information on something about to happen, advice supposed to be based on actual knowledge, as a *tip* on a race.

tip (tip), *v.t.* to cause to lean or dip, tilt, as to *tip* a table, *tip* a hat.

tip (tip), *v.t.* to reward for personal service, as to *tip* a waiter; to give secret information or a hint to, as to *tip* a friend on the market.

tip (tip), *v.i. and v.t.* to form a point; to furnish with a point or cap, to cover the point of.

tippet (tip' et), *n.* a narrow cape or covering of cloth or fur for the neck and shoulders.

tipple (tip' l), *n.* liquor.

tipple (tip' l), *v.i.* to drink liquor frequently, a little at a time.

tipsy (tip' si), *adj.* [*comp.* tipsier, *superl.* tipsiest] slightly intoxicated, unsteady from the effects of liquor but not drunk.

tiptoe (tip' tō), *v.i.* to walk on the toes.

tiptoe (tip' tō), *adv.* on the toes, expectantly; quietly, silently.

tiptop (tip' top), *adj.* extra good, best of its kind.

***tirade** (tī' rād), *n.* a long, violent speech, especially one of a scolding nature.

tire (tīr), *n.* a band or hoop of metal or rubber for the rim of a wheel.

tire (tīr), *v.i. and v.t.* to grow weary; to make weary.

tiresome (tīr' sum), *adj.* wearisome, tedious.

***tissue** (tish' ū), *n.* muscular or nerve fiber in a plant or animal body; any thin or delicate woven texture or fabric; a web or interwoven network, as his testimony was a *tissue* of falsehoods.

tit (tit), *n.* any of several small birds, as the *tit*mouse.

tit (tit), *n.* a tap or light blow, as *tit* for tat.

titanic (tī tan' ik), *adj.* huge, having enormous strength.

titbit (tit' bit), *n.* a choice morsel.

***tithe** (tī*th*), *n.* the 10th part of anything; a tax of one-tenth, especially collected to support churches.

titillate (tit' i lāt), *v.t.* to tickle.

title (tī' tl), *n.* an appellation indicating dignity, rank or office; a rightful claim; the name of an article, a book, poem, picture or other work of art.

titmouse (tit' mous), *n.* a small songbird.

titter (tit' ēr), *n.* a giggle; a restrained laugh.

title (tit' l), *n.* a tiny bit.

tittle-tattle (tit' l tat' l), *n.* idle chatter, gossip.

titular (tit' ū lēr), *adj.* pertaining to a title; existing in name only, nominal.

to (tōō), *adv.* toward or into a certain direction or condition, as heave *to,* come *to,* push the door *to;* nearby, as close *to.*

to (tōō), *prep.* in the direction of or into, as *to* the north, I am going *to* the city; resulting in, as *to* my great joy, burned *to* ashes; in honor of, as drink *to* the king, sing *to* the Lord; in accord with, as *to* the best of my belief; for, as a key *to* the house; against, as hand *to* hand; as far as, as come *to* the corner, burned *to* the ground.

***toad** (tōd), *n.* a froglike, tailless animal that feeds on insects, breeds in water, but lives mostly on land.

toadstool (tōd' stōōl), *n.* an umbrella-shaped fungus usually a poisonous variety of mushroom.

toady (tōd' i), *n.* [*pl.* toadies] a flatterer, a sycophant, one who fawns upon the wealthy or influential.

toady (tōd' i), *v.i. and v.t.* [*p.t. and p.p.* toadied, *pr.p.* toadying] to flatter, fawn upon, seek favor.

***toast** (tōst), *n.* sliced bread browned by dry heat; the person named when a health is drunk; a sentiment expressed and drunk to.

toast (tōst), *v.t.* to brown sliced bread by dry heat; to brown or heat by fire, as he *toasted* his shins as he stood before the hearth; to drink to the health of.

***tobacco** (tō bak' ō), *n.* [*pl.* tobaccos] a plant native to America, the dried and cured leaves of which are used for smoking and chewing; the dried and cured leaf of this plant.

tobacconist (tō bak' ō nist), *n.* one who deals in cigars, cigarettes, pipe tobacco, chewing plugs and the like.

toboggan (tō bog' an), *n.* a long, flat sled without runners, with the front end curving upward and backward, used for coasting.

toboggan (tō bog' an), *v.i.* to coast down a hill on a runnerless sled; to make any swift descent that might be compared to such a slide, as he fairly *tobogganed* down from the heights of his earlier success.

tocsin (tok' sin), *n.* an alarm bell; any warning signal.

today (too dā'), *n.* the present day, time or era.

today (too dā'), *adv.* nowadays, as there is no slavery in the U. S. *today.*

toddle (tod' l), *v.i.* to move with short, uncertain steps like those of a child learning to walk.

toe (tō), *n.* one of the digits on the human foot; the forward part of a hoof; the part of an article of footgear covering the forward part of the foot.

toe (tō), *v.i. and v.t.* to hold the toes, as he *toes* in when he walks; to touch with one's toes, as to *toe* the mark.

tog (tog), *v.i. and v.t.* to dress, to put clothes on, as he was *togged* out in his best.

toga (tō' ga), *n.* [*pl.* togas] a loose outer garment worn by the citizens of ancient Rome; a symbol of dignity, as of a judge or senator.

***together** (too ge*th'* ēr), *adv.* in company each with the other, as we were *together;* jointly, at the same time, as let us work *together;* into contact or collision, as to clap the hands *together,* two cars ran *together;* without intermission, as to read for hours *together.*

toggery (tog' ēr i), *n.* [*pl.* toggeries] clothing, articles of finery.

toggle (tog' l), *n.* a fastener used in place of a button and passing through a loop of cord instead of a buttonhole; an iron bolt or wooden pin with a groove around the middle to be passed through a ring or loop of rope as a temporary fastening.

togs (togz), *n. pl.* clothing.

***toil** (toil), *n.* hard work; work that wearies the mind or body.

toil (toil), *v.i.* to work hard and with close application, as I am *toiling* on this lesson.

toilsome (toil' sum), *adj.* laborious, wearisome.

token (tō' ken), *n.* a symbol; indication, evidence, as a *token* of friendship; a keepsake; a piece of metal used in place of a coin, as for paying carfare on conveyances operated by those who sell the tokens.

***tolerable** (tol' ēr *a* bl), *adj.* endurable, supportable; permissible, acceptable, fairly good.

tolerance (tol' ēr ans), *n.* liberality toward the opinions of others; patience with others.

tolerant (tol' ēr ant), *adj.* forebearing; patient with the ideas or acts of others.

tolerate (tol' ēr āt), *v.t.* to endure, permit, put up with; to refrain from opposing.

toleration (tol ēr ā' shun), *n.* the act of permitting to go on without interference; acceptance of something not entirely approved.

***toll** (tōl), *n.* a charge for the use of something, as a bridge or a telephone, maintained usually by private operators for use by the public.

toll (tōl), *n.* the sound of a bell rung with slow, regular strokes.

toll (tōl), *v.i. and v.t.* to ring slowly at regular intervals of time, as the bell *tolls,* the sexton *tolls* the bell.

***tolu** (tō lōō'), *n.* a fragrant resin obtained from a South American evergreen tree, used in medicines and perfumery: also called *tolu balsam.*

tomahawk (tom' *a* hôk), *n.* a weapon of the North American Indians resembling a hatchet.

***tomato** (tō mā' tō), *n.* [*pl.* tomatoes] a plant with a red-skinned, red-fleshed juicy fruit eaten raw as a vegetable or cooked in various ways.

tomb (tōōm), *n.* a grave or burial vault.

tomboy (tom' boi), *n.* a wild, romping girl.

tome (tōm), *n.* a large book; a bulky volume.

tomfoolery (tom fōōl' ēr i), *n.* [*pl.* tomfooleries] silly behavior; silly finery.

***tomorrow** (too mor' ō), *n.* the day after this day, as *tomorrow* is the day set; the future.

tomorrow (too mor' ō), *adv.* on the next day after today, as I shall go tomorrow; in the future.

tom-tom (tom' tom), *n.* a primitive drum, originally made of a hollowed log; a drum used in Oriental countries.

***ton** (tun), *n.* a measure of weight: *short ton,* 2,000 pounds; *long ton,* 2,240 pounds; *metric ton,* 2,204.6 pounds.

ton (tun), *n.* a unit of measure applied to the internal capacity of ships and equal to 100 cubic feet; a unit of measure used to reckon the displacement of vessels and equal to 35 cubic feet.

tonal (tōn' al), *adj.* pertaining to tone or to the quality of sound.

***tone** (tōn), *n.* a sound; the quality of a sound; the characteristics of sound, in respect of vibration, duration, volume and pitch; the characteristic quality of a voice, as to speak in strong *tones* or sweet *tones;* the character or quality of anything, as the *tone* of this essay is harsh, this painting is in soft *tones;* physical condition, as the patient's general *tone* is good.

tone (tōn), *v.i. and v.t.* to harmonize, as this color *tones* well with the general scheme of decoration; to bring to a required shade of sound or color; to bring into a certain condition, as he should *tone* up his condition, to *tone* down one's enthusiasm.

tone poem (tōn pō' ēm), a musical composition expressing poetic images.

tong (tông), *n.* a Chinese secret society.

***tongs** (tôngz), *n. pl.* an implement with two pivoted arms, used to grasp, as ice *tongs,* sugar *tongs.*

***tongue** (tung), *n.* the organ of taste and speech, located in the mouth; anything thought of as resembling this organ in shape or use, as the *tongue* of a buckle, the *tongue* of a bell, a *tongue*-and-groove board; a language.

tonic (ton' ik), *n.* a strengthening medicine.

tonic (ton' ik), *adj.* strengthening, bracing, as this air is *tonic,* your ideas have a *tonic* quality.

tonight (too nīt'), *n.* the present night, the night following today.

tonight (too nīt'), *adv.* on or during this night or the night following today.

tonnage (tun' ij), *n.* weight measured by the ton; the carrying capacity of a ship calculated in units of 100 cubic feet; displacement of a ship, figured by the number of tons of water it pushes aside when not in motion; a tax on ships or shipping according to amount of displacement.

***tonneau** (tun ō'), *n.* [*pl.* tonneaus or tonneaux] the rounded rear section of some automobiles.

tonsil (ton' sil), *n.* one of two small glands at the opening of the throat.

tonsillectomy (ton si lek' tō mi), *n.* [*pl.* tonsillectomies] removal of one or both of the small glands of the throat by a surgical operation.

***tonsillitis** (ton si lī' tis), *n.* inflammation of the two small glands at the back of the mouth, a form of sore throat.

tonsorial (ton sō' ri al), *adj.* pertaining to barbers or their business.

***tonsure** (ton' shēr), *n.* the act of shaving the crown of the head; the bare crown of a shaved head, worn by monks and some priests.

tonsure (ton' shēr), *v.t.* to shave the crown of.

too (tōō), *adv.* excessively, very, as *too* much, I shall be only *too* glad to do it; likewise, also, as let me come *too.*

tool (to͞ol), *n.* an instrument for doing work, as a hand *tool,* machine *tools;* a person used as an instrument by another, as he is the *tool* of a gang of crooks.

tooling (to͞ol′ ing), *n.* work done with a hand implement, as decorative designs on a fine leather bookbinding.

toot (to͞ot), *n.* a short note sounded with horn or whistle.

toot (to͞ot), *v.i. and v.t.* to sound, as a horn or whistle, with short notes.

tooth (to͞oth), *n.* [*pl.* teeth] one of the hard structures growing in the jaws to bite or grind food; any projection likened to such a structure, as the *teeth* of a saw, a *tooth* on a cog wheel.

tooth (to͞oth), *v.t.* to supply with an edge having notches and projections in a regular series.

toothsome (to͞oth′ sum), *adj.* palatable, pleasant-tasting.

top (top), *n.* the highest point, summit, as the *top* of a mountain; the part of a plant above ground, as beet *tops;* a platform at the head of a mast; the highest position, person or rank, as he stands at the *top* in his profession.

top (top), *n.* a toy with a sharp point or peg on which it spins.

top (top), *v.t.* to rise above others, as this peak *tops* the whole range; to cover the peak of, as the mountains are *topped* with snow; to cut off the part of a plant above ground or the ends of the rising stems; to excel, as this car *tops* them all.

topaz (tō′ paz), *n.* a semiprecious, transparent, yellow stone, having a luster and sparkle like that of crystal.

top boot (top bo͞ot), a high legcovering or boot of old style, now worn by huntsmen and liveried servants.

top coat (top cōt), a light overcoat.

toper (tōp′ ẽr), *n.* a hard drinker, a drunkard.

***topic** (top′ ik), *n.* a subject of discourse, argument or conversation, as live *topics* of the day.

topmast (top′ mȧst), *n.* the second mast upward from the deck of a ship.

***topography** (tō pog′ ra fi), *n.* [*pl.* topographies] the detailed description of the physical features of a region; the art of making maps showing the characteristic features of the land.

topple (top′ l), *v.i. and v.t.* to totter and fall; to overturn.

topsy-turvy (top′ si tûr′ vi), *adv.* upside down, higgledy-piggledy, confused, in disorderly manner.

toque (tōk), *n.* a woman's hat, fitting close and having no brim; a knitted cap.

***torch** (tôrch), *n.* a flaming light from burning wood, tallow or the like; a mass of inflammable material carried burning on a pole to light the way or kindle a fire; anything that enlightens, as the *torch* of research; a can filled with oil and having a wick, carried on the end of a pole; a flameblower used in burning off paint, melting metals or welding.

***toreador** (tor′ ē *a* dôr), *n.* a bullfighter, especially a mounted one.

***torment** (tôr′ ment), *n.* extreme pain, torture or anguish of body or mind.

Syn. Torture. *Torture* is extreme *torment.* We may suffer *torment* from any of a great variety of indirect means; *torment* has come to mean often very little more than harassment; *torture* is the infliction or experiencing of exquisite physical or mental pain or agony.

torment (tôr ment′), *v.t.* to torture, cause agony to; to vex, tease.

***tornado** (tôr nā′ dō), *n.* [*pl.* tornadoes or tornados] a violent storm with a black, funnel-shaped whirling cloud and wind that follows a narrow path.

torpedo (tôr pē′ dō), *n.* [*pl.* torpedoes] a toy of twisted paper containing gravel and a charge of powder to explode when thrown against a hard surface; a cap placed on a railroad track, exploded by the passing of a train and giving the signal to stop; a case or shell with high explosive charge; a large cigar-shaped self-propelling projectile discharged underwater and aimed to strike the hull of an enemy ship.

torpid (tôr′ pid), *adj.* numb, inactive, sluggish, as a *torpid* liver.

torpor (tôr′ pẽr), *n.* numbness, inactivity, sluggishness.

torrent (tor′ ent), *n.* a violent, rapid stream; a violent downpour, as the rain came down in *torrents;* any violent outpouring, as a *torrent* of bad language.

torrid (tor′ id), *adj.* extremely hot, scorching, burning.

torso (tôr′ sō), *n.* [*pl.* torsos] the human trunk; a statue of the human trunk.

tort (tôrt), *n.* any wrongful act except breach of contract for which a civil suit can be brought.

***tortoise** (tôr′ tus), *n.* a turtle, especially one that lives on land or in fresh water.

***tortuous** (tôr′ tū us), *adj.* winding, twisting, crooked, devious.

torture (tôr′ tūr), *n.* agony of mind or body, excruciating mental or physical pain.

torture (tôr′ tūr), *v.t.* to cause to suffer greatly, cause agony to; to inflict great pain upon; to distort or twist, put to great strain, as to *torture* a Bible text to get new meanings.

***toss** (tôs), *n.* a short throw; an upward movement, as a *toss* of the head.

***toss** (tôs), *v.t. and v.i.* to throw with the hand; to lift with a quick motion, as to *toss* one's head; to move from side to side or be lifted up and down, as branches *toss* in a heavy wind, boats *toss* on rough water.

tot (tot), *n.* anything small and insignificant; a small child.

total (tō′ tal), *n.* the whole sum or amount; the aggregate.

total (tō′ tal), *v.i. and v.t.* to form a complete whole; to add up to, as the bill *totals* $5; to find the complete sum, as *total* the items of this account.

total (tō′ tal), *adj.* complete, entire, as *total* cost, a *total* loss.

***totem** (tō′ tem), *n.* an animal or other natural object considered as being related to or significant of a clan or tribe among primitive people; the image of this animal or object used as a symbol.

totter (tot′ ẽr), *v.i.* to shake as if about to fall; to be unsteady.

***touch** (tuch), *n.* the sense by which we perceive through contact with things; the sensation produced through physical contact; a trace, as a *touch* of fever; style or manner, as this shows the *touch* of an expert; relationship or communication, as to be in *touch* with someone.

touch (tuch), *v.i. and v.t.* to come in contact, as two things *touch;* to make contact with, as this wire *touches* the beam; to perceive by feeling; to move the sensibilities of, as your news *touches* me deeply.

touching (tuch′ ing), *adj.* pathetic, moving the emotions.

touchy (tuch′ i), *adj.* [*comp.* touchier, *superl.* touchiest] peevish; sensitive.

***tough** (tuf), *adj.* tenacious; hard to break or pull apart; hard-fibered; strong.

toughen (tuf′ en), *v.i. and v.t.* to strengthen; to harden.

***toupee** (to͞o pē′), *n.* a small or partial wig.

tour (toor), *n.* an excursion; a trip; a journey through many places.

***tour** (toor), *v.t. and v.i.* to go through, as to *tour* a state or country; to journey from place to place, as we toured all summer.

touring car (toor′ ing kär), an open two-seated automobile seating five or more persons.

tourist (toor′ ist), *n.* one who travels from place to place.

***tournament** (toor′ na ment), *n.* a series of sport contests or games; a mock battle by knights in olden times.

***tourney** (toor′ ni), *n.* a tournament.

***tousle** (tou′ zl), *v.t.* to disarrange, put in disorder.

tousled (tou′ zld), *adj.* disordered, disarranged, as *tousled* hair.

tow (tō), *n.* coarse fiber of flax, hemp or jute, distinguished from fine clean fiber: *tow-colored,* flaxen, yellow.

tow (tō), *n.* a boat or number of boats pulled through the water by another vessel; a barge; the state or an instance of being towed, as to take in *tow.*

tow (tō), *v.t.* to pull by means of a rope, as to *tow* a boat, *tow* a disabled car.

towage (tō′ ij), *n.* the act of hauling a boat; the charge for such hauling.

***toward** (tō′ ẽrd or tôrd) or **towards** (tō′ ẽrds or tôrds), *prep.* in the direction of, as *towards* the north; contributing to, for, as here is a dollar *toward* your expenses; near to, as *toward* the end of day; regarding, as your attitude *toward* religion; near in time, as it happened *toward* noon.

***towel** (tou′ el), *n.* a piece of cloth or paper for drying things by wiping, as a hand *towel,* a dish *towel.*

toweling (tou′ el ing), *n.* material for making towels.

***tower** (tou′ ẽr), *n.* a lofty structure rising above its surroundings, either a separate structure or part of a building, as the schoolhouse *tower.*

tower (tou′ ẽr), *v.i.* to rise to a great height, project above surrounding things, as mountains *tower* over a lake.

town (toun), *n.* a settlement larger than a village, smaller than a city.

township (toun′ ship), *n.* a subdivision of a county; a land section of 36 square miles.

toxemia (toks ē′ mi *a*), *n.* a morbid condition of the blood, the presence of poison in the blood; a form of blood poisoning.

toxic (tok′ sik), *adj.* poisonous.

toxicology (tok si kol′ ō ji), *n.* the science that treats of poisons and their antidotes.

***toxin** (tok′ sin), *n.* a poison produced in organic matter, as the tissues of plants or animals.

***toy** (toi), *n.* a plaything; a bauble; something of no real value.

toy (toi), *v.i.* to dally with, trifle.

***trace** (trās), *n.* a mark left by anything; a footprint; a barely perceptible quality or amount, as a *trace* of poison in the cup.

trace (trās), *v.t.* to delineate, sketch; to copy by following the lines through a transparent sheet placed over an original drawing; to follow by means of tracks left by something that passed before; to hunt out evidence of, as to *trace* the development of a city.

***trachea** (trā′ kē *a*), *n.* the windpipe.

track (trak), *n.* a mark left by something passing; footprints showing the passage of a person or animal; any regular course; a double line of rails for trains; contact or knowledge, as to keep *track* of things or events.

track (trak), *v.t.* to leave marks on, as to *track* a floor; to trail, as to *track* a fugitive; to make footprints with, as to *track* mud on the carpet.

tract (trakt), *n.* a short treatise, especially on matters of religion or politics.

tractable (trak′ ta bl), *adj.* docile, easily managed.

traction (trak′ shun), *n.* the act of drawing over a surface; the friction of a body moving over a surface; the power to move over a surface and stick to it, as slippery mud kills the *traction* of car wheels.

tractor (trak′ tẽr), *n.* an automotive vehicle to furnish power to pull a plow, draw stumps, or the like.

trade (trād), *n.* commerce; exchange of goods; buying and selling for gain; a special craft or those engaged in it, as the building *trade;* a bargain or swap.

trade-mark (trād′ märk), *n.* a symbol registered with the Government to distinguish and protect a line of goods or some particular product.

trade price (trād prīs), the cost of goods to the retailer buying from a wholesaler.

trader (trād′ ẽr), *n.* one who engages in commerce.

trade-union (trād ūn′ yun), *n.* an organized combination of workers engaged in the same craft.

trade wind (trād wind), a steady air current in the Torrid Zone, blowing strongly and steadily from the northeast on the north of the equator and from the southeast on the south of the equator.

tradition (tr*a* dish′ un), *n.* the handing down of knowledge, beliefs and customs from one generation to another; a belief or custom so taught; anything handed down from the past and so strongly rooted as to be as inviolable as law.

traduce (tr*a* dūs′), *v.t.* to slander; to make deliberate false statements about another person's acts or character.

traffic (traf′ ik), *n.* business or trade, commerce; transportation; the movement of vehicles on street or highway, as the *traffic* is very heavy today.

traffic (traf′ ik), *v.i.* [*p.t. and p.p.* trafficked, *pr.p.* trafficking] to buy and sell; to do business in a commercial way, as he *traffics* in dry goods.

traffic manager (traf′ ik man′ ij ẽr), a superintendent in an industrial establishment or railway office who routes shipments, checks waybills or controls traffic.

***tragacanth** (trag′ *a* kanth), *n.* a gum obtained from certain Asiatic and East European herbs and used in finishing textiles and in making medicines and mucilage.

***tragedy** (traj′ e di), *n.* [*pl.* tragedies] any human experience of disaster; a play presenting situations that show people undergoing and reacting to such experiences of failure and trial.

tragic (traj′ ik), *adj.* involving calamity, trial and suffering.

***trail** (trāl), *n.* the track left by anything in motion; the track, as of marks on the ground or scent in the air, by which hounds and hunters follow fleeing game; a path or fixed route, as an Indian *trail;* a train, anything dragged behind, as the war brought death in its *trail.*

trail (trāl), *v.i. and v.t.* to drag behind or be drawn along; to follow in a straggling line; to lag; to drag along behind; to pursue by following a track, as to *trail* game.

trailer (trāl′ ẽr), *n.* any vehicle, as a car, wagon, sled, van or house on wheels, pulled by a motorcar.

train (trān), *n.* a series, as a *train* of events, a *train* of arguments, a *train* of cars; the part of a gown or robe that trails; a line of gunpowder laid to a charge of explosive to set it off.

train (trān), *v.i. and v.t.* to prepare for a contest, make oneself fit for high exertion, as athletes *train;* to prepare, as a person or persons, for sports, as to *train* a ball club; to teach, as an animal to do tricks or obey orders; to direct, aim, as to *train* a gun on a mark; to keep company or fraternize, as he *trained* with a rough group.

training (trān′ ing), *n.* instruction, drill; the state of being instructed or drilled, as to be in *training.*

train oil (trān oil), an illuminating and lubricating oil obtained from the blubber of the right whale or some other sea animal, used in soapmaking, preparing leather, tempering steel.

traipse (trāps), *v.i.* to wander or gad about in a bold manner: sometimes spelled *trapes.*

***trait** (trāt), *n.* a distinguishing characteristic of character or mind.

traitor (trā′ tẽr), *n.* one guilty of treason; one who is false to a trust; one who betrays his country, a cause or an associate.

***trajectory** (tr*a* jek′ tō ri), *n.* [*pl.* trajectories] —the curved path of a body hurled horizontally into space, as of a baseball or a bullet.

tram (tram), *n.* a coal car in a mine; a streetcar; a street railway.

***trammel** (tram′ el), *n.* anything that impedes progress or action; anything that limits freedom; a fetter.

trammel (tram′ el), *v.t.* to impede or hinder; to shackle.

tramp (tramp), *n.* a vagrant; one who wanders from place to place aimlessly.

tramp (tramp), *v.i. and v.t.* to walk with heavy steps; to wander through on foot, as to *tramp* the hills; to tread upon heavily and repeatedly, trample, as to *tramp* the lawn.

trample (tram′ pl), *v.t.* to tread underfoot; to crush with the feet, as you boys have *trampled* the lawn.

tramway (tram′ wā), *n.* a pathway with light rails on which small cars may run.

***trance** (trȧns), *n.* a temporary cessation of consciousness; a hypnotic state; a deep sleep from which one cannot be aroused; a state of ecstatic dreaming.

***tranquil** (trang′ kwil), *adj.* calm, quiet, undisturbed.

tranquilize (trang′ kwil īz), *v.t.* to calm and quiet; to free from disturbance.

***tranquility** (tran kwil′ i ti), *n.* serenity; a state of calm and peace.

***transact** (trans akt′), *v.t.* to carry through, accomplish, as to *transact* business.

transaction (trans ak′ shun), *n.* something accomplished; a business deal.

***transcend** (tran send′), *v.i.* to rise above, surpass, exceed, as this *transcends* belief.

transcendent (tran sen′ dent), *adj.* surpassing, superlative, extraordinary.

***transcendental** (tran sen den′ tal), *adj.* beyond the limits of human experience; outside the field of perception by the senses.

transcribe (tran skrīb′), *v.t.* to copy; to write out from notes, as a stenographer *transcribes* a dictated letter.

transcript (tran′ skript), *n.* a copy made directly from an original.

transcription (tran skrip′ shun), *n.* a copy; the act of copying.

***transept** (tran′ sept), *n.* the part of a church at right angles to the chancel, making the short arms of a cross.

***transfer** (trans′ fûr), *n.* removal from one place to another; conveyance of property from one owner to another; a station where passengers change from one conveyance to another; a ticket entitling a passenger to finish his journey in another vehicle without further charge.

***transfer** (trans fûr′), *v.i. and v.t.* to move from one place to another; to change to another vehicle; to convey to another, as property.

transfigure (trans fig′ ūr), *v.t.* to change the outward form or appearance of.

Syn. Transform, transfigure, metamorphose. *Transform* is the general term and means to change completely both the inner nature and the outward form or appearance; *transfigure,* because of its Biblical connotation, implies a change that glorifies or exalts; *metamorphose* means to change into something entirely different, as a tadpole is *metamorphosed* into a frog, and Ulysses' men were *metamorphosed* into swine.

transfix (trans fiks′), *v.t.* to pierce through, as with a spear or with surprise or horror.

transform (trans fôrm′), *v.t.* to change the shape, appearance or character of.

transformation (trans fôr mā′ shun), *n.* a complete change, as of appearance or personality.

transformer (trans fôr′ mẽr), *n.* an induction coil to raise or lower the strength of an electric current.

transfuse (trans fūz′), *v.t.* to pour from one vessel to another; to pump from one person's veins into those of another, as blood.

transfusion (trans fū′ zhun), *n.* the transference of blood from one person into the veins of another; any injection into the blood, as of salt.

transgress (trans gres′), *v.i. and v.t.* to break or violate a law; to violate or sin against, as to transgress a law; to go beyond, as to *transgress* a boundary.

transgression (trans gresh′ un), *n.* an offense against or violation of a law or moral rule; a sin.

transgressor (trans gres′ ẽr), *n.* an offender; a sinner.

***transient** (tran′ shent), *n.* something that exists for a short time only; a temporary guest, especially at a hotel.

transient (tran′ shent), *adj.* fleeting, brief, passing quickly, as *transient* beauty; not staying long, as *transient* guests.

transit (tran′ sit), *n.* passage through or over, as to permit *transit,* rapid *transit;* a surveyor's instrument to measure angles.

***transition** (tran zish′ un), *n.* passage from one place to another; a state of change from one state of being or development to another; the change effected or the period of time during which the change takes place; change from one key to another in a musical composition.

transitive (tran′ si tiv), *n.* a verb taking an object.

transitive (tran′ si tiv), *adj.* requiring an object, either expressed or understood, as a *transitive* verb.

transitory (tran′ si tō ri), *adj.* passing quickly, lasting but a short time, as fame is *transitory* at best.

***translate** (trans lāt′), *v.t.* to render from one language into another, as to *translate* a Latin text into English; to carry from one state to another, as Enoch was *translated,* that is, carried to heaven without dying; words are *translated* into action.

translation (trans lā′ shun), *n.* the act of rendering from one language to another; a book, article or the like rendered from one language into another; the action of being carried from one state to another, as the *translation* of a poem into music, the *translation* of thought into words or action.

***translucent** (trans lū′ sent), *adj.* permitting light to pass through but not permitting objects to be distinguished, as frosted glass is *translucent.*

***transmigration** (trans mī grā′ shun), *n.* the passing of the soul from one body into another at the time of death.

transmissible (trans mis′ i bl), *adj.* capable of being passed from one to another or through a body or substance, as electricity is *transmissible* through any conductor; permitted to be sent, as *transmissible* matter for the mails or telegraph.

***transmission** (trans mish′ un), *n.* the act of sending or transferring; the state of being transferred; that by which power is conveyed; passage of radio waves between sending and receiving stations.

***transmit** (trans mit′), *v.t.* to send through or across, pass on, as to *transmit* a message; to conduct, as to *transmit* heat.

transmitter (trans mit′ ẽr), *n.* the sending apparatus of a telegraph; the part of a telephone into which one speaks.

transmute (trans mūt′), *v.t.* to change from one form, nature or substance into another, as the alchemists of old sought to *transmute* baser metals into gold.

***transom** (tran′ sum), *n.* a small window above another window or above a door.

***transparency** (trans pâr′ en si), *n.* [*pl.* transparencies] the state of permitting passage of light so that objects can be discerned, as the transparency of clear glass; clear simplicity of character or of style in writing; a picture on glass, to be held in front of a light.

***transparent** (trans pâr′ ent), *adj.* permitting the passage of light so that objects can be seen: opposite of *opaque;* absolutely clear, as a *transparent* style of writing.

transpire (tran spīr′), *v.i. and v.t.* to leak out, become known; to pass off as vapor; to happen, come to pass, occur; to exhale, as plants *transpire* moisture.

***transplant** (trans plȧnt′), *v.t.* to take up and plant in another place; to remove and reestablish in another place, as to *transplant* colonists.

***transport** (trans′ pōrt), *n.* conveyance, as the *transport* of goods overseas; any conveyance used in moving passengers or goods; a vessel used to carry troops and stores overseas in wartime; a state of rapture or great emotion.

***transport** (trans pōrt′), *v.t.* to carry from one place to another, as this vessel *transports* freight; to move or carry away with violent emotion, as to be *transported* with joy; to remove or deport from a country, as to *transport* an undesirable alien.

transportation (trans pōr tā′ shun), *n.* the act or business of moving passengers and goods; the means of conveyance used; banishment, especially of convicts to a penal colony.

transpose (trans pōz′), *v.t.* to change about, putting one in place of the other; to reverse; to move from one side of an algebraic equation to the other.

transposition (trans pō zish′ un), *n.* the act of interchanging; an accidental misplacing of letters in print.

transship (trans ship′), *v.t.* to transfer from one conveyance or line to another.

*__transubstantiation__ (tran sub stan shi ā′ shun), *n.* the conversion of the bread and wine into the body and blood of Christ; the doctrine that supports belief in this change and holds that only the appearances of the bread and wine remain.

transverse (trans vûrs′), *adj.* lying crosswise, as a *transverse* beam; athwart.

trap (trap), *n.* a device closing suddenly with a spring to catch game or other animals; an ambush; a contrivance preventing escape indoors of foul air from a drain.

trap (trap), *n.* any of various dark-colored igneous rocks.

trap (trap), *v.t.* to take or catch in a snare; to catch by means of a trick, as to *trap* a burglar.

*__trapeze__ (tra pēz′), *n.* a swinging horizontal bar used in a gymnasium or a circus.

trapezium (tra pē′ zi um), *n.* a four-sided plane figure of which no two sides are parallel.

*__trapezoid__ (trap′ ē zoid), *n.* a plane figure with four sides, having only two sides parallel.

trappings (trap′ ingz), *n. pl.* ornamental harness or decoration for a horse; any decorations.

trash (trash), *n.* refuse, waste or worthless matter, rubbish.

trashy (trash′ i), *adj.* [*comp.* trashier, *superl.* trashiest] worthless, useless; cheap and insubstantial, as writing.

travail (trav′ āl), *n.* labor with pain; the pains of childbirth.

travel (trav′ el), *n.* the act of journeying; amount of traffic, as heavy *travel: travels,* journeys, trips; a literary record of one's journeyings.

travel (trav′ el), *v.i.* to journey, tour, go from place to place.

traveler (trav′ el ẽr), *n.* one who journeys; a salesman who goes from city to city.

*__traverse__ (trav′ ẽrs), *n.* a crosspiece.

traverse (trav′ ẽrs), *v.t.* to cross over or pass through; to go from one end to the other, as to *traverse* a state; to cross to and fro, to review, as to *traverse* a subject; to deny, as to *traverse* an indictment.

traverse (trav′ ẽrs), *adj.* lying crosswise, athwart.

*__travesty__ (trav′ es ti), *n.* [*pl.* travesties] a burlesque or parody; a fantastic resemblance.

travesty (trav′ es ti), *v.t.* [*p.t. and p.p.* travestied, *pr.p.* travestying] to burlesque or parody; to treat a serious subject in such a way as to make it seem ridiculous.

*__trawl__ (trôl), *n.* a fish net shaped like a bag for dragging along the bottom; a long fishing line with many hooks.

trawl (trôl), *v.i.* to fish with a dragged bait or net.

trawler (trôl′ ẽr), *n.* a fishing boat equipped for trawling.

tray (trā), *n.* a broad, flat, shallow vessel with raised edges to carry things on, as dishes when serving at table; a shallow box at the top of a trunk.

treacherous (trech′ ẽr us), *adj.* false to a trust; appearing trustworthy but actually faithless and ready to betray; untrustworthy, as *treacherous* footing.

*__treachery__ (trech′ ẽr i), *n.* [*pl.* treacheries] perfidy; an act of betrayal.

*__treacle__ (trē′ kl), *n.* the sirup drained from sugar in refining; molasses.

tread (tred), *n.* the horizontal part of a step in a flight of stairs; the part of a tire that comes in contact with the ground; manner of walking; sound of footsteps.

tread (tred), *v.i. and v.t.* to step, walk; to put the foot down, as don't *tread* on the wet floor; to step on, as to *tread* grapes for wine.

treadle (tred′ l), *n.* a foot lever operating a machine.

treadmill (tred′ mil), *n.* a large wheel driven by the weight of persons or animals moving on steps built inside the rim; a monotonous grind.

*__treason__ (trē′ zn), *n.* betrayal of one's country; treachery.

*__treasure__ (trezh′ ẽr), *n.* accumulated wealth; riches; something highly valued.

treasure (trezh′ ẽr), *v.t.* to value highly; to collect and keep.

treasurer (trezh′ ẽr ẽr), *n.* an officer in a government, a business concern or a private organization having charge of the funds.

treasury (trezh′ ẽr i), *n.* [*pl.* treasuries] a place where public or private moneys are kept; funds or money on hand, as the *treasury* is low.

treat (trēt), *n.* something given as refreshment or entertainment; a pleasant experience, as it was a *treat* to hear you play.

treat (trēt), *v.i. and v.t.* to negotiate, as he *treated* with his competitor over the matter; to take in a certain way, as to *treat* a proposal with scorn; to subject to some process, as to *treat* wood with creosote; to deal with medically or surgically, as to *treat* sickness; to give refreshment or entertainment to, as he *treated* her to a show; to act toward, as he *treats* his mother well.

*__treatise__ (trē tis), *n.* a written study of a subject.

treatment (trēt′ ment), *n.* manner of dealing with, as old people deserve good *treatment,* this subject should have a different *treatment,* the doctor gave the right *treatment.*

treaty (trēt′ i), *n.* [*pl.* treaties] a formal agreement between two or among several governments.

*__treble__ (treb′ l), *n.* the highest vocal or instrumental part; a high, thin sound.

treble (treb′ l), *v.i. and v.t.* to become or to make threefold; to multiply by 3.

treble (treb′ l), *adj.* high-pitched; the part above middle C on a piano or similar keyboard.

treble (treb′ l), *adj.* threefold.

trebly (treb′ li), *adv.* in threefold manner, triply.

tree (trē), *n.* the largest kind of plant having a single trunk and spreading branches; anything thought of as resembling a trunk and branches, as a family *tree;* a shaped piece of wood or metal to fit within, as a shoe *tree.*

tree (trē), *v.t.* to drive up into the branches, as to *tree* a coon.

trek (trek), *n.* a long journey, as a *trek* across the desert.

trek (trek), *v.i.* to travel by wagon, migrate; to make a long, difficult journey.

trellis (trel′ is), *n.* a structure of latticework on which a vine is trained.

trelliswork (trel′ is wûrk), *n.* a grating of light bars or wooden strips in a crisscross pattern; a lattice.

tremble (trem′ bl), *n.* a quiver or shiver from fright, anxiety or excitement.

tremble (trem′ bl), *v.i.* to shake unintentionally, as with fear, cold, weakness, excitement or anxiety.

trembling (trem′ bling), *n.* a condition of shaking with fear, excitement or weakness.

Syn. Tremor, trepidation. *Trembling* may be caused by physical or mental conditions; a *tremor* is a slight *trembling,* arising from fear or weakness; *trepidation* implies a state of great alarm or agitation.

tremendous (trē men′ dus), *adj.* terrifying; causing astonishment by reason of great size or force, as a *tremendous* crash, a *tremendous,* black cloud.

*__tremolo__ (trem′ ō lō), *n.* [*pl.* tremolos] a vibrating sound, a trembling effect in a tone.

*__tremor__ (trem′ ẽr), *n.* a trembling; a shake of the earth; one of the successive shocks in an earthquake.

tremulous (trem′ ū lus), *adj.* trembling, quivering; wavering.

*__trench__ (trench), *n.* a long, narrow ditch; a long ditch with earth piled in front of it and a firing ledge along the side, for protection of troops in warfare.

trench (trench), *v.t.* to dig ditches in, as a method of drainage, as to *trench* a field.

*__trenchant__ (tren′ chant), *adj.* sharp, keen, cutting, as *trenchant* wit; forceful, penetrating, lucid.

trencher (tren′ chẽr), *n.* a wooden plate used at table in the olden times.

trencherman (tren′ chẽr man), *n.* an eater, as a poor *trencherman.*

trend (trend), *n.* a tendency, general direction, as that is the *trend* of public opinion today.

trend (trend), *v.i.* to take a general course; to incline to a certain conclusion.

*__trepan__ (trē pan′), *n.* a surgeon's cylinder-shaped saw for cutting a hole in the skull: also *trephine.*

*__trepan__ (trē pan′), *v.t.* to operate on by cutting the bones of the skull.

*__trephine__ (trē fīn′), *v.* to perforate the skull with a trepan or trephine.

trepidation (trep i dā′ shun), *n.* involuntary trembling; a state of great fear.

*__trespass__ (tres′ pȧs), *n.* a deliberate breaking of the law; an invasion of the rights of another; a transgression, a sin.

trespass (tres′ pȧs), *v.i.* to commit any offense; to enter unlawfully upon the land of another.

tress (tres), *n.* a lock of hair.

*__trestle__ (tres′ l), *n.* a bar with spreading legs at each end to form a support, as a *trestle* for a platform; a framework of timbers or steel girders supporting railroad tracks above a ravine or over a river.

trestle board (tres′ l bōrd), a draftsman's designing board supported on wooden horses.

trestlework (tres′ l wûrk), *n.* a system of connected frames supporting a heavy structure, as a viaduct, pier or scaffold.

triad (trī′ ad), *n.* any group of three; a chord of three tones.

*__triangle__ (trī′ ang gl), *n.* a plane figure with three sides and three angles.

triangulate (trī ang′ gū lāt), *v.t.* to divide into three-sided sections; to survey land by dividing in that way.

tribe (trīb), *n.* a community of primitive people under one chief; in ancient states, a division of the people into groups, as the *tribes* of Israel; any class or group, as the newspaper *tribe.*

tribulation (trib ū lā′ shun), *n.* a severe affliction, great sorrow.

*__tribunal__ (trī bū′ nal), *n.* a magistrate's bench; a court of justice.

*__tribune__ (trib′ ūn), *n.* a magistrate of ancient Rome; a champion of the people's rights.

tribune (trib′ ūn), *n.* a stand from which addresses were delivered in ancient Rome; a platform for public speaking.

*__tributary__ (trib′ ū ter i), *n.* [*pl.* tributaries] a river that flows into a larger one; a state that pays money to another for protection.

tributary (trib′ ū ter i), *adj.* serving to enlarge or increase; subordinate, as a *tributary* state.

*__tribute__ (trib′ ūt), *n.* money paid to a superior state by a subordinate and dependent one; acknowledgment of worth, as a *tribute* of praise.

trice (trīs), *n.* an instant, as in a *trice.*

trice (trīs), *v.t.* to pull or lash with a small rope, as to *trice* up a sail.

trick (trik), *n.* a stratagem or artifice; a puzzling deception, as the *tricks* of a magician; one man's turn, as a *trick* at the helm; a knack, as you haven't the *trick* of it; all the cards played in one round, as he won the *trick.*

trickery (trik′ ẽr i), *n.* [*pl.* trickeries] deception, cheating, fraud, imposture.

trickle (trik′ l), *v.i.* to drip, flow in a thin stream.

trickster (trik′ stẽr), *n.* a cheat, a deceiver.

tricky (trik′ i), *adj.* [*comp.* trickier, *superl.* trickiest] puzzling; artful.

tricolor (trī′ kul ẽr), *n.* a national flag of three hues, in about equal parts, as the French *tricolor.*

tricycle (trī′ sik l), *n.* a vehicle with three wheels.

*__trident__ (trī′ dent), *n.* a fork or spear with three prongs, especially a fish spear; the emblem of Neptune or Poseidon, god of the sea.

***triennial** (trī en′ i al), *n.* the third anniversary; a plant that lives 3 years.

triennial (trī en′ i al), *adj.* taking place every third year or lasting 3 years.

trifle (trī′ fl), *n.* anything of little value or importance.

trifle (trī′ fl), *v.i.* to act or talk with levity; to spend time on small matters; to sport, jest, as to *trifle* with one's affections.

trig (trig), *adj.* trim and neat.

trigger (trig′ ẽr), *n.* a means of releasing a catch or spring; a catch that is pulled with the finger and releases the hammer of a gun.

***trigonometry** (trig ō nom′ e tri), *n.* [*pl.* trigonometries] the science of measuring the sides and angles of triangles; a textbook on this subject.

trilateral (trī lat′ ẽr al), *adj.* three-sided.

trill (tril), *n.* a quaver of the voice; a vibrating tone.

trillion (tril′ yun), *n.* the number represented by 1 followed by 12 ciphers in the United States and France and by 1 with 18 ciphers in Great Britain.

***trilogy** (tril′ ō ji), *n.* a series of three, as dramas, musical compositions or novels, each complete in itself but all on the same general theme.

trim (trim), *v.t.* to make neat by cutting, as to *trim* a hedge, to make neat by smoothing, as to *trim* a board; to adorn, as to *trim* a hat; to adjust sails; to keep a ship well balanced by shifting cargo or ballast.

trim (trim), *adj.* neat, in good order.

trimmer (trim′ ẽr), *n.* one who holds a middle position on any issue and refuses to take sides; one who trims any article of manufacture; one who keeps coal or cargo in safe position on shipboard.

trinket (tring′ ket), *n.* a small article, as an ornament or jewel, usually of little value, a trifle.

***trio** (trē′ ō), *n.* [*pl.* trios] a set of three; a musical composition arranged for three musicians.

trip (trip), *n.* a stumble; a mistake; a journey.

***tripartite** (trī pär′ tīt), *adj.* divided into three sections.

***tripe** (trīp), *n.* a part of the stomach of a cud-chewing animal used as food.

***triplane** (trī′ plān), *n.* an airplane with three main planes.

triple (trip′ l), *v.i. and v.t.* to increase threefold; to multiply by 3.

triple (trip′ l), *adj.* consisting of three united things or three parts of one thing, as a *triple* play.

triplet (trip′ let), *n.* one of three children born at one birth.

tripod (trī′ pod), *n.* a three-legged stool or table; a three-legged stand used to support a surveying instrument or a camera.

***trisect** (trī sekt′), *v.t.* to divide into three equal parts.

***trisyllabic** (tris i lab′ ik), *adj.* having three syllables.

trite (trīt), *adj.* worn-out, stale, repeated till commonplace, as a *trite* remark.

***triturate** (trit′ ū rāt), *v.t.* to rub or grind to powder.

***triumph** (trī′ umf), *n.* a great victory; celebration of a victory.

triumph (trī′ umf), *v.i.* to win a victory; to celebrate a victory.

triumphant (trī um′ fant), *adj.* victorious and rejoicing.

triumvirate (trī um′ vi rāt), *n.* government by three people sharing authority equally; a group of three people, as a *triumvirate* of friends.

triune (trī′ ūn), *adj.* consisting of three in one.

trivet (triv′ et), *n.* a stand or support having three legs and so standing steady, as right as a *trivet;* a metal plate with ornamental design and feet, used to protect a table from hot dishes.

***trivial** (triv′ i al), *adj.* of little value, unimportant, insignificant.

***troche** (trō′ kē), *n.* a medicinal lozenge.

***trochee** (trō′ kē), *n.* a metrical foot of one long syllable and one short syllable or one accented and one unaccented.

***troglodyte** (trog′ lō dīt), *n.* an early caveman; anyone who lives in a cave.

***troll** (trōl), *n.* a being supposed to live in mountain caves, pictured sometimes as a giant, sometimes as a mischievous dwarf.

***troll** (trōl), *v.t. and v.i.* to fish for, as with hook and line from a moving boat, the bait dragging behind, near the surface of the water; to fish by drawing a hook and line through the water behind a moving boat.

troll (trōl), *v.t.* to sing in parts in succession, as in a round; to sing in a strong, hearty voice.

trolley (trol′ i), *n.* a grooved metal wheel that rolls on a charged electric wire overhead, propelling a street car; a car propelled in this manner: also called a *trolley car.*

***trombone** (trom′ bōn), *n.* a brass wind instrument with a U-shaped slide.

troop (trōōp), *n.* a number of persons moving together; a cavalry company.

troop (trōōp), *v.i.* to move in numbers, as they all came *trooping* in.

***trope** (trōp), *n.* a word or expression used in an unusual sense; a word used figuratively; a figure of speech; a turn of language.

***trophy** (trō′ fi), *n.* [*pl.* trophies] something taken from an enemy and kept as a memorial; a memorial of a victory; a prize won in an athletic competition.

tropic (trop′ ik), *n.* one of the two imaginary circles around the earth, one on each side of and parallel to the equator 23° 27′ distant from it and enclosing the Torrid Zone.

tropics (trop′ iks), *n.* the region between the Tropic of Cancer and the Tropic of Capricorn.

trot (trot), *n.* the gait of a horse when the fore and hind legs on opposite sides move at the same time; a jogging run.

trot (trot), *v.i. and v.t.* to run by lifting the front and hind legs on opposite sides at the same time; to jog; to cause to trot, as I am going to *trot* this horse a mile.

***troth** (trôth), *n.* fidelity, truth, faithfulness, as to pledge, (or plight) one's troth.

***troubadour** (trōō′ ba door), *n.* one of a class of poets who sang their own songs in Provence in the 12th century.

trouble (trub′ l), *n.* worry, distress, grief, afflictions, such as loss of health, wealth or dear ones; effort, as to take the *trouble* to do something; pathological condition, as heart *trouble.*

Syn. Disturbance, molestation. *Trouble* may be permanent; *disturbance* and *molestation* are temporary and both refer to the peace that is destroyed. A *disturbance* ruffles us and throws us out of a tranquil state. A *molestation* affects either the body or the mind.

trouble (trub′ l), *v.t.* to distress; to cause to worry; to inconvenience.

Syn. Disturb, molest. We may be *troubled* by the want of a thing or by that which is unsuitable. We are *disturbed* and *molested* only by that which *troubles* actively.

troublous (trub′ lus), *adj.* uneasy, restless, full of distress, as *troublous* times.

***trough** (trôf), *n.* a receptacle like an open-topped tub or tank to hold a liquid, as water for horses; a basin in which dough is kneaded; a gutter on a roof; any long narrow depression, as between waves of the sea.

trounce (trouns), *v.t.* to beat soundly.

troupe (trōōp), *n.* a company of actors.

trousers (trou′ zẽrz), *n.* an outer garment covering each leg separately.

***trousseau** (trōō sō′), *n.* [*pl.* trousseaux] a bride's outfit.

trout (trout), *n.* a fresh-water game fish; a number of varieties of fish resembling it, some living in salt water.

trow (trō), *v.i. and v.t.* to think, suppose.

trowel (trou′ el), *n.* a flat-surfaced tool used by masons and plasterers to spread and smooth mortar or plaster; a small scoop with a handle used in working in a garden.

troy weight (troi wāt), a system of measures based on a 12-ounce pound and used in weighing precious metals and gems.

***truant** (trōō′ ant), *n.* one who stays away from duty or business; a student who stays away from school without permission.

truant (trōō′ ant), *adj.* neglectful of duty; idle, lazy; not attending school.

truce (trōōs), *n.* an agreement to cease fighting for a certain time; a lull in a period of action, respite.

truck (truk), *n.* a stout vehicle to move heavy articles or goods; the structure with wheels supporting one end of a railroad car; a hand-pushed or motor vehicle on which porters move things, such as trunks and hand luggage.

truck (truk), *n.* fresh garden produce for sale.

truck (truk), *v.i. and v.t.* to move heavy loads as a business; to carry in stout wagons.

truck (truk), *v.i.* to barter, peddle.

truckle (truk′ l), *n.* a small wheel.

truckle (truk′ l), *v.i. and v.t.* to move on rollers; to seek favor through flattery and obsequious service.

***truculent** (truk′ ū lent), *adj.* savage, aggressive, fierce.

trudge (truj), *n.* a long, weary walk.

trudge (truj), *v.i.* to walk ploddingly.

true (trōō), *adj.* conforming to fact; faithful, loyal, genuine.

true (trōō), *v.t.* to bring into correct line; to cause to fit exactly, as you should *true* that window frame.

true-blue (trōō blōō′), *adj.* of inflexible honesty and unwavering fidelity.

***truffle** (truf′ l), *n.* a potato-shaped fungus that grows underground and is valued as a table delicacy.

truism (trōō′ izm), *n.* a self-evident truth, a platitude.

truly (trōō′ li), *adv.* in agreement with truth or fact, honestly.

trump (trump), *n.* a card of the suit outranking others for the time being: *trumps,* the ranking suit, as diamonds are *trumps.*

trump (trump), *v.i. and v.t.* to play a card of the ranking suit; to take a trick with such a card.

trumpery (trump′ ẽr i), *n.* [*pl.* trumperies] worthless finery, showy rubbish, nonsense.

trumpery (trump′ ẽr i), *adj.* showy but valueless.

trumpet (trum′ pet), *n.* a metal wind instrument with a single curved tube with a flaring end; the call of an elephant; a trumpet-shaped devise or instrument, as an ear *trumpet.*

trumpet (trum′ pet), *v.i. and v.t.* to make clear, strong, sustained tones; to proclaim as if by the call of the trumpet.

***truncheon** (trun′ chun), *n.* a short staff or cudgel; the baton of a high military officer.

trundle (trun′ dl), *n.* a small broad wheel, like that of a caster: *trundle bed,* a bed with a low frame resting on casters, so that it can be rolled under a large bed.

trundle (trun′ dl), *v.i. and v.t.* to roll on casters; to cause to roll, as a child *trundles* a hoop.

trunk (trungk), *n.* the main stem of a tree; the body without the head and limbs, the torso; the long, flexible snout of the elephant; a stout case with compartments in which to pack a traveler's wardrobe and personal effects.

trunk line (trungk līn), the main stem of a railroad or electric-wire system.

trunks (trungks), *n.* a short-legged garment that extends from the waist to the upper part of the thighs, worn by swimmers, athletes and others.

trunnion (trun′ yun), *n.* one of the two pivots that project from the opposite sides of a cannon and form a bearing on which it can be raised or lowered.

truss (trus), *n.* a support for a ruptured place in the body; a braced framework in the structure of a roof, bridge or airplane; a bundle of hay or straw.

truss (trus), *v.t.* to pack; to support with a bracing framework; to hold together with skewers or cord before roasting, as to *truss* a roast of beef, or a fowl.

trust (trust), *n.* confidence, faith; credit; a combination of corporations; an estate held for another.

trust (trust), *v.i. and v.t.* to have faith, feel secure; to place confidence in; to sell to on credit.

trustee (trus tē′), *n.* a person to whom property is turned over to be managed for the benefit of others.

trusty (trus′ ti), *n.* [*pl.* trusties] a convict who has been found worthy of confidence and receives special privileges.

trusty (trus′ ti), *adj.* [*comp.* trustier, *superl.* trustiest] justly deserving confidence; faithful.

truth (trōōth), *n.* agreement with reality; the eternal principle of right or the natural law of order; fidelity, constancy.

Syn. Veracity. *Truth* belongs to the thing, *veracity* to the person. The *truth* of the story is admitted upon the *veracity* of the narrator.

try (trī), *v.i. and v.t.* to make an attempt or effort; to put to a test; to test by experiment; to argue and decide, as to *try* a case; to purify by melting, as to *try* out fat.

tryout (trī′ out), *n.* a test of a person or thing in actual performance to determine his desirability for employment.

***tryst** (trist), *n.* an arrangement to meet at a specified place and time; the place of meeting.

tub (tub), *n.* a small cask; a broad open-topped vessel of wood or metal to hold water, as a wash*tub*, a bath*tub;* the amount contained in a small cask, as a *tub* of butter; a broad, clumsy boat.

tub (tub), *v.t. and v.i.* to wash or bathe in a tub.

tuba (tū′ b*a*), *n.* a large, low-pitched, brass wind instrument, a saxhorn.

***tube** (tūb), *n.* a long, hollow stem of glass, rubber or metal to conduct water or gas; a tubelike organ of the body, as the bronchial *tubes;* a pipe; the barrel of a gun or a telescope; a subway or tunnel; a cylindrical, collapsible container made of thin, flexible metal with a screw cap to hold a paste or cream.

tuber (tū′ bẽr), *n.* a thick, round part of a root, as the potato.

***tuberculosis** (tū bûr kū lō′ sis), *n.* a disease caused by a bacillus, with formation of little rounded growths in the tissues, commonly called *consumption* when it affects the lungs.

***tuberose** (tūb′ rōz), *n.* a plant that produces a long spike with a tuft of leaves at the lower end and clusters of fragrant, white funnel-shaped flowers at the other.

tuck (tuk), *n.* a fold in a dress, stitched in for ornament or to make it fit.

tuck (tuk), *v.t.* to fold under; to roll up, as a sleeve; to cover snugly; to put away for safekeeping, as to *tuck* something in a drawer.

tucker (tuk′ ẽr), *n.* that which tucks; a part of a sewing machine.

tucker (tuk′ ẽr), *n.* a covering of lace or fine muslin worn over the shoulders and folded across the breast by women of the 17th and 18th centuries.

***tufa** (tōō′ f*a*), *n.* a porous Italian limestone; a light rock composed of volcanic dust.

***tuft** (tuft), *n.* a knot or bunch, as a *tuft* of grass or hair.

tug (tug), *n.* a strong pull; a boat that tows other boats or ships; a rawhide trace in harness.

tug (tug), *v.i. and v.t.* to pull hard; to tow, as another vessel.

tuition (tū ish′ un), *n.* instruction; a charge for instruction.

tularemia (tōō l*a* rē′ mi *a*), *n.* a disease of rodents, especially rabbits, which may be communicated to human beings and causes a depressing fever that lasts several weeks.

***tulip** (tū′ lip), *n.* a bulbous-rooted plant of the lily family having single, cup-shaped flowers in many colors and combinations of colors.

tumble (tum′ bl), *n.* a fall.

tumble (tum′ bl), *v.i. and v.t.* to roll about; to fall awkwardly; to perform acrobatic stunts; to throw down; to muss, rumple.

tumbler (tum′ blẽr), *n.* a drinking glass without a stem; an acrobat.

***tumid** (tū′ mid), *adj.* swollen, distended, as *tumid* flesh; bombastic, pompous, as a *tumid* style of writing.

***tumor** (tū′ mẽr), *n.* a local swelling or abnormal growth in any part of the body.

***tumult** (tū′ mult), *n.* commotion made by a number of people, with uproar and disorderly movement; agitation, as my mind is in a *tumult.*

tumultuous (tū mul′ tū us), *adj.* disorderly, agitated, turbulent, as *tumultuous* feelings, a *tumultuous* storm.

tumulus (tū′ mū lus), *n.* [*pl.* tumuli] an artificial hillock; a burial mound.

tun (tun), *n.* a large cask; a fermenting vat used in brewing; a measure of wine, 252 gallons.

***tune** (tūn), *n.* a melody; proper pitch or key, as the piano is in *tune;* harmony, as in *tune* with the universe.

tune (tūn), *v.t. and v.i.* to adjust so as to produce the proper tones in music, as to *tune* a violin; to bring into harmonious relation, as his spirit is *tuned* with nature; to put into smooth running order, as to *tune* an engine; to make or break radio connections, as to *tune* in or out; to get in harmony, as the orchestra is *tuning* up.

tuneful (tūn′ fool), *adj.* musical, harmonious, melodious.

tungsten (tung′ sten), *n.* a hard, heavy, grayish-white metallic element used in hardening steel and in making electric-light filaments.

tunic (tū′ nik), *n.* a loose, skirted blouse; a type of military coat.

tunnel (tun′ el), *n.* an underground passageway cut through a hill or under a river.

tunnel (tun′ el), *v.i. and v.t.* to make or dig a passageway through, as to *tunnel* a hill for a railroad.

turban (tûr′ ban), *n.* an Oriental headdress; worn by men; a close-fitting, brimless hat worn by women.

turbid (tûr′ bid), *adj.* clouded, muddy, disturbed, as a *turbid* stream; confused, as *turbid* thoughts.

***turbine** (tûr′ bīn), *n.* a motor operated by water or steam directed against cups on the rim of a wheel.

turbot (tûr′ bot), *n.* a flat fish or flounder.

turbulence (tûr′ bū lens), *n.* disorder, agitation; a disturbed state of mind, with confused thoughts.

turbulent (tûr′ bū lent), *adj.* agitated; disorderly; in great confusion, unsettled, as a *turbulent* mind.

***tureen** (tū rēn′), *n.* a deep, covered and usually footed vessel from which soup is served at the table.

turf (tûrf), *n.* closely sodded grass, as in a fine lawn; the matted mass of grass and roots covering the soil: *the turf,* horse racing and all connected with it.

turf (tûrf), *v.t.* to sod; to cover with turf; to produce a fine, close-growing lawn.

turgid (tûr′ jid), *adj.* distended, swollen, as a gland; inflated, pompous, as a *turgid* style of writing.

turkey (tûr′ ki), *n.* [*pl.* turkeys] a large bird related to the pheasant, valued as food.

turmeric (tûr′ mẽr ik), *n.* the dried and powdered root of an East Indian plant used in making yellow dye and as seasoning and coloring for pickles or other food.

turmoil (tûr′ moil), *n.* confusion of motion, noise and excitement.

turn (tûrn), *n.* motion about a center, as a *turn* of a wheel; a bend or curve, as a *turn* in a road; a place in a series of acts, as it is my *turn* to go; manner of expression, as the *turn* of a sentence; tendency, as he has a mathematical *turn* of mind; an act affecting another, as you have done your good *turn* today; a purpose, as it has served its *turn;* a winding, as give that rope a *turn* around the post.

turn (tûrn), *v.i. and v.t.* to rotate or revolve; to bend aside or reverse; to sour, as the milk *turned;* to move in a circle, as to *turn* a crank; to fold back, as *turn* your sleeves up; to go around, as you must *turn* a corner; to cause to go, as *turn* the horse loose; to form symmetrically, as to *turn* on a lathe.

Syn. Bend, twist, distort, wring, wrest, wrench. We *turn* a thing by moving it; we *turn* the soil over in digging. To *bend* is to change the direction of; to *twist* is to *bend* many times; to *distort* is to *turn* or *bend* something out of its right line or course; to *wring* is to *twist* vigorously; to *wrest* or *wrench* from is to separate by means of twisting; thus a stick may be *wrested* out of one's hand, a door *wrenched* off its hinges.

turncoat (tûrn′ kōt), *n.* one who abandons his professed principles and goes over to the other side, a renegade, as a political *turncoat.*

turnip (tûr′ nip), *n.* the bulbous, edible root of a field or garden plant.

turnkey (tûrn′ kē), *n.* a jailer, a prison keeper.

turnover (tûrn′ ō vẽr), *n.* a complete transaction of purchase, sale and replacement of stock in a store; the amount of such business done in a given period; the number of new workers hired in a given period, in proportion to the entire force: called *labor turnover;* a pie or tart made of a single crust folded to form a shell.

turnpike (tûrn′ pīk), *n.* a road with tollgates.

turnstile (tûrn′ stīl), *n.* formerly a post with a pivoting top consisting of four arms with sufficient space between to permit a person to pass through by turning it; a similar device at the entrance to a subway.

turntable (tûrn′ tā bl), *n.* a revolving platform for turning a wheeled conveyance, as a locomotive.

turpentine (tûr′ pen tīn), *n.* an oil distilled from the resin of several varieties of cone-bearing evergreens, especially the pine, and used largely in making paints and varnishes.

***turpitude** (tûr′ pi tūd), *n.* gross depravity, vileness.

***turquoise** (tûr′ koiz), *n.* a semiprecious stone of a bright-blue or greenish-blue color, found mostly in Persia; the color of this stone.

turret (tûr′ et), *n.* a small tower.

turtle (tûr′ tl), *n.* a tortoise; any of a number of species of reptile, some living on the land, some in fresh water and some in the sea, all having a hard shell in two sections, under and over the body, into which the animal draws its head and legs when threatened with harm.

turtledove (tûr′ tl duv), *n.* a bird of the pigeon family but slightly smaller than the common pigeon.

tusk (tusk), *n.* the long, projecting tooth on either side of the jaw of certain animals, as the walrus and elephant; any large tooth.

tussle (tus′ l), *n.* a scuffle, a struggle.

tussle (tus′ l), *v.i.* to scuffle, struggle.

***tutelage** (tū′ tē lij), *n.* guardianship; state of being a tutor or guardian or of having a tutor or guardian.

***tutor** (tū′ tẽr), *n.* a teacher, especially one who gives a student private instruction.

tutor (tū′ tẽr), *v.t.* to instruct.

***twaddle** (twod′ l), *n.* loose, silly talk.

twaddle (twod′ l), *v.i.* to talk foolishly.

twain (twān), *n.* two: *in twain,* in two parts.

twang (twang), *n.* a sharp, vibrating sound, as that of a plucked wire; a nasal tone of voice.

twang (twang), *v.t.* to pluck at a stringed instrument, unmusically.

tweak (twēk), *n.* a sudden twisting jerk.

tweak (twēk), *v.t.* to pinch or pull with a sudden jerk or twist, as to *tweak* someone's nose.

tweed (twēd), *n.* a fabric, usually of wool, used extensively in making tailored suits and coats: *tweeds,* clothing made of tweed.

tweezers (twēz′ ẽrz), *n.* small pincers to grip tiny things, as in pulling out a hair.

twelfth (twelfth), *n.* one of 12 equal parts.

twelfth (twelfth), *adj.* next in order after the 11th.

twelve (twelv), *n.* one more than 11; a symbol (12) representing that number.

twentieth (twen′ ti eth), *n.* one of 20 equal parts.

twentieth (twen′ ti eth), *adj.* next in order after the 19th.

twenty (twen′ ti), *n.* one more than 19; a symbol (20) representing that number.

twice (twīs), *adv.* two times; doubly.

twiddle (twid′ l), *v.t.* to twirl lightly or idly, as to *twiddle* the thumbs.

twig (twig), *n.* a small shoot or branch.

twilight (twī′ līt), *n.* the time between sunset and darkness or just preceding the sunrise.

twill (twil), *n.* a fabric with the lines of the weave formed to cross it diagonally, as in serge; the diagonal pattern in this cloth.

twin (twin), *n.* one of two born at a single birth; a person or thing closely resembling another.

twin (twin), *adj.* matching exactly, duplicating.

twine (twīn), *n.* stout cord of twisted strands; a tangle; the act of twisting around.

twine (twīn), *v.i. and v.t.* to twist or wind around something; to meander, as the woodbine *twines* around the fence; to form by twisting.

twinge (twinj), *n.* a sharp, shooting pain; a sharp misgiving, as a *twinge* of conscience.

twinge (twinj), *v.i. and v.t.* to have or cause a sudden, darting pain.

twinkle (twing′ kl), *n.* a quick motion of the eye; a tremulous sparkle of light; a moment.

twinkle (twing′ kl), *v.i.* to shine with a tremulous, sparkling light; to shine, sparkle, as the eyes *twinkle* in a moment of merriment.

***twirl** (twûrl), *n.* a quick circular motion, a whirl, as he gave the baton a *twirl.*

twirl (twûrl), *v.t.* to cause to whirl, turn round and round, as to *twirl* a stick.

twist (twist), *n.* a quick turn or sharp bend, as a *twist* in a stream; anything made of tightly intertwined strands, as a *twist* of rope; a bias, prejudice or characteristic, as his books all have a political *twist.*

twist (twist) *v.i. and v.t.* to wind around and around, intertwine; to wrench violently.

twister (twis′ tẽr), *n.* a tornado.

twit (twit), *v.t.* to taunt, annoy by reminding of a fault or error.

twitch (twich), *n.* a sudden jerk; involuntary tightening of a muscle.

twitch (twich), *v.t. and v.i.* to pull with a sudden jerk; to contract spasmodically, as my muscles *twitch.*

twitter (twit′ ẽr), *n.* a succession of chirping sounds.

twitter (twit′ ẽr), *v.i. and v.t.* to chirp, as sparrows *twitter;* to be excited; to sing with chirpy notes, as to *twitter* a song.

two (to͞o), *n.* one more than 1; a symbol (2) representing this number.

twofold (to͞o′ fōld), *adj.* double; consisting of two.

two-ply (to͞o′ plī), *adj.* consisting of two thicknesses; woven double.

***tympanum** (tim′ pa num), *n.* [*pl.* tympanums] the thin membrane separating the outer from the inner ear, the eardrum.

type (tīp), *n.* a unit representative of a class; the class represented; a character in wood or metal to print from; such pieces collectively or the print made from them.

type (tīp), *v.t.* to produce a copy of, prefigure; to write by means of a machine.

type metal (tīp met′ l), an alloy of lead, antimony and tin, used in casting the characters from which print is made.

typesetter (tīp′ set ẽr), *n.* one who puts the pieces of metal bearing characters in order for printing; one who operates a machine by which the characters are cast.

typewriter (tīp′ rīt ẽr), *n.* a keyboard machine that may be operated to print characters on paper by striking an inked ribbon against it.

***typhoid** (tī′ foid), *n.* a fever caused generally by drinking water or milk containing germs of the disease.

***typhoon** (tī fo͞on′), *n.* a cyclonic storm occurring in the China Sea.

***typhus** (tī′ fus), *n.* a fever caused by insanitary conditions and conveyed by body lice.

***typical** (tip′ i kal), *adj.* representative, symbolic, characteristic.

typify (tip′ i fī), *v.t.* [*p.t. and p.p.* typified, *pr.p.* typifying] to represent, symbolize, stand as an example of.

typist (tīp′ ist), *n.* one who operates a typewriter.

***typography** (tī pog′ r*a* fi), *n.* [*pl.* typographies] the art of printing; the character of print, as this book shows excellent *typography.*

***tyrannical** (ti ran′ i kal), *adj.* despotic, cruel, overbearing.

tyranny (tir′ *a* ni), *n.* [*pl.* tyrannies] despotism, misuse of power over others, oppression.

tyrant (tī′ rant), *n.* a despot, an oppressor.

tyro (tī′ rō), *n.* [*pl.* tyros] a beginner, a novice: often spelled *tiro.*

U

***ubiquitous** (ū bik′ wi tus), *adj.* seeming to be everywhere at once.

***ubiquity** (ū bik′ wi ti), *n.* omnipresence.

U-boat (ū′ bōt), *n.* a German submarine or *Unterseebot.*

udder (ud′ ẽr), *n.* a milk bag with two or more nipples, as the udder of a cow.

ugly (ug′ li), *adj.* [*comp.* uglier, *superl.* ugliest] unpleasing to the eye; implying danger, as an *ugly* rumor; threatening to have serious results, as an *ugly* wound; bad-tempered.

ukase (ū kās′), *n.* a decree of the czar in the old Russian Empire, having the force of law; any official or authoritative decree.

***ukulele** (ū ku lā′ lē), *n.* a Hawaiian musical instrument like a guitar but much smaller.

ulcer (ul′ sẽr), *n.* an open, festering sore; a corrupting influence in public affairs.

ulcerate (ul′ sẽr āt), *v.i.* to form an open, discharging sore, as the tooth ulcerated.

ulna (ul′ n*a*), *n.* the larger of the two bones of the forearm.

ulster (ul′ stẽr), *n.* a long, loose, heavy overcoat, first made in Belfast, Ulster.

ulterior (ul tẽr′ i ẽr), *adj.* more remote; hidden, kept secret, as he had *ulterior* motives.

***ultimate** (ul′ ti mit), *n.* the last or final step or result, the conclusion.

ultimate (ul′ ti mit), *adj.* final, last, farthest; fundamental, as the *ultimate* truth.

***ultimatum** (ul ti mā′ tum), *n.* [*pl.* ultimatums or ultimata] a final statement or offer of terms, the last word.

ultimo (ul′ ti mō), *adv.* in the last preceding month, in the month before this one.

ultra (ul′ tr*a*), *adj.* extreme, uncompromising, as he belongs to the *ultra* group.

ultramarine (ul tr*a* m*a* rēn′), *n.* a blue pigment.

ultramarine (ul tr*a* m*a* rēn′), *adj.* lying beyond the sea; having any of the shades of blue given by a certain pigment.

ululation (ūl ū lā′ shun), *n.* a howling like that of a wolf.

ultraviolet rays (ul′ tr*a* vī′ ō let rāz), invisible light beyond the violet of the spectrum, having faster and shorter vibrations than the eye can perceive.

umber (um′ bẽr), *n.* a brown pigment or its dark, yellowish-brown color.

umber (um′ bẽr), *adj.* having a dark, yellowish-brown color.

umbilicus (um bil′ i kus), *n.* [*pl.* umbilici] the navel.

***umbrage** (um′ brij), *n.* shade, shadows, obscurity; resentment, a sense of injury.

***umbrageous** (um brā′ jus), *adj.* shady.

***umbrella** (um brel′ *a*), *n.* a sliding, opening and closing frame of wire ribs covered with cloth or paper and carried overhead as a screen against sun, rain, snow.

umpire (um′ pīr), *n.* a third party to whom a dispute is referred; an official who applies the rules and settles points in dispute in a sports contest or arbitration.

umpire (um′ pīr), *v.t. and v.i.* to settle referred disputes; to act as an official in sports or games to settle disputes by the rules.

unabridged (un *a* brijd′), *adj.* not reduced in content, complete, as an *unabridged* dictionary.

unaccountable (un a koun′ t*a* bl), *adj.* not responsible; inexplicable, as an *unaccountable* absence.

***unanimity** (ū n*a* nim′ i ti), *n.* [*pl.* unanimities] agreement by all concerned.

***unanimous** (ū nan′ i mus), *adj.* agreeing in opinion or desire, with no dissenters.

unawares (un *a* wârz′), *adv.* unexpectedly, by surprise, as we came upon them *unawares.*

unbend (un bend′), *v.i. and v.t.* to relax, free from strain, release tension; to become more genial; to make straight, as to *unbend* wire.

unbelief (un bē lēf′), *n.* doubt; a withholding of acceptance of a statement or doctrine.

Syn. Disbelief, incredulity. *Unbelief* means only the absence of belief; *disbelief,* actual rejection; *incredulity,* an attitude of skepticism.

Ant. Belief, faith, credulity.

uncanny (un kan′ i), *adj.* weird, mysterious, not explainable.

uncertain (un sûr′ tin), *adj.* doubtful in one's mind; hesitant; unpredictable, as the outcome is *uncertain.*

uncle (ung′ kl), *n.* the brother of one's father or mother; the husband of one's aunt.

unconcern (un kon sûrn′), *n.* indifference, lack of interest.

unconditional (un kon dish′ un al), *adj.* absolute, without limitation; as my terms are *unconditional* surrender.

unconscionable (un kon′ shun *a* bl), *adj.* out of all reason or expectation.

uncover (un kuv′ ẽr), *v.i. and v.t.* to remove the hat as a sign of respect; to make known, as to *uncover* the facts of a case, expose.

unction (ungk′ shun), *n.* the act of anointing; ointment; anything that soothes; religious fervor; a sacrament administered to those about to die, as extreme *unction;* suavity, smoothness of manner; gush, pretended fervor.

unctuous (ungk′ tū us), *adj.* soothing; smooth and oily; suave.

undaunted (un dôn′ ted), *adj.* fearless, undismayed.

under (un′ dẽr), *adj.* lower, as the *under* dog; subordinate, as an *under* officer.

under (un′ dẽr), *adv.* underneath; in or into a state of inferiority, as the business went *under* in the depression.

under (un′ dẽr), *prep.* beneath, as *under* the stars, *under* water; accountable to, as *under* the jurisdiction of a higher court; subject to the conditions of, as *under* the terms of the agreement; less than, as *under* 21 years of age.

underbrush (un′ dẽr brush), *n.* a dense growth of small shrubs and trees; undergrowth.

undercurrent (un′ dẽr kûr ent), *n.* a circulation, as of air or water, beneath an upper, similar circulation; a thought or feeling that is observable but not definitely expressed, as an *undercurrent* of disapproval.

undergo (un dẽr gō′), *v.t.* [*p.t.* underwent, *p.p.* undergone, *pr.p.* undergoing] to submit to, as to *undergo* an operation; to pass through, as an experience, as to *undergo* a great loss.

undergraduate (un dẽr grad′ ū āt), *n.* a college student who has not taken his first degree.

underground (un′ dẽr ground), *adj.* subterranean, as an *underground* tunnel; transmitted or conveyed by secret means.

underhand (un′ dẽr hand), *adj.* crafty, sly, secret.

underhand (un′ dẽr hand), *adv.* in a sly, secret, mean manner; underhandedly.

underhung (un′ dẽr hung), *adj.* with the lower jaw projecting, as the bulldog has an *underhung* head.

underling (un′ dẽr ling), *n.* a person of inferior station, a subordinate.

undermine (un dẽr mīn′), *v.t.* to weaken, to work against in secret, as to *undermine* a person.

underneath (un dẽr nēth′), *adv.* beneath, on the lower side.

underneath (un dẽr nēth′), *prep.* directly beneath; beneath the guise of, as *underneath* a pretense of gayety.

undershot (un′ dẽr shot), *adj.* turned by water flowing under, as an *undershot* water wheel; with the lower jaw projecting beyond the upper.

underslung (un dẽr slung′), *adj.* built, as an automobile, so that the frame of the chassis is below the axles.

understand (un dẽr stand′), *v.i. and v.t.* [*p.t. and p.p.* understood, *pr.p.* understanding] to perceive with the mind; to be informed upon, as he *understands* engines; to comprehend, as I cannot *understand* you; to know fully, realize, as you do not *understand* the reason; to be sympathetic.

understanding (un dẽr stand′ ing), *n.* the faculty of reasoning; discernment; knowledge; an agreement, as they came to an *understanding;* sympathy.

Syn. Intellect, intelligence. The *understanding* rests upon mental power to perceive and to form images in the mind. *Intellect* implies understanding of abstruse subjects; it is a matured state of the *understanding*. *Intelligence* may shine forth in the facial expression of a child, though his *intellect* is as yet almost completely undeveloped.

Ant. Dullness, stupidity, ignorance.

understudy (un′ dẽr stud i), *v.t.* to learn the part of, as an actor, in order to serve as substitute in case of necessity.

undertake (un dẽr tāk′), *v.t.* [*p.t.* undertook, *p.p.* undertaken, *pr.p.* undertaking] to assume charge; to attempt, promise to do if possible.

undertaker (un′ dẽr tāk ẽr), *n.* one who prepares the dead for burial, provides the shroud and casket and oversees funeral arrangements; one who manages a business, an entrepreneur.

undertaking (un′ dẽr tāk ing), *n.* an enterprise, business, project; a promise or guarantee.

undertone (un′ dẽr tōn), *n.* a low tone of voice; a murmured utterance, as he said it in an *undertone;* subdued color, as an *undertone* of blue.

undertow (un′ dẽr tō), *n.* a current beneath the water's surface that moves in an opposite direction to the current of the surface, especially the current at the seashore that drags against the force of the incoming waves, as the *undertow* is dangerous this morning.

underworld (un′ dẽr wûrld), *n.* the dwelling place of the dead, Hades; the criminal classes.

underwrite (un dẽr rīt′), *v.t.* [*p.t.* underwrote, *p.p.* underwritten, *pr.p.* underwriting] to sign with one's name; to agree to buy all for which other buyers are not found, as to *underwrite* an issue of bonds; to insure.

underwriter (un′ dẽr rīt ẽr), *n.* one who insures others.

undue (un dū′), *adj.* improper, excessive, more than is reasonable.

undulate (un′ dū lāt), *v.i. and v.t.* to move or cause to move in waves or like waves.

unduly (un dū′ li), *adv.* excessively, improperly.

unearned increment (un ûrnd′ in′ krē ment), increase in the value of property without labor or expenditure by the owner, as from greater demand due to growing population.

unearthly (un ûrth′ li), *adj.* supernatural, weird.

uneasy (un ēz′ i), *adj.* ill at ease in mind or body; constrained.

unequal (un ē′ kwal), *adj.* not equivalent, disproportionate, varying.

unequivocal (un ē kwiv′ ō kal), *adj.* clear and plain, unmistakable in meaning, definite.

unerring (un ûr′ ing), *adj.* accurate, certain, infallible.

uneven (un ē′ ven), *adj.* not smoothly level, rough-surfaced; not uniform; unfair in distribution.

***unguent** (ung′ gwent), *n.* an ointment; a salve for sores or burns.

unicorn (ū′ ni kôrn), *n.* a fabulous creature like a horse but having a single horn projecting from its forehead.

uniform (ū′ ni fôrm), *n.* an official or regulation costume.

uniform (ū′ ni fôrm), *adj.* not varying, each one like all the others, all alike in shape, character or manner; consistent and unchanging.

unify (ū′ ni fī), *v.t.* [*p.t. and p.p.* unified, *pr.p.* unifying] to form into a unit, unite, join together.

unimpeachable (un im pēch′ *a* bl), *adj.* unquestionable, free from fault.

***union** (ūn′ yun), *n.* the act of joining together or state of being united; an organization of workers in one trade; a league of states; harmony.

unionize (ūn′ yun īz), *v.t.* to form into an organized group or association, as to *unionize* a trade; to cause to become a member of such an association.

unique (ū nēk′), *adj.* alone of its kind.

***unison** (ū′ ni sun), *n.* a state of concord or harmony; the same pitch for all, as voices in *unison.*

unit (ū′ nit), *n.* a single person or thing considered as part of a group, as each student is a *unit* in a class; a group regarded as a part of a whole, as the class is a *unit* in the organization of a school; a standard quantity by which to measure, as the pound is a *unit* of weight.

unite (ū nīt′), *v.i. and v.t.* to join together; to combine.

unity (ū′ ni ti), *n.* [*pl.* unities] the state of oneness, as national *unity;* concord; wholeness, as the *unity* of action in a play.

universal (ū ni vûr′ sal), *adj.* all-pervading; relating to the whole world, general, common to all.

universal joint (ū ni vûr′ sal joint), a union or coupling that permits both parts to move freely in any direction.

Universalism (ū ni vûr′ sal izm), *n.* the belief that all souls will be saved.

universe (ū′ ni vûrs), *n.* the whole system of created things, including the world we know and any others that may exist.

university (ū ni vûr′ si ti), *n.* [*pl.* universities] an educational institution of highest rank, with various departments of instruction and professional schools in addition to the academic branches; a number of colleges under a single administration.

unkempt (un kempt′), *adj.* disheveled, untidy, rough in appearance.

unless (un les′), *conj.* if not, as I shall go *unless* you forbid; *unless* it snows, the game will be played.

Syn. Except. *Unless* is employed for the particular case. *Except* has reference to some general rule. I shall not do it *unless* he asks me. No one can enter *except* those who have tickets.

unlettered (un let′ ẽrd), *adj.* ignorant, lacking education, illiterate.

unlike (un līk′), *adj.* dissimilar, having no resemblance.

unlimited (un lim′ i ted), *adj.* boundless, unrestricted in scope.

unnerve (un nûrv′), *v.t.* to deprive of courage, reduce to a state of helpless fear; to cause to lose control.

unprincipled (un prin′ si pld), *adj.* having no conscience, unscrupulous.

unqualified (un kwol′ i fīd), *adj.* without the qualifications necessary; without reservations, as *unqualified* approval.

unravel (un rav′ el), *v.i. and v.t.* to become disentangled; to present a solution of, as to *unravel* a mystery; to separate the threads of, as to *unravel* a knitted garment.

unreasonable (un rē′ zn *a* bl), *adj.* immoderate, asking too much, as an *unreasonable* request; absurd, irrational.

unregenerate (un rē jen′ ẽr it), *adj.* not spiritually renewed; unreformed.

unremitting (un rē mit′ ing), *adj.* persistent, never relaxing.

unrivaled (un rī′ vald), *adj.* having no equal, peerless, as a scene of *unrivaled* beauty.

unruffled (un ruf′ ld), *adj.* undisturbed, tranquil, as *unruffled* calm.

unruly (un rōōl′ i), *adj.* disregarding restraint and defying authority, hard to manage or control.

unsearchable (un sûr′ cha bl), *adj.* hidden, mysterious.

unseasonable (un sē′ zn *a* bl), *adj.* coming at an unusual or inappropriate time of year, as *unseasonable* heat; untimely.

unseat (un sēt′), *v.t.* to throw, as a horse its rider; to remove from office, as a legislator.

unsightly (un sīt′ li), *adj.* hideous, ugly, as an *unsightly* building.

unspeakable (un spēk′ *a* bl), *adj.* unutterable; not to be expressed.

Syn. Ineffable, unutterable, inexpressible. Anything beyond the descriptive power of language is *unspeakable*, as the *unspeakable* glory of God; *ineffable* means unable to be adequately stated, as the *ineffable* sweetness of a person's look; that is *unutterable* or *inexpressible* which cannot be made wholly comprehensible to another.

Ant. Describable; communicable.

unstrung (un strung′), *adj.* having the strings loosened or broken; nervously upset.

unthinkable (un thingk′ *a* bl), *adj.* incapable of being contemplated, inconceivable.

until (un til′), *conj.* to the time, degree or place that, as he worked *until* he was exhausted.

until (un til′), *prep.* to or up to, as she stayed *until* evening.

unto (un′ tōō), *prep.* to.

untold (un tōld′), *adj.* not describable, uncounted, as *untold* wealth.

untoward (un tō′ ẽrd), *adj.* willful, refractory; awkward; unfortunate.

untruth (un trōōth′), *n.* the quality of being untrue; a falsehood.

untutored (un tū′ tẽrd), *adj.* lacking in education; unsophisticated, naïve.

unusual (un ū′ zhoo al), *adj.* out of the ordinary, rare, strange.

unveil (un vāl′), *v.t.* to remove a covering from, as to *unveil* a statue.

unutterable (un ut′ ẽr *a* bl), *adj.* beyond the power of words to describe, inexpressible.

unwieldy (un wēld′ i), *adj.* not easily managed, bulky, clumsy, as an *unwieldy* package.

unwitting (un wit′ ing), *adj.* unaware, ignorant, unknowing, as she was the *unwitting* cause of the misunderstanding.

unworthy (un wûr′ *th*i), *adj.* [*comp.* unworthier, *superl.* unworthiest] lacking merit or soundness; unsuitable, unbecoming.

Syn. Worthless. *Unworthy* is a term of less reproach than *worthless.* There are many *unworthy* members in a religious community, but every society that is conducted upon proper principles finds it necessary to exclude the *worthless.*

Ant. Worthy; deserving; useful.

unwrap (un rap′), *v.i. and v.t.* to unfold, open up; to open, to remove the covering from, as a package.

up (up), *adj.* moving or sloping in a direction thought of as tending higher, as an *up* grade.

up (up), *adv.* on high; above the horizon; from a lower to a higher position: opposite of *down*, as a kite goes *up;* a successful man goes *up* in the world; someone who has been downstairs goes *up;* prices go *up* when they increase; we get *up* and stand *up.*

up (up), *prep.* toward the top or beginning, as *up* the hill, *up* the river.

upbraid (up brād′), *v.t.* to reproach, chide.

upbringing (up′ bring ing), *n.* training, rearing.

upheaval (up hēv′ al), *n.* the act or state of being raised or overturned, especially a raising of a part of the earth's crust; a violent turmoil.

uphill (up′ hil), *adv.* toward a higher level; upward.

uphill (up′ hil), *adj.* sloping in an upward direction; difficult, arduous, as he had an *uphill* fight to success.

uphold (up hōld′), *v.t.* [*p.t. and p.p.* upheld, *pr.p.* upholding] to support, maintain; to defend.

upholstery (up hōl' stẽr i), *n.* [*pl.* upholsteries] the act of decorating a room with textile hangings and draperies, and particularly fitting furniture with springs, padded seats and coverings; materials used for stuffing and covering furniture and for curtains and drapery.

upkeep (up' kēp), *n.* the act or cost of keeping anything in working order, maintenance, as it is not the initial cost but the *upkeep* that counts.

upon (u pon'), *adv.* on; resting on the top or surface of, as it rests *upon* the shelf; depending on or springing from, as it rests *upon* such evidence; at the time of, as *upon* departure of the ship; so as to encounter, as we came *upon* a lovely scene.

upper (up' ẽr), *n.* a top part, as the *upper* of a shoe.

upper (up' ẽr), *adj.* higher in place, rank or dignity, as the *Upper* House of Congress, the *upper* levels of literature, the *upper* story of a house.

uppish (up' ish), *adj.* arrogant, snobbish.

upright (up' rīt), *n.* something in a vertical position, as the *uprights* in a wall.

upright (up' rīt), *adj.* erect, vertical, as an *upright* piano; honest, just, square-dealing.

uprising (up rīz' ing), *n.* rebellion, mutiny.

*__uproar__ (up' rōr), *n.* noisy disturbance, bustle and clamor.

uproot (up ro͞ot'), *v.t.* to pluck up by the roots; to remove.

upset (up set'), *n.* the act of overturning or state of being overturned; a reversal of form, as that game was an *upset* for the champions.

upset (up set'), *v.t.* to overturn, overthrow; to disturb, put out of normal condition.

upshot (up' shot), *n.* the final result or outcome, conclusion.

upstart (up' stärt), *n.* a person who has a sudden success or rising in the world, a parvenu.

upstream (up' strēm), *adv.* toward the source of a stream; against the current.

upturn (up' tûrn), *n.* a change to a rising direction; a change for the better.

upturn (up tûrn'), *v.t.* to turn over, as soil with a plow; to tilt upward, as *upturned* faces.

upward (up' wẽrd), *adv.* toward a higher place or level, in a rising direction.

uranium (ū rā' ni um), *n.* a heavy, white metallic element which is obtained from pitchblende and from which radium and helium are extracted.

*__urban__ (ûr' ban), *adj.* pertaining to cities or towns.

*__urbane__ (ûr bān'), *adj.* polite, refined, courteous.

urchin (ûr' chin), *n.* a pert or mischievous little fellow.

urge (ûrj), *n.* the act of trying to persuade; a strong desire or impulse.

urge (ûrj), *v.t.* to try to persuade to do something, advise strongly; to push or drive, as to *urge* a horse onward, *urge* consideration of a matter.

urgent (ûr' jent), *adj.* calling for immediate consideration.

*__urine__ (ū' rin), *n.* the fluid secreted by the kidneys, stored in and discharged from the bladder.

urn (ûrn), *n.* a rounded vessel of metal or pottery, usually having a base or pedestal; a closed metal receptacle with a faucet for making tea or coffee and keeping it hot.

*__ursine__ (ûr' sīn), *adj.* pertaining to a bear; like a bear.

usable (ūz' *a* bl), *adj.* suitable to be employed for a given purpose.

*__usage__ (ūs' ij), *n.* treatment, as hard *usage;* habitual custom; manner of expressing, as good *usage* in language.

Syn. Custom, use. *Usage* implies long-continued practice; *custom* suggests a usual course of action; *use* is a general term and suggests the act of employing anything for a specific purpose.

Ant. Disuse, discontinuance, neglect.

*__use__ (ūs), *n.* application of anything to a particular end; custom or practice; occasion to employ, as I have *use* for that book; state of being in employment, as the car is in constant *use*.

*__use__ (ūz), *v.t.* to employ; to practice constantly, as to *use* good judgment in business; to make familiar by constant association or practice, as I am *used* to hard work.

useful (ūs' fool), *adj.* serving a purpose, helpful in accomplishing an end.

useless (ūs' les), *adj.* not serving any purpose, not helpful.

usher (ush' ẽr), *n.* a person who conducts others to their seats, as in a church or theater; a pupil who acts as teacher, an untrained instructor.

usher (ush' ẽr), *v.t.* to introduce or lead in, as bright days *usher* spring into the land; to conduct or escort.

*__usual__ (ū' zhoo al), *adj.* customary, habitual, occurring in the regular course of things.

*__usufruct__ (ū' zū frukt), *n.* the privilege of using the property of another and enjoying its profits without reducing its substance.

usurer (ū' zhoo rẽr), *n.* one who lends money, especially at more than a legal rate of interest.

*__usurp__ (ū zûrp'), *v.t.* to take and hold by force without legal right.

*__usury__ (ū' zhoo ri), *n.* [*pl.* usuries] the practice of lending money at more than legal interest.

*__utensil__ (ū ten' sil), *n.* an implement or vessel serving a practical purpose, as kitchen *utensils.*

utilitarianism (ū til i târ' i an izm), *n.* the belief that good and evil should be measured by the usefulness of actions in contributing to human happiness and welfare.

utility (ū til' i ti), *n.* [*pl.* utilities] usefulness; a corporation supplying public necessaries, as water, electricity and gas companies are public *utilities.*

utilize (ū' til īz), *v.t.* to make use of; to make profitable by using, as to *utilize* spare time.

utmost (ut' mōst), *n.* the extreme limit or extent, as to the *utmost* of one's ability.

utmost (ut' mōst), *adj.* greatest; farthest, as the *utmost* extent.

utter (ut' ẽr), *v.t.* to speak, pronounce; to give out by sound, as to *utter* a sigh.

Syn. Express, enunciate, voice, deliver, issue. To *utter* and to *voice* imply giving expression to and both are applied rather generally; to *express* is to give voice to, either privately or publicly; to *enunciate* usually means to pronounce, as to *enunciate* each word clearly; to *deliver* is to give forth in words, often in forceful words, as to *deliver* an ultimatum; to *issue* usually implies official action, as to *issue* a proclamation, to *issue* a command.

utter (ut' ẽr), *adj.* complete, absolute, entire.

utterance (ut' ẽr ans), *n.* the act of speaking; that which is spoken.

uttermost (ut' ẽr mōst), *n.* the farthest extent or highest degree.

uttermost (ut' ẽr mōst), *adj.* farthest.

*__uvula__ (ū' vū l*a*), *n.* the fleshy, cone-shaped body attached to the soft palate.

*__uxorious__ (uks ō' ri us), *adj.* fond of one's wife to the point of doting.

V

vacancy (vā' kan si), *n.* [*pl.* vacancies] the state of being empty or unoccupied; empty-mindedness; an office or position to be filled.

vacant (vā' kant), *adj.* empty, unoccupied; lacking intelligence, as a *vacant* look.

*__vacate__ (vā' kāt), *v.i. and v.t.* to give up and leave, as a house, office or position of employment; to make empty, as to *vacate* a house; to set aside, nullify and make void, as to *vacate* a court order.

*__vacation__ (vā kā' shun), *n.* the act of leaving without occupants, as the *vacation* of premises; a period of absence from work, for recreation.

*__vaccinate__ (vak' si nāt), *v.t.* to inoculate with germs developing resistance and giving immunity from a disease, as smallpox.

*__vaccine__ (vak sēn'), *n.* the substance taken from a cow with cowpox and the fluid used in inoculating against smallpox.

vacillate (vas' i lāt), *v.i.* to waver, be unsteady, move one way and then the other; to hesitate in making up one's mind.

vacuity (va kū' i ti), *n.* [*pl.* vacuities] emptiness; complete inactivity of the mind.

vacuous (vak' ū us), *adj.* empty; blank, as a *vacuous* expression; stupid.

vacuum (vak' u um), *n.* a space devoid of matter and air; an utter void.

vacuum bottle (vak' u um bot' l), a container in which liquids are kept at the temperature they had when poured in.

vacuum pump (vak' u um pump), a machine to raise water through a pipe by exhausting the air; a machine to remove air from an inclosed space.

vacuum tube (vak' u um tūb), a sealed glass used in radio to cause, detect or increase electrical movements or to rectify an alternating current.

*__vagabond__ (vag' *a* bond), *n.* a wanderer, one who rambles about and does not work, a tramp.

vagabond (vag' *a* bond), *adj.* roaming, idle and wandering.

*__vagary__ (v*a* gâr' i), *n.* [*pl.* vagaries] a whim, a fanciful turn of the mind, a wild notion.

vagrancy (vā' gran si), *n.* a state of wandering without a settled home.

*__vagrant__ (vā' grant), *adj.* wandering from place to place; rambling, as thoughts; sometimes, especially in poetry, *vagrom.*

vague (vāg), *adj.* indefinite, not clear, hazy.

*__vain__ (vān), *adj.* without value; without force, fruitless; conceited.

vainglorious (vān glō' ri us), *adj.* boastful over one's own accomplishments or achievements.

valance (val' ans), *n.* a short curtain hung at the top of a window or around the sides of a bed or other furniture.

*__vale__ (vāl), *n.* a valley.

valedictorian (val ē dik tō' ri an), *n.* the member of a graduating class (usually highest in rank) who delivers the farewell address to classmates at commencement.

valedictory (val ē dik' tō ri), *n.* [*pl.* valedictories] a farewell speech; an address to a graduating class at commencement.

valedictory (val ē dik' tō ri), *adj.* pertaining to a farewell.

valence (vā' lens), *n.* the degree of combining power of an atom, as chlorine has a *valence* of 1.

valentine (val' en tīn), *n.* a sweetheart chosen on St. Valentine's Day, February 14; a love message sent to a sweetheart on that day.

*__valet__ (val' et), *n.* a manservant who personally attends a gentleman and takes care of his clothes.

*__valetudinarian__ (val ē tū di nâr' i an), *n.* an invalid; one who spends too much time thinking about his health.

valiant (val' yant), *adj.* courageous, brave, fearless.

valid (val' id), *adj.* resting upon fact, sound, logical; having legal force.

*__valise__ (v*a* lēs'), *n.* a traveling bag, usually of leather or a substitute made in two equal parts on hinged frames that close lengthwise.

valley (val' i), *n.* [*pl.* valleys] a tract of lower land lying between two lines of hills or mountains; a low spot in a curve on a diagram or graph.

valor (val' ẽr), *n.* courage, bravery.

valorous (val' ẽr us), *adj.* brave.

valuable (val' ū *a* bl), *adj.* having real worth; possessing useful qualities.

*__valuables__ (val' ū *a* blz), *n.* personal possessions, such as jewelry, art objects, silverware, mortgages, deeds, policies, wills, stocks and bonds, which one usually places in safe deposit.

value (val' ū), *n.* that which renders anything desirable or useful, worth; the exact use and meaning, as what is the *value* of this word; a market price; a fair price.

value (val' ū), *v.t.* to estimate the worth of; to esteem, regard highly.

Syn. Prize, esteem. To *value* is to set a price upon. It may be based upon intrinsic worth or upon special, personal considerations. An appraiser *values* goods in one way, the owner in another. To *prize* and to *esteem* are only mental actions. We *value* books for their market price; we *prize* them for their contents. In this sense *prize* is a stronger term than *value*.

valve (valv), *n.* a lid or cover opening in one direction and shutting in the other to open a conduit to passage of a liquid one way and prevent it from moving in the reverse direction; any device to regulate flow in a pipe, as of steam in radiators.

vamp (vamp), *n.* the leather piece forming the upper front part of a shoe.

vamp (vamp), *v.t.* to put on an upper piece of leather; to patch.

vampire (vam′ pīr), *n.* a fabled creature that sucks the blood of sleeping persons.

van (van), *n.* the leading units of an army or fleet; the persons who lead any movement; the place of leadership.

van (van), *n.* a large, covered truck used to move furniture and household goods; a railway baggage car.

vanadium (v*a* nā′ di um), *n.* a metallic element used as an alloy to increase the resistance of steel to shock.

***vandal** (van′ dal), *n.* one who destroys ruthlessly; one who destroys beautiful things.

***vane** (vān), *n.* a weathercock; a flat arm in a propeller or the wheel of a windmill; any flat piece attached to an axis so that it moves with the wind or with the passage of a fluid.

vanguard (van′ gärd), *n.* the troops that march at the head of an army.

vanilla (v*a* nil′ *a*), *n.* a tropical American climbing plant of the orchid family; its pods or beans, from which a flavoring extract is made.

vanish (van′ ish), *v.i.* to disappear; to be lost.

vanity (van′ i ti), *n.* [*pl.* vanities] shallow pride, desire for admiration, conceit; a vanity bag.

vanity bag (van′ i ti bag), a case in which powder, rouge, lipstick and a mirror are carried for immediate use.

***vanquish** (vang′ kwish), *v.t.* to conquer, subdue, defeat.

***vapid** (vap′ id), *adj:* stale, stupid, empty, as *vapid* talk.

***vapor** (vā′ pẽr), *n.* mist in the air; the gas into which a solid or liquid is transformed, steam, smoke; anything that vanishes like mist.

vaporize (vā′ pẽr īz), *v.t. and v.i.* to convert or be converted into steam or gas.

vaporous (vā′ pẽr us), *adj.* misty; unreal.

***variable** (vâr′ i *a* bl), *n.* anything that is subject to change.

variable (vâr′ i *a* bl), *adj.* changing, unreliable.

variance (vâr′ i ans), *n.* the state of being subject to change; the extent of change; a disagreement or dispute.

variant (vâr′ i ant), *n.* something that differs in a particular respect from something else that it otherwise closely resembles; an alternative form or spelling, as theatre is a *variant* of theater.

variant (vâr′ i ant), *adj.* differing in some particular respect from others that it closely resembles; alternative, as a *variant* spelling.

variation (vâr i ā′ shun), *n.* a difference between two things; a difference between two states of the same thing; the extent of change a thing undergoes or may undergo, as there has been little *variation* in the weather this week.

varicolored (vâr′ i kul ẽrd), *adj.* marked with different colors.

***varied** (vâr′ id), *adj.* consisting of different sorts, as you need a more *varied* diet.

***variegate** (vâr′ i e gāt), *v.t.* to mark with different colors.

***variety** (v*a* rī′ e ti), *n.* [*pl.* varieties] change from one thing to another; intermixture of different things, diversity; a group within a class, as a *variety* of apple.

***varioloid** (vâr′ i ō loid), *n.* a mild form of smallpox, occurring in patients who previously have had smallpox or have been vaccinated.

***variorum** (vâr i ō′ rum), *adj.* indicating an edition of a text with comments by a number of critics and editors, as a *variorum* edition of *Hamlet.*

***various** (vâr′ i us), *adj.* different; several.

varlet (vär′ let), *n.* a menial; a rogue.

varnish (vär′ nish), *n.* a thick, resinous liquid used to gloss wood or metal; polish of manners.

varnish (vär′ nish), *v.t.* to coat with varnish; to gloss over, palliate.

vary (vâr′ i), *v.i. and v.t.* [*p.t. and p.p.* varied, *pr.p.* varying] to undergo a change, differ; to alternate kinds; to mix different sorts, as you should *vary* your diet.

vascular (vas′ kū lẽr), *adj.* relating to the vessels and ducts of the body.

***vase** (vās), *n.* a tall vessel of glass, pottery or similar ware, ornamental and used for such purposes as holding flowers.

***vaseline** (vas′ e lēn), *n.* petroleum jelly, used as an ointment and a lubricant, and for other proprietary articles made from petroleum: a trade name.

vassal (vas′ al), *n.* a tenant in the feudal system; a bondman or slave.

vassalage (vas′ al ij), *n.* services rendered to a feudal lord in payment for protection; bondage, slavery.

***vast** (vȧst), *adj.* of great extent; very great in quantity or amount, as a *vast* sum.

vat (vat), *n.* a large flat tub or tank used in some processes of manufacture, especially dyeing or tanning; a liquor for dyeing which colors material only after the material has been dipped in it and then exposed to the air.

***vaudeville** (vōd′ vil), *n.* an entertainment with a varied program of songs, dances, acrobatics, juggling and short dramatic sketches; a tropical song.

***vault** (vôlt), *n.* a leap over a fence or other barrier or bar with the help of the hands or a pole.

vault (vôlt), *n.* a chamber with an arched roof, as a burial *vault;* a steel-walled room in which a bank keeps money and papers; the broad arch of the skies.

vault (vôlt), *v.i. and v.t.* to leap over a high bar with the help of a pole; to leap, placing the hands on the barrier, as to *vault* a fence.

***vaunt** (vônt), *n.* a boast or brag.

vaunt (vônt), *v.i. and v.t.* to boast or brag; to display proudly.

veal (vēl), *n.* calf's flesh used as meat.

vector (vek′ tẽr), *n.* a line studied with regard to direction as well as length; a quantity that can be represented by such a line, as velocity.

vedette (vē det′), *n.* a sentinel, usually mounted and occupying an advanced position nearer the enemy than the sentinels of his own force; a small naval vessel used for scouting.

veer (vēr), *v.i. and v.t.* to change direction, as the wind *veered* to the south; to turn the course of, as a ship going into a new tack; to change one's opinion or allegiance, as he *veers* toward the other party.

veery (vēr′ i), *n.* a small thrush found in the eastern United States, sometimes called Wilson's thrush.

vegetable (vej′ ē t*a* bl), *n.* a plant especially one grown for food; the edible parts of such plants as marketed and used at the table.

vegetable (vej′ ē t*a* bl), *adj.* pertaining to plants; produced by plants, as *vegetable* food or fiber.

***vegetarian** (vej ē târ′ i an), *n.* one who eats only vegetable foods, fruits and nuts, with no animal products except perhaps milk and eggs.

vegetate (vej′ ē tāt), *v.i.* to grow as a plant; to live with no more activity than a vegetable, or with little physical or mental energy.

vegetation (vej ē tā′ shun), *n.* plants collectively, plant life.

***vehement** (vē′ ē ment), *adj.* violent, as a *vehement* wind; ardent, earnest, as a *vehement* speech.

***vehicle** (vē′ i kl), *n.* any kind of conveyance; that by which anything is carried or conveyed, as the radio is a great *vehicle* for news; magazines and newspapers are *vehicles* for advertising.

veil (vāl), *n.* a light fabric or net worn over the face; a piece of fabric hanging from the head over the shoulders, as worn by nuns; a curtain hiding something from sight, as a statue about to be revealed to the public; anything that conceals.

veil (vāl), *v.t.* to screen from sight, conceal, as to *veil* a meaning.

***vein** (vān), *n.* one of the tubes in the body through which blood flows back to the heart; a branching rib of a leaf; a seam of rock bearing ore; a wandering line of another color in marble; a particular character or style of speaking or writing, as this essay has a strong *vein* of humor.

***vein** (vān), *v.t.* to form lines resembling veins, as to *vein* imitation marble.

vellum (vel′ um), *n.* fine parchment made of calfskin, lambskin or kid leather, used for binding or as a writing or printing material.

***velocipede** (vē los′ i pēd), *n.* a child's light vehicle with a large wheel in front and two smaller wheels behind, with a saddle and a handle bar to steer by, propelled by foot power; an early form of the bicycle.

velocity (vē los′ i ti), *n.* [*pl.* velocities] speed, rate of movement.

velours (ve loor′), *n.* a woven fabric with a pile like that of velvet.

velum (vē′ lum), *n.* the soft palate.

velure (ve lūr′), *n.* a velvety material of linen, cotton, jute or silk, with a short pile; a velours; a silk pad used to brush and polish hats.

velvet (vel′ vet), *n.* a closely woven silk, rayon or cotton fabric with a short, thick pile.

velveteen (vel ve tēn′), *n.* a cotton velvet.

velvety (vel′ vet i), *adj.* soft, smooth, as the rose petal has a *velvety* texture; mild in taste or touch.

***venal** (vē′ nal), *adj.* mercenary, willing to take a bribe.

***vendee** (ven dē′), *n.* one to whom anything is sold.

vendetta (ven det′ *a*), *n.* a blood feud.

vendor or **vender** (ven′ dẽr), *n.* a seller.

vendue (ven dū′), *n.* a public sale, an auction to the highest bidder.

veneer (ve nēr′), *n.* a thin layer of fine wood over a piece of ordinary wood used for cabinet work; pretense.

veneer (ve nēr′), *v.t.* to overlay with a thin layer of fine wood or other more valuable outer material, as to *veneer* pottery.

***venerable** (ven′ ẽr *a* bl), *adj.* worthy of great respect; impressively old.

venerate (ven′ ẽr āt), *v.t.* to hold in highest respect, revere.

vengeance (ven′ jans), *n.* injury done to retaliate for injury received: *with a vengeance,* furiously, in excessive amount or to an excessive degree.

vengeful (venj′ fool), *adj.* vindictive.

***venial** (vē′ ni al), *adj.* excusable, capable of being forgiven.

***venison** (ven′ i zn), *n.* deer meat.

venom (ven′ um), *n.* the poison in certain snakes and spiders that is injected by their bites; malignity.

venous (vē′ nus), *adj.* pertaining to veins.

vent (vent), *n.* a small opening for the escape of air or a liquid; an outlet; expression, as to give *vent* to one's feelings.

vent (vent), *v.t.* to permit to escape through an opening; to air, as to *vent* opinions, anger, spite.

ventilate (ven′ ti lāt), *v.t.* to cause air to circulate through; to expose for free public investigation and discussion; to air, as to *ventilate* a grievance.

ventral (ven′ tral), *adj.* pertaining to or situated on or near the belly or abdomen.

ventricle (ven′ tri kl), *n.* any small cavity in a body or in an organ of the body, particularly one of the two lower chambers of the heart.

***ventriloquism** (ven tril′ ō kwizm), *n.* the art of throwing the voice so that it seems to come from another person or place.

***venture** (ven′ tūr), *n.* an undertaking of dangerous or daring nature; an enterprise involving risk, as a business *venture.*

venture (ven′ tūr), *v.i. and v.t.* to dare, to risk; to expose to chance of loss; to present at risk of incurring criticism, as to _venture_ an opinion.

__venturesome__ (ven′ tūr sum), _adj._ daring; dangerous.

*__venue__ (ven′ ū), _n._ the place where a court action or trial takes place, as the attorney asked for a change of _venue._

*__veracious__ (vē rā′ shus), _adj._ truthful.

__veracity__ (vē ras′ i ti), _n._ [_pl._ veracities] truthfulness.

__veranda__ (ve ran′ da), _n._ an outside porch, usually having a roof.

__verb__ (vûrb), _n._ the part of speech that expresses being or action.

__verbal__ (vûrb′ al), _adj._ expressed in words.

*__verbatim__ (vûr bā′ tim), _adv._ word for word.

*__verbiage__ (vûr′ bi ij), _n._ a superabundance of words.

*__verbose__ (vûr bōs′), _adj._ wordy.

__verdant__ (vûr′ dant), _adj._ green; inexperienced.

__verdict__ (vûr′ dikt), _n._ the finding by a jury; a judgment, as my _verdict_ is that you are right.

*__verdigris__ (vûr′ di grēs), _n._ the blue-green pigment that is produced by the action of acetic acid or vinegar on copper; the blue-green deposit that forms on corroding copper and brass.

*__verdure__ (vûr′ dūr), _n._ the fresh greenness of vegetation.

__verge__ (vûrj), _n._ a rod or staff carried before a bishop or dean as an emblem of his office; an edge or brink.

__verge__ (vûrj), _v.i._ to tend, to come near, as this _verges_ on the absurd.

__verger__ (vûr′ gẽr), _n._ one who carries a bishop's or dean's staff; the servant of a high church official; a sexton, one who cares for a church building.

__verify__ (ver′ i fī), _v.t._ [_p.t. and p.p._ verified, _pr.p._ verifying] to prove to be true; to examine the truth of; to support by facts.

__verily__ (ver′ i li), _adv._ in truth.

*__verisimilitude__ (ver i si mil′ i tūd), _n._ appearance of truth; probability; realism.

__veritable__ (ver′ i ta bl), _adj._ actual, genuine.

__verity__ (ver′ i ti), _n._ [_pl._ verities] that which is true; agreement with fact.

*__vermicelli__ (vûr mi sel′ i), _n._ a stiff paste or dough of white flour cut into long threads, smaller than spaghetti and not hollow like macaroni.

__vermifuge__ (vûr′ mi fūj), _n._ a medicine to remove worms from the intestines.

__vermilion__ (vûr mil′ yun), _n._ a brilliant-red pigment or its color.

__vermin__ (vûr′ min), _n._ any small animal or insect pests, such as rats and mice, fleas, lice, bedbugs, cockroaches.

__vernacular__ (vẽr nak′ ū lẽr), _n._ the native tongue; native idiom; forms of speech peculiar to a locality or a business or profession, as the _vernacular_ of printing.

__vernacular__ (vẽr nak′ ū lẽr), _adj._ pertaining to or characteristic of one's native country or its language; peculiar to a locality or group or class of people; belonging to those persons who use the native or local language, as Dante, who wrote in Latin, was also a _vernacular_ poet.

__vernal__ (vûr′ nal), _adj._ pertaining to spring, springlike.

__vernier__ (vûr′ ni ẽr), _n._ a movable scale for precise measurements; a small auxiliary part used with a main device in order to attain sensitive adjustment in radio.

*__versatile__ (vûr′ sa til), _adj._ turning with ease from one thing to another, able to do many things well.

__verse__ (vûrs), _n._ poetry; a single line in meter; a type of poetry, as blank _verse,_ heroic _verse;_ a stanza of a hymn; one of the numbered divisions of a chapter of the Bible.

__versify__ (vûrs′ i fī), _v.i. and v.t._ [_p.t. and p.p._ versified, _pr.p._ versifying] to compose in meter; to put into verse.

__version__ (vûr′ shun), _n._ a translation from one language to another; one person's account of anything as compared with someone else's.

__versus__ (vûr′ sus), _prep._ against, as Princeton _versus_ Yale: abbreviated v. or vs., especially in naming the parties to a lawsuit.

*__vertebra__ (vûr′ tē bra), _n._ [_pl._ vertebrae or vertebras] a single bone of the spinal column.

__Vertebrata__ (vûr tē brāt′ a), _n. pl._ one of the great divisions of the animal kingdom, all animals having a backbone.

__vertex__ (vûr′ teks), _n._ [_pl._ vertexes or vertices] the top, summit, highest point.

__vertical__ (vûr′ ti kal), _adj._ at right angles with the horizon, pointing straight up.

*__vertigo__ (vûr′ ti gō), _n._ [_pl._ vertigoes] giddiness, dizziness.

__verve__ (vûrv), _n._ enthusiasm for creative work; energy, vigor, spirit; talent, creative ability.

__very__ (ver′ i), _adj._ real, actual, as the _very_ truth; exactly the same, as the _very_ one; mere, the _very_ thought of it.

__very__ (ver′ i), _adv._ truly, extremely, as it is _very_ hard work.

__vesicle__ (ves′ i kl), _n._ a small sac containing liquid; a water blister.

__vespers__ (ves′ pẽrz), _n._ evening prayer or evensong.

__vessel__ (ves′ l), _n._ a container to hold liquids; a ship; a tube or canal in the body holding fluids, as the blood _vessels._

__vest__ (vest), _n._ a body garment like a tight coat without sleeves, worn by men beneath a suit coat.

__vest__ (vest), _v.i. and v.t._ to rest or take effect, as title to property _vests_ in someone, a _vested_ interest; to clothe, as with authority or garments symbolizing it.

__vestal__ (ves′ tal), _n._ a virgin; a nun.

__vestal__ (ves′ tal), _adj._ chaste.

__vested__ (ves′ ted), _adj._ fixed by law, in effect, already acquired, as a _vested_ right.

*__vestibule__ (ves′ ti būl), _n._ a lobby between the inner and outer doors of a house; an enclosed porch at the door of a building; an enclosed entrance to a railroad car.

__vestige__ (ves′ tij), _n._ a mark left in passing, a trace or fragment of something long gone.

__vestment__ (vest′ ment), _n._ a garment, especially a robe in a church ceremony.

__vestry__ (ves′ tri), _n._ [_pl._ vestries] a room in a church where vestments are kept.

*__vesture__ (ves′ tūr), _n._ clothing, apparel.

__veteran__ (vet′ ẽr an), _n._ one grown old in service; one who has served in a war.

*__veterinary__ (vet′ ẽr i ner i), _n._ [_pl._ veterinaries] one who treats the diseases and injuries of animals.

__veterinary__ (vet′ ẽr i ner i), _adj._ pertaining to the art of healing the diseases of animals.

__veto__ (vē′ tō), _n._ [_pl._ vetoes] the right of a chief executive to refuse to approve an act of legislation submitted to him for signature.

__veto__ (vē′ tō), _v.t._ to refuse to sign, as a legislative bill; to forbid, with authority, as I must _veto_ your proposal.

__vex__ (veks), _v.t._ to irritate with small annoyances, provoke.

__vexed__ (vekst), _adj._ much debated but not settled, as a _vexed_ question.

__viaduct__ (vī′ a dukt), _n._ an arch-supported structure carrying a highway or railroad over a ravine, valley or low ground.

*__vial__ (vī′ al), _n._ a small glass bottle or vessel: sometimes _phial._

__viand__ (vī′ and), _n._ an article of food, especially meat: _viands,_ provisions.

__vibrant__ (vī′ brant), _adj._ pulsing, throbbing, resonant; lively, animated, vigorous, as a _vibrant_ personality.

*__vibrate__ (vī′ brāt), _v.i. and v.t._ to move back and forth with even timing, oscillate; to waver, vacillate; to quiver; to cause to quiver; to cause to move back and forth.

__vibration__ (vī brā′ shun), _n._ oscillation; a quivering of the voice.

*__vicar__ (vik′ ẽr), _n._ one who is authorized to act in place of another, a deputy; a clergyman serving as deputy to one of higher rank.

*__vicarious__ (vī kâr′ i us), _adj._ delegated, as _vicarious_ power; done or endured in place of another, as _vicarious_ suffering.

__vice__ (vīs), _n._ a bad habit; depravity; fault.

*__vicegerent__ (vīs jēr′ ent), _n._ one delegated to act for another; an officer with authority to act for another, a lieutenant.

__vice-president__ (vīs′ pres′ i dent), _n._ an official ranking next below a president, acting for the president in his absence or disability and succeeding as president on the president's death.

__viceregal__ (vīs rē′ gal), _adj._ pertaining to a viceroy.

__vice-regent__ (vīs rē′ jent), _n._ an officer substituting for a regent.

*__viceroy__ (vīs′ roi), _n._ a governor of a colony or province, in the name and by the authority of the sovereign of the empire of which it is a part; a deputy of the sovereign.

*__vice versa__ (vī′ sē vûr′ sa), the order being reversed, conversely, the other way round.

*__vicinage__ (vis′ in nij), _n._ neighborhood; state of being neighbors.

__vicinity__ (vi sin′ i ti), _n._ [_pl._ vicinities] nearness, neighborhood.

__vicious__ (vish′ us), _adj._ having bad habits, depraved; ugly, malicious.

*__vicissitude__ (vi sis′ i tūd), _n._ change in circumstances; any of the hazards of life.

__victim__ (vik′ tim), _n._ a human being sacrificed to a deity; a person hurt or killed by intention or in an accident; a sufferer from disease; a dupe.

__victor__ (vik′ tẽr), _n._ the winner in a battle or contest, a conqueror.

__victorious__ (vik tō′ ri us), _adj._ having conquered an enemy in battle; having won a contest; triumphant, successful in any struggle.

*__victory__ (vik′ tō ri), _n._ [_pl._ victories] the defeat of an enemy in battle or of an opponent in a contest.

*__victual__ (vit′ l), _v.t._ [_p.t. and p.p._ victualed, _pr.p._ victualing] to furnish with supplies of food; to stock with provisions, as to _victual_ a ship.

*__victuals__ (vit′ lz), _n._ food, especially when ready to be eaten.

*__vicuña__ (vi kōōn′ ya), _n._ an animal resembling the llama, found in Mexico and the Andes, furnishing a fine, long reddish wool used in delicate and expensive fabrics; a fabric made from the wool of this animal or a wool-and-cotton imitation of it.

*__videlicet__ (vi del′ i set), _adv._ namely, that is to say, to wit: abbreviated _viz._

__vie__ (vī), _v.i._ [_p.t. and p.p._ vied, _pr.p._ vying] to strive for superiority, rival, compete, as he is fit to _vie_ with champions.

__view__ (vū), _n._ the act of seeing, as I had a good _view_ of the parade from my window; a landscape, as there is a beautiful _view_ from the top of the hill; a mental survey; a belief or opinion, as according to my _view;_ purpose, as with a _view_ to increasing profits.

__view__ (vū), _v.t._ to look upon, regard, see; to survey mentally; to form an opinion of.

__viewpoint__ (vū′ point), _n._ a position from which objects, principles or acts are considered and judged, as her _viewpoint_ is always charitable.

*__vigil__ (vij′ il), _n._ the act of staying awake during the normal time for sleeping in order to watch or wait for something; evening or nighttime devotions.

__vigilant__ (vij′ i lant), _adj._ watchful, alert, cautious.

*__vignette__ (vin yet′), _n._ a small design usually decorating the page preceding the title page; a drawing or an illustration that shades off at the edges without a sharp border; a short, graphic description, a word picture.

__vigor__ (vig′ ẽr), _n._ physical or mental strength and force; vital energy in a plant or animal.

__vigorous__ (vig′ ẽr us), _adj._ strong, energetic, robust, forceful, as a _vigorous_ person, a _vigorous_ style of writing.

*__viking__ (vī′ king), _n._ one of the Northmen who ranged the known seas in the 8th, 9th and 10th centuries terrorizing the coasts of Europe.

__vile__ (vīl), _adj._ despicable, worthless, ignoble, evil.

__vilify__ (vil′ i fī), _v.t._ [_p.t. and p.p._ vilified, _pr.p._ vilifying] to defame, slander, abuse.

__villa__ (vil′ a), _n._ a country seat, a fine suburban residence.

__village__ (vil′ ij), _n._ a small assemblage of houses and other buildings, larger than a hamlet but smaller than a town.

*__villain__ (vil′ in), _n._ a scoundrel; the character in a play or novel who complicates the plot with his evil designs and actions.

__villous__ (vil′ us), _adj._ covered with soft, fine hair, downy.

vindicate (vin′ di kāt), *v.t.* to defend successfully; to clear from suspicion of wrongdoing or dishonorable action; to justify.

vindication (vin di kā′ shun), *n.* justification against charges of wrongdoing or dishonorable acts.

vindictive (vin dik′ tiv), *adj.* revengeful, inclined to hold grudges.

vine (vīn), *n.* a climbing or trailing plant, as a grape*vine*, a sweet-potato *vine*.

vinegar (vin′ ē gẽr), *n.* an acid obtained by the fermentation of cider, malt or wine and used in seasoning and pickling; a weak form of acetic acid.

vinegary (vin′ ē gẽr i), *adj.* thin and sour, as a *vinegary* speech.

vinery (vīn′ ẽr i), *n.* [*pl.* vineries] a place where grapes are grown indoors.

vineyard (vin′ yẽrd), *n.* a plantation of grapevines.

***vinous** (vī′ nus), *adj.* pertaining to wine; like wine.

vintage (vin′ tij), *n.* the year's output of a vineyard or of the vineyards of a given region.

***viol** (vī′ ul), *n.* a four-stringed musical instrument played with a bow.

***viola** (vē ōl′ *a*), *n.* a stringed instrument between the violin and violoncello in size, tuned a fifth lower than the violin.

violate (vī′ ō lāt), *v.t.* to transgress; to ravish; to treat a sacred place with irreverence; to trespass upon.

violence (vī′ ō lens), *n.* great force; fury and vehemence; unwarranted change of words or meaning in a text.

violent (vī′ ō lent), *adj.* urged or driven by force, as a *violent* nature; marked by physical force, as a *violent* storm; vehement, as *violent* speech; unnatural, due to accident or attack, as a *violent* death.

Syn. Furious, boisterous, vehement, impetuous. A man may be *violent* in his opinions, measures, resentments; he is *furious* in his anger or has a *furious* temper; he is *vehement* in his affections or passions, in love, zeal, pursuit of an object. *Violent* persons wreak their passions upon another person or an object; *vehemence* is confined to the person himself. An *impetuous* nature is one of extreme *vehemence*. One is *boisterous* in manner and behavior, not in the mind.

Ant. Gentle, mild, calm.

violet (vī′ ō let), *n.* a low-growing herb with dainty flowers, (often purple), some very fragrant and some odorless; the bluish blue-red color of the purple violet, one of the colors of the spectrum, at the end opposite to the color red.

violet rays (vī′ ō let rāz), the shortest vibrations of light perceptible by the human eye; to be distinguished from ultraviolet rays, used in the treatment of disease.

***violin** (vī ō lin′), *n.* a four-stringed musical instrument played with a bow and developed from the viola.

***violoncello** (vē ō lon chel′ ō), *n.* [*pl.* violoncellos] a large four-stringed musical instrument of the viol class, tuned an octave lower than the viola; often called *cello*.

***viper** (vī′ pẽr), *n.* a venomous snake.

viperous (vī′ pẽr us), *adj.* treacherous, malignant.

***virago** (vi rā′ gō), *n.* [*pl.* viragoes] a bold, quarrelsome woman; a scold.

virgin (vûr′ jin), *n.* a maiden: *the Virgin*, Mary, the mother of Jesus.

virgin (vûr′ jin), *adj.* pure, untouched, as *virgin* soil, a *virgin* forest.

virginal (vûr′ ji nal), *adj.* maidenly, chaste.

***virile** (vir′ il), *adj.* pertaining to mature manhood; manly, forceful, as a *virile* style of writing.

virtual (vûr′ tū al), *adj.* in essence or effect though not in name, as he is the *virtual* head of this business.

***virtue** (vûr′ tū), *n.* inherent power or merit; moral excellence, chastity.

***virtuoso** (vûr tū ō′ sō), *n.* [*pl.* virtuosos or virtuosi] one with special knowledge of or skill in a fine art; a connoisseur of artistic things; one who has mastered the technique of an art.

***virulence** (vir′ ū lens), *n.* the quality of being poisonous or venomous; bitter enmity, rancor.

virulent (vir′ ū lent), *adj.* poisonous; actively injurious to life or health; hostile.

virus (vī′ rus), *n.* venom; a poison that is produced in the body by a disease; something that poisons the mind.

visa (vē′ z*a*), the official endorsement on a passport, indicating that it has been examined by governmental authorities so that the traveler may proceed.

***visage** (viz′ ij), *n.* the face or countenance.

***viscera** (vis′ ẽr *a*), *n.* the internal organs, as heart, liver and intestines.

***viscid** (vis′ id), *adj.* thick and sticky.

***viscount** (vī′ kount), *n.* a nobleman next in rank below an earl or count.

***viscous** (vis′ kus), *adj.* adhesive, sticky.

vise (vīs), *n.* a two-jawed instrument to hold things steady while being worked on.

visé (vē zā′), *n.* a visa.

visibility (viz i bil′ i ti), *n.* the state of being perceptible to the eye; the range of vision for those in an airplane under existing conditions of atmosphere and clouds.

visible (viz′ i bl), *adj.* perceptible to the eye; in view.

***vision** (vizh′ un), *n.* the sense of sight; act of seeing; that which is seen; an apparition; understanding and insight, as he has great *vision* in matters of administration.

visionary (vizh′ un er i), *n.* [*pl.* visionaries] a dreamer; one who tends to accept fancied things as facts; one who is not a realist.

visionary (vizh′ un er i), *adj.* existing only in the imagination; not realistic or practical.

visit (viz′ it), *n.* the act of calling upon another; a short stay.

visit (viz′ it), *v.t. and v.i.* to call on; to stay with as a guest; to send upon, as the sins of the fathers shall be *visited* upon the children; to be a guest.

visitation (viz i tā′ shun), *n.* an official inspection; a judgment.

visor (vī′zẽr), *n.* the front piece of a helmet that protects the face; the projecting part of a cap that shades the eyes: sometimes spelled *vizor*.

vista (vis′ t*a*), *n.* a view down a comparatively long and narrow channel of sight, as this avenue affords a lovely *vista*.

***visual** (vizh′ ū al), *adj.* pertaining to sight.

visual (vizh′ ū al), *n.* a rough sketch for a layout or design.

visualize (vizh′ ū al īz), *v.t.* to form a mental picture of; to make a rough sketch of, as he *visualized* the idea of the advertisement.

vital (vī′ tal), *adj.* pertaining to life; essential, indispensable.

vitality (vī tal′ i ti), *n.* living force; ability to sustain or retain life; vigor and endurance.

vitalize (vī′ tal īz), *v.t.* to animate, give life to, increase the vigor of, as to *vitalize* an essay.

vitals (vī′ talz), *n.* the organs of the body that are essential to life, as the heart, liver, lungs and brain are the *vitals*.

vitamin (vī t*a* min), *n.* a constituent of many foods, that strengthens the body tissues and prevents contraction of such diseases as pellagra and scurvy.

***vitiate** (vish′ i āt), *v.t.* to render faulty or defective; to impair the quality of; to corrupt, debase.

viticulture (vit′ i kul tūr), *n.* the growing of grapes.

vitreous (vit′ rē us), *adj.* consisting of or resembling glass.

vitrify (vit′ ri fī), *v.t.* [*p.t. and p.p.* vitrified, *pr.p.* vitrifying] to convert into glass, glaze; to cause to become glass or to resemble glass.

***vitriol** (vit′ ri ul), *n.* sulphuric acid; anything sharp and burning, as sarcasm.

vitriolic (vit ri ol′ ik), *adj.* pertaining to sulphuric acid; caustic, sharp and stinging, as a *vitriolic* speech.

***vituperate** (vī tū′ pẽr āt), *v.t.* to berate, censure abusively.

***vivacious** (vī vā′ shus), *adj.* lively, gay, animated.

vivacity (vī vas′ i ti), *n.* [*pl.* vivacities] liveliness, animation.

***viva voce** (vī v*a* vō′ sē), by the living voice; oral; expressed orally, as a *viva voce* vote.

vivid (viv′ id), *adj.* brilliant; forming lifelike images in the mind, realistic.

vivify (viv′ i fī), *v.t.* [*p.t. and p.p.* vivified, *pr.p.* vivifying] to give life to, enliven, quicken, animate.

vivisect (viv′ i sekt), *v.t.* to dissect the living body of.

vixen (vik′ sn), *n.* a female fox; a quarrelsome, ill-natured woman.

viz. (viz), *adv.* namely, to wit. (An abbreviation of Latin *videlicet*, meaning namely; usually read "namely" but sometimes pronounced as it is spelled.)

***vocable** (vō′ k*a* bl), *n.* a word or term.

vocabulary (vō kab′ ū ler i), *n.* [*pl.* vocabularies] a collection of words arranged alphabetically for reference and defined or explained; the special stock of words employed by an individual, in a business or by an author, as the *vocabulary* of finance, the *vocabulary* of Shakespeare.

vocal (vō′ kal), *adj.* pertaining to the voice, oral, spoken.

vocal cord (vō′ kal kôrd), either of two pairs of bands of fibrous tissue attached to the larynx and producing the human voice through vibration.

vocal organs (vō′ kal ôr′ ganz), the parts of the mouth, tongue and palate used in speaking or singing.

vocalize (vō′ kal īz), *v.t. and v.i.* to utter with the voice; to express in words or tones; to sing.

vocation (vō kā′ shun), *n.* calling, occupation.

***vocative** (vok′ *a* tiv), *n.* a case of noun or pronoun indicating address; a noun naming a person or thing addressed.

vociferate (vō sif′ ẽr āt), *v.i. and v.t.* to clamor, utter loudly, cry out noisily.

vociferous (vō sif′ ẽr us), *adj.* noisy, clamorous.

***vogue** (vōg), *n.* fashion, the prevailing style; popularity, as his books have a great *vogue*.

voice (vois), *n.* utterance; faculty of speech; sound made by air passing through the larynx and made audible through the vibrations of the vocal cords; opinion.

voice (vois), *v.t.* to give expression to, express in speech, as he *voiced* his discontent strongly.

void (void), *n.* an empty space, a vacuum.

void (void), *v.t.* to make empty or vacant, eject; to make ineffective or invalid, annul.

void (void), *adj.* empty, vacant, unoccupied; without effect.

voile (voil), *n.* a thin fabric of cotton, silk or wool used as a material for women's dresses, especially light, summer dresses.

***volatile** (vol′ *a* til), *adj.* easily changed into gas; tending to turn into vapor; fickle, changeable.

volcanic (vol kan′ ik), *adj.* pertaining to, proceeding from or caused by a volcano.

***volcano** (vol kā′ nō), *n.* [*pl.* volcanoes or volcanos] an aperture in the earth's surface from which molten lava and steam are ejected; a conical hill or mountain formed from the erupted matter.

vole (vōl), *n.* any of several small rodents, such as the field mouse and meadow mouse.

volition (vō lish′ un), *n.* the act or power of willing or exerting choice; that which is willed.

volley (vol′ i), *n.* the shooting of many missiles at once; a sudden burst of anything, as a *volley* of words; a ball in its flight without touching the ground, as a *volley* in tennis, cricket and other games.

***volplane** (vol′ plān), *v.i.* to bring an airplane down by gliding with little or no engine power.

***volt** (vōlt), *n.* the unit of electromotive force.

voltaic (vol tā′ ik), *adj.* pertaining to the production of electricity by chemical action or galvanism.

voltaic cell (vol tā′ ik sel), a device to produce electrical energy by chemical action.

voluble (vol′ ū bl), *adj.* fluent in speech, talkative.

volume (vol′ ūm), *n.* the amount of space occupied by an object, as measured in cubical units; mass or bulk; a large quantity, as a great *volume* of steam; a single book.

__voluminous__ (vō lū′ mi nus), _adj._ occupying much space, bulky; filling many volumes.

*__voluntary__ (vol′ un ter i), _n._ [_pl._ voluntaries] a musical prelude, especially an organ solo.

__voluntary__ (vol′ un ter i), _adj._ acting from choice or free will, done of one's own accord, not compulsory.

__volunteer__ (vol un tēr′), _n._ one engaged in a service, especially military or naval, by his own will; one who offers his services.

__volunteer__ (vol un tēr′), _v.i. and v.t._ to enter the army or navy of one's own accord; to offer of one's own free will, as to _volunteer_ one's services, to _volunteer_ information.

__voluptuary__ (vō lup′ tū er i), _n._ [_pl._ voluptuaries] one devoted to gratification of the senses.

__voluptuous__ (vō lup′ tū us), _adj._ sensual; luxurious.

*__volute__ (vō lūt′), _n._ a spiral ornament on an architectural detail, such as on the capital of a column.

__vomit__ (vom′ it), _v.t. and v.i._ to throw up from the stomach through the mouth; to discharge, as a volcano _vomits_ lava.

__voodoo__ (vo͞o′ do͞o), _n._ a system of magic practiced by the Negroes of Africa and Haiti.

*__voracious__ (vō rā′ shus), _adj._ greedy, ravenous, insatiable.

__vortex__ (vôr′ teks), _n._ [_pl._ vortexes or vortices] an eddy, whirlpool, the depression at the center of a body of whirling air or water, drawing things in and down.

__votary__ (vō′ t*a* ri), *n.* [*pl.* votaries] a devotee; one who has concentrated upon some particular subject of interest, service or pursuit.

__vote__ (vōt), _n._ an expression of choice or preference by ballot or some other method of suffrage; decision by a majority; the right to express political preference; the whole number of ballots cast in an election.

__votive__ (vō′ tiv), _adj._ given, consecrated or promised by vow; done in fulfilment of a vow.

__vouch__ (vouch), _v.i._ to attest, as to _vouch_ for another's trustworthiness; to confirm, bear witness.

__voucher__ (vouch′ ēr), _n._ a paper that bears witness, as to payment made, as the _vouchers_ in a checkbook.

__vouchsafe__ (vouch sāf′), _v.t._ to condescend to grant, permit.

__vow__ (vou), _n._ a solemn promise or pledge; a pledge of faithfulness.

__vow__ (vou), _v.t. and v.i._ to promise solemnly; to make a solemn pledge.

__vowel__ (vou′ el), _n._ an open sound of the voice with no shaping by or with the tongue, teeth or lips; a letter representing such a sound, as _a, e, i, o, u._

*__voyage__ (voi′ ij), _n._ a journey of considerable distance by water or by air.

__vulcanize__ (vul′ kan īz), _v.t._ to change the properties of by combination with certain substances (notably sulphur) that give toughness, as to _vulcanize_ rubber.

__vulgar__ (vul′ gēr), _adj._ common, unrefined, coarse.

__vulgarism__ (vul′ gēr izm), _n._ a coarse expression; language or phrasing not in good usage.

__vulgarity__ (vul gâr′ i ti), _n._ [_pl._ vulgarities] coarseness of speech or manners.

__vulnerable__ (vul′ nēr *a* bl), *adj.* capable of being wounded; open to attack.

*__vulpine__ (vul′ pīn), _adj._ foxy, like a fox, cunning.

__vulture__ (vul′ tūr), _n._ a large flesh-eating bird of prey related to the hawks and eagles.

W

*__wad__ (wod), _n._ a small mass of soft material; a soft piece of material like cotton or wool used to stop an opening or give extra thickness to a garment; a plug of soft fiber to hold the charge of a muzzle-loading gun in place.

__wad__ (wod), _v.t._ to form into a compact mass, as to _wad_ paper; to pack or close up with a mass of soft material, as to _wad_ up a crack; to pad or line with soft substance, as a garment; to insert a plug or stopper into, as to _wad_ a gun.

__wadding__ (wod′ ing), _n._ any soft stuff used for padding garments, in surgical dressings or to protect fragile articles in wrapping.

__waddle__ (wod′ l), _n._ a clumsy, rocking gait like that of a duck.

__waddle__ (wod′ l), _v.i._ to walk with a clumsy roll from side to side, as the duck _waddles._

__wade__ (wād), _v.i._ to walk through water, mud, snow or anything fluid or semifluid; to advance with difficulty, as to _wade_ through a tiresome book.

__wafer__ (wā′ fēr), _n._ a thin, dry biscuit; the thin cake of unleavened bread used in the communion service; a small disk of glued paper used in sealing papers; a disk of wax used to seal papers and attached by heating.

__waffle__ (wof′ l), _n._ a battercake cooked in a waffle iron over an open fire or electric element.

__waffle iron__ (wof′ l ī′ ērn), a device consisting of a pair of hinged pivoted plates, molded in squares, which close upon the filling of batter for cooking it over fire or electricity.

__waft__ (wȧft), _n._ the act of floating lightly or causing to float lightly; a light puff of wind; a passing odor or taste, a whiff.

*__waft__ (wȧft), _v.i. and v.t._ to float through the air; to cause to float lightly.

__wag__ (wag), _n._ a side-to-side motion, as the _wag_ of a dog's tail; a to-and-fro motion, as the _wag_ of head or finger.

__wag__ (wag), _n._ a practical joker; a witty person.

__wag__ (wag), _v.i. and v.t._ to move from side to side, as a dog's tail _wags;_ to cause to move from side to side, as a dog _wags_ its tail; to move up and down, as to _wag_ one's head or one's finger, both signs of amusement or derision.

__wage__ (wāj), _v.t._ to carry on or engage in, as war.

__wager__ (wā′ jēr), _n._ a bet.

__wager__ (wā′ jēr), _v.i. and v.t._ to bet; to put up, as stakes.

__wages__ (wāj′ ez), _n._ money paid for work, by the hour, day or week.

__waggery__ (wag′ ēr i), _n._ [_pl._ waggeries] mischievous merriment, jesting, good-humored teasing.

__waggle__ (wag′ gl), _v.t._ to cause to move back and forth.

__waggle__ (wag′ gl), _n._ the swinging of a golf club back and forth over the ball before striking it.

__wagon__ (wag′ un), _n._ a four-wheeled vehicle for heavy work.

*__waif__ (wāf), _n._ a stray person or thing; a lost child.

*__wail__ (wāl), _n._ a cry of grief.

__wail__ (wāl), _v.i._ to cry in grief; to make a mournful, long-drawn sound, as the wind _wails_ around the house.

__wailing__ (wāl′ ing), _n._ lamentation.

__wain__ (wān), _n._ a wagon, as in _Charles's Wain,_ the British name for the Great Dipper.

*__wainscot__ (wān′ skut), _n._ a paneled wooden lining on walls, generally on the lower part.

*__wainscot__ (wān′ skut), _v.t._ to line or face, as the lower part of a room wall, with wood in strips or panels.

__waist__ (wāst), _n._ the narrowest part of the trunk of the body, below the ribs; the middle part of anything resembling a body, as the _waist_ of a ship; the slender middle section of an hourglass.

__waist__ (wāst), _n._ a garment that covers the body from shoulders to belt line.

__waistband__ (wāst′ band), _n._ the edge of a garment, as skirt or trousers, encircling the body at the belt line.

*__waistcoat__ (wes′ kut), _n._ a short garment for men covering the trunk of the body, like a sleeveless coat, a vest.

*__wait__ (wāt), _n._ the act of delaying or lingering; a stay in one place; time spent in expectation of something about to happen, as a long _wait_ for a train; hiding, as to lie in _wait._

__wait__ (wāt), _n._ one of a band of musicians who play and sing music in the streets at Christmas time.

__wait__ (wāt), _v.i. and v.t._ to linger in expectation of something; to continue in one place, as we _waited_ for you all morning; to serve, as he _waited_ on us very competently; to await, as _wait_ orders.

__waiter__ (wāt′ ēr), _n._ one who serves others at table; a serving tray.

*__waive__ (wāv), _v.t._ to forego, as to _waive_ a right.

__waiver__ (wāv′ ēr), _n._ a voluntary relinquishment, as a _waiver_ of a legal right; the legal document stating this relinquishment.

__wake__ (wāk), _n._ a trail left by some moving object, as the _wake_ of a ship, in the _wake_ of the storm, the _wake_ of an invading army.

__wake__ (wāk), _n._ a vigil; the watch over a dead body awaiting burial.

__wake__ (wāk), _v.i. and v.t._ [_p.t._ waked or woke, _p.p._ waked, _pr.p._ waking] to be aroused from sleep; to emerge from slumber; to cause to stop sleeping, arouse, as you _woke_ me too soon.

__wakeful__ (wāk′ fool), _adj._ unable to sleep; watchful, vigilant.

__Syn.__ Watchful, vigilant. To be _wakeful_ is to be physically unable to sleep; to be _watchful_ may mean to stay awake for a purpose or to be on the alert; to be _vigilant_ is to be on guard against impending evil or danger.

Ant. Slumbrous, heedless.

__wale__ (wāl), _n._ a mark left by the stroke of a lash; a rib in the weave of cloth; a timber fastened horizontally to a row of piles to hold them in position.

*__walk__ (wôk), _n._ the act of advancing by alternate steps without running; manner of moving afoot; a stroll; a place for moving afoot; the distance one goes afoot, as it was a long _walk;_ gait; a way of living, as a different _walk_ of life.

__walk__ (wôk), _v.t. and v.i._ to traverse afoot, as to _walk_ the floor; to cause to traverse afoot; to drive or ride at a slow pace, as I _walked_ my horse; to proceed by steps at a pace slower than a run; to stroll.

__walking beam__ (wôk′ ing bēm), a horizontal, pivoted lever with connecting rods at the ends, transmitting the power of a steam engine from the piston rod to the wheel shaft.

__walking delegate__ (wôk′ ing del′ ē gāt), a labor-union official who visits the different unions in his craft.

__walking stick__ (wôk′ ing stik), a cane.

*__wall__ (wôl), _n._ a structure of stone, brick, wood or other material constituting the side of a building, enclosing a room or marking and protecting a boundary.

__wall__ (wôl), _v.t._ to enclose, surround with vertical enclosing surfaces or structures, as to _wall_ a garden; to fill, as a hole; to fortify.

__wallet__ (wol′ et), _n._ a large pocketbook that holds money or papers flat; any pocketbook or leather kit.

__walleyed__ (wôl′ īd), _n._ having eyes that turn outward, to the sides: opposite of cross-eyed; having a white-irised, staring eye.

__wallflower__ (wôl′ flou ēr), _n._ a plant belonging to the mustard family, with fragrant flowers, yellow to red in color.

__wallop__ (wol′ up), _v.t._ to strike, beat.

__wallow__ (wol′ ō), _n._ the act of rolling, as in mud; a muddy place in which animals roll.

__wallow__ (wol′ ō), _v.i._ to roll or flounder about in mud, as a hog; to live in vice or filth.

*__walnut__ (wôl′ nut), _n._ a nut-bearing tree, the English _walnut_ or the American black _walnut;_ the nut borne by this tree; its wood, used in making furniture.

*__walrus__ (wôl′ rus), _n._ [_pl._ walruses or walrus] a large sea animal living in the Arctic Regions and valuable for its blubber, skin and tusks.

__waltz__ (wôlts), _n._ a round dance in triple time; the music for such a dance.

__waltz__ (wôlts), _v.i. and v.t._ to perform a round dance in triple time; to whirl.

*__wampum__ (wom′ pum), _n._ beads made of shells and strung, used by the North American Indians as money and for ornament.

*__wan__ (won), _adj._ pale, sickly.

*__wand__ (wond), _n._ a long, slender rod; a magician's staff; a staff, symbol of authority; a musician's baton.

__wander__ (won′ dēr), _v.i. and v.t._ to ramble aimlessly, stroll; to be delirious, as his mind _wanders;_ to roam through or over, traverse.

wane (wān), *n.* the decreasing phase of the moon; a decline in power or influence.

wane (wān), *v.i.* to grow less, decline in power or importance.

*__want__ (wont), *n.* deficiency, need, penury, lack, scarcity.

want (wont), *v.i. and v.t.* to be in need; to be deficient in, as the stew *wants* salt; to lack, need, require.

Syn. Need, lack. To *want* is to be without that which contributes to comfort or is desired; to *need* is to be without that which is essential to existence or to our purposes; to *lack* is simply to be without, and the word carries no collateral idea. What we *want* would meet artificial desires, what we *need* would satisfy real requirements.

Ant. Have, hold, possess.

wanton (won′ tun), *n.* a person of unrestrained behavior.

wanton (won′ tun), *adj.* unrestrained, sportive, reckless.

*__war__ (wôr), *n.* an armed conflict between states or nations; any contest or strife, as a *war* of words.

war (wôr), *v.i.* [*p.t.* warred, *pr.p.* warring] to fight, carry on hostilities.

warble (wôr′ bl), *n.* a soft, sweet flow of melodious sounds, as of a bird.

warble (wôr′ bl), *v.i. and v.t.* to trill, as the bird *warbled;* to sing in a trilling manner, as to *warble* a tune.

ward (wôrd), *n.* protection; a person under protection; one committed to the care of another as guardian and protector; a hospital section with a number of patients in one large room; a section of a prison; a voting section in a town; a projection in a lock or on a key to prevent use of any but the proper key.

ward (wôrd), *v.t.* to guard, protect, care for, defend against danger; to avert, as to *ward* off a blow or an attack.

warden (wôr′ dn), *n.* a guardian; trustee, as a church*warden;* head keeper, as a jail *warden.*

warder (wôr′ dẽr), *n.* a guard or keeper.

wardrobe (wôrd′ rōb), *n.* a portable closet for clothes; an outfit of wearing apparel.

wardroom (wôrd′ ro͞om), *n.* the living quarters on a warship for commissioned officers of all ranks between ensign and captain.

ware (wâr), *n.* manufactured articles, pottery, as earthen*ware,* silver: *wares,* merchandise, goods.

warehouse (wâr′ hous), *n.* a building for storing goods, for holding goods to be distributed locally or for holding imports until duties are paid.

warehouse (wâr′ hous), *v.t.* to place in a building for storing or for local distribution.

warfare (wôr′ fâr), *n.* the waging of armed conflict.

warily (wâr′ i li), *adv.* in a cautious manner.

warm (wôrm), *adj.* having heat in a moderate degree; giving out mild heat; keeping heat in, as a *warm* blanket; having tones that suggest heat, as red, orange and yellow are *warm* colors; genial, cordial, as a *warm* welcome; fresh, as a *warm* scent.

warmth (wôrmth), *n.* moderate heat; earnestness, as he spoke with *warmth;* friendliness, as *warmth* of feeling.

warn (wôrn), *v.t.* to give notice of danger, caution; to advise, as I *warn* you not to go; to signal something that is coming, as the clock gave a warning sign that the hour was near.

warp (wôrp), *n.* the act of twisting out of shape; state of being twisted out of shape; the threads that extend lengthwise in the loom and are crossed by the woof.

warp (wôrp), *v.i. and v.t.* to shrink and twist out of shape, as the board *warped;* to move, as a vessel, by pulling on a rope attached to some fixed point; to twist out of shape; to make biased, as her bitter experience *warped* her point of view.

*__warrant__ (wor′ ant), *n.* a written guarantee; justification, as to act without *warrant;* a court order to arrest a person.

warrant (wor′ ant), *v.t.* to give definite assurance as to the value of, guarantee, as to *warrant* material pure silk; to authorize; to justify, as certain situations *warrant* drastic action.

warren (wor′ en), *n.* a place for breeding rabbits; any crowded area.

*__warrior__ (wor′ i ẽr), *n.* a soldier, a fighter.

wart (wôrt), *n.* a dry excrescence on the skin; a similar hard, dry lump on the stem of a plant.

*__wary__ (wâr′ i), *adj.* [*comp.* warier, *superl.* wariest] watchful, cautious; alert and circumspect.

wash (wosh), *n.* the act of cleansing; a collection of clothes to be cleaned with soap and water, as the family *wash;* the dash of water against something, as the *wash* of the waves on the shore; the churned air or water behind the propellers of an airplane or surface ship; a lotion or liquid with which anything is cleansed or tinted; a thin coat of water color in painting.

wash (wosh), *v.t. and v.i.* to take the dirt out of by scrubbing in soapy water, as to *wash* clothes; to flow against, as the waves *wash* the shore; to carry off by the action of water, as the waves *washed* out the railroad tracks; to become cleansed with soap and water, as I *washed* in the lake; to cleanse clothes, as she *washes* on Mondays; to pass through the application of soap and water without injury, as that material will not *wash;* to come through any sort of test, as his explanation will not *wash;* to move with a lapping sound, as the waves *washed* against the side of the sailboat.

washboard (wosh′ bōrd), *n.* a ribbed or ridged surface upon which to rub the dirt out of clothes in cleansing them with soap and water.

wash drawing, a water-color painting with the color washed on.

washer (wosh′ ẽr), *n.* a ring of metal, leather or rubber to give more tightness to a joint or prevent wear on wood by a nail or nut; a machine for cleansing clothes with soap and water.

washout (wosh′ out), *n.* a carrying away of earth by running water.

*__wasp__ (wosp), *n.* a winged insect with a poisonous sting.

*__wassail__ (wos′ l), *n.* an ancient toast or expression of good will given on a festive occasion; a spiced ale used on occasions of feasting and merrymaking.

waste (wāst), *n.* useless expenditure of time, effort or money; refuse matter; leftover parts in a process of manufacture; a mass of otherwise worthless remnants of textiles used to wipe grease off machinery; a vast, unproductive tract of land, as a desert *waste.*

wasteful (wāst′ fool), *adj.* spending or using with extravagance.

*__watch__ (woch), *n.* vigilance; a guard; a guard's spell of duty; one of the periods into which the day is divided on ships; a timepiece carried in a pocket.

watch (woch), *v.i. and v.t.* to keep guard; to observe carefully and closely; to guard, as I'll *watch* the house while you are gone.

watchful (woch′ fool), *adj.* vigilant, on guard.

watchword (woch′ wûrd), *n.* a password; a secret word used to identify friends.

*__water__ (wô′ tẽr), *n.* a transparent fluid without color or odor, composed of hydrogen and oxygen; the liquid used for cooking, washing, drinking; a sea, river, lake, pond; the fluid that falls from the clouds in the form of rain; the luster of a precious stone; the wavy shine of silk.

water (wô′ tẽr), *adj.* relating to the use, storage or distribution of water, as *water* bread, *water* tank, *water* main, *water* boy.

*__water__ (wô′ tẽr), *v.i. and v.t.* to run, as the wind makes my eyes *water;* to secrete saliva, as the mouth *waters;* to provide with a drink, as to *water* a horse; to sprinkle, as to *water* a lawn; to irrigate, as to *water* a farm; to add water to, as he *watered* the milk he sold.

water back (wô′ tẽr bak), a coil or chamber alongside the fire pot of a stove or furnace, in which water is heated.

water color (wô′ tẽr kul′ ẽr), a paint to which water is added before using; a picture in the delicate colors produced by such paint.

waterfall (wô′ tẽr fôl), a cascade of water, as over a dam; a cataract.

water gate (wô′ tẽr gāt), a valve to control the flow of water.

water line (wô′ tẽr līn), farthest reach of a stream, as this is the *water line* of the last flood; a mark on the side of a ship showing how deep she will lie when loaded.

watermark (wô′ tẽr märk), *n.* a mark that indicates the farthest extent of the rise of water; a marking on certain kinds of paper that becomes visible when the paper is held to the light.

watermelon (wô′ tẽr mel′ un), *n.* the fruit of a trailing plant of the gourd family, with tough rind and a sweet, juicy pulp.

water meter (wô′ tẽr mē′ tẽr), an instrument that measures the flow of water through pipes as used in a building.

water polo (wô′ tẽr pō′ lō), a game resembling basketball but played in a pool or tank by swimmers.

waterproof (wô′ tẽr pro͞of), *n.* a garment made of material that sheds moisture.

watershed (wô′ tẽr shed), *n.* a ridge of land separating waters flowing into two river systems, a divide.

waterspout (wô′ tẽr spout), *n.* a moving column of water drawn up from the sea by a whirlwind; a pipe to carry off rain.

watertight (wô′ tẽr tīt), *adj.* made so compactly that water cannot enter or escape.

water wheel (wô′ tẽr hwēl), a mill wheel turned by the force of a passing or falling stream.

waterworks (wô′ tẽr wûrks), *n.* a pumping station; the system of public water supply, including reservoir, pumps, pipe line, dams and other adjuncts.

watt (wot), *n.* a unit of power, especially electrical.

wattage (wot′ ij), *n.* the amount of electrical power used, expressed in watts.

wattle (wot′ l), *n.* a twig; flexible rod; a framework made of such rods; the featherless, fleshy flap under the neck of some birds or reptiles.

wave (wāv), *n.* a moving mass of liquid on the surface of a larger mass; a wind-driven ridge or swell of water at sea, one of a series separated by troughs or lower levels; a long ridge on any surface, resembling a wave of the sea; a swelling state, as a *wave* of anger; a vibrating motion through the air, as light *waves,* heat *waves;* a to-and-fro motion, as a *wave* of the hand.

Syn. Billow, surge, breaker. The *waves* that swell more than ordinarily are termed *billows;* those that rise unusually high are called *surges;* those that break and dissolve in foam as they reach the shore are *breakers.*

waver (wā′ vẽr), *v.i.* to move to and fro; to vacillate, hesitate, unable to make up one's mind.

wax (waks), *n.* the material of which bees make their honeycomb or any material resembling it in being adhesive, plastic, easily melted by heat but not dissolving in water.

wax (waks), *v.t.* to treat with wax, as the cobbler *waxes* his thread.

wax (waks), *v.i.* to grow, increase in size or any other respect, as the moon *waxes* and wanes.

waxen (wak′ sen), *adj.* composed of or coated with wax; pale, as a *waxen* face.

way (wā), *n.* a road or passage; the route from one place to another; a manner of doing things, as this is the *way* to write; a characteristic, as he is set in his *way;* progress, as to make one's *way* in the world; room, space to advance, distance, as a long *way;* regard, respect, as the project appeals to me in every *way.*

wayfarer (wā′ fâr ẽr), *n.* a traveler, especially one who travels on foot.

*__waylay__ (wā lā′), *v.t.* [*p.t. and p.p.* waylaid, *pr.p.* waylaying] to lie in wait for; to beset by the road or in ambush.

wayward (wā′ wẽrd), *adj.* impatient of discipline, unruly, disobedient; vacillating.

we (wē), *personal pron.* plural of I.

weak (wēk), *adj.* lacking strength; deficient in moral courage; diluted, as a *weak* mixture; easily influenced, as *weak*-willed; below standard, as he is *weak* in mathematics; lacking distinctness, faint, as a *weak* cry.

Syn. Feeble, infirm. We may be *weak* in body or mind, but we are commonly *feeble* or *infirm* only in the body. We may be *weak* from disease or *weak* by nature. An old man is *feeble* from age; he may likewise be *infirm* in consequence of sickness.

Ant. Strong, vigorous, healthy.

wealth (welth), *n.* riches, affluence.

wealthy (wel′ thi), *adj.* [*comp.* wealthier, *superl.* wealthiest] rich, affluent.

*__wean__ (wēn), *v.t.* to accustom, as a child, to take other food than the mother's milk; to divert from any object of interest.

wean (wēn), *n.* a child, a half-grown baby.

*__weapon__ (wep′ un), *n.* any instrument of offense or defense.

*__wear__ (wâr), *n.* damage caused by use, as my coat shows *wear;* garments of a certain kind or for a certain season, as men's *wear,* summer *wear.*

wear (wâr), *v.i. and v.t.* [*p.t.* wore, *p.p.* worn, *pr.p.* wearing] to endure use, as this material *wears* well; to impair or waste by time, usage, friction; to pass slowly, as the day *wore* on; to carry as covering for the body, as we all *wear* clothes; to make by friction, as heavy traffic *wears* ruts in soft roads; to show, as to *wear* a cheerful look.

wearisome (wēr′ i sum), *adj.* tiring, tedious.

*__weary__ (wēr′ i), *adj.* [*comp.* wearier, *superl.* weariest] tired, worn out physically or mentally.

weasel (wē′ zl), *n.* a small flesh-eating animal with a long, thin body and short legs.

*__weather__ (we*th*′ ẽr), *n.* the state of the atmosphere with respect to cold, heat, rainfall, drought and storms.

weather (we*th*′ ẽr), *v.t.* to season by exposure to the air; to endure, as to *weather* a storm.

weather (we*th*′ ẽr), *adj.* facing the wind, windward, as the *weather* side of a ship: opposite of *lee.*

weather-beaten (we*th*′ ẽr bēt′ n), *adj.* toughened from exposure, as a *weather-beaten* skin; worn, damaged by climatic conditions, as a *weather-beaten* shack.

weathercock (we*th*′ ẽr kok), *n.* a vane, often in the shape of a cock, attached to the top of a spire or pole where it is turned back and forth by the wind and so indicates the direction of the wind.

weather vane (we*th*′ ẽr vān), a thin strip of wood or metal that turns with the wind and shows which way it is blowing.

*__weave__ (wēv), *n.* a textile or woven fabric, any particular pattern in fabrics.

weave (wēv), *v.i. and v.t.* [*p.t.* wove, *p.p.* woven, *pr.p.* weaving] to make cloth on a loom; to wind in and out; to interlace, as threads, as to *weave* a fabric; to compose with several threads of narrative, as to *weave* a lively story; to take a winding course, as he *wove* his way through the crowd; to move from side to side, as the boxer was *weaving* to avoid his opponent's blows.

web (web), *n.* a texture of threads or of threadlike materials; anything woven, as a spider's *web;* a tangle, as the *web* of life; the skin in the foot of a swimming bird and some animals; a large roll of newsprint.

web-footed (web foot′ ed), *n.* having the toes joined by a membrane for swimming, as a duck.

wed (wed), *v.i. and v.t.* [*p.t. and p.p.* wedded or wed, *pr.p.* wedding] to marry.

wedding (wed′ ing), *n.* a marriage ceremony.

wedge (wej), *n.* a piece of hardwood or metal, thick at one end and sharp-edged at the other, used in splitting logs, raising heavy objects; anything shaped like this instrument, as a *wedge* of pie; anything used to create an opening.

*__wedge__ (wej), *v.t.* to cleave, force, drive or fasten with a block of wood or iron, thick at one end and sharp-edged at the other end.

wedlock (wed′ lok), *n.* matrimony.

wee (wē), *adj.* very small, tiny.

*__weed__ (wēd), *n.* a wild plant growing in cultivated land and injurious to the planted crops; any plant without beauty or usefulness; a garment or costume, as widow's *weeds.*

weed (wēd), *v.t.* to free a plot of land from wild and useless plants; to remove harmful or useless parts of, as to *weed* out a mailing list.

weedy (wēd′ i), *adj.* [*comp.* weedier, *superl.* weediest] overgrown with useless plants; long-legged, lean and lank.

*__week__ (wēk), *n.* a period of 7 consecutive days.

weekday (wēk′ dā), *n.* any day but Sunday.

week end (wēk end), the time from Friday night or Saturday noon to Monday morning, when business offices are closed.

weekly (wēk′ li), *n.* [*pl.* weeklies] a publication put out every 7 days.

weekly (wēk′ li), *adj.* pertaining to a 7-day period; happening once every 7 days.

weekly (wēk′ li), *adv.* once in 7 days.

weep (wēp), *v.i.* [*p.t. and p.p.* wept, *pr.p.* weeping] to shed tears; to exude moisture, as the heavens *weep.*

weevil (wē′ vil), *n.* any of several species of beetles that feed on dry grain or other products, as the boll *weevil* that destroys growing cotton.

weft (weft), *n.* the woof or threads carried across the warp or lengthwise threads on a loom.

weigh (wā), *v.i. and v.t.* to have heaviness; to be valid or important, as his word does not *weigh* with me; to measure the heaviness of; to ponder and estimate the value of, as to *weigh* the facts in a case; to bear heavily upon, as his financial burdens *weigh* him down.

weight (wāt), *n.* heaviness; the relative pull of gravity on different objects; pressure; a system of units to determine the heaviness of things, as troy *weight;* a heavy block of matter, as a *weight* for use on scales; something that rests heavily on the mind, as a *weight* of care or sorrow; power or importance, as his word has much *weight* with me, a man of considerable *weight* in the community.

Syn. Burden, load. A person may sink under the *weight* that rests upon him. A platform may break down from the *weight* imposed upon it. A person gives way under his *burden.* A cart breaks under its *load.*

Ant. Lightness.

weighty (wāt′ i), *adj.* [*comp.* weightier, *superl.* weightiest] heavy, ponderous; momentous or important, as a *weighty* matter.

*__weir__ (wēr), *n.* a dam to raise the level of water in a stream; a barrier of interwoven twigs to catch fish.

welcome (wel′ kum), *n.* a greeting, friendly reception of a guest or newcomer.

welcome (wel′ kum), *adj.* received with gladness or hospitality, as a *welcome* guest.

welcome (wel′ kum), *v.t.* to greet with kindness, receive hospitably, as we *welcome* you.

weld (weld), *n.* a union of metallic pieces by melting; the place at which such joining occurs.

weld (weld), *v.t.* to unite, as pieces of metal, by heating the parts to be joined, so that they fuse; to effect a permanent and harmonious union.

welfare (wel′ fâr), *n.* prosperity, happiness.

welfare work (wel′ fâr wûrk), organized activity to better the living conditions of the poor.

welkin (wel′ kin), *n.* the sky.

well (wel), *n.* a spring or fountain; a shaft sunk in the earth to reach a supply of underground liquid, as water or oil.

well (wel), *adj.* healthy; in satisfactory state, as all is *well.*

well (wel), *adv.* in a proper manner, suitably; favorably; justifiably; intimately; considerably or extensively, as we were *well* on our way when you called.

well-being (wel bē′ ing), *n.* general health and prosperity.

well-bred (wel bred′), *adj.* refined in manners, cultivated, descended from good stock.

well-nigh (wel nī′), *adv.* very nearly, almost but not quite.

Welsh rabbit (welsh rab′ it), melted cheese, sometimes mixed with ale, seasoned and spread on toast: sometimes spelled *rarebit.*

welt (welt), *n.* a narrow strip of leather around a shoe between the upper leather and the sole; any edge or border ornamented or reinforced, as a strip of cloth enclosing a cord and sewed over a seam; a swollen mark made on the skin by a blow.

Weltanschauung (velt än′ shou oong), *n.* a view of things, especially international relations, on a world-wide scale.

welter (wel′ tẽr), *n.* a state of disturbance and confusion; turmoil.

welter (wel′ tẽr), *v.i.* to roll in mud, wallow; to rise and fall, toss violently, as waves.

welterweight (wel′ tẽr wāt), *n.* a boxer or wrestler who weighs no more than 147 pounds.

Weltpolitik (velt′ pō li tēk), *n.* foreign policy based upon a worldwide view of conditions and relations.

wen (wen), *n.* a fleshy tumor, not malignant; a cyst or sac full of fatty skin secretions.

wench (wench), *n.* a girl; a female servant.

wend (wend), *v.i. and v.t.* to go, pass; to direct, as one's way or course.

west (west), *n.* one of the four cardinal points of the compass: opposite of *east;* the direction of the setting sun: *the West,* the states of the United States between the Mississippi and the Pacific Ocean; the well-defined western part of any country or of the whole world, as East is East and West is West, and never the twain shall meet.

western (wes′ tẽrn), *n.* a motion picture showing scenes and characters of a conventionalized ranch life.

western (wes′ tẽrn), *adj.* pertaining to, situated in or coming from the direction opposite to the east.

westward (west′ wẽrd), *adj.* situated or moving in a direction opposite to the east, as a *westward* course.

westward (west′ wẽrd), *adv.* toward the west, as to go *westward.*

wet (wet), *n.* moisture, liquid, rainy weather, as do not go out in the *wet.*

wet (wet), *v.t.* [*p.t. and p.p.* wet or wetted, *pr.p.* wetting] to moisten or soak with a liquid.

wet (wet), *adj.* moistened or soaked with liquid; abounding with water or rain, as a *wet* day.

wet nurse (wet nûrs), *n.* a woman employed to suckle another woman's baby.

*__whack__ (hwak), *n.* a smart, resounding blow.

whack (hwak), *v.t.* to strike with a smart, resounding blow.

*__whale__ (hwāl), *n.* a large warm-blooded air-breathing sea mammal, some species of which yield oil and whalebone.

whaler (hwāl′ ẽr), *n.* one whose occupation is whale fishing; a ship used for whale fishing.

wharf (hwôrf), *n.* [*pl.* wharves] a structure on the shore of a navigable body of water where ships load and unload passengers and cargo.

*__what__ (hwot), *interrogative pron.* which thing or things, as *what* is the matter? In exclamations, what things, how much, as *what* he has undergone! *Relative pron.* that or those which.

what (hwot), *adj.* which, as *what* town is this? how much, as of *what* use is that? any, all, whatever, as I will give you *what* little I have.

what (hwot), *adv.* how, in what regard, as *what* will it profit a man? partly, in part, used with a preposition following, as *what* with the dust storms and *what* with the drought, the West was devastated; in exclamations, as *what* a beautiful day!

whatnot (hwot′ not), *n.* an article of furniture to hold bric-a-brac and odds and ends.

wheat (hwēt), *n.* a cultivated grass, the most important of the cereal plants, with seeds rich in starch and gluten and milled to make flour.

*__wheedle__ (hwēd′ l), *v.i. and v.t.* to coax, cajole; to get by means of flattery and indirect urging.

*__wheel__ (hwēl), *n.* a circular spoked frame or solid disk of wood or metal that turns on an axle and is used on conveyances for ease and rapidity of transportation or to transmit power in a system of machinery; the circular spoked frame by means of which a ship or an automobile is steered; anything resembling a wheel in formation and movement, especially a maneuver in which a line of troops or ships pivots on a given point.

wheel (hwēl), *v.i. and v.t.* to move or cause to move by means of rotating disks or circular spoked structures pivoting on an axle, as to *wheel* a barrow; to turn or cause to turn as if rotating, as troops; to turn or change, as the wind has *wheeled* about.

wheelbarrow (hwēl′ bar ō), *n.* a light vehicle with two handles, two legs and one wheel and used to carry small loads.

wheel horse (hwēl hôrs), the animal nearest the vehicle when driven in tandem; the person who does the heavy work in an organization, as he is the *wheel horse* in this office.

***wheelwright** (hwēl′ rīt), *n.* one who makes or repairs wheels and vehicles.

***wheeze** (hwēz), *n.* a puffing and blowing as in labored breathing, a whistling in the breath.

wheeze (hwēz), *v.i.* to breathe with a whistling sound, breathe hard and audibly; to make such a sound, as the old car *wheezed* on hills.

wheezy (hwēz′ i), *adj.* [*comp.* wheezier, *superl.* wheeziest] breathing hard and with a whistling sound, as a *wheezy* horse.

whelm (hwelm), *v.t.* to flood, overpower, destroy.

***whelp** (hwelp), *n.* one of the young of certain animals, as the dog, lion, wolf or fox; a cub.

whelp (hwelp), *v.i.* to bring forth young.

when (hwen), *adv.* at what time; as they knew *when* they had to sing; *when* are we going?

when (hwen), *conj.* at or after the time; on any occasion that, as *when* I go, I always take the bus; as soon as, as *when* the work is finished, you may go home; whereas.

whence (hwens), *adv.* from what place, source or origin, as whence comes the wind?

where (hwâr), *adv.* at which place; whither, as *where* is it? *where* are you going? the place *where* I was born.

whereas (hwâr az′), *adv.* considering that, it being the case that; when in fact, as he left, *whereas*, had he only waited, he would have been sent to London with the other delegates.

whereby (hwâr bī′), by which.

wherefore (hwâr′ fōr), *adv.* for which or what reason, why.

whereof (hwâr ov′), *adv.* of whom, of which, as I know *whereof* I speak.

whereupon (hwâr u pon′), *adv.* as a result of which, after which, as *whereupon* he left abruptly.

wherever (hwâr ev′ ẽr), *adv.* at, to or in whatever place, as I shall find it *wherever* it is.

whet (hwet), *n.* anything that sharpens the appetite; the act of sharpening.

whet (hwet), *v.t.* to sharpen by rubbing; to stimulate, as this exercise *whets* my appetite.

whether (hwe*th*′ ẽr), *conj.* in case that, in either case, if, as I do not care *whether* you go or stay; *whether* it is successful depends upon your effort.

whetstone (hwet′ stōn), *n.* a slab on which edged tools are rubbed to sharpen them.

whey (hwā), *n.* the thin, watery part of milk after separation from the curd.

which (hwich), *pron.* what one of two or more, as *which* book do you want; that, as the truth, *which* is known by some, must be published; the thing that, as the book, *which* is much worn, has been returned.

whichever (hwich ev′ ẽr), *pron.* any one or ones that, as take *whichever* you wish.

whichever (hwich ev′ ẽr), *adj.* any, as *whichever* road you take will lead into heavy traffic.

whiff (hwif), *n.* a sudden breath of air or smoke, a puff, as a *whiff* of a pipe; a faint odor, as a *whiff* of springtime fragrance.

whiff (hwif), *v.t.* to puff lightly, as smoke; to move by puffing at or in some similar manner, as to *whiff* something away.

whiffletree (hwif′ l trē), *n.* a swinging bar to which the traces are attached at the front of a wagon or carriage.

while (hwīl), *n.* a short space of time, as he only stayed a *while;* time needed for an action, as it would not be worth his *while* to travel so far.

while (hwīl), *conj.* as long as; during the time that, as stay here *while* I ask the way.

while (hwīl), *v.t.* to pass, as time; to spend, as to *while* away the hours.

whim (hwim), *n.* a capricious fancy, notion, unreasonable wish.

whimper (hwim′ pẽr), *n.* a fretful, whining cry.

whimper (hwim′ pẽr), *v.i.* to cry in a whining way; to make a complaining sound; to complain, be dissatisfied.

whimsical (hwim′ zi kal), *adj.* fanciful; having a humorous quirk, quaint.

***whine** (hwīn), *n.* a plaintive tone, a sound of fretful complaining.

whine (hwīn), *v.i.* to cry plaintively, complain in a fretful manner.

***whinny** (hwin′ i), *n.* [*pl.* whinnies] a horse's call; a subdued neigh.

whinny (hwin′ i), *v.i.* [*p.t. and p.p.* whinnied, *pr.p.* whinnying] to neigh softly.

***whip** (hwip), *n.* a flexible rod or a stick with a lash attached at one end, with which to urge or discipline; a hoist with rope and pulley worked by a horse; one whose duty it is to maintain discipline in a party representation in a parliamentary or legislative body; a light dessert made of stewed fruit and whipped cream or whites of eggs beaten stiff, as prune *whip.*

whip (hwip), *v.i. and v.t.* to have the motion of a lash, as the awning *whipped* in the gale; to cast a fishing line with a lashing motion; to cast in all parts, as of a pool, as we *whipped* the stream for trout; to lash or beat; to beat to a froth, as to *whip* cream; to sew with an overcasting stitch, as to *whip* a seam; to snatch, as he *whipped* out his knife.

***whippoorwill** (hwip poor wil′), *n.* a night-flying North American bird, mottled brown and black, with a cry resembling its name.

whir (hwûr), *n.* a sound as of mixed buzzing and swishing caused by rapid motion, as the *whir* of a bird's wings, the *whir* of machinery.

whir (hwûr), *v.i.* to move very fast, with a sound of buzzing and whizzing.

***whirl** (hwûrl), *n.* a rapid rotation, swift circular motion; something rotating fast, as a *whirl* of dust in the wind.

whirl (hwûrl), *v.i. and v.t.* to be moved fast with a circular motion, as the leaves *whirled* in the wind; to move fast with a circular motion, as the wind *whirls* fallen leaves.

whirligig (hwûr′ li gig), *n.* anything rotating rapidly; a child's toy that spins; a merry-go-round.

whirlpool (hwûrl′ pool), *n.* an eddy or deep swirl of water with circular motion that draws down floating things within its scope.

whirlwind (hwûrl′ wind), *n.* a gale with circular motion about a central point, a tornado, cyclone.

***whisk** (hwisk), *n.* the act of brushing with short, quick strokes; a small brush made like a broom; a mechanical device that moves with short, quick strokes.

whisk (hwisk), *v.i. and v.t.* to move or be moved briskly, with swift action; to move or carry off nimbly, as he *whisked* it out of sight.

whiskers (hwis′ kẽrz), *n. pl.* the hair on a man's cheeks; the bristly hairs at the corners of the mouth of a cat or other animal.

whisky (hwis′ ki), *n.* [*pl.* whiskies] an intoxicant distilled from starchy grains, as barley, corn and rye.

whisper (hwis′ pẽr), *n.* a subdued utterance or way of uttering; anything said under the breath; a rumor, as *whispers* may do much harm; a subdued rustling sound.

whisper (hwis′ pẽr), *v.i. and v.t.* to speak without vibrating the vocal cords; to say under the breath; to circulate rumors.

***whist** (hwist), *n.* a card game for two pairs of partners.

whistle (hwis′ l), *n.* a shrill sound produced by forcing air or steam through an opening in a tube or through the lips; an instrument especially made to produce such a sound.

whistle (hwis′ l), *v.i. and v.t.* to make a shrill sound by forcing the breath through the pursed lips or by forcing air or steam through a shaped hole in a pipe or tube; to move swiftly with a shrill sound, as bullets *whistled* all around them; to express by a shrill sound through pursed lips, as to *whistle* a tune.

whit (hwit), *n.* the smallest particle.

***white** (hwīt), *n.* absence of hue, the condition of reflecting all the rays of light and absorbing none; a Caucasian; the albumen of an egg; the uncolored part of an eyeball, the *white* of the eye; the bull's-eye of a target.

white (hwīt), *adj.* being without color; fair-skinned; clear and colorless, as a *white* wine; pure.

whitecap (hwīt′ kap), *n.* the fringe of foam that tops a breaking wave offshore.

white gold (hwīt gōld), gold alloyed with other metals, usually nickel and zinc, to make it look like platinum.

white lead (hwīt led), lead carbonate, used as a pigment.

white lie (hwīt lī), a pious fraud; a fib told to do good.

white plague (hwīt plāg), tuberculosis, consumption.

whitewash (hwīt′ wash), *n.* a mixture of lime and water used to whiten walls and fences.

whitewash (hwīt′ wash), *v.t.* to cover with a coat of lime mixed with water; to cause to appear better than is the case, as to *whitewash* a person who is at fault.

***whither** (hwi*th*′ ẽr), *adv.* to what place; to what degree or end.

whittle (hwit′ l), *v.i. and v.t.* to cut aimlessly with a knife; to cut down or shape with a knife, a bit at a stroke.

***whiz** (hwiz), *n.* the humming sound made by an object in fast motion, as the ball passed my head with a *whiz.*

whiz (hwiz), *v.i.* to move fast and with a humming or buzzing sound, as the ball *whizzed* past my head.

whiz-bang (hwiz′ bang), *n.* a high-explosive shell.

who (hōō), *pron.* whatever person; the person that, as I will tell you *who* did it, Mrs. Jones *who* lives next door to us; which person, what person, as *who* is this?

whoever (hōō ev′ ẽr), *pron.* every one that, as *whoever* knows must tell.

***whole** (hōl), *n.* the entirety; a unity or total.

whole (hōl), *adj.* containing all parts, complete; sound in body; not defective; unbroken.

Syn. Entire, complete, total, integral. *Whole* excludes subtraction; *entire* excludes division; *complete* excludes deficiency. A *whole* orange has had nothing taken from it; an *entire* melon has not been cut; a *complete* disaster has reached its full extent. *Total* is the opposite of partial; *integral* is applied to parts or numbers not broken.

Ant. Partial, divided, incomplete.

wholehearted (hōl härt′ ed), *adj.* complete, sincere, as *wholehearted* enthusiasm.

wholesale (hōl′ sāl), *n.* the purchase of goods in large quantities for reselling, as bought at *wholesale.*

wholesale (hōl′ sāl), *adj.* in large quantities, as we do a *wholesale* business.

wholesome (hōl′ sum), *adj.* sound and healthful; good for the health of body, mind or morals, salubrious, salutary.

wholly (hōl′ li), *adv.* completely, fully, as I am *wholly* in sympathy with your aims.

whoop (hōōp), *n.* a loud shout of triumph; the sound that accompanies a deep sonorous coughing.

***whooping cough** (hōōp′ ing kôf), *n.* an infectious disease, often of children, with spasms of coughing accompanied by long loud and resonant respiration.

***whorl** (hwûrl), *n.* the spiral design in fingerprints; a circular arrangement of leaves or petals on one stem.

***whortleberry** (hwûr′ tl ber′ i), *n.* [*pl.* whortleberries] a small shrub and its edible fruit; the huckleberry.

***why** (hwī), *n.* reason or explanation, as that's the *why* of it.

why (hwī), *adv.* for what cause or reason; for what purpose, as *why* did you do it?

why (hwī), *interj.* an exclamation indicating surprise, impatience, hesitation, as why, he really does not know.

wick (wik), *n.* the cord in a candle or piece of absorbent fabric that draws up fuel for the flame of an oil lamp.

wicked (wik′ ed), *adj.* evil in principle or practice, sinful, immoral.

Syn. Iniquitous, nefarious. It is *wicked* to deprive another of his property or rights. It is *iniquitous* to do this by fraud and circumvention; and *nefarious* if it involves a breach of trust.

Ant. Virtuous.

wicker (wik′ ẽr), *n.* a flexible twig or rod of willow.

wicker (wik′ ẽr), *adj.* made of pliant rods, interwoven, as a *wicker* chair.

wickerwork (wik′ ẽr wûrk), *n.* the interweaving of pliant rods; anything made by interweaving pliant rods, as this chair is *wickerwork.*

wicket (wik′ et), *n.* a small gate; a minor entranceway through a large door; a small opening resembling a window, especially one having a grill, as in a ticket office; the three upright stumps with bails crossing at the top at which a bowler in cricket hurls the ball; a wire arch through which the ball is to be shot in croquet.

wide (wīd), *adj.* extended far from side to side; broad, vast, spacious; comprehensive in scope, as a man of *wide* interests.

wide (wīd), *adv.* broadly; all the way, as the gate is *wide* open.

widen (wīd′ n), *v.i. and v.t.* to become or to make more broad; to expand sideways.

widow (wid′ ō), *n.* a woman who survives her husband and remains unmarried.

widower (wid′ ō ẽr), *n.* a man whose wife has died and who has not married again.

width (width), *n.* the measure from side to side, breadth.

wield (wēld), *v.t.* to use with the hands, as to wield a pickax; to exercise, as to *wield* influence.

wife (wīf), *n.* [*pl.* wives] a married woman.

wig (wig), *n.* false hair worn to conceal baldness, to complete a fancy dress costume or as part of official dress, as of a court judge in England.

wiggle (wig′ gl), *v.i.* to wriggle; to move to and fro with a quick, jerky motion.

wigwag (wig′ wag), *n.* a signal by the movement of flags or lights.

wigwag (wig′ wag), *v.t.* to send, as a message, by waving lights or flags.

***wigwam** (wig′ wom), *n.* an Indian hut.

wild (wīld), *n.* unsettled country, desert, wilderness, as the *wilds* of Arabia.

wild (wīld), *adj.* living in a state of nature, untamed, uncontrolled; not cultivated; fantastic; visionary, as a *wild* scheme; wide of the mark, as a *wild* shot.

wildcat (wīld′ kat), *n.* an undomesticated animal of the feline species, such as the bobcat or lynx.

wildcat (wīld′ kat), *adj.* out of control, as a *wildcat* railroad locomotive; unsound, haphazard, risky, speculative, as a *wildcat* project.

wilderness (wil′ dẽr nes), *n.* wasteland, a tangled growth of plants; an uncultivated and uninhabited region.

***wile** (wīl), *n.* a sly artifice, a trick.

wile (wīl), *v.t.* to beguile, wheedle.

will (wil), *n.* desire or power to control by mental force; determination; a document disposing of one's property at death; a testament.

will (wil), *v.t. and v.i.* to determine, decree, as the king *wills* war; to bequeath, as to *will* a fortune to an heir; to influence by mental power, as she *willed* that he should think of her; to choose, as you can if you *will.* As an auxiliary verb *will* is used with the infinitive of other verbs (without the *to*) to express the future tense, as he *will* sing at the next concert; to express willingness or determination, as he *will* do as you say, I *will* do it no matter what you say; to express probability, as the bridge *will* hold 6 tons; to express inevitability, as boys *will* be boys.

willing (wil′ ing), *adj.* inclined to do or grant; done freely and with pleasure, as *willing* to help, a *willing* service.

willingly (wil′ ing li), *adv.* voluntarily, cheerfully, of one's own accord.

***wily** (wī′ li), *adj.* [*comp.* wilier, *superl.* wiliest] sly, cunning, crafty.

wimble (wim′ bl), *n.* a boring tool such as the gimlet or auger.

wimple (wim′ pl), *n.* a kind of silk or linen head and neck covering formerly worn by women and now used by some orders of nuns.

win (win), *v.i. and v.t.* [*p.t. and p.p.* won, *pr.p.* winning] to acquire by effort or gain by superiority; to be successful, triumph; to be victorious in, as to *win* a game; to obtain, as to *win* consent.

wince (wins), *n.* the act of flinching, as from pain.

wince (wins), *v.i.* to shrink, draw back, flinch, as he *winced* at the touch.

winch (winch), *n.* the crank of a wheel; the handle that turns a machine like the grindstone; a hoisting machine in which the work is done by winding a rope or chain about a turning axle.

wind (wind), *n.* a current of air; air in motion; scent, as to get *wind* of something; *winds,* musical instruments played by blowing the breath through a tube.

wind (wind), *v.t.* to blow, sound by blowing, as he *winded* the bugle; to make breathless, as he was *winded;* to rest so as to recover breath, as they *winded* their horses for an hour.

wind (wīnd), *v.i. and v.t.* to twist around; to get started, as the pitcher is *winding* up; to coil about or encircle, as the river *winds* through a valley, *wind* the rope around the post; to set the machinery in motion, as to *wind* a watch; to complete or finish, as they *wound* up the company.

windfall (wind′ fôl), *n.* fruit blown down by the wind; unexpected good fortune.

wind gauge (wind gāj), an instrument to determine the direction and force of air in motion.

winding sheet (wīn′ ding shēt), a cloth in which a body is enfolded for burial, a cerecloth.

windlass (wind′ lȧs), *n.* a cylinder or roller by means of which weights are raised by the turning of a rope or chain.

***windmill** (wind′ mil), *n.* a mill operated by the rotation of a large wheel having oblique blades that are turned by the wind.

window (win′ dō), *n.* an aperture in a wall to admit light, usually glazed or covered with paper.

window envelope (win′ dō en′ ve lōp), an envelope with a transparent section through which an address written on the paper inside is visible.

windpipe (wind′ pīp), *n.* the trachea, the breathing tube.

windward (wind′ wẽrd), *n.* the direction from which the wind blows: opposite of *leeward.*

windward (wind′ wẽrd), *adj.* toward the wind, as the *windward* side of a building.

windy (win′ di), *adj.* [*comp.* windier, *superl.* windiest] breezy, exposed to the movement of the air; boastful, talkative.

wine (wīn), *n.* the fermented juice of the grape or of certain berries and leaves; a color like these beverages, usually a shade of red.

wing (wing), *n.* a broad, flat member by means of which a bird or insect flies; one of the main supporting surfaces of an airplane; a part of a building added to and projecting from the main structure; the side extension of a stage; anything else that resembles a bird's wing.

wing (wing), *v.i. and v.t.* to fly; to make fly, as to *wing* an arrow or a shaft of wit; to pass through or across by flying, as the geese *winged* their way South; to injure in the wing, to disable, as to *wing* a bird.

wing loading (wing lōd′ ing), the weight carried by an airplane per unit of wing area.

wing rib (wing rib), one of the rigid parts of the supporting surface of an airplane.

wing skid (wing skid), a brace extending down from an airplane's wing, at the end, to keep the wing from touching the ground.

wing spar (wing spär), one of the long, rigid ribs of an airplane wing.

wink (wingk), *n.* a quick closing and reopening of the eyelid; a short time, as he had returned in a *wink.*

wink (wingk), *v.i.* to close and open the eyelid with quick motion; to hint or suggest.

winnow (win′ ō), *v.i. and v.t.* to separate chaff from grain; to separate by blowing, as to *winnow* chaff from grain; to sift.

winsome (win′ sum), *adj.* attractive, pretty, winning.

winter (win′ tẽr), *n.* the cold season of the year.

winter (win′ tẽr), *v.i. and v.t.* to spend the cold months, as to *winter* in Florida; to keep through the cold weather, as the cattle were *wintered* in the barns.

wintergreen (win′ tẽr grēn), *n.* a low-growing evergreen herb with red berries and pungent leaves from which oil of wintergreen is extracted.

winterkilled (win′ tẽr kild), *adj.* dead from exposure to more cold than it can stand, as a plant.

wipe (wīp), *n.* the act of rubbing; a projecting part in machinery that raises another part and lets it fall by its own weight.

wipe (wīp), *v.t.* to dry or clean by rubbing, as with a cloth.

wire (wīr), *n.* a metallic thread of one diameter throughout its length.

wire (wīr), *v.i. and v.t.* to equip with metallic threads, as to *wire* a house for electricity; to send a telegram, as to *wire* a message.

wireless (wīr′ les), *adj.* not using metal-thread conveyors of electricity, as a *wireless* message.

wireless telegraphy (wīr′ les tē leg′ *ra* fi), direct telegraphic electric-wave communication without the use of metal threads to carry the electric impulse; radio.

wireless telephony (wīr′ les tē lef′ ō ni), the sending of vocal messages by radio.

wirepulling (wīr′ pool ing), *n.* secret influence or intrigue, as in political maneuvering.

wiry (wīr′ i), *adj.* [*comp.* wirier, *superl.* wiriest] like a metal thread; strong and flexible; lean and sinewy.

***wisdom** (wiz′ dum), *n.* sagacity, prudence, good judgment; great learning.

Syn. Prudence. *Wisdom* directs all matters, present or to come. *Prudence,* acting by foresight, directs what is to come. Rules of conduct are framed by *wisdom.* It is the part of *prudence* to apply these rules to the business of life.

Ant. Folly, recklessness, rashness.

wisdom tooth (wiz′ dum to͞oth), the third molar on each side in each jaw, usually cut between the ages of 17 and 22.

wise (wīz), *adj.* having the ability to form true judgments; discerning.

wiseacre (wīz′ ā kẽr), *n.* a would-be wise person; a stupid person who thinks he knows it all.

wish (wish), *n.* a strong or eager desire.

wish (wish), *v.i. and v.t.* to desire strongly; to long for.

wishbone (wish′ bōn), *n.* the forked bone in front of the breastbone of a fowl; when broken and wished upon, the longer end supposedly bringing good luck.

wisp (wisp), *n.* a handful or small bundle, as of hay or straw.

wistful (wist′ fool), *adj.* longing, pensive, wishful.

wit (wit), *n.* knowledge, sagacity; talent, ingenuity; keen humor; a humorist.

***witch** (wich), *n.* a woman supposed to be in contact with evil spirits and to possess supernatural powers; a sorceress.

witch (wich), *v.t.* to fascinate, enchant, bewitch.

witchcraft (wich′ kråft), *n.* the practice of sorcery or black magic.

witchery (wich′ ẽr i), *n.* [*pl.* witcheries] fascination; enchantment.

witch hazel (wich hā′ zl), a shrub with small yellow flowers and a bark from which a soothing lotion is made.

***with** (wi*th*), *prep.* beside, in the company of, close to, as I am *with* you; by, as fill it *with* water; in the manner or state of, as I shall do it *with* pleasure; because of, as to laugh *with* joy, suffer *with* hunger; in the care of, as leave him *with* me; by means of, as he was killed *with* a knife.

withdraw (wi*th* drô′), *v.i. and v.t.* to depart, retreat, as to *withdraw* from the town; to take back, retract, as I *withdraw* my statement; to remove, as to *withdraw* a child from a school.

***withe** (with) *n.* a tough flexible twig, especially of willow, used for tying or binding.

wither (wi*th*′ ẽr), *v.i. and v.t.* to shrivel and shrink, as this plant *withers* in the sun; to cause to fade and dry up, as the heat *withers* this plant.

***withers** (wi*th*′ ẽrz), *n. pl.* the highest part of a horse's back, between the shoulderblades.

within (wi*th* in′), *adv.* inside, as look *within;* in or into a house, indoors, as step *within.*

within (wi*th* in′), *prep.* inside, inside of, as *within* the charmed circle; not farther or longer than, as *within* 6 feet, *within* a week.

without (wi*th* out′), *adv.* outside, outdoors; externally, as painted *without.*

without (wi*th* out′), *prep.* out of, at or on the outside: opposite of *within;* lacking, as *without* food, *without* fear.

witness (wit′ nes), *n.* attestation of anything, testimony; one who has seen; one who gives evidence, as he had a reliable *witness.*

witness (wit′ nes), *v.i. and v.t.* to give evidence of, to prove, as his failure *witnessed* his honesty; to see or behold, as the bystander *witnessed* the accident; to attest, be present to observe, as the servants *witnessed* the signing of the will.

witticism (wit′ i sizm), *n.* a joke; a keenly humorous remark.

wittingly (wit′ ing li), *adv.* with knowledge, knowingly; intentionally.

witty (wit′ i), *adj.* [*comp.* wittier, *superl.* wittiest] smartly or cleverly facetious; having keen humor.

***wizard** (wiz′ ẽrd), *n.* one supposed to possess supernatural powers; a sorcerer.

wizened (wiz′ nd), *adj.* dried up, shriveled, as a *wizened* old man.

***wobble** (wob′ l), *n.* an irregular swaying or rocking motion; a rolling or rocking from side to side unsteadily and irregulary.

wobble (wob′ l), *v.i.* to move unsteadily, swaying from side to side; to vacillate; to lack steadiness and decision.

woe (wō), *n.* sorrow, grief, misery.

wolf (woolf), *n.* a fierce flesh-eating wild animal of the dog family.

wolf (woolf), *v.t.* to eat like a wild beast, as he *wolfed* his food.

wolverine or **wolverene** (wool vẽr ēn′), *n.* a flesh-eating animal of Canada and the northern United States, related to the weasels and martens.

***woman** (woom′ an), *n.* [*pl.* women] an adult female human being.

womb (wōōm), *n.* the organ in which the young of mammals grow and develop before birth, the uterus.

***wonder** (wun′ dẽr), *n.* astonishment; a marvel.

Syn. Miracle, marvel, prodigy, monster. *Wonders* are natural; *miracles* are supernatural. The whole creation is full of *wonders;* the Bible contains an account of the *miracles. Wonders* are real; *marvels* are often fictitious; *prodigies* are extravagant and often imaginary; *monsters* are violations of the laws of nature.

***wonder** (wun′ dẽr), *v.i. and v.t.* to be astonished at; to feel surprise and amazement; to have doubt about and a desire to know, as I *wonder* why he did not come.

wonderful (wun′ dẽr fool), *adj.* strange, extraordinary, amazing, astounding, as radio communication is a *wonderful* achievement.

***wont** (wunt), *n.* habit or custom, as it is her *wont* to rise early.

***wont** (wunt), *adj.* accustomed to, in the habit of, as he is *wont* to do good.

***wonted** (wun′ ted), *adj.* habitual, customary, usual.

woo (wōō), *v.t.* to make love to, urge to marry; to invite with importunity.

***wood** (wood), *n.* the hard part of a tree or shrub under the bark; trunks and branches of trees cut into boards for use in building, timber, lumber; logs and branches cut for use in fires: *woods,* a forest, a thick growth of trees, as the *woods* were fresh and green.

woodcock (wood′ kok), *n.* a wild fowl allied to the snipe.

wooden (wood′ n), *adj.* made of wood; stiff, awkward, as *wooden* movements.

woodpecker (wood′ pek ẽr), *n.* a bird that drills into the trunks and branches of trees with its beak to discover and eat insects living under the bark.

woody (wood′ i), *adj.* [*comp.* woodier, *superl.* woodiest] covered with forests; like wood; containing wood fiber, as a shrub is a *woody* plant.

woof (wōōf), *n.* the weft or threads that cross the warp in weaving; texture.

***wool** (wool), *n.* the soft fine coat of the domestic sheep and certain kindred animals; cloth or clothing made from it; anything fleecy or resembling wool.

woolen (wool′ en), *adj.* made of wool: as a noun, plural, *woolens,* goods or garments made of wool.

woolly (wool′ i), *adj.* made of or resembling wool; bearing wool, as a *woolly* sheep.

***word** (wûrd), *n.* a sound or combination of sounds used to express an idea or name a thing; a report, as we have had no *word* of it.

word (wûrd), *v.t.* to express in language, as to *word* a note politely.

wording (wûr′ding), *n.* phrasing, style or manner of using words in writing or speech, as the *wording* of a letter.

wordy (wûrd′ i), *adj.* [*comp.* wordier, *superl.* wordiest] verbose, containing or using too many words.

***work** (wûrk), *n.* physical or mental effort directed toward an end; labor; employment; something brought into being by man's toil and skill, as a *work* of art: *works,* the moving parts of a mechanism, as the *works* of a clock; buildings and machines for manufacture, as iron*works.*

Syn. Labor, toil, drudgery, task. *Work* is necessary for support if one does not have independent means. *Toil* and *labor* are hard, tedious forms of work. *Drudgery* is still more taxing. A *task* is a specific piece of work to be accomplished, self-imposed or assigned by another.

Ant. Play, pleasure, leisure, idleness.

work (wûrk), *v.i. and v.t.* to put forth physical or mental effort toward a set end; to labor, toil; to be employed, as he *works* in a mill; to be useful for a special purpose, as this is not the right thing, but it *works;* to reach a certain stage or condition step by step or bit by bit, as this screw has *worked* loose; to operate, as I do not know how to *work* this machine; to cause to move, as to *work* a beam into place; to cause to labor, as to *work* a team too hard.

workhouse (wûrk′ hous), *n.* a public institution where petty offenders are confined and required to labor for their support.

workmanship (wûrk′ man ship), *n.* art and skill in making, craftsmanship, as her *workmanship* is excellent.

world (wûrld), *n.* the earth and its inhabitants; the system of created things; the universe as we know it; any separate system or sphere of interest, as the *world* of art; a large amount, as a *world* of troubles.

worldling (wûrld′ ling), *n.* one who is devoted to the pleasures and advantages of the earthly life.

worldly (wûrld′ li), *adj.* [*comp.* worldlier, *superl.* worldliest] pertaining to earthly life; devoted to earthly things; not spiritual.

***worm** (wûrm), *n.* a small creeping legless, usually hairless animal, as an angleworm; a rotating screw whose threads engage the teeth of a gear wheel.

worm (wûrm), *v.t.* to crawl; to make one's way by obsequious service; to relieve of parasites, as to *worm* a dog.

worm gear (wûrm gẽr), a wheel with teeth that engage the threads of a rotating screw and work with it.

wormwood (wûrm′ wood), *n.* a bitter plant used as a tonic and in making absinthe; anything bitter, as grief.

worrisome (wûr′ i sum), *adj.* causing anxiety and distress.

worry (wûr′ i), *n.* [*pl.* worries] anxiety; perplexity; mental distress and misgiving; anything that causes mental distress, as *worry* cause his mental breakdown.

worry (wûr′ i), *v.i. and v.t.* to be fretful, perplexed, anxious; to cause mental distress to; to tease, as do not *worry* the dog.

worse (wûrs), *adj.* [comp. of *bad*] more bad, less well, as he is *worse* today.

worse (wûrs), *adv.* in a more unsatisfactory manner, as it works *worse* than it did before you repaired it.

***worship** (wûr′ ship), *n.* the act of paying reverence to God; adoration, as hero *worship;* a title of reverence, as his *worship,* the master of the lodge.

***worship** (wûr′ ship), *v.i. and v.t.* to perform religious service; to reverence, adore.

***worst** (wûrst), *n.* the most evil state, as be prepared for the *worst.*

worst (wûrst), *adj.* [superl. of *bad*] evil or inferior in the highest degree.

worst (wûrst), *adv.* to the extreme degree of badness or inferiority, as this is the *worst* built house I have ever seen.

***worsted** (woos′ ted), *n.* twisted thread spun of wool yarn.

***worth** (wûrth), *n.* value; price; moral excellence, her *worth* to the community was recognized.

worth (wûrth), *adj.* equal in value to, as this article is *worth* a dollar.

worthless (wûrth′ les), *adj.* having no value, virtue or excellence; morally bad, as a *worthless* fellow.

***worthy** (wûr′ *th*i), *adj.* [*comp.* worthier, *superl.* worthiest] deserving, as *worthy* of close attention; estimable.

would (wood), *v.t.* wish, desire, as I *would* that I could swim.

would (wood), *auxiliary v.* [past tense of *will*] is apt to or sure to, as that *would* hurt his feelings; was or were accustomed to, as the cat *would* purr by the hour, they *would* come every day: used in quoting a phrase originally containing *will,* as they said he *would* go for he *will* go.

***wound** (wōōnd), *n.* a hurt; an injury, especially one that breaks the skin.

wound (wōōnd), *v.t.* to hurt, injure, as to *wound* a man with a dagger; to hurt the feelings of, as your words *wound* me deeply.

wrack or **rack** (rak), *n.* seaweed cast up on a beach; ruin, destruction, as *wrack* and ruin.

***wraith** (rāth), *n.* the ghost of a person supposed to be seen just before or just after his death; any specter.

wrangle (rang′ gl), *n.* an angry or a noisy dispute, a quarrel, as their *wrangle* disturbed the neighbors.

wrangle (rang′ gl), *v.i.* to dispute noisily and angrily.

wrap (rap), *n.* a blanket; a garment that can be folded about one.

wrap (rap), *v.t.* to roll or fold around, as *wrap* this blanket around you, *wrap* yourself in this robe, *wrap* those things in this paper.

wrapper (rap′ ẽr), *n.* a loose overgarment; a covering, as the *wrapper* of a book.

***wrath** (råth), *n.* great anger, rage; indignation, as the king's *wrath* made his attendants tremble.

wrathful (råth′ fool), *adj.* very angry, full of rage.

wreak (rēk), *v.t.* to give free course to, inflict, as to *wreak* one's wrath.

wreath (rēth), *n.* a garland or chaplet; anything curled or twisted into a circular form, as a wreath of roses.

wreathe (rēth), *v.t.* to intertwine and make in circular form; to give the form of a garland or chaplet to; to encircle, adorn, as a face *wreathed* in smiles.

wreck (rek), *n.* destruction by accident or storm, especially of a ship; shipwreck; destruction of a car or train in a collision or derailment; total failure or destruction of anything, as the *wreck* of a business, a life, a home.

wreckage (rek′ ij), *n.* the remains of anything ruined.

wrecker (rek′ ẽr), *n.* one who destroys, especially one who lures a ship to destruction so that he may steal part of its cargo; a person, train, car or vessel employed to salvage wrecks; one who or that which demolishes a building.

wrench (rench), *n.* an implement with a vise, socket or opening adapted to turn or twist mechanical parts; a violent turn or twist, a sprain, as his foot suffered a severe *wrench.*

wrench (rench), *v.t.* to twist; to distort, pervert, as you *wrench* my words out of their meaning.

wrest (rest), *v.t.* to take from by wrenching, turning or twisting with force or violence.

wrestle (res′ l), *v.i.* to contend by grappling and striving to throw down another; to struggle with a difficulty, as I have *wrestled* 2 hours with this lesson.

wretch (rech), *n.* a miserable being; a mean, contemptible person.

wretched (rech′ ed), *adj.* miserable, unhappy; worthless, as this is a *wretched* makeshift.

***wriggle** (rig′ l), *v.i.* to move or writhe to and fro, squirm, as the dog will *wriggle* under the fence.

wring (ring), *v.t.* to twist so as to expel moisture, as to *wring* washed clothes; to twist violently, as *wring* its neck; to force out by twisting and pressure, as to *wring* a secret from its possessor; to torture, as sorrow *wrings* one's heart.

wrinkle (ring′ kl), *n.* a fold or crease.

wrinkle (ring′ kl), *v.i. and v.t.* to form folds, as this material *wrinkles* easily; to cause to form folds and creases, as he *wrinkles* his nose unconsciously.

***wrist** (rist), *n.* the joint uniting the hand to the arm.

writ (rit), *n.* a court order, as the *writ* was served promptly; anything written.

write (rīt), *v.i. and v.t.* [*p.t.* wrote, *p.p.* written, *pr.p.* writing] to make intelligible symbols with a pointed instrument, as letters on paper with a pen or pencil; to express in words on paper, as to *write* a letter; to compose, as to *write* an essay.

writer (rīt′ ẽr), *n.* an author; one who writes for publication as a livelihood.

writhe (rīth), *v.i.* to twist one's body about; to squirm as if in pain.

writing (rīt′ ing), *n.* the act of making letters with a pen or pencil; that which is written; the literary art or profession: *writings,* literary works, as the *writings* of Poe.

***wrong** (rông), *n.* that which is contrary to moral right, evil; injury, as you have done me a great *wrong.*

wrong (rông), *adj.* not morally correct or justifiable; unjust; mistaken, as you are *wrong* in thinking such things; incorrect, as to get the *wrong* answer in adding a column of figures.

wrong (rông), *v.t.* to hurt, injure, treat unjustly, as such an act will *wrong* your friend.

***wroth** (rôth), *adj.* much exasperated, indignant.

wry (rī), *adj.* [*comp.* wrier, *superl.* wriest] twisted, distorted, askew, as he made a *wry* face.

X

***xanthein** (zan′ thē in), *n.* the yellow coloring matter of certain plants and flowers.

xanthous (zan′ thus), *adj.* pertaining to the yellow-skinned races, especially the Mongolian.

***xebec** (zē′ bek), *n.* a small, three-masted ship used in Mediterranean waters.

xenon (zē′ non), *n.* a heavy, inactive gaseous element.

xeroderma (zē rō dûr′ m*a*), *n.* a disease of the skin characterized by abnormal dryness.

xerophthalmia (zē rof thal′ mi *a*), *n.* abnormal dryness of the eyeball.

X ray (exs′ rā), a Roentgen ray.

***xylograph** (zī′ lō gráf), *n.* an engraving on a block of wood or an impression made from it.

xylonite (zī′ lon īt), *n.* a manufactured material resembling ivory or celluloid: a trade name.

***xylophone** (zī′ lō fōn), *n.* a musical instrument consisting of hard wooden bars set on a frame, played with small mallets.

***xyster** (zis′ tẽr), *n.* a surgeon's implement for scraping diseased bones.

Y

***yacht** (yot), *n.* a light, fast boat for pleasure cruising or racing, propelled by the wind or motor power or both.

yak (yak), *n.* a Central Asiatic wild ox with long hair fringing its sides.

yam (yam), *n.* a tropical vine with edible, tuberous roots; a large kind of sweet potato.

yard (yärd), *n.* a unit of linear measure, 36 inches or 3 feet; a spar hung crosswise on a sailing ship's mast; an area about a dwelling or its outbuildings and commonly enclosed, as a front *yard;* an enclosed area in which some particular kind of work is done, as a brick*yard,* railroad *yards.*

yardstick (yärd′ stik), *n.* a measuring stick 36 inches long; a means of measuring, a test or criterion, as the TVA will furnish a *yardstick* of public-utility rates.

yarn (yärn), *n.* spun thread for weaving or knitting.

***yaw** (yô), *n.* a momentary deviation from the straight course by a ship or an airplane.

yaw (yô), *v.i.* to deviate momentarily from the right course, as a ship or airplane.

***yawl** (yôl), *n.* a boat with two masts, the smaller being aft of the rudder post, and fore-and-aft rigged.

***yawn** (yôn), *n.* an involuntary opening of the jaws from drowsiness.

yawn (yôn), *v.i.* to gape, to stand wide open, as a chasm; to open the jaws wide and inhale deeply from drowsiness, fatigue, boredom.

***yea** (yā), *n.* an affirmative vote taken by rollcall.

yea (yā), *adv.* yes; indeed; even, as a hundred, *yea,* a thousand.

yean (yēn), *v.i. and v.t.* to bring forth young, as sheep or goats.

***year** (yēr), *n.* the period of 365¼ days during which the earth makes one complete revolution about the sun.

***yearling** (yēr′ ling), *n.* an animal that is a year old, especially a horse, sheep, cow or deer; one in his second year at West Point.

yearn (yûrn), *v.i.* to long for, desire greatly and incessantly, as the traveler *yearns* for home; to be filled with compassion.

***yeast** (yēst), *n.* a minute-celled fungus that causes fermentation and is used in making bread dough or beer.

yell (yel), *n.* a sharp shout; a school or college cheer, as we heard the Harvard *yell.*

yell (yel), *v.t. and v.i.* to cry out or cheer loudly, as he *yelled* vengeance; to utter a sharp shout.

***yellow** (yel′ ō), *n.* a bright elementary color, between green and orange in the spectrum.

yellow daisy (yel′ ō dā′ zi), the black-eyed Susan of the fields.

yellow fever (yel′ ō fē′ vẽr), an infectious disease in which the skin turns yellow.

yellow jacket (yel′ ō jak′ et), *n.* a hornet with a yellow-banded, black abdomen.

yelp (yelp), *v.i.* to utter a short, sharp cry, as a dog when hurt.

***yeoman** (yō′ man), *n.* [*pl.* yeomen] a small landowner in England; a petty officer who does clerical work in the United States Navy.

yes (yes), *adv.* the primary word of affirmation: opposite of *no.*

yesterday (yes′ tẽr di), *n.* the day before this day; the day last past; a recent time, as it seems only *yesterday* that we were in school together.

***yesterday** (yes′ tẽr di), *adv.* on the day before this, as he came *yesterday.*

***yet** (yet), *adv.* up until now, as it has not happened *yet;* up to the present, as I have it *yet;* in future time, as I shall do it *yet;* still, as that is more important *yet.*

***yew** (yōō), *n.* a large evergreen tree with dark foliage; its fine-grained wood; an archer's bow made from this wood.

Y-gun (wī gun), *n.* a gun with two barrels on a Y-shaped frame used in the navy for dropping depth bombs to wreck enemy submarines.

***yield** (yēld), *n.* the return on labor expended or money invested; that which is produced, as the *yield* of grain from wheat fields, or the mixture of oil and vinegar *yields an* emulsion.

yield (yēld), *v.i. and v.t.* to produce as a return on investment of labor or money; to submit, give up; to concede, as a point, in an argument.

yielding (yēld′ ing), *adj.* inclined to give way under any kind of pressure, physical, mental or moral; gentle, submissive.

yodel (yō′ dl), *v.i.* [*p.t. and p.p.* yodeled, *pr.p.* yodeling] to sing in Swiss fashion with changes from chest tones to head tones.

yoke (yōk), *n.* a curved wooden bar with which a team of draft oxen is hitched together; a similar device fitting over the shoulders for carrying heavy loads; part of a dress fitting over the shoulders or hips to support the lower part of the garment; that which unites two, as the *yoke* of marriage; a symbol of slavery.

***yolk** (yōk), *n.* the yellow part of an egg: sometimes *yelk.*

yonder (yon′ dẽr), *adj.* situated some distance away, as *yonder* lake; more distant, as the *yonder* side of the lake.

yonder (yon′ dẽr), *adv.* over there, as *yonder* lies the town.

yore (yōr), *n.* olden times; the days of long ago.

***you** (yōō), *personal pron.* the second person, sing. and pl., signifying the person or persons addressed.

***young** (yung), *n.* offspring; those, collectively, who are in early life.

young (yung), *adj.* in the early stages of life or growth; not old; fresh, healthy, clear and strong.

youngster (yung′ stẽr), *n.* a young person; a lad.

***your** (yoor), *possessive pron.* belonging to you, as *your* house.

***yours** (yoorz), *possessive pron.* belonging to you, as here is my hat, where is *yours?*

***yourself** (yoor self′), *pron.* [*pl.* yourselves] you personally: a more emphatic form than *you.*

***youth** (yōōth), *n.* the period of life between childhood and maturity; a young man; young persons collectively, as the *youth* of America.

youthful (yōōth′ fool), *adj.* pertaining to the young; having the qualities of youth; immature.

Syn. Juvenile, puerile. To be *youthful* or *juvenile* is, strictly, merely to stand at a certain period of life; to be *puerile* is to be literally boyish, no matter how old one may be. We are surprised and displeased at *puerile* words or acts by a grown man.

Ant. Mature, venerable, senile.

yowl (youl), *n.* a prolonged, wailing cry, the cat's yowl.

yowl (youl), *v.i.* to cry in a prolonged, wailing fashion; howl.

***yttrium** (it′ ri um), *n.* a rare metallic element.

yucca (yuk′ *a*), *n.* a plant with a clump of long, pointed leaves from which rises a tall spike of white flowers.

yucca moth (yuk′ *a* môth), an insect that lays its eggs in the seed pods of the yucca, and the larvae of which eat the seeds of the plant.

__yuletide__ (yo͞ol′ tīd), *n.* the Christmas season.

Z

__zaffer__ (zaf′ ẽr), *n.* an oxide of cobalt, used in blue pigments for decorating chinaware and pottery.

__zamindar__ or __samindar__ (z*a* mēn där′), *n.* an owner of land in India.

__zany__ (zā′ ni), *n.* a buffoon.

*__zeal__ (zēl), *n.* ardor, earnestness, fervor, as their *zeal* in party politics exceeded their patriotism.

*__zealot__ (zel′ ut), *n.* a zealous person, especially one who is overzealous; a fanatic.

__zealotry__ (zel′ ut ri), *n.* a state of excessive zeal, fanaticism.

__zealous__ (zel′ us), *adj.* characterized by zeal, ardent, earnest, fervent, as a *zealous* Christian.

*__zebra__ (zē′ br*a*), *n.* an African animal related to the horse and the ass and having a white or buff coat striped with black.

__zebrawood__ (zē′ br*a* wood), *n.* the hard, striped wood of a tropical tree and used in cabinetwork.

*__zebu__ (zē′ bū), *n.* a breed of cattle domesticated in India, China, East Africa and the East Indies.

__zed__ (zed), *n.* the letter *z,* as everything from *a* to *zed.*

*__zenana__ (ze nä′ n*ȧ*), *n.* the part of a dwelling in India or Persia that is reserved for women, a harem.

*__zenith__ (zē′ nith), *n.* the highest point in the sky, directly overhead; the highest point in the orbit of a planet; the peak, acme, culmination of any activity or enterprise.

*__zephyr__ (zef′ ẽr), *n.* the west wind, named for the ancient Greek god, Zephyrus; any gentle breeze.

__zero__ (zēr′ ō), *n.* nought; one less than one; the point from which a numerical scale starts, as on a thermometer.

__zero hour__ (zēr′ ō our), the time set for starting a planned military movement; the moment of beginning any ordeal; any moment of crisis.

__zest__ (zest); *n.* eagerness for and enjoyment of something; relish.

__zigzag__ (zig′ zag), *n.* a series of sharp turns in a line or course, as the zigzag of his path showed great uncertainty.

__zigzag__ (zig′ zag), *adv.* first this way, then that in a continuous course, as to run *zigzag.*

__zigzag__ (zig′ zag), *adj.* having sharp turns and angles, as a *zigzag* pattern.

__zigzag__ (zig′ zag), *v.i. and v.t.* to move or cause to move in a zigzag course, as the lightning *zigzags* across the heavens, the designer will *zigzag* the lines of the pattern.

*__zinc__ (zingk), *n.* a bluish-white metallic element used in alloys for roofing, galvanizing, electrical work and the like.

*__zincography__ (zing kog′ r*a* fi), *n.* a process of printing or engraving zinc.

__zinnia__ (zin′ i *a*), *n.* a brilliantly colored flower of the aster family.

__zip__ (zip), *n.* speed, energy.

__zipper__ (zip′ ẽr), *n.* a sliding device used for fastening clothing, bags and the like.

*__zircite__ (zûr′ kīt), *n.* a mineral found principally in Brazil and used for lining furnaces.

__zircon__ (zûr′ kon), *n.* a mineral, of which some varieties, reddish and transparent, are used as gems and called *hyacinth.*

__zirconia__ (zẽr kō′ ni *a*), *n.* zirconium dioxide, useful because of its resistance to heat.

__zirconium__ (zẽr kō′ ni um), *n.* a metallic element used as an alloy with other metals to increase their resistance to heat.

*__zither__ (zith′ ẽr), *n.* a musical instrument consisting of 36 to 40 strings stretched over a horizontal sounding box and played with a plectrum.

*__zodiac__ (zō′ di ak), *n.* an imaginary strip in the sky on each side of the sun's path, including 12 major constellations and used by astrologers in predicting the future.

*__zodiacal__ (zō dī′ *a* kal), *adj.* relating to the zodiac.

__zonation__ (zō nā′ shun), *n.* an arrangement in zones.

*__zone__ (zōn), *n.* a girdle or belt; one of the five belts into which the earth's surface is divided, as the Arctic, Antarctic, North and South Temperate and Torrid *zones;* an area set off from surrounding regions by some distinct characteristic, as a business *zone,* the cotton *zone,* the Panama Canal *Zone;* one of the circular areas about a shipping point on which parcel-post charges are based; a section in a city in which building is restricted to certain types; a field or territory, as a *zone* of influence.

__zone__ (zōn), *v.t.* to arrange in belts or sections.

__zoo__ (zo͞o), *n.* a building or enclosed space in which live animals are kept for exhibition; a zoological garden.

*__zoogeography__ (zō ō jē og′ r*a* fi), *n.* the study of animals with special reference to the parts of the world to which they are native.

*__zoology__ (zō ol′ ō ji), *n.* the science of animal life; animal life, as the *zoology* of the tropics.

*__zoom__ (zo͞om), *n.* a sudden upward turn at an angle sharper than an airplane's ordinary climbing power can master.

__zoom__ (zo͞om), *v.i.* to execute an upward turn of an airplane at a very sharp angle.

*__zwieback__ (swī′ bak), *n.* a kind of sweetened bread, first baked then sliced and toasted.

__zygoma__ (zī gō′ m*a*), *n.* the bony structure that connects the bones of the face with those about the ear.

*__zyme__ (zīm), *n.* a fermentation; the ferment that spreads certain disease germs in the body.

__zymology__ (zī mol′ ō ji), *n.* the scientific study of fermentation.

*__zymosis__ (zī mō′ sis), *n.* the development and spread of bacteria through fermentation.

__zymotic__ (zī mot′ ik), *adj.* pertaining to the spread of disease germs through fermentation, as in smallpox.

*__zymurgy__ (zī′ mûr ji), *n.* scientific application of fermentation, as in making beer and wine.

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FINE ARTS

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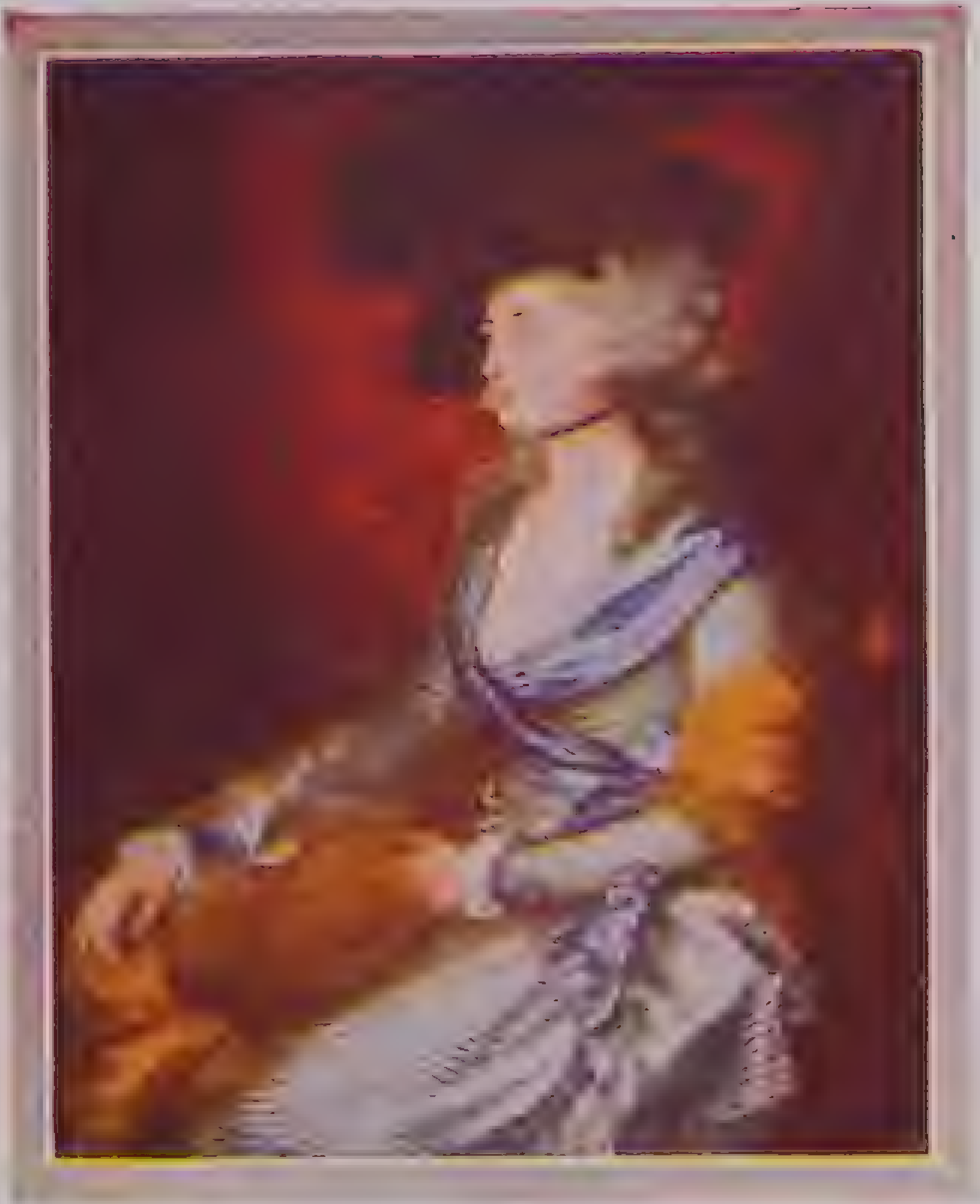

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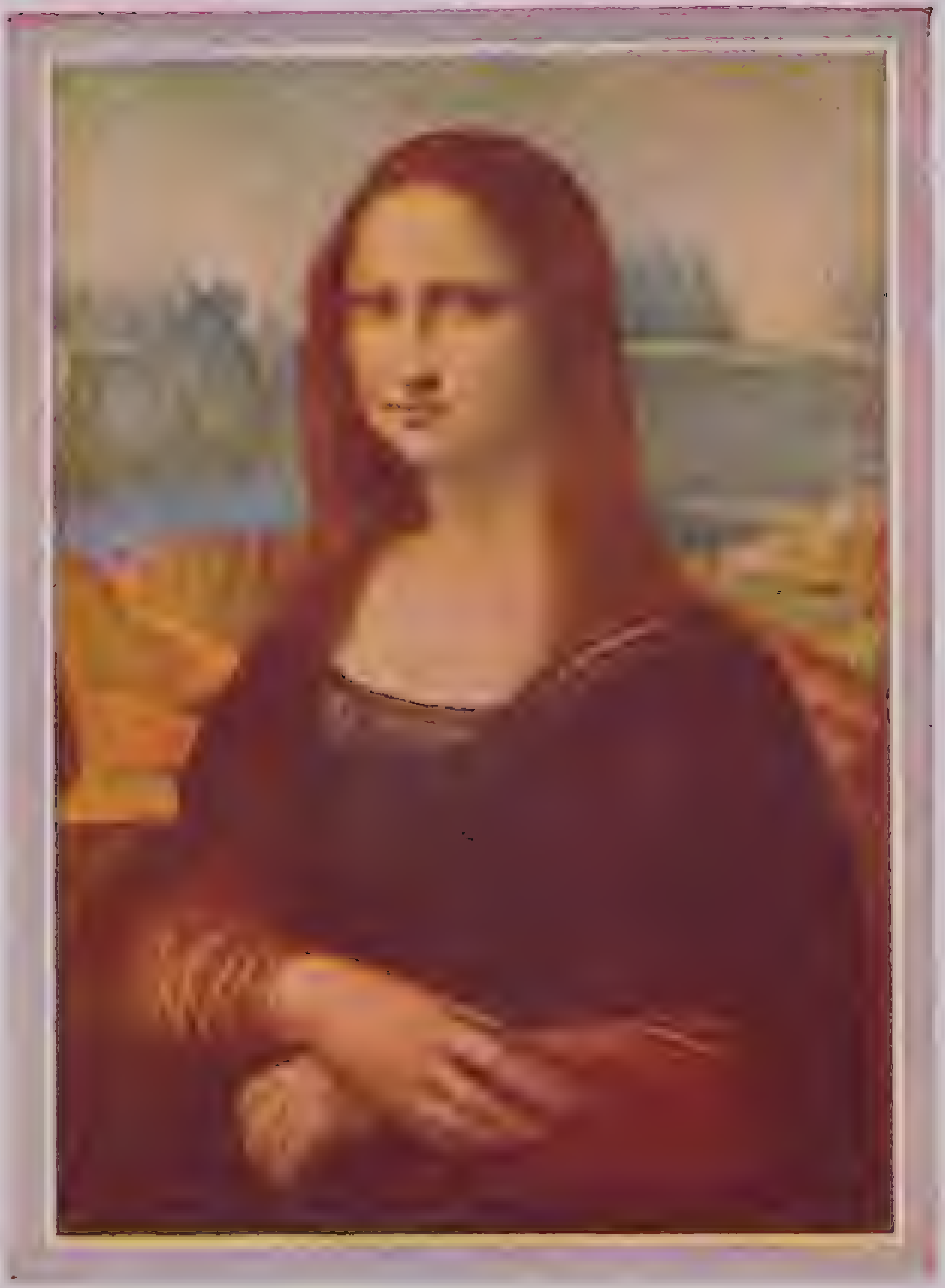

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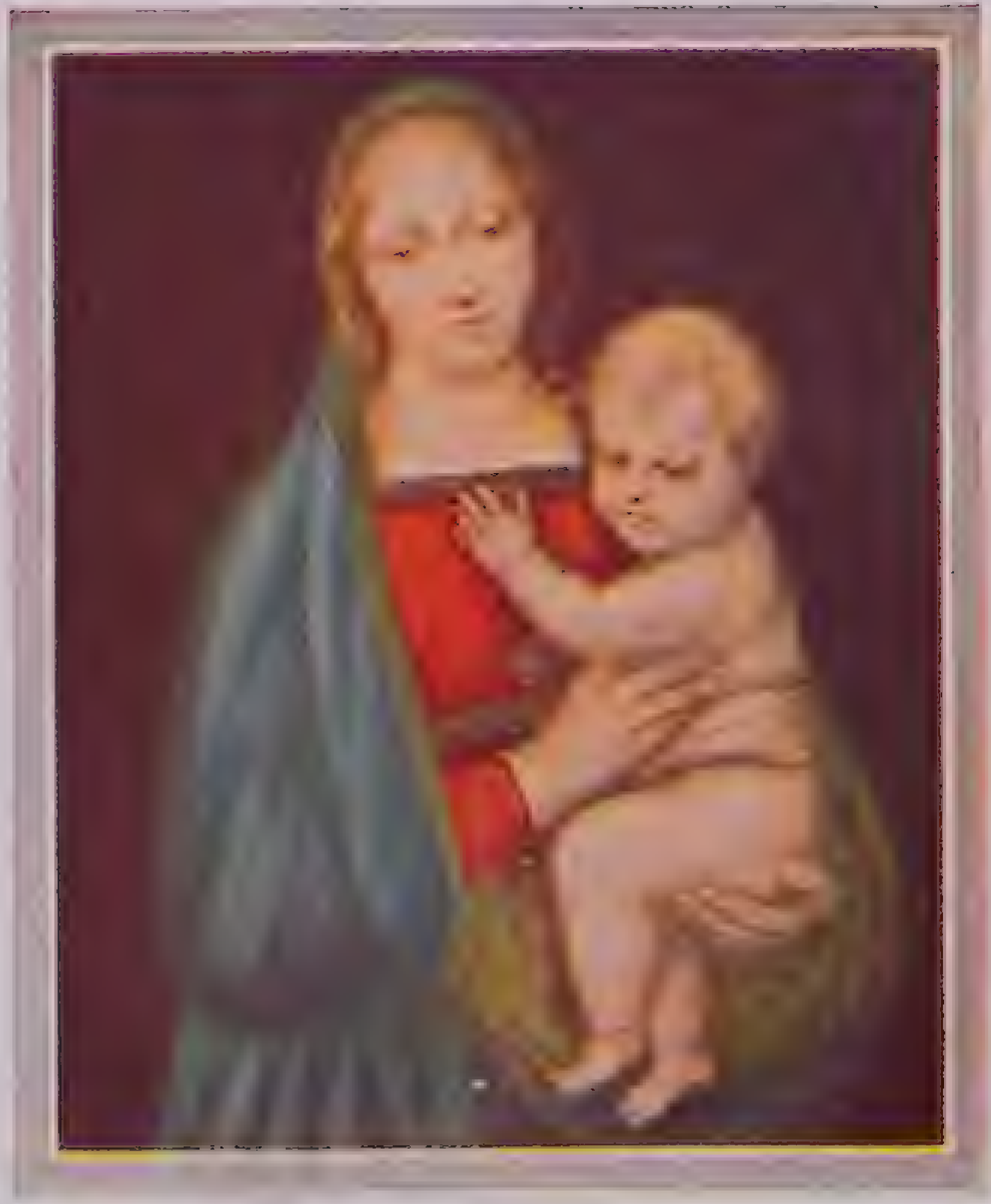

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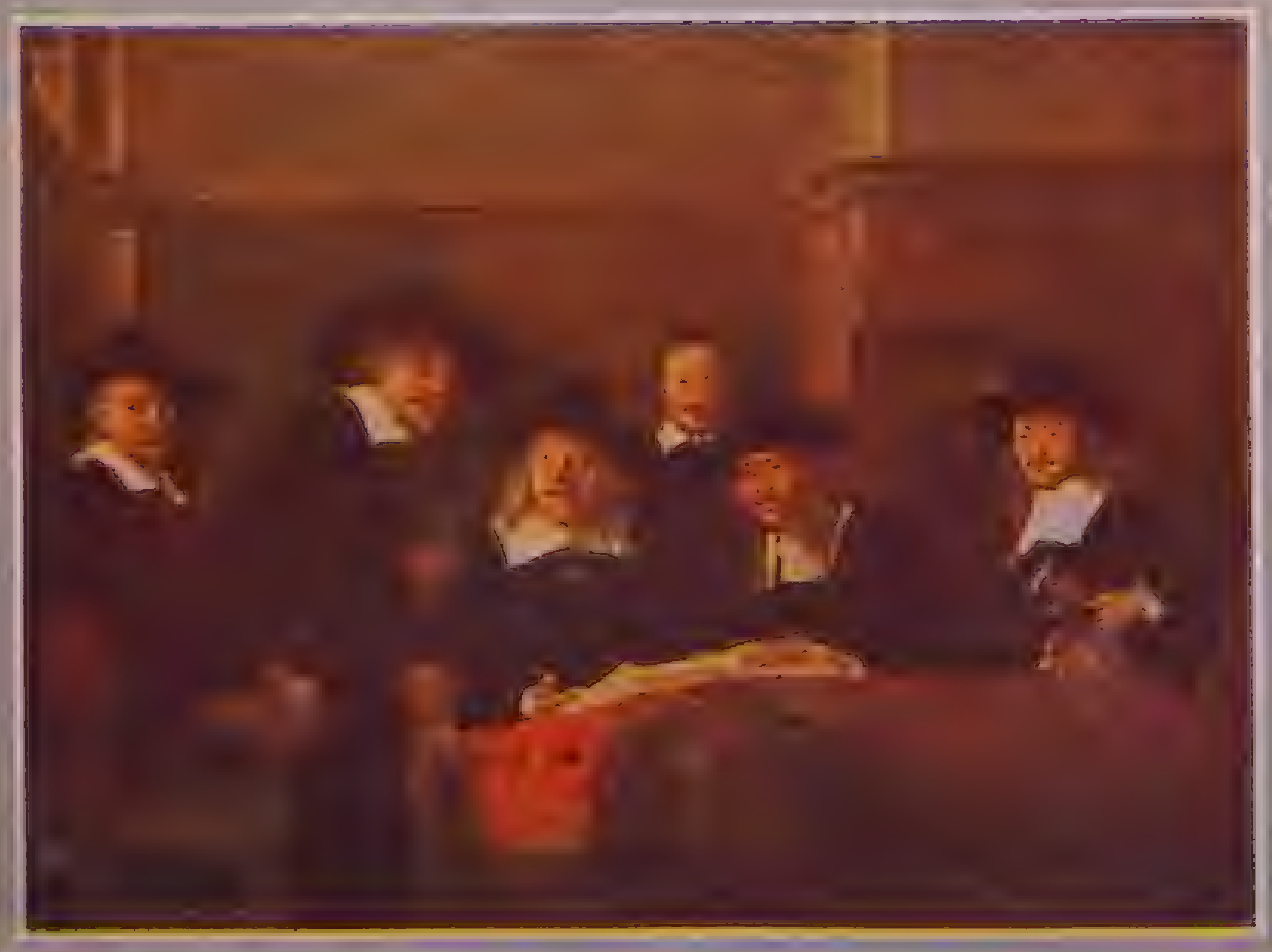

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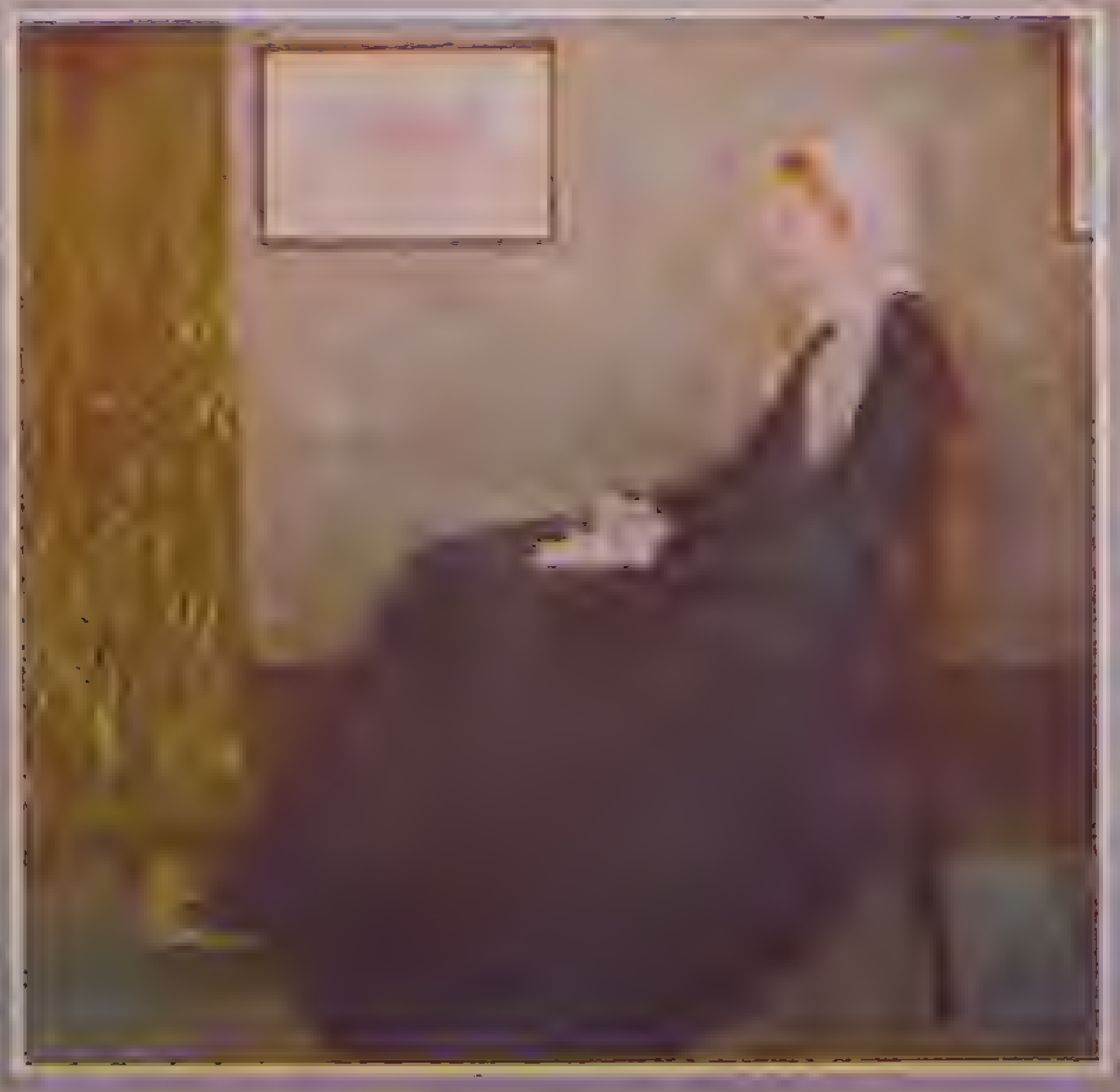

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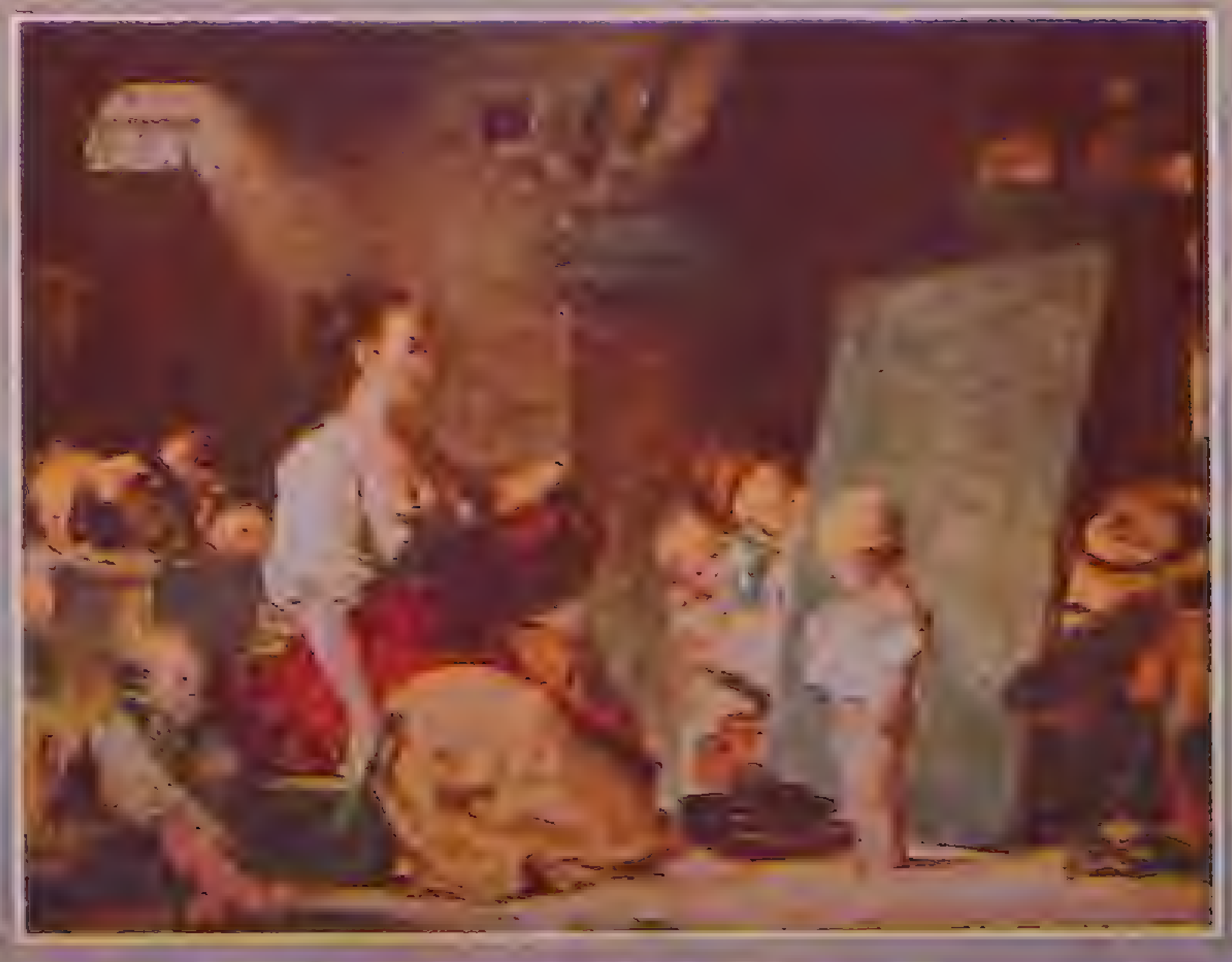

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THE SCHOOLMISTRESS—*Fragonard*
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BOOK XIV: FINE ARTS

INTRODUCTION TO THE FINE ARTS

The division that man can make of what he sees about him is nature and art. A thing is either natural or artificial; either God made it or man made it. The things that man makes may be either useful or beautiful or both. Usually there is the combination of beauty and utility, as in architecture, the handicrafts and the new machine-age industrial art. The arts in which utility is considered secondary to the creation of formal beauty are called the *fine arts* and are usually listed as architecture, painting, sculpture, music and poetry. Of these the most nearly related are architecture, painting and sculpture, which are the major *visual* arts.

It seems as if all the wise men through the ages have tried to answer the question, *What is art?* But it is still impossible to tell in simple intelligible language what art is or what it means. Esthetes used to say that "art is the creation of the beautiful"; but nowadays such a definition seems dangerously like an evasion of the whole difficulty, because *beautiful* is just as impossible to explain as *art;* and *beautiful* applies to many natural things that are not art.

A few modern definitions hint at the essence of art and so may be useful in affording us an inkling of its meaning. A common one is that "art is the expression of an emotion." Since art has more to do with emotions than with intellectual knowing and logical statement, there is at least a valuable clue in this definition.

Some of the moderns, in referring to the visual arts, have given this basic statement: "Art is the expression of a conceived image." This reminds us that the artist has conceived or imagined something in his inner being: he has seen it uniquely and then has given it concrete expression in terms of the materials and methods of the particular art he has chosen as his medium.

At the end of any attempt to explain the theory of art or esthetics, one might as well say: Do not worry too much if you do not discover a simple definition. If you will take the pains to go where actual art is and expose yourself to it, you will find yourself enjoying it; and that *experience* of art will give you a better notion of its essence and characteristics than all the definitions ever penned.

Art is surely an evidence of the divine in man. It is something that distinguishes him from all the rest of creation. The work of art carries a message that the artist receives from his Creator, and it is his duty and joy to pass it on to humanity. This is the reason why the artist has been revered at many times during the course of civilization.

There are other fine arts, such as the dance and the drama, and there are those industries where the arts of painting and sculpture are closely intermingled with the handicrafts, such as ceramics, leaded and stained glass, jewelry, weaving, cabinetmaking and many others.

The general terms that divide art into chronological or historical divisions are unfortunately very loose and uncertain. Usually they are listed: prehistoric, ancient, Byzantine, medieval, Renaissance and Modern. These divisions leave out of account the magnificent manifestations of art in India, later Persia, Java, China and Japan, and the student should keep in mind that hardly one-half of world achievement is told in the story of western art alone.

Prehistoric Art.—It is only during the last 50 years that we have discovered that a truly great and noble pictorial art existed among our ancestors perhaps 50,000 years ago. The Cro-Magnon men, who lived in caves in Europe in the Paleolithic or Old Stone Age, left drawings and carvings of animals that compare very favorably with the work of the foremost modern artists. This work we call *prehistoric* art, and so also can be classified the work of any race produced before the dawn of its recorded history; such was the art of the lake dwellers of Switzerland and of the mound builders and cliff dwellers of America.

Ancient Art.—Not long after 5,000 B.C. the Egyptians built the first of their tombs and invented the system of picture-writing or hieroglyphics. This affords a convenient date for beginning the study of ancient art. The course of ancient art continues through the lives of the inhabitants of Babylonia, Assyria, ancient Persia, Phoenicia, Crete, Greece (where in the 6th and 5th centuries B.C. it reached its greatest glory) and Rome. The art of Greece and Rome is termed *classic,* and on it alone is based a great deal of the subsequent art of Europe and even of the art of today. At the fall of Rome and the Western Empire in 476 A.D., ancient art may be considered to have ended.

Byzantine and Medieval Art.—Medieval is the name given to the period of a thousand years that followed the fall of Rome—the time when modern western nations began to rise out of the wreck of the ancient Roman Empire, and the northern barbarian hordes that had overthrown Rome gradually became civilized. Its most important phenomenon was the rise and increasing power of Christianity as exemplified in the Roman Catholic Church, with its head, the Pope, in Rome. This was the romantic period of chivalry and of the feudal system, of King Arthur and his Round Table, of knights and ladies, of castles and dungeons. During the late Middle Ages occurred the Crusades, the long-drawn-out struggle of the Christian nations to recover the Holy Land from the Moslems. Christianity triumphed over Mohammedanism in the struggle for the possession of Europe. England was won by William the Conqueror. Although the Middle Ages had the usual share of ignorance, poverty, cruelty and wretchedness, it was glorified by the highest examples of chivalry, ecstatic faith and courage, and it saw the creation of some of the most magnificent architecture and sculpture of all time. The Christian monasteries nurtured the minor arts through the period of the Dark Ages and developed crafts and traditions that were to lead to the building and ornamentation of the Gothic cathedrals. The monastic system had grown up first in the Eastern churches, and it is to the East that we must look for the origins of a good deal that went into both Romanesque and Gothic art.

Even before the fall of Rome the *Byzantine* style had taken form in Asia. It is essentially an eastern Christian art. Its background is Persian, Syrian and Egyptian (Coptic), with also some post-classic Greek strains. It is the one European style marked by the frank formalism and the opulent decorativeness of the Oriental peoples. It was brought to Ravenna and Venice and Palermo in its purest types of expression, especially in the 5th, 6th and 11th centuries. It went to France, Spain and Lombardy in only slightly modified forms. Finally it deeply influenced the Romanesque, the western medieval style, and indeed is so mingled with it that no dividing line between the two can be found.

The *Romanesque* style is often said to mark the survival or revival of classic Roman elements as Europe came back to civilized living and expression after the Dark Ages. It is really the most impure of the major styles: Roman methods of building and classic motives are mixed with the distinctive patterning, rich color and abstract formalization brought westward by the Byzantine craftsmen. Romanesque as a style had its beginnings about the 6th century and flourished especially in the 10th and

11th. It disappeared finally in the *Gothic* style in the 12th century. From that time until 1500 Gothic expression ruled in all the northern countries. The outstanding monuments and the culminating glory of the entire Middle Ages are the Gothic cathedrals.

The Renaissance.—Renaissance means rebirth and refers to a rebirth of classic ideals—the ideals of Greece and Rome. The term Renaissance in a strict sense covers the period from 1420 to 1500. In a broad sense, it includes the entire period up to the emergence of modern styles in architecture, sculpture and painting in the early 20th century. In architecture Europe, beginning with Italy in the early 15th century, began to use again the ancient forms and methods of Rome. In sculpture Italian artists had initiated the revival of classic methods as early as the 13th century, although the culmination came in the 15th. There was a corresponding interest in Greek and Roman literature, and this intellectual activity spread to science and exploration. Perspective was discovered, and there was a great interest in anatomy; these studies gave birth to the Renaissance painting that is still considered the finest in European history. Printing, the telescope, the circulation of the blood, the Copernican theory of the universe, the discovery of America—all are Renaissance gifts, where "Man discovers himself and the world."

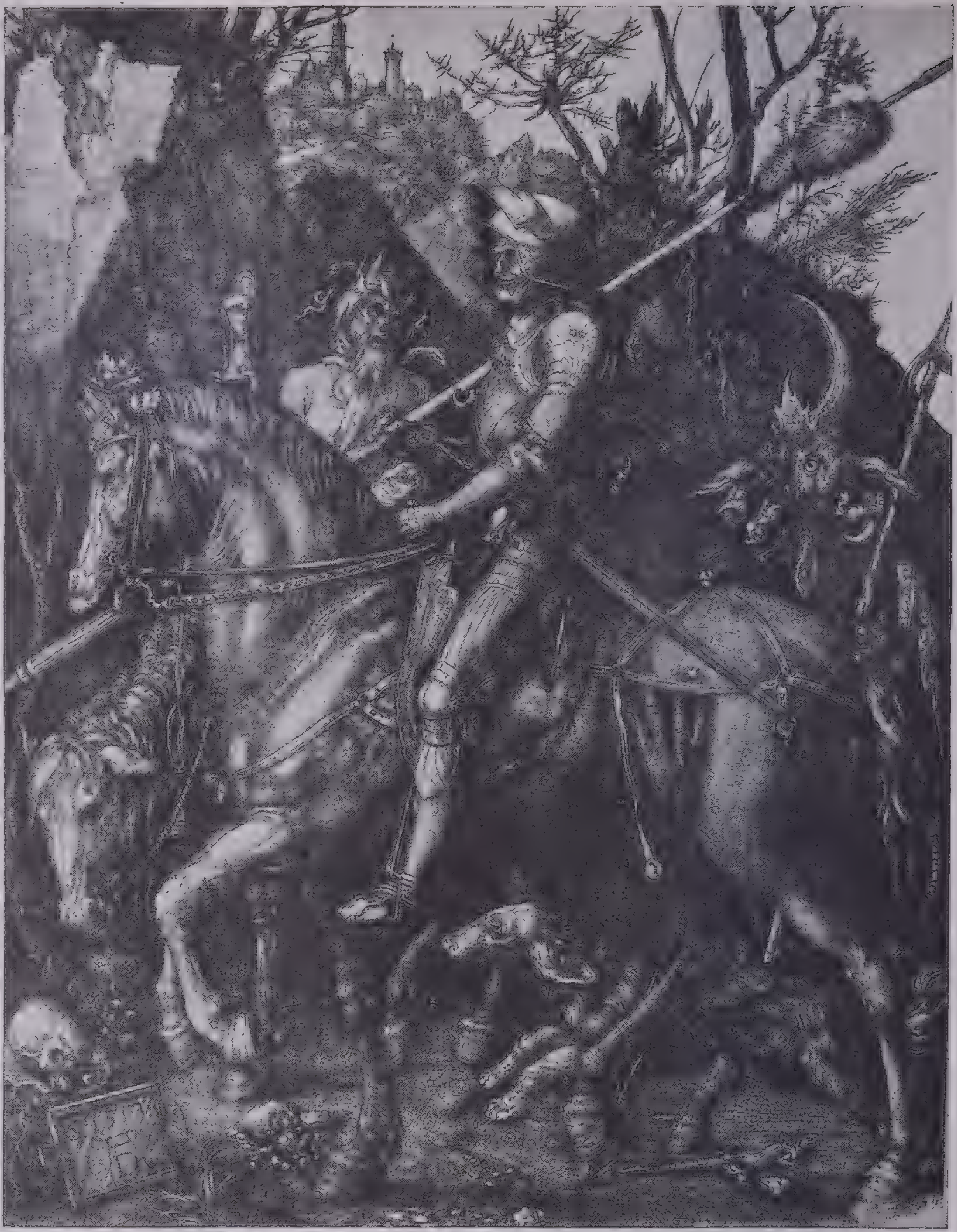
The middle years of the Renaissance were concerned with spreading the new arts over Europe and with wars determining the boundaries of European nations; the later years, generally speaking, were concerned with the development of science and industry. An outstanding event of the Renaissance was the discovery of America and the spread of the European neoclassic culture on the new continent.

Modernism.—We are so close to modern events and modern art that it is difficult properly to appraise their significance. There is no doubt that vital changes, social and artistic, were taking place in the decades just preceding the World War; and the world we live in today is a very different one from that of 1890. In fact, there are many reasons for believing that we are seeing the birth of a new era in culture and art—an era that future historians will classify as opening a new epoch as different from the Renaissance as that was different from the Middle Ages. Within a single generation we have seen the overturning of the standards of art that had prevailed from the beginning of the Renaissance until the opening of our century. Thus is born Modernism.

Divisions of the Fine Arts.—Architecture has been called the *mother of the arts.* In her sheltering arms painting and sculpture have been nourished and protected. It is architecture, therefore, that best shows in its development the chronology of art described above, but all the other arts to a greater or less degree keep step with architecture in their march through the centuries.

Sculpture, the eldest, is ever present from the days of the caveman-artist. Egyptian sculpture appears with the earliest ruins of buildings, and the art has a noble history through 4,000 years of recorded civilization on the Nile. In Greece, in the age of Pericles, sculpture reached a height that in perfection of craftmanship, beauty of transcribed natural form and logical conception has seldom been surpassed. In the Middle Ages sculpture shared, side by side, the fortunes of architecture: they begged by the roadside in the Dark Ages but were the hosts of popes and kings in the portals of magnificent cathedrals of the 12th and 13th centuries. From the time of the Renaissance sculpture strayed away from architecture. But now when the possibilities of freestanding sculpture seem almost exhausted, there are tremendous opportunities opening up for the sculptural adornment of mighty modern buildings.

If we go back to the adornment of the Pleistocene caves, the art of the Cro-Magnons—a combination of painting and engraving—appears to antedate architecture, although obviously anything in the nature of a structure could not have survived the enormous stretch of the centuries. We know much of the pictorial and painted art of the Egyptians, which is found chiefly in the abundant and engaging mural paintings in the tomb-temples. Greek painting we know at firsthand only in miniature forms, but if the murals and easel pictures described by Greek writers were as fine as the surviving works of the early vase painters, the art flourished then. In medieval times painting appeared in new forms garbed in the gorgeous beauty of stained and leaded glass, in the dignity of Byzantine mosaics and in the countless varieties of the art of the weaver and the illuminator. Painting and its sister



Courtesy Fogg Art Museum, Harvard University

The Graphic Arts—Knight, Death and Devil by Albrecht Dürer (1513)

In this copper engraving the artist shows a knight riding through dismal woods while specters of fantasy rise up around him. He sees Death with his hourglass and the Devil with claws outstretched, but he keeps his eyes straight on the road and rides forward arts, drawing and engraving of various kinds, did not come to full flower in Europe until the Renaissance. First, in late medieval times, came the fresco and altarpiece; and in the 15th century appeared the use of perspective, painting in oils, development of the easel picture and engraving. Painting was no longer the handmaid of architecture and of the Church; it became the independent and splendid interpreter of a new era. The painting of the Renaissance is comparable to the sculpture of Greece in the Periclean Age.

The *graphic arts* are, with the possible exception of music and the dance, the most popular and widely distributed of all arts. Besides the various forms of painting in oils on canvas (such as murals, portraits, still life and landscapes), there are water colors, wash drawings, line drawings of many kinds, etching, aquatints and dry points, mezzotints, steel and copperplate engraving, woodcuts and woodblocks, lithography and the many commercial and mechanical forms of reproduction, such as half-tones, zinc etchings and color reproduction.

(NOTE: Sometimes the term *graphic arts* is limited to printing, etching, engraving and the other arts that reproduce and manifold copies of an original work of art.)

Interior decoration and the design of furniture are and always have been more closely allied to architecture than have any other arts. So true is this that characteristic ornament often occurs simultaneously in furniture and architecture. Choir stalls, if they are movable, would be regarded as furniture; if they are connected to the structure, they become a part of the architecture. The same is true of other decoration.

The fine arts, in graphic form, have never been with us and about us more than they are today. If science and the machine have crowded them out of the position closest to our hearts, they are nevertheless as indispensable to a happy and healthy life as they ever were. It is our duty and should be our joy to know and love them.

ARCHITECTURE

The art of building beautifully is architecture. Temples and cathedrals, palaces and public buildings have taken major space in histories of the art, but houses and shops, factories and garages are equally subject to treatment that will endow them with architectural beauty. Recently men have tended to think of all fine art as in the monumental fields, but today we know that the shed and the silo no less than the skyscrapers have their own appropriate artistic character if the architect is both able engineer and imaginative designer.

Architecture from the dawn of history has so constantly touched and mingled with human life in the home, the shop and the temple that often it is the best history and commentary we have of the life of its creators. On account of its universality and its ancient origin, it is often called *the mother of the arts.* It is the most useful of the fine arts and the noblest of the useful arts.

CONSTRUCTION

Twenty years ago students used to be told that there are three elemental types of construction that (alone or in combination) control the form of all architecture:

First, the lintel or lintel-and-post system, in which openings are spanned by a flat slab or beam supported at each end by uprights;

Second, the arch with the opening covered by a number of pieces of masonry arranged usually in a curved form (the vault and the dome are forms of the arch);

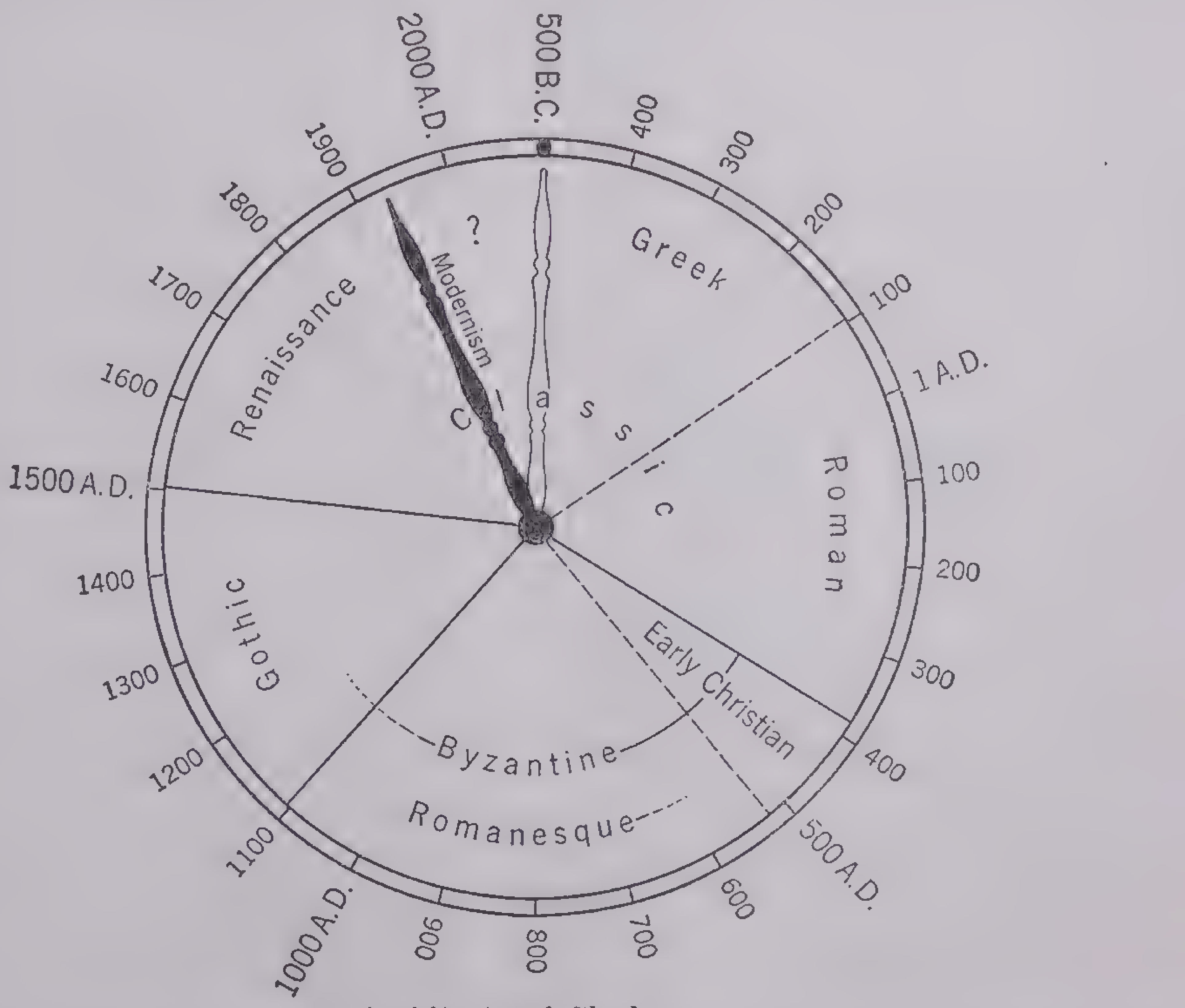
Third, the truss, in which pieces of wood or metal are joined together in triangular formation, the main cross member being relieved of a portion of the down-pressing weight by a scientific method of bracing. More accurately speaking, a truss is a framework substituted for the lintel and designed with true regard to compression and tension.

These elementary principles, formerly the three Rs of the building art, continue to be important, and any student will do well to study them in practice wherever building projects are currently going forward. But modern building in its creative development since 1890 has brought in so many new methods and materials, and they are so commonly used in conjunction with the old, that the simple historic approach no longer brings full understanding. Steel framing is today almost universal in monumental structures and is the basic invention making possible our most spectacular form of building, the skyscraper. In relation to the lintel and arch, steel framing is an utterly revolutionary step, for it provides a sort of birdcage frame upon which walls, roof and floors are hung. Finally concrete came in to displace masonry, particularly concrete reinforced with steel bars to form monolithic floors, roofs or wall sections. Glass also has been developed in new forms and for a great variety of new uses.

The lintel system was used exclusively by the Egyptians and the Greeks. The arch and the vault were Eastern inventions and were probably brought to Europe by the Etruscans. From the Etruscans the Romans took the device, and the Roman engineers used the arch to erect some of the grandest structures known to history. Extension of the arch principle was responsible for the great medieval cathedrals. It is said that the truss was not invented until the 16th century, when it made possible the roofing of great areas not easily compassed by the dome; but as a device or principle it failed to give rise to major styles of building. The steel frame and concrete, however, have made it possible for contemporary architects to initiate a totally new stylistic cycle.

HISTORY OF ARCHITECTURE

Architectural Styles.—Styles properly grow out of materials, methods of construction and building uses. Elaboration in the direction of accent and ornament arose from structural forms.



Architectural Clock

This diagram shows the lapse of time in terms of architectural style from 500 B.C. through nearly 2,500 years to the present time. Note the large space on the dial, nearly two-thirds of the whole, in which classic influence prevailed

The Greek, Byzantine and Gothic are most notable in the Western world of a very few fundamental styles. But many different countries and different races, different climates and different periods have developed styles or sub-styles more or less distinctive and logical. Thus one meets such varieties as English Perpendicular, a sort of Gothic; baroque Renaissance (a variation of a variation); Norman and Spanish Colonial.

Historically, the outstanding family of styles is the *classic,* born and matured in Greece, adapted in ancient Rome, revived in Renaissance Italy, from there disseminated to all parts of Europe and America and with us still in our Georgian Colonial architecture.

Egyptian Architecture.—Egypt is an extraordinary country in many ways and particularly in its architecture. The earliest Greek architecture dates from about 650 B.C., but in Egypt thanks to its climate and isolated position there are buildings in excellent preservation that were built more than 2,000 years earlier, between 4,000 and 5,000 years ago. Notwithstanding the vastness and sublimity of Egyptian architecture, it had almost no effect on the architecture of Greece and has none at all on ours. In that sense it is a dead art, whereas Greek art served as a model and inspiration to architects of Europe (and finally America) at intervals down to the opening of the 20th century.

The Egyptian buildings that have come down to us are tombs and temples. The temples were probably palaces as well. They employed exclusively the lintel type of construction. The buildings were built of stone or granite blocks, usually of huge size, and the walls were covered with word pictures or hieroglyphics and figures of men and gods in low-relief sculpture, which were usually colored. The great pyramids built, perhaps, about 3500 B.C., are the most impressive of the tombs. They have been admired through the ages as masterly examples of simple, monumental architecture. There were other rock-cut tombs, such as that of Tutankhamen, which have given us not only the mummified bodies of the royal occupants themselves but their furniture, jewelry, toys and even food. Besides the tombs there were obelisks, sphinxes and great figures of the kings, who were regarded as gods. The temple-palaces were equally extraordinary. That of Karnak is a vast assemblage of pylons, colonnades and the hypostyle hall, covering in all an area 1,215 feet long by 376 feet wide. The great columns are 70 feet high and 12 feet in diameter. Other great temples are at Edfu, Luxor, Dendera and Philae.

Egyptian art was practiced until about 300 A.D., long after the conquest by Rome, and maintained its character to the last.

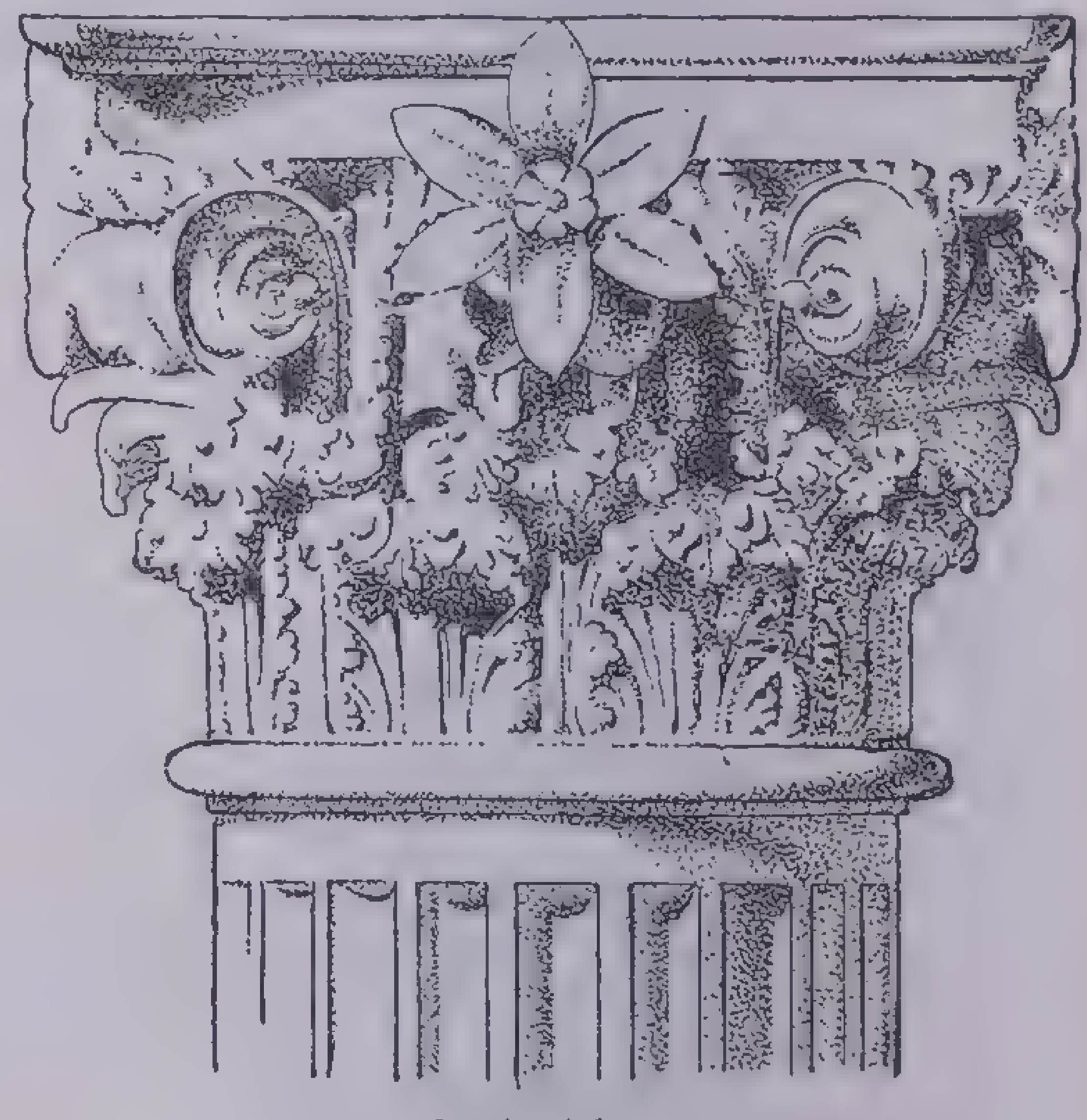
Sumer and Babylonia.—Recent excavations in Sumeria, the land later known as Babylonia and then as Chaldea, indicate that the art and culture of the Mesopotamian region are as ancient as those of Egypt. The dwellers in the Fertile Crescent of Mesopotamia were greatly handicapped by having little but mud to build with; but they made the mud into bricks and with these they built low buildings with immensely thick walls on the top of stupendous terraces of brick and clay. Decorative effects were secured by applying glazed colored tiles and carved slabs of precious alabaster to the face of the walls. Since they had no stone or even wood of large sizes, their rooms were very narrow; possibly some rooms were vaulted, for the Babylonians seem to have understood the use of the arch. No evidence of windows has been discovered, and these strange hall-like rooms probably reflected from their tiled walls only the flickering light of lamps and the daylight that entered the single door. Today many houses in the same locality dispense with windows as a protection against the terrific heat. The principal remains of art and architecture are found in excavations at the sites of the Sumerian city-states, especially Ur and Lagash, and in the ruins of Babylon. The Sumerian buildings were blocklike affairs, built in terraces, with dominating towers. The present ruins of Babylon date from a comparatively late rebuilding, of the 6th century B.C. At that time the great Chaldean King Nebuchadnezzar built an immense palace (near the Tower of Babel), and it was he who had the vast hanging gardens, one of the Seven Wonders of the World.

Assyria.—To the north of Babylonia, in the valley of the Euphrates, was its rival Assyria. The Assyrians possessed stone and wood in limited quantities and understood well the arch and vault. Nevertheless they copied the uncomfortable plans of the Babylonians and their ornament seems to have been derived equally from Babylonia and Egypt. They seem never to have made use of the column. The remains of architecture in Assyria are extensive owing to their use of stone, and the great palace of Sargon at Khorsabad and palaces at Nineveh and Nimrud are notable.

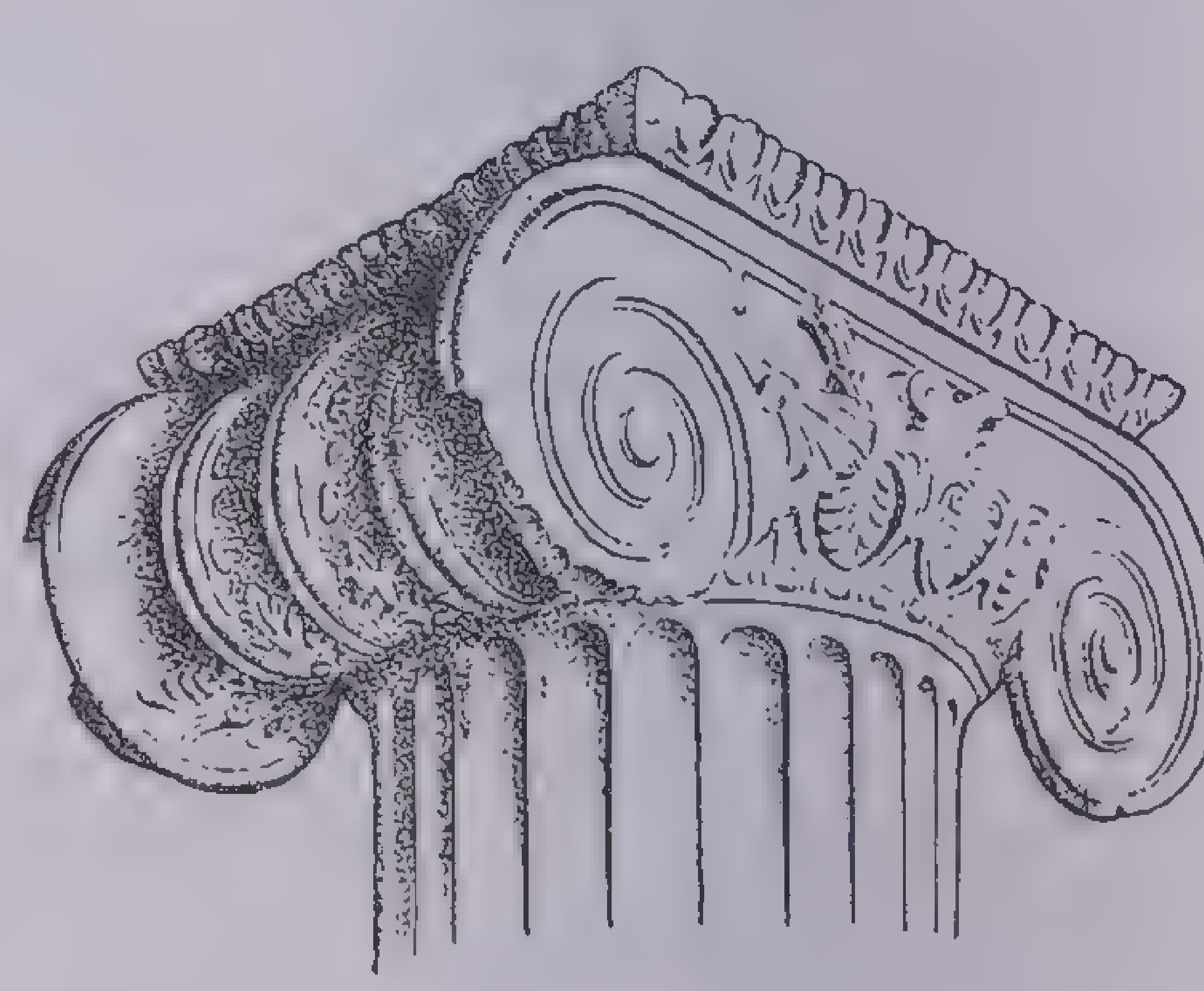
Persia.—From 536 to 525 B.C. the Persians under Cyrus the Great and Cambyses became masters of ancient Assyria and of Chaldea and Egypt as well. At Persepolis and Susa they built great palaces from the remains of which we can form excellent conceptions. The Persians continued the building traditions of Assyria and Chaldea in the use of glazed brick and tile on terraces and thick walls; but they added the use of the column, thereby attaining vast rooms in which slender columns of stone of a curious design supported timber roofs. The arts which they borrowed from the conquered countries were modified by their Eastern inheritance, but it is doubtful whether they advanced far beyond the Babylonians in developing a style of building. The truer architecture of Persia was to follow typically Oriental designing with arch and dome and colorful ornamentation. It was to father both the Byzantine and the Mohammedan styles.

Solomon's Temple.—About the architecture of Biblical times our knowledge comes almost solely from the Bible, which contains a detailed description of the Temple built by Solomon. Added to and rebuilt by different rulers it presented, during the lifetime of Christ, an extraordinary combination of Egyptian, Assyrian and classic elements and must have been one of the most magnificent buildings of its day. The great contribution of the Hebrews to civilization is in the realms of religion, literature and law and not in the visual arts.

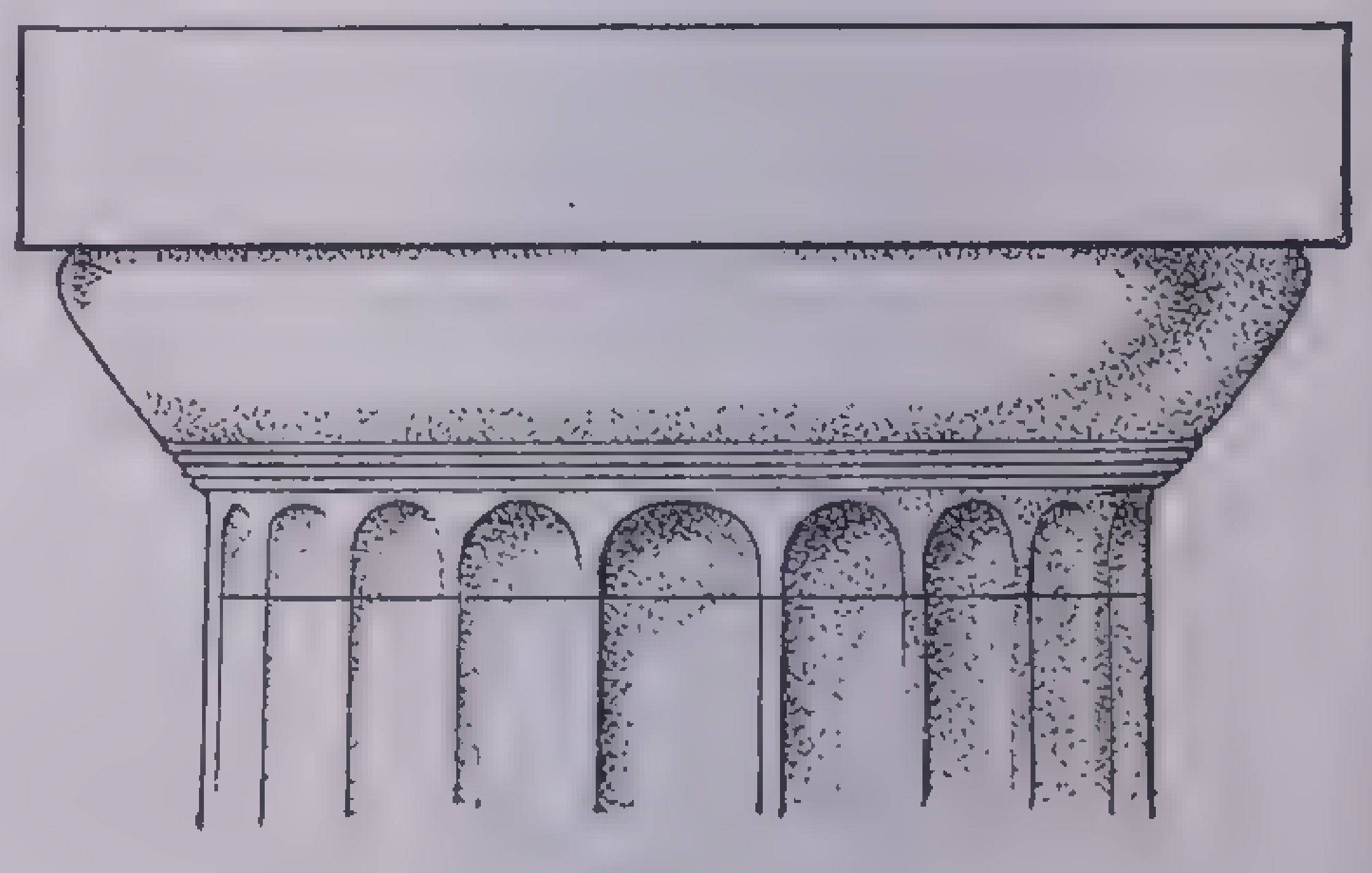
Greek Classic Architecture.—The mind of the Greek was sharply distinguished from that of the Egyptian, the Assyrian or the Hebrew. Joined to a love of nature, of whose attributes he created deities, was a highly intellectual and analytical mind. A Greek lived close to the sea (a circumstance which made him a trader and traveler) and in a land rich in structural, if not ag-



Corinthian



Ionic



Doric

The Three Greek Orders

The orders are the various types of columns and their entablatures. The Greeks used these three. The Romans added the Tuscan and Composite orders. The Doric is the oldest and plainest, the finest examples being in the Parthenon and the Theseum. The more ornate Ionic is illustrated in the Erechtheum. The Corinthian was used more by the Romans than by the Greeks but a notable example of its use in ancient Greece is the monument of Lysicrates at Athens ricultural, resources. The Egyptian had granite; the Assyrian, clay; the Greek, marble. The beginnings of Greek art are original, vivid and human. There was some borrowing of methods and motives from earlier and alien cultures, chiefly of Egypt and Babylonia. But most authorities find the foundation materials in the relics of earlier occupants of the same lands, the Mycenaeans on the Peloponnesus and their kinsfolk, the Minoan peoples of nearby Crete.

It is with the invention of the orders, about 700 B.C., that Greek architecture takes a definite stamp. The type of construction adopted by the Greeks was exclusively of the lintel form; the arch and vault, even if they were not unknown, were never used. The lintels were upheld by posts or columns. These columns with the lintels they supported were of three distinct varieties, called *orders*. The first had sturdy columns from 5 to 7 diameters in height, without any base, and with a cap of great simplicity and beauty composed of a square block (*abacus*) above a curved molding (*echinus*). The lintel, more properly in this case called the *entablature,* was composed of three members, the *architrave, frieze* and *cornice,* each arranged in a characteristic fashion. This is the *Doric* order, apparently invented by a vigorous northern tribe of Greeks called Dorians.

The Ionians from across the Aegean gave us the second order, the *Ionic.* The curious and beautiful capital has delicate spirals (*volutes*) as its characteristic feature. The entablature is divided into three parts but is differently ornamented from the Doric. The columns have bases as well as caps and are more widely spaced. The Doric was likened in its vigor, even by the ancients, to the masculine form; and the Ionic, in its grace, represented the feminine. The third order is the *Corinthian,* little used among the Greeks and the last in origin. It is the same as the Ionic except for the capital, an inverted bell in form, richly decorated with acanthus leaves arranged below four small protruding volutes. The shafts of all these columns were lined vertically with delicate grooves (*flutes*); and temples, particularly in the Doric style, were highly colored. One of the orders was generally used exclusively in a building, but they were sometimes combined.

The Greek solved his problem perfectly, but we must admit it was very simple. Buildings that have come down to us were chiefly of two kinds, temples and theaters. The temples were composed of a rectangular room, to which in various ways was attached a colonnaded portico often embellished with sculpture. The theaters were usually semicircular, uncovered and occupying a natural depression in a hill. The noblest period of Greek architecture is the age of Pericles, 460-410 B.C. To it belong the three gems of Greek architecture—the Parthenon, the Erectheum and the Propylaea. Greek architecture became florid in the years after Alexander the Great, 300-100 B.C., but lasted as a recognizable style through the Roman domination, from about 100 B.C. to 200 A.D.

Roman Classic Architecture.—The 500 or 600 years in which the western world was under Roman domination, from about 100 B.C. to the fall of Rome, saw the erection of many great monuments of engineering but the decline rather than advance of the classic style, decoratively considered. The Roman was ambitious, hardheaded, a great organizer and builder. He was not the artist or the individualist that the Greek was. His outward architectural expression is based on the three Greek orders which he altered and elaborated. His favorite was the Corinthian, which became the principal vehicle for the "grandeur that was Rome."

In engineering the Roman made great and original contributions. He developed the arch, the vault and the dome from the primitive arched construction of the Etruscans, and these he united with the column and lintel of the Greeks. He used concrete for vaults and walls, facing it with stone and marble. Where the Greeks had but one or two types of building, the Romans had a dozen and often on an enormous scale. Temples, basilicas, theaters, amphitheaters, circuses, triumphal arches, vast baths, palaces and houses in their ruins attest the might and skill of the Romans. In every Roman city, from Italy to Britain, was a forum or civic center adorned with statues, colonnades and monumental buildings. The greatest of these that have come down to us are the Pantheon, the Baths of Diocletian and of Caracalla, the Colosseum, the Forum and many arches—all in Rome; the Maison Carrée, a temple at Nimes in France, and the nearby aqueduct known as the Pont du Gard; ruined temples in Timgad, Algeria, and Palmyra and Baalbek in Syria; and, perhaps most interesting of all, the entire city of Pompeii at the foot of Mount Vesuvius in Italy. In 79 A.D. this Roman suburban city was entirely engulfed by mud and ashes from the volcano, and has thereby been preserved through the ages. The excavated houses and other buildings show us in minute detail the daily life and surroundings of a Roman citizen in the century in which Christ lived.

The great pagan Roman Empire became Christian by an edict of Constantine in 313 A.D., and hardly more than 100 years later, in one of the most extraordinary cataclysms in history, it fell before the onrush of vast hordes and tribes of northern barbarians. Civilization was almost snuffed out, and in the following period of a thousand years, called the Dark Ages, a new culture slowly emerged from the ruins of the mighty Roman Empire.

Romanesque and Byzantine Architecture.—The architecture and art of Europe between 500 and 1100 A.D. are called *Romanesque,* which of course means like Roman or derived from Roman. Though the style was derived in part from Roman art, it soon developed characteristics that made it very distinct.

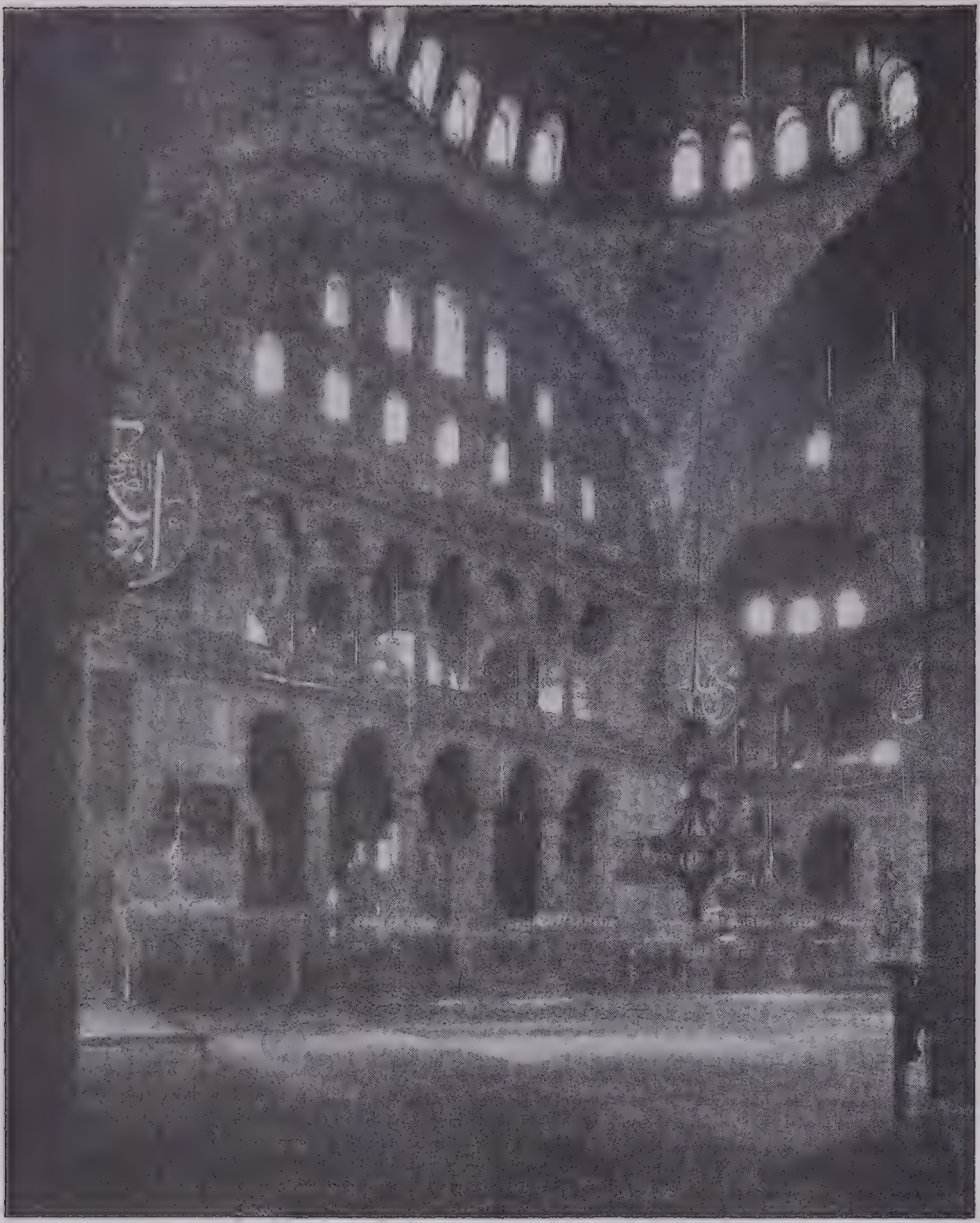
There was very little building after the fall of the Empire. Temples and villas lay empty and forlorn. The artists and artisans had been killed or dispersed, and their knowledge had died with them. The small amount of construction was done with fragments of imperial buildings. The only type of building the Romans had not built in profusion was the church. The early Christians refused to use pagan temples, but had no objection to using the law courts or basilicas. These were low, oblong buildings, usually divided by two parallel rows of columns into a central space or *nave* and an aisle on either side. At the end opposite the entrance was a bay or *apse* that held the judge's seat. The Christians replaced the seat with an altar, and the basilica made an excellent church. Many of our own churches today can be traced back, step by step, to the basilica. The great Christian basilicas of St. Paul, St. John Lateran and others in Rome have come down to us. Romanesque art is almost entirely concerned with the building of churches and monasteries, although utilitarian fortifications and castles took on some of the same forms of expression. Columns soon took a secondary place, and Romanesque buildings are usually attempts, often crude, to use the arch in decorative design and some kind of vault or dome to cover the aisles and nave. Heavy walls, deep shadows, recessed doors and windows often gave the buildings a gloomy aspect. But the portals and sometimes full façades were enriched with sculptural compositions as opulently patterned as those of Asia.

Courtesy French Government Tourist Bureau

Notre Dame la Grande, Poitiers

This Romanesque masterpiece was erected at Poitiers, France, in the 11th century. Rich in sculptured decorative treatment, it still calls forth admiration for the sobriety of its lines and the general magnificence of its basilica

In the Eastern Christian Empire there developed a style corresponding to the Romanesque, in the same centuries or earlier, known as the *Byzantine* (from Byzantium, the old name of Constantinople, capital of the Eastern emperors). It seemed to appear suddenly, fully developed, in one magnificent building in Constantinople—Santa Sophia, built during 532-37 A.D. under the Emperor Justinian—but in reality it had prototypes, both structurally and in decorative idioms, in the Oriental Christian countries, Mesopotamia, Syria, Persia and Egypt. But Santa Sophia is the masterpiece in the style, and certainly it ranks as one of the most precious buildings in the world, perhaps next to the Parthenon in importance. Except



Underwood & Underwood

Interior of the Mosque of Santa Sophia

At Constantinople, modern Istanbul, stands one of the great masterpieces of architecture, built 532–537 A.D. by the Emperor Justinian as the Church of Divine Wisdom. Santa Sophia is the earliest and best example of Byzantine. The disks are Turkish additions

for certain Mohammedan disfigurements it still exists in its pristine splendor.

Justinian's architects, Anthemius and Isodorus, supported the great dome on the tops of four mighty arches, the support taking the form of four spherical triangles (*pendentives*). This became the method used thereafter in the building of domes, as it made possible the roofing of a square plan by a dome. The Byzantine dependence on color by the use of inlays of marble and mosaic continued as the basis of all Mohammedan and Near-Eastern decoration. The exquisite arabesques and inlays of the Alhambra, built by the Moors in Spain, are similar expressions of the Eastern genius for delicate but rich ornamentation. In Venice St. Mark's is an outstanding Byzantine monument, and there are other notable examples at Ravenna and in and near Palermo, Sicily.

The principal monuments of the Romanesque in Europe are: in Italy, the leaning tower, cathedral and baptistery at Pisa; in France, many vaulted churches that vary in their constructional scheme according to their locality; in England, all the Norman churches and cathedrals, such as those at Durham and parts of Canterbury; along the Rhine, a number of fine brick churches of which the Cathedral of Mainz is a good example; and in Spain, many churches (such as that at Salamanca), which were often altered into the succeeding Gothic.

The Gothic Style.—The 5th century B.C. in Greece and the 13th century A.D. in France are usually regarded as marking the highest peaks to which architecture as a fine art has attained. In the 13th century were built the great cathedrals that have immortalized the Middle Ages. Their style is called *Gothic*—not a very appropriate name but one too firmly entrenched to be uprooted.

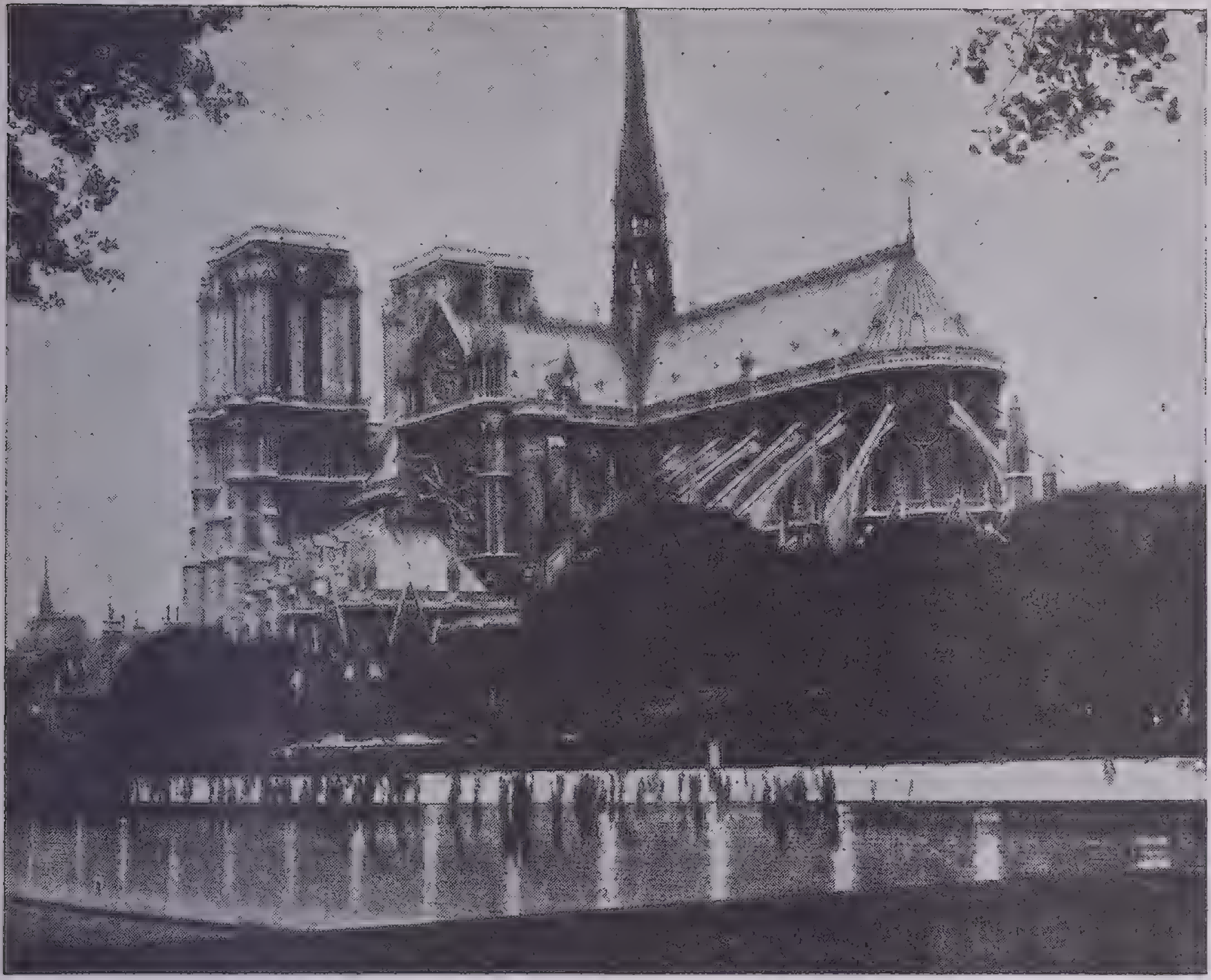
Romanesque architecture rather suddenly developed into Gothic through the invention or adaptation of three architectural devices. The first was the *ribbed vault;* the second, the *flying buttress;* the third, the *pointed arch.* Combination of these devices made it possible to build naves of great height (Beauvais is 165 feet in the clear); but it is the pointed arch that gives the style its characteristic appearance, because this form was uniformly used in ornamental as well as in structural features.

Whereas the Romanesque found its limited opportunity in the abbey church, the monastery and the fortress, the Gothic found a broader and more magnificent field in the great cathedral and later in secular buildings of various kinds, such as town halls, palaces and college buildings. The Gothic style owed much to the arts of sculpture, stained glass and even painting. The cathedral with its piers, buttresses and towers leading heavenward, its niches filled with statues of saints and kings, its great windows glowing with the fires of stained and leaded glass, its altars hung with rare fabrics and painted with scenes from the Scriptures, became a symphony of beauty and exaltation. No wonder they thrill us today! The Gothic style can usually be dated by its window tracery, which progressively became more complicated and ornate.

Some of the great cathedrals are: in France—Chartres, Amiens, Reims, Paris; in England—Salisbury, Westminster Abbey, York, Canterbury; in Germany—Cologne, Strasbourg, Freiburg; in Belgium—Antwerp; in Spain—Seville, Burgos, Toledo. The Italian Gothic cathedrals are less pure in style; but Giotto's Tower in Florence is uniquely beautiful, and Milan cathedral is impressive in some aspects. Other examples of Gothic occur in Belgium's town halls and Italy's civic buildings.

The Classic Renaissance.—The meaning of the Renaissance has already been suggested, and its architectural peculiarity—the abandonment of medieval forms and the return to the Classic (the architecture of Greece and Rome)—has been pointed out. Architecturally the Renaissance began later than in sculpture and painting. In 1420 Filippo Brunelleschi used Classic forms in the addition of the great dome to the cathedral of Florence. Classic art became the fashion; Gothic was looked upon with contempt. We know the names of very few ancient or medieval architects. With the Renaissance they became important personalities. Alberti, Bramante, Peruzzi, Raphael, Michelangelo, Palladio, Vignola—all followed the example of Brunelleschi and developed the application of Classic art to contemporary problems.

About 1500 the Renaissance, partly through French conquest but mostly through fashion, spread to France. Here it became associated with the reigns of brilliant kings, each of whom developed it in some characteristic fashion and gave his name to a period, such as Francis I, Henry II, Henry IV, Louis XIV, Louis XV, Louis XVI. Napoleon is represented



Courtesy French Government Tourist Bureau

Gothic Architecture: Cathedral of Notre Dame, Paris

One of the finest specimens of decorated Gothic in all Europe stands on the Île de la Cité, Paris. Construction was begun in 1163 and was not completed until 1235. The view shows the flying buttresses, a lateral support feature of Gothic architecture. Their bold projection permitted the construction of chapels between them

by a further variation, known as Empire.

The English work in its early stages was less sophisticated and much cruder than the Italian models. Here the periods are named from the reigning families or rulers, such as Tudor, Elizabethan, Jacobean and Georgian. England has given us one of the best known of architects, Sir Christopher Wren, the builder of Saint Paul's Cathedral.

Partly through the influence of native artists who had traveled in Italy, partly through rulers who wished to have the latest thing in palaces, Germany adopted a good deal of the Renaissance architectural language. Here it developed in a manner somewhat similar to that of England. Spain produced in the plateresque and churrigueresque styles the most fantastic variations of classic motives that are to be found.

The American colonies, before our government was founded, were active participants in the Renaissance. Our beautiful Colonial style is an importation of the English Georgian, tastefully adapted to our needs and materials.

Renaissance buildings, particularly in Italy, were often embellished with the most beautiful painting and sculpture. The art of the landscape architect was a new development; and great palaces, such as those at Versailles in France, owe much of their effect to the gardens, fountains and trees. Though the architects of this period borrowed the orders and most of their constructional features from ancient Rome, they used great ingenuity and a high degree of skill to conform these to the complexities of contemporary life. By the invention of the true truss they added a great structural principle to architecture.

The amount of building in the Renaissance vastly exceeded that of all the preceding periods, and almost all of it exists today. Only the briefest summary of outstanding examples can be made here.

Italy, which had so woefully lagged behind in the Gothic period, inaugurated and predominantly led in the Renaissance. The Medici, Rucellai and Strozzi palaces, the Pazzi Chapel, and the loggia of the Foundling Hospital in Florence; the library of Saint Mark's in Venice; palaces and churches almost without number in such cities as Siena, Milan, Verona, Vicenza, Genoa; and especially the Farnese Palace, the Vatican and Saint Peter's in Rome, the largest church in Christendom, culminated one of the most brilliant architectural epochs in history.

In France we find the chateaux of the pleasure-loving monarchs, such as Blois and Fontainebleau; great churches, like the Invalides and St. Sulpice in Paris; and the magnificent palaces of Versailles and the Louvre.

England gives us many manor houses, the palace of Whitehall by Inigo Jones and the famous churches and Saint Paul's Cathedral from the hand of Sir Christopher Wren.

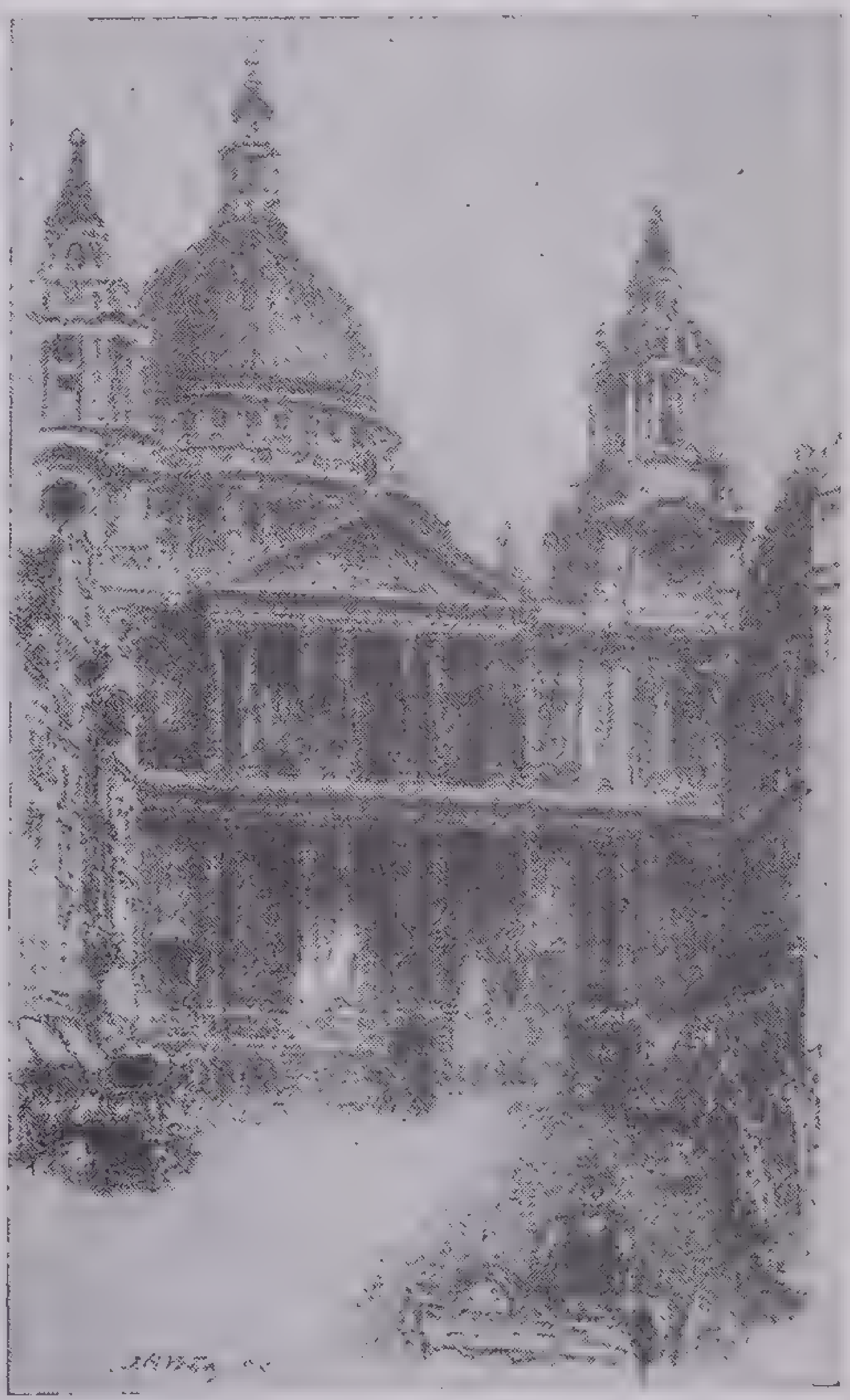
In Germany the buildings are fewer, comprising town halls of picturesque design, the ruined castle of Heidelberg and a number of minor palaces.

The architecture of Spain varies between the greatest exuberance, as at Salamanca, and the frigidity of the Escorial, the palace and tomb of Philip II.

Town halls and churches were built in lesser degree in Holland, Belgium and the Scandinavian countries.

Later Architecture in Europe.—About 1800 for the first time the Greek buildings of the Acropolis in Athens became widely known. This gave rise to an architectural fashion known as the Greek Revival. Its best monuments in England are St. George's Hall, Liverpool, and the British Museum, London. Germany built its art museums and the Brandenburg Gate; France, the beautiful Madeleine Church. Towards the middle of the century there was a Gothic revival in England that produced the Houses of Parliament; and in France, under Napoleon III, an ostentatious variation of regal Renaissance that has given us the Opera House in Paris. *Eclectic* design—that is, revivals and adaptations of the historic styles—ruled in the decades from 1860 to 1920 in all of Europe and the Americas, producing a crop of buildings in direct imitation of the monuments of Greece, Rome, medieval France and Italy.

Before the end of the century, pioneering architects, especially in America but notably also in Holland and Austria, laid the groundwork for a totally new architecture, known now as the *Modern* style; but it was 1920 before it was brought into extensive practice. Based on honest expression of machine-age materials and method



Saint Paul's Cathedral, London

View of the west façade of the cathedral. Saint Paul's is Renaissance architecture, with a mass of classic details: the double portico shown here combines Corinthian columns (below) with Composite (above). The great dome rises over the center of a simple Latin cross, the general plan of the cathedral. Saint Paul's, begun in 1675 and completed in 1710, was designed by Sir Christopher Wren; he is buried under the choir, and the tablet on his tombstone is inscribed: *Lector, si monumentum requiris, circumspice*—"Reader, if thou seekest his monument, look around" of building and on perfect fitness to use, this latest style derives its appearance values out of function and thus out of the life of these times. The actual buildings erected so far should be considered as only the early, experimental expressions of the mode, but there can be no doubt that an epochal and revolutionary style has been born.

Original and interesting work has been done in Germany and the northern countries, especially in Finland and in Sweden; and Holland, Austria, France and Italy are progressively substituting in most new building this essentially machine-age art for the borrowed historic or eclectic forms. At present Modernism is everywhere growing apace. In the direction particularly of engineering and planning America is exerting an increasing influence upon Europe. Further discussion of the Modern style and particularly of its most striking form, the skyscraper, will be found at the close of the section dealing with American architecture.

Mohammedan Architecture.—From the the 8th century A.D. onward for a thousand years, a characteristic and often magnificent type of architecture was practiced at varying times in the great stretch of territory from Spain on the west along the southern shores of the Mediterranean to northern India on the east. The style, like the Byzantine, is based on the architecture of the Near East, particularly Persia. Structurally it depends on the dome and vault; decoratively, on elaborate geometrical surface ornament and on color for effect. Its buildings are principally mosques, palaces, tombs and city gates. Its great centers are in the Moorish cities of Spain, where the Alhambra, the Mosque of Cordova and the Giralda Tower furnish magnificent examples; in the Arabic city of Cairo, with its many mosques, of which the mosques of Omar and of Sultan Hassan are characteristic; in Constantinople, where the Turks built the great Mosque of Solyman; in Persia, with the famous tomb at Sultaniyeh, and finest and noblest of all, the buildings of the great Mogul Empire in northern India. The Taj Mahal at Agra, the gem of the style, was built as a tomb by Shah Jahan about 1650. In beauty of material, proportion, workmanship and setting it is hardly surpassed by any building in the world.

Oriental Architecture.—The Hindu and Buddhist styles of India and the architecture of China and Japan are so remote, and their contact with our arts so slight that a description of them must be very brief. Indian architecture dates as far back as 279 B.C. It has various manifestations, and the buildings are either circular shrines to Buddha (called *topes*), rock-cut temples or monasteries. Use was made of both domes and columns, and surfaces were elaborately carved with ornament and allegorical figures. Horizontal emphasis predominates. Monuments are scattered over the whole land, but predominate in the South.

Chinese and Japanese Architecture.—The architecture of China and Japan has been chiefly of wood and perishable material. Within the limits adopted it has a consistent beauty, unappreciated in the West because of the unfamiliarity of the structural and decorative forms, but enjoyed and praised by those who have got beyond its strangeness. With the exception of towerlike pagodas, the temples are low and unimpressive and are usually aggregations of small buildings. It is remarkable that the splendid sense of beauty in decoration in both these peoples has not led to a monumental architecture. Perhaps this is partially responsible for the fact that European architecture is appearing beside the native styles, although there is a determined effort in some places to return to the local tradition.

Architecture in the United States.—Architecture in the United States used to be dismissed with a paragraph or two. But the extraordinary development and expansion of building in the last 35 years has raised America to world leadership, and its architectural development has become a thrilling story that all should know.

Colonial Style (1630-1800). Our colonists looked to England for their models in building; so the American houses built before 1700 were small, crude, very simple and without enriching detail, very like houses of the reign of Elizabeth in England. Such is the Capen house, Topsfield, Massachusetts, or the Paul Revere house in Boston. Under stress of new economic and climatic conditions, the variation sometimes known as *Founders' Colonial* or merely as *Early American* was created by invention builders. About 1730, safety, prosperity and regular intercourse with England were established, and thereafter the decorative features of the architectural style of the mother country were freely imported.

This is the *Georgian* style, a form derived by the English architects from the Italian Renaissance. It makes great use of the orders and classic detail. With excellent taste the orders were altered in proportion to fit American material, which was for the most part good white pine. For the greater part of the century the style was vigorous and robust—the influence, doubtless, of Sir Christopher Wren, whose London churches in particular were models for the familiar New England churches. After the Revolution the style became delicate and attenuated, following the mode dictated in London by the Adam brothers, famous architects and designers. Buildings were limited to houses, churches and a few town halls.

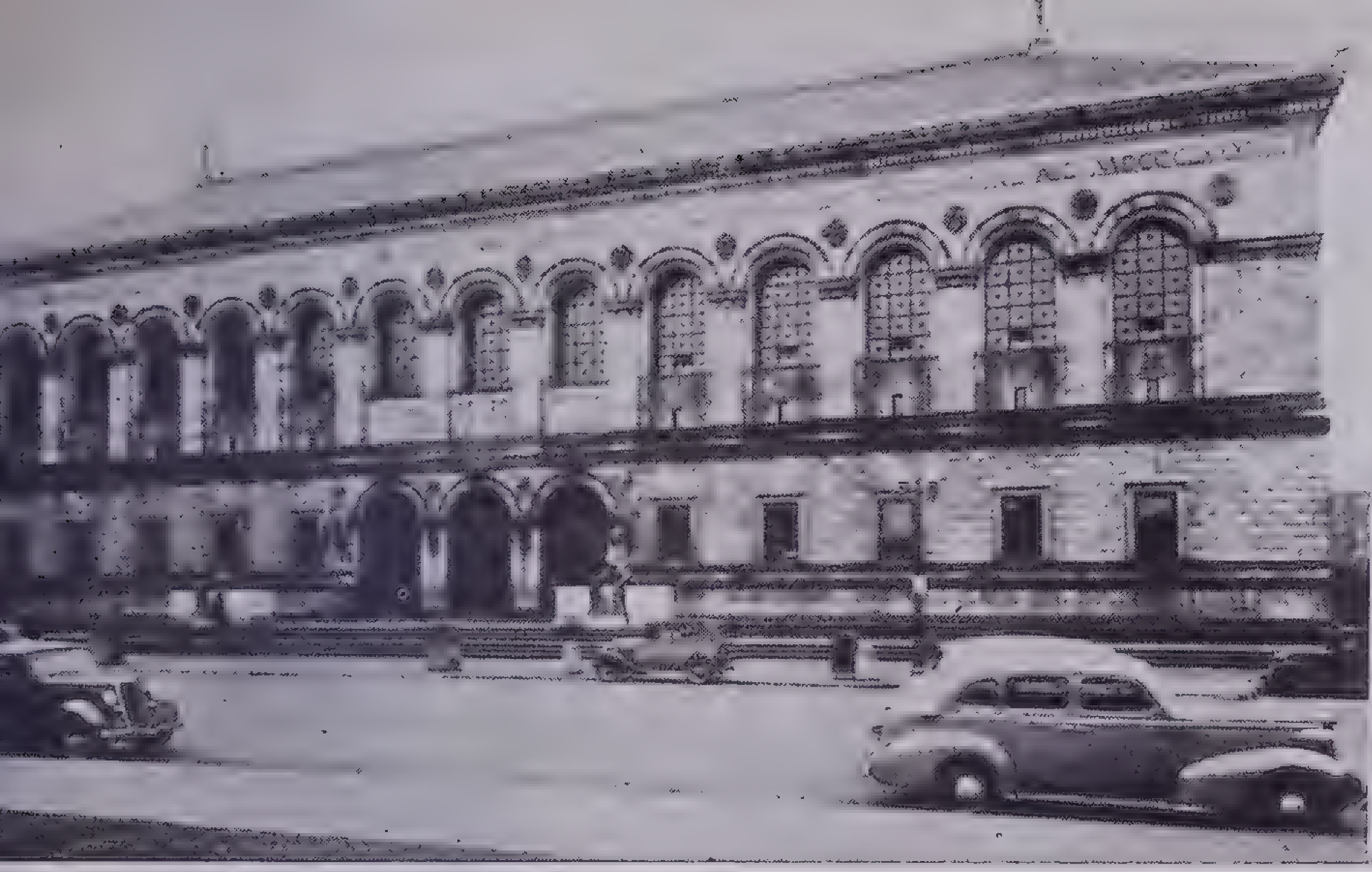
Founders' Colonial and the simplified Georgian house, which we are likely to visualize as typical Colonial, developed especially in New England. The central seaboard colonies and especially New York saw the creation of the beautiful and distinctive Dutch Colonial variation. In the Southern colonies a more dignified and pretentious, even monumental, type evolved, which was based on English Renaissance models. There was an unrelated development in the Southwest from Texas to California of Spanish Colonial forms, also neoclassic, brought in from Mexico.

Post-Colonial (1790-1820). Thomas Jefferson, on his return from France, where he had been the U. S. minister for four years, turned our eyes from England to France. He designed three important buildings—Monticello, his home; the capitol at Richmond and the University of Virginia. Professional architects began to appear, notably Charles Bulfinch (1763-1844), a native of Boston and one of the architects of the Capitol at Washington. The old City Hall in New York city was built in the French manner. At Washington the Capitol was under construction, and the White House was built. The architecture of this period is sometimes labeled *Republic*.

Greek Revival (1820-1850). We have mentioned the Greek Revival in Europe. It was introduced into America by a famous architect, Benjamin Henry Latrobe (born in England and educated in Germany) and, curiously enough, it flourished in the second quarter of the 19th century. The Greek style was used for every kind of building from the Atlantic Ocean to the Great Salt Lake and throughout the southern states. Arlington, Va., the home of Robert E. Lee, is a fine example; one of the best is Girard College, Philadelphia.

Eclecticism (1850-1920). Our attitude toward architecture was decidedly provincial in the years immediately preceding and following the Civil War. These years mark the low ebb of taste in America. We attempted to borrow the architectural fashions of the hour from England and from France. The first exists in many examples of a debased form of Gothic made popular in England by John Ruskin; and the second in the fashionable and elaborate Classic style, popular in Paris under Napoleon III. Houses with cupolas and mansard roofs belong to this period. The Centennial Exposition (Philadelphia, 1876) marked the high point of this era.

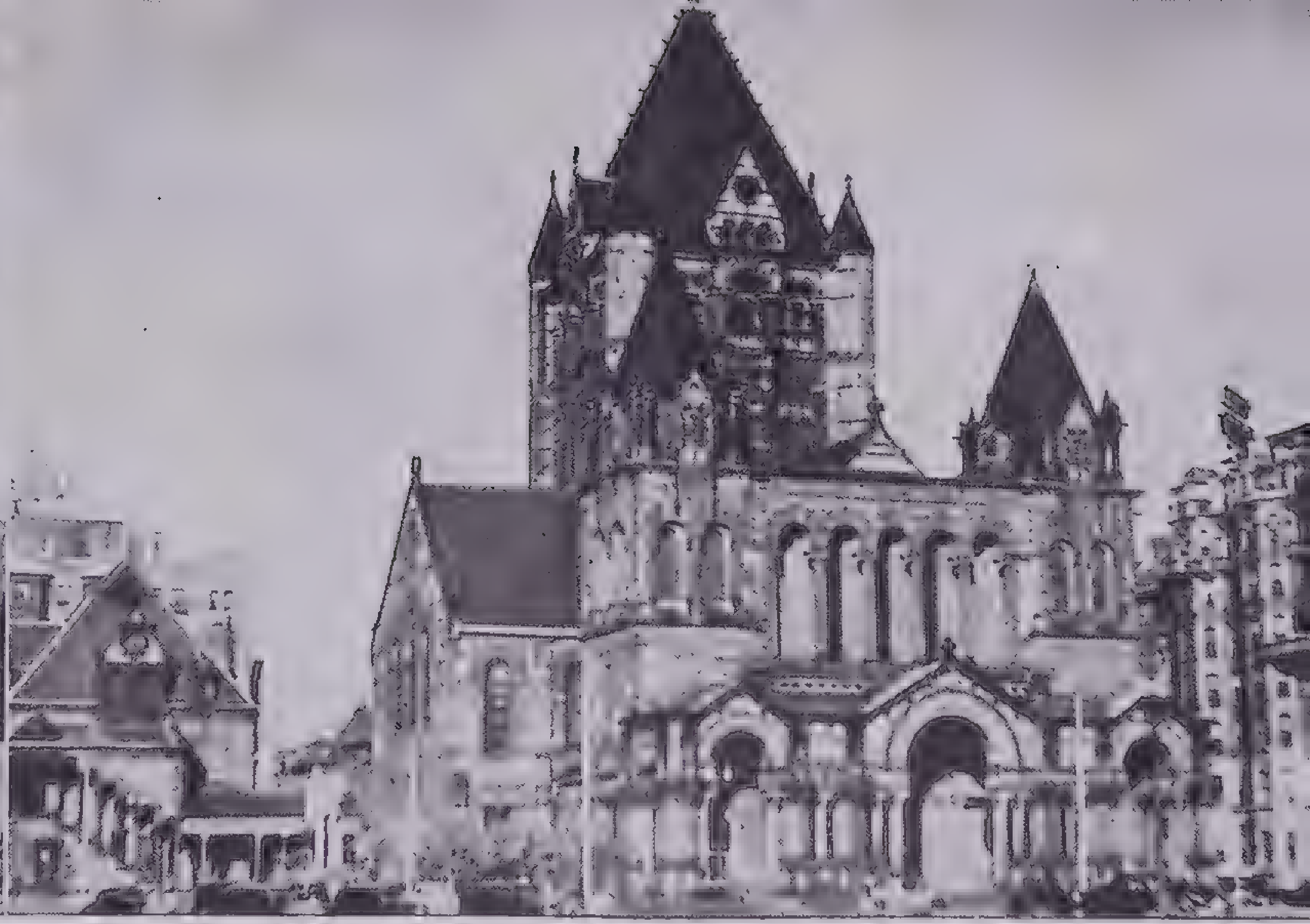
After 1876 and up to 1920, there was a succession of able designers, equipped with taste and wide knowledge, who clothed their buildings in one or another of the historic styles. H. H. Richardson built Trinity Church, Boston, in 1877. This caused a sudden and extraordinary vogue for building in the Romanesque style, second only in popularity to the rage for Greek art of 50 years before. The Chicago World's Fair of 1893, of which Daniel H. Burnham was architect in chief, put an end to the Romanesque Revival and re-established the Classic style in its several forms. Thereafter there were adaptations from the Greek on bank fronts and for libraries and college buildings. Then, in what is sometimes called the *American Imperial* age, the architects turned to Rome and built monuments like the Pennsylvania Station in New York (a vast building modeled after the Baths of Caracalla in Rome) and Columbia University Library (after the Pantheon). McKim, Mead and White took leadership with the building of the Boston Public Library (an



sy Boston Chamber of Commerce

Public Library, Boston, Massachusetts, 1895

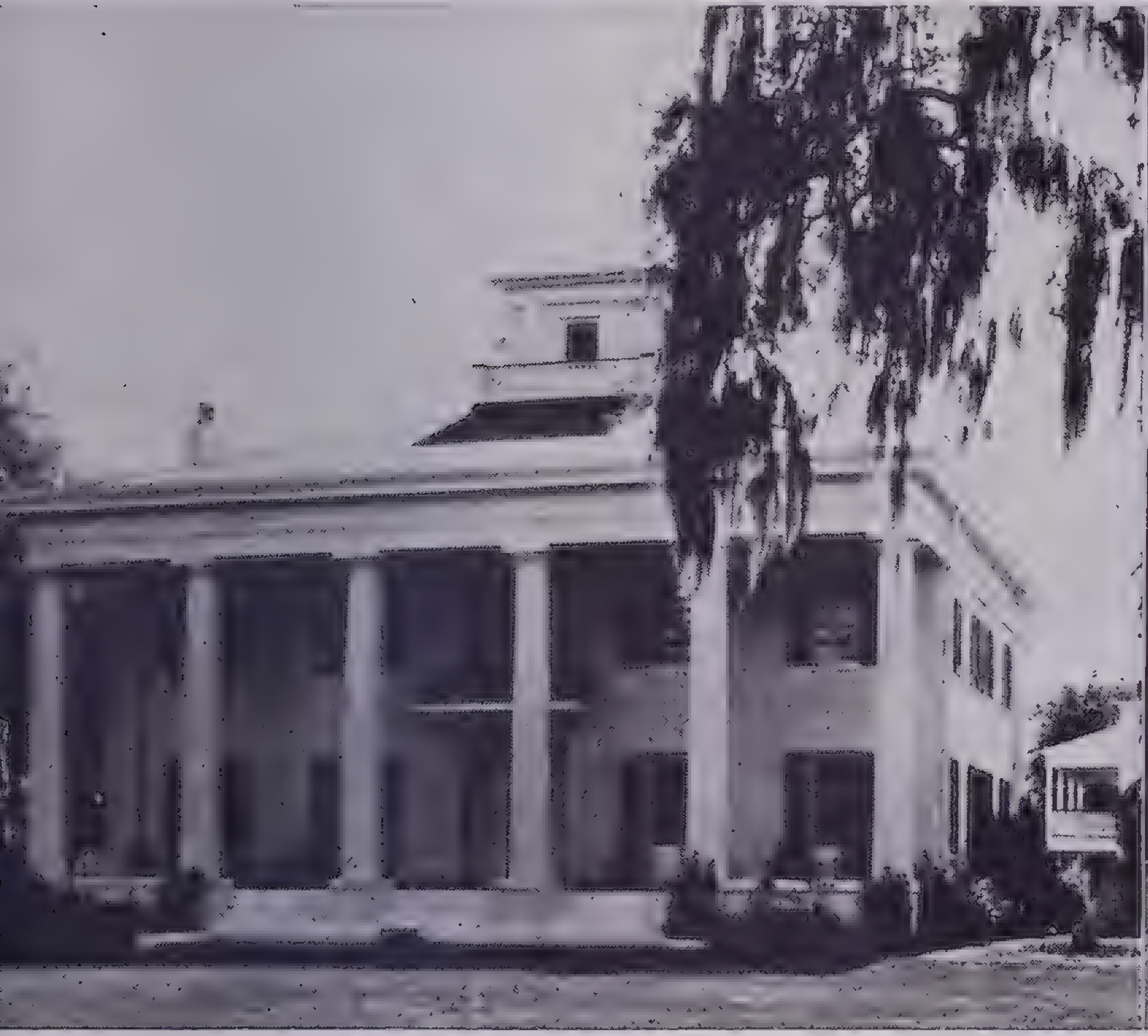
Renaissance revival; McKim, Mead and White, architects



Courtesy New England Council

Trinity Church, Boston, Massachusetts, 1877

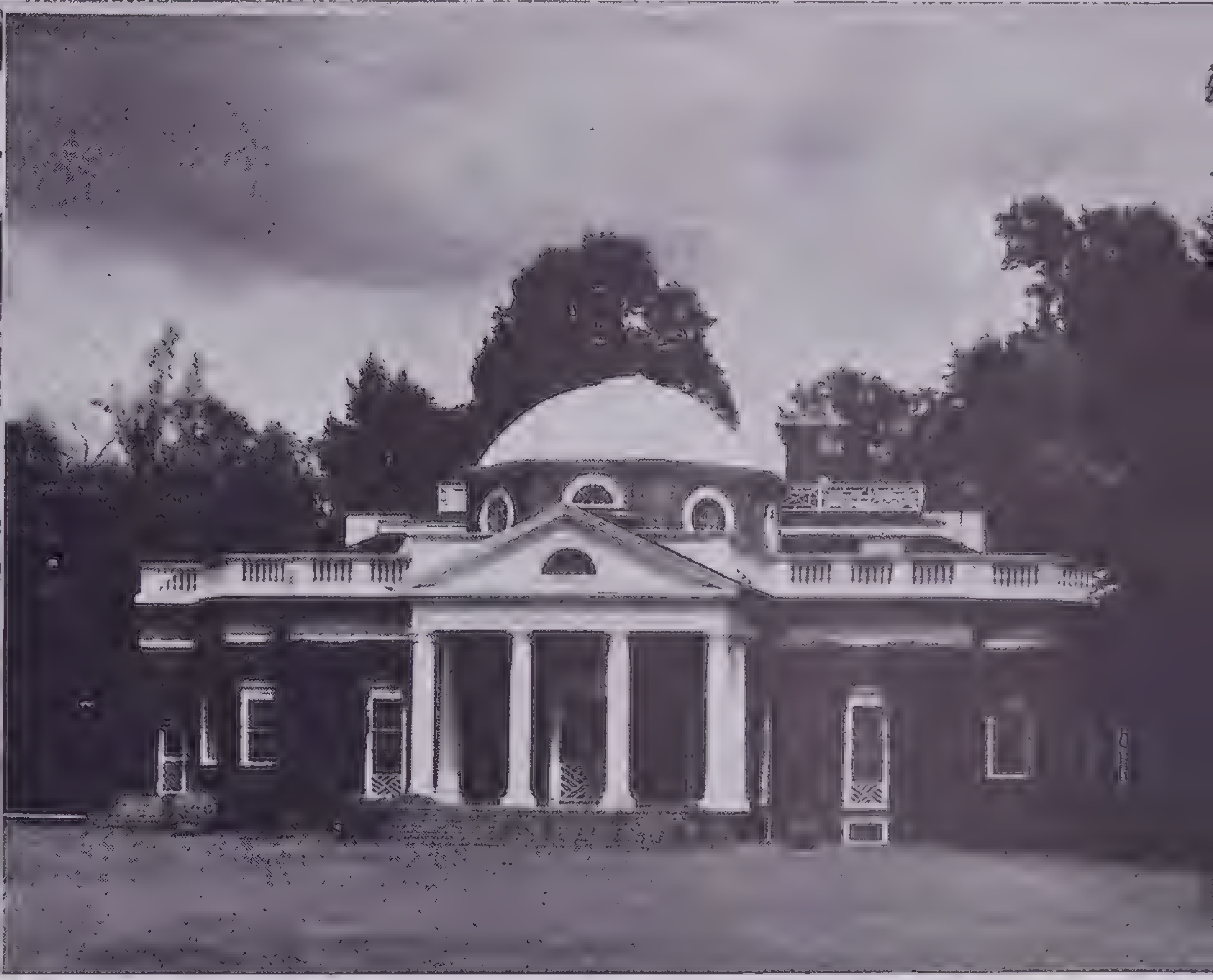
Romanesque revival; Henry Hobson Richardson, architect



sy Mississippi Publicity Commission

D'Evereux, Natchez, Mississippi, 1840

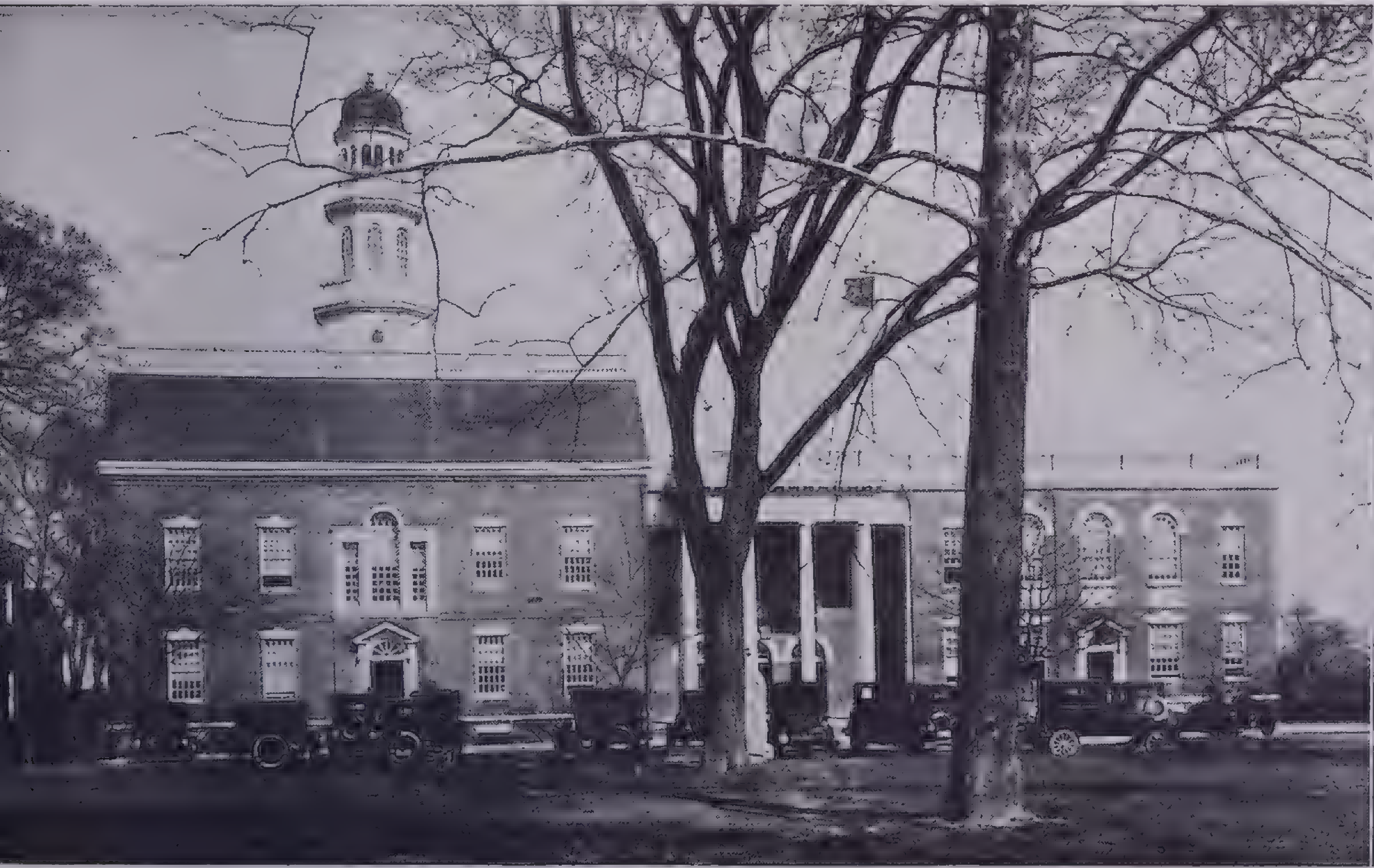
Southern home in Greek revival style



Courtesy Virginia Conservation Commission

Monticello, near Charlottesville, Virginia, 1796–1808

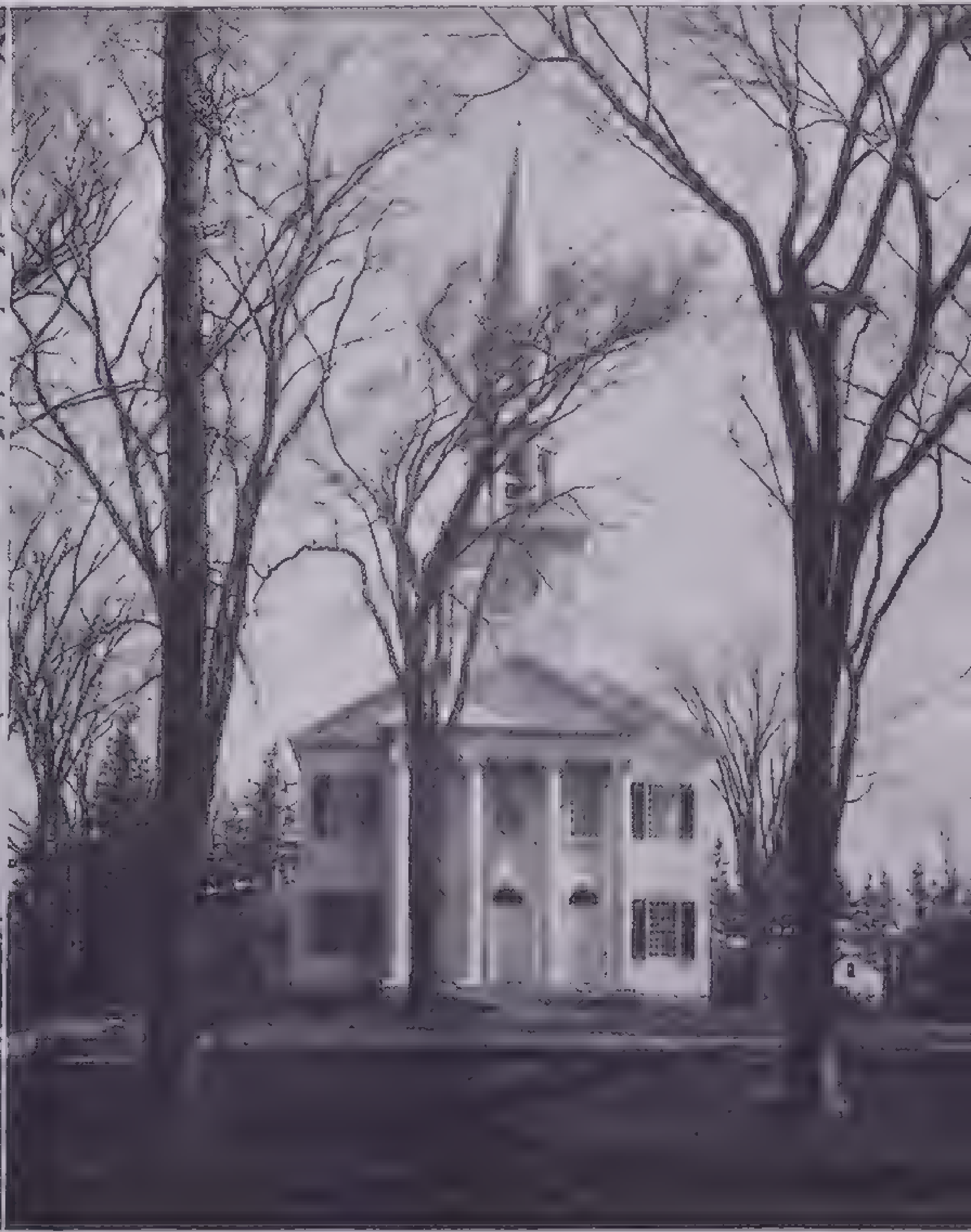
Classic inspiration; Thomas Jefferson, architect



sy Wilmington Chamber of Commerce

Old State House, Dover, Delaware, 1722

n example of early colonial architecture. (The wing farthest to the right is a modern addition.)

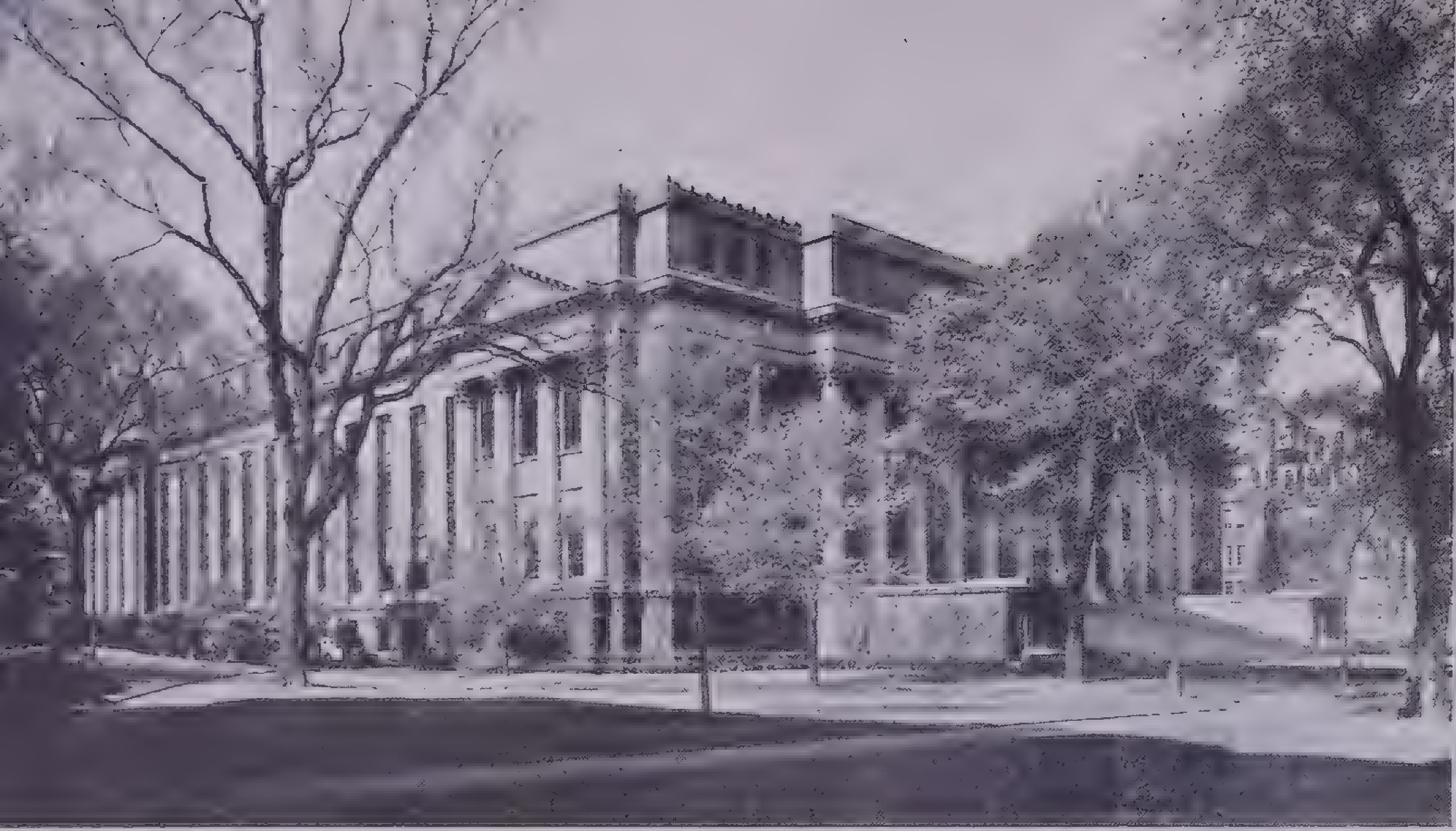


Courtesy Connecticut Publicity Commission

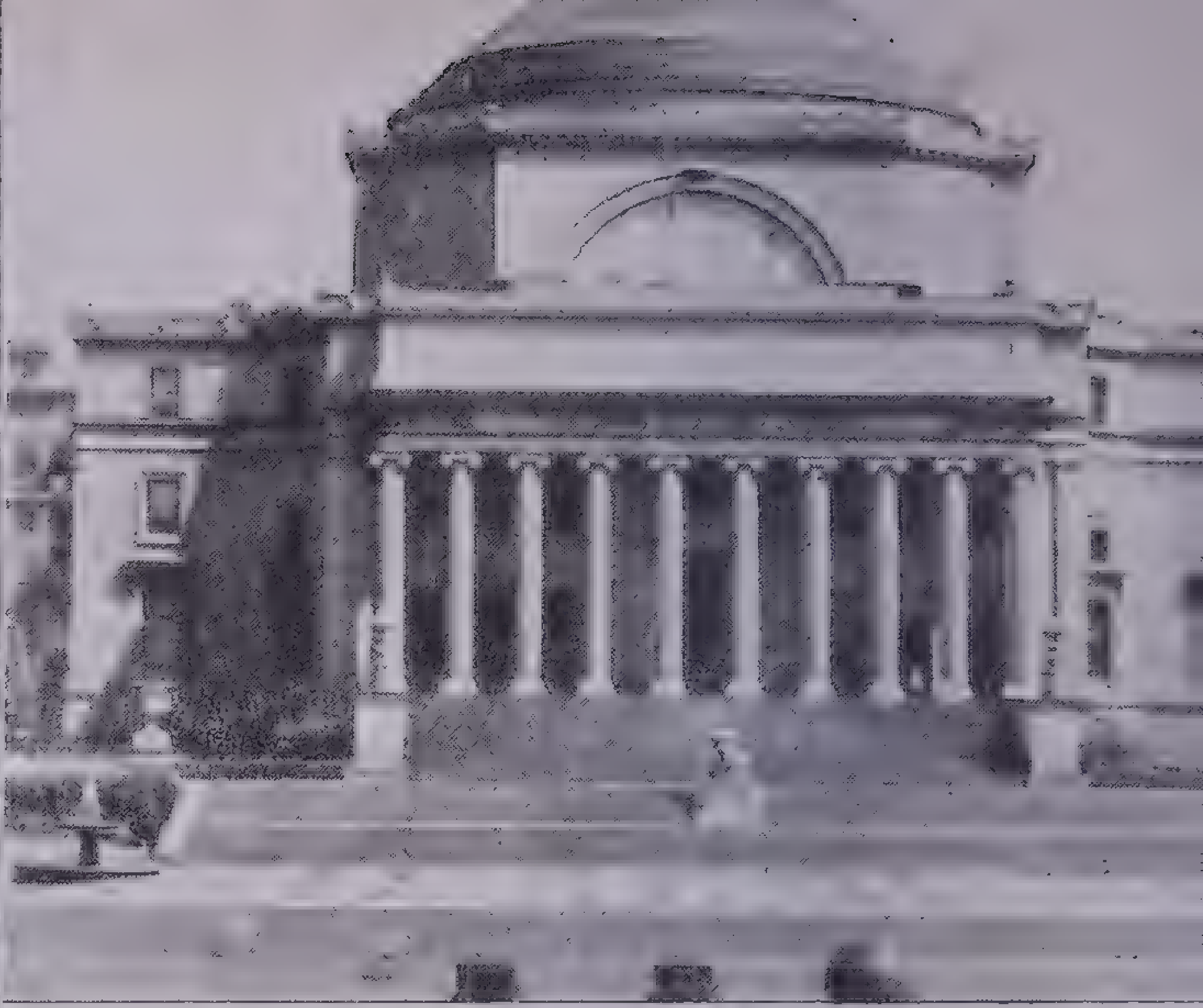
Congregational Church, Litchfield, Conn., 1829

An Ionic portico and a graceful spire

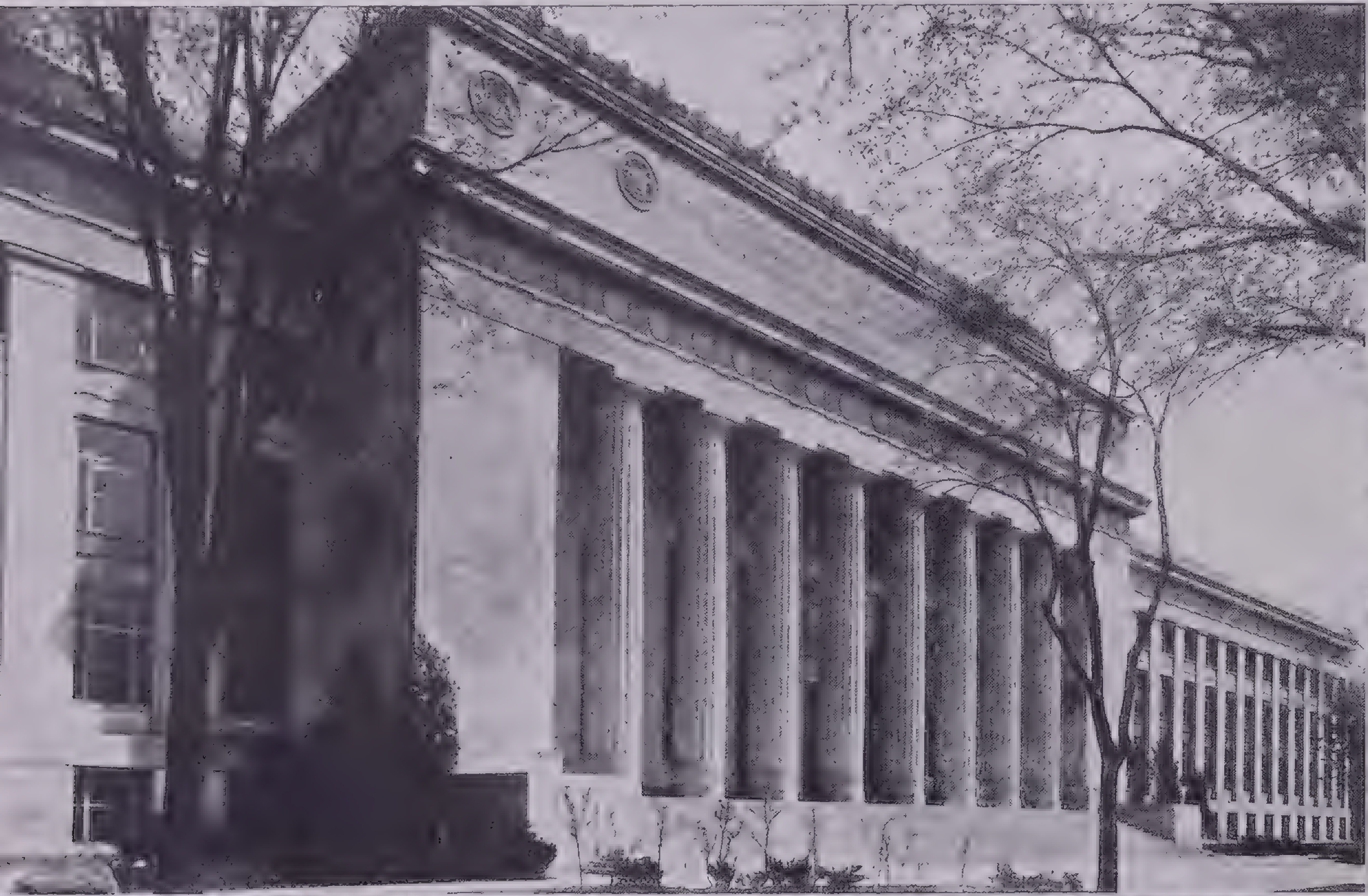
Varied Examples of American Architecture of the 18th and 19th Centuries

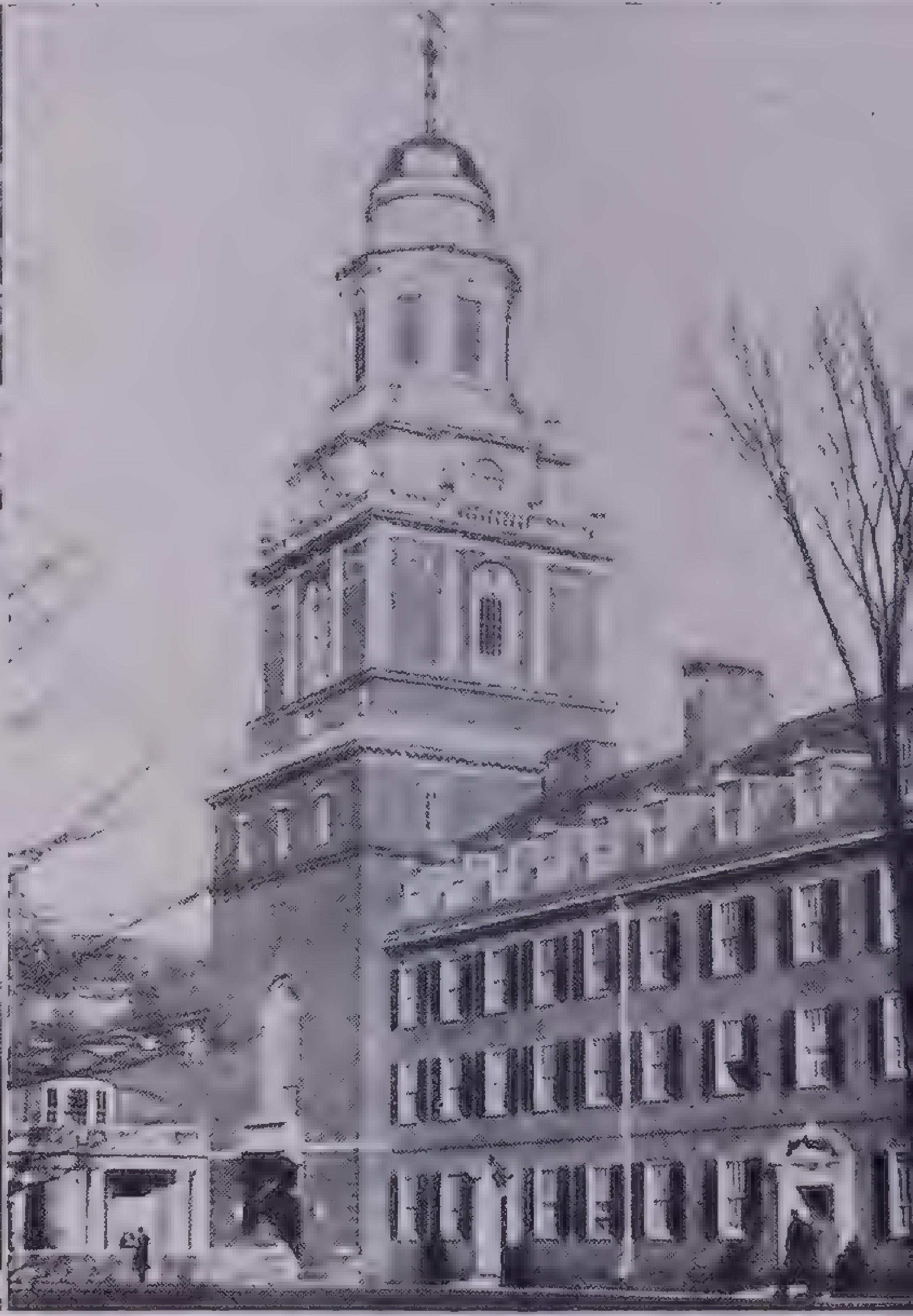


Widener Library, Harvard University, Cambridge, Massachusetts, 1915
Classic inspiration; Horace Trumbauer, architect



Seth Low Memorial Library, Columbia University, New Yo
Classic inspiration; McKim, Mead and White, architec

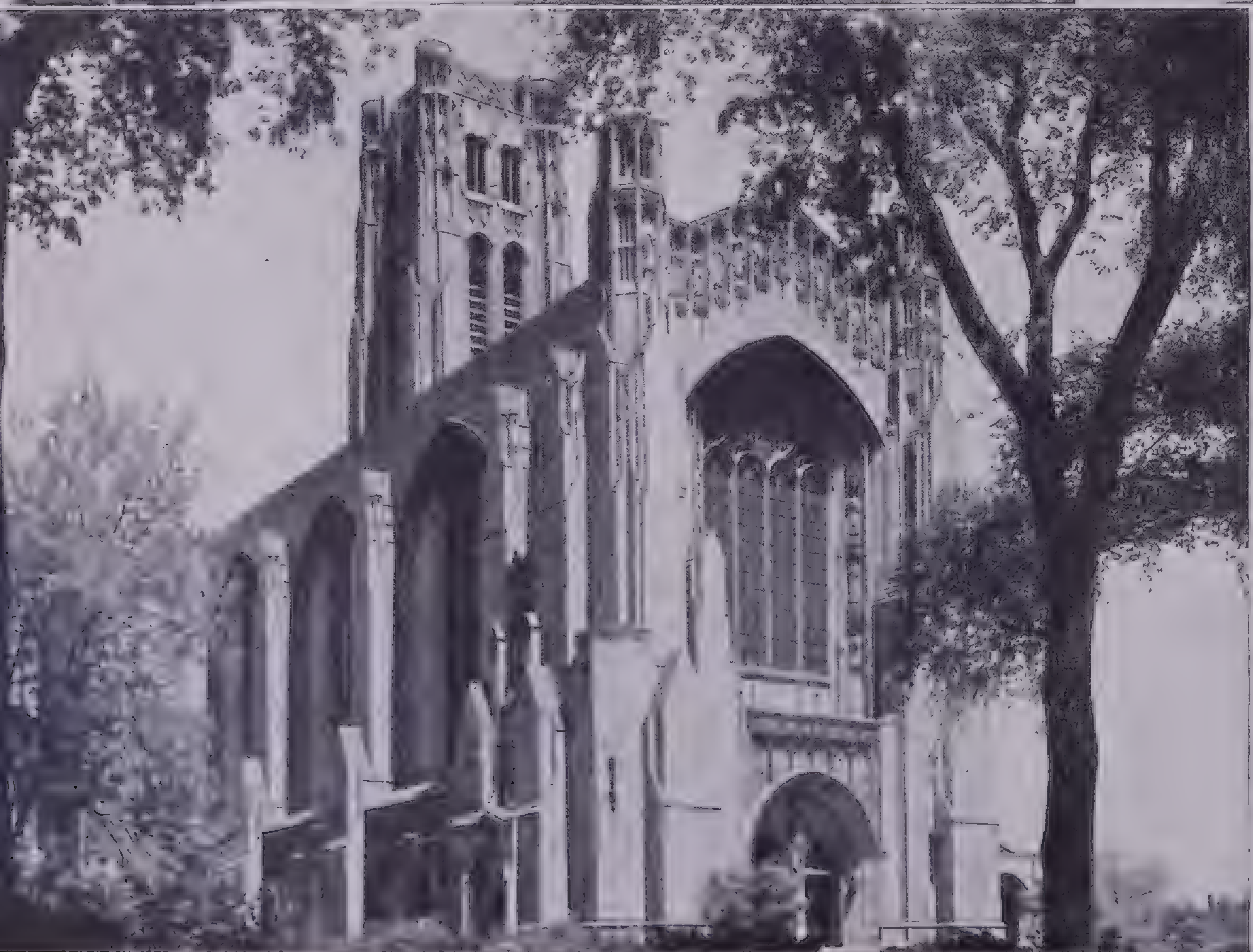




Pierson College, Yale University, New Haven, Connecticut, 1930
Colonial, with variations;
James Gamble Rogers, architect

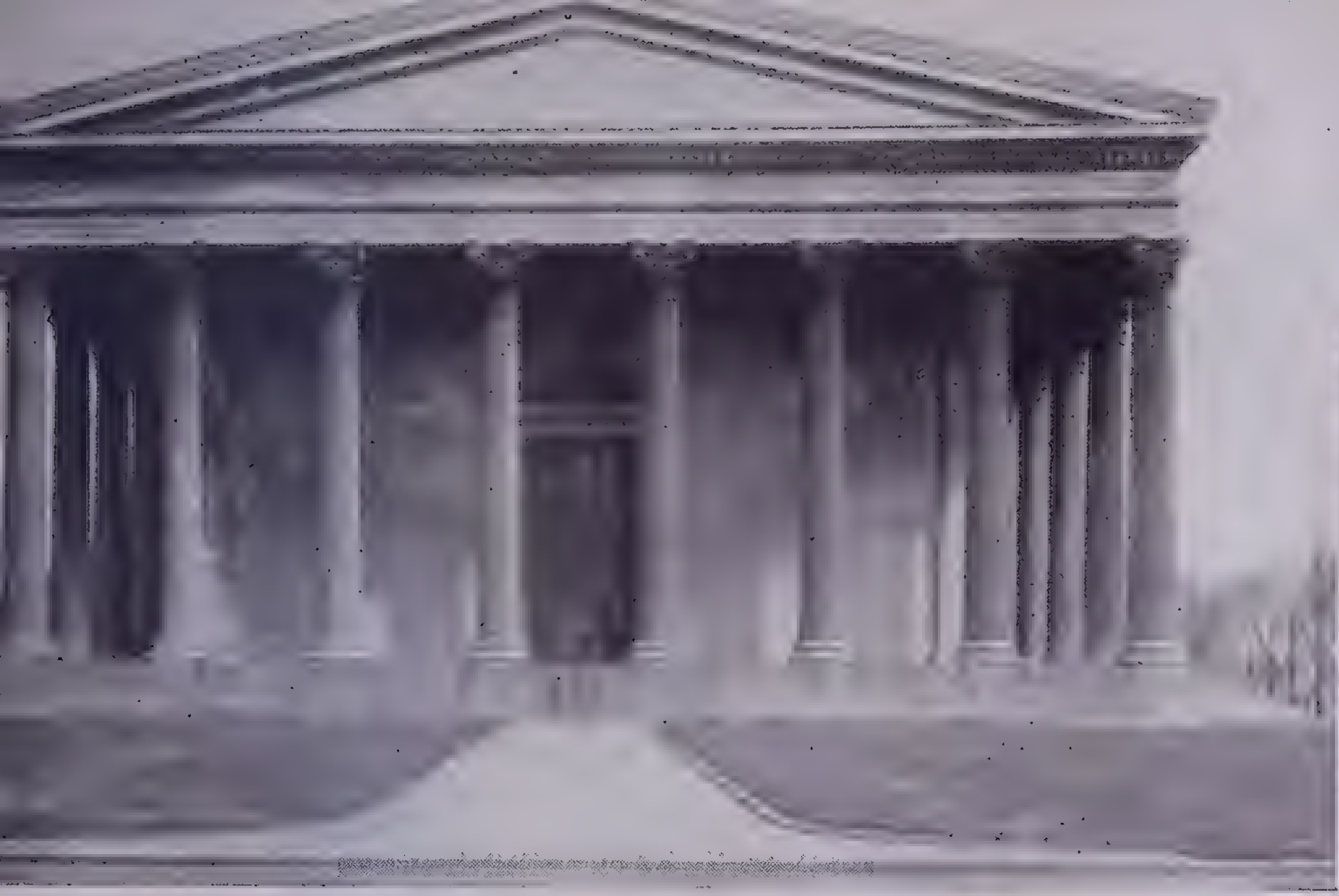
Above left:

James B. Angell Hall, University of Michigan, Ann Arbor, Michigan, 1924
Classic inspiration;
Albert Kahn, architect

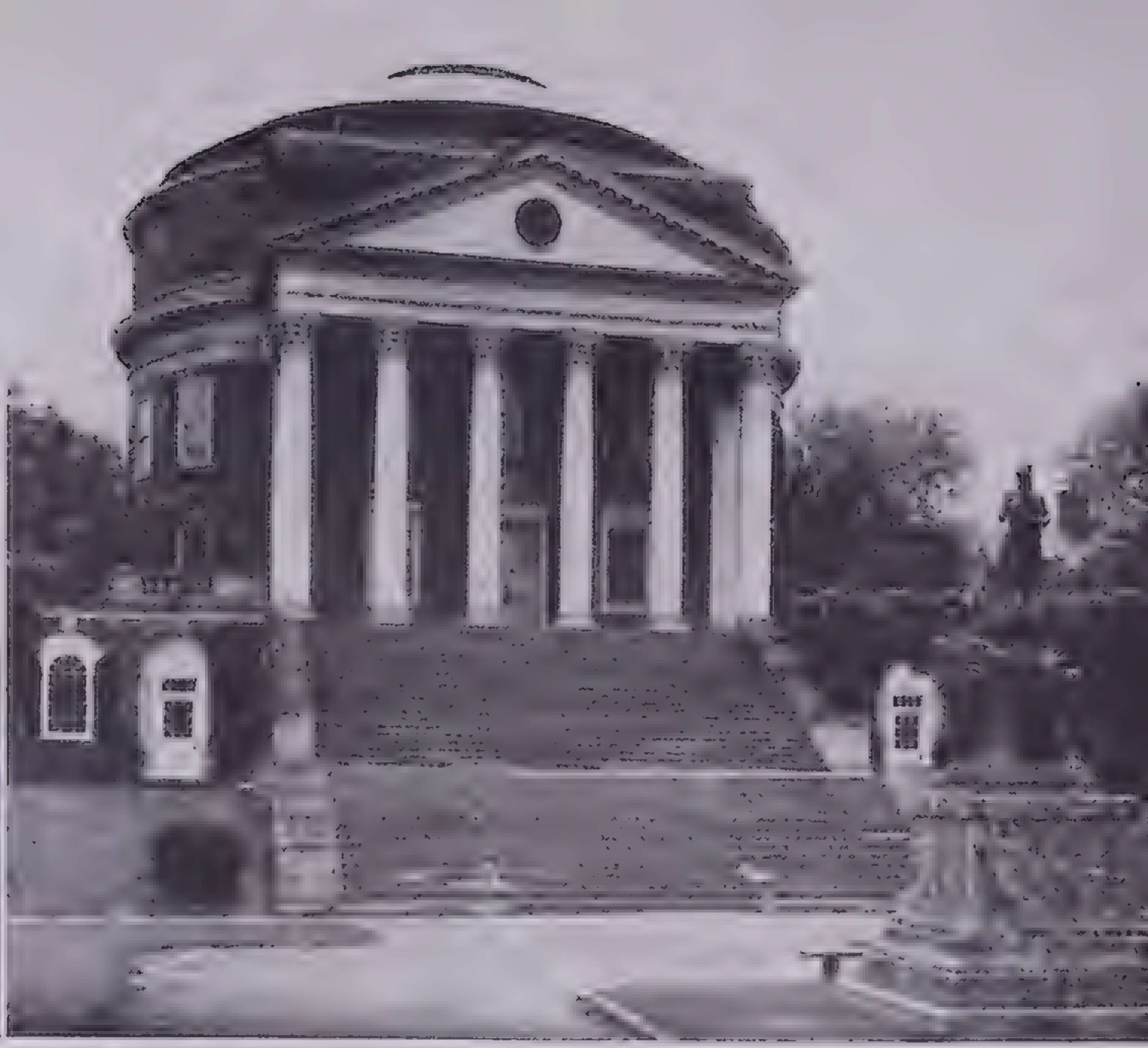


Rockefeller Memorial Chapel, University of Chicago, 1928
Modern Gothic; Bertram
Grosvenor Goodhue, architect

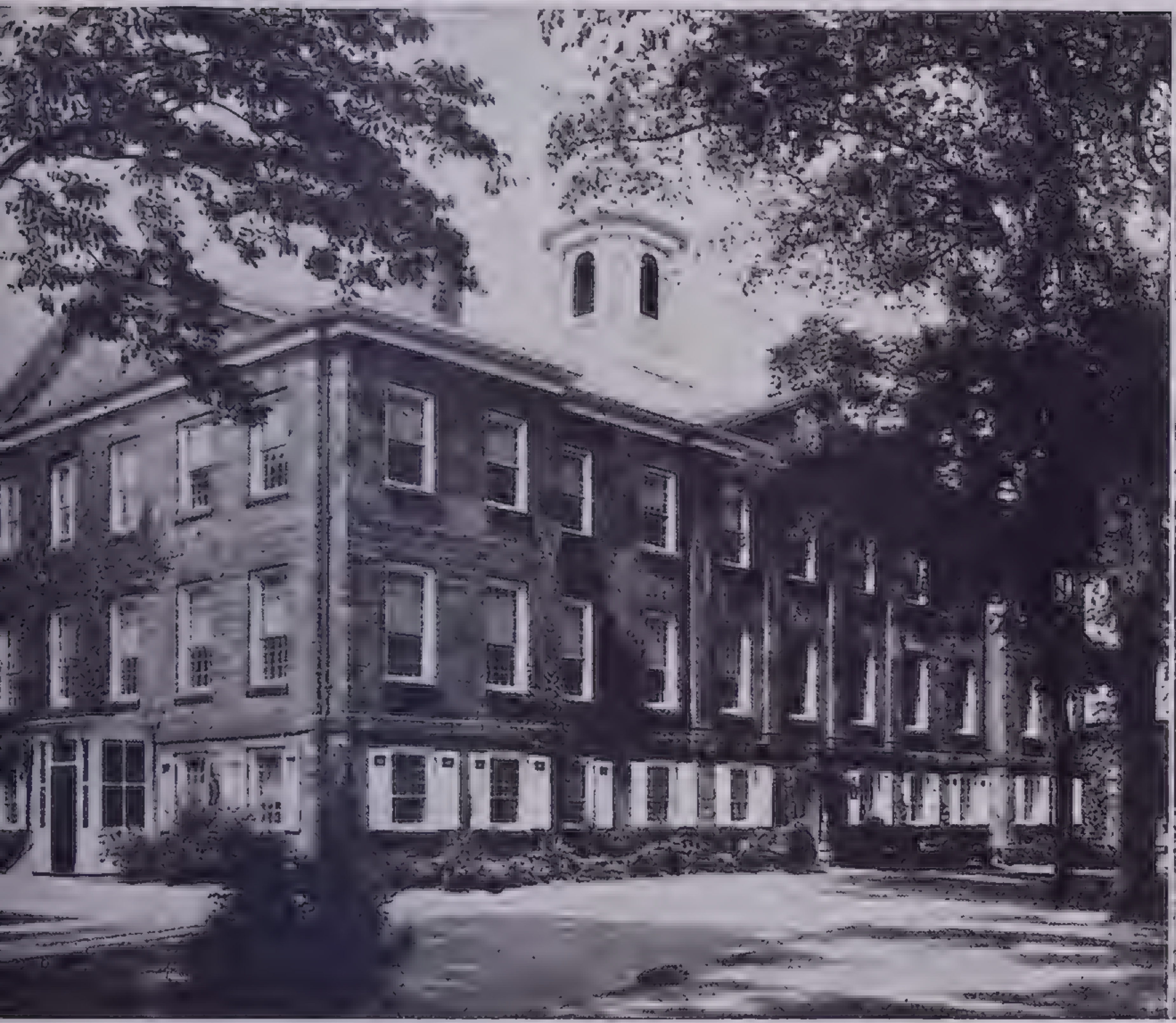
Varied Architectural Styles in Later American College Buildings



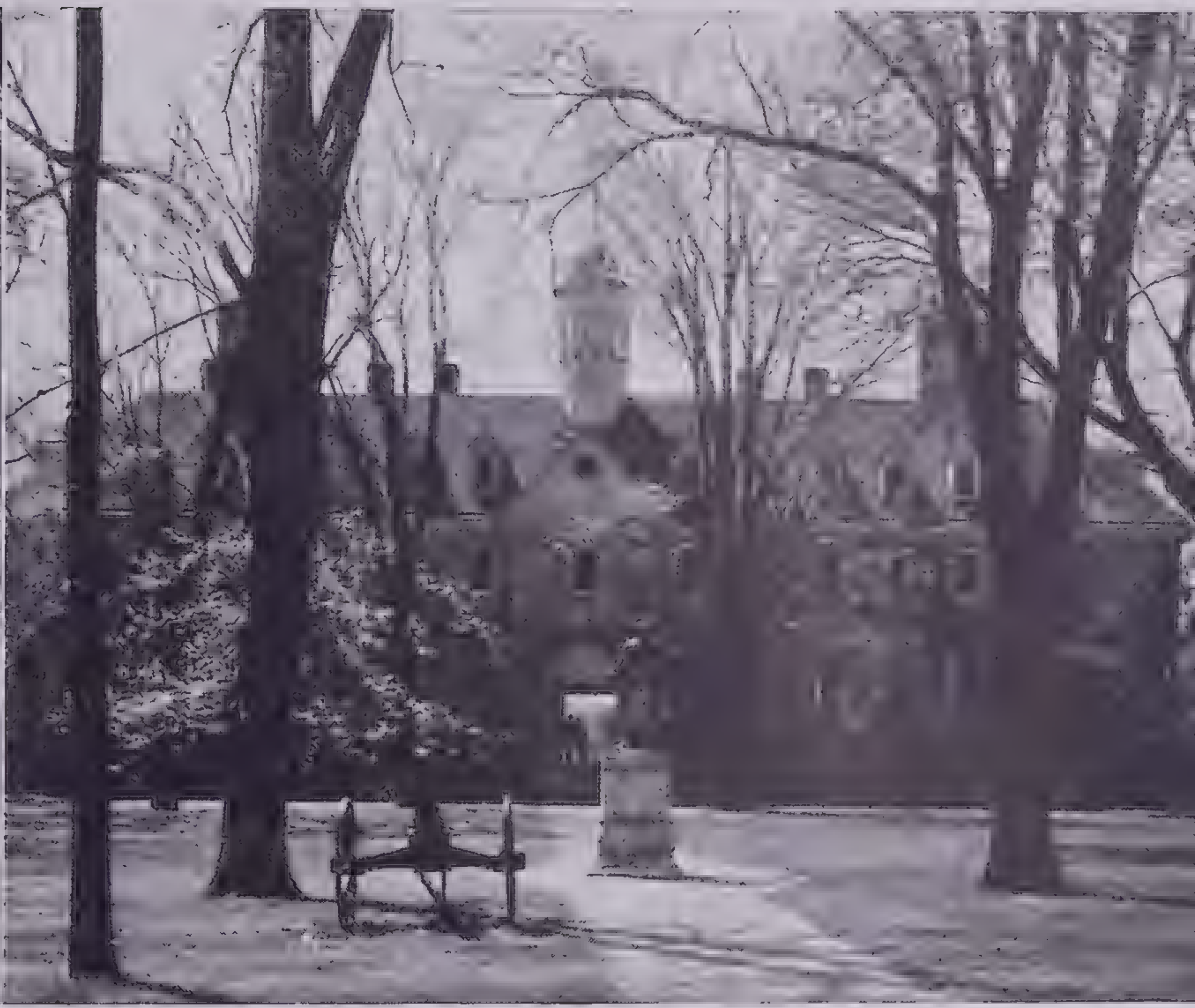
Girard College, Philadelphia, Pennsylvania, 1847
Classic revival; Thomas U. Walter, architect



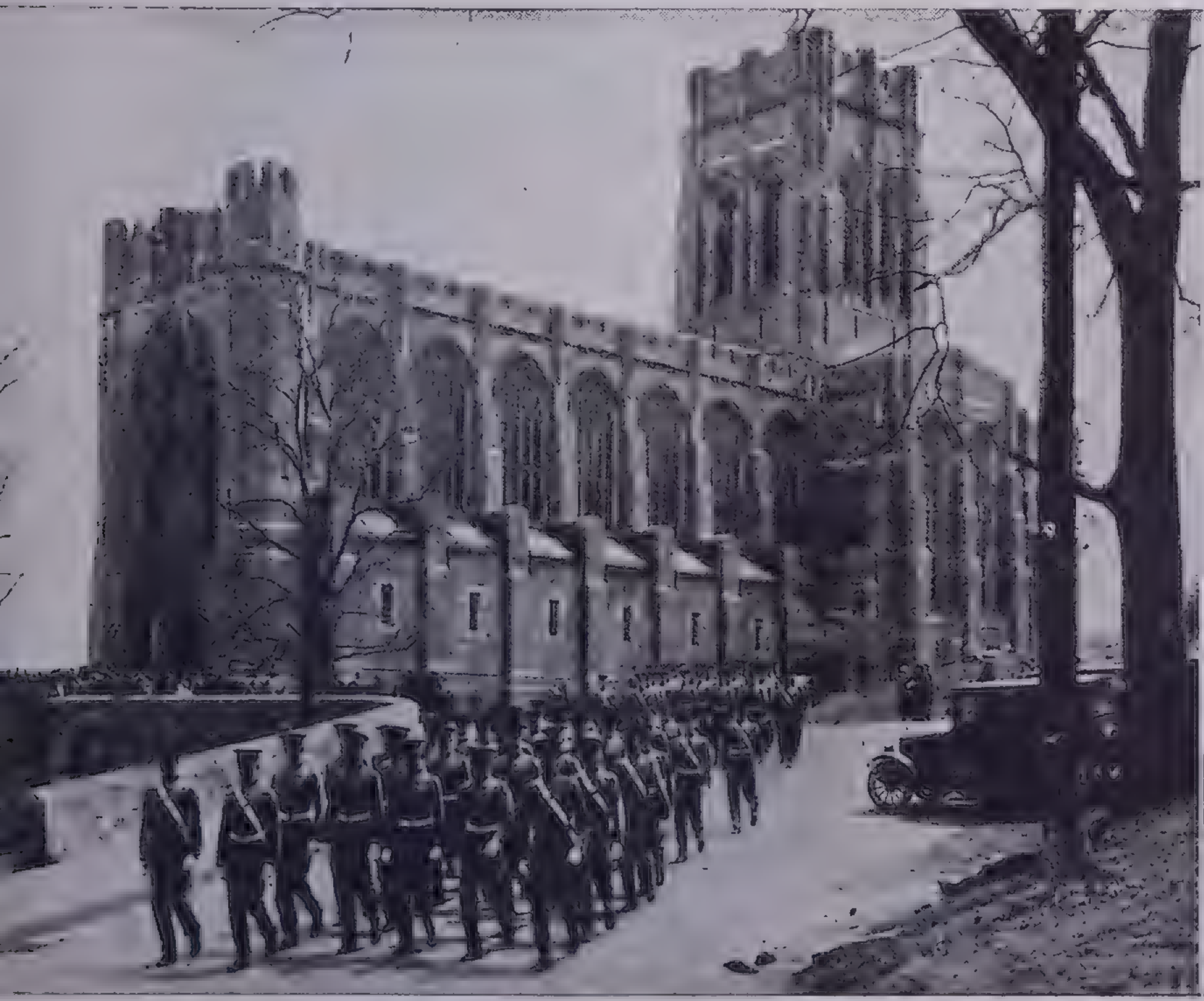
Courtesy Virginia State Chamber of Commerce
Rotunda, University of Virginia, Charlottesville, Virginia, 1819
Classic revival; Thomas Jefferson, architect



d Queen's Building, Rutgers University, New Brunswick, New Jersey, 1809
Early Federal; John McComb, Jr., architect



Courtesy Colonial Williamsburg, Inc.
Wren Building, College of William and Mary, Williamsburg, Va., 1934
Based on designs by Sir Christopher Wren for the original building (1695)



det Chapel, United States Military Academy, West Point, New York, 1910
Modern Gothic; Cram, Goodhue and Ferguson, architects

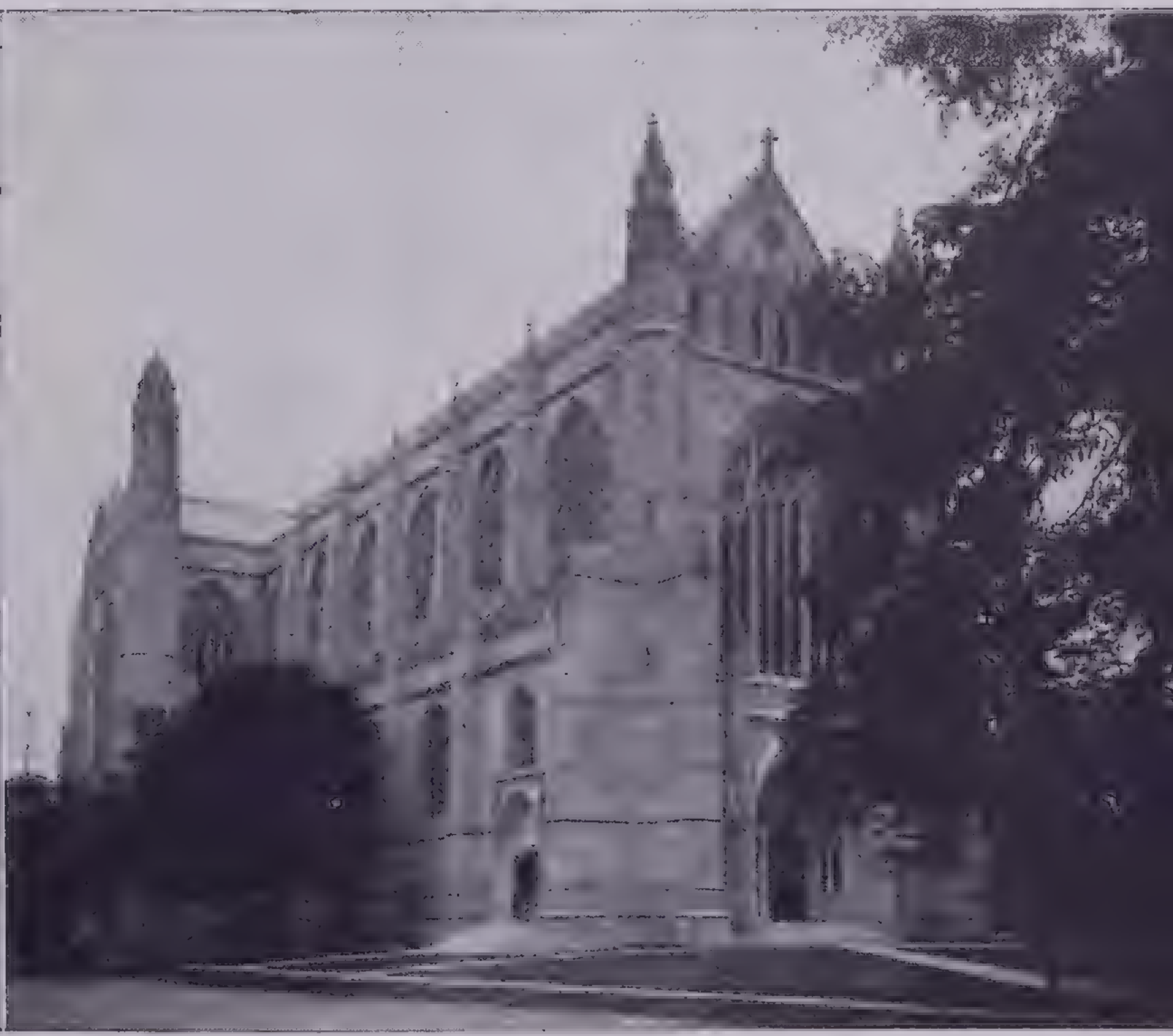
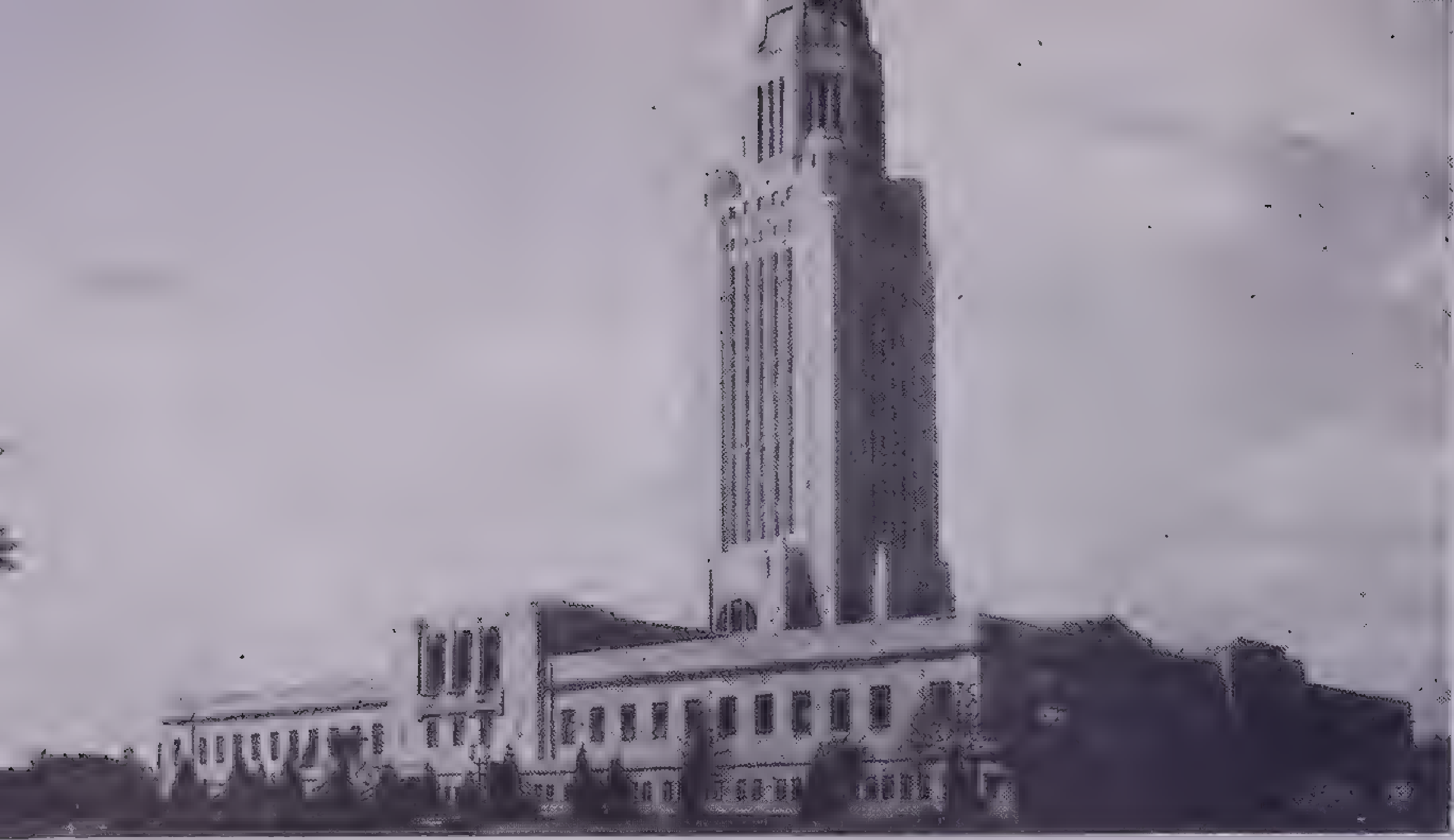


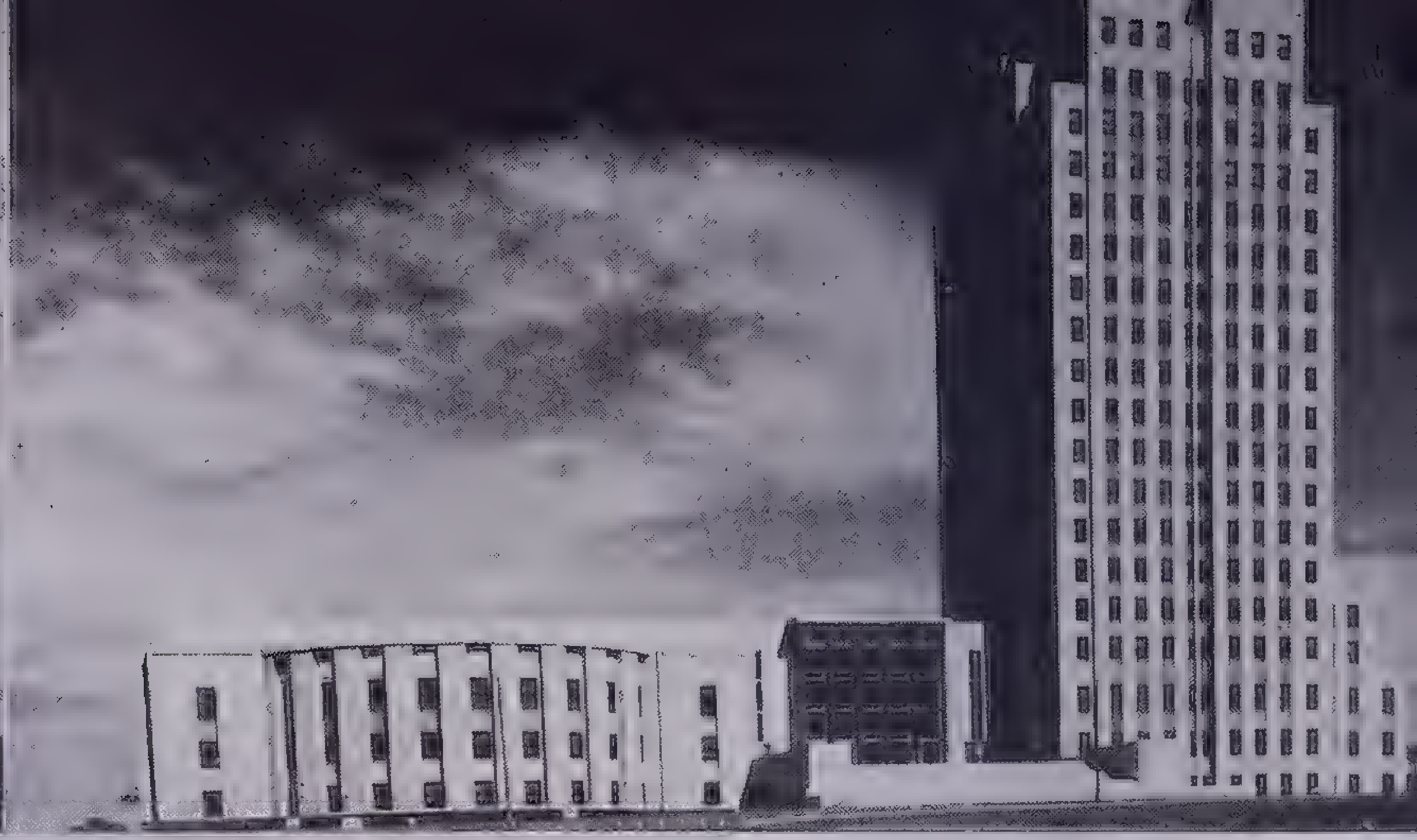
Photo by Orren Jack Turner
Memorial Chapel, Princeton University, Princeton, New Jersey, 1933
Modern Gothic; Cram and Ferguson, architects

College Buildings Designed by Noted American Architects



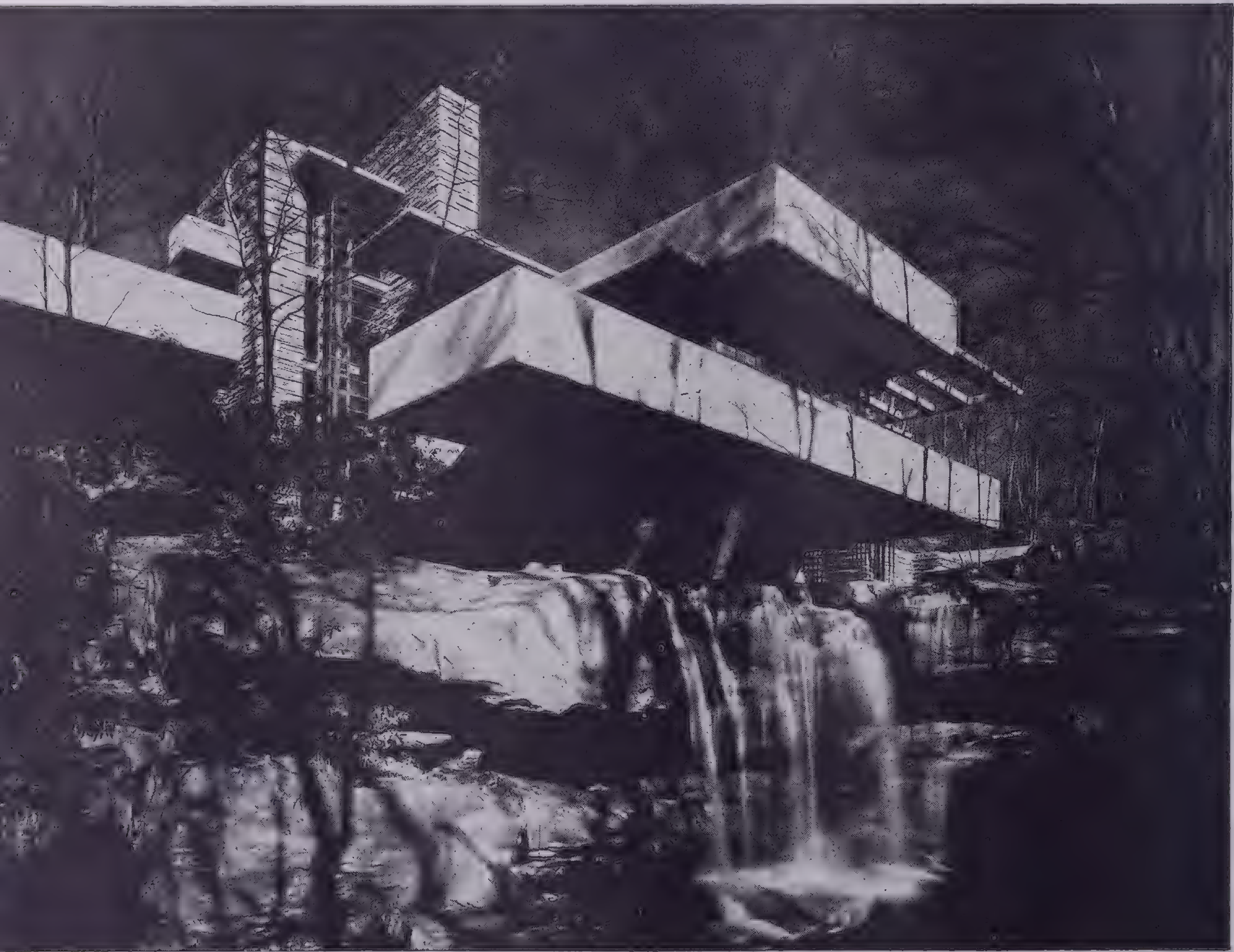
Courtesy Lincoln Chamber of Commerce

Nebraska State Capitol, Lincoln, Nebraska, 1934
Bertram Grosvenor Goodhue, architect. The Capitol has a 400-foot tower rising from a base 2 stories high



Courtesy Greater North Dakota Association

North Dakota State Capitol, Bismarck, North Dakota, 1934
Joseph Bell DeRemer, William F. Kurke and Holabird & Root, architects.
legislative chambers are to the left, the 18-story administrative group to the



Hedrich Blessing photo, courtesy The Architectural Forum

Modern Architectur
in the United State

***Fallingwater*, Country I**
of Edgar J. Kauffman,
Bear Run, Pennsylvania

Frank Lloyd Wright is
architect of this house
signed to be part of
scenery of a woodl
glen. The house, built
the cantilever system, g
the effect of being an
tension of the cliff t
forms its foundation. T
exterior construction is
inforced concrete and
tive stone, with steel sas
and extensive use of gl

Below, Oregon State Capitol, Salem, Oregon (*from a model*) 1938. The Statue of a Pioneer Surmounts the Building
(Trowbridge & Livingston, architects; Francis Keally, associate)

Courtesy State Capitol Reconstruction Commission

Skyscrapers in Modern Architecture

Philadelphia Savings Fund Society bank and office building. Howe and Lescaze, Architects

Chicago Daily News Building, at the corner of West Madison Street and the Chicago River. Holabird and Root, Architects

adapted Renaissance palaces about 1895, and that firm held top rank for a considerable period, due to its tasteful Eclectic works. Ralph Adams Cram and Bertram Goodhue, however, achieved the finest work in Gothic Revival, erecting such monuments as St. Thomas's Church, New York, the chapel of West Point Military Academy and buildings in the Princeton University group. Yale and other universities also adopted the revived Gothic style. In Italian Renaissance style, beautiful villas were built at Newport, R. I., Santa Barbara, Calif., and Lake Forest, Ill.

The greater number of existing architectural monuments in America are, of course, survivals from this Eclectic era. It is often pointed out that they well represent the vast wealth and power of our country as developed between the Civil War and the World War. But they also symbolize America's dependence upon Europe for artistic standards and models. It is increasingly recognized that our architects then were practicing tastefully in every style except one that might be termed American. The buildings showed excellent taste in selection but no originality; intelligent imitation but a lack of creativeness.

Modernism. The great revolution that has taken place in American architecture in the past decade, during which a true machine-age style has emerged, was, as a matter of fact, foreseen and to a small extent practiced 50 years ago. It was during the late 80s that the steel-frame skeleton for tall buildings was invented in Chicago. Soon throughout the country the architects were struggling with the problem of the skyscraper. In mechanical invention it developed with marvelous rapidity, and the towers soared higher and higher. But the architects failed to find any outward artistic expression of the new materials and the exciting new engineering feats that made the towers possible. Mostly they clothed the new tall structures in patches and shreds taken from the exterior garments of the ancient buildings that had so long been their models—Greek temples, Roman stadiums, medieval fortresses and Gothic cathedrals. The best of these "masked" skyscrapers—the least illogical, the Moderns would say—are perhaps the Woolworth Building in New York and the Chicago Tribune Tower, both Gothic-decorated.

But long before their time a courageous and brilliant Chicago architect, Louis Sullivan, had suggested that all architectural theory and practice be revised to bring building design into consonance with engineering truth. Sullivan even designed some lesser skyscrapers now recognized as by far the most logical and beautiful of their time. But his work and his ideas were obscured under the renewed wave of Eclectic ideals, and it was only after the World War that his example and his teachings prevailed, and they prevailed, curiously enough, because his work and that of one of his disciples had become known in Europe, had been recognized there as the basis of a truly new style and had returned to America as "the new architecture." The finest of American skyscrapers, such as the Chicago Daily News Building and the Rockefeller Center structures in New York and the Philadelphia Saving Fund Society Building, are really delayed fulfilments of the dreams of this pioneer of the 80s. They represent at last a functional, truly American architecture.

But skyscrapers are merely one phase, though doubtless the most spectacular, of a Modern style evident in all types of building and now recognized throughout the world. Sullivan established his foundation tenet when he wrote the four words, "Form must follow function." Sullivan's pupil and follower, Frank Lloyd Wright, brilliant, individualistic and even more creatively gifted than his master, carried on the fight for Modernism through the following three decades. It was he rather than Sullivan who was accepted by European radicals and innovators about 1910, as prophet and first creator of the new building art. By 1920 foreign-trained American architects, who had "discovered" the style in Austria and Germany and Holland and finally in Paris, paved the way to popular and professional recognition of the two American pioneers, and joining with them helped to create the increasing flood of machine-age building.

It is possible to assert that from this time forward any building erected in America clothed in the architectural garments of Greece and Rome, of Byzantium or Italy or of medieval France, will be seen immediately as already out-of-date, as a somewhat meaningless imitation of past accomplishment. In other words, it is clear that the modern world, machine-powered and scientific-minded, has found its own forms of architectural expression. That there are already masterpieces of design in the new style is open to question. More likely we have seen merely the primitive, starkly expressive phase. But architects are today feeling for richer expression in innumerable houses and business buildings, factories and clubs, even churches. Each year sees the ranks of the Eclectics dwindling, the Moderns gaining new ground and new adherents.

The aspect of the new architecture is utterly different from that of any style out of the past, as should be the case, considering that within a half-century mankind has experienced the most revolutionary change in ways of living known to human history. The architect has at his disposal engineering methods undreamed of in earlier eras, and there is a bewildering range of new materials: steel and chromium; glass in sheets of unprecedented size, as well as glass bricks; concrete in precast blocks and poured concrete reinforced with steel bars. These materials alone give new appearance values to the building, an exterior flash and gleam, long unbroken lines and solidity of mass. New ways of fabricating these materials equally find external expression, as in the unimpeded lift of the skyscraper and the horizontal spread of the new architecture now applied to dwellings.

Above all, there is the extreme simplification, the shearing off of all ornament, the creation of effect by precise calculation of proportion and mass and the playing of sheer surfaces against patterned window complexes. Externalized too is the feeling of the *use* of each building. so that banks and railway terminals no longer masquerade as temples, or public libraries as regal palaces. All this is to be found implied in the key word *functionalism*. But the best architects are bringing in also that other indefinable quality or element, vision or imagination, which lifts the utilitarian structure to the plane of universal art, to the status of creative architecture. Today Frank Lloyd Wright is still the greatest figure among architects in America; William Lescaze in New York and Philadelphia and Richard J. Neutra in California are among the foremost exponents of the functionalist or severely simple school of design.

It is an exciting era in architecture with the foundations of the epochal new style thus laid, with a new and dynamic way of living to be expressed and with visionary creators working all round us. The next half century is likely to see an immense expansion of engineering and building, and, we hope and believe, the creation of masterpieces comparable to those of Egypt and Greece, of Italy and France, but in our own unmistakable architectural language. It is the hardest part of history to write, but for you, the reader, it should be the most fascinating bit in the whole account of the world's ways of building. You can look through the nearest window and actually see history fresh-made or in the making—can find actual illustration of these words in your own immediate surroundings. For architecture is the art nearest to every man's everyday life.

PAINTING

The art of painting is expression on a flat surface of forms in space, accomplished by the major means of line, color and light and shade, often aided by texture and other minor devices. Painting is thus a two-dimensional art (as distinguished from sculpture), but is concerned with three-dimensional effects, every picture affording the impression of volumes in space or at least of planes or areas receding from the surface of the painter's paper or canvas.

The visual form that constitutes a painting has two aspects—*representation* and *design*. Representation as a term covers the objects and events depicted from outward nature, their shapes, make-up, relationships and meanings—for instance, a body, a flower, a spacious landscape, a trait of character or a story. Design refers to the arrangement or organization of the abstract elements—color, line and the like—as such, and with the creation of that unexplainable element known as order or rhythm or formal beauty. Design and representation cannot be separated; they grow together in the creative mind of the artist. Artists vary in their emphasis. Some are greatly interested in representation, in which case they add to the world's store of realistic, naturalistic and documentary art. Others, more visionary and imaginative, care more for the fine organization of their color, light and line, in which case they add to the art that is highly formalized or decorative.

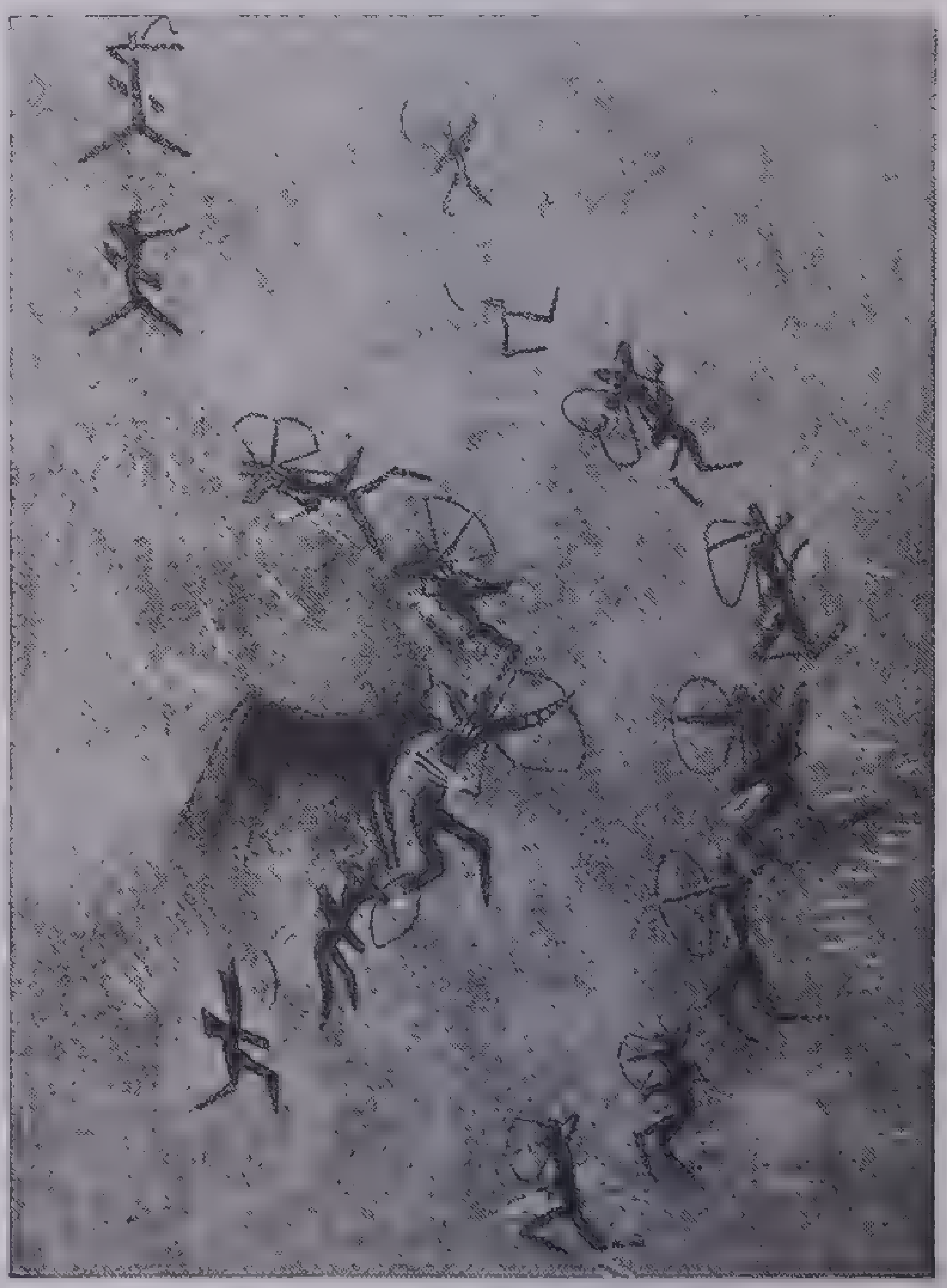
There are various ways in which order is manifested in a work of art: in balance, in similarity or repetition, in easy sequence or clearly felt gradation and in that final unity, like that of a living organism, in which every part is essential to every other part. These are so-called principles of design, but no great painting was ever achieved merely by following them. The life or order of a great work of art is so complex and so subtle that it eludes our crude attempts at analysis. As one critic has said, artists can only work for order and hope for beauty.

ANCIENT PAINTING

Old Stone Age.—The oldest paintings that we know were painted thousands of years ago by men of the Paleolithic or Old Stone Age on the walls and ceilings of caves in southern France and northern Spain. These men were hunters and painted their familiar world, a world of animals—the reindeer, wild horse and mammoth, the bison, wolf and wild boar. Sometimes they were shown at rest or grazing, but more often they were depicted running, galloping, fighting. They were painted with the most astonishing keenness of vision and with a line that was swift and sure.

There was a development covering thousands of years, from the early drawings cut into the rock with a sharp flint or sketched in red or yellow ocher to the great polychrome period when the strong contour lines were filled in with shaded color masses of red, yellow, brown and black, earth colors mixed wth animal oil or fat. The polychrome period may have been 15,000 B.C. or 30,000 or even 60,000.

Later, perhaps about 10,000 B.C., a different people in the south and east of Spain left in caves and under overhanging rocks some remarkable paintings of human figures. These people had the bow and arrow, and their paintings were largely of bowmen in action—in the hunt, fight or war dance. Occasionally there were other scenes, such as a man taking honey from a tree while the angry bees fly about him. There was no such realism or form or rhythm of line as was shown by the animal painters, but there was a great aptitude for expressing movement. Recent discoveries have indicated that these people went from southern Europe into Africa, where their rock pictures



Courtesy Museum of Modern Art

Primitive Rock Painting

Found at Khargur Tahl, a sandstone valley in the Libyan Desert of Africa, showing a fight, apparently for the possession of a bull are found in many localities. The art of the African Bushmen of the last 500 years seems to be a survival of this Old Stone Age painting.

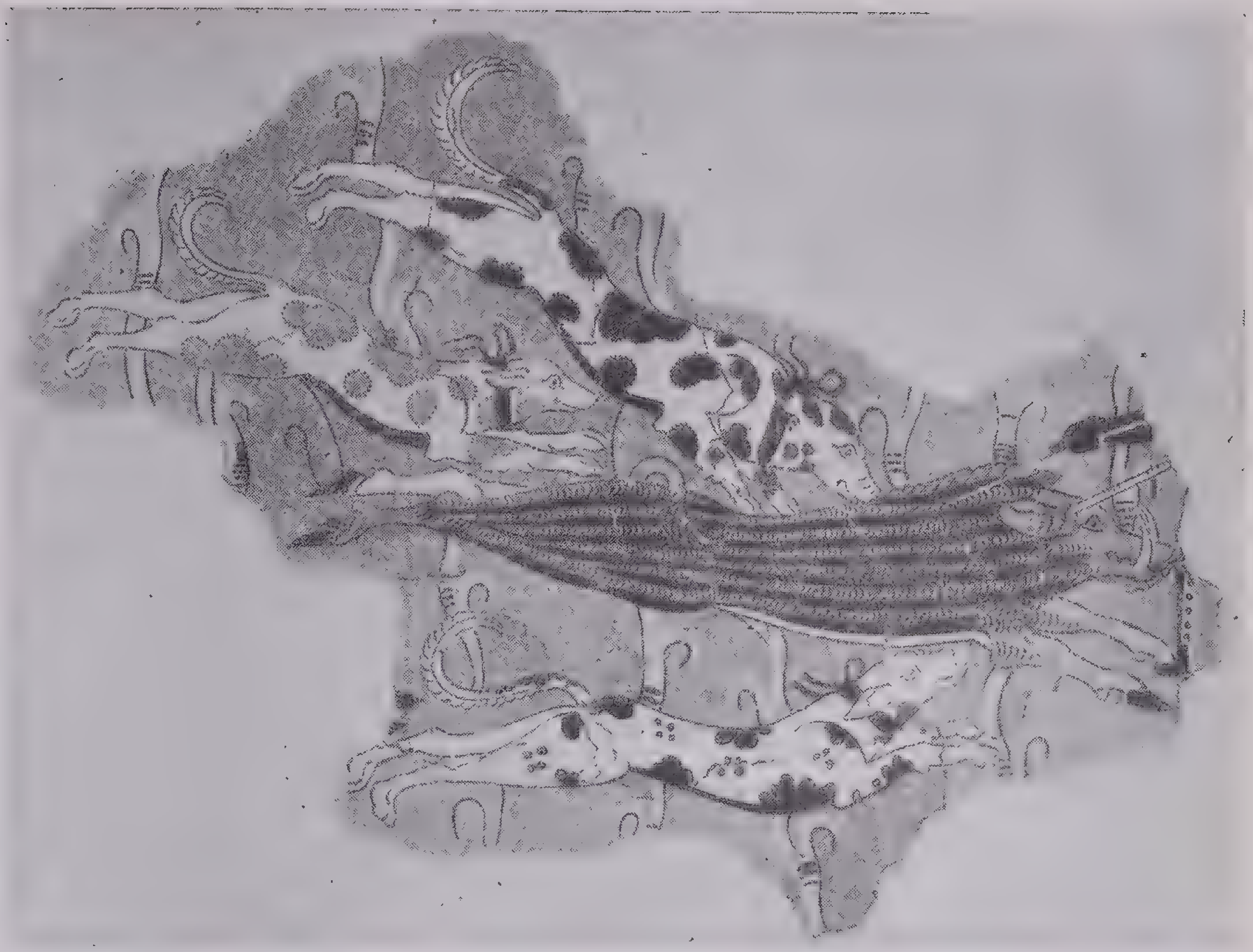
New Stone Age.—By 10,000 B.C. it is supposed that the climate and geography of Europe was about the same as it is today; and with this change the Paleolithic men disappeared. The people of the Neolithic or New Stone Age were a different people with a very different art. Neolithic man learned to cultivate grain and domesticate animals; he built houses, wove cloth and made pottery. In Europe his painting was confined to geometric designs on pottery—lines, zigzags, curves, spirals—with rarely any suggestion of the human figure.

Egyptian Painting.—In the years between 4000 and 3000 B.C., when Europe was still in the Stone Age, Egypt had discovered metal, invented a system of writing and started to build up a high civilization. Before 2000 B.C., paintings were not very numerous, and we must trace the pictorial tradition in painted low reliefs. But after that there is a continuous history of painting down to the Christian era. The Egyptian loved the out-of-doors so much that he brought it into his house, painting the floors with lotus, ducks, birds and fishes, the walls with trees and the ceiling with stars in a blue sky. But the houses have perished, and only fragments of such painting remain. There were also paintings in temples, in papyrus manuscripts and on the coffins of the dead; but most surviving Egyptian painting is found on the walls of tombs.

This tomb painting is not a gloomy art; far from it. There are pictures of the Egyptian's gods, of his adventures in war but especially of his own intimate little world. He loved life and all its hard-won luxury, and he wanted depicted on the walls of his tomb all the good things of his life on earth as reassurance that they would continue in the life hereafter. We see him gliding in his reed boat in the marshes hunting ducks, perhaps accompanied by his wife and daughter, who are gathering lotus; or harpooning fish or feasting at a banquet where dancing girls sway to the music of harps. We see his butchers cutting, his masons building, his slaves reaping and threshing the grain, picking grapes and making wine.

The Egyptian painter worked in outlines and flat color tones: long, swift, continuous lines and strong harmonies of vivid blue, green, red and yellow. Since he ignored light and shade, volume and distance, his painting is flat and decorative.

Exact representation is not his strong point. He did not see in his imagination the figure as a whole, from a single point of view. He drew the face in side view, eye front, shoulder front; and then, by a mysterious twist he drew the body below the waist in side view again. This rendering became traditional and scarcely changed through the centuries. By the XVIII Dynasty (1580–1350 B.C.) considerable progress had been made; greater freedom in pose and movement, more flowing line, overlapping of figures, an occasional face in front view. In the time of Ikhnaton (1375–1358), the great king who believed in one god, there was a great advance in the direction of naturalism; but with his son-in-law Tutankhamen came a reversion to the old forms in art as in religion.



Courtesy Metropolitan Museum of Art

Aegean Painting: The Boar Hunt

A fragment of a fresco from the Late Minoan Period in the Island of Crete (1350–1100 B.C.) shows hunting dogs pursuing a boar to its death. The original painting, found at Tiryns, Greece, is now in the National Museum at Athens

There is no deep space in Egyptian painting. If an object is to appear as behind another, it is placed above. A pool of water is drawn in floor plan and not as it appears to the eye. The flesh of men is always dark; that of women, light. But in spite of these unnatural conventions the Egyptian tells his story well, with expert craftsmanship and a feeling for fine design.

Aegean Frescoes.—In Europe it was the part nearest Egypt that first emerged from the Stone Age—the lands around the Aegean Sea: Greece, Asia Minor and the nearby islands, especially Crete. Apparently it was in Crete that the first important European culture developed, marked by monumental architecture, refined pottery, exquisite metalwork and some small achievement in sculpture and in painting. Excavations of the great palace at Knossos (built about 1500 B.C.) have revealed a series of frescoes in vivid colors that tell a story of luxury and splendor and of an amazing art.

We see a strangely modern-looking people with irregular European features, pinched waists, elaborate coiffures, tight bodices and flounced skirts. A youth marches in procession bearing a silver vase, a naked boy picks crocuses, women in low-cut gowns watch a bull fight from a balcony, and youths and maidens engage an angry bull. A vivacious young girl, with a curl in the middle of her forehead, presents her profile with a large front-view eye—for the Cretans hardly advanced beyond the Egyptians in mastery of anatomical detail. A fresco from Melos made about 1600 B.C. shows flying fish darting through the water in rhythmic movement.

Cretan paintings, like Egyptian, are in outlines and flat color tones; they have no distance, neither have they light and shade; and the same convention of brown for the skin of men, white for that of women is seen. But their line is less continuous; it has a quicker and more lively tempo, and the contours have more individuality. From Crete supremacy in the arts, as in other activities of life, passed to the Myceneans of the Peloponnesus, and the ruins of their palaces yield fragments of similar frescoes.

Greek Vase Painting.—It was an invasion of barbarians from the North that finally destroyed the Aegean civilization. About 1400 B.C. the palace of Knossos was burned; by 1100 the whole of Aegean culture had been overturned. Gradually this new people, known as Dorians, joining with the Ionians, developed into the Greeks of historic times, and the Cretan world lived only in Greek myth and legend.

The earliest Greek painting (1100–800) consisted of geometric designs on pottery, with human figures and animals almost as geometric as the bands and zigags. The 8th- and 7th-century pottery showed contacts with the Near East in its rows of animals and backgrounds filled with rosettes. In the 6th century further progress foretold the glory of the 5th. Athens began to manufacture wares of great refinement of shape and beauty of decoration. There were water jars, mixing bowls, drinking cups, wine pitchers and oil flasks. In the 6th century they were black-figured, the decoration being painted in black glaze on the natural red of the clay, with details of features and drapery scratched into the glaze, disclosing the clay beneath.

Toward 500 B.C. this style was gradually supplanted by the red-figured, in which the background was painted with black glaze and the figures and decoration were left in the reddish clay. Now all the details, instead of being cut into the glaze, could be freely executed with the brush. All through the black-figured period the Greeks made progress in realistic representation. They learned not only how to draw a consistent profile but also how to show three-quarters and front views. The figure becomes flexible; it bends and twists; its contours suggest volume and solidity; stiff draperies change to flowing folds. Progressively, however, the artists lost the virtues of stylized drawing and spirited decorativeness that characterized the vases of certain 6th-century masters.

The vase pictures tell the stories of the Greek gods—those very human gods made in the image of man and enjoying all that he enjoyed—and of the heroes, the labors of Hercules and the adventures of the Trojan War. And they give a very remarkable picture of Greek daily life; we see children at school, women weaving, athletes at their games. There is still no deep space—a mountain is indicated by a tree and the sea by dolphins. But there is, until the late and decadent periods, a splendid sense of pattern in line and mass.

Greek Murals.—The humble vase paintings, which flourished until the 4th century B.C., are one of our best clues to the mural and panel painting of Greece, all of which has perished. This loss is a great tragedy in art history, for we know that the Greeks esteemed their painting as highly as their sculpture. Literature tells us about the famous painters, such as Polygnotus (active 480–450 B.C.), who still painted in outlines and flat color tones, but who introduced the new freedom in representation that is reflected by the vases; and it tells us about the painters of the middle of the century who were interested in deep space and perspective and about Apollodorus (5th century B.C.), who introduced light and shade and thus helped to determine the future of European painting.

In the 4th century, murals for the home as well as for temple and public building became popular. Panel paintings increased. Portraits and scenes of everyday life were painted beside illustrations of the ancient myths and national wars. The conquests of Alexander were of tremendous importance in the history of art. After his death in 323 B.C. Greek culture was spread over all his vast empire. Athens yielded to new art centers in Asia Minor and in Egypt. In this Hellenistic period (323–146 B.C.) painting rapidly became more expressive of emotion, of movement and of individual character; costumes grew realistic, landscape appeared—all this, however, often at the cost of great design.

Roman Painting.—Rome in the second and first centuries B.C. became mistress of nearly all the countries bordering on the Mediterranean and of western Europe as well. Even earlier her victorious generals had collected works of Greek art and pillaged conquered provinces. But the first centuries B.C. and A.D. saw a golden age of art production in Rome herself. There are many paintings of this period, some in and about Rome, but most from the excavated cities of Pompeii and Herculaneum, buried by Vesuvius in 79 A.D. The artists were mostly Greek or Greek-trained. Some of the paintings were copies of Greek works of the 5th and 4th centuries, others were in the Hellenistic mode of the day. Design often suffers, but there is convincing expression of the volume and weight of the modeled figures and variety in pose and action.

These pictures, framed by painted architecture, give the Roman house, with its few windows, the effect of opening out on gardens and spacious vistas. They give an impression of bright color in subdued light, and they are filled with garlands of fruits and flowers, gods and goddesses, half-veiled dancers. Cupids play at being merchants, goldsmiths, wine dealers; they race in chariots on land and on crabs and dolphins on the sea.

Landscape backgrounds had probably originated at Alexandria in Egypt, but on Roman soil they ceased to be mere backdrops and began to give the illusion of real space in which the figures took their proper places. This was a Roman contribution to Hellenistic naturalism.

Early Christian Painting.—From the early years of the Christian era we have paintings in the catacombs of Rome—those galleries below the ground where the members of the new faith, forced to secrecy, buried their dead and held religious services. These frescoes were made from the 2d to the 4th centuries, most of them probably in the 4th. The beginnings of Christianity caused no more upheaval in Roman art than in Roman life. Early Christian artists were Roman or Alexandrian artists working in the Hellenistic style. Decorative settings were quite Pompeian. Only the subject matter was new—the Greek and Roman story was supplanted by the Jewish, and many of the old pagan forms were used as symbols to express new Christian meanings. The great change was in the quality of the painting; it became very poor. Design fell apart, and figures lost their relation in space as well as in meaning.

In the 4th century, when Christianity was made a legal religion, Christians emerged from the catacombs and began to build churches. The 5th century was a period of rich decoration of Christian buildings, mostly in mosaic with great splendor of color and gold. Ravenna was the chief center in Italy, and the artists came largely from the Eastern Empire rather than from Rome. The early frescoes and mosaics in Roman churches had been distinctly classical; but in the 6th century, when the new style came in, it was called *Byzantine* because it was brought from Byzantium (capital of the Eastern Roman Empire) and the Near East.

Byzantine Painting.—Byzantine was really an old Greek style that had been orientalized. When this style traveled to the Near East, the Asiatic artists gradually flattened the rounded figures of the Greeks and turned their light and dark into a decorative pattern. They also added an oriental opulence of color. We can trace the flattening out of the Greek forms through Asia Minor and Syria and even down to Egypt. Christian illuminated manuscripts best tell the story. These are the early Christian books written by hand on vellum, lavishly illuminated in gold and colors and illustrated with pictures called *miniatures*. They were lettered and decorated by monk artists in specially established studios at the monasteries, at first in Egypt and Syria, perhaps, then throughout the Eastern Christian lands and finally in Italy and other parts of Europe.

In the 6th century, when the mosaicists of Byzantium came to decorate the churches of Ravenna with pictures of Christ and the Virgin, solemn processions of apostles and of saints, gorgeous portraits of the emperor and his court; they brought with them this new Eastern style, and it became so popular that it dominated mural art in Italy for centuries. Although highly decorative and emotional in its rich color, gold ground and rhythmic pattern, it was from the start quite lacking in any physical reality. Gradually it declined into mere lifeless repetition in which the fine qualities of Byzantine pattern finally were lost.

In the 11th century there came a new period of building, and decoration received a fresh wave of influence from the Near East. This was the developed Byzantine style, still highly decorative and other-worldly but not so flat, not so unnatural. Gold backgrounds are occasionally pierced by a clump of trees; figures show considerable modeling and are sometimes in vigorous movement. It was still, however, an unrealistic art, solemn and gorgeous, well planned to inspire the awe and reverence that the medieval church desired and, through color and line, to create a spiritual mood. It remained the style of Italy until the 13th century.

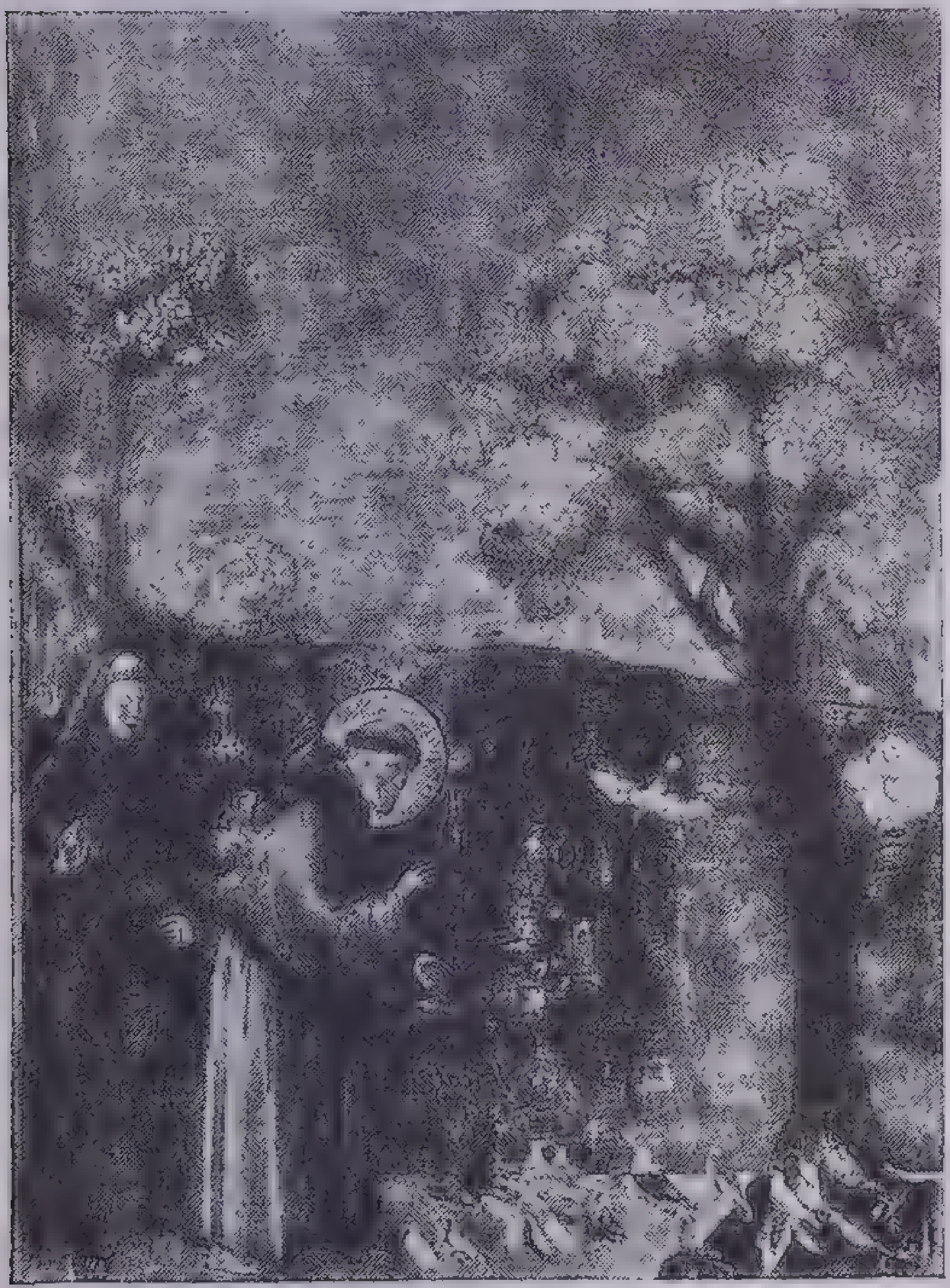
EARLY ITALIAN PAINTING

In the last years of the medieval period there came the changes that ushered in a new culture and a new art—the Renaissance or rebirth, which began in the 13th century and reached its climax in the 16th century. The crusades, the growth of the cities, the fervent religious revivals, all played their part in the tremendous stir of thought and feeling that characterized the 13th century. Men no longer looked to a future life as the only one of value but enjoyed their part in the present world.

A new naturalistic art was the result of two discoveries: the naturalism of exhumed Greek and Roman art, now considered *classic,* and a fresh vision of the world of nature and of simple human things. In this new vision there was no greater influence than that of St. Francis of Assisi who brought man back to nature. St. Francis praised the Lord for the earth and all its creatures, for the sun and moon and stars, for his brother wind, for his sister water and brother fire. In 1226 he died, and immediately there grew up about him a cycle of picturesque stories with a local Italian background that furnished the artist with a new and very human world of figures, events and meanings.

The Early Florentine School.—The great church erected over the tomb of St. Francis at Assisi has been called the cradle of Italian painting, for on its walls we find the seed of almost all that was to come. There Cimabue, first of the Florentine school, tried to make the old Byzantine forms express the new fire and passion. There the colder Cavallini of Rome drew his solid forms. And there Giotto, their young assistant, learned from them both and then created a new form of expression that was to determine the whole future of the art of Florence.

We are not certain as to what his share was in the fine series of St. Francis stories at Assisi—*St. Francis Preaching to the Birds, The Miracle of the Spring* and many others. But in the Arena Chapel at Padua, Giotto told the story of the Virgin, her birth and childhood, her suitors and her marriage; there, also, he told the story of Christ, from his birth and the flight into Egypt through all the episodes of his life to that final scene of the women mourning over his pale body, while the men stand by in silent, helpless grief, and frantic little angels fly about the sky. He turned the whole of the Arena Chapel into a gallery of such pictures, all in soft, bright colors against an azure ground that suggests the sky.



Courtesy Metropolitan Museum of Art

The Sermon to the Birds by Giotto

One of the scenes from the life of St. Francis in the now faded upper fresco of the Church of Santo Francesco, Assisi

His figures are rounded, sculptural. Solid bodies underneath the clothes are suggested by the simplest line and light and shade. There is little depth—a tree stands for a landscape, a stone portal for a town. There is no perspective, in the later scientific sense, but this passes unnoticed in the dramatic telling of the story and the unity of the designs.

In 1337 Giotto died. After that most of the painters of Florence adopted his manner, but throughout the 14th century not one approached his stature. At most they made progress in representation. As religious intensity lessened, the Bible stories tended to become events of the day, rich in incident and detail. So naturally there was improvement in showing landscape, architecture and objects of everyday life.

Sienese Painting.—The first master of the Sienese School was Duccio di Buoninsegna, who lived about the same time as Giotto. In Siena the new naturalism never did away with old Byzantine ideals. Painters still delighted in rhythmic pattern of line, in rich color, brocaded stuffs, inlay and ornament. They began to care very much for spatial organization. Figures were purposely flattened, and even when they were highly modeled, they had not the solidity of Giotto's. Space, harmonious line and lack of insistence on the physical gave Sienese painting a spiritual feeling akin to that of Byzantine but tempered with a distinctive sweetness of expression.

Duccio's altarpiece executed for the cathedral of Siena contains the elements of all later Sienese painting. On the front is the Virgin with the Child, enthroned in majesty, encircled by angels. At her feet kneel the patron saints of Siena; beside her extend long lines of girl martyrs and bearded evangelists. It is a flat decorative pattern of gold, deep color and flowing line. But on the back are 38 scenes from the life of Christ and the Virgin, each a lively narrative, not so simple and dramatic as in Giotto but with more definition and a clearer rhythm. In *Christ Entering Jerusalem* the city towers stretch into the distance; an orchard appears beyond a wall, with people in the trees; a great crowd of diverse types streams from the city gate.

Sienese painting developed along these two lines; decoration in line and color and increased narrative and pageantry. Simone Martini of the next generation was a master of enrichment by pattern and melodious line; he was chiefly the artist of the decorative altarpiece as shown in his exquisite *Annunciation* in the Uffizi Gallery in Florence. Ambrogio Lorenzetti, however, was more accomplished as a storyteller. Sienese art had considerable influence on individuals in other Italian schools and even influenced French art when Simone Martini was called to Avignon in 1339 to paint at the court of the exiled Pope. But for the most part it could not withstand the pressure of other schools, and although Siena continued, even in the 15th century, to produce artists devoted to the old ideal, such as Sassetta, it was an ideal so little congenial to the spirit of the Renaissance that it finally died away or merged with other tendencies.

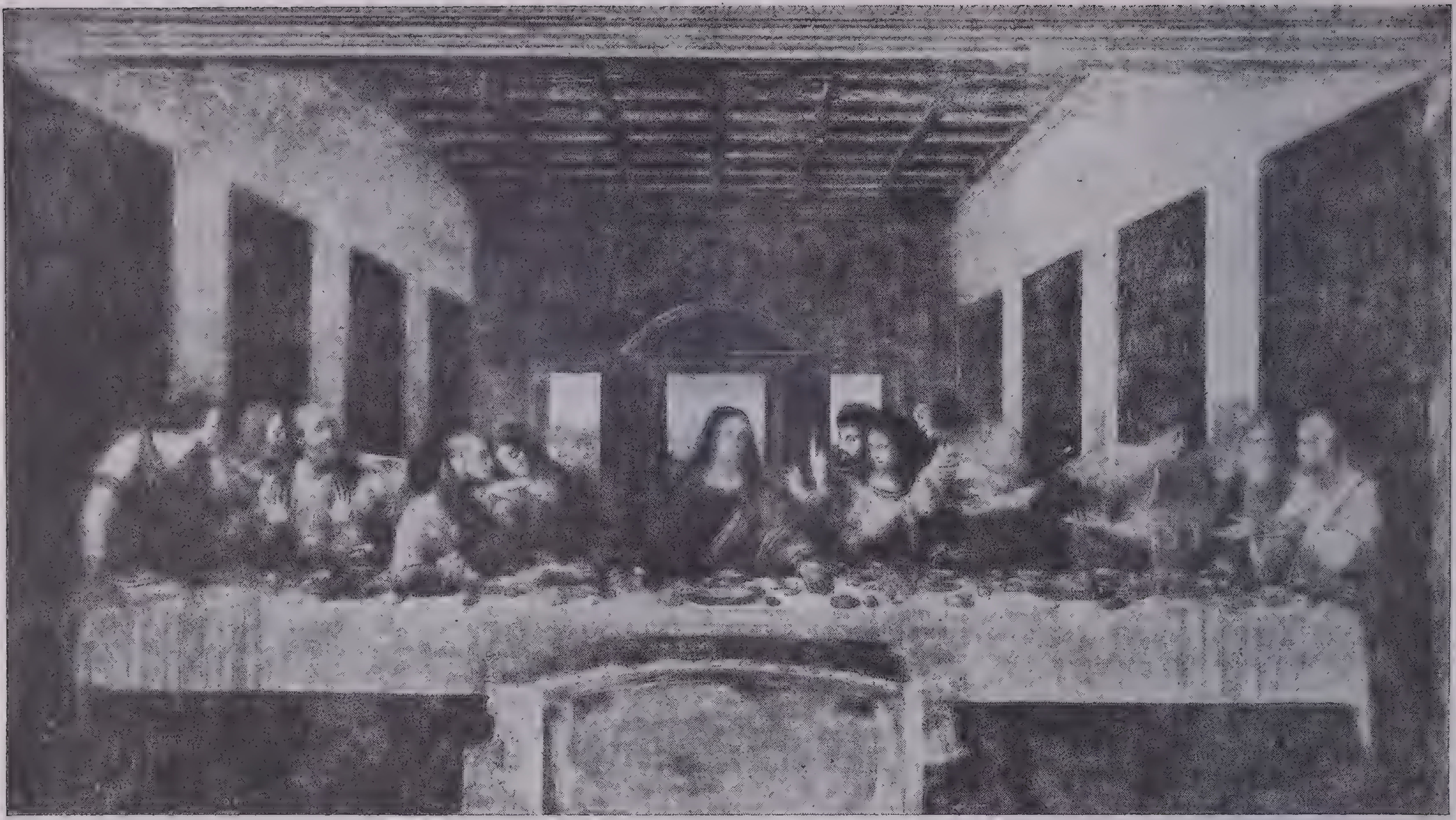
The 15th Century in Florence.—Masaccio came at the beginning of the 15th century and lived only 27 years. As one critic has said, he was Giotto born again and instantly making his own all that had been gained in the years that came between. His figures are majestic in their breadth and mass; they look like real people, and one can move around and among them. Both architecture and landscape assume a more normal relation to the figures; there is deep space and atmosphere—objects become increasingly blurred as they retreat. Lighting has logical direction, and tonal shadowing begins. There is interest in the nude and in facial expression; and the storytelling is as simple and direct as Giotto's.

As far as the religious subject is concerned, Masaccio is a true child of the approaching Renaissance. He converted legendary materials into intimate stories of man and his immediate world. At times he even let religious meaning be obscured by some human element, such as the powerful realism of a naked man shivering with cold in his *St. Peter Baptising the Heathen.* As the century advanced, the religious subject yielded more and more to other interests. Portraits became common, with plain or landscape background. There were battles, tournaments, historical scenes and finally many subjects from ancient Greek and Roman literature, then being eagerly read in the great revival of classical learning that was the dominating characteristic of the Renaissance.

All through the 15th century painters thought about the same things as did Masaccio. There were exceptions, it is true. The monk, Fra Angelico, for instance, somewhat older than Masaccio, showed in certain works that he was not unaffected by the new realism; but he preferred a pattern of rhythmic line and of bright harmonious colors. He is always deeply religious and has something in common with the spirit of Siena and also with the earlier illuminators of manuscripts. He recently has gained in stature, as art lovers during the 20th century have returned to appreciation of formal and spiritual values as against realistic; and he now takes a place with Duccio and Giotto among the foremost masters of the early Renaissance.

LATER ITALIAN PAINTING

Early Renaissance in Florence.—For the most part, however, 15th-century painters carried forward the interests of Masaccio. They were not content with expressing the large essentials of form, movement and decoration. They studied anatomy because they wanted to be able to show the body in every variety of posture and of movement. They studied perspective to help them in showing the changes that objects undergo as they appear at increasing



Courtesy Metropolitan Museum of Art

The Last Supper by Leonardo da Vinci

On the fading and fast-crumbling walls of the old refectory of Santa Maria delle Grazie, Milan, is painted one of the great masterpieces of the world, Leonardo's *Last Supper*. Christ is shown just as He is pronouncing the words, "One of you shall betray me." The Twelve Apostles as the artist envisioned them at this moment are: *John,* to the left next to Christ; *Simon Peter,* with his hand on John's shoulder; *Judas* leaning on the table and sitting between John and Peter; *Andrew* next to Peter, with his hands upraised; *James the Younger,* the brother of Jesus (Matthew 13: 55; Mark 6: 3), and *Bartholomew,* standing at the foot of the table. To the right are: next to Christ *Thomas,* with his hands pointing up; *James the Elder; Philip,* with his hands to his breast; *Matthew,* facing the extreme right but with one arm extended to the left across the table; *Thaddeus* (*Jude*), white-bearded, whom Matthew is addressing, and *Simon the Cananaean,* bald, the last figure to the right. *The Last Supper* was painted between 1494 or 95 to 1497

distance from the eye. They were ambitious to represent deep space, the vista of a long room, the far-sweeping Tuscan landscape. Sometimes they were so intent upon what they were representing that they quite forgot design and became recorders of facts instead of artists. But this was not true of the greatest men of the school. Their ability to show deep space and movement and three-dimensional form only added to the richness and variety of their expression and design,

Uccello (1396–1475) had a passion for perspective and is sometimes rather amusing in his exaggeration of the rate at which his distant hills recede, and in those battle scenes where he fills the ground with broken lances, armor, dead cavaliers—all directed toward the "vanishing point." But he used the new lines and spaces to make very rich pageantlike pictures.

Most powerful of all the realists was Andrea del Castagno (1390–1457) who knew all the secrets of bone and muscle and built up three-dimensional forms of tremendous vigor and powerful design. Antonio Pollaiuolo (1429–98) made a systematic study of anatomy. He contributed an extraordinary knowledge of movement, especially of the nude figure fighting, wrestling or in other violent action.

Piero della Francesca (*c.* 1420–92), although an Umbrian (the Umbrian school derived originally from Siena), was in spirit Florentine. He wrote a treatise on perspective, but apparently his scientific interests only helped him as an artist for he became one of the greatest designers of his day.

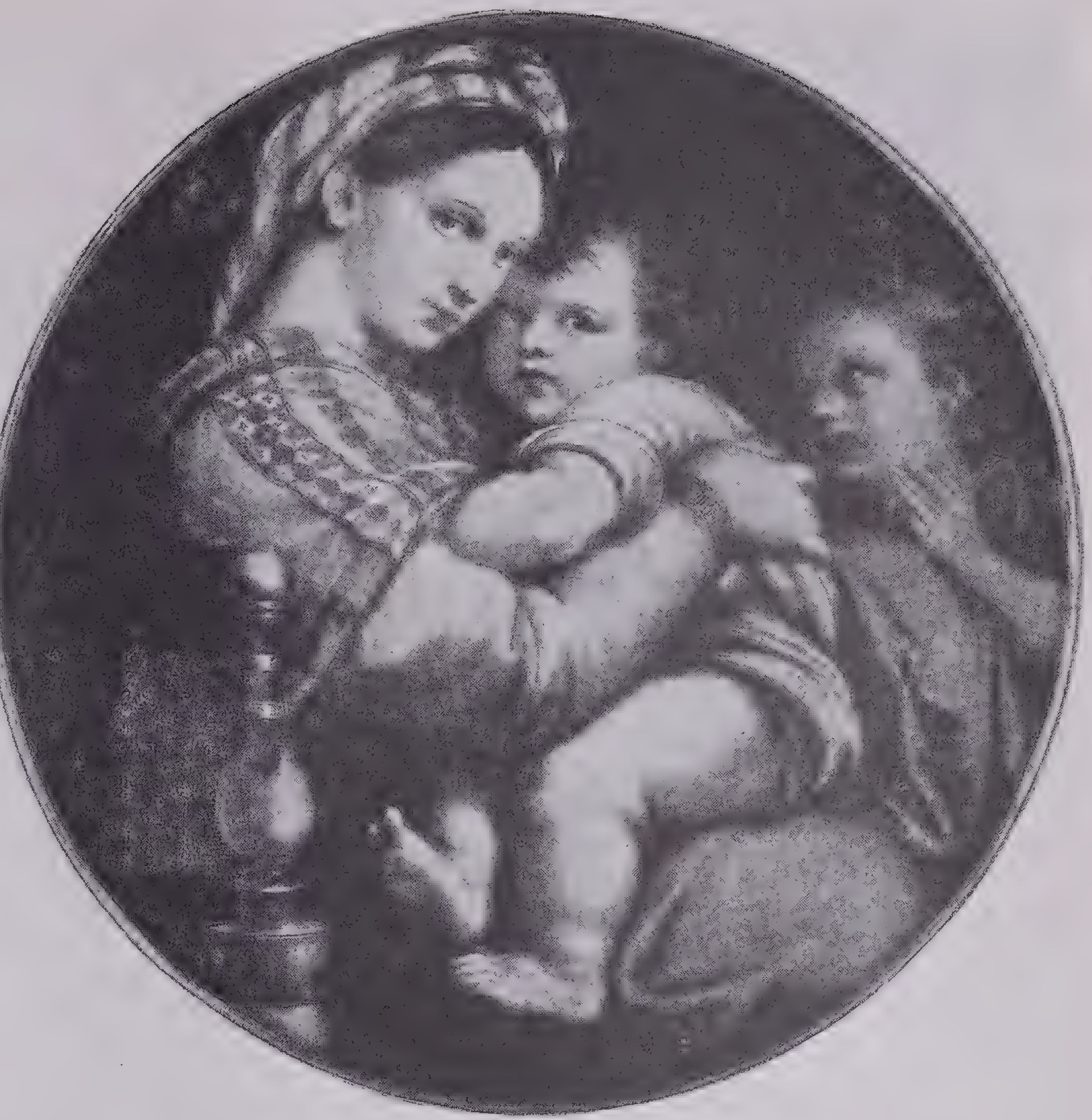
However, not all painters made contributions of this sort. Many, notably Fra Filippo Lippi and Ghirlandaio, were content with illustrating the stories and depicting the panorama of the Florentine life of their time and humanizing further the Christian stories. Especially do individual Florentines live for us in the amazing portraits of Ghirlandaio.

High Renaissance in Florence.—Botticelli and Leonardo da Vinci both lived into the 16th century. Botticelli (*c.* 1447–1510) springs from Fra Filippo Lippi and Pollaiuolo, and his early work is what one might expect from an accomplished painter with his training. But he turned aside to indulge a passion for movement, not only of moving figures and fluttering draperies but also of pure line—long and quiet or swiftly changing as a flame. He was quite willing to distort the figure, twist and bend it, lengthen legs and arms, if thereby he might weave his lines into a more living arabesque. He gives us idylls of the ancient world. Venus, born of the sea, sails shoreward, lightly poised upon a shell and wafted by the winds; or she watches the coming of Spring, blown in by the West Wind, while Flora scatters flowers and the Graces dance for Mercury. But these visions of the ancient world are seen through Tuscan eyes and are tinged with melancholy, even though the scenes are dressed in the rich trappings of Florentine court life.

Leonardo da Vinci (1452–1519) cared for light and shade as Botticelli cared for line, not only for the sake of form but for its own sake, for the pure melody of its gradations. Leonardo without a trace of effort exploited all that the Florentines had achieved in representation since the days of Giotto. His figures surpass any before in delicate modulations of light and shade that suggest flesh as well as bone and muscle. His outlines waver in a veil of atmosphere. Landscape backgrounds, filled with air, recede into a luminous distance. Oil painting, which had come in during the 15th century, made possible a softer edge than tempera. His religious subjects are very human. His Christ Child is a real baby. His *Last Supper* is a dramatic rendering of the effect on the Twelve of one startling sentence, "One of you shall betray me."

High Renaissance in Rome.—Michelangelo (1475–1564) was unlike Leonardo. He was chiefly a sculptor and wanted no lost edges or veil of air to soften the massive bulk and structure of his figures. He bends them back and forth in space in splendid balanced designs and stops at no exaggeration that would increase the solid weight or rhythm of their forms. His great work in painting is the ceiling decoration of the Sistine Chapel in Rome. A multitude of gigantic figures are held together by moving line and a subdued color tone of gold and violet. The subject is the drama of Genesis, the Creation and Fall and man's continued struggle. Painted architectural motives and nude figures connect the paintings, and supporting this framework are great seated sibyls and prophets. Michelangelo is the culminating figure in Florentine expression of form and surpasses all his predecessors in imaginative vision.

Raphael (1483–1520) was not a Florentine but went to Florence in 1504 and fell under the spell of Leonardo and Michelangelo. He was Umbrian and reflects all the influences of the Umbrian school—Sienese line and pattern, sweetness of facial expression and fondness for space—modified by Florentine realism. Raphael was always the skilful adapter of traits of other men, but he did create a combination that was quite his own. In 1508 he was called to Rome to decorate certain rooms in the Vatican, and it is in his great murals there and in his masterly portraits rather than in his storytelling pictures and long series of Madonnas that his real achievement lies. He went farther than had any earlier artist in detailed naturalistic representation, and he had an extraordinary sense of balanced surface composition. He was, too, the culminating figure in the refinement of the technical means of the painting art; his religious pictures have attained unrivaled popularity.



Madonna of the Chair by Raphael

One of Raphael's most famous Madonnas, the *Madonna of the Chair,* in the Palazzo Pitti, Florence, was painted shortly after 1513, at the order of Giovanni de' Medici

Early Renaissance in Venice.—In Venice there was such close relation to the East that the Byzantine influence toward formalism lasted longer than elsewhere in Italy. In the 14th century it was softened by a new realism more suited to this gay, luxurious, nature-loving people. But it was not until the early years of the 15th century that Venetian painting was really stirred into new life. Then Sienese and Florentine traditions were brought to Venice through the visiting Umbrian painter, Gentile da Fabriano, and his Verona follower, Vittore Pisano.

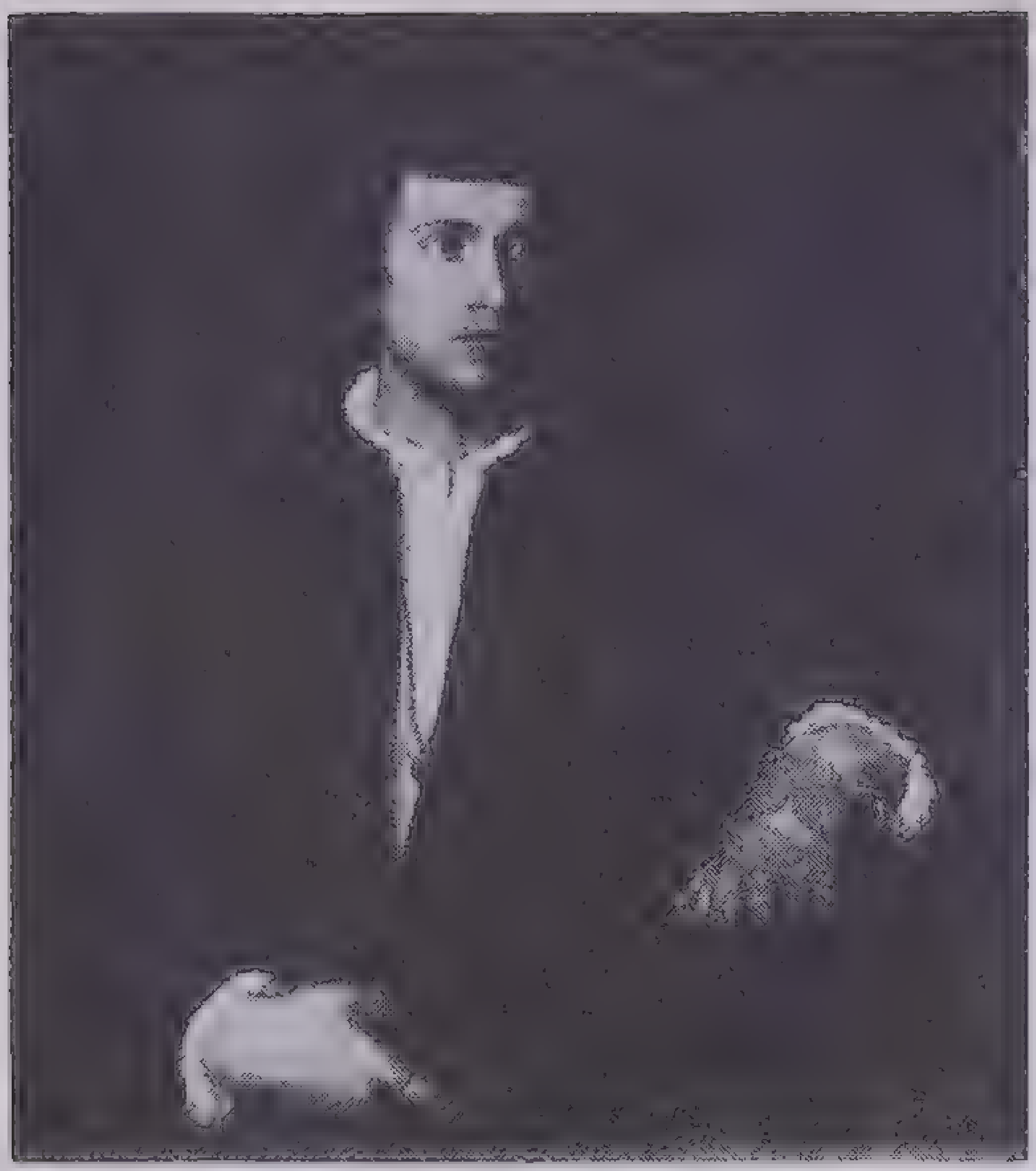
The movement was carried on by Jacopo Bellini, the so-called father of Venetian painting, and his sons Gentile and Giovanni. Jacopo's daughter married Andrea Mantegna of Padua, and this brought a fresh outside influence into Venice. Padua more than any other Italian city was under the spell of antiquity. Mantegna studied Francisco Squarcione's famous collection of ancient sculpture, and whenever possible he used in his paintings Roman architecture, costumes and details of every sort. His fine form did not come from the antique alone—he knew also the frescoes of Giotto in the Arena Chapel and other work from Florence.

The early works of Giovanni Bellini echo the Paduan style of Mantegna with its hard linear documentation and its accentuation of contours. But gradually Giovanni begins to modulate his light and dark, to clothe with flesh the skeleton. His style broadens; rich color takes on the beginning of Venetian glow; pastoral backgrounds foretell Giorgione's poetic landscapes. Giovanni lived to be 90 years old and took part in the whole development of Venetian painting from the Paduan influence to the triumph of those broad, simplified surfaces of light and color, with edges lost in atmosphere, that were created by his great pupils, Titian and Giorgione.

Venetian painting stands primarily for glorious color and masterly formal organization. It never deserted the solid structure of the body but saw it in terms of light and color. It did not emphasize line as Florentine painting did. Line, color and strong rhythms of dark and light entered together into Venetian design. Oil technique was very helpful in producing effects of light and space. Venetian art was not religious; it was quite worldly and delighted in depicting the joy of living. The Venetian loved beautiful textures, picturesque costumes, architecture, processions and pageants, civil or religious. He treated religious subjects in an intimate, everyday fashion. Vittore Carpaccio's *Vision of St. Ursula* becomes a detailed picture of a Venetian room in early morning light, with a young girl asleep, and the visiting angel is merely introduced in one corner. The altarpieces of Madonnas and saints are in reality pictures of happy, healthy Venetians. Symmetry of design disappears in favor of an equally well-balanced but more natural grouping. There is new emphasis on the nude and on landscape. But most notably there are more opulent color, richer pageantry and a certain symphonic grandeur of design.

High Renaissance in Venice.—Giorgione (*c.* 1478–1511) abolishes the edge, discovers the color in deep shadows, builds his forms in broad masses of rich, glowing color. In his *Sleeping Venus* (probably completed by Titian) he also weaves his lines into fine rhythmic pattern. Landscape is a natural outcome of feeling for color and light. It is not so much a mere background as in Florentine painting; the figures are not in front of it but often in it. Giorgione made the greatest progress up to this time in landscape—luminous distance, luxuriant trees or bare trees patterned against the sky, the heat of a summer day or the cool of evening, the lightning flashes of a coming thunderstorm. His portraits have a mood of reverie, his Arcadian idyls belong to some past golden age.

With Titian we reach the climax of the Venetian school. He was born a year before Giorgione and outlived him 66 years, dying in 1576, aged 99. At first he resembles his master Bellini, then Giorgione. But gradually his own personality asserts itself—he changes from the lyrical to the



L'Homme aux Gants by Titian
The Man with Gloves (*c.* 1518–21) is in the Louvre

more dramatic style shown in the vigorous action and exuberance of his *Bacchus and Ariadne.* His work is more elaborated and more powerful than that of Giorgione, more solid and real and still more splendid in color. His range is vastly greater. He left a huge number of works of all kinds, portraits, altarpieces, nudes, classic myths and great decorations. He can be thoughtful and profound, as in the splendid *Entombment* of the Louvre; his portraits are intense and vivid studies of character. His large altarpieces, although often grandiose, are always rich designs in line, light and color. But perhaps most typical and most popular are the allegorical and pastoral pieces in which the nude figure is presented with unparalleled dignity, opulence and even nobility.

Il Tintoretto's style is quite different. There is no trace of calm and serenity. All is tremendous energy, movement and drama, due largely to the brilliant lighting of parts and their dramatic contrast with shadow. Tintoretto achieves a sense of deep space within his canvas, and he manipulates swirling lines, receding planes and figures touched by flamelike lights in a sort of symphony of movement. He also uses his brush in a new way, with evident delight in the strokes as such.

Veronese, who came from Verona to Venice in 1528, painted enormous canvases of great decorative richness—usually very spectacular pictures with imposing architectural backgrounds giving the illusion of great space. He turns the *Last Supper* and the *Marriage at Cana* into contemporary Venetian banquets. He does not retain the Venetian glow but paints in cooler tones, and he is a lesser master of plastic design.

Decadence in Italy.—The decline of painting was not so rapid in Venice as elsewhere in Italy. Even in the 17th century Venice produced sound painters and in the 18th had a brief but brilliant renaissance of which Tiepolo, Canaletto and Guardi were the masters. The decline everywhere began with the imitation and exaggeration by lesser men of the obvious traits of the great masters of their time: Michelangelo's muscles and twisted torsos, Raphael's "ideal" figures and grace of line, Correggio's light and shade. Correggio's influence was especially destructive. He was a north Italian painter who lived in the first half of the 16th century. In certain churches he actually painted away the architecture, giving an illusion of real figures soaring into clouds with hosts of angels. He also did a series of illustrations of the Greek myths, with charming rhythmic figures of exceptional sensuous charm. His light and shade, derived from Leonardo but carried further, lent itself to very sentimental and exaggerated treatment by his followers.

The Eclectics (meaning "choosers") tried to revive art by combining "the line of Angelo, the color of Titian and the grace of Raphael," but their ambition was not rewarded. There was one new movement in the 16th century in revolt from the artificiality of the decadence—that of the Realists headed by Caravaggio of Naples, who painted murders, quarrels and the like and used even for his religious paintings Neapolitan types of the day. These he painted with striking effects of narrow streaks of light coming out of dense shadows and with very limited color. His treatment by emphasized light was later to influence Rembrandt and Velásquez and thus be passed down to modern art.

MEDIEVAL PAINTING IN THE NORTH

By northern painting we mean chiefly that of England, France, Germany, the Netherlands and Spain. Not many mural and panel paintings of the period before the 15th-century Renaissance have survived. But there are many paintings in illuminated manuscript books throughout the Middle Ages and also considerable stained and painted glass of Gothic period in which we can trace a continuous history of the art.

The manuscript books were the product of the monasteries, written and illuminated by the monks who civilized and Christianized the men of the North and preserved for them the remains of ancient culture. Some were copies of old Greek and Roman manuscripts, but most of them were religious books: Bibles, lives of the saints, books of devotion, service books for the church. The paintings in them were a mixture of the native art of the North and the traditions brought from Rome and Byzantium.

Celtic Painting.—The chief quality of native northern art was linear movement. In Ireland and England this was most developed. Irish painting is entirely unrealistic, mostly pure ornament. Ribbons and spirals are elaborated with animal features; birds, dragons and serpents are stretched into patterns, their tongues and tails prolonged into ribbons interlaced and tied with wonderful dexterity. Human beings become purely geometrical figures very much like the kings and queens of playing cards. The unity lies in the continuous, rhythmic movement. The most important manuscripts preserved belong to the 7th century A.D.

Continental Painting.—When Charlemagne restored the Roman Empire (800 A.D.), he wanted to make his court at Aix-la-Chapelle (now Aachen in Germany) the home of all the ancient culture that had survived and the center of a new culture that would radiate to all parts of his empire. To that end he gathered scholars and artists from Italy, England and Spain. The pictures in the magnificent volumes executed at his court show a curious mixture: Celtic ornament combined with classical and Byzantine, stiff Byzantine portraits of Evangelists in frames of architecture or perhaps with a perspective background that hints of Hellenistic sources.

Away from Aix, especially at Reims, we find the old Hellenistic naturalism preserved. This is especially true of illustrations in the *Utrecht Psalter* (9th century). It shows an immense number of small, restless figures in the most lively action, draperies fluttering wildly, in a spacious landscape that looks like windswept dunes.

The style of the *Utrecht Psalter* had an enlivening influence on painting after Charlemagne's time, and when it was imported into England in the 10th century, its rhythmic linear movement proved so agreeable to Anglo-Saxon artists that it became the favorite style for 2 centuries. And when England was brought into the fold of the continent by the Norman invasion of the 11th century, the linear style returned to the continent and influenced Romanesque painting and sculpture in France.

Gothic Painting.—For the arts the 12th and 13th centuries are periods glorious and unique. Architecture dominated, but sculpture, painting, illumination, stained glass, tapestry, embroidery and all the allied crafts were joined in an amazing unity. Its center was no longer the monastery but the town and the cathedral. The artists were laymen instead of monks. Subject matter was no longer exclusively religious; manuscripts, for instance, included historical, literary and scientific subjects. As the cathedral rose to dizzy heights, and the openings grew larger, painting was transferred from the walls to the glass of the windows. More splendid color has never been produced, and the French cathedrals particularly are still visited by art pilgrims from all parts of the world.

The colors are luscious shades of rich reds and deep blues, yellows and greens in smaller quantity. The pieces of colored glass are very small, and when from a distance the difference between the colors is lost, the whole becomes a purple of wonderful richness. Details were painted in brown enamel on the colored glass and then fired, thus fusing enamel with the glass. The figures, always small in the early 12th-century glass, were used in a series of medallions, each one telling some sacred or legendary story. Thirteenth century glass was much the same except that some larger figures appeared. In the 14th century large figures were predominant, and shadows and relief appeared as did a whole range of delicate half tones; but the glory of the earlier centuries had vanished.

The Thirteenth Century.—For painting proper our chief source is still the manuscript. Books became small in this century and pictures delicate and minute. Books were resplendent with burnished gold and rich colors, especially blue and red, reflecting the brilliance of stained glass—black outlines even suggesting the leading of the glass. Backgrounds were commonly of gold, blue or red, with no suggestion of surroundings other than perhaps a tower or patterned tree. Later in the century the little figures became supple and delicate in body and feature, slightly modeled in color and took on a certain gentle gayety—in form and spirit they resembled Gothic sculpture.

Fourteenth Century.—Naturalism increased. Drawing became more flexible, lines more flowing, the figure elastic and swaying, the narrative more lively. Colors were still rich but more varied. Modeling created an effect of third dimension. Backgrounds became elaborate with stippled gold and patterns. Occasionally they were broken to admit a bit of landscape or interior view. By the 15th century the formal background yielded entirely, and the figures took their place in natural surroundings, interior or landscape. The range of subject matter became broader.

In the late 14th and 15th centuries literary and historical works increased, and manuscript books of all sorts were made in great numbers, not only for churches and monasteries but especially for the magnificent libraries of the princes and nobles. In the 14th century we can trace the gradual changes that mark off English, French, Flemish, Dutch and Spanish manuscripts as the life of the different countries takes on distinct national character. In general we may say that illuminated manuscripts, with their rich imagination, fine craftsmanship, brilliant colors and lavish gold upon the silken texture of fine vellum, are among the most exquisite remains of the Middle Ages.

NORTHERN RENAISSANCE PAINTING

Paris was the great artistic and intellectual center of the 14th century, and a brilliant French Renaissance was about to unfold there when civil war and later disasters plunged France into misery. The Renaissance of northern painting took place in Flanders and in Burgundy at the hands of Flemish artists. In the 15th century the dukes of Burgundy had united under their peaceful and prosperous rule all the Netherlandish provinces. Netherlandish art flourished, and even the manuscripts of the great French patrons were done by Flemish painters. (Flemish is a time-honored term for the art of the whole Netherlands until the 17th century when the term Dutch is used for the separated provinces—Holland—in the north.)

Panel paintings had been increasing in the 14th century, but the 15th was their real flowering period. Paintings were now made for the home, guild hall and town hall as well as for church and chapel. Religious feeling was still fervent but no longer dominated. Art tended to become a record of the splendor and great wealth of princely merchants and manufacturers.

Flemish Painting, 15th Century.—The earliest important Flemish painters were the brothers Hubert and Jan van Eyck, whose altarpiece at Ghent, *The Adoration of the Lamb,* was all—and more—to the painting of the North that Masaccio's frescoes were to that of Italy. In this painting all the interests of the Flemish school are revealed. When the wings are opened, the color has the blazing splendor of stained glass. Above a great figure of God in jeweled robes is enthroned with Mary (a Flemish Virgin, fair and blonde) and John beside him. On either side are singing and playing angels in rich brocades heavy with gold embroidery and with jewels. Beyond are naked figures of Adam and Eve shown in stark realism. Below is a Paradise of green with violets, cowslips, daisies, roses and purple flags; in the far distance are the towers of a Gothic city and snowcapped mountains against a blue sky. In the meadow the angels with rainbow wings surround the Lamb on the altar. Hosts of worshipers stand and kneel —popes and cardinals, poets and philosophers—while from either side hermit, pilgrim and warrior saints wind through a wooded country toward the scene of adoration. On the outside of the wings are portraits of the donor of the altarpiece and his wife, solid, weighty forms, full of character.

These were the qualities handed down to northern painting of the 15th century by Hubert and Jan van Eyck: brilliant color; a painstaking realism; delight in the texture of stuffs, of jewels, wood and stone; a tendency to angular line pattern instead of curves; an enthusiasm for portrait and landscape. Jan van Eyck's little portraits are powerful renderings of individual character, unified in design in spite of their exact detail. Landscape was very spacious, with a high horizon giving what is often called *bird's-eye perspective* because the point of view is from a height. It was an assembled landscape in the sense that many bits studied from nature were put together in an imaginary whole.

The Van Eycks have been credited with the invention of oil painting. It was not oil painting in the modern sense but the use of an oil varnish mixed with the white or yolk of egg (or both) as a medium for the ground pigments. Probably the Van Eycks perfected this method, and it became the traditional technique of the North just as tempera was in the South before the introduction of real oil painting in the 16th century.

A quite different personality was Roger van der Weyden (*c.* 1400–64), whose home was in the southern part of the country and who was more French in temperament. His religious pictures express intense emotion and are bound together by a rhythmic flow of line. Dirk Bouts of Haarlem contributed to the color and light of landscape. Hugo van der Goes made further contributions to realism in his study of light and of everyday types of people.

Hans Memling, who lived some 50 years after Jan van Eyck, brought in more delicate transitions of light and dark. His figures have little weight or solidity—they are ethereal and otherworldly. His line is flowing, and his design is beautifully patterned. On the panels of a little shrine he tells the story of the martyrdom of St. Ursula and her 11,000 virgins in the spirit of a medieval fairy tale against a background of castles and cities and the swelling sails of boats. He is never dramatic, but he does impart a definite spiritual quality to his religious pictures even when he must introduce in the foreground careful portraits of the donor and his five sons and the donor's wife and her 11 daughters.

Flemish Painting, 16th Century.—Quentin Matsys, a transitional painter between the 15th and 16th centuries, played a role similar to that of Leonardo in Italy in humanizing and dramatizing the religious story, in his enthusiasm for light and dark and in his creation of form by softly modulated tones. Sometimes the genre element overwhelmed the religious sentiment, as in the case of a martyrdom of St. John in which the fiendish stokers are obviously of more interest to the painter than is the exalted saint in the caldron of boiling oil. The next step was to paint the genre subject for its own sake, and in this Matsys was the pioneer. Matsys has the color of the earlier men with more variety, shimmer and sparkle.

Bosch and Pieter Breughel were both from the Holland country. Bosch (*c.* 1462–1516) was the inventor of a world of nightmares and monstrous beings, of caricature and satire, but he was also a master of pictorial construction and carried on the splendid color tradition of his school. From him descended Breughel (*c.* 1525–69), humorist, satirist of the vices and foibles of humanity but a painter of such broad interests that he could turn from the most involved allegory to the depiction of a village fair, a peasant dance or a landscape more natural than any seen before. With Breughel landscape becomes truly local and believable instead of an imaginary assemblage of bits. Often he lowers the horizon line so that his perspective is from the normal point of view. He is distinguished for his light and color and for his spatial pattern. Recently he has been elevated by critics to a place close to the foremost masters of western painting. Expressionistic values were discovered in his paintings that were not recognized during the realistic centuries. Beyond his achievement of masterly formal organization, Breughel repays study for his typical Flemish characterization and human feeling.

Bosch died early in the 16th century; Breughel lived through the middle. Both men were the natural outgrowth of the Van Eyck tradition. But in the early years of the century there had developed a new and elaborate style that reflected the changing taste of the time. In this new painting there was an abundance of impossibly fanciful architecture, and saints and Virgin appeared in the latest fashions of the day. This extravagance was further complicated by Italian influence.

In the 15th century the Italians had been eager to learn the secrets of Flemish craftsmanship, but after the Florentine Renaissance had culminated in the achievements of Leonardo, Michelangelo and Raphael, the situation was quite different. Early in the 16th century the Flemings were fired with enthusiasm for Italian art, and there was a pilgrimage of artists to Italy with the most unfortunate results. They could not make their natures Italian, and the outcome was a strange mixture that sometimes reached the grotesque. They imitated the great compositional schemes of the Italians and especially their treatment of the nude; it became the height of ambition to be known as the Flemish Raphael. Probably the leading artists were Jan Gossart (otherwise known as Mabuse) and Bernard van Orley.

No period is wholly decadent, and there was some progress made, chiefly in greater breadth and freedom in representation. Pictures of contemporary life and portraits flourished. Landscape became of more importance than figure interest, thus pointing the way to the 17th-century development of landscape for its own sake with no figure interest at all. In this development, besides Breughel, Joachim de Patinir was important. He is accounted by some, indeed, as the first great western master of landscape. (In China this branch of painting had been practiced beautifully for many centuries.)

French Painting.—In France in the 15th century there are few famous names. There are a few outstanding anonymous paintings such as the great *Virgin of Pity* from Villeneuve, now in the Louvre, which illustrates perfectly the French style with its northern realism modified by feeling for line, its emotion and masterly arrangement. Ever since Simone Martini went to Avignon during the exile of the popes, there had lingered a Sienese influence very agreeable to the French temperament. In the course of the 15th century this yielded to realistic Flemish influence as shown in the work of Nicholas Froment. Jean Fouquet is the greatest French name of the century, a painter of simple and direct portraits and also of miniatures in manuscripts, some of which give intimate pictures of his country and his time.

In the 16th century France, like Flanders, was in the grip of Italianism. Italian artists were brought to the court to cover palace walls with paintings in the southern manner. Pictures of allegory and mythology with many nude figures grew common, but at the same time there was an intense enthusiasm for portraits. Jean Clouet, who was of Flemish origin, and his son François were the most famous of the portrait painters. Their portraits are light, delicate, with few colors and few lines, but they express the personalities of the aristocracy of the time with great vitality.

German Painting, 15th Century.—In the 14th century a school of painting had emerged from manuscript illumination, supposedly under the leadership of a Master Wilhelm of Cologne. The style of this school was not expressive of ceremony but rather of private devotion. There were small Madonna pictures for private oratories and Paradise pictures with Virgin and Child surrounded by saints in a medieval garden.

In 1430 Stephan Lochner, a stranger from Swabia, came to Cologne and became the leading master of the school. Lochner quite lacked the force and grandeur of the Van Eycks; he is simple and human with no trace of the austere realism of the Flemings. The Virgin sits in a garden, eyes lowered, smiling and ecstatic, holding the Child; small angels gather around her, painted in clear tones of red, blue, green and rose. Flesh tones are luminous, and the bright colors have a soft modulation.

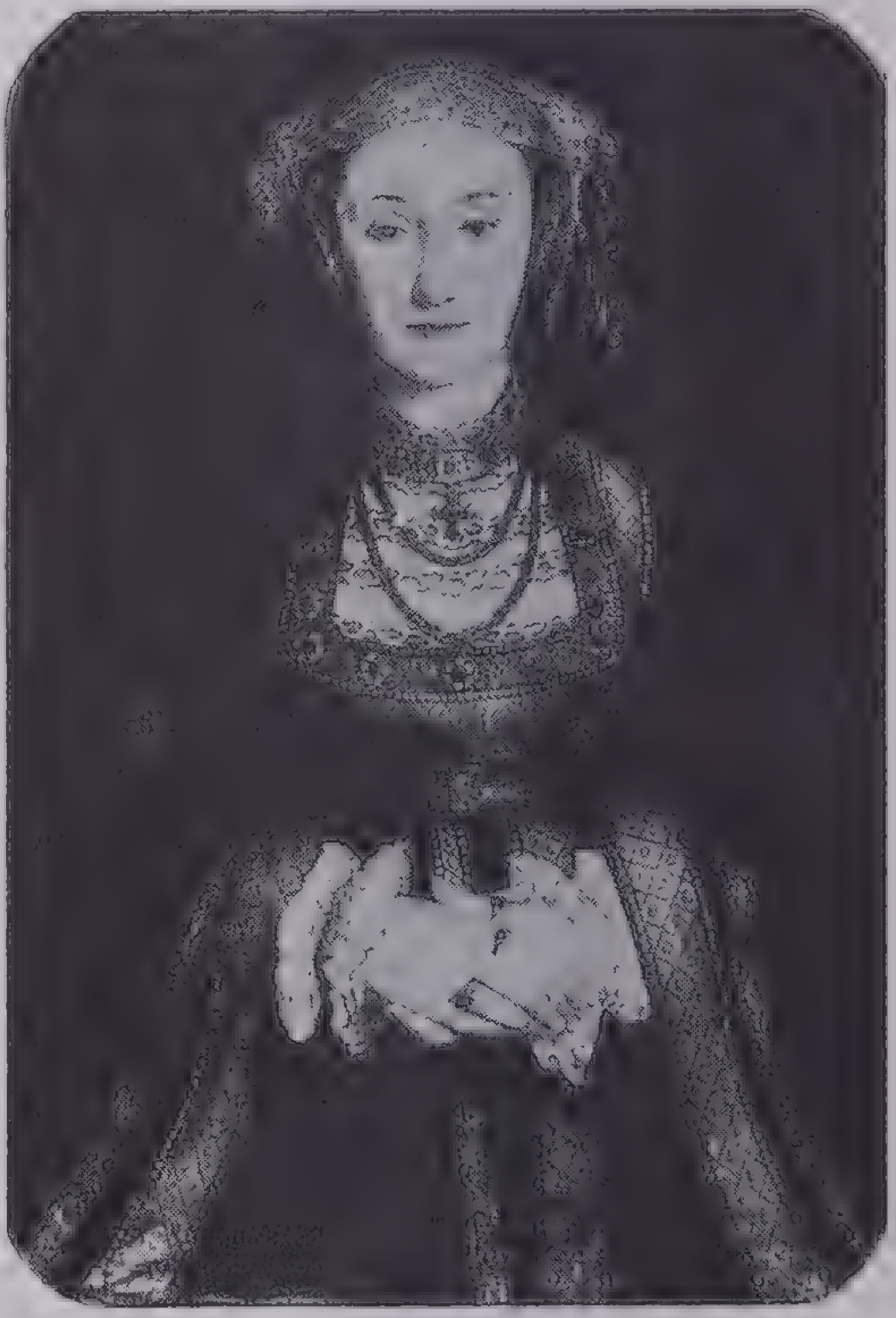
As the century advanced the religious story took on the flavor of everyday life; painting deserted the mystic garden and told new stories in the spirit of naturalistic observation. After 1450 Flemish influences, especially from Bouts and Van der Weyden, turned the school from 14th-century idealism and fondness for line to realism and modeling in light and dark.

From about 1480 Flemish influence, especially that of Van der Weyden, came to predominate in the South also. The most influential painter of this epoch was Martin Schongauer. In general the German schools may be distinguished from the Flemish by their heavier color, their angularities of gesture and attitude and their more crowded designs.

German Painting, 16th Century.—In the 16th century came the same Italianism that had overwhelmed the other countries. But several great artists learned from Italy and still maintained their German spirit. Chief of these was Albrecht Dürer (1471–1528), the learned artist of the time, curious, theoretical. He worked for a time in Italy and developed from the Venetians an absorbing interest in light. In spite of their extraordinary amount of detail his compositions are held together by a lighting that is emotionally expressive—somber gloom, unearthly glitter, soft sunshine. He absorbed all Italian progress in representation. He tried to carry his expression even to the point of symbolizing abstract ideas. He advanced from a very complicated style to the simple broad unity of his last powerful work, the *Four Apostles, John, Peter, Mark and Paul.* Today his brilliant and lifelike portraits are most appreciated among his paintings. He is even more celebrated for his engravings and ranks as Europe's foremost master of engraving on both copper and wood.

Contemporary with Dürer was Lucas Cranach, who as a painter was a more versatile master. He was an accomplished portraitist and painted some of the most distinctive and imposing of German religious pictures and (what is exceptional among northern artists) a series of naively charming nude Eves and Venuses.

Among others of the period Mathias Grünewald stands out as an exceptional colorist and a master of emotional expression. His colors and his dramatic forms can be agitating and harrowing, tragic and ecstatic. Grünewald as well as Dürer influenced Albrecht Altdorfer, who is known for the development of landscape for its own sake, though in a technique more fitting for a draughtsman than for a painter. Hans Baldung (known oftener as Hans Baldung Grün because he so loved the color green) was one of the greatest of German painters but left very few works that can be confidently identified as his.

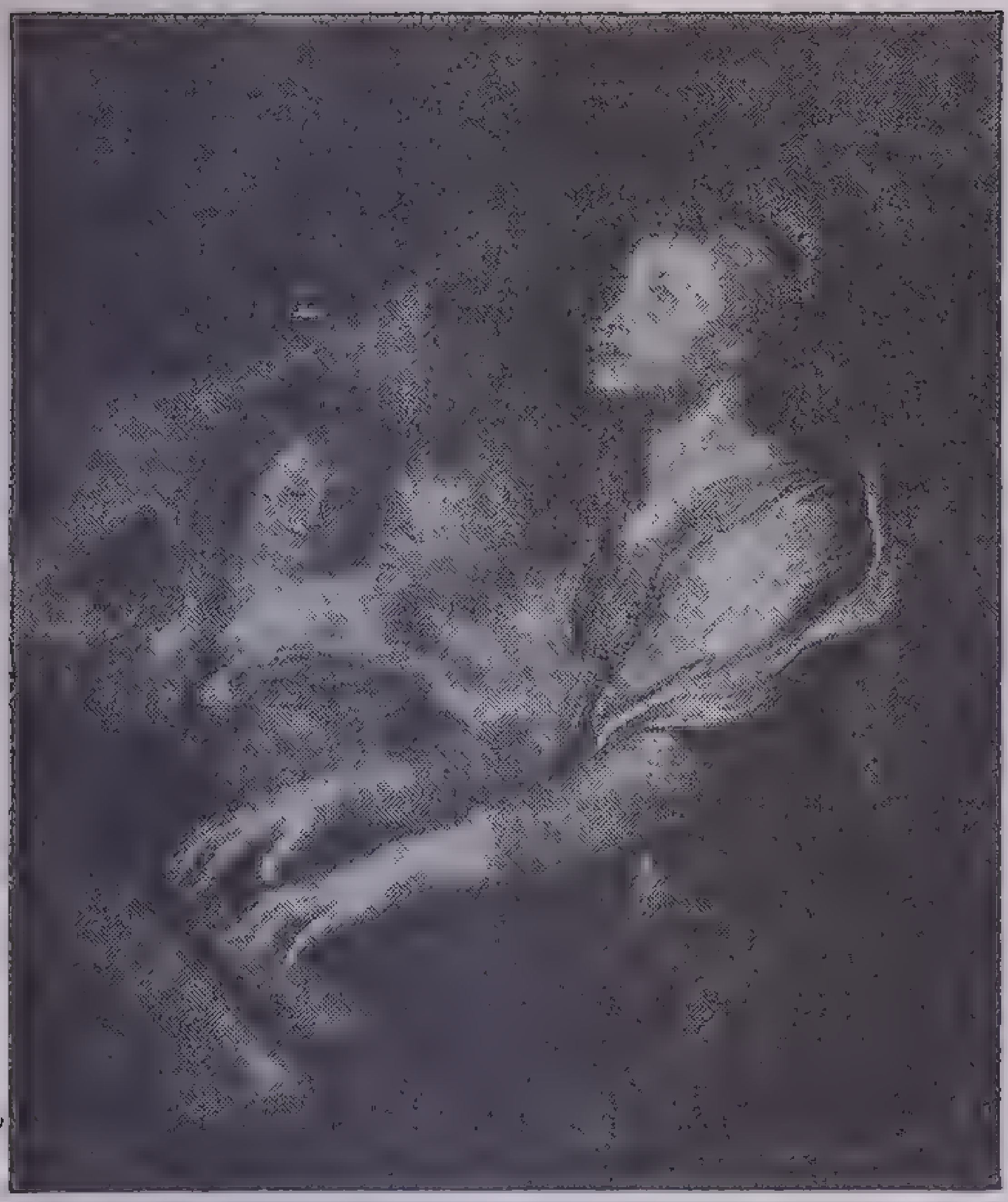


Courtesy Metropolitan Museum of Art

Anne of Cleves by Hans Holbein the Younger

The portrait of Henry VIII's fourth wife, painted in 1539, hangs in the Louvre. It portrays the queen dressed in crimson velvet against a peacock-blue background

Hans Holbein the Younger early fell under Italian influence and produced religious pictures in the southern manner. He was a second-rate painter in all but portraiture. In that field he became a master with an international reputation. After working in Germany and Switzerland he went to England and became court painter to Henry VIII. His gallery of painstaking and sensitive likenesses of notables of the time is endlessly interesting as a revelation of character and as an example of sustained craftsmanship. If his work lacked imagination, if it erred often in overdetail, Holbein is yet foremost among the world's realistic portraitists. One



Saint Cecilia by Peter Paul Rubens

Saint Cecilia plays the clavichord while two Cherubs join in the singing. This painting is in the Metropolitan Museum of Art, New York

must go to the Orient to find artists who could outline a contour of cheek or lip with equal delicacy and grace.

THE SEVENTEENTH CENTURY

In this century we find certan changes that contain all the germs of 18th- and 19th-century art. Interest in landscape led to a great interest in space. Il Tintoretto had carried his figures back into space; but beyond the figures space tended to lose reality. Certain painters of the 17th century carried their realization of depth even to the horizon. Space stretched out as never before, not in parallel planes as was usual with Renaissance painters, but through great diagonals or curves that led attention in and out of the picture field. Space existed between objects. Design was no longer a matter of the surface in relation to the rectangle of the picture but moved in and out of depth.

At the same time an absorbing interest in light and color tended to break down expression of space and volume in favor of a mosaic of light and color that anticipated the 19th-century impressionists.

Flemish Painting.—With the giant Rubens a new golden age of Flemish painting emerged from the 16th-century decline. Peter Paul Rubens, born in 1577, about the time of Titian's death, went to Italy and was able to assimilate Italian ideals without damage to his Flemish traditions and to pass on to later centuries the elements of both. He has Venetian feeling for color masses, with Florentine sense of form and expressive line; but Venetian glow becomes reddish with Rubens, the strong modeling is softened, line grows atmospheric and turns to shorter curves and double curves, and Venetian composition becomes more florid.

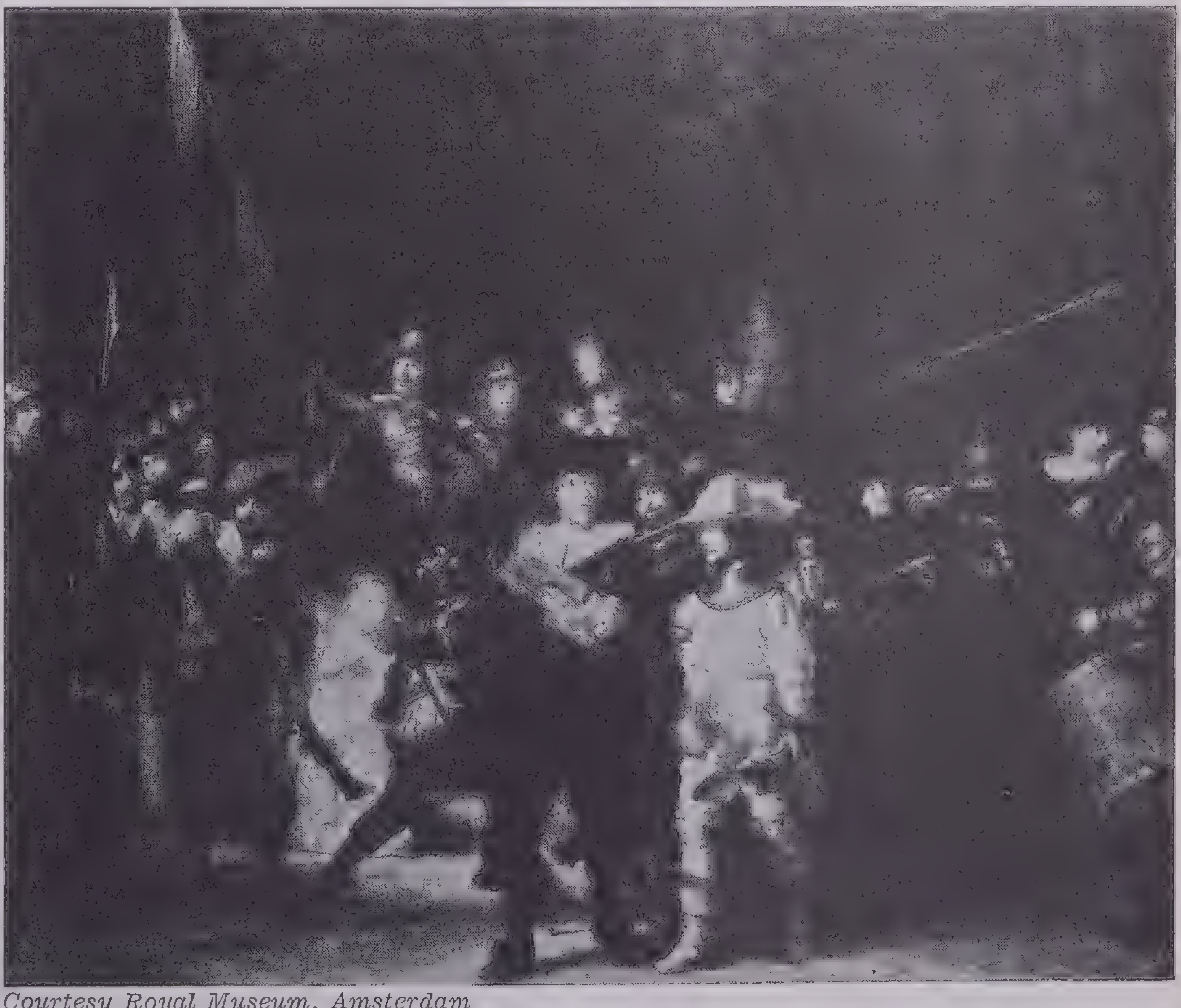
Whether he painted myths, battles, animals, markets, peasant fetes, altarpieces, landscapes, portraits, still life —everything is in movement; if it is not a drama of human beings in movement, it is a drama of moving color, light and dark and line. One has the impression of a great energy in continual transformation but of a controlled and ordered energy, for Rubens is a great designer—a designer in space—even to the smallest unit of his great canvases. His chief followers were Jakob Jordaens and Sir Anthony Van Dyck, the latter a very great master of portraiture; and after them came the Flemish decadence.

Dutch Painting.—In the 17th century the southern part of the Netherlands, modern Belgium, was still Catholic and was under the rule of Spain; but the northern Netherlands, modern Holland, had become Protestant and independent. There were no palaces for which the Dutch could paint and no churches, for Protestantism disapproved of the decoration of churches. Instead they painted for the private house, the town hall, the homes of the various guilds and institutions. There was great enthusiasm for paintings of everything that had to do with their own people and their own country, now especially dear to them in their new and hard-won independence. Artists began to specialize as painters of portraits, of landscapes, of genre.

Frans Hals, next to Rembrandt, was the greatest of the portrait painters. He has left us a transcription of the Dutch people, the merchants and their wives, the archers of the civic guard, directors of the poorhouse, a laughing servant, a jolly toper, an old witch with her owl. He is known for his vivid expression of life, due partly to catching his subject in a lively mood, partly to his vigorous and dashing brush strokes.

Rembrandt van Rijn (1606–69), the greatest genius of the Dutch school, painted not only portraits but scenes of everyday life, landscapes, still life and a vast number of religious subjects. These were not monumental paintings for the church but stories of the Old Testament, told with splendor of imagination and with feeling for the ancient East, and pictures of the New Testament in the simple spirit of the Gospels. He treats of all ages, all emotions and all conditions of people. Most of his early paintings were executed with a sober realism and attention to form in minute detail. But in 1642 in his *Sortie of the Civic Guard* he allowed himself, in his passion for light and dark, to forget the careful representation of form so dear to the Dutch heart. Only a few figures emerge clearly from the moving light and shadow—and the result was his immediate decline in popularity. Rembrandt's light is not natural but a glow that is all his own, with which he brings volumes from the shadows into golden light and then lets them retreat again into gloom. Sometimes his fascination with light so dominated that his lights and darks mass into patterns that quite obscure objects and foretell the complete visual impressionism of the 19th century.

The Dutch of the 17th century gave genre painting a distinct character. Their works are small, minute in technique, splendid in craftsmanship; placid little pictures that repeat over and over again favorite themes of peasant life, such as the fete, dance or market, or scenes from the home life of the rich burghers, as the music



Courtesy Royal Museum, Amsterdam

The Night Watch by Rembrandt Van Rijn

In 1642 Rembrandt painted *The Sortie of the Banning Cock Company,* now known as *The Night Watch* because the background darkened with the passing of the years. Twenty-nine members of this company of harquebusiers or civic guards are shown pouring forth from their clubhouse lesson and card party. The story is of little importance; the real concern is with color, texture and the decorative whole. The chief men were Gerard Ter Borch, Jan Steen, Jan Vermeer and Pieter de Hooch. The last two were fascinated with natural light, air-filled space, effects of sunlight. Vermeer could show the most delicate differences in value (amount of light) of every spot of color.

Of the Dutch landscapists, Meyndert Hobbema and Jacob Ruisdael were the greatest. Ruisdael studied the forms of trees and their manner of growth, the solid ground and vastness of the sky; his clouds have bulk and carrying power. Sometimes it is the country around his native Haarlem; again, with romantic imagination, he treats of strange rocks and hills and waterfalls.

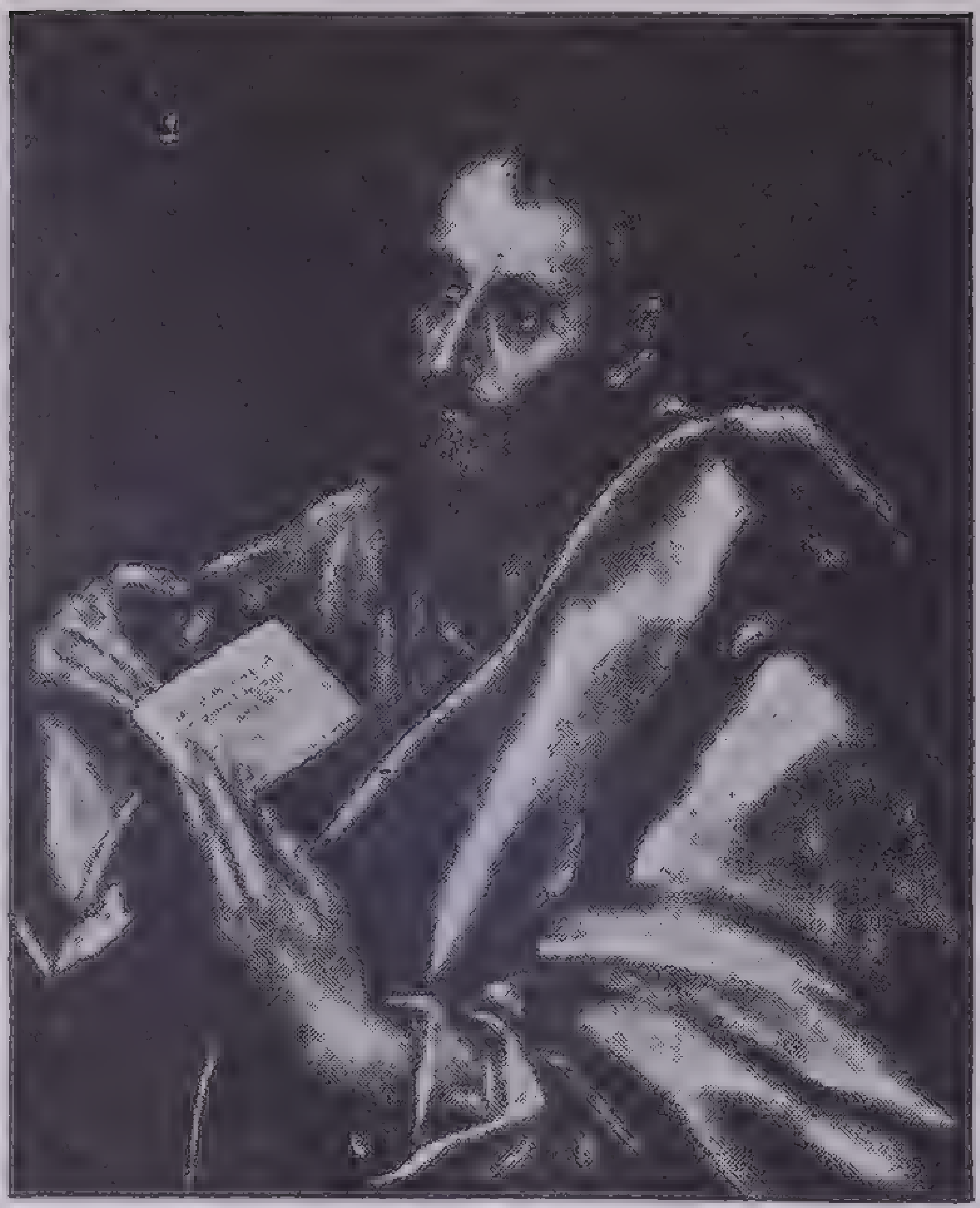
Realism did not extend to color; Dutch landscape, with few exceptions, transposed the colors of nature into a scheme of browns and brown-greens, sparingly enlivened with blue and red.

French Painting.—Italianism was less disastrous to France than to other countries. It continued even into the 17th century with happy results in the work of Nicolas Poussin and Claude Lorrain. Poussin, who preferred to live in Rome rather than in Paris, admired Raphael and ancient sculpture, and his work shows the spirit of the Italian Renaissance through French eyes. His sculptural figures are tied together in varied and rhythmical arrangements. His favorite subjects were stories of classical antiquity against a background of landscape carefully studied for its clouds, tree forms and the solid structure of the ground.

Claude Lorrain was primarily a landscape painter, although he always introduced some small and unimportant figure interest, biblical or classical. His special contribution lay in light and atmosphere. His landscapes are romantic, majestic, with great tree masses placed against a vast and mist-filled distance. Color is secondary, being submerged in a warm or silvery light enveloping the whole. For his fondness for introducing classical architecture he is often called the father of classical landscape. It is an assembled landscape, built on the study of nature but entirely imaginary in its final form.

Spanish Masters.—The history of Spanish painting during the Renaissance is largely one of foreign influences but of influences that immediately took on a Spanish character. They were Flemish in the 15th century—Jan van Eyck visited Spain—and Italian in the 16th. A distinguishing feature of Spanish style in the 15th century was the primitive fondness for gold backgrounds—plaster relief covered with gold. The eclectic Italians dominated the 16th century with their twisted torsos, exaggerated muscles, striking darks and lights.

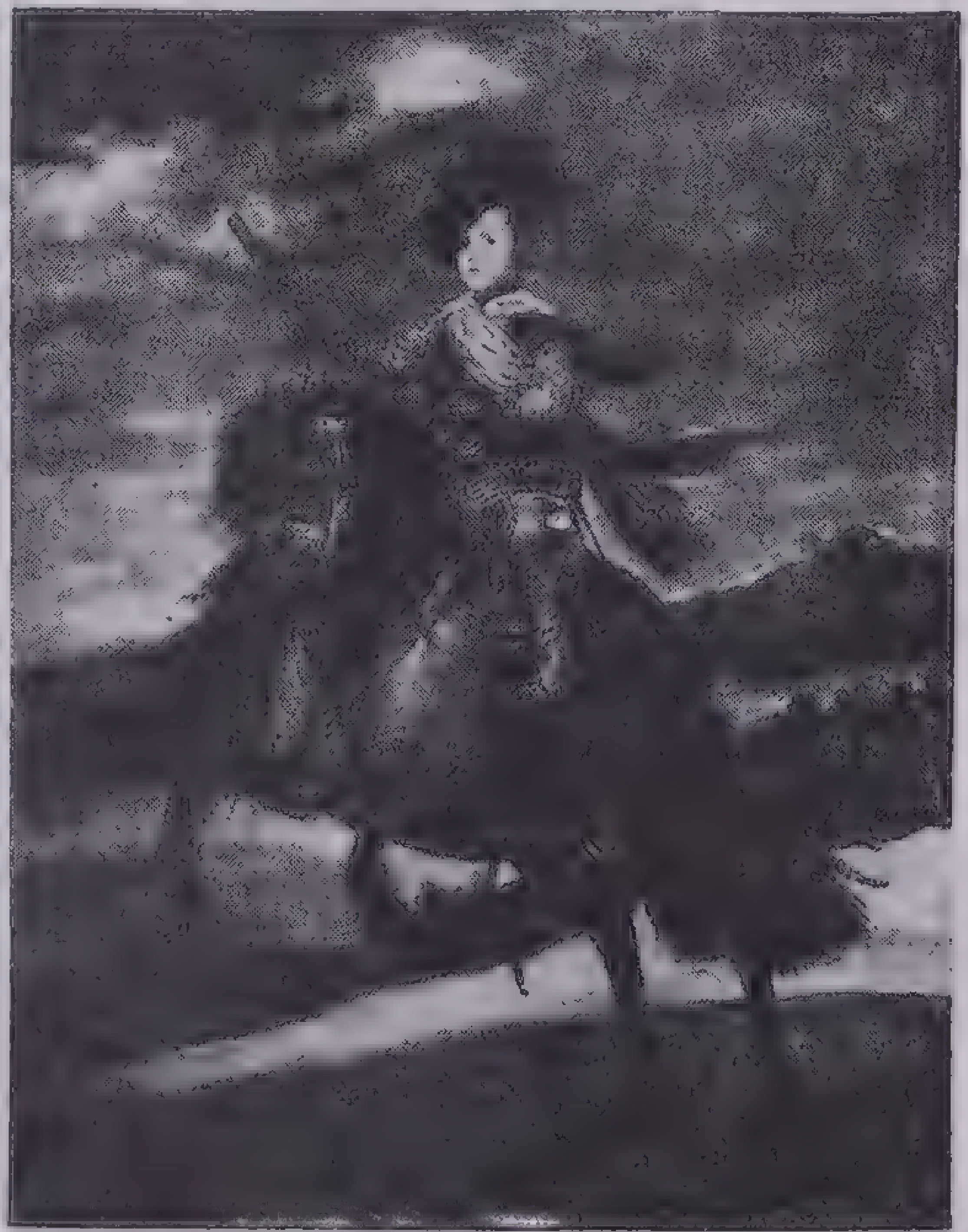
In the late 16th century there came to Spain a foreign painter, Domenico Theotocopuli. He came from Crete and was popularly called *El Greco* (The Greek). He had studied with Titian and knew the works of Michelangelo. In Spain his warm Venetian colors cooled, became dulled with black, and his whites became silvery. More than any other painter he expresses the religious emotion of the Spanish temperament. He is unique in the restless, flamelike rising of his forms, the flickering lights, the elongated, undulating bodies that he does not hesitate to bend at will. From these he created formal organizations, dynamic and powerful, unsurpassed in the whole range of world art.



St. Paul by El Greco

A portrait painted 1598–1600, now in the City Art Museum, St. Louis, Missouri

El Greco worked into the 17th century. Quite unlike him were the realists, Francisco de Zurbarán and Velásquez, who lived some 50 years later. Velásquez began as the accomplished student of all the traditions of his time. Later in his life he became court painter of Philip IV of Spain, and in the long series of portraits of the king and queen, the infantas, dwarfs and the whole nobility of the Spanish court, he revealed himself in a new and individual manner. In the cool, diffused light of the Spanish palace there were no strong shadows to throw forms into relief; instead they tended to appear as color masses of various degrees of light. Velásquez became engrossed with purely visual impressions. So sensitive was he to the exact relations of values that at times he produced an uncanny illusion of space; but he did it solely with his color and not with line or shadow. He was never a mere reproducer of nature's light and color but achieved a decorative unity by arranging his masses of color and light in finely balanced patterns. He grew fond of low-toned colors, casting aside the warm glow of the Italians for cool subtleties of blacks and whites and silver grays, with notes of rose, red, blue and yellow. Velásquez's color-studies had some influence two centuries later upon French painting, particularly through Manet, and he is sometimes called one of the fathers of Impressionism.



Courtesy Metropolitan Museum of Art

Don Balthasar Carlos by Velásquez

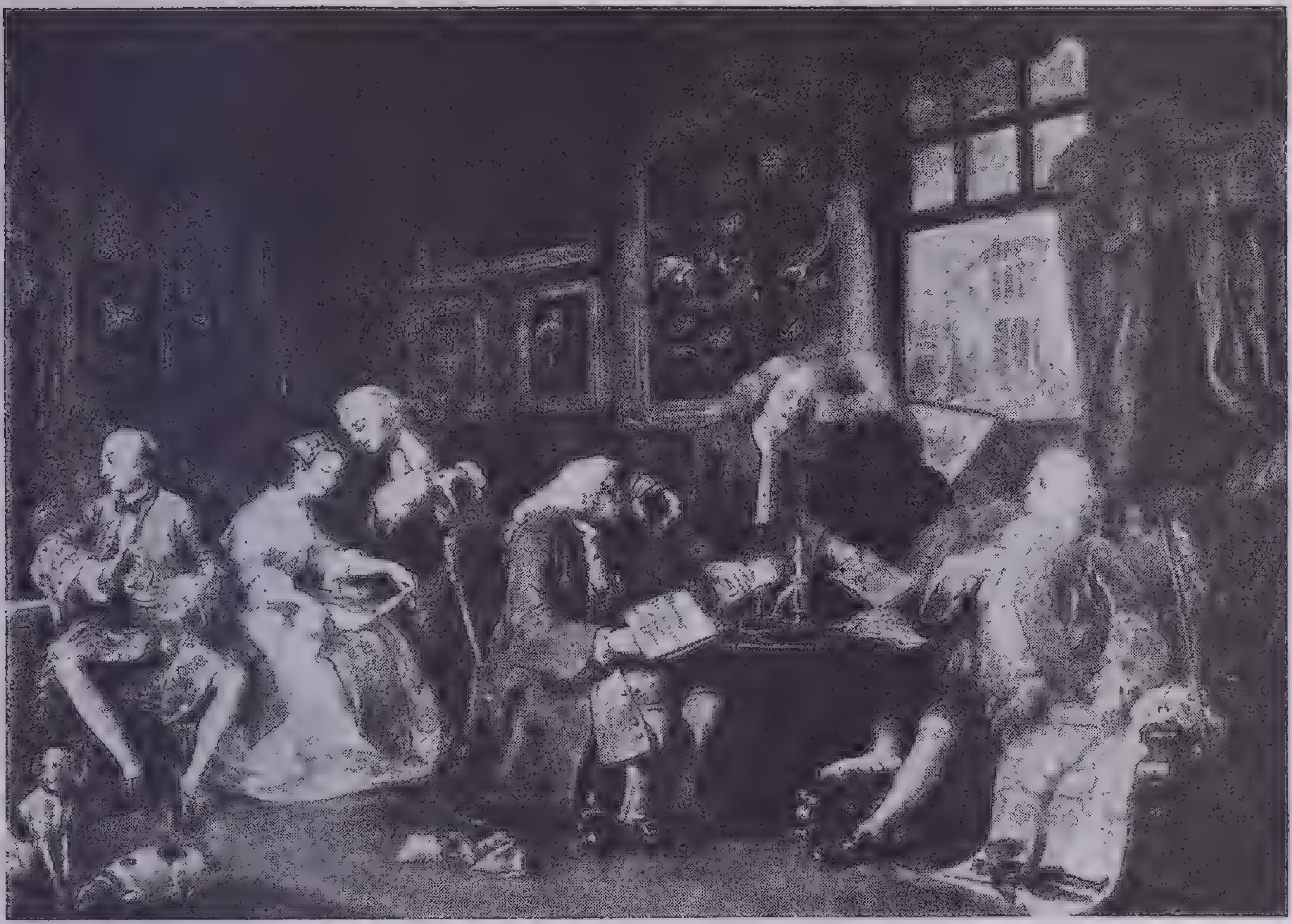
This portrait of the son of Philip IV of Spain was painted in 1635, when the young prince was 6 years old. It is in the Prado, Madrid

THE EIGHTEENTH CENTURY

English Painting.—Painting was still on its downward slope in Italy and in Germany; Holland and Flanders, after the brilliant 17th century, had not a single great name. In England and France, however, there was an art founded on that of Rubens. England had not developed a national school since the Middle Ages. In the 16th century she had imported Holbein from Germany as court painter; in the 17th, Van Dyck from Flanders. The first important English painter was William Hogarth, a portraitist and storytelling painter who satirized the social life of his day, notably in his famous series *Marriage à la Mode.*

About the middle of the century, chiefly under the influence of Rubens and Van Dyck and the Venetians, there grew up a school of English portrait painters with Sir Joshua Reynolds and Thomas Gainsborough as leading masters. Compared with the older masters whose secrets they sought to recapture, they have only surface charm; but their portraits of David Garrick, Sarah Siddons, Dr. Samuel Johnson and of the English aristocracy are a valuable record of the artificial elegance of the England of their day. Reynolds was a more academic painter than Gainsborough, but Gainsborough had a better grasp on the deeper elements of design. He had too a special charm of light and texture and of vivacity and movement, with an undercurrent of romantic melancholy. The school ended with the superficially brilliant portraiture of the early 19th century.

French Painting.—The painter who brought into France something of the color, light and movement of Rubens and of the Venetians was Jean Antoine Watteau. He painted fairylike fetes of lovers in romantic landscapes and the Harlequins, Columbines and other actors of French and Italian comedy. He is slight as compared with Rubens, light and vivacious; but within his scope he is a master. His



Courtesy Metropolitan Museum of Art

The Marriage Contract by William Hogarth

The brilliant satirist of early 18th-century English life included this scene in his series, *Marriage à la Mode,* painted about 1744. The painting is in the National Gallery, London

delicately modulated light and dark move rhythmically in and out of space, his color breaks into jewellike and iridescent bits. His fairyland art degenerated in the hands of his followers into shallow and frivolous imitation.

The ingenious decoration of salon walls and ceilings with make-believe shepherdesses, dairymaids and classical divinities had a special vogue in the 18th century. Painters like François Boucher tried to merge the classical art of Poussin with the tradition of Rubens with resulting weakness but decorative charm. Jean Honoré Fragonard was more successful. Jean Marc Nattier was the painter of many portraits, artificial but decorative, of the French aristocracy posing as classical divinities.

Jean Chardin, following a path directly away from the fashionable, make-believe art of Watteau and Fragonard, was perhaps the finest painter of the century. He was a genre painter who turned the most trivial subjects into poetry. He painted his wife and children, their kitchen, the vegetables, meats, pots and pans; and he achieved a triumph in texture of materials, color and design.

About the middle of the 18th century came the first important discoveries among the ruins of Pompeii and Herculaneum. French taste of the day turned to the classical subject. Jacques Louis David inaugurated a classical movement in painting that successfully put an end to the frivolities of the salon decorators but at the same time destroyed the whole tradition of northern art. David succeeded in imposing his style upon almost the whole of Europe—the classical subject, figures like marble statues in their clear-cut contours and hard texture, flat tones of lifeless color, statuesque rigidity instead of movement.

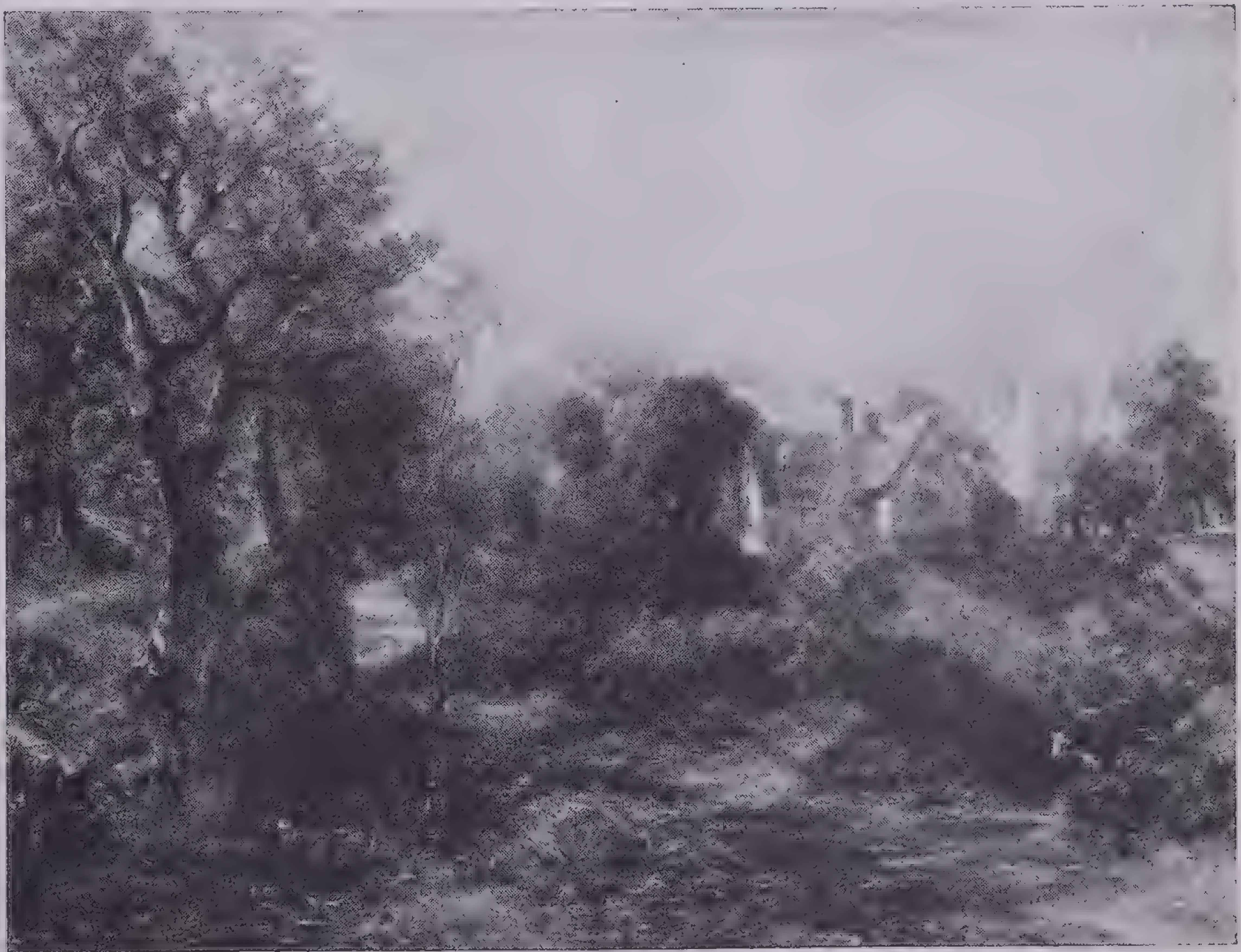
The Spanish Goya.—Goya, who like David lived through the first quarter of the 19th century, stands out in vivid contrast, as a realist with exceptional human warmth and a brilliant technical method. His style descended from Velásquez, and he likewise was a painter of the Spanish court. He is distinguished for his character portrayal, his fine patterns of light and dark and his color harmonies. In another aspect, in his illustration and satire of the corruptions and weaknesses of his day, he suggests the Englishman Hogarth.

THE NINETEENTH CENTURY

Classical Movement.—David's classical art proved to be only a curious break in the chain of tradition. Jean Ingres, his greatest follower, also subordinated color to line; but his classical works had much more life, and there was movement and vitality in his linear patterns. Pierre Paul Prud'hon was even romantic in his veiling of classical forms and his emotional use of light and dark.

French Romanticism.—Classical art could not hope to express the emotion and passion for liberty let loose by the French Revolution. Swift on the heels of classicism came the Romantic movement—life and color, play of light and shadow, the atmospheric edge, emotional expression, the tradition of Rubens reinstated. Subject matter changed to heroic events of the day or, in reaction against the classical subject, to the medieval story—the crusades, tales from Dante, Shakespeare or Byron. Eugène Delacroix was the leader. His special contribution lay in color, which he used to express emotion and to contribute to the drama of the situation. Sometimes he let color dominate so that we see his pictures as a pattern of color masses before we can distinguish what the patches of color represent. In this he anticipated Impressionism.

Naturalism in England.—Revolt against the idea that only subjects strange or remote in time or place were suitable for painting brought about a new naturalism—painters insisted upon expressing their fresh impressions of the world about them. This is some-



Glebe Farm with a View of Langham Church, by John Constable

A characteristic scene by the English landscape painter, in the Metropolitan Museum of Art, New York times called a new aspect of romanticism because of the sentimental attitude toward nature. The greatest impetus came from England in the work of John Constable who painted intimate scenes of his own England with the same love that the Dutch had lavished on the Holland countryside. He dared to cast away their green-brown scheme of color and paint nature's greens, making them more vital by painting what he called a *multitude of greens* in separate strokes instead of mixing them upon the palette. Constable painted only in the English summer, but he caught its exact character, its breezes, heat and heavy coloring, lowering storm clouds, rainbows and sudden bursts of sunshine.

Constable is a great contrast to his contemporary, Turner, who began by painting landscapes in the tradition of Claude Lorrain—vast, majestic, artificial—but developed an individual style of his own, marked by great luminosity and brilliance of color. His technique for achieving this was like Constable's, and the two men are considered forerunners of the French school of Impressionists.

The Barbizon School.—Paintings by Constable shown at the Paris Salon in 1824 stimulated Delacroix to further study of color and inspired a little group of revolutionary spirits who were founding a new school of French landscape painting. Theodore Rousseau settled in the little village of Barbizon on the edge of the Forest of Fontainebleau and began to paint intimate scenes of the French countryside. The permanence and strength of nature appealed to Rousseau; he built up the solid structure of his trees and placed them against a blue sky or flaming sunset. Charles François Daubigny, Diaz de la Peña and Jules Dupré were also at work in the forest—all different personalities but filled with the same sincere desire to express their vision of the world about them.

Jean François Millet (1814–75) added to the new landscape. He had a great reverence for Poussin and Michelangelo, and this appears in his simple paintings of the French peasant when he seizes just the essential lines to indicate a movement or to create the solid volume of a figure against a far-reaching plain.

Corot never lived at Barbizon, but he was allied in spirit to the group. His art was descended directly from Claude and Poussin. He introduced small classical figures into his landscapes and like Poussin created arabesques of line and mass. He was especially the painter of morning light, of the cool blue-green of foliage, of vanishing distance half-hidden by mist. He was even more important as a figure painter although less known as such.

Realism.—It was not Millet but a more aggressive personality, Gustave Courbet, who came to Paris in 1839 and succeeded in putting to rout the historic-romantic subject. He painted such subjects as a *Funeral at Ornans* and the *Stonebreakers* and many landscapes and marines of great vigor and breadth but photographically detailed. His professed aim was to transcribe nature unadorned.

Honoré Daumier, who was also important in the cause of realism, was descended from Michelangelo, Rembrandt and Bosch. He painted in rich, somber color, giving only the essential volumes of his figures and binding them into strong spatial designs. Expressive line is important in the part of his work devoted to satire and character studies. He seems destined to live on—with Goya—as one of the two very great realists of the 19th century, because he added to his gifts as observer and reporter a genius for formal organization.

Impressionism.—Courbet had painted his out-of-door figures with the colors and shadows of the studio. Édouard Manet, who had discovered Velásquez, wanted to show the natural subject in natural light. Both his figures and background tended to become flat color masses. These he simplified so that they appeared to have almost no modeling and bound them into a decorative whole.

Light, as Manet once said, became the principal person in the picture. But Manet never went so far as his landscapist friends, Claude Monet and Camille Pissarro, who dissolved all form into atmosphere and broke up Manet's simple color masses into a wealth of changing hues. About 1870 Monet and Pissarro in their desire to add to Manet's light the brilliance of out-of-door color adopted a special technique of broken or divided color, based on the fact that a blue and red, for instance, placed side by side on the canvas, will produce a more luminous and brilliant violet than when mixed upon the palette. The stained-glass painters of the 12th century had understood this; so to some extent had Watteau, Constable and Turner. But the color impressionists made a scientific study of this technique; its possibilities stimulated new observation of nature and suddenly a whole new world of color was revealed, not the artificial jewellike gleam of the Flemish or the suffused glow of the Venetians but splendid in quite another way—in the shimmer, glitter and radiance of the light and atmosphere of out-of-doors.

Impressionism took the final step in freedom of subject matter, for when light and color became the chief interests no subject was too commonplace to interest the painter.

Postimpressionism.—Certain artists at first allied with the Impressionists, notably Manet, Degas and Whistler, created novel patterns in line and color, partially under the influence of Japanese prints, which were then coming into vogue. But most of the painters continued to imitate the momentary appearance of some fragment of nature in some particular light.

The reaction from Impressionism had two aspects, first a desire to recover the solider subject elements that the Impressionists had lost, and second, a conscious endeavor to push forward into new fields of plastic and decorative design. The new artists arose within the ranks of the Impressionist group. Renoir, one of the less radical insurgents, became interested in recovering volume and structure and at the same time was inspired by the voluptuousness and fragile decorativeness of Boucher and the court painters. In his nude studies in particular he arrived at a sensuous loveliness and a feminine grace seldom paralleled in the history of painting.

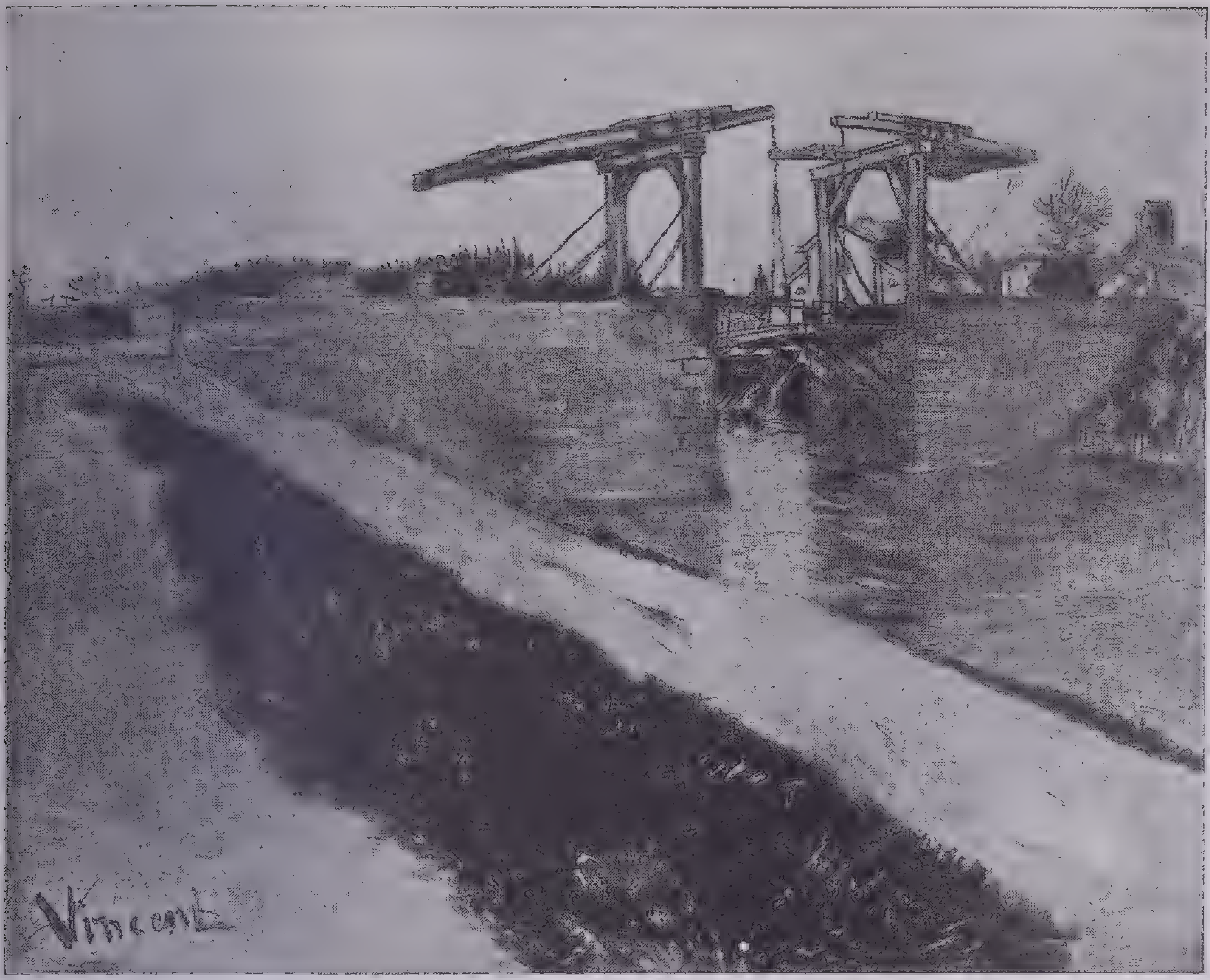
Georges Seurat turned in the opposite direction and hardened rather than softened composition. He carried on the scientific study of color and has been called a *Neoimpressionist*. But it is clear from his too rare pictures that he is to be marked as a pioneer in the search for abstract and plastic values and is therefore a forerunner of the 20th-century *Expressionists*.

But the real father of Postimpressionism was Paul Cézanne, who said that he wanted to make something solid of Impressionism. He wanted volume and depth as well as color. He began to use color to intensify his form, painting not the accidental surface patches of light and dark and color but studying the way in which hues change as they advance into light and recede into gloom and using such advancing and receding colors to help build up his formal structure. Volume in itself has no artistic merit. but Cézanne's paintings, whether of apples and dishes on his kitchen table or of the far-reaching plains and distant mountains of his home in southern France, have their volumes composed, ordered in some compelling relationship.

THE TWENTIETH CENTURY

The reaction against Impressionism began in the '80s but did not acquire momentum until the late years of the 19th century; from the time of Cézanne's death in 1906 it became a very definite movement. Cézanne was the most influential of all the Postimpressionists. The term is very inclusive, for the men who belong to the era after Impressionism are varied in their interests. They are held together only by certain broad qualities such as these: a desire to express impressions or ideas beyond the color and light mosaic of the Impressionists; a tendency on the part of many artists to express volume and structural order and of others to paint in sober color, because this was the opposite of Impressionism; a greater simplicity for the sake of more direct emotional and formal expression; a comparative indifference to subject matter because they believed that the real value of painting lay in the orchestration of its color and form. In a broader sense the whole movement may be described as antirealistic. Impressionism is sometimes termed the last form of realism—surface realism; and *Modern* art, as now understood, embraces all that has come since Impressionism, in reaction from the centuries-old effort to refine realism.

The frequent distortions of modern art are due to the fact that in the reaction against Impressionism the appearance of things to the eye had become of minor importance, so that painters distorted at will in order to express better their ideas or emotions or in the interest of better abstract design.



Courtesy Museum of Modern Art

The Bridge at Arles by Vincent van Gogh

The famous painting of the bridge in the southern French town in which the Dutch post-impressionist painter spent his later years is now in the Kröller-Müller Collection, Wassener, Germany

Thus Cézanne altered color and light to achieve effects of form and space or distorted his dynamic lines to create a new poised "structure" within the picture. Paul Gauguin, in his idyls of Tahiti and the South Seas, freely used his color and line in the cause of emotion and decorative design. Vincent van Gogh, the Hollander, used quite unreal color for its emotional value and carried his desire for emotional expression even into the handling of his brush—the strokes of pure color being drawn into writhing forms that give not only a sense of life and motion in the world depicted but express directly the artist's own emotional excitement. Henri Matisse was the leader of a group that made a still further departure from visual appearance in the interest of such *expressionism.* Matisse particularly turned to the Orient to find parallels to the new nonrealistic art, and from his studies he gained something of the lush ornamentalism of Eastern design. Today he is considered Europe's foremost decorative painter.

Cubism.—Cézanne, being interested in form, once said that nature could be expressed with the cube, cone and cylinder. Thereupon the Cubists—Pablo Picasso and Georges Braque were the driving spirits—undertook to reduce nature to those geometrical essentials. Later in an effort to escape farther from the limitations of appearance to the eye they substituted for the single aspect of an object the many aspects that might be preserved in the memory. These were arranged together, intersecting or superimposed. Gradually emphasis on design turned cubism into flat pattern.

But the greatest achievement of Cubism as a school was that it passed on to all open-minded artists a new sense of the importance of abstract design as an element in picture making and especially an understanding of plane arrangement as a resource for the creation of movement and tension in the composition. Significantly Picasso abandoned Cubism as an end in itself and went on to original work in varied fields. He is considered by some critics the greatest of modern painters.

Many other schools and cults appeared in the years just before and after the World War, but none attained an importance approaching that of Cubism. Munich became a center of fruitful experiment for a time, and a group of painters there first used the name *Expressionists.* The aims of the group were largely those of the important radicals in other countries—particularly France, Mexico and the United States—and later the name Expressionism came into common use as a label for all the antirealistic schools, for all the art built on the principles uncovered by the first group of Postimpressionists, Cézanne, Gauguin, Van Gogh and Seurat. A great deal of the significant achievement of the last 20 years is to be found in the canvases of the French followers of those pioneers, especially André Derain, Georges Rouault, Maurice de Vlaminck and Raoul Dufy. In the same main stream of Expressionism are to be found the varied works of the Italian Modigliani, the Austrian Kokoschka and the Germans Marc, Hofer and Nolde.

Only two further special types of nonrealistic painting seem to have lasting importance within the Modern movement. One is that termed *primitive Modern,* the product of artists who intuitively abandon all pretense to faithful representation of nature, composing instead with naive or primitive formalization and conventions. The one undisputed master of this minor mode was Henri Rousseau (or Rousseau *le douanier*). The other school—and it is at the very center of current controversy and probably of current progress—is that of the *Abstractionists,* who are willing to omit from their paintings all reference to objective nature or at least to subordinate natural likeness to the attainment of formal or abstract order or movement. They believe that painters will learn to create formal orchestrations that will be as effective visually as musical compositions are aurally and as little dependent upon natural scenes as music is upon natural sounds. Wassily Kandinsky is the recognized master in the abstract field, and Paul Klee is another who has put a fleeting rhythm or a compelling sense of contrived order into innumerable nonrepresentational *pictures.* A host of younger men are exploring this field. Perhaps from their experiments will come the next great release of creativeness in the art.

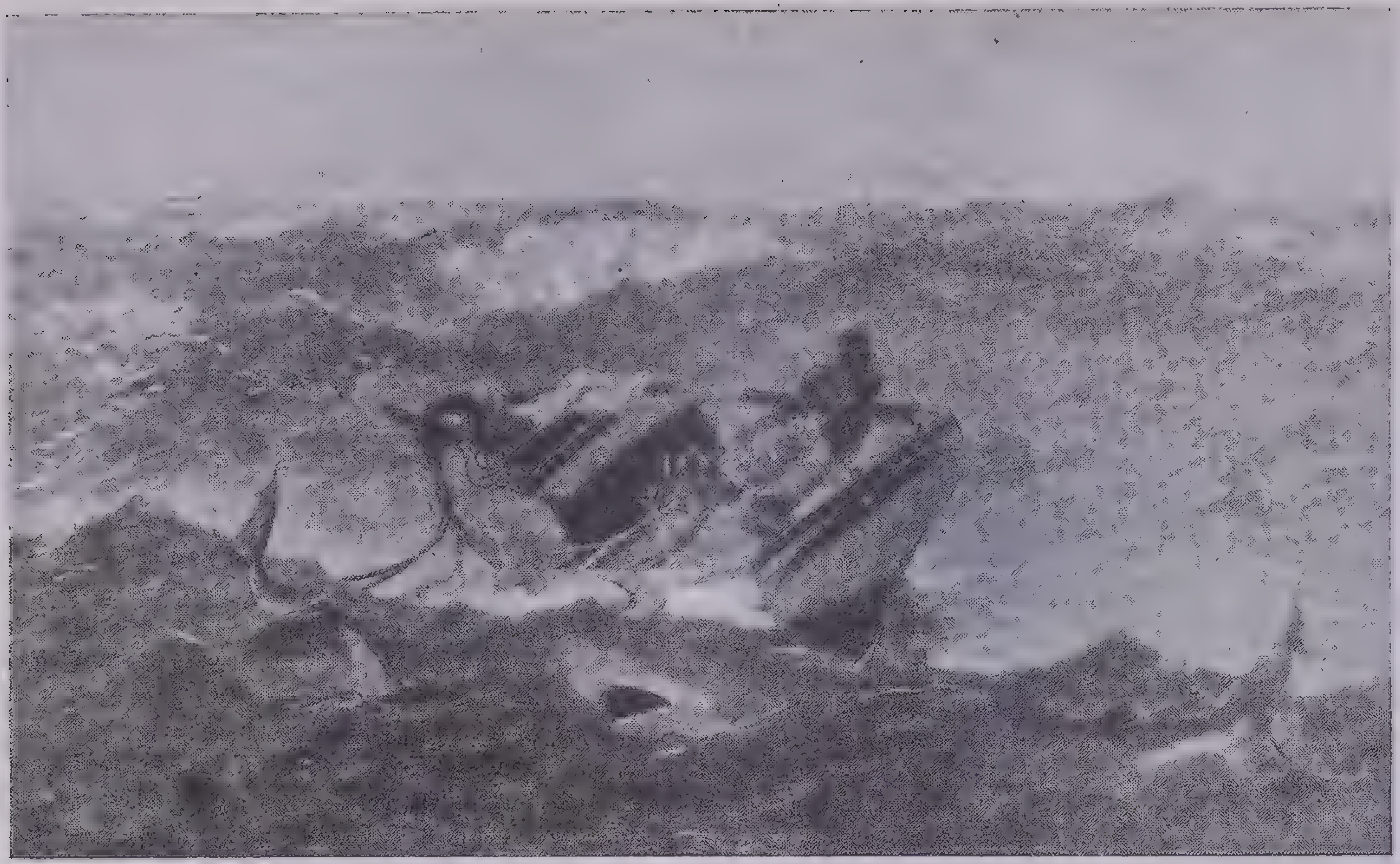
PAINTING IN THE UNITED STATES

Ever since the early 19th century Paris has been the clearinghouse for the painters of all Europe. Even ideas that came from other countries, notably England, matured there. There were always individuals who were not allied with any group, but in general we can trace in all European countries a development corresponding to the broad movements of recent French painting and usually under direct French influence. This was true also of America.

Colonial Painting.—In America the Colonial painting of the 18th century was really a branch of the English school. The leading portraitists, John Singleton Copley and Gilbert Stuart, spent years of their lives in England. Benjamin West left America in 1763 to settle in London and became the master of most of the American painters who came to London for instruction, such as John Trumbull, the historical painter, and Thomas Sully, who continued the tradition of the English portrait school past the middle of the 19th century.

Nineteenth Century.—When the influence of England declined, painters turned to Düsseldorf, Munich and finally Paris for their training. At the same time there was a native development in landscape known as the Hudson River School (Thomas Cole, Asher Brown Durand, Frederic Edwin Church). The accomplishment of these painters was not great, but inspired by a new national enthusiasm for their surroundings they laid the foundation for the landscape development that has become a distinguishing feature of American painting.

Of the next generation of landscapists, which was on quite a different level, the most important were Homer



The Gulf Stream by Winslow Homer

Homer here depicts vividly the plight of the shipwrecked Negro in the shark-infested Gulf Stream. *The Gulf Stream,* painted in 1899, is in the Metropolitan Museum of Art, New York

Martin, Alexander H. Wyant and George Inness. They correspond to the Barbizon group in France. The landscapes of Imess are distinguished for their harmony of color and mass and their emotional expression of nature's moods. His contemporary, John La Farge, was a painter of wide range, including large murals of religious subjects. Through wide travel he became familiar with Oriental as well as European traditions. His emotional use of color suggests Delacroix and his technique. He carried his color experiments into the field of stained glass also.

Realism and Impressionism.—Winslow Homer, a powerful painter of the sea and the Maine coast, might be called the American Courbet. Thomas Eakins, the portrait painter, belongs also to the realistic movement. As in France, there were always artists who worked apart from the general tendency, such as the visionary Albert Ryder, the sensitive George Fuller and the poetic Arthur B. Davies. There are simplicity and largeness like Daumier's in the pictures painted by Ryder and an utterly honest expression of his vision. Rugged reality, a dreamy method and intuitive achievement of beautiful design combine strangely to place his canvases in the very first rank of modern painting.

An able exponent of early Impressionism was Whistler, American-born but claimed also by the British because he made London his permanent home. He was formed chiefly under the influence of Velásquez, the Japanese and of his friends, the Impressionists. Design was his chief motive—subtle patterning of line and tone and color. Even the meaningful portrait of his mother he calls *Arrangement in Grey and Black.* Although he was on the exquisite side, he anticipated the abstract rhythms and patterning of the latest Moderns, and his position in the postrealistic galleries seems secure.

John Singer Sargent also made London his permanent residence. His brush work is very brilliant and stirring, and he achieved a fashionable success for his showy portraits on both sides of the Atlantic. Mary Cassatt, the painter of a long series of mother-and-child pictures, lived for the most part in Paris and was a follower of Degas. Corresponding to the color Impressionists are J. Alden Weir, Childe Hassam, Ernest Lawson, William James Glackens and Maurice Prendergast. John H. Twachtman took the Impressionist colorfulness and delicacy but added organic structure, creating pictures rich in chromatic patterning but distinguished by coherent composition. His luminous landscapes and particularly his snow scenes afford a pleasure deeper than that to be found only in Impressionism.

After the Impressionist adventure a group of avowed Realists, of whom Robert Henri, George Luks and John Sloan were foremost, took the center of the American stage. They were followed by others who only partially yielded to the impact of French Post-impressionism, men who held to tradition—and to the natural object—even while gaining something of Modern freedom: George Bellows, Eugene Speicher, Leon Kroll and Rockwell Kent. But history has been made rather by the insurgents who, fired by the example of Cézanne, Van Gogh and Matisse, struck off into a search for more emotional expression and more compelling formal organization, often at the expense of what the conservatives considered normal vision.

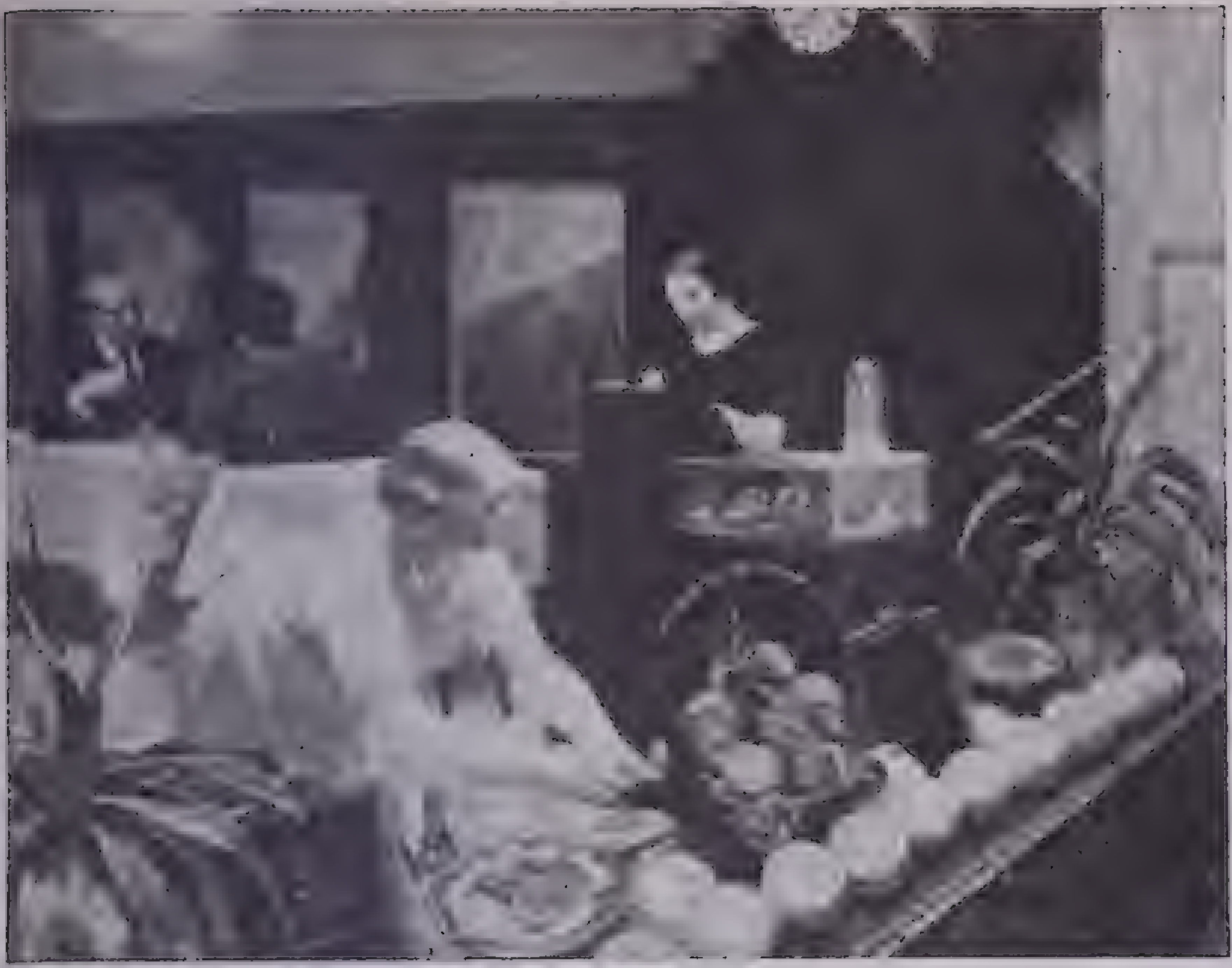
The pioneers in American Postimpressionism, counted today as the elder Moderns, were Walt Kuhn, Max Weber, Bernard Karfiol, Abraham Walkowitz and Marsden Hartley. From their midst John Marin emerged as having the most individualistic talent or genius. His near-abstract water colors, brilliant, spontaneous and profoundly decorative, mark him as one of the most original and sensitive of artists living today.

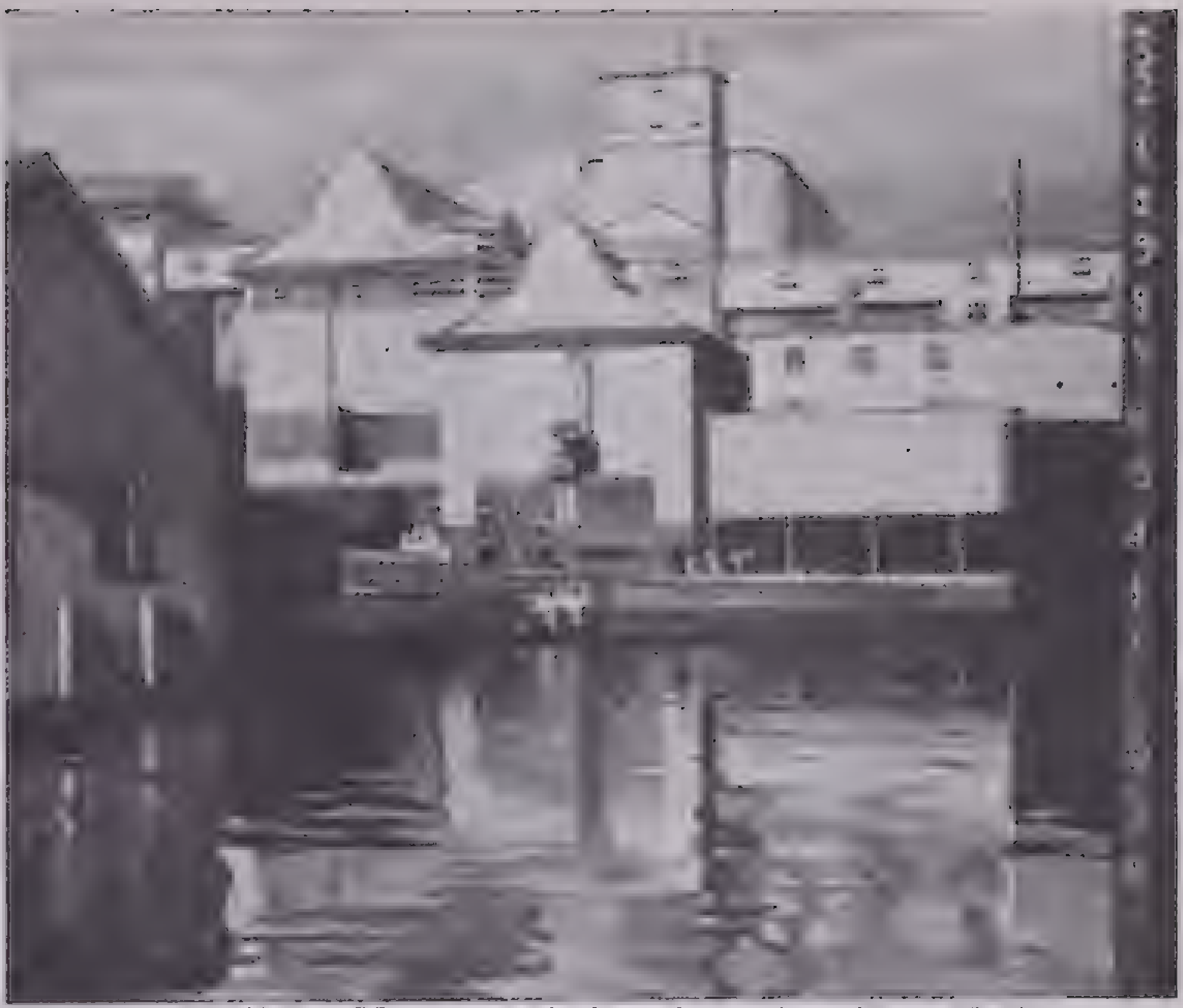
Others who have gone far in the direction taken by the European Abstractionists are Georgia O'Keeffe and Charles Sheeler, and a considerable school of younger men is at present experimenting with almost geometrical materials. Really masterly, however, is the work of a group of artists who have gained depth and abstract order with these others but who have not denied the importance of representational elements. They are men who may truly be called Expressionists because of their grasp of the new plastic values, who nevertheless avoid the insistent distortions introduced by the early Expressionists. Perhaps foremost among these moderate radicals are Maurice Sterne, Henry Mattson, Henry McFee and John Carroll.

Popular interest in American art has been stimulated recently by the pictures of the so-called *Regionalists* or *American Scene* artists and the controversy over them. They treat local subjects with engaging naturalism and often with humor, specializing in regional types, picturesque environment and local historical chronicles. In general their work is in the nature of illustration and satire and denies the gains made in the name of Post-impressionism. But a few practitioners have brought to their essentially reproductive and literary pictures sufficient understanding of the new formal ideas to score as real creators. Such especially is John Steuart Curry, who has specialized in portraying Middle Western life. Charles Burchfield, Edward Hopper and Grant Wood are leaders in the group; and Reginald Marsh has similarly transcribed, with satirical overtones, picturesque aspects of metropolitan slum and night-club life. Thomas Hart Benton has carried the American Scene materials and purposes over into mural art in a style dynamically alive.

Nearer to the main current of world progress in mural painting is the poised and ordered work of Boardman Robinson. It may be added that many art lovers see in mural art the next great opportunity for the painter to serve society. The greatest living muralists, American but not of the United States, are the Mexicans Diego Rivera and José Clemente Orozco. They are leaders of a national school of painting, founded on the new international European-American tradition.

Most famous and beautiful works of art were achieved when the artist served within a faith, most notably that of the Christian church. With the coming of political rather than religious loyalty one of the greatest incentives to expression was lost. Portraiture and landscape have had their later masters, but these are limited fields; and since the artist became an individualist, only a very few have risen to mastery comparable to that of Duccio, Giotto, Michelangelo and El Greco. Perhaps Western art, like disorganized Western life in general, awaits galvanization through the coming of a spiritual faith or the finding of some burning communal interest. Or perhaps the *meaning* value of painting will assume less and less value, and the art will become self-sufficient like music.


Courtesy Metropolitan Museum of Art, New York
Tables for Ladies by Edward Hopper


Courtesy Whitney Museum of American Art, New York
River Rouge Plant by Charles Sheeler

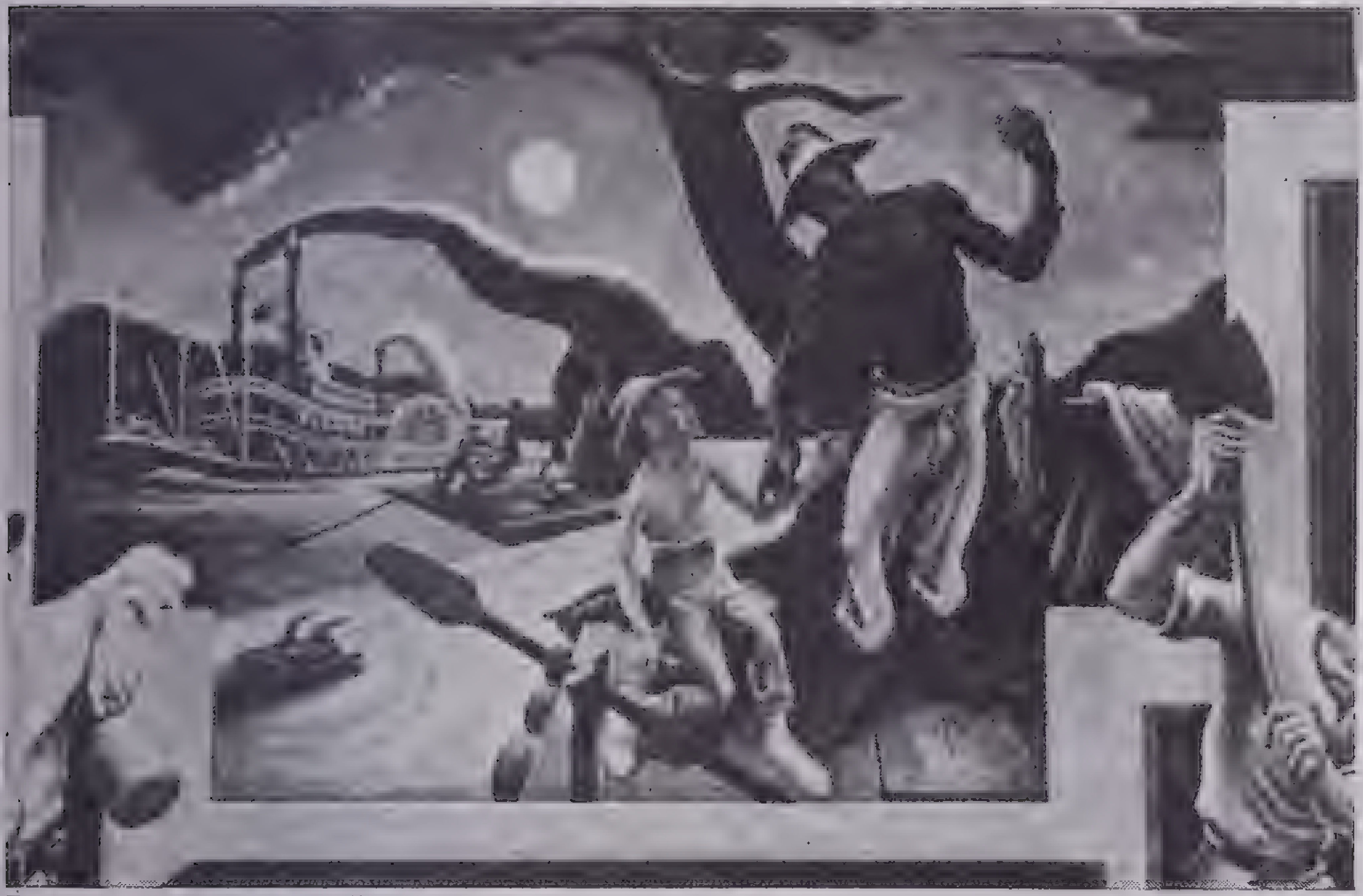
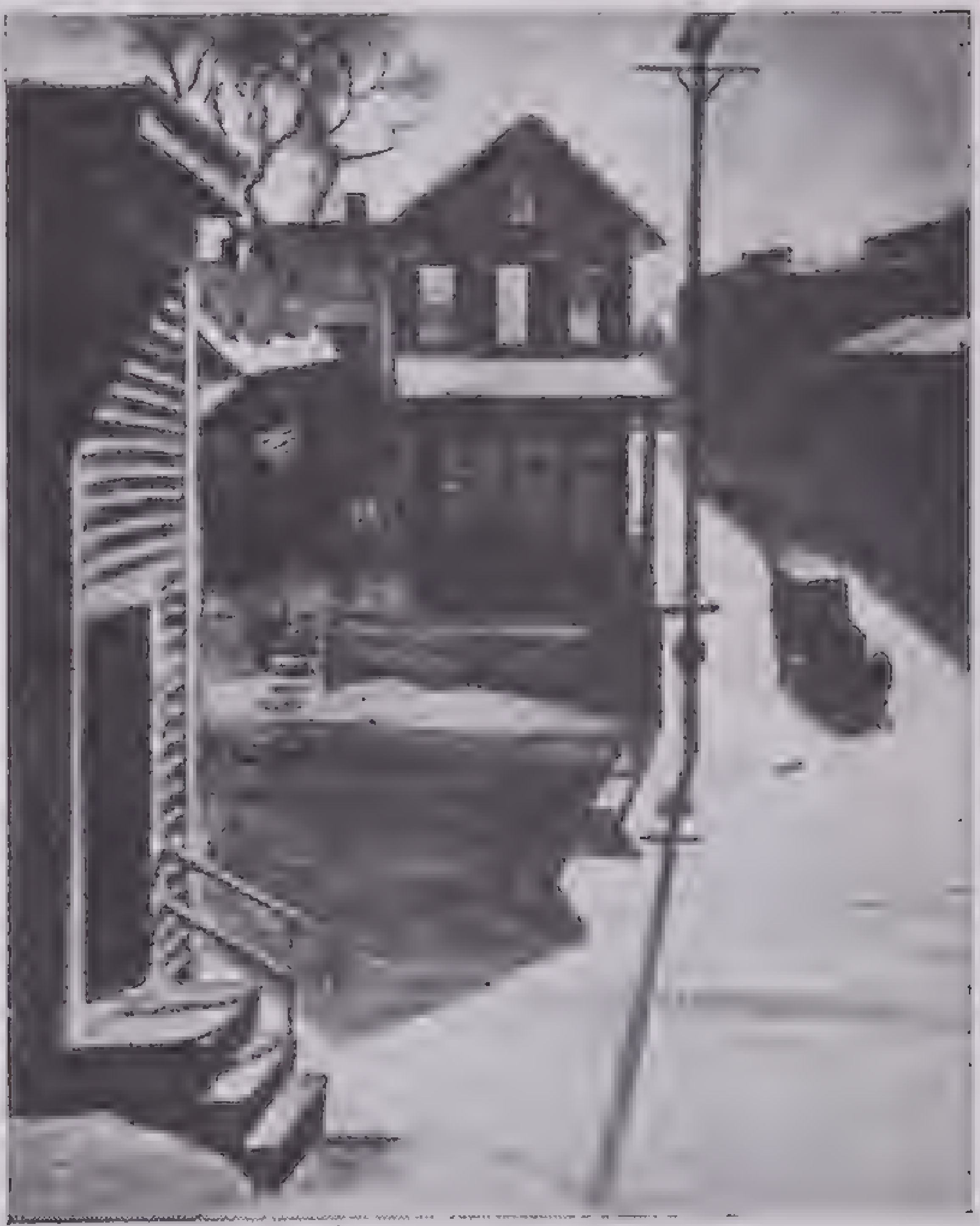
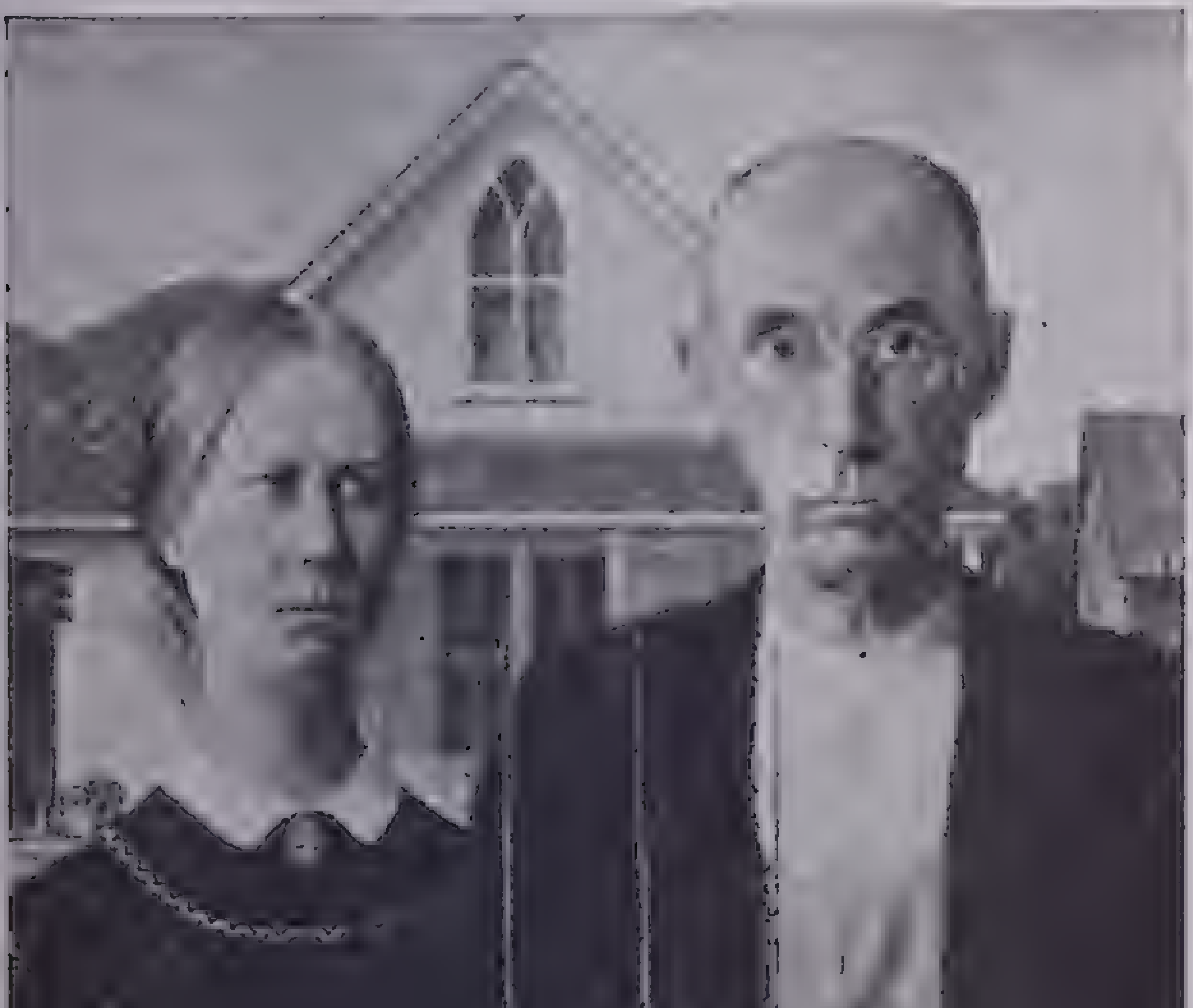
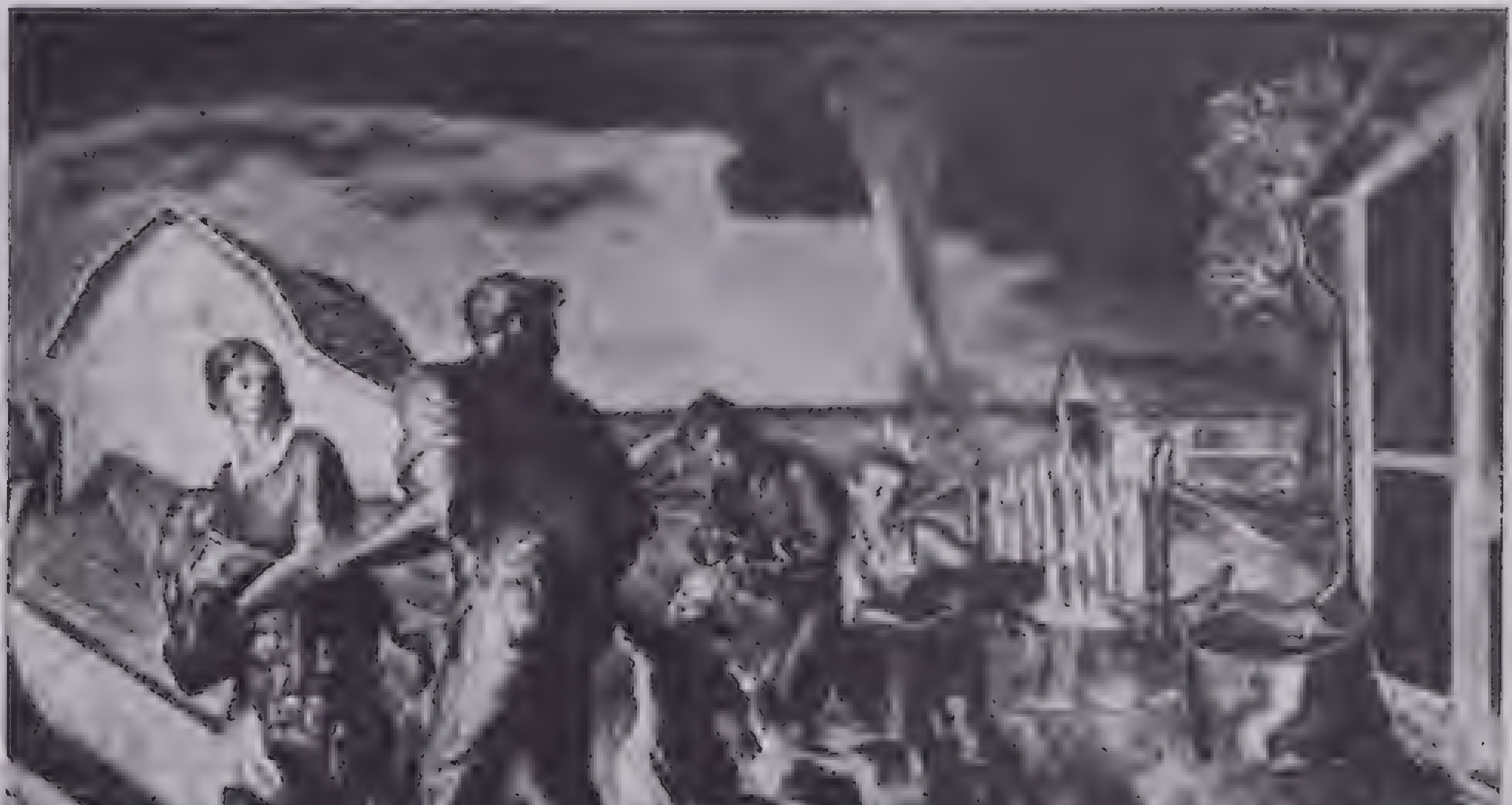


Photo by Townsend Godsey
Huck Finn and Nigger Jim, a Mural by Thomas Hart Benton in the Missouri State Capitol, Jefferson City


Courtesy Whitney Museum of American Art
Ice Glare by Charles Burchfield


Courtesy Art Institute of Chicago
American Gothic by Grant Wood


Courtesy Hackley Art Gallery, Muskegon, Michigan
The Tornado by John Steuart Curry

Paintings by Modern American Artists

GREAT PAINTERS

	Italy			Netherlands	Germany	France
	Florentine	Sienese				
Thirteenth and Fourteenth Centuries	**Cimabue** *c.* 1240–1302	**Guido da Siena** 13th century				
	Pietro Cavallini (Rome) 1250–1330	**Duccio di Buoninsegna** *c.* 1260–1319				
	Giotto *c.* 1276–*c.* 1337	**Simone Martini** *c.* 1283–1344				
	Taddeo Gaddi *c.* 1300–1366	**Pietro Lorenzetti** active 1305–1348				
	Andrea Orcagna 1308?–1368	**Ambrogio Lorenzetti** active 1323–1346?				**Jean d'Orleans** 1305–1408
	Spinello Aretino *c.* 1330–1410					
						André Beauneveu active 1360–1403
						Jacquemart de Hesdin active 1384–1400
	Florentine	Umbrian	Venetian and North Italian			
Fifteenth Century				**Hubert van Eyck** *c.* 1370–1426		**Engverrand Charonton** 15th century
		Gentile da Fabriano *c.* 1370–1427		**Robert Campin** 1375–1444		
				Jan van Eyck *c.* 1390–1440		**Henri Bellechose** active *c.* 1415–1440
	Masolino da Panicale *c.* 1383–*c.* 1447			**Jacques Daret** active 1427–1468		
	Fra Angelico 1387–1455	**Sassetta** (Siena) 1392–1450	**Francesco Squarcione** (Padua) 1394–1474			
	Andrea del Castagno *c.* 1390–1457			**Roger van der Weyden** *c.* 1400–1464		
	Paolo Uccello 1396–1475		**Vittore Pisano** 1397–1455	**Petrus Christus** *c.* 1400–1473		
	Masaccio 1401–1428			**Dirk Bouts** (Dutch) *c.* 1410–1475		
	Fra Filippo Lippi 1406–1469	**Giovanni da Paolo** (Siena) *c.* 1403–1483				
		Piero della Francesca *c.* 1420–1492				**Jean Fouquet** *c.* 1415–*c.* 1480
	Benozzo Gozzoli 1420–1498		**Vincenzo Foppa** (Pavia) *d.* 1462	**Justus van Ghent** b. 1410		
	Alessio Baldovinetti *c.* 1425–1499					**Jean Bourdichon** 15th century
	Antonio Pollaiuolo 1429–1498		**Jacopo Bellini** *c.* 1400–1470	**Hans Memling** 1430–1495	**Stephan Lochner** d. 1451	
			Antonio Vivarini d. *c.* 1470	**Aelbert van Ouwater** (Dutch) active *c.* 1450–*c.* 1480		
			Giovanni Bellini *c.* 1426–1516			
			Gentile Bellini *c.* 1427–1507			
			Antonello da Messina *c.* 1430–1479			
			Cosimo Tura (Ferrara) *c.* 1430–*c.* 1495			
			Andrea Mantegna (Padua) 1431–1506			
	Andrea Verrocchio 1435–1488	**Melozzo da Forli** 1438–1494	**Francesco Cossa** (Ferrara) 1438–1480	**Hugo van der Goes** d. 1482	**Michael Wolgemut** 1434–1519	
	Cosimo Rosselli 1439–1507	**Fiorenzo di Lorenzo** *c.* 1445–1525	**Bartolommeo Vivarini** 1450–1499			
	Piero Pollaiuolo 1443–1496	**Luca Signorelli** 1441–1524				
					Martin Schongauer *c.* 1445–1491	
	Sandro Botticelli *c.* 1447–1510	**Pietro Perugino** 1446–1523	**Carlo Crivelli** *c.* 1430–*c.* 1493			
	Domenico Ghirlandaio 1449–1494		**Francia** (Bologna) 1450–1518		**Bartholomäus Zeitblom** *c.* 1450–1517	
	Leonardo da Vinci 1452–1519	**Bernardino Pinturicchio** 1454–1513	**Ambrogio de Predis** (Milan) *c.* 1455–1506			
	Filippino Lippi *c.* 1457–1504		**Cima da Conegliano** *c.* 1459–*c.* 1517			
	Lorenzo di Credi 1459–1537		**Lorenzo Costa** (Ferrara) 1460–1535	**Gheerardt David** *c.* 1450–1523		
				Jerome Bosch *c.* 1462–1516	**Hans Holbein the Elder** 1460–1524	
				Geertgen van Haarlem (Dutch) *c.* 1465–*c.* 1493		
				Quentin Matsys 1466?–1530		**Nicolas Froment** active 1476
	Florentine	Venetian				
Sixteenth Century		**Vittore Carpaccio** *c.* 1450–*c.* 1522			**Albrecht Dürer** 1471–1528	
		Marco Basaiti *c.* 1470–1527				
	Mariotto Albertinelli 1474–1515			**Jan Gossaert** (Mabuse) *c.* 1470–*c.* 1541	**Lucas Cranach the Elder** 1472–1553	
					Hans Burgkmair 1473–1531	
				Jan Mostaert (Dutch) 1475–*c.* 1556		
	Fra Bartolommeo 1475–1517	**Titian** 1477–1576				
	Bernardino Luini *c.* 1475–*c.* 1533	**Giorgione da Castelfranco** 1478–1511			**Hans Baldung** (Grün) *c.* 1476–1545	**Jean Clouet** 1485–1545
	Michelangelo Buonarroti 1475–1564					
	Il Sodoma (Siena) 1477–1549					

GREAT PAINTERS—Continued

	Italy	Italy	Spain	Netherlands	Germany	France
	Florentine—Cont.	Venetian—Cont.				
Sixteenth Century—Cont.	**Raphael** (Umbria) 1483–1520 **Andrea del Sarto** 1486–1531 **Giulio Romano** (Rome) 1492–1546 **Jacopo da Pontormo** 1494–1557 **Il Moretto** (Brescia) c. 1498–1554 **Bronzino, Il** 1502–1572 **Daniele da Volterra** (Rome) 1509–1566 **Alessandro Allori** 1535–1607 **Agostino Carracci** (Bologna) 1557–1602 **Annibale Carracci** (Bologna) 1560–1609 **Caravaggio** (Naples) 1569–1609	**Marcantonio Raimondi** c. 1480–1534 **Palma Vecchio** 1480–1528 **Lorenzo Lotto** c. 1480–1556 **Sebastiano del Piombo** c. 1485–1547 **Correggio** (Parma) 1494–1534 **Tintoretto** 1518–1594 **Giambattista Moroni** (Brescia) c. 1525–1578 **Paul Veronese** 1528–1588	**Luis de Morales** c. 1509–1586 **El Greco** c. 1548–1614	**Joachim de Patiner** c. 1485–1524 **Bernard van Orley** c. 1491–1542 **Lucas van Leyden** (Dutch) 1494–1533 **Jan van Scorel** (Dutch) 1495–1562 **Pieter Pourbus** (Dutch) c. 1510–1584 **Antonio Moro** (Dutch) 1519–1576 **Pieter Breughel the Elder** c. 1525–1569	**Albrecht Altdorfer** 1480–1538 **Matthias Grünewald** c. 1480–c. 1530 **Hans Holbein the Younger** c. 1497–1543 **Christopher Amberger** c. 1500–1562	**Corneille de Lyon** 1500–1575 **François Clouet** c. 1510–c. 1572

	Italy	Spain	Holland	Holland	Flanders	France
Seventeenth Century	**Guido Reni** 1575–1642 **Francesco Albani** 1578–1660 **Domenichino** 1581–1641 **Sassoferrato** 1605–1685 **Salvator Rosa** 1615–1673 **Carlo Dolci** 1616–1686	**Francisco de Herrera** 1576–1656 **José Ribera** 1588–1656 **Francisco de Zurbarán** 1598–1662 **Diego Velásquez** 1599–1660 **Bartolome Murillo** 1618–1687	**Frans Hals** c. 1581–1666 **Jan van Goyen** 1596–1656 **Rembrandt van Rijn** 1606–1669 **Gerard Douw** 1613–1675 **Gerard Ter Borch** 1617–1681 **Philips Wouwerman** 1619–1668 **Aalbert Cuyp** 1620–1691 **Jan Steen** 1626–1679 **Pieter de Hooch** 1629–1677 **Nicolaas Maas** 1631–1693 **Willem Van de Velde** 1633–1707	**Adrian Van Ostade** 1610–1685 **Ferdinand Bol** 1616–1680 **Gonzales Coques** 1618–1684 **Paul Potter** 1625–1654 **Jacob Ruysdael** c. 1628–1681 **Jan Vermeer** 1628–1691 **Gabriel Metzu** 1630–1667 **Ludolf Bakhuisen** 1633–1709 **Meyndert Hobbema** 1638–1709	**Peter Paul Rubens** 1577–1640 **Frans Snyders** 1579–1657 **Jakob Jordaens** 1593–1678 **Anthony Van Dyck** 1599–1641 **Adriaen Brouwer** c. 1605–1638 **David Teniers the Younger** 1610–1690	**Simon Vouet** 1590–1649 **Jacques Callot** 1592–1635 **Le Nain Brothers** (3) Antoine, c. 1588–1648 Louis, c. 1593–1648 Mathieu, 1607–1677 **Nicolas Poussin** 1594–1665 **Claude Lorrain** 1600–1682 **Pierre Mignard** 1610–1695 **Charles Lebrun** 1619–1690
	England					
	Nicholas Hilliard 1537–1619 **Isaac Oliver** 1556–1617 **Sir Peter Lely** 1618–1680					

	Italy	United States	England	Germany	France	France
Eighteenth Century	**Giovanni Battista Tiepolo** 1696–1770 **Canaletto** 1697–1768 **Pietro Longhi** 1702–1785 **Francesco Guardi** 1712–1793 **Giambattista Piranesi** 1720–1778 **Bernardo Bellotti** 1724–1780	**Gustavus Hesselius** 1682–1755 **John S. Copley** 1738–1815 **Benjamin West** 1738–1820 **Charles Willson Peale** 1741–1827 **Gilbert Stuart** 1755–1828 **John Trumbull** 1756–1843	**William Hogarth** 1697–1764 **Richard Wilson** 1714–1782 **Sir Joshua Reynolds** 1723–1792 **Thomas Gainsborough** 1727–1788 **George Romney** 1734–1802 **Valentine Green** 1739–1813 **Sir Henry Raeburn** 1756–1823 **William Blake** 1757–1827 **John Hoppner** 1758–1810 **John Crome** 1768–1821	**Anton Raphael Mengs** 1728–1779	**Nicolas Largillière** 1656–1746 **Antoine Coypel** 1661–1722 **Jean Baptiste Chardin** 1699–1779 **Jean Nattier** 1685–1766 **François Lemoine** 1688–1737 **François Boucher** 1703–1770 **Joseph Vernet** 1714–1789 **Jean Baptiste Greuze** 1725–1805 **Jean Honoré Fragonard** 1732–1806 **Gabriel Moreau** 1740–1806	**Hyacinthe Rigaud** 1659–1743 **Antoine Watteau** 1684–1721 **Nicolas Lancret** 1690–1743 **Jean Baptiste Pater** 1696–1736 **Maurice Quentin de La Tour** 1704–1788 **Joseph Vien** 1716–1809 **Clodion** (Claude Michel) 1738–1814 **Jacques Louis David** 1748–1825
				Spain		
				Francisco de Goya y Lucientes 1746–1828		

GREAT PAINTERS—Continued

	United States		England	France		Other Countries
Nineteenth Century and Early Twentieth Century	**John Vanderlyn** 1775–1852 **Edward Malbone** 1777–1807 **Washington Allston** 1779–1843 **Thomas Sully** 1783–1872 **Samuel F. B. Morse** 1791–1872 **Chester Harding** 1792–1866 **Henry Inman** 1801–1846 **Thomas Cole** 1801–1848 **Emanuel Leutze** 1816–1868 **George Fuller** 1822–1884 **William Hart** 1823–1894 **J. F. Crapsey** 1823–1900 **George Inness** 1825–1894 **James Abbott McNeill Whistler** 1834–1903 **A. H. Wyant** 1836–1892 **Winslow Homer** 1836–1910 **Thomas Moran** 1837–1926 **Robert S. Gifford** 1840–1905 **Thomas Eakins** 1844–1916 **Albert Ryder** 1847–1917 **Frank Duveneck** 1848–1919 **D. W. Tryon** 1849–1925 **Charles M. Dewey** 1849–1937 **Theodore Robinson** 1852–1896 **Edwin A. Abbey** 1852–1911 **Benjamin Foster** 1852–1926 **John Twachtman** 1853–1902 **Henry W. Ranger** 1853–1916 **L. Birge Harrison** 1854–1929 **George de F. Brush** 1855–1941 **John W. Alexander** 1856–1915 **John Singer Sargent** 1856–1925 **Willard Metcalf** 1858–1925 **Harry S. Mowbray** 1858–1928 **Childe Hassam** 1859–1935 **Frederick J. Waugh** 1861–1940 **Arthur B. Davies** 1862–1928 **Cecilia Beaux** 1863– **Robert Henri** 1865–1929 **Max Bohm** 1868–1923 **William S. Kendall** 1869–1938 **William J. Glackens** 1870–1938 **John Marin** 1870– **Frederick B. Williams** 1871– **Ernest Lawson** 1873–1940 **Boardman Robinson** 1876– **Maurice Sterne** 1878– **Jonas Lie** 1880–1940 **Abraham Walkowitz** 1880–	**Thomas Doughty** 1793–1856 **Asher B. Durand** 1796–1886 **Charles L. Elliott** 1812–1868 **Daniel Huntington** 1816–1906 **John F. Kensett** 1818–1872 **William Morris Hunt** 1824–1879 **Eastman Johnson** 1824–1906 **Frederic E. Church** 1826–1900 **James Hart** 1828–1901 **Edward Moran** 1829–1901 **Albert Bierstadt** 1830–1902 **John La Farge** 1835–1910 **Homer Martin** 1836–1897 **Elihu Vedder** 1836–1923 **Mary Cassatt** 1845–1926 **Ralph Blakelock** 1847–1919 **Edwin Blashfield** 1848–1936 **William Chase** 1849–1916 **Abbott H. Thayer** 1849–1921 **J. Alden Weir** 1852–1919 **Edward E. Simmons** 1852–1931 **J. F. Murphy** 1853–1921 **Will H. Low** 1853–1932 **Emil Carlsen** 1853–1932 **Leonard Ochtman** 1854–1934 **Kenyon Cox** 1856–1919 **Douglas Volk** 1856–1935 **Charles H. Davis** 1857–1933 **John Elliott** 1858–1925 **Elliott Daingerfield** 1859–1932 **Gari Melchers** 1860–1932 **I. R. Wiles** 1861– **Frank Benson** 1862– **Alfred Stieglitz** 1864– **George Luks** 1867–1933 **Edward W. Redfield** 1868– **Hugh Breckenridge** 1870–1937 **John Sloan** 1871– **Charles W. Hawthorne** 1872–1930 **John Johansen** 1876– **Paul Dougherty** 1877– **Daniel Garber** 1880– **Walt Kuhn** 1880– **Max Weber** 1881–	**Thomas Lawrence** 1769–1830 **Joseph Mallord William Turner** 1775–1831 **John Constable** 1776–1837 **John Cotman** 1782–1842 **William Etty** 1787–1849 **Richard Bonington** 1801–1828 **Edwin Henry Landseer** 1802–1873 **George F. Watts** 1817–1904 **Alfred Stevens** 1818–1875 **Francis Haden** 1818–1910 **William Holman-Hunt** 1827–1910 **Dante Gabriel Rossetti** 1828–1882 **John Millais** 1829–1896 **Sir Edward Burne-Jones** 1833–1898 **Paul Steer** 1860– **Maurice Prendergast** 1861–1924 **James Shannon** 1862–1923 **Charles Shannon** 1865– **David Cameron** 1865– **Frank Brangwyn** 1867– **William Rothenstein** 1872– **Sir William Orpen** 1878–1931 **Augustus John** 1879–	**Pierre Prud'hon** 1758–1823 **Antoine Jean Gros** 1771–1835 **Jean Dominique Ingres** 1780–1867 **Jean Theodore Géricault** 1791–1824 **H. Paul Delaroche** 1797–1856 **Paul Huet** 1803–1864 **Constant Troyon** 1810–1865 **Jules Dupré** 1812–1889 **Jean François Millet** 1814–1875 **Charles Daubigny** 1817–1878 **Théodore Chassériau** 1819–1856 **Rosa Bonheur** 1822–1899 **Eugène Boudin** 1824–1898 **Gustave Moreau** 1826–1898 **Édouard Manet** 1832–1883 **Edgar Degas** 1834–1917 **Ignace Fantin-latour** 1836–1904 **Paul Cézanne** 1839–1906 **Alfred Sisley** 1840–1899 **Auguste Renoir** 1841–1919 **Eugène Carrière** 1849–1906 **Georges Seurat** 1859–1891 **Paul Signac** 1863–1935 **Henri Matisse** 1869– **Maurice de Vlaminck** 1876– **Andre Derain** 1880– **Georges Braque** 1881–	**Georges Michel** 1763–1843 **Jean Camille Corot** 1796–1875 **Eugène Delacroix** *c.* 1799–1863 **Narcisso Diaz de la Peña** 1808–1876 **Honoré Daumier** 1808–1869 **Theodore Rousseau** 1812–1867 **Thomas Couture** 1815–1879 **Gustave Courbet** 1819–1877 **Pierre Puvis de Chavannes** 1824–1898 **Jean Gérôme** 1824–1904 **Jules Breton** 1827–1906 **Camille Pissarro** 1831–1903 **Claude Monet** 1840–1926 **Berthe Morisot** 1840–1895 **Odilon Redon** 1840–1916 **Paul Gauguin** 1848–1903 **Jeanne Lucien Simon** 1861– **Henri Toulouse-Lautrec** 1864–1901 **Georges Rouault** 1871– **Raoul Dufy** 1877–	Germany **Adolf Menzel** 1815–1905 **Franz von Lenbach** 1836–1904 **Hans von Marées** 1837–1887 **Wilhelm Leibl** 1844–1900 **Max Liebermann** 1847–1935 **Emil Nolde** 1867– **Franz Marc** 1880–1916 Switzerland **Arnold Böcklin** 1827–1901 **Ferdinand Hodler** 1853–1918 **Paul Klee** 1879–1940 **André Hofer** active 1912–1930 Sweden and Norway **F. Thaulow** (Norway) 1847–1906 **Carl Larsson** (Sweden) 1853–1919 **Anders Zorn** (Sweden) 1860–1920 **Edward Munch** (Norway) 1863– Spain **Mariano Fortuny y Carbo** 1839–1874 **Joaquin Sorolla y Bastida** 1863–1923 **Ignacio Zuloaga** 1870– **Pablo Picasso** 1881– **Salvador Dali** 1904– Holland **Johann Jongkind** 1819–1891 **Joseph Israels** 1824–1911 **Hendrik Mesdag** 1831–1902 **Jacob Maris** 1837–1899 **Anton Mauve** 1838–1888 **Vincent van Gogh** 1853–1890 Italy **Adolphe Monticelli** 1824–1886 **Giovanni Segantini** 1858–1899 **Amedeo Modigliani** 1884–1920 Mexico **José Clemente Orozco** 1883– **Diego Rivera** 1886– Austria **Oskar Kokoschka** 1886–

GREAT PAINTERS—Concluded

	United States		England	France	Other Countries
Twentieth Century	**George Bellows** 1882–1925	**Edward Hopper** 1882–			
	Rockwell Kent 1882–	**Charles Sheeler** 1883–			
	Eugene Speicher 1883–	**Leon Kroll** 1884–	**Duncan Grant** 1885–		
	Bernard Karnol 1886–	**Henry McFee** 1886–	**Henry Lamb** 1885–		
	Georgia O'Keeffe 1887–	**Henry Mattson** 1887–	**Wyndham Lewis** 1886–		
	Thomas Hart Benton 1889–	**John Carroll** 1892–	**Paul Nash** 1889–		
	Grant Wood 1892–	**Charles Burchfield** 1893–	**C. R. W. Nevinson** 1889–		
	John Steuart Curry 1897–	**William Gropper** 1897–	**Gilbert Spencer** 1892–		
	Reginald Marsh 1898–	**Paul Cadmus** 1904–	**Stanley Spencer** 1892–		
			John Nash 1893–		

FAMOUS PAINTINGS IN IMPORTANT GALLERIES

I. In the Rijks Museum, Amsterdam

Title of the Painting	Painter	School	Comments
The Pantry	Pieter de Hooch (1629–c. 1677)	Dutch	A study of light and space in the characteristic Dutch rectilinear pattern
William of Orange and Mary Stuart	Van Dyck (1599–1641)	Flemish	The betrothal of William of Orange and Mary Stuart executed by the artist when he was painter at the Court of England
The Mill	Jacob Ruysdael (c.1628–1681)	Dutch	Fine cloud structure and dramatic play of light and dark
Woman Reading a Letter	Vermeer of Delft (1628–1691)	Dutch	Masterly in values of light, balance of spaces and harmony of color
Sortie of the Civic Guard	Rembrandt (1606–1669)	Dutch	In this picture, usually called the *Night Watch*, Rembrandt presented the members of this company not as sober portraits but for the rich play of light and shade
Syndics of the Cloth Guild			Holds in one unified impression six powerful and individual portraits
Madonna and Child	Fra Angelico (1387–1455)	Florentine	The gold curtain and the pattern suggest illuminated manuscripts

II. In the Royal Museum, Antwerp

Entombment	Quentin Matsys (1466–c. 1530)	Flemish	Shows realism of types and brilliance and diversity of color
The Seven Sacraments	Roger van der Weyden (c. 1400–1464)	Flemish	Blends daily life of the people with medieval mysticism
The Mandolin Player	Ter Borch (1617–1681)	Dutch	Intimate home life of the Dutch aristocracy of his day
The Dauphin of France	François Clouet (c. 1510–c. 1572)	French	Every stroke of the brush counts in the simple, vivid characterization
Saskia	Rembrandt (1606–1669)	Dutch	Portrait of his wife in one of the elaborate costumes he designed
St. Barbara	Jan van Eyck (1390–1440)	Flemish	An unfinished panel revealing the method of painting in the 15th century; pigment used as a glaze after the picture had been completely drawn and modeled in monotone
Adoration of the Magi	Rubens (1577–1640)	Flemish	Of his third period when light and color reached the peak
The Crucifixion			The majesty of Christ is contrasted with the violence of the thieves
Christ and Angel Musicians	Memling (1430–1495)	Flemish	Figures stand out in soft, light tones against a gold background

III. In the Walters Art Gallery, Baltimore

Madonna and Child	Mantegna (1431–1506)	Venetian	Pioneer effort at perspective rendering; classic theme
Immaculate Conception	Murillo (1618–1687)	Spanish	Showing his favorite subject in charming pattern and color
Madonna of the Candelabra	Raphael (1483–1520)	Umbrian	Masterly skill and human feeling in his favorite subject
Jugurtha Before the Consul	Tiepolo (1696–1770)	Italian	Delicate coloring in a spirited vigorous style

IV. In the Kaiser Friedrich Museum, Berlin

Hieronymus Holzschuer	Dürer (1471–1528)	German	A powerful characterization of a man of impressive personality
Madonna of the Goldfinch			Showing the influence of Venetian light and color
Portrait of a Lady			Lady against the sea. Executed with breadth of light and shadow
The Pearl Necklace	Vermeer of Delft (1628–1691)	Dutch	A splendid relation of tones and of color—blue and gold against gray
Altar of John the Baptist	Roger van der Weyden (c. 1400–1464)	Flemish	A very small altarpiece showing the Baptism of Christ in the center
Adoration of the Christ Child	Fra Filippo Lippi (1406–1469)	Florentine	Against a decorative background the Virgin adores the Child
The Concert	Ter Borch (1617–1681)	Dutch	An example of the perfect color craftsmanship of the Dutch Little Masters
The Prophet Elijah	Dirk Bouts (c. 1410–1475)	Dutch	Shows the characteristic jewellike color, stiff figures and angular pattern
Man with the Pink	Jan van Eyck (1390–1440)	Flemish	Powerful and uncompromising realism in depiction of age and character

FAMOUS PAINTINGS IN IMPORTANT GALLERIES—Continued

IV. In the Kaiser Friedrich Museum, Berlin—Concluded

Title of the Painting	Painter	School	Comments
St. John of Patmos	Geertgen (*c.* 1465–1493)	Dutch	Brooding figure of St. John in a spacious and decorative landscape
Madonna and Child	Quentin Matsys (1466–*c.* 1530)	Flemish	A very human mother kissing her child
Étienne Chevalier and St. Stephen	Jean Clouet (1485–1545)	French	Portrait of the king's treasurer and his patron saint
Hille Bobbe	Frans Hals (*c.* 1581–1666)	Dutch	The rollicking soothsayer of Haarlem painted in loose, bold brush strokes
Nurse and Child			Showing a minute technique in rendering flesh but no sacrifice of lifelike quality
Portrait of Two Canons	Antonio Moro (1519–1576)	Flemish	Two impressively truthful portraits
Lavinia	Titian (1477–1576)	Venetian	The daughter of Titian; showing his usual skill in the treatment of flesh and sumptuous fabrics
Adoration of the Shepherds	Hugo van der Goes (d. 1482)	Flemish	Shows the realism of daily life
The Bladelin Altarpiece	Roger van der Weyden (*c.* 1400–1464)	Flemish	The Nativity, the Christ Child and a vision of the Virgin and Child

V. In the Museum of Fine Arts, Boston

Catalonian Fresco	(12th century)	Byzantine	Byzantine decoration of the apse of a little Romanesque church in Spain
Infanta Maria Theresa	Velásquez (1599–1660)	Spanish	Showing mastery of color values and relations, texture and brush
St. Luke Painting the Virgin	Roger van der Weyden (*c.* 1400–1464)	Flemish	Shows influence of the Italians
The Quarry	Gustave Courbet (1819–1877)	French	Hunting the roebuck in the high Jura
Emma and Her Children	George Bellows (1882–1925)	American	A portrait in bold technique, design and color
Portrait of George Washington	Gilbert Stuart (1755–1828)	American	Painted from life in 1796; considered the standard likeness

VI. In the Art Institute of Chicago

Retable and Altar Frontal	(14th century)	Spanish	Scenes from the life of Christ and the Virgin in the style of an enlarged miniature
Assumption of the Virgin	El Greco (1548–1614)	Spanish	This altarpiece of the soaring Virgin shows his own vivid coloring
Life of St. John the Baptist	Giovanni da Paolo (*c.* 1403–1483)	Sienese	Showing dramatic quality and fantastic treatment of landscape
Wings of Altarpiece	School of Amiens (15th Century)	French	Seven panels of great decorative quality
Madonna and Child	Roger van der Weyden (*c.*1400–1464)	Flemish	Brilliant jewellike color and texture
The Story of Rinaldo	Tiepolo (1696–1770)	Venetian	A great decoration in a brilliant style telling an idyllic love story
In the Circus	Renoir (1841–1919)	French	Two jugglers, notable in design as well as in color and radiant light
Stoke-by-Nayland, Suffolk	Constable (1776–1837)	English	A landscape in his most spontaneous and vigorous manner
Sunday at the Grande Jatte	Seurat (1859–1891)	French	Illustrating his pointillist technique and vigorous design
The Bedroom at Arles	Van Gogh (1853–1890)	Dutch	The artist's own room; showing his emotional intensity
The Basket of Apples	Cézanne (1839–1906)	French	An achievement in design and in expression of form through color
The Interrupted Reading	Corot (1796–1875)	French	Showing Corot's treatment of the figure
The Home of the Heron	Inness (1825–1894)	American	Sensitive romantic treatment of mood in landscape

VII. In the Dresden Gallery

The Sistine Madonna	Raphael (1483–1520)	Umbrian	The Virgin and Child float forward in the clouds. World famous
Sleeping Venus	Giorgione (*c.*1478–1511)	Venetian	Brilliant color and golden glow—a Venetian nude Venus
Tribute Money	Titian (1477–1576)	Venetian	The story is told by two figures sharply contrasted in character and color
The Cheat	Caravaggio (1569–*c.* 1609)	Neapolitan	An example of Caravaggio's realism and of his experiments in light
Lady Washing Her Hands	Ter Borch (1617–1681)	Dutch	A sensitive treatment of the intimite scene, especially fine in textures
Holy Night	Correggio (*c.* 1494–1534)	Venetian	Movement among the figures and a dramatic light contrasted with night
Finding Moses	Veronese (1528–1588)	Venetian	A splendid design in swinging curves. The figures wear gorgeous costumes
Madonna and Four Saints	Titian (1477–1576)	Venetian	A painting of beautiful texture and brilliant color

VIII. In the Pitti Gallery, Florence

The Concert	Giorgione (*c.* 1478–1511)	Venetian	Some critics attribute this to Giorgione; others to Titian
Pope Julius II	Raphael (1483–1520)	Umbrian	One of Raphael's greatest character interpretations
Granduca Madonna			One of his many treatments of this theme
Portrait of Ippolito de' Medici	Titian (1477–1576)	Venetian	A superb portrait of Ippolito in Hungarian hunting dress of rich purple velvet
Portrait of Cardinal Bentivoglio	Van Dyck (1599–1641)	Flemish	A distinguished portrait, in a scheme of brilliant reds
Madonna and Child	Fra Filippo Lippi (1406–1469)	Florentine	The design is a circular panel

IX. In the Uffizi, Florence

Birth of Venus	Botticelli (1447–1510)	Florentine	Born of the sea foam, the goddess is wafted ashore by the breath of the Winds
Adoration of the Magi			The group includes three of the de'Medici family
Spring			The goddess of Love presides over a springtime festival
Madonna Enthroned	Cimabue (*c.* 1240–*c.* 1302)	Florentine	One of the first efforts to revive the art of painting
The Annunciation	Simone Martini (1283–1344)	Sienese	An exquisite decoration on a background of gold
Heracles and Hydra	Antonio Pollaiuolo (1429–1498)	Florentine	A pioneer representation of the body in violent movement
Madonna of the Harpies	Andrea del Sarto (1486–1531)	Florentine	So named from the harpies which are carved on the pedestal
Portrait of the Duke of Urbino	Piero della Francesca (*c.* 1420–1492)	Umbrian	Remarkable for realism of characterization and for unity of linear pattern
Madonna of the Goldfinch	Raphael (1483–1520)	Umbrian	Raphael's characteristic pyramidal grouping against a spacious landscape
Altar of the Portinari Family	Hugo van der Goes (*d.* 1482)	Flemish	One of the most important Flemish altarpieces, so called because it was ordered by Tommaso Portinari
Holy Family	Michelangelo (1475–1564)	Florentine	The interest is in the composition and form of his figures
Coronation of the Virgin	Fra Filippo Lippi (1406–1469)	Florentine	Painted for the nuns of St. Ambrosio—radiantly informal, joyous and exciting
Deposition	Fra Angelico (1387–1455)	Florentine	Showing broad, panoramic treatment in pure sparkling color
Adoration of the Magi	Leonardo da Vinci (1452–1519)	Florentine	A rich, complicated, beautifully ordered picture

X. In the Hermitage, Leningrad

Evening	Claude Lorrain (1600–1682)	French	Expressing the mood of evening in imaginative and classical style
The Swamp	Jacob Ruysdael (*c.* 1628–1681)	Dutch	Sunlight playing through twisted trees, showing romantic attitude
Return of the Prodigal Son	Rembrandt (1606–1669)	Dutch	Showing the intense feeling with which Rembrandt interpreted the Old Testament stories and his dramatic use of light and dark to give accent and mystery
Sacrifice of Abraham			
Danae			One of this artist's few essays in the nude figure
Old Woman in Black Head-dress			No one before Rembrandt so well realized the picturesque possibilities for play of light and dark on wrinkled face and knotted hands
Old Man with White Beard			
Card Player	Chardin (1669–1779)	French	Charm of subject together with a color, texture and pattern that delight the eye

FAMOUS PAINTINGS IN IMPORTANT GALLERIES—Continued

XI. In the Haarlem Museum, Haarlem

Title of the Painting	Painter	School	Comments
Officers of St. George	Frans Hals (*c.* 1581–1666)	Dutch	Ruddy flesh tones set off by black costumes with crimson sashes
Banquet of Officers of St. George			One of Hals' earliest known pictures. A vivid portrayal of a group
Officers of St. Adrien			A wonderful canvas in which the subjects are completely characterized
Regents of St. Elizabeth's Hospital			A portrait group with natural attitudes and gestures
Lady Governors of St. Elizabeth's			Every figure is a remarkably individualized portrait

XII. In the Royal Museum, The Hague

Robert Cheseman	Holbein (*c.* 1497–1543)	German	Portrait of the king's falconer richly dressed, showing superb textures
Anatomy Lesson	Rembrandt (1606–1669)	Dutch	A group of excellent portraits in Rembrandt's earlier manner
Isabella Brant	Rubens (1577–1640)	Flemish	Portrait of Rubens's first wife, suggestive of his Venetian inheritance
Helena Fourment			A seated portrait of Rubens's second wife
View of Haarlem	Jacob Ruysdael (*c.* 1628–1681)	Dutch	Dramatic play of light and dark on a linen bleaching scene near Haarlem
Anna Wake	Van Dyck (1599–1641)	Flemish	Showing splendid portrayal of texture and interesting pattern

XIII. In the National Gallery, London

Avenue at Middelharnis	Meyndert Hobbema (1638–1709)	Dutch	Shows splendid expression of distance
Jan Arnolfini and His Wife	Jan van Eyck (1390–1440)	Flemish	Minute detail with a new realism of light in every part
Man with Red Turban			The great red turban contributes to the vitality of the portrait
Madonna of the Rocks	Leonardo da Vinci (1452–1519)	Florentine	Believed to be a copy of the Virgin in the Louvre
Chapeau de Paille	Rubens (1577–1640)	Flemish	Portrait of the sister of Rubens's second wife
Judgment of Paris			An example of mastery of form and rendering of golden flesh
Château Steen			The country place of the Dutch painter, Jan Steen
Doge Leonardo Loredano	Giovanni Bellini (*c.* 1426–1516)	Venetian	A direct, forceful portrait; beautiful play of color—white, gold and orange against the old blue of the background
Origin of the Milky Way	Tintoretto (1518–1594)	Venetian	Figures lightly poised in air, subdued harmony and luminous shadows
Bacchus and Ariadne	Titian (1477–1576)		The effect of impetuous movement is carried through the whole group
The Tailor	Moroni (*c.* 1525–1578)	Brescian	Designed in a cool color scheme suggestive of the Spanish
Lord Heathfield	Sir Joshua Reynolds (1723–1792)	English	One of his best works; a complete picture of English characteristics
Lady Hamilton	Romney (1734–1802)	English	A delicate portrait free from sentimentality
Valley Farm	Constable (1776–1837)	English	An exhilarating, fresh, unaffected study of light in a landscape
The Shrimp Girl	Hogarth (1697–1764)	English	Spontaneous, live painting; fresh color and bold handling
Canon and Patron Saints	Gheerard David (*c.* 1450–1523)	Flemish	Strongly individualistic portrait in a simple unified composition
Mystic Marriage of St. Catherine			Shows delicate treatment of light
Cornelius van der Geest	Van Dyck (1599–1641)	Flemish	Strong interpretation of character and masterly drawing
Court of Dutch House	Pieter de Hooch (1629–*c.* 1677)	Dutch	A study of a bright day without direct sunshine
Mrs. Siddons	Gainsborough (1727–1788)	English	The face with its brilliant painting of flesh holds the interest
Philip IV of Spain	Velásquez (1599–1660)	Spanish	Extremely simple and subtle in its rendering of form by color values
A Franciscan	Zurbaran (1598–1662)	Spanish	A study of an impressive figure of simple and powerful design
Artist's Father	Dürer (1471–1528)	German	The most minute detail, dominated by the intense vitality of the eyes
Self Portrait	Rembrandt (1606–1669)	Dutch	Simple in representation but subtle in its pattern of light and dark
The Fighting Temeraire	Turner (1775–1851)	English	Turner's brilliant color. The ship is being towed to her last berth

XIV. In the Prado, Madrid (before the Spanish Revolution)

The Young Cardinal	Raphael (1483–1520)	Umbrian	Striking portrait of Cardinal Alidoro in brilliant-red robe and cap
Family of Charles IV	Goya (1746–1828)	Spanish	Ruthless characterization in the richest color and sparkling light
Marie Louise of Parma			An unusually live portrait, a full-length figure in blues and greens
The Entombment	Titian (1477–1576)	Venetian	The emotional effect is achieved by movement of figures and the play of light
Charles V on Horseback			A portrait imaginative rather than realistic, but expressive of character
Crucifixion	El Greco (1548–1614)	Spanish	Elongated forms and swift contrasts of light heighten the emotion
Don Roderigo Vazquez			Subdued color harmony in yellows and greenish blacks
Portrait of a Man	Dürer (1471–1528)	German	A portrait, strong in characterization, of a Nuremberg banker
Martyrdom of St. Bartholomew	Ribera (1588–1656)	Spanish	Striking treatment of light and of various movements of the body
Marie de' Medici	Rubens (1577–1640)	Flemish	Painted to decorate the galleries of the Luxembourg
Maids of Honor	Velásquez (1599–1660)	Spanish	Picture of the Infanta Margarita with her maids, dwarfs and dogs
Infanta Maria Theresa			The Infanta, in rose and silver against a red curtain, stands facing the light
The Tapestry Weavers			The figures in the sunlight are cleverly differentiated from those of the tapestry
The Topers			The amazing life and realism of Velásquez' early manner
The Surrender of Breda			Often called *The Lances.* The general receives the keys of the city
Queen Mary of England	Antonio Moro (1519–1576)	Flemish	A gorgeous court portrait of the determined queen
Adoration of the Magi	Jerome Bosch (*c.* 1462–1516)	Flemish	The artist's satiric fancy is shown in the actions of the rustics
Donor and St. John the Baptist	Robert Campin (1375–1444)	Flemish	Two panels of a triptych in which the furniture and accessories are treated with extraordinary minuteness
St. Barbara			

XV. In the Alte Pinakothek, Munich

The Four Apostles	Dürer (1471–1528)	German	Life-sized, intense and powerful figures showing breadth and grandeur
Daughters of Leucippus	Rubens (1577–1640)	Flemish	Extraordinary rendering of form and movement in an allegory
The Lion Hunt			The dramatic struggle of wild animals organized into fine design
Landscape with Cattle			Showing command over representation of space and of design in depth
Elevation of the Cross	El Greco (1548–1614)	Spanish	Swift contrasts of light and dark heighten the emotional effect
Deposition of Christ	Rembrandt (1606–1669)	Dutch	Rembrandt manipulates his light for drama, emotional expression and the revealing of significant forms
Seven Joys of the Virgin	Memling (1430–1495)	Flemish	An altarpiece, depicting events in the life of the Virgin

XVI. In the Frick Gallery, New York

Romance of Love and Youth	Fragonard (1732–1806)	French	His masterpiece; an allegory in light decorative coloring
Portrait of Comtesse d'Haussonville	Ingres (1780–1867)	French	A serious color study in the classic technique
Saint Jerome	El Greco (1548–1614)	Spanish	Cardinal's red robe gives color to serious character study
Sir Thomas More	Holbein (*c.* 1497–1543)	German	A portrait unsurpassed for character and color harmony
Mistress and Maid	Vermeer (1628–1691)	Dutch	Harmonious arrangement; remarkable shadow luminosity
Lady Hamilton as Nature	Romney (1734–1802)	English	Shows grace and charm in brilliant color technique
Choice of Hercules	Veronese (1528–1588)	Venetian	Allegorical portraits, superbly drawn but weakly characterized
The Forge	Goya (1746–1828)	Spanish	Vivid color contrast and shadow technique with simple theme
The Polish Rider	Rembrandt (1606–1669)	Dutch	An equestrian portrait of subdued color but studied grace
Cologne, Evening	Turner (1775–1831)	English	Unusual golden color richly applied to a river scene
Saint Francis in Ecstasy	Giovanni Bellini (*c.* 1426–1516)	Venetian	A pioneer use of landscape as a major interest in the theme

FAMOUS PAINTINGS IN IMPORTANT GALLERIES—Continued

XVII. In the Metropolitan Museum, New York

Title of the Painting	Painter	School	Comments
Ville d'Avray	Corot (1796–1875)	French	A river with trees "drenched with light," in the cool of early morning
Abduction of Rebecca	Delacroix (*c.* 1799–1863)	French	A spirited and romantic illustration of Scott's *Ivanhoe*
Portrait of Philip IV	Velásquez (1599–1660)	Spanish	Known as the Villahermosa portrait
Wheatfields	Jacob Ruysdael (*c.* 1628–1681)	Dutch	Extraordinary illusion of moving light with clouds scudding across the fields
Woman Opening Casement	Vermeer of Delft (1628–1691)	Dutch	An effect of diffused light throughout the picture
Woman with a Parrot	Manet (1832–1883)	French	Subtle color study in tones of yellow-rose showing broad areas of light
Portrait of Madame X	John Singer Sargent (1856–1925)	American	The brilliant style of Sargent at his simplest and best
The Nativity	El Greco (1548–1614)	Spanish	Flamelike movement throughout the canvas
Don Sebastian Martinez	Goya (1746–1828)	Spanish	Range of color and economy in rendering contrasted with detail
James, Duke of Lennox	Van Dyck (1599–1641)	Flemish	Has the characteristic rendering of varied textures
Junker Ramp and His Sweetheart	Frans Hals (*c.* 1581–1666)	Dutch	A lively picture of a tavern scene in rich and varied color
The Maine Coast	Winslow Homer (1836–1910)	American	By the American realist whose marines are known for depth and power
Christ after the Resurrection	Roger van der Weyden (*c.* 1400–1464)	Flemish	The third panel of a famous triptych
Holy Family	Rubens (1577–1640)	Flemish	Life-sized figures of Virgin and Child with infant St. John
Landscape	Poussin (1594–1665)	French	Showing depiction of far distant space
Madame Charpentier and Children	Renoir (1841–1919)	French	In the cool delicate color of Renoir's early period
Meditation	Carpaccio (*c.* 1450–*c.* 1522)	Venetian	Two hermits meditating on the death of Christ

XVIII. In the Louvre, Paris

Mona Lisa	Leonardo da Vinci (1452–1519)	Florentine	Often called La Gioconda. The most subtle interpretation of character and an equally subtle modeling of form
Madonna of the Rocks			An original and intense conception in a romantic setting
Madame Récamier	Louis David (1748–1825)	French	The classical portrait at its best—a finely organized pattern of flowing line
The Gleaners	Millet (1814–1875)	French	Powerfully constructed figures in rhythmic movement against a vast plain
Marriage at Cana	Veronese (1528–1588)	Venetian	The Bible story converted into a gorgeous banquet of the Renaissance
Man with the Glove	Titian (1477–1576)	Venetian	One of the great portraits of all time, in the lyrical spirit of youth
The Entombment			A dramatic and poignant rendering rich in color and in arabesque
The Lace Maker	Vermeer of Delft (1628–1691)	Dutch	A broad and simple treatment of light in a scheme of blue and yellow
Olympia	Manet (1832–1883)	French	The delicacy of flesh set off by varied whites
Shepherds in Arcadia	Poussin (1594–1665)	French	A French version of the classical tradition of the Italian Renaissance
Supper at Emmaus	Rembrandt (1606–1669)	Dutch	Use of light and dark to create deep religious feeling
Hendrickje Stoffels			Splendid modeling, characteristic illumination, suggestive treatment
Banker and his Wife	Quentin Matsys (1466–*c.* 1530)	Flemish	One of the earliest examples of *genre* painting for its own sake
Gipsy Girl	Frans Hals (*c.* 1581–1666)	Dutch	An impression of movement and dashing use of the brush
Mystic Marriage of St. Catherine	Correggio (*c.* 1494–1534)	Venetian	A study in light and in brilliant transparent color, like that of Venetian glass
Pastoral Symphony	Giorgione (*c.* 1478–1511)	Venetian	Showing romantic quality and warm glow of color
La Belle Jardinière	Raphael (1483–1520)	Umbrian	One of the finest of Raphael's series of the Madonna and Child
Virgin and Child with Chancellor Rolin	Jan van Eyck (1390–1440)	Flemish	Showing Jan van Eyck's jewellike color, his portrayal of character, of texture, and of the intimate and picturesque details of Flemish life
Portrait of Erasmus	Holbein (*c.* 1497–1543)	German	Powerful characterization has seldom been carried so far as in this portrait
Embarkation for Cythera	Watteau (1684–1721)	French	The light suffusing the canvas moves in rhythmic pattern
La Source	Ingres (1780–1867)	French	The simple modeling, the delicacy and truth of line reveal classical qualities
La Kermesse	Rubens (1577–1640)	Flemish	Realistic and exuberant portrayal of Flemish peasant life
Landing of Marie de Médicis at Marseille			One of the series of twenty-one decorative canvases of episodes in the life of Marie de Médicis
Infanta Margarita	Velásquez (1599–1660)	Spanish	Exquisite color and subtle tone values in satin dress and silky hair
Charles I	Van Dyck (1599–1641)	Flemish	An achievement in color and clever subordination of unimportant figures
Mother	Whistler (1834–1903)	American	A subtle characterization called *An Arrangement in Gray and Black*
The Burial at Ornans	Courbet (1819–1877)	French	This sincere and vigorous painting initiated the realistic movement
Dante and Virgil	Delacroix (*c.* 1799–1863)	French	The intensity and emotional color are significant of the new Romanticism
The Blue Vase	Cézanne (1839–1906)	French	A still-life resolved into perfect order of line and color and space
Madonna	Memling (*c.* 1430–1495)	Flemish	Showing the artist's seductive color and polished technique

XIX. In the Huntington Gallery, Pasadena

Mrs. Siddons as Tragic Muse	Reynolds (1723–1792)	English	One of the world's most-loved portraits in superb color harmony
The Beckford Children	Romney (1734–1802)	English	Superficial characterization in brilliant, transparent coloring
Isabella, Marchioness of Hertford	Hoppner (1758–1810)	English	Portrait of a lady of fashion in the best taste of the age
Pinkie	Lawrence (1769–1830)	English	Restraint and idealism in a gay informal portrait study
Master William Blair	Raeburn (1756–1823)	English	Realism in vivid style and graceful portrait technique
The Blue Boy	Gainsborough (1727–1788)	English	Masterly portrait composition with startlingly massed blues

XX. In the Villa Borghese, Rome

Sacred and Profane Love	Titian (1477–1576)	Venetian	Richness of color and texture of nude forms and sumptuous fabrics
The Entombment	Raphael (1483–1520)	Umbrian	A serious theme in a confused style and arrangement
Diana and Her Nymphs	Domenichino (1581–1641)	Bologna	Spirited nude girls in a landscape setting
Danae	Correggio (*c.* 1494–1534)	Venetian	Showing illusion of depth and imaginative treatment of the Greek myth

XXI. In the Vatican Gallery, Rome

Transfiguration	Raphael (1483–1520)	Umbrian	Good example of space design and use of gesture to unite figures
Madonna di Foligno			With portrait of Sigismondo Conti as donor
The Entombment	Caravaggio (1569–1609)	Naples	One of his most important paintings; drastic contemporary tragedy
Madonna in Glory with Six Saints	Titian (1477–1576)	Venetian	Below the Mother, Child and angels are the six saints
Portrait of Sixtus IV	Melozzo da Forli (*c.* 1438–1494)	Umbrian	Historical portrait group of Sixtus IV, his librarian and attendant cardinals
St. Antonio and Saints	Antonio Vivarini (d. *c.* 1470)	Venetian	Characteristic of conservative tendencies in Venetian painting before advances of the remarkable Bellini family

XXII. In the Royal Gallery of Fine Arts, Venice

Madonna of the Trees	Giovanni Bellini (*c.* 1426–1516)	Venetian	Showing breadth of modeling and life and vitality
Ursula's Vision	Carpaccio (*c.* 1450–1522)	Venetian	The angel offers to the dreaming Ursula the martyr's palm
Presentation			Ruskin considered this the most beautiful baby Christ in all Venetian art
Miracle of St. Mark	Tintoretto (1518–1592)	Venetian	Irresistible rhythm of movement in space and golden brilliance of color
Death of Abel			Dramatic expression; superbly balanced masses of light and shade
Procession in Piazzo of San Marco	Gentile Bellini (*c.* 1427–1507)	Venetian	A procession, showing the artist's capacity as painter of light and air

FAMOUS PAINTINGS IN IMPORTANT GALLERIES—Concluded

XXIII. In the Imperial Gallery, Vienna

Title of the Painting	Painter	School	Comments
Madonna of the Cut Pear	Dürer (1471–1528)	German	The German type of Madonna painted with minute precision
Madonna with Cherries	Titian (1477–1576)	Venetian	The more mature type of Virgin and informal composition
Gipsy Madonna			This picture foreshadows the splendor of his later coloring
Portrait of Jane Seymour	Holbein (*c.* 1497–1543)	German	Portrait of the third wife of King Henry VIII in miniaturelike style
Portrait of Helena Fourment	Rubens (1577–1640)	Flemish	Portrait of Rubens's second wife, nude with only a fur coat about her
Miracle of St. Ildefonso			A mature work in which light and color had become major interests
Infanta Margarita Theresa	Velásquez (1599–1660)	Spanish	A portrait in a color scheme of silver, black and coral
Hunters in the Snow	Breughel (*c.* 1525–1569)	Flemish	An innovation in landscape and representation of great space
The Rustic Wedding			Red caps, white coifs and yellow omelettes in an unusual color harmony
Portrait of His Mother	Rembrandt (1606–1669)	Dutch	Rembrandt was probably the first artist to interpret old age with sympathy
Madonna of the Meadow	Raphael (1483–1520)	Umbrian	Painted in 1506 under the influence of Leonardo da Vinci
Birth of Christ	Gheerard David (*c.* 1450–1523)	Flemish	Remarkable for its effect of light which emanates from the Child's body
Virgin and Donor	Memling (1430–1495)	Flemish	Depicting the Virgin and worshiping donor in the central panel

XXIV. The National Gallery (Mellon Foundation), Washington

Title of the Painting	Painter	School	Comments
Adoration of the Magi	Botticelli (*c.* 1447–1510)	Florentine	One of several subjects done in the traditional classic method
Salisbury Cathedral	Constable (1776–1837)	English	Masterpiece of perspective and charming color harmony
Marquesa de Pontejos	Goya (1746–1828)	Spanish	Characteristic brilliant color contrast and vivid style
Officer with Red Sash	Hals (*c.* 1581–1666)	Dutch	A vigorous character study
La Ferme au Soleil	Hobbema (1638–1709)	Dutch	Simple realistic study in superb lights and shadings
Alba Madonna	Raphael (1483–1520)	Umbrian	A simple study full of character and grace
Isabella Brant	Rubens (1577–1640)	Flemish	Blending of Venetian and Flemish color techniques
Toilet of Venus	Titian (1477–1576)	Venetian	Unsurpassed rich golden flesh tones and human feeling
Lord Philip Wharton	Van Dyck (1599–1641)	Flemish	Sensitive portraiture and finished technique
Lace Maker	Vermeer (1628–1691)	Dutch	Distinguished by luminous color and harmony of design

This list is merely an introduction to the great galleries of the world and certain of their treasures. It does not include all the accepted masterpieces or great museums, omitting especially the smaller galleries which may be very important on account of the masterpieces they possess. Neither does it represent the most important paintings of the world, for there are many such paintings that are not in museums but in churches and buildings for which they were originally painted. For instance, we do not go to museums to see the works of Giotto, but to the Arena Chapel at Padua; and the greatest paintings of Rome are not in the galleries of Rome but in the apartments of the Vatican decorated with the great frescoes of Raphael, and in the Sistine Chapel where Michelangelo spread upon the ceiling his great drama of creation.

SCULPTURE

Sculpture in the strict sense of the word refers only to works carved or cut by hand in some solid substance; but the term is commonly extended to include all three-dimensional figuring, whether carved, molded, hammered, cast or engraved.

MATERIALS AND METHODS

Almost every imaginable material has been used—gold, silver, bronze, ivory, marble and other stones, wood, clay, wax and plaster. Sometimes several materials are combined.

Polychromy.—We are so accustomed to a colorless sculpture in stone that we forget how large a part was played in the past by polychromy, the art of giving a colored surface to sculpture. This was particularly the practice among the Babylonians, Egyptians, Assyrians and early Greeks. It survived through the best Greek periods and was used by Etruscan, Roman, medieval and Renaissance artists. As most of this color gradually wore off when exposed to the weather, it is difficult to understand exactly how a great deal of the sculpture appeared when it came from the sculptor's hand. On the colored and glazed terra cottas the color was permanent. The lions and other animals and figures built up of enameled tiles in relief, found at Babylon, Susa and Khorsabad, show how familiar this method was to the ancient Orient. The most famous later examples are the terra cottas of the Italian Renaissance, called *Robbia ware* because they were made by the Della Robbia family.

Courtesy Metropolitan Museum of Art

Queen Nefertete in Colored Limestone

A portrait sculpture of an Egyptian queen made about 1370 B.C. and now in the National Museum, Berlin

The remains of polychromatic Greek sculpture are enough to show that brilliant and heavy coloring was used at an early date, especially in architectural sculptures. As soon as marble replaced other stone it was not necessary to stucco and paint the entire surface, and the polychromy was gradually restricted to patterns and borders and to shading the eyes, the hair and other details. Statues of women found on the Acropolis, after being buried there since about 480 B.C., show the most exquisite of the early coloring. We are told that Nicias, a famous painter, was accustomed to color the masterpieces of the sculptor Praxiteles.

Surface Treatment.—There is great variety in the treatment of surfaces, from sculpture in the round at one end to intaglio or incised design below the surface, used particularly in precious and semiprecious stones. In intaglio the design is often reversed. Sometimes the design is merely scratched or outlined on the surface, as in Greek and Etruscan bronze mirrors and jewel cases, but this is really more like engraving than sculpture. Next comes work in which the background is but slightly lowered, and the figures are left standing in slight relief, sometimes in connection with figures in higher relief in the same composition. The Romans combined figures on different planes in a single composition with the figures in the foreground nearly detached and held by only one or two members of the figures behind them. This gives practically the effect of statuary.

In statuary or sculpture in the round, the figure is freestanding on all sides, as in statues that stand upon pedestals, to be viewed from any angle.

Objectives of Sculpture.—Sculpture of the human figure has a triple aim: to express plastic beauty of form, to embody thought and feeling and to act as a chronicler of facts. Naturally it is impossible to accomplish this triple aim with equal emphasis on the three parts, and different civilizations have stressed one or another aspect. In general it may be said that the Oriental countries have magnified plastic or abstract values or as we say, have formalized their sculpture; but in Greece, Rome and Renaissance Italy factual or naturalistic representation prevailed.

The special character of sculpture gave it certain limitations. Sculpture cannot tell a story with the same detail as painting. But it can embody a natural or idealized representation of typical humanity better than painting.

At the other extreme is sculpture turned into pictorial channels; this was mainly in relief work, especially after the Romans had used a multiplicity of figures in several planes. The reliefs of Greco-Roman art with their backgrounds of landscape and architecture and the spiral narrative of Trajan's Column lead up to such elaborate compositions as the bronze doors of the baptistery of Florence, the work of Lorenzo Ghiberti (*c.* 1378–1455). In this sort of relief, modern critics believe, sculptors were trying unwarrantedly to do the work of painting, and the trend is to appreciation of the solider and less involved types of work. If one part of the mission of sculpture is to express plastic beauty of form, they say, the expression should be obviously sculptural and therefore to an extent heavy and rocklike, not light and painty.

HISTORY OF SCULPTURE

Bird's-Eye Views.—Sculpture has had a history of at least 6,000 years. Aside from the crude statuettes of the Old Stone Age and similar works found in many parts of the world from the time when mankind was emerging from prehistory into the earliest phases of civilization, the first flowering of sculpture came about 3000 B.C. when Egyptian culture began to take shape. During the next 300 years the Egyptians produced some of the noblest examples of sculptural art known to history. Even earlier the Mesopotamian culture of the Sumerians or early Babylonians was assuming definite form; but in that region sculpture was not an outstanding accomplishment until many centuries later, when the Assyrians and later Babylonians developed the art of relief carving to a notable degree.

In the light of modern archeological findings, it is safe to say that magnificent sculpture had been achieved long before the advent of the Greeks. Explorers and scholars are still reconstructing our knowledge of the little-known Scythians and other steppe peoples of Asia, who left beautiful relics in small metal sculpture; but we do not know whether it was before or after the Greek flowering. The early history of Chinese sculpture also is veiled in doubt.

By 500 B.C. the Greeks had already produced that portion of their art known as *archaic.* At this time a tide of realism and idealization got underway that set the standard in Europe for many centuries to follow. The immediate result of the Greek devotion to a clear, natural art was the creation of a long series of *classic* masterpieces dating from the time of the Parthenon artists.

With the fall of Rome there came something of a dark age for sculpture. Before the last Roman monuments had been erected, however, the Byzantine style had developed in small sculpture in the Near East and Egypt. Sculpture flowered again with the emergence of the Romanesque style of building. There is no real dividing line between Romanesque and Gothic work, and the abundant and gorgeous sculptures that are still to be seen on the great Gothic cathedrals are best studied with the Romanesque under the general name *medieval.* They represent one of the major achievements of the art.

Contemporary with the Gothic development in the north of Europe, Italian artists were reviving the ideals of Rome. By the end of the 13th century the seed of the Renaissance had been sown. Thenceforward the revival of classic forms shaped the course of sculpture in the western world except for the work of the nonconformist genius, Michelangelo. From the time of the mid-Renaissance, when naturalistic and pictorial sculpture reached again the pitch of perfection touched by the Romans, the art gradually declined and grew artificial. In their better manifestations these artificial and involved forms are called *baroque.* Towards the end of the 19th century there was a further revival of realism, this time scientifically and even photographically exact; and this gave way to the Modernism of the 20th century, which is frankly antirealistic and akin to the efforts and aims of Oriental sculpture.

In the Far East sculpture has from earliest times taken a course directly away from the naturalism and idealism of the West. In the countries of most importance in Asiatic art, Persia, India, Java, Cambodia, China and Japan, the ideals have been formal and decorative. Indian, Cambodian and Chinese sculpture may be said to have been expressionistic through all history. China especially is rich in monuments that look strange and even abnormal if one limits appreciation to the Greek conception; but in the wider view of sculpture the Chinese have produced a greater and more varied body of beautiful works than any other people.

Egyptian Sculpture.—In Egypt sculpture ranges over more than 3,000 years. In that time the changes are many, but a recognizable character runs through the nation's achievement from beginning to end. In general Egyptian sculpture is massive, solid and dignified. The best of it is nobly monumental, impersonal and serene, as befits an art closely related to religious beliefs and customs. On the other hand there are works as graceful, charming and intimate as any to be encountered in Europe or Asia.

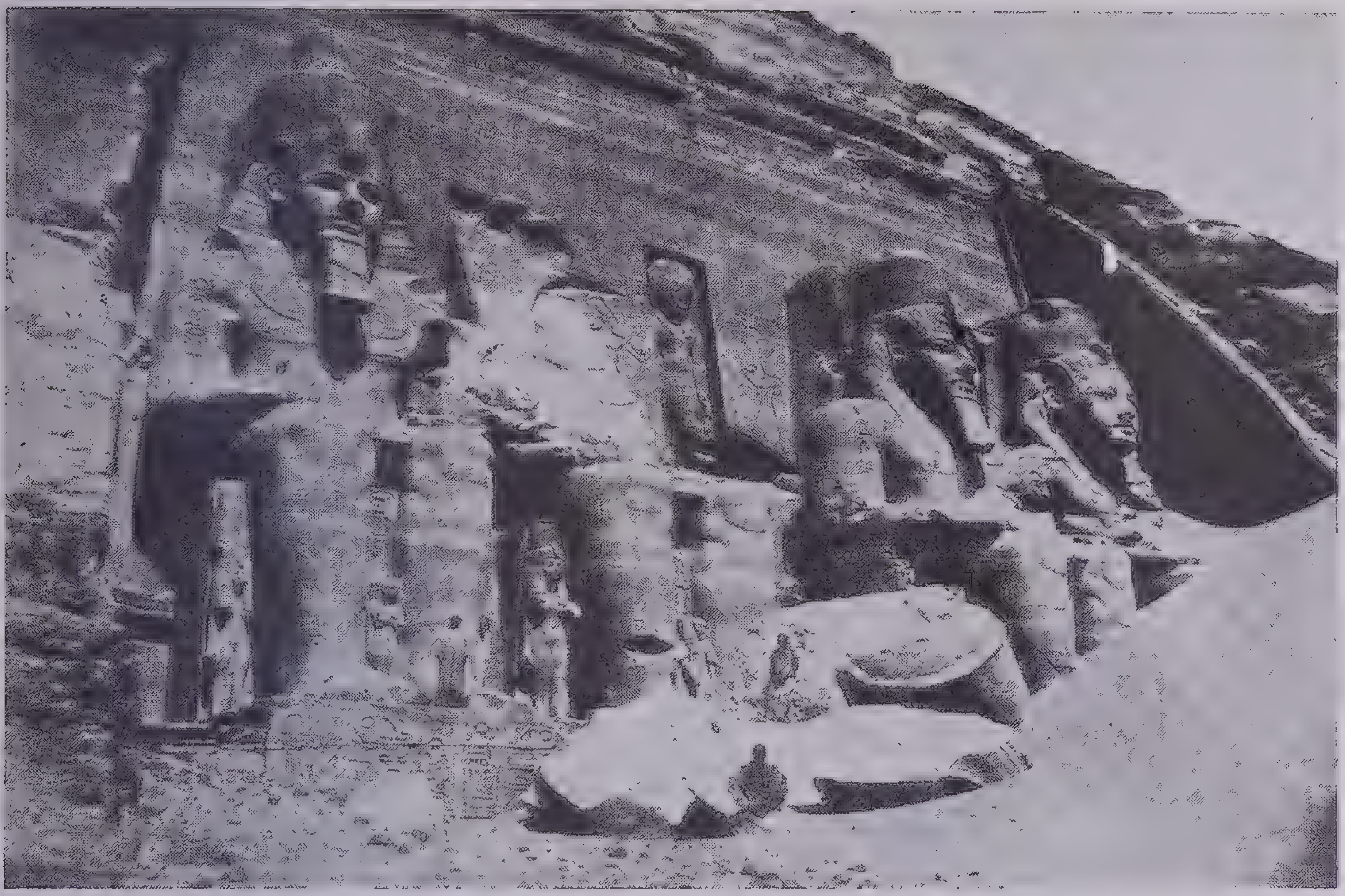
Three main periods of creativeness are generally marked. In the *Old Kingdom,* which began about 2980 B.C., the sculptors produced some of the outstanding masterpieces of monumental art. The subjects are usually kings (portrayed perhaps as gods), nobles and officials. In these there is the characteristic Egyptian amplitude, massiveness and dignity. The bodies are in general standardized, appearing in a few conventional poses. But the heads are likely to be realistically individual, with as fine a combination of exact rendering and sculptural stylization as one can find in the whole annals of the art. In other words the statue becomes at once an unmistakable likeness of the sitter and a formal creation of inescapable beauty. Such particularly is one of the best-known of the large rock-cut works, the *Seated Figure of King Khafre* (*c.* 2800 B.C.). This and the statue in wood called *The Village Magistrate* should be known to well-informed art lovers as favorably as the Parthenon marbles and the later Greek *Venuses* and *Victories.*

Courtesy Metropolitan Museum of Art

Seated Figure of King Khafre

This diorite figure, now in the Cairo Museum, is one of the earliest examples of Egyptian sculpture existing today

The realism of *The Village Magistrate* and of a great number of less masterly works is explained by a very special intention on the part of the artists, growing out of the Egyptian



Courtesy Metropolitan Museum of Art

Egyptian Sculpture: Statues of Ramses II at Abu-Simbel, Egypt

These four 65-foot seated figures of Ramses II were carved out of the living rock at the Temple of Abu-Simbel in 1350 B.C. The façade is 119 feet wide and 100 feet high

religion. It was believed that the soul of the deceased would return at intervals to inhabit the body and in case anything should have happened to the body portrait statues were provided with heads so realistic that the soul would be sure to recognize it. Hence the pains to reproduce every smallest peculiarity and the filling of the chamber tombs of Egypt with such statues.

In the figures of the god-kings, such as the *Khafre,* there was an effort to add to the likeness a feeling of grandeur and majesty. The quality becomes at times one of aloofness and other-worldliness; the supreme example of this being the famous *Sphinx* near the pyramids at Giza, near Cairo, where a natural outcropping of rock is carved into a colossal statue, having a body of a lion and the head of a man, the face bearing an enigmatic expression.

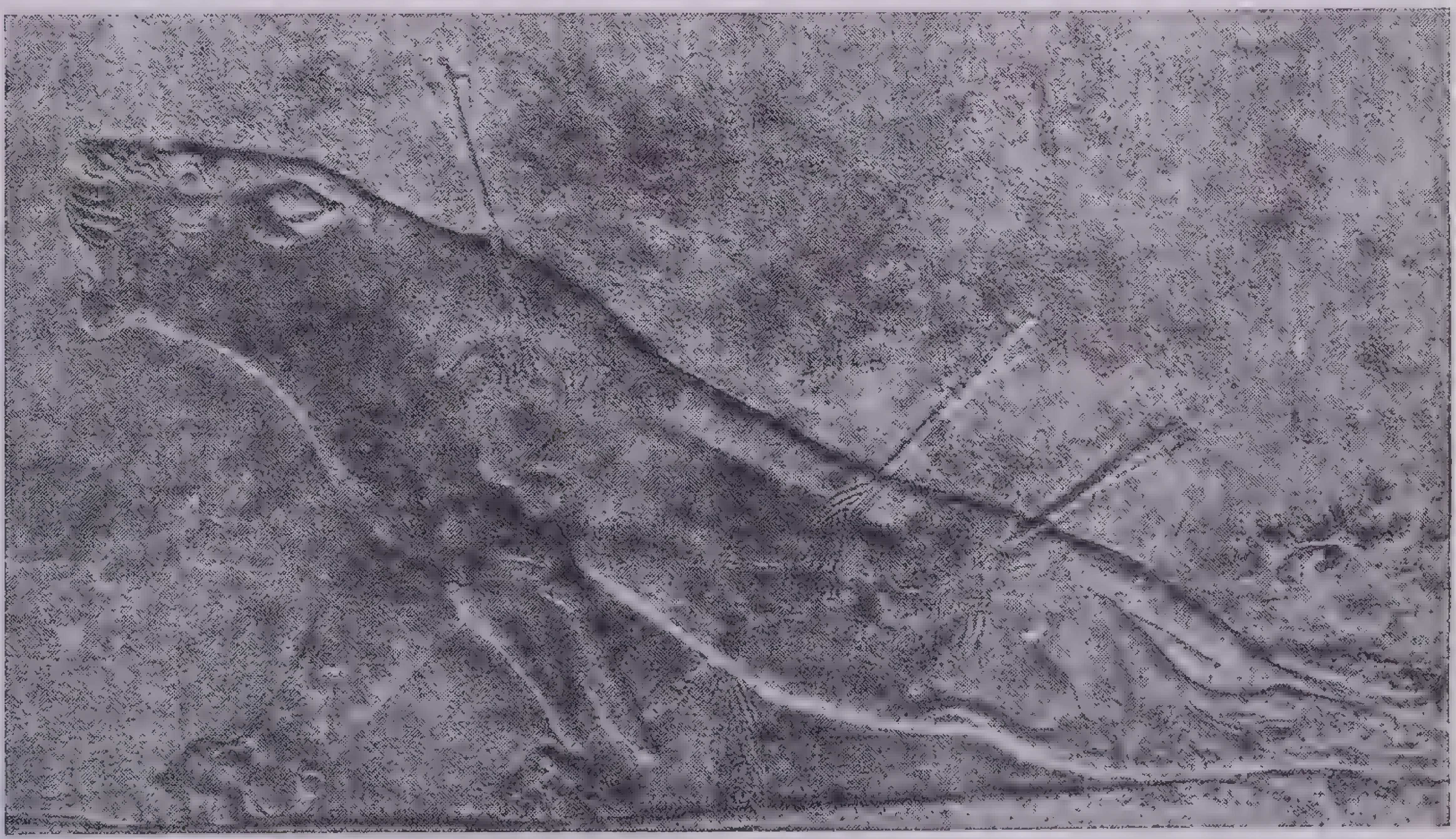
In later eras the sculpture of the Old Kingdom was freely copied, sometimes beautifully, oftener with loss of the finer characteristics. A true renaissance occurred during the Middle Kingdom, about a thousand years after the time of King Khafre, and some of the most magnificent regal statues date from the period. It was, however, after another lapse of centuries, in the so-called New Kingdom, that a totally different sort of excellence was accomplished. Under King Ikhnaton, a ruler who brought a new freedom in the arts, there were produced portrait statues which combined amazing character portrayal with solid sculptural virtues. The faces are so clear a revelation of the inner man or woman that we of today find these studies, 33 centuries old, modern in our sense of the word. The finest examples are heads and busts of Ikhnaton, of Nefretete his queen and of their daughters.

In all the forms of monumental and portrait sculpture, the Egyptians must be ranked as among the three or four foremost peoples of all times. To this should be added the fact that they have left more masterly relief art, literally untold miles of it, than any other nation. The relief sculptures that line the tomb walls of important personages tell amazingly full and engaging stories of the life of these pleasure-loving and pious people. And in the tombs have been found exceptionally beautiful craftwork enriched with miniature forms of sculpture: household utensils, jewelry and jewel boxes, combs and decorated furniture.

Babylonia, Assyria, Persia.—There is reason to believe, from latest excavations, that the history of the arts will be carried back to an earlier date in Babylonia or Sumer as the original civilization on the Euphrates is known, than in Egypt. Certainly the Sumerian and Babylonian artists never approached in artistry the workers on the Nile. The most successful and typical pieces from the earlier periods are some comparatively crude statues and statuettes of gods, reliefs for architectural decoration in metal and a few attractive little figures of animals found in the grave of Queen Shub-ad (*c.* 3100 B.C.). Lack of stone suitable to easy carving may have hindered the development of sculpture.

Assyria was Babylonia's successor in artistic leadership in western Asia. Numerous quarries of soft limestone gave an opportunity to develop relief sculpture and to illustrate on the inner palace walls the exploits of the Assyrian kings. Although this sculpture was chiefly narrative and at first bound by some rather wooden conventions, one gets a distinct impression of force from the muscular and energetic Assyrian warriors and of animal vitality from the hybrid monsters that guard the portals of the palaces. The Assyrians were great sportsmen and hillmen; they knew and studied animal life and could picture animals far more faithfully than men. The lions, wild asses, deer and hounds that we see in the royal hunts—wounded, slain or led—are full of character and realism. In fact in the opinion of some critics the depiction of animals in action has never been accomplished with more sensitive artistry. One Assyrian reproduction of a wounded lioness, with paralyzed spine, dragging herself along, is famous.

All the other peoples of the Near East practiced sculpture to a certain extent; but there are only a few important recovered works of the Hittite and Phoenician artists. With the conquest of Babylonia, Persia began the development of a distinctive type of sculpture based at first on Assyrian, Hittite and Babylonian models but with a touch of Oriental formal-



Courtesy Metropolitan Museum of Art

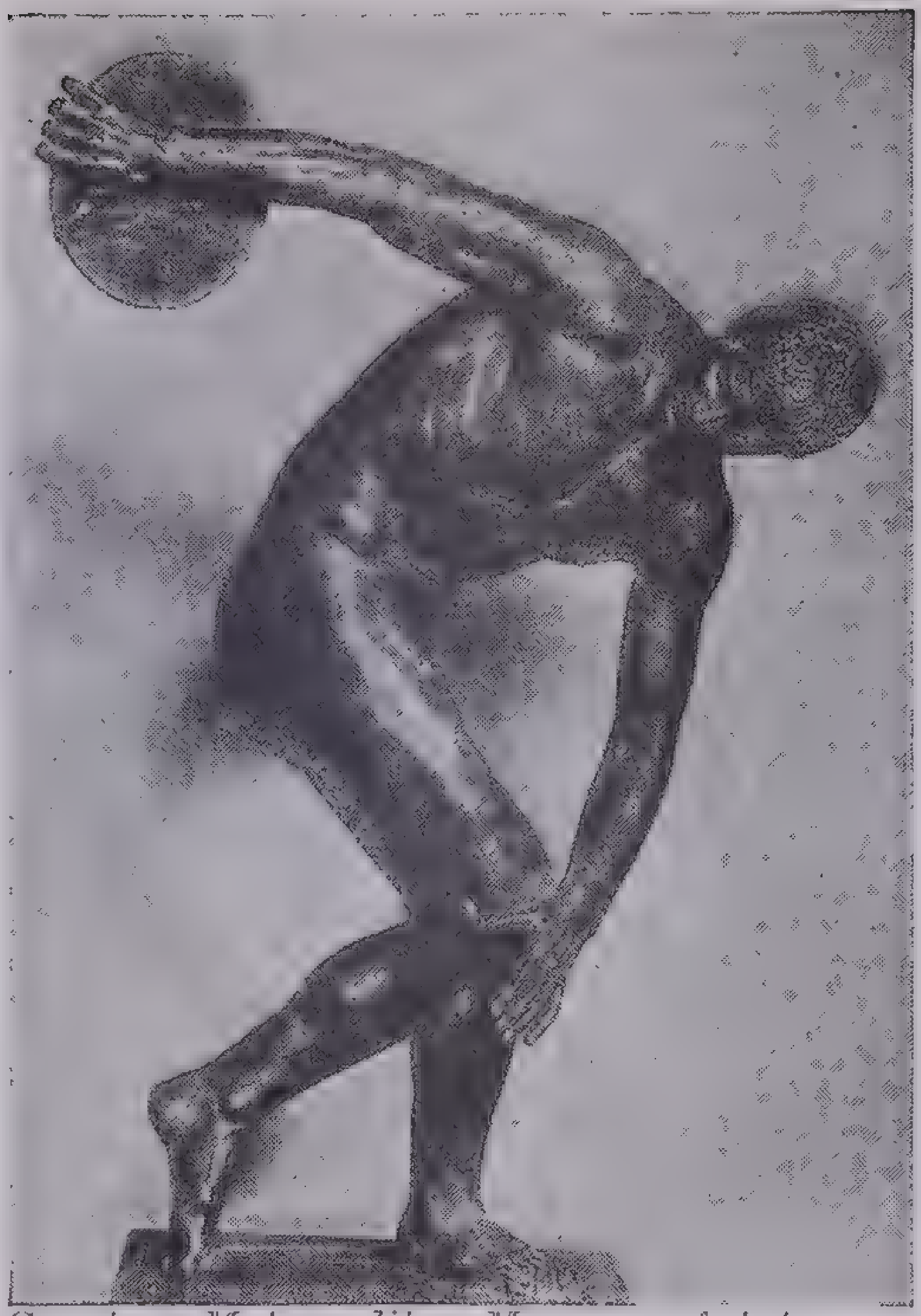
Assyrian Sculpture: Wounded Lioness

An alabaster relief from the walls of the palace of the Assyrian King Ashurbanipal (*d.* 626 B.C.), now in the British Museum, London. The Assyrians were great hunters and studied animal life carefully. Their artists portrayed animals, as this lioness paralyzed by a spinal wound, with graphic realism ization and ornamentalism that came from Persia's own Iranian background. The reliefs in the royal audience hall of the palace at Persepolis, built by the Persian kings at about 500 B.C., exhibit a better sense of stylization than do the Babylonian reliefs, and the so-called bull capitals in the palace at Susa similarly illustrate a superior sculptural conception. There are also some marvelously spirited animal figures, apparently in the tradition of the Scythian or steppe art. From these Persia was to go on to a foremost place as a homeland of the design styles of the Near East. She was to influence deeply the later Byzantine and Mohammedan cultures and to recapture at intervals her own deeply creative impulse, as in the celebrated reliefs in silver of the Sassanian period and the later Persian-Islamic decorated metalwares.

The Sculpture of Greece.—Greek sculpture may be divided into four periods: *the archaic style,* before 480 B.C.; the *grand style* of the 5th century; the more relaxed and *realistic* style of the 4th century; the *dramatic* and *picturesque* style of the Hellenistic Age.

Archaic Period. A few statuettes and considerable gold ware and silverware with pictorial-sculptural reliefs of an ancient Aegean art have been preserved, chiefly from the Minoan period in Crete and from the Mycenaean civilization in the Peloponnesus. The Dorian invasion seems to have wiped out this civilization, and it is not until the 6th century B.C. that sculpture of importance reappears. Two distinct racial schools had then formed: the *Ionic,* originating in Asia Minor, and the *Doric* with its center in Greece in the Peloponnesus. We are accustomed to these styles in architecture; they were quite as real in sculpture. The Ionian school developed relief work and the draped female figure, and showed imagination in types of gods, heroes, legends and myths. The Dorian school studied particularly the nude male figure and perfected the athletic type. Both schools made attempts at portraiture and realism in details, and that is interesting to remember in connection with the ancient Minoan and Mycenaean work which also showed a gift for observation, as contrasted with the Oriental gift for imagination and decoration. The most interesting sculptures of this early or archaic Greek period are the fascinating priestesses from the Athenian Acropolis, each a different character study, and the long series of type figures that are known as *Apollos* though they more likely represent athletes.

The famous statues of the gables of the Temple of Aegina, now at Munich, are the best works of the pure Doric school. The discoveries at Delphi have given notable works of both schools to this age: the unique bronze *Charioteer,* purely Doric, and a series illustrating the development of relief sculpture during the century preceding the Parthenon (550-450 B.C.).


Courtesy Metropolitan Museum of Art

Greek Sculpture: The Discobolus
No original of Myron's statue exists today. This copy is in the Palazzo Lancelotti, Rome

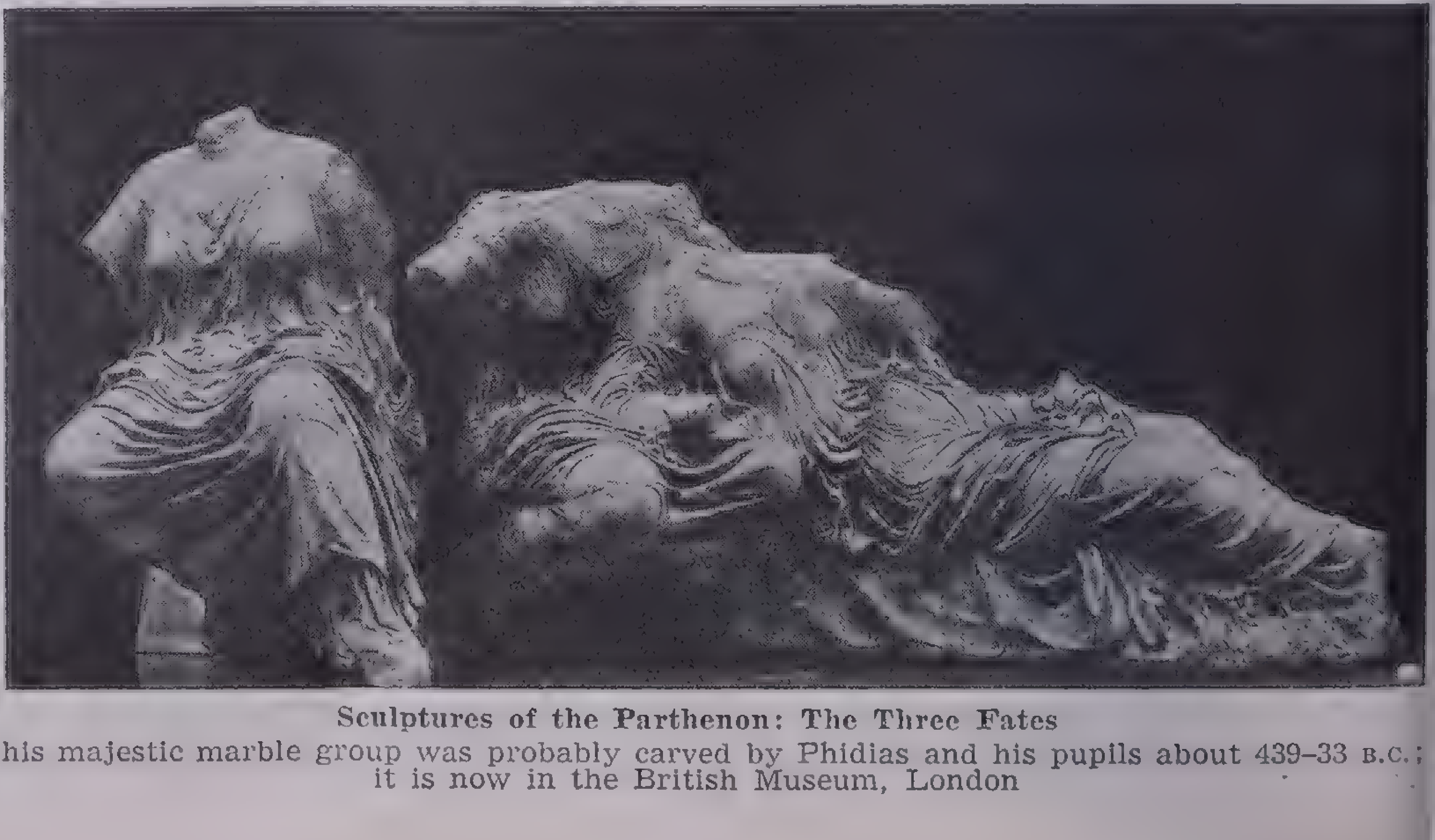
The reaction against the archaic stiffness of the early athletic figures, with arms glued to their sides, already evident at Aegina, is emphasized in the group of the tyrant killers, *Harmodius and Aristogiton,* carved by Critius and Nesiotes, of which a copy is in Naples. They are rushing forward vehemently to strike the tyrant Hipparchus. This vehemence is itself eliminated in the works of Myron, in which mastery of physical form in action is complete and yet repressed. His two masterpieces, of which copies remain, are the *Discobolus* (discus thrower), bending low for the throw, and the *Marsyas* (a god of nature, resembling Pan), starting back as he sees the flutes of Athena. The *Marsyas* is in the Lateran at Rome. All traces of the archaic have disappeared except in such minor details as the hair.

Another masterly work was the gable sculpture at the Temple of Zeus at Olympia. It represented, at one end of the building, a fight between the Lapithae and Centaurs, and at the other a chariot race. The grouping and posing are freer than at Aegina. Apparently the artists, said by Pausanias to be Paeonius and Alcamenes, relied considerably on polychromy and distance. The stately Apollo in the center is still somewhat archaic, but the reclining seer is a realistic portrait. This archaic art was supple and human before the full advent of the Phidian types.

Grand Style. The decorations of the Parthenon are sometimes considered the greatest works of sculpture of any age. They are nearly all collected in the British Museum. It is impossible to say that Phidias himself actually handled any part of them or that he did more than merely plan them; but as all his known masterpieces, such as the colossal statues of *Athena Parthenos* and the *Olympian Zeus,* have disappeared, the Parthenon decorations are our only clue to his style. The two pediments pictured the *Birth of Athena* and the *Contest between Athena and Poseidon for Athens.* The most wonderful of the remaining male nude figures are the *Theseus* and the *Cephisus* or *Ilissus,* both reclining. Of the females, the group of the *Three Fates* is perhaps the grandest in its majestic beauty; in the drapery, minute yet broad, free yet clinging; in the full yet supple forms, showing so richly in Ionic softness.

The frieze representing the Panathenaic procession in honor of Athena had an average relief of only one inch and a half, but the extraordinary modeling makes the figures appear to project much farther, and this effect is increased by the skilful overlapping managed through inclining the planes. The most beautiful of the figures in repose is the group of the three gods from the east frieze, still in Athens; but it is difficult to select one slab as more perfect than another among the graceful groups of Athenian horsemen and maidens. They are the embodiment of idealized humanity expressed by an art as subtle in the rendering of personality as in that of form and texture.

There was another great master of realism in the 5th century, Polyclitus. He was Dorian, not Attic, and he naturally excelled in athletic figures. His masterpieces are the *Diadumenos,* a young victor binding the fillet around his head, and the *Doryphoros,* an ath-


Sculptures of the Parthenon: The Three Fates
This majestic marble group was probably carved by Phidias and his pupils about 439–33 B.C.; it is now in the British Museum, London

lete with a spear. In his massive build this javelin thrower embodies the law of proportions for the human body that Polyclitus established as a rule to be followed by all sculptors.

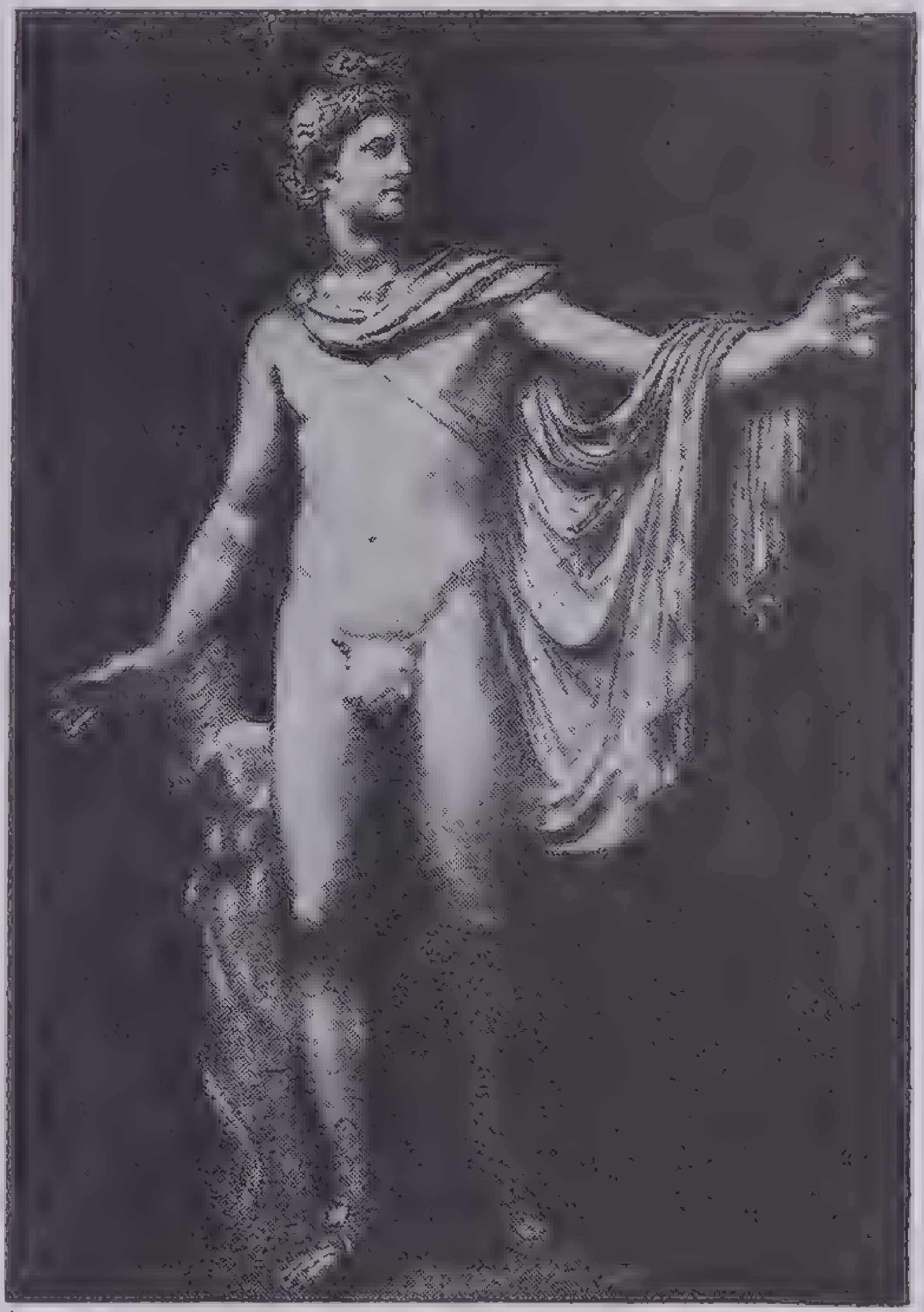
Realistic Period. Praxiteles, about 350 B.C., introduced a new ideal of grace and beauty, a different feeling for textures and postures, a more humanized and less lofty esthetic ideal. The most beautiful of Praxiteles' statues was considered by antiquity to be the *Aphrodite of Cnidus.* Of the lost original, the best copy is in the Vatican. It was the most famous of Greek nude Aphrodites: soft and voluptuous, yet broadly developed; shrinking, yet conscious of her beauty. There remains one original by the hand of Praxiteles himself which, though less famous in antiquity, is far more precious to us because it gives his own handling, which was so great a part of his art. It is the statue of Hermes holding the infant Dionysus, found at Olympia, a pretty combination of strength and tenderness, of structure and finish.

Another sculptor, quite as great as Praxiteles and as dramatic as Praxiteles was self-poised, was Scopas. His is the spirit that heralds the coming age. He took part in the most ambitious sculptural work of the times, the Mausoleum of Halicarnassus, built after 351 B.C. Many characteristic pieces are in the British Museum, especially the majestic colossal statue of Mausolus himself and the frieze of the Amazons, which is interesting to compare with 5th-century work. It is less crowded, more delicate and lithe. The museums are full of the statues of the schools of Scopas and Praxiteles: gods and goddesses (particularly Eros and Aphrodite), satyrs and fauns, as well as various portrait statues of poets and philosophers. This period was the golden age for well-poised, calm and humanistic types. There was also, however, the dramatic and pathetic side to this art, represented especially by Scopas.

Latest of the 4th-century masters is Lysippus, a prolific and popular artist who headed the Dorian or Sicyonian school. The best copy of his masterpiece, the *Apoxyomenos* (athlete cleaning himself with a scraper) with its light pose and agile strength, indicates a further advance in naturalism. Alexander the Great so admired Lysippus that he decreed that no other sculptor could make portraits of him, and several notable busts of Alexander may be Lysippus's work.

The most famous work of the end of this age, and the best preserved work of Greek sculpture, is the so-called *Sarcophagus of Alexander* from Sidon, in Constantinople. Its hunting and battle scenes between Greeks and Persians are even more picturesque than the Amazon frieze of Halicarnassus; and the effect is enhanced by the perfect condition of the surface, on which every detail of the delicate polychromy remains to show us how the late Greek sculptors strove to eliminate the hard whiteness of the marble.

Picturesque Hellenistic Period. Alexander's conquests assisted in the spread of Hellenic sculpture throughout the East and changed its character by creating new centers of artistic production. Athens and even Greece itself ceased to lead. The principal schools were at Alexandria, Rhodes, Pergamum and other cities of Asia Minor. Sculpture became more pictorial, dramatic and sentimental. Landscape, portraiture, genre, colossal figures and groups, historic scenes and theatrical episodes became the fashion. The placidity and grace of the previous age were lost. Many among the best-known Greek originals and copies belong to this period.


Courtesy Metropolitan Museum of Art

Greek Sculpture: The Apollo Belvedere

A Roman copy of a Greek bronze statue representing the god Apollo as a young, victorious archer, in the Vatican, Rome

Conspicuous is the *Apollo Belvedere,* a Roman copy in marble of a bronze Greek original of Apollo as an archer —a graceful figure which became famous at a time when few Greek originals were known.

Of the figures of Venus or Aphrodite, the foremost and the only Greek original is the celebrated *Venus de Milo* (Louvre), which is considered to stand on a level with even the sculpture of the Parthenon. The exquisite handling of flesh and drapery and the grace of the pose are subordinated to the artist's conception of the goddess as superwoman.

A Greek original dating from the very beginning of this age (306 B.C.) is the Nike (goddess of victory) found at Samothrace and now in the Louvre, a nobly exultant work adorned with flying drapery.

Pergamum, in Asia Minor, was the seat of the Attalid kings. Its greatness was due to Attalus (241 B.C.), whose victories over the hordes of Gauls were commemorated in a group of bronze statues. The intensely dramatic figure of *The Dying Gaul* in the Capitoline Museum at Rome is an early marble copy of one of these masterpieces and a realistic study of a barbarian hero. Another copy from this series is the Gaul slaying himself and his wife in preference to falling a captive (Terme Museum, Rome). Eumenes, the direct successor of Attalus, built at Pergamum the great Altar of Zeus, one of the Seven Wonders of the Ancient World. It was surrounded by an enormous carved frieze, 430 feet long. The subject is *The Battle of the Gods and Giants.* It is for the Hellenistic age what the Parthenon sculptures are for the 5th century. The two most dramatic sections are those where Zeus and Athena are engaged in combat. There is an exuberant and massive vigor about the figures, a restlessness and intricacy, a contrast of light and shade, a clashing of lines in the composition that combines with the size of the figures to make it quite overpowering. The relief is so high that the figures are almost detached. For nearly three centuries this great Pergamene altar influenced art.

This influence is shown in the spectacular group of Laocoön and his sons, by Agesander, Polydorus and Athenodorus. They were of the Rhodian school, and completed their work about 100 B.C. We see in this struggling and writhing mass a decadent form of the art of the earlier Pergamenians, in which everything is sacrificed to technical display and melodramatic emotion. To the same school and date belong the group of the *Farnese Bull* in Naples, representing the punishment of Dirce, fastened to a bull's horns by her stepsons, the last word in naturalistic, pictorial, theatrical sculpture.

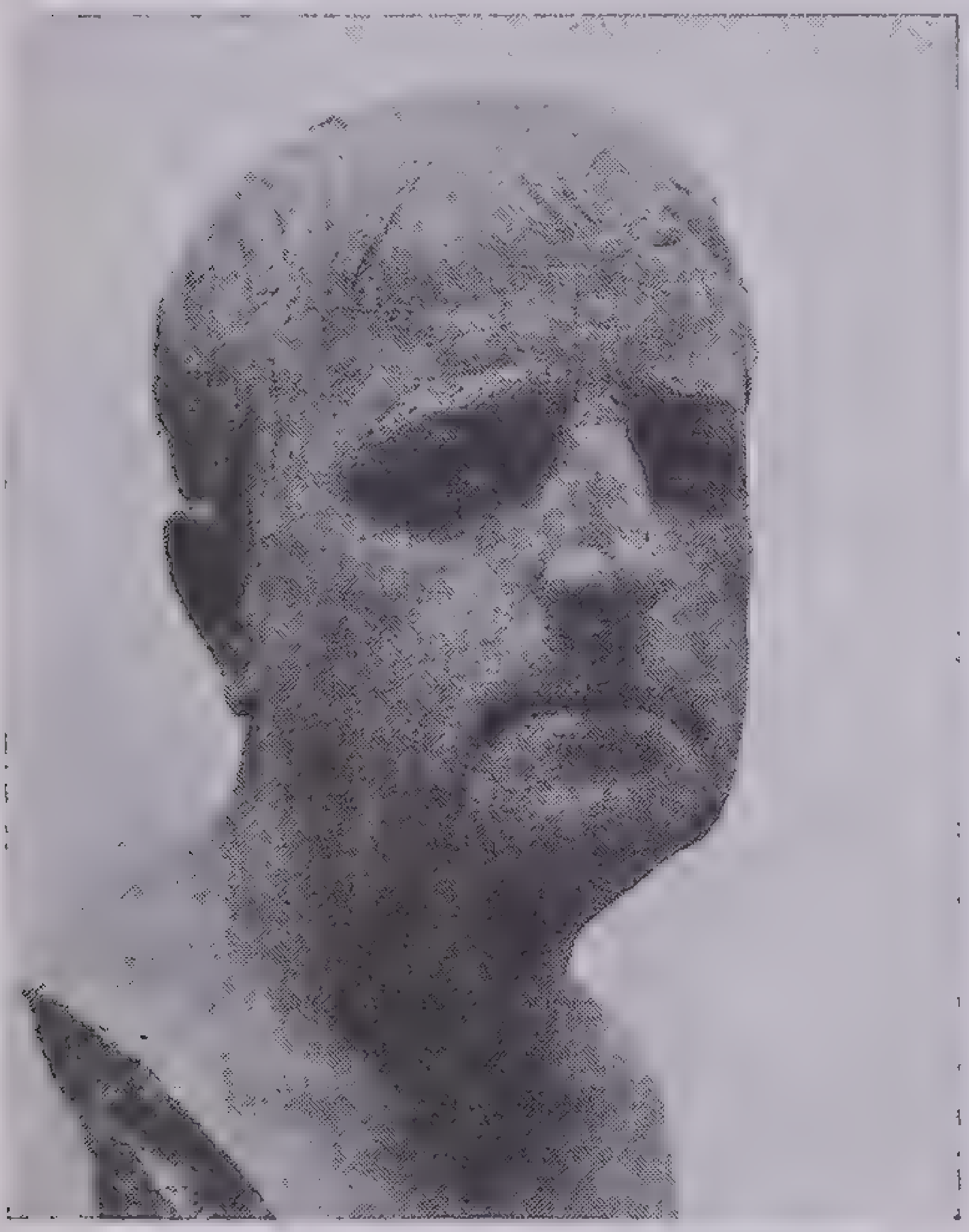
Portraiture also was developed. There are the characteristic heads of Alexander, conspicuous for his leonine locks, his deep-set eyes and his neck drawn down to one side. In the Naples Museum are many bronze heads from Herculaneum of this age, some supposed to be portraits of the Ptolemies; others, of the famous Greek philosophers and poets. The *Boy with a Goose,* in the Louvre, after Boethus (2d century), and similar pieces in the Vatican show the genre work that was so popular in Alexandria.

Roman Sculpture.—Before Rome became great, there had already been a notable development of sculpture on Italian soil. The Etruscans had produced beautiful works, not unrelated to the art of western Asia and of archaic Greece. A number of terra cotta sarcophagi or coffins have formalized figures, and others in stone have carved relief panels. Most distinctive and beautiful are the Etruscan statuettes in bronze, particularly the figures of warriors.

As the Roman conquerors subdued neighboring peoples, they took over certain cultural elements, and for a time Etruscan sculptors helped shape early Roman expression. But soon generals, whose armies had overrun and plundered the western and eastern Greek colonies and then Greece itself, brought back Hellenistic Greek works of art as spoils, and thereafter Etruscan works and ideals were lost to sight, and naturalistic late Greek statuary became fashionable.

Rome's contribution to the art of sculpture is not original or important and cannot be compared with Greek or Egyptian or Indian. But in certain departments Rome added new elements to the art, chiefly in *portraiture, historic reliefs, equestrian* statuary and *decorative relief* sculpture.

Portraiture. In almost any of the large museums one is impressed by some characteristic Roman bust or portrait statue. Ancestor worship and the use of realistic wax figures and painted terra cotta portraits in Republican Rome explain why portraiture in marble and bronze under the Empire attained a perfection never equaled before or since. It is a realistic art that approaches photography from nature in its exact rendering of detail; but in the best examples attains to a revelation of inner character. This art kept its excellence for nearly three centuries. To compare the seamed and gnarled old man with nearsighted eyes in the marvelous head of the time of Cicero with the serene countenance of Augustus from his statue in the Vatican, is to see the two sides of this art in its earliest stage. One can gain a clearer idea of Roman character from these heads than from reading Latin literature. The equally rotund and unintellectual emperors, Vitellius and Vespasian, are amazingly characterized. And before the art begins to stiffen, these are followed by numerous excellent portraits of Trajan and Hadrian. Even then there are remarkable exceptions, such as a head of Caracalla, a masterly transcript of unbalanced fury and a return to a vicious primitive type. How different all this is from the Greek ideal of concealing the emotions under a serene and perfectly balanced exterior and of giving to sculpture the form of types instead of the form of individuals!


Courtesy Museum of Fine Arts, Boston

Roman Sculpture: Portrait Statue

The subject of this terra cotta head is unknown

Many of the portraits belong not to busts but to life-size or colossal statues, in which Hellenic and Roman peculiarities were combined. The emperors were represented often as gods and as nude or slightly draped figures of Hellenic type. They were also shown as orators and benefactors in statues like those of Sophocles or Demosthenes produced by Hellenistic art. They also appear as generals in full military panoply like the Vatican Augustus, and this form is typically Roman. There never was a time in the history of sculpture when so many portrait statues of persons of every sort, men and women, were erected. The squares of every town, the basilicas and porticos, the villas, the baths, the theaters and hippodromes were all peopled with hundreds of these works.

Historic Relief Sculpture. The second peculiarly Roman field, historic relief sculpture, was made possible by new advances in technique. Roman artists revolutionized the art. Their realism seized on relief sculpture as a medium for expressing national and political life as well as mythological scenes. They did this at first without breaking away radically from the Greek methods. We see this in the reliefs covering the marble parapet that encircled the famous Altar of Peace, which was erected in the Campus Martius at Rome in 12 A.D. to celebrate the pacification of the world by Augustus. In contrast with the Hellenic symbolism that left out personalities entirely, we see in certain panels of the *Ara Pacis* the imperial family headed by Augustus on their way to the commemorative sacrifice.

It took a century to develop out of this graceful semi-Hellenic Augustan style what was more characteristically Roman—forceful, picturesque and storytelling. A halfway stage was marked in 81 A.D. by the relief on the Arch of Titus, with its triumphal procession and the carrying of the seven-branched candlestick. It was in 114 A.D., in the reliefs of the Arch of Trajan at Beneventum, that the final stage was reached and perfectly expressed. Here nearly all the principal events of Trajan's reign were represented: his triumph over the Dacians, his Eastern wars, his army reforms, his efforts to restore prosperity by the encouragement of agriculture and commerce.

To tell all of these stories effectively the sculptor placed his figures in three planes in perspective, one behind the other, and so rivaled, perhaps inappropriately, the painters of the time. The figures in the front plane are sometimes almost detached, being held by an arm so that they have almost the effect of freestanding statues; but the figures in the background are almost flat and sink back. This gave the sculptor the opportunity for the greatest variety of pose and direction, of groupings and composing. There is great play of light and shade, and this helps to give dramatic effect. So carried away were the Romans of this time with the storytelling possibilities of relief sculpture that the same men who decorated this arch carved a continuous spiral band that winds around the Column of Trajan at Rome, which tells the entire history of his two Dacian wars. It is in very low relief, and local touches are given by details of architecture and landscape. Originally its effectiveness was increased by brilliant coloring.

Equestrian Statues. Equestrian statues were used by Greek sculptors before the time of Alexander, whose figure on a prancing steed, engaged in battle, is known to have been a work often copied by Roman artists. The colossal bronze *Marcus Aurelius* in the square of the Capitol at Rome is one of the most famous equestrian statues in the world, and served as a model for artists during the Renaissance and later.

Decorative Sculpture. Another interesting innovation was the increased use of decorative sculpture, lavishly employed and fantastically varied, as an embellishment of architecture. Encouraged by late Hellenistic suggestions, there developed a rank exuberance, a richness of decorative work, a charming mingling of figures and ornament. Nothing could be more exquisite than some of the carved marble vases and altars in the Vatican Museum, or the continuous friezes or separate wall panels or pilaster decorations on buildings.

Even figures alone were made to serve a decorative purpose, as in the stuccoes in the walls of certain tombs on the Via Latina and in the Terme Museum at Rome. The artist would sketch in the wet stucco on the walls little genre scenes that have never been surpassed in light effectiveness.

During and after the reign of Septimius Severus there came a gradual decline. At the close of the 3d century, under Diocletian, figure sculpture had become lifeless and almost puppetlike.

Early Christian and Byzantine Sculpture.—It was the natural result of the decay of Roman society rather than enmity to sculpture that eliminated it from the field of art at about the time when Christianity became the religion of the state under Constantine. The friezes of the Arch of Constantine—about the only parts of its sculpture that were not robbed from earlier monuments—and the figures of consuls of this time found in the Roman Forum show that the growing incapacity of sculptors is a sufficient explanation, and that it is not necessary to suppose that the Christian Church prohibited the art because it so frequently represented the idols of paganism. The decay was general throughout Roman territories except where they had contact with the Orient. For a short time the Christian tombs in their reliefs could tell in a mechanical way the story of Christian belief in the Bible and immortality; but even this phase came to an end in the 5th century.

After this sculpture remained in eclipse in Europe for several centuries, while the world went through many changes: the crumbling of the old Roman civilization, the invasion of the northern races, the rise of Mohammedanism and the gradual growth of the nationalities and the culture of European peoples under the guidance of the Church. Architecture and painting ebbed but survived. In the midst of the Dark Ages the rich art of mosaic murals developed in the Eastern Roman Empire, especially at Byzantium, the modern Constantinople.

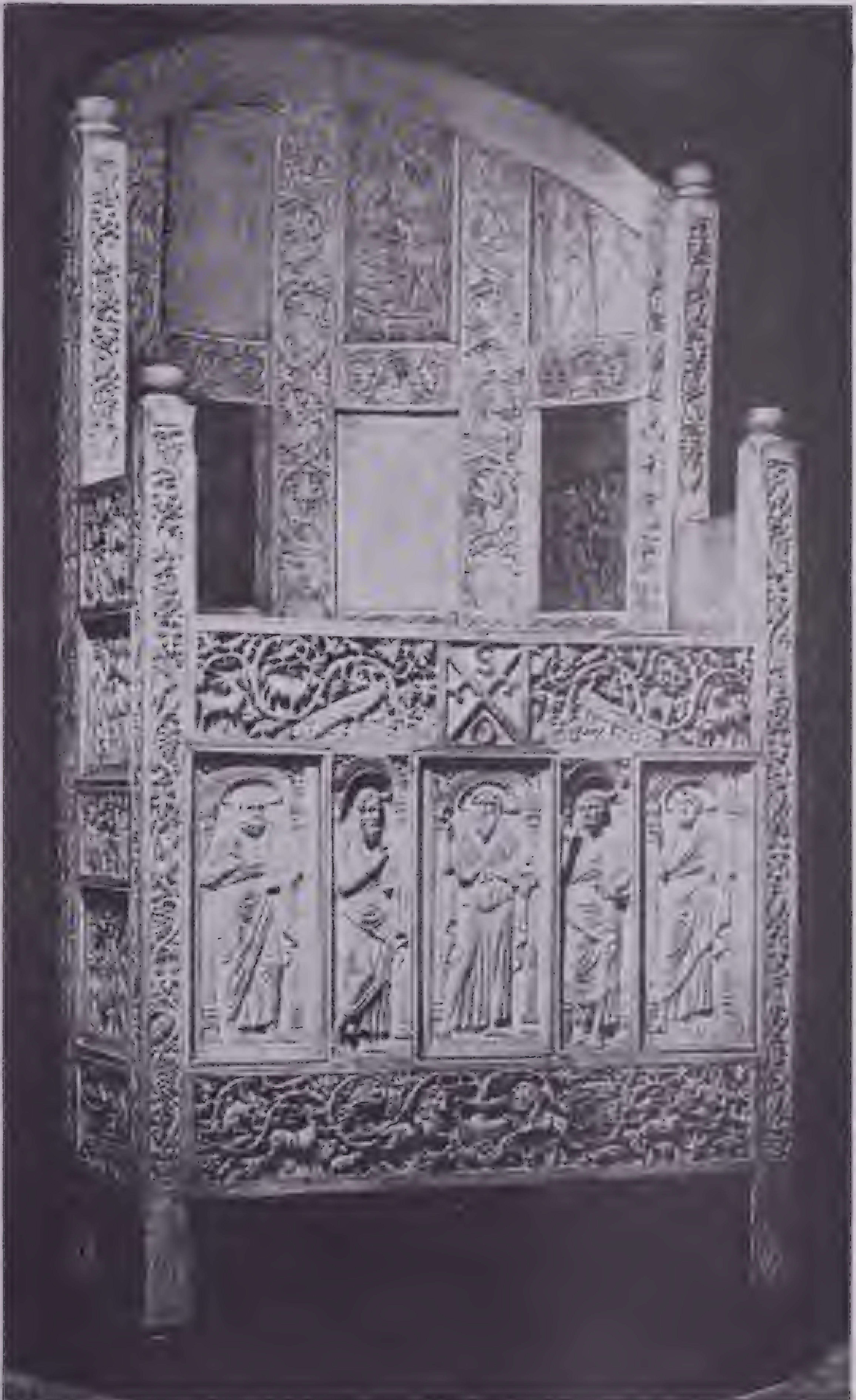
The next great flowering of sculpture also is Byzantine and is seen first in the Eastern Christian lands—Syria, Greece, Constantinople and its surrounding region—and in Egypt where a special form known as Coptic is notable. Gradually the style pushed westward and became the standard sculpture of Christian Europe until the Romanesque type emerged in the 11th century. Byzantine sculpture is typically Oriental in its denial of the Western realistic canons and in its rich ornamental patterning. Large statuary is almost unknown. The most characteristic product is high- or low-relief, especially in miniature ivory panels which were often hinged together as a triptych, a picture that can be opened to show three related compositions and can be closed to protect the sculptured portions.

Some of the finest reliefs in ivory were carved for the adornment of book covers, altar fronts and caskets. One of the best-known examples of Byzantine carving is the cathedra or bishop's chair of Maximian at Ravenna. The chair is covered with a great number of intricately carved panels in ivory imbedded with innumerable exquisite independent compositions, beautiful arabesquelike designs of leaves and branches, birds and animals. As in so much Eastern sculpture, the human figure is an incidental rather than dominating motive. The commonest Byzantine sculptures are smaller ivory reliefs treating religious subjects.

Byzantine influences seeped into western Europe, and examples of Byzantine work were imported or were actually produced in Spain, Italy, and France. At various times Byzantine artists and workmen emigrated from the Eastern to the Western Empire, and their ideas and craftsmanship became part of the background of Romanesque art. In Ravenna, Venice and Sicily there are the magnificent architectural monuments erected under imported Byzantine designers, and in conception and execution many sculptures in the medieval churches of France may be considered more Eastern than Roman. Before the end of the 11th century Byzantine influences had fused with those surviving from old Rome. This period marked the beginning of the Romanesque style. Romanesque sculpture was influenced by the stone crosses of early Celtic Ireland, the finest decorative sculpture of the northern peoples up to that time, and to some extent by the art of other northern peoples.

Romanesque Sculpture.—Romanesque sculpture is marked by two types. The first is illustrated by examples surviving on the porch of the Church of St. Trophime at Arles in southern France. Byzantine ancestry is shown in the massing of figures in panels for pattern effect, in the close relationship of sculpture and architecture with no freestanding figures and in a fat rounding of the figures. The sculpture is mixed with typically classic architectural detail, and the symmetry of arrangement is Roman rather than Eastern. Other fine examples are to be seen in Spanish and Italian churches, especially Lombardian.

Before 1150 the marvelous church sculptures at Moissac, Vézelay and Autun, all of the 12th century, had been produced. They represent the second type of Byzantine sculpture and are among the foremost sculptural monuments in all Europe. They are rich in motives repeated in pattern effects, and the single figures are treated with unprecedented freedom and vigor. The sculptor's art has seldom been so fitted to its decorative place within an architectural organism. Similar works existed in abundance in other countries, especially in England, but destruction of religious images during the struggles between the Catholic and Reformed



Courtesy Metropolitan Museum of Art

Byzantine Sculpture: Ivory Throne of Maximian

Front view of the cathedra or throne of Archbishop Maximian in the Archiepiscopal Palace at Ravenna, made sometime in the 6th century A.D. Each panel is complete in itself and yet all help to make one complete unit of the chair. The designer or sculptor carved scenes from the life of Christ on the back of the chair. The central figure of the five front panels has been identified as St. John churches left those countries with hardly more than broken fragments.

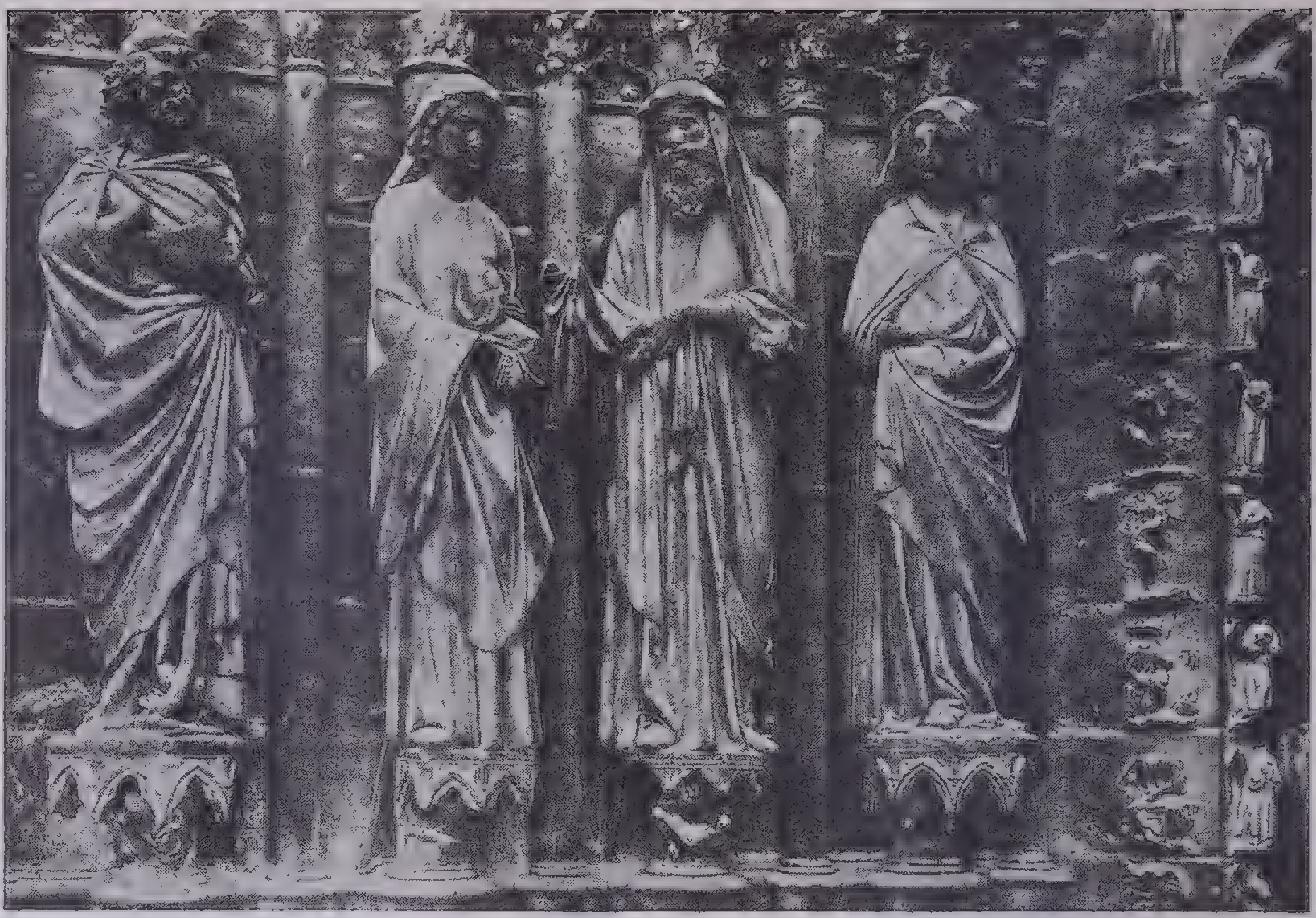
Gothic Sculpture.—If it is difficult to find a dividing line between Byzantine sculpture and Romanesque, the change from Romanesque to Gothic is even more obscure. Almost insensibly the formalism, distortion and rhythmic patterning of the earlier style were modified, and more natural and humanistic works were substituted. More emphasis was put upon the single figure, as against the group composition, and increasingly the statue began to stand out independent of the architecture.

Chartres cathedral affords an instructive lesson in the change of methods and aims. The west portal figures, set back stiffly in their niches on the columns, are obviously more important as parts of an architectural whole than for their own sake; and the tympanums (arched spaces over the doors) are filled with richly composed story scenes of the sort noted at Moissac and Vézelay. But in later doorways of the same cathedral the statues take on individual character and importance, and the story scenes in the panels become at once more real and more literary. At Chartres these changes took place over a period of more than a century, from 1145 to the mid-13th century.

At this time occurred the very culmination of the Gothic development, when Amiens, Reims and Paris are being built. All through the 13th and 14th centuries the drift to a more intimately realized humanity and a more believable reality can be traced. Nevertheless the sculpture of the finest Gothic cathedrals of the early and middle periods remains beautifully integrated in the architectural fabric, and today the French cathedrals afford the richest first-hand experience of sculptural art to be had in the Western world.

France. France not only was the birthplace of the Gothic style but established its purest forms as well. The cathedrals were the one place where all the people congregated not only for worship but for plays, for fairs, for public and political meetings; the cathedrals were used as the means for instructing the masses. Their walls and portals were carved with figures and reliefs that systematically summed up all the teaching and knowledge of the time. The sculptor was once more a man with a mission as he was in Greece in the 5th century B.C. Each cathedral is a museum of masterpieces, beginning at Notre Dame in Paris and continuing at the cathedrals of Bourges, Chartres, Reims, Amiens and others.

The perfection of French Gothic sculpture is shown in the 530 figures that decorate the west façade of Reims cathedral. We have here breadth of style, a grand treatment of drapery and majesty of pose. At the same time there is the greatest variety. A sense of humor is shown in many heads, as in the *St. Joseph,* and a capacity for grotesque effects appears in many of the corbel masks. One of the apostles recalls an antique philosopher or poet—a Sophocles or Aeschines. St. Elizabeth is like a Juno.



Courtesy Metropolitan Museum of Art

French Gothic Sculpture: Figures Decorating the West Façade of Reims Cathedral

A section of the left side of the central portal of the Cathedral of Notre Dame, Reims, depicts the Purification of the Virgin Mary. St. Joseph stands beside the Virgin who offers the Child to St. Simeon, while the prophetess Anna looks on

Although it is true that most of the heads are types rather than portraits, there is an evident study of nature. This is seen, for instance, in the charming youthful head of the Virgin and the piquant angel at Reims. Some of the finest statues are those dividing the main portal. The *Beautiful Christ* at Amiens and the severer one at Chartres, the dignified *Virgin* at Notre Dame, the smiling and coquettish *Virgin* at Amiens and the rather self-conscious *Grande Dame* at Reims are all masterpieces. As a composition one of the most symmetrical and artistic is the tympanum of the left doorway at Notre Dame with the *Resurrection and Coronation of the Virgin.* Mannerisms and studied richness in drapery appeared later in the century, as in the apostles at the Sainte Chapelle. And the sculptors became more and more artificial as the 14th century advanced, until from the North, especially Flanders, came a wave of detailed realism and character study, notable in the school of Burgundy, in the monuments of Dijon, in the tombs of the dukes of Burgundy and in Claus Sluter's fountain called the *Well of Moses.*

Spain. French artists carried to Spain their decorative system and subjects. There are fine portals of Burgos, León and Toro of the 13th century, and sculpture was more abundant here than in Italy or Germany; but though the designs were good, we seldom find the sensitive beauty of French work.

Germany. An interesting use of monumental sculpture had begun in the Romanesque age, especially in Saxony and neighboring provinces; and it is in Germany in the middle of the 13th century that one finds the first works of real genius, with a mastery of technique and expression to rival the French works. These are the Golden Gates of the cathedral of Freiburg, the portals of Magdeburg cathedral and especially the statuary and portals of Bamberg. The most famous single figure is the equestrian statue of the Emperor Conrad III at Bamberg. There is little of the French idealism, little of creation of types; but rather a strong individuality and directness of expression. This art reaches great force in certain figures in the choir of the cathedral at Naumburg, especially the 12 statues of the great nobles. Bold, free, strong and full of life, they have all the virtues and none of the defects of German naturalism and are the most perfect embodiments of the feudal pride of the Saxons. Perhaps the finest are the Margrave Eckardt and his wife Uta. Their date is about 1260.

At Strasbourg cathedral we find other great German masterpieces of a few years later, though in this Rhenish school French influence is much more dominant. The earliest part is the extraordinary *Angels' Pillar* inside the transept, which is still archaic; and the most perfect are the two famous statues of *The Church* and *The Synagogue,* outside the south transept. On the main façade the statues of the *Wise Virgin* and the *Foolish Virgins* and of the *Prophets* are less masterly but very striking and dramatic.

Besides architectural sculpture there are also many German sepulchral monuments and shrines, which are better preserved than in France, where the Revolution destroyed so much. Terra cotta and wood were more generally used than in France, and here we can see more traces remaining of the polychromy originally in Gothic sculpture. The tradition of sculpture in wood continued for two centuries longer, and some of the minor religious figures of the 14th and 15th centuries are among the masterpieces of wood carving.

The Pre-Renaissance.—We usually speak of the *revival* of art, in the sense of an early Renaissance, as beginning in Italy during the 13th century with Giotto in painting and Niccola Pisano in sculpture. Yet Italy was far inferior to France during the Gothic age in the amount and quality of her sculpture. Niccola Pisano (*c.* 1220–1278) was her first great sculptor, and the famous pulpit in the baptistery at Pisa, completed in 1260, was his earliest masterpiece. In its bas-reliefs we see an interesting adaptation of Roman, Byzantine and French Gothic models. In *The Adoration of the Magi* the Virgin is a Juno, and the angel seems taken from some work of the time of the Emperor Justinian. The figures have none of the Gothic vivacity and slenderness, but are majestic and heavy, and an occasional nude figure indicates plainly the study of the antique. Another pulpit, at Siena, is the work of the master with the help of his son Giovanni and several scholars. Here enters a dramatic element that was developed by Giovanni (1245–*c.* 1320) who is far more of a typical Gothic artist than is his father: his pulpit in Sant' Andrea at Pistoia is his best. Giovanni became overdramatic in his later works, but several of his statues of the Virgin and Child are full of dignity.

This school of the Pisani spread over the entire peninsula. At Bologna is the shrine of St. Domenico, and the royal tombs in Naples prove how quickly the new movement conquered the south. In Florence and Orvieto are the school's two most extensive undertakings. The façade of the cathedral of Orvieto is unique in Italy. Four broad piers flank the portals and are covered with a series of low reliefs representing a vast Christian poem in four groups of scenes, from Genesis to the Last Judgment. This epitome of the Biblical world is given in a charmingly poetic and at times dramatic style.

Giotto's tower at Florence has many reliefs on five-sided panels (54 in all), which were planned by Giotto himself, mainly in the spirit of allegory—the virtues and vices, the arts and sciences, the glorification of labor, commerce, industry and organized society. Of greater grace are the reliefs in the bronze doors of the baptistery by Andrea Pisano (? –1348), mainly devoted to the life of John the Baptist. These charming framed and grouped scenes lie midway between the typical formalized work of medieval times and the work of those Renaissance sculptors who were to surrender completely to the pictorial and illustrational ideals of the 15th century. The last notable master of this school was Orcagna (*c.* 1308–*c.* 68), whose famous tabernacle at Or San Michele in Florence is an extraordinary combination of Gothic architectural forms with lavish examples of the new picture-book or story-telling sculpture.

The Renaissance.—Italy now wrests the leadership from France. The Renaissance comes to its fullest flowering in Florence during the 15th century. Three men take the lead in the field of sculpture: Donatello, Ghiberti and Jacopo della Quercia.

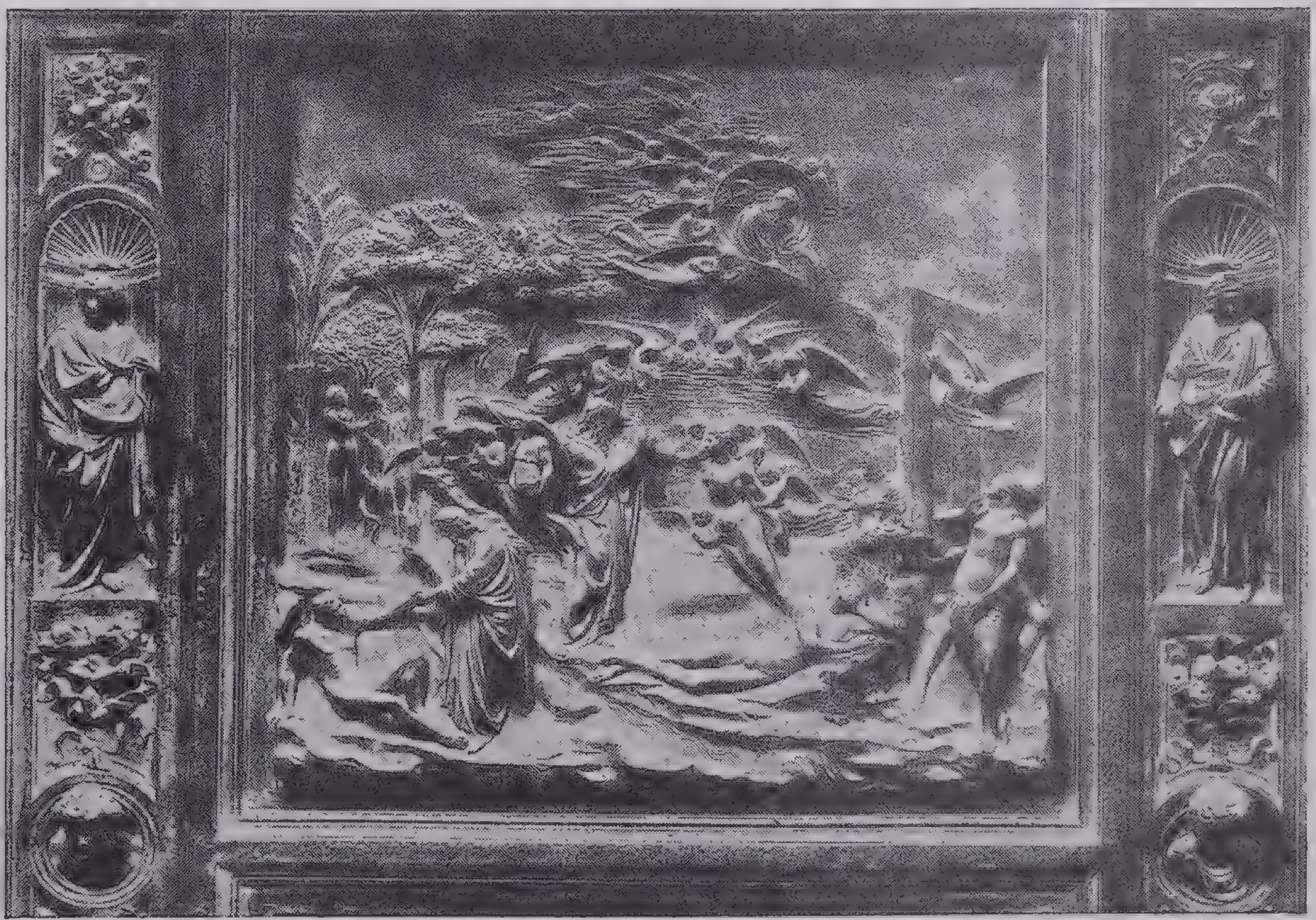
Italian Renaissance Sculptors. Donatello (1386-1466) occupies a key position in the history of the Renaissance and was undoubtedly one of the world's greatest realistic sculptors. His *St. George* is one of the famous statues of the era, standing solidly and earnestly, a masterpiece of simplification. But nothing more rollicking and joyous can be imagined than his dances of merry children as depicted on reliefs designed for the singing gallery of the cathedral of Florence. His portraits are startlingly vivid. He hewed great figures out of the rock, and he modeled tiny reliefs of exquisite delicacy. He created in his *Gattamelata* (1453) the first great equestrian statue since the *Marcus Aurelius.*

Lorenzo Ghiberti (*c.*1378–1455), a contemporary of Donatello, is chiefly famous for the bronze gates of the baptistery at Florence. In the first gate he imitates closely the neighboring gate of 1336 by Andrea Pisano, with its small simple compositions. A few years later he adopted an absolutely opposite scheme for his second gate. Here the scenes were few and large and the figures numerous and small. These reliefs with their vanishing planes, their picturesqueness and elaborate scenario struck an entirely new note in sculpture.

Jacopo della Quercia (1378–1438), the third in this early trio, was the forerunner of Michelangelo in his dramatic power. He was superior to all other sculptors of his time in the achievement of a largeness appropriate to this art, an amplitude of forms and a massive simplicity. This is especially evident in his work at San Petronio in Bologna in the reliefs of the portals in the façade and the group of the Virgin holding the Child. He was at the same time master of a delicate and penetrating charm, which he shows in the exquisite reclining figure of Ilaria del Caretto on her tomb at Lucca, on a cenotaph decorated with children holding a long wreath, the most beautiful instance of a favorite motive suggested by some Roman original. As the culminating work of the early Florentine school came the greatest equestrian statue the world has seen, the *Bartolommeo Colleoni* in Venice by Andrea del Verrocchio, the faultless ideal of a fearless Renaissance adventurer. Horse and man are one and full of force and life.

The latter part of the 15th century is so crowded with talent not only of Florentines and other Tuscans but also of Lombards that it is difficult to single out special men and works. Mino da Fiesole's bust of Bishop Salutati, with its keen, ascetic face, naturalistically realized, is a highly finished example of Tuscan skill. Among the numerous sepulchral monuments, in which decoration and figures were more happily combined than in any other class of works, the Carlo Marsuppini tomb by Desiderio da Settignano and the tomb of Leonardo Bruni by Bernardo Rossellino, rank high. Among the pulpits the most characteristic of this period is that in Santa Croce in Florence by Benedetto da Majano.

Robbia School. Luca della Robbia (*c.*1400–82), a serene religious artist, is most noted as the creator of that form of relief sculpture in polychromatic glazed terra cotta known as



Courtesy Metropolitan Museum of Art

Italian Renaissance Sculpture: A Section of Ghiberti's Bronze Doors

This section of the bronze doors of the baptistery at Florence, made by Lorenzo Ghiberti during 1425–52, depicts the Creation of Adam and Eve, the Temptation and the Expulsion from the Garden of Eden. The doors are composed of a series of 10 panels, each a scene from the Bible, with small side panels decorated with carved heads, figures and designs. Michelangelo said these bronze doors were worthy to be the gates of paradise

Bartolommeo Colleoni by del Verrocchio

This famous bronze equestrian figure standing in the Campo SS. Giovanni e Paolo, Venice, was finished after del Verrocchio's death in 1488 from a clay model he had left

Robbia ware. It was extremely popular throughout Tuscany and farther south. His nephew, Andrea, almost equaled him in talent and productiveness. Later the coloring became more and more elaborate until under Andrea's son Giovanni it was at times crude. The Robbia school was the great popular religious medium in the Italian sculpture of the Renaissance.

Michelangelo (1475–1564) was essentially a plastic genius, a sculptor by first intention. It is evident even in his works of architecture and painting. He cut himself loose from traditions and schools. At first he steeped himself in classic sculpture and imitated it so well in his *Faun's Mask* as to deceive the best critics. Then he passed through a phase of normal religious themes, as is evidenced in his *Pietà* at St. Peter's. This work of art, with its highly finished surface, presents a magnificent group completed before its author was 26 years old. Michelangelo reached the full realization of his colossal talent in two works: the tomb of Pope Julius II, which was never completed, and of which the famous statue of Moses was a detail; and the monuments of the Medici at San Lorenzo in Florence, of which the tombs of Giuliano and Lorenzo were almost finished. We have in these works primitive, elemental sculpture used to convey general ideas of life and death. The mystery that has enveloped the reclining figures that we call *Dawn* and *Twilight, Day* and *Night,* has been continuous since the day of their execution. The *Lorenzo,* popularly called *Il Pensieroso,* is far more than a portrait; it is brooding introspection. No artist before Michelangelo had so habitually played with the human form, and yet none had been so completely an idealist. His heads, especially the *David,* the *Brutus* and the *Lorenzo,* make an undying appeal.

After Michelangelo came a decline. Benvenuto Cellini, to be sure, was an extraordinary technician. His *Perseus with the head of Medusa* shows that he could produce things other than the miniature works of delicate and decorative beauty for which he was famous. Baccio Bandinelli and Bartolommeo Ammanati were inflated and debased followers of Michelangelo's tempestuous mood. Giovanni da Bologna had better taste and in his bronze statuettes created works that are pleasing and competent. But with him the spirit of the Italian Renaissance is all but spent.

The French Renaissance. Though Italy certainly overshadowed the rest of Europe during the Renaissance, some interesting sculpture was produced in France, and its national character is now being more clearly seen. Its greatest representative in the 16th century was Jean Goujon (*c.*1510–*c.*64), whose influence transformed the French school, combining with it characteristics both Italian and Flemish. His most famous figures are the *Water Nymphs* for the Fountain of the Innocents in Paris and the *Diana of the Fountain* for the chateau at Anet. In the latter, really a portrait of Diane de Poitiers in the guise of the goddess Diana, one finds the strange combination of naturalism of detail and artificiality of pose and conception that will be evident in so much European sculpture until the end of the 19th century. The work of Goujon's predecessor, Michel Colombe (*c.* 1431–1512), though it is quite different from the Italian style, is more closely related to it. There is a great deal of picturesqueness in his relief of *St. George Fighting the Dragon,* made for the chateau of Gaillon. Germain Pilon made masterpieces of the tombs of Francis I and Henry II at St. Denis.

The German Renaissance. The German Renaissance failed to reach in sculpture the high level it attained in painting. Something seemed to prevent its sculptors from passing beyond a vigorous naturalism. One great exception was Peter Vischer (*c.* 1455–1529). His exquisite shrine of St. Sebaldus at Nuremburg with its beautiful apostles shows Italian influence; his colossal bronze statues of Kings Arthur and Theodoric at Innsbruck are quite original and deserve to take their places beside the Gothic *St. Theodoric* at Chartres and Donatello's *St. George.*

It is somewhat remarkable that in all Germany, Austria and the Netherlands there is so little during the 16th century that is at all notable, considering that so much was produced in mere quantity: carved portals, stations of the cross, altarpieces, sepulchral monuments. Curiously, the German sculptors seem to have stepped from the formalism and naïveté of a lingering medievalism direct into the light decorativeness of the baroque style; with little pause between for the intellectual and realistic triumphs of the true Renaissance artists.

Baroque and Neoclassic Sculpture.—The 17th and 18th centuries were a rather futile period for sculpture everywhere in Europe. The spirit of the Renaissance was dead, the modern spirit not yet born. There was nothing real or simple in art; all was artificial and exaggerated and designed to display technical skill. Giovanni Lorenzo Bernini led the baroque style in Italy; François Girardon and Pierre Puget in France, Andreas Schlüter in Germany. Draperies were inflated, attitudes twisted, compositions overdramatic. The *Vision of St. Theresa* by Bernini is more characteristic of him and of the religious sentimentality of the age than are his classic pieces, and the same is true of Girardon's monument to Richelieu. Puget's *Milo of Crotona* and *Alexander and Diogenes* introduced the manner even into classic themes. The climax of theatrical art so characteristic of the age of Louis XV is embodied in such works as the extravagant monument for Marshal Maurice of Saxony by Jean Baptiste Pigalle at Strasbourg.

One may perhaps date the real beginning of the next phase at the French Revolution and preface it with Jean Antoine Houdon's vivacious figure of *Voltaire,* its prophet—though Houdon carried on certain mannerisms of the baroque. The change was at first characterized by a classic revival, necessarily artificial because it had no connection with the age. Canova, a Venetian, and Thorvaldsen, a Dane, were its leaders. Canova's influence became universal. Rome and the excavated marbles of antiquity inspired them all.

Antonio Canova (1757–1822) was an unusually prolific artist. Of his many works the early *Cupid and Psyche* and *Pauline Borghese* represented as Venus are especially famous and illustrate his charm of line and smoothness of texture. The essential coldness of his style, however, kept his art from becoming great.

Albert Thorvaldsen (1770–1844) showed even more dependence on the antique. His frieze at the Quirinal in Rome proves that he was as accomplished in reliefs as in statuary. Johann von Dannecker (1758–1841) spread the new style in Germany as in his *Ariadne* at Frankfort. John Flaxman (1755–1826) did the same in England, though his design was better than his modeling.

Sculpture as the real reflection of the age had, however, its representatives and grew stronger with the years. On the Arc de Triomphe in Paris, the stupendous group commemorating the French Revolution, known as *The Marseillaise,* is a work of vital drama bordering on melodrama by François Rude (1784–1855). A similar quality appears in his pupil, Jean Baptiste Carpeaux (1827–75) whose nervous force is best expressed in the group of *The Dance* at the Opera in Paris. Antoine Louis Barye (1795–1875) came also with his spirited and faithful representations of animal life, so familiar to Americans. In Germany, Johann Schadow (1764–1850) created many public monuments and graceful works. Toward the end of the century Adolf von Hildebrand (1847–1921) was important, partly for his teaching; and Louis Tuaillon (1862–1919) created some of the finest equestrian monuments of recent times.

Modern Sculpture.—In sculpture as in painting France retained her leadership during the last half of the 19th century. National styles were no longer to be discovered, but the outstanding artists and talented students of other countries flocked to the famous Latin Quarter in Paris. A strong insurgent current was present, unrecognized under the realistic sculpture of the moment. It was Auguste Rodin (1840–1917) who summed up the several phases of both scientific and impressionistic realism and then, at the end of his life, stepped over into Modern art, that of the expressionists.

With Rodin, in other words, we reach the ultimate break with tradition and with all recurrences to past types. He was at times as naturalistic as Donatello in his beginnings; as primeval as Michelangelo, if less bridled, in largeness and power. His *The Kiss* is an embodiment of passion; his *The Thinker,* the ruminating spirit of brute force; his *The Age of Bronze,* a perfect photographic impression. The group *The Burghers of Calais* is extraordinarily original and full of power. Rodin's extreme individualism made his works very uneven, but finally his innate originality carried him on to creation of striking works in the field beyond realism, most notably the powerful and thought-provoking monument to Balzac.

Modern Sculpture: The Hand of God by Rodin
In the Metropolitan Museum of Art, New York

The true Modern revolution was signalized in the coming of Aristide Maillol, who returned to simple, massive composition and to inherent sculptural values as against visual effects. The other leading Modern among Frenchmen, Antoine Bourdelle, retained a good deal of the impressionist technique of vibrating light and is noteworthy for creation of decorative panels fitted to architectural settings. A notable part of 20th-century sculpture has been the effort to restore the art to its former place in architecture. The radical tendencies are illustrated in the works of a Rumanian resident in Paris, Constantin Brancusi. He carries the revolt against realism almost to the point of offering geometrical abstractions in place of the familiar representations of human face and figure. His egglike *Head of Mlle. Pogany* and his several birds are like red rags to the realistic-minded but are defended and enjoyed by those who accept creation of *abstract order* or *sculptural rhythm* as sufficient.

Germany has given birth to more masters of Modern sculpture than any other country. The greatest German sculptor was Wilhelm Lehmbruck, who died at the age of 38, in 1919. In the outpouring of his own individualistic emotion, in organization of essentially sculptural form, in revelation of a sitter's character rather than a mere representation of his appearance, Lehmbruck was a master. His most celebrated statue is the *Kneeling Figure,* sensitively realized but solidly sculptural figure, of which versions exist in the State Museums of both Berlin and Munich. Some of his figures of women in two-thirds length are almost as widely appreciated.

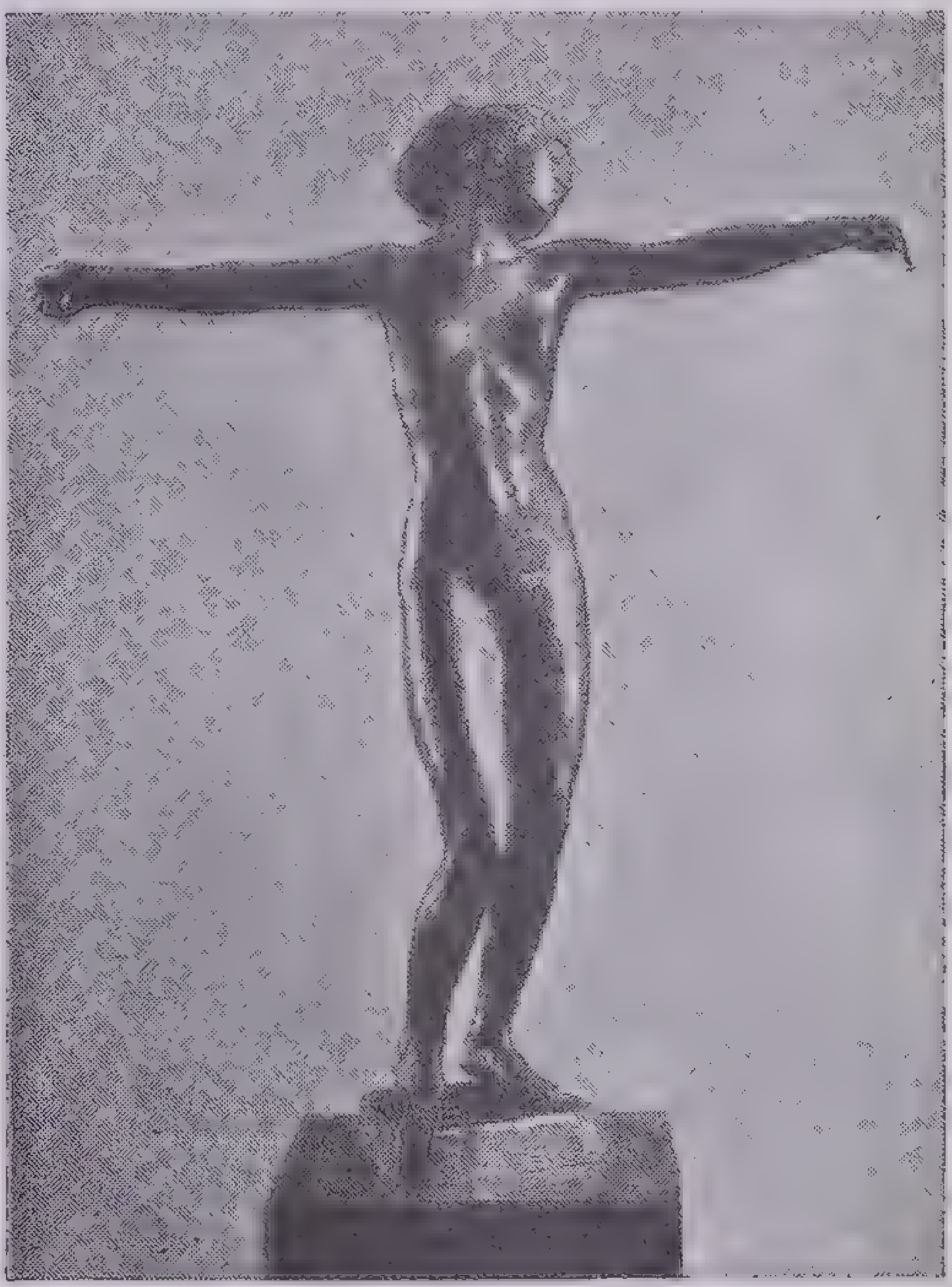
From a considerable group of practitioners, Georg Kolbe stands out today as a leader in Germany and in Europe. He distorts nature less freely than did Lehmbruck, and indeed he started his career as a follower of Rodin. His *Dancer* at Berlin is counted one of the most beautiful creations in the impressionist tradition; but his later figures have taken on deeper form values and are frankly nonrealistic. Ernst Barlach has utilized wood beautifully in the feeling of the old German tradition and is a leading figure in an international group that has restored wood carving as an authentic creative art.

In all the countries of Europe expressionistic sculpture has appeared, but nowhere is the revolutionary change more striking than in England. Lacking a significant national tradition in the art, the British sculptors up to the time of the World War had followed the lead of Paris, and no name stands out prominently until 1920. By that time the works of Jacob Epstein, an American Jew long resident in London, had precipitated many controversies over Modernism, and today Epstein is recognized as a world figure. He is accepted less for his monumental pieces—of which the best are perhaps his compositions on the Underground Building in London—than for the extremely sensitive and penetrating portrait busts. The stone-cut figures by the native artist Eric Gill illustrate the contemporary effort to exploit the special materials and glyptic method of the art. Another leader is Henry Moore, whose dynamic and rhythmic figure compositions illustrate how fully the insurgents have escaped from Victorian ideals of copying nature.

One of the most important of living sculptors is Ivan Meštrović, born in Dalmatia in 1883. His figures in a memorial chapel at Cavtat near Ragusa are among the truly sculptural products of our time. His religious reliefs are deeply tinged by the Byzantine inheritance of his people. His portrait of his mother is widely considered a masterpiece.

Two other leaders who made their reputations in Europe now live in the United States. Carl Milles, the foremost sculptor of Sweden, became known 20 years ago as a master of decorative sculpture designed for close integration with architecture. He is rather more conservative than others mentioned here, but he belongs to the Modern group by right of consistent achievement of formal rather than realistic effects. Alexander Archipenko, a Russian, was for many years considered one of the most unconventional of the expressionists, experimenting freely in near-abstract forms and in new materials. His torsos, simplified approximations of the human body that express rhythmic order and plastic vitality, are well known.

American Sculpture.—Horatio Greenough (1805–52) was one of America's earliest professional sculptors and the first to study abroad. Like his contemporary, Hiram Powers, he was unavoidably influenced by the neoclassic vogue of his day, and his *Washington,* like Powers' *Greek Slave,* might have been carved in the workshop of Canova. Thomas Crawford made a grandiose pediment for the national Capitol, an equestrian *Washington* for Richmond. Other pioneers were Thomas Ball, Henry Kirke Brown, John Rogers, William Wetmore Story, Erastus D. Palmer and William H. Rinehart. John Q. A. Ward was long the dean of American sculptors and will be remembered for his *Henry Ward Beecher* in Brooklyn. Our greatest sculptor up to the opening of the 20th century was Augustus Saint-Gaudens (1848–1907) who, from his *Admiral Farragut* to his second *Lincoln,* produced a series of noble works. Among these are the standing *Lincoln,* the *Puritan,* the *Shaw Memorial, Adams Memorial* and *General Sherman.* Daniel Chester French likewise created a host of widely appreciated works, like *Death and the Young Sculptor* and the great


Modern Sculpture: Dancer by Georg Kolbe
A bronze in the National Gallery, Berlin

ROBERT GOULD SHAW

Courtesy Boston Chamber of Commerce

The Shaw Memorial at Boston, by Augustus Saint-Gaudens

Lincoln in the Lincoln Memorial at Washington. Frederick MacMonnies has won a great name both at home and abroad. He lived in France for many years and there he modeled his *Nathan Hale, Shakespeare, Bacchante* and his fountain at the Columbian Exposition at Chicago in 1893. Equally well known abroad was Paul Bartlett whose *Columbus, Michelangelo* and *Law* for the Library of Congress are typical. His equestrian *Lafayette* stands in the court of the Tuileries in Paris. George Gray Barnard was characterized by originality and vigor. His large groups for the State House of Pennsylvania are among the most remarkable of American sculptures. Herbert Adams has modeled female heads of exquisite beauty. Hermon MacNeil, Gutzon Borglum, Cyrus Dallin, Adolph Weinman and James Fraser are a few among an army of well-trained artists. Malvina Hoffman, a pupil of Rodin, is known for her figures of ballet dancers, for studies of Paderewski and for the 100 studies of racial types in the Field Museum, Chicago.

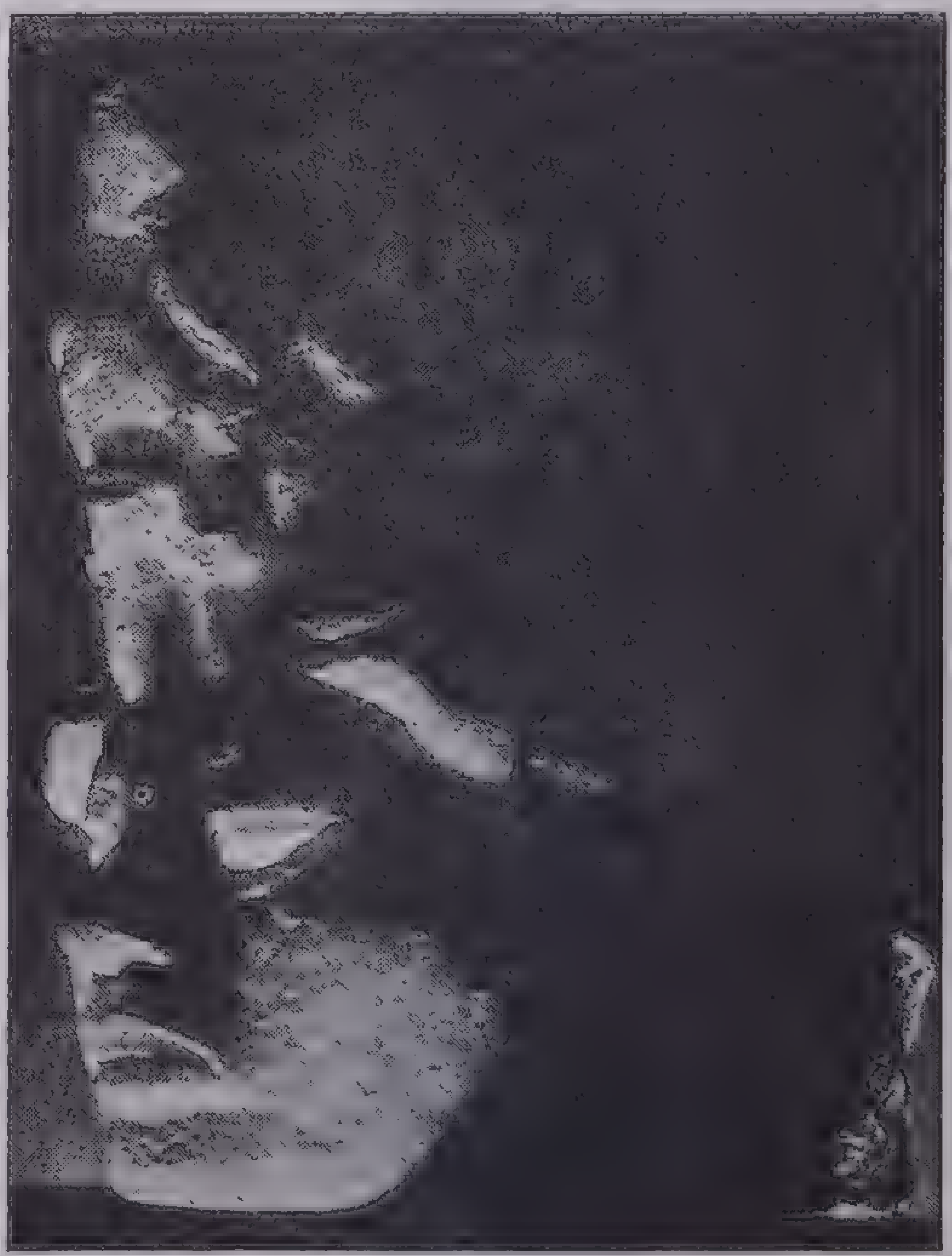
In general these sculptors, with the possible exception of Barnard, belonged to the 19th-century tradition of realism and electicism and thus capitalized upon observed movement, a studied informality and a surface expressiveness in modeling. But in America as elsewhere, the first two decades of the new century saw the overturning of old standards and introduction of expressionistic ideals. The most talented proponent of the new sculpture was Gaston Lachaise, born in France but a resident of New York during all his working years. His figures mark clearly the return to sculptural largeness and an almost primitive massiveness. Throughout his life he strove to express plastically a conception that he embodied in a series of statues entitled simply *Woman,* each a concrete working out of a conceived image of woman as a cosmic symbol of earth-abundance.

Something of the same largeness is caught by William Zorach, who does not, however, depart so far from the model as did Lachaise. Hunt Diederich is a pioneer creator of highly stylized decorative sculpture. Paul Manship, considered by some critics the leading American sculptor, is distinguished for his tasteful electicism and a talent for formalized groups. Others, who work robustly and in the main current of Modernism, are Robert Laurent, John B. Flanagan, Maurice Sterne, José de Creeft, Alfeo Faggi and Ahron Ben-Shmuel. The quality of their work seems to indicate that the sculptors of this country, even if they are a little behind the painters and the architects, are at the beginning of one of the great creative periods of the art. There is ample reason to believe that more beautiful and nonimitative work is being produced today than in any era since the Gothic.

Mayan, African and Oriental Sculpture.—Some of the greatest sculptors ever to live on the American continent were the anonymous artists of the Mayan civilization of Mexico and Central America. As early as the 6th century the Mayans were creating idols and architectural figures and sculptural potteries worthy to stand beside the finest works produced in the Old World. From monumental to miniature figures an amazing range of expressive and beautiful works has recently been uncovered by archeologists.

Modern interest in nonrealistic forms of art has resulted in opening up to appreciation other national or racial bodies of sculpture neglected by earlier histories because they were considered exotic and crude. Especially popular in the last decade have been the small wooden idols of the negro carvers of Africa, examples of intuitive feeling for rhythm, and impeccably craftsmanlike. Even stranger to the eye are the fine masks and idols discovered among the peoples of the South Sea Islands.

But the greatest step accomplished in the broadening of appreciation during the recent reappraisal of world art has been embraced in the rediscovery of the arts of the Far East and the bringing of Eastern works to our Western museums. Histories of Indian, Chinese and Japanese art cannot be included in a brief review such as this, nor can the consecutive periods and changes in styles mean a great deal without knowledge of the background of life in the several countries. But at least it should be said that China leads all the countries of the world in the amount and the variety of sculpture produced and surviving. The whole gamut is run from gorgeously spirited monumental works in stone to the most sensitive and exquisite miniature figures in the metals and clay and jade. Japan has contributed rather less of original work in sculpture, but Cambodia is rich in masterpieces (mostly religious works grown out of the Buddhist faith), and Java has architectural monuments as richly ornamented with vitalized sculpture as the great medieval churches of Europe.



Courtesy Middle American Research Institute, Tulane University

Maya Sculpture

This huge limestone head was once fastened high on the wall of a Mayan temple at Puente Tanguas in the Department of Copan, Honduras. It is a dazzling white and weighs more than 100 pounds

LEADING SCULPTORS

	Italy			France	Germany	Other Countries
Thirteenth and Fourteenth Centuries	Giovanni Pisano 1245–c. 1320	Nicola Pisano c. 1220–1278 Andrea Pisano d. 1348	Orcagna Andrea 1308–1368			
	Jacopo della Quercia 1378–1438	Filippo Brunelleschi 1377–1446	Lorenzo Ghiberti 1378–1455			Claus Sluter (Dutch) c. 1400
Fifteenth Century	Luca della Robbia 1400–1482 Bernardo Rossellino 1409–1464 Antonio Rossellino 1427–c. 1479 Andrea del Verrocchio 1434–1488	Donatello (Donato) 1386–1466 Bernardo Rossellino 1409–1464 Desiderio da Settignano 1428–1464 Mino da Fiesole 1431–1484 Matteo Civitali 1435–1501 Benedetto da Majano 1442–1497	Agostino di Duccio 1418–1498 Antonio Pollaiuolo 1429–1498 Andrea della Robbia 1435–1525	Michel Colombe c. 1455–1529	Veit Stoss c. 1440–1533	
Sixteenth Century	Andrea Sansovino 1460–1529 Jacopo Sansovino 1486–1570 Benvenuto Cellini 1500–1571 Giovanni da Bologna c. 1524–1608	Michelangelo 1475–1564 Baccio Bandinelli 1493–1560 Bartolomeo Ammanati 1511–1592		Jean Goujon c. 1510–1564 Germain Pilon 1535–1590	Peter Vischer c. 1455–1529	Gasparo Becerra (Spanish) 1520–1570
	Italy	United States				
Seventeenth Century	Giovanni Bernini 1598–1680			Pierre Puget 1622–1694 François Girardon 1628–1715 Antoine Coysevox 1640–1720	Andreas Schlüter 1664–1714	Juan Montañés (Spanish) 1568–1649 Alonso Cano (Spanish) 1601–1667 Grinling Gibbons (English) 1648–1720
Eighteenth Century	Antonio Canova 1757–1822	Patience Wright 1728–1785	William Rush 1756–1833	Nicolas Coustou 1658–1733 Guillaume Coustou 1677–1746 Jean Baptiste Pigalle 1714–1785 Jean Antoine Houdon 1741–1828		
	United States					
Early Nineteenth Century	John Frazee 1790–1852	Horatio Greenough 1805–1852	Thomas Crawford 1813–1857	Francois Rude 1784–1855 Pierre Jean David 1788–1856 Antoine Louis Barye 1795–1875	Johann von Dannecker 1758–1841 Johann Schadow 1764–1850 Christian Rauch 1777–1857	John Flaxman (English) 1755–1826 Albert Bertel Thorwaldsen (Danish) 1770–1844
	United States		France			
Late Nineteenth and Early Twentieth Centuries	Hiram Powers 1805–1873 Clark Mills 1815–1883 Erastus Palmer 1817–1904 Thomas Ball 1819-1911 Randolph Rogers 1825–1892 Harriet Hosmer 1830–1908 Olin Warner 1844–1896	Henry Kirke Brown 1814–1886 William Rimmer 1816–1879 William Wetmore Story 1819–1895 William H. Rinehart 1825–1874 John Rogers 1829–1904 J. Q. A. Ward 1830–1910 Augustus Saint-Gaudens 1848–1907	Jean Léon Gérôme 1824–1904 Jean Baptiste Carpeaux 1827–1875 Alexandre Falguière 1831–1900 Jules Dalou 1838–1902 Louis Barrias 1841–1905	Emmanuel Frémiet 1824–1910 Paul Dubois 1829–1905 Henri Chapu 1833–1890 Auguste Rodin 1840–1917 René de Saint-Marceaux 1845–1915 Antonin Mercié 1845–1916	Reinhold Begas 1831–1911 Rudolf Siemering 1835–1905 Emil Hundreiser 1846–1911 Adolf von Hildebrand 1847–1921	George F. Watts (English) 1817–1904 Alfred Stevens (English) 1818–1875 Frederic Leighton (English) 1830–1896 Constantin Meunier (Belgian) 1831–1905 Thomas Brock (English) 1847–1922
	Daniel C. French 1850–1931 Charles Henry Niehaus 1855–1935 Herbert Adams 1858– A. Phimister Proctor 1862– Paul W. Bartlett 1865–1925 Karl Bitter 1867–1915 Furio Piccirilli 1870– Frederick G. R. Rath 1872– Charles Keck 1875 James E. Fraser 1876– Mahonri Young 1877– John Gregory 1879– Harriet Frishmuth 1880– Hunt Diederich 1884– Paul Manship 1885– Robert Laurent 1890– Edgar Miller 1899–	John Boyle 1851–1917 Edward C. Potter 1857–1923 Lorado Taft 1860–1936 George Grey Barnard 1863–1938 John B. Flanagan 1863– Gutzon Borglum 1867–1941 Attilio Piccirilli 1868– Adolph Weinman 1870– Bessie Vonnoh 1872– Evelyn Longman 1874– Anna Hyatt Huntington 1876– Robert Aitken 1878– Leo Lentilli 1879– Chester Beach 1881– José de Creeft 1884– Malvina Hoffman 1887– Carl Jennewein 1889– Albert Stewart 1900–	John Donaghue 1838–1903 Philip Martiny 1858–1927 Cyrus E. Dallin 1861– Frederick MacMonnies 1863–1937 Hermon MacNeil 1866– Solon Borglum 1868–1922 Augustus Lukeman 1871–1935 Janet Scudder 1873–1940 Nellie Walker 1874– Lee Lawrie 1877– Maurice Sterne 1878– Sherry Fry 1879– Albin Polásek 1879– Jo Davidson 1883– Alfeo Faggi 1885– William Zorach 1887– Ahron Ben Schmuel 1903–	Antoine Bourdelle 1861–1929 Aristide Maillol 1861– Charles Despiau 1874– Henri Bouchard 1875– Gaston Lachaise 1882–1935	Max Klinger 1857–1920 Louis Tuaillon 1862–1919 Ernst Barlach 1870– Hugo Lederer 1871– George Kolbe 1877– Wilhelm Lehmbruck 1881–1919	Hamo Thornycroft (English) 1850–1925 Edward Onslow Ford (English) 1852–1901 Alfred Gilbert (English) 1854–1934 George Frampton (English) 1860–1928 William G. John (English) 1860– Franz Metzner (Austrian) 1870–1919 Carl Milles (Swedish) 1875– Constantin Brancusi (Rumanian) 1876– Jacob Epstein (English) 1880– Eric Gill (English) 1882– Ivan Meštrović (Slav) 1883– Alexander Archipenko (Russia) 1887– Henry Moore (English) 1898–

EARLY HISTORY OF MUSIC

Music is sometimes classed with Literature as an *immaterial* art, whereas Architecture, Painting and Sculpture are termed *material* arts. These three arts of the second group seek expression through visible, tangible means. Literature and Music, though they may have a visible record in the form of certain arbitrary symbols, speak more immediately and directly from one mind to another. Hence they are to a certain extent allied and they may be combined in a variety of ways. But Music speaks even more directly and immediately than does Literature. Schopenhauer said that Music differs from other arts in that it is not the image of an idea but is itself idea. Other arts, he said, are shadow, but Music is substance.

So nearly universal is music, even if only in rude form, that it has been said that wherever human life is, there is music. Owing to its nature it has, however, been slower in development than the other arts. Because it is subjective, it could not look to physical nature for patterns as did painting and sculpture. Any musical system had to be based on tones, which had to be arranged in a certain order or *scale.* Yet such an arrangement, without which musical art forms could not exist, has no prototype in physical nature; nor does physical nature afford originals for the intervals of the scale. It is not surprising, therefore, that mythologies so often ascribed the invention of music to the gods, who bestowed this noble gift upon mankind.

The origin of music remains obscure. From the study of the music existing today among primitive peoples, we have gained some hints of what the music of races now civilized may once have been. In such study the use of recording by phonograph has been of aid. Something has been learned also from the music of the peoples of Asia. The examination of actual instruments and of instruments as pictured in wall paintings and pottery has helped scholars in tracing stages of advancement from crude beginnings; for, in a general way, the extending scope of these instruments and the increasing skill in their making point to the use of a wider range of tones, the arrangement of those tones in scales and a developing technique on the part of the performers. Yet in many cases we are limited to theories about which the learned disagree. At best our knowledge is only fragmentary.

Still more obscure is the fundamental nature of music. Science has gained practical knowledge of the action and effects of the force we call electricity and has devised means for utilizing that force, but scientists do not know what electricity really is. In somewhat the same way we say that music is divided into three basic elements: *rhythm, melody* and *harmony.* We determine the relations of *tones,* one to another, and have the means for producing them; we are conscious of musical effects. But why and how music speaks to us in a manner difficult to interpret in words—this we cannot fathom.

Primitive Music.—The element of rhythm was undoubtedly the first to be appreciated by primitive man. Gradually tones were chosen. Then small groups of tones, repeated over and over, were used to form *melodies.* Next *melodic design* was introduced; instead of repeating one group or *phrase,* contrasting groups or phrases were used alternately. Then tones were arranged in different scales. Common among primitive peoples was the *pentatonic* or five-toned scale. This had the same series of tones as may be produced by striking the black keys of a piano in regular succession, no white keys being struck. The reason for this was that music was at first wholly *vocal.* Half-tones were found more difficult to sing than whole or primary tones, and the pentatonic scale did not contain half-tones. Primitive music lacked *tonality;* there was no central tone to which all the other tones were referred; and it was also without *modulation* from one scale into another. Probably no attempts were made to combine tones into *chords,* groups of tones produced simultaneously instead of successively—the element of *harmony* was lacking. According to our present-day idea, the beginning not only of harmony but of musical art is in the chord—three or more concordant tones sounded simultaneously.

The first musical instruments were of the *percussion* (or *drum*) type. Their resonance was employed to accent rhythm. Next came instruments of the *wind* type, first made of reeds or of the horns of animals. Horns were later wrought of metal, and the reeds were replaced by more durable wood. Last in order of development were instruments of the *lyre* or string type. Possibly these had their inception in the taut bowstring. And just as the string instrument appeared last in order, so today the musical culture and appreciation of a people are found to be higher in proportion as instruments of the string type are given precedence over those of the percussion type.

Through the study of the condition of music among savage and semi-barbarous peoples of today, it has been possible to gain some idea of what the music of primitive man must have been. In the United States musicians and students of music have learned something of primitive musical forms through investigation of the music of the southern Negro and the American Indian. Some have thought that in this way a basis might be found for a distinctive national school. Others, though regarding it as necessarily outside the line of the white man's musical development, have valued it for its tonal coloring and emotional content and have drawn upon it as source material.

FOLK MUSIC

The first musical impulse in every nation springs from the people, and it is natural to look to folk music for the germ of all that later will be found in the great musical compositions of every nation. Yet in considering folk music, there are several points to remember.

First, there is the influence of actual geographical conditions. All dwellers in the mountains lift or lower their voices in song to correspond to the peaks rising above them, while those on the vast plains show a monotony in their songs quite as apparent as that of the landscape; and people living by the sea reflect the rocking of the waves in the rhythm of their songs.

Second, there is the difference in racial characteristics; for example, all the music of the Slavic race has points of striking similarity, whether it be found in Russia, Poland, Serbia or Czechoslovakia. The fiery music of the Slav is in direct contrast with the more stolid, plodding type of Teutonic music found among the German and Scandinavian peoples. All Latins, whether they live in Italy, Spain, France or Rumania, show similar musical characteristics, and their music is unlike that of other races. Interesting examples of racial similarity are to be found in the music of Scotland and Ireland, for both these lands have inherited many melodies from the Gaelic race. The folk airs of the Welsh and of the people of northern France are similar, which is not strange when one recalls that both are of the Celtic race. Probably the most striking instance of racial influence is found in the music of the Hungarians and the Finns, both coming from the Magyar race.

Third, political conditions have influenced the folk music of the world. Thus Germany claims many folk airs belonging to Austria, to Poland, to Lithuania, to Alsace, to Lorraine, to Bohemia and to Switzerland. Russia has usurped many folk airs of the Ukraine, of Georgia, of Poland, of Lithuania, of Latvia, of Estonia and of Finland.

Historical events have left their mark on folk music. Many of the greatest patriotic airs were born during war days.

Five Classes of Folk Music.—Folk music is usually divided into the following classes:

1. Folk Dance Songs, the earliest type of folk music, sung by the people as an accompaniment to their simple games and dances.
2. Legendary Folk Songs, airs sung for so many generations that the composer's name, if it ever was known, has long since been forgotten.
3. Composed Folk Songs, usually of a later period; the name of the composer is known.

4. Patriotic Songs, reflecting a love for native land and a desire to serve it. There are many patriotic songs of the legendary type, though the composer is generally known.

5. National Compositions, musical works in which folk themes have been used. Sometimes the composer uses folk music from a land other than his own, an outstanding example being the opera *Carmen,* which uses Spanish characteristics, though the opera was written by a Frenchman, Georges Bizet.

A study of the folk music of every land will give one an amazing understanding of geographical and historical facts. Our modern music has been greatly influenced by folk music, and much of the national music of the past 50 years has been founded on nationality.

MUSIC OF THE ORIENT

Chinese Music.—As civilization advanced, definite musical systems arose, scales were established and beginnings were made in musical theory. Instruments were more skilfully made and more proficiently used. This was particularly true in Oriental countries.

A system existed in China from very early times. So old, indeed, was it that even in Confucius's day it was growing obsolescent; and three centuries later it had disappeared. We learn from Chinese books that the first scale was the pentatonic. The octave was later divided into 12 semitones similar to ours, and 84 scales were fixed. The Chinese regard these scales as descending, whereas we think of ours as ascending. In Chinese music the interest lies not in the progression of individual tones but in the tone color. Eight kinds of tone color are recognized, depending on the material used in producing them, whether baked earth, bamboo, gourd, metal, silk, skin, stone or wood. From these materials instruments are made such as the *king,* in which 16 stone plates are suspended from a frame, tones being produced by striking the plates with a mallet. Similar instruments employ bells instead of stone plates. The *sheng* is constructed by inserting into a gourd bamboo pipes, each of them with a metal reed; the performer blows into a mouthpiece resembling the spout of a teapot, and vibrations in the bamboo pipes create the tones. Hence the *sheng* is a forerunner of the reed organ once found in nearly every American parlor. Among the Chinese instruments, the greater number are of the percussion type. There are many sorts of drums, and the tone of a drum is sometimes modified by placing rice inside. Save for the music used in religious ceremonies, the most characteristic Chinese melodies are met with in the folk songs of sailors and peasants.

Music in Japan and Siam.—In Japan, Java and Siam, the pentatonic scale is common, though often considerably modified. Among Japanese instruments of the string type are the *koto,* in the style of an elaborate zither; the *samisen,* like a small guitar, and the *kokiu,* a kind of rude violin. Women are frequent performers. Sometimes Japanese music is based upon a scale approximating in form our own chromatic scale. Music in the native style is still considered an important feature of religious worship, but it is in some danger of being superseded for secular use by the European system, which has been generally adopted for instruction in the public schools.

In Siam the characteristic instrument is the *ranat,* in which metal or wooden bars are sounded with a hammer. Orchestras are common among the Siamese.

The Music of India.—The origin of Hindu music was ascribed to the gods, and a well-developed system appears in the sacred books known as the *Vedas.* The scale was originally pentatonic, but it was in time so modified that it consisted of 21 minute portions termed *srutis,* separated from one another by only a third or quarter tone. From these an extensive collection of scales was developed. There are numerous instruments, among which those of the string type are in the majority. These include two rudimental violins: the *magoudi,* a four-stringed, long-necked guitar, and the *vina,* which may be called the national instrument. The *vina* is a long, hollow tube, with seven metal strings stretched over no less than 19 movable bridges. Attached to the tube are two hollow gourds for reinforcing the volume of tone.

Hindu melodies are full of embellishments, and the rhythms are greatly varied. The Brahmins composed songs called *ragas,* celebrating various special occasions and of highly formal character. Religious music of a strictly prescribed nature and frequently combined with dancing has an important place in the life of the Hindu. Music dramas are performed, and musical fare is also provided by orchestras and by strolling minstrels.

Burmese instruments include gong and bell organs, each with 21 tones.

Arabian Music.—The Arabs divided the octave into 17 equal parts, each being one-third of a tone, and from these they derived 34 scales. With such minute intervals as a basis and with delicately adjusted instruments they produced melodies of a chantlike sort. They were used principally for social diversion, for Mohammed frowned on the use of music in connection with religion. Of all Oriental music that of the Arabs sounds least unfamiliar to our ears.

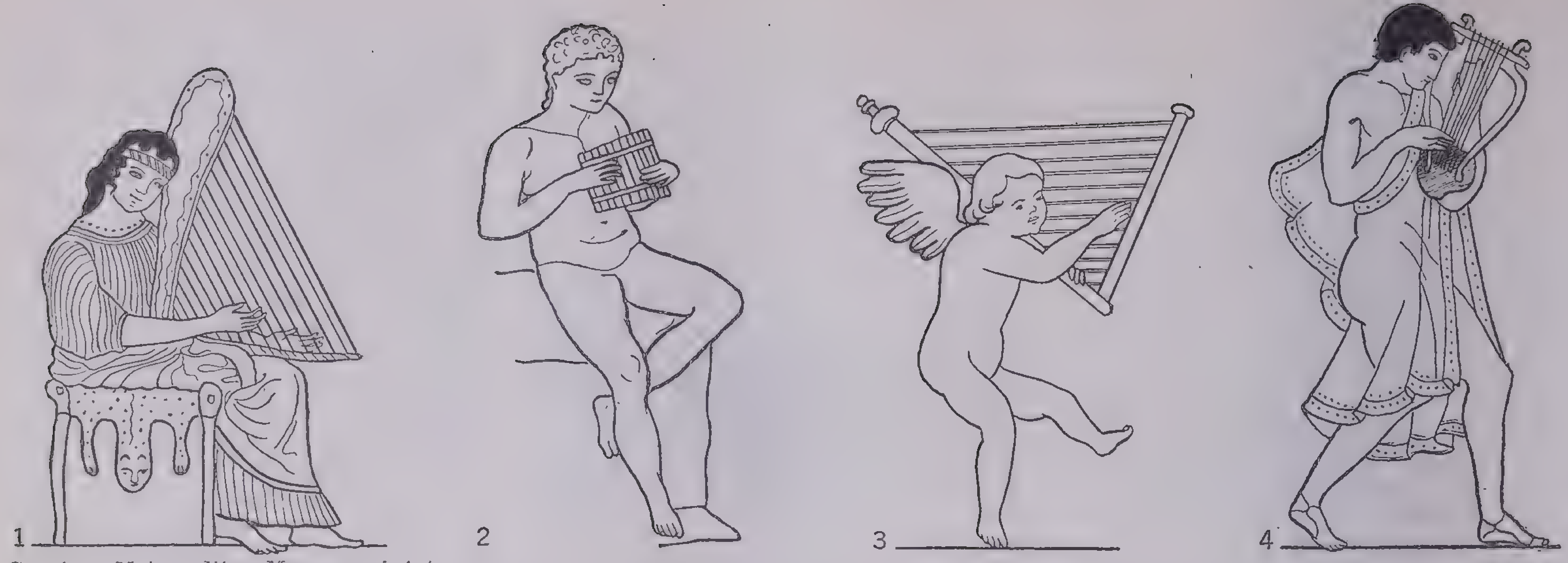
Arabian instruments are especially worth noting because they were the precursors of many of our own. Such was the *rabab* or *rebab,* kin to the medieval viol in its several forms; such was a mandolin-shaped instrument called *al'ud,* the type of pear-shaped instruments having strings stretched over resonant bodies and played by snapping, plucking or twanging. Of this there were no less than 32 varieties with a varying number of strings. It was known to medieval Europe as the *lute.* Modern representatives of this type are the *banjo,* the *guitar* and the *mandolin.* The Arabs had also three varieties of *lyres* and several kinds of *dulcimers,* instruments placed on a table and struck with hammers. When under the influence of Mohammedanism the Arabs overran North Africa and Spain, they naturally took with them their music; and thus, as well as through the Crusades, European civilization came in contact with it.

Egyptian Music.—Egyptian music, like Egyptian civilization in general, was of ancient origin, at least antedating 3000 B.C. From the first it was closely connected with religion. By the time it reached its golden age (1500–1200 B.C.), it was also employed for social diversion. It was performed by trained singers, players and dancers—professionals who formed choruses and orchestras. In bas-reliefs and paintings these orchestras are always shown with a leader, and stringed instruments predominate. From the size of the orchestras it is surmised that some kind of harmony must have existed.

The national instrument was the *harp,* which was made in a variety of sizes, from the huge, superbly decorated specimens used in temples to those that were easily portable. It was characteristic of these harps that they were invariably constructed without the supporting pillar in front to which we are accustomed in the modern harp. Lyres and lutelike instruments also were used. Chief among the wind instruments were flutes and both single and double pipes. For military music there were drums, trumpets and a distinctive instrument called the *sistrum.* This was a horseshoe-shaped affair of metal with metal bars mounted loosely on it, so that they rattled when it was shaken. Such knowledge as we have of Egyptian music has been derived wholly from the paintings and bas-reliefs already mentioned and from hieroglyphics and the actual remains of instruments discovered by archeologists. From the structure of the instruments it has been supposed that the scale was diatonic; but whatever records of the Egyptian system may have existed have unfortunately disappeared.

Assyrian Music.—In Assyria flourished a system no less ancient than that of Egypt—a part of the culture of Babylonia, which was merged with the Assyrian empire. Some of the Assyrian remains show that although the Assyrians had instruments similar to those of Egypt, these instruments were so made that they might be suspended from the body and borne in processions. Drums, tambourines, trumpets, double pipes, dulcimers, harps—all were portable, thus reflecting the warlike character of the people.

Hebrew Music.—It is probable that the Hebrews derived their music from Egypt, Babylonia and Assyria. They had but two distinctively national instruments—the *shofar* and the *kerem,* which were ram's horns employed in the Temple worship. We encounter nothing similar among the other races of antiquity. Most of their other instruments were taken over from the Egyptians—for example, the *harp,* which was smaller than its



Courtesy Metropolitan Museum of Art

Musical Instruments of Ancient Greece and Rome

1, Harp from a Greek vase dating from the time of Alexander the Great (356–323 B.C.). *2,* Panpipe from a bas-relief in the Albani Villa at Rome. *3,* Trigon (*trigonos*) from Herculaneum. *4,* Lyre (*phorminx*) from the interior of an Etruscan tomb (*c.* 400 B.C.)

common Egyptian prototype, and the four-stringed *nebel* (or psaltery). Most of the wind instruments mentioned in the Hebrew Scriptures had likewise an Egyptian origin. Nor can it be said that the Hebrews contributed much to music on its purely artistic side. But they exalted it by regarding it as an aid to direct communication with deity. When Elisha was about to prophesy before King Jehoshaphat, he said: "Now bring me a minstrel." "And it came to pass," says the account (II Kings 3:15–16), "when the minstrel played, that the hand of Jehovah came upon him [Elisha]."

Music assumed a prominent place in the Temple, especially in the reign of Solomon, although the figures given for the number of singers and instrumentalists are so prodigious that they may be taken as exaggeration. The book of Ecclesiasticus includes in its types of famous men (44:5):

"Such as sought out musical tunes,
And set forth verses in writing."

It is considered probable that the melodies were of narrow compass (though much embellished) and sung in unison, no matter how large the number of performers may have been. The most distinctive and interesting feature of Hebrew singing resulted from the use of the parallel couplets of Hebrew poetry, for example:

"Who shall ascend into the hill of the Lord?
Or who shall stand in his holy place?"

These balancing couplets seem to have been sung either by opposite sides of a choir or by a choir giving response to a leader. This antiphonal style of chanting was borrowed by the early Christians and became a feature of Christian worship.

It is impossible to draw from the present music of the Jewish synagogue any conclusions as to ancient Hebrew music. In music, as in other arts, the Jews have been wont to adapt themselves to the forms prevailing among the peoples with whom they lived. It has been said that in certain Gregorian chants we may perhaps more truly distinguish traces of the ancient Hebrew style. That this style had a special character among Oriental systems is evidenced by the invitation of the Babylonians to their Hebrew captives: "Sing us a song of Zion!" To which the significant response was: "How shall I sing the Lord's songs in a strange land?" In 70 A.D. the Temple was destroyed. The Hebrews lost their national focus and their national culture. Dispersed about the world, they became artistic rivals of the races with whom they tarried. The *shofar* continues to be used in synagogues on holy days; and the *cantor* (precentor or leader of the singing) has a post of dignity next to that of the rabbi.

MUSIC AMONG THE GREEKS

The Greeks and Ourselves.—It is true that Greek music had a considerable influence upon our own. This statement demands, however, some explanation. It is a truism that in the case of our plastic art and our poetry we cannot construct an outline of development that ignores Greek influence. From the very beginning of the Christian era we discover them existing under this influence, though at times it may not be plainly evident; and apart from it, European cultural remains have little significance. With the Renaissance began a definite awakening of what was called the Greek spirit. The recovered works of Greek plastic art and Greek poetry were a wellspring of modern art among all European peoples. It was then that Greek music first took on real importance with respect to ours. No doubt it had long before had a direct effect on early Christian music, but it was not until the Renaissance that any actual study of it was attempted. At the close of the 16th century, the union of drama and music in an independent art form was undertaken, with the ancient Greek drama as a model. But whereas in the case of the plastic and literary arts surviving examples furnished a direct working pattern, in the case of the music there was nothing but a theoretical basis from which to start—a basis fashioned from principles arrived at purely by reasoning from inadequate data. Theory was forthwith discarded, and the new art form proceeded along its own line of development. Of this we shall learn more when we consider *opera* and *oratorio.*

Fragments of Greek music have since been discovered by archeologists. For example, in October 1893 the French School unearthed at Delphi two stones bearing the words of a hymn to Apollo with the Greek musical notation attached. By a strange coincidence it celebrated a victory over the Gauls in 279 B.C. But it cannot be said that even if rich finds of such music were made, they would ever have for us a significance comparable to that of Greek poetry and plastic art. They would never contribute to a musical renaissance. For the Greek concept of music was quite different from our own. The Florentines of the Renaissance and Wagner in the 19th century alike had the ideal of an art form in which poetry and music should be combined—in which, so to say, each should permeate the other. Have we not here a connecting link between Greek music and the music of today? The rejoinder must be: What is the nature of the music with which poetry is to be joined? In its means of expression, in its *timbre,* in its entire character the music of Wagner is as remote from the music of the Greeks as are the symphonies of Beethoven.

With the Greeks music was absolutely subject to poetry in much the same way that their painting was subservient to plastic design. Both mimicry and music were but the attendants of poetry and employed only to heighten its effect. The connection between music and poetry was maintained, whereas in certain instances, as in the epic and the lyric, the dance was dispensed with. The emphasis given to the text helps to explain the lack of *polyphony* in Greek music; for all polyphony (as well as free instrumental accompaniments) must unavoidably render more difficult a ready comprehension of the words. From the statements of Greek writers on musical theory, we gather that to the Greek, *melody,* as contrasted with *rhythm,* was more material in character, and rhythm appeared more spiritual. To us, on the other hand, the express soul of music lies in melody; melody seems to be the essence of music because it is peculiar to music, whereas rhythm is operative also in poetry and the dance.

The Course of Greek Music.—For convenience, the history of Greek music may be divided into three periods, as follows:

1. *From about 1000* B.C. *to about 660* B.C. This is largely the period of mythology. Hermes invents the *lyre,* and to the sound of the lyre Amphion builds the walls of Thebes. The lyre becomes an attribute of Apollo, who, when the flute-playing Marsyas challenges him, wins the contest and flays the presumptuous Marsyas alive —thus asserting the supremacy of strings over wind instruments. Pan devises the *syrinx* or shepherd's pipe. Orpheus receives the lyre from Apollo and with it enchants beasts, trees and rocks, so that they follow him. To the accompaniment of the lyre the bards chanted heroic poetry, of which we have examples in the *Iliad* and the *Odyssey.*

2. *From about 660* B.C. *to the Macedonian conquest, 338* B.C. Intercourse with Egypt gave fresh impetus to music at the beginning of this period. Terpander of Sparta increased the strings of the lyre from four to seven and established the first Grecian system or school of music. Pythagoras, the celebrated mathematician and philosopher of Samos, studied musical principles and wrote about them, and advanced the famous doctrine of the *music of the spheres,* to which Lorenzo refers in The Merchant of Venice (V, 1) when he says:

> "There's not the smallest orb which
> thou behold'st
> But in his motion like an angel sings,
> Still quiring to the young-eyed cherubins."

A well-known story told how Pythagoras fixed the mathematical relations of the original Greek scales by chancing to hear the different tones produced by striking hammers of varying weights upon an anvil. He then suspended weights corresponding to those of the several hammers. Unfortunately for the story, different hammers do not produce different tones from the same anvil any more than do different clappers from a given bell.

The most important expression of music during this period was in the Attic drama, which flourished at Athens during the 5th century B.C. In works of this type the chief use of music was in accompanying the *chorus,* which to the notes of flutes and lyres marched or danced about an altar and voiced a commentary upon the action of the piece. The post of *choragus* or leader of the chorus was considered one of high honor. One *choragus* was elected from each tribe, and he was expected to provide the funds for rehearsing and equipping his chorus.

Plato and Aristotle both wrote on musical esthetics; and Aristoxenus (*c.* 320 B.C.) of Tarentum, a pupil of Aristotle, was a voluminous writer on musical topics. Portions of two of his works have survived; and *On Music,* by Plutarch (or attributed to him), owes much of its value to the copious extracts from Aristoxenus.

3. *The period of decline.* Everything now ran to elaboration and to empty displays of virtuosity. Whereas one flute player had once sufficed, orchestras of six hundred musicians were now assembled. Lyres had 40 strings, ten times their original number. Upon certain virtuosi were heaped honors exceeding those accorded in modern times to our coloratura sopranos.

Greek Modes.—The subject of the Greek *modes,* as the scales were called, is an involved and difficult one. The Greek tonal system was based not upon the *octave,* as is ours, but on the *tetrachord.* That is, each mode consisted of four notes, corresponding to the four strings of the primitive Grecian lyre. Tones were not, as in our system, determined by their relation to *tonic* (or *keynote*) and dominant (or fifth note of the scale) but purely by intervals. The difference between one mode and another lay in the different arrangements of the intervals (for only the highest and lowest tones were uniformly the same distance apart); and in the *pitch* of the perfect fourth that comprised them. Like the Chinese scales, the Greek modes were thought of as descending. They were of three sorts:

(*a*) *Diatonic,* the most important and the most favored by the purists (two whole tones and one half tone);

(*b*) *Chromatic* (two half tones and one minor third);

(*c*) *Enharmonic* (two quarter tones and one major third).

Today our ear no longer distinguishes quarter-tones. Even among the Greeks themselves enharmonic modes were in only transient use. Our notion of *chromatic* is different from theirs. A five-toned scale seems to have been the most ancient form used by them. In their musical *notation* the words were cut on stone, with letters placed above them as symbols to indicate the pitch.

Greek Instruments.—The Greeks had string and wind instruments. The native lyre (*phorminx*) and *kithara* were in course of time added to by string instruments introduced from Asia. Each string served for but one tone, to which it was tuned. In playing, the finger or a *plektron* was used. Wind instruments (*auloi*) were of many kinds—chiefly they remind us of our own *clarinet, oboe* or *flute.* The *Panpipe* was a later addition. It was a kind of mouth organ, with seven reeds fastened together, each reed producing a different tone of the scale. Homer and Hesiod mention only the string instruments. The Homeric heroes and minstrels sing to the accompaniment of the phorminx, and it is only from within the Trojan lines that we hear the sound of flutes and pipes. Wind instruments seem to have reached the Greeks by way of Phrygia. As a rule the Greeks used a double flute—two blown at the same time, but the single flute (*monaulos*) was introduced from Egypt. Among the foreign string instruments taken over by the Greeks were the *trigonos,* or three-sided harp, from Syria; the *magadis* and *pektis* from Lydia; and the *barbiton.* In no other field were the Greeks more influenced from without than they were in music. The terms *Phrygian* and *Lydian* were used in naming some of the diatonic modes.

In general it may be said that among the Greeks the knowledge and cultivation of music were deemed essential to the character of a free man. Music was fundamental in the education of youth, a necessary part of all liberal training.

Roman Music.—The Romans borrowed instruments from Greece and from Asia. With the extension of Roman conquests and the founding of the Empire, alien music of many sorts became familiar. Trumpets (*tuba, buccina*), introduced from Lydia, suited the Roman military turn of mind. There was much rather vulgar affectation of art, even by the emperors. Nero is a classic example of the idle, shallow dilettante. During his reign the *hydraulic organ* (a Greek development from the Panpipe), in which air was forced into pipes by water pressure, became popular. Hadrian and, still later, Justinian, made unavailing attempts toward musical reforms. Though contributing to music almost nothing that was original, the Romans did help to disseminate musical ideas. The late Roman philosopher Boëthius (*c.* 500 A.D.) wrote, when the antique world was already passing, five books *De Musica* (*On Music*) that had a remarkable influence throughout the Middle Ages as a textbook of the musical art.

MUSIC OF THE MIDDLE AGES

In a survey of the music of the Middle Ages, we must follow the progress of two different styles, the *churchly* or *ecclesiastical* and the *lay* or *secular.* The first grew up and developed in connection with the ritual or form of public worship of the Christian Church. Following the division of the Roman Empire (395 A.D.) into the empires of the East and the West, church history also began to be divided, although the final separation into Eastern and Western churches did not take place until 1054 A.D. In tracing the formation of our musical system, our interest lies with the progress of music in the Western or Roman Church. The second style, the secular, developed from *folk music,* the expression of the people; from the music of strollers—singers and also instrumentalists, playing fiddles, clarinets, flutes, trumpets, pipes and harps; from the art songs of *troubadours* and *trouvères, minnesinger* and *Meistersinger;* from music of a religious or devotional nature with words not in the ecclesiastical Latin of ritual but in the vernacular or common speech.

Early Church Music.—The Romans did not take over into Latin the Greek word *hymnos* (hymn), by which the Greeks meant a poem in honor not only of their gods but also of heroes or distinguished men. It happens, however, that we have from the classic age of Latinity a few poems that in both their form and their general character are nearer to modern ideas of hymnody than is anything we have in Greek. Such, for example, are Horace 1,21: "Sing to Diana, gentle maids," and Catullus xxxiv: "We are Diana's votaries." It is nevertheless to the Greek-speaking churches that we must look for the first use of Christian hymnody. Paul (Coloss. 3:16) refers to "psalms and hymns and spiritual songs" and to "singing with grace in your hearts unto God." In I Cor. 14:26, he says, "When ye come together, each one hath a psalm," the context plainly showing that he alludes to meetings for worship. It is told that Paul and Silas sang hymns in their jail at Philippi (Acts 16:25). James (5:13) says: "Is any cheerful? let him sing praise." In Acts 4:24–30 we read of a group of Christians who "lifted up their voice to God with one accord" in a passage of hymnlike character; and elsewhere in the New Testament are passages that have sometimes been regarded as quotations from hymns of the Apostolic period. The modern distinction between hymns and psalms must be viewed as purely arbitrary; such a distinction appears to have been unknown to the early Church. St. Augustine's definition of *hymn* was "praise to God with song."

Although the word *hymn* is from the Greek, it is to Hebrew sources that we must look for the origin of Christian hymn singing. Psalm tones (or psalm tunes) in Christian use at a very early date are found to be adapted not to Greek prosody but to the peculiar construction of Hebrew verse—the parallel couplets that we have already noted. This points to the *antiphonal* style of chanting, a characteristic Hebrew form. Pliny's famous letter to the Emperor Trajan (Epist. 97) reveals that in Bithnia at the end of the 2d century A.D., when Pliny was governor there, antiphonal singing was already well established. Christianity came to the West through Greek channels, and it was therefore quite natural that the West should follow Greek authority and practice. Even in Latin-speaking assemblies the hymns long were sung in Greek. This Greek hymnody was not imitated in the West until the 4th century, when Latin hymnody had its beginnings with Hilary of Poitiers (d. 367 A.D.) and Ambrose of Milan (d. 397 A.D.). St. Augustine, one of Ambrose's converts, explains how it was appointed that "after the manner of the Eastern churches, hymns and songs should be sung lest the people should grow weary and faint through sorrow." Of himself, as he listened, he says: "The voices flowed into my ears; the truth distilled into my heart."

Ambrose of Milan, to prevent the loss of the ancient melodies, which had been preserved by vocal tradition only and had suffered many changes, compiled the Ambrosian Breviary—a *breviary* being a collection of hymns proper to the season and the week. The hymns it contained by Ambrose himself were lofty in expression, brief and readily singable. Pope Gregory I (Pope, 590–604) has been credited with another revision of Church music, the compilation of an *antiphonary* and the establishment at Rome of a *schola cantorum* (singing school) in which teachers were prepared to form other schools elsewhere. So in addition to the Ambrosian style of ecclesiastical music another and different style arose known as *Gregorian*. The Gregorian style came to be accepted as the sanctioned Roman use, and the Ambrosian was almost wholly restricted to the diocese of Milan.

It is a mistake to suppose that the Gregorian *modes* (or scales) were derived from the ancient Greek modes, though Greek names were given to them. Between the two *tonalities* no connection whatever existed. The melodies of the *Gregorian chant* or *plain chant* (*cantus firmus*) are written not in the major and minor scales of present-day music but in one of 12 modes, the intervals of each mode being based on a fundamental starting note paradoxically known as the *final* and corresponding to the *tonic* (or keynote) of present-day scales. Each mode comprises eight sounds. The compass of the first series of six, known as *authentic* modes, runs to the octave above the final; that of the second series of six, known as *plagal* modes, extends from the fourth note below the final to the fifth note above it. Of the several distinct classes of plain-chant melodies, the oldest and most interesting is that including the psalm tones sometimes known as *Gregorian tones*. Following these in antiquity are the *antiphons, graduals, introits* and *offertoria* that are employed at High Mass.

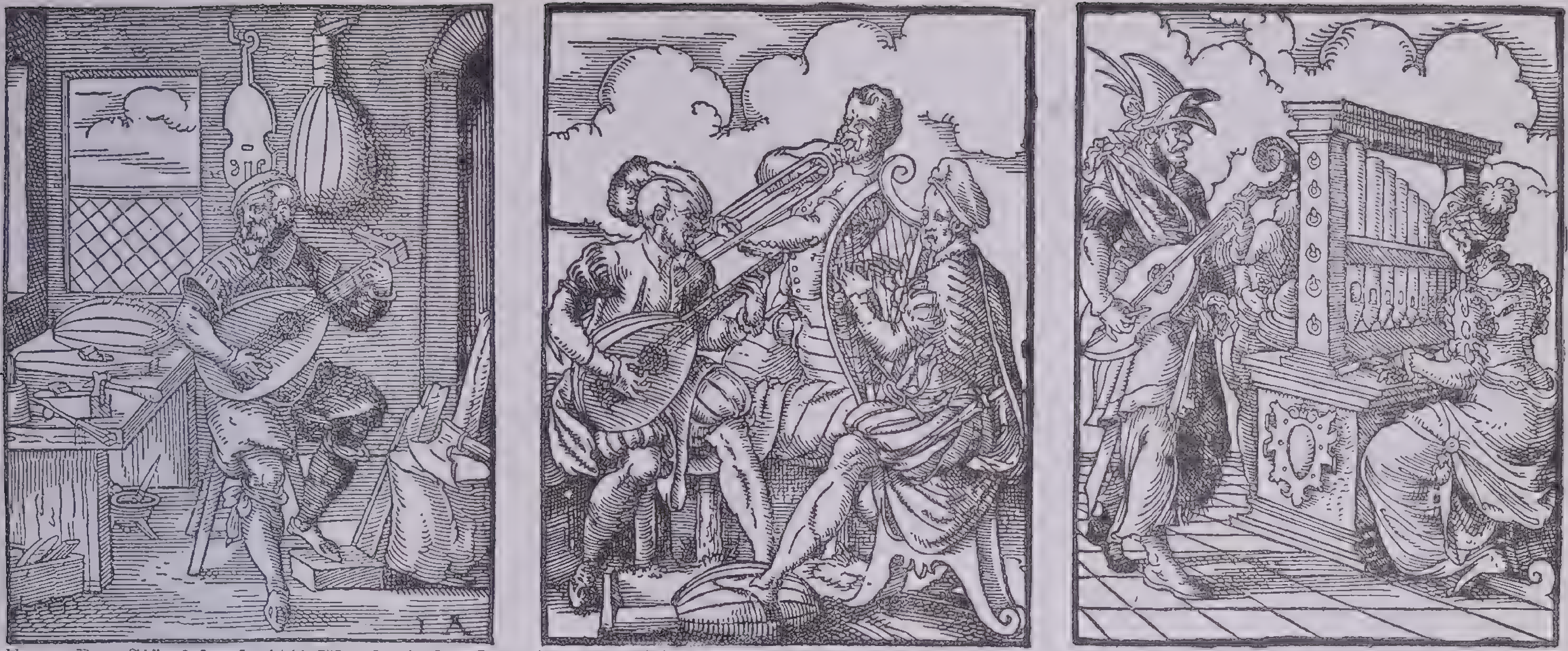
Originally notation was by means of symbolic letters, as in the ancient Greek system; but later, in place of letters, a series of signs called *neumes* was devised. These were written over the words of the text, to indicate the melodic trend. Eight of these (with Latin names) were of particular importance, and from these, in some cases, combinations were formed. Letters prefixed to indicate the pitch evolved into *clef* or *key* signs, and a four-line *staff* was adopted, this being sufficient for the compass of Gregorian modes. To a Benedictine monk, Guido d'Arezzo (*c.* 990–*c.* 1050), is usually attributed the invention of *solmisation*—the way of reading scales by the syllables *ut, re, mi, fa, sol, la.* It was said that he took these syllables from the initial words of successive lines of an ancient hymn to John the Baptist:

Ut queant laxis
*Re*sonare fibris,
*Mi*ra gestorum
*Fa*muli tuorum,
*Sol*ve polluti
*La*bii reatum,
Sancte Ioannes.

At any rate, the syllables are certainly there; and when a seventh note was added to the scale, the syllable *si* was formed from the initial letters of "Sancte Ioannes." The ingenious Guido divided the scale into seven interchangeable groups of six notes each (*hexachords*). Of these the lowest started from a foundational G (Greek *gamma*) below *ut*. From this conjunction of *gamma* and *ut* came the word *gamut*, meaning the whole scale of tones.

Gradually the use of the classical metres (for congregational singing the *iambic* dimeter was a favorite) yielded to that of accentual rhythm, and this was aided by *rhyme*. Ultimately intricate rhyme patterns were employed. The greater the freedom of melody from metrical quantities, the more were experiments made with prolonging tones, with embellishments, with developing fantastic *motifs* on a single syllable. It is recorded that in the Roman Church the Alleluia in the Mass was anciently sung "with the *pneuma*"—that is, the *coloratura* was sustained so long as the singer had breath (Greek *pneuma*). In the ritual of the Coptic Church to the present day, it is said, a single Alleluia is often prolonged for a quarter of an hour. In the Roman Church, the *gradual* was the anthem that followed the *epistle* and preceded the *gospel* in the office of the Mass. The gradual ended with an Alleluia, and the extension of this was known as a *sequence*. The sequence was originally metrical—a "musical jubilation" was prolonged through a certain number of tones. Notker Balbulus of St. Gall (*d.* 912 A.D.) wrote new words to go with the old *motifs*. These Notkerian sequences (or *proses*) were not metrical but rhythmical, fitted exactly to the tones they were designed to accompany. From this it was but a step to the composition of new motifs also. The sequence became the favorite form of composition in the earlier Middle Ages, and numerous examples have survived. Five still have place in the Roman missal: *Victimae paschali laudes; Veni Sancte Spiritus; Lauda Sion Salvatorem; Stabat mater; Dies irae.* Originally the congregation had been permitted to take up the sequence as a response, but afterward the tendency of the Church was set against this. But sequences became the means through which the music of the Church most influenced secular music. The Gregorian chant also had its influence. Hymns continued to be written—to the Trinity, for the holy seasons, to the Virgin, for private devotions and for other uses; but Latin hymnody had reached its finest development. The subsequent revival of learning led to an extensive revision of the hymns of the breviary (or abridgment of the daily offices for the use of those in major orders), by which the medieval Latin was much altered to conform to that of classical writers.

Early Secular Music.—From a period so remote that it is lost in obscurity, folk music and folk dancing characteristic of different nationalities are known to have existed. The songs were of simple literary form and often, because of their combination



From Das Ständebuch (114 Woodcuts by Jost Amman with Rhymes by Hans Sachs), Leipzig

The Lute Maker **Lute Player, Trombonist and Harpist** **Guitar-Fiddle Player and Organist**

Musicians and Musical Instruments of the Middle Ages

with dancing, had strongly marked rhythms. The folk music of Germany and France won particular importance. That of Germany was marked by a concise form and a freedom from ornamental embellishment. That of France was a source of *themes* for the musicians who developed *counterpoint* in the Netherlands. To furnish accompaniment for voices, many different instruments were used; and these contributed to the rise of our modern *tonalities* and *harmonies*.

In the earlier Middle Ages we encounter two classes of *minstrels*—the *bards,* found principally in the northern countries, where their recitals of mighty deeds of the heroic past were esteemed as a means to arouse patriotism; and the *itinerant* entertainers who roamed through Europe. At first, though their music was welcomed at village festival and town fair (where they were accustomed to show their versatility by exhibiting trained beasts and performing tricks), they were regarded as vagabonds of the road, outside the pale of the law. In time laws dealing with them were enacted; but the Church that had frowned on them admitted them to some part in its miracle plays. They were particularly numerous in France, where they were styled *jongleurs* (literally, jugglers). Massenet's charming opera *Le Jongleur de Notre Dame* has to do with one of these strollers. In the towns, *guilds* of minstrels were commonly formed, and these guilds, like the trade guilds, endeavored to fix certain standards for their members. Some minstrels became musicians in the private orchestra of a nobleman or in a military band. For a time the minstrels were the most faithful custodians of the *folk song,* and the evolution of instrumental music depended wholly upon them. Then there were traveling clerics, *vagantes* and goliards, who used mostly Latin rather than the vernacular. One of their songs is "Meum est propositum," attributed to a Gualterus who is variously identified. Some songs of a folk character have Latin words and rhyming lines—such as the *Festum asini* (or *Prose de l' âne*), which was known as early as the 12th century and was sung at festivals in France.

The Age of Chivalry that had its beginnings in the 12th century led to a study of Provençal music and poetry and an imitation of Provençal customs. A group or school of courtly musicians and poets arose; and during the 12th and 13th centuries these poets and musicians, aided by the professional services of *jongleurs,* wrote *chansons, pastorelles, serenades* and the like in praise of their ladies. The rendition of these was usually supplied by the *jongleurs.* The Church modes were used, though somewhat simplified. These compositions, at first natural and sincere in manner, later became thoroughly artificial. In some cases the melodies were made the basis of works for the Church or were adapted to folk songs. In Germany a similar movement was carried on by the *minnesinger,* though with differences. The *minnesinger* were usually but not always of rank; they less frequently sought the aid of the minstrels; and they had a greater variety of topics, nature, patriotism or even piety. Their compositions were written in the Gregorian modes but were sung more in the recitative manner, and greater attention was paid to the instrumental accompaniment. Prominent representatives of this school were Walther von der Vogelweide and Wolfram von Eschenbach in the first quarter of the 13th century.

The *Minnelied* became increasingly formalized and was succeeded by the *Meistergesang.* The *Meistersinger* took their work very seriously. Most of them were worthy artisans and honest citizens of German towns, who, usually of a Sunday afternoon, gathered at the church, the town hall or the guild house to study singing. Many of them not only were unfamiliar with the melodies of the *minnesinger,* to whom they believed themselves to be the successors, but did not even understand musical notation. To them, for the most part, the writing of poetry was a purely formal job, the skill for which was to be acquired by learning the rules. The gay science of the *troubadours,* the *trouvères* and the *minnesinger* had now become a handicraft. One worked his way up through the grades of *Schüler, Schulfreund, Dichter* and *Sänger* to become *Meister.* One figure stands out from these surroundings—Hans Sachs (1494–1576), the cobbler-poet of Nuremberg, 13 of whose melodies we have. He appears in Wagner's *Die Meistersinger von Nürnberg,* which gives a livelier and truer picture than could any mere description, however lengthy. From this we may learn that although from a strictly musical point of view the *Meistersinger* may have little significance for us, they did perform a service in endeavoring to preserve a native musical art at a time when German princes and nobles were turning their backs upon it.

Secular Instruments.—As a result of the Crusades a number of Oriental instruments were added to the instruments already in use, and these were adapted to accompaniments for Western dances and songs. Percussion instruments were not much in favor. Of wind instruments, *pipes* of various sorts (including both whistle and reed types) were popular; for military uses, horns and trumpets served. Stringed instruments were especially preferred, and were of two leading sorts: (*a*) those that were struck or plucked; and (*b*) those that were bowed. In the first group were *guitars, harps, lutes* and *psalteries.* Lutes, though to our notions difficult to tune and play, were prime favorites and appeared in a wide variety of shapes and sizes. In the second group were *viols* of many designs; the viol had the Arabian *rabab* (with the Welsh *crwth*) as its supposed prototype and was itself the prototype of the violin family of today. As the compass of instruments increased, a corresponding extension became necessary in the system of notation. Hence arose various schemes of *tablatures,* specially adapted to different kinds of instruments. For example, the tablature for the lute represented by lines the strings of the instrument itself, and symbols on these lines indicated the various positions of the fingers on the strings for producing the desired tones.

Contrapuntal Schools.—We pass now in the history of medieval music from unison singing to vocal polyphony. *Counterpoint* has to do with the arrangement of a musical composition into a number of separate and distinct *parts.* As we have already seen, *harmony* implies that several concordant tones are heard at the same time. The art of counterpoint consists in the arrangement of these several tones in such a way that each may belong to a different part, which is throughout capable of being performed by a separate and distinct voice or instrument. Each of the parts must in itself form a kind of melody, but the combination of them all must be so arranged as to produce, when they are heard together, a satisfactory harmony. It is chiefly in vocal composition that counterpoint is used, although it appears in instrumental works, as in *chamber music* (*quartets, quintets*) and sometimes also in orchestral pieces—though in these not all the parts are *real,* that is, perfectly separate and distinct one from another. Counterpoint is found in organ works by Johann Sebastian Bach, though these are to be played upon a single instrument.

The exponents of strict counterpoint, which flourished in the period we have now reached, added to a given melody or *cantus firmus* one or more other melodies, the relations of which to the given melody were determined by rule. Ever since that time a knowledge of counterpoint has been part of a thorough study of composition, although the art has often been greatly neglected and the rules governing it have been much relaxed in modern times. A school, directed by the organists of Notre Dame, grew up in Paris; another at Tournai. This activity spread northward—to the north of France, to Belgium, to the Netherlands. For a long time, musicians of the Netherlands were highly considered all over Europe as composers, performers and teachers. They surpassed all others in the involved technique of their contrapuntal arrangements. Prominent among them were Johannes Okeghem and Josquin des Près, but the greatest of the school was undoubtedly Orlando Lasso (*c.* 1520–1594), who wrote a vast number of compositions and was known as the Prince of Musicians. Schools were busy also at Venice and in Rome. Most distinguished of the Roman school was Palestrina (*c.*1515–1594), who became organist and later director of music at St. Peter's and developed an individual style in his contrapuntal works, which include his famous Mass dedicated to Pope Marcellus.

The system of neumes no longer sufficed for musical notation. It had been adequate for chanting in unison; but when counterpoint arrived and different singers had different melodies with a differing number of notes, it was necessary to the harmony that the duration of each note be known. So *mensural* notation was introduced—clumsily at first, to be sure, but marking a great advance.

MUSIC OF THE REFORMATION

As early as 1476 Ulrich Hahn of Ingolstadt printed a missal in which he used movable types for the notes. This was at Rome, and there the process was developed by Ottaviano Petrucci (1466–1539), who employed two impressions (one for the lines, the other for the notes), and who was the foremost music printer of his day. Before this innovation, the printing of music had been done with plates cut from wood. By the new method, compositions could be published much less expensively. This resulted in an increased circulation of music and helped musical art eventually to have its share in the general movement of the Renaissance.

Music in Protestant Churches.—Luther's purpose was to reform, not wholly to discard, the old forms of service. He therefore retained many of their features, introducing the modifications he felt to be required by new conditions. In conformity with his insistence upon the natural right of the individual to communicate directly with God, he had much of the old liturgy rendered into the vernacular. He also made a point of restoring the custom of hymn singing by the congregation that had prevailed in the early Church. In order to provide suitable music, he enlisted the aid of prominent musicians, and not only Gregorian melodies but German religious and secular folk tunes were arranged for the new vernacular hymns.

A highly dignified strophic or rhythmic form was developed, known as the *Choral.* This came to take in the Lutheran services a place very similar to that of the Gregorian chant in Roman services. In the beginning, chorales were sung in unison, unaccompanied, by the entire congregation. After a while additional parts were written in the contrapuntal style. These were sung by the choir while the congregation sang the chant (*cantus*). But whereas the old way of counterpoint was to build an ornate vocal structure upon the *cantus firmus* as basis, this new style put more emphasis on the basis, with a resultant effect of greater simplicity. Plain chords came much into use, and the leading part was, for greater convenience in harmonizing, transferred from the *tenor* to the *soprano.* Modern music was beginning; and it should here be clearly stated that modern music is greatly simplified from the highly wrought polyphony of medieval music, written in accordance with a set of rules often subtilized to the point of absurdity. Subsequently the Choral lost its vital character and grew rather tedious. Because, as was the custom of the time, the music was written without *bars,* the original rhythmic movement gave way to *polyrhythm*—frequent change of rhythm within the same composition. This was opposed to the earlier simplicity and unity and to the idea of congregational singing with a text that should be readily intelligible.

The *motet* (a word that has been explained as a diminutive of *motus*) was also much in favor. The older *a capella* motet was a kind of contrapuntal anthem in which the tenor part carried a Gregorian melody, and against it the other voices sang another Latin text. It was not divided for stanzas but had continuous movement. It might be secular as well as ecclesiastical. The new variety of motet had instrumental accompaniment and was written with greater freedom. Such motets were sometimes called *cantiones sacrae.* The older unaccompanied motet was not, however, entirely supplanted. The *cantata,* which had originated in Italy and been developed by Giacomo Carissimi and others, also became popular for the new church music. It had been made up of chorus passages varied by *arias* (solos) with accompaniment. The new style of cantata used texts drawn from hymnals, expanded by the interpolation of passages from the Bible. It showed less use of the aria and greater development of the choruses.

Among the leading German composers of this period were Heinrich Finck, Heinrich Isaac (*c.* 1450–1517), Ludwig Senfl (1492–1555) and Johann Walther (1496–1570). But these were only a few out of many, for there was a veritable flood of texts and melodies.

The Swiss Reformation adopted a musical usage not greatly different from the Lutheran but putting a special emphasis on the singing of metrical psalms. These were collected in volumes known as *psalters.* In England a well-developed school of music must have existed as early as the 13th century, for King Sigismund and the Duke Philip of Burgundy after their stay in England were loud in their praises of the English art and sought to introduce it into their own lands. English musicians and singers by hundreds visited the Continent and were welcomed there. Among them the best-known was John Dunstable (*d.* 1453), composer and theorist, whose pupils included founders of the Netherlands school of counterpoint.

Music of the English Reformation.—As consequences of the English Reformation, the Bible was translated into English and the liturgy was both translated and adapted, appearing in authorized form in the Book of Common Prayer (1549). Three kinds of musical setting were used: (*a*) for the portions intoned by the clergy or used for responses; (*b*) for the chanting of Psalms; (*c*) for the *canticles* (such as the *Te Deum*) prescribed for use in the different services. In addition to the music of the liturgy, there were anthems set to words from the prayer book or from the Bible and congregational hymns. At the outset Gregorian melodies were employed, but in time distinctive new styles based on harmonic forms arose. Thomas Tallis (*d.*1585) and Tallis's pupil William Byrd (1540–1623), both organists of the Chapel Royal; Dr. John Bull (1562–1628), also organist of the Chapel Royal and later at the Antwerp Cathedral; and Orlando Gibbons (1583-1625) were distinguished members of the contrapuntal group that still relied mainly on vocal effects in their works.

Secular Music in England.—Throughout England folk dances and folk songs were abundant. Many of the most characteristic of the songs were in the form of *ballads,* recounting at length some episode or glorifying some deed. Among art compositions, *madrigals* were especially popular. The madrigal was a kind of motet, simple, tuneful and gay. It had its origin in Italy. Thomas Morley (1557–1603), a pupil of William Byrd, and John Dowland (1562–1626) wrote numerous madrigals. Among fashionables the six-stringed lute was a favorite instrument, and concerted pieces in madrigal form, known as *fancies,* were written for it. The *virginal,* a quadrangular, boxlike, legless kind of *spinet,* was supposed to be particularly an instrument for young ladies. Queen Elizabeth, who liked to be regarded as a patron of secular music, performed on the virginal; and at Cambridge is preserved a manuscript volume of compositions, known as *Queen Elizabeth's Virginal Book,* in which are short pieces by composers of her day—some variations on popular tunes, others dances, but all in counterpoint and very like works written for the organ during the same period.

Instruments with Keyboards.—It has already been noted that the hydraulic organ had some popularity among the Romans of Nero's day. In the earlier Middle Ages the organ went out of use. After some hundreds of years its use was revived, and three varieties of the instrument were made: (*a*) the *portative*—small enough to be carried about quite readily or to be held on the lap; (*b*) the *positive,* larger than the portative—often designed for being wheeled about and sometimes even installed in churches; (*c*) the *great organ*—large, powerful instruments, for the most part built into churches. These great organs were at first exceedingly clumsy; the keys were six inches in width and were struck with the fist. Narrowed until the performer's hand could span a fifth, they were finally brought down to their present dimensions. Gradually, too, the compass was extended from the original 12 diatonic tones and was filled in by adding chromatics, beginning with the middle register; then other *manuals* (keyboards) were introduced; the positive organ was attached to the great and became the *choir organ* (so called, probably, because used in the first place for accompaniments to the choir); and *pedals* (a keyboard to be played with the feet) were devised. The great organ must by itself have been unsuited to accompaniments, and probably its chief use was to announce the Gregorian tone for the singers. But prior to the invention of the wind chest, even greater trouble was had with the matter of air supply. In some cases so many bellows were needed that one organ took seventy men to blow it.

The organ had a series of *claves* (keys; from the Latin *clavis,* a key), levers that opened valves (otherwise closed) to admit air from the windchest into the respective pipes. The assembly of these *claves* was known as a *claviarium.* Hence came the name of a type of instrument quite different from the organ—the *clavier* type. In German a pianoforte is still termed *Klavier.* It is the key and its associated mechanism that form the characteristic distinction between instruments of the clavier type and other stringed instruments. These claviers were adapted to domestic and social use and were of two main types, *clavichords* and *harpsichords.* Harpsichords, derived from the psaltery, plucked the strings by means of quills attached to the keys. Clavichords, originating in the dulcimer, used brass tangents raised and held against the strings. Among the instruments of the harpsichord type were the *clavecin,* the *spinet* and the *virginal.* A larger form was developed, called the *harpsichord,* in shape like the modern grand piano but smaller and suited to use with orchestras of the period. From this the type derived its name.

THE RISE OF OPERA

Beginnings in Italy.—The high point of the music of the Middle Ages had been reached in unaccompanied choral music. In its *polyphonic* style all the voices had an equal importance. It was contemplative music, quite without anything of what we know as dramatic quality. Within its own limits it did reach a high development—some, indeed, have described its expression as perfect. The limits were, however, decided. With the Renaissance a demand was made upon the musical art that it express, as other arts had begun to do, the new assertion of the rights of the individual that characterized the Renaissance spirit. A means was found through *homophony* (or monody), in which paramount importance was given to one melody and the other melodies were subordinated to it. One natural result was that contrapuntal design gave place to *harmonic* design. In *polyphony, chords* were purely matters of chance, happening at times as the melodies progressed. But in homophony, chords, both individually and in their relations with one another, ceased to be mere chance affairs and took a leading place in the writing of music. Harmonic design had existed to a certain extent in secular dance music, derived mainly from folk sources; but now it began to be a subject of experiment and study. With this change in musical form, *opera* and *oratorio* (and also the instrumental *suite*) really had their start.

Opera (the word is Italian, meaning *work*) was launched by amateurs who, in the closing years of the 16th century, met in Florence at the house of Giovanni Bardi, philosopher and poet. The first public performance of opera was *Euridice* (1600), music by Jacopo Peri, book by Ottavio Rinuccini. In this, certain quieter passages were sung with half-spoken tones to a subdued accompaniment; and here was the origin of dramatic *recitative.* Some composers who had been trained in polyphony endeavored to write opera (*dramma per musica,* it was at first called) on a polyphonic, strictly vocal basis with choruses in madrigal style. The works of Claudio Monteverde (1567–1643), who had been well schooled in the polyphonic style, made a definite break and prevented a further development in the choral art of the 16th century. His *Orfeo* (1607), *Arianna* (1608) and *Il Combattimento di Tancredi e Clorinda* (*The Combat of Tancred and Clorinda,* 1624) had in their day a truly impressive effect, particularly in the development of the resources of the orchestral instruments. Formal melody began to supplant recitative; pauses in the action were used for vocal displays, which by the time of Alessandro Scarlatti (1659–1725) had established the *aria* or solo tune. From Scarlatti until the works of Gluck appeared, opera was virtually aria and little else, with two exceptions. The first was that of Giovanni Lully (1633–1687), a Florentine who became conductor at the court of Louis XIV and who introduced into opera of the Italian sort spectacular *ballets* in the French manner. The second was that of Henry Purcell (1658–1695), an Englishman who at 21 composed his *Dido and Aeneas,* a work much in advance of its time. Italian opera reached England in 1707.

THE EARLY ORATORIO

The first oratorio was Emilio del Cavalieri's *Rappresentazione di Anima e di Corpo* (*Representation of Soul and Body*), which was produced in the oratory of the church of Santa Maria at Vallicella, Italy, in 1600—the same year in which the first opera was performed. In fact there is, as has been pointed out by historians, practically nothing that distinguishes it from Peri's *Euridice* except its religious subject. Giacomo Carissimi (1604–1674), a pioneer of the cantata, was also known as an oratorio writer. He and other Italians composing in this field during his general period wrote in the manner of serious Italian opera, although to a Latin text; and their oratorios were presented with dramatic action and stage accessories. Later the oratorio passed from Italian composers to those of Germany and England, where it became a significant art form.

English Church Music.—The English Puritans officially discouraged the singing of anything but the most austere psalm tunes, sung in unison and unaccompanied. Psalmbooks were issued with tunes severe and cheerless in melody, having the simplest rhythms and set to metrical versions that detracted from the poetry of the Scripture originals. During the Commonwealth (1649–1660) Puritan influence had full sway. Milton's lifelong fondness for music is always referred to as something exceptional for those days. Church organs were destroyed by iconoclasts. The ecclesiastical music of an earlier period was kept alive chiefly at Oxford. After the Restoration the new harmonic forms began to be adopted. Purcell wrote anthems. Croft and Boyce were learned musicians but not of Purcell's quality. Anthems were now written with elaborate instrumental accompaniments by orchestra or organ. A new method of chanting, the *Anglican* chant, consisted of a single tune (seven measures) or a double tune (fourteen measures), each preceded by a varying group of words called the recitation, which was made on a reciting-note. These tunes, harmonized in plain chords, were introduced for antiphonal chanting of the Psalter, but similar ones were adapted to the *canticles.* Until the 18th century hymns continued without musical decoration.

DEVELOPMENT OF ORGAN MUSIC

It was through the organ that instrumental music, which had existed as an auxiliary to vocal music, achieved its independence. Compositions written specially for the organ as an independent instrument find their earliest date in the works of a group of musicians, who all served as organists of St. Mark's, Venice. Two of them were from the Netherlands: Adrian Willaert (1480–1562)—"Messer Adriano" the Italians styled him—, and Cyprian de Rore (1516–1565). Two were Italians: Andrea Gabrieli (*c.* 1510–1586) and his nephew, Giovanni Gabrieli (1557–1612?). Girolamo Frescobaldi (1583–1644), whom some have called Italy's greatest organ virtuoso, was organist at St. Peter's, Rome, except for a brief interval, from 1608 until 1643. Such was his reputation as a performer that his audiences often numbered 30,000. He took over existing forms—*canzone, fantasia, fugue, passacaglia, toccata*—but gave them all an irregular turn, sometimes a dash of the fantastic and bizarre. Subsequently, he has been esteemed less for his compositions than for the strong impetus he gave to the technique of the organ (and also of the claviers) and for his activity as a teacher. Jan Sweelinck of Amsterdam (1562–1621) was considered the greatest organ instructor of his day. In Germany at the beginning of the 17th century the organ had begun to furnish accompaniment for the *Choral.* In this way the organists to a certain extent directly inherited the vocal art of the past. Counterpoint was appropriated and was adapted to instrumental technique. On the technical side, several composers did much to pave the way for Bach. Prominent among these were: Samuel Scheidt (1587–1654); Johann Froberger (*c.* 1605–1667), Frescobaldi's most important pupil; and the Danish Dietrich Buxtehude (1637–1707), organist of the Marienkirche in Lubeck, to hear whom Bach, then aged 19 and organist at Arnstadt, walked from Arnstadt to Lubeck, overstayed his leave, and nearly got himself into trouble with his church.

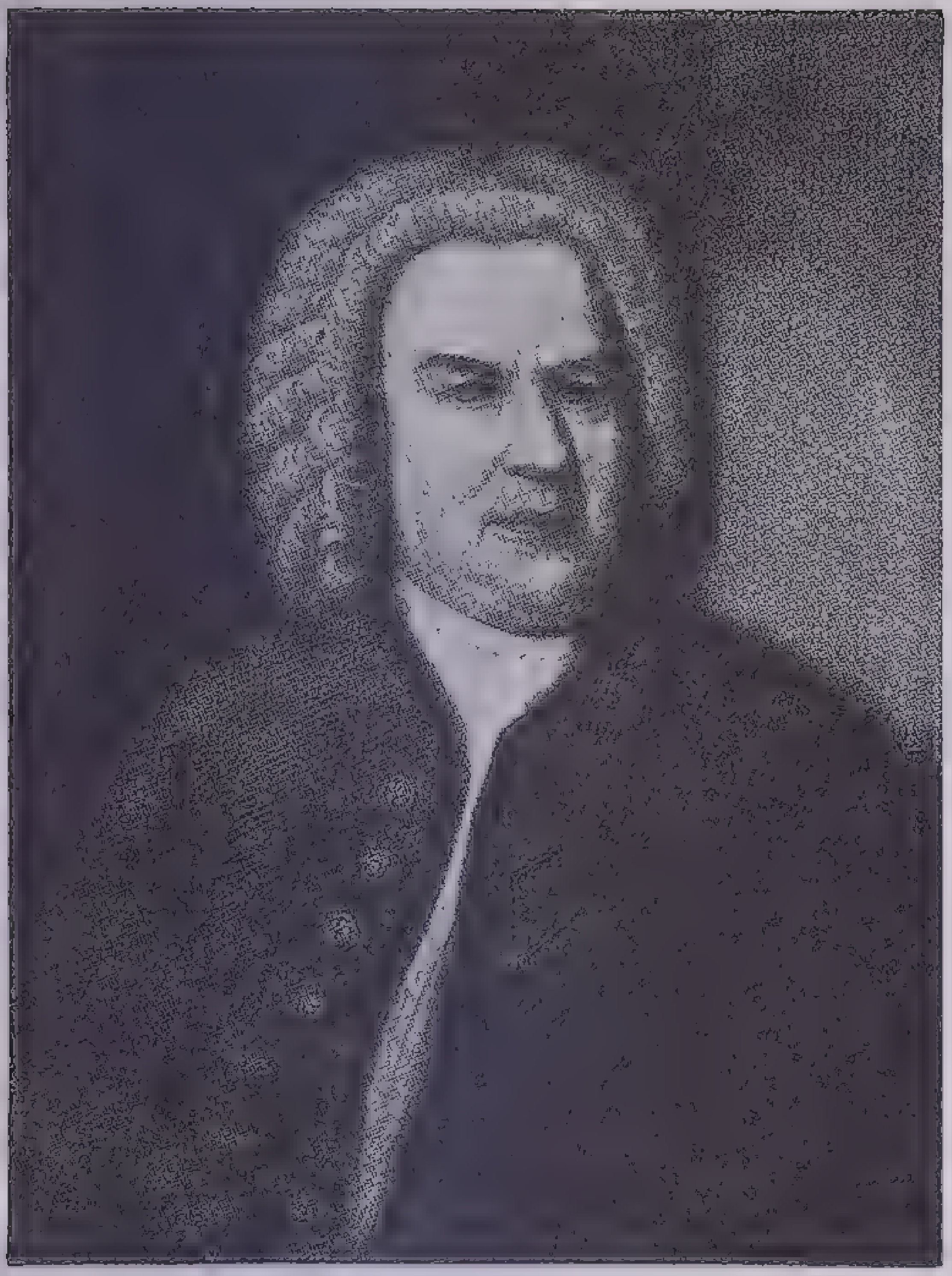
MUSIC OF THE 18TH CENTURY

In music the earlier 18th century has three pre-eminent and commanding figures: Handel, Bach and Gluck—all Germans, although Handel spent so much of his life in England that he is identified with English music. Handel and Bach were born in the same year; Gluck was born 30 years later. Handel was a cosmopolitan, versed in music of many origins and sorts, much before the public, seeking to reach that public with genuine music cast in a brilliant and popular form. Handel wrote for the vocalist, aiming at beauty of melodic line and some vocal flourish. Bach wrote as an organist, though in a highly characteristic idiom. He wrote reflective music, wrote to please himself and to satisfy his own ideals of art. In his own day he was little understood and had far less influence than did Handel. Since that day he has increased in stature until in the 20th century his compositions, though not appealing to a superficial taste, are regarded as standards of musical expression. Gluck, like Handel and Bach, sought to lead music away from the trite, the banal, the trivial; for into these it had begun to lapse. Having gained success in Italian opera, he turned from it to find a new path. He was a militant, publishing expositions of his theories and writing works to exemplify them. He was accepted in France, but elsewhere the Italian style continued to prevail. It has been asserted that only because there was a lack in the tonal resources available did he fail of a place similar to that of the later Wagner, to whom he was certainly prior in the field of music drama.

George Frederick Handel

Handel.—Georg Friedrich Händel (1685–1759), who became George Frederick Handel to the England in which he spent two-thirds of his life and who was known in Italy as Hendel or *Il Sassone* (*The Saxon*), was born in Halle-an-der-Saale, Lower Saxony. Though destined for a lawyer, the boy by surreptitious practice in the attic upon an instrument variously called a clavichord, a harpsichord or a spinet, acquired a skill that amazed the court musicians of the duke of Saxe-Weissenfels. At 10 he wrote six trios, still extant, for two oboes and bass, which give him as a youthful prodigy a niche close beside that of Mozart. He was a pupil of Zachau, organist of the Hauptkirche (cathedral) in Halle, studying clavier instruments, organ, violin, oboe and composition. In 1702 he became organist of the Schlosskirche in Halle; in 1703 went to Hamburg, where opera was coming into some prominence and where the first of his 42 operas, *Almira,* was performed with great success. At the end of 1706 he left for Italy. There he was active in Florence, Naples, Rome and Venice; was welcomed by such musicians as Domenico Scarlatti (1685–1757), the foremost Italian representative of clavier music, whose harpsichord technique had significance for the works of Haydn and Beethoven and thus for the modern pianoforte. In Italy Handel produced two operas and two oratorios; and during this sojourn, with the ready power of assimilation that always characterized him, he developed the smoothness of vocal style that was a consistent feature of his subsequent work.

Appointed *Kapellmeister* (conductor) to the elector of Hanover in 1709, he went on leave of absence to England in 1710; and in February 1711 his opera *Rinaldo,* which Addison reviewed for the *Spectator,* had a highly successful première at the London Haymarket. Though he went back to his post in Hanover when the opera season was over, he paid a second visit to England in 1712, wrote a *Te Deum* for Queen Anne and was still in the vicinity of London when the elector arrived in 1714 as George I. Pardoned for his breach of contract, he was naturalized in 1726. In 1720 he became impresario of the Italian opera at the Haymarket, which he managed until 1728. He directed other companies and went on writing Italian opera until 1741, when *Deidamia,* his last work in that genre, was produced. None of his many Italian operas continues to be performed in its entirety, but arias from most of them (like "Lascia ch'io pianga" from *Rinaldo*) are still prized. He now turned his back on opera and devoted his attention particularly to the oratorio. In this field he had already made a successful beginning and in it he wrote his best works and made his most significant contributions to music. His subjects were both secular and Biblical. Between the two kinds is no discernible difference in method and treatment. His method was in fact operatic, and the Biblical oratorios originally served as a kind of Biblical opera that might be patronized during Lent. He began to use English texts in 1733 with an augmented version of *Esther.* Transferred from the strict conditions of stage production to the freedom of the concert, the Handelian oratorios increasingly emphasized the choruses. In so doing they greatly aided the development of the English art of chorus singing. The best-known to



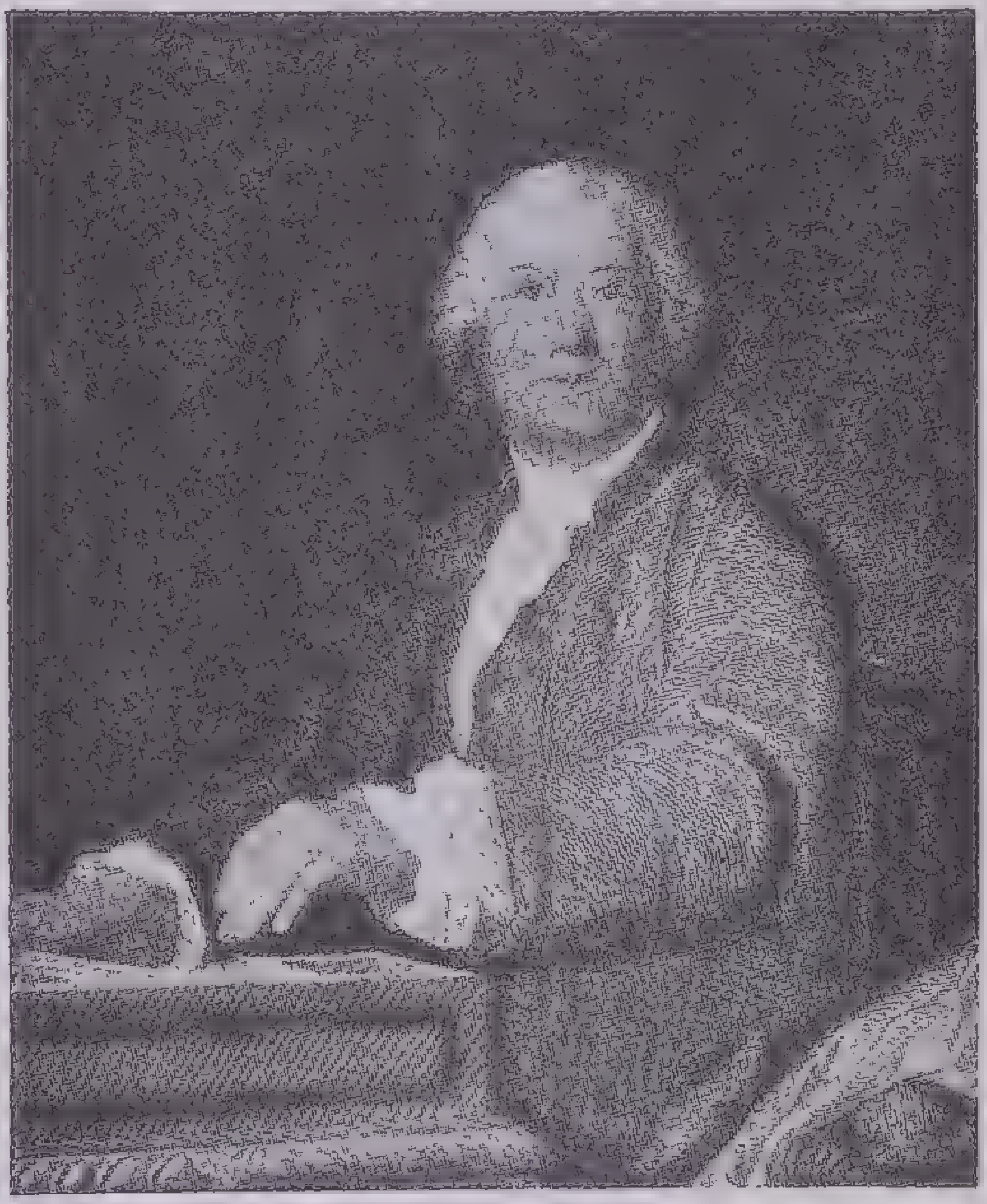
Johann Sebastian Bach

modern audiences is *The Messiah* (1742), although Handel himself preferred *Samson* (1744). Others are *Belshazzar* (1745), *Judas Maccabaeus* (1747), *Joshua* (1748), *Jephtha* (1752). Handel also wrote music for Dryden's "Ode for St. Cecilia's Day" and Milton's "L'Allegro." Among his instrumental compositions are harpsichord suites, organ concertos and violin sonatas. A suggestion of his vast output may be given in the statement that one edition of his complete works fills a hundred volumes. His indebtedness to other composers for material has been a subject of much discussion. From May 1752 his eyesight was affected, but he continued to labor.

Bach.—Johann Sebastian Bach (1685–1750) was born in Eisenach, almost in the shadow of the Wartburg, where singers of the Middle Ages once had competed, and Luther had translated the Bible. The Bachs were a musical clan, and Sebastian was taught from an early age. In 1700 he became a student in the St. Michael's school at Luneburg, where he had been appointed a chorister. His earlier development in music was due chiefly to his study of the works of earlier composers, such as Frescobaldi, and those of his contemporaries, for example, Dietrich Buxtehude (1637–1797) and Johann Reinken (1623–1722). He made copies of all the worth-while music he could find. After a brief stay at Weimar as a violinist in the orchestra of Prince Ernst, he took the post of organist at the new church in Arnstadt in 1703. There the consistory reprimanded him for astonishing the congregation "by introducing many remarkable variations into the *Choral,* mingled with many strange tones." For about a year (1707–1708) he was organist at Muhlhausen; then he returned to the court of Saxe-Weimar, where he spent nine happy, busy years—composing some of his finest organ works, as well as cantatas. From 1717 to 1723 he was *Kapellmeister* to Prince Leopold of Anhalt-Köthen, having neither organ nor church services but writing and directing chamber music. After 1723 the remainder of his life was passed at Leipzig as cantor of the Thomasschule, where he was often enough annoyed by the town councilors, who were able to understand neither the independence of the man nor the genius of the composer. There, however, such works were written as his *Passion According to St. Matthew* and the *Mass in B-minor.* His last days were passed in blindness. The Germany that was afterward so eager to claim him as an expression of the German spirit did not at all realize what it had lost. His grave was unmarked, its place was long unidentified; his widow was allowed to fall into such want that she died a pauper. Such was the gratitude of the world toward one who caused Beethoven to exclaim: *Nicht Bach, Meer sollte er heiszen!*—"His name should be not Bach [the German for brook] but Ocean!"

Neglected by his smart young contemporaries, his works waited until the first half of the 19th century to be rediscovered. In the past he was appreciated by only the more significant composers—by Mozart, whose style was greatly enriched by study of manuscript copies of Bach scores; by Beethoven, who devoted much thought to Bach's harpsichord and other works, so far as accessible; by Mendelssohn, who learned from the *St. Matthew Passion* a great deal about the oratorio. The critics have traced Bach's influence in the styles of such diverse composers as Chopin, Wagner and Brahms. It has been said that Bach towers, a gigantic landmark, between two eras. All that music had achieved before him, converges in him. "In the genius of the amazing Bach," declared Tieck, "reposed all the subsequent development of music."

Gluck.—Christoph Wilibald von Gluck (1714–87), born at Weidenwang in the Palatinate, studied music first at Prague and later as a pupil of Sammartini (1704–1774) at Milan. In Italy he wrote several operas in the conventional Italian style; they were so well received that he was invited to London to supply works in that vein for the Haymarket company, which at that time (1745) had declined from the excellence it had known in the days of Handel. In 1746 he quit London for Paris, where he made a first-hand study of the traditions and style of French opera, although for several years these appeared to have had no effect upon his own methods of composition. Appointed *Kapellmeister* at the court of Maria Theresa in 1754, he settled in Vienna in 1756 and there gradually developed his ideas for a reform of opera. To advance these ideas, he produced at Vienna three works, *Orfeo ed Euridice* (1762), *Alceste* (1767) and *Paride ed Elena* (1769). Feeling that these had not been received by the Viennese with the proper interest, he departed in 1773 for Paris, where he had earlier become familiar with the works of Lully and of Jean Rameau (1683–1764). In the French capital, as Gluck was aware, a controversy had for years been in progress as to the true nature of the music drama. Italian opera had won many successes, but French national opera, in which the rights of the dramatic action and the libretto had been respected, had also held its ground. Though it had thus far remained a long way from true music drama, Gluck felt that the best elements in it coincided with his own views. With the aid of Marie Antoinette, who had been his pupil in Vienna and now was dauphiness of France, his *Iphigènie en Aulide* was produced at the Academie de Musique on April 19, 1774. Thereupon burst out one of those violent musical wars that have been so characteristic of Europe. Niccolo Piccini (1728–1800), a well-known composer, was summoned from Rome and put forward by the Italian party as its champion. Piccini's works in the field of *opera buffa* (*opéra bouffe,* comic opera of a rather extravagant sort) are said to show spontaneity and humor; but in the rivalry that followed, engineered by the partisans of the Italian school, Gluck, following the stormy reception of his *Armide* (1777), won an unquestioned artistic and popular triumph with *Iphigènie en Tauride.* In 1780 he returned to Vienna.



Christoph Wilibald von Gluck

Gluck, in expounding his theories, carefully stated his purpose. He wrote: "I shall try to reduce music in opera to its real function, that of seconding poetry by intensifying the expression of sentiments and the interest of situations without interrupting the action by needless ornament." He gave more character to the orchestra; represented different moods by varied tone colors; restricted the aria and made the recitative more free.

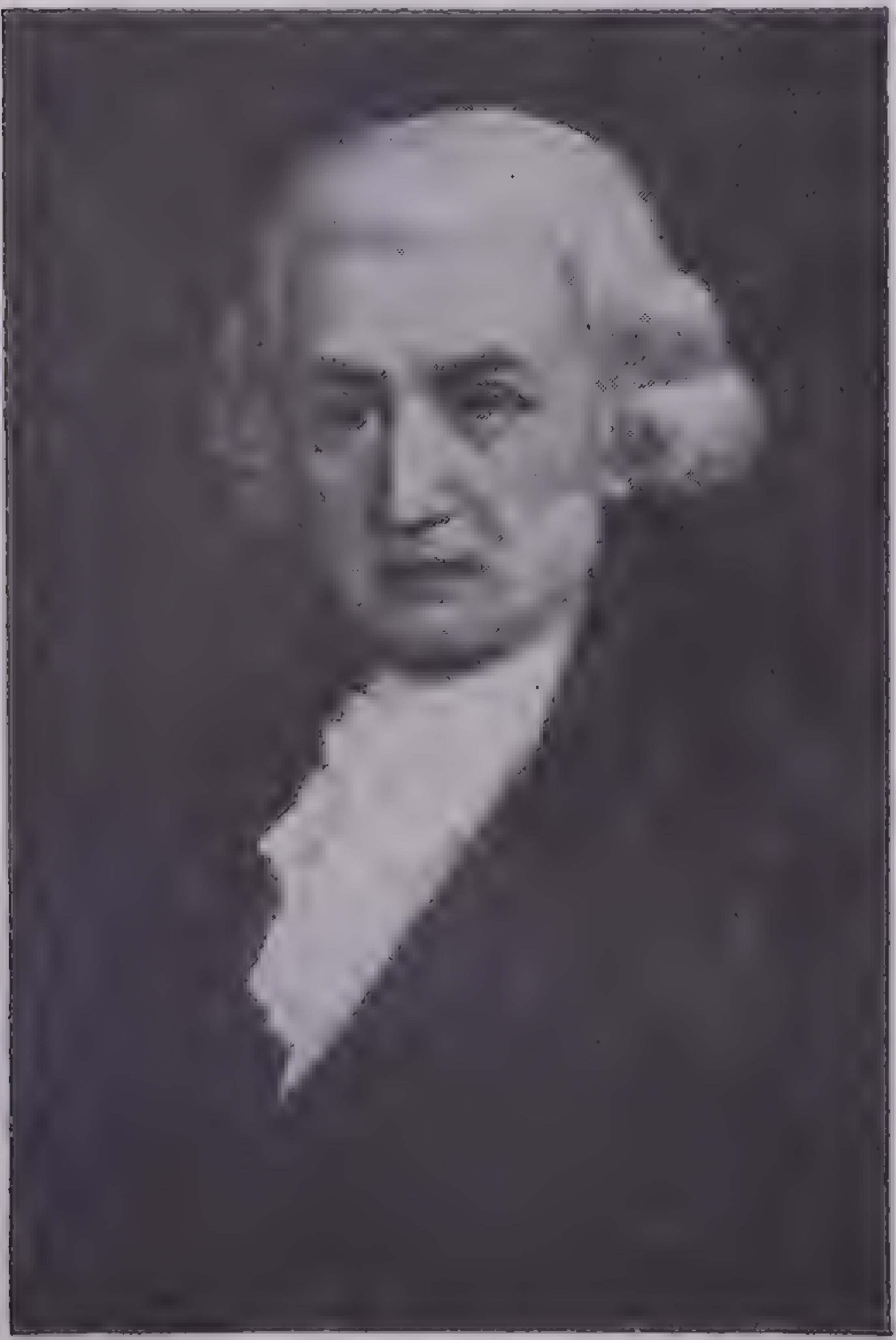
Gluck will sometimes be met with as the Chevalier Gluck or Ritter von Gluck because a papal knighthood was bestowed on him. His name is often incorrectly spelled Glück.

Special attention has been given to Handel, Bach and Gluck for their individual importance and for their position in musical history. Their immediate influence determined the character of modern music as we know it today. Furthermore, though earlier art music holds interest for the antiquary or the professional and may even in some cases, if skilfully and persuasively rendered, be enjoyed by average present-day audiences, the compositions of these men are the earliest that keep an assured place in répertoires and in the regard of listeners.

INSTRUMENTAL MUSIC PROGRESSES

Haydn.—Franz Joseph Haydn (1732–1809), born in the little market town of Rohrau in lower Austria, was favored by the appreciation and support of the Esterhazys of Hungary, and remained in the service first of Prince Paul Anton, then of Prince Nicholas, for 33 years. During most of this time he was director of an excellent orchestra and leader of a group of well-trained singers. Pensioned from 1790, honored both on the Continent and in England, he devoted the remainder of his life to composition. He was the friend of Mozart, who came to live in Vienna in 1781. Beethoven went to Vienna in 1792 in order to be his pupil. Both these composers were indebted to him, and he in turn enriched his own style through a study of Mozart's works, which he greatly admired. A simple, sunny, kindly, unselfish soul, his temperament was clearly reflected in his work.

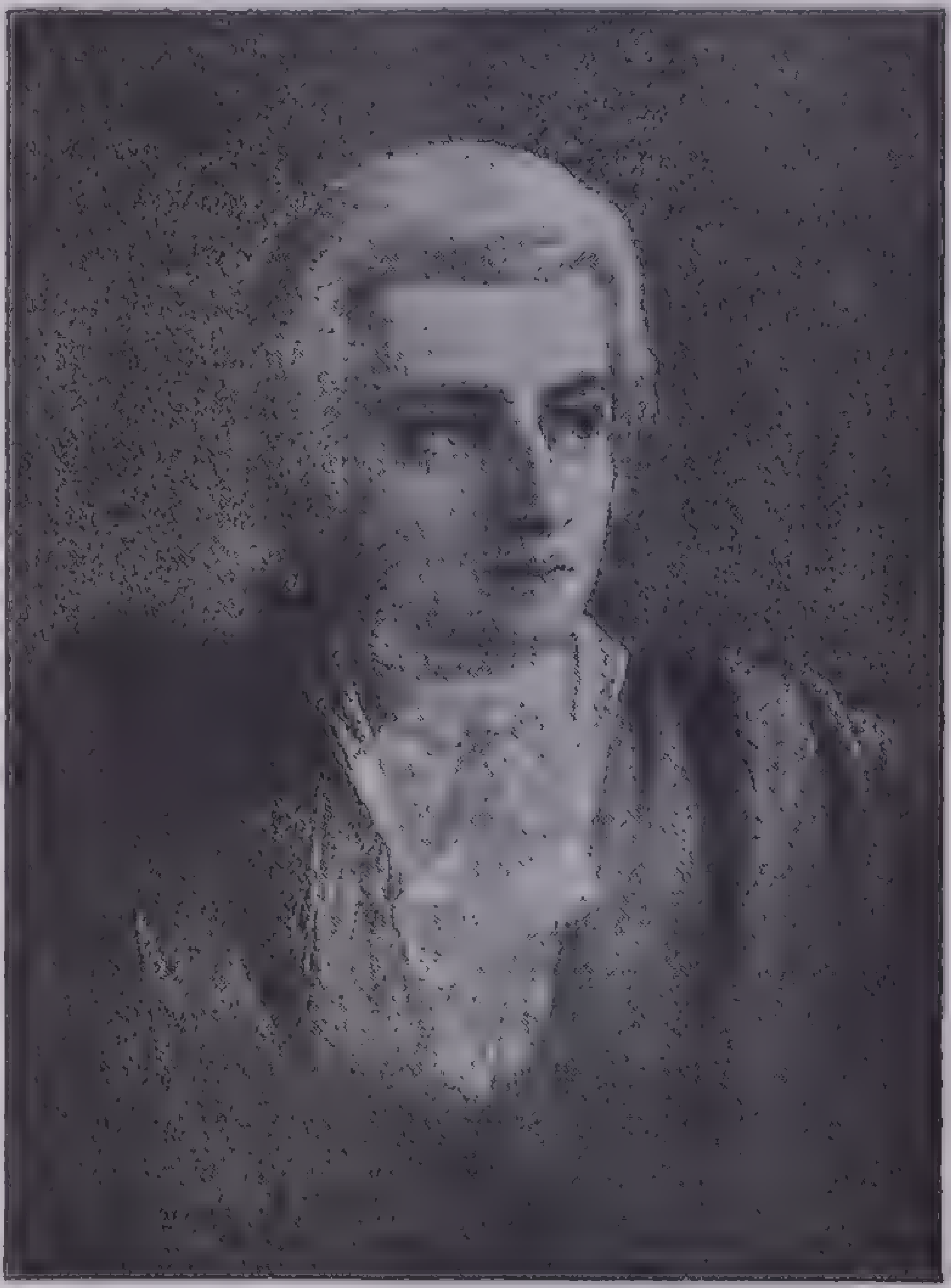
His services to music were many and varied. He developed the *symphony,* the *string quartet* and the *sonata* forms as they are today understood. His clavier sonatas number 54; his symphonies (which in a general way follow the form of the sonata, but with increased scope), no less than 125, about 18 of which have been designated as representative of his finest style. His string quartets, of which he wrote 77, are of all his chamber music the most important. The skill with which the separate parts are contrapuntally treated never gets in the way of the melody. In one of these string quartets are found the variations on the theme of the Austrian Hymn ("Gott erhalte Franz den Kaiser"), which he wrote and which is familiar in church hymnals. He also ignored the formalists of his day by his use of folk tunes and by fashioning many of his own tunes in the manner of folk music. His instrumental works also include 30 string trios. None of his 24 operas has continued to hold the stage, but his oratorio *The Creation* (with descriptive passages rather in the style of Handel) has maintained a place, especially in England. This includes the well-known chorus, "The heavens are telling."


Franz Joseph Haydn

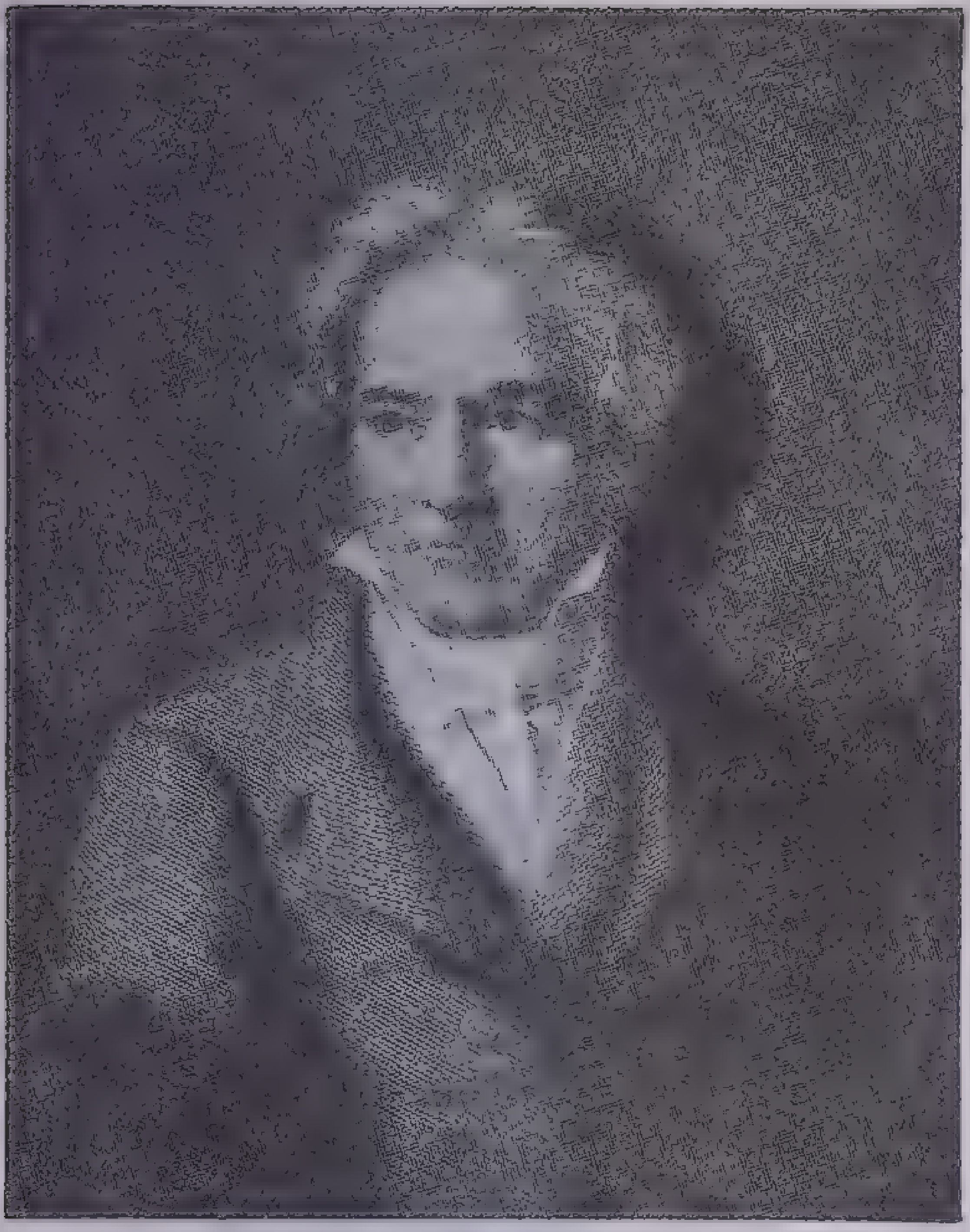
Mozart.—Another figure of high importance in the development of instrumental polyphony was Wolfgang Amadeus Mozart (1756–1791), probably the most outstanding example of precocious genius yet known. At the age of 5 he was an accomplished harpsichord player and was composing little pieces. One day, without having had any instruction on the violin, he played faultlessly the second violin part in a trio. Born in Salzburg, known to us for its music festivals in our own day, at the age of 6 he was taken on tour with his sister Maria Anna, 5 years older. They appeared with much success in Munich, Vienna, Paris and London. Following his return to Salzburg, Wolfgang was appointed (1769) *Konzertmeister* to the archbishop of Salzburg, by whom and by the members of whose court he was treated with a brutal tyranny. From this unpleasant job he departed in 1777 and went to Paris, where the controversy was in full swing between the supporters and the opponents of Gluck, and where Mozart had ample opportunity to study Gluck's method. From it he received a certain stimulus, but he was himself too much of an eclectic to adopt it wholeheartedly or to identify his art with Gluck's reforming ideals. His opera *Idomeneo* was produced at Munich in January 1781, and he went to Vienna to live. There in July 1782 was produced his opera *Belmonte und Konstanze, oder die Entführung aus dem Serail* with a German text. But his most important operas belong to the last 5 years of his life: *Le Nozze di Figaro* (1786; to a libretto by Lorenzo da Ponte), *Don Giovanni* (1787; book also by da Ponte) and *Die Zauberflöte* (1789; text by Emanuel Schikaneder). These have all kept the stage, and *Don Giovanni* has been an especial favorite. Mozart did not live to finish a requiem mass, which was completed from his notes by his pupil Süszmayer. His other vocal works include *Lieder,* of which the best-known is probably *Das Veilchen* (*The Violet*), with words by Goethe; and a quantity of church music.

His instrumental compositions, written with a remarkable facility, comprise sonatas, in the form established by Haydn but individual in treatment; piano concertos; string quartets (six of them dedicated to Haydn) and quintets and symphonies, of which at least three—the *E-flat,* the *G-minor,* and the *C* (with fugue), popularly styled "the Jupiter"—are ranked with the world's greatest. His melodic style was always full of beauty and his skill unfailing, especially in the handling of orchestral effect. Through Haydn and Mozart the symphonic orchestra took on its present organization, and they furnished it with its earliest means of adequate expression.

Beethoven.—Probably the most striking personality in the history of music was Ludwig van Beethoven (1770–1827). Born at Bonn, he too was a prodigy; for at 8 years he played the violin well; at 12 was an accomplished pianist; and at 13 was a composer. In 1792 he went to Vienna, where he was a pupil of Haydn, and where he made his debut as a concert pianist, playing his own *C-minor Concerto.* What is termed his first period as a composer extended to 1803, and works of that period include numerous sonatas for piano, the first three piano concertos and the first two symphonies. During the second period, 1803–1815, were written his only opera, *Fidelio* (first produced in November 1805), piano concertos, sonatas and his third symphony (known as the *Eroica*). This symphony was originally dedicated to Napoleon, but Beethoven trampled on its title page when he learned that Napoleon had become emperor. During this period the composer's deafness increased. The third period, from 1815, was marked by the later piano sonatas, the *Missa solemnis* (*Solemn Mass*), and the *Ninth Symphony.* In 1822 Beethoven became completely deaf. When the *Ninth Symphony* was presented in 1824, he was quite unable to hear the storm of applause. Karoline Unger, one of the soloists, turned him toward the audience that he might see the waving of handkerchiefs and hats.


Wolfgang Amadeus Mozart

An eminent pianist, as was Mozart, Beethoven was able to avail himself



Ludwig van Beethoven

of improvements in the construction of the piano, and thus obtained in his piano works an extended compass, greater body and richness and a sustained tone. He took the sonata where Haydn and Mozart had left it and went on to treat it in his own fashion, subordinating form to an often intense style of personal expression. His piano concertos, though they show an extraordinary command of technical resources, keep the musical content steadily in mind. He enlarged the possibilities of the symphony orchestra and in his symphonies (written with four movements) continued to disregard conventional boundaries until in the great *Ninth* he introduced a chorus to supplement the orchestra. In fact he was ruggedly original, both as a person and in his work. He composed most readily for the orchestra, and his compositions other than the symphonic abound in traces of his predilection for using orchestral terms.

THE ROMANTIC MOVEMENT

Beethoven forms the real starting point of 19th century music. Between the formal style of the 18th century and the romantic movement he was a kind of connecting link. It is not easy to give to this romantic movement an exact definition. In general it may be said that it emphasized the subjective—the altering or discarding of traditional restrictions, so that a composer might express his own thoughts in his individual way. With this went the alliance of music and poetry, folklore, legend, the development of descriptive music (or what we today call *program music*) and the carrying of instrumental brilliance to a point of extreme difficulty and often of utter irrelevance.

Schubert.—Living in Vienna at the same time as Beethoven, though the two never met, was one of the most spontaneous musicians ever known. Exquisite melody flowed from his pen and he wrote in many forms. This great genius was Franz Schubert (1797–1828)—a man who in his short life wrote over 600 songs (*Lieder*); twenty-four piano sonatas; nine symphonies, of which that in C-major and that in B-minor (known as the *Unfinished*) are generally ranked with Beethoven's; besides choral works, violin pieces and short piano compositions (*impromptus, moments musicals*). Many of Schubert's compositions he never heard; they were found after his death by Robert Schumann. The collected edition of his works fills forty volumes.

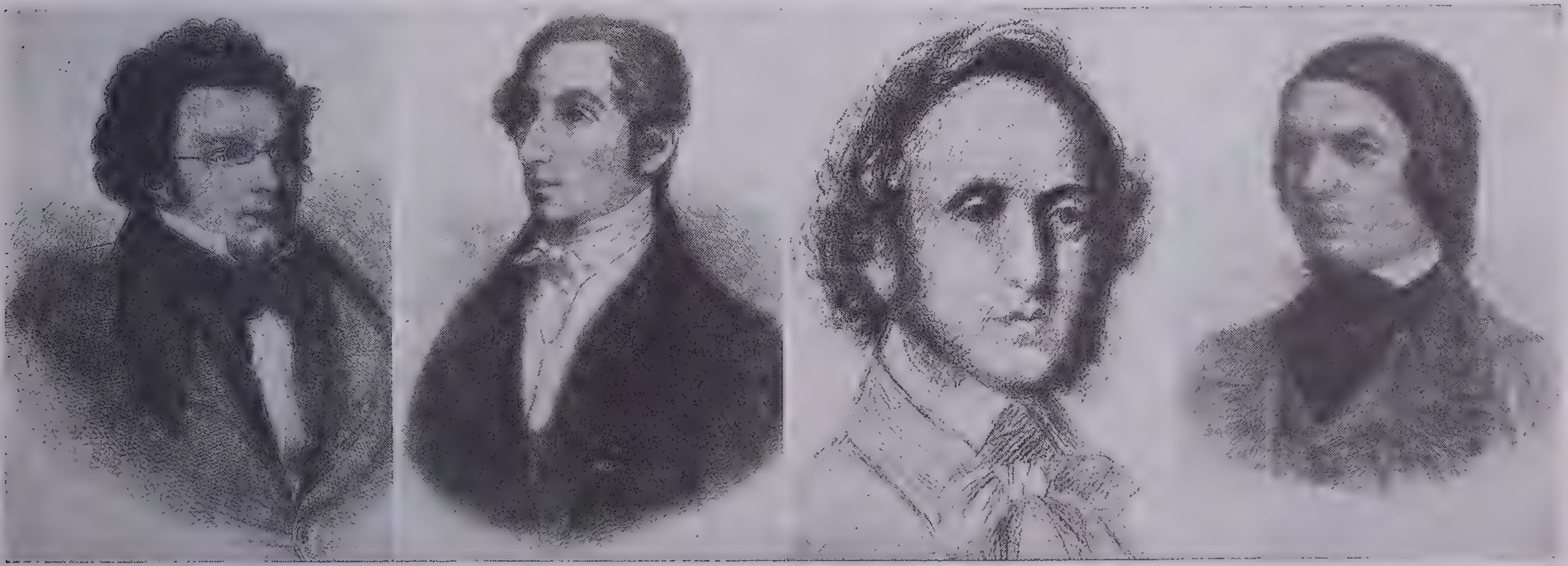
Schubert's songs are his outstanding contribution to music. His accompaniments are of as great importance as is the voice part in reflecting the meaning of the text. To Beethoven he owed more artistically than to anyone else. "Truly, in this Schubert lives the divine spark," said the dying Beethoven.

Weber.—Contemporaneous with Beethoven and Schubert was another German, Karl Maria von Weber (1786–1826). *Der Freischütz,* Weber's first opera, produced in 1821, gave to Germany her first national opera, telling a German folk story through the medium of German folk music. It retained the spoken dialogue of the 18th century *Singspiel,* and by its supernatural element and its descriptive music, as well as its folk character, it exemplifies the romantic movement. His *Oberon* was produced at London in 1826. The romantic opera he thus established led directly to Wagner.

Also identified with the romantic movement in Germany was Ludwig Spohr (1784–1859), who wrote chamber music, nine symphonies, ten operas and several oratorios. His best work was in his violin concertos. He was among the finest violinists of his day, and his method was continued for years through the activities of his numerous pupils. His general style was more or less in the manner of the classical school, but his romantic tendencies were evidenced in his increase of tone color in the orchestra and his leaning toward the supernatural. He was among the few elder musicians who recognized the significance of Wagner; and his opera *Die Kreuzfahrer* (*The Crusaders,* 1845) shows the influence of Wagnerian ideas.

Mendelssohn and Schumann.—The two greatest composers associated with the German Romantic School are Felix Mendelssohn-Bartholdy (1809–1847) and Robert Schumann (1810–1856). Both were highly educated and brought a rich background of historical and literary associations to their music. Mendelssohn possessed a greater melodic gift, but Schumann was more dramatic. Mendelssohn wrote in all forms except opera, although his incidental music for Shakespeare's *A Midsummer Night's Dream* ranks with any operatic work. His greatest oratorios were *St. Paul* and *Elijah.* His further works include symphonies, concert overtures, two piano concertos (D-minor and G-minor), a violin concerto (universally a favorite), string quartets and other compositions for chamber combinations; 48 piano numbers in the form of tone pictures, known as *Songs Without Words;* vocal solos, and six sonatas for organ. (Bach and Mendelssohn were the only composers of foremost rank to write distinctly for the organ.)

Schumann was not only a great



Franz Schubert Karl Maria von Weber Felix Mendelssohn-Bartholdy Robert Schumann

Four Leaders of the Romantic Movement

composer but the first great music critic. His praises introduced to the musical world Berlioz, Chopin, Liszt, Wagner and Brahms and made known the true greatness of Bach and Schubert.

As a composer Schumann excelled in short but exquisite compositions for the piano. For orchestra he left concert overtures and symphonies. His other works include the piano concerto in A-minor; a secular oratorio, *Das Paradies und die Peri* (1841), based on Moore's *Lalla Rookh,* and many chamber-music compositions. His opera *Genoveva* (1850) was not successful. A few of Schumann's songs (such as "Ich grolle nicht" and "Die Lotosblume") have been ranked close to Schubert's.

At this time a new form the concert overture came into existence. It bore a title and was program music inasmuch as it was descriptive and told a definite story; it was a free adaptation of the sonata-form pattern.

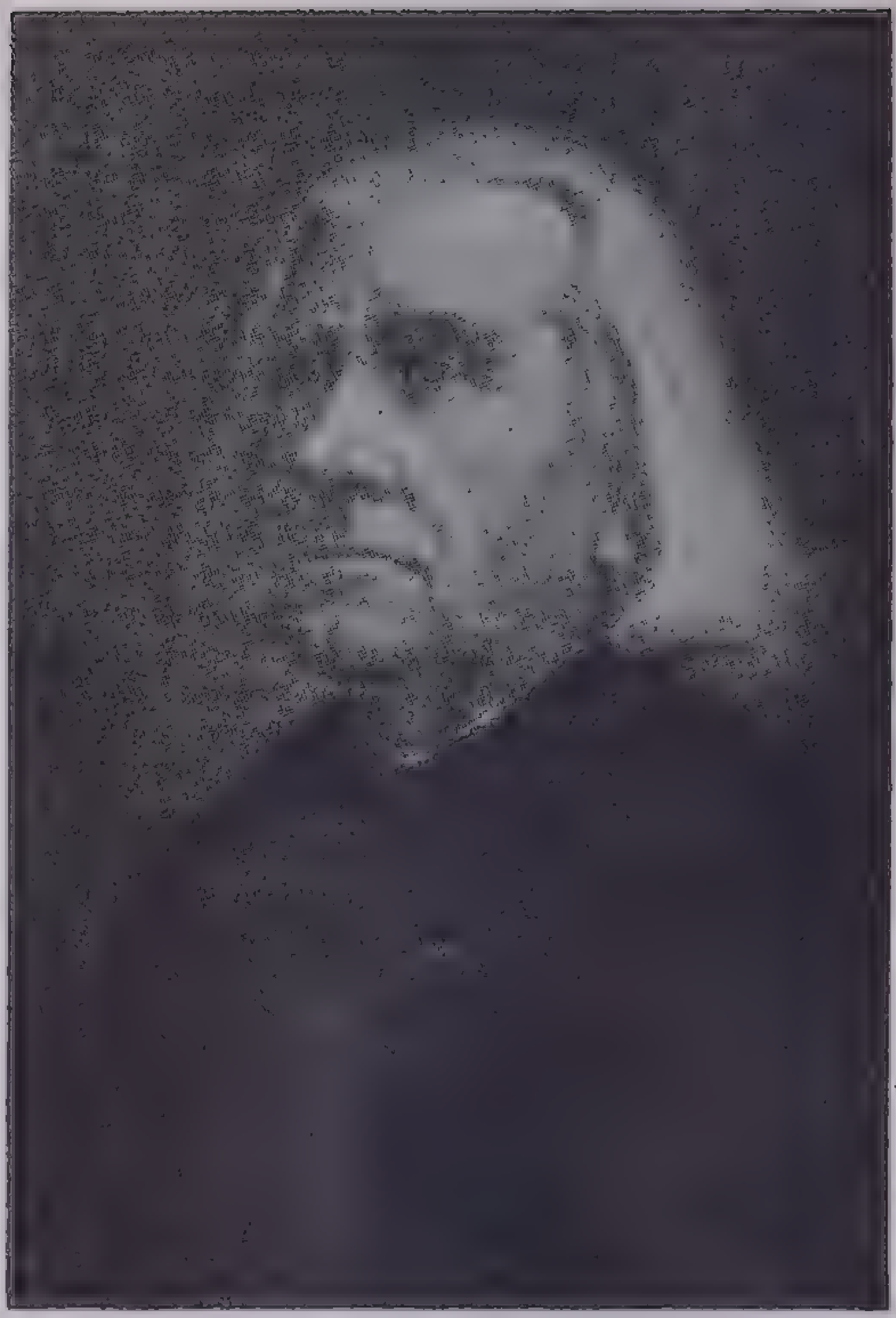
Chopin.—Frédéric Chopin (1810–1849) came to Paris from his native Poland in 1831, and his poetic genius attracted the attention of the musical world. With the exception of a few songs and a trio for piano and strings, Chopin wrote only for the piano. His two concertos are his largest works. He also wrote sonatas, but his best-known compositions were his small pieces for his chosen instrument. Chopin was the first great composer to use the folk-dances of his native land; and his mazurkas, polonaises, nocturnes and waltzes are among his most popular works. Other groups (the individual pieces being without title) were the préludes, études, ballades, rondos, scherzi. Chopin developed new resources in the piano and made it speak an individual language. As a *salon* pianist he played with magnetic charm. Schumann greeted him by writing: "Hats off, gentlemen—a genius!"

The Romantic Movement in France.—In France the ideals or romanticism were carried to a far greater extreme than in Germany. The Court of Louis Philippe attracted to Paris all the greatest artists of the day, while the French public, satiated with the horrors of the recent Revolution, demanded that their literature and art should all be extremely sensational. To Paris came not only Chopin but also the great violinist Nicolo Paganini (1782-1840), whose dazzling technique laid the foundation for the present-day school of violin playing, and Franz Liszt, the brilliant Hungarian pianist. The greatest French composer of the day was Hector Berlioz (1803–1869), called by Schumann the "uncompromising champion of programme music." Berlioz wrote almost exclusively for the orchestra. He possessed a dazzling virtuosity in orchestral composition, and his uses of the instruments were always startling and unusual. All his compositions were descriptive, and he frequently used a definite theme, which he called "the fixed idea," to designate certain characters. His operas are rarely given today. His greatest works are his dramatic symphonies: *Harold en Italie, La Damnation de Faust* and *Roméo et Juliette.*

Frédéric François Chopin

Franz Liszt.—Franz Liszt (1811–1886), who was a Hungarian by birth, went to Paris to pursue his education as a composer. His pianistic ability attracted such attention that he soon became the center of the artistic group of the French capital and was recognized as the most dazzling pianist of his day. His tours were continuous ovations. For some time he lived with the gypsies, studying their music. In 1847 he accepted the position of court music director at Weimar, where he remained for 10 years, and from that time was known chiefly as a composer. In 1865 he was made an abbé. From 1873 he divided his time between Pesth, Weimar and Rome. Wherever he was, a crowd of pupils surrounded him. Liszt used Hungarian melodies in the same remarkable manner that Chopin had used those of Poland. His fourteen *Hungarian Rhapsodies* are still his most popular works. He wrote with great dramatic intensity for orchestra, all his works following the lines of program music. His greatest symphonies are based on Dante's *Divine Comedy* and Goethe's *Faust,* and his symphonic poems (such as *Les Préludes*) were inspired by various literary and historical works. Liszt created a new form in the symphonic poem (an adaptation of the sonata form), a work which bore a title and followed a definite dramatic program. There were two main subjects, but these were so developed that frequently the entire character of the work itself was changed. Liszt also wrote vocal works, including two oratorios. He did much to aid the musicians of his time, and his help to Wagner was chiefly responsible for the development of the Wagnerian music drama.

Writers of French Grand Opera.—The French Romantic School brought forward the French grand opera, which supplanted the earlier *opera seria* of Händel's day. Many of the great names associated with this form are of Italian composers, who came to Paris at this time.



Franz Liszt

Luigi Cherubini (1760–1842) was for many years head of the Paris Conservatory. Among the better-known Italians who rejuvenated Italian opera in Paris were: Gasparo Spontini (1774–1851) who cultivated the style of Gluck; Gioachino Rossini (1792–1868), whose *Barber of Seville* and *William Tell* are still popular; Gaetano Donizetti (1797–1848), composer of *Lucia di Lammermoor, La Fille du Régiment* and *Don Pasquale;* and *Vincenzo Bellini* (1801–1835), whose *Norma* and *Sonnambula* are the joy of coloratura sopranos.

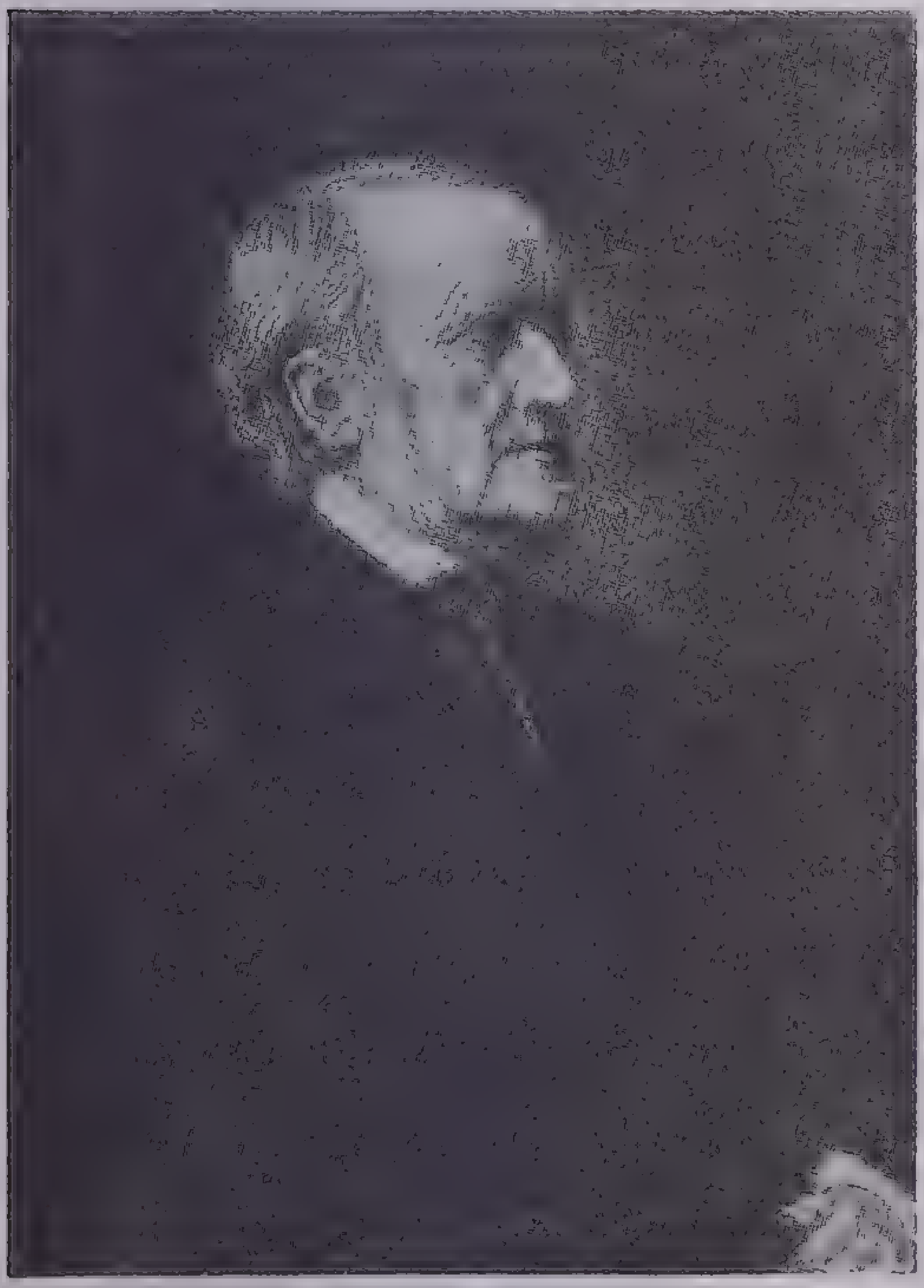
The most spectacular opera composer of the day was a German who took the Italian name of Giacomo Meyerbeer (1791–1864). His works were all written to dazzle and amaze. His operas *Les Huguenots* and *Le Prophète* are still given all over the world.

There were also a few French composers of opera at this period, among them being Méhul (1763–1817), Boieldieu (1775–1834), Auber (1782–1871), Hérold (1791–1833), and Halévy (1799–1862). Although they wrote excellent operas, these men were completely overshadowed by the more spectacular works of their foreign competitors.

Richard Wagner and the Music Drama.—A great change came at the end of the Romantic School through the advent of the mighty Richard Wagner (1813–1883)—a figure who stands in the same relation to the music drama that Beethoven does to the symphony. Conductor successively at Magdeburg, Königsberg and Dresden, he took some part in the revolutionary movement of 1848. A writ was issued against him, and he fled to Switzerland where he lived an exile until 1859. His earlier operas, *Rienzi* (1842) and *Der fliegende Holländer* (1843), were in the spectacular vein of Meyerbeer. But he had begun to feel that the only right principles for dramatic composition were those which had been held by Gluck in his attempted reforms. In *Tannhäuser* (1845) and still more fully in *Lohengrin* (completed in 1848) he began to set forth his ideas, which, although based on principles before attempted, were still new. Wagner used for each character, as well as for many inanimate objects, a definite characteristic musical figure or *leitmotiv* and, although "fixed" numbers (arias, duets) are still present, the tendency is toward a more continuous dramatic action. His other works, for which he continued to write his own libretti, were: *Die Meistersinger von Nürnberg;* the cycle *Der Ring des Nibelungen* (usually known as the Ring cycle), comprising *Das Rheingold, Die Walküre, Siegfried* and *Die Götterdämmerung; Tristan und Isolde* and *Parsifal.*

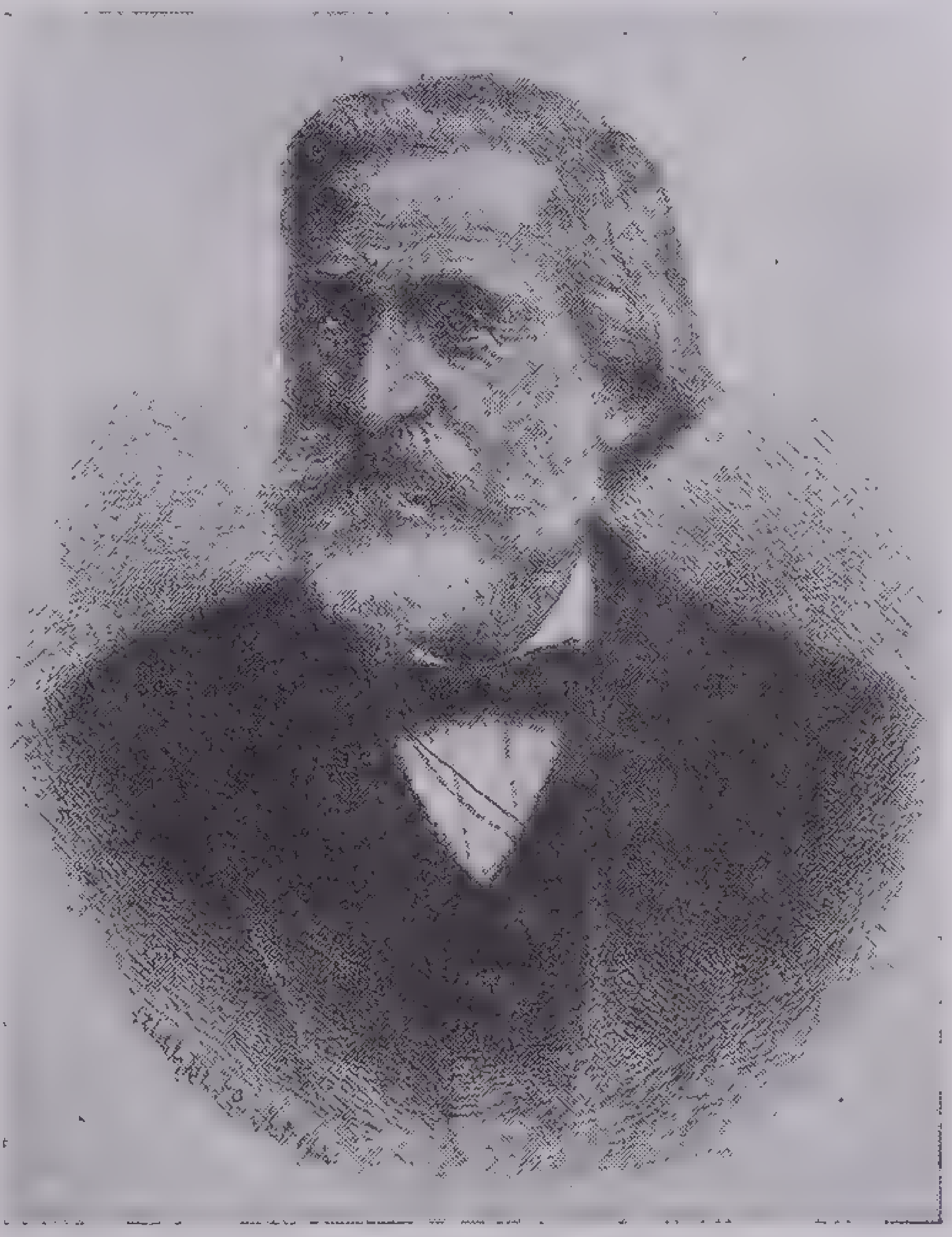
In these developed operas, preludes (*Vorspiele*) are used instead of overtures; the melody is carried by the orchestra; the music is a kind of running commentary on the action and the text; *Leitmotive* are more prominent; the action is viewed throughout from the viewpoint of poetry and drama instead of from that of musical form; vocal or instrumental ornament is extremely rare; the brasses are placed on equality with the strings and the woodwind; new effects are introduced.

Feeling that these great works needed an ideal performance, Wagner and his friends, aided by the generosity of Ludwig II of Bavaria, erected in Bayreuth, Germany, an opera house devoted exclusively to the production of Wagner's works and opened in 1876. His influence on the composers who have followed him is far greater than that of any other writer of music. Every composer since his day has reflected Wagner's principles. This is particularly noticeable in the operas of the great Italian Verdi, whose early works had been modeled after the Italian operas of the period.



Richard Wagner

Verdi.—Giuseppe Verdi (1813–1901), became organist of his native Roncole (Italy) and in the period from 1836 to 1849 composed ten operas— expressive of the trend toward national unity, and all successful, *Ernani* (1844) being at once the best and the most popular. *Rigoletto* (1851), *Il Trovatore* (1853) and *La Traviata* (also 1853) marked a decided advance; for though they were cast more or less in the routine mold of Italian opera, they showed power of characterization and of drama, and in *La Traviata* the little chorus and long passages are in the *parlando* manner. These were followed by *Un Ballo in Maschera* (1859), in two versions, the second of which had its scene in Boston; and *Don Carlos* (1867). His third period produced his greatest works (which clearly show Wagner's influence). *Aïda* (1871), a perennial favorite, written for the khedive of Egypt to celebrate the opening of the Suez Canal; *Otello* (1887), and *Falstaff* (1893), written when the composer was 80, are regarded as the most significant Italian operas. The libretti to *Otello* and *Falstaff* were by Arrigo Boito, himself a composer.



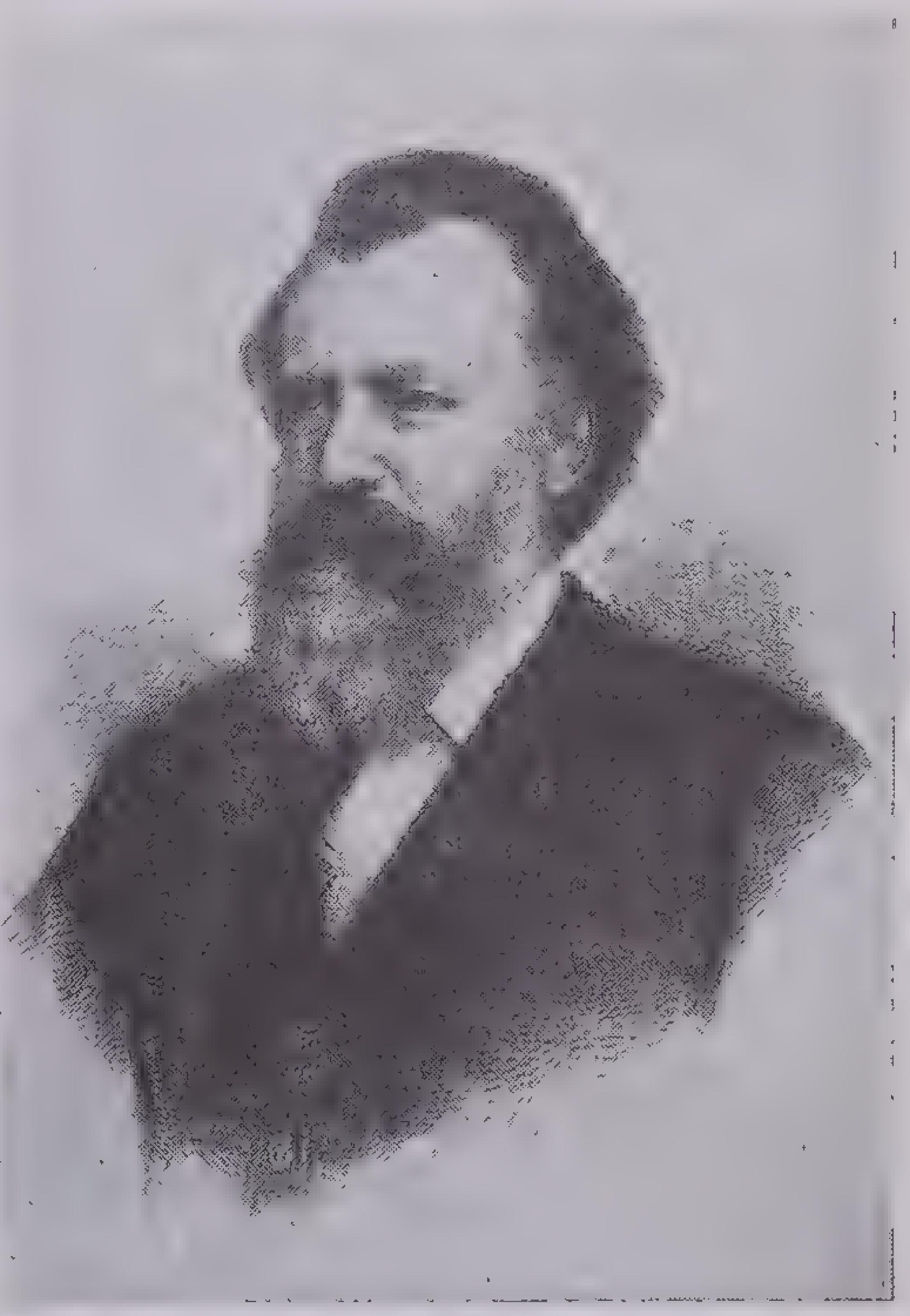
Giuseppe Verdi

Brahms.—Johannes Brahms (1833–1897) has been called the greatest modern master of *absolute music*—that is, music in which formal pattern is of greater importance than descriptive program. As a matter of fact his opposition to programme music was considerably exaggerated. Ranked by some with Bach and Beethoven, Brahms is considered one of the greatest symphonic writers in the history of music. He wrote no operas, his largest choral work being the *Deutsches Requiem,* in cantata form. He left many short piano compositions, which included the Hungarian Dances; exquisite songs; a piano quintet (op. 34); two concertos, and four great symphonies, of which the most popular is the second.

Other modern masters of absolute music in Germany were: Joseph Rheinberger (1839–1901); Anton Bruckner (1824–1896); Max Bruch (1838–1920); Gustav Mahler (1860–1911); Georg Schumann (1866–); Max Reger (1873–1916).

MODERN SCHOOLS OF MUSIC

Italian Opera After Verdi.—Following Verdi in the modern operatic school of Italy were Arrigo Boito (1842–1918), whose greatest work was *Mefistofele;* Amilcare Ponchielli (1834–1886), with *Gioconda;* Ruggiero Leoncavallo (1858–1919, *I Pagliacci* and *Zaza;* Pietro Mascagni (1863–), *Cavalleria Rusticana* and *Iris;* Baron Alberto Franchetti (1860–), *Germania;* Umberto Giordano (1867–), *Andrea Chénier, Fedora* and *La Cena della Beffe;* Giacomo Puccini (1858–1924), *La Bohème, Tosca, Manon Lescaut, Madama Butterfly* and *The Girl of the Golden West;* Ermanno Wolf-Ferrari (1876–), *Il Segreto di Susanna* and *I Gioielli della Madonna;* Riccardo Zandonai (1883–), *Conchita* and *Francesca da Rimini,* and Italo Montemezzi (1875–), *L'Amore dei Tre Re.*



Johannes Brahms

Of these composers, Leoncavallo and Puccini were the most popular. Puccini's works have been successful all over the world. Both are exponents of *verismo*—the Italian realistic school.

Italian Instrumental Composers.—There was practically no instrumental school in Italy from the 17th century until that founded by Giovanni Sgambati (1843–1914), a pupil of Liszt. Among his followers were Martucci (1856–1909), the pianist Busoni (1866–(1924) and the organist Bossi (1861–1925). Lorenzo Perosi (1872–) has written fine church music in the style of Palestrina. The greatest modern masters of Italy today—Ottorino Respighi (1879–1936), whose *Pini di Roma* and transcription of old dances and airs for the lute (suite 3) are known in America; Alfredo Casella (1883–), Gian Malipiero (1882–)

and Ildebrando Pizzetti (1880–)—these all are chiefly concerned with instrumental development.

Modern German Composers.—German, writers who followed after Wagner and Liszt were: Karl Goldmark (1832–1915), a Hungarian by birth, whose best-known opera is *Die Königin von Gaba* (1875) and whose orchestral works include the *Rustic Wedding* symphony; Engelbert Humperdinck (1854–1921), whose *Hänsel and Gretel* is among the popular operas of today; and Hugo Wolf (1860–1903), who was one of the greatest masters of song writing. A modern German, who tried to startle the musical world by his disregard of all established rules of form and composition, is Arnold Schoenberg (1874–). His followers, Franz Schreker (1878–1934), Ernst Křenek (1900–), and Erich Korngold (1897–), attempted musical combinations that seem impossible.

César Franck

The French School.—In France the operatic genius following Meyerbeer was Charles Gounod (1818–1893), whose *Faust* is among the prime favorites of opera. Gounod's other operas, except *Roméo et Juliette,* are rarely heard.

Also popular is the opera *Mignon* by another French composer, Ambroise Thomas (1811–1896), whose other works for the operatic stage are not often presented. Georges Bizet (1838–1875), who showed Wagnerian influence, wrote music for Daudet's *L'Arlésienne,* and his *Carmen* (1875) is one of the most popular operas of all time.

Contemporaneous with Brahms was the organist César Franck (1822–1890), a distinctive spirit in the French music of his time. Franck wrote in the polyphonic (many-voiced) style of Bach, and all his compositions were filled with poetic mysticism. His greatest choral work was *Les Béatitudes.* He wrote many compositions for piano and organ, exquisite works for chamber-music combinations, songs, symphonies and symphonic poems. His *Symphony in D-minor* ranks with the greatest works in that form.

Franck had many followers, among them being his pupils Vincent d'Indy (1851–1931) and Ernest Chausson (1855–1899). Other French composers of that period were Alexis Chabrier (1841–1894); Alfred Bruneau (1857–1934), the great organists, Alexandre Guilmant (1837–1911), whose organ method was taught in the United States by his pupil William C. Carl and Charles Widor (1845–1937); Théodore Dubois (1837–1924); Gabriel Fauré (1845–1924).

Camille Saint-Saëns (1835–1921) was one of the most prominent of modern French composers. He wrote in all forms, his greatest works being the opera *Sanson et Délilah* and his symphonic poems (especially the *Danse Macabre*).

Unique among modern composers was Claude Debussy (1862–1918), who returned to the pentatonic (five-tone) scale. Debussy left many short pieces for piano, exquisite songs, orchestral pieces and chamber-music compositions. His largest and most important work was the music drama *Pelléas et Mélisande.* Debussy had many followers in every land, the best French composers who have made use of his principles being Maurice Ravel (1875–1937), Florent Schmitt (1870–) and Paul Dukas (1865–1935).

Some of the modern French school have thrown overboard past rules of composition. A group of musicians, including Milhaud, Poulenc and Honegger (the last-named in his opera *Judith* and with his compositions for orchestra), sought discordantly for recognition.

Music of Scandinavia.—The founder of the Scandinavian School of music was Nils Gade (1817–1890), a Dane who was greatly influenced by the romanticism of Schumann and Mendelssohn. The great Norwegian violinist, Ole Bull (1810–1880), was exceedingly fond of the folk tunes of his native land and played them all over the world. He encouraged Edvard Grieg (1843–1907) in his musical work, and Grieg became the most popular of the composers of Norway. Grieg wrote no symphonies and but few large orchestral works; yet his shorter compositions for piano and violin and his many lovely songs won for him world recognition. The incidental music for Ibsen's drama, *Peer Gynt,* as arranged in two orchestral suites, is Grieg's best-known work. Also popular are his great piano concerto and his sonatas for violin and piano. All Grieg's works are in the Norwegian musical idiom and are outstanding examples of modern national composition. Other Norwegian composers are Johann Svendsen (1840–1911) and Christian Sinding (1856–), the latter regarded as Grieg's successor.

Sweden has not yet produced a Grieg, although August Södermann (1837–1876), Emil Sjögren (1853–1918) and Tor Aulin (1866–1914) have all used Swedish folk material effectively in their compositions.

Finland, except by location, should not be linked with Scandinavia, yet its music school is generally classified in this way. An amazing musical personality is found today in Finland in the person of Jean Sibelius (1865–) who, in his great tone poems for orchestra (particularly the *Finlandia*), as well as in his songs and smaller compositions, has imbued all his works with the mysticism and rare beauty of his far-away land. Armas Järnefelt and Selim Palmgren are using ultramodern methods of expression, yet have retained many definite characteristics of the Finnish folk music.

Bohemian Composers.—Bohemia, as it was known before the World War, has always been regarded as a most musical country, distinguished for the musical aptitude of its people; but it has only been in the modern day that this land has possessed its own school of music. Friedrich Smétana (1824–1884), a pupil of Liszt, was the first to write a Bohemian opera. His *Bartered Bride* (1866), a gem of lighter opera, tells a folk tale in the Bohemian language with Bohemian folk tunes. Smétana also wrote symphonies and symphonic poems descriptive of scenes in Bohemia and of events in her history.

Edvard Grieg

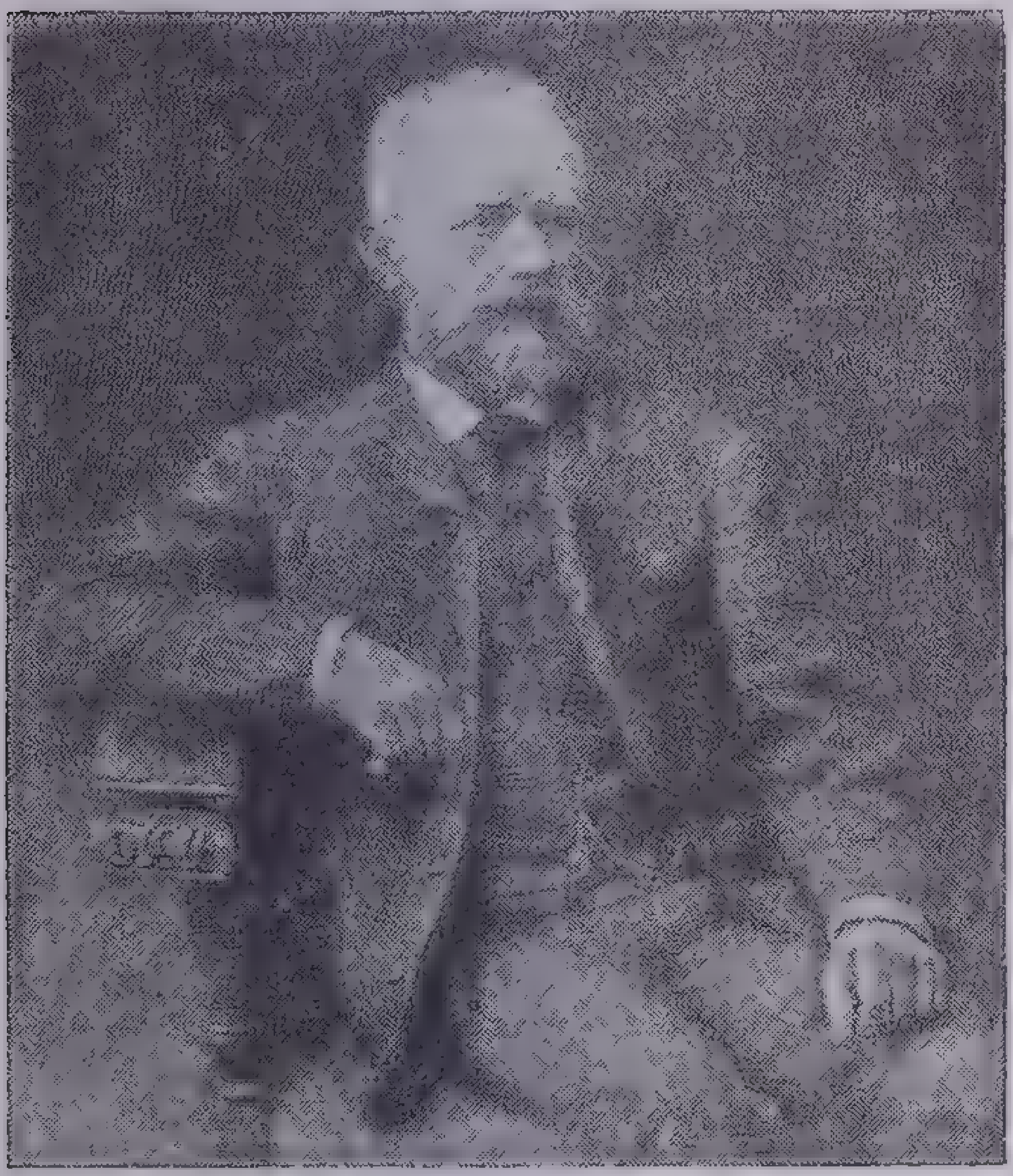
Edvard Grieg

The greatest Bohemian composer was Anton Dvořák (1841–1904), who wrote in all forms and is regarded as the greatest modern master of national composition. He used original themes, but always in such a characteristic manner that they seemed to have been born of the people. Dvořák lived in America for several years and was the first to bring to the attention of the musical world the importance of America's native folk music. His symphony *From the New World* (op. 95) contains reminiscences of the manner of American Negro spirituals. Dvořák's other works include the *Slavonic Dances;* four other symphonies; symphonic poems; many charming chamber-music compositions and equally charming songs. His operas are rarely presented; but his oratorios *Stabat Mater* and *Requiem* are frequently performed by choral organizations.

Other Bohemian composers were Wilhelm Blodek (1834–1874) and Zedenko Fibich (1850–1900).

The Russian School.—The feeling for national expression that came into music with the Romantic School has developed and increased among modern composers of every country. The latter half of the 19th century saw the development of great national schools not only in Scandinavia and Bohemia but also in Russia. Italian and French opera received a welcome there but not until the 19th century was attempt made toward a Russian school. The early native composers were men of other professions, who gave up their work for the cause of Russian music.

The first great Russian composer was Mikhail Glinka (1804–1857), whose *A Life for the Czar* was the first Russian opera. Associated with Anton and Nikolai Rubinstein in the Russian Musical Society were César Cui (1835–1918); Alexander Borodin (1834–1887); Nikolay Rimski-Korsakov (1844–1908); Modest Moussorgski (1839–1881); Mili Balakirev (1837–1910); and Petr Tchaikovsky (1840–1893). The last ranks as one of the popular modern composers. He wrote in all forms. His operas *Eugen Onégin, Jeanne d'Arc* and *Pique Dame* are regarded as his best. He left six great symphonies (including the *Pathétique*), piano concertos, many dramatic concert overtures, ballet suites, much chamber music and many short piano compositions and songs. As in the case of other Russian musicians, many of his compositions are based on Russian folk songs. He used the orchestra always in a striking and unusual manner, his characteristics being excessive melancholy or extreme gayety. Rimski-Korsakov was a popular, brilliant master of orchestration and had many followers, chief among them being Alexandr Glazunov (1865–1936), Anton Arensky (1861–1906) and Sergei Rachmaninov (1873–), a great pianist as well as a composer, who came to live in the United States.



Petr Ilich Tchaikovsky

Anton Rubinstein (1830–1894), the distinguished piano virtuoso, though he did so much for Russian music, especially as director of the St. Petersburg Conservatory and the instructor of a large group of pupils, has, as a composer, been regarded as more German than Russian. He wrote ten operas, six symphonies (including the *Ocean*), concertos, piano pieces and *Lieder* (*Gelb rollt mir zu Füssen; Der Asra*). The pianist Alexandr Scriabin (1872–1915) in his later years led an open revolt against formal restrictions and rules of composition. Followers of Scriabin are Sergei Prokofiev and Igor Stravinski.

Other great Russians of today are Ippolitov-Ivanov (1859–), Glière (1875–), Gretchaninov (1864–), Rebikov (1866–), Medtner (1879–). All these writers use Russian folk themes, but are also deeply imbued with the most extreme theories of modern tonal combinations.

Modern Spanish Composers.—A recent group of national composers to attract the attention of the musical world come from Spain. The founder of the modern school in Madrid was Isaac Albéniz (1860–1909), a pupil of Liszt. He used Spanish folk airs as the basis for his compositions. The greatest talent of his school was Enrique Granados (1869–1916) whose remarkable opera *Goyescas* received international recognition. Granados lost his life during the World War when the boat on which he was returning from America was sunk by a German submarine. Manuel de Falla (1876–) attracted much attention because of his remarkable ability to combine the folk melodies of Spain with the most extreme principles of modernism.

Modern English Composers.—In England an outstanding composer was Sir Edward Elgar (1857–1934). Elgar's largest compositions are the oratorios *The Dream of Gerontius* and *The Apostles*. These united the Handelian oratorio with the Wagnerian orchestra; and the first-named was hailed as a great sacred work. Elgar wrote also several symphonies, concertos and overtures for orchestra, as well as chamber music, organ compositions and songs.

An unusual composer was Samuel Coleridge-Taylor (1875–1912), an English Negro, who used African and American Negro melodies in many of his works.

Other modern English composers include Sir Arthur Sullivan (1842–1900) who, together with the talented librettist, Sir W. S. Gilbert, gave the world several of its best comic operas —*Pinafore, The Pirates of Penzance, Iolanthe, The Mikado, The Yeomen of the Guard* and others; Arthur Goring Thomas (1850–1892), Sir Edward German (1862–1936), Liza Lehmann (1862–1918), and Sir Granville Bantock (1868–).

A unique personality of the modern English school is Percy Grainger (1882–), who, although born in Australia and later a naturalized American, used English folk tunes in the ultramodern manner.

Cyril Scott (1879–), known as "The English Debussy," followed the French master but used English folk melodies. So did Ralph Vaughan Williams (1872–), whose *London Symphony* is highly regarded.

Other English composers that may be mentioned are Frank Bridge; Frederick Delius, (1862–1934), whose recognition was late and whose rhapsody *Brigg Fair* is among numerous works of real charm; Arnold Bax, Gustav Holst and Eugene Goossens.

AMERICAN MUSIC

Music in the Colonies.—The Puritans brought to New England their psalmody. At first they had no books with musical notation and not many with even the words; so the psalms were "lined" (or "deaconed")—a deacon read a line and then (occasionally with the aid of a pitch pipe) "raised" the tune. Later, instrumental music (before organs were introduced) accompanied the singing. Singing was natural to the Dutch of New Amsterdam and to the Germans of Pennsylvania. The first performances of Haydn's *Creation* and *Seasons* in this country were by the Moravians of Bethlehem. In the North religious music was popular, but the South leaned more toward the secular. Companies of singers from London, like Hallam's and Kean and Murray's, toured in the South. Charleston in 1735 had the first performance of opera in the colonies, the piece being the ballad opera *Flora*. In Charleston was established (1762) the first musical society, the St. Cecilia, which continued in existence until 1912. With the exception of the Quakers, the early Americans were generally fond of singing. Singing schools grew up everywhere. Cooper in his *Last of the Mohicans* gives us David Gamut, the singing teacher who delivered "sacred song" in "full, sweet and melodious tones."

The Revolution and Afterwards.—Among the earliest composers were Francis Hopkinson (1737–1791), author of the satirical "Battle of the Kegs" and one of the signers of the Declaration; James Lyon (1735–1795) and William Billings (1746–1800). Immigration after the Revolution helped to encourage and develop music, especially in New York and Philadelphia. National airs arose—"Hail, Columbia" (Joseph Hopkinson); "Adams and Liberty" (Samuel Arnold); and patriotic ballads like "The Death of Warren" (Epes Sargent) and "The Sword of Bunker Hill" (Bernard Covert). Lowell Mason (1792–1872) was a force in awakening musical interest. He traveled about, particularly in New England, organizing music festivals, holding teachers' conventions (the predecessors of the summer normal schools of today) and introducing the teaching of music in public schools. Other composers were Thomas Hastings (1784–1872), George J. Webb (1803–1887) and William B. Bradbury (1816–1868). The choral Handel and Haydn Society was founded in 1815; the Musical Fund Society in Philadelphia in 1820; the New York Philharmonic Society in 1842, furnishing the first professional orchestra in the United States.

Stephen Collins Foster.—In Stephen C. Foster (1826–1864), America had a musical genius, a natural composer unschooled in his art, whose airs both plaintive and comic are known over the world; a melodist who has been ranked with Schubert, though his simple accompaniments lack the harmonic richness of the Viennese. It was Foster who wrote both words and music of such irresistible songs in the folk manner as "Old Dog Tray," "My Old Kentucky Home," "Massa's in de Cold, Cold Ground," "Camptown Races," "Oh, Susannah" (favorite of the pioneers that crossed the plains), "I Think of Jeanie" and "Old Folks at Home" (Suwanee River). He wrote a greater number of popular songs than any other American—songs of which it has been said, "We have yet to hear one which is devoid of meaning in the words or beauty in the air." Louis M. Gottschalk (1829–1869), the first American pianist of note, was one of the most popular performers of his day (he gave no less than 80 recitals in New York during the winter of 1855–1856) and made transcriptions of Creole melodies with much originality.

With the German invasion of 1848 and the development of a national consciousness in the Civil War period, American music had an impetus that led to an increasing spread of musical culture. Composers to be mentioned are Anton Heinrich (1781–1861), William H. Fry (1813–1864), George F. Bristow (1825–1898) and William Mason (1829–1908), who had much influence as a piano teacher. Prominent among those who did effective work in improving public taste were Leopold Damrosch (1832–1885) and Theodore Thomas (1835–1905), active as conductors. In 1881 the Boston Symphony orchestra was established. Other orchestras of excellent quality began to be maintained. John K. Paine (1839–1906), professor of music at Harvard from 1876 to 1905; Dudley Buck, William Gilchrist, Frederick Gleason—these all were leaders; Buck doing much, both as organist and composer, for American organ music. Then we pass to the "Boston group"—George W. Chadwick (1854–1931), head of the New England conservatory; Horatio Parker (1863–1919), director of music at Yale and composer of the opera *Mona;* Arthur Foote and Mrs. H. H. A. Beach, foremost among American women composers.

MacDowell and Later Composers.—A most individual genius in America's music was Edward MacDowell (1861–1908). MacDowell used both Indian and Negro folk idioms in some compositions. His largest works were his symphonic poems, orchestral suites (one of which is founded on the airs of the American Indian), two concertos and four sonatas for piano (including the great *Keltic*). MacDowell wrote many beautiful songs ("Menie," "The Sea") and numerous short tone poems for his favorite instrument, the piano. His popular fame rests chiefly on such poetic and fanciful short piano compositions as the "Woodland Sketches," "New England Idyls," "Sea Pieces" and "Fireside Tales." Many of these are of such romantic beauty that it is difficult to explain the neglect of MacDowell by professionals.

Ethelbert Nevin (1862–1901) wrote graceful piano pieces, beloved of amateurs, and tuneful songs, among which is *The Rosary,* one of the most popular vocal compositions of any age. Edgar Stillman Kelley (1857–), Henry Gilbert (1868–1928), Reginald De Koven (1861–1920), Victor Herbert (1859–1924) and Henry Hadley (1871–1937), all won fame. The "March King," John Philip Sousa (1854–1932), is known in every land.

Among German-Americans in music are Charles Martin Loeffler (1861–1935), Walter Damrosch 1862—), Frank Damrosch (1859–1937), Ernest Bloch (1880–) and Frederick Stock (1872–).

Outstanding American composers of today are Ernest Schelling (1876–), Charles Wakefield Cadman (1881–), John Alden Carpenter (1876–), Deems Taylor (1885–) and Leo Sowerby (1895–).

Underwood & Underwood

Edward MacDowell

Jazz.—Considerable attempt has been made to read into jazz some real significance as an expression of the American spirit. The antecedents of jazz were ragtime and "coon" songs. The ragtime was so named because it had a ragged rhythm. In the accompaniments to the coon songs the rhythmic accent was designed to fall on the weak beat rather than on the strong. Like ragtime and coon songs, jazz is a matter of rhythm, the most primitive element in music. It employs syncopation, long known and used by composers. Underneath this syncopation, used to an exaggerated degree, beats a monotonous four-four time, carried eternally by the piano or the banjo. The ordinary melodies of jazz are rather like certain Negro manifestations—not the spirituals of the American Negro, but the shrieking discordances of black primitives. Jazz can no longer be deemed a novelty. It dates, in its present status, from 1915 or 1916. George Gershwin (1898–1937) especially was able to adapt its style to acceptable composition, chiefly in his "Rhapsody in Blue." Křenek's attempt to write a jazz opera in *Jonny spielt auf* was not a success. So long ago as 1924 an effort to win the world for jazz was made, when, on February 12 of that year, a concert was held in Aeolian Hall, New York.

American Folk Music.—Our music in America is only in its earliest development for, like every other country, we have had to wait until the position of our country as a world power should be firmly established. Since the World War, a remarkable interest in American music is taking place throughout the world. Although all of our greatest musicians in the past were trained in foreign schools or were of foreign birth, we had much native talent here which was unrecognized.

The music of the American Indian is of far greater importance to American music than many of us realize. Each tribe had its own music as it had its own language. The savage tribes, constantly on the warpath, used the drums or tom-toms with reiterated rhythms; but among the peace-loving tribes, the flute songs were the most popular, the flute being the most cherished possession of the Indian chief. The Navajos, outstanding lovers of peace, are said to possess more than 15,000 different songs. All the Indian songs have legendary stories, for they recall the important ceremonies and history of the different tribes. Indian mothers sing lullabies to their babies, sometimes using as a refrain the flute love-call theme which was sung as a wooing song during the days of the father's courtship. Many tribes have work songs, while the medicine men use songs and dances for the cures for all diseases. Indian themes have been used as the basis of musical works by many American composers, including Charles Wakefield Cadman, Thurlow Lieurance, Arthur Farwell and Charles Sanford Skilton.

The music of the American Negro is more interesting than any other American folk expression. It was but natural that, during the days of slavery, a distinctive musical expression should come into being. All people who are oppressed or denied political freedom reflect in their rhythmic expression their desire for liberty. This breaking-over of rhythmic laws is called syncopation. Singing always binds closely any oppressed people and the high, close harmonies heard when Negroes sing together is an outstanding characteristic of their music. Like other primitive peoples the Negro always showed his religious enthusiasm by his personal appeal to his Maker, and the Negro spirituals are rightly regarded as the most beautiful "folk songs of sorrow" found in musical literature. There are two types of spirituals: those of the "Lower South" being intensely sad and reflecting the dread of being sold into deeper slavery "down river," while the "Upper South" spirituals are of a happier character, frequently using dance rhythms and reflecting the carefree nature of the Negro whose life on the plantation was a fairly contented one.

Negroes have always sung as they have worked, and many of their work songs are characteristic of the occupation of the singers. The dance and play songs are very gay and lively. Among the Louisiana Negroes many of the songs are tinged with French feeling and Spanish rhythms. Many American composers have used Negro themes and there have also developed in recent years a distinctive group of composers of Negro blood, among them being Henry Burleigh and Nathaniel Dett.

Another distinctive folk expression of America is the music of the cowboys. Just as in medieval days the singing of ballads by the bard or minstrel was the chief entertainment of any large group, so in the old ranch houses, after a hard day's work, the cowboys used to meet and sing songs telling of their various adventures. Some of the airs were old ballad tunes which they had known in their homes in the East; others they made up as they sang. When driving the cattle over the trail, in search of the fresh, green grass, the chief danger to the cowboys was that of a stampede. In order to quiet the cattle and avert a panic, the cowboys would ride around the herds all night singing to the cattle the "Dogie Songs" or "Cattle Lullabies." To keep the dogies (yearlings) on the trail, the cowpuncher used sharp, rhythmic cries, which developed into a definite type of cowboy song.

Another distinctive type of American folk song is to be found among the mountaineers of the Appalachian range. Many of these were originally old folk songs of Great Britain. The words of these songs were changed by the different conditions under which the singer was living. Also, entirely new songs have developed. The young people of the mountains loved to dance to the old fiddle tunes of their ancestors and many of our simple pioneer dance tunes, like "Turkey in the Straw," "Arkansas Traveler" and others came into being from the old mountain fiddlers.

From the beginning of America's first settlements, music has been coming to our land from other countries, and much of this has been assimilated and made our own. The Puritans did not believe in singing and dancing, and they chanted their hymns and psalms in a monotonous drone. Yet some fine old hymn tunes developed from the Puritans. When the early Scotch and Irish colonists came into New England, they brought their love of song with them.

The first English settlers of Virginia brought their old ballads and their homes were filled with the stately dance tunes they had known at home. But when the Negro musicians began to play for their masters minuets and gavottes and the gayer country dances popular in England, the character of these compositions changed most decidedly and, they became the "Virginia Reel" and the old jig tunes so popular in Colonial America.

The French colonists brought many interesting songs, which are to be found, not only in French Canada but all through the Great Lakes region and down the Mississippi to New Orleans. When the French Canadian pioneer ventured forth into the wilderness, he was called a *voyageur,* and as many of these brave men were identified with America's lumber industry, their songs became identified with the logging camps. The voyageur songs are another important addition to the folk music of America.

Spain made her colonies in America chiefly in the Southwest and in California, and here is to be found another distinctive type of American folk music. This Spanish influence is also to be noted among many of the Indian tribes of the Southwest.

GREAT NAMES IN MUSIC

4th TO 13th CENTURIES

France	
St. Hilary of Poitiers	(*c.* 300–67)
Italy	
St. Ambrose	(*c.* 340–97)
St. Augustine	(354–430)
Boëthius	(*c.* 480–524)
St. Gregory	(*c.* 540–604)
Guido of Arezzo	(990–1050)
Switzerland	
Notker Balbulus	(d. 912)
Netherlands	
Hucbald of Flanders	(*c.* 840–930)
Germany	
Franco of Cologne	(*c.* 1200)
Early Secular School	
Troubadours	(12th and 13th centuries)
Richard, I of England	(1157–99)
Chatelain de Coucy	(12th century)
Thibaut, King of Navarre	(1201–53)
Adam de la Hale	(*c.* 1238–88)
Minnesingers	
Wolfram von Eschenbach	(*c.* 1165–*c.* 1220)
Gottfried von Strassburg	(13th century)
Walter von der Vogelweide	(1198–1228)
Heinrich von Meissen	(*c.* 1250–1318)
Mastersingers	
Hans Sachs	(1494–1576)

14TH AND 15TH CENTURIES

Gallo-Belgic School	
Guillaume de Machaut	(1300–77)
Guillaume Dufay	(*c.* 1400–74)
England	
John Dunstable	(15th century)
Netherlands	
Johannes Okeghem	(d. *c.* 1495)
Italy	
Ulrich Hahn	(d. 1478)
Ottaviano Petrucci	(1466–1539)

16TH CENTURY

Italy	
Gioseffo Zarlino	(1517–90)
Andrea Gabrieli	(*c.* 1510–86)
Giovanni Gabrieli	(1557–*c.* 1612)
Giovanni Pierluigi Palestrina	(d. 1594)
Filippo Neri	(1515–95)
Emilio del Cavalieri	(*c.* 1550–*c.* 99)
Germany	
Heinrich Finck	(d. 1527)
Martin Luther	(1483–1546)
Ludwig Senfl	(d. 1555)
Johann Walther	(1496–1570)
Sethus Calvisius	(1556–1615)
Hans Leo Hasler	(*c.* 1564–1612)
England	
Thomas Tallis	(*c.* 1510–85)
Thomas Morley	(*c.* 1557–1603)
Thomas Weelkes	(d. 1623)
Netherlands	
Heinrich Isaac	(*c.* 1450–1517)
Josquin des Près	(1450–1521)
Adrian Willaert	(1480–1562)
Cyprian de Rore	(1516–65)
Jacob Arcadelt	(*c.* 1514–75)
Claude Goudimel	(1510–72)
Orlando Lasso	(1530–94)

17TH CENTURY

Italy	
Guilio Caccini	(1558–*c.* 1615)
Felice Anerio	(1560–1614)
Jacopo Peri	(1561–1633)
Claudio Monteverde	(1567–1643)
Gregorio Allegri	(*c.* 1580–1652)
Girolamo Frescobaldi	(1583–1644)
Pietro Francesco Cavalli	(*c.* 1599–1676)
Giacomo Carissimi	(*c.* 1604–74)
Marcantonio Cesti	(1618–69)
Alessandro Stradella	(1645–81)
Arcangelo Corelli	(1653–1713)
Alessandro Scarlatti	(1659–1725)
France	
Pierre Perrin	(d. 1680)
Robert Cambert	(1628–77)
Giovanni Lully (Italian born)	(1633–87)
Germany	
Heinrich Schütz	(1585–1672)
Samuel Scheidt	(1587–1654)
Johann Froberger	(1605–67)
Johann Kaspar Kerl	(1628–93)
Dietrich Buxtehude	(1637–1707)
England	
William Byrd	(1540–1623)
John Dowland	(1562–1626)
John Bull	(*c.* 1562–1628)
William Lawes	(d. 1645)
Orlando Gibbons	(1583–1625)
Henry Lawes	(1596–1662)
Henry Purcell	(*c.* 1658–95)
Netherlands	
Jan Sweelinck	(1562–1621)

18TH CENTURY

Italy	
Giovanni Battista Bonocini	(b. *c.* 1672)
Antonio Lotti	(*c.* 1667–1740)
Antonio Vivaldi	(1675–1743)
Francesco Durante	(1684–1755)
Domenico Scarlatti	(1685–1757)
Benedetto Marcello	(1686–1739)
Nicolo Porporo	(1686–1766)
Guiseppe Tartini	(1692–1770)
Nicola Logroscino	(*c.* 1700–*c.* 63)
Giovanni Sammartini	(1704–74)
Baldassare Galuppi	(1706–85)
Giovanni Pergolesi	(1710–36)
Niccola Jommielli	(1714–74)
Niccolo Piccini	(1728–1800)
Antonio Sacchini	(1734–86)
Giovanni Paisiello	(1741–1816)
Luigi Boccherini	(1743–1805)
Domenico Cimarosa	(1749–1801)
Muzio Clementi	(1752–1832)
Giovanni Viotti	(1753–1824)
Antonio Salieri	(1750–1825)
France	
Jean Philippe Rameau	(1683–1764)
Jean Jacques Rousseau	(1712–78)
François Philidor Danican	(1726–95)
Pierre Alexandre Monsigny	(1729–1817)
François Gossec	(1731–1829)
André Grétry	(1741–1813)
Étienne Méhul	(1763–1817)
Jean François Lesueur	(1760–1837)
Luigi Cherubini (Italian born)	(1760–1842)
Germany	
Johann Kuhnau	(1660–1722)
Friedrich Wilhelm Zachau	(1663–1712)
Johann Reinken	(d. 1722)
Johann Matheson	(1681–1764)
Georg Philipp Telemann	(1681–1771)
Johann Sebastian Bach	(1685–1750)
Georg Friedrich Handel	(1685–1759)
Johann Adolph Hasse	(1699–1783)
Karl Heinrich Graun	(1701–59)
Karl Philipp Emanuel Bach	(1714–88)
Christoph Wilibald von Gluck	(1714–87)
Franz Joseph Haydn	(1732–1809)
Karl von Dittersdorf	(1739–99)
Wolfgang Amadeus Mozart	(1756–91)
England	
Henry Carey	(d. 1743)
John Pepusch (German born)	(1667–1752)
William Croft	(1678–1727)
Thomas Arne	(1710–78)
William Boyce	(1710–79)

19TH CENTURY

Italy	
Gasparo Spontini	(1774–1851)
Nicolo Paganini	(1782–1840)
Gioachino Rossini	(1792–1868)
Gaetano Donizetti	(1797–1848)
Vincenzo Bellini	(1802–35)
Giuseppe Verdi	(1813–1901)
Amilcare Ponchielli	(1834–86)
France	
François Adrien Boïeldieu	(1775–1834)
Daniel François Auber	(1782–1871)
Louis Joseph Hérold	(1791–1833)
Jacques Fromental Halévy	(1799–1862)
Adolphe Adam	(1803–56)
Louis Hector Berlioz	(1803–69)
Felicien David	(1810–76)
Ambroise Thomas	(1811–96)
Friedrich von Flotow (German born)	(1812–83)
Charles François Gounod	(1818–93)
Jacques Offenbach (German born)	(1819–80)
César Franck	(1822–90)
Édouardo Lalo	(1823–92)
Léo Delibes	(1836–91)
Alexandre Guilmant	(1837–1911)
Georges Bizet	(1838–75)
Alexis Chabrier	(1841–94)
Jean Robert Planquette	(1848–1903)
Benjamin Godard	(1849–95)
Ernest Chausson	(1855–99)

Germany	
Ludwig van Beethoven	(1770–1827)
Ludwig Spohr	(1784–1859)
Karl Maria von Weber	(1786–1826)
Giacomo Meyerbeer	(1791–1864)
Heinrich Marschner	(1795–1861)
Johann Carl Loewe	(1796–1869)
Franz Peter Schubert	(1797–1828)
Gustave Lortzing	(1803–59)
Felix Mendelssohn-Bartholdy	(1809–47)
Robert Schumann	(1810–56)
Ferdinand David	(1810–73)
Richard Wagner	(1813–83)
Joachim Raff	(1822–82)
Peter Cornelius	(1824–74)
Anton Bruckner	(1824–96)
Johann Strauss	(1825–99)
Johannes Brahms	(1833–97)
Max Bruch	(1838–1920)
Joseph Rheinberger	(1839–1901)
Engelbert Humperdinck	(1854–1921)
Hugo Wolf	(1860–1903)
Gustav Mahler	(1860–1911)
Ludwig Thuille	(1861–1907)
England	
Sir Julius Benedict	(1804–84)
Michael Balfe	(1808–70)
Sir Arthur Sullivan	(1842–1900)
Arthur Goring Thomas	(1850–92)
Czechoslovakia (Bohemia)	
Friedrich Smétana	(1824–84)
Wilhelm Blodek	(1834–74)
Anton Dvořák	(1841–1904)
Zedenko Fibich	(1850–1900)
Hungary	
Franz Liszt	(1811–86)
Poland	
Frédéric François Chopin	(1810–49)
Denmark	
Niels Gade	(1817–90)
Norway	
Ole Bull	(1810–80)
Halfdan Kjerulf	(1815–68)
Edvard Grieg	(1843–1907)
Sweden	
August Sodermann	(1837–76)
Russia	
Mikhail Glinka	(1804–57)
Aleksandr Serge Dargomyzhsky	(1813–69)
Anton Rubinstein	(1830–94)
Aleksandr Porfirevich Borodin	(1834–87)
Nikolai Rubinstein	(1835–81)
Modest- Moussorgski	(1839–81)
Petr Ilich Tchaikovsky	(1840–93)
Nikolay Rimski-Korsakov	(1844–1908)
Anton Arensky	(1861–1906)
Spain	
Isaac Albeniz	(1860–1909)

20TH CENTURY

Italy	
Arrigo Boito	(1842–1918)
Giovanni Sgambati	(1843–1914)
Giuseppe Martucci	(1856–1909)
Giacomo Puccini	(1858–1924)
Ruggiero Leoncavallo	(1858–1919)
Baron Alberto Franchetti	(1860–)
Marco Enrico Bossi	(1861–1925)
Pietro Mascagni	(1863–)
Umberto Giordano	(1867–)
Dom Lorenzo Perosi	(1872–)
Italo Montemezzi	(1875–)
Ermanno Wolf-Ferrari	(1876–)
Ortorino Respighi	(1879–1936)
Ildebrando Pizzetti	(1880–)
Gian Francesco Malipiero	(1882–)
Alfredo Casella	(1883-)
Riccardo Zandonai	(1883–)
France	
Camille Saint-Saëns	(1835–1921)
François Théodore Dubois	(1837–1924)
Jules Massenet	(1842–1912)
Charles Marie Widor	(1845–1937)
Gabriel Fauré	(1845–1924)
Paul Vincent d'Indy	(1851–1931)
Alfred Bruneau	(1857–1934)
Claude Debussy	(1862–1918)
Gustave Charpentier	(1860 -)
Paul Dukas	(1865–1935)
Erik Satie	(1866–1925)
Florent Schmitt	(1870–)
Maurice Ravel	(1875–1937)
Francis Poulenc	(1889–)
Darius Milhaud	(1892–)
Arthur Honegger	(1892–)
Germany	
Moritz Moszkowski (Polish born)	(1854–1925)
Felix Weingartner	(1863–)
Eugen d'Albert	(1864–1932)
Richard Strauss	(1864–)
Georg Schumann	(1866–)
Max Reger	(1873–1916)
Arnold Schoenberg	(1874–)
Franz Schrecker	(1878–1934)
Erich Korngold	(1897–)
Ernest Krenek	(1900–)
England	
Sir Charles Hubert Parry	(1848–1918)
Frederic Cowan	(1852–1924)
Sir Charles Villiers Stanford	(1852–1924)
Sir Edward Elgar	(1857–1934)
Liza Lehman	(1862–1918)
Sir Edward German	(1862–1936)
Frederick Delius	(1862–1934)
Sir Granville Bantock	(1868–)
Ralph Vaughn Williams	(1872-)
Gustav Holst	(1874–1934)
Samuel Coleridge Taylor	(1875–1912)
Josef Holbrooke	(1878–)
Cyril Scott	(1879–)
Frank Bridge	(1879–)
Percy Grainger	(1882–)
Arnold Bax	(1883–)
Eugene Goossens	(1893–)
Czechoslovakia (Bohemia)	
Josef Suk	(1874–1924)
Hungary	
Karl Goldmark	(*c.* 1832–1915)
Poland	
Ignace Jan Paderewski	(1860–1941)
Norway	
Johann Svendson	(1840–1911)
Christian Sinding	(1856–)
Sweden	
Emil Sjogren	(1853–1918)
Tor Aulin	(1866–1914)
Finland	
Jean Sibelius	(1865–)
Edvard Armas Järnefelt	(1869-)
Selim Palmgren	(1878–)
Russia	
César Cui	(1835–1918)
Mili Balakirev	(1837–1910)
Ippolitov-Ivanov...	(1859–)
Aleksandr Tichonovich Gretchaninov	(1864–)
Alexandr Glazunov	(1865–1936)
Vladimir Ivanovich Rebikov	(1866–1920)
Alexandr Scriabin	(1872–1915)
Sergei Rachmaninov	(1873–)
Reinhold Glière	(1875 -)
Nikolaus Medtner	(1879 -)
Igor Stravinksi	(1882 -)
Sergei Prokofiev	(1891 -)
Spain	
Felipe Pedrell	(1841–1922)
Enrique Granados	(1867–1916)
Manuel de Falla	(1876–)

AMERICA—FROM 1700 TO THE PRESENT

James Lyon	(1735–94)
Francis Hopkinson	(1737–91)
William Billings	(1746–1800)
Joseph Hopkinson	(1770–1842)
Anton Philipp Heinrich	(1781–1861)
Thomas Hastings	(1784–1872)
Dr. Lowell Mason	(1792–1872)
George James Webb	(1803–87)
William H. Fry	(1813–64)
William B. Bradbury	(1816–68)
George F. Root	(1820–95)
Samuel Greene Arnold	(1821–81)
Rubin Goldmark	(1832–1915)
George Frederick Bristow	(1825–98)
Louis Moren Gottschalk	(1829–69)
William Mason	(1829–1908)
Leopold Damrosch	(1832–85)
Theodore Thomas	(1835–1905)
John Knowles Paine	(1839–1906)
Dudley Buck	(1839–1909)
William Gilchrist	(1846–1916)
Frederick G. Gleason	(1848–1903)
Arthur Foote	(1853–)
John Philip Sousa	(1854–1932)
George W. Chadwick	(1854–)
Edgar Stillman Kelley	(1857–)
Victor Herbert	(1859–1924)
Frank Heino Damrosch	(1859–1937)
Edward MacDowell	(1861–1908)
Charles Martin Loeffler	(1861–1935)
Reginald de Koven	(1861–1920)
Ethelbert Nevin	(1862–1901)
Horatio Parker	(1863–1919)
Walter Damrosch	(1862–)
Rossetter Cole	(1866–)
Henry Thacker Burleigh	(1866–)
Mrs. Amy Beach	(1867–)
Henry Franklin Gilbert	(1868–1928)
Charles Sanford Skilton	(1868–1941)
Henry K. Hadley	(1871–1937)
Frederick Converse	(1871–1940)
Frederick August Stock	(1872–)
Arthur Farwell	(1872–)
Daniel Gregory Mason	(1873–)
Arne Oldberg	(1874–)
John Alden Carpenter	(1876–)
Ernest Schelling	(1876–1939)
Thurlow Lieurance	(1878–)
Ernest Bloch	(1880–)
Eric Delamarter	(1880–)
Charles Wakefield Cadman	(1881–)
Robert Nathaniel Dett	(1882–)
Deems Taylor	(1885–)
Leo Sowerby	(1895–)
George Gershwin	(1898–1937)

MUSIC DICTIONARY

A cappella (It.) (ä käp pel′lä), in the old church style; vocal music unaccompanied, especially those pieces of the Italian school.

A capriccio (It.) (ä kä prēt′ chō), at will; according to the individual taste.

Accelerando or **Accelerato** (It.)(ak sel ēr an′dō or ät chā lā rän′dō), gradually increasing the speed.

Accent, a stress or emphasis upon a certain note or passage to mark its position in the bar, or its relative importance in regard to the composition. The first beat of each measure has *primary* accent. In 4/4 time, the third beat has *secondary* accent; in 9/8 time the fourth has secondary accent, the seventh *tertiary*. Notes especially accented are marked with the sign ∧, called *sforzando,* abbreviated *sf., sfz.* or *fz.*

Accessory Notes, small embellishing notes which are located one degree above or one degree below the principal note.

Accidentals, sharps, flats, double sharps, double flats and naturals which are not provided for in the signature.

Accompaniment, a separate part or parts, for voices or instruments, added to a solo or concerted piece, to enrich or support the general effect, or to produce such effects as would be otherwise unattainable.

Accordion (a kôr′di un), a small, portable wind instrument, perhaps the most popular in the world. It consists of a pair of hand bellows to which is attached a keyboard having from five to fifty keys, according to the size of the instrument. As the player presses a key a valve opens and the air is admitted to the metal reeds, one sounding when the air is expanded and the other when it is compressed. The right hand plays the keys and the left hand works the bellows.

Acoustics (a ko͞os′tiks), the science which treats of the nature and laws of sound.

Action, the mechanism attached to the keys of piano or organ; also the mechanism attached to the pedals of a harp, which changes the pitch of the strings by shortening them.

Adagio (It.) (a dä′jō), slowly; quicker than *largo* but slower than *andante;* also, a name given to a movement written in that time.

Ad libitum (Lat.) (ad lib′i tum), at will; in passages so marked, the time may be altered at the will of the performer; also, the part so marked may be omitted.

Agitato (It.) (ä jē tä′tō), an agitated or restless style of playing or singing, in which the time and expression are broken and hurried.

Air, in its modern sense, a tune, or the tune, or melody, with or without words; the part of the composition which carries the melody.

Alla breve (It.) (ä′lä brā′vā), a direction that the notes are to be made shorter, that is, the pace taken quicker than usual. Expressed in the signature by ¢.

Allegretto (It.) (al e gret′ō), (1) rather light, cheerful and quick; slower than allegro; (2) a movement in this time.

Allegro (It.) (ä lā′grō), quick, lively; sometimes used to describe a whole movement of a quartet, sonata or symphony.

Allegro con brio (It.) (ä lā′grō kōn brē′ō), quickly and with spirit.

Alto (al′tō), one of the chief divisions of the human voice; female altos are more properly called contraltos. In mixed chorus, it is the next part below the soprano sung by the low female voice; a tenor violin, or viola; term formerly given to the highest male voice or part.

Andante (It.) (än dän′tā or an dan′tē) (literally, walking), moderately slow, but flowing easily; often qualified by other words, as *con moto, largo, maestoso.*

Andantino (It.) (än dän tē′nō), a diminutive of andante, by some understood to mean *not so slow* as andante; by others, rather *slower than* andante.

Anthem, a vocal composition, the words of which are usually selected from the Bible, used in church either with or without accompaniment.

Apassionato (It.) (ä päs syō nä′tō), with feeling, passion or affection.

Appoggiatura (It.) (a poj′*a* to͞o′*ra*), an accessory note, placed before a principal note. If it is marked with a diagonal line through the stem and hook, it is called *short* and is played with the least possible duration; if it is without a diagonal line, it is called *long* and has definite time value as indicated.

Arabesque, Arabesk (ar *a* besk′), an embellished work.

Aria (It.) (ä′ri *a* or âr′i *a*), (1) an air; (2) a vocal solo with instrumental accompaniment, generally threefold in form. The words consist frequently of two sentences.

Arioso (It.) (ä ryō′so), in the style of an air; the direction that the music to which it refers is to be performed tunefully, sweetly, in the style of an aria.

Arpeggio (It.) (är pej′ō), playing the notes of a chord in succession instead of striking them together; marked with a wavy line before the chord.

Articulation, (1) in singing, the art of distinct pronunciation; (2) in instrumental music, the art of producing proper tone by a right adjustment of the fingers, or the lips.

Augmentation, the introduction of a subject of a fugue or canon, in the course of its progress, in notes of longer duration.

Authentic Cadence, a final close, in which the common chord of the tonic is immediately preceded by the common chord of the dominant.

Auxiliary Notes, notes not essential to the harmony, introduced for the sake of breaking monotony, or of giving freedom of motion to one or more of the parts. They may occur on either the accented or the unaccented part of the bar, and if introduced below the melody should be only a semitone from the proper note of that melody, but if above they may be either a tone or a semitone as the position in the scale would warrant, or taste suggest.

Ave Maria (Lat.) (ä vā′ mä rē′ä or ā′vē ma rī′a), Hail! Mary, the angel's salutation of the Blessed Virgin Mary, used in the Roman Catholic Church as an Antiphon, etc.

Bagatelle (Fr.) (bag a tel′), sketch, short piece, trifle.

Bagpipe, wind instrument. It is still found in a primitive form among the shepherds of the countries of Europe; the Scotch and Irish bagpipes are well known. The bellows, held under the player's arm, force the air into the bag, while the pipes, fitted into the side, give out various tones as they are set in vibration by the player's breath. The "chanter pipe" has eight holes in the side, which are operated by the player's fingers.

Courtesy Bulgarian Consulate, New York

Bagpipe Player, Bulgaria

Balalaika (bal a lī′kā), a Russian stringed instrument, played like the mandolin with a plectrum held in the player's right hand while the strings are stopped with his left. The balalaika is triangular in shape, having a very long neck over which the two, often three, strings are stretched.

Ballad, a short, simple song of natural construction, usually in the narrative or descriptive form.

Ballet (Fr.) (bal′ā or ba lā′), a theatrical representation of some story by means of dances or pantomimic action, accompanied by music.

Banjo, a stringed instrument of African origin which has reached a high state of development in the United States. Over its tambourine-like body parchment is stretched like a drumhead. A long neck is attached to this, and in it are fitted pegs for five tornine strings which are plucked with the fingers or plectrum. The banjo is a favorite instrument of American Negroes.

Bar, a line drawn from the top to the bottom of the stave to denote the division of the time in a piece of music, and the place of the strong accent.

Barcarolle (Fr.) (bär ka rōl′), a song or air sung by the Venetian gondoliers, or boatmen, while at work.

Baritone, a male voice intermediate between bass and tenor; also applied to any musical instrument between bass and tenor.

Bass, the lowest part in a musical composition, the lowest male voice; the lowest of a family of instruments.

Bassoon (ba sōōn′), the largest and deepest-voiced of the wood wind instruments. Its long tube, bent double for convenience, has a long curved mouthpiece. The bassoon is the bass of the double reed family. Although its tone is deep, the instrument possesses such agility of execution that its tones often sound grotesque; therefore it is frequently called "the clown of the orchestra." Yet it possesses a lovely pastoral singing voice in its upper registers. The deepest wood wind instrument is the double bassoon or contra bassoon.

Baton (Fr.) (bȧ tôn′ or bat′un), stick used by a leader in beating time.

Beat, a single motion of the band, or baton, in beating time. A division of a bar, or measure.

Bell, the lower termination of any tubular musical instrument which by the outward turning of the rim assumes the form of a bell.

Bells, percussion instruments of various kinds, such as the gong, glockenspiel and celesta.

Berceuse (Fr.) (ber sûz′), a cradle song.

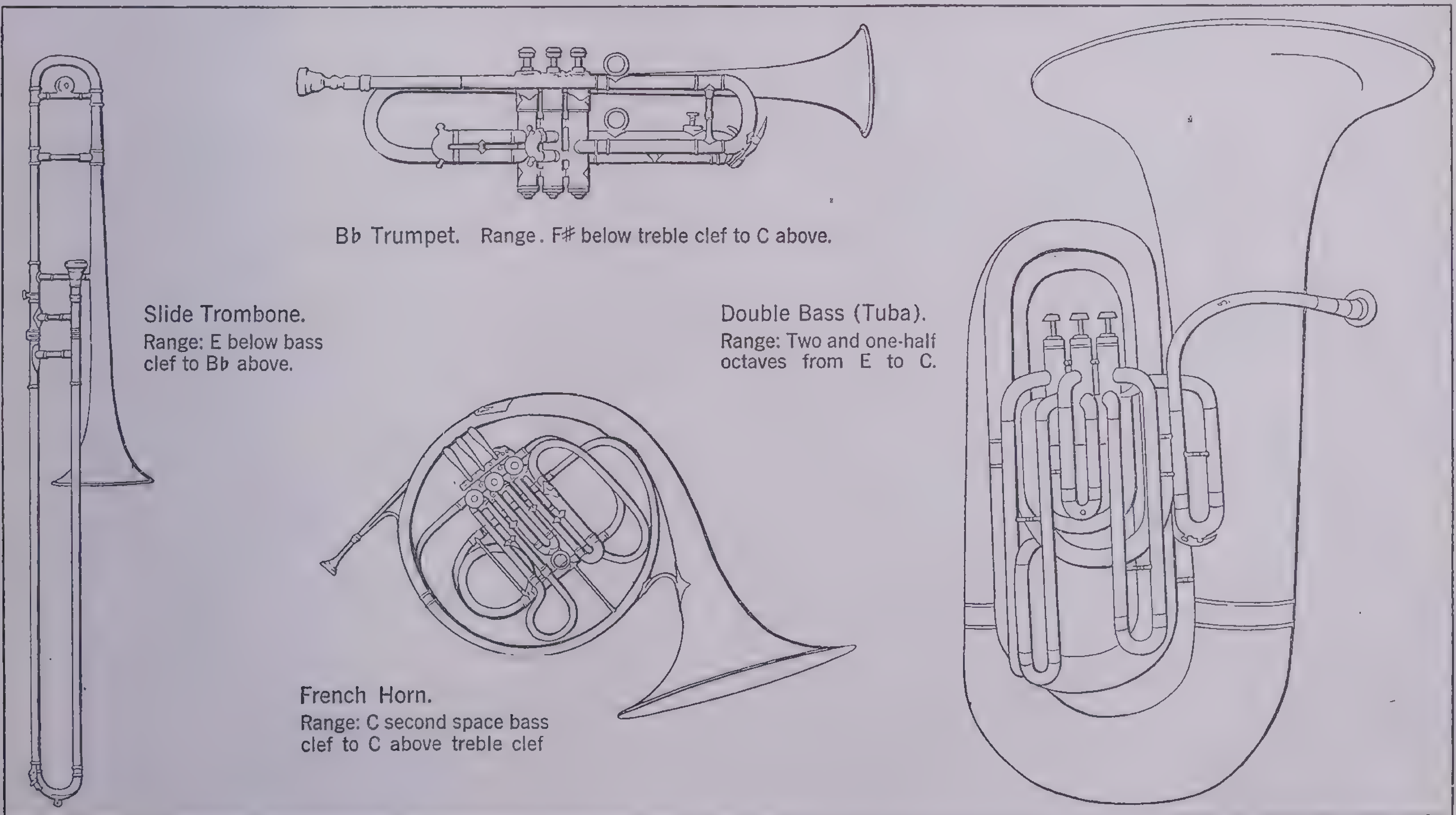
Binary Form (bī′n*a* ri fôrm), the form of a movement which is founded on two principal themes or subjects.

Bolero (Sp.) (bō lâr′ō), a Spanish dance in triple measure with strongly-marked accent, similar to the cachucha. It is accompanied by singing and castanets.

Bowing (bō′ing), the art of managing the bow; the proper manner of using the bow, indicated by certain marks; ⊓ for *down* bow; ∧ for *up* bow; two dots over a note for *spiccato* or *bounding bow.*

Brass Wind Instruments, in the modern orchestra the trumpet, horn, trombone and tuba. The lips of the players act as the reeds of the brass instruments, each tone being produced by a different lip pressure.

Break, (1) the point of junction in the quality of tenor, soprano and alto voices. A genuine bass voice has no break. (2) Break in an organ stop is the sudden alteration of the


B♭ Trumpet. Range. F♯ below treble clef to C above.
Slide Trombone.
Range: E below bass clef to B♭ above.
Double Bass (Tuba).
Range: Two and one-half octaves from E to C.
French Horn.
Range: C second space bass clef to C above treble clef

Courtesy Rudolph Wurlitzer Company; G. Schirmer, Inc.

Important Brass-Wind Instruments of the Orchestra

proper scale-series of the pipes by returning to those of an octave lower in pitch.

Bridge, a piece of wood which, on instruments having a resonance box, performs the double duty of raising the strings above the belly and of terminating at one end their vibrating portion.

Brindisi (It.) (brin′dē zē), a drinking song.

Burden, the chorus or refrain of a song.

Cachucha (Sp.) (k*a* cho͞o′ch*a*), a Spanish dance, resembling the bolero.

Cadence, (1) a close in melody or harmony, dividing it into numbers or periods, or bringing it to a final termination; (2) the end of a phrase, formerly called fall, either in melody or harmony.

Cadenza (It.) (k*a* dent′s*a* or k*a* den′z*a*), a florid ornamental passage introduced before the cadence of a song or instrumental solo.

Canon, a contrapuntal composition in which the melody is taken by the leading voice, and then taken up in turn by the second, third and fourth voices at intervals of a definite number of beats or measures.

Cantabile (It.) (kän tä′bē lā), in a · singing manner.

Cantata (It.) (kán tä t*a*), a short oratorio, frequently entirely secular. Bach wrote a coffee-cantata (a humorous protest against drinking too much), as well as many religious cantatas; Haydn selected a Greek subject, *Ariadne at Naxos;* Mozart composed a Masonic cantata.

Canticle (kan′ti kl), a song or hymn in honor of God, or of some special sacred event.

Canto (It.) (kan′tō), the upper voice part in concerted music, so called because it has the melody or air.

Cantor (Lat.) (kan′tôr or tẽr), a singer; a precentor.

Cantus firmus (Lat.) (kan′tus fûr′mus), (1) the *tenor* or chief melody; (2) a fragment of plain song, to which counterpoint has been added; (3) any subject chosen for contrapuntal treatment, generally a short diatonic passage of semibreves or other long notes.

Canzone (It.) (kän tsō′nā), a short song, the music being more important than the words.

Capellmeister (Ger.) (kä pel′mīs′tẽr), (1) the musical director of a church or chapel; (2) a conductor of a band or an opera: usually spelled **kapellmeister.**

Capriccio (It.) (kä prēt′chō), a freak; whim; fancy. A composition irregular in form.

Carillon (Fr.) (kar′i lon or k*a* rē yôn′), a set of bells upon which a melody can be played; an instrumental piece in the style of carillon music.

Carol, a song of praise, applied to a species of songs sung at Christmastide; originally a song accompanied with dancing.

Castanet (kas t*a* net′ or kas′t*a* net), a musical instrument of percussion introduced into Spain by the Moors. Originally they were of dried chestnut husks, but later were made of hard wood.

Catch, a round for three or four voices, in which each singer in turn "catches" up the melody; later usually with comic effect.

Cavatina (It.) (kä vä tē′nä or kav *a* tē′n*a*), a melody or a more simple form than the *aria.*

Celesta (sē les′t*a*), a small keyboard instrument producing a sparkling bright tone as the player strikes the hammers with his fingers through a mechanism similar to that of the piano. It has superseded the glockenspiel.

Celeste (Fr.) (sā lest′ or sē lest′), a direction for the use of the soft pedal.

Cello or **'Cello,** see **Violoncello.**

Cembalo (sem′b*a* lō or chem′b*a* lo), a popular instrument of the Hungarian gypsies, a descendant of the primitive dulcimer of Biblical days.

Chaconne (Fr.) (shā cōn′), a slow dance in 3/4 time.

Chamber Music, vocal or instrumental compositions suitable for performance in a small hall, as opposed to a concert hall; instrumental music in the sonata form for a small group of string or woodwind instruments, with or without piano.

Chanson (Fr.) (shan′son or shän′son′), a song; a vocal solo with piano accompaniment; formerly a ballad.

Chant, (1) a simple melody, generally harmonized in four parts, to which lyrical portions of the Scriptures are set, part of the words being recited *ad libitum* and part sung in strict time; (2) to recite musically.

Characters, a general name for the signs employed in music, such as brace, bind, bar, sharp, flat, natural, clef, stave, shake, turn, beat and the signs of words indicating time and expression.

Chime, a set of bells tuned to a musical scale; music played upon a set of bells; music or melody; to sound in harmony.

Choir (kwīr), a group of singers, usually connected with a church; that part of a church edifice set apart for the singers.

Morse's Photo Service, Lake Wales, Fla.

Florida's Carillon: The Singing Tower

At Mountain Lake, Florida, is the Singing Tower or carillon surrounded by the grounds of a bird sanctuary. Both were the gift in 1929 of Edward W. Bok. The carillon has 71 bells capable of producing 53 tones or four and a half octaves

Choir Organ, in a large pipe organ, that group of pipes and the corresponding manual having a soft tone and therefore suitable for the accompaniment of vocal music.

Choral, (1) of or belonging to the choir, concert or chorus; choral service, a service with music; (2) a hymn or psalm tune.

Chorale (Ger.) (kō räl′), psalm or hymn tune; a form of sacred song introduced by Luther.

Chord, a combination of musical sounds, consonant or dissonant.

Chorister, a member of a choir whether juvenile or adult.

Chorus, a group of singers; a choir; a composition intended for a chorus; a refrain.

Chromatic (krō mat′ik), progression by semitones.

Chromatic Scale, including every tone within the octave.

Chromatic Signs, marks used in musical notation to indicate that a note should be played a semitone higher or lower than it is written. These marks are: the sharp (♯); the flat (♭); the natural (♮); the double sharp (𝄪); and the doble flat (𝄫).

Clarinet (klar i net′), a single reed instrument of the wood wind family. It is a little larger than the oboe and has a very extensive range which gives its voice a fuller and deeper tone quality. The deep voice of the clarinet is found in the bass clarinet, an instrument similar in shape to the saxophone with a bell of brass turning upward like a pipe. Its voice is deep and impressive and similar to that of a pipe organ.

Clef (klef), a character used to determine the name and pitch of the notes on the staff to which it is prefixed.

Close Harmony, harmony produced by drawing the parts which form it closely together.

Coda (It.) (kō′d*a*), the tail of a note; the bars occasionally added to a contrapuntal movement after the close or finish of the *canto fermo;* that closing adjunct of any movement, or piece, especially intended to enforce a feeling of completeness and give an impression of finality.

Coloratura (It.) (kul ẽr *a* tu′r*a* or kō lō rä-to͞o′r*a*), ornamental passages, runs, trills, embellishments, in a vocal or instrumental solo; a high soprano voice of great flexibility and unusual brilliancy.

Common or **Double Time,** time with two beats in a bar, or any multiple of two beats in a bar.

Compass, the whole range of sounds capable of being produced by a voice or instrument.

Composition, (1) a piece of music, for voices or instruments, or a combination of both effects, constructed according to the rules of art; (2) the act and the art of writing original music.

Concert, a public performance of music, in which a number of singers or instrumentalists, or both, take part.

Concertina (kon sẽr tē′n*a*), an instrument similar to the accordion. It has a keyboard at each end, the bellows being between. The same tone is produced when the bellows are compressed as when they are expanded. The compass of the concertina is much greater than that of the accordion, and as it is possible to play very intricate harmonies, the concertina is a popular instrument.

Concertmeister (Ger.) (kōn tsert′mīs tẽr), the leader of the band, the conductor; the leader of the first violins, who is next in rank to the conductor.

Concerto (It.) (kōn cher′tō or kon sûr′tō), (1) a concert; (2) an extended composition in sonata form for a solo instrument with orchestral accompaniment.

Conductor, the director or leader of an orchestra or chorus.

Con sordino (It.) (kōn sōr dē′nō), with the mutes on; with the soft pedal at the pianoforte held down.

Contra (It.) (kon′tr*a*), against; in compound words this signifies an octave below.

Contrabass (It.) (kon′tr*a* bās), the double bass; the deepest toned stringed instrument played with a bow.

Contralto (It.) (kon tral′to), the voice of deepest tone in females.

Cornet (kôr′net or kôr net′), a brass wind instrument similar to the trumpet.

Cotillion or **Cotillon** (Fr.) (kō til′yun or kō tē-yôn′), a lively, spirited dance, introducing a great variety of figures, such as the pyramid, the two flowers, the coquette, a quadrille.

Counterpoint. The art of adding one or more parts to a given theme or subject.

Courante (Fr.) (ko͞o ránt or ko͞o ränt′), "running." A dance of French origin in triple time; the second part in the old *suites des danses.*

Cremona (krē mō′n*a*), (1) a violin made in the town of Cremona; (2) a reed stop in the organ.

Crescendo (It.) (kre shen′dō), increasing, a gradual increase in the force of sound expressed by the sign <, or the abbreviation *cresc.*

Cymbals (sim′balz), percussion instruments, large cylindrical plates of metal that are either clashed together or struck with the drumstick.

Czardas (chär′däsh or zär′das), the Hungarian national dance.

Da Capo (It.) (dä kä′pō), from the beginning.

D.C., abbreviation for da capo.

Degree of a Scale, a stop in the tone ladder; it may consist of a semitone, a tone, or—in the minor scale—an augmented tone.

Descant (des′kant), the addition of a part or parts to a tenor or subject.

Development of a Subject, the elaboration of a given theme, according to the rules of art.

Diapason (Eng.) (dī *a* pā′zun), (1), an octave; (2) the name given in this country to the most important foundation stops of an organ, termed in other countries more properly *Principal.*

Diatonic (Gr.) (dī′*a* ton′ik), pertaining to the major and minor scales of eight tones to each octave, in any key.

Diminished Chord, a chord composed of a fundamental, a minor third and a diminished fifth.

Diminuendo (It.) (di min ŭ en′dō), decreasing in power of sound.

Dirge (dûrj), a solemn piece of music, of a funeral or memorial character, so called from the first word of the Antiphon, "Dirige, Domine Deus meus, in conspectu tuo, viam meam."

Discord, a chord which, when struck or sung, requires to be resolved into a concord.

Dispersed Harmony, harmony in which the notes composing the chord are at wide intervals from each other.

Dissonance (dis′ō nans), an interval or chord displeasing to the ear and requiring to be followed by another in which the dissonant note is resolved.

Divertimento (It.) (dē ver tē men′tō), (1) an instrumental composition in several movements (six or seven), like a *serenada* or *cassation;* (2) a potpourri.

Divisi (It.) (dē vē′zē), a direction that instruments playing from one line of music are to separate and play in two parts. The reunion of the parts into unison is directed by the words *a due*.

Dominant, the fifth degree of the scale; the reciting note of Gregorian chants.

Double Bar, a sign formed of two single bars showing (1) the end of a piece; (2) the end of a movement of a work; (3) the end of a portion to be repeated; (4) the commencement of a change of key; (5) the commencement of a change of time; (6) the end of a line of words set to music as in a hymn tune.

Double Bass, the largest of the stringed instruments played with a bow. Like the viola and cello it is a descendant of the viol family. Until Beethoven's time it was used chiefly to double the bass parts by the cello, but modern composers have used it as an important individual voice.

Double Flat, a sign (♭♭) used before a note already flatted in the signature, which depresses the note before which it is placed another half tone. It is contradicted by a natural and a flat.

Double Octave, the interval of a 15th.

Double Sharp, a sign (𝄪) used before a note already sharp, to indicate that it is desired to raise the pitch by a semitone. It is contradicted by a natural and a sharp.

Down Beat, the first beat in each bar is so called because in counting time the hand or conducting stick is allowed to fall at that place.

Doxology (Gr.) (doks ol′ō ji), the hymn or song of praise—the Gloria in Excelsis and the Gloria Patri as sung in the Christian church; also any metrical form of the same.

Drone, the largest pipe of the bagpipe, sounding only one note, which serves as a bass for every tune; the chorus or burden of a song.

Drums, in the modern orchestra the tympani or kettledrums, the side or snare drum and the bass drum. (See *Kettledrums.*) The snare drum is cylindrical. It has thin pieces of gut (snares) stretched under the vellum on one side which, as the player beats upon it, produces a sharp, incisive tremolo frequently needed in military music. The bass drum is the largest instrument of the group. In military music it is played *fortissimo;* played *pianissimo,* it is very impressive in funeral marches.

Duet, a composition for two voices or instruments, or for two performers upon one instrument, or for two instruments of the same kind.

Dynamics (dī nam′iks), that part of musical science which deals with differences and contrasts in loudness of tones.

Echo, a sound produced by reverberation.

Eighth, the interval of an octave: *Eighth note,* a note whose value is ⅛ that of a whole note.

Encore (Fr.) (äng kōr′ or -kôr′), again; more; a demand for the reappearance of a performer, as by applause; the performance given in response to such a demand.

English Horn, see *Oboe.*

Enharmonic (en här mon′ik), (1), one of the three genera of Greek music, the other two being the Diatonic and Chromatic; (2) having intervals less than semitone; (3) an enharmonic modulation is a change as to notation, but not as to sound.

Ensemble (Fr.) (än′som′bl), together; the whole; (1) the general effect of a musical performance; (2) the union of the whole company of performers in a concerted piece.

Entr'acte (Fr.) (än tract′ or än′träkt′), music played between the acts or divisions of an opera, drama or other stage performance.

Episode, a term in fugue writing, applied to those phrases which are supplemental to the main subjects or their answers.

Etude (Fr.) (ā tüd′), a study, exercise or lesson.

Euphony (ū′fō ni), sweet sound; an agreeable combination of sounds.

Exercise, (1) preparatory practice in order to obtain skill; (2) a composition intended for the improvement of the singer or player; (3) a composition or thesis, required of candidates for degrees in music in the universities.

Expression, the power or act of rendering music so as to make it the vehicle of deep and pure emotion; the *spirit* of music as opposed to the mere mechanical production of sound. Expression marks are given in compositions to aid the performer in the proper interpretation of the number.

Extemporize, to play *extempore,* that is, to create melody and harmony without premeditation.

Extravaganza (eks trav *a* gan′ z*a*), a composition in burlesque style.

Falsetto (It.) (fôl set′ō), the artificial or supplementing tones of the voice, higher than the chest or natural voice.

Fandango (Sp.) (fan dang′gō), a lively Spanish dance in triple time, derived from the Moors. It is danced by two persons, male and female, and accompanied by the sounds of a guitar.

Fanfare (Fr.) (fan′fâr), a flourish of trumpets, a call.

Fantasia (It.) (fan t*a* zē′*a* or fan tä′zi *a*), a composition in a style in which form is subservient to fancy.

Fermata (It.) (fer mä′tä), a pause—from *fermare,* to stay or stop.

Fife, a small flute used with the drum in military bands.

Fifth, a diatonic interval of five notes. The interval between a fundamental tone and the fifth tone above.

Figure, a form of melody or accompaniment maintained throughout the phrase in which it is suggested. In a melody figure is called sequence. In harmony a figure relates to the rhythmical observance of a certain form in all the accompanying chords to the melody; (2) a musical phrase; (3) a florid melody.

Finale (It.) (fē nä′lā or lē), the conclusion; the last piece of any act of an opera; the concluding number of a concert; the last movement of a composition in the sonata form.

Fine (It.) (fē′nā), the end; used to show the end of a piece or movement; often a repeat, or partial repeat.

Fingering, the art of placing and using the fingers properly in performing upon a musical instrument.

Flat, the sign (♭), which directs the lowering of the tone to which it is prefixed by one semitone; singing or playing is said to be *flat* when the sounds produced fail to reach the true pitch.

Flute, a wind instrument used in various forms since ancient Greece. The flute is a cylindrical tube, closed at one end, and blown at a lateral opening called the embouchere. Its compass is about three octaves above middle C. The flute is extremely agile, well adapted to serve as a coloratura voice, and is useful in light, graceful passages. Other flutes are the fife and piccolo.

Foot, (1) a metrical measure; (2) a drone bass; (3) the chorus of a song; (4) the part of an organ pipe below the mouth; (5) to foot, to dance.

Form, the pattern or design in which musical ideas are presented.

Forte (It.) (fôr′tā), loud; powerful.

Fortissimo (It.) (fôr tis′i mō), very loud.

Forzando (It.) (fôr tsän′dō), forced; emphasis upon one note or chord; marked >.

Fourth, an interval of four notes.

Free Style, composition not absolutely according to the strict rules of counterpoint.

French Horn, see *Horn.*

Fugue (fūg), a fugue is a composition in which a melody is chosen that may be accompanied by a perfect imitation of itself. It is hard to explain it without using terms that must themselves be explained; but everybody has sung *"Three Blind Mice"* or some other *round* in which different voices come in with the same tune at different points. On such a principle of imitation is built up what is called a *canon.* A fugue is a freer and more elaborate canonical structure.

Full Score, a score in which all the parts for voices and instruments are displayed.

Fundamental, the lowest element of a tone, the other elements being its harmonics; applied also to the lowest note of a chord when the chord is founded upon that note.

Fundamental Tones, the tones from which harmonics are generated; that is, the first, fifth and fourth tones of any diatonic scale.

Galop (Fr.) (gal′up), a lively dance in 2/4 time, originally a separate and independent dance, but now also forming a portion of a set of quadrilles.

Gavotte or **gavot** (g*a* vot′ or gav′ot), a dance tune of a lively yet dignified character, said to be of French origin, and to take its name from the Gavots; in quick common time, introduced at the French Court in the 16th century, the step characterized by raising the feet instead of sliding; a composition in gavotte style.

Gigue, see *Jig.*

Glee, a vocal composition of three or four more or less independent parts, not necessarily gleeful; popular in England between 1760 and 1830.

Glissando (It.) (glē sän′dō), slurred; in a gliding manner.

Glockenspiel (glok′en spēl), a percussion instrument, either flat metal bars fastened to a frame, or bells tuned to the diatonic scale, played by hammers or by means of a keyboard.

Gong, a bronze, copper or tin disc hanging from a bar and struck with a padded stick. It is occasionally used in orchestras.

Grace Notes, Graces, ornamental notes or short passages, introduced as embellishments into vocal or instrumental music, not actually essential to its harmony or melody. Grace notes are written small and are not counted as part of the measure.

Gregorian Chant, a style of church music without definite rhythm, written in one of the eight church modes or scales, formerly attributed to Pope Gregory. It is now believed that he did not originate it, but merely arranged and edited such music as already existed.

Guitar (gi tär′), a stringed instrument with a flat back and curved sides, made in several sizes. The Spanish guitar of present-day use has six strings, giving the instrument a range of about three and a half octaves. The tone is produced by plucking the strings with the fingers of the right hand, while the left hand stops the string on the frets of the neck.

Half Note, a note having half the time value of a whole note and twice that of a quarter note.

Half Rest, a pause equal in duration to a half note.

Harmonic Modulation, the change from one key to another in a succession of chords.

Harmonics, higher partial tones present in practically every musical sound, which can also be sounded separately upon many musical instruments.

Harmonium, see *Reed Organ.*

Harmony, a combination of tones which, sounded simultaneously, produce a pleasing effect; the structure of music with respect to the composition and progression of its chords, as contrasted with melody and rhythm; music consisting of a progression of chords, as distinguished from counterpoint, which consists of melody added to melody.

Harp, a stringed instrument of triangular form, furnished with gut strings. It has a compass varying from three to six octaves and a half, according to the size of the instrument.

Head-voice, the sounds produced above the chest-register, but not in falsetto.

Hold, an old English name for the sign of a pause (𝄐).

Homophony (Gr.) (hō mof′ō ni or hom′ō fō ni), unison of voices or instruments of the same character.

Horn, a general term for wind instruments of brass or metal, wood or animal horn. The French horn has perhaps one of the most exquisite voices in the modern orchestra. It is a long brass tube bent into a number of circular curves ending in a flaring bell and provided by pistons, making it a chromatic instrument.

Hymn, a lyric for use in worship.

Imitation, the repetition of a short subject by another part.

Impresario (It.) (im prā sä′ri ō), a designer, conductor or manager of a concert or opera party. This term is often applied to a man who trains singers, or obtains them for public performances.

Impromptu (Fr.) (im promp′tū), a piece of music written or played without previous preparation of the subject.

Improvisation (im prō vī zā′shun or im prov i-za′shun), the act and the art of composing and rendering music without previous preparation.

Inflection, any change in the pitch of the voice.

Interlude, a piece of music either impromptu or prepared, played between the acts of a drama, the verses of a canticle or hymn or between certain portions of a church service.

Intermezzo (It.) (in tēr med′zō), an interlude; a short movement in the symphony; one of the parts of the old suite.

Interval, the distance between any two sounds; *harmonic,* if between two tones sounded together and *melodic,* if between two tones sounded in succession. The intervals of the diatonic scale are do, *unison* or *primo;* do-re, *second;* do-mi, *third;* do-fa, *fourth;* do-sol, *fifth;* do-la, *sixth;* do-si, *seventh;* do-do, *eighth* or *octave.* Of these, the *unison, fourth, fifth* and *octave* are classified as *perfect.* The *second, third, sixth* and *seventh* are *major* in the major scale. The *minor intervals* are a chromatic half step smaller than the major intervals of the same name. *Augmented intervals* are a chromatic half step larger than perfect and major intervals. *Diminished intervals* are a chromatic half step smaller than perfect and minor intervals. Intervals not exceeding an octave are called *simple;* those greater than an octave, *compound.*

Intonation, the method of producing sound from a voice or an instrument; correctness of pitch; the method of chanting certain portions of the church services.

Introduction, an opening strain or short movement which prepares the way for the main body of a composition.

Inversion, changing the position of notes forming intervals, chords or themes.

Jig or **Gigue** (Fr.), a lively dance which may be performed by one or more dancers.

Kettledrums, important percussion instruments of the modern orchestra, used usually in pairs, threes or fours: also called timpani. They are kettle-shaped drums of brass or copper having parchment coverings. The drummer uses two sticks. It is the only drum which can be tuned to a definite pitch; this is done by tightening or loosening the head by means of key screws or foot pedals.

Key, (1) in its modern sense, it is the starting point of the definite series of sounds which form the recognized scale. Different starting points require the relative proportion of the steps of the scale to be maintained by means of sharps or flats in the signature. The key of C requires no flats or sharps for this purpose, hence it is called the *normal* key; (2) mechanical contrivance for closing or opening ventages, as in flutes, clarinets, etc.

Keyboard, the range of keys upon a pianoforte or organ. Keys played by the fingers are called *manuals;* those by the feet are called *pedals.*

Keynote, the note which, according to the signature, forms the starting point of the scale. The tonic, or first note of the scale, as "do."

Keys, Related, those differing by not more than one accidental in their respective signatures.

Larghetto (It.) (lär get′ō) (dim, of *largo*), at a slow pace but not so slow as *largo.*

Largo (It.) (lär′gō); slow; broadly.

Larynx, the organ by means of which we produce vocal sounds. It is situated at the top of the trachea or windpipe, of which it forms a continuation, and its position is known popularly by that of the "Adam's apple," the prominence of one of the cartilages or masses of gristle which form it.

Leading Note, the seventh degree of ascending major scale. It is called *leading* because of its tendency to rise or lead up to the tonic.

Ledger Lines, short lines drawn above or below the ordinary stave at the relative distances at which the whole lines would be placed.

Legato (It.) (lā gä′tō or lē gä′tō), smooth and connected, opposite of *staccato.*

Leitmotiv or **Leitmotif** (Ger.) (līt′mō tēf′), a guiding theme associated with a special person, act or sentiment in an extended composition.

Libretto (It.) (li bret′ō), literally, little book; the text of an opera or oratorio.

Lied (Ger.) (lēt), a song, but the word is especially applied to that class of song which owes its origin and evolution to the German temperament, poetic leanings and national tastes.

Ligature (lig′*a* tūr), a slur; a group of notes sung to one syllable or in one breath, or bowed with one stroke.

Litany (lit′*a* ni), a prayer, or supplication; in particular, that early form of prayer in which a minister recites a petition and the people answer "Lord, have mercy."

Lullaby, a cradle song.

Lyre (līr), one of the most ancient stringed instruments.

Madrigal (mad′ri gal), an unaccompanied song, usually a love song, for three or more voices, often six or eight, making use of counterpoint and imitation; perfected about 1450 in the Netherlands.

Major, greater; a major third consists of four semitones, a minor third of three; used to signify standard or normal as opposed to minor, diminished and augmented; applied to intervals, chords and keys.

Major Mode or **Scale,** the ordinary diatonic scale, having semitones between the third and fourth, and the seventh and eighth degrees.

Mandolin (man′dō lin), a lute-like stringed instrument. It has four to six pairs of strings, tuned in fifths with the same tonality as the violin. These strings are of wire and vibrate as they are plucked by a plectrum with a thin, sweet tone. The player stops the strings with his left hand, the pitch being indicated by frets on the long-necked keyboard.

Manual, a key or digital of a keyboard; the keyboard of an organ played by the hands, as opposed to the pedal board played by the feet.

Marcato (It.) (mär kä′tō), marked, or emphasized.

March, a musical composition so arranged as to be suitable for accompanying troops in marching. There are quick and slow marches, in double and triple time, besides marches peculiar to certain nationalities.

Marimba (m*a* rim′b*a*), see **Xylophone.**

Mass, name given to the Communion Office, Eucharist Service or Liturgy, from the words *Ite, missa est* (Depart; the congregation is dismissed), sung by the priest or minister just before the end of the service. The subdivisions are Kyrie, Gloria, Credo, Sanctus, Benedictus and Agnus Dei.

Mazurka (Pol.) (m*a* zûr′k*a* or m*a* zo͞or′k*a*), a Polish dance of lively, grotesque character, the music of which is in 3/8 or 3/4 time, with a peculiar rhythm; a composition in the rhythm of this dance.

Measure, time; pace; rhythm; the contents of a bar; also the space lying between two adjoining bars. In England the name used for a very stately dance, slow in movement, supposed to be somewhat like the minuet and once in favor on occasions of high court functions, somewhat like our grand march.

Mediant, the third degree of any scale.

Medley, a mixture; a composition made up of detached passages from other compositions; usually applied to vocal music.

Meistersinger (Ger.) (mīs′tẽr sing ẽr), a title given to the most renowned musician of a township or district in Germany during the Middle Ages.

Melodeon (mē lō′de un), see *Reed Organ.*

Melodrama, a dramatic piece in which the interest is heightened by the character of the vocal or instrumental music accompanying certain situations.

Melody, an agreeable succession of simple sounds, produced by a single voice or instrument, and so regulated as to give a pleasing effect, or to be expressive of some kind of sentiment; opposed to harmony, which consists of two or more tones sounded simultaneously; the leading part of a composition.

Meter, Metre, the grouping of notes or beats into units of measure to form rhythm; the distribution of long and short, accented and unaccented notes in the measure.

Metronome (Gr.) (met′rō nōm), an instrument said to have been invented in 1816 by J. B. Maelzel for the purpose of measuring the relative duration of the notes in a piece of music. The machinery is of clock work, and the various grades of time are measured on a balance rod serving the purpose of a pendulum, the speed being regulated by a shifting or sliding weight. To be correct, the metronome should beat seconds when set at 60.

Mezzo (It.) (med′zō) or **Mezza** (med′zä), medium, half, as *mezzo bravura*—semi bravura style.

Mezzo-Soprano (It.) (med′zō-sō prä′nō or -pran′ō), a female voice, the range of which lies between the soprano and the alto.

Middle C, the note standing on the first ledger line above the bass stave and the first ledger line before the treble stave.

Minor (Lat.), less; smaller; applied to intervals and to chords, scales, and keys having intervals a semitone less than major.

Minor Scale, a scale having its third and sixth minor. There are three forms: *Normal* or *natural minor* which has half steps between 2 and 3, and 5 and 6. *Harmonic minor* which is the same except that the 7th tone is raised a semitone. This makes it a scale with half steps between 2 and 3, 5 and 6, 7 and 8, and one step and a half between 6 and 7. The *melodic minor* has half steps between 2 and 3, and 7 and 8 ascending, while in descending it usually has the form of the normal minor.

Minuet (min′ū et′ or min′ū et), a slow, graceful dance in triple rhythm, said to have been invented in Poitou, France, about the middle of the 17th century; a composition in the rhythm of this dance.

Missa (Lat.) (mīs′*a*), a mass; as *missa pro defunctis,* a requiem mass.

Mode, a scale; a species of scale, as *major mode, minor mode;* a church scale.

Modulation, going from one key to another, by a certain succession of chords, either in a natural and flowing manner or sometimes in a sudden and unexpected manner; inflecting the voice musically.

Moll (Ger.) (mol), minor.

Molto (It.) (mōl′tō), much; very; as *molto adagio,* very slow.

Monody (Eng.) (mon′ō di), a song for a single voice, generally of a plaintive character. The term was originally applied to vocal solos in the church service.

Monotone (mon′ō tōn), to recite words on a single note without inflections.

Motet (mō tet′), a vocal composition in harmony, set to words generally from the Scriptures, or to paraphrases of the sacred writing.

Motion, melodic progression; (1) motion of a single part, *conjunct* if by single degrees, *disjunct* if by skips; (2) of two parts, *contrary* or *opposite* if one ascends while the other descends; *oblique* if one remains stationary while the other ascends or descends; *parallel* if both ascend or descend together; (3) of several parts, *mixed* if two of these motions occur at the same time.

Motive, a musical figure or phrase which serves as the germ from which a composition or a movement is developed.

Moto (It.) (mō′tō), motion; movement, as *con moto* with spirited movement, keeping up the interest of the music.

Movement, same as *Motion;* style of rhythm, as waltz movement; a distinct division of a composition having its own key, rhythm, themes and general character.

Mute, a small instrument of brass, wood or ivory, so made that it can be readily fixed upon the bridge of a violin or violoncello, to muffle or deaden the sound. The direction for its use is written *con sordini,* or *muta,* its discontinuance by *senza sordini.*

Natural, a sign (♮) which restores a note to its position in the natural scale. It has the effect of sharpening a note previously flatted, or of flatting a note previously sharpened.

Natural Keys, those having no sharps or flats in the signature, as C major and A minor.

Neapolitan (nē *a* pol′i tan) **Sixth,** a name, apparently without much reason, given to a chord occurring on the subdominant of a minor key, and consisting of a minor third and minor sixth.

Nocturne (nok′tûrn or nok tûrn′), originally a kind of serenade, or night piece; now a piece of music of gentle and quiet character.

Notation, the act and the art of representing music by means of notes and other symbols; these notes and other symbols taken collectively.

Obbligato (It.) (ob li gä′tō), an instrumental part or accompaniment of such importance that it cannot be dispensed with.

Oboe (It.) (ō′bō or ō′boi), hautbois, Fr.; hautboy, Eng., from the French word literally translated "high-wood," a wood wind instrument with a mouthpiece having a double reed. The oboe is the soprano of the double reed family and is essentially a pastoral instrument. Its voice is more reedy in quality than that of the clarinet, and, although it may play soft, tender passages, its tone is always penetrating. The alto oboe is the English horn, an instrument larger and longer than the oboe, and bell-shaped at the end. The tone of the English horn is always sad and plaintive.

Octave (ok′tāv or -tiv), the interval of an eighth—major, minor or augmented; the whole series of tones within the interval.

Offertory (ôf′ẽr tō ri), in the Roman Catholic Church an anthem or instrumental piece performed while the bread and wine are "presented" to God before consecration, and at this time a collection may be taken; in Protestant churches, music performed while an offering is being taken.

Open Score, when each part has a separate line assigned to it, music is said to be in *open score.* When more than one part is written, in *close* or *short score.*

Opera (op′ẽr *a*), a drama set to music, for voices and instruments, and with scenery, decorations and action.

Operetta (op ẽr et′*a*), a little opera, generally of a light and playful character.

Opus (Lat.) (ō′pus), a work; a composition, as opus No. 1, the first work of a composer. Properly the number of an opus refers to the order of publication, not of the composition. May include several numbers or may consist of a single piece.

Oratorio (or *a* tō′ri ō), a sacred work analogous to an opera, but without action, scenery or costume.

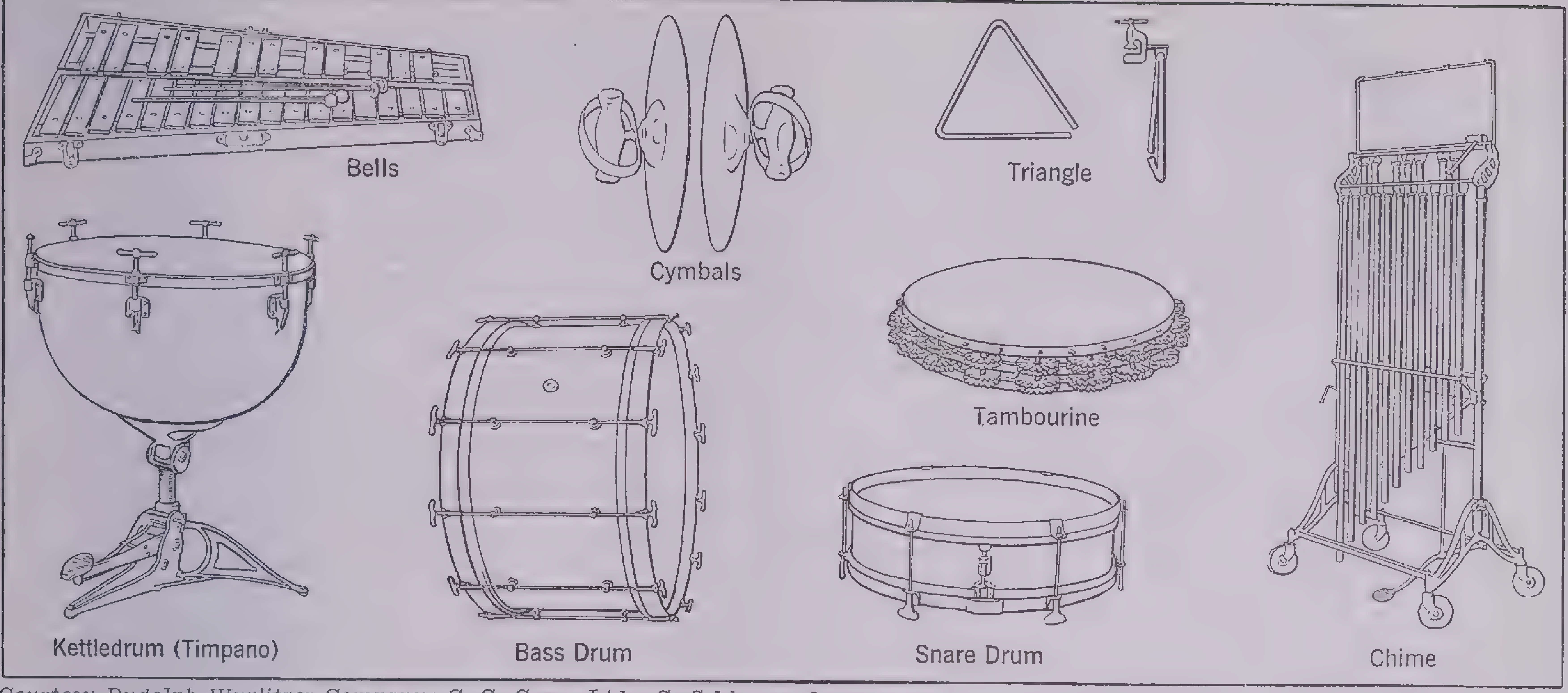
Orchestra (ôr′kes tr*a*), (1) a band of musicians performing upon various instruments; the modern orchestra employs four kinds of instruments: (a) *stringed*—belonging to the violin family; (b) *woodwind*—flutes, oboes, clarinets and bassoons; (c) *brass*—trumpets, horns, and trombones; (d) *percussion*—kettledrums, cymbals, triangle and bells; (2) the space in a theater occupied by the band or orchestra.

Organ (ôr′gan), the largest, most intricate and one of the oldest of musical instruments. It was developed from the ancient Panpipe. The tone of the modern organ is produced from a graduated series of pipes by means of compressed air, the player controlling the tone through a system of keyboards similar to a piano keyboard. The instrument is entirely in the control of a single player, the organist, who sits at the console. The wind pressure and pneumatic devices, which make the keyboard of the organ as easy to manipulate as that of the piano, are controlled by electricity. No effect of the modern orchestra is impossible of imitation on the organ.

Organ Point or **Pedal Point,** a tone sustained by one part through a succession of harmonies of which it forms no part.

Ornamental Notes, unessential notes introduced for the purpose of embellishment, such as *acciaccatura, appoggiatura, grace notes, trill, turn.*

Overture (Eng.) (ō′vẽr chūr), an introduction to an oratorio, opera or other large composition.



Courtesy Rudolph Wurlitzer Company; C. G. Conn, Ltd.; G. Schirmer, Inc.

Important Percussion Instruments of the Orchestra

Parallel Motion, the motion of two or more parts at fixed intervals as thirds, sixths. Parallel fifths are under certain limitations forbidden.

Paraphrase, the rearrangement of a composition for some other instrument than that for which it was originally written.

Part, the music for any one voice or instrument; division of a work.

Partita (It.) (pär tē't*a*), a composition consisting of a collection of dance tunes, which came into vogue about 1700; also called *suite*.

Part Song, an unaccompanied song for three or four voices, which originated in Germany.

Passage, a phrase of music; a figure; a run.

Passion Music, music set to the narrative of our Lord's Passion in the Gospels, similar to a cantata or an oratorio.

Pastorale (pás tō rä'lā or pas tō rä'lē), a simple melody in 6/8 time in a rustic style; a cantata, the words of which are founded on pastoral incidents; a complete symphony, wherein a series of pastoral scenes is depicted by sound-painting, without the aid of words.

Patetico (It.) (pä tā'tē kō), pathetic.

Pause, a rest or pause; a bar's rest.

Pedal, a foot lever, as piano pedal, organ pedal, harp pedal.

Pedal Keys, a set of pipe organ keys played by the feet.

Pedal Point, see *Organ Point*.

Pentatonic (pen t*a* ton'ik) **Scale,** a name given by Carl Engel to the ancient musical scale which is easiest described as that formed by the black keys of the pianoforte. It consists of the 1st, 2d, 3d, 5th and 6th degrees of a modern diatonic scale.

Percussion (pēr kush'un), an ingenious contrivance whereby a hammer strikes the tongue of a reed and sets it in motion simultaneously with the admission of air from the windchest, thus securing the rapid speech of the reed.

Percussion Instruments, in the modern orchestra those instruments sounded by striking, as drums, cymbals, triangles, tambourines, bells, chimes and castanets.

Period, a complete musical sentence; it is composed of two or more phrases usually of four measures each, and closes with a cadence.

Phrase (frāz), a musical clause, corresponding to a line of a poem.

Phrasing, a musical punctuation; in piano music, it refers to varieties of touch; in violin music, to bowing; in singing, to breathing places.

Phrygian (Gr.) (frij'i an), one of the Greek modes; the name of a cadence.

Piano (pi an'ō), less commonly, **pianoforte** (pi an o fōr'te), the most popular and important keyboard stringed instrument. The modern piano was developed in the early 18th century by Bartolomeo Cristofori, an instrument-maker of Florence, from the older keyboard forms of virginals, harpsichords and clavichords. The chief difference between the modern piano and those earlier instruments is that in the pianoforte the tones are produced by vibrating strings struck by hammers, which are controlled by a keyboard. The mechanism is so constructed that the force of the blow struck by the hammers is under the control of the player's fingers, therefore the tone may be very soft or very loud; hence the name pianoforte.

Piano (It.) (pi än'ō), softly; *pianissimo,* as softly as possible.

Piccolo (pik'ō lō), a small flute an octave higher than the ordinary flute.

Pitch, the position of a sound with reference to the number of vibrations which cause it; as standard of pitch as *international pitch,* now used in all civilized countries except England, in which the A above middle C has 435 vibrations a second.

Pizzicato (It.) (pit sē kä'tō), a direction to violinists to produce the tone by plucking the string with the finger instead of using the bow.

Plagal (plā'gal), church modes beginning a fourth below the authentic and distinguished by the word hypo; also the name of a cadence formed when a subdominant chord immediately precedes the final tonic chord.

Plain Song, a nonmetrical chant in one of the ecclesiastical modes, common in early church music; such a melody serving as *cantus firmus* in a contrapuntal composition; any simple tune or melody.

Plectrum (plek'trum), a small thin piece of horn, metal or wood, used for playing certain stringed instruments, as the mandolin, banjo, etc. In Greek the word was *plectron.*

Polacca (It.) (pō lä'ka), Polish. A title applied to melodies written in imitation of Polish dance tunes. Synonymous with the French word polonaise.

Polonaise (Fr.) (pō lō nāz' or pol'ō nāz), see *Polacca.*

Polyphony (pō lif'ō ni or pol'i fō ni), music in which the parts or voices are melodically independent while at the same time in harmony; contrapuntal music; opposed to *homophony,* in which one part carries the melody.

Position, a chord is said to be in its *original position* when the ground note is in the bass, in other *positions* when the relative arrangement of the component notes is changed; a *position.*

Postlude (pōst'lūd), a concluding voluntary; a piece played at the end of the service.

Potpourri (Fr.) (pō po͞o rē' or pot poor'i), a medley, a collection of various tunes linked together.

Precentor (prē sen'tēr), the leader of a church choir or of congregational singing.

Prelude (prel'ūd or prē'lūd), a movement played before, or an introduction to, a musical work or performance.

Presto (It.) (pres'tō), quick; rapid.

Program Music, music intended to portray or suggest a definite series of objects or events; first applied to Beethoven's "Pastoral Symphony."

Progression, *melodic progression* is a succession of sounds forming a tune or melody; *harmonic progression* is the movement of one chord to another, and is diatonic or chromatic.

Psalm (säm), a sacred song.

Quadrille (Fr.) (kwo dril' or k*a* dril'), a French square dance of five figures in 6/8 or 2/4 time; the music for such a dance.

Quartet (kwôr tet'), a composition in four parts, or for four performers; part of a movement sung by four voices *soli* as opposed to *coro;* the four performers rendering the quartet.

Quintet (kwin tet'), a composition in five parts, or for five performers.

Recitative (It.) (res i tä tēv'), musical declamation.

Reed Instruments, those in which the sound is produced by the vibration of one or more reeds in the mouthpiece.

Reed Organ, an organ in which the air is forced over free metal reeds, as in the vocalion, harmonium, melodeon and cabinet organ.

Refrain, the *burden* or *chorus* of a song, repeated at the end of each stanza.

Register, an organ stop; the range of voice or musical instrument.

Relative Key, a key whose tonic chord is a relative chord; that is, a key whose first, third and fifth degrees form a common chord made up of notes of the key to which it is related.

Repeat, a sign that a movement or part of a movement is to be twice performed. That which is to be repeated is generally included within the sign of two or four dots in the spaces of the staff.

Requiem (Lat.) (rē'kwi em or rek'wi em), a mass for the dead; a musical setting for the same.

Rests, signs enjoining the silence of a performer for a given length of time.

Rhapsody (rap'sō di), a composition of irregular form, and in the style of an improvisation.

Rhythm (ri*th*'m or rith'm), movement characterized by regular, measured or harmonious recurrences of stress or impulse, beat, sound accent or motion.

Ritardando (It.) (rē tär dän'dō or -dan'dō), with gradually increasing slowness of pace.

Romance (rō mans'), a vocal or instrumental composition of a romantic character, without a fixed form.

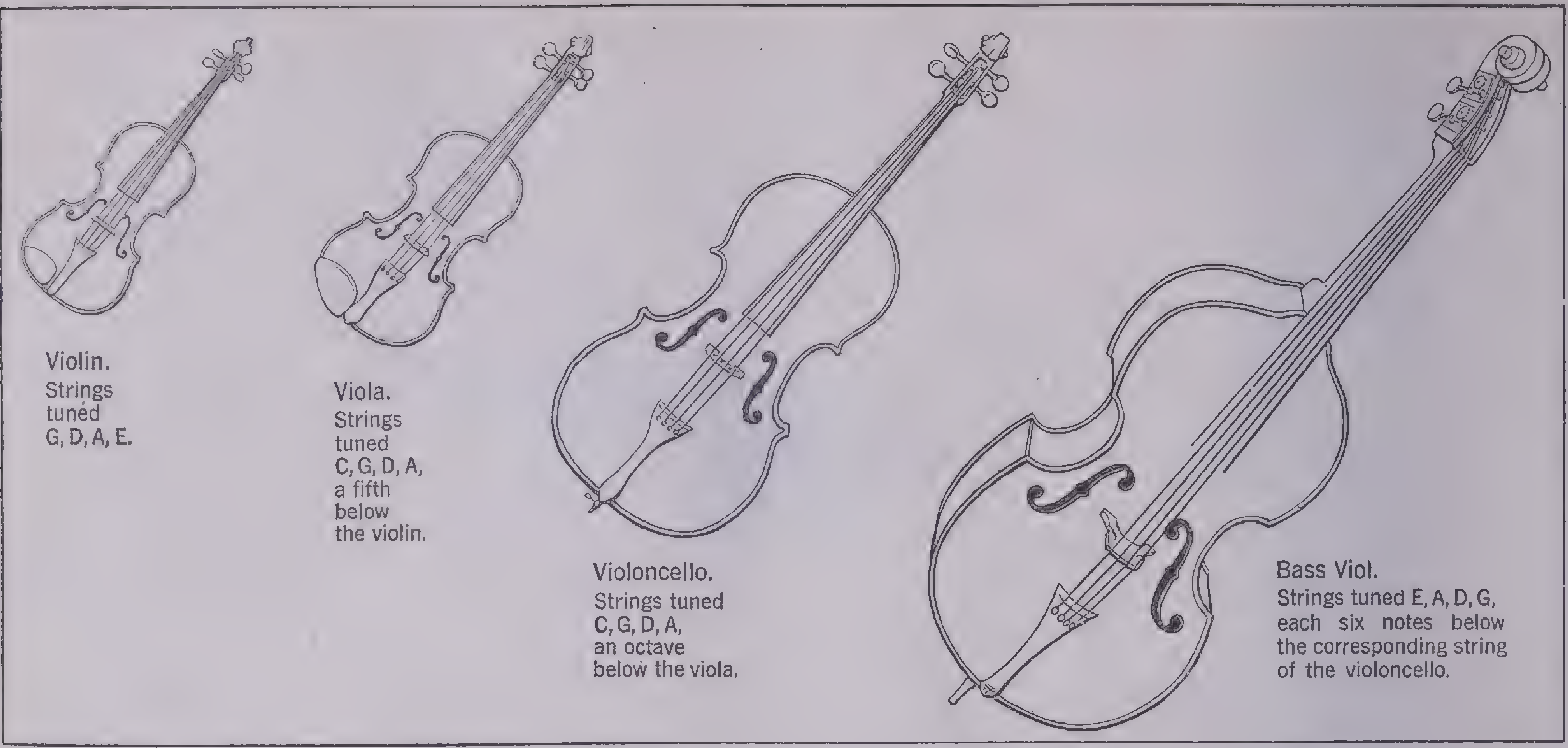
Rondo (It.) (ron'dō), a vocal or instrumental composition in which the first strain recurs after each of the other strains.

Root, called also fundamental note, generator and ground note. The lowest note if the chord is in its natural position, but some other if the chord is inverted.

Round, a composition in which several voices starting at stated distances of time from each other, sing each the same music, the combination of all the parts producing correct harmony.

Rubato (It.) (ro͞o bä'tō), literally, robbed; some notes are held for more, and others for less than their strict duration.

Run, a rapid succession of notes.


Violin.
Strings tuned G, D, A, E.
Viola.
Strings tuned C, G, D, A, a fifth below the violin.
Violoncello.
Strings tuned C, G, D, A, an octave below the viola.
Bass Viol.
Strings tuned E, A, D, G, each six notes below the corresponding string of the violoncello.

Courtesy Rudolph Wurlitzer Company; G. Schirmer, Inc.

Important Stringed Instruments of the Orchestra

Other stringed instruments often used in orchestral compositions are the *piano* and the *harp*.

Saraband (sar′*a* band), Spanish dance of Moorish origin, for a single performer, who accompanies himself with the castanets, in triple rhythm.

Saxhorn (saks′hôrn), a group of brass wind instruments made in seven different keys.

Saxophone (sak′sō fōn), a wind instrument with a clarinet mouthpiece and a bent conical tube of metal with finger keys; it is made in six sizes. The saxophone and the saxhorn were the inventions of Adolph Sax. The former is an important instrument in jazz orchestras and military bands.

Scale, a ladder; a series of tones ascending by regular intervals, and descending, usually in the same order. The interval scheme of the modern scale is the octave. The standard and most common form is called *major*. The three *minor* scales are the *normal, harmonic* and *melodic*. Another variant form is the *chromatic*.

Scena (It.) (shā′nä), the largest vocal solo form, usually part of an opera, but sometimes an independent composition.

Scherzo (It.) (sker′tsō), literally, jest; instrumental composition of a humorous, playful or whimsical character.

Schottische (Ger.) (shot′tish), literally, Scotch; a slow dance of modern introduction, written in 2/4 time; the music for such a dance.

Score; a copy of a musical work in which all the component parts are shown, either fully, or in a compressed form.

Second, the interval between a fundamental tone and the next diatonic tone above.

Secondo (It.) (sā kōn′dō), second; as *violino secondo*—second violin.

Semitone, a half a tone, or an approximate half a tone.

Sequence (Eng.) (sē′kwens), the recurrence of a harmonic progression or melodic figure at a different pitch or in a different key to that in which it was first given.

Serenade (Fr.) (ser ē nād′), originally a vocal or instrumental composition for use in the open air at night, generally of a quiet, soothing character; now any composition of that general character.

Seventh, the seventh diatonic tone above a fundamental; the interval between a keynote and the seventh step.

Sextet (seks tet′), a composition for six voices or instruments; the performers of such a composition.

Sforzando (sfôr tsän′dō) or **sforzato** (sfôr tsä′tō), emphasis upon a certain note or chord, marked *sf*. or (∧) or (>).

Shake, an ornament produced by the rapid alternations of two notes, either one tone or a semitone apart, as the case may be. The sign of the shake is *tr.*, the first two letters of the word trillo placed over the chief note.

Sharp, the sign (♯) which raises a note one semitone above the normal or natural pitch; above the proper pitch, as one sings or plays sharp.

Signature, the signs placed at the commencement of a piece of music. There are two kinds of signature, the time-signature and the key-signature—the latter requiring a clef to show the pitch.

Sixth, Chord of the, the first inversion of the common chord; it consists of a note with its third and sixth.

Slur, a curved line placed over notes directing that they are to be played or sung legato.

Solfeggio (It.) (sol fej′ō), a singing exercise in which a single vowel or the syllables do, re, mi, fa, sol, la, si are used.

Solo, alone; as *voci soli*—voices alone.

Sonata (It.) (sō nä′t*a*), an instrumental composition made up of three or four movements in different though related keys and in different forms and moods. The word *sonata* originally meant something played, as contrasted with cantata, something sung. Sonatas have been written not only for the piano but for almost every other instrument in combination with it. A *string quartet* is a sonata for two violins, a viola and a cello. An *overture* is only an orchestral work based on the same form as the first movement of a sonata. A *concerto* is a brilliant sonata for some instrument, as piano or violin, with orchestral accompaniment. A *symphony* is simply a sonata for the full orchestra with the enlargements natural to the enlarged resources.

Sonatina (It.) (sō nä tē n*a*), a short sonata. One in which the subjects are not developed at length.

Song, a short poem intended for music; a musical setting of a short poem or portion of prose.

Soprano (It.) (sō prä′nō or sō pran′ō), the highest kind of female or boy's voice; also the singer possessing that voice.

Sotto Voce (It.) (sōt′tō vō′chā), in an undertone.

Space, the degree or interval between two lines of the staff.

Stabat Mater (Lat.) (stä′bät mä′tĕr or stā′bat mā′tĕr), a well-known Latin hymn on the Crucifixion, sung during Passion Week in the Roman Catholic Church.

Staccato (It.) (st*a* kä′tō or stäk kä′tō), detached; taken off; separated. Sometimes a dot over a note is called a staccato mark, but it is more properly the sign of a spiccato.

Staff (ståf), the five horizontal lines, on and between which music is written.

Stop, the pressure by the fingers of the strings upon the finger board of a stringed instrument; a fret upon a guitar or similar instrument; a collection, register or row of pipes in an organ.

Strain, a musical subject forming part of, and having relation to, a general whole; a complete period, its close being indicated upon the staff by a double bar.

Stringed Instruments, musical instruments in which the tone is produced by the vibration of strings. The violins, violas, violoncellos and double basses are the strings of the modern orchestra. Stringed instruments are divided: (1) strings plucked by the fingers—harp, guitar, etc.; (2) strings struck by plectra—mandolin, zither, etc.; (3) strings vibrated with a bow—violin, violoncello, etc., and (4) strings struck with hammers—piano, dulcimer, etc.

String Quartet, music written for four stringed instruments, usually two violins, a viola and a cello; the performers of such music.

Style, character; form or temperament of music with reference to the result of individual influence; the conformity of music to the purpose for which it was written; the conventional or national method of performance, or its construction.

Subdominant (sub dom′i nant), the dominant below; the fourth tone of the diatonic scale, which is in the same relation to the keynote from below as the dominant is from above.

Subject, the theme or principal phrase of any movement from which all the subordinate ideas spring or are developed.

Submediant (sub mē′di ant), the sixth of the scale.

Subtonic, the seventh tone of the diatonic scale.

Suite (Fr.) (swēt), a set; series, or succession of movements in music; a large orchestral composition consisting of a series of movements in any one of a number of forms and in different keys; sometimes a collection of distinct compositions.

Supertonic, the tone one degree above the tonic in the diatonic scale.

Suspension, the holding or prolongation of a note in any chord which follows, thereby often producing a discord or dissonance which is resolved by moving the discordant tone into the chord tone which it had displaced.

Symphony (sim′fō ni), a composition for an orchestra, similar in construction to the sonata, which is usually for a single instrument. See *Sonata*.

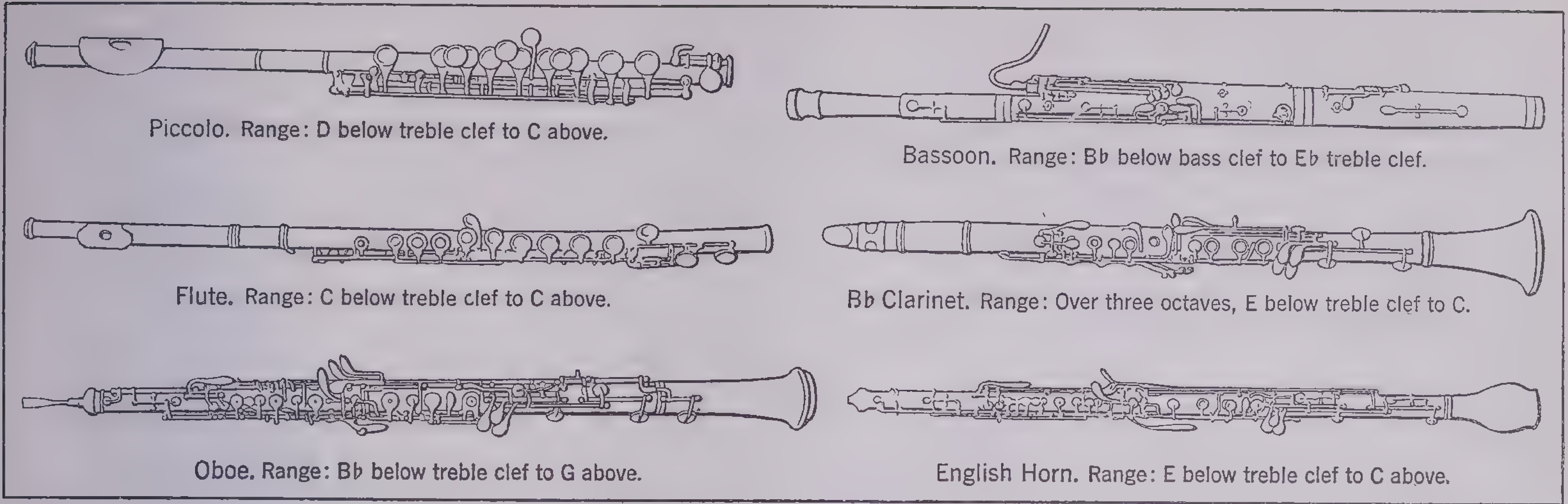
Syncopation (sing ko pā′shun), suspension or alteration of rhythm by driving the accent to that part of a bar not usually accented.

Tambourine (tam boo rēn′), percussion instrument similar to a small drum, often used to accompany dancing. It consists of a hoop of wood or metal about two inches deep with a covering of parchment; jingles are attached to the frame. The tambourine is held in the left hand and struck by the right.

Tarantella (It.) (tar′an tel′*a*), a rapid Neapolitan dance in triplets, so called because it was popularly thought to be a remedy against the supposed poisonous bite of the tarantula spider. Others say that the bite of the spider causes this delirious dance, which ends fatally.

Technic (tek′nik), technique.

Technique (tek nēk′), manner of execution; musical skill.



Piccolo. Range: D below treble clef to C above.

Bassoon. Range: B♭ below bass clef to E♭ treble clef.

Flute. Range: C below treble clef to C above.

B♭ Clarinet. Range: Over three octaves, E below treble clef to C.

Oboe. Range: B♭ below treble clef to G above.

English Horn. Range: E below treble clef to C above.

Courtesy Rudolph Wurlitzer Company; G. Schirmer, Inc.

Important Wood-Wind Instruments of the Orchestra

The *alto clarinet* and the *bass clarinet* are other wood-wind instruments often used in orchestral compositions.

Tema (tä'mä), theme; subject.

Tempo (It.) (tem'pō), time or measure; the rate of speed at which a composition should be played. Indicated at the beginning by such terms as *tempo rubato*—robbed or stolen time; *tempo di marcic*—in marching time.

Tenor, the third of the four kinds of voices arranged with regard to their compass; a musical instrument, the range of which corresponds to the high male voice.

Tetrachord (Gr.) (tet'*ra* kôrd), a scale-series of four notes; half an octave.

Theme, one of the divisions of a subject in the development of sonata form; the *cantus firmus* on which counterpoint is built; the subject of a fugue; a simple tune on which variations are made.

Theremin, a musical instrument invented in 1920 by the Russian electrical engineer and musician Professor Leon Theremin (b. 1896). The instrument is based on the principle of high frequency oscillations produced by electronic (radio) vacuum tubes. It is played by movement of the hands and fingers in free space without touching anything, through the electrical capacity influence of the human body on two metal rods attached to high-frequency circuits. The right hand, through approach to the vertical rod, controls the pitch, while the left hand through raising and lowering toward the locklike bent rod, controls the volume. The Theremin produces a sound similar to the singing human voice, string-bow instruments or wind instruments, depending on the character of the movements of the musician's hands. The usual range is four and one-half octaves. About 1,000 of the instruments have been distributed by the Radio Corporation of America.

Thesis (thē'sis), the downward wave of the hand to denote the absence of accent.

Tie, a curved line placed over two or more notes in the same position on the stave, indicating they should be played as one.

Timbre (Fr.) (tim'bẽr or tan'br'), literally, texture; the quality of tone or sound.

Time, the rate of speed at which a piece of music should be played.

Timpani (tim'pa nē), see *Kettledrums.*

Toccata (It.) (tō kä'*ta* or tōk kä'tä), a prelude or overture; a composition for the organ or harpsichord, popular in the 16th century, free in style, resembling the cappriccio.

Tom-tom (tom'tom'), a Chinese gong; a percussion instrument used for producing harsh effects.

Tone, sound; quality of tone; a sound whose vibrations are sufficiently regular to give it a definite pitch.

Tonic Sol-fa, a letter system of notation, and of teaching vocal music, employing the syllables *do, re, mi, fa, sol, la* and *si,* with modifications for sharps and flats.

Touch, the resistance made to the fingers by the keys of a pianoforte or organ; the peculiar manner in which a player presses the keyboard, whether light, heavy, firm, etc.

Transition, a modulation; a passing; a change from one theme to another.

Transposition, a change of key; an inversion of parts in counterpoint.

Treble, the highest vocal or instrumental part, sung by women or boys, or played by violins, flutes, oboes, clarinets or other instruments of acute tone.

Treble Clef, the G clef on the second line of the stave used for treble voices and instruments of high and medium pitch, such as flutes, oboes, etc.

Tremolo (It.) (trem'ō lō), the rapid repetition of a note or chord which produces the effect of trembling or quivering; the stop of a pipe organ, which, when brought into use, causes the tones to tremble or flutter.

Triad (trī'ad), a chord of three notes; a common chord composed of a fundamental tone and the third and fifth above.

Triangle, a percussion instrument consisting of a bent piece of steel shaped like a triangle. It is struck with a steel rod and gives out a clear bell-like tone.

Trill, see *Shake.*

Trio (trē'ō or trī'ō), a composition for three voices or instruments; a part of a minuet, march, etc.

Triplet, a group of three notes performed in the time of two. The triplet is always indicated by a slur and the figure 3. ($\overset{\frown}{3}$).

Trombone (trom'bōn), a brass wind instrument consisting of a long cylindrical tube bent back upon itself; its tubes slide into each other, contracting its length and regulating its tone. The voice of the trombone is of great majesty and beauty and adds dignity and solemnity to the full orchestra.

Trumpet (trum'pet), a brass wind instrument consisting of a long twice curved metal tube ending in a bell. Tone variations are secured by the force of blowing and by means of finger holes and keys. The trumpet is the highest voice of the brasses. Its noble, brilliant tone quality is one of the most penetrating in the orchestra.

Tuba (tū'b*a*), a brass wind instrument resembling a large horn and with from three to five valves. The tuba is the bass of the brasses, giving impressive strength to the brass choir.

Tuning, the adjustment of the sounds naturally produced by any instrument to some standard pitch and to their proper relation to each other.

Tuning Fork, an instrument of steel with two prongs, which, when set in vibration, gives out a musical sound varying in pitch according to the thickness of the metal or the length or width apart of the prongs; useful as a standard of pitch in tuning musical instruments.

Turn, an embellishment following a note, which consists of rapid alternation between the principal note, the note a step above and the note a half step below, indicated by the sign (∽).

Tutti (It.) (tōō'tē), all; the whole, as *tutta forza*—the full power or force.

Ukelele (ū ku lā'lē), the Hawaiian adaptation of the guitars and mandolins brought to the South Seas by Spanish and Portuguese sailors. A miniature guitar in shape, the tiny metal strings of the ukelele are capable of many new and interesting chord combinations.

Unison, having the same number of vibrations; identical in pitch; another name for the interval *prime.*

Variations, certain modifications with regard to the time, tune and harmony of a theme proposed originally in a simple form.

Verse, those portions of an anthem or service intended to be sung by a single voice to a part; a separate stanza of a song or a ballad.

Vibrato (It.) (vē brä'tō), a tremulous quality of tone as opposed to a pure equal production.

Viol (vī'ul), a stringed instrument, shaped like the violin but of larger size.

Viola (vē ō'l*a*), a tenor violin, slightly larger than the violin, but tuned a fifth lower. Its tone is not as brilliant or penetrating as that of the violin, but possesses a lovely quality.

Violin (vī ō lin'), a four-stringed instrument of the viol class, played with a bow. The violin has the first place in the orchestra. It is divided into two groups; the second violins play the second soprano or contralto voice to the first violin.

Violoncello (vē ō lon chel'ō), a stringed instrument, the modern Viola da Gamba. It has four strings and is played with a bow. The cello is tuned in fifths like the viola, but an octave lower in pitch. In the string quartet the cello serves as the bass; in the orchestra it is used as the baritone, and sometimes as the tenor. Its tone is more like the human voice than any other instrument. Violoncello is commonly shortened to *cello.*

Virtuoso (It.) (vûr chū ō'sō), a skilled performer on some particular instrument, especially the violin.

Vivace (It.) (vē vä'chā), quickly; sprightly.

Vocal, for or by the voice; music intended to be sung.

Voice, sound produced by the vocal organs in singing or speaking; the faculty of uttering sound.

Voicing, the regulation of the tone and power of an organ pipe.

Volume, a term applied to the power and quality of the tone of a voice or instrument, or of a combination of sounds.

Voluntary, an organ prelude; an organ solo played before, during or after an office of the Church.

Waltz (wôlts), a round dance in triple rhythm, performed by couples whirling around and advancing around the room; music in the rhythm of this dance.

Whole Note, the longest note in common use. Shorter notes are timed as parts of the whole note.

Whole Rest, a rest equal in duration to a whole note.

Whole Step, a major second; the interval between a fundamental tone and the next diatonic tone above.

Wind Instruments, in the modern orchestra the wood-wind and brass-wind instruments (*q.v.*).

Wood-wind Instruments, in the modern orchestra the flute, oboe, bassoon and clarinet.

Xylophone (zī'lō fōn or zil'ō fōn), a percussion instrument consisting of strips of wood graduated to produce the diatonic scale. They rest on belts of straw or felt and are struck by hammers held one in each hand. The primitive African xylophone, also its modern form, is called the marimba.

Zither (zith'ẽr), a stringed instrument, a descendant of the cithara of ancient Greece. The zither consists of a flat box, which lies on a table. Across this are stretched five metal strings which pass over frets. The melody is played by a plectrum attached to the player's right thumb; this plucks the string as the tones are stopped by the player's left hand. In addition to the five melody strings there are from 25 to 40 open strings; these are played as an accompaniment to the melody, being struck harp-fashion by the fingers of the right hand.

FURNITURE

A chair is a rest for the body when it is seated. A bed is a rest for the body in repose. A table is space for work. A cabinet is space to put things in when they are not in use. Some practical persons argue that improving ideas of usefulness and comfort gradually changed and multiplied the shapes of these first pieces of furniture, and so determined the history of all furniture design. Thus the matter might be dismissed if furniture had not been closely associated with the fine arts of all periods, if the habit of beautifying useful objects had not been common throughout human nature at all times. Domestic objects, especially, have been wrought age after age with loving care and skill. They are records of the manners and customs, and the taste, of the generations who used them. They belong to the art of the world. We might have attractive homes without taking the trouble to learn much of the history of furniture design. But that study is a part of a cultured person's background and is the basis for a developed taste in home decoration. It is best approached as a development of architectural and decorative influences.

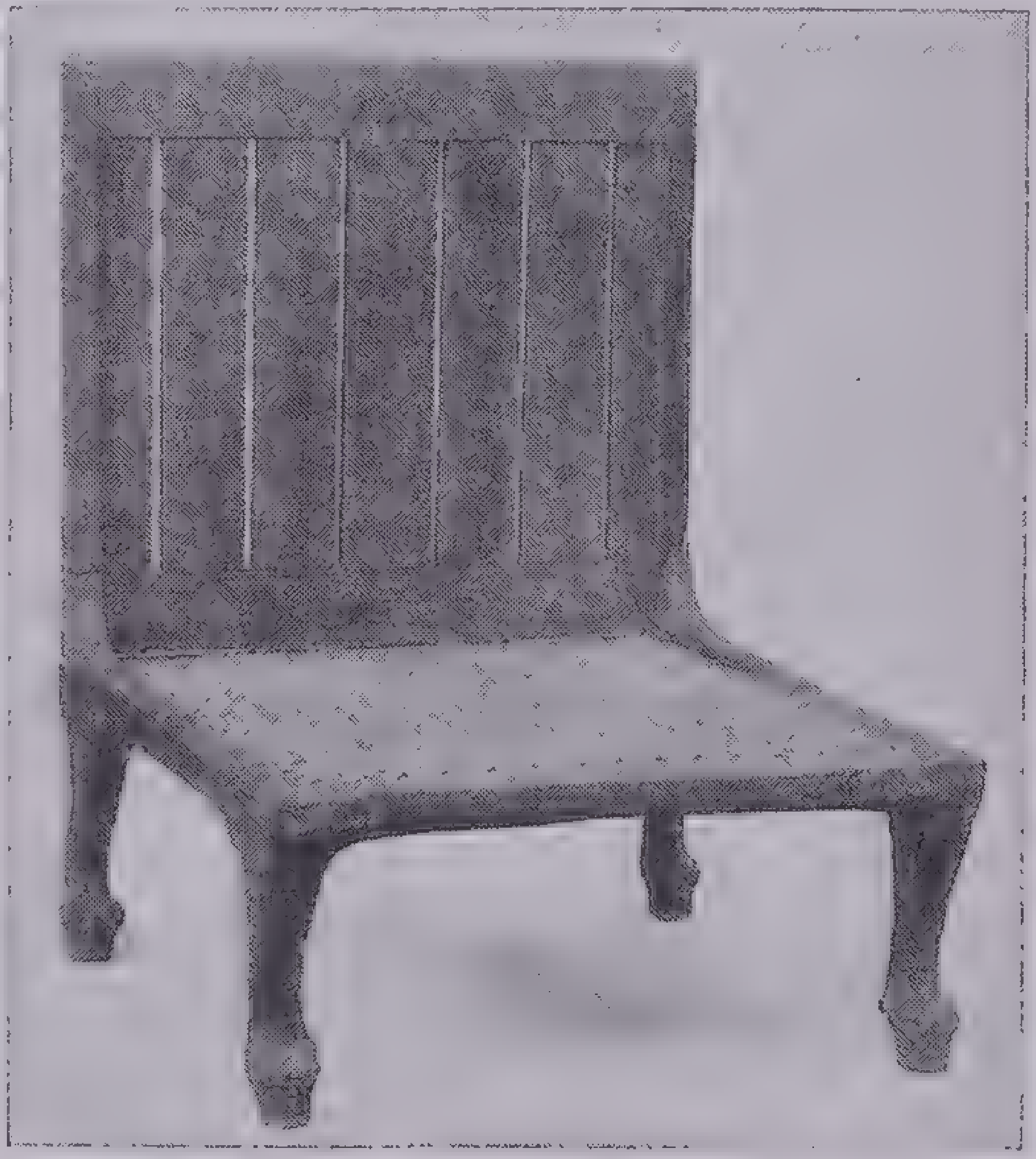
Development of Furniture

Egypt.—Egypt mothered many of the arts, and to Egypt we are indebted for the first light thrown on furniture making. The dry air of Egypt has preserved material that gives us a fairly adequate idea of early Egyptian furniture. Excavations have brought to view examples of household equipment constructed of stone, metal and wood. Because the Egyptians believed that the souls of the dead would be aided in a future state by the presence of familiar objects of this life, burial places were filled with domestic furniture and utensils indicative of the rank, position and wealth of the deceased. In the tombs of kings have been found chairs, couches and tables made of ebony, cedar and sycamore and sometimes ornamented with horn, ivory, silver and gold.

The art of the Egyptians is symbolic, formal and full of restraint and vigor, at its best. Although largely derived from natural forms, it is highly conventionalized, stylized and refined. Motives common to much of the art, architecture and furniture are the lotus, the palm and the papyrus. Other important symbols are the scarab, the asp and the ram. Mythical figures with wings are seen in all the decorative arts, as are borders of frets, circles, triangles, scrolls, leaves, buds and flowers.

Our knowledge of this remote age which began at least 30 centuries before Christ, has been greatly increased by the careful representations of domestic life and of the processes used in all sorts of industrial occupations, painted on walls, carved in friezes and illustrated in ink drawings on papyrus scrolls. Most of our large museums contain originals or reproductions of these pictorial histories from tomb or palace walls, and with them sometimes actual furniture and useful objects. There is a chair in the Cairo Museum that was taken from the tomb of a prince of the 18th Dynasty (1580–1350 B.C.). It is made of redwood, with a seat of woven cord, and has decorations in colored plaster. Like bedsteads and chests of the same great age seen in some American museums, it is remarkably akin to the design of our time. Through such survivals we know more about the life and the handicraft arts of ancient Egypt than of the life and art of peoples to whom we are more closely related in time and space, for example, western Europe in the Dark Ages.

Mesopotamia.—In Mesopotamia, the legendary cradle of the race, archeological explorations have revealed a buried city with art objects and jewelry, household utensils and decorations in perfect condition. This city was built by the Sumerians 500 years before previously known history. Musical instruments and game tables, bowls and wall friezes have been uncovered as fine as the rare Egyptian work and not unlike it. In these two places, Sumeria and Egypt, the connected story of civilization began.



Courtesy Metropolitan Museum of Art

Egyptian Redwood Chair

Made hundreds of years before the birth of Christ, this chair has the appearance of modern furniture

The land known as Sumeria became Babylonia, and Assyria too is in the Mesopotamian region. We have Bible stories of these countries, their kings and palaces, feasts and furniture. We know of the barbaric splendor of Assyria's red and gold ornaments, of the warlike and vainglorious pursuits of old Assyrian kings and of Babylon's parks and palaces. The palace of Nebuchadnezzar was surrounded by the famous hanging gardens that were one of the Seven Wonders. Many of our museums have sculptured friezes from the walls of those Mesopotamian palaces and domestic objects of stone and marble. Babylonian and Assyrian design is cruder than that of the Egyptians and it is not as well preserved by the climate. Animal forms are used with symbolic meaning; the bull, the lion and the griffin predominate and often have human faces. The kings are sometimes shown as god-men, warlike in Assyria and engaged in hunting pursuits in Babylonia. Animallike or godlike winged men are seen on objects of use, even on the domestic utensils that survive.

Among the Greeks.—The Greeks were the first to make beauty a way of life. The Egyptians had made their finest furniture and ornaments for tomb chambers and for use in some afterlife, but the Greeks thought only of making objects that should be both useful and beautiful in everyday life. The Greeks utilized to a certain extent motives used by the Assyrians and the Egyptians and purified their forms in a new development that gave the modern world its conception of proportion, order and beauty. The anthemion or honeysuckle, the laurel and acanthus occur frequently in decoration, together with borders known as the *egg-and-dart fret, guilloche, Greek-key scroll* and *dentil.* Our knowledge of this period and its domestic and industrial history is relatively complete. Through the study of Greek vases and their well-painted scenes, we gain much light on manners, customs and costumes. Down the centuries we have made intermittent use in interior architecture of the classic Greek motives. In the Greek theater of Athens, itself the model of some of our finest outdoor auditoriums, there are stone chairs still in place in the section reserved for personages of high rank. With the wooden chairs of ancient Egypt, these might have furnished the pattern for the first objects of their kind which were made by fine craftsmen for general domestic use in the modern eras.

Roman Ideals.—Carving, inlaying, veneering, sculpture, mosaic work and gold, made Roman art ornate and overdecorated. Greek forms and Greek ornament lost their characteristics of order and simplicity. Wreaths, festoons, garlands and emblems of wars and the chase were often so elaborate that the architectural character of interiors and furniture was lost beneath them. Where Roman and Greek ideas were fused, as in the city of Pompeii, unearthed in the 19th century, interiors and ornaments were finest. When Napoleon I remembered "the glory that was Rome," he ordered furniture designed after the forms used by the Caesars. The style that he thus established is not called Roman but *Empire.* The *curule* chair and the beds and divans still made under the influence of the Napoleonic period are our most notable inheritance from the Roman Empire.

East Meets West in the Arts.—Rome fell in 476 A.D., and from that date until the great age of cathedral building set in the story of art in the Western world is a story of the influence of Oriental ideals and especially of the

Byzantine art of the Eastern Empire.

This Byzantine art was the art of Europe during the great period when it was being Christianized and was submitting to the ideas of form and color that flowed in from eastward.

Romanesque art represents the turn of the current. Western ideas became vital and mingled more and more strongly with those of the East as churches, monasteries and communities grew up in Italy, France and England. It came first to Italy when builders revived engineering and architectural learning from the classic past and combined it with Byzantine styles. It developed later in countries to the north, where barbarian strains had come in and brought fresh kinds of design; and it was out of this later Romanesque design in France, England and Germany that the character of Gothic form first appeared.

Gothic Handicraft.—France and England are the important centers of Gothic art. The Romanesque style in decorative motives as well as in architecture made use of the tall, round arch form. Romanesque style gave place to Gothic style when builders learned the secret of pointing the arch and vault in support of buildings that rose high in the air. The religious enthusiasm of people, inspired by the Crusades and the attempts to win the Holy Sepulcher inspired new endeavors and new forms. Everything "reached towards heaven."

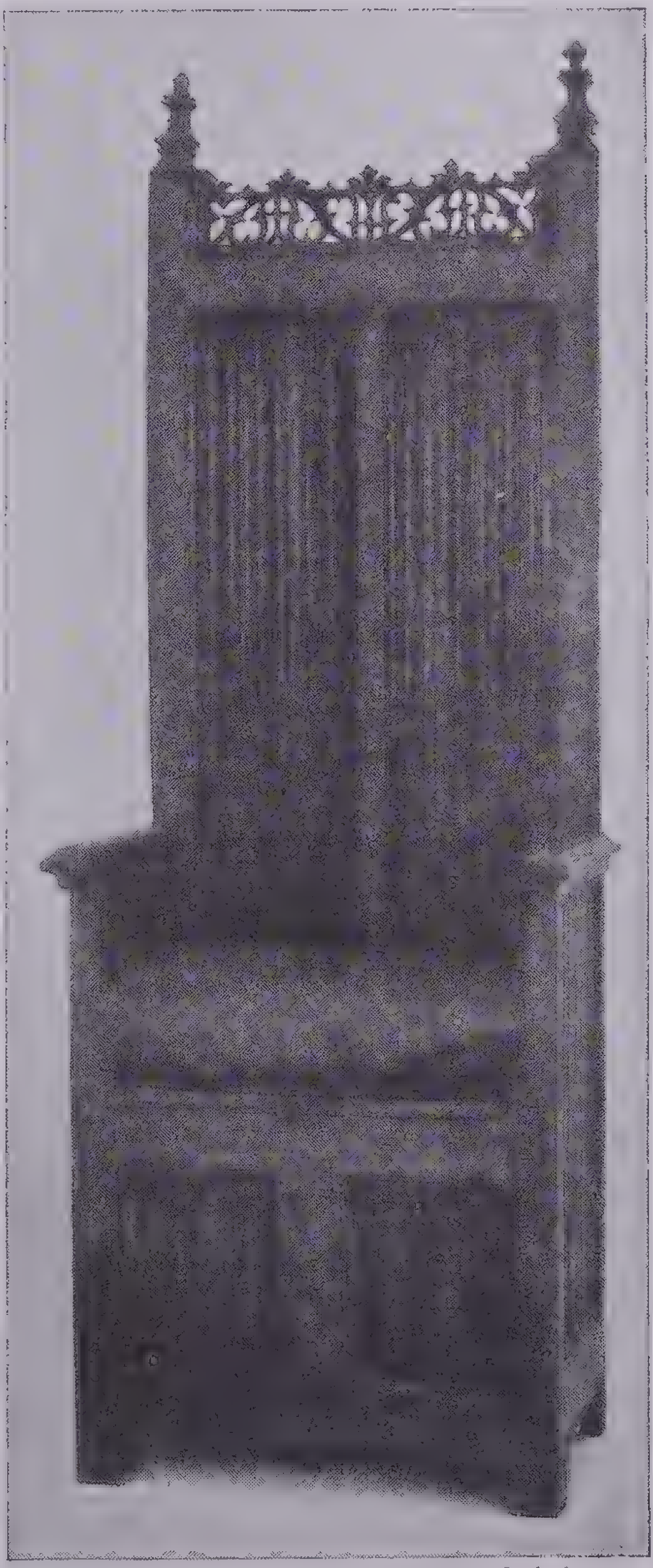
The leading decorative characteristics of the early Gothic style as applied to furniture designing were the pointed arch, the trefoil (three divisions), the quatrefoil (four divisions) and simple tracery. Furniture was massive, and Gothic motives were confined to ornament. Construction was at first little affected. The prominent features of the later Gothic style as expressed in furniture were the divided Gothic arch, the quatrefoil, the cinquefoil (five divisions) and an intricate scheme of tracery. The larger number of pieces in actual use at this period were chests of many varieties, cupboards, presses, stools, benches, chairs, bedsteads and bedstocks, the latter being built into the wall.

The Hall. During the 12th and 13th centuries, both in England and France, the hall was the main room in the house—in many cases the one room of the dwelling. In the homes of the nobility it was a lofty apartment that served the purpose of both kitchen and dining room and afforded the only living room. Meals were served on trestle tables. The lord and lady of the manor sat on a dais that elevated them a few inches above their guests.

Below the dais the long and narrow table was set with viands less costly than those served to the master and the mistress. Here were gathered the barons and the retainers. The placing of the salt divided the guests from the serving people, and the expression *below the salt* is one which has endured until today. On the dais were chairs with high backs and canopies. The canopies were convenient in case of rain, for the raftered roof was not always proof against the weather. Benches without backs for the guests and stools for the servants constituted the rest of the dining-room furniture. Between meals the tables were placed against the wall, and the chairs drawn to the fire. It is interesting to note in passing that as circumstances of a very different kind cause architects to devote almost the entire main floor of many modern houses to one big living room, trestle tables are again used. They are separated into sections and disposed around the walls between meals, as are the benches sometimes used with them.

The Drawing Room. The 14th century added another room in the home of the affluent—a *withdrawing* room—the beginning of our modern drawing room. Here the mistress of the house with her ladies in waiting could retire when the music from the minstrels' gallery became too loud, or the jester's jokes too broad, or the drinking and fun too boisterous.

The 15th century was an important milestone in the march of progress. By this time the Gothic hall had lost its early character. It was large and often a meeting place for the owner and his friends. There are interiors in houses of Colonial America built after the idea of the medieval great hall. A tavern on the Hudson River, used by Washington as his headquarters during one part of the Revolution and now a museum, still has the great open hearth in the middle of the room, without a chimney to carry the smoke through the roof. As rooms multiplied, the hall ceased in turn to be parlor, kitchen and dining room. It was gradually approaching the great entrance hall of the 17th and 18th centuries. It retained its fine proportions and its lofty dimensions, but the raftered roof had given place to a beamed or vaulted ceiling. The big fireplace had grown more architectural, though still retaining its generous hearth. The rough walls were replaced by oak panels and fine tapestries imported from Flanders, the home of the great medieval weaving centers.



Courtesy Metropolitan Museum of Art

Gothic Chair of 15th-Century France

The massive carved linen-fold back and low legless seat are characteristic of Gothic furniture

During this period, furniture was of two general types—movable articles that could be transported with ease and massive pieces that could be left behind with safety. It would be a bold thief who would try to escape with a heavily carved chair weighing several hundred pounds and made more unwieldy by a wooden canopy. In the same way the bedstead of the day was also quite immovable, for it, too, was well incased in wood and finished with a canopy. Both canopies had the same origin—namely, to protect the occupant from rain in case the roof should not be sufficient shelter. Though canopies survive in some bedrooms today, their practical necessity ceased when better building methods came into existence. When houses became watertight and airtight, furniture gradually assumed different aspects.

In the late 15th century, except in ecclesiastical chairs, the canopy was discarded. The evolution of the everyday chair form was completed. Flemish designers in the 16th century had an active hand in its further adaptation. They remodeled or revised the chair on new lines and sent it to England where, in the 17th century, it underwent other changes. It was the old Gothic craftsmen who took the crude pieces of the Dark Ages—the bench, the chest and the bedstock—and transformed them into things of beauty. In comparison with earlier efforts, they made these pieces of furniture articles of real comfort and convenience. Their constructive work was built for centuries rather than for years, yet the grace and charm of their carving, now almost as perfect as when it left their hands, still stand as models for the world.

The Renaissance in Furniture

Renaissance means a rebirth. The European Renaissance that came after the Middle Ages was marked by the energy and the creation that had resulted from the mingling of many races and strains and from a turning back to the Golden Age of classic antiquity for inspiration and for style.

Italian Renaissance.—The important city-states of Italy experienced the dawn of the Renaissance while Gothic inspiration was at its height in northern countries. Italy had no important Gothic Age but advanced direct into the newer expression from the Byzantine and the Romanesque styles that had developed more or less separately in the different principalities.

The Italian Renaissance falls into three distinct subdivisions, the *trecento* (1300–99); the *quatrocento* (1400–99) and the *cinquecento* (1500–99). The first century was one of beginnings. It produced the painter Giotto and was important for its fresh conceptions of painting and sculpture. The *quatrocento* witnessed an increasing return to Greek and Roman sources for design and decoration, and a climax of efforts which brought together in cathedral, palace or public hall the finest expressions of artist and artisan, who sought to achieve a new synthesis out of the combination of old and new motives, classic and modern details. This is a convenient period in which to observe a process active throughout history, the process by which architectural or other useful forms develop their decorations. The structural features and the ornaments associated together in any fixed style have not come into being at the same time. The Greeks had been developing their pure classical forms for ages before the decorative details we associate with them were fully developed. Specialists of this period or those who would be able to recognize the date of a piece of Renaissance furniture at a glance must pay particular attention to the persistence of medieval and even Byzantine decorations almost down to 1500.

From 1400 to 1500 the increased use of classical detail may be observed. This was the age of Brunelleschi, Leonardo da Vinci, Michelangelo and the great Medici patrons of art. Great art and great literature familiarize us with the influences which, in the *cinquecento,* brought the period to its culmination. The *cinquecento* in Italy felt the full influence of the Roman revival.

The Renaissance raised furniture making to an equality with the other industrial arts. Pupils were apprenticed to a master and studied with him until they had perfected their craft, after which they opened workshops of their own. The pieces produced in these great studios united beauty with utility. For the first time in Europe designs were made with reference to their setting. The furniture of the private dwelling no longer suggested cathedrals or abbeys. It was made with a careful regard for the needs of the owner, his station and manner of living. Thus houses possessed a harmony that had hitherto been absent.

French Renaissance.—The French Renaissance really began in the 16th century under Francis I and extended to 1643 through the reign of Louis XIII. The Renaissance had begun to extend northward, and now a lively competition arose among these three monarchs. They summoned to their courts the great architects, painters, sculptors, woodcarvers and metal-craftsmen of Italy and Flanders. Francis inaugurated the French Renaissance with its many important buildings and established a precedent of art patronage that in the succeeding centuries was equalled only once, when Louis XIV undertook the elaboration of the palace group at Versailles in the latter part of the 17th century. The reign of Francis at a more interesting period of the world's history and its art, from 1515 to 1547, represented extraordinary achievement. The combined reigns of the five succeeding monarchs completed the century and brought to a close the most important years of the French Renaissance. Of these sovereigns, Henry II and Henry IV alone were worthy successors to the great Francis I. They exerted a helpful influence on the fine and industrial arts and left much to testify to their taste and generosity. Each has been immortalized by a style named for him, the *Henry II* being the more celebrated.

Renaissance Details at first were combined with Gothic construction. It was not until the 16th century was well under way that the real force of the Renaissance was felt. France had been the birthplace of Gothic art and the transitional period was of longer duration than in Italy.

In the reign of Francis I, chairs became more varied in treatment. The cane design of Flanders was early adopted; the plain high Dutch chair became a favorite but was somewhat reconstructed. The French seem at all times to have been very much concerned about comfort, far more so than the English who were more or less indifferent to many of the refinements of life until the 17th century. And then it was by way of France that many minor comforts reached England.

As the 16th century advanced, French cabinets developed on high and narrow lines. Those of the Francis I period show carved panels, moldings and pilasters, but seldom anything ponderous—although at this time presses and armoires were built on heavy models. Distinctions between these pieces of furniture were always made in France, where subtle dividing lines were recognized. French furniture makers also made a distinction between designs for the *salon de famille* or family rooms and the *salon de compagnie* or rooms for more formal use, and this is the reason why so much French furniture that is brought to America is unfitted for modern living rooms.

Henry II in many ways did as much for France, artistically speaking, as Francis I. He did not build in the lavish way of his father, but two very clever women ruled his court, and each in different ways had a tremendous influence on the arts of the day. One was Catherine de' Medici, whose tastes were naturally Italian; the other, Diane de Poitiers, was easily the most remarkable woman of her time. Diane's emblem, the crescent, is found combined with Henry's monogram in one of the beautiful rooms in Fontainebleau. The chimney piece shows the early stages of the beautiful Renaissance pattern known as *strapwork,* a carved pattern of interlaced lines, so popular with workers in stone, wood and silver in both France and England. It is seen in woodwork, in furniture, in bookbindings and in the Oiron pottery that is known as *Henry II ware.*

By the time of Henry IV (Henry of Navarre) a good deal of the beauty of early Renaissance ornament had disappeared. The simple arabesques, seen to such charming advantage in the Francis I style, and the equally simple strapwork of the Henry II style lost favor with decorators and woodcarvers. In this period the shell ornament that was destined to play such an important part in the decorative arts of France for nearly two centuries came into great prominence.

During the reign of Louis XIII came many changes in domestic comfort. The upholstered chair in the modern meaning of the term came into existence. It was an armchair, and the seat was lower and broader than in previous periods; and the upholstery, instead of being any rich and sumptuous material that the designer of the chair could command or the owner happened to possess, was an especially selected covering so designed as to correspond with other chairs or harmonize with the wall treatment. Window draperies also were selected with great care and were more than a mere protection against air and sunlight. The age of *upholstery* had arrived.

Wall treatment received especial attention and was carried to a very elaborate point in France during Louis XIII's reign. Simon Vouet, who bore the same relationship to Louis XIII that his famous pupil, Le Brun was to bear to Louis XIV, was responsible for most of the florid decoration of the day. Furniture makers were always a little behind the decorators, and though many of the wall schemes of the day are too ornate from the modern viewpoint, at least the beautiful chairs, tables and cabinets are well worth studying. Flemish influence was strong in the early part of the 17th century, probably because Rubens had visited the French court.

Characteristics of the French Renaissance.—The Renaissance had matured in France much later, and through a longer transitional period, than in Italy. Gothic art had come first to France and had been firmly rooted there. The ornament of the French Renaissance was in a lighter vein than that of the Italian and was much more original in design. It followed the same path of development, culmination and decline. Delicate arabesques and pierced shields were used by furniture makers and decorators. Later in the 16th century woodcarvers combined an interlaced ribbon or strap ornament with the lozenge and the cartouche, and this was followed by the introduction of the shell and the ornate scroll. From that date woodcarving lost much of its charm.

Flemish and Dutch Renaissance.—The Renaissance reached Flanders and Holland tardily. Gothic traditions lingered in the north, and the long transitional period lasted well into the 16th century. Holland was more independent politically than Flanders, and her work was less influenced by outside conditions. This fact makes Dutch work comparatively easy of identification, while that of the Flemish, being more mixed, sometimes raises a question. Spanish and French influences are more often present in the early Flemish work. Charles, King of Spain and Emperor of Germany, was also Count of Flanders and Duke of Burgundy. The intercourse between these countries and provinces grew decidedly intimate at this period. The Italian Renaissance had waned when the Flemish Renaissance was at its height.

When Italian influence reached Flanders it came by way of France, with a strong mixture of French feeling added. When this complex influence was carried into England it had gained another element in addition to the Franco-Italian, and this is one reason why the English Renaissance swings so far from the classic. In the 16th century, particularly, English work showed far more Flemish influence than either French or Italian. In the 17th century it was more Dutch than Flemish in feeling and remained so until the pendulum swung once more toward French designs, this movement giving way to the Classic Revival of the late 18th century. This was the period in which English household furnishings reached a high standard of excellence in the matters of simplicity, elegance and grace. It was the period that was reflected in the finest designs for furniture and decoration in America—the late Colonial or mahogany period.

Flemish Furniture. Primarily the Flemings were carvers. They were less bound by classic traditions than the Italians and maintained a simpler mode of living. Heads of men and women decorate many of their pieces, particularly in such articles as cabinets, cupboards and sideboards, and where there are large expanses of wood to be covered. But paneling, ribbon bandeaux, garlands of fruit and flowers, strapwork and kindred things are more harmonious in a modern dining room or living room than masks, animal heads or the human figure, clever as they may be in execution. The *linen-fold* pattern, sometimes called the *parchment scroll,* is found in much of the Flemish furniture of the 16th century and is one of the simplest and best patterns of that day.

Many Flemish details exist in our everyday furniture, but we have long since accepted them as entirely our own. They do not suggest to the casual observer anything bordering on period styles and have come down through long years of transforming and adapting. Flemish furniture makers rebuilt the beautiful Gothic chair, lowering the seat as well as the back, and substituting horizontal braces for the heavily carved arched braces of the 15th century. Flemish chairs were of several varieties, but two types were prominent—the upholstered chair with turned legs and braces and the carved chair with a cane back and a cane seat.

Dutch Furniture. Marquetry and inlay were favorite Dutch methods of ornamenting furniture during the 17th century. *Inlay* and *marquetry* are often confused, but they are quite different in workmanship and appearance. Inlay is of ancient origin and is made by filling in a depression cut from the surface of the wood. The Italian word is *intarsia* from a word that means to insert. Marquetry is of Renaissance origin and is, in reality, an overlay, a thin veneer of different woods fitted together to form a pattern. When the veneer is applied to the surface of the cabinet or other piece of furniture it seems a part of the construction. In the hands of an expert, marquetry offers great opportunity for varied and colorful effects. Dutch craftsmen have achieved marked success in this field.

But the especial importance of the Flemish and the Dutch Renaissance is the effect it had in the furniture making of England; for by this time (late 17th century) American furniture was beginning its history.

German and Spanish Renaissance.—Two phases of the Renaissance, German and Spanish, belong to the twilight of the great Classic Revival on the Continent. In Germany there was a long transitional period during which the lingering traditions of Gothic art died slowly. The early phases of the Renaissance show the grafting of the new upon the old. This mixture of Gothic and Renaissance was less successful in Germany than in France.

The best examples of German woodcarving of the early 16th century were of ecclesiastical origin and were more sculptural than architectural. Choir stalls and altar pieces were richly decorated in the manner of the day. In domestic furniture the combination of Gothic construction and Renaissance ornament was less harmonious.

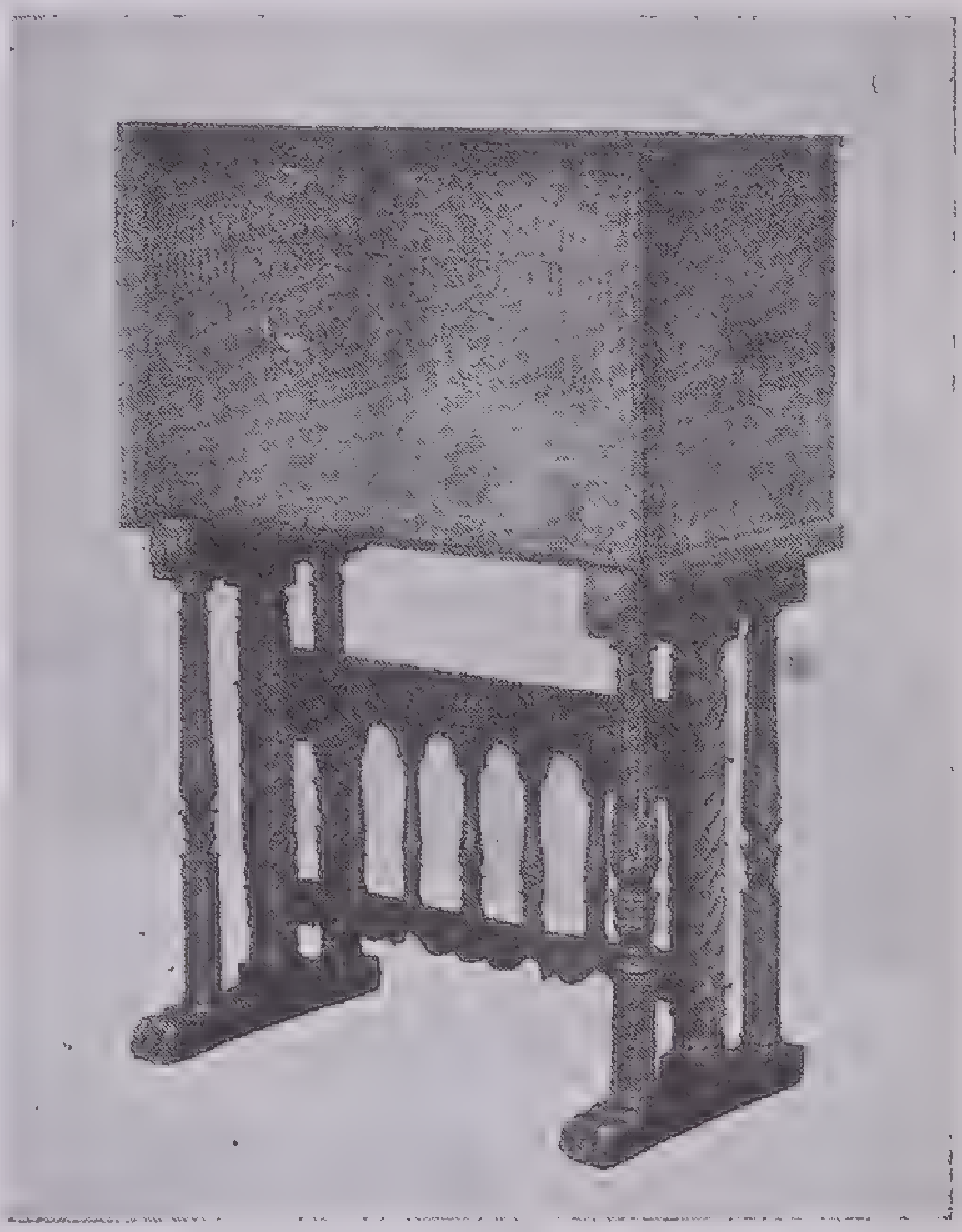
The great presses and cabinets are the most characteristic pieces. Made of oak and walnut with carved panels and heavy doors, they are as substantial today as when they came from the hands of their maker. The plain surfaces are well distributed and the ornament, although it is elaborate, is neither heavy nor fantastic. The lock is usually concealed in the carving, and the key repeats the lines of the ornament. The ball feet are worthy of note, as they indicate a new feature of furniture making.

From her oriental colonies, Spain imported ebony and ivory and other costly adjuncts to furniture making. The elaborate metal work that today is the most interesting part of a great deal of this furniture is Spain's most important addition to furniture design.

Damascening, niello work (inlaying of black alloys) and kindred crafts had long belonged to Spain, following closely on the Moorish invasion. In Granada, the medieval city of the Moors, were fashioned many of the most elaborate chests and coffers, and long after the Moorish expulsion from Spain Granada still remained the center of fine cabinetwork. The Gate of Justice and the Gate of Judgment in the Alhambra were ornamented with many of the same motives used in minor metalcraft work and woodcarving. This is mainly an art of arabesque, developed by a people whose religion forbade them to use animal and human forms.

The Spanish cabinet, elevated on tall turned or carved columns, was a characteristic piece. One type is quite plain, apparently, but the whole front lowers at the turn of a key and reveals an exquisite inlay of ivory and metals with ornamental bosses. There are many variations of this beautiful style. Iron is used most attractively at times, and the inlay includes bone, horn, shell and occasionally painted decorations.

The influence of the Flemish cane chair on the furniture makers of Europe has been mentioned. The leather chair of Spain equaled it in importance. Both had high backs and carved legs and braces, but there the resemblance ended. The Spanish design consisted of a sturdy frame of oak, chestnut or walnut, a back completely encased in leather, turned stretchers, a carved underbrace and hoof feet. English furniture makers of the 17th century gained inspiration from both Flemish and Spanish models in their famous Jacobean designs of wood and cane.



Courtesy Hispanic Society of America

Spanish Vargueño of the 16th Century

The elaborate bone inlay and carving on this walnut vargueño show the Moorish influence on Spanish furniture of this period. The vargueño is a cabinetlike combination of chest and desk. Like a secretary the outer covering opens out on two sliding horizontal supports to reveal a writing surface and an inner chest with many carved and inlaid drawers of various sizes. Some vargueños have secret compartments

The English Renaissance.—By the middle of the 17th century, French and Italian furniture, like the wall treatments of that day, became heavy and ornate. The vitality of the Renaissance in these countries had ended. It was the age of beautiful surfaces, but there was a growing insensitiveness to the values of art. Historically this effect has marked the decline of great styles, which may be seen to observe a cycle of developing forms, developing decoration, maturity and a period of decline in which surface effects are labored as the forms deteriorate.

When the classic wave reached England, it had gained and lost much on the way. There were French and Flemish influences—and English traditions too firmly planted to be uprooted.

Historic Periods. The characteristics of the 16th and 17th centuries in English designing may be summarized briefly:

First, the *English Renaissance* or *Tudor* style, which was a mingling of Flemish and Italian grafted upon Gothic.

Second, *Elizabethan,* showing greater unity. Strapwork and paneling were features of this period.

Third, *Jacobean,* covering nearly a century and including many types. Furniture was paneled and carved until the introduction of walnut, when veneer and marquetry became popular. Among Jacobean characteristics were the spiral leg, the rising panel and spindle ornaments. With the accession of William of Orange in 1688, Dutch influence prevailed, and English furniture was slowly developed on more graceful lines.

The English Renaissance, extending through the 16th and 17th centuries, a long period to sum up in a sentence, was nevertheless one that remained remarkably homogeneous through the era of international cross influences in Europe called *baroque.*

Queen Elizabeth was, of course, a Tudor, but gave her name to a style all her own. The term *Tudor* is usually applied to the reigns of Henry VII, Henry VIII and Mary. Elizabeth's long term ended in 1603 while Henry of Navarre was on the French throne. Her reign with that of the succeeding Tudors covered more than a century during one of the most interesting periods of style transition, an influence we still feel.

Strapwork is seen in many English cupboards of the late 16th century and also in chimney breasts and wall treatments. It is one of the most valuable contributions to design of the Elizabethan period and ranks with the linen-fold motive of an earlier day and with the rising panel of a later one.

Styles in English furniture were of slow growth, with much overlapping and intermingling. Of the kind noted during the Italian Renaissance, and it was not until Charles I ascended the throne that the popularity of certain Elizabethan patterns waned. Even then the outlines of furniture changed little. The court and livery cupboards were modified to suit a simpler scheme of carving; but oak was still the chief wood, and so long as it remained in use, massive furniture continued to be made. The Protectorate caused a break in the crafts, and by the time it was over and Charles II safely placed on the throne (1660), many new influences shaped and developed English handiwork.

Jacobean furniture is roughly divided into two parts—*Early* and *Late.* Early Jacobean preceded the Commonwealth, covering the reigns of James I and Charles I. Late Jacobean followed the Commonwealth, including the reigns of Charles II and James II. The Commonwealth or Protectorate period was too turbulent to be very productive of the arts and certainly produced nothing approaching a style, though the *Cromwell chairs,* simple in line, unornamented except by refined moldings, partly typify the spirit of the Protectorate.

After the Restoration, all English furniture became more graceful. Charles II had been brought up at the court of Louis XIV and quite naturally returned to England with French ideas of comfort and refinement.

The furniture of the Charles II period is worthy of its present revival. Designers of that period retained the best of the many motives bequeathed from the earlier part of the century and combined them with newer schemes. Paneling remained in favor but was diversified by nailhead and spindle ornaments.

The introduction of walnut brought about a decided change in English furniture. It made possible a lighter, more graceful construction and an entirely different scheme of decoration. Carving was largely superseded by marquetry, which was well adapted to walnut and to the Dutch designs which William introduced.

The William and Mary period is a brief but important link between 17th-century oak and 18th-century mahogany. During this period the revocation of the Edict of Nantes caused many Huguenots to take refuge in England. Some of them were of the craftsman class and readily found employment. This added another and very refined element in furniture designing.

Walnut was used during Queen Anne's time and continued in favor until mahogany was well established between 1720 and 1730. The cabriole or curved leg came into popular use in her day.

The Eighteenth Century

French.—When Madame de Maintenon wrote to a friend, "The king will have us buried in symmetry," she expressed characteristic features of the Louis XIV style. It was beautifully proportioned, formal, splendid, lacking in imagination and, from modern viewpoints, oppressively grand—like the monarch for whom it was named. The next Louis was to bury his court beneath ornament of gilt and paint before the balance swung back in the ill-starred reign of Louis XVI to a semblance of Greek simplicity and harmony.

Characteristics of Styles. French styles may be briefly characterized as follows:

Louis XIV was a formal rococo in which proportion and balance were the chief features. Important details were the shell, the classic acanthus, the ram's head, the mask and the satyr. In the early period, furniture was massive, and the designs of the Louis XIII style were perpetuated. Carving was largely displaced by marquetry and by chiseled mounts of metal. Boulle furniture belongs to this reign and is among the most valuable of the period. André Charles Boulle was a talented man; but his fame rests chiefly on a unique marquetry of tortoise shell and brass with which he ornamented furniture. Brilliant effects were obtained by lining the shell with color and by adding mounts of ormolu (a mixture of mercury and copper that gave brass the tone and texture of gold). Much French furniture of the time was thus embellished.

The period of French designing known as the Regency was the work of that brief time between the death of Louis XIV and the coming of age of Louis XV, when the duke of Orleans was Regent. It was characterized by extremes of ornament and is the least worthy of admiration of any of the French Periods.

In the Louis XV period balance and symmetry were less important in the eyes of the furniture makers than richness of ornament and flawless execution. Angles gave way to curves, and the talents of the goldsmith and the painter were employed in designing furniture that in workmanship and decorations have never been surpassed.

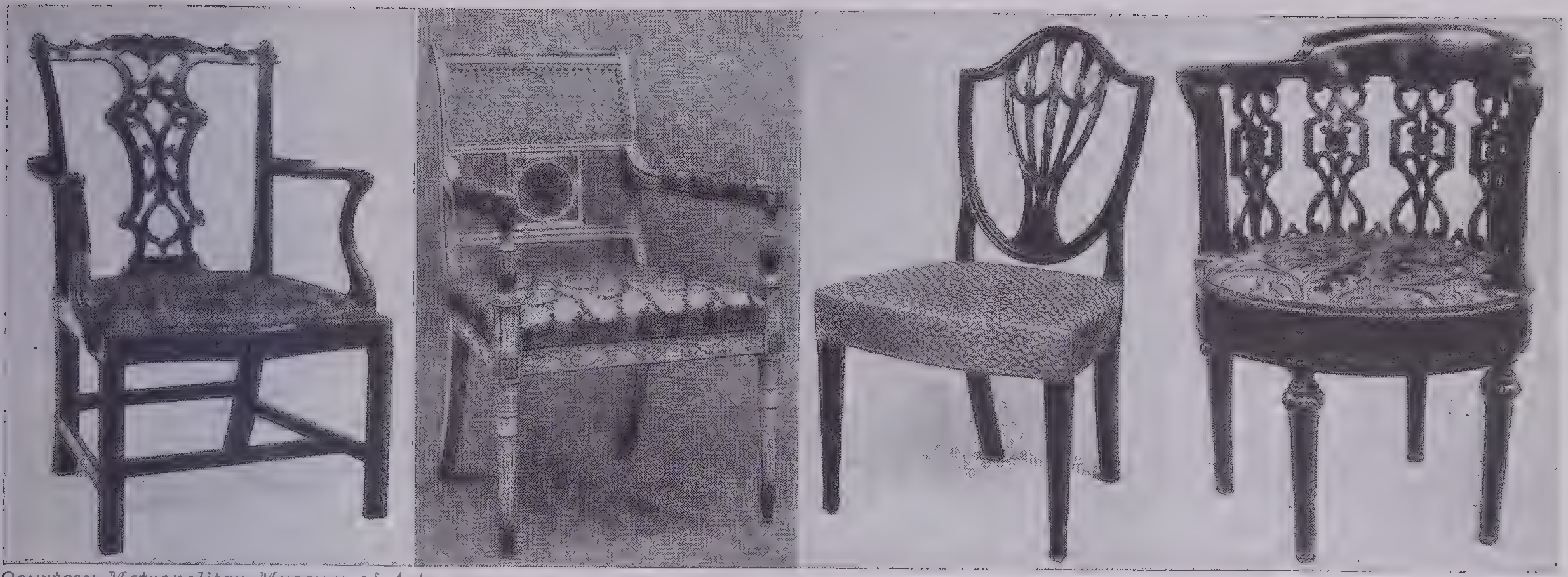
In the time of Louis XVI simplicity of construction and severity of ornament were dominant. Rococo details disappeared, and classic emblems replaced them. Important features were the fluted column, the bay leaf, the oak and the acorn, the bell flower or corn husk, the Greek band and the acanthus. Straight lines took the place of curves, and ornament was a means instead of an end.

The long reign of Louis XIV witnessed many changes and developments in furniture designing. The reign of the next Louis was briefer but long enough to make any one phase impossible; however, with Louis XVI the designing of the 18th century seems to have been crystallized. All the furniture of these three great epochs shows marvelous execution through extreme expressions of taste. Whether it be a Louis XIV cabinet, a Louis XV chair or a Louis XVI table, the workmanship is unsurpassed.

Metal played a very important part in many of the designs and added tremendously to their cost. All kinds of artists and craftsmen collaborated in furniture making. Furniture decorated with insets or porcelain, usually of Sèvres, formed one class of furniture; and fine upholstery of Beauvais and Aubusson were important accessories in the periods of both Louis XV and Louis XVI.

English.—In our devotion to English furniture of the late 18th century we are apt to overlook the rich legacy bequeathed to us by the early years of that century or to confuse it with other periods. It was a time of varied influences and designs, of many men working in many veins, of old ideas slowly giving way to new. It was full of picturesque vigor and of sturdy simplicity. Mingled traditions partly Dutch, partly Jacobean, persisted amid changing conditions.

The perpetuation of Dutch motives such as the cabriole leg and the web foot continued until the fourth decade of the century. The web foot or flat foot we find in most of the furniture of Queen Anne's time, and a charming adjunct it is to the designing of the day. Chippendale preferred the ball-and-claw foot that he used with distinction. He was one of the first English furniture makers to use the square leg and one of the first to adopt



Courtesy Metropolitan Museum of Art

Chippendale **Sheraton** **Hepplewhite** **Adam**

The four chairs pictured here are characteristic pieces by the great English cabinetmakers of the 18th century. The *Chippendale* armchair of mahogany (1760) has the straight legs and a pierced scrollwork back. The painted and gilded *Sheraton* armchair (late 18th century) belongs to one class of this designer's work. The *Hepplewhite* side chair of mahogany (*c.* 1780) has the characteristic shield back and tapering square legs. The *Adam* roundabout chair of mahogany (*c.* 1770) has the urn-shaped figures and rosettes frequently seen in the work of the Adam brothers

the curving French leg of the Louis XV period; but he clung to the cabriole in its various forms until about 1740.

Chippendale was the first English furniture maker to have his name perpetuated by a style. Celebrated designers had preceded him, but their identity is submerged in that of their sovereigns. Chippendale raised his craft to such a point of excellence that his own name became associated with it.

What furniture of the 18th century would have been without mahogany is difficult to fancy. It is impossible to imagine Chippendale's designs in oak, just as it is impossible to conceive the heavy furniture of the 17th century executed in mahogany.

The chairs and settees from the Chippendale shop in Martin's Lane comprised many different styles. Among them were the early Dutch types with ball-and-claw feet and plain splats and these same Dutch types with pierced splats. (Splats are the single central upright parts in a chair back, a simplification of other forms, such as the ribbon backs, of this period.) These two distinct backs were also combined with straight legs, and later there were other variations. The curved leg of the Louis XV style was a favorite with Chippendale but was usually combined with an elaborate back.

There were several distinct *ribbon* styles, a rather uncommon one having an intricate leaf pattern carved with the ribbons. After 1740 the Gothic manner and the Chinese taste fascinated Chippendale, and about 1750 he became extremely rococo. It is important to realize that these incursions of new influence from far times and places are usually connected with important contemporary events. The English porcelain of the time, like the Chinese Chippendale furniture, tells a story of British trade in the East. It is only in the 20th century that the decorative arts of the Far East began to be assimilated and used to good effect in the industrial designing of the Western world.

Chippendale's great point of excellence as an industrial artist was his ability to take the designs he found at hand and so improve them that they took on new life and meaning. He adapted more than he originated; and in the end he lent his name and trademark to much more furniture than he made or even designed.

The Late 18th Century. Thomas Sheraton, George Hepplewhite and Robert Adam are the names that stand out brightest in the roster of the late 18th century. Robert Adam studied in Italy, and when he returned home he brought with him skilled artist craftsmen. Sir Christopher Wren, influenced by classic architects, had already set the stage; the time had come for an important period of English furniture design true to the Renaissance spirit.

We recognize the urn and the oval rosette as Adam; and we recognize certain motives like the acanthus, the ribbon band, the arabesque and the garland as both Adam and Louis XVI. There is a great deal of similarity between the two styles. We find in the English style a greater slenderness and a totally different treatment of the wood. The Adam brothers used carving very sparingly; many of their finest pieces have not a trace of it. They also brought to perfection painted furniture, employing Angelica Kauffman and other skilled pictorial artists for the finer work.

Many secrets of color learned during the Italian Renaissance went into Adam furniture, as so much of it was painted by Italian artists. A charming light green is often seen; there is also a burnished gold which almost equals vernis Martin, the celebrated French varnish.

Cane Furniture was designed by Adam and is today the type most frequently reproduced by American furniture makers. The chair back is usually oval, and the cane webbing follows the lines of the frame. Adam preferred the round leg. Hepplewhite chose the square leg. Most of the Sheraton furniture in America has the fluted leg. In the sideboards especially, it is a characteristic feature.

Inlaid Work. By the last decade of the century, the fancy was no longer for mahogany of any kind. Inlaid furniture of satinwood and painted furniture of satinwood represented the taste of the hour. Many writers have credited to Sheraton the introduction of satinwood. If this is true, he gave almost as much to the Adam brothers as they gave to him.

Sheraton. Sheraton's furniture creations may be divided into three classes—carved, inlaid and painted. His sideboards and chairs come usually under the first head; his cabinets and tables (the latter found in great variety in England) to the second; and to the third belongs a large portion of the work he did for the Adam brothers, which is extremely scarce in this country. Some of his inlay has as much color as if it had been executed with the brush.

Hepplewhite. Hepplewhite made masterly use of heart- and shield-shaped motives. Most of his chairs have shield backs, but it was in his dressing tables and kindred articles that this motive is seen in his most charming guise. Hepplewhite lacked the sound craftsmanship of Chippendale and Sheraton's fine sense of proportion. He understood little of the use of wood and nothing of carving and inlay, and there was little variety in his design. He used the one heart or shield shape over and over. But he had a fine intuition of form, and his popular success was so great that finally he employed many men to help him. His reputation was so well established that after his death in 1775 his widow successfully carried on his business for years.

Chippendale still held his field in chairmaking. Sheraton's sideboards, cabinets, tables and bedsteads are very commendable. Hepplewhite's sideboards and tables are also greatly to his credit. To Sheraton we accord a grasp of proportion and a feeling for restraint that were not equaled in his generation. He approaches the ideals of our own day—simplicity, proportion and reserve. Chippendale produced a far greater variety of designs, because variety of design appealed to him and because he lived at a time when fashions in furniture were extremely diversified. The last quarter of the 18th century was a remarkably unified period in English design, a fact for which Robert Adam is principally responsible.

The French Empire.—The Empire style marked the last of the great historic periods in furniture and decoration. It coincided with one of those recurrent returns to the decorative storehouse of classic art, and it was classical in a cold and restrained way, reflecting the personality of Napoleon, the man so closely identified with it. The Revolution had brought chaos to the industries of France that had flourished under the old regime. Cabinetmakers and metalworkers suffered imprisonment or death by the guillotine. Napoleon was insensitive to art values, but he sponsored a revival of craftsmanship and style and organized great public exhibitions with the idea of a courtly art, as in the time of the Louis. Court artist, architect and celebrated craftsworkers of the period worked together to produce a vast unified style with the letter "N" prominently marked on each piece. State suites in European hotels still contain such pieces from the days of Napoleon. Perhaps the whole effort would have been more important to us today but for the fact that already new industrial methods had weakened the old handicrafts of the Louis. Yet no monarch of the old regime had so dominated a style.

Designers of Louis XVI's day had revived classical design and made it an expression of elegance and refinement, in the reaction that followed the overornate style of the preceding period. But Empire artists exceeded all past efforts in using it to the glory of one man. The laurel leaves of the preceding style were rearranged and twisted into a victor's wreath. The fluted column upheld a torch. Roman and Grecian emblems were used lavishly. The craze for the antique transformed the dress of the day. Statesmen wore togas, and court ladies donned the gowns of Greek goddesses to match their background. Architects, decorators and furniture makers were imbued with the spirit of the hour.

The chief characteristics of the Empire style are still to be seen in tawdry side-street shops of most great cities, shops devoted to pseudo-art furnishings. They were reproduced on thousands of badly conceived objects of use and decoration. The commoner motives were the wreath, the torch, the Roman eagle, the Athenian bees, the Greek fret and the honeysuckle. After the campaign in Egypt the sphinx was added to the medley and became a conspicuous feature in both furniture and decoration. Distinctive qualities of the furniture of the period are few and easily mastered. Constructively the plain column and the claw foot are the most salient features; decoratively the wreath and torch are most prominent. Marquetry was discarded, and plain surfaces were covered with ornamental mounts of chiseled metal. Chairs showed a square frame with a plain round leg.

In the plainer form the Empire style was full of dignity. It lacked the charm of the graceful Louis XVI style, but it had qualities of repose and stability that placed it far above some of its predecessors. One of the most interesting phases was the strong influence it exerted upon American furniture making of the early 19th century.

American Furniture

American furniture making described the same course as that of Europe. It differed in time and quantity; and new motives and materials gradually gave it a character of its own. Even when the new world craftsmen followed noteworthy English or French styles, they added stylemarks of their own. Today we value American Windsors more than those from England that provided the model; and we have Philadelphia Chippendale with its own unerring proportions and durable workmanship and its own fresh innovations of ornament.

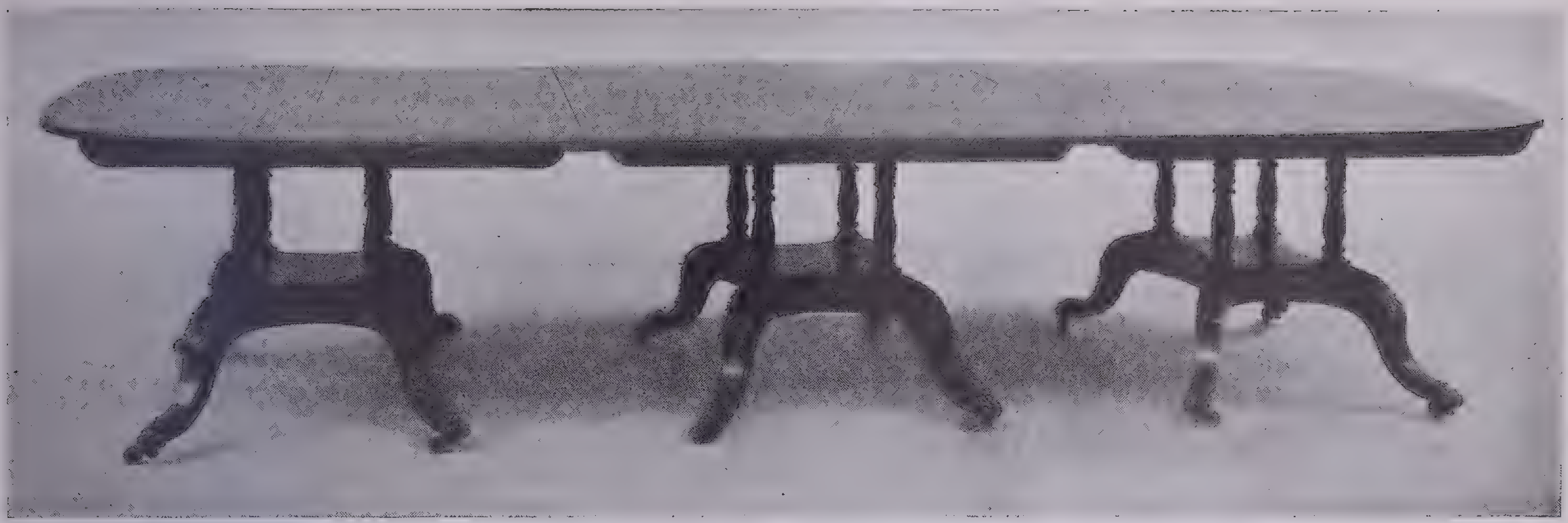
The demand for old furniture, which has been increasing since the end of the 19th century, has brought to light much more information about our native product than we had before. Names of gifted 18th-century craftsmen have come to light and have been added to those of the great English cabinetmakers of that century. Goddard, Savery, Gillingham, Gostelow and Randolph are among them. John Goddard's block-front desks made in Rhode Island and the Philadelphia lowboys from the hand of William Savery justly merit fame. Demand for American antiques, coupled with interest in native folk arts and primitive paintings, has led gradually to systematic examination of all available sources of New World design, and has tended to multiply the names of designers and the styles for which they are responsible. Cabinetwork long attributed to English masters has been reclassified on the basis of this fresh research, which is still going on.

Periods.—Classifications of work done by American furniture makers from the 17th to the mid-19th century vary with various experts and have lately been the subject of much reordering as public taste tends more and more to turn back to our national background for old motives and new inspiration. *Founders' Colonial, Georgian Colonial* and *American Republic* are adequate labels.

The pioneers brought sturdy oak furniture from their native lands and used it as models for the first crude pine and hickory products. Gradually the forms were refined, more kinds of native wood were used and the numbers and kinds of pieces multi-

Room in an Early 18th-Century American Home

This room from the Metcalf Bowler House at Portsmouth, Rhode Island, reproduced in the American Wing of the Metropolitan Museum of Art, New York, is an example of the style known as *Founders' Colonial*. Against a paneled background (apparently done by a ship's carpenter) are late 17th- and early 18th-century veneered walnut pieces. A cane-seated armchair stands by a walnut table, and a pair of rush-seated, cabriole-legged side chairs flank a lowboy with cabriole legs. On either side of the fireplace is a chair upholstered in an India print, common in homes of early American merchants. The andirons and candlesticks are of iron and brass and the Delft tiles around the fireplace portray Bible scenes. Above the lowboy is a mezzotint of Sir William Pepperell done in 1747 by Peter Pelham



Courtesy Metropolitan Museum of Art

Dining Table Designed by Duncan Phyfe

This mahogany dining table, made in the second decade of the 19th century, has the legs characteristic of the work of the great American cabinetmaker. Duncan Phyfe, best known of American furniture designers, lived from 1768 to 1854 and from his shop in New York turned out a series of tables, chairs, settees and sideboards that today are collectors' or museum pieces

plied. The heavy medieval oak of English, Dutch and Flemish character persisted here and there. But plain painted or stained furniture of pine, maple and chestnut, with the later cherry and walnut, prevailed. This furniture was used in farm regions and in unpretentious homes until well into the 19th century and never passed entirely out of use. In museums, where it is enjoying a new season of appreciation, it is classified as Early American or *cottage* furniture. It is this that some authorities have given the very appropriate name *Founders' Colonial.*

Even before the end of the 17th century the English furniture of the period was being imported and used as models for new efforts. Demand for parlor pieces and fine furniture became much more general. The first half of the 18th century was a time of transition in our social, cultural and decorative tastes. Mixed influences in the mother country resulted in fresh Elizabethan, Jacobean and Dutch strains. The massive forms and elaborate carvings seen in some Early American furniture usually belong at their best to this time. The Queen Anne period brought lighter and more graceful adaptations, often in walnut. It continued many old style marks such as the cabriole leg and the webbed foot. This period has often been included in the general class of *American Georgian;* but no fresh source of inspiration prevailed, and there were no dominant new style characteristics till midcentury. Many elements of the international mixture that shaped the European baroque found their way into this earlier 18th-century American furniture; but traditional sources of English origin really prevailed until the coming of the great English cabinetmakers who followed Adam and ushered in the American *age of mahogany,* the *Late* or *Georgian Colonial.*

After the Revolutionary War the influence of Chippendale, Sheraton and Hepplewhite was still at its height and it weakened only gradually. Considerations, sentimental as well as political, then turned the eyes of the new nation to Paris. Thomas Jefferson, third President of the United States, had studied architecture in France and had felt the same impulses towards Greece and Rome that were already at work in France. Jefferson revived and used Roman forms in a fresh American Renaissance. His public and private buildings may still be studied for a better understanding of form, proportion and balance. There was a brief post-Colonial period, during which these buildings and others they inspired, with transitional furniture, prevailed. The ideals of an American Republic that should resemble the republic of which Plato wrote accompanied the wide and general classic revival in our architecture that came about 1820. American Empire furniture, based upon the classic designs of Napoleon's craftsmen, came to its complete and final expression at this time. Like Jefferson's Roman Revival buildings, it was purer in form and more refined in detail than its models made for the French Emperor. But it was never a widely prevailing style during the efforts and experiments of the young republic to express itself in a homogeneous and appropriate manner.

19th-Century Currents. The influences of the Victorian era upon furniture and interiors overlapped with the American Empire style. Early Victorian furniture in walnut and rosewood often had something of the same sturdy construction and simple design; but in later phases, it was to mark a twilight of the gods in furniture design and domestic taste. The reaction swung back only slowly during the last half of the century to the honest Gothic creations of the Middle Ages for its inspiration. Thus came the Romantic revival that gave us mission furniture and indirectly influenced some of our prominent innovators of the present, notably Frank Lloyd Wright and some of today's industrial designers.

Founders' Colonial.—The straight chairs with banister or slat backs and seats woven of rushes are typical Early American. They were usually painted black, sometimes other colors. Plain deal tables with drop leaves and square legs or gate-leg tables with turned legs belong to this period. The gate-leg style usually had eight turned legs, four of which swung around to raise and support drop leaves. American Windsor chairs and butterfly tables of rare and unusual charm are based upon Elizabethan models. The butterfly table is made of maple. Its name comes from the shape given the pair of flanges that replace the swinging legs of the gate-leg table. Chests, cupboards, benches and bedsteads, conspicuous in the limited Early American inventory, to which slope-top box desks and clocks with wooden works were added have a prim New World appearance in New England, Pennsylvania and Maryland. Early furniture was fine in the South and included more highboys, lowboys and cabinets, in a variety of hardwoods. Large chairs, small tables and utility stands soon appeared everywhere. The spinning-wheel and the loom, the cobblers' and the saddlers' bench were often considered part of the keeping-room equipment in the first days in New York, New England and Pennsylvania, when one great fireplace was the center of heat for all purposes. They are exhibited as furniture in modern museums and many sales galleries.

A paneled room of about 1740 is often typical of the Queen Anne or 18th-century transition style that may be studied in reproductions in American museums. It may contain inset cupboards paneled to correspond with the conventional rectangular divisions of the walls, and there may be a gate-leg table of walnut with a drawer and a walnut stand with drop leaves. Straight chairs with cabriole legs, sloped backs, straight arms and rush bottoms may be used alone, or a slim upholstered wing chair may accompany them. One of the most prized heirlooms of many American homes is a delicate Queen Anne lowboy of maple with the familiar cabriole legs and a slightly ornamental shaping of the drawer frames. The broken arch pediment, more familiar in Georgian Colonial, came at this time. So did the single fluted shell ornament set into some desks and lowboys for a century.

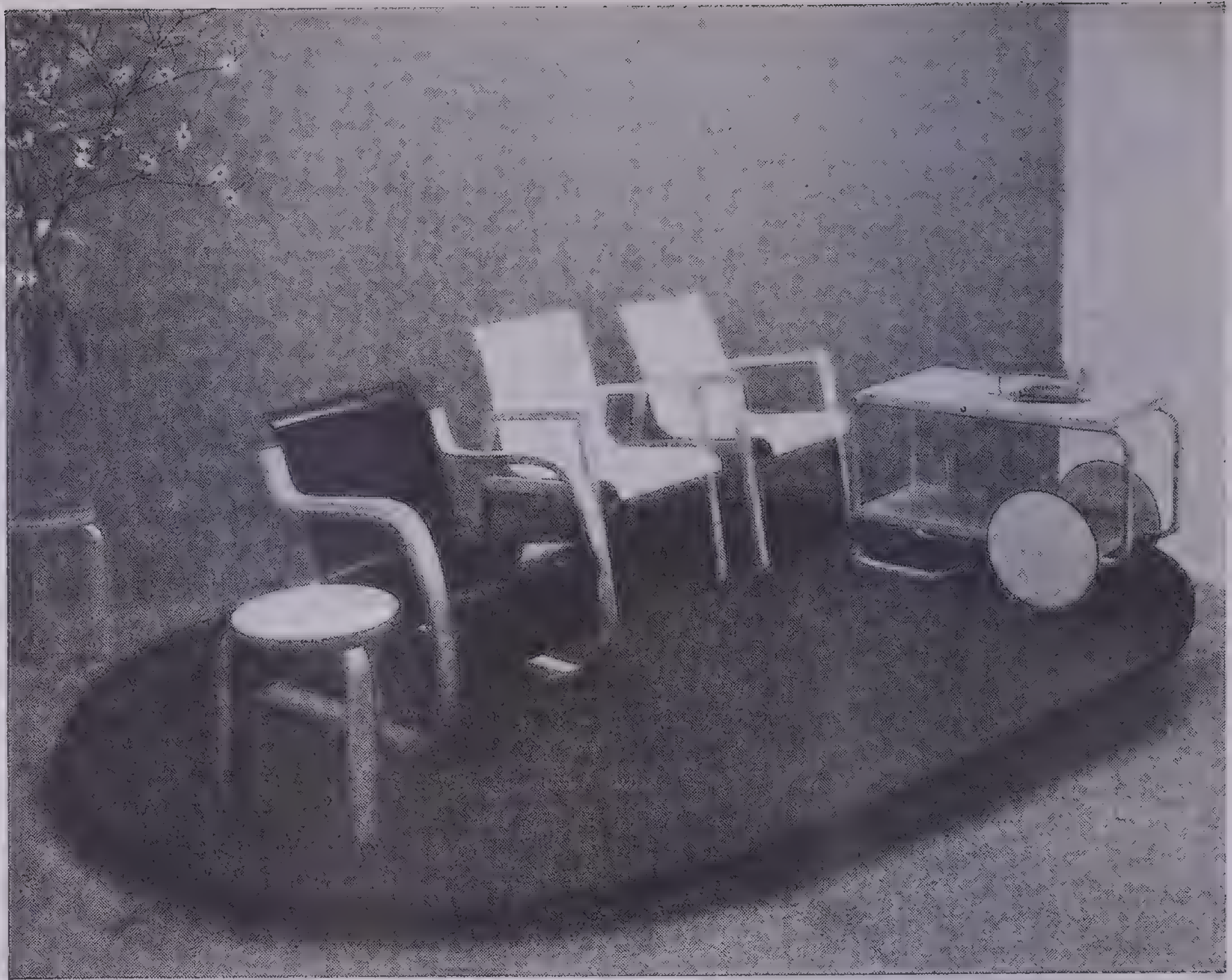
Georgian Colonial.—This furniture depended for its success upon the great supplies of West Indian mahogany then available. It could not have been developed so perfectly had not the shop practice of the American cabinetworkers served to prepare the way for its delicate forms and subtle ornament. The English architect of the Renaissance, Sir Christopher Wren, had helped to prepare the way for it when he revived classic architectural forms and made pattern books and working drawings that American architects had been using for a long time.

Architectural settings as well as craftsworkers' shops awaited the new era. These facts help to account for the Georgian flowering, the most homogeneous period in the history of American design until today. In furniture, the workmen made fresh adaptations but seldom departed far from the models set by Sheraton, Hepplewhite, Adam and the others; the fresh expression was that of a colonial dependency. But there was no later period in which the arts and crafts and industrial design of all kinds were so integrated in a single style.

American Republic.—The Empire style in America followed the trend of the movement in France witout many of the incongruities that developed there. Carved columns, claw feet, pineapple finials and ornamental brasses were the American style marks. Many of these are dismissed by the careless as Colonial detail; doubtless because this stream of influence is still difficult to free from the continuing traditions of the late Georgian. The American Empire style came between two periods of English influence that far outreached it in their effect upon the art and industry of the time. Both periods used some of the same forms and motives.

Duncan Phyfe was the single original furniture designer in America who made an impression upon the period. He was a Scotsman working in New York. His beautiful and now famous designs represent a conscious effort to improve upon the heaviness of Empire form and ornament. Insofar as he followed a model, it was Sheraton; but one of the chief distinctions of Duncan Phyfe's work is its individuality. A few museums devote rooms to it. Some of his followers in the Victorian era that was dawning designed equally elegant furniture using rosewood. But the taste of the times was fast becoming unfriendly to all sound principles of construction.

Eclecticism.—Heavy black walnut followed light and graceful rosewood carvings and was as elaborately ornamented. Ponderous tables soon supported marble slabs, and there were black horsehair upholstered chairs and sofas. The art impulse of the time expressed itself in Rogers groups, china dogs and chromo-lithographs. A little later dawned the era of golden oak, ushered in by the English reformer Eastlake and persisting in America after it was forgotten overseas.



Courtesy Museum of Modern Art

Modern Furniture in Bentwood and Plywood

The group pictured here was designed by Alvar Aalto, Finnish designer and architect

To review the revivals that now succeeded each other with ever-increasing rapidity is to realize that within little over a half century the American public has been treated to brief styles out of almost every past period.

The most practical importance of the great Romantic Revival that came from England near the end of the 19th century was to free us finally from the jigsaw carving and the pressed ornament of the golden-oak period. Following closely upon it came Old English, Colonial, Norman, Mediterranean, Italian and Spanish styles and a renewed and widespread vogue for the plain pine of our earliest American homes.

Twentieth-Century Furniture.—The confusion of dates, periods and intermingling influences is less when we take Renaissance Europe as the starting point. The great rebirth of ancient culture in the Western world more than 5 centuries ago has been the most important inspiration of all fresh art and industrial design until our own time. In spite of minor changes and recurrent impulses toward other pasts, modern civilization has returned again and again for its forms and decorative ideas to Greece and Rome or to those Renaissance eras that made conspicuous use of ancient styles and added new idioms to them.

If the completion of the industrial revolution in America and the adoption of machine-age methods, ideas and ideals of living are gradually to mark the end of all Renaissance ornament and decoration, what are we to have instead? Have the tubular steel framing and glass table tops any promise of a style as sophisticated and elegant as that of 18th-century England or America or of the France of Louis XVI?

Only the future can answer this question. But industrial designers have already been refining upon models for modern American furniture for modern American homes to be made of machine-age materials and by mass-production methods. They work as artist engineers, studying the problems involved in making tables, chairs and beds in the same way that the problems of airplane or automobile design are studied. The design problem, they say, is the same. The designer undertakes to produce efficiency, economy, durability and the best possible appearance in his product. He is working according to definite principles with definite ends in view. When he is asked if he rejects all past ideas of style and decoration, he sometimes replies that Queen Elizabeth might as appropriately have sent her workmen to copy the work of the Egyptian pyramids when the English Renaissance was beginning to take shape; that Brunelleschi might have gone back as fittingly to King Solomon's temple when he began the designs that were to produce one of the great, fresh feats in Renaissance engineering and art, the dome of the cathedral in Florence. Like Brunelleschi, the industrial designer, with the architect, is today preoccupied with the creation of fresh forms that embody the knowledge and the spirit of the time. The principle of the new forms, like the principle of the dome, may dominate a long period of building and furnishing.

Style Marks of Modernism. Polished metal, construction glass, plywood, bentwood and a group of synthetic chemical products notable for their great range of beautiful colors are the prominent materials of the contemporary industrial designer. Even when these are unique products for a luxury market, their forms are simple, and their surfaces are sheer. The machine is no longer asked to imitate decorative art from the age of handcrafts, and therefore ornament is little seen at this stage.

The designer is artist engineer. Efficiency, comfort and appearance are his present watchwords. He works in the same spirit and often uses the same materials and methods as the airplane designer. He has borrowed the long lines, the bright polished surfaces, the rounded forms and the appearance that is associated with an important principle of aeronautics: *streamline design.* This phrase has been misused almost as much as the unfortunate word *modernistic.* Unlike that term it represents a sound principle of construction design rather than a vogue for immoderate decorating.

In considering the designs of furniture in past periods it is evident that the forms were established and then the decorative features were developed. This was true of the beginnings of Egyptian manufacture. We may study the progression from the one element to the other in Greece from preclassic times. It has been noted in the Gothic period and in our own Early American. We may have a future machine-age decorative style as elegant as the Georgian Colonial, following the plain forms of today.

Meantime the inappropriate, late ornamentation into which the last vitality of the Renaissance ran during the 19th century is being more and more rejected by Modern art during this transition period of plain, artist technician designing. Today, as never before in history, men approach the problem of making furniture consciously, saying that before the shape, appearance or material for a chair is selected, the designer must learn what height of seat and back, what depth, what width will most comfortably conform to the proportioning of the average figure. For types of chairs there are other considerations: durability of material and joinings and angle of incline, for example. For a long time to come Americans may prefer a Boston rocker or a Louis XVI occasional chair to one made of tubular steel and leather, but that is no reason for saying: "This *modernistic* is terrible; give me the old things." Remember that the good features of every period are absorbed first and last into the next period, though it is the last and weakest aspects that persist in the outworn style.

INTERIOR DECORATION

Interior decoration is the art of making our homes beautiful; of creating settings suitable for the intimate daily life of the occupants. Whether the house be a mansion or a cottage, the planning of its contents and their arrangement should follow certain fundamentals. Natural taste reinforced by study will insure a harmonious and attractive home interior at moderate expense, but an unlimited outlay without these essentials may result in an opposite atmosphere.

Classical Influence.—Modern decorative practice began with the Renaissance in Europe and the revival of ancient art, that is, Greek art. From about 1600 to 1900 interior decoration, like architecture and painting of the time, was based upon ideas out of ancient Athens. Learning was revived also; and the scholarship and research that followed resulted in knowledge of the arts of all the other past periods. Through these centuries, *classic* art was the basis of styles not only in decoration but other arts as well.

Throughout this time there were occasional intervals of influence from other past periods: the *Roman* revival (classed with the Greek under the general term *classic*), the *Gothic* revival, and so on. But there was no new major style in the all-inclusive sense of the Gothic or the Greek. Art, architecture and other kinds of design relied upon adaptations and combinations of these earlier styles. The entire modern practice of their use is *eclecticism*—choosing here and there from the classical past. Gradually during the 20th century a new style is developing that appears to be taking its place among those great historic periods. It has begun to take form slowly as a revolt against borrowings and as a conviction that the machine-age way of life carries with it its own way of design. Past history is the best study of the slow process by which style revolutions come about.

French Styles.—Louis XIV built the Palace of Versailles in the 17th century. Interior decoration as a profession comes down from his time. He brought together the finest craftsmen of Europe to gild and paint and carve the interiors and fill them with sumptuous and glittering furniture, mirrors and jewellike ornaments. With the aid of the renowned Colbert he established centers for production of luxury wares. Gobelin, Aubusson, and Beauvais tapestries, Sèvres china, St. Gobain glass are all among the finest products of their kind ever made. For a century and a half the Versailles Palace and its contents were copied and imitated all over the world, and France became rich and famous as a producer of styles and of sumptuous merchandise. In spite of a general reaction against artificiality and ornateness, homes today are still full of reminders of that old king.

In the reign of Louis XV, extravagant decoration reached a climax. In the period of Louis XVI and Marie Antoinette, a quieter taste asserted itself as a reaction against extremes of vanity and folly in architecture, interiors and costumes. Many museums have recreated rooms from these periods and arranged them so that they may be compared. The ideal of classic style returned in the period of Louis XVI. In Napoleon's time a simpler use of Greek forms was introduced and became the basis of what we recognize as *Empire.* In 1925 Paris, still the world's recognized center of new styles and of decorative merchandise, was the scene of an international exposition of arts and crafts. From there *Art Moderne* was widely disseminated. It enjoyed a brief vogue in the United States under the name of *Modernistic,* but by 1930 it had largely passed. Today it is confused with the newer style that is based upon sounder and more permanent principles, called *Modernism* for lack of a better name. Modernism in America has appeared and is making its way in interior design, largely as an independent development based upon changing industrial design and architecture.

English Decoration.—In England the heavy oak-timbered walls and furniture of the Middle Ages were slow to yield to Renaissance ideals. The 18th century brought an era of prosperity in which influences of the great Christopher Wren and of Adam and the fine furniture makers gave us what is still called "the golden age of home interiors." We have only to study this period to understand how the Georgian mansion came about and why Georgian interiors still contain what many people consider the most beautiful furniture available. American Georgian or *late Colonial* followed a similar course of development and produced a style that followed but did not imitate the English. This style still sets the standard for the average American home of taste and refinement, possibly because American culture arose out of the ideas that gave rise to the Georgian style.

Interrelation of the Arts.—In all these periods, in all countries, we find the art, architecture, interior decoration and costumes related to one another. The pointed arch of Gothic architecture was repeated in sculpture and furniture and also in the tall pointed headdress of the women and the sharply upturned points on the boots of all persons of rank. It is helpful in approaching the account of the 20th-century transition period to recall that the historic events of the time, great or small, determine the character of design.

Modernism or Functional Modernism came out of the industrial revolution. In this age when rapid, efficient machines are the basis of culture, we question classic decorations and painstakingly wrought handiwork on utilitarian objects. The result of functional design often appears over-plain, hard and cold. In some quarters at the height of the reaction all decoration and all ornament were rejected. Interiors today, where they depart from traditional use of period motives and styles, rely upon the beauty that is natural to the materials used. The grain of wood, the texture of fabrics, the polish of glass and metal are conspicuous. Large spaces, uninvolved masses and long horizontal lines bespeak the machine, as the Gothic product bespoke the cathedral.

Fortunately for us, there are unchanging principles common to all good design, capable of being applied under all varieties of changing custom and taste.

Elements Necessary for Success.—Starting with the indispensable elements of all interiors, space, form and color, the decorator undertakes to achieve harmony, rhythm and unity. He uses the same principles adopted by the painter for this purpose. They are the principles of proportion, balance and emphasis. Scale and order are important in the decorator's dictionary; and among his ideals are simplicity, charm and originality. These ideals are hard to define—in people or in interiors—but they are instantly felt. Proportion, balance and scale may be achieved with almost mathematical accuracy.

Proportion. The Greeks were the world's masters of form. A study of Grecian architecture of the true classic period reveals subtleties of proportion that are amazing. Many modern efforts have been made to organize this *golden proportioning* into a modern system of design; but the decorator is concerned only with the broad principle of selecting and grouping objects in relation to interior space and to each other.

If the architect has done his work faithfully, it will not be necessary for the decorator to concern himself with the structural proportioning of the interior. In practice faulty dimensions must often be corrected or minimized, and architectural space divisions must be changed.

Balance is the principle by which repose is attained. There are two kinds of balance, symmetric and asymmetric. *Symmetric balance* is characteristic of all classic design. A Greek building façade or a wall in any classic-revival period represents two perfectly matching halves. The ancient Chinese and the modern Japanese have been masters of *asymmetric design,* which achieves its effect by more subtle means. It is sometimes called *occult balance.* In modern design of all sorts this assymetric design is relied upon to produce an effect of vitality and interest and is called *dynamic balance* in contrast to the static effect of the more conventional symmetry. Modern designers say, "A seagull poised in flight is more beautiful than a sleeping cat"; and they speak of the balance that suggests movement.

Emphasis is based upon the natural habit of the eye to come to rest upon the most conspicuous object in view. Every picture, every room needs some strong point of attraction, some central emphasis to which attention returns again and again. Points of lesser interest must be calculated with this in mind. We have only to examine photographs of mid-19th-century parlors to see that so many points caused an atmosphere of unrest and confusion.

We might say that *scale* is a matter of the relative size of objects, and that *order* is the relative placing of those objects in a composition.

Rhythm, harmony and unity are often referred to as principles. They result from the principles of proportion, balance and emphasis. *Harmony* is attained by the successful blending or grouping of many elements. *Unity* results from carrying the results of this blending or grouping into a single effect. Rhythm is the interrelating of the parts: as the eye travels over any scene, it follows a *path of interest;* it moves and pauses before being brought to rest upon the central point of emphasis. If the decorator has been successful, this movement around a room becomes satisfying and pleasant. We understand the effect of movement and rest for the eye from analogy to the ear in listening to music. In decoration as in music, harmony, unity and rhythm are felt. Interior decoration is an art and a science, and these qualities are most apparent when the decorator is most an artist.

COLOR

The old discussion whether color or form is more important seems as futile as that of the hen and the egg. Sir Joshua Reynolds, founder of the English school of painting, and his contemporary, Gainsborough, became enemies through argument of the point. Romney was nearer right than either when he said that color and form need never be considered separately, and that line merely suggested the beginning of one color where another ended. Since the time of Cézanne, the French father of Modernist art, it has often been said that the eye actually sees little of forms except their color.

Color in History.—Color has always been a powerful agent in the hands of the decorator, never more so than today. It has been relied upon for beautiful effects, and gradually, in recent times, we have approached a more scientific understanding of its properties and influences. Something that is common to human nature finds its expression in color. The history of color is as long and as fascinating as the history of humanity. Scientists of our own day are studying paintings thirty thousand years old in ancient caves of prehistoric France and Spain. The animals and men and hunting scenes represented in these paintings are sometimes solid black, sometimes red or ochre and sometimes in a full range of polychrome colors, an effect that civilized man did not achieve again until the age of classic Greece.

The Egyptians used three-color combinations in unshaded tones: red, yellow and black; blue, white and yellow; black, yellow and white. Assyrian decorations were strong and barbaric with greater use of red. The Persians preferred blue. These three ancient nations, Egypt, Assyria and Persia, laid the foundations for the industrial arts of the western world. Persian blue, one of our precious possessions today, may be found in many forms. Rugs, pottery, enamels and illuminations show this matchless hue.

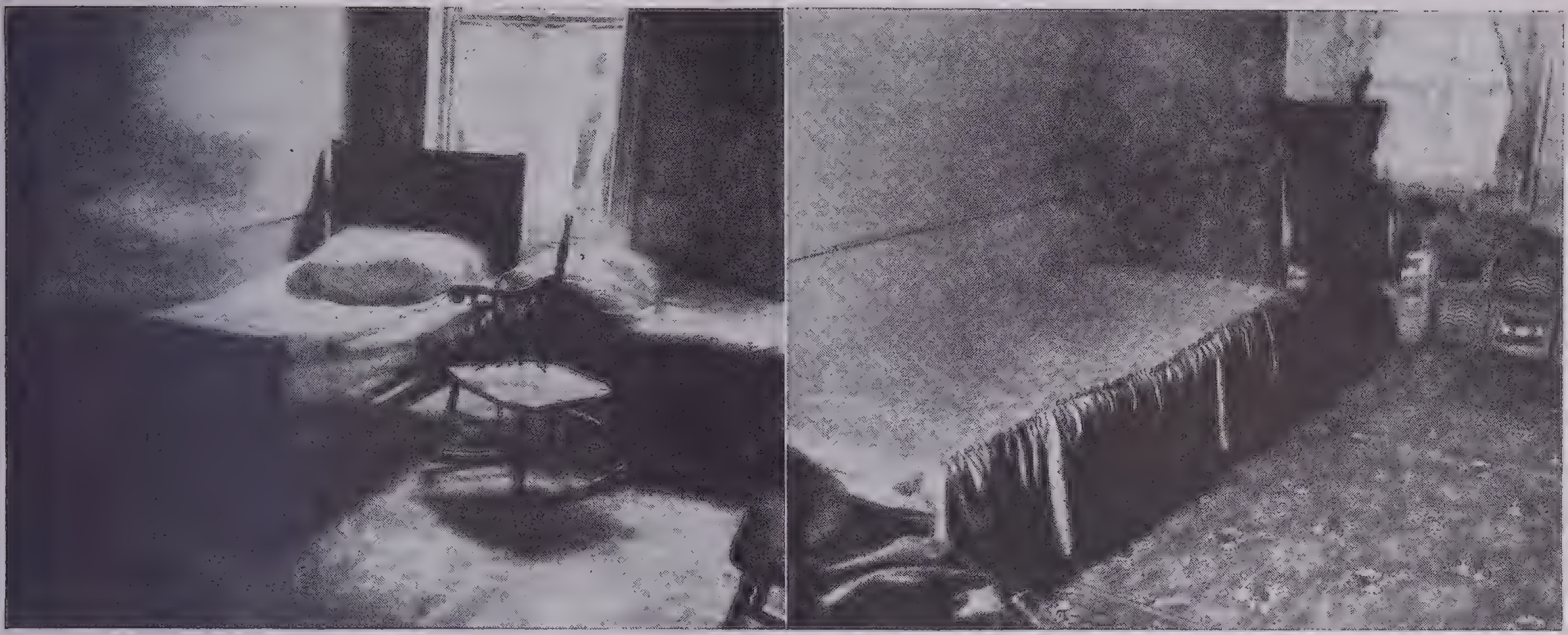
The Greeks first used shaded colors and made liberal use of purple and green. The lost *Tyrian purple* of history and romance seems to have originated in Greece and not in Tyre. It was a strange and beautiful dye, made from a shellfish found in the Aegean Sea. The secret of the dye has been lost since the days of the Roman Empire.

Roman color schemes are familiar to us because the Roman cities of Pompeii and Herculaneum have been excavated in modern times, and many public and private rooms have been completely uncovered. The deep flamelike hue called *Pompeiian red* was much used with white; and orange, black and white also are often seen in wall panels and furnishings. When the seat of Roman government was transferred to Byzantium by the Christian Emperor Constantine, the name of the city was changed to Constantinople, but the long period of rich Oriental art represented by this union of East and West is still called Byzantine. It is discussed at greater length in other articles in this volume. A brief Byzantine revival in recent times affected Continental Europe and the United States at the height of the modernistic vogue of the late 1920s.

Following the end of the Roman Empire came the Dark Ages, but this coming of Gothic culture was accompanied by the jewellike glow of the first cathedral windows, such as those at Chartres. The famous Gothic tapestries borrowed some of the color as well as the design of these windows. Gothic blues and greens and reds may be studied at their best in many museums. They were less gorgeous than the Byzantine colors of the preceding era and less sophisticated than those of the Renaissance that followed.

Brilliance and subtlety, depth and delicacy distinguished Renaissance schemes. Venetian red, Florentine blue, Neapolitan yellow belong to the story of the Italian Renaissance, when fine textiles and fine paintings were important to the backgrounds of a rich and regal way of life. From the Renaissance to the present the study of color is a part of the long story of period revivals and eclecticism that has already been reviewed. But color is a clue to lead us from period to period and from country to country. It will bring us safely through the mazes of styles and dates if we follow it with sufficient zeal.

Theoretical Color.—There are many theories of color. The spectrum theory based upon the rainbow or nature's colors has been used by the artist during much of the period of painting. It has been partially rejected in recent years as a result of scientific studies in various direc-



Courtesy Works Progress Administration, New York

Every Room Can Be Made More Livable

The two pictures above show what can be done with the simplest of rooms by applying ingenuity and the principles of interior decoration. No money was spent for redecoration. More light was admitted by removing the ends of the bed and placing the springs on wooden horses. The chair was repaired and upholstered with a back rest. Drapes and bedspreads were pieced together from remnants of material. A more thoughtful arrangement of furniture gives added space and comfort to the ensemble

tions: the chemical nature of color; the analysis of light waves into the colors of the spectrum, and the length and behavior of these color waves; and the psychological reactions of normal people to color combinations.

The spectrum theory is worthy of careful study because it helps us to understand past art and decoration and to build theoretical color schemes. The modern artist and decorator say that artists' colors are not the same as nature's colors. Even though they show us why this is so, we nevertheless hold fast to the laws of color in nature, and their study is rendered fascinating by the use of color charts.

Color and Scientific Research.—Many modern researches in color and light are too technical to be readily understood by lay persons. We accept the scientist's evidence in this field, however, because his studies of the ray of light have given us the violet ray and the infrared ray. As the artist has taken the scientist's discoveries to the studio, he has made demonstrations that the Modernist decorator is more and more applying to his problem. A first principle is this: If colors affect one another, they are affected even more in a painting or in an interior by other considerations—space, changing light, relative areas of colored objects or surfaces and the texture or finish of the areas. The spectrum theory, because it is mechanical, may yield color schemes that are garish under one set of conditions and lifeless under another. Under the new compositional theories, a color unit is sometimes calculated under conditions like those in calculating a weight in engineering construction. We hear of *building* a color scheme, of the *weights* and *tensions* of colors, of their *dynamic interplay*.

The effects of modern color use are more familiar than the methods. Important national or international exhibitions include modernist interiors. These are seen also in many public and social buildings and in an increasing number of private homes. They are illustrated in fine color in yearbooks and magazines. Department stores of most cities have made demonstrations of them, sometimes successfully, sometimes deplorably. The total color reappraisal in process may prove as revolutionary as the discovery of mechanical perspective in the 15th century. Like that early discovery, it may not be codified into a set of working principles for the decorator for many years. If, meantime, we see conventional color schemes on every hand, that is because public style and taste are matters of slow change.

Color and Taste.—Even the members of one family seldom have the same likes and dislikes. Red pleases one and irritates another. Yellow strongly appeals to a third. A fourth may have a violent aversion to shades of brown or green. There is no arguing taste. But we no longer confuse taste and whim.

Colors have a psychological effect that is not measurable but is much better understood than by past generations. Under given conditions large groups of people react in given ways to certain colors and combinations of colors. Too much red overstimulates. Young ladies of the mid-Victorian era were flighty and hysterical; perhaps because their black walnut parlors were too full of red plush upholstery and big red roses climbing over wallpaper and carpet. Green is restful. Blue is depressing. We know from the poets that optimism is rosy, and melancholy is purple. Yellow is the color of the sun and is universally the symbol of warmth and life. Color combinations are now regarded as a play of these effects one against another in degrees and groupings suitable to the kind of effect desired. The strong, irritating character of red becomes pleasantly stimulating in certain combinations with a well-considered group of other colors. Color as well as music has its normal scale and range of emotional effects on the average person.

Practical Color Considerations.—Among the first questions that any decorator, professional or amateur, will ask are these:

1. What is the height, width and proportion of the room?
2. How much and what kind of light does it receive?

Historically, the best periods of decoration have been those in which colors have been so used that the effect was of more space and light, more harmony and repose. Designers know that through the use of color walls or parts of walls may be moved backward or forward in appearance, ceilings may be raised or lowered, and floors may be kept underfoot. Red comes forward, blue recedes. Yellow and light green, with a large range of other delicate tones, have the effect of increasing the sense of space. The ceiling of a room recedes into distance if it is made a delicate blue or pink; a cold blue or grey of medium tone brings the ceiling down. This one consideration often makes or mars an interior.

The problem of lighting is always important—both artificial light and natural light. The number and size of windows and the direction of light are all connected with color—how much color and what intensity of color are desirable. There is a marked difference in a room when it is hung with yellow-green and when it is hung with blue-green. Rooms with insufficient light are made more cheerful by the use of buff, light yellow, light green and warm grey. Occasional use of mulberry, gold or Venetian red accomplishes the same effect but requires skill. Silver, sapphire, jade and mauve are cool colors successfully used for sunny rooms. But most rooms are not sunny all the time—or dark all the time. Rooms facing east are dark in the afternoon, and rooms facing west have little direct light in the morning. Northwest rooms receive a clear, cold light most of the day and strong, bright light in the late afternoon, so that an ordinary, conventional color scheme that looks well for half of the day looks garish in the other half. This is largely true also of southeastern rooms.

There has been a gradual return to light neutral backgrounds for homes of all classes, but period rooms in natural wood or carved wood paneling are always the exception. Wallpaper of bright red or poisonous green is no longer used as it was in that recent period when all houses were tall and dark, most windows were narrow and slitlike, country houses were made darker by wide porches and thick, close planting, and city houses were crowded together. Then no colors appeared bright enough to lighten the interior gloom. Today the pendulum swings far in the opposite direction. The architect captures direct sunlight for every room. He diffuses and reflects all the daylight there is so that the interior has the maximum benefit of it at all hours. Many kinds of experts help architect, decorator and homemaker by devising systems of artificial illumination that recreate fixed degrees of daylight. At the same time the range of inexpensive colors in transparent hues has grown steadily more fascinating, and the decorator's knowledge of using these for subtle combinations has become more and more apparent.

Planning the Decoration.—The architectural style of any interior goes far toward dictating the decorative treatment. Fortunately the idea of a detailed architectural treatment for the walls of a room is now generally rejected along with the idea of bright and solid colors. Backgrounds are kept relatively neutral and uninvolved, even in period interiors where proportions, furnishings and general color scheme are as authentic as in a museum. It is therefore interesting to glance back briefly over the thousands of years in which the interior wall was treated as a problem in classic architecture.

From the Athens of Pericles to the Chicago of General Grant, the wall consisted of a dado, a frieze, a cornice and the space between. These members were originally subjected to the same principles of balance, proportion and harmony as the classic column with its base, pedestal, shaft and capital. The Romans misunderstood the principle and corrupted the proportions; but the practice continued with many modifications well into the 19th century. Marble, stone, wood, plaster and tapestry supplied the materials. Lastly, the dado and the frieze, and often the connecting vertical support at the corners were imitated in wallpaper. That was the period when wealthy Europeans were known to paint the end wall of an interior to simulate a trellised opening with another room beyond or even a window and a view.

The human hand that had played the chief part in all things that man had made for use and beauty became relatively unimportant. It threatened to become useless for the great masses of working people, as machines multiplied, and factories grew larger and larger. The Romantic Revival was organized in England by people who saw that the whole countryside and the daily life were becoming ugly and unbearable through industrialization. William Morris and John Ruskin preached a return to the ways of the Middle Ages and the revived use of all the ancient handicrafts. The *Arts and Crafts Movement* helped re-educate a new age to the unchanging principles of good design. The interior decorator inherited from it certain fresh conceptions of utility and beauty, of form and function—and some of our finest conceptions of decorating informal rooms.

All interiors of our time are characterized by a certain atmosphere that derives from the current ideals of everyday life. They are modern in many ways, tangible and intangible. But when we consider the interior of the home that the Functional Modernist plans, we find a complete set of conditions that the decorator must make it his business to understand and respect. At first the new interiors were incomprehensible to decorators educated in traditional industrial and applied arts fields. A situation arose, apparently unique in the modern history of furnishing. The architects designed their own interior decorations and often the furniture and the accessories as well. It is only in the final years of the 1930s that decorative arists and designers of high repute began to work in both traditional and Modernist styles. Gradually manufacturers of furniture and textiles and department stores and special shops are becoming more able to provide the necessary designs for creating a good Modernist interior. Through the use of reliable books and magazines the amateur may arrive at his own sound plan of decoration.

Harmonizing Furniture and Background.—The interior and its furniture should be planned at the same time. Happy are those who can build and then buy suitable furniture. The logical sequence is first the walls, then the floors, then the contents of the room. But the complete scheme must be well in mind at the start to avoid serious and costly mistakes. Present conditions of mass-production manufacture and distribution make it fatally easy for the enthusiastic amateur to embark upon overambitious undertakings. Architectural units for schemes of all kinds are prefabricated, and often the practical aspects of the interior or the final effects will be sacrificed to some notion of picturesqueness. Besides, furniture from a worn-out or outgrown home must often be reconciled with new pieces in the same rooms. Pieces around which sentimental associations have gathered or substantial survivals representing now outmoded fashions in interiors may sometimes be remodeled with good effect either in establishments specializing in such work or at home. But their haphazard use gives disturbing results.

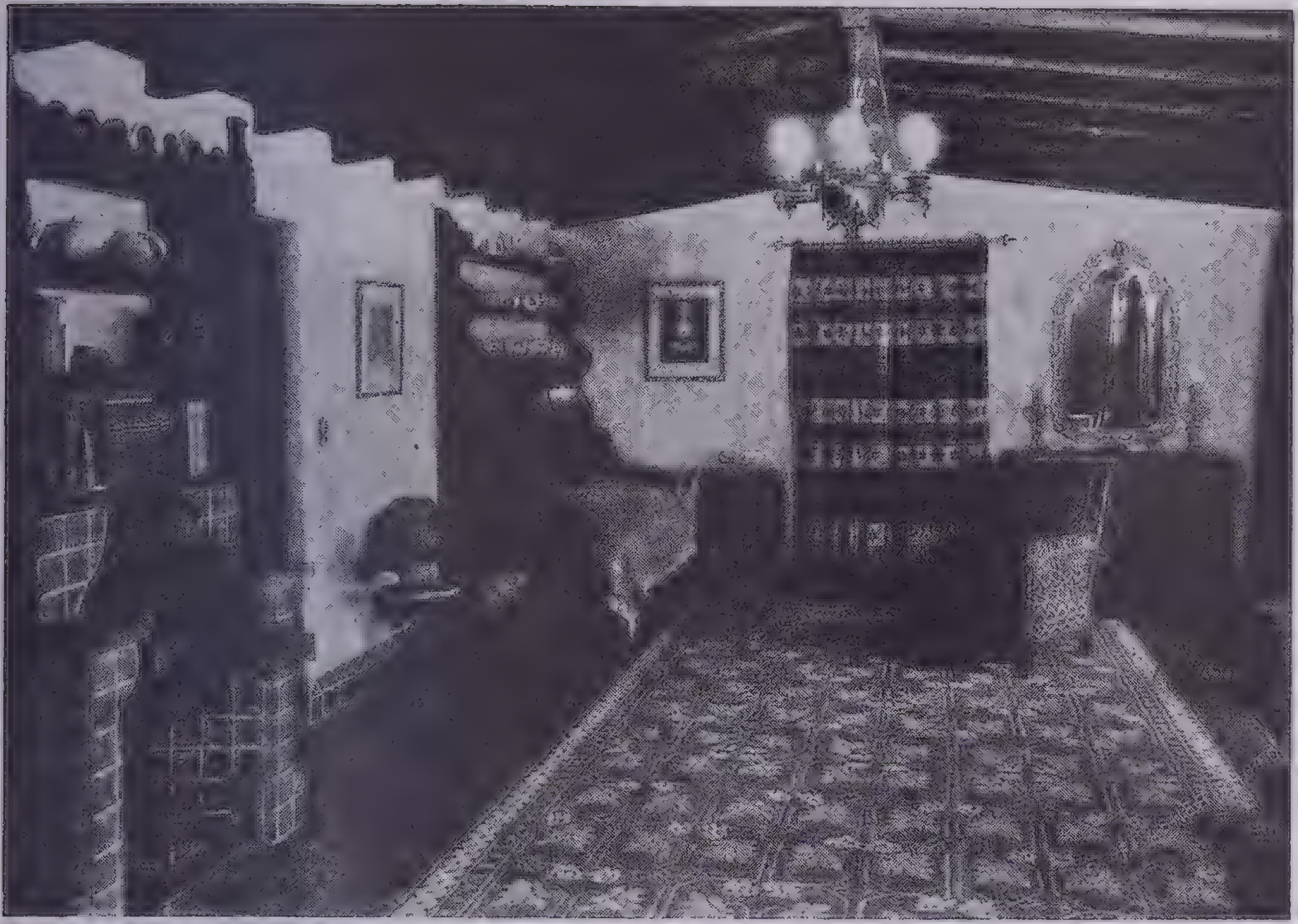
The *what* and *how* of successful interiors are best determined by the amateur working with a good handbook as a guide. The distinction achieved by the skilled decorative designer or the "fun" enjoyed by the gifted amateur comes from the introduction of fresh and harmonious notes into the fixed limitations of a special kind of interior. It is important to see how the style of the room influences its contents in achieving an integrated effect. It is necessary to consider which rooms are suitable for special purposes.

American Styles.—The late Colonial or American Georgian house is favored by the homeowners in this country who represent the higher ranges of culivated taste; and so it is the most satisfactory type of interior to consider. Fine originals exist in many parts of the country with the furnishings that were designed for them still in place. Museums have carefully reconstructed many famous rooms of the period. Mahogany furniture in full range may be bought in antique stores and at auctions. All conditions make this a happy period to reproduce in intimate American living space. The influences of Wren and Adam upon interior architecture, and the influences of the fine craftsmen who shaped the Hepplewhite, Chippendale and Sheraton furniture flowed together in the American Georgian mansions that are probably the high watermark of American cultural expression. Perhaps the tradition has persisted because American heirlooms, insofar as there are any, come out of the Colonial interiors. The era that produced them was one of wealth and of cosmopolitan interests and foreign travel. Fine Oriental rugs, china, porcelains and metalwork belong in them.

The American interiors of an earlier time were often paneled in oak or pine according to their date. The architecture that we call *Founders Colonial,* so widely used in the restoration of old New England farmhouses and in new homes everywhere, makes typical use of exposed beams and woodpaneled walls in natural effect. Pine furniture is rightly used here in combination with maple, chestnut and the familiar American fruit woods in natural effect. The wide-board floors in these old houses often have taken on the finish of the ages.

The Elizabethan half-timbered house, in modern adaptation, usually has simple interiors of plaster with stained oak woodwork. The furniture should therefore be of oak in a sturdy and simple design and should be stained to harmonize with the exterior finish.

Mediterranean architecture, formerly seen in Florida and California only, has been adopted for homes all over the country. Its rough, tinted plaster walls with interconnecting archways instead of doors, its intimate warm and bright informalities make it ideal as a background for painted furniture in several colors. The colors here, as well as in the



©*Frashers, Pomona, Calif.*

Bedroom Decorated in Spanish-American Style

A room in Death Valley Scotty's Castle in California typifies a style popular in that state and in the southwest. The beams and ridge pole are of walnut, the plaster walls are white; often they are painted pink or yellow. The brilliantly-colored arras (wall hanging) and chair covers are Mexican (Spanish Indian). The rug and the mirror belong to the elaborate Spanish Renaissance style

Norman house, should avoid the delicate effects and the elegancies of the occasional lacquered piece seen in a late Colonial or a formal French room.

Unity without Monotony.—To sum up: there is a prevailing unity in a well-conceived interior. The character, proportioning and treatment of the wall dictates the amount and kind and style of the furniture used. There are materials and finishes, forms and colors that are traditionally associated with every style of interior. But unity is not monotony. No one today would put fine mahogany furniture in a dark-oak interior or unpainted pine furniture against a formal Georgian wall, but even the amateur understands the advantages of diversifying tones and textures in finish and of alternating between Sheraton and Hepplewhite. A modern sense of fitness often aids us in placing a pair of fine Sèvres vases and a Persian embroidery on the same wall with an old Chinese portrait in a formal Colonial reception room where a gilt chair or an ornate cabinet full of small *objets d'art* would be fatal to the effect.

The Modernist Room may best be studied on the basis of an illustration taken from one of the soundest and most widely publicised homes built during the decade of steel-and-glass building design in America. This is one of the main floor rooms of a country house. Here, true to principle, walls tend to disappear. Large portions of the living floor are divided by short raillike partitions placed here and there as an aid to grouping the furniture. Large areas of the outside wall are of clear glass planned to enclose extensive panoramas of the landscape. In the working out of the color-and-exposure problem of this room, and again true to modern principle, one wall is of a contrasting color. The ceiling and portions of the side walls are finished in a synthetic material belonging to the group of chemical products called *plastics* with a shining surface especially planned to reflect light. The darker wall section is a warm brown tone, harmonizing with the floor finish but not attempting to match it. The fireplace is white. The floor covering is of light beige. The draperies are arranged to make a continuous covering for the wall spaces of glass and are slightly deeper in tone than the rug.

Use of Color.—The harmony of walls and furniture is realized through color. The rich brown of Circassian walnut in the grand piano and the low section of partition is repeated in lighter tone in the fireplace wall section. Both are balanced measurably by the use of unbroken areas of shining white in the wall and the fireplace and in the white furniture. Chairs and couches form a conspicuous part of the furniture. The white upholstery is alternated by the use of neutral tans and warm gold in solid color and by a couch covering patterned in horizontal stripes in an interesting interplay of many colors. The low tables and most of the other furniture are made of polished tubular metal. Table tops are glass. The harmony of walls and furniture is further realized here in terms of form and proportioning. The effect of unbroken horizontality depends on the relationship of all elements to a basic height line.

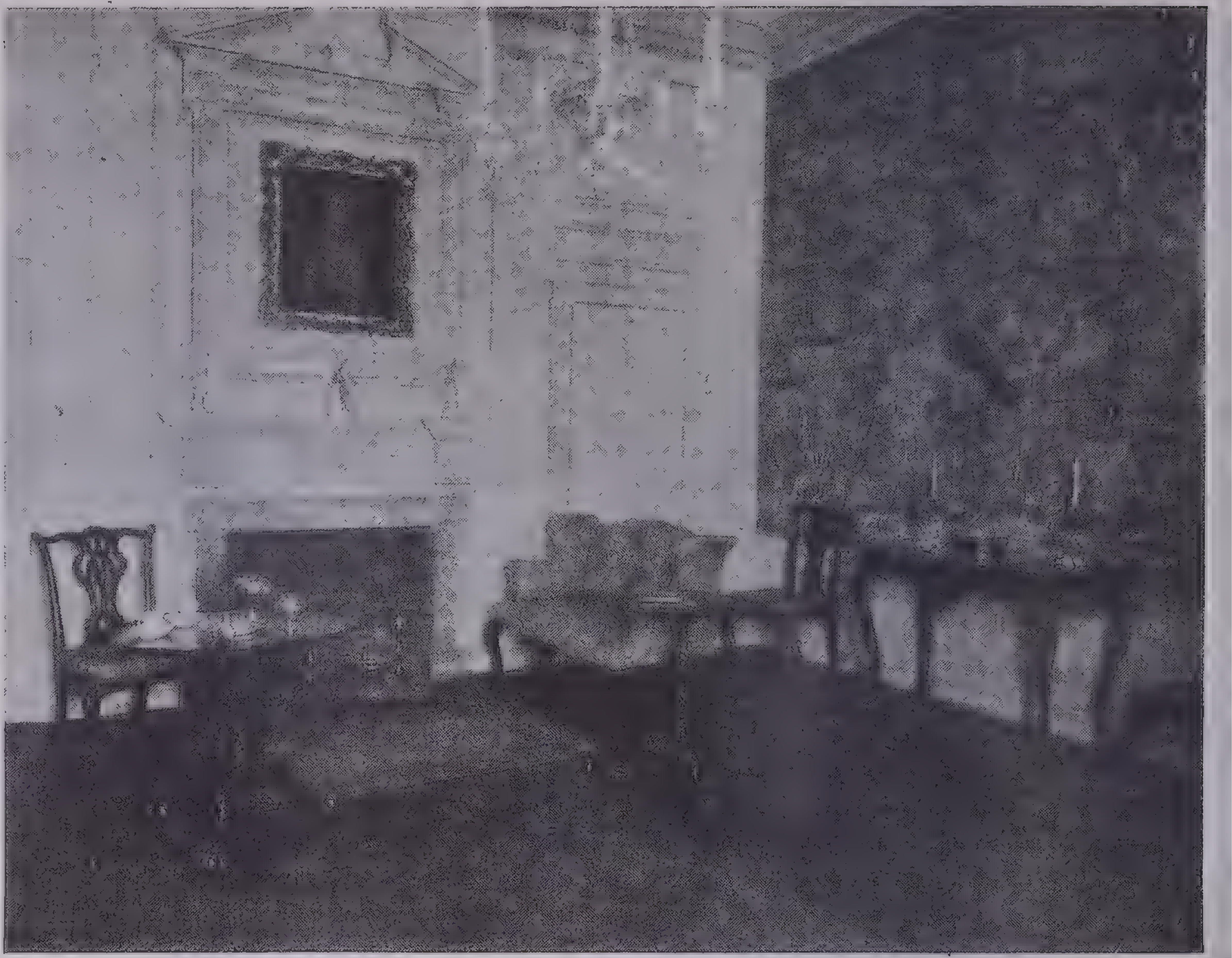
Everything that is done in designing a room of this character submits to the most rigid analysis according to the principles of decoration with which we started. If the effect in the view shown appears formal and a little cold, remember that a part of the same general living space is devoted to a library, small and informal enough to be called a den.

The most successful woman decorator in the field of Functional Modernism explains how she designs a room with color: "With it we fortify or complement the existing architectural background, bringing some walls or lines forward by accenting them and making others recede by wiping them out with neutral tones. . . . We study the relative intensity of light as it reaches walls and then determine whether it is in the best interest of the room to bring forward a wall by projecting it more intensely into the light or to let it fall back into shadows." This designer confirms the practicability of new color theories and illustrates at least something of the new practice when she says that the client who insists upon a fuchsia-colored room does not really want a room with fuchsia-colored walls or hangings or furniture, but only a harmony of other colors with perhaps rare touches of the coveted hue, which afford the apparent effect of the flowers. The process is as subtle as that of a modern painter who undertakes to flood his landscape with the sense of sunlight or cold, clear dawn without falling back upon the palette of the academic painter. There is, of course, a perfect understanding, on the part of such designers, of key, rhythm and harmony, but particularly there is reliance upon the dynamic values of certain colors within the restful unity of the whole.

The Living Room.—Now that the word *parlor* has passed into disuse and *library* has lost most of its significance, the living room is the heart and center of the house. The architect often goes more than halfway toward making this the most cheerful, usable and attractive part of the interior when he bases his floor plan upon a study of the future occupants, their interests and their habits of work and play. The amount of main floor space devoted to this room is best determined by the architect's analysis. All that goes into the room and its arrangement and contents should conform also. Useful reference volumes, new books, magazines and newspapers, the telephone and the radio belong there; and the fireplace holds its ancient position of honor even where modern central heating and ideas of functional design prevail.

The living room is not a retreat for the quiet scholarly worker nor an appropriate laboratory or workroom for the amateur inventor or chemist, as some families suppose. Nor is it the ideal play place for the children. Its effect should be neither too formal nor too informal, as befits the center of the family's intimate home and social life. The furniture should be simple, durable and beautiful. Above all, the walls and furniture should never be permitted to become collecting places for trivial things.

In a Colonial living room an old landscape paper is sometimes very attractive. A paper in several colors is a decoration rather than a background and looks well with plain curtains and with rugs that derive their interest from texture rather than color pattern. Mahogany furniture of appropriate design and proportioning may be mingled with book cases and certain other pieces, stationary or movable, that are painted to match the ivory woodwork. A high, old-fashioned bookcase desk often looks well between two windows or where it will balance a door; it will afford protection behind its latticed glass for a few rare or delicately bound volumes.



Graceful Mahogany and Brilliantly Colored Wallpaper in an Early American Home

The living room of the Powel House of Philadelphia (1768) has been reproduced in the American Wing of the Metropolitan Museum of Art, New York. The room is papered in an 18th-century Chinese wallpaper with brilliantly colored designs of birds, flowers and summer houses on a white background. A mahogany and curly maple settee covered in green damask and a mahogany tripod stand are drawn up to one side of the fireplace. On the other are a table and Chippendale chair in mahogany. The andirons are bronze and the figures on the mantel are of Chelsea porcelain, made about 1760. A pier table of mahogany with a marble top is against the wall on one side of the room. Soft paste English Chelsea candlesticks decorate the table and mahogany side chairs, showing the influence of James Gillingham, stand to either side of it. The chandelier is of English cut glass and dates from the early part of the 18th century. The portrait of Mrs. Joseph Reade by John Wollaston was done sometime between 1751 and 1759

Furniture as a Part of the Room. There is a growing practice in rooms of this character to recess the bookcases and made them a part of the architectural treatment; and this is in line with a wide movement towards furniture that is built into place. Properly planned and installed cupboards between the sections of recessed shelves are very useful in a large room. The extent to which modern cabinet work features can replace mahogany furniture successfully will depend on the degree of formality that is wanted and the experience of the planner. Millwork or precut designs for such combinations are nationally marketed by many producers who spend large sums of money in educating the public to the most satisfactory combinations and best schemes. Photographs and working drawings are sent to professional decorators and homemakers on request. They illustrate the Colonial period and many others.

Oak, walnut and maple offer endless possibilities in the living room. Unfinished furniture (as widely marketed as millwork) is especially helpful to the amateur who wants to avoid the effect of the conventional department-store suite. When such pieces are of good materials and workmanship, they may cost almost as much as those in the stock set. They must be finished to produce a harmonious, though not necessarily matching, effect. Above all, the finish must make the most of the natural beauty, grain and texture of the wood. The cheaper whitewoods are reserved for the rooms where paint is a suitable finish. Besides following a good formula and set of instructions in finishing, care and patience are necessary, and a workroom is highly desirable if the job is undertaken at home.

Choice of Furniture. New furniture for this or any other room where a strict period ensemble is not attempted is best when simplest. The room in careful period reproduction ought always to use only "fine" furniture that, if it is not actually old, is of expert handcraftsmanship. The popular, machine-made sets of furniture so widely sold imitate the hand effects or the style marks of the most elaborate periods, and so they display very poor taste. This is the reason why people, even those of moderate means, have turned back to the use of old things. If we follow our hobby as antique collectors with courage and judgment, we can often pick up old oak furniture for a living room at prices comparing favorably with those paid for well-built mahogany furniture. We realize handsomely on such a hobby through the pleasure and the practical use we derive from an interior that is uniquely our own, even if our antiques do not actually increase in value with the passing of time.

Whether oak, maple or mahogany is used in one room, it should harmonize in a general way with the furnishing of other rooms in the same part of the house. Like mahogany, maple or walnut, oak is the proper wood for many different styles of interiors. This leads to the necessity of special study in the shapes and finishes that are suitable for combination with each other in any scheme we undertake to assemble without expert guidance. In one beautiful living room, for instance, the owner used Circassian walnut for the woodwork and a warm oil-finish ivory stain for the walls as a background for Italian walnut furniture of the 16th century. The curtains are rosy in tone, and rose color is prominent in the rug. Silver-blue, mignonette green, rose and ivory contribute to a color harmony that is soft and bright without being too elegant for a room of general use.

The Book Alcove.—A book alcove may appropriately be made a part of the structural design if the room is sufficiently large and has well-distributed light, and the furniture is substantially proportioned to the space. The character of the woodwork and the style of the finish determine the atmosphere. The formal effect of the alcove as it is seen in the Bodleian Library at Oxford and at other famous English libraries is more suitable for the special than the general room, and so are the styles derived from the Spanish and Italian periods in which elaborate carving of oak was used. As a general principle, in contemporary furnishing, the bindings of the books are emphasized, and their often bright and beautiful color effects are made an important point of emphasis in the room. The cases, like the walls, tend to become neutral and unobtrusive in form and finish.

The Dining Room.—For many years the dining room was subjected to massive treatment, no matter what the other rooms were like. This theory gave us the beautiful, formal room hung in subdued leathers and furnished in carved oak. This is one of the most desirable state dining rooms that have come to us out of the past. When it is well executed, it has a true baronial dignity. Cordovan leather paneling and massive oak furniture produce a kind of somber beauty and a suitable setting for a table service of elaborately designed metal. The walls, though in rich and dense coloring, need not be gloomy under present conditions of lighting. But we do not often need baronial interiors in private American homes, even when expense is not the main consideration. The heavy silver and pewter plate

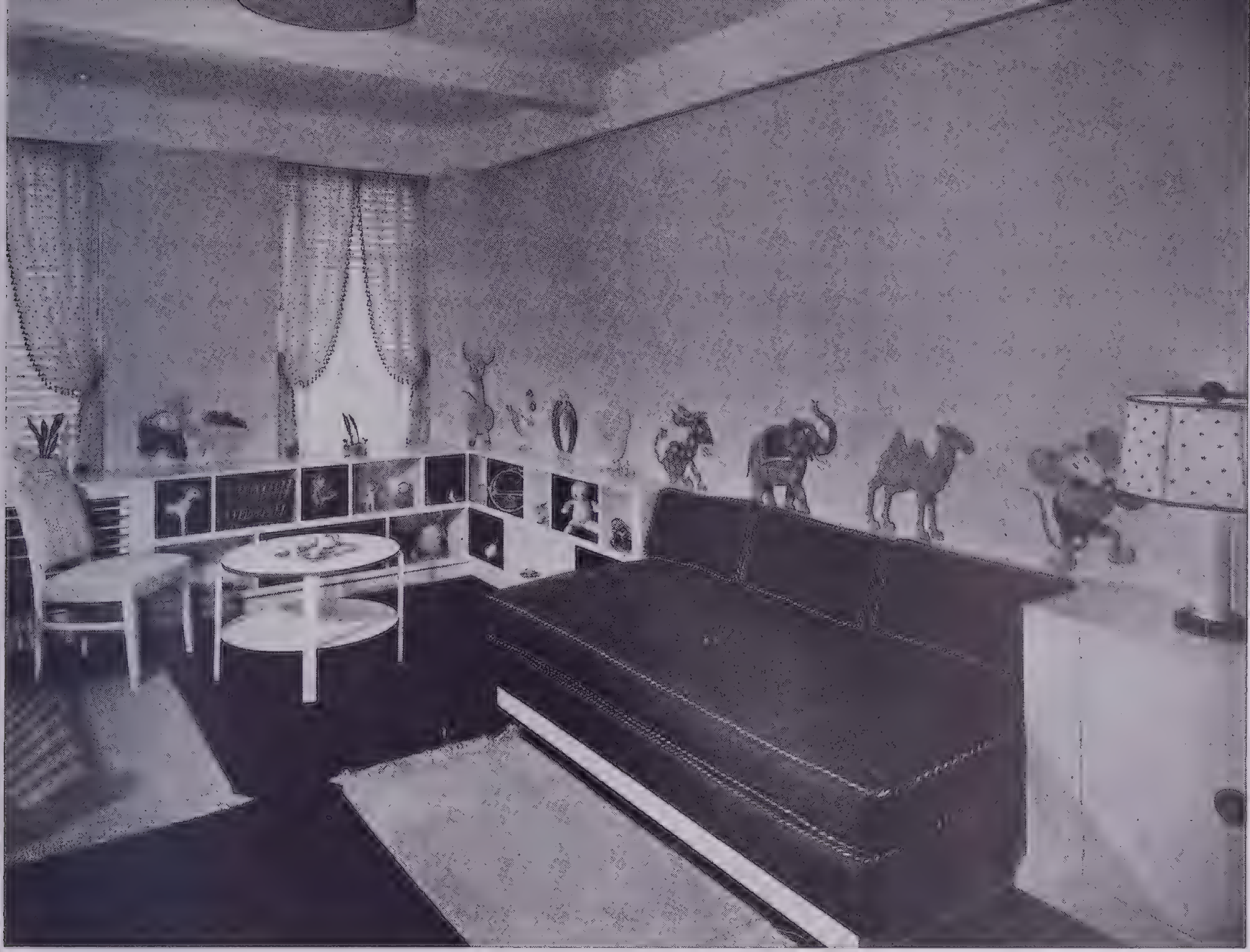
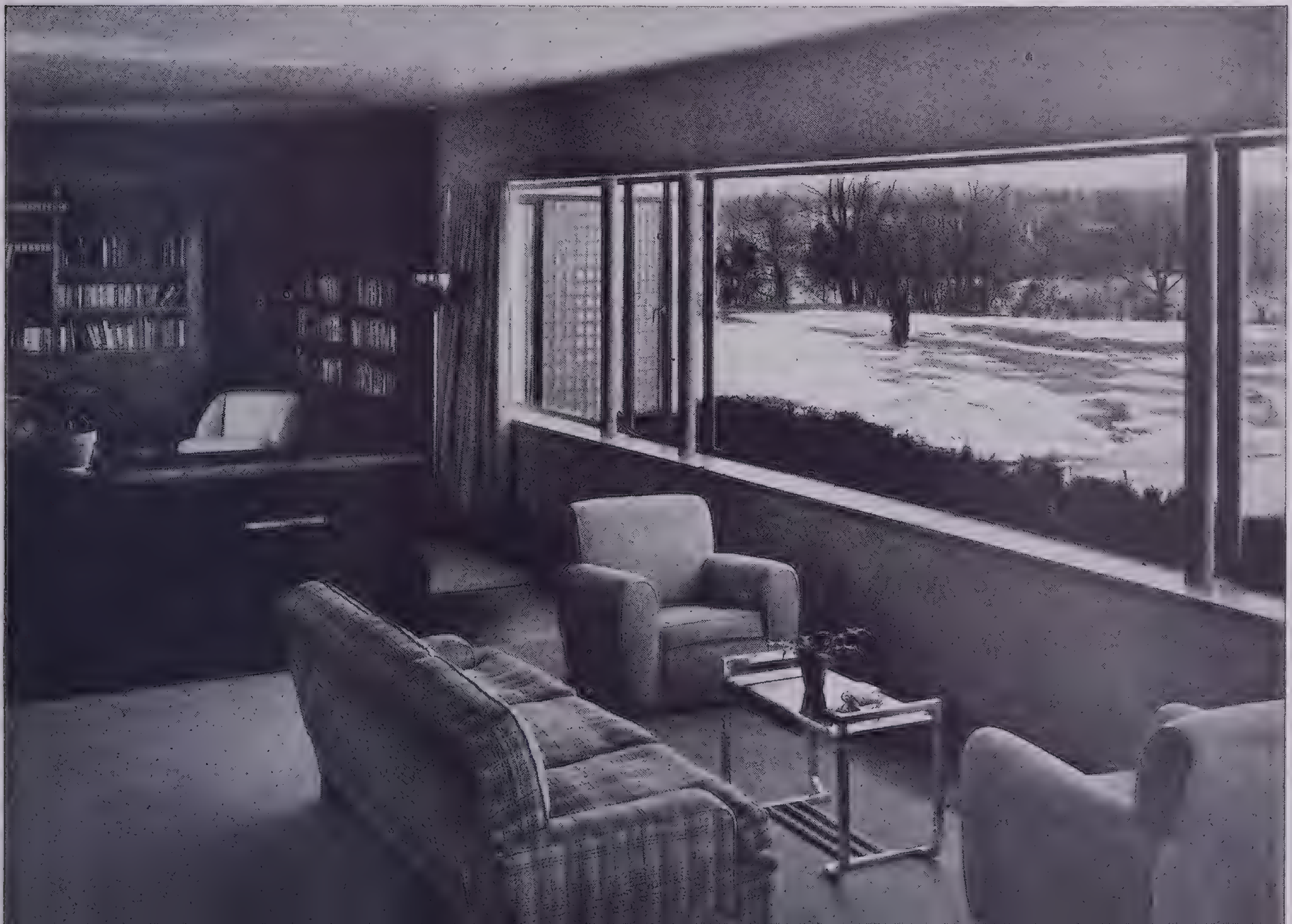


Photo by Emelie Danielson

Nursery designed by Robert Heller: Pale-blue walls and white ceiling; bright-blue linoleum floor covering; shelves to hold books and toys at a young child's height; above the shelves a parade of circus animals and Mother Goose characters cut from wood and painted in brilliant colors; white lacquer furniture with fire-engine-red trim; white Venetian blinds

Modern Interior Decoration in a Nursery and a Living Room

Living room designed by Donald Deskey outstanding for its use of natural light: Built-in corner bookshelves of oak and dark walnut; sofa in yellow chenille; chairs in rough natural wool; table of brushed chromium and plate glass



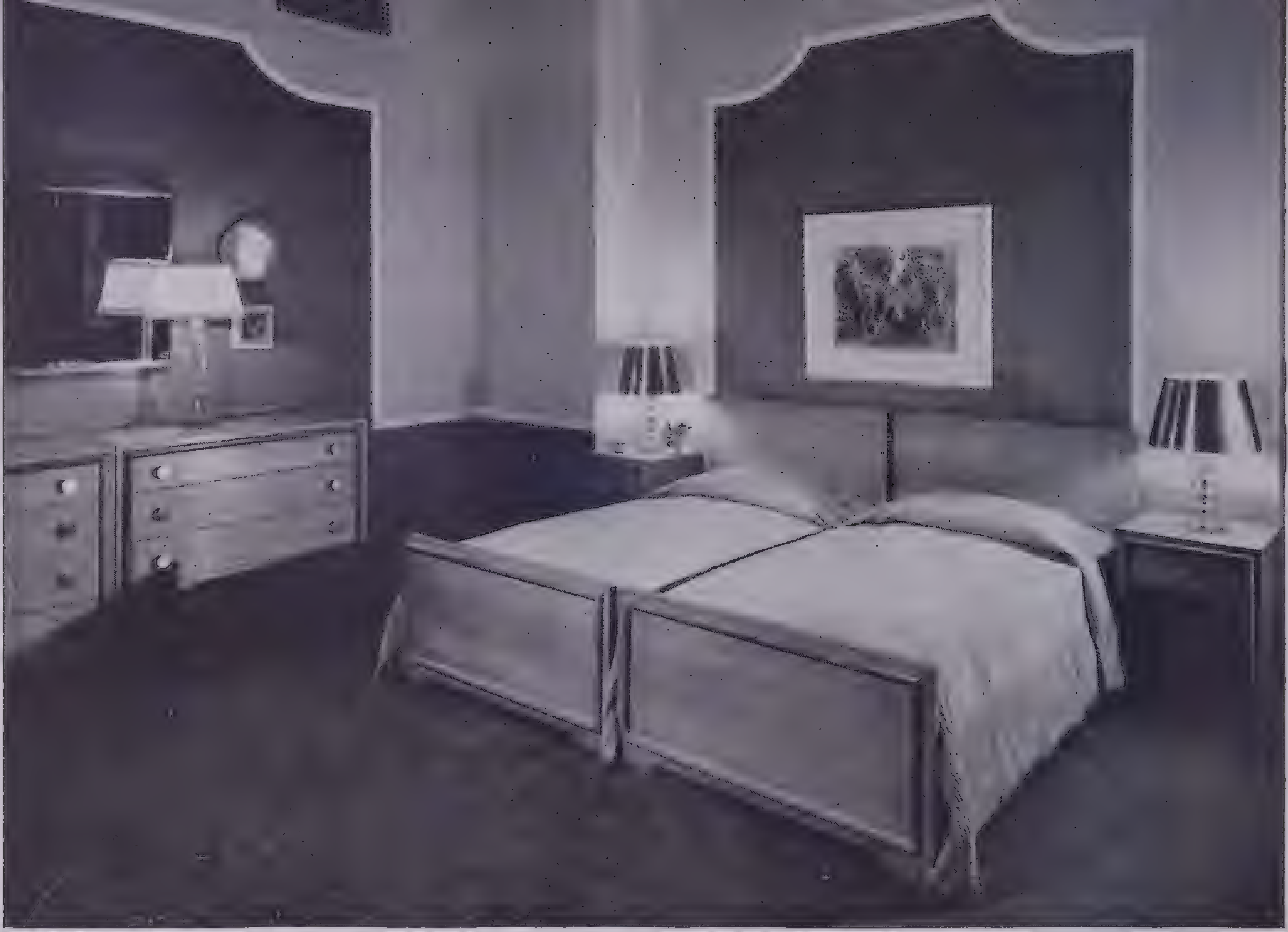


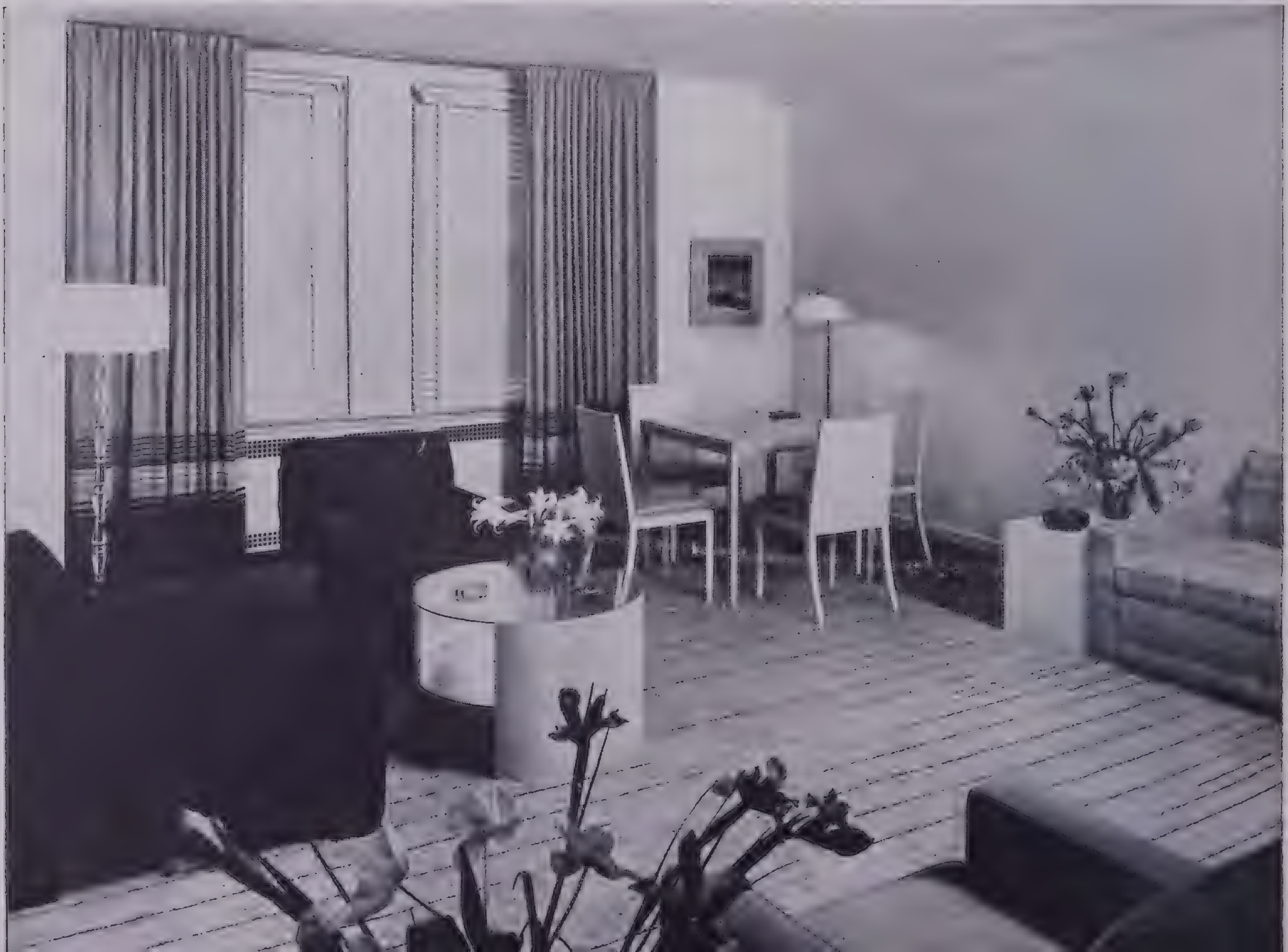
Photo by Emelie Danielson, courtesy R. H. Macy & Company

Bedroom group of bleached walnut designed by Katharine Kinnane: Walls painted in pale blue and chocolate in a series of frames emphasizing each furniture group placed against them; carpeting, an allover one-tone design of powdered blue; spreads, heavy-ribbed chenille repeating the major tone in the watercolor by Raoul Dufy in the panel above

Modern Interior Decoration in a Bedroom and a Living Room

Living room designed by Eleanor Le Maire: Side wall, light gray blue; floor covering, black linoleum; draperies, gray blue and off-white; rug, brown and off-white; two upholstered chairs, dark blue; bridge chairs in orange and white lacquer; bridge table, bleached oak with leather top; round table in bleached oak with copper mirror and transparent glass

Photo by F. S. Lincoln



Courtesy Metropolitan Museum of Art (Clearwater Collection)

Silverware from the Shop of Paul Revere at Boston

Teapot and stand, cream pitcher, sugar bowl and slop basin made by the early American patriot and silversmith sometime during 1790–1800. All but the basin are marked *Revere,* and that is probably his work as well. The engraving shows the influence of classic models

"fit to set before a king" are better suited to glass cases in museums. The state dining room, according to present judgment, is better in clubs, hotels and institutions of state. Even in those places, where the effect is carried out in old Flemish, Spanish or Jacobean oak, there is still the danger of falling into the errors that led in the late 70s to some of our unhappiest interiors, little calculated to inspire modern "feast of wit, and flow of soul."

The dining room does not "go out on its own" except in the relatively few instances where a formal salon is furnished for social use; and some informal dining space is used for every day. Still keeping within the oak scheme, such dining rooms may be developed in Tudor as well as Jacobean, in Italian Renaissance as well as Spanish or Flemish style. They may be in the formal French styles or even Pompeiian or Byzantine if an expensive architect and an owner of cultivated taste combine their efforts with those of a decorator.

Less formal period dining rooms in Colonial, Louis XVI or American Empire effect may be made very attractive and may be harmonized with the entire interior scheme. Decorating and furnishing in one style and in a manner consistent with one period (even if not limited to that period), is more a matter of taste and care than of expense. A Louis interior costs much more than a Colonial interior of equal excellence, and an Italian Renaissance room more than one in Queen Anne style, not for the artistic values involved but because they require more consistency and are luxury interiors. The furnishings and fittings suitable for them are rarer and more costly, when they are good, and are often impossibly cheap and tawdry in modern reproduction. But today for the first time we can readily assemble any kind of interior we really need and find ourselves able to pay for.

Dining rooms offer fewer problems of consistency than almost any other rooms. The size and scale of pieces needed are well established in practice and have been subject to comparatively little variation down the centuries. Even in the cluttered periods, the dining room was less covered with bric-a-brac, and its walls were less abused by too many pictures than living rooms and bedrooms. Their general proportioning was less offensive even when they suffered from overcrowding. Nevertheless many dining rooms even today strike us as too full of things. Their furniture may be beautiful, their color schemes harmonious, their walls and sideboards free of irrelevant decorations—still they produce an atmosphere of tiring confusion. We instantly feel the finer restraint and the greater atmosphere of repose in a room where a few inexpensive pieces are well placed; and we instantly feel disturbed where a set however beautiful is used in a space too restricted for it.

Little Rooms. The functions of the dining room tend to merge with those of the living room. Often some special part of the living room is devoted to the service of the family's meals. In larger homes there may be a breakfast nook and a dining porch, in addition to the regular dining room. The dining room often has a *bay* where informal luncheon may be served or a terrace for summer dining. Houses of conventional period design, even, make much of what the decorators sometimes call the *little rooms.* They are interesting centers of fresh experiment in the house because they may be redesigned with relative ease.

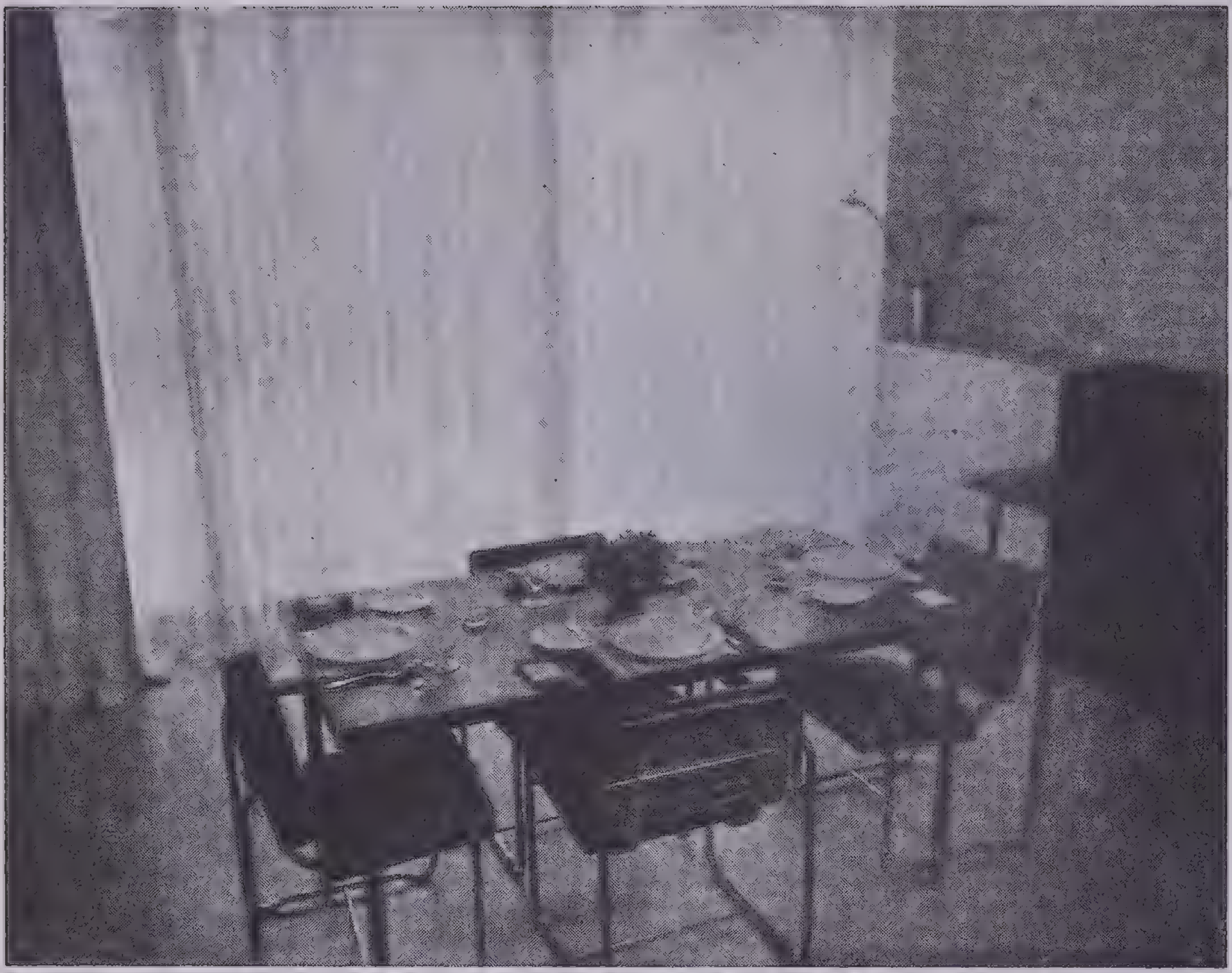
In one successful breakfast room, the furniture and woodwork were painted peacock blue. The paper had a white ground on which small, brilliantly colored peacocks were seen through a pleasant patterning of green foliage. A rug of Scotch weave covered the floor within six inches of the walls. It was green, with a well designed border repeating the peacock shades. The exposed part of the floor was also peacock blue to match the woodwork. White ruffled curtains were used. The narrow painted table had a runner of coarse canvas bordered by a design in green cross-stitching. On the narrow mantelpiece were a pair of dwarfed evergreen trees in blue miniature tubs. The furniture and color effects were carefully harmonized with the narrow space available, and the table was set with inexpensive peasant pottery in suitable color effects.

Another informal breakfast room was planned to make a place for six Early American chairs with rush seats, painted yellow and decorated with grapes. A round table of common pine was painted and decorated to correspond. A background for this crude but effective treatment was a paper of the 1820 period that gave the effect of paneling put on in small squares of green and yellow, each broken in the center to show a basket of fruit. The woodwork and the floor were painted green, and a large circular rug in black, green, gray and yellow completed the scheme.

Early American Suggestions. Interest in domestic life and taste of the pioneer Americans of three centuries is heightened by the present vogue for Early American pine furniture, the recent interest in *primitive painting* and the knowledge that these things were not the property of any particular period but the possessions of the common people, familiar in farmhouses through several centuries. The pine furniture was painted in solid colors, and different colors were often used in one room. Floral and other decorations were used in New England, New York, Pennsylvania and the South, as paints became more common—red and black, at first, and later the polychrome colors seen on old Pennsylvania Dutch chests and bridal boxes.

In certain parts of the country, nothing could be more appropriate than a summer home dining room where old and new pine pieces are harmonized in a scheme of solid colors alternated. Blue, red, black, yellow and shutter green may be harmonized in a single interior if they are balanced with sufficient skill. The effect of a Colonial crazy quilt or an oval braided rug of the hit-and-miss variety will give a clue. Some Early American floors had solid colored borders painted on. Others made use of a spatter pattern covering the entire area of the wide oak, chestnut or pine space. This floor pattern, painted furniture, plain plastered walls, brick fireplace, hand-braided scatter rugs and some early native pottery will make an interior as attractive as it is sound for a house in the country. The blue of old wagon wheels keys a color scheme for the informal dining room by the sea; barn red for the farmhouse. The use must be wise and the effect subtly calculated; but it must be remembered that the colors and the combinations are pleasing because of their crude and naive blends, just as are Balkan embroideries or Scandinavian weavings.

A Modernist Dining Room. An interesting modernist dining room, at the other extreme, is in a city house where two of its walls are of glass brick. They are rounded together by a third wall, almost entirely of clear glass. The design shuts out the neighboring sights and frames the tiny garden. The glass-topped table stands upon four slim legs of tubular metal. The chairs are of metal with leather backs and seats in a combination of



A Modern Dining Room

A room designed by William Lescaze, American architect. The table is pearwood and metal upholstered in a gray-and-white fabric. The curtains are white celanese, the drapes a heavy white material. The floor is gray rubber tile, the ceiling of acoustical tile. An air-conditioning unit is shown at the right. The table is complemented by a serving table of the same size; these may be moved together to make one long table. The service is white Wedgwood

plain colors. The glass wall spaces are hung from ceiling to floor with adjustable draperies, straight-cut, plain-textured and almost neutral in tone. A room like this has little furniture. The table is a factory product, and one or two others like it may be brought in on special occasions. The view is the point of greatest emphasis. The gleaming table and its modern fittings merge into the design with it. The walls are of white arranged to diffuse light. The small, very modern fireplace without a mantel is a strong secondary note of emphasis, and there are few others except the specially designed lighting fixtures of polished white metal.

In more than one Modernist home of distinction wall partitions are movable, so that the living floor is sometimes practically one large unit, and at other times the dining space is closed off from general living space. Some walls roll quietly into place at the pushing of a switch. These movable partitions are very beautiful when they are made of light material such as is used in Japan. Heavy, soundproof curtains or clear, thick, unbreakable glass, set in folding panels of chromium or monel metal, are other materials for Modernist partitions.

The Bedroom.—Though the main living floor is always on display, the bedroom floors are private. The essentials in a bedroom are good ventilation, sunshine, freedom from disturbing sounds in the house and outside, convenient furniture, sufficient space and a pleasing appearance. When Mrs. F. D. Roosevelt went to Washington as First Lady, her White House bedroom was very large. She had the dressing room of her suite made into sleeping quarters and the oversized chamber into a private office. No need, she said, for so much walking back and forth while one is dressing. Many bedrooms of the periods since the White House was built are too small for convenience and also for adequate treatment. Today we are again striking a happy medium.

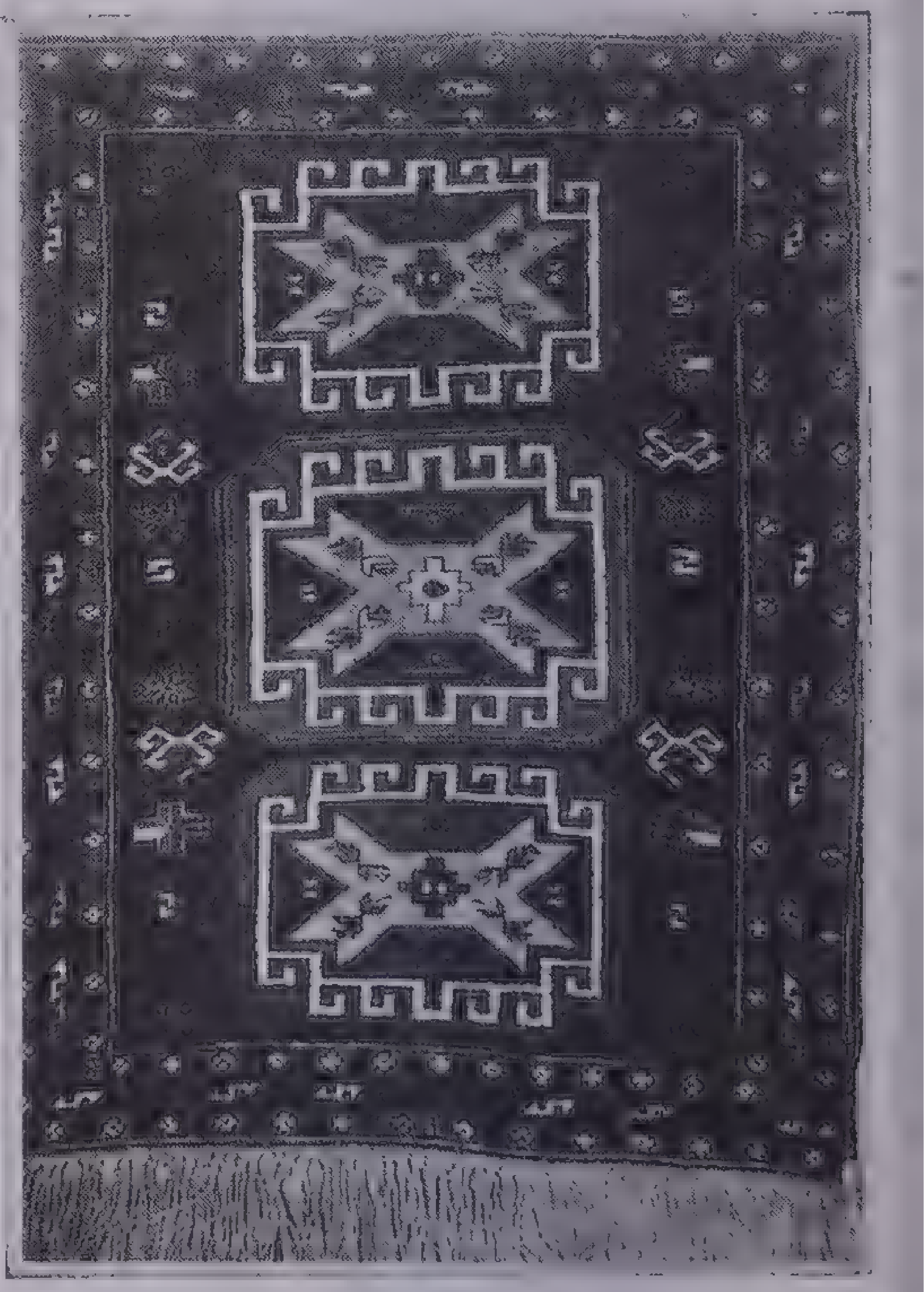
The usual bedroom contains too many things. Photographs, knickknacks and senseless little ornaments are strewn all over the place. If any part of the house should be simple in its appointments, it is the sleeping quarters. A few pictures and two or three interesting accessories are all that a bedroom ordinarily needs, and the accessories should be useful as well as beautiful. Another fault is the involved wall treatment. The wall finish may be plain or inconspicuously patterned. If it is plain, it should not be covered over with meaningless and ill-assorted pictures. If it is figured, care must be taken in the furnishing to avoid a crowded and confused effect. A rather bare scheme is required for figured backgrounds.

Where a figured wall is planned, the effect may be very interesting and pleasing if the paper is chosen with regard for the style of the furniture. There are many beautiful American, English and French patterns on the market. The same principles of harmony, emphasis and balance hold good here, and whatever scheme is adopted should prove restful but not monotonous, cheerful but not garish. Plain walls are often more pleasant when their texture is slightly rough. But recent restudies of the whole problem of color in its relation to light have resulted in the wide use of polished wall areas designed to reflect light and of other special plain surface treatments to create other special effects under artificial illumination. Many wall preparations are washable, a feature especially desirable in a sleeping room. Bedroom schemes may be carried out in many ways. Plain colors are pleasing in combination with chintz hangings. Success is not bound up with any one kind of treatment or by use of any particular period schemes. Whatever else it may have or not have, the bedroom calls for air, sunshine and order.

Rugs.—Better delay the scheme or let the floors go bare than make hasty, ill-advised selections. A wealth of material on almost every aspect of the subject is available. The history of the weavings with which civilized man has covered his floors is more fascinating than his use of color, because it is more closely associated with his growing ideas of domestic life and his art expression in other ways.

The *prayer rugs* of the Orient were originally objects of reverence, and their significance is mainly sacred in the East even today. Berber rugs have a strange pattern—bright but diffuse, with designs rich but abstract and formless—that is said to be a reconstruction of the effect derived from riotous fields of flowers seen in the native country. Swedish and Icelandic rugs woven in recent times for marketing throughout the western world take the peculiar character of their design and sometimes their motives from the days of the vikings. Our own hooked rugs, representative as they are of a minor, relatively unimportant activity, belong among American primitive arts or folk arts.

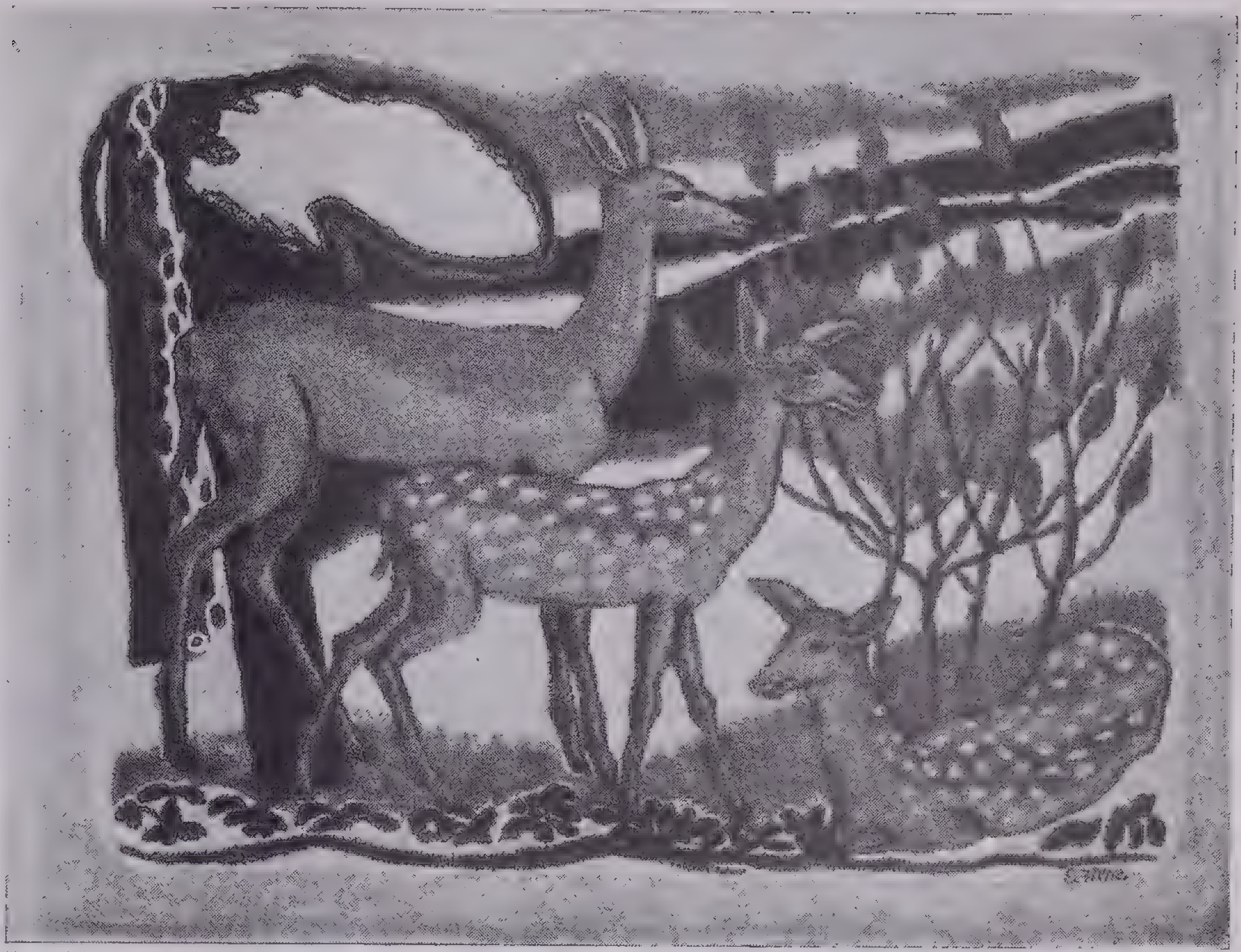
Rugs to complement the Room. At



Courtesy Amtorg Trading Corp.

Oriental Rug: Dagestan

In this product of a weaver of the northeastern Caucasus region the Turkish influence both as to coloring and technique predominates. The patterns in a Dagestan rug are generally based on geometric designs



Courtesy Museum of Modern Art

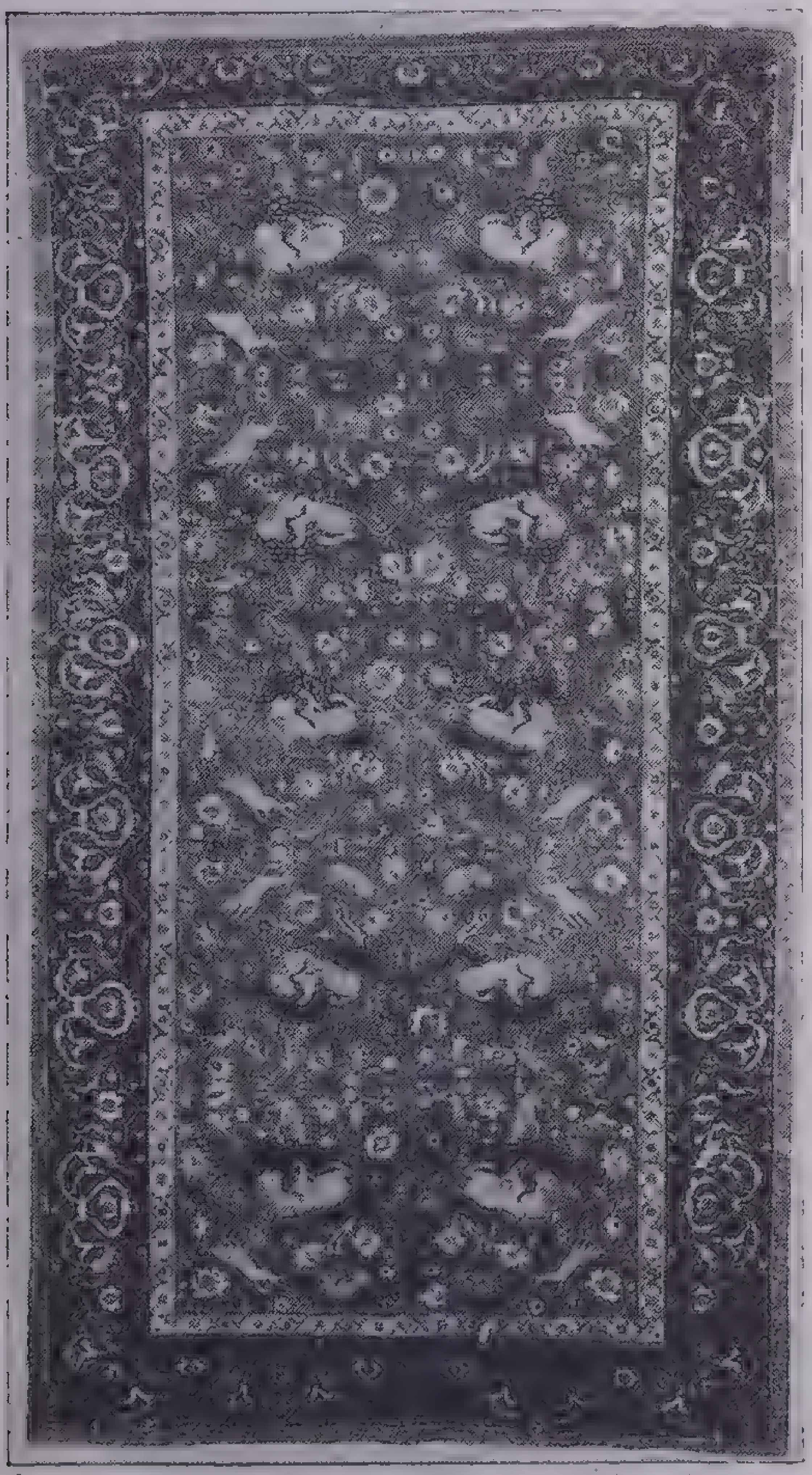
A Modern Hand-Hooked Rug

This rug, 6 × 4½ feet, was designed by Ernest Fiene, American artist, for a shop operated by the New York Association for Improving the Condition of the Poor. Colors are naturalistic, white snow, green grass and leaves and the deer in three shades of tan

one time in America no rug but an Oriental rug pleased us. For certain period rooms and certain effects we still accept no substitutes. We frowned upon all but plain unbroken weaves in floor coverings for a generation or two; but now we plan the coverings with full regard for the interior and its other contents. In the 19th-century period that produced red plush upholstery and wallpaper flowered over with red roses, carpets covered every inch of the floor space, and patterns of flowers and vines sprawled over every inch of the carpets. Now the 20th century turns to rugs and carpets designed with sobriety and thoughtfulness.

American carpet and rug manufacturers have a trade association through which information is being constantly developed regarding the best current ideas in style, design, color and popular taste. Rugs and carpets are woven in accordance with this research, and campaigns of advertising and education are carried on to help the homemaker in her choice of a particular covering for the floor of a particular room. The weight of the colors used sometimes appears more important than the pattern or actual color combination. Texture is emphasized as one of the means to a rich and subtle effect. The relative absorption of light of different weaves is stressed. For ordinary uses colors are almost never the bright and positive ones of the old times.

In a pleasant and varied color scheme of one new bedroom, white, with large areas of almost sapphire blue and touches of shell pink, the large scatter rugs are all in one light color, a delicate jade green.



Courtesy Metropolitan Museum of Art

Oriental Rug: Persian

An early 16th-century rug brocaded with silver threads, from a Moslem shrine at Ardebil, Iran, showing a hunting scene

The rugs are woven with long, loose loop stitches, and the feet sink into them as into a bearskin rug. The magazines and Sunday newspapers constantly describe the new floor coverings of the best designers. The Metropolitan Museum (which has provided designers with study materials of all kinds, since the manufacturers' requirements in the styling of merchandise first took their revolutionary turn in the '20s) recently organized an international exhibition of modern rug designs. The trend seems established towards more color. American Modernist interiors until recently had almost exclusively made use of monotone effects in neutral colors for the floors. A newer phase equally avoids the naturalistic pattern of Oriental rugs from Persia and the geometric complications of the brief 1920–30 fad; but subdued patterns are returning.

Antique Rugs. Consideration of antique rugs as floor coverings is a subject apart from the study of fine collector's rugs. Aniline dyes and western influences have altered the old traditions and commercialized the old centers of weaving; almost every past style and kind of Oriental rug is imitated or reproduced for modern markets. We ignorantly place upon our floors rugs made to hang upon the wall. We incorporate into our decorative schemes fine designs that were approached by the Oriental only after he had removed his shoes. We grind precious symbolic patterns under foot.

The general classifications of Orientals are based upon geographical differences.

1. Persian designs are largely floral, and include among many others the Isfahan, Kermanshah, Kurdistan, Kashan, Meshed, Mosul, Saruk, Shiraz and Teheran.

2. The Turkish rugs of Asia-Minor are conventionalized patterns. Among them are the Anatolian, Bergama, Kaisarish, Karaman, Kurdish and Smyrna weaves.

3. Caucasians comprise the Baku, Cashmere, Dagestan, Derbend, Genghis, Kabistan, Karbagh, Kazak, Lezghian, Malgaran, Shirvan, Sumak, Tcherkess and Tzitzi. These designs are prevailingly geometric.

4. The Turkoman group from Afghanistan, Turkestan and Beluchistan includes, besides the weaves that take their names from these geographical subdivisions, the Bokhara, the Kashgar, Samarkand and Yarkand. They are designed upon the octagonal form.

5. Chinese rugs form a fifth class which has suffered from badly conceived imitations made in the West in recent times.

In deciding what kind of Oriental rug is suitable for the 20th-century interior, we must ask: Will it lie flat? Is the pattern two-dimensional or does it seem to rise in space? Is the composition one which may be viewed from any of its four sides or has it a top and a bottom? The Turkish, Turkoman and Caucasian examples are more geometrical than the Persian. It is the flatness and simplicity of the Bokhara design from the Turkoman or Turkestan group that has given it its tremendous vogue. The rich wine shades are well adapted to oak paneling, oak furniture and the color schemes often selected for living room and library. Certain old specimens are very valuable when they have taken on the bloom of iridescence that only time can give.

Modern Reproductions. The practical modern Bokharas compare favorably with the modern Kazaks, Kelims, Samarkands and Kabistans in weave, wearing qualities, color and price. The Persians were masters of color, their floral and animal forms still influence our fine arts, and their finest rugs are beyond price. Only a deep study of the subject or the advice of an expert should be relied upon in buying them. Rare hunting rugs or garden rugs or rugs in tree-of-life design have been reproduced in all their original colors, in modern wool and silk for use as wall decorations. They have an up-and-down design that gives them many of the values of a painting. They are especially effective in rooms where the floor covering is not too conspicuous.

The smaller Caucasian rugs contribute just the right note to a room now and then when thrown across a table. Early American rooms reconstructed in museums or pictured by eminent American painters show that this use is long established here.

Of the many famous and time-honored textiles now reproduced or imitated for everyday use, none is more noteworthy than the modern Persian rug, the Sharistan, woven on hand looms in this country. The designs are based upon traditional weavings of the 15th and 16th centuries, and made to order. Their peculiar, characteristic color harmony, suggesting the influences of time and sunlight, is entirely a matter of weaving, without washing or artificial aging.

Few people realize the extent to which the ancient weaving art has been revived in modern America. The famous tapestries of the Middle Ages were made in France. Famous rugs and hangings were made also in the France and Flanders of the 17th and 18th centuries, when Versailles, as we have seen, was made the center of western craftsmanship and decoration. The same kind of hand looms and the same traditions of design may be seen in use in New York today.

Pictures.—In many past times it has been truthfully said that the books, rugs and pictures make a room. Early in this century a general reaction set in against overcrowded rooms where the walls were literally lined with pictures. We are still fondly attached to inherited art, and the very ease with which all art of all pasts is reproduced in full color effect and the plentiful supply of fine modern etchings and lithographs at low prices make it fatally easy to misuse wall space.

The home decorator should have a compulsory history course in interior appearances in this one regard. The Louvre (the world's first public art gallery) and the palaces upon which it was modeled treated framed pictures as a wall covering, fitting them together with care. People who were artistic made the mistake of following this bad precedent that if one painting was a fine thing, a thousand paintings must be very much finer. Little by little for a hundred years, the canvases in museums have been thinned out, and a system of grouping has been established. Only gradually in very recent decades, the museums have begun to think first of the individual picture and the total effect and afterwards of the number of things they must put somewhere. Cultured people no more show their love of art by making a display of it, than of their children or their jewelry. More than one decorative designer has built a room upon a single one of Van Gogh's colorful paintings or a Cézanne still life of the brighter period.

Choosing the Right Picture. The general principal to remember is: a picture must be carefully chosen and simply framed—and it must be in keeping with its environment. It must be submitted to the same test as the various other elements of the interior. The relation of periods of painting to periods of decoration is easily traced and applied. A good painting or a faithful color reproduction falls into a color relationship with other products of the same period, and less tangible relationships arise through the association of historic periods with each other. We look for classic marbles and classic themes in painting throughout the changing styles of the Renaissance era and associate with them certain classic color combinations. American portraits and the historic flower and botany prints are effective in Georgian rooms; and so are silhouettes, hunting scenes and many kinds of landscapes and painted studies of everyday life.

The familiar sentimental pictures that remind us of the appeal of mother love, the faithfulness of the old shepherd dog or the pathos of an aged and blind negro servant passed out of popular favor when the public first accepted post-Impressionist painting. Pictures that are marvelous in the detail with which they copy nature (as a photographic reproduction copies it) also have passed from favor among people of discriminating taste.

In general, we hang some one or two good paintings on the walls of a room where they form an appropriate part of the general scheme. Or if not paintings, prints. These should represent good art and good decoration. It matters little whether the room is planned as background for a treasured work of art or a work of art is chosen to fit into the scheme of the room. The picture must be suitable in size, scale, proportion and manner of framing to the room where it is hung if a truly pleasing, harmonious and discriminating effect is to be realized.

The fact that individuals often collect paintings in our day, and the additional fact that special interior planning is not prohibitive even in average homes, has made possible many private picture galleries. These have the atmosphere of the finest and most modern public picture galleries or some small special museums of recent planning. Pictures are the reason for the room's existence, but the pictures are arranged in a reposeful scheme, and confusion and crowding are avoided. Small sculptures or other three-dimensional accessories are used to aid the effect of balance, and a little simple furniture is added to enhance appearance and comfort.

Picture Frames. Pictures, especially paintings, require frames when they are used in a planned interior decoration scheme. Gold frames were formerly correct and elegant and they are still almost indispensable for certain period rooms. Those of early Italian or 18th-century Georgian design are often beautiful. Those of the Louis XV and XVI period are almost always too elaborate for the average taste of the average home owner. Dull gold with a little Renaissance detail or perhaps some polychrome color is effective for reproductions of some Old Masters. It used to be important to graduate the width of the gold frame and the ornateness of the gilt carving to the grandeur of the subject. Today natural wood or wood stained in well-considered colors is preferable to gold frames. This sets the frame back and brings the picture forward. Some of the best artists of the modern world insist upon designing and even making the frames for their pictures—and the frames they make are most often plain unstained wood, sometimes with a little flat conventional carving, oftener without it.

If we really understand the principles of harmony, proportion and balance as they are applied to all the other aspects of a decorative scheme, we shall be able to use this understanding in choosing our pictures room by room and in putting them in frames that will emphasize their interest but keep them in their place as major points of emphasis.

Courtesy Museum of Modern Art

African Negro Sculpture

A bronze equestrian figure from Benin, Nigeria, 18¾ inches high, in the Louis Carré Gallery, Paris

GLASS

Glass is properly included among ceramic products because it results from treatment of earthy materials by fire. The main difference between clay wares and glass is in the effect of the fire or heat, which brings the glassmaking mixture to a completely liquid condition, whereas clay wares contain a great deal of crystallized material bound together by a glassy matrix.

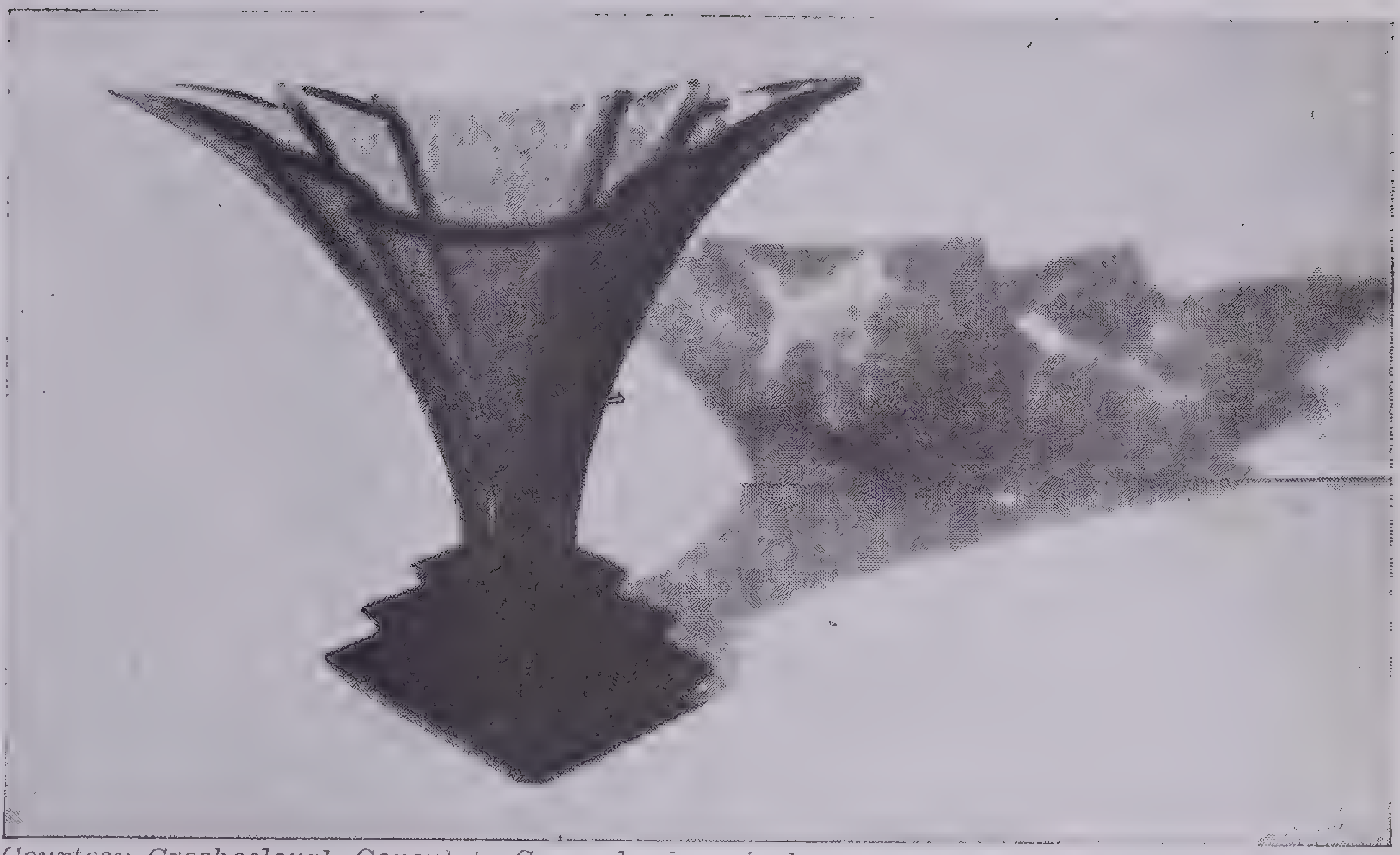
The various kinds of glass commercially produced are made up of a few oxides dissolved together by fusion in a relatively wide range of proportions. Essentially, glass contains silica, an alkali and lime or lead oxide. Silica is the vitally necessary glass-forming oxide. The alkali is the flux that makes the mixture melt at temperatures not too high. The lime or lead oxide gives the glass resistance to attack by water and changes its physical and optical properties.

Pure silica can be melted at temperatures above 3100° F. to a very viscous liquid that will cool without crystallizing. This fused silica is the remarkable *quartz glass* that finds many important uses because it is so durable and so indifferent to sudden changes of temperature; and because it transmits all colors and wavelengths of light—including the ultraviolet—remarkably well.

Silica retains this glass-forming character when it is combined with alkalis such as soda and potash. The resulting silicates melt much more readily. Soda and potash, which hasten the process, are called *fluxes.* But the alkali silicates are quite soluble in water. Tons of silicate of soda are annually made, dissolved in water to form the syrupy liquid known as *water glass* and used to cement together corrugated paper boxes, to preserve eggs and in many other ways.

In order to make glass that will be durable, some oxide whose silicate is insoluble must be included in the composition. Lime is the most important of these oxides and is used in all common glass, as for windows, bottles and tableware. Magnesia is commonly found in American limestones and thus gets into a great many mixtures, behaving like lime. Lead oxide is used instead of lime in many optical glasses and in fine tableware and art glass. It makes the glass softer to cut, easier to work and more brilliant and sparkling (refractive). Barium oxide and zinc oxide appear in some special glasses. Boron oxide—also a glass former by itself—gives glass a lower expansibility and is used in laboratory ware, cooking ware and thermometers. Alumina is always accidentally present as an impurity and is often added to increase durability.

Commercial glasses contain, as an average, about three-quarters silica, with the remaining quarter divided more or less equally between alkalis and earthy oxides. At a bright red heat glass is gathered on iron tools or flowed in cut-off gobs to machines, where it behaves like stiff molasses. It can still be shaped as long as it is hot enough to show redness. In special ovens called *leers* or *lehrs,* the glassware is cooled slowly, because rapidly cooled glass develops internal strains that may cause it to fly to pieces.


Courtesy Czechoslovak Consulate General, New York

Czechoslovakian Glass
Some of the best of modern glassware is turned out by the factories of Czechoslovakia. There are 140 glassworks in this little place giving employment to some 150,000 workers

The raw materials for the common glasses are sand, soda, ash and lime. Glass sand consists of fine grains of quartz and is almost chemically pure silica. Soda ash (the dry carbonate) may be replaced in part by sodium sulphate or sodium nitrate. Lime may also be introduced as raw limestone or as the hydrate. For large-scale melting, these granular materials are mixed into a batch and fed into a tank. This is a huge receptacle 3 or 4 feet deep, as large as a living room, built of thick blocks of fire clay and roofed with silica brick. Here the furnace fire plays directly upon the glass and the new batch, producing a dazzling white heat of perhaps 2700° F.—so hot that it melts the materials into a uniform liquid and makes the glass fluid for the bubbles of carbon dioxide and other gases to escape.

When fine glassware is being made, potassium carbonate, saltpeter and red lead are mixed with the sand, and the batch is melted in covered pots that hold a ton or more. The temperatures inside the pots may reach 2500° F.

All materials used in glassmaking must be oxides or yield oxides when they are exposed to heat in the presence of silica. Borax is used to introduce both boron oxide and soda. Feldspar is a convenient mineral for putting in alumina and, with it, alkalis and silica. Reagents such as arsenic oxide are added in small quantities to help remove the bubbles.

All the raw materials, especially limestone and sand, contain as an impurity iron oxide, which colors glass green. In order to produce glass that will be colorless or crystal, this green or yellowish-green color from the iron must be covered up or masked by producing a complementary color in the glass. This is done by using manganese dioxide in pot glasses or a combination of selenium and cobalt oxide in tank glasses. The best crystal glass requires exceptionally pure raw materials and much skill in the use of these decolorizers.

Larger quantities of manganese give a purple or violet color; selenium makes the glass pink; and cobalt oxide, a rich blue. The best greens are obtained with chromium oxide, and uranium oxide gives a peculiar greenish yellow. Copper oxide was used by the Egyptians for making blue glasses and glazes. Iron oxide in quantity gave the color to the antique green glass and is used for window glass and bottle glasses today. Ruby glasses owe their color to exceedingly small particles of gold or copper or a combination of selenium and cadmium sulphide. Yellow or amber glasses are colored by sulphur or sulphides. Black glass is made by loading the glass with such a quantity of several colorants that all the light is prevented from passing through it. White or opal glasses contain very small crystals of fluorides, phosphates, tin oxide or antimony oxide. The intensity of coloration of a piece of glass depends on the quantity of coloring material it contains and its thickness.

Interesting effects are produced upon glass surfaces by the slow processes of weathering. No glass is completely insoluble or unaffected by water. Glass made in ancient medieval times was so susceptible to the action of the moisture and carbonic acid of the atmosphere that the surface of much old glassware has been strongly corroded. When this weathering or corrosion penetrated far enough to make a laminated or scaled surface, the play of light on this surface produces an iridescent effect that at times is very beautiful. This is seen in many museum pieces, such as tear bottles, taken from ancient tombs in Cyprus and elsewhere.

Old cathedral windows were made of glass so imperfectly melted and refined that it would seem crude today; they were worked by processes that gave them irregular thickness and uneven surfaces, and they have been weathered to a dimmed or iridescent surface so that they have a softness and rich variety of color tones that cannot be duplicated by the processes now in use for colored window glass. The modern glass is too clear, too uniform and too perfect in its surface.

In a few small establishments art glass for windows is now being made by processes that imitate those in use in the Middle Ages and that give artistic color effects; but only time can give the patina that is a part of the charm of the old cathedral glass. Stained-glass making is not a lost art —except as modern methods have eliminated some of the charm of colored glass for windows by making it too faultless. John LaFarge and Louis C. Tiffany promoted the art of the stained-glass window in America, and Tiffany Furnaces, Flushing, L. I., produce the Favrile iridescent glass that originated there. Opal glass is much used in windows.

HISTORY

Glassmaking is an art so ancient that its beginnings can no more be traced than the beginnings of the use of iron. Anyone who is familiar with the formation of clinkers in a coal fire or glassy, stuck-together masses where a hot wood fire has burned can readily imagine the accidental discovery of crude glass. In nature it is as old as the earliest rocks. Obsidian is a volcanic glass rock, and a great cliff of this solid glass may be seen in Yellowstone Park. Many volcanic lavas are glassy, especially pumice, which is glass that was filled with fine bubbles while it was molten. The glazes and enamels of early Egypt are remarkable for their quality and exquisite coloring.

While glass for table and household use was made quite extensively in the Near East during the Middle Ages there was no great improvement or development until the 16th century when all the arts were stimulated by the great Renaissance. Venice took the lead. It is said that the purity of the sand on the island of Murano led to the establishment there of the industry. Venetian glass has long been regarded as the finest example of the art. Every attempt was made to keep Venetian methods a secret. A law of 1474 pronounced a sentence of death on any glassblower who left Venice and refused to return. The republic paid an executioner to track him down and kill him. The Venetian experts were lured to all parts of Europe and were protected in their new homes. As the industry developed in Germany, France and England it was generally more utilitarian than it had been in Venice. Bohemian table glass is unexcelled, and of late years the English factories in London and Stourbridge have produced some beautiful examples.

Courtesy Metropolitan Museum of Art

Eighteenth-Century American Glass

Pear-shaped salt cellar and cream pitcher of deep-blue Stiegel glass. The glassworks of Henry William Stiegel (1729–85) at Manheim, Lancaster County, Pennsylvania, turned out what is considered the most beautiful glass ever blown in America

Glassmaking began in America about 1611 when the Virginia colonists made colored beads for the Indian trade and later made bottles. Other factories were opened in southern New Jersey and in Massachusetts where supplies of good sand offered advantages. Later, as settlement spread to the west, the abundant coal of Pennsylvania and West Virginia and the natural gas found in these states and still farther west encouraged the location of the principal American factories in a broad belt between the Allegheny Mountains and the Mississippi River.

Courtesy Metropolitan Museum of Art

Engraved Flip Glass

An example of Early American glass from the factory of Henry William Stiegel at Manheim, Lancaster County, Pennsylvania

AMERICAN GLASS

The chief American contribution to glassworking is the art of pressing. Cast-iron molds can be made in many different shapes and any sort of surface design or marking can be cut in them. When hot glass is dropped into one of these molds and forced by a plunger to conform to mold outlines, shapes and designs can be duplicated in any desired number. Sometimes further shaping of pressed ware is done by reheating the pieces as they are held on hot iron rods and by polishing their surfaces with the aid of wooden tools. Sometimes the surface designs are more carefully finished by smoothing and polishing after the ware is cold. Stiegel glass, a treasured American flint product made in Manheim, Pa., by Henry W. Stiegel after 1768, is superior in color, form and quality.

The pressed glass made at Sandwich, Mass., as early as 1827, and called *Sandwich glass* is much prized by collectors as an early example of this American development. It has its direct descendants in many examples of modern tableware excellent in crystal and colors. By no means all these shapes and patterns have any artistic merit, but the fault does not lie with the quantity production made possible by pressing, but in the lack of artistry in the original designs.

This democracy in production, resulting from mechanical methods and producing glassware in quantity for all to possess, has given rise to a few excellent items designed for purely utilitarian purposes. Naturally the business of shaping glass in a mold rather than by hand tools has been extended to ware that is blown either on a pipe by mouth or by a machine using compressed air. The graceful flasks and retorts of the laboratory, copied as they are from the more or less natural forms produced by blowing the glass free in the air, the bulbs that serve as envelopes for electric lamps, bottles and containers of countless shapes and sizes have all a certain honesty of design and a fitness for their purpose that gives them a simple type of beauty, although their purely ornamental value is slight.

One of the centers where artistic glasswares are now being made is the Corning Glass Works, the Steuben Division of which produces many lovely handmade pieces. Architectural panels and applications of glass to illumination have been highly developed at Corning. Such tableware factories as Fostoria, Heisey and Cambridge produce lovely stemware and dishes by hand blowing and pressing in molds in fairly large quantities. Numerous small plants make novelties and knickknacks that occasionally include pieces of surprising merit. Many large factories with automatic machinery turn out by the million pieces that make up in their perfection of workmanship and finish and their excellent quality for any lack of individuality in their design.

Courtesy Steuben Glass, Inc.

Fine Modern Glass

The products of modern glassworks are of high artistic excellence, such as *The Zodiac Bowl* (designed by Sidney Waugh) shown here. Contrast the simple, clean design of this bowl with the overdecorated character of the glassware of a bygone day. The design of the bowl accentuates the crystalline character of the glass and makes the whole take on a jewellike appearance. Notice that the artist's choice of the zodiacal signs is a sharp departure from the use of floral designs by glassmakers for so many generations. In another way, also, the bowl is a good example of modern design in that its decoration does not interfere with its utility. The Zodiac Bowl is of blown crystal and is shaped entirely by hand. After the bowl was blown and shaped the signs of the zodiac were engraved on its surface by the use of copper wheels.

The modern trend especially in America has been toward more and more automatic mechanical production of glassware. Though we have lost the skilled craftsmanship that could make a few finely executed pieces for the possession of the very rich, we have gained in the abundance of fairly good glassware for everyone.

It remains for us to apply better designing and to develop in all the people a better artistic taste that will demand the abolition of ugliness in our pieces of glassware. The modern window pane, drawn as a smooth, flat sheet directly from the bath of glass, is so clear and perfect that we forget its presence when we look through a window. Still more perfect is plate glass, formed by the careful grinding and polishing of thick rolled sheets. Optical glass, compounded with extreme care and stirred to a high degree of homogeneity, supplies us with spectacles, telescopes, opera glasses and microscopes, which are not only indispensable to the scientist, but which enable us to perceive beauties which would otherwise be hidden from us forever as a result of our own visual inadequacy.

The opportunity for the artist of today lies not in any attempt to develop hand craftsmanship but rather in the development of original designs that will be not only useful but beautiful and that through mass production will bring this beauty within the reach of all the people. Glassmaking today must be both a science and an art.

GLASS

COUNTRY	DATE	NATURE OF PRODUCT	REMARKS
	B.C.		
Egypt	circa 2400	Dark-blue glass. Semiopaque	The earliest dated specimens known are of this era
Egypt	1450	Transparent green glass	A bead found at Thebes is the oldest clear glass known
Nineveh	712	Pale green transparent	A small vase in the British Museum bears the name of Sargon, King of Assyria
Greece or **Phoenicia**	circa 400	Colored glass. Waved, striated and sometimes carved	Numerous small bottles. Beads and ornaments. The Phoenicians claimed the invention of glass
Rome	circa 30 B.C. to 309 A.D.	Common green glass. Colored and ornamental glass, carved, cut and woven glass	Enormous quantities of glass of every description, even including window glass, were produced
China	circa 140 B.C.	Small vessels ornamented and embossed	The statements regarding early glass in China are very uncertain. Few specimens remain
	A.D.		
Constantinople (Byzantium)	800 to 1200	Heavy molded glass in dark colors. Some window glass	Classic models were followed, but the wars of the period caused much interchange of plunder, and the origin of many specimens is doubtful
Damascus and the East	1200 to 1400	Vessels of clear glass often richly ornamented	Many lamps and vessels for religious use are found in mosques
Italy (Venice and Murano)	1090	Every description of fancy glass	Glass mosaics preceded the general manufacture of glass in Venice. The furnaces were removed to Murano probably about 1300. Venetian glass is the model for the world
Italy (Murano)	1490	Mille-fiore (thousand-flowers) glass	This had been made by the Romans. Canes of colored glass were cut into short lengths and these, with the cut ends showing, were fused into the body of the vessel
Italy (Murano)	1500	Vitro-di-trina (lace glass)	Threads of opaque white glass were fused in a geometric pattern into the clear glass of the vessel
France	1400 to 1600	Utensils of various sorts colored and decorated. Window glass	Small manufactories of glass existed in many parts of France, but most of the product was unimportant
Spain	circa 500 to 800	Cups, vials and bottles	As in the case of France, the Roman influence was felt in Spain
Spain	1400 to 1600	Utensils and drinking cups	Some Spanish glass bears evidence of Venetian influence. Colored and reticulated forms are found
Germany	1400 et seq.	Steins and goblets. Window glass	The stein was even then a feature in Germany. A great variety of form and treatment is found. Some highly ornate pieces are preserved
Great Britain	circa 600	Beads, crude cups, window glass	Both Roman and Saxon specimens are found. The original tumbler was a glass drinking horn which could not be set down until empty
Great Britain	1300 to 1600	Cathedral glass. Vessels of many sorts	English stained glass for church windows is unsurpassed. The vessels were generally plain and useful

MODERN PRODUCTIONS

Italy (Venice and Murano)	The glass is much on the old style. Every description of colored, blown, woven and reticulated glass is produced. The material is still of the lime-soda mixture
France	A great deal of modern French glass is crystal of the lead-potash compound. The molded glass is very fine. Some French craftsmen have produced wonderful effects in colors
Bohemia	This glass is well known in the small and inexpensive bric-a-brac of the stores. A good deal of it is decorated in color and gold
Germany (Jena)	In optical and chemical glass the Jena works led the world for many years. All varieties of commercial glass are produced
England	The English glassmakers are surpassed by none. Table glass of pure crystal, cut glass and ornamental pieces are made in great variety
America	Much of the American glass is molded in the form of tumblers and household vessels. Fine cut glass is made at Corning, Toledo and other places Plate glass is an important part of the industry. Fine optical glass and heat-resisting glasses have been developed here

CERAMICS

In the broadest sense the term ceramics includes the whole field of the compounds and mixtures of which the foundation is silica and to which solidity and permanence are given by the action of fire. In this term, therefore, are included not only pottery and porcelain but bricks, tiles, terra cotta, stoneware, glass, the hydraulic cements and enamels for steel ware and for use in jewelry. The practical production in each case involves mixing or preparation, shaping or application and firing or fusion.

The study of ceramics may be approached from many sides. The historical view concerns itself with the gradual development of the nations as expressed in fictile ware; the artistic is founded upon the historical and deals with clay, glaze and color as means of art expression; the technical and scientific considers the methods by which results are produced and the industrial or utilitarian view deals with the production of wares upon a large scale and as a commercial proposition.

Materials Employed.—Certain rocks and minerals are the foundation of all ceramic work. Clays of various kinds, feldspars, quartz, limestone, steatite, cryolite and fluorspar are used more or less, and with them, for glazing, the compounds of lead, zinc, barium, boron, potash and soda. Some of these substances are easily fusible, others resist the action of very high temperatures and the remarkable variety of ceramic products is due to the possibility of wide variation in the nature of the compounds. Two things are, in the main, necessary—a sufficient resistance to the action of fire and a sufficient yielding to produce the solidity due to partial fusion. Some clays, such as those used for brick or terra cotta, possess both these properties naturally balanced; others, such as the white clays used for porcelain and fine earthenware, possess only the refractory nature, the yielding to heat must be induced by an admixture. Thus all white wares are more or less artificial in that the material is not found in nature ready for use. In fact almost the only wares that are made from unmixed clays are bricks, roofing tile, pipes for drainage and conduits for wiring.

Courtesy Metropolitan Museum of Art

Red-Figured Amphora of 5th-Century Greece

A two-handled vase from about 440 B.C. is decorated with carefully-drawn realistic figures by the Lykaon painter. The warrior Neoptolemus is pictured saying farewell to his father Antiochus, while his wife (or mother) Kalliope pours a libation

DEVELOPMENT OF CERAMICS

The development of clay working among the nations has been through similar phases in all parts of the world although in some cases the beginning has been with the brick, in others with the pot. Broadly speaking the brick was evolved from adobe and was manufactured only under climatic conditions such as made sun-dried clay a possibility. The pot was evolved from the basket, leather or bark vessel and was made by primitive peoples in many parts of the world. Possibly sun-dried pots were made at the first but no specimens remain. The origin of burning or baking the clay is unknown. The Britons placed pots in the funeral pyre and afterward collected the bones and buried them in one of the vessels, using others to contain food and water.

Though the earliest pottery was shaped by hand alone, numerous examples formed on the potter's wheel have been found in settlements dating from 4000 B.C. The wheel of that period was very crude, but the evidence of its use is definite.

The Greeks.—As producers of pottery from natural clays the Greeks were supreme. Thousands of their vases are now to be seen in museums. The work is classified under certain well-marked styles. The earliest wares were plain or simply decorated with bands; then came the geometric style in which, as the name implies, the pieces were covered, more or less completely, with lines arranged in angular patterns. This was succeeded by the black-figured ware in which animals, birds and human figures were painted in black silhouette upon the brown or red clay. The finest period was that of the red-figured ware in which the black pigment was used as a background, and the figures were reserved in the natural red. All these wares are fired only once, the pigment being laid upon the unburned clay.

The Romans.—The Roman potters carried their art into many lands using often local clay. The black ware commonly known as *Upchurch* from the locality in England where much of it has been found was made of a common red clay and was turned black in the burning by the action of smoke. Castor ware is a variety that is characterized by painting in white clay upon a black or brown body. Arretine ware was molded from a bright red clay and glazed. None of these ancient wares has been perpetuated with the possible exception of the Castor ware that may have been the remote ancestor of the early English slip-decorated wares. The treatment is similar though there does not seem to have been any continuity of production.

Courtesy Metropolitan Museum of Art

Arretine Cup

The ancient Latin town of Arretium (modern Arezzo), where this cup was found, was the center of a school of ceramics which flourished 40 B.C.–60 A.D. Arretine ware was made of a red clay, glazed, and usually decorated in relief. The cup pictured shows a bear hunt in high relief

Chinese Influence.—The whole trend of the pottery idea was changed by the influence of Chinese porcelain upon the western world. Up to about the 13th century dark-colored wares from natural clays had been made exclusively; but as soon as the porcelains of the Chinese became known through the channels of trade the whole ceramic world strove for the production of white pottery. In the Near East the expedient was adopted of coating the dark clay with a white veneer of ground quartz mixed with a little pipe clay. The knowledge of this process was confined to the Persians, Arabs and Moors.

Majolica.—Upon the invasion of Spain by the Moors the ware known as *majolica* was originated. The characteristic feature of this is a glaze rendered opaque by the use of tin oxide that serves, as did the earlier white veneer, to conceal the dark-colored clay of the body. Nearly every country in Europe participated in this development. The majolica of Italy, delftware of Holland, and the different styles of faïence made at Nevers, Rouen, Moustiers and other places in France are technically almost identical. Wide differences are, of course, apparent in design and form, but the essential technique is the opaque tin enamel.

The name *majolica* is from that of the island of Majorca in the Mediterranean, whence these wares were exported. The term was first applied only to the lustered pottery that originated in Spain and was afterward made with such great success

Courtesy Metropolitan Museum of Art

Italian Majolica Plate

Italian majolica ware is similar to that introduced into Spain by the Moors. This plate was made by Giorgio Andreoli at Gubbio in the late 16th century. It is predominantly blue and green with the gold-and-ruby glaze for which Maestro Giorgio was famous

in Italy; but it is now generally used for all wares with the stanniferous enamel or tin glaze. Whether the knowledge of this was carried from Spain to Italy or was communicated to the Italian potters by Oriental workmen is a debatable point. In any case it was in Italy that the art reached its fullest perfection. The names of Luca della Robbia, Giorgio Andreoli and even Michelangelo are connected with this product. It is from the name of the town of Faenza that the word *faïence* is derived. The world is fortunate in possessing a manual of the potter's art in Italy during the 16th century by Piccolpasso, a contemporary writer. In this most exhaustive work detailed information is given as to the production of the wares of the time and every modern writer has drawn liberally upon this source.

Soft Porcelain.—Ware of soft body may be said to have grown naturally from majolica, first in Italy where the rare Medici porcelain was made about the year 1580, and afterward in France at St. Cloud in 1695, at Chantilly in 1725 and at Vincennes, the forerunner of Sèvres. The aim of the early porcelain makers was to produce a translucent white ware that would approach the Chinese masterpieces in appearance. No pure white clay had then been discovered in Europe, so that it had to be accomplished by artificial means. A mixture was made of sand, gypsum, salt, alum and niter and was fused in crucibles to a solid slag known as *frit*. This was then ground to a fine powder and to it was added a small portion of a plastic calcareous clay. This clay tended to darken the color, so that it was not possible to use enough to impart a working plasticity to the mass. Hence the porcelain makers were driven to use such emollients as soap and mucilage before the paste could be shaped. So tender was this ware in its resistance to fire that heavy losses were experienced in the kilns and it was eventually superseded by the hard porcelain that now constitutes the staple European product. No more beautiful ware than the French *pâte tendre* has ever been made. The glaze was a very fusible glass composed largely of lead oxide and, consequently, the paintings, which were executed with consummate skill by artists of repute, sank into the glaze in the burning and acquired lustrous beauty. To this fact is also to be attributed the superb quality of the ground colors, the inimitable turquoise, the apple green, the *rose du Barry* and the *bleu du Roi*.

Progress in France.—France gave birth, in the 16th century, to two notable departures from established pottery methods. These were the faïence known as Henri II and the ware of Bernard Palissy. The former has been the subject of much discussion as to its place of origin. It was first attributed to Hélène de Hangest, who was a woman of refined taste, the chatelaine of the Château d'Oiron. It was said that she and her librarian together made this pottery as a labor of love. Only 53 pieces are now known to exist. The characteristic feature of the ware is that a light, yellowish clay is inlaid, somewhat after the method of a bookbinder, with clays of darker color, the whole being covered with a transparent glaze. Other locations have been given to this ware but the name Henri Deux (Henry II) is accepted as the most satisfactory.

Courtesy Metropolitan Museum of Art

Sèvres Sugar Bowl

Sèvres ware is a soft porcelain (*pâte tendre*) first made at a national factory at Sèvres, France, in the 18th century. This sugar bowl was probably produced in 1761, 2 years after Louis XV became proprietor of the factory

Bernard Palissy was born in 1510, and his life has inspired many a theme. His aim was to make a perfect white-enameled pottery, and though he struggled for 15 years he never realized his purpose. He made, however, the beautiful colored glazes that will always be associated with his name. Being a devoted student of nature he modeled reptiles and fishes on his platters and covered the clay with glazes in the natural colors.

Neither of these two French wares had any appreciable effect upon the ceramic industry and neither is made at the present time.

Hard Porcelain.—Chinese porcelain is generally conceded to be the criterion, as it is the prototype of this class of ware. The ingredients are the pure clay, known as *kaolin,* and feldspar and quartz. The glaze is composed of lime, clay, feldspar and quartz. Both body and glaze are burned together at a very high temperature. The perfection of the work of the Chinese potters was reached between the 14th and the 17th centuries to which period most of the finest pieces are referred. It was this porcelain that inspired the European connoisseurs as already stated. France led the way at St. Cloud with a purely artificial ware; but the first hard porcelain made in Europe must be accredited to Saxony. In the year 1709 one Johann Friedrich Böttger, being employed as chemist by the Elector of Saxony, was shown some infusible, white earth. He had become interested in porcelain through the fine collection of Chinese and Japanese wares in the possession of the Elector and at once essayed its production. The result was the famous porcelain of Meissen (near Dresden) now known as Dresden china. The production of porcelain now became the passion of princes. One after another the rulers of the German states established studios or small factories in which the fashionable art could be pursued. Vienna, Höchst, Berlin, Nymphenburg and many other places became centers of production; but in the majority of cases the work ceased upon the death of the patron, Meissen, Vienna and Berlin still flourish, together with a large number of modern manufactories that are successfully producing commercial wares.

Kaolin (porcelain clay) was discovered in France in the year 1768 and after some experiments the manufacture of hard porcelain was begun. For some years both wares were produced at Sèvres, but in 1804 making the soft paste was finally abandoned.

English Porcelains

England soon became involved in the passion for porcelain, three manufactories being established within a very brief period. These were Bow (1744), Chelsea (1748) and Worcester (1751). The work of each was in close imitation of the French in technical treatment but influenced by the Chinese as to motive. The china made at Bow contained as one of the ingredients a white earth that was imported from America, from the "back of Virginia," a locality whence china-clays are now procured. There was a factory in Derby that was flourishing in 1756, though the exact date of its origin is unknown. Worcester, now known as *Royal Worcester* is the only one of these establishments that survives, though a new factory has been set up at Derby.

Hard porcelain in England has had but two exponents. When, in 1756, William Cookworthy discovered china clay in the country at Cornwall, he set up a factory at Plymouth, the nearest important town, for the purpose of using the clay. He made a kaolinic porcelain after the manner of the Chinese, but so imperfect were his methods that a piece of Plymouth porcelain without a flaw is unknown. The venture did not succeed and in

1770 the factory was removed to Bristol where Richard Champion was already engaged in making a similar porcelain. The works at Bristol are now engaged in the manufacture of earthenware only.

About this time the characteristic English china was perfected. This is known as *bone china* from the fact that the paste contains about 40 per cent calcined bone. This ware differs from both soft and hard porcelains and may be regarded as a compromise. It is not as tender as the French soft paste and is glazed with a compound that is much softer than that necessary for hard porcelain. Much of the success of English tablewares may be attributed to the quality of this china.

General Types.—Although the manufacture of porcelain came to England as an alien art, the production of pottery is indigenous to the soil. From the days of the ancient Britons there were potters in the land. They wrought the native clays and evolved the slip-painted wares, the combed and marbled wares, the tortoise-shell, the agate and the mottled wares of modern museums. They also made a beautiful white stoneware, glazed with salt, after the German fashion, and decorated with transparent colors. From the ranks of these potters arose Dwight and Toft and Astbury and Whieldon to be topped in turn by Josiah Wedgwood. The potters foregathered in North Staffordshire, where clays and coal were abundant, and thus were founded the Staffordshire potteries, a federation of small towns that have separate entities but one interest. Here are the famous Minton, Copeland, Wedgwood, Doulton, Meakin, Johnson and a hundred other flourishing factories whose wares are on every table. Nearly all the English potters make both china and earthenware. The latter is a white ware, light and porous, which is much cheaper than china. Native clays are almost exclusively employed, but feldspar is imported from Sweden.

Courtesy Metropolitan Museum of Art

Wedgwood Chocolate Pot

Part of a set with white cameo-like decorations on blue paste 1785-90 by the pottery of Josiah Wedgwood

The type of ware known as *grès de Flandres* originated in Germany and was exported from the low countries, hence the name. From its hardness it was also known as *stoneware* and was the forerunner of the recent wares of this type. The first glazing was by a unique and previously unknown process. When the pottery was in the kiln and at a glowing heat a quantity of common salt was thrown upon the fire. This was vaporized by the heat and the fumes attacked the hot clay forming a glassy coating over the surface. This process, while still in demand for decorative wares, has been superseded in the manufacture of common jars by a cheaper method.

Pottery in America

The aboriginal pottery of America constitutes a rich field of study to those who are specially interested in the historical and artistic growth of this industry. The primitive craftsmen of ancient Maya produced ornamented, utilitarian and religious objects of unglazed clay. Quantities of such articles have been unearthed, some in an excellent state of preservation, and authentically dated as having been made as early as 95 B.C. Pottery making in the countries of Central America reached its highest peak by the year 500 A.D. It has a distinct relation to present-day potting as there is every indication to prove that many of these early objects were mold-made. Original clay molds have been discovered from which many pieces had been either pressed or cast in clay. Native potters are still producing domestic utensils in the Middle American countries much in the same manner as their ancestors.

In 1600 glazed pottery was being made in Puebla, Mexico, by native workmen who were trained by Dominican friars from Spain. Consequently the wares produced were very similar to the Spanish tin-enameled majolicas. It is interesting to note that pottery of nearly the same character is still being made in Puebla.

The mound builders in many sections of the United States made crude vessels of clay, many of which are to be found in museums in all parts of the country and offer an interesting field of research. The industrial aspect of pottery making in America, however, is evidenced by the work of the early settlers in Virginia and Pennsylvania. Brick and roofing tile were probably the first to be made, for there is evidence that in Virginia brick were burned in the year 1612, and Professor Morse states that the German immigrants in Pennsylvania introduced the manufacture of roofing tile after the German pattern. Very early in the settlement of the country, white or light-colored wares were made by those who brought with them a knowledge of the potter's art. Native clays were used, but at that time the country had been so little explored that the finer clays were unknown. Naturally the potters settled where clays were found and in those places the pottery centers were established. The exact location of the earliest pottery is not known, although from the middle of the 17th century local clays were being used in Virginia, Massachusetts, New Jersey, Pennsylvania and South Carolina. These early efforts in all cases were influenced by Dutch and English potters. Jugs, crocks and even dinnerware were made. A stoneware with decorations mostly in blue, covered with a salt glaze, and red-clay ware with slip decorations were the main types manufactured. Very few specimens of this earliest colonial pottery remain today.

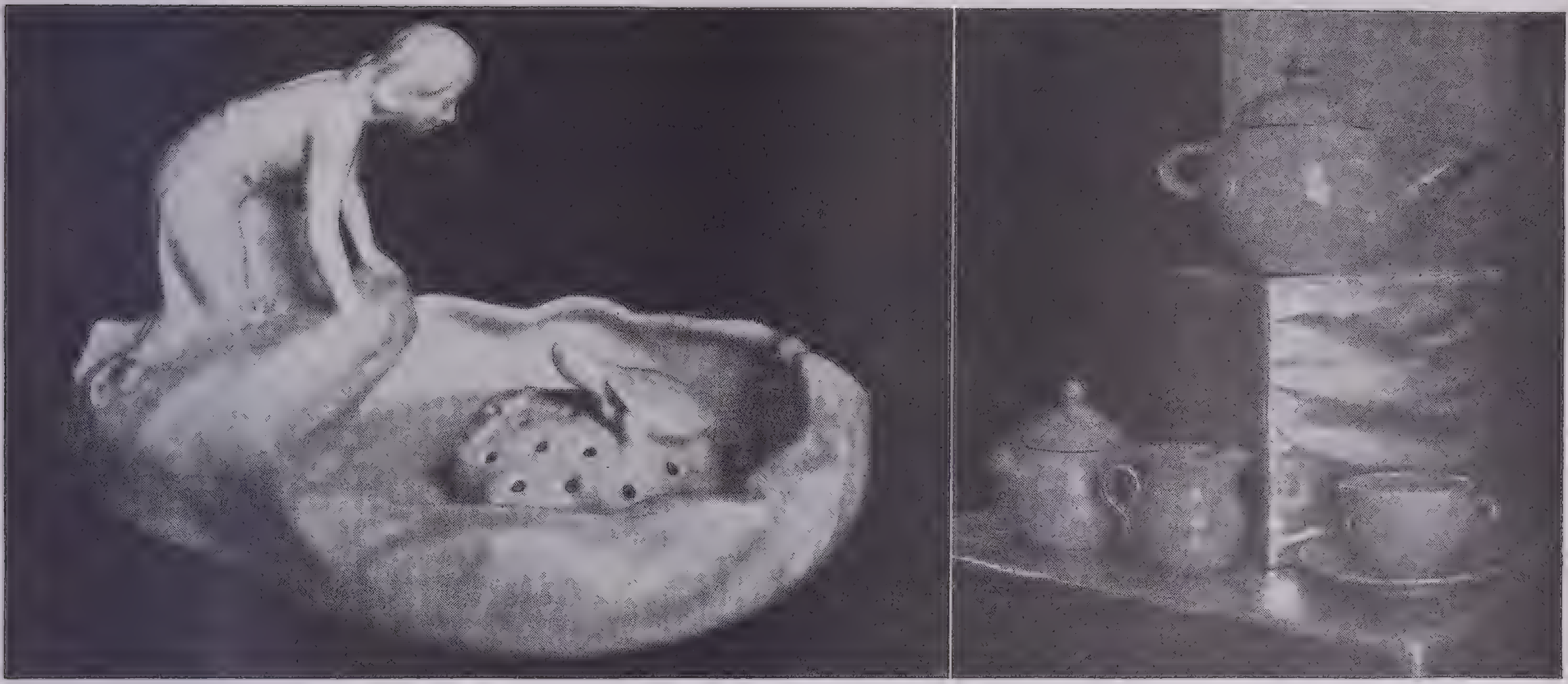
As a foil to the importation of American clays by English potters it is related that Josiah Wedgwood was greatly exercised in mind over the fact that an English workman named Bartlem emigrated to South Carolina in 1766 and attempted to establish a pottery there. Wedgwood, in a private letter, deplored this, stating that "an amazing quantity of white stoneware" was being exported to the "continent of North America" and expressing fear that if English potters should begin to practice their art in the colonies the trade of the mother country would suffer. Recent developments have shown that his fears were without foundation.

Eighteenth-Century Wares.—During the 18th century a number of small potteries were established in the eastern counties of Pennsylvania, mainly by the German settlers. Dr. E. A. Barber has made a special study of the wares produced in this district and has written a good deal upon the subject. He thus describes the process of sgraffito as practiced by the Pennsylvania potters:

> The decorative process consisted in covering the red clay with a thin layer of lighter-colored slip, through which designs were scratched with a style to expose the darker [clay] below. A coating of transparent glaze, slightly clouded with green and yellow oxides, was then applied to the surface, and, after the final firing, the ware presented the appearance of a rich red intaglio beneath a greenish or mottled-yellow ground.

The slip decoration that was a contemporary of this process consisted in using a fluid clay as a pigment. It was usually a light clay painted upon a darker surface, but the reverse also was used. Some fine earthenware, fairly white and decorated domestic utensils were made in this period in both Pennsylvania and New York. Besides these, the red clay Dutch tulip ware and fine stonewares were very prominent. Many interesting pieces of these wares are to be seen in most museums, some of which are splendid examples of artistic merit.

Nineteenth-Century Developments.—During the opening years of the 19th century attempts were made in many places in the eastern states to establish the industry of pottery manufacture. At first the potters paid but little heed to the location of the clays, thus departing from the practice of their predecessors. Stoneware was attempted in more than one place in



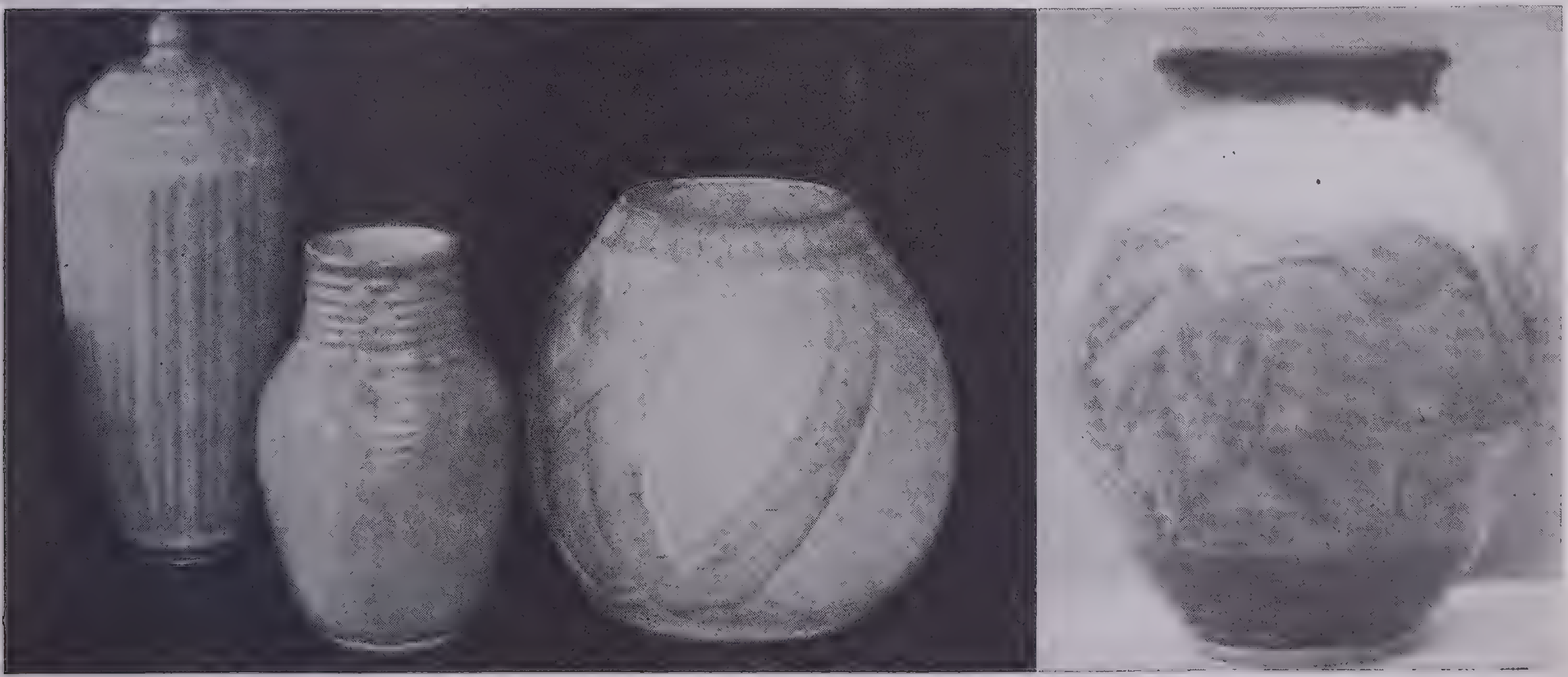
Examples of the Work of American Art Potteries

Left, The Lady of the Lake in turquoise blue glaze, a product of the Van Briggle Art Pottery, Colorado Springs, Colorado. *Right,* a tea set in the native orange clay of North Carolina, from the Jugtown Pottery near Steeds, North Carolina

New York state where little or no stoneware clays are to be found. Gradually, however, the matter of raw materials prevailed and segregation began. The first pottery in East Liverpool, Ohio, now one of the most important seats of the industry, was built in 1839 by James Bennett, who selected this location on account of the superior quality of the clay for the manufacture of yellow ware. As evidence of the progress of the art it is interesting to note that, though this clay is still used, the bulk of East Liverpool wares are now made from clays found elsewhere. Mr. Bennett was joined by his three brothers, one of whom, the late Edwin Bennett of Baltimore, in 1851 was the originator of the well-known teapot with the bas-relief of Rebecca at the Well, a design that has been copied by teapot-makers all over the world. The next few years saw some important developments. Men bearing the now well-known names of Harker, Taylor, Goodwin, Knowles, Vodrey and Lee settled along the Ohio River and built their kilns until there are now in East Liverpool nearly 50 establishments engaged in the manufacture of clay products.

Likewise in the early part of the 19th century hard-paste porcelain, of excellent body and glaze and decorated with gold as a rule, was being manufactured in Jersey City, N. J., as a commercial product. Other factories soon opened for the manufacture of porcelain in Philadelphia, Penn., and Bennington, Vt., many of which employed artisans from the well-known establishments in France, Germany and England. In 1842 quite a distinct type of ware was developed in America, statuary porcelain, used for making miniature reproductions of famous pieces of sculpture called *Parian ware* because it looks like Parian marble. It is a special kind of hard-paste biscuit porcelain, made of finely ground clays and mellowed somewhat by the use of bone ash. Parian china was made eventually by most all the larger factories of this era, although Bennington, Vt., appears to have been the first to make it in any quantity.

The first kiln in Trenton, N. J., was set up in the year 1852 by Taylor and



Examples of the Work of American Art Potteries

Left, wheel-turned vases in blues and greens from Newcomb Pottery, H. Sophie Newcomb Memorial College, New Orleans, Louisiana. *Right,* a vase from the Rookwood Pottery, Cincinnati, Ohio, showing a modern design developed in soft browns and modified blacks and covered with a rich glaze called *butterfat*

Speeler. As in the Ohio field the first product was yellow ware made from local clay. In order to improve the quality of the wares extensive search was made for better materials, and kaolin deposits were found in Delaware and Pennsylvania, feldspar in Pennsylvania and quartz in Maryland. The potters had difficulty in adjusting themselves to the new materials and lost heavily. Gradually, however, the obstacles were overcome and distinctive wares were developed. One of these, known as *hotel china* is a fine earthenware that closely approaches hard porcelain in character, being white and translucent. This ware is in constant demand wherever severe usage is expected, and it has no superior for service under such conditions. The body is composed of kaolin (porcelain clay), a plastic clay known also as *ball clay,* feldspar and quartz. The glaze is a compound of lead oxide, lime, potash, soda, boron sesquioxide, alumina and silica. When the ingredients are melted, they form a hard glass that protects the body and offers great resistance to wear. The decoration is usually printed beneath the glaze and therefore lasts as long as the china itself.

Belleek Ware.—Another development was the soft porcelain known as *Belleek.* The name is that of a village in Ireland where a porcelain of similar character was originally made. Not finding any natural substance that would fuse at a sufficiently low temperature, the experimenters, Messrs. Brewer and Bromley, constructed an artificial feldspar or *frit* to which they added a sufficient amount of plastic clay, thus following the plan of the early workers in France. Belleek ware is of a soft-yellow color and is usually made extremely thin. It is much in demand for decorative pieces but is too tender for severe use on the table.

In the latter part of the 19th century the manufacture of pottery in this country was beginning to come into its own. Man-power for turning the potter's wheel was being supplanted by steam, and in our present generation has given way to the scientifically constructed and delicately balanced potter's wheel or *jigger,* as it is termed in the industry, driven by electricity. Many changes also took place with regard to the processes of hardening the clay to make the ware more durable, such as the addition of synthetic fluxes to the body, and more scientific heat treatment through the use of controlled firing processes in muffle and tunnel kilns.

By the year 1880 several well-established potteries were making a high grade of ware. A short list of some of these that are still working include such centers as East Liverpool, Ohio, Syracuse, N. Y., Beaver Falls, Penn., and Trenton, N. J. From this time on the bulk of the pottery industry seems to have grown up around centers of the larger markets and nearness of skilled labor, rather than in locations of clay deposits. The potteries mentioned above were making certain types of dinnerware,

TABLE OF POTTERY AND EARTHENWARE

COUNTRY	DATE	NATURE OF PRODUCT	REMARKS
Egypt	B.C. 3000	Unglazed pottery	Household vessels, mostly wheel-made
Egypt	1900	Glazed stoneware	Rich blue glaze. Figures and charms molded
Greece	1800	Pottery, Minoan	Primitive decoration. Wheel-made
Assyria	800	Unglazed pottery	Utensils both hand- and wheel-made
Assyria	700	Inscribed tablets	Cylinders and slabs with impressed letters
Greece	700	Polished pottery; called *Mycenaean*	Geometric style. Interlaced lines in dark color. Wheel-made
Greece	600	Polished pottery; called *Mycenaean*	Wheel-made. Archaic style Birds and animals in black silhouette; the details scratched in
Greece	500	Polished pottery. Red figured ware. Finest period	Wheel-made. Background in black, figures in natural color of clay. Faces and eyes in profile. Drapery in detail
Greece	400	Polished and ornamental ware. Decadent period	Figures and embossments in color
England	400	Primitive hand-formed pottery	Used in funeral ceremonies and found in burial mounds
Rome	100	Black and gray ware, called *Upchurch* from the English locality where much is found. Found also in France and Germany	Wheel-made. Lines polished. Black color produced by smoke in burning
North America (Maya)	95	Unglazed pottery. Crude red clays	Hand-built and mold-made. Domestic utensils and religious idols
Rome	A.D. 40	Dark ware with white decoration. Called Castor from the English locality	The beginning of slip painting. Hunting scenes and scrolls
Japan	200	Common pottery glazed and unglazed	The art introduced by Korean potters
England	490	Anglo-Saxon pottery	Crude and unglazed
China	c.800	The first hard porcelain	Porcelain was a gradual development. The first undoubted product appears in the Sung dynasty
India	900 *et seq.*	Pottery of natural clay with with colored glazes	Wheel-made. Decorated with floral arabesques under the glaze
England (Malvern; other places)	1250	Encaustic tiles. Particolored clays	Made for church use, by the monks
Persia	1300	Engobe or slip-coated pottery	A natural dark clay covered or veneered with a white coating, colored and glazed
Spain	1320	Tin-enameled ware, known as *majolica*	Elaborately decorated with rich paintings in color. Lustered and sometimes with a brilliant overglaze
China	1368	Ming dynasty. The finest period	The works of this time constitute the crowning glory of Chinese porcelain
Syria; Arabia	1400	Engobe ware of the same general type as the Persian	Decorated under the glaze with fine arabesques in color
Persia	1400	Called *Gombroon ware.* Attributed to Chinese influence	A porcelaneous earthenware of fine quality. Perforated and filled in with semitransparent glaze. Sometimes decorated in blue
Italy (Luca della Robbia)	1450	Architectural modeled work coated with the characteristic tin enamel	Luca della Robbia is believed to have greatly improved the quality of the enamel
Italy (Giorgio Andreoli)	1520	Ruby pots, dishes and platters	Maestro Giorgio, worked at Gubbio; his ruby lusters are unique
France	1520	Glazed cream-colored pottery, inlaid with dark clays	Called *Faience d'Oiron* from the supposed place of origin. A very rare and valuable ware; only 53 pieces are known
Mexico	1532	Unglazed pottery. Utilitarian wares	Made by native workmen. Hand built
France (Rouen)	1540	Tin-enameled wares of superior quality	The style is entirely French. Figures and conventional ornament
Germany	1540	Salt-glazed stoneware	Brown, gray or cream clays, embossed and sometimes decorated in blue
England (Fulham, Mortlake, Staffordshire)	1550	Salt-glazed ware	Knowledge of the process was derived from Germany
France (Palissy)	1560	Light-colored earthenware with richly toned glazes	Modeled embossments of natural objects glazed in proper colors. Also some modeled figures
France (Nevers)	1580	Tin-enameled wares in Italian style	The maker of these wares came from Faenza, Italy; hence the term *faience*
Italy (Florence)	1580	A semihard porcelain with blue decoration	The famous and rare Medici porcelain. Only 26 pieces are known
Holland	1600	Tin-enameled pottery decorated in blue	The well-known delftware, made in Delft
England (Staffordshire)	1610	Lead-glazed pottery on colored clays	Primitive in character. Wheel-made or shaped by hand
United States	1612	Brick and hollow tile	Crude clays. Made in Virginia and Pennsylvania
England (Wrotham, Staffordshire)	1620	Slip-decorated ware	A characteristic English product. Dark clay with ornamentation in light-colored slips
England (Lambeth, Staffordshire, Liverpool)	1635	Tin-enameled wares	Introduced from Holland
United States	1641	Wheel-made red wares with slip decoration. Stoneware with underglaze decoration and salt glaze	Exact location of earliest potteries not known. Early efforts influenced by English and Dutch potters.

Table of Pottery and Earthenware—Continued

COUNTRY	DATE	NATURE OF PRODUCT	REMARKS
Mexico (Puebla)	1650–1750	Glazed pottery. Mexican majolica tiles, tin-enameled wares. Finest period	Introduced from Spain by Dominican friars. Spanish style of painting. Blue monochrome and polychrome, on-glaze decoration
China	1661	*Famille vert* (Jacquemart)	Porcelain finished and glazed in the usual way, then decorated in black and covered with a fusible green enamel
England (Staffordshire)	1680	Combed and marbled wares in particolored clays	A domestic pottery largely made in cottage homes
France (St. Cloud)	1695–1773	Soft porcelain	The first French porcelain
Germany (Meissen or Dresden	1709	Hard porcelain, called *Dresden china*	No porcelain was made in Germany until the discovery of kaolin. Böttger was the first man to make hard porcelain in Europe
Germany (Vienna, Anspach, Bayreuth, Höchst, Fürstenberg, Berlin, Frankenthal, Nymphenburg, Ludwigsburg)	1718-58	Hard porcelain	Nearly every German prince desired a porcelain works during this period. There is not much to choose between the wares as regards quality, but the decoration, largely overglaze, has different characteristics. Few such factories now exist
China	1723	*Famille rose* (Jacquemart)	Overglaze decoration in which rose-color made from gold is the characteristic feature
Italy (Capo di Monte, near Naples)	1743	Soft porcelain	Modeled figures colored over the glaze
England (Bow)	1744	Soft porcelain	Bow was at one time called *New Canton*. It is believed that bone ash was here first used in English china. The factory closed in 1776 when William Duesbury removed the equipment to Derby
France (Vincennes)	1745	Soft porcelain	Vincennes was the forerunner of Sèvres. In 1753 the king of France purchased one-third the stock and gave the title *Royal* to the factory
England (Chelsea)	1745	Soft porcelain, called *Chelsea ware*	Patronized by the king and by the duke of Cumberland. The style of treatment was French. Purchased in 1769 by Duesbury and the equipment removed to Derby.
England (Derby)	*c.* 1750	Soft porcelain	Derby was concerned in making china probably as early as 1745. In 1769 Duesbury combined with the Derby works the resources of Chelsea. Hence the term *Chelsea-Derby* for the product from 1770–84
United States	1750–1850	Mostly earthenware with underglaze slip decoration. Some stoneware and porcelain	Pennsylvania Dutch tulip ware, puzzle jugs, domestic utensils and Rockingham ware are of this period
England (Worcester)	1751	Soft porcelain. Ivory porcelain. Bone porcelain	Founded by Dr. Wall and for a time occupied chiefly in producing Chinese patterns. Consolidated with Chamberlains in 1840. The present company, formed in 1862, now manufactures the famous Royal Worcester wares
France (Sèvres)	1756	Soft porcelain (*pâte tendre*), called *Sèvres ware*	Removed from Vincennes. In 1759 Louis XV became sole proprietor; now national factory
England (Lowestoft)	1757	Soft porcelain; blue-and-white product	Outgrowth of the Bow works. None made after 1802.
Spain (Buen Retiro)	1760	Soft porcelain	Removed from Capo di Monte, Italy, when King Charles of Naples became King Charles III of Spain
Denmark (Copenhagen)	1760	Soft porcelain	This factory was closed in 1768. The paste is good and the painting of excellent quality
England (Etruria)	1762–76	Wedgwood wares, queensware and jasper	The beginning of modern manufacture
England (Etruria)	1762 (still working)	Bone porcelain and earthenware	The original House of Wedgwood has developed all the modern styles with success
England (Bristol)	1768	Hard porcelain	Champion began to make porcelain in Bristol and in 1771 purchased the Plymouth patent. The works still exist, but produce earthenware only
England (Plymouth)	1768	Hard porcelain	This, the first factory in England for the manufacture of hard porcelain, was established by Cookworthy as a consequence of the discovery of porcelain clay in Cornwall. Removed to Bristol in 1771
France	1769	Hard porcelain (*pâte dure*)	Kaolin (porcelain clay) was discovered at St. Yrieix-la-Perche in 1768 and the production of hard porcelain followed. The *pâte tendre* was finally discontinued in 1804. The factory still exists as the most important national porcelain works in the world
United States	1769	Earthenware, white and decorated. Fine stoneware. Bone china	Domestic utensils. Some slip-decorated stoneware

for the most part. These types included hotel china, Belleek, semivitreous ware and both hard and soft porcelains.

American Decorative Wares.—In pottery that claims to be decorative and ornamental, America has achieved some notable results. The general type of wares made is best defined as faience, that is, glazed earthenware produced at a low or moderate temperature. The glazes are both brilliant (glossy) and matt (dull) and the decorations are either beneath the glaze or consist in colors added to the glaze itself. A pioneer in this field has been the Rookwood Pottery of Cincinnati, Ohio, which was founded in 1880. Several other potteries making decorative wares of an individual nature have had careers equally fascinating and instructive as that of Rookwood. The background of purpose and intention of these smaller companies was the feeling of a need in America for rare and beautiful products made by individual craftsmen rather than on the commercial basis of mass production. The fact that many of these early projects have survived and kept to their standards of technical and artistic excellence attests their importance in the ceramic developments in America. Two other potteries of this type are the Newcomb Pottery, founded in 1897 at Newcomb College, New Orleans, La., and the Van Briggle Pottery, Colorado Springs, Colo., founded by Artus Van Briggle in 1899. The above-mentioned potteries alone cover a geographically wide area and point out that interest in pottery-making was not confined solely to established centers.

Some very important works in interior decoration have been carried out in several cities by some of these smaller potteries. Tiles and architectural faïence have been made for use in fireplace mantels, fountains and decorative panels. Another type of pottery being made in America, classed as art ware, is the stoneware garden pottery. Since the advent of architectural landscaping of gardens a fair demand for pottery to be used outdoors has arisen. It is usually made of stoneware clays and may be either glazed or unglazed. The pieces consist in large ornamental jars, flower pots, bird baths and lawn benches.

The growth of small potteries and clay products made by individual craftsmen all over America increased by leaps and bounds in the early part of the 20th century. Nearly all these enterprises were producing a representative art ware, characteristic of the taste of the founders or of their particular section of the country. A list of a few of this type includes Marblehead, Fulper, Weller, Haeger, Jugtown, Conestoga, Inwood, Cowan, Appletree Lane, Pewabic, Niloak, Shearwater and Camark located in as many different states. Besides these a great many studio potteries are operating as individuals making unique pieces that are always in demand by collectors and for use in attractive homes. Most museums contain at least a few pieces of some of these contemporary art potteries. In 1931 there was inaugurated an annual exhibition of contemporary American ceramics, founded as a memorial to Mrs. Adelaide Robineau, and opened each year at the Syracuse Museum of Fine Arts, Syracuse, N. Y. Here one may find a representative collection of the creative work of individual potters from all over the United States.

Structural Clay Products.—The structural clay products include brick, roofing tile, hollow tile and terra cotta. A résumé of the development of ceramics in America would not be complete unless mention was made of these products and the many others made partly or entirely of clay. Great progress has been made in the structural clay products in this country since 1900. Technical improvements have been made in their manufacture in recent years. These products are generally thought of as unglazed objects, although in the last few years even brick have been glazed for architectural color effects. Many alluvial clays are used in the manufacture of common brick, which are used as backers in all types of structural work. Bricks are made in regular or special shapes and for different purposes, such as in building, paving and firebrick for furnace linings, gas retorts and in general wherever a high-temperature refractory is needed. Architectural terra cotta is an excellent fireproof building material and is also used for ornamental effects on some structures. In the latter case terra cotta is usually glazed and perhaps decorated in colors. For the most part the coal-measure clays are the best for the manufacture of terra cotta because the demand is for light colors. These clays are buff-colored when burned and therefore do not destroy the light surface tints as red clays would. The unglazed terra cotta is coated with a thin film of prepared clay that secures both uniformity of tint and the desired color effect. The surface is impervious to water and is easily cleaned. The weight of the piece makes it impossible to dip them in the liquid coating, so this is sprayed on by means of compressed air.

Table of Pottery and Earthenware—Concluded

COUNTRY	DATE	NATURE OF PRODUCT	REMARKS
England (Leeds)	1770	White earthenware	Perforated and glazed
Denmark	1772	Hard porcelain	Became a royal factory in 1779. Is now noted as one of the first in the world
England (Stoke on Trent)	1779 (still working)	Bone porcelain, ironstone china and other wares, such as Spode	Copeland was the successor to Spode. All kinds of tablewares. Also ornamental wares
France (Limoges)	1779 *et seq.*	Hard porcelain	The famous works of Haviland, Guerin, Pouyat and others now manufacture very large quantities of the well-known French china
England (Staffordshire)	1784	Willow pattern, introduced by Spode	Spode was the forerunner of the House of Copeland
England (Stoke on Trent, Mintons)	1793 (still working)	Bone porcelain, earthenware and pottery	Begun as a factory of earthenware, the House of Minton, under the leadership of Campbell and Arnoux, took the lead in the well-known Staffordshire potteries. The wares are of the finest
England (Cauldon Place, Brown-Westhead, Moore & Co.)	1794 (still working)	Bone porcelain and earthenware	The present house is the successor to Ridgway & Sons. They are noted for china dinnerware
England (Coalport)	1814	Soft porcelain. Bone porcelain	The successor of Jackfield and Caughley. This factory is still in existence and produces fine wares
England (Lambeth, Doulton)	1818 (still working)	Stoneware	A salt-glazed ware, decorated in sgraffito and otherwise commonly known as *Doulton ware*
England (Staffordshire, Furnivals)	Date of origin of these factories is unknown. They developed from 17th century domestic industry.		A fine quality of earthenware for table use; blue-and-white
England (Staffordshire, Meakin's)			An excellent earthenware, largely in demand for table services
England (Staffordshire, Johnson's)			One of the best of the English earthenwares
United States	1841	Cream-colored and Rockingham wares	Domestic untensils. Hound-handled pitchers
United States	1850–58	Slip-decorated and sgraffito wares. Red earthenware and coarse stoneware	Some agate wares and ironstone china. Hard-paste wares. Parian china in Vermont
England (Derby)	1877	Bone porcelain and other wares	Royal Crown Derby porcelain. Still among the foremost in England
United States (Rookwood; Newcomb, Van Briggle)	1880–1900	Ornamental tiles and decorative wares. Earthenware and faience	Unique pieces made by individual craftsmen. Pottery of excellent artistic merit for this period
United States (Ohio, New Jersey, Pennsylvania)	1880	White wares. Yellow and Rockingham wares	Whitewares called ironstone china and white granite. Several of these factories are still working although not necessarily making the same kind of wares
England (Burslem, Doulton)	1880 (still working)	Bone porcelain and other wares	The factory of Pindar, Bourne & Co. was purchased by the firm of Doultons, Lambeth, and the work now produced ranks with the finest English wares
United States (Lenox, Onondaga, Harker, Homer-Laughlin, Knowles, Taylor, Sebring, Mayer)	1890	Porcelain, earthenware, semi-vitreous ware	These factories and many others are the largest producers of tablewares in America. They manufacture but one type of product in one factory, such as porcelain or hotel china
United States (Jugtown, Marblehead, Shearwater, Fulper, Weller, Niloak)	1900	Decorative art ware. Faience and stoneware	These smaller potteries are still working and along with numerous others have been in production between 1900 and the present; some actually were begun after 1900, although in the first quarter of the century

Electrical Porcelain.—Recent advances in the use of electric power have made it necessary to transmit high-tension currents for long distances. This has created a large demand for insulators capable of resisting the strain. Glass, though suitable for currents of low voltage will not, on account of the irregularities of structure caused by rapid cooling, stand the heating that is inseparable from the transmission of currents at high pressure and recourse has been had to porcelain. The body structure is the same as that used for all porcelain wares except that color is not of great importance. It is found, however, that the white porcelains are the best because they can be burned at a higher temperature than those of impure color; in fact the color of the ware is an indication of the purity of the clay. The wares are glazed with the lime-feldspar compound already mentioned and are burned at an intense heat, approximately 1400° C. They are tested under an enormous voltage for the detection of flaws.

The automobile and airplane industries have created a large demand for porcelain spark plugs. These and other porcelain specialties in several varieties are made according to requirements. The operations have been so standardized as to be almost entirely automatic and great mechanical perfection has been attained.

Glass and Enamel.—Glass and enameled products are not closely related but both are important in the field of ceramic industry. The growth of both fields in the last 20 years has been phenomenal. Window glass and ordinary glass containers are not new but structural glass bricks, ornamental glass and many specialties, such as heat-resistant glass are the products of more recent scientific development. Vitreous enamels are applied to steel and iron and increase the durability and appearance of the metal to a great extent. These enamels have been applied to copper and some of the finer metals for decorative objects, such as bowls, boxes, trays and desk accessories.

GRAPHIC ARTS

In general the term graphic may be applied to any fine art that represents figures and appeals to the eye. In the more limited sense the graphic arts are printing, engraving, etching and the like—the duplicating and manifolding arts.

There are two steps in any graphic art: first, making a design on copper, zinc, stone or wood; and second, printing impressions of the design with ink on paper, vellum or fabric. The first step is creative—what we call artistic; the second is largely mechanical but to a considerable degree artistic too, and the particularly important thing about it is that it makes it possible to duplicate the design many times.

Although few of us are able to collect paintings and sculpture, and we may be far from museums, we are not wholly excluded from owning and seeing superlatively fine examples of the visual arts. Through *prints* we may share in the treasures left by the great artists of the past; and in a few well-chosen woodcuts and etchings and lithographs we may find our deepest and most intimate pleasure in the art of today. These are, indeed, the arts that touch the common man most closely. They afford, too, the best approach to an understanding of the *fine arts.*

The advantage of the graphic arts over painting and sculpture lies, of course, in the wide dissemination of pictures at a moderate cost. Great paintings and sculpture are found in art galleries, museums and private collections where but limited numbers have the opportunity to study them. There are reproductions of these masterpieces; but they are usually reduced in size and lack the full richness and sensitive detail of the originals.

In the graphic arts the number of prints may run up to hundreds, each print an exact duplicate of the first impression from the plate of metal, stone or wood. Each is therefore an original—not a reproduction of the artist's work, but a duplication.

The commoner graphic arts, named for the methods employed, are etching, soft-ground etching, dry point, copper engraving, aquatint, mezzotint, woodcut and lithograph. Making prints by any of these processes involves the use of ink. Ink is usually black, but methods of printing have been developed to such a high degree of perfection as to present a full range of color, and the graphic arts have the range of color possible to painting. This is accomplished chiefly through lithography but also by colored etchings and colored woodcuts—as in the well-known *Japanese prints.* On the other hand many collectors and lovers of prints believe that etching, copper engraving and wood engraving, because they are essentially *arts of line,* are at their best when the artist limits his work to black and white.

An additional factor in the enjoyment and possession of the graphic arts is the fact that prints are usually limited to a size for easy handling. They range from plates no larger than a postage stamp through the average size that comprises most collections in portfolios, coming within the range of 15 by 20 inches, up to much larger sizes, for example, the large lithographic posters on billboards.

Rare printed pictures may equal paintings in cost, but first published prices are usually nominal and within the reach of moderate purses. Enthusiastic collectors of prints enjoy a hobby that brings deep satisfaction and the power to share it with others.

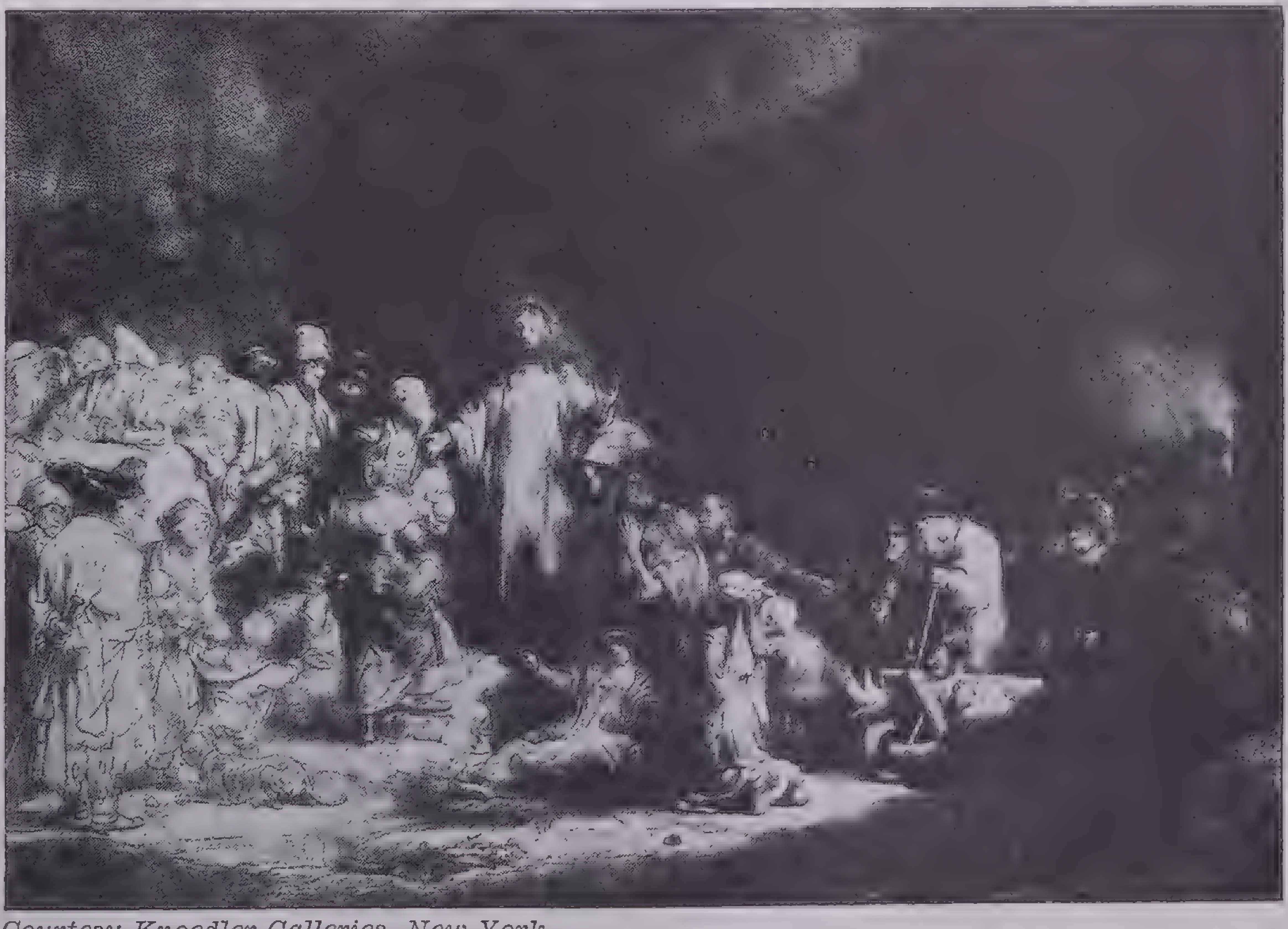
ETCHING

Chronologically etching belongs at the end of the list of graphic arts; but because it is now receiving more attention in America than it has in 50 years and has become more popular for the home and portfolios than lithography or line engraving, it will be considered first.

The history of etching begins late in the 15th century, and the first very great practitioner is Albrecht Dürer (1471–1528). Only a few of his finest plates are in etching (as compared with his engravings on both wood and copper); and for a long time after him there are only lesser masters, of whom the German Albrecht Altdorfer and the French Jacques Callot are most notable. Then comes the superlative artist Rembrandt van Rijn, who carried on his work between the years 1628 and 1661. In him the art reached its greatest perfection and found its widest expression. Before him etching had often been used as a mere adjunct of engraving with no separate existence of its own until he raised it to a high art; and afterward many print makers combined the two methods, so that there are great numbers of prints that cannot with certainty be labeled etchings or engravings. After the death of Rembrandt (1669) the art suffered periodical decadence and restoration to favor, coincident with the rise and fall of specialized interest in art. It was only in the late 19th century that etchers again appeared who are now considered worthy to rank with the great masters. Most appreciated is Whistler, an American-born artist who spent most of his later life in England. Charles Méryon (French) and Sir Francis Seymour Haden (English) are other great modern figures. In the 20th century a number of proficient artists have turned to the medium, and never have etchings of sterling quality been so plentiful, although no living etcher seems quite so inspired as those named.

The method of etching is suggested by its name translated from the Dutch (where it was first used): *etsen,* like the German *essen,* means eat; applied specifically, it denotes the eating or corrosive action of acids on metal; to use the etcher's own laboratory term, the *biting* of the acid into the metal. Etchings are printed from a metal plate, usually copper or zinc, upon which the lines have been etched or deepened by acid.

Preparation of the Plate.—The plate of polished metal is about 1/16 of an inch thick, cut to the dimensions required. In order to subject it safely to the action of acid, usually nitric, the plate must be covered with a protecting substance. This is found in a preparation of wax, asphaltum and pitch called a *ground,* which is melted and spread thin by roller or dabber over the entire surface of the hot plate.



Courtesy Knoedler Galleries, New York

Etching—Christ Healing the Sick by Rembrandt van Rijn

Called the *Hundred Guilder Print* because Rembrandt received 100 guilders for it—unprecedentedly high pay in the 17th century

When cold, this thin covering forms a smooth, hard surface that is made black by smoking over a candle flame. Through this black surface lines are drawn by a steel needle.

Making the Drawing.—Some artists work from nature directly upon their plates with the needle, just as they would sketch with pencil on paper. In this case the drawing, when printed, will be in reverse. Others make careful drawings with ink or pencil on paper and transfer them by various methods to the plate in reverse. The transferred lines are visible on the wax grounds and may be followed with the needle. This insures greater accuracy in drawing and placing, inasmuch as corrections may be made before the transfer; but a print produced by this careful procedure is not so likely to convey that spontaneity or freshness of inspiration that is apparent when a well-directed needle records the impressions of the moment upon the metal itself. Such a picture, when printed, will be a positive of the original drawing—but a negative of the reverse on the metal.

As the lines are drawn by the needle in the wax only, they must be made permanent upon the plate by being bitten into the copper. This is accomplished by applying acid, usually nitric, nitrous fuming, Dutch mordant or perchloride of iron, in one of two ways: either by dropping it on the plate and moving it about with a feather or by entirely submerging the plate (held by waxed strings) in a glass or porcelain dish. The strength of the acid to be used is determined by the atmosphere. If the air is warm, it calls for a weak solution, say three parts of water to one of acid. Cold makes chemical action sluggish, and the solution must be strengthened accordingly.

If the lines have been drawn with a fine needle, they may be varied in strength and depth by submitting them to the acid through longer or shorter periods. Delicate lines representing distance should be exposed only a short time, probably a minute or two. The plate is then taken out of the solution, washed carefully in cool water and dried, and the finest lines are covered by a small brush with stopping-out varnish. When it is dry, the plate may be returned to the acid and exposed for the next grade of lines for a period of several minutes or more, after which the process of washing, drying and stopping out is repeated. In this way the work is carried forward until the lines desired to be heaviest have been bitten. Some etchers vary their lines by using fine and coarse needles and give the plate only one biting; but this is an exceptional method, and those who use it are certain to lose variety and delicacy of line. Others work on the plate while it lies in the acid, putting the heaviest lines in first and ending with the lightest. There is no way of determining, except approximately, what the acid is doing until the wax ground is removed. This is done by kerosene or turpentine after the plate has been warmed.

There are three distinct chances for failure in making an etching: in the drawing, the biting and the printing. An artist may be an excellent draftsman and draw lines on the copper faultlessly, but the etching will not be a success unless he possesses the knowledge of how to bite lines into the copper. Again he may have the skill to draw and bite, but his plate will be useless if it is not well printed. Many etchers do not attempt the printing themselves but leave it to experienced craftsmen who make that their profession. The most satisfactory results are obtained when the artist does his own work from the first drawing to the final print, but the expense of the necessary equipment is so great as almost to prohibit etching as a pastime. The practice involved in acquiring skill in printing plates is such as to put it out of the hands of most etchers for anything but the simplest working proofs of their work.

The chief joy of an etching is its spontaneity. In the hands of a skilful worker, it may be rushed through to completion, and the etcher may look upon the moist print from his copper plate before his enthusiasm cools. This joy is unknown to the artist who must send his plate to a professional printer for a proof. So the etcher who can take his plate out of the acid, wash and dry it for the last time, warm and remove the wax ground and turn at once to his press is the only one to taste the full fruition of pleasure in his work.

Printing.—A thoughtful etcher will have prepared his paper by dampening it before it is time to print, dipping it in clean water or sponging it and putting it in piles between blotters upon which are heavy weights. If he grinds his own ink, which is made of a fine black powder and plate oil, he will have that ready also.

With a smooth roller or dabber the thick ink that stands up in a shiny heap is forced into the lines. The whole surface of the plate is solidly blacked. Then with a pad of open-meshed cloth—tarlatan is best—the ink lying on the surface of the plate is carefully wiped off, leaving the sunken lines full. At this point it would be possible to list the many methods of manipulation that result in the production of various special effects; but an explanation of these would be interesting and comprehensible only to a printer. Both bare hand and cloth may be used to clean the plate of superfluous ink and yet leave what is necessary to produce the effect desired.

The plate, which should be warm, is now laid on the steel bed of the press; over it is laid a sheet of paper moistened with water until it is limp and soft but not wet. Over this are placed several fine white blankets woven for the purpose. Then the bed passes between two heavy steel rollers, as clothes are fed into a wringer, coming out and stopping on the other side. The pressure should be even and as heavy as it can be and still allow the bed to pass between the rollers.

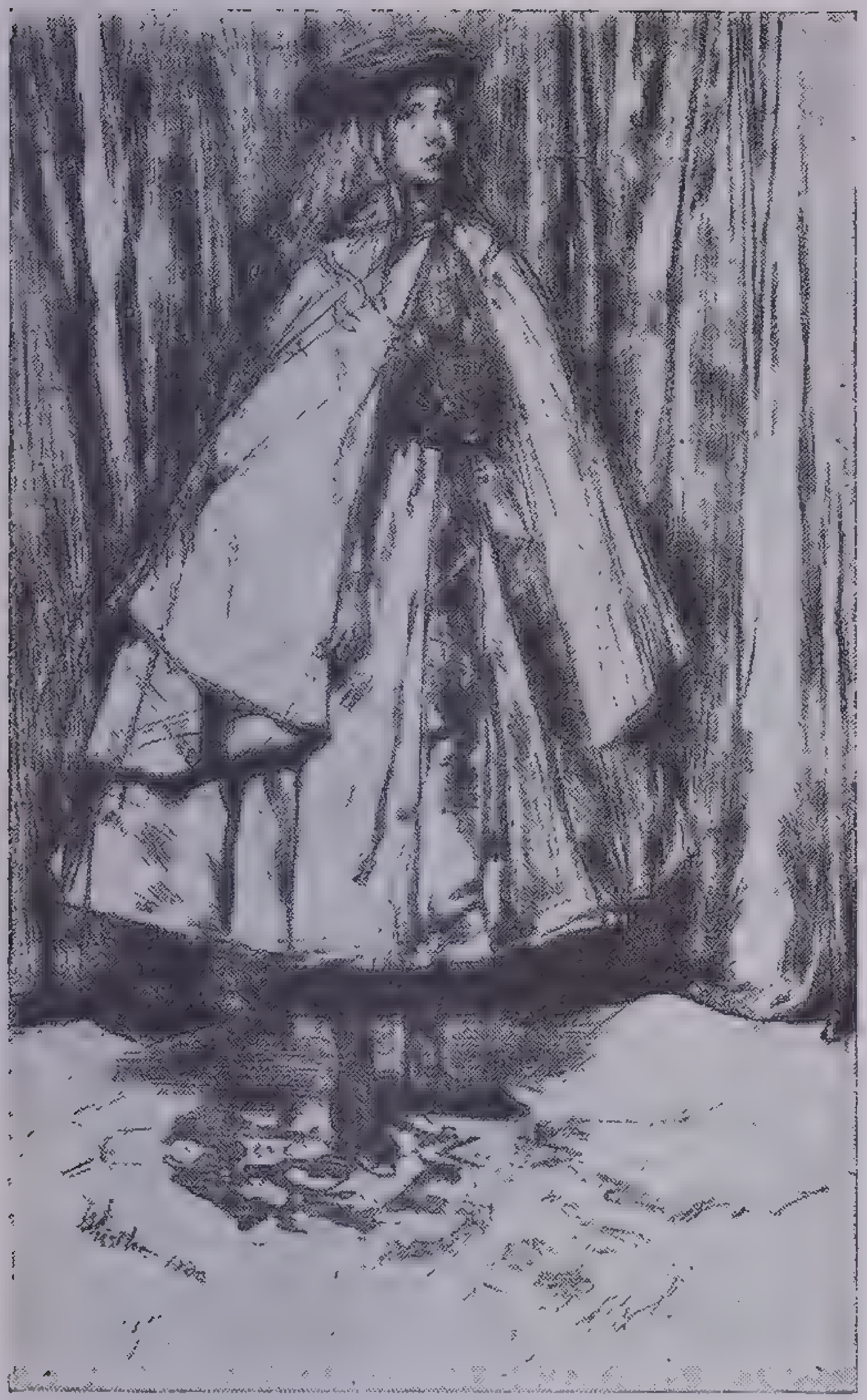
The soft blankets force the moist paper into the lines, and the sheet takes up all the ink it finds there. When the blankets are lifted and the paper is peeled off the metal plate, permanently embossed upon the paper will be the ridges of ink that filled the etched lines, together with any tone left on the surface. For the artist this is the crucial moment in the whole work of etching. Up to this time there has been no certainty of what has been accomplished. The lines may be clearly seen upon the plate, but it is not enough merely to make a line; there should be fine lines, heavy lines, black, gray, rich and ragged lines. The success of the biting lies in the quality of the lines. Hence it is a staid heart that does not quicken when the first proof of an etched plate is lifted.

Alterations.—If the proof is satisfactory, the plate is ready for further printing. If some lines are too heavy, the copper surface around them is scraped with a sharp-edged scraper, burnished with a smooth polished burnisher and rubbed down with fine charcoal and a buffer, reducing the depressions to the desired depth. If the lines are too light, the plate may again be covered with a wax ground and the lines bitten deeper. Lines may be added or erased, but never with ease; it is a slow and tedious process to make alterations on a plate.

Color.—The color of an etching results from, and corresponds with, the color of the ink with which it is printed. There may be light color on the print where there are no lines; this is a thin film of ink left on the surface of the plate. Wiping a plate clean puts the whole burden of the story on the lines. If they are not expressive and full of quality, the picture may as well have been drawn with pen and ink. But a printer with a painter's touch knows how to make hard lines sympathetic and draws them all together with a bond of tone. A plate, however well it may be etched, is not complete nor desirable unless it is well printed. Although etching is primarily a linear process, colors other than black are sometimes used; but they are always put on the plate and never on the paper, except in the way described above.

Paper.—Both paper and ink are large factors in the success of an etching. Any plate that can stand the test of white paper and black ink can be considered well done, for it is a severe combination. Ink that is slightly warmed by brown, printed on paper of a creamy tone, is generally more pleasing. Soft Japan paper is still more mellow but not brilliant. All Japanese papers are likely to grow wooly with handling and are difficult to clean. The Western handmade papers are desirable for their texture and lasting qualities. Most attractive of all are the precious sheets of handmade paper made in early centuries, some of which are still discoverable in old shops in Italy, Germany, France and Holland. A rare proof may be seen on a worm-eaten sheet of paper, on the other side of which are found accountant's notes of three centuries ago. But with its very age has come a tone and quality that cannot be duplicated in modern paper.

Perfect tonality is difficult to attain in an etching, except with great labor and skill, and labor is the one thing



Dry Point—Annie Haden, by James Abbott McNeill Whistler

that should not be apparent in an etching. The action should appear effortless and spontaneous, just as one would pen a letter to a friend. This is why etching is called the most autographic of all arts. Its strong points are brevity, freedom, precision and power; but coarseness of line is not to be confused with strength. Etching is the intimate art—the art of the home and of the hand. Poring over a portfolio of master prints is a recreation that never palls, because the final word is never said; there is always a new impression to meet a different mood.

DRY POINT

Dry point is so frequently confused with etching, both as to method and result, that only those familiar with the actual steps of production may be expected to define the term correctly. The name *dry-point etching,* although it is essentially incorrect, has come into such wide use that a special explanation is necessary.

An etching is etched with acid, as its name implies; a dry point, on the other hand, is a method of incising lines on metal with a sharp cutting needle or diamond point without the intervention of acid, hence the term *dry point.* The work is different and the result is different from etching, as the student will quite readily detect and understand with observation.

With a sharp steel point or—even better—with a ruby or diamond set in a handle that is held in a slanting position, lines are cut directly into the metal plate lightly or deeply, doing at once what the acid takes longer to do. As the cutting edge acts much like a plow throwing a furrow, the edge of a dry-point line holds a *burr* that, unless it is removed with a scraper, is the one distinguishing characteristic of the method. When the plate is wiped and inked, the burr catches extra ink and spreads it like the edge of a tiny feather along the line, thereby producing a rich, velvety appearance not known to the lines in any other graphic-art process. The possibility of achieving the lightest and subtlest of lines and at the same time the heaviest and richest, makes dry point a desirable medium for portraits and subjects in which great variation and delicacy are required. It lacks the freedom of the etched line because, in its making, it must be guided with pressure sufficient to furrow the metal. Moreover, a dry-point plate yields fewer proofs than an etched one because the delicate burr quickly wears away with the manipulation of inking and wiping the plate. Since the mechanical work of biting a plate is the greatest stumbling block in etching, the omission of grounding and biting and the directness of the method lead many artists to dry point; but the preference is not without its drawbacks, especially the extra difficulties in printing.

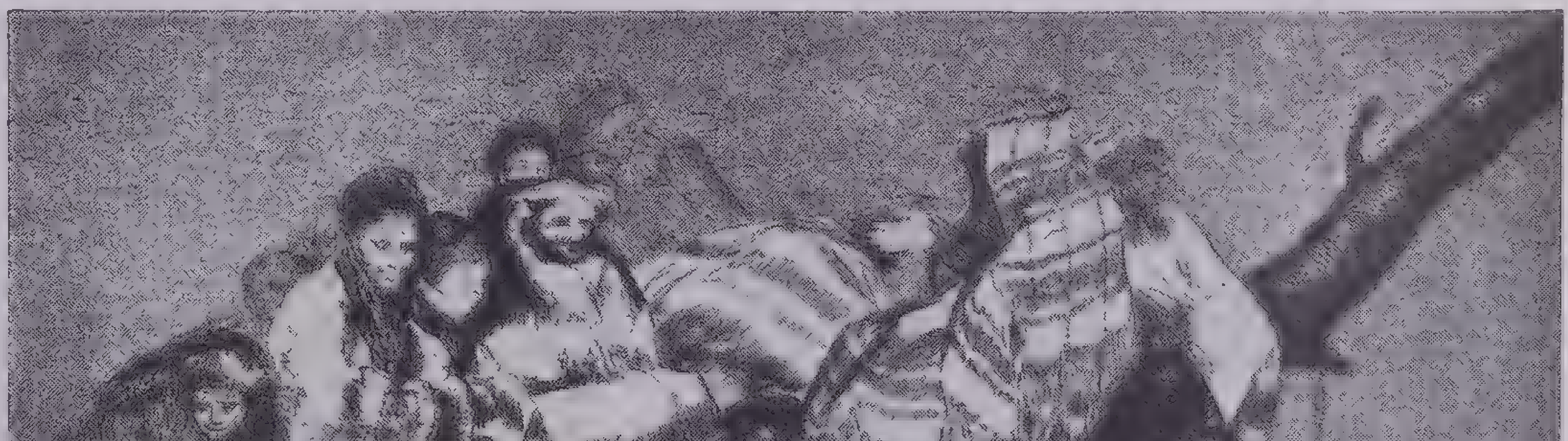
SOFT-GROUND ETCHING

The artist employing the soft-ground process does not use the usual etcher's needle. The copper plate is covered with ordinary etching ground mixed with tallow in such proportions that whether it be used in summer or winter, it does not become hard. Over the plate coated with this soft ground is stretched a sheet of thin, grained paper upon which a drawing is made with a lead pencil. When the paper is removed, it will be found that the ground has adhered to it wherever the pencil was used, leaving the lines exposed on the copper. These lines are bitten with acid in the regular way, producing varied depths by stopping out, just as in regular etching. The principle of printing is the same. The result looks somewhat like a pencil drawing or a lithograph.

AQUATINT

Aquatint is the art of etching upon metal *in tones* (as distinct from lines) with acid or, as it is technically called, *aquafortis.* The result printed in black or brown, strongly resembles a water color or wash drawing; hence the name *aqua tinto* or *aquatint.* There are several ways of preparing a ground for this process, all of them designed to leave on the copper plate a multitude of tiny globules of resin with minute interstices between. The simplest preparation is by a coating with *spirit ground,* a mixture of alcohol and resin being applied, and the alcohol permitted to evaporate. Preferable to this is the *dust ground,* which is produced by powdering dry resin particles uniformly over the copper surface and then heating the plate to melt the particles into a secure ground. There are elaborate devices for spreading the dust, such as boxes with a fan to set the dust flying or screens of cloth through which the dust is sifted on the plate. But the simplest way of all is to put powdered resin in a small bag of fine mesh that can be held in the hand and that may be struck lightly with a ruler, thus causing the particles to drop. The disadvantage of this method is that the particles may not be distributed as evenly as if they are allowed to settle from the air in a box.

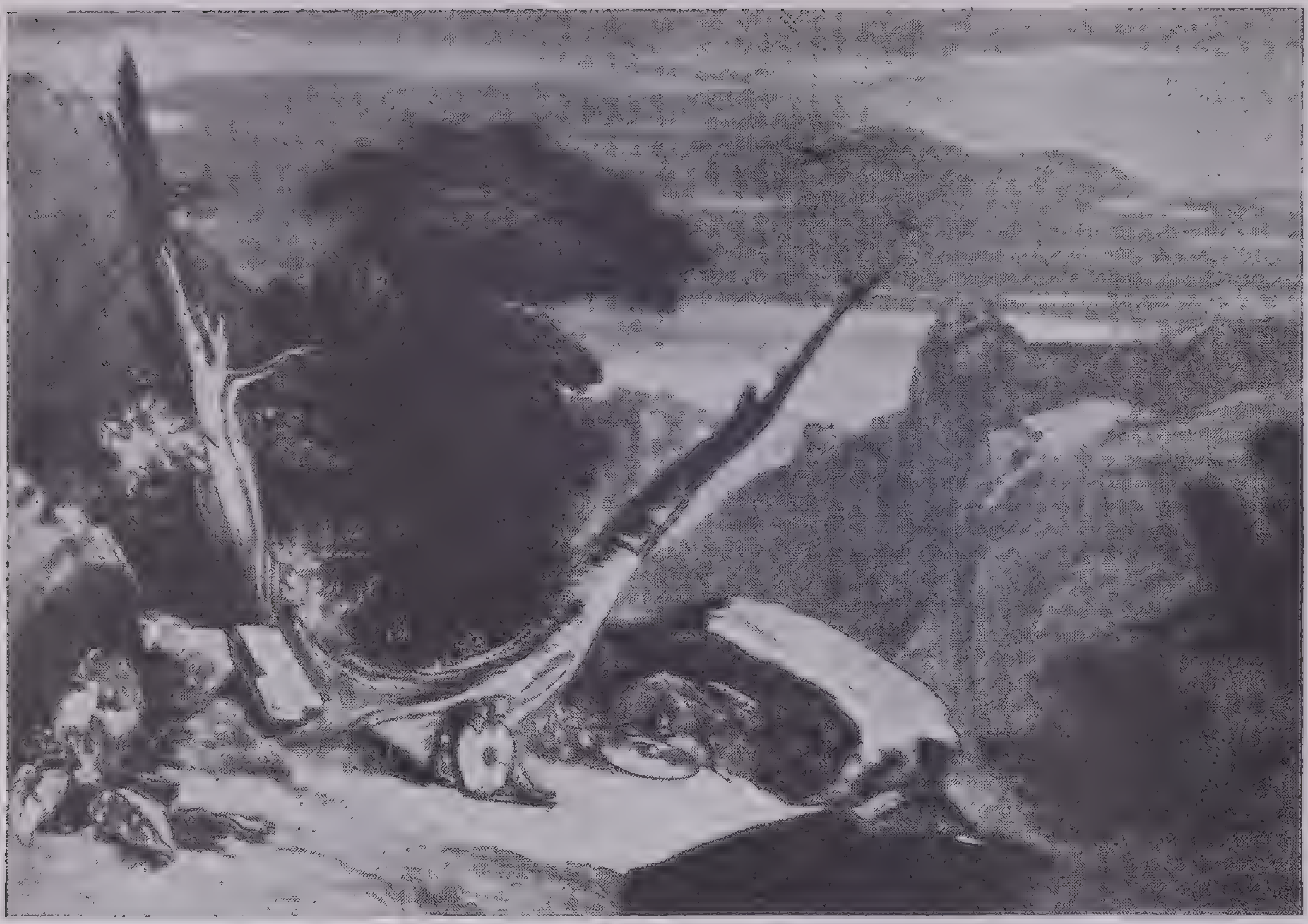
The plate must be carefully handled while it is being put on a heater where each grain of resin is crystallized, forming a hard but porous surface. Where no color on the plate is desired, the highest lights are painted out with stopping-out varnish before the first immersion of the plate in the acid, and succeeding steps are followed as in biting etched lines: short



Courtesy Metropolitan Museum of Art

Aquatint—Los Proverbios by Francisco de Goya

The group on a bough of a tree listening to a hooded orator is one of Goya's series, *Los Proverbios* (Proverbs), in which he portrayed allegorically and fantastically his views of the follies and foibles of humanity. He called each aquatint of the series a *Disparáte* (Folly). In the *Disparáte Ridiculo* (Ridiculous Folly) pictured here he warned against imposters preaching new doctrines and against small groups purporting to spread new ideals



Courtesy Metropolitan Museum of Art

Mezzotint—A Plate from J. M. W. Turner's Liber Studiorum

This plate is said to have been inspired by the following lines:

Ere long they come, where that same wicked wight
His dwelling has, low in an hollow cave, . . .
And all about old stockes and stubs of trees
Whereon nor fruit nor leafe was ever seene,
Did hang upon the ragged rocky knees;
On which had many wretches hanged beene,
Whose carcases were scattered on the greene,
And thrown about the cliffs. Arrived there
That bare-head knight, for dread and doleful teene,
Would faine have fled, ne durst approachai neare,
But th' other forst him stay, and comforted in feare.

—Edmund Spencer: *The Faerie Queene*

intervals for shallow spaces and longer intervals for deep ones. The removal of the ground and the printing are the same as with etching, except that the tiny sections of copper that stand up will not yield as many impressions as the depressed lines. Aquatint is capable of many gradations of tone, and the artist conceives his picture from the painter's point of view rather than the etcher's.

MEZZOTINT

This is another method of engraving in tone not in lines, but the work is done with tools and without acid. A metal plate is uniformly roughened by means of a toothed instrument called a *rocker* or *cradle*—a method that dates back, as far as records tell us, to 1611. There may be from 40 to 120 fine teeth to the inch of the tool. It is rocked over the copper in every direction, either by hand or by machinery, to produce tiny indentations, each with a slight burr on its edge like a shallow volcanic crater. If it is inked and printed at this stage, the plate yields a rich solid black surface. The object is to let the lights of the design through this dense black, which is done by means of a bayonet-shaped scraper and a burnisher. Where a clear surface is desired, all indentations must be removed and the surface polished with a burnisher; this takes that part of the plate back to its first state. From this point to the deepest, blackest shadows, it is a question of controlling the scraper in the leveling process to produce varying gradations of tones. The complete result, when the plate is inked, wiped and printed as already described, is the richest combination of light and shade that can be produced. But like dry point, which depends upon burr for its richness, and like aquatint, which has shallow indentures, the yield of proofs is limited. Were it not for an invention called *steel facing,* which has been in use since 1857, much of the fine work would have been limited to very few proofs. Steel facing consists in laying on the copper plate by electroplating methods a thin film of steel that protects the soft copper and preserves a uniformity of excellence in the prints for whatever larger edition the artist determines. Without steel facing, the wearing of the plate determines the number of proofs that may be taken; for as it loses its fine values, it is no longer printable and should be canceled or destroyed.

ENGRAVING

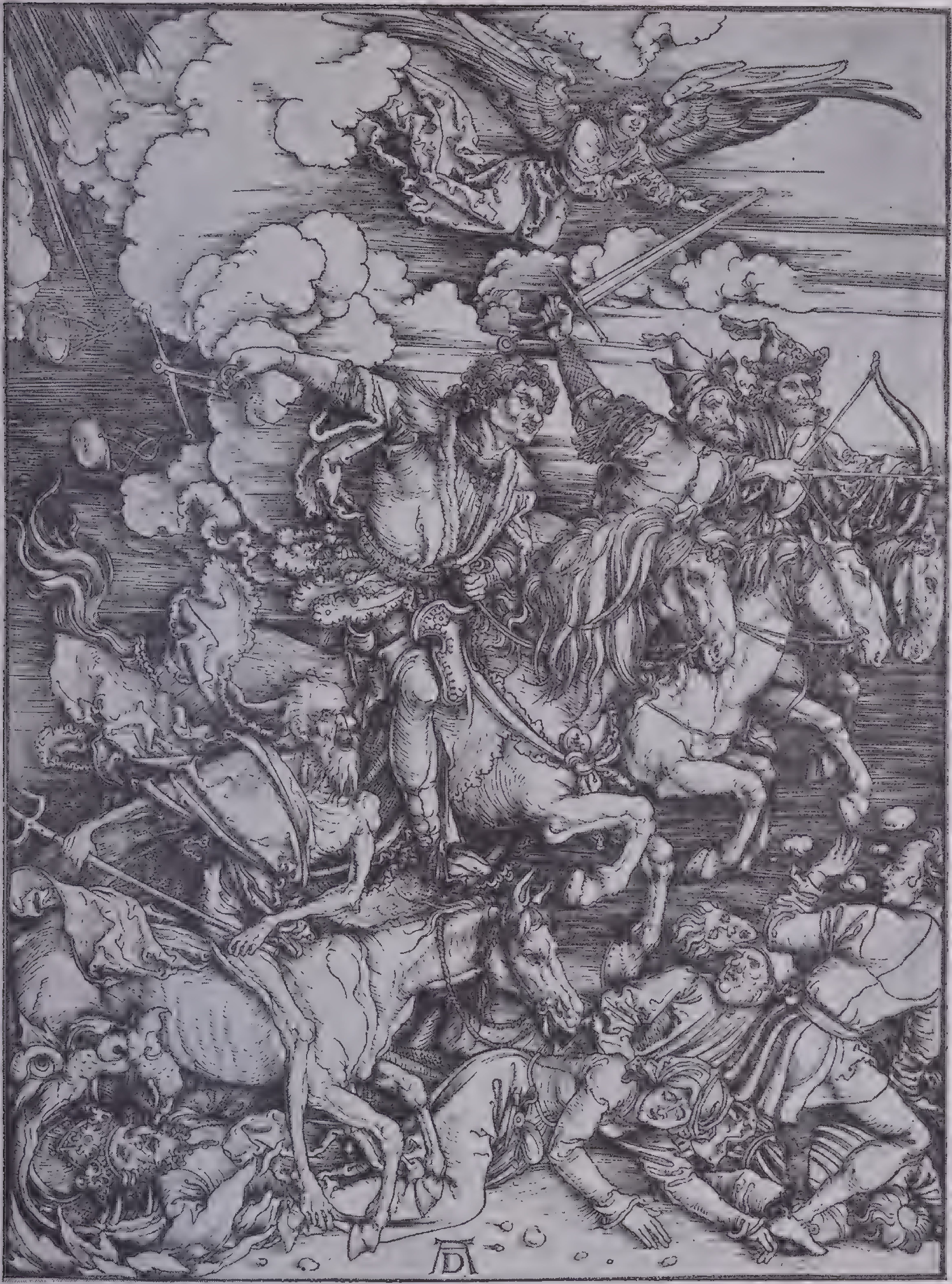
Practically all engraving work on metal before 1820 was on copper. At about that time steel came into use because very much larger editions of prints could be taken from steel plates without loss of delicate nuances or brilliancy. The art was widely popularized, and the name *steel engravings* came into common currency. This name still incorrectly persists in some quarters. As a matter of fact, engraving on steel flourished through only one generation. Then, with the invention of the process of steel facing metals softer than steel, engravers returned to the more sympathetic copper. *Copper engraving* is the correct term today, as it had been up to 1820—that is, through the greater part of the history of the art.

Engraving originated in the 15th century with the work of goldsmiths, who cut designs in gold and silver plates and filled in the lines with black alloy for ornaments called *nielli* (from Latin *nigelli,* little blocks). The black substance in the design made it possible to get an impression on paper. This discovery eventually developed into engraving for the sake of the printed picture. From a mere record of a *niello* design, engraving passed into an art that became lucrative for the translation and interpretation of paintings and other work. The work of the artist lapsed into laborious and tedious copying that, although resulting in superlative technique, furnished the world, except in a few notable instances, with no masterpieces. But between 1460 and 1550 came that culmination of the art that gave to the world the most brilliant engravings known to history. The earliest great independent engravers, creators rather than copyists, were the Italian Andrea Mantegna (1431–1506) and the German Martin Schongauer (*c.* 1445–91). Transcending all others, were Dürer's copper-plate prints. They are rich and full, yet drawn with a felicitous touch and sensitive restraint. After him the German "Little Masters" created many beautiful prints, with a special miniature delicacy; but the next outstanding master was the Dutch artist Lucas van Leyden (1494–1523). At a later period France took over leadership, especially in portrait engraving, a field in which Robert Nanteuil (1623–78) was supreme. But the art never again touched the heights attained by the 15th-and 16th-century group of Germans.

Each artist has his own way of indicating or sketching on the copper plate design that is to be cut. The incised lines themselves are carved with a tool called an *engraver* or *burin.* It is a steel rod about 4 inches long, lozenge-shaped and sharpened by being cut obliquely at the end. The wooden handle is shaped like half of a mushroom to fit the palm of the hand, while the rod is held between the thumb and second finger and is pushed forward, cutting a clear V-shaped furrow without burr. Such a laborious method cannot approach the etched line in its freedom and spontaneity; it results in stiffness and formality. Stipple engraving makes use of dots instead of lines, although it is sometimes used with line. The printing of engravings, in principle, is like that of all incised metal plates as described in the paragraphs about etching. With line engraving, however, the impressions are taken with a view to keeping the lines clear, and less tone is employed than in printing etchings. Indeed one of the cardinal virtues of an engraving is considered to be a clean-cut, almost severe quality of line, without *drag* or blur.

WOODCUTS

Broadly speaking, *engraving* may be applied to an incision made in any material; but the word *engravings* when used alone is the more likely to mean prints from *metal* plates, as some authorities would restrict the



Courtesy Metropolitan Museum of Art

Woodcut—The Four Horsemen of the Apocalypse (1498) by Albrecht Dürer

Dürer made 15 woodcuts based on the Apocalypse, of which this one illustrates Revelation 6:2-8. The Four Horsemen are Conquest, aiming with his arrow; War, with drawn sword; Famine and Death. The third rider illustrates the artist's original conception of the war profiteer who grows rich on the famine of others

term. Nevertheless it is logical and not unusual to speak of wood engravings. It is just as well, however, to adopt here the word *woodcuts* for all sorts of prints from negatives cut on wood. Woodcuts may be produced by either one of two processes: white-line or black-line.

There is one basic distinction between woodcuts whether white-line or black-line and all types of hand engraving or etching on metal, a distinction that the student of the subject should hold in mind from the outset. The parts of the wood block that print are *in relief;* they stand up on the block, and the hollows between and around them produce whites in the final product. This is the exact opposite of intaglio or incised processes on metal, for in them the lines to be printed are cut *into* the metal, indented below the surface, and the parts that are not etched away do not print in the final product. Woodcut prints are *contact* prints; they can be produced from the block exactly as fine books are printed from set type—the paper merely touches the block face or type face. But copper engravings and etchings can be properly printed only with sufficient pressure to force the dampened paper down into the ink-filled incisions.

The tools used by the woodcut artist are knives and an engraving tool like that of the copperplate engraver, the *burin.* In general it may be said that knives are used to produce the broader effects, and the burin for delicate work. The block most commonly used is of boxwood, sawed across the grain; but many engravers have preferred other woods and blocks cut with the grain. Because woodcuts have been so generally used with type for illustration of book texts, the blocks are usually prepared type high—meaning 0.918 inch (about 11/12). The artist's design is drawn on the block in reverse.

In white-line engraving the artist conceives his design in terms of white lines on black, and the strokes of his cutting tool appear in white. He carves away the high lights and secures half lights with white lines or white cross-hatching or white stippling on areas originally black. Some connoisseurs consider white-line engraving superior to black-line, since the toolmarks are shown more directly for what they are; a certain spontaneity results, not easily attainable by a process in which the lines have to be "worked around."

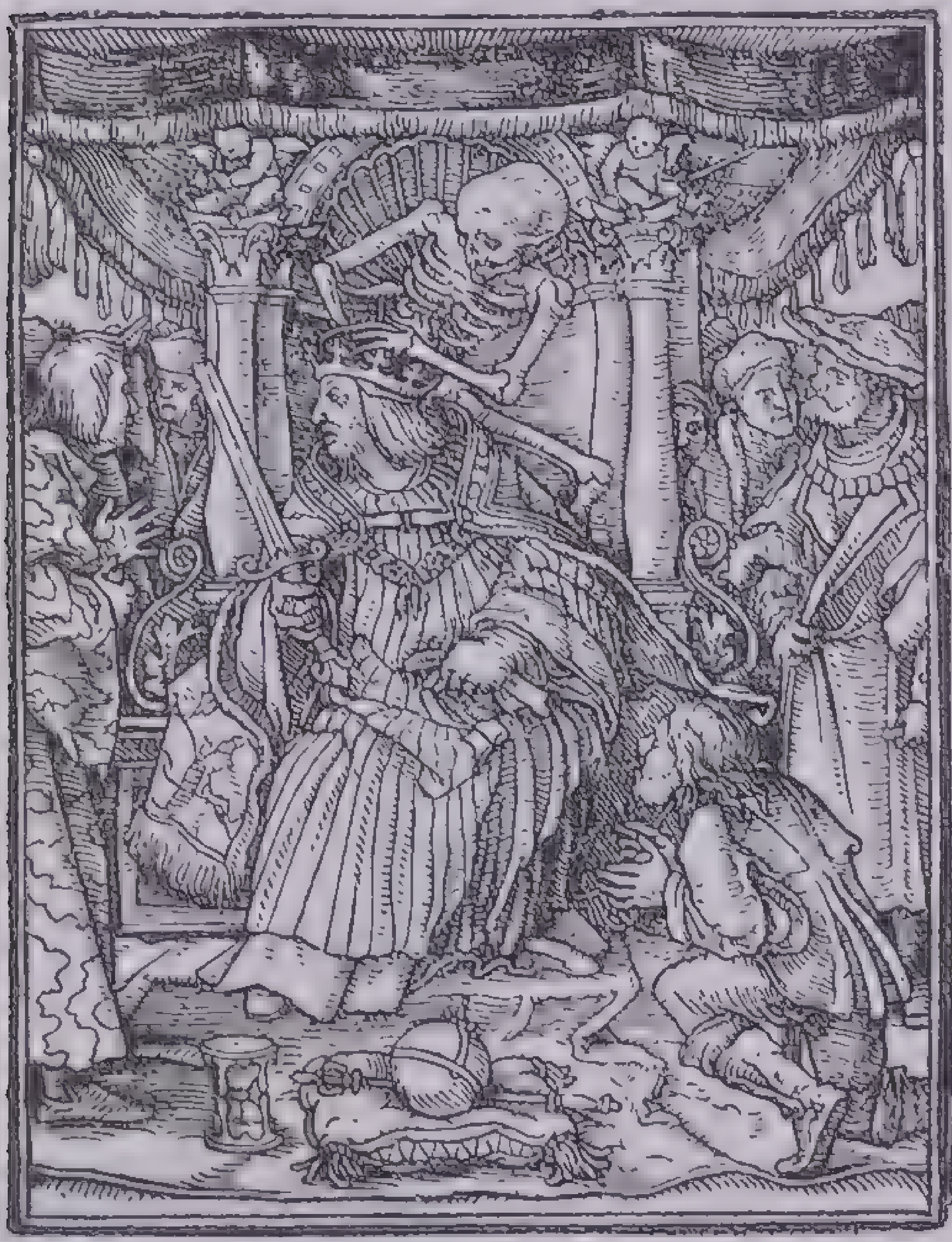
Working around the lines is just what the artist does when he produces the more common black-line woodcut. He carves away the white spaces, to leave a design in black lines standing on the surface of the block. Beautiful work has been done in this technique, and if it is less characteristic of the woodcutting process than white-line, it nevertheless has been practiced far more by the outstanding masters of the art—perhaps because the draughtsman who made the drawing on the block was often an artist renowned in painting and pen work, and the engraver merely a craftsman translating the other's design, making possible its duplication by printing.

The history of the art in Europe is concerned at first with a great number of anonymous designs indicating masterly ability. These are partly from the *block books* that were designed to give the common people stories in picture form, at a time when painting and illuminated manuscripts were reserved for the very wealthy classes; and partly from early printed and illustrated books. The first masters of the woodcut whose names we know and perhaps the greatest of all time were the Germans. Again Dürer must be put down as the master of all masters, and Hans Baldung, Lucas Cranach and Hans Holbein the Younger deserve mention in even the shortest list. Much later, in England, Thomas Bewick, William Blake and Edward Calvert were important innovators. Timothy Cole in America was the last but not the least of the wood engravers of the older period.

For a long period woodcutting became a reproductive art, craftsmen trying only to reproduce the characteristic effects of pen-and-ink drawing and wash drawing, chiefly for magazine and book illustration. But in our own time creative woodcutting has known a renaissance, and very beautiful work is being done in the medium in most European countries and in Mexico and the United States.

Block Prints.—The name *block prints* is reserved by some authorities for woodcuts of a broad sort cut on *planks* instead of the cross-grained boxwood block, with knives instead of burin. This is the process employed by the Japanese artists for their famous color prints; and indeed the method is standard wherever polychrome prints are made from wood.

In polychrome work a block is made for each color, and the designs superimposed. The artist begins by drawing his outlines on very thin paper that is pasted, face down, on the first or key block. With knives and gouges lines are cut standing up with sloping sides like dikes, to give solidity, and large spaces are gouged out more deeply. At each of two opposite corners there is a triangular mark for registering, that the Japanese call *kento.* In turn a block for each additional color is cut, and each one is provided with corresponding register marks. There may be 5 or 6 blocks or (more rarely) as many as 16 or even 18. Finally the dampened paper is laid on the face of the first block, which has been charged with color by short brushes. Over this is gently rubbed a flat disk about 4 inches in diameter called a *baren,* which presses the paper to the block and absorbs the color. One by one the colored parts of the picture from each of the remaining blocks are superimposed. The resulting color prints, as produced by the Japanese, constitute one of the most wonderful instances in all history of a popular and a cheap art with the highest artistic values. Every one should know the names and works of Utamaro, Hokusai and Hiroshige, masters of the Japanese block print.



Courtesy Metropolitan Museum of Art

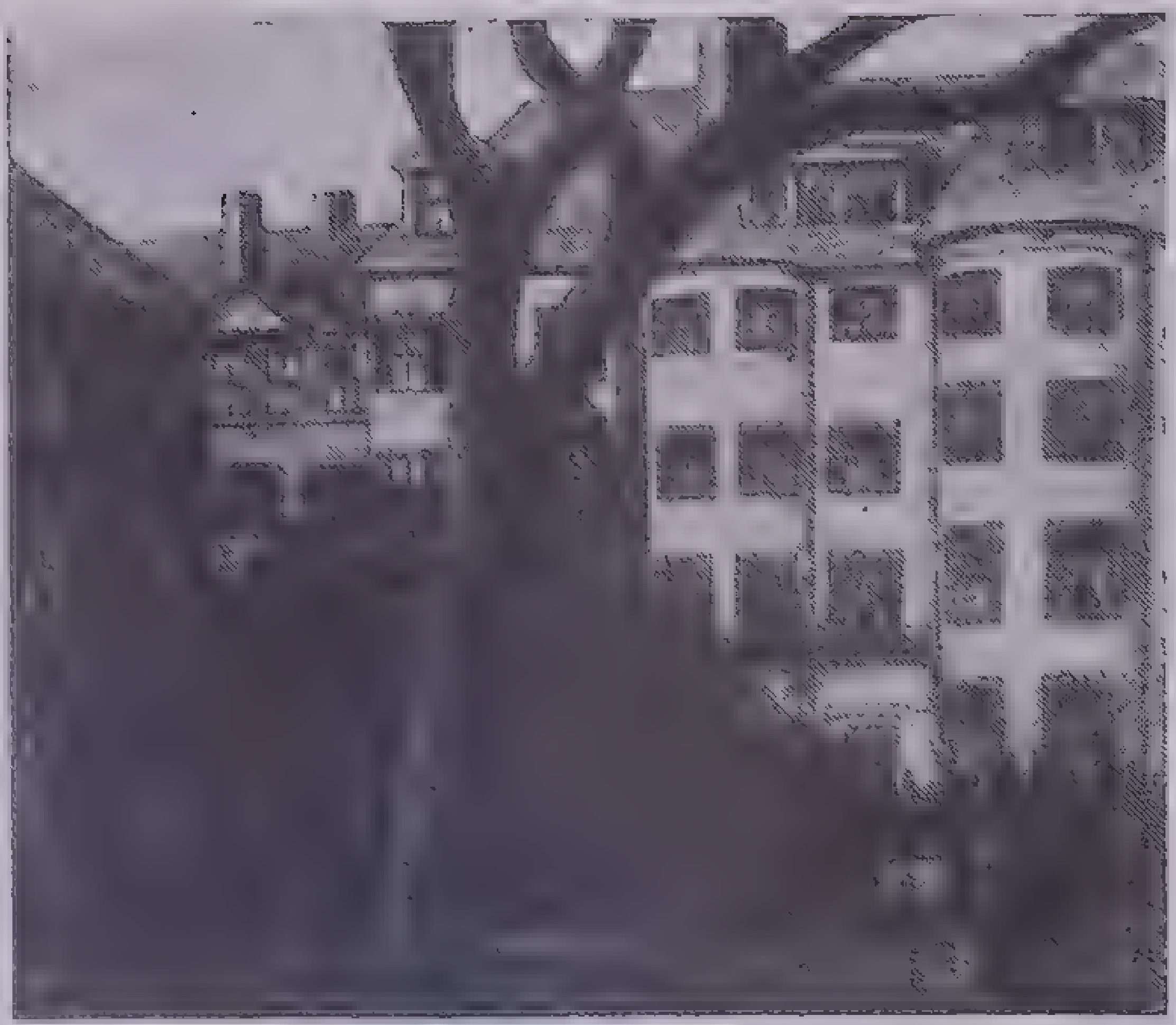
Woodcut by Hans Holbein the Younger

The Emperor, one of Holbein's 58 woodcuts for *The Dance of Death* (1538), a *block book*

LITHOGRAPHY

Metal plate lines are in itaglio. Wood plates are in relief. Printing from the surface or plane is lithography. A lithograph is a crayon drawing on stone, done in the manner of a crayon or charcoal drawing on paper, the difference being that by means of inking and a press the drawing on stone may be multiplied.

Lithographic stone is a form of calcium carbonate cut in slabs 2 or 3 inches thick. The best stone comes from Solnhofen, Bavaria. The crayon is composed of a greasy substance that sinks into the stone wherever it is touched by the crayon. When the drawing is finished, the stone is moistened with water. As water and grease do not combine, the parts that have drawing on them repel the water, but the parts not drawn upon absorb it. A roller charged with greasy ink is then passed over the surface; the ink is repelled by the wet parts and adheres to every part that is not wet and that was drawn upon by the crayon. A sheet of paper is next placed upon the stone, which is passed under a heavy roller. The ink is transferred to the paper and produces an exact facsimile of the original drawing. These are the principles of lithography, though there are mechanical details connected with the printing of interest only to workers.



Wood Engraving—Louisburg Square, Boston, by Thomas W. Nason

Drawings may be made on prepared paper and sent to lithograph printers who transfer them to stone. This process (called *transfer lithography*) permits making drawings where large and cumbersome stones may not be taken; such, for instance, as the large drawings of Panama Canal subjects made by one of the best lithographers, Joseph Pennell (1857–1926). The drawing transferred to the stone is exactly as it was made by the artist, but some critics insist that the resulting lithograph is less artistic than the one drawn on the stone itself by the artist. Nevertheless certain very delicate gradations and textural subtleties are possible where the draughtsman works directly on the stone—effects not possible to the transfer process of lithography.

No other graphic art possesses as immense scope or has been called upon for such a variety of purposes as lithography. It has been used for the most delicate of book illustrations and for such miniature designs as pictorial calling cards and bookplates; and at the other extreme it has produced commercial posters in full color of huge size.

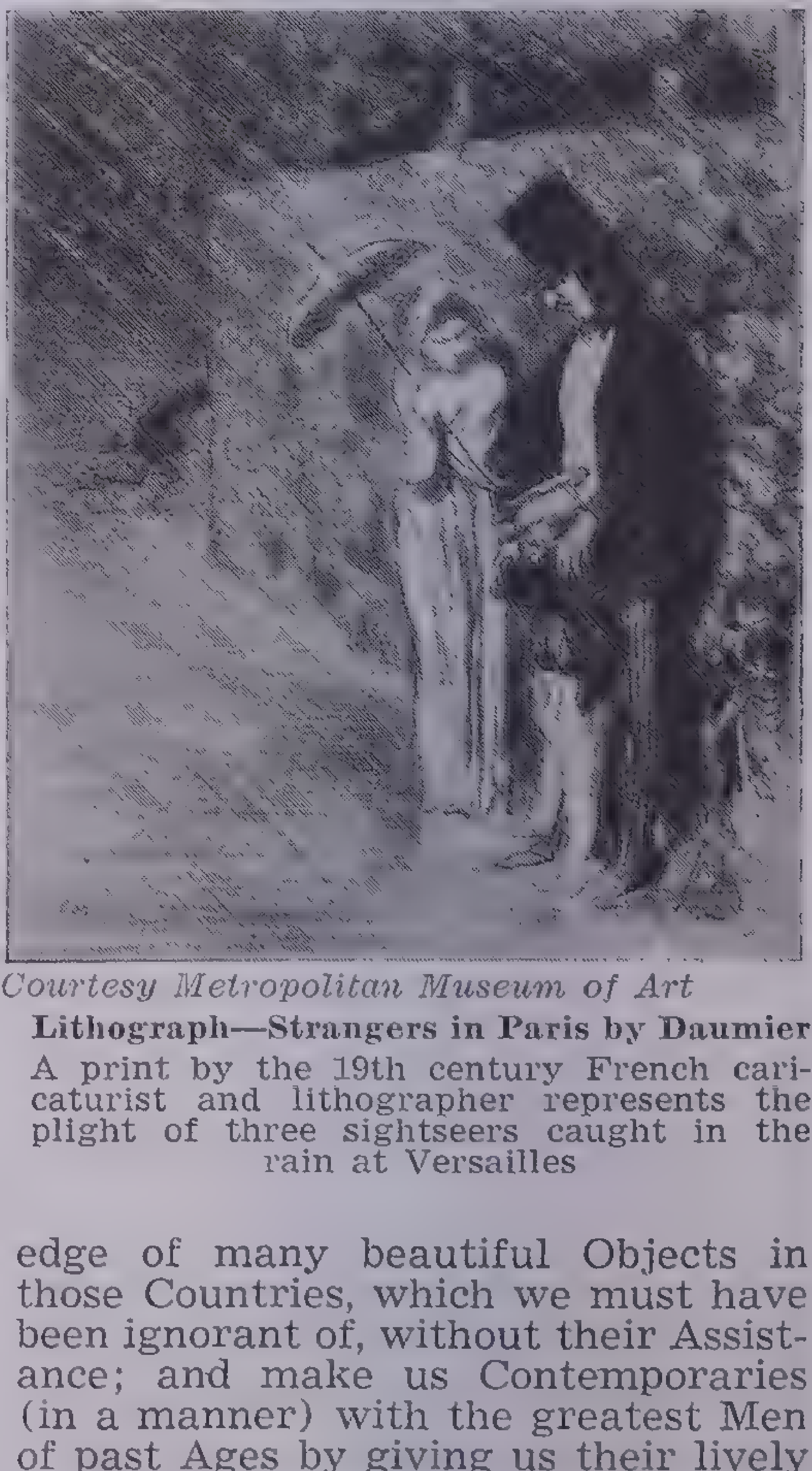
There is no other multiplying medium as sensitive to the artist's touch. The most delicate grays as well as the strongest blacks may be reproduced exactly as the artist made them. It was discovered in 1798 by Aloys Senefelder, a Bavarian, and was introduced into the United States about 1835. In the early 19th century some of the most eminent artists of Germany and France turned to the new medium, and the French painter and caricaturist Honoré Daumier is considered the greatest of all lithographers.

PRINT COLLECTING

The fascination of collecting prints is such that a whole library of books has been written on the subject, and print dealers and print galleries are to be found even in small cities. The latest historian of print making, Carl Zigrosser, opens his *Six Centuries of Fine Prints* with a quotation from an anonymous author of two centuries ago; and this passage may, more fitly than any more recent expression, serve to close the present brief review of the graphic arts:

"When I reflect on the Usefulness of this Art, I am surprized to find so few Gentlemen professed Admirers of it. It requires a large Fortune to make a fine Collection of Paintings, and great Judgement to avoid Imposition, and understand their Beauties; but Prints are adapted to all Ages, all Ranks of Men, and all Fortunes; . . .

"Prints are also as useful as entertaining; they represent absent things to us, as if they were present; they convey us instantly, without Hazard or Expence, into the most distant Countries, and make us as well acquainted with them as with our own; they communicate to us the Knowledge of many beautiful Objects in those Countries, which we must have been ignorant of, without their Assistance; and make us Contemporaries (in a manner) with the greatest Men of past Ages by giving us their lively Resemblance . . .



Courtesy Metropolitan Museum of Art

Lithograph—Strangers in Paris by Daumier

A print by the 19th century French caricaturist and lithographer represents the plight of three sightseers caught in the rain at Versailles

"Lastly, there is hardly any Subject, with Regard to which we cannot either acquire some Knowledge, or enlarge what we already have, by the Help of this noble Art."

Letterpress printing, the oldest and best-known way of transferring impressions of type and engravings to paper, is often called *relief* printing because only the raised surface of the type or engraving receives the ink, which is then transferred to the paper by pressure. Nearly all newspapers, books and magazines, as well as numerous other forms of printed matter, are produced by this method.

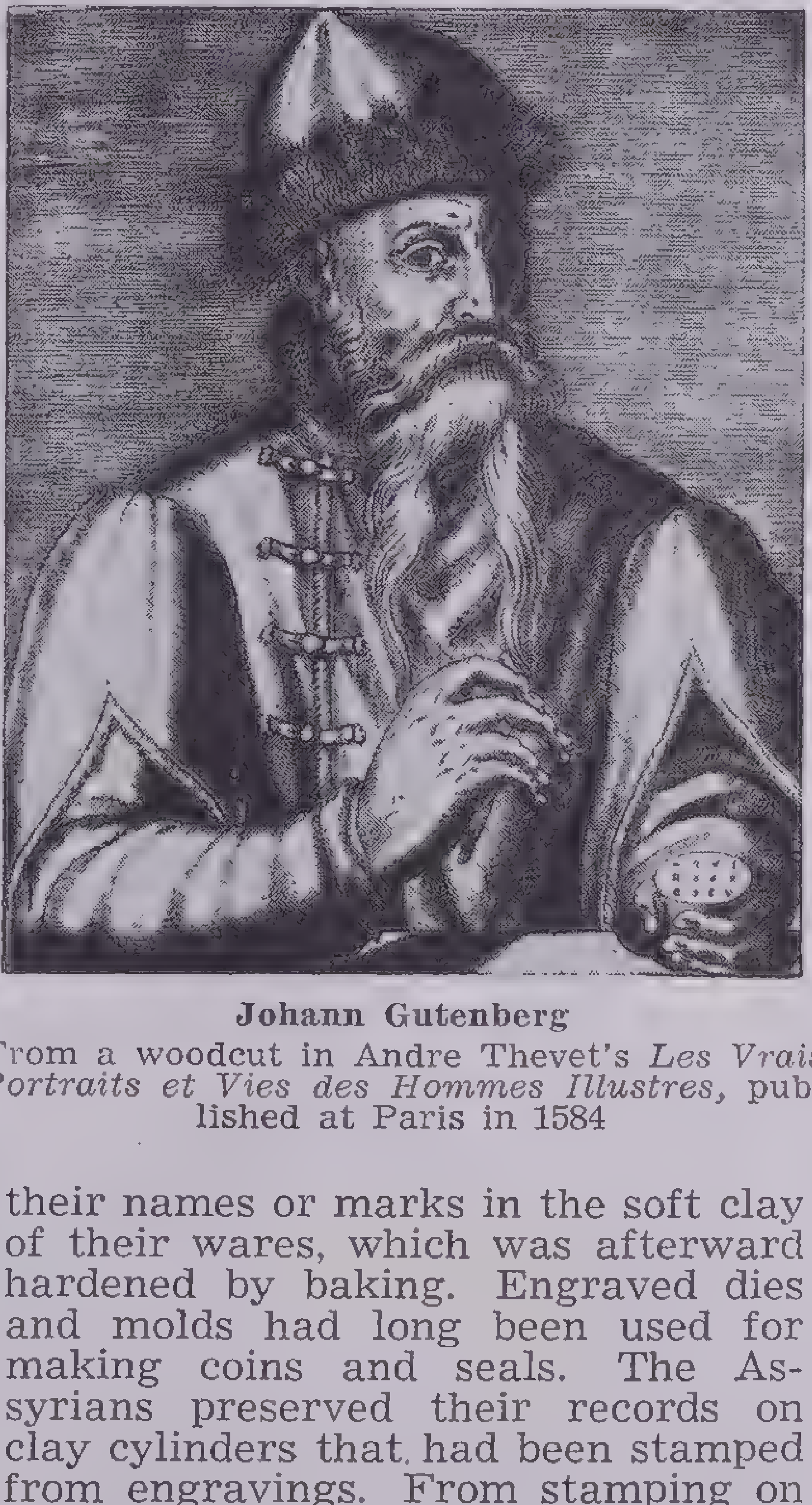
The Historical Background.—Letterpress printing in the western world began about 1440 when Johann Gutenberg of Mainz invented movable types. This invention was the final link in a long series of previous developments: the alphabet; a surface to write on; a liquid and an instrument to write with. The next and final step was a method of duplicating, quickly and economically, the written page and its illustrations.

The Alphabet.—Prehistoric man drew pictures of animals and other objects on various surfaces—the walls of caves, flat rocks, bones, metals, the skins of animals. He supplemented his primitive language with gestures or signs, from which were evolved pictographs, a crude sort of picture writing. From these pictographs were evolved ideographic writing such as is used by the Chinese and various alphabets, notably the Roman that we use.

Writing Materials.—It is probable that one of the first materials used for writing was the tanned skins of animals. As skins were often difficult to obtain, the Egyptians made from the papyrus reed a crude form of paper that was far from satisfactory. It was so brittle that it could not be folded or creased. The only way to bind a papyrus book was to wind it around a stick of wood. Split, tanned and bleached animal pelts proved to be far better. Calfskin made a very satisfactory product known as *vellum.* Sheepskin or goatskin made into parchment was less expensive. The Chinese produced the first satisfactory paper—about 105 A.D., and this invention was transmitted to Europe by the Arabs after their conquest of Samarkand in 751. But it was four centuries later that the first paper was made in Europe—in Spanish mills. Before 1270 paper was being made in Germany. There is no authentic record when writing ink was discovered or when brushes and pens came into use. Probably it was long before papyrus was first used.

Manuscript Books.—Sheets of vellum or parchment, folded to make two leaves or more, and a number of sheets bound together to form a book by 400 A.D., had largely supplanted the papyrus or parchment rolls that had been used for so many centuries. During the next thousand years these manuscript books became more and more elaborate. On many were lavished the utmost skill of the penman, the illustrator, the illuminator, the binder. They were very expensive, and a grave fault was the inaccuracy of the texts. It was impossible for the copyist to avoid repeating the errors in the book he was copying or to escape making new errors. What was needed was a method of producing books at much less cost that would also reduce the number of errors.

Movable Types.—As early as 1050 A.D. the Chinese were using movable types. Centuries before this and long before the idea of printing from movable types dawned on Gutenberg, men had been cutting letters on stone, wood and various metals. These letters were often in relief (above the surface). In the early times slaves and cattle were branded by burning with hot irons, the letters or signs used being forged or cut in relief on the ends of iron rods. Potters stamped their names or marks in the soft clay of their wares, which was afterward hardened by baking. Engraved dies and molds had long been used for making coins and seals. The Assyrians preserved their records on clay cylinders that had been stamped from engravings. From stamping on these materials it was but a step to stamping on vellum or parchment. Some manuscript books are decorated with large initial capitals that were cut in relief on wood or metal and then impressed on the parchment. The letters were more uniform, and there was a tremendous saving in labor.



Johann Gutenberg

From a woodcut in Andre Thevet's *Les Vrais Portraits et Vies des Hommes Illustres,* published at Paris in 1584

Then crude pictures were stamped from designs cut in relief on wood. The first extensive use of this method of printing was for playing cards; and about the same time, early in the 15th century, pictures of sacred personages began to be made in large quantities by wood-block printing. At first the titles of these pictures were added with pen or brush. Soon they were made part of the picture, being cut in relief on the engraved block.

Obviously, the next step was to bind a number of these pictures into the form of a book, adding a cover of some kind to protect the leaves. These first printed books with crude engravings poorly printed on inferior paper could not compare with the magnificent handwritten books blazing with brilliant colors and with elaborate gold-stamped leather bindings. But all that was required to produce a book equal to the handwritten volume (and at much less expense) was better paper, better ink, better presswork and some method that would obviate the excessive labor of cutting on wood the many letters of the text. In Paris in 1470 a copy of Gutenberg's 42-line Bible could be bought for 2,000 francs; a few years before, the same book handwritten cost five times as much.

To improve the paper was not difficult. All that was needed was better ingredients and more care in manufacture. Lacking a satisfactory paper, vellum or parchment could be used. To obtain better ink it was only necessary to adapt the new linseed-oil paints then popular with artists and use them instead of the weak watercolor inks that had been used for printing block books. Nor did better presswork present a problem. The screw press was then in general use for pressing grapes and olives, for removing moisture from the sheets in making paper and for printing textiles. All Gutenberg had to discover was a method of producing quickly, cheaply and accurately letters that could be combined into one page of text and then could again be assembled into another page of text with different words.

We shall never know how Gutenberg solved this problem, but it would seem that he must have devoted years to study and experiment before he hit on the solution. It is easy to picture him as testing and rejecting letters cut on wood as being too laborious to produce; as cutting letters on lead or other metals and rejecting them for the same reason; as placing one of the wooden letters in a recess and filling the cavity with molten lead. The great discovery was now almost within his grasp. From the reversed letter thus produced it was only necessary to obtain a reversed duplicate. What, then, could be more natural than to place this duplicate in the recess and again fill the cavity with metal? When the metal had cooled, and the letter was removed from the cavity, Gutenberg held in his hand his first type cast in a mold. The possession of books was no longer to be confined to a few persons, and their cost was soon to be reduced until they were within the means of nearly everybody.

The Mold.—It would seem that Gutenberg's first problem was devising a mold that would cast type with one unvarying dimension but would be adjustable for the dimensions that do vary—the widths of the different letters. The principle of the mold he evolved was very simple and was in use for centuries. Probably the first one constructed was two L-shaped blocks of brass, copper or iron, shaped thus: ─⊔─ With one of the blocks held stationary, moving the other in either direction left one dimension of the opening unchanged but made it possible to vary the other to any size within the limit of the mold. Thus from a single mold letters of various widths could be cast, yet all would be of uniform size from top to bottom of the printing surface. The other dimension, the distance from the printing surface to the base of the type, was not of great importance, except it was necessary that all the types be of the same length. This was doubtless obtained by the thickness of the blocks, which controlled the depth of the cavity, and the final degree of accuracy was obtained with a file or plane.

The Matrix.—In operating the mold the reversed type (known at the *matrix*) was accurately positioned at the bottom of the opening in the mold, and the recess was filled with molten lead. It is probable that the first matrices were cast in lead from letters cut on wood. It was soon discovered that they had but a short life. Doubtless it was not long before Gutenberg evolved the method used today, cutting the letter in relief on the end of a rod of soft iron or steel that was then hardened and driven into a block of copper or brass. Matrices of this kind are almost indestructible.

The Press.—The claim has been made that Gutenberg *invented* the first printing press, since the block books already mentioned seem to have been printed by laying the paper on the inked block and rubbing or brushing the back of the sheet until the ink was transferred to the paper. It would be better to say that he adapted the press. Probably what Gutenberg did was to build a stronger and heavier press than those then in use for pressing grapes and printing textiles, so that it was powerful enough to give an even impression to a large page of heavy-face type when printed on parchment or vellum. It was difficult to devise a method of applying an even coat of thick ink to the type page. It is probable that he used two leather balls stuffed with hair and obtained a more or less even coating of ink on the balls by rotating them together by hand and then rolling the balls over the type page. Obviously this was a task that required much skill. It is not known if ink balls were invented by Gutenberg. They may have been devised by the printers of block books.

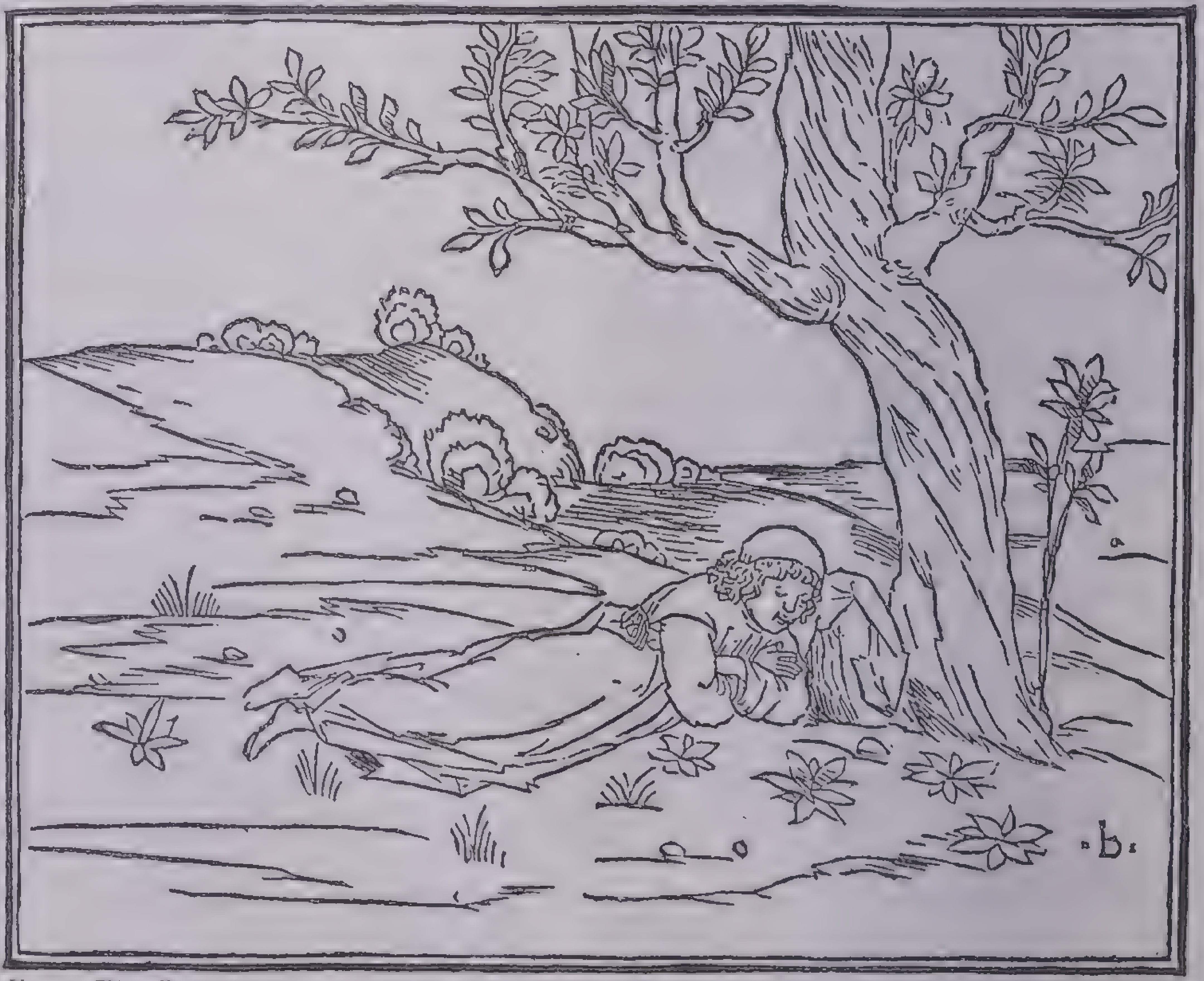
Did Gutenberg Invent Movable Types?—The claim that Gutenberg was the first European to cast metal type from matrices and the first to use such types for the printing of books is based on evidence that is scanty and inconclusive but is more conclusive than the proof for any other claimant. Gutenberg, born in Mainz about 1400, was living in Strasbourg in 1439. Records of a lawsuit in that year contain obscure references that may mean he was then engaged in making type or printing books. The records of a lawsuit in 1455 show that Gutenberg had borrowed 800 gulden from a goldsmith named Johann Fust to "finish the work;" and in 1452 Fust had advanced another 800 gulden so he could share as a partner in the profits of the enterprise. Here there is definite proof that the enterprise was making books. Fust won the suit and obtained possession of Gutenberg's printing equipment. In 1465 Archbishop Adolph appointed Gutenberg one of the gentlemen of his court, and in 1468 a Dr. Konrad Humery gave the archbishop recompense for certain materials used in printing that Gutenberg had left after his death.

Besides we know that the goldsmith Fust and his son-in-law and partner Peter Schoeffer in 1457 completed a magnificent Psalter. This book bears a colophon in Latin that says it was printed by Fust and Schoeffer in 1457. Even if these men printed this book, there is strong presumptive evidence that it was planned by Gutenberg, and that he had it well under way when his connection with Fust was brought to an end by the 1455 lawsuit.

The Gutenberg Bibles.—These Bibles are perhaps the most convincing proof that Gutenberg was the inventor of movable types; at the time they appeared he was the only man who had the knowledge and the experience to produce such magnificent books. The best-known is the 42-line, so called because there are 42 lines to a column on many of the pages. So far as known, only 32 perfect copies are in existence. It was printed before the Fust and Schoeffer Psalter, for the Mazarin 4-volume copy of the 42-line Bible in a Paris library has a notation that the binding and rubrication were completed on August 15, 1456. Not so well known is the 36-line Bible, only eight copies of which are in existence, and not all of these are perfect. It is conjectured that Gutenberg had this Bible under way when he secured the first loan from Fust; that it was then laid aside to bring out the 42-line work; and that he completed it with Albrecht Pfister as his financial backer after his partnership with Fust ceased in 1455. If this conjecture is correct, then the 36-line Bible has the best claim to being the first printed book.

Early German Printers.—Printing was not long confined to Mainz, but soon spread to other near-by towns. Early German books are noted for their woodcut illustrations. At Bamberg, in 1460, Albrecht Pfister, already mentioned as the reputed financial backer of Gutenberg, began printing a long series of illustrated books. At Cologne, about 1478, Heinrich Quentell printed a magnificent Bible with over a hundred woodcut illustrations. At Nuremberg, the great wood engraver, Albrecht Dürer, served his apprenticeship.

Printing Spreads Over Europe.—After Fust won his lawsuit against Gutenberg, the firm of Fust and Schoeffer prospered for several years, printing a considerable number of fine books. It is probable that their plant was either wrecked or closed when the town of Mainz was sacked in 1462. Their workmen then emigrated to other countries, taking with them all the knowledge required to make type and print books. The best-known of these men were Konrad Sweynheim and Arnold Pannartz, who began to print near Rome in 1464. At Strasbourg Johann Mentelin was printing huge volumes by 1460. Three German printers, probably from the Fust and Schoeffer printing shop, established a press at the Paris Sorbonne in 1469. Their names were Freiburger, Kranz,



From The Book, courtesy of Douglas C. McMurtrie

Illustration from a Book Designed by Aldus Manutius

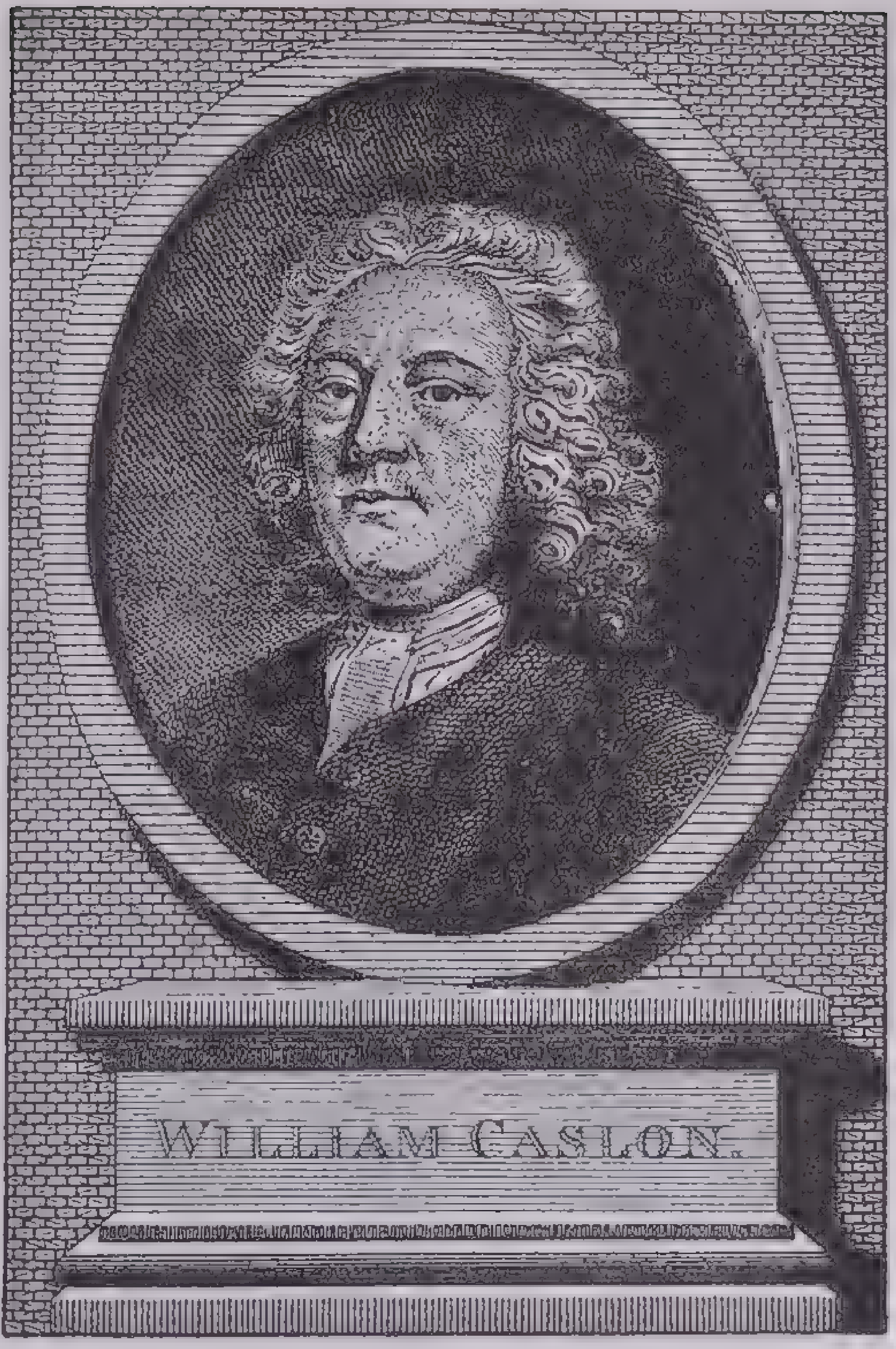
The great typographic masterpiece of the Aldine press at Venice was the *Hypnerotomachia Poliphili* issued in 1499

Gering. At Bruges in 1474 William Caxton printed the first book in English. Two years later he set up the first press in England. He was long the only printer in that country and though he was not a finished workman, he was an excellent scholar and translated into English more than a score of the books he printed. The type he used was an unusual but readable form of black letter, more graceful that Gutenberg's.

Venice, the Center of Early Printing.—Venice noted for its sea-borne commerce and many industries, was famous for its printers, and the number of books printed there soon exceeded that of any other city in Europe. One of the first printers and perhaps the best-known was the Frenchman Nicolas Jenson, the first great type-designer, who made the first Roman lower-case types. Next was the Italian Aldo Manuzio, better known by his Latinized name, Aldus Manutius, not a printer but a great scholar and publisher and the first to issue small and inexpensive books. He was much interested in the literary treasures of antiquity and published a number of the Greek classics, as well as Greek grammars and dictionaries. He also printed many correct texts of the Latin classics. He died in 1515, but the business he established did not end until 1597.

Early French Printers.—The 16th-century Estienne family (also known by the Latinized form, Stephanus) is perhaps the best known. Henri, who married the widow of a printer, specialized on Greek and Latin classics. One of his proofreaders was the celebrated Geoffroy Tory, spelling reformer and type-designer, best known for his remarkable wood engravings and his ability to teach that difficult art to others. When Henri Estienne died, his widow married another famous printer, Simon de Colines, who frequently employed Tory to design the initials, borders and diagrams for the books he printed. Robert Estienne, who was the son of the widow Estienne and Henri, and his learned wife edited scores of the Greek and Latin classics they printed. Robert was also famous for the Latin, Greek and Hebrew dictionaries he compiled, aided by others. Distinguished as a scholar, he attained equal fame as a printer, and his books were noted for their correct design and careful workmanship. Several other members of the Estienne family gained fame as scholars, publishers or printers.

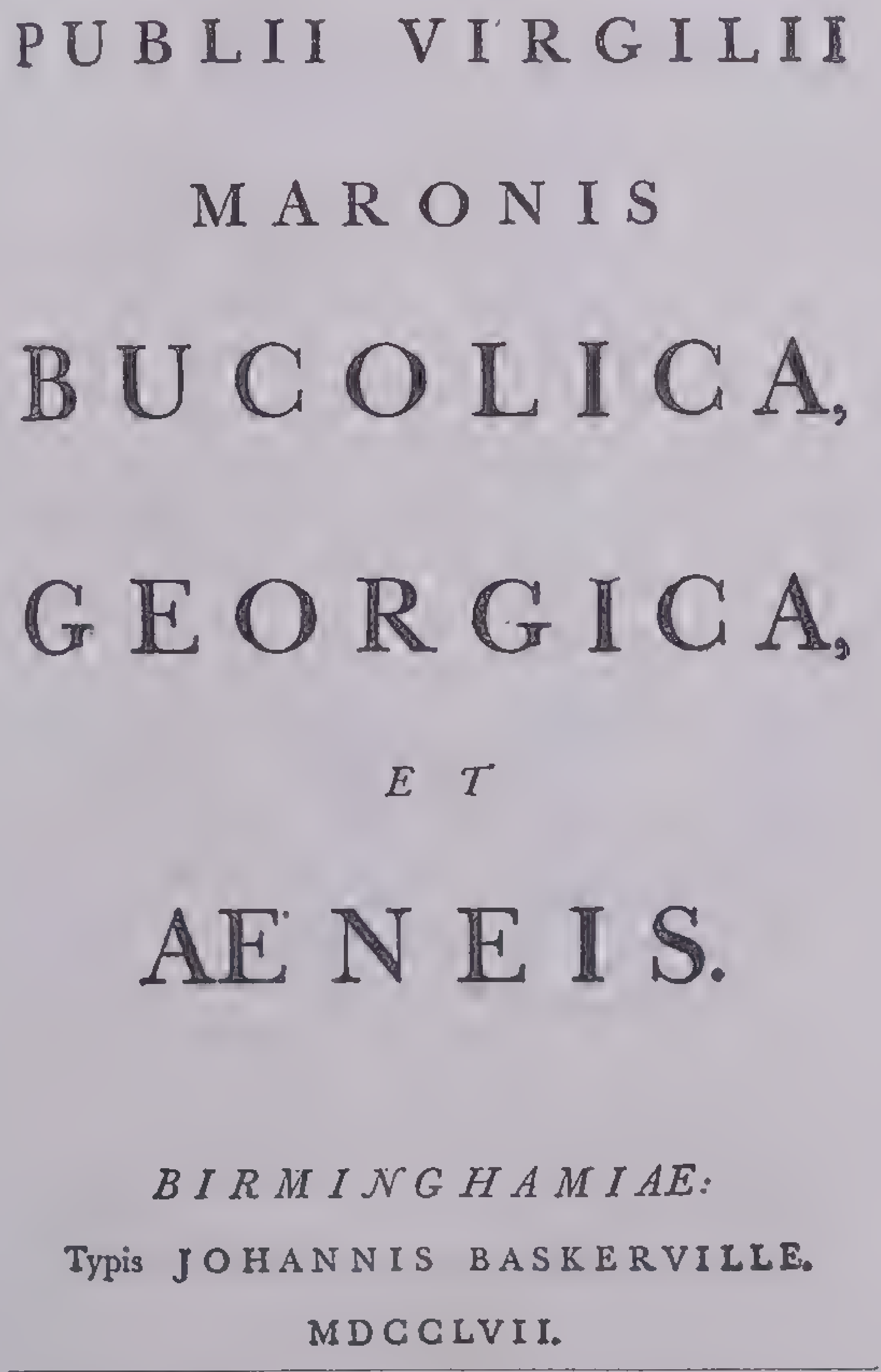
Early Printers in Holland and Belgium.—There is reason to believe that a crude form of printing was practiced in Holland before Gutenberg printed his famous Bibles, but the first dated books produced in that country were printed at Utrecht in 1473. Perhaps the best known of the early printers in Belgium was the Frenchman Christophe Plantin (1514–89). His masterpiece, which almost ruined him, was his great eight-volume Polyglot (many-language) Bible. His printing house in Antwerp, in existence for many years after his death, is now a museum. Another celebrated family of printers and publishers in Holland in the 17th century were the Elzevirs. Their claim to fame rests on the many small and inexpensive books they produced.


WILLIAM CASLON.

From The Book, courtesy of Douglas C. McMurtrie

Engraved Portrait of William Caslon

The Spanish Polyglot Bible.—Although printing in Spain had been introduced at an earlier date, perhaps the first great masterpiece was a Polyglot Bible, printed by Brocar at Alacalá in 1514–18. The languages were Hebrew, Greek, Latin and Chaldee. Another notable figure was Ibarra, remembered for his Spanish and Latin editions of Sallust. In one of his many existing letters Benjamin Franklin expressed admiration of the Sallust and a fine edition of *Don Quixote*.



PUBLII VIRGILII

MARONIS

BUCOLICA,

GEORGICA,

ET

ÆNEIS.

BIRMINGHAMIAE:

Typis JOHANNIS BASKERVILLE.

MDCCLVII.

From The Book, courtesy of Douglas C. McMurtrie

Title Page of John Baskerville's Virgil

Printed at Birmingham, 1757.

The New Craft in England.—Caxton, the first English printer, was succeeded by an Alsatian, Wynkyn de Worde (d. *c.* 1534). Other early printers were Thomas Berthelet, Richard Grafton, John Day. Little notable work was produced, however, until William Caslon (1692–1766) cut the types that have since borne his name and that ended the importing of inferior types from Holland. The next great name in English type design and printing is that of John Baskerville (1706–75), erstwhile footman and master penman, who made a fortune as a japanner and lost the greater part of it as a publisher and maker of fine books. In return, however, he gained a great measure of fame and the acquaintance and friendship of many famous men. Of his first production, a Vergil over which he labored for years, Macaulay said it "went forth to astonish all the librarians of Europe." Benjamin Franklin, who never forgot he was a printer or any of the details of the printer's craft, purchased six copies, one of which he presented to Harvard College. Samuel Johnson hastened to buy a copy and present it to Trinity College, Oxford, as a recompense for the extensive use he had been permitted to make of its library. Cambridge University recognized what Baskerville had accomplished by electing him printer to the University for 10 years. Oxford University commissioned him to design and cast a font of great primer Greek, for which he was paid 200 guineas. During the next 20 years he produced scores of beautiful volumes, one of the most magnificent being his Folio Bible. Long out of fashion and bitterly criticised when they first appeared, Baskerville's types are now having extensive use. This penniless youth, who started life without education or friends, belongs in the second rank of the world's printers.

Baskerville's Disciples.—The fame of Baskerville spread all over Europe, and others began to print books more or less in the style he had created, notably that energetic Italian Giambattista Bodoni (1740–1813). Baskerville accentuated the light and heavy strokes of the letters he designed, and Bodoni increased the difference, avoiding any suggestion that his letters were the offspring of pen or brush, and made it clear that they were produced solely with the square and compass. Like Baskerville, in his later books Bodoni avoided all decoration but paid great attention to paper and presswork.

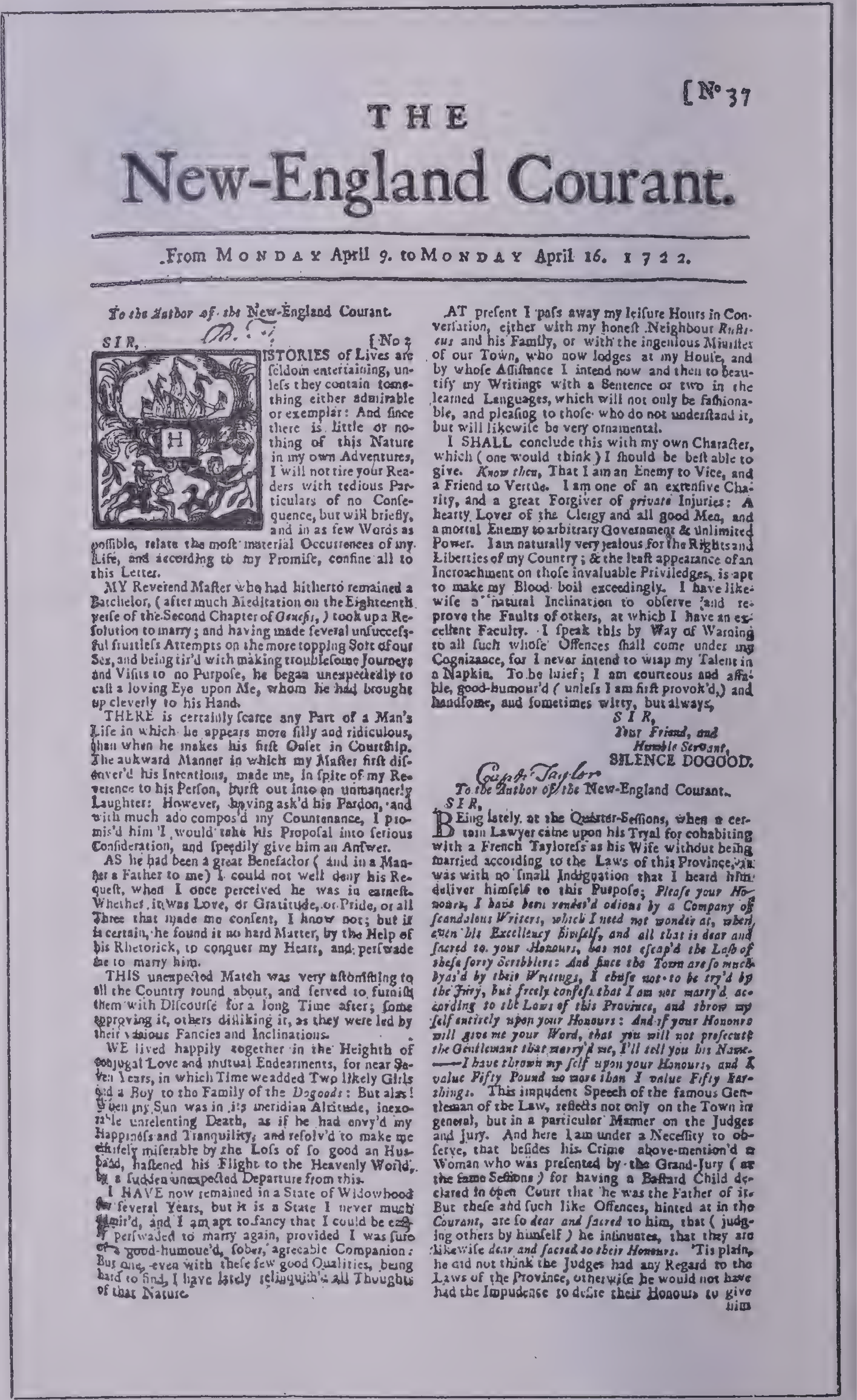
A French family of printers and type founders, the Didots, also were disciples of Baskerville. François, printer, publisher, bookseller, produced a number of well-printed volumes before he died in 1757. One of his sons, François Ambrose, was an able type founder who perfected Fournier's point system of measuring type bodies, which continues to be the basis of the French method. Among other books he printed is a collection of French classics sponsored by Louis

XVI. It was with this family that Benjamin Franklin placed his grandson, young Bache, that he might master the type founder's trade. One of the sons of this family, Pierre, *l'aîné,* took over the printing office and printed a long series of magnificent editions, perhaps the finest being one of Racine. The other brother, Firmin, succeeded to the type-foundry branch, and the many handsome types he produced, reminiscent of Baskerville, retain their popularity in France.

Early American Printing.—It is probable that the first printing in North America was in Mexico City. In 1539 an Italian, Giovanni Paoli, was sent there with printing equipment. The first printing in what is now the United States was at Cambridge, Mass. Jose Glover, a clergyman, interested in establishing a college in Massachusetts Bay Colony, decided that a printing office would be a worth-while adjunct to the proposed institution. In addition to the equipment for printing, when he sailed from England in 1638, Glover brought with him Stephen Day, a locksmith, and two of Day's sons; one, Matthew, 18 years old, was a printer. Glover died during the voyage and his widow purchased a house in Cambridge and later married Rev. Henry Dunster, the first president of Harvard College. Meanwhile the management of the college provided a dwelling for Stephen Day and his family, and in this house the printing plant was established. It was probably in operation by October, 1638. The first work produced was a small broadside, "The Freeman's Oath," no copy of which is in existence. The first book, the *Bay State Psalm Book,* appeared in 1640. Matthew Day died in 1649 and was succeeded by Samuel Green, who was connected with the Cambridge Press for nearly half a century. Green's greatest work was the printing, with the help of Marmaduke Johnson, of Eliot's Indian Bible, in the language of the Natick Indians.

Ben Franklin, Printer.—No mention of early printing in the United States would be complete unless something was said about that public-spirited citizen, great statesman, scientist and diplomat, the genial old philosopher who thus began his last will and testament: "I, Benjamin Franklin, Printer . . ." At the age of 12 he was apprenticed to his half-brother James, a printer. At 16 his name appeared as editor and publisher of a newspaper that his brother had started but that the authorities had forbidden to appear under the brother's name. After a quarrel with his brother, young Ben left Boston for Philadelphia. He worked as a printer in London for a time. Returning to Philadelphia, he soon embarked in the printing business and then started the profitable *Pennsylvania Gazette* and the even more profitable *Poor Richard's Almanack.* Twenty years later he was able to retire with a comfortable fortune.

The Deterioration of Printing.—Unlike other great discoveries, the first printed book, the 42-line Bible, was an almost perfect example of correct design and fine workmanship. But it was not long before the high standards set by Gutenberg began to deteriorate. There were revivals from time to time, but it is not too much to say that by 1888, all over the world, the average quality of printing had fallen to a very low level. William Morris, a many-sided genius, must be given credit for arousing interest in the production of better books, as well as all forms of printed matter. It was in 1889 that he started to design a type-face he termed the Golden, which was first used in a book he



[Nº 37

THE

New-England Courant.

From MONDAY April 9. to MONDAY April 16. 1722.

To the Author of the New-England Courant.

B. F.

S I R, [No 2.

HISTORIES of Lives are ſeldom entertaining, unleſs they contain ſomething either admirable or exemplar: And ſince there is little or nothing of this Nature in my own Adventures, I will not tire your Readers with tedious Particulars of no Conſequence, but will briefly, and in as few Words as poſſible, relate the moſt material Occurrences of my Life, and according to my Promiſe, confine all to this Letter.

MY Reverend Maſter who had hitherto remained a Batchelor, (after much Meditation on the Eighteenth verſe of the Second Chapter of *Geneſis,*) took up a Reſolution to marry; and having made ſeveral unſucceſsful fruitleſs Attempts on the more topping Sort of our Sex, and being tir'd with making troubleſome Journeys and Viſits to no Purpoſe, he began unexpectedly to caſt a loving Eye upon Me, whom he had brought up cleverly to his Hand.

THERE is certainly ſcarce any Part of a Man's Life in which he appears more ſilly and ridiculous, than when he makes his firſt Onſet in Courtſhip. The aukward Manner in which my Maſter firſt diſcover'd his Intentions, made me, in ſpite of my Reverence to his Perſon, burſt out into an unmannerly Laughter: However, having ask'd his Pardon, and with much ado compos'd my Countenance, I promis'd him I would take his Propoſal into ſerious Conſideration, and ſpeedily give him an Anſwer.

AS he had been a great Benefactor (and in a Manner a Father to me) I could not well deny his Requeſt, when I once perceived he was in earneſt. Whether it was Love, or Gratitude, or Pride, or all Three that made me conſent, I know not; but it is certain, he found it no hard Matter, by the Help of his Rhetorick, to conquer my Heart, and perſwade me to marry him.

THIS unexpected Match was very aſtoniſhing to all the Country round about, and ſerved to furniſh them with Diſcourſe for a long Time after; ſome approving it, others diſliking it, as they were led by their various Fancies and Inclinations.

WE lived happily together in the Heighth of Conjugal Love and mutual Endearments, for near Seven Years, in which Time we added Two likely Girls and a Boy to the Family of the *Dogoods*: But alas! When my Sun was in its meridian Altitude, inexorable unrelenting Death, as if he had envy'd my Happineſs and Tranquility, and reſolv'd to make me entirely miſerable by the Loſs of ſo good an Husband, haſtened his Flight to the Heavenly World, by a ſudden unexpected Departure from this.

I HAVE now remained in a State of Widowhood for ſeveral Years, but it is a State I never much admir'd, and I am apt to fancy that I could be eaſily perſwaded to marry again, provided I was ſure of a good-humour'd, ſober, agreeable Companion: But one, even with theſe few good Qualities, being hard to find, I have lately relinquiſh'd all Thoughts of that Nature.

AT preſent I paſs away my leiſure Hours in Converſation, either with my honeſt Neighbour *Ruſticus* and his Family, or with the ingenious Miniſter of our Town, who now lodges at my Houſe, and by whoſe Aſſiſtance I intend now and then to beautify my Writings with a Sentence or two in the learned Languages, which will not only be faſhionable, and pleaſing to thoſe who do not underſtand it, but will likewiſe be very ornamental.

I SHALL conclude this with my own Character, which (one would think) I ſhould be beſt able to give. *Know then,* That I am an Enemy to Vice, and a Friend to Vertue. I am one of an extenſive Charity, and a great Forgiver of *private* Injuries: A hearty Lover of the Clergy and all good Men, and a mortal Enemy to arbitrary Government & unlimited Power. I am naturally very jealous for the Rights and Liberties of my Country; & the leaſt appearance of an Incroachment on thoſe invaluable Priviledges, is apt to make my Blood boil exceedingly. I have likewiſe a natural Inclination to obſerve and reprove the Faults of others, at which I have an excellent Faculty. I ſpeak this by Way of Warning to all ſuch whoſe Offences ſhall come under my Cognizance, for I never intend to wrap my Talent in a Napkin. To be brief; I am courteous and affable, good-humour'd (unleſs I am firſt provok'd,) and handſome, and ſometimes witty, but always,

S I R,
Your Friend, and
Humble Servant,
SILENCE DOGOOD.

Capt. Taylor

To the Author of the New-England Courant.

S I R,

BEing lately at the Quarter-Seſſions, when a certain Lawyer came upon his Tryal for cohabiting with a French Tayloreſs as his Wife without being married according to the Laws of this Province, it was with no ſmall Indignation that I heard him deliver himſelf to this Purpoſe; *Pleaſe your Honours, I have been render'd odious by a Company of ſcandalous Writers, which I need not wonder at, when even his Excellency himſelf, and all that is dear and ſacred to your Honours, has not eſcap'd the Laſh of theſe ſorry Scribblers: And ſince the Town are ſo much byas'd by their Writings, I chuſe not to be try'd by the Jury, but freely confeſs that I am not marry'd according to the Laws of this Province, and throw my ſelf entirely upon your Honours: And if your Honours will give me your Word, that you will not proſecute the Gentleman that marry'd me, I'll tell you his Name. ——I have thrown my ſelf upon your Honours, and I value Fifty Pound no more than I value Fifty Farthings.* This impudent Speech of the famous Gentleman of the Law, reflects not only on the Town in general, but in a particular Manner on the Judges and Jury. And here I am under a Neceſſity to obſerve, that beſides his Crime above-mention'd a Woman who was preſented by the Grand-Jury (at the ſame Seſſions) for having a Baſtard Child declared in open Court that he was the Father of it. But theſe and ſuch like Offences, hinted at in the *Courant,* are ſo *dear and ſacred* to him, that (judging others by himſelf) he inſinuates, that they are likewiſe *dear and ſacred to their Honours.* 'Tis plain, he did not think the Judges had any Regard to the Laws of the Province, otherwiſe he would not have had the Impudence to deſire their Honours to give him

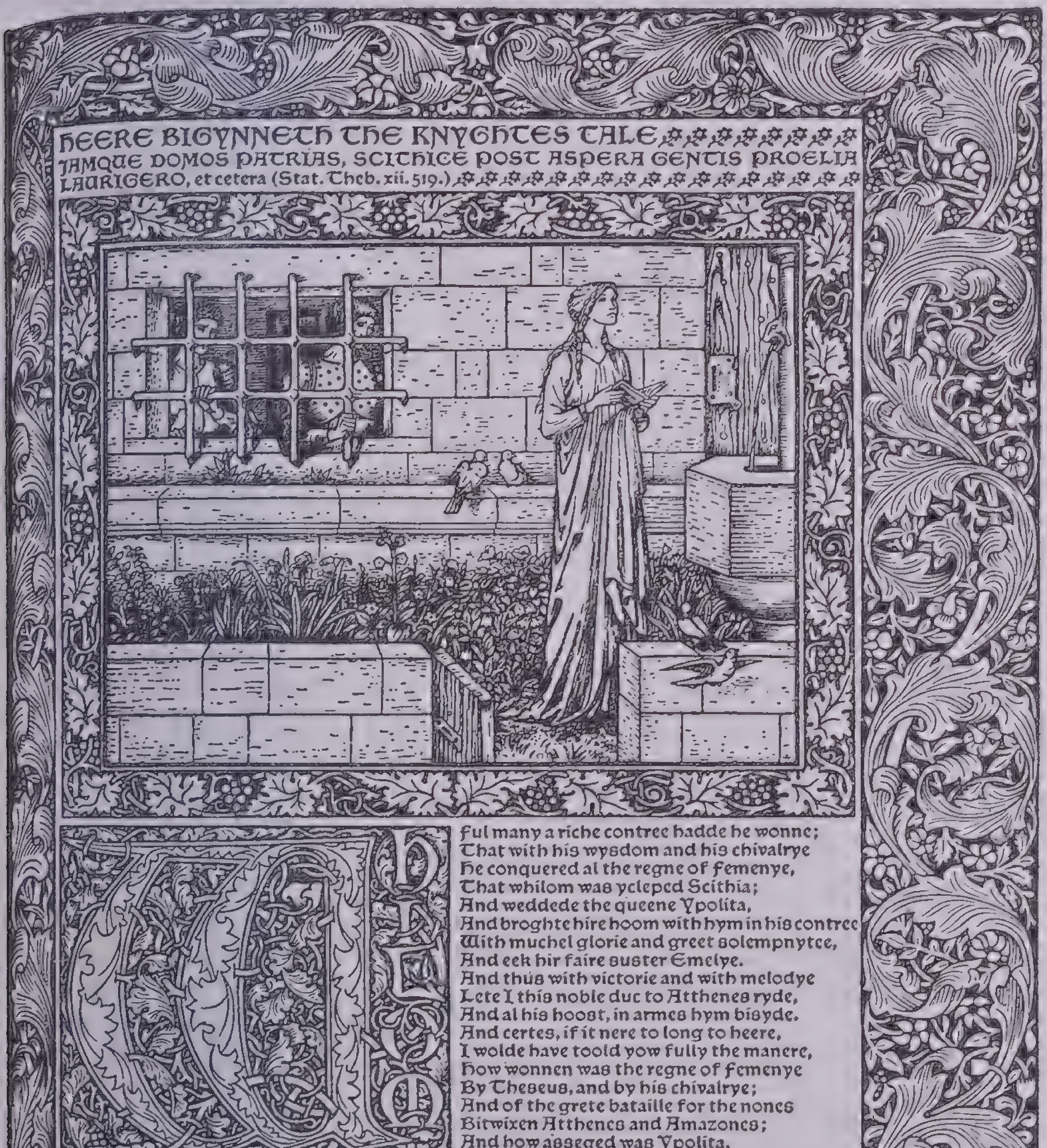
From John Clyde Oswald: Printing in the Americas

Franklin was Printer's Apprentice on this Newspaper

The fourth newspaper to appear in the colonies was published by James Franklin of Boston. Benjamin, his younger brother, was the hard-worked apprentice who set type, worked the hand press, ran errands and still found time to contribute articles, such as the one above signed Silence Dogood, written when he was 16. On this copy of the *Courant* Franklin identified each contribution in his own handwriting, marking his own. *B. F.*

wrote himself, *The Story of the Glittering Plain* (1891). This volume, as well as the later issues of the Kelmscott Press, attracted much attention, so perfect were they in every detail. Not since the days of Gutenberg had such magnificent volumes been produced. *The Works of Geoffrey Chaucer* is considered the masterpiece among the Kelmscott books. But it is not so much by what Morris accomplished in the field of fine bookmaking that he will be long remembered. Rather, it is by the many talented men whom he inspired to make better books.

Fine Printing of Today.—In the United States the two veterans who should be mentioned first are Bruce Rogers and D. B. Updike, who both made fine books for 40 years or more. Another veteran is Carl Rollins, an unusually fine workman with exquisite taste. Updike will be best remembered for his monumental *Printing Types,* a scholarly two-volume production that probably will never be supplanted by a more accurate and comprehensive study. The fame of Rogers rests chiefly on the Lectern Bible, printed at the Oxford University Press under his direction in his Centaur type. Frederic W. Goudy, American type-designer, produced more and better typefaces than any other man since movable types were invented. Aided by his gifted wife, the late Bertha Goudy, who composed in such faultless style the type matter in the books bearing the imprint of the Village Press, Goudy composed books treasured by many collectors. A fifth veteran is John Henry Nash of San Francisco, who produced many fine books that are notable for their good composition, excellent presswork and faultless bindings.



HEERE BIGYNNETH THE KNYGHTES TALE ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿
JAMQUE DOMOS PATRIAS, SCITHICE POST ASPERA GENTIS PROELIA
LAURIGERO, et cetera (Stat. Theb. xii. 519.) ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿ ✿

WHILOM
AS OLDE STORIES TELLEN US,
Ther was a duc that highte Theseus;
Of Atthenes he was lord and governour,
And in his tyme swich a conquerour,
That gretter was ther noon under the sonne.
Ful many a riche contree hadde he wonne;
That with his wysdom and his chivalrye
He conquered al the regne of Femenye,
That whilom was ycleped Scithia;
And weddede the queene Ypolita,
And broghte hire hoom with hym in his contree
With muchel glorie and greet solempnytee,
And eek hir faire suster Emelye.
And thus with victorie and with melodye
Lete I this noble duc to Atthenes ryde,
And al his hoost, in armes hym bisyde.
And certes, if it nere to long to heere,
I wolde have toold yow fully the manere,
How wonnen was the regne of Femenye
By Theseus, and by his chivalrye;
And of the grete bataille for the nones
Bitwixen Atthenes and Amazones;
And how asseged was Ypolita,
The faire hardy queene of Scithia;
And of the feste that was at hir weddynge,
And of the tempest at hir hoom comynge;
But al that thyng I moot as now forbere.
I have, God woot, a large feeld to ere,
And wayke been the oxen in my plough.

From the copy in the New York Public Library

Page from the William Morris Edition of the Works of Geoffrey Chaucer

Fine printing and bookmaking were revived by William Morris and his Kelmscott Press at the end of the 19th century. In 1896 Chaucer's works were issued in a large folio format (11¼ × 16¾ inches). Sir Edward Burne-Jones did 87 illustrations for the book and many elaborate borders, initial letters and initial words of which the above is an example

How Printing Is Produced.—It is only within the last century that there has been any great improvement in the methods used to produce printing. Many of the chief labor-saving devices are less than 50 years old. Others came into existence within the last 25 years. The last 10 years have witnessed a number of other remarkable advances. Judging the future by the past, it would seem safe to predict a continual improvement in quality, as well as a reduction in the cost of printing.

Casting Type.—The hand mold Gutenberg invented for casting type was in use for centuries. Not until about 1840 with the advent of the Bruce type-caster did casting type by machine come into general use.

Setting Type.—Today type is set by hand in about the same way it was 500 years ago. With a shallow wooden tray before him, termed a *case,* and holding in his left hand a device known as a *stick,* with the thumb and two fingers of his right hand, the compositor picks up the types, letter by letter and places them in the stick. With the thumb of his left hand he holds the tvpes upright until the line is almost completed. Between each word he places a shorter piece of metal known as a *space.* As he approaches the end of the line and finds that he has either too many or too few words to make a line the right length, he substitutes thinner or thicker spaces between the words until the length of the line is correct. This is known as *justification.* When the stick is full of composed types, they are placed on a galley, a shallow tray; and when the galley is full, a proof is made of the composition. The proof is read by comparison with the copy; the type matter is corrected and revised; and it is then ready to be made up into pages. The pages are then locked in a steel frame (a *chase*).

Sizes of Types.—Types are made in many sizes, the smallest in general use being about 12 lines to the inch; larger sizes may be but a single line to the inch or less. Type cut on wood, used for posters, may measure a foot to the line or more. The early printers had names for the various sizes of type—diamond, agate, pearl, minion, brevier, long primer, pica and others. These picturesque terms are now seldom used. A more accurate system of measurement was devised about 50 years ago. This is based on a unit known as a *point,* which is .013837 of an inch; 72 points measure approximately one inch or .996. The body of 6-point type (nonpareil) measures .083 or a trifle less than a twelfth of an inch.

Machine Composition.—Setting type by hand is now seldom practiced. To set type by machine was long the goal of many inventors; one of the first devices patented was that of William Church in 1822. Mark Twain, a compositor in his youth, sunk a considerable fortune in financing an attempt to perfect the Paige composing machine. The inventors who tried to make machines for setting the types used by hand compositors encountered two unsurmountable obstacles—justifying the lines to even length and distributing the type after it was used. A German, Otto Mergenthaler (1854–1909), overcame the difficulty when he approached the problem from a different angle—casting all the characters of a line in a single cast and from matrices assembled by the operator, using wedges between the words to justify the line. Tolbert Lanston (1844–1913), with his Monotype, gained the same end by a different and more complicated method.

The Linotype.—The first practical Linotype, a crude machine, was used in 1886 in the office of the *New York Tribune*. Constantly improved, the Linotype is now capable of producing nearly every kind of type composition. The machine is operated from a keyboard, the touching of a key releasing a matrix from the magazine, located directly over the keyboard. A revolving belt transfers the matrix to an assembly box. When enough matrices to fill a line are thus assembled, depressing a lever causes the line of matrices, with its wedge-shaped spaces between the words, to be presented to the mold. There a cast is made from a pot of molten metal, and the product is a slug, on one of the narrow surfaces of which is an impression of the matrices. The machine now automatically shaves the slug to correct size, delivers it to a galley and returns the matrices to the machine, each being housed in its proper channel, ready to be released again by the touch of a key. While these operations are taking place, the operator is assembling another line of matrices.

This description also applies to the Intertype, a machine almost identical with the Linotype. A third machine that produces a slug is the Typograph, used to a large extent in Germany.

The Monotype.—Unlike the Linotype, the Monotype produces individual types. They are automatically assembled and after they are corrected and made up into pages, they are ready for the press or to be electrotyped. Two units are required, a keyboard and a caster. The keyboard has keys like those of a typewriter, but there are five alphabets and no shift key. Striking a key does not produce a type but makes perforations in a strip of paper ribbon. When the ribbon is completed, it is placed in a power-driven casting machine, the operations of which are controlled by the perforations in the ribbon and cause the matrix case to present to the mold in correct sequence the matrices required to cast the letters indicated by the perforations. The justification of the lines is accomplished automatically. By means of certain attachments the casting machine can also be used to cast large type for hand composition, as well as rules, borders and spacing material.

The Ludlow Typograph.—With this machine, matrices are set by hand and the line is cast in the form of a slug. It is much used for setting large type, such as newspaper headings and advertisements.

Other Type Casters.—The All-Purpose Linotype is operated in much the same way as the Ludlow, its product also being a slug cast from matrices set by hand. The Thompson casts type for hand composition as large as 48-point. The Monotype Giant Caster casts individual type to be set by hand as large as 72-point.

Proofs and the Proofreader.—Proofreaders are a necessary part of printing because authors make many errors, and errors are also made by machine operators and compositors, all of which the proofreader is supposed to detect. With what is known as the first proof, the copyholder reads the copy while the proofreader follows the proof and corrects any errors or deviations, marking them by symbols. Many more proofs may be required before all concerned are agreed that the type composition is without error.

Make-up, Imposition, Lockup.—*Make-up* is the assembling of the various sizes and kinds of type, as well as engravings, and placing them in correct positions on the page. *Imposition* is placing in correct position

Marks	Explanation	Example	
		Marginal Marks	Errors Marked
₰	Take out letter, letters, or words indicated.	₰	He marked the prooff.
#	Insert space where indicated.	#	He marked theproof.
9	Turn inverted letter indicated.	9	He maɹked the proof.
r	Insert letter as indicated.	r	He maked the proof.
lc	Set in lower-case type.	lc	He Marked the proof.
wf	Wrong font.	wf	He marked the proof.
×	Broken letter. Must be replaced.	×	He marked the proof.
ital	Reset in italic type the matter indicated.	ital	He marked the proof.
rom	Reset in roman (regular) type the matter indicated.	rom	He marked *the* proof.
bf	Reset in bold-face type word, or words, indicated.	bf	He marked the proof.
⊙	Insert period where indicated.	⊙	He marked the proof
tr	Transpose letters or words as indicated.	tr	He the proof marked.
stet	Let it stand as it is. Disregard all marks above the dots.	stet	He ~~marked~~ the proof.
/-/	Insert hyphen where indicated.	/-/	He made the proofmark.
eq.#	Equalize spacing.	eq #	He marked the proof.
[or]	Move over to the point indicated. [if to the left; if to the right]	[	He marked the proof.
⊔	Lower to the point indicated.	⊔	He marked the proof.
⊓	Raise to the point indicated.	⊓	He marked the proof.
,	Insert comma where indicated.	,	Yes he marked the proof.
’	Insert apostrophe where indicated.	’	He marked the boys proof.
“ ”	Enclose in quotation marks as indicated.	“ ”	He marked it proof.
H	Replace with a capital the letter or letters indicated.	H	he marked the proof.
sc	Use small capitals instead of the type now used.	sc	He marked the proof.
⊥	Push down space which is showing up.	⊥	He marked the proof.
⁀	Draw the word together.	⁀	He ma rked the proof.
$_2$	Insert inferior figure where indicated.	$_2$	Sulphuric Acid is HSO
^{2}	Insert superior figure where indicated.	^{2}	$a^2 + b^2 = c$
Out, see copy	Used when words left out are to be set from copy and inserted as indicated.	Out, see copy	He proof.
æ	The diphthong is to be used.	æ	Caesar marked the proof.
fi	The ligature of these two letters is to be used.	fi	He filed the proof.
spell out	Spell out all words marked with a circle.	spell out	He marked the 2d proof.
¶	Start a new paragraph as indicated.	¶	reading. The reader marked
No ¶	Should not be a separate paragraph. Run in.	No ¶	marked. The proof was read by
(?)	Query to author. Encircled in red.	(was ?)	The proof read by
?	This is the symbol used when a question is to be set. Note that a query to author is encircled in red.	?	Who marked the proof
=	Out of alignment. Straighten.	=	He marked the proof.
1/em	1-em dash.	1/em	He marked the proof
2/em	2-em dash.	2/em	He marked the proof
1/n	En dash.	1/n	He marked the proof
□	Indent 1 em.	□	He marked the proof.
□□	Indent 2 ems.	□□	He marked the proof.
□□□	Indent 3 ems.	□□□	He marked the proof.

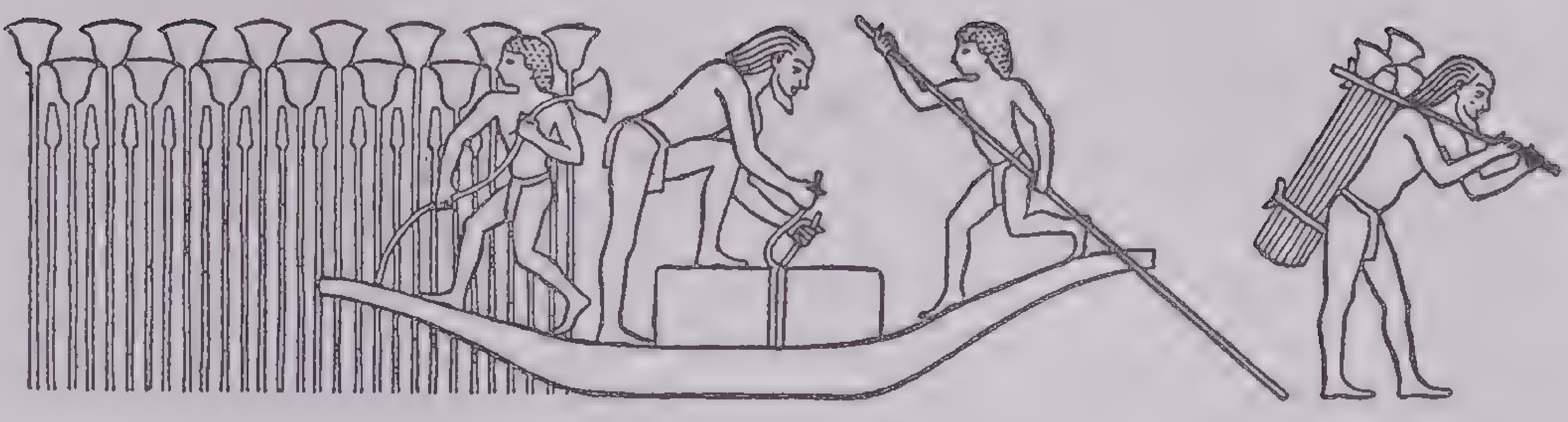
Proofreader's Marks

all the pages that are to be printed on one sheet at one impression. *Lockup* is locking in a steel frame all the pages that are to be printed on a sheet of paper.

Printing Presses.—Over a century elapsed before the screw type of wooden press that Gutenberg used was improved to any great extent. Late in the 18th century the English earl of Stanhope constructed the first iron printing press. Though it would print a larger sheet than the presses then in use, there was little or no increase in the output. A German, Friedrich König (1774–1833), aided by Andrew Bauer, developed a machine that made the impression from a continually revolving cylinder. The type rested on a flat bed, and the machine was operated by steam power. Later it was improved to print both sides of the sheet before the sheet was delivered. The first machine was used to print *The Times* of London in 1814. Meanwhile, George Clymer had improved the hand press, greatly increasing its output by substituting a compound-lever movement for the screw method of making the impression. The hand press was further improved and the output increased by the use of a toggle joint to make the impression. Daniel Treadwell of Boston in 1882 brought out a press that was operated by power but used the principle of the hand press. This press was improved by Isaac Adams, and a few Adams presses are still in use at the Riverside Press in Cambridge, Mass.

There is not space to enumerate other early presses, nor to mention the huge newspaper and magazine presses in use today, or the many large and small presses used by book and commercial printers. Some of these print as many as five or more colors from a roll of paper and at unbelievable speeds.

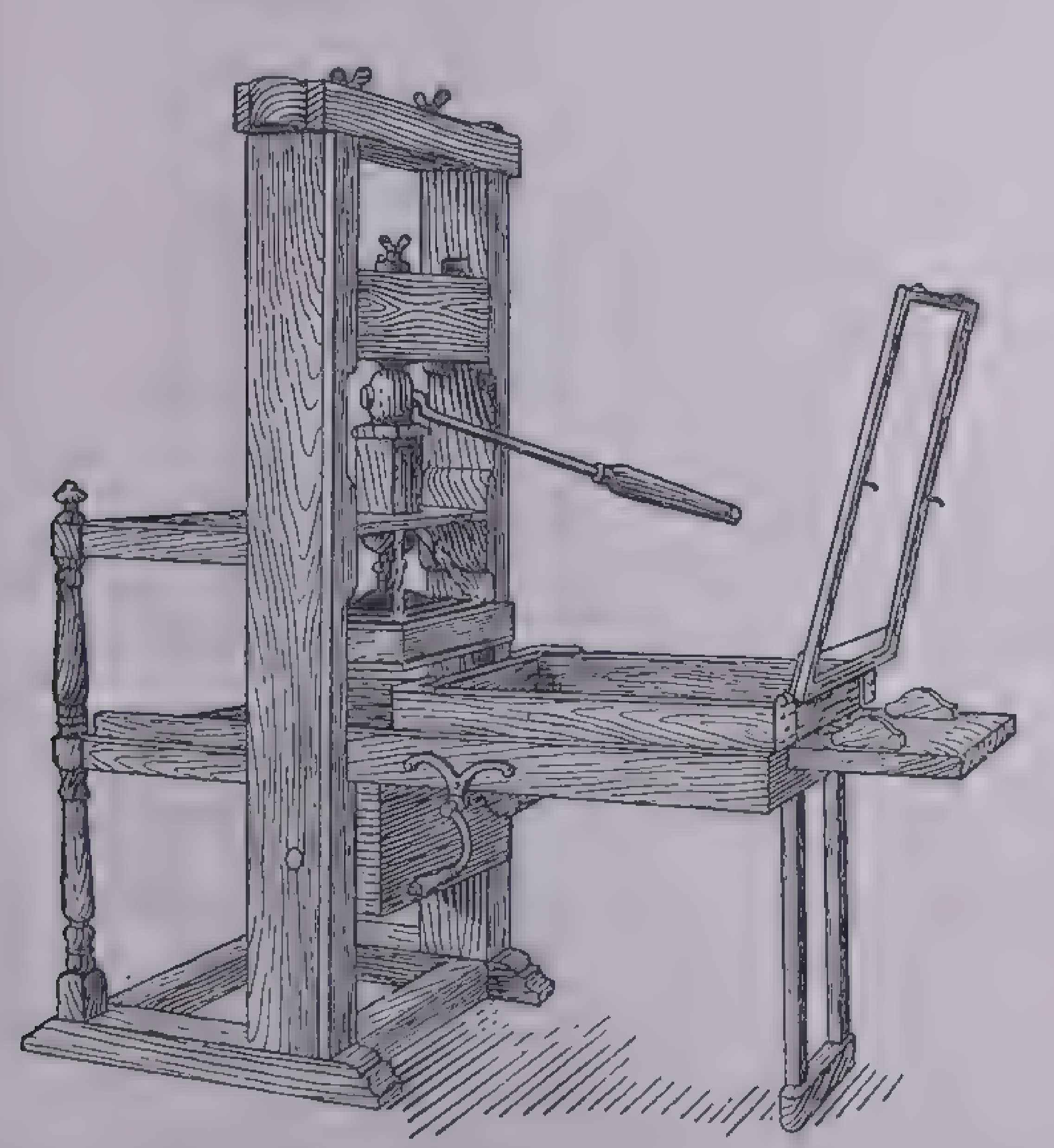
Modern Methods of Making Paper.—Printing presses could not be operated to advantage if paper were not made by machine. Until about 1805 all paper was made by hand, the sheets seldom being larger than 22 by 28 inches, and much of it was of very poor quality, quite unlike the beautiful handmade and machine papers now obtainable. A Frenchman named Louis Robert in 1798 invented a machine that made paper in a continuous roll. The Fourdrinier brothers greatly improved Robert's machine and built a mill in England in 1803. Another invention was necessary before the Fourdrinier machine could be successful. It was soon found that the supply of cotton and linen fibers (or even of straw and fibrous grasses) was not equal to the demand or was too expensive. Henry Voelter in 1860 devised a method of making paper from pine and hemlock pulp. Nearly all modern papers are made from wood fibers.



From The Book, courtesy of Douglas C. McMurtrie

Papyrus Was the First Writing Material

A papyrus harvest in Egypt, from an inscription of about 1475 B.C.



From John Clyde Oswald: Printing in the Americas

Wooden Hand Press

Presses of this kind were used for centuries. The one illustrated here is at Montpelier, Vermont, and is thought to be the press brought to America by Mrs. Jose Glover in 1638, and used by Matthew Day at Cambridge, Mass.

Related Processes.—The present low cost and high quality of printing has been made possible by a number of interrelated processes; electrotyping, stereotyping, half-tone and line engraving and the use of machines for so many of the operations required for binding printed matter.

Electrotyping and Stereotyping.—These processes make possible the rapid and economical duplicating of type pages or engravings. They are used to avoid wear or damage to the originals, to avoid keeping pages in type for future editions, to reduce the number of impressions by printing more than one copy at a single impression and for producing curved plates that make it practicable to print from a rotating cylinder.

By the electrotype process, the duplicate is obtained by depositing with an electric current a thin film of copper on the face of a wax impression of the type matter or engraving. This film is then strengthened with a backing of lead. When it is heated, it can be curved for clamping to the cylinder of a rotary press; or it can be used as a flat plate for printing on a flat-bed press. Half-tone engravings are frequently molded in lead, and the copper is deposited on the lead.

Instead of wax, the stereotype method uses a flexible matrix of papier-mâché, and the cast is made by bringing the molten stereotype metal in contact with the matrix. Curved plates are cast in curved boxes, and flat casting boxes are used to produce flat plates.

Half-tone and Line Photoengraving.—Few illustrations appeared in newspapers, magazines and books until this century. Those that did appear were usually wood engravings. These ranged from the masterpieces of great engravers, such as Timothy Cole, to the crude productions of less skilled workmen. An expensive book might have steel or copperplate engravings, but the ordinary volume was usually without pictures of any kind. Some of the illustrated weekly publications, *Puck* and *Judge* being typical examples, depended on lithography, then a comparatively slow and expensive process. There was a great need of a better, faster, more accurate and less expensive method of reproducing photographs and other subjects. This need had long been recognized, and there were many attempts to solve the problem. The first experiments were probably made by Fox Talbot in 1852. His idea, a sound one, was to resolve an image into dots of various sizes, and from that to make a printing plate. It was based, as is all photoengraving, on a previous discovery that gelatin or albumen impregnated with chromate or bichromate salts, when it is exposed to light, becomes insoluble in water. But evidently he could not solve the dot problem; that had to await the experiments of Frederic Eugene Ives, who produced the first satisfactory half-tone screen in 1885–86. As it is used today, this screen is two plates of glass, each ruled with very fine opaque lines that may be as close together as 400 to the inch, or as coarse as 65 to the inch. When the plates are cemented together with a transparent adhesive, the lines cross each other. (The number of lines to the inch gives the size of the screen—a 100-line half tone is one that has 100 lines to the inch. A 65-line half tone is used in newspapers; 120-line, for magazine illustration.)

This screen is interposed between the lens and the sensitized plate when the photographic negative is made, thus breaking up the subject into very small dots. The sizes of these dots are dependent on the amount of light passing through the lens, and then through the screen. But little light is transmitted from the dark parts of the image, hence those parts of the negative have very large dots. More light is transmitted from the lighter parts of the image. This means that when they are developed and fixed, those parts of the negative will have very small dots. When the negative is developed, those parts that receive the most light are the most transparent. Obviously, then, when a print is made from this screened negative to a bichromated metal plate, it has the appearance of a photograph, the dots being so small that they can be detected only when magnified. Before the print is made, the negative must be reversed because there will be another reversal when the plate is printed.

The metal plate, having been coated with a bichromatic solution of fish glue, is washed in water. Parts of the glue are dissolved and disappear, while the remainder are not affected. It is now only necessary to protect the remaining glue with something that will resist the acid used to etch the plate. Asphaltum is generally used with copper plates, as it resists the chloride of iron used for etching. If the plate is zinc, a resinous powder is required to resist the nitric acid used to etch the plate. In either case the action of the acid etches away all the parts of the plate not to be printed from, leaving the printing surface in relief. After various hand operations, the plate is ready for the printing press.

A line plate, made from a pen-and-ink drawing or any other subject that does not have continuous tones, is produced in much the same way as a half tone only there is not a screen between the lens and the negative.

The photoengraving method of producing printing plates is largely a mechanical process. It has now been so perfected and organized that little handwork is required. Aside from the faithfulness of the reproduction, it is a very fast process, the production of a newspaper half tone requiring but a few minutes.

Color Reproductions by Photoengraving.—Before the half-tone process was perfected, experimenters were endeavoring to make reproductions in color. It had already been established that all the colors of the spectrum could be obtained from the three primaries. In addition to the half-tone screen a *color filter* must be placed between the subject and the sensitized plate. This filter permits the passage of all the colors in the subject except one of the primaries. As that color does not pass through the filter, it later becomes the printing surface of the plate. This method is used with the other two primaries, a different filter being used for each. An etched copper plate is made from each of these three negatives, and when they are printed with yellow, red and blue inks in register (that is with accurate matching or superimposition of the plates), a result approximating the original is obtained. This was the method used by the first color engravers. It has since been found that better results are gained by the addition of a black plate.

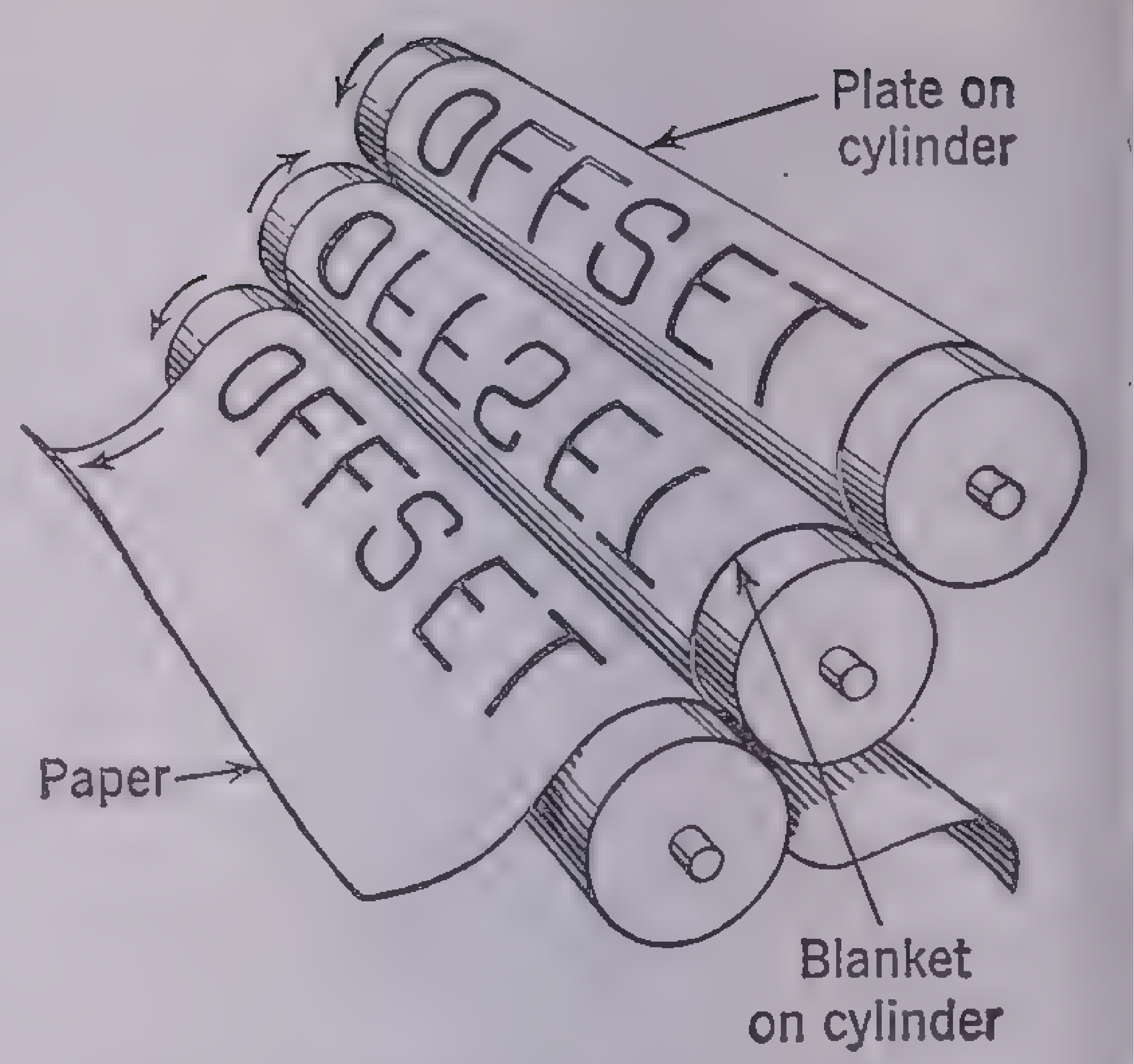
PLANOGRAPHIC PRINTING

In *planographic* printing the printing surface is a flat plane. Alois Senefelder, a German, discovered this new way of printing in 1796. Near his home in Bavaria he found a porous stone that would absorb both grease and water. The legend is that he happened to write on a flat surface of the stone with a greasy crayon. Curious to know what would happen, he dampened the stone with water and then endeavored to cover it with printing ink. As he expected, he found that the ink would adhere only to the greasy writing; it was impossible to make it stick to the damp surface of the stone. Applying pressure to a sheet of paper placed on the stone, he found the ink would transfer to the paper. Thus lithography came into existence, and during the next hundred years it developed into a huge and complex industry. One of its chief uses was for illustrations in color. The Currier & Ives prints, millions of which were printed, and specimens of which now frequently command good prices, are typical examples of early color lithography.

But measured by present-day standards, lithography was far from being a perfect reproductive process. With the development of photoengraving for letterpress printing, inventive minds began to seek a way to apply that process to lithography. First, however, a way had to be found to eliminate the heavy and fragile lithographic stones, their use preventing a high production speed. While others had been working on the problem, the discovery of the offset method of lithographic printing was made in 1904 by Ira W. Rubel, a New Jersey lithographer. He had made some reproductions through a screen on a lithographic stone and was endeavoring to print them on a flat-bed lithographic press, the impression cylinder of which he had covered with a rubber blanket. When the press feeder omitted to send a sheet of paper through the press, the image on the stone was printed on the rubber blanket. With the next impression, the sheet of paper was printed on both sides, on one side being the direct impression of the image on the stone and on the other side the previous impression on the rubber blanket. When Rubel saw the back of the double-printed sheet, he was so impressed with the clearness and sharpness of the result that the feeder and he spent the remainder of the day making further experiments. Rubel later designed a press to print by this *offset* method, and as its merits were soon apparent, several concerns began to manufacture the presses. Unfortunately for Rubel, no basic patent could be obtained, because the same principle of printing had long been used for printing on tin. Furthermore, it had been previously discovered that thin, light sheets of zinc or aluminum grained so as to retain a certain amount of moisture could be substituted for lithographic stones, thus making it possible to use a rotating cylinder as a printing surface instead of the slow reciprocating movement the lithographic stone requires.

The principle of offset printing is very simple. Instead of printing direct from the printing cylinder to the paper, as with letterpress work, another cylinder is interposed, covered with a yielding rubber blanket, which receives the inked impression of the printing cylinder. This impression is then transferred or *offset* to a third cylinder, to which is attached a sheet of paper. As the three cylinders are geared to turn in unison, the offset press is capable of high speed.

Photography and the principle of the letterpress half tone have now been adapted to placing on the zinc or aluminum sheets reproductions of type matter, drawings and photographs. As a consequence, the use of the offset method is rapidly expanding. A rubber blanket is used to receive the impression of the printing plate and then transfer it by pressure to the paper. This makes it possible to use rough-surface papers for printing half tones, which is almost impossible with letterpress. Larger and better presses and the perfecting of details have greatly increased production and improved the quality of the work. Remarkable results are also being obtained with photo-color reproductions, made possible by the use of two-color and four-color presses.



Courtesy Harris-Seybold-Potter Company

Offset Printing: Its Principle

The impression passes from a curved zinc plate *to a rubber blanket* and thence to the paper. Note the rotary principle of the offset process and that the inked impression does not pass directly from plate to paper.

THE GRAVURE METHOD

The discovery of the gravure method of printing has been attributed to an early Italian goldsmith, Tommaso Finiguerra (1426–64). It is assumed that he was the first to incise a design on a metal plate, fill the lines with ink, remove the surplus ink from the flat surface and then impress on the plate a sheet of paper, using a soft packing and considerable pressure to force the paper into the incisions and transfer the ink to the paper. This is the basic principle of all gravure processes.

Dissatisfied with the results obtained with woodcuts, early printers often made use of copperplate engravings, the subjects being incised on copperplates and printed by the method just outlined. The steel engravings of a later period were identical with the copperplates, except for the use of steel, the method of printing being the same. Though copper and steel engravings are still used for the more expensive forms of announcements and stationery and paper currency, they are seldom used for book illustrations, having been superseded by the gelatin process or the hand photogravure. Hand photogravure is etching with acid positives of photographs or wash drawings that have been printed on sensitized tissue and transferred to copper. No screen is used, for the acid bites through the interstices of a fine powder dusted on the plate and affixed with heat. The powder forms a resist, and the acid etches holes in the plate. These holes carry the ink, and the printing process is the same as that used for hand-engraved copperplates. Hand gravure is still used to a limited extent for small editions; it yields beautiful results.

The next and most radical improvement was to adapt the hand gravure method to volume production, the result being the Sunday newspaper supplements and similar work printed on inexpensive papers and at tremendous speeds. This method, *rotogravure* or *rotary photogravure,* requires that the subjects be etched on a copper cylinder. Web-feed and sheet-feed presses are used. The paper is fed between a plate cylinder and an impression cylinder. The resiliency of the rubber surface of the impression cylinder forces the paper into the cavities of the plate cylinder and thus transfers the ink to the paper. As the plate cylinder revolves, and before it comes in contact with the printing cylinder, it receives a coating of almost liquid ink, but all the surplus ink is then scraped off the surface of the cylinder by a steel bar called a *doctor,* and the ink remains only in the etched cells that represent the design.

Etching the cylinder is the most difficult task, but anything that can be photographed can be used as a subject. The negative is photographed in the usual way, and a positive is made from the negative. From the positive is printed the *resist,* a film of chromated gelatin mounted on carbon tissue. The resist is next exposed under a special screen that breaks up the image into a series of black dots. The various pieces of resist are now placed in exact position on the copper cylinder and are then soaked in water until the carbon can be peeled off. This leaves the gelatin attached to the cylinder. The cylinder is now developed by rotating in hot water. When it is dry, it is etched with perchloride of iron. When it has been developed, those parts of the gelatin exposed to the most light, being insoluble, are the thickest and offer the most resistance to the acid. The parts that received less light, especially those protected by the tiny opaque squares of the screen, retain little or no coating of the gelatin. Here the acid penetrates deepest into the copper, and the result is that these parts have many fine holes of various depths and will retain various amounts of ink.

Minor Printing Processes and Binding Methods.—A description of every method of placing type or pictures on paper would be an endless task, as new methods are being continually devised. The following are some of the more important:

Collotype.—This is a lithographic process using a gelatin plate as a printing surface. It is adapted only to small editions, but so far as faithfulness of reproduction is concerned it is superior to any other. It is used particularly for making copies of famous originals, like first editions.

Thermography.—When the cost prohibits the use of copper or steel engraving, but an embossed effect is desired, this method will give a pleasing result. The letterpress method is used, but a special ink is required, and while the ink is still wet on the sheet, it is dusted with a powder that adheres to the ink. The sheets are then baked, and this causes the particles of powder to fuse together and give a raised effect.

Embossing requires a female die, usually of brass, and a male die formed on the press. If the design is large and requires great pressure, a special press is necessary. Best results are obtained if the female die is heated.

Bronzing is accomplished by printing an adhesive size on the paper and dusting with a metallic powder while it is still wet. In recent years there has been a great improvement in metallic inks applied direct to the paper like ordinary inks. While the results are not always as satisfactory, these inks are frequently used in preference to bronzing, because of the greater cost of the latter.

Die Cutting strictly speaking is not a printing process, but the work is frequently done on printing presses. The work is cutting paper or cardboard to some irregular shape and is usually accomplished with steel cutting rules, a brass plate being used to receive the pressure of the die after it has cut through the substance.

Binding.—Printing has become a highly specialized industry and today few printers do their own binding. Binding has also become specialized. In nearly every large city there are a few small shops binding books by hand and by methods used for centuries. There are also *edition binderies,* turning out every day thousands of sewed and case-bound books. This is made possible by the use of machinery. The sheets are folded, collated, sewed and trimmed by machine and nearly every succeeding operation is also done by machine. The boards, forming the front and back of the binding, are cut by special cutters; the rolls of cloth are split by cloth cutters; the cloth is glued to the boards by glueing machines; casing-in machines attach the covers to the books; and the covers of the books are stamped with power presses. These mechanical methods of manufacturing make it possible for books to be made at lower cost and therefore increase their range of usefulness.

Pamphlet binderies have different equipment for folding sheets. Their collating machines have wire-stapling attachments; and they have punching, perforating, numbering and ruling machines. Other plants use round-cornering, eyeleting, varnishing, pebbling and gumming machines.

DICTIONARY OF PRINTER'S TERMS

agate, the old name for 5½-point type.

agate line, a unit for measuring advertisements. In an advertisement a column wide and an inch deep, there are 14 agate lines; if it is *two* columns wide and an inch deep, it contains 28 agate lines.

alive, type composition until it is no longer of use. It then becomes *dead* matter.

ampersand, the type character that represents the word *and;* printers usually call it the *short and.*

ascenders, the seven tall letters of the lower-case alphabet—b, d, f, h, k, l, t—and the parts of these letters that go above the height of other letters.

author's alterations, changes or corrections in type composition not the fault of the printer and so subject to an extra charge.

author's proof, the proof sent to the author with the manuscript; the same proof after it has been corrected and returned by the author or editor.

backed-up, printed on both sides.

backing, the molten lead poured over the back of the copper shell to strengthen it in electrotyping. Afterward it is shaved to the desired thickness. In bookbinding, backing is preparing and shaping the back to fit the cover. Books may be *backed flat,* which means little or no *round* or the back may be rounded.

back margin, that part of the blank paper between the type impression and the binding edge of the leaf. On right-hand pages this margin is at the left of the type page.

bastard title, the title only of the book; printed on a right-hand page preceding the regular title-page; also called *half title* or *mock title.*

batter, the damaged part of a page of type, engraving or plate that will not print properly.

Ben Day, a process invented by Ben Day that makes it possible to produce tone on any part of a line drawing by using gelatin films. These films have their designs in relief, and when they are inked, the design is printed on the plate before it is etched.

bevel, the sloping edge of a printing plate that makes it possible to attach the plate to a wood or metal base.

Bible paper, a very light book paper, usually thicker than India paper.

binding edge, that part of a folded sheet where the pages are stitched together.

black letter, a pointed Gothic typeface used by Gutenberg to produce the first printed book. It was designed to imitate the letters then used in Germany for hand-written books and was later called *black letter* to distinguish it from the lighter, more open and more rounded letters designed by Nicolas Jenson, which are now the more popular form of the roman alphabet.

bleed, an illustration that projects beyond the trimmed size of the leaf. When the leaf is trimmed, part of the illustration is cut away or *bled.* The bleed allowance is usually ⅛ inch. For example the size of the plate for a 6-by-9-inch booklet cover that is to bleed on all but the binding edge should be 6⅛ by 9¼ inches.

body type, that used for reading matter, usually sizes smaller than 18 point, to distinguish it from the larger type used for headings and other display purposes.

bold face, a heavier, blacker type than that used in a text. **This is bold face.**

book paper, the paper principally used for books—antique and smooth finish stocks; not newsprint, writing or coated papers.

botched, printing badly or carelessly executed.

box head, a type heading enclosed with a rule or ornamental border.

bronzing, printing with an adhesive size, to which a metallic powder is applied while the size is still wet.

capitals or **caps,** the large letters in printing used at beginning of sentences, proper names and so forth. In printers' parlance, *upper case.*

caption, title for article, chapter or illustration.

case, the compartments in which type is kept for hand composition. The old arrangement of the case had small letters nearer the compositor's hand in the lower case; so *lower case* (abbreviated *l.c.*) is the printer's term for small letters. *Upper case* (*u.c.*) means capital letters. Nowadays both large and small letters are kept in one case.

casting off copy, estimating the space required for type set from given copy.

chase, an iron or steel frame in which type matter is locked.

composition, type setting by hand or machine.

cut, a wood engraving; also (less correctly) any engraving or illustration.

cylinder press, a printing press with a continuously rotating cylinder. The blank sheet of paper is fed to the cylinder, where one edge is seized by the grippers attached to the cylinder. The sheet now comes in contact with the printing form, attached to a flat bed with a reciprocating movement, and the impression is made. With the completion of the impression, the printed sheet is transferred to a mechanism that transfers it to the delivery table.

dagger, symbol (†) used as a reference mark.

dead, type composition that has served its purpose and will not be used again.

deckle edge, the irregular edge left on paper as manufactured without trimming.

descenders, those letters that go below the regular line—g, j, p, q, y; and the part that goes below the line.

devil, a printer's youngest apprentice.

display, emphasizing certain words by using larger or heavier type, often in shorter and centered lines, as in heads or advertising headlines.

display type, heavy-faced types of any size or design; all types larger than 14-point used for emphasis or in headings and seldom used for ordinary reading.

distribute, to return types to their proper locations in cases after they have been used.

double leaded, placing two 2-point leads between lines of type. With machine composition this is usually avoided by casting the types or slugs on larger bodies. For example, 8-point type cast on 12-point body.

dummy, the assembled sketched or pasted layout giving the intended arrangement for a book or periodical.

edition, the first press run of a publication or book and subsequent printings that vary from the first or one another. Additional unchanged printings are properly called *impressions.*

electrotyping, a process for making duplicate printing plates of type composition or engravings. A wax impression is made of the form to be duplicated. A thin shell of copper is then deposited electrically on the wax. This shell is then backed up or strengthened by a coating of molten metal. After the plate has been made the proper thickness and attached to a wood or metal block, it is ready for use.

em, the square of a type body of any size; the unit of measure for type matter, originally the letter *m* (formerly square). The size of the em, of course, varies with the size of type. In 6-point matter, there are 144 ems to the square inch; in 12-point, only 36; 500 ems of 10-point (52 to the square inch) occupy an area of nearly 10 square inches. Column widths are expressed in pica ems, each 1/6 of an inch; so that a 12-pica column is 2 inches wide. The em dash is the single type or its imprint showing a line the length of the *m* in that size of type and used as a mark of punctuation; it is doubled or tripled in length as desired—2-em and 3-em dashes are used to indicate elision, between body type and footnotes and in charts and tables.

embossing, stamping with dies to form letters or ornaments in relief.

en, in English usage, the unit of measuring type matter; it is one-half the em. An *en* dash is a dash half as long as the *em* dash.

fillet, a decorative band or border.

folio, the page number, always beginning with a right-hand (*recto*) page, thus causing the even numbers to be on left-hand (*verso*) pages; a *dropped folio* appears at the bottom of the page. The term also applies to a sheet of paper folded once.

font (older form, still used in England, *fount*), a full assortment in proper proportion (*e*'s and *a*'s occur more frequently than other letters in English) of all the letters and symbols of a given size and face of type, as 12-point Caslon. It includes the requisite number for limited work of capitals, small capitals, lower-case letters, figures, punctuation marks, accents, signs and logotypes. A font may be in either roman or italics.

NOTE. Specimens of the complete font of the body type of this book are printed below:

A B C D E F G H I J K L M N O P Q R S
T U V W X Y Z
A B C D E F G H I J K L M N O P Q R S
T U V W X Y Z
A B C D E F G H I J K L M N O P Q R S
T U V W X Y Z
a b c d e f g h i j k l m n o p q r s
t u v w x y z
a b c d e f g h i j k l m n o p q r s
t u v w x y z
a b c d e f g h i j k l m n o p q r s
t u v w x y z
A B C D E F G H I J K L M N O P Q R S T U
V W X Y Z
1 2 3 4 5 6 7 8 9 0
& , . : ; - ( ) ! ? ' ' * $
fi fl ff ffi ffl

fonted, printed, taken from a font.

foolscap, sheets of paper about 13 inches wide and 16 or 17 inches long. The name comes from the fool's cap and bells that were used as a watermark by early papermakers.

foolscap and half, sheets of paper 13 by 24 inches.

foolscap and third, sheets of paper 13 by 21½ inches.

foot, the lower part of a type block, opposite the face or printing surface of the type.

foot line, the name given to the line at the foot of a page; it usually refers specifically to the blank line, below the type page, where the page number is sometimes put.

footnote, a line or a paragraph in smaller type than the text, placed at the foot of the page and giving a reference or an explanation for matter referred to in the text.

fore edge, the front of a page in a book, that is, the edge opposite the bound edge.

form, (1) type matter, engravings, electrotypes or stereotypes locked in a chase ready to be printed from. Job forms may be a single page; book forms are usually some multiple of four—4, 8, 16, 32, 64 pages. (2) A printed sheet or several sheets with blank spaces left for dates, names, amounts, descriptions and the like.

format, an indefinite term generally used to describe the form of a book, including size, paper, types, illustrations and the like.

forwarding, rounding, backing and other work in bookbinding after the sewing and before casing or attaching the cover.

foundry, place where metal is cast or where the electros and the printing plates are made.

foundry form, a page of type, or several pages of type or engravings, surrounded with type-high pieces of metal about ¼-inch thick and locked in an iron chase, ready to be sent to the foundry and electrotyped or stereotyped.

foundry proof, a proof of a page after the type has been locked in a chase for electrotyping. It is usually scanned carefully by the proofreader to detect damaged letters and errors that have been overlooked, since it is expensive to make corrections in an electrotype and impossible with a stereotype.

full bound, having a binding of all leather.

furniture, strips of wood or metal used around type matter to fill the extra space and make it possible to lock all tightly in the form.

galley, narrow, shallow metal tray, to hold type matter after it is set; also abbreviation for *galley proof,* the impression taken while type is in the galley.

gothic, a square-faced letter with no serifs.

grain, with machine-made paper, the direction the fibers run. Paper folds easier with the grain but has greater strength across the grain. With work requiring the paper to be folded, the fold is usually with the grain. Due to the method of manufacture, handmade papers have no grain, the fibers being equally matted or crossed in every direction.

guards, strips of type-high metal, ¼-inch or less thick, placed around type composition or engravings to prevent the spreading of the wax when the electrotyper makes a mold of the form.

gutters, the blank spaces between the pages of a type form.

hair line, the finest possible printed line.

half tone, an engraving on either copper or zinc, produced by the photoengraving process.

hanging indention, see *indention.*

head or **heading,** display phrase or caption used to gain attention, inform, summarize or suggest; usually named according to the position occupied on the page or in the column, as *center heads,* placed in the center of the column; *side heads,* at the beginning of a paragraph; *cut-in heads,* next to the outside margin in a space created by indenting several lines; *box heads,* enclosed by rules in the margin. *Running heads* are the book and chapter titles on the top of opposite pages in a book or other publication.

height to paper, the standard height of type, that is, its upright dimension as it stands on the press. All sizes have the same height, 0.9186 inch.

hellbox, printer's box for broken type and type-metal discards.

hot embossing, the usual process of producing raised effects on paper by means of male and female dies. With heavy papers, such as cover stocks, better results are obtained if the female die is heated.

imposition, placing the pages in the form on a table or stone (called imposing stone) in the order necessary to insure their proper sequence when the signatures (pages on a single sheet) are folded to be sewn.

indention or **indent,** white space at the beginning of a paragraph; or in the *hanging indention,* such as this paragraph shows, where the first line is set full measure, and those that follow are indented 1 em.

India paper, a very thin book paper used mainly for Bibles and prayer books and developed to perfection by Oxford and Cambridge University presses.

inferiors, characters cast low on the face of a type body and standing at the bottom of the line as in chemical symbols.

inserts, illustrations or type matter printed separate from the signatures and inserted and pasted between the pages during binding operations; also called tip-ins.

inside form, those pages that when printed are on the inside of the folded sheet, that is, with a 16-page form, pages 2, 3, 6, 7, 10, 11, 14, 15.

intaglio (in tal′ yō), incised, cut in, as distinct from relief printing. Intaglio engraving is used in photogravure.

intertype, a composing machine almost identical with the linotype. The matrices of Intertype and Linotype machines are interchangeable.

italic, a sloped letter; used in words to be emphasized, book titles and foreign phrases; first used by Aldus in Venice, in imitation of the Italian handwriting of the 15th century.

jacket, the paper slip cover of a book used to protect the cloth cover and to attract attention; also called *dust jacket* and *wrapper.*

job press, any of a number of small presses used for various purposes. At one time the term was applied only to platen presses, but it is now used to describe small cylinder presses, such as the Miehle vertical.

justify, to equalize the spacing to fill a line properly. Composing machines justify automatically.

kern, in such letters as the *f* the beak that frequently projects beyond the body of the type.

keyplate, in process color work the plate with which all the other plates must register.

kill, to cancel portions of copy or type matter.

layout, sketched or pasted plan or arrangement for an advertisement, section or full page.

leaders, dots or dashes in a row to connect related parts—in bills, price lists, tables, formulas and on content pages—as a convenience to carry the eye from the name of an item to its price or page number; also used to indicate a full-line omission.

lead mold, an impression in lead of a half tone in the process of making electrotype duplicates to be used in printing. The lead impression is separated from the original and is faced with a shell of copper, deposited by electroplating. The first deposit may be nickel, followed by copper, or when extreme durability is required, the copper may be given a chromium plating. The other method of molding is with wax. The lead mold makes a plate that yields as good impressions as the original; it is preferable to wax for fine-screen half tones.

leads, thin strips of metal between lines of type, used for spacing.

legend, title or description printed under an illustration.

letterpress, typography or relief printing; type matter as distinct from illustrations.

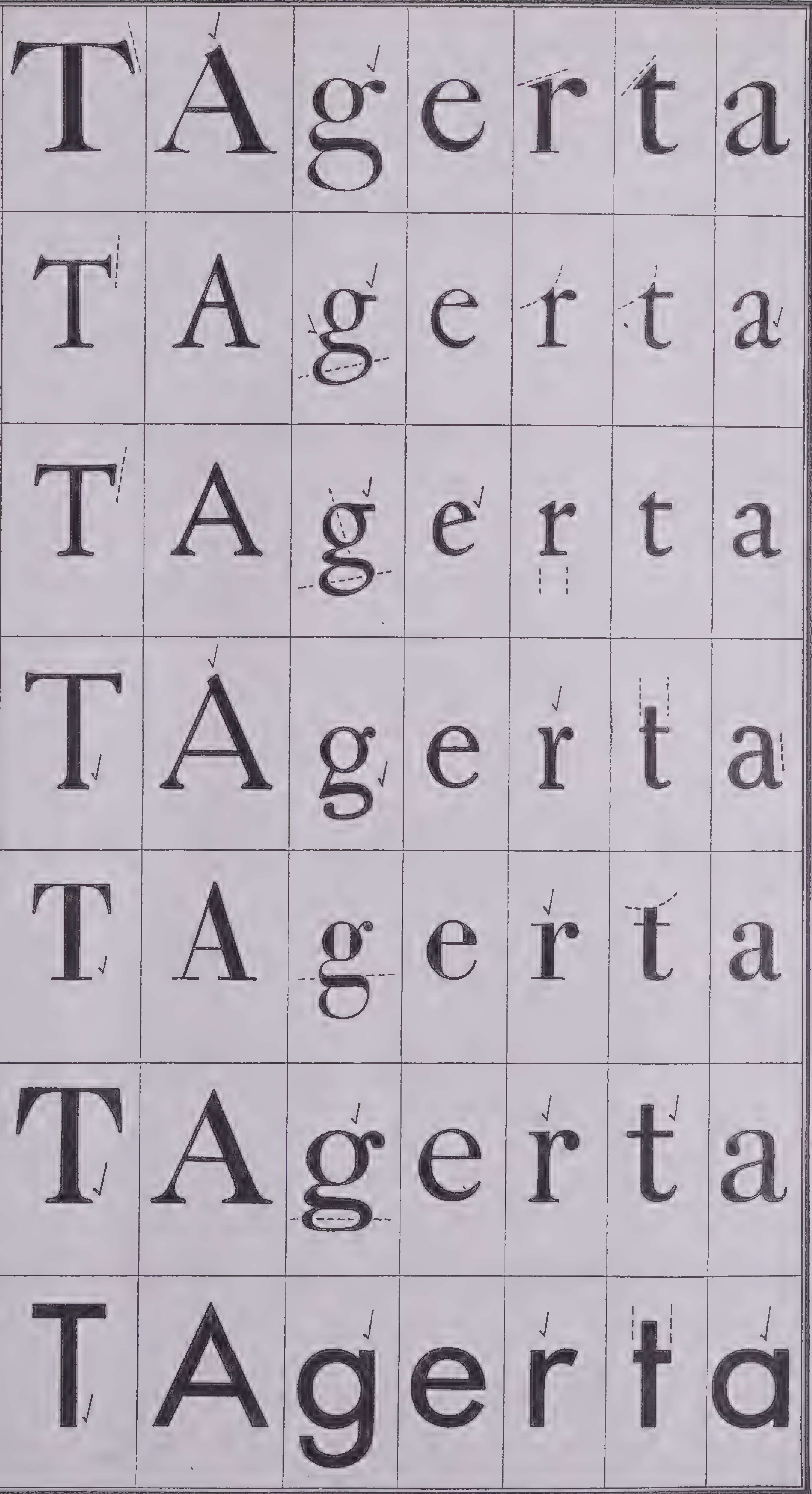
line drawing, a pen-and-ink, dry-brush or other drawing without tone that can be photoengraved without the use of a screen.

linotype, a composing machine whose product is a slug bearing on one of its surfaces a cast of a line of matrices assembled by the operator so that a whole line of type is cast in a single unit.

lithography, a method of printing based on the physical law of repulsion between grease and water.

logotype, a type on which is cast more than a single letter, either letters tied together—*ligatures* like æ, œ, fi, ff, fl, ffi, ffl, found in all fonts of type and set as a single character; or a whole word cast as a single character—like such frequent words as *the, and, of;* or a peculiar setting of a trade name, such as *Ford* in the distinctive script used in Ford advertising.

low-to-paper, type composition or any printing surface less than the standard height of .9186 of an inch.



Caslon Old Style
Full of swing and character. An excellent general purpose type, though a little light in smaller sizes for glossy coated stock.

Garamond Old Style
Similar to Caslon, but more even in weight, and closer to old manuscript forms. Good on both smooth and antique stock.

Cloister Old Style
Very old style, monotone weight, modeled after Jenson's Venetian types. Sets a slightly darker page than either Caslon or the Garamond.

Cheltenham Old Style
A close-setting, monotone, rather heavy, but very legible face. Excellent in small sizes on coated stock with halftones.

Bodoni
Modern, somewhat stiff, but very dignified. Because of contrast in stroke, small sizes more legible on soft than hard surface stock.

Scotch Roman
Rather modern than old style. While not beautiful, a very legible, useful face for both display and text purposes.

Futura
One of several very useful Gothic faces. Suggests the stripped-for-action simplicity of the modern steel-frame sky-scraper.

Courtesy Printers' Ink Monthly and Prof. T. B. Stanley

Characteristics of Type Styles

Roman letters (lines 1 to 6 above) have serifs—fine cross strokes at top and bottom. Roman Old Style (lines 1 to 4) imitates letters incised on Roman triumphal arches. Roman Modern (lines 5 and 6) imitates hand-drawn letters made with pen and ink. Gothic (line 7) has no serifs, no frills. Check marks call attention to style differences.

lower case, the small letters of the alphabet. See *case.*

make-up, arrangement of type and illustrations in pages according to dummy, with running heads, captions and folio, ready for imposition (or placing in the form); also the planned arrangement in the dummy.

margins, blank area surrounding the printed part of a page.

masthead, statement as to the name and place of publication, editors and subscription rate, published in every issue of a newspaper or periodical.

matrix, any impression from which metal is molded and cast for relief printing. Type is cast from matrices of brass, hard copper or (for large sizes) aluminum alloy. Stereotypes for newspaper printing are made by pouring molten metal into papier-mâché or composition matrices (usually called *mats*) that have been molded from original type metal or engravings or both. The matrix is a positive, that is, the letter or illustration is seen on its face as it appears when it is printed and is not reversed as it is in type or actual printing plate.

matter, copy or type set for printing, before which it is *live matter,* after which it is *dead matter* or if it is kept for further use, *standing matter.*

modern typefaces, a new form of the roman alphabet late in the 18th century designed by the celebrated Italian printer and punch-cutter Giambattista Bodoni. His types were characterized by marked differences between the widths of the light and heavy strokes of the letters and by long and slender serifs. Since then all types with these characteristics have been termed *moderns.*

monotype, a composing machine whose product is individual types automatically cast in a machine. The machine is controlled by a ribbon perforated at another machine by the operator. Corrections are easier to make on matter set by monotype as the whole line need not always be reset as in linotype.

mortising, making an opening through a cut to receive type so that a legend or caption may be inserted where the part was removed.

multicolor press, a press for printing several colors at one operation.

nickeltype, an electrotype in which the first deposit in the mold is nickel, followed by the copper deposit. Nickeltypes are not affected by mercury inks.

offset, a mark or smudge made by the wet ink of a printed sheet when it comes in contact with another sheet.

offset printing, a recent development of lithography by which the image is printed on a rubber-covered cylinder and then offset or transferred to the paper attached to another cylinder.

old style, roman types distinguished by short, stubby serifs and comparatively uniform weight of light and heavy strokes. Caslon type is a good example. Old style is contrasted with modern roman, which has more contrast in light and heavy strokes.

overmatter, matter in excess of allotted space.

overrun, surplus printing—printed copies or sheets above the number ordered.

photoengraving, a printing plate produced by a combination of chemical and photographic processes. Also the print made from a photoengraved plate.

photogravure, the photographic process of intaglio engraving; and the print from such a plate.

pi, type matter that has been upset and disordered.

pica, 12-point type; the pica em (1/6 × 1/6 in.) is the standard unit of type measurement, matter or column being so many picas (*ems* is dropped but understood) in width, whatever size of type is used.

plates, electrotypes, stereotypes, female embossing, dies and so on. The term is also applied to half tones and line engravings. *Plating* is making a page or other unit of type or illustration into one piece of metal from which it can be printed. Matter that is electrotyped or stereotyped is *plated.*

point, the unit for measuring type sizes, approximately 1/72 inch. The measurement is the depth of the type body—in other words, the vertical measure on the page. If nine lines of type set solid occupies one inch (up and down the page) it is 8-point type. *Pointwise* is measure of type vertically, up and down the page.

proofs or **proof sheets,** impressions pulled by hand of printed matter after it has been set so that it may be read for alterations and corrections before it goes to press. The first proofs are called *galley proofs,* and most changes are made on them. Revised galleys are checked before the matter is made-up into pages. Then *page proof* is pulled, and further comparison and corrections are made. *Foundry proof* is final and comes from the composing room before the type is cast for electrotyping.

punch, the die for a type matrix.

quad, a square shaft of type metal, not quite type high, used for wide spacing between words, before and after paragraphs and for blocking out wherever necessary in charts, tables and similar short-line composition. The em-quad is the size of the type for the letter *m*; the en-quad, the size of the letter *n* in the different points or sizes. To avoid misunderstanding the similar sounds of em and en in speaking, printers use the terms *mutton quad* and *nut quad,* respectively.

quad folder, a folding machine that folds four signatures from one sheet of paper at a single operation.

query, a question mark on the margin of a proof to call attention to an error in the copy or to a doubtful point.

quire, a measured quantity of paper, 24 sheets of coarse paper, 25 of fine.

quoin, originally a wooden wedge, now usually a wedge-shaped metal device operated with a key, used between furniture and iron or steel chases to tighten the type securely within the form for safe removal from imposing stone to press or to the electrotyper.

ream, formerly 20 quires of 24 sheets each—or 480 sheets; now 500 sheets of paper.

recto, right-hand page of a book.

reference marks, marks inserted in reading matter to call attention to footnotes in smaller type at the bottom of the page or at the end of the chapter. The names of the marks and the order in which they should be placed are:

* Asterisk
† Dagger
‡ Double Dagger
§ Section
‖ Parallel
¶ Paragraph

Reference marks are now seldom used; superior figures are preferred.

register, correct correspondence of parts, as columns or lines printed on both sides of one sheet or page, or the superimposition of the several plates in multicolor printing.

resist, a protective acid-proof coating used to cover the printing area of a plate, the parts to be etched being left exposed to the acid. Dragon's blood, which is a palm-tree resin, or some asphaltic substance is commonly used for resist.

revise, a corrected proof or the act of checking a proof to see if all errors marked on a previous proof have been corrected.

roman, name of the most used, upright style of type. The capitals are based on the letters on Trajan's Column in Rome, but the small letters were derived from those used in Italian manuscript books at the time printing came into use.

rotary, a printing press that prints from curved plates attached to a printing cylinder. Sheet-feed rotaries print from single sheets; web-feeds from a continuous web of paper.

rotogravure, printing from intaglio-etched cylinders.

routing, cutting away by hand or machine any part of a zinc or copper etching or half tone not wanted to print.

rules, strips of type-high brass or type metal used for tabular composition, borders and so on. Steel rules are used for die-cutting.

run in, to omit paragraphing or add new matter without setting new paragraph.

running head, a line appearing at the top of a page of type, usually with the number of the page. Although newspapers and books usually carry the running head at the top, some magazines have it at the bottom of the page.

sans serif, types without serifs. What is known in this country as Gothic types are sans serifs, as well as the popular imported types, such as the Kabel and Futura.

screen, etched glass interposed between the lens and the negative of a camera with diagonal lines drawn close together and crossing at right angles. These lines break up the photographic image into fine dots. When these dots are printed on metal and the metal is etched with acid, the dots become the printing surface of a half-tone photoengraving. In the gravure method, they become holes in the plate, and the holes are filled with ink before the impression is made.

script, any type face designed to reproduce handwriting with letters that join; they may be upright or slanting.

Cursive type, which has similar characteristics, is somewhat more fluent.

serif, a fine line on letters of certain faces, especially cross strokes at the top or foot of a letter. Gothic letters are square cut with no serifs.

set, arrangement and spacing in composition. *Setwise* means in the direction that the type is set, that is, width—distinguished from *pointwise,* the vertical dimensions, up and down the page.

sheetwise, printing one side of a sheet of paper at a time, the other side of the sheet to be printed at another operation.

short letters, the characters (capitals, small capitals and lower case letters, either roman or italics) so formed that each occupies only the central part of a type; they are a, c, e, m, n, o, r, s, u, v, w, x, z.

signature, a printed sheet containing a number of pages and folded as one unit, usually 8, 16 or 32 pages.

slipsheeting, placing sheets of paper, usually waste, between printed sheets as they are delivered from the press, to prevent offset of the ink. It is not necessary when the wax-spray device is used, as the minute particles of transparent wax prevent close contact of the sheets.

small caps, letters having the capital-letter outlines but the same size as lower case letters. They are used for emphasis or cross reference. THESE LETTERS ARE SMALL CAPS.

stereotype, a printing plate made from type or engraving (or both) by taking an impression (matrix) in plaster or wood pulp and then filling this mold with type metal. It is used in newspaper printing.

stick, a small adjustable metal tray used in setting type by hand. It is held in the left hand, and the thumb and first two fingers of the right hand are used to pick up the type and transfer it to the stick. It will contain about two inches of type Long sticks for setting widths 12 inches or more are usually of wood.

superiors, letters, figures and signs, smaller than the text type and cast high on the body of the type. They are used as exponents or algebraic symbols—in x^2 the 2 is superior; and as references to footnotes.

swash letters, italic capitals that display decorative flourishes at top or bottom; used as ornamental initial letters.

take, any part of copy that is divided among various typesetters.

tint laying, a mechanical method of shading a line drawing for engraving, usually called by the name of its inventor Ben Day.

turtle, the half-cylinder plate used on a rotary press; an imposing stone on rollers.

type family, all the variants of one parent design, such as the Cheltenham family. This family includes light, medium, bold, extra bold; as well as wide, normal, condensed, extra condensed, in both roman and italic. The Goudy type family is also quite extensive, and all the variants are based on a single design conceived by Frederic W. Goudy.

type height, the standard height for type from foot to printing surface, 0.9186 inch.

upper case, abbreviated *u.c.,* capital letters.

verso, the left-hand page of a book.

wax engraving, the process in which a design is incised on a metal plate coated with wax, the incisions being cut through to the metal base. An electrotype is then made from the matrix thus formed. The process was once used to a considerable extent for mapmaking.

wax mold, one method of taking an impression from an original half-tone or line engraving in the process of making electrotype duplicates to be used in printing. The wax impression is separated from the original and is faced with a shell of copper, deposited by electroplating. The wax mold is more economical than the lead mold for making reproductions of line engravings; but it is not so good as lead for fine-screen half-tone engravings.

widow, a closing word or line of a paragraph left standing alone in the make-up; to be avoided because it mars the general appearance of a page.

wood engraving, picture or design engraved upon a boxwood block.

work-and-turn, printing both sides of a sheet of paper at one operation. This necessitates that the sheet be double size. The first time through the press the front and back pages are printed on one side of the sheet. The sheet is then backed up with a second impression, and when cut in half two complete signatures are obtained.

zinc etching or **zinc,** a photoengraving upon a zinc plate much used for reproducing line drawings and lettering, and for coarse-screen half tones.

Beginnings of Dress.—An interesting way to understand the great sweep of civilization is by tracing the changes occurring in people's dress. Primitive man, cradled as he was in tropical regions, would have become extinct as he wandered toward the poles had he not learned to clothe himself. We can imagine that when it rained unceasingly in the valley and snow fell on the mountains, early man, naked and half delirious with cold, made for the lair of a bear that he had scented. He killed the bear, made a hole in its body, crept inside the dead beast and slept until its carcass was cold. Then he stripped off its skin and before long he learned to wear the bear skin by day and to wrap himself in it by night.

In warm regions man had no need of protection beyond his own hairy skin. The impulse toward adornment and approval of one's fellows, however, was just as keen then as in modern times. When after a battle he returned to his tribe gashed and bloody, he was received with admiration and esteem. Desiring to retain these badges of courage, he gashed himself or daubed on colored clays. Thus began design. Later he supplemented his ornamentation with trophies of war. Around his neck and waist he hung bones, feathers and polished stones that waved or flapped as he walked keeping off the swarms of tropical insects. Eventually he learned the art of weaving, and his necklace probably developed the idea for a tunic, and his decorated girdle perhaps gave him the notion for a skirt or trousers.

Egyptian Attire.—Five thousand years ago the ancient Egyptians were already a highly developed people who had carried the art of weaving linen to a perfection hardly surpassed today. No books on costume remain, but the ways of the kings are recorded in great stone reliefs and wall paintings. The garments worn during the early dynasties were very simple. A man of rank wore a loincloth secured by a girdle. A wide jeweled collar and a distinguishing headdress were his chief adornments.

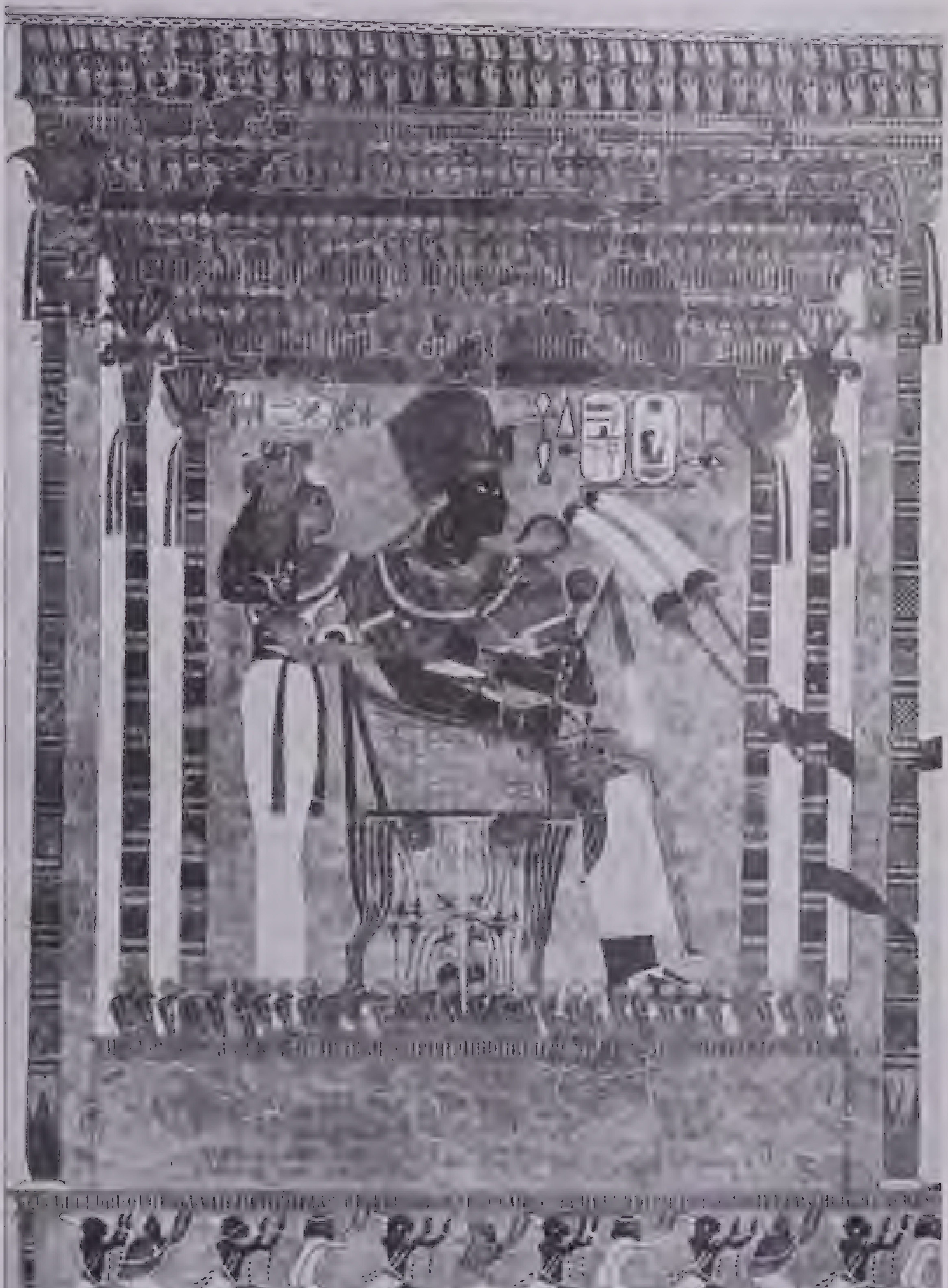
The dress of a woman of similar rank was a straight ungirdled linen sheath from breasts to ankles suspended by shoulder straps. She wore no lingerie though her dress was so scant as barely to allow her freedom to move and so sheer as to be hardly more than a veiling; for Egypt is very warm and our modern ideas of modesty did not yet exist. During later dynasties this simple gown was made in Nile green or red, and pleated or decorated with embroidery or fringes. Around the Egyptian lady's neck was always the wide jeweled collar, and she wore bracelets and a stately headdress.

Subsequently, when Egypt had greater riches and power, a man of wealth added to his loincloth a transparent pleated skirt that was short in front but in the back sometimes nearly reached the ground. Another garment adopted by both sexes was the robe of sheer linen slipped on over the head and swathed with a wide girdle that defined the hips and brought the fullness to the front.

This simple Egyptian attire was enhanced by elaborate headdresses. Being a very cleanly people they cut their hair, shaved their beards and wore large black wigs made of hundreds of tiny corkscrew curls or of scores of tiny braids made of human hair. Sometimes it was allowed to hang in straight locks. Over all were worn head decorations in many varieties according to rank:

(1) the kerchief, folded like a dust cap;
(2) diadems and wreaths of flowers;
(3) gold ornaments in the forms of the asp and vulture—symbols of royal rank; and
(4) helmets and crowns for the rulers.

Egyptian jewelry is of special interest because its influence upon the costume jewelry of our day has been marked. Their necklaces and bracelets of gold and semiprecious stones, in characteristic green blues are now exhibited in many American museums and are marvels of the jeweler's art. At the Metropolitan Museum (New



Courtesy Metropolitan Museum of Art

Egyptian Attire of About 1400 B.C.

A wall painting at Thebes shows King Amenophis III, with his mother, upon a throne sheltered by a triple baldachin. The royal mother wears a headdress dominated by the royal vulture; the king's headdress has the royal asp

York) is a jeweled casket that went with a royal princess to her tomb. Among many pieces of rare beauty in the casket is a necklace of drop beads in gold, lapis lazuli and carnelian that any modern woman would be proud to wear.

Cretan Costume.—During the period of Egypt's greatest wealth (2000–1500 B. C.) another rich civilization flourished on the more or less isolated island of Crete in the Mediterranean. Their records have not been deciphered but their murals and tiny statuettes indicate an advance in the art of costume much beyond their contemporaries. The little figures show men wearing loin cloths and plumed headdresses; but the Cretan woman's dress reveals a shaped and sewed costume worn over a corset; and snug-fitting jackets with set-in sleeves. The jackets are laced up the front, which is low enough to expose the breasts. The skirt is a series of graduated flounces, each with bands of trimming. Over this an apron and a tubular girdle are worn. Strands of hair fall in waves over the shoulders and from the ends of a Psyche knot. These evidences of skill and sophistication lead us to believe that here was an amazingly modern civilization of which the half is not yet known.

Classic Greek Simplicity, 600-146 B.C.—In 600 B.C. when classic Greece emerged from the shadows of antiquity, the beautiful Cretan city of Knossos with its labyrinth had been destroyed and the history of the Cretan people had become only a legend. The classic Greeks seem not to have known the art of sewing, for their simple garments were woven in one piece and fastened with brooches. The Greeks were a nation of artists who sought perfection in all they did. Their costume possessed an elegance, a beauty of proportion and a fitness to purpose that have been of utmost inspiration to succeeding ages. Greek dress consisted of only one or two garments worn alike by men and women. The chiton or dress, the principal garment, was arranged in beautiful folds. The himation was a wrap of rectangular shape arranged according to individual taste. Without it no man appeared beyond the portals of his house.

The Doric chiton was a rectangle of soft wool decorated with colored borders of simple geometric design. It measured one foot more than the wearer's height, and its width was twice the distance from finger tip to finger tip with arms outstretched. The extra foot of material was folded down at the top. This long rectangle was then folded in half and around the body. The back and front were caught together at each shoulder with brooches, and the open edges were allowed to cascade down the side. The waist fullness was confined by a girdle, sometimes high, often low and bloused.

The Ionic chiton was a fuller garment that had sleeves made by pinning together the back and front edges along the arms with a series of brooches. A girdle and straps crossing at both front and back confined the fullness and formed dolman sleeves. The simple elegance of this classic drapery was enriched by ornaments of beautifully wrought bronze or gold, seldom jeweled. Necklaces, diadems and bracelets that have been preserved are evidences that Greek goldsmiths had a skill equal to or even greater than any the world has since achieved.

The Roman Toga and Palla.—When Greece became tributary to Rome in 146 B.C., she was still master in the arts, and the finest in Roman art is but the reflection of Greek culture. Roman costumes resemble those of Greece but have less grace. The Ionic and Doric chiton were worn together—the Ionic over the Doric. This combination was called the stola and was made of fine linen or sheer cotton and often had a wide circular ruffle or *instita* at the hem. The Greek himation became the palla, worn by the Roman matron. It was made of sheer wool and wrapped several times about her body. The Roman citizen wore a toga with a decorative border and cut as an ellipse about 6 by 18 feet, larger than the himation. It was the badge of citizenship.

As Rome added to her conquests and her commerce, men needed less cumbersome apparel. In the 3rd century A.D. a new garment called the *dalmatica* replaced the toga, which now became a ceremonial robe. The dalmatica was shaped like a great cross, folded in half with a slit for the head. The sides were sewed to form wide sleeves. Down the sides and on the sleeves were bands called *clavi,* with jewellike bits of color in weaving or embroidery. A shirt or tunic with long close sleeves was worn underneath and showed at the neck and wrist. Over all was a semicircular cloak.

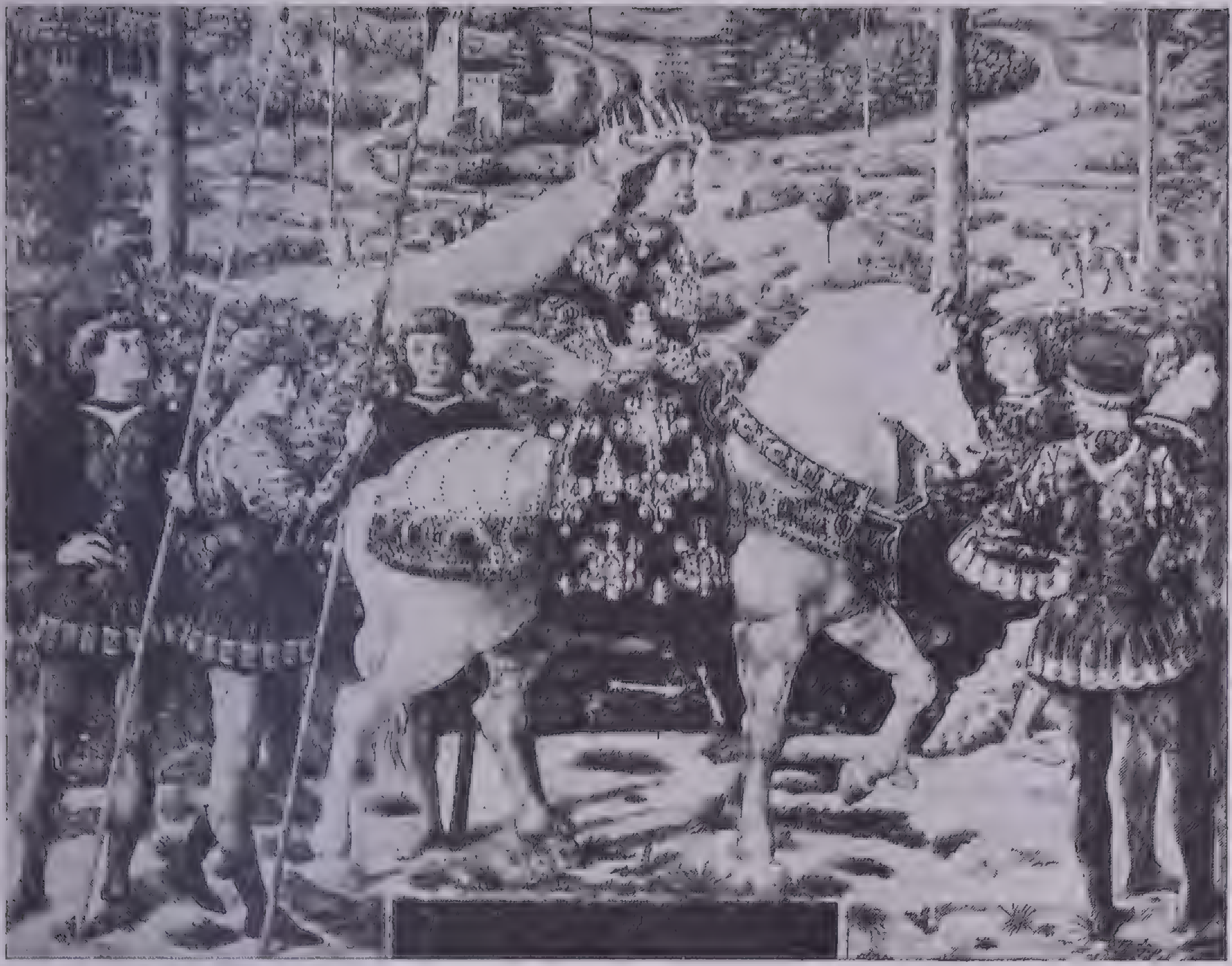
The Roman matron also adopted the dalmatica but soon cut it like a maltese cross, which made the sleeve very wide at the wrist. A mosaic of the 4th century shows four ladies, each clad in the new dalmatica, one of which is emerald green embellished with white circles; another is orange with black clavi; still another is deep green with circles of red and gold; and the last is deep blue shot with green. All the ladies wear gauzelike veils that hang to the feet. The toes of their shoes are scarlet. Their waists are circled by jeweled girdles, and their hair is elaborately marcelled.

Costumes of the Barbarians.—As to their costumes, ancient peoples may be divided into two groups—the trousered and the untrousered. Among the untrousered are the Egyptians, Greeks and Romans; among the trousered are the Persians and the hordes of barbarians who swarmed into western Europe at the time of the Roman Empire. When Caesar conquered Gaul (55 B.C.), he found Gaulic chieftains attired in *braccae* or breeches like the wide trousers of today. They were made of hide or hemp, often striped in saffron or scarlet, and were secured around the waist by a thong of hide. A checkered tunic (in Celtic, a *crys*), made of hides or small bits of highly colored cloth, was a chieftain's body garment. Over all he wore a wide colored cloak or sagum. His mustache and hair were long and bushy and the effect of his appearance was heightened by large bronze ornaments. Boadicea, Celtic chieftainess, gives us a glimpse of the barbarian woman: Tall, grim and harsh-voiced but with a wealth of yellow hair falling below her waist, she wore a long tunic checkered in red, blue and yellow, a bronze collar and bracelets. Over all she fastened a cloak with a large brooch and in her hand she grasped a spear.

Byzantine Robes.—Before Rome fell into the hands of barbaric tribes the government had been transferred to Byzantium or Constantinople. Here for many centuries was kept alive the classic learning. Here was the center of a vast commerce between the East and the West. Here flourished the arts of weaving, mosaic decoration and painting. To the last two arts we owe our knowledge of a costume that had a wide influence on future modes. In the 6th century the upper classes had adopted the formerly despised trousers. A mosaic of the period shows Emperor Justinian wearing them in a new form—tight-fitting leg coverings made of purple silk. Both he and his Empress Theodora are represented as resplendent in elegant white silk dalmaticas, now become tunics with long sleeves, and purple cloaks. Wide bands of the most elaborate gold embroidery, one of Byzantium's most important contributions to succeeding modes, bordering their robes. Theodora wears a wide jeweled collar and the imperial diadem of pearls and emeralds with ropes of pear-shaped pearls hanging over her shoulders.

These costumes give us a glimpse of the magnificence of the court, which in the same century introduced silk culture into Europe. It happened that war with Persia cut off the supply of rich things from the Orient, making the price of silk prohibitive. The story runs that two monks, who had lived for years in China and knew the art of silk culture, were bribed by Justinian to smuggle from China some precious "seeds." They brought them in hollow bamboo canes and from this beginning grew the entire silk industry of western Europe. Justinian started the silk production within his own palace walls and imported skilled weavers from Greece and Egypt. Soon beautiful damasks, brocades and cloth of gold were woven in patterns showing lions, dragons, birds and human figures enclosed in circular bands. For many years these fabrics were reserved for the Byzantine court robes; but in the 10th century Venetian merchants traded in the rich stuffs from Constantinople and carried them inland to France and England. Thus Byzantine culture spread and helped to bring a new era to the world.

Fashions of the Age of Chivalry, 1066–1500.—The scene now shifts to western Europe. The era ushered in with the close of the 11th and ending with the 15th century is a period of youth, adventure and romance—the age of chivalry and of wars with Saracens and Moors; of tournaments and troubadours and fairs; of feudal castles and great cathedrals; and of the Cru-



Courtesy Metropolitan Museum of Art

Gay Masculine Attire of the Age of Chivalry

The Byzantine Emperor John VII Palaeologus (1425–48) and attendants, from a mural painting by Benozzo Gozzoli in the Palazzo Riccardi, Florence

sades to Jerusalem from which men returned with new ideas and a new view of life.

These happenings were reflected in the costume of the day. Rich silken fabrics came from Italy and fine woolens from Flanders. A parti-colored fashion made the two sides of tunics or their sleeves of widely different hues. Toes of shoes grew long and pointed. Fine ermine and sable bordered and lined voluminous robes. Scallops and points adorned edges and strange fantastic head coverings were seen everywhere.

The loose cross-gartered trousers of the Dark Ages gave way to close-fitting hose. A new tunic—the cote-hardie—fitted closely above the waist and flared below. Its long close sleeves, cut away at the elbow to show a gay undersleeve, buttoned smartly at the wrist. The young gallant of this period wore a pointed hood with shoulder cape. Its point extended as a long, slim streamer or liripipe that he twisted about his neck or let fall to his heels. Above the hood was a shaggy beaver hat with peaked crown and upturned brim.

In contrast to this dashing masculine attire, the dress of ladies was cumbersome indeed. Halls were cold and religion forbade the attractions of the flesh. Queen Matilda, famous for the Bayeux Tapestry, wore a camise showing at the wrists and a gown with wide flowing sleeves that would have touched the floor but for the knots tied in them. The gown was girdled by a cord with tassels or a jeweled belt with hanging ends. Her two long braids hung down in front, and she wore a wimple or veil held by a snood.

Woman soon turned to less concealing garments, which led to the corset of the Renaissance. Over her gown she put on a wide, stiff, laced bodice from bust to hips, like that still worn by some European peasants. Lovelier than all, she cut her gown on princess lines and laced it up the back.

After the Crusades a new garment called a *surcoat* made its appearance, first worn by men to protect their eyes from the glare of the sun on their armor; it was a strip of rich stuff slit to go over the head and open down the sides. Women cut their surcoats low at the neck, wide at the bottom, and seamed the sides leaving wide armholes. They edged these garments with fur and wore them over their gowns.

The 14th- and 15th-century gentlemen, if less youthful, were still more splendid. Over a gay cote-hardie the man of that day wore the new houppelande, a loose-fitting robe with a high collar and wide flowing sleeves. For a young man, this garment was very short; for an old man it was long and slashed for walking. In both cases its fullness was arranged in precise folds like organ pipes.

A lady of high rank wore the houppelande slashed from neck to waist to form straight revers, which were made of fur or velvet, and showed a tiny vest. A wide belt encircled her high small waist. Her sleeves were long and close with cuffs like the revers. Her wide trailing skirt of splendid pattern she caught up in front to reveal a costly underdress.

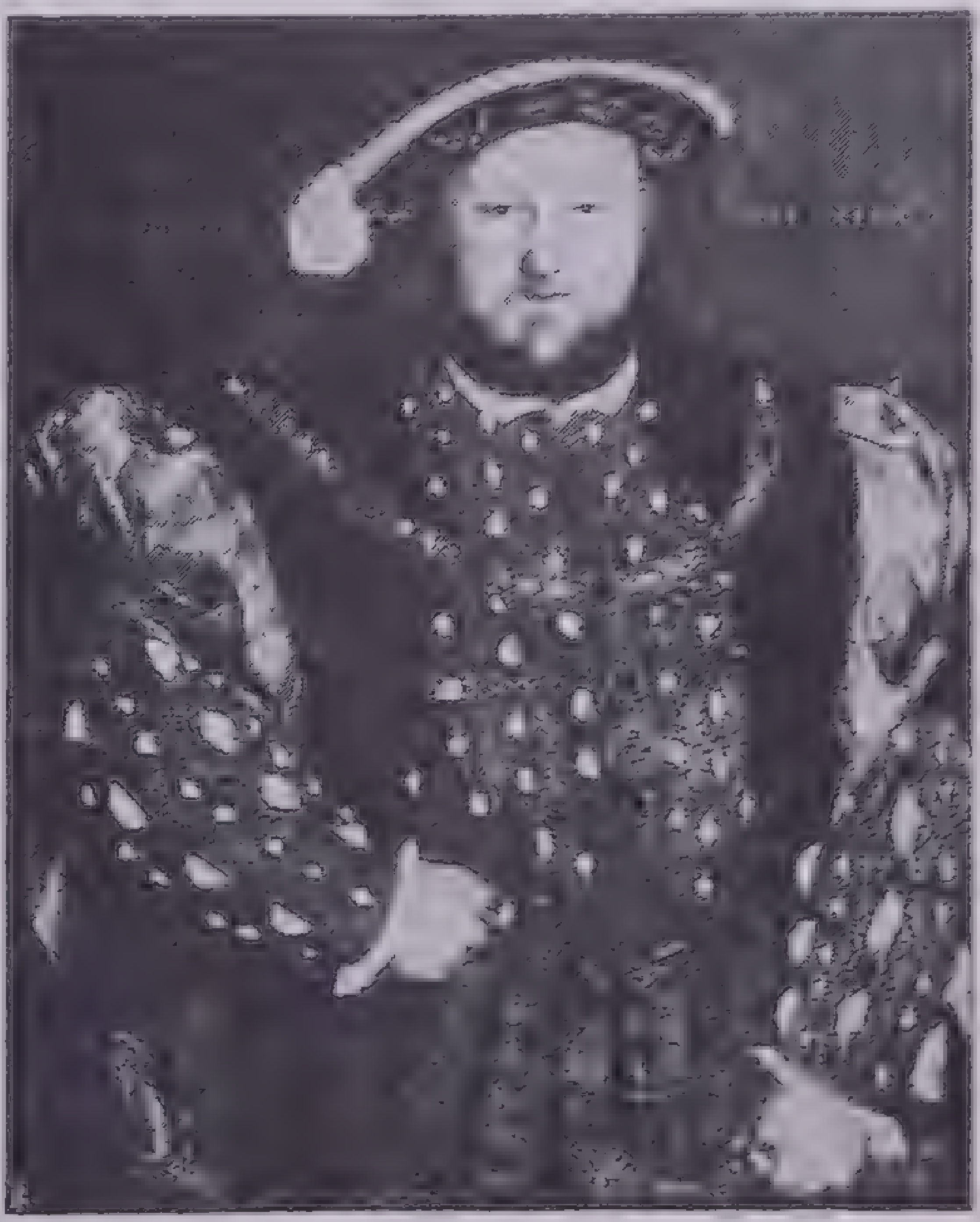
Fifteenth-century headdresses are the most distinctive feature of the time. There were: (1) the bonnet in black velvet—a toque with narrow brim and feather held by a jeweled pin—that men wore over their bobbed hair; (2) the tall sugar-bag crown that flopped limply over the brim and had its edges slashed or dagged; (3) large tubular brims with coxcomb crowns.

In the time of the surcoat women looped their braids about their heads and encased them in jeweled cauls or nets. Some were heart-shaped, some turbanlike and draped with petal-edged veils. The 15th-century mode developed the hennin, which entirely concealed the hair. It was constructed of wire and a stiffened fabric and draped with starched linen or a floating veil of gauze. Some types of hennin were very grotesque in shape and extended several feet above the head. The familiar cone-shaped hennin is the most beautiful of all, with its looplet at the forehead and its sheer veil floating from the end.

The Richness of the Renaissance.—If medieval dress with its varied colors, enormous patterns and fantastic headdresses is the most brilliant in costume history, that of the Renaissance is the most gorgeous. Venice and Genoa vied with each other in the magnificence of their brocaded velvets and brocatelles, and their commerce provided the rich things of the entire world.

In Renaissance dress there is much that is picturesque, but this period is remarkable for a silhouette disguising the natural lines of the figure. The corset, the hoop or farthingale, the ruff, quantities of fabric and slashings everywhere produced a figure only remotely related to the form beneath.

An aristocrat of the time of Henry VIII, as seen in paintings of the day, has a square appearance. He wears trim-looking hose, wide-toed mule-like shoes, short loose contrasting breeches, puffed and slashed, and a shirt of cambric embroidered in black or red, with frills at neck and wrists. Over this a doublet or vest of rich ornamental silk is left partly open to reveal the shirt. His doublet sleeves are detachable, it seems, and tied on



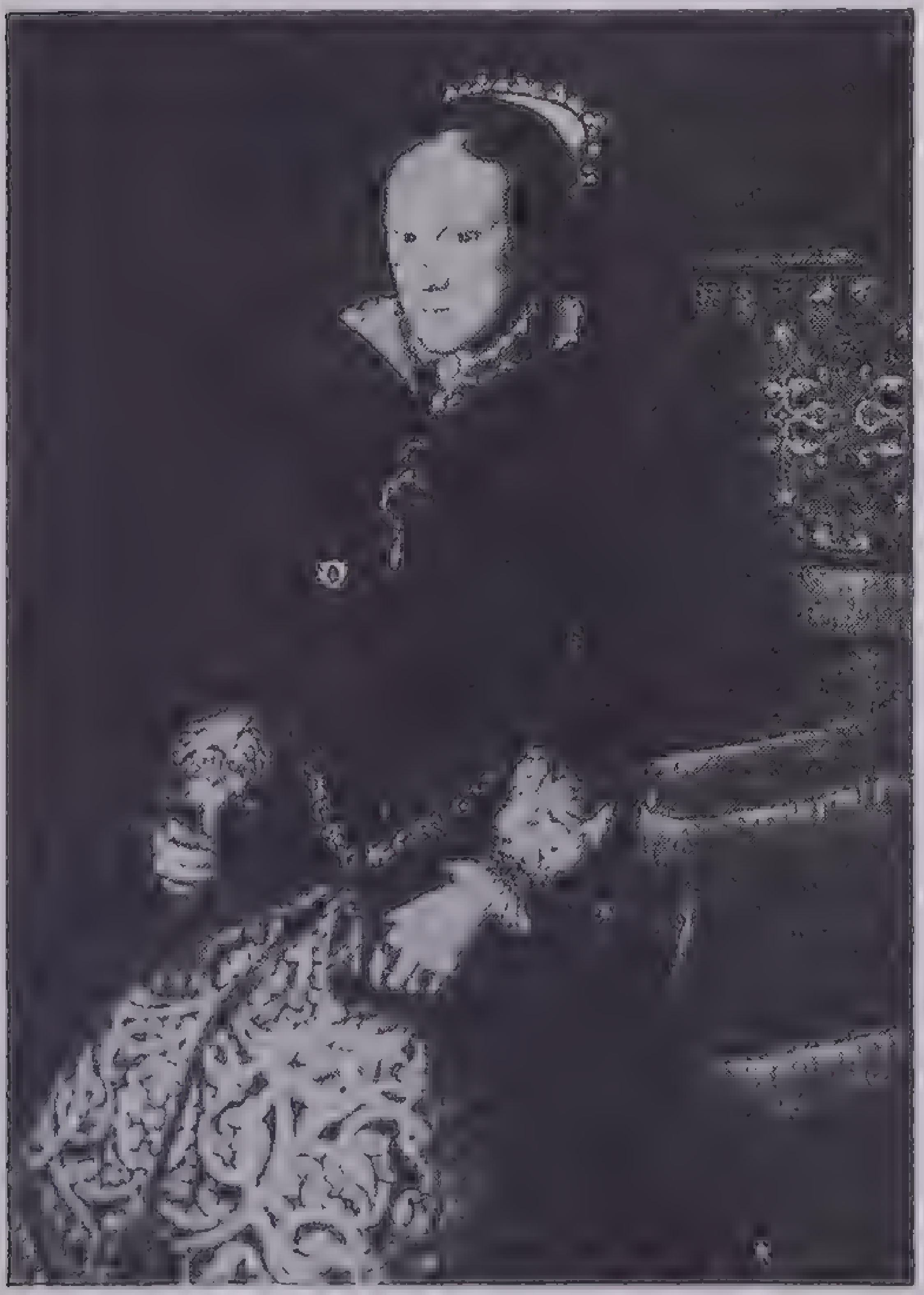
Courtesy Metropolitan Museum of Art

Richness and Squareness

From the portrait of Henry VIII by Hans Holbein the Younger, in the Palazzo Corsini, Rome with cords for the undersleeves to puff between. Such a dandy also donned a jerkin or short jacket of rich pattern covered with small slashes in blistered effect, and the contrasting silk lining was pulled through the slashes. For added enrichment it was sewed all over with pearls. His cloak was a full garment reaching halfway to the knees. Made of velvet, grosgrain or wool, it had large puffed sleeves extending to the elbow, below which the jerkin sleeves appeared. Wide lapels and collar of sable completed his mantle and around his neck hung a massive gold chain with jewel-encrusted pendant. Jauntily tilted to the left over his bobbed hair, he wore a turbanlike hat ornamented with jewels and a tuft of feather.

In the latter half of the 16th century masculine dress was still distorting. The doublet had a nipped-in waist ending in a fanlike peplum, the front buttoned to the neck, which was set off by a cambric ruff. Sleeves had padded epaulets; the trousers were full, stuffed trunks. A short circular cape was folded back from the shoulders, and a tall-crowned velvet bonnet replaced the flat beret.

The Renaissance found women confined in steel or leather corsets very short below the waist and very snug about the bust, and extending downward in front to a point that grew longer and longer as the century advanced. Worn with this corset was the farthingale or hoop skirt, a funnel-shaped petticoat of canvas and whalebone covered with taffeta and standing out to form the lower part of the hourglass silhouette. A lady of the time wore over this foundation a gown of velvet or patterned stuff fur-bordered and open up the front to show an underdress of embroidery and jewels. Her bodice fitted like a glove and was cut square at the neck and in wide décolletage at the shoulders. Her cambric shift or chemise, delicately embroidered in black, followed the shape of the neckline and showed above it. The sleeves of the gown were narrow at the shoulders, but widened at the elbow in a huge square cuff faced with fur or silk. Below was the richly patterned undersleeve, false or belonging to the underdress. A chain was wrapped twice about her neck and ended in a pendant or rosary; a jeweled girdle extended to the floor. Satin shoes, wide of toe, were slashed to show the lining or her scarlet hose.



A Lady's Dress of the Renaissance

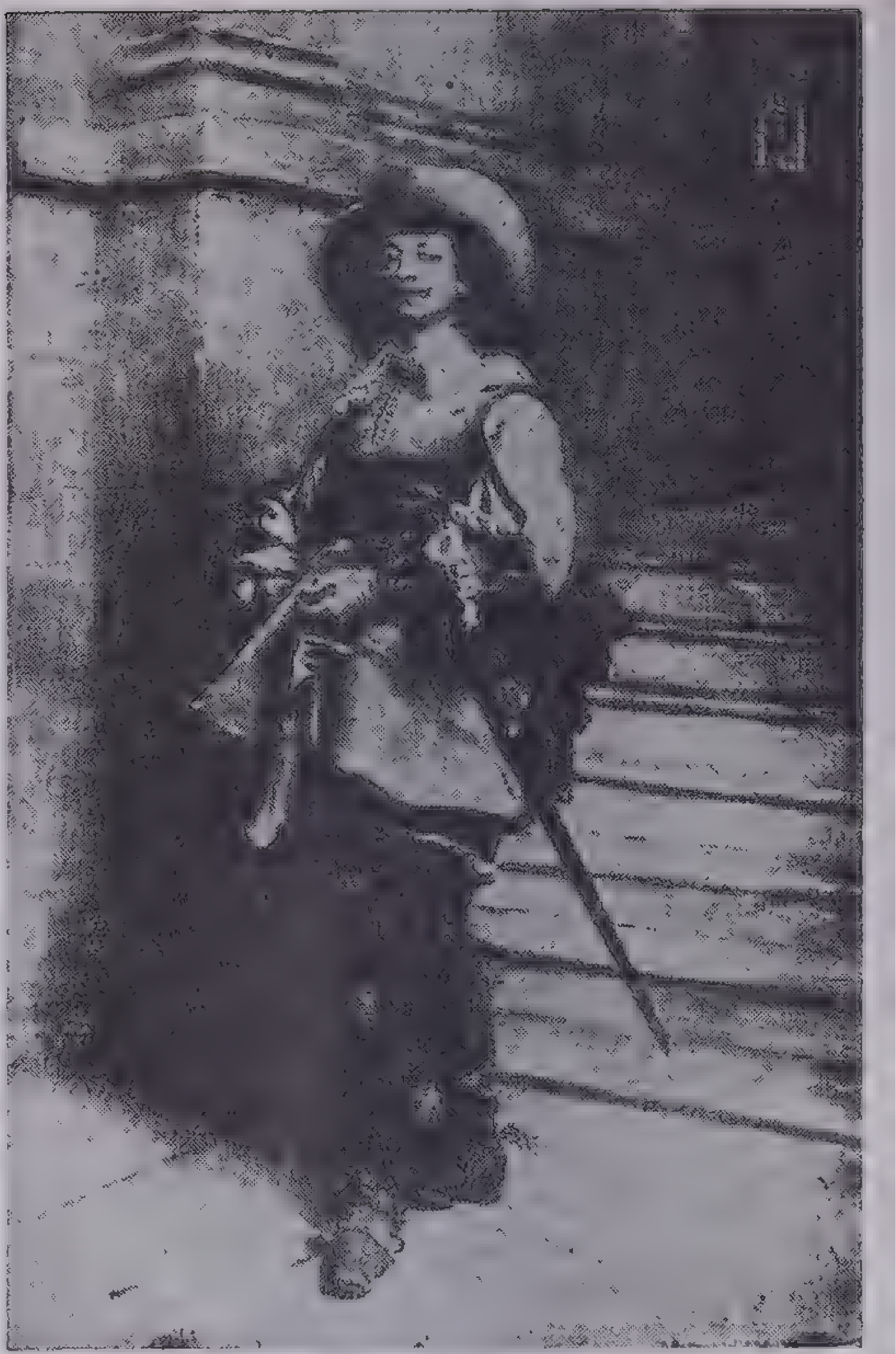
From the portrait of Mary I of England by Antonio Moro in the Metropolitan Museum of Art, New York

The hair was done in simple style, parted, waved and coiled into a knot. Over this, far back from the face, was a simple cambric hood or coif covered by another of heavier material. This so-called Brittany cap had a stiffened border turned back from the forehead and richly faced. As the century advanced, this mode variously modified its outline, as in: (1) the stiff diamond-shaped arch of the unfortunate Jane Seymour; (2) the graceful arched cap of Mary Stuart with its widow's-peak point; and (3) the tiny cap of the late Renaissance worn behind a rounded pompadour.

Later in the century a yoke or guimpe of white jewel-embroidered silk filled in the square décolletage of the gown. In English costume, the ruff from Italy was introduced. Mary Tudor is pictured in a gown cut high to the neck with stiff little quillings of linen at neck and wrists. The mode reached its limit of extravagance and bourgeois taste in the era of Elizabeth. The funnel-shaped hoop gave way to a barrel-shaped form of Spanish origin. Its full width at the hips caused the voluminous skirt to fall straight to the hem. The waist is reduced to wasplike smallness, with the point of the bodice greatly elongated. Sleeves had epaulets or large puffs at the shoulders and ruches at the wrists. The bodice was finished with an enormous torturing ruff of starched cambric or by a wired Medici collar rising fanlike behind the head. Lace from Italy edged the ruff and made the fan-shaped collar. As though they still lacked decoration, the wealthy Renaissance men and women wore embroidered or slashed and puffed robes stitched stiff with sparkling gems.

Seventeenth-Century Designs.—The ornate magnificence of Renaissance dress was doomed to disappear under 17th-century influences. This was a time when kings were quick to see the values of home industries and liked not at all to see their wealth pour in an endless stream across the borders for the finery of other lands. Embargoes were soon passed against sumptuous fabrics, gold and silver braids and the passementeries of foreign lands. Thus France fell back upon the simple patterns and plain silks of lighter weight from Tours and Lyons, and shrewd ministers sent to Italy for skilled lacemakers and to Hungary for workers in the art of dressing leather; and to feed silkworms, mulberry trees were planted along the Roman roads in southern France.

By 1630 the ruff had lost both starch and wire and become a broad turned-down collar; the hoop had vanished and the corset loosened. The many distinguished portraits by Van Dyck show the charming costumes of this period. A lovely portrait of a court lady has a straight full trailing skirt of grey watered taffeta attached to a high-waisted bodice with deep décolletage. A wide sheer double collar edged with exquisite lace falls over her shoulders. There is a peplum cut in square tabs and over the pointed stomacher is a red ribbon lacing. Her three-quarter sleeves are very full and end in deep lace ruches. A narrow red sash is knotted at her waist. Her lovely black hair is drawn tightly back to a coil, leaving a fringe of ringlets on her forehead. At the sides curls fall to her neck.



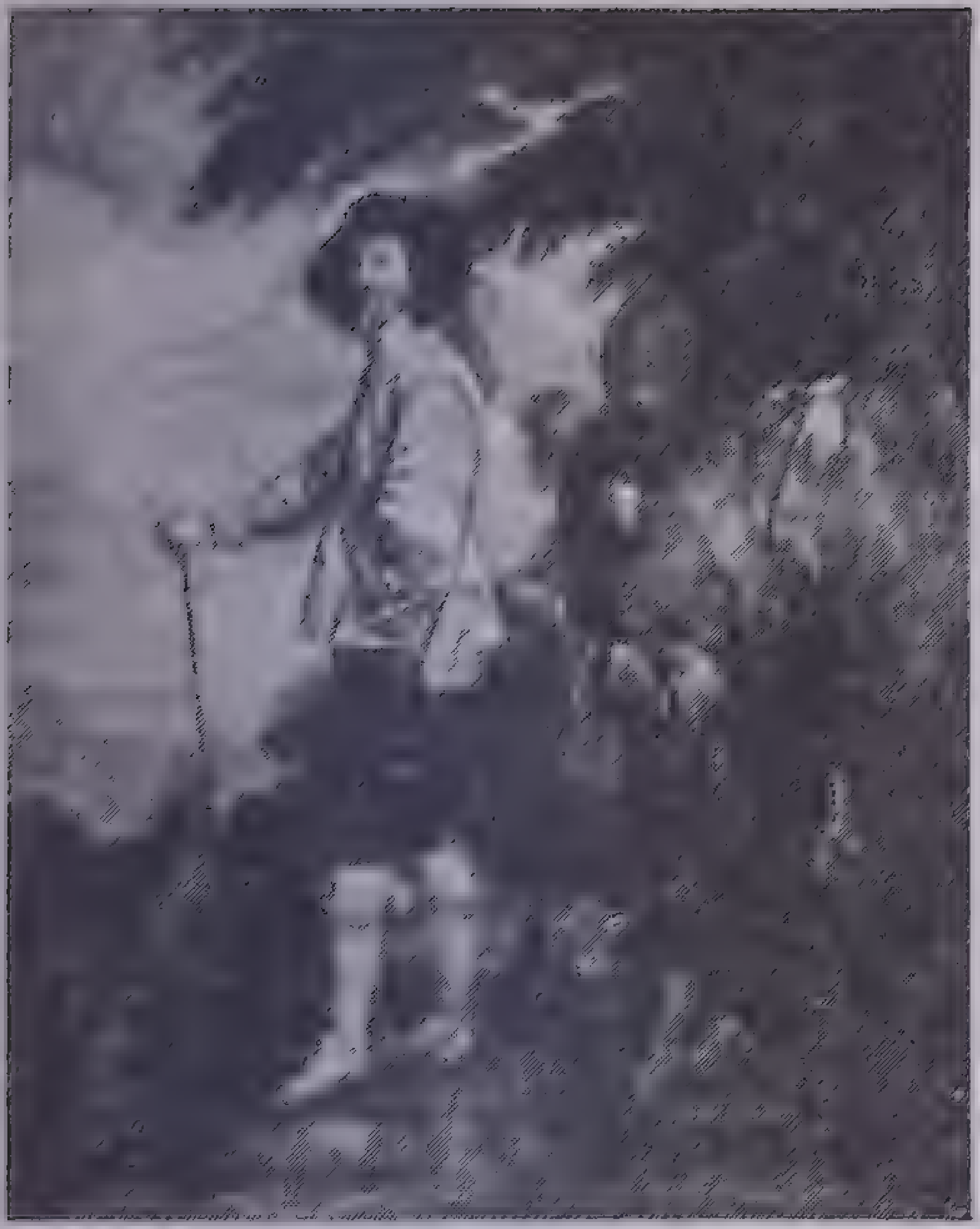
Courtesy Metropolitan Museum of Art

The Cavalier

Gentleman's attire of the time of Louis XIII (1610–43). From the painting by Jean Meissonier, in the Wallace Collection, London

Other portraits show such elaborate details as: (1) the gown open from neck to hem revealing a beautiful satin underdress or jupe; (2) rich braids or jeweled embroidery edging slashes and peplum tabs; (3) puffed and slashed sleeves tied with ribbon bows; (4) deep turned-back cuffs edged with lace.

Masculine attire in the Van Dyck portraits has even more style and dash. One elegant cavalier wears a cream-colored satin jerkin, buttoned up the front and finished with a beautiful turned-down collar of lace. His large bishop sleeves are faced with rose and have one long slash through which we see a full fine cambric shirt. Falling back from his wrists are deep, frilled cambric cuffs. He wears knee breeches, unpadded and rose-colored, the side seam finished with a row of buttons. White garters tie below his knees in ribbon bows. Parted at the brow, his hair flows over his shoulders, and he has a neat pointed beard and



17th-Century Masculine Attire

From a copy of the portrait of Charles I and attendant by Sir Anthony Van Dyck in the Metropolitan Museum of Art, New York

small mustache. His black hat, carried in hand or worn cocked at rakish angle, is broad-brimmed and graced with sweeping ostrich plumes.

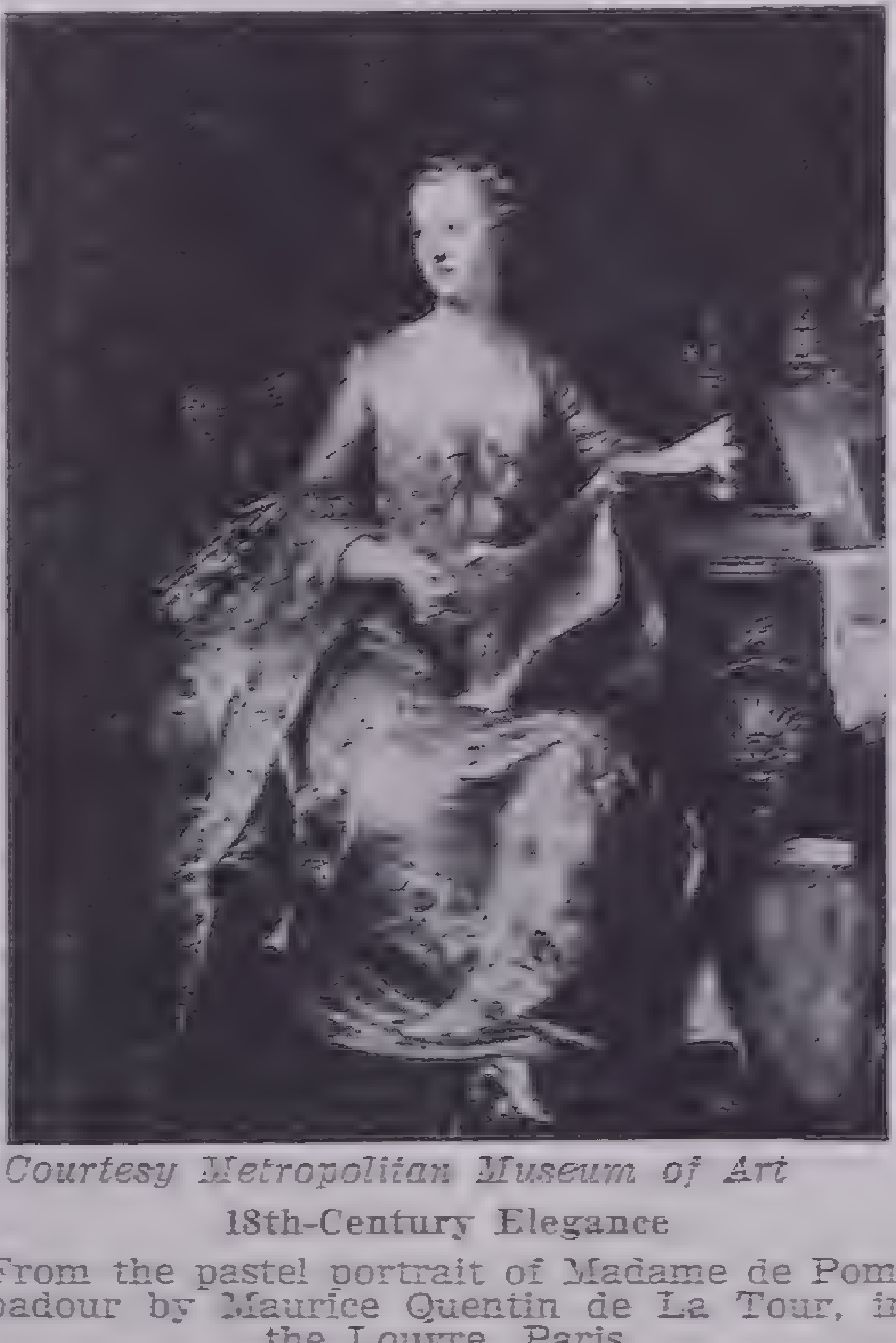
Old engravings of actual costumes handed down show many variations: (1) hip-length capes, collared and lined with fur, swing from one shoulder; and (2) Russia leather boots are flared at the top and faced with lace.

Under the despotic reign of Louis XIV, Paris became the world's center of fashion, a prestige held for 300 years except for brief intervals. The court of Louis was of unparalleled splendor and extravagance. Under his unfailing patronage, Lyons made silks and velvets of magnificent pattern; and skilled French fingers supplied the court with laces of exquisite design and staggering price. In his youth Louis had beautiful hair and in later life replaced it with wonderful wigs. These wigs were universally adopted; the hair was much curled, was parted in the middle and fell over the shoulders like that in the wigs of English judges. A wide flat tricorn hat and a walking stick lent the finishing touches to his ensemble.

Artificiality returned to the mode. Women tightened their corsets, again wore torturing stomachers and donned widespreading hoops and towering ungraceful headdresses. The major fashion in men's attire for this time carried far into the 18th century, and included a long straight coat (forerunner of the frock coat), which came nearly to the knees. Made of an upholsterylike fabric, it buttoned up the front to the neck and had a square-shaped flat lace collar or cravat. Its three-quarter sleeves were small and set in normal armholes. Deep cuffs were finished with the same button trimming used on the front and linen shirt frills showed at the wrist. Deep pocket flaps also were trimmed like the front closing. The contrasting vest of rich embroidery or velvet was long and buttoned to the throat. This stately gentleman's breeches, like today's riding breeches, came to the knee. He wore thick silk stockings and square-toed, red-heeled pumps with stiff bows.

Revolutionary Changes in Dress. The pompous stately magnificence of the late 17th century gradually gave place in the 18th to a mode of great brilliance and artificiality. France was the leader of the entire world in art and letters, and her costumes and mode of life were copied throughout the Continent and by the American colonists; but the French Revolution marked the end of the era and brought with it revolutionary changes in dress.

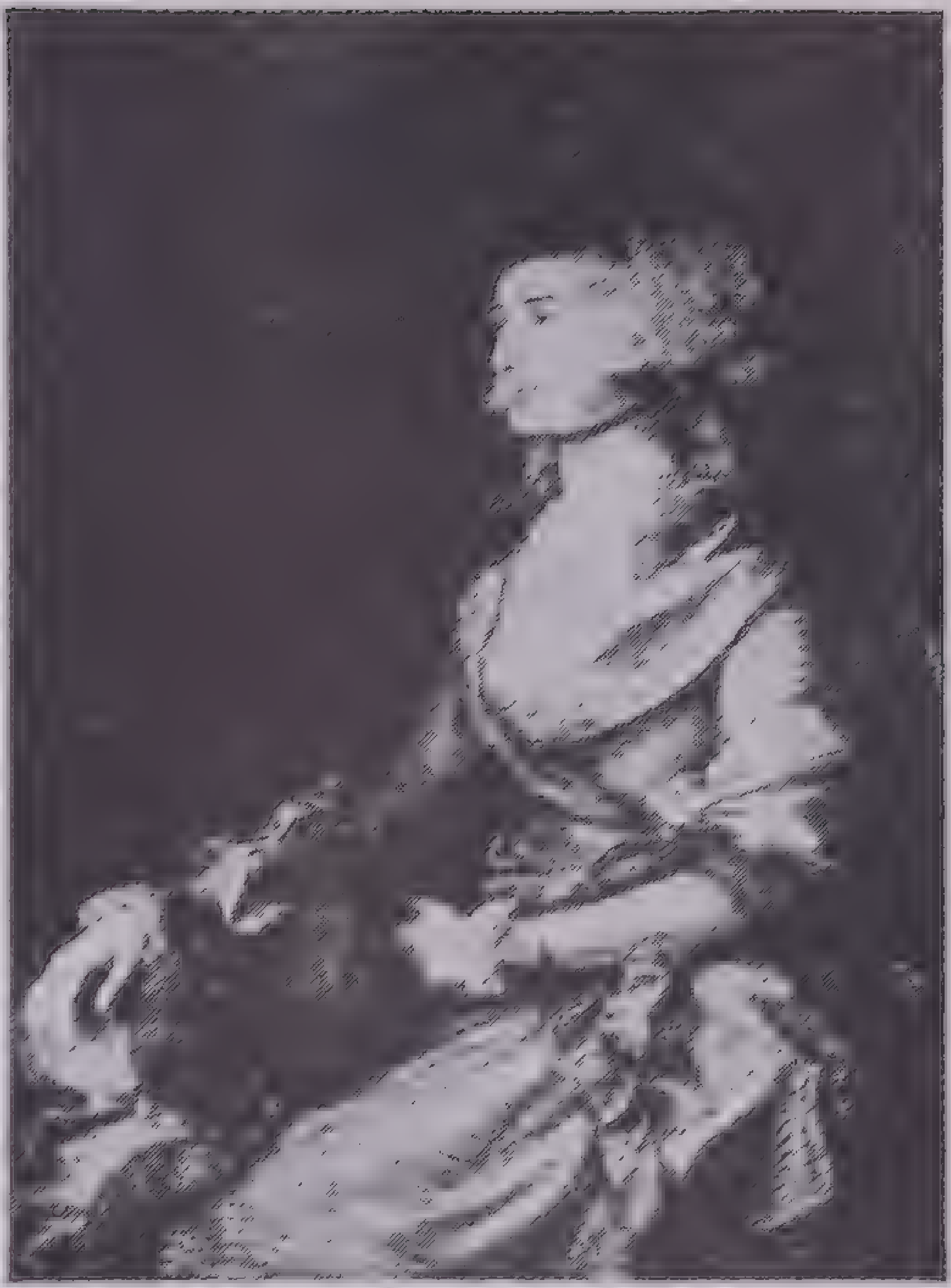
Though 18th-century costume reflected the sham and frivolity of the age, it had much elegance and charm, an essentially feminine mode. Favorite materials were crisp taffetas shimmering satins and damasks, dainty muslins, sheer gauzes and priceless laces. Pastels and light clear colors suggestive of Chinese textiles were worn by both sexes. Woven and printed designs in natural flowers, fruits, twisted ribbons, hearts and arrows decorated plain or striped backgrounds. Paintings and engravings up to the time of the French Revolution show women gowned in wasp-waisted basques (fitted jackets that extended below the waist) or boned bodices with pointed stomachers. Such a costume is characterized by small set-in sleeves ending at the elbow in circular flounces or lace ruffles; a neck cut in square décolletage and edged with ruffles; a bouffant skirt open over petticoat-hoops or paniers flat in both front and back but very wide at sides. A portrait of Madame de Pompadour shows a border of silken flowers forming a little ruche at her throat, running down her skirt front and trimming the petticoat flounces. Large bow knots conceal her stomacher and finish her pagoda sleeves. Twisted in her simple coiffure are strands of pearls. From beneath her skirt, which barely escapes touching the floor, peep tiny, buckled satin slippers.



Courtesy Metropolitan Museum of Art

18th-Century Elegance

From the pastel portrait of Madame de Pompadour by Maurice Quentin de La Tour, in the Louvre, Paris



Courtesy Metropolitan Museum of Art

A Gainsborough Lady of the Late 18th Century

From the portrait of Sarah Siddons by Thomas Gainsborough in the National Gallery, London

Variations of this style popular in England and America up to the time of the Empire included: (1) The Watteau dress with deep box pleats in the back extending from neck to hem and merging with the fullness of the skirt; (2) the polonaise, with its fullness festooned over the hips and back, and edged with pinked taffeta ruffles, worn over an elegant embroidered or quilted petticoat; (3) the fluted fichu of sheer muslin filling in the décolletage; (4) the simple English style of long plain sleeves, ruffled neck and a sash tied in the back.

Only minor changes occurred in men's dress till the last half of the century. The long straight coat acquired very full skirts buckramed at sides and back. It was left open to display the long skirted waistcoat with pockets and cut-steel buttons. The skirt had a jabot at the neck and lace ruffles at the wrists. A satin cravat or neckerchief was wrapped about the neck and tied in knotted ends in front.

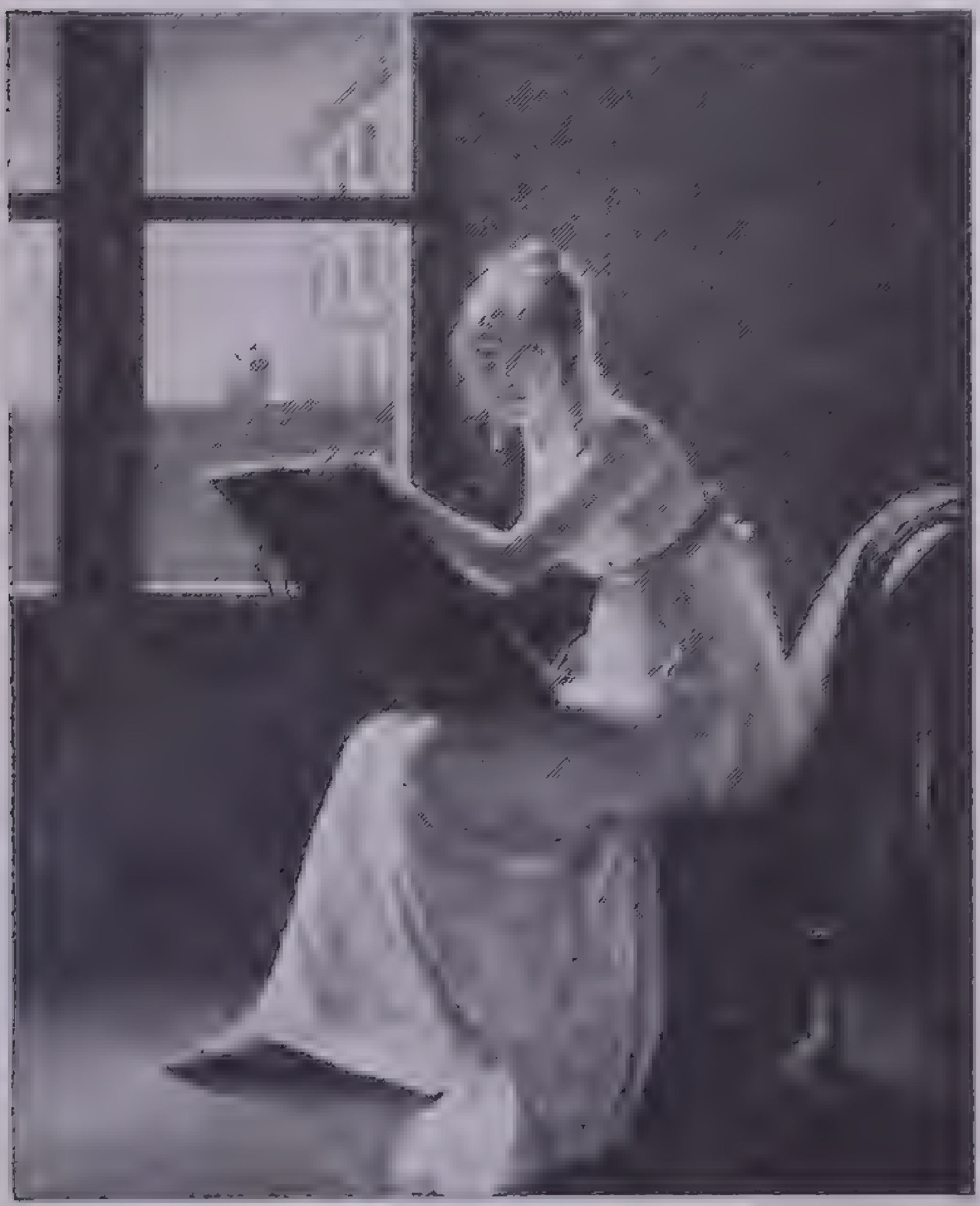
After 1770 the wide-skirted coat lost favor and the fronts sloped away into the cutaway coat reminiscent of of our George Washington. Still later the coat acquired a deep velvet-faced collar and revers. and the waistcoat became short and double-breasted. The breeches were snug fitting and buttoned at the knee. A brilliant effect resulted from an ensemble composed of black velvet breeches. a light-green-blue taffeta coat with silver embroidery and jeweled button. a cream satin waistcoat embroidered richly in colors, light silk hose, silver-buckled pumps, a black plush tricorn with ribbon cockade, exquisite linen and a powdered wig.

Men's headgear of that time was a distinguishing note in costume. Fashionable attire demanded a powdered wig, now called a *periwig*. In the early full-bottomed wig, the hair was brushed back from the forehead and arranged in cross wise curls in rows above the ears. The back hair formed a queue—wound with ribbon, plaited and tied with a black ribbon bow or encased in a square black bag.

In the middle of the century women's coiffures were dressed off the face in Pompadour style and small ruffled lace caps were worn. By the time of the American Revolution coiffures had become towering structures of wire and padding, massively curled and powdered, and enormous caps were tied demurely under the chin. Eighteenth-century portrait painters reveal the charming modified versions of this style: the Gainsborough hat with its ostrich plumes and wide undulating brim worn at a smart angle; the leghorn straw or milkmaid hat trimmed with flowers and tied under the chin with ribbons. Not to be forgotten is the calash, a great drumlike cap stiffened with whalebone and framing in a circle of frills or shirring the piquant face of the 18th-century maiden.

Directoire and First Empire Costumes, 1795–1814.—The immediate effect of the French Revolution upon dress was the disappearance of any semblance of elegance in costume. It was dangerous to look as if one belonged to the aristocracy. Safety lay in the simplest, poorest clothing. Knee breeches, which had been worn only by gentlemen, gave way to pantaloons or trousers, the garb of workingmen. Gradually in the next century the world came to accept the ideals of democracy and the trousers of the sans-culottes (those without breeches) were adopted by all classes. Except for the brief interval of Napoleon, the old magnificence for men was gone forever. Little by little, the lace frills, gay brocades and embroideries gave place to the somber-hued woolens and cottons that still characterize masculine fashions.

With the necessity to wipe out all memories of the old order, a new era in fashion came into being. The classic influence already strong in decoration was now reflected in costume. Knowing little of the cut of classic robes, women of the Directoire period attained a classic effect with a simple chemiselike garment of clinging white transparent material with a very short waist joined to a very long skirt with a train. A short close sleeve left the lower arm bare to be covered by long gloves. The neck was exceedingly décolleté. Over this was a redingote (a cloak with a long skirt beginning just under the arms; the upper part completed by shoulder capes). Another popular wrap was the spencer jacket, scarcely to the waist, with long close sleeves and edgings of fur.



Directoire Costume

From the portrait of Mademoiselle Charlotte du Val D'Ognes by Jacques Louis David in the Metropolitan Museum of Art, New York

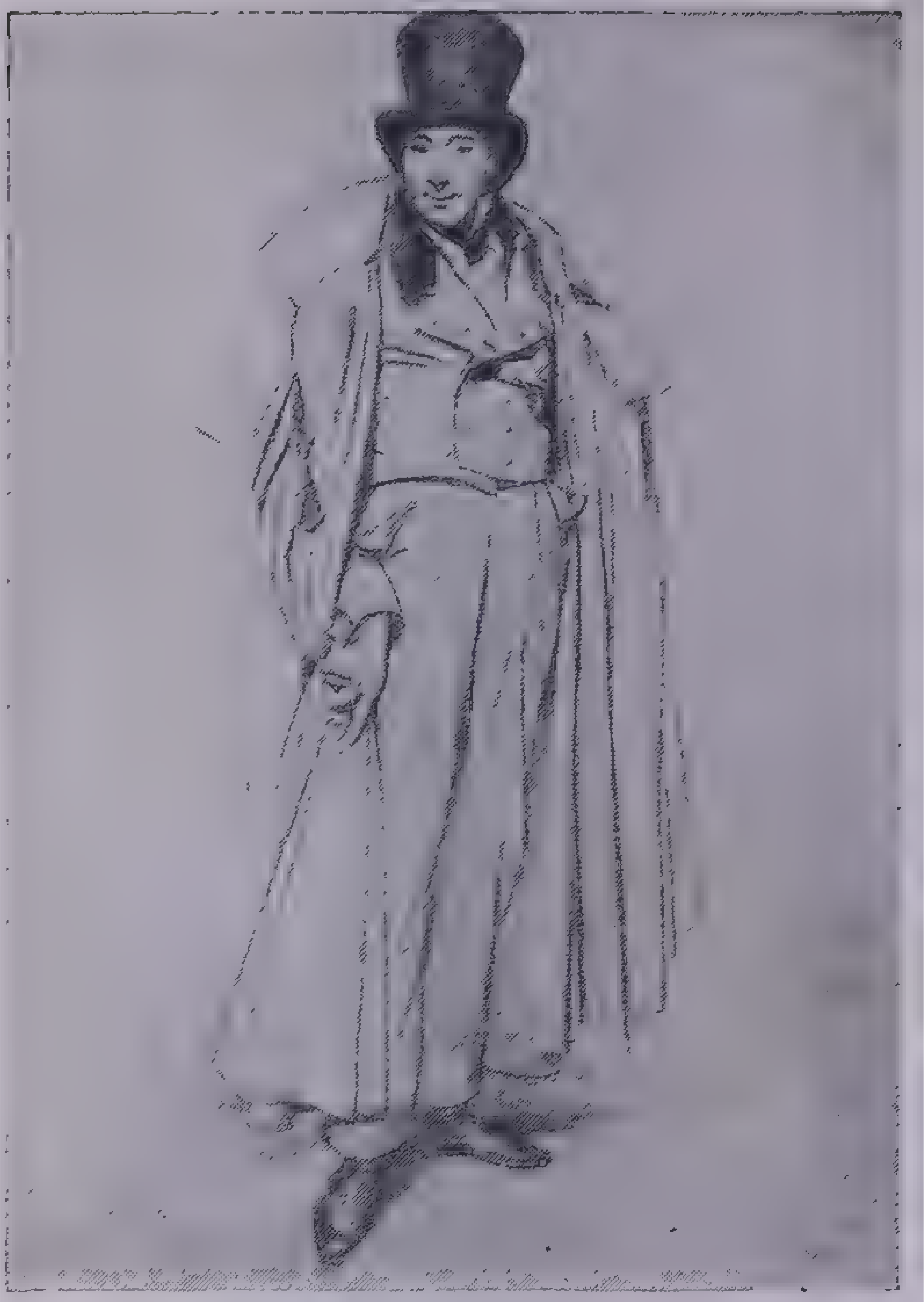
The Empire mode retained the simple classic silhouette of the Directory but introduced variations and a gradually increasing richness of material. Napoleon was a lover of display and desired to build up once more the exhausted industries of France. Thus he encouraged wearing luxurious costumes of silk and velvet, embroidery, fringe and spangles, fur and lace. The bodice remained short, the sleeve became slightly fuller at the top and sometimes fitted the arm closely at the wrist. A ruff of delicate lace outlined the décolletage. The hair was done in flat ringlets in imitations of classic statues. Imported cashmere shawls were draped with many wonderful effects. Dainty bonnets of organdie and taffeta were enriched with feathers, ribbons and flowers.

Styles of the Restoration and Louis Philippe, 1814–48.—When the First Empire ended with Napoleon's abdication and the House of Bourbon returned to the throne of France, reaction was toward the classic influences of the Empire. A new wealthy middle class with less taste came into power and their influence was reflected in the dress of the period. The Empire bodice reached the neck and finished with a ruche. The slim graceful skirt gave place to one moderately short, with fullness centered in the back, which soon acquired a deep border of puffing, tucks or artificial-flower trimming that made it stand out stiff and straight. Sleeves were long and plain or mousquetaire (puffed in rows). Poke bonnets made their appearance and remained in various forms for 40 years. Epaulets and braids recalled the military.

By the '30s another distorting silhouette based on 18th-century bouffant dress had arrived. The waistline crept down to its normal position but the waist became smaller and smaller and the compressing corset or stay had come—to remain into the 20th century.

Horsehair and whalebone lent support to the ever-widening skirts and another need was found for crinoline—enormous leg-o'-mutton sleeves were made to stand out, widening the figure above its sixteen-inch waist almost as much as the skirt did below.

All this was done in the lighter and most delicate colored materials, such as flowered organdies, muslin prints and thin merino woolens, trimmed all too generously with bow knots of ribbons, artificial flowers and lace. The ensemble was enhanced by a high coiffure of fantastic loops and curls and by a flower- and ribbon-laden bonnet. Beside the lady so arrayed was likely to be a gentleman wearing violet trousers with instep straps, a light-green waistcoat, a dark-green frock coat or a spencer similar to today's mess jacket, a great coat with shoulder capes and an elegant top hat.



Courtesy Metropolitan Museum of Art

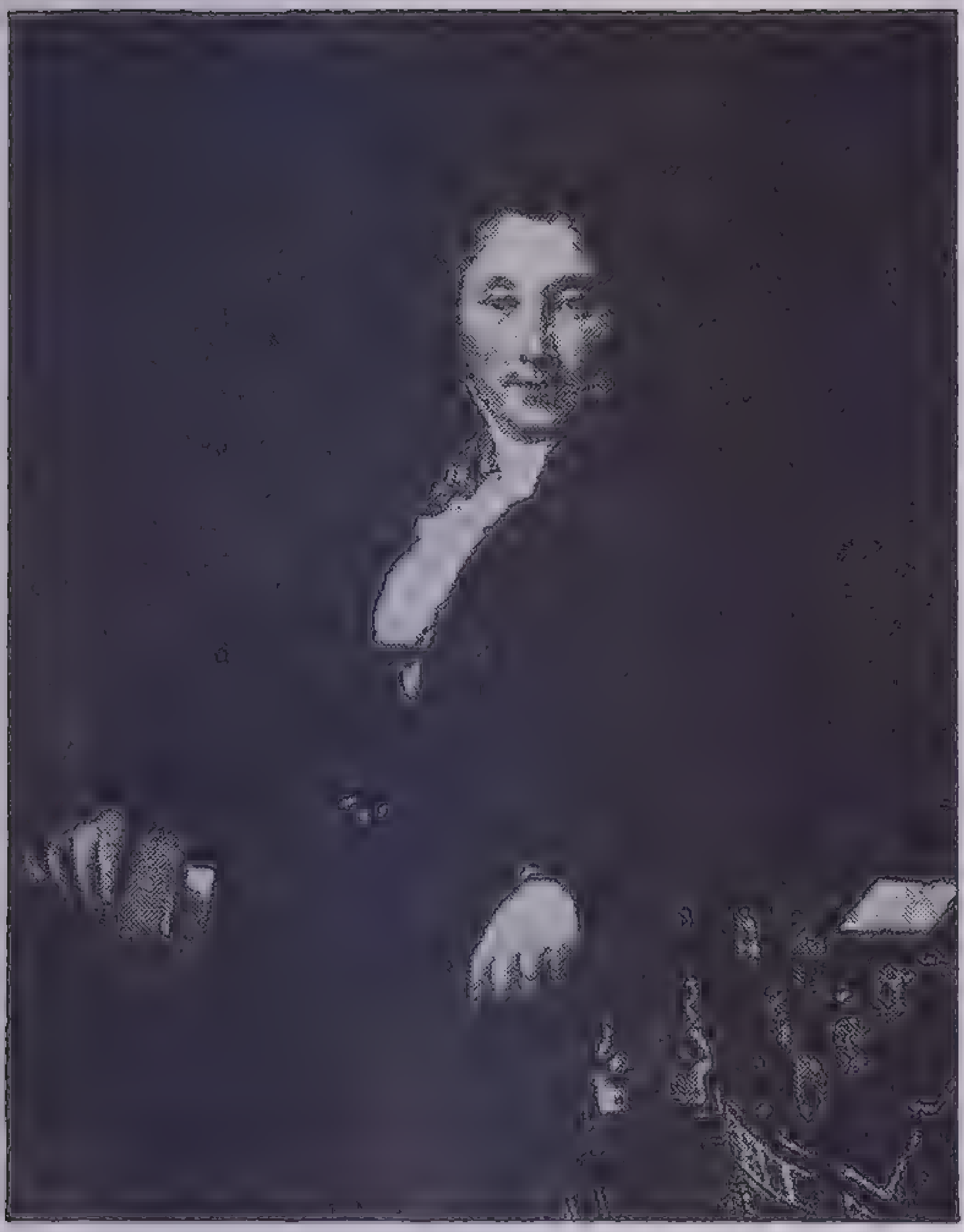
A 19th-Century Gentleman

In 1823 a gentleman of fashion wore the street clothing shown here in Jean Ingres's drawing of his friend Monsieur Leblanc

Apparel of the Second Empire, 1852–70.—The next major fashion advance for women came when the lovely Eugénie swayed the mode of the Continent while she was Empress of France. The unlovely leg-o'-mutton puff now moved down the arm to become a wide medieval sleeve. The shoulders became smooth and plain, producing that wide-off-the-shoulder evening mode associated with Victorian days. Mantillas of black Chantilly lace and shawls of costly imported Cashmere or embroidered Chinese crepe with long fringes were drawn around bare shoulders. Daytime dresses were high necked with demure turned-over collars and undersleeves of daintiest white needlework.

Hair was parted in the middle, waved and arranged low on the neck. Poke bonnets, large and small, were embellished under the brim with flowers and lace ruches. Wide taffeta ribbons tied quaintly under the chin lent charm.

The most distinguishing feature, however, of Second Empire fashions was the wide bell-shaped skirt. Already ample in width, it increased to many yards around the bottom and was held out by voluminous starched petticoats or stiffened with whalebone and horsehair. It was cumbersome indeed. The crinoline, which eliminated the necessity of many burdensome petticoats, was a cagelike frame of steel wire introduced by Charles Worth, arbiter of fashions and originator of the Paris House of Worth. The crinoline was soon universally adopted and as part of fashionable attire was worn alike by drawing-



Gentleman's Dress of the Second Empire
From the portrait of Monsieur Le Blanc by Jean Ingres in the Metropolitan Museum of Art, New York

room belles and cooks—and even peasant girls in the fields.

To add to the effect of great width, skirts at this time were trimmed with numerous flounces. In 1840 ladies had been content with two or three ruffles around the bottom of their skirts. By 1860 rows of six to eighteen flounces sometimes reached to the waist. Flounced evening frocks were made of the airiest fabrics tulle, tarlatan, gauze, grenadine. For morning and visiting, they were of muslins, taffetas and moirés that were crisp or heavy enough to stand alone. The stitching of these elaborate frocks could then be done on the newly invented American sewing machine.

For social occasions in the 1860s and later, a man chose a broadcloth suit—for daytime, close fitting light-colored trousers, minus the instep straps, and a black fitted coat, often of the Prince Albert type, with narrow velvet collar. His fine linen shirt was without ruffles but often was minutely tucked or puffed; and a stiff collar and cravat or tie gradually replaced the stock. Men often wore a shawl instead of a topcoat.

Modes of the Late 19th Century.—After the Franco-Prussian War and the passing of the influence of the French court, the crinoline disappeared from the mode; but it was many more years before scientific research, invention and our 20th-century way of living freed women from encumbering bustles, pads and stiffening and confining stays. The costume of these years, frequently referred to as late-Victorian, was in every way a parallel of its architecture, furniture and interior decoration with their material display and overornateness—a definite departure from classic lines.

The skirt of the late-Victorian gown was extremely complicated. The fullness was draped over a bustle in a polonaise reminiscent of Queen Anne or Madame de Maintenon. The puffing at the hips was finished with ribbon bows; ruffles or pleatings edged the polonaise and its long narrow train.

Contrasting with this elaboration of the skirt was the extremely tight-fitting bodice with high neck and smooth long or three-quarter sleeves. Passementerie or fringe trimmed the edge and lace ruches the neck and sleeves. Materials were heavy, rich and somber in hue, such as plum-colored faille silk, dark-brown woolens. Most dresses combined contrasting textures and colors.

The hair was worn in a chignon, a knot or mass, sometimes artificial, at the back or top of the head, in keeping with the back emphasis of the dress. Hats were very small, worn tilted forward and almost concealed by masses of feathers, aigrettes or flowers. A popular wrap was the dolman, a jacket with wide loose sleeves, trimmed with jet, sequins or fur. Glacé kid gloves and a diminutive ruffled parasol were among the accessories.

Masculine clothing showed no major change in this period. The Prince Albert coat remained popular for dress wear; for business the less formal sack coat was chosen, and the Norfolk jacket became popular for sportswear. Chin whiskers or sideburns were universally worn giving even young men the appearance of greater age and maturity. The derby or bowler hat became a general favorite.

From the Gay '90s into the 20th Century.—This epoch is noted as one of extraordinary elegance in materials and as one in which dressmaking reached a high degree of perfection. In the early '90s an entirely different emphasis in silhouette appeared with a shift of interest from skirt to sleeves. At first acquiring only a modest fullness at the top, sleeves steadily increased in size till they became huge balloons like the leg-o'-mutton sleeve of the 1830s. Lined and stiffened, they dominated the costume. The bustle was out of the picture. Skirts were almost glove-fitting to the knees spreading at the bottom in wide bells with graceful trains. To obtain this effect, they were gored or shaped and stiffened and lined with silk. Women now developed to a high art the technique of carrying these trains. The petticoat was thus brought into view, and much attention was given to its color and beauty. A ruffled and rustling taffeta petticoat of brilliant color was coveted by all women.

The first decade of the 20th century is the one known as Edwardian, a style widely revived in 1937. Its silhouette was distinguished by a sleek poured-in-the-mold line with wide fullness at the bottom, a deep décolletage and puffs at the shoulders. The ideal of slenderness was in that day further accomplished by a tall pompadour and by the ostrich plumes that graced the large-brimmed hats.

The tailored suit for women, which appeared as early as 1888, became increasingly popular through the '90s and the Edwardian epoch. Worn with this early suit was a mannish blouse or shirtwaist severe in cut, and a stiff sailor hat. The skirt of the suit gradually became shorter and the blouse was made of soft silk or lavishly embroidered or lace-trimmed sheer cotton. With it was worn a Merry Widow hat with upstanding plumes or flower ornament and a boa of feathers or fur. The princess dress was much seen.

Styles for men remained conventional—the sack suit for business and informal wear, the frock coat for daytime, the tuxedo for dinner and swallow-tail for evening social functions and public appearances. National taste varied the models and fitting of men's apparel, but the general style of trousers, waistcoat and coat had become almost world-wide, particularly in cities.

Fashions Since 1910.—The period just prior to the World War was marked by variety of silhouette and details of costume, some without either beauty or comfort, notably the well-named hobble skirt with its ankle length and extremely narrow width. Another short-lived fashion was the pannier, very full about the hips and rather close at the hem. Directoire influence was revived in transparent fabrics and high waist lines. The robe-de-style by Lanvin had a close-fitting bodice and a flaring skirt; it had a limited vogue for evening gowns.

New interests and occupations demanding comfort and freedom in dress began to engage women outside their homes. Skirts were raised to shoe tops, tailored suits increased in importance and were manufactured ready to wear of worsteds and tweeds.

The post-war period established an entirely new epoch in the history of women's fashions. Never before had skirts displayed the calves; not since ancient Egypt had women worn short hair; and only once since the Renaissance had they gone uncorseted. In one brief decade woman emancipated herself from the encumbrances of the ages. She bobbed her hair and cultivated a boyish figure. She replaced the old-fashioned corset and underthings with brassière, step-ins and slip. A slipover, one-piece dress with the hemline finally to her knees and a small mushroom hat or cloche completed the costume.

By 1929, however, our post-war psychology had somewhat changed. We began to appreciate feminine curves; skirts rapidly grew longer till for evening they acquired full length and even trains.

Today a new elegance and sophistication has entered the mode in women's formal afternoon and evening clothes. Increased participation and interest in sports of all kinds has led to the adoption of simple tailored clothes for business and general wear. The overornamentation of past days is stripped away. In all forms the seemingly casual simplicity is really the result of meticulous attention to fabric, fit and grooming. In both men's and women's clothing, great emphasis is placed on accessories that match or contrast subtly or dramatically with the basic costume color. Our way of dressing has been changed to harmonize with the spirit of modern activities, modern art, modern living. Each occasion now demands its suitable costume and accessories. Both men and women must have an individuality in the wearing of clothes—a dash, a nonchalance, a spirit that the modern world calls style, smartness.

THE DANCE

The dance is believed to be the oldest art in the world, and for thousands of years it was the most important and popular. All other personal arts such as poetry, drama and music were mere accompaniments for the dance before they separated from it and became arts in their own right. Although these three are still used in a dance composition, the most important element is movement.

This movement may be chiefly of the arms, as in some Hawaiian dances, or of the legs, as in most folk and social dances, or of the entire body, as in the primitive or modern dance; but no matter what part of the body is used the movements are always rhythmic. They are accented, repeated and varied, and they are composed in the same manner as words are composed in poetry so as to express an emotion or an idea.

The dance is the most immediate and most personal expression that we can give of the great rhythms that run through all things and bind them together. Each place and each thing has a rhythm peculiar to itself, and each of these is a variation on a larger rhythm that contains them all. We walk differently in the city from the way we walk at the seashore because each place has a rhythm that affects us differently. We breathe in a rhythm of inhalation, hold and exhalation that becomes faster or slower, accented or distorted according to our excitement or calm. The waves along the seashore also have a rhythm. At first they seem monotonous, but as we watch them we find that there are several small waves in succession followed by two or three large waves, which are stronger and faster, like an accent in poetry. These will be followed again by smaller ones. Certain birds and mammals during the mating season step out a rhythmic dance to attract the attention of their mate.

We dance, then, largely because we are compelled to. Rhythmic movement satisfies equally two conflicting desires that all men have. One is the desire to make themselves outstanding. The other is the desire to feel themselves as part of a social group. In dancing, almost alone of the arts, we can perform to our best ability as individuals and at the same time feel ourselves one with all others in the common rhythm. The dance gives us ease, strength and self-assurance. When man lived closer to nature than he does now, and when he was less burdened with the laws, ideas, traditions and scientific facts that govern us, he was more aware of the value of the dance and gave it more spontaneous expression.

Primitive Dance.—Among primitive peoples the dance was used at all times of social significance and was performed by all the people, young and old. It made use of movement employing all parts of the body. Rarely, if ever, was there an audience in the way that we conceive of audiences at a theater today. It was a dance of the whole people and covered all the major activities of their lives. Through it primitive man celebrated courtships, marriages and deaths; he inaugurated wars and celebrated their victory; above all else, he appealed to his many gods and tried to coerce them into bestowing favors and granting wishes.

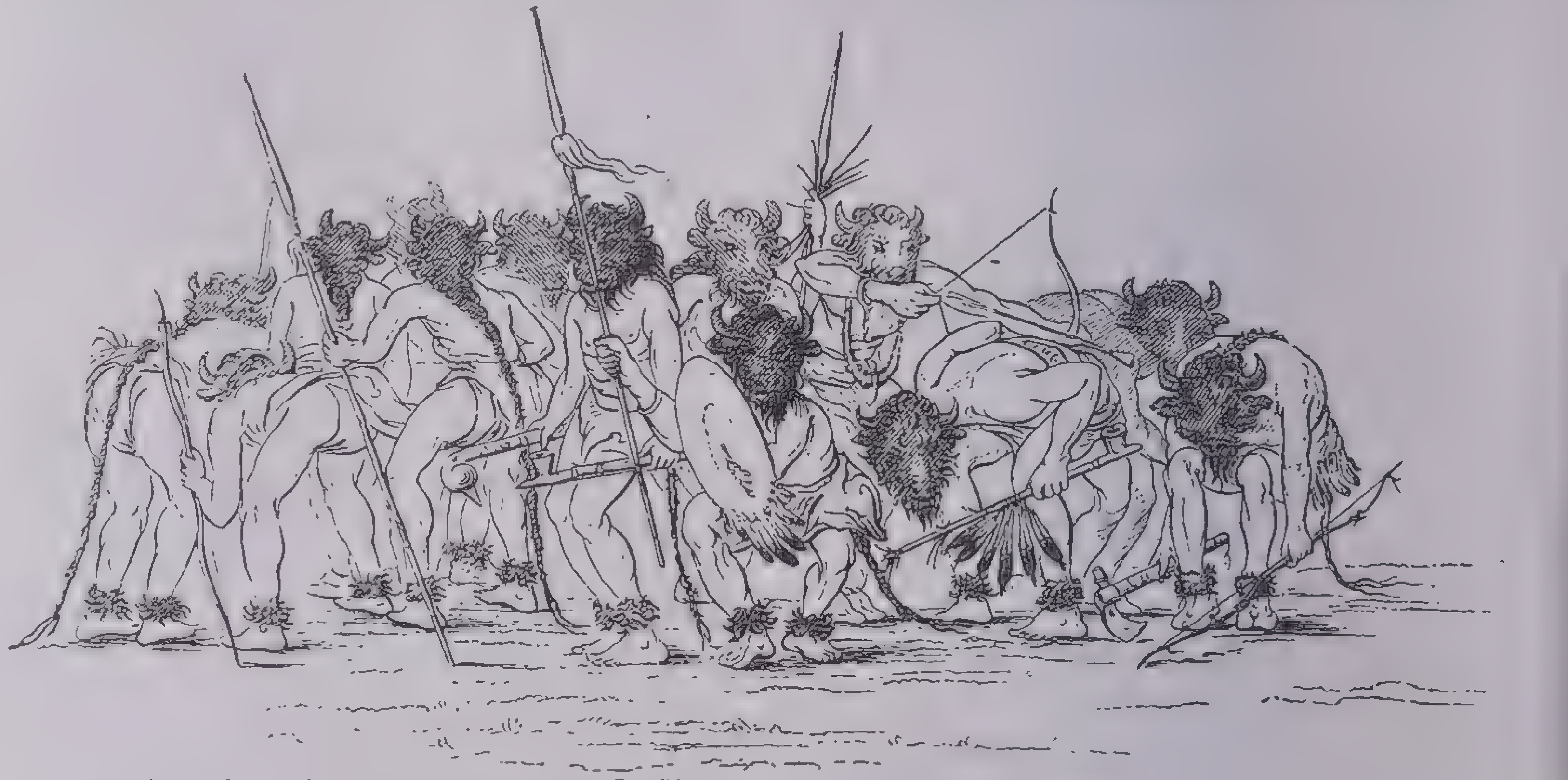
He used the dance on these occasions for several reasons, consciously or unconsciously. Probably the most important were those ceremonies in which he used the dance as magic. Here he imitated the movements and habits of the animal, human being or god whom he wished to influence and control. His human enemies were mimicked so that they might be more easily vanquished. The buffalo was mimicked so that it might increase in numbers and be easily killed. The gods were mimicked so that they might be favorable to him and give him the things he needed.

In other dances he abandoned himself to wild, excited movement that was used to intoxicate and hypnotize the dancer. The movement often mounted to a frenzy at the peak of which he became "possessed." In the mimetic dances mentioned above he tried to secure control, to influence and coerce his gods through magic, but in this dance he himself became the god with all the god's strength and divine power. By this wild abandonment he became for a time more powerful than he would ordinarily be and was therefore able to accomplish greater things. These dances were often used in preparation for war so that he might become bolder and more daring.

Still other dances were used for courtship and marriage. In many ways these are similar to dances performed by birds and other animals wherein they exhibit themselves to their best ability and advantage so that they may appeal to their mates. Many of our social dances are, in a lesser degree, this form of personal exhibition.

Through repetition over many centuries a great many of these dances became set in form and turned into a ritual in which it was of vast importance that everything be done exactly according to rule. One false step might destroy the powerful effect of these dances. Often the original purpose of the dance was forgotten through the centuries, and it was preserved simply for the pleasure it afforded. Others, which had been dances of magical control, were formalized and used in religion for the same purpose that we use the spoken prayer.

Besides all these purposes, the dance was primarily important in achieving social unity. All persons are in some degree afraid of solitude and the dance was the best means of releasing them from themselves and their fears and bringing them into the stream of life. That is why, even when the purpose of a dance had been lost or when its value as a means of coercing the gods and influencing enemies was no longer believed, it still had its use as a means of social communication.



Courtesy American Museum of Natural History

Primitive Buffalo Dance of the Mandan Indians

From George Catlin's *Manners, Customs and Condition of the North American Indians* (1841)

The primitive dance contained all the elements by which a work of art is composed, whether it be dance, poetry, drama or painting.

Primitive man used movement to express things that he felt deeply but for which he had no words. That is the purpose of all the arts: to say things that can be said in no other way. He found that it was not enough to use a certain movement or phrase once. It had to be repeated several times to be sure that its meaning was understood. Furthermore in mimicking some subject, he found that he must concentrate on some things and leave out others, for if he mimicked everything, he would never be done, and in the second place he would give no emphasis to what he felt was most important. At times some elements were so important that he found it necessary to emphasize them even more, so that he clapped his hands, stamped his feet, drummed with a stick, sang or increased the volume of the musical accompaniment.

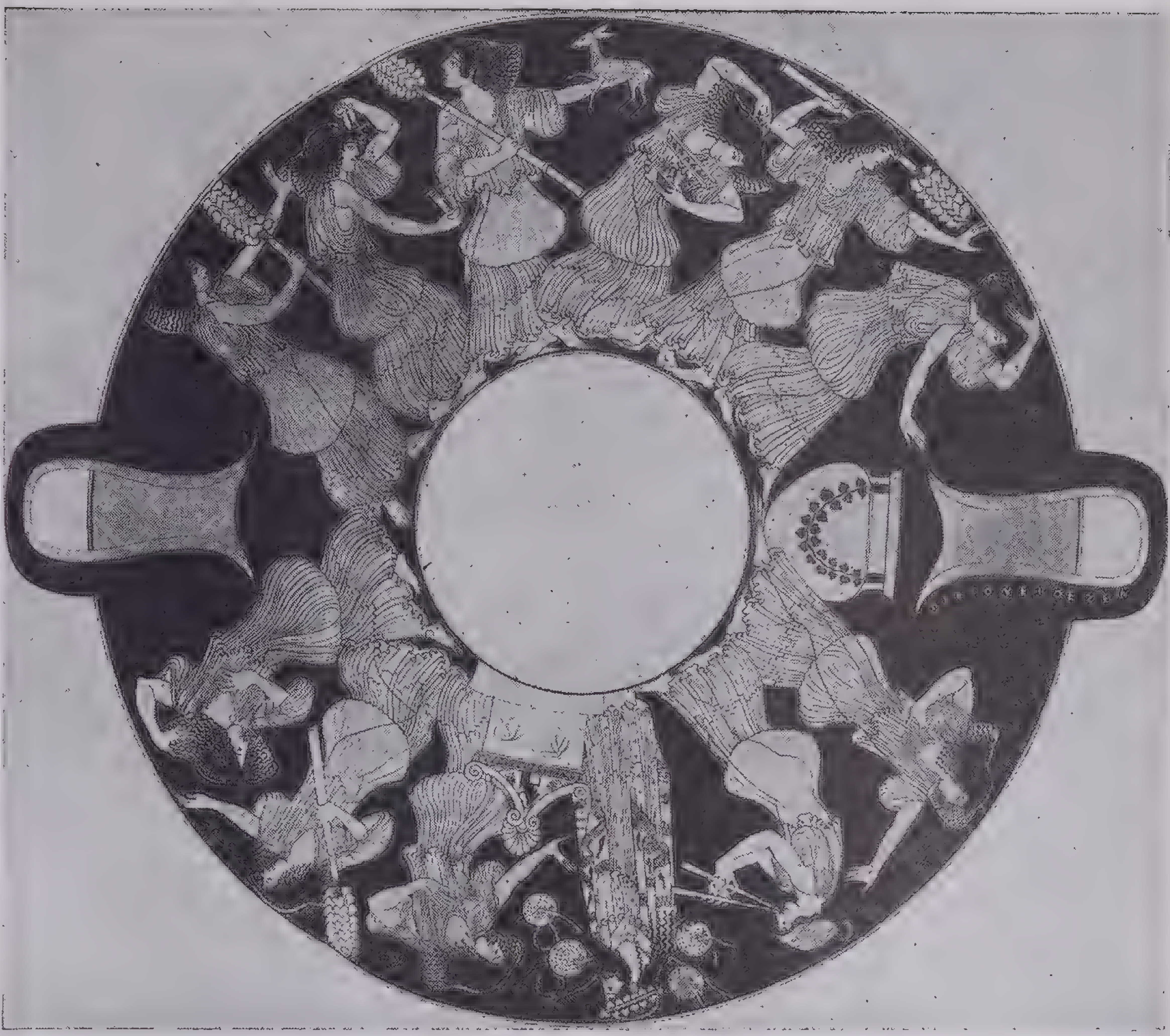
In doing these things, he was using elements which have become the basis of all art form. They are: repetition, accent, contrast and distortion, the first three of which together constitute rhythm.

Transition.—We have a great deal of information on the primitive dance because primitive tribes still exist almost as they were centuries ago, preserving the same habits and customs, which are easily studied. The next period of which we have extensive information begins in the 1400s, but there was a period of many centuries between this and the primitive period during which great dancing, on which information is sparse, was performed in Egypt and Greece. Apparently no one at this time thought of inventing a method of signs by which the dances might be written down and preserved for the use of people ages later. Even the written descriptions do not tell us much about the actual form of the dance.

As religion gradually replaced magic, the divine powers that had belonged to everyone became concentrated in a few people, the priests. Likewise the dance, which had been a communal activity, became concentrated in certain groups, and the professional dancer appeared. As the complexities of life increased, more and more people became specialized in particular things and that specialization continues to the present day. In primitive times man was killer of game, tiller of the soil, weaver, dancer, artist and builder; then he began to specialize in only one of these things in which he excelled, and the rest of the things he was required to trade, buy or merely look at and admire. From this point onward the separation between dancer and audience grew ever wider, and the dance itself began to break up into different types for different classes of people: the aristocracy (nobleman and ruler), the middle class (merchant and business man) and the lower classes (worker, artisan and peasant).

The first great center that influenced the western world was Egypt, where there were now religious and secular dances. The secular dances, which employed a wide range of movement for all parts of the body, became more personal and were carried at the height of Egypt's power across to all the Mediterranean countries and profoundly influenced the dances of Spain and Greece.

Eventually Egypt declined and Greece was in the ascendancy. Here the dance was held in greater esteem than it has ever been held before or since. It was practiced by all types of people both for religious purposes and for sheer enjoyment. Great philosophers taught it as a necessity in order to have a healthy mind in a healthy body. It was widely used in the training of soldiers to give them greater poise, co-ordination and strength. As in primitive times it was used to commemorate great events and to celebrate the sowing and the harvest. It was employed by professional dancers and buffoons. Very probably the dance was the mother of that other art in which Greece excelled, the drama. Even after the spoken word became of greater importance than the movement, large choruses of dancers were still used.



From Eduard Gerhard: Trinkschalen und Gefässe des Königlichen Museums zu Berlin, 1848

The Dance in Ancient Greece

On the under side of a cylix or two-handled drinking cup the artist Hieron painted the circular pattern of maenads dancing

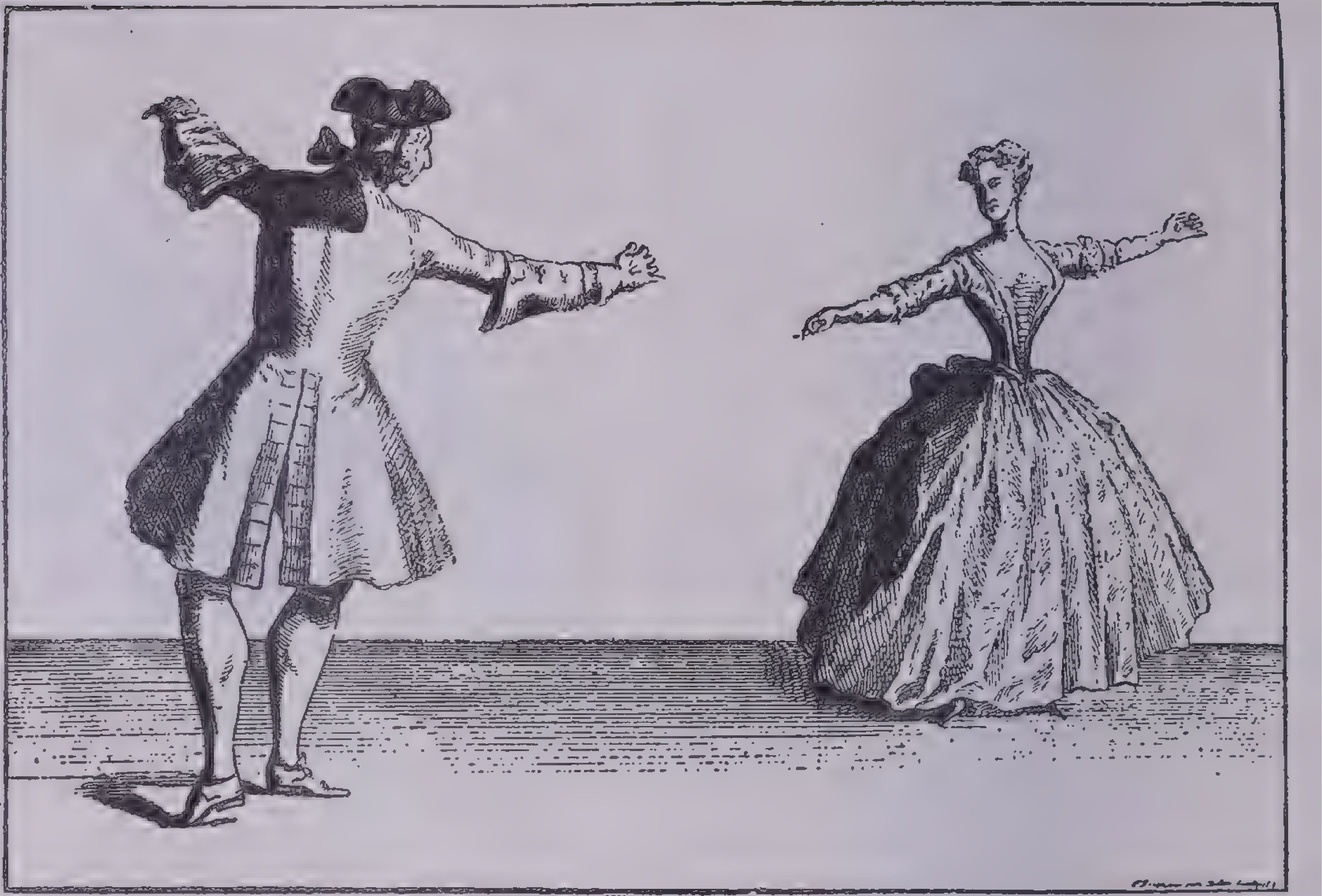
When Greece's power fell, the dance center moved to Rome. There the art became degenerate and obscene, and the Romans themselves contributed nothing to its development. Later it was taken under the protection of the Christian church and was widely used in religious services until the reformers eventually banished it as indecent and immoral. Nothing further was contributed to the art until the birth of the ballet in Italy in the late 1400s.

Folk and Social Dances.—But the desire to dance could not be banished. There has been no time in the history of the world when it has not been practiced assiduously at some place. It was widespread in India and the Orient, where great dancing may still be seen, but the dances of these countries, although they have often influenced the dance of the western world momentarily, have not had a sufficiently profound effect on the dances of Europe and America to be discussed here. We turn instead to the common people of the West, the slaves, workers and peasants, to find the dances that were later to be adapted in the court and in the beginnings of the ballet.

The folk dance is generally gay and is performed mainly with the feet and legs, although there are exceptions to this in such countries as Spain where effective use is made of the whole body. It expresses the national characteristics of the people who create it, and the number of folk dances practiced by a given nation will often tell us of its vitality or weakness. After hours of hard work it was these dances that gave amusement and release to the great working classes. The movement in them is usually large, open and free, full of exuberance and gusto.

The movement of the social dance, on the other hand, is usually restrained, refined and close to the body. Its origin is almost invariably a folk dance that has found favor with the ruling classes and has been polished and refined for use in their gala occasions. The animal gusto and vigor of the upper classes seems to have been weakened and effeminized so that they are unable to participate in the dance as do the lower classes. Even in our own day the wild dances borrowed from the Negro have been only fads, eventually disappearing and giving place to the staid, dignified and monotonous fox trot.

Among some of the better-known folk dances that are still being practiced we have, from Scotland, the *sword dance* and the *Highland fling,* both vigorous and spirited in execution and angular in movement. England gives us the *sailor's hornpipe* and the more ordinary *morris dances;* Ireland, the clog and shuffle dances, such as the *jig,* the *reel* and the *hornpipe,* all with complicated foot movement. Some of the best composed dances come from Russia and Poland, such as the *czardás,* the *mazurka,* the *Cossack dance* and the *obertass.* These are full of violent changes in rhythm and are performed with quick, brilliant movement. Italy is best known for its *tarantella,* which is said to have been used originally to cure the bite of the Tarantula spider.



From Pierre Rameau: The Dancing Master, London, 1731

Dancing in the 1700s: The Minuet

A gentleman and a lady are shown with hands extended and bodies slightly bent just before taking hands to dance a turn together

The country richest in dances is Spain. Cadiz, under the influence of dancers from Egypt, became one of the great dance centers of the world. The dances of Gypsy origin are called *flamenco* dances and include *la farruca, el tango* and *el garrotin,* all wild and exuberant and full of violent contrasts in rhythm. The more dignified and stately dances that were cultivated by the court are called Iberian or Classic dances, the most famous of which are the *bolero, las seguidillas* and the *fandango.*

To trace the progressive history of the dance from primitive times until today, we must turn to France. The French invented very few dances themselves, but they are of great importance for two reasons: they served as a melting pot for the national dances of other countries, and they established the first terminology and rules and regulations for the dance. It is to France that we are indebted for the first accurate descriptions of social dances and for the analysis of movement and the setting up of rules that resulted in an Academy of dancing and governed the later history of the ballet. All terminology of any importance, up to the present day, describing steps and series of movements, is of French origin. The French people, although poor at invention and creation, were excellent at systematizing and cataloguing and describing.

One of the most important dance books in the world is the *Orchesography* of an elderly clergyman, under the assumed name of Thoinot Arbeau, describing the social dances that were prominent in the 1500s. It was the first book of its kind to give sufficiently accurate descriptions so that the dances can be recreated today. The most popular dance during the 1500s was the *gaillarde,* a lively dance for a man and woman, of which there were innumerable varieties. Others of importance were the *volte,* the *allemande,* the *pavane* and *sarabande,* both borrowed from Spain, the *courante,* from which the *minuet* and *waltz* were partly derived, and the *gavotte.* It was these social dances of the 16th century that were first used in the ballet.

As court manners became more stiff and formalized, the popular *gaillarde* was replaced during the late 1600s and early 1700s by the *minuet,* which was the essence of the artificiality of that age. It in turn was replaced by the *waltz,* which remained the most popular dance until 1900.

Other dances that were popular in Europe and America up to the 20th century were the *quadrille,* the *lancers,* the *polka,* the *galop,* the *barn dance,* the *Paul Jones,* the *Washington Post,* the *polka-mazurka,* the *polonaise,* the *schottisch,* the *Sir Roger de Coverley* and the *cotillion.*

The Ballet.—Let us suppose that, in celebration of some famous event, we wish to have as festive an entertainment as possible. The committee will choose a rambling theme or story to serve as framework. Then they will hire troupes of masked actors to parade down the aisles, other actors and dancers to form striking tableaux in brilliant costume, musicians and singers to accompany this with a medley of tunes and songs, and possibly even large floats to be drawn across the stage. Interspersed in all this activity there will be occasional dances performed by various troupes. These dances will be ballroom displays of the *waltz,* the *tango,* the *fox trot,* the *rumba* and the *Charleston.* At the end of the entertainment both performers and audience will join in a concluding dance.

It was in such a way as this that the ballet was born in Italy in the late 1400s as a spectacular pageant designed to amuse the nobility. The *gaillardes, gavottes* and other dances that were used were as modern at that time as the *rumba* or the *Susy-Q* were in 1938. In its general form the ballet was at first influenced by the mime and the pantomime, which came to be known as the mummery or masque, and by the great circuses and pageants that were dominant during the height and decline of the Roman Empire.

New Interests and Ideas. There were many influences at work in society that eventually shaped the ballet, and we may stress two in particular. The first was man's interest in himself and his own adventures, whereas previously all of his art works had been concerned solely with gods and supernatural beings. Some things that contributed to this interest were the fact that he had become a Christian and believed in a personal God and a future life, that printing had been invented and that sciences were coming into being whereby things could be more accurately measured, tested and explained.

The second was the increasing interest in time and space that came as a result of the first. Previously he had known little of the world beyond the small town or village in which he lived. He believed that the world was flat and was surrounded by unknown monsters. It was as though he were standing within a small, walled-in arena beyond whose circumference he could not see, then slowly that arena was enlarged and came to include more and more things.

At the time the ballet was created, Leonardo da Vinci, the great Italian painter, was interested in flying machines; Gutenberg had printed the first book; Columbus was bold enough to declare that there should be a land to the west and requested money and ships to find it; the clock and the mirror came into general usage; and perspective, a method of creating depth on a flat surface, was introduced into painting.

All these interests were reflected at first in the subject matter of the ballet. It danced about moons and stars, Indians and tobacco, legendary heroes and nymphs, but it still used an earthy movement, performed almost exclusively by the feet and legs close to the ground.

The Court Masques, which were pageants with interludes of dancing, attracted the attention of Catherine de' Medici, Queen of France. It was not long before the ballet declined in Italy and its center was established in France where it remained until its decline in the late 1800s. Louis XIV established the first Royal Academy of the Dance in 1661, and he himself danced in the ballets invented by Beauchamps and Pécour to the music of Lully.

In the Renaissance. The Renaissance in Italy had focused attention upon man as an individual, and it was during the reign of Louis XIV that attempts were being made on all sides to organize this new knowledge and to establish fully the importance and nobility of man. This was also a time of scheming, planning and rationalizing. Everything was to be explained by mechanical and mathematical laws The gardens were laid out in geometric patterns and the hedges and trees clipped into geometric shapes. Fantastic costumes and headdresses prevented one from ever knowing what the human being actually looked like. Even metal rods were worn under the coat up one's spine, partly to prevent one from tiring, since no one sat down but the king, and partly to make one seem as noble as possible. It was natural, then, that movement also should be explained mathematically and mechanically.

Beauchamps described the Five Positions of the feet, which are still used by the ballet today, with the feet turned out at a certain degree of angle and moved precisely only in certain established directions. Symmetrical movements for the arms also were invented, and much attention was given to the correct manner of entering a room, standing, bowing and saluting a lady. It was at this time also that the curve became predominant and afflicted the ballet until the 1900s, as it afflicted everything else. Curves and spirals and circles were so profusely applied to everything from clocks to architecture that their real structure was completely hidden.

The whole life of the period was best expressed in the *minuet,* which was one of the dances used in the ballets. It combined correct, systematic, strictly regulated steps with a certain gaiety and lightness. It was both pompous and delightful, full of affectation yet suffused with charm. The stiff-jointed action of the marionette was considered more beautiful than any possible human movement.

Greater Freedom and Grace. While these rules and regulations were being formulated, the interest in time and space was again felt in the gradual increase during the next two hundred years in aerial movement. The jumps, leaps and toe-dancing defied the laws of gravity. They were used to free the body from the earth and make it as close to a light, ethereal spirit as possible.

In 1681 female dancers were introduced into the ballets for the first time, and they grew increasingly important until the male dancers were often reduced to mere props used to hold them up during difficult elevations or to increase the length of a linear design that could not be done without the male dancer's help. The introduction of the female dancer, coupled with current notions of her supposed fragility and delicacy, added to the ethereal quality of the movement and made the whole of ballet dancing more feminine. (Women, of course, had danced in primitive times in Egypt and Greece and in folk and social dances, but they had not before been allowed to dance on the stage in Europe.)

Each dancer in turn made contributions to the vocabulary of movement, but it was not until the advent of Jean Georges Noverre that revolutionary changes were made. Dancing up to his time had been used as *divertissement* and had become increasingly stilted, partly through the cumbersome costumes and masks that were worn. In 1760 in his book *Letters on the Dance* he pled for reform in costume and took the first steps toward the creation of the *ballet d'action* in which a good, consistent plot was to be expressed entirely in dancing and mime. His purpose was "to break hideous masks, to indicate a manner of dress more noble, to demand action and expression in dancing, to demonstrate the immense distance which lies between mechanical technique and the genius which places dancing beside the imitative arts."

Noverre himself was not very successful in realizing his aims, but his work was carried on by Dauberval and finally achieved by Salvatore Vigano, who was active in the early 1800s. The *ballet d'action* remained the accepted form until the early 1900s. After this step forward the ballet again declined, and no new movements or other developments have come from France since that time.

Birth of the Modern Ballet. It was the visit of Isadora Duncan, American dancer, to Russia in the first decade of the 20th century that finally caused the revolution in the ballet academy. Michel Fokine was the dancer who led this revolt, inspired by the new, free dancing of Duncan. He

Courtesy New York Public Library

Anna Pavlova

Anna Pavlova was born in St. Petersburg in 1886, at 10 entered the Imperial Russian Ballet school and at 16 was a *prima ballerina.* Before she died in 1931 she was recognized as one of the greatest woman ballet dancers of all time. She appears here in a scene from Charles Camille Saint-Saëns' ballet, *The Swan* wished to free the classical ballet from its restrictions, to broaden its scope, to add new steps derived from unexplored folk material, to make fuller use of the entire body and above all to make the ballet a true expression of the Russian spirit.

Fokine was joined by such famous dancers as Mlles. Pavlova, Lopoukowa and Karsavina, Adolph Bolm and the great Nijinsky. Léon Bakst designed costumes and sets, and such composers as Glazunov, Tcherepnin and Rimski-Korsakov provided the musical setting. The Russian Government, which sponsored the academy, disapproved of this revolt and banished them, but fortunately they found a brilliant director in Diaghilev, and in 1909 the Diaghilev Ballet was storming Europe.

They turned to the legends of Russia, Persia and Egypt for subject matter, dispensed with the restrictions of the ballet slipper and the traditional costume and recreated the mimetic drama wherein the designer, the musician and the choreographer (dance composer) worked closely together. The dance was no longer a *divertissement* but grew out of the subject matter itself. Traditional technique was still maintained as a basis.

Brilliant as it was, there remained two problems that could not be solved. One was that the real form of the ballet was not the dance itself but the story upon which dances were hung as beads on a string. Pantomime filled in the intervening places. The other was that the technique they used was not able to express the great drama of contemporary life, since the foundations of that technique were laid several centuries before, when people thought and lived differently.

Two of the greatest dancers of that period were Anna Pavlova and Nijinsky. Two contemporary choreographers of importance are Massine, who has created ballets on well-known symphonies, and Balanchine. The Diaghilev Ballet itself eventually disbanded. Two contemporary ballet companies that are carrying on this tradition are the Ballet Russe of Monte Carlo and the American Ballet.

The ballet as we know it today is usually a series of dances arranged on a thread of dramatic narrative. Its technique is abstract, brilliant and spectacular. Its purpose is generally to provide a technical display for entertainment. Its use of movement divested of human qualities and of movement used in lever action from the joints, which gives it a marionette quality, forces it to remain a theater spectacle, at present without profound significance.

The Modern Dance.—Meanwhile, a new development has arisen in the dance. It started in America and developed simultaneously in Germany and America. It is called *Modern Dance* and was created in the belief that the dance solely as entertainment was not fulfilling its function as an art.

This new revolution that, as we have seen, also affected the ballet actually began in the late 1800s. At that time the ballet was in a decline in France, and Puritanism was still in full command of people's ideas and actions. This was an age of restriction and repression, and it was natural that it should give rise to a slowly growing opposition. A number of revolutionary figures arose who broke down the accepted traditions and made way for greater freedom. Among them were Amelia Bloomer, who invented the bloomer and began to free woman from the yards of material and padding with which she clothed and distorted her body; Friedrich Froebel, who originated the kindergarten and made way for progressive education; Pierre de Coubertin, who revived the Olympic games; Jack Broughton, who invented the boxing glove; Émile Jaques-Dalcroze, who formed a new method of teaching music through coupling it with simple dance movements based on the Greeks; Michel Fokine, whose innovations in the ballet have already been mentioned; Vernon Castle, ballroom dancer; and Isadora Duncan.

As late as 1904 Zorn complained about the "objectionable hugging" in the *waltz* and declared that "we should unhesitatingly pronounce the waltz position to be indecent." But freedom was in the air and, through the ballroom work of Irene and Vernon Castle and other people, America was shortly doing the *one-step,* the *hesitation waltz,* the *maxixe,* the *tango* and the *fox trot.* The *fox trot,* like many other dances, such as the short-lived *Charleston* and *black bottom,* grew simultaneously with the new syncopated music of Negro origin that has been called *Ragtime, blues* or *jazz.* It began to be popular around 1913. Once again, as in the earlier adaptation of folk dances to the court, the more energetic ones proved to be merely fads, and it was the more dignified dances that remained.

The most important figure in the dance field was Isadora Duncan, who was inspired by a study of Greek dances and ridiculed the ballet technique as artificial and abnormal. She discarded the ballet slipper and danced in her bare feet, wore loose Greek tunics that gave greater bodily freedom and danced to the music of great symphonic composers. She used a simplified natural movement, built on breath rhythm and wave rhythm, which found its greatest expression through the arms, whereas the ballet had been mostly leg movement. Although she left behind her no technique that could be carried on, she gave great impetus to all who were seeking a new form of dancing that would be contemporary.

She said, "The fundamental movements of the new school of the dance must have within them the seeds from which will evolve all other movements. Study the movement of the earth, the movement of plants and trees, of animals, the movement of winds and waves. All movement on earth is governed by the law of gravitation, by attraction and repulsion, resistance and yielding. Every movement, even in repose, possesses the power to give birth to another movement."

She was trying to recapture the dance of the primitive world, where movement was more important than anything else. She attempted to free the body from puritanical restrictions, to express the soul and the great emotional climaxes of life through movement and to show this movement as continuously flowing from some central source in the body, instead of being action from the joints as it was in the ballet.

She was followed by many imitators and by one other dancer and teacher, Ruth St. Denis, who made a study of Oriental dancing and experimented with visualizing music through movement. It was from her studio that the leading American dancers came.

While this second generation of dancers was experimenting in America, another group was working in Germany, the two most important of whom were Rudolf von Laban and Mary Wigman. Duncan had stressed self-expression and musical interpretation. These new leaders thought this was too romantic and substituted an emphasis on movement for movement's sake, based on the ebb and flow of muscular impulse. In America such dancers as Doris Humphrey, Martha Graham and Charles Weidman made similar experiments in this direction.

The modern dance uses dynamic movement in the same way that the musician uses sounds. Everything else, such as story, pantomime, setting and accompaniment, is used to accentuate the movement but is never allowed to interfere with the movement, which is the most important element. Its four major innovations are: (1) that movement is the substance of the dance, not story or music; (2) that movement is based on dynamic rhythms or such oppositions as the inhalation and exhalation in the breath rhythm, the tension and relaxation of the muscles, the fall and recovery of the body; (3) that movement should carry overtones of emotion and meaning; (4) that movement should make its own form or that one movement should grow from another and build to a climax.

With this approach the dancer is able to express his feelings and reactions toward the world in which he lives, and his dances are of social significance as were the dances of the primitives. At the present moment the modern dance and the ballet are in conflict with each other, and no one can forecast how that conflict may end.

BIBLIOGRAPHY

Art and Architecture

V. M. Hillyer and E. G. Huey, *A Child's History of Art,* Appleton-Century, N.Y., 1933, $3.00

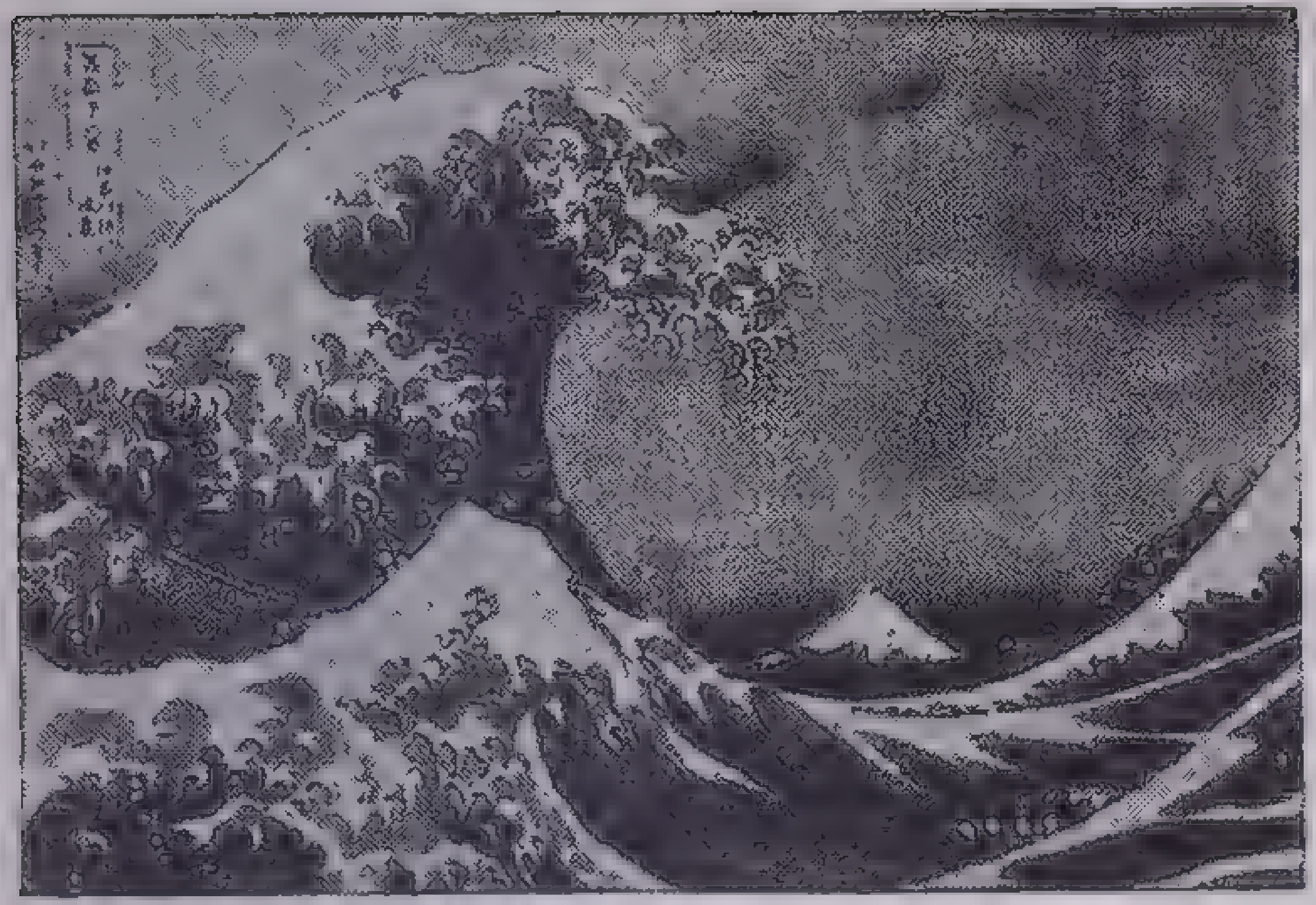
Ida P. Whitcomb, *Young People's Story of Art,* Dodd, Mead, N.Y., 1906, $3.50

Anna C. Chandler, *Treasure Trails in Art,* Hale, Boston, 1937, $2.00

Anna C. Chandler, *Magic Pictures of the Long Ago,* Holt, N.Y., 1918, $1.75

Anna C. Chandler, *Story Lives of the Master Artists,* Stokes, N.Y., 1929, $2.50

A. E. and M. Conway, *Book of Art for*



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Block Print—The Wave by Hokusai

Young People, Macmillan, N.Y., 1909, $2.00

Winifred M. and Frances Kirkland, *Girls Who Became Artists,* Harpers, N.Y., 1934, $1.00

Sacheverell Sitwell, *Narrative Pictures,* Scribners, N.Y., 1938, $8.50

Anna C. Chandler, *A Voyage to Treasure Land* (art) Harpers, N.Y., 1929, $2.50

L. M. Bryant, *The Children's Book of Celebrated Buildings,* Appleton-Century, N.Y., 1924, $2.50

L. Lamprey, *All the Ways of Building,* Macmillan, N.Y., 1933, $2.00

L. Lamprey, *Wonder Tales of Architecture,* Stokes, N.Y., 1927, $2.50

E. H. Butterfield, *Young People's Story of Architecture,* Dodd, Mead, N.Y., 1933, $3.00

C. L. Barstow, *Famous Buildings,* Appleton-Century, N.Y., 1932, $2.50

C. L. Barstow, *Famous Sculptures.* Appleton-Century, N.Y., 1932, $2.50

C. J. Bulliet and Jessica MacDonald, *Painting, an Introduction to Art,* Blue Ribbon, N.Y., 1935, 98¢

Helen Gardner, *Art through the Ages,* Harcourt, Brace, N.Y., 1916, $4.00

H. W. van Loon, *The Arts,* Simon & Schuster, N.Y., 1937, $3.95

Sheldon Cheney, *A World History of Art,* Viking, N.Y., 1937, $5.00

F. W. Ruckstull, *Great Works of Art and What Makes Them Great,* Garden City Pub. Co., Garden City, N.Y., $1.98

S. Reinach, *Apollo* (history of art), Scribners, N.Y., 1924, $2.00

A. F. Laurie, *New Lights on Old Masters,* Macmillan, N. Y., 1935, $2.25

Ludwig Goldscheider, *Art without Epoch,* Oxford Univ., N.Y., 1937, $2.50

Sir William Orpen (editor), *The Outline of Art,* Putnam, N.Y., 1938, $2.95

Painting, Garden City Pub. Co., Garden City, N.Y., $2.19

Élie Faure, *History of Art* (5 vols.), Garden City Pub. Co., Garden City, N.Y., 1921–24, $1.98 each:
  - *Ancient Art*
  - *Renaissance Art*
  - *Medieval Art*
  - *Modern Art*
  - *The Spirit of the Forms*

The Art of Ancient Egypt, Oxford Univ., N.Y., 1934, $2.50

The Romance of Chinese Art, Garden City Pub. Co., Garden City, N.Y., $1.98

H. W. van Loon, *R.v.R., the Life and Times of Rembrandt,* Garden City Pub. Co., Garden City, N.Y., 1927, $1.69

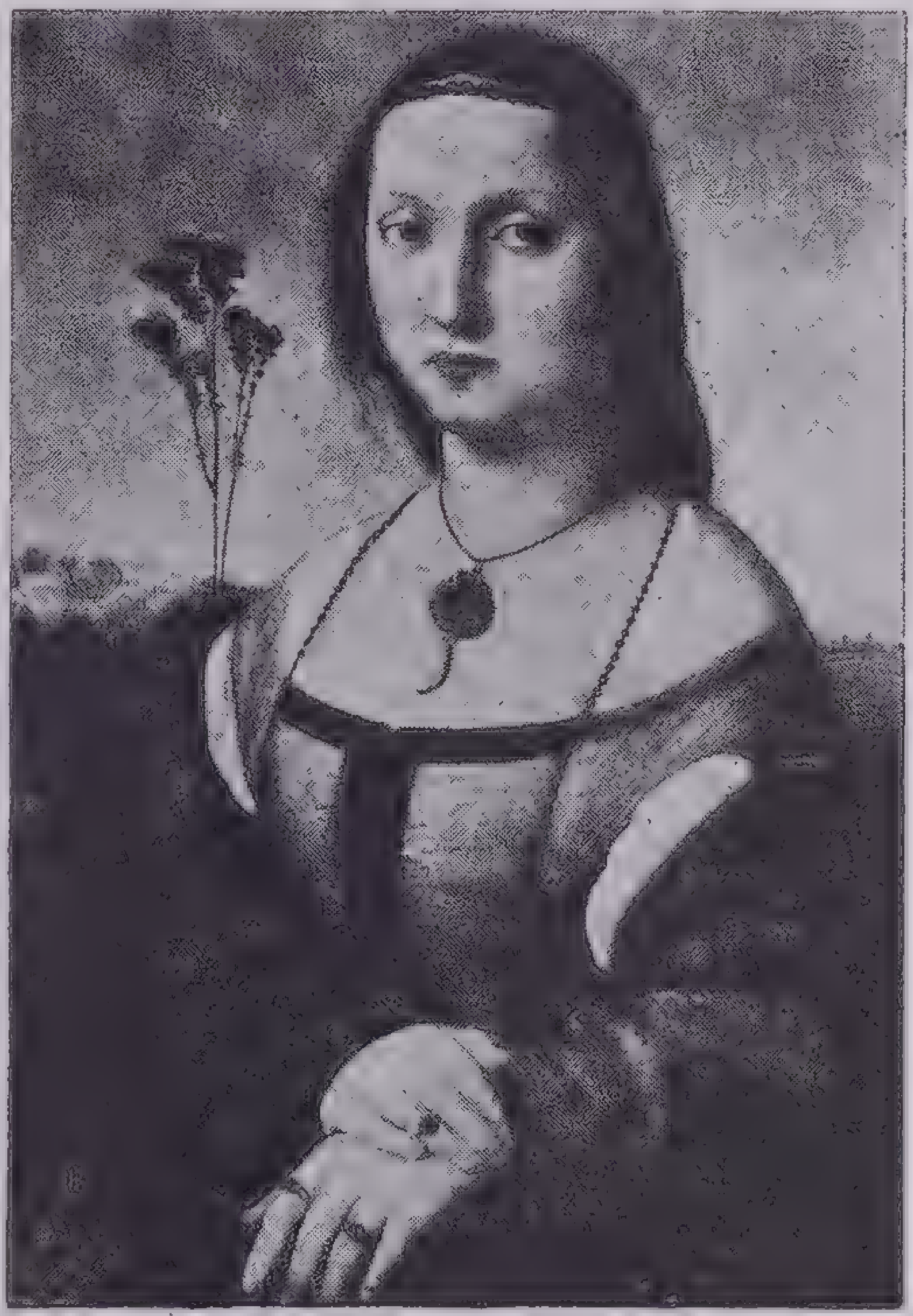
Irving Stone, *Lust for Life* (Van Gogh), Longmans, Green, N.Y., 1934, $2.50

F. J. Mather, *Modern Painting,* Garden City Pub. Co., Garden City, N.Y., 1927, $1.69

C. J. Bulliet, *The Significant Moderns,* Halcyon House, N.Y., 1936, $1.89

Samuel Isham and Royal Cortissoz, *American Painting,* Macmillan, N.Y., 1927, $2.39

Charles H. Coffin, *The Story of American Painting,* Garden City Pub. Co., Garden City, N.Y., $1.79



Courtesy Metropolitan Museum of Art

A Lady of the Italian Renaissance

From the portrait of Maddalina Doni by Raphael Sanzio in the Palazzo Pitti, Florence

Russel Crouse, *Mr. Currier and Mr. Ives,* Garden City Pub. Co., Garden City, N.Y., 1930, $1.98

J. H. Duveen, *Secrets of an Art Dealer,* E. P. Dutton, N.Y., 1938, $3.00

C. H. Whitaker, *Rameses to Rockefeller: the Story of Architecture,* Halcyon House, N.Y., 1934, $1.69

Lewis Mumford, *Sticks and Stones: a Study of American Architecture and Civilization,* Norton, N.Y., 1938, $2.00

Sheldon Cheney, *The New World Architecture,* Longmans, Green, N.Y., 1937, $10.00

E. F. and P. Robinson, *Houses in America,* Viking, N.Y., 1936, $3.00

Bruno Taut, *Houses and People of Japan,* Dodd, Mead, N.Y., 1938, $6.00

Music

Ernest La Prade, *Alice in Orchestralia,* Doubleday, Doran, Garden City, N.Y., 1925, $1.00

H. M. Brower, *Story Lives of Master Musicians,* Stokes, N.Y., 1922, $2.50

F. Schwimmer, *Great Musicians as Children,* Doubleday, Doran, Garden City, N.Y., 1929, $2.00

Ernest Newman, *Stories of the Great Operas and their Composers,* Garden City Pub. Co., Garden City, N.Y., 1928, $1.59

Eric Blom, *The Master Musicians,* E. P. Dutton, N.Y., 1938, $2.00

Philip H. Goepp, *Great Works of Music,* Garden City Pub. Co., Garden City, N.Y., 1913, $1.69

Martin Bernstein, *An Introduction to Music,* Prentice-Hall, N.Y., 1937, $4.00

Arthur Elson, *The Book of Musical Knowledge,* Houghton Mifflin, Boston, 1927, $1.89

Deems Taylor, *Of Men and Music,* Simon & Schuster, N.Y., 1937, $2.50

Claire Reis, *Composers in America,* Macmillan, N.Y., 1938, $3.50

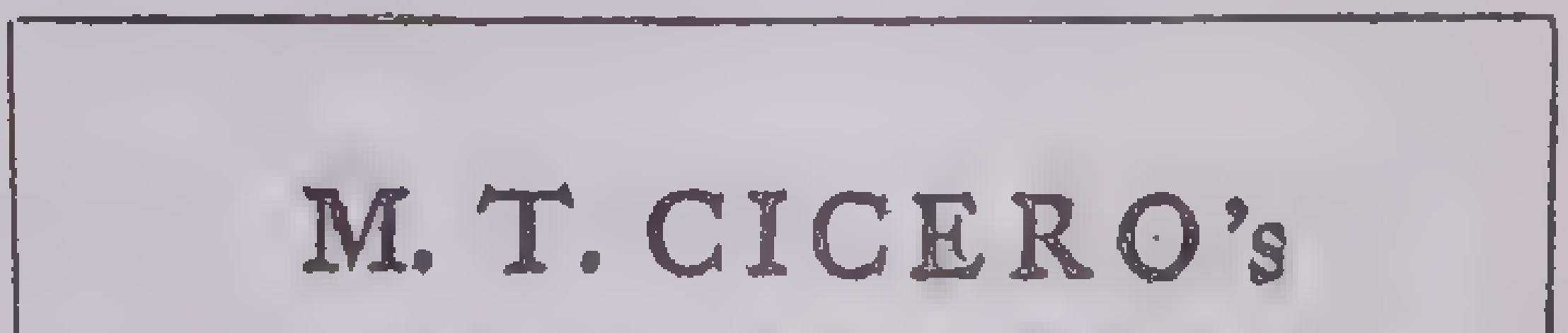
Sigmund Spaeth, *Stories behind the World's Great Music,* Harpers, N.Y., 1937, $2.50

O. A. Stokowski, *A Music Manual,* Norton, N.Y., 1937, $1.00

Marion Bauer and Ethel Peyser, *How Music Grew,* Putnam, N.Y., 1925, $4.50

H. W. Schwartz, *The Story of Musical Instruments,* Doubleday, Doran, Garden City, N.Y., 1938, $3.50

Satis N. Coleman, *The Drum Book,* Reynal & Hitchcock, N.Y., 1931, $2.00



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Olin Downes, *Symphonic Masterpieces,* Dial, N.Y., 1935, $1.29

H. Howard Taubman, *Opera Front and Back,* Scribners, N.Y., 1938, $3.75

The Victor Book of the Opera, RCA Manufacturing Co., Camden, 1936, $1.88

Charles Annesley, *Home Book of the Opera,* Dial, N.Y., 1899, $1.69

H. G. Kinscella, *Music on the Air,* Garden City Pub. Co., Garden City, N.Y., 1934, $1.79

Romain Rolland, *Beethoven the Creator,* Garden City Pub. Co., Garden City, N.Y., 1927, $1.69

Madeline Goss, *Beethoven, Master Musician,* Doubleday, Doran, Garden City, N.Y., 1931, $2.50

S. Kracauer, *Orpheus in Paris* (Offenbach), Knopf, N.Y., 1938, $4.00

Marcia Davenport, *Mozart,* Scribners, N.Y., 1932, $2.50

Sigmund Spaeth, *The Art of Enjoying Music,* Whittlesey House, N.Y., 1933, $2.50

Graphic Arts

Marjorie Maxwell, *The Story of Books,* Harpers, N.Y., 1928, $1.25

D. C. McMurtrie, *The Book,* Covici-Friede, N.Y., 1937, $5.00

D. B. Updike, *Printing Types: Their History, Forms and Use,* Harvard Univ., Cambridge, 1922, $15.00

J. C. Oswald, *Printing in the Americas,* Gregg, N.Y., 1937, $7.50

Frances Rogers and Alice Beard, *Five Thousand Years of Glass,* Stokes, N.Y., 1937, $2.50

N. Hudson Moore, *Old Glass,* Tudor, N.Y., 1935, $1.89

Charles J. Connick, *Adventures in Light and Color* (stained glass), Random House, N.Y., 1937, $12.50

Katherine Gibson, *The Goldsmith of Florence,* Macmillan, N.Y., 1929, $3.00

Graphic Arts (from *Encyclopedia Britannica*), Garden City Pub. Co., Garden City, N.Y., 1936, $1.98

Furniture and Interior Decoration

E. S. Holloway, *American Furniture and Decorations,* Lippincott, Phila., 1936, $2.48

Joseph Aronson, *The Book of Furniture and Decoration,* Crown, N.Y., 1937, $3.00

Thomas H. Ormsbee, *Early American Furniture Makers,* Tudor, N.Y., 1930, $1.29

Thomas H. Ormsbee, *Story of American Furniture,* Macmillan, N.Y., 1934, $4.50

F. C. Morse, *Furniture of Olden Times,* Macmillan, N.Y., 1936, $5.00

N. Hudson Moore, *The Old Furniture Book,* Tudor, N.Y., 1903, $1.19

H. C. Candee, *The Tapestry Book,* Tudor, N.Y., 1902, $1.69

Rosa Belle Holt, *Rugs, Oriental and Occidental,* Garden City Pub Co., Garden City, N.Y., 1917, $1.98

Ross Stewart and John Gerald, *Home Decoration,* Garden City Pub. Co., Garden City, N.Y., 1935, $1.98

Samuel Chamberlain, *Beyond New England Thresholds,* Hastings House, N.Y., 1937, $4.00

Elizabeth Burris-Meyer, *Decorating Livable Homes,* Prentice-Hall, N.Y., 1937, $5.00

Ada W. Camehl, *The Blue China Book,* E. P. Dutton, N.Y., 1938, $5.00

H. D. Eberlein and R. W. Ramsdell, *Practical Book of Chinaware,* Halcyon House, N.Y., 1925, $1.69

N. Hudson Moore, *The Old China Book,* Tudor, N.Y., 1903, $1.48

S. G. C. Ensko and E. Wenham, *English Silver, 1675–1825,* Robert Ensko, N.Y., 1937, $2.50

Fred W. Burgess, *Silver, Pewter and Sheffield Plate,* Tudor, N.Y., 1937, $1.69

Mary H. Northend, *American Glass,* Tudor, N.Y., 1926, $1.37

Edward Thorne and Henry W. Frohne, *Decorative Draperies and Upholsteries,* Garden City Pub. Co., Garden City, N.Y., $2.98

Costume and Design

Agnes Brooks Young, *Recurring Cycles of Fashion,* Harpers, N.Y., 1937, $3.00

Elizabeth McClellan, *History of American Costume,* Tudor, N.Y., 1937, $3.48

Mary Evans, *Costume Through the Ages,* Lippincott, Phila., 1938, $3.50

Elizabeth Hawes, *Fashion is Spinach,* Random House, N.Y., 1938, $2.75

Dance

Lincoln Kirstein, *The Dance,* Putnam, N.Y., 1935, $5.00

Troy Kinney, *The Dance,* Stokes, N.Y., 1924, $7.50

Curt Sachs, *A World History of the Dance,* Norton, N.Y., 1937, $5.00

Cyril W. Beaumont, *Complete Book of Ballets,* Putnam, N.Y., 1938, $6.00

John Martin, *America Dancing,* Dodge, N.Y., 1936, $3.00

John Martin, *The Modern Dance,* Barnes, N.Y., 1933, $1.50

Virginia Stewart, *Modern Dance Symposium,* Armitage & Kessler, Los Angeles, 1935, $3.00

Angna Enters, *First Person Plural,* Stackpole, N.Y., 1937, $4.00

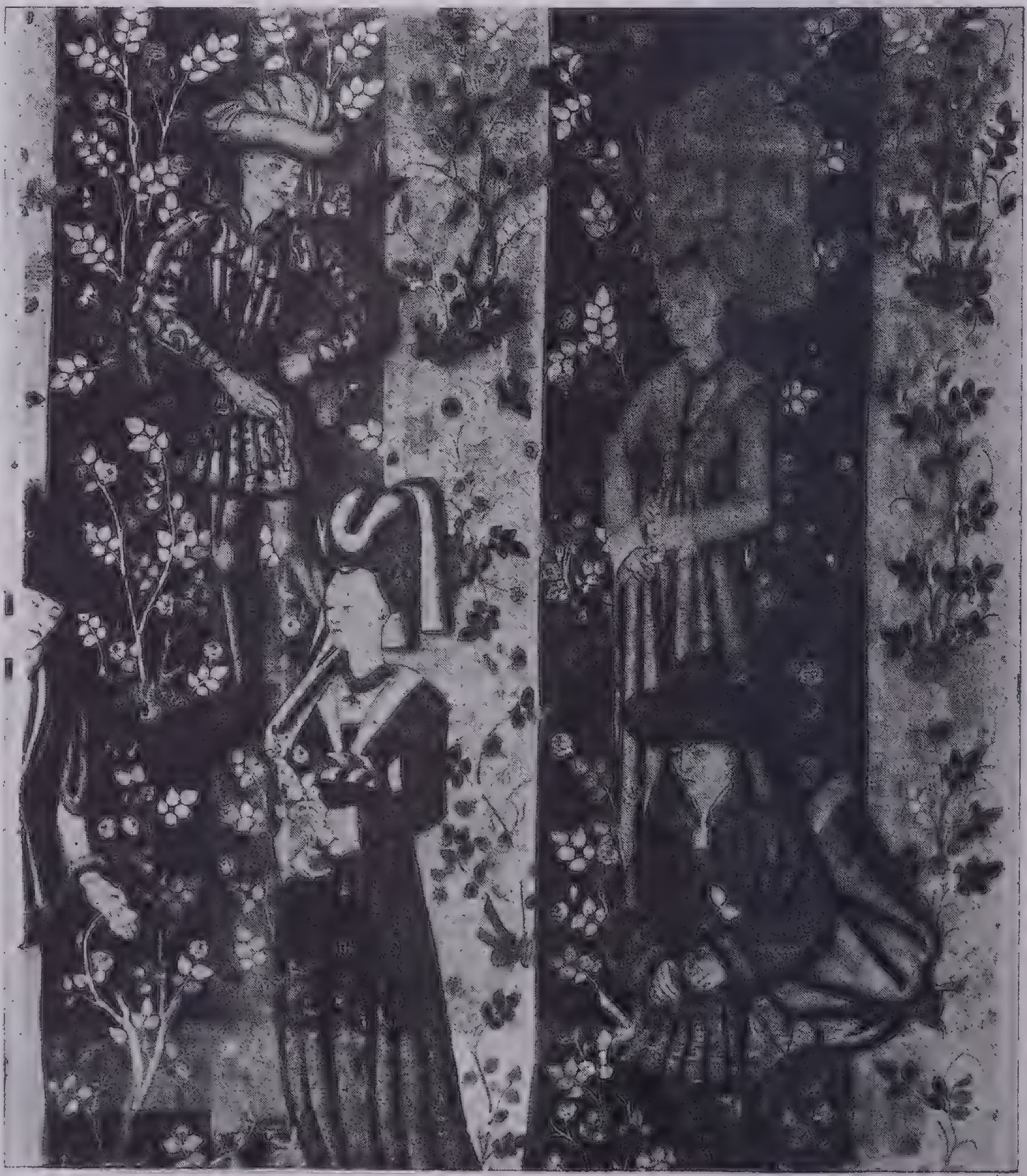
Romola Nijinsky, *Nijinsky,* Simon & Schuster, N.Y., 1936, $2.50

Havelock Ellis, *The Dance of Life,* Houghton Mifflin, Boston, 1929, $1.00

Wilfred D. Hambly, *Tribal Dancing and Social Development,* Macmillan, N.Y., 1927, $6.50

Ninette LaVois, *Invitation to the Ballet,* Oxford Univ., N.Y., 1938, $5.00

Evelyn Porter, *Music through the Dance,* Scribners, N.Y., 1938, $3.00



Courtesy Metropolitan Museum of Art

Gentlemen in Turbans, Ladies in Cauls

Section of a wool tapestry, *La Baillie des Roses,* made in France near the end of the 15th century. The man in the lower right wears a form of turban with a *liripipe* depending from it; the women wear bossed cauls, often known as *butterfly* headdresses

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USEFUL MISCELLANY

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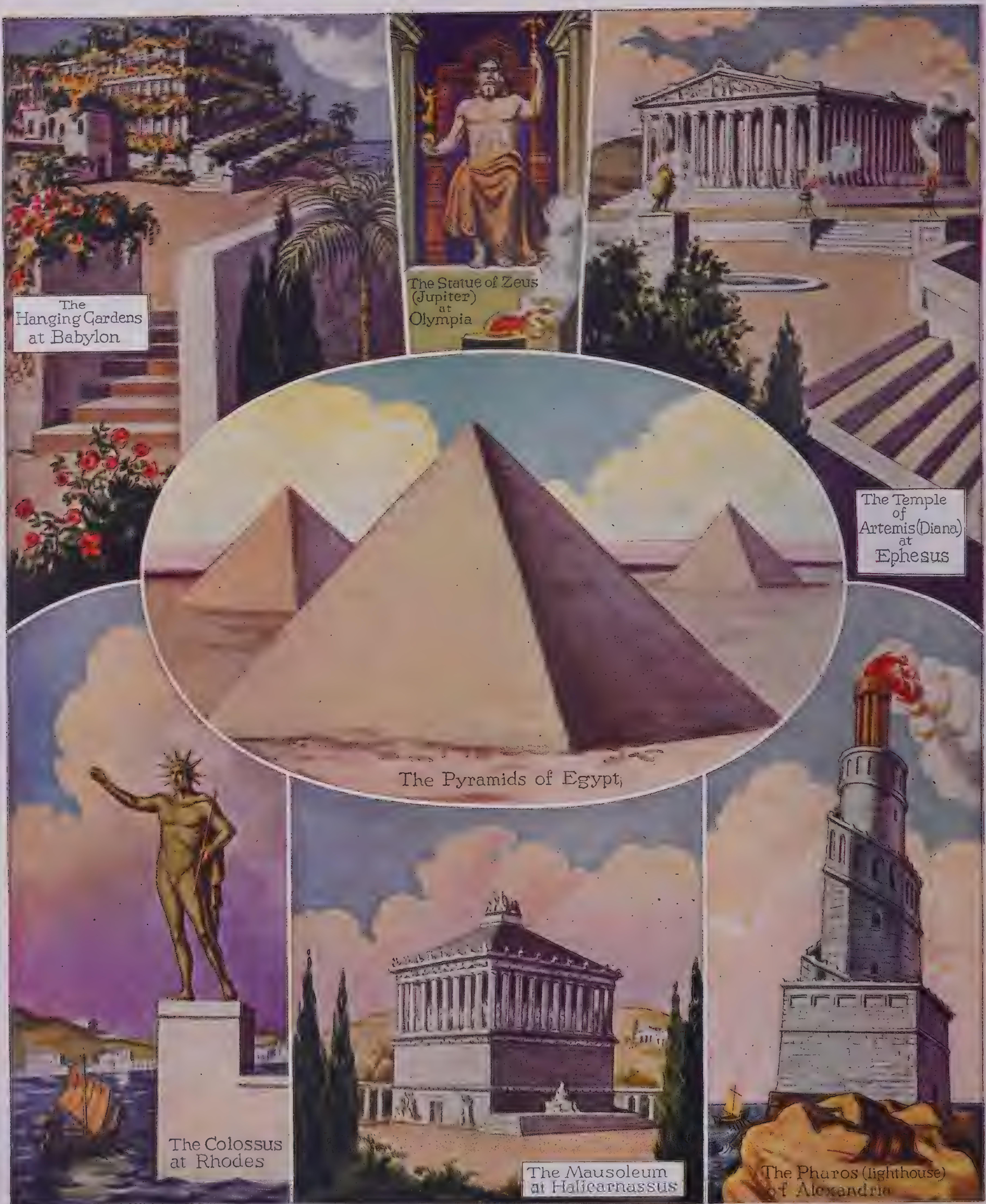
The Hanging Gardens at Babylon
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The Seven Wonders of the Ancient World

BOOK XV: USEFUL MISCELLANY

GAMES, SPORTS AND RECREATIONS

Recreation is a basic human need; it is a spontaneous expression of childhood and a necessary relaxation for the well-poised adult. The need for play has long been recognized. One of the most lucid statements of the principles of recreation was set forth by Howard Braucher, Secretary of the National Recreation Association; the following principles are particularly noteworthy:

> Every child needs to be exposed to the growth-giving activities that have brought satisfaction through the ages—to climbing, chasing, tumbling; to tramping, swimming, dancing, skating, ball games; to singing, playing musical instruments, dramatizing; to making things with his hands, to working with sticks and stones and sand and water; to building and modeling; to caring for pets; to gardening; to nature; to trying simple scientific experiments; to learning team play, group activity and adventure, comradeship in doing things with others.
>
> Every child needs to discover which activities give him personal satisfaction. In these activities he should be helped to develop the essential skills. Several of these activities should be of such a nature that he can keep them up in adult life.
>
> Every man should have certain forms of recreation which require little space and which can be fitted into small fragments of time.
>
> Every man needs to know well a certain limited number of indoor and outdoor games which he himself likes so that there will never be an occasion when he cannot think of anything to do. . . .
>
> . . . Those recreation activities are most important which most completely command the individual so that he loses himself in them and gives all that he has and is to them. . . .
>
> . . . The happy play of childhood is essential to normal growth. Normal men are most likely to grow from the children who have played well and happily. Normal men more easily continue normal as they keep up childhood habits of play.

The means of recreation given in the following pages include those that are *educative,* training brain and muscle to act quickly and accurately; *recreative,* tending to produce relaxation from care; *corrective,* restoring balance and poise to overwrought bodies; and *hygienic,* stirring the sluggish organs of the body so they will better perform their functions.

Athletics have been popular in the United States since Colonial days, but they received a great impetus in the 1850s, '60s and '70s through the establishment of intercollegiate meets. This interest led to the formation in 1875 of the Intercollegiate Association of Amateur Athletes of America (known as the "I.C.4A.'s"); in 1879 the National Association of Amateur Athletes of America was formed; and in 1888 the Amateur Athletic Union of the United States. The control of athletic events has since been distributed among many associations: *local* elementary and high *school* groups; *intercollegiate* conferences (particularly the National Collegiate Athletic Association) with a *regional* or *national* range; and the Y.M.C.A. and similar organizations, *national* groups with the Amateur Athletic Union as the major governing body. The major body with *international* scope is the American Olympic Association with 79 member bodies. In 1937 the Amateur Athletic Union and the National Collegiate Athletic Association were allowed six members each on the governing committee of the American Olympic Association.

Members of the A.A.U. and the I.C.4A. are all amateurs, and the two bodies have similar rules defining amateur standing, which differs primarily from professional standing in the professional's acceptance of money for services as a player or coach. The A.A.U. rules on all sports except tennis, golf, rowing, football and outdoor baseball, which have their individual governing bodies. Amateur standing is closely scrutinized in these sports also, but *open* tournaments, as in golf, are often held, in which both amateur and professional entrants may compete. The Olympic games and other international championship meets specify that all contestants be sworn amateurs.

ANGLING

(Intermediate Grades to Adults)

Angling is the art of catching fish with a rod, line and bait as a recreation; it is termed *angling* in contrast to *fishing,* which is a commercial occupation. There are two branches of the sport—angling in fresh water and angling in the sea.

The boy with a crooked stick, a length of twine, a bent pin and an angleworm probably gets as great a thrill from angling as does the older person with elaborate equipment. The latter attends carefully to the selection of his rod, of which there are several approved varieties. The favorite is of steel or of split bamboo, in three pieces, which may be securely joined into one length when in use. Whether of wood, bamboo or steel, the forms do not vary; an inch or more in diameter at the butt, they taper to a point and possess the property of elasticity to a high degree.

Lines are of finely braided silk or twisted linen threads. To protect them against sizable fish, next above the hook is a strand of gut, which the fish cannot sever by biting. The line is wound upon a reel that is clamped to the handle of the rod through eyelets. The hook is of finely tempered steel; a good hook will not bend but will remain rigid against stress.

To lure different kinds of fish, a variety of bait is recommended. Bass are caught with minnows, small frogs and crawfish; trout are attracted to minnows, grasshoppers and worms. Artificial bait (*flies*) consists of brightly colored pieces of feathers, fur, wool and so on, held together by thread, wax and the like and fastened close to the hook.

After the rod has been used, it should be wiped with a dry rag and gone over again with an oily cloth. If the rod is put away while wet, it may mildew and the glue will be so softened that the rod may soon be ruined.

For the protection of the fish supply in most states there are closed seasons of the year when it is unlawful to fish for one or more varieties. In practically every state angling is declared illegal during the spawning season.

Angling becomes a competitive group sport by means of casting contests for accuracy and distance.

AQUAPLANING

(Senior High School and Adults)

An aquaplane is a narrow raft, light in weight, about 8 feet in length and less than 3 feet in width. Three ropes are attached to the front. One, from 20 to 30 feet in length, is fastened to the stern of a swift motor boat; two short ropes, made secure at the extreme ends of the front, are grasped by the rider to assist in maintaining equilibrium.

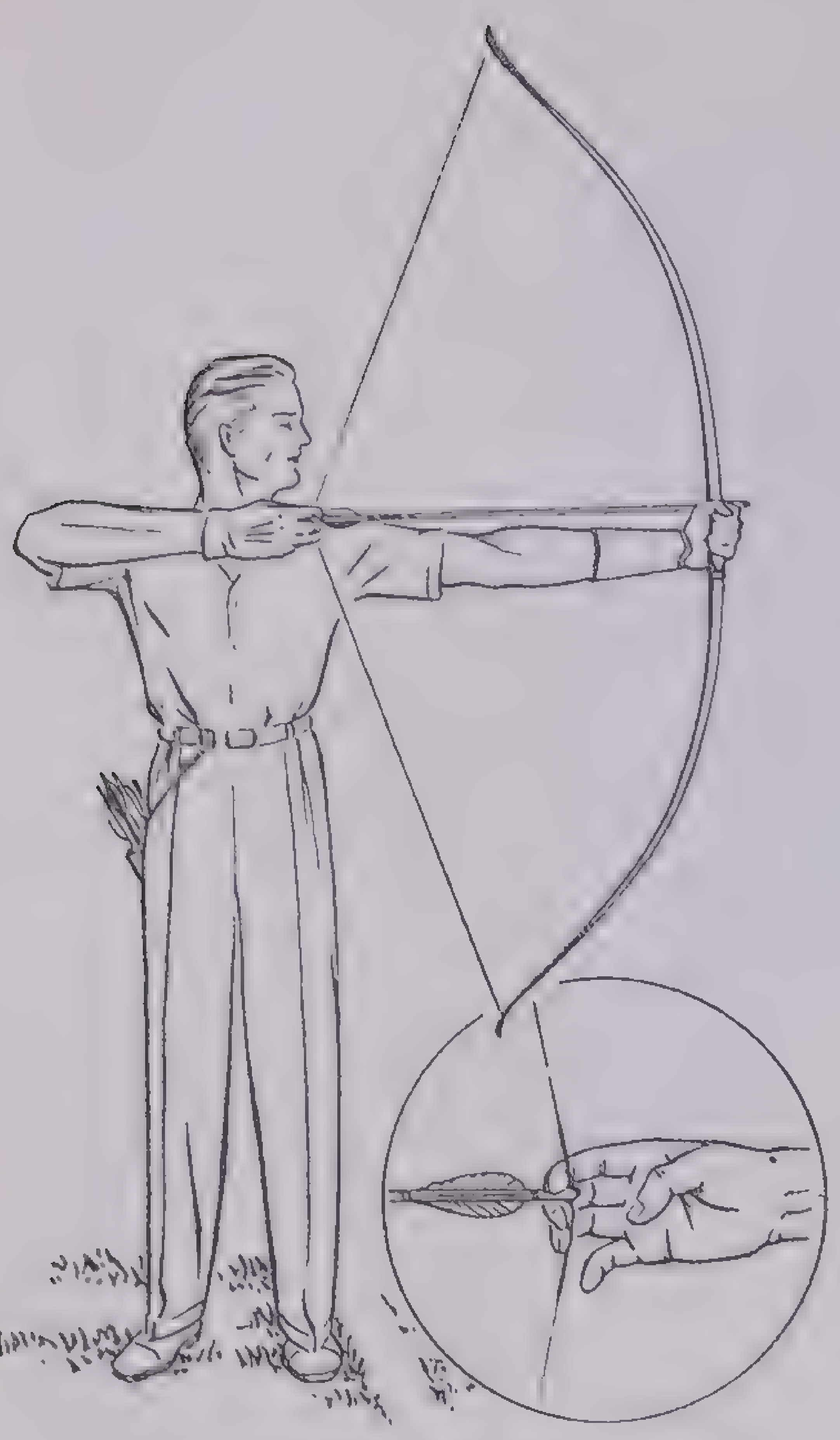
The sport of aquaplaning consists of standing erect on the aquaplane, grasping the two ropes firmly for support and riding atop the water at a rapid rate behind the motor boat that furnishes the power. As the rider is quite likely to lose his footing and be pitched headlong into the water, only good swimmers should attempt to ride unless the route is in very shallow water.

ARCHERY

(Late Elementary School to Adults)

Archery is a recreation that consists of shooting at a target with a bow and arrow and at varying distances. It has never lost its vogue throughout the hundreds of years since the bow and arrow were the equipment of medieval armies.

A bow, arrows, quiver, arm guard or bracer and shooting gloves or finger tips are necessary equipment. The



Drawing the Bow

best wooden bows are still made of yew from Italy, Spain and the northwestern United States. Other satisfactory woods are the American Osage orange, tropical lancewood and lemonwood. Jointed steel bows have been used with enthusiasm since 1927.

The English longbow was usually 5 feet long. The practice now is to have it about equal in height to the bowman. Women's bows are from 5 feet to 5 feet 6 inches and weigh 18 to 35 pounds. Men's bows are from 5 feet 8 inches to 6 feet and weigh from 36 to 80 pounds; Boy Scout bows weigh 15 pounds.

Like fishing rods, bows are made either solid or spliced and are glued. The one-piece, "self" bow has the pleasanter action, but costs more and is more apt to warp or spring out of shape. Very long bows are likely to be spliced in the middle. The wood is rounded on the inside, toward the string and flattened on the other side.

A target arrow is painstakingly made, with a main shaft of Norway pine, cedar or spruce and a piece of hardwood to carry the metallic head. A square notch is cut at the base for the string, and just forward of the notch three feather guides are attached, either by glue, silk winding or a celluloid coating. If these feathers curve, it is important that they all curve in the same direction. Cadmium-plated arrows with feathers affixed by celluloid also are used successfully.

The string of the bow is made of flax or linen, silk-wound to prevent abrasion by the arrow nock and carefully waxed or glued.

Targets for the modern sport or archery, made of solidly pressed straw or of cork, are 4 feet in diameter, with a series of concentric rings 4⅘ inches broad. Each ring has a value that determines the scoring: inner circle (gold), 9 points; inner ring (red), 7 points; next ring (blue), 5 points; next ring (black), 3 points; outer ring (white), 1 point. The bull's eye is 4 feet from the ground and the target is tipped back at the top.

The course for women is 60 yards long with shooting lines 50, 40 and 30 yards from the target; the field for men is 100 yards in length, with the lines at 80, 60, 50 and 40 yards from the target.

The archer with the largest total score wins a tournament unless there is a tie, when the archer with the largest total score at the longest range would be the winner.

Archery courses may be installed economically in basements, attics or gymnasiums, and there should be a backstop for the target of bales of straw or felt. If the range is to be less than the regulation, the target would be made correspondingly smaller—a 2-foot target is correct for a field of 15 yards.

BADMINTON

(Junior High School to Adults)

Badminton is a comparatively new game in America, but is becoming popular because of its close relationship to tennis. It is an especially desirable game for younger children who like tennis; tennis rackets are too heavy for them, while the badminton racket is very light, and the game is less strenuous.

Badminton can be played indoors or outdoors upon a court with a net whose top is 5 feet from the floor or ground. The doubles court is 20 feet wide by 44 feet long. On each side of the net there is a 6-foot service line and back of that two 13-foot courts, one on either side, and the back boundary line is 2½ feet wide. The singles court is practically the same but does not have a separate back boundary line and is only 17 feet wide.

The racket is similar to that used in tennis but much lighter, and the handle is longer, resembling a squash racket. A shuttle consisting of a weighted cork with a row of feather is used instead of a ball.

The object of the game is to make returns before the shuttle touches the ground. This makes the game interesting and very fast. As the shuttle is struck with a racket it goes swiftly for a short distance and then slows down suddenly. It requires accurate judgment to cope with this change of pace. Scoring is similar to that of volleyball and is easy for a beginner to follow. Badminton is an especially desirable game because it does not require expensive courts and high fence protection. The shuttle never goes far, so that time is not lost in retrieving it.

BASEBALL

(Late Elementary School to Adults)

Baseball is a game played by two opposing teams of nine men each, on a field marked in the form of a square, with a plate called a *base* at each corner. This field is known as a *diamond* and is 82 feet square for boys under 16 years of age and 90 feet square for players over 16. The participants on each side are a pitcher, catcher, first baseman, second baseman, third baseman, shortstop, right fielder, center fielder and left fielder. An umpire is chosen to rule on each play and have full authority to decide any controversy.

The object of the game is to make as many runs as possible, that is, make circuits of the four bases as a result of hits by an individual batter or other members of his team. The members of each team bat in turn according to the manager's schedule.

The opposing team in the field, the *outs,* employ various accepted methods of *putting out* the batters or base runners, so that they may take their turn at bat. The team that makes the larger number of runs wins the game; in case of a tie at the end of the ninth inning, the game is continued until one team scores more runs than its opponent in the same number of innings.

A standard game of baseball consists of nine innings. The captain of the home team chooses whether his men shall bat or take the field for the first half of the first inning, but it has become standard practice for him to allow the visiting team to bat first. After three men of the side first at bat have been put out, the teams exchange places and so alternate throughout the game, each half inning continuing until three men have been put out.

The game begins when the fielders of one side have taken their positions and the first batter has come "up" to the home plate.

The pitcher delivers the ball to the batter, and the batter attempts to hit the ball out of reach of the fielders so that he may run the bases. He is allowed three fair opportunities to hit the ball or three *strikes.* One *strike* is called:

1. Whenever the batter swings at a pitched ball and misses.
2. Whenever the ball is legally thrown by the pitcher over the home plate at a height between the batter's knees and shoulders although the batter does not swing at it. The umpire is the final judge of whether a given pitched ball meets these conditions.
3. Whenever a *foul tip* (that is, a ball just grazed by the bat but not deflected above the batter's head) is caught by the catcher.
4. When the batter, on the first or second strike, hits a *foul* (that is, a ball that settles outside the lines running from the home plate to first and third base). Fouls (other than a foul tip held by the catcher or a foul bunt) may be hit on the third strike without penalty.
5. Whenever the ball is *bunted* (that is, not swung at, but met with the bat and tapped slowly) and a foul results. It makes no difference whether the foul bunt occurs on the first, second or third strike.

If the batter does not swing at a pitched ball and if, in the judgment of the umpire, the ball does not pass fairly over the plate between the batter's knees and shoulders, a *ball* is called. The batter is permitted to take first base if four *balls* are thrown before three *strikes*.

Becoming a Base Runner.—A man at bat, standing at the home base (or home plate), becomes a base runner:

1. If he makes a fair hit (not a foul) by intercepting a pitched ball with his bat and knocking it into *fair* territory within the diamond or within lines that are left and right extensions of the diamond.
2. If the umpire calls *four balls* on the pitcher.
3. If a third strike called by the umpire is not caught and held by the catcher.
4. If the person or clothing of the batter is hit by a pitched ball at which he does not swing and which he makes a reasonable effort to avoid.
5. If the catcher interferes with his attempt to bat.
6. If a fair-hit ball touches the person or clothing of an umpire or base runner before touching a fielder.

Advancing a Base.—A runner may advance from first or any base whenever he can touch the next plate before the ball can intercept him. If two men claim the same base as the result of one hit or pass to base succeeding another, the first runner is forced to advance to the next base. The runner may also advance a base if he is blocked from a base by a fielder who is trying to catch the batted ball or if the umpire calls a balk. A move out of position by the catcher for an intentional base on balls allows the runner to advance a base; also an illegal stop or catch by a fielder permits the runner to advance. He is further entitled to a base if the pitched ball passes the catcher and hits a building or fence within 60 feet.

Putting Out.—A player is declared *out* in any one of 20 cases, the commonest being these:

1. If he bats either a foul or a fair hit that is caught by an opponent before the ball touches the ground. (Except a foul tip caught by the catcher, which counts only as a strike.)
2. If, while he is a batter, three strikes are called on him.
3. If, while he is a base runner, he is touched by a ball in the hands of an opponent, unless some part of the runner's person is in contact with a base to which he is entitled.
4. If he is forced by a fair hit or third strike fumbled by the catcher to advance to any base (usually first base) and the ball is fielded and held by an opposing player in contact with that base before the runner reaches it.
5. If he interferes with a player attempting to field a batted ball.
6. If, while he is running bases, he runs more than 3 feet from the base line to escape being tagged by an opposing fielder with the ball, except to avoid an opponent who is fielding a batted ball. But a player is permitted to overrun first base and may not be touched out while returning.
7. If, after a fair or foul fly ball is caught, the ball is held by a fielder in contact with any base occupied by a base runner at the time the ball is batted before the base runner retouches such base after the catch. A base runner is said to occupy a base up to the instant he touches the next base.

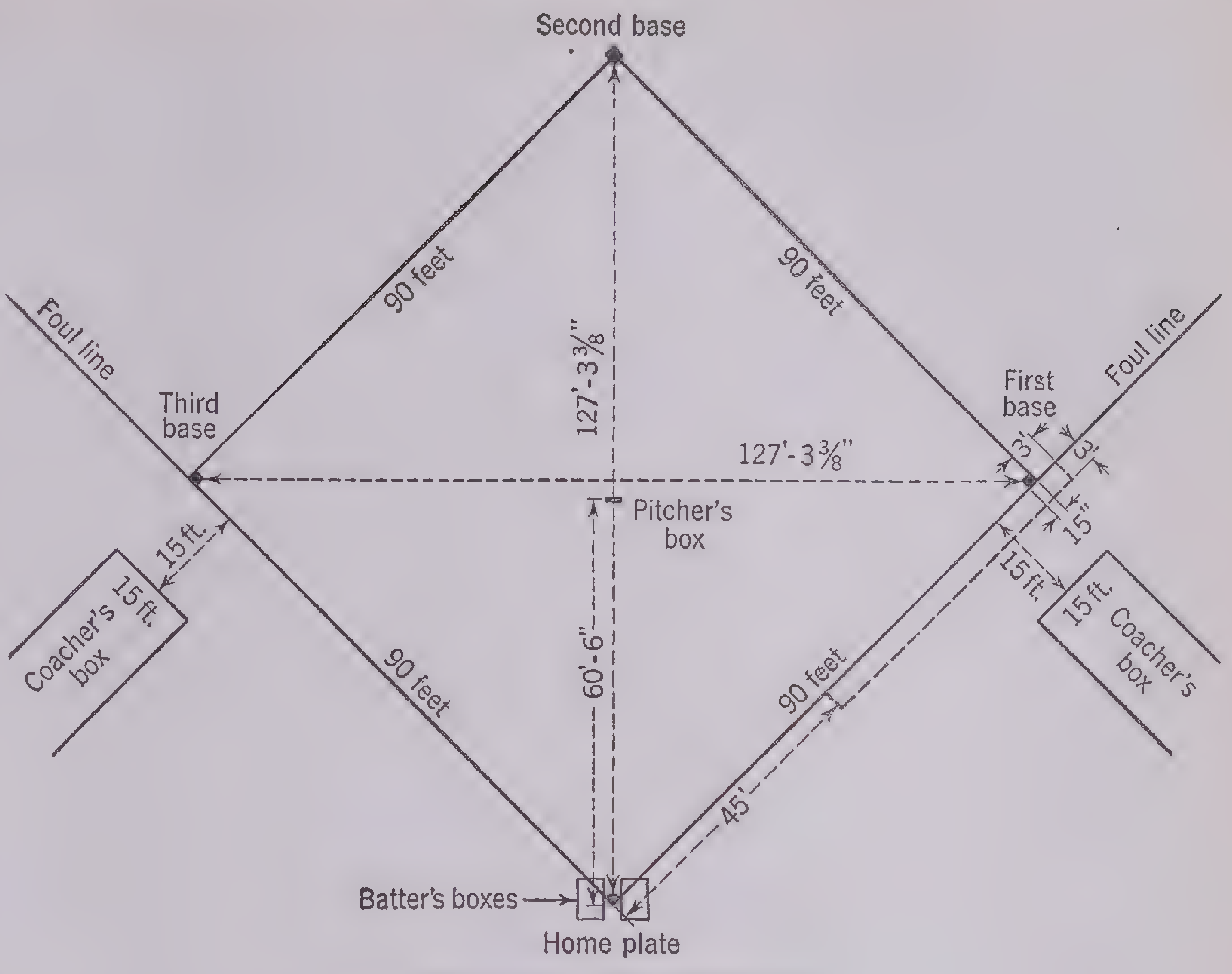


Diagram of a Baseball Diamond

Three *outs* are permitted to each team in each inning. After three players have been put out, the team at bat is retired for that inning, and the fielding team becomes the batting team. Any runners who may be on base at the time the third out is made lose their advanced positions; each inning begins with all of the bases clear.

A run is scored every time a base runner legally touches the home plate before three men are put out, except that a run cannot be scored on the third out if the batter is put out before reaching first base or if the third out is the result of a *force play,* that is, the touching of a base by a fielder with the ball before the base is reached by a base runner forced to advance to it by a fair hit by the batter.

Materials

official ball, Reach or Spalding, cork center, yarn wound, horsehide cover, 9 to 9¼ inches circumference, 5 to 5¼ ounces.

bat, hardwood, round, tapering, diameter not over 2¾ inches, not over 42 inches long.

catcher's or first baseman's glove, any size, shape or weight.

all other gloves, weight not over 10 ounces, size not over 14 inches around palm.

protector, a padded or air-filled shield as breastplates for the bodies of umpire and catcher.

mask, a wire headgear for catcher and umpire stationed behind the bat, especially to protect against foul tips.

leg guard, a lower defensive armor for umpire and catcher.

base, stuffed white canvas bag, 15 inches square, attached by its center at intersection of base lines for first, second and third bases.

home plate, five-sided white rubber plate. Front 17 inches, side 8½ inches, running along base lines 12 inches each.

pitcher's plate, white rubber, 24×6 inches, located 60 feet 6 inches from the home plate. For boys under 16 the pitcher's box is 50 feet from the home plate.

toe plate, heel plate, spiked to prevent slipping.

Grounds

diamond or infield, a square, 90 feet on a side, within or near which the pitcher, catcher, basemen and shortstop play their defensive game against the batsmen and base runners of the opposing team.

outfield, the clear space beyond first, second and third bases, in which the three fielders work. The outfield should extend at least 235 feet from the home plate.

pitcher's box, a position for the pitcher, in which one or both of the pitcher's feet are touching the pitcher's plate.

catcher's box, a triangular space 10 feet deep, behind the home plate.

batter's box, a rectangle 4 × 6 feet, at right and left of home plate, 6 inches from the plate.

player's lines, enclosed rectangles 50 × 75 feet along base lines each side of home plate, to be kept clear of all players not actually engaged in the game.

coachers' lines, outside the diamond, 15 feet from the foul line and parallel to it, near first and third bases, beyond the players' lines. One coacher may work along this line at first and one at third, but never within the line.

backstop, a large upright frame covered with wire netting, at least 90 feet behind home plate.

grandstand, covered stands with seats for spectators at least 90 feet from home plate or foul lines.

bleachers, in outfield, benches for spectators at least 235 feet from home plate.

foul lines, outside the base lines from home plate to first and third bases and their continuation into the outfield.

players' bench, a bench at least 25 feet outside players' lines, on which must be seated all players of the team at bat except those actually batting, coaching or running bases.

Terms of Play

assist, any handling of the ball that directly aids in putting an opponent out is called *an assist* and is so recorded by the scorer.

balk, one of the numerous motions forbidden chiefly to the pitcher; for example, the pitcher may not begin to throw to the batter or to first base without completing the throw; he may not throw to put out a base runner without stepping directly toward the base at which he aims.

base on balls, when a pitcher has made four throws to a given batter, at which the batter does not strike and which do not pass over any part of the home plate, the batter is entitled to become a base runner at first base.

base runner, a player who has ceased to be a batter and is on his way around the diamond in an attempt to score.

batting order, a regular arrangement of player's names for succession in batting. Batting order cannot be changed during a game, except by the use of substitutes. When a player is succeeded by a substitute, he cannot re-enter the game.

blocked ball, a ball that, while in play, touches any person not in the game. In case of a blocked ball, the players running bases may advance until the ball is again in the pitcher's hands.

bunt, bunt hit, a form of batting in which the ball strikes the bat, which remains horizontal in the batter's hands. A bunted ball is commonly a sacrifice (see below), though a swift runner with a quick getaway may sometimes "beat out" a well-placed bunt, especially if there is indecision among the fielders as to who shall field the bunted ball. A bunted foul counts as a strike, even though it is a third strike.

called game, a game terminated by the umpire because of rain, panic, fire, darkness or any other cause that might endanger or seriously inconvenience players or spectators. Games thus ended before the fifth inning is completed are commonly called *no game;* if five innings have been played, and the game is stopped, the score at the conclusion of the last inning is considered the final score.

caught stealing, the putting out of a base runner who is trying to make a base on the sly.

chance, the opportunity of a fielder to field a ball in such manner as to assist in retiring a base runner.

foul strike, fouls count toward the first two of a batter's three possible strikes. Three foul bunts may count for all three strikes.

foul tip, a foul hit in which the bat merely grazes the ball.

hit batter, a batter whose person or clothing has been hit by a pitched ball that he made reasonable effort to avoid.

home run, a fair hit that goes so far that the batter is able to make the circuit of the bases before the ball can be fielded and returned to one of the bases in time to interrupt his run.

infield fly, before two men are out, with runners on first and second bases, the umpire will declare out any man who bats a fair fly that can be handled by the infield, bunts excepted.

passed ball, a pitched ball that goes without interference to the backstop 90 feet behind home plate. In such case all runners advance one base.

run, a complete circuit of the bases, resulting in a score.

runs batted in, runs scored by reason of hits made by other players on the same team.

sacrifice, a hit made for the purpose of advancing a base runner, though the batter expects to be put out.

safe hit, a hit that cannot be fielded in time to prevent the batter from reaching first base.

shut out, a game in which a team is prevented from making any score.

strike, in general, one of three batting opportunities when the ball is pitched properly over the home plate.

time, temporary suspension of play by the umpire.

wild pitch, a pitched ball so high or wide that it cannot be fielded effectively by the catcher.

double play, triple play, a play in which two or three runners are put out by clever fielding in quick succession.

drawn game, a game with a tie score, called by the umpire after five or more innings.

earned run, scored when a player reaches home base by reason of safe hits, sacrifice hits, stolen bases, bases on balls, wild pitches and balks but not by reason of fielding errors or penalties other than those implied in this list.

error, in general, any misplay in fielding.

extra innings, play that runs beyond the regular nine innings by reason of a tied score.

fair hit, a hit that settles on the foul line or inside the diamond, short of first or third base; a hit that, passing first or third base, bounds on fair territory or first strikes on fair territory.

fly, a ball batted high in fair territory.

forfeited game, a game awarded by the umpire against an offending team by reason of broken rules of play.

foul, foul hit: (1) short of first or third base, a batted ball that settles outside the diamond or would so settle if not interfered with; (2) a batted ball that bounds past first or third base into foul territory; (3) a batted ball that first lands on foul territory beyond first or third base.

The Box Score.—Newspapers publish in compact columns the record of each important baseball game. Below is the score of one of the most famous games in the history of baseball—the final game of the World's Series between the Boston Red Sox (American League) and the New York Giants (National League), at Boston, played October 16, 1912. Several of the greatest players of all time participated—"Christy" Mathewson, pitcher of the famous *fadeaway* drop curve; "Smoky Joe" Wood, speed-ball pitcher; "Tris" Speaker, star outfielder. The game was the eighth of the series (each team had won three games, and one game had been tied), and so great was the popular interest that the hard-fought presidential campaign and the attempted assassination of Theodore Roosevelt in Milwaukee that had occurred a few days earlier were crowded off many front pages to make room for the report. The game ran to 10 innings with the score tied 1 to 1 at the beginning of the 10th. The Giants scored what should have been the winning run in their half of the 10th inning; in the last half of the 10th inning, a pinch hitter, Engle, lifted a fly to center field. Fred Snodgrass, Giant center fielder fumbled the easy catch; and Engle, thus allowed on base, later scored the tying run. The Giant defense became rattled; and Tris Speaker, who should have been put out on an easy foul near first base, drove Engle in with a long single. Snodgrass's error, which was universally blamed for the loss of the game by the Giants, became known as the "$30,000 muff" since this was the amount lost by the Giant players in consequence.

New York (Giants)

	AB.	R.	H.	TB.	PO.	A.	E.
Devore, rf	3	1	1	1	3	1	0
Doyle, 2b	5	0	0	0	1	5	1
Snodgrass, cf	4	0	1	1	4	1	1
Murray, lf	5	1	2	4	3	0	0
Merkel, 1b	5	0	1	1	10	0	0
Herzog, 3b	5	0	2	3	2	1	0
Meyers, c	3	0	0	0	4	1	0
Fletcher, ss	3	0	1	1	2	3	0
Shafer, ss	0	0	0	0	0	0	0
Mathewson, p	4	0	1	1	0	3	0
McCormick*	1	0	0	0	0	0	0
Totals	38	2	9	12	29†	15	2

* Batted for Fletcher in 9th.
† 2 out when winning run scored.

Boston (Red Sox)

	AB.	R.	H.	TB.	PO.	A.	E.
Hooper, rf	5	0	0	0	3	0	0
Yerkes, 2b	4	1	1	1	0	3	0
Speaker, cf	4	0	2	2	2	0	1
Lewis, lf	4	0	0	0	1	0	0
Gardner, 3b	3	0	1	2	1	4	2
Stahl, 1b	4	1	2	3	15	0	1
Wagner, ss	3	0	1	1	3	5	1
Cady, c	4	0	0	0	5	3	0
Bedient, p	2	0	0	0	0	1	0
Wood, p	0	0	0	0	0	2	0
Henriksen*	1	0	1	2	0	0	0
Engle†	1	1	0	0	0	0	0
Totals	35	3	8	11	30	18	5

* Batted for Bedient in 7th.
† Batted for Wood in 10th.

Score by innings:

New York	0	0	1	0	0	0	0	0	0	1—2
Boston	0	0	0	0	0	0	1	0	0	2—3

2 base hits—Murray (2), Herzog, Gardner, Henriksen, Stahl. Sacrifice hit, Meyers. Sacrifice fly, Gardner. Stolen base, Devore. Left on bases, New York 11, Boston 9. Bases on balls, off Bedient 3; off Mathewson 5; off Wood 1. First base on errors, New York 1, Boston 1. Struck out, by Mathewson 4; by Bedient 2; by Wood 2. Time, 2h. 37m. Umpires—At plate O'Laughlin; on bases Rigler; in left field Klein; in right field Evans.

Meaning of Abbreviations.—AB, times at bat; R, runs; H, (safe) hits; TB, total bases made on safe hits (example, a two-base hit and a three-base hit count for five total bases); PO, put-outs; A, assists; E, errors.

In scoring put-outs the player holding the ball at the instant the out is made is credited; thus, the catcher, not the pitcher, is credited with the put-out on a strike-out; the first baseman is credited when the batter is thrown out at first base on a ground hit to the infield. In most scores the total number of put-outs scored by the winning team is 27 (3 in each of 9 innings); the number scored by the losing team is either 24 or 27 depending on whether the winning team took the field first or second in the first inning. If the team entitled to bat second is ahead at the end of the first half of the 9th inning, there is no point in playing the game out, and accordingly only 24 put-outs will ordinarily be made by the winning team. It occasionally happens that an out occurs without a put-out being scored; for example, when a base runner is hit by a batted ball. In such a case the box score usually carries a footnote explaining why the number of put-outs is not 24 or 27.

Times at bat are not counted if the batter receives a base on balls, makes a sacrifice hit or becomes a base runner in consequence of being struck by a pitched ball. It may thus happen that runs may be scored by players whose "times at bat" in the box score is zero.

Batting averages are figured by dividing the number of base hits made by a player by the number of times at bat; in the batting average a home run counts the same as a single or one-base hit. Batting averages are spoken of in terms of the number of hits per thousand times at bat; thus a player who makes 6 hits in 20 times at bat has an average of 6/20 or 300/1000 and is said to bat 300.

BASKETBALL

(Junior High School to Adults)

This most popular of all American indoor games was invented in 1891 by James Naismith, a student at the Springfield, Mass., Y.M.C.A., to fill the need for an active game to bridge the period between fall sports and those of the following spring. It is played on a specially marked court between two opposing teams that endeavour to score the larger number of goals by tossing the ball through the opponents' basket.

Two teams of five men (two forwards, two guards and a center) play for two halves of 20 minutes each, with an intermission of 10 minutes. Women's basketball teams are usually formed of six players with an additional center and observe somewhat different rules of play.

A basketball court is a rectangle with clearly marked sides and end lines with a minimum size 60 feet long and 35 feet wide and a maximum size 94 feet long and 50 feet wide. The court for younger players should be the minimum size.

At the center of each end of the court, a bottomless "basket" of string is suspended 10 feet above the floor from a wire ring 18 inches in diameter, carried by a backboard 4 feet wide and 6 feet long. The ball is an inflated leather bladder 30 to 32 inches in circumference.

Free-throw lines are 24 inches long, directly in front of the baskets, 17 feet from the end lines. Free-throw lines are so marked that no player of either side may come within 3 feet of the ball during its progress from the free-throw line to the basket.

At the center of the court is a circle 4 feet in diameter, within which the ball is put in play by the referee at the beginning of each half of the game.

A goal scored from the field in the ordinary course of the game counts two points; a goal secured from the free-throw line as the penalty for a foul committed by opponents counts one point.

Two classes of fouls are distinguished: *Personal fouls* are declared for forbidden roughness in personal contact, for holding a player or blocking his progress. For personal fouls, the penalties range from one free throw to the disqualification of the player for the remainder of the game. Four personal fouls of any sort during a game disqualify the player for the remainder of that game.

Technical fouls are called for other violations of the rules; for example, it is forbidden to *carry* the ball more than one step in any direction; to delay the game, to talk to officials during the game and so on.

To *dribble* is to keep the ball moving, in one player's possession, by throwing, batting, rolling or bounding it on the floor with one hand. A dribble ceases if the ball comes to rest in one or both hands, if it touches both hands at once, or if it touches a second player. The ball may be batted in the air only once during a dribble. A player may throw for goal after dribbling.

The ball is *dead* after a goal is made, or a goal after foul is made; the referee hands the ball to a player of the team against whom the score was made, and from back of the goal line he throws, rolls or bounces it to another player.

A ball becomes dead when it goes out of bounds. The last player who touches it before it leaves the court is held to be the cause of its going out of bounds. The referee commonly designates the nearest opposing player to put the ball in play by throwing, rolling or bounding it to another player in the court.

A ball is *held* when two opposing players have one or both hands on it or when a closely guarded player is held by the referee to be withholding the ball from play. A held ball is dead until put in play by the referee at the spot where held, in the same manner as at the beginning of the game, except that a ball held in either end zone must be thrown out by a member of the defending team.

If the referee is unable to decide who is responsible for a ball going out of bounds, he declares a *jump ball* near the boundary line, two players of his own choosing jumping for it when he tosses it up.

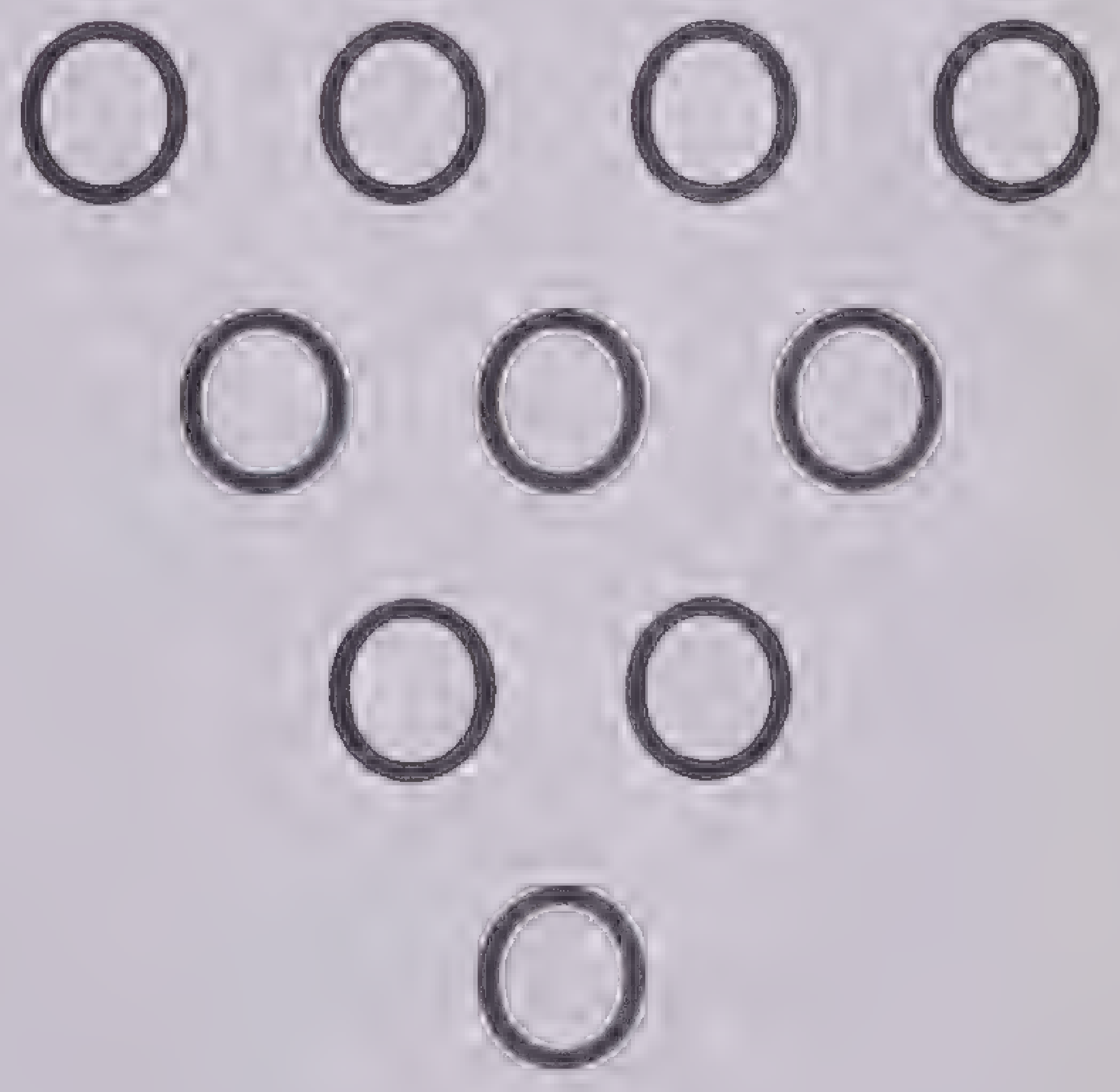
Three time-out periods may be taken during any game whenever the ball is dead. For younger boys of junior high school age, it is preferable that the game be divided into four quarters of 6 minutes each, with a 2-minute rest following the first and third quarters and an intermission of 10 minutes between halves. The periods for senior high school boys are often divided into 8-minute quarters with 1-minute rests after the first and third quarters and a 10-minute intermission between halves.

BOWLING

(Junior High School to Adults)

Bowling is a game played on a long, specially constructed alley; the purpose of the contest is to roll large balls down the alley and knock over as many as possible of the 10 pins at the far end. The alley is very smooth, constructed of boards set on edge, so the balls rolled upon it will move forward as directed without any deviation; it is 42 inches wide and 60 feet long from starting point to the number-one pin. On each side of the alley is a narrow depression to receive balls that are poorly directed and to return them to the player.

The pins are of hardwood and are set at the lower end of the alley in this fashion:



The standard-sized ball is 27 inches in circumference and weighs 16½ pounds; smaller sizes and weights also are available.

A player throws two balls in succession from any distance behind the foul line with the hope of toppling over all 10 pins; if he does it in one throw, he makes a *strike;* if in two throws, a *spare.* If he leaves some pins standing, he is credited with the number of pins downed. If he gets a strike, it counts 10 plus all the pins downed in the next two throws; if he gets a spare, it counts 10 plus the number of pins downed in the next single throw. The score for each two balls constitutes a *frame,* and there are 10 frames to be filled in each game.

When a strike is made, no score is immediately recorded, but a cross is made in the small square set in the corner of the frame, and the result of the frame cannot be put into figures until two more balls are thrown. If a spare is made, a diagonal line is put into the small square, and not until the next ball is rolled can the figure for that frame be added.

The accompanying diagram shows the scores for two players; the system of scoring can be explained from the exhibit of player J.C.B.:

NAME	1	2	3	4	5	6	7	8	9	10	STR.	SP.	TOTAL
J.C.B.	☐ 9	/ 26	☐ 35	☒ 55	/ 72	☐ 80	/ 98	☐ 106	/ 124	☐ 133	1	4	133
E.W.M.	☒ 20	/ 38	☐ 47	/ 65	/ 84	☐ 93	/ 111	/ 130	☐ 139	/ 158	1	6	158

In his first two throws only 9 pins were downed. In the second frame he secured a spare, and in the third frame 7 pins on the first ball, which credits him with 17 points to be added to the 9 in the first frame or a total of 26 for the second frame. On his second throw in the third frame 2 more pins are downed, which gives him 9 for that frame, which is added to the 26 of frame two, making 35 to and including frame three. In the fourth frame a strike occurs, and a cross records it. In the fifth frame of two balls, a spare is made, counting 10 to be added to the 10 for the preceding strike, totalling 20, which total is added to the 35 shown in frame three, a grand total of 55 for frame four.

In frame six only 7 pins are downed on the first throw; there is a credit of 10 for the preceding spare, so frame five will record 17 to be added to the preceding 55 or 72 for frame five; on the second throw in frame six 1 more pin topples, a total of 8 for the frame. Frame seven yields a spare; and frame eight, 8 pins on the first throw; the 10 for the spare plus 8 gives 18 for the score for frame seven, which, added to the 80 totaled to and including frame six, makes 98, for the second throw yielded nothing. Frame nine records another spare, or 10, plus 8 for the first throw in frame ten, or 18, which added to the 106 totaled so far gives 124; the second throw in the last frame adds 1 or 9 altogether for frame 10, and this, added to 124 up to and including frame nine, gives 133 for the game. If a strike is made on the tenth frame, two more balls may be thrown; if a spare is made, as in E.M.W.'s score, one more ball may be thrown and the result is added to the score.

Candlepins and Duckpins. There are two interesting variations of the game of bowling (tenpins). One, known as *candlepins,* is played in the same way and with the same sized bowling ball as tenpins, but the candlepins are in the general shape of a candle, long, narrow and nearly straight from bottom to top.

The other variation of bowling is a game called *duckpins,* played with very much smaller pins and balls about the size of croquet balls. The rules, scoring and procedure are as in bowling. This game is especially attractive for women and children since they can get from it practically all the sport of bowling but without the strain of handling a heavy ball.

BOXING

(Junior High School to Adults)

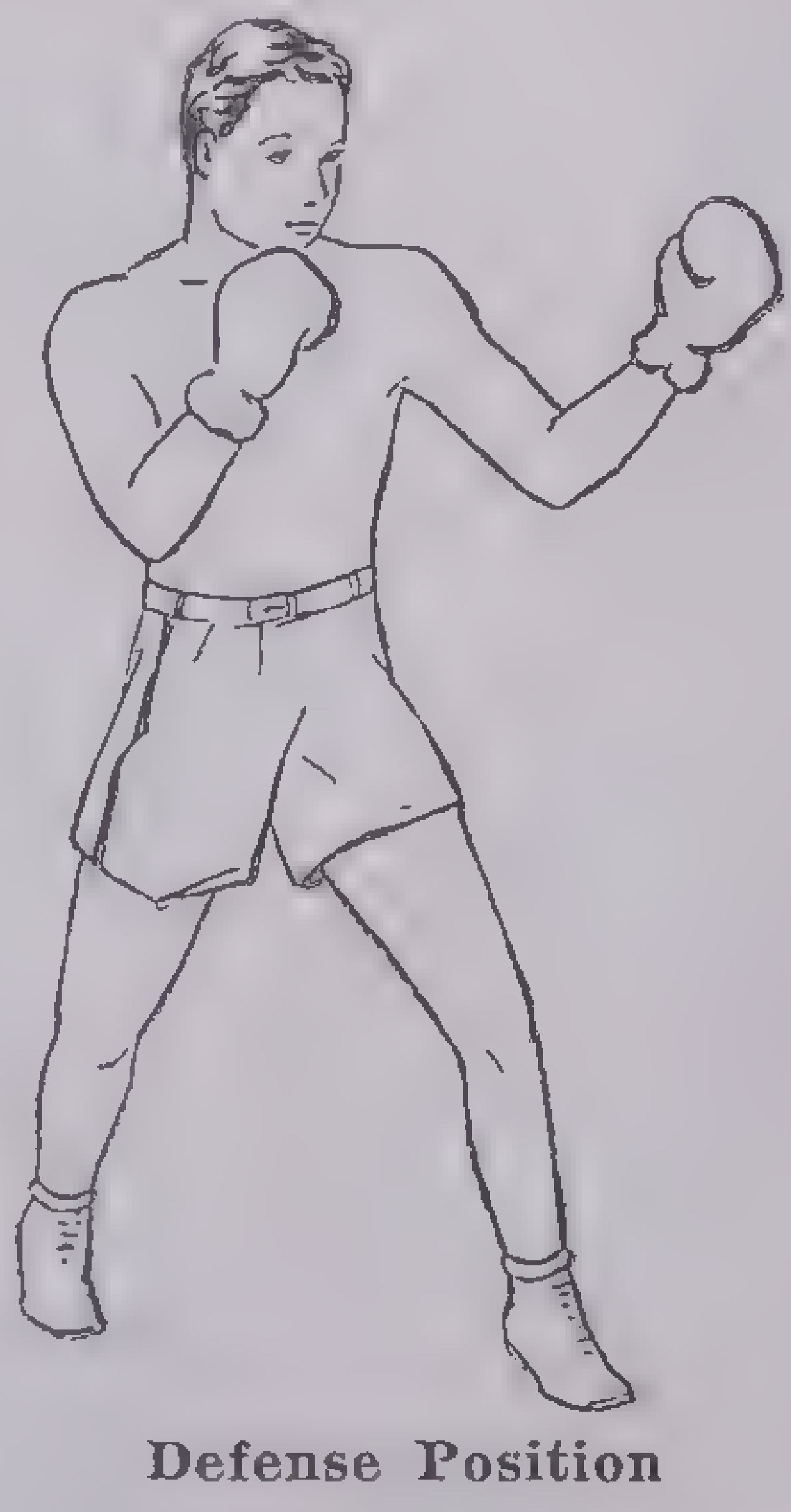
Boxing is a desirable activity in the modern program of physical education when it is conducted on a proper basis. It is a contest of pluck, skill and endurance and under competent instruction develops in the participants a sense of honor, integrity and fair play.

As a sport boxing was in vogue among the early Greek and Roman athletes. In those days the contestants armed their fists with strips of rawhide (the *cestus*), which were often loaded with iron or lead. In England, where the sport became immensely popular, rules were formulated that made its practice less brutal and laid the foundation for the dominance of intelligence over sheer strength.

Modern boxing is a contest of skill in which the contestants strike at each other with the closed fist that is covered with leather gloves stuffed with horsehair. With the use of boxing gloves came the adoption of new rules framed by the marquis of Queensbury. Under newer and better rules boxing has become a leading sport and exercise.

General Suggestions

Position. The left arm and left foot are advanced; the right foot is placed at a right angle to the body for a brace in starting, and the right heel is slightly lifted for quick action. The left side of the body is advanced to a *quarter* position and the boxer crouches slightly. The thumb is safe only when it is kept outside and close to the clenched fist.

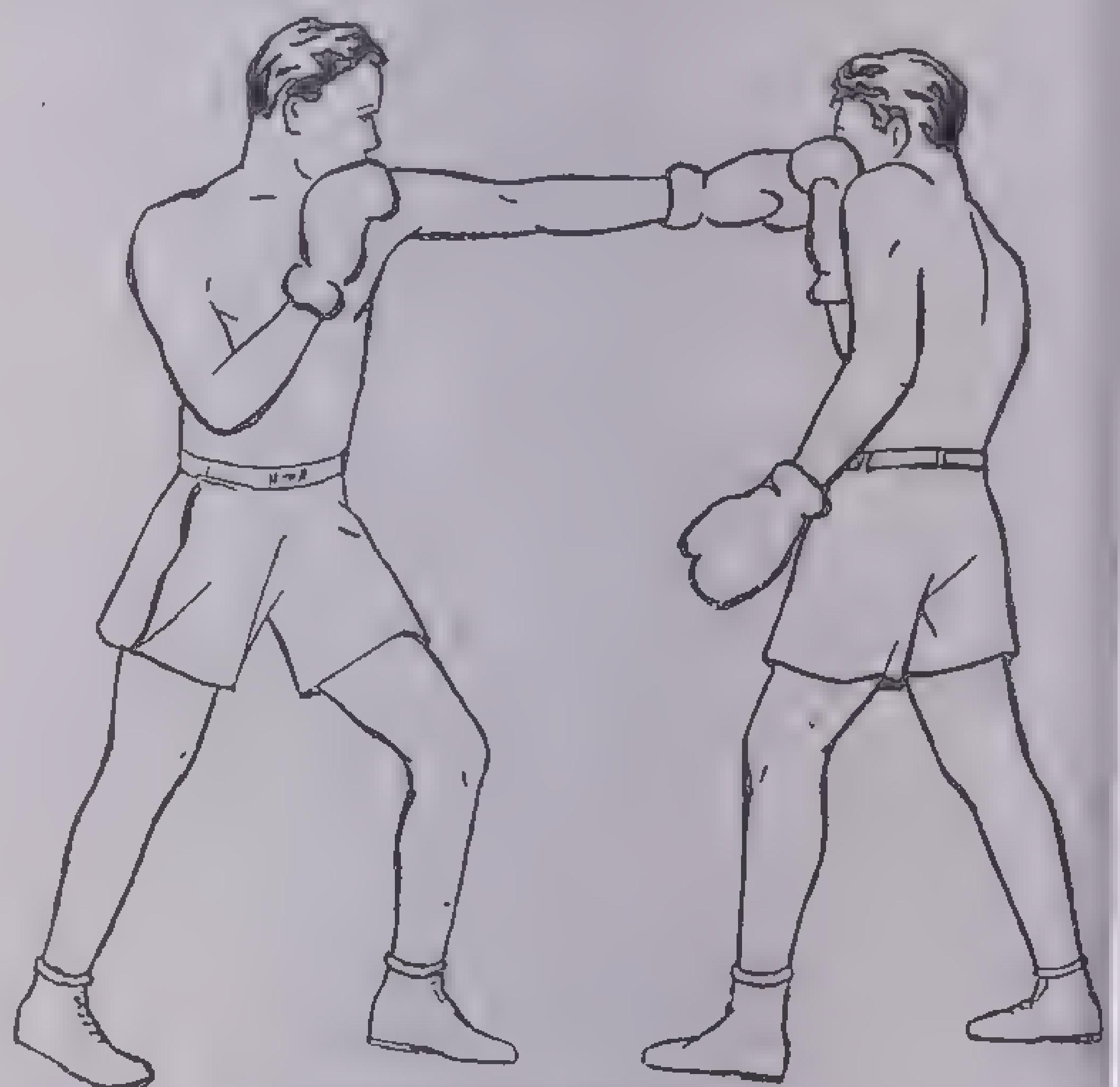

Defense Position

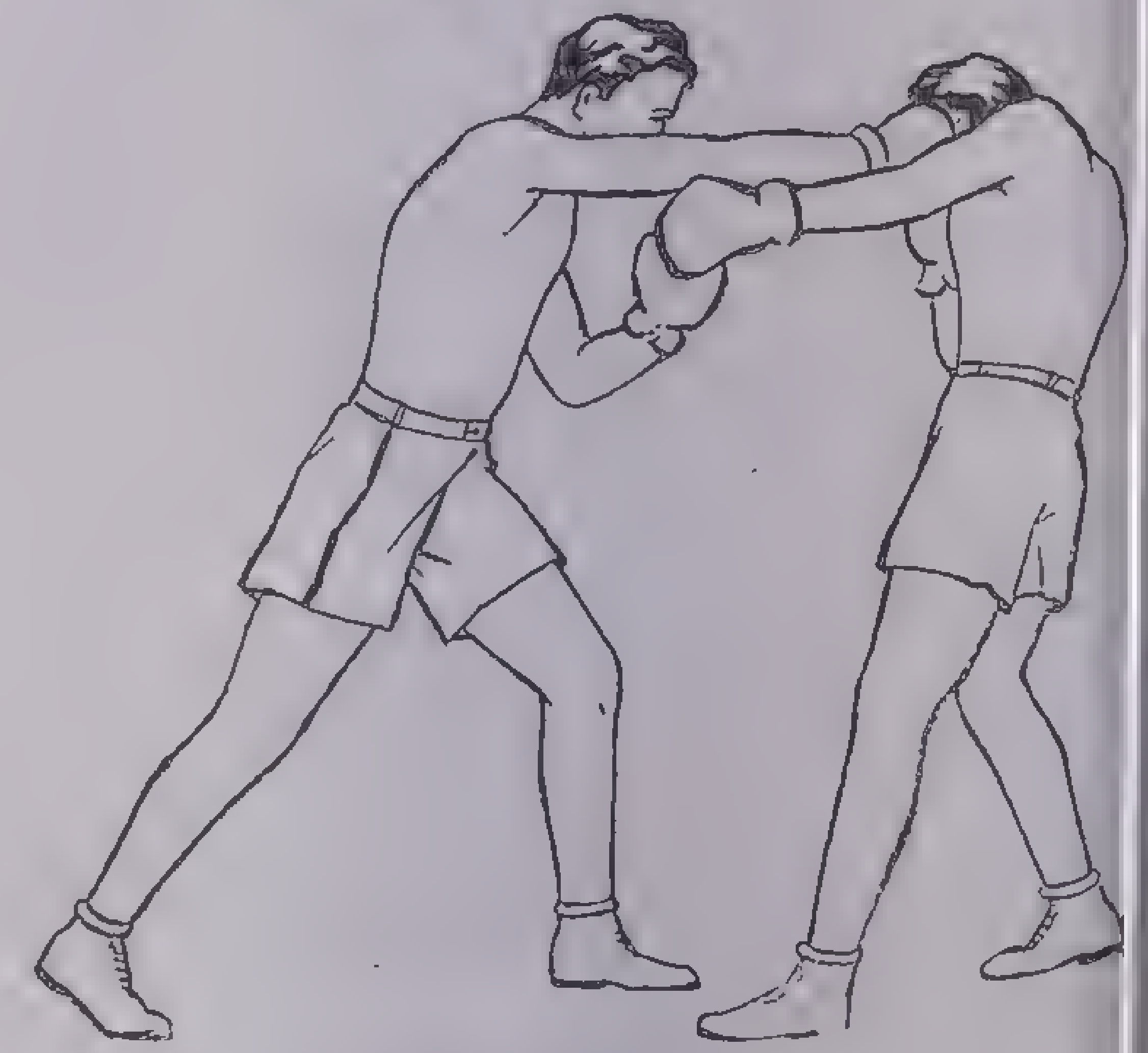
Distance. Do not waste strength making or guarding blows that could not reach their mark. Work in quickly before really attempting to land. Give as little warning as possible. Make the blows rapid with a quick getaway. In gauging distance by extending the arm, work around toward the left, away from the opponent's dangerous right arm, until there is an opportunity to lead.

Muscles. Keep the muscles active but not strongly contracted, except in the very act of striking or receiving a heavy blow.

Movements. Bend the body forward and back from hips; bend head, neck, shoulders and back quickly, freely in all directions. These movements deceive the enemy as to distance and are useful in guarding, in covering and in launching an attack. This is called *weaving.*

Offense. It is exceedingly important to answer every aimed blow of an opponent by a counter blow, at the same time guarding with the other arm. There are many scientific methods of offense and defense, but the fundamental blows are the *straight left jab* and the *right cross.* The jab is aimed at the opponent's body and face and the right hand is used to guard. Many points may be won by a boxer who has mastered the straight left jab.


Straight Left Jab


Right Cross

The right cross is a more dangerous blow used most successfully in answer to a left jab and is aimed at the head or chin, over the opponent's left arm

The *straight right* differs from the right cross by going under the opponent's left arm and is aimed at the body or chin.

The *uppercut* is a blow employed a close quarters, directed upward to the pit of the stomach or chin.

A *hook* may be delivered from the side with the hand and with the arm in a curved position. Follow all successful blows with a *rush* and shower blows rapidly whenever possible to do so.

Defense. Give careful attention to defense. The chief means of guarding against attack are blocking, shoving aside a blow, stopping an opponent's blow by a quick counter blow, slipping, ducking and side stepping. Study the signs of a coming blow. The eye of your opponent is the great telltale. Watch it and you may see where he intends to aim his next blow.

To *block* is to receive on the fist or arm a blow meant for the body or head. In the instant of using one hand for blocking, watch for an opening for the other. Put only enough effort in the blocking motion to ward off the force of the blow. The right arm is the main guard. Do not extend it too far in blocking or you will leave an opening.

Coming blows may be shoved aside to the right or left. It is occasionally possible to shove an opponent's right across to your right, or his left to your left, thus turning him partially around, making an opening and perhaps disturbing his balance. The open palm does well in blocking and shoving off blows.

Stops are quick counter blows with the left hand shot out for the head or body in the instant you feel the enemy is going to strike. Stops are good when they beat the other fellow to it and counteract the force of his blow or head it off altogether. While making stops with the left, change the guard of the right to protect both body and face.

A *slip* is a sudden jerk of the head or body to right or left, letting a blow glance by. If the blow is from the opponent's right, slip to your right and vice versa.

A *duck* is a big slip, usually to avoid a swing for the head. Guard the chin while ducking and make a counter blow with the other hand.

A *side step* has three swift movements; retreat one step, spring to right one step and turn to left, facing opponent.

A *feint* is a useful preparation for a lead; it is a short step forward with the left, a rapid blow that you know will not quite land, instant recovery and instantly a longer step, with a real blow. Feinting is commonly done with the left hand. If done with the right, feint for the head and lead for the body or feint low and strike high. Feinting succeeds only when it causes the enemy to raise or lower his guard and leave an opening. Feints are used also to draw leads from the opponent, which, being expected, can be blocked and countered to marked advantage. The feint and the real blow following are almost always by the same hand. A good feinter may succeed in lessening his opponent's confidence.

There are four main types of knockout, and it is well to know about them, possibly for offense and surely for defense. These four blows land (1) on the point of the chin or near it; (2) on the solar plexus or pit of the stomach; (3) over the heart; and (4) on the neck close under the ear. The most painful of these is the stomach blow; the most transient effect is from the blow under the ear.

Skill in boxing can come only through constant practice. A punching bag is indispensable, and so are chest weights used in all possible positions.

Breathing exercises and long runs in the open are good for the *wind,* and some active game like tennis is fine for increasing speed on the feet. Most necessary of all are a wrestling mate and a skilful sparring partner.

CAMPING

Where, When and How.—The best vacation is the one that offers complete change. No matter how well we like our complex modern civilization it is fun to return to the primitive at times—provided we know the essentials of primitive living. It is possible to be very comfortable with minimum equipment if that minimum includes the right things and to be very uncomfortable with maximum equipment if the articles are unwisely chosen. With the right clothing and a knowledge of how, one can live comfortably in the open in all kinds of weather.

Before you start on a camping trip make sure of the laws of the locality or country you plan to visit. Many states have stringent laws regarding campfires and even camping; fishing and hunting laws must be obeyed and licenses procured. Get a map and study it.

The kinds and amounts of equipment depend largely on the kind of camping you plan to do—permanent or movable, cabin, auto trailer or tent—and the kind of transportation. The minimum equipment for an auto-camping trip is far different from that for a hiking trip where the weight is limited to a pack carried on the back or for a canoe trip where portages must be made. The season, too, must be considered. Hunting equipment is needed in the fall; fishing, in the spring and summer. So first decide where, when and how and then make a check list of what.

Check List

Special Equipment

flashlight
camera
fishing tackle
gun and ammunition
canteen
notebook
first-aid kit
maps
blanket pins
toilet articles

Clothing

shirts, blouses (flannel, cotton)
trousers (knickers, slacks, breeches)
socks, stockings (wool, cotton)
coat
shoes (moccasins, sneakers)
pajamas
sweaters
bathing suit
hat
handkerchiefs

Camping Equipment

tent
blankets
waterproof sheet
poncho
lantern
axe or hatchet (sheathed)
belt knife or jackknife
compass
waterproof matchbox
cot
air mattress
muslin bag
table (folding)
chairs (folding)
cooking outfit
folding water bag
stove
reflecting baker

Foods

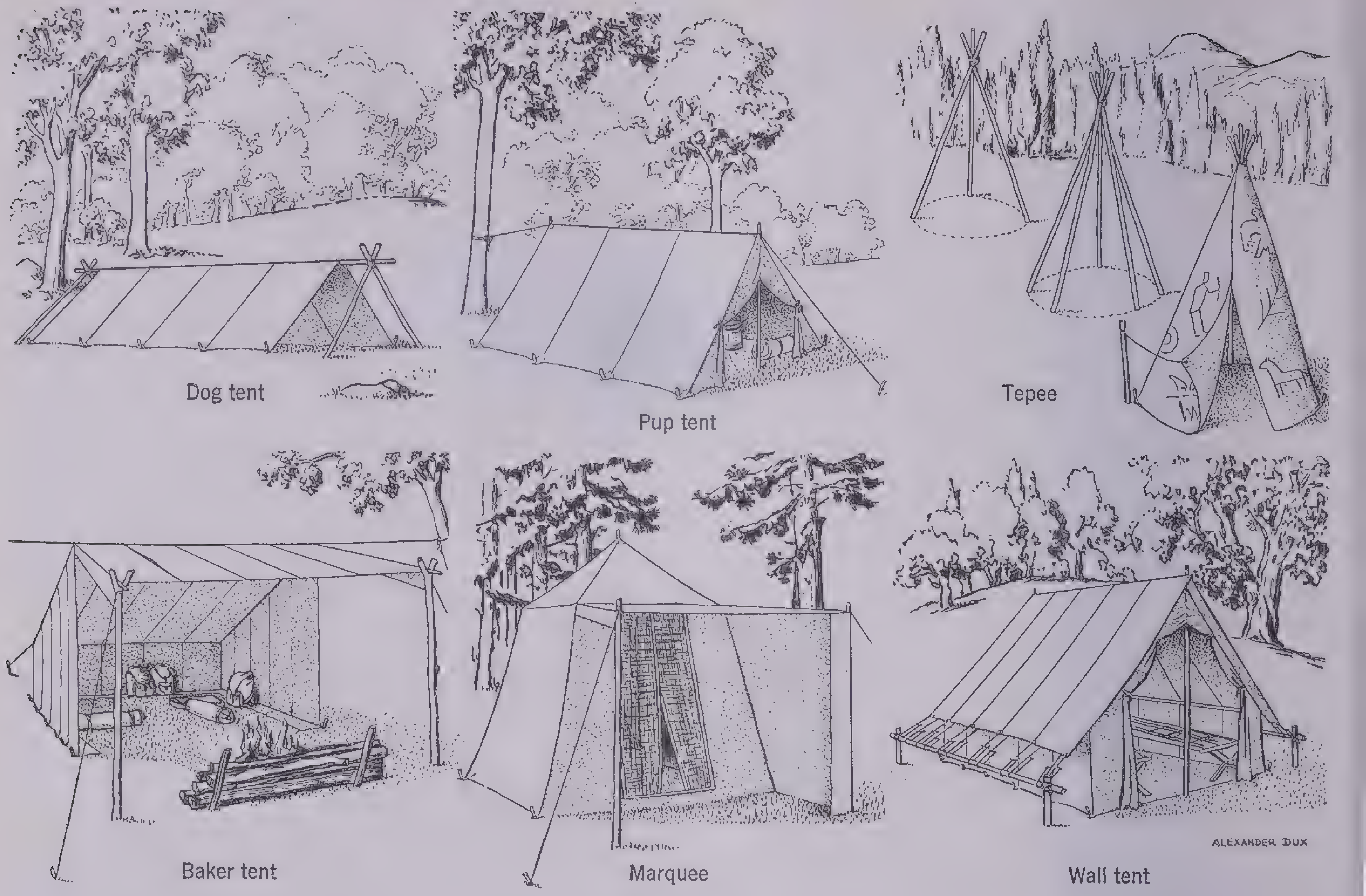
sugar
salt
flour
baking powder
butter
bacon
prunes
apricots
raisins
dehydrated vegetables and soups
egg powder
milk powder
evaporated milk
cereals—oatmeal, rice, cornmeal, whole wheat

Put everything you think you can possibly need on the list—then choose from it, eliminating what you consider is not necessary. Just before you pack up, check your outfit with the list to make sure you have not left out any essential.

Choosing the Camp Site.—Use care in choosing the camp site. Find an open, level spot for the tent, where the drainage is good; if camping for more than a night, it is important that the sun reach the tent sometime during the day to prevent dampness; as a general rule a camp facing the south or east is preferable. Drinking water is a necessity. If there is a spring nearby the water is probably safe but TAKE NO CHANCES. Carry a bucket of water from the nearest dwelling and, if you have the slightest doubt, boil the water and then aerate it by pouring it from one container to another. It is wise to remember that courtesy pays—it is better to ask permission to camp than to have an irate owner put you off.

Tents.—Until the advent of the trailer camps were divided into two kinds: permanent, for which the cabin and wall tent are the accepted shelters, and the movable variety for which various small tents have been designed. The *wall tent* is shaped much like a house, with a ridge pole and with walls about 4 feet high; it is usually made of canvas or duck, has an extra fly stretched over the roof for added protection from sun and rain and is usually built over or on a wooden platform. Wooden instead of canvas walls make it still more permanent. If it is lined with mosquito netting or bobbinet for excluding insects, it makes a comfortable summer home. If it is not built on a platform or wooden floor, a canvas floor adds much to livability. A generous sod cloth around the bottom helps to keep out vermin and insects. For camping in wooded country it is not necessary to carry tent poles or stakes.

The simplest of the movable or cruising tents is the *dog* tent, which consists merely of a large square or rectangular piece of canvas, balloon silk or other waterproofed material with loops on two sides. It is stretched over a horizontal pole and the loops staked down on either side. Thick boughs may be stuck in the ground at one or both ends for extra protection from wind or rain. If one is caught in the woods without any shelter, a lean-to may be built of boughs by standing poles or large branches diagonally against a horizontal pole and covering them thickly with boughs, arranged so they will shed rain. Throughout the Adirondacks and some parts of the Catskills log lean-tos have been built on many of the trails for the use of campers.



Dog tent

Pup tent

Tepee

Baker tent

Marquee

Wall tent

Six Kinds of Camp Shelters

The *dog* tent is a large square or rectangular piece of waterproof cloth stretched over a horizontal pole and staked to the ground. The *pup* tent illustrates the simple *A* tent. The Indian *tepee* may be copied in canvas if one is camping in the mountains or pinelands: use the slender trunks for tent poles. In cold weather the open-fronted *baker* tent lives up to its name when heat is thrown back from a campfire. The *marquee* or umbrella tent has plenty of headroom and is easy to erect, and the *wall* tent has most of the comforts of home

The *marquee* tent is popular for the semipermanent camp or on the auto-camping trip where weight is not an item, for it has plenty of head room. Shelter tents of various types are available, the *A* or *wedge-shaped* tent and variations of it being perhaps the most popular. The *baker tent*—so called because it resembles the folding baker—is a favorite cold-weather tent because a campfire built in front of it sends the warmth into the tent. The Indian *tepee* is the only tent in which a fire can be built and it is only suitable in lodge-pole-pine country. Tents with sewed-in ground cloths are a great advantage except that, like canoes, the floor must not be walked on with boots or shoes.

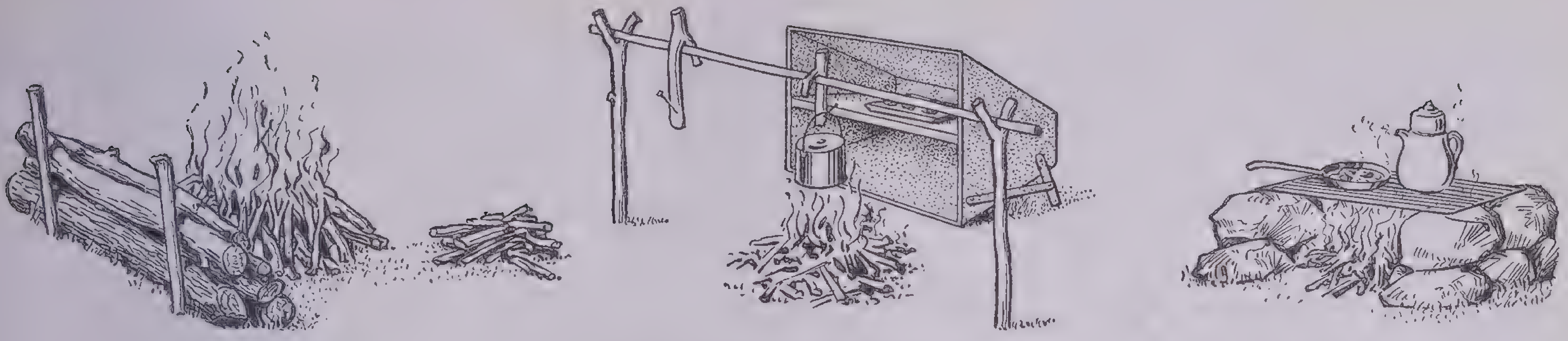
Think about ventilation in choosing your tent—a small window in the back will add much to comfort; and, if you are camping in fly or mosquito season, have it fitted with a bobbinet or netting front. Materials for tents are either water-repellent or waterproofed by a number of processes. Jointed tent poles and metal tent pegs should be carried along unless you are traveling in wooded country. Whatever type of tent you choose, roll it carefully and pack it with poles and stakes in its own bag so that it can be pitched as soon as you reach a camp site, without unpacking the other duffel.

Beds and Bedding.—The hiker or canoe cruiser who must limit the weight of his pack has not much choice in sleeping equipment. He may carry a waterproof-covered sleeping bag with an awning arrangement over the head and sleep in the open—the disadvantage of this is that he cannot do much about it if he gets too warm; the waterproof covering prevents the evaporation of perspiration and causes a clammy feeling. Sleeping bags are best suited to really cold weather. The camper may carry a small tent and woolen blankets—two are enough for any ordinary weather—with a poncho or waterproof sheet. Light, loosely woven woolen blankets are much warmer than hard, tightly woven ones.

Staying rolled in a blanket is not easy to do. It is better to carry a supply of blanket pins and pin the blankets into a bag, leaving the top layer loose so that it may be thrown off if one gets too warm. There must be as many layers under as over the body for much cold comes from the ground; and there must always be a waterproof sheet under the blankets. Camp cots are fine in the permanent camp and may be carried on an automobile trip. Twice as many blankets are needed under one as over if he sleeps on a cot without a mattress, however, as the wind then has a fine chance to chill one. A wind- and waterproof poncho will serve as well.

Air mattresses that roll into compact bundles and are inflated before using make comfortable beds. Too much air makes them hard; a small bicycle pump helps the inflating process. Mattress pads of kapok, wool and cotton also are on the market. A muslin bag or tick, which weighs little and occupies little space, may be stuffed with grass, ferns, hay, boughs or leaves and adds much to the comfort. There is always the bough bed—wonderful if carefully made, awful if not. Balsam, spruce or hemlock boughs are best for the purpose; use only small ones and place logs to form the boundaries so the bed will not spread. Starting at the head, lay a row of boughs across with the tips up, place the second row over these with their tips just a little below the first ones, and so on until the bed is long enough. Use plenty of boughs and lay them carefully so all the butts will be well buried and the tips form a soft, fragrant couch. When you pack up, roll the blankets into a compact bundle of whatever shape best fits the pack and wrap it carefully in the waterproof sheet or poncho, so there will always be a dry bed.

Campfire and Cook Fires.—There is a difference between the two. A campfire can be as large as one wishes or


Campfire

Cooking fire with crane and reflecting baker

Stone fireplace

A Large Fire for Warmth and a Small Fire for Cooking

the weather demands; but a cooking fire must be small. *Dry wood* and *air* are the two necessary ingredients for any fire. Standing dead trees are best; even in rainy weather it is possible to find a few dry, dead branches and twigs on the under sides of trees. Lay the fire carefully, placing small split sticks crisscross in layers, the first two about 6 inches apart, with plenty of dry twigs laid over each layer and some dry tinder placed on the windward side. The wetter or greener the wood, the more kindling material or heat is required to make it burn. Learn the burning qualities of various woods. Oak and hickory will burn fairly well even when green; poplar and balsam will not; pine makes a quick, hot fire. Never throw wood on or at a fire—lay it carefully in place; and *never forget to put out the fire.* Never build a fire where there is danger of its spreading; choose rocks, bare soil, the bank of a stream; make a rough fireplace of stones if that is possible or place the fire between two green logs—with their tops flattened off they make a good resting place for pans.

Simple cooking irons or a small grate with folding legs are convenient to hold pots; or a crane may be rigged up and the pots fastened to it with hooks. Be sure to use green wood for the crane so that it will not catch fire. A reflecting baker makes delicious baked things possible. A variety of camp stoves are on the market.

The Cook Kit.—The Boy Scout cook kit is good for an individual outfit. Other excellent kits consisting of cups, plates, bowls, pails, coffeepot, frying pan, knives, forks and spoons, all fitted so that they nest in a compact bag, are available in aluminum or tin, for parties of two, four or more. If you choose an aluminum outfit, be sure to specify that cups and spoons be of tin or enamelware, if you do not want to burn your tongue. If you assemble your own outfit, plan it so that the different articles fit into one another and choose a frying pan that has a hinged handle to fold back when not in use and holes in the handle in which a long, green stick may be put for convenience when cooking.

Camp Lights.—With the exception of the auto camp where the headlights may be utilized, lighting the camp is a problem. Several kinds of lanterns—kerosene, gasoline and electric—are on the market. All have good and bad points. Perhaps the simplest and most satisfactory of all is the folding candle lantern with a good supply of plumbers' candles (they last longer than ordinary ones).

Foods and Cookery.—Where space and weight are not limited or where one has ready access to stores, canned meats, vegetables, soups and fruits are fine; even if you expect to find fresh food along the trail, it is well to carry a supply. Evaporated milk often proves more satisfactory than fresh. The food list for the canoe cruise deep into the wilderness, however, must be carefully planned. Dried fruits, dessicated vegetables, milk and egg powders must be depended upon. Bacon is the staple meat. Wherever you go, make your emergency supplies ample, for wayside replenishments are not always dependable, the fish do not always bite or the rabbits appear when the hunter wants them.

Pack all dry staples—salt, flour, coffee and tea—in small waterproof bags; push- or screw-top tins are satisfactory for butter and other soft foods. Then pack all the small food bags in a large food pack, placing the articles used least at the bottom. Practice some simple cookery at home before starting out on a trip—learn to make a stew, a chowder, biscuits, muffins and the like.

Personal Kit.—Suitcases and similar luggage are taboo in camp. Clothing and toilet articles must be packed in *duffel bags.* The chief requisites of camp clothing are durability and suitability. Except in the very hottest weather, wool is the most satisfactory material. Hikers will find woolen socks or stockings much more comfortable; canoeists will find that wool makes wet feet much more endurable. Sneakers or moccasins are the only footwear for a canoe. High-heeled shoes are never suitable in outdoor living and besides are dangerous.

First-aid Kit.—Regular packaged first-aid kits are on the market, but you can assemble your own. Gauze, bandages, adhesive tape, absorbent cotton, iodine or other antiseptic, a pair of tweezers, small scissors, ammonia—the small swabs of iodine and ammonia that are used by crushing the ends are a convenient form—vaseline, mosquito lotion and preventive (oil of citronella is good), sunburn lotion and soda. If you have your own pet remedies, obtain them in compact and nonbreakable containers and pack them in a waterproof bag. Before you go to camp, it is a good idea to practice some simple first aid—rescue and resuscitate someone from simulated drowning. Be sure you know how to treat sunburn, insect bites, small wounds, nose bleed; and practice applying different types of bandages.

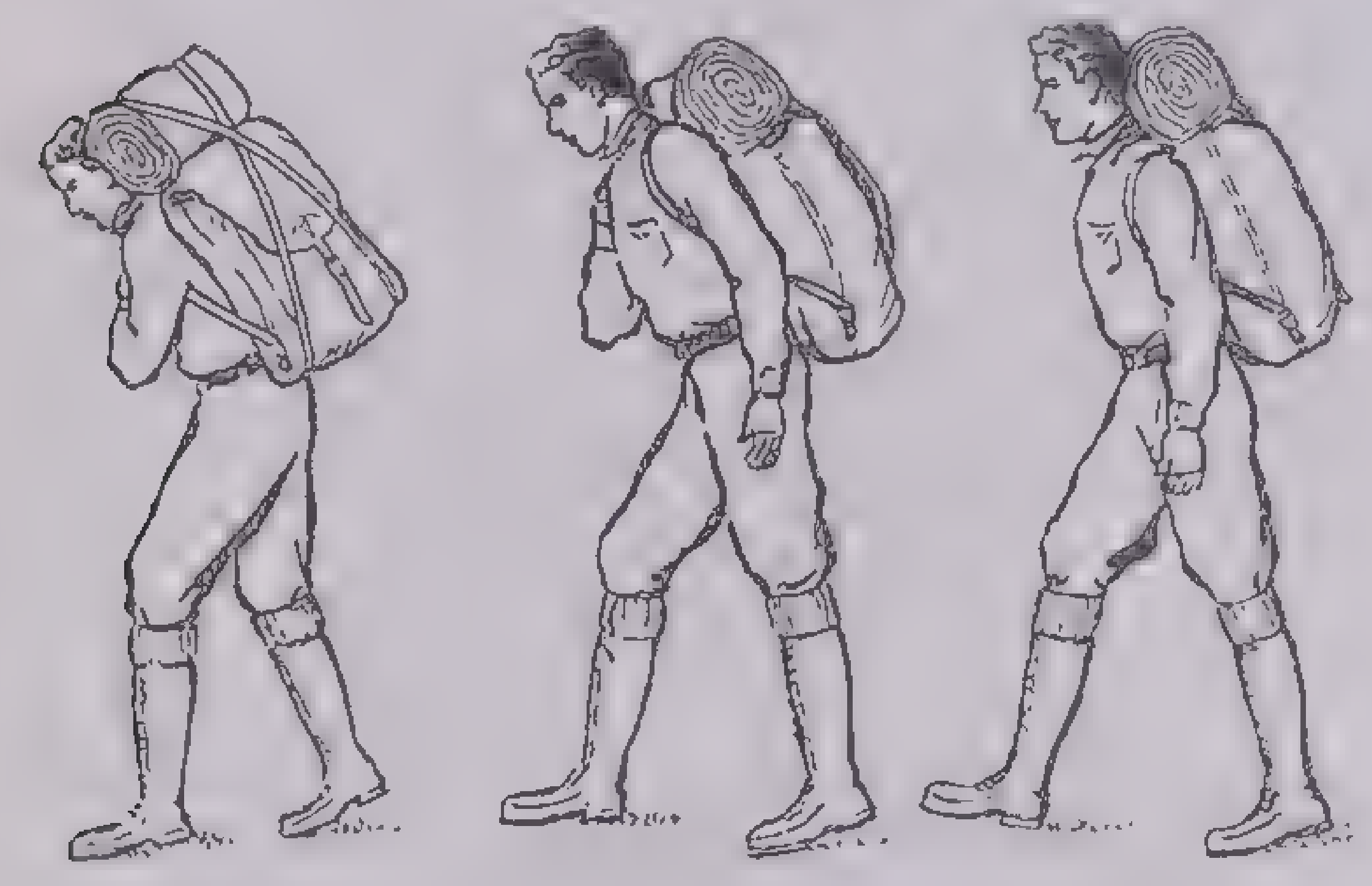
Outdoor Hazards.—The three real villains that threaten comfort or even life in the woods are *poison ivy, poison sumac* and *snake bite.* There are only three really poisonous snakes in the United States—the rattlesnake, copperhead and cottonmouth water moccasin. It is well to become familiar with their habits and their habitats. The rattlesnake is found quite generally over the country, although those of the prairie are small and hence not so venomous. The most dangerous is the great diamond rattlesnake of the South. The rattlesnake, if he is awake, warns by rattling before he strikes. The copperhead lives in the mountainous and hilly regions of the eastern and southern United States and west through Kansas, Oklahoma and Texas. It neither gives warning before striking nor tries to get out of the way. The cottonmouth moccasin is found in North Carolina and south and west through Kentucky, southern Illinois, Oklahoma and eastern Texas, usually near water or hanging from trees that overhang the water. All snakes sleep during the day and, if they are stepped on, may strike instantly. It is wise to wear high moccasins or shoes in snake country as the bite is not so venomous through leather or other clothing.

In case of snake bite the first thing to do is to twist a tourniquet, using any piece of cloth available, between the bite and the heart to keep the poison from circulating through the system. Then cut the wound open so that it will bleed freely and suck out the poison, spitting it out. Snake-bite remedies are available; or you can carry along a hypodermic syringe and potassium permanganate to inject near the wound.

Poison ivy takes many forms from the tiny vine in the grass to the large shrub; its leaves vary in color, but it always may be distinguished by the *three leaves to the group,* as contrasted with the five leaves of regular ivy. No one is immune to poison ivy all the time. He who escapes one time may succumb the next, if it happens to be a warm, muggy day or he is not quite at his best physically. Ordinary yellow laundry soap is a good preventive. Wash with it, rubbing vigorously. Baking soda applied promptly often checks the poison.

Weak ammonia water is another remedy; or the druggist will give you a prescription. Poison sumac—not the staghorn, with its big red fruit clusters—is more poisonous than ivy. It is found in low ground and has white berries, and the bushes grow quite large. Remedies are the same as those for poison ivy.

Carrying the Pack.—Comfortable footwear and a well-arranged pack are the two most important requisites to a successful hiking trip. Be sure to have shoes that are long enough and wear two pairs of lightweight wool socks or stockings to give a cushion for the feet. Never try to carry extra items in the hands; they should be kept free. Be sure that any sharp articles are put in the center or outside the pack so that they will not dig into your back when you walk. The real old timer carries his pack by a tumpline around his forehead; most moderns prefer to use shoulder straps.


Too high Too low Just right

Carrying a Pack

Whether packcloth and strap or pack bag, it should be fitted just right to the center of the back. The weight should not come upon the small of the back but high enough so that the neck column helps to hold and steady it. A pack that lies too low on the back will grow heavier and heavier as one travels. The lower end of the pack should not extend much below the middle of the back. Remember when adjusting it that the body inclines forward when walking.

CANOEING

A Word of Warning.—Canoes, although they are the most maligned of water craft, are safe and easily managed if they are used properly. They will ride heavy seas, shoot the wildest rapids, follow the most devious courses—in the hands of experts. The tyro should be careful. No one who cannot swim should enter a canoe or try to paddle one. Even the good swimmer will do well to stick to the canoe if overturned, for it will always float.

When entering a canoe step into the middle—not to the side; and do not try to stand up or change places while afloat. The lower the center of gravity, the better the balance; in rough water it is better to sit in the bottom rather than on seats. In fact the expert does not even have seats in his canoe.

Choosing the Canoe and Paddles.—The choice of a canoe depends on the water on which it is to be used. The deep and wide cruising model is best suited for open water and for carrying heavy loads; the narrow, shallow canoe is satisfactory for small, protected streams; too short a canoe is tippy.

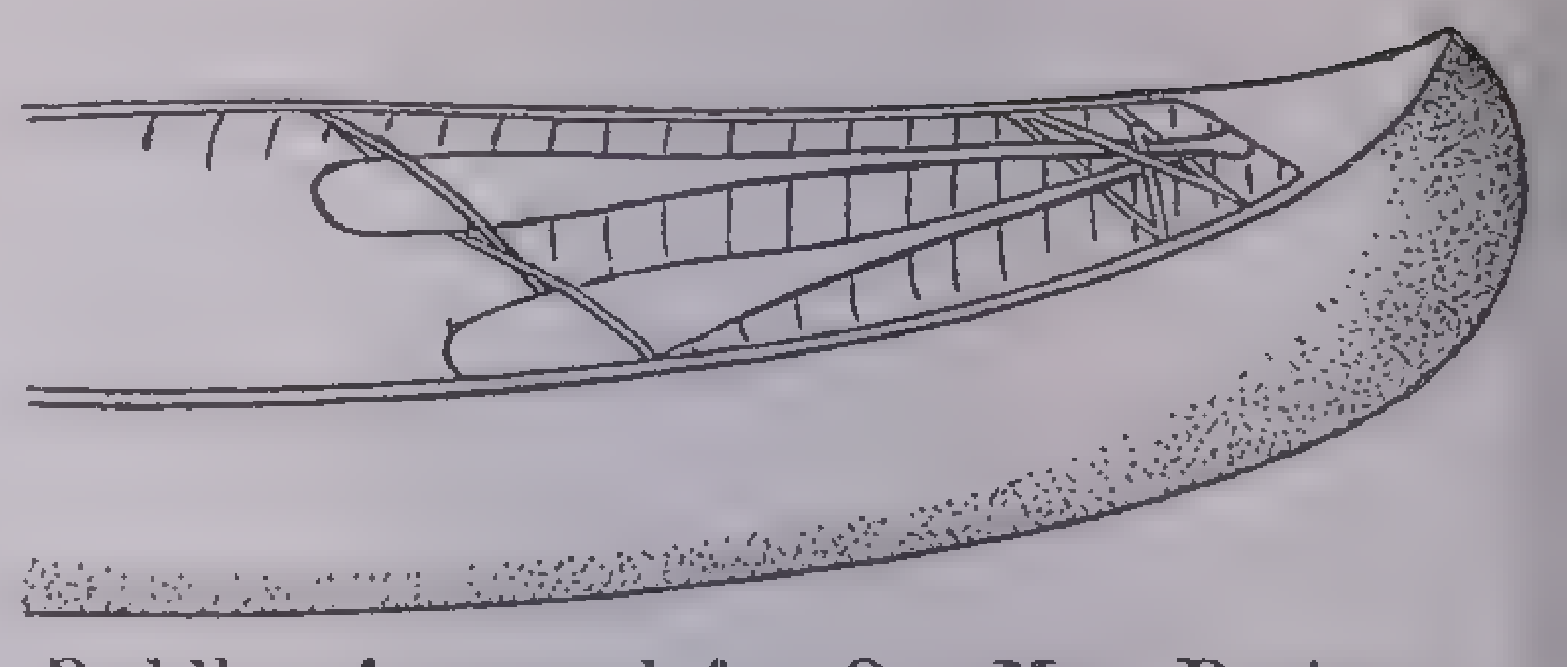
Paddles, like shoes, should fit the user. The bow paddler should choose a paddle about 6 inches shorter than himself; the stern paddler, one whose length equals his own height. Maple paddles are strong; those of spruce are light. In large, open waters a pair of double blades, which fasten together with a ferrule and enable the paddler to stroke first on one side and then the other, will help to move the craft more rapidly, especially if one paddles alone. The middle is the best place to sit and paddle if one is alone in the canoe.

Paddling.—The stern paddler is the captain and pilot and steers the canoe; the bow paddler sets the stroke. It is better to learn to paddle in the bow, with the stern paddler directing. A quick, even stroke, starting the paddle out from the side a little and pulling it straight back, is good. Do not reach too far forward to start; and recover quickly, for the stroke is valueless after it passes the body. The stern paddler adjusts his stroke to that of the bow paddler, but the finish is different, for he must steer the canoe by turning his paddle like a rudder. He does this by turning the near or inside edge of the paddle back with a roll of the wrists while it is alongside the body, not after it has passed. Steering should always be done by turning the paddle rather than by swinging it from one side of the canoe to the other. The Indian sits on his feet in the bottom of the canoe to paddle; modern canoes have built-in seats; a position between these two styles, which many canoeists prefer, is to kneel on the bottom with hips against a thwart.

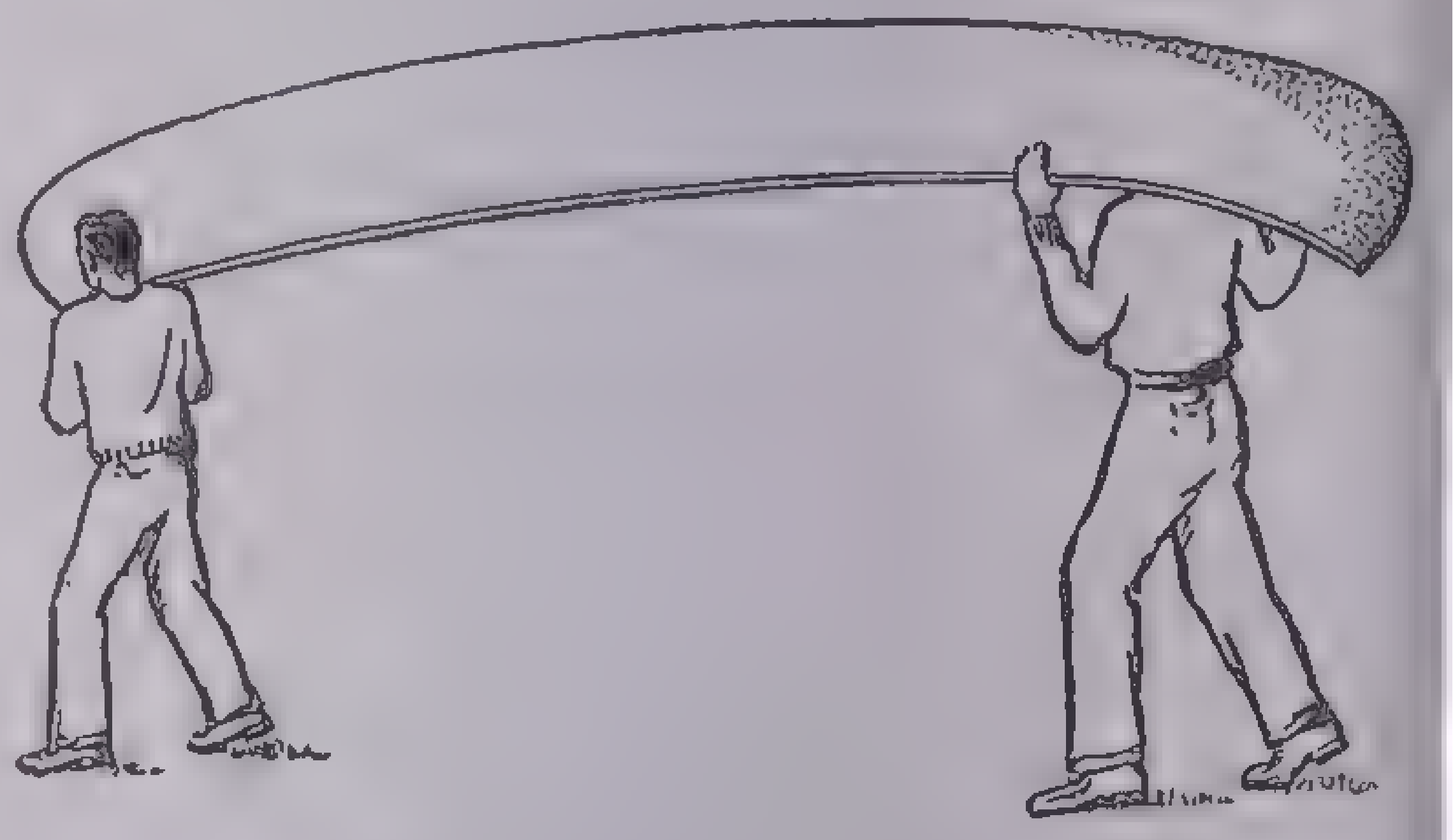
Care of the Craft.—Never step or sit in a canoe when it is on shore; hold it lengthwise to the dock and free from projections when you embark. If you must get in from a beach, push it off and wade to the floating depth of the canoe. Always wear moccasins or sneakers, never shoes or boots, in the canoe. When it is not in use, turn it upside down in a shady place if possible. Scrape the canoe and give it a new coat of paint or varnish every spring. On a cruise it is well to carry along patches—you may strike a snag.

Canoe Cruising.—When you have learned to paddle, plan a canoe cruise. Whether it be the wilderness nearest you or the one far away, there is no other way to get so close to it. To paddle along a narrow stream where you can watch the life on shore, pick out a suitable camping spot and pitch your tent for the night is great fun though strenuous. Do not put off finding the camping spot until too late in the day—it is amazing how camp sites disappear along toward night. Pack your duffel in compact waterproof packs or bags, arrange it carefully in the center of the canoe, the heaviest pieces in the bottom, and lash each one to the thwarts. Then, if you should tip over, your duffel will not go to the bottom.

To Carry the Canoe.—A canoe is not so heavy, but it is rather unwieldy. The Indian method of portage is practical for one man. Tie one end of a stout string or thong to the middle thwart close to the gunwale. Stretch it taut and tie the other end of it to the opposite gunwale. Slip the two paddle blades, lying flat, under the string and bind the handles on the forward thwart with another string. Spread the blades apart enough to admit the head; then, standing on the left side of the canoe with face to the stern, grasp the gunwale on the far side a little forward of the middle thwart with the left hand and that on the near side with the right; swing the canoe up over the head so that your head goes between the paddles just forward of the middle thwart with the flat sides of the paddles resting on the shoulders. Thus the face is toward the bow and, by tipping it up a little, the trail ahead is visible.



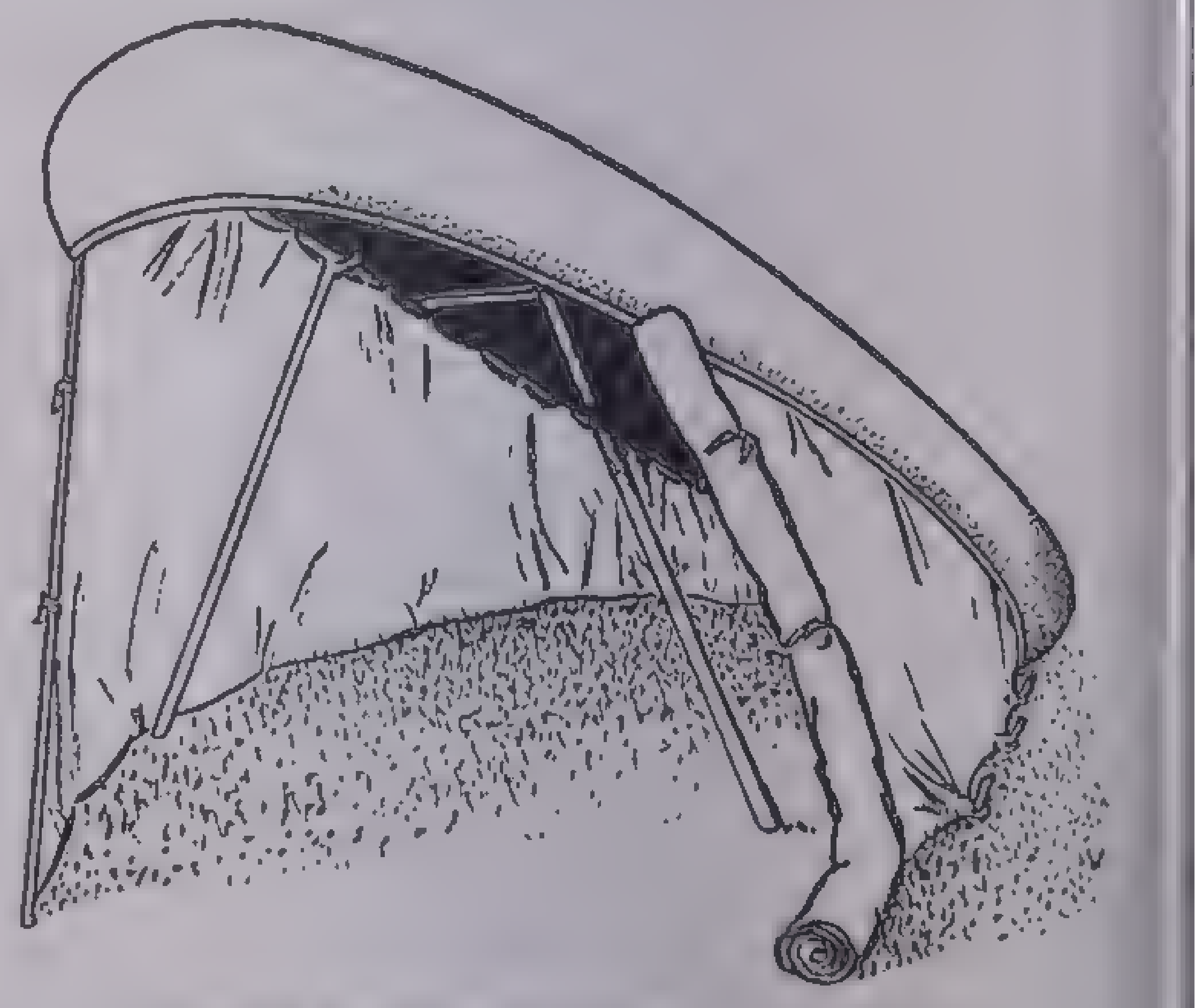
Paddles Arranged for One-Man Portage



Two-Man Portage

The easiest way for two men to carry a canoe is to swing it upside down so that the bow is on the right shoulder of the front man and the stern on the left shoulder of the rear man.

For Shelter.—Many canoe cruisers use their canoes, turned upside down and propped up at one end, as shelter instead of carrying tents. Some rig up side curtains that fit the sides of the canoe, fastening them to the gunwales with snap fasteners. The only disadvantage of using the canoe as shelter



Using the Canoe as a Shelter

An adequate shelter may be made of the canoe by staking it up as illustrated and fastening waterproof curtains, cut to fit the curved sides, to the inner sides of the gunwales. Loops on the lower edges are then pulled tau and staked to the ground is that it cannot be used otherwise at the same time. But, if you have made sure of all supplies before you pitch camp, this will not matter.

Sleeping in the Canoe.—It is fun to sleep in a canoe. Choose a night when you can be fairly sure it will not rain. Remove the center thwarts and spread mattress and blankets in the bottom of the canoe, with a poncho over the top to keep off dampness. Paddle out to a quiet, sheltered spot that is free of any obstructions into which the canoe might bump as it swings with breeze or current and drop anchor (any heavy object securely tied to a rope).

Racing.—A canoe regatta can be held any place where a group of canoes is assembled. To make a race fair the boats must be as nearly alike as possible in length, beam and weight. Contestants also should be grouped as to size or age and as to proficiency with the paddle. Any number of straightaway races may be held—the one-man single-blade, one-man double-blade, two-man single- and double-blade, four men in each and, if war canoes are available, 9- to 15-man races.

Then there are many kinds of stunt races, such as the hand paddle (using the hands for paddles), tilting contests, tug-of-war, in which paddlers in two canoes tied stern to stern with about 4 feet of rope between them try to paddle in opposite directions from a center line; the hurry-scurry race that consists of a 50-yard dash to shore from a given point inland, a 50-yard swim to a canoe anchored outstream and a 50-yard paddle; also a cruising race that consists of loading the camping outfit in the canoe, paddling a certain distance and pitching camp in the shortest possible time. Clever paddlers learn to *flip* their canoes—turn them over, right them and flip the water out by rocking from side to side with a hand on each gunwale. (Always get back in the canoe from the end, never from the side). Flipping races are exciting.

Sailing.—Sailing canoes are of two kinds. The ordinary cruising canoe rigged with a single lateen sail and steered with a paddle held overside is a practical arrangement that can be paddled or sailed as the occupant prefers and often enables the canoe cruiser to rest or to make better time on a fairly large body of water. The decked sailing canoe, a wooden boat with two leg-of-mutton sails and fitted with a centerboard and rudder is a wonderful racing machine, to be sailed only by the expert.

CHECKERS

(Elementary School to Adults)

The game of checkers (called *draughts* in England) has been known in one form or another for 3,500 years. It is played by two players upon a board divided into 64 squares alternately colored red and black, although any two contrasting colors are satisfactory. Each player places his 12 thick red or black disks, called *men,* on the same-colored squares on his side of the board, thus occupying three horizontal rows. All the disks for each player are of one color.

The object of the game is to remove the opponent's men from the board by a series of strategic moves. With the players alternating in their moves, the men are moved diagonally only, one square at a time, unless a move brings a man into the diagonal next to an opponent's man; then it is necessary to *jump* the opponent by moving over his man to the square next beyond and, in the jump, removing from the board the man that was thus exposed. However, a jump cannot be made unless the diagonal square beyond the opponent's man is vacant. By adroit maneuvering a player may lead his opponent into such positions that more than one of his men may be jumped at a time.

Each player moves his men toward the opposite side of the board. If a man successfully passed step by step across the board to the opponent's first row and is moved into an empty space there, that man so advanced becomes a *king,* for he has reached the opposing *king row.* A king is distinguished by being *crowned*—that is, by having another man placed on top, making the king double height. A king has the advantage over an ordinary man in that he may move both forward and backward.

When one player has removed all his opponent's men or has placed his own men in such positions as to block his opponent from making any move without loss of a man, the game is won.

CHESS

(Junior High School to Adults)

Chess is a highly scientific game of great antiquity, played on the same board that is used in checkers. Only two players may participate. Each contestant plays with 16 *men*—a king, a queen, two knights, two bishops, two castles (or rooks) and eight pawns. The opposing sets of men are usually colored black and white or black and red.

In beginning play each player arranges his men in the two horizontal rows of the board nearest him. The queen is placed *on her color;* that is, the player who has the black or darker set of men will place his queen on the dark square that is fourth from one end in the first row. The opposing queens thus face each other across the board. The king occupies the square next to the queen, so the king and queen rest on the two squares that occupy the center of the row. On either side of these two the bishops are placed; next to the bishops are the knights; the castles (rooks) occupy the two corners. The pawns are ranged along all the squares in the second row.

The rules regarding the moving of the men are intricate. The queen may be moved diagonally, straight ahead or straight backward, as far as the route is clear; this is the principal piece on the board, so far as freedom of movement is concerned. The king may move only one square at a time in any direction; his freedom of movement is less than that of any other piece on the board. He is, however, the object of the defense and attack that is the main feature of the game, and he is therefore the most important piece on the board. A bishop may not leave its color but may be moved diagonally as far as the path is clear. The knight always moves two squares—one straight ahead and one diagonally. Like every other piece in the game the knight cannot move unless there is a vacant square to which it may proceed, or unless the player wishes to capture a man occupying the square to which the piece moves, in which event the captured man is removed from play. The castles may be moved forward or backward in a straight line as far as their path is clear but never diagonally. When a pawn is first moved, it may be set directly ahead two squares or only one square as desired; after it has once been moved, it may thereafter be moved only one square at a time. When the pawn is not capturing a man from the opposition, it moves directly forward; but it moves diagonally when the object of the move is to capture an opposing man.

In moving to capture any man, the moved man goes into the position or square occupied by the piece to be removed. When by strategical moves against the king, the next move would capture him, the player who thus puts his opponent's king in jeopardy says, "Check!" This is a warning that the owner of the hard-pressed king must move that piece if possible to a place of safety where he cannot be captured by the next assault or must interpose another piece. This may be difficult, for the king may move only one square at a time. When the king is eventually trapped and cannot move anywhere without capture by the opponent's next move, the result is *checkmate,* and the game is ended.

The above is but a brief outline of the game. A good book of rules is suggested for careful study by anyone who would become proficient. Chess is the most scientific of all games; it does not depend upon luck or good fortune but rather upon acumen, clear thinking and the ability to look ahead to see the effect of present and future plays. The movements of the men are so intricate that the chessboard becomes a battlefield on which more than a dozen different forces of varying power on each side are marshaled against the enemy.

CRICKET

(Junior High School to Adults)

Cricket is a favorite game in England and many other parts of the British Empire, and its popularity has been increasing in some sections of the United States. Cricket is played by two teams of 11 players on a level field, which should be about 100 yards wide and 150 yards long.

Two *wickets* are placed 22 yards apart; each wicket is a set of three stumps or posts 27 inches high, supporting a loose block of wood called a *bail.* The posts must be too close together to let a ball through them, but must be sensitive enough to make the bail fall off if a pitched ball hits the wicket. The ball varies from 9 to 9¼ inches in circumference and averages 5½ ounces in weight. The bat is flat, 3 feet in length, 4½ to 5 inches wide for the upper 2 feet and with a handle tapered to a thickness comparable to the handle of a baseball bat.

The wicket is the center front of a space 8 feet 8 inches in length called the *bowling crease;* this marks the position of the bowler or pitcher. Four feet in front of and parallel to each wicket is a line marking the batter's position called the *popping crease.* Two batters are up at once, one by each wicket. In each inning all the players come to bat. While one team is at bat, the other is in the field. A bowler or pitcher stands beside each wicket, and each bowler throws in turn at the opposite wicket. His delivery of the ball is not a throw or a pitch; the arm is held straight and not jerked. If he can hit his mark, the bail will fall, and the batter at that wicket will be out (bowled out). It is the batter's business to hit the ball before it strikes the wicket.

All batted balls are fair hits, and each hit requires the two runners to exchange places before the other's wicket. There are four main ways of putting a batter out: (1) if he fails to hit the pitched ball and it strikes the wickets; (2) if he bats a ball that is caught on the fly; (3) if the ball is thrown to the wicket and the bail is knocked off before he has completed his run; (4) if he oversteps the boundaries of the popping crease.

The batsman may make up to 6 runs for each hit if he has time, and since many long hits are made with the flat bat the score often runs into hundreds and the game may go into several days of play.

CROQUET

(Elementary School to Adults)

Croquet is a popular game that is commonly played on lawns, municipal parks and country-club greens. It is simple to set up and the upkeep is not expensive. The court need not be of any exact dimensions, although 30 feet wide by 60 feet long is a common size. Any level, smooth grass plot is excellent. The boundaries can be marked with a white cord.

At each end of the court there is a colored stake or post, carrying stripes of various colors representing the colors of the croquet balls and surmounted by a red top. The balls are made of wood 3¼ inches in diameter and are painted in colors corresponding to those on the stakes. The more expensive balls are of hard rubber; these will outlast the wooden balls and are better in play. There are either nine or ten wire wickets in a court; they are 1 foot above ground, as in the following diagram, W representing the wickets and O the stake:

W W
O WW W WW O
W W

There may be one or two wickets in the center of the court. Wooden mallets are used to drive the balls over the court and through the wickets.

Two or more people may play as opponents or as teams. The ball is started from one end of the court directly in front of the stake and the object of the game is to get the ball through all the wickets and back to the home stake before other players reach home stake. The specified circuit the ball must make passes through the two wickets before the home stake, to the upper right-hand wicket, to the center one, the lower right-hand one, the two lower post wickets and to the lower stake. From the lower stake the ball is driven through the two lower post wickets, to the lower left-hand wicket, to the center one, the upper left-hand one, through the upper post wickets to the home stake again.

Players take turns in playing their balls. When teams are playing, alternate turns are taken by players of the respective teams. If the ball goes through one wicket, it entitles the player to one more stroke; if through two wickets at a time, to two more strokes. No player may hit the same ball twice in succession unless he first drives his own ball through another wicket. A player is permitted to play upon others' balls, giving him additional strokes to go through the wickets. When teams are playing, the game is not won until all the balls of a team have gone through all the wickets and returned to home stake. Each of the players on a team gives his partner every advantage and tries to keep both balls together over the course. When one player has made the complete circuit of the wickets, he may choose to be a *rover* and assist his partner and hinder his opponents before finally striking out by hitting the home stake.

A scientific refinement of croquet is the game called *roque,* played on a smooth, perfectly level court with a border of cement, rubber or wood from which shots may be banked as in billiards. The wickets are smaller, and the mallets usually have shorter handles than in ordinary croquet.

FOOTBALL

(Senior High School to Adults)

Football is a highly technical game governed by exacting rules and to one ignorant of its details may seem an unintelligible series of falls and rushes. College football, sometimes called *American Rugby,* is adapted from English Rugby but differs from it in many ways. College football and English Rugby use an ellipsoidal (oval) ball in contrast to association football, more commonly called *soccer,* in which a spherical ball is employed.

The game is played on a field 160 feet wide and 300 feet long, with *end zones* at each end 30 feet long and the full width of the field. A line divides the field in two equal parts and on each side are 10 white crosslines 5 yards apart. Counting from the center, the 10th crossline at each end of the field is a goal line. The area enclosed by the side lines and the goal lines is the field of play. At the middle of each end zone line stand two goal posts, 18 feet 6 inches apart, with a crossbar 10 feet above the ground.

Two teams of 11 men each play the game. The general object of each team is to advance the ball toward and across the opponent's goal line. This advance is made by throwing the ball, carrying it or kicking it, subject to rules. The team not in possession of the ball attempts to block the advance, either by checking the progress of the player who carries the ball or by getting possession of the ball itself.

A football game is divided into two halves, and each half into two quarters. The quarters are commonly of 15 minutes each. A 15-minute intermission separates the halves; a 1-minute intermission occurs between the first and second quarters and between the third and fourth.

At the beginning of the game the opposing captains toss up for choice of goal or kickoff. If the winner of the toss chooses goal, the other side must kick off. At the beginning of the third quarter, the team that lost the initial toss-up has its choice of goal or kickoff. For the second and fourth quarters, the teams exchange goals.

The team that has possession of the ball makes the attack or offensive. For this attack the opening play of the first and third quarters is a kickoff. At kickoff the ball is sent into the opponent's territory by a place kick from the holders' 40-yard line—the line 10 yards from the middle of the field on the attackers' side. If the opponents secure possession of the ball after a kickoff, they become the attacking party. At kickoff the team

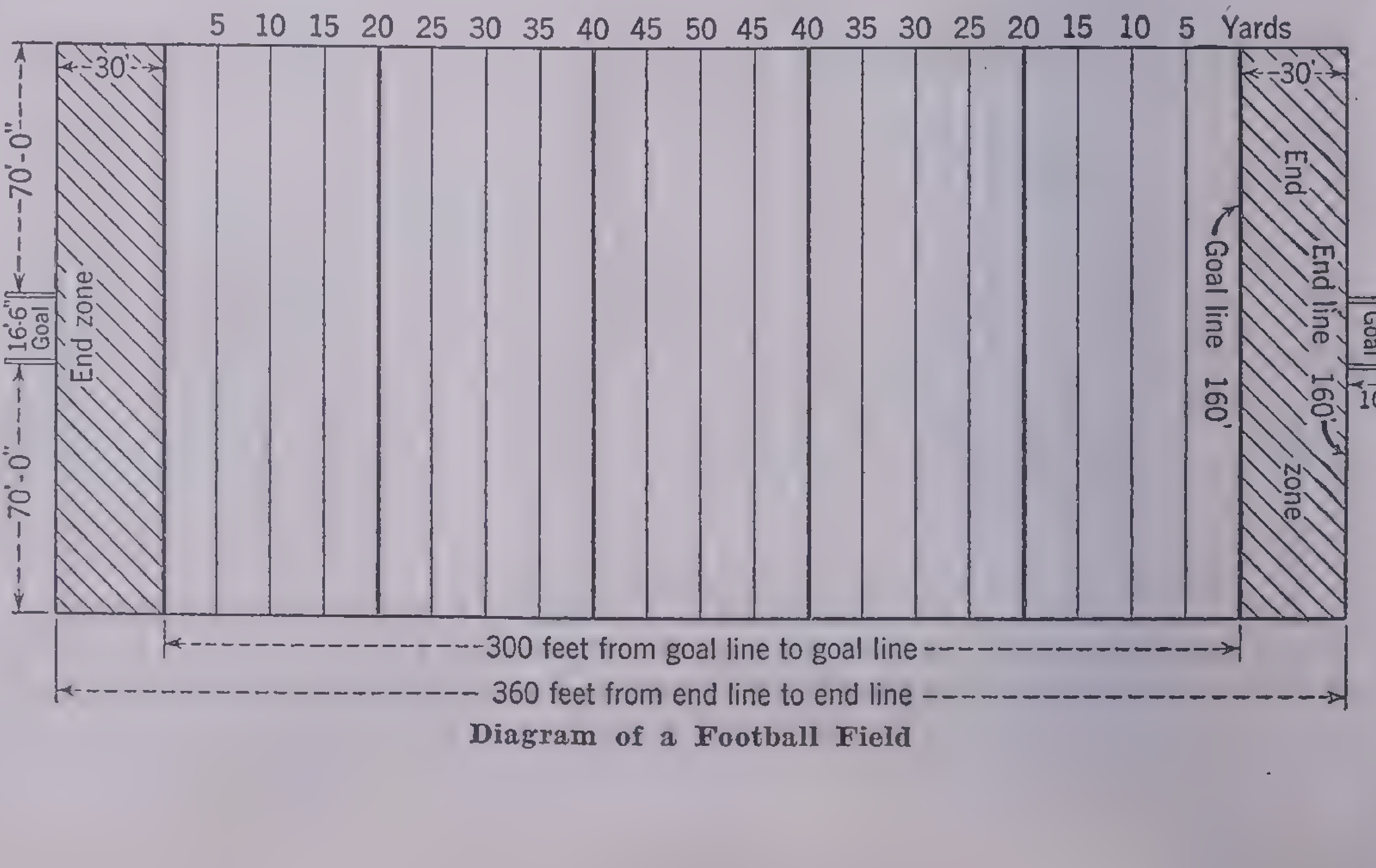

5 10 15 20 25 30 35 40 45 50 45 40 35 30 25 20 15 10 5 Yards
30'
30'
70'-0"
16'6" Goal
70'-0"
End zone
Goal line 160'
End line 160'
End zone
Goal
10'
300 feet from goal line to goal line
360 feet from end line to end line

Diagram of a Football Field

possessing the ball may not advance beyond the crossline on which the ball lies, nor may the opponents come within 10 yards of that line until the kick is made.

There are four general methods of putting the ball in play: punt, drop kick, place kick and scrimmage. As just explained, a place kick is used to open each half game. After a free catch, any one of the four methods may be used.

Definitions and Chief Rules of Play.—The principal terms used in football are listed alphabetically and defined below.

Down. A down, the name of each new play, occurs when the referee blows his whistle and declares the ball *dead.* When a player carrying the ball is so held that he cannot advance, the ball is *down,* and either the player or the referee may call it so. If the man carrying the ball is so held by an opponent that any part of his body other than his hands or feet touches the ground while he is so held, the ball is down. Other chief instances of downs or dead balls are: after a touchdown, touchback, safety or goal has been made; in general: when the ball goes out of bounds at the side; after an incompleted forward pass; while the penalty for a foul is being enforced and after a fair catch.

If a team having continuous possession of the ball fails to make a 10-yard advance during four consecutive downs, the ball goes to the opponents on the fifth down.

No play may be made while the ball is dead, except as provided by rules for reopening play in the case.

To make a *drop kick,* a player lets the ball fall from his hands and kicks it just as it rebounds from the earth.

When a player has an opportunity to catch a ball that is in the air from an opponent's kick, he may signal for a *fair catch* by raising his arm, in which case he must not be interfered with in his attempt at a catch. If he succeeds in catching the ball and takes no more than two steps after catching it, his team is entitled to put the ball back into play by any one of the four methods already mentioned—scrimmage, drop kick, punt or kick from placement.

Forward Pass. From a point at least 5 yards back of the scrimmage line the ball may be thrown forward any distance toward the opponents' goal. Gripping the ball is a more satisfactory hold before a pass than is the open-hand throw. Any member of Team A may pass the ball to any other member if the other player is on the end of the line or 1 yard back of the line of scrimmage. Any member of Team B may attempt to catch or bat the ball by bona fide methods even if some roughness is involved and, if he succeeds, may advance with it or call it down in his possession. After a member of Team B has touched the ball, any player of either side may seek to gain possession of it. If a ball passed forward is not caught but strikes the ground either before or after being touched by a player of either side, the pass is incomplete, and the ball is returned to the point from which it was passed. An incomplete forward pass counts as a down at the spot of the preceding down.

Lateral Pass. A lateral pass may be made at any time during the game, either across the field or backward if desired. It may be intercepted in the air by a member of the other team and advanced; but if the ball strikes the ground or is dropped on a fumble, it is declared dead for the offensive team but not for the defensive team.

Foul. Certain violations of rules are considered fouls (see *Penalties*).

Free Kick. A punt, drop kick or place kick following a fair catch is called a *free kick.* During this play the side in possession of the ball must not advance beyond the line of the fair catch, and the opponents must not come within 10 yards of that line until the ball has been kicked or has touched the ground for a kick.

Field Goal. A goal kicked from the field by a drop or placement kick during the regular progress of the play. The ball must go over the crossbar or over one of the goal posts. Score, 3 points.

Hurdling. A player carrying the ball is not permitted to hurdle in the scrimmage line by jumping over a player within 5 yards of the point from which the ball was snapped back. A man carrying the ball in the open more than 5 yards from the point of beginning the play may not attempt to jump over a player who is still on his feet. Stepping over a prostrate player is not hurdling. In the open a player on his knee may be hurdled without penalty.

Kickoff. First and third halves are opened by this play. It is a place kick from the 40-yard line of the team possessing the ball.

Offside. A team is offside when one or more men of either team shall advance beyond the point whereat the ball is or is about to be put in play—at the time the ball leaves the center's hands or on the kickoff.

Out of Bounds. The ball is out of bounds when either the ball or the player carrying it touches the ground on or outside the side line or side line extended. If a ball kicked by a member of Team A goes out of bounds without touching a member of Team B, the ball goes to Team B; but if such a ball touches a member of Team B before going out, it belongs to the team that first secures possession of it. A ball out of bounds must be brought back into the field 5 or 15 yards for scrimmage. No player may be out of bounds when the ball is put in play except the kicker and the holder of the ball in a place kick.

Place Kick. A ball kicked while it is resting on the ground, either free, as at kickoff, or supported by an assisting player.

Punt. A kick in which the ball is struck as it drops from the player's hands and before it touches the ground.

Safety. A safety is made when the ball is declared dead, behind or on the goal line, in the hands of a player defending his own goal, provided that the impetus that sent the ball over the goal line was given by a member of the defending team. Certain other technical cases of fouls, incomplete passes or kicks across the side lines also constitute safeties. A safety made by a player of Team A counts two points for Team B.

Scrimmage, the action of putting the ball in play between closely opposing lines of players. At least seven men of each team must be in position on the scrimmage when the ball is put in play. There are really two scrimmage lines, separated by the length of the ball as it lies lengthwise on the field. To be in position on the scrimmage line, a player must have two hands or two feet or one hand and the opposite foot, within 12 inches of his team's line. The seven men in the line-up for scrimmage are, each way from the middle: center, right and left guards, right and left tackles and right and left ends. Back of the line, 1 yard or more, are: the quarterback, the right and left halfbacks and the fullback. The ball is put in play by being snapped back on signal from center to a back. The quarterback calls secret signals giving directions to his teammates, including the runner to whom the ball is passed.

Touchback resembles a safety; it occurs when a member of Team B holds the ball behind B's goal line, having been forced behind his goal line by Team A. After a touchback or a safety, the defenders who made the touchback or the safety put the ball in play anywhere on their own 20-yard line.

Touchdown, made when a ball lawfully held by a member of either team is declared down, on, over or behind the opponents' goal line. A touchdown counts 6 points and entitles the team that just scored to add an additional point if successful in kicking the ball over the crossbar of the goal post or in passing or rushing the ball across the goal line.

Penalties.—Losses of 5 to 15 or more yards are imposed according to the nature of the violation of the rules.

Loss of 5 Yards: For taking time out more than three times during either half, unless the player is removed for whose benefit time was taken out; for failure of a substitute to report to referee before entering play; for illegal position or offside play; for violating neutral zone at scrimmage; for playing out of bounds; for putting ball in play illegally; for guard or center carrying ball; for feint to snap the ball; for fake attempts to draw opponents offside; for player taking more than two steps after fair catch; for delaying the game; for interfering with opponents before ball is in play; for holding by defense; for wilful collision with the fullback; for crawling after the ball is down; for flying tackle or tackle below the knees; for unfair play not specifically mentioned in the rules.

Loss of 15 Yards: For intentional throwing of forward pass to the ground; for substitute communicating with a player before the ball is put in play; for any player leaving the field during the 1-minute intermissions; for interfering with a signaled fair catch; for tackling a player who has made a fair catch; for unlawful assistance to a man carrying the ball, including interlocked interference; for holding, by side possessing the ball; for forward pass by the team that did not put the ball in play; for roughing a man who has kicked the ball; for hurdling; for piling up after the referee declares the ball dead; for any unnecessary roughness or unsportsmanlike action; for coaching from the side lines; for illegal presence on the field of play.

Loss of 25 Yards: For being unready to play at the beginning of the second half.

Loss of Half the Distance to the Goal: For a player illegally returning to the game; for striking, kneeing or kicking an opponent; for a foul by the defense within 1 yard of its goal line.

Loss of a Down: For each incomplete forward pass; for two players of the passing side touching a forward pass; for forward pass going out of bounds on the fly; for ball snapped out of bounds by Team A and recovered by Team A.

Loss of Ball to Opponents: For the four cases last mentioned, if on fourth down; for an offside player touching the ball; for a kicker recovering the ball before it has been touched by a man entitled to get it; for illegal batting, kicking or kicking at a loose ball.

Suspension from Game: For illegal return to the game; for illegal equipment.

Disqualification: For striking, kneeing and kicking; for roughing the kicker; for any flagrantly unsportsmanlike conduct.

Forfeiture of the Game: For refusal to allow the game to proceed or refusal to play within 2 minutes, when ordered by the referee.

Six-man Football Teams.—In 1937 American football was influenced by a growing enthusiasm for a six-man team. The movement began in the Southwest and was taken up in the East by Yale and many other colleges. In all, some 700 schools have adopted the smaller team; it is composed of three backs, two ends and a center.

GOLF

(Junior High School to Adults)

Golf is an outdoor game played on a *course* or *links.* The game probably originated in Holland or Belgium in the early Middle Ages. Very soon afterwards it became popular in Scotland, but it was not until the 19th century that its popularity spread to England and the United States, where it has become a national pastime.

A golf course contains either 9 or 18 *holes.* Each hole consists of a *tee,* a level plot of varying size on which the ball is teed up for the initial shot on each hole; a *fairway* or lawn extending all or most of the way from the tee to the green; and the *green,* generally a roundish plot made of very closely cut grass or in some places of sand. In the green is the hole, about 4¼ inches in diameter and 4 inches deep, into which the ball must go before the next hole can be played.

Clubs of various shapes are used to hit the ball off the tee into the fairway or into the *rough* (the uncut grass surrounding the fairway) and from there to the green and the hole. The position of the hole is marked by a slender pole with a colored flag. The pole is removed from the hole when all the players have reached the green. The fairway may contain natural hazards, such as trees, rocks, small streams or ponds; and artificial ones, such as *bunkers* (mounds of earth) and *traps* (depressions filled with sand).

The distance from the tee to the hole may be anywhere from 60 to 650 yards. Each hole should theoretically be played in *par,* the number of strokes needed to reach the hole from the tee. Par for holes of 250 yards or less is generally 3; for holes of 251 to 445 yards, 4; and of 446 to 600 yards, 5. This may vary somewhat according to the difficulty of the hole; and on each course there is an official par for each hole. When a player makes a hole in one less than par, he gets a *birdie.* If he does it in two strokes less than par, he has an *eagle.* The purpose of the game, therefore, is to hit the ball, without touching it except by the clubs, from tee to hole in as few strokes as possible. The lowest score is the best score.

The clubs used in golf may be classified in three general groups: wooden clubs for long shots; iron clubs for intermediate shots; and the putter for use on the green in actually hitting the ball into the hole.

Golf is usually played in *twosomes* (one player against another) or *foursomes* (partners against partners). Players are usually accompanied by a caddie, who carries the bag of clubs. The player who takes the fewest strokes on the first hole has the *honor;* that is, he starts first on the next hole and so on. After all the players have driven off the tee, the one farthest from the hole shoots next, and play continues in this manner until all the balls are holed. *Colonel Bogey* is an imaginary opponent who makes every hole in a little more than par and so provides competition for a single player. The bogey for each hole is not official.

Golf is usually scored in one of two ways: in *match* play the score is by holes; that is, whoever wins the most holes wins the match; in *medal* play the score is by strokes, and whoever has the fewest number of strokes for the number of holes played wins the match. There are numerous and interesting variations: in *two-ball foursomes* partners alternate shots on the same ball; in a *Nassau match,* one point is given for winning the first 9 holes, one for the second 9 and one for the 18. Women use the same courses as men, though sometimes special tees a few yards closer to the green are provided for their use.

HANDBALL

(Late Elementary School to Adults)

Handball is a game that may be played outdoors but is often played in an indoor gymnasium. There are two main divisions of the game: *Four-wall handball,* an old Irish game played with four walls, front, sides and rear; and *one-wall handball,* the American adaptation of the Irish game, which originated in New York about 1900 and is played against a single wall. The single-wall court is more commonly used and enables camps and outdoor playgrounds to feature the game. Because it is more common and practicable, only the one-wall game will be described.

Dimensions of the One-wall Court. A handball floor is 34 feet long by 20 feet wide. The front wall is 16 feet high. A line called the *short line* is drawn on the floor parallel to the front wall and 16 feet from it. Nine feet farther from the wall, behind the short line, markers are placed to indicate an imaginary line known as the *service line.* If the court is outdoors, 6-foot wire extensions should be built above the wall and on the side lines to stop balls that miss the wall.

The game is played by two to four persons on opposing teams. The object is to secure points by causing the op-

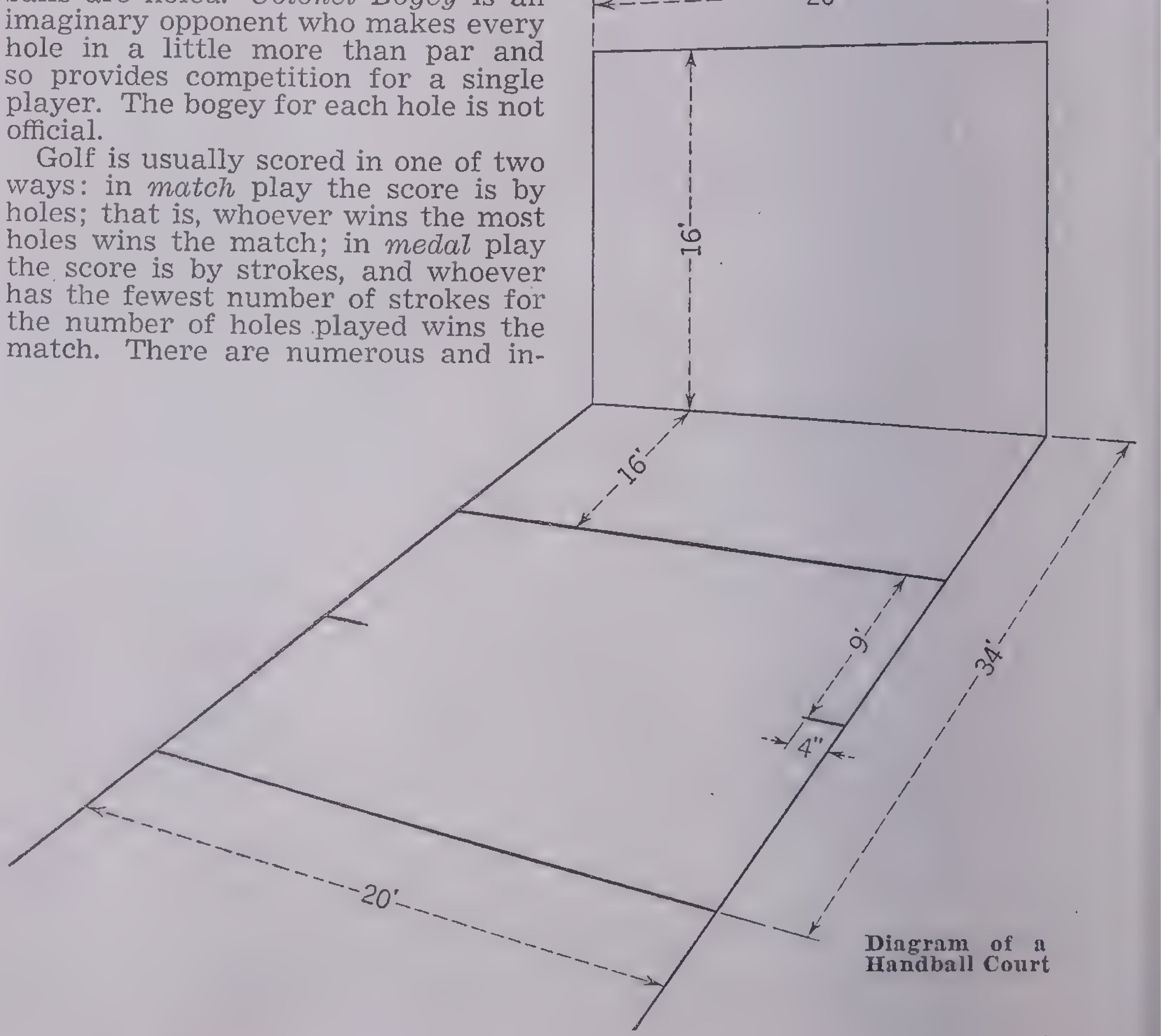


Diagram of a Handball Court

ponent to fail in his effort to hit the wall. In the United States 21 points constitute a game.

The standard handball is a black rubber ball 1 inches in diameter ⅞ and 2 ounces in weight. It may be hit with either hand. The hand is best held as a shallow cup, deepest at the second joint, where the ball strikes. Gloves may be worn.

Each effort to win a point begins with a service from the space between the short line and service line. For this play a ball is dropped to the floor and hit on the first bounce. A player may bounce the ball twice before swinging at it but will be out unless he swings on his third try. A ball served must go to the front wall without striking any other object, must hit the wall above the 4-inch baseboard and in rebounding must first touch the floor beyond the ace line—though it may be made to strike side and back walls on its way to the floor. A served ball that strikes between the front wall and the ace line in its rebound from the front is a *short* ball. A *long* ball, one that strikes the floor behind the back line, may combine with short balls to lose the three attempts at fair service, and the hand-in becomes hand-out. Each fair service cancels whatever shorts and longs the server may have against him.

If a served ball strikes properly behind the ace line, the receiver (an opponent) must return it on the fly or first bound to the front wall above the baseboard. After this first service and return the players alternate in striking the ball until one fails to get it back to the front. Only the served ball must strike behind the ace line in rebounding from the front wall; all returned balls may fall on either side of the ace line as long as they stay within the court. Balls in play may be volleyed before they strike the floor or be hit on first bound.

In general intentional interference, blocking the ball, is a *foul;* unintentional interference by an opposing player is called a *hinder.* Fouls are punished, but a hinder is merely followed by reservice from the same player. It is always a foul, however, to stop a ball on its way to the front wall. It is a foul to strike a ball with both hands or to touch the ball twice in one attempt at batting.

Since only the server can score, fouls by the hand-in forfeit the ball, and fouls by the hand-out score for the server.

The officials of handball are a referee and a scorer.

HOCKEY

(Senior High School to Adults)

Hockey is a stick game of ancient origin passed down the centuries from the Persians to the Greeks, to the Romans and northward to the Britons. It became one of the national games of England and Scotland. In Ireland it was played differently and was called *hurling* or *hurley.* Boys in the United States have a simple game called *shinny* that they play with a curved stick and ball or block of wood and which is based on some of the principles of hockey. There are two major divisions of this sport—field hockey and ice hockey.

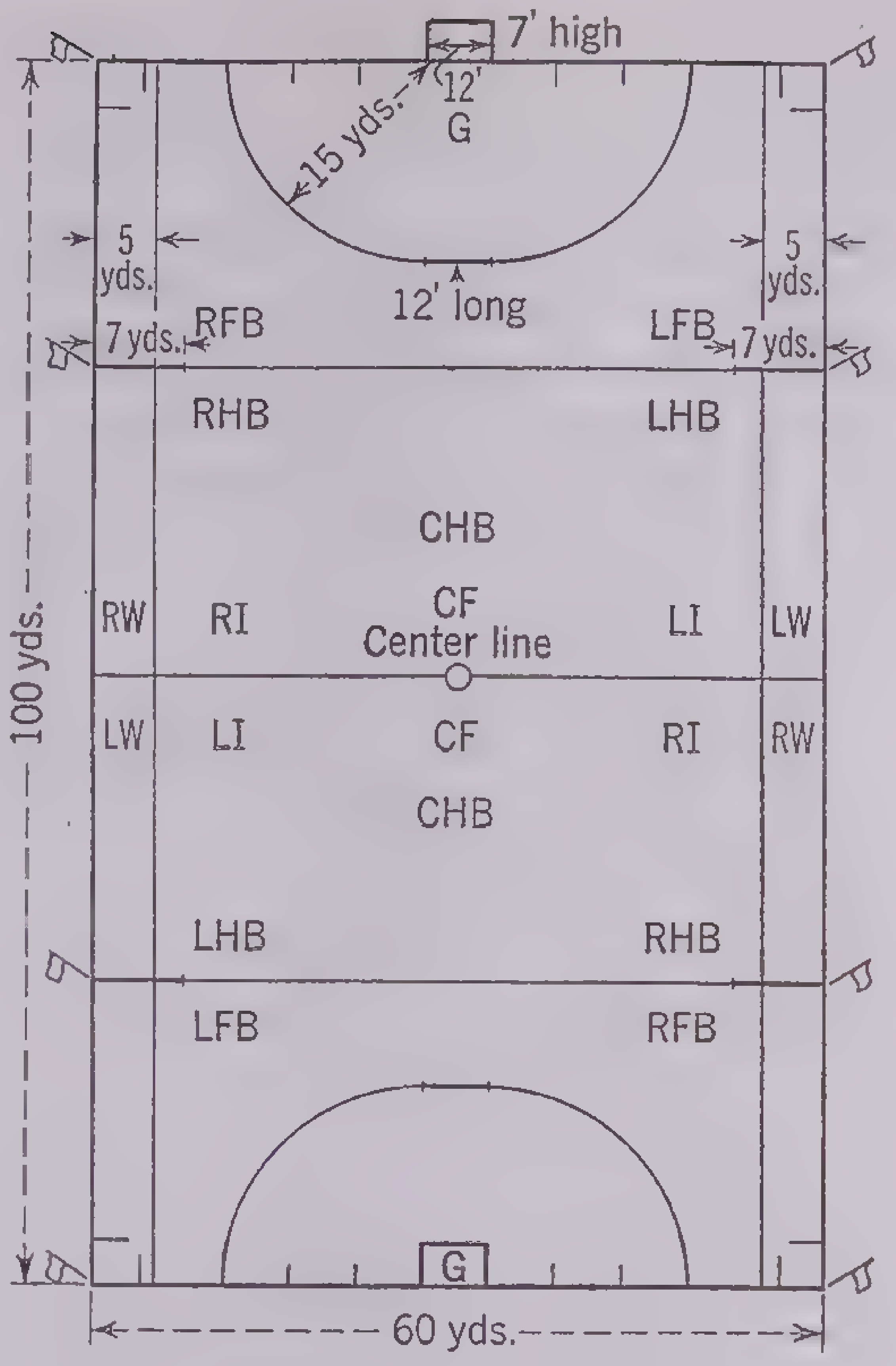


Diagram of a Hockey Field

Positions of players: RFB, right fullback; LFB, left fullback; RHB, right halfback; LHB, left halfback; CHB, center halfback; RW, right wing; RI, right inside; CF, center forward; LI, left inside; LW, left wing; G, goalkeeper

Field Hockey.—The playing field is 90 or 100 yards in length by 50 or 60 yards in width; for secondary schools the size is reduced to 85 yards by 45 yards. There are 5-yard strips along each side. The goal posts are 12 feet apart at the middle of each end with a crossbar at a height of 7 feet. A net is placed back of the goal to catch the ball. Fifteen yards directly in front of each goal line, a 4-yard line is drawn in white; ends of this forward line are connected with the goal line by arcs with the goal posts as centers and a radius of 15 yards. This space is called the *striking circle.* Boundary lines are called *side lines* and *goal lines,* respectively. The field is divided into four 25-yard sections by a *mid-line* and two *quarter lines.*

The game is played by two teams of 11 members each; each eleven has five forwards, three halfbacks, two fullbacks and one goalkeeper, with general positions as shown in the diagram. The players use hooked or bent sticks with blades of ash and handles of cane, often with rubber inserts. The sticks weigh up to 28 ounces. Lighter sticks are used by the forwards and heavier sticks by the backs. The ball is painted white and is the same size as a cricket ball—9 inches in circumference and 5½ ounces in weight. Heavy low-heeled shoes without spikes or cleats are worn.

The object of the game is to pass the ball from player to player until it is driven into the opponents' goal. All shots at goal must be made from within the striking circle. Each goal scores one point.

The forwards are the chief attackers; the halfbacks assist the forwards; fullbacks break up attacks by the enemy; goalkeepers block shots at goal. Every attacking man is guarded by a corresponding opponent.

Only players *onside* may strike a ball toward the opponents' goal. A player is *offside* when the ball has last been hit or rolled in by a member of his own team behind him, unless at the time the player is in his own half of the field, unless the striker or roller-in is nearer the opponents' goal line, or unless there are three or more opponents between the player and the goal he is attacking. An offside player becomes onside when his teammate who last touched the ball passes him toward the opponents' goal, or when an opponent touches the ball.

It is permissible to stop the ball by using any part of the body, but only the goalkeeper may kick the ball. A ball caught in the hands must be dropped at once to fall perpendicularly.

Back strokes are not permitted. A player may hook sticks with an opponent within striking distance of the ball.

The beginning of a hockey game is an operation known as the *bully,* for which two opposing players stand on the center line, each with the opponents' goal at his left hand and with the ball between them. Each must strike the ground and the opponent's stick three times in succession, after which both are free to strike the ball. During this operation all players of each side must be in their regular team positions.

A bully on the mid-line is also used at the beginning of the second half and after each scoring of a goal. If an attacker drives the ball across the opponents' goal line outside the posts, a bully must be played on the 25-yard line nearer this goal. An intentional foul by the defenders within the 25-yard line calls for a *penalty corner;* an unintentional foul of the same type gains a *corner* (a hit taken within 3 yards of a corner flag); a penalty corner is taken from any point of the goal line not less than 10 yards from the nearer goal post.

When any player causes the ball to go out of bounds at the side, one of his opponents must put the ball back in play by rolling it into the field in any direction. For this purpose only one man may be outside the 5-yard line, and no player may enter the 5-yard line until the roll-in is begun.

It is a foul (1) to hold, strike, push, trip or kick an opponent; (2) to raise the stick above the shoulders; (3) to strike with the back of the stick (4) to strike the ball while offside; (5) to cross between a player and the ball in order to prevent his striking.

Penalty for each of these fouls is one free hit by the opponents, the defenders standing at least 5 yards from the man who makes the free hit.

The game has two halves of 30 minutes each. Halves of 15, 20 or 25 minutes are often used by younger players. The referee is head official and has charge of the ball. An umpire in each half of the field watches the conduct of players and reports certain classes of fouls assigned to him.

Ice Hockey.—Ice hockey was originally called *bandy* and is more popular than field hockey in countries where there is ice in the winter. To most Americans, therefore, *hockey* means *ice hockey*. In its simplest form of driving a ball across a given limit with a stick, ice hockey has been known for at least 5 centuries in northern Europe. The present form of the game has been played in Great Britain for over 65 years; the international rules of play emanated from Canada.

The rink for ice hockey is usually 200 feet long and 85 feet wide but may be as small as 160 feet by 60 feet. The rink is surrounded by a board fence called the *banking board,* approximately 40 inches high; the purpose of this board is to permit the *puck* to rebound. The goals, open net- or wire-covered cages 6 feet broad and 4 feet high, are placed at the center of each end line. Sixty feet from each end *zone lines* are drawn across the rink; the remaining center area is called the *center zone.*

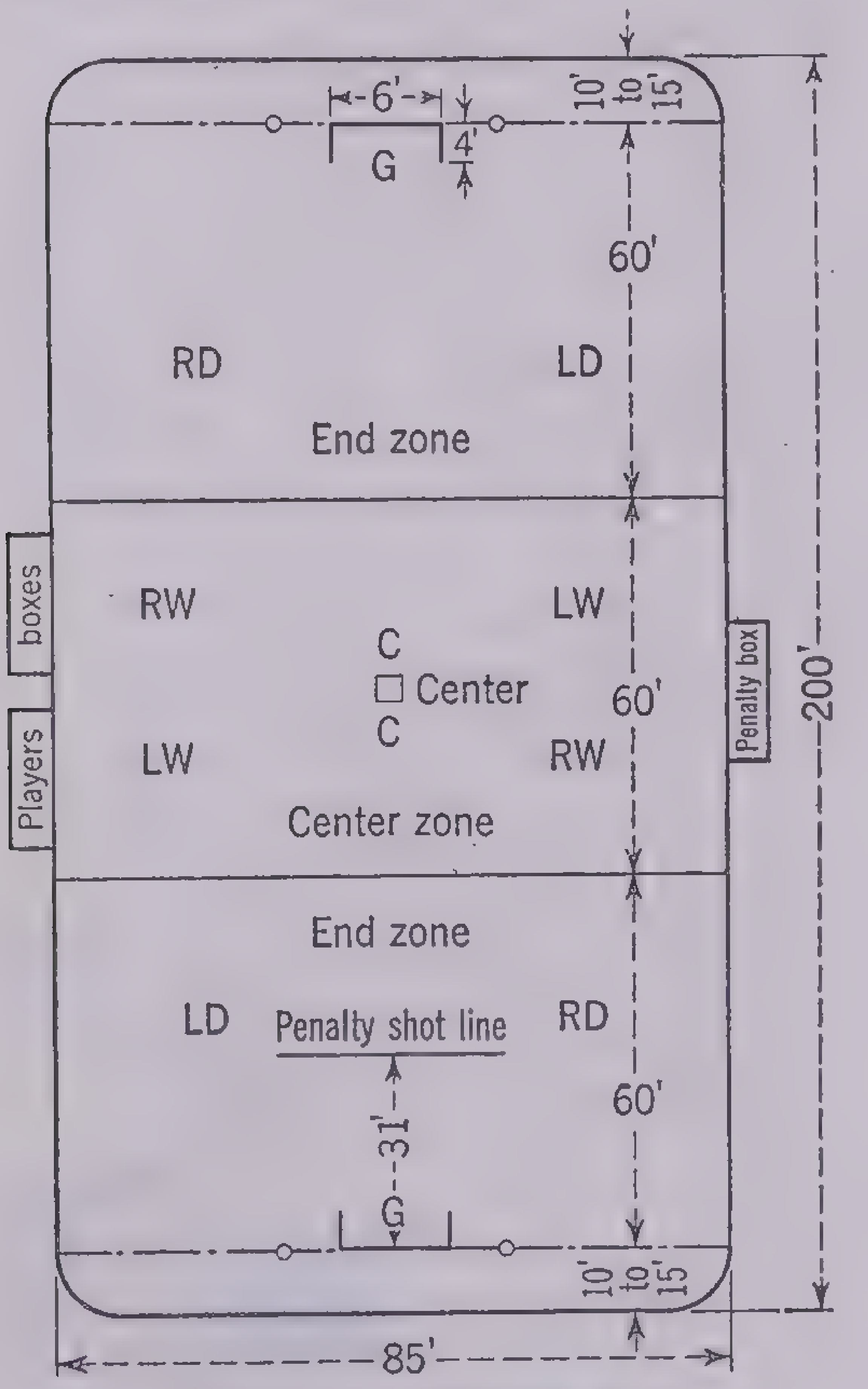


Diagram of a Hockey Rink

Positions of players: G, goalkeeper; RD, right defense; LD, left defense; RW, right wing; LW, left wing; C, center

The players are on skates and carry official ice-hockey sticks. The puck is a flat solid disk of vulcanized rubber 1 inch thick and 3 inches in diameter and the banking boards keep it almost constantly in play, so that ice hockey is one of the fastest and most strenuous of sports. Heavy gloves and shin guards are worn to protect the hands and legs from injury by the puck or sticks. The goalkeeper wears heavier guards fully covering his legs and a padded protector for his chest.

Each team has 6 players formed of right and left wing (forwards), center (also a forward), right and left defense and goalkeeper. Both hockey teams endeavor to secure the larger score by shooting the puck into the opponents' goal. Each fair goal counts one point.

The *facing off* that starts the game is similar to *bullying* in field hockey, but the sticks cannot be less than 1 foot apart.

Players carrying the puck take it down the field toward the opponents' goal by pushing it along the ice or passing it to a teammate who carries it toward the goal. Opposing players intercept the puck whenever possible. Although any player may score, the majority of the goals are made by the forwards; shots lifted from the ice, possessing a rotary movement and aimed at the top of the lower left corner of the cage are the most successful in escaping the goalkeeper.

Minor fouls are penalized by suspension from play for 2 minutes and include: hitting an opponent with a stick, throwing the stick, swinging the stick above the shoulder, cross-checking (holding the stick with both hands before an opponent) and playing without a stick.

Five-minute suspensions penalize these *major fouls:* pushing an opponent with unnecessary roughness or shoving him violently against the banking board, blocking the goalkeeper's movements or throwing a stick in the path of a shot at goal. Any extreme or obviously unnecessary roughness may earn suspension from the rest of the game. After his suspension time is up, the player immediately re-enters the rink.

A substitute may replace any player at any time during the game when play is officially stopped by the main official, the referee, or his assistant. A timekeeper, assistant timekeeper, penalty timekeeper and two goal umpires also are used.

The game is played in three 20-minute periods with 10-minute intermissions between periods. In case of a tie overtime is allowed.

HORSESHOE PITCHING

(Late Elementary School to Adults)

Horseshoe pitching is an ancient and popular informal contest and has become a standard event outdoors and at picnics. A less scientific form of the game is called *quoits* and employs a flat, iron ring instead of an open-end horseshoe.

Courts for informal play have iron stakes 30 to 40 feet apart, usually the greater distance unless the players are women or boys. The stakes are in the center of a *pitcher's box* 6 feet square, with a wooden frame 1 inch above the ground. Moist sand or loam is used to fill the pitcher's box to a depth of 6 inches or more. The stakes are 1 inch in diameter and are 8 inches above the surface of the surrounding clay.

Each player is allowed two shoes that may not be more than 7 inches wide and 7½ inches long, or over 2½ pounds in weight. After a toss for the choice of first pitch or follow, the two to four players take turns in pitching, the player with the larger score throwing first. No player may pitch from a step ahead of the line 3 feet in front of each stake that forms the pitcher's box on penalty of forfeiting his score by the pitch.

Any shoe that strikes the ground or frame of the pitcher's box in called a *foul shoe* and does not score; if a shoe encircles the stake or peg it is called a *ringer* and scores three. A *leaner,* a shoe that hits the peg without encircling it, counts as the closest shoe to the stake, which always scores one point. If two or more shoes are equal distances from the peg or are ringers, it is a tie and no points are given. A shoe may be moved by the impact of another shoe and both are measured from their new position. A score of 21 or 50, as agreed upon, constitutes a game.

ICEBOATING

(Senior High School to Adults)

An American Sport.—Iceboating, although practiced a little in Holland, the Scandinavian countries, Russia and Great Britain, is distinctly an American sport. Iceboat races were held on the Hudson River in the latter part of the 18th century, and iceboating is a popular winter sport in many parts of Canada and the United States.

The first iceboat was merely a square box with a skate on either side for runners and one in the back for a rudder. The modern boat, which will speed 70 miles an hour, consists of a long, single, wooden beam (usually of bass, pine or butternut) set on a crossbeam at right angles and about two-thirds of the way forward to make a kite-shaped frame. To the crossbeam are attached two runners set into oak frames; a third runner is attached to the lengthwise beam at the rear end for a rudder, which is worked by a tiller, usually made long enough for the steersman to lie in the box and steer with his feet while his hands manipulate the sails.

The passenger box (usually triangular or elliptical) is placed on the beam just ahead of the rudder. The single mast may be either ahead of or at the junction of the beam and crossbar. The mast and spars are usually hollow and are rigged with pliable steel wire. A mainsail and jib rigging are generally used, and the sail area varies from 300 to 600 square feet.

The sailing course for a race is an equilateral triangle, each side 1 mile long. The boats must sail a certain number of times around the course.

Scootering.—A development of the iceboat peculiar to Great South Bay off the south shore of Long Island is the *scooter,* which consists of a duckboat fitted with runners and sails. It originated, so the story goes, with the duck hunters who grew tired of pulling their boats over the ice to open water. At first they equipped their boats with runners only, which made it easier to push the boats. Then someone tried the sail. The modern scooter has standard equipment and is a strong boat 14 feet long with a 5-foot beam, on the bottom of which two long runners are set midway each side of the center, and two shorter ones are placed well out to each side to carry the boat when it heels over. The sail area, mainsail and jib, is 150 square feet, the mainsail stretched far astern on a long boom; the jib (by which the boat is steered) streched out on the bowsprit. The scooter's great advantage over the iceboat is that it is amphibious and hence well adapted to places where the ice has many open spots.

LACROSSE

(Senior High School to Adults)

Lacrosse is a field game of North American Indian origin that has long been a favorite in Canada and is gaining popularity in the United States and Great Britain. Lacrosse resembles hockey in some respects but has a different-shaped club in which the ball is carried to the goal.

Two teams of 12 players each play on a field that may be 100 to 130 yards long and 70 to 85 yards wide. Most fields allow about 20 yards back of each goal across the width of the field. The goals are set midway at the ends of the playing field in a space 12 feet deep and 18 feet long called the *goal crease* and are formed by two poles 6 feet high and 6 feet apart with a crossbar to which a net is attached. A circle in the exact middle of the field has a diameter of 20 feet.

The rubber sponge ball may be 7¾ to 8 inches in circumference and 4½ to 5 ounces in weight; for camp use the ball is sometimes whittled from softwood. The racket or *crosse* may have a handle of any desired length, but the net-covered oval triangle formed by the bent stick may not be more than 12 inches wide. Rubber-soled shoes are worn.

The purpose of the game is to throw or carry the ball into the opponents' goal. At the start of play each team has a goalkeeper, point, cover point and third-home man in a line up the field directly before their goal, right and left defense, center, right and left attack, and third-, second- and first-home men in front of the opponents' goal.

The play begins with *facing*—a maneuver corresponding to the bully of hockey and the center-jump of basketball. Two players face each other, left hands toward the goal they are to attack and the ball placed between the reverse surfaces of their crosses. On signal, each draws his crosse sharply toward him and is then free to try for the ball. He may bat the ball if he chooses or scoop it up and run with it, but the best of tactics is to begin as promptly as possible a series of short quick passes toward the goal. The Canadians have developed amazing team play, and their pass work is more remarkable than that of the best basketball player considering the tools by which the passing must be done. It is possible to throw the ball 100 yards or more with the crosse, but short throws retaining control of the ball are better in the long run.

Charging is not permitted, but a man may block the progress of an advancing player by standing in his way. When the ball goes out of bounds, the two nearest opposing players must *face* not less than 4 yards from the boundary line.

It is a foul to strike, push, hold or trip an opponent; to throw the crosse; to interfere with a player who has not the ball; to interfere with the goalkeeper before the ball passes into the crease; to touch the ball with the hand. (A goalkeeper may stop the ball with his hands, as in hockey.)

The penalty for a foul is either suspension from 1 minute to 5 minutes or a *free position.* A personal foul earns suspension for the rest of the game. If a free position or throw is to be made, the referee designates a player of the side against which the foul was committed to make such play with the ball as he may choose, no opponent being permitted within 5 yards when his play is made. A free throw cannot be declared within 10 yards of the goal endangered by it.

PING-PONG or TABLE TENNIS

(Junior High School to Adults)

Ping-pong is an indoor table game adapted from lawn tennis; it is played on a standard table with small, hollow celluloid balls and a solid-faced racket or paddle. The racket is of plain wood or surfaced with sandpaper, rubber, leather or cork, and the blade is 5¼ inches wide and 6½ inches long with a handle 5¼ inches long. The standard table is painted dark green, is 30 inches above the floor and is 5 feet wide by 9 feet long. White lines (about ¾ of an inch wide) go lengthwise down the center of the table top and around its outside edges. The net, stretched across the center, is dark green with white binding and is 6¾ inches in height.

Either solid or folding tables may be used; for informal or home use, tables may run as small as 5½ by 3 feet, and the net is adjusted to allow a ¾-inch height for each foot of table length.

Singles or doubles games may be played by two or four persons, and rules similar to those used in tennis apply, except that only one serve (underhand) is permitted, no ball may be volleyed (hit before the bounce), and in singles service may be to either court.

The purpose of the game is to return the serve so that the receiver cannot get it back into his opponent's half of the table. A *fault* in service or failure to make a fair return during play adds one point to the opponent's score. The first player to earn 21 points with a 2-point margin over his opponent is declared the winner. A score of *20-all* requires one player to secure two points in a row to win.

Each player serves five times in succession, then receives five times, and so on until the game is won or the score is 20-all. After 20-all is reached, service changes after each point.

In doubles the serve must be to alternate courts as in tennis, and partners take turns serving; that is, when A and B are playing against C and D, A serves five times, then C, B and D each serve five times. In doubles each player may take one side of the court, or he may alternate shots with his partner. When partners alternate shots, it is a fault if the ball is returned twice in succession by the same player.

An exciting game in which several people can participate is played as follows: All stand around the ping-pong table, with one player at each end holding a racket. After the ball is served, the server drops the racket and starts around to the other end of the table, and the player behind him picks up the racket and makes the next shot, again dropping the racket for the next player. After a player makes three misses, he drops out. As the players become fewer, the game becomes more exciting, and finally only three are left rushing madly around the table. One soon drops out, and the survivors are proclaimed the winners.

POLO

(Adults)

Polo is the ancient predecessor of hockey—the game with stick and ball. Judging by the records and literary references, hockey on foot always derived from the mounted version. Authentic polo originated in Persia more than 2,000 years ago and spread throughout the East. Polo was played for the first time by Europeans in 1863, English cavalry officers forming the first polo club in Calcutta in 1864–65. News of the game spread to England and the first game was played there by army teams in 1869 with improvised mallets and wooden balls about the size of cricket balls. Through the enthusiasm of a visiting American journalist, James Gordon Bennett, the game was introduced to the United States in 1876. The first game between the United States and another nation's team took place in 1886, when an English team won the cup offered by the Westchester Polo Club. In 1921 a committee met in London and drew up rules for polo that have since been adopted universally with minor local changes. Teams from Argentina have played United States teams since 1922, and many expert American players prefer Argentine ponies. The major national governing body for polo is the United States Polo Association, which includes the Intercollegiate Association as a member organization.

Polo fields are 150 to 200 yards wide and about 300 yards long and may be boarded on all sides. Goal posts are 24 feet apart, 250 yards distant from each other and are made of light wood that may break without injury to a player or his mount. The game is played by riders on horseback; its object is to drive a 3-inch white wooden ball, by the stroke of a long, flexible-handled mallet, between the opponents' goal posts. The usual game is divided into *chukkers* or periods of 7½ or 8 minutes each, with 3-minute intermissions; at the half, a 7-minute rest is allowed. Match play outdoors has 4-man teams with two forwards and two backs, but indoor polo is usually played by 3-man teams. A system of handicaps for less skilled players has done much to widen the popularity of the game.

The requirements of the game are severe, and considerable danger and expense are involved. The major prerequisites are excellent horsemanship, clear and cool headwork and the ability to make controlled shots, forward or backhand, and to meet the flying ball with the head of the mallet.

Fouls are declared for all cases of careless, reckless, dangerous riding, for roughness in personal contact with an opponent or for cruel treatment of the ponies. It is a foul for a dismounted player to strike the ball or for any assistance to be given in the progress of the game by a person who comes on the field for that purpose.

Each foul subtracts one-quarter or one-half point from the score of the offending team. A goal made, directly or indirectly, by means of foul play does not count. Fair goals count one point.

ROWING

(Senior High School to Adults)

Rowing is propelling a boat by oars operated by two or more persons; *sculling* is a similar operation by one person who uses a pair of sculls or short oars approximately 2 feet shorter than those for rowing. A single shell as used for sculling is about 26 feet long, eleven inches wide, with a weight of 28 pounds.

Rowing has been officially recognized as a sport for over a century, although records exist of rowing races in England as far back as 1715. Rowing was used for purely utilitarian purposes in transportation, war and commerce from early days until the Elizabethan age.

Outriggers (steel frames for placing the row-locks well out at the side of the boat) were invented in 1845 by Clasper, a builder at Oxford, and started the rapid development of the long, narrow, light modern racing *shells*. The sliding seat now universally employed in intercollegiate contests was first used by Yale in 1870.

Shells with 6 to 10 oars were used in many historical races but the 8-oared shell has become the common type. An 8-oared shell is about 60 feet long, 2 feet wide, about 9½ inches deep and weighs between 270 and 300 pounds. In an 8-oared shell each man pulls one oar or *sweep*, about 12 feet 3 inches long. Races in a regular rowing regatta are likely to include single and double sculls and sweeps in pairs, fours and eights.

An 8-oared crew is accompanied by a *coxswain*, who sits in the stern facing forward, steers the boat and has the responsibility of setting the speed of the stroke. In spurts a racing crew is likely to finish a short race at about 41 strokes to the minute. Longer courses of 3 miles or more take a steady pace of about 33 and quicken at the finish to 38 or better.

The first oarsman facing the coxswain is the *stroke oar*, who receives the advice of the coxswain and himself sets the stroke that the others must take. Other oarsmen must follow his lead or there can be no hope of winning. Good generalship is required in placing the men to distribute both the weight and the strength to the best advantage. In general the less the rudder has to be used, the more energy can go into the straightaway course, for turning the shell even slightly creates a drag in the water that slows the speed.

Much depends on form. The sliding seat makes it possible to use muscles from neck to toes, but it is no easy matter to bring all the muscles into the smooth co-ordination that means the greatest possible drive and power. Long before the spring season opens, muscles are disciplined by practice on gymnasium rowing machines.

Certain types of stroke have proved advantageous. Best results require that the oar blades should not be deeply plunged during the stroke but should be merely covered by water. To *feather* is to give such a downward flip to the wrist and forearm as to make the oar blade skim along nearly parallel to the surface of the water in the recovery after each stroke. If the oar is spoon-shaped, it is sometimes allowed to touch the water lightly as it swings back, thus sustaining a part of the weight of the oar on the water; but much of this saves the rower at the expense of the pace. Feathering is universal, in order to cut the resistance of the air in the backward thrust of the oar.

Rowing is a favorite intercollegiate contest wherever a water course is available, but it is by no means limited to the colleges and universities. Secondary schools have excellent crews, and they have competed creditably in the great English regatta at Henley. Boat clubs practice the world over, and annual regattas are of national and international interest.

SMALL-BOAT SAILING

One of the very finest of all outdoor sports, sailing a small boat, not only gives a great amount of thorough enjoyment but is highly valuable as training in judgment, quickness of decision, and the development of courage.

A small *cat-rigged* boat is the best kind in which to learn, because its equipment is simple and the comparatively wide *beam* (breadth) that marks the typical catboat makes it safe. Cat-rigged means rigged as a catboat, with only one sail, and with the mast set far forward in the *bow* (forward end). A cat generally has a *centerboard* set in the middle of the boat, which can be raised and lowered and is used in sailing against the wind. The sail may be either triangular or quadrilateral. In either case the lower end of the sail is fastened to a *boom*, a horizontal spar free to swing horizontally with the mast as a pivot. A quadrilateral sail has also a *gaff*, a shorter pole supporting the upper edge of the sail. The gaff also pivots against the mast.

The sail is raised and lowered by means of one *halyard* (rope to hoist sail) in the case of the triangular, two halyards in the case of the quadrilateral sail, because one is needed to adjust the outer end of the gaff. When the boat is under way, the sail is controlled by means of a rope, called the *sheet*, fastened to the boom at its *after* (rear) end.

The boat is steered and controlled by means of *rudder* and *tiller*. The rudder is a square or rectangular flat piece of wood or metal at the stern end under the water; the tiller is a handle that is attached to the top of the rudder and extends into the cockpit or open space where the helmsman sits.

If the catboat is fastened to a mooring and you go aboard to go sailing, *before* you raise the sail, if it is the triangular type, you should do two things: (1) see that the sheet is unfastened from the cleat and neatly coiled so as to run freely; (2) pull your boat up close to the mooring and fasten her there; then raise the sail and, when it is all the way up, fasten the halyard to the *cleat* (wooden or metal device used for holding ropes fast). Coil the halyard neatly and place it *out of the way* where it will not get trampled and snarled. One of the very first things to learn and remember is to *keep ropes coiled and out of the way of your feet*, for in a sudden squall, it is very important to lower the sail quickly or to let the sheet run out fast.

Your boat, with sail up, is *still fastened to the mooring*. In that position she will *swing to the wind* with her sail shaking in the wind, if you follow the above directions. If you did not leave the sheet free and have the boat fastened close to the mooring, every little variation of the wind would fill the sail and start your boat forward, drive her this way and that, perhaps even keel her over dangerously.

Now ready to start sailing *before the wind* or *sailing free*, see once more that the sheet is neatly coiled and free to run; next see that your centerboard is *up*; then go forward and unfasten from the mooring the *painter* (rope from bow to mooring), but *don't yet let go* the mooring; still holding on to it with one hand, throw the painter inside your boat out of the way. Put both hands on the mooring and pull your boat briskly up to and past the mooring, so that she will head *off the wind* (away from the wind) and will have a little headway, then get quickly back to your sheet and tiller. Haul the sheet in smartly and at the same time put your tiller *up* (away from the sail). These motions should be made quickly but *smoothly and evenly—not* jerkily and with a rush. Gradually *pay out* (let run) the sheet as the boat's head falls off until you are headed *before the wind*.

It is important not to pay out the sheet too fast or you will spill the wind from the sail, lose headway and thus lose control of your boat. One of the most important principles of good sailing is *always to have some headway for good control of your boat*.

Having swung your boat off dead before the wind, you may *cleat the sheet fast* (fasten it tight to a cleat) and give your entire attention to steering a straight course. The beginner should *never* cleat the sheet fast *except* when the boat is dead before the wind. In this position the sheet cannot be let out any farther, so it is all right to cleat it. At any other time, it may be dangerous to have the sheet cleated fast, for you cannot then let it run quickly if a heavy puff of wind strikes. Letting it run out spills the wind from the sail and is a safeguard against an upset.

When sailing before the wind, it is well for a beginner to select some object directly ahead—either on shore or in the water, provided the object is stationary—at which he can steer, thus being enabled to judge quickly and easily whether he is *holding a true course* (steering straight). It often seems to a beginner that it would be very easy to steer a straight course right before the wind, but this is not true. The pressure of the wind is constantly tending to head the boat around *into the wind* (toward the wind). This tendency must continually be counteracted with the tiller. Remember that the tiller always should be pulled in the direction opposite to that in which you want your boat to go. In thus counteracting the boat's motion, however, do not swing the bow back too far; when you see that your boat is approaching a straight course again, begin to let up on your tiller pull; and when you are straight on the course, steady the tiller there. To haul your tiller too far up will cause the boat to *jibe,* that is, the boat's stern will shift so as to bring the wind *around the end of the boom,* and the sail will swing across the boat with great speed and force if the wind is heavy and if the sail is not well controlled by the sheet. This may be dangerous if there is much wind and a high sea.

It is important to know how to jibe properly. In the *flying jibe,* the sheet is not trimmed at all, and the sail comes *flying* over with the full force of the wind behind it. The beginner is advised not to experiment with the flying jibe except under expert supervision. The safest way to jibe is to *trim* (adjust the angle of) your sail in close over the boat before you jibe, and then let the sheet run out *through your hands smoothly and rapidly* as the wind gets behind the sail. You should swing your boat *up* or *toward* the wind, *while* you trim your sheet in close. Then when you swing your boat *off* (away from) the wind for the jibe, you have everything well under control.

If you are dead before the wind and want to go back to your starting point *without* jibing, first drop your centerboard. You will need that to sail against the wind; then trim your sheet gradually and keep gradually putting your tiller *down* until your boat is *close on the wind*—that is, headed close into the wind, with the sail *close-hauled* (close in along the rail of the boat) and with the *luff* of the sail (the part next to the mast) shaking very little. *On the wind* you must constantly watch that your boat shall neither come into the wind so that the whole sail shakes, nor fall off the wind too far. *Watch the luff of your sail* is the best motto for the novice. When it stops trembling, you are too far off the wind; when it begins to snap and shake strongly, you are too far into the wind.

When the wind is coming over the *starboard* (right) bow, you are on the *starboard tack* (right leg of a boat's course); when the wind is over your *port* (left) bow, you are on the *port tack.* Suppose you are close-hauled on the starboard tack. To *go about* to the port tack, put your tiller *down* with a smooth, rapid motion and your boat will shoot up into the wind with her sail shaking. Keep moving your tiller in the direction in which you started it until the sail swings across the boat and fills on the port tack. As soon as your sail fills on the new tack, steady the boat with the tiller so that the luff is just shaking a little and then proceed as you did on the starboard tack, always watching the luff.

Sailing with wind abeam means sailing with the wind coming across your boat from either side *amidships* or at a right angle to the hull. *Sailing with wind quartering* is sailing with the wind coming from either side diagonally over the stern. In both cases you have to be on your guard against a strong tendency for the boat to *broach to* (swing into the wind while running free). Remember to watch the luff and also to avoid swinging your tiller too hard and far at a time.

To *make a landing* or *pick up the mooring* is not easy. It is an art in itself. Get an expert to demonstrate for you and then let you experiment.

A beginner should take along an experienced sailor to instruct him and to help him in case of emergency; he also should do his utmost to *carry out the instructions without assistance.* This is the quickest possible way to learn.

You should know how to swim before you try to learn to sail.

You should not take other people sailing until you really know how to sail well! You have no right to take the responsibility of other people's safety until you are qualified to meet any of the emergencies that may and do arise.

SKATING

(All Ages)

Early and Modern Skates.—Bone runners tied to the feet with leather thongs were the skates of the early Norsemen. The next development, supposedly in the 3d century, was the wooden skate with an iron runner that was screwed on to the heel of the shoe and strapped to the toe. Steel runners later replaced the iron ones, then came the all-steel skate. The club skates of the 1890s were of this last type. They were fastened to the shoes by adjustable clamps and were likely to come off at embarrassing moments, often bringing a sole of shoe off too. Although ordinary shoes were worn, they had to have strong, fairly heavy soles for the clamps to get a grip. The skates were all steel, with blades about 3/16 inch thick, resting on the ice at only one point of an arc, thus earning the name of *rockers.* These rockers tended to curves and to pleasing variations of balance, which made for graceful rather than speedy skating.

With the advent of hockey as a popular ice game new types of skates designed for quick stops, speed, lightness and safety were introduced. The skating shoe became a permanent part of the skating outfit, with the plates of the skates riveted to it. One of the most popular of these modern skates is the Norwegian, which has blades of especially hardened steel, from 16½ to 19 inches long, thin and straight, borne on three aluminum tubes, one horizontal, two vertical. For soft ice the width of the blade is about ⅛ inch. It may be narrower for very hard ice.

Skating as a Sport.—In ancient times the Scandinavians, Finns and Dutch were the most proficient skaters because in their countries skating was a means of transportation as well as a sport. In England references to the art of skating appeared as early as the 12th century. European colonists brought the sport to America. In modern times skating has become a popular and well-organized winter sport in practically all the European countries, in Japan and, of course, in Canada and the United States. Contests are held annually in the winter resorts of Europe; skating is always a part of the winter sports contests at Montreal and Lake Placid. Twenty-three nations belong to the International Skating Union. The organizations of each country—the Amateur Skating Association of Canada, the Amateur Skating Union in the United States—are subject to its rulings.

Contests.—There are two general types of modern skating contests. One emphasizes speed; the other, grace and ingenuity. Each has its devotees, and national and international contests are held annually in each branch of the sport.

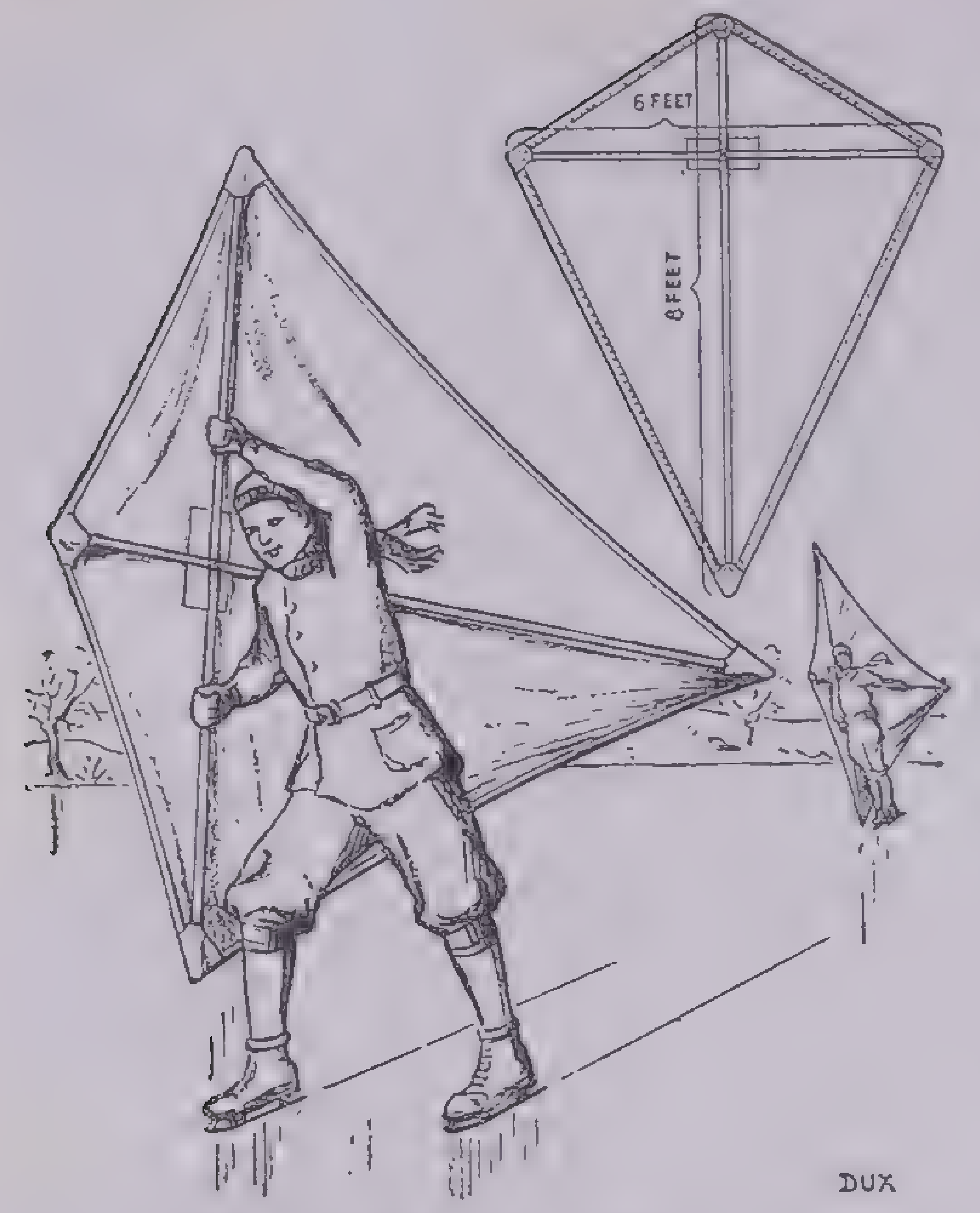
Figure Skating, although an accomplishment of individual skaters long ago, first became subject to definite contest rules in the 19th century. It has been highly developed in Europe, on both the Continent and the British Isles, where two distinct styles—the Anglo-Swiss, in which the body remains almost upright, the leg that cuts the figure is held straight, and the other leg straight out behind and the arms loosely at the sides; and the Continental, in which the knee of the leg cutting the figure is bent slightly, and the other leg is used in various positions to balance the body.

For Speed. In America speed skating has always been more popular than figure skating. Most of the contests held are for speed. Speed records in short-distance skate racing do not differ greatly from sprinting records on foot—the 100-yard dash on skates is made in approximately 9 seconds. By official agreement the title of champion in international speed contests goes to the winner of three out of four races, the distances being 500, 1,500, 5,000 and 10,000 meters (a meter is slightly in excess of 3 feet).

Ice Hockey. Perhaps America's greatest interest in skating is shown in the popularity of ice hockey. Hockey matches, attended by huge crowds, are held in the skating rinks of most of the large northern cities each season. Many intercollegiate matches are held. The game itself is described in the article on hockey.

The recreational popularity of skating is also great and is quite sure to remain so. Outdoor rinks are a feature of most cities in the snow country. In many large cities indoor skating rinks, where the ice is frozen mechanically, are kept open the greater part of the year.

Ice Games.—There are numerous games besides hockey that may be adapted to skating. Tag, pom-pom-pullaway, ice basketball and baseball, crack the whip, ice shinney and ice shuffleboard are just a few.



Make Your Own Skate Sail

Lightweight duck is the best material for the sail. Edges should be hemmed and corners reinforced. The two spars should be about 1 inch square. They are glued and lashed securely together with rawhide or fishing line where they cross

Skate Sailing.—In broad, open stretches skating with a sail is fine sport. These sails should be absolutely flat and stretched very tight. Spars and rigging should be strong, yet sufficiently light and simple in construction to be handled easily in cold, windy weather. Spruce or lightweight ash are good for spars; bamboo also is light and strong. The spars are better in two sections. The skate sail is kite-shaped and should be about 24 square feet in area for a person weighing around 100 pounds. Small windows or portholes, about 3 by 7 inches, made of celluloid, add much to the safety and are quite necessary for racing.

Stunt-Skating Races.—In addition to straight skating races many stunt races add variety and fun to a tournament—backward races, in which the contestants skate a given distance (not too far) backwards; skateless races, in which the participants go through the motions of skating without skates; a one-skate race, in which each contestant wears a skate on one foot and runs or jumps with the other; the three-legged race, in which various couples compete as they stand side by side with the inside legs tied together at ankle and knee; and tandem races in which the contestants skate in pairs, one behind the other.

Skate jumping is good sport. In this the contestants skate up to a given line and jump. The distance is measured to the nearest spot any part of the body touches. In an *obstacle skating race* a number of obstacles, such as low hurdles to be jumped or tables to be climbed over or crawled under, are placed at regular intervals on the racing track.

SKIING

(All Ages)

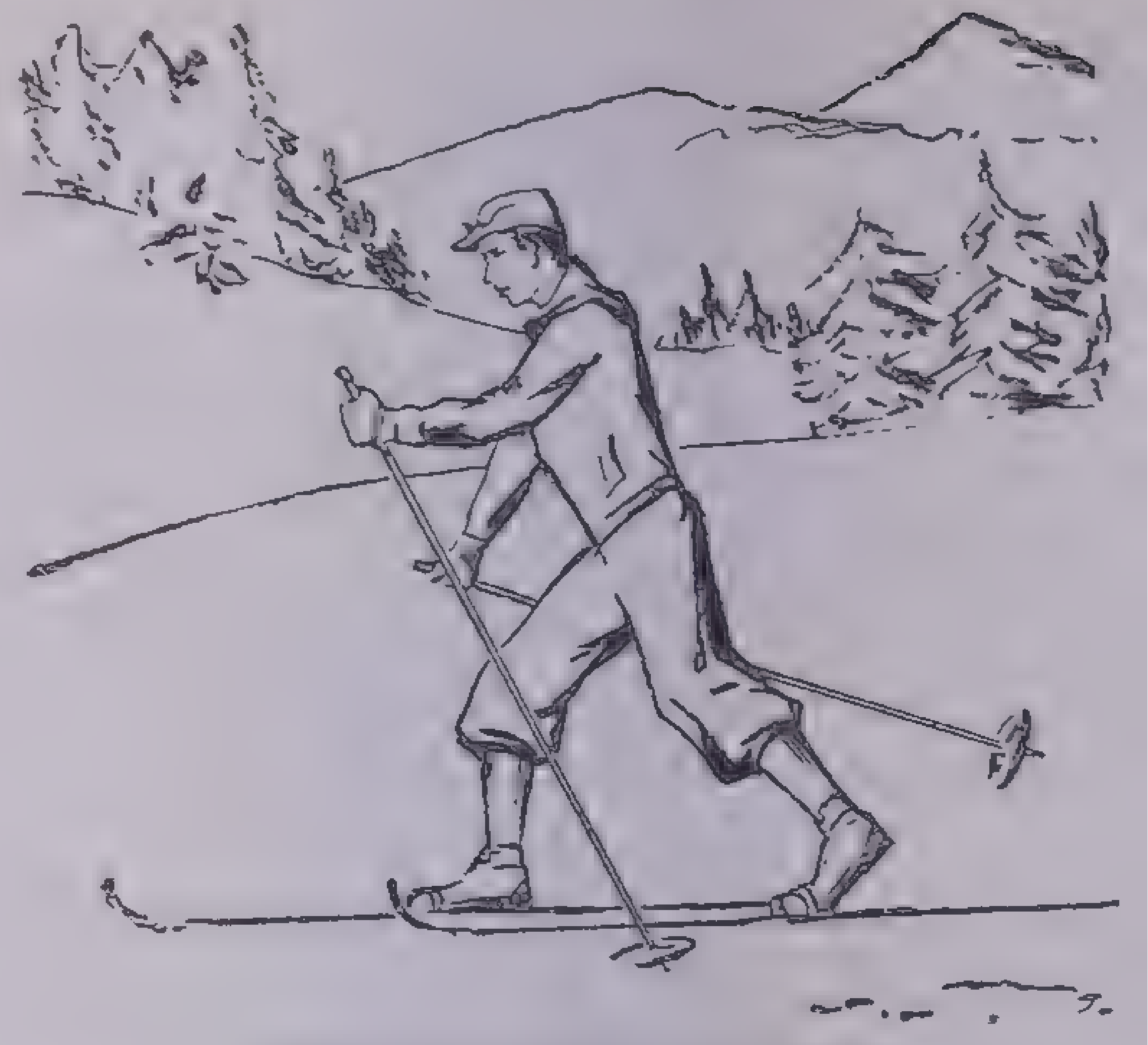
Skis, which originated in the Scandinavian countries, were originally, like our American snowshoes, a means of transportation over deep snow. They are still used for this purpose in both Europe and America and have many advantages over the snowshoe in open country but are not practical in forested regions. In recent years skiing has risen to a high place among winter sports in those countries.

The original skis were long, narrow leather-covered snowshoes. Modern ones consist of long, narrow strips of wood—ash, oak, beech, birch, spruce or hickory—pointed and turned up at the toes. Their length depends on the height of the wearer. They should be just long enough so that when stood on end upright the wearer can reach their tops with the tips of his fingers. Their width varies from 3 to 3½ inches at the rear, 2¾ to 3⅛ inches in the middle or narrowest part and 3½ to 5 inches in the broadest part at the front where the bend begins. They are thickest in the middle—from 1 to 1⅜ inches—and taper out to as little as ⅜ inch at the ends. The bottoms are either smooth or have small grooves to prevent snow from caking on them. They are oiled and waxed to a high polish. Skis are attached to the feet by straps, called the *binding,* which fit over the instep and heel. These are attached to the ski about midway, often with a thin plate of brass or zinc under them for a footrest.

Material for Skis.—Hickory or white ash with a straight, even grain running from end to end is the best material for skis. If you wish to make your own, choose the heaviest of these woods you can find, as it is better seasoned.

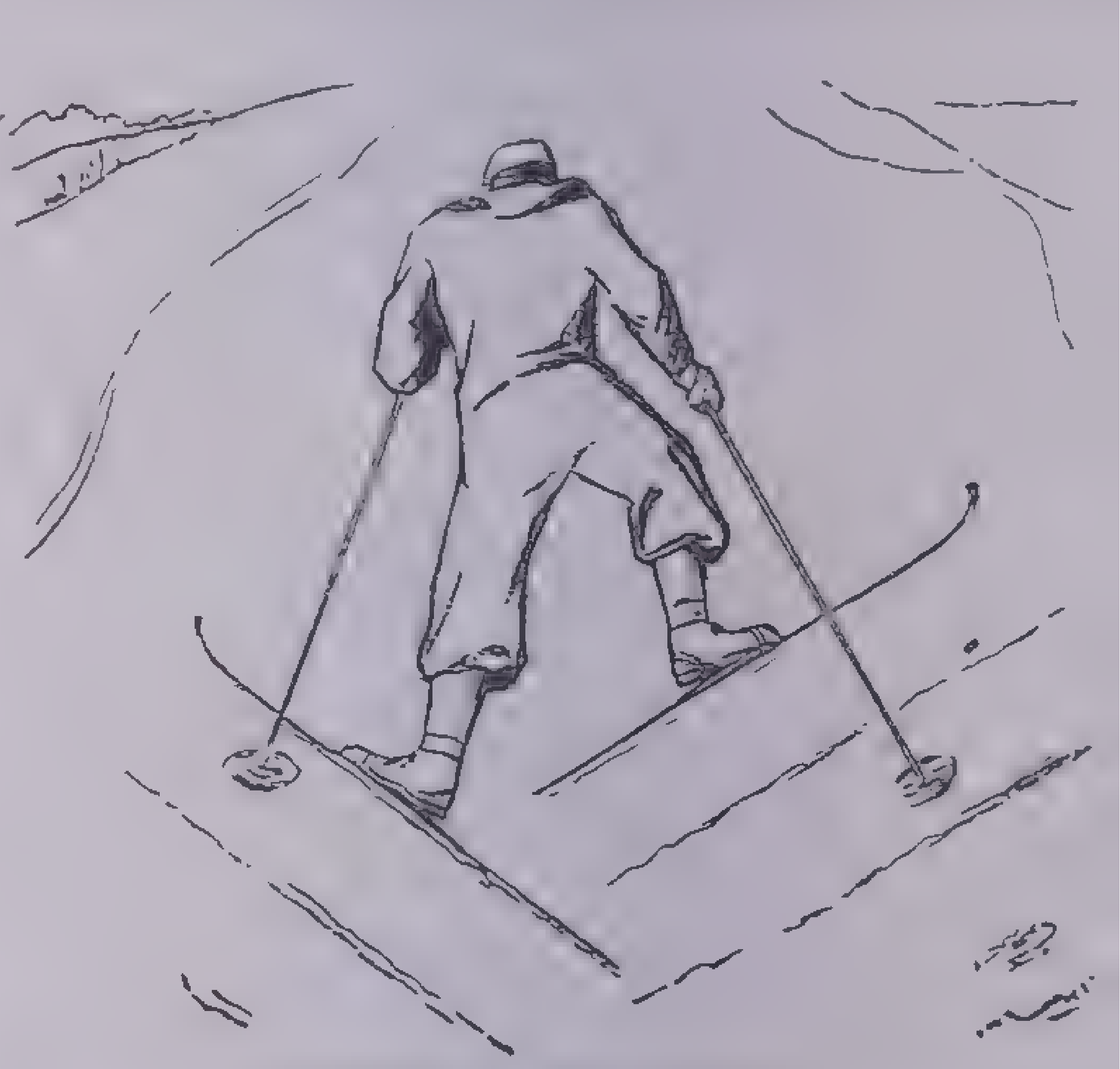
Ski Sticks.—Good ski sticks (about shoulder high) are necessary to assist progress and balance. A good quality bamboo makes a light, elastic and strong stick. A metal ice peg is fitted to the end of the stick by a ferrule, which adds strength. A few inches above this peg is a ring or disk made of hard rubber, metal or wicker to prevent the stick from sinking too deeply in the snow.

The Art of Skiing.—Taking long, gliding steps, with the heel raised at each movement forward, the skier can glide at a steady, swift pace over the snow on level ground without the skis leaving the surface. To go downhill he must place the feet closely together with one a little ahead of the other, lean the body forward in a crouched position and, using the sticks as brakes and balancers, slide. The climb uphill may be made by stepping, in which the skier stands with the skis at right angles to the hill and steps up sidewise, or by facing the slope and ascending straight up with the skis turned at an angle in herringbone fashion. In making a turn the body leans slightly in the opposite direction from the turn with the weight on the stationary foot and the knee on that same side bent slightly to maintain the balance. The other leg is raised forward until the rear end of the ski is on the snow, swung clear around and placed parallel to the stationary leg but with the toe pointing in the opposite direction; the stationary foot is then lifted and turned around with the body until it heads in the same direction as the first ski. In making a turn on a hillside the valley foot is always the stationary one.



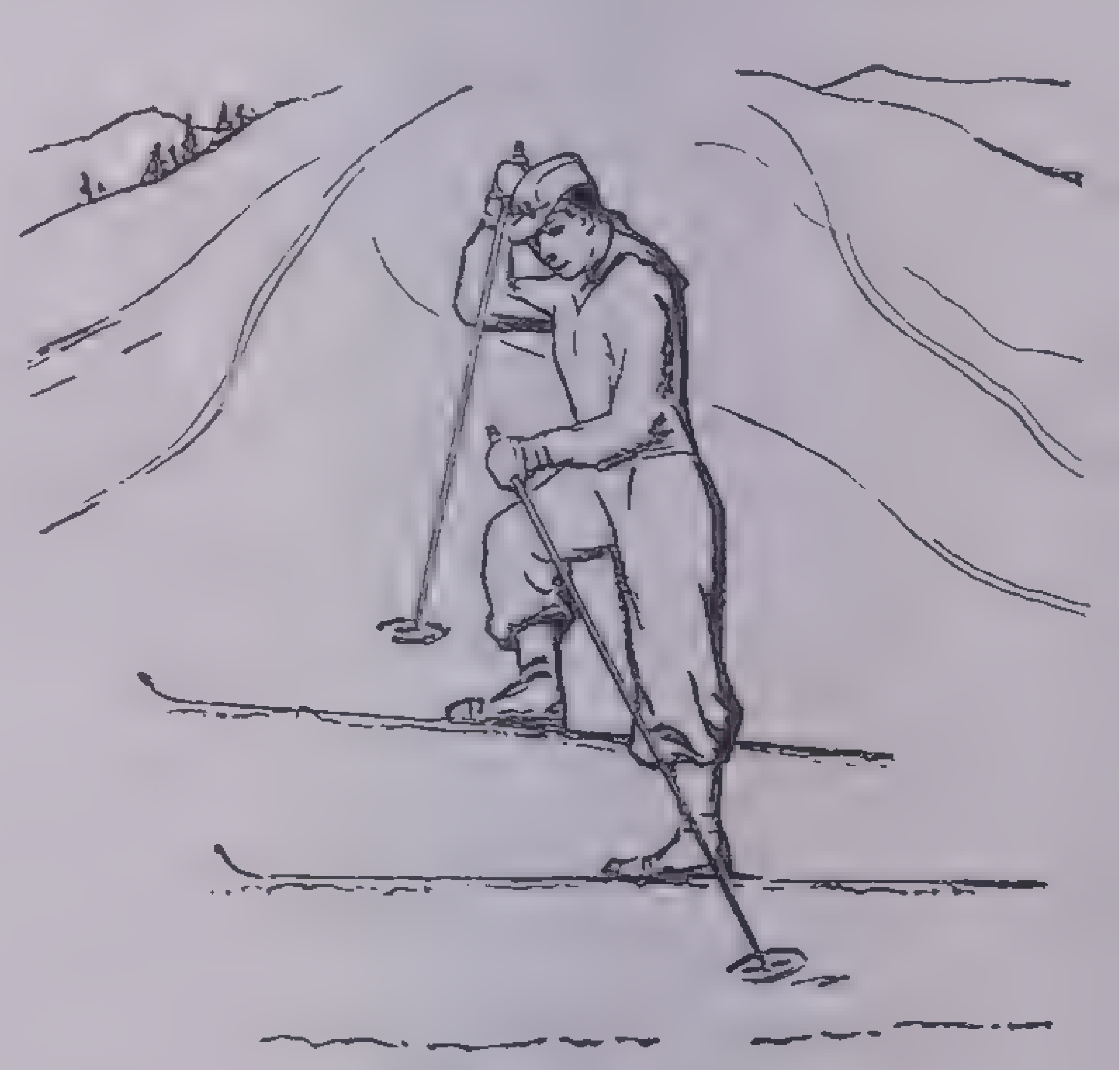
Skiing on a Level Surface

Knees flexible and relaxed, upper part of body bent forward, skis brought forward by the toes



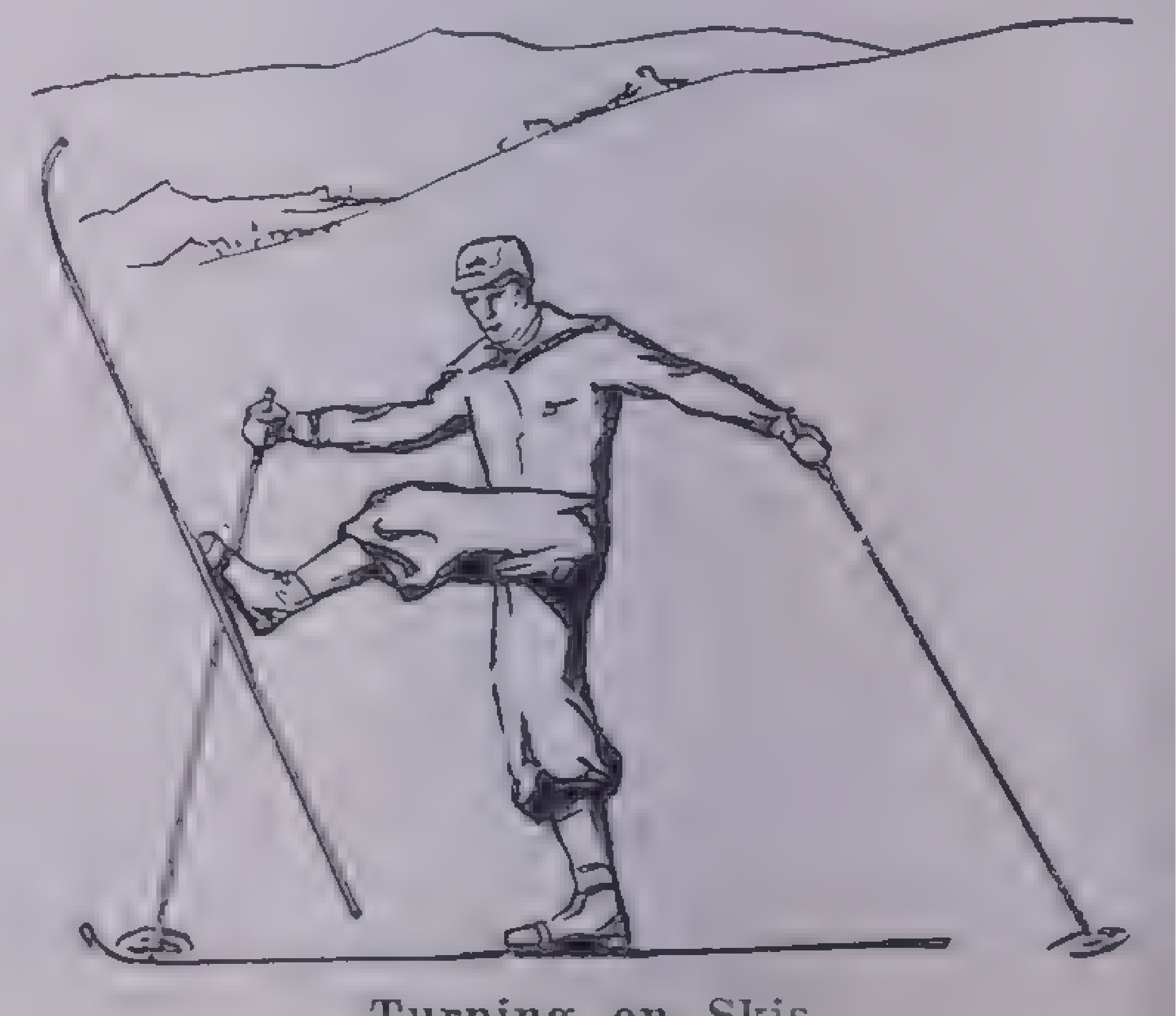
Uphill by Herringbone

Weight on the left ski while the right is brought forward, and vice versa

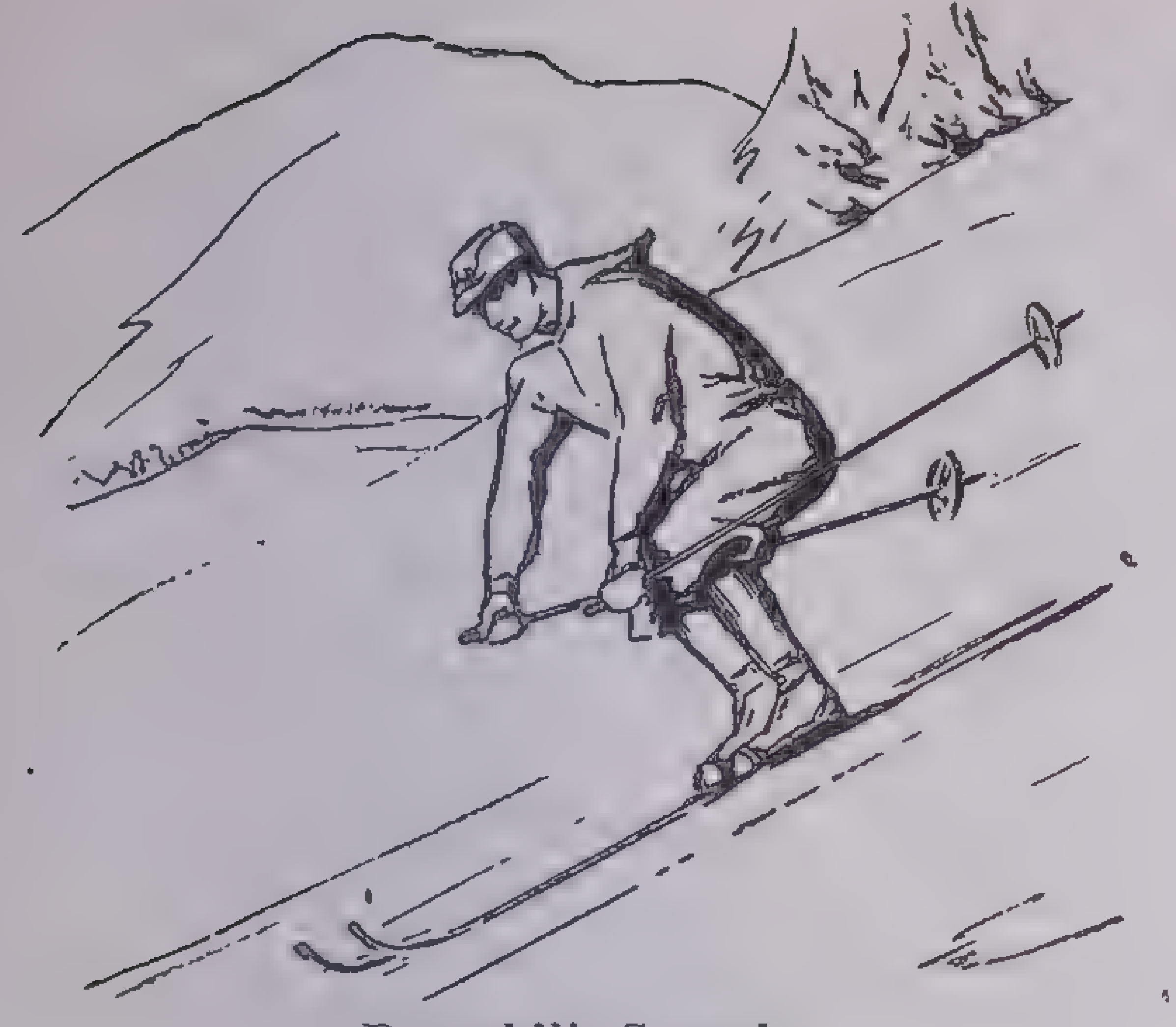


Uphill by Side-Stepping

Weight on the left ski while the right is brought a step up, and vice versa



Turning on Skis



Downhill Crouch
Upper part of body erect and the skis, ankles and knees together

As a Sport.—Skiing as a sport first began in Norway in 1860; the first American ski club was organized in Minnesota in 1881. Norway, Sweden, Switzerland, Great Britain, Canada and the United States all hold ski tournaments that are governed by the rules of the International Federation of Ski Events and are classified in two general divisions—racing and jumping—and in combinations of the two. In the United States two organizations—the United States Amateur Ski Association and the Eastern United States Ski Association—foster the principal tournaments. In addition all over the northern part of the country numbers of collegiate interscholastic, interclub, state and interstate competitions are held each snow season. The Canadian Amateur Ski Association co-operates with the two United States associations.

Ski Racing.—

Ski Running and Turning. Contestants run on skis from a starting line over a 50-yard level course to a turning line, make a turn and race back to the starting line.

Cross-country Contests. Mark out a course over a given distance (from ½ to 3 or 4 miles according to the ability and endurance of the contestants) uphill, downhill, across level stretches. Contestants start at a given signal, travel by whatever skiing method seems best to them and whoever finishes first wins.

Uphill. An uphill course varying in steepness is laid out. Contestants start at a signal from a given starting line at the bottom, using the climbing method (stepping or herringbone) designated—or a choice may be allowed if preferred.

Barrel Staves versus Regulars. Younger children often make their own skis from barrel staves. Any of the races may be tried with these. Or it may be interesting to have a contest between skiers with regular skis and those with barrel staves.

Skijoring. Teams consisting of two contestants on foot drawing one on skis compete over a course varying in length from 100 to 500 yards. (The term is also used for the ski sport of being towed by a horse.)

Ski Jumping.—Ski jumping has become very popular, both in Europe and America. Great skill and daring have been developed. In 1893 the record jump, made at Red Wing, Minn., by Torjus Hemmestvelt, was 103 feet. Since then the jumping distances have increased continually. In 1937 the record jump for an American was 245 feet. The world record of 324 feet was held by Sigmond Ruud.

The Take-off.—The take-off for a ski-jumping contest is built into the side of a hill. The jumper starts up the hill some distance above the take-off to acquire speed, leans over as he approaches the take-off and straightening the body, leaps into the air. He must keep the legs close together while in the air, bend his knees and hit the ground with one foot a little ahead of the other, legs yielding to preserve balance and lighten the force of the impact.

Ski Sailing.—On broad open stretches, with a good stiff breeze, skiing with a sail (built like that described for skating) is good sport. The snow must have a layer of soft, firm snow on top; a hard crust is bad for the skis. It is not possible to sail as fast on skis as on skates and one must tack into the wind at broad angles and step around with the sail overhead when changing tacks.

SNOW MODELING

Building a snowman has long been a favorite occupation of childhood; but snow modeling is much more than this. A number of schools and cities conduct regular snow-modeling contests every snow season.

The first step in modeling a figure is to build a foundation block of snow, from 2 to 3 feet square, pour water on it and leave it to freeze. Before it freezes insert sticks (four if you wish to model a 4-legged animal) in it on which to start building the body of the figure. Mold wet snow roughly to the sticks; if they are to form the legs of a body, tie their tops together with wire and either weave strands of the wire across or place sticks across to make a support for the snow that is to form the body. Moisten the snow to a packing consistency and build the body. When the body is roughly molded, insert sticks for the head, tail or arms and mold them roughly with snow.

When the rough figure is shaped, use modeling sticks, spoons and the fingers to shape and smooth it. Then sprinkle with water and leave it to freeze. To color the statue, paint it with water colors.

In contests it is necessary that participants be classified as to age, experience, ability and the like.

SNOWSHOEING

Invented by the Indians of the northern part of America to help them walk on deep snow, snowshoes consist of a single strip of hickory or other tough, pliable wood curved into a more or less oval shape with the ends fastened together at the back, reinforced with one or two crossbars and interwoven, much like a tennis racket, with a webbing of caribou or deerskin thongs. Moccasins or other soft-soled shoes are worn with them.

A small opening is left in the webbing just behind the front crossbar, into which the toe fits when walking. Leather or woven straps fastened on the crossbar hold them on the feet. Walking on them is quite simple. It is only necessary to lift one shoe a little, carry it over and ahead of the other and put it down so that its narrow rear part fits against the wide curved part of the other shoe. The beginner is inclined to do a straddle walk to avoid stepping on his own feet; this is not necessary and is very fatiguing. Care must be taken in turning, however, not to step with one shoe on the tail of the other and so cause an upset. Experts travel 30 miles or more a day on snowshoes, but it is wise for the beginner not to overdo, for a very painful lameness, called *mal de raquette* by the Canadian voyageurs, may result.

Styles of Snowshoes.—The style of snowshoe varies with the type of country in which it is used. There are four general types. The first two, which are used most in the northern country, particularly by trappers, are long and narrow (about 5 feet by 1 foot in the widest part). The first of these is narrow and sharp at each end, broadens out in the middle and is turned up at the toe; the other turns up in front and has a long, pointed tail. The third kind, which is, perhaps, that most generally used for sports, curves in a fairly broad oval in front, is about 3½ feet long, 16 to 18 inches wide and has a medium length narrow tail. The fourth kind is almost round in shape, with a stumpy tail, and is called the *bear paw.* It is used mostly in heavily wooded sections.

Snowshoeing as a Sport.—The sport of snowshoeing is highly developed in Canada, where many snowshoe clubs hold many competitions. In the United States snowshoe hikes, obstacle races and cross-country races are held in many of the colleges in the snow country. The Dartmouth Outing Club climbs Mt. Washington every winter; the Appalachian Club stages mountain-climbing expeditions, and the Intercollegiate Winter Sports Union makes snowshoe racing a part of their schedule.

SOCCER

(Junior High School to Adults)

The rules of association football, known in the United States as *soccer,* were first published in 1863 at Cambridge University, England. The game has grown steadily in popularity because of its simple rules and the ease with which spectators may follow the movements of the players.

The field is rectangular with a minimum length of 100 yards and width of 50 yards and a maximum of 130 yards by 100 yards. At the middle of each end are goal posts 8 yards apart with a crossbar 8 feet above the field. A mid-line divides the field across, and from the middle of this line a circle with a 10-yard radius is drawn. Flags mark the corners of the field. A penalty kick mark is 12 yards in front of the mid-point of each goal line. A corner kick area is a quadrant drawn from each corner with a radius of 1 yard.

The diagram shows the *goal areas,* 6 yards ahead of both goals and 20

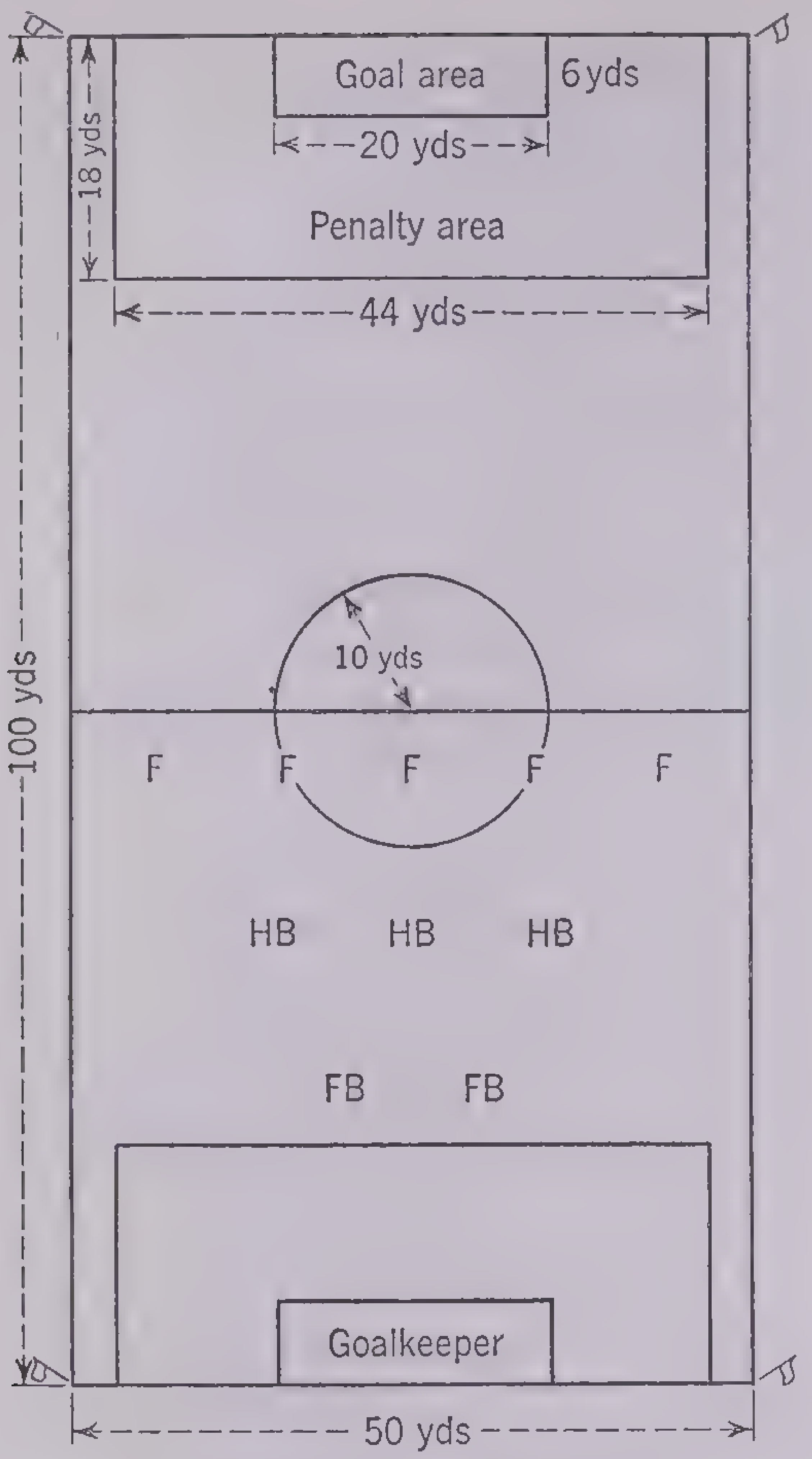


Diagram of a Soccer Field

Positions of players: F, forward; HB, halfback; FB, fullback

yards across, and the *penalty areas,* 18 yards in front of the end line and 44 yards in breadth. A smaller field, 200 feet long and 140 feet wide, is recommended for players on the junior-high-school levels; the goal areas on such fields are 30 by 18 feet, and the penalty areas are 108 by 45 feet.

The official soccer ball is round, smaller than a basketball, not more than 28 inches nor less than 27 inches in circumference.

Eleven players form a team and endeavor to score by kicking or knocking the ball between the goal posts and *under* the opponents' crossbar. Each goal counts one point. There are five forwards, the two outside called the *right* and *left wings,* three halfbacks, two fullbacks who act mainly as guards and the goalkeeper, with positions as shown in the diagram.

After the toss for choice of goal or kickoff, the game begins by a place kick toward the opponents' goal from the center of the field. At the kickoff no member of either team may cross the mid-line until the ball is kicked, nor may any opponent approach within 10 yards of the ball until that time. After the scoring of goal by either team, their opponents kick off at center.

The ball may be advanced only by kicking or knocking the ball with other parts of the body than the hands or arms. Only the goalkeeper may handle the ball in actually guarding the goal and he may carry it two steps. The players make long kicks or keep the ball close to their feet and *dribble* it down the field, passing it to a teammate whenever advisable. The forwards are the main offensive players and are blocked mainly by the halfbacks and backs.

If the ball crosses a side line, a member of the team that did not drive it is allowed a *throw-in* by an overhead throw from both hands. The throw-in may not score a goal.

If the attackers send the ball over the end line outside the goal posts, a member of the defending team has a *goal kick* from within the goal area, no opponent being permitted within 10 yards. The ball is in play as soon as kicked.

If the defenders send the ball over their own goal line, the attackers have a free kick (known as a *corner kick*) from the nearest corner, no opponent to be within 10 yards. A corner kick may not score a goal.

A player is *offside* when he is ahead of the ball, which was last touched by a teammate. If there are three or more opponents ahead of player A, at the instant his teammate B kicks the ball, player A is *onside.* A player cannot be offside if he stood in his own half of the field when the ball was last played.

If play is suspended for time out, substitution or injury to a player, it is resumed by the referee tossing the ball up at the point where it became dead. At toss-up, the ball is not in play until it strikes the ground.

A *foul* may be called for offside play; for touching the ball with the hands (except the goalkeeper); for tripping, kicking, kneeing, pushing, holding or roughly charging an opponent.

Penalties vary according to location. If the defenders commit personal fouls within the penalty area, the attackers have a *penalty kick* from the penalty-kick mark, 12 yards in front of the goal. For fouls committed by either party outside the penalty area and by the attackers within that area, the offended party is awarded a free kick at the spot where the foul occurred.

The officials of soccer are one referee and two linesmen. Linesmen are the referee's assistants, particularly charged with watching the ball, noting the cause of its crossing bounds or goal line and furnishing necessary measurements of free kicks.

SOFTBALL, PLAYGROUND BASEBALL and INDOOR BASEBALL

(Late Elementary School to Adults)

The major sport of baseball has three popular adaptations: softball, playground baseball and indoor baseball. In most features—purposes, scoring and rules—they are so similar to baseball that only their differences from the parent game will be noted.

Softball.—Softball is the favorite variant of baseball and has features that make it more suitable for women and children to play, but skilled athletes enjoy it. Softball differs from baseball mainly in the following rules:

1. The size of the diamond is 60 feet square, instead of 90 feet, and the pitching distance is 40 feet from home plate rather than 60 feet.

2. The number of players is increased from nine to ten by the addition of a roamer playing *short field* back of second base.

3. The standard softball is not so hard as a baseball and is approximately 12 inches in circumference (instead of 9 inches). A ball with raised outside seams is not permissible.

4. The standard bat is shorter and smaller in diameter than a baseball bat, not more than 34 inches long nor more than 2⅛ inches in diameter.

5. The pitch in softball must be underhand, unlike the overhand pitch in baseball; the softball pitch must be made with the hand below the hip after a full-arm swing.

6. Bunting is not permissible in softball but is common practice in baseball.

7. Fewer bases are stolen in softball, as base runners are not permitted to leave base until the ball has reached or passed home plate or been hit by the batter.

8. The batter is declared to be out after the third strike, even if the catcher has not caught the ball.

9. If a pitched ball strikes a batter who makes an honest effort to avoid it, it is called *a ball,* but unlike baseball does not entitle the batter to proceed to first base unless the ball happens to be the fourth ball thrown to the same batter.

10. Softball pitchers watch balks more carefully; except at the commencement of each inning, any delay of more than 20 seconds by the pitcher may be called a ball.

11. A runner is not permitted to score from third on any pitched ball that passes him.

12. Shoes with sharp spikes or blunt spikes longer than ⅜ inch are not allowed; golf cleats were forbidden in 1938.

13. The regular game in softball has 7 innings instead of 9, as in baseball.

Playground Baseball.—This game is very similar to softball except that the playground baseball diamond has base lines 45 feet in length and a pitcher's box, 35 feet from home plate. The bat may be longer than the 34-inch softball bat and the 12-inch ball also is used. As in softball, there are 10 players on each side, but the additional player is called a *right shortstop* rather than a short fielder; 7 innings constitute a game.

Indoor Baseball.—Indoor baseball is played on the smallest of all baseball diamonds, 27 feet square with the pitcher's box 23 feet from the center of home base. If the building is sufficiently large to permit it, diamonds with 35-feet base lines and pitcher's box 30 feet from home may be used. Nine innings may be played with seven to nine players on a team, assigned to their positions by the team captain. Balls 14 inches in circumference are used on the 35-feet square diamonds, and on the smaller diamonds 17-inch balls are required. Shoes with corrugated rubber soles are worn.

SQUASH RACKETS

(Junior High School to Adults)

Squash rackets is an adaptation of the old game of rackets that was played by aristocrats of the Middle Ages. Modern tennis is a similar but newer game; squash-racket courts were first standardized in 1911 by the

English Tennis and Rackets Association.

The standard American court (narrower than the English) is 31 or 32 feet long and 18½ feet wide, with a back wall 7 feet high and front and side walls 15 feet high; there are, therefore, five playing surfaces. The back and side walls are painted white and are of wood or composition, and the front wall is of composition. Since light and ventilation are provided from the ceiling, squash courts are best located on upper floors. Entrance to the court is through a door in the rear wall made flush with the playing surface.

A red service line 6½ feet from the floor sets off the top area, within which balls must strike in service. Nearest the floor is a forbidden area, within which no ball may strike without loss to the man who drives it there. The upper part of this forbidden area is commonly covered by the *telltale*—a loose strip of sheet metal 17 inches wide, painted black. Balls that strike here are noted because of their resonant impact. The planking is left bare for 9 inches next to the floor to aid in the recovery of balls.

The back wall is divided across by a line 6½ feet from the floor, below which line lies the playing surface for all balls that are to rebound to the front wall.

The floor is divided lengthwise into equal parts and crosswise by a service line 10 feet from the back wall. Behind this line are the right and left boxes, between which service alternates, and forward are the right and left service courts.

The usual game and official contest are between two players but four persons may play. Official squash rackets have bent ash frames and are unlike tennis rackets only in their longer handles and smaller, circular heads. Official balls are of black rubber.

Play is begun by a service, as in tennis. The choice of serve is determined by spinning rackets. The server stands in either box, tosses up the ball and strikes it as it comes down. He must alternate between the boxes until he loses service. A served ball must hit in the upper rectangle of the front wall, above the service line and must rebound into the opposite court from the one used for service. The ball must be returned by the opponent on the volley or before second bounce to the front wall above the telltale. Except in service, balls may strike the front wall anywhere above the telltale. In returning a ball to the front either player may use caroms from the floor, rear wall or side walls. After service, a ball coming from the front may similarly carom from any or all playing surfaces, including the floor, but it must be played before it strikes the floor a second time or the point is lost. A player is permitted to aim at but not to strike a ball twice during one effort at return.

A failure to serve correctly is called a *fault*. Two faults or one failure to return a ball in due turn causes the server (*hand-in*) to become receiver (*hand-out*).

A *fly ball,* directly from the racket, is dead if it strikes above a boundary line on any of the four walls, but a bounding ball is not counted as dead in such case.

A *let* is a failure for which the player failing is not responsible under the rules; for example, if a player is interfered with by his opponent, or if a player is hit by an opponent's ball on its way to the front wall, no score can follow as a result of the failure to return. If a ball coming from the front wall strikes a player, no let is allowed.

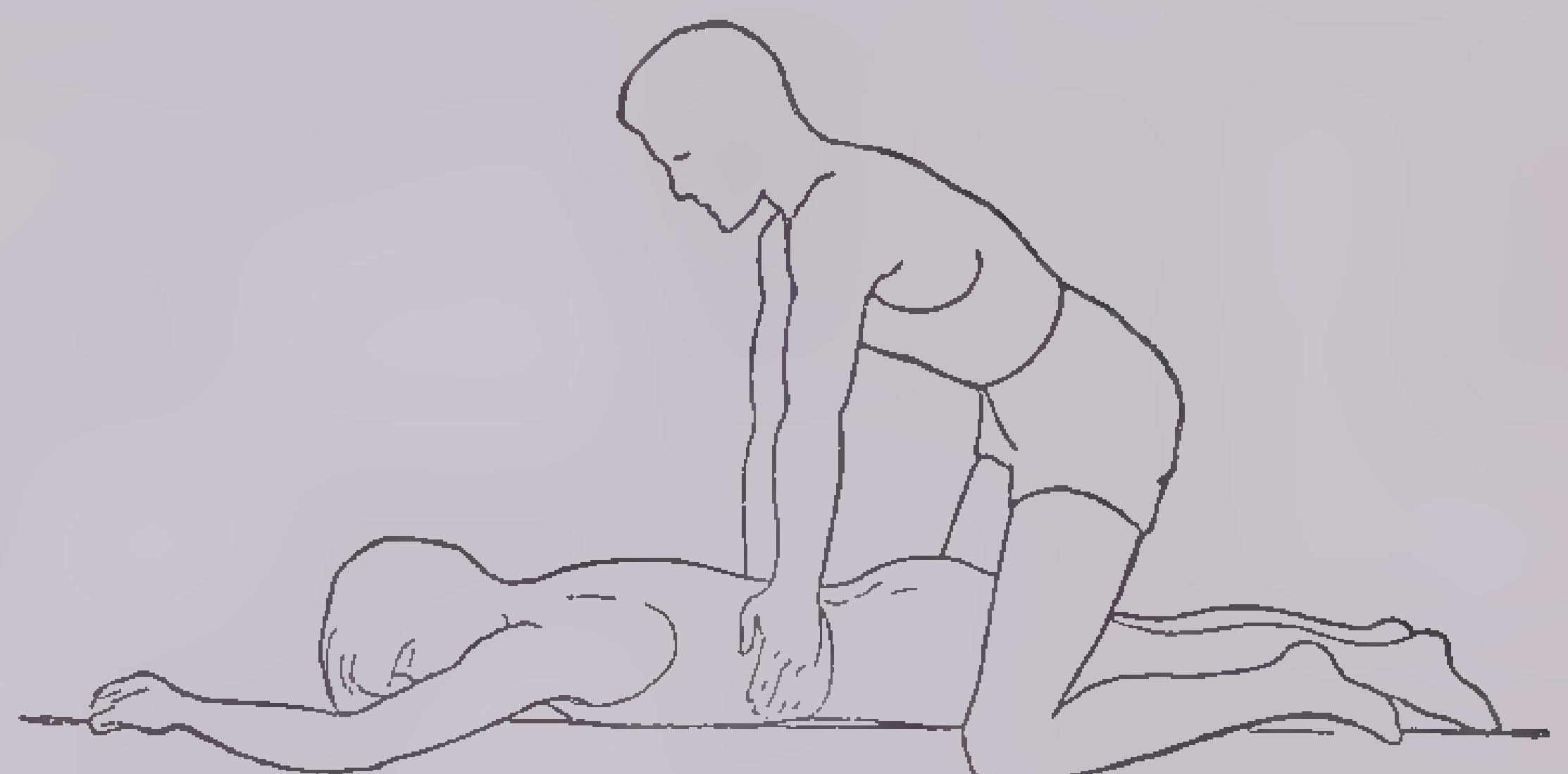
A player's deliberate interference before a strike is called a *balk* and a free point is given to his opponent.

Only the server can score or make *aces* in squash by the failure of the hand-out to keep the ball properly coming back to the front. The first person to reach a score of 15 points wins the game, provided that whenever the score is tied at 13 or 14, the hand-out sets the game by announcing whether the winner of the next three or next five points shall have the game. A match consists of the best three out of five games.

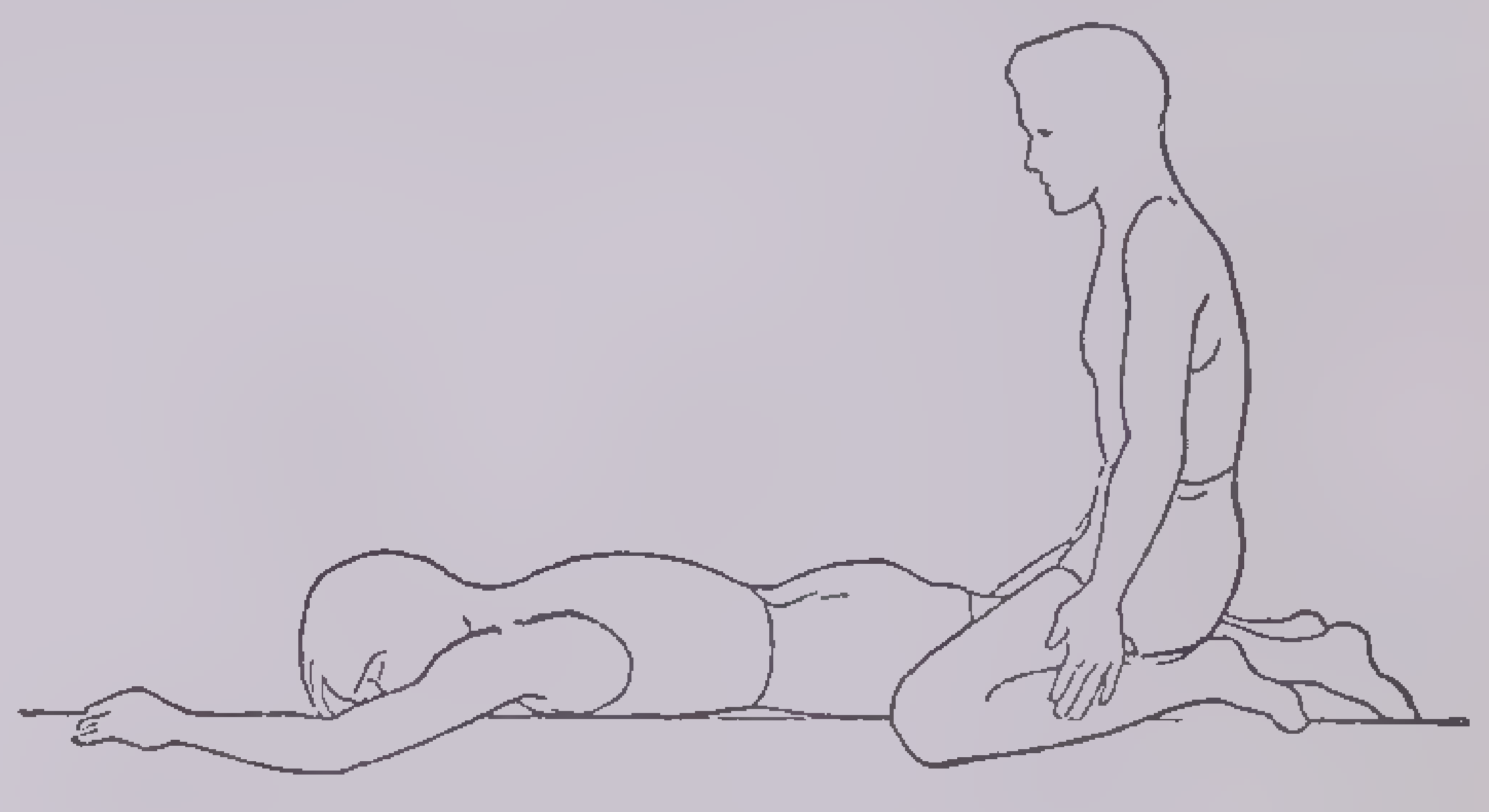
SWIMMING

Overcome Fear of Drowning.—Many who have never been taught to swim have found themselves able to keep afloat and to make some progress toward the shore when they have accidentally fallen into deep water; but progress of that sort is likely to be slow and panicky and, if the panic gets too severe, drowning occurs. Drowning is often the result of a mental state—fear of sinking; a frantic desire to keep the head and shoulders above water; fear to breathe, because a bit of water, gone wrong, has been unpleasant. If the shore or other safety spot is in sight, the struggle to reach it is needlessly hurried and exhausting. The motions necessary to keep afloat are so utterly simple and easy that accidental drowning sometimes becomes the tragedy of ignorance. Small children and animals usually swim instinctively because they have no fears. Older people must first convince themselves of two things—that their bodies will float and that they can swim and breathe at the same time.

Learn to Float.—Floating is much easier in salt water than in fresh, and in deep water than in shallow. First hold on to a rope, dock or someone's hands, submerge the chin, let the body float out until you get the feeling that the water holds you up. Still holding on, take a deep breath, immerse the face, hold the breath as long as possible and relax. Practice this. Let go with one hand, making all movements slowly; let go with both hands, moving the arms and legs gently. When you find that the body actually floats, you have taken the first important step. Try the same thing on your back. Unless you are absolutely unable to relax or are unusually skinny or bony, you will find that you can lie stretched out on the water for an indefinite time. Wade out in the water until it is waist or even shoulder deep, turn the back to shore, lean backward and let the feet come up, then move the hands and feet slowly and see how quickly you bump the shore.



Exhalation: Pressure on (one second)



Inhalation: Pressure off (four seconds). Operator rests.

Artificial Respiration

It is important to begin artificial respiration as quickly as possible. Artificial respiration can be effective in restoring breathing not only in drowning, but also in cases of electric shock, paralysis and of asphyxia from choking

Learn to Breathe.—Beginners try to keep their chins dry and so make swimming harder; for the more nearly flat the body lies in the water, the better it floats. In all the racing strokes the face is under water more than it is out, so it is necessary to learn to breathe differently. A good general rule is to breathe in through the mouth and out through the nose. The mouth need not be closed under water. One should exhale slowly while the face is submerged and so be ready for a quick intake the moment the face is out of water. Practice this breathing—it can be done even in a basin or tub of water at home. Inhale through the mouth, immerse the face and exhale slowly through the nose; turn the face up sidewise to inhale and immerse again. Learn not to get panicky even if a little water gets down your throat.

Swimming Strokes

Breast Stroke. A swimming frog illustrates the leg motion of this stroke. The knees are drawn up under the body and well apart, the legs kicked out straight and then brought quickly together. At the same time the hands are drawn up in front of the chest with the palms together and then shot forward (the palms turned outward as they go to push as much water as possible), and the arms sweep around at each side at right angles to the body and then are drawn in to start a new stroke. Snapping the legs together and pushing the water back with the palms propels the body forward. The chin should be kept as low as possible in the water, letting the water wash in and out of the mouth.

Side Stroke. This movement is all done under water with the body on the side (usually the right). The right arm swings out and up and down as the left swings back, down and up, each pushing as much water as possible with the palm on the downward stroke. When the right arm is straight up, the left is straight down. This is the position at the beginning and end of each stroke with the body lying long in the water, the feet together, the right arm stretched straight out above the head, the left arm straight down close to the body. The impetus of the stroke will shoot the body forward considerably in this position, so hold it as long as possible between each stroke. The legs cut back and forth in a scissors kick. In this the legs are separated as in walking (rather than drawn up sidewise as in the breast stroke) and are then snapped together.

The Over-and-Over Stroke. This is a variation of the side stroke and gives greater speed. The right arm is pulled down toward the hips with the palm pushing as much water as possible, turned sidewise, forward and up straight above the head. While the right arm is held at the hips, the left arm is moved in front of the head, is then pulled down past the face, chest and hips, where it is straightened and brought up out of the water to the position in front of the face again. The legs are kicked apart when the left arm is at the shoulder on the downward pull and are drawn back together again when it is back in the starting position.

The Trudgen and Crawl. In both these strokes, which are popular for racing, the swimmer lies in the water face downward, rolling from side to side and twisting the head to bring the mouth up for air. The trudgen, named after an English swimmer, J. Trudgen, who learned it in South America, involves a double, overarm movement, the two arms alternating, and a scissors kick. The Australian crawl, which originated with the natives of the South Sea Islands and became popular in Australia, uses a short, alternating overarm stroke, a sort of downward flip from the elbow, like the motion of good base throwing on a ball diamond, with a similarly alternating thrash of the lower leg. In the true Australian crawl the right arm and the left leg strike together; then the left arm and the right leg. In the American adaptation the arms are used independently of the leg motion and the angle of the leg stroke is narrowed. All of the upper motion of the arms takes place out of the water in both these strokes.

Treading Water. As soon as a swimmer has become confident enough to go over his depth he should learn to tread water. This consists of standing erect and moving the feet as if climbing a steep flight of stairs. The ability to do this gives complete confidence in the water.

Artificial Aids.—If you learn to swim in deep water, water wings, inflated belts and the like are a necessity; in shallow water it is just as well not to use them as they prevent acquiring self-confidence.

Diving.—Every swimmer should be able to dive—at least well enough to get in the water without sliding or falling in. The easiest way to learn is to stand on the side of the pool or a float, lean over until the body is nearly double, lower the head between the outstretched arms—and plunge, entering the water headfirst with the legs straight. The first time you will probably go flat on the water with a bang and that is not so comfortable. Diving requires practice. As soon as skill is acquired the spring board and any of a number of more complex dives may be tried.

WARNING: Anyone who has sinus or ear trouble should wear ear stoppers and a bathing cap while he is swimming.

TENNIS

(Late Elementary School to Adults)

Tennis is the name popularly applied to *lawn tennis* although it is more correctly used to designate *royal* or *court tennis,* which is played on a limited number of expensive indoor courts.

In 1874 Major Walter Wingfield patented specifications for lawn tennis, adapted from the ancient game of court tennis and with simplified features that were suitable for an outdoor game. Since that date lawn tennis has become the most widely played of all ball games.

The following Code of Rules is the official Code of the International Lawn Tennis Federation, of which the United States Lawn Tennis Association is a member. It is reprinted here through the courtesy of these two organizations.

Lawn Tennis—Singles Game

Rule 1

The *Court* shall be a rectangle 78 feet long and 27 feet wide. It shall be divided across the middle by a net, suspended from a cord or metal cable of a maximum diameter of one-third of an inch, the ends of which shall be attached to, or pass over, the tops of two posts, 3 feet 6 inches high, which shall stand 3 feet outside the court on each side. The height of the net shall be 3 feet at the center, where it shall be held down taut by a strap not more than 2 inches wide. There shall be a band covering the cord or metal cable and the top of the net for not less than 2 inches nor more than 2½ inches in depth on each side. The lines bounding the ends and sides of the court shall respectively be called the *Base Lines* and the *Side Lines.* On each side of the net, at a distance of 21 feet from it and parallel with it, shall be drawn the *Service Lines.* The space on each side of the net between the service line and the side lines shall be divided into two equal parts called the *Service Courts* by the *Center Service Line,* which must be 2 inches in width, drawn half-way between, and parallel with, the side lines. Each base line shall be bisected by an imaginary continuation of the center service line to a line 4 inches in length and 2 inches in width called the *Center Mark,* drawn inside the court and at right angles to and in contact with such base line. All other lines shall be not less than 1 inch nor more than 2 inches in width, except the base lines, which may be 4 inches in width, and all measurements shall be made to the outside of the lines.

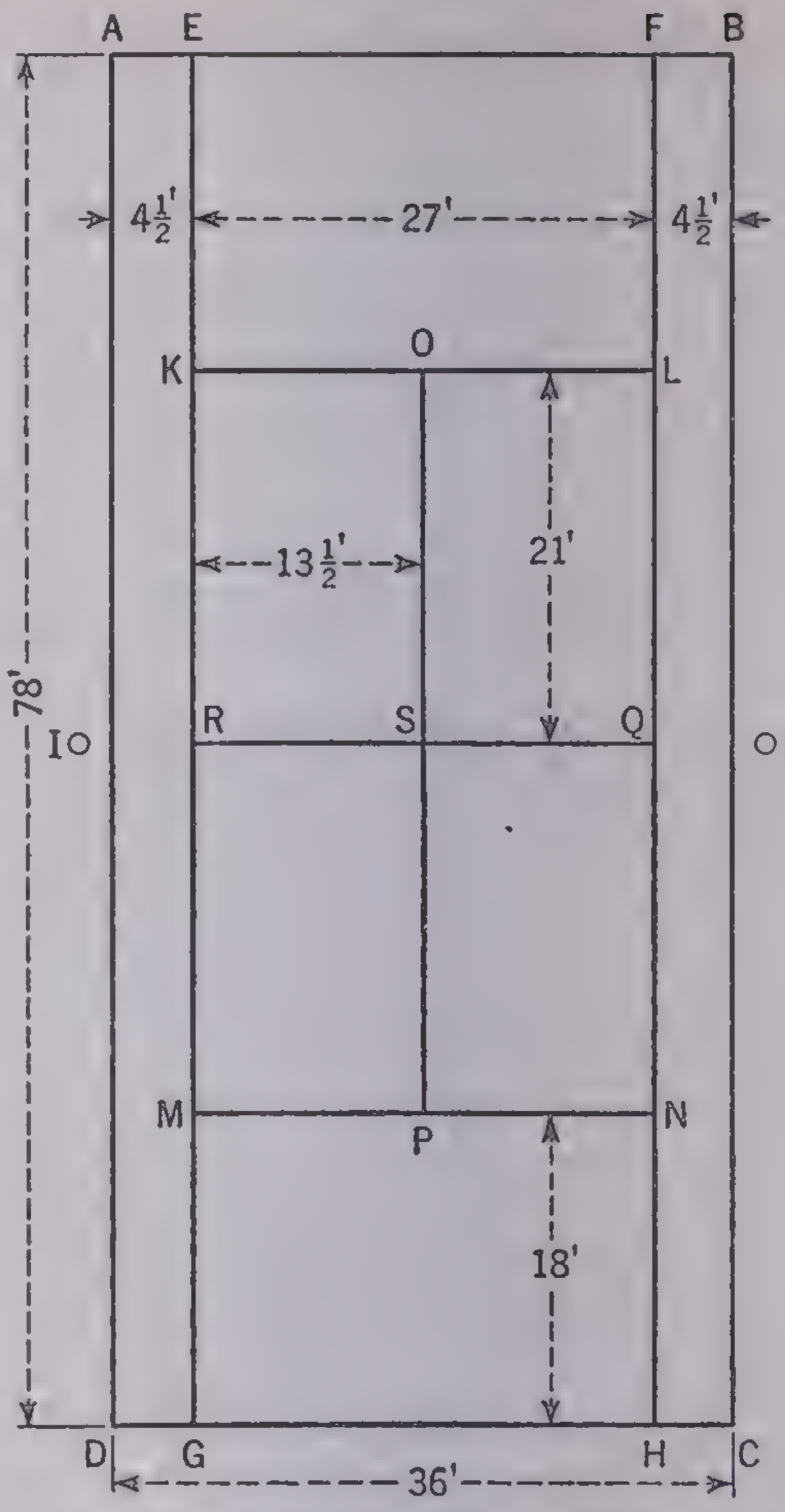


Diagram of a Lawn-Tennis Court
The doubles game is played with the alleys

Rule 2

The permanent fixtures of the court shall include not only the nets, posts, cord or metal cable, strap and band, but also, where there are any such, the back and side stops, the stands, fixed or movable seats and chairs round the court, and their occupants, all other fixtures around and above the court, and the umpire, foot fault judge and linesmen when in their respective places.

Rule 3

The ball shall have a smooth outer surface, seams in the cover shall be stitchless. The ball shall be more than 2½ inches and less than 2⅝ inches in diameter and more than 2 ounces and less than 2 1/16 ounces in weight. The ball shall have a bound of more than 53 inches and less than 58 inches when dropped 100 inches upon a concrete base, and a deformation of more than .265 of an inch and less than .290 of an inch when subjected to pressure of 18 lb. applied to each end of any diameter. All tests shall be made in accordance with the Regulations in the Appendix hereto.

Rule 4

The players shall stand on opposite sides of the net; the player who first delivers the ball shall be called the *Server,* and the other the *Receiver.*

Rule 5

The choice of sides and the right to be Server or Receiver in the first game shall be decided by toss.

The player winning the toss may choose, or request his opponent to choose:—

(*a*) the right to be Server or Receiver, in which case the other player shall choose the side; or (*b*) the side in which case the other player shall choose the right to be Server or Receiver.

Rule 6

The service shall be delivered in the following manner. Immediately before commencing to serve the server shall stand with both feet at rest behind (*i.e.,* further from the net than) the baseline, and within imaginary continuations of the center-mark and side line. The server shall then project the ball by hand into the air in any direction and *before it hits the ground* strike it with his racket, and the delivery shall be deemed to have been completed at the moment of the impact of the racket and the ball. A player with the use of only one arm may utilize his racket for the projection.

Rule 7

The Server shall throughout the delivery of the service—

- (*a*) Not change his position by walking or running.
- (*b*) Maintain contact with the ground.
- (*c*) Keep both feet behind (*i.e.,* further from the net than) the base line.

Rule 8

In delivering the service, the Server shall stand alternately behind the right and left courts, beginning from the right in every game. The ball served shall pass over the net and hit the ground within the service court which is diagonally opposite, or upon any line bounding such court, before the Receiver returns it.

Rule 9

The service is a *Fault* (*a*) if the Server commit any breach of Rules 6, 7 or 8, (*b*) if he miss the ball in attempting to strike it, (*c*) if the ball served touch a permanent fixture (other than the net, strap or band) before it hits the ground.

Rule 10

After a fault (if it be the first fault) the Server shall serve again from behind the same half of the court from which he served that fault, unless it was a fault because he served from behind the wrong half, when he shall be entitled to deliver one service from behind the other half.

A fault may not be claimed after the next service has been delivered.

Rule 11

The Server shall not serve until the Receiver is ready. If the latter attempt to return the service, he shall be deemed ready. If, however, the Receiver signify that he is not ready, he may not claim a fault because the ball does not hit the ground within the limits fixed for the service.

Rule 12

The service is a *Let* (*a*) if the ball served touch the net, strap or band, provided the same be otherwise good, (*b*) if a service or fault be delivered when the Receiver is not ready (see Rule 11). In case of a let, the service counts for nothing, and the Server shall serve again, but a let does not annul a previous fault.

Rule 13

At the end of the first game the Receiver shall become Server, and the Server, Receiver; and so on alternately in all the subsequent games of a match. If a player serve out of turn, the player who ought to have served shall serve as soon as the mistake is discovered. All points scored before such discovery shall be reckoned, but a single fault served before such discovery shall not be reckoned. If a game shall have been completed before such discovery, the order of service shall remain as altered.

Rule 14

A ball is in play from the moment at which it is delivered in service (unless a fault or a let), and remains in play till the point is decided.

Rule 15

The Server wins the point (*a*) if the ball served touch the Receiver or anything which he wears or carries before it hits the ground, (*b*) if the Receiver otherwise lose the point as provided by Rule 17.

Rule 16

The Receiver wins the point (*a*) if the Server serve two consecutive faults, (*b*) if the Server otherwise lose the point as provided by Rule 17.

Rule 17

A player loses the point if—

- (*a*) He fail, before the ball in play has hit the ground twice consecutively, to return it directly over the net [except as provided in Rule 20 (*a*) or (*c*)].
- (*b*) He return the ball in play so that it hits the ground, a permanent fixture or other object outside any of the lines which bound his opponent's court [except as provided in Rule 20 (*a*) and (*c*)]; or
- (*c*) He volley the ball and fail to make a good return even when standing outside the court; or
- (*d*) He touch or strike the ball in play with his racket more than once in making a stroke; or
- (*e*) He or his racket (in his hand or otherwise) or anything which he wears or carries, touch the net, posts, cord or metal cable, strap or band, or the ground within his opponent's court at any time while the ball is in play; or
- (*f*) He volley the ball before it has passed the net; or
- (*g*) The ball in play touch him or anything that he wears or carries, except his racket in his hand or hands; or
- (*h*) He throw his racket at and hit the ball.

Rule 18

A ball falling on a line is regarded as falling in the court bounded by that line.

Rule 19

If the ball in play touch a permanent fixture (other than the net, posts, cord or metal cable, strap or band) after it has hit the ground, the player who struck it wins the point; if before it hits the ground, his opponent wins the point.

Rule 20

It is a good return—

- (*a*) If the ball touch the net, posts, cord or metal cable, strap or band, provided that it passes over any of them and hits the ground within the court;
- (*b*) If the ball, served or returned, hit the ground within the proper court and rebound or be blown back over the net, and the player whose turn it is to strike reach over the net and play the ball, provided that neither he nor any part of his clothes or racket touch the net, posts, cord or metal cable, strap or band or the ground within his opponent's court, and that the stroke be otherwise good;
- (*c*) If the ball be returned outside the post, either above or below the level of the top of the net, even though it touch the post, provided that it hits the ground within the proper courts;
- (*d*) If a player's racket pass over the net after he has returned the ball, provided the ball pass the net before being played and be properly returned;
- (*e*) If a player succeed in returning the ball, served or in play, which strikes a ball lying in the court.

Rule 21

In case a player is hindered in making a stroke by anything not within his control, except a permanent fixture of the court, the point shall be replayed.

Rule 22

If a player wins his first point, the score is called 15 for that player; on winning his second point, the score is called 30 for that player; on winning his third point, the score is called 40 for that player; and the fourth point won by a player is scored *Game* for that player, except as follows:

If both players have won three points, the score is called *Deuce;* and the next point won by a player is scored *Advantage* for that player. If the same player wins the next point, he wins the game; if the other player wins the next point, the score is again called *Deuce;* and so on, until a player wins two points immediately following the score at deuce, when the game is scored for that player.

Rule 23

The player who first wins six games wins a set, except as follows:

If both players have won five games, the score is called *Games-All,* and the next game won by a player is scored *Advantage Game* for that player. If the same player wins the next game, he wins the *Set;* if the other player wins the next game, the score is again called *Games-All;* and so on until a player wins two games more than his opponent, when the set is scored for that player.

Rule 24

The players shall change sides at the end of the first, third and every subsequent alternate game of each set, and at the end of each set, unless the total number of games in such set be even, in which case the change is not made until the end of the first game of the next set.

Rule 25

The maximum number of sets in a match shall be five or where women take part, three.

Rule 26

Except where otherwise stated, every reference in these Rules to the masculine includes the feminine gender.

Rule 27

In matches where an Umpire is appointed, his decision shall be final; but where a Referee is appointed, an appeal shall lie to him from the decision of an Umpire on a question of law, and in all such cases the decision of the Referee shall be final.

The Referee, in his discretion, may at any time postpone a match on account of darkness or the condition of the ground or the weather. In any case of postponement the previous score and the previous occupancy of courts shall hold good, unless the Referee and the players unanimously agree otherwise.

Rule 28

Play shall be continuous from the first service till the match be concluded; provided that after the third set, or when women take part, the second set, either player is entitled to a rest, which shall not exceed 10 minutes, except that in the countries situated between Latitude 15° North and Latitude 15° South such rest shall not exceed 45 minutes, and provided further that when necessitated by circumstances not within the control of the players, the Umpire may suspend play for such a period as he may consider necessary. If play be suspended and be not resumed until a later day the rest may be taken only after the third set (or when women take part, the second set) of play on such later day, completion of an unfinished set being counted one set. These provisions shall be strictly construed, and play shall never be suspended, delayed or interfered with for the purpose of enabling a player to recover his strength or his wind or to receive instruction or advice. The Umpire shall be the sole judge of such suspension, delay or interference, and after giving due warning he may disqualify the offender.

The Doubles Game

Rule 29

The foregoing rules shall apply to the *Doubles Game* except as follows:

Rule 30

For the doubles game, the court shall be 36 feet in width, *i.e.,* 4½ feet wider on each side than the court for the singles game, and those portions of the singles side lines which lie between the two service lines shall be called the *Service Side Lines.* In other respects the court shall be similar to that described in Rule 1, but the portions of the singles side lines between the base line and the service line on each side of the net may be omitted if desired.

Rule 31

The pair who have to serve in the first game of each set shall decide which partner shall do so, and the opposing pair shall decide similarly for the second game. The partner of the player who served in the first game shall serve in the third; the partner of the player who served in the second game shall serve in the fourth, and so on in the same order in all the subsequent games of a set. The order of service having been decided shall not be altered during the set, but it may be changed at the beginning of a new set.

Rule 32

The pair who have to receive the service in the first game of each set shall decide which partner shall receive the first service and the opposing pair shall decide similarly in the second game of each set. Partners shall receive the service alternately throughout each game and the order of receiving the service having been decided shall not be altered during the set, but it may be changed at the beginning of a new set.

Rule 33

If a partner serve out of his turn, the partner who ought to have served shall serve as soon as the mistake is discovered, but all points scored, and any fault served before such discovery, shall be reckoned. If a game shall have been completed before such discovery, the order of service remains as altered.

Rule 34

If during a game the order of receiving the service is changed by the receivers, it shall remain as altered until the end of the game in which the mistake is discovered, but the partners shall resume their original order of receiving in the next game of that set in which they are receivers of the service.

Rule 35

The service is a fault as provided for by Rule 9, or if the ball served touch the Server's partner or anything which he wears or carries; but if the ball served touch the partner of the Receiver or anything which he wears or carries, before it hits the ground, the Server wins the point.

Rule 36

The ball shall be struck alternately by one or other player of the opposing pairs, and if a player touch the ball in play with his racket in contravention of this Rule, his opponents win the point.

TOBOGGANING

The toboggan, which seems to have originated with the Indians of northeastern America, was used by them to haul their possessions over the trackless snow. It consisted of a strip of bark turned up in front and reinforced by strips of wood along the edges and crosswise. The Eskimos make toboggans from strips of whalebone.

The modern toboggan is made of thin strips of wood (usually maple, hickory or ash) placed side by side and held in place by crosswise cleats. The under sides of the strips are curved slightly and polished. The toboggan is about 18 inches wide and from 6 to 8 feet long. It has no steering apparatus. The rear man must crouch on one knee and stretch the other behind to use as a rudder. Or the single user may lie prone and steer with his toes. For this reason toboggans are not as practical for coasting as sleds or bobs unless a track or slide is built to keep them within bounds.

Uses of the Toboggan.—Toboggans are most used as a means of transportation in places where the climate is dry and cold and there are quantities of soft, fluffy snow. In Alaska dog teams harnessed to toboggans draw heavy loads of supplies great distances, and races with toboggans and dog teams are popular. Winter campers and hunters in the north woods use them to haul equipment and game.

Toboggan Slides.—The easy way to make a toboggan slide is to cut out a track deep enough to control the toboggan on a natural hill or slope that is covered with a thick layer of snow. In places where winter sports are a specialty, a wooden framework is covered with snow. Quebec, Montreal and Lake Placid in America have famous slides. The sport is popular in Switzerland, where it is called *lugeing,* though the real Swiss *luge* is a small sled and not a toboggan.

TRACK AND FIELD EVENTS

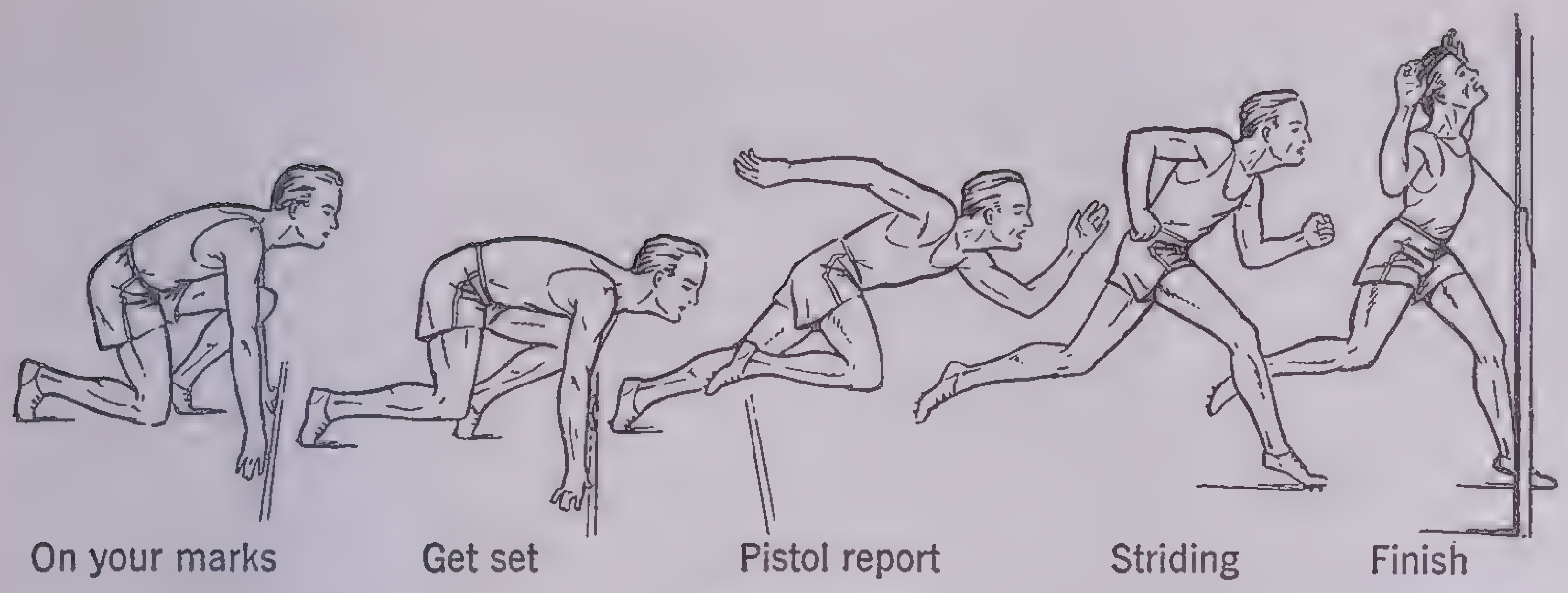
Track and field events are unlike games in their emphasis on individual or group contests instead of on cooperation in team play. In track and field events the individual can endeavor without interference to surpass rivals in standardized contests held outdoors on a prepared course or track. *Track events* are divided into walking, running and hurdling races; and *field events* are commonly confined to weight throwing, jumping and vaulting.

Before a meet all contestants report to the clerk of the course on arrival, register, enter for certain events, receive handicaps according to previous records and receive a number for the meet. They are subject to decisions made by the referee and his assistants, the clerk of the course, starter, inspectors, finish judges, timekeepers, scorer, field judges and marshal.

Track events have the following divisions:

Sprinting—100-yard dash, 220-yard dash
Middle-distance races—440-yard run, ½-mile run
Long-distance races—1-mile run, 2-mile run and longer distances
Track-relay race—¼-mile to 4-mile relay
Cross-country race—1½-mile to 7-mile run
Walking race—220-yard to 2-mile walk
Hurdle races—120-yard high hurdle, 220-yard low hurdle, 440-yard intermediate hurdle.

Sprints or Dashes (*Late Elementary School to Adults.*)—Sprints or dashes cover any distance from 40 to 440



Sprinting Form

yards (¼ mile), according to the age of the runner. Dashes for 4th-grade pupils should be 40 yards for girls and 50 yards for boys and should be lengthened about 10 yards for each grade up to the 8th.

The course is divided into lanes, one for each contestant. These lanes are assigned by lot and should be 3 feet or more in width. Runners who are not handicapped start from *scratch,* a starting line drawn across the track. They usually dig holes about 3 inches deep for the toes of each foot; such holes or their substitute starting blocks aid in establishing a drive at the start. A crouch start is taken when the starter says, "Get ready," or "On your marks," with the front (usually the left) foot 8 to 12 inches behind scratch and the knee of the back (usually the right) leg placed on the ground near the instep of the front foot. Both hands are placed on the starting line in one of the three illustrated positions and the elbows are locked.

At the starter's call, "Get set," the body is moved well forward, with its weight mainly supported by the hands and front leg. When all the runners have been poised for 2 seconds or more, "Go," is shouted by the starter or he fires the pistol as the signal to run.

Short strides are preferable for the first 10 yards but are lengthened thereafter. The rear foot should not be raised too high, the hands should not rise above the chest and the toes should not point out. The best stride is made on the ball of the foot with the knee bent no more than necessary.

Middle-Distance Runs (*Senior High School to Adults.*)—Runs of ¼ mile to ¾ mile are called *middle-distance* runs; they are most frequently run on an oval track. The same arm action is used in these runs as in the sprints but with a more relaxed swing. The stride is long, and the runner may drop his heels a little more than in the sprint. Lanes are sometimes used for ¼-mile runs but are usually discarded for the longer races. Middle-distance runs are likely to begin vigorously, to use a moderate middle pace and to end with a dash. These runs are not recommended for boys or girls under 15 or 16 years of age.

Long-Distance Runs (*Senior High School to Adults.*)—Runs of 1 or 2 miles are the true distance runs and with the ½-mile middle-distance run sometimes employ the erect start instead of the crouch. The erect standing start is assumed with one foot toeing scratch and the other back one pace. The best distance runners put in long, conditioned training before their races and acquire a perception of proper *pacing,* the maintenance of equal speed throughout a run. Training for distance runs should never be begun without a physician's approval.

The marathon is the longest of running races, the usual course being 26 miles 385 yards long. Runs to 90 miles have been staged by British athletes but the marathon is a track event suitable only for mature men of exceptionally good physique, great endurance and long training in distance running. This race should be prohibited to boys under 21 years of age.

Track—Relay Runs (*Junior High School to Adults.*)—Relay races are run by several competing teams over a stated course; each of the usual four members of a group runs an equal distance (except in medley relay races) and passes the stick to another teammate. The standard relay distances for track meets are ¼ mile, ½ mile, 1 mile, 2 miles and 4 miles; in the ¼-mile race, four men run 110 yards each; in the ½ mile, four men run 220 yards each; and so on.

Each competitor in a relay runs a sprint and the same technique is used, except that only the first runner can employ the crouch start. The first runners are started as in dashes; no other runner may start until he has received the *baton* or stick from the teammate who precedes him in the race. The delivery of the baton or any other stated token must occur by passing (not throwing) within a 20-foot space marked off for the purpose. An inspector is stationed at each of these starting points to see that the rules are observed.

Novelty relays, not used in regular track events, are well-liked as amusements in indoor gymnasiums and at picnics and carnivals; they may be run by hopping, jumping, crawling on all fours, rolling or carrying some object, by sack racing or with other diverting variations.

Racing

Cross-Country Competition (*Senior High School to Adults.*)—Runs across country may be from 1½ to 7 miles long although the English national championship and the International race have 10-mile runs. The course is marked by 1-foot-square flags, the blue flag showing that the course runs directly ahead, the white flag directing a turn to the right and the red flag pointing out a turn to the left. The flags are on poles from 2 to 4 feet above the ground.

If teams compete on cross-country runs they usually consist of five men, the four who finish first scoring points for their group—one for first place, two for second and the like—the team with the lowest score winning the event.

Runners of high-school age should not be allowed to overexert nor to run more than a 2-mile cross-country race.

Walking Contests (*Junior High School to Adults.*)—Walking contests are very popular in England and on the Continent but have lost favor in championship events in the United States because it is so difficult to supervise the run, enforce rules and distinguish between a run and a fair walk. Heel-and-toe walking races are conducted differently from running races only in the rule that contestants must walk; the rear toe must not be raised until the forward heel has hit the ground. The knee must be locked, the arms are swung vigorously and because of the resultant jerky motion, the walking race is very fatiguing.

The Hurdles (*Senior High School to Adults*).—Three types of hurdle races are run: one of 120 yards with high (3½-foot) hurdles, one of 220 yards with low (2½-foot) hurdles and one of 440 yards with intermediate (3-foot) hurdles. The 440-yard hurdle is unusually tiring and is omitted in intercollegiate championship events, although it is still included in A.A.U. meets. For all course lengths, 10 fencelike hurdles divide the course into 11 parts; the 120-yard-hurdle course has 15-yard end sections and 10 yards between the hurdles; the 220-yard and 440-yard courses are divided into 11 equal sections of 20 and 40 yards, respectively.

Hurdling is an adaptation of sprinting, so the same start and rules are used except for *taking the hurdle* by a leap. The object of the race is to clear the obstacles with the least possible interference with sprinting speed. Most runners spring from the same foot before each leap, jump with the chest bent close to the front leg and with the arms spread. The best hurdlers almost graze each bar. If more than two hurdles are knocked down, the runner is disqualified; record runs are never made unless all hurdles remain upright. Courses on indoor tracks vary from 40 to 60 yards with three to five low or high hurdles.

Field events have the following divisions:

Jumping

Running high jump
Standing high jump
Running broad jump
Standing broad jump
Three standing broad jumps
Running hop, step and jump

Weight Throwing

Shot-put—16-pound shot
Hammer throw—16-pound hammer
Fifty-six-pound weight throw
Javelin throw
Discus throw

Vaulting

Pole vault—for height or distance

Running High Jump (*Late Elementary School to Adults*).—The high jump is one form of the sport of jumping that has been a favorite from ancient times. Jumping for height requires a landing pit of soft earth or sand, which may vary from 10 to 14 feet in width and 14 to 16 feet in length. The high jumps employ a pair of uprights 12 feet apart, bored for pegs not longer than 3 inches and supporting a light crossbar; the crossbar may be triangular, with each face 1$\frac{3}{16}$ inches wide, or square with rounded edges, 1$\frac{1}{8}$ inches wide. A light bamboo pole may serve as the crossbar for informal jumping. The running ground is V-shaped, so that contestants can get a 36- to 40-foot approach from either side. In intercollegiate practice a *balk line* is drawn on the ground 3 feet in front of and parallel to the bar; any runner who steps over this line twice in an attempt to jump is judged to have made one trial. The usual take-off varies from 3 to 4$\frac{1}{2}$ feet at any point in front of the bar.

The purpose of both the running and the standing high jump is to clear the bar without knocking it off its pegs. The bar is first placed at a height all the runners can clear and raised peg by peg. Displacing the bar or leaving the ground in any attempt is called a *trial.* Three trials are permitted at each height. A contestant may decline to try at any particular height and may come in at a greater height later on, but there may be no return to lower levels, except to break a tie. Each jumper drops out of the contest when he fails to clear the bar.

The major principle of the modern high jump is the *layout*—the moving of the body from a vertical to a horizontal position at the moment of clearing the bar. The *scissors jump,* most commonly employed by the amateur, is least efficient because the jumper does not use the layout and is in a sitting position as he clears the bar. The Sweeney, half Sweeney, short-hook Sweeney and California or western jump are variations of the *roll-over* style and have been instrumental in achieving record jumps. The jumper rolls sidewise over the bar in these jumps but must avoid crossing the bar with his head in advance of either foot, as such a position results in an illegal jump. Record jumps have been within 2 and 3 inches of 7 feet.

Standing High Jump (*Late Elementary School to Adults*).—The rules and technique of the running high jump apply to this jump except that the jumper is not allowed to run or hop before his take-off from a crouching position about 18 inches in front of the bar. He may lift first one foot and then the other or jump from both and hop over the bar with or without a layout. A foot lifted twice or two springs without a try at a jump count as a trial.

Running Broad Jump (*Junior High School to Adults*).—This event requires a running track of cinders or firm earth 4 feet wide and 80 feet long with a mark 20 feet in front of the take-off plank; the runner judges his stride by the manner in which he touches this mark. The take-off plank varies in width, the standard being 8 inches wide and 4 to 6 feet long, but is always sunk broad side up on a level with the ground. Behind the take-off board the soil is dug out 3 inches deep and 1 foot wide for leverage in springing from the plank. The pit starts 5 feet in front of the take-off plank; it may be from 5 to 8 feet wide, from 20 to 25 feet long, is dug to a depth of about 1 foot and the ground mixed with sand or sawdust to be soft for landing.

Each contestant takes as much run as he pleases—the ordinary run is about six paces—so timing his steps as to bring his jumping foot on the take-off plank for the spring. If the running path is soft or the wind unfavorable, more is lost than gained by long runs. The runner approaches the board at full speed, lands solidly on his jumping leg and without pause makes a crouching spring, flings his arms forward for a lift and while he is still in the air, thrusts his legs and arms forward in order to maintain balance and to make his mark as far as possible from the plank. Some broad jumpers keep the knees well up near the chin and land in a forward-bending crouch. Extending the legs too soon often causes a fall backward. A *hitch kick* or powerful step taken during the time the contestant is in the air is an aid in achieving distance.

Jumps are measured from the forward or unburied edge of the take-off plank to the nearest mark made by the jumper in landing. For this reason he must be careful not to fall backward or even throw a hand back to support himself in landing, for any mark so made will lower his record.

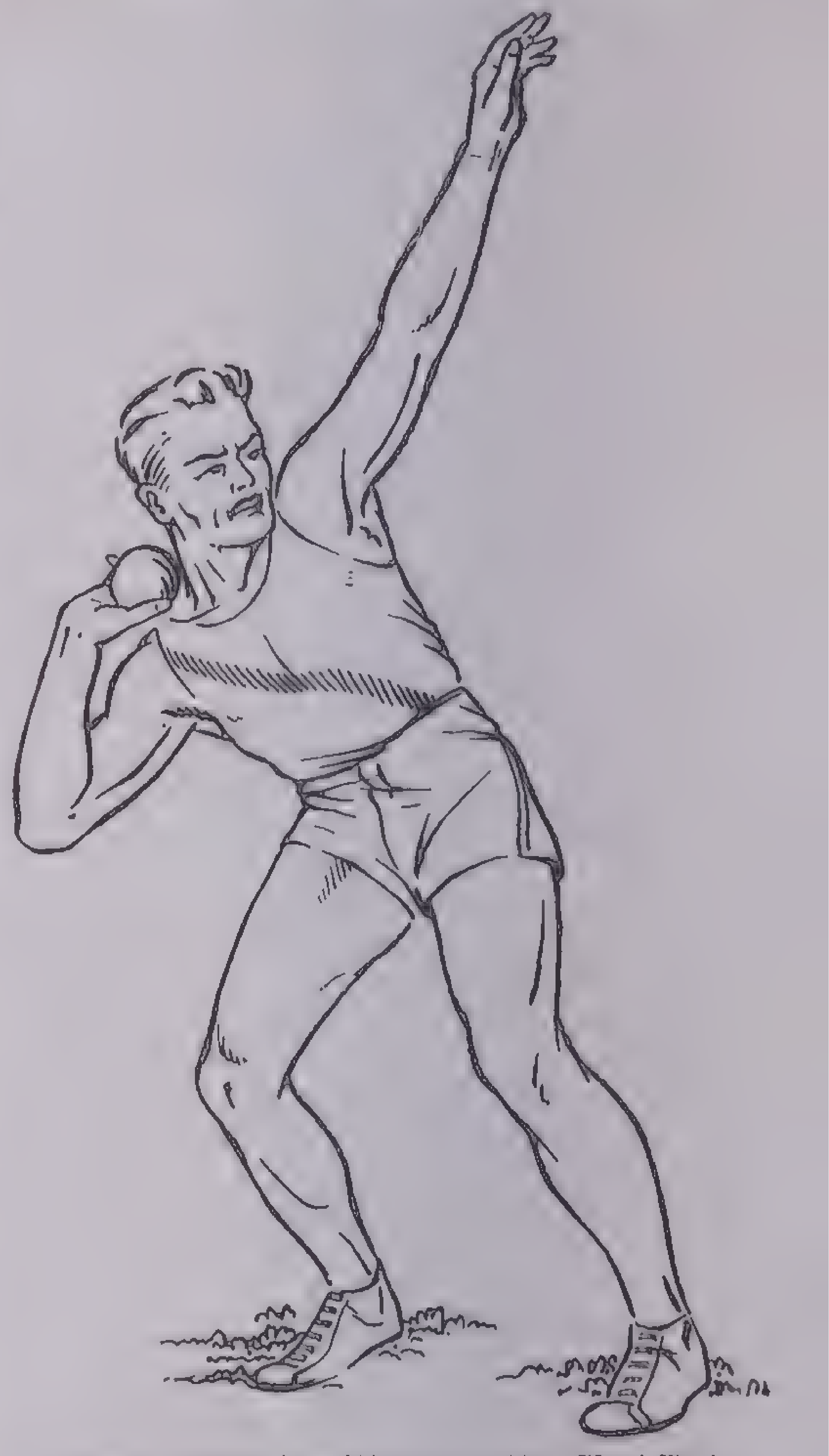
A step over the take-off plank counts as a trial although the jump is not measured. When a large number of competitors is entered, each has three trial jumps, and a convenient number of winners from these trials enters the final competition. In the finals each man again has three jumps, and the best of the three jumps made by each man is his record for the event. Record jumps have exceeded 26 feet.

Standing Broad Jump (*Junior High School to Adults*).—This event uses a regular take-off board, with both feet on the board and the arms upright when the spring is made. Preliminary hops or runs are not permissible. Toes may overhang the edge of the board for starting thrust. If, as sometimes happens, the jump is from a scratch line on the ground, the toes may touch this line but must not overreach it. Three trials are used, as in the running jumps.

Triple standing broad jump is the same as the standing broad jump except that three jumps are made in succession.

Running Hop, Step and Jump (*Junior High School to Adults*).—The start is like that of the running broad jump with one foot on the take-off board. The foot that makes the take-off must make the first landing; the opposite foot at once takes the step; then without a pause both feet register the final jump. The distance is measured from the scratch line or take-off board, as in the other types of jumps for distance.

Shot-put (*Junior High School to Adults*).—Both the shot and hammer are thrown from a circle that is 7 feet in diameter with a *toe board* 4 inches high around 4 feet of its circumference. Putting the shot has been practiced as a sport in Ireland for more than a century. The shot is a round metal ball weighing 16 pounds for competition between men, 12 pounds for high-school boys and 8 pounds for women and junior high-school students.



Good Initial Position for the Shot-Put

The right shoulder is dropped low to begin the shift across the circle

The contestant must not step across or beyond the toe board in putting the shot or leave his throwing position until the throw is measured. The measurement is made from his position on the circle to the nearest mark made by the shot.

The shot must be *put* overhand, not thrown—that is, it must not be drawn back of the ear in line with the shoulder; at the beginning of the action it usually rests *on* the shoulder, in the hand as near the end of the fingers as strength permits to give leverage. Form is important: (1) a half crouch at the rear of the circle, the weighted shoulder drawn far back and low; (2) a sliding glide forward; (3) a twisting shift of the feet and and an upward lunge of the whole body, while the putting arm straightens, and even the fingers add their push or *flip* at the end, like the kick of the toes in swimming. The putter should avoid a pause between this series of actions, making the put a smooth flow of motion.

Each contestant has three trials. The best of the three is his record for the event. In 1934 the shot was put 57 feet and 1 inch.

Hammer Throw (*Adults*).—The hammer is thrown from the same type of circle that is used for the shot-put. The hammer is a circular metal weight with a flexible wire handle and grips; the entire hammer weighs 16 pounds and is no more than 4 feet in length.

The event has rules similar to those governing the shot-put but the form differs. The hammer may be thrown without a turn but the majority of contestants use from one to three turns. The handle is gripped near the ends of the fingers and the initial position is taken with the back toward the course of the throw. The hammer is swung around the head with the arms straight; after several swings the body is twisted around. After the pivot, a jump is taken to the edge of the circle where the hammer is released. Crossing the legs or dragging the foot at the end of the heave may prevent the thrower from leaving the circle.

All fair throws must fall within a 90-degree sector marked on the ground. As the event is dangerous for spectators, wire screen protectors often are provided or the watchers are kept 200 feet in all directions from the throw. The amateur record was made in 1913—189 ft. 6½ in.

Fifty-Six-Pound Weight Throw (*Adults*).—The 56-pound weight is thrown in A.A.U. events but has been omitted from many intercollegiate meets. The undergraduate intercollegiate meets include a 35-pound-weight-throwing contest in preference to one with the heavier weight. Both weights are thrown for distance from a 7-foot circle.

The 35- and 56-pound weights have a circular metal sphere with a triangular handle having 7¼-inch sides. The weight is thrown like a hammer except that the starting position is taken with the head bent near the knees, the arms between the legs and the hands grasping the weight, which is placed on the ground. The swing to the left can be followed successfully by only one turn. Fouls and measurements for this event are similar to those for the hammer throw.

Javelin Throw (*Senior High School to Adults*).—The javelin throw grew out of the throwing of spears in ancient wars; it was a popular feature of the old Olympic games in Greece and was first popularized as a modern sport in Sweden. The javelin has a wooden shaft with an attached iron or steel point and a whipcord-wound grip at the center of gravity; it must be about 8½ feet long and weigh no less than 1.76 pounds.

The javelin is held by the grip with the thumb extending along the shaft; it is thrown by a full-arm swing from behind a scratch line after as long a run as the contestant requires, although the usual distance is 15 yards. A hop is helpful after the run, with the javelin held parallel to the outflung arms and with the body turned to one side. Both feet should be on the ground when the javelin is cast.

Only those throws are counted in which the point of the javelin strikes the ground first. The distance of the throw is measured from the scratch line or the scratch line extended to the place where the javelin point touches the ground. Each contestant is credited with the best of three trial throws. If a javelin breaks in the air, it is not counted as a trial.

Discus Throw (*Senior High School to Adults*).—Discus throwing was a favorite sport of the Greeks and the modern version uses a similar but freer style. The standard discus is a convex circular wooden object approximately 9 inches in diameter and with a metal rim. It may not weigh less than 4 pounds 6.4 ounces. Throws are made from a circle 8 feet 2½ inches in diameter; to be valid they must fall within a 90-degree sector. Rules governing discus throwing are about the same as those for the shot-put.

There are two styles of throwing the discus—one (the old Greek form), with prescribed motions from a fixed position; the other (the modern free style) conducted much like the shot-put, except that the discus is really slung with a full-arm swing rather than thrown.

Pole Vault (*Senior High School to Adults*).—The pole vault for height has the same purpose as the high jump—to clear a bar without displacing it. The pole vault requires: a runway about 4 feet wide and 100 feet long; uprights at least 12 feet apart and about 20 feet high, notched or pinned for half-inch or one-inch lifts of the crossbar; a landing pit of soft earth with a sawdust top; and a standard pole. The pole is 16 feet long, of female bamboo, wound with electric tape for grip and plugged with wood at the lower end. A 14-foot pole is preferable for beginners. Mid-point in front of the uprights is the *planting-pit*, a hole to receive the pole at the moment of the vault; this pit may be 6 to 9 inches deep, about 24 inches long and 18 inches across the middle of a wide plank sunk between the uprights with a 2-inch projection to stop the end of the pole. Fifteen feet in front of the bar is a *balkline*, which may not be crossed by a contestant without counting against him as a trial.

A vaulter measures the pole against the height of the crossbar, grasps it with his right hand slightly *below* this point and places his left hand 2 to 3 feet *lower* on the pole. He carries the pole with this grip on a rapid sprint up the runway. As he places the end of the pole in the planting-pit, he slides his lower hand up the pole next to the upper hand and by the pull and thrust of both arms swings his body to a horizontal position above the pole with the feet forward. The pole is then shoved back and the vaulter lands in the pit. A good vaulter may clear the bar as high as 15 feet from the ground.

TRACKING

The story of tracks in the snow is an interesting one always, particularly in the woods, for those who learn to read it. Each bird, animal and human being makes a different track, and each track varies according to the mood of the tracked. Br'er Rabbit's larger hind feet are always ahead of his front ones—and if you follow him you can soon tell by the tracks whether he was afraid and in a hurry or taking a leisurely hop. Some animals (the muskrat, raccoon and red squirrel) make tracks that are amazingly like the impress of the human hand in shape.

Recording the Story.—The most common way to get a record of tracks is to photograph them. To do this one must learn to judge lights and shadows on the snow, and even then results are not always good for often the best tracks lie in shadow too deep for the camera. Making plaster-of-Paris casts is a satisfactory and fairly simple process. It requires only plaster of Paris, available at any hardware store and water (carry some along unless you are certain of finding it on the trail) with which to mix it. An average-sized track—fox or dog—will take less than ½ pound of plaster. Have a tin box or can to mix the plaster and water, stirring with a stick to remove all lumps and making the mixture about the consistency of thick cream. Pour it into the track and leave it until it hardens. You will then have a negative of the track. Positives may be made in clay, plaster or plasticene. Shaped into paper weights, book ends and the like, they make decorative ornaments. The best snow is that near the melting point—soft and well packed; tracks in snow that has melted a little and then frozen also make good prints. If it is a dry, cold day so that the snow is soft and powdery, it is well to take along a sprayer of some sort and spray the track gently with water until it is icy.

Tracks in sand or mud also may be preserved with plaster of Paris.

VOLLEYBALL

(Junior High School to Adults)

Volleyball is a widely popular game because it does not require great skill, is not strenuous, has simple equipment and rules and may be played by teams of 6 to 12 persons.

Across the middle of a rectangular court not larger than 30 feet by 60 feet, a net is stretched with the upper edge 8 feet from the floor. For younger boys and girls the court is 25 feet by 50 feet, and the net may be 7½ or even 6½ feet from the floor. The object of each team is to keep the ball beyond the net in the enemy's country and to prevent its striking the ground in home territory.

A standard volley ball is an inch smaller in diameter and much lighter than a basketball, though a basketball will do when the game is played for recreation only. Any tennis net will serve for the net.

Teams in official play have six players, but 12 may play. Women's teams usually have eight players; in all teams the players stand in rows across the court, the server standing outside the lower right-hand corner of the court. The server tosses up the ball and bats it with his hand toward the opponents' court. He may use either or both open hands but must not use doubled fists. No matter how many play, each player must take his turn at serving the ball and must continue to serve until his side is out, by reason of faulty service, foul or failure in returning the ball. To be successful a serve must be hit over the net and into the opponents' court. Men are allowed one attempt at service, but younger players and women are permitted two.

When a team makes a foul or fails in service or return, the referee calls, "Side out"; service passes to the opposing team, and each of the losers moves on one stage in his rotation toward service. Served balls are dead if they touch the net, but returned balls may be recovered from the net.

After service, the ball may be hit by three teammates who *relay* the ball before it is sent over the net. The game for women permits any number of relays if the same player does not hit the ball twice in succession.

The ball is dead or *out of bounds* when it touches the floor, goes out of the court, strikes a player below the hips or when the referee blows his whistle. After the ball is dead, service goes to the opposite team.

Fouls. No player may touch the net or reach over the net to strike a ball. No player may be helped or supported while striking the ball. Players must remain in their own court. Catching or holding the ball is illegal; *dribbling* (touching the ball twice in succession) is prohibited. Players must not delay the game by batting the ball about unnecessarily; they must seek legitimately to advance their score. Stepping into the court during service and serving out of order are illegal plays.

If the serving side makes a foul, the ball goes to the opponents, and an additional penalty of one point may be added to the opponents' score if the foul is for unsportsmanlike conduct or for addressing officials. A foul by the receivers adds a point to the servers' score. Only the servers may score, except for fouls.

The first side to score 15 points by their own service wins the game, providing that they possess two or more points more than their opponents. Otherwise the game continues until one side is two points ahead. The game for women has two 15-minute halves and the winning team has the higher score at the end of play.

The officials are a referee, a scorer and two linesmen. The referee is chief official and works near the middle of the field, with a linesman at each end.

WRESTLING

Wrestling is a sport that consists of a hand-to-hand encounter between two unarmed contestants who attempt to throw each other. It is, no doubt, as old as man, but the rules of the game have changed from age to age. In the old Greek wrestling matches, for instance, no hold below the waistline was permitted. In the Irish collar-and-elbow contests neither man may for an instant let go his hold on his opponent's collar.

In Japan a wrestling match was recorded as early as 23 B.C. and, except for the period from the 12th to the 17th century, wrestling has always been popular there. Japanese wrestlers try to increase their weight as much as possible, instead of reducing as in other countries. Jujitsu, a kind of trick wrestling that probably originated with the Japanese army, is still practiced there but is not the regular wrestling form.

In England a number of wrestling styles were developed. One of them, the Lancashire or catch-as-catch-can, which is a combination of upright and ground wrestling, is the style used in Great Britain and America today. The Greco-Roman style, which originated in France and has no relation to classic wrestling, is popular on the Continent. It is almost entirely ground wrestling and holds below the hips and tripping are not allowed.

Catch-as-catch-can Wrestling.— In this form of wrestling a fall is secured whenever both shoulders squarely touch the floor at once. Only strangle holds, shutting off an opponent's wind are barred. At least 25 different holds are named and distinguished by professional wrestlers. There is not much value in a mere list of wrestling positions. The moves may, however, be divided into:

The Approach, which should be cautious, the body leaning forward, the arms bent a little at the elbow and out in front with the hands open, fingers together and curved, the feet spread apart with the weight fairly distributed.

The First Hold, in which the opponents first assume the referee's hold, each with his right hand on the other's neck and his left holding the other's right elbow.

To Go Behind.—This is an offensive move to get behind the opponent to throw him to the mat; the leg dive, elbow throw, arm pull and chin lift are the moves used. The defensive move is to try to keep the body bent forward and not to be forced into an upright position.

To Take to Mat.—One way to take the opponent to mat is to drop to the knees behind him, grasp his ankles and push him forward with the head and shoulders. The defensive move is to try to go forward and out of the hold. A second offensive move is to fasten the opponent's left arm between his body and yours, quickly place one or both feet against his and throw him off balance to the left, keeping close as he falls. The defensive move is to keep the arm from being caught and to reach back between your legs and grasp the opponent's leg. A third offensive is to lift the opponent into the air and throw him; the defensive move is to relax, so that it is more difficult to be thrown off balance, and to twist a leg around the opponent's leg, so that he lifts against himself.

To Keep the Advantage.—When the offensive player has his opponent down, he must try to keep him there by holding his elbow with one hand and twining the other arm around his abdomen. Then he can bring one leg inside and twist it around the opponent's. He can also try to keep the man underneath off balance and tire him out by keeping part of his weight on him.

Out from Underneath.—The defensive move, if taken to the mat, is to catch oneself with the hands and knees well spread to keep the balance and then try to get from under. In the *arm roll* the defensive man seizes the wrist of the arm that is around his abdomen, pulls it and turns his body so that the opponent rolls off. It helps to hook a foot under his thigh and lift with that too. Another move is to *sit out* from under by suddenly throwing the feet out in front and sitting down flat on the floor, pulling the opponent's hands loose, straightening and twisting out of his hold. A move similar to this is a *body twist,* performed by loosening the opponent's fingers from the abdomen, raising up and stepping forward with one leg and turning upward to face the opponent.

Pinning Holds.—Once the opponent is brought to the mat he must be rolled over on his back and then overpowered. Common holds are: the *near half nelson* (arm underneath the opponent's arm and across his back with the hand on his head), combined with the *farther leg* in which your other arm reaches under the opponent and grasps the thigh or knee of his opposite leg from the back and pulls the leg toward you, keeping your body at right angles and chest against his; with the *waist lock* in which the pressure is relaxed to allow the body to turn; and with the *farther arm* in which the arm is twisted around the opponent's opposite wrist from the inside. The defensive for these is to keep the head and neck stiff and use the arm roll, sit out or body twist.

The near leg and *far arm* consists of the under man reaching across and grasping his opponent's far arm from in front and rolling him over by raising his nearer leg, following with the crotch hold and locking the arms when the opponent is rolled off. The defensive move is to try to twist out as the opponent is reaching for the leg.

The jackknife hold consists of a near half nelson with one arm and a crotch hold with the opposite leg, forcing the opponent's head down so that he rolls forward until his shoulders touch the mat. The defensive is to keep the head up and try to get out of the underneath position.

The three-quarter nelson consists of following the near half nelson by clasping hands around the opponent, the second hand crossing under his chest. With it you twist your leg around his and press until his body turns, return to the half nelson and pin him with a crotch hold.

The farther half nelson is the opposite of the near (reach across his back and underneath his farther arm). It may be combined with the side scissors (one leg placed over the opponent's body and locked with the under leg).

The top scissors consists of a straddle on the back of the opponent with the legs wrapped around, the feet crossed and pushed back between his legs so that his arms are forced forward until he lies flat. The defensive move is to keep the elbows in so tight that the opponent cannot get his legs around you.

Wrestling Contests.—The time regulation for amateur matches is 10 minutes; for high-school matches, 8 minutes. A *fall* consists of pinning both shoulders to the floor for 2 seconds by referee's silent count. The *full nelson, hammer lock* and *toe hold* are barred in amateur contests.

ETIQUETTE

Etiquette plays an important part in one's success. It comprises those rules and forms of conventional decorum that indicate what is proper in various contacts with one's fellow men and that have been developed among civilized peoples over many centuries. Many times what we consider to be the hallmarks of good breeding may be traced to the days of chivalry. The custom of raising the hat originated when knights, on accosting each other, raised the visors of their helmets to determine whether they were friends or foes. The custom of shaking hands originated in a desire to show a friendly feeling by indicating that one carried no concealed weapons, especially as one's left hand would generally be too weak to wield an effective blow. Many people still observe the custom of serving the hostess first, which may be traced to the desire of a medieval host to prove by having his lady taste each dish first that he did not wish to poison his guests.

The rules of etiquette are based on such qualities as courtesy, kindliness and consideration for the rights of others. They should be practiced from childhood until they become automatic. To speak in low tones and without boasting, to use accepted forms of speech, to talk too little rather than too much, to avoid superlatives and evident exaggerations—these are some of the marks of good manners and good breeding.

The foundation of etiquette is laid in the home. Thence its influence extends to every phase of the individual's life—to the school, to the church, to his work, to his social life and to his various contacts with strangers as well as friends. Etiquette is most useful in smoothing your contacts with others and making you through conformance to the social norms a more acceptable person.

Courtesy in the Home.—Every boy and girl should try to start the day right. Get up the first time that you are called rather than the third or fourth time. When you appear at the breakfast table, greet the family pleasantly. Observe the same punctuality at all other meals, taking care each time to wash your hands and comb your hair before you sit down to the table. When you take your place at the table, do so quietly without jerking or scraping your chair. Sit up straight, and don't tip your chair. Don't cross your legs under the table, and don't twine them around the legs of your chair or put your feet on the chair's rounds.

Contribute your share to the table conversation, modestly recounting events of the day at school or discussing some motion picture that you may have seen or some book that you have read. Don't interrupt or contradict when others are speaking. Try to avoid family arguments and mentioning troubles at meal time, as such expressions react on each individual nervously and impair digestion. Don't mention at the table any subject that is repulsive. The older members of the family should always be careful about what they discuss at the table, as the younger children may cause embarrassment by repeating remarks they should not have heard.

When you leave school at noon or in the afternoon, go straight home so that your mother will not be worried by fearing an accident has befallen you. If you wish to go to a chum's home, first get your mother's permission.

Never tattle about your schoolmates to your teacher or about your brothers and sisters to your parents.

Be responsible for the appearance of your bedroom. Keep it orderly. Don't form the habit of leaving things around for your mother or the maid to pick up. Hang up each dress or suit in the closet, when you take it off. Leave your underclothes folded on a chair by your bedside and shine your shoes each night before you go to bed.

Leave each room, from the bathroom to the kitchen, in as tidy a condition as possible. Put back in the bookcase a book that you may be reading, and do not litter the piano with sheet music or leave the newspaper strewn in sections over the living-room floor.

Try to save your mother steps by answering the doorbell or telephone promptly. If the person wanted is not in, ask if you may take a message. Look for other ways, especially on Saturday, that you may assist your mother, such as dusting or running errands. Don't monopolize the telephone for your personal calls, and if you borrow the family car, do not keep it out too long without permission.

If you are a boy, be sure to rise when your mother or one of her friends enters the room and offer her a chair and remain standing until she is seated. Both boys and girls should rise on the approach of an older person. They are careful also to let this person, whether mother or grandmother, and, in the case of the boys, father or grandfather, precede them on entering or leaving a room and to hold the door open. Boys should pick up any article that the women may drop. Both boys and girls excuse themselves, if they leave the room. Excuses are offered also if one must pass in front of another person.

Respect the property of each member of your family, and don't borrow anything without permission. Return the borrowed article promptly and in good condition, and willingly reciprocate when the person from whom you have borrowed asks a favor. Respect for property extends also to the letters that your mother may receive and to the diary that your sister or brother may keep. Respect the privacy of others. Always knock on the door before you enter the bedroom of any member of the family; and never try to eavesdrop or overhear any conversation in which you are not included.

Be careful to thank a member of your family for a favor as graciously as you would a friend. Father will appreciate the fact that he is regarded as something more than a pocketbook, and Mother will cherish your thoughtfulness, especially if she has sewed until the wee small hours on your graduation dress.

Both your mother and father will be glad of the good example that you set your younger brothers and sisters; for instance, you may share the candy stick that you have bought, offering the larger piece to your brother or sister.

Cultivate a family spirit and sense of loyalty by little attentions. Among these are remembering the birthdays of different members of the family, Mother's Day and Father's Day and observing occasional anniversaries, as well as Thanksgiving and Christmas. About once a week all the members of the family may participate in an "at home," playing games, making candy or reading aloud, which provides opportunity to observe many rules of etiquette. Games especially cultivate a sense of good sportsmanship.

To indulge in tantrums so as to have your own way or to tease and impose on members of your family violates the rules of good breeding. Try always to be respectful, obedient and aboveboard in all your family relationships. If things do go wrong sometimes, don't criticize your family circle to outsiders; and never allow others to make disparaging remarks about any member of your family.

Deportment in Public Places.—On the street a girl bows to another person; a boy lifts his hat when he greets a girl or an adult, whether man or woman. If the boy and girl should be walking together, he raises his hat to the people whom she greets, whether or not he knows them. If the hat is a soft one, he raises it by the crown; if it is a derby, he takes hold of the brim.

A boy is careful to walk next to the curb; he takes a girl's arm only when he is steering her through a traffic maze. She may take his arm, though, if she needs support on slippery streets, over a rough road or in descending a flight of stairs. If the boy is walking with two girls, instead of walking between them he is still careful to keep his place on the outer side of the sidewalk. He raises his hat on taking leave of them at their destination.

When a couple are boarding a streetcar or bus, the girl gets on first; if the step is high, she may be assisted by her escort. On leaving the vehicle the boy gets off first and assists the girl to alight. The same holds true of a taxi or automobile, especially if there is no doorman. Since the advent of women in business the rule that a man should always offer his seat to a woman who is standing in a streetcar or subway train is not so strictly observed. However, he should be considerate of an older woman or of a young woman who may be holding a baby. If another man offers your companion a seat or picks up some article that she has dropped, tip your hat in thanks for this courtesy. The girl or woman should express her thanks verbally.

When a couple are attending the theater, the usher leads the way to the reserved seats. The girl follows the usher and in turn is followed by her friend. If there is no usher, the escort goes first to find the seats and then steps aside to let the girl enter, seating himself on or nearest to the aisle. Those who rise to let the couple pass should be thanked for this courtesy; care should be taken not to brush against them. The girl slips off her coat and removes her hat after she is seated. The boy may check his coat in the theater lobby before going to the seats.

Legitimate theater tickets should always be bought before the performance, and the girl's wishes should be consulted as to the kind of play that she would like to see. In the case of a theater party the host or hostess should determine before the party starts down the aisle the order in which the guests are to be seated, each young man following the girl for whom he has been chosen as partner. Ordinary afternoon dress is customary for the theater, although those who hold orchestra seats often like to dress—the girls wear dinner or evening dresses and the men tuxedos or "tails."

When a couple are dining at a restaurant, the headwaiter or hostess shows them to a table. The girl follows the headwaiter and in turn is followed by her friend. If there is no headwaiter, the young man goes first and selects a table. After choosing for the girl the more advantageous position he pulls out her chair and, when she is seated, helps her to remove her coat and arranges it over the back of her chair. If the girl is wearing an afternoon or simple dinner dress, she wears a suitable hat; but, if she is wearing an evening dress (and this is obligatory in many smart restaurants and night clubs in the large cities), she wears no hat and allows her friend to check her wrap. The boy should check his topcoat and hat at the entrance, or if the couple are dining informally, he may hang them on the nearest coat rack.

After the couple have scanned the menu, the young man gives his companion's order first and then his own. The *à la carte* dishes or those that may be ordered separately are printed on the left-hand side of the menu. The *table d'hôte* dishes or those that may be ordered at a set price for a dinner of four or five courses are printed on the right-hand side of the menu. A girl should be considerate of her friend's pocketbook and should not order too elaborate a meal, unless she is sure that he can afford it. Many a girl has not received a second invitation because she proved to be too expensive to entertain.

If two couples are dining together, one of the men will assume the responsibility of host and give all the orders. The seating arrangement is for the girls to face each other and for each man to sit at the left of the girl he is accompanying. If the party numbers more than four, the host or hostess indicates where each person is to sit. The men rise if someone stops at the table to greet someone in their party.

In first-class restaurants the host pays the waiter for the meal just after the bill has been presented, or if his party is very large, he may arrange with the proprietor to pay the bill afterward. In other restaurants one hands the bill to the cashier and pays him as one goes out. The customary tip left for the waiter is 10 per cent of the bill's amount.

When a couple are to attend a formal dance that is of a semipublic nature, the young man calls for the girl promptly at the hour stated, and she should not keep him waiting. Most girls appreciate a corsage, and the man should learn beforehand what color evening dress his companion will be wearing so that the flowers will blend nicely with it. If he is unable to find out, gardenias are always suitable. On arriving at the hall where the dance is held the couple greet the hostess and others in the receiving line, the girl going first and presenting her friend to those who may not know him. If the dance is given by a school society, for instance, the officers and faculty adviser may constitute the receiving line. Not until after the couple have passed down the receiving line does the girl remove her long gloves.

The young man always dances the first and last dances with his companion and generally asks her to reserve several other dances. He introduces to her any of his friends who may be present and endeavors to fill the rest of her dance program. He also escorts her to supper if special refreshments are served about midnight. If the girl's parents have asked that they return before the dance is over, say by one thirty, her escort makes sure that she is back by that time. Before leaving the couple must seek the hostess to thank her for a pleasant evening. The girl should apologize to any partners who have requested later dances on her program.

The following rules will aid you to improve your manners:

Don't call attention to yourself or to the group that you are with by laughing or talking too loudly.

Don't walk down the street four or more abreast and with arms linked.

Don't block traffic if you stop to chat with a friend on the street. Withdraw to one side or, better still, continue your conversation while you walk part of the way with your friend.

Don't stop to talk with anyone in a doorway; allow those who are coming out to do so before you enter.

Don't call to anyone in public unless it is an urgent matter.

Don't point and don't stare at another person, particularly a cripple or other unfortunate.

Don't discuss personal matters in public.

Don't walk along the street eating.

Don't replenish your make-up, comb your hair or clean your nails in public. If your morale needs to be improved by attention to these details, repair to a dressing room.

Don't read your neighbor's newspaper over his shoulder or surreptitiously from the side when you are riding on a streetcar, bus or subway train.

Don't indulge in any show of emotion in public, such as anger, embarrassment, unrestrained grief or hilarity. If you should be treated discourteously, don't descend to the churl's level with a crude retort.

Don't annoy others, especially in a theater or church, by whispering, giggling, fidgeting, rattling programs or returning for each act after the curtain has gone up. Moreover, don't attend if you have a cold, as continual coughing is annoying to the actors, the concert artist or the preacher and is disconcerting as well to the audience or congregation.

Don't litter the sidewalk or parkway. If you are reading a newspaper on the streetcar or subway train, don't leave the paper in your seat but carry it outside and deposit it in the nearest waste-disposal bin. When you are at the theater, don't toss your seat stubs carelessly aside in the lobby when you come out.

Excuse yourself if you brush against anyone on a crowded street or in a public vehicle.

When you are shopping, resist the temptation to handle the merchandise, unless it is something you actually intend to buy. Be courteous to the clerk, even though she may annoy you by calling you "dear." And don't show impatience if a harassed salesperson cannot wait on you as quickly as you would like.

Entertaining and Being Entertained.—A good host endeavors to invite those guests who will be congenial with one another. Instead of trusting to chance he plans every minute of the party so that there is never a lag in the conversation or games. He also tries to provide the kind of entertainment and refreshments that each of his guests will enjoy. At the outset he makes sure that all the guests are introduced to one another and generally suggests some game that will serve as an icebreaker so as to make those who are shy or who are new in the group feel at ease. If there is dancing, the host should prevent stag and wallflower groups by insisting that every boy dance if he can. Many a boy is surprised at the latent possibilities of a shy girl, if she receives a little attention. The girl should try to overcome shyness and, if her dancing is a social handicap, she should take lessons to improve it.

The well-bred guest co-operates with the host to make the party a success. He arrives on time (except in the case of an informal tea when he may arrive any time during the hours stated). He shows enthusiasm about any form of entertainment that the host may suggest and instead of monopolizing any one person is attentive to all the guests. He is gay but never rowdy, for the person who tries to show off as the so-called life of the party generally turns out to be a bore to all the others. Making a double date for one evening should not be considered; it is discourteous to leave one party to go to another. Exceptions, of course, occur in holiday time.

When he takes his leave, each guest should find the guest of honor (or person in whose honor the party has been given) and express his pleasure in meeting him; also one should thank the host for a pleasant time. The host or hostess should shake hands with guests and respond with suitable sentiments of appreciation for their coming. If the guest is unable to pay a party call, he should send a gracious note expressing his enjoyment. A girl never pays a party call after she has been entertained with others at a party in a man's apartment.

When he is invited to spend a weekend or a longer period in a home, a guest should answer the invitation at once, and if he accepts, he should be explicit as to the time that he will arrive so that his friend may meet him. As a token of appreciation he should take a small gift for his hostess (generally the mother of the boy or girl he is visiting) and suitable gifts for small children in the family. He endeavors to fit into the family routine, offering to assist in the performance of certain home duties, and is even more careful about punctuality and neatness than he would be in his own home. He enjoys whatever entertainment is planned and, even if it should not quite meet with his approval, does not spoil the pleasure of his friends by criticism.

The guest does not stay beyond the period for which he was invited unless he is especially urged to do so, for it is never wise to outstay one's welcome. As soon as he returns to his home, he writes a bread-and-butter letter expressing his thanks and appreciation. He is careful not to criticize his host or hostess or their friends either in their presence or to others, for one of the oldest rules of etiquette is loyalty to anyone whose hospitality one has accepted. The host and hostess also should be considerate in their attitude and comments and should not embarrass a guest in any way.

When he is invited to a luncheon or dinner, the well-bred guest answers the invitation promptly and arrives at least 10 minutes before the hour set. No hostess is expected to wait longer than 20 minutes for a tardy guest. The signal for all to repair to the dining room is when the maid or butler announces to the hostess: "Dinner [or luncheon] is served."

On entering the dining room women guests go first and the men guests follow. At a formal dinner, when the guests number more than eight, the hostess may indicate to each man who his dinner partner will be. The host takes in the woman guest of honor (the most important or the oldest woman), who is seated at his right. The man guest of honor (or *first gentleman* as he is called, if there is a woman guest of honor) serves as the hostess's dinner partner and is seated at her right. For such a formal dinner plain or gilt-edged place cards should be used. Otherwise the hostess may indicate where each person is to sit, congeniality being the determining point.

Each person stands behind his chair until the hostess is seated and then seats himself from the left side. It is customary for a man to arrange the chair of the woman at his right and to push it forward as she seats herself. However, during the meal he is not supposed to confine his attentions entirely to her; he must talk occasionally to the woman at his left. Even if there has been some past unpleasantness between two guests, for the sake of the host and hostess they must appear to be good friends. The signal for all to rise is when the guest of honor signifies that he or she is ready to leave the table. Otherwise the hostess suggests that the company repair to the drawing room for coffee.

At a more formal luncheon, generally at a hotel, and at a formal tea the women guests wear hats and remove their gloves only when they are served. In the case of a tea even the two friends of the hostess who pour tea at either end of the long table, do not remove their hats. Only the hostess and the girls who may assist her in passing the sandwiches and cakes are hatless.

Dinner dress is appropriate at a dinner in a home, especially if there is bridge, dancing or a musicale, or if the company is attending a play afterward. The issuance of formal rather than informal invitations generally indicates that the hostess expects her guests to dress formally. If her invitation comes over the telephone, she may indicate whether or not dinner jackets are in order, or the guest may ask if the dinner party is a dress affair.

An organization or society that is giving a formal dinner should have printed in the lower left-hand corner of the invitations, "Formal dress" or "Kindly wear dinner jackets," so that all the guests will be in formal attire. The women guests, of course, take their cue from this and appear in dinner or evening dress. At such a dinner the guests at the smaller tables start eating only after those at the speakers' table have begun.

The following important rules will guide you in proper table etiquette:

Eat your soup quietly and slowly, dipping the spoon forward or away from you. The spoon always remains in the soup plate when it is not in use.

Instead of buttering a whole slice of bread at one time, break it into small pieces and butter each piece (on the plate not in the hand) just before it is eaten.

Learn the acceptable way of eating spaghetti (wrapping it around the fork in Italian fashion), asparagus (eating the tips only), artichokes (pulling off one leaf at a time and dipping it in the sauce), celery and olives (eating them with the fingers rather than spearing them with a fork) and corn on the cob (holding the whole piece with the fingers).

Cultivate dexterity in handling the knife and fork. On finishing the meat or fish course lay them together on the right-hand side of your plate, the fork with the prongs uppermost and the knife on the outside.

At a formal dinner there are additional pieces of silverware that you should learn to identify. Among these are the oyster fork, fish knife and fork, canapé fork, dinner knife (steel blade), butter knife (which is laid across the bread plate when it is not in use), salt spoon, salad fork, desert fork and spoon, coffee spoon, teaspoon and ice-tea spoon. Many households also have special breakfast silver, such as orange spoons.

When any dish is passed at the table, take the portion nearest you. This same rule applies to cake or cookies.

Don't take too large mouthfuls.

Don't chew with your mouth open.

Don't talk or drink with food in your mouth.

Don't pick your teeth.

Don't put hands, arms or elbows on the table except occasionally between courses.

Don't find fault with the food; if you are unable to eat any dish, leave it untouched without comment.

Don't continue eating after others at the table have stopped.

Don't push back your plate when you have finished or pile your dishes together.

Know how to use a finger bowl—first dip the fingers of the right hand and then the left and wipe them on the napkin.

Leave your napkin unfolded but laid carefully on the left side of the dessert plate. If you are staying several days in a household and receive a napkin ring, fold your napkin and insert it in the ring.

To Make Introductions Properly and Converse Easily.—A man is introduced to a woman. One may say in presenting him, "Miss Martin, may I introduce Mr. Collins?" The only men to whom a woman is presented are the President of the United States, a member of royalty, a foreign ambassador or a clergyman. In the case of a Roman Catholic cardinal or other dignitary such a form as "Your Eminence" is used. A Catholic priest is called "Father," but any Protestant clergyman, unless he holds a title or degree, such as bishop, dean, canon, Doctor of Divinity or Doctor of Theology, is addressed as "Mister." A doctor (physician, surgeon or dentist) and a judge are addressed by their titles, but in social life a woman who holds a Ph.D. or other academic degree is not addressed as "Doctor."

If the more abbreviated form of introduction is used, such as "Miss White, Mr. Black," emphasis is on the more important person's name. Moreover, one inquires of the man if he has met the woman but not of the woman if she has met the man. If the introduction occurs on the street, the woman bows, and the man raises his hat in acknowledgment.

Young women and girls are introduced to those who are older, as "Mrs. Smith, this is Helen Jones" or "Mrs. Smith, Miss Jones." Other permissible forms are: "This is my sister Ruth, Mrs. Smith" or in the case of a young married sister, "Mrs. Smith, my sister, Mrs. Johnson."

When a man or woman is introduced to several other persons, the usual form is to mention first the person's name and then the names of the persons to whom he or she is being introduced, as "Mrs. Robinson, Miss Jackson, Miss Roberts and Mr. Wilson."

Your friends, both boys and girls, are introduced to your parents with such phrases as "Mother, these are my friend Jimmy Reeves and his brother Joe"; or "Father, you know Frank Short, don't you?" If the introduction occurs in your home, you are careful to include the other members of the family in presenting your friends. You also use the full name, if you are introducing them to intimate friends and feel that they would be congenial, as "Mary West, Bertha Dickinson."

Generally each person who is introduced responds with "How do you do?" A cordial touch, however, is to add the name of the person, looking him squarely in the eyes and with a friendly smile. If you should not catch the name, do not immediately ask "What is the name?" Wait until you have an opportunity to inquire privately of the person who made the introduction and then take care to use the name the next time that you see your new acquaintance. However, if your own name is mispronounced, it is permissible to say: "I am sorry but you misunderstood my name. It is Clapp, not Platt."

Boys and men should shake hands when they are introduced to other boys or men. The younger one, though, waits for the older one to extend his hand. Boys and men also rise for introductions. Girls should rise when they are introduced to a woman or to a distinguished man; they remain standing until that person decides to be seated. If the introductions are made at a dinner table, it is not necessary to rise. A hostess rises to receive all introductions, to greet her guests and to say good-by to those who have to leave early.

Self-introductions may be made at, say, an alumni dinner, as it seems rude not to talk to your neighbors. It is also proper to approach without introduction and speak to anyone in such an intimate gathering as a tea at a friend's house.

The host or hostess or the sponsor making an introduction tries to find some topic of conversation that will be of interest to those who have been introduced. This, of course, should not be carried too far, but often an embarrassing pause after the "How-do-you-dos" may be saved by adding: "Mr. Minor has just returned from Florida," or "Miss Nolan is planning a trip to England this summer." On taking their leave the two acquaintances, if they have found each other congenial, may express their pleasure. One may say: "I am very glad to have met you," or "I trust that we shall meet again," and the other replies: "Thank you," or "I hope so, too."

The following are some rules of conversation that will make you more agreeable to others:

Take care not to monopolize the conversation. Don't interrupt when others, especially your elders, are speaking, and don't contradict them, argue with them or point out their mistakes. Be attentive so as not to ask them to repeat what they have said.

Don't indulge in unkind gossip or criticism. Try to discuss general topics, and be tactful in your remarks; avoid any subject that may later prove embarrassing—religion, politics and personalities are topics to avoid.

Try to avoid all nervous mannerisms, such as twisting your beads or tie or patting your elbow, and don't indulge in nudging, poking or slapping on the back the person with whom you are talking. Don't yawn if you find the conversation boring, and don't hum or whistle in the presence of others.

On joining a group, first listen to what they are talking about so as not to break into their conversation with some irrelevant remark.

Learn to be a sympathetic listener, but be wary about whom you choose as your own confidant. Many a girl has learned to her sorrow that the girl in whom she confided could not resist the impulse to repeat what had been told her.

On Obtaining and Keeping a Position.—The fundamental qualifications of a good employee are good health, intelligence, technical excellence, honesty, sincerity, punctuality and a well-modulated voice; but today the applicant for a position must have more than these to offer. Many personnel managers consider that a carefully groomed appearance counts from 50 to 75 per cent in obtaining a position, and even after one is hired this standard must be maintained. The other important factors are loyalty, a pleasing personality, an understanding of human nature, the ability to get along with others, flexibility in adapting oneself to varied employment, good background, self-confidence and a sense of humor.

Your appearance is your front to the world, and you should try to look your best when you are making interviews. Cleanliness comes first. Start with a morning bath, and wear fresh underclothes. If you are a girl, be sure that you do not apply too much make-up (especially lipstick) and that your nails are clean. A tailored suit is always best for an interview. Later when you get the position you may wear spectator sports dresses that are semifeminine. Don't wear loud or unsuitable colors, gaudy jewelry or high-heeled shoes, and don't arrange your hair in a style that would be more suited to a ballroom than a business office. Be particular also about the use of a deodorant and a mouth wash, and save your perfume for use on social occasions. If you are a young man, you will shave carefully each morning, and you will be painstaking about such details as having your shoes well polished, socks that do not wrinkle or dangle, a spotless shirt and collar, buttons well sewed on, a suit free from spots, well-creased trousers, a tie that harmonizes with your shirt and socks and neatly combed hair.

If you are sent out on an interview by an employment agency, it is sufficient to present to the reception clerk the card of introduction that the agency gives you. If a friend or acquaintance is recommending you, he should send a letter of introduction in advance or should give you his card with some such notation as: "To Mr. Howard Pierce, Introducing Miss Cora Landon."

When you are admitted to your prospective employer's presence, remain standing until he asks you to be seated and then state your business briefly. Try to make as good an impression as possible with intelligent replies to the questions that he may ask about your dictation or typewriting speed and your educational qualifications. Watch your posture. Walk gracefully across the room and when you are seated, don't slouch or sprawl in your chair and, if you are a girl, don't cross your legs. Avoid discussing details of a personal nature or showing overanxiety about getting the position. On the other hand, don't show resentment at any personal questions the prospective employer may ask, such as the condition of your health and whether or not you live at home or are engaged to be married. If when you leave the interviewer says that there is no opening just at present but that he will keep your application in mind, don't show disappointment but try to be as friendly as when you entered. If he asks you to send him a letter stating your qualifications, do so within the next few days and express the hope that you will be remembered when there is an opening.

After you obtain the position, don't be disappointed if it is not so important a position as you had hoped it would be and if the salary does not come up to your expectations. Be glad to get the experience that may lead to a better and more remunerative opportunity later. A girl especially must realize that in the business world she will not receive as courteous treatment as she does socially.

The following rules of business etiquette should be observed daily:

Be punctual in the morning, take only your allotted time for lunch and do not be too eager to leave exactly at closing time.

Greet each person with whom you are closely associated with a friendly "Good morning" and "Good night."

If you are a young man, always remove your hat and always rise when you are addressed by your superior.

Don't chew gum when you are on duty, whether at a desk in an office or on the floor of a store.

Don't smoke unless you first find out that smoking is permitted.

Don't indulge in too much shop talk either with your friends or your business associates, and be careful not to reveal anything that is of a confidential nature.

Don't abuse the privilege of sick and emergency leave.

Don't use the firm's stationery and stamps for your personal mail.

Don't make too frequent use of the office telephone for personal calls, and don't allow your friends to call you too often.

Don't resent criticism and don't sulk if you are reprimanded.

Don't loiter in the dressing room when you must comb your hair, clean your nails or otherwise repair the ravages of the day.

Don't visit with your associates on office time. Save the description of your week-end until you go out to lunch with them.

Be willing to do your share, even though the job that you are asked to help out on is not your regular work.

Be loyal to the firm. Don't broadcast your notions about the inefficient way the business is run; and take extra care to do your own work so well that none of the inefficiency may be traced to you.

Remember that a business connection has no social significance; so take care, if you should see your employer and his wife dining at the Rainbow Room, not to intrude.

The Etiquette of Travel.—Travel has long been recognized as one of the finest educational means. Now that it is being made available to all by reduced or special train and bus fares in the United States and by European second- and third-class study tours it is essential that one know the accepted rules of conduct while traveling.

The first thing to remember is that travel will bring you into contact many times with people whose ways of doing things are different from those to which you are accustomed. Unless you are able to overlook certain inconveniences, such as the necessity to order the water heated and pay especially for it each time that you want a bath, or having to eat food that is not especially palatable to you, you will be continually disgruntled and unable to enjoy the things that you have gone to see.

The second thing to remember is that, whether you are at home or abroad, you and your group will be judged by local standards. You may be in a neighboring town, say as a member of the Ithaca High School Glee Club that is scheduled to give a concert at the Elmira Methodist Church, or you may be traveling through France with a party of students, but in either case you will be an example of what the people are like in Ithaca or in the United States. Don't take it for granted that a difference in language will protect you, for actions speak louder than words. Moreover, English like French and German is such a universal language that many people with whom you come in contact, whether in Rome, Munich, Stockholm or Paris, may know what you are saying. They most likely will show their resentment at any criticism of their country and at any invidious comparison with the way that things are done back in America.

The nature of your trip will determine the kind and amount of clothing that you take; the well-bred person does not overdress. You may be off for a week at camp or the seashore, when you will want to relax in slacks or a play suit. When you attend a house party, more elaborate clothes will be required for teas and dances. When you travel through Europe, you will need suitable clothes for various occasions. Don't take too many clothes; two evening dresses will serve your purpose as well as six when you are on shipboard. At the country club or camp a young man can wear flannel trousers or slacks with his suit coat and look suitably dressed. Far too many trips are spoiled by taking along too much luggage at the start. The tips to porters and bellboys mount with extra luggage. Many a time too, you may have to forego purchasing some article that you want but lack the space in which to pack it.

When you are taking a long train journey, you will doubtless travel in a Pullman car. The person who occupies the lower berth has the privilege of riding face forward or facing the engine. If you are that person, remember it is courteous to offer to exchange your seat once in a while with the person who is riding backward or to invite him to sit beside you. When you are dressing in the morning you can help to relieve the congestion in the dressing room by putting on most of your clothes in your berth. When you are traveling, always carry your money and valuables in a belt or chamois pocket on your person, and don't leave them in your pocketbook under your pillow.

In the dining car courtesy requires that you greet your table companion or companions; but "Good morning" or "Good evening" is sufficient without further attempts at conversation. If a woman is traveling with a man, he should offer to take the seat nearer the engine so that he will ride backward. The dining-car waiter is tipped 15 per cent of the bill. The Pullman porter receives a tip of 25 cents for a one-night journey, 50 cents for a two-night journey and a dollar or more for a trip across the continent. The Red Cap at the station is tipped 15 cents.

Since traveling on a boat is like being on a floating hotel, you will be seeing the same people at each meal and on either side of your deck chair, and it is quite proper to introduce yourself and enter into conversation with them. If you have to share your stateroom with others, be careful not to encroach on the space that properly belongs to them; and if you return to your stateroom late at night after dancing, be quiet; don't disturb your cabin mates and those in the adjoining staterooms. When you are on deck, don't appropriate a deck chair that belongs to someone else; you are supposed to pay for and use your own.

On the last day of the voyage, distribute tips amounting to about 10 per cent of the passage money. If you have been a poor sailor and have had to have most of your meals in your room, the largest amounts go to the cabin steward and stewardess. Otherwise you remember the table, deck, bath and lounge stewards and others who have served you.

When you register at a hotel, sign your name and address. The proper form is "Lewis Clapp, New York, N. Y." or "Miss Ruth Johnson, Brooklyn, N. Y."; if a girl is staying at a girls' club, she drops the "Miss." A married woman signs herself "Mrs. Francis G. Short, Palo Alto, Calif." and a professional man, such as a doctor or dentist, writes "Dr. Eugene Baker, Ithaca, N. Y." When an entire family stays at a hotel, each child is registered separately. The parents' names come first and then the names of each girl and boy according to age, with "Miss" prefixed to the name of each girl over five, as follows:

Mr. and Mrs. James F. Reeves, Baldwinsville, N. Y.
Miss Mary Reeves
James F. Reeves, Jr.
Joseph Alan Reeves

While you are at a hotel, be sure that your door is kept locked, whether or not you are in your room. Leave the key at the desk every time that you go out of the hotel, and keep the room clerk and the telephone operator informed of your plans if you are expecting acquaintances to call. The dining-room waiter, the maid, bellboy and porter are tipped for any services.

In a first-class hotel you settle your bill on checking out. American-plan hotels have a rate by the day or week for room and three meals daily; European-plan hotels charge only for the room; the guest pays the waiter or dining-room cashier for the meals that he takes at the hotel. Many hotels require that one vacate the room by noon, if one has taken it for only one night. Otherwise notice should be given immediately after breakfast that one is planning to stay another day or several days.

The well-bred man removes his hat and does not smoke when he is riding in the elevator of a hotel or an apartment house. A woman wears her hat to every meal in the dining room of a large city or resort hotel; if she stays in a family hotel for any length of time, it is permissible to enter the dining room hatless.

When you call on a friend at a hotel, ask for him at the desk or telephone to his room from the lobby. Never walk in unexpectedly, no matter how well you may know him or the hotel attendants may know you. A young woman should receive men friends in the public rooms adjoining the lobby.

Funeral Formalities.—When you learn of the death of a friend or of some near relative of a friend, courtesy requires that you leave your card at the house and offer your sympathy to the next of kin. On the card that you send with flowers you should write, "With deepest sympathy" or "With heartfelt sympathy." Address the flowers to the member of the family you know best. They should be acknowledged with a personal word on a visiting card, if the recipient feels unable to write a note. A call of condolence is seldom returned. In the case of the death of an acquaintance send a card of sympathy by mail; if you knew the person sufficiently well, write a letter of condolence to his or her parents, brother or sister.

If the notice in the newspaper reads "Funeral Private," do not attend unless you are invited. It is quite proper to go if you are an intimate friend of either the deceased or of the family. Don't wear black unless you sit with the family but dress as inconspicuously as possible in something dark. If you are merely an acquaintance, you should sit near the back of the church or room in which the funeral service is held. Only intimate friends are invited to ride to the cemetery. If you are a young man and are asked to be a pallbearer at the funeral of a friend or the relative of a friend, only grave illness can excuse you from serving.

It is permissible to invite a friend who is in mourning to a concert a month or so after a funeral, but for at least 6 months one in mourning does not attend parties or gay affairs.

The Engagement.—As soon as a young man and a girl have decided that they will marry, the man should go to the girl's father or her guardian and ask consent. After he has announced that the girl has accepted his proposal of marriage, the young man should give a satisfactory explanation of his financial standing and prospects. He should postpone marriage until he can support a wife unless his own or the girl's father is willing to help the young couple to get a start.

The mother and sisters of the young man (or both parents) should call on the bride-to-be and her parents immediately after the girl's father or guardian has given his consent. If the bridegroom-elect is an orphan, his nearest relatives, such as an uncle and aunt, should go in the parents' place. If these relatives live at too great a distance, the welcome into their family may be extended by mail. The bride-elect and her mother return the call or send an appropriate letter acknowledging this courtesy. The call may be followed by dinners at which the two immediate families entertain each other.

If there has been a recent death in either immediate family, the engagement is announced quietly by telling only relatives and intimate friends. Otherwise a public announcement is made by the parents of the bride-to-be in the newspapers, and notes announcing the betrothal are sent to intimate friends. If a dinner or other kind of party is given to announce the engagement, the announcement may be made by the girl herself or by her mother as they introduce the fiancé who stands with them in the receiving line; or when the dessert course is reached during the dinner, the father of the bride-to-be may propose a toast to the betrothed pair, and a suitable reply is made by the young man.

The announcement of the engagement is followed by various parties and showers. The parents of the young man may give a dance or party so that their friends may meet their daughter-to-be. The girl's friends will invite those girls and women who know her very well to showers of various kinds—kitchen, linen and so forth. As to the selection of the engagement ring, the symbol since Roman times of betrothal, the young man should consult the taste of his fiancée whether she prefers the conventional solitaire diamond or some other stone. Superstition has built around certain jewels a romantic sentiment, such as "depth of true blue" for the sapphire and "warmth and ardor" for the ruby.

The Formal Wedding.—If a church wedding is decided on, the bride's parents must attend to such details as whether the date chosen is convenient for the clergyman who is to perform the ceremony and for the caterer. Weddings are never held in a Roman Catholic or Protestant Episcopal church on Sundays, Fridays or days in Lent, and among other denominations Sunday weddings are rarely solemnized in church.

The order for the wedding invitations is placed by the girl's parents about a month before the ceremony. One should be careful to invite only as many guests as the church will hold. The same holds true for the invitations to the wedding breakfast or other reception that may be held after the ceremony. A good safeguard is to use "R.S.V.P." (*Répondez, s'il vous plaît,* French for please reply) on the invitation to the reception, so that one can tell the caterer the exact number of guests who are expected.

Both the bride's mother and the bridegroom's mother decide whose names will be included among those who are invited only to the church and those who are invited to both the ceremony and the reception. Invitations are sent to intimate friends even hundred of miles away, as they not only carry news of the marriage but are a token of the esteem in which the friend is held. If the ceremony is a private one, announcements are sent afterward to persons on the visiting lists of both families and special friends of both the bride and bridegroom.

The wedding reception is held at the home of the bride's parents, grandparents or other close relatives, or it may be held in a hotel banquet room rented especially for the occasion. Only if the bride were an orphan would it be permissible to hold the reception at the home of the bridegroom's parents. The bride's trousseau must be provided by her family or herself.

The invitations, which the bride has addressed, aided perhaps by her mother and some of her friends, are mailed from 2 to 3 weeks before the wedding. Those who are invited to both the church and the reception, if they plan to attend, should send a wedding gift. This gift is sent direct by the store at which it was purchased and is addressed to the bride; with it is enclosed the donor's calling card. In the case of an informal wedding, it is permissible to use a wedding-gift card and to send a more personal gift to the bridegroom as well as to the bride.

The sooner the gifts are sent the better, because the bride will then have an opportunity to acknowledge them all before the wedding. Should she receive many gifts, she will find it wise to keep a list and to check off each entry as she writes her thank-you notes. If the gift is sent by a married couple, she uses the wife's name in her salutation and says: "Thank you for the exquisite present you and Dr. Blank sent me." In arranging the presents for the guests to see at the time of the reception it is customary to group together similar articles, such as all the silver on one table and all the china or glass on another.

At a formal wedding the bridesmaids are dressed alike, only their dresses or hats differing sometimes in color. The dress and hat of the maid or matron of honor may show more individuality, provided that they blend in coloring, material and general style with the dresses and hats worn by the bridesmaids. Only at an evening wedding are hats omitted. The flower girl is generally dressed in a period costume.

The bridesmaids carry their bouquets as if they were sheaves, holding them stem downward on the outer arm as they take their places in the procession. The bride furnishes her attendants with their bouquets, but they must furnish their own gowns, although the style and material and color are chosen by the bride. The bride shows her gratitude by presenting to each attendant some gift, such as a bracelet or other piece of jewelry, at the bridesmaids' luncheon or tea that is held a day or two before the wedding. The bridegroom likewise presents to his attendants some personal gift, such as cuff links or cigarette cases.

The bride's favorite sister is her maid or matron of honor, and her other sisters and one of the bridegroom's sisters serve as bridesmaids. If she has no sisters, she chooses for this honor the bridegroom's sisters and her most intimate friends. At an average wedding there are four to six bridesmaids. A bride may dispense with bridesmaids, if she wishes, but she retains the maid of honor to arrange her train and hold her bouquet.

The brother of the bridegroom usually serves as best man. If he has no brother, he may select the brother of the bride or his most intimate friend. His attendants are called *ushers* and are usually the same in number as the bridesmaids—from four to six. One of these should be a brother or cousin of the bride. The ushers wear light-gray gloves at a daytime wedding and white ones at an evening wedding. The bridegroom and best man wear white buckskin gloves. Cutaway coats, gray-striped trousers, high silk hats, black socks, gray ties, wing collars and white boutonnières constitute the traditional garb for bridegroom, best man and attendants at a formal daytime wedding. At a more informal wedding dark sack suits with white waistcoats and dark trousers may take the place of the morning suits. There still prevails the custom of the bridegroom giving a bachelor dinner two nights before the wedding day, at which his men friends drink the health of the bride and break the stems of their wineglasses.

For a formal wedding it is generally best to hold a rehearsal the day before. Everyone participates but the bride, for whom a substitute serves because it is considered bad luck for the bride to take part. The attendants have to be drilled in the pace decided on for the wedding march. The ushers who go first are followed by the bridesmaids, maid or matron of honor, flower girl and the substitute bride with the bride's father. The two shortest ushers lead the procession, and the two shortest bridesmaids are chosen to head the bridesmaids' section. Each pair in the procession counts a measure or four beats of time before following the pair in front of them. The bride and her father, though, must remember to count eight beats of time before starting up the aisle.

On reaching the chancel steps the ushers divide and assume positions on the steps or in front of the choir stalls that generally face each other. The bridesmaids, on reaching the chancel, also divide and take their positions on the inner side beside the ushers. The maid or matron of honor continues to the foot of the altar steps, where she stands on the left side opposite the best man. When the bride and her father reach the altar steps, the bridegroom, who has entered the chancel from the vestry with the clergyman and the best man at the first strains of the wedding march, steps forward and stands at the bride's right. The bride then takes the left arm of the bridegroom, and they ascend the steps of the altar, followed by the maid of honor and the best man.

At the proper moment in the ceremony the best man hands to the bridegroom the ring, which after the couple have pledged their troth is put upon the third finger of the bride's left hand. If the bride is wearing gloves, she slips off her left glove (or the hand of the left glove if she is wearing long gloves), when she gives her bouquet to the maid or matron of honor. To avoid any possible embarrassment at the actual wedding the best man should obtain from the jeweler a duplicate ring, which may be returned the day after the ceremony. Among his other duties on the wedding day is presenting the clergyman with his fee. He also acts as valet, travel and hotel agent and even expressman for the bridegroom.

Details for the Wedding Day.—About two hours before the hour scheduled for the ceremony, the bridesmaids, maid of honor and flower girl all meet at the bride's house, where they receive their bouquets. The automobile carrying the bride's mother leaves the house first, then the cars taking the maid of honor, bridesmaids and flower girl and last in the procession comes the automobile in which ride the bride and her father. This car waits in front of the church awning until the bride returns on the arm of her husband. The bridegroom and the best man arrive at the church at least 15 minutes before the hour scheduled and wait in the minister's study until word is received that the bride and her father have arrived. Just before entering the chancel the bridegroom removes his right glove and throughout the ceremony holds it in his left hand; or he may remove his gloves altogether and leave them in the study.

The women guests at a daytime wedding and at an evening wedding in an Episcopal church always wear hats; at a formal wedding the men generally wear high silk hats. The usher offers his left arm to a woman guest when he escorts her to her seat. The man who has accompanied her walks behind them. If the man has come alone, the usher walks beside him on the right. At a large wedding the usher may escort only the oldest woman (generally the mother). The younger women and girls follow according to age, and the same order of precedence is observed by the men and boys in the party, unless the father prefers to come last.

The head usher escorts the bride's mother to her pew on the left side of the church (facing the chancel) just before the wedding procession starts. The bridegroom's mother and father are seated with other relatives on the right side of the church, an usher escorting the mother to the section reserved for the bridegroom's relatives just before the bride's mother enters. No guest is seated in the main part of the church while the bride's mother is being escorted to her pew or after she is seated. After the bride's father has signified by placing her hand in the hand of the clergyman that he "giveth this woman to be married to this man," he descends the chancel steps and takes his place next to his wife in the pew reserved for them. If the bride has no near relative to give her away, her mother may answer the clergyman's query with "I do"; but in such a case the mother does not escort the bride; she walks alone in the wedding procession.

When the strains of the recessional sound, the maid of honor hands to the bride her bouquet, lifts her front veil if she has chosen to wear one over her face and arranges her train. The procession leaves in reversed order. The bride takes the bridegroom's right arm, and the couple are followed by the flower girl, maid or matron of honor, bridesmaids and ushers (or each bridesmaid may leave the church on the right arm of the usher who stood beside her during the ceremony). The best man, however, returns to the clergyman's study to collect the bridegroom's hat, gloves, stick and other belongings and hand them to the bridegroom before he and the bride step into the waiting vehicle. After the couple and the bride's attendants have driven away, the ushers escort to the door in the order of precedence the bride's mother, the bridegroom's mother and then the other women relatives. When they remove the white ribbons that mark off the sections reserved for special guests of the bride and bridegroom, the entire congregation leaves.

At the wedding reception the bride stands at the bridegroom's right; behind them is generally an elaborate setting of palms and flowering plants. The bridegroom's parents and the bride's parents stand in the receiving line nearest the door. On the other side of the couple are the maid or matron of honor, flower girl and bridesmaids. At a small wedding the ushers may present the guests to the bride and bridegroom. At a larger one a butler who stands at the door announces the name of each guest. What one says to the bridal couple depends on how well one knows them. The bride is wished every happiness, and the bridegroom receives congratulations. The bride presents her friends to her husband if they are unacquainted; and the bridegroom asks those guests who are his friends if they are acquainted with his wife.

On the bride's table in the dining room stands the wedding cake that the bride cuts, sharing the first piece with the bridegroom. In this cake are often hidden favors for the bridal attendants, such as a gold ring for the first to be married, a wishbone for good luck and so forth. At a large wedding, though, it is customary to present to each guest, on leaving, a small white box containing a piece of the wedding cake.

When the bride goes upstairs to change to her traveling clothes, the bridesmaids gather at the foot of the stairs so as to catch her bouquet, which she tosses to them when she has nearly reached the top, repeating the rhyme:

> Hail, there, pretty maidens,
> Standing all-arow!
> The one who catches this,
> The next bouquet shall throw.

The bridegroom also goes to the room reserved for him to change into the street clothes that the best man has left. When the couple are ready to leave, they descend the stairs together. Generally on the veranda the guests greet them with a shower of confetti, as they dash for the waiting car.

In the case of a home wedding there may be an improvised altar, and the procession may advance through an aisle marked off by white ribbons. The bride's mother receives the guests as they arrive. When she takes her place in the section reserved for relatives of the bride, it is the signal for the procession to start. It is very pretty if the wedding party descends a staircase, the ushers first, followed by the bridesmaids, maid or matron of honor, flower girl and the bride and her father. The clergyman and the bridegroom and best man, who have been waiting in an adjoining room, take their places as soon as the first strains of the wedding march are heard. After the ceremony, there is no recessional. The bride and bridegroom are first congratulated by the clergyman, who then retires. They receive their other guests where they stand.

If a bride chooses to be married in her traveling costume either at a church or her home, she dispenses with all attendants but a maid or matron of honor who is similarly garbed. The bridegroom is attended by only his best man.

In addition to paying the clergyman's fee and giving the ushers and best man their boutonnières and suitable gifts the bridegroom buys the bride's bouquet and ring. He is also responsible for furnishing the new home. All that the bride brings to it are her linen and silver, unless she has inherited some cherished pieces of antique furniture.

FORMS OF ADDRESS — RELIGIOUS, CIVIL AND MILITARY TITLES

Time-honored forms used in addressing notable people should always be observed; the schedule shows accepted usage.

Personage	Letter Should Be Addressed	Complimentary Salutation in Letter
Alderman (In the United States and Canada)	Alderman John Brown.	Dear Sir:
Ambassador	His Excellency, —— ——, Ambassador of Chile at ——; *or* To his Excellency, the Chinese Ambassador at ——; *or* To his Excellency, the Ambassador of the French Republic at ——. The words *His Excellency* may precede the personal name or hereditary or professional title. (*His Excellency* is usually abbreviated to *H. E.*).	Sir: *or* (with the personal title) My Lord: *or* Your Excellency:
Ambassador and his wife	Their Excellencies, the Ambassador of Peru and Madame ——; *or* Their Excellencies, the Chinese Ambassador and Madame ——. (*Their Excellencies* is usually abbreviated to *T. E.*)	Your Excellencies:
Army Officers (In the United States)	The Commander in Chief, Army of the United States; *or* Major —— ——, U. S. A.	Sir: *or* (informal) My Dear Colonel Blank: *or* Dear Commander Blank: *but*, for officers below the rank of captain, Dear Mr. Blank:
Assemblyman	Assemblyman ——; *or* The Honorable —— ——, Member of Assembly.	Sir: Dear Sir: *or* My Dear Mr. Blank:
Assistant Secretary (Assistant to a Cabinet Officer)	The Assistant Secretary of the —— Department; *or* The Honorable —— ——; Assistant Secretary of ——.	Sir: *or* Dear Sir: *or* Dear Mr. Blank: (never Mr. Secretary).
Associate Justices	Honorable —— ——, Justice, Supreme Court of the United States; *or* The Honorable —— ——, Associate Justice of the Supreme Court; *or* Mr. Justice ——.	Mr. Justice: *or*, Sir: *or* My Dear Mr. Justice: *or* Your Honor:
Cabinet Officers (United States)	The Honorable the Secretary of War (or Labor, Commerce, etc.). The Honorable the Secretary of the Treasury. The Honorable the Postmaster General; *or* The Honorable —— ——, Secretary of Agriculture; *or* The Attorney General; The Secretary of State.	Sir: *or* Dear Sir: *or* My dear Mr. Secretary: *or* My dear Mr. Attorney General:
Cardinal	His Eminence Cardinal Blank; *or* His Eminence Paul, Cardinal Blank.	My Lord Cardinal: *or* Your Eminence:
Chief Justice of the Supreme Court of Canada	The Right Honourable Blank, P.C., Chief Justice of Canada.	Sir:
Chief Justice of the United States	The Chief Justice of the United States; *or* The Chief Justice of the Supreme Court; *or* The Honorable —— ——, Chief Justice of the Supreme Court of the United States; *or* (in social correspondence) Mr. Justice Blank; *or* (if to the Chief Justice and his wife) The Chief Justice and Mrs. Blank.	Mr. Chief Justice: *or* Sir: *or* (in social correspondence) My dear Mr. Chief Justice:
Congressman	The Honorable Henry F. Brown, House of Representatives, Washington, D. C.; *or* The Honorable William P. Brown, Representative in Congress, Albany, N. Y.	Sir: *or* Dear Sir: *or* My dear Mr. Brown:
Consul	To the American Consul at ——; *or* Mr. John Brown, United States Consul at ——; *or* John Brown, Esq., American Consul at ——.	Dear Sir:
Governor	The Honorable the Governor of ——; *or* The Hon. Henry Brown, Governor of ——; *or* (in Mass. and by courtesy in some other States) His Excellency, the Governor of ——; *or* His Excellency Henry Brown.	Sir: *or* Dear Sir: (see also *Lieutenant Governor*).
Governor-General of Canada	His Excellency, The Governor-General (official); His Excellency ——, The Governor-General (personal); *or* (if a royal duke) His Royal Highness, The Governor-General.	Sir: *or* My Lord: (according to rank).
Governor-General's wife (India and British Dominions)	Her Excellency —— ——.	Madame:
Judge (in Canada)	The Honorable Mr. Justice —— (if of a superior court or of the circuit court of Montreal); *or* His Honour Judge —— (if of a county court, court of sessions or district magistrates' court).	Sir:
Judge (in the United States)]	The Honorable John Brown, United States District Judge (or Chief Judge of the Court of Appeals, etc.).	Dear Sir: *or* My Dear Judge Brown:
Lawyer	Mr. John Brown, Attorney at Law; *or* John Brown, Esq. (The form *Mr. John Brown, Esq.* is incorrect.)	Dear Sir: My Dear Mr. Brown:
Lieutenant Governor	The Honorable ——, Lieutenant Governor of —— (in a state of the U. S. A. and in South Africa); His Honour The Lieutenant Governor of —— (in other British dominions and colonies; if a title of nobility is held, it should be used first).	Sir: *or* Dear Sir:
Mayor (in Canadian cities and towns, and in English boroughs)	His worship, The Mayor of ——.	Sir: *or* Dear Sir:
Mayor (in English cities)	The Right Worshipful the Mayor of ——. (In London, York, etc., The Right Honourable the Lord Mayor of ——.)	Sir:
Mayor (in the United States)	The Honorable John Brown, Mayor of the City of ——; *or* The Mayor of the City of ——.	Sir: *or* Dear Sir: *or* My Dear Mr. Mayor: *or* (informal) Dear Mayor Brown:
Member of Parliament (*or* of a Provincial Legislative Council *or* of a Provincial Legislature, etc.).	To the usual form of address add M.P. (*or* M.L.C., *or* M.P.P., *or* M.L.A., etc.).	Sir:
Minister (Diplomatic)	The Honorable —— ——, Minister of Iran; *or* His Excellency The Right Honorable —— ——, Minister of ——.	Sir: or (with personal title) My Lord: Your Grace: *or* My dear Mr. Minister:
Naval Officers	The Admiral of the Navy of the United States; *or* Admiral ——, Commanding United States Navy; Captain John Brown, U.S.N.	Sir: *or* (informal) My dear Admiral Blank: Dear Captain Brown; *but* for officers below the rank of captain, Dear Mr. Brown:
Pope	To His Holiness Pope Pius.	Most Holy Father: *or* Your Holiness:
Premier of a Province of Canada	The Honourable ——, Premier of the Province of ——.	Sir:
President of a College *or* University	John Henry Brown, L.L.D. (*or* use the initials of his highest degree), President of —— University (*or* President, —— University); *or* President —— ——.	Dear Sir: *or* Dear President Brown:
President of the Senate of the United States	The Honorable, The President of the Senate of the United States; *or* The Honorable John Brown, President of the Senate.	Sir:

Forms of Address—Concluded

Personage	Letter Should Be Addressed	Complimentary Salutation in Letter
President of the United States	The President, The White House; *or* The President of the United States, The White House; *or* His Excellency, The President of the United States.	The President: My Dear Mr. President: *or* Mr. President:
Prime Minister of Canada	The Right Honourable ——, P.C., Prime Minister of Canada.	Sir:
Professor in a College *or* University	Professor John Brown; *or* John Brown, Ph.D. (or L.L.D., M.D., etc., using only the initials of his highest degree, if the degrees are in the same field), Professor of ——. (The title *professor* should not be assigned to teachers who have not attained professorial rank.)	Dear Sir: *or* My dear Professor Brown: *or* Dear Professor Brown: *or* My dear Professor:
Senator (in Canada)	The Honourable Senator ——.	Dear Sir: Dear Senator ——:
Senator (in the United States)	Senator Brown (unless there are two Senators Brown, in which case the first name or initial is added); *or* The Honorable Henry C. Brown, United States Senate, Washington, D. C.; *or* The Honorable James C. Jones, United States Senator, Harrisburg, Pa.	Sir: Dear Sir: My dear Mr. Senator: *or* My dear Senator: *or* My dear Senator ——: *or* Dear Senator:
Speaker of the House of Commons (Canada)	The Honourable ——, The Speaker of the House of Commons.	Dear Mr. Speaker:
Speaker of the House of Representatives of the United States	The Honorable The Speaker of the House of Representatives; *or* The Honorable Henry C. Brown, Speaker of the House of Representatives; *or* To the Speaker of the House of Representatives; *or* The Speaker.	Sir: *or* Mr. Speaker: *or* My dear Mr Speaker:
Speaker of the Senate (in Canada)	The Honourable Senator ——, The Speaker of the Senate.	Dear Mr. Speaker:
Vice-President	The Vice-President; *or* The Honorable, The Vice-President of the United States; *or* The Honorable —— ——, Vice-President of the United States.	Mr. Vice-President: *or* Sir: *or* My dear Mr. Vice-President:

Titles of Nobility

Personage	Letter Should Be Addressed	Complimentary Salutation in Letter
Baron	The Right Honourable The Lord ——; *or* The Lord ——.	My Lord:
Baroness	To the Right Honourable the Baroness ——; *or* Right Honourable the Lady ——; *or* The Lady ——.	Madam:
Countess	To the Right Honourable The Countess of ——; *or* The Countess ——.	Madam:
Duchess	To her Grace, the Duchess of ——; *or* The Most Noble the Duchess of ——.	Madam: *or* Your Grace:
Duke	To His Grace, the Duke of ——.	My Lord Duke: *or* Your Grace:
Earl	The Right Honourable The Earl of ——; *or* The Earl of ——.	My Lord:
King	The King's Most Excellent Majesty; *or* His Most Gracious Majesty, King ——.	Sir: *or* May it please your Majesty:
Knight	Sir Henry W—— (initials of his order, if any, as K.C.B.).	Sir:
Lady	Lady ——; *or* (if the daughter of a viscount or baron) Hon. Lady ——; *or* (if the daughter of a duke, earl or marquis) Lady Mary ——.	Madam: My Lady: Your Ladyship:
Marchioness	The Most Honourable the Marchioness of ——.	Madam:
Marquis	The Most Honourable the Marquis of ——; *or* The Marquis of ——.	My Lord Marquis:
Prince of the Blood Royal	His Royal Highness Prince William.	Sir:
Princess of the Blood Royal	Her Royal Highness the Princess Elizabeth.	Madam:
Queen	The Queen's Most Excellent Majesty; *or* Her Gracious Majesty, The Queen.	Madam: *or* May it please your Majesty:
Queen Mother	Her Gracious Majesty Queen Alexandra.	Madam: *or* May it please your Majesty:
Viscount	The Right Honourable the Viscount ——; *or* The Viscount ——.	My Lord:
Viscountess	The Right Honourable the Viscountess ——; *or* The Viscountess ——.	Madam:

HOLIDAYS AND FESTIVALS

A holiday (short for holy day) was originally a day set apart as a religious festival. Its meaning has now been extended to include a day on which some important event is commemorated or the memory of some distinguished person is honored. Most of the latter holidays in the United States have been so designated by special enactment of Congress or of the state legislatures and are called *legal holidays.* On such days there is a cessation of ordinary business activities.

Each nation has its own such holidays, some of which, like Christmas, are celebrated throughout the Christian world and others of which, like Canada's Dominion Day and Australia's Foundation Day, receive only local recognition. Just as the United States celebrates July 4 as its Independence Day, France recognizes July 14, the anniversary of the fall of the Bastille, as its day of independence. Likewise there are independence days for Belgium, Bulgaria, Denmark, Finland, Greece, Italy, Latvia, Lithuania, Mexico, Norway, the Philippines, Switzerland and Yugoslavia. The following list and calendar cover the chief holidays celebrated in the United States and other countries:

Admission Day. A legal holiday in several states, celebrating the day that each of such states was admitted to the Union. West Virginia observes Admission Day on June 20; Colorado, on Aug. 1; California, on Sept. 9; Nevada, on Oct. 31; and Indiana on Dec. 11.

Advent. The period including the four Sundays before Christmas.

Alaska Day. Oct. 18, marking the accession of Alaska.

All Saints' Day. Nov. 1, a feast in honor of all the saints; also known as *Allhallows.*

All Souls' Day. Nov. 2, a day of prayer for souls in Purgatory.

Annunciation. Mar. 25, the festival of the incarnation of Christ, also called *Lady Day.*

April Fools' Day or **All Fools' Day.** Apr. 1. The origin of the custom of April fooling on April 1 is not known. One theory is that it is a survival of the Roman Cerealia, a festival at the beginning of April in honor of Ceres, whose daughter Proserpina was carried away by Pluto to the Elysian fields. Ceres heard the echo of Proserpina's screams, but until the sun came to her aid her search was like a fool's errand, for she never could locate the echo.

It is much more likely that the English custom came from France where *poisson d'avril,* April first, is the equivalent of April fool as the cry of derision after one has been sent on a silly errand. But no one can explain *April fish* any more satisfactorily than *April fool.* Certainly it does not make sense to say that an April fish is a young fish—and so easily caught. April 1 as All Fools' Day has been considered an unlucky day.

Arbor Day. This day was first observed for planting trees on April 10, 1872, in Nebraska. It was the outgrowth of a resolution adopted by the Nebraska Board of Agriculture on the motion of J. Sterling Morton, a board member. Since Nebraska at that time did not have many trees, Mr. Morton believed that they would be useful as windbreaks in cutting off the warm, dry chinook and that they would aid in conserving the soil's moisture. On the first Arbor Day the citizens of Nebraska planted 1,000,000 trees. Twenty years later some 100,000 acres of wasteland had been converted into woodlands through their efforts. Since 1885 the state has observed Arbor Day on April 22, the anniversary of Mr. Morton's birth, and has declared it a legal holiday. Rhode Island also has proclaimed Arbor Day a legal holiday and observes it on the second Friday in May.

Arbor Day is made the occasion for teaching school children the importance of planting and protecting trees. In many states the date is fixed either by proclamation of the governor or of the state board of education. Arkansas observes Arbor Day on the first Saturday in March; California, on March 7 (Luther Burbank's birthday); Colorado, on the third Friday in April; Florida, on the first Friday in February; Georgia, on the first Friday in December; Indiana, on the second Friday in April; and Louisiana, on the second Friday in January. Massachusetts has selected the last Saturday in April; Mississippi, the first Friday in February; Missouri, the Friday after the first Tuesday in April; Montana, May 2; New Jersey, the second Friday in April; New Mexico, the second Friday in March; North Carolina, the first Friday after March 15; and Oklahoma, the Friday after the second Monday in March. The western part of Oregon celebrates Arbor Day on the second Friday in February and the eastern part, on the second Friday in April. In South Carolina Arbor Day falls on the third Friday in November; in Tennessee, on the first Friday in April; in Texas, on February 22; in Utah, on April 15; in Vermont, Washington and Wisconsin on the first Friday in May; and in West Virginia, on the second Friday in April.

Armistice Day. Nov. 11. This day is the anniversary of the suspension of hostilities between the Allies and Germany, which marked the close of the World War. The armistice was signed at 11 o'clock on the morning of Nov. 11, 1918. Notable ceremonies are held on this day at: the Cenotaph in Whitehall, London; the Tomb of the Unknown French Soldier beneath the Arc de Triomphe de l'Étoile in Paris; and the Tomb of the Unknown American Soldier in Arlington (Va.) Cemetery near Washington. The day is also observed with suitable ceremonies at the World War memorials that have been erected in nearly every city of every country that participated to any great extent in the conflict. In most American communities a 2-minute period of silence is observed at 11 A.M., and parades and other public demonstrations are held. Since President Wilson designated in 1920 the Sunday nearest to Armistice Day as Armistice Sunday, clergymen generally choose international peace as a sermon topic on that day. Armistice Day was made a national legal holiday in May 1938 in a bill signed by President Roosevelt.

Army Day. Apr. 6, a patriotic day.

Ascension Day. The 40th day after Easter.

Ash Wednesday. This day is the first of the 40 weekdays of the Lenten period of the Christian church and was established as early as the 10th century. Palms that were blessed on Palm Sunday of the previous year are burned into ashes and these ashes, in turn, are blessed by the priest. At Roman Catholic masses on Ash Wednesday each penitent comes forward to the altar rail to have the priest, after dipping his finger in the ashes, make the form of a cross on his forehead; at the same time the priest says in Latin: "Remember, man, that thou art dust and unto dust thou shalt return." Ash Wednesday is observed by the Protestant Episcopal and Lutheran churches but without the use of ashes.

Assumption. Aug. 15, a festival honoring the Virgin Mary.

Bastille Day. July 14, the anniversary of the destruction of the Paris Bastille, a prison for political offenders, on the outbreak of the French Revolution in 1789. It is observed with parades, street dances and fireworks.

Belgian Independence Day. July 21, a Belgian holiday that is the anniversary of the coronation of Leopold I in 1831.

Bennington Battle Day. Aug. 16, a legal holiday in Vermont.

Bulgarian Independence Day. Oct. 5, a national holiday celebrating the proclamation of Bulgaria's freedom from Turkey in 1908.

Bunker Hill, Anniversary of the Battle of. June 17, a legal holiday in Massachusetts.

California Day. Sept. 9, a legal holiday in California.

Candlemas. Feb. 2. This church festival, which is observed on February 2, celebrates in the Roman Catholic Church the purification of the Virgin Mary and in the Eastern Church the presentation of the infant Christ in the Temple. A pagan Roman festival of purification called the *Lupercalia* or *Februa* was celebrated on February 15. Until the latter part of the 4th century the Roman Church observed the festival on February 14 or 40 days after January 6 (regarded as Christ's birthday until the adoption of December 25). The Armenian church still keeps the date of February 14. Candlemas takes its name from the fact that on this day all the candles that will be needed for various church services throughout the year are blessed. These candles symbolize Christ as the spiritual light of the world and are a reminder of the blessing bestowed by Simeon when the Holy Child was presented in the Temple.

With Whitsunday, Lammas and Martinmas, Candlemas is one of the *quarter days* appointed in Scotland for the payment of debts of various kinds. There is a popular superstition that if the ground hog comes out of his hole and sees his shadow on this day, he will go back, and there will be six more weeks of severe winter weather before he reappears. Hence February 2 is sometimes called *Ground-Hog Day*.

Child Health Day. May 1, a focus of activities for improved child health.

Childermas. Dec. 28, the festival of the Holy Innocents.

Christmas. Dec. 25. The anniversary of the birth of Christ has been celebrated as a special Church festival since the 3d century. The English name is derived from two Middle English words, *Christes Messe*, meaning Christ's Mass. In Germany this festival is called *Weihnachtsfest* (Feast of the Holy Night); in Italy, *Il Natale* (the Day of the Nativity); in France, *Noël* (derived like the Italian name from the Latin word *natalis*, meaning birthday).

The early Church fathers had condemned the observance of birthdays as a heathen custom. In early times the date of Christmas varied: the churches in some countries observed it on December 25 and in others on January 6, April 19 or May 20. Still other authorities claimed that it should be observed on November 17 and March 28. Even when December 25 was recognized as the actual birthday, many authorities urged the celebration of January 6 as the feast of baptism or spiritual birth. The Western Church first adopted December 25 as the feast day, and in the 4th century it began to be celebrated in the East, but it never entirely displaced the celebration of Epiphany or Twelfth Night on January 6.

One reason why the Western church may have chosen December 25 for the observance of Christmas is because it marks the beginning of the Saturnalia or great winter solstice festival of the Romans, and because December 25th was a festival in the Mithraic sun-worship as the birthday of the unconquered sun. The giving of presents and the exchange of greeting cards at Christmas is a transfer to this day of the gift-giving custom of the Romans that took place on the first of the year. Many other pagan customs were adapted to the Christian holiday: the Britons, for instance, contributed mistletoe, the symbol of peace used by the Druids, and the Scandinavians burned a Yule log as a relic of their festival of Juul (Yule) in honor of the god Thor.

During the Middle Ages Christmas became the most popular of festivals. Churches and baronial halls were decorated with holly and other greens—a custom that originated with the legend of the blossoming of trees and plants at Christmas like the thorn bush that Joseph of Arimathea is supposed to have planted at Glastonbury, England. St. Francis of Assisi is said to have devised the crèche set up in Roman Catholic and some Episcopal churches during the Christmas season to represent the stable of Bethlehem.

The medieval dramas known as *mystery plays* originated in an attempt to portray for the congregation the events of the first Christmas season, ranging from the cattle kneeling in their stalls to the visit of the Magi. The manger songs and the carols sung by Christmas waits had their origin in the attempt to tell the story in song. No words and music are more moving than the German "Heilige Nacht" (Holy Night); the French "Noël"; the English "Hark, the Herald Angels Sing"; the American "O Little Town of Bethlehem." The giving of gifts to the poor at Christmas is an outgrowth of the medieval belief that at this season the Christ Child may come to one's door in the guise of a beggar. Candles were set alight in several windows of a house to light the Christ Child's way.

In Tudor England Christmas was celebrated for 12 days up to January 6th, Epiphany, popularly known as *Twelfth Day* or *Twelfth Night*. The king and nobles had attached to their households a Lord of Misrule who presided over the merrymaking and feasting of this period. The most popular feature of these feasts was a boar's head stuffed with apples and borne in held aloft on a huge platter. The favorite beverage was the wassail, made of wine or ale flavored with spices.

Just as they abolished the May Day festivals, the Puritans in 1644 caused Parliament to prohibit any festivities whatsoever on Christmas Day. Instead it was to be a day of fasting. The Puritans frowned equally on the New Year's and Twelfth Night revels, and a short time later their prohibition was enforced in colonial Massachusetts. After the Restoration the Christmas celebrations were renewed but were confined only to Christmas Day rather than to the Christmas Cycle or Yuletide.

Throughout the Christian world today people of all faiths observe Christmas. It has become especially a children's festival. Small children in the United States look for Santa Claus to drive to the rooftop in a sleigh drawn by reindeer, climb down the chimney and fill their stockings that are hung by the fireplace. This belief comes from the early Dutch settlers of New York, the name *Santa Claus* being a corruption of *Sant Nikolaas,* the Dutch form for St. Nicholas. Out of the tales of the saint's generosity grew the legend that he was the bringer of all gifts. He was the bishop of Myra in Lycia, Asia Minor, and, after his death about the middle of the 4th century, December 6 was selected as his feast day.

English children call their Santa Claus *Father Christmas.* In Italy the children look to the *Urn of Fate* (a relic of Roman times) for their gifts. In Norway the presents are found hidden throughout the house. In France the presents supposedly are brought by *Bonhomme Noël* (or Christmas Good Man) and, in the case of the peasant children, are put in wooden shoes that are placed at the fireside. Sant Nikolaas leaves the Dutch children their gifts, and in some Baltic countries and Germany the Christ Child is said to leave the remembrances. The German name for the Christ Child is *Kriss Kringle* (derived from *Christkindl.*)

The Christmas tree is said to have originated in Germany in the 16th century, when Martin Luther decorated the first tree for his children. Generally an evergreen, the modern tree is decorated with tinsel, colored electric lights and fancy, thin glass ornaments, with a tiny Santa Claus or Star of Bethlehem at the top. The Christmas tree was introduced into England by Queen Victoria's husband, the Prince Consort, and made its appearance in the United States about the same time on the arrival of many German immigrants. A large fir tree is often placed in the center of a community park, such as Boston Common, and crowds gather to sing carols about the lighted tree on Christmas Eve. The use of fireworks in Louisiana and other southern states on Christmas Eve originated among the residents of French, Spanish and Italian extraction.

Colorado Day. Aug. 1, a legal holiday in Colorado.

Columbus Day. Oct. 12. The anniversary of Columbus's discovery of America is observed in the United States, in most Latin American countries and in some Spanish and Italian cities. The first celebration seems to have been arranged by the Society of St. Tammany in New York on the 300th anniversary in 1792. The day is observed with elaborate ceremonies, staged by the Italian residents of the large cities of 34 states. The ceremony in New York city, for instance, centers around the statue of Columbus, which was erected in Columbus Circle on the 400th anniversary of the discovery.

Confederate Memorial Day. A legal holiday in the states that were in the Confederacy. Alabama, Florida, Georgia and Mississippi observe this day on Apr. 26; North Carolina, South Carolina and Tennessee, on May 10; Virginia, on May 30; and Louisiana, on June 3.

Constitution Day. Sept. 17, the anniversary of adoption of the United States Constitution.

Corpus Christi. The Thursday following Trinity Sunday, the festival of the Lord's Supper.

Danish Independence Day. June 5, the anniversary of the abolition of absolute monarchy by Frederick VII, who promulgated the Unionist Constitution in 1848.

Davis's Birthday. June 3, a holiday in several southern states.

Dead, Festival of the. August or September (15th day of the 7th moon). On this day the Chinese offer sacrifices to the spirits of their ancestors and present gifts that consist of paper replicas of worldly goods.

Decoration Day. May 30, a legal holiday in most states; called also *Memorial Day.*

Dedication Day. Jan. 31, a Portuguese holiday honoring Dr. Theophilo Braga and others who founded the republic of Portugal in 1910.

Defenders' Day. Sept. 12, a legal holiday in Maryland.

Delaware Day. Dec. 7, a legal holiday in Delaware. It marks the anniversary of the ratification of the Federal Constitution by Delaware, the first state to do so, in 1787.

Dominion Day. July 1, a national holiday in Canada. New Zealand observes this day on the 4th Monday in September.

Durga, Festival of the Goddess. About Oct. 1. This is the most important of Indian festivals and is held in honor of Durga, wife of Siva, who is worshiped as the female embodiment of Divine Energy. The ceremonies last for 5 days.

Easter. This festival of the Christian church celebrates the resurrection of Christ. Its name, according to the Venerable Bede, comes from Eostre, the Teutonic goddess of spring, whose festival observed the renewal of life —hence the analogy with Christ's resurrection as symbolic of a future life in the teachings of the early church fathers. The French name of the festival is *Pâques,* which is derived from the Latin expression *Festa Paschalia* (from Hebrew *pāsah,* to pass over), and this great Christian festival coincides with the Jewish feast of Passover. Since the decision reached by the Council of Nicaea in 325, Easter has been celebrated on the first Sunday after the full moon that follows the spring equinox; if the full moon occurs on March 21, Easter is observed on the next Sunday.

A popular pastime connected with Easter is coloring and hunting Easter eggs. The egg from time immemorial has been a symbol of a new birth and hence of the resurrection; when it is dyed red the color represents the blood of Christ, which was shed on the cross. Of Norse origin is the legend that the Easter rabbit brings these eggs.

Egg-rolling contests on a sloping lawn have been popular in Europe for many centuries. The winner is the child who succeeds in rolling the largest number of eggs without cracking the shells. Dolly Madison, wife of President Madison, is said to have introduced the egg-rolling contests that are still held on the White House grounds in Washington on Easter Monday. Only during the Civil War and the World War was this picturesque custom discontinued.

Easter Monday. The day following Easter; a bank holiday is declared in many states.

Emancipation Day. Mar. 22, in Puerto Rico.

Empire Day. May 24, a holiday in many parts of the British Empire, first observed by Canada in 1899 on Queen Victoria's birthday.

Epiphany. Jan. 6, a festival marking the coming of the Magi.

Fast Day. The last Thursday in April, observed in New Hampshire.

Fathers' Day. The third Sunday in June was first suggested as a Fathers' Day by Mrs. John Bruce Dodd, of Spokane, Wash., in 1909. She launched the movement to establish this holiday as a tribute to her own father, William J. Smart, a Civil War veteran. Although it is not an officially established holiday, the day is widely observed.

Filipino Independence Day. Aug. 13, the anniversary of the American occupation of Manila in 1898.

Finnish Independence Day. Dec. 6, a national holiday celebrating the proclamation of Finland's freedom from Russia in 1917.

Fire Prevention Day. Oct. 9, the anniversary of the fire that destroyed most of Chicago in 1871.

Flag Day. June 14. Throughout the United States this holiday is observed, celebrating the adoption of the Stars and Stripes as our national emblem by the Continental Congress, on June 14, 1777. The custom is to display flags and hold patriotic exercises in schools, where the story and meaning of our flag are explained.

Forefathers' Day. Dec. 21, marking the landing of the Pilgrims.

Forrest's Birthday. July 13, a public holiday in Tennessee.

Foundation Day. Jan. 26, the anniversary of the establishment of the first British colony at Botany Bay (near Sydney), Australia, in 1788.

Fraternal Day. Oct. 9, a public holiday in Alabama.

General Election Day. A legal holiday in most states.

Georgia Day. Feb. 12, a public holiday in Georgia in celebration of the founding of the colony by Oglethorpe in 1733.

Good Friday. This holy day, the Friday before Easter, commemorates the crucifixion of Jesus Christ. Made a legal holiday by the Roman Emperor Constantine in the 4th century, it is observed in many countries. Though it is not a legal holiday in the United States it is largely observed. Local ruling closes schools, city departments and banks in some cities.

Gran Canaria Fete. Apr. 29, a festival in the Canary Islands, which celebrates the union with Spain in 1476.

Greek Independence Day. Apr. 6, a national holiday that commemorates the day in 1821 when the war to free Greece from Turkey started.

Ground-hog Day. Feb. 2, the date on which the woodchuck is reputed to emerge from his burrow to prophesy the extent of winter. See *Candlemas.*

Guadalupe, Feast of the Virgin of. Dec. 12, a national holiday in Mexico, which celebrates the miraculous appearance of the Virgin to an Indian convert in 1531.

Guy Fawkes's Day. Nov. 5, the observance in England with mummers and fireworks of the discovery of the gunpowder plot of 1605 to blow up the House of Parliament.

Halifax Independence Resolutions, Anniversary of. Apr. 12, a public holiday in North Carolina. North Carolina was the first colony to authorize her delegates to the Continental Congress to adopt formal resolutions that favored separation from England.

Hallowe'en. Oct. 31. This night of frolic takes its name from the fact that it is the eve of All Saints' Day or All Hallows. The mystic rites with which it is observed originated among the Druids. In Ireland October 31 is still called the *Vigil of Samhain.* The legend runs that this night Samhain, Celtic lord of death, assembles the souls of the wicked that during the year have been condemned to assume animal forms; and the fairies are abroad and can be seen by mortals. To the Druid rites were added in time some of the rites associated with the Roman festival of Pomona, the goddess of the harvest. These are retained today in the custom of bobbing for apples and roasting chestnuts at a Hallowe'en party. Bonfires are built —as in the spring and midsummer festivals of Celtic people.

During the Middle Ages the belief developed that Hallowe'en was a time when both ghosts and witches were abroad, since it was held that on this occasion the human spirit was enabled by the aid of supernatural power to detach itself from the body and wander through the realms of space. The traditional companion of these witches was a black cat. It was also believed that a witch had the power to change herself into a black cat nine times.

The fortunetelling that prevails at a Hallowe'en party is an outgrowth of the medieval belief that this eve was a time for divining the future and especially for trying spells to determine the course of one's love affairs. The jack-o'-lantern carved from a pumpkin that children like to set on the front porch on Hallowe'en is of uncertain origin. It may be an imitation of the ghostly *will-o'-the-wisp* or *ignis fatuus,* the flickering light that appears over marshes; and there is an Irish legend of a miser named Jack who, being barred from both heaven and hell, was condemned to walk the earth with a lantern until the Day of Judgment.

Hindu New Year. About May 1. Good Hindus seek to avert evil influences by bathing in the Ganges and in other holy streams on this day. After visiting a temple, the day is spent in merrymaking.

Hope, Day of. Mar. 15, a Hungarian holiday celebrating the attempt at Magyar independence under Louis Kossuth in 1849.

Hospital Day. May 12, the anniversary of the birth of Florence Nightingale, founder of scientific nursing.

Inauguration Day. Jan. 20, a legal holiday in the District of Columbia in years when a new President takes office.

Independence Day. July 4. This national holiday celebrates the birth of the United States. On July 4, 1776, the delegates to the Second Continental Congress in Independence Hall, Philadelphia, adopted the Declaration of Independence. (The text of the Declaration and an account of the Liberty Bell that pealed forth the glad tidings are given elsewhere.)

Independence Day has long been selected for the inauguration of various enterprises. Among the more outstanding of these are the turning of the first sod for the digging of the Erie Canal by De Witt Clinton, Governor of New York, on July 4, 1817; the turning of the first sod on July 4, 1828, for the construction of the first American railway, the Baltimore & Ohio Railroad, by Charles Carroll, the last surviving signer of the Declaration of Independence; and the laying of the cornerstone of the Washington Monument in Washington, D. C., on July 4, 1848. Philadelphia observed the 50th anniversary of the signing of the Declaration of Independence with a special celebration. Also in Philadelphia the 100th and 150th anniversaries were marked by the famous Centennial and Sesquicentennial expositions.

Indiana Day. Dec. 11, a legal holiday in Indiana.

Italian Independence Day. June 6, a national holiday celebrating the unification of Italy in 1870.

Jackson Day. Jan. 8, a public holiday in Louisiana, where it is celebrated as the anniversary of the Battle of New Orleans, won by Andrew Jackson at the close of the War of 1812.

Jan Nepomucky Day. May 16, a Czech holiday observed with pilgrimages to the tomb of St. John of Nepomuk in the Cathedral of St. Vitus, Prague.

Japanese Boys' Festival. May 5, a day whose emphasis is on teaching Japanese boys to be good citizens and good soldiers. The paper carps that are flown on this occasion are to remind them to be as brave as the carp in fighting against the strong currents of life's difficulties.

Japanese Dolls' Festival. Mar. 3, a day reserved for Japanese girls when they have the privilege of playing with the ceremonial dolls that have been handed down in their families for generations. The most beautiful dolls represent the emperor and the empress; they are surrounded by other dolls that represent court officials and their ladies. Before them is placed a banquet of rice, fruit and *sake.*

Jefferson's Birthday. Apr. 13, a public holiday in Alabama.

Kamehameha Day. June 11, a public holiday in Hawaii.

Kitchen God, Festival of the. December or January (23d day of the 12th moon). This is a ceremony to appease the kitchen god whose picture is pasted against the chimney of nearly every Chinese house. Just before the end of the old year, he is thought to ascend to heaven to report on the conduct of each member of the family. Cakes are generally offered to him so that he will speak kindly.

Komensky Day. Mar. 28, a Czech holiday in honor of the great Moravian educator who is more generally known by his Latin name Comenius.

Kosciusko Day. Feb. 11, a Polish holiday in honor of Thaddeus Kosciusko, who served in the American Revolution and who in 1794 led an uprising of the Poles against their Russian and Prussian oppressors.

Kosovo Day. June 28, a Yugoslav holiday, observed since 1389, when Serbia lost to Turkey the battle of the Field of the Blackbirds. A wounded Serbian after the battle killed the victorious Sultan Amurath I.

Labor Day. The first Monday in September, a legal holiday throughout the United States.

Lady Day. Originally any feast day of the Virgin Mary, especially the Annunciation, Mar. 25, or in some parts of England, Apr. 6 (the old-style date and so called *Old Lady Day*). Up to 1752 Lady Day was the beginning of the calendar year in England; and it is still an official quarter day in that country for paying rent.

Lafayette Day. Sept. 6, the birthday of General Lafayette.

Lammas Day. Aug. 1 or (old style) Aug. 13, harvest festival (originally *Hlafmaesse,* loaf mass). In early times loaves of bread made from new grain were consecrated at the mass. Lammas is a quarter day in Scotland. Aug. 1 was a feast day in Druid times with harvest-home games. It was called *Lugnas,* the feast of Lug, the sun-god.

Latvian Independence Day. Nov. 18, a national holiday celebrating Latvia's achievement of freedom from Russia in 1918.

Lee's Birthday. Jan. 19, a legal holiday in the states that belonged to the Confederacy.

Lent. The period of 40 weekdays preceding Easter.

Lincoln's Birthday. Feb. 12. The Emancipator's birthday is observed with appropriate exercises by schools and patriotic organizations. The first formal observance was in Washington on Feb. 12, 1866, when both the Senate and the House gathered at the Capitol to listen to a memorial address extolling the martyred President. There were present on this occasion President Johnson and his cabinet, the justices of the Supreme Court, the diplomatic corps and the governors of several states. Illinois, to whose bar Lincoln was admitted and in whose legislature he sat, was the first state (in 1892) to declare Lincoln's Birthday a legal holiday.

Lithuanian Independence Day. Feb. 16, the anniversary of the day in 1918 when Lithuania declared its independence of Russia.

Lord Mayor's Show Day. Nov. 9, a London holiday that is observed with a street procession, when the newly elected Lord Mayor proceeds to the Courts of Justice to take the oath of office, and with the Lord Mayor's Banquet at the Guildhall.

Magna Charta Day. June 15, a British holiday that is observed with a celebration at Runnymede, where the barons wrested from King John in 1215 the Magna Charta.

Mardi Gras. This festival is observed on Shrove Tuesday (the day preceding Ash Wednesday or first day of Lent). It is a day of pleasure in most of the Roman Catholic countries of Europe and Latin America. It is the concluding day of the Italian carnival season, the *Mardi Gras* (or Fat Tuesday) of the French, the *Fastnacht* (or Eve of Fasting) of the Germans and the *Pancake Tuesday* of former times in England. The term *Shrove Tuesday* refers to the custom of confessing one's sins and being shriven by a priest before the start of the Lenten season.

In the United States Mardi Gras is a legal holiday in most of the parishes of Louisiana and in Alabama and Florida. It is celebrated each year with pageantry and gay festivities in New Orleans and Shreveport, La., Mobile, Ala., and Pensacola, Fla., and occasionally in other cities of these states. The New Orleans festival originated in 1827 on the return to the city of some young men who had been studying in France. The first celebration on a large scale occurred in 1852.

During the Mardi Gras season the entire city of New Orleans is ostensibly under the control of Rex, the king of the carnival. There are four principal pageants. The festival starts on the Thursday before with the appearance of Momus at a ball sponsored by the Knights of Momus. On the following Monday night is the parade sponsored by the Krewe of Proteus. Tuesday, the principal day of the festival, is marked by the daytime parades of Rex and the Druids. The first parade escorts Rex (who corresponds to the Lord of Misrule at the medieval Christmas revels) through the city. This king of the carnival is selected from among the so-called *Dukes of the Krewe of Rex.* On another float rides the queen of the carnival, who is surrounded by maids of honor chosen from among the city's debutantes. The parade on Tuesday night is sponsored by the Mystick Krewe of Comus and is characterized by elaborate floats and costumes.

The New Orleans Mardi Gras draws to the city each year from 50,000 to 100,000 visitors. Preparation for it takes months. In addition to the four principal societies—the krewes of Rex, Comus, Proteus and Momus—the Krewe of Nereus, the Atlantians, the High Priests of Mithras, the Prophets of Persia and the Elves of Oberon all aid in preparing for this event of nation-wide fame.

Martinmas. Nov. 11, an old English holiday, marking the season of St. Martin's (in America, Indian) summer.

Maryland Day. Mar. 25, a public holiday in Maryland in celebration of the landing in 1634 of the English colonists led by Leonard Calvert.

Maundy Thursday. The Thursday of Holy Week, preceding Good Friday.

May Day. May 1. The celebration of May Day is traced to the Floralia or festival that the Romans held in honor of Flora, goddess of flowers. The earliest record of it was in 238 B.C. On the establishment of the Roman Empire throughout central and western Europe the custom was introduced into Gaul, Britain and other provinces.

In the Celtic countries there was a Maytime festival called *Beltane* with Druidical ceremonies, notably bonfires. The Highland cattle were driven between two bonfires for purification, and the phrase, "between Beltane's two fires," means in a dilemma. In France, Germany and England in medieval times the Maypole was a collection of green boughs decorated with flowers that the young people gathered in the neighboring woods before dawn. This custom was called *bringing in the May.* The girls stopped to wash their faces in the early morning dew of a May Day, for this rite was supposed to ensure a beautiful complexion. In time a tree, stripped of its boughs, was used for the Maypole; it was decorated with such flowers as the hawthorn, and to its top were attached ribbons for each dancer to hold. On this occasion a young girl was selected and crowned *Queen of the May.*

In England during the 14th and 15th centuries in connection with the dances about the Maypole the morris dances were developed; the characters were the principal figures in the legend of Robin Hood. The Puritans, however, found the May Day festival abhorrent and on coming into power they passed an Act of Parliament (1644) forbidding the observance of this day. After the Restoration, however, May Day came into its own, with men dancers weaving in and out the pattern of a sword dance or both men and women participating in a jolly country dance. The morris dances were abandoned in the 18th century, but the English Folk Dance Society has lately met with considerable success in reviving these dances in both England and the United States.

Small girls in the United States like to observe May Day by making cardboard baskets, which they fill with flowers and leave on the doorpost of a friend's house. Older girls in high school and college often participate in May Day revels, crowning one of their number Queen of the May. Bryn Mawr, Elmira, Vassar and Wellesley colleges all are noted for their traditional May Day celebrations.

In 1889 the International Socialist Congress designated May Day as an international Labor Day. It was formerly celebrated in Germany, and it is now a great holiday in Soviet Russia.

Mecklenburg Declaration of Independence, Anniversary of. May 20, a public holiday in North Carolina.

Memorial Day or **Decoration Day.** May 30. Southern women started the practice of placing early spring flowers on the graves of their dead. This beautiful custom gradually spread, until in 1868, General John A. Logan, Commander in Chief of the Grand Army of the Republic, named May 30 on which to beautify the graves of soldiers.

This date has been made a legal holiday in most of the states for honoring dead American soldiers. Alabama, Georgia, Florida and Mississippi observe Memorial Day on April 26, North Carolina, South Carolina and Tennessee on May 10, Virginia on May 30 and Louisiana on June 3.

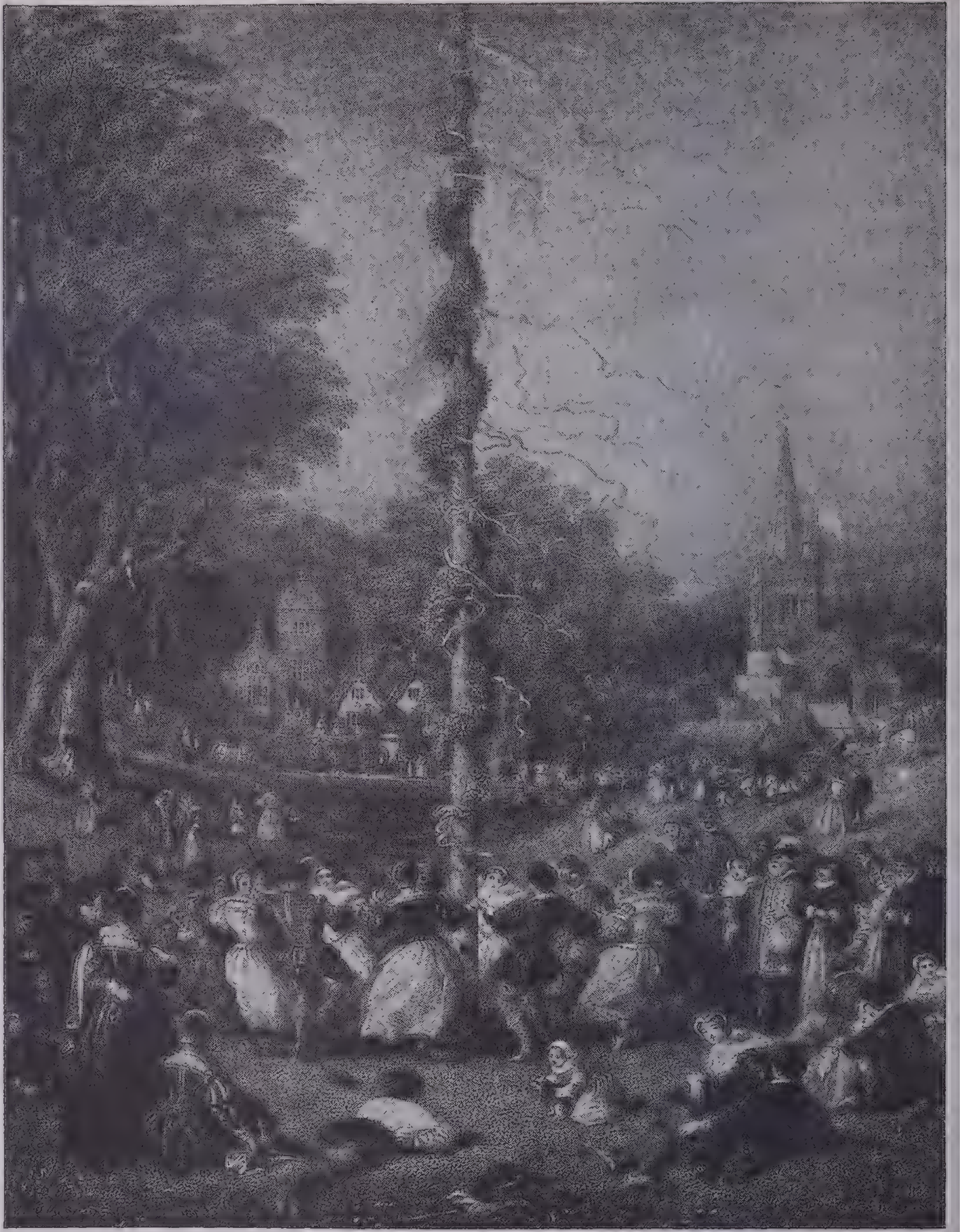
Memorial Day. Oct. 6, a Hungarian day of remembrance, which has been observed since the abortive revolution of 1849.

Mexican Independence Day. Sept. 16, a national holiday celebrating the insurrection that Hidalgo y Costilla attempted to foment against the Spanish Government in Mexico in 1810.

Michaelmas. Sept. 29, an old English holiday and church festival celebrating the feast of the archangel Michael.

Midsummer Day or **St. John's Day.** The 24th of June is the feast of St. John the Baptist, and its celebration and that of the night before (Midsummer Eve, Shakespeare's Midsummer Night) combine church ceremony with old Celtic pagan rites—bonfires and merrymaking. As on Hallowe'en, it is believed that spirits are abroad on this night.

Milky Way Festival. August or September (7th day of the 7th moon). This Chinese festival is in honor of the constellation *Aquila* and the star *Vega.* According to the legend the Shepherd Boy and the Weaving Maid whom they represent are allowed by the Sun God to meet only once a year when the magpies build a bridge across the Heavenly River or Milky Way. All the women and girls pray that it will be a fair night, for should it rain the lovers will be separated for another year.



From a painting by Joseph Nash

A May-Day Celebration in Elizabethan England

Missouri Day. Oct. 1, a public holiday in Missouri.

Mothering Sunday. The fourth Sunday in Lent.

Mothers' Day. In 1907 Miss Anna M. Jarvis of Philadelphia urged that on the second Sunday of each May a carnation be worn in honor of one's mother. The day was first observed in Philadelphia, May 10, 1908, and is now widely celebrated. In England Mothers' Day was first observed in 1913, although there already existed an ancient rural custom of visiting one's parents on Mothering Sunday in Mid-Lent. For living mothers a carnation of any color may be worn; for a mother not living the flower should be white. Gifts are now presented to mothers on that day.

National Maritime Day. May 22, a date fixed for local observances.

Nevada Day. Oct. 31, a legal holiday in Nevada.

New Year's Day. Jan. 1. This is one of the oldest and most universal holidays throughout the civilized world. The Romans were responsible for its inauguration, when on the adoption of the Julian calendar in 46 B.C. they changed the first month of the year from March to January. In order that the year might have an auspicious start they offered sacrifices to the god Janus (for whom the month is named) and exchanged greetings with their relatives, friends and acquaintances on January 1. The gifts that they gave on this occasion were called *strenae,* and in French New Year's gifts are still called *étrennes.* In the Roman Catholic and Protestant Episcopal churches New Year's Day is the feast of the Circumcision of Jesus Christ.

In the United States New Year's

Eve and New Year's Day are given over to social entertainment and calling. Many churches hold watch-night services on New Year's Eve. At 12 o'clock midnight horns are blown, bells are rung and whistles announce the arrival of the New Year. George Washington, when he was President, inaugurated the custom of holding a reception on this holiday, and the President's New Year's reception has been observed by all his successors except Franklin D. Roosevelt.

Two American cities have acquired fame for the manner in which they observe New Year's Day—Philadelphia for its Mummers' Parade; and Pasadena, Calif., for its Tournament of Roses. The Mummers' Parade dates from 1876 and may be traced to Philadelphia's early English and Swedish residents; masqueraders roamed the city for a week after Christmas, making sport for everyone. The English residents brought with them the tradition of the Mummers' plays about St. George and the dragon and other subjects, which were given by masked performers dressed in fantastic costumes. More than 10,000 persons now participate in it, and prizes are offered for the best costumes, comic and otherwise.

The Pasadena Tournament of Roses was first held on Jan. 1, 1886. From that parade of a few flower-decorated private carriages of members of the Valley Hunt Club it has become one of the most elaborate float parades in the United States. Sometimes there are as many as 75 entries for the important communities of southern California. Each year some distinctive theme is chosen for the parade; that of 1937 was *Playland.* Its floats represented merry-go-rounds, seesaws and such Mother Goose or fairy-tale subjects as *Snow White and the Seven Dwarfs, Humpty-Dumpty* and the *Old Woman Who Lived in a Shoe.* The floats are always a mass of the gorgeous flowers that have added to the reputation for beauty of southern California.

Nobel Day. Dec. 10, a Swedish holiday when the king distributes the Nobel prizes to each year's winners. The date is the anniversary of the death (in 1896) of Alfred Nobel, the inventor who founded these prizes.

Norwegian Independence Day. May 17, a holiday observing the adoption of the Norwegian Constitution in 1814.

Occupation Day. July 25, a holiday in Puerto Rico.

Orange Day. July 12, the anniversary of the battle of the Boyne in 1690, observed in Northern Ireland. *Orange* refers to the victorious William III, of the House of Orange. This day is known also as *Orangemen's Day.*

Palio Races. July 2 and Aug. 16, special holidays in Siena, Italy, when horse races are held in the Piazza del Campo. The picturesque procession that precedes the races is held in honor of the Virgin Mary, the city's patroness. All who participate wear medieval costumes.

Palm Sunday. The Sunday preceding Easter.

Passover. This most solemn festival of the Jewish people is in commemoration of the night when the Lord, smiting the first-born of the Egyptians passed over the homes of the Jews and spared their children. The celebration is during the full moon of the month of Nisan, corresponding to March in the Gregorian calendar. It begins at sundown on the eve of the 14th day of Nisan, the extremely orthodox Jews celebrating for eight days instead of seven. The father of a family sits at the head of his table and recites the story of Passover, while before him are several dishes of food symbolic of the flight, which are partaken of at stated times. They include matzoth or unleavened bread, to commemorate the unraised dough carried in the hurried flight from Egypt; a roasted lamb bone and roasted egg to symbolize the burnt offerings made for their deliverance; horseradish or bitter herbs to represent the bitterness of life under the Egyptian rule and a stiff paste of apples, nuts and spices to typify the mortar used by the Jews in their heavy toil during their captivity. Before the holiday begins there are special dishes brought forth for cooking and serving, and no leavened bread is permitted in the house during the days of Passover.

The story of the passing-over is in the 12th chapter of Exodus, and the institution of the memorial is prescribed in the first 16 verses of chapter 13.

The *Lord's Supper* of the Christian Church is closely related to the Passover, since it was at the Passover feast that Jesus instituted the *Eucharist* or Holy Communion. The New Testament accounts are in I Corinthians 11: 23-26; Matthew 26: 26-30; Mark 14: 22-25; Luke 22: 14-20.

Patriots' Day. Apr. 19, a public holiday in Maine and Massachusetts in observance of the battle of Lexington and Concord at the beginning of the Revolution.

Pennsylvania Day. Oct. 24, a public holiday in Pennsylvania that is observed on the birthday of William Penn (often given as Oct. 14 from the old-style reckoning).

Pentecost. A Jewish festival that comes 7 weeks after the first day of the Passover.

Pioneer Day. A legal holiday in several western states. Idaho observes it on June 15; and Utah, on July 24.

Polish Constitution Day. May 3, a Polish holiday celebrating the adoption of a more liberal constitution in 1791.

Rizal Day. Dec. 30, a Filipino holiday that is the anniversary of the death of the patriot, José Rizal, in 1896.

Rosh Hashana. The Jewish New Year, known also as the Feast of the Trumpets, usually observed in September.

St. Andrew's Day. Nov. 30, a holiday in Scotland and New Zealand, the feast day of the patron saint of Scotland.

St. Catherine's Day. Nov. 25, the feast day of St. Catherine of Alexandria. It is marked in Paris by the parade of the midinettes or shopgirls. The unmarried ones under 25 attend St. Catherine's Mass.

St. David's Day. Mar. 1, a Welsh national festival, whose most distinctive feature is the wearing of leeks by all good Welshmen.

St. Francis' Day. Oct. 4, special observance of the saint's feast day at Assisi, Italy.

St. George's Day. Apr. 23, a holiday that is observed in England and New Zealand. Among celebrations in England is the ceremony of the Order of St. Michael and St. George at St. Paul's Cathedral, London. The day is also celebrated in Barcelona and other Spanish cities.

St. Januarius's Day. Sept. 19. The most important celebration of this feast day occurs in Naples, Italy. It has been held since the year 306, when Naples adopted St. Januarius as its patron saint.

St. John's Eve. June 23. This holiday in honor of St. John the Baptist is observed with the lighting of bonfires and dancing throughout most of the European countries. It is also known as Midsummer Eve, and the following day, when the festivities often continue, is called Midsummer Day.

St. Olaf's Day. July 29, a Norwegian holiday on which tribute is paid to Olaf Haraldsson, who reigned from 1016 to 1028. He is also the country's patron saint.

St. Patrick's Day. Mar. 17. On this day the Irish people throughout the world honor their great national saint. At the age of 106 years, St. Patrick died on March 17, 493 A.D., at Saul, County Down, and was buried at the Chieftain's Fort, about 2 miles from town. Bishops, priests and laymen gathered from all parts of Ireland around the burial place of their beloved leader.

Especially loyal in their devotion to St. Patrick are those Irishmen who have chosen to make their home in the United States. The first layman's celebration on this day was held under the auspices of the Charitable Irish Society of Boston about the middle of the 18th century. Later the Friendly Sons of St. Patrick was organized in Philadelphia and New York to take special note of the anniversary. St. Patrick's Day is observed in New York city also with a special mass and a parade on Fifth Avenue reviewed by the Cardinal and staff of St. Patrick's Cathedral.

St. Stephen's Day. Aug. 20, a Hungarian feast day whose religious procession is the culminating feature of St. Stephen's Week, celebrated Aug. 15–20. Stephen I, the canonized King of Hungary, 900 years ago converted his people to Christianity.

St. Swithin's Day. July 15, an old English holy day, on which the weather for the following 40 days was traditionally thought to depend.

St. Valentine's Day. Feb. 14, an old English festival for the exchange of sentimental tributes. The custom of sending valentines cannot be historically connected with the St. Valentine whose day is February 14. There are *two* saints of this name and day, but nothing is known of them but their date of martyrdom.

The Roman festival of the Lupercalia came on February 15th, and it was a time of considerable license when young men clad in goatskins ran through Rome striking women with thongs of goatskin—and thus (the belief was) making the women capable of bearing children. There is little but the date to connect the Lupercalia with our modern Valentine's Day.

St. Wilibrord's Day. Whit-Tuesday, the 52d day after Easter, a holiday in Luxemburg marked by the famous dancing procession at Echternach.

San Jacinto, Anniversary of the Battle of. Apr. 21, a public holiday in Texas.

Santa Fe Fiesta. Sept. 1–4, the anniversary period of the reconquering of what is now New Mexico by the Spanish under Don Diego de Vargas. This celebration was revived in 1919.

Seward Day. Mar. 30, a public holiday in Alaska.

Shrove Tuesday. The last day before Lent, celebrated in Roman Catholic communities by Mardi Gras festivities.

Sun Yat-sen Day. Mar. 12, the anniversary of the death in 1925 of the Chinese revolutionary leader.

Swiss Independence Day. Aug. 1, the anniversary of the day in 1291 when the three Forest Cantons—Uri, Schwyz and Unterwalden—formed a confederation.

Texan Independence, Anniversary of. Mar. 2, a public holiday in Texas.

Thanksgiving Day. The President of the United States and the governors of the various states usually name the last Thursday in November as Thanksgiving Day. The Pilgrim Fathers after landing at Plymouth had a very poor harvest in the summer of 1621. Although in great need, after getting the harvest in, they gathered together and thanked God for what He had given them.

Thanksgiving Day was annually recommended by Congress during the Revolution, but was discontinued from 1784 until 1789, when Congress recommended that Washington name a day of Thanksgiving for the adoption of the Constitution. In 1795 President Washington appointed a Thanksgiving Day upon the suppression of insurrection. In 1815 President Madison, upon recommendation from Congress, named a Thanksgiving Day in honor of peace.

In 1863 President Lincoln named a Thanksgiving Day and recommended that it be held yearly, and since then it has been an annual event. Mrs. Sarah J. Hale, editor of *Godey's Lady's Book,* for almost 20 years advocated this national religious festival.

Trinity Sunday. The eighth Sunday after Easter.

Twelfth Day and Twelfth Night. Jan. 6, Epiphany.

Union Day. May 31, a holiday celebrating the formation of the Union of South Africa in 1910.

Walpurgis Night. April 30, the eve of the feast day of St. Walburga, abbess of a German nunnery in the 8th century. The saint became associated with the tale of witches that on this night rode to the Brocken in the Harz Mountains for a rendezvous with Satan. Throughout Europe bonfires are lighted on Walpurgis Night.

Washington's Birthday. Feb. 22. This day is celebrated as a patriotic holiday in all the states, territories and possessions of the United States. Its observance dates from Washington's death in 1799. One of the last acts of Congress before its removal from Philadelphia to Washington was the recommendation that Washington's Birthday be observed throughout the United States with "exercises intended to express the popular esteem for the first President."

West Virginia Day. June 20, a public holiday in West Virginia.

Whitmonday or **White Monday.** The day following Whitsunday.

Whitsunday. The seventh Sunday after Easter, the festival of the Pentecost in certain Christian churches.

Wilson's Birthday. Dec. 28, a public holiday in South Carolina.

Yom Kippur. A Jewish fast day, occurring in September or October; the Day of Atonement.

Yugoslav Independence Day. Dec. 2, a national holiday celebrating the formation in 1918 of the Kingdom of the Serbs, Croats and Slovenes.

Yule. Christmas, Dec. 25.

SPECIAL DAYS

(Listed by Calendar Dates)

January
1, New Year's Day
6, Epiphany
6, Twelfth Day
6, Twelfth Night
8, Jackson Day
19, Lee's Birthday
20, Inauguration Day
26, Australian Foundation Day
31, Portuguese Dedication Day
February
2, Candlemas
2, Ground-hog Day
11, Kosciusko Day
12, Georgia Day
12, Lincoln's Birthday
14, St. Valentine's Day
16, Lithuanian Independence Day
22, Washington's Birthday
March
1, St. David's Day
2, Texan Independence, Anniversary of
3, Japanese Dolls' Festival
12, Sun Yat-Sen Day
15, Hungarian Day of Hope
17, St. Patrick's Day
22, Emancipation Day (Puerto Rico)
25, Annunciation or Lady Day
25, Maryland Day
28, Komensky Day
30, Seward Day
April
1, April Fool's Day
6, Army Day
6, Greek Independence Day
12, Halifax Independence Resolutions, Anniversary of
13, Jefferson's Birthday
19, Patriots' Day
21, San Jacinto, Anniversary of Battle of
23, St. George's Day
26, Confederate Memorial Day
29, Gran Canaria Fete
30, Walpurgis Night
May
1, Child Health Day
1, May Day
3, Polish Constitution Day
5, Japanese Boys' Festival
10, Confederate Memorial Day
12, Hospital Day
16, Jan Nepomucky Day
17, Norwegian Independence Day
20, Mecklenburg Declaration of Independence
22, National Maritime Day
24, Empire Day (British)
30, Decoration Day, Memorial Day
31, Union Day in the Union of South Africa
June
3, Confederate Memorial Day
3, Davis's Birthday
5, Danish Independence Day
6, Italian Independence Day
11, Kamehameha Day
14, Flag Day
15, Magna Charta Day
15, Pioneer Day (Idaho)
17, Bunker Hill, Anniversary of Battle of
20, West Virginia Day
23, St. John's Eve
24, Midsummer Day
28, Kosovo Day
July
1, Dominion Day
2, Palio Race, Siena, Italy
4, Independence Day
12, Orange Day
13, Forrest's Birthday
14, Bastille Day
15, St. Swithin's Day
21, Belgian Independence Day
24, Pioneer Day (Utah)
25, Occupation Day, Puerto Rico
29, St. Olaf's Day
August
1, Colorado Day
1, Lammas Day
1, Swiss Independence Day
13, Filipino Independence Day
15, Assumption
16, Bennington Battle Day
16, Palio Race, Siena, Italy
20, St. Stephen's Day
September
1–4, Santa Fe Fiesta
6, Lafayette Day
9, California Day
12, Defenders' Day
16, Mexican Independence Day
17, Constitution Day
19, St. Januarius's Day
29, Michaelmas
October
1, Missouri Day
4, St. Francis's Day
5, Bulgarian Independence Day
6, Hungarian Memorial Day
9, Fire Prevention Day
9, Fraternal Day
12, Columbus Day
18, Alaska Day
24, Pennsylvania Day
31, Halloween
31, Nevada Day
November
1, All Saints' Day
2, All Souls' Day
5, Guy Fawkes's Day
9, Lord Mayor's Show Day
11, Armistice Day
11, Martinmas
18, Latvian Independence Day
25, St. Catherine's Day
30, St. Andrew's Day
December
2, Yugoslav Independence Day
6, Finnish Independence Day
7, Delaware Day
8, Immaculate Conception
10, Nobel Day
11, Indiana Day
12, Feast of the Virgin of Gaudalupe
21, Forefathers' Day
25, Christmas, Yule
28, Childermas
28, Wilson's Birthday
30, Rizal Day

Days with Movable Dates

Arbor Day. Date set in most states by proclamation, coming early in the spring.

Passover. A period of 8 days coming late in March or early in April. Seven weeks after the first day of the Passover is the festival of the Pentecost.

Lent and related days vary with the date of Easter, which is determined by the moon's phases. Lent begins with ASH WEDNESDAY and includes the 40 weekdays preceding Easter. The last day before Lent is SHROVE TUESDAY, marked by MARDI GRAS celebrations. MOTHERING SUNDAY is the middle of Lent. The last week of Lent is HOLY WEEK, which begins with PALM SUNDAY. MAUNDY THURSDAY and GOOD FRIDAY occur in Holy Week. EASTER SUNDAY may fall on any date between Mar. 22 and Apr. 25, inclusive. EASTER MONDAY is the following day. Other days determined by the date of Easter include ASCENSION DAY, 40 days after Easter; WHITSUNDAY, the seventh Sunday after Easter; TRINITY SUNDAY, next after Whitsunday; and CORPUS CHRISTI, the Thursday following Trinity Sunday.

Fast Day. The last Thursday in April.

Mothers' Day. The second Sunday in May.

Fathers' Day. The third Sunday in June.

Labor Day. The first Monday in September.

Yom Kippur or **Day of Atonement.** In the last half of September or the first half of October.

General Election Day. The Tuesday following the first Monday in November.

Advent. The period beginning with the fourth Sunday before Christmas.

Thanksgiving Day. The last Thursday in November.

DICTIONARY OF GIVEN NAMES

Aaron (âr′ un), m. From the Hebrew Aharōn, mountaineer, enlightener. Arab. Hārūn, or Hāroun; Fr. Aaron; Ger. Adrōn; It. Aronne; Lat. Aaron; Port. Aarão; Sp. Aron.

Abel (ā′ bl), m. From the Hebrew Hebel, transitoriness, vanity, breath, Arab, Habeel Habil; Fr. Abel; Gr. Abel; Lat. Abel.

Abigail (ab′ i gāl), f. From the Hebrew Abigayil, my father is joy, source of delight.

Abner (ab′ nẽr), m. From the Hebrew Abnẽr, my father is light; father of light.

Abraham (ā′ br*a* ham), m. From the Hebrew Abrāhām, meaning exalted father or father of a multitude. Arabic Ibrahim; Danish Abraham; Dutch Abraham; Fr. Abraham; Ger. Abraham; It. Abrahamo; Lat. Abrahamus; Port. Abrahão; Sp. Abrahán.

Abram (ā′ bram), m. From the Hebrew Abrām, exalted father. Fr. Abram; It. Abramo; Lat. Abramus; Sp. Abram.

Absalom (ab′ s*a* lom), m. From the Hebrew Abshālōm, father of peace.

Ada (ā′ d*a*), f. From the Hebrew Ādāh, ornament, beauty, happiness. Gr. Ada.

Adam (ad′ am), m. From the Hebrew Ādām, man or earthy, of red earth, human frailty. Danish Adam; Fr. Adam; Ger. Adam; It. Adamo; Port. Adão; Sp. Adán.

Adelaide (ad′ e lād), f. From the Old High German Adelheit, of noble rank.

Adelbert (ad′ el bẽrt), m. From the Middle High German Adelberht, nobly bright.

Adelina (ad e lī′ n*a*) or **Adeline** (ad′ e līn), f. From the Teutonic, of noble birth. Danish Adeline; Dutch Adelina; Fr. Adeline, Adèle, Aline; Ger. Adeline, Adele, Adelheid, Else, Ilse; It. Adelaida; Lat. Adelina.

Adolph (ad′ olf), m. From the Old High German Adolf, Adulf, Athaulf, noble wolf, noble hero. Danish Adolf; Dutch Adolf; Fr. Adolphe; Ger. Adolf, Adolph; It. Adolfo; Lat. Adolphus; Port. Adolfo; Sp. Adolfo.

***Adrian** (ā′ dri an), or **Hadrian** (hā′ dri an), m. From the ancient place named Adria or Hadria on the Adriatic Sea, near Venice.

Adrienne (ā′ dri en). Feminine of Adrian.

Agatha (ag′ *a* tha), f. From the Greek *ag′athē*, feminine of *agathos*, good, kind. Dutch Agnes; Fr. Agnès; Ger. Agnes; It. Agata; Lat. Agatha; Port. Agatha; Sp. Agata; Sw. Agata.

Agnes (ag′ nes), f. From the Greek *hagnē*, feminine of *hagnos*, holy. Danish Agnes; Dutch Agnes; Fr. Agnès; Ger. Agnes; It. Agnese; Lat. Agnes; Port. Inês; Sp. Inés.

***Aileen** (ā′ lēn), or **Eileen** (ī′ lēn), f. From the Irish Eibhlīn, Helen.

Alan (al′ an), m. From Latin and Celtic, cheerful. Fr. Alain; It. Alano; Lat. Alanus; Sp. Alano.

***Alaric** (al′ a rik), m. From the Gothic *alareiks*, all-ruler, supreme ruler. Danish Alarick; Fr. Alaric; Ger. Alarich; It. Alarico; Lat. Alaricus; Sp. Alarico.

Albert (al′ bẽrt), m. From the Old High German Albrecht, illustrious through nobility. Fr. Albert; Ger. Adalbert, Albert, Albrecht; It. Alberto; Lat. Albertus; Sp. Alberto; Sw. Albert.

Alberta (al bûr′ t*a*). Feminine form of Albert.

Alexander (al eg zan′ dẽr), m. From the Greek Alexandros, defender of men, helper of men. Dutch Alexander; Fr. Alexandre; Ger. Alexander; It. Alessandro, Sandro; Lat. Alexander; Turkish Iskander; Sp. Alejandro; Port. Alexandre.

Alexandra (al eg zan′ dr*a*). Feminine form of Alexander. Fr. Alexandrine; It. Alessandra; Sp. Alejandra, Alejandrina.

***Alexis** (a lek′ sis), m. From the Greek Alexis, help, defense. Fr. Alexis; Russ. Alexei.

Alfred (al′ fred), m. From the Anglo-Saxon Ælfred, elf in council, good counselor. Danish Alfred; Dutch Alfred; Fr. Alfred; Ger. Alfred; It. Alfredo; Lat. Alfredus; Port. Alfredo; Sp. Alfredo.

***Algernon** (al′ jẽr non), m. From the Old French *al grenon*, with mustache, bearded.

Alice (al′ is), f. From the Greek *alētheia*, truth. Danish Else; Dutch Elsje; Fr. Alice; Ger. Alice; It. Alicia; Lat. Alicia; Sp. Alícia; Sw. Elsa.

Allan (al′ an) or **Allen** (al′ en), m. Variant forms of Alan.

Allison (al′ i son), f. From Alexis.

Alma (al′ ma), f. Latin, nourishing, cherishing.

Aloysius (al ō is′ i us), m. From the Old High German Hluth awig, famous warrior.

Alphonso (al fon′ zō), m. From the Old High German Adalfuns, of noble birth, ready, willing, eager for battle. Danish Alfons; Fr. Alphonse; Ger. Alfons; It. Alfonso; Lat. Alphonsus; Port. Affonso; Sp. Ildefonso, Alfonso, Alonso.

Althea (al thē′ *a*), f. From the Greek *althaia*, healer.

Alvah (al′ v*a*), or **Alvan** (al′ van), m. From the Hebrew Alvāh, Alvān, tall.

Alvin (al′ vin) or **Alwin** (al′ win), m. Teutonic, noble, friend, loved by all. Dutch Alewijn; Fr. Aluin; Ger. Alwin; It. Aluino; Lat. Alwinus; Sp. Aluino.

Amanda (a man′ d*a*), f. Latin, worthy of being loved. Fr. Amandine.

Ambrose (am′ brōz), m. From the Greek *ambrotos*, immortal, divine. Danish Ambrosius; Dutch Ambrosius; Fr. Ambroise; Ger. Ambrosius; It. Ambrogio; Lat. Ambrosius; Port. Ambrosio; Sp. Ambrosio.

Amelia (a mēl′ y*a*), f. Teutonic, industrious, energetic. Danish Amalie; Dutch Amalia; Fr. Amélie; Ger. Amalia; It. Amelia, Amalia; Port. Amelia; Sp. Amelia.

Amos (ā′ mos), m. Hebrew, God, burden.

Amy (ā′ mi), f. From the Latin Amata; beloved. Fr. Aimée; It. Amata.

Anastasia (an as tā′ shi *a*), f. From the Greek Anastasios, of the Resurrection.

Andrew (an′ dro͞o), m. From the Greek Andreas, manly, strong, courageous. Danish Andreas; Dutch Andreas; Fr. André, Andrieu; Ger. Andreas; It. Andrea; Lat. Andreas; Port. Andre; Sp. Andrés.

Angela (an′ je l*a*) or **Angelina** (an jel ī′ n*a*), f. Variant forms of Angelica.

Angelica (an jel′ i k*a*), f. From the Greek *angelikos*, angelic. Fr. Angelique; Ger. Angelika; It. Angelica.

Angus (ang′ gus), m. From the Middle Irish Oengus, excelling strength.

Ann, Anne (an) or **Anna**, f. From the Hebrew Hannāh, grace. Danish Anna; Dutch Anna; Fr. Anne, Annette, Nannette, Ninon; Ger. Anna; It. Anna; Lat. Anna; Sp. Ana.

Anselm (an′ selm) or **Ansel,** m. Teutonic, with divine helmet. Dutch Anselmus; Fr. Anselme; Ger. Anselm; It. Anselmo; Lat. Anselmus; Port. Anselmo; Sp. Anselmo.

Anthony (an′ tō ni) or **Antony,** m. From the Latin Antonius, inestimable, praiseworthy. Danish Anton; Dutch Anton; Fr. Antoine; Ger. Anton, Antonius; It. Antonio; Port. Antonio; Sp. Antonio; Sw. Anton.

Arabella (ar *a* bel′ *a*), f. Teutonic, eagle heroine. Dutch Arabella; Fr. Arabelle; Ger. Arabelle; It. Arabella; Lat. Arabella; Sp. Arabela.

Archibald (är′ chi bôld), m. From the Old High German Erchanpald, nobly bold. Fr. Archambault; Ger. Archimbald; It. Arcibaldo; Lat. Archibauldus.

Arnold (ar′ nuld), m. From the Old High German Aranold, strong as an eagle. Fr. Arnaud; Ger. Arnold; It. Arnoldo; Lat. Arnoldus, Arnaldus; Sp. Arnaldo.

Arthur (är′ thẽr), m. From the Welsh Artus, high, valorous. Fr. Arthur, Artus; It. Arturo; Lat. Arthurus.

Asa (ā′ s*a*), m. From the Hebrew Āsā, healer.

Aubrey (ô′ bri), m. From the German Alberich, elf ruler. Dutch Alberich; Fr. Aubri; Ger. Alberich; It. Alberico.

Audrey (ô′ dri), f. From the Anglo-Saxon Aethelthrȳth, simplicity.

Augusta (ô gus′ t*a*). Feminine of Augustus.

Augustin (ô gus′ tin) or **Augustine** (ô′ gustēn), m. From the Latin Augustinus, belonging to Augustus. Dutch Augustinus, Augustijn; Fr. Augustin; Ger. Augustin; It. Agostino; Port. Agostinho; Sp. Augustín.

Augustus (ô gus′ tus), m. From the Latin, august, majestic. Danish August; Dutch Augustus; Fr. Auguste; Ger. August; It. Augusto.

Aurelia (ô rē′ lia). Feminine form of Aurelius. Dutch Aurelia, Aurelie; Fr. Aurélie; Ger. Aurelie, Aurelia; It. Aurelia; Sp. Aurelia.

Aurelius (ô rē′ li us), m. Latin, golden. Fr. Aurèle; It. Aurelio.

Baldwin (bôld′ win), m. From the Old High German Baldwini, bold friend, courageous friend. Danish Balduin; Fr. Baudouin; Ger. Balduin; It. Baldovino, Balduino; Lat. Balduinus.

***Balthasar** (bal thā′ zẽr) or **Balthazar,** m. From the Greek Baltasaros. Variant of Belshazzar.

Barbara (bär′ b*a* r*a*), f. From the Greek *barbaros*, foreign, strange. Dutch Barbara; Fr. Barbe; Ger. Barbara; It. Barbara; Sp. Bárbara; Lat. Barbara.

Barnabas (bär′ n*a* bas) or **Barnaby** (bär′ n*a* bi), m. From the Aramaic *barnebhūāh*, son of exhortation. Danish Barnabas; Dutch Barnabas; Fr. Barnabé; Ger. Barnabas; It. Barna, Barnaba; Lat. Barnabas; Port. Barnabe; Sp. Bernabé.

***Bartholomew** (bär thol′ ō mū), m. From the Greek form of Aramaic meaning son of Talmai. Danish Bartholomæus; Dutch Bartholomeus; Fr. Barthélemy, Bartholomé; Ger. Bartholomäus; It. Bartolomeo; Lat. Bartholomaeus; Port. Bortolomeu; Sp. Bartolomé.

***Basil** (baz′ il), m. From the Greek *basileios*, kingly royal. Danish Basilius; Dutch Basilius; Fr. Basile; Ger. Basilius; It. Basilio; Lat. Basilius; Russ. Vasilii; Port. Basilio; Sp. Basilio; Sw. Basilius.

Beatrice (bē′ *a* tris), f. From the Latin *beatrix*, she that makes happy. Danish Beatrix; Dutch Beatrix; Fr. Béatrice, Béatrix; Ger. Beatrice; It. Beatrice; Lat. Beatrix; Port. Beatriz; Sp. Beatriz; Sw. Beatrix.

Belinda (bē lin′ d*a*), f. Latin, serpent, wise.

Belle (bel), f. From the French *belle*, feminine of *beau*, beautiful, fair.

Belshazzar (bel shaz′ ẽr), m. From the Hebrew Bēlshatstsar, may Bel protect the king.

Benedict (ben′ ē dikt), m. From the Latin Benedictus, blessed. Danish Benedict; Dutch Benedictus; Fr. Benoît; Ger. Benedikt; It. Benedetto; Port. Benedicto, Bento; Sp. Benedicto; Benito.

Benjamin (ben′ j*a* min), m. From the Hebrew Benjāmīn, son of the right hand. Danish

Benjamin; Fr. Benjamin; Ger. Benjamin; It. Beniamino; Lat. Benjaminus; Port. Benjamin; Sp. Benjamín.

Bennet (ben′ et), m. Variant of Benedict.

Berenice (ber ē nī′ sē), f. From the Greek Berenikē, bringing victory.

Bernard (bur′ närd) or **Barnard** (bär′ nērd), m. From the Old High German *berohart,* bold as a bear. Danish Bernhard; Dutch Barend, Berenhardus; Fr. Bernard, Bernardin; Ger. Bernhard, Barend, Berend; It. Bernardo, Bernardino; Lat. Bernardus; Sp. Bernardo, Bernal; Sw. Bernhard.

Bernice (bûr′nis), f. Variant of Berenice.

Bertha (bûr′ th*a*), f. From the Old High German Perahta, bright. Dutch Bertha; Fr. Berthe; Ger. Bertha; It. Berta; Lat. Bertha; Sw. Bertha.

Bertram (bûr′ tram), m. From the Old High German Berahtram, Berahthraban, bright raven. Fr. Bertrand; Ger. Bertram, Bertrand; It. Bertrando; Port. Bertrão; Sp. Beltrán.

Bertrand (ber′ trä N), m. French form of Bertram.

Beryl (ber′ il), f. From the Greek *bēryllos,* a crystal.

Beulah (bū′ l*a*), f. From the Hebrew *beūlāh,* married.

Blanch (blånch) or **Blanche,** f. From the Old High German *blanch,* shining bright, white. Danish Blanca; Fr. Blanche; Ger. Blanca; It. Bianca; Sp. Blanca; Sw. Blanka.

Boniface (bon′ i fās), m. From the Latin Bonifatus, lucky, fortunate. Dutch Bonifacius; Ger. Bonifacius; It. Bonifacio, Bonifazio; Lat. Bonifacius; Port. Bonifacio; Sp. Bonifacio.

Boris (bō′ ris), m. Russian, a warrior.

Brian (brī′ an) or **Bryan,** m. Irish, strong.

***Bridget** (brij′ et) or **Brigid** (brij′ id), f. From the Irish *brighid,* high, lofty, august. Fr. Brigitte; Ger. Brigitte; It. Brigida; Sp. Brigida.

Bruno (brōō′ nō), m. From the Old High German *brūn,* brown.

Cadwallader (kad wol′ *a* dēr), m. From the Welsh *cadgwaldr,* battle arranger.

***Caesar** (sē′ zēr), m. Latin. Fr. César; Ger. Cäsar; It. Cesare; Port. Cesar; Sp. César.

Caleb (kā′ leb), m. From the Hebrew *kālēb,* dog.

Calvin (kal′ vin), m. From the Latin *calvus,* bald. Fr. Calvin, Cauvin; It. Calvino; Lat. Calvinus; Sp. Calvino.

Camilla (c*a* mil′*a*), f. Latin, attendant at a sacrifice, a freeborn girl. Fr. Camille; It. Camilla; Lat. Camilla.

Carlotta (kär lot′ *a*), f. Italian form of Charlotte.

Carmen (kär′ men), f. Latin, song.

Caroline (kar′ ō līn). Feminine of Charles. Danish Caroline; Dutch Carolina; Fr. Caroline; Ger. Caroline, Karoline; It. Carolina; Lat. Carolina; Port. Carolina; Sp. Carolina; Sw. Carolina.

Caspar or **Casper** (kas′ pēr), m. Variants of Gaspar, Jasper.

Catherine (kath′ ēr in) **Catharine, Kathryn** or **Catharina** (kath a rī′ n*a*), f. From the Greek *katharos,* pure. Danish Catharine; Fr. Catherine; Ger. Katharine, Katrina; It. Caterina; Lat. Catharina; Port. Catharina; Sp. Catalina.

Cecil (sē′ sil), m. From the Latin Cæcilius, dim-sighted. Dutch Cecilus; Fr. Cécile.

Cecilia (se sil′ i*a*) **Cecily** (ses′ ili) or **Cecile** (sē sēl′), f. Feminine forms of Cecil. Dutch Cecilia; Fr. Cécile; Ger. Cäcilia; It. Cecilia; Port. Cecilia; Sp. Cecilia.

Cedric (sed′ rik), m. From the Anglo-Saxon Cerdic, chieftain.

Celeste (sē lest′), f. From the French Céleste, heavenly.

Celestine (sē les′ tin), f. From the Latin Caelestina, heavenly. Fr. Célestine; Ger. Cölestine.

Celia (sēl′ y*a*), f. From the Latin *caelum,* heaven. Fr. Célie, It. Celia.

Charissa (k*a* ris′ *a*), f. From the Greek *charis,* grace.

Charles (chärlz), m. Teutonic, manly, strong, noble spirited. Danish Carl; Dutch Karel; Fr. Charles; Ger. Carl, Karl; It. Carlo; Lat. Carolus; Sp. Carlos; Sw. Karl.

Charlotte (shär′ lot), f. Teutonic, noble spirited. Danish Charlotte; Dutch Charlotta; Fr. Charlotte; Ger. Charlotte; It. Carlotta; Lat. Caroletta; Port. Carlota; Sp. Carlota.

Chloë (klō′ ē) or **Chloe,** f. From the Greek Chloē, blooming. Fr. Chloé; Lat. Chloe.

Christabel (kris′ t*a* bel). A feminine name.

Christian (kris′ chan), m. From the Greek Christianos, one who believes in Christ. Danish Christian; Fr. Chrétien; Ger. Christian; It. Cristiano; Lat. Christianus; Port. Christiano; Sp. Christiano.

Christina (kris ti an′ *a*). Feminine of Christian. Dutch Christina; Fr. Christine; Ger. Christiane, Christine; It. Christina; Port. Christinya; Sp. Christina.

Christina (kris tē′ n*a*), f. Dutch, Italian and Spanish form of Christiana.

Christopher (kris′ tō fēr), m. From the Greek Christophoros, bearing Christ. Danish Christoffer; Dutch Christophorus; Fr. Christophe; Ger. Christophorus, Christoph; It. Cristoforo; Lat. Christophorus; Port. Christovēo; Sp. Christobal; Sw. Kristofer.

Cicely (sis′ e li), f. Variant of Cecilia.

Clara (klar′ *a*), f. Latin, bright, illustrious. Danish Clara; Dutch Clara; Fr. Claire, Clara; Ger. Klara, Clara; It. Chiara; Port. Clara; Sp. Clara; Sw. Klara.

Clare (klar). Latin, bright.

Clarence (klar′ ens), m. From Clare in the English dukedom.

Claribel (klar′ i bel), f. Latin, brightly, fair.

Clarice (klar′ is) or **Clarissa** (klar is′ *a*), f. Latin, making famous. Fr. Clarisse; Ger. Klarissa, Clarissa; It. Clarissa.

Clarinda (kla rin′ d*a*), f. Latin, brightly, fair.

Claude (klôd), m. Variant of Claudius.

Claudia (klō′ di *a*). Feminine of Claudius. Dutch Claudia; Fr. Claude, Claudie, Claudine; Ger. Claudia; It. Claudia; Sp. Claudia, Claudina; Sw. Claudia.

Claudius (klô′ di us), m. From the Latin *claudus,* lame. Danish Claudius; Dutch Claudius; Fr. Claude; Ger. Claudius; It. Claudio; Lat. Claudius; Sp. Claudio; Sw. Claudius.

Clement (klem′ ent), m. From the Latin *clemens,* mild, calm, merciful. Danish Clemens; Dutch Clementius; Fr. Clément; Ger. Klemens; It. Clemente; Sp. Clemente.

Clementina (klem en tē n*a*) or **Clementine** (klem′ en tēn). Feminine of Clement. Dutch Clementine; Fr. Clémentine; Ger. Klementine; It. Clementina.

Clifford (klif′ ērd), m. Anglo-Saxon, ford at cliffs.

Clothilda (klō til′ d*a*), **Clothilde** (klō tēld′) or **Clotilda** (klō til′ d*a*), f. Teutonic, famous battle maid.

Conrad (kon′ rad), m. From the Old High German Kuonrāt, giving hold or wise counsel. Danish Conrad; Dutch Koenraad; Fr. Conrad, Conrade; Ger. Konrad; It. Corrado, Conrado; Lat. Conradus; Sp. Conrado; Sw. Conrad.

Constance (kon′ stans), f. From the Latin Constantia, firmness, constancy. Dutch Constantia; Fr. Constance; Ger. Konstanze, Constantia; It. Costanza; Port. Constancia; Sp. Costenza, Constanza.

Constant (kon′ stant), m. From the Latin Constans, firm, faithful, true. Ger. Konstanz; It. Costante, Costanzo; Port. Constanzio; Sp. Constancio.

Constantine (kon′ stan tīn), m. From the Latin Constantinus, firm. Danish Constantin; Dutch Constantijn; Fr. Constantin; Ger. Konstantin, Constantin; Gr. Konstantinos; It. Constantino; Port. Constantino; Sp. Constantino.

Cora (kō′ r*a*), f. From the Greek *kore,* maiden. Fr. Corinne.

Cordelia (kôr dēl′ y*a*), f. From the Celtic Creiddylad, jewel of the sea. Fr. Cordélie; Ger. Cordelia, Cordula.

Corinna (kô rin′ *a*), f. From the Greek Korinna, maiden. Fr. Corinne.

Cornelia (kôr nēl′ y*a*). Feminine of Cornelius. Fr. Cornélie; Ger. Cornelia; It. Cornelia.

Cornelius (kôr nēl′ yus), m. Latin, horn. Danish Cornelius, Dutch Kornelis, Cornelis; Fr. Corneille, Cornélius; Ger. Cornelius; It. Cornelia; Lat. Cornelius; Port. Cornelio; Sp. Cornelio.

Crispin (kris′ pin), m. From the Latin *crispus,* curly. Dutch Krispijn; Fr. Crépin, Crispin; Ger. Crispus; It. Crispino, Crispo; Sp. Crispo; Sw. Krispin.

Cuthbert (kuth′ bērt), m. From the Anglo-Saxon Cūthbeorht, noted splendor.

Cynthia (sin′ thi a), f. From the Greek Kynthia, of or from Mt. Cynthus.

Cyril (sir′ il), m. From the Greek Kyrillos, lordly. Danish Cyrillus; Dutch Cyrillus; Fr. Cyrille; Ger. Cyrill; It. Cirillo; Lat. Cyrillus; Sp. Cirilo.

Cyrus (sī′ rus), m. From the Old Persian *kūrush,* the sun. Fr. Cyrus; Ger. Cyrus; It. Ciro; Sp. Ciro.

Dagmar (dag′ mär), f. Teutonic, Dane's joy.

Daisy (dā′ zi), f. From the Anglo-Saxon *dœges-ēage,* day's eye, daisy.

Dan (dan), m. From the Hebrew Dān, judge, name of one of the 12 tribes.

Daniel (dan′ yel), m. From the Hebrew Dāniēl, Dānīyāl, God is my judge. Danish Daniel; Dutch Daniel; Fr. Daniel; Ger. Daniel; It. Daniele; Lat. Daniel; Sp. Daniel.

Daphne (daf′ nē), f. From the Greek *daphnē,* laurel, bay tree.

Darius (da rī′ us), m. From the Old Persian Dārayavahush, possessing wealth.

David (dā′ vid), m. From the Hebrew Dāwid, Dāwīd, beloved. Danish David; Dutch David; Fr. David; Ger. David; It. David, Davidde.

Deborah (deb′ ō r*a*), f. Hebrew Dēbōrāh, a bee. Dutch Debora; Fr. Débora; It. Debora; Lat. Debora.

Delia (dēl′ y*a*), f. From the Greek, *dēlia,* of Delos.

Delphine (del fēn′), f. French, from Latin, dolphin.

Demetrius (dē mē′ tri us), m. From the Greek, Dēmētrios, belonging to Demeter. Fr. Démétrius; Ger. Demetrius; It. Demetrio; Lat. Demetrius; Port. Demetrio; Russ. Dmitri.

Denis (den′ is), or **Dennis,** m. Variants of Dionysius.

Denise (dē nēz′). French feminine form of Denis.

Dexter (dek′ stēr), m. Latin, on the right hand, fortunate.

Diana (dī an′ *a*), f. From the Latin *dius,* divine, goddess. Danish Diana; Fr. Diane; Ger. Diana; Gr. Artemis; It. Diana; Lat. Diana.

Dinah (dī′ n*a*), f. Hebrew Dīnāh, judged.

Dionysius (dī ō nish′ us), m. From the Greek Dionysios, belonging to the god of wine. Danish Dionysius; Dutch Dionysius; Fr. Denys, Denis; Ger. Dionysius, Dionys; It. Dionigi, Dionisio; Port. Dionysio; Sp. Dionisio.

Dolores (dō lō′ res), f. Spanish, sorrows.

Dominic (dom′ i nik), m. From the Latin *dominicus,* belonging to the Lord. Danish Dominicus; Dutch Dominicus; Fr. Dominique; It. Domenico; Port. Domingos; Slavik Dominik; Sp. Domingo; Sw. Dominicus.

Donald (don′ ald), m. From the Gaelic Domnall, world ruler, proud chief.

Doris (dôr′ is), f. From the Greek Dōris, of the sea.

Dorcas (dôr′ kas), f. From the Greek *dorkas,* gazelle.

Dorothy (dôr′ ō thi) or **Dorothea** (dor ō-thē′ *a*), f. From the Greek Dōrothea, gift of God. Danish Dorothea; Dutch Dorothea; Fr. Dorothée, Dorette; Ger. Dorothea; It. Dorotea; Sp. Dorotea; Sw. Dorothea.

Drusilla (drōō sil′ l*a*), f. Diminutive and feminine of the Latin masculine name Drusus. Fr. Drusille; Ger. Drusille; It. Drusilla; Lat. Drusilla.

Drusus (drōō′ sus), m. Latin, strong.

Dulce (dul′ sē) or **Dulcie** (dul′ si), f. From the Latin *dulcis,* charming, dear, sweet.

Duncan (dung′ kan), m. From the Gaelic *donnchadh,* brown.

Earl (ûrl), m. Anglo-Saxon, man, noble.

Ebenezer (eb en ē′ zēr), m. From the Hebrew Eben ha-Ezer, the stone of help.

Edgar (ed′ gēr), m. From the Anglo-Saxon Ēadgar, javelin, rich spear. Ger. Edgar; It. Edgaro; Lat. Edgarus.

Edith (ē′ dith), f. From the Anglo-Saxon Eadgyth, happy. It. Edita; Lat. Editha.

Edmund (ed′ mund), m. From Anglo-Saxon Ēadmund, defender of property. Danish Edmund; Dutch Edmund; Fr. Edmund; Ger. Edmund; It. Edmondo; Lat. Edmundus; Port. Edmundo; Sp. Edmundo.

Edna (ed′ n*a*), f. From the Hebrew *ēdnāh,* rejuvenation.

Edward (ed′wērd), m. From the Anglo-Saxon Ēadweard, guardian of property, defender. Danish Edvard; Dutch Eduard; Fr. Édouard; Ger. Eduard; It. Edoardo, Eduardo; Lat. Edvardus; Port. Eduardo, Duarte; Sp. Eduardo.

Edwin (ed′ win), m. From the Anglo-Saxon Ēadwin, gainer of property. Danish Edwin; Ger. Edwin; It. Edvino; Lat. Edvinus.

Edwina (ed wē′ n*a*). Feminine form of Edwin.

Egbert (eg′ bērt), m. From the Anglo-Saxon Ecgbeorht, bright sword. Ger. Eckbert, Egbert; It. Egberto; Lat. Egbertus; Port. Egberto.

Eileen (ī′ lēn), f. Irish form of Helen.

Elaine (ē lān′), f. Variant of Helen.

Elbert (el′ bērt), m. Variant of Albert. Lat. Elbertus.

Eldred (el′ dred), m. From the Anglo-Saxon Ealdrēd, battling counsel. Lat. Eldredus.

Eleanor (el′ *a* nēr) or **Elinor** (el′ i nēr), f. From the Old French Elienor. Danish Eleonore; Dutch Leonora; Fr. Éléonore, Aliénor; Ger. Eleonore; It. Eleonora; Lat. Eleanora; Sp. Leanor.

Eleazer (el ē ā′ zēr) or **Eleazar,** m. From the Hebrew Elāzār, God hath helped. Dutch Eleazar; Fr. Éléazar; It. Eleazaro; Sp. Ecázaro.

Eli (ē′ lī), m. From the Hebrew Elī, high.

Elias (ē lī′ as), m. Variant of Elijah. Danish Elias; Fr. Élie; Ger. Elias; It. Elia; Lat. Elias.

Elihu (ē lī hū or el′ i hū), m. From the Hebrew Elīhū, God is He.

Elijah (ē lī′ j*a*), m. From the Hebrew Elīyāh, Jehovah is God. Dutch Elias, Elia; Fr. Élie; Ger. Elias, Elia; It. Elia; Lat. Elija.

Elisha (ē lī′ sha), m. From the Hebrew Elīshā, God is salvation. Fr. Elisée; It.

Eliseo; Lat. Elisæus; Port. Eliseu; Sp. Eliseo.

Elizabeth (ē liz′ *a* beth), **Elisabeth** or **Eliza** (ē līz′ *a*), f. From the Hebrew Elīsheba, consecrated to God. Danish Elisabeth; Dutch Elizabeth, Elisa; Fr. Élisabeth, Élisa, Élise; Ger. Elisabeth, Elise; Gr. Elisabet; It. Elisabetta, Elisa; Lat. Elizabetha, Sp. Isabel.

Ellen (el′ en), f. Variant of Helen.

Elmer (el′ mẽr), m. From the Anglo-Saxon Æthelmær, noble, famous.

Eloise (el ō ēz′), f. Variant form of Heloise.

Elsa (el′ s*a*), f. A German feminine name.

Elspeth (el′ speth), f. Scottish variant of Elizabeth.

Elvira (el vī′ r*a*), f. Spanish, fair, white.

Emeline (em′ e līn) or **Emmeline** (em′ el ēn), f. Variants of Emily.

Emery, Emmery or **Emory** (em′ e ri), m. From the Old High German Amalrīch, work, rule. Fr. Émeri, Émery; Ger. Emerich; It. Amerigo; Lat. Almericus.

Emil (ē′ mil or ā′ mil), m. French, industrious.

Emilia (ē mil′ i*a*), f. Italian, Spanish and Dutch form of Emily.

Emily (ĕm′ i li), f. From the Latin Aemilia, a famous family. Dutch Emilia; Fr. Émilie; Ger. Emilie; It. Emilia; Sp. Emilia.

Emma (em′ *a*), f. Teutonic, grandmother. Fr. Emma; Ger. Emma; It. Emma; Lat. Emma; Port. Emma; Sp. Ema.

Emmanuel (e man′ ū el), m. From the Hebrew Immānūēl, God with us. Fr. Emmanuel; Ger. Emanuel; It. Emannuele; Port. Manoel, Manuel; Sp. Manuel.

Enid (ē′ nid), f. Celtic, the soul.

Enoch (ē′ nuk), m. From the Hebrew Hanōkh, dedicated, consecrated. Fr. Enoch, Henoch; Lat. Enochus, Ænochus.

Enos (ē′ nos), m. From the Hebrew Enōsh, man.

Enrico (en rē′ kō), m. Italian form of Henry.

Ephraim (e frȧ im), m. From the Hebrew Ephrayim, two-fold increase, very fruitful. Lat. Ephraimus.

Erasmus (ē raz′ mus), m. From the Greek Erasmios, lovely, worthy of love. Danish Erasmus; Dutch Erasmus; Fr. Érasme; Ger. Erasmus; It. Erasmo; Lat. Erasmus; Port. Erasmo; Sp. Erasmo.

Erastus (ē ras′ tus), m. From the Greek Erastos, beloved. Fr. Éraste; Ger. Erastus.

Eric (er′ ik), m. From the Scandinavian, ever king.

Ermengarde (ûr′ men gärd), f. From the Anglo-Saxon Eormengard.

Erminia (ûr min′ ia). Italian feminine name.

Ernest (ûr′ nest), m. From the Old High German Ernust, earnest, serious. Danish Ernst; Dutch Ernestus; Fr. Ernest; Ger. Ernst; It. Ernesto; Lat. Ernestus; Port. Ernesto; Sp. Ernesto; Sw. Ernst.

Ernestine (ûr′ nes tēn). Feminine of Ernest.

Esau (ē′ saw), m. From the Hebrew Ēsāw, hairy. Fr. Esau; Lat. Esavus.

Estella (es tel′ *a*) or **Estelle** (es tel′), f. From the Latin *stella,* star.

Esther (es′ tẽr), f. From the Hebrew Estēr, star. Dutch Hester; Fr. Esther; Ger. Esther; It. Ester, Esterre; Sp. Ester.

Ethan (ē′ than), m. From the Hebrew Ēythān, firmness, strength.

Ethel (eth′ el), f. From the Anglo-Saxon Æthelu, noble.

Ethelind (eth′ e lind) or **Ethelinda** (eth e lin′-d*a*). Feminine names from the Old High German Adallinda.

Eudora (ū dō′ r*a*), f. From the Greek Eudōra, generous, good gift. Fr. Eudore; Lat. Eudora.

Eugene (ū jēn′), m. From the Greek *eugenēs,* wellborn, of noble race. Dutch Eugenius; Fr. Eugène; Ger. Eugen, Eugenius; Lat. Eugenius; It. Eugenio; Port. Eugenio; Sp. Eugenio.

Eugenia (ū jē′ ni *a*). Feminine of Eugene. Fr. Eugénie; Ger. Eugenie, Eugenia; It. Eugenia; Sp. Eugenia.

Eulalia (ū lā′ li *a*), f. From the Greek Eulalia, fair speech. Fr. Eulalie; It. Eulalia; Sp. Eulalia.

Eunice (ū′ nis), f. From the Greek Eunikē, happy victory.

Euphemia (ū fē′ mi *a*), f. From the Greek Euphēmia, of good report. Fr. Euphémie; Ger. Euphemia; It. Eufemia; Sp. Eufemia.

Eustace (ūs′ tis), m. From the Greek Eustathios, happy in harvest. Dutch Eustatius; Fr. Eustache; Ger. Eustathius; It. Eustazio; Lat. Eustachius; Port. Estacio; Sp. Eustaquio.

Eva (ē′ v*a*), f. Variant form of Eve. Dutch Eva; Fr. Eve; Ger. Eva; It. Eva; Port. Eva; Sp. Eva.

Evadne (ē vad′ nē), f. From the Greek Evadnē, fortunate.

Evan (ev′ an), m. Welsh, young warrior.

Evangeline (ē van′ je lēn), f. From the Greek *evangelos,* bringer of good news.

Eve (ēv), f. From the Hebrew Hawwāh, life, living.

Evelyn (ev′ *e* lin). A masculine or feminine name meaning youth.

Everard (ev′ ẽr ärd), m. From the Teutonic *eberhard,* strong as a wild boar. Danish Eberhard; Dutch Everardt, Evert; Fr. Everaud; Ger. Eberhard, Ebert; It. Everardo, Eberardo.

Ezekiel (ē zē′ ki el), m. From the Hebrew Yehezqēl, God makes strong. Dutch Ezechiel; Fr. Ézéchiel; Ger. Ezechiel; It. Ezechiele, Ezechiello; Sp. Ezequiel.

Ezra (ez′ r*a*), m. From the Hebrew Ezrā, help. Fr. Esdras; Ger. Esra; Lat. Ezra, Ezdras.

Faith (fāth), f. From the Old English.

Faustina (fôs tī n*a*), f. Latin, lucky. Fr. Faustine; Ger. Faustine; It. Faustina.

Felicia (fē lish′ *a*), f. Latin, happiness. Fr. Félicie, Félicité; It. Felicia; Sp. Felicidad.

Felix (fē′ liks), m. Latin, happy, prosperous. Danish Felix; Dutch Felix; Fr. Félix, Félicien; Ger. Felix; It. Felice; Port. Feliz; Sp. Félix.

Ferdinand (fẽr′ di nand), m. Teutonic, adventurous, risking life. Dutch Ferdinand; Fr. Ferdinand, Ferrand; Ger. Ferdinand; It. Ferdinando, Ferrando; Lat. Ferdinandus; Port. Fernando, Fernão; Sp. Hernando, Fernando.

Fergus (fur′ gus). A masculine name from the Gaelic Fearghas, strength.

Fidelia (fi dē′ li *a*), f. Latin, faithful.

Flavia (flā′ vi *a*), f. Latin, yellow, blonde.

Flora (flō′ r*a*), f. From the Latin *flos (floris),* flower. Dutch Flora; Fr. Flore; It. Flora; Lat. Flora.

Florence (flor′ ens), f. From the Latin Florentia, bloom. Danish Florenz; Dutch Florentia; Fr. Florence; Ger. Florentia, Florenz; It. Fiorenza; Lat. Florentia; Sp. Florencia; Sw. Florenz.

Frances (fran′ ses). Feminine of Francis. Danish Francisca; Dutch Francisca; Fr. Françoise, Francisque; Ger. Franzisca; It. Francesca; Lat. Francesca, Francisca; Port. Francisca; Sp. Francisca; Sw. Franciska.

Francis (fran′ sis), m. From the Old French Franceis, free. Danish Frants, Franciscus; Dutch Franciscus; Fr. François; Ger. Franziscus, Franz; It. Francesco, Franco; Lat. Franciscus; Port. Francisco; Sp. Francisco; Sw. Frans.

Franklin (frangk′ lin), m. From the Middle Latin *franchilanus,* a freeman.

Frederica (fred ẽr ī′ k*a*). Feminine of Frederic. Fr. Frédérique; Ger. Friederike; It. Frederica; Port. Frederica; Sp. Federica.

Frederick (fred′ ẽr ik), m. From the Old High German Fridrich, peaceful ruler. Danish Frederik; Dutch Frederik; Fr. Frédéric; Ger. Friedrich, Fritz; It. Federigo, Federico; Lat. Fredericus, Fridericus; Port. Frederico; Sp. Federico.

Frieda (frē′ d*a*), f. German, peace.

Gabriel (gā′ bri el), m. From the Hebrew Gabhrīēl, man of God. Fr. Gabriel; Ger. Gabriel; It. Gabriello; Port. Gabriel; Sp. Gabriel; Sw. Gabriel.

Gabriella (gā bri el′ *a*) or **Gabrielle** (gā bri-el′ or gab ri el′). Feminine forms of Gabriel.

Gamaliel (g*a* mā′ liel), m. From the Hebrew Gam līēl, recompense of God.

Garret (gar′ et) or **Garrett,** m. Teutonic, firm spear.

Gaspar (gas′ per) or **Gaspard,** m. Persian treasure master.

Genevieve (jen e vēv′), f. Celtic, white wave.

Geoffrey (jef′ ri), m. From the Old High German Gaufrid, land of peace. Fr. Geoffroi.

George (jôrj), m. From the Greek Geōrgos, a husbandman, farmer. Danish Georg; Dutch Georg; Fr. Georges, George; Ger. Georg; Gr. Georgios; Hungarian Gyorgg; It. Giorgio; Lat. Georgius; Port. Jorge; Sp. Jorge; Sw. Georg.

Georgiana (jôr ji an′ *a*), **Georgia** (jôr′ ji*a*) or **Georgina** (jôr jē′ n*a*). Feminine forms of George. Gr. Georgienne, Georgine, Georgette; Ger. Georgine; It. Georgia.

Gerald (jer′ ald), m. From the Old High German Gerwald, spear wielder. Danish Gerhard; Dutch Gerard; Fr. Géralde, Géraud, Giraud, Girauld; Ger. Gerold, Gerolt; Gerhart; It. Giraldo, Gherardo, Gerardo; Lat. Geraldus, Gerardus; Sw. Gerhard.

Geraldine (jer′ al dēn). Feminine form of Gerald. Fr. Géraldine; Ger. Gerhardine; It. Giralda.

Gerard (jē rärd′), m. From the Old High German *gērhart,* strong with the spear. Danish Gerhard; Dutch Gerard; Fr. Gérard; Ger. Gerhard; It. Gerardo, Gherardo; Lat. Gerardus; Sw. Gerhard.

Gertrude (gûr′ tro͞od), f. From the Old High German *gērtrūt,* spear maiden. Dutch Geertruida; Fr. Gertrude; Ger. Gertrud; It. Gertrude, Gertruda; Lat. Gertruda; Port. Gertrudes; Sp. Gertrúdis; Sw. Gertrud.

Gervas (jûr′ vas), **Gervase** (jûr′ vās) or **Gervais,** m. French, eager for war.

Gideon (gid′ ē on), m. From the Hebrew Gidōn, hewer, feller. Fr. Gédéon; It. Gedeone; Lat. Gideon.

Gilbert (gil′ bẽrt), m. From the Old High German Giselbert, bright, bright wish. Danish Gilbert; Dutch Gilbert; Fr. Guilbert, Gilbert; Ger. Gilbert, Gizelbert; It. Gilberto, Lat. Gilbertus; Sp. Gilberto; Sw. Gilbertus.

Gilda (gil′ d*a*), f. Celtic.

Giles (jīlz), m. From the Latin Ægidus, with the Aegis, protected. Dutch Egidious; Fr. Gilles, Égide; Ger. Egidius; It. Egidio; Lat. Ægidius; Port. Gil; Sp. Gil.

Giorgio (jōr′ jō), m. Italian form of George.

Giovanni (jō van′ nē), m. Italian form of John.

Giuseppe (jo͞o sep′ pā), m. Italian form of Joseph.

Gladys (glad′ is), f. Probably from the Latin, *gladiolus,* sword lily.

Gloria (glō′ri *a*), f. Latin, glory.

Goddard (god′ ẽrd), m. From the Old High German Godehard, god-strong, pious, virtuous. Dutch Gotthard; Fr. Godard; Ger. Gotthart.

Godfrey (god′ fri), m. From the Old High German Godafrid, peace of God. Danish Gottfried; Dutch Godfried; Fr. Godefroi, Geoffroi; Ger. Gottfried; It. Goffredo, Godefredo, Giotto; Lat. Godefridus, Galfridus; Port. Godofredo; Sp. Godofredo, Gofredo.

Godwin (god′ win), m. From the Anglo-Saxon Godwine, friend of God. Dutch Godewijn; Lat. Godwinus.

Grace (grās), f. From the Latin *gratia,* pleasing, beloved, dear.

Gregory (greg′ ō ri), m. From the Greek Grēgorios, vigilant, watchful. Danish Gregor; Dutch Gregoor, Gregorius; Fr. Grégoire; Ger. Gregor, Gregorius; It. Gregorio; Lat. Gregorius; Port. Gregorio; Sp. Gregorio; Sw. Gregorius.

Griffin (grif′ in), or

Griffith (grif′ ith), m. A name from the Welsh Gruffydd; a family name.

Guido (gwē′ dō), m. Italian form of Guy.

Guillaume (gē yōm′), m. French form of William.

Guinevere (gwin′ e vēr), **Guenever** (gwen′ e-vēr) or **Guinever,** f. Celtic, white lady, fair lady.

Gustavus (gus tā′ vus), m. Teutonic, goth's staff. Dutch Gustaaf; Fr. Gustave; Ger. Gustav; It. Gustavo; Lat. Gustavus; Sp. Gustavo; Sw. Gustaf.

Guy (gī), m. From the Old French Gui, leader. Danish Guido; Dutch Guido; Fr. Guy; Ger. Guido; It. Guido; Lat. Guido; Port. Guido; Sp. Guido; Sw. Guido.

Gwendolen (gwen′ dō len), f. Celtic, white browed.

Hannah (han′ *a*), f. From the Hebrew Hannāh, grace.

Hannibal (han′ ni bal), m. Punic, grace of Baal. Fr. Annibal, Hannibal; Gr. Hannibas; It. Annibale; Lat. Hannibal; Port. Annibal; Sp. Aníbal.

Hans (häns), m. German form of John.

Harold (har′ uld), m. Anglo-Saxon army leader. Danish Harald; Dutch Herold; Fr. Harold; It. Araldo, Aroldo; Lat. Haroldus.

Harriet (har′ ri et). Feminine of Harry.

Hazel (hā′ zl), f. Teutonic, name of a color.

Hector (hek′ tẽr), m. From the Greek name Hektōr, holding fast. Fr. Hector; It. Ettore; Lat. Hector.

Hedwig (hed′ wig), f. German, strife.

Heinrich (hīn′ ri*ch*), m. German form of Henry.

Helen (hel′ en) or **Helena** (hel′ ēn *a*), f. From the Greek Helenē, light. Danish Helena; Dutch Helena; Fr. Hélène; Ger. Helena, Helene; Ir. Aileen, Eileen; It. Elena; Lat. Helena; Port. Helena; Sp. Helena, Elena.

Heloise (hel ō ez′), f. French form of Louise.

Heman (hē′ man), m. From the Hebrew Hēymān, faithful, reliable. Fr. Héman; Ger. Heman; Sp. Emán.

Henri (aN′ rē), m. French form of Henry.

Henrietta (hen ri et′ *a*). Feminine form of Henry. Danish Henriette; Dutch Henrietta; Fr. Henriette; Ger. Henriette; It. Enrichetta; Port. Henriqueta; Sp. Enriqueta; Sw. Henrietta.

Henry (hen′ ri), m. From the Old High German Hoganrīh, the ruler of an enclosure, home ruler. Danish Hendrik; Dutch Hendrik; Fr. Henri; Ger. Heinrich; It. Enrico; Lat. Henricus, Enricus; Port. Henrique; Sp. Enrique; Sw. Henrik.

Hephzibah (hef′ zi b*a*), f. From the Hebrew Hephtsībāh, my delight in her.

Herbert (hûr′ bẽrt), m. From the Anglo-Saxon Herebeorht, glory of the army. Dutch Herbert; Fr. Herbert; Ger. Herbert; It. Erberto; Lat. Herbertus; Sp. Heberto.

Herman (hûr′ man), m. From the Old High German Hariman, warrior. Danish Hermann; Dutch Herman; Fr. Armand; Ger.

Hermann; It. Ermanno; Lat. Arminius; Sw. Herman.

Hermione (hûr mī′ ō nē), f. From the Greek Hermionē, of the earth.

Hester (hes′ tẽr) or **Hesther,** f. Variant forms of Esther.

Hezekiah (hez ē kī′ *a*), m. From the Hebrew Hizqīyāh. God has strengthened. Dutch Hiskia; Fr. Ézéchias; Ger. Hiskia; It. Ezechia, Ezecchia; Sp. Ezequías.

Hilaria (hi lā′ ri *a*). Feminine form of Hilary.

Hilary (hil′ *a* ri), m. From the Latin *hilaris,* cheerful, merry. Danish Hilarius; Dutch Hilarius; Fr. Hilaire; Ger. Hilarius; It. Ilario; Lat. Hilarius; Port. Hilario; Sp. Hilario; Sw. Hilarius.

Hilda (hil′ d*a*), f. Anglo-Saxon, battle maid.

Hildegarde (hil′ dē gärd), f. From the Old German Hildigard, battle maiden.

Hiram (hī′ ram), m. From the Hebrew Hīrām, most noble.

Homer (hō′ mẽr), m. From the Greek Homēros, pledge, security. Dutch Homerus; Fr. Homère; Ger. Homerus; It. Omero; Lat. Homerus.

Honora (hō nō′ r*a*) or **Honoria** (hō nō′ ri *a*), f. Latin, honorable. Fr. Honoré.

Hope (hōp), f. From the Anglo-Saxon, *hopa,* hopeful.

Horace (hor′ is), m. Variant of Horatio.

Horatio (hō rā′ shō), m. From the Latin Horatius, timekeeper. Danish Horats; Dutch Horatio; Fr. Horace; Ger. Horatius, Horaz; It. Orazio; Lat. Horatius; Port. Horacio; Sp. Horacio.

Hortensia (hôr ten′ si *a*), f. Latin, a lady gardener. Dutch Hortensia; Fr. Hortense; Ger. Hortensia; It. Ortensia; Lat. Hortensia.

Hosea (hō zē′ *a* or ho zā *a*), m. From the Hebrew Hōshēa, salvation.

Howard (hou′ ẽrd), m. Anglo-Saxon, keeper of the stronghold.

Howell (hou′ el), m. From the Welsh *howel.*

Hubert (hū′ bẽrt), m. From the Old High German Huqubert, bright in spirit, soul-bright. Dutch Hubertus; Fr. Hubert; Ger. Hubert, Hugibert; It. Uberto; Lat. Hubertus; Port. Huberto; Sp. Huberto.

Hugh (hū), m. From the Old High German *hugu,* mind. Danish Hugo; Dutch Hugo; Fr. Hugues; Ger. Hugo; It. Ugo, Ugolino; Lat. Hugo; Port. Hugo; Sp. Hugo; Sw. Hugo.

Huldah (hul′ d*a*), f. From the Hebrew Huldāh, weasel.

Humphrey (hum′ fri), m. From the Anglo-Saxon Hunfrith, support of peace. Dutch Humfridus; Fr. Onfroi; Gr. Humfried; It. Onofredo, Onfredo; Lat. Humphredus, Humfridus; Port. Hunfredo; Sp. Hunfredo; Sw. Humfrid.

Ian (ē′ än or ē′ an or ī′ an), m. Gaelic form of John.

Ibrahim (ē brä hēm′), m. Arabic form of Abraham.

Ichabod (ik′ *a* bod), m. From the Hebrew I-khābhōdh, inglorious.

Ida (ī′ d*a*), f. From the Old High German Ida, happy. Dutch Ida; Fr. Ida; Ger. Ida; It. Ida.

Ignatius (ig nā′ shi us), m. From the Greek Ignatios, ardent, fiery. Dutch Ignatius; Fr. Ignace; Ger. Ignaz, Ignatius; It. Ignazio, Ignacio; Port. Ignacio; Sp. Ignacio, Iñigo.

Imogen (im′ ō jen) or **Imogene** (im′ ō jēn). A feminine name.

Inez (ī nez or ē′ nez), f. Spanish and Portuguese form of Agnes.

Ira (ī′ r*a*), m. From the Hebrew Ira, watchful.

Irene (ī rēn′), f. From the Greek Eirēnē. Fr. Irène; Ger. Irene; It. Irene.

Iris (ī′ ris), f. From the Greek Iris, rainbow.

Isaac (ī′ zak), m. From the Hebrew Yitshāq, laughter. Danish Isak; Dutch Izaak; Fr. Isaac; Ger. Isaak; Hungarian Izsák; It. Isacco; Lat. Isaac, Isaacus; Polish Izaak; Sw. Isak.

Isabel (iz′ *a* bel), **Isabella** (iz *a* bel′ *a*) or **Isobel** (iz′ ō bel), f. From the Hebrew Elīsheba, consecrated to God or God is her oath. Dutch Isabella; Fr. Isabeau, Isabelle; Ger. Isabelle; It. Isabella; Lat. Isabella; Port. Isabel; Sp. Isabel.

Isadora (iz *a* dō′ r*a*), f. From the Greek Isidōros, gift of Isis.

Isaiah (ī zā′ y*a*), m. From the Hebrew Yeshayāh, salvation of the Lord. Danish Esaias; Dutch Jezajas; Fr. Isaie; Ger. Esaias; It. Isaia; Lat. Esaias; Port. Isaias; Sp. Isaias.

Ishmael (ish′ mā el), m. From the Hebrew Yishmāēl, God heareth.

Isidore (iz′ i dōr) or **Isidor,** m. From the Greek Isidōros, gift of Isis. Dutch Isidore; Fr. Isidore; Ger. Isidor; It. Isidoro; Lat. Isidorus; Port. Isidoro, Isidro; Sp. Isidoro, Isidro.

Israel (iz′ rā el), m. From the Hebrew Yisrāēl, contender with God. Lat. Israel.

Ivan (ē vän′ or ī van′), m. Russian form of John.

Ivy (ī′ vi), f. From the Anglo-Saxon Ifig, ivy.

Jabez (jā′ bez), m. From the Hebrew Yabēts, he will cause pain.

Jack (jak), m. From the Hebrew Ya′ aqōbh, Jacob. Fr. Jacques; Gr. Iakōbos; Lat. Jacobus; familiar form for John.

Jacob (jā′ kub), m. From the Hebrew Yaaqōbh, supplanter. Danish Jakob; Dutch Jacob; Fr. Jacob, Jacques; Ger. Jakob; Hungarian Jakób; It. Giacobbe, Jacopo, Jachimo, Giacomo; Lat. Jacobus; Polish Jacob; Port. Jacob, Jayme, Diogo; Sp. Jacobo, Diego, Jago, Jaime; Sw. Jakob.

Jacqueline (jak′ we lin) or **Jaqueline.** Feminine of Jacques, French form of Jacob.

Jairus (jā′ i rus), m. From the Hebrew Yāīr, he will enlighten.

Jan (yän), m. Dutch form of John.

Jane (jān), f. Variant of Joan.

Janet (jan′ et), f. Diminutive of Jane.

Japheth (jā′ feth), m. From the Hebrew Yepheth, enlargement, the extender.

Jared (jā′ red), m. From the Hebrew Yeredh, descent.

Jason (jā′ sun), m. From the Greek Iasōn, healer.

Jasper (jas′ pẽr), m. Variant of Gaspar. Fr. Gaspard; Ger. Caspar, Kaspar; It. Gasparo; Lat. Gaspar; Port. Gaspar; Sp. Gaspar.

Jean (jēn). English feminine form of John.

Jean (zhän), m. French form of John.

Jeanne (zhän). French feminine form of Jean.

Jeffrey (jef′ ri), m. Variant of Geoffrey.

Jemima (jē mī′ ma), f. From the Hebrew Yemīmāh, dove.

Jephthah (jef′ th*a*), m. From the Hebrew, God opens or makes free. Fr. Jephte; Lat. Jephtha.

Jeremiah (jer ē mī′ *a*) or **Jeremy** (jer′ ē mi), m. From the Hebrew Yirmeyāh, exalted of the Lord. Danish Jeremias; Dutch Jeremias; Fr. Jérémie; Ger. Jeremias; It. Geremia; Lat. Jeremias; Sp. Jeremias; Sw. Jeremias.

Jerome (je rōm′), m. From the Greek Hierōnymos, bearing a holy name. Danish Jeronymus; Dutch Hieronymus; Fr. Jérôme; Ger. Hieronymus; It. Geronimo, Girolamo; Lat. Hieronumus; Port. Jeronimo; Sp. Jerónimo, Jeromo; Sw. Hieronimus.

Jessamine (jes′ *a* min), f. From the Middle French Jessemine.

Jesse (jes′ ē), m. From the Hebrew Yishay, wealth.

Jessica (jes′ i k*a*), f. Hebrew, grace of God.

Jessie (jes′ i), f. Variant of Jessica.

Joab (jō′ ab), m. From the Hebrew Yōābh, Jehovah is his father.

Joachim (yō *a* kim′), m. From the Hebrew, the Lord will judge. Dutch Joachim; Fr. Joachim; Ger. Jochim, Joachim; It. Joachino, Joachimo; Sp. Joaquin, Joaquim.

Joan (jōn), **Joanna** (jō an′ a) or **Johanna** (jō han′ *a*). Feminine forms of John. Danish Johanne; Dutch Hanna; Fr. Jeanne; Ger. Johanna; It. Giovanna; Lat. Johanna, Joanetta; Port. Jovanna; Sp. Juaña; Sw. Johanna.

Job (jōb), m. From the Hebrew Iyyōbh, afflicted, persecuted. Fr. Job; Ger. Hiob; It. Giobbe; Lat. Job, Jobus; Sw. Job.

Jocelin (jos′ e lin), m., **Jocelyn,** m. or f., or **Joceline,** f. From the Latin *jocosus,* merry, full of fun.

Joel (jō′ el), m. From the Hebrew Yōēl, the Lord is God. Fr. Joel; Lat. Joel.

Johanna (jō han′ *a*), f. Variant of Joan.

John (jon), m. From the Hebrew Yōhānān, God is gracious. Danish Johann, Hans; Dutch Johann, Hans, Jan; Fr. Jean; Ger. Johann, Hans, Johannes; Hungarian János; It. Giovanni; Lat. Joannes, Johannes; Polish Jan; Port. João; Russ. Ivan; Sp. Juan; Sw. Johann, Hans.

Jonah (jō′na) or **Jonas** (jō′ nas), m. From the Hebrew Yōn*ā*h, a dove. Fr. Jonas; Ger. Jonas; Lat. Jonas.

Jonathan (jon′ *a th*an), m. From the Hebrew Yōnāthān, God has given.

Joseph (jō′ sef), m. From the Hebrew Yōsēph, he shall add. Fr. Joseph; Ger. Joseph; Hungarian Jozsef; It. Giuseppe; Lat. Josephus; Polish Jozef; Port. José, Jozé; Sp. José.

Josepha (jō sē′ f*a*). Feminine form of Joseph. Fr. Joséphine; Ger. Josephine; It. Giuseppina; Port. Josephina; Sp. Josefina.

Josephine (jō′ se fēn). Feminine form of Joseph. Fr. Joséphine, Josèphe; Ger. Josephe, Josephine; It. Giuseppa, Giuseppina; Lat. Josepha; Port. Josephina; Sp. Josefina.

Joshua (josh′ ū *a*), m. From the Hebrew Y'hoshua, Jehovah is deliverance. Dutch Josua; Fr. Josué; Ger. Josua; It. Giosue; Lat. Josua; Sw. Josua.

Josiah (jō sī′ *a*) or **Josias** (jō sī′ as), m. From the Hebrew Yōshīyāh, Jehova supports. Danish Josias; Dutch Jozias; Fr. Josias; It. Giosiade; Lat. Josias.

Jotham (jō′ tham), m. From the Hebrew Yōthām, Jehova is perfect.

Joyce (jois), f. Old French *joyeuse,* joyful, rejoicing.

Juan (jū än′), m. Spanish form of John.

Judah (jū′ d*a*), **Judas** (jū′ das), **Jude** (jūd), m. From the Hebrew Yĕhūdhāh, praised. Fr. Juda, Jude; Ger. Judas; Hungarian Juda; It. Giuda; Lat. Judas; Polish Judas; Sw. Judas.

Judith (jo͞o′ dith), f. From the Hebrew Yĕhūdhīth, praised. Fr. Judith; Ger. Judith; It. Giuditta; Lat. Juditha.

Julia (jo͞ol′ y*a*). Feminine of Julius. Dutch Julia; Fr. Julie; Ger. Julie; It. Giulia; Lat. Julia; Port. Julia; Sp. Julia; Sw. Gulia.

Julian (jo͞ol′ yan), m. From the Latin Julianus, sprung from or belonging to Julius. Dutch Julianus; Fr. Julien; Ger. Julianus, Julian; It. Giuliano; Lat. Julianus; Port. Julião; Sp. Julián, Juliano; Sw. Juliano.

Juliana (jo͞o li an′ *a*). Feminine of Julian. Dutch Juliana; Fr. Julienne; Ger. Juliana; It. Giuliana; Lat. Juliana; Port. Juliana; Sp. Juliana; Sw. Juliana.

Julienne (zhū li en′), f. French form of Juliana.

Julius (jo͞ol′ yas), m. Latin. Dutch Julius; Fr. Jules; Ger. Julius; It. Giulio; Lat. Julius; Port. Julio; Sp. Julio.

Junius (jo͞on′ yus), m. Latin.

Justin (jus′ tin), m. From the Latin Justinus, just. Fr. Justin; Ger. Justin; It. Giustino; Sp. Justino.

Justina (jus tī′ na). Feminine of Justin. Fr. Justine; Ger. Justine; It. Giustina; Sp. Justina.

Karen (kä′ ren), f. Danish and Norwegian form of Catherine.

Karl (kärl), m. German form of Charles.

Katherine (kath′ *a* rin), **Katharina** (kath *a*-rē′n*a*) or **Kathryn** (kath′ rin), f. Variant forms of Catherine.

Kenneth (ken′ eth), m. From the Anglo-Saxon Cynath, handsome.

Keziah (kē zī′ *a*), f. From the Hebrew Qetsīāh, cassia.

Laban (lā′ ban), m. From the Hebrew Lābhān, white.

Lambert (lam′ bẽrt), m. From the Old German Landberht, illustrious with landed possessions, the land's brightness. Dutch Lambert, Lambertus; Fr. Lambert, Lanbert; Ger. Lambert; It. Lamberto; Lat. Lambertus.

Lancelot (lån′ se lot) or **Launcelot** (lôn′ selot), m. From the Latin Lancelottus, servant. Fr. Lancelot; Ger. Lanzelot; It. Lancilotto; Lat. Lancelottus, Lance, Launcelot; Port. Lancelote.

Lars (lärz), m. Etruscan, Lord.

Laura (lô′ r*a*), f. From the Latin laurus, laurel. Fr. Laure; Ger. Laura; It. Laura; Lat. Laurinda.

Laurence (lô′ rens) or **Lawrence,** m. From the Latin Laurentius, laurel-crowned. Danish Lorenz; Dutch Laurens; Fr. Laurent; Ger, Laurenz, Lorenz; It. Lorenzo; Lat. Laurentius; Port Laurencio; Sp. Lorenzo; Sw. Lars.

Lavinia (l*a* vin′ i *a*), f. Latin.

Lazarus (laz′ *a* rus), m. From the Hebrew Elāzār, God will help. Fr. Lazare; Gr. Lazaros; It. Lazaro; Lat. Lazarus.

Leah (le′ *a*), f. Hebrew, languid.

Leander (lē an′ dẽr), m. From the Greek Leiandros, lionlike man.

Leila (lē′ l*a*) or **Leilah,** f. From the Arabic Layla, dark as night.

Lelia (lē′ li *a*), f. From the Latin Laelia, name of a famous family.

Lemuel (lem′ ū el), m. From the Hebrew Lēmūēl, consecrated to God.

Leo (lē′ ō) or **Leon** (lē′ on), m. Latin, lion. Fr. Léon; It. Leone; Lat. Leo.

Leonard (len′ ẽrd), m. From the Old German Leonhard, as strong as a lion. Dutch Leonard; Fr. Léonard; Ger. Leonhard; It. Lionardo; Lat. Leonardus; Port. Leonardo; Sp. Leonardo.

Leonidas (lē on′ i das), m. From the Greek Leōnidas, son of a lion.

Leonora (lē ō nō′ r*a*), f. Variant of Eleanor. Ger. Leonore, Lenore; It. Lenore.

Leopold (lē′ ō pōld), m. From the Old High German Leutpald, bold for the people. Fr. Léopold; Ger. Leopold, Luitpold; It. Leopoldo; Lat. Leopoldus; Port. Leopoldo; Sp. Leopoldo.

Leroy (lē roi′), m. From the Old French, the king, royal.

Letitia (lē tish′ ia), f. From the Latin *laetitia,* joy, gladness. Danish Laetitia; Dutch Laetitia; Fr. Léetice; It. Letizia; Lat. Laetitia.

Lettice (let′ is), f. Anglicized form of Letitia.

Levi (lē′ vī), m. From the Hebrew, united.

Lewis (lū′ is), m. Variant of Louis.

Lillian (lil′ i an) or **Lily** (lil′ i), f. From the Latin *lilium,* lily.

Lionel (lī′ ō nel), m. French, young lion. It. Lionello.

Llewellyn (lōō el′ in), m. Welsh, lightning.

Lois (lō′ is), f. From the Greek Lōis, desirable.

Loretta (lō ret′ *a*), f. Anglo-Saxon, wise.

Louis (lū′ is), m. From the Old High German Hluthawig, famous warrior. Dutch Lodewijk; Fr. Louis; Ger. Ludwig; It. Lodovica, Luigi; Lat. Ludovicus; Polish Lodoiska; Port. Luiz; Sp. Luis, Clodoveo; Sw. Ludwig.

Louisa (lōō ēz′ *a*). Feminine of Louis. Fr. Louise, Héloise, Lisette; Ger. Luise, Ludovika; It. Luigia, Luisa, Eloisa; Lat. Luisa; Port. Luiza; Sp. Luisa; Sw. Ludovika.

Louise (lōō ēz′), f. Variant of Louisa.

Lucia (lū′ shi *a*). Feminine of Lucius.

Lucian (lū′ shi an), m. From the Latin Lucius, belonging to or sprung from Lucius. Fr. Lucien; It. Luciano; Lat. Lucianus.

Lucile (lū sēl′) or **Lucille,** f. Variant of Lucy.

Lucinda (lū sin′ d*a*), f. Variant of Lucy.

Lucius (lū′ shus), m. From the Latin, possibly from *lux, lucis,* light. Fr. Luce, Lucius; Ger. Lucius; It. Lucio; Lat. Lucius; Port. Lucio; Sp. Lucio.

Lucretia (lū krē′ shi *a*). Latin feminine of Lucretius. Fr. Lucrèce; Ger. Lucretia; It. Lucrezia; Lat. Lucretia; Sp. Lucrecia.

Lucy (lū′ si), f. From the Latin Lucia. Fr. Lucie, Lucille; Ger. Lucia; It. Lucia; Port. Lucia; Sp. Lucia.

Ludwig (lōōt′ vik), m. German and Swiss form of Louis.

Luigi (loo ē′ jē), m. Italian form of Louis.

Luke (lūk), m. From the Greek Loukas, light. Danish Lucas; Dutch Lucas; Fr. Luc; Ger. Lukas; Hung. Lucáts; It. Luca; Lat. Lucas; Port. Lucas; Sw. Lucas.

Luther (lū′ thẽr), m. Teutonic, noted warrior. Fr. Lothaire; Ger. Luther, Lothar; It. Lotario; Lat. Lutherus; Sp. Clotario.

Lydia (lid′ i *a*), f. From the Greek Lydia, a native of Lydia. Danish Lydia; Dutch Lydia; Fr. Lydie; It. Lidia; Lat. Lydia.

Mabel (mā′ bel), f. Variant of Amabel.

Madeline (mad′ e lin), f. Variant of Magdalene.

Magdalen (mag′ d*a* len) or **Magdalene,** f. From the Hebrew, belonging to Magdala. Dutch Magdalena; Fr. Magdelaine, Madeleine, Madelan; Ger. Magdalene; Gr. Magdalene; It. Maddalena; Port. Magdalena; Sp. Magdalena; Sw. Magdalena.

Malachi (mal′ *a* kī), m. From the Hebrew Malākhī, messenger.

Malcolm (mal′ kum), m. From the Anglo-Saxon, Mælcolm, servant of Columba.

Malvina (mal vī′ n*a*), f. From the Celtic, a handmaid.

Manuel (man′ u el), m. Portuguese and Spanish form of Emmanuel.

Marcia (mär′ sh*a*). Feminine of Marcus. Fr. Marcie; It. Marcia.

Marcus (mär′ kus) or **Mark** (märk), m. From the Latin, of Mars. Danish Marcus; Dutch Marcus; Fr. Marc; Ger. Markus; Hung. Mark; It. Marco; Lat. Marcus; Sp. Marcos; Sw. Markus.

Margaret (mär′ g*a* ret), f. From the Greek margaritēs, pearl. Dutch Margaretha; Fr. Marguerite; Ger. Margarete; It. Margarita, Margherita; Lat. Margarita, Margaretta; Port. Margarida; Sp. Margarita.

Margery (mär′ jẽr i) or **Marjory** (mär′ jō ri), f. Variants of Margaret.

Marguerite (mär gē rēt′), f. French form of Margaret.

Maria (m*a* rī′ *a*), f. Variant of Mary.

Marian (mar′ i an), f. Variant of Marianne.

Marianne (mâr i an′), f. A compound of Mary and Ann. Sp. Mariana.

Marie (mȧ rē′), f. French form of Mary.

Marion (mar′ i un), m. Masculine form of Mary.

Marjory. See Margery.

Mark (märk), m. Variant of Marcus.

Martha (mär′ th*a*), f. From the Aramaic, lady, mistress. Dutch Martha; Fr. Marthe; Ger. Martha; It. Marta; Lat. Martha; Sp. Marta; Sw. Martha.

Martin (mär′ tin), m. From the Latin Martis, warlike. Dutch Martijn; Fr. Martin; Ger. Martin; It. Martino; Lat. Martinus; Port. Martinho; Sp. Martino.

Mary (mâr′ i), f. From the Hebrew Miryām, bitter. Danish Maria; Dutch Maria; Fr. Marie, Marion; Ger. Maria, Marie; Hung. Maria; It. Maria; Lat. Maria; Polish Marya; Port. Maria; Sp. Maria; Sw. Maria.

Mathilde (mä tēld′), f. French form of Matilda.

Matilda (m*a* til′ d*a*) or **Maud,** f. From the Old High German Machthilt, mighty battle maid, heroine. Danish Mathilde; Dutch Mathilda; Fr. Mathilde; Ger. Matilde; It. Matilda; Lat. Mathilda; Sp. Matilde; Sw. Matilda.

Matthew (math′ ū), m. From the Hebrew Mattīthyāh, gift of Jehovah. Danish Matthæus; Dutch Mattheus; Fr. Mathieu; Ger. Matthäus; Gr. Matthaios; Hung. Mate; It. Matteo; Lat. Mattæus; Polish Mateusz; Sp. Mateo; Sw. Matthäus.

Matthias (math ī′ as), m. Variant of Matthew.

Maura (môr′ *a*) or **Maurya** (môr′ ya), f. Variants of Mary.

Maurice (mô′ ris), m. From the late Latin Maurus, Moorish. Danish Moritz; Dutch Maurits, Mauritius; Fr. Maurice; Ger. Moritz; It. Maurizio; Lat. Mauritius; Sp. Mauricio; Sw. Moritz.

Maximilian (mak si mil′ i an), m. From the Latin *maximus,* greatest and Aemilianus. Dutch Maximilianus; Fr. Maximilien; Ger. Maximilian; It. Massimiliano; Lat. Maximilianus; Port. Maximiliano; Sp. Maximiliano; Sw. Maximilian.

Maximus (mak′ si mus), m. From the Latin, greatest. Fr. Maxime; It. Massimo; Lat. Maximus; Sp. Maximo.

Melicent (mel′ i sent), f. Variant of Milicent. Fr. Mélisande; Sp. Melisenda.

Melissa (mē lis′ *a*), f. From the Greek Melissa, bee. Fr. Mélisse; It. Melissa.

Mercedes (mûr sē′ dēz), f. From the Spanish *merced,* grace, favor.

Mercy (mûr′ si), f. From the Latin *merces,* pity, mercy.

Meredith (mer′ ē dith), m. From the Celtic, sea protector.

Merlin (mūr′ lin), m. From the Celtic, sea hill.

Methuselah (mē thū′ ze l*a*), m. From the Hebrew Methushāel.

Micah (mī′ k*a*), m. From the Hebrew Mīkhāh, who is like God?

Michael (mī′ kel), m. From the Hebrew Mikhāēl, who is like God? Fr. Michel; Ger. Michael; Hung. Mihaly; It. Michele; Lat. Michale; Polish Michal; Port. Miguel; Russ. Michail; Sp. Miguel.

Mignon (mē nyo*n*), f. From the French, dainty, darling.

Mildred (mil′ dred), f. From the Anglo-Saxon Mildthryth, mild counselor. Lat. Mildreda.

Miles (mīlz), m. From the Old German Milā, soldier.

Milicent (mil′ i sent), f. From the Teutonic, strength. Sp. Melisende.

Minerva (mi nûr′ v*a*), f. From the Greek *menos,* force, purpose, wisdom.

Minnie (min′ i), f. From the Greek Minna, remembrance, love.

Miranda (mi ran′ d*a*), f. From the Latin *miranda,* admirable. Ger. Miranda.

Miriam (mir′ i am), f. From the Hebrew Miryām, bitter.

Moira (moi′ r*a*), f. Variant of Maura.

Monica (mon′ i k*a*), f. From the Latin, adviser.

Morgan (môr′ gan), m. From the Welsh Morgant, dweller on the sea.

Mortimer (môr′ ti mẽr), m. From a famous Norman French family.

Moses (mō′ zez), m. From the Hebrew, Mōsheh, drawn out. Dutch Mozes; Fr. Moïse; Ger. Moses; Hung. Mozes; It. Moise; Lat. Moses; Polish Moyzesz; Port. Moises; Sp. Moisés; Sw. Moses.

Muriel (mū′ ri el), f. From the Greek *myrrha,* bitter.

Myra (mī′ r*a*), f. From the Latin, wonderful.

Myrtle (mûr′ tl), f. From the Greek *myrtos.*

Naaman (nā′ *a* man), m. From the Hebrew Naamān, pleasantness.

Nahum (nā′ hum), m. From the Hebrew Nahūm, comforter.

Nancy (nan′ si), f. Variant of Anne.

Naomi (nā′ ō mī), f. From the Hebrew, Nāomī, my sweetness.

Napoleon (n*a* pō′ lē un), m. Of Naples, of the new city. Fr. Napoléon; It. Napoleone.

Natalie (nat′ *a* li) or **Natalia** (n*a* tā′ li *a*), f. From the Latin, Christmas child.

Nathan (nā′ than), m. From the Hebrew Nāthān, a gift, given. Fr. Nathan; Ger. Nathan; Lat. Nathan; Sp. Natan.

Nathanael (n*a* than′ yel) or **Nathaniel** (n*a*than′ ā el), m. From the Hebrew Nethanēl, gift of God. Dutch Nathaniel; Fr. Nathaniel; Ger. Nathaniel; Lat. Nathanael; Sp. Natanael.

Neal (nēl) or **Neil,** m. From the Gaelic and Irish *Niall,* valorous champion.

Nehemiah (nē hē mī′ *a*), m. From the Hebrew Nēhemyāh, comfort of Jehovah. Danish Nehemias; Dutch Nehemia; Fr. Néhémie; Ger. Nehemias; It. Neemia; Lat. Nehemias; Sp. Nehemias.

Nicholas (nik′ ō l*a*s), m. From the Greek Nikolaos, victory of the people or army. Dutch Nicolaas, Klaas; Fr. Nicolas, Nicole; Ger. Nikolaus; Hung. Miklos; It. Niccolo, Nicolò, Nicola; Lat. Nicolaus; Port. Nicoloá; Russ. Nikolai, Nikolas; Sp. Nicolás; Sw. Nils.

Nigel (nī′ gel), m. From the Latin, black.

Ninon (nē′ no*n*), f. French form of Anne.

Noah (nō′ *a*), m. From the Hebrew Nōah, rest, comfort. Dutch Noach, Fr. Noé; Ger. Noah; Sw. Noa.

Noel (nō′ el), m. From the French, Christmas carol. Fr. Noël; It. Natale; Lat. Natalis, Noelius; Port. Natal; Sp. Natal.

Norma (nôr′ m*a*). Feminine of Norman.

Norman (nôr′ man), m. From the Old French *normant,* Northman.

Obadiah (ō b*a* di′ *a*), m. From the Hebrew Ōbadhyah, servant of the Lord.

Octavia (ok tā′-vi *a*), f. Feminine of Octavius. Fr. Octavie, Octave, Ger. Octavia; It. Ottavia; Sp. Octavia.

Octavius (ok tā′ vi us), m. From the Latin, the eighth born. Fr. Octave; It. Otavio; Lat. Octavius; Sp. Octavio.

Olga (ol′ g*a*), f. Russian, holy.

Olive (ol′ iv), f. From the Latin Oliva, olive.

Oliver (ol′ i vẽr), m. From the French Olivier. Dutch Olivier; Fr. Olivier; Ger. Olivier; It. Oliviero, Uliviero; Lat. Olivarus, Olivarius; Port. Oliveiro; Sp. Oliverio; Sw. Olivier.

Olivia (o liv′ i ȧ). Feminine of Oliver. Danish Olivia; Dutch Olivia; Fr. Olivie; Ger. Olivia; It. Olivia; Lat. Olivia; Sw. Olivia.

Olympia (o lim′ pi *a*), f. From the Greek Olympia, heavenly. Fr. Olympe; Ger. Olympie; It. Olimpia; Lat. Olympia.

Ophelia (o fēl′ y*a*), f. From the Greek, Ophellia, serpent wisdom. Fr. Ophélie; Gr. Ophelia; Lat. Ophelia.

Orlando (ôr lan′ dō), m. Italian form of Roland.

Orson (ôr′ sn), m. From the Latin *ursus,* little bear.

Oscar (os′ kẽr), m. From the Celtic, bounding warrior.

Osmond (oz′ mund) or **Osmund,** m. From the Anglo-Saxon Osmund, protection of God. Fr. Osmont.

Oswald (oz′ wald), m. From the Anglo-Saxon Osweald, power of God.

Otto (ot′ tō) or **Otho** (ō′ thō), m. Teutonic, rich. Dutch Otho, Otto; Fr. Othon; Ger. Odon, Otto; It. Ottone; Lat. Otho; Sp. Otonio; Sw. Otho, Otto.

Owen (ō′ en), m. From the Welsh Owain, lamb, young warrior.

Pamela (pam′ e l*a*; earlier pronunciation pȧ mē′ la). A feminine name.

Paolo (pä ō′ lō), m. Italian form of Paul.

Pascal (pas′ kal), m. From the Hebrew, Easter, born at Easter.

Patience (pā′ shens), f. From the Latin, suffering.

Patricia (p*a* trish′ *a*). Feminine of Patrick.

Patrick (pat′ rik), m. From the Latin Patricius, patrician, noble. Dutch Patricius; Fr. Patrice; Ger. Patrizius; It. Patrizio; Lat. Patricius; Port. Patricio; Sp. Patricio.

Paul (pôl), m. From the Latin, *paulus,* little. Danish Paul, Paulus; Dutch Paulus; Fr. Paul; Ger. Paul; Gr. Paulos; Hung. Pál; It. Paolo; Lat. Paulus; Polish Pavel; Port. Paulo; Russ. Pavel; Sp. Pablo; Sw. Paul.

Paula (pô′ la). Feminine of Paul.

Paulina (pô lī′ n*a*), f. Feminine of Paul.

Pauline (pô lēn′), f. From the French. Fr. Pauline; Ger. Pauline; It. Paolina; Sp. Paulina.

Pearl (pûrl), f. From the Middle English.

Pedro (pā′ drō), m. Spanish and Portuguese form of Peter.

Penelope (pē nel′ ō pē), f. From the Greek, Pēnelopē; weaver. Fr. Pénélope; Lat. Penelope.

Percival (pûr′ si val), m. From the Old French, valley piercer.

Peter (pē′ tẽr), m. From the Greek Petros, rock. Danish Peder; Dutch Pieter; Fr. Pierre; Ger. Peter, Petrus; Hung. Peter; It. Pietro; Lat. Petrus; Port. Pedro; Sp. Pedro; Sw. Peter.

Phebe (fē′ bē), f. Variant of Phoebe.

Philemon (fī lē′ mon), f. From the Greek, Philēmōn, loving. Fr. Philémon; It. Filemona; Lat. Philemon.

Philip (fil′ ip), m. From the Greek Philippos, lover of horses. Dutch Philippus; Fr. Philippe; Ger. Philipp; It. Filippo; Lat. Philippus; Polish Filip; Port. Felippe; Russ. Philipp, Filip; Sp. Felipe; Sw. Filip.

Philippa (fi lip′ *a*). Feminine of Philip. Dutch Philippa; Fr. Philippiné; Ger. Philippine; It. Filippa; Lat. Philippa; Port. Felipa; Sp. Felipa.

Phillis (fil′ is), f. Variant of Phyllis.

Phineas (fin′ ē as) or **Phinehas,** m. From the Hebrew Pīnēhās, mouth of brass. Fr. Phinéas; It. Fineo; Sp. Fineas.

Phœbe (fē′ bē), f. From the Greek Phoibē, shining one. Fr. Phébé; It. Febe; Lat. Phœbe.

Phyllis (fil′ is), f. From the Greek Phyllis, green bough. It. Filide.

Pierre (pyâr), m. French form of Peter.

Pietro (pyā′ trō), m. Italian form of Peter.

Pius (pī′ us), m. From the Latin, pious, filial. Fr. Pie; Ger. Pius; It. Pio; Lat. Pius.

Priscilla (pris sil′ l*a*), f. From the Latin *priscus,* primitive, ancient. Dutch Priscilla; Fr. Priscille; It. Priscilla; Lat. Priscilla.

Prudence (prōō′ dens), f. From the Latin *prudentia,* wisdom, prudence.

Quentin (kwen′ tin), m. Scottish form of Quintin.

Quintin, Quintyne (kwin′ tin), m. From the Latin *quintus,* fifth. Lat. Quintus, Quintianus; Scot. Quentin.

Rachel (rā′ chel), f. From the Hebrew Rāhhēl, a ewe. Fr. Rachel; Ger. Rahel; It. Rachele; Port. Rachel; Sp. Raquel; Sw. Rachel.

Ralph (ralf), m. From the Anglo-Saxon Rædwulf. Lat. Radulphus.

Ramona (r*a* mō′ n*a*), f. Teutonic, judge's protection.

Raoul (rā ōōl′), m. French form of Ralph.

Raphael (raf′ ā el), m. From the Hebrew Rephāēl, God hath healed. Fr. Raphael; Ger. Raphael; It. Raffaello, Raffaele.

Raymond (rā′ mund), m. From the Old German Raimund, wise protection. Fr. Raymond; Ger. Raimund; It. Raimondo; Port. Raimundo; Sp. Raimundo.

Rebecca, Rebekah (rē bek′ *a*), f. From the Hebrew Ribhqāh, ensnarer. Fr. Rébecca; Ger. Rebekka; It. Rebecca; Lat. Rebecca; Sp. Rebeca.

Regina (rē jī′ na), f. From the Latin, queen.

Reginald (rej′ i nald), m. From the Old German Reginald, strong ruler. Danish Reinhold; Dutch Reinold; Fr. Regnauld; Regnault, Renaud; Ger. Reinwald, Reinald; It. Rinaldo; Lat. Reginaldus; Sp. Reynaldos; Sw. Reinhold.

René (re nā′), m. French, warrior of judgment.

Renée (re nā′). Feminine of René.

Reuben (rū′ ben), m. From the Hebrew Reūben, behold a son. Fr. Ruben; Lat. Reubenus.

Reuel (rōō′ el), m. From the Hebrew Reūēl, God is his friend.

Rex (reks), m. From the Latin, king.

Reynold (ren′ uld), m. Variant of Reginald.

Rhoda (ro′ da), f. From the Greek Rhodē, a rose.

Richard (rich′ ĕrd), m. From the Old High German Richart, strong like a ruler, powerful. Dutch Richart; Fr. Richard; Ger. Richard, Reichard; It. Riccardo; Lat. Ricardus; Port. Ricardo; Sp. Ricardo.

Rita (rē′ t*a*), f. A feminine name from the Italian.

Robert (rob′ ĕrt), m. From the Old German Robert, Ruopert, bright in fame. Danish Robert; Dutch Robert; Fr. Robert; Ger. Robert, Rudbert, Ruprecht; It. Roberto, Ruberto; Lat. Robertus; Port. Roberto; Sp. Roberto; Sw. Robert.

Roberta (rō bûr′ ta). Feminine of Robert.

Roderick (rod′ ĕr ik), m. From the Old German Hroderich, rich in fame. Fr. Rodrique; Ger. Roderich; It. Rodrigo; Lat. Rodericus; Russ. Rurik; Sp. Rodrigo, Roderigo, Ruy.

Rodolph (rō′ dolf) or **Rodolphus,** m. Variants of Rudolph.

Rodrigo (rō drē′ gō), m. Spanish form of Roderick.

Roger (roj′ ĕr), m. From the Old High German Rothger, famous with the spear. Dutch Rutger; Fr. Roger; Ger. Rüdiger; It. Ruggiero, Rogero; Lat. Rogerus; Port. Rogerio; Sp. Rogerio.

Roland (rō′ land) or **Rowland,** m. From the Old German Ruodlant, famous in the land. Danish Roland; Dutch Rœland; Fr. Roland; Ger. Roland; It. Orlando, Rolando; Lat. Rolandus; Port. Rolando, Roldão; Sp. Roldán.

Romola (rom′ ō l*a*), f. From the Latin, strong.

Rosa (rō′ za), f. Italian form of Rose.

Rosabel (roz′ *a* bel), f. From the Latin, fair rose.

Rosalia (rō zā′ li *a*) or **Rosalie** (roz′ *a* li), f. A feminine name from the Latin.

Rosalind (roz′ *a* lind), f. From the Spanish, pretty rose.

Rosamond (roz′ mund), f. From the Latin, rose of the world. Dutch Rozamond; Fr. Rosemonde; It. Rosmonda; Lat. Rosamunda; Sp. Rosamunda.

Rose (rōz), f. From the Latin Rosa. Danish Rosa; Dutch Rosa; Fr. Rose; Ger. Rose; It. Rosa; Lat. Rosa; Sp. Rosa; Sw. Rosa, Rosina.

Rosemary (rōz′ mâr i), f. From the Latin *rosmarinus,* dew of the sea.

Rowena (rō ē′ n*a*), f. From the Celtic, white mane, white skirt.

Roxana (roks an′ *a*), f. From the Persian, brilliant.

Roy (roi), m. From the Old French *roy,* king.

Ruben (rōō′ ben), m. Variant of Reuben.

Rudolph (rū′ dolf), m. From the German Rudolf. Dutch Rudolf; Fr. Rodolphe, Raoul; Ger. Rudolf; It. Rodolfo, Ridolfo; Lat. Rodolphus; Port. Rodolfo; Sp. Rodolfo.

Rufus (rū′ fus), m. From the Latin, red, redhaired.

Rupert (rū′ pērt), m. From the German Ruprecht. Lat. Rupertus. See also Robert.

Ruth (rōōth), f. From the Hebrew Rūth, beauty. Fr. Ruth; Lat. Ruth.

Sabina (s*a* bī′ n*a*), f. From the Latin, a Sabine woman. Dutch Sabine; Fr. Sabine; Ger. Sabine; It. Sabina; Lat. Sabina; Sp. Sabina; Sw. Sabina.

Salome (s*a* lō′ mē), f. From the Hebrew Sālōme, peace, completeness, welfare. Fr. Salomé; Ger. Salome.

Samson (sam′ sn) or **Sampson** (samp′ sn), m. From the Hebrew *shimshōn,* solar or sun's man. Danish Samson; Dutch Samson; Fr. Samson; Lat. Samson; Port. Sansão; Sp. Sansón; Sw. Simson.

Samuel (sam′ ū el), m. From the Hebrew Shemūēl, his name is God. Danish Samuel; Dutch Samuel; Fr. Samuel; Ger. Samuel; Hung. Samuel; It. Samuele; Lat. Samuel; Sp. Samuel.

Sara (sâr′ *a*), f. Variant of Sarah.

Sarah or **Sara** (sā′ rā), f. From the Hebrew Sārāh, princess. Dutch Sara; Fr. Sara; Ger. Sara; It. Sara; Lat. Sara; Port. Sara; Sp. Sara; Sw. Sarah.

Saul (sôl), m. From the Hebrew Shāūl, asked for. Fr. Saul; Lat. Saulus.

Sebastian (sē bas′ chan), m. From the Greek Sebastianos, reverenced, reverence. Dutch Sebastiaan; Fr. Sebastien; Ger. Sebastian; It. Sebastiano; Lat. Sebastianus; Port. Sebastião; Russ. Sevastian; Sp. Sebastián; Sw. Sebastiaan.

Selina (sē lī′ n*a*), f. From the Greek, moon.

Serena (sē rē′ n*a*), f. From the Latin, serene, calm.

Seth (seth), m. From the Hebrew Shēth, appointed.

Sheila (shē′ l*a*), f. Irish form of Cecilia.

Shirley (shûr′ li), f. From the Anglo-Saxon, possibly meaning county meadow.

Sibyl (sib′ il), f. From the Greek Sibylla, prophetess. Dutch Sibylla; Ger. Sibylle; Fr. Sibylle; Lat. Sibylla.

Sidney (sid′ ni) or **Sydney,** m. From the Latin, a Sidonian.

Siegfried (sēg′ frēd) or **Sigfrid** m. Teutonic, conquering peace.

Sigismund (sij′ is mund), m. Teutonic, conquering protection. Dutch Sigismundus; Fr. Sigismond; Ger. Sigismund, Sigmund; It. Sigismondo, Sismondo; Lat. Sigismundus; Port. Sigismundo; Sp. Sigismundo; Sw. Sigismund.

Silas (sī′ las), m. Variant of Silvanus.

Silvanus (sil vā′ nus), m. From the Latin, forester, woodsman. Dutch Silvanus; Fr. Silvain; Ger. Silvanus, Silvan; It. Silvano, Silvio; Lat. Silvanus; Sp. Silvano.

Silvester (sil ves′ tēr) or **Sylvester,** m. From the Latin *silvester,* bred in the country, rustic. Fr. Silvestre; Ger. Silvester; It. Silvestro; Port. Sylvestre; Sp. Silvestre.

Silvia (sil′ vi *a*), f. Variant of Sylvia.

Simeon (sim′ ē on), m. From the Hebrew Shimōn, hearing. Fr. Siméon; Ger. Simeon; It. Simeone; Lat. Simeon; Port. Simeão; Sp. Simeon.

Simon (sī′ mon), m. From the Hebrew Shimōn. Dutch Simon; Fr. Simon; Ger. Simon; Hung. Simon; It. Simone; Lat. Simon; Port. Simão; Sp. Simón; Sw. Simon.

Solomon (sol′ ō mun), m. From the Hebrew Shelōmōh, peaceable. Dutch Salomo; Fr. Salomon; Ger. Salomon; Hung. Salomon; It. Salomone; Lat. Salomon; Polish Salomon; Port. Salomão; Sp. Salomón.

Sophia (sō fi′ *a*), f. From the Greek meaning knowledge, wisdom. Danish Sophie; Dutch Sophie; Fr. Sophie; Ger. Sofia; It. Sofia; Lat. Sophia; Russ. Sofia; Sp. Sofia; Sw. Sofia.

Sophie (sō fē′), f. French form of Sophia.

Sophronia (sō frō′ ni*a*), f. From the Greek Sōphronia, sensible.

Stella (stel′ *a*), f. From the Latin, star. Fr. Estelle; Sp. Estella.

Stephana (stef′ *a* n*a*). Feminine of Stephen.

Stephen (stē′ ven), m. From the Greek, Stephanos, crown. Danish Stephan; Dutch Steven, Stephanus; Fr. Étienne; Ger. Stephan; Hung. Istvan; It. Stefano; Lat. Stephanus; Polish Sczepan; Port. Estevão; Russ. Stepan, Stefan; Sp. Estevan, Esteban; Sw. Stefan.

Susan (sū′ zan) or **Susanna** (sū zan′ *a*), f. From the Hebrew Shūshan, lily. Danish Susanna; Dutch Susanna; Fr. Susanne; Ger. Susanne; It. Susanna; Lat. Susanna; Port. Susana; Sp. Susana; Sw. Susanna.

Susannah (sū zan′ *a*). Variant of Susan.

Suzanne (su zan′), f. French form of Susan.

Sybil (sib′ il), f. Variant of Sibyl.

Sydney (sid′ nē), m. Variant of Sidney.

Sylvanus (sil vā′ nus), m. Variant of Silvanus.

Sylvester (sil ves′ tēr), m. Variant of Silvester.

Sylvia or **Silvia** (sil′ vi*a*), f. From the Latin, of the woods. Fr. Silvie; It. Silvia; Sp. Silvia.

Tabitha (tab′ i th*a*), f. From the Aramaic Tabhītha, gazelle.

Terence (ter′ ens), m. From the Latin Terentius.

Teresa (te rē′ sa). Variant of Theresa.

Thaddeus (thad′ ē us), **Thadeus** (thad ē′ us), m. From the Hebrew, Theudas, praised. Ger. Thaddäus; It. Taddeo; Lat. Thaddæus; Port. Thaddeo; Sp. Tadeo.

Thalia (thāl′ y*a*), f. From the Greek Thaleia, blooming, luxuriant.

Theobald (thē′ ō bôld), m. From the Old German Theodbold, bold for the people. Danish Theobald; Dutch Tiebout; Fr. Thibaut; Ger. Dietbold; It. Theudebaldo; Lat. Theobaldus; Port. Theobaldo; Sp. Teobaldo; Sw. Theobald.

Theodora (thē ō dō′ r*a*), f. From the Greek Theodōra. Ger. Theodora; It. Teodora.

Theodore (thē′ ō dōr), m. From the Greek Theodorus, gift of God. Danish Theodor; Dutch Theodorus; Fr. Théodore; Ger. Theodor; It. Teodoro; Lat. Theodorus; Polish Feodor; Port. Theodoro; Russ. Feodor; Sp. Teodoro; Sw. Theodor.

Theodoric (thē od′ ō rik) or **Theoderick,** m. From the Teutonic, ruler of the people. Fr. Théodoric; Ger. Theodorich; It. Teodorico; Lat. Theodoricus; Sp. Teodorico; Sw. Theodor.

Theodosia (thē ō dōsh′ i*a*), f. From the Greek Theodosia, gift of God. Ger. Theodosia; It. Teodosia; Lat. Theodosia.

Theodosius (thē ō do′ shius), m. From the Greek, gift of God. Fr. Théodose; It. Teodosio; Lat. Theodosius; Sp. Teodosio.

Theophilus (thē of′ il us), m. From the Greek, Theophilos, dear to the gods. Danish Gottlieb; Dutch Theophilus; Fr. Théophile; Ger. Theophilus; It. Teofilo; Lat. Theophilus; Port. Theophilo; Sp. Teófilo.

Theresa (te rē′ s*a*), f. From the Greek, harvesting. Fr. Thérèse; Ger. Therese; It. Teresa; Lat. Theresa; Port. Theresa; Sp. Teresa; Sw. Theresa.

Thomas (tom′ *a*s), m. From the Aramaic Teōma, twin. Danish Thomas; Dutch Thomas; Ger. Thomas; Fr. Thomas; Hung. Tamas; It. Tomaso; Lat. Thomas; Port. Thomas, Thomaz; Sp. Tomás; Sw. Thomas.

Thomasa (tom′ *a* s*a*) or **Thomasine.** Feminine forms of Thomas.

Timothy (tim′ ō thi), m. From the Greek Timotheos, honoring God. Danish Timotheus; Dutch Timotheus; Fr. Timothée; Ger. Timotheus; It. Timoteo; Lat. Timotheus; Port. Timotheo; Sp. Timoteo; Sw. Timotheus.

Titus (tī′ t*u*s), m. From the Greek Titos, safe, saved. Fr. Tite; Ger. Titus; It. Tito; Lat. Titus; Port. Tito; Sp. Tito.

Tobiah (tō bī′ *a*) or **Tobias** (tō bī′ as), m. From the Hebrew Tōbhīyāh, The Lord is my good. Danish Tobias; Dutch Tobias; Fr. Tobie; Ger. Tobias; It. Tobia; Lat. Tobias; Sp. Tobias.

Tomaso (tō mä′ zō), m. Italian form of Thomas.

Tristram (tris′ tram), m. From the Latin *tristis,* sad, sorrowful.

Ulysses (ū lis′ ēz), m. From the Greek Odysseus, hater. Fr. Ulysse; It. Ulisse.

Una (ū′ n*a*), f. From the Latin, *unus*, one.

Urban (ûr′ ban), m. From the Latin *urbanus,* of the city, courteous. Danish Urban; Dutch Urbaan; Fr. Urbain; Ger. Urban, Urbanus; It. Urbano; Lat. Urbanus; Sp. Urbano; Sw. Urban.

Uriah (ū rī′ *a*), m. From the Hebrew *ūrīyāh,* flame of Jehovah, my light is Jehovah. Fr. Urie; Ger. Urias; It. Uria; Lat. Urias.

Ursula (ûr′ sū l*a*), f. From the Middle Latin, she-bear. Dutch Ursula; Fr. Ursule; Ger. Ursula; It. Orsola; Lat. Ursula; Sp. Ursola.

Valentina (val en tī′ n*a*). Feminine name of Valentine.

Valentine (val′ en tīn); m. From the Latin Valentinus, mighty, strong. Danish Valentin; Dutch Valentijn; Fr. Valentin; Ger. Valentin; It. Valentino; Lat. Valentinus; Port. Valentim; Sp. Valentín; Sw. Valentin.

Valeria (v*a* lēr′ i*a*), f. From the Latin, healthy. Fr. Valérie; Ger. Valerie; It. Valeria.

Valerie (vȧ′ lā rē), f. French form of Valeria.

Vanessa (v*a* nes′ *a*), f. From the Greek, butterfly.

Veronica (ve ron′ i k*a*), f. From the Greek Berenike, but apparently changed to make it seem to mean true picture, for the Saint Berenike made the *true image* of the Saviour on the napkin with which she wiped his face. Fr. Veronique; It. Veronica.

Victoria (vik tō′ ri *a*), f. From the Latin, victory. Fr. Victoire; Ger. Victoria; It. Vittoria; Lat. Victoria; Sp. Vitoria.

Vincent (vin′ sent), m. From the Latin Vincentius, conqueror. Dutch Vincentius; Fr. Vincent; Ger. Vincenz; It. Vincenzo; Port. Vicente; Sp. Vicente.

Viola (vī′ o l*a*), f. From the Latin *viola,* violet. Fr. Violette; Ger. Viola, Viole; It. Viola; Port. Violante; Sp. Violante.

Violet (vī′ ō let), f. From the Latin *viola.*

Virgil or **Vergil** (ver′ jil), m. Latin, flourishing—and connected by folk etymology with the *virga* or golden bough.

Virginia (ver jin′ ia), f. From the Latin Virginia, virgin, pure. Dutch Virginie; Fr. Virginie; Ger. Virginia; It. Virginia.

Vivian (viv′ i an), f. From the Celtic, animated, lively. Fr. Vivienne; It. Viviana.

Walter (wôl′ tẽr), m. From the Old High German Walthere, ruling the host, powerful warrior. Dutch Wouter; Fr. Gauthier, Gautier; Ger. Walther; It. Gualtiero; Lat. Gualterus; Port. Gualter; Sp. Gualterio; Sw. Walter.

Wilbur (wil′ bẽr), m. From the Old German *Wilburg,* loved stronghold.

Wilfred (wil′ fred) or **Wilfrid** (wil′ frid), m. From the Anglo-Saxon Wilfridh, desire for peace, resolute for peace.

Wilhelmina (wil hel mē′ n*a*), f. From the German Wilhelmine, resolute protectress. Fr. Guillelmine, Guillemette; Ger. Wilhelmine; It. Guglielma; Sp. Guillelmina.

Wilhelmine (wil′ hel mēn′). Feminine form of Wilhelm. It. Guglielma.

William (wil′ yam), m. From the Old High German Willehelm, resolute protector, strong defender. Danish Wilhelm; Dutch Willem; Fr. Guillaume; Ger. Wilhelm; It. Guglielmo; Lat. Guilielmus, Gulielmus; Port. Guilherme; Sp. Guillermo; Sw. Wilhelm.

Winfred (win′ fred), m. From the Anglo-Saxon Winfrith, friend of peace.

Winifred (win′ i fred), f. From the Anglo-Saxon Winefrith, friend of peace. Dutch Winfried; Fr. Winifred; Lat. Winfreda; Sw. Winfrid.

Yvonne (i von′), f. French, possibly a feminine of Ivan or Jean.

Zaccheus (zak ē′ us), m. From the Hebrew Zakkay, pure, innocent. Fr. Zacchée; It. Zacheo; Lat. Zaccheus.

Zachariah (zak *a* rī′ *a*), m. From the Hebrew Zekhar-Yāh, Jehovah hath remembered. Danish Zacharias; Dutch Zacharias; Fr. Zacharie; Ger. Zacharias; It. Zaccaria; Lat. Zacharias; Sp. Zacarias; Sw. Zacharias.

Zachary (zak′ *a* ri), m. Variant of Zachariah.

Zadok (zā′ dok), m. From the Hebrew īsādhōq, just, righteous. Fr. Zadoc; Lat. Zadocus.

Zenobia (zē nō′ bi *a*), f. From the Greek, Zenobia, having life from Jupiter. Fr. Zénobie; Lat. Zenobia.

Zoe (zō′ ē), f. From the Greek *zōe,* life.

DICTIONARY OF INTERESTING FACTS

ALMA MATER

Alma mater, Latin, fostering mother, a phrase applied to Ceres, goddess of agriculture and of plenteous harvests, and to Cybele, goddess mother of man and giver of the arts. Today it is applied by school or college graduates to the institution that nurtured them in arts and culture.

ALMIGHTY DOLLAR

This phrase, coined by Washington Irving, makes money the god of Americans, for *Almighty* is an adjective properly applied only to God.

AMERICA'S CUP RACE

In 1851 the yacht *America,* owned by Commodore John C. Stevens and other members of the New York Yacht Club, beat all entries in a race in English waters around the Isle of Wight and won the £500 prize cup offered by the Royal Yacht Club of Cowes (established in 1812). The winners gave the cup to the New York Yacht Club in 1857 to be a challenge cup for yachts of all nations. This famous competition is the *America's Cup Race.* The first race was in 1870. In 1899, 1901, 1903, 1920 and 1930 Sir Thomas Lipton, an Irish tea merchant, competed with his *Shamrock I, II, III, IV* and *V,* respectively. He lost five times, but because he was such a good loser, the American people presented him with a gold cup in 1930. There were contests in 1934, 1935 and 1937, when the British challenger, T. O. M. Sopwith's *Endeavour II,* was defeated by Harold S. Vanderbilt's *Ranger* off Newport, R. I.

ANCESTOR WORSHIP

The profound reverence that the Chinese and Japanese hold for their ancestors is regarded as worship.

Ancestor worship has been practiced throughout history in almost every type of civilization. In ancient Rome the *manes* or spirits of the dead received gifts and sacrifices, and a feast was held in honor of the *di parentes* or ancestral spirits; in Greece it was held that the ancestral heroes, if they were appeased, would protect, advise and warn; in Africa it is often the chief or founder of a family who is worshiped.

Ancestor worship usually makes a people extremely conservative and ties them to their home land.

ANIMAL WORSHIP

In many parts of the world various animals have been objects of veneration. The mummied scarabs and cats of ancient Egypt are famous examples, and on Egyptian monuments representations of gods show several with animal heads on human bodies—the lion goddess called *Sekhet,* the bull called *Apis, Thoth* with the head of an ibis or an ape, the cow-headed *Hathor* and the hawk-headed *Horus* and *Ra.* An underworld goddess *Tawit* or *Thoueris* was shown with the head and body of a hippopotamus, the hindquarters of a lion and the tail of a crocodile. Animal worship grew up in many ways—the animal that was hunted, the animal that gave food, the animal that was dreaded, each might come to be worshiped. Animals were symbols of tribes, families or certain groups; and these *totems* became half-sacred, and there were *taboos* or traditional prohibitions against killing, eating or touching them.

The cow is a sacred animal in India, and in the United States *sacred cow* is newspaperman's slang for a special interest, business or person that must not be criticized but must always be glorified.

NATIONAL ANTHEMS

Nearly every civilized country has its officially recognized national anthem. Sometimes there are other songs, like *America* in the United States, which are as popular as the official anthems. Sometimes there is a song that is the popular song in one section of a country, like *Dixie* in the Southern States. Again, a change of government may bring a change in the official anthem, as has happened in a number of European countries since the World War. While there is some question as to the official anthem in a few instances, notably in modern Russia, the following list is representative.

Argentina. *Oid, mortales, el grito sagrado* (Mortals, Hear the Heavenly Call). The music is by D. V. Lopez.

Australia. Song of Australia. Words by Mrs. Carleton and music by Singer.

Austria. *Oesterreichische Bundeshymne.* Words by Renner and music by Kenzl.

Belgium. *La Brabançonne.* The words of this song were written during the revolution of 1830, when Belgium obtained her freedom. The music was composed by François van Campenhout, and the words were by Jenneval. New words were written in 1852 by Louis Hymans.

Brazil. *Hymno da Proclamacão da Republica* (Hymn of the Proclamation of the Republic). Music by Leopoldo Miguez and words by Medeiros e Albuquerque.

Bulgaria. *Shouma Maritza.*

Burma. *Kayah Than* (Blow the Trumpet).

Canada. *The Maple Leaf Forever.* Words and music by Alexander Muir.

Chile. *Dulce Patria.* Words and music by Ramoń Carnicer y Batlle.

Costa Rica. *De la Patria.* Music by M. M. Gutierrez.

Czechoslovakia. *Kde Domov Muj?* (Where is My Fatherland?) is sung by the Czechs; the Slovaks sing *Lightning Above the Mountains.*

Denmark. *Kong Kristian stod ved höien Mast.* (King Christian Stood by the Lofty Mast). Music by J. P. E. Hartmann, words by Johannes Evald.

Ecuador. *Salve, O Patria* (We Greet Thee, Our Fatherland). Words by Mera.

Egypt. *Salaam Effendi* (The Khedive March).

Finland. *Vårt Land* (Our Fatherland). Music by Fredrik Pacius, words by J. L. Runeberg.

France. *La Marseillaise* was the inspiration of Rouget de l'Isle, who wrote both words and music in one night in 1792.

Germany. *Die Wacht am Rhein* (The Watch on the Rhine) by C. Wilhelm and M. Schneckenburger and *Deutschland über Alles* (Germany Above All) with words by Hoffmann von Fallersleben set to the music of Haydn. These popular airs lack the official recognition now accorded the *Horst Wessel Lied.*

Great Britain. *God Save the King.* The authorship probably belongs to Henry Carey. Other countries have adopted the melody for their own use, notably the United States, in *America.*

Greece. *Sons of Greece, Come, Rise.* During the Greek war for independence in 1821-1829, the words and music were written.

Hungary. *Isten áld meg a Magyart* (Lord Bless the Hungarian). Music by Ferencz (Franz) Erkel.

Italy. *Marcia Reale Italiana* (Royal Italian March), by G. Gabetti, is the official anthem. Equally popular is *The Garibaldi Hymn* by Luigi Mercantini. Even more frequently heard on patriotic occasions in recent years is *The Fascist Hymn.*

Japan. *Kimi Ga Yo Wa* (May Our Sovereign Lord Remain). A very brief simple verse of unknown antiquity, set to music by Hironokami.

Latvia. *Dievs sveti Latviju* (God Bless Latvia).

Mexico. *Mexicanos, al grito de guerra* (Mexicans, Arise to War). Music by Jaime Nunó and words by F. G. Bocanegra.

Netherlands. *Wein Neerlandsch Bloed* (Ancient Blood of the Netherlands) by H. C. Tollens, and the stirring *Wilhelmus van Nassouwe* (William of Nassau).

Nicaragua. Blas Villatas wrote the national song.

Norway. *Sang for Norge* (Song for Norway): The words are by the great Norwegian author, Björnstjerne Björnson.

Persia. *Salamati Shah* (Salute the Shah). Music by A. Lemaire.

Peru. *Somos libres, seámoslo siempre* (We are Free, So Let us Remain Forever).

Poland. *Jeszcze Polska Nie Żginela* (Never Shall Poland Die).

Portugal. The *Portuguese National Hymn* was written by A. Keil after Portugal became a republic in 1910.

Rumania. *Traeasca Regale* (Long Live the King).

Russia. The *Internationale* is the commonly recognized song of the entire Union of Socialist Soviet Republics. The words are by Pottier.

Salvador. *Saludemos la Patria* (Let Us Salute our Country). Music by J. Aberle and words by J. J. Canas.

Spain. *Marcha Real* (Royal March) still retains its national significance in republican Spain, so occupied with the process of rebuilding.

Sweden. *Ur Svenska Hjertans djup* (From the Bottom of Swedish Hearts). Music by Lindblad, words by Strandberg.

Switzerland. *Dem Vaterland* (To the Fatherland). Written to the music of *God Save the King;* words by J. R. Wyss, author of *Swiss Family Robinson.*

Turkey. *March of Independence.*

United States. *The Star Spangled Banner* is the national anthem. It was written by Francis Scott Key on Sept. 14, 1814, when the British were bombarding Fort McHenry. The words were set to music by Ferdinand Durang who used an old air, *Adams and Liberty.* The song at once met with tremendous applause. It was made the national anthem of the United States by an act of Congress in 1931. *America,* although not the official song, is probably the most popular one, the words being by Samuel F. Smith and set to the tune of *God Save the King.*

Uruguay. *Himmo Nacional de la República Oriental del Uruguay* (National Hymn of the Republic of Uruguay).

Venezuela. *Gloria al bravo pueblo* (A Brave Nation Honored). Music by J. Sandaeta, words by V. Salvias.

Yugoslavia. The national anthem of Yugoslavia is made up of a combination of the Serbian *Boze Pravde,* the Croatian *Liepa Nasa Domvina* and the Slovene *Napred Zastava Slave.*

ASHES

When a tree grows it takes up from the earth by means of its roots certain minerals called *salts.* These salts, which all plants need as much as they do air, become a part of the wood of the tree. When a stick of wood is burned, most of it is turned into gas and goes off into the air. All that is left is the ashes, which cannot burn, as they are the salts that the tree took up from the earth when growing. If the ashes are spread over the ground, the salts go back into the earth again, and this is the reason why wood ashes make good fertilizer for land: the salts that have been taken from it by growing plants are given back to it in the ashes and help other trees and plants to grow. Some kinds of wood give more ashes when burned than others. Willow gives more than twice as much as oak, and about one-fourth more than elm. The bark of all trees makes more ashes than the solid wood.

ASSOCIATIONS, SOCIAL, FRATERNAL AND SCIENTIFIC

Actors' Equity Association; headquarters, New York; founded 1915; about 5,000 members. An organization to better the working conditions and protect the legal rights of actors.

American Academy of Arts and Letters, see *Arts and Letters.*

American Academy of Political and Social Sciences, see *Political and Social Sciences.*

American Association for the Advancement of Science, see *Science.*

American Association of University Professors, see *University Professors.*

American Association of University Women, see *University Women.*

American Astronomical Society, see *Astronomical Society, American.*

American Automobile Association, see *Automobile Association, American.*

American Bankers Association, see *Bankers Association, American.*

American Bar Association, see *Bar Association, American.*

American Civil Liberties Union, see *Civil Liberties Union.*

American College of Surgeons, see *Surgeons.*

American Farm Bureau Federation, see *Farm Bureau Federation, American.*

American Federation of Arts, see *Arts.*

American Federation of Labor; headquarters, Washington; founded 1881; membership fluctuates, 3,440,000 claimed. A group of labor unions, organized by trades and industries, which seeks to improve working conditions in industry and to provide relief for the families of members on strike.

American Federation of Musicians, see *Musicians, American Federation.*

American Geographical Society, see *Geographical Society, American.*

American Institute of Architects; headquarters, Washington; founded 1857; about 3,000 members. A professional group, designed to advance the standards of its members and protect their interests.

American Institute of Banking, see *Banking, American Institute of.*

American Legion, The; headquarters, Indianapolis, Ind.; founded 1919; about 966,000 members. An organization of those who served in the armed forces of the United States during the World War. Local posts in hundreds of communities have fraternal meetings and support local educational and social activities; these are grouped in departments by states. The national organization devotes much effort to political activities intended to improve the economic condition of its members. The American Legion Auxiliary is an affiliated organization for the families of Legion members.

American Library Association, see *Library Association, American.*

American Mathematical Society, see *Mathematical Society, American.*

American Medical Association, see *Medical Association, American.*

American Nurses Association, see *Nurses Association, American.*

American Optometric Association, see *Optometric Association, American.*

American Osteopathic Association, see *Osteopathic Association, American.*

American Philosophical Society, see *Philosophical Society, American.*

American Physical Education Association, see *Physical Education Association, American.*

American Physical Society, see *Physical Society, American.*

American Radio Relay League, see *Radio Relay League, American.*

American Red Cross, see *Red Cross, American.*

American Revolution, Daughters of the, National Society; headquarters, Washington; first organized at Washington in 1890, incorporated by Act of Congress in 1896; about 170,000 members in many local chapters. The membership is restricted to those whose ancestors were in the American army during the Revolution. The society supports patriotic activities of various sorts.

American Society for the Prevention of Cruelty to Animals; headquarters, New York; founded 1866; about 5,600 members. An organization to provide relief for animals in the cities, to destroy stray animals and to prevent the abuse of horses in harness.

American Sunbathing Association, see *Sunbathing Association, American.*

Ancient Order of United Workmen, see *United Workmen, Ancient Order of.*

Animals, American Society for the Prevention of Cruelty to, see *American Society for the Prevention of Cruelty to Animals.*

Anti-Saloon League of America; headquarters, Washington; founded 1894; membership in local units. An organization for political activity in the field of liquor prohibition that enjoyed great national power during the era of National Prohibition.

Architects, American Institute of, see *American Institute of Architects.*

Arts, American Federation of; headquarters, Washington; founded 1909; 325,000 members in affiliated groups. An association of many local and special organizations intended to promote the interests of all branches of pure and commercial art.

Arts and Letters, American Academy of; headquarters, New York; founded 1904; limited to 50 members. A self-perpetuating group of persons who have attained distinction in literature or the arts.

Astronomical Society, American; headquarters, Princeton, N. J.; founded 1897; about 600 members. A professional group, designed to support the activities of its members and advance the science.

Audubon Societies, National Association of; headquarters, New York; founded 1905 by George Bird Grinnell and named after John James Audubon, the ornithologist; about 5,000,000 members in affiliated groups. An endowed association working with all local and special organizations interested in the propagation and preservation of wild life. *Bird Lore* is the official magazine.

Authors' League of America; headquarters, New York; founded 1912; 3,000 members. A professional group for advancing the standards and guarding the legal rights of its membership.

Automobile Association, American; headquarters, Washington; founded 1902; about 1,000,000 members. An association of local clubs working in the interests of automobile owners.

Bankers Association, American; headquarters, New York; founded 1875; 13,000 members. The principal organization of commercial banks in the United States, designed to advance standards and improve the economic and political position of its membership.

Banking, American Institute of; headquarters, New York; founded 1900; 58,300 members. A professional organization of officers and employees of banks that seeks to protect their position and improve banking conditions.

Baptist Young People's Union of America; headquarters, Chicago; formed 1891; 250,000 members. A social and charitable organization with groups in most Baptist churches designed to appeal to the interests of youth.

Bar Association, American; headquarters, Chicago; formed 1878; 30,000 members. The professional organization of the legal profession, designed to maintain the standards and promote the interests of its membership.

Big Brother and Big Sister Federation; headquarters, New York; founded 1917; an affiliation of 47 local organizations throughout the nation engaged in welfare work among the youth of the cities.

Boy Scouts of America; headquarters, New York; founded 1910; 1,080,000 members. Subordinate local troops in all sections seek to develop citizenship and character in boys and stimulate interest in nature and outdoor life.

Boys' Clubs of America; headquarters, New York; founded 1906; 255,000 members in about 300 affiliated groups. A federation of boys' clubs in the various cities, working for entertainment and character advancement among its membership.

The Boy Scout

The Scout Law: "A Scout is trustworthy. A Scout is loyal. A Scout is helpful. A Scout is friendly. A Scout is courteous. A Scout is kind. A Scout is obedient. A Scout is cheerful. A Scout is thrifty. A Scout is brave. A Scout is clean. A Scout is reverent."

Business and Professional Women's Clubs, see *Women's Clubs, National Federation of Business and Professional.*

Camp Fire Girls; headquarters, New York; founded 1912; 235,000 members. A federation of local troops planned to encourage self-reliance and outdoor life among growing girls, following the general scheme of the Boy Scout movement.

Chamber of Commerce of the United States; headquarters, Washington; formed 1912; 17,200 members. A national organization to study and give information on business matters and to correlate the activities of over 1,300 local business organizations.

Chautauqua Literary and Scientific Circle; headquarters, Chautauqua, N.Y.; formed 1878; 700,000 members. A group for self-improvement, both by individual study and by lecture and reading courses under a definite program; begun as a correspondence school to extend the activities of the summer school that met at Chautauqua, N.Y.

Chemical Society, American; headquarters, Washington; founded 1876; 20,500 members. A professional organization designed to advance the interests of its members and to make available the results of their work.

Christian Endeavor; headquarters, Boston; about 4,000,000 members in 77,500 local groups. Dr. Francis E. Clark formed the first Young People's Society of Christian Endeavor in the Congregational Church at Portland, Me., in 1881. The World's Christian Endeavor Union was formed in 1895. It is an interdenominational religious group working for the advancement of the Christian religion among young people.

Churches of Christ in America, Federal Council of the; headquarters, New York; organized in Philadelphia in 1908. A federation of 30 different Christian denominations representing some 22,000,000 members of Protestant churches, working for the general advancement of their common interests.

Cincinnati, Society of the; headquarters, Baltimore; founded 1783 with George Washington as president; 1,400 members. Originally made up of officers of the American army in the Revolution, membership is hereditary and restricted; its activities are mainly honorary.

Civil Liberties Union, American; headquarters, New York; founded 1920; 5,000 members. A group designed to advance the cause of freedom of speech for political and social minorities and to defend by propaganda and legal measures the rights of individuals.

Committee for Industrial Organization; headquarters, Washington; formed 1935; membership fluctuates, 4,000,000 claimed. An affiliation of labor organizations grouped by plants and industries instead of by trades; it seeks to protect the rights of its members and better their economic situation.

Confederacy, United Daughters of the; headquarters, St. Louis; founded 1894; 40,100 members. An organization restricted to those whose ancestors were in the Confederate military service. It provides care for the surviving Confederate veterans, participates in various activities aimed at the commemoration of their activities and promotes historical work.

Confederate Veterans, Sons of; headquarters, Richmond; founded 1896; 50,000 members. A society that provides support for veterans and fosters commemorative and historical activities related to Confederate interests; membership is restrictel to descendants of Confederate soldiers.

Consumers' League, National; headquarters, New York; founded 1899; 2,500 members. An organization to defend the interests of consumers of nationally distributed merchandise; it cooperates with local groups with the same motives.

Daughters of the American Revolution, National Society, see *American Revolution, Daughters of the, National Society.*

Daughters of the Confederacy, United, see *Confederacy, United Daughters of the.*

Disabled American Veterans of the World War; headquarters, Cincinnati; founded 1920; 44,500 members. Composed of wounded and other disabled veterans, the organization seeks to advance their economic condition and to secure adequate care for those in need of aid.

Eastern Star, Grand Chapter, Order of; headquarters, Washington; founded 1896; 2,000,000 members. A benevolent society restricted in membership to Masons and their families, whose local units participate in community charity work and in social affairs.

Education Association of the United States, National; headquarters, Washington; founded 1857; 205,000 members. A group composed of teachers and school executives that seeks to promote educational activities of all kinds and to advance the status of the profession.

Elks, Grand Lodge, Benevolent and Protective Order of; headquarters, Chicago; founded 1868; 500,000 members. A fraternal organization, restricted to cities, which provides security for its membership and engages in local charitable activities. The original Elks Club was founded in New York in 1866 as a good-fellowship club by a group of men who took the head of an elk from Barnum's Museum as their emblem. Benevolent aspects were gradually assumed.

Epworth League of the Methodist Episcopal Church; headquarters, Chicago; founded 1889; 552,000 members. A federation of many local units intended to promote evangelism and Bible study among young people.

Exchange Club, National; headquarters, Toledo; founded 1917; 40,000 members. An association, restricted in membership, of local groups of business men working for higher standards and for local programs of civic and community betterment.

Farm Bureau Federation, American; headquarters, Chicago; founded 1919; 500,000 members. Composed of farmers and their families, this organization co-ordinates the political activities of local farmer associations and develops programs to advance their common interests.

Foresters of America; headquarters, Jersey City; founded 1790; 175,000 members. A benevolent fraternal group that provides security for members and their families.

Forty and Eight, see *Quarante Hommes et Huit Chevaux, La Société des.*

4-H Clubs, under supervision of the Extension Service in U. S. Department of Agriculture, Washington, with local control by county extension agents; to improve the 4 H's—Head, Hands, Heart and Health. Founded 1907, membership approximately 1,200,000.

Freemasonry, 33d Degree Scottish Rite of; 241,000 members. The Mother Supreme Council, organized in Charleston, S.C., in 1801, became the southern Jurisdiction with seat at Washington, D.C., when the Supreme Council for the Northern Jurisdiction was organized in 1813 with seat at Boston. One of the most active and widespread Masonic orders, this secret

The Girl Scout

By helping brother to help himself, this Girl Scout exemplifies the laws of her organization. The laws provide a simple code of conduct that girls everywhere can understand and accept: "A Girl Scout's honor is to be trusted. A Girl Scout is loyal. A Girl Scout's duty is to be useful and to help others. A Girl Scout is a friend to all and a sister to every other Girl Scout. A Girl Scout is courteous. A Girl Scout is a friend to animals. A Girl Scout obeys orders. A Girl Scout is cheerful. A Girl Scout is thrifty. A Girl Scout is clean in thought, word and deed."

benevolent fraternity works through its local lodges to provide security for its membership and participates in community charitable activities.

Freemasons, The. The Masonic fraternity is the largest, oldest and most widely distributed secret society in the world. Introduced into America by English Masons about 1730, Masons of various rites met in scattered lodges irrespective of their original affiliations, but organizations of the more powerful branches by states and localities soon developed. In addition to the Scottish Rite and Royal Arch Freemasons and the Eastern Star, important Masonic groups include the Grotto, a social fraternity, the Knights Templars, an order with about 200,000 adherents in this country, and the Shrine or Nobles of the Mystic Shrine. The total membership of master masons in the United States is about 2,988,000.

Freemasons of the United States, Royal Arch, General Grand Chapter; headquarters, Coldwater, Mich., founded 1797, 515,000 members. A Masonic order, this secret benevolent fraternal organization with many local units shares in community charity work and provides security for its members.

Geographic Society, National; headquarters, Washington; founded 1888; 1,125,000 members. An organization of world-wide scope, designed to advance and spread geographic knowledge. The membership includes subscribers to the Society's *National Geographic Magazine.*

Geographical Society, American, headquarters N.Y.; founded 1852; about 1,125,000. An organization formed to encourage geographical exploration and discovery and to provide a place to obtain accurate information on every part of the globe.

Girl Scouts, Inc.; headquarters, New York; founded 1912; 423,000 members. Its local troops in all sections work to advance character and outdoor activities among growing girls and to promote an interest in good citizenship.

Grand Army of the Republic; headquarters, Cincinnati; founded 1866. Its membership, restricted to veterans of the Northern Army in the Civil War, has declined steadily with their deaths from a maximum of 409,000. It is patriotic in purpose and has worked for the advantage of its members in political and economic fields.

Grotto, see *Freemasons.*

Hibernians in America, Ancient Order of; headquarters, Pittsburgh; formed 1836; 200,000 members. A semisecret benevolent fraternal order limited in membership to Roman Catholic men of Irish birth or ancestry; Irish immigrants were formerly the special care of this order.

Improved Order of Red Men, Great Council, see *Red Men, Great Council, Improved Order of.*

Independent Order of Odd Fellows, Sovereign Grand Lodge, see *Odd Fellows, Sovereign Grand Lodge, Independent Order of.*

International Amateur Radio Union, see *Radio Union, International Amateur.*

Izaak Walton League of America; headquarters, Chicago; founded 1922; 20,000 members. A national organization interested in the preservation of wild life for recreation and sport, particularly fishing, and working to promote co-operation between sportsmen and legal authorities.

Junior Leagues of America, The Association of; headquarters, New York; more than 100 leagues and 30,000 members. The Junior League of the N.Y. College Settlement, organized by Miss Mary Harriman in 1900, was the nucleus; in 1920 Mrs. Willard Straight organized the 39 leagues then formed in different cities into a National Association; headquarters were established in New York city in 1926. Essentially a federation of young women of accepted social rank, its local units participate in social and charitable activities.

Kiwanis International; headquarters, Chicago; founded 1915; 96,000 members. A union of local organizations of business and professional men, restricted in membership, dedicated to better business standards and social and civic improvement.

Knights of Columbus; headquarters, New Haven; founded 1882; 434,000 members. A fraternal and benevolent society of Roman Catholic men, devoted to educational charities and the economic security of its members.

Knights of Pythias; headquarters, Minneapolis; founded 1864; 400,000 members. A fraternal benevolent organization with local units in all parts of the nation; it has worked actively to secure economic security for its members and their families.

Knights Templar, see *Freemasons.*

La Société des Quarante Hommes et Huit Chevaux, see *Quarante Hommes et Huit Chevaux, La Société des.*

Leonard Wood Memorial for the Eradication of Leprosy; headquarters, New York; founded 1927; 50,000 members. A society working for the elimination of leprosy in all parts of the world.

Library Association, American; headquarters, Chicago; founded 1876; 13,400 members. A professional society for the advancement of the status of its members and the improvement of library service.

Lions International (International Association of Lions Clubs); headquarters, Chicago; organized 1917 in Chicago by Melvin Jones; now composed of 2,700 clubs with 100,000 members. A federation of local business clubs restricted in membership and designed to promote fellowship and advance social and civic service. *The Lion* is the official magazine.

Loyal Order of Moose, see *Moose, Loyal Order of.*

Maccabees, The; headquarters, Port Huron, Mich.; founded 1878; 275,000 members. A benevolent, secret fraternal society organized in a lodge system with a fixed ritual.

Masons, The, see *Freemasons.*

Mathematical Society, American; headquarters, New York; founded 1888; 2,000 members. A professional group devoted to the advancement of knowledge in its special field.

Mechanics, National Council, Junior Order United American; headquarters, Philadelphia; founded 1853; 282,000 members. A federation of local secret benevolent and patriotic lodges, admitting only native-born Americans.

Medical Association, American; headquarters, Chicago; founded 1847; 107,000 members. A professional organization, made up of state and local divisions, to which belong most of the physicians of the country. It works to advance the conditions of its members and to promote health and medical knowledge through established channels.

Methodist Episcopal Church, Epworth League of the, see *Epworth League of the Methodist Episcopal Church.*

Modern Woodmen of America, see *Woodmen of America, Modern.*

Moose, Loyal Order of; headquarters, Mooseheart, Ill.; founded 1888; 575,000 members. A social benevolent fraternity that promotes the security of its members.

Musicians, American Federation of; headquarters, New York; founded 1896; 120,000 members. A labor union working for the economic advancement of members of the profession.

National Congress of Parents and Teachers, see *Parents and Teachers, National Congress of.*

National Consumers' League, see *Consumers' League, National.*

National Education Association of the United States, see *Education Association of the United States, National.*

National Exchange Club, see *Exchange Club, National.*

National Geographic Society, see *Geographic Society, National.*

National Institute of Social Sciences, see *Social Sciences National Institute of.*

National Research Council, see *Research Council, National.*

National Rifle Association, see *Rifle Association, National.*

National Safety Council, see *Safety Council, National.*

National Woman's Christian Temperance Union, see *Woman's Christian Temperance Union, National.*

Needlework Guild of America; headquarters, Philadelphia; founded 1885; about 1,500,000 members. A federation of local women's units united in charitable and social endeavors.

Nobles of the Mystic Shrine, Ancient Arabic Order of, see *Shrine, Ancient Arabic Order of Nobles of the Mystic.*

Nurses Association, American; headquarters, New York; founded 1896; 130,000 members. A professional organization that guards the standards and economic status of its members.

Odd Fellows, Sovereign Grand Lodge, Independent Order of; headquarters, Baltimore, Md.; founded 1819; about 1,550,000 members. An affiliation of many local lodges of a patriotic, secret, benevolent fraternal order that shares in community charities and provides relief for its membership. The Independent Order of Odd Fellows, Manchester Unity, which was organized in Manchester, England, in 1810, was the first of the Friendly Societies to take definite form.

Optometric Association, American; headquarters, Minneapolis; formed 1899; 6,600 members. A professional group to promote the interests of its members and advance knowledge in its field.

Order of Eastern Star, Grand Chapter, see *Eastern Star, Grand Chapter, Order of.*

Order of Elks, Grand Lodge, Benevolent and Protective, see *Elks, Grand Lodge, Benevolent and Protective Order of.*

Order of Owls, see *Owls, Order of.*

Osteopathic Association, American; headquarters, Chicago; founded 1897; 5,100 members. The professional organization of practicing osteopaths, it defends their rights and works to promote knowledge in that field.

Owls, Order of; headquarters, Hartford; founded 1904; about 380,000 members. A benevolent fraternal order with social and protective aims.

Parents and Teachers, National Congress of; headquarters, Washington; founded in 1897 by Mrs. Theodore W. Birney, as the National Congress of Mothers; developed into the National Congress of Mother and Parent-Teacher Associations in 1908 and changed to the National Congress of Parents and Teachers in 1924; about 2,050,000 members. A federation of local units in which parents and teachers work to advance the efficiency of the schools.

Phi Beta Kappa, headquarters, N.Y.; first chapter founded at William and Mary College, 1776; United Chapters of Phi Beta Kappa, 1883; about 80,000. An organization in which membership is restricted to those of scholarly attainments. Vassar received the first chapter given to a women's college in 1898.

Philosophical Society, American; headquarters, Philadelphia; founded 1727 by Benjamin Franklin; about 500 members. This, the oldest scientific association in America, has a rigidly restricted membership and works to advance knowledge and encourage its spread.

Physical Education Association, American; headquarters, Ann Arbor, Mich.; founded 1885; 8,500 members. A professional organization of instructors in the field, it develops their special interests.

Physical Society, American; headquarters, New York; founded 1899; 3,000 members. A professional organization that supports the diffusion of knowledge in its field and guards the special interests of its members.

Political and Social Sciences, American Academy of, headquarters, Philadelphia; founded 1889. The academy publishes papers and reports to promote political and social science.

Quarante Hommes et Huit Chevaux (Forty and Eight), La Sociéte des; headquarters, Indianapolis; founded 1920; 37,500 members. An honor society within the American Legion for the amusement of its members.

Radio Relay League, American; headquarters, Hartford; formed 1914; 23,000 members. A co-operative organization of amateur radio operators that maintains emergency communication channels and works to improve facilities.

Radio Union, International Amateur; headquarters, Hartford; formed 1925; a confederation of the amateur radio organizations of 29 countries.

Red Cross, American; headquarters, Washington; founded 1881; about 5,000,000 members, with some 8,000,000 junior members. The central organization of the principal facilities in the country for the relief of disaster victims, the improvement of hygiene, the succor of the disabled in warfare and the eradication of disease.

Red Men, Great Council, Improved Order of; headquarters, Philadelphia; founded 1763; 360,000 members. A fraternal benevolent organization with many local units that engage in charitable activities and promote the social security of their members.

Research Council, National; headquarters, Washington; founded 1915; 235 members. A central body for the direction and stimulation of scientific investigation, particularly for the national good, with membership by invitation.

Rifle Association, National; headquarters, Washington; founded 1871; about 250,000 members. An organization of sportsmen engaged in the betterment of standards in that field, the conservation of wild life and the promotion of contests of skill.

Rotary International; headquarters, Chicago; about 184,000 members. A federation of local organizations of business and professional men, restricted in membership, which endeavor to promote ethics, fellowship and civic and community ideals. The first Rotary Club was organized in Chicago, Feb. 23, 1905, by a lawyer, Paul P. Harris, and the members met in rotation at different offices. A National Association with 16 clubs was formed in 1910 and an International Association in 1912. The name was changed to Rotary International in 1922, and the federation now includes 4,318 clubs in 44 countries.

Royal Arcanum, headquarters, Boston; founded 1877; about 75,000 members. A benevolent fraternity, devoted mainly to the security of its membership.

Safety Council, National; headquarters, Chicago; founded 1913; 5,000 members. The national group for the advancement of accident prevention and the elimination of industrial and highway hazards.

Science, American Association for the Advancement of; headquarters, Washington; founded 1848; about 19,000 members. A professional organization with several affiliated scientific groups, all working to foster knowledge in the sciences.

Shrine, Ancient Arabic Order of Nobles of the Mystic; headquarters, New York; founded 1871; 575,000 members. A social fraternity with membership restricted to Masons of rank.

Social Sciences, National Institute of; headquarters, New York; founded 1889; 616 members. A co-ordinating group that supports the diffusion of knowledge in its field.

Society of the Cincinnati, see *Cincinnati, Society of the.*

Sons of Confederate Veterans, see *Confederate Veterans, Sons of.*

Sons of Union Veterans of the Civil War, see *Union Veterans of the Civil War, Sons of.*

Sovereign Camp of Woodmen of the World, see *Woodmen of the World, Sovereign Camp of.*

Spanish War Veterans, United; headquarters, Washington; founded 1898; about 105,000 members. An organization of veterans of the war with Spain, to guard their security and economic status.

Sunbathing Association, American; headquarters, Oakland, N.J.; founded 1931; 50,000 members. A group that supports propaganda in the cause of nudism.

Surgeons, American College of; headquarters, Chicago; formed 1913; 12,000 members. A professional organization that fosters the advancement of knowledge and the economic status of surgeons.

Union Veterans of the Civil War, Sons of; headquarters, Reading; founded 1881; 50,000 members. A patriotic society that supports commemorative activities and guards the interests of surviving veterans; membership is restricted to descendants of Union soldiers.

United American Mechanics, National Council Junior Order, see *Mechanics, National Council, Junior Order United American.*

United Spanish War Veterans, see *Spanish War Veterans, United.*

United Workmen, Ancient Order of; headquarters, Meadville, Pa.; founded 1868; 110,000 members. A benevolent fraternal organization that guards the security of its members.

University Professors, American Association of; headquarters, Washington; founded 1915; 13,000 members. A professional organization for the improvement of the status of its members and maintenance of standards.

University Women, American Association of; headquarters, Washington; founded 1882; 55,000 members. A federation of local units of university women, with social and civic-betterment objectives.

Veterans of Foreign Wars of the United States; headquarters, Kansas City; founded 1899; 250,000 members. A patriotic society with membership limited to those who have served American armies outside the boundaries of the country; it works for the security of its members and the promotion of patriotic activities.

Women's Christian Temperance Union, National; headquarters, Evanston; founded 1874; 500,000 members. A federation of local groups actively interested in the promotion of total abstinence and Prohibition.

Women's Clubs, General Federation of; headquarters, Washington. After a preliminary meeting of representatives of women's clubs in New York in 1889 a constitution was adopted in 1890, and a charter was granted by Congress in 1901. Some 15,000 affiliated groups in the United States and foreign countries have about 2,000,000 members. A co-ordinating body to advance the common causes of many local organizations.

Women's Clubs, National Federation of Business and Professional; headquarters, New York; founded 1919; 65,000 members in affiliated groups. A coordinating organization for local units of women in professional and business occupations, with general social and civic-betterment purposes.

Woodmen of America, Modern; headquarters, Rock Island, Ill.; organized at Lyons, Ia., by Joseph Cullen Root in 1883; 453,000 members. A fraternal benevolent society that fosters the security of its members.

Woodmen of the World, Sovereign Camp of; headquarters, Omaha; organized June 1900 by Joseph Cullen Root; 380,000 members. A fraternal benevolent society organized in local units whose chief purpose is the security of its members.

Young Men's Christian Associations of the United States; headquarters, New York. The Y.M.C.A. was first organized in England in 1844 by George Williams, and branches were soon formed in France, Holland, Canada, India, Australia and the United States (Boston, 1851). The first World-Conference was held in 1855, and the National Council was founded in 1866. The federation has now about 1,121,000 members in local units and is designed to advance the religious, intellectual, physical and social welfare of young men.

Young Men's Hebrew Association; headquarters, New York; formed 1874; about 6,500. An organization to promote the religious and social welfare of its members.

Young Women's Christian Associations of the United States; headquarters, New York; formed 1906 (first local association founded in Boston in 1866); about 465,000 members in over 1,000 local groups. A federation of clubs designed to promote the physical, intellectual, social, moral and spiritual interests of young women, particularly those without family attachment. A World's Y.W.C.A., formed in 1894, has headquarters in Geneva.

Young Women's Hebrew Association, headquarters, N.Y.; formed 1902; about 3,000. An organization to promote the religious and social welfare of its members.

Zionist Organization of America; headquarters, New York; founded 1897; about 100,000 members. An association for the advancement of Jewish interests, particularly the renationalization of Palestine.

Zonta International; headquarters, Chicago; founded 1919; 3,700 members. The central organization of local professional clubs for women, restricted in membership and similar in plan and purpose to the Rotary movement.

ASTRAL SPIRITS

Before there was any science of astronomy, the movements of the stars were superstitiously explained by the notion of astral spirits, souls of dead men, that controlled the stars —usually a single spirit for each star. The neo-Platonists, especially the 16th-century Paracelsus, maintained that every man had his attendant star, which received him at death and took charge of him till the great resurrection.

ASTROLOGY

A term originally applied to the science of the heavenly bodies and their supposed influence over human affairs. Now the word is limited to the second meaning. Astrology is one of the oldest superstitions and has been sedulously cultivated by the Egyptians, Chaldeans, Hindus, Chinese and Etruscans, Greeks and Romans. The Arabs also pursued the study with great zeal from the 7th to the 13th century, and it was in great vogue in Italy and France during the 16th century. In England it was cultivated by Bede (673–735) and Roger Bacon (*c.*1214–94). Queen Elizabeth (1558–1603) consulted the astrologer John Dee, and Lord Burleigh is said to have calculated the nativity of the Virgin Queen. Sir William Lilly was frequently consulted by Charles I (1625–49). Nostradamus was a great French astrologer of the 16th century, after which time this pseudo science failed to attract superior minds. The discoveries of Copernicus, Kepler and Galileo were death blows to astrology, which, however, continues to attract believers even at the present day. Astrological almanacs are still published, and fortunetellers still carry on a thriving business.

The past influence of astrology is best seen in the many words still in use that originated when astrology was in its full sway: *ill-starred, mercurial, saturnine, jovial,* for example.

BARBER'S POLE

The spiral red stripe on a barber's pole is said to symbolize the winding of a ribbon or bandage around the arm of a patient upon whom the barber had operated in the capacity of surgeon. The pole, too, is a symbol, for the barber who was a bloodletter had a pole or staff for his patient to grasp to steady himself during the operation.

In former times, when the operation of bleeding was extensively practiced, bloodletting was one of the barber's duties.

BIBLE TRANSLATIONS

The *Septuagint* (Greek for seventy; often referred to as LXX) was a Greek version of the Hebrew Old Testament begun in Alexandria about 270 B. C. and completed before the beginning of the Christian era. It is still the official text in the Eastern Church and is important because it made the Old Testament accessible to those who knew no Hebrew.

The *Vulgate* (Latin for common, everyday) was a translation into Latin of the whole Bible made by St. Jerome and others in the 4th century. It was based on earlier versions in Latin made from the Septuagint and from the original Greek of the New Testament.

The first printed book probably was Gutenberg's Bible (in Latin), and the first half century of the history of printing saw unimportant versions in several different languages of Europe —several in German and Italian and French.

Luther's version in German (1534) was a landmark in German literature.

The English versions are important. There had been paraphrases in Anglo-Saxon. The earliest complete translations were those known by the name of John Wycliffe in 1382 and 1397; they were from the Latin Vulgate, and it is not certain that Wycliffe himself did any of the work. The second version was revised by John Purvey and is now called the Wycliffe-Purvey Bible.

The first printed English translation was made by William Tyndale in 1525 and was from the Hebrew and Greek originals; the earliest complete English Bible was prepared by Miles Coverdale and appeared in 1535. The following are later English translations: 1537, by Matthew; 1539, the Great Bible; 1540, by Cranmer; 1560, by British exiles at Geneva, Switzerland; 1582, the Reims New Testament, and 1609–10, the Douay Bible, both for Roman Catholics; 1611, the famous King James Version; 1885, the Revised Version; 1901, American Revised Version; 1922, a translation by James Moffatt; 1931, a modern American version by J. M. P. Smith and E. J. Goodspeed.

BIRTHSTONES

Two classifications are here given, the ancient (a) and modern (m).

January: the garnet (a), and the jacinth or hyacinth (m), symbolizing constancy and fidelity.

February: the amethyst (a and m) symbolizing peace of mind, sobriety and sincerity.

March: the aquamarine (a), and bloodstone (m), symbolizing courage and success in dangerous enterprise.

April: the sapphire (a), symbolizing wisdom, and the diamond (m), symbolizing repentance and innocence.

May: the agate (a), and the emerald (m), symbolizing happiness and success in love.

June: the emerald (a), and the agate (m), symbolizing happiness. The agate also indicates long life and health. The pearl is preferred by many for June.

July: the sardonyx or onyx (a), and ruby (m), symbolizing respectively conjugal felicity and contented mind.

August: the carnelian (a), and sardonyx (m), symbolizing respectively cure of evils resulting from forgetfulness, and felicity.

September: the chrysolite (a), and sapphire (m), symbolizing wisdom and also hope.

October, the aquamarine (a), and tourmaline (m), symbolizing hope.

November: the topaz (a and m), symbolizing fidelity and friendship.

December: the ruby (a), and turquoise or the lapis lazuli (m), symbolizing prosperity and success.

BLUE BLOOD

Blue blood means aristocracy and nobility. The historical origin of the phrase was in Spain where the members of the oldest families with no admixture of Moorish or Jewish blood were famed for their fair skins through which the veins on the back of the hand showed blue.

BLUE LAWS

This phrase is used of unusually strict laws, especially these regulating personal conduct. The ancient Romans had a definite public official, the *censor,* whose duty it was to supervise the conduct of the citizens and to punish flagrant breaches of the accepted standards of morality. *Sumptuary legislation,* that is, legislation against expensive indulgence, has been common in both ancient and modern times. In the reign of Edward II of England, for example, a proclamation was issued denouncing the "outrageous and excessive multitude of meats and dishes which the great men of the kingdom had used and still used in their castles." With the rise of Protestantism in the 16th century many customs that had formerly been deemed harmless were prohibited by law—notably in the theocratic government set up at Geneva by John Calvin in 1544. In New England in the 17th and 18th centuries the influence of Calvinism was exceedingly strong and resulted in laws enforcing a strict and to modern notions an absurdly suppressive morality. In 1781 a Tory minister Samuel Peters, who had lived in Hartford, Conn., but had fled to England after the outbreak of the American Revolution, published *The General History of Connecticut* in which he listed 45 laws that he attributed to the "Dominion of New Haven" and which he called "Blue Laws." This is the earliest known use of the expression although it is probable that it was in common conversational use at the time. Perhaps the laws were printed on blue paper, but it seems more likely that the word *blue* was used to mean gloomy, morose. The laws originally published by Peters were gathered at secondhand and very inaccurately quoted; for some of them Peters had scarcely any authority, and the generally partisan character of his book discredited his statements even when they were substantially correct. In the late 19th century historians treated the whole story of the Connecticut Blue Laws as a libel on New England. Later critical investigation found Peters guilty of gross inaccuracy and uncritical acceptance of legends, but it showed that laws of the kind actually did exist and that Peters did not seriously misrepresent their general spirit. But the blue laws were not confined to Connecticut; they were in force in other colonies as well, particularly in Massachusetts, and an investigation of 17th-century legislation in any of the European countries would turn up many similar statutes shocking to modern libertarians.

Some of the more amusing laws on the statute books of early Massachusetts and Connecticut were the following:

> If any person, whether children, or servants, or others shall be taken or known to rob any orchard or garden, or that shall steal away any grafts or fruit trees, fruits, etc., shall forfeit treble damage to the owners thereof and such fine or corporal punishment as the court shall think meet.—*Gen. Laws of Conn.,* 1673.
>
> That what person or persons soever shall bring into this jurisdiction any playing cards or dice, or with whomsoever such cards or dice be found in his or their custody, he or they shall pay as a fine the sum of five pounds, the one half to the treasurer, the other half to the informer.—*Gen. Laws of Mass.,* 1672.
>
> Whosoever shall be found observing any such day as Christmas or the like, either by forbearing of labor, feasting, or any other way, as a festival, shall be fined five shillings.—*Gen. Laws of Mass. Bay Col.,* 1672.
>
> No man shall be forced by torture to confess any crime against himselfe, nor any other, unless it be some capital case where he is first fully convicted by cleare and sufficient evidence to be guilty. After which, if the cause be of that nature that it is very apparent that there be other conspirators or confederates with him then he may be tortured yet not with such tortures as be barbarous or inhumane.—*Gen. Laws of Mass. Bay Col.,* 1672.
>
> Whoever, professing the Christian religion, shall wittingly deny the Song of Solomon to be the infallible word of God may be whipped 40 lashes and fined £50. On the second offense he shall be put to death or banished.—*Gen. Laws of Mass. Bay Col.,* 1672.
>
> Saying that the Christian religion is a politic device to keep ignorant men in awe shall be punished with death.—*New Haven Code,* 1655.

There were also laws in various New England colonies providing that:

> Any man who uses tobacco in the street shall be fined, or if he do so in his own house a stranger being present he shall be fined or if he and another together they shall be fined but if on a journey five miles away from any house he may smoke.
>
> Every man must have a Bible, a catechism and other good books. Constables, selectmen and grand jurors must warn all delinquents, and if they continue negligent must report them to authority.
>
> No person shall abuse a person holding public office by saying 'thee' or 'thou' to him.
>
> Any single person without a servant wishing to keep house by himself must get the consent of the selectmen unless he be a public officer.

BLUE MONDAY

The Monday before Lent was called *Blue Monday,* apparently because churches were decorated with blue hangings on that day. Then the words came to mean holiday, and later by transference and influenced by the use of blue to mean gloomy the two words were used of the Monday after a holiday season (Saturday and Sunday) when business is slow, and efficiency is low.

BLUE RIBBON

First-prize winners or winners of the highest awards in various kinds of shows usually receive the Blue Ribbon. These badges are seen attached to all kinds of animals and articles, ranging from a pedigreed Pomeranian at a dog show to a basket of luscious pears exhibited in the pomology section at a county fair.

The term *blue ribbon* originated from the fact that in most orders of knighthood the decoration of the highest rank was fastened with a blue ribbon. The ribbon worn below the knee of the left leg by members of the Order of the Garter, the highest order of knighthood of Great Britain, is of Copenhagen blue edged with gold. The decoration of the Order of the Holy Ghost (St. Esprit), founded by Henry III of France in 1578, was fastened with a sky-blue ribbon or *cordon bleu.* So *cordon bleu* and *blue ribbon* have both come to mean first class.

BLUE-SKY LAWS

The colloquial term for a law providing regulation and supervision of sale of stocks, bonds and other securities, so called because the proposer of the first such law in Kansas, in 1911, said that some companies sought to "capitalize the blue skies."

BLUESTOCKING

The term *bluestocking* originated in England in the days of Doctor Johnson and was applied to ladies who cultivated learned conversations at assemblies to which famous literary men were invited. A Mr. Stillingfleet, who always wore blue stockings, instead of the conventional black, addressed many of these groups; and by degrees these clubs came to be called *bluestocking,* and so did the ladies who attended them. It is used today of any pedantic woman.

BOOK SIZES

In the early days of printing all paper was made the same size, and the size of the page in a book was determined by the number of times the paper stock was folded. Now paper is made in any size desired, but the old terminology is still used to designate the size. The book-board sizes as arbitrarily set by the Allied Printing Trades Council of New York are as follows:

Quarto (4to), 8¼ by 12⅝ inches
Imperial Octavo, 7½ by 11⅝ inches
Royal Octavo, 6⅞ by 10⅝ inches
Octavo (8vo), 6 by 9¾ inches
Crown Octavo, 5½ by 8¾ inches
Duodecimo (12mo), 4¾ by 7⅝ inches
Sixteenmo (16mo), 4¼ by 6⅞ inches
Eighteenmo (18mo), 3⅞ by 6⅛ inches
Thirty-twomo (32mo), 3⅛ by 4⅝ inches

BRITISH LION

The lion and the unicorn are the heraldic animals on the British royal coat of arms. The unicorn came from the royal arms of Scotland, the lion was English, being first borne on the seal of Richard Coeur de Lion. So the lion is the symbol of English and British power.

BUILDINGS, HEIGHTS OF

Name of Building	*Height in Feet*
Empire State, New York	1,248
Chrysler Tower, New York	1,046
Eiffel Tower, Paris	984
60 Wall Tower, New York	942
R. C. A., Rockefeller Center, New York	850
Bank of Manhattan, New York	838
Woolworth, New York	792
Terminal Tower, Cleveland	708
Metropolitan, New York	700
500 Fifth Avenue, New York	697
City Bank Farmers Trust, New York	685
Chanin Tower, New York	680
Lincoln, New York	638
Irving Trust, New York	627
Waldorf-Astoria Hotel, New York	626
Sherry-Netherland Hotel, New York	620
Mercantile, New York	617
10–14 East 40th Street, New York	617
Singer, New York	612
Board of Trade, Chicago	612
New York Life Insurance, New York	610
Gulf Oil, Pittsburgh	584
Municipal, New York	580
U. S. Court House, New York	579
Carew Tower, Cincinnati	574
Carlyle, New York	570
General Electric, New York	570
New York Central, New York	560
Continental Bank, New York	558
Penobscot, Detroit	557
Pittsfield, Chicago	557
Chicago Temple, Chicago	556
20 North Wacker Drive, Chicago	555
A. I. U. Citadel, Columbus	555
701–719 First Ave., New York	553
Equitable Trust, New York	550
City Hall Tower, Philadelphia	548
Transportation, New York	542
Ritz Tower, New York	540
Bankers' Trust, New York	539
Field Estate, Chicago	535
One North La Salle, Chicago	530
Ulm Cathedral, Germany	529
Travelers Tower, Hartford, Conn.	527
Morrison Hotel (addition), Chicago	526
Nelson Towers, New York	525

BURY THE HATCHET

This phrase means make peace, and it originated with the North American Indians. They smoked the *calumet* or peace pipe and buried their hatchets, scalping knives and war clubs in the ground when they made peace—to remove every sign of war.

> Buried was the bloody hatchet;
> Buried was the dreadful warclub;
> Buried were all warlike weapons,
> And the warcry was forgotten:
> Then was peace among the nations.
> —Longfellow, *Hiawatha*

CARPETBAGGERS

The term *carpetbagger* was a disparaging epithet applied by the people of the South to the northerners who went into the southern states after the Civil War with all their possessions in carpetbags. Some were worthy individuals, desirous only of becoming a part of the southern communities; some were agents for the Freedman's Bureau; many were unscrupulous rascals who gained control of the negro vote by threatening them with the return of slavery.

CARTE BLANCHE

A French term widely used in the sense, "Do as you please," "full powers," "anything you like," but literally meaning *white paper* or blank paper. The story is told that when Charles II of England was Prince of Wales he fled to Holland for safety when his father, Charles I, was made a prisoner under Cromwell. The prince signed a blank piece of paper, sent it to Cromwell's Parliament and promised that if his father's life was saved he would assent to any terms that might be written over his signature. So *carte blanche* means, "Write your own terms."

CALENDAR FOR READY REFERENCE

For ascertaining any day of the week for any given time within the two hundred years from the introduction of the new style, 1753 to 1952, inclusive.

Years 1753 to 1952									Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1753g 1754d	1781g 1782d	1800e 1801a	1828q 1829a	1856q 1857a	1884q 1885a	1900g 1901d	1928h 1929d	a	4	7	7	3	5	1	3	6	2	4	7	2
1755e 1756p	1783e 1784p	1802b 1803c	1830b 1831c	1858b 1859c	1886b 1887c	1902e 1903a	1930e 1931a	b	5	1	1	4	6	2	4	7	3	5	1	3
1757c 1758f	1785c 1786f	1804h 1805d	1832h 1833d	1860h 1861d	1888h 1889d	1904k 1905f	1932k 1933f	c	6	2	2	5	7	3	5	1	4	6	2	4
1759g 1760q	1787g 1788q	1806e 1807a	1834e 1835a	1862e 1863a	1890e 1891a	1906g 1907d	1934g 1935d	d	2	5	5	1	3	6	1	4	7	2	5	7
1761a 1762b	1789a 1790b	1808k 1809f	1836k 1837f	1864k 1865f	1892k 1893f	1908l 1909b	1936l 1937b	e	3	6	6	2	4	7	2	5	1	3	6	1
1763c 1764h	1791c 1792h	1810g 1811d	1838g 1839d	1866g 1867d	1894g 1895d	1910c 1911f	1938c 1939f	f	7	3	3	6	1	4	6	2	5	7	3	5
1765d 1766e	1793d 1794e	1812l 1813b	1840l 1841b	1868l 1869b	1896l 1897b	1912m 1913e	1940m 1941e	g	1	4	4	7	2	5	7	3	6	1	4	6
1767a 1768k	1795a 1796k	1814c 1815f	1842c 1843f	1870c 1871f	1898c 1899f	1914a 1915b	1942a 1943b	h	7	3	4	7	2	5	7	3	6	1	4	6
1769f 1770g	1797f 1798g	1816m 1817e	1844m 1845e	1872m 1873e		1916n 1917g	1944n 1945g	k	5	1	2	5	7	3	5	1	4	6	2	4
1771d 1772l	1799d	1818a 1819b	1846a 1847b	1874a 1875b		1918d 1919e	1946d 1947e	l	3	6	7	3	5	1	3	6	2	4	7	2
1773b 1774c		1820n 1821g	1848n 1849g	1876n 1877g		1920p 1921c	1948p 1949c	m	1	4	5	1	3	6	1	4	7	2	5	7
1775f 1776m		1822d 1823e	1850d 1851e	1878d 1879e		1922f 1923g	1950f 1951g	n	6	2	3	6	1	4	6	2	5	7	3	5
1777e 1778a		1824p 1825c	1852p 1853c	1880p 1881c		1924q 1925a	1952q	p	4	7	1	4	6	2	4	7	3	5	1	3
1779b 1780n		1826f 1827g	1854f 1855g	1882f 1883g		1926b 1927c		q	2	5	6	2	4	7	2	5	1	3	6	1

Note. The letters in the list of "Years from 1753 to 1952" refer to the table headed with the Months; the figures in which refer to the same figures at the head of the Table of Days. For example: To know on what day July 4, 1911, fell look for 1911 in the Table of Years. The letter "f" is attached. Look for the same letter in the Table of Months and in a parallel line under July is the figure 6, which directs to column 6 in the Table of Days below, in which it will be seen that July 4, 1911, fell on Tuesday.

TABLE OF DAYS

1		2		3		4		5		6		7	
Monday	1	Tuesday	1	Wednesday	1	Thursday	1	Friday	1	Saturday	1	SUNDAY	1
Tuesday	2	Wednesday	2	Thursday	2	Friday	2	Saturday	2	SUNDAY	2	Monday	2
Wednesday	3	Thursday	3	Friday	3	Saturday	3	SUNDAY	3	Monday	3	Tuesday	3
Thursday	4	Friday	4	Saturday	4	SUNDAY	4	Monday	4	Tuesday	4	Wednesday	4
Friday	5	Saturday	5	SUNDAY	5	Monday	5	Tuesday	5	Wednesday	5	Thursday	5
Saturday	6	SUNDAY	6	Monday	6	Tuesday	6	Wednesday	6	Thursday	6	Friday	6
SUNDAY	7	Monday	7	Tuesday	7	Wednesday	7	Thursday	7	Friday	7	Saturday	7
Monday	8	Tuesday	8	Wednesday	8	Thursday	8	Friday	8	Saturday	8	SUNDAY	8
Tuesday	9	Wednesday	9	Thursday	9	Friday	9	Saturday	9	SUNDAY	9	Monday	9
Wednesday	10	Thursday	10	Friday	10	Saturday	10	SUNDAY	10	Monday	10	Tuesday	10
Thursday	11	Friday	11	Saturday	11	SUNDAY	11	Monday	11	Tuesday	11	Wednesday	11
Friday	12	Saturday	12	SUNDAY	12	Monday	12	Tuesday	12	Wednesday	12	Thursday	12
Saturday	13	SUNDAY	13	Monday	13	Tuesday	13	Wednesday	13	Thursday	13	Friday	13
SUNDAY	14	Monday	14	Tuesday	14	Wednesday	14	Thursday	14	Friday	14	Saturday	14
Monday	15	Tuesday	15	Wednesday	15	Thursday	15	Friday	15	Saturday	15	SUNDAY	15
Tuesday	16	Wednesday	16	Thursday	16	Friday	16	Saturday	16	SUNDAY	16	Monday	16
Wednesday	17	Thursday	17	Friday	17	Saturday	17	SUNDAY	17	Monday	17	Tuesday	17
Thursday	18	Friday	18	Saturday	18	SUNDAY	18	Monday	18	Tuesday	18	Wednesday	18
Friday	19	Saturday	19	SUNDAY	19	Monday	19	Tuesday	19	Wednesday	19	Thursday	19
Saturday	20	SUNDAY	20	Monday	20	Tuesday	20	Wednesday	20	Thursday	20	Friday	20
SUNDAY	21	Monday	21	Tuesday	21	Wednesday	21	Thursday	21	Friday	21	Saturday	21
Monday	22	Tuesday	22	Wednesday	22	Thursday	22	Friday	22	Saturday	22	SUNDAY	22
Tuesday	23	Wednesday	23	Thursday	23	Friday	23	Saturday	23	SUNDAY	23	Monday	23
Wednesday	24	Thursday	24	Friday	24	Saturday	24	SUNDAY	24	Monday	24	Tuesday	24
Thursday	25	Friday	25	Saturday	25	SUNDAY	25	Monday	25	Tuesday	25	Wednesday	25
Friday	26	Saturday	26	SUNDAY	26	Monday	26	Tuesday	26	Wednesday	26	Thursday	26
Saturday	27	SUNDAY	27	Monday	27	Tuesday	27	Wednesday	27	Thursday	27	Friday	27
SUNDAY	28	Monday	28	Tuesday	28	Wednesday	28	Thursday	28	Friday	28	Saturday	28
Monday	29	Tuesday	29	Wednesday	29	Thursday	29	Friday	29	Saturday	29	SUNDAY	29
Tuesday	30	Wednesday	30	Thursday	30	Friday	30	Saturday	30	SUNDAY	30	Monday	30
Wednesday	31	Thursday	31	Friday	31	Saturday	31	SUNDAY	31	Monday	31	Tuesday	31

CITIES, POPULAR NAMES OF

Certain cities have received popular names because of their identification with particular religious beliefs and observances, educational or literary preeminence, topography, resemblances to other cities, location, dominant industries and surroundings.

Aberdeen, Scotland. Granite City, from the prevalence and use of this stone.

Agra, India. Rome of Hindustan. It was the seat of the Mohammedan empire in India.

Akron, Ohio. The Rubber City, from its principal industry.

Alexandria, Egypt. (1) Delta City, from the delta of the Nile. (2) Mother of Books, for the largest collection of books ever gathered together prior to the invention of printing.

Amiens, France. Little Venice, because it is so intersected by different branches of the Somme and the numerous bridges over them.

Amsterdam, Holland. Venice of the Netherlands, because of its canals.

Antioch. (1) Queen of the East, because it was formerly the capital of Syria. (2) Mother of Christian Mission. From thence (Acts xiii, 1-3) Paul started on his first missionary journey.

Athens, Greece. (1) The Violet Crowned, so named by Pindar, in allusion to the violet crowns offered to the god at the Dionysiac festivals. (2) Religious City, a name given by the old writers. It is said that there were 30,000 temples, statues and sacred places dedicated to the gods.

Atlanta, Ga. The Gate City, so named for its military importance to the Confederacy during the Civil War.

Baalbec, Syria. City of the Sun, the Heliopolis of the Greeks.

Baltimore, Md. Monumental City. It contains one of the first Washington monuments and many others.

Benares, India. Holy City of the Hindus.

Birmingham, Ala. Magic City, so named for its rapid rise into size and prominence.

Birmingham, England. The Midland Capital, from its geographical location.

Boston, Mass. (1) Athens of America, because famed alike for its institutions of learning and the culture of its citizens. (2) Hub of the Universe, a humorous appellation popularly applied, originated with Oliver Wendell Holmes.

Brighton, England. Queen of Watering Places, from its popularity as a seaside resort.

Brooklyn, N. Y. City of Churches, from the large number of churches.

Buffalo, N. Y. Queen City of the Lakes, for its commanding position on the Great Lakes.

Chicago, Ill. Windy City, from the winds blowing from Lake Michigan.

Cincinnati, Ohio. Queen City, so called when it was the commercial metropolis of the Middle West.

Cleveland, Ohio. Forest City, from the number of trees on its streets in the 19th century.

Cologne, Germany. (1) City of the Three Kings, in reference to the old legend that makes Cologne the burial place of the "wise men of the East."

Constantinople (Istanbul), Turkey. City of the Golden Horn, from the name of its harbor.

Cuzco, Peru. Holy City of the Ancient Incas.

Damascus, Syria. Pearl of the Desert, for its beautiful site.

Detroit, Mich. City of the Straits, from its location on the strait connecting Lake St. Clair and Lake Erie.

Duluth, Minn. Zenith City of the Unsalted Seas, from its position at the head of the Great Lakes.

Edinburgh, Scotland. (1) Auld Reekie, so named on account of the canopy of smoke that seems to overhang the city when viewed from a distance. (2) Modern Athens. It is the headquarters of learning in Scotland; as a literary town it is second only to London.

Gary, Ind. The Steel City, from its spectacular rise as a center for steel manufacture.

Grand Rapids, Mich. The Furniture City, for its chief industry.

Hannibal, Mo. Bluff City, from its location on the bluffs of the Mississippi River.

Hartford, Conn. Charter Oak City, after the oak tree in which Connecticut's Colonial charter is said to have been concealed.

Holyoke, Mass. Paper City, from its extensive paper mills.

Jerusalem, Palestine. (1) City of Peace; its ancient name, Salem, signifies "peace." (2) Holy City of the Jews and Christians. (3) City of David.

Lhasa, Tibet. The Forbidden City. It is the holy city of the Buddhists in Asia, and foreigners are rigidly excluded.

NATIONAL (AMERICAN PERMANENT) CEMETERIES IN EUROPE

NAME	LOCATION	ACRES	CAPACITY	INTERMENTS	KNOWN	UNKNOWN
Brookwood....	Brookwood (near London), England.......	4½	452	452	410	42
Flanders Field.	Waereghem, Belgium..................	3	368	366	345	21
Meuse-Argonne	Romagne-sous-Montfaucon, Meuse, France.	130	14,177	14,177	13,720	457
Oise-Aisne.....	Seringes-et-Nesle; Aisne, France..........	32	6,160	6,004	5,388	616
St. Mihiel.....	Thiaucourt, Meurthe-et-Moselle, France...	30	4,208	4,151	4,034	117
Somme........	Bony, Aisne, France..................	13	2,096	1,829	1,698	131
Suresnes.......	Suresnes, Seine, France (near Paris).......	7½	1,691	1,534	1,528	6
Aisne-Marne ..	Belleau, Aisne, France..................	34	2,348	2,270	2,018	252
	TOTAL........................	256	31,500	30,783	29,141	1,642

NATIONAL CEMETERIES

National Cemeteries were authorized by an Act of Congress, July 17, 1862, and by subsequent acts.

LOCATION	AREA IN ACRES		INTERMENTS		TOTAL
	TOTAL	INCLOSED	KNOWN	UNKNOWN	
Alexandria (Pineville), La..................	8.24	8.24	2,299	2,380	4,679
Alexandria, Va..................	5.50	5.50	3,454	124	3,578
Andersonville, Ga..................	120.	25.	12,697	1,040	13,737
Andrew Johnson (Greenville), Tenn.........	15.	15.	53	0	53
Annapolis, Md..................	4.125	4.125	2,355	206	2,561
Antietam (Sharpsburg), Md...............	11.	9.50	2,899	1,923	4,822
Arlington (Ft. Myer), Va...............	408.03	408.03	32,938	4,713	37,651
Barrancas, Fla..................	8.56	7.10	2,179	808	2,987
Baton Rouge, La..................	7.50	7.50	2,772	536	3,308
Battle Ground (Takoma Park), D. C.........	1.033	1.033	44	0	44
Beaufort, S. C..................	29.	29.	5,135	4,598	9,733
Beverly, N. J..................	1.	1.	253	7	260
Camp Butler (Springfield), Ill...............	6.02	6.02	1,455	166	1,621
Camp Nelson, Ky..................	9.50	8.25	2,428	1,245	3,673
Cave Hill (Louisville), Ky..................	4.29	4.29	4,701	593	5,294
Chalmette (Arabi), La..................	16.	13.60	7,684	5,746	13,430
Chattanooga, Tenn..................	129.53	75.	9,333	5,059	14,392
City Point, Va..................	7.49	6.60	3,776	1,435	5,211
Cold Harbor (Richmond), Va...............	1.75	1.75	692	1,279	1,971
Corinth, Miss..................	20.	18.33	1,760	3,995	5,755
Crown Hill (Indianapolis), Ind...............	1.37	1.37	1,029	37	1,066
Culpepper, Va..................	6.	6.	466	912	1,378
Custer Battlefield (Crow Agency), Mont.....	640.	6.91	1,370	276	1,646
Cypress Hills (Brooklyn), N. Y............	18.14	18.14	11,626	440	12,066
Danville, Ky..................	.31	.31	354	9	363
Danville, Va..................	8.50	3.17	1,172	159	1,331
Fayetteville, Ark..................	6.63	6.	570	810	1,380
Finns Point (Salem), N. J..................	2.50	2.50	2,622	30	2,652
Florence, S. C..................	3.76	3.73	217	2,802	3,019
Fort Donelson (Dover), Tenn...............	15.34	5.	170	512	682
Fort Gibson, Okla..................	6.90	5.70	362	2,208	2,570
Fort Harrison (Richmond), Va...............	1.55	1.55	237	582	819
Fort Leavenworth, Kan..................	15.	15.	2,816	1,583	4,399
Fort McPherson (Brady), Neb...............	20.	4.50	555	558	1,113
Fort Scott, Kan..................	10.26	10.26	957	126	1,083
Fort Smith, Ark..................	14.74	9.	1,129	1,466	2,595
Fredericksburg, Va..................	12.005	12.005	2,482	12,738	15,220
Gettysburg, Pa..................	14.87	14.87	2,109	1,642	3,751
Glendale, Va..................	2.12	2.	243	959	1,202
Grafton, W. Va..................	3.40	3.40	681	657	1,338
Hampton, Va..................	19.611	19.611	12,907	635	13,542
Jefferson Barracks, Mo..................	50.	20.50	10,955	3,028	13,983
Jefferson City, Mo..................	2.	2.	465	446	911
Keokuk, Iowa..................	2.75	2.75	1,005	45	1,050
Knoxville, Tenn..................	9.85	9.83	2,740	1,163	3,903
Lebanon, Ky..................	2.50	2.38	603	277	880
Lexington, Ky..................	.75	.75	1,121	106	1,227
Little Rock, Ark..................	23.12	23.12	4,325	3,039	7,364
Loudon Park (Baltimore), Md...............	3.69	3.69	4,577	348	4,925
Marietta, Ga..................	24.	21.05	7,489	3,095	10,584
Memphis, Tenn..................	43.91	37.	6,043	8,864	14,907
Mexico City, Mexico..................	2.	2.	812	751	1,563
Mill Springs (Somerset), Ky...............	3.50	1.75	344	402	746
Mobile, Ala..................	2.68	2.68	1,037	1,416	2,453
Mound City, Ill..................	10.50	8.	2,793	2,759	5,552
Nashville (Madison), Tenn...............	65.	60.60	12,755	4,121	16,876
Natchez, Miss..................	11.07	11.07	876	2,786	3,662
New Albany, Ind..................	5.46	5.46	2,611	732	3,343
Newbern, N. C..................	7.69	7.69	2,352	1,110	3,462
Philadelphia (Pittsville Sta.), Pa............	13.26	13.26	4,495	40	4,535
Poplar Grove (Petersburg), Va...............	8.65	8.65	2,161	4,071	6,232
Port Hudson, La..................	8.	8.	619	3,240	3,859
Quincy, Ill..................	.459	.459.	263	57	320
Raleigh, N. C..................	7.83	6.90	699	550	1,249
Richmond, Va..................	9.74	9.74	945	5,704	6,649
Rock Island, Ill..................	1.79	1.79	526	46	572
Salisbury, N. C..................	6.	6.	156	12,036	12,192
San Antonio, Tex..................	3.63	3.63	3,312	318	3,630
San Francisco (Presidio Sta.), Calif.........	11.8	11.8	10,754	510	11,264
Santa Fe, N. M..................	9.44	9.35	920	461	1,381
Seven Pines (Richmond), Va...............	1.55	1.47	168	1,238	1,406
Shiloh (Pittsburg Landing), Tenn...........	10.05	9.	1,232	2,405	3,637
Soldiers Home, D. C..................	16.	16.	8,586	291	8,877
Springfield, Mo..................	11.	10.90	1,470	1,248	2,718
St. Augustine, Fla..................	1.33	1.33	320	1,553	1,873
Staunton, Va..................	1.15	1.15	227	547	774
Stone River (Murfreesboro), Tenn...........	20.10	18.455	3,605	2,559	6,164
Vicksburg, Miss..................	40.	34.50	4,448	12,910	17,358
Wilmington, N. C..................	5.	4.50	806	1,609	2,415
Winchester, Va..................	4.89	4.89	2,124	2,436	4,560
Woodlawn (Elmira), N. Y..................	2.36	2.36	3,303	20	3,323
Yorktown, Va..................	3.	3.	758	1,446	2,204
Sitka, Alaska..................	3.98	1.19	70	0	70
TOTAL........................	2,126.6797	1,241.9747	257,854	154,801	412,655

Louisville, Ky. Falls City, from the falls of the Ohio River at Louisville.

Lowell, Mass. City of Spindles, from its large manufacturing interests.

Lucknow, India. City of Roses, because embowered with them.

Manchester, England. The Cotton City, for its extensive manufactures of cotton.

Mecca, Hejaz. Holy City of the Mohammedans.

Medina, Hejaz. Prophet's City. To this place Mohammed fled for refuge during the Hegira, July 16, 622; and here is his tomb.

Milan, Italy. Little Paris, in allusion to its similarity to the French capital in gaiety.

Milwaukee, Wis. The Beer City, because it produced more beer than any other American city.

Minneapolis, Minn. Flour City, from its extensive flour mills.

Montpelier, Vt. The Green Mountain City, from its location.

Naples, Italy. The Beautiful, from its location on the Bay of Naples.

New Haven, Conn. City of Elms, from the great number of elms it contains.

New Orleans, La. Crescent City, from its position on a curve of the Mississippi.

Newport, R. I. City by the Sea, famous as a fashionable summer resort.

New York, N. Y. (1) Empire City, as the chief city of the United States. (2) Gotham.

Niagara Falls, N. Y. Power City, since the falls generate tremendous electric power.

Paris, France. City of the Lily or City of Louis.

Pavia, Italy. City of a Hundred Towers; so called in the Middle Ages.

Pernambuco, Brazil. City of the Reef; the harbor is protected by an extensive reef of rocks.

Philadelphia, Pa. (1) City of Brotherly Love, from the meaning of the name. (2) Quaker City, planned and colonized by William Penn and other members of the Society of Friends. (3) City of Homes.

Pittsburgh, Pa. The Smoky City, from the pall of fog and smoke that often envelops it.

Portland, Me. Forest City, from the number of trees lining its streets.

Portland, Ore. The Rose City, from its beautiful rose gardens.

Quebec, Quebec. Gibraltar of America, after the heights on which the city is founded.

Rochester, N. Y. (1) Flower City, from the profusion of flowers there. (2) Kodak City, from its outstanding industry.

Rome, Italy. (1) Holy City of the Roman Catholic church. (2) City of Seven Hills, from the site of the ancient city. (3) Eternal City, a name inherited from the period of its ancient greatness.

Salt Lake City, Utah. City of the Saints; here are located the headquarters of the Mormon Church of Latter-Day Saints.

San Francisco, Calif. City of the Golden Gate.

Santa Fe, N. M. City of the Holy Faith.

Savannah, Ga. Garden City, from its parks and gardens.

Seattle, Wash. Queen City of Puget Sound.

Springfield, Ohio. Flower City, from the beauty of its flowers.

St. Louis, Mo. Mound City, from the artificial mounds found there.

Stockholm, Sweden. Venice of the North, from the many islands and waterways.

Strasbourg, France. City of the Bells, for its numerous bells of many sizes.

Syracuse, N. Y. Hub of the Empire State, from its geographical position.

Tulsa, Okla. Oil Capital of the World, from its principal industry.

Venice, Italy. (1) City of St. Mark. (2) City of the Seventy Isles.

Washington, D. C. City of Magnificent Distances, from its being laid out on a large and regular scale.

CONGRESSIONAL MEDALS

These medals are awarded by a special act of Congress for outstanding service to the United States or to mankind in general. Over 1,800 Congressional medals have been awarded, among them being the following:

Recipient	*Occasion of Award*	*Date*
George Washington.	The Capture of Boston	1776
Horatio Gates.	Surrender of the British Army	1777
Anthony Wayne.	Capture of Stony Point	1779
Henry Lee.	Surprise of Pawlus-Hook	1779
John Paulding, David Williams, Isaac Van Wart (Silver Medal).	Capture of Major Andre	1780
Daniel Morgan.	Victory of Cowpens	1781
John Paul Jones.	Capture of *Scrapis*	1787
Thomas Truxton.	Action with the *Vengeance*	1800
Edward Preble.	Naval operations against Tripoli	1805
Isaac Hull.	Capture of the *Guerriere*	1813
Jacob Jones.	Capture of the *Frolic*	1813
Stephen Decatur.	Capture of the *Macedonian*.	1813
William Bainbridge.	Capture of the *Java*	1813
Oliver H. Perry.	Battle on Lake Erie	1814
Jesse Duncan Elliott.	Battle on Lake Erie	1814
James Lawrence (Nearest relative).	Capture of the *Peacock*	1814
Thomas Macdonough.	Victory of Lake Champlain	1814
Robert Henley.	Victory of Lake Champlain	1814
Stephen Cassin.	Victory of Lake Champlain	1814
Lewis Warrington.	Capture of the *Epervier*	1814
Johnston Blakeley.	Capture of the *Reindeer*	1814
Jacob Brown.	Victories of Chippewa, Niagara and Erie	1814
Peter Buel Porter.	Victories of Chippewa, Niagara and Erie	1814
Eleazer Wheelock Ripley.	Victories of Chippewa, Niagara and Erie	1814
James Miller.	Victories of Chippewa, Niagara and Erie	1814
Winfield Scott.	Victories of Chippewa, Niagara and Erie	1814
Edmund P. Gaines.	Victory of Erie	1814
Alexander Macomb.	Victory of Plattsburg	1814
Andrew Jackson.	Victory of New Orleans	1815
Charles Stewart.	Capture of the *Cyane* and of the *Levant*	1816
James Biddle.	Capture of the *Penguin*	1816
William Henry Harrison.	Victory of the Thames	1818
George Croghan.	Defence of Fort Stephenson	1835
Zachary Taylor.	Victories on the Rio Grande	1846
Zachary Taylor.	Capture of Monterey	1847
Winfield Scott.	Mexican Campaign	1848
Zachary Taylor.	Victory of Buena Vista	1848
Duncan N. Ingraham.	Release of Martin Koszta	1854
Frederick Henry Rose.	Kindness and humanity. (Dr. Rose was a British subject who boarded a United States war vessel that had been visited by an epidemic of yellow fever and took care of the sick)	1858
Ulysses S. Grant.	Victories of Fort Donelson, Vicksburg and Chattanooga	1863
Cornelius Vanderbilt.	Free gift of steamship *Vanderbilt*	1864
Cyrus West Field.	Laying of the Atlantic Cable.	1867
George Peabody.	Promotion of industrial education	1867
George Foster Robinson.	For saving the life of William H. Seward, Secretary of State, on April 14, 1865, when he was attacked by the assassin Payne, one of the conspirators against Lincoln and his Cabinet	1871
John Horn, Jr.	For saving over one hundred people from drowning on various occasions	1874
J. S. Crandall and others.	For rescuing the passengers and crew of the steamer *Metis* off Watch Hill, R. I.	1874
Joseph Francis.	For life-saving appliance	1888
David H. Jarvis, Ellsworth P. Bertholf, Samuel J. Call.	In recognition of the heroic services rendered by them in connection with the expedition of 1879–1898, for the relief of the whaling fleet in the Arctic regions	1902
Orville Wright and Wilbur Wright.	For services rendered the science of aerial navigation	1909
Capt. Arthur Henry Rostron.	For service in giving relief to passengers of the wrecked steamship, Titanic	1912
Kroonland officers and crew.	Relief of *Volturno*.	1914
Maj. John O. Skinner (Medal of Honor).	Gallantry during Modoc Indian campaign of 1873	1915
Unidentified British and French soldiers in Westminster Abbey (London) and the Arc de Triomphe (Paris)		1921
Robert Edward Cox, Chief Gunner, U. S. N.	Heroism at accident on U.S.S. *Missouri*, 1904	1921
Unidentified American soldier in Arlington Cemetery. (Congressional Medal of Honor and Distinguished Service Cross)		1921
Unidentified Italian soldier in Rome		1921
Army World Flyers—Major Fred L. Martin, Captain Lowell H. Smith, Lieutenants Leigh Wade, Leslie Arnold and Erik Nelson and Sergeant Alva L. Harvey. (Distinguished Service Medals)		1925
Richard E. Byrd, Rear-Admiral U.S.N., retired.	North Pole flight by aircraft	1927
Floyd Bennett, aviation pilot, U.S.N.	Services in Byrd Arctic Expedition	1927
Col. Chas. A. Lindbergh, U.S.A. C.R.	New York-Paris flight	1927
Thomas Eadie.	Saved companion diver, risking his own life over two hours to do so	1927
Col. De Pinedo, Coste, Le Brix, von Huenefeld, Fitzmaurice and Koehl. (Distinguished Flying Cross.)	Several aircraft flights	1928
Thomas A. Edison.	In recognition of achievements	1928
Commander John H. Towers and crew of *NC-4*.	Transatlantic flight of 1919	1929
Walter Reed, James Carroll and others.	Services in yellow fever investigations in Cuba	1929
Col. Edward V. Rickenbacker.	Attack on seven airplanes and destruction of two of them at Billy, France	1929
Christian F. Schilt.	Saved three lives and carried aid by airplane at Quilali, Nicaragua	1930
Richard E. Byrd.	Exploration at the South Pole	1930
Wiley Post and Harold Gatty.	Transatlantic and round-the-world flights	1932

DIAMONDS OF NOTE

CARATS (Uncut)	CARATS (Cut)	NAME	DISCOVERED	POSSESSOR
3106[1]	516½	Cullinan I (also called Star of South Africa)	1905	British Royal Family
	309 3/18 and over 100 smaller stones	Cullinan II	1905	British Royal Family
1680	Never cut	Braganza	1741	Republic of Portugal
971	Cut into 10 pieces, 69 to 13 each	Excelsior	1893	Sold privately
787½	367.9	Rajah of Mattan	1756	Rajah of Mattan (Borneo)
787½	279 9/16	Great Mogul	1650	Probably lost
726	Cut into 12 stones, 142.9 to 53 each.	Jonker	1934	N. Y. Gem Importer
650	245	Jubilee	1896	Great Britain. Used at Queen Victoria's Jubilee
	199.6	Orloff		Diamond Treasure of the Union of Soviet Republics
410	143.2	Pitt or Regent	1701	Louvre, Paris.
150	138½		1775	Republic of Portugal
	137.25	Florentine (cinnamon-colored)	before 1657.	Austrian Government
242½		Tavernier	1668	Stolen in 1792
254	128.5	Star of the South (a Brazilian Diamond)	1853	Gaekwar of Baroda, India
280	128.5	Tiffany Yellow	1878	Tiffany and Co., New York
296	123	Stewart	1872	English private ownership
186½	106.1	Kohinoor	B.C.	Jewel Room, Tower of London
	88.7	Shah of Persia	before 1591.	Diamond Treasure of the Union of Soviet Republics
89¾	78⅝	Nassac		Duke of Westminster
119½	76½	English Dresden	1857	Gaekwar of Baroda
288⅝		Stewart		English private ownership
150		Porter Rhodes	1872	Private ownership
83	55	Sancy	about 1570.	Unknown
	55	Empress Eugenie		Gaekwar of Baroda, India
	49.8	Dresden Green	before 1743.	Green Vaults (Grune Gewölbe), Dresden
	49	Pigot	before 1775.	Destroyed 1882
83½	46½	Star of South Africa or Dudley	1867	Countess of Dudley
112¼	44¼	Hope Blue		Mrs. Edw. B. McLean, Washington, D. C.
	40	Pasha of Egypt		Egyptian Government
	40	Polar Star		Diamond Treasure of the Union of Soviet Republics
	26	Star of Este		Archduke Franz Ferdinand of Austria-Este (Assassinated 1914)

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[1] Oliver C. Farrington, *Famous Diamonds*, Chicago, 1929. Geo. F. Kunz gives 3,024.

CRESCENT

The crescent moon and similarly shaped objects, such as horseshoes, have long been considered lucky.

The crescent was a symbol of the various nature goddesses of Asia Minor, and when Greek Artemis and Latin Diana became identified with these Asiatic divinities, the crescent was shown on the head of the goddess in her statues. The crescent was a symbol of the old city of Byzantium, later called Constantinople. When the Turks took that city, it became a symbol of Turkish and Mohammedan power, as the cross is of Christianity. The crescent moon appears on the flag of Egypt with three stars and on the flag of Turkey with one star. The crescent is used in heraldry to designate the second son and his descendants.

DIXIE

A name popularly applied to the states south of the Mason and Dixon Line, so that some scholars explain Dixie as coming from Dixon. In negro folklore Dixie is a fabulous realm of peace, plenty and indolence, whose charms form the burden of many a negro melody. The story goes that a Mr. Dixie, a slaveholder of Manhattan Island, was compelled by public opinion to remove his slaves to the South. In their new abode they sighed for their old home in the North, Dixie's land, so that Dixie or Dixie's land became a proverbial phrase for a paradise.

Another explanation is that Louisiana came to be called *Dixie land* when the state $10 notes bore the French word *DIX* in large letters.

"Dixie" is the name of the song composed by Daniel Decatur Emmett in 1859 and adopted by the South as a political campaign song in 1860 and sung by the soldiers of the Confederate Army in the Civil War.

DOLLAR MARK

There has been much doubt about the derivation of the sign ($) to represent dollars. Some say it comes from the letters U.S., which after the adoption of the Federal Constitution were prefixed to the Federal currency, and which afterwards in the hurry of writing were run into one another, the U being made first and the S over it.

Another explanation is that it is a modification of the figure eight and denotes a piece of eight reals or the dollar, which was formerly divided into eight parts and designated by the figures 8–8.

The likeliest explanation is that the sign is a mere variation of P^s, the common abbreviation in Mexico and other parts of Latin America for *pesos* or *piastres* or *pieces of eight*.

DOMES OF FAMOUS BUILDINGS

Name	*Diameter (Feet)*	*Height (Feet)*
Albert Hall, London	185	219
Pantheon, Rome	142	143
Duomo, Florence	139	310
St. Peter's, Rome	139	330
Capitol, Washington, D. C.	135½	287½
Cathedral of St. John the Divine, New York	135	190
St. Sophia, Constantinople	115	180
Baths of Caracalla (ancient), Rome	112	116
St. Paul's, London	112	215
Mosque of Sultan Solyman, Constantinople	95	187
Les Invalides, Paris	92	350
Santa Maria della, Salute, Venice	80	133
Escorial, Madrid	60	320

DRACONIAN LAWS

The laws of Draco, enacted by him when he was archon and thesmothete (lawmaker) of Athens (*c.* 621 B.C.), on account of their rigor were said to be written in blood. Even petty larceny was punished with death. This code was set aside by the laws of Solon 594 B.C., which were founded on the principle of making property, not birth, the title to the honors and offices of the state. In modern usage the term is applied to any statutes of unusual severity.

DREAMS

A dream is a series of images, thoughts and emotions that come to the mind when one is asleep. When dreaming one does not have control over the trend of his thoughts, and the principle of suggestion is in control. The images that appear in dreams are usually completely lacking in coherency but sometimes the mind develops wonderful brilliancy during sleep. It is generally accepted that dreams result from natural causes. Internal bodily condition or the immediately preceding state of mind or emotions usually cause and mold a dream. Dreams, therefore look backward over time past, instead of anticipating the future; and yet throughout the world in all the ages many people have interpreted dreams as prophesying future events.

Modern psychology interprets dreams as mental phenomena. The psychoanalysts believe that the dream is an important indication of the psychological character and problems of the individual, and that it may be interpreted by studying what associations the dream symbols have for the individual.

EAGLE

The figure of an eagle is chosen to support the lectern or reading desk in churches, and from early times the eagle has been the symbol of St. John the Evangelist who wrote about the Word of God. The outspread wings of the eagle were supposed to symbolize the Old and the New Testaments. In mythology the eagle often represented the sun; it was also Jupiter's symbol. In royal banners it was the ensign of the ancient kings of Babylon and Persia, of the Ptolemies, Seleucidae and Romans. The Roman legions carried an eagle or an image of an eagle as a standard. The French under the Empire adopted the same device; Napoleon's standards carried it. The two-headed eagle signifying a double empire was an emblem of Austria, which claimed to be the successor of the Caesars and Charlemagne. In Czarist Russia the two-headed eagle represented the union of Church and State. The American or bald eagle is the national emblem of the United States.

ECHO

The repetition of a sound in the air caused by reflection from an obstacle is an echo. A very sharp, quick sound can produce an echo when the reflecting surface is only 50 feet distant. Sound travels in air about 1,100 feet per second, and the reflecting surface must be far enough away to allow time for the sound before its echo returns. A five-syllable word like "incompatible" takes about 1 second to pronounce, and to get a clear echo of such a word the reflecting surface must be distant at least 550 feet; if the surface is nearer, the echo will be confused with the original sound. If the sound lasts 3 seconds, the distance of the reflecting surface must be at least 1,650 feet and so on.

Expectation of Life and Mortality Rate per 1,000 at Specified Ages for Total Persons and for White Persons by Sex, United States

AGE	EXPECTATION OF LIFE			MORTALITY RATE PER 1,000		
	Total Persons	White Males	White Females	Total Persons	White Males	White Females
0	61.37	60.72	64.72	50.89	53.90	41.65
1	63.64	63.15	66.51	7.57	7.34	6.51
2	63.12	62.61	65.94	3.89	4.05	3.36
3	62.36	61.86	65.16	2.79	2.84	2.45
4	61.53	61.04	64.32	2.26	2.24	2.08
5	60.67	60.17	63.45	1.93	1.93	1.79
10	56.14	55.65	58.89	1.25	1.37	1.04
15	51.51	51.05	54.20	1.81	1.83	1.35
20	47.06	46.57	49.62	2.83	2.62	2.10
25	42.76	42.21	45.18	3.52	3.13	2.70
30	38.52	37.87	40.80	4.03	3.65	3.11
35	34.32	33.59	36.44	5.09	4.74	3.78
40	30.22	29.43	32.15	6.38	6.27	4.61
45	26.23	25.41	27.92	8.49	8.78	6.21
50	22.41	21.61	23.85	11.85	12.52	8.79
55	18.80	18.04	19.95	16.06	17.62	12.38
60	15.40	14.73	16.28	23.51	25.97	19.00
65	12.34	11.78	12.97	35.40	38.92	29.98
70	9.66	9.21	10.06	52.59	57.54	46.71
75	7.37	7.04	7.59	79.62	86.38	73.72
80	5.50	5.28	5.59	117.57	124.75	113.17
85	3.98	3.80	4.02	176.41	184.82	175.39
90	2.87	2.70	2.94	255.89	273.25	253.36

E PLURIBUS UNUM

E pluribus unum, the motto of the United States, is Latin and means one out of many, the notion of federal union. Its adoption was recommended to the Continental Congress on July 4, 1776, the day when the Declaration of Independence was formally approved, by a committee composed of Thomas Jefferson, John Adams and Benjamin Franklin. It was adopted as a part of the Great Seal of the United States. It appears also on most United States coins, and it is the state motto of Michigan.

EXPECTATION OF LIFE

This table, computed from the mortality statistics for 1935 and an estimated distribution of population by color, sex and age, shows the expectation of life. Table is on Page 2251.

There was considerable gain in 1935 over the United States figures for 1929–31 at all ages up to 60 years among white males and up to 75 years among white females. Declines in mortality were particularly marked in early infancy and childhood—within the ages from 1 to 4 years the decreases in mortality averaged almost 25 per cent.

In 1930 the expectation at birth for white males was 59.31 years; in 1935 it was 60.72. For white females the increase was from 62.83 years in 1930 to 64.72 years in 1935. In the same period the birth rate dropped from 18.60 per 1,000 to 16.50; and the death rate went down from 10.78 to 10.55 per 1,000.

WORLD EXPOSITIONS

Date	*Name and Place*
1851	Crystal Palace, London
1855	International, Paris
1862	International, London
1867	International, Paris
1873	International, Austria
1876	Centennial, Philadelphia
1878	International, Paris
1889	International, Paris
1893	World's Columbian, Chicago
1900	International, Paris
1901	Glasgow, Glasgow
1901	Pan-American, Buffalo
1903	International, Osaka
1904	Louisiana Purchase, St. Louis
1905	Lewis and Clark, Portland, Ore.
1906	International (Simplon tunnel), Milan
1907	Jamestown Tercentennial, Norfolk
1909	Alaska-Yukon-Pacific, Seattle
1915	Panama-Pacific, San Francisco
1915	Panama-California, San Diego
1924	British Empire, Wembly, England
1926	Sesquicentennial, Philadelphia
1929	International, Barcelona
1933	Century of Progress, Chicago
1935	California-Pacific, San Diego
1936	Great Lakes, Cleveland
1936	Texas Centennial, Dallas
1939	Golden Gate International, San Francisco
1939	New York World's Fair, New York

FIRE

When the union of oxygen with some other element takes place slowly, heat is made but no fire or light is visible; when the union takes place quickly, heat is to be felt and fire or flame results. The rusting of iron is chemically the same thing as the burning of wood; both, that is, are oxidations. The oxygen of the air unites with the iron so slowly that the heat is not enough to be felt. If the union is made to take place quickly, heat and light will be caused. When the nails on the heel of a shoe strike a stone, one often sees a spark fly. This is burning iron. The iron nail in the heel of the shoe strikes the stone, a bit of it is knocked off, enough heat is made by the blow to cause the iron to unite with the oxygen of the air and this in turn produces more heat and makes the iron particle glow. A piece of iron or steel may easily be heated enough to make it burn in a jar of oxygen, and a most brilliant light will be given off by it. When wood or coal is set on fire, it gives out both heat and light; but if it could be given still more oxygen it would burn still brighter. This happens when one blows a fire with the bellows, and this is the reason why it then blazes up and burns more briskly. Some things take fire—that is, unite with oxygen—much more easily than others. When one scratches a match, it at once bursts into flame.

The match has a little phosphorous sulphide mixed with glue and an *oxidizing agent*—a chemical containing easily released oxygen—on the end, and when the match is scratched on any rough surface, enough heat is caused for the phosphorus to unite quickly with the oxygen and the top of the match bursts into flame.

Wood and coal have not as great an affinity for oxygen as phosphorus, and it requires much more heat to make them ignite.

FIRES, GREAT AND HISTORIC

London, England, Sept. 2–6, 1666. 89 churches, 13,200 houses destroyed; 400 streets laid waste; 200,000 persons homeless. Ruins covered 436 acres.
London, England, 1794. 650 houses destroyed, $5,000,000 loss.
Richmond, Va., Dec. 26, 1811. Governor and many leading citizens perished.
Moscow, Russia, 1812. The famous firing of the city by the Russians at the approach of Napoleon I; 12,000 houses burned, also palaces and churches; $150,000,000 loss.
Washington, D. C., 1814. Part of the city, including the White House, burned by British soldiers.
New York, N. Y., Dec. 16, 1835. 600 buildings; loss $20,000,000.
Hamburg, Germany, 1842. $35,000,000 loss.
St. Louis, Mo., May 4, 1851. Large proportion of the city burned; loss, $15,000,000.
San Francisco, Calif., May 3–5, 1851. 2,500 buildings; loss, $3,500,000.
Washington, D. C., Dec. 24, 1851. Congressional library, 35,000 volumes, with works of art burned.
London, England, 1861. Fire in Tooley Street; $10,000,000 loss.
Charleston, S. C., Feb. 17, 1865. Almost totally destroyed, with large quantities of naval and military stores.
Richmond, Va., April 2 and 3, 1865. Great part destroyed by fire at time of Confederate evacuation.
Portland, Me., July 4, 1866. Almost entirely destroyed; loss, $15,000,000.
Constantinople, Turkey, 1870. 7,000 buildings burned; loss, $25,000,000.
Chicago, Ill., Oct. 8–9, 1871 Three and one-half square miles laid waste; 17,450 buildings destroyed; 200 persons killed; 98,500 made homeless; loss over $200,000,000.
Michigan and Wisconsin, Oct. 8–14, 1871. Great forest fires; 2,000 lives lost.
Boston, Mass., Nov. 9–11, 1872. 800 buildings; loss, $73,000,000; 15 killed.
St. John, N. B., June 20, 1877. Loss, $12,500,000.
Minnesota, 1894. Forest fires, $25,000,000 damage; 418 lives lost.
Hoboken, N. J., 1900. $4,627,000 loss; 215 lives lost.
Hull and Ottawa, Canada, 1900. $10,000,000 loss; 18,000 homes.
Jacksonville, Fla., May 3, 1901. Property loss $10,000,000.
Chicago, Ill., Iroquois Theater, Dec. 30, 1903. Entailed a loss of 639 lives.
Baltimore, Md., Feb. 7–8, 1904. Financial loss, $85,000,000.
Toronto, Canada, April 9, 1904. Destruction in business district; loss, $12,000,000.
San Francisco, Calif., April 18–19, 1906. Fire and earthquake (see earthquakes); loss, $400,000,000.
Iloilo, P. I., April 19, 1907. 20,000 homeless.
North Collinwood, Cleveland, Ohio, 1908. 167 children burned in a public school.
Chelsea, Mass., April 12, 1908. Loss, $6,000,000.
Kootenay Valley, B. C., Aug. 4, 1908. Forest fires burned three towns and $6,000,000 worth of property.
Albany, N. Y., 1911. State Capitol Bldg.; $1,500,000 loss.
Coney Island, N. Y., 1911. Amusement Park; $2,725,000 loss.
Houston, Tex., 1912. Business district; $4,500,000 loss.
New York, N. Y., 1912. Equitable Bldg.; $3,000,000 loss.
Salem, Mass., 1914. 1,700 buildings destroyed; $14,000,000 loss.
Jersey City, N. J., 1916. Railroad terminal warehouses and steamer; $11,000,000 loss.
New York Harbor, N. Y., 1916. Black Tom Island; $11,000,000 loss.
Ottawa, Can., 1916. Parliament Bldgs.; $3,000,000 loss.
Halifax, N. S., 1917. 1,500 killed. Explosion of war materials and fire; 20,000 homeless; 4,000 injured; $50,000,000 loss.
Kingsland, N. J., 1917. Munition factory; $12,000,000 loss.
Minnesota, 1918. Forest fires; $35,000,000 loss.
Morgan Station, N. J., 1918. Munition plant; $20,000,000 loss.
Minnesota and Wisconsin, 1918. Forest fires; 1,000 dead; $100,000,000 property loss.
Tokyo, Japan, 1921. 1,000 houses in residence district; $12,500,000 loss.
Smyrna, Asia Minor, 1922. Great loss of life. City almost completely destroyed. 100,000 homeless; $12,500,000 loss.
Berkeley, Calif., 1923. 600 residences covering 35 blocks; $5,000,000 loss.
Mexicali, Mexico, 1923. 30 killed. Fire started in theater; $5,000,000 loss.
Japan, 1923. Earthquakes, houses destroyed by fire, 447,128.
Jersey City, N. J., 1924. $8,000,000 loss on waterfront.
Lake Denmark, N. J., 1926. 21 killed, 80 buildings wrecked and $85,000,000 property and ammunition destroyed by explosions and fires when lightning struck navy munition reservations.
Tatavia, Turkey, 1929. 400 houses destroyed, many dead.
Igolkmo, Russia, 1929. Film theater; 114 dead.
Cleveland, Ohio, 1929. Clinic; 123 dead.
Columbus, Ohio, 1930. 300 convicts died in Ohio Penitentiary fire.
Berlin, Germany, 1933. Reichstag building partially destroyed.
Chicago, Ill., 1934. Union Stock Yards, $6,000,000 damage.

FLAG ETIQUETTE

There is no Federal law now in force concerning the manner of displaying, hanging or saluting the United States flag, but there are certain fundamental rules that are accepted as correct.

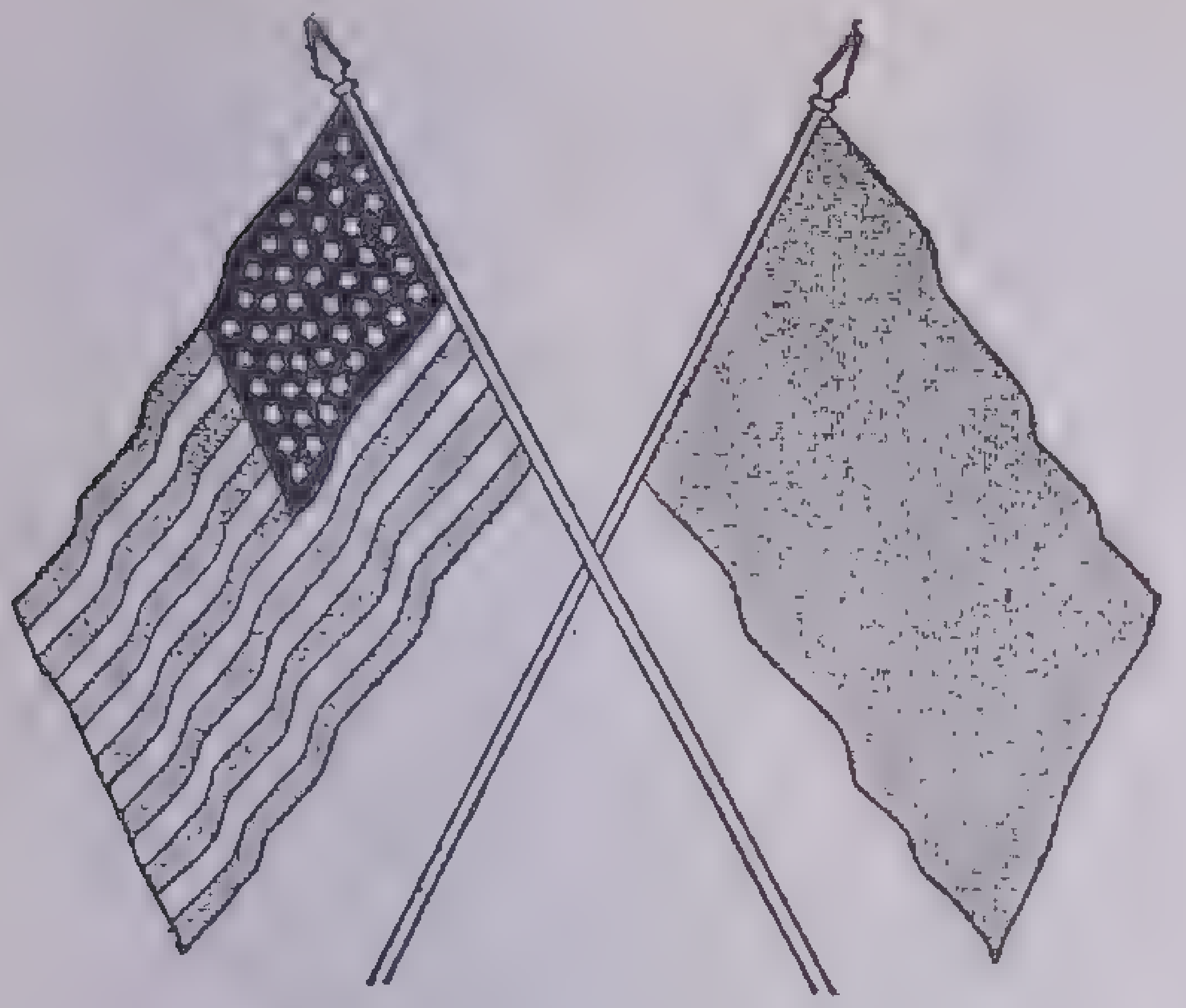
The flag should be displayed only between sunrise and sunset or between such hours as may be designated by proper authority. It should be displayed on national and state holidays and on historic and special occasions.

The flag should always be hung with the union or stars at the top. The only time that the flag should be displayed with the union down is as a distress signal by a vessel at sea.

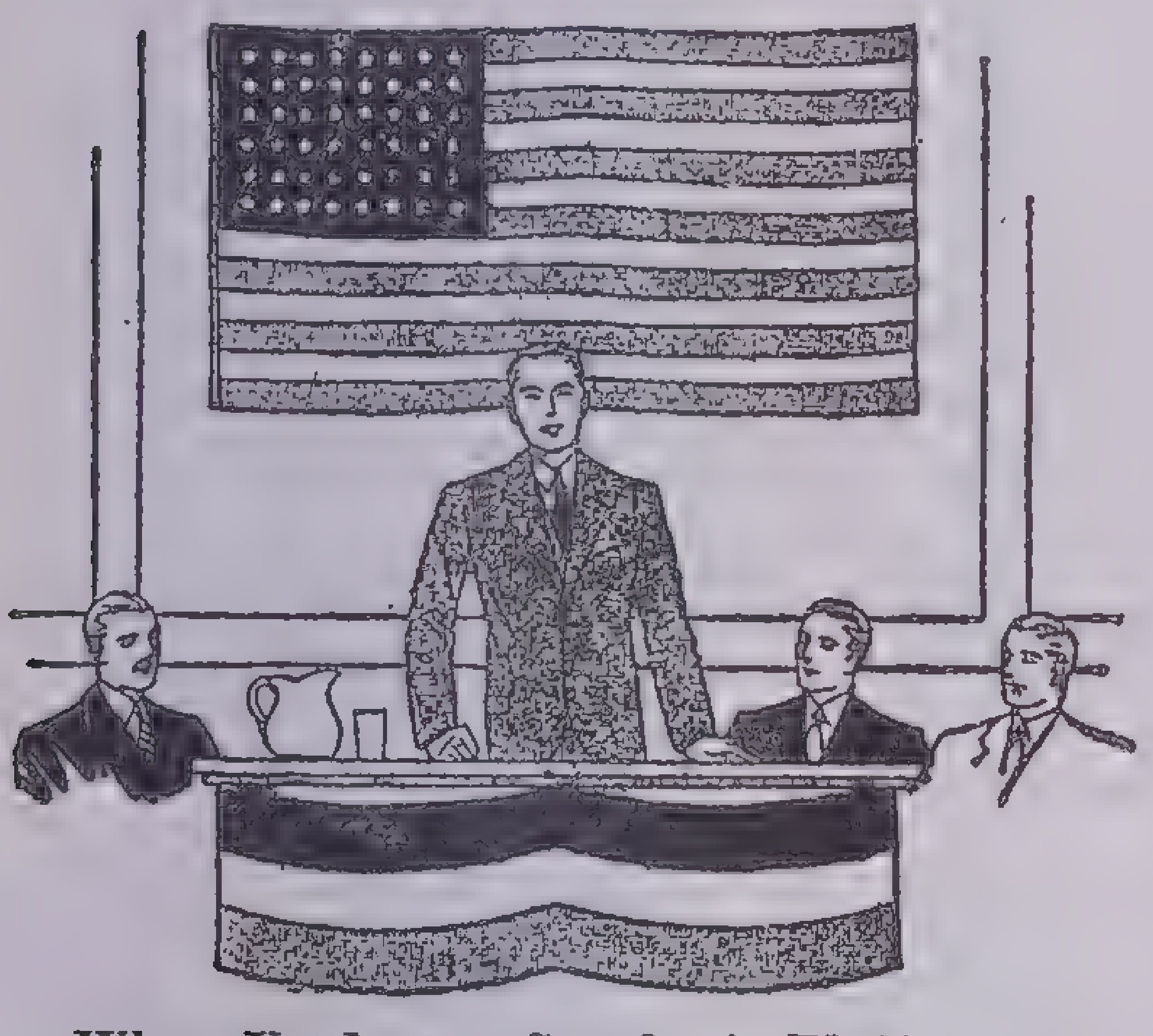
When it is carried in procession, the flag of the United States should be carried on the marching right, or when there is a line of other flags, that of the United States should be borne in front of the center of that line.

International usage forbids the display of the flag of one nation above that of any other nation in times of peace. When flags of two or more nations are displayed, they should be flown from separate staffs or from separate halyards of the same size and on the same level. When it is hung from buildings or over a street, the flag of the United States should be hung vertically with the union to the north in an east-and-west street, and to the east in a north-and-south street.

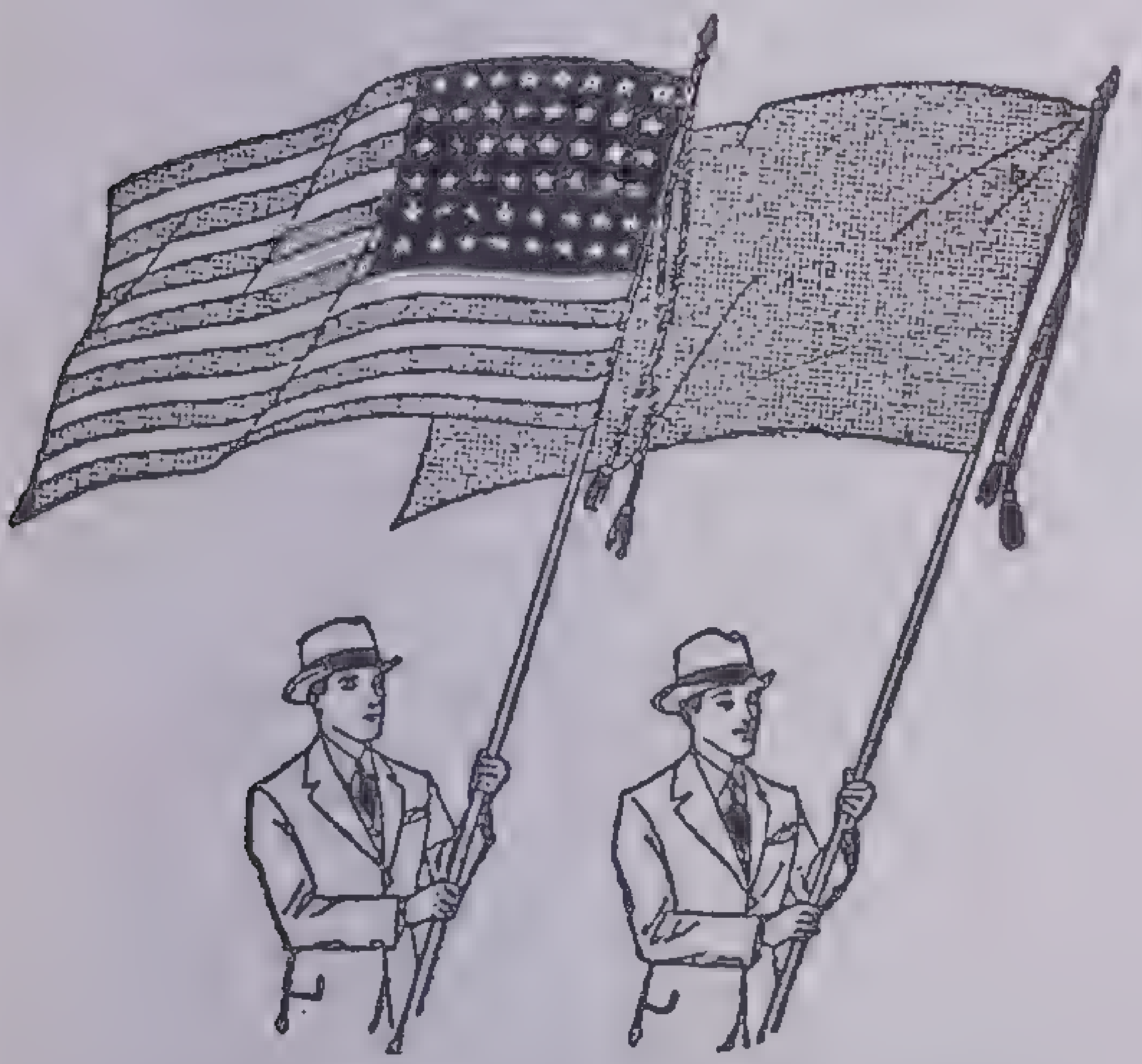
When flags of states or cities or other special flags are flown with that



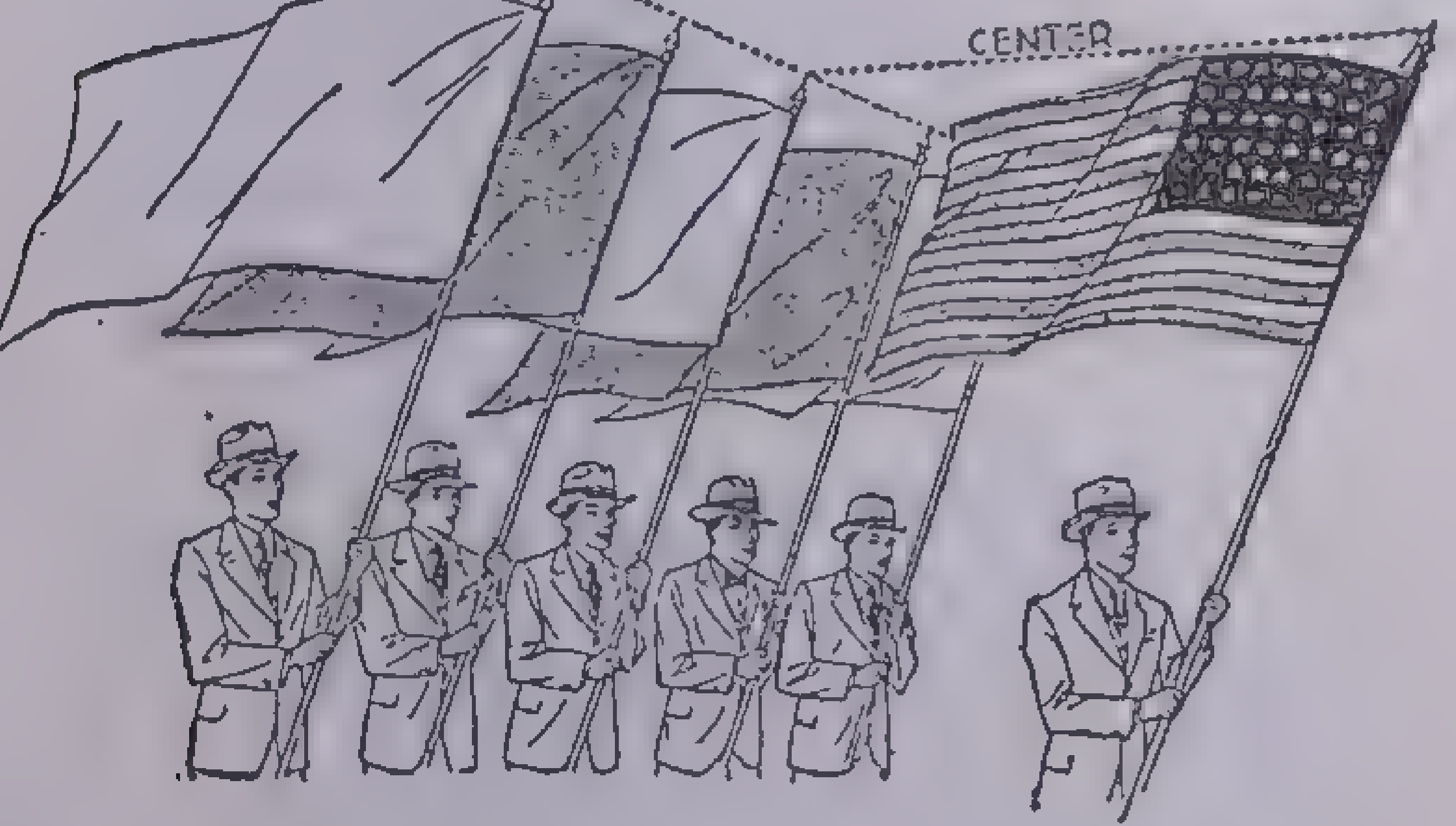
With Another Flag Against a Wall—
The United States flag is on the observer's left, and its staff in front of the staff of the other flag



When Used on a Speaker's Platform—
a, If displayed flat, the flag is above and behind the speaker (red, white and blue bunting is more correctly used on such occasions)
b, If flown from a staff, the flag is in the position of honor, at the speaker's right, and preferably slightly in front



In a Procession With Another Flag—
The United States flag is on the marching right



In a Procession with a Line of Other Flags—
The United States flag is in front of the center of the line

of the United States, the national flag must always be raised first and be at the peak. The church pennant of army or navy may be flown above the national flag during divine services.

It is better form to display the flag hung flat and not festooned. For decorative purposes, for covering a speaker's desk or draping the front of a table or platform bunting of national colors should be used, with the blue stripe at the top, since the blue union of the flag is always above.

When flown at half-staff, the flag is hoisted to the peak for an instant, then lowered to half-staff. Before lowering for the night, the flag is again run up to the top of the staff for a moment. On ships at sea, this position is called *half-mast*. On Memorial Day the flag is displayed at half-staff from sunrise until noon, and at full staff from noon until sunset.

When the national flag is used on a bier or casket at a military funeral, the union is placed at the head of the casket and over the left shoulder of the body, and the casket is carried foot first. The flag must neither be allowed to touch the ground nor be lowered into the grave.

Among important "don'ts" in flag etiquette are:

Don't show or permit disrespect to be shown to the flag.

Don't place any object on or above the flag, with the possible exception of the Bible.

Don't fasten the flag so carelessly that it will be easily torn.

Don't use the flag as drapery in any form. It should not be used as part of a costume or an athletic uniform or draped over any part of an automobile, boat or railroad train. If the flag is displayed on such vehicles, it should be flown from a rigidly fixed staff.

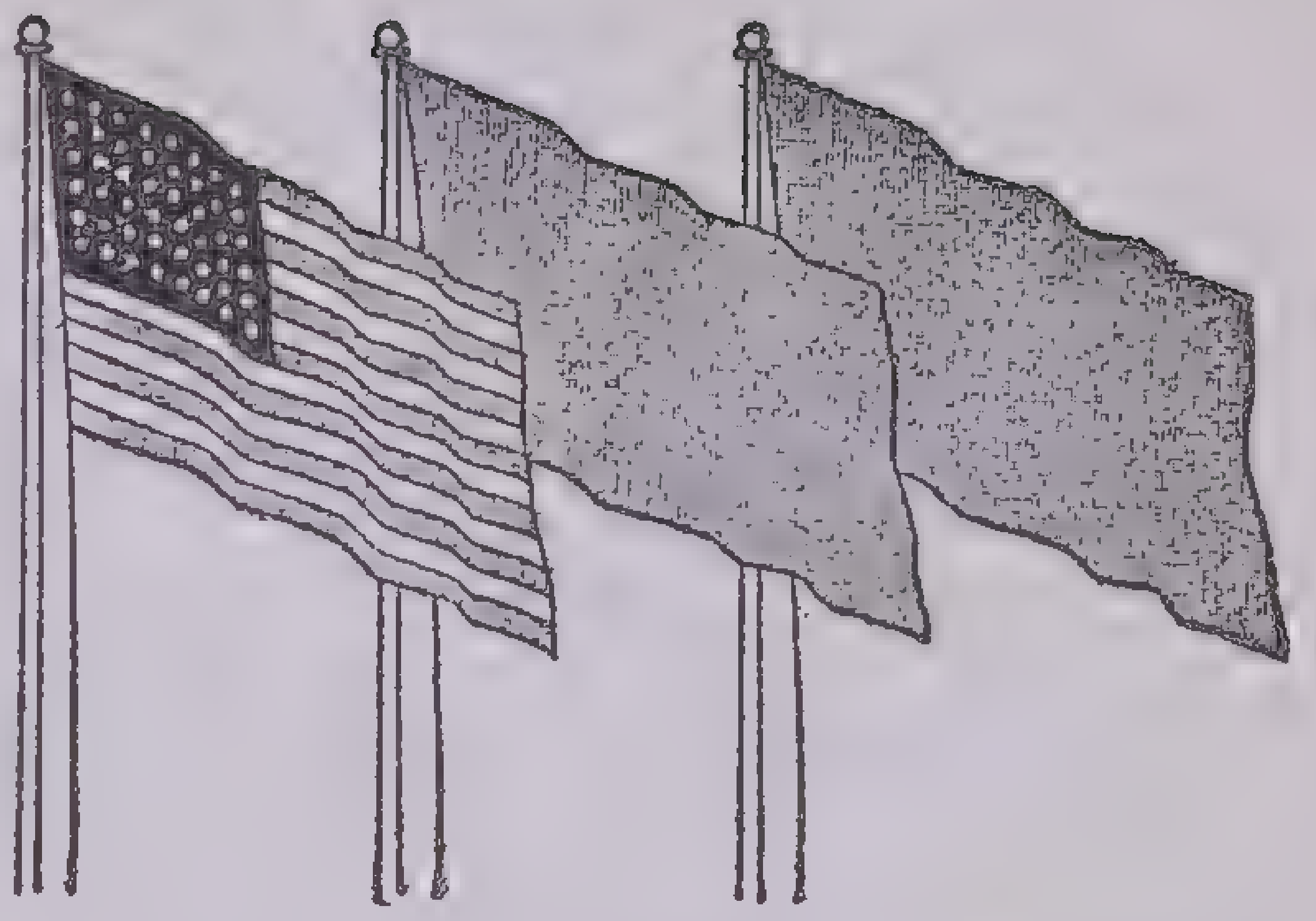
Don't use the flag for any kind of advertising.

If you are a boy, always remove your hat when the flag passes. The color-bearer must also take care to hold the flag aloft, gripping the pole firmly.

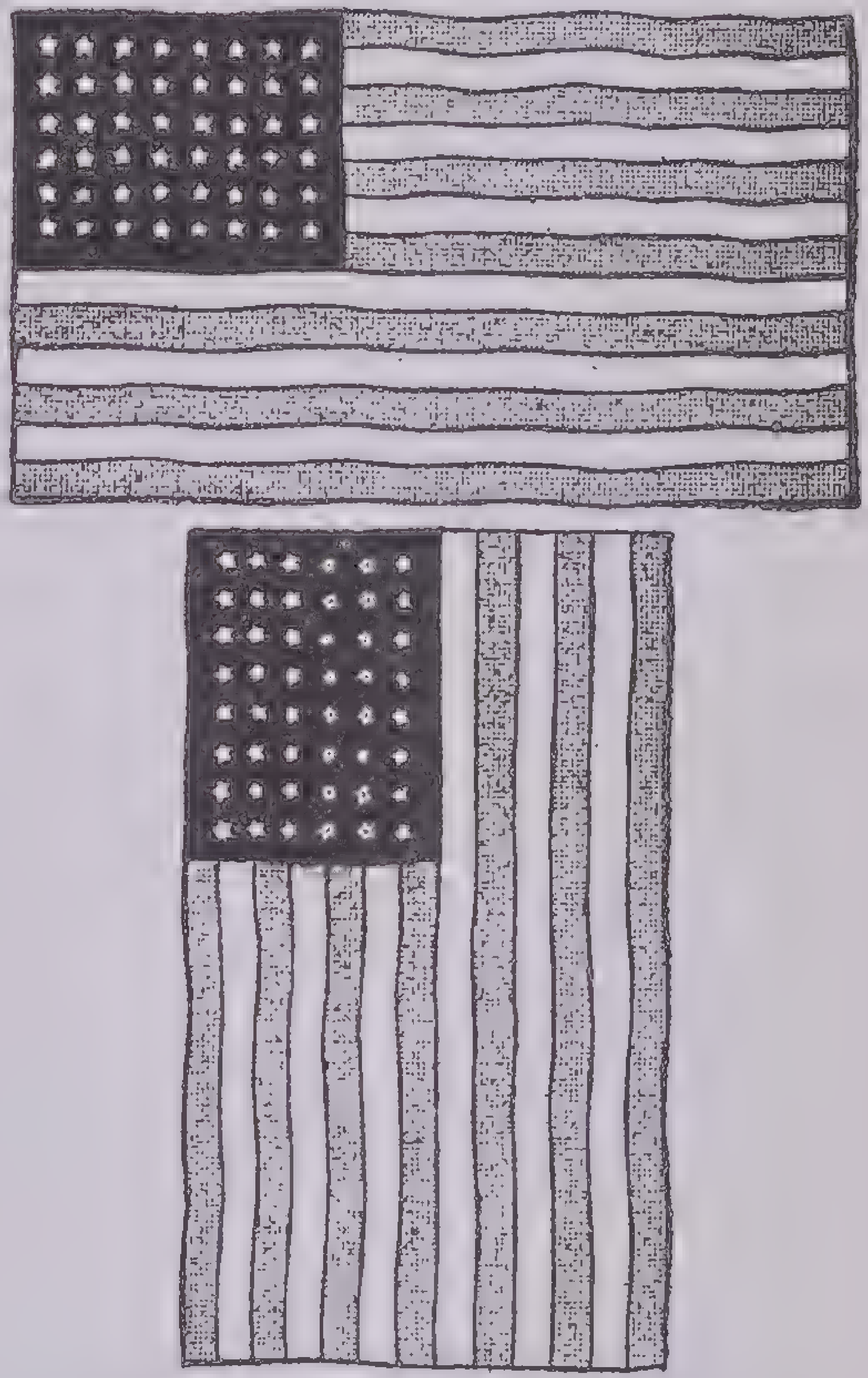
When an old flag is discarded, it should be destroyed in private by burning.

Occasions on which to display the flag:

January 20 (1937, 1941, etc., every fourth year thereafter). On the day the President of the United States is inaugurated.
February 12. Lincoln's Birthday.
February 22. Washington's Birthday.
April 6. Army Day. (Anniversary of the entrance of the United States into the World War, April 6, 1917.)
Second Sunday in May. Mothers' Day.
May 30. Memorial Day. The Flag to be at half-staff until noon, and at full staff from noon to sunset.
June 14. Flag Day.
July 4. Independence Day.
First Monday in September. Labor Day.
September 17. Constitution Day (anniversary of the adoption of the Constitution of the United States, September 17, 1787).
October 12. Columbus Day.
October 27. Navy Day (anniversary of the birth of President Theodore Roosevelt.) See *April 6, Army Day.*
The first Tuesday after the first Monday in November in 1936, 1940, etc. (every fourth year). Presidential election.
November 11. Armistice Day. See *Armistice Day.*
Last Thursday in November. Thanksgiving Day.



When Flown With Other Flags from Adjacent Staffs—
The United States flag is on the right of the line—that is, on the observer's left



When Displayed Horizontally or Vertically—
The blue field is uppermost and to the flag's own right—that is, to the observer's left

FLAG, UNITED STATES

On June 14, 1777, the United States Congress passed a resolution declaring "that the flag of the thirteen United States be stripes alternate red and white; that the Union be thirteen stars, white in a blue field, representing the new constellation."

In 1794 Congress decreed that after May 1, 1795, "the flag of the United States be fifteen stripes, alternate red and white, and that the Union be fifteen stars white in a blue field." This change was made to mark the admission of Vermont and Kentucky into the Union. The stars and stripes were then equal, and a star and stripe were to be added with the admission of each new state. It was realized, however, that the addition of a stripe for each new state would soon render the flag too large, and a resolution was accordingly passed by Congress, April 4, 1818, reducing the number of stripes to 13—representing the original Union—and making the stars 20 in number. It was furthermore enacted that a new star should be added for each new state admitted into the Union. The flag now contains 48 stars, corresponding to the 48 states.

FLOWERS, SYMBOLISM OF

Poetry, tradition and common usage have attached particular meanings to a great many flowers. The Greeks and Romans had an extensive flower language purporting to symbolize thoughts and feelings. During the Middle Ages, chivalry, as well as the Roman Church, revived floral symbolism. Such symbolism is, at best, unauthoritative and contradictory. However, it has been found interesting for sentimental reasons.

Flower	*Meaning*
Amaranth	Immortality
Anemone	Weakness
Apple blossom	Esteem
Aspen	Dread
Buttercup	Prosperity
Calla	Beauty
Camellia, white	Loveliness
Candytuft	Indifference
Cardinal flower	Superiority
Carnation, white	Disdain
China aster	Variety
Clover, four leafed	Be mine; good fortune
Clover, red	Industry
Clover, white	Think of me
Columbine	Folly
Cornflower	Tenderness
Cowslip	Charm of youth
Cyclamen	Indifference
Cypress	Sorrow
Daisy	Innocence
Daisy, [illegible]	Beauty
Dandelion	Coquetry, flirtation
Everlasting	Eternal love
Fern	Fascination, sincerity
Forget-me-not	Sincere love
Foxglove	Deceit
Fuchsia, scarlet	Taste
Geranium, scarlet	Consolation
Goldenrod	Encouragement
Heather	Lonesomeness
Heather, white	Good luck
Heliotrope	Devotion
Hepatica	Wrath
Hollyhock	Ambition
Honeysuckle	Friendliness
Hyacinth, purple	Sorrow
Hyacinth, white	Loveliness
Ivy	Friendship, trustfulness
Jasmine, white	Amiability
Laurel	Glory
[illegible]	Discernment
Lily, white	Purity
Lily, yellow	Gayety
Lily of the valley	Unconscious sweetness
Lotus	Forgetfulness
Marigold	Disdain
Myrtle	Love
Narcissus	Pride
Oak leaf	Love of country
Olive branch	Peace
Orange blossoms	Marriage
Oxalis	Sorrow
Palm leaf	Conquest
Pansy	Thoughts
Poppy, white	Forgetfulness
Passion flower	Faith
Peony	Anger
Primrose	Inconstancy
Rose	Love
Rosebud	Confession of love
Rosemary	Fond memory
Rue	Disgust
Scotch thistle	Vengeance
Shamrock	Faithfulness
Smilax	Constancy
Snowdrop	True friendship
Sweet pea	Departure
Sweet william	Chivalry
Thistle	Sternness
Tulip, yellow	Despairing affection
Violet	Modesty
Wallflower	Patient affection
Water lily	Simplicity, purity of heart

FOURTH ESTATE

This term was first applied to press representatives—journalists or newspaper writers—by Edmund Burke in the British Parliament, in the sentence, "Yonder sits the Fourth Estate, more powerful than all the others!" The others were the clergy, the nobility and the mass of the people.

GARDENS OF THE WORLD, FAMOUS

Garden of Eden. First abode of man supposed to be located near the city of Babylon.

Garden of England. The Isle of Wight and the counties of Worcestershire and Kent have all been so named.

Garden of Erin. Carlow in Leinster, Ireland.

Garden of Europe. Italy.

Garden of France. The District of Amboise.

Garden of Gethsemane. East of Jerusalem.

Garden of Helvetia. Name given to Thurgau, Switzerland.

Garden of Hesperides. In the western part of the mythological world.

Garden of India. Oude.

Garden of Italy. The Island of Sicily.

Garden of Kentucky. Bourbon County, in that state.

Garden of Scotland. Morayshire has been so named.

Garden of Spain. Andalusia.

Garden of the West. A name sometimes applied to Kansas.

Garden of the World. That vast fertile country watered by the Mississippi and its tributaries.

Garden of the East. Ceylon and Burma.

Garden of the Gods. Near Colorado Springs, Colorado.

GLASSES TOUCHED BEFORE DRINKING

Why are glasses touched when two or more persons drink a health? The simplest explanation is that the glasses make a pleasant sound, and that the joint action is symbolized by the glasses being momentarily together. But it is quite possible that the custom goes back to times of distrust when a guest feared he might be poisoned. In those days when two drank together, some of the wine was poured from each glass into the other. Now merely touching glasses expresses friendliness and good will.

HARP OF IRELAND

The Irish harp, a simple triangular instrument, was made famous by the early minstrels. Often it was handed down from father to son, and it was pictured on early Irish stone crosses.

SAORSTÁT ÉIREANN
19 28

The Harp Appears on All Irish Coins

Especially famous was the harp of King Brian Boru (or Brian Boroimhe, also pronounced Boru) who reigned from 1002 to 1014. When his harp was given to Henry VIII, a picture of the harp was put on Irish coins by order of the English king.

HIPPOCRATIC OATH

This solemn oath was taken in the days of ancient Greece and still is by young men entering the practice of medicine; it is named for Hippocrates, the father of medicine. It has formed the basis of medical ethics and, in an abbreviated form, is administered to the graduating classes of most American medical colleges. Some parts of it are later than Hippocrates (5th century B.C.), but some may be 500 years older and Egyptian in origin.

The oath is as follows:

> I swear by Apollo the physician, by Aesculapius, by Hygeia and all the gods and goddesses that according to my ability and judgment I will keep this oath and stipulation.
>
> I will reckon him who has taught me this art equally dear with my parents. I will share my substance with him and will relieve his necessities, if he be in need. I will look upon his offspring as my own brothers and will teach them this art, if they shall wish to learn it, without fee or stipulation. By precept, lecture and every mode of instruction I will impart a knowledge of this art to my own sons, to the sons of my teachers and to those disciples who are bound by covenant and oath, according to the law of medicine, but to no others.
>
> I will follow that system of regimen which according to my belief and judgment I consider best for my patients and will abstain from whatever is injurious. I will give no deadly drug to anyone, though it be asked, nor will I counsel such, and especially I will not aid a woman to procure abortion. I will not cut a person who is suffering with stone but will leave this to be done by those who are practitioners of such work.
>
> With purity and holiness will I pass my life and practice my art. Into whatever house I enter I will go for the benefit of the sick and will abstain from all wrongdoing and corruption and especially from the seduction of females or males, bond or free. Whatever in connection with my professional practice or even apart from it I may see or hear concerning the life of men I will not divulge, holding that all such things should be kept as sacred secrets.
>
> While I continue to keep this oath inviolate, may it be granted to me to enjoy life and the practice of my art, respected always by all men, but should I break and violate this oath, may the reverse be my lot.

HISTORIC AGES

The Greek poet Hesiod, who lived during the 8th century B.C., assigned the historical ages to the following periods: *the Golden Age* or age of simplicity in which mankind was free from bodily infirmities and the necessity of toil; the *Silver Age* or period of toil and resulting pride, luxury and lawlessness; the *Bronze Age* or period filled with violence and war; the *Heroic Age* or period of the heroes and demigods who distinguished themselves in the Trojan Wars; and the *Iron Age* of Hesiod's time, in which toil and turmoil were the lot of degenerate mankind. By extension these terms are applied to other periods having the same general characteristics—Golden Age for any period of special glory; Iron Age for any time of inglorious war or peace.

Outstanding among Greece's authentic historical ages are the Age of Pericles and the Alexandrian Age. The Age of Pericles (462–429 B.C.) constitutes the greatest period of Greece's artistic glory; under Ictinus and Callicrates, the architects of the Parthenon, architecture reached its highest perfection; under Phidias, sculpture; and under Aeschylus, Sophocles and Euripides, dramatic literature. The Alexandrian Age was the period when Egypt's Alexandria (founded by Alexander the Great in 332 B.C.) was the center of Greek culture; during the reigns of the Ptolemies from about 300 to 150 B.C. it was illumined by the greatness of Euclid, Eratosthenes and Apollonius Pergaeus, as well as scores of lesser scientists, philosophers, poets and artists.

The Augustan Age was Rome's most brilliant period; it lasted from 29 B.C. to 14 A.D., and during it such great writers as Horace, Ovid, Vergil and Livy flourished. The Augustan Age of English literature was the reign of Queen Anne (1702–14); of French literature, it was the period of Louis XIV (1643–1715).

The Middle Ages extended from the downfall of the Roman Empire in the year 476 to the Renaissance era of the 14th century. Its earlier centuries are often called the Dark Ages from their general intellectual stagnation, the flame of learning being kept alight only by the monastic scholars. The Renaissance witnessed a revival of learning and of classical influence and was marked by a rich flowering of all the arts in most of the countries of Europe.

The Elizabethan Age, named for England's Virgin Queen who reigned from 1558 to 1603, was the period of the nation's greatest literary development, producing Spenser, Shakespeare, Bacon and other notables. In the commercial field it also marked the rise of capitalism and the transition from the Renaissance to the Modern Age.

The Age of Reason was the period during the French Revolution when Reason supplanted Christianity; in 1793 the Cathedral of Notre Dame in Paris was converted into a Temple of Reason, and there for about a decade an actress, dressed in white and wearing a Phrygian cap, was worshiped as the Goddess of Reason.

The Victorian Age, coincident with the reign of Queen Victoria from 1837 to 1901, was distinguished by great progress in science, literature, art and industry; literary figures of this era are Darwin, Huxley, Dickens, Thackeray, George Eliot, Browning, Tennyson, Mill, Kingsley, Ruskin, Carlyle and Spencer. The great political leaders were Gladstone and Disraeli.

HOBBY HORSE

A hobby or riding a hobby horse means a leisure-time activity in which one finds special pleasure. Hobby, like Dobbin, was a common name for a family horse; and hobby horse meant a rocking horse for children or a light framework with the head of a horse that was so attached to an English morris dancer's body that he appeared to be riding the animal.

HOBNOBBING

Hab or nab was an old drinking invitation, "Take it or leave it," literally, "Have or have not." Shakespeare says, "Hob, nob is his word; give't or take't." From this informal invitation to hospitality comes our

THE HALL OF FAME FOR GREAT AMERICANS (NEW YORK UNIVERSITY)

The terrace and colonnade on University Heights in New York city contain places for 150 bronze tablets and busts of distinguished American men and women Every five years five names may be added. Only those who have been dead 25 or more years are eligible for selection. The figures in parentheses following the names indicate the order in which the names were chosen. Washington, of course, is first.

NAME	BIRTHPLACE	DATES OF BIRTH AND DEATH	EDUCATION	VOCATION
John Adams (28)	Braintree, Mass.	1735–1826	Harvard	Statesman
John Quincy Adams (32)	Braintree, Mass.	1767–1848	Harvard	Statesman
Louis Agassiz (51)	Motier, Switzerland	1807–1873	University of Munich	Naturalist
John James Audubon (24)	Aux Cayes, Haiti	1785–1851	In France	Ornithologist
George Bancroft (39)	Worcester, Mass.	1800–1891	Harvard	Historian
Henry Ward Beecher (26)	Litchfield, Conn.	1813–1887	Amherst	Preacher, Orator
Daniel Boone (55)	Berks Co., Pa.	1734–1820	Elementary	Explorer
Edwin Booth (64)	Belair, Md.	1833–1893	Self-educated	Actor
Phillips Brooks (46)	Boston, Mass.	1835–1893	Harvard	Preacher
William Cullen Bryant (38)	Cummington, Mass.	1794–1878	Williams College	Poet, Editor
William Ellery Channing (29)	Newport, R. I.	1780–1842	Harvard	Preacher, Essayist
Rufus Choate (54)	Essex, Mass.	1799–1859	Dartmouth	Jurist
Henry Clay (15)	Hanover Co., Va.	1777–1852	Elementary	Statesman
Samuel Langhorne Clemens (Mark Twain) (57)	Florida, Mo.	1835–1910	Common Schools	Humorist, Writer of Fiction
Grover Cleveland (72)	Caldwell, N. J.	1837–1908	Academic and Legal	Statesman
James Fenimore Cooper (19)	Burlington, N. J.	1789–1851	Yale	Novelist
Peter Cooper (45)	New York, N. Y.	1791–1883	Elementary	Philanthropist, Merchant
Charlotte Saunders Cushman (35)	Boston, Mass.	1816–1876	Private Musical	Actress
James Buchanan Eads (59)	Lawrenceburg, Ind.	1820–1887	Self-educated	Engineer
Jonathan Edwards (12)	East Windsor, Conn.	1703–1758	Yale	Theologian, Preacher
Ralph Waldo Emerson (8)	Boston, Mass.	1803–1882	Harvard	Essayist, Philosopher
David Glasgow Farragut (14)	Near Knoxville, Tenn.	1801–1870	United States Navy	Admiral
Benjamin Franklin (4)	Boston, Mass.	1706–1790	Elementary	Statesman, Writer
Robert Fulton (9)	Lancaster Co., Pa.	1765–1815	Elementary	Inventor
Ulysses Simpson Grant (5)	Point Pleasant, Ohio	1822–1885	West Point	Soldier, Statesman
Asa Gray (31)	Paris, N. Y.	1810–1888	Fairfield Academy	Botanist
Alexander Hamilton (48)	Charles Town, Nevis, W. I.	1757–1804	Columbia	Statesman
Nathaniel Hawthorne (18)	Salem, Mass.	1804–1864	Bowdoin College	Poet, Essayist
Joseph Henry (53)	Albany, N. Y.	1797–1878	Albany Academy	Scientist
Patrick Henry (61)	Hanover Co., Va.	1736–1799	Common Schools	Lawyer
Oliver Wendell Holmes (43)	Cambridge, Mass.	1809–1894	Harvard	Poet, Essayist
Mark Hopkins (49)	Stockbridge, Mass.	1802–1887	Williams College	Educator
Elias Howe (52)	Spencer, Mass.	1819–1867	Elementary	Inventor
Washington Irving (11)	New York, N. Y.	1783–1859	Academic and Legal	Novelist, Diplomat
Andrew Jackson (40)	Waxhaw Settlement, N. C.	1767–1845	Elementary	Soldier, Statesman
Thomas Jefferson (7)	Shadwell, Va.	1743–1826	William and Mary College	Statesman
John Paul Jones (65)	Kirkcudbrightshire, Scotland	1747–1792	Elementary and Naval	Naval Officer
James Kent (25)	Philippi, N. Y.	1763–1847	Yale	Lawyer, Jurist
Robert Edward Lee (21)	Stratford Co., Va.	1807–1870	West Point	Soldier
Abraham Lincoln (2)	Hardin Co., Ky.	1809–1865	Self-educated	Statesman
Henry Wadsworth Longfellow (10)	Portland, Me.	1807–1882	Bowdoin College	Poet
James Russell Lowell (33)	Cambridge, Mass.	1819–1891	Harvard	Poet, Diplomat
Mary Lyon (23)	Buckland, Mass.	1797–1849	Byfield Academy	Educator
James Madison (36)	Port Conway, Va.	1751–1836	Princeton	Statesman
Horace Mann (22)	Franklin, Mass.	1796–1859	Brown University	Educator
John Marshall (6)	Fauquier Co., Va.	1755–1835	William and Mary College	Jurist
Matthew Fontaine Maury (68)	Spotsylvania Co., Va.	1806–1873	Harpeth Academy	Naval Officer, Scientist
Maria Mitchell (42)	Nantucket, Mass.	1818–1889	Privately	Astronomer
James Monroe (67)	Westmoreland Co., Va.	1758–1831	William and Mary College	Statesman
Samuel Finley Breese Morse (13)	Charlestown, Mass.	1791–1872	Yale	Inventor, Artist
William Thomas Green Morton (60)	Charlton, Mass.	1819–1868	Harvard Medical School	Physician
John Lothrop Motley (41)	Dorchester, Mass.	1814–1877	Harvard	Historian, Diplomat
Simon Newcomb (71)	Wallace, N. S.	1835–1909	Harvard	Astronomer
Alice Freeman Palmer (63)	Colesville, N. Y.	1855–1902	University of Michigan	Educator
Francis Parkman (50)	Boston, Mass.	1823–1893	Harvard	Historian
George Peabody (17)	Danvers, Mass.	1795–1869	Self-educated	Merchant, Philanthropist
William Penn (70)	London, England	1644–1718	Oxford	Quaker leader
Edgar Allan Poe (44)	Boston, Mass.	1809–1849	West Point, Univ. of Va.	Poet, Short Story Writer
Augustus Saint-Gaudens (62)	Dublin, Ireland	1848–1907	Beaux Arts	Sculptor
William Tecumseh Sherman (34)	Lancaster, Ohio	1820–1891	West Point	Soldier
Joseph Story (27)	Marblehead, Mass.	1779–1845	Harvard	Jurist, Law Writer
Harriet Beecher Stowe (16)	Litchfield, Conn.	1811–1896	Litchfield Academy	Novelist
Gilbert Charles Stuart (30)	Narragansett, R. I.	1755–1828	London, with West	Portrait Painter
George Washington (1)	Westmoreland Co., Va.	1732–1799	Academic	Soldier, Statesman
Daniel Webster (3)	Salisbury, N. H.	1782–1852	Dartmouth College	Orator, Statesman
James Abbott McNeill Whistler (66)	Lowell, Mass.	1834–1903	Privately and Imperial Art Academy, Leningrad	Painter, Etcher
Walt Whitman (69)	Westhills, L. I., N. Y.	1819–1892	Public Schools	Poet
Eli Whitney (20)	Westboro, Mass.	1765–1825	Yale	Inventor
John Greenleaf Whittier (37)	Haverhill, Mass.	1807–1892	Haverhill Academy	Poet
Emma Willard (47)	Berlin, Conn.	1787–1870	Hartford Academy	Educator
Frances Elizabeth Willard (56)	Churchville, N. Y.	1839–1898	Northwestern Female College	Temperance Reformer
Roger Williams (58)	London, England	1604–1684	Cambridge University, Eng.	Religious Reformer

word *hobnob,* to associate familiarly and informally.

HOBSON'S CHOICE

Thomas Hobson, the keeper of a livery stable in Cambridge in the early 17th century, insisted that his customers, when they hired a horse, must take the one nearest to the door. It was thus that the phrase *Hobson's choice* came to mean no choice at all. Milton wrote two epitaphs on Hobson, who left valuable bequests to Cambridge.

HOYLE, ACCORDING TO

This expression, meaning "according to strict rules," is applied today not alone, as it was at first, to cards but to any field of endeavor. Edmond Hoyle, an Englishman (1672–1769), became the highest authority on whist by systematizing the rules of that game before Cavendish in 1862 introduced the modernized form of play.

JAMBOREE

This word of uncertain origin was first used of a high hand in the game of euchre that scored 16 points. Then it was applied to any noisy merrymaking—probably because there was usually excitement when a jamboree was scored in euchre. Now jamboree is the official name for the international rally of the Boy Scouts that is held every 4 years or for annual national rallies.

JOHN BULL

A collective nickname for the English people, commonly used since Dr. John Arbuthnot's satire, *The History of John Bull.*

JOHN DOE AND RICHARD ROE

Fictitious names given by English law previous to 1852 to the plaintiff and defendant, respectively, in an ejection action. In America these names are applied to anonymous or unknown characters in law cases. The John Doe warrant was a general writ with no specified name of person whose premises were to be searched; and the use of such warrants was bitterly resented by the American colonists just before the Revolution.

LEAP YEAR

The present arrangement for leap year was devised on the adoption in 1582 of the Gregorian or New Style calendar. This is a modification of the Julian calendar (46 B.C.), which added a day to the 28 days of February every fourth year, so as to compensate for the additional 24 hours over the 365 days ordinarily allotted to a year. This was on the basis of 365¼ days, but in reality the solar year is less than 365 days and 6 hours —only 365 days 5 hours 48 minutes and 46 seconds. Between 325 (when the Council of Nicaea decided when Easter should be observed) and 1582 10 complete days were unaccounted for. Pope Gregory XIII accordingly decreed that these days should be deducted from the calendar by calling October 5, 1582, October 15. To prevent a repetition of this error it was ordained that of the century years only every 400th year should be counted a leap year. Thus the years 1700 and 1800 were not leap years, but 2000 and 2400 will be.

LIBERTY BELL

The Liberty Bell was cast in London by order of the Pennsylvania Assembly for use in its State House. The bell reached Philadelphia in August, 1752. It cracked without any apparent reason when rung to test the sound, and it was necessary to have it recast. This was done by Philadelphia workmen. Around it were inscribed the words: "Proclaim liberty throughout all the land unto all the inhabitants thereof (Lev. 25:10)." In June 1753 the bell was again hung in the belfry of the State House. On July 4, 1776, when the Continental Congress declared the colonies independent of Great Britain, the bell was rung for 2 hours, so the story goes, by the old bellman, who was so filled with enthusiasm and excitement that he could not stop. It was taken down and hidden when the British threatened Philadelphia in 1777 and was in Allentown during the British occupation of the city. It was returned to the State House in 1781. A few years afterwards, in 1835, the bell cracked while it was being tolled for Chief Justice John Marshall, and an attempt to restore its tone by sawing the crack wider was unsuccessful. Since 1854 the bell has been exhibited in the rotunda of the State House (Independence Hall), Philadelphia.

LITTLE CHURCH AROUND THE CORNER

This is the popular name for the Church of the Transfiguration, located at 1 East 29th Street, in the heart of the business section of New York city. In 1870 the famous actor Joseph Jefferson, in his effort to arrange for the funeral of a brother actor George Holland, was advised to go to "the little church around the corner" where the funeral of an actor could be held. Ever since, members of the stage profession have shown marked affection for this church, and the headquarters of the Episcopal Actors' Guild is now located there in the Parish House.

LOVING CUP

This was originally a large ornamental drinking vessel with two or more large handles. Loving cups are now used as trophies, being presented to winners of athletic contests.

LYNCH LAW

Lynch law is summary punishment, especially death, without the form of law. It is frequently mob law or, as in the case of the vigilance committees of the old West, the mode of ridding an outraged community of its incorrigible criminals. The phrase was originally *Lynch's law,* from the name of a native of Campbell Co., Va., Colonel Charles Lynch (1736–96), who, without any legal authority, administered summary punishment to Tories during the Revolutionary War. He was exonerated by the legislature of Virginia. Lynch law has always been a feature of frontier civilizations.

MAN IN THE MOON

One of the most ancient as well as one of the most popular superstitions concerns the man in the moon, a shadowy figure suggested by the dark lines and spots upon the surface of the moon. The legend supposedly originated in the account given in the Book of Numbers, 15:32–36, of a man stoned to death for gathering sticks on the Sabbath. In one of the drawings representing this character, he appears as a man with a staff over his shoulder, on which he carries his fatal bundle of sticks. He is followed by a dog. Science tells us that the face of the man in the moon is formed by bright and dark patches. The bright patches are mountainous craters, resembling the volcanic peaks of the earth, and the dark patches are areas of cooled lava. The craters of the moon may be seen distinctly through either powerful magnifying glasses or a small telescope.

MONTHS OF THE YEAR

The word *month* is derived from *mona,* the Anglo-Saxon word for moon, the month lasting from one new moon to the next. A lunar month —*luna* is the Latin word for moon— was 29 days 12 hours and a fraction over 44 minutes long. The solar month that we use is practically one-twelfth the length of time it takes the earth to revolve around the sun. Calendar months are of different lengths, but they total almost one full revolution around the sun in a year, the slight extra time each year being set straight by the extra day in every fourth or leap year.

Various months bear names derived from those of old Roman personages, gods or goddesses; others have names from the Latin. January was so called in honor of the two-faced god Janus, who guarded all gateways, doors and other entrances. One of the god's faces looked toward the past and the other toward the future. A festival called the *Agonalia* was celebrated in Janus's honor on January 9.

February was thus named because on the 15th of that month was held the *Februa* (or Lupercalia), a Roman festival of purification. (The name of the festival is derived from the Latin verb *februare,* meaning to purify.) After the priests had sacrificed a goat, they took a piece of its skin and struck the women who had attended the ceremony on the hands with it to insure fertility.

March was named for Mars, the god of war. It was the first month of the Roman year until the adoption of the Julian calendar (named for Julius Caesar) in 46 B.C. As late as the middle part of the 18th century it was the first month of the legal year in Great Britain and the colonies belonging to that country.

April derived its name from the Latin verb *aperire,* meaning to open, in allusion to the blossoming of trees and shrubs during this spring month.

May is named in honor of Maia, the goddess of growth. Since the Romans observed in this month the festival of the unhappy dead, they considered it an unlucky month in which to marry, and the superstition still persists.

June is named in honor of Juno, the wife of Jupiter. The Romans regarded her as the protective deity of women. They accordingly believed that June was an especially propitious month for marriage.

July was named for Julius Caesar by order of Mark Antony immediately after his assassination. Formerly known as *Quintilis* (or the fifth month of the Roman calendar), it was the month in which Caesar was born.

August bears the name of Augustus Caesar, who decided that since July was named for his uncle, he should call the following month (then *Sextilis*) for himself. During August the emperor celebrated his three greatest triumphs.

September, the seventh month of the old Roman calendar, has retained its original name. The three remaining months of the year have kept their old Roman numbering names: *October* derived from *octo*, eight; *November*, from *novem*, nine; and *December*, from *decem*, ten.

MOONSHINERS

The term arose in the mountains of North Carolina, Tennessee and Kentucky, where the practice of making illicitly distilled whisky was carried on chiefly at night in order to avoid detection and the payment of the government excise tax. Those who ran these stills were called *Moonshiners*, and the word has also been used of smugglers who worked at night by the light of the moon.

The moon is connected with many stories of illegal distilling. Natives of Wilshire, England, are often called *moonrakers*, and the story is that revenue officers found rustics there fishing with rakes in a pond. They explained that they wanted to rake the moon out of the water; but really they were after hidden casks of liquor.

MORGANATIC MARRIAGE

A morganatic or left-handed marriage is a legal marriage between a man of superior and a woman of inferior station, in which it is stipulated that the woman and her children shall neither enjoy the rank nor inherit the possessions of her husband. Such marriages are not uncommon in the families of sovereign princes and of the higher nobility in certain European countries; but they are restricted to personages of these classes.

The name comes from the German word *Morgen*, morning, because in these marriages the bride received the *morning gift*, a money settlement made the morning after the wedding, but did not receive the *Mund* or privilege of protection for her property that she would have in regular marriage.

Morganatic marriages were popularly called *left-handed* because the groom gave his left hand in troth instead of his right, which would have pledged all the rights of matrimony.

MOUNTAINEERING

Since the middle of the last century mountain climbing has become a popular sport, although its essential function is still exploration. Since the formation of the London Alpine Club in 1857 systematic assaults have been made on the mountain peaks of the world, particularly those of Europe, British Asia and North America. Mt. Kamet in India, 25,431 feet high, was ascended in 1931 by the British Himalaya Expedition, headed by Frank B. Smythe, and is the highest peak that has yet been conquered. Numerous attempts have been made to scale Mt. Everest (29,141 feet), but none has been successful.

Alpine climbing is usually a combination of two skills—climbing over snow and over rock. The mountains of the United States, which usually have an easy side, do not present any special difficulties for expert climbers, but they do provide fine sport for the amateur. In Alaska and northern Canada, where mountain climbing becomes a part of arctic exploration, weeks and sometimes months of preparation are necessary. The summit of Mt. McKinley, highest peak in North America, was reached in 1913 after three months of climbing by Dr. Hudson Stuck and Harry P. Karstens. In 1925 a party of Canadians and Americans headed by A. H. MacCarthy ascended Mt. Logan (19,850 feet). The preparations for this trip took several months.

MOURNING

Mourning garb seems to have originated in a desire for disguise as if to avoid evil spirits—or in an effort to warn others that the near of kin to the dead person were unclean and to be avoided.

Although black is the conventional garb of mourning in the United States and most of the Western nations, various colors are used in other lands. Aside from America the following listing gives the mourning garb for a number of countries and peoples.

Black. The color of mourning in Europe; also in ancient Greece and Rome.

Black and white striped. Expressive of sorrow and hope combined; worn by the South Sea Islanders.

Grayish brown. The color of the earth; worn in Ethiopia.

Pale brown. The color of withered leaves; worn in Persia.

Sky blue. Expressive of hope for the deceased; worn in Syria, Cappadocia and Armenia.

Deep blue. The mourning of Bokhara, in central Asia: worn also by the Romans under the Republic.

Purple and violet. Denotes royalty; worn for cardinals and the kings of France.

Violet. Used in Turkey.

White. Mourning of China. Until 1498 it was the mourning of Spain.

Yellow. Mourning worn in Egypt and Burma. Yellow was the mourning color of the queens of France, and Anne Boleyn wore yellow as mourning for Catherine of Aragon, Henry VIII's first wife.

African Negroes use white clay or even a red paste as a sign of mourning.

NATIONAL LEAGUE OF WOMEN VOTERS

The idea of a League of Women Voters was suggested by Mrs. Carrie Chapman Catt at the 1919 convention of the National American Woman Suffrage Association in St. Louis. Formal organization of the National League of Women Voters took place in Chicago in conjunction with the Victory Convention of the National American Woman Suffrage Association in 1920. Mrs. Maud Wood Park was the first president.

The National League of Women Voters exists for the political education of women through active participation in government. It is based on the idea that a continuing political education is necessary to the success of a democratic form of government. Membership is open to women of all political beliefs, but the organization is strictly nonpartisan.

NEWBERY PRIZE

The Newbery Prize is a medal awarded annually to the best book for children published during the year in the United States. The medal is named in memory of John Newbery (1713–67), a bookseller in St. Paul's Churchyard, London. He encouraged authors to write for young readers, issued small-sized juveniles and was a friend and patron of Oliver Goldsmith, who is said to have written *Goody Two-shoes* at the instance of Newbery. The award is determined by a special committee of the Children's Librarians Section of the American Library Association, and the medal is the gift of the publisher of *Publishers' Weekly*. The winners of the award since its establishment are:

NEWBERY PRIZE WINNERS

YEAR	AUTHOR	BOOK TITLE
1921	Hendrik Van Loon	The Story of Mankind
1922	Hugh Lofting	Voyages of Mr. Doolittle
1923	Charles B. Hawes	Dark Frigate
1924	Charles J. Finger	Tales From Silver Lands
1925	Arthur B. Chrisman	Shen of the Sea
1926	Will James	Smoky
1927	Dhan Gopal Mukerji	Gay Neck
1928	Erik Kelly	The Trumpeter of Krakow
1929	Rachel Field	Hitty: Her First Hundred Years
1930	Elizabeth Jane Coatsworth	The Cat Who Went to Heaven
1931	Laura Adams Armer	Waterless Mountain
1932	Elizabeth Foreman Lewis	Young Fu of the Upper Yangtze
1933	Cornelia Meigs	Invincible Louise
1934	Monica Shannon	Dobry
1935	Carol Ryrie Brink	Caddie Woodlawn
1936	Ruth Sawyer	Roller Skates
1937	Kate Seredy	The White Stag

NOBEL PRIZE

The Swedish manufacturer and scientist, Alfred Bernhard Nobel, inventor of dynamite, died in 1896 and left a fund of $9,000,000, the interest of which should annually be distributed to those who had contributed most to the benefit of mankind during the year preceding in the fields of chemistry, physics, medicine or physiology, literature and the promotion of international peace. The awards are made by designated committees: the peace award, by a group selected by the Parliament of Norway; physiology or medicine by the Caroline Institute of Stockholm, Sweden; physics and chemistry by the Swedish Royal Academy of Sciences; literature by the Swedish Academy. The value of each prize varies according to the income but is around $45,000. Both men and women from every nation of the globe are eligible for the Nobel Prize. When the committee decides that two or more persons have equally contributed to the welfare and progress of the world, the prize is divided. The first prizes were awarded in 1902, and, except during the World War, most of the prizes have been awarded each year.

NOBEL PRIZE WINNERS

YEAR	PHYSICS	CHEMISTRY	MEDICINE	LITERATURE	PEACE
1901	W. K. Röntgen (G.)	J.H. van't Hoff (D.)	E. A. von Behring (G.)	R. F. A. Sully-Prudhomme (F.)	H. Dunant (Swi.) Fr. Passy (F.)
1902	H. A. Lorentz (D.) P. Zeeman (D.)	E. Fischer (G.)	Sir Ronald Ross (E.)	Th. Mommsen (G.)	E. Ducommun (Swi.) A. Gobat (Swi.)
1903	H. A. Becquerel (F.) P. and Marie Curie (F.)	S. A. Arrhenius (Swe.)	N. R. Finsen (Dan.)	B. Bjornson (N.)	Sir W. R. Cremer (E.)
1904	Lord Rayleigh (E.)	Sir Wm. Ramsay (E.)	I. P. Pavlov (R.)	F. Mistral (F.) J. Echegaray (Sp.)	Institute of International Law
1905	Ph. Lenard (G.)	A. von Baeyer (G.)	R. Koch (G.)	H. Sienkiewicz (P.)	Baroness von Suttner (Aus.)
1906	J. J. Thomson (E.)	H. Moissan (F.)	C. Golgi (I.) S. Ramony Cajal (Sp.)	G. Carducci (I.)	Th. Roosevelt (A).
1907	A. A. Michelson (A.)	E. Buchner (G.)	C. L. A. Laveran (F.)	R. Kipling (E.)	E. T. Moneta (I.) L. Renault (F.)
1908	G. Lippmann (F.)	E. Rutherford (E.)	P. Ehrlich (G.) E. Metchnikoff (R.)	R. Eucken (G.)	K. P. Arnoldson (Swe.) F. Bajer (Dan.)
1909	G. Marconi (I.) F. Braun (G.)	W. Ostwald (G.)	Th. Kocher (Swi.)	Selma Lagerlof (Swe.)	A. M. F. Beernaert (B.) Baron de Constant (F.)
1910	J. D. van der Waals (D.)	O. Wallach (G.)	A. Kossel (G.)	P. Heyse (G.)	Int'l. Peace Bureau (Swi.)
1911	W. Wien (G.)	Marie Curie (F.)	A. Gullstrand (Swe.)	M. Maeterlinck (B.)	T. M. C. Asser (D.) A. H. Fried (Aus.)
1912	Gustaf Dalén (Swe.)	V. Grignard (F.) P. Sabatier (F.)	Alexis Carrel (A.)	G. Hauptmann (G.)	Elihu Root (A.)
1913	H. K. Onnes (D.)	A. Werner (Swi.)	C. Richet (F.)	R. Tagore (Beng.)	H. LaFontaine (B.)
1914	M. von Laue (G.)	T. W. Richards (A.)	R. Barany (Aus.)	No award	No award
1915	W. H. Bragg (E.) W. L. Bragg (E.)	R. Willstatter (G.)	No award	Romain Rolland (F.)	No award
1916	No award	No award	No award	Verner Heidenstam (Swe.)	No award
1917	Charles G. Barkla (E.)	No award	No award	K. Gjellerup (Dan.) H. Pontoppidan (Dan.)	International Red Cross of Geneva
1918	M. Planck (G.)	F. Haber (G.)	No award	No award	No award
1919	J. Stark (G.)	No award	Jules Bordet (B.)	Carl Spitteler (Swi.)	W'drow Wilson (A.)
1920	C. E. Guillaume (Swi.)	Walther Nernst (G.)	A. Krogh (Dan.)	Knut Hamsun (N.)	L. Bourgeois (F.)
1921	Albert Einstein (G.)	Fred'k Soddy (E.)	No award	Anatole France (F.)	K. H. Branting (Swe.) Chr. L. Lange (N.)
1922	Niels Bohr (Dan.)	F. W. Aston (E.)	A. V. Hill (E.) O. Meyerhoff (G.)	J. Benavente (Sp.)	F. Nansen (N.)
1923	R. A. Millikan (A.)	Fritz Pregl (Aus.)	F. G. Banting (Can.) J. J. R. McLeod (Can.)	W. B. Yeats (Irish)	No award
1924	K. M. G. Siegbahn (Swe.)	No award	W. Einthoven (D.)	Vladislav Reymont (P.)	No award
1925	Jas. Franck (G.) Gust. Hertz (G.)	Richard Zsigmondy (G.)	No award	G. B. Shaw (E.)	C. G. Dawes (A.) A. Chamberlain (E.)
1926	Jean B. Perrin (F.)	T. Svedberg (Swe.)	Johan Fibiger (Dan.)	Grazia Deledda (I.)	Aristide Briand (F.) G. Stresemann (G.)
1927	Arth. Compton (A.) C. T. R. Wilson (E.)	Heinrich Wieland (G.)	J. Wagner-Jauregg (Aus.)	Henri Bergson (F.)	Ludwig Quidde (G.) Ferd. Buisson (F.)
1928	O. W. Richardson (E.)	Adolf Windaus (G.)	Ch. Nicolle (F.)	Sigrid Undset (N.)	No award
1929	Duc de Broglie (F.)	A. Harden (E.) H. Von Euler-Chelpin (Swe.)	F. G. Hopkins (E.) C. Eijkmann (G.)	Thomas Mann (G.)	Frank B. Kellogg (A.)
1930	Sir C. V. Raman (In.)	Hans Fischer (G.)	Karl Landsteiner (A.)	Sinclair Lewis (A.)	Nathan Soederblom (Swe.)
1931	No award	Carl Bosch (G.) and Fred. Bergius (G.)	Otto Warburg (G.)	Erik A. Karlfeldt (Swe.)	Dr. N. M. Butler (A.) Jane Addams (A.)
1932	W. Heisenberg (G.)	Irving Langmuir (A.)	C. Sherington (E.) E. D. Adrian (E.)	John Galsworthy (E.)	No award
1933	P. A. M. Dirac (E.) E. Schroedinger (E.)	No award	T. H. Morgan (A.)	Ivan Bunin (R.)	Norman Angell (E.)
1934	No award	H. C. Urey (A.)	G. R. Minot (A.), W. F. Murphy (A.), G. H. Whipple (A.)	Luigi Pirandello (I.)	Arthur Henderson (E.)
1935	J. Chadwick (E.)	Fred & Irene C. Joliot (F.)	Hans Spemann (G.)	No award	C. von Ossietzky (G.)
1936	C. D. Anderson (A.) V. G. Hess (Aus.)	P. J. W. Debye (Dan.)	H. H. Dale (E.) Otto Loewi (Aus.)	Eugene O'Neill (A.)	C. S. Lamas (Arg.)
1937	C. J. Davisson (A.) G. P. Thomson (E.)	W. N. Haworth (E.) Paul Karrer (Swi.)	A. von Szent-Gyongyi (Hung.)	R. M. du Gard (F.)	Viscount Cecil (E.)
1938	E. Fermi (I.)	No Award	No Award	Pearl S. Buck (A.)	Nansen Bureau in Geneva

A., American; Arg., Argentina; Aus., Austrian; B., Belgian; Beng., Bengalese; Can., Canadian; D., Dutch; Dan., Danish; E., English; F., French; G., German; Hung., Hungarian; I., Italian; In., British Indian; N., Norwegian; P., Polish; R., Russian; Sp., Spanish; Swe., Swedish; Swi., Swiss.

OLYMPIC GAMES

When the Roman Emperor Theodosius put an end to the ancient Olympic games in 396 A.D., he stopped a custom that had endured over 1,000 years. In fact the Olympic games are said to have originated in Greece in 776 B.C. and they were held every fourth year in honor of the great god Zeus. The word *olympiad* came to mean a four-year period. The games were held on the Plain of Olympia in Elis and nearby stood the great temple erected to Zeus and the ivory-and-gold statue of the god that was counted one of the Seven Wonders of the Ancient World.

All free-born honorable citizens from the Greek states were invited to take part and, after the Roman domination began, those from other countries were welcomed. Hostilities were suspended during the celebration. The early contests were foot races, but later came the pentathlon, a fivefold contest in which the participants took part in five events, these usually being leaping, running, wrestling, throwing the discus and hurling the javelin. Later still, other events were scheduled. The prizes were simple olive wreaths made from branches taken from the sacred grove back of the statue of Zeus.

After 15 centuries these games were revived at Athens in 1896, and all the nations of the earth were invited to send chosen representatives. Only amateurs were permitted to contend and the games included most forms of athletics. The modern Olympic games, like the ancient ones, are held every four years, but take place in different countries. Only during the World War were they suspended. In 1900 they were held in Paris; 1904, in St. Louis; 1908, in London; 1912, in Stockholm; 1920, in Antwerp; 1924, in Paris; 1928, in Amsterdam; 1932, in Los Angeles; and 1936, in Berlin.

PASSION PLAY

A play that portrayed the sufferings and death of Christ was made a part of the Good Friday ritual of the Catholic Church and developed into the passion plays of the 13th century. During the 15th century these plays developed into great pageants and were given in many towns in Europe, often lasting a week or more. The passion play is still given in some villages in the Tirol and southern Bavaria, but the best-known one in modern times is that at Oberammergau, a small town 45 miles southwest of Munich, in the valley of the Ammer. To this little mountain village every 10th year go crowds of people to see the passion play given today as it has been for more than 3 centuries. In the year 1633 the district was plague-ridden and Oberammergau lost 84 of its 600 inhabitants. Then the members of the council went to the village church and there made a solemn vow to hold the passion play every 10 years from then on. It is recorded that not another inhabitant died from the plague thereafter.

Because of this vow the play was performed the following year, 1634. After the performance in 1674 the people decided to give it again in 1680 and keep it on the decennial. The only exceptions have been the years 1811, 1815, 1871, 1922 and 1934, the year of the tercentenary. During these centuries the community and the church shared the heavy expenses of giving the play, and the people, some 2,400 in all, gave their services. Even today, with great throngs of people from all over the Christian world gathering to see this medieval mystery drama of the Passion of Christ, the expenses are heavy. When there is a surplus, the actors receive one-fourth, and the remainder is divided between local charities, civic improvements and the church. The Passion Play Theatre, with semicovered stage, accommodates 5,000 spectators at each performance.

Tradition forbids married women to take part and only men and maidens of unquestioned integrity are permitted in the play, so that it is considered an honor to take part. This group of villagers who are wood carvers, shopkeepers, housekeepers, butchers and bakers have built up a tradition and each 10th year a play is given by them that is the essence of

Courtesy German Railroads Information Office

The Last Supper—A Scene from the Passion Play

Jesus is shown with His disciples on the night of the betrayal. The role of the Saviour is portrayed by Alois Lang (no relation to Anton Lang)

beauty, reverence and simple faith. A number of the actors have taken their parts until too old for them. Thus Anton Lang, the Christus of earlier years, became the speaker of the prologue and one of the disciples in 1930. He died in 1938. Many a young girl has delayed her marriage until after the play in order to take her part therein. The men players must not cut their hair or trim their beards for a year before the performance. The parts are assigned by secret ballot, and before the voting the committee goes to the Pilgrimage Church at Wies to prepare themselves for the decision.

PATRON SAINTS

During the Middle Ages those saints that were supposed to watch over and protect the interests of particular persons, places and trades were known as Patron Saints. The following is a list of some of the more prominent of these:

Place	*Patron Saint*
Aberdeen	St. Nicholas
Antwerp	St. Norbert
Austria	SS. Colman and Leopold
Bavaria	St. Henry
Brussels	St. Gudule
Cologne	St. Ursula
Edinburgh	St. Giles
England	SS. George and Mary
Flanders	St. Peter
France	SS. Mary, Michael and Denis
Genoa	St. George
Germany	SS. Martin, Boniface and George
The Netherlands	St. Mary
Ireland	St. Patrick and St. Bridget
Italy	St. Anthony
Lisbon	St. Vincent
Milan	St. Ambrose
Naples	St. Januarius
Norway	St. Olaf
Paris	St. Genevieve
Poland	St. Ladislas
Portugal	SS. Sebastian, James and George
Prussia	SS. Mary, Adalbert and Andrew
Rome	SS. Peter and Paul
Scotland	St. Andrew
Spain	SS. James the Great and Michael
Venice	SS. Mark, Justina and Theodore
Vienna	St. Stephen
Wales	St. David

PAWNBROKER'S SIGN

It is generally held that the three golden balls used by pawnbrokers as a sign were adopted from the armorial bearings of the Medici family of Italy by the Lombard merchants, among whom were several representatives of that family. This sign was used in London in very early times by some of those merchants who had emigrated from Italy and established the first money-lending establishments in England. The three golden circles on the Medici coat of arms seem to have represented golden bezants, coins received by the crusaders as payment for their services.

PHYSIOLOGICAL FACTS

Coughing.—We cough because the respiratory organs are excited by the presence of some body foreign or unnatural to them. A cough is an effort on the part of the air tubes to free themselves from some irritation. So important are the organs of breathing to the welfare of the body that the muscles of the chest, back and abdomen unite in the endeavor to get rid of the exciting substance.

Freckles.—The action of the sun's rays on certain kinds of skin causes a yellowish brown pigment to speckle the skin instead of spreading evenly, as in tanning. Persons of fair complexion and hair generally are more subject to freckles. Other people, because of a different kind of skin, do not freckle, regardless of exposure to the sun. Though some freckles are permanent, in most cases cold weather causes them to disappear.

Hair.—The number of hairs on an adult's head averages from 129,000 to 150,000. A healthy scalp has a certain amount of natural oil that lubricates.

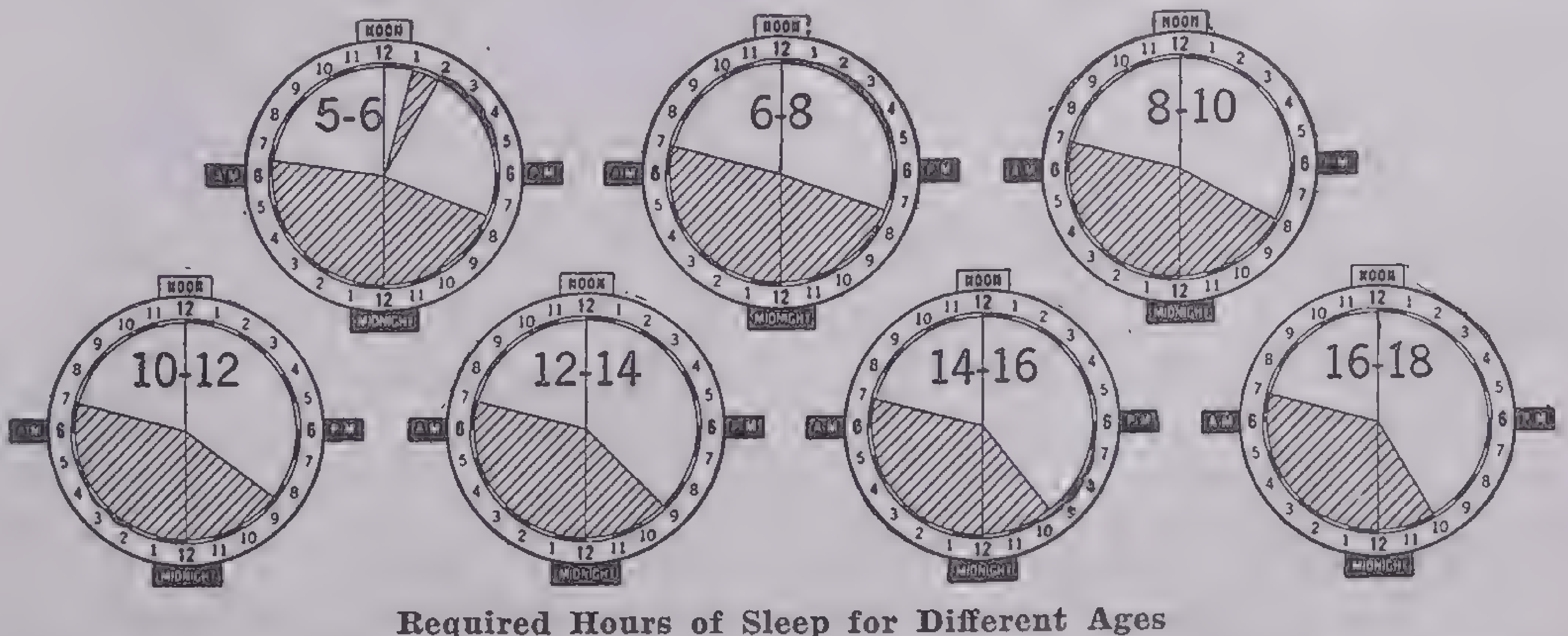
Hiccoughs are caused by spasmodic twitching of the diaphragm, the muscular wall that divides the chest from the abdomen. They generally arise from sympathy with the stomach; and it is highly probable that the muscular twitches and jerks are so many efforts on the part of the diaphragm to assist the stomach to get rid of some undigested food.

Laughter.—Laughing is caused by influences the very opposite of those that produce sighing or tears. The nervous system is highly excited by some external cause. The impression is so intense, and the mind so fixed upon it that the respiratory process is irregular and uncontrolled. Persons excited to a fit of laughter generally hold their breath until they can hold it no longer, and then suddenly there is a quick expiration causing eccentric sounds, the mind being too intently fixed upon the cause of excitement either to moderate the sounds or to control the breathing.

Sighing.—The action of sighing arises from very similar causes to those of yawning; but in sighing, the nervous depression is usually caused by sadness; while in yawning, it is the result of fatigue. In sighing, the effect is generally caused by an expiration —in yawning by an inspiration. The mind, wearied and weakened by sorrow, omits for a few seconds to continue the respiratory process; and then suddenly there comes an involuntary expiration of the breath, causing a faint sound as it passes the organs of the voice.

Sleep is that state of rest in which the relation of the brain to some parts of the body is temporarily suspended.

Certain bodily functions are not suspended by sleep, such as those of the heart, the lungs, the organs of circulation and those parts of the nervous system that direct their operations. But during sleep it seems as if the relations of those parts under the control of the will, for instance, those nerves which move the arms, the legs, the eyes, the tongue, were all at once



Required Hours of Sleep for Different Ages

The large numbers indicate the ages. The shaded areas show the hours of sleep necessary to give the body adequate rest relaxed, just as the strings of an instrument are relaxed by the turning of a key or throwing down the bridge over which they were stretched.

What is meant by the suspension of the relation of the brain to some parts of the body, may be thus explained. Notice a man when he sits dozing in a chair; at first his head is held up, the brain controlling the muscles of the neck and keeping the head erect; but drowsiness comes on, the brain begins to withdraw its influence, and, the muscles of the neck becoming as it were "unstrung," the head drops upon the breast. If the sleep is unsound and disturbed by surrounding noises, the brain is frequently excited to return its influence to the muscles and draw up the head of the sleeper. He gives a sudden start, every muscle is tightened in an instant, up goes the head, the eyes open, the ears listen, until a feeling of security and composure returns when sleep comes again, the nervous connection is again withdrawn, and then down drops the head as before.

Sneezing.—We sneeze because particles of matter enter the nostrils and excite the nerves of feeling and of smell. In sneezing, as in coughing, the effort is to free the parts affected from the intrusion of something of an irritating nature. And in this case, as in the former one, there is a very general sympathy of other organs with the part affected, and an energetic effort to get rid of the evil.

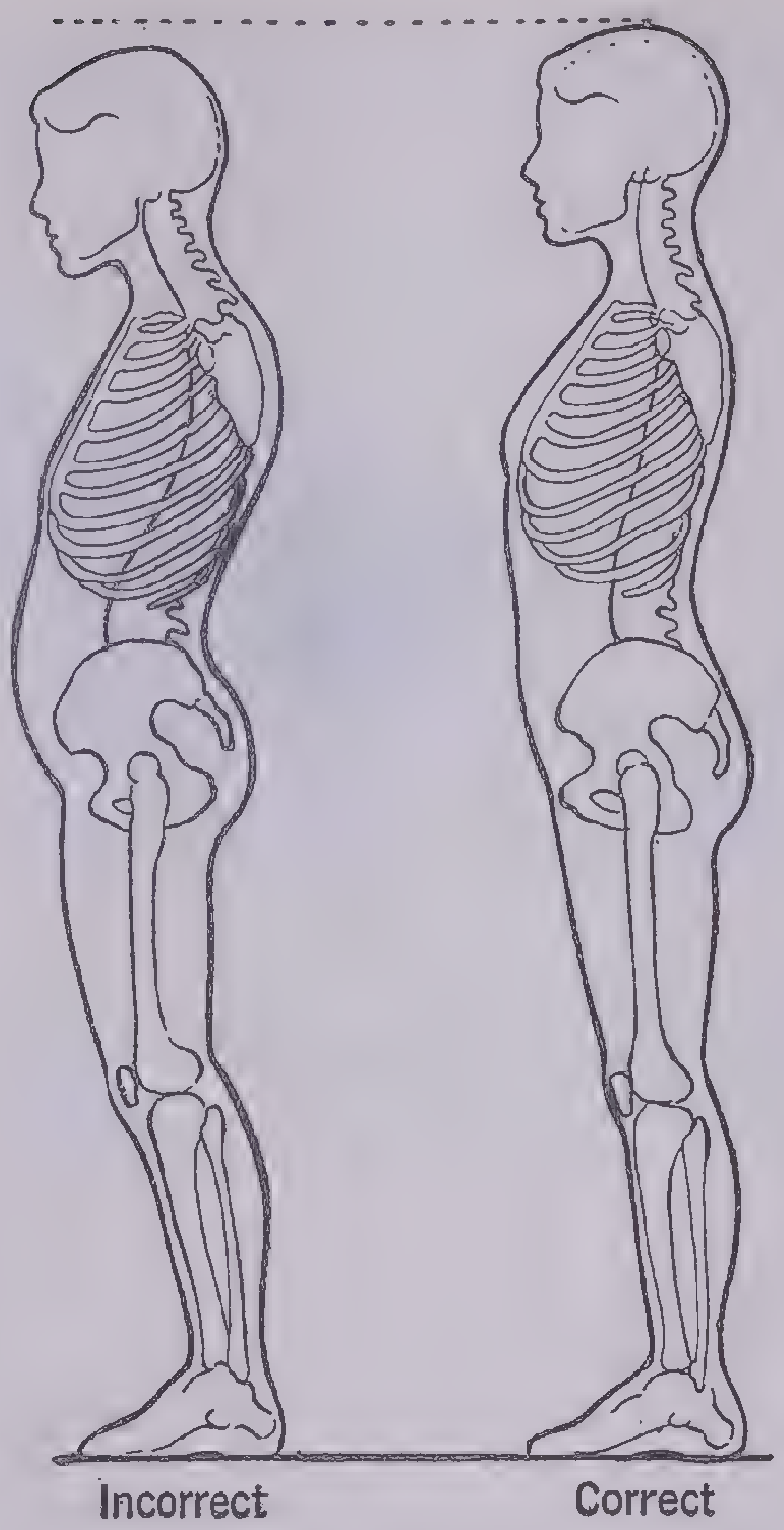
Snoring is caused by air drawn through the passages that lead from the mouth through the nostrils and that in our waking moments are capable of certain muscular modifications to adapt them to quiet breathing. In sleep the nervous control over the uvula and soft palate is withdrawn, and they react to respiration with noisy vibration.

Tears.—Tears are drops of the saline fluid secreted by the lachrymal glands to moisten the parts of the eye; they overflow from the eye during emotional stress of pain or gladness.

Yawning.—When we are bored, sleepy, tired or not getting enough fresh air, we do not breathe as deeply as we should, and our blood does not receive enough oxygen from the air. To counteract this we open the mouth wide and take several very deep breaths.

POSTURE

Results of college examinations and draft examinations during the World War showed that about 80 per cent. of Americans in early adult life used their bodies poorly—in other words, had poor posture. As it has been shown that improvement in body mechanics among children almost always improves health and efficiency, the value of good posture habits in early life cannot be questioned. Habits of good posture develop very slowly. Posture tends to change from babyhood into childhood, and a foundation for a later good posture is laid in childhood by an all-round development of the muscles of the body. Good posture is realized through active play and through sufficient body-building foods. Defective vision, adenoids and bad tonsils tend to have an unfavorable effect on a child's posture.



Standing Posture

To realize the difference between incorrect and correct posture, look at the illustration. In incorrect posture, the child is slumped, with his weight on his ankles and heels. He holds his head forward and his chin down. His chest is flattened, and his abdomen relaxed. The curves of his back are too great, and his knees are bent. In correct posture, the child stands to his full height, with his weight on the balls of his feet. He holds his head high and his chin in. His abdomen is drawn in, the curves of his back are slight and his knees are straight.

POTTER'S FIELD

Today the potter's field is the ground where unidentified persons and the bodies of unclaimed paupers are buried. The term comes from the New Testament story of the betrayal of Jesus by Judas Iscariot for 30 pieces of silver paid him by the chief priests and elders. Judas repented, brought back the money and committed suicide. Because the money was the "price of blood," it could not be put in the treasury and the chief priest "bought with it the potter's field, to bury strangers in. Wherefore that field was called, the field of blood unto this day." (Matthew 27:7–8). The Aramaic word *Aceldama* for field of blood is given in Acts 1:19. The potter's field seems to have been a cave where a potter carried on his business.

PRESS ASSOCIATIONS

The beginnings of a news agency that gathered news and sent it out to various subscribing newspapers began about 1830, when several New York newspapers combined to gather shipping news for their common use. There are three types of news-distributing agencies. The Associated Press (1892; reorganized, 1900) is a cooperative service, the members sharing the expenses between them. No newspaper is a member of the Associated Press, some individual on each paper taking the membership. The United Press (1907, merging several earlier organizations) is probably the largest of the news agencies that are on a strictly commercial basis, selling its news to its member newspapers. International News Service and Universal News Service were organized by W. R. Hearst in 1906, but the latter organization is now a feature service not a news service.

The Associated Press and the Canadian Press work in close co-operation and receive foreign reports from such European press agencies as Reuter's in Great Britain and Havas in France, which maintain offices in New York, and also from their own special agents located in large cities all over the world. The news agencies began their great growth when the telegraph became a practical machine, and again a forward thrust was felt when the cable was perfected. Wireless has increased the news-gathering power of the agencies by connecting them with the world's outposts.

There is also the news agency that sends out propaganda of a business or political nature, and this is sent free as a general rule, although some services charge a small fee.

PULITZER PRIZES

Joseph Pulitzer, who was publisher of the New York *World,* donated funds for annual awards to be given for the best publications in certain lines. The prizes range from $500 to $2,000 in amount and are awarded for the best American novel, play, book of poetry, historical work relating to the United States, cartoon, most outstanding example of newspaper reporting, most outstanding editorial and the best biography teaching patriotic and unselfish service. The first awards were made in 1918 for the year 1917, and they have been given annually since then.

RED-LETTER DAYS

As a long-standing custom, church calendars indicate holy days, saint's days and feast days by the use of red letters. So *red-letter day* means one of great joy to be long remembered.

RED TAPE

Official and public documents used to be tied with red tape, and Lord Minto is said to have been the first (1775) to use the phrase *red tape* to signify official formality and delay.

RHODES SCHOLARSHIPS

Rhodes scholarships were founded by the will of Cecil John Rhodes, which provides in perpetuity for the support at Oxford University for a term of 3 years each of about 200 selected scholars from British colonies, the United States and Germany. The scholarships have an annual value of from £300 to £400 each and were given to bring about a more complete unity and fellowship of the English-speaking race.

The German scholarships, of £250 each, were added when the former kaiser made the study of English compulsory in German schools. When the war was declared against Germany, an Act was passed in 1916 transferring the German scholarships to additional British colonies. Awards were suspended completely during the World War.

Those receiving the scholarships are not restricted as to subjects to be studied. They may work for the degree of Bachelor of Science, Bachelor of Literature or Doctor of Philosophy; or if they are not prepared for these, they may enter any of the Oxford Honor Schools.

All those between the ages of 19 and 25 who are unmarried and have had at least 2 years of college training may compete. An applicant may try for the scholarship in his own state or that in which he has received the greater part of his education. Selections are made by the committee in each state appointed for that purpose and based on the candidate's record in school and college according to scholarship, character, interest in outdoor sports, interest in one's fellows and instincts of leadership, which were the points that were outlined in the Rhodes will.

RING WEARING

The custom of adorning one's person with rings dates from remote antiquity. Some primitive peoples wear rings in their noses; both primitive and civilized peoples wear them in or on their ears and on their fingers. Very early a person in authority wore what is known as a *signet ring;* it bore an intaglio design that represented the status of the wearer, who impressed the design upon clay or wax as his signature or seal. A seal ring could be given to an agent as a token of authority: when Pharaoh set Joseph over all the land of Egypt, he "took off his ring from his hand and put it on Joseph's hand" (Gen. 41, 42). The metal used for the ring depended on the rank—those in high authority wore gold; common citizens wore iron. Slaves were not allowed to wear rings of any kind.

There were in classic times in Greece and Rome more elaborate rings than are in vogue today. In royal and patrician circles rings were extravagantly ornate; many were very large and were adorned with a number of precious stones, intaglios, enameling, cameos and the like. One form was hollow, to keep poison always at hand.

The Wedding Ring. Records show that the early Egyptians used rings in making marriage vows. They were also used by the Romans, Hebrews and Anglo-Saxons. Since the days of Imperial Rome, rings have been used as pledges of betrothals throughout the western world. The conventional form is a plain band of gold or platinum, often encircled with small precious stones, usually diamonds. The wedding ring for centuries was a sign that the woman was the possession of the man.

The Ring Finger. The ancient Greeks held that a small nerve runs to the heart from the third finger of the left hand; therefore it was honored with the ring and is designated as the ring finger. In many countries the bride and bridegroom exchange rings during the ceremony.

ROBBING PETER TO PAY PAUL

This expression is traced to the rivalry that existed between the Abbey of St. Peter (better known as *Westminster*) and St. Paul's Cathedral in London. During the 16th century the congregation of St. Peter's had to make up a deficit that the sister cathedral had incurred, but they expressed their indignation in the words: "Why rob St. Peter to pay St. Paul?" On the death of William Pitt the Younger in 1806 the expression was revived. The City of London, in which St. Paul's Cathedral stands, argued that the statesman should be buried in its crypt with Admiral Nelson and other illustrious personages; but Parliament upheld the claim of Westminster Abbey by declaring that, if he were not buried there, St. Peter would once more be robbed to pay St. Paul.

The phrase now means to give one person what is due to another or belongs to another.

ROSE WINDOW

This architectural term is applied to a circular window that is usually of stained glass set in tracery that radiates from the center in the manner of rose petals. The rose window is generally located in the triangular space above the entrance to a church or at either end of the transept. Of Roman origin it first made its appearance in ecclesiastical architecture in the Romanesque churches of the 10th and 11th centuries. The Crusaders returned with a richer conception of this form after seeing its application in the various Mohammedan mosques. Such windows have been among the most prominent embellishments of Gothic churches. Notable examples are in the French cathedrals of Notre Dame de Paris, Chartres, Amiens, Reims and Strasbourg, the cathedral at Lincoln, England, and the Cathedral of St. John the Divine in New York city. The *wheel window* is similar to the rose window, but its mullions radiate like the spokes of a wheel, which is the attribute of St. Catherine of Alexandria—the wheel on which the Emperor Maximinus ordered her to be broken, but which was broken at her touch.

Courtesy C. J. Connick, designer

Central Quatrefoil from the Great Western Rose Window, Cathedral of St. John the Divine, N. Y.

SABBATICAL YEAR

The ancient Israelites were compelled by Hebrew Law (Exodus 23:11) to let their fields lie fallow every 7th year in order to allow the land to enrich itself. The crops were left ungarnered to be turned back later into the ground. Adapting this idea, a number of schools, colleges and universities grant members of their faculties a long vacation with pay, approximately every 7th year, for study, travel and rest, in order that they may enrich their minds and return with fresh and stimulating ideas and renewed energies.

SAFETY RULES[1]

STREET SAFETY RULES

1. Cross only at street corners.
2. Watch and obey the traffic signals.
3. Obey the traffic officer. He is your friend.
4. Obey the school boy patrol. He is helping you.
5. Avoid the three things that cause most accidents to children: darting out into the street, running from behind parked cars, hitching rides.
6. Obey traffic regulations when you are riding a bicycle. Never carry anyone on the handlebars.
7. Face front when you get off a street car. Wait until the street is clear before crossing to the curb.
8. On highways (where there is no sidewalk) walk on the left side of the road, facing traffic.
9. Stop, look and listen at railroad crossings. Obey the signals. Never walk or play along railroad tracks or trestles.

RULES FOR SAFE BICYCLE RIDING

1. Learn to ride in a park or other safe place. Stay off streets until you can ride well.
2. Keep your bicycle adjusted to fit you and in good condition. Check your brake frequently.
3. Keep to the right. In towns stay close to the curb.
4. Obey all traffic rules and regulations. Use hand signals when you are going to stop or turn.
5. Ride without wabbling and avoid sharp turns. Weaving through traffic is dangerous. Avoid fast riding over slippery or rough roads.
6. Never carry a passenger. It is dangerous.
7. Never hold on to a moving vehicle.
8. When you are riding at night, carry a light in front and either a light or re-

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[1] Courtesy of the Education Division of the National Safety Council.

flector in the rear. Light colored clothing also helps motorists see you.

9. Do not try to carry an object in one hand, or to ride in the street "no handed." If parcels must be carried, they should be strapped to the bicycle or placed in a carrier.

10. Choose your route carefully. Avoid crowded streets and highways.

HOW TO PREVENT FALLS :

At Home

1. Put things away in their proper places. Keep floors and stairs free of loose objects and obstructions.
2. Hold hand rail walking up and down stairs. Do not run.
3. Avoid leaning out of windows or from other high places.
4. Use a good ladder for reaching high places.
5. Wipe up all oil, grease and water spilled on floors.
6. With your parents make an inspection for the following hazards and eliminate any you may find: Worn stair treads, loose or torn carpets, unguarded steps (particularly where there are small children), poorly lighted halls and stairs, loose banisters, slippery floors.
7. Check to see if the following are provided: Nonskid attachments or pads for rugs, safety gates at head and foot of stairs, strong hooks for screens, bars at lower section of windows, well constructed ladder, rubber mat for bathtub.

At School

1. Keep feet, books and other obstructions out of aisles.
2. Keep material stored neatly in its proper place. Use a good ladder for reaching high shelves.
3. Keep to the right walking through corridors and up and down stairs.
4. Do not run.
5. Wear proper shoes in the gymnasium. Follow safety rules in using apparatus.
6. Avoid leaning out of windows.
7. Keep playground neat and free of obstructions. Don't crowd or push when you are using apparatus.

At Play

1. Watch out for unguarded openings in sidewalks, excavations and so on.
2. Don't play around demolished buildings or new construction.
3. Avoid climbing in dangerous places (roofs, poles, dead trees).
4. Walk carefully on icy pavements. Choose solid ice for skating. Avoid rough games on crowded ponds.
5. Choose safe hills for coasting. Wait your turn.
6. Obey traffic regulations when you are riding a bicycle.

SALUTES

Salute to the Union.—This is the only salute of more than 21 guns. It is a 48-gun salute commemorative of the Declaration of Independence. One gun for each state is fired at noon on the Fourth of July at every military post and on board every commissioned naval vessel of the United States.

International Courtesy.—An exchange of national salutes is required by the International Courtesy Code whenever foreign men-of-war visit United States waters or when an American naval vessel visits foreign waters. The foreign vessel entering an American harbor in continental or territorial waters breaks out the American flag and fires the salute to the flag, a salute of 21 guns, which is returned by their saluting fort or battery of that harbor. Calls are then made by the juniors to the commanding officers of the home guard and the visiting vessel. These calls are returned by the commanding officers. The same procedure is followed when an American vessel enters a foreign port. The vessel breaks out the national colors of the power being visited and fires the salute to the flag, which is returned by the foreign battery, after which courtesy calls are made.

The National Salute is a salute of 21 guns and is the salute given to the national flag, the President of the United States, ex-Presidents of the United States, the presidents and sovereigns of foreign republics and states and members of reigning royal families.

A 19-gun Salute is fired for the Vice-President of the United States, the Secretary of War, other members of the Cabinet, the president *pro tempore* of the United States Senate, ambassadors of foreign powers, high commissioners of foreign powers with the equivalent of superior rank of ambassador, the Chief Justice of the Supreme Court and the general of the Army.

A 17-gun Salute is received by assistant secretaries of war and the navy, the governor general of the Philippines, governors or viceroys of territories of foreign powers, the Speaker of the House of Representatives, a committee of Congress, the chief of staff of the United States Army, former chiefs of staff, generals in the United States Army, admirals in the United States Navy and foreign officers with corresponding ranks.

A 15-gun Salute is fired for territorial vice-governors, American envoys and ministers plenipotentiary, foreign envoys and ministers plenipotentiary accredited to the United States, lieutenant generals in the United States Army, vice-admirals in the United States Navy and foreign officers with corresponding ranks.

A 13-gun Salute is fired for American ministers resident, foreign ministers resident accredited to the United States, major generals in the United States Army, rear admirals in the United States Navy and foreign officers with corresponding rank.

An 11-gun Salute is fired for American chargés d'affairs, foreign chargés d'affaires accredited to the United States, brigadier generals in the United States Army, foreign officers with equivalent rank, consuls general of the United States and foreign consuls general.

A 7-gun Salute is given consuls of the United States and foreign consuls to the United States.

A 5-gun Salute is given vice-consuls of the United States, foreign vice-consuls and consular agents of the United States and foreign powers.

Salutes are generally fired between sunrise and sundown on weekdays. But according to military regulations the commanding officer of a saluting fort has discretionary powers, and on the occasions of visits of important officials salutes have been fired at night and on Sundays, although these are exceptions to the rule. The national colors are always displayed at the time of saluting. The salute to the flag is the only salute that is returned, and this must be done within 24 hours.

If there are several batteries or forts within sight of each other or within 6 miles of each other, only one is designated as the official saluting fort. Fort Jay on Governors Island in New York Harbor is the official saluting fort for the city of New York. It fires salutes with a special battery of 3-inch guns.

United States vessels do not return a salute to the flag in United States waters if there is a fort or land battery to do it. United States vessels do not salute United States forts, posts or other vessels flying the American flag. The international salute is a salute to the flag and is not a personal salute to the commanding officers of firing vessels or posts.

SEVEN WONDERS OF THE ANCIENT WORLD

The Seven Wonders of the Ancient World were: the Pyramids of Egypt, the Walls and Hanging Gardens of Semiramis at Babylon, the statue of Zeus (Jupiter) at Olympia, the Temple of Artemis at Ephesus, the Mausoleum at Halicarnassus, the Colossus at Rhodes, the Pharos (lighthouse) of Alexandria.

The Pyramids of Egypt, originally tombs of the Kings, are of blocks of red or syenitic granite and of a hard calcareous stone. The blocks are of extraordinary dimensions, and their transportation to the sites of the pyramids and adjustment in their places indicate a surprising degree of mechanical skill. The Great Pyramid of Cheops (*c.* 2900–2877 B.C.) is a limestone monument that covers an area between 12 and 13 acres. The masonry, solid piles with triangular sides sloping at an angle of 50°, consisted originally of 89,028,000 cubic feet and still amounts to about 82,111,000 feet. The present vertical height is 450 feet (481 feet originally), and the present length of the sides is 746 feet (756 feet originally). The total weight of the 2,300,000 stone blocks is estimated at 6,316,000 tons.

Smaller pyramids line the west bank of the Nile for 60 miles south of Giza and include the step-pyramid at Saggara and those containing the tombs of Kings Menkaura, Khafra and Tutankhamen.

The Hanging Gardens of Semiramis at Babylon consisted of a magnificent building on the terraced roofs of which were planted trees, flowers and shrubs. This edifice is supposed to have been built about 600 B.C. by Nebuchadnezzar for the gratification of his Median queen, because the Babylonian plain seemed dreary to her in comparison with the mountain scenery of her native land. According to Strabo the structure was a square, nearly an acre in area; it rested on arches supported by hollow pillars of burnt brick, filled with earth, in which roots of trees were planted; the terraced gardens were 75 to 300 feet above the ground, and a force of men constantly pumped water from the Euphrates River for irrigation.

The Walls of Babylon rose directly from the Euphrates River and encompassed the square-shaped city. They were high walls of brick with many defense towers.

The Colossal Statue of Zeus at Olympia was the work of Phidias. It was a majestic bearded figure in gold and ivory that sat enthroned in the temple for 800 years. It was destroyed by fire about 475 A.D.

The Temple of Artemis (Diana) at Ephesus was built in the 5th century B.C. at the expense of all the Asiatic states. The chief architect was Chersiphron, and Pliny says that 220 years were employed in completing the temple, whose riches were immense. It was 425 feet long, 225 feet broad and was supported by 127 columns of Parian marble (60 feet high, each weighing 150 tons) furnished by as many kings. It was set on fire the night of Alexander's birth in 356 B.C. by an obscure person named Erostratus, who confessed on the rack that the sole motive that prompted him was the desire to transmit his name to future ages. The temple was rebuilt and was burned by the Goths in 262 A.D.

The Mausoleum at Halicarnassus was a sepulcher built in honor of Mausolus, King of Caria, at Halicarnassus, in southwestern Asia Minor. In 377 B.C., Mausolus and his sister-wife, Artemisia, came to the throne. Great prosperity was enjoyed under their rule, and considerable sums were spent to beautify the city. When Mausolus died in 353 B.C. his wife immediately set about to honor her husband by the erection of a white marble tomb.

The sculptors were Scopas, Leochares, Bryaxis and Timotheus, and the architects were Satyrus and Pythis. The foundation was laid upon a large rock. A rectangular podium or basement supported a pteron or square stage with 36 fluted columns of Ionic architecture. Between the columns stood marble statues, and above them was said to be a wonderful frieze with which the greatest artists of the ancient world, including Scopas and Praxiteles, sought to perpetuate their fame. On one side was sculptured the combat between the Greeks and the Amazons. On another was a battle of the Centaurs. Above the frieze was a cornice with a sculptured lion's head at each of its corners. Surmounting the pyramid-shaped roof was a platform to support a great chariot. To this were attached four huge horses; within the chariot stood a statue of King Mausolus, 9 feet, 9½ inches high.

At the beginning of the Christian era Halicarnassus was almost completely depopulated, and the Mausoleum, which still remained, was unguarded. The chariot group, the friezes and the entire pyramid were shattered, probably by an earthquake sometime between the 12th and 15th centuries. In the year 1402, when the Knights of St. John of Jerusalem took Halicarnassus, the stones were taken from the Mausoleum to build the castle of St. Peter, and the sculptures were converted into lime for cement.

The word *mausoleum,* applied to any massive sepulcher, was derived from the name of Mausolus.

The Colossus at Rhodes was a huge bronze statue of Helios (Apollo), the sun-god, which stood facing the Mediterranean Sea. Grateful for a victory over the Macedonians, the natives of the island city of Rhodes commissioned the Greek sculptor Chares to erect a tribute to Apollo. Chares spent 12 years working on the statue, which was completed about 280 B.C. It was 109 feet high and hollow, with a winding staircase that ascended to the head. After standing 56 years, it was overthrown by an earthquake, 224 B.C., lay 9 centuries on the ground and then was sold to a Jew by the Saracens, who had captured Rhodes about the middle of the 7th century. It is said to have required 900 camels to remove the metal, and from this statement it has been calculated that its weight was 720,000 pounds. Long after its fall unfounded legend described it as having straddled the harbor, its light shining on the ships that sailed between its feet.

The Pharos or Lighthouse of Alexandria is on the rocky island of Pharos off the western extremity of the Egyptian coast opposite the town of Rakotis. When Alexander chose the site of Alexandria, he connected the island with the mainland by the Heptastadium or Seven-furlong Mole, 280 rods in length. This made it possible to build two harbors. On the eastern side of the island Ptolemy I began the erection of a great lighthouse that was completed by his son, Ptolemy Philadelphus, between 265 and 247 B.C., at a cost of 800 talents ($850,000). The lighthouse was a tower about 400 feet high with a base about 100 feet square. Light was furnished by a beacon fire on the summit. After this lighthouse had stood nearly 1,600 years, it was destroyed by an earthquake in 1375.

SMOKE

Smoke is any volatile and especially any carbonaceous matter escaping from a burning substance. Although much smoke is made up of particles of carbon the composition of smoke depends on what is burned. When wood or coal is in process of combustion, it emits not merely minute particles of unconsumed carbon but invisible gaseous matter. Appliances for consuming smoke aim simply at preventing the rise of the carbonaceous particles, ignoring the unseen gases. These appliances attempt to furnish a supply of air containing an abundance of oxygen, the absence of which is the reason why carbon escapes unconsumed.

S O S

The radio distress-call letters, SOS, have no meaning in themselves. They were selected by the International Radiotelegraph Conference at London in 1912 because the combination of dots and dashes—three dots, three dashes, three dots—was so simple that the most inexperienced radio operator would have little difficulty in detecting it. Before 1912 the distress call was C Q D. The words *Save Our Ship* or *Save Our Souls* have been given as the meaning of the distress call, but U. S. Naval Communications is authority for the statement that the S O S letters stand for no words.

STATUARY HALL

Statuary Hall is the name given to the historic chamber in the Capitol in Washington, D. C., formerly used by the House of Representatives but now utilized for the statues of notable Americans, by the terms of an Act of Congress approved by President Lincoln on July 2, 1864. The chamber was thus officially designated as a national Statuary Hall, and an invitation was extended to all states to contribute statues. Each state is permitted space for marble or bronze statues of two of her most distinguished deceased citizens, men or women (no person still living may be so honored). The accompanying table on page 2264 lists the statues now installed.

SWASTIKA

This ancient symbol is a Greek cross with arms bent at right angles (all to the right, to indicate the female form; and all to the left, to indicate the male). The two parts of the arms are of equal length. The swastika dates back to the Bronze Age. Examples have been found at Hissarlik, the site of ancient Troy. It was common in India in the 4th century, but as it has been found among remains of ancient Scandinavian culture and of the American Indians in North, Central and South America and in China and Japan, it could not have originated in India. It became a sacred symbol of both Buddhism and Jainism in the Orient. The name *swastika* derives from the Sanskrit words meaning welfare or good luck; perhaps this is the reason it was appropriated by Hitler as the emblem of the National Socialist (*Nazi*) party of Germany.

Other names for the swastika are *fylfot* and *gammadion.* The latter name was given because each part of the swastika is shaped like a Greek letter gamma (Γ). Fylfot is a modern coinage by antiquarians, intended to mean that which fills the *foot of a window.*

THIRD DEGREE

A colloquial term in the United States that is applied to a system used by the police to compel a suspected criminal to tell the truth. The suspect is constantly questioned over a long period of time until his strength of will and mind are so exhausted that he no longer withholds the facts. The authorities favor the third degree on the grounds of necessity and justice, although serious accusations of cruelty have often been made against the police, because of this form of extracting information from a suspect. Apparently third degree originally meant extreme.

TIME ON SHIPBOARD

The twenty-four hours of each day are divided on board ship into seven parts, and the crew is divided into two parts or watches, designated *port* and *starboard watches.* Each watch is on duty four hours, except from 4 to 8 p.m., which time is divided into two watches of two hours each, called *dog watches,* by means of which the watches are changed every day, and each watch gets a term of eight hours' rest at night. *First watch,* 8 p.m. to midnight; *middle watch,* midnight to 4 a.m.; *morning watch,* 4 to 8 a.m.; *forenoon watch,* 8 a.m. to noon; *afternoon watch'* noon to 4 p.m.; *first dog watch,* 4 to 6 p.m.; *second dog watch,* 6 to 8 p.m. The bell is struck every half-hour to indicate the time as follows:

1 bell	12.30 a.m.	1 bell	12.30 p.m.
2 bells	1.00 a.m.	2 bells	1.00 p.m.
3 bells	1.30 a.m.	3 bells	1.30 p.m.
4 bells	2.00 a.m.	4 bells	2.00 p.m.
5 bells	2.30 a.m.	5 bells	2.30 p.m.
6 bells	3.00 a.m.	6 bells	3.00 p.m.
7 bell	3.30 a.m.	7 bells	3.30 p.m.
8 bells	4.00 a.m.	8 bells	4.00 p.m.
1 bell	4.30 a.m.	1 bell	4.30 p.m.
2 bells	5.00 a.m.	2 bells	5.00 p.m.
3 bells	5.30 a.m.	3 bells	5.30 p.m.
4 bells	6.00 a.m.	4 bells	6.00 p.m.
5 bells	6.30 a.m.	1 bell	6.30 p.m.
6 bells	7.00 a.m.	2 bells	7.00 p.m.
7 bells	7.30 a.m.	3 bells	7.30 p.m.
8 bells	8.00 a.m.	4 bells	8.00 p.m.
1 bell	8.30 a.m.	1 bell	8.30 p.m.
2 bells	9.00 a.m.	2 bells	9.00 p.m.
3 bells	9.30 a.m.	3 bells	9.30 p.m.
4 bells	10.00 a.m.	4 bells	10.00 p.m.
5 bells	10.30 a.m.	5 bells	10.30 p.m.
6 bells	11.00 a.m.	6 bells	11.00 p.m.
7 bells	11.30 a.m.	7 bells	11.30 p.m.
8 bells	12.00 n'n.	8 bells	12.00 ngt.

TINKER'S DAM

This expression indicates utter uselessness. Possibly it originates from the little heap of clay or dirt that a tinker or plumber, in repairing a leak or soldering a joint, places around the soft, heated solder until it cools and hardens. This dam of clay can never be used again and is thrown away as worthless.

Another explanation is based on the spelling *damn,* the insignificant curse of the vulgar tinker.

TIP

A tip is a gift given to servants by guests or patrons, as at hotels or on ships. Many explanations are given as to how this word originated. One is that it is made of the initials of the three words *To Insure Promptness,* which were lettered above the small box that was placed in a conspicuous place in the old English inn. Another explanation is that a slight tap or tip on the arm by a servant is a gentle suggestion that a gratuity should be given. The English used the word also for a small money gift to a child, especially a schoolboy. The simplest explanation of all is that *tip* sometimes means *give,* as in the idiomatic phrases, *tip a wink* and *tip us a stave* or *a tune.*

STATUES OF STATE HEROES IN THE NATIONAL CAPITOL[1]

State	Name of Statue	Name of Sculptor
Alabama	J. L. M. Curry	Dante Sodini
	Gen. Joe Wheeler*	Berthold Nebel
Arizona	John C. Greenway*	Gutzon Borglum
Arkansas	Uriah M. Rose*	F. W. Ruckstull
	James P. Clarke	Pompeo Coppini
California	Junipero Serra*	Ettore Cadorin
	Thomas Starr King	Haig Patizian
Connecticut	Roger Sherman*	C. B. Ives
	Jonathan Trumbull	C. B. Ives
Delaware	Caesar Rodney*	Bryant Baker
	John M. Clayton	Bryant Baker
Florida	John Gorrie*	C. A. Pillars
	Kirby Smith	C. A. Pillars
Georgia	Alexander H. Stephens*	Gutzon Borglum
	Dr. Crawford W. Long	J. Massy Rhind
Idaho	George L. Shoup*	F. E. Triebel
Illinois	James Shields	L. W. Volk
	Frances E. Willard*	Helen Farnsworth Mears
Indiana	Oliver P. Morton	C. H. Niehaus
	Lew Wallace*	Andrew O'Connor
Iowa	James Harlan	Nellie V. Walker
	S. J. Kirkwood*	Vinnie R. Hoxie
Kansas	John J. Ingalls*	C. H. Niehaus
	George W. Glick	C. H. Niehaus
Kentucky	Henry Clay*	C. H. Niehaus
	Ephraim McDowell	C. H. Niehaus
Maine	William King	Franklin Simmons
	Hannibal Hamlin*	Chas. E. Tefft
Maryland	Charles Carroll*	R. E. Brooks
	John Hanson	R. E. Brooks
Massachusetts	Samuel Adams*	Annie Whitney
	John Winthrop	R. S. Greenough
Michigan	Lewis Cass*	D. C. French
	Zachariah Chandler	C. H. Niehaus
Minnesota	Henry M. Rice*	F. E. Triebel
Mississippi	Jefferson Davis*	Augustus Lukeman
	James Z. George	Augustus Lukeman
Missouri	Francis P. Blair	Alex. Doyle
	Thomas H. Benton*	Alex. Doyle
New Hampshire	John Stark	Carl Conrads
	Daniel Webster*	Carl Conrads
New Jersey	Richard Stockton*	H. K. Brown
	Philip Kearney	H. K. Brown
New York	Robert R. Livingston*	E. D. Palmer
	George Clinton	H. K. Brown
North Carolina	Zebulon B. Vance*	Gutzon Borglum
	Charles B. Aycock	Charles Keck
Ohio	James A. Garfield	C. H. Niehaus
	William Allen*	C. H. Niehaus
Oklahoma	Sequoyah*	Vinnie R. Hoxie
Pennsylvania	J. P. G. Muhlenberg	Blanche Nevin
	Robert Fulton*	Howard Roberts
Rhode Island	Nathanael Green	H. K. Brown
	Roger Williams*	Franklin Simmons
South Carolina	John C. Calhoun*	F. W. Ruckstull
	Wade Hampton	F. W. Ruckstull
Tennessee	Andrew Jackson	Belle Kinney Sholz and L. F. Sholz
	John Sevier*	Belle Kinney Sholz and L. F. Sholz
Texas	Stephen F. Austin	Elisabet Ney
	Samuel Houston*	Elisabet Ney
Vermont	Ethan Allen*	L. G. Mead
	Jacob Collamer	Preston Powers
Virginia	George Washington	Jean Antoine Houdon
	Robert E. Lee*	Edward V. Valentine
West Virginia	John E. Kenna	Alex. Doyle
	Francis H. Pierpont*	Franklin Simmons
Wisconsin	James Marquette	G. Trentanove
	Robert LaFollette*	Jo Davidson

NOTABLE TREES

A number of trees are preserved as monuments marking scenes of historic value; but others have perished as a result of disease) or of man's disregard of their worth. Some of the most noted trees are:

Cary Tree. Planted by the roadside in 1832 by Alice and Phoebe Cary. It is a large sycamore standing on the turnpike between College Hill and Mount Pleasant, Hamilton County, Ohio.

Charter Oak, The. A tree celebrated in American (legendary) history. It formerly stood in Hartford, Conn., and according to tradition, when Governor Andros came to Hartford in 1687 to demand of the Assembly the surrender of the colonial charter, the debate in that body over the governor's demand was prolonged beyond daylight, when suddenly the lights were extinguished, and in the darkness a patriot, Captain Wadsworth, escaped with the charter and hid it in a hollow oak. There is, however, no contemporary record of this event. The Charter Oak was overthrown by a storm in 1856.

Elm, Old Liberty. A famous tree on Boston Common, which stood near the "long walk," at the foot of Flagstaff Hill. It was a tree of unknown age, believed to have stood before the settlement of the town in 1630 and already decrepit as long ago as 1755. It was over seventy-two feet high and measured twenty-two and a half feet in circumference one foot above the ground. After resisting many a storm, it was blown down in the winter of 1876. An iron fence surrounds the spot where it stood.

Fairlop Oak. A giant oak in Hainault Forest, Essex, England, whose girth was forty-eight feet, and beneath whose widely spreading branches an annual fair was held on the first Friday in July. The tree was blown down in February 1820.

Mather's Willow. The weeping willow over the grave of Cotton Mather in Cop's burying ground, near Bunker Hill, taken from a tree that shaded the grave of Napoleon at St. Helena.

Mt. Vernon Ashes. The immense ash trees planted by General Washington at Mount Vernon and now the admiration of visitors.

Old Moses. One of the largest trees in the world is in a grove near Tule River, in California. Though the top has broken off, it is 240 feet high, and the diameter of the tree where it has been broken is twelve feet. This giant of the forest is called Old Moses from a mountain in the neighborhood and is calculated to be over 4,850 years old. The hollow of its trunk, which is 111 feet, will hold 150 persons

General Sherman Tree. This is the largest of the sequoias, 273.9 feet high, 37.3 feet in diameter at the base and 18.7 feet in diameter 100 feet from the ground. It stands in the Sequoia National Park

Washington Elm, The. The noted elm under which George Washington took command of the Continental army, in Cambridge, Mass., July 3, 1775. While being trimmed by workmen, this tree fell, October 26, 1923.

An offshoot of the famous elm was presented, as a gift from the University of Washington, and planted on Cambridge common in the spring of 1931. The shoot from the parent tree had grown, from the time of its planting in 1896, to a height of forty feet.

TRAIN SIGNALS

The following signals are displayed to the rear of every train:

By day the marker lamps are not lighted.

By night, when a train is running on a single track, with the current of traffic on a double track and with the current of traffic on passenger tracks where there are three or more tracks, green lights are displayed to the front and side and red to the rear. When a train is on a siding to be passed by another train, green lights are shown to the front, side and rear.

A train running by night with the current of traffic on a slow-speed track where there are three or more tracks displays green to the rear on the side next to the high-speed track in the direction of the current of traffic and a red light on the opposite side.

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[1] Each state was invited to contribute statues of two noted sons to the National Capitol. One of these stands in Statuary Hall, the other, if the second has been provided, stands elsewhere in the Capitol. In the table an asterisk (*) indicates those in Statuary Hall.

The rear of a train running by night on any track against the current of traffic where there are three or more tracks displays green to the rear with a red light on the platform or the cupola.

Cabooses equipped with revolving signal lamps on cupolas display green when the train is running at full speed. Red is displayed at the moment speed is reduced and until full speed is resumed; but when the train is on a siding clear of the main track, green is displayed.

The following signals are displayed to the rear of every train as markers to indicate the rear of the train: by day, marker lamps (not lighted); by night, green lights to the front and side and red lights to the rear, but when the train is clear of the main track, green lights are displayed to the front, side and rear. When a train is turned out against the current of traffic, green lights are shown to the front and side, a green light to the rear on the side next to the main track on which the current of traffic is in the direction the train is moving, and a red light to the rear on the opposite side.

All sections except the last display two green flags and (by night) two green lights in places provided for that purpose on the front of the engine.

Extra trains display two white flags and (by night) two white lights in the places provided for that purpose on the front of the engine. A blue signal displayed at one or both ends of an engine, train or car signifies that workmen are under or about it; when it is thus protected, the train or car must not be coupled to or moved. Each class of workmen displays the blue signals and one workman alone is authorized to remove them. Other equipment may not be placed on the same track so as to intercept the view of the blue signals without first notifying the workmen.

Color Signals.—Red indicates: Stop.

Yellow indicates: Proceed at restricted speed. (Other uses prescribed by the rules.)

Green indicates: Proceed. (Other uses prescribed by the rules.)

Green-and-white indicates: Flag stop.

Blue indicates: Workmen busy about train. (Other uses prescribed by the rules.)

Purple indicates: Stop indication for dwarf signals.

The explosion of two torpedoes is a signal to proceed at restricted speed. The explosion of one torpedo indicates the same as two, but the use of two is required.

UNDER THE ROSE

The Latin *sub rosa,* literally translated under the rose, means that a thing is done or said secretly. Among the Egyptians, the rose was the emblem of the god Horus (called *Harpocrates* by the Greeks), the god of silence. At certain entertainments, the ancients were accustomed to hang up a rose in token that nothing said was to be divulged.

UNION JACK

The term *union jack,* as applied to the United States and other flags, is probably a direct application of the meanings of the two words. A jack is a small flag; a union is a device or emblem that symbolizes combined power, such as the three blended crosses of St. George, St. Andrew and St. Patrick, for England, Scotland and Ireland, respectively, on the British union jack, or the cluster of white stars on the United States ensign.

VISIBILITY DISTANCE

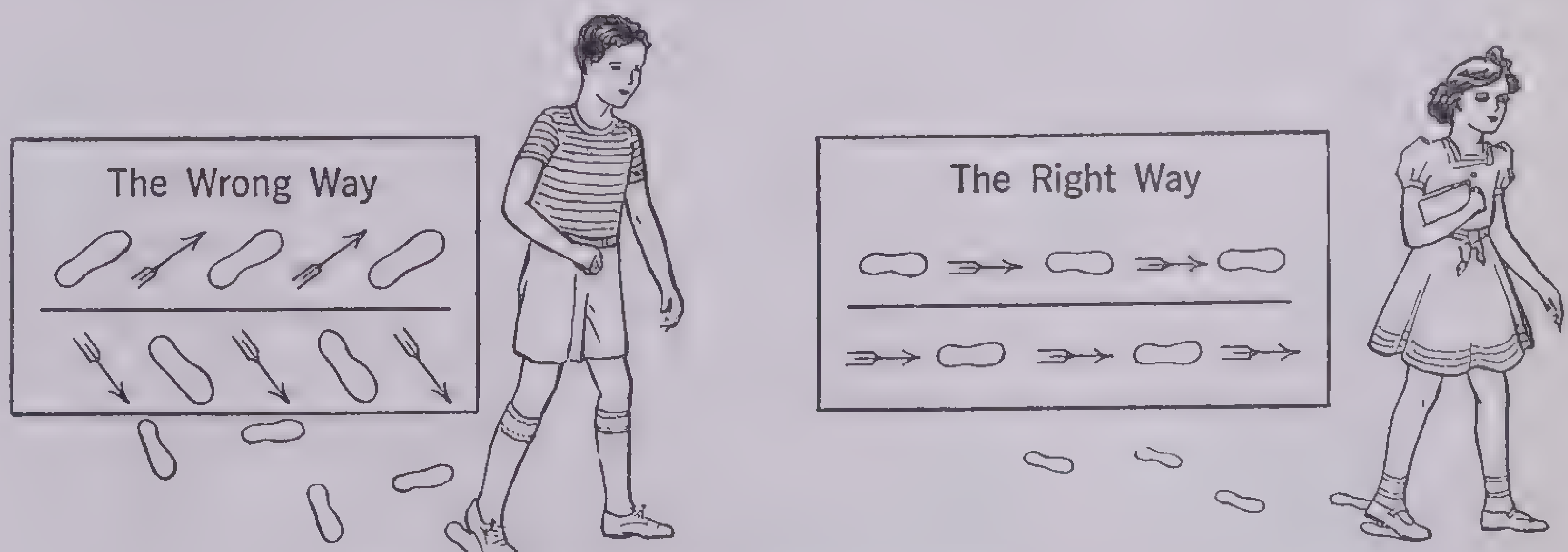
The distance one can see varies with elevation, conditions of the atmosphere, intensity of illumination and other modifying elements. Of course the size and lighting of the object must be great enough to produce an image.

Visibility Distance at Sea.—Table of elevations of objects above sea level, with their corresponding distances of visibility.

Height in Feet	Distance in Nautical Miles	Height in Feet	Distance in Nautical Miles
5	2.555	110	11.986
10	3.614	120	12.519
15	4.426	130	13.030
20	5.111	140	13.522
25	5.714	150	13.997
30	6.260	200	16.162
35	6.761	250	18.070
40	7.228	300	19.795
45	7.666	350	21.381
50	8.081	400	22.857
55	8.476	450	24.244
60	8.852	500	25.555
65	9.214	550	26.802
70	9.562	600	27.994
75	9.897	650	29.137
80	10.222	700	30.237
85	10.536	800	32.325
90	10.842	900	34.286
95	11.139	1000	36.140
100	11.428		

WALKING, RIGHT WAY OF

The Indian, walking and running for hours without fatigue, points his toes slightly inward. The runner or jumper and the person who has never worn shoes all walk with toes pointed straight ahead or slightly inward. The old rule of toe out did much damage to children's feet and was one of the causes of flat foot or the fallen arch, which in turn causes pain in the calf of the leg and makes a person tire easily. It is impossible to have free knee action when toes are turned outward and a clumsy gait is the result. Graceful, easy walking and running can be accomplished only by persons who point the foot straight ahead or slightly inward.



Learn to Walk With the Toes Pointing Straight Ahead

WATER

Water is a clear, colorless, transparent liquid that has neither taste nor smell. All these qualities may occur from mineral or vegetable matter in the water or, in case of color, from reflections, but pure water possesses none of them. It is one of the most important and most widely distributed substances in nature, occurring universally in one or another of its three physical states—liquid, solid or gaseous.

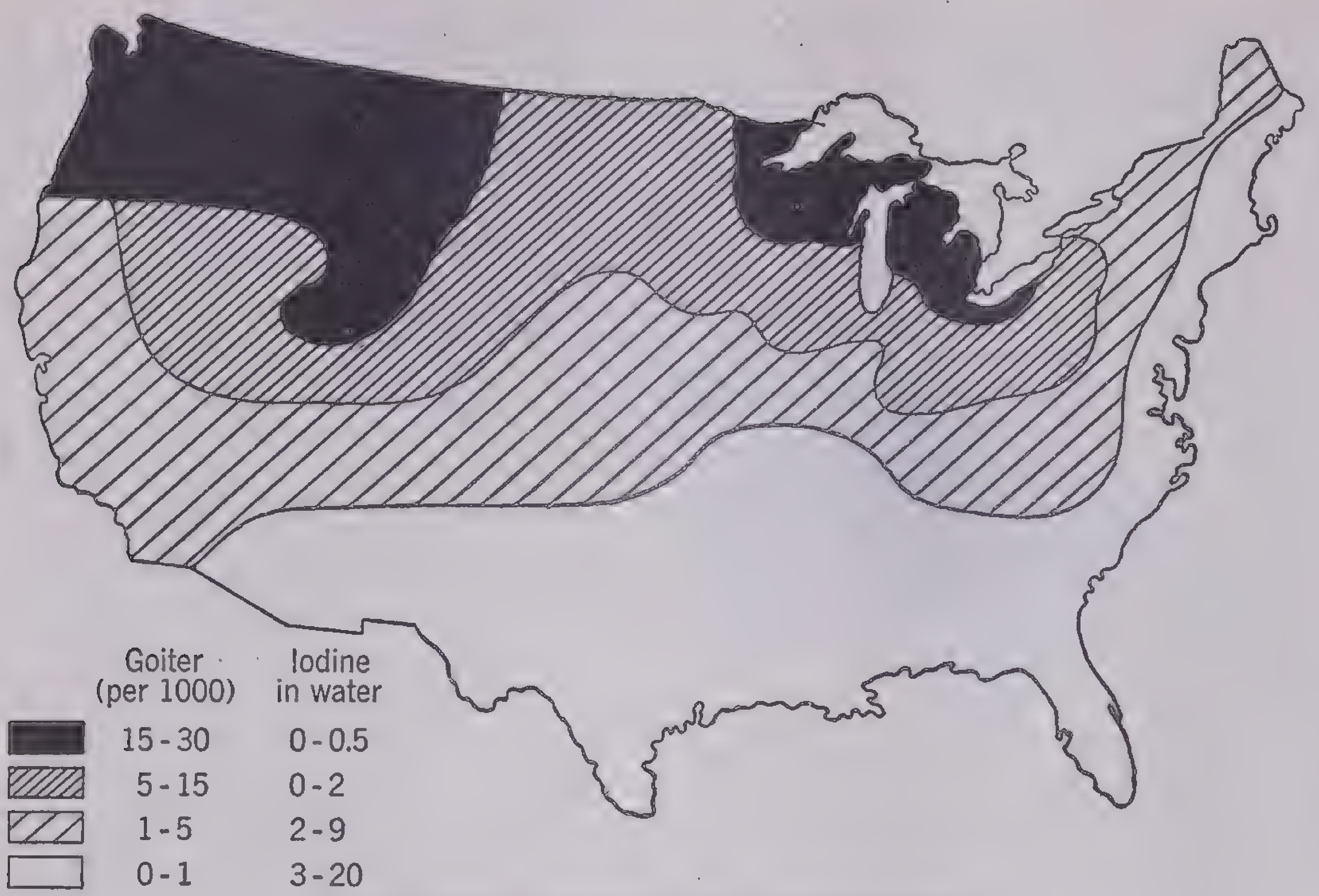
In its liquid state it constitutes the great mass of the oceans, rivers and lakes, which cover nearly three-fourths of the earth's surface; in the solid state it exists in the form of ice or snow, and as a vapor is a constituent of the aerial envelope of the earth and the exhalations of volcanoes and boiling springs. In the course of many years water broke down rock and formed the soil. It equalizes the temperature and keeps the earth sweet and clean. Without it there could be no life on earth. It occurs in combination in many mineral substances and also in organic bodies. Animals and plants contain from 80 to 95 per cent water. It is the most efficient of all solvents, there being few substances that are not to some extent affected by it; hence natural waters never occur absolutely pure but contain in solution more or less of the constituents of the strata through which they have passed.

Rain water contains substances derived in minute quantities from the atmosphere, such as ammonia, nitrate of ammonia, carbonic acid, nitrous and sulphurous acids.

Spring water always contains a much larger proportion of dissolved substances than rain water. When highly charged with saline or gaseous constituents it has a peculiar taste or smell, and is called mineral water. When the amount of these constituents does not sensibly affect its taste, it is described as *fresh water*.

Sea water is essentially a mineral water, its saline constituents consisting of the chlorides and sulphates of sodium, potassium, magnesium and calcium, together with minute quantities of silica, bromine, iodine, phosphoric acid and other minerals. The total solid contents of sea water in mid-ocean varies from 30 to 40 grams per liter, being largest near the equator and smallest near the poles.

A cubic inch of fresh water at ordinary temperature weighs .0361 pounds; a cubic foot, 62.4 pounds; and a gallon, 8.34 pounds. A ton of water occupies approximately 32 cubic feet. Salt water is slightly heavier than fresh, and this is the reason that it is



The Chemical Content of Water Affects Health

In regions where a sufficient amount of iodine is present in water, there are few or no cases of goiter. The figures show the goiter rate per thousand drafted men in the United States Army in 1920 and the parts of iodine per billion parts of water from representative rivers

easier to float in ocean water than in the fresh water of a lake.

Water was long regarded as an element, but toward the end of the 18th century it was shown by Cavendish and Lavoisier to be a compound and to consist of two parts by weight of hydrogen to 16 of oxygen or two volumes of hydrogen to one of oxygen. When pure it is free from taste and smell and at ordinary pressure, it is liquid between 0 and 100° C.; boils at 100° and freezes at zero C. Unlike most substances water expands when it freezes, so that ice is less dense than liquid water. For this reason lakes in winter freeze over the top, and the ice covering insulates the rest of the water and keeps the lake from freezing solid.

In its gaseous form water is colorless and invisible, quite distinct from the visible cloud that issues from a kettle, which is composed of minute drops of liquid water produced by the condensation of the steam as it issues into the colder air. Steam always has the 100° C. temperature, no matter how fast the water is made to boil. The heat that is supplied simply suffices to do the work of converting the liquid water at 100° into gaseous steam at 100° without raising the temperature of the steam. If the temperature of steam at 100° is lowered by only a very small amount, part of the steam is condensed; hence steam at this temperature is termed moist or saturated steam. At high temperatures and pressures, steam behaves like a perfect gas; but at lower pressures and at temperatures near the boiling point of water, its behavior differs markedly from that of perfect gases; and this change of properties has to be taken into account in all calculations connected with the expansion of steam in steam engines.

WEATHER PROVERBS

A sort of folklore, a group of sayings or proverbs has grown up concerning the weather. Many of these proverbs seem meaningless at first; yet, when they are analyzed, some of them are found to be based on scientific facts. Almost anyone can think of a number that are widely known, and quoted. Who has not heard "rain before seven, clear before eleven"; "rainbow at night, sailor's delight"; "rainbow in the morning, sailors take warning"? These and similar proverbs have a real scientific background.

There are others that arise from the mistaken belief that somehow things are evened up; hence we have such expressions as: "A green Christmas and a white Easter." "A hot summer and a cold winter." There is also an unwarranted belief that plants and the lower animals somehow know what the weather is to be; for example, most of us have heard the ground-hog story or that about the thick corn husks and a cold winter. Weather predictions are connected also with two religious feast days—Candlemas and St. Swithin's Day (July 15). The first of these is:

If Candlemas Day is bright and clear,
We'll have two winters in one year.

The second reads:

St. Swithin's Day, if thou dost rain,
For forty days it will remain;
St. Swithin's Day, if thou be fair,
For forty days 'twill rain no mair.

The most familiar weather saws include:

If March comes in like a lamb, it will go out like a lion.

If it rains on Friday, it will rain again before Monday.

Rain on Easter means rain for seven Sundays thereafter.

When the sun sets as a flaming ball, it means a hot day on the morrow.

Bright stars in winter foretell zero weather.

A disk surrounding the moon indicates rain or snow.

If a new moon occurs on Saturday, it portends rain.

If the moon changes on Sunday, there will be a heavy storm before the month is out.

A mist from the hills means bad weather; a mist from the sea is a portent of good.

Rain may be expected when swallows fly low, cattle or sheep herd together, horses neigh frequently, cats sneeze and bees enter but do not leave a hive.

WEDDINGS

Anniversaries

There are various lists given, some suggesting straw for the first anniversary, others reversing the order of the first two here noted.

First year	Paper
Second year	Cotton
Third year	Leather
Fourth year	Silk
Fifth year	Wood
Sixth year	Iron
Seventh year	Copper
Eighth year	Bronze
Ninth year	Pottery
Tenth year	Tin
Fifteenth year	Crystal
Twentieth year	China
Twenty-fifth year	Silver
Thirtieth year	Pearl
Thirty-fifth year	Coral
Fortieth year	Ruby
Forth-fifth year	Sapphire
Fiftieth year	Gold
Fifth-fifth year	Emerald
Sixtieth year	Diamond
Seventieth year	Diamond
Seventy-fifth year	Diamond

White House Weddings

Date	*Contracting Parties*
Mar. 11, 1811	Anna Todd (cousin of Mrs. Madison) to Rep. John G. Jackson.
Mar. 9, 1820	Maria[1] Monroe (daughter of President Monroe) to Samuel L. Gouverneur.
........1826	Helen Jackson to John Adams (son and private secretary to President John Quincy Adams).
........183–	Mary Lewis (daughter of a friend of President Jackson) to M. Alphonse Pageot.
........183–	Miss Easten to Mr. Polk
Jan. 31, 1842	Elizabeth Tyler (daughter of President Tyler) to William Waller.
May 21, 1874	Nellie Grant (daughter of President Grant) to Algernon C. F. Sartoris.
June 19, 1878	Emily Platt (niece of President Hayes) to Gen. Russell Hastings.
June 2, 1886	Frances Folsom to President Grover Cleveland.
Feb. 17, 1906	Alice Roosevelt (daughter of President Roosevelt) to Nicholas Longworth.
Nov. 25, 1913	Jessie Woodrow Wilson (daughter of President Wilson) to Francis B. Sayre.
May 7, 1914	Eleanor Wilson (daughter of President Wilson) to William Gibbs McAdoo.

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[1] Referred to as "Hester" and "Martha" in various accounts.

Wedding Customs

The medieval bride as described in Sigrid Undset's *Kristin Lavransdatter* participated in the wedding ceremony with her hair hanging loosely; on the top of her head was a garland of flowers, the symbol of her virginity. After the ceremony her hair was bound under a coif as a sign that her girlhood freedom was ended and that now she must submit to her husband. In the 16th century a white veil, emblematic of purity, gradually took the place of the garland and flowing tresses. The orange blossoms that are often used to decorate the coronet that holds the veil portend happiness. The "something blue" that the bride should include in accordance with the adage;

Something old and something new,
Something borrowed and something blue,

may be traced to the ancient Israelites, as they regarded blue as the color of love, purity and fidelity and sewed a blue ribband upon the borders of their fringed wedding garments. If the bride should have her picture taken before the wedding day, she must leave a seam in her dress unsewed; otherwise, according to popular superstition, her lot would not be a happy one.

Among the various attendants at a modern wedding two are linked with more primitive ceremonials. The best man is a relic of marriage by capture, for when the primitive bridegroom set out to steal a wife, he was usually accompanied by a strong-armed friend who staved off, if possible, pursuit by the girl's father. The flower girl is a survival of the custom of having a child walk before the bride carrying a sheaf of wheat as symbolic of the wish that the union would be fruitful. Later when ornamental flower baskets took the place of the sheaf, the flower girl strewed flowers in the path of the bride.

At the wedding breakfast or other reception it is the bride's traditional right to cut the first piece of the wedding cake on account of the superstition that if anyone else should do so her happiness would be marred. The old shoes that may decorate the back of the automobile in which the couple ride away are a symbol that authority over the bride has been transferred from her father to her husband. This custom is mentioned in the Old Testament. In Ruth 4: 7–8, when the kinsman of Boaz gave up his claim to Ruth herself and her inheritance, he indicated his assent by plucking off his shoe and giving it to Boaz. The term *honeymoon* is fancifully supposed to have originated from the medieval custom of a newly married couple's drinking metheglin (a fermented drink made from honey) for a period of 30 days after marriage. It is more likely a jocular coinage with possibly a cynical allusion to the moon's waxing and waning—excitement and then domestic calm.

WEEK, DAYS OF

The division of time known as a week commonly consists of 7 days. It originated in western Asia (probably among the Phoenicians and Hebrews) and from there spread to Europe and later to northern Africa. The origin of the week among the Hebrews is described in Gen. 1, in which it is recorded that God created the world in 6 days and rested the seventh day.

The names given to the days of the week in the Latin countries of Europe are derived from the planetary system —the Sun, Moon, Mars, Mercury, Jupiter, Venus and Saturn. In French,

TABLE OF FOREIGN WEIGHTS AND MEASURES

DENOMINATIONS	WHERE USED	AMERICAN CUSTOMARY EQUIVALENTS
Almude	Portugal	4.422 gallons
Ardeb	Egypt	5.619 bushels
Are	Metric	0.02471 acre
Arratel or libra	Portugal	1.012 pounds
Arroba (dry)	Brazil, Portugal	32.38 pounds
	Cuba, Latin America	25.3664 pounds
	Spain	25.36 pounds
Arroba (liquid)	Cuba, Spain and Venezuela	4.263 gallons
Arshine	Russia	28 inches
Artal	Morocco	1.12 pounds
Baril	Argentina and Mexico	20.0787 gallons
Barrel	Spain (raisins)	100 pounds
Batman or tabriz	Persia	6.49 pounds
Berkovets	Russia	361.12 pounds
Bouw	Sumatra	7,096.5 square meters
Bu	Japan	0.119 inch
Buncal	India	832 grains
Butt (wine)	Spain	140 gallons
Caffiso	Malta	5.4 gallons
Candy	India (Bombay)	560 pounds
	India (Madras)	500 pounds
Cantar	Morocco	113 pounds
	Turkey	124.45 pounds
Cantaro (cantar)	Malta	175 pounds
Carga	Mexico and Salvador	300 pounds
Catty	China	1.316 pounds (avoir.)
	Japan	1.31 pounds
	Java, Siam and Malacca	1.35 pounds
	Sumatra	1.36 pounds
Centner	Denmark and Norway	110.11 pounds
	Germany, Austria	110.23 pounds
	Sweden	93.7 pounds
	Double or metric	220.46 pounds
Chetvert	Russia	5.96 bushels
Chih	China	12.6 inches
Coyan	Siam (Koyan)	2,645.5 pounds
Cuadra	Argentine Republic	4.2 acres
	Paraguay	94.7 yards
	Uruguay	1.85 acres
Cubic meter	Metric	35.3 cubic feet
Cwt. (hundredweight)	British	112 pounds
Dessiatine	Russia	2.6997 acres
Drachma	Greece	67.5 grains
Fanega (dry)	Central America	1.5745 bushels
	Chile	2.75 bushels
	Cuba	3 bushels
	Mexico	2.577 bushels
	Morocco	1.59 bushels
	Spain	1.58 bushels
	Venezuela	3.33 bushels
Feddan	Egypt	1.03 acres
Frail (raisins)	Spain	50 pounds
Frasco	Argentine Republic	2.5096 quarts
	Mexico	2.5 quarts
Fuder	Luxemburg	264.17 gallons
Funt	Russia	0.9028 pound
Garniec	Poland	1.06 gallons
Gram	Metric	15.432 grains
Hectare	Metric	2.471 acres
Hectoliter: Dry	Metric	2.838 bushels
Liquid	Metric	26.417 gallons
Joch	Austria	1.422 acres
Ken	Japan	5.965 feet
Kilogram (kilo)	Metric	2.2046 pounds
Kilometer	Metric	0.621376 mile
Koku	Japan	4.9629 bushels
Korec	Russia	3.5 bushels
Kwan	Japan	8.27 pounds
Last	Belgium and Holland	85.134 bushels
	England (dry malt)	82.52 bushels
	Germany	2 metric tons (4,409 pounds)
League (land)	Paraguay	4,633 acres
Li	China	0.0126 inches
Libra (pound)	Argentine Republic	1.0127 pounds
	Chile	1.014 pounds
	Mexico	1.01465 pounds
	Peru, Central America	1.0143 pounds
	Portugal, Brazil	1.011 pounds
	Spain, Cuba	1.0144 pounds
	Uruguay, Venezuela	1.0143 pounds
Liter	Metric	1.0567 quarts
Livre (pound)	France	1.1 pounds
Load	England (timber)	Square, 50 cubic feet; unhewn, 40 cubic feet; inch planks, 600 superficial feet
Manzana	Central America	1.73 acres
Maund	India	82.28 pounds
Meter	Metric	39.37 inches
Mil	Denmark	4.68 miles
Milla	Honduras	1.1493 miles
Morgen	Prussia	0.63 acre
Oke	Egypt	2.7225 pounds
	Greece	2.84 pounds
	Hungary	3.0817 pounds
	Turkey	2.82838 pounds
Pic	Egypt	22.8 inches
Picul	Borneo and Celebes	136 pounds
	China, Japan and Sumatra	133⅓ pounds
	Java	135.1 pounds
	Philippine Islands	139.4 pounds
Pie	Argentine Republic	0.9478 foot
	Spain	0.91407 foot
Pik	Turkey	27.9 inches
Pood	Russia	36.112 pounds
Pund (pound)	Denmark and Iceland	1.102 pounds
Quarter	Great Britain	8.252 bushels
	London (coal)	36 bushels
Quintal	Argentina and Paraguay	101.42 pounds
	Brazil	130.06 pounds
	Chile, Mexico and Peru	101.41 pounds
	Newfoundland (fish)	112 pounds
	Syria	125 pounds
	Metric	220.46 pounds
Rotl	Palestine	6 pounds
	Syria	3.93 pounds
Sagene	Russia	7 feet
Salm	Malta	490 pounds
Se	Japan	0.02451 acre
Seer	India	2.057 pounds
Shaku	Japan	11.9303 inches
Sho	Japan	0.48 gallon
Standard (lumber)	Northern Europe	165 cubic feet
Stone	British	14 pounds
Suerte	Uruguay	7.69 square miles
Sun	Japan	1.193 inches
Tael	Cochin China	590.75 grains (troy)
Tan	Japan	0.25 acre 9,884 sq. ft.
To	Japan	2 pecks
Ton (cargo)	Space measure	40 cubic feet
Tonde (cereals)	Denmark	3.94783 bushels
Tondeland	Denmark	1.36 acres
Tsubo	Japan	3.9 square yards
Tsun	China	1.26 inches
Tunna	Sweden	4.16 bushels
Tunnland	Sweden	1.22 acres
Vara	Argentina, Paraguay	34.1208 inches
	Central America	32.87 inches
	Chile and Peru	33 inches
	Cuba	33.384 inches
	Mexico and Spain	33 inches
	Venezuela	33.384 inches
Vedro	Russia	3.249 gallons
Verst	Russia	0.6629 mile
Wlocka	Poland	41.5 acres

for instance, these names are *dimanche, lundi, mardi, mercredi, jeudi, vendredi* and *samedi.* In England, a language of Teutonic origin, the days of the week were similarly named. Sunday and Monday are the days sacred to the Sun and Moon. Tuesday was named for Tiu, the Teutonic god of war; and Wednesday is the day of Woden or Odin, a Teutonic deity something like Mercury. Thursday is the day of Thor, the Teutonic god of thunder; and Friday that of Frigg, Odin's wife and the Teutonic goddess of the sky; but Saturday was named for Saturn, the ancient Roman god of sowing.

BIBLIOGRAPHY

Jessie H. Bancroft, *Games,* Macmillan, N.Y., 1937, $3.00

Neva L. Boyd, *Hospital and Bedside Games,* Recreation Department, Chicago School of Civics and Philanthropy, Chicago, 35¢

Boy Scouts of America, *Handbook for Boys,* Boy Scouts of America, N.Y., 1935, 35¢

Girl Scouts, Inc., *Girl Scout Handbook,* Girl Scouts, Inc., N.Y., 1934, 60¢

E. R. Hewitt, *Hewitt's Handbook of Fly Fishing,* Marchbanks Press, N.Y., 1933, $1.50

Nathan Holman, *Winning Basketball,* Scribners, N.Y., 1932, $2.00

Mabel Reagh Hutchins, *Creative Handicrafts,* Leisure League of America, N.Y., 1938, No. 30, 25¢

Elon Jessup, *Snow and Ice Sports,* E. P. Dutton, N.Y., 1923, $3.50

T. E. Jones, *Track and Field,* Scribners, N.Y., 1925, $2.00

Horace Kephart, *Camping and Woodcraft,* Macmillan, N.Y., 1921, $2.50

Dorothy La Salle, *Play Activities for Elementary Schools,* A. S. Barnes, N.Y., 1929, $2.00

Lou Little, *How to Watch Football,* McGraw-Hill, N.Y., 1935, $2.50

D. W. Lovelace, *Rockne of Notre Dame,* Putnam, N.Y., 1931, $2.00

B. S. Mason and E. D. Mitchell, *Active Games and Contests,* A. S. Barnes, N.Y., 1935, $3.00

Bernard F. Mooney, *Wrestling for Beginners,* M. & M. Pub. Co., Columbus, Ohio, 1935, $1.00

National Recreation Association, N.Y.: *88 Successful Play Activities,* 1936, 60¢
  Games for the Playground, 1936, 25¢

H. A. Reynolds, *Game Way to Sports,* A. S. Barnes, N.Y., 1937, $2.00

Babe Ruth, *Babe Ruth's Baseball Advice,* Rand McNally, Chicago, 1936, 10¢

Otto Schniebs, *Skiing for All,* Leisure League of America, N.Y., 1936, No. 29, 25¢

Ben Solomon, *Hiker's Guide,* Leisure League, N.Y., 25¢

Spalding's Athletic Library, American Sports Pub. Co., N.Y.:
  Basketball for Women, 1929, 25¢
  Field Hockey Guide, 1928, 25¢
  Golf Guide, 1930, 35¢
  Volley Ball, 1928, 25¢
  Baseball Guide (Annual), 35¢
  Tennis (Annual), 25¢
  Basketball (Annual), 35¢

William T. Tilden, *Art of Lawn Tennis,* Garden City Pub. Co., Garden City, N.Y., $1.00

Frederic R. Toombs, *How to Wrestle,* American Sports Pub. Co., N.Y., 1932, 25¢

Charles D. Wardlaw, *Fundamentals of Baseball,* Scribners, N.Y., 1924, $2.00

John Weissmuller and C. A. Bush, *Swimming the American Crawl,* Houghton Mifflin, Boston, 1930, $2.50

Helen Wills, *Tennis,* Scribners, N.Y., 1928, $2.50

Manual of Classified Questions for Examinations, Reading and Study Courses

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Distinguish between *imply* and *infer.* 160a

Does *monstrous* mean large? 160b

What is wrong with the sentence "I only have three dollars"? 160c

Is *phenomena* singular or plural? . 160c

Is "thanking you for your attention to this matter, we remain" a good closing for a letter? 165b

What are important differences between spoken style and written style? 167a

What is meant by parsing a sentence? 145b

Diagram the following sentence: "To play the piano well is an accomplishment." 146a

Do the following nouns ordinarily take singular or plural verbs: *mathematics, politics, mumps, news?* 146c

Insert the correct forms of *lie* or *lay* in the following sentences:
  (a) I have   it there daily for some time.
  (b) The book now   on the table.
  (c) It has often   there before.
  (d) It   there yesterday.
  (e) I now   the book on the table.
  (f) I   it there last night... 160a

What is metonymy? 151a

Give the plurals of *ox, sheep, crisis, volcano, piano, datum* .... 140a, b

Of what value is an outline in preparing a composition? 155c, 156a

Of what value is the study of foreign languages? 170a

What is the difference between a stimulant and a stimulus? 161b

What is meant by overlearning? .. 139b

Literature

What book was written in a single week to defray the expenses of the funeral of the author's mother? 207c

Who "wrote like an angel but talked like poor Poll"? 207c

Who were the Lake Poets? 252c

In German literary history, what is meant by the *Sturm und Drang?* 228a

Who was the greatest genius of Spanish literature? 235c

What contemporary of Shakespeare is said to have written more than 2,000 plays? 236a

Who took for his motto the skeptical words "Que sais-je?" 222c

Who were the three great dramatists of the age of Louis XIV in France? 223a

Who wrote a famous epigram on the heroic dead of the battle of Thermopylae? 193b
What American patriotic air is taken from an English drinking song? 194b
What play was selected by Aristotle as the finest Greek drama? 194c
What is the origin of the word *philippic,* meaning a denunciatory speech or pamphlet? 195c
What is the earliest and greatest of books describing a Utopia? 195c
What were the miracle and morality plays? 254c, 255a
Who wrote of Shakespeare "He was not of an age, but for all time"? 205c
What is the importance of the King James Bible in the development of English style? 206a
What book of the Bible is a profound discussion of the philosophical problem of evil? 302a
What were the Twelve Labors of Hercules? 280b, c
Tell briefly the story of Oedipus 287b
Who wanted to be written down "as one who loves his fellow-men"? 237a
What is *The Greek Anthology?* 239a
What English poet wrote an eloquent defense of free speech? 189c
What is usually considered the greatest English biography? 207c
Who were the minnesingers? 254c
Name five English poets laureate 257b
Who were the Yahoos? 267c
What is the origin of the pen name *Mark Twain?* 309c
What is meant by the "Enlightenment" in French literature? 224a
Who wrote the poem *Ichabod,* attacking Daniel Webster? 218a
Who was Babe, the Blue Ox? 289a
What have *Erewhon, Looking Backward* and *Utopia* in common? 246c; 253c; 264a
How did the Sirens lure mariners to destruction? 293c
Who wrote *Tale of a Tub?* 207a
What was Transcendentalism? 217b
What is meant in literature by impressionism? 250c
Why did King Lear disinherit Cordelia? 252b
Who were the earliest users of English blank verse? 204b
What is the leading doctrine of Rousseau's treatise on education, *Emile?* 224a
Name ten leading English writers of the 18th century 207
What was the remarkable thing about Cassandra? 274b
What was the name of Arthur's famous sword? 277b
How did Odysseus get out of the Cyclops's cave? 287b
Who was Hosea Biglow? 241b
Who wrote *The Man Without a Country* and what is its theme? 254a
Who was Wackford Squeers of Dotheboy's Hall? 255b
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Who was Mr. Dooley? 307c
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Geography

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In what state is the southern iron and steel industry concentrated? 362a
What is the great mountain system of South America? What are its highest peaks? 366b
What is an archipelago? 370a
What state produces 96 per cent of the aluminum ore produced in the United States? 373b
Where is the Sea of Azov? 379c
What is a bore? 387a
What is the predominant agricultural product of Brazil? 389b
What is the capital and chief city of Ceylon? 400a
What are important natural products of Burma? 393a
What are the nine provinces of Canada? 395b
Where is the greater part of the world's nickel found? 396b
What is the world's largest inland sea? 398c
In what state is the brass and bronze industry of the United States chiefly concentrated? 407c
Where and what are the Cyclades? 412a
What is meant by the fall line? 428a
What is a geyser? 440c
Where is the Gobi Desert? 441b
In what range are the highest mountains in the world? 450b
What falls in South America are greater than Niagara in height and width? 453c
What is the largest lake in Europe? 469a
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Where are the most important petroleum deposits of Europe? 543a
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Where is most of the petroleum of South America produced? 353b
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What are the most important industries and products of Alabama? 361c
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What were the *lettres de cachet?* 722a
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West Virginia 2334
Wisconsin 2335
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THE WORLD

Pop., Thous.

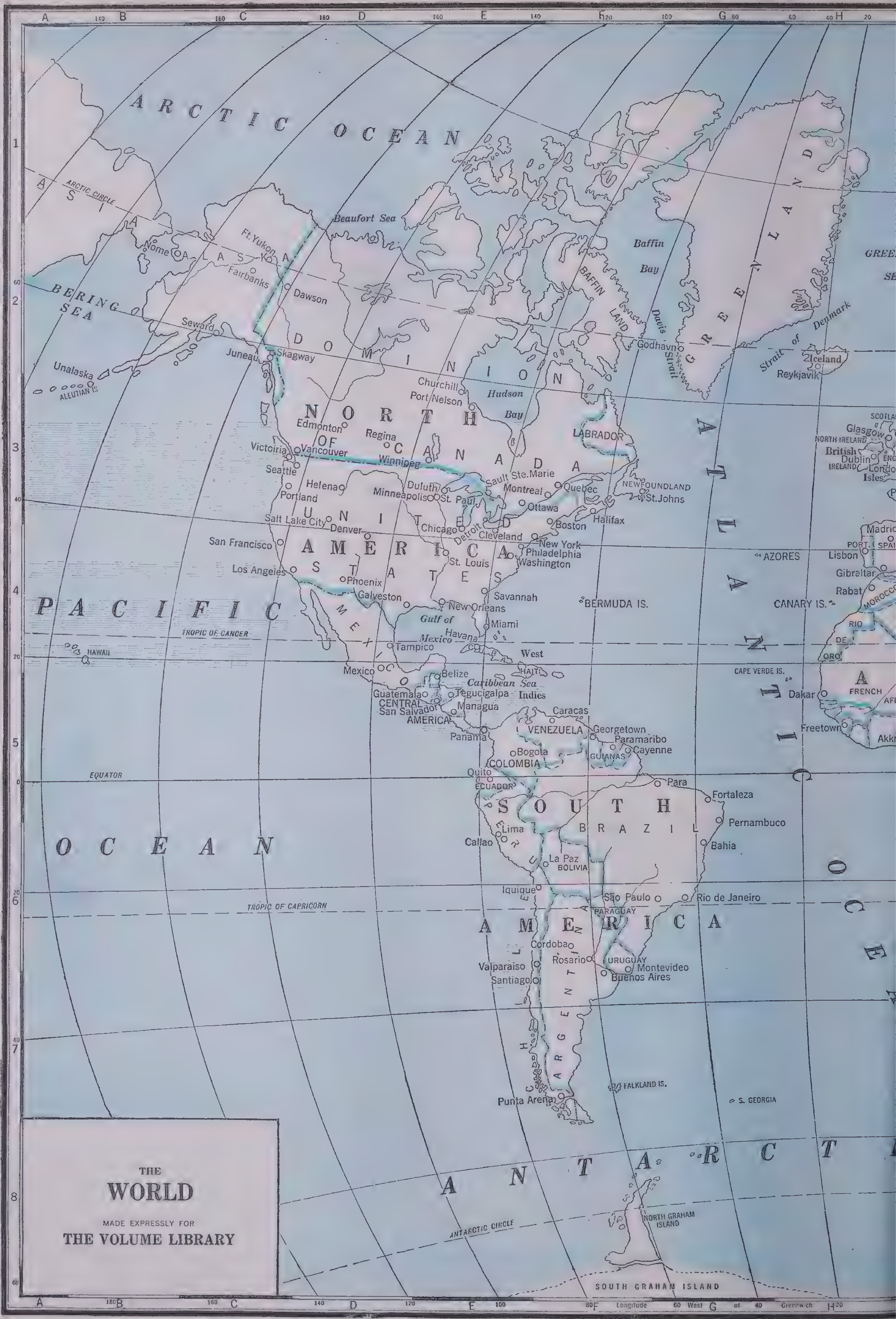
2,136,767

Continents. Islands, etc.

Name	Key	Pop. Thous.
Africa	5K	166,390
Aleutian Islands	2Q & 3B	
Asia	3M	1,098,054
Australia	6O	6,753
Azores	4G	253
Baffin Land	2F	
Bermuda Is.	4F	29
Borneo	5O	2,471
British Isles	3H	47,200
Canary Is.	4H	632
Celebes	5O	4,226
Cuba	4E	4,011
Europe	3K	541,278
Falkland Is.	7F	2
Fiji Is.	6Q	202
Fridtjof Nansen Land	1K	1
Greenland	2G	17
Guam	5P	22
Haiti	4E	3,200
Hawaii	4B	423
Iceland	2H	114
Japan	4P	97,697
Java	5O	42,521
Madagascar	6L	3,372
New Caledonia	6Q	57
Newfoundland	3F	277
New Guinea	5P	545
New Zealand	7Q	1,587
North America	3D	182,810
Novaya Zemlya	2K	1
Philippines	5O	16,356
South America	6F	89,847
South Georgia	7G	1
Spitsbergen (Svalbard)	1J	2
Sumatra	5N	8,238
Taiwan (Formosa)	4O	5,212
Tasmania	7P	231
West Indies	4E	1,605

Cities

Name	Key
Addis Ababa	5K
Adelaide	7P
Aden	5L
Akkra	5J
Albany	6O
Alexandria	4K
Algiers	4J
Angora	4K
Antananarivo	6L
Archangel	2K
Athens	4K
Auckland	7Q
Bagdad	4L
Bahia	6G
Bangkok	5N
Beira	6K
Belize	5E
Benghazi	4K
Berlin	3J
Bogota	5E
Boma	5J
Bombay	4M
Boston	3F
Brisbane	6P
Bucharest	3K
Budapest	3K
Buenos Aires	7F
Cairo	4K
Calcutta	4M
Callao	6E
Canberra	7P
Canton	4O
Cape Town	6J
Caracas	5F
Cayenne	5F
Chicago	3E
Churchill	3E
Cleveland	4E
Colombo	5M
Cordoba	6F
Dakar	5H
Damascus	4K
Darien	3O
Dawson	1Q & 2C
Delhi	4M
Denver	4D
Detroit	4E
Diego Suarez	6L
Dublin	3H


A
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8
ARCTIC OCEAN
ARCTIC CIRCLE
ASIA
BERING SEA
Beaufort Sea
ALASKA
Nome
Ft. Yukon
Fairbanks
Dawson
Seward
Juneau
Skagway
Unalaska
ALEUTIAN IS.
DOMINION OF CANADA
NORTH AMERICA
Baffin Bay
BAFFIN LAND
Davis Strait
GREENLAND
Godhavn
Strait of Denmark
Iceland
Reykjavik
GREENLAND SEA
Churchill
Port Nelson
Hudson Bay
LABRADOR
Edmonton
Regina
Winnipeg
Victoria
Vancouver
Seattle
Helena
Portland
Duluth
Minneapolis
St. Paul
Sault Ste. Marie
Montreal
Quebec
Ottawa
NEWFOUNDLAND
St. Johns
Halifax
Boston
Salt Lake City
Denver
Chicago
Detroit
Cleveland
New York
Philadelphia
Washington
San Francisco
UNITED STATES OF AMERICA
St. Louis
Los Angeles
Phoenix
Galveston
New Orleans
Savannah
BERMUDA IS.
AZORES
Lisbon
Madrid
PORT.
SPAIN
Gibraltar
Rabat
MOROCCO
CANARY IS.
RIO DE ORO
SCOTLAND
Glasgow
NORTH IRELAND
British Isles
Dublin
IRELAND
London
ENG.
PACIFIC OCEAN
TROPIC OF CANCER
HAWAII
Gulf of Mexico
Miami
Havana
Tampico
MEXICO
Mexico
West Indies
HAITI
Belize
Caribbean Sea
Guatemala
Tegucigalpa
San Salvador
Managua
CENTRAL AMERICA
Panama
CAPE VERDE IS.
Dakar
FRENCH
AFRICA
Freetown
Akkra
ATLANTIC OCEAN
Caracas
VENEZUELA
Georgetown
Paramaribo
Cayenne
GUIANAS
Bogota
COLOMBIA
Quito
ECUADOR
EQUATOR
Para
Fortaleza
Pernambuco
Bahia
SOUTH AMERICA
BRAZIL
PERU
Lima
Callao
La Paz
BOLIVIA
Iquique
São Paulo
Rio de Janeiro
TROPIC OF CAPRICORN
PARAGUAY
Cordoba
Rosario
URUGUAY
Montevideo
Buenos Aires
Valparaiso
Santiago
CHILE
ARGENTINA
FALKLAND IS.
S. GEORGIA
Punta Arenas
ANTARCTIC
ANTARCTIC CIRCLE
NORTH GRAHAM ISLAND
SOUTH GRAHAM ISLAND
Longitude 60 West of 40 Greenwich

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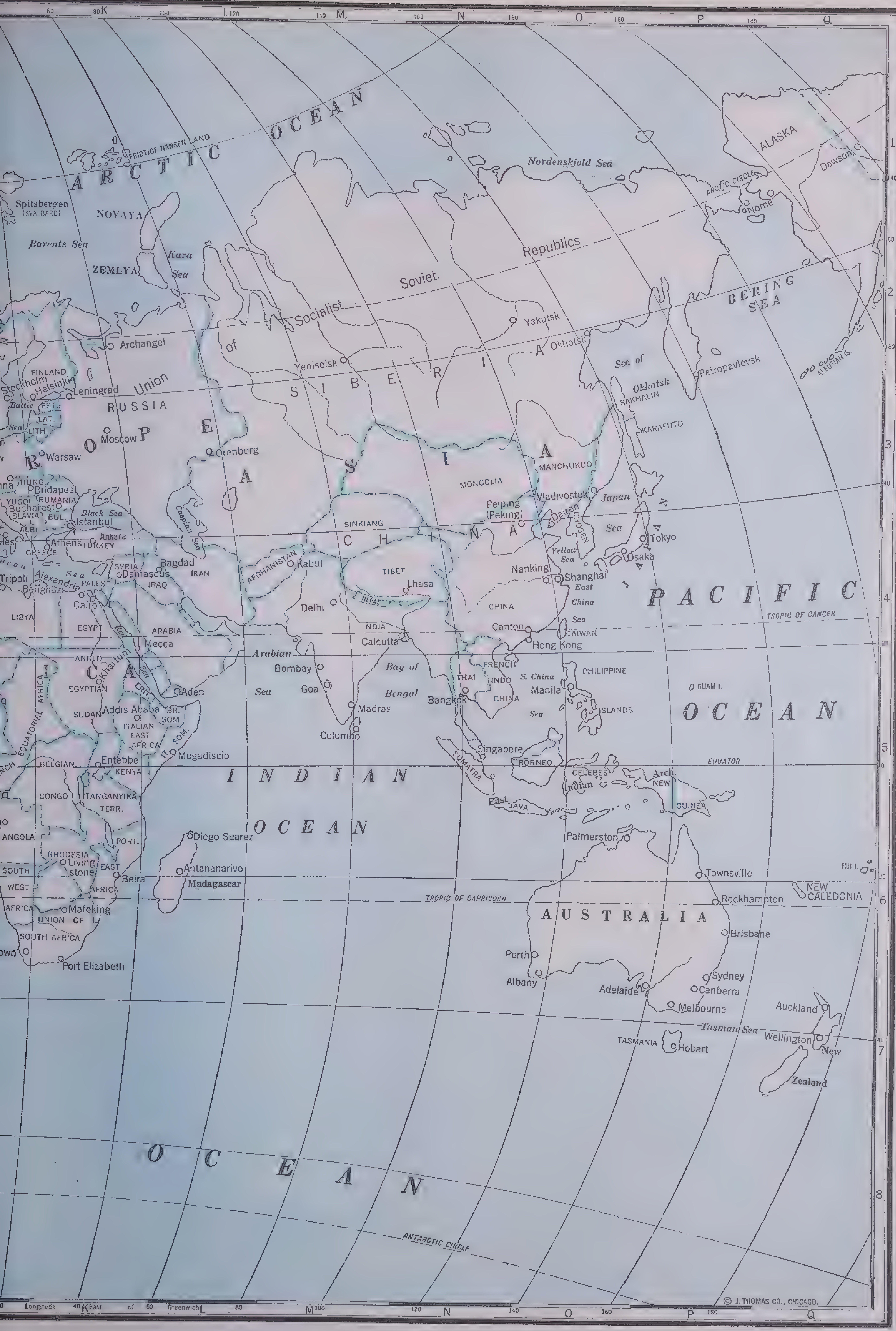
ARCTIC OCEAN
FRIDTJOF NANSEN LAND
Spitsbergen (SVALBARD)
NOVAYA ZEMLYA
Barents Sea
Kara Sea
Nordenskjold Sea
ALASKA
Dawson
Nome
ARCTIC CIRCLE
Union of Soviet Socialist Republics
BERING SEA
ALEUTIAN IS.
Petropavlovsk
Yakutsk
Okhotsk
Sea of Okhotsk
SAKHALIN
KARAFUTO
Yeniseisk
SIBERIA
Archangel
FINLAND
Stockholm
Helsinki
Leningrad
RUSSIA
EUROPE
Baltic Sea
EST.
LAT.
LITH.
Moscow
Warsaw
Orenburg
HUNG.
Budapest
YUGOSLAVIA
RUMANIA
Bucharest
BUL.
Black Sea
Istanbul
ALB.
Athens
GREECE
TURKEY
Ankara
Caspian Sea
ASIA
MANCHUKUO
MONGOLIA
Vladivostok
Japan Sea
Peiping (Peking)
Dairen
CHOSEN
Tokyo
Osaka
JAPAN
Yellow Sea
SINKIANG
CHINA
TIBET
Lhasa
NEPAL
AFGHANISTAN
Kabul
IRAN
Bagdad
IRAQ
SYRIA
Damascus
PALEST.
Mediterranean Sea
Tripoli
Alexandria
Benghazi
Cairo
LIBYA
EGYPT
ARABIA
Mecca
Red Sea
Delhi
INDIA
Calcutta
Nanking
Shanghai
East China Sea
TAIWAN
Canton
Hong Kong
TROPIC OF CANCER
PACIFIC OCEAN
Arabian Sea
Bombay
Goa
Bay of Bengal
Madras
Colombo
THAI
Bangkok
FRENCH INDO CHINA
S. China Sea
Manila
PHILIPPINE ISLANDS
GUAM I.
AFRICA
ANGLO-EGYPTIAN SUDAN
Khartum
ERIT.
Aden
Addis Ababa
BR. SOM.
ITALIAN EAST AFRICA
IT. SOM.
Mogadiscio
FRENCH EQUATORIAL AFRICA
BELGIAN CONGO
Entebbe
KENYA
TANGANYIKA TERR.
ANGOLA
RHODESIA
Livingstone
PORT. EAST AFRICA
Beira
SOUTH WEST AFRICA
Mafeking
UNION OF SOUTH AFRICA
Port Elizabeth
Diego Suarez
Antananarivo
Madagascar
INDIAN OCEAN
Singapore
SUMATRA
BORNEO
CELEBES
EQUATOR
East Indian Arch.
JAVA
NEW GUINEA
Palmerston
Townsville
FIJI I.
NEW CALEDONIA
TROPIC OF CAPRICORN
Rockhampton
AUSTRALIA
Brisbane
Perth
Albany
Adelaide
Sydney
Canberra
Melbourne
Auckland
Tasman Sea
Wellington
New Zealand
TASMANIA
Hobart
OCEAN
ANTARCTIC CIRCLE
K L M N O P Q
1 2 3 4 5 6 7 8
60 80 100 120 140 160 180 160 140
Longitude East of Greenwich
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Name	Key
Duluth	3E
Edmonton	3D
Entebbe	5K
Fairbanks	2C
Fortaleza	5G
Ft. Yukon	2C
Freetown	5H
Galveston	4D
Georgetown	5F
Gibraltar	4H
Glasgow	3H
Goa	5M
Godhavn	2G
Guatemala	5D
Halifax	3F
Havana	4E
Helena	3D
Helsinki	3K
Hobart	7P
Hong Kong	4O
Iquique	6E
Istanbul (Constantinople)	4K
Jerusalem	4K
Juneau	2C
Kabul	4M
Kano	5J
Khartum	5K
Lagos	5J
La Paz	6F
Leningrad	3K
Lhasa	4N
Lima	6E
Lisbon	4H
Livingstone	6K
Loanda	6J
London	3H
Los Angeles	4C
Madras	5M
Madrid	4H
Mafeking	6K
Managua	5E
Manila	5O
Mecca	4K
Melbourne	7P
Mexico City	4D
Miami	4E
Milan	3J
Minneapolis	3E
Mogadiscio	5L
Montevideo	7F
Montreal	3F
Moscow	3K
Nanking	4O
Naples	4J
New Orleans	4E
New York	4E
Nidaros	2J
Nome	1Q & 2B
Orenburg	3L
Okhotsk	2O
Osaka	4O
Oslo	3J
Ottawa	3E
Palmerston	6O
Panama	5E
Para	5F
Paramaribo	5F
Paris	3J
Peiping (Peking)	3O
Pernambuco	6G
Perth	6O
Petropavlosk	2P
Philadelphia	4E
Phoenix	4D
Port Elizabeth	6K
Portland	3C
Port Nelson	3E
Punta Arena	7F
Quebec	3F
Quito	5E
Rabat	4H
Regina	3D
Reykjavik	2H
Rio de Janeiro	6G
Rockhampton	6P
Rome	4J
Rosario	6F
St. Johns	3F
St. Louis	4E
St. Paul	3E
Salt Lake City	3D
San Francisco	4C
San Salvador	5E
Santiago	7E
Sao Paulo	6F
Sault Ste. Marie	3E
Savannah	4E
Seattle	3C
Seward	2C
Shanghai	4O
Singapore	5N
Skagway	2C
Stockholm	3J
Sydney	6P
Tampico	4D
Tegucigalpa	5E
Tokyo	4P
Townsville	6P
Tripoli	4J
Tunis	4J
Unalaska	2B
Valparaiso	6E
Vancouver	3C
Victoria	3C
Vienna	3J
Vladivostok	3O
Warsaw	3K
Washington	4E
Wellington	7Q
Winnipeg	3D
Yakutsk	2N
Yeniseisk	2M

NORTH AMERICA

Pop., Thous., 182,810

Area, Sq. Miles, 8,559,00

Political Divisions, Islands, etc.

[illegible]

Towns Exclusive of United States

[illegible]

Towns in United States

[illegible]

Columbia	[illegible]
Columbus	[illegible]
Dallas	[illegible]
Denver	[illegible]
Des Moines	[illegible]
Detroit	[illegible]

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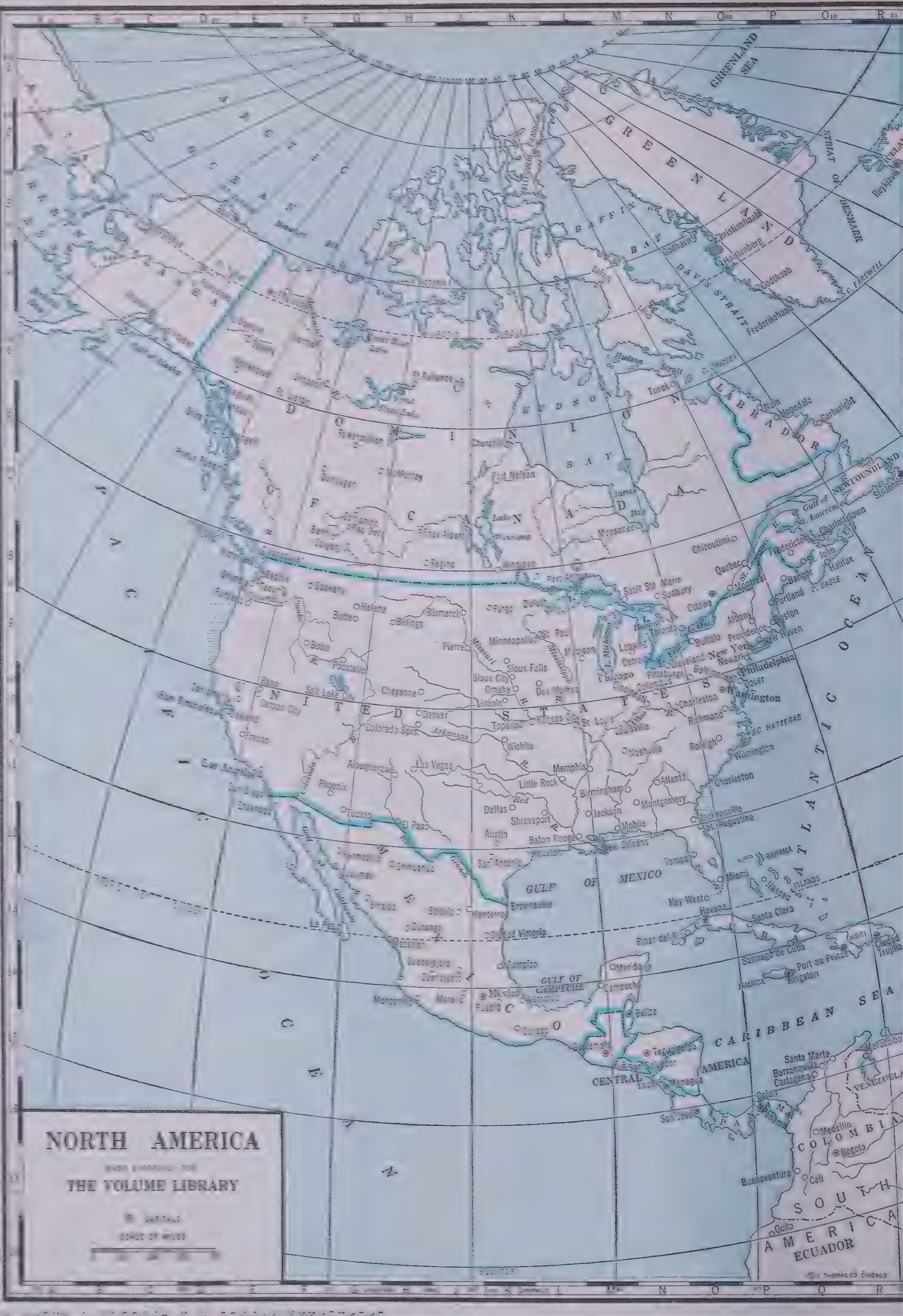
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DAVIS STRAIT
STRAIT OF DENMARK
Reykjavik
Godhavn
Christianshaab
Holstenborg
Godthaab
Frederikshaab
C. FAREWELL
Hudson Strait
LABRADOR
Nain
Hopedale
Cartwright
NEWFOUNDLAND
Gulf of St. Lawrence
St. Johns
Charlottetown
Fredericton
St. John
Halifax
C. SABLE
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James Bay
Churchill
Port Nelson
Moosonee
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Great Slave Lake
Great Bear Lake
Gulf of Alaska
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Manzanillo
Morelia
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Puebla
Oaxaca
MEXICO
Gulf of California
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Merida
Campeche
Belize
Havana
Santa Clara
Pinar del Rio
Santiago de Cuba
HAITI
Port au Prince
Ciudad Trujillo
JAMAICA
Kingston
CARIBBEAN SEA
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Guatemala
Tegucigalpa
San Salvador
Leon
Managua
San Jose
Colon
Panama
Santa Marta
Barranquilla
Cartagena
Maracaibo
VENEZUELA
COLOMBIA
Medellin
Bogota
Buenaventura
Cali
Quito
ECUADOR
SOUTH AMERICA
PACIFIC OCEAN
ATLANTIC OCEAN
Missouri
Mississippi
Arkansas
Red
Rio Grande
Colorado
Snake
L. Superior
L. Michigan
L. Huron
L. Erie
L. Ont.
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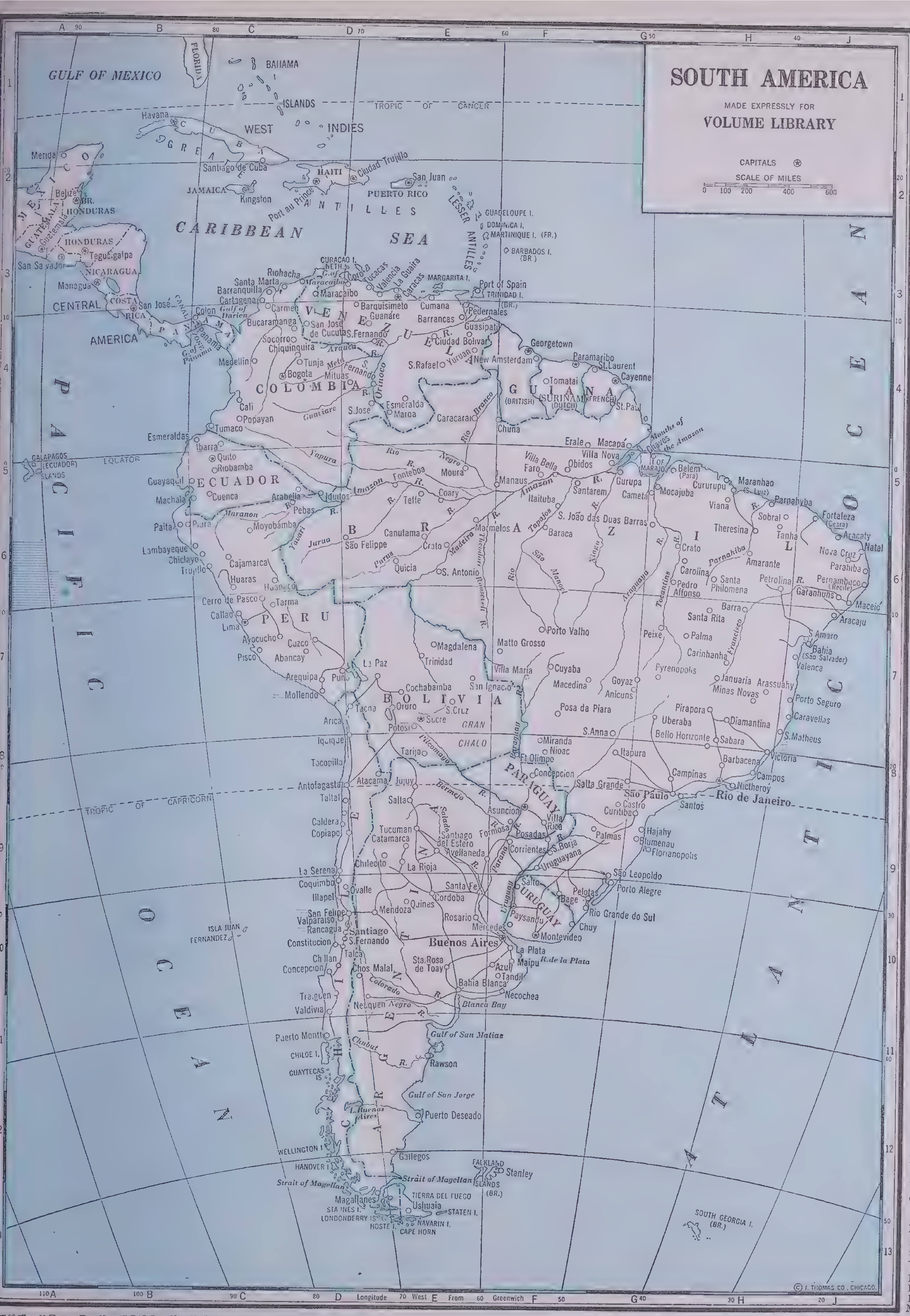
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BAHAMA ISLANDS
TROPIC OF CANCER
WEST INDIES
GREAT ANTILLES
LESSER ANTILLES
CARIBBEAN SEA
CUBA
Havana
HAITI
JAMAICA
Kingston
Port au Prince
Ciudad Trujillo
San Juan
PUERTO RICO
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Merida
Belize
BR. HONDURAS
GUATEMALA
HONDURAS
Tegucigalpa
San Salvador
NICARAGUA
Managua
COSTA RICA
San José
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CANAL ZONE
Colon
Panama
G. of Panama
VENEZUELA
Caracas
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Bogota
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Quito
Guayaquil
PERU
Lima
Callao
BOLIVIA
La Paz
Sucre
GRAN CHACO
PARAGUAY
Asuncion
CHILE
Santiago
Valparaiso
ARGENTINA
Buenos Aires
URUGUAY
Montevideo
GUIANA
BRITISH
Georgetown
SURINAM (DUTCH)
Paramaribo
FRENCH
Cayenne
BRAZIL
Rio de Janeiro
São Paulo
Amazon R.
Mouths of the Amazon
EQUATOR
TROPIC OF CAPRICORN
GALAPAGOS ISLANDS (ECUADOR)
ISLA JUAN FERNANDEZ
CHILOE I.
GUAYTECAS IS.
WELLINGTON I.
HANOVER I.
Strait of Magellan
TIERRA DEL FUEGO
Ushuaia
STATEN I.
CAPE HORN
FALKLAND ISLANDS (BR.)
Stanley
SOUTH GEORGIA I. (BR.)
PACIFIC OCEAN
ATLANTIC OCEAN
Longitude West From Greenwich
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SOUTH AMERICA

Pop., Thous., 89,847

Area, Sq. Miles, 7,598,000

Political Divisions, Islands, etc.

Name	Key	Pop. Thous.
Argentina	10E	12,402
Barbados Islands	3F	182
Bolivia	7E	3,170
Brazil	6G	47,794
Chiloe Island	11D	
Chile	10D	4,507
Colombia	4C	8,665
Cuba (West Indies)	1C	4,011
Curacao Island	3D	87
Ecuador	5C	2,701
Falkland Islands	12F	2
Galapagos Islands	5A	2
Guadeloupe Island (West Indies)	2E	268
Guiana, British	4F	328
Dutch	4F	144
French	4G	25
Haiti (West Indies)	2D	3,200
Jamaica (West Indies)	2C	1,121
Margarita Island	3E	
Martinique Island	2E	246
Paraguay	8F	926
Peru	6C	6,147
Puerto Rico (West Indies)	2E	1,723
South Georgia	13H	1
Staten Island	13E	
Trinidad Island	3E	439
Uruguay	10F	2,040
Venezuela	3D	3,206

Towns

Name	Key	Pop. Thous.
Antofagasta	8D	53
Aracaju	6J	38
Arequipa	7D	46
Asuncion	9F	97
Azul	10F	59
Bage	9F	35
Bahia (São Salvador)	7J	363
Bahia Blanca	10E	108
Barbacena	8H	100
Barranquilla	3C	150
Belém (Pará)	5G	311
Bello Horizonte	8H	108
Blumenau	9G	112
Bogota	4C	350
Bucaramanga	3C	45
Buenos Aires	10F	2,268
Cali	4C	115
Callao	6C	63
Campinas	8G	150
Campos	8H	227
Caracas	3D	135
Cartagena	3C	105
Cayenne	4G	10
Cochabamba	7E	49
Chiclayo	6C	35
Concepcion (Chile)	10D	77
Cordoba	9E	309
Corrientes	9F	53
Cuenca	5C	44
Curitiba	8G	100
Cuyaba	7F	34
Cuzco	7D	40
Diamantina	8H	70
Fortaleza (Ceara)	5J	98
Garanhuns	6J	65
Georgetown	4F	65
Guayaquil	5B	136
Havana (Cuba)	1B	550
Iquique	8D	10
Kingston (Jamaica)	2C	72
La Paz	7D	150
La Plata	10F	190
Lima	7C	289
Maceió	6J	103
	13D	21
Manaos	5F	83
Maracaibo	3D	74
Maranhao (S. Luis)	5H	53
Medellin	4C	150
Mendoza	10D	81
Merida (Mexico)	2A	110
Minas Novas	7H	48
Montevideo	10F	674
Natal	6J	30
Nictheroy	8H	125
Oruro	7E	30
Pará	5G	311
Parahiba	6J	53
Paramaribo	4F	52
Parnahyba	5H	74
Paysandu	9F	31
Pelotas	9G	107
Pernambuco (Recife)	6J	472
Popayan	4C	31
Port au Prince (Haiti)	2D	115
Porto Alegre	9G	327
Port of Spain	3E	70
Posadas	9F	29
Potosi	8E	35
Quito	5C	114
Riobamba	5C	23
Rio de Janeiro	8H	1,700
Rio Grande do Sul	10G	48
Rosario	10E	507
Salta	8E	45
Salto	9F	35
San Francisco	5G	32
San Rafael	4E	48
Santa Cruz	8E	31
Santa Fe	9E	140
Santa Marta	3C	23
Santarem	5F	20
Santiago	10D	696
Santiago do Cuba	2C	145
Santos	8G	127
São Leopoldo	9G	37
São Paulo	8G	1,151
Socorro	4C	23
Sucre	8E	26
Theresina	5H	57
Trujillo	6B	30
Tucuman	9E	136
Uberaba	7G	35
Valdivia	11D	34
Valparaiso	10D	193
Villarica	9F	35

CENTRAL AMERICA

Countries

Name	Key	Pop. Thous.
Costa Rica	3B	577
Guatemala	3A	2,245
Honduras	3A	962
Honduras, Br.	2A	55
Nicaragua	3B	829
Panama	3C	483
Panama Canal Zone	3C	51
Salvador	3A	1,574

Towns

Town	Key	Pop. Thous.
Belize	2A	16
Colon	3B	20
Guatemala	3A	131
Managua	3A	32
Panama	3B	74
San José	3B	68
San Salvador	3A	9[illegible]
Tegucigalpa	3A	47

EUROPE

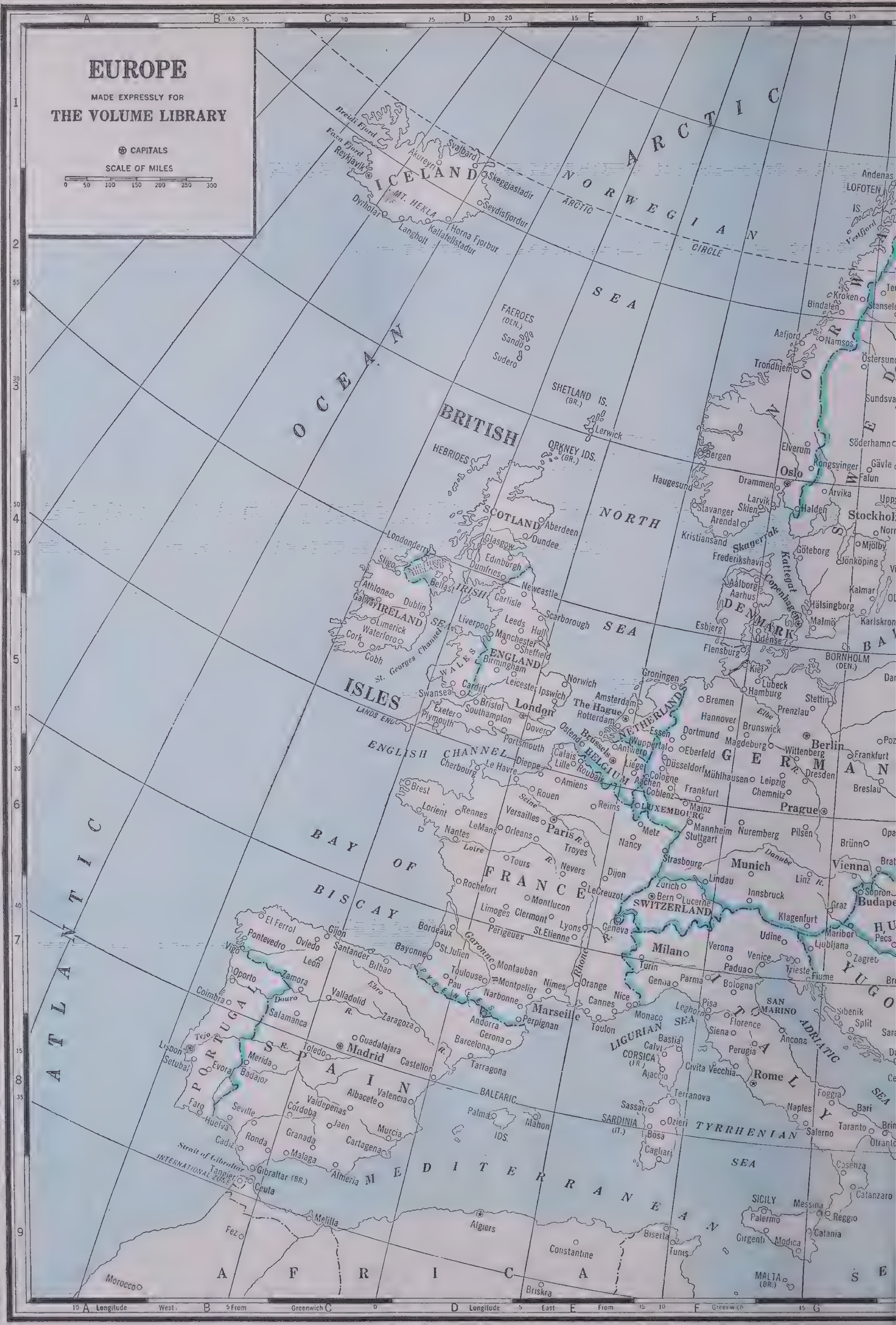
Pop. 541,278,178
Area, Sq. Miles, 4,526,534

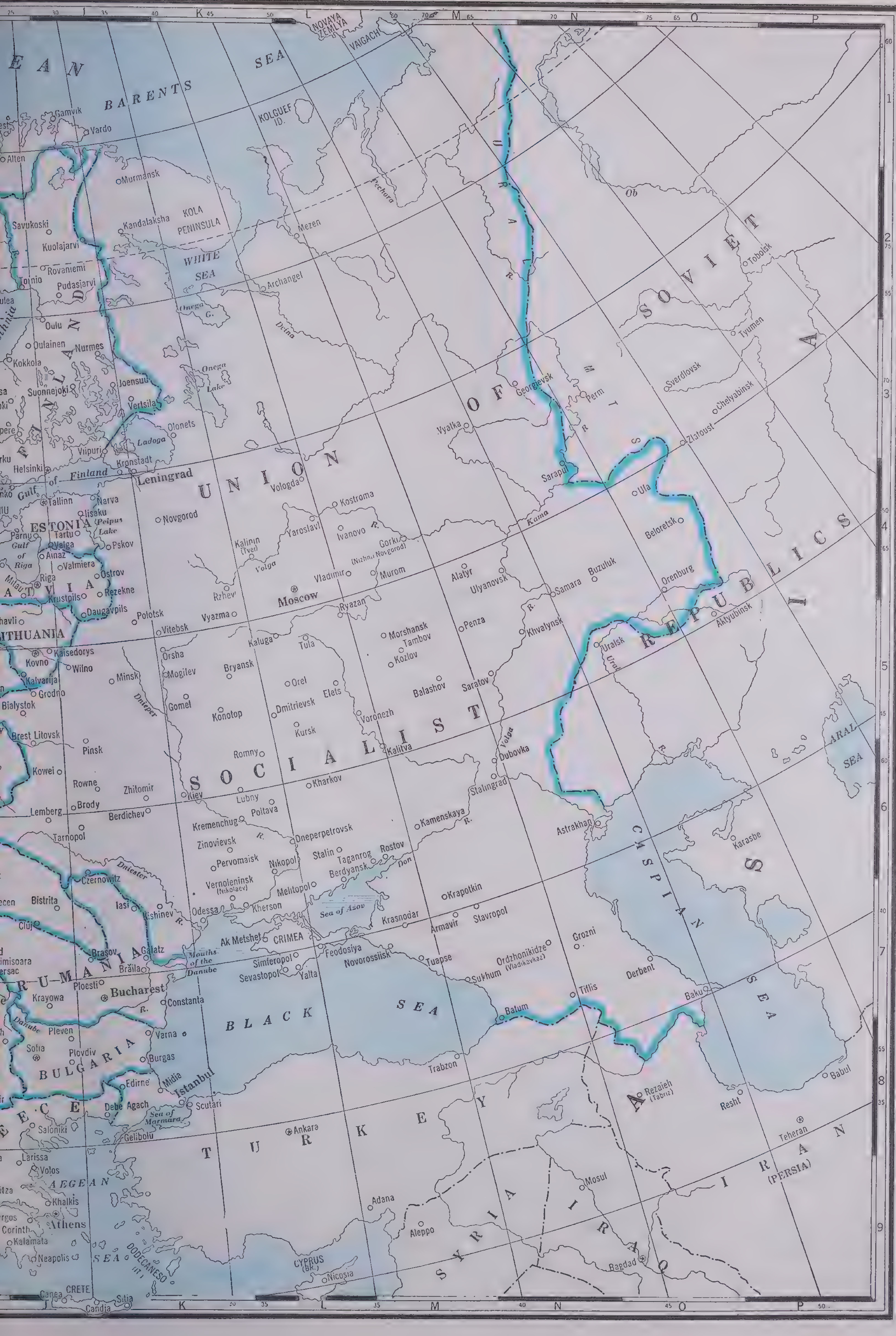
Countries, Islands, Etc.

Name Key Pop. Thous.
Albania 8H.1,003
Andorra 8D....5
Belgium 6E.8,275
British Isles 5D 49,163
Bulgaria 8J.6.090
Cyprus 9L...347
Danzig 5H...407
Denmark 5F 3,706
England 5E 37,936
Estonia . 4J.1,128
Finland 3J.3,762
France 6E.41,905
Germany 6F and 5H 73,000
Gibraltar 9B..21
Greece 8J..6,750
Hungary 7H 8,898
Iceland 1D..114
Ireland 5C.3,033
Italy 8G..42,527
Latvia 4H..1,950
Liechtenstein 7F 10
Lithuania 5J 2,499
Luxemburg 6F 304
Malta 9G....279
Monaco 8F....22
Netherlands 5F 8,474
Northern Ireland 4D 1,256
Norway 3G.2,871
Nova Zemlya 1L 1
Orkney Islands 4E 15
Portugal 8B.6,826
Rumania 7J 19,319
San Marino 8G 14
Sardinia 8F..955
Scotland 4E.4,842
Sicily 9G..4,426
Spain 8C..24,583
Sweden 3H.6,249
Switzerland 7F 4,066
Turkey (in Europe) 8K.1,004
Union of Socialist Soviet Republics (Soviet Russia) 5L pop. in Europe and Asia ..178,300
Vatican City 8G 1
Wales 5D..2,158
Yugoslavia 8H 14,513

TOWNS

Aachen 6F...162
Aberdeen 4D.176
Amsterdam 5E 781
Antwerp 6E..273
Archangel 2L.194
Astrakhan 6N.225
Athens 9J...392
Baku 7O.....709
Barcelona 8D 1,148
Belfast 4D...415
Belgrade 7H.238
Berlin 6G..4,242
Bern 7F.....111
Bilbao 7D...175
Birmingham 5D 1,013
Bologna 7F..266
Bordeaux 7D.258
Braunschweig 6F 166
Bremen 5F...323
Breslau 6G..625
Bristol 5D...413
Brunn 6G....264
Brussels 6E..900
Bucharest 7J.641
Budapest 7H 1,051
Cadiz 8B.....75
Cagliari 8F..105
Calais 6E....67
Candia 9J....33
Cardiff 5D...221
Catania 9G..242
Chemnitz 6F.250
Cologne 6F..756
Copenhagen 5G 843
Córdoba 8C..117
Danzig 5H..407
Debrecen 7H.125
Dneperpetrovsk 6L 379
Dortmund 6F.510
Dresden 6G..642
Dublin 5D...467
Dundee 4E...177


EUROPE
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
⊛ CAPITALS
SCALE OF MILES
0 50 100 150 200 250 300
ARCTIC
NORWEGIAN SEA
ARCTIC CIRCLE
ICELAND
Reykjavik
Svalbard
FAEROES (DEN.)
SHETLAND IS. (BR.)
ORKNEY IDS. (BR.)
HEBRIDES
BRITISH ISLES
SCOTLAND
IRELAND
NORTHERN IRELAND
ENGLAND
WALES
London
NORTH SEA
IRISH SEA
ENGLISH CHANNEL
OCEAN
ATLANTIC
BAY OF BISCAY
FRANCE
Paris
NETHERLANDS
BELGIUM
LUXEMBOURG
GERMANY
Berlin
DENMARK
Copenhagen
Oslo
Stockholm
SWITZERLAND
Bern
PORTUGAL
Lisbon
SPAIN
Madrid
ITALY
Rome
SARDINIA (IT.)
CORSICA (FR.)
SICILY
MALTA (BR.)
BALEARIC IDS.
LIGURIAN SEA
TYRRHENIAN SEA
ADRIATIC SEA
MEDITERRANEAN
Strait of Gibraltar
INTERNATIONAL ZONE
AFRICA
Algiers
Morocco
Longitude West From Greenwich
Longitude East From Greenwich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NOVAYA ZEMLYA
VAIGACH
KOLGUEF ID.
Gamvik
Vardo
Alten
Murmansk
KOLA PENINSULA
Kandalaksha
Savukoski
Kuolajarvi
Rovaniemi
Tornio
Pudasjarvi
WHITE SEA
Onega G.
Archangel
Mezen
Pechora
Oulu
Oulainen
Nurmes
Kokkola
FINLAND
Suonnejoki
Joensuu
Vertsila
Onega Lake
Dvina
Olonets
Ladoga
Viipuri
Helsinki
Kronstadt
Gulf of Finland
Leningrad
Tallinn
Narva
ESTONIA
Iisaku
Peipus Lake
Parnu
Tartu
Valga
Ainaz
Gulf of Riga
Pskov
Valmiera
Riga
Ostrov
LATVIA
Krustpils
Rezekne
Daugavpils
LITHUANIA
Kaisedorys
Kovno
Wilno
Kalvarija
Grodno
Bialystok
Brest Litovsk
Pinsk
Kowel
Rowne
Lemberg
Brody
Tarnopol
Czernowitz
Bistrita
Cluj
Iasi
Kishinev
Brasov
Galatz
Braila
RUMANIA
Ploesti
Bucharest
Constanta
Krayowa
Danube
Pleven
Sofia
Plovdiv
BULGARIA
Varna
Burgas
Edirne
Midie
Istanbul
Scutari
Debe Agach
Sea of Marmara
Gelibolu
GREECE
Saloniki
Larissa
Volos
AEGEAN SEA
Khalkis
Athens
Corinth
Kalamata
Neapolis
DODECANESO (IT.)
CRETE
Canea
Candia
Sitia
Novgorod
Vologda
Kostroma
Yaroslavl
Ivanovo
Kalinin (Tver)
Volga
Gorki (Nizhni Novgorod)
Vladimir
Murom
Rzhev
Moscow
Vyazma
Ryazan
Polotsk
Vitebsk
Orsha
Mogilev
Minsk
Kaluga
Tula
Bryansk
Orel
Gomel
Konotop
Dmitrievsk
Elets
Kursk
Voronezh
Morshansk
Tambov
Kozlov
Penza
Balashov
Saratov
Dnieper
Romny
Kharkov
Kalitva
Dubovka
Zhitomir
Kiev
Lubny
Poltava
Berdichev
Kremenchug
Zinovievsk
Pervomaisk
Dneperpetrovsk
Kamenskaya
Stalingrad
Stalin
Taganrog
Rostov
Don
Berdyansk
Nikopol
Vernoleninsk (Nikolaev)
Melitopol
Dniester
Odessa
Kherson
Sea of Azov
Ak Metshet
CRIMEA
Simferopol
Sevastopol
Yalta
Feodosiya
Novorossiisk
Krasnodar
Armavir
Stavropol
Krapotkin
Tuapse
Sukhum
Ordzhonikidze (Vladikavkaz)
Grozni
Batum
Tiflis
Derbent
Baku
Mouths of the Danube
BLACK SEA
Trabzon
TURKEY
Ankara
Adana
Aleppo
SYRIA
CYPRUS (BR.)
Nicosia
IRAQ
Mosul
Bagdad
IRAN (PERSIA)
Teheran
Rezaieh (Tabriz)
Resht
Babul
CASPIAN SEA
Karasbe
Astrakhan
UNION OF SOVIET SOCIALIST REPUBLICS
Vyatka
Alatyr
Ulyanovsk
Samara
Buzuluk
Khvalynsk
Orenburg
Uralsk
Ural R.
Aktyubinsk
Kama
Sarapul
Ula
Beloretsk
Zlatoust
Chelyabinsk
Sverdlovsk
Tyumen
Tobolsk
Perm
Georgievsk
URAL R.
URAL MTS.
Ob
ARAL SEA
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Dusseldorf	6F	498
Edinburgh	4D	464
Essen	5F	654
Florence	8F	319
Frankfort	6F	555
Frederikshavn	4G	
Gelsenkirchen	6F	332
Geneva	7E	124
Genoa	7F	625
Gibraltar	9B	17
Glasgow	4D	1,124
Gorki (Nizhnii Novgorod)	4M	457
Goteborg	4G	258
Granada	8C	124
Graz	7G	152
Hamburg	5F	1,129
Hannover	5F	433
Havre	6E	164
Helsinki	4J	277
Hull	5E	322
Istanbul	8K	740
Kazan	4M	258
Kharkoff	6L	654
Kieff	6K	538
Kiel	5F	213
Konigsberg	5H	316
Krasnodar	7M	218
Leeds	5E	487
Leghorn	8F	123
Leicester	5E	261
Leipzig	6G	713
Leningrad	4K	2,776
Liége	6E	162
Lille	6E	200
Lisbon	8B	594
Liverpool	5D	857
Lodz	6H	638
London	5E	8,202
Luxemburg	6F	57
Lyon	7E	570
Madrid	8C	1,048
Magdeburg	6F	306
Malaga	8C	203
Malmo	5G	141
Manchester	5D	748
Mannheim	6F	275
Marseilles	8E	914
Milan	7F	1,103
Minsk	5J	180
Moscow	5L	3,663
Munich	6F	735
Murcia	8C	166
Nancy	6E	121
Nantes	6D	195
Naples	8G	860
Newcastle	4E	292
Nice	7E	241
Nikolaev	7K	141
Nuremberg	6F	410
Odessa	7K	497
Oporto	7B	232
Orenburg	5O	144
Orleans	6D	73
Oslo	4G	253
Padua	7F	136
Palermo	9G	408
Paris	6E	2,829
Penza	5M	119
Plymouth	5D	208
Posen	6H	260
Portsmouth	5D	203
Praha (Prague)	6G	848
Reval	4J	134
Reykjavik	1C	34
Riga	4J	385
Rome	8G	1,148
Rostoff	6M	520
Rotterdam	5E	595
Roubaix	6E	107
St. Etienne	7E	190
Saloniki	8J	236
Samara	5N	259
Saratov	5M	327
Seville	8B	238
Sheffield	5E	520
Sofia	8J	287
Stalingrad	6M	388
Stettin	5G	254
Stockholm	4H	533
Strasbourg	6F	193
Stuttgart	6F	415
Szeged	7H	139
Tallin	4J	140
Taranto	8G	116
The Hague	5E	482
Tiflis	7N	405
Toulouse	7D	243
Trieste	7G	242
Tula	5L	199
Turin	7F	623
Tver	4K	145
Ufa	4N	167
Valencia	8D	352
Venice	7G	260
Vienna	6G	1,874
Vilna	5J	207
Voronezh	5L	212
Warsaw	6H	1,225
Wuppertal	6F	408
Zagreb	7G	185
Zaragoza	8D	189
Zurich	7F	249

ASIA

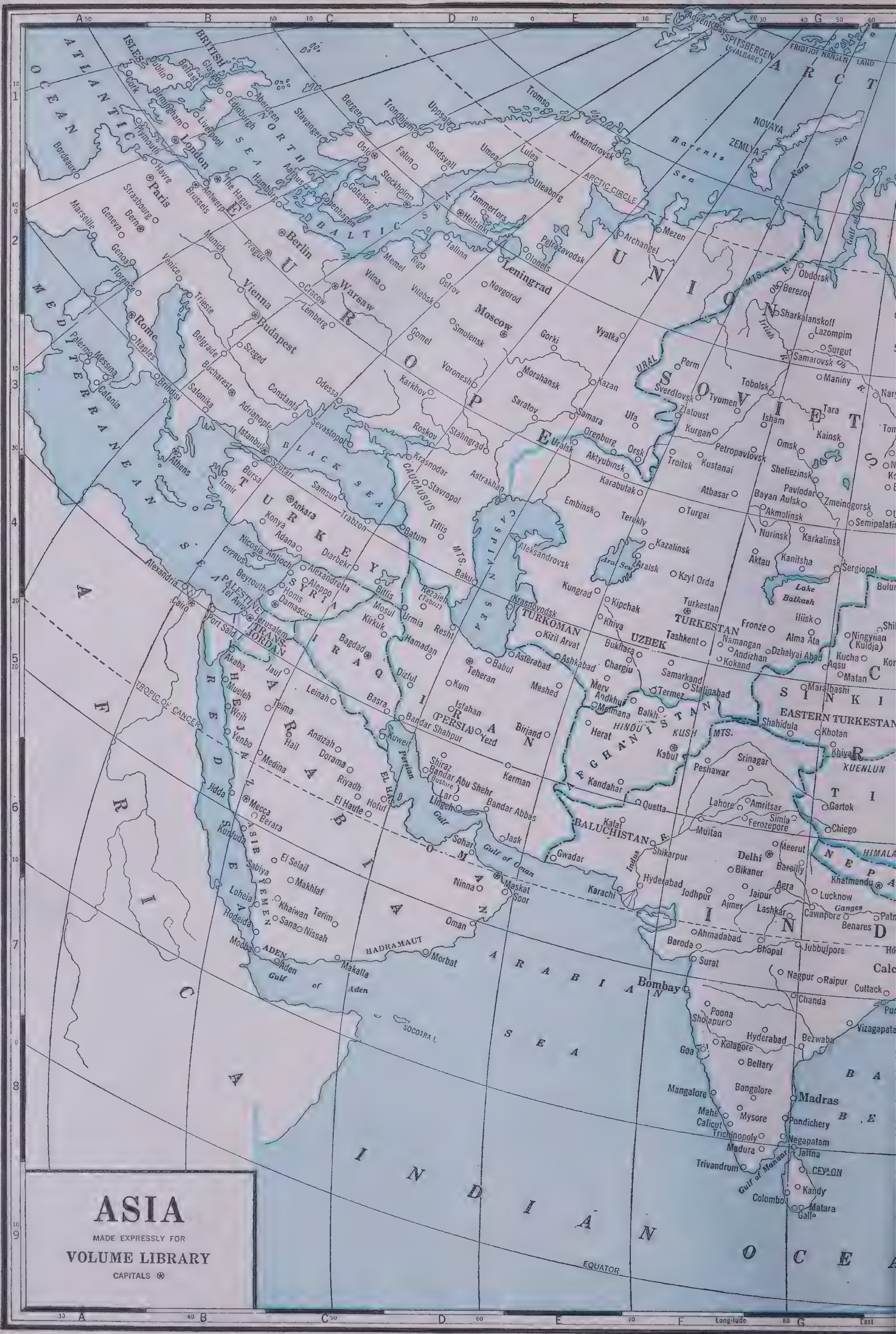
Pop., Thous., 1,098,054
Area, Sq. Miles, 17,255,890

Divisions, Islands, etc.

Name	Key	Pop. Thous.
Aden	7C	151
Afghanistan	6E	12,000
Andaman Is.	8H	14
Annam	8K	5,122
Arabia	6C	10,000
Asir	6B	
Bhutan	6H	300
Borneo	9L	2,194
British North Borneo	8M	277
Burma	7J	14,667
Cambodia	8K	2,806
Celebes	9M	4,226
Ceylon	9G	5,552
China	6K	428,687
Chinese Republic	5J	
Chosen	5M	24,326
Cochin China	8K	4,484
Cyprus	4B	347
Dutch East Indies	9M	60,731
El Koweit	6C	50
Federated Malay States	9K	1,813
Formosa (Taiwan)	6M	5,872
French Indo-China	8K	21,659
Fridtjof Nansen Land	1G	1
Goa	8F	579
Hadramaut	7D	150
Hejaz	5B	3,000
Hong Kong	7L	1,075
India	7G	352,837
Iran (Persia)	5D	15,000
Iraq	5C	3,300
Japan, Empire of	4N	105,226
Kwantung	5L	1,367
Laos	8K	944
Malay Peninsula	8J	1,576
Manchukuo	4L	34,200
Molucca Is.	9N	892
Mongolia	4J	6,160
Nepal	6G	5,600
New Guinea	9O	394
New Siberia Is.	1K	1
Nicobar Is.	9J	9
Novaya Zemlya	1G	1
Oman	7D	500
Palestine	5B	1,336
Philippine Is.	8M	16,356
Sakhalin I.	3M	331
Sarawak	9L	475
Siam	8K	13,502
Siberia	2J	10,335
Sinkiang	5H	2,688
Sokotra I.	7D	12
Straits Settlements	9K	1,114
Sumatra	9K	8,238
Svalbard (Spitsbergen)	1F	2
Syria	4C	3,630
Taiwan (Formosa)	6M	5,212
Tannu Tuva	4L	62
Tonking	8K	8,096
Tibet	6H	3,722
Transjordan	5B	300
Turkestan	5F	1,268
Turkey	4C	16,158
Union of Socialist Soviet Republics	3J	178,300
Yemen	7B	2,500

CITIES

Town	Key	Pop. Thous.
Agra	6G	229
Ahmadabad	7F	313
Allahabad	7G	183
Aleppo	4C	177
Amoy	6L	234
Amritsar	6G	264
Angora	4C	123
Antung	4L	166
Bagdad	5C	175
Bangalore	8G	306
Bangkok	8J	545
Bareilly	6G	144
Barnaul	4H	109
Baroda	7F	112


ASIA
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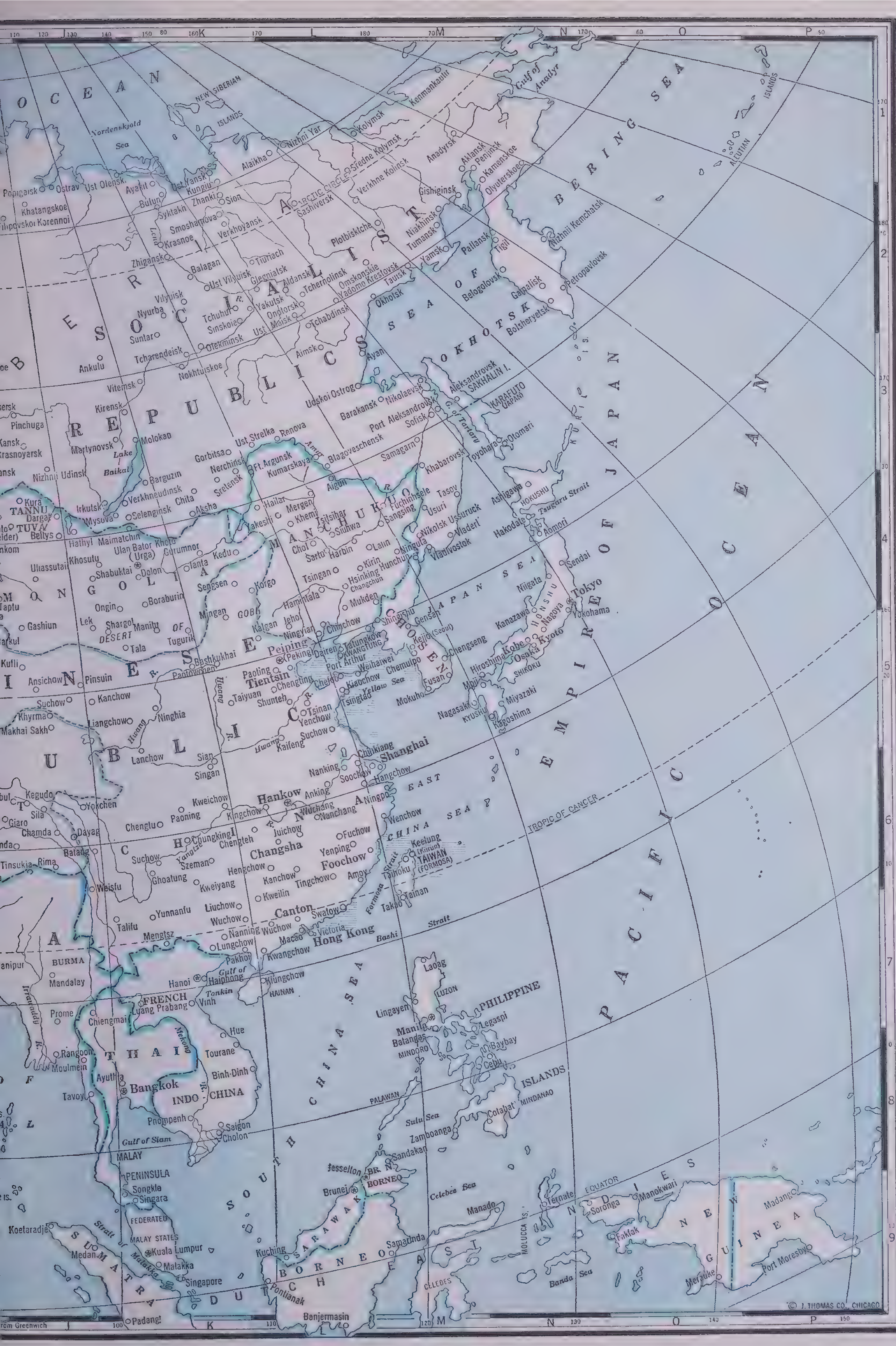
ATLANTIC OCEAN
BRITISH ISLES
NORTH SEA
BALTIC SEA
EUROPE
MEDITERRANEAN SEA
BLACK SEA
CASPIAN SEA
ARCTIC
Barents Sea
Kara Sea
NOVAYA ZEMLYA
SPITSBERGEN (SVALBARD)
FRIDTJOF NANSEN LAND
Advent Bay
ARCTIC CIRCLE
UNION OF SOVIET
URAL MTS.
CAUCASUS MTS.
TURKEY
SYRIA
PALESTINE
TRANS-JORDAN
IRAQ
IRAN (PERSIA)
ARABIA
HEJAZ
ASIR
YEMEN
ADEN
HADRAMAUT
OMAN
AFRICA
RED SEA
Persian Gulf
Gulf of Oman
Gulf of Aden
SOCOTRA I.
ARABIAN SEA
INDIAN OCEAN
TROPIC OF CANCER
EQUATOR
TURKOMAN
UZBEK
TURKESTAN
AFGHANISTAN
HINDU KUSH MTS.
BALUCHISTAN
INDIA
CEYLON
Gulf of Manaar
SINKIANG
EASTERN TURKESTAN
KUENLUN
TIBET
NEPAL
HIMALA
Lake Balkash
Aral Sea
Indus R.
Ganges
Ob R.
Irtish
Gulf of Ob
Dublin
Belfast
Glasgow
Cork
Birmingham
Liverpool
Edinburgh
Aberdeen
Plymouth
London
Bordeaux
Havre
Paris
Strasbourg
Bern
Geneva
Marseille
Genoa
Florence
Rome
Naples
Palermo
Messina
Catania
Brindisi
Venice
Trieste
Munich
Prague
Vienna
Budapest
Brussels
Antwerp
The Hague
Hamburg
Aarhus
Copenhagen
Goteborg
Oslo
Bergen
Stavanger
Trondhjem
Uppsala
Falun
Sundsvall
Stockholm
Umea
Lulea
Tromso
Alexandrovsk
Uleaborg
Tammerfors
Helsinki
Tallinn
Riga
Memel
Vilna
Berlin
Warsaw
Cracow
Lemberg
Szeged
Belgrade
Bucharest
Constanta
Salonika
Adrianople
Istanbul
Athens
Bursa
Izmir
Scutari
Odessa
Sevastopol
Vitebsk
Ostrov
Novgorod
Leningrad
Olonets
Petrozavodsk
Archangel
Mezen
Moscow
Smolensk
Gomel
Voronesh
Karkhov
Roskov
Krasnodar
Stavropol
Stalingrad
Saratov
Morshansk
Gorki
Vyatka
Kazan
Samara
Ufa
Perm
Sverdlovsk
Tyumen
Zlatoust
Kurgan
Orenburg
Orsk
Uralsk
Aktyubinsk
Astrakhan
Troitsk
Kustanai
Petropavlovsk
Tobolsk
Obdorsk
Berezov
Sharkalanskoff
Lazompim
Surgut
Samarovsk
Maniny
Tara
Isham
Kainsk
Omsk
Sheliezinsk
Pavlodar
Bayan Aulsk
Akmolinsk
Zmeinogorsk
Semipalatinsk
Nurinsk
Karkalinsk
Aktau
Kanitsha
Sergiopol
Atbasar
Karabutak
Turgai
Embinsk
Terekly
Kazalinsk
Aralsk
Kzyl Orda
Turkestan
Fronze
Alma Ata
Iliisk
Ningyuan (Kuldja)
Tashkent
Namangan
Andizhan
Kokand
Dzhalyai Abad
Kucha
Aqsu
Matan
Maralbashi
Kashgar
Samarkand
Bukhara
Chargiu
Stalinabad
Termez
Merv
Andkhui
Meimana
Balkh
Kabul
Herat
Kandahar
Quetta
Kalat
Peshawar
Srinagar
Lahore
Amritsar
Simla
Ferozepore
Multan
Shikarpur
Hyderabad
Karachi
Gwadar
Delhi
Meerut
Bareilly
Bikaner
Jodhpur
Jaipur
Agra
Ajmer
Lashkar
Cawnpore
Lucknow
Khatmandu
Benares
Ahmadabad
Baroda
Surat
Bhopal
Jubbulpore
Nagpur
Raipur
Cuttack
Chanda
Bombay
Poona
Sholapur
Hyderabad
Kolagore
Bellary
Goa
Bezwada
Vizagapatam
Mangalore
Bangalore
Madras
Mahe
Calicut
Mysore
Pondichery
Trichinopoly
Negapatam
Madura
Jaffna
Trivandrum
Kandy
Colombo
Matara
Galle
Khotan
Khiya
Shahidula
Gartok
Chiego
Ankara
Konya
Adana
Samsun
Trabzon
Batum
Tiflis
Baku
Nicosia
Antioch
Alexandretta
Aleppo
Diarbekr
Bitlis
Beyrouth
Homs
Damascus
Tel Aviv
Jerusalem
Port Said
Cairo
Alexandria
Mosul
Kirkuk
Urmia
Rezaieh (Tabriz)
Resht
Hamadan
Bagdad
Dizful
Kum
Teheran
Babul
Asterabad
Ashkabad
Kizil Arvat
Krasnovodsk
Aleksandrovsk
Kungrad
Khiva
Kipchak
Meshed
Isfahan
Birjand
Yezd
Kerman
Basra
Bandar Shahpur
Kuwet
Shiraz
Bandar Abu Shehr (Bushire)
Lar
Lingeh
Bandar Abbas
Jask
Sohar
Maskat
Soor
Ninna
Oman
Akaba
Jauf
Leinah
Mueleh
Teima
Wejh
Hail
Anaizah
Dorama
Yenbo
Medina
Riyadh
Hofuf
El Haute
Mecca
Jidda
Berera
Kunfuda
El Selail
Sabiya
Makhlaf
Loheia
Khaiwan
Terim
Hodeida
Sana
Nissah
Mokha
Aden
Makalla
Morbat


OCEAN
NEW SIBERIAN ISLANDS
Nordenskjold Sea
Gulf of Anadyr
BERING SEA
ALEUTIAN ISLANDS
ARCTIC CIRCLE
Nizhni Yar
Kolymsk
Kenmankautir
Sredne Kolymsk
Verkhne Kolinsk
Anadyrsk
Aktansk
Penjinsk
Kamenskoe
Olyuterskoe
Alaikha
Ust Yansk
Kungiu
Sion
Ust Olensk
Ostrav
Popigaisk
Khatangskoe
Filipovskoi Korennoi
Aykit
Bulun
Syktakh
Zhanki
Smoshanova
Krasnoe
Verkhoyansk
Sashiversk
Gishiginsk
Niakhinsk
Tumansk
Plotbisktcha
Zhigansk
Balagan
Ust Viljuisk
Tiuriach
Glegniatsk
Aldansk
Tchernolinsk
Omskonskie
Vadomo Krestovsk
Tausk
Yamsk
Pallansk
Tigil
Nizhnii Kemchatsk
Petropavlovsk
Vilyuisk
Nyurba
Yakutsk
Tchuhur
Sinskoie
Ongtorsk
Ust Maisk
Tchabdinsk
Okhotsk
Belogolovsk
Gapalisk
Bolsheryetsk
SEA OF OKHOTSK
Suntar
Olekminsk
Tcharendeisk
Ankulu
Aimsk
Ayan
Nokhtuiskoe
Vitemsk
Kirensk
Udskoi Ostrog
Barakansk
Nikolaevsk
Aleksandrovsk
SAKHALIN I.
KARAFUTO (JAPAN)
Port Aleksandrovsk
Sofisk
Toyohara
Otomari
KURIL IS.
UNION OF SOVIET SOCIALIST REPUBLICS
Pinchuga
Kansk
Krasnoyarsk
Nizhnii Udinsk
Martynovsk
Molokao
Lake Baikal
Barguzin
Verkhneudinsk
Irkutsk
Mysova
Selenginsk
Chita
Aksha
Gorbitsa
Ust Strelka
Renova
Nerchinsk
Sretensk
Ft. Argunsk
Kumarskaya
Amur R.
Blagoveschensk
Samagarn
Khabarovsk
Aigun
Tasoy
Usuri
Kura
TANNU TUVA
Dargat
Bellys
Hathyl
Maimatchin
Ulan Bator Khoto (Urga)
Gurumnor
Hailar
Mergen
Khemil
Tsitsihar
Yakeshi
Fuchinnsele
Sangsing
Siuhwa
MANCHUKUO
Choi
Sarto
Harbin
Lalin
Ninguta
Nikolsk Ussuruck
Vladeri
Vladivostok
Ashigawa
HOKUSHU
Tsugaru Strait
Hakodate
Aomori
Khosutu
Uliassutai
Shabuktai
Dolon
Tanta
Kedu
MONGOLIA
Senesen
Korgo
Tsingan
Kirin
Hsinking
Changchun
Hunchun
JAPAN SEA
Niigata
Sendai
Tokyo
Yokohama
HONSHU
Nagoya
Kanazawa
Kyoto
Osaka
Kobe
SHIKOKU
Hiroshima
Moji
Miyazaki
Nagasaki
KYUSHU
Kagoshima
Taptu
Ongin
Boraburin
Mingan
GOBI DESERT
Hamitala
Mukden
Gashiun
Lek
Shargol
Manitu
Tuguril
Kalgan
Jehol
Ningyian
Chinchow
Shingishu
Gensan
Keijo (Seoul)
CHOSEN
Chengseng
Tala
Peiping (Peking)
Dairen
Tatungkow
KWANTUNG
Port Arthur
Weihaiwei
Chemulpo
Fusan
Mokuho
Kufli
Bshkukhai
Paotowchen
Paoting
Tientsin
Taiyuan
Chengting
Shunteh
Chefoo
Kiaochow
Tsingtao
Yellow Sea
Ansichow
Pinsuin
Suchow
Kanchow
Khyrma
Makhai Sakh
Liangchow
Ninghia
Hwang R.
Tsinan
Yenchow
Suchow
Kaifeng
Lanchow
Sian
Singan
Chinkiang
Shanghai
Nanking
Soochow
Hangchow
EAST CHINA SEA
Kegudo
Yokchen
Kweichow
Hankow
Anking
Wuchang
Nanchang
Ningpo
Sila
Giaro
Chamda
Dayag
Chengtu
Paoning
Kingchow
Wenchow
Batang
Suchow
Chungking
Chengteh
Juichow
Fuchow
Changsha
Yenping
Foochow
Yangtze R.
Keelung (Kirun)
TAIWAN (FORMOSA)
Taihoku
Tainan
Takao
Formosa Strait
Tinsukia
Rima
Szeman
Henchow
Kanchow
Tingchow
Amoy
Weisfu
Ghoatung
Kweiyang
Kweilin
Yunnanfu
Liuchow
Wuchow
Canton
Swatow
Talifu
Mengtsz
Nanning
Lungchow
Macao
Victoria
Hong Kong
Kwangchow
Bashi Strait
TROPIC OF CANCER
Manipur
BURMA
Mandalay
Irrawaddy R.
Pakhoi
Hanoi
Haiphong
Gulf of Tonkin
Kiungchow
HAINAN
FRENCH INDO-CHINA
Luang Prabang
Vinh
Hue
Tourane
Binh-Dinh
Prome
Chiengmai
Rangoon
Moulmein
THAI
Mekong R.
Ayuthia
Bangkok
Tavoy
Pnompenh
Saigon
Cholon
Gulf of Siam
MALAY PENINSULA
Songkla
Singara
FEDERATED MALAY STATES
Kuala Lumpur
Malakka
Singapore
Strait of Malakka
SUMATRA
Medan
Koetaradje
Padang
SOUTH CHINA SEA
Laoag
LUZON
Lingayen
Manila
Batangas
MINDORO
Legaspi
Baybay
Cebu
PHILIPPINE ISLANDS
PALAWAN
Sulu Sea
Zamboanga
Cotabato
MINDANAO
Sandakan
Jesselton
BR. N. BORNEO
Brunei
SARAWAK
Kuching
BORNEO
Samarinda
Pontianak
Banjermasin
Celebes Sea
Manado
CELEBES
MOLUCCA IS.
Ternate
EQUATOR
Sorong
Manokwari
Fakfak
Banda Sea
DUTCH EAST INDIES
NEW GUINEA
Madang
Port Moresby
Merauke
EMPIRE OF JAPAN
PACIFIC OCEAN
CHINESE REPUBLIC
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Baskra	5C	90
Benares	7G	205
Beyrouth	4C	134
Blagoveschensk	3L	63
Bombay	7F	1,161
Bursa	4B	72
Calcutta	7H	1,161
Cawnpore	7G	243
Canton	7L	861
Changsha	6L	606
Chefoo	5I	131
Chita	4K	81
Colombo	9G	284
Dacca	7H	138
Dairen	5L	282
Damascus	4C	193
Delhi	6G	447
Erivan	4D	111
Foochow	6L	322
Fusan	5M	163
Hakodate	4N	207
Hangchow	6M	506
Hankow	6L	777
Hanoi	7K	148
Harbin	4L	458
Hiroshima	5M	310
Hong Kong	7L	850
Hue	8K	33
Hunchun	4M	390
Hyderabad	8G	466
Irkutsk	4J	158
Istanbul	3B	740
Jaipur	7G	144
Jerusalem	5B	125
Jubbulpore	7G	124
Kabul	6F	80
Kagoshima	5N	137
Karachi	7E	263
Keijo-fu (Seoul)	5M	394
Khabarovsk	3M	62
Kobe	5N	912
Kokand	5F	69
Krasnoyarsk	3H	101
Kuala Lumpur	9K	111
Kweiyang	6K	100
Kyoto	5N	1,080
Lahore	6F	429
Lanchow	5K	450
Lhasa	6H	50
Lucknow	7G	274
Macao	7L	75
Madras	8G	647
Madura	8G	182
Mandalay	7J	147
Manila	7M	623
Moulmein	8J	61
Mecca	6B	70
Meerut	6G	136
Meshed	5E	139
Mosul	5C	392
Moulmain	8J	61
Mukden	4L	527
Multan	6F	119
Mysore	8F	83
Nagasaki	5M	211
Nagoya	5N	1,082
Nagpur	7G	215
Nanking	6L	1,019
Niigata	4N	125
Ningpo	6L	218
Omsk	3G	227
Osaka	5N	2,989
Patna	7H	159
Peiping (Peking)	5L	1,556
Perm	3F	170
Peshawar	6F	121
Petropavlovsk	2N	72
Pnom Penh	8K	102
Poona	7F	250
Port Arthur	5L	50
Rangoon	8J	400
Rezaieh (Tabriz)	4D	219
Saigon	8K	109
Samarkand	5E	135
Semipalatinsk	4G	120
Sendai	4N	219
Shanghai	6M	3,489
Shiraz	6D	119
Sholapur	7G	144
Singapore	9K	596
Smyrna	4B	170
Soochow	5J	260
Srinagar	6G	173
Surat	7F	117
Sverdlovsk	3F	223
Tabriz	4D	219
Tainan	6M	274
Tashkent	5F	491
Teheran	5D	360
Tel Aviv	5B	140
Tientsin	5L	1,292
Tokyo	4N	6,778
Tomsk	3H	128
Trichinopoly	8G	142
Tsinan	5L	260
Tsingtao	5I	514
Urga	4K	100
Victoria	7L	94
Vladivostok	4M	190
Wenchow	6M	631
Yarkand	5G	107
Yokohama	4N	704
Yunnanfu	7K	156

AFRICA

Pop., Thous., 166,390

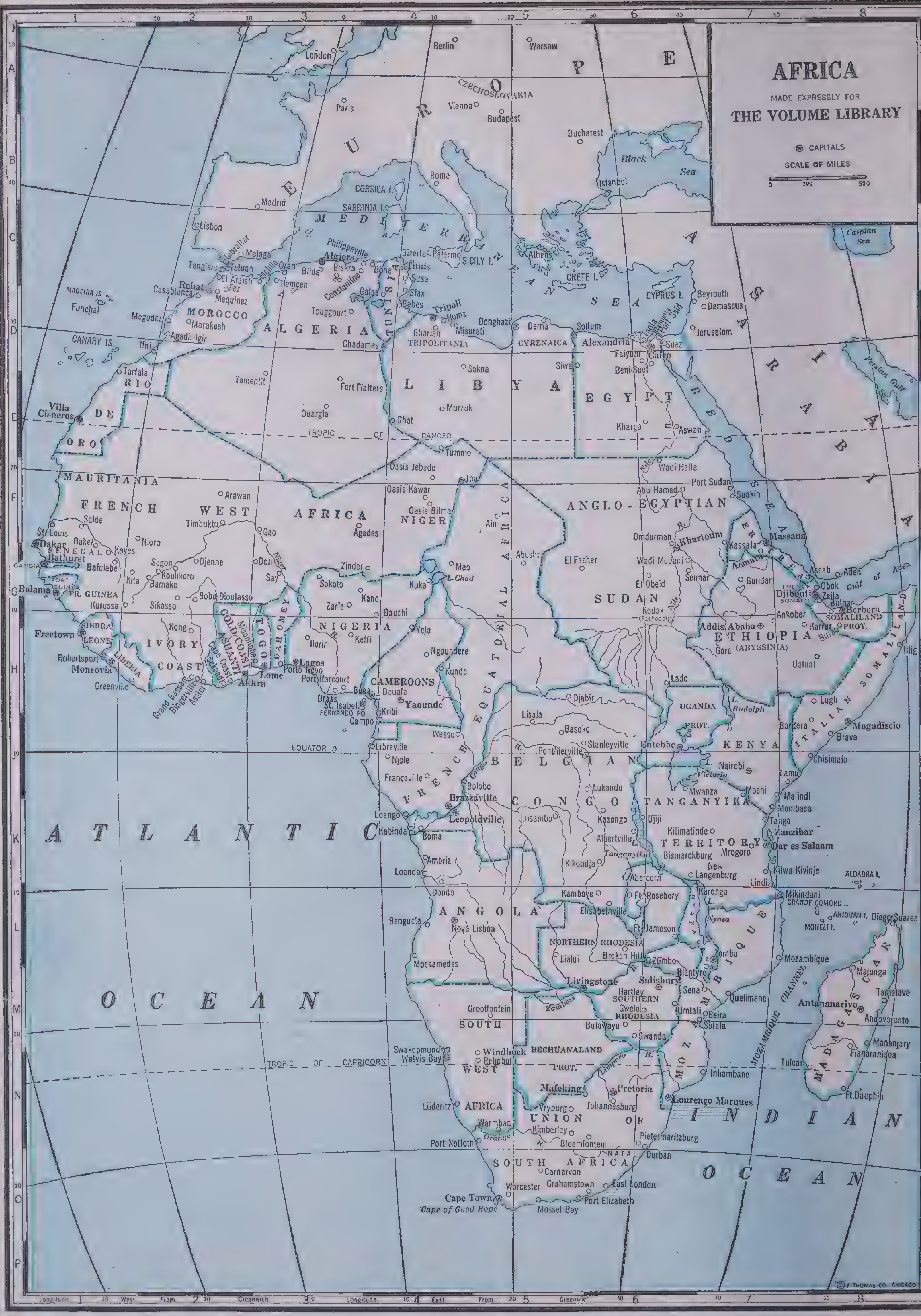
Area, Sq. Miles, 11,545,000

Political Divisions, Islands, etc.

Name	Key	Pop. Thous.
Algeria	3D	7,234
Anglo-Egyptian Sudan	6F	5,816
Angola	5L	3,225
Ashanti	2H	578
Basutoland		558
Bechuanaland Protectorate	5M	265
Belgian Congo	5J	9,843
Cameroons	4H	3,017
Canary Islands	1D	632
Comoro Islands	8L	123
Dahomey	3H	1,149
Egypt	6E	15,546
Eritrea	6F	621
Ethiopia	7G	7,600
Fernando Po Island	4H	23
French Equatorial Africa	5H	3,549
French West Africa	2F	14,575
Gambia	1G	199
Gold Coast	2H	3,527
Guinea, French	1G	2,236
Guinea, Portuguese	1G	390
Guinea, Spanish	1G	140
Ifni	2D	20
Ivory Coast	2H	3,871
Kenya	7J	3,094
Liberia	1H	2,250
Libya	5E	704
Madagascar	8M	3,372
Mauritania	1F	410
Mauritius		407
Morocco (French)	2D	6,242
Morocco (Spanish)	2C	744
Mozambique	7M	4,028
Niger	4F	1,758
Nigeria	4G	19,928
Nyasaland	7L	1,606
Rhodesia, Northern	6L	1,383
Rhodesia, Southern	6M	1,259
Senegal	1G	1,638
Sierra Leone	1H	1,672
Somaliland, Fr.	8G	69
Somaliland, Italian	9H	1,210
Somaliland Protectorate	8G	344
Southwest Africa	5M	360
Tanganyika	7K	5,104
Togo	3H	1,043
Tunisia	4D	2,603
Uganda Protectorate	6H	3,661
Union of South Africa	5O	9,530
Zanzibar	7K	244

TOWNS

Town	Key	Pop. Thous.
Addis Ababa	7G	100
Alexandria	6D	573
Algiers	3C	257
Antananarivo	8M	98
Aswan	6E	16
Bamako	2G	22
Benghazi	5D	44
Berbera	8G	30
Bizerta	4C	23
Blantyre	7L	6
Blida	3C	39
Bloemfontein	6N	60
Boma	4K	1
Bône	4C	18
Brazzaville	4J	12
Bulawayo	6M	29
Buthar	8G	75
Cairo	6D	1,064
Cape Town	5O	285
Casablanca	2D	158
Constantine	3C	104
Dakar	1F	92
Damietta	6D	34
Dar es Salaam	7K	29
Diego Suarez	8L	12
Djibouti	8G	14
Durban	6N	154
East London	6O	31
El Fasher	5G	12
Elizabethville	6L	18
El Obeid	6G	17
Entebbe	6J	[illegible]
Fez	2D	144
Fianarantsoa	8M	13
Freetown	1H	60
Gabes	4D	10
Grahamstown	6O	15
Grand Bassam	2H	7
Grootfontein	5M	11
Homs	4D	31
Ifni	2D	20
Ilorin	3H	85
Johannesburg	6N	381
Kano	4G	50
Kassala	6F	10
Kayes	1G	12
Keffi	3H	24
Khartoum	6F	46
Kimberley	5N	15
Lagos	3H	100
Leopoldville	4K	18
Libreville	4J	6
Loanda	4K	23
Lome	3H	6
Lourenço Marques	6N	42
Lüderitz	4N	10
Majunga	8L	22
Mananjary	8M	12
Marakesh	2D	190
Massaua	6F	20
Melilla	3D	52
Mequinez	2D	75
Misurati	4D	43
Mogadiscio	8H	20
Mogador	2D	18
Mombasa	7J	50
Monrovia	1H	10
Mossel Bay	5O	6
Murzok	4E	7
Mwanza	6J	12
Nairobi	7J	32
Omdurman	6F	110
Oran	3C	163
Philippeville	3C	47
Pietermaritzburg	6N	45
Port Elizabeth	5O	53
Port Louis		55
Porto Novo	3H	25
Port Said	6D	104
Port Sudan	6F	30
Pretoria	6N	84
Rabat	2D	83
Rehoboth	5M	9
Saint Louis	1F	33
Salisbury	6M	32
Sekondi	2H	10
Sfax	4D	39
Sikasso	2G	12
Suakin	6F	8
Suez	6D	40
Tamatave	8M	22
Tanga	7K	6
Tangiers	2C	54
Tanta	6D	90
Tetuan	2C	49
Timbuktu	2F	15
Tlemcen	3C	46
Touggourt	3D	12
Tripoli	4D	95
Tulear	8M	15
Tunis	4C	202
Wadi Medani	6G	35
Windhoek	5M	18
Worcester	5O	8
Yaounde	4H	6
Yola	4G	22


AFRICA
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THE VOLUME LIBRARY
⊛ CAPITALS
SCALE OF MILES
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EUROPE
MEDITERRANEAN SEA
ATLANTIC OCEAN
INDIAN OCEAN
ARABIA
RED SEA
MOROCCO
ALGERIA
TUNISIA
LIBYA
EGYPT
RIO DE ORO
MAURITANIA
FRENCH WEST AFRICA
NIGER
ANGLO-EGYPTIAN SUDAN
ERITREA
ETHIOPIA (ABYSSINIA)
FRENCH EQUATORIAL AFRICA
NIGERIA
CAMEROONS
GOLD COAST
IVORY COAST
LIBERIA
SIERRA LEONE
BELGIAN CONGO
UGANDA PROT.
KENYA
ITALIAN SOMALILAND
TANGANYIKA TERRITORY
ANGOLA
NORTHERN RHODESIA
SOUTHERN RHODESIA
MOZAMBIQUE
SOUTH WEST AFRICA
BECHUANALAND PROT.
UNION OF SOUTH AFRICA
MADAGASCAR
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Longitude West From Greenwich
Longitude East From Greenwich
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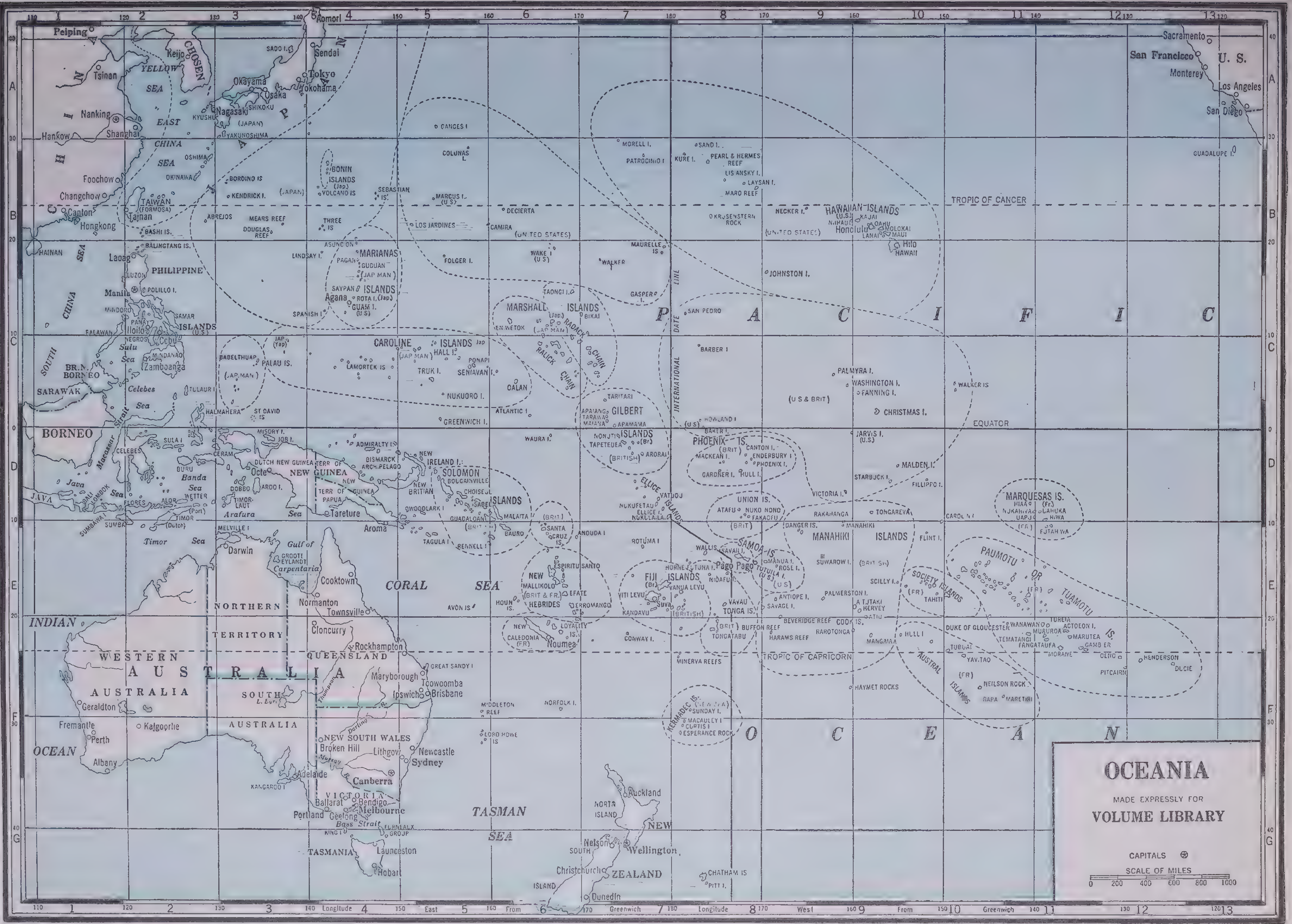
OCEANIA
MADE EXPRESSLY FOR
VOLUME LIBRARY
CAPITALS ⊕
SCALE OF MILES
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P A C I F I C
O C E A N
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
INTERNATIONAL DATE LINE
U. S.
San Francisco
Los Angeles
San Diego
HAWAIIAN ISLANDS
Honolulu
JAPAN
Tokyo
CHOSEN
CHINA
Peiping
Nanking
Shanghai
PHILIPPINE ISLANDS
Manila
BORNEO
NEW GUINEA
MARIANAS ISLANDS
CAROLINE ISLANDS
MARSHALL ISLANDS
GILBERT ISLANDS
SOLOMON ISLANDS
NEW HEBRIDES
FIJI ISLANDS
SAMOA IS.
Pago Pago
TONGA IS.
PHOENIX IS.
MANAHIKI ISLANDS
COOK IS.
SOCIETY ISLANDS
PAUMOTU OR TUAMOTU IS.
MARQUESAS IS.
AUSTRAL ISLANDS
KERMADEC IS.
CORAL SEA
TASMAN SEA
INDIAN OCEAN
AUSTRALIA
WESTERN AUSTRALIA
NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
TASMANIA
Canberra
Sydney
Melbourne
Brisbane
Adelaide
Perth
NEW ZEALAND
Auckland
Wellington
Dunedin
Longitude East from Greenwich
Longitude West from Greenwich

OCEANIA

Countries, Islands, Etc.

Name	Key	Pop. Thous.
Admiralty Islands	4D	14
Aroo Island	3D	
Asuncion	4B	
Australia	3F	6,753
Austral Islands	10F	
Baker Island	8D	†1
Bali Island	1D	900
Bismarck Archipelago	4D	247
Bowin Island	4B	
Borneo	1D	2,194
British North Borneo	1C	277
Buru	2D	
Carolin Island	10D	
Caroline Islands	5C	38
Celebes	2D	4,231
Ceram	3D	
Chatham Islands	7G	75
Christmas Island	9D	†1
Cook Isl.	9E	12
Cure Island	8B	
Danger Islands	9E	†5
Dobbo Island	3D	
Ducie	13F	
Dutch New Guinea	3D	195
Ellice Islands	7D	4
Fanning Island	9C	†3
Federal Terr. (Australia)	4F	9
Fiji Islands	7E	202
Fillipo Island	10D	
Flores	2D	
Furneaux Group	4G	
Ganges Island	5A	
Gilbert Islands	7D	33
Great Sandy Island	5F	1
Greenwich Island	5C	
Groote Eylandt	3E	2
Guam	4C	22
Guguan	4B	
Halmahera	3D	
Hawaii	9B & 10B	399
Henderson	12F	
Hull Island	10E	†1
Jarvis Island	9D	†1
Job Island	3D	
Johnston Island	9C	
Kangaroo Island	3G	
Kermadec Islands	7F	
King Island	4G	
Krusenstern Rock	8B	
Laysan Island	8B	
Lisiansky Island	8B	
Lombok	1D	900
Los Jardines	5B	
Loyalty Island	6E	†1
Malden Island	10D	
Manahiki Islands	9E	†4
Marianas Islands	4C	69
Markus Island	5B	
Maro Reef	8B	
Marquesas Islands	11D	2
Marshall Islands	6C	10
Melville Island	3E	
New Britain	5D	96
New Caledonia	6E	57
New Guinea	4D	301
New Guinea, Terr. of	4D	545
New Hebrides	6E	50
New Ireland Island	5D	†6
New South Wales	4F	2,657
New Zealand	7G	1,587
Norfolk Island	6F	1
N. Australia	3E	5
Oalan	6C	
Pagan Island	4B	
Palau Island	3C	8
Palmerston Island	9E	†1
Palmyra Island	9C	
Papua, Terr. of	4D	276
Patrocinio	7B	
Paumotu or Taumota Islands	11E	
Philippine Islands	2C	16,356
Phoenix Islands	8D	†1
Pitcairn	12F	†2
Pitt Island	8G	
Queensland	4E	970
Radack Chain	7C	6
Ralick Chain	6C	4
Rota Island	4C	
Samoa Islands (Brit.)	8E	54
Samoa Islands (U. S.)	8E	12
Santa Cruz Islands	3E	5
Sarawak	1C	475
Saypan	4C	
Society Islands	10E	10
Solomon Islands	5D	138
S. Australia	3F	586
Starbuck Island	9D	
Sula Island	2D	
Sumbawa	2D	
Tagula Island	5E	
Tahiti	10E	7
Tasmania	4G	231
Timor	2D	1,656
Timorlaut	3D	
Tonga Islands	8E	30
Tulaur Island	2C	
Union Islands	8D	1
Victoria	4G	1,843
Victoria Island	9D	
Volcano Island	4B	
Washington Island	9C	†5
Western Australia	2F	447

TOWNS

Name	Key	Pop. Thous.
Adelaide	3F	315
Albany	1F	3
Auckland	7G	212
Ballarat	4G	38
Bendigo	4G	29
Brisbane	5F	309
Broken Hill	4F	26
Canberra	4G	7
Christchurch	6G	132
Cloncurry	4E	5
Darwin	3E	2
Dunedin	6G	81
Fremantle	1F	25
Geelong	4G	39
Geraldton	1F	4
Hilo	10B	19
Hobart	4G	62
Honolulu	9B	179
Iloilo	2B	45
Ipswich	5F	23
Kalgoorlie	2F	5
Laoag	2B	42
Launceston	4G	32
Lithgow	4F	13
Manila	2C	353
Maryborough	5F	12
Melbourne	4G	1,008
Nelson	7G	12
Newcastle	5F	107
Normanton	4E	4
Noumea	6E	10
Perth	1F	210
Ponapi	5C	10
Rockhampton	5E	30
Suva	7E	1
Sydney	5F	1,254
Toowoomba	4F	27
Townsville	4E	27
Wellington	1G	149
Zamboanga	2C	25

MEXICO

Pop. 16.552,722
Area, Sq. Miles, 763,944

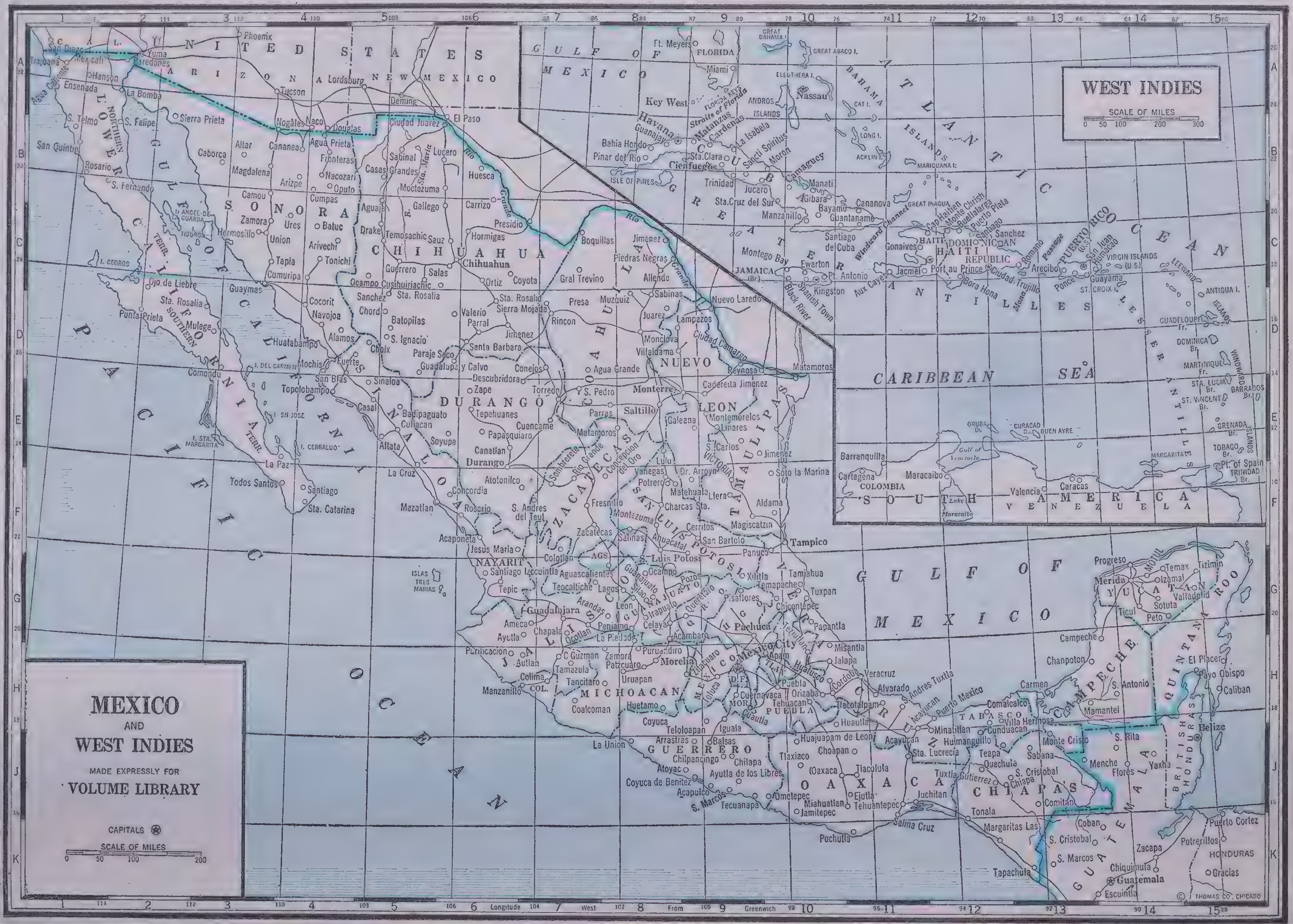
TOWNS

Name	Key	Pop. Thous.
Acambaro	8H	16
Acaponeta	6F	7
Acapulco	9J	6
Acayucan	11J	5
Aguascalientes	8G	82
Alamos	4D	3
Aldama	10F	3
Allende	8D	5
Alvarado	11H	6
Ameca	7G	11
Apam	10H	4
Arandas	8G	8
Atotonilco	6F	9
Atoyac	9J	5
Autlan	7F	11
Campeche	14H	20
Cananea	4B	13
Carmen	13H	7
Celaya	8G	24
Cerritos	9F	6
Chiapa	12J	5
Chihuahua	6C	61
Chilapa	9J	7
Chilpancingo	9J	8
Ciudad Juarez	6B	43
Ciudad Victoria	9F	18
Colima	7F	21
Colotlan	7G	5
Comitan	13J	9
Concepcion del Oro	7F	6
Concordia	6F	2
Cordoba	10H	16
Cuautla	9H	5
Cuernavaca	9H	8
Culiacan	5E	71
Cumpas	4B	3
Durango	6F	56
Ensenada	1A	3
Fresnillo	7F	16
Guadalajara	7G	184
Guanajuato	8G	16
Guaymas	3C	9
Hermosillo	3C	20
Huatusco	10H	6
Huautla	10J	10
Huetamo	8H	6
Iguala	9J	12
Irapuato	8G	29
Izamal	14G	6
Jalapa	10H	40
Jimenez	6D	6
Juchitan	11J	15
Lagos	8G	11
Lampazos	9D	4
La Paz	4E	8
La Piedad	8H	13
Leon	8G	99
Linares	9E	10
Matamoros	10E	10
Matehuala	8F	13
Mazatlan	5F	25
Merida	14G	110
Mexicali	1A	7
Mexico	9H	1,029
Miahuatlan	11J	3
Minatitlan	12J	12
Mochis	4D	7
Monclova	8D	7
Montemorelos	9E	6
Monterrey	8E	137
Morelia	8H	65
Motul	14G	5
Navojoa	4D	5
Oaxaca	10J	31
Ometepec	10J	4
Oputo	4B	2
Orizaba	10H	43
Pachuca	9G	47
Panuco	10G	1
Parral	6D	19
Parras	8E	7
Patzcuaro	8H	8
Penjamo	8G	10
Piedras Negras	8D	16
Progreso	14G	11
Puebla	10H	122
Puruandiro	8H	8
Queretaro	9G	76
Reynosa	9E	5
Rio Grande	7F	4
Salamanca	8G	12
Salina Cruz	11J	5
Saltillo	8E	66
San Andres Tuxtla	11H	9
San Cristobal	13K	17
San Luis Potosi	8G	91
San Pedro	7E	19
Santa Barbara	6D	10
Santiago	4F	3
Silao	8D	13
Sombrerete	7F	5
Tacubaya	9H	55
Tampico	10F	70
Tapachula	13K	14
Tehuacan	10H	11
Tehuantepec	11J	9
Tepic	6G	15
Teziutlan	10H	12
Ticul	11G	7
Tlacolula	11J	5
Tlacotalpan	11H	5
Tlaxiaco	10J	9
Toluca	9H	89
Tonala	12J	5
Torreon	7E	74
Tulancingo	9G	9
Tuxpan	10G	11
Tuxtla	12J	13
Uruapan	8H	17
Valladolid	15G	6
Veracruz	11H	71
Villa Hermosa	12H	15
Zacatecas	7F	19
Zamora	8G	13
Zitacuaro	9H	9

WEST INDIES

Islands, Republics, Towns

Name	Key	Pop. Thous.
Andros Islands	10A	7
Antigua	14C	33
Bahama Islands	11B	64
Barbados	15E	182
Camaguey	10B	133
Cat I.	11A	4
Cuba	9B	4,011
Curacao	13E	87
Dominica	15D	46
Dominican Republic	12C	1,478
Eleuthera I.	10A	6
Great Abaco Island	10A	4
Greater Antilles	10C	
Grenada	15E	75
Guadeloupe	15D	268
Haiti (Island)	12C	3,200
Haiti (Republic)	11C	2,550
Havana	8B	550
Jamaica	10C	1,121
Kingston	10C	72
Leeward Islands	15D	1.8
Lesser Antilles	14D	
Long Island	11B	4
Martinique Island	15D	246
Port au Prince	12C	115
Port of Spain	15F	70
Puerto Rico	13C	1,869
St. Croix Island	14D	11
St. Vincent	15E	51
Sancti Spiritus	9B	88
San Juan	13C	169
Santa Lucia	15E	57
Santiago de Cuba	10C	145
Santo Domingo	12C	(town) 45
Tobago	15E	25
Trinidad	15F	439
Virgin Islands	14C	25
Windward Islands	15E	185


MEXICO
AND
WEST INDIES
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CAPITALS
SCALE OF MILES
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WEST INDIES
SCALE OF MILES
0 50 100 200 300
UNITED STATES
ARIZONA
NEW MEXICO
GULF OF MEXICO
ATLANTIC OCEAN
CARIBBEAN SEA
GREATER ANTILLES
LESSER ANTILLES
SOUTH AMERICA
VENEZUELA
COLOMBIA
PACIFIC OCEAN
GULF OF CALIFORNIA
LOWER CALIFORNIA
SONORA
CHIHUAHUA
COAHUILA
NUEVO LEON
TAMAULIPAS
DURANGO
SINALOA
ZACATECAS
SAN LUIS POTOSI
NAYARIT
JALISCO
MICHOACAN
GUERRERO
OAXACA
PUEBLA
VERACRUZ
CHIAPAS
TABASCO
CAMPECHE
YUCATAN
QUINTANA ROO
GUATEMALA
BRITISH HONDURAS
HONDURAS
CUBA
HAITI
DOMINICAN REPUBLIC
PUERTO RICO
JAMAICA
BAHAMA ISLANDS
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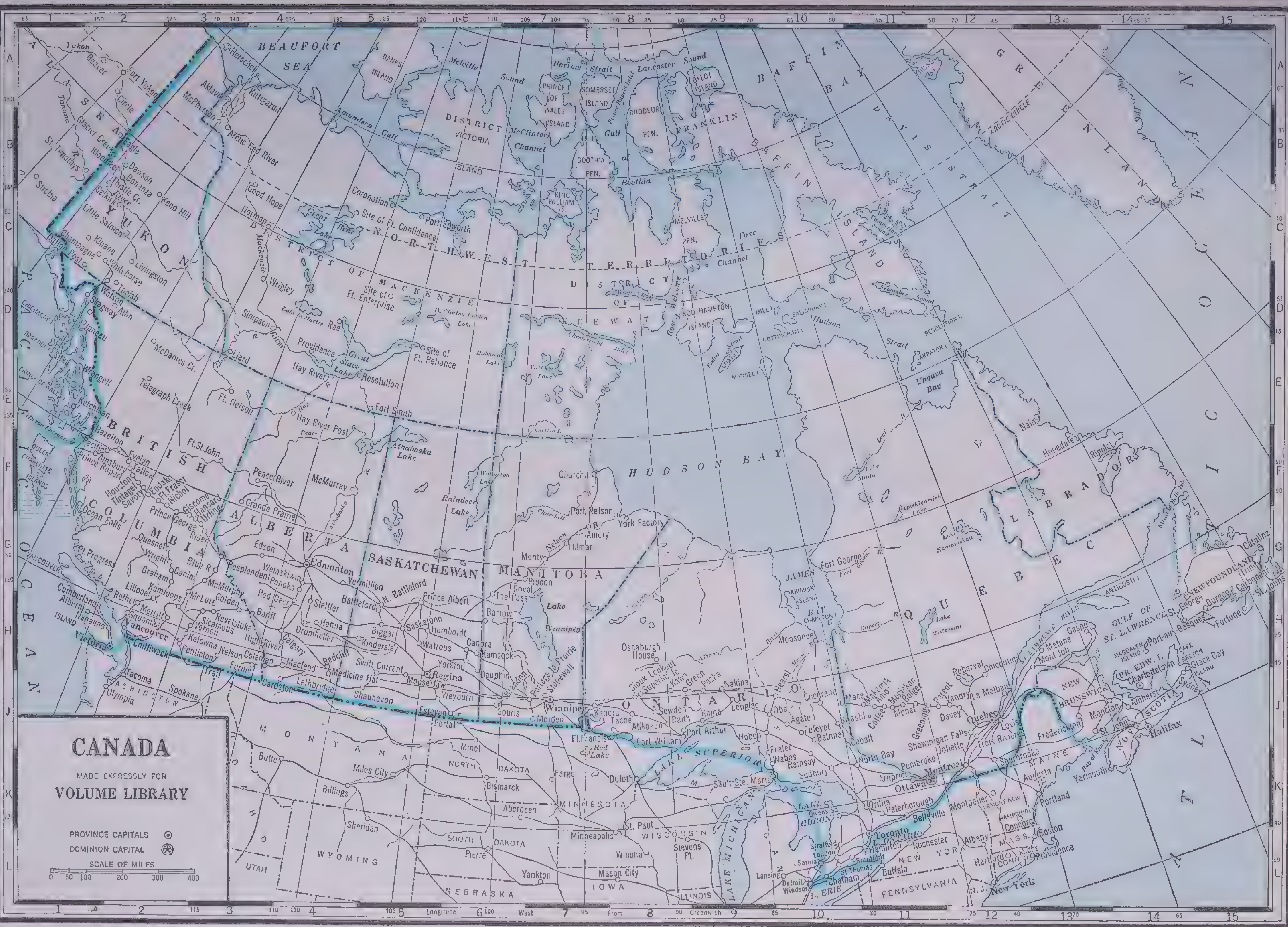


CANADA

Pop. 10,376,786

Area, Sq. Miles, 3,684,463

PROVINCES

Name	Key	Pop. Thous.
Alberta	4G	731
British Columbia	2G	694
Manitoba	7H	700
New Brunswick	13J	408
Northwest Territories	7D	9
Nova Scotia	14J	512
Ontario	9J	3,431
Prince Edward Island	14J	88
Quebec	12H	2,874
Saskatchewan	5H	921
Yukon	2C	4

TOWNS

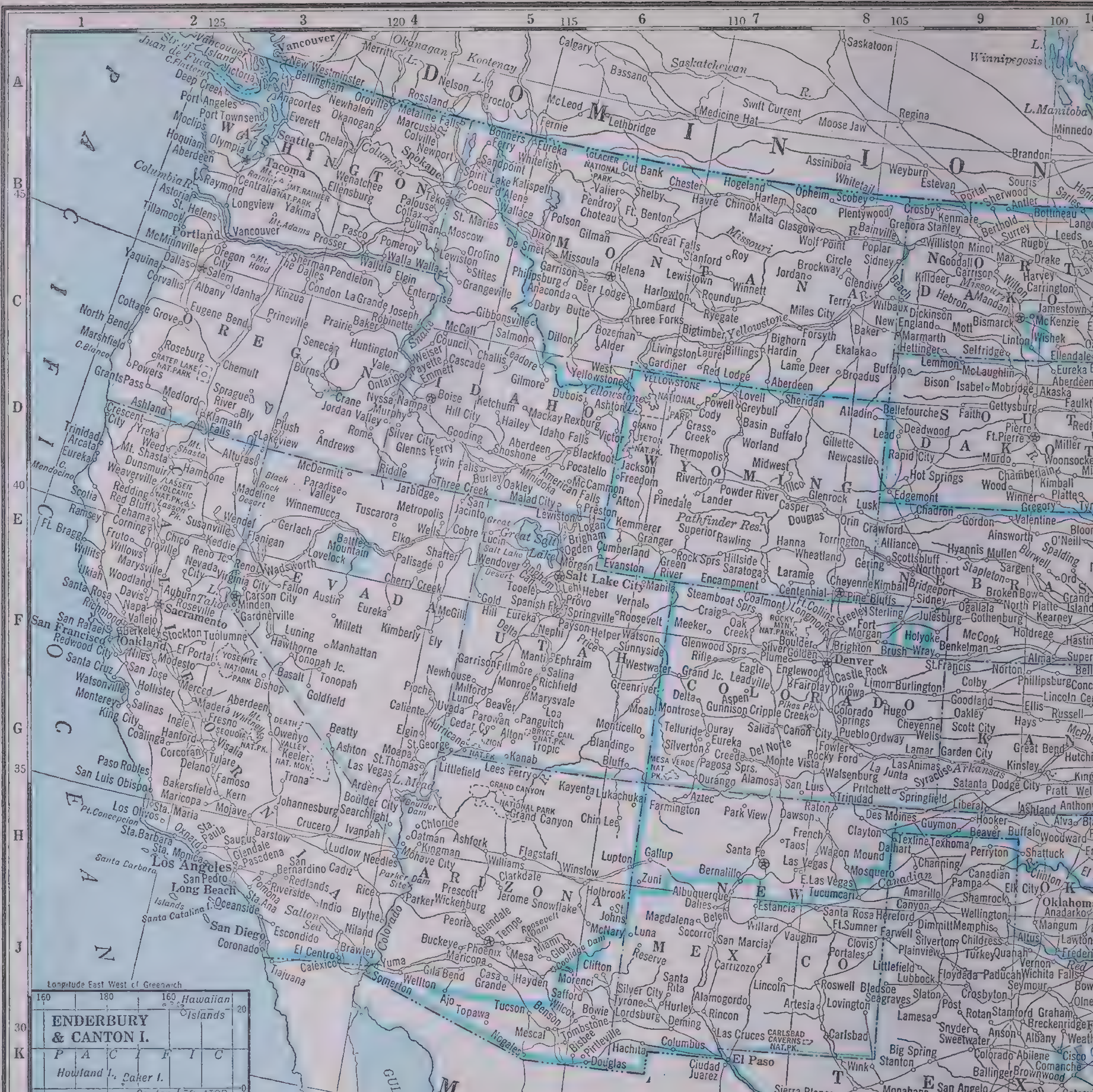
Name	Key	Pop. Thous.
Amherst	14J	7
Arnprior	11K	4
Barrie	11K	7
Beauport	12J	3
Belleville	11K	13
Bowmanville	11K	4
Brampton	10K	5
Brandon	6J	17
Brantford	10L	30
Brockville	11K	9
Buckingham	12K	4
Calgary	4H	83
Campbellton	13J	6
Cap de la Madeleine	12J	8
Cap St. Ignace	13J	3
Charlottetown	14J	12
Chatham (Ontario)	10L	14
Chatham (New Brunswick)	13J	4
Chicoutimi	12J	11
Coaticook	12K	4
Cobalt	10K	3
Collingwood	10K	5
Cornwall	12K	11
Dartmouth	14J	9
Dundas	10L	5
E. Angus	12K	3
Eastview (part of Ottawa)		6
Edmonton	4G	79
Edmunston	13J	6
Esquimalt	2H	3
Fairbank (near Toronto)		3
Farnham	12K	4
Fernie	3H	2
Ford	10L	5
Fort Francis	8J	5
Fort William	8J	26
Fredericton	13J	8
Galt	11L	14
Glace Bay	15J	20
Goderich	10L	4
Grand Mere	12J	6
Guelph	11L	21
Halifax	14J	59
Hamilton	11L	155
Hawkesbury	12K	5
Hudson Heights	11K	27
Hull	11K	29
Ingersoll	10L	5
Joliette	12K	10
Jonquiere	12H	9
Kamloops	2H	6
Kenora	7J	6
Kingston	11K	23
Kitchener	10L	30
Lachine	12K	18
La Tuque	11H	7
Leamington	10L	4
Lethbridge	4J	13
Levis	12J	11
London	10L	71
Magog	12K	6
Midland	10K	6
Mimico (near Toronto)		6
Moncton	13J	20
Montmagny	13J	3
Montreal	12K	818
Moose Jaw	5J	21
Mt. Denis (near Toronto)		4
Nanaimo	2H	6
Nelson	3H	5
New Glasgow	14J	8
Newmarket	11K	3
New Waterford	14J	7
New Westminster	2H	17
Niagara Falls	11L	19
North Battleford	5H	5
North Bay	10K	15
North Sydney	14H	6
Orillia	11K	8
Oshawa	11K	23
Ottawa	11K	126
Outremont	12K	28
Owen Sound	10K	12
Pembroke	11K	9
Penetanguishene	10K	4
Penticton	3H	4
Peterboro	11K	22
Picton	11K	3
Portage la Prairie	7J	6
Port Arthur	8J	19
Port Hope	11K	4
Preston	10L	6
Prince Albert	5H	9
Prince Rupert	2F	6
Quebec	12J	130
Regina	5J	53
Renfrew	11K	5
Riviere du Loup	13H	8
St. Boniface	7J	16
St. Catherines	11L	24
St. Hyacinthe	12K	13
St. James Jc.	7J	11
St. Jerome	12K	4
St. John	13J	48
St. Johns	12K	10
St. Thomas	10L	15
Sandwich	10L	10
Sarnia	10L	18
Saskatoon	5H	43
Sault Ste. Marie	9K	23
Selkirk	7H	4
Shawinigan Falls	12J	15
Sherbrooke	12K	28
Smiths Falls	11K	7
Sorel	12J	10
Spring Hill	14J	6
Stellarton	14J	5
Stratford	10L	17
Sudbury	10J	18
Swift Current	5J	5
Sydney	14H	23
Sydney Mines	14H	7
Thetford Mines	12K	10
Thorold	11L	5
Toronto	11L	631
Transcona	7J	5
Trenton	11K	6
Trois Rivières	12J	35
Truro	14J	7
Valleyfield	12K	11
Vancouver	2H	246
Verdun (part of Montreal)		60
Victoria	2H	39
Wallaceburg	10L	4
Waterford	14J	5
Waterloo	10K	8
Welland	11L	10
Westmount (part of Montreal)		24
Weyburn	6J	5
Windsor	10L	63
Winnipeg	7J	218
Woodstock	10L	11
Yarmouth	13K	7
Yorkton	6H	5

U. S. TOWNS

In Order of Size

1940 CENSUS

Average Elevation In ft.	City	Key	Pop. Thous.
54	New York, N.Y.	19E	7,455
593	Chicago, Ill.	14F	3,397
11	Philadelphia, Pa.	18F	1,931
579	Detroit, Mich.	15E	1,623
267	Los Angeles, Calif.	2H	1,504
582	Cleveland, O.	16E	878
130	Baltimore, Md.	18F	859
455	St. Louis, Mo.	16G	816
10	Boston, Mass.	19D	771
743	Pittsburgh, Pa.	17F	672
25	Washington, D. C.	18F	663
15	San Francisco, Calif.	1F	635
593	Milwaukee, Wis.	14E	587
583	Buffalo, N. Y.	17E	576
5	New Orleans, La.	13L	495
812	Minneapolis, Minn.	12D	492
490	Cincinnati, O.	15G	456
60	Newark, N. J.	19E	430
750	Kansas City, Mo.	12G	399
708	Indianapolis, Ind.	13G	387
38	Houston, Tex.	11L	385
10	Seattle, Wash.	3B	368
513	Rochester, N.Y.	17D	325
5,183	Denver Colo.	8F	322
449	Louisville, Ky.	15G	319
741	Columbus, O.	16F	306
29	Portland, Ore.	2B	305
14	Oakland, Cal.	1F	302
1,032	Atlanta, Ga.	15J	302
15	Jersey City, N. J.	18E	301
425	Dallas, Tex.	11K	295
273	Memphis, Tenn.	13J	293
703	St. Paul, Minn.	12D	288
587	Toledo, O.	15E	282
600	Birmingham, Ala.	14J	268
11	Providence, R.I.	19D	254
675	San Antonio, Tex.	10L	254
873	Akron, O.	16E	245
1,034	Omaha, Neb.	11F	224
740	Dayton, O.	15D	211
398	Syracuse, N. Y.	17D	206
1,197	Oklahoma City Okla.	10H	204
13	San Diego, Calif.	3J	203
475	Worcester, Mass.	19D	194
18	Richmond, Va.	18D	193
614	Ft Worth, Tex.	11K	178
8	Jacksonville, Fla.	17L	173
15	Miami, Fla.	17N	172
841	Youngstown, O.	16F	168
450	Nashville, Tenn.	15H	167
38	Hartford, Conn.	19D	166
610	Grand Rapids, Mich.	15E	164
47	Long Beach, Calif.	2J	164
10	New Haven, Conn.	12E	161
805	Des Moines, Ia.	12F	160
712	Flint, Mich.	15F	152
4,248	Salt Lake City, Utah	5F	150
83	Springfield, Mass.	19D	150
9	Bridgeport, Conn.	19E	147
12	Norfolk, Va.	19G	144
10	Yonkers, N. Y.	19E	143
804	Tulsa, Okla.	11H	142



PACIFIC OCEAN
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IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
TEXAS
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
MEXICO
GULF OF CALIFORNIA
Seattle
Portland
San Francisco
Oakland
Sacramento
Los Angeles
Long Beach
San Diego
Salt Lake City
Denver
El Paso
Spokane
Boise
Phoenix
Tucson
Santa Fe
Great Salt Lake
Yellowstone National Park
Grand Canyon National Park
Longitude East West of Greenwich
ENDERBURY & CANTON I.
Hawaiian Islands
Howland I.
Baker I.
Enderbury I.
Canton I.
EQUATOR
Phoenix Islands
Hull I.
New Hebrides
Samoa Ids.
Fiji Is.
New Caledonia
SCALE OF MILES
PHILIPPINE ISLANDS
SCALE OF MILES
CHINA SEA
PACIFIC OCEAN
SULU SEA
LUZON
Manila
MINDANAO
Borneo
ALASKA
SCALE OF MILES
BERING SEA
ARCTIC OCEAN
GULF OF ALASKA
PACIFIC OCEAN
DOMINION OF CANADA
Nome
Fairbanks
Anchorage
Juneau
Ketchikan
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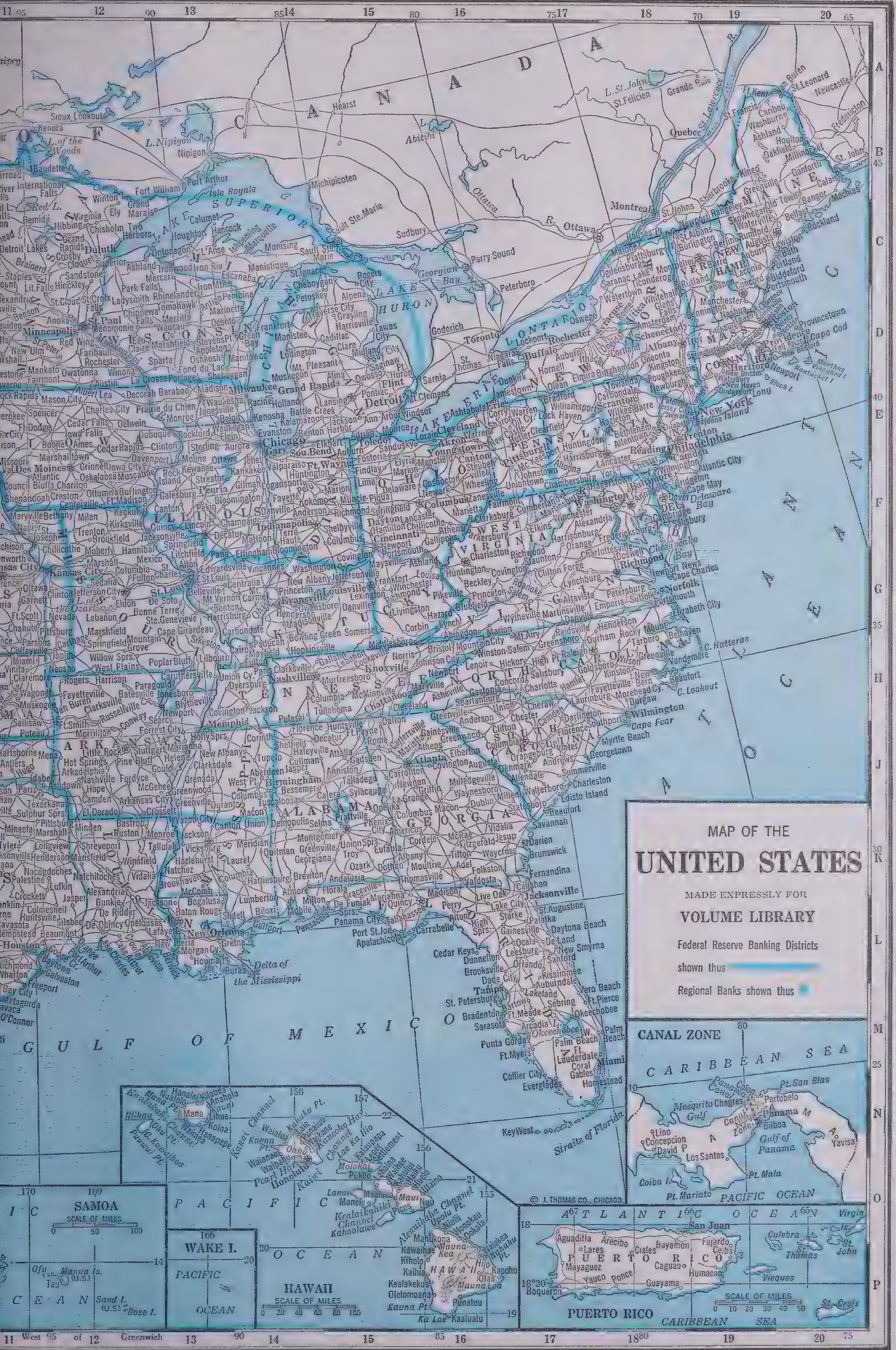
MAP OF THE
UNITED STATES
MADE EXPRESSLY FOR
VOLUME LIBRARY
Federal Reserve Banking Districts shown thus
Regional Banks shown thus
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CANADA
GULF OF MEXICO
ATLANTIC OCEAN
CANAL ZONE
CARIBBEAN SEA
PACIFIC OCEAN
PUERTO RICO
HAWAII
SAMOA
WAKE I.
West of Greenwich

193	Paterson, N. J.	18E	140
726	Scranton, Pa.	18E	140
30	Albany, N. Y.	19D	131
674	Chattanooga, Tenn.	15J	128
35	Trenton, N. J.	19E	125
1,909	Spokane, Wash.	4B	122
771	Kansas City, Kans.	12G	121
6	Camden, N. J.	19F	118
788	Ft. Wayne, Ind.	15F	118
684	Erie, Pa.	17E	117
12	Fall River, Mass.	19D	115
1,291	Wichita, Kan.	11H	115
134	Wilmington, Del.	18F	113
620	Gary, Ind.	14F	112
890	Knoxville, Tenn.	16H	112
22	Cambridge, Mass.	19D	111
206	Reading, Pa.	18E	111
24	Elizabeth, N. J.	19E	110
17	New Bedford, Mass.	19D	110
46	Tacoma, Wash.	3B	109
1,030	Canton, O.	16F	108
15	Tampa, Fla.	17M	108
468	Peoria, Ill.	13F	105
30	Sacramento, Calif.	2F	105
13	Somerville, Mass.	19D	102
721	Charlotte, N. C.	17G	101
609	Duluth, Minn.	12C	101
101	Lowell, Mass.	19D	101
712	South Bend, Ind.	14F	101
407	Utica, N. Y.	18D	101
260	Waterbury, Conn.	19E	99
3,695	El Paso, Tex.	7K	99
26	Lynn, Mass.	19D	98
210	Shreveport, La.	12K	98
383	Evansville, Ind.	14G	97
254	Allentown, Pa.	18E	97
21	Savannah, Ga.	17K	96
466	Austin, Tex.	10L	89
264	Little Rock, Ark.	12J	88
246	Schenectady, N. Y.	18D	88
642	Wilkes-Barre, Pa.	18E	86
183	Berkeley, Cal.	1F	86
730	Rockford, Ill.	13F	85
65	Lawrence, Mass.	19D	84
317	Harrisburg, Pa.	18F	84
593	Saginaw, Mich.	15E	83
290	Glendale, Cal.	2H	83
1,104	Sioux City, Ia.	11F	82
829	Pasadena, Cal.	3H	82
1,148	Lincoln, Neb.	11F	82
858	Winston-Salem, N. C.	17H	80
1,179	Altoona, Pa.	17K	80
50	Bayonne, N. J.	19E	79
828	Lansing, Mich.	15E	79
565	Huntington, W. Va.	16G	79
252	Mobile, Ala.	14L	79
863	Binghamton, N. Y.	18E	78
173	Manchester, N. H.	19D	78
160	Montgomery, Ala.	15K	78
571	Niagara Falls, N. Y.	17D	78
828	St. Joseph, Mo.	11G	76
92	Pawtucket, R. I.	*	76
418	E. St. Louis, Ill.,	13G	76
12	Quincy, Mass.	19D	76
612	Springfield, Ill.	13G	76
26	Portland, Me.	20C	74
10	Charleston, S. C.	17J	71

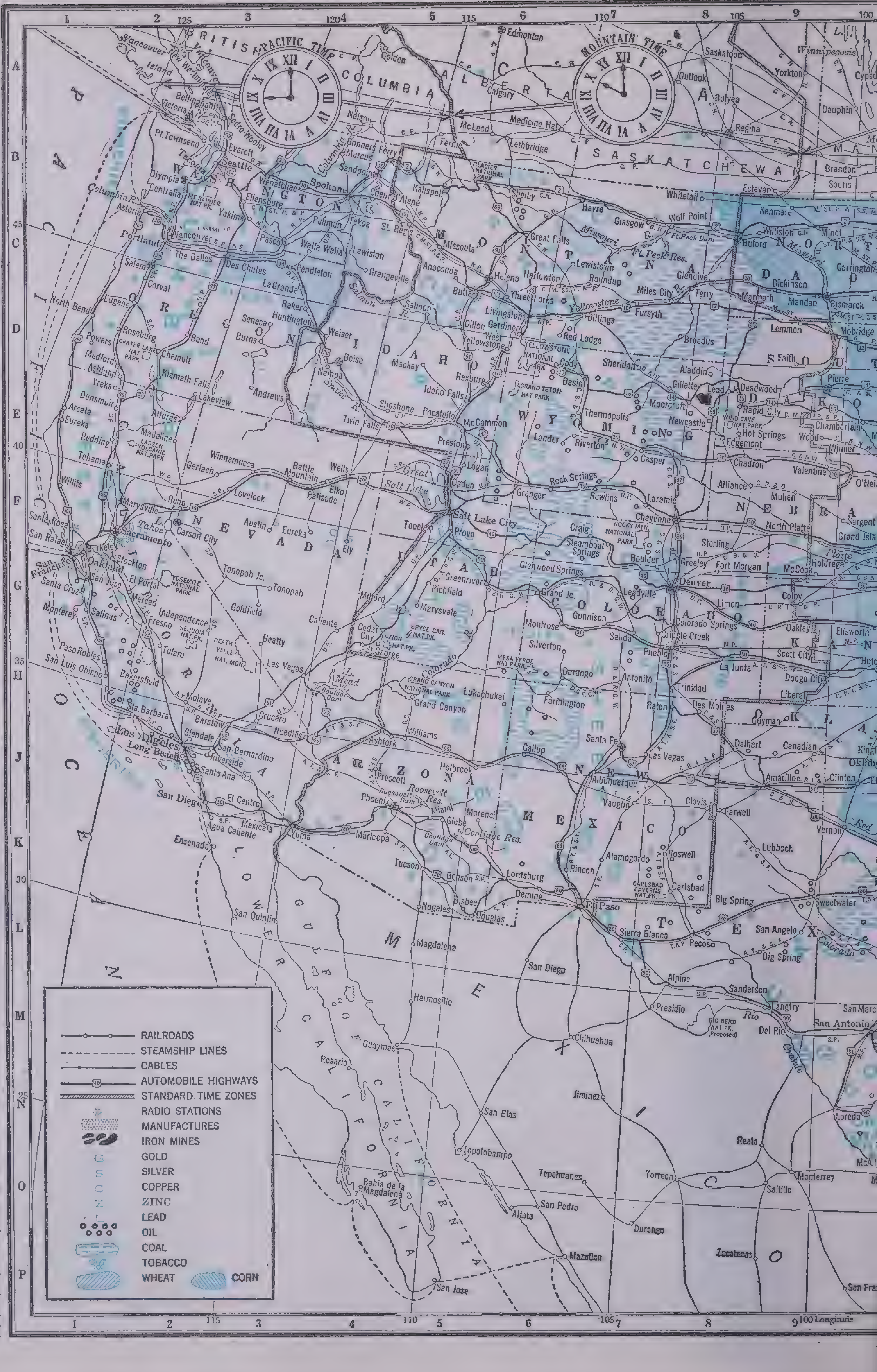
(Cont. on page 2288)

TOWNS OF THE UNITED STATES

In Order of Size

(Continued from page 2287)

Springfield, O. 15F 71
590 Hammond, Ind. * 70
33 Newton, Mass. * 70
35 Troy, N. Y. 19D 70
904 Roanoke, Va. 17G 69
762 Lakewood, O. * 69
173 E. Orange, N. J. * 69
199 New Britain, Conn. 19E..69
70 Charleston, W. Va. 16G.68
118 San Jose, Cal. 1F 68
886 Topeka, Kan. 11G 68
1,184 Johnstown, Pa. 17F 67
114 Mt. Vernon, N. Y. *....67
860 Madison, Wis. 13E 67
932 Pontiac, Mich. 15E 67
620 Racine, Wis. 14E 67
143 Augusta, Ga. 16G 66
559 Davenport, Ia. 13F 66
630 Oak Park, Ill. * 66
608 Cicero, Ill. * 65
592 Evanston, Ill. 14F 65
1,082 Phoenix, Ariz. 5J....65
10 Atlantic City, N. J. 19F..64
604 Dearborn, Mich. *....64
13 Medford, Mass. * 63
485 Terre Haute, Ind. 14F...63
128 Brockton, Mass. 19D 62
513 Covington, Ky. 15G 62
732 Cedar Rapids, Iowa - 12F..62
190 Columbia, S. C. 17J..62
283 Jackson, Miss. 13K 62
281 Fresno, Cal. 2G 61
6 Galveston, Tex. 12L...61
357 Lancaster, Pa. 18F 61
20 St. Petersburg, Fla. 16M...61
1,260 Springfield, Mo. 12H...61
57 Passaic, N. J. * 61
652 Wheeling, W. Va. 16F.61
392 Durham, N. C. 17H 60
21 Beaumont, Tex. 12L 59
22 Chester, Pa. 18F 59
678 Decatur, Ill. 13G 59
837 Greensboro, N. Car. 17H.59
235 Bethlehem, Pa. 18E 58
34 Malden, Mass. * 58
331 Macon, Ga. 16K 58
72 New Rochelle, N. Y. *....58
370 York, Pa. 18F 57
104 Union City, N. J. *....56
400 Waco, Tex. 11L 56
592 E. Chicago, Ind. *.....55
752 McKeesport, Pa. 17F....55
785 Cleveland Hts., Ohio *.....55
19 Stockton, Cal. 2F 55
115 Holyoke, Mass. * 54
753 Kalamazoo, Mich. 15F..54
260 Columbus, Ga. 16K 53
16 Santa Monica, Calif. 2H..53
3,683 Amarillo, Tex. 9J 52
4,660 Pueblo, Colo. 8G 52
841 Waterloo, Ia. 12E 52
1,985 Asheville, N.C. 16H 51
593 Hamilton, O. 15G 51
635 Highland Park, Mich. *,,,,51


PACIFIC TIME
MOUNTAIN TIME
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MEXICO
LOWER CALIFORNIA
GULF OF CALIFORNIA
PACIFIC OCEAN
Seattle
Portland
San Francisco
Los Angeles
San Diego
Salt Lake City
Denver
Spokane
Boise
Phoenix
El Paso
Cheyenne
RAILROADS
STEAMSHIP LINES
CABLES
AUTOMOBILE HIGHWAYS
STANDARD TIME ZONES
RADIO STATIONS
MANUFACTURES
IRON MINES
GOLD
SILVER
COPPER
ZINC
LEAD
OIL
COAL
TOBACCO
WHEAT
CORN
100 Longitude

CENTRAL TIME
EASTERN TIME
JAMES BAY
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE
WISCONSIN
IOWA
ILLINOIS
OHIO
PENNSYLVANIA
MAINE
NEW BRUNSWICK
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
ALABAMA
GEORGIA
LOUISIANA
FLORIDA
GULF OF MEXICO
ATLANTIC OCEAN
BAHAMA ISLANDS
CUBA
Chicago
Detroit
SCALE OF MILES
0
50
100
200
300
Greenwich

COMMERCIAL MAP
OF THE
UNITED STATES
MADE EXPRESSLY FOR
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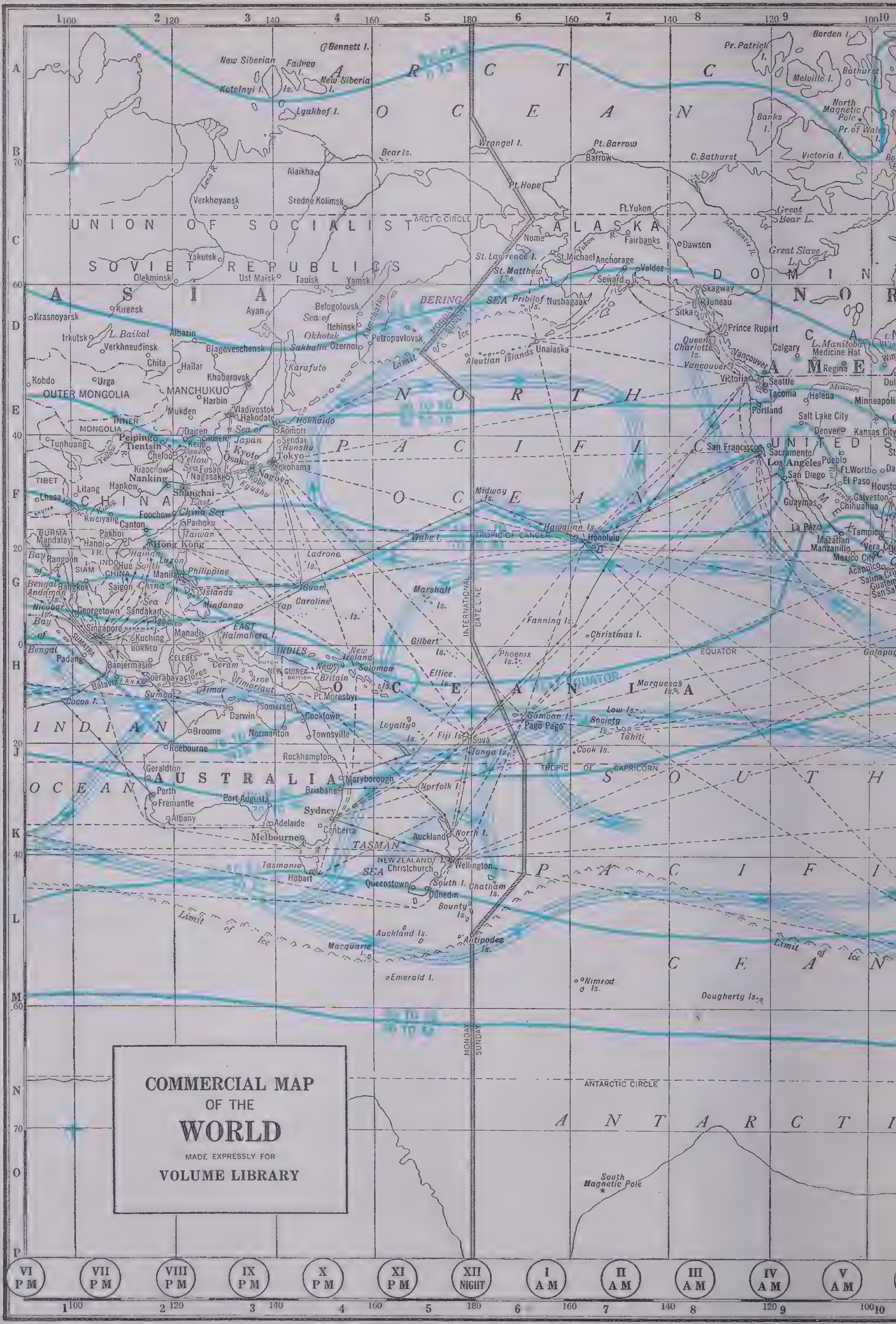
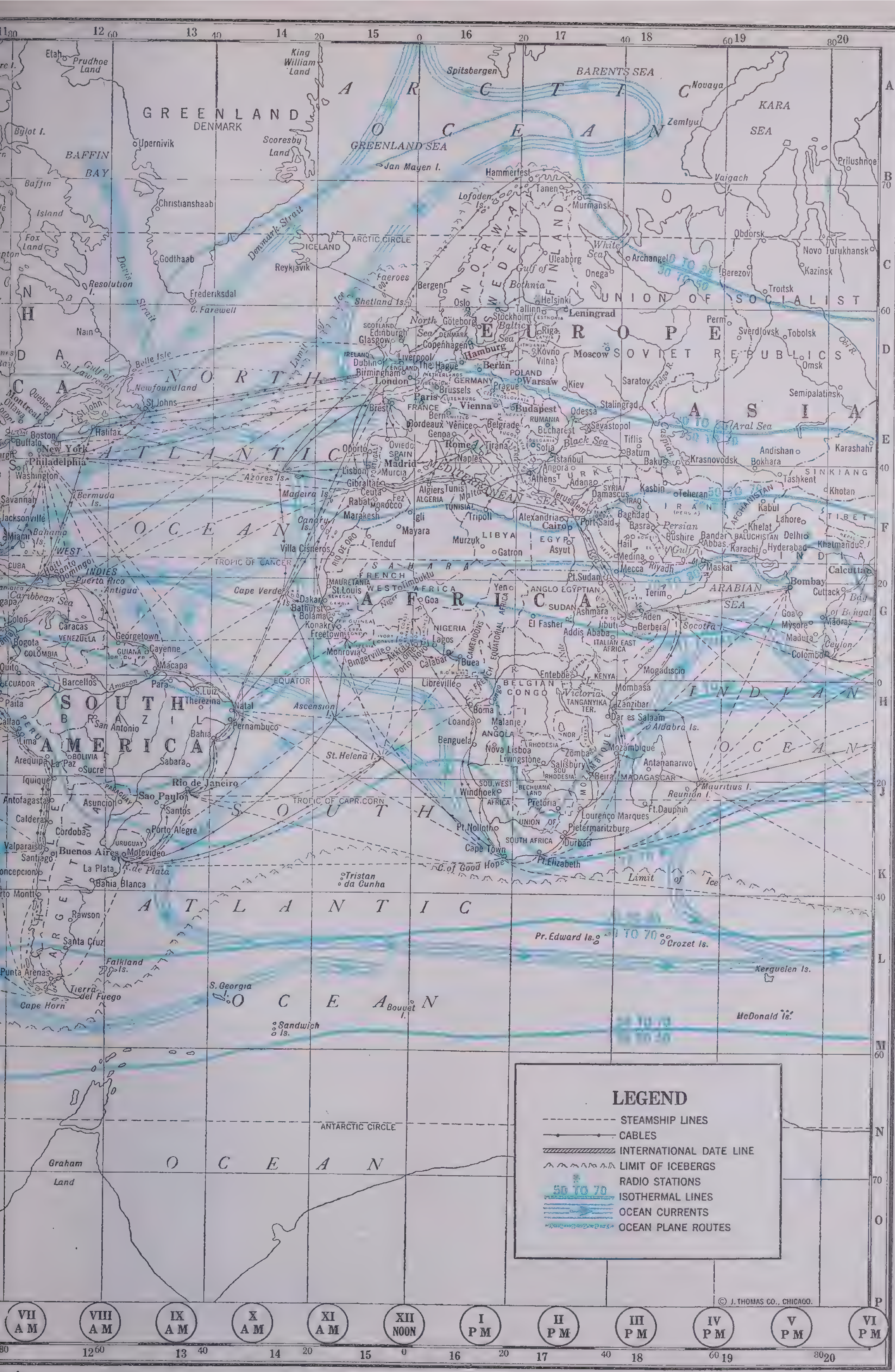
10	Portsmouth, Va. 28G	51
43	Brookline, Mass. *	50
935	Muncie, Ind. 15E	50
[illegible]	[illegible], Mich. [illegible]E	[illegible]
1,037	Pittsfield, Mass. *	50
730	Hamtramck, Mich. *	50
7	Hoboken, N. J.	[illegible]
[illegible]	[illegible], N. J.	49
611	Kenosha, Wis. 14E	49
946	Lexington, Ky. 15G	49
162	Woonsocket, R. I. *	[illegible]
609	Berwyn, Ill.	[illegible]
594	Bay City, Mich. 15E	48
592	Muskegon, Mich. 15E	48
806	New Castle, Pa. 17E	[illegible]
34	Stamford, Conn. *	48
647	Aurora, Ill. 14F	47
[illegible]	[illegible], R. I. *	47
12	Everett, Mass.	47
35	Haverhill, Mass.	47
316	Raleigh, N. C. 18H	47
590	Green Bay, Wis. 14D	46
8	Port Arthur, Tex. 12L	46
857	Elmira, N. Y. 18E	45
880	Lima, O. [illegible]	45
517	Lynchburg, Va. 17G	45
946	Wichita Falls, Tex. 10J	45
412	D[illegible], Ia. 13F	44
610	Lorain, O. 16F	44
4,296	Ogden, Utah 6E	44
1,077	San Bernardino, Calif. 3H	44
524	Williamsport, Pa. 17E	44
819	Battle Creek, Mich. 15F	43
1,317	Jamestown, N. Y. 17E	43
651	LaCrosse, Wis. 13E	43
563	Rock Island, [illegible]	[illegible]
897	Warren, O. 16F	43
874	Anderson, Ind. 15G	42
125	Bloomfield, N. J. *	42
84	Chicopee, Mass. *	42
536	Joliet, Ill. 14F	42
[illegible]	[illegible] 19D	42
11	[illegible], Mass.	41
[illegible]	[illegible]	41
10	Salem, Mass. *	41
984	Council Bluffs, Iowa 11F	41
[illegible]	[illegible] 14E	41
[illegible]	[illegible], Mass. *	[illegible]
241	Montclair, N. J. *	[illegible]
17	Norwalk, Conn. *	40
[illegible]	[illegible], Ill. 13G	40
51	Waltham, Mass. *	40
156	Poughkeepsie, N. Y. 18E	40
525	Portsmouth, O. 16G	40
150	Meriden, Conn. *	39
641	Cumberland, [illegible] 17F	[illegible]
12	[illegible], N. J.	[illegible]
743	Oshkosh, Wis. 13E	39
[illegible]	[illegible], O.	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible], Pa.	[illegible]
3,098	High Point, N. Car. 17H	38
[illegible]	[illegible]	[illegible]
[illegible]	[illegible] 5D	[illegible]
11	T[illegible]	[illegible]
[illegible]	T[illegible], Ariz. 5J	37
[illegible]	Z[illegible], O.	[illegible]
[illegible]	[illegible], N. Y. 17D	[illegible]



COMMERCIAL MAP OF THE WORLD MADE EXPRESSLY FOR VOLUME LIBRARY

ARCTIC OCEAN
New Siberian Is.
Bennett I.
Fadeev I.
New Siberia I.
Kotelnyi I.
Lyakhof I.
Bear Is.
Wrangel I.
Pt. Barrow
Barrow
Pt. Hope
UNION OF SOCIALIST SOVIET REPUBLICS
ASIA
ARCTIC CIRCLE
Verkhoyansk
Sredne Kolimsk
Alaikha
Yakutsk
Olekminsk
Ust Maisk
Tauisk
Yamsk
Lena R.
Kirensk
Krasnoyarsk
Irkutsk
L. Baikal
Verkhneudinsk
Chita
Albazin
Blagoveschensk
Hailar
Khabarovsk
Ayan
Belogolovsk
Sea of Okhotsk
Itchinsk
Ozernoi
Petropavlovsk
Kamchatka
Sakhalin
Karafuto
Kobdo
Urga
OUTER MONGOLIA
MANCHUKUO
Harbin
Mukden
INNER MONGOLIA
Vladivostok
Hakodate
Hokkaido
Aomori
Sendai
Honshu
Tokyo
Yokohama
Nagoya
Kyoto
Osaka
Kobe
Kyushu
Nagasaki
Fusan
Keijo
CHOSEN
Sea of Japan
Dairen
Peiping
Tientsin
Chefoo
Kiaochow
Yellow Sea
Tunhuang
Yellow R.
TIBET
Lhasa
Litang
Hankow
Nanking
Shanghai
CHINA
East China Sea
Foochow
Paihoku
Taiwan
Kweiyang
Canton
Hong Kong
BURMA
Mandalay
Pakhoi
Hanoi
FR. INDO CHINA
Hainan
Hue
Rangoon
SIAM
Bangkok
Saigon
South China Sea
Luzon
Manila
Philippine Islands
Mindanao
Bay of Bengal
Andaman Is.
Nicobar Is.
Georgetown
Sandakan
Singapore
Kuching
BORNEO
Sumatra
Padang
Banjermasin
Soerabaya
Batavia
JAVA
Flores
Sumba
Timor
Celebes
Manado
Halmahera I.
Ceram
Aroe
Timorlaut
EAST INDIES
NEW GUINEA
Pt. Moresby
New Ireland
New Britain
Solomon Is.
Cocos I.
INDIAN OCEAN
Darwin
Somerset
Cooktown
Normanton
Townsville
Broome
Roebourne
Rockhampton
AUSTRALIA
Geraldton
Perth
Fremantle
Albany
Port Augusta
Maryborough
Brisbane
Sydney
Adelaide
Canberra
Melbourne
Tasmania
Hobart
TASMAN SEA
NEW ZEALAND
Auckland
North I.
Wellington
Christchurch
South I.
Queenstown
Dunedin
Chatham Is.
Bounty Is.
Antipodes Is.
Auckland Is.
Macquarie I.
Emerald I.
Nimrod Is.
Dougherty Is.
Limit of Ice
BERING SEA
Pribilof Is.
Nushagak
St. Matthew I.
St. Lawrence I.
St. Michael
Nome
ALASKA
Yukon R.
Ft. Yukon
Fairbanks
Anchorage
Valdez
Seward
Aleutian Islands
Unalaska
Dawson
Mackenzie R.
Skagway
Juneau
Sitka
Prince Rupert
Queen Charlotte Is.
Vancouver I.
Vancouver
Victoria
Seattle
Tacoma
Portland
NORTH PACIFIC OCEAN
Midway Is.
Hawaiian Is.
Honolulu
TROPIC OF CANCER
Wake I.
Ladrone Is.
Guam
Yap
Caroline Is.
Marshall Is.
Gilbert Is.
Ellice Is.
Phoenix Is.
Fanning Is.
Christmas I.
EQUATOR
Samoan Is.
Pago Pago
Fiji Is.
Suva
Loyalty Is.
Tonga Is.
Norfolk I.
Cook Is.
Society Is.
Tahiti
Low Is.
Marquesas Is.
TROPIC OF CAPRICORN
SOUTH PACIFIC OCEAN
INTERNATIONAL DATE LINE
MONDAY SUNDAY
ANTARCTIC CIRCLE
ANTARCTIC
South Magnetic Pole
Borden I.
Pr. Patrick I.
Melville I.
Bathurst I.
North Magnetic Pole
Pr. of Wales I.
Banks I.
C. Bathurst
Victoria I.
Great Bear L.
Great Slave L.
DOMINION OF CANADA
NORTH AMERICA
Calgary
L. Manitoba
Medicine Hat
Regina
Missouri R.
Helena
Minneapolis
Salt Lake City
Denver
Kansas City
San Francisco
Sacramento
UNITED STATES
Los Angeles
San Diego
Pueblo
Ft. Worth
El Paso
Houston
Galveston
Chihuahua
Guaymas
La Paz
Tampico
Mazatlan
Manzanillo
Vera Cruz
Mexico City
Acapulco
Salina Cruz
Galapagos
A, B, C, D, E, F, G, H, J, K, L, M, N, O, P
1, 2, 3, 4, 5, 6, 7, 8, 9, 10
100, 120, 140, 160, 180, 160, 140, 120, 100
70, 60, 40, 20, 0, 20, 40, 60, 70
VI PM
VII PM
VIII PM
IX PM
X PM
XI PM
XII NIGHT
I AM
II AM
III AM
IV AM
V AM

The International Date Line.—This line marks the change of day in circumnavigating the earth east or west. By common consent of the leading nations, it is placed in the Pacific; for a great part of its extent it coincides with the 180th meridian. When ships "cross the line," they add a day to their calendar if they are going west, and subtract a day if they are going east. Why? The date line is placed in the Pacific, far from most lands,


ARCTIC OCEAN
GREENLAND
DENMARK
BAFFIN BAY
GREENLAND SEA
BARENTS SEA
KARA SEA
ICELAND
ARCTIC CIRCLE
EUROPE
UNION OF SOCIALIST SOVIET REPUBLICS
ASIA
NORTH ATLANTIC OCEAN
AFRICA
SAHARA
SOUTH AMERICA
BRAZIL
ARGENTINA
INDIAN OCEAN
ARABIAN SEA
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
SOUTH ATLANTIC OCEAN
Limit of Ice
ANTARCTIC CIRCLE
OCEAN
Graham Land
LEGEND
STEAMSHIP LINES
CABLES
INTERNATIONAL DATE LINE
LIMIT OF ICEBERGS
RADIO STATIONS
50 TO 70
ISOTHERMAL LINES
OCEAN CURRENTS
OCEAN PLANE ROUTES
© J. THOMAS CO., CHICAGO.
VII AM
VIII AM
IX AM
X AM
XI AM
XII NOON
I PM
II PM
III PM
IV PM
V PM
VI PM
A
B
C
D
E
F
G
H
J
K
L
M
N
O
P
11
12
13
14
15
16
17
18
19
20
80
60
40
20
0
20
40
60
80

Approximate Length of Longest Day of Different Latitudes.

North Latitude

	Days	
90° (North Pole)	186	
85°	161	
80°	134	
75°	103	
70°	65	
	Hrs.	Min.
66°33′	24	..
65°	21	9
60°	18	30
55°	17	7
50°	16	9
45°	15	26
40°	14	51
35°	14	22
30°	13	56
25°	13	34
20°	13	13
15°	12	53
10°	12	35
5°	12	17
0° (Equator)	12	..

South Latitude

	Hrs.	Min.
0° (Equator)	12	..
5°	12	17
10°	12	35
15°	12	53
20°	13	13
25°	13	34
30°	13	56
35°	14	22
40°	14	51
45°	15	26
50°	16	9
55°	17	7
60°	18	30
65°	21	9
66°33′	24	..
	Days	
70°	65	
75°	103	
80°	134	
85°	161	
90° (South Pole)	196	

because the change is most conveniently made where traffic is not likely to be disturbed by a confusion of dates. As a matter of fact, the observance of the date line is theoretical rather than actual, and sailing masters change time, not at the line, but most commonly at the nearest port of call. The line as drawn on the Flat-Globe represents the official interpretation of the United States Government at present.

NORTH POLE REGION

Expeditions

Name	Key
Amundsen-Ellsworth	— — — — —
Andree	—*—*—*—
Byrd-Bennett	- - - - - - -
De Long-Jeanette	—|—|—|—|—
Nansen-Fram	—x—x—x—
Peary	————————
Stefanson	—*—*—
Wilkins-Eielson	—-—-—-—

Countries, Islands, Etc.

Name	Key	Pop. Thous.
Baffin Island	6G	
Banks Island	4E	
Borden Island	5E	
Cockburn Land	5F	
Devon Island	5F	
Edge Island	8C	
Ellesmere Island	6E	
Finland	10B	3,667
Fridtjof Nansen Land	7B	1
Greenland	8F	17
Iceland	10F	114
Jan Mayen Island	9D	
Lenin Island	6A	
New Siberia Islands	4A	1
North East Island	8C	
Norway (Section of)	10C	2,814
Nova Zemlya	8A	1
Siberia (Section of)	4A	
Spitsbergen (Svalbard)	8C	2
Victoria Island	4F	
Wales Island	5F	
West Spitsbergen	8C	

TOWNS

Name	Key	Pop. Thous.
Åbo	11B	67
Archangel	10A	194
Bergen	11D	98
Dawson	2E	1
Fairbanks	2D	3
Fort Hope	5G	
Fort Nelson	2G	
Helsinki	11B	277
Juneau	1F	6
Leningrad	11B	2,776
Nidaros	11D	
Nome	1C	2
Orca	1E	
Oslo	11D	253
Resolution	3G	
Reykjavik	10F	34
Sitka	1F	2
Stockholm	11C	533
Tanana	2D	
Teller	1C	
Umivik	9G	
Yakutat	1F	

Points Reached by Explorers

Explorer	Key
Andree	7C
Cagni	6C
Greely	7D
Kane	6E

SOUTH POLE REGION

Expeditions

Name	Key
Amundsen	—..—..—
Byrd	- - -.- -
Scott	—.—.—.—.—
Shackleton	—x—x—x—

Countries, Islands, Etc.

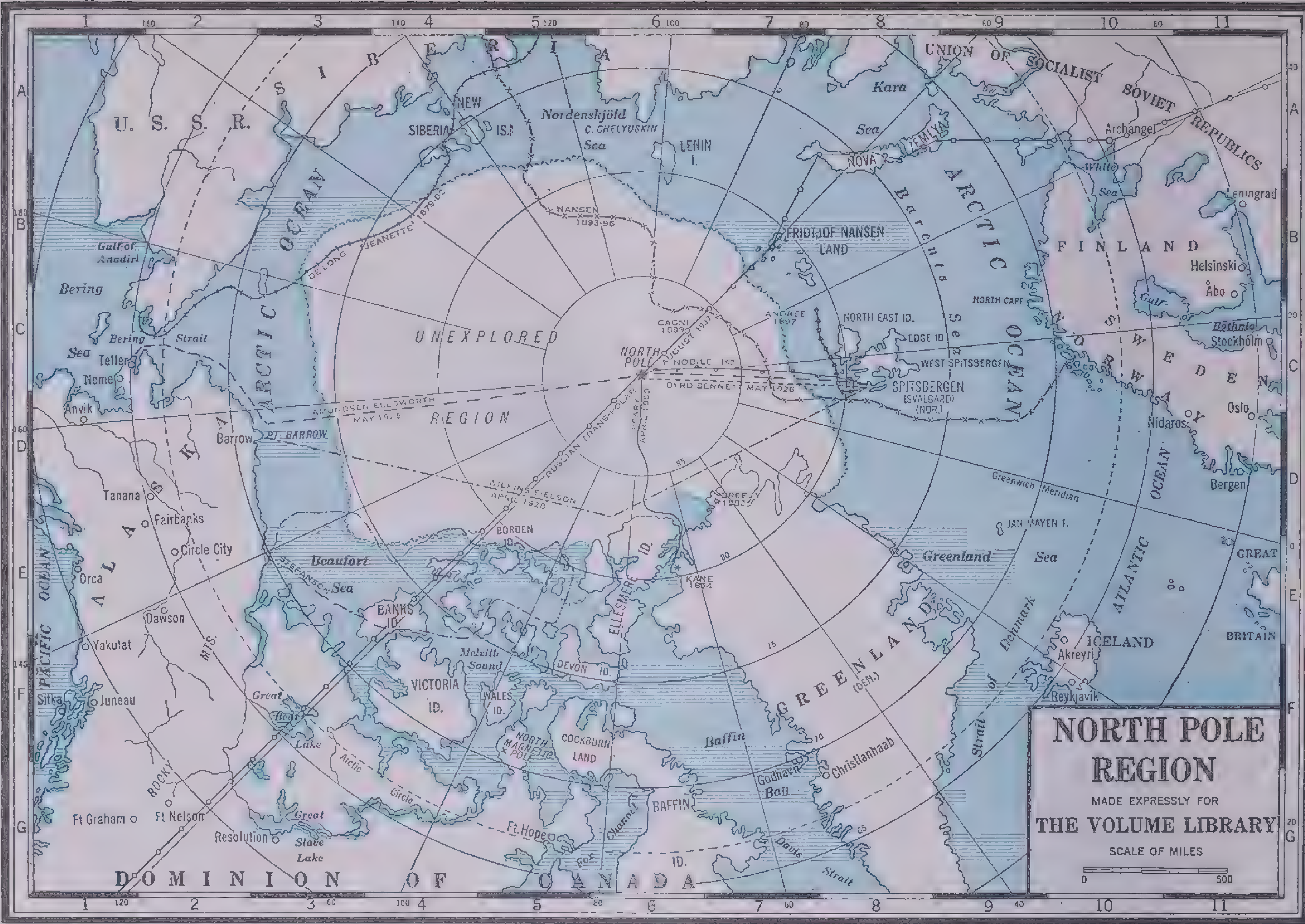
Name	Key	Pop. Thous.
Adelaide Islands	6B	
Auckland Islands	[illegible]F	
Caird Coast	7C	
Campbell Island	[illegible]	
Chatham Island	2E	†562
Crozet Islands	9F	
Enderby Land	8E	
Falkland Islands	7A	2
Gough Island	10B	
Heard Island	8G	
Kemp Land	7E	
Kerguelen Island	8G	
Knox Land	6F	
Little America	5D	
Macquarie Island	3F	
Marie Byrd Land	5D	
Marion Island	10E	
New Zealand	2F	1,587
North Graham Island	6B	
North Island (New Zealand)	1F	984
Queen Maud Range	6D	
Sandwich Islands	8B	
South America (Southern Tip)	6A	89,847
South Graham Island	6B	
South Georgia	8A	1
South Island (New Zealand)	2F	540
South Orkney Islands	7B	
South Shetland Islands	6B	
Tasmania	3G	231
Tierra del Fuego	6A	
Tristran da Cunha	10B	

TOWNS

Name	Key	Pop. Thous.
Brisbane	2G	309
Cape Town	11D	165
Christchurch	2E	132
Durban	11E	151
Hobart	3G	62
Invercargill	2F	24
Melbourne	3G	1,008
Port Elizabeth	11E	53
Sydney	2G	1,254
Wellington	2E	149

Points Reached by Explorers

Name of Explorer	Key
Bellingshausen	4D & 8D
Biscoe	4B & 8D
Borchgrevink	5D
Bransfield	7B
Bruce	7C
Christiansen	5D
Cook	4C, 5C & 8D
De Gerlache	6B
Drygalski	7F
Durville	5F
Evensen	6B
Kemp	7E
Larsen	6B
Moore	8D
Nares	7F
Ross	5D & 7C
Walker	5B
Weddell	7C
Wilkes	6F


NORTH POLE REGION
MADE EXPRESSLY FOR
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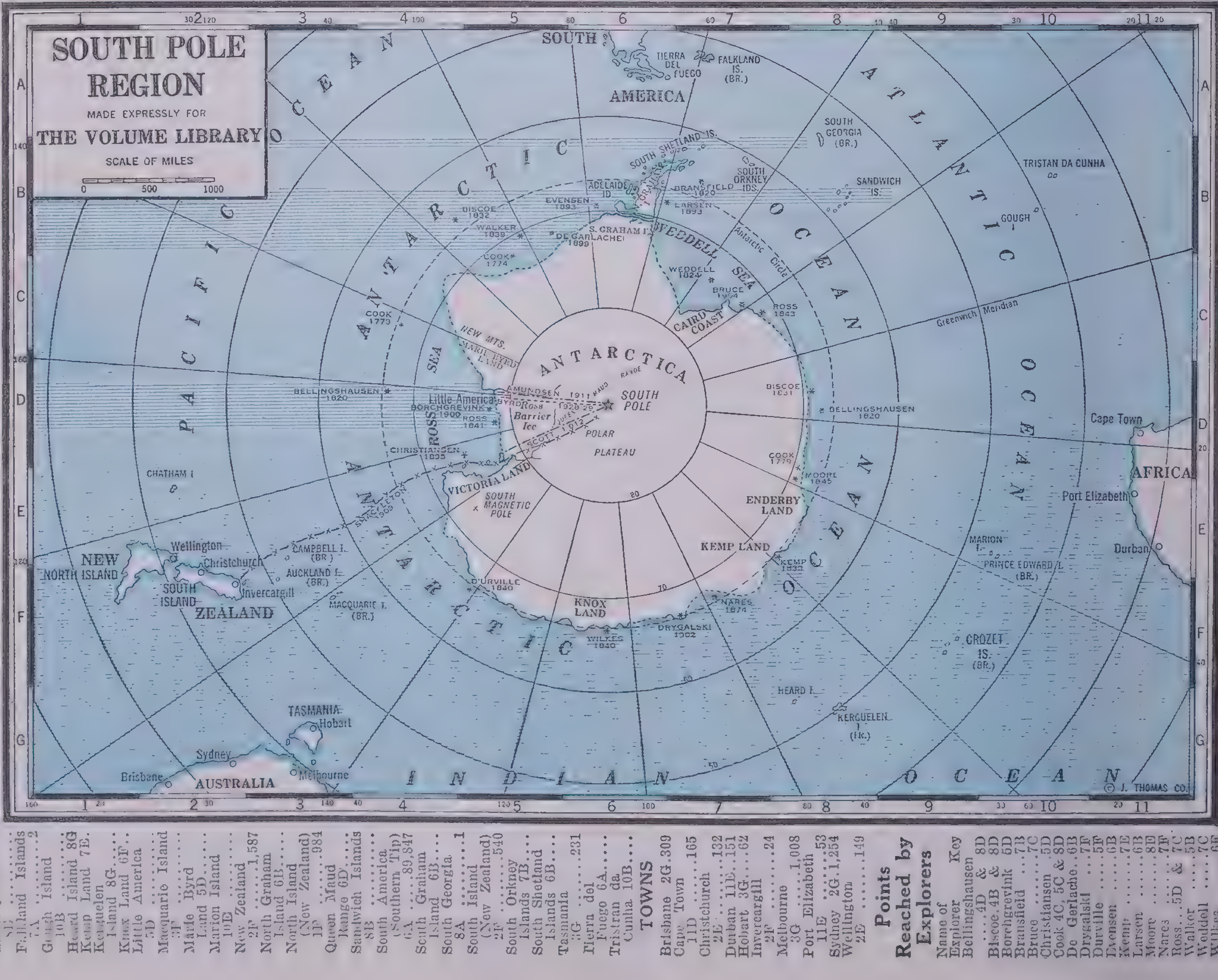
SCALE OF MILES
0
500
U. S. S. R.
SIBERIA
NEW SIBERIA ISS
Nordenskjöld Sea
C. CHELYUSKIN
LENIN I.
Kara Sea
NOVA ZEMLYA
UNION OF SOCIALIST SOVIET REPUBLICS
Archangel
White Sea
Leningrad
FINLAND
Helsinski
Åbo
Gulf of Bothnia
Stockholm
SWEDEN
NORWAY
Oslo
Nidaros
Bergen
GREAT BRITAIN
ICELAND
Akreyri
Reykjavik
Greenwich Meridian
JAN MAYEN I.
Greenland Sea
ATLANTIC OCEAN
Strait of Denmark
ARCTIC OCEAN
Barents Sea
FRIDTJOF NANSEN LAND
NORTH CAPE
NORTH EAST ID.
EDGE ID.
WEST SPITSBERGEN
SPITSBERGEN (SVALBARD) (NOR.)
ANDREE 1897
CAGNI 1900
NORTH POLE
NOBILE 1928
BYRD BENNETT MAY 1926
PEARY APRIL 1909
RUSSIAN TRANS-POLAR
NANSEN 1893-96
JEANETTE 1879-82
DE LONG
UNEXPLORED REGION
AMUNDSEN ELLSWORTH MAY 1926
WILKINS-EIELSON APRIL 1928
GREELY 1882
KANE 1854
Gulf of Anadir
Bering Sea
Bering Strait
Teller
Nome
Anvik
Barrow
PT. BARROW
ARCTIC OCEAN
ALASKA
Tanana
Fairbanks
Circle City
Orca
Dawson
Yakutat
Sitka
Juneau
PACIFIC OCEAN
ROCKY MTS.
Beaufort Sea
STEFANSON
BORDEN ID.
BANKS ID.
ELLESMERE ID.
Melville Sound
DEVON ID.
VICTORIA ID.
WALES ID.
NORTH MAGNETIC POLE
COCKBURN LAND
Great Bear Lake
Arctic Circle
Great Slave Lake
Ft. Hope
Fox Channel
BAFFIN ID.
Baffin Bay
Godhavn
Christianhaab
Davis Strait
GREENLAND (DEN.)
Ft Graham
Ft Nelson
Resolution
DOMINION OF CANADA


SOUTH POLE REGION
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
SCALE OF MILES
0
500
1000
SOUTH AMERICA
TIERRA DEL FUEGO
FALKLAND IS. (BR.)
SOUTH GEORGIA (BR.)
SOUTH SHETLAND IS.
SOUTH ORKNEY IDS.
SANDWICH IS.
TRISTAN DA CUNHA
GOUGH
ATLANTIC OCEAN
PACIFIC OCEAN
ANTARCTIC OCEAN
ADELAIDE ID.
EVENSEN 1893
BRANSFIELD 1820
LARSEN 1893
BISCOE 1832
WALKER 1839
DE GARLACHE 1898
S. GRAHAM I.
COOK 1774
COOK 1773
WEDDELL SEA
WEDDELL 1824
BRUCE 1904
ROSS 1843
Antarctic Circle
CAIRD COAST
Greenwich Meridian
NEW MTS.
MARIE BYRD LAND
ANTARCTICA
QUEEN MAUD RANGE
AMUNDSEN 1911
BYRD 1929
SOUTH POLE
POLAR PLATEAU
Ross Barrier Ice
SCOTT 1912
ROSS SEA
Little America
BORCHGREVINK 1900
ROSS 1841
BELLINGSHAUSEN 1820
CHRISTIANSEN 1895
SHACKLETON 1909
VICTORIA LAND
SOUTH MAGNETIC POLE
CHATHAM I.
BISCOE 1831
BELLINGSHAUSEN 1820
COOK 1774
MOORE 1845
ENDERBY LAND
KEMP LAND
KEMP 1833
NARES 1874
DRYGALSKI 1902
KNOX LAND
WILKES 1840
D'URVILLE 1840
CAMPBELL I. (BR.)
AUCKLAND I. (BR.)
MACQUARIE I. (BR.)
NEW ZEALAND
NORTH ISLAND
SOUTH ISLAND
Wellington
Christchurch
Invercargill
TASMANIA
Hobart
AUSTRALIA
Sydney
Brisbane
Melbourne
INDIAN OCEAN
HEARD I.
KERGUELEN (FR.)
CROZET IS. (BR.)
MARION I.
PRINCE EDWARD I. (BR.)
AFRICA
Cape Town
Port Elizabeth
Durban
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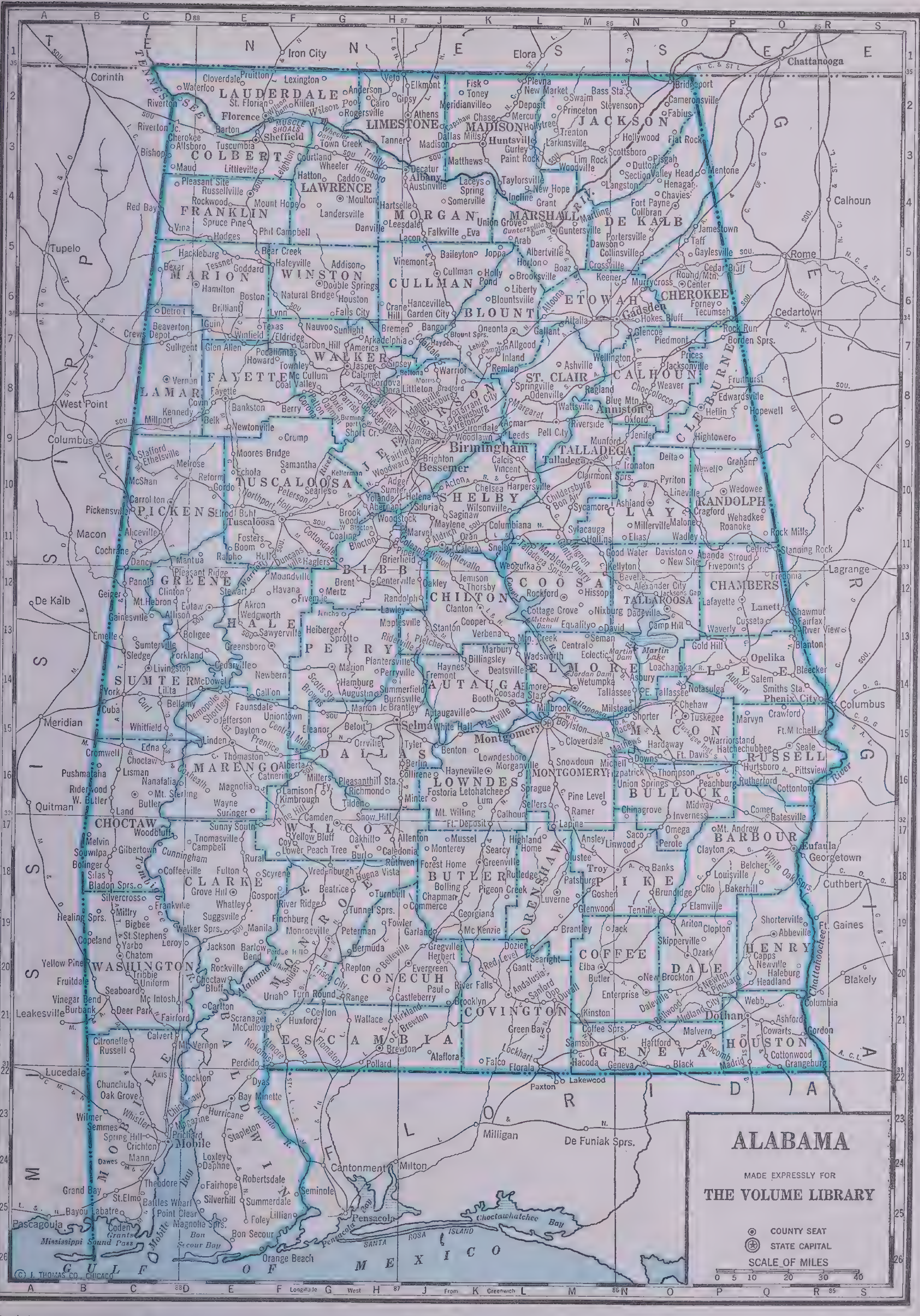
ALABAMA
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
COUNTY SEAT
STATE CAPITAL
SCALE OF MILES
0 5 10 20 30 40
TENNESSEE
GEORGIA
FLORIDA
MISSISSIPPI
GULF OF MEXICO
LAUDERDALE
LIMESTONE
MADISON
JACKSON
COLBERT
LAWRENCE
MORGAN
MARSHALL
DE KALB
FRANKLIN
MARION
WINSTON
CULLMAN
BLOUNT
ETOWAH
CHEROKEE
LAMAR
FAYETTE
WALKER
JEFFERSON
ST. CLAIR
CALHOUN
CLEBURNE
PICKENS
TUSCALOOSA
SHELBY
TALLADEGA
CLAY
RANDOLPH
GREENE
HALE
BIBB
CHILTON
COOSA
TALLAPOOSA
CHAMBERS
SUMTER
PERRY
AUTAUGA
ELMORE
LEE
MARENGO
DALLAS
LOWNDES
MONTGOMERY
MACON
RUSSELL
BULLOCK
CHOCTAW
CLARKE
WILCOX
BUTLER
CRENSHAW
PIKE
BARBOUR
WASHINGTON
MONROE
CONECUH
COFFEE
DALE
HENRY
MOBILE
BALDWIN
ESCAMBIA
COVINGTON
GENEVA
HOUSTON
Birmingham
Montgomery
Mobile
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Longitude West From Greenwich

ALABAMA

Pop. 2,832,961

COUNTIES

Name	Key	Pop. Thous.
Autauga	14J	21
Baldwin	23E	32
Barbour	17P	32
Bibb*	11G	20
Blount	6K	29
Bullock	16N	20
Butler	18J	32
Calhoun	7N	63
Chambers	12P	42
Cherokee	5O	20
Chilton	12J	28
Choctaw*	17B	20
Clarke*	18D	28
Clay	10N	17
Cleburne	8P	14
Coffee	20M	32
Colbert	3E	34
Conecuh	20H	25
Coosa*	12L	13
Covington	21L	42
Crenshaw	18L	24
Cullman	6J	47
Dale	20O	23
Dallas	15G	55
De Kalb	4N	43
Elmore	14M	35
Escambia	21H	31
Etowah	6M	73
Fayette	8E	22
Franklin	4D	28
Geneva	21N	29
Greene	12D	19
Hale	13E	26
Henry	20Q	22
Houston	21Q	46
Jackson	2M	42
Jefferson	9H	460
Lamar*	7C	20
Lauderdale	2E	46
Lawrence*	4G	28
Lee	14P	36
Limestone	2H	36
Lowndes*	16J	23
Macon	15O	28
Madison	2K	66
Marengo	15D	36
Marion*	5D	29
Marshall	4L	42
Mobile	23C	142
Monroe	19F	29
Montgomery	16M	114
Morgan	4J	48
Perry	13G	27
Pickens*	10C	28
Pike	18N	32
Randolph*	10P	26
Russell*	15Q	36
Saint Clair*	7L	27
Shelby	10K	29
Sumter	14C	27
Talladega	10M	52
Tallapoosa	12N	35
Tuscaloosa	10F	76
Walker	7G	64
Washington*	20C	16
Wilcox*	17F	26
Winston	5F	19

TOWNS

Town	Key	Pop.
Abbeville	**19Q**	**2**
Adamsville	9H	1
Albertville	5L	4
Alexander City	12O	7
Aliceville	11D	1
Altoona	6L	1
Andalusia	**20L**	**7**
Anniston	**8N**	**26**
Ashland	**10N**	**2**
Athens	**2H**	**4**
Atmore	22F	3
Attalla	6M	5
Auburn	14P	5
Bay Minette	**23E**	**2**
Bessemer	9J	23
Bevelle	12O	1
Birmingham	**9K**	**268**
Blocton	11G	1
Blue Mtn.	8N	†7
Boaz	5M	2
Brantley	19M	1
Brewton	**21H**	**3**
Bridgeport	1N	2
Brighton	9J	1
Brookwood	10G	1
Brundidge	18O	2
Butler	**16D**	**†7**
Calera	11K	1
Camden	**17G**	**†9**
Camp Hill	13O	1
Carbon Hill	7F	3
Carrollton	**10C**	**†6**
Center	**5O**	**1**
Centerville	**12H**	**†9**
Chapman	18K	1
Chatom	**20C**	**†5**
Chickasaw	23C	1
Citronelle	21C	1
Clanton	**12K**	**4**
Clayton	**17P**	**2**
Columbiana	**10K**	**1**
Cordova	7H	2
Crichton	24D	1
Cullman	**5J**	**5**
Dadeville	**12N**	**2**
Decatur	**3H**	**17**
Demopolis	11E	4
Dora	8H	1
Dothan	**21P**	**17**
Double Springs	**5G**	**†4**
East Brewton	21J	1
Elba	**20N**	**2**
Enterprise	**20N**	**4**
Eufaula	**17Q**	**6**
Eutaw	**12D**	**2**
Evergreen	**20J**	**2**
Fairfield	9H	12
Fairhope	25E	2
Fayette	**8E**	**3**
Five Points	12P	†8
Flomaton	22	†8
Florala	22L	3
Florence	**2E**	**15**
Fort Deposit	17K	1
Fort Payne	**4N**	**4**
Frisco City	19G	1
Gadsden	**6M**	**37**
Geneva	**22N**	**3**
Georgiana	19K	2
Good Water	11M	1
Gordo	10E	1
Greensboro	**13F**	**2**
Greenville	**17K**	**5**
Grove Hill	**18E**	**†7**
Guin	7D	1
Guntersville	**4L**	**4**
Haleyville	5F	2
Hamilton	**5D**	**1**
Hartford	21O	1
Hartselle	4H	3
Hayneville	**16K**	**†5**
Headland	20P	2
Heflin	**8P**	**2**
Homewood	9H	7
Huntsville	**2K**	**13**
Hurtsboro	16Q	1
Irondale	9H	1
Jackson	19E	2
Jacksonville	7O	3
Jasper	**7G**	**7**
Lafayette	**12P**	**2**
Lanett	12Q	6
Leeds	9H	2
Linden	**15D**	**1**
Lineville	10O	1
Lipscomb	9H	2
Livingston	**14D**	**1**
Lockhart	21L	1
Luverne	**18L**	**2**
Marion	**13G**	**2**
Mignon	9M	2
Mobile	**24D**	**73**
Monroeville	**20G**	**2**
Montevallo	11K	1
Montgomery	**15L**	**78**
Moulton	**4G**	**†8**
Muscle Shoals	**3F**	**1**
Northport	10F	3
Oakman	8G	1
Oneonta	**6K**	**2**
Opelika	**13P**	**8**
Opp	21L	3
Oxford	8N	1
Ozark	**19P**	**4**
Parrish	8G	†9
Pell City	**9L**	**†9**
Phenix City	14R	15
Piedmont	7O	4
Pleasant Grove	9K	1
Prattville	**14K**	**3**
Prichard	23D	6
Ragland	8M	1
Red Bay	4D	2
Reform	10C	1
Roanoke	10P	4
Rockford	**12L**	**†4**

Alabama Towns Cont. on p. 2294

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

ARIZONA

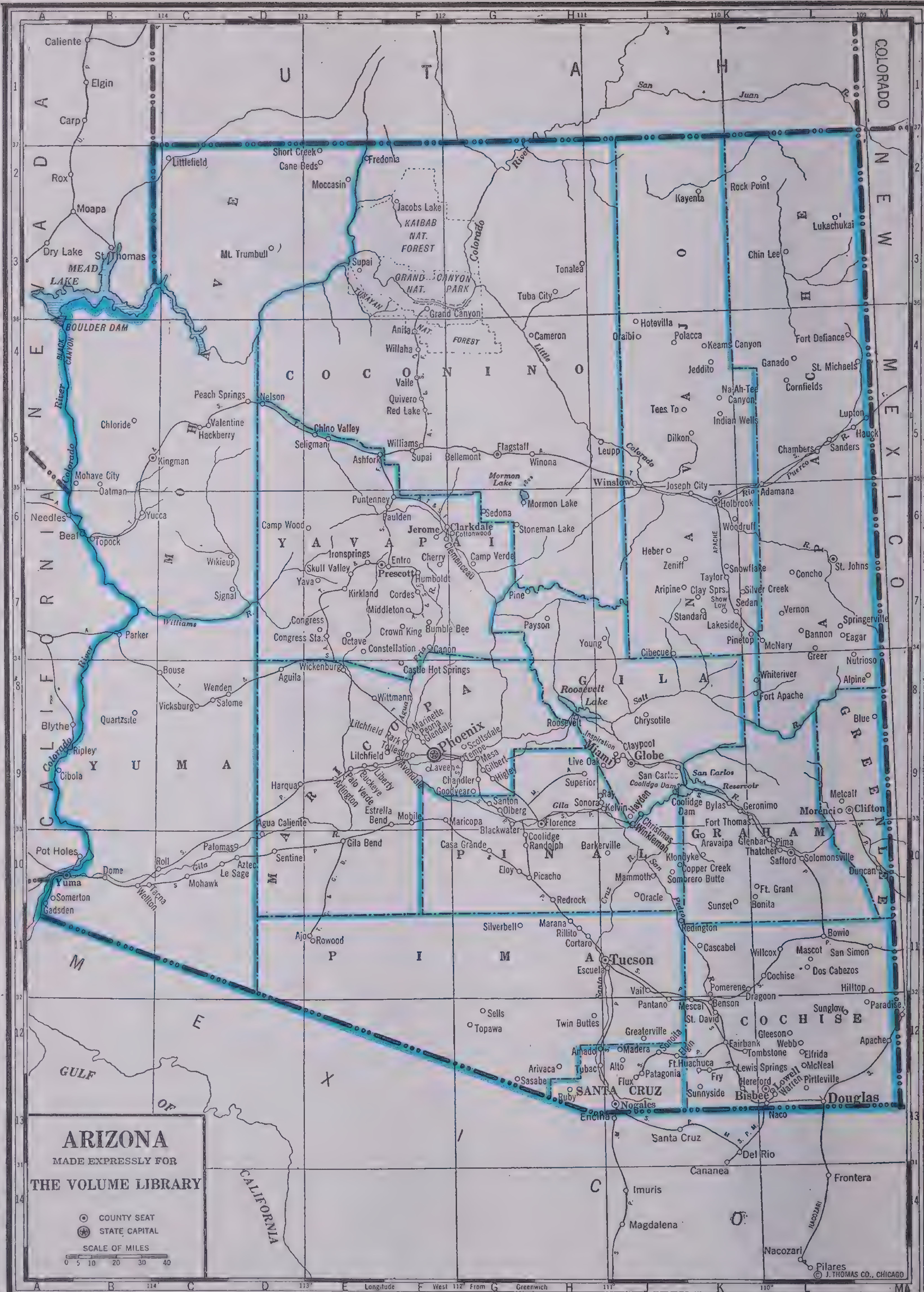
Pop. 499,261

COUNTIES

	Pop. Thous.
Apache 6M	...24
Cochise 12L	...35
Coconino 5G	..19
Gila 8J	24
Graham 10L	..12
Greenlee 9M	...9
Maricopa 9F	..186
Mohave 5C	9
Navajo 6K	25
Pima 11H	73
Pinal 10H	29
Santa Cruz 13J	.9
Yavapai 7F	...27
Yuma 10A	19

TOWNS

Town	Key	Pop.
Ajo	11E	1
Ashfork	5F	...†5
Benson	12K	1
Bisbee	**13L**	6
Bowie	11M	...†6
Buckeye	9E	1
Camp Verde	6G	.........†4
Casa Grande	10G	2
Chandler	9G	...1
Clarkdale	6G	2
Clemenceau	6G	..1
Clifton	**9M**	3
Coolidge	10H	..1
Cottonwood	6G	..1
Douglas	13L	...9
Duncan	10N	..1
Flagstaff	**5G**	...5
Florence	**9H**	...1
Gila Bend	10E	†7
Gilbert	9G	....†8
Glendale	8F	...5
Globe	**9J**	6
Hayden	9J	2
Holbrook	**6K**	...1
Humboldt	6F	..1
Jerome	6F	2
Kingman	**5B**	..2
Leupp	5H	....†5
Lowell	13L	4
Mesa	9G	7
Metcalf	9M	...†5
Miami	9J	5
Morenci	9M	5
Nogales	**13J**	5
Oatman	5B	1
Patagonia	12J	.†7
Peoria	8F	2
Phoenix	**9F**	...65
Pima	10L	1
Pirtleville	13L	..5
Prescott	**6F**	6
Ray	9J	4
Safford	**10L**	1
Saint Johns	**7M**	.1
San Simon	11M	........†7
Scottsdale	8G	..1
Seligman	5E	...†5
Snowflake	7J	..†6
Solomonsville	10L	1
Somerton	10A	..†9
Sonora	9J	3
Springerville	7M	........†7
Tempe	9G	3
Thatcher	10L	..1
Tolleson	9F	...2
Tombstone	12K	†8
Tucson	**11J**	...39
Wickenburg	8E	.1
Willcox	11L	...1
Williams	5F	...3
Winkelman	10J	†7
Winslow	5J	5
Yuma	**10A**	5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STATE CAPITAL
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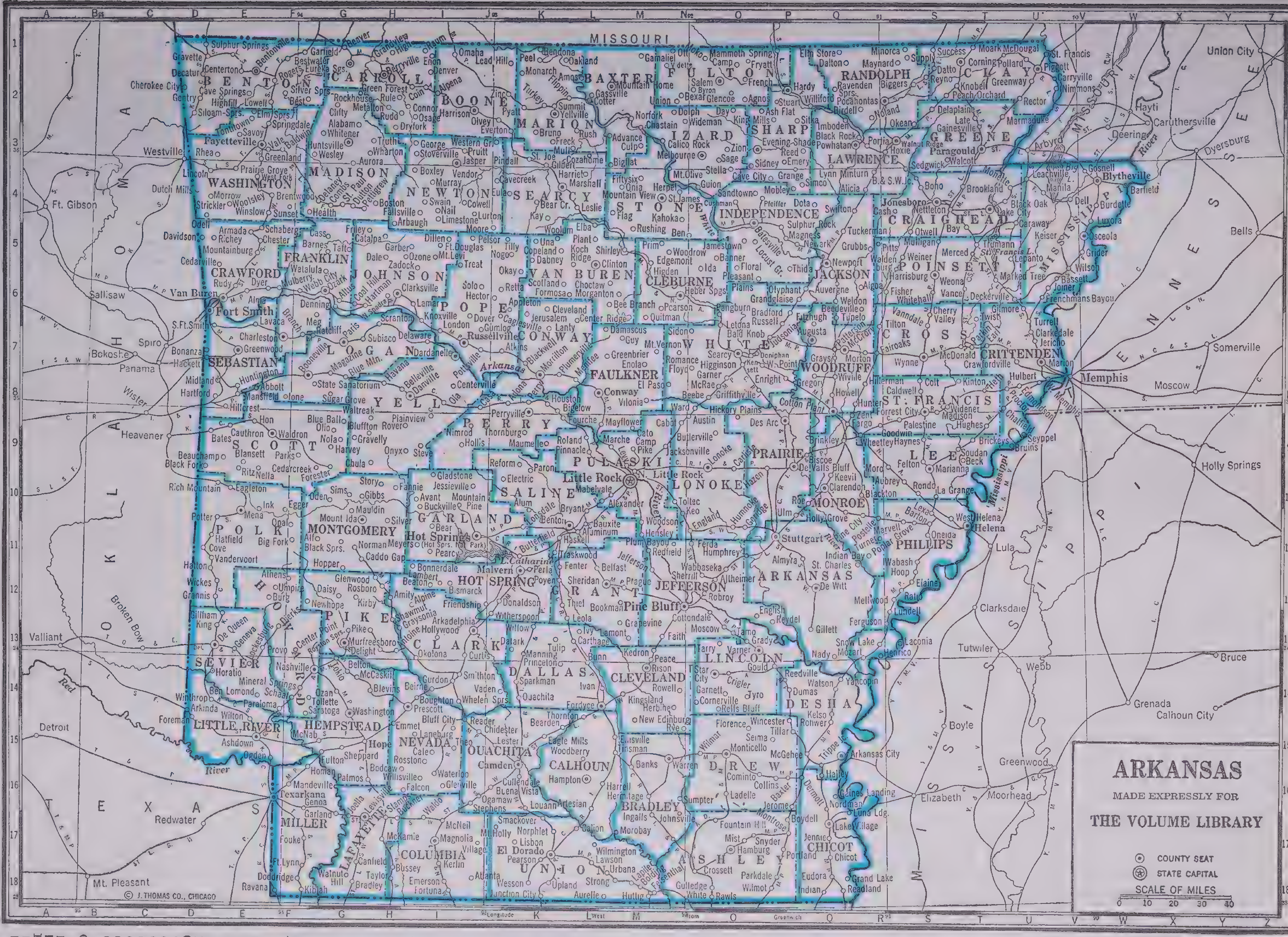
UTAH
NEVADA
CALIFORNIA
COLORADO
NEW MEXICO
MEXICO
GULF OF CALIFORNIA
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
YUMA
MARICOPA
GILA
GREENLEE
GRAHAM
PINAL
PIMA
SANTA CRUZ
COCHISE
BOULDER DAM
LAKE MEAD
KAIBAB NAT. FOREST
GRAND CANYON NAT. PARK
Colorado River
Little Colorado
Williams R.
Gila R.
Salt R.
Roosevelt Lake
Phoenix
Tucson
Prescott
Flagstaff
Kingman
Yuma
Nogales
Douglas
Bisbee
Globe
Holbrook
St. Johns
Clifton
Safford
Florence
Tombstone

ALABAMA
Towns—Cont.

Town	Key	Pop.
Russellville	**4E**	.3
Samson	21M	..2
Scottsboro	**3M**	..3
Seale	**15Q**	....†3
Selma	**15H**	20
Sheffield	2E	8
Slocomb	21O	...1
Stockton	22D	..1
Sulligent	7D	...1
Sylacauga	11L	.6
Talladega	**9M**	..9
Tallahassee	14O	.1
Tarrant City	9H	7
Thomasville	17E	2
Townley	7F	1
Troy	**18N**	7
Tuscaloosa	**10E**	27
Tuscumbia	**2E**	..6
Tuskegee	**14O**	..4
Union Springs	**16O**	3
Uniontown	14F	.2
Vernon	**8C**	....†8
Vincent	9L	1
Vredenburgh	18G	1
Warrior	8H	1
Wedowee	**10P**	.†4
West Blocton	11H	1
Wetumpka	**14M**	.3
Whistler	23C	..2
Winfield	7E	...2
Yolande	10H	..1
York	14C	2

† FOP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAN



ARKANSAS

Pop. 1,949,387

COUNTIES

		Pop. Thous.
Arkansas	12Q	24
Ashley	17O	27
Baxter*	1L	10
Benton	1E	36
Boone	2I	16
Bradley	15N	18
Calhoun*	15L	10
Carroll	1G	15
Chicot	17Q	27
Clark	13J	24
Clay	1T	28
Cleburne	6N	13
Cleveland	13M	13
Columbia	17I	30
Conway	7K	22
Craighead	4T	47
Crawford	6D	24
Crittenden*	7V	42
Cross	6R	26
Dallas	14L	14
Desha	15Q	27
Drew	15O	20
Faulkner	7L	26
Franklin	5F	16
Fulton*	1O	10
Garland	10J	42
Grant	12L	10
Greene	2T	30
Hempstead*	14G	33
Hot Spring	11K	19
Howard	13F	17
Independence	4O	26
Izard*	3N	13
Jackson	5Q	26
Jefferson	12N	65
Johnson	6H	19
Lafayette	16G	17
Lawrence	2R	23
Lee	9S	27
Lincoln	13P	20
Little River	15E	16
Logan	7G	26
Lonoke	9O	30
Madison*	2G	15
Marion*	2K	9
Miller	16E	32
Mississippi	4V	80
Monroe	9Q	21
Montgomery*	11G	9
Nevada	14I	20
Newton*	3I	11
Ouachita	15K	31
Perry	8K	8
Phillips	10T	46
Pike*	13G	12
Poinsett	5S	38
Polk	10D	16
Pope	6I	26
Prairie	8P	15
Pulaski	9M	156
Randolph	1R	18
Saint Francis	8S	36
Saline	10L	19
Scott	8E	13
Searcy*	3K	12
Sebastian	7D	63
Sevier	13E	15
Sharp*	1P	11
Stone*	4M	9
Union	17K	50
Van Buren*	5L	13
Washington	3E	41
White	7O	37
Woodruff	7Q	22
Yell	8H	21

TOWNS

Town	Key	Pop.
Arkadelphia	12J	6
Arkansas City	15Q	1
Ashdown	15E	2
Atkins	7J	1
Augusta	6Q	2
Bald Knob	7P	1
Batesville	4O	5
Benton	10L	4
Bentonville	1E	2
Berryville	1G	1
Blytheville	3W	11
Booneville	7F	2
Brinkley	8Q	3
Camden	15K	9
Charleston	7F	1
Clarendon	10Q	3
Clarksville	5H	3
Clinton	5L	†9
Conway	8L	6
Corning	1T	2
Cotton Plant	8Q	2
Crossett	17N	5
Danville	8H	1
Dardanelle	7I	2
De Queen	13D	3
Dermott	15Q	3
Des Arc	8P	1
Devalls Bluff	9P	†7
DeWitt	12Q	2
Dumas	14Q	2
Earl	7T	2
El Dorado	17K	16
England	10N	2
Eudora	18Q	2
Eureka Springs	1G	2
Evening Shade	3O	†3
Fayetteville	3E	8
Fordyce	14L	3
Foreman	14D	1
Forrest City	8S	6
Fort Smith	6D	37
Greenwood	7D	1
Gurdon	13J	2
Hamburg	17O	2
Hampton	15L	†7
Hardy	1P	†7
Harrisburg	5S	1
Harrison	2I	4
Heber Springs	6N	2
Helena	10T	9
Hope	15G	7
Hot Springs	10J	21
Huntsville	3G	†7
Jasper	3I	†4
Jonesboro	4S	12
Lake City	4T	†8
Lake Village	16Q	2
Lewisville	17G	1
Little Rock	10M	88
Lonoke	9N	2
McCrory	7Q	1
McGehee	15Q	4
Magnolia	17I	4
Malvern	11K	5
Marianna	9S	4
Marion	7V	†8
Marked Tree	5T	3
Marshall	3K	†8
Melbourne	3N	†6
Mena	10D	4
Monticello	15O	4
Morrilton	7K	5
Mountain Home	1L	†9
Mountain View	4M	†7
Mount Ida	10G	†5
Murfreesboro	13G	†8
Nashville	13F	3
Newport	5Q	4
North Little Rock	9M	21
Osceola	4V	3
Ozark	6F	1
Paragould	3T	7
Paris	7G	3
Perryville	8K	†6
Piggott	1U	2
Pine Bluff	12N	21
Pocahontas	2R	3
Powhatan	3R	†1
Prescott	14H	3
Rison	13N	1
Rogers	1F	4
Russellville	7J	6
Salem	1O	†5
Searcy	7O	4
Sheridan	12L	1
Siloam Springs	2D	3
Smackover	17K	2
Springdale	2E	3
Stamps	16H	2
Star City	13O	1
Stephens	15J	1
Stuttgart	11P	6
Texarkana	16E	12
Trumann	5S	3
Van Buren	6D	5
Waldron	8E	1
Walnut Ridge	3R	2
Warren	15N	3
Washington	14G	†4
West Helena	10T	5
West Memphis	7V	3
Wynne	7S	4
Yellville	2K	†5

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

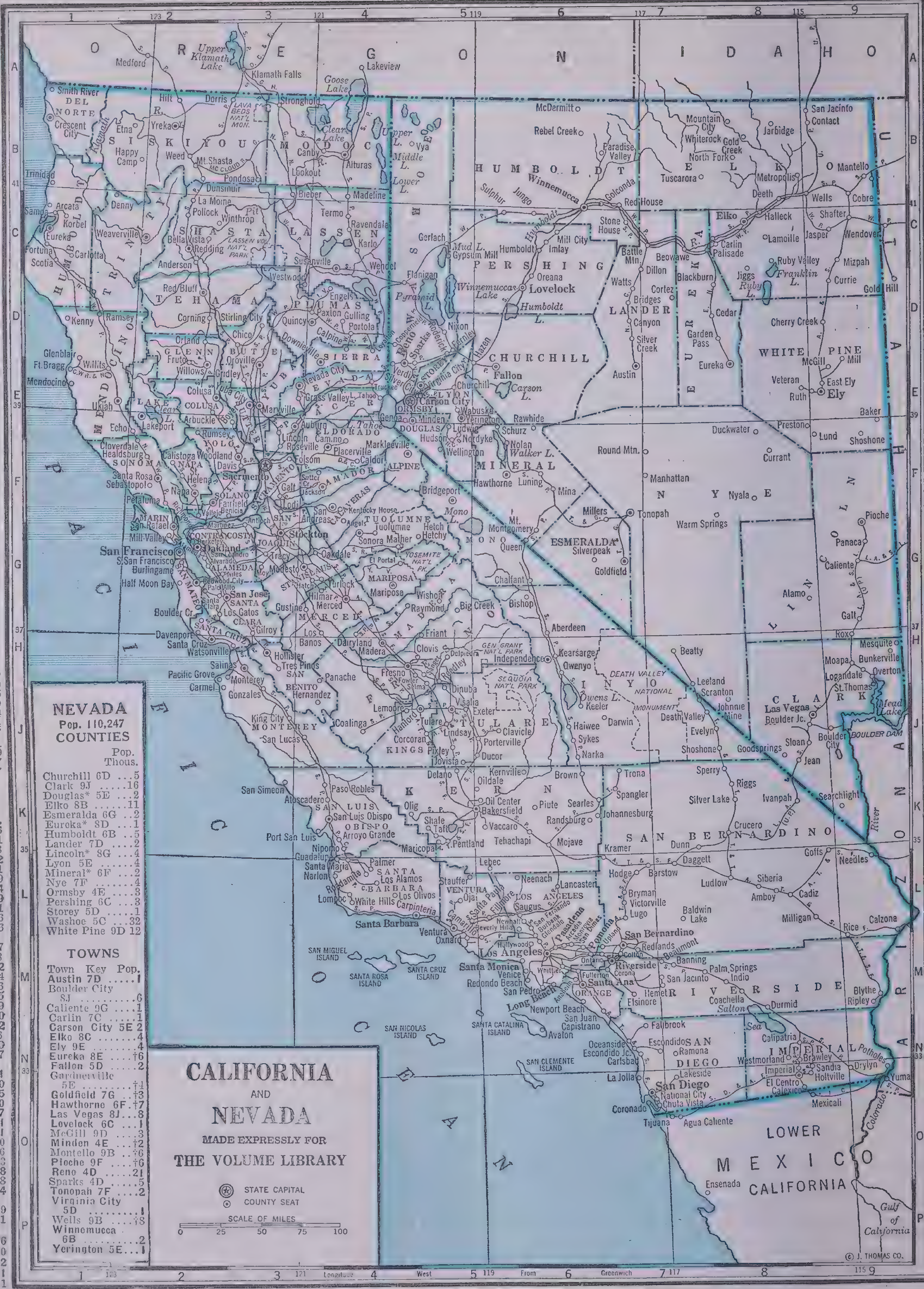
CALIFORNIA
Pop. 6,907,387

COUNTIES

		Pop. Thous.
Alameda	3G	513
Alpine*	4F	†3
Amador	4F	9
Butte	3E	43
Calaveras	4F	8
Colusa	2E	10
Contra Costa	3G	100
Del Norte	1B	5
Eldorado	4F	13
Fresno	5H	179
Glenn	2E	12
Humboldt	1C	46
Imperial	8N	60
Inyo*	6H	8
Kern	5K	135
Kings	4J	35
Lake	2E	8
Lassen	4C	14
Los Angeles	6M	2,786
Madera	4H	23
Marin	2G	53
Mariposa*	4G	6
Mendocino	1E	28
Merced	4H	47
Modoc	4B	9
Mono*	5F	2
Monterey	3J	73
Napa	2F	29
Nevada	4E	19
Orange	6M	131
Placer	4I	28
Plumas	4D	12
Riverside	8M	106
Sacramento	3F	170
San Benito	3H	11
San Bernardino	7L	161
San Diego	7N	289
San Francisco	2G	635
San Joaquin	3G	134
San Luis Obispo	3K	33
San Mateo	2G	112
Santa Barbara	4L	71
Santa Clara	3H	175
Santa Cruz	3H	45
Shasta	3C	29
Sierra*	4E	3
Siskiyou	2B	29
Solano	3F	49
Sonoma	2F	69
Stanislaus	3G	75
Sutter	3E	19
Tehama	3D	14
Trinity	2C	4
Tulare	5J	107
Tuolumne	4G	11
Ventura	5L	70
Yolo	3F	27
Yuba	3E	17

TOWNS

Town	Key	Pop.
Alameda	2G	36
Albany	2G	11
Alhambra	6M	38
Alturas	**4B**	**2**
Anaheim	6M	11
Arcadia	6L	9
Auburn	**4E**	**4**
Bakersfield	**5K**	**29**
Bell	6M	11
Bellflower	6M	6
Berkeley	2G	86
Beverly Hills	6M	27
Brawley	8N	18
Bridgeport	**5F**	**†2**
Burbank	6M	34
Burlingame	2G	16
Calexico	8O	5
Chico	3D	9
Colton	7M	10
Colusa	**2E**	**2**
Compton	6M	16
Corona	6M	9
Coronado	7O	7
Crescent City	**1B**	**1**
Daly City	2G	10
Downieville	**4D**	**†5**
El Centro	**8O**	**10**
Eureka	**1C**	**17**
Fairfield	**3F**	**1**
Fresno	**4J**	**61**
Fullerton	6M	10
Gardena	6M	6
Glendale	6M	83
Hanford	**4J**	**8**
Hawthorne	6M	8
Hollister	**3H**	**4**
Huntington Park	6M	29
Imperial	8N	1
Independence	**6H**	**†6**
Inglewood	6M	30
Jackson	**4F**	**2**
Lakeport	**2E**	**1**
Lodi	3G	11
Long Beach	6M	164
Los Angeles	**6M**	**1,504**
Lynwood	6M	11
Madera	**4H**	**6**
Mariposa	**4G**	**†4**
Markleeville	**4F**	**†1**
Martinez	**2G**	**7**
Marysville	**3E**	**7**
Maywood	5L	10
Merced	**4G**	**10**
Modesto	**3G**	**16**
Monrovia	6M	12
Monterey	3H	10
Monterey Park	6M	9
Napa	**2F**	**8**
National City	7O	10
Nevada City	**4E**	**2**
Oakland	**2G**	**302**
Ontario	6M	14
Orange	6M	8
Oroville	**3E**	**4**
Oxnard	5M	9
Pacific Grove	3H	6
Palo Alto	2G	17
Pasadena	6M	82
Petaluma	2F	8
Piedmont	2G	10
Pittsburg	2G	10
Placerville	**4F**	**3**
Pomona	6M	24
Quincy	**4D**	**1**
Red Bluff	**2D**	**4**
Redding	**3C**	**8**
Redlands	7M	14
Redondo Beach	6M	13
Redwood City	**2G**	**12**
Richmond	3G	24
Riverside	**7M**	**35**
Roseville	3F	7
Sacramento	**3F**	**106**
Salinas	3H	12
San Andreas	**4F**	**1**
San Bernardino	**7M**	**44**
San Diego	**7O**	**203**
San Fernando	6M	9
San Francisco	**2G**	**635**
San Gabriel	6M	12
San Jose	**3G**	**68**
San Leandro	2G	17
San Luis Obispo	**4K**	**9**
San Mateo	2G	19
San Rafael	**2G**	**9**
Santa Ana	**6M**	**32**
Santa Barbara	**4L**	**35**
Santa Clara	2H	7
Santa Cruz	**2H**	**17**
Santa Maria	4L	9
Santa Monica	6M	54
Santa Paula	5M	9
Santa Rosa	**2F**	**13**
Sonora	**4G**	**2**
S. Gate	6M	27
South Pasadena	6M	14
South San Francisco	2G	7
Stockton	**3G**	**55**
Susanville	**4C**	**2**
Torrance	6M	10
Tulare	5J	8
Ukiah	**1E**	**4**
Vallejo	2G	20
Ventura	**5M**	**12**
Visalia	**5J**	**8**
Watsonville	2H	9
Weaverville	**2C**	**1**
Whittier	6M	16
Willows	**2E**	**2**
Woodland	**3F**	**7**
Yreka	**2B**	**2**


O R E G O N
I D A H O
U T A H
A R I Z O N A
P A C I F I C O C E A N
LOWER CALIFORNIA
M E X I C O
Gulf of California
HUMBOLDT
PERSHING
CHURCHILL
LANDER
EUREKA
ELKO
WHITE PINE
MINERAL
NYE
ESMERALDA
LINCOLN
CLARK
SISKIYOU
MODOC
SHASTA
LASSEN
TEHAMA
PLUMAS
SIERRA
NEVADA
PLACER
ELDORADO
AMADOR
ALPINE
TUOLUMNE
MARIPOSA
MONO
INYO
TULARE
KERN
SAN BERNARDINO
RIVERSIDE
IMPERIAL
SAN DIEGO
LOS ANGELES
VENTURA
SANTA BARBARA
SAN LUIS OBISPO
MONTEREY
FRESNO
MADERA
MERCED
STANISLAUS
SAN JOAQUIN
SACRAMENTO
SAN FRANCISCO
Lake Tahoe
Salton Sea
Mead Lake
BOULDER DAM
DEATH VALLEY NATIONAL MONUMENT
SEQUOIA NAT'L PARK
YOSEMITE NAT'L PK.
GEN. GRANT NAT'L PARK
LASSEN VOL. NAT'L PARK
SAN MIGUEL ISLAND
SANTA ROSA ISLAND
SANTA CRUZ ISLAND
SAN NICOLAS ISLAND
SANTA CATALINA ISLAND
SAN CLEMENTE ISLAND
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NEVADA
Pop. 110,247

COUNTIES

		Pop. Thous.
Churchill	6D	5
Clark	9J	16
Douglas*	5E	2
Elko	8B	11
Esmeralda	6G	2
Eureka*	8D	1
Humboldt	6B	5
Lander	7D	2
Lincoln*	8G	4
Lyon	5E	4
Mineral*	6F	2
Nye	7F	4
Ormsby	4E	3
Pershing	6C	3
Storey	5D	1
Washoe	5C	32
White Pine	9D	12

TOWNS

Town	Key	Pop.
Austin	**7D**	**1**
Boulder City	8J	6
Caliente	9G	1
Carlin	7C	1
Carson City	**5E**	**2**
Elko	**8C**	**4**
Ely	**9E**	**4**
Eureka	**8E**	**†6**
Fallon	**5D**	**2**
Gardnerville	5E	†4
Goldfield	**7G**	**†3**
Hawthorne	**6F**	**†7**
Las Vegas	**8J**	**8**
Lovelock	**6C**	**1**
McGill	9D	3
Minden	**4E**	**†2**
Montello	9B	†6
Pioche	**9F**	**†6**
Reno	**4D**	**21**
Sparks	4D	5
Tonopah	**7F**	**2**
Virginia City	**5D**	**1**
Wells	9B	†8
Winnemucca	**6B**	**2**
Yerington	**5E**	**1**

CALIFORNIA
AND
NEVADA
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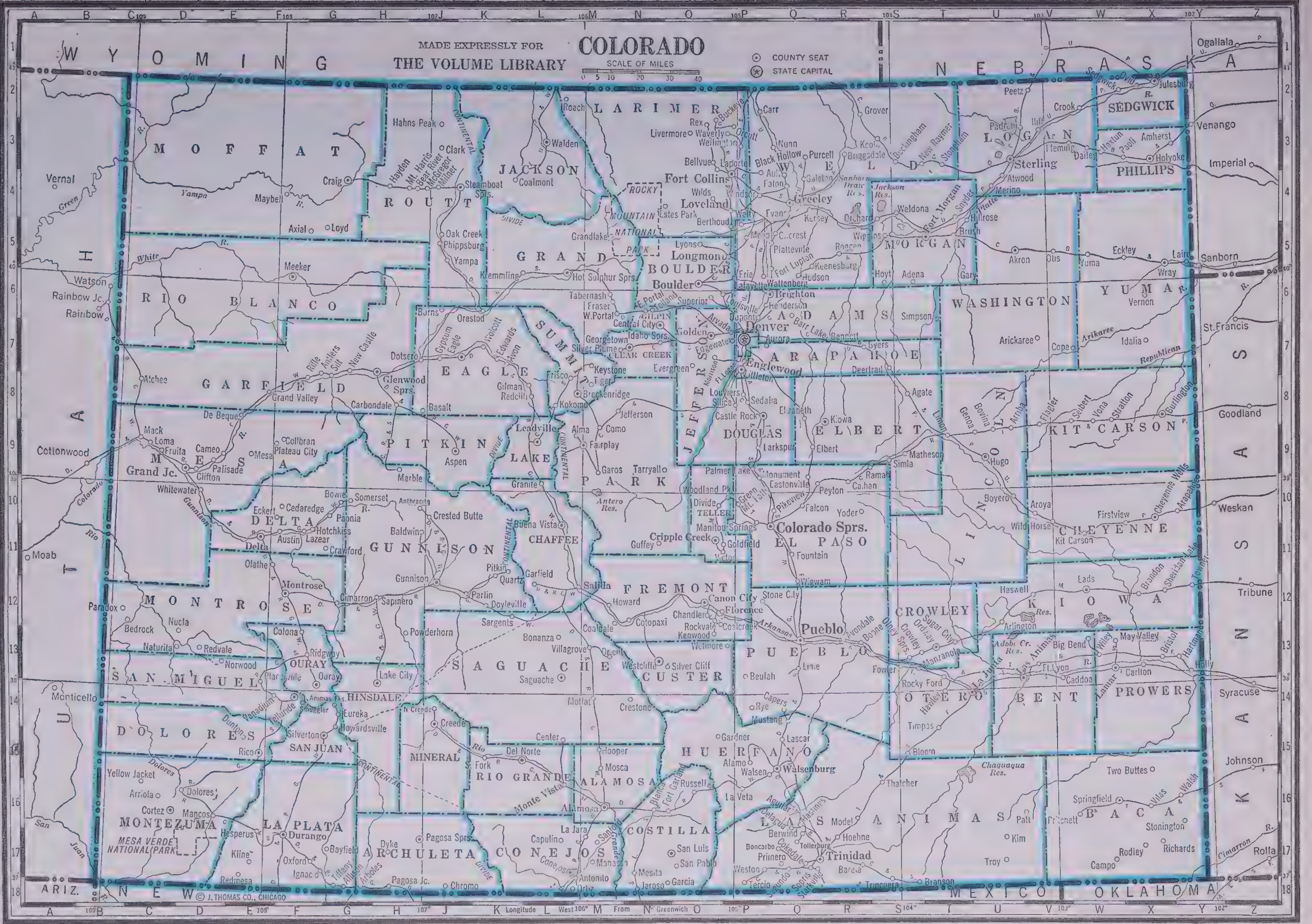
⊛ STATE CAPITAL
⊙ COUNTY SEAT

SCALE OF MILES
0 25 50 75 100

† POP. SHOWN IN HUNDREDS

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAN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ROUTT
JACKSON
LARIMER
WELD
LOGAN
SEDGWICK
PHILLIPS
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BOULDER
ADAMS
ARAPAHOE
GARFIELD
EAGLE
SUMMIT
JEFFERSON
DOUGLAS
ELBERT
KIT CARSON
LINCOLN
CHEYENNE
MESA
PITKIN
LAKE
PARK
TELLER
EL PASO
DELTA
GUNNISON
CHAFFEE
FREMONT
PUEBLO
CROWLEY
KIOWA
OTERO
BENT
PROWERS
MONTROSE
OURAY
SAGUACHE
CUSTER
SAN MIGUEL
HINSDALE
DOLORES
SAN JUAN
MINERAL
RIO GRANDE
ALAMOSA
HUERFANO
LAS ANIMAS
BACA
MONTEZUMA
LA PLATA
ARCHULETA
CONEJOS
COSTILLA
ROCKY MOUNTAIN NATIONAL PARK
MESA VERDE NATIONAL PARK
CONTINENTAL DIVIDE
Denver
Colorado Sprs.
Pueblo
Boulder
Fort Collins
Greeley
Grand Jc.
Trinidad
Longitude West 106° From Greenwich
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COLO-
RADO

Pop. 1,123,296

COUNTIES

		Pop. Thous.
Adams	6R	22
Alamosa	16M	10
Arapahoe	7R	32
Archuleta	17J	4
Baca	16X	6
Bent	14V	10
Boulder	5O	37
Chaffee*	10L	8
Cheyenne*	10W	3
Clear Creek*	7N	4
Conejos*	17L	12
Costilla	17O	8
Crowley	13T	5
Custer*	13O	2
Delta	10F	16
Denver	7P	322
Dolores*	15D	2
Douglas*	8P	3
Eagle*	7K	5
Elbert*	8R	5
El Paso	10Q	54
Fremont	12O	20
Garfield	7G	11
Gilpin*	6N	2
Grand*	5M	4
Gunnison	11J	6
Hinsdale*	13H	†4
Huerfano	15P	16
Jackson*	3L	2
Jefferson	7Q	31
Kiowa*	12W	3
Kit Carson	8W	8
Lake	9L	7
La Plata	16F	15
Larimer	3O	36
Las Animas	17S	32
Lincoln*	9U	6
Logan	3U	18
Mesa	9D	34
Mineral*	15J	1
Moffat	3F	5
Montezuma*	16D	10
Montrose	11F	15
Morgan	4T	17
Otero	14T	24
Ouray*	13K	2
Park*	9M	3
Phillips	3X	5
Pitkin*	9J	2
Prowers	13X	12
Pueblo	13Q	69
Rio Blanco	5F	3
Rio Grande	15L	12
Routt	3J	11
Saguache*	13L	6
San Juan	**14G**	**1**
San Miguel	11D	4
Sedgwick	2X	5
Summit*	8M	2
Teller	10O	6
Washington	5U	8
Weld	4R	64
Yuma	5X	12

TOWNS

Town	Key	Pop.
Aguilar	16Q	1
Akron	**5U**	**1**
Alamosa	**16M**	**6**
Antonito	17M	1
Arvada	6P	1
Aspen	**9K**	**†8**
Ault	4Q	†8
Aurora	7P	3
Berthoud	4P	†8
Berwind	17Q	†1
Boulder	**5O**	**13**
Breckenridge	**8M**	**†4**
Brighton	**6Q**	**4**
Brush	5T	2
Buena Vista	**10M**	**†8**
Burlington	**8X**	**1**
Canon City	**12O**	**7**
Castle Rock	**8P**	**†6**
Center	15L	2
Central City	**6O**	**†7**
Cheyenne Wells	**10X**	**†7**
Colorado Springs	**10Q**	**37**
Conejos	**17M**	**†3**
Cortez	**16D**	**2**
Craig	**4G**	**2**
Creede	**14J**	**†7**
Crested Butte	10J	1
Cripple Creek	**11O**	**2**
Delagua	16Q	†4
Del Norte	**15L**	**2**
Delta	**10F**	**4**
Denver	**7P**	**322**
Durango	**16F**	**6**
Eads	**11W**	**†7**
Eagle	**7K**	**†5**
Eaton	3Q	1
Edgewater	7P	2
Englewood	7P	10
Erie	6P	1
Fairplay	**9M**	**†7**
Florence	12O	3
Fort Collins	**3O**	**12**
Fort Lupton	5Q	2
Fort Morgan	**4S**	**5**
Fowler	13S	1
Fruita	9D	1
Georgetown	**7N**	**†3**
Glenwood Springs	**7F**	**2**
Golden	**6O**	**3**
Grand Junction	**9D**	**12**
Greeley	**4Q**	**16**
Gunnison	**11J**	**2**
Haxtun	3W	1
Holly	13V	1
Holyoke	**3X**	**1**
Hot Sulphur Springs	**5M**	**†2**
Hugo	**9U**	**†9**
Idaho Springs	7N	2
Julesburg	**2X**	**2**
Kiowa	**8Q**	**†2**
Lafayette	5P	2
La Jara	**17M**	**†9**
La Junta	**14T**	**7**
Lake City	**13H**	**†2**
Lamar	**13W**	**4**
Las Animas	**13V**	**3**
La Veta	15P	†9
Leadville	**9L**	**5**
Limon	8T	1
Littleton	**7P**	**2**
Longmont	5P	7
Louisville	5O	2
Loveland	4P	6
Manassa	17M	1
Mancos	16D	†7
Manitou	10P	1
Meeker	**5F**	**1**
Monte Vista	15L	3
Montrose	**11F**	**5**
Mount Harris	4H	1
Oak Creek	5J	2
Olathe	11F	†7
Ordway	**13T**	**1**
Ouray	**13G**	**1**
Ovid	2W	†7
Pagosa Springs	**16J**	**2**
Palisade	9D	†9
Paonia	10G	1
Pueblo	**12Q**	**52**
Rico	**15E**	**†4**
Rifle	8F	1
Rockvale	12P	†6
Rocky Ford	13T	3
Saguache	**13L**	**1**
Salida	11M	5
San Luis	**17O**	**1**
San Pablo	17N	†8
Silver Cliff	**13O**	**†3**
Silverton	**14G**	**1**
Sopris	17Q	1
South Canon	12P	2
Springfield	**16N**	**1**
Starkville	17Q	1
Steamboat Springs	**4K**	**2**
Sterling	**3U**	**7**
Telluride	**14F**	**1**
Trinidad	**17R**	**13**
Victor	11P	2
Walden	**3L**	**†7**
Walsen	15P	†8
Walsenburg	**15Q**	**6**
Westcliffe	**13O**	**†4**
West Portal	6N	†1
Wheat Ridge	7P	†5
Windsor	4P	2
Wray	**5X**	**2**
Yuma	5W	2

POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

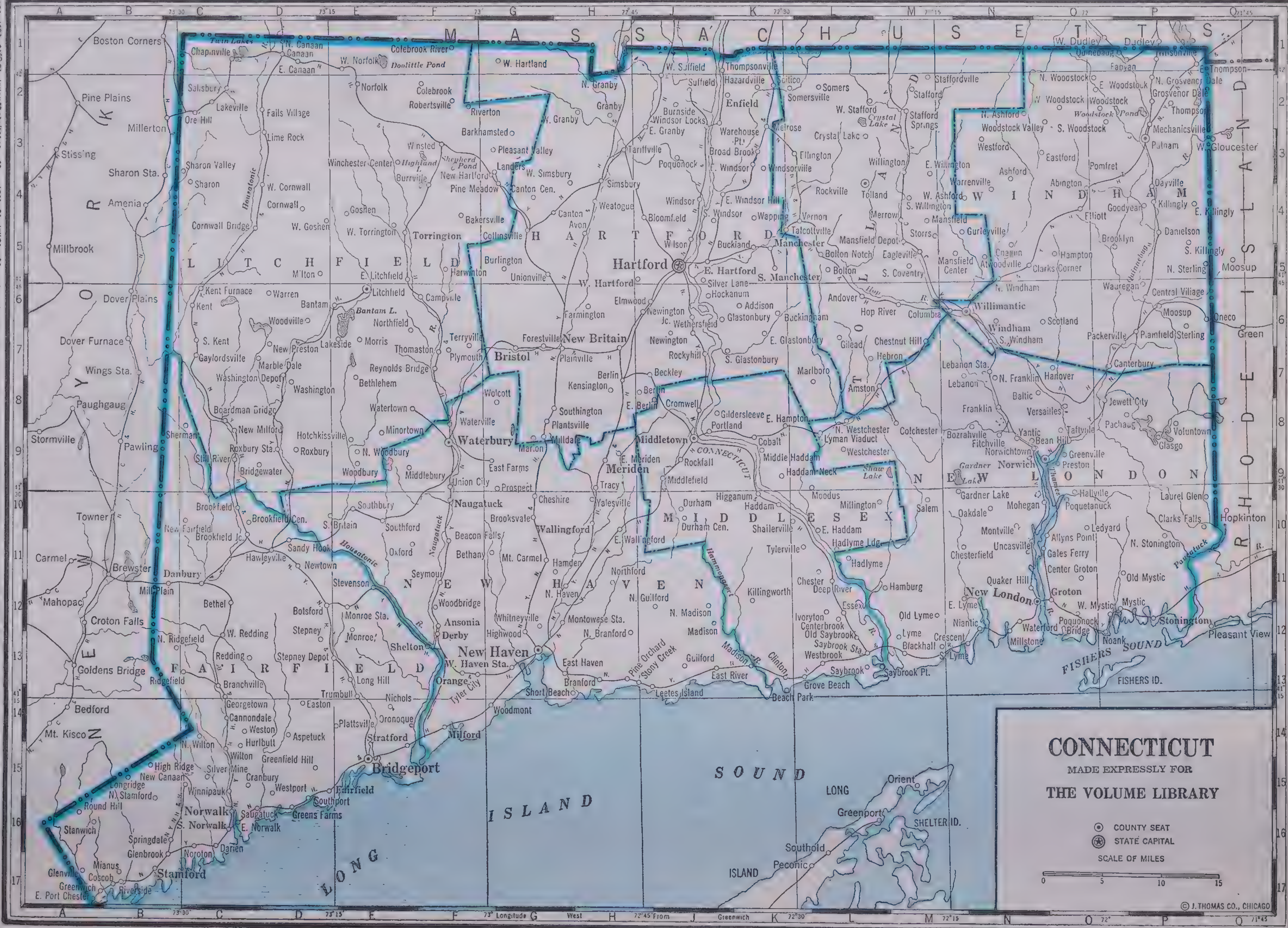
CONNECTICUT
Pop. 1,709,242

COUNTIES

Name	Key	Pop. Thous.
Fairfield	13D	418
Hartford	5J	450
Litchfield	5E	87
Middlesex	9K	56
New Haven	12G	484
New London	9N	125
Tolland	4L	32
Windham	4O	56

TOWNS

Name	Key	Pop. Thous.
Ansonia	13F	19
Avon	5H	2
Baltic	7N	2
Beacon Falls	11F	2
Berlin	7J	5
Bethel	12C	4
Bloomfield	4J	4
Branford	13H	2
Bridgeport	**15E**	**147**
Bristol	7G	30
Brookfield	10C	1
Brooklyn	5O	2
Burlington	5G	1
Burnside	3J	2
Canton	4G	3
Cheshire	10G	4
Chester	11L	4
Clinton	13K	2
Colchester	8M	1
Cromwell	8J	3
Danbury	12C	22
Danielson	4P	5
Darien	16C	9
Deep River	11L	2
Derby	12F	10
Durham	10J	1
E. Granby	3J	1
E. Haddam	10L	2
E. Hampton	8K	2
E. Hartford	5J	19
E. Haven	13H	9
E. Killingly	4O	1
E. Lyme	12M	3
E. Windsor Hill	4K	1
Ellington	3L	2
Elmwood	6J	4
Enfield	2K	14
Essex	12L	3
Fairfield	15D	21
Farmington	6H	1
Forestville	7G	3
Glastonbury	6K	7
Granby	2H	2
Greenwich	17A	35
Groton	11O	5
Guilford	13J	2
Haddam	10K	2
Hartford	**5J**	**166**
Hazardville	2K	1
Higganum	9K	1
Jewett City	7O	4
Kensington	7H	2
Kent	6C	1
Killingly	4P	6
Lakeville	2C	2
Lebanon	7N	1
Ledyard	10O	1
Litchfield	**6E**	**1**
Madison	12J	2
Manchester	4K	24
Mansfield	4M	5
Merriden	9H	39
Middlebury	9F	2
Middlefield	9J	1
Middletown	**8J**	**26**
Milford	14F	16
Monroe	13E	2
Montville	10N	4
Moodus	9L	1
Moosup	6P	3
Mystic	11O	3
Naugatuck	10F	15
New Britain	7H	69
New Canaan	15C	6
New Hartford	4G	2
New Haven	**12G**	**161**
Newington	7J	5
New London	**12N**	**30**
New Milford	9C	4
Niantic	12N	1
Noank	12O	2
Norfolk	2E	1
North Canaan	1D	2
North Grosvenor Dale	2P	2
North Haven	11H	5
North Stonington	10P	1
Norwalk	16C	40
Norwich	**8N**	**24**
Old Lyme	12M	2
Old Saybrook	12L	2
Orange	13F	2
Oxford	11E	1
Plainfield	6P	8
Plainville	7G	7
Plantsville	8G	2
Plymouth	7F	6
Pomfret	3O	2
Poquonock	3J	1
Portland	8J	4
Preston	8N	4
Putnam	**3P**	**8**
Redding	13C	2
Ridgefield	13C	4
Rockville	4L	8
Rockyhill	7J	3
Salisbury	2C	3
Sandy Hook	11D	1
Saybrook	13L	2
Seymour	12F	7
Sharon	4C	2
Shelton	13F	11
Simsbury	3H	4
Somers	2L	2
Somersville	2L	1
Southbury	10E	2
South Coventry	5M	1
S. Glastonbury	7K	1
Southington	7G	5
S. Manchester	5K	15
S. Norwalk	16C	15
Southport	16D	1
S. Windsor	4K	3
Stafford	2M	6
Stafford Springs	2M	3
Stamford	17B	48
Sterling	6P	1
Stanington	12P	2
Stratford	15F	23
Suffield	2J	4
Taftville	8O	2
Tariffville	3H	1
Terryville	7F	5
Thomaston	7F	4
Thompson	2P	6
Thompsonville	1K	12
Tolland	**3L**	**1**
Torrington	5F	27
Trumbull	13E	5
Uncasville	11N	2
Union City	9F	3
Unionville	5G	2
Vernon	4L	9
Versailles	8O	1
Wallingford	10H	11
Warehouse Point	3K	2
Washington Depot	8D	2
Waterbury	**9F**	**99**
Waterford	12N	7
Watertown	8F	9
Waterville	8F	1
Westbrook	13L	1
W. Hartford	5J	34
W. Haven	13G	30
Westport	16D	8
Wethersfield	6J	10
Willimantic	**6N**	**12**
Willington	3M	1
Wilson	5J	1
Wilton	15C	3
Windham	6N	14
Windsor	4J	10
Windsor Locks	3J	4
Winsted	3F	8
Woodbridge	13F	2
Woodbury	9E	2
Woodstock	2O	2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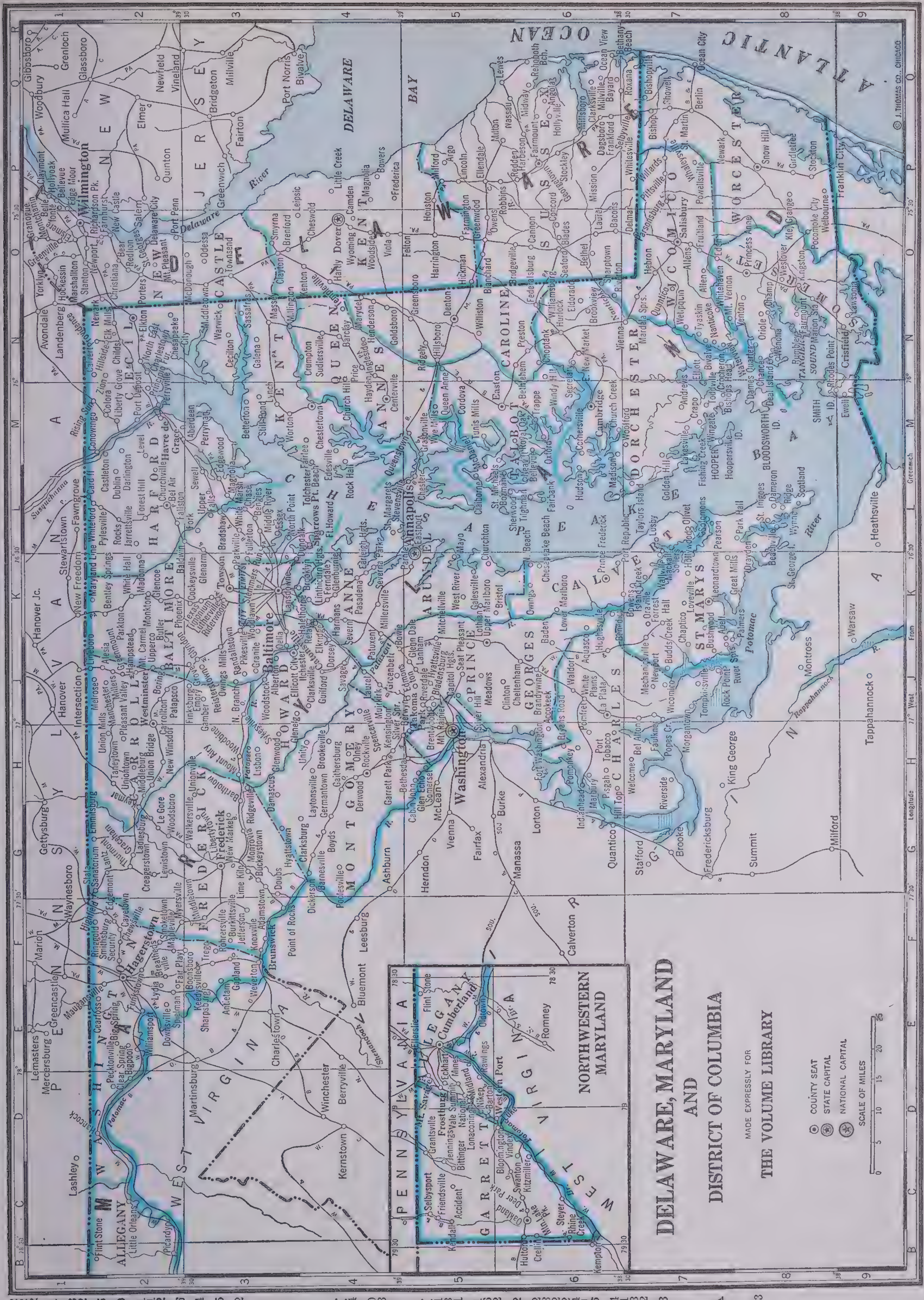
RHODE ISLAND
NEW YORK
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
FAIRFIELD
NEW HAVEN
MIDDLESEX
NEW LONDON
LONG ISLAND SOUND
FISHERS SOUND
FISHERS ID.
SHELTER ID.
LONG ISLAND
73° Longitude West From Greenwich

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND



MARYLAND

Pop. 1,821,244

COUNTIES

Name	Key	Pop. Thous.
Allegany	5E	87
Anne Arundel	5K	68
Baltimore	2K	156
(Baltimore City	3K	859)
Calvert*	6K	10
Caroline	5N	18
Carroll	2H	39
Cecil	2N	26
Charles*	6J	18
Dorchester	6M	28
Frederick	3G	57
Garrett	5B	22
Harford	2L	35
Howard	3J	17
Kent	3M	13
Montgomery	4H	84
Prince Georges*	5J	89
Queen Annes	4M	14
Saint Marys*	7K	15
Somerset*	8O	21
Talbot	5M	19
Washington,	2E	69
Wicomico	7O	35
Worcester	8P	21

TOWNS

Name	Key	Pop. Thous.
Aberdeen	2M	2
Annapolis	**5L**	**13**
Baltimore	**3K**	**859**
Barton	5D	†8
Bel Air	**2L**	**2**
Berlin	7Q	1
Bethseda	5H	4
Brentwood	5J	2
Brunswick	3F	4
Cambridge	**6M**	**10**
Capitol Heights	5J	2
Centerville	**4M**	**1**
Chesapeake City	2N	1
Chestertown	**4M**	**3**
Childs	2N	1
Crisfield	9N	4
Cumberland	**5E**	**39**
Dames Quarter	8N	1
Deal Island	8N	1
Delmar	7O	1
Denton	**5N**	**2**
Easton	**5M**	**5**
Eastport	5L	1
Elkton	**2N**	**4**
Ellicott City	**3J**	**1**
Emmitsburg	2G	1
Essex	3L	2
Federalsburg	6N	2
Frederick	**3G**	**16**
Frostburg	4D	8
Fullerton	3K	1
Gaithersburg	4H	1
Greenbelt	5J	3
Hagerstown	**2F**	**32**
Havre de Grace	2M	5
Hyattsville	5J	7
Indianhead	6H	1
Lakesville	7M	1
Landsdowne	4K	2
La Plata	**6J**	**†5**
Laurel	4J	3
Leonardtown	**7K**	**†7**
Lonaconing	5D	2
Luke	6D	1
Mount Rainier	5J	5
Mount Savage	5D	3
North East	2N	1
Oakland	**6C**	**2**
Oxford	6M	†8
Pikesville	3K	1
Pocomoke City	8O	3
Port Deposit	2M	†9
Prince Frederick	**6K**	**†4**
Princess Anne	**8O**	**†9**
Reistertown	3J	1
Relay	4K	2
Riverdale	5J	2
Rockville	**4H**	**2**
St. Michaels	5L	1
Salisbury	**7O**	**13**
Snow Hill	**8P**	**2**
Sparrows Point	4L	5
Takoma Park	5H	9
Taylors Island	7L	1
Thurmont	2G	1
Towson	**3K**	**2**
Upper Marlboro	**5J**	**†6**
Western Port	6D	4
Westminster	**2H**	**5**
Williamsport	2E	2

DELAWARE

Pop. 266,505

COUNTIES

Name	Key	Pop. Thous.
Kent	4O	34
New Castle	2O	180
Sussex	6P	53

TOWNS

Name	Key	Pop. Thous.
Claymont	1P	1
Bellefonte	1P	3
Bridgeville	5O	1
Delaware City	2P	1
Dover	**4O**	**6**
Elsmere	1O	2
Georgetown	**6P**	**2**
Harrington	5O	2
Laurel	6O	2
Lewes	5Q	3
Middletown	3O	2
Milford	5P	4
Milton	5P	1
Newark	2O	5
New Castle	2O	4
Rehoboth	6Q	1
Seaford	6O	3
Smyrna	3O	2
Wilmington	**1O**	**113**

DISTRICT OF COLUMBIA

Pop. 663,091

Name	Key	Pop. Thous.
Washington	5H	663

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

FLORIDA

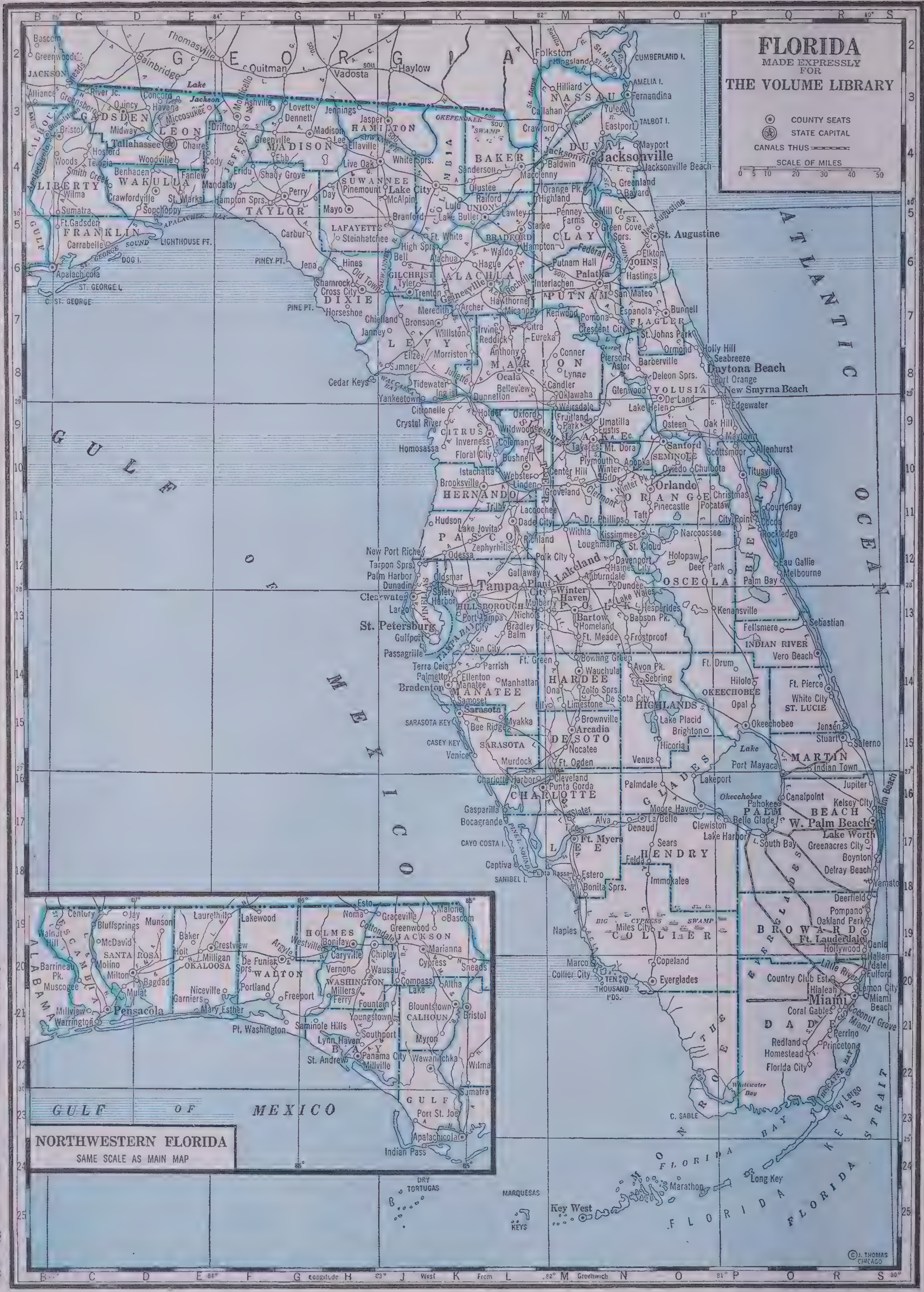
Pop. 1.897.414

COUNTIES

		Pop. Thous.
Alachua	6L	39
Baker*	4L	7
Bay	22H	21
Bradford	5L	9
Brevard	11Q	16
Broward	19R	40
Calhoun	3B	8
Charlotte	16M	4
Citrus	9K	6
Clay	5M	6
Collier*	20O	5
Columbia	4K	17
Dade	21S	268
De Soto	15M	8
Dixie	7H	7
Duval	4N	210
Escambia	20C	74
Flagler*	7O	3
Franklin	5C	6
Gadsden	3D	31
Gilchrist*	6J	4
Glades*	16O	3
Gulf	5B	7
Hamilton	3J	10
Hardee	14M	10
Hendry*	17O	5
Hernando	10L	6
Highlands	14O	9
Hillsborough	13K	180
Holmes	19H	15
Indian River	14R	9
Jackson	2B	34
Jefferson	3F	12
Lafayette*	5H	4
Lake	10N	27
Lee	17M	17
Leon	3E	32
Levy*	7K	13
Liberty*	4C	3
Madison	3G	16
Manatee	14K	26
Marion	8L	31
Martin	15R	6
Monroe	23O	14
Nassau	3N	11
Okaloosa*	20E	13
Okeechobee	14P	3
Orange	10O	70
Osceola	12O	10
Palm Beach	16R	80
Pasco	11L	14
Pinellas	13J	92
Polk	13M	87
Putnam	6N	19
St. Johns	6O	20
St. Lucie	14R	12
Santa Rosa	20D	16
Sarasota	15L	16
Seminole	10O	22
Sumter	10L	11
Suwannee	4J	17
Taylor	5G	12
Union*	5K	7
Volusia	8O	54
Wakulla*	4D	5
Walton	20F	14
Washington	20H	12

TOWNS

Town	Key	Pop.
Apalachicola	**6B and 23K**	**3**
Apopka	10N	1
Arcadia	**15M**	**4**
Auburndale	12M	3
Avon Park	14N	3
Bartow	**13M**	**6**
Belle Glade	17Q	4
Blountstown	**21K**	**2**
Bonifay	**20H**	**2**
Boynton	17S	2
Bradenton	**14K**	**7**
Bronson	**7K**	**†8**
Brooksville	**10L**	**2**
Bushnell	**10L**	**1**
Cedar Keys	8H	1
Chipley	**20H**	**2**
Clearwater	**13J**	**10**
Clermont	11M	2
Cocoa	11P	3
Coral Gables	21R	8
Crawfordville	**4D**	**†3**
Crescent City	7N	1
Crestview	**20E**	**2**
Cross City	**7H**	**2**
Dade City	**11L**	**3**
Dania	19R	3
Daytona Beach	8P	23
Deerfield	18R	2
De Funiak Springs	**20G**	**3**
De Land	**8O**	**7**
Delray Beach	17R	4
Dunedin	12J	2
Dunellon	8K	1
Eustis	9M	3
Everglades	**20N**	**†5**
Fernandina	**3N**	**3**
Fort Lauderdale	**19R**	**18**
Ft. Meade	13M	2
Ft. Myers	**17M**	**11**
Ft. Pierce	**14R**	**8**
Gainesville	**6L**	**14**
Green Cove Springs	**5N**	**2**
Haines City	12M	4
Hialeah	20R	6
High Springs	6K	2
Hollywood	19S	6
Homestead	22R	3
Inverness	**9L**	**1**
Jacksonville	**4N**	**173**
Jacksonville Beach	4O	4
Jasper	**3J**	**2**
Key West	**25M**	**13**
Kissimmee	**11N**	**3**
La Belle	**17N**	**†8**
Lake Butler	**5K**	**†9**
Lake City	**4K**	**6**
Lakeland	12M	22
Lake Wales	13N	5
Lake Worth	17S	7
Largo	13J	1
Leesburg	9M	5
Live Oak	**4J**	**3**
Macclenny	**4L**	**†8**
Madison	**3G**	**3**
Manatee	14L	4
Marianna	**20K**	**5**
Mayo	**5H**	**†5**
Melbourne	12Q	3
Miami	**21R**	**172**
Miami Beach	21S	28
Milton	**20D**	**2**
Monticello	**3F**	**2**
Moore Haven	**16O**	**8**
Mt. Dora	10N	2
Mulberry	13M	2
New Smyrna	8P	4
Ocala	**8L**	**9**
Okeechobee	**15P**	**2**
Orlando	**10N**	**36**
Ormond	7O	2
Oviedo	10O	1
Pahokee	16Q	5
Palatka	**7N**	**7**
Palm Beach	16R	4
Palmetto	14K	3
Panama City	**22H**	**12**
Pensacola	**21D**	**37**
Perry	**5G**	**3**
Plant City	12M	7
Pompano	18R	4
Port St. Joe	23K	2
Port Tampa City	13K	1
Punta Gorda	**16M**	**2**
Quincy	**3D**	**4**
River Jc.	3C	7
St. Augustine	**5O**	**12**
St. Cloud	12O	2
St. Petersburg	13K	61
Sanford	**9O**	**10**
Sarasota	15K	11
Sebring	**14N**	**3**
So. Miami	20R	2
Starke	**5L**	**1**
Stuart	**15R**	**2**
Tallahassee	**4E**	**16**
Tampa	**13K**	**108**
Tarpon Spgs.	12J	3
Tavares	**10N**	**1**
Titusville	**10Q**	**2**
Trenton	**6J**	**†8**
Vero Beach	**14R**	**3**
Wauchula	**14M**	**3**
West Palm Beach	**17S**	**34**
Wewahitchka	**22K**	**1**
Wildwood	9L	1
Winter Garden	10N	3
Winter Haven	12N	6
Winter Park	10O	5


FLORIDA
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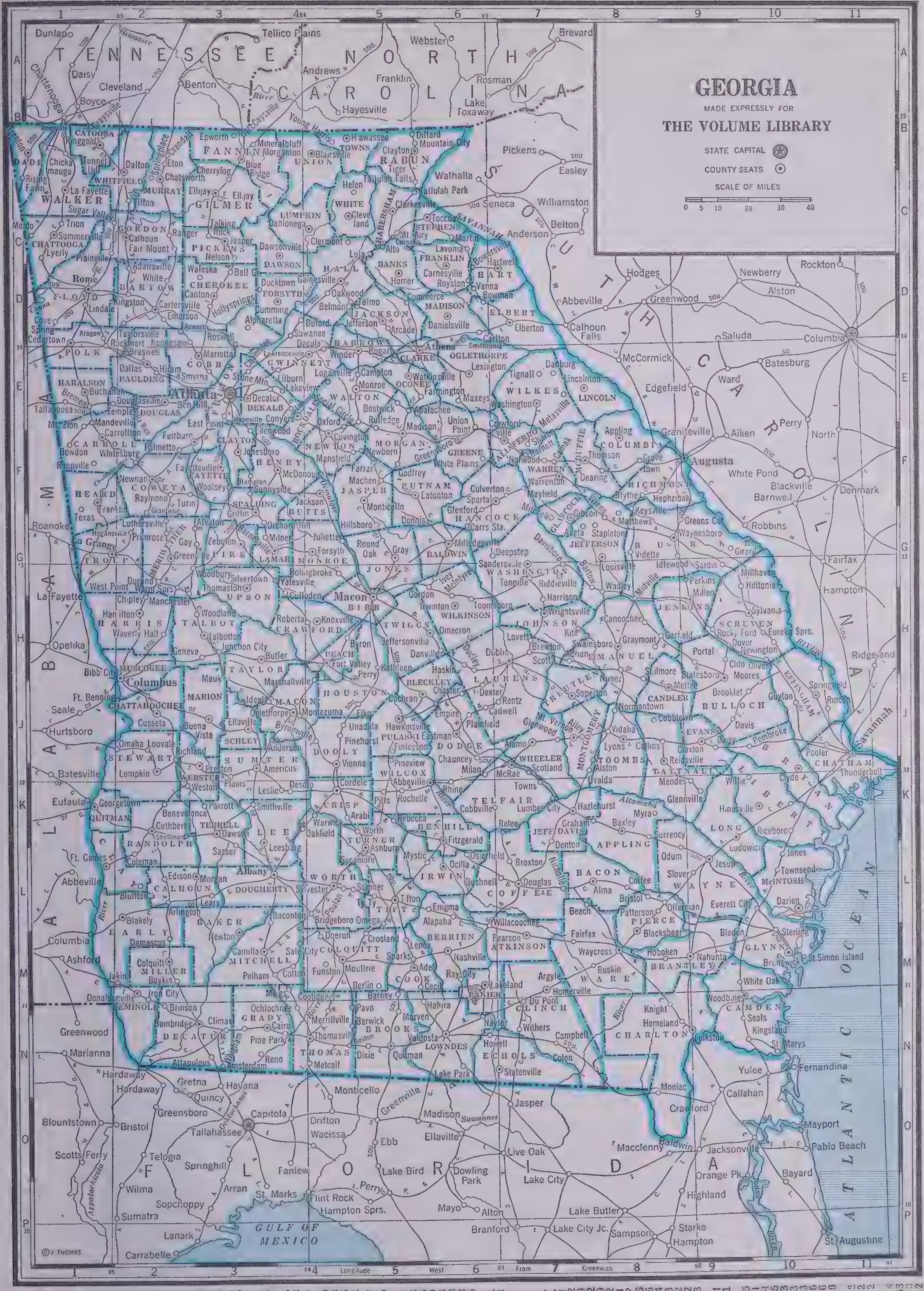
THE VOLUME LIBRARY
COUNTY SEATS
STATE CAPITAL
CANALS THUS
SCALE OF MILES
0 5 10 20 30 40 50
GEORGIA
ATLANTIC OCEAN
GULF OF MEXICO
FLORIDA STRAIT
FLORIDA KEYS
FLORIDA BAY
Lake Okeechobee
Tallahassee
Jacksonville
St. Augustine
Daytona Beach
Orlando
Tampa
St. Petersburg
Lakeland
W. Palm Beach
Ft. Lauderdale
Miami
Key West
Pensacola
NORTHWESTERN FLORIDA
SAME SCALE AS MAIN MAP
©J. THOMAS CHICAGO

† POP. SHOWN IN HUNDREDS.   COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.   *POP. OF COUNTY SEAT BELOW ONE THOUSAND



GEORGIA
Pop. 3,123,723

COUNTIES

Name	Key	Pop. Thous.
Appling	8K	14
Atkinson*	7L	7
Bacon	8L	8
Baker*	3L	7
Baldwin	6G	24
Banks*	5C	9
Barrow	5D	13
Bartow	2D	25
Ben Hill	6K	15
Berrien	6M	15
Bibb	5H	84
Bleckley	5J	10
Brantley*	9M	7
Brooks	5N	20
Bryan*	10K	6
Bulloch	9J	26
Burke	9G	27
Butts	4F	9
Calhoun	2L	10
Camden*	10M	6
Candler	8J	9
Carroll	1F	34
Catoosa*	2B	12
Charlton*	9N	5
Chatham	11K	118
Chattahoochee*	2J	15
Chattooga*	1C	19
Cherokee	3D	20
Clarke	5E	28
Clay	1L	7
Clayton	3F	12
Clinch	7M	6
Cobb	3E	38
Coffee	7L	22
Colquitt	4M	33
Columbia*	8F	9
Cook	5M	12
Coweta	2F	27
Crawford*	4H	7
Crisp	4K	18
Dade*	1B	6
Dawson*	4C	4
Decatur	2N	22
DeKalb	4E	87
Dodge	6J	21
Dooly	1J	17
Dougherty	1L	29
Douglas	2E	10
Early	1L	19
Echols*	7N	3
Effingham*	10J	10
Elbert	7D	20
Emanuel	8H	24
Evans	9J	7
Fannin	3B	15
Fayette*	3F	8
Floyd	1D	56
Forsyth*	4D	11
Franklin*	6C	16
Fulton	3E	393
Gilmer*	3C	9
Glascock*	7F	5
Glynn	10M	22
Gordon	2C	18
Grady	3N	20
Greene	6F	14
Gwinnett	4E	29
Habersham*	5C	15
Hall	4D	35
Hancock	6F	13
Haralson*	1E	14
Harris*	2H	11
Hart	7D	15
Heard*	1F	9
Henry	4F	15
Houston	5H	11
Irwin	5L	13
Jackson	5D	20
Jasper	5F	9
Jeff Davis	7K	9
Jefferson	8G	20
Jenkins	9H	12
Johnson	7H	13
Jones*	5G	8
Lamar	4G	10
Lanier	6M	5
Laurens	7H	34
Lee*	4K	8
Liberty*	10K	9
Lincoln*	7E	7
Long*	9K	4
Lowndes	6N	32
Lumpkin*	4C	6
McDuffie	7F	11
McIntosh*	10L	5
Macon*	4J	16
Madison*	6D	13
Marion	3J	7
Meriwether*	2G	22
Miller*	2M	10
Mitchell	4M	23
Monroe	4G	11
Montgomery*	7J	10
Morgan	5F	13
Murray*	2B	11
Muscogee	2H	75
Newton	4F	19
Oconee*	5E	8
Oglethorpe*	6E	12
Paulding	2E	13
Peach	4H	10
Pickens*	3C	9
Pierce	8L	12
Pike*	3G	10
Polk	1E	28
Pulaski	5J	10
Putnam	5F	9
Quitman*	1K	3
Rabun*	5B	8
Randolph	2K	17
Richmond	8F	82
Rockdale	1E	8
Schley*	3J	5
Screven	10H	20
Seminole	2N	8
Spalding	3F	18
Stephens	6C	13
Stewart	2K	11
Sumter	1K	25
Talbot	3H	8
Taliferro*	7F	6
Tattnall*	8K	16
Taylor*	4H	11
Telfair	7K	15
Terrell	3K	17
Thomas	4N	31
Tift	5L	19
Toombs	8J	17
Towns*	5B	5
Treutlen	7J	8
Troup	1G	44
Turner	5K	11
Twiggs*	5H	9
Union*	4B	8
Upson	3G	25
Walker	1B	31
Walton	5E	21
Ware	8M	28
Warren	7F	10
Washington	7G	24
Wayne	9L	13
Webster*	3K	5
Wheeler*	7J	9
White*	5C	6
Whitfield	2B	26
Wilcox	5K	13
Wilkes	7E	15
Wilkinson*	6H	11
Worth	4L	21

TOWNS

Name	Key	Pop. Thous.
Abbeville	5K	1
Adel	5M	2
Albany	4L	19
Alma	8L	2
Americus	3K	9
Ashburn	5L	2
Athens	5E	21
Atlanta	3E	302
Augusta	9F	66
Bainbridge	2N	6
Barnesville	4G	4
Baxley	8K	3
Bibb City	2H	2
Blackshear	8L	2
Blakely	2L	3
Blue Ridge	3B	1
Boston	1N	1
Brunswick	10M	15
Buena Vista	3J	1
Buford	1D	4
Cairo	3N	5
Calhoun	2C	3
Camilla	4M	3
Canton	3D	3
Carrollton	1F	6
Cartersville	2D	6
Cedartown	1D	9
Chickamauga	1B	2
Claxton	9J	2
Cochran	5J	2
College Park	3E	8
Columbus	2H	53
Commerce	5D	3
Conyers	4E	2
Cordele	4K	8
Cornelia	5C	2
Covington	4F	4
Cuthbert	2K	3
Dahlonega	4C	1
Dallas	2E	2
Dalton	2B	10
Darien	10L	1
Dawson	3K	4

Cont. on p. 2302

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

IDAHO

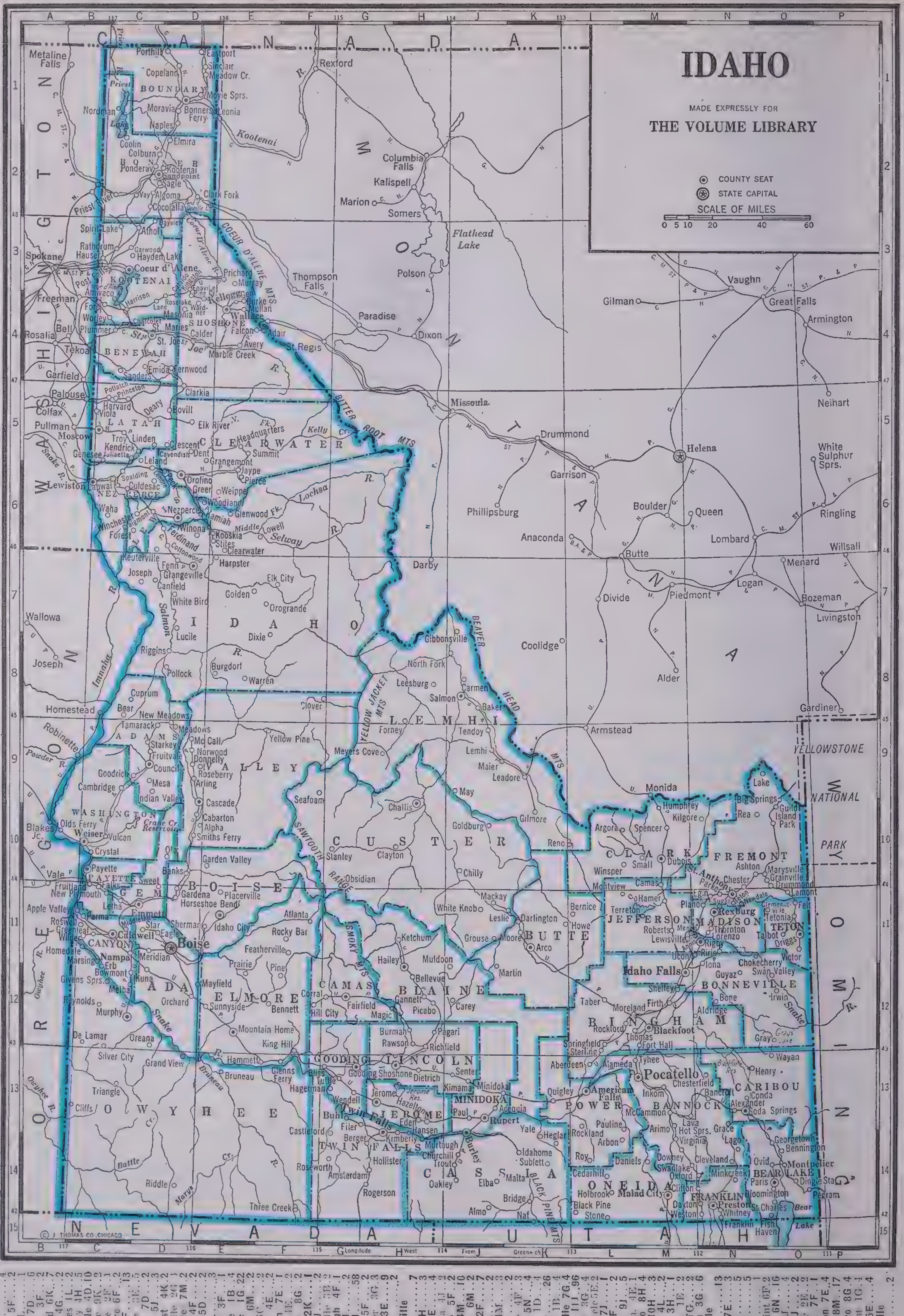
Pop. 524,873

COUNTIES

Name Key Pop. Thous.
Ada 12D.....50
Adams* 9C.....3
Bannock 13N..35
Bear Lake* 14O 8
Benewah 4C...7
Bingham 12M.21
Blaine* 12H.,.5
Boise* 11E.....2
Bonner 2C....16
Bonneville 12O 26
Boundary 1C...6
Butte* 11K....2
Camas* 12G....1
Canyon 11C...41
Caribou 13O...2
Cassia 14J....14
Clark* 10M....1
Clearwater 5E..8
Custer* 10H....4
Elmore 12F.....6
Franklin 14N.10
Fremont 10O..10
Gem 10D.....10
Gooding 13G...9
Idaho 7E......13
Jefferson 11L..11
Jerome 13H...10
Kootenai 3C...22
Latah 5C......19
Lemhi 9J......7
Lewis* 6D.....5
Lincoln 13H....4
Madison 11N...9
Minidoka 13J..10
Nez Perce 6C.19
Oneida 14L....5
Owyhee 13C....6
Payette 10C...10
Power 13L.....4
Shoshone 4E..21
Teton 11O 4
Twin Falls 14G 36
Valley 9E......4
Washington 10C.9

TOWNS

Name Key Pop. Thous.
Aberdeen 13L..1
Alameda 13M..3
American Falls 13L 1
Arco 11K.....†5
Ashton 10O....1
Blackfoot 12M.4
Boise 11D.....26
Bonners Ferry 1D 1
Buhl 13G......2
Burke 4E.....†8
Burley 14J.....5
Caldwell 11C...7
Cascade 9D.....1
Challis 10H...†6
Coeur d'Alene 3C 10
Council 9D....†7
Driggs 11O....1
Dubois 10M...†3
Emmett 11C...3
Fairfield 12G..†5
Filer 14G......1
Glenns Ferry 13F 1
Gooding 13G...3
Grangeville 7D.2
Hailey 12H....1
Idaho City 11E ....†3
Idaho Falls 12M 15
Jerome 13H....4
Kellogg 3D....4
Lewiston 6C...11
Malad City 14M 3
Meridian 11D..1
Montpelier 14O.3
Moscow 5C.....6
Mountain Home 12E 1
Mullan E1.....2
Murphy 12C...†1
Nampa 11C...12
Nezperce 6D..†6
Oakley 14J....†8
Orofino 6D.....2
Paris 14O.......1
Parma 11B....1
Payette 10C....3
Pocatello 13M.1[illegible]
Preston 14N....4
Priest R. B2..1
Rexburg 11N..3
Rigby 11N.....2
Rupert 13J.....3
St. Anthony 11N 3
St. Marian 4C..2
Salmon 8J......2
Sandpoint 2C...5
Shelley 12M...2
Shoshone 13H..1
Soda Springs 13N 1
Spirit Lake 3C.1
Twin Falls 13H.12
Wallace 4E....4
Weiser 10C....4
Wendell 13G...1


IDAHO
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
COUNTY SEAT
STATE CAPITAL
SCALE OF MILES
0 5 10 20 40 60
CANADA
MONTANA
WASHINGTON
OREGON
NEVADA
UTAH
WYOMING
YELLOWSTONE NATIONAL PARK
BOUNDARY
BONNER
KOOTENAI
SHOSHONE
BENEWAH
LATAH
CLEARWATER
NEZ PERCE
LEWIS
IDAHO
ADAMS
VALLEY
LEMHI
WASHINGTON
PAYETTE
GEM
BOISE
CUSTER
CLARK
FREMONT
CANYON
ADA
ELMORE
CAMAS
BLAINE
BUTTE
JEFFERSON
MADISON
TETON
BONNEVILLE
BINGHAM
GOODING
LINCOLN
MINIDOKA
JEROME
TWIN FALLS
CASSIA
POWER
BANNOCK
CARIBOU
ONEIDA
FRANKLIN
BEAR LAKE
OWYHEE
Boise
Helena
BITTER ROOT MTS
BEAVER HEAD MTS
SAWTOOTH RANGE
Salmon R.
Snake R.
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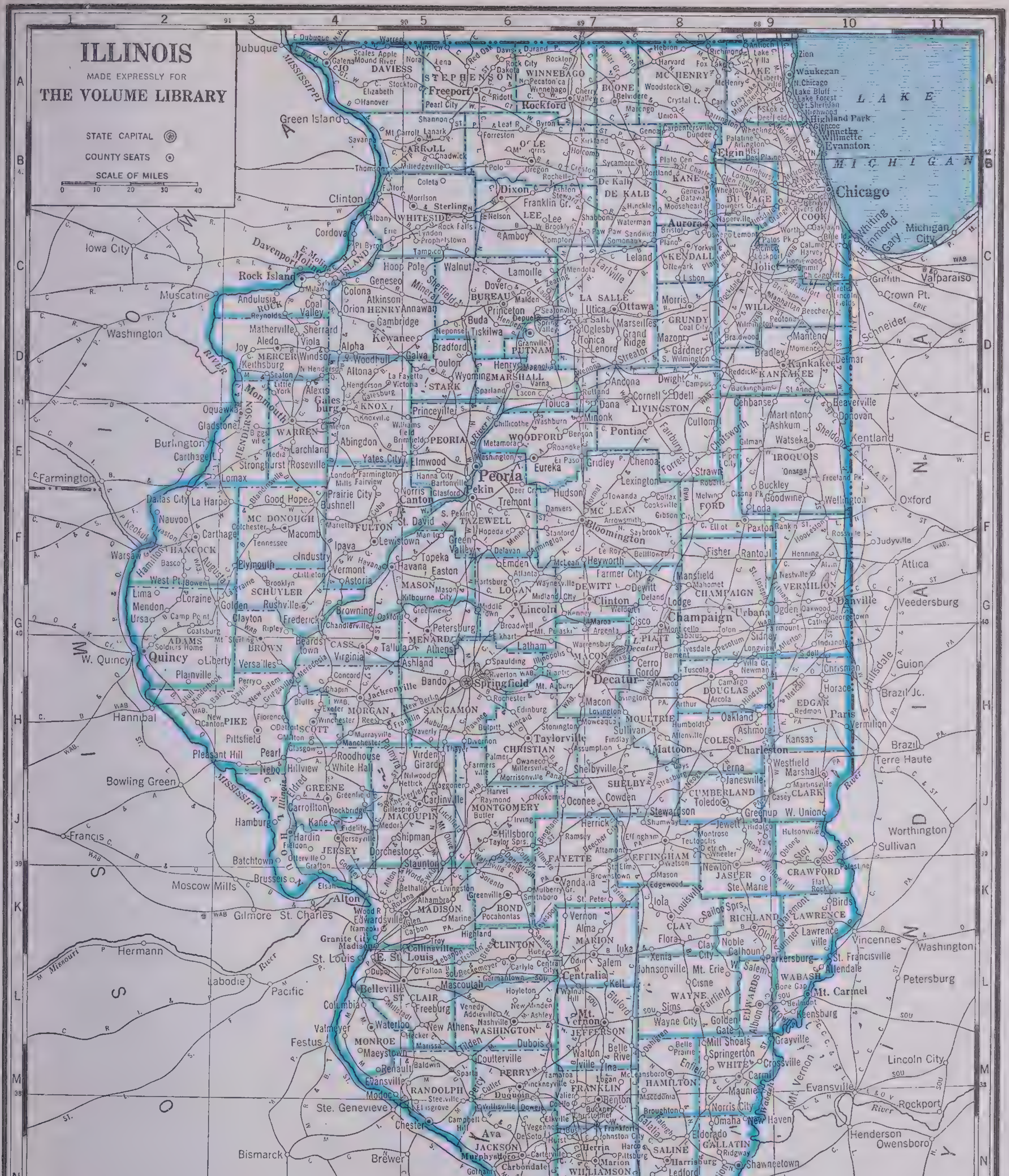
GEORGIA
Towns—Cont.
Decatur 4E....17
Donalson 2M...2
Douglas 7L....5
Douglasville 2E.3
Dublin 7H.....8
Eastman 6J....3
East Point 3E.12
East Thomaston 1G 4
Eatonton 5F....2
Edison 2L......1
Elberton 7D....6
Fairburn 3F...2
Fitzgerald 6K...7
Forsyth 4G....2
Ft. Gaines 1L..2
Ft. Valley 4H..5
Gainesville 4D.10
Glennville 9K..2
Grantville 2F..1
Greensboro 6F..2
Griffin 3F.....13
Hapeville 3E..5
Hartwell 7D...2
Hawkins 5J....3
Hazlehurst 4K.2
Hogansville 2G 1
Homerville 7M.2
Jackson 4F....2
Jefferson 5D....2
Jesup 9L.......3
Jonesboro 3F...1
LaFayette 1B..4
LaGrange 1G.22
Lakeland 6M...2
Lavonia 6C.....2
Lawrence 4E...2
Lincolnton 7E..1
Lithonia 4E....2
Louisville 8G..2
Lumpkin 2K....1
Lyons 3J......2
McCaysville 3B.2
McDonough 4F.1
McRae 7J......2
Macon 5H.....58
Madison 5F....2
Manchester 3G.3
Marietta 3E....9
Metter 8J 2
Milledgeville 5G 7
Millen 9H.....3
Monroe 5E.....4
Montezuma 4J..2
Monticello 5F..2
Moultrie 4M...10
Nashville 6M..2
Newnan 2F....7
Ocilla 6L......2
Pelham 4M....3
Perry 5J.......2
Porterdale 4F..3
Quitman 5N....4
Rockmart 1D...4
Rome 1D.....26
Rossville 1B...4
Sandersville 7G.4
Savannah 11J..96
Silvertown 3G..4
Social Circle 5E.2
Soperton 7J....1
Sparta 6F.....2
Statesboro 9J...5
Stone Mtn. 4E.1
Swainsboro 8H.4
Sylvania 10H...3
Sylvester 4L...2
Talbotton 3H...1
Tallapoosa 1E..2
Tennille 7G....2
Thomaston 3G..6
Thomasville 4N 13
Thomson 7E....3
Tifton 5L......5
Toccoa 6C......5
Trion 1C...... 1
Union Point 6F.2
Valdosta 6N..16
Vidalia 8J.....4
Vienna 4J.....2
Villa Rice 2E..2
Warrenton 7F..1
Washington 7E..4
Waycross 8M..17
Waynesboro 8G.4
West Point 1G.4
Winder 5E....4
Wrightsville 7H 2

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND



ILLINOIS

Pop. 7,897,241

COUNTIES

Name	Key	Pop. Thous.
Adams	2G	65
Alexander	6O	25
Bond	6K	15
Boone	7A	15
Brown	3G	8
Bureau	6C	38
Calhoun*	3J	8
Carroll	5B	18
Cass	4G	16
Champaign	8G	71
Christian	6H	39
Clark	10J	19
Clay*	8K	19
Clinton	6L	23
Coles	8H	38
Cook	9B	4,063
Crawford	10K	21
Cumberland*	9J	12
De Kalb	7B	34
De Witt	7G	18
Douglas	8H	18
Du Page	9B	103
Edgar	10H	24
Edwards	9L	9
Effingham	8J	22
Fayette	7K	29
Ford	8F	15
Franklin	7M	53
Fulton	4F	45
Galatin	9N	11
Greene	4J	20
Grundy	8D	18
Hamilton	8M	13
Hancock	2F	26
Hardin*	9O	8
Henderson*	3E	9
Henry	4C	44
Iroquois	9E	32
Jackson	6N	38
Jasper	9K	13
Jefferson	7L	34
Jersey	4J	14
Jo Daviess	4A	20
Johnson*	7O	11
Kane	8B	130
Kankakee	9D	61
Kendall*	8C	11
Knox	4D	52
Lake	9A	121
La Salle	7C	98
Lawrence	10K	21
Lee	6C	35
Livingston	8D	39
Logan	6G	29
McDonough	4F	27
McHenry	8A	37
McLean	7F	74
Macon	7G	85
Macoupin	5J	46
Madison	5K	149
Marion	7K	48
Marshall	6D	13
Mason	5F	15
Massac	8O	15
Menard	5G	11
Mercer	3D	17
Monroe	4L	13
Montgomery	6J	34
Morgan	4H	36
Moultrie	8H	13
Ogle	6B	30
Peoria	5E	153
Perry	6M	23
Piatt	8G	15
Pike	3H	25
Pope	8O	8
Pulaski	7O	16
Putnam*	6D	5
Randolph	5M	34
Richland	9K	17
Rock Island	3C	113
Saint Clair	5L	167
Saline	8N	38
Sangamon	6H	118
Schuyler	4G	11
Scott	4H	8
Shelby	7J	26
Stark	5D	
Stephenson	5A	41
Tazewell	6F	58
Union	6N	22
Vermilion	9G	87
Wabash	10L	14
Warren	4E	21
Washington	6L	16
Wayne	8L	22
White	9M	20
Whiteside	5B	43
Will	9C	114
Williamson	7N	51
Winnebago	7A	121
Woodford	6E	19

TOWNS

Town	Key	Pop.
Alton	4K	31
Aurora	8C	47
Belleville	**5L**	**28**
Belvidere	**7A**	**8**
Benton	**7M**	**7**
Berwyn	9B	48
Bloomington	**7F**	**32**
Blue Island	9B	17
Brookfield	9B	10
Cairo	**7P**	**14**
Calumet City	9B	13
Canton	5F	12
Carlinville	**5J**	**5**
Centralia	7L	16
Champaign	8G	23
Charleston	**8H**	**8**
Chicago	**9B**	**3.397**
Chicago Heights	9B	22
Cicero	9B	65
Clinton	**7G**	**6**
Danville	**10G**	**37**
Decatur	**2H**	**59**
Dixon	**6C**	**11**
E. Moline	4C	12
East St. Louis	5L	76
Edwardsville	**5K**	**8**
Elgin	8B	38
Elmhurst	9B	15
Elmwood Park	9B	14
Evanston	9B	65
Forest Park	9B	15
Freeport	**5A**	**22**
Galesburg	**4D**	**29**
Geneva	**8B**	**4**
Granite City	4K	23
Greenville	**6K**	**3**
Harrisburg	**8N**	**11**
Harvey	9B	18
Havana	**5F**	**4**
Highland Park	9A	14
Hillsboro	**6J**	**5**
Jacksonville	**4H**	**20**
Jerseyville	**4J**	**5**
Joliet	**9C**	**42**
Kankakee	**9D**	**22**
Kewanee	4C	17
La Grange	9B	10
La Salle	7D	13
Lawrenceville	**10K**	**6**
Lincoln	**6G**	**13**
Macomb	**4F**	**9**
Marion	**7N**	**9**
Mattoon	8H	15
Maywood	9B	27
Melrose Park	9B	11
Metropolis	**8O**	**6**
Moline	4C	35
Monmouth	**4E**	**9**
Morris	**8D**	**6**
Morrison	**5B**	**3**
Mount Carmel	**10L**	**7**
Mount Vernon	**7L**	**15**
Murphysboro	**6N**	**9**
Nashville	**6L**	**2**
Oak Park	9B	66
Olney	**9K**	**8**
Ottawa	**7C**	**16**
Paris	**10H**	**9**
Park Ridge	9B	12
Pekin	**6F**	**19**
Peoria	**6E**	**105**
Pontiac	**8E**	**10**
Princeton	**6C**	**5**
Quincy	**2G**	**40**
Rockford	**7A**	**85**
Rock Island	**3C**	**43**
Salem	**7K**	**7**
Springfield	**6H**	**76**
Sterling	5C	11
Streator	8D	15
Sycamore	**7B**	**5**
Taylorville	**6H**	**8**
Urbana	**8G**	**14**
Vandalia	**7K**	**5**
Waukegan	**9A**	**34**
West Frankfort	7M	12
Wheaton	**9B**	**7**
Wilmette	9B	17
Winnetka	9B	12
Wood River	5K	8

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

INDIANA

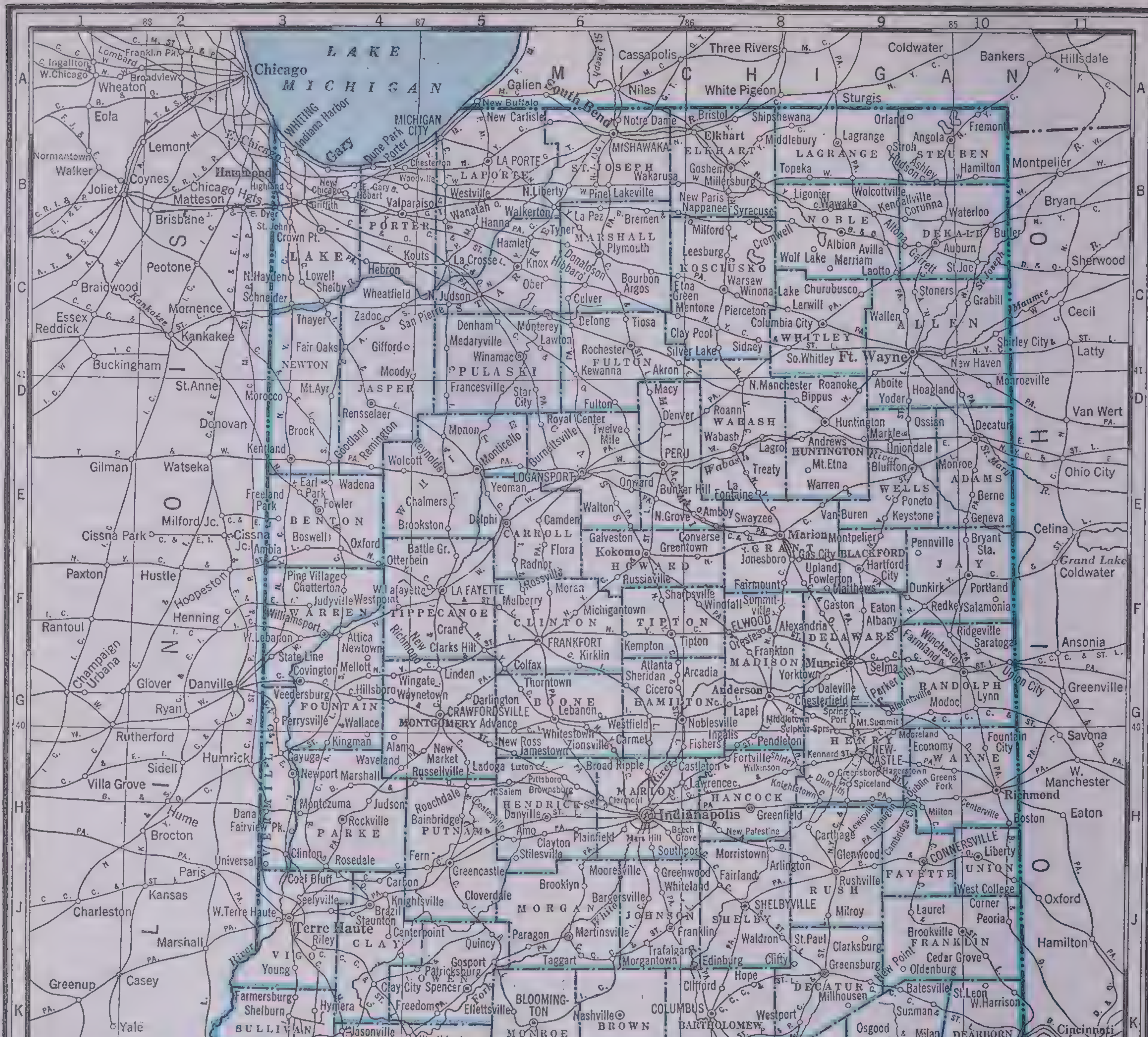
Pop. 3,427,796

COUNTIES

Name	Key	Pop. Thous.
Adams	10E	21
Allen	9D	155
Bartholomew	7K	28
Benton	3E	11
Blackford	9F	14
Boone	6G	22
Brown*	6K	6
Carroll	6E	15
Cass	6D	37
Clark	8N	31
Clay	4J	25
Clinton	6F	28
Crawford*	6N	10
Daviess	4L	26
Dearborn	10K	23
Decatur	8K	18
De Kalb	10C	25
Delaware	9G	75
Dubois	5N	23
Elkhart	7B	73
Fayette	9J	19
Floyd	7N	35
Fountain	4G	18
Franklin	10J	14
Fulton	6D	16
Gibson	3N	31
Grant	8F	56
Greene	5K	31
Hamilton	7G	25
Hancock	8H	17
Harrison	7O	17
Hendricks	6H	20
Henry	9H	40
Howard	7F	48
Huntington	8E	30
Jackson	7L	27
Jasper	4D	11
Jay	10F	23
Jefferson	9M	20
Jennings	8L	11
Johnson	7J	22
Knox	3L	44
Kosciusko	7C	30
Lagrange	9A	14
Lake	3B	293
La Porte	5A	64
Lawrence	5L	35
Madison	8G	89
Marion	6H	461
Marshall	6C	26
Martin	5M	10
Miami	7E	28
Monroe	6K	37
Montgomery	5G	27
Morgan	6J	20
Newton	3D	11
Noble	8B	23
Ohio	10L	4
Orange	6M	17
Owen	5K	12
Parke	4H	17
Perry	5O	18
Pike	3M	17
Porter	1B	28
Posey	2O	19
Pulaski	5D	12
Putnam	5H	21
Randolph	10G	27
Ripley*	9K	19
Rush	8J	19
St. Joseph	6A	162
Scott	8M	9
Shelby	8J	26
Spencer	4O	16
Starke	5C	12
Steuben	10A	14
Sullivan	3K	27
Switzerland	8L	8
Tippecanoe	5F	51
Tipton	7F	15
Union	10J	6
Vanderburg	6O	131
Vermillion*	3H	22
Vigo	3J	100
Wabash	7D	27
Warren	3F	9
Warrick	3O	19
Washington	6M	17
Wayne	10H	59
Wells	9E	19
White	5E	17
Whitley	8C	17

TOWNS

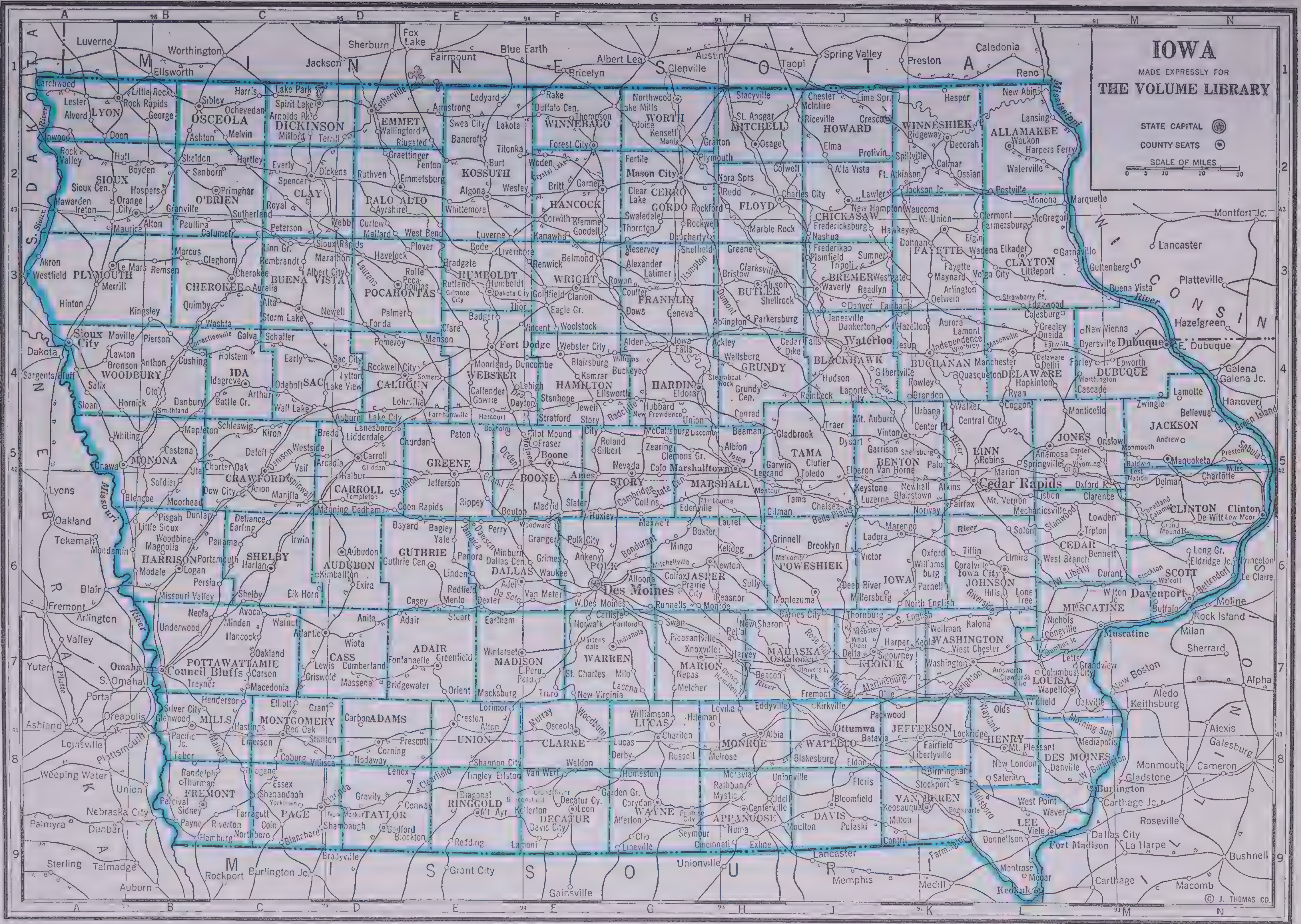
Town	Key	Pop.
Albion	**8B**	**1**
Anderson	**8G**	**42**
Angola	**10A**	**3**
Auburn	**9C**	**5**
Bedford	**5L**	**13**
Bloomfield	**5K**	**2**
Bloomington	**6K**	**21**
Bluffton	**9E**	**5**
Boonville	**3O**	**4**
Brazil	**4J**	**8**
Brookville	**10I**	**2**
Brownstown	**7L**	**2**
Cannelton	**5O**	**2**
Columbia City	**8C**	**4**
Columbus	**7K**	**12**
Connersville	**9J**	**13**
Corydon	**6N**	**2**
Covington	**3G**	**2**
Crawfordsville	**5G**	**11**
Crown Point	**3B**	**5**
Danville	**5H**	**2**
Decatur	**10E**	**5**
Delphi	**5E**	**2**
East Chicago	3A	55
Elkhart	7A	33
Elwood	8G	11
Evansville	**3O**	**99**
Fort Wayne	**9D**	**118**
Fowler	**3E**	**2**
Frankfort	**6F**	**14**
Franklin	**7J**	**6**
Gary	3A	112
Goshen	**7B**	**11**
Greencastle	**5H**	**5**
Greenfield	**8H**	**4**
Greensburg	**8K**	**6**
Hammond	3A	70
Hartford City	**9F**	**7**
Huntington	**8D**	**14**
Indianapolis	**7H**	**387**
Jeffersonville	**8N**	**11**
Kentland	**3D**	**2**
Knox	**6B**	**2**
Kokomo	**7F**	**34**
La Fayette	**5F**	**29**
Lagrange	**9A**	**2**
La Porte	**5A**	**16**
Lawrenceburg	**10K**	**4**
Lebanon	**6G**	**6**
Liberty	**10J**	**1**
Logansport	**6E**	**20**
Madison	**9M**	**7**
Marion	**8F**	**27**
Martinsville	**6J**	**5**
Michigan City	5A	26
Mishawaka	6A	28
Monticello	**5E**	**3**
Mt. Vernon	**2O**	**5**
Muncie	**9G**	**50**
Nashville	**6K**	**†5**
New Albany	**7N**	**25**
Newcastle	**9H**	**17**
Newport	**3H**	**†7**
Noblesville	**7G**	**6**
Paoli	**6M**	**2**
Peru	**7E**	**12**
Petersburg	**3M**	**3**
Plymouth	**6C**	**6**
Portland	**10F**	**6**
Princeton	**3N**	**8**
Rensselaer	**4D**	**3**
Richmond	**10H**	**35**
Rising Sun	**10L**	**2**
Rochester	**6D**	**4**
Rockport	**4O**	**2**
Rockville	**4H**	**2**
Rushville	**8J**	**6**
Salem	**6M**	**3**
Scottsburg	**8M**	**2**
Shelbyville	**8J**	**11**
Shoals	**5M**	**1**
South Bend	**6A**	**101**
Spencer	**5K**	**2**
Sullivan	**3K**	**5**
Terre Haute	**3J**	**63**
Tipton	**7F**	**5**
Valparaiso	**4B**	**9**
Vernon	**8L**	**†4**
Versailles	**9K**	**†6**
Vevay	**10M**	**1**
Vincennes	**3L**	**18**
Wabash	**7E**	**10**
Warsaw	**7C**	**6**
Washington	**4L**	**9**
Whiting	3A	10
Williamsport	**3F**	**1**
Winamac	**5C**	**2**
Winchester	**10G**	**5**



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND



IOWA

Pop. 2,538,268

COUNTIES

Name	Key	Pop. Thous.
Adair	7E	13
Adams	8D	10
Allamakee	1L	17
Appanoose	9H	24
Audubon	6D	12
Benton	5K	23
Black Hawk	4J	80
Boone	5F	30
Bremer	3J	18
Buchanan	4K	21
Buena Vista	3C	20
Butler*	3H	18
Calhoun	4D	18
Carroll	5D	23
Cass	7D	19
Cedar	6L	17
Cerro Gordo	2G	44
Cherokee	3C	19
Chickasaw	2J	15
Clarke	8F	10
Clay	2C	18
Clayton	3L	24
Clinton	5N	45
Crawford	5C	21
Dallas	6E	25
Davis	9J	11
Decatur	9F	14
Delaware	4L	18
Des Moines	8L	37
Dickinson	1C	12
Dubuque	4M	64
Emmet	1D	13
Foyette	3K	29
Floyd	2H	20
Franklin	3G	16
Fremont	9B	15
Greene	5E	17
Grundy	4H	14
Guthrie	6E	17
Hamilton	4F	20
Hancock	2F	15
Hardin	4G	23
Harrison	6B	23
Henry	8K	18
Howard	1J	14
Humboldt*	3E	13
Ida	4C	11
Iowa	6J	17
Jackson	5M	19
Jasper	6H	31
Jefferson	8K	16
Johnson	6K	33
Jones	5L	20
Keokuk	7J	18
Kossuth	2E	27
Lee	9L	41
Linn	5K	89
Louisa	7L	11
Lucas	8G	15
Lyon	1A	15
Madison	7E	15
Mahaska	7H	26
Marion	7G	27
Marshall	5H	35
Mills	8B	15
Mitchell	1H	14
Monona	5B	18
Monroe	8H	15
Montgomery	8C	16
Muscatine	6M	31
O'Brien*	2B	19
Osceola	1B	11
Page	9C	25
Palo Alto	2D	16
Plymouth	3A	24
Pocahontas	3D	16
Polk	6F	196
Pottawattamie	7C	67
Poweshiek	6J	19
Ringgold	9E	11
Sac	4D	18
Scott	6M	85
Shelby	6C	17
Sioux	2A	27
Story	5G	33
Tama	5J	22
Taylor	9D	14
Union	8E	16
Van Buren*	9K	12
Wapello	8J	44
Warren	7F	18
Washington	7K	20
Wayne	9G	13
Webster	4E	
Winnebago	1F	14
Winneshiek	1K	22
Woodbury	4A	104
Worth	1G	11
Wright	3F	20

TOWNS

Name	Key	Pop. Thous.
Albia	**7H**	**5**
Algona	**2E**	**5**
Ames	5F	13
Anamosa	**5L**	**4**
Atlantic	**7D**	**6**
Audubon	**6D**	**2**
Bedford	**8D**	**2**
Belle Plaine	5J	3
Bellevue	4M	2
Bettendorf	6M	3
Bloomfield	**8J**	**3**
Boone	**5F**	**12**
Burlington	**8L**	**26**
Carroll	**5D**	**5**
Cedar Falls	4J	9
Cedar Rapids	**5K**	**62**
Centerville	**8H**	**8**
Chariton	**8G**	**6**
Charles City	**2H**	**9**
Cherokee	**3C**	**7**
Clarinda	**8C**	**5**
Clarion	**3F**	**3**
Clear Lake	2G	4
Clinton	**5N**	**26**
Colfax	6H	2
Corning	**8D**	**2**
Council Bluffs	**7B**	**41**
Cresco	**2J**	**4**
Creston	**8E**	**8**
Davenport	**6N**	**66**
Decorah	**1K**	**5**
Denison	**5C**	**4**
Des Moines	**6F**	**160**
Dubuque	**4M**	**44**
Eagle Grove	3F	4
Eldora	**4H**	**4**
Elkader	**3L**	**2**
Emmetsburg	2D	3
Estherville	**1D**	**6**
Fairfield	**8K**	**7**
Forest City	**2F**	**3**
Ft. Dodge	**4E**	**23**
Fort Madison	**9L**	**14**
Glenwood	**8B**	**6**
Grinnell	6H	5
Hampton	**3G**	**4**
Harlan	**6C**	**4**
Hawarden	2A	3
Humboldt	3E	3
Idagrove	**4C**	**2**
Independence	**4K**	**4**
Indianola	**7G**	**4**
Iowa City	**6L**	**17**
Iowa Falls	4G	4
Jefferson	**5E**	**4**
Keokuk	**9L**	**15**
Knoxville	**7G**	**7**
Lake City	4D	2
Le Mars	**3A**	**5**
Leon	**8F**	**2**
Manchester	**4L**	**4**
Maquoketa	**5M**	**4**
Marengo	**6J**	**2**
Marion	5K	5
Marshalltown	**5H**	**19**
Mason City	**2G**	**27**
Missouri Valley	6B	4
Monticello	4L	3
Mount Pleasant	**8K**	**5**
Muscatine	**6M**	**18**
Nevada	**5F**	**3**
New Hampton	**2J**	**3**
Newton	**6G**	**10**
Oelwein	3K	8
Onawa	**5B**	**3**
Osage	**1H**	**3**
Osceola	**7F**	**3**
Oskaloosa	**7H**	**11**
Ottumwa	**7J**	**32**
Pella	7H	3
Perry	5E	6
Red Oak	**8C**	**6**
Rock Rapids	**1A**	**3**
Sac City	**4D**	**3**
Sheldon	2B	4
Shenandoah	8C	7
Sioux City	**4A**	**82**
Spencer	**2C**	**7**
Storm Lake	**3C**	**5**
Tama	5J	3
Tipton	**6L**	**3**
Vinton	**5K**	**4**
Washington	**7K**	**5**
Waterloo	**4J**	**52**
Waukon	**1L**	**3**
Waverly	**3J**	**4**
Webster City	**4F**	**7**
W. Des Moines	6F	1
Winterset	**7E**	**3**

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

KANSAS

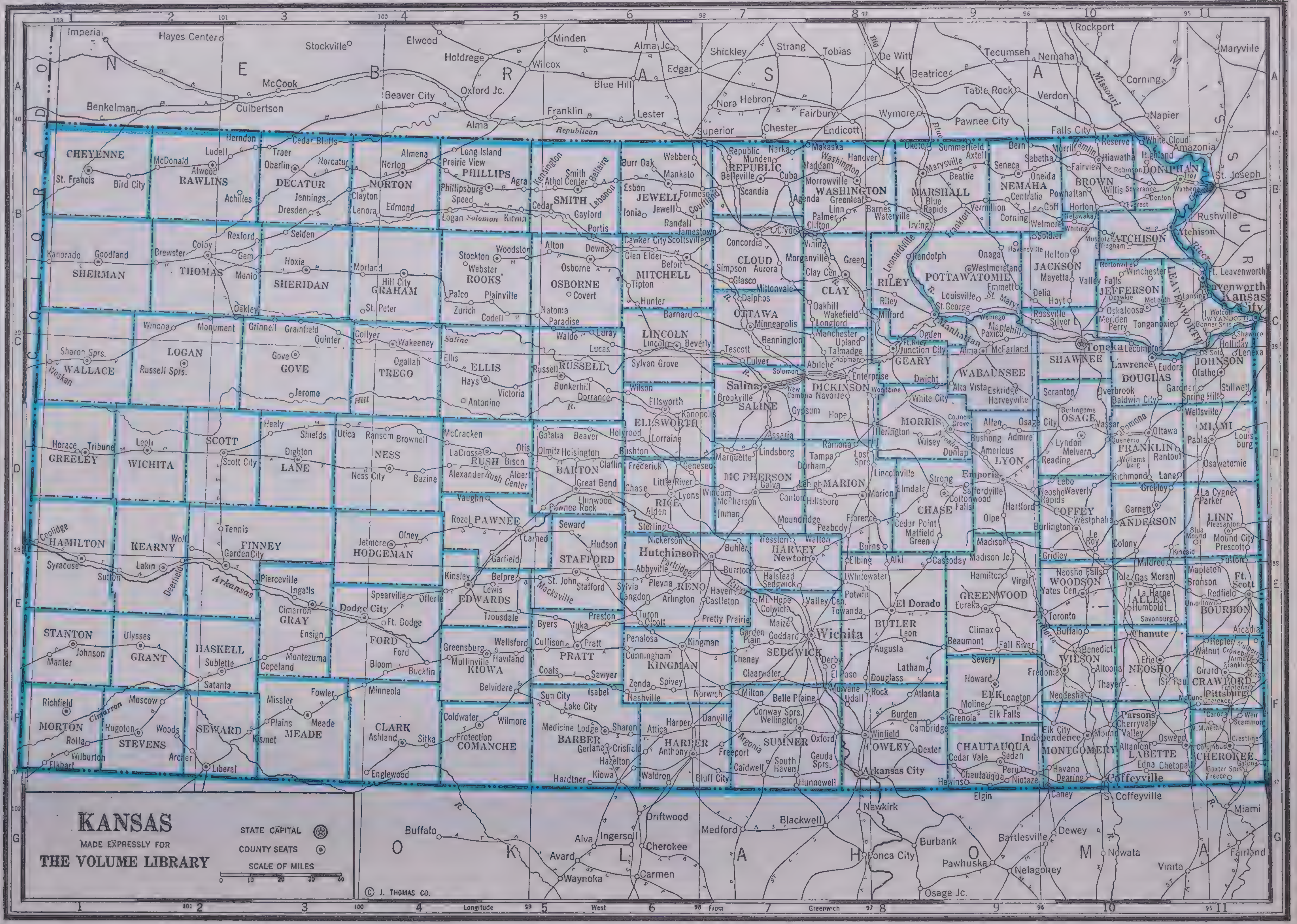
Pop. 1,801,028

COUNTIES

Name	Key	Pop. Thous.
Allen	10E	20
Anderson	10D	12
Atchison	10B	22
Barber	5F	9
Barton	5D	25
Bourbon	11E	21
Brown	10B	17
Butler	8E	32
Chase*	9D	6
Chautauqua	9F	9
Cherokee	11F	30
Cheyenne*	1B	6
Clark	4F	4
Clay	8B	13
Cloud	7B	17
Coffey	10D	12
Comanche	5F	4
Cowley	8F	38
Crawford	11F	44
Decatur	3B	7
Dickinson	8C	23
Doniphan	11B	13
Douglas	10C	25
Edwards	4E	6
Elk	9F	8
Ellis	5C	18
Ellsworth	6C	10
Finney	3E	10
Ford	4E	17
Franklin	10D	21
Geary	8C	15
Gove*	3C	5
Graham	4B	6
Grant	2E	2
Gray	3E	5
Greeley*	1B	2
Greenwood	9E	16
Hamilton	1E	3
Harper	6F	12
Harvey	7D	22
Haskell*	2E	2
Hodgeman*	4E	4
Jackson	10B	13
Jefferson*	10C	13
Jewell	6B	12
Johnson	10C	33
Kearney*	2E	3
Kingman	6E	12
Kiowa	4E	5
Labette	10F	30
Lane*	3D	3
Leavenworth	11C	41
Lincoln	6C	8
Linn*	11D	12
Logan*	2C	4
Lyon	9D	26
McPherson	7D	24
Marion	8D	19
Marshall	8B	21
Meade	3F	6
Miami	11D	19
Mitchell	6B	11
Montgomery	10F	50
Morris	8C	10
Morton*	1F	2
Nemaha	9B	17
Neosho	10F	22
Ness	4D	7
Norton	4B	10
Osage*	10D	15
Osborne	5B	10
Ottawa	7C	9
Pawnee	5D	10
Phillips	5B	10
Pottawatomie	9B	14
Pratt	5E	12
Rawlins	2B	7
Reno	6E	52
Republic	7B	13
Rice	6D	17
Riley	8B	21
Rooks	4B	8
Rush	5D	8
Russell	5C	13
Saline	7C	30
Scott	2D	4
Sedgwick	7E	143
Seward	2F	7
Shawnee	10C	91
Sheridan*	1B	5
Sherman	1B	6
Smith	5B	11
Stafford	6E	10
Stanton*	1E	1
Stevens	2F	3
Sumner	7F	26
Thomas	2B	6
Trego	4C	6
Wabaunsee	*9C	9
Wallace*	1C	2
Washington	8B	16
Wichita*	2D	2
Wilson	10F	18
Woodson	10E	8
Wyandotte	11C	145

TOWNS

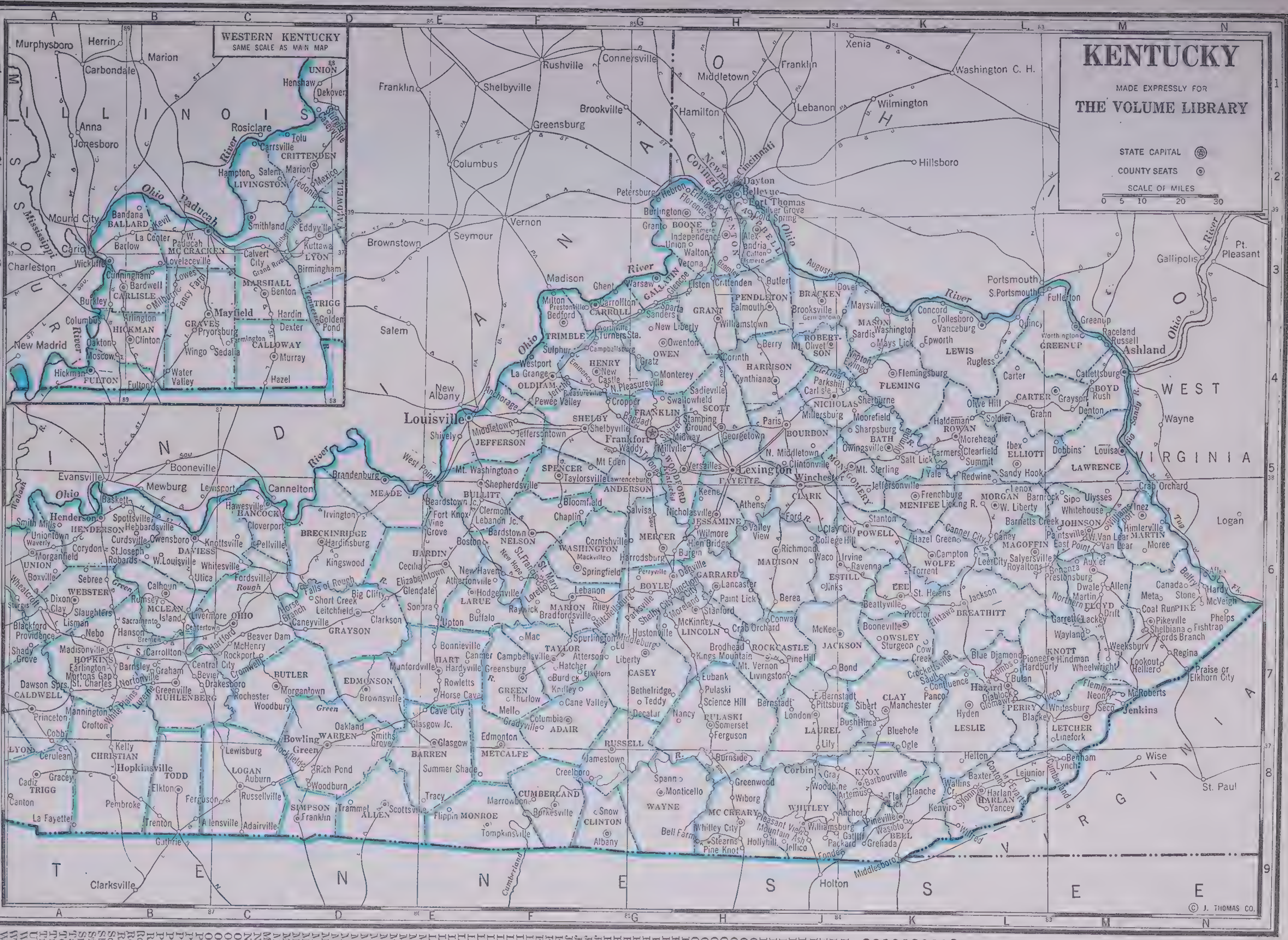
Name	Key	Pop. Thous.
Abilene	8C	6
Anthony	6F	3
Arkansas City	8F	13
Arma	11F	2
Atchison	11B	13
Augusta	8E	4
Baxter Springs	11F	5
Belleville	7B	3
Beloit	6B	4
Bonner Springs	11C	2
Burlington	10D	2
Caldwell	7F	2
Caney	10F	3
Chanute	10E	10
Cherryvale	10F	3
Clay Center	8B	5
Coffeyville	10F	17
Colby	2B	2
Columbus	11F	3
Concordia	7B	6
Council Grove	8D	3
Dodge City	4E	8
Eldorado	8E	10
Ellinwood	6D	2
Ellis	5C	2
Ellsworth	6C	2
Emporia	9D	13
Eureka	9E	4
Ft. Scott	11E	11
Fredonia	10F	4
Frontenac	11E	2
Galena	11F	4
Garden City	3E	6
Garnett	10D	3
Girard	11F	3
Goodland	1B	3
Great Bend	5D	9
Hays	5C	6
Herington	8C	4
Hiawatha	10B	3
Hoisington	5D	4
Holton	10B	3
Horton	10B	3
Howard	9F	1
Hugoton	2F	1
Humboldt	10E	2
Hutchinson	7E	30
Independence	10F	12
Iola	10E	7
Junction City	8C	9
Kansas City	11C	121
Kingman	6E	3
Kinsley	4E	2
Larned	5D	4
Lawrence	10C	14
Leavenworth	11C	19
Liberal	2F	4
Lindsborg	7D	2
Lyons	6D	3
McPherson	7D	4
Manhattan	8C	12
Marion	8D	2
Marysville	8B	4
Minneapolis	7C	2
Neodesha	10F	3
Newton	7D	11
Norton	4B	3
Olathe	11C	4
Osage City	10D	2
Osawatomie	11D	4
Osborne	5B	2
Oswego	10F	2
Ottawa	10D	10
Paola	11D	4
Parsons	10F	11
Phillipsburg	5B	2
Pittsburg	11F	17
Pratt	5E	7
Russell	5C	5
Sabetha	10B	2
Salina	7C	21
Seneca	9B	2
Stafford	6E	2
Sterling	6E	2
Topeka	10C	68
Wellington	7F	7
Wichita	7E	115
Winfield	8F	10
Yates Center	10E	2



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND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COUNTY SEATS
SCALE OF MILES
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MISSOURI
INDIANA
OHIO
WEST VIRGINIA
VIRGINIA
TENNESSEE
Louisville
Frankfort
Lexington
Covington
Newport
Paducah
Ashland
Owensboro
Bowling Green
Ohio River
Mississippi
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KEN-TUCKY

Pop., 2,845,627

COUNTIES

Name	Key	Pop. Thous.
Adair	8F	19
Allen	8D	15
Anderson	5G	9
Ballard	3A	9
Barren	8E	28
Bath*	5J	11
Bell	8K	44
Boone*	2G	11
Bourbon	4J	18
Boyd	4M	46
Boyle	6G	17
Bracken*	3J	9
Breathitt	6K	24
Breckinridge*	6D	18
Bullitt*	5E	10
Butler*	7C	11
Caldwell	2D & 7A	14
Calloway	4C	19
Campbell	2H	72
Carlisle	3B	8
Carroll	3G	9
Carter	4L	26
Casey*	7G	19
Christian	8B	36
Clark	5J	18
Clay*	7K	24
Clinton*	8G	10
Crittenden	2D	12
Cumberland*	8F	12
Daviess	6B	52
Edmonson*	7D	11
Elliott*	5L	9
Estill	6J	18
Fayette	5H	79
Fleming	4K	13
Floyd	6M	53
Franklin	4G	23
Fulton	4A	15
Gallatin*	3G	4
Garrard	6H	12
Grant*	3H	10
Graves	4C	32
Grayson	7D	18
Green	7F	12
Greenup	4L	25
Hancock*	5C	7
Hardin	6E	29
Harlan	8L	75
Harrison	4H	15
Hart*	7E	17
Henderson	6A	27
Henry*	4G	12
Hickman	4B	9
Hopkins	7B	38
Jackson*	7J	16
Jefferson	4E	385
Jessamine	5H	12
Johnson	5M	26
Kenton	2H	93
Knott*	7L	20
Knox	8J	31
Larue	6E	10
Laurel	8J	26
Lawrence	5M	17
Lee*	6K	11
Leslie*	7K	15
Letcher	8L	41
Lewis	4K	16
Lincoln	7H	20
Livingston*	2C	9
Logan	8C	23
Lyon	3D & 8A	9
McCracken	3B	49
McCreary*	8H	16
McLean*	7B	11
Madison	6H	29
Magoffin*	6L	17
Marion	6F	17
Marshall	3C	17
Martin*	5M	11
Mason	3J	19
Meade*	5E	9
Menifee*	5K	6
Mercer	6G	15
Metcalf*	8F	11
Monroe*	8E	14
Montgomery	5J	12
Morgan*	5L	17
Muhlenberg	7B	38
Nelson	6F	18
Nicholas	4J	9
Ohio	7C	24
Oldham	4F	11
Owen*	4G	11
Owsley*	7K	9
Pendleton	3H	10
Perry	7L	42
Pike	6N	63
Powell*	6J	6
Pulaski	8H	10
Robertson*	4J	3
Rockcastle*	7H	17
Rowan*	4K	13
Russell*	8G	14
Scott	4H	14
Shelby	4F	18
Simpson	8D	12
Spencer*	5F	7
Taylor	7F	14
Todd*	8B	14
Trigg	3D, 8A	13
Trimble*	4F	6
Union	1D, 6A	17
Warren	8D	37
Washington	6F	13
Wayne	8G	17
Webster*	6A	19
Whitley	8J	33
Wolfe*	6K	10
Woodford	5G	12

TOWNS

Name	Key	Pop. Thous.
Ashland	4M	30
Augusta	3J	2
Barbourville	**8J**	**2**
Bardstown	**6F**	**3**
Bardwell	**3B**	**1**
Beaver Dam	**7C**	**1**
Bellevue	2H	9
Benton	**3C**	**2**
Berea	6H	2
Bowling Green	**8D**	**15**
Cadiz	**8A**	**1**
Campbellsville	**7F**	**2**
Carlisle	4J	1
Carrollton	**3G**	**3**
Catlettsburg	**4M**	**5**
Central Cy.	7C	4
Clay	6A	1
Cloverport	6D	1
Corbin	8J	8
Covington	**2H**	**62**
Cumberland	8L	4
Cynthiana	**4H**	**5**
Danville	**6G**	**7**
Dawson Sprs.	7A	3
Dayton	2H	8
Earlington	7B	3
Eddyville	2D	2
Elizabethtn.	**6F**	**4**
Elsmere	7H	3
Erlanger	7H	2
Falmouth	**3H**	**2**
Ft. Thomas	2H	11
Frankfort	**4G**	**11**
Franklin	**8D**	**4**
Fulton	4B	4
Georgetown	**4H**	**4**
Glasgow	**8E**	**6**
Greenville	**7B**	**2**
Harlan	**8L**	**4**
Harrodsburg	**6G**	**5**
Hazard	**7L**	**7**
Hellier	7M	†6
Henderson	**6A**	**13**
Hickman	**4A**	**2**
Hopkinsville	**8B**	**10**
Irvine	**6J**	**4**
Jackson	**6K**	**2**
Jenkins	7M	9
Lebanon	**6F**	**4**
Lexington	**5H**	**49**
Louisville	**4E**	**319**
London	7J	2
Louisa	5M	2
Ludlow	2H	6
Lynch	8M	7
Madisonville	**7B**	**8**
Mayfield	**4C**	**9**
Maysville	**3J**	**7**
Middlesboro	9K	11
Morganfield	**6A**	**3**
Mount Sterling	**5J**	**5**
Murray	**4C**	**4**
Newport	**2H**	**31**
Nicholasville	**5H**	**3**
Owensboro	**6B**	**30**
Paducah	**3B**	**33**
Paintsville	**5M**	**2**
Paris	**4J**	**7**
Pikeville	**6M**	**4**
Pineville	**8K**	**4**
Prestonsburg	**6M**	**2**
Princeton	**7A**	**5**
Providence	6A	4
Richmond	**6H**	**7**
Russell	4M	2
Russellville	**8C**	**4**
Shelbyville	**4F**	**4**
Somerset	**8H**	**6**
Sturgis	6A	2
Van Lear	6M	2
Versailles	**5G**	**3**
Wayland	7M	3
Winchester	**5J**	**9**
Wheelwright	7M	2

†POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

LOUISIANA

Pop. 2,363,880

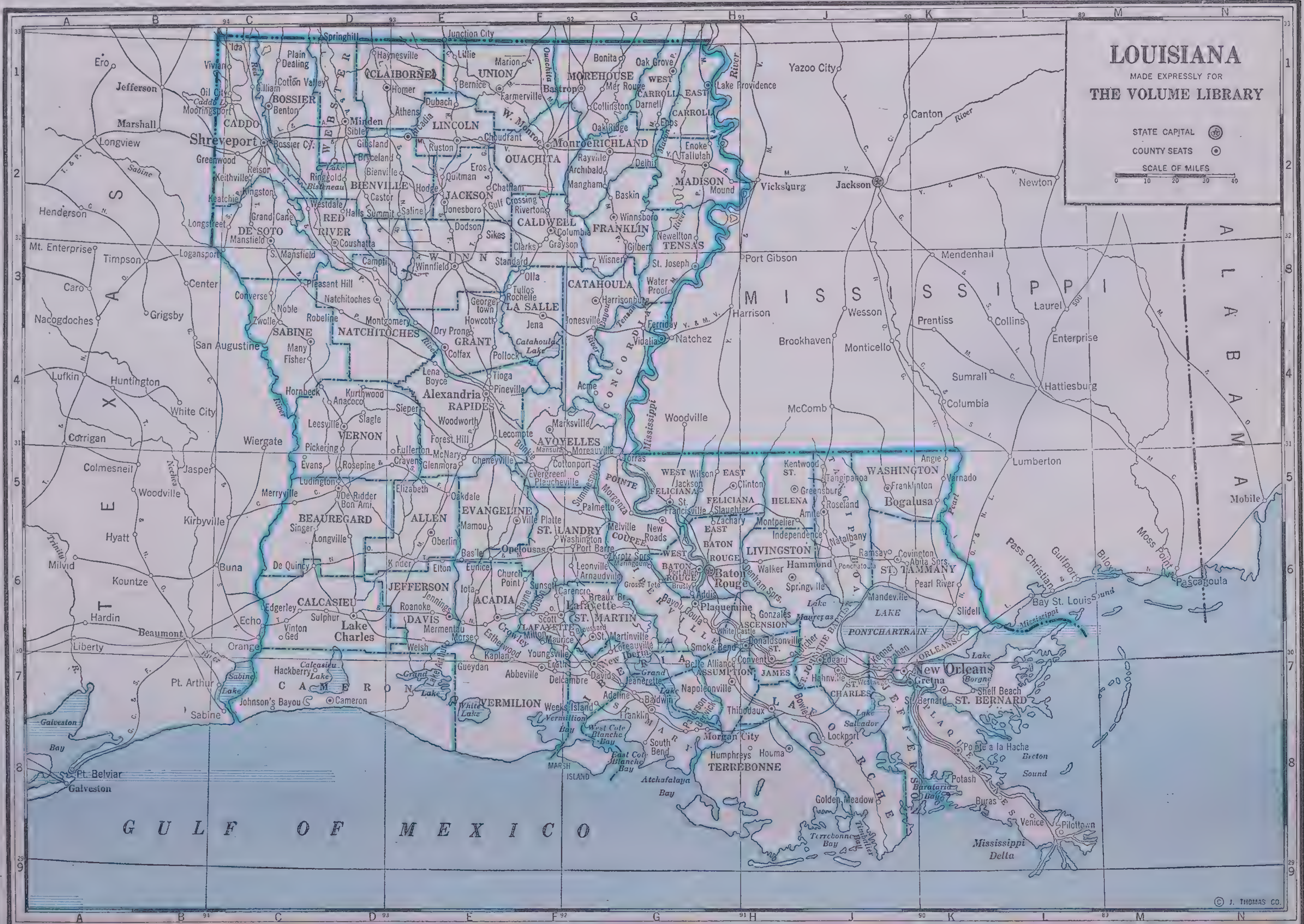
PARISHES

Same as Counties

Name	Key	Pop. Thous.
Acadia	6E	46
Allen*	5E	18
Ascencion	6H	21
Assumption	7H	19
Avoyelles	4F	39
Beauregard	5D	15
Bienville	2D	24
Bossier*	1C	33
Caddo	2C	150
Calcasieu	6C	57
Caldwell*	3F	12
Cameron*	7C	7
Catahoula*	3G	15
Claiborne	1D	30
Concordia	4G	15
De Soto	3C	32
East Baton Rouge	6H	88
East Carroll	1H	19
East Feliciana*	6H	18
Evangeline	5E	30
Franklin	3G	32
Grant	4E	16
Iberia	7G	37
Iberville	6G	28
Jackson	2E	18
Jefferson	8K	50
Jefferson Davis	6E	24
Lafayette	6F	44
Lafourche	8J	39
La Salle	3F	11
Lincoln	2E	25
Livingston*	6J	18
Madison	2H	18
Morehouse	1G	28
Natchitoches	3D	41
Orleans	7K	495
Ouachita	2F	59
Plaquemines*	8K	12
Pointe Coupee	5G	24
Rapides	4E	73
Red River*	3D	16
Richland	2G	29
Sabine	4C	24
St. Bernard*	7K	7
St. Charles*	7J	12
St. Helena*	5J	10
St. James*	7H	17
St. John the Baptist*	7J	15
St. Landry	5F	71
St. Martin	6G	26
St. Mary	8G	31
St. Tammany	6K	24
Tangipahoa	5J	46
Tensas*	3H	16
Terrebonne	8H	36
Union	1F	21
Vermilion	8F	38
Vernon	4D	19
Washington*	5K	31
Webster	1D	34
West Baton Rouge	6G	11
West Carroll	1G	19
West Feliciana*	5G	12
Winn	3E	17

TOWNS

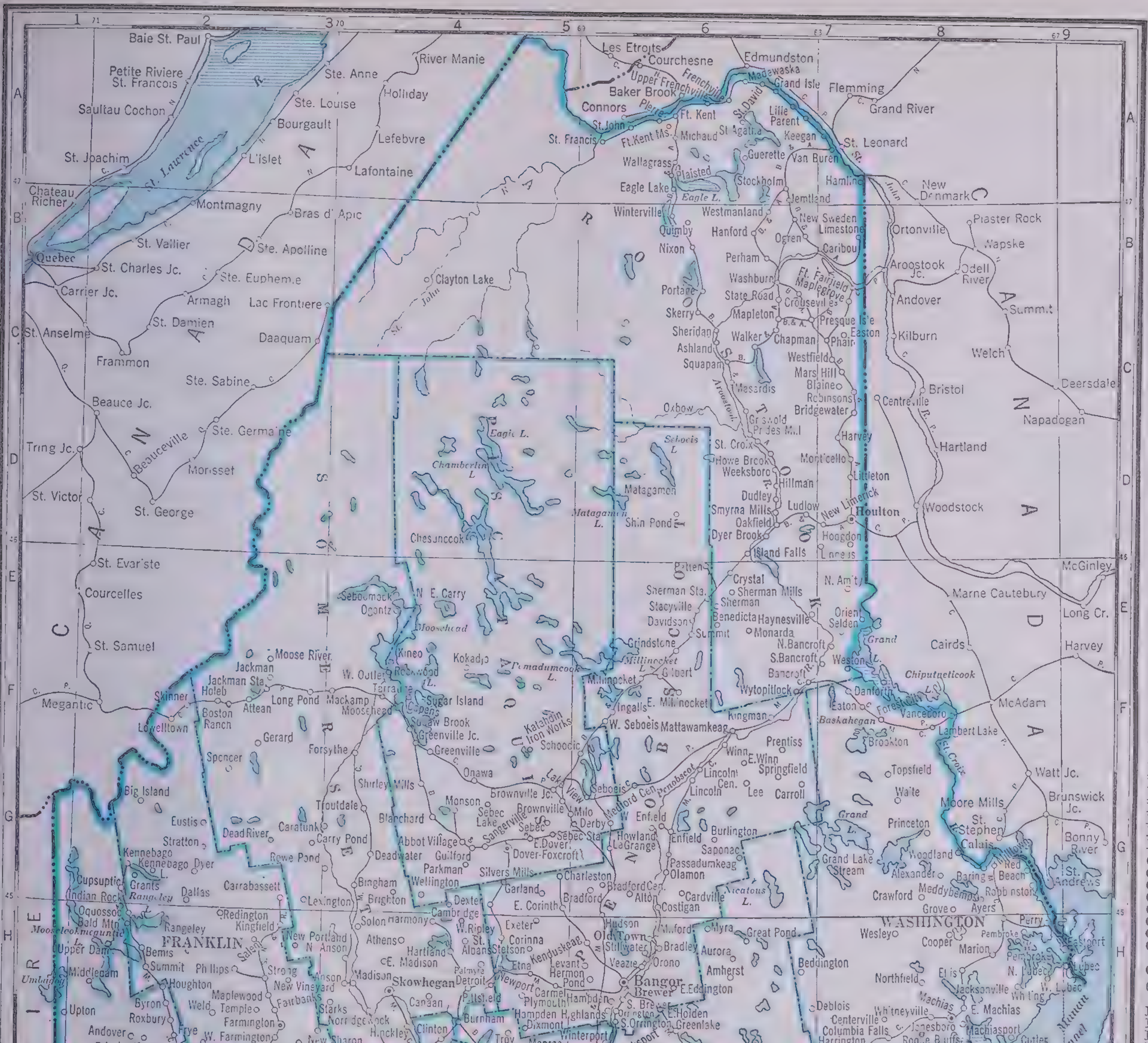
Town	Key	Pop. Thous.
Abbeville	7F	7
Alexandria	4E	27
Amite	5J	2
Arcadia	2E	2
Bastrop	1F	7
Baton Rouge	6H	35
Berwick	8H	2
Bogalusa	5K	15
Bossier City	2C	6
Breaux Bridge	6F	2
Bunkie	5F	4
Church Point	6F	2
Colfax	4E	1
Cottonport	5F	1
Coushatta	3D	1
Covington	6K	4
Crowley	6F	10
Delhi	2G	1
Denham Springs	6H	1
De Quincy	6C	3
De Ridder	5D	4
Donaldsonville	7H	4
Eunice	6F	5
Farmerville	1F	3
Ferriday	1G	2
Franklin	8G	4
Franklinton	5K	2
Gibsland	2D	1
Glenmora	5E	1
Gretna	7K	11
Gueydan	7F	2
Hammond	5J	6
Haynesville	1D	2
Hodge	2E	1
Homer	1D	3
Houma	8J	9
Independence	5J	1
Jackson	5H	5
Jeanerette	7G	3
Jena	3F	1
Jennings	6E	4
Jonesboro	2E	3
Jonesville	4G	2
Kaplan	7F	3
Kenner	7J	2
Kentwood	5J	1
Lafayette	6F	19
Lake Arthur	7E	2
Lake Charles	6D	21
Lake Providence	1H	4
Lecompte	4F	1
Leesville	4D	3
Logansport	3C	1
Lutcher	7H	2
Mandeville	6K	1
Mansfield	2C	4
Mansura	4F	1
Many	4D	1
Marksville	4F	2
Melville	5G	2
Merryville	5C	1
Minden	1D	7
Monroe	2F	28
Morgan City	8H	7
Napoleonville	7H	1
Natchitoches	3D	7
New Iberia	7F	14
New Orleans	7K	495
New Roads	5G	2
Oakdale	5E	1
Oak Grove	1G	2
Opelousas	6F	9
Patterson	8G	2
Pineville	4E	4
Plaquemine	6H	5
Ponchatoula	6J	4
Port Allen	6H	2
Rayne	6E	5
Rayville	2G	2
Roseland	5J	1
Ruston	2E	7
St. Martinville	6F	4
Shreveport	2C	98
Slidell	6K	3
Springhill	1D	3
Sulphur	6D	3
Tallulah	2H	6
Thibodaux	7H	6
Vidalia	4G	2
Ville Platte	5F	4
Vinton	6C	2
Vivian	1C	2
Washington	5F	1
Welsh	7E	2
West Monroe	2F	9
Westwego	7J	5
White Castle	6H	2
Winnfield	3E	5
Winnsboro	2G	3



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAN


MAINE
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 20 30
CANADA
NEW HAMPSHIRE
ATLANTIC OCEAN
AROOSTOOK
PISCATAQUIS
SOMERSET
PENOBSCOT
FRANKLIN
OXFORD
KENNEBEC
WALDO
HANCOCK
WASHINGTON
LINCOLN
KNOX
CUMBERLAND
YORK
SAGADAHOC
ANDROSCOGGIN
Augusta
Portland
Bangor
Lewiston
Auburn
Quebec
St. Lawrence R.
Moosehead L.
Chamberlain L.
Grand Manan Channel

MAINE

Pop. 847,226

COUNTIES

Name	Key	Pop. Thous.
Androscoggin	2K	77
Aroostook	6B	94
Cumberland	2L	146
Franklin	2H	20
Hancock	6J	32
Kennebec	3K	77
Knox	5L	27
Lincoln	4L	16
Oxford	1J	43
Penobscot	6G	97
Piscataquis	4E	18
Sagadahoc	3L	19
Somerset	3F	38
Waldo	5J	21
Washington	8G	38
York	1M	86

TOWNS

Name	Key	Pop. Thous.
Alfred	**1M**	**1**
Anson	3H	2
Ashland	6C	2
Auburn	**2K**	**20**
Augusta	**3K**	**19**
Bangor	**5H**	**30**
Bar Harbor	6J	4
Bath	**3L**	**10**
Belfast	**5J**	**.6**
Belgrade	3J	1
Benton	3K	1
Biddeford	2M	20
Bingham	3G	1
Blaine	7C	1
Blue Hill	6J	1
Boothbay	4L	1
Boothbay Harbor	4L	2
Bowdoinham	3L	1
Brewer	5H	7
Bridgewater	7C	1
Bridgton	1K	3
Bristol	4L	1
Brooksville	6K	1
Brownville	5G	2
Brunswick	3L	9
Bucksport	6J	3
Buxton	2M	2
Calais	8G	5
Camden	5K	4
Caribou	7B	8
Chelsea	3K	2
Cherryfield	7J	1
China	4J	1
Clinton	4J	1
Coopers Mills	4K	1
Corinna	4H	2
Cumberland Center	2L	1
Danforth	7F	1
Deer Isle	6K	1
Dexter	4G	1
Dixfield	2J	2
Dover-Foxcroft	**4G**	**4**
Eagle Lake	6A	2
E. Livermore	2K	2
E. Machias	8J	1
E. Millinocket	6F	2
Easton	7C	2
Eastport	9H	3
Eliot	1N	2
Ellsworth	6J	4
Ellsworth Falls	6J	1
Enfield	6G	1
Fairfield	3J	5
Falmouth	2M	3
Farmington	**3J**	**4**
Fort Fairfield	7B	6
Fort Kent	6A	5
Frenchville	6A	2
Gardiner	3K	6
Gorham	2M	3
Gouldsboro	7J	1
Grand Isle	6A	2
Gray	2L	1
Greenville	4F	2
Guilford	4G	2
Hallowell	3K	3
Hampden	5H	3
Harrington	7J	1
Hartland	4H	1
Hodgdon	7D	1
Houlton	**7D**	**8**
Island Falls	6D	1
Jay	2J	3
Jonesport	8J	2
Kennebunk	1N	4
Kennebunk Port	2N	1
Kittery	1N	5
Kittery Point	1N	1
Lewiston	2K	39
Limestone	7B	2
Lincoln	[illegible]	4
Lisbon	3L	4
Lisbon Falls	3L	2
Littleton	7D	1
Livermore	2K	1
Livermore Falls	3J	3
Lubec	9H	3
Machias	**8J**	**2**
Machiasport	8J	1
Madawaska	6A	4
Madison	3H	4
Mapleton	6C	1
Mars Hill	7C	2
Mechanic Falls	2L	2
Mexico	2J	4
Milford	6H	1
Millbridge	7J	1
Millinocket	5F	6
Milltown	8G	2
Milo	5G	3
Monmouth	3K	1
Monson	4G	1
Monticello	7D	2
Mount Desert	6K	2
New Gloucester	2L	2
Newport	4H	2
Norridgewock	3J	2
North Berwick	1N	1
Norway	2K	4
Oakfield	6D	1
Oakland	3J	3
Old Town	6H	8
Orono	6H	4
Orrington	5J	2
Paris	2K	4
Patten	6E	2
Pembroke	9H	1
Perry	9H	†7
Pittsfield	4H	3
Poland	2L	1
Portland	**2M**	**74**
Presque Isle	7C	8
Randolph	3K	2
Richmond	3K	2
Rockland	**5K**	**10**
Rockport	5K	2
Rumford	2J	10
Sabattus	2K	1
Saco	2M	9
Saint Agatha	6A	2
Saint George	4K	2
Sanford	1M	15
Sangerville	4G	1
Scarboro	2M	3
Searsport	5J	1
Sherman	6E	1
Skowhegan	**3H**	**7**
S. Berwick	1N	3
S. Brewer	5H	1
S. Paris	**2K**	**2**
S. Portland	2M	16
Standish	2M	1
Stockholm	7A	1
Stockton Springs	5J	1
Stonington	6K	1
Thomaston	4K	3
Topsham	3L	2
Turner	2K	1
Union	4K	1
Van Buren	7A	5
Vassalboro	3J	2
Vinalhaven	5K	2
Waldoboro	4K	2
Wallagrass	6A	1
Warren	5K	1
Washburn	6B	2
Waterville	4J	17
Wells	2N	2
Westbrook	2M	11
Wilton	2J	3
Winslow	4J	4
Winterport	5J	2
Winthrop	3K	3
Wiscasset	**4L**	**1**
Woodland	8G	1
Yarmouth	3L	2
York	1N	3

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

MASSA-CHUSETTS

Pop. 4,316,721

COUNTIES

Name	Key	Pop. Thous.
Barnstable	6M	37
Berkshire	3A	122
Bristol	5U	365
Dukes	8L	6
Essex	1K	496
Franklin	2D	49
Hampden	4D	332
Hampshire	3C	72
Middlesex	2J	971
Nantucket	8N	3
Norfolk	4J	325
Plymouth	5K	169
Suffolk	3J	863
Worcester	3F	504

CITIES

Name	Key	Pop. Thous.
Abington	4K	5
Adams	2B	13
Agawam	4C	7
Amesbury	1K	10
Amherst	3D	6
Andover	1J	11
Arlington	3J	40
Athol	2E	11
Attleboro	5H	22
Auburn	4G	7
Auburndale	3F	4
Barnstable	**6M**	**8**
Belmont	3J	27
Beverly	2K	26
Billerica	2H	6
Blackstone	5H	5
Boston	**3J**	**771**
Braintree	3J	16
Bridgewater	5K	9
Brockton	4J	62
Cambridge	**3J**	**111**
Canton	4J	6
Chelmsford	2H	7
Chelsea	3J	41
Chicopee	4D	42
Clinton	3G	12
Concord	3H	8
Dalton	2B	4
Danvers	2K	14
Dartmouth	7K	9
Dedham	**3J**	**16**
Dracut	1H	7
Dudley	4F	5
E. Dedham	3J	4
Easthampton	3D	10
Easton	5J	5
E. Weymouth	3J	6
Everett	3J	47
Fairhaven	6K	11
Fall River	**6J**	**115**
Falmouth	7L	7
Fitchburg	**2G**	**42**
Foxboro	4J	6
Framingham	3H	23
Franklin	4H	7
Gardner	2F	20
Gloucester	1L	24
Grafton	4G	7
Great Barrington	4A	6
Greenfield	**2D**	**16**
Greenwood	2J	2
Groton	2G	3
Haverhill	1J	47
Hingham	3K	8
Holyoke	4D	54
Hudson	3H	8
Indian Orchard	4D	6
Ipswich	1K	6
Lawrence	**1J**	**84**
Leicester	3F	5
Leominster	2G	22
Lexington	2J	13
Lowell	**2H**	**101**
Ludlow	4D	8
Lynn	2K	98
Malden	3J	58
Mansfield	5J	7
Marblehead	2K	11
Marlboro	3H	15
Maynard	3H	7
Medfield	3H	4
Medford	3J	63
Melrose	3J	25
Methuen	1J	22
Middleboro	5K	9
Milford	3H	15
Millbury	4G	7
Milton	3J	19
Monson	4E	6
Montague	2D	8
Nantucket	**8N**	**3**
Natick	3H	14
Needham	3J	12
New Bedford	**6K**	**110**
Newburyport	**1K**	**14**
Newton	3J	70
Newtonville	3J	5
North Adams	1B	22
Northampton	**3D**	**25**
North Andover	2J	6
North Attleboro	5H	10
Northbridge	4G	10
Norwood	4J	15
Orange	2E	6
Palmer	4E	9
Peabody	2K	22
Pittsfield	**3A**	**50**
Plymouth	**5L**	**13**
Quincy	3K	76
Randolph	4J	8
Reading	2J	11
Revere	3K	34
Rockland	4K	8
Salem	**2K**	**41**
Saugus	2K	15
Seekonk	6J	5
Somerset	6J	6
Somerville	3J	102
South Braintree	3J	6
Southbridge	4F	17
S. Hadley	4D	7
Spencer	3E	7
Springfield	**4D**	**150**
Stoneham	3J	11
Stoughton	4J	7
Swampscott	2K	11
Taunton	**5J**	**37**
Templeton	2E	5
Tewksbury	3J	6
Uxbridge	4G	6
Wakefield	2J	16
Walpole	4H	7
Waltham	3J	40
Ware	3E	8
Wareham	6K	6
Watertown	3J	35
Webster	4F	13
Wellesley	3J	15
Westboro	3G	6
Westfield	4C	19
West Concord	2H	3
W. Newton	3J	6
Westport	7J	4
W. Springfield	4D	17
Weymouth	3J	24
Whitinsville	4G	7
Whitman	4K	8
Wilmington	2J	5
Winchendon	2F	7
Winchester	3J	15
Winthrop	3K	17
Woburn	3J	20
Worcester	**3G**	**194**

RHODE ISLAND

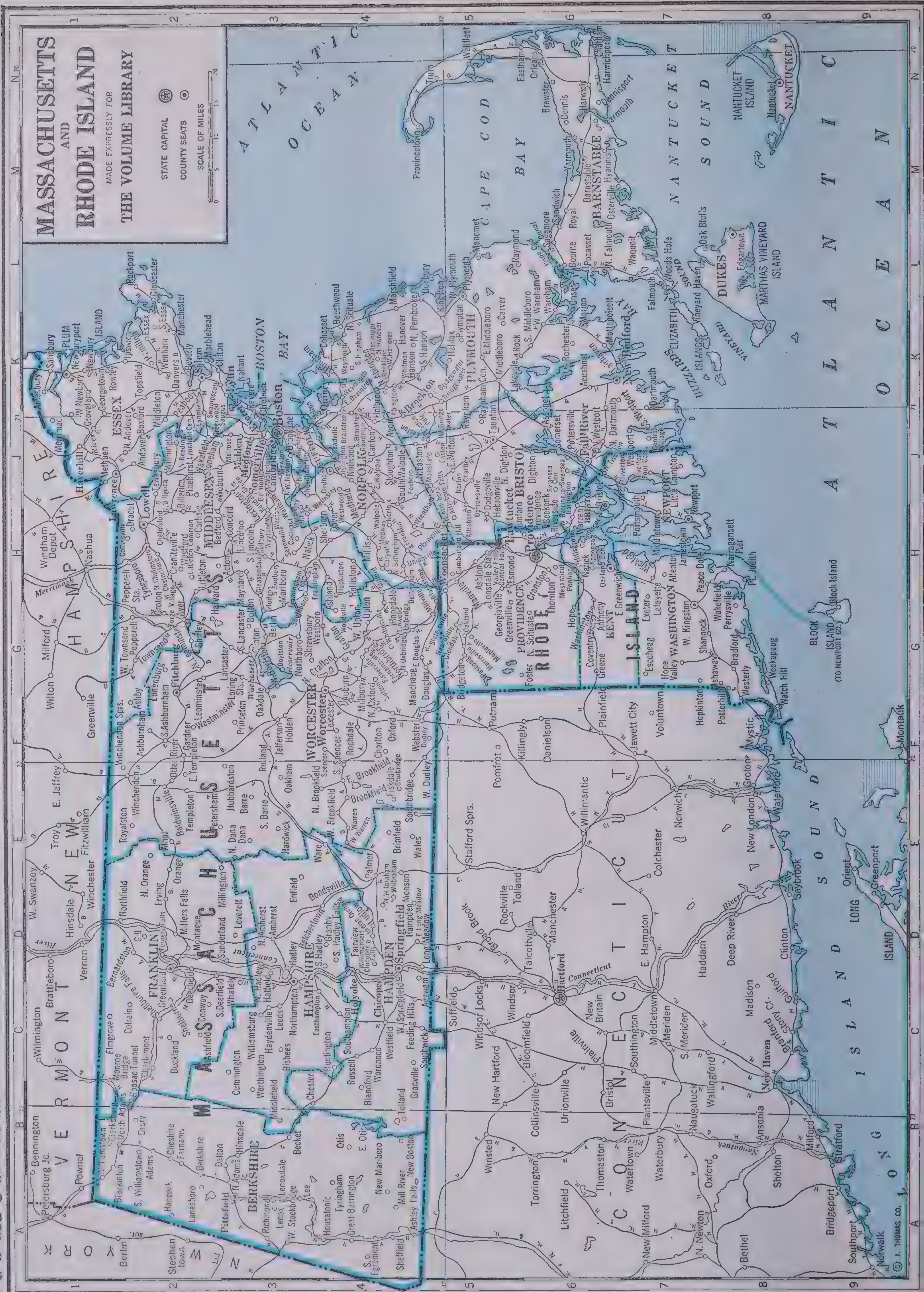
Pop. 713,346

COUNTIES

Name	Key	Pop. Thous.
Bristol	6J	26
Kent	6G	58
Newport	7J	47
Providence	5G	550
Washington*	7G	32

TOWNS

Name	Key	Pop. Thous.
Bristol	**6J**	**11**
Central Falls	5H	25
Cranston	6H	47
Cumberland	5H	11
East Greenwich	**6H**	**4**
East Providence	6H	32
Lincoln	5H	11
Newport	**7H**	**31**
North Providence	6H	12
Pawtucket	5H	76
Providence	**6H**	**254**
Warwick	6G	29
Westerly	8F	11
West Warwick	6H	18
Woonsocket	5H	49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AND
RHODE ISLAND
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
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ATLANTIC OCEAN
BOSTON BAY
CAPE COD BAY
NANTUCKET SOUND
LONG ISLAND SOUND
VERMONT
NEW HAMPSHIRE
NEW YORK
CONNECTICUT
MASSACHUSETTS
RHODE ISLAND
BLOCK ISLAND (TO NEWPORT CO.)
NANTUCKET ISLAND
MARTHAS VINEYARD ISLAND
ELIZABETH ISLANDS
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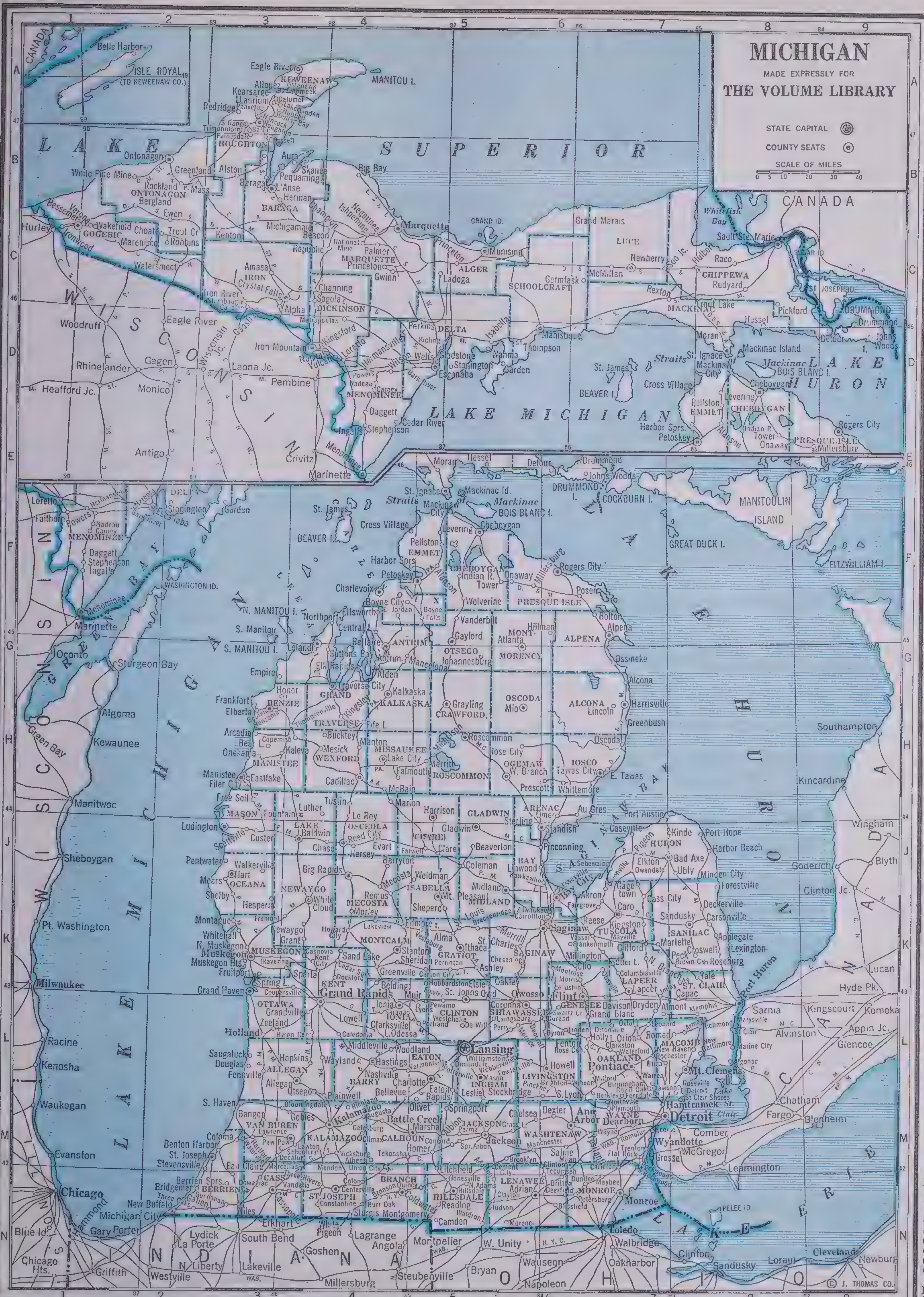
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 20 30 40
LAKE SUPERIOR
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LAKE ERIE
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OHIO
ILLINOIS
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ISLE ROYAL (TO KEWEENAW CO.)
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SAGINAW BAY
GREEN BAY
Lansing
Detroit
Grand Rapids
Flint
Saginaw
Marquette
Sault Ste. Marie
Chicago
Milwaukee
Toledo
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MICHIGAN

Pop. 5,256,106

COUNTIES

Name	Key	Pop. Thous.
Alcona*	6G	5
Alger	5C	10
Allegan	3L	42
Alpena	7G	21
Antrim*	4G	11
Arenac*	6J	9
Baraga	3B	9
Barry	4L	23
Bay	6J	75
Benzie*	3H	8
Berrien	3M	89
Branch	4M	26
Calhoun	5M	91
Cass	3M	22
Charlevoix	4F	13
Cheboygan	8D & 5F	14
Chippewa	8C	28
Clare*	5J	9
Clinton	5L	27
Crawford	5G	4
Delta	5D&2F	34
Dickinson	4C	29
Eaton	5L	34
Emmet	7D&5F	16
Genesee	6K	228
Gladwin	5J	9
Gogebic	1C	32
Grand Traverse	4H	23
Gratiot	5K	32
Hillsdale	6N	29
Houghton	3B	48
Huron	7J	33
Ingham	5L	131
Ionia	4L	36
Iosco	6H	9
Iron	3C	20
Isabella	5J	26
Jackson	5M	93
Kalamazoo	4M	100
Kalkaska*	4G	5
Kent	4L	246
Keweenaw*	3A	4
Lake*	3J	5
Lapeer	7K	32
Leelanau*	4G	8
Lenawee	6N	53
Livingston	6L	21
Luce	7C	7
Mackinac	7C	9
Macomb	8L	108
Manistee	3H	18
Marquette	4C	47
Mason	3J	19
Mecosta	4J	17
Menominee	4D & 1F	25
Midland	5J	27
Missaukee*	4H	8
Monroe	7N	59
Montcalm*	4K	29
Montmorency*	6G	4
Muskegon	3K	95
Newaygo*	3J	19
Oakland	7L	254
Oceana	3J	15
Ogemaw	6H	9
Ontonagon	2B	11
Osceola	4J	13
Oscoda*	6G	3
Otsego	5G	6
Ottawa	3L	60
Presque Isle	9D & 6F	12
Roscommon*	5H	4
Saginaw	6K	130
St. Clair	8K	76
St. Joseph*	4M	32
Sanilac	7K	30
Schoolcraft	6C	10
Shiawasee	6L	41
Tuscola	7K	36
Van Buren	3M	35
Washtenaw	6M	81
Wayne	7M	2,016
Wexford	4H	18

TOWNS

Name	Key	Pop. Thous.
Adrian	**6N**	**14**
Albion	5M	8
Allegan	**3L**	**5**
Alma	5K	7
Alpena	**7G**	**13**
Ann Arbor	**6M**	**30**
Bad Axe	**7J**	**3**
Battle Creek	4M	43
Bay City	**6J**	**48**
Belding	4K	4
Benton Harbor	2M	17
Berkley	7L	6
Bessemer	**1C**	**4**
Big Rapids	**4J**	**5**
Birmingham	7L	11
Buchanan	3N	4
Cadillac	**4H**	**10**
Caro	7K	3
Charlevoix	**4F**	**2**
Charlotte	**5L**	**6**
Cheboygan	8B	6
Clawson	7L	4
Coldwater	**4M**	**7**
Corunna	**6L**	**2**
Crystal Falls	**3C**	**3**
Dearborn	7M	64
Detroit	**7M**	**1,623**
Dowagiac	3M	5
Durand	6L	3
E. Detroit	7L	9
E.Gr.Rapids	4L	5
E. Lansing	5L	6
Eaton Rapids	5L	3
Ecorse	7M	13
Escanaba	**5D & 2F**	**15**
Fenton	6K	3
Ferndale	7M	23
Flint	**6K**	**152**
Gladstone	5D	5
Gr. Haven	**3K**	**9**
Grand Ledge	5L	4
Gr. Rapids	**4L**	**164**
Grayling	**5G**	**2**
Greenville	4K	5
Grosse Pt.	7M	13
Hamtramck	7M	50
Hancock	3A	6
Hastings	**4L**	**5**
Highland Park	7M	51
Hillsdale	**5M**	**6**
Holland	3L	15
Houghton	**3A**	**4**
Howell	**6L**	**4**
Inkster	7M	7
Ionia	**4L**	**6**
Iron Mtn.	**4D**	**11**
Iron River	3C	4
Ironwood	1C	13
Ishpeming	4C	9
Jackson	**5M**	**50**
Kalamazoo	**4M**	**54**
Kingsford	**4D**	**6**
L'Anse	**3B**	**3**
Lansing	5L	79
Lapeer	**7K**	**5**
Laurium	3A	6
Lincoln Pk.	7M	15
Ludington	**2J**	**9**
Manistee	**3H**	**9**
Manistique	**6D**	**5**
Marine City	8L	4
Marquette	**4C**	**16**
Marshall	**4M**	**5**
Mason	**5L**	**3**
Menominee	**3E**	**10**
Midland	**5J**	**10**
Monroe	**7N**	**18**
Mt.Clemens	**8L**	**14**
Mt. Pleasant	**5J**	**8**
Munising	**5C**	**4**
Muskegon	**3K**	**48**
Muskegon Heights	3K	16
Negaunee	4C	7
Newberry	**7C**	**3**
Niles	3M	11
Norway	4D	4
Ontonagon	**2B**	**2**
Otsego	3L	3
Owosso	6K	14
Oxford	7L	2
Petoskey	**5F**	**6**
Plymouth	7M	5
Pontiac	**7L**	**67**
Pt. Huron	**8K**	**33**
Reed City	**4J**	**2**
River Rouge	7M	17
Rochester	7L	4
Rogers City	**6F**	**3**
Roseville	7L	9
Royal Oak	7M	25
Saginaw	**6K**	**83**
St. Clair	8L	3
St. Clair Shores	7M	10
St. Ignace	**5F**	**3**
St. Johns	**5L**	**4**
St. Joseph	**2M**	**9**
St. Louis	5K	3
Sault Ste. Marie	**8C**	**16**
S. Haven	3M	5
Stambaugh	3C	2
Sturgis	4M	7
Tecumseh	6M	3
Three Rivers	4M	7
Traverse C.	**4G**	**14**
Trenton	7M	5
Wakefield	1C	4
Wayne	7M	4
Wyandotte	7M	31
Ypsilanti	6M	12
Zeeland	3L	3

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP, OF COUNTY SEAT BELOW ONE THOUSAND

MINNESOTA

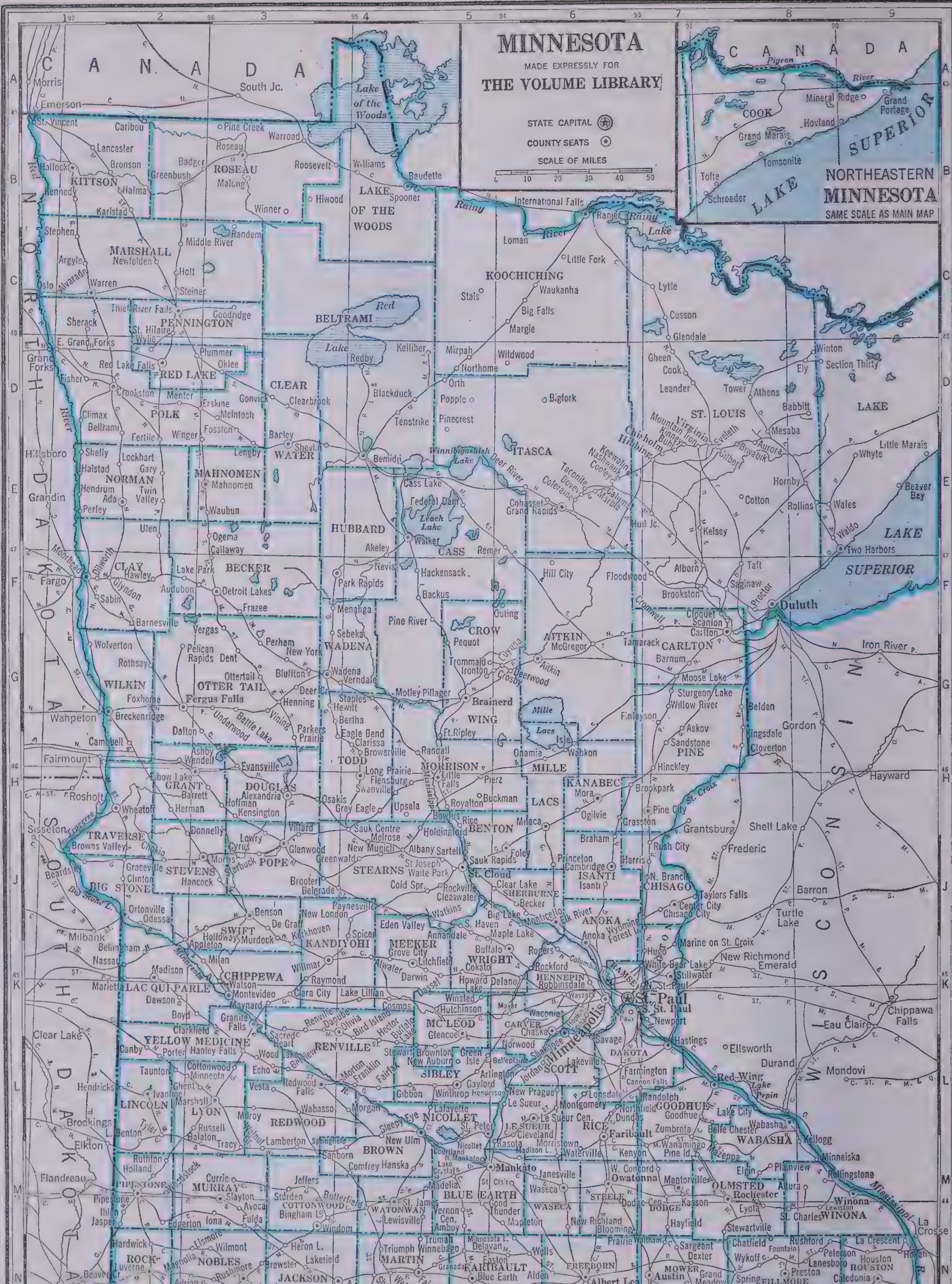
Pop. 2,792,300

COUNTIES

Name	Key	Pop. Thous.
Aitkin	6G	18
Anoka	6J	22
Becker	3F	27
Beltrami	4D	26
Benton*	5J	16
Big Stone	1J	10
Blue Earth	5M	36
Brown	4M	26
Carlton*	7G	24
Carver	5K	18
Cass*	5F	21
Chippewa	3K	17
Chisago*	7J	13
Clay	1F	25
Clearwater*	3E	11
Cook*	8B	3
Cottonwood	3M	16
Crow Wing	5G	30
Dakota	7L	40
Dodge*	7M	13
Douglas	3H	20
Faribault	5N	24
Fillmore	8N	26
Freeborn	6N	32
Goodhue	7L	32
Grant*	2H	10
Hennepin	6K	569
Houston	9N	15
Hubbard	4E	11
Isanti	6J	13
Itasca	6E	33
Jackson	4N	17
Kanabec	6H	10
Kandiyohi	4K	27
Kittson*	1B	11
Koochiching	6C	17
Lac Qui Parle	2K	16
Lake	9D	7
Lake of the Woods*	4B	6
Le Sueur*	4B	19
Lincoln*	2L	11
Lyon	3L	22
McLeod	5K	21
Mahnomen*	3E	8
Marshall	2C	18
Martin	4N	25
Meeker	4K	19
Mille Lacs	6H	16
Morrison	5H	27
Mower	7N	36
Murray	3M	15
Nicollet	5L	18
Nobles	3N	21
Norman	2E	15
Olmsted	7M	43
Otter Tail	3G	53
Pennington	2C	13
Pine	7H	21
Pipestone	2M	14
Polk	2D	38
Pope	3J	14
Ramsey	6K	310
Red Lake	2D	7
Redwood	3L	22
Renville	4K	25
Rice	6L	32
Rock	2N	11
Roseau	3B	15
St. Louis	7D	207
Scott	6L	16
Sherburne	5J	10
Sibley*	5L	17
Stearns	4J	67
Steele	6M	20
Stevens	2J	11
Swift	3J	15
Todd	4H	27
Traverse	1H	8
Wabasha	8L	18
Wadena	4G	13
Waseca	6M	15
Washington	7K	26
Watonwan	4M	11
Wilkin	1G	10
Winona	9M	38
Wright	5K	28
Yellow Medicine	2K	17

TOWNS

Albert Lea	6N	12
Alexandria	3H	5
Anoka	6J	6
Austin	7N	18
Bayport	7K	3
Bemidji	4E	9
Benson	3J	3
Blue Earth	5N	4
Brainerd	5G	12
Breckenridge	1G	3
Cambridge	6J	2
Chaska	6K	2
Chisholm	7E	7
Cloquet	7F	7
Columbia Heights	6K	6
Crookston	2D	7
Crosby	5G	3
Detroit Lakes	3F	5
Duluth	8F	101
E. Grand Forks	1D	4
Edina	6K	6
Ely	8D	6
Eveleth	7D	7
Fairmont	4N	7
Faribault	6L	14
Fergus Falls	2G	11
Gilbert	7E	3
Glencoe	5K	2
Glenwood	3J	3
Grand Rapids	6E	5
Hastings	7L	6
Hibbing	7E	16
Hopkins	6K	4
Hutchinson	5K	4
International Falls	6B	6
Jackson	4N	3
Keewatin	6E	2
Lake City	8L	3
Le Sueur Center	5L	1
Litchfield	4K	4
Little Falls	5H	6
Long Prairie	4H	2
Luverne	2N	3
Madison	2K	2
Mankato	5M	16
Marshall	3L	5
Melrose	4J	2
Minneapolis	6K	492
Montevideo	3K	5
Moorhead	1F	9
Morris	2J	3
Nashwauk	6E	2
New Ulm	5M	9
Northfield	6L	5
North Mankato	5M	4
N. St. Paul	6K	3
Ortonville	1J	2
Owatonna	6M	9
Park Rapids	4F	3
Pipestone	2M	5
Proctor	8F	2
Red Wing	7L	10
Redwood Falls	3L	3
Robbinsdale	6K	6
Rochester	7M	26
St. Cloud	5J	24
St. James	4M	3
St. Louis Park	6K	8
St. Paul	6K	288
St. Peter	5L	6
Sauk Centre	4J	3
Sauk Rapids	5J	3
Shakopee	6L	2
Sleepy Eye	4L	3
S. St. Paul	6K	12
Springfield	4M	2
Staples	4G	3
Stillwater	7K	7
Thief River Falls	2C	6
Tracy	3M	3
Two Harbors	9E	4
Virginia	7D	12
Wabasha	8L	2
Wadena	4G	3
Waseca	6M	4
W. St. Paul	7L	6
White Bear Lake	7K	3
Willmar	4K	8
Windom	3M	3
Winona	9M	22
Worthington	3N	6


MINNESOTA
MADE EXPRESSLY FOR
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0
10
20
30
40
50
NORTHEASTERN MINNESOTA
SAME SCALE AS MAIN MAP
CANADA
LAKE SUPERIOR
NORTH DAKOTA
SOUTH DAKOTA
IOWA
WISCONSIN
Lake of the Woods
Red Lake
Mille Lacs
Leech Lake
Winnibigoshish Lake
Rainy Lake
Lake Pepin
Mississippi R.
KITTSON
ROSEAU
LAKE OF THE WOODS
KOOCHICHING
MARSHALL
PENNINGTON
RED LAKE
BELTRAMI
POLK
CLEAR WATER
NORMAN
MAHNOMEN
ITASCA
ST. LOUIS
LAKE
COOK
HUBBARD
CASS
CLAY
BECKER
WADENA
CROW WING
AITKIN
CARLTON
WILKIN
OTTER TAIL
TODD
MORRISON
MILLE LACS
KANABEC
PINE
GRANT
DOUGLAS
TRAVERSE
STEVENS
POPE
STEARNS
BENTON
SHERBURNE
ISANTI
CHISAGO
BIG STONE
SWIFT
KANDIYOHI
MEEKER
WRIGHT
ANOKA
HENNEPIN
RAMSEY
WASHINGTON
CHIPPEWA
LAC QUI PARLE
YELLOW MEDICINE
RENVILLE
MC LEOD
CARVER
SCOTT
DAKOTA
SIBLEY
LINCOLN
LYON
REDWOOD
NICOLLET
LE SUEUR
RICE
GOODHUE
WABASHA
BROWN
PIPESTONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON
St. Paul
Minneapolis
Duluth
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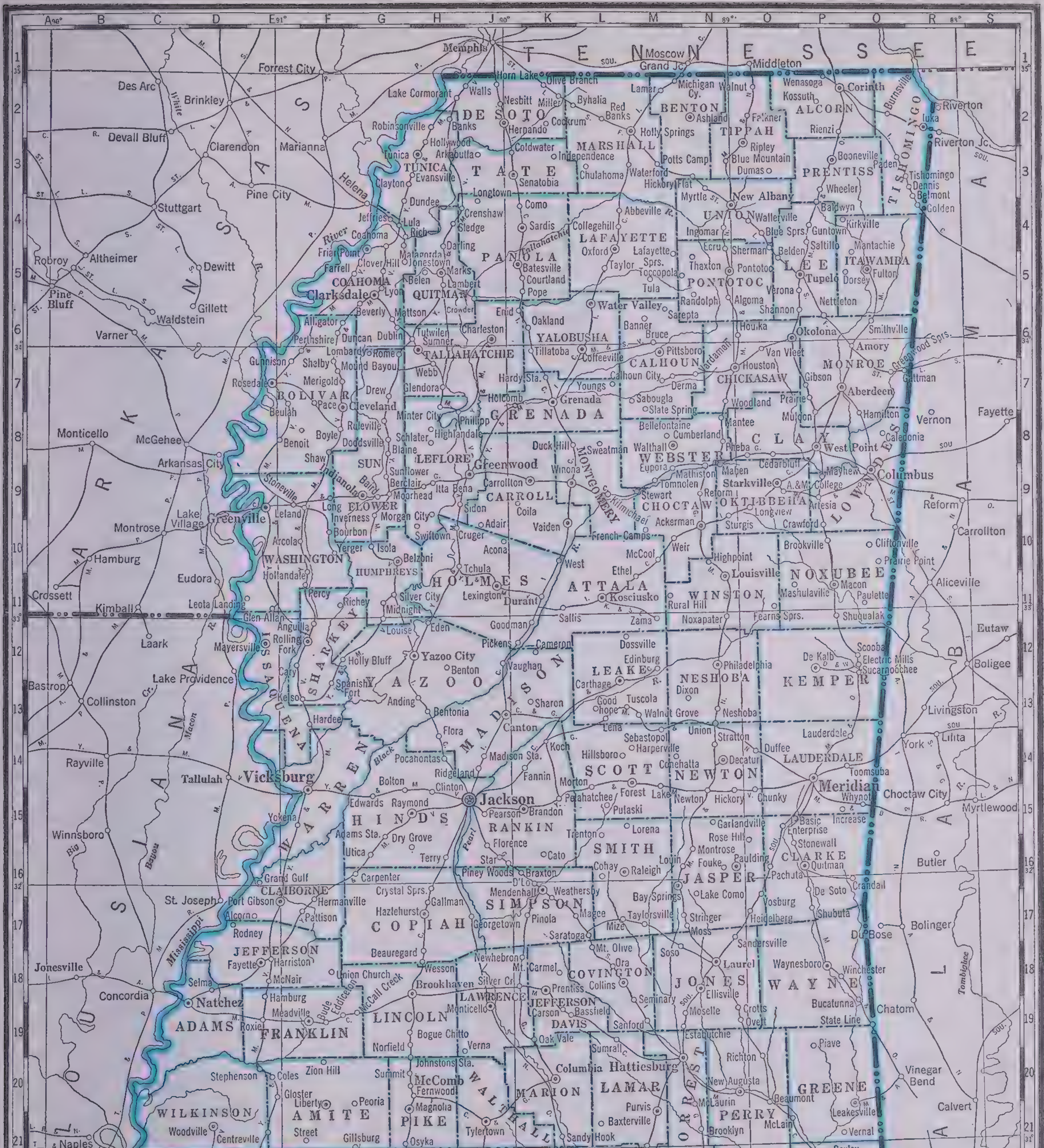
† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX,

*POP. OF COUNTY SEAT BELOW ONE THOUSAND


MISSISSIPPI
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
COUNTY SEAT
STATE CAPITAL
SCALE OF MILES
0 5 10 20 30 40
© J. THOMAS CO. CHICAGO
TENNESSEE
ARKANSAS
LOUISIANA
ALABAMA
GULF OF MEXICO
Lake Pontchartrain
Mississippi River
Jackson
Vicksburg
Meridian
Hattiesburg
Natchez
Gulfport
Biloxi
Memphis
New Orleans
Mobile
Longitude West 90 from Greenwich

MISSISSIPPI

Pop. 2,183,796

COUNTIES

Name	Key	Pop. Thous.
Adams	19C	27
Alcorn	1P	27
Amite*	20F	22
Attala	11L	30
Benton*	2M	10
Bolivar	7E	68
Cathoun*	6M	21
Carroll*	9J	21
Chickasaw	5N	21
Choctaw	9M	14
Claiborne	17E	13
Clarke	16P	21
Clay	8P	19
Coahoma	5G	48
Copiah	17G	34
Covington*	18M	17
De Soto*	2J	27
Forrest	20M	35
Franklin*	19E	13
George	22P	9
Greene*	20P	10
Grenada	8K	19
Hancock	25L	11
Harrison	25N	51
Hinds	15G	107
Holmes	11J	40
Humphreys	10G	26
Issaquena*	12E	6
Itawamba*	5Q	20
Jackson	25P	21
Jasper*	16N	19
Jefferson*	18D	14
Jefferson Davis	18K	16
Jones	18N	49
Kemper*	12P	22
Lafayette	4L	21
Lamar	20M	12
Lauderdale	14P	58
Lawrence*	19J	14
Leake*	13L	25
Lee	5P	39
Leflore	8H	53
Lincoln	18G	28
Lowndes	8Q	35
Madison	13J	38
Marion	20K	24
Marshall	2L	26
Monroe	7P	38
Montgomery	9L	16
Neshoba	12N	28
Newton*	14N	24
Noxubee	11P	26
Oktibbeha	9O	22
Panola	4J	34
Pearl River	22L	19
Perry*	20N	9
Pike	21H	35
Pontotoc	5N	23
Prentiss	3P	21
Quitman	5H	27
Rankin	15J	28
Scott	14L	23
Sharkey	12F	15
Simpson*	16K	22
Smith*	16L	19
Stone	22N	6
Sunflower	9G	61
Tallahatchie	6H	34
Tate	3J	19
Tippah	2N	20
Tishomingo	2R	17
Tunica	3G	23
Union	3N	22
Walthall	21J	18
Warren	15E	40
Washington	10E	68
Wayne	18P	17
Webster*	8M	14
Wilkinson	21C	16
Winston	10N	28
Yalobusha	6K	18
Yazoo	12G	40

TOWNS

Town	Key	Pop.
Aberdeen	**7P**	**5**
Ackerman	**10N**	**2**
Amory	6Q	4
Baldwyn	4P	1
Batesville	**4J**	**2**
Bay St. Louis	**25M**	**4**
Bay Springs	**16N**	**1**
Belzoni	**10G**	**4**
Biloxi	24O	17
Booneville	**3P**	**2**
Brandon	**15K**	**1**
Brookhaven	**18H**	**6**
Calhoun	6M	1
Canton	**13J**	**6**
Carrollton	**9K**	**†5**
Carthage	**13L**	**2**
Centreville	21E	1
Charleston	**6J**	**2**
Clarksdale	**5G**	**12**
Cleveland	**8F**	**4**
Coffeeville	**7L**	**†4**
Collins	**18L**	**1**
Columbia	**20K**	**6**
Columbus	**8Q**	**14**
Corinth	**1P**	**8**
Crystal Springs	16G	3
Decatur	**14N**	**†8**
Dekalb	**12P**	**†8**
Drew	7G	2
Durant	11K	3
Electric Mills	12O	1
Ellisville	**18N**	**3**
Eupora	9M	1
Fayette	**18D**	**†8**
Forest	**14L**	**3**
Friar Point	**4F**	**1**
Fulton	**4Q**	**1**
Gloster	20E	1
Greenville	**9D**	**21**
Greenwood	**9H**	**15**
Grenada	**7K**	**6**
Gulfport	**25N**	**15**
Hattiesburg	**20M**	**21**
Hazelhurst	**17H**	**3**
Hernando	**2J**	**1**
Hollandale	10F	2
Holly Springs	**2L**	**3**
Houston	**7N**	**2**
Indianola	**9F**	**4**
Itta Bena	9H	2
Iuka	**2R**	**2**
Jackson	**15H**	**62**
Kosciusko	**11L**	**4**
Laurel	**18N**	**21**
Leakesville	**20P**	**†8**
Leland	9E	4
Lexington	**11J**	**3**
Liberty	**20F**	**†7**
Long Beach	25N	1
Louisville	**10N**	**3**
Lucedale	**22Q**	**1**
Lumberton	21M	1
McComb	20H	10
Macon	**11P**	**2**
Magnolia	**21H**	**2**
Marks	**5H**	**2**
Mendenhall	**16K**	**1**
Meridian	**14P**	**35**
Monticello	**19J**	**†8**
Moss Point	24Q	3
Natchez	**19C**	**15**
New Albany	**3N**	**4**
New Augusta	**20N**	**†3**
Newton	15N	2
Ocean Springs	25P	2
Okolona	**6O**	**2**
Oxford	**4L**	**3**
Pascagoula	**25O**	**6**
Pass Christian	25N	3
Philadelphia	**12N**	**4**
Picayune	23L	5
Pontotoc	**5N**	**2**
Poplarville	**22L**	**2**
Port Gibson	**17E**	**3**
Prentiss	**18K**	**1**
Purvis	**21M**	**1**
Quitman	**16P**	**1**
Raymond	**15G**	**†6**
Ripley	**2O**	**2**
Rolling Fork	**12F**	**1**
Rosedale	**7E**	**2**
Sardis	**4J**	**2**
Senatobia	**3J**	**2**
Shelby	6F	2
Starkville	**9O**	**5**
Summit	20H	1
Sumner	**6G**	**†6**
Sumrall	19L	†8
Tunica	**2G**	**1**
Tupelo	**5P**	**8**
Tylertown	**21J**	**1**
Union	11N	2
Vaiden	**10K**	**†6**
Vicksburg	**14E**	**24**
Water Valley	**5L**	**3**
Waynesboro	**18P**	**1**
West Point	**8P**	**6**
Wiggins	**22N**	**1**
Winona	**9K**	**3**
Woodville	**21C**	**1**
Yazoo City	**12G**	**7**

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

MISSOURI

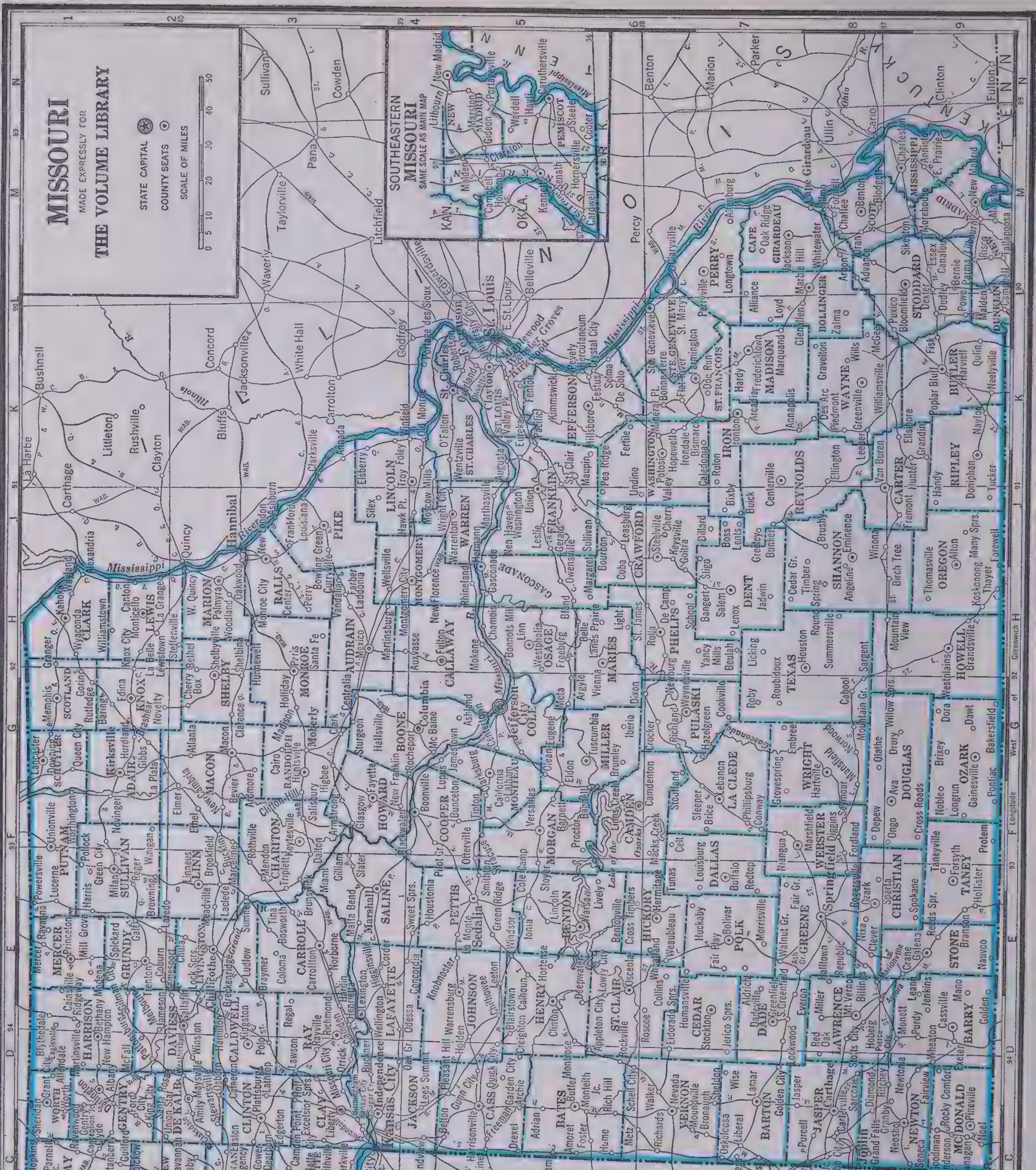
Pop. 3,784,664

COUNTIES

Name	Key	Pop. Thous.
Adair	2G	20
Andrew	2C	13
Atchison	1B	13
Audrain	4H	23
Barry	9D	24
Barton	7C	14
Bates	6C	20
Benton	5E	11
Bollinger*	7L	13
Boone	4G	35
Buchanan	3C	94
Butler	9K	34
Caldwell*	3D	12
Callaway	4H	23
Camden*	6F	9
Cape Girardeau	7M	38
Carroll	3E	18
Carter*	8J	6
Cass	5C	20
Cedar*	7D	12
Chariton*	3F	18
Christian*	8E	14
Clark	1H	10
Clay	3C	30
Clinton	3C	13
Cole	5G	35
Cooper	4F	18
Crawford	6J	13
Dade	7D	11
Dallas*	7F	12
Daviess	2D	13
De Kalb*	2D	10
Dent	7H	12
Douglas	8F	16
Dunklin	9L & 5M	45
Franklin	5J	34
Gasconade	5H	12
Gentry	2D	13
Greene	8E	91
Grundy	2E	16
Harrison	1D	17
Henry	5D	22
Hickory*	6E	7
Holt*	2B	12
Howard	4F	13
Howell	9H	22
Iron*	7K	10
Jackson	4C	478
Jasper	8C	79
Jefferson*	5K	32
Johnson	5D	22
Knox	2G	9
Laclede	7F	19
Lafayette	4E	28
Lawrence	8D	25
Lewis*	2H	11
Lincoln	4J	14
Linn*	2F	21
Livingston	2E	18
McDonald*	9C	16
Macon	2G	21
Madison	7K	10
Maries*	6H	9
Marion	2H	32
Mercer	1E	9
Miller*	6G	15
Mississippi	8M	23
Moniteau	5G	12
Monroe	3H	13
Montgomery	4H	12
Morgan	5F	11
New Madrid	9M & 4N	40
Newton	9C	29
Nodaway	1C	26
Oregon*	9J	13
Osage*	5H	12
Ozark*	9G	11
Pemiscot	5N	47
Perry	7L	15
Pettis	5E	33
Phelps	6H	17
Pike	3J	18
Platte*	3C	14
Polk	7E	17
Pulaski*	6G	11
Putman	1F	11
Ralls*	3H	10
Randolph	3G	24
Ray	4D	19
Reynolds*	7J	9
Ripley	9J	13
St. Charles	4K	26
St. Clair	6D	13
Ste. Genevieve	6L	10
St. Francois	6K	36
St. Louis	5K	274
St. Louis City	5L	816
Saline	4E	29
Schuyler*	1G	7
Scotland	1G	9
Scott*	8M	30
Shannon*	8H	12
Shelby*	2G	11
Stoddard	8L	33
Stone*	9E	11
Sullivan	2F	11
Taney*	9F	10
Texas*	7H	20
Vernon	6C	26
Warren	4J	8
Washington	6K	17
Wayne*	8K	13
Webster	7F	17
Worth	1C	6
Wright*	8G	18

TOWNS

Name	Key	Pop.
Albany	**1D**	**2**
Aurora	8D	4
Bethany	**1D**	**3**
Bolivar	**7E**	**3**
Bonne Terre	6K	4
Boonville	**4F**	**6**
Brentwood	5K	4
Brookfield	2F	6
Butler	**6C**	**3**
California	**5G**	**3**
Cameron	3D	4
Cape Girardeau	7M	19
Carrollton	**3E**	**4**
Carthage	**8C**	**11**
Caruthersville	**5N**	**7**
Chaffee	8M	3
Charleston	**8M**	**5**
Chillicothe	**2E**	**8**
Clayton	**5K**	**13**
Clinton	**5D**	**6**
Columbia	**4G**	**18**
Crystal City	5K	3
De Soto	6K	5
Eldon	5G	3
Excelsior Springs	3D	5
Farmington	**6K**	**4**
Fayette	**4F**	**3**
Ferguson	4L	6
Festus	6K	5
Flat River	6K	5
Fredericktown	**7K**	**3**
Fulton	**4H**	**8**
Hannibal	2J	21
Hermann	**5H**	**2**
Higginsville	4E	3
Independence	**4C**	**16**
Jackson	**7M**	**3**
Jefferson City	**5G**	**24**
Joplin	8C	37
Kansas City	4C	399
Kennett	5M	6
Kirksville	**2G**	**10**
Kirkwood	5K	12
Lamar	**7C**	**3**
Lebanon	**7F**	**5**
Lexington	**4D**	**5**
Liberty	**3C**	**4**
Louisiana	3J	4
Macon	**3G**	**4**
Maplewood	5L	13
Marceline	2F	3
Marshall	**4F**	**9**
Maryville	**1C**	**6**
Mexico	**4H**	**9**
Milan	**2F**	**2**
Moberly	3G	13
Monett	8D	4
Neosho	**9D**	**5**
Novada	**6C**	**8**
Perryville	**7L**	**4**
Poplar Bluff	**9K**	**11**
Rich Hill	6C	2
Richmond	**4D**	**5**
Richmond Hts.	5K	13
Rolla	**6H**	**3**
St. Charles	**4K**	**11**
Ste. Genevieve	**6L**	**3**
St. Joseph	**2C**	**76**
St. Louis	**5L**	**816**
Salem	**7H**	**3**
Sedalia	**5E**	**20**
Sikeston	8M	8
Slater	4M	3
Springfield	**8E**	**61**
Trenton	**2E**	**7**
Union	**5J**	**2**
University City	5K	33
Warrensburg	**5E**	**6**
Washington	5J	7
Webb City	8C	7
Webster Groves	5K	18
West Plains	**9H**	**4**



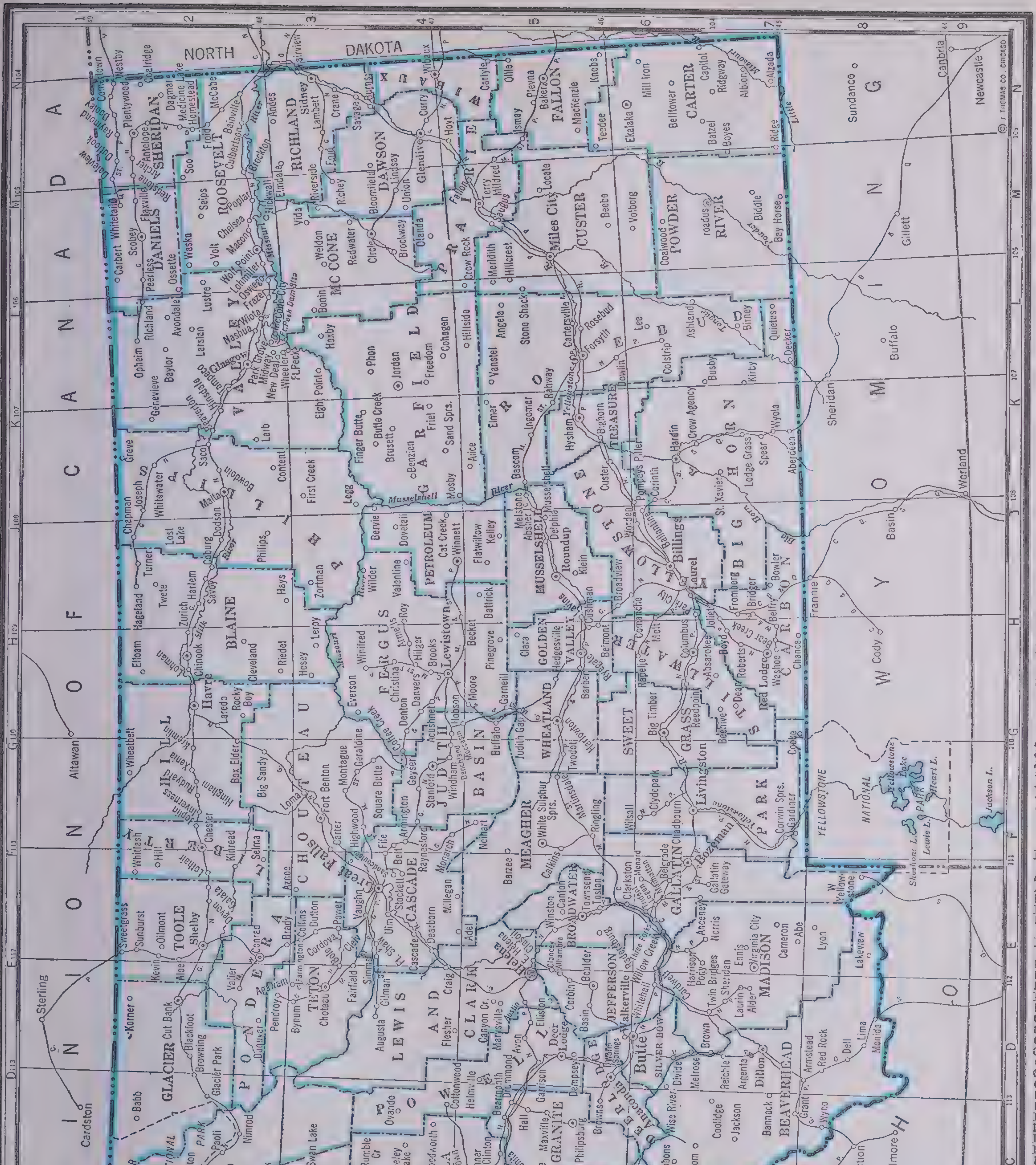
† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

MONTANA

Pop. 559,456


MONTANA
MADE EXPRESSLY FOR
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 10 20 30 40 50 60
DOMINION OF CANADA
NORTH DAKOTA
WYOMING
IDAHO
YELLOWSTONE NATIONAL PARK
GLACIER NATIONAL PARK
LINCOLN
FLATHEAD
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
DANIELS
SHERIDAN
ROOSEVELT
RICHLAND
MC CONE
DAWSON
WIBAUX
PRAIRIE
GARFIELD
PETROLEUM
FERGUS
CHOUTEAU
PONDERA
TETON
LAKE
SANDERS
MINERAL
MISSOULA
POWELL
LEWIS AND CLARK
CASCADE
JUDITH BASIN
MEAGHER
WHEATLAND
GOLDEN VALLEY
MUSSELSHELL
ROSEBUD
CUSTER
FALLON
CARTER
POWDER RIVER
BIG HORN
TREASURE
YELLOWSTONE
STILLWATER
CARBON
SWEET GRASS
PARK
GALLATIN
BROADWATER
JEFFERSON
SILVER BOW
DEER LODGE
GRANITE
RAVALLI
BEAVERHEAD
MADISON
Helena
Butte
Great Falls
Billings
Missoula
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COUNTIES

Name	Key	Pop. Thous.
Beaverhead	7D	7
Big Horn	7J	10
Blaine	2H	10
Broadwater	5E	3
Carbon	7H	12
Carter*	6N	3
Cascade	4F	42
Chouteau	3G	7
Custer	5M	10
Daniels	1M	5
Dawson	4M	9
Deer Lodge	6D	14
Fallon	5N	4
Fergus	4H	14
Flathead	2C	24
Gallatin	6F	18
Garfield*	4K	3
Glacier*	2D	9
Golden Valley*	5H	2
Granite	5C	4
Hill	2G	13
Jefferson*	6E	5
Judith Basin*	4G	4
Lake	3C	13
Lewis and Clark	4E	22
Liberty*	2F	2
Lincoln	2A	8
McCone*	3M	4
Madison*	7E	7
Meagher*	5F	2
Mineral*	4B	2
Missoula	4C	29
Musselshell	5H	6
Park	7F	12
Petroleum*	4J	1
Phillips	2J	8
Pondera	2E	7
Powder River*	7M	3
Powell	5D	6
Prairie*	4M	2
Ravalli	6B	13
Richland	3N	10
Roosevelt	2M	10
Rosebud	5L	6
Sanders*	3B	7
Sheridan	1N	8
Silver Bow	6D	53
Stillwater*	6H	6
Sweet Grass	6G	4
Teton*	3E	7
Toole	2E	7
Treasure*	5K	1
Valley	2K	15
Wheatland	5G	3
Wibaux*	4N	2
Yellowstone	6J	41

TOWNS

Name	Key	Pop. Thous.
Anaconda	6D	11
Argenta	7D	†1
Baker	5N	1
Belt	4F	†7
Big Timber	6G	2
Billings	6J	23
Black Eagle	4F	1
Boulder	6E	†9
Bozeman	6F	9
Broadus	7M	†2
Browning	2D	2
Butte	6D	37
Chester	2F	†5
Chinook	2H	2
Chouteau	3E	1
Circle	4M	†5
Columbus	6H	1
Conrad	2E	1
Cut Bank	2E	3
Deer Lodge	5D	3
Dillon	7D	3
E. Helena	5E	1
Ekalaka	6N	†7
Ennis	7E	†4
Eureka	1B	1
Forsyth	5K	2
Fort Benton	3F	1
Glasgow	2K	4
Glendive	4M	5
Great Falls	4F	30
Hamilton	6C	2
Hardin	6J	2
Harlem	2H	1
Harlowton	5G	1
Havre	2G	6
Helena	5E	15
Hysham	5K	†4
Jordan	4K	†5
Kalispell	2C	8
Klein	5J	1
Laurel	6H	3
Lewistown	4H	8
Libby	2A	2
Livingston	6F	7
Malta	2J	2
Miles City	5L	7
Missoula	5C	18
Philipsburg	5D	1
Plentywood	1N	2
Polson	3C	2
Poplar	2M	1
Red Lodge	7H	3
Ronan	4C	1
Roundup	5H	3
Ryegate	5H	†3
Sandcoulee	4F	†5
Scobey	1M	1
Shelby	2E	3
Sidney	3N	3
Stanford	4G	†5
Stockett	4F	†5
Superior	4B	†3
Terry	4M	1
Thompson Falls	4A	†7
Three Forks	6E	1
Townsend	6E	1
Virginia City	7E	†4
Walkerville	6D	2
Whitefish	2C	3
White Sulphur Springs	5F	†9
Wibaux	4N	†6
Winnett	4J	†4
Wolf Point	2L	2

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

NEBRASKA

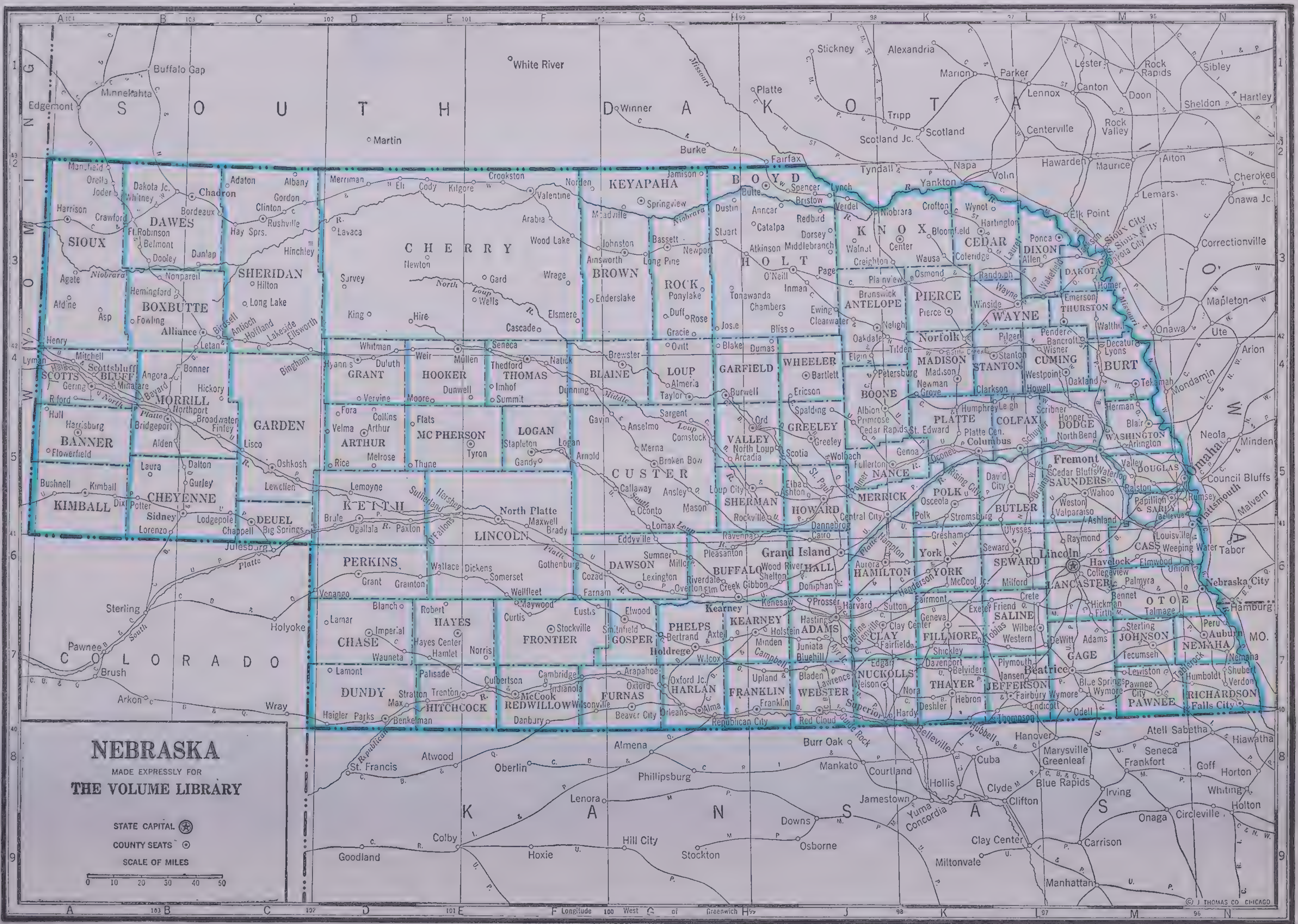
Pop. 1,315,834

COUNTIES

Name	Key	Pop. Thous.
Adams	7J	25
Antelope	3J	13
Arthur*	5D	1
Banner*	5A	1
Blaine*	4G	2
Boone	4J	12
Box Butte	3B	11
Boyd*	2H	6
Brown	3G	6
Buffalo	6H	24
Burt	4M	13
Butler	5L	13
Cass	6M	17
Cedar	3K	15
Chase*	7D	5
Cherry	3E	10
Cheyenne	5B	10
Clay*	7J	10
Colfax	5L	11
Cuming	4L	14
Custer	5G	23
Dakota*	3M	10
Dawes	2B	10
Dawson	6G	18
Deuel	5C	4
Dixon*	3L	10
Dodge	5L	24
Douglas	5M	248
Dundy	7D	5
Fillmore	7K	11
Franklin	7H	8
Frontier*	7F	6
Furnas	7G	10
Gage	7L	30
Garden*	5C	5
Garfield	4H	3
Gosper*	7G	4
Grant*	4D	1
Greeley*	5J	7
Hall	6J	28
Hamilton	6J	10
Harlan	7G	7
Hayes*	7E	3
Hitchcock*	7E	6
Holt	3H	17
Hooker*	4E	1
Howard	5J	8
Jefferson	7L	16
Johnson	7M	9
Kearney	7H	7
Keith	5D	8
Keyapaha*	2G	3
Kimball	5A	4
Knox*	2K	16
Lancaster	6L	101
Lincoln	5F	25
Logan*	5F	2
Loup*	4G	2
McPherson*	5E	1
Madison	4K	24
Merrick	5J	9
Morrill	4B	9
Nance	5K	8
Nemaha	7N	13
Nuckolls*	7J	10
Otoe	6M	19
Pawnee	7M	9
Perkins*	6D	5
Phelps	7G	8
Pierce	3K	10
Platte	5K	20
Polk	5K	9
Redwillow	7F	12
Richardson	7N	19
Rock*	3G	4
Saline	7L	15
Sarpy*	5M	11
Saunders	5L	18
Scotts Bluff	1A	34
Seward	6L	14
Sheridan	3C	10
Sherman	5H	8
Sioux*	3A	4
Stanton	4L	7
Thayer	7K	12
Thomas*	4F	2
Thurston	3M	10
Valley	5H	8
Washington	5M	12
Wayne	3L	8
Webster	7J	10
Wheeler*	4J	2
York	6K	15

TOWNS

Name	Key	Pop. Thous.
Ainsworth	3G	2
Albion	4J	2
Alliance	4B	6
Alma	7H	1
Arapahoe	7G	1
Ashland	5M	2
Atkinson	3H	1
Auburn	7N	4
Aurora	6J	2
Bayard	4B	2
Beatrice	7L	11
Beaver City	7G	1
Bellevue	5M	1
Benkelman	7D	1
Blair	5M	3
Bloomfield	2K	1
Bridgeport	5B	2
Broken Bow	5G	3
Burwell	4H	1
Cambridge	7F	1
Central City	5J	2
Chadron	2B	4
Chappell	5C	1
Collegeview	6L	2
Columbus	5K	8
Cozad	6G	2
Crawford	2B	2
Creighton	3K	1
Crete	6L	3
David City	5L	2
Deshler	7K	1
Elwood	7G	†5
Fairbury	7L	6
Falls City	7N	6
Franklin	7H	1
Fremont	5M	12
Friend	6L	1
Fullerton	5K	2
Geneva	7K	2
Genoa	5K	1
Gering	4A	3
Gordon	2C	2
Gothenburg	6F	2
Grand Island	6J	19
Grant	6D	1
Greeley G.	5J	1
Hartington	2L	2
Hastings	7J	15
Havelock	6L	3
Hebron	7K	2
Hemingford	3B	†8
Holdrege	7G	3
Humboldt	7N	1
Imperial	7D	1
Kearney	6H	10
Kimball	5A	2
Lexington	6G	4
Lincoln	6L	82
Loup City	5H	2
McCook	7F	6
Madison	4K	2
Minatare	1A	1
Minden	7H	2
Mitchell	4A	2
Nebraska City	6N	7
Neligh	3J	2
Norfolk	4K	10
North Bend	5L	1
North Platte	5F	12
Oakland	4M	1
Ogallala	5D	3
Omaha	5N	224
O'Neill	3J	3
Ord	5H	2
Osceola	5K	1
Oxford	7G	1
Pawnee City	7M	2
Pender	3L	1
Pierce	3K	1
Plainview	3K	1
Plattsmouth	6N	4
Randolph	3K	1
Ravenna	6H	1
Red Cloud	7J	2
Rushville	3C	1
St. Edward	4K	1
St. Paul	5J	2
Schuyler	5L	3
Scottsbluff	4A	12
Scribner	4L	1
Seward	6L	3
Sidney	5B	3
South Sioux City	3M	5
Stanton	4L	2
Stromsburg	5K	1
Superior	7J	3
Sutton	6K	1
Tecumseh	7M	2
Tekaham	4M	2
Tilden	4K	1
Trenton	7E	†9
Tryon	5E	†1
Valentine	2F	2
Valley	5M	1
Wahoo	5M	3
Wakefield	3L	1
Walthill	3M	1
Wayne	3L	3
Weeping Water	6M	1
Westpoint	4L	3
Wilber	7L	1
Wisner	4L	1
Wymore	7L	2
York	6K	5



NEBRASKA

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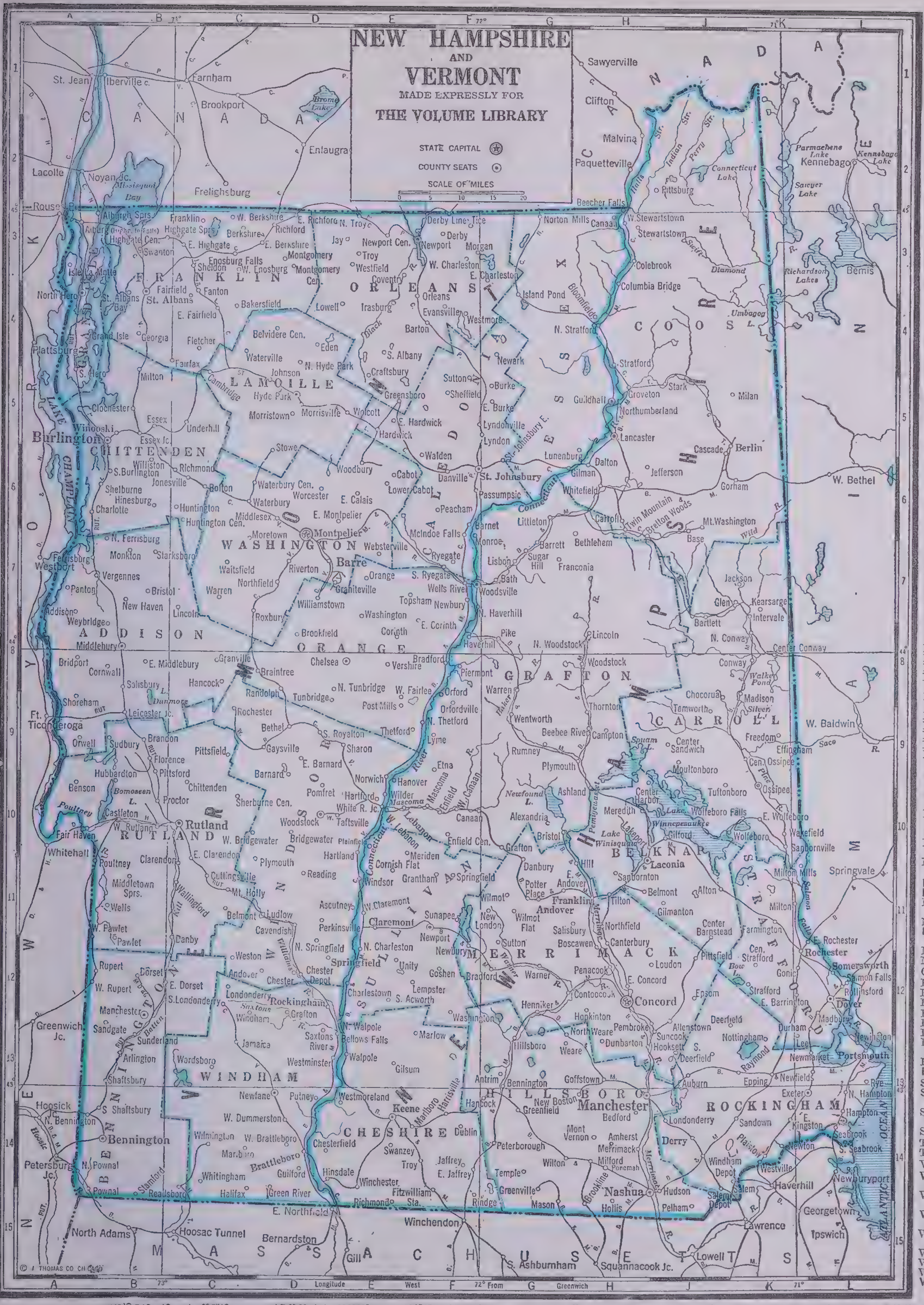
COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND


NEW HAMPSHIRE
AND
VERMONT
MADE EXPRESSLY FOR
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 15 20
CANADA
NEW YORK
MASSACHUSETTS
MAINE
ATLANTIC OCEAN
LAKE CHAMPLAIN
FRANKLIN
ORLEANS
ESSEX
COOS
LAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
ADDISON
ORANGE
GRAFTON
CARROLL
RUTLAND
WINDSOR
SULLIVAN
BELKNAP
STRAFFORD
MERRIMACK
BENNINGTON
WINDHAM
CHESHIRE
HILLSBORO
ROCKINGHAM
Montpelier
Concord
Burlington
Manchester
Nashua
Longitude West 72° From Greenwich
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VERMONT

Pop. 359,231

COUNTIES

Pop. Thous.
Addison 8B...18
Bennington 13B 22
Caledonia 5F..24
Chittenden 5B 52
Essex* 1G 6
Franklin 3B..30
Grand Isle* 4A 4
Lamoille* 5D.11
Orange 8E....17
Orleans 3E....22
Rutland 10B..46
Washington 7D 42
Windham* 13C 28
Windsor 10D..38

TOWNS

Town Key Pop.
Barnet 6F......2
Barre 7D.....11
Barton 4E.....1
Bellows Falls 13E 4
Bennington 14B 8
Bethel 9D......1
Bradford 3C....1
Brandon 9B....3
Brattleboro 14D 10
Bristol 7B.....1
Burke 5F......1
Burlington 5A 28
Castleton 10B..2
Cavendish 11D.1
Chelsea 8D.....1
Corinth 8E....†8
Craftsbury 5E..1
Danville 6F....1
Derby 3F......2
Dorset 12B.....1
East Montpelier 6D 1
Enosburg Falls 3C 1
Essex Jc. 5B...2
Fair Haven 10A 2
Graniteville 7D 1
Guildahll 5H..†3
Hardwick 5E...2
Hartford 10E...5
Hartland 10E...1
Highgate 3E...2
Hyde Park 5D.†3
Island Pond 4G 2
Lowell 4D.....1
Ludlow 11D....2
Lunenburg 6G..1
Lyndon 5F.....1
Lyndonville 5F 1
Manchester 12B ....†3
Middlebury 8B 2
Montgomery Center 3D....1
Montpelier 7D..8
Morristown 5D 3
Morrisville 5D 2
Newfane 13D..†2
Newport 3E....5
North Bennington 14A......1
Northfield 7C...2
North Hero 4A ....†4
North Troy 3E.1
Norwich 10E...1
Orleans 4E.....1
Pawlet 12B....1
Poultney 11B...1
Proctor 10B....5
Randolph 8D...3
Richford 3D...2
Rochester 9C...1
Rockingham 12D 5
Royalton 9D...1
Rutland 10C..17
St. Albans 4B.8
St. Johnsbury 6F 7
Springfield 12E 5
Swanton 3B....1
Thetford 9E....1
Troy 3E.......1
Vergennes 7B...2
Waterbury 6C 3
West Rutland 10B 3
White River Jc. 10E 2
Williamstown 7D 1
Windsor 11E...3
Winooski 5A...6
Wolcott 5D.....1
Woodstock 10D 1

NEW HAMPSHIRE

Pop. 491,524

COUNTIES

Pop. Thous.
Belknap 10H..24
Carroll 9J.....16
Cheshire 11E..35
Coos 4J.. 39
Grafton 8G...45
Hillsboro 14G 145
Merrimack 12G 61
Rockingham 13K 58
Strafford 11K.41
Sullivan 12F..25

TOWNS

Town Key Pop.
Andover 11G...1
Berlin 5J 19
Boscawen 12H..2
Bristol 10G....2
Campton 9H...1
Canaan 10F....1
Charlestown 12E 2
Claremont 11E.12
Colebrook 3H...2
Concord 12H..27
Contoocook 12G 1
Conway 8K....4
Derry 14J......5
Dover 12L....15
Exeter 13K....5
Farmington 11K 3
Franklin 11H..7
Goffstown 13H.4
Gonic 12K.....2
Gorham 6J.....3
Greenville 14G 1
Groveton 5H...2
Hampton 13L...2
Hanover 10E...3
Haverhill 8F...3
Henniker 12G..1
Hillsboro 13G..2
Hinsdale 14D..2
Hooksett 13H...2
Hopkinton 12H.2
Hudson 14J.....3
Jaffrey 14F....3
Keene 14E....14
Laconia 10H...13
Lancaster 5H 3
Lebanon 10E...8
Lincoln 8H....2
Lisbon 7G......2
Littleton 6G...5
Manchester 13H ...... .78
Marlboro 14E..1
Meredith 10H..2
Merrimack 14H.1
Milford 14H...4
Milton 11K.....1
Nashua 14H...33
Newmarket 13K.3
Newport 11F...5
Northumberland 5H 3
Ossipee 9K.....1
Pembroke 12H..3
Penacook 12H..2
Peterboro 14G..2
Plainfield 10E..2
Ponemah 14H..3
Portsmouth 13L 14
Rochester 12L.12
Salem 14J.....3
Somersworth 12L 6
Suncook 13H...3
Walpole 13E...2
Weare 13G.....1
Whitefield 6H..2
Wilton 14G...2
Winchester 14E.2
Wolfeboro 10K..3
Woodsville 7F..2

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

NEW JERSEY

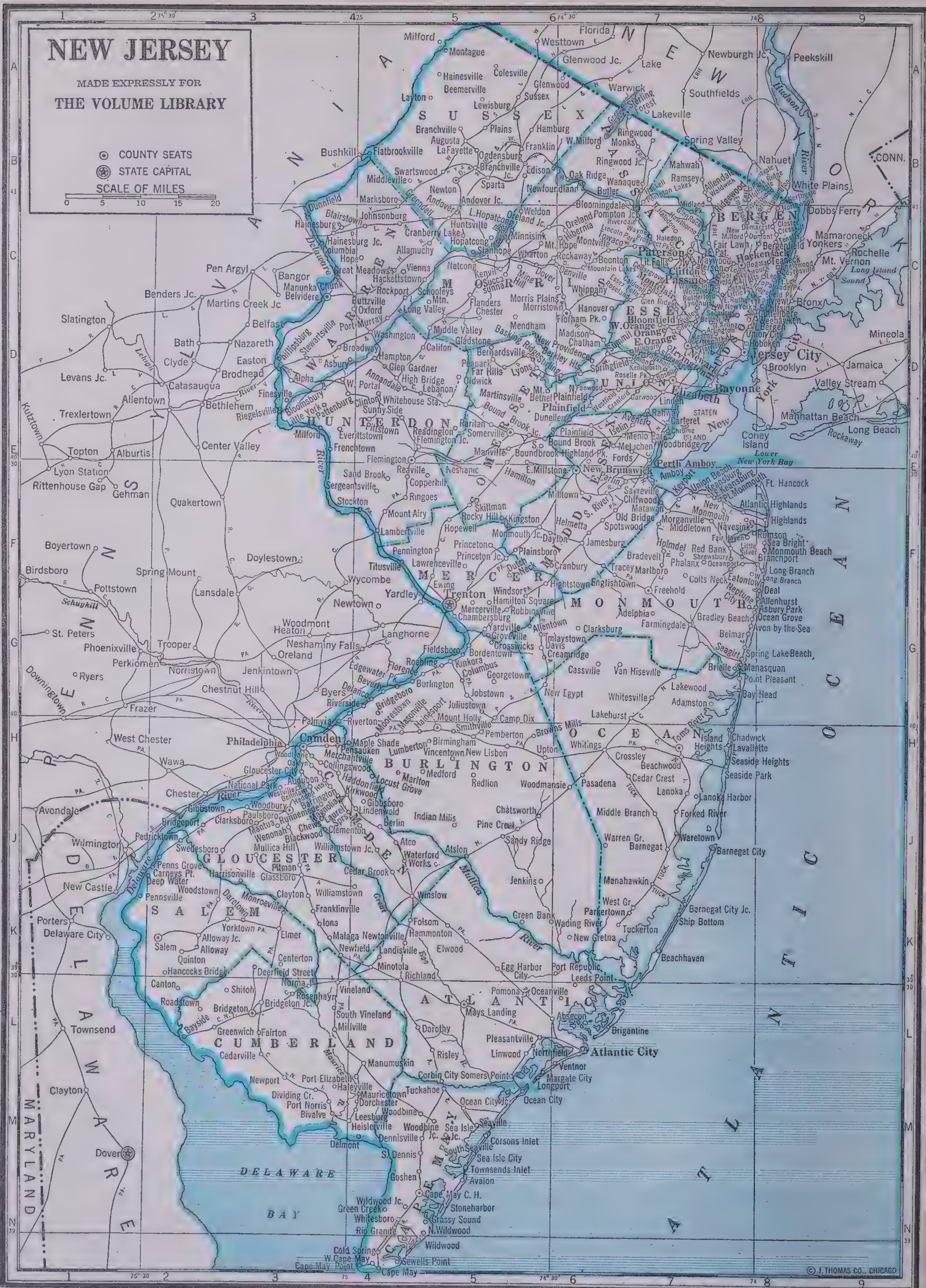
Pop. 4,160,165

COUNTIES

Name	Key	Pop. Thous.
Atlantic	5L	124
Bergen	8C	410
Burlington	5H	97
Camden	4J	256
Cape May	5N	29
Cumberland	3L	73
Essex	7D	837
Gloucester	3J	72
Hudson	8D	652
Hunterdon	5E	37
Mercer	5F	197
Middlesex	7E	217
Monmouth	7F	161
Morris	6C	126
Ocean	7H	38
Passaic	7B	309
Salem	2K	42
Somerset	6E	74
Sussex	5B	30
Union	7D	328
Warren	4C	50

TOWNS

Name	Key	Pop. Thous.
Asbury Park	8G	15
Atlantic City	6L	64
Audubon	4H	9
Bayonne	7D	78
Belleville	7C	28
Belmar	8G	3
Bergenfield	8C	10
Bernardsville	6D	3
Bloomfield	7C	42
Bogota	8C	7
Boonton	7C	7
Bordentown	5G	4
Bound Brook	6E	8
Bradley Beach	8G	3
Bridgeton	**3L**	**16**
Burlington	4G	11
Butler	6C	3
Caldwell	7C	5
Camden	**3H**	**118**
Carlstadt	8C	6
Carteret	6E	12
Cedargrove	7D	4
Chatham	6D	4
Cliffside	8C	17
Clifton	7C	49
Collingswood	3H	13
Cranford	7D	13
Dover	6C	10
Dumont	8C	8
Dunellen	6D	5
E. Orange	7D	69
E. Paterson	8C	5
East Rutherford	8C	7
Edgewater	8C	4
Egg Harbor City	5K	4
Elizabeth	**7D**	**110**
Englewood	8C	19
Fair Lawn	8C	9
Fairview	8C	9
Fort Lee	8C	9
Franklin	6B	4
Freehold	**7F**	**7**
Garfield	7C	28
Garwood	7D	4
Glassboro	3J	5
Glen Ridge	7C	7
Glen Rock	8C	5
Gloucester City	3H	14
Guttenberg	8D	6
Hackensack	**8C**	**26**
Hackettstown	5C	3
Haddonfield	4H	10
Haddon Heights	4H	6
Haledon	7C	5
Hammonton	5K	8
Harrison	7D	14
Hasbrouck Heights	8C	7
Hawthorne	7C	13
Highland Park	6E	9
Hightstown	6F	3
Hoboken	8D	50
Irvington	7D	55
Jersey City	**8D**	**301**
Kearny	7C	39
Keyport	7E	5
Lakewood	7G	5
Lambertville	4F	4
Leonia	8C	6
Linden	7D	24
Little Falls	7C	4
Little Ferry	8C	5
Livingston	7C	3
Lodi	8C	12
Long Branch	8F	17
Madison	6D	8
Manville	6E	6
Maywood	8C	4
Merchantville	4H	4
Metuchen	7E	6
Middlesex	6E	4
Midland Park	8C	5
Milburn	7D	11
Milltown	6E	4
Millville	3L	14
Montclair	7C	40
Moorestown	5H	3
Morristown	**6C**	**15**
Mt. Holly	**5H**	**6**
Newark	**7D**	**430**
New Brunswick	**6E**	**33**
Newton	**5B**	**6**
N. Arlington	8C	10
N. Plainfield	6D	11
Nutley	7C	22
Oaklyn	4H	4
Ocean City	5M	5
Orange	7C	36
Oxford	4C	3
Palisades Park	8C	8
Palmyra	4H	5
Passaic	8C	61
Paterson	**7C**	**140**
Paulsboro	3J	7
Penns Grove	3J	6
Perth Amboy	7E	41
Phillipsburg	3D	18
Pitman	3J	5
Plainfield	6D	37
Pleasantville	6L	11
Pompton Lakes	7B	3
Princeton	5F	8
Prospect Park	7C	6
Rahway	7D	17
Ramsey	8C	4
Raritan	6E	5
Red Bank	8F	11
Ridgefield	8C	5
Ridgefield Park	8C	11
Ridgewood	7C	15
Rockaway	6C	4
Roselle	7D	14
Roselle Park	7D	10
Rutherford	8C	15
Salem	**2K**	**9**
Sayreville	7E	8
Scotch Plains	7D	4
Secaucus	8C	10
Somerville	**6E**	**9**
S. Amboy	7E	8
S. Orange	7D	14
S. Plainfield	6E	5
S. River	7E	11
Springfield	7D	3
Summit	6D	16
Tenafly	8C	7
Toms River	**7H**	**3**
Totowa	7C	5
Trenton	**5G**	**125**
Union	7D	24
Union City	8C	56
Vauxhall	7D	3
Ventnor	6L	8
Verona	7C	9
Vineland	4L	8
Wallington	8C	9
Wanaque	7B	3
Washington	4D	5
Westfield	7D	18
W. New York	8D	39
W. Orange	7D	26
W. Paterson	7C	3
Westville	3J	4
Westwood	8C	5
Wharton	6C	3
Wildwood	5N	5
Woodbridge	7E	27
Woodbury	**3J**	**8**
Wood Ridge	8C	6



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

NEW MEXICO
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 10 20 30 40 50
COLORADO
UTAH
ARIZONA
OKLAHOMA
TEXAS
MEXICO
SAN JUAN
RIO ARRIBA
TAOS
COLFAX
UNION
MC KINLEY
SANDOVAL
SANTA FE
MORA
HARDING
SAN MIGUEL
QUAY
GUADALUPE
BERNALILLO
VALENCIA
TORRANCE
CURRY
DE BACA
ROOSEVELT
CATRON
SOCORRO
LINCOLN
CHAVES
SIERRA
GRANT
LEA
OTERO
EDDY
DONA ANA
LUNA
HIDALGO
Santa Fe
Albuquerque
Elephant Butte Reservoir
CHACO CANYON NATIONAL MONUMENT
MESCALERO APACHE INDIAN RESERVATION
CARLSBAD CAVE NAT. PARK
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NEW MEXICO

Pop. 531,818

COUNTIES

Name	Key	Pop. Thous.
Bernalillo	4F	69
Catron*	2J	5
Chaves	7J	24
Colfax	7D	19
Curry	9G	18
De Baca*	7H	4
Dona Ana	4L	30
Eddy	7L	24
Grant	2L	20
Guadalupe	7G	7
Harding*	8E	4
Hidalgo	1M	5
Lea*	9K	21
Lincoln	6J	9
Luna	3M	6
McKinley	2E	24
Mora*	6E	11
Otero	5L	11
Quay	8F	12
Rio Arriba	4D	25
Roosevelt	9H	15
Sandoval*	4E	14
San Juan*	2D	17
San Miguel	6F	28
Santa Fe	5E	31
Sierra*	3K	7
Socorro	4H	11
Taos	5D	19
Torrance*	5G	11
Union	9D	9
Valencia*	2G	20

TOWNS

Name	Key	Pop. Thous.
Alamogordo	**5L**	**4**
Albuquerque	**4F**	**35**
Artesia	7K	4
Aztec	**2C**	**†8**
Belen	4G	3
Bernalillo	**4F**	**2**
Carlsbad	**8L**	**7**
Carrizozo	**5J**	**1**
Central	2L	†7
Clayton	**9D**	**3**
Clovis	**9H**	**10**
Dawson	7C	2
Deming	**3L**	**4**
El Rito	5D	†5
Estancia	**5G**	**†6**
Eunice	9L	1
Farmington	2C	2
Fort Sumner	**7H**	**2**
Gallup	**1F**	**7**
Hillsboro	**3L**	**†3**
Hobbs	9L	11
Hot Springs	3K	3
Hurley	2L	2
Las Cruces	**4L**	**8**
Las Vegas	**6F**	**6**
Lordsburg	**1L**	**3**
Los Lunas	**4G**	**†7**
Lovington	**9K**	**2**
Magdalena	3H	1
Malaga	8M	†7
Mora	**6E**	**1**
Mosquero	**8E**	**†7**
Mountainair	5G	1
Park View	4D	†5
Portales	**9H**	**5**
Raton	**7C**	**8**
Reserve	**1J**	**†2**
Roswell	**7J**	**13**
Roy	7E	1
San Marcial	4J	†4
Santa Fe	**5E**	**20**
Santa Rita	2L	1
Santa Rosa	**7G**	**2**
Sierra Amarilla	**4D**	**†5**
Silver City	**2L**	**5**
Springer	7G	1
Socorro	**4H**	**4**
Taos	**6D**	**†5**
Tucumcari	**8F**	**6**
Tularosa	5K	1
Vaughn	6G	1
Wagon Mound	7E	1

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

NEW YORK

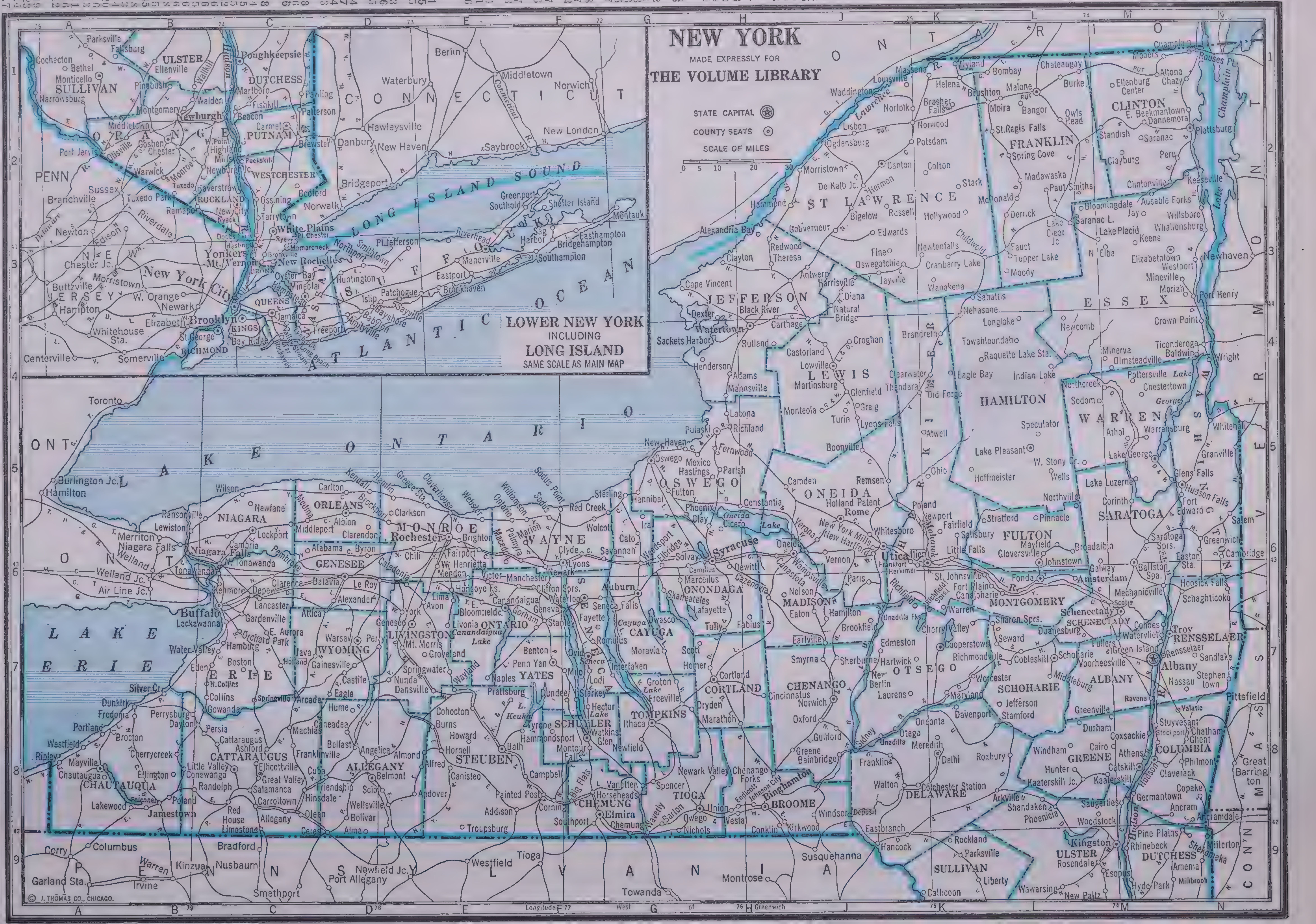
Pop. 13,479,142

COUNTIES

Name	Key	Pop. Thous.
Albany	7M	221
Allegany	8D	40
Bronx	3C	1,395
Broome	8H	166
Cattaraugus	8C	73
Cayuga	6G	66
Chautauqua	8A	124
Chemung	8G	74
Chenango	7J	36
Clinton	1M	54
Columbia	8M	41
Cortland	7H	31
Delaware	8K	41
Dutchess	1C & 9M	121
Erie	7C	798
Essex*	3M	34
Franklin	2L	44
Fulton	6L	49
Genesee	6D	44
Greene	8M	27
Hamilton	5L	4
Herkimer	5K	60
Jefferson	4H	84
Kings	4C	2,698
Lewis	4J	23
Livingston	7E	39
Madison*	6J	40
Monroe	6E	438
Montgomery	6L	59
Nassau	3C	407
New York	3C	1,890
Niagara	5C	160
Oneida	5J	203
Onondaga	6H	295
Ontario	6E	55
Orange	2B	140
Orleans	5D	28
Oswego	5H	71
Otsego	7K	46
Putnam*	2C	17
Queens	4C	1,298
Rensselaer	7N	122
Richmond	4B	174
Rockland*	3B	74
St. Lawrence	2J	91
Saratoga	6M	66
Schenectady	6M	122
Schoharie*	7L	21
Schuyler	8F	13
Seneca	7F	26
Steuben	8E	85
Suffolk	3E	197
Sullivan	1A & 9K	38
Tioga	8G	27
Tompkins	7G	42
Ulster	1B & 9L	87
Warren*	5M	36
Washington	5N	47
Wayne	6F	53
Westchester	3C	574
Wyoming	7D	31
Yates	7F	16

TOWNS

Name	Key	Pop.
Albany	**7M**	**131**
Albion	**5D**	**5**
Amityville	3D	5
Amsterdam	6L	33
Auburn	**6G**	**36**
Babylon	3D	5
Ballston Spa	**6M**	**4**
Batavia	**6D**	**17**
Bath	**8E**	**4**
Beacon	1C	13
Binghamton	**8H**	**78**
Bronxville	3C	6
Buffalo	**6B**	**576**
Canandaigua	**6E**	**8**
Carthage	4H	4
Catskill	**8M**	**5**
Cedarhurst	4C	5
Cohoes	7M	22
Corning	8F	16
Cortland	**7H**	**16**
Dansville	7E	5
Depew	6C	6
Dobbs Ferry	3C	6
Dunkirk	7B	18
East Aurora	7C	5
Elmira	**8G**	**45**
Endicott	8H	18
Floral Park	3C	13
Frankfort	6K	4
Freeport	3D	20
Fredonia	8A	6
Fulton	5G	13
Garden City	3C	11
Geneva	6F	16
Glen Cove	3D	12
Glens Falls	5M	19
Gloversville	6L	23
Green Island	7M	4
Hastings	2C	7
Haverstraw	2B	6
Hempstead	3C	21
Herkimer	**6K**	**10**
Hornell	8E	16
Hoosick Falls	6N	4
Hudson	**8M**	**12**
Hudson Falls	**5N**	**7**
Huntington	3D	11
Ilion	5K	9
Ithaca	**7G**	**20**
Jamestown	8B	43
Johnson City	8H	18
Johnstown	**6L**	**11**
Kenmore	6B	19
Kingston	**9M**	**29**
Lackawanna	7B	24
Lancaster	6C	7
LeRoy	6D	4
Little Falls	6K	10
Lockport	**6C**	**24**
Lynbrook	4C	11
Lyons	**6F**	**4**
Malone	**1L**	**9**
Mamaroneck	2C	13
Massena	1K	11
Medina	5C	6
Middletown	2B	22
Mineola	**3C**	**10**
Mt. Kisco	2C	6
Mt. Vernon	3C	67
Newark	6F	10
Newburgh	2B	32
New Rochelle	3C	58
New York	**3C**	**7 455**
New York Mills	6J	4
Niagara Falls	6B	78
North Tarrytown	2C	9
North Tonawanda	6C	20
Norwich	**7J**	**9**
Nyack	2B	5
Ogdensburg	2J	16
Olean	8C	22
Oneida	6J	10
Oneonta	7K	12
Ossining	3C	16
Oswego	**5G**	**22**
Owego	**8H**	**5**
Patchogue	3D	7
Peekskill	2C	17
Penn Yan	**7F**	**5**
Plattsburg	**1N**	**16**
Pleasantville	3C	4
Pt. Chester	3C	23
Pt. Jervis	2A	10
Potsdam	2K	5
Poughkeepsie	**1C**	**40**
Rensselaer	7M	11
Riverhead	**3E**	**6**
Rochester	**6E**	**325**
Rockville Center	3D	19
Rome	**5J**	**34**
Rye	3C	10
Salamanca	8C	9
Saranac Lake	2L	7
Saratoga Springs	6M	14
Saugerties	8M	4
Scarsdale	3C	13
Schenectady	**6M**	**88**
Seneca Falls	6F	6
Solvay	6H	8
Syracuse	**6H**	**206**
Tarrytown	2C	7
Tonawanda	6B	13
Troy	**7M**	**70**
Tupper Lake	3L	5
Utica	**6J**	**101**
Valley Stream	3C	17
Walden	1B	4
Waterloo	**6F**	**4**
Watertown	**4H**	**33**
Watervliet	7M	16
Waverly	8G	5
Wellsville	8D	6
White Plains	**3C**	**40**
Whitehall	5N	5
Yonkers	3C	143


NEW YORK
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 20 30
LOWER NEW YORK
INCLUDING
LONG ISLAND
SAME SCALE AS MAIN MAP
LAKE ONTARIO
LAKE ERIE
ATLANTIC OCEAN
LONG ISLAND SOUND
CONNECTICUT
PENN
NEW JERSEY
ONTARIO
PENNSYLVANIA
VERMONT
MASS.
CONN.
CLINTON
FRANKLIN
ST. LAWRENCE
JEFFERSON
LEWIS
HAMILTON
ESSEX
WARREN
WASHINGTON
SARATOGA
FULTON
HERKIMER
ONEIDA
OSWEGO
MONTGOMERY
SCHENECTADY
RENSSELAER
ALBANY
SCHOHARIE
OTSEGO
MADISON
ONONDAGA
CAYUGA
WAYNE
MONROE
ORLEANS
NIAGARA
GENESEE
ERIE
WYOMING
LIVINGSTON
ONTARIO
YATES
SENECA
SCHUYLER
TOMPKINS
CORTLAND
CHENANGO
DELAWARE
GREENE
COLUMBIA
ULSTER
DUTCHESS
SULLIVAN
BROOME
TIOGA
CHEMUNG
STEUBEN
ALLEGANY
CATTARAUGUS
CHAUTAUQUA
ORANGE
PUTNAM
WESTCHESTER
ROCKLAND
QUEENS
KINGS
RICHMOND
NASSAU
SUFFOLK
New York City
Albany
Buffalo
Rochester
Syracuse
Utica
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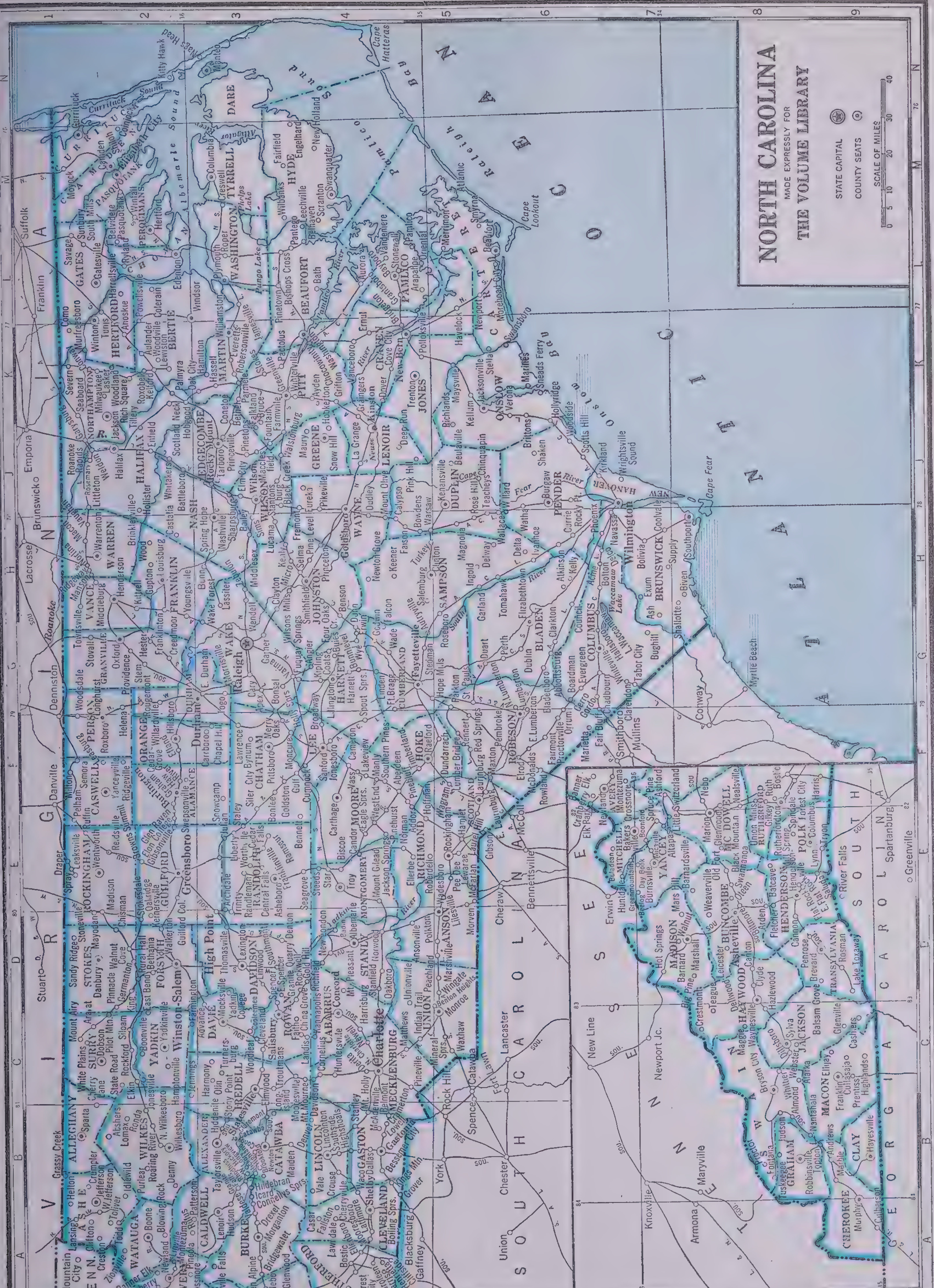
NORTH CAROLINA

Pop. 3,571,623



COUNTIES

Name Key	Pop. Thous.
Alamance 2F	57
Alexander* 2B	13
Alleghany* 1B	8
Anson 5D	28
Ashe* 1A	23
Avery* 2A and 6F	14
Beaufort 3L	36
Bertie 2K	26
Bladen* 5H	27
Brunswick 7H	17
Buncombe 8D	109
Burke 3A	39
Cabarrus 4C	59
Caldwell 2A	36
Camden* 1M	5
Carteret 5L	18
Caswell* 1F	20
Catawba 3B	52
Chatham* 3F	25
Cherokee 9A	19
Chowan 2L	12
Clay* 9B	6
Cleveland 4A	58
Columbus 6G	46
Craven 4K	31
Cumberland 5G	46
Currituck* 1N	7
Dare* 3N	6
Davidson 3D	53
Davie 3C	15
Duplin* 5J	40
Durham 2G	80
Edgecombe 3J	49
Forsyth 2D	126
Franklin 2H	30
Gaston 4B	88
Gates* 1L	10
Graham* 8B	6
Granville 1G	29
Greene* 4J	19
Guilford 2E	160
Halifax* 1J	57
Harnett* 4G	44
Haywood 8D	35
Henderson 9E	26
Hertford* 1K	19
Hoke 5F	15
Hyde 4M	8
Iredell 3C	50
Jackson 9C	19
Johnston 3H	64
Jones 5K	11
Lee 4F	19
Lenoir 4J	41
Lincoln 1B	24
McDowell 3A and 7E	23
Macon 9C	16
Madison 7D	23
Martin 3K	26
Mecklenburg 4C	152
Mitchell 7E	16
Montgomery 4E	16
Moore 4F	31
Nash 2I	56
New Hanover 7J	48
Northampton 1K	28
Onslow* 5K	18
Orange 2F	23
Pamlico* 4L	10
Pasquotank 2M	21
Pender 6J	18
Perquimans 2L	10
Person 1F	25
Pitt 5K	61
Polk* 9E	12
Randolph 3E	45
Richmond 5E	37
Robeson 5F	77
Rockingham* 1E	58
Rowan 3C	69
Rutherford 4A and 8F	46
Sampson 5H	47
Scotland 5F	23
Stanly 4D	33
Stokes* 1D	23
Surry 1C	42
Swain 8B	12
Transylvania 9D	12
Tyrrell* 3M	6
Union 5C	40
Vance 1H	30
Wake 3G	110
Warren 1H	23
Washington 3L	12
Watauga 2A	18
Wayne 4J	58
Wilkes 2B	43
Wilson 3J	50
Yadkin* 2C	21
Yancey* 7E	17

TOWNS

Name Key	Pop. Thous.
Ahoskie 1K	2
Albemarle 4D	4
Andrews 9B	2
Asheboro 3E	7
Asheville 8D	51
Badin 4D	3
Beaufort 6L	4
Belhaven 3L	2
Belmont 4B	4
Bessemer City 4B	4
Brevard 9D	3
Burlington 2F	12
Canton 8D	5
Charlotte 4C	101
Cherryville 4A	3
Clinton 5H	4
Concord 4C	16
Cooleemee 3C	2
Cramerton 4B	2
Dunn 4G	5
Durham 2G	60
E Spencer 3D	2
Edenton 2L	4
Elizabeth City 1M	12
Elkin 1C	3
Enfield 1J	2
Farmville 3J	3
Fayetteville 4G	17
Forest City 9F and 4A	5
Gastonia 4B	21
Goldsboro 4J	17
Graham 2F	4
Granite Falls 3B	2
Greensboro 2E	59
Greenville 3K	12
Hamlet 5E	5
Henderson 1H	8
Hendersonville 8E	5
Hickory 3B	13
High Point 3E	38
Kings Mountain 4A	7
Kinston 4J	15
Laurinburg 5F	6
Lenoir 3A	8
Lexington 3D	10
Lincolnton 4B	5
Louisburg 2H	2
Lumberton 6F	6
Marion 7E	3
Monroe 5C	6
Mooresville 3L	7
Morehead City 6L	4
Morganton 3A	8
Mt. Airy 1C	6
Mt. Holly 4B	2
Mt. Olive 4J	3
New Bern 4K	12
Newton 3B	5
N. Wilkesboro 2B	3
Oxford 1G	4
Plymouth 3L	2
Raleigh 3G	47
Reidsville 1E	10
Roanoke Rapids 1J	9
Rockingham 5E	4
Rocky Mount 3J	26
Roxboro 1F	5
Rutherfordton 8F	2
St. Pauls 5G	2
Salisbury 3C	19
Sanford 4F	5
Scotland Neck 2J	3
Shelby 4A	14
Smithfield 3H	4
Southern Pines 5F	1
Spencer 3C	3
Spindale 8F	4
Statesville 3C	11
Tarboro 3J	7
Thomasville 3D	11
Valdese 3A	3
Wadesboro 5D	4
Washington 3K	9
Waynesville 8L	3
Whiteville 6G	3
Wilkesboro 2B	1
Williamston 3K	4
Wilmington 6J	33
Wilson 3J	19
Winston Salem 2D	80

† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

NORTH DAKOTA

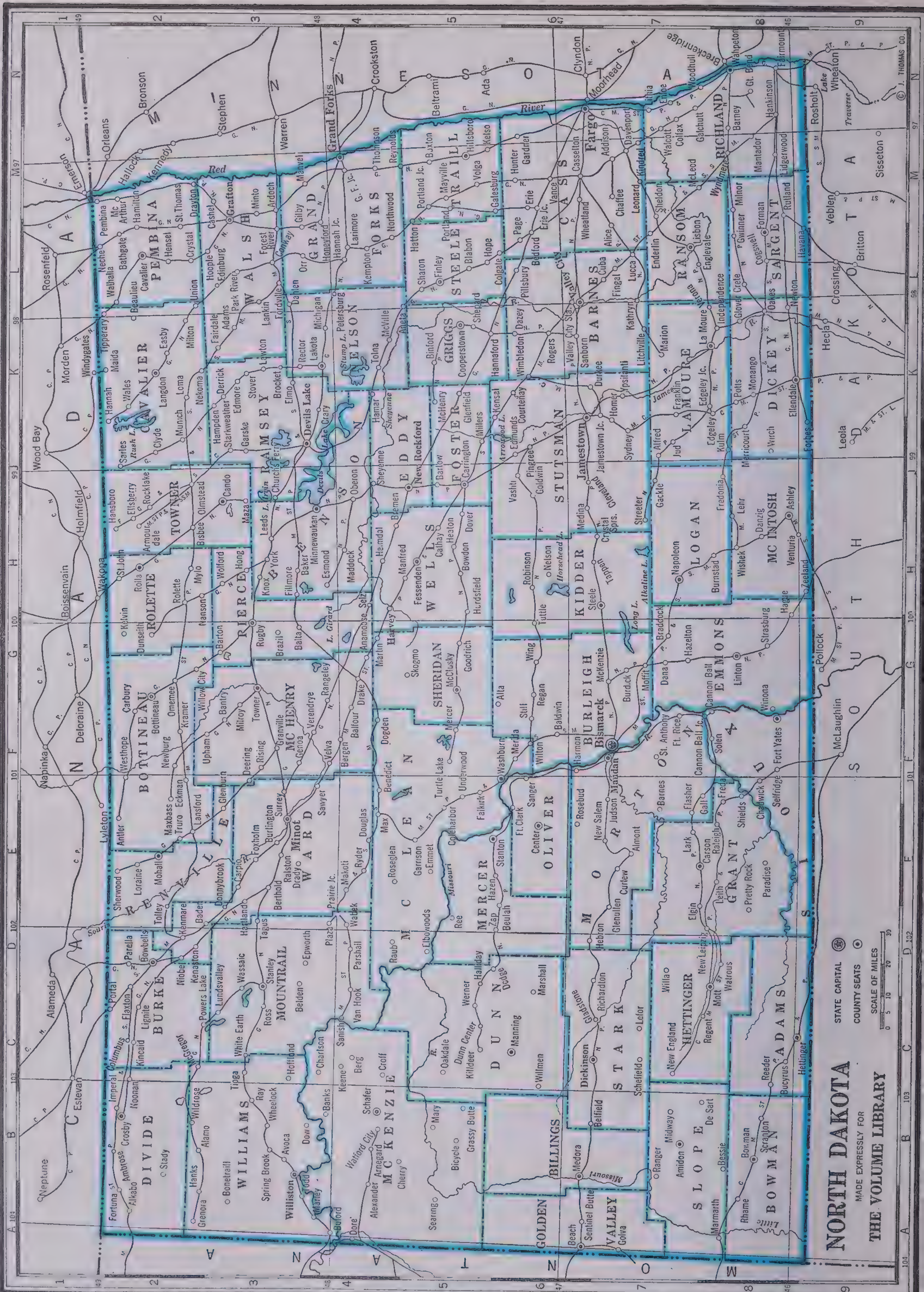
Pop. 641,935

COUNTIES

Name	Key	Pop. Thous.
Adams	8C	5
Barnes	6L	18
Benson*	3J	13
Billings*	6B	3
Bottineau	2F	13
Bowman*	8B	4
Burke*	2D	8
Burleigh	6F	23
Cass	6M	53
Cavalier	2K	14
Dickey	8K	10
Divide	2B	7
Dunn*	5C	8
Eddy	4J	6
Emmons	8G	12
Foster	5J	6
Golden Valley	6A	3
Grand Forks	4M	35
Grant*	7E	8
Griggs	5K	6
Hettinger	7C	7
Kidder*	6H	7
La Moure*	7K	10
Logan*	7H	8
McHenry*	3F	14
McIntosh	8H	9
McKenzie*	4B	8
McLean*	5E	16
Mercer*	5D	10
Morton	7F	20
Mountrail*	3D	10
Oliver*	6E	4
Nelson*	4K	9
Pembina*	2L	16
Pierce	3G	9
Ramsey	3J	16
Ransom	7L	10
Renville*	2E	6
Richland	8N	21
Rolette	2H	13
Sargent*	8L	9
Sheridan*	5G	7
Sioux*	8F	4
Slope*	7B	3
Stark	7C	15
Steele*	5L	6
Stutsman	6J	23
Towner	3J	7
Traill	5M	12
Walsh	3L	21
Ward	3E	32
Wells*	5H	11
Williams	3B	16

TOWNS

Name	Key	Pop. Thous.
Ashley	8J	1
Beach	6A	1
Bismarck	7F	15
Bottineau	2G	2
Bowman	8B	1
Cando	3J	1
Carrington	5J	2
Casselton	6M	1
Cavalier	2L	1
Cooperstown	5K	1
Crosby	2B	1
Devils Lake	3J	6
Dickinson	6C	6
Ellendale	8K	2
Enderlin	7L	2
Fargo	6N	33
Fessenden	5H	†7
Garrison	5E	1
Grafton	3M	4
Grand Forks	4M	20
Hankinson	8N	1
Harvey	5H	2
Hebron	6D	1
Hettinger	8C	1
Hillsboro	5M	1
Jamestown	6J	9
Kenmare	2D	2
Lakota	3K	1
La Moure	7K	1
Langdon	2K	2
Larimore	4L	1
Lidgerwood	8M	1
Linton	8G	2
Lisbon	7L	2
McClusky	5G	1
Mandan	7F	7
Mayville	5M	1
Minot	3E	17
Mohall	2E	†7
Mott	8D	1
Napoleon	7H	1
New Rockford	4J	2
Northwood	4L	1
Oakes	8L	2
Park River	3L	1
Rolla	2H	1
Rugby	3G	2
Schafer	4B	†2
Stanley	3D	1
Stanton	5E	†3
Steele	7H	†7
Towner	3G	†9
Valley City	6L	6
Wahpéton	8N	4
Washburn	5F	†9
Williston	3B	6
Wilton	6F	1
Wishek	8H	1



OHIO

Towns—Cont.

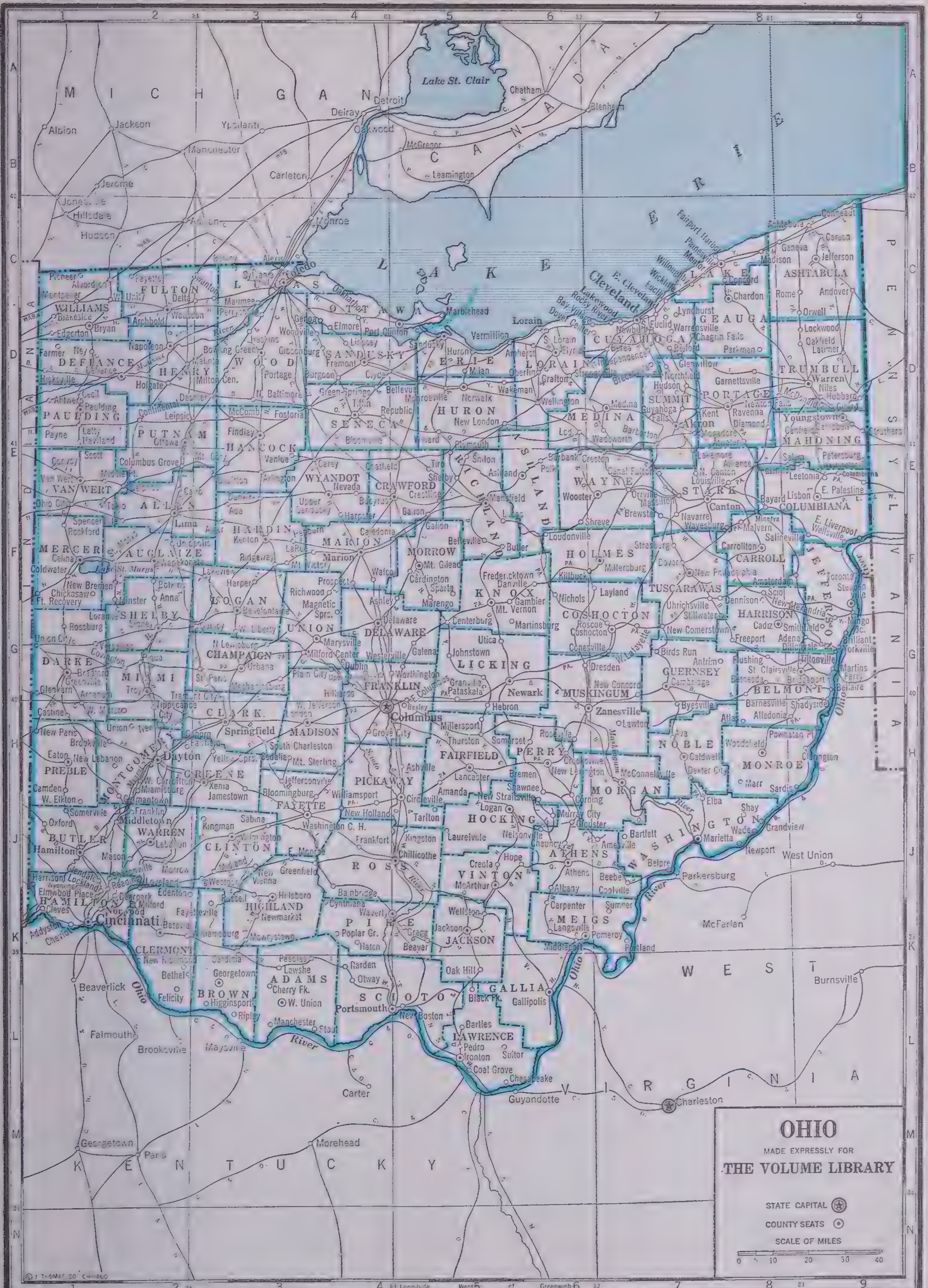
Name	Key	Pop. Thous.
Campbell	9E	11
Canton	7E	108
Carrollton	8F	3
Celina	1F	5
Cheviot	1K	9
Chillicothe	4J	20
Cincinnati	1K	456
Circleville	4H	8
Cleveland	7C	878
Cleveland Hts.	7C	55
Clyde	4D	3
Columbus	4H	306
Conneaut	9B	9
Coshocton	7G	12
Crestline	5E	4
Crooksville	6H	3
Cuyahoga Falls	7D	21
Dayton	2H	211
Defiance	2D	10
Delaware	4G	9
Delphos	2E	6
Dennison	7F	4
Dover	7F	10
E. Cleveland	7C	39
E. Liverpool	9F	24
E. Palestine	9E	5
Eaton	1H	4
Elmwood Place	1K	4
Elyria	6D	25
Euclid	7C	18
Fairport	7C	5
Fairview	7D	5
Findlay	3D	20
Fostoria	3D	13
Franklin	2J	5
Fremont	4D	15
Galion	5E	9
Gallipolis	6L	8
Garfield Hts.	7D	17
Geneva	8C	4
Girard	9D	10
Glouster	6J	3
Grandview Hts.	4G	7
Greenfield	3J	4
Greenville	1G	8
Hamilton	1J	51
Hillsboro	3J	5
Hubbard	9D	4
Ironton	5L	16
Jackson	5K	6
Kent	7D	9
Kenton	3F	8
Lakewood	6C	69
Lancaster	5H	22
Lebanon	2J	4
Lima	2F	45
Lisbon	9E	3
Lockland	2K	6
Logan	6J	6
London	4H	5
Lorain	6C	44
Louisville	7E	3
Mansfield	5E	37
Marietta	7J	15
Maple Heights	7D	7
Marion	4F	31
Martins Ferry	9G	15
Marysville	4G	4
Massillon	7E	27
Maumee	3C	5
Medina	6D	4
Miamisburg	2H	6
Middleport	6K	3
Middletown	2J	31
Mingo Jc.	9F	5
Montpelier	1C	4
Mt. Gilead	5F	2
Mt. Healthy	1K	4
Mt. Vernon	5F	10
Napoleon	2D	5
Nelsonville	6J	5
Newark	6G	31
New Boston	4L	6
Newburg Hts.	7C	4
New Comerstown	7G	5
New Lexington	6H	4

Cont. on p. 2323

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND


MICHIGAN
CANADA
LAKE ERIE
Lake St. Clair
INDIANA
PENNSYLVANIA
WEST VIRGINIA
KENTUCKY
Ohio River
WILLIAMS
FULTON
LUCAS
OTTAWA
DEFIANCE
HENRY
WOOD
SANDUSKY
ERIE
LORAIN
CUYAHOGA
LAKE
GEAUGA
ASHTABULA
TRUMBULL
PORTAGE
SUMMIT
MEDINA
HURON
SENECA
HANCOCK
PUTNAM
PAULDING
VAN WERT
ALLEN
HARDIN
WYANDOT
CRAWFORD
RICHLAND
ASHLAND
WAYNE
STARK
MAHONING
COLUMBIANA
MERCER
AUGLAIZE
LOGAN
UNION
MARION
MORROW
KNOX
HOLMES
TUSCARAWAS
CARROLL
JEFFERSON
HARRISON
DARKE
SHELBY
MIAMI
CHAMPAIGN
DELAWARE
LICKING
COSHOCTON
MUSKINGUM
GUERNSEY
BELMONT
PREBLE
MONTGOMERY
CLARK
MADISON
FRANKLIN
FAIRFIELD
PERRY
NOBLE
MONROE
BUTLER
WARREN
GREENE
FAYETTE
PICKAWAY
HOCKING
MORGAN
WASHINGTON
ATHENS
HAMILTON
CLINTON
ROSS
VINTON
MEIGS
CLERMONT
HIGHLAND
PIKE
JACKSON
GALLIA
BROWN
ADAMS
SCIOTO
LAWRENCE
Columbus
Cleveland
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OHIO

Pop. 6,907,612

COUNTIES

Name	Key	Pop. Thous.
Adams	3L	22
Allen	2E	73
Ashland	6E	30
Ashtabula	9C	69
Athens	6J	44
Auglaize	2F	28
Belmont	8G	96
Brown	2L	22
Butler	1J	120
Carroll	8F	17
Champaign	3G	25
Clark	3H	96
Clermont	2K	34
Clinton	3J	23
Columbiana	9E	90
Coshocton	6G	31
Crawford	5E	38
Cuyahoga	7D	1,217
Darke	1G	39
Defiance	1D	24
Delaware	4G	27
Erie	5D	43
Fairfield	5H	48
Fayette	3J	21
Franklin	4G	389
Fulton	2C	24
Gallia	6L	25
Geauga	8C	19
Greene	3H	36
Guernsey	7G	53
Hamilton	1K	622
Hancock	3E	41
Hardin	3F	27
Harrison	8G	20
Henry	2D	23
Highland	3K	27
Hocking	5J	22
Holmes	6F	18
Huron	5D	35
Jackson	5K	27
Jefferson	9F	98
Knox	5F	31
Lake	8C	50
Lawrence	5L	47
Licking	5G	62
Logan	3F	30
Lorain	6D	112
Lucas	3C	344
Madison	4H	22
Mahoning	9E	240
Marion	4F	45
Medina	6D	33
Meigs	6K	24
Mercer	1F	26
Miami	2G	53
Monroe	8H	19
Montgomery	2H	295
Morgan	6H	14
Morrow	5F	16
Muskingum	6H	70
Noble	7H	15
Ottawa	4C	24
Paulding	1E	16
Perry	6H	31
Pickaway	4H	28
Pike	4K	16
Portage	8D	47
Preble	1H	23
Putnam	2E	25
Richland	5E	74
Ross	4J	52
Sandusky	4D	41
Scioto	4L	87
Seneca	4E	48
Shelby	2G	26
Stark	7E	235
Summit	7D	339
Trumbull	9D	132
Tuscarawas	7F	69
Union	4G	20
Van Wert	1E	27
Vinton	5J	12
Warren	2J	30
Washington	7J	44
Wayne	6E	51
Williams	1C	26
Wood	3D	52
Wyandot	4E	19

TOWNS

Name	Key	Pop. Thous.
Ada	3F	2
Akron	**7D**	**245**
Alliance	8E	24
Amherst	6D	3
Ashland	**6E**	**12**
Ashtabula	8C	21
Athens	**6J**	**8**
Barberton	7D	24
Barnesville	8G	5
Bedford	7D	7
Bellaire	9G	14
Bellefontaine	**3G**	**10**
Bellevue	5D	6
Bexley	4G	9
Berea	6D	6
Bowling Green	**3D**	**7**
Bridgeport	9G	5
Bryan	**1C**	**5**
Bucyrus	**5E**	**10**
Cadiz	**8G**	**3**
Cambridge	**7G**	**15**

Cont. on p. 2322

OHIO

Towns—Cont.

Name	Key	Pop. Thous.
New Philadelphia	**7F**	**12**
Newton Falls	8D	3
Niles	9D	16
N. College Hill	1J	5
Norwalk	**5D**	**8**
Norwood	2K	34
Oakwood	1E	8
Oberlin	6D	4
Orrville	7E	4
Painesville	**7C**	**12**
Parma	7C	16
Perrysburg	3C	3
Piqua	2G	16
Pomeroy	**6K**	**4**
Pt. Clinton	**5D**	**5**
Portsmouth	**4L**	**40**
Ravenna	**8D**	**9**
Reading	2K	6
Rittman	6E	3
Rocky River	6C	8
St. Bernard	1K	7
St. Marys	2F	6
Salem	9E	12
Sandusky	**5D**	**25**
Sebring	9E	4
Shadyside	9G	4
Shaker Hts.	7C	23
Shelby	5E	7
Sidney	**2G**	**10**
S. Euclid	7C	6
Springfield	**3H**	**71**
Steubenville	**9F**	**38**
Struthers	9D	12
Tiffin	**4D**	**16**
Toledo	**3C**	**282**
Toronto	9F	7
Troy	**2G**	**10**
Uhrichsville	7F	6
University Hts.	7C	6
Upper Arlington	5G	5
Upper Sandusky	**4E**	**4**
Urbana	**3G**	**8**
Van Wert	**1E**	**9**
Wadsworth	6D	6
Wapakoneta	**2F**	**5**
Warren	**9D**	**43**
Washington Court House	**3J**	**9**
Wauseon	**2C**	**3**
Wellston	5J	6
Wellsville	9F	8
Willard	5D	4
Willoughby	7C	4
Wilmington	**3J**	**6**
Wooster	**6E**	**12**
Wyoming	1J	4
Xenia	**3H**	**10**
Youngstown	**9D**	**168**
Zanesville	**6H**	**37**

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

OKLA-HOMA

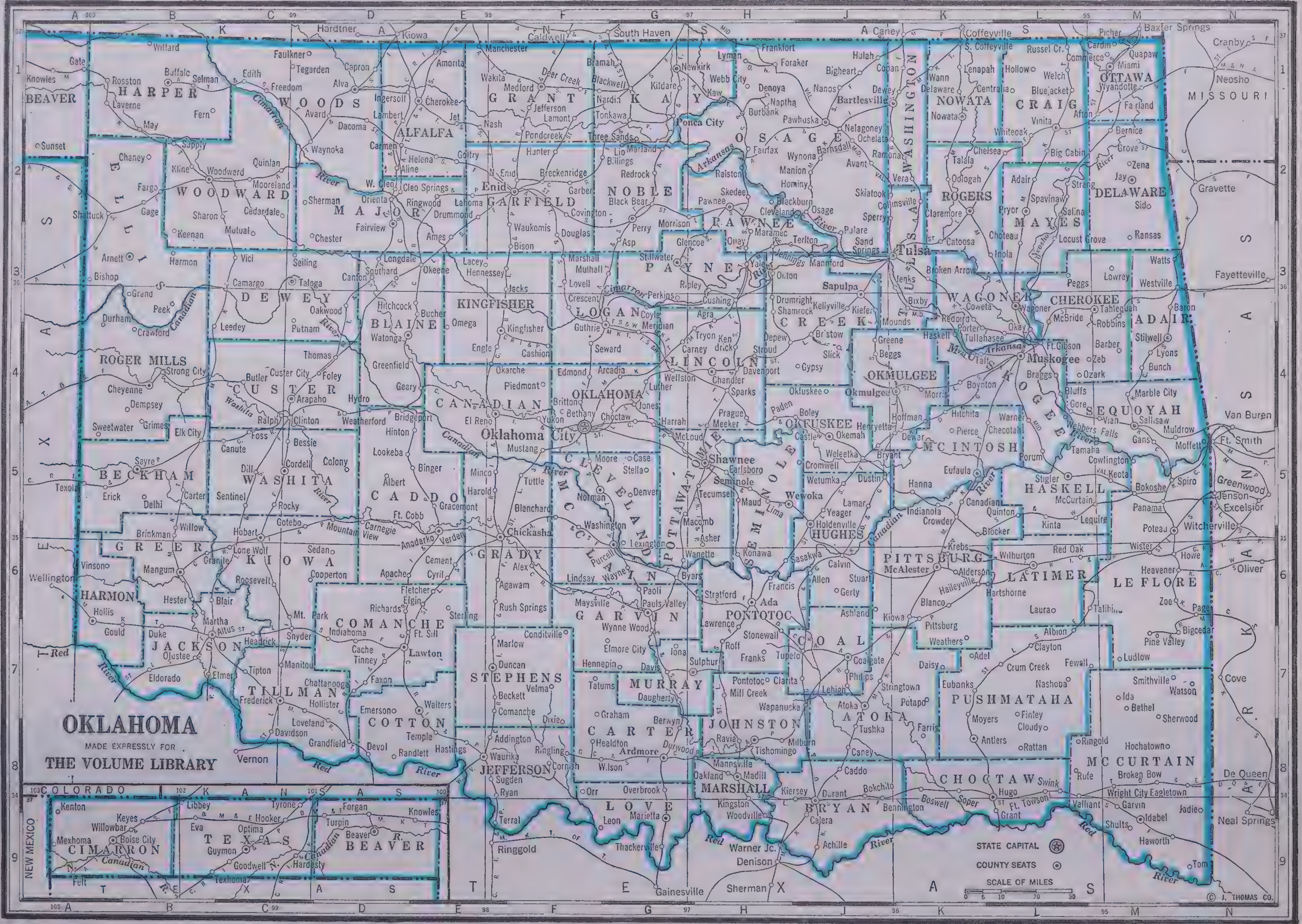
Pop. 2,336,434

COUNTIES

Name	Key	Pop. Thous.
Adair	3M	16
Alfalfa	1E	14
Atoka	7J	19
Beaver	1A and 9D	9
Beckham	5B	22
Blaine	3E	19
Bryan	8J	38
Caddo	5D	42
Canadian	4E	27
Carter	8G	43
Cherokee	3L	21
Choctaw	8L	28
Cimarron	9A	4
Cleveland	5F	28
Coal	7J	13
Comanche	7D	39
Cotton	8D	13
Craig	1L	21
Creek	3J	56
Custer*	4C	23
Delaware*	2M	19
Dewey*	3C	12
Ellis*	3A	8
Garfield	2F	45
Garvin	6G	31
Grady	6E	41
Grant	1F	13
Greer	6B	15
Harmon	6A	10
Harper*	1B	6
Haskell	5L	17
Hughes	5J	29
Jackson	7B	22
Jefferson	8F	15
Johnston	7H	16
Kay	1G	47
Kingfisher	3E	16
Kiowa	6C	23
Latimer	6L	12
Le Flore	6M	46
Lincoln	4H	30
Logan	3F	25
Love	9G	11
McClain	5G	19
McCurtain	8M	41
McIntosh	5K	24
Major	2D	12
Marshall	8H	12
Mayes	2L	22
Murray	7G	14
Muskogee	4L	66
Noble	2G	15
Nowata	1K	16
Okfuskee	4J	26
Oklahoma	4F	224
Okmulgee	4K	50
Osage	2J	42
Ottawa	1M	36
Pawnee	2H	17
Payne	3G	36
Pittsburg	6K	49
Pontotoc	6H	40
Pottawatomie	5H	51
Pushmataha	7L	19
Roger Mills*	4B	11
Rogers	2K	21
Seminole	5H	61
Sequoyah	4M	23
Stephens	7F	31
Texas	9C	10
Tillman	7C	21
Tulsa	3K	193
Wagoner	3L	22
Washington	1K	31
Washita	5C	22
Woods	1D	15
Woodward	2C	16

TOWNS

Name	Key	Pop. Thous.
Ada	**6H**	**15**
Altus	**7B**	**9**
Alva	**1D**	**5**
Anadarko	**5E**	**5**
Antlers	**7K**	**3**
Arapaho	**4C**	**†4**
Ardmore	**8G**	**17**
Arnett	**3A**	**†5**
Atoka	**7J**	**3**
Bornsdall	2J	2
Bartlesville	**1K**	**16**
Beaver	**9D**	**1**
Bethany	4F	2
Blackwell	1G	9
Boise City	**9A**	**1**
Bristow	4J	6
Britton	4F	2
Broken Arrow	3K	2
Broken Bow	8M	2
Buffalo	**1B**	**1**
Carnegie	5D	2
Chandler	**4H**	**3**
Checotah	5L	2
Cherokee	**1E**	**3**
Cheyenne	**4B**	**1**
Chickasha	**5E**	**14**
Claremore	**2K**	**4**
Cleveland	3H	2
Clinton	4C	7
Coalgate	**7J**	**2**
Collinsville	2K	2
Commerce	1M	2
Cordell	**5C**	**3**
Cushing	3H	9
Dewey	1K	2
Drumright	3H	4
Duncan	**7E**	**9**
Durant	**8J**	**10**
Earlsboro	5H	†5
Edmond	4F	4
Elk City	5B	5
El Reno	**4E**	**10**
Enid	**2F**	**28**
Erick	5A	2
Eufaula	**5K**	**2**
Fairfax	2H	2
Fairview	**2D**	**2**
Frederick	**7C**	**5**
Geary	4E	2
Guthrie	**4F**	**10**
Guymon	**9C**	**2**
Haileyville	6K	1
Hartshorne	6K	3
Healdton	8F	2
Heavener	6M	2
Henryetta	5J	7
Hobart	**6C**	**5**
Holdenville	**5H**	**7**
Hollis	**7A**	**3**
Hominy	2J	3
Hugo	**8L**	**5**
Idabel	**9M**	**4**
Kingfisher	**4E**	**3**
Konawa	6H	2
Lawton	**7D**	**18**
McAlester	**6K**	**12**
Madill	**8H**	**3**
Mangum	**6B**	**4**
Marlow	7F	3
Maud	5H	2
Miami	**1M**	**8**
Muskogee	**4L**	**32**
Newkirk	**1G**	**2**
Norman	**5F**	**11**
Nowata	**1K**	**4**
Okemah	**5J**	**4**
Oklahoma City	**4F**	**204**
Okmulgee	**4J**	**16**
Pauls Valley	**6G**	**5**
Pawhuska	**1J**	**5**
Pawnee	**2H**	**3**
Perry	**2G**	**5**
Picher	1M	6
Ponca City	1G	17
Poteau	**5M**	**3**
Pryor	2L	3
Purcell	**5G**	**3**
Quinton	5L	1
Sallisaw	**4M**	**2**
Sand Springs	3J	6
Sapulpa	**3J**	**12**
Sayre	**5B**	**3**
Seminole	5H	12
Shawnee	**5H**	**22**
Skiatook	2J	1
Stillwater	**3G**	**10**
Stroud	4H	2
Sulphur	**7H**	**5**
Tahlequah	**3M**	**3**
Tecumseh	5H	2
Tonkawa	1G	3
Tulsa	**3K**	**142**
Vinita	**1L**	**6**
Wagoner	**3L**	**4**
Walters	**8E**	**2**
Watonga	**4E**	**2**
Waurika	**8E**	**2**
Waynoka	2D	2
Weatherford	4D	3
Weleetka	4J	2
Wetumka	5J	2
Wewoka	**5H**	**10**
Wilburton	6L	2
Wilson	8F	2
Woodward	**2B**	**5**
Wynne Wood	6G	2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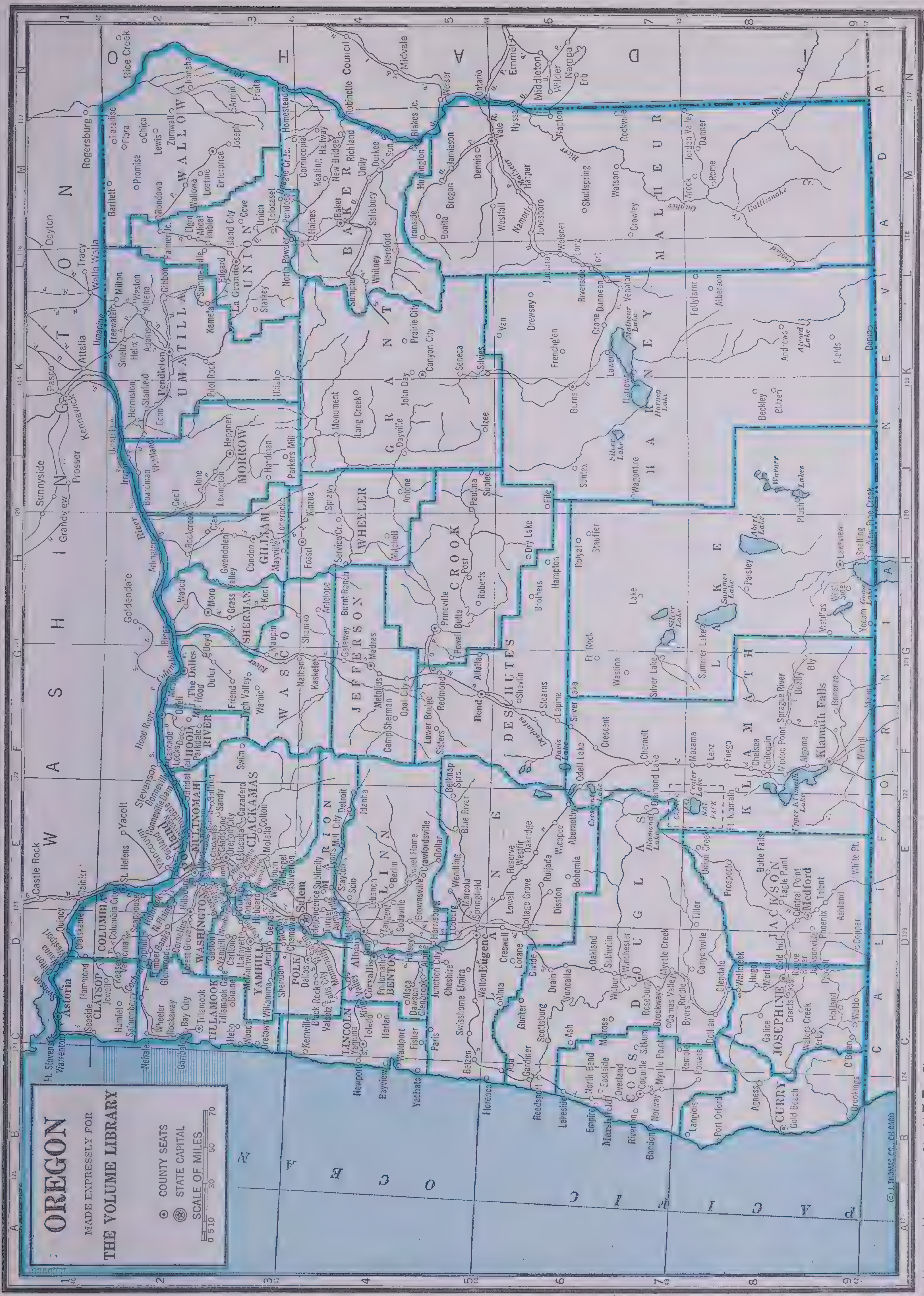
WOODS
ALFALFA
GRANT
KAY
OSAGE
WASHINGTON
NOWATA
CRAIG
OTTAWA
DELAWARE
MAYES
ROGERS
TULSA
PAWNEE
NOBLE
GARFIELD
MAJOR
WOODWARD
ELLIS
DEWEY
BLAINE
KINGFISHER
LOGAN
PAYNE
CREEK
WAGONER
CHEROKEE
ADAIR
SEQUOYAH
MUSKOGEE
OKMULGEE
OKFUSKEE
LINCOLN
OKLAHOMA
CANADIAN
CUSTER
ROGER MILLS
BECKHAM
WASHITA
CADDO
GRADY
McCLAIN
CLEVELAND
POTTAWATOMIE
SEMINOLE
HUGHES
McINTOSH
HASKELL
LE FLORE
LATIMER
PITTSBURG
COAL
PONTOTOC
GARVIN
MURRAY
STEPHENS
COMANCHE
KIOWA
GREER
HARMON
JACKSON
TILLMAN
COTTON
JEFFERSON
CARTER
LOVE
MARSHALL
JOHNSTON
ATOKA
BRYAN
CHOCTAW
PUSHMATAHA
McCURTAIN
CIMARRON
TEXAS
Oklahoma City
Tulsa
Muskogee
Enid
Red River
Canadian
Cimarron
Arkansas

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND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WASHINGTON
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NEVADA
CALIFORNIA
PACIFIC OCEAN
CLATSOP
COLUMBIA
TILLAMOOK
WASHINGTON
MULTNOMAH
HOOD RIVER
CLACKAMAS
YAMHILL
POLK
MARION
LINCOLN
BENTON
LINN
LANE
DOUGLAS
COOS
CURRY
JOSEPHINE
JACKSON
KLAMATH
LAKE
DESCHUTES
JEFFERSON
CROOK
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
UNION
WALLOWA
BAKER
GRANT
WHEELER
HARNEY
MALHEUR
Salem
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OREGON

Pop. 1,089,684

COUNTIES

Name	Key	Pop. Thous.
Baker	4M	18
Benton	4D	19
Clackamas	3E	57
Clatsop	1C	25
Columbia	1D	21
Coos	7C	32
Crook	5H	6
Curry*	8B	4
Deschutes	5G	19
Douglas	7D	26
Gilliam*	2H	3
Grant*	4K	6
Harney	7K	5
Hood River	2F	12
Jackson	8D	36
Jefferson*	4G	2
Josephine	8C	16
Klamath	8F	40
Lake	8H	6
Lane	5D	69
Lincoln	4C	15
Linn	4E	30
Malheur*	7M	20
Morion	3E	75
Morrow	2J	4
Multnomah	2E	355
Polk	3D	20
Sherman*	2G	2
Tillamook	2C	12
Umatilla	2K	26
Union	3L	17
Wallowa	2M	8
Wasco	3G	13
Washington	2D	39
Wheeler*	4H	3
Yam Hill	3D	26

TOWNS

Name	Key	Pop. Thous.
Albany	**4D**	**6**
Ashland	9E	5
Astoria	**1C**	**10**
Baker	**4L**	**9**
Bandon	7B	1
Beaverton	2E	1
Bend	**5G**	**10**
Burns	**6K**	**3**
Canby	3E	1
Canyon City	**5K**	**†3**
Condon	**3H**	**1**
Coquille	**7B**	**3**
Corvallis	**4D**	**8**
Cottage Grove	6D	3
Dallas	**3D**	**4**
Enterprise	**2M**	**2**
Eugene	**5D**	**21**
Forest Grove	2D	2
Fossil	**3H**	**†5**
Gladstone	5E	2
Gold Beach	**8B**	**†5**
Grants Pass	**8D**	**6**
Gresham	2E	2
Heppner	**2J**	**1**
Hillsboro	**2D**	**4**
Hood River	**2F**	**3**
Huntington	5M	†7
Independence	3D	1
Junction City	5D	1
Klamath Falls	**9F**	**16**
La Grande	**3L**	**8**
Lakeview	**9H**	**2**
Lebanon	4D	2
McMinnville	**3D**	**4**
Madras	**4G**	**†4**
Marshfield	6B	5
Medford	**8D**	**11**
Milton	1L	2
Milwaukie	2E	2
Monmouth	3D	1
Mt. Angel	3E	1
Moro	**2H**	**†3**
Myrtle Point	7C	1
Newberg	3D	3
Newport	1C	2
North Bend	6B	4
Nyssa	6M	2
Ontario	5N	4
Oregon City	**3E**	**6**
Oswego	2E	2
Pendleton	**2K**	**9**
Portland	2E	305
Prineville	**4G**	**2**
Rainier	1E	1
Redmond	4G	2
Reedsport	6C	1
Roseburg	**7D**	**5**
St. Helens	**2E**	**4**
Salem	**3D**	**31**
Seaside	1C	3
Sheridan	3D	1
Silverton	3E	3
Springfield	5D	4
Stayton	4E	1
Sweet Home	4E	1
The Dalles	**2G**	**6**
Tillamook	**2C**	**3**
Toledo	**4C**	**2**
Union	3L	1
Vale	**5M**	**1**
Vernonia	2D	1
Warrenton	1C	1
West Linn	3E	2
West Salem	3D	1
Woodburn	3D	2

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

PENNSYL-VANIA

Pop. 9,900,180

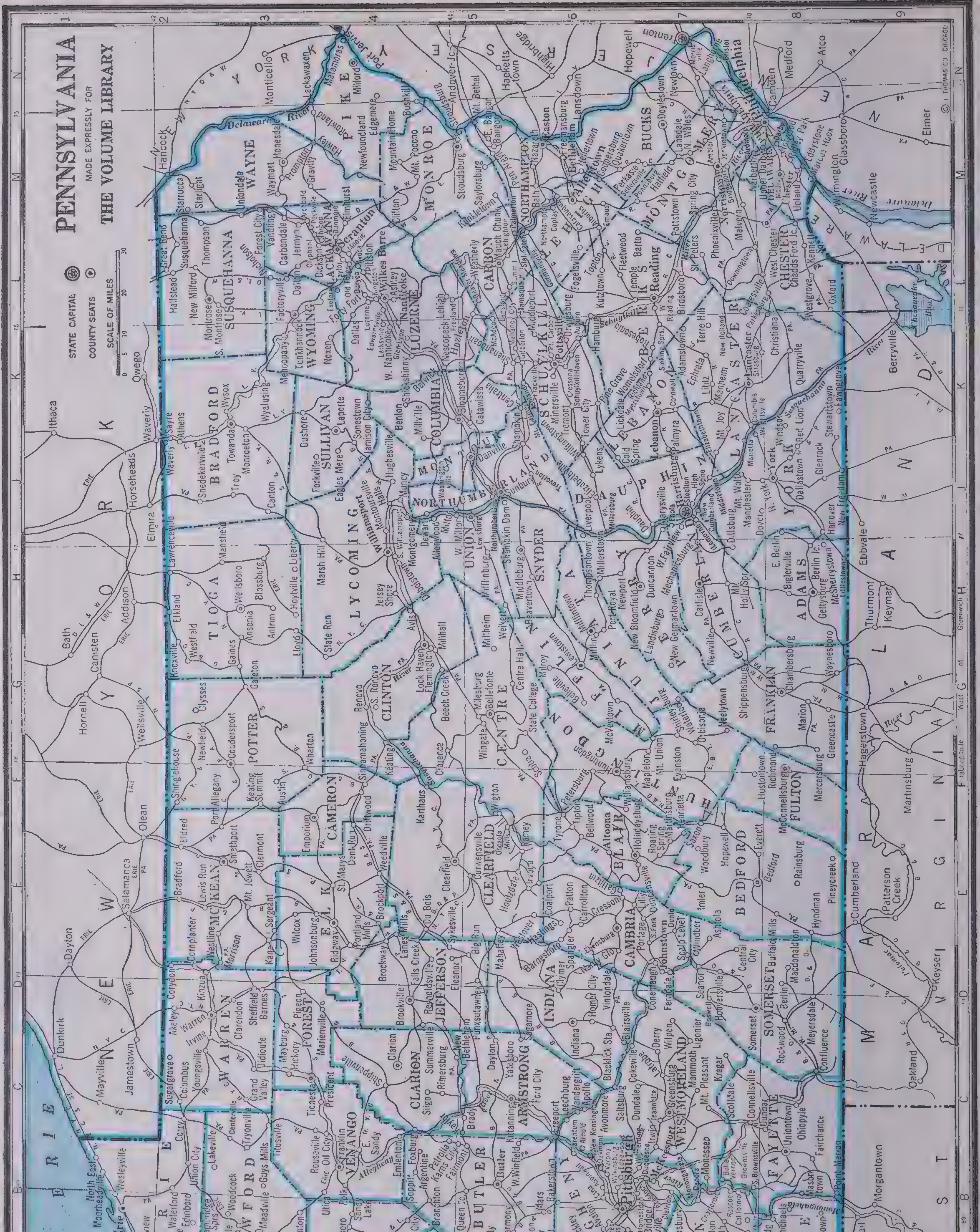
COUNTIES

Name	Key	Pop. Thous.
Adams	8H	39
Allegheny	6B	1,412
Armstrong	5C	81
Beaver	5A	157
Bedford	7E	41
Berks	6L	242
Blair	6E	140
Bradford	2K	51
Bucks	7M	108
Butler	5B	88
Cambria	6E	213
Cameron	3F	7
Carbon	5L	62
Centre	5G	53
Chester	8L	136
Clarion	4C	38
Clearfield	5E	92
Clinton	4G	35
Columbia	5K	51
Crawford	3A	72
Cumberland	7H	75
Dauphin	6J	177
Delaware	8M	311
Elk	3E	34
Erie	2B	181
Fayette	8B	201
Forest*	3C	6
Franklin	8G	69
Fulton*	8F	11
Greene	8A	45
Huntingdon	6F	42
Indiana	6D	80
Jefferson	4D	54
Juniata	6H	15
Lackawanna	3L	301
Lancaster	7K	213
Lawrence	5A	97
Lebanon	6K	73
Lehigh	6M	178
Luzerne	4L	442
Lycoming	4H	94
McKean	2E	57
Mercer	4A	101
Mifflin	6G	43
Monroe	4M	30
Montgomery	7M	289
Montour	5J	15
Northampton	5M	169
Northumberland	5J	127
Perry*	6H	23
Philadelphia	8N	1,951
Pike*	4N	7
Potter	2F	18
Schuylkill	5K	228
Snyder	5H	20
Somerset	8D	84
Sullivan*	3J	7
Susquehanna	2L	34
Tioga	2H	35
Union	5H	20
Venango	4B	64
Warren	2D	43
Washington	7A	211
Wayne	3M	30
Westmoreland	7C	303
Wyoming	3L	17
York	8J	187

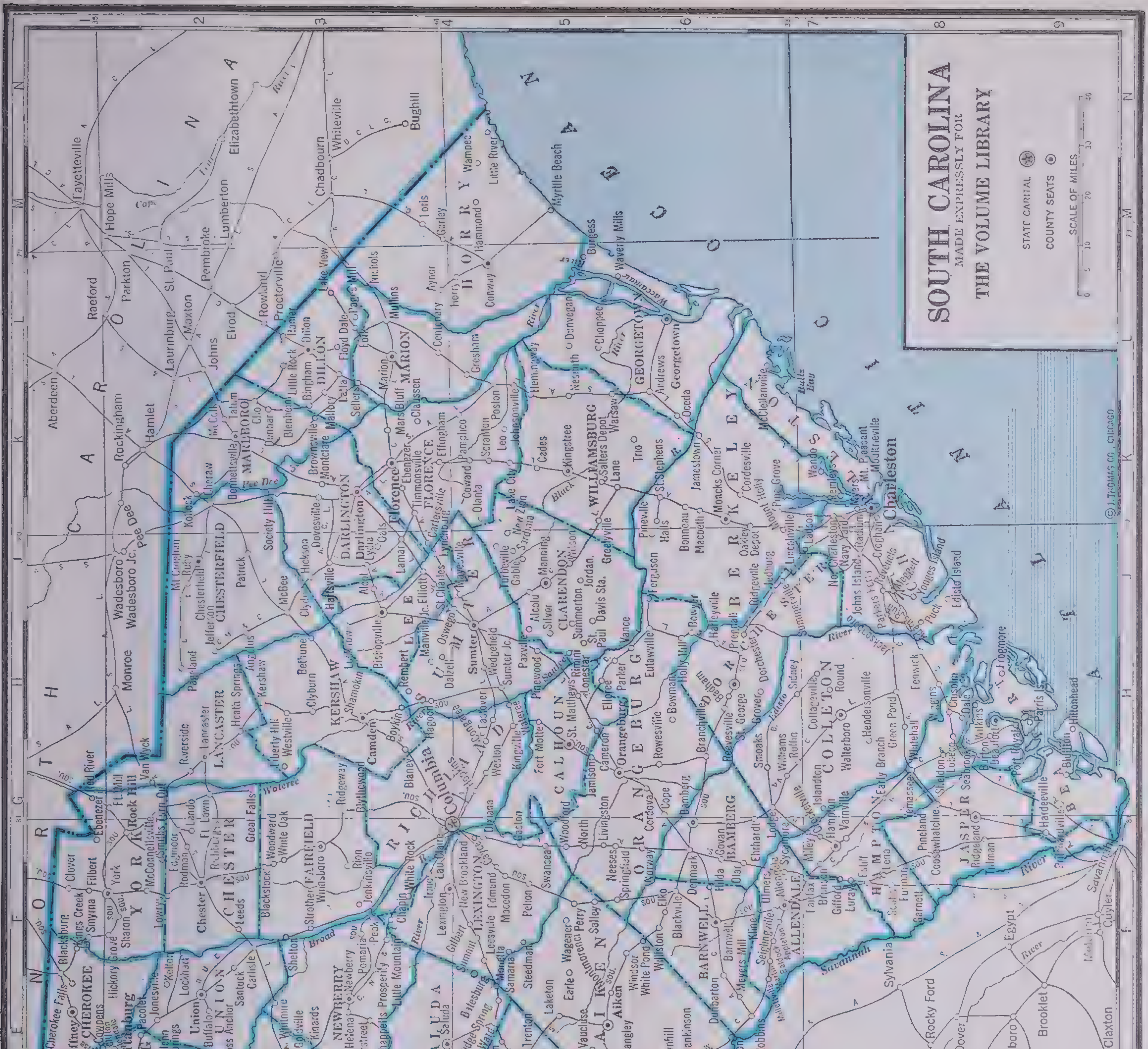
TOWNS

Name	Key	Pop.
Aliquippa	6A	27
Allentown	**6M**	**97**
Altoona	6E	80
Ambridge	6A	19
Archbald	3L	11
Ashland	6K	7
Ashley	4L	6
Aspinwall	6B	5
Athens	2J	4
Avalon	6B	6
Avoca	4L	5
Bangor	5M	6
Beaver	**5A**	**6**
Beaver Falls	5A	17
Bellefonte	**5G**	**5**
Bellevue	6B	10
Berwick	4K	13
Bethlehem	6M	58
Blairsville	6C	5
Blakely	3L	8
Bloomsburg	**5K**	**10**
Brackenridge	6B	6
Braddock	6B	18
Bradford	2C	18
Bridgeport	7M	6
Bristol	6M	12
Brookville	**4D**	**4**
Butler	**5B**	**24**
Canonsburg	7A	13
Carbondale	3L	19
Carlisle	**7H**	**14**
Carnegie	6B	13
Catasauqua	6M	5
Centerville	7B	6
Chambersburg	**8G**	**15**
Charleroi	7B	11
Chester	8M	59
Clairton	6B	16
Clarion	**4C**	**4**
Clearfield	**4E**	**9**
Clifton Hts.	8M	5
Coaldale	5K	6
Coatesville	8L	14
Columbia	7K	12
Connellsville	7C	14
Conshohocken	7M	11
Coraopolis	6A	10
Corry	2C	7
Danville	**5J**	**7**
Darby	8M	10
Dickson	3L	12
Donora	7A	13
Dormont	6B	12
Downingtown	7L	5
Doylestown	**7M**	**5**
Du Bois	4E	12
Dunmore	3L	23
Duquesne	6B	21
Duryea	4L	8
E. Conemaugh	6E	5
Easton	**6M**	**34**
E. Pittsburgh	6B	6
E. Stroudsburg	5M	6
Edgewood	6B	5
Edwardsville	4L	8
Ellwood City	5A	12
Emaus	6M	7
Ephrata	7K	6
Erie	**1B**	**117**
Etna	6B	7
Exeter	4L	6
Farrell	4A	14
Ford City	5C	6
Forest City	3M	4
Forty Fort	4L	6
Frackville	5K	8
Franklin	**3B**	**10**
Freeland	4L	7
Gettysburg	**8H**	**6**
Girardville	5K	5
Glassport	6B	9
Greensburg	**7C**	**16**
Greenvill	3A	8
Grove City	4B	6
Hanover	8J	13
Harrisburg	**7J**	**84**
Hazelton	5L	38
Hollidaysburg	**6E**	**6**
Homestead	6B	19
Honesdale	**3M**	**6**
Huntingdon	**6F**	**7**
Indiana	**6D**	**10**
Jeannette	7C	16
Jersey Shore	4H	5
Johnsonburg	3E	5
Johnstown	7D	67
Kane	3D	6
Kingston	4L	21
Kittanning	**5C**	**8**
Kulpmont	5J	6
Lancaster	**7K**	**61**
Lansdale	7M	9
Lansdowne	8M	11
Lansford	5L	9
Larksville	4L	8
Latrobe	7C	11
Lebanon	**6K**	**27**
Lehighton	5L	7
Lewistown	**6G**	**13**
Lock Haven	**4G**	**11**
Luzerne	4L	7
McAdoo	5K	5
McKeesport	6B	55
McKees Rocks	6B	17
Mahanoy City	5K	13
Marcus Hook	8M	4
Meadville	**3A**	**19**
Mechanicsburg	7H	6
Media	**8M**	**5**
Middletown	7J	7
Midland	5A	6
Milton	5J	8
Minersville	6K	8
Monessen	7B	20
Monongahela	7B	9

Cont. on p. 2327



† POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND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OCONEE
PICKENS
GREENVILLE
SPARTANBURG
CHEROKEE
YORK
ANDERSON
ABBEVILLE
LAURENS
UNION
CHESTER
LANCASTER
CHESTERFIELD
MARLBORO
DILLON
MARION
HORRY
GREENWOOD
MC CORMICK
NEWBERRY
FAIRFIELD
KERSHAW
LEE
DARLINGTON
FLORENCE
SALUDA
EDGEFIELD
LEXINGTON
RICHLAND
SUMTER
CLARENDON
WILLIAMSBURG
GEORGETOWN
AIKEN
CALHOUN
ORANGEBURG
BARNWELL
BAMBERG
ALLENDALE
DORCHESTER
BERKELEY
COLLETON
CHARLESTON
HAMPTON
JASPER
BEAUFORT
Columbia
Charleston
Savannah
Augusta

SOUTH CAROLINA

Pop. 1,899,804

COUNTIES

Name Key	Pop. Thous.
Abbeville 3C	23
Aiken 5E	50
Allendale 7F	13
Anderson 2C	89
Bamberg 6G	19
Barnwell 6F	20
Beaufort 8H	22
Berkeley* 6K	27
Calhoun 5H	16
Charleston 7K	121
Cherokee 1E	33
Chester 2F	33
Chesterfield 2J	36
Clarendon 5J	31
Colleton 7H	26
Darlington 3K	45
Dillon 3L	30
Dorchester 6H	20
Edgefield 4E	18
Fairfield 3G	24
Florence 4K	71
Georgetown 6L	26
Greenville 2C	137
Greenwood 3D	40
Hampton* 7G	17
Horry 4M	52
Jasper* 8G	11
Kershaw 3H	33
Lancaster 2H	34
Laurens 3D	44
Lee 3H	25
Lexington 4F	38
McCormick 4D	11
Marion 4L	30
Marlboro 2K	33
Newberry 3E	34
Oconee 2B	37
Orangeburg 5G	64
Pickens 1C	37
Richland 4G	105
Saluda 4E	17
Spartanburg 1E	128
Sumter 4H	52
Union 2E	31
Williamsburg 5K	41
York 1F	59

TOWNS

Name Key	Pop. Thous.
Abbeville 3C	5
Aiken 5E	6
Allendale 7F	2
Anderson 3C	19
Bamberg 6G	3
Beaufort 8H	3
Bennettsville 2K	5
Bishopville 3J	3
Camden 3H	6
Charleston 7K	71
Cheraw 2K	4
Chester 2F	6
Clinton 3E	6
Clover 1F	3
Columbia 4G	62
Conway 4L	5
Darlington 3K	6
Dillon 3L	4
Easley 1C	5
Eau Claire 4G	4
Edgefield 4E	2
Florence 3K	16
Fort Mill 1G	3
Gaffney 1E	8
Georgetown 6L	5
Greenville 2D	35
Greenwood 3D	13
Greer 1D	3
Honea Path 3C	3
Hartsville 3J	5
Kingstree 5K	3
Lancaster 2G	4
Laurens 3D	7
Liberty 1C	2
Marion 3L	6
Mullins 3L	4
Newberry 3E	8
No. Augusta 5E	3
Orangeburg 5G	11
Rock Hill 1G	15
Spartanburg 1E	22
Summerville 6J	3
Sumter 4H	16
Union 2E	8
Walhalla 2B	3
Walterboro 7H	3
Whitmire 3E	3
Williamston 2C	3
Winnsboro 3F	3
Woodruff 2E	4
York 1F	3

PENNSYL-VANIA

Towns—cont. from page 2326

Name Key	Pop.
Moosic 3L	5
Morrisville 7N	5
Mt. Carmel 5J	18
Mt. Pleasant 7C	6
Munhall 6B	14
Nanticoke 4L	24
Nanty Glo 6D	6
Nazareth 6M	6
New Brighton 5A	10
New Castle 5A	48
New Kensington 6B	17
Morristown 7M	36
Northampton 6M	10
N. Braddock 6B	16
Northumberland 5J	4
Oakmont 6B	6
Oil City 3C	20
Old Forge 3L	12
Olyphant 3L	10
Palmerton 5L	7
Parnassus 6B	6
Peckville 3L	8
Philadelphia 8M	1,931
Phoenixville 7M	12
Pitcairn 6B	6
Pittsburgh 6B	671
Pittston 4L	17
Plymouth 4L	16
Pottstown 7L	20
Pottsville 6K	25
Punxsutawney 5D	9
Quakertown 6M	5
Rankin 6B	7
Reading 7L	111
Ridgway 3E	6
Rochester 6A	7
St. Clair 6K	7
St. Marys 3D	8
Sayre 2J	8
Schuylkill Haven 6K	7
Scottdale 7C	6
Scranton 3L	140
Sewickley 6B	6
Shamokin 5J	19
Sharon 4A	26
Sharpsburg 6B	8
Sharpsville 4A	5
Shenandoah 5K	20
Somerset 7D	5
S. Brownsville 8B	5
Springdale 6B	5
State College 5G	6
Steelton 7J	13
Stroudsburg 5M	6
Summit Hill 5L	5
Sunbury 5J	15
Swissvale 6B	16
Tamaqua 6K	12
Tarentum 6B	10
Taylor 3L	9
Throop 3L	7
Titusville 3C	8
Towanda 2K	4
Turtle Creek 6B	10
Tyrone 6F	9
Uniontown 8B	22
Vandergrift 6C	11
Warren 2D	15
Washington 7A	26
Waynesboro 8C	10
Waynesburg 8A	5
West Chester 8M	13
W. Hazleton 5K	8
W. Pittston 4L	8
W. Reading 7L	7
West View 6B	7
Wilkes Barre 4L	86
Wilkinsburg 6B	30
Williamsport 4H	44
Wilmerding 6B	6
Windber 7D	9
Winton 3L	8
York 8J	57

† POP. SHOWN IN HUNDREDS.   COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.   *POP. OF COUNTY SEAT BELOW ONE THOUSAND

SOUTH DAKOTA

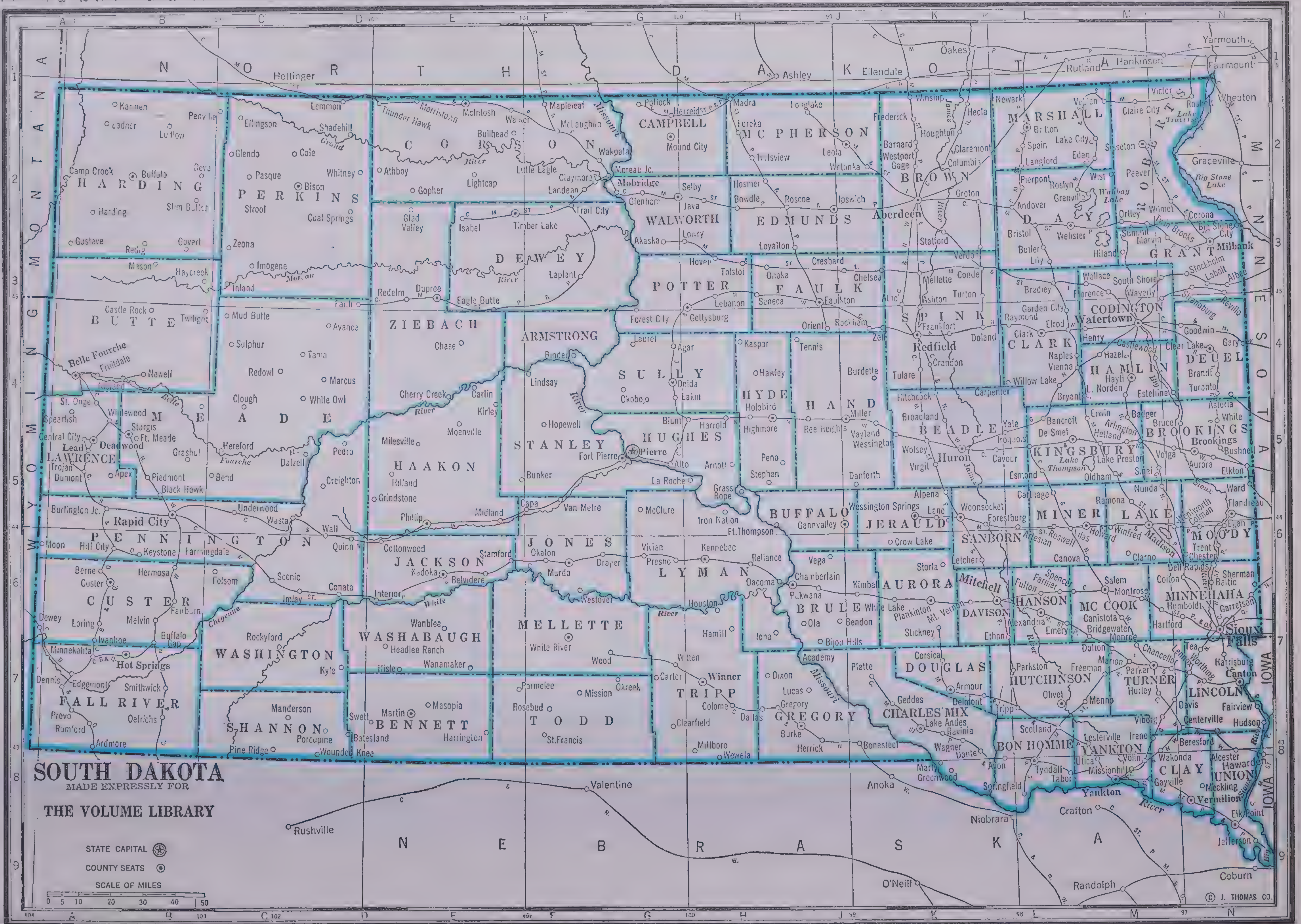
Pop. 642,961

COUNTIES

Name	Key	Pop. Thous.
Armstrong	5F	†1
Aurora*	7K	5
Beadle	5K	20
Bennett	8E	4
Bon Homme	8L	10
Brookings	5N	17
Brown	2K	30
Brule	7J	6
Buffalo*	6J	2
Butte	3A	8
Campbell*	1G	5
Charles Mix*	1G	13
Clark	4L	9
Clay	8N	10
Codington	4M	17
Corson*	1E	7
Custer	6A	6
Davison	7L	15
Day	2L	11
Deuel	4N	8
Dewey*	2F	6
Douglas	7K	5
Edmunds*	2J	8
Fall River	7A	8
Faulk*	3J	5
Grant	3N	11
Gregory*	8J	10
Haakon*	5E	4
Hamlin*	4M	8
Hand	4J	7
Hanson*	7L	5
Harding*	2A	3
Hughes	5G	7
Hutchinson*	7L	12
Hyde	4H	3
Jackson*	6E	2
Jerauld	6K	5
Jones*	6F	3
Kingsbury	5L	11
Lake	6M	12
Lawrence	5A	19
Lincoln	7N	13
Lyman*	6H	5
McCook	6M	10
McPherson*	1J	8
Marshall	1L	9
Meads	4C	10
Mellette*	7F	4
Miner	6L	7
Minnehaha	7N	58
Moody	6N	9
Pennington	6B	24
Perkins*	2C	7
Potter	3G	5
Roberts	2M	16
Sanborn	6K	6
Shannon	8C	5
Spink	4K	13
Stanley*	5F	2
Sully*	4G	3
Todd	8F	6
Tripp	7H	10
Turner	7M	13
Union	9N	12
Walworth*	2G	7
Washabaugh	7E	2
Washington	7C	2
Yankton	8M	17
Ziebach*	3E	3

TOWNS

Name	Key	Pop. Thous.
Aberdeen	**2K**	**17**
Alexandria	**7L**	**†7**
Arlington	5M	1
Armour	**7K**	**1**
Belle Fourche	**4A**	**2**
Beresford	8N	1
Bison	**2C**	**†2**
Britton	**1L**	**1**
Brookings	**5N**	**5**
Buffalo	**2B**	**†2**
Burke	**8J**	**†6**
Canton	**7N**	**3**
Centerville	8N	1
Chamberlain	**6H**	**2**
Clark	**4L**	**1**
Clear Lake	**4N**	**1**
Custer	**6A**	**2**
Deadwood	**5A**	**4**
Dell Rapids	6N	2
De Smet	**5L**	**1**
Dupree	**3E**	**†5**
Edgemont	7A	1
Elk Point	**9N**	**1**
Elkton	5N	†8
Eureka	1H	1
Faulkton	**3J**	**†7**
Flandreau	**6N**	**2**
Fort Pierre	**5G**	**†8**
Freeman	7M	1
Gannvalley	**6J**	**†1**
Gettysburg	**3G**	**1**
Gregory	8H	1
Groton	2L	1
Hayti	**4M**	**†4**
Highmore	**4H**	**1**
Hot Springs	**7B**	**4**
Howard	**6M**	**1**
Huron	**5K**	**11**
Ipswich	**2J**	**1**
Kadoka	6E	†5
Kennebec	**6H**	**3**
Kimball	7J	1
Lake Andes	**8K**	**†8**
Lake Preston	5M	†9
Lead	5A	8
Lemmon	1D	2
Lennox	7N	1
Leola	**2J**	**†8**
McIntosh	**1E**	**†6**
Madison	**6M**	**5**
Martin	**7E**	**1**
Menno	7L	†9
Milbank	**3N**	**3**
Miller	**5J**	**1**
Mitchell	**6L**	**11**
Mobridge	2G	3
Mound City	**2G**	**†2**
Murdo	**6F**	**†7**
Olivet	**8L**	**†2**
Onida	**4G**	**†6**
Parker	**7M**	**1**
Parkston	7L	1
Philip	**6F**	**†8**
Pierre	**5G**	**4**
Plankinton	**7K**	**†7**
Platte	7J	1
Rapid City	**5B**	**14**
Redfield	**4K**	**2**
Salem	**6M**	**1**
Scotland	8L	1
Selby	**2G**	**†6**
Sioux Falls	**7N**	**41**
Sisseton	**2M**	**3**
Spearfish	4A	2
Springfield	8L	†7
Sturgis	**4B**	**3**
Timber Lake	**2F**	**†5**
Tripp	8L	1
Tyndall	**8L**	**1**
Vermillion	**8N**	**3**
Wagner	8K	1
Watertown	**4M**	**11**
Webster	**3L**	**2**
Wessington Springs	**6K**	**1**
White River	**7F**	**†6**
Winner	**7H**	**2**
Woonsocket	**6K**	**1**
Yankton	**8M**	**7**


NORTH DAKOTA
MINNESOTA
IOWA
NEBRASKA
MONTANA
WYOMING
HARDING
PERKINS
CORSON
CAMPBELL
MC PHERSON
BROWN
MARSHALL
ROBERTS
BUTTE
MEADE
ZIEBACH
DEWEY
WALWORTH
EDMUNDS
DAY
GRANT
LAWRENCE
PENNINGTON
HAAKON
STANLEY
ARMSTRONG
SULLY
POTTER
FAULK
SPINK
CLARK
CODINGTON
DEUEL
HAMLIN
HUGHES
HYDE
HAND
BEADLE
KINGSBURY
BROOKINGS
CUSTER
FALL RIVER
SHANNON
WASHINGTON
JACKSON
WASHABAUGH
JONES
MELLETTE
BENNETT
LYMAN
TODD
TRIPP
BUFFALO
JERAULD
SANBORN
MINER
LAKE
MOODY
BRULE
AURORA
DAVISON
HANSON
MC COOK
MINNEHAHA
GREGORY
CHARLES MIX
DOUGLAS
HUTCHINSON
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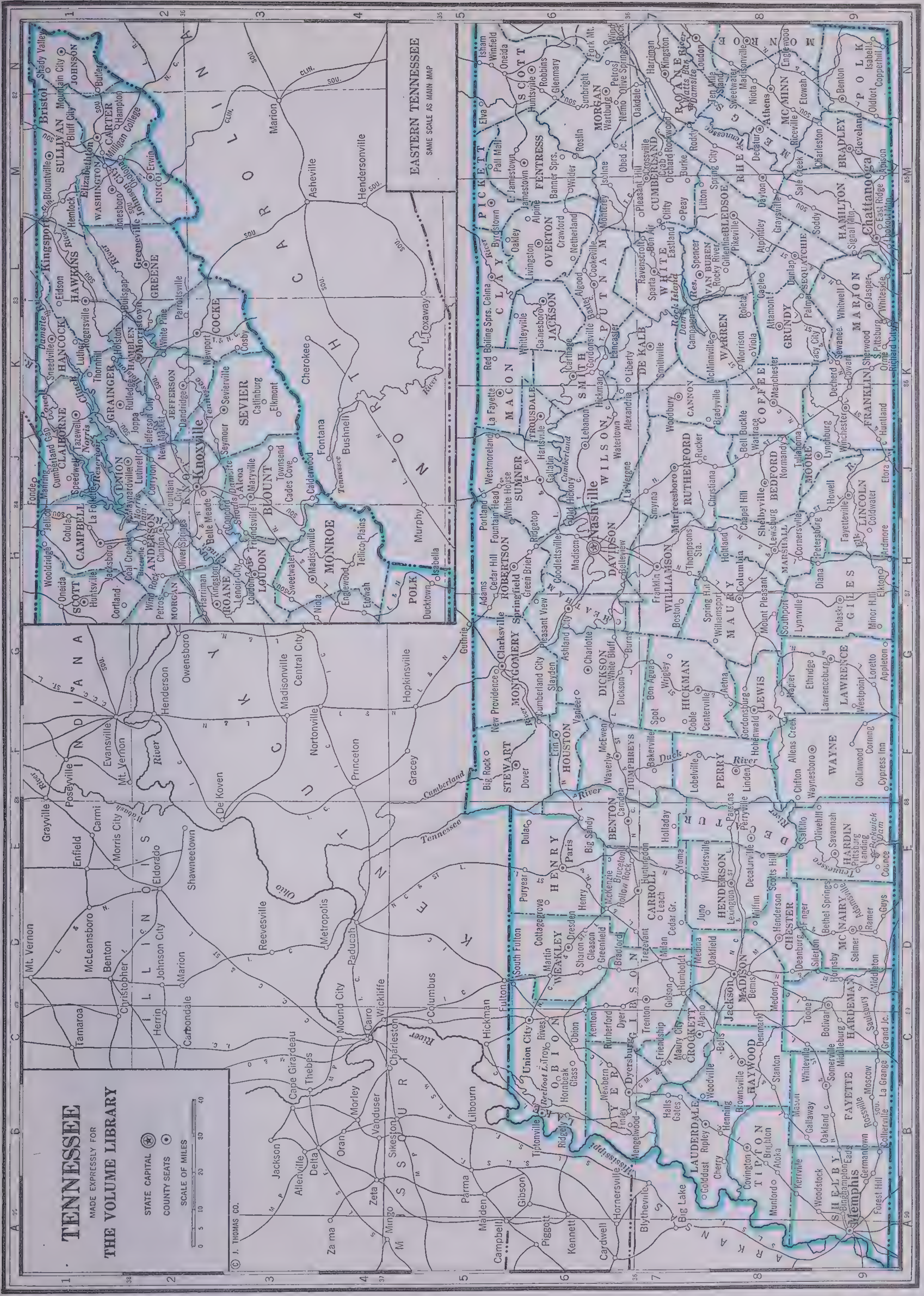
*POP. OF COUNTY SEAT BELOW ONE THOUSAN



TENNESSEE

Pop. 2,915,841

COUNTIES

Name	Key	Pop. Thous.
Anderson	2H and 6N	27
Bedford	8J	23
Benton*	7E	12
Bledsoe*	8M	8
Blount	3J	41
Bradley	9M	28
Campbell*	1H	31
Cannon*	7K	10
Carroll	7E	26
Carter	1M	35
Cheatham*	6G	10
Chester	8D	11
Claiborne*	1J	25
Clay*	5L	11
Cocke	2K	24
Coffee	8K	19
Crockett*	7C	17
Cumberland	7M	16
Davidson	6H	257
Decatur*	8E	10
De Kalb*	7K	15
Dickson*	6G	20
Dyer	7B	35
Fayette	9B	30
Fentress*	6M	14
Franklin	9K	24
Gibson	7C	45
Giles	9H	29
Granger*	2J	14
Greene	2L	39
Grundy*	8K	12
Hamblen	2K	19
Hamilton	9L	180
Hancock*	1K	11
Hardeman	9C	21
Hardin	9E	18
Hawkins	1L	29
Haywood	8C	28
Henderson	8E	19
Henry	6E	26
Hickman*	7G	15
Houston*	6F	6
Humphreys	7F	12
Jackson*	6L	15
Jefferson*	2K	19
Johnson	1N	13
Knox	2J	178
Lake	6B	11
Lauderdale	7B	21
Lawrence	9G	29
Lewis*	8G	6
Lincoln	9J	27
Loudon	3H	20
McMinn	8N and 4G	31
McNairy*	9D	20
Macon*	5K	15
Madison	8D	54
Marion	9L	19
Marshall	8H	16
Maury	8H	40
Meigs*	8M	6
Monroe*	8N and 4H	24
Montgomery	5G	33
Moore*	9J	4
Morgan*	2G and 6N	15
Obion	6C	31
Overton	6L	19
Perry*	8F	8
Pickett*	5M	6
Polk*	5G and 9N	15
Putnam	6L	26
Rhea	8M	16
Roane*	7N and 2G	28
Robertson	5H	29
Rutherford	7J	34
Scott*	1H and 6N	16
Sequatchie	8L	5
Sevier*	3K	23
Shelby	9A	358
Smith	6K	16
Stewart*	5F	14
Sullivan*	1M	69
Sumner	6J	33
Tipton	8C	28
Trousdale	6K	6
Unicol	2M	14
Union*	2J	9
Van Buren*	7L	4
Warren	8K	20
Washington*	2M	52
Wayne*	9F	14
Weakley	6D	29
White	7L	16
Williamson	7H	25
Wilson	6J	25

TOWNS

Name	Key	Pop. Thous.
Alcoa	3J	5
Athens	8N	7
Belle Meade	6H	2
Bolivar	9C	1
Briceville	2H	2
Bristol	1M	14
Brownsville	8C	4
Bruceton	7E	1
Carthage	6K	2
Chattanooga	9L	128
Clarksville	5G	12
Cleveland	9M	11
Clinton	2H	3
Coal Creek	2H	1
Collierville	9B	1
Columbia	8H	11
Cookeville	6L	4
Covington	8B	4
Cowan	9K	1
Crossville	7M	2
Dayton	8M	2
Dickson	6G	4
Dresden	6D	1
Ducktown	5H	1
Dunlap	8L	1
Dyer	7C	1
Dyersburg	7B	10
E. Ridge	9L	3
Elizabethton	1M	9
Englewood	8N and 1H	1
Erwin	2M	3
Etowah	8N and 4H	1
Fayetteville	9J	5
Fountain	2J	3
Franklin	7H	4
Gallatin	6J	5
Greeneville	2L	7
Greenfield	7D	2
Halls	7B	2
Harriman	2G and 7N	6
Hartsville	6K	1
Henderson	8D	2
Humboldt	7D	5
Huntingdon	7E	1
Jackson	8D	24
Jasper	9L	1
Jefferson City	2K	3
Jellico	1H	2
Johnson City	1M	25
Kingsport	1M	11
Knoxville	2J	112
La Follette	1H	4
Lawrenceburg	9G	3
Lebanon	6J	6
Lenoir City	3H	4
Lewisburg	8H	4
Lexington	8E	3
Livingston	6L	2
Lookout Mtn.	9L	1
Loudon	3H and 7N	3
McKenzie	7D	2
McMinnville	8K	5
Manchester	8K	2
Martin	6D	4
Maryville	3J	6
Memphis	9A	293
Milan	7D	3
Morristown	2K	8
Monteroy	6L	2
Mountain City	1N	1
Mt. Pleasant	8G	3
Murfreesboro	7J	9
Nashville	6H	167
Newbern	7C	2
Newport	2K	4
Paris	6E	6
Portland	5J	1
Pulaski	9H	5
Ripley	7B	3
Rockwood	7M	4
Rogersville	1L	2
Savannah	9E	2
Shelbyville	8J	7
Somerville	9B	2
South Fulton	5C	2
South Pittsburg	9K	3
Sparta	7L	3
Springfield	5H	7
Sweetwater	8N and 3H	3
Tiptonville	6B	2
Tracy City	8K	3
Trenton	7L	3
Tullahoma	8J	5
Union City	6C	7
Waverly	7F	1
Whitwell	9L	2
Winchester	9K	3
Woodbury†	7K	7

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

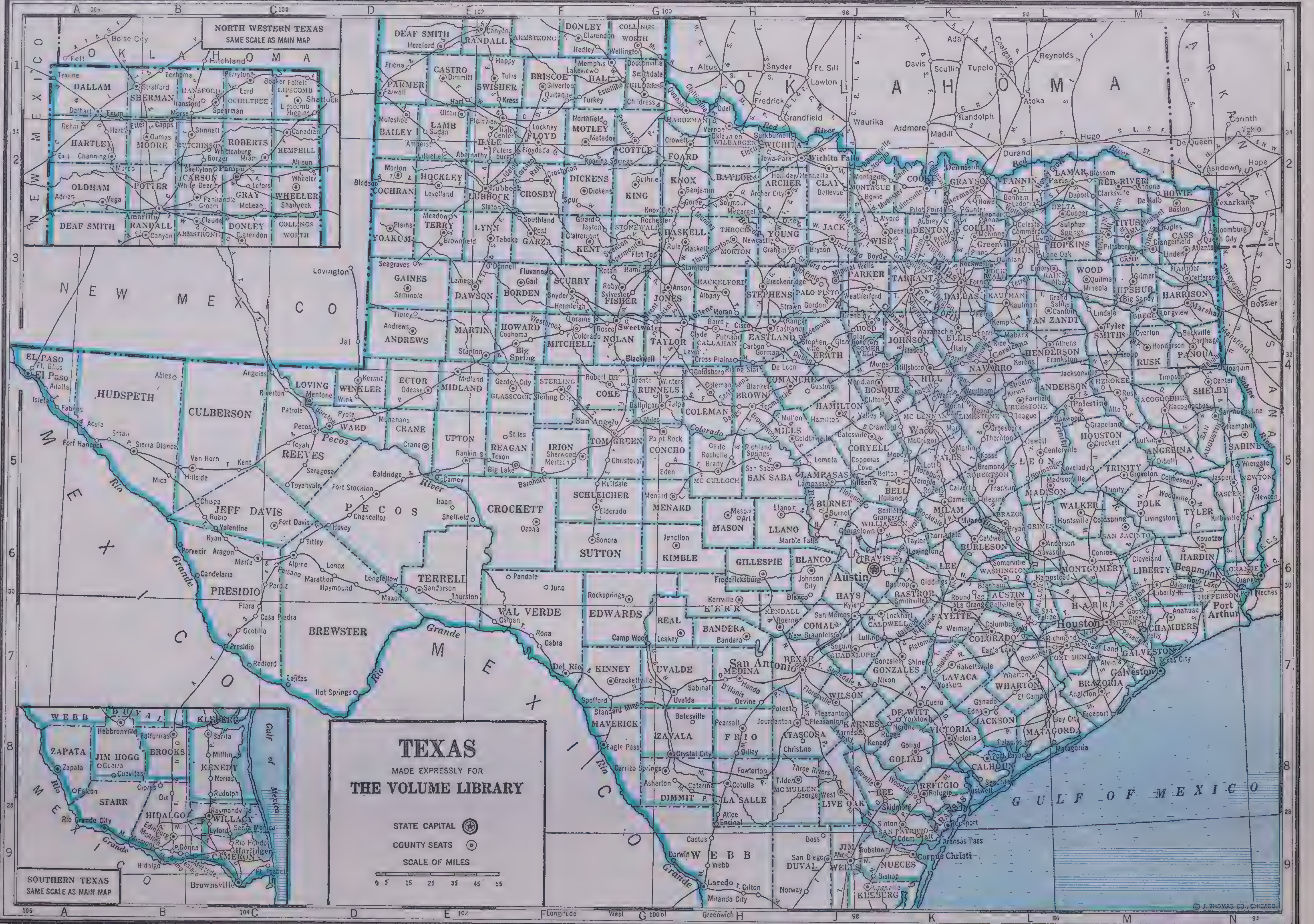
TEXAS

Pop. 6,414,824

COUNTIES

Name	Key	Pop. Thous.
Anderson	4L	37
Andrews*	4D	1
Angelina	5M	32
Aransas	8K	3
Archer	2H	8
Armstrong	1F	2
Atascosa*	8J	19
Austin	6L	17
Bailey*	2D	6
Bandera*	7H	4
Bastrop	6K	22
Baylor	2H	8
Bee	8J	16
Bell	5K	15
Bexar	7J	338
Blanco*	6J	4
Borden*	3F	1
Bosque*	4J	16
Bowie	2M	50
Brazoria	7M	27
Brazos	5L	27
Brewster	6D	6
Briscoe*	1F	4
Brooks	8B	6
Brown	4H	26
Burleson	5K	18
Burnet	5J	11
Caldwell	6J	25
Calhoun	8L	6
Callahan	4H	12
Cameron	9C	83
Camp	3M	10
Carson	2B	7
Cass*	3M	33
Castro*	1E	5
Chambers*	6M	8
Cherokee	4M	44
Childress	1G	12
Clay	2J	13
Cochran	2D	4
Coke*	4G	5
Coleman	4H	21
Collin	3K	47
Collingsworth	3C & 1G	10
Colorado	7L	18
Comal	6J	12
Comanche	4H	19
Concho*	5G	6
Cooke	2K	25
Coryell	5J	20
Cottle	2G	7
Crane	5E	3
Crockett	6F	3
Crosby	2F	10
Culberson*	5B	2
Dallam	1A	6
Dallas	3K	399
Dawson	3E	15
Deaf Smith	3A & 1D	6
Delta	2L	13
Denton	3K	34
De Witt	7K	25
Dickens*	2F	8
Dimmit	8G	9
Donley	3C&1F	7
Duval	9J&8B	21
Eastland	4H	30
Ector	4D	15
Edwards*	6G	3
Ellis	4K	48
El Paso	4A	131
Erath	4J	21
Falls	5K	36
Fannin	2L	41
Fayette	6K	30
Fisher*	3G	13
Floyd	2F	11
Foard	2G	5
Fort Bend	7L	33
Franklin	3M	8
Freestone*	4L	21
Frio	8H	9
Gaines*	3D	8
Galveston	7M	81
Garza	3F	6
Gillespie	6H	11
Glasscock*	4F	1
Goliad	8K	9
Gonzales	7K	26
Gray	2C	24
Grayson	2K	69
Gregg	3M	58
Grimes*	5L	22
Guadalupe	7J	26
Hale	2E	19
Hall	1F	12
Hamilton	4J	13
Hansford*	1B	3
Hardeman	2G	11
Hardin*	6N	16
Harris	6M	529
Harrison	3M	51
Hartley*	2A	3
Haskell	3G	15
Hays	6J	15
Hemphill	2C	4
Henderson	4L	32
Hidalgo	9B	106
Hill	4K	38
Hockley	2E	13
Hood*	4J	7
Hopkins	3L	30
Houston	5M	31
Howard	4F	21
Hudspeth*	5B	3
Hunt	3L	49
Hutchinson*	2B	19
Irion*	5F	2
Jack	3J	10
Jackson	7L	12
Jasper	5N	17
Jeff Davis*	6C	2
Jefferson	6N	145
Jim Hogg	8A	5
Jim Wells	9J	20
Johnson	4K	30
Jones	3G	23
Karnes	7J	19
Kaufman	3L	38
Kendall	6H	5
Kenedy*	8C	7
Kent*	3F	3
Kerr	6H	12
Kimble	6G	5
King*	2G	1
Kinney	7F	5
Kleberg	8C	13
Knox*	2G	10
Lamar	2L	50
Lamb*	2E	18
Lampasas	5J	9
La Salle	8H	8
Lavaca	7K	25
Lee	6K	13
Leon	5L	18
Liberty	6M	25
Limestone	4K	34
Lipscomb*	1C	4
Live Oak*	8J	10
Llano	5H	6
Loving	4C	†3
Lubbock	2E	52
Lynn	3E	12
McCulloch	5H	13
McLennan	4K	102
McMullen*	8J	1
Madison	5L	12
Marion	3M	11
Martin	4E	6
Mason	5H	5
Matagorda	7L	20
Maverick	8G	10
Medina	7H	16
Menard	5G	5
Midland	4E	12
Milam	5K	33
Mills	4H	8
Mitchell	4F	12
Montague*	2J	20
Montgomery	6M	23
Moore*	2B	4
Morris*	3M	10
Motley	2F	5
Nacogdoches	4M	35
Navarro	4K	51
Newton*	5N	14
Nolan	4G	17
Nueces	9K	93
Ochiltree	1C	4
Oldham*	2A	1
Orange	6N	17
Palo Pinto*	3J	18
Panola	4M	23
Parker	3J	20
Parmer*	1D	6
Pecos	6D	8
Polk	5M	21
Potter	2B	54
Presidio	6C	11
Rains*	3L	7
Randall	1E	7
Reagan*	5F	2
Real*	6G	2
Red River	2M	30
Reeves	5C	8
Refugio	8K	10
Roberts*	2C	1
Robertson*	5K	26
Rockwall	3L	7
Runnels	4G	19
Rusk	4M	51
Sabine*	5N	11
San Augustine	4N	12
San Jacinto*	5M	9
San Patricio	8K	28
San Saba	5H	11
Schleicher	5F	3
Scurry	3F	12
Shackelford	3H	6
Shelby	4N	29
Sherman*	1B	2
Smith	4M	69
Somervell*	4J	3
Starr	9A	13
Stephens	3H	12
Sterling*	4F	1
Stonewall*	3G	6
Sutton	6F	4

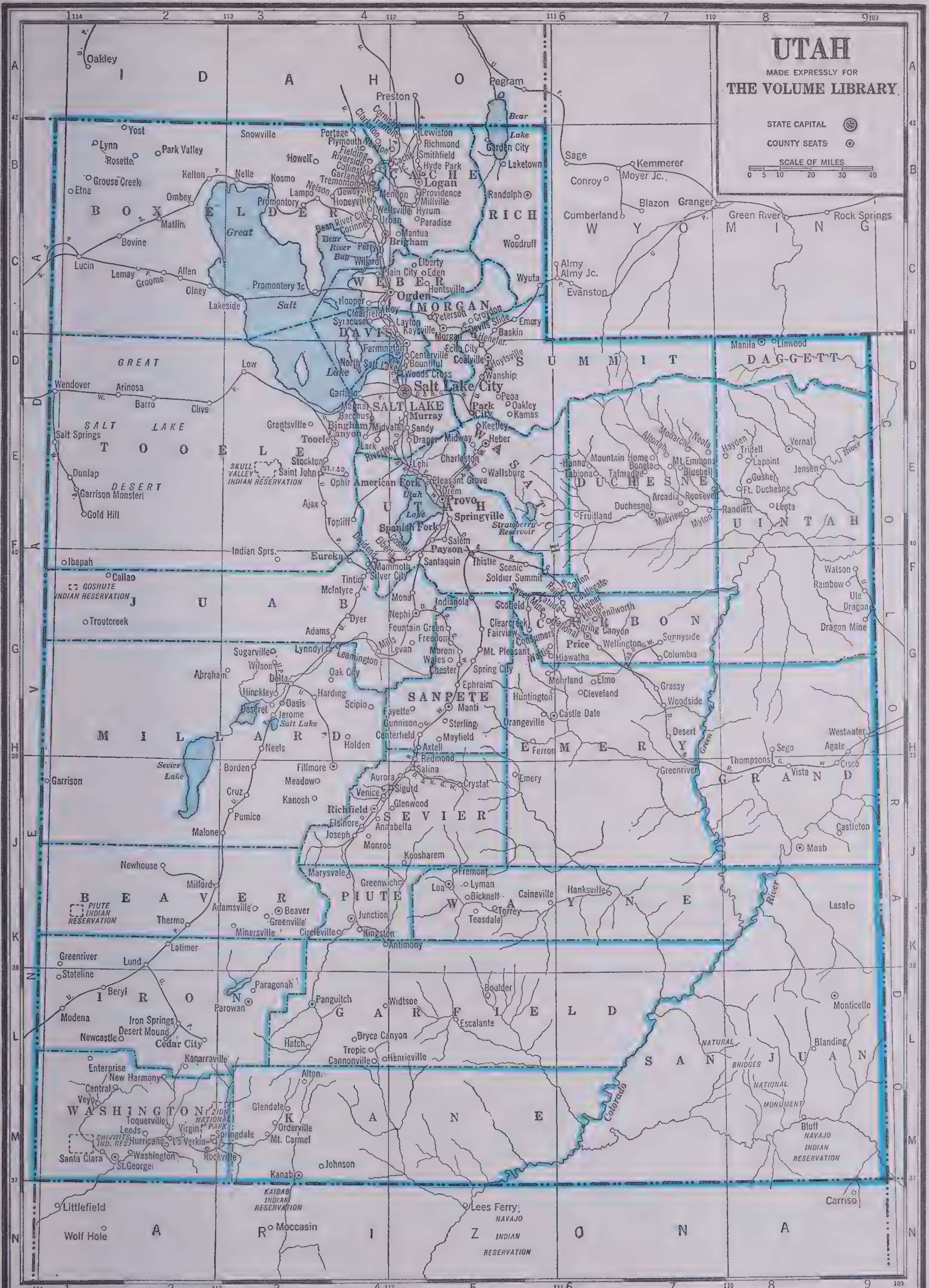
Cont. on p. 2331



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND


UTAH
MADE EXPRESSLY FOR
THE VOLUME LIBRARY
STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 20 30 40
IDAHO
WYOMING
COLORADO
ARIZONA
NEVADA
BOX ELDER
CACHE
RICH
WEBER
MORGAN
DAVIS
SUMMIT
DAGGETT
SALT LAKE
TOOELE
WASATCH
DUCHESNE
UINTAH
UTAH
JUAB
CARBON
SANPETE
EMERY
GRAND
MILLARD
SEVIER
BEAVER
PIUTE
WAYNE
IRON
GARFIELD
SAN JUAN
WASHINGTON
KANE
Great Salt Lake
GREAT SALT LAKE DESERT
Salt Lake City
Ogden
Provo
Logan
Sevier Lake
Utah Lake
Bear Lake
Colorado
Green
SKULL VALLEY INDIAN RESERVATION
GOSHUTE INDIAN RESERVATION
PIUTE INDIAN RESERVATION
SHIVWITS IND. RES.
ZION NATIONAL PARK
NATURAL BRIDGES NATIONAL MONUMENT
NAVAJO INDIAN RESERVATION
KAIBAB INDIAN RESERVATION

UTAH

Pop. 550,310

COUNTIES

Name	Key	Pop. Thous.
Beaver	2K	5
Box Elder	2B	19
Cache	5B	30
Carbon	6G	18
Daggett*	8D	†6
Davis	4D	16
Duchesne*	7E	9
Emery*	6H	7
Garfield	5L	5
Grand*	8H	2
Iron	2L	8
Juab	3G	7
Kane	4M	3
Millard	3H	10
Morgan*	5C	3
Piute*	4K	2
Rich*	6B	2
Salt Lake	4E	212
San Juan*	8L	5
Sanpete	5G	16
Sevier	5H	12
Summit*	6D	9
Tooele	2E	9
Uintah	8E	10
Utah	5F	57
Wasatch	5E	6
Washington	1M	9
Wayne*	6K	2
Weber	4C	57

TOWNS

Name	Key	Pop Thous.
American Fork	4E	3
Bingham Canyon	4E	3
Bountiful	4D	3
Brigham	**4C**	**6**
Cedar City	2L	5
Ephraim	5H	2
Eureka	4F	2
Heber	**5E**	**3**
Helper	6G	3
Hyrum	6B	2
Lehi	4E	3
Logan	**5B**	**12**
Magna	4E	3
Manti	**5H**	**2**
Midvale	4E	3
Mt. Pleasant	5G	2
Murray	4E	6
Nephi	**5G**	**3**
Ogden	**4C**	**44**
Orem	5E	3
Park City	5D	4
Payson	5F	4
Price	**6G**	**5**
Provo	**5E**	**18**
Richfield	**4J**	**4**
St. George	**1M**	**4**
Salt Lake City	**4D**	**150**
Smithfield	5B	2
Spanish Fork	5F	4
Springville	5E	5
Tooele	**4E**	**5**

TEXAS

Texas Counties Cont. from P. 2330

Name	Key	Pop. Thous.
Swisher	1E	7
Tarrant	3K	226
Taylor	4G	44
Terrell	6E	3
Terry	3E	11
Throckmorton	3H	4
Titus	3M	19
Tom Green	5G	39
Travis	6J	111
Trinity	5M	14
Tyler*	5M	12
Upshur	3M	26
Upton*	5E	4
Uvalde	7G	13
Val Verde*	7F	15
Van Zandt*	3L	31
Victoria	7K	24
Walker	5L	20
Waller	6L	10
Ward*	5D	10
Washington	6L	25
Webb	9H & 8A	46
Wharton	7L	36
Wheeler*	2C	12
Wichita	2H	74
Wilbarger	2H	20
Willacy	9C	13
Williamson	5J	42
Wilson	7J	17
Winkler*	4D	6
Wise	3J	19
Wood*	3M	24
Yoakum*	2D	5
Young	3H	19
Zapata*	8A	4
Zavala*	8G	11

TOWNS

Name	Key	Pop. Thous.
Abilene	**3G**	**27**
Alice	**9J**	**8**
Amarillo	**3B**	**52**
Athens	**4L**	**5**
Austin	**6J**	**88**
Ballinger	**4G**	**4**
Bay City	**7L**	**7**
Beaumont	**6N**	**59**
Beeville	**8J**	**7**
Big Spring	**4F**	**13**
Bonham	**2L**	**6**
Borger	2D	10
Breckenridge	**3H**	**6**
Brenham	**6L**	**6**
Brownsville	**9C**	**22**
Brownwood	**4H**	**13**
Bryan	**5L**	**12**
Cameron	**5K**	**5**
Canadian	**2C**	**2**
Canyon	**1E**	**3**
Carthage	**4M**	**2**
Childress	**1G**	**6**
Cisco	3H	5
Cleburne	**3K**	**11**
Coleman	**4H**	**6**
Colorado	**4F**	**5**
Commerce	3L	5
Corpus Christi	**9K**	**57**
Corsicana	**4K**	**15**
Crockett	**5M**	**5**
Crystal City	8G	7
Cuero	**7K**	**5**
Dalhart	**1A**	**5**
Dallas	**3K**	**295**
Del Rio	**7F**	**13**
Denison	2K	16
Denton	**3K**	**11**
Donna	9B	5
Eagle Pass	**8G**	**6**
Eastland	**4H**	**4**
Edinburg	**9B**	**9**
Electra	2H	6
El Paso	**4A**	**97**
Ennis	4K	7
Ft. Worth	**3K**	**178**
Gainesville	**2K**	**10**
Galveston	**7M**	**60**
Goose Creek	6M	7
Graham	**3H**	**5**
Greenville	**3L**	**14**
Harlingen	**9C**	**13**
HighlandPk	3K	10
Hillsboro	**4K**	**8**
Houston	**7M**	**385**
Huntsville	**5L**	**5**
Jacksonville	4M	7
Kerrville	**6H**	**6**
Kingsville	**9J**	**8**
Laredo	**9H**	**39**
Lockhart	**7J**	**5**
Longview	**3M**	**14**
Lubbock	**2E**	**32**
Lufkin	**5M**	**10**
Luling	7J	4
McAllen	9B	12
McKinney	**3K**	**9**
Marlin	**5K**	**7**
Marshall	**3M**	**18**
Memphis	**1G**	**4**
Mercedes	9B	8
Mexia	4K	6
Midland	**4E**	**9**
MineralWells	3J	6
Mission	9B	6
Mt. Pleasant	**2M**	**5**
Mt. Vernon	**3M**	**1**
Nacogdoches	**4M**	**8**
Navasoto	5L	6
New Braunfels	**7J**	**7**
Orange	**6N**	**7**
Palestine	**4L**	**12**
Pampa	**2C**	**13**
Paris	**2L**	**19**
Plainview	**2E**	**9**
PortArthur	7N	46
Quanah	**2G**	**4**
Ranger	3H	2
Robstown	9K	7
San Angelo	**5G**	**26**
San Antonio	**7J**	**254**
San Benito	9C	10
Seguin	**7J**	**7**
Sherman	**2K**	**17**
Sulphur Springs	**3L**	**7**
Sweetwater	**3G**	**10**
Taylor	5K	8
Temple	5K	15
Terrell	3L	10
Texarkana	2N	17
Tyler	**3M**	**28**
University Pk.	3K	14
Uvalde	**7G**	**7**
Vernon	**2H**	**9**
Victoria	**7K**	**12**
Waco	**4K**	**56**
Waxahachie	**3K**	**9**
Weatherford	**3J**	**6**
Weslaco	9B	7
Wichita Falls	**2J**	**45**
Yoakum	7K	5

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

VIRGINIA

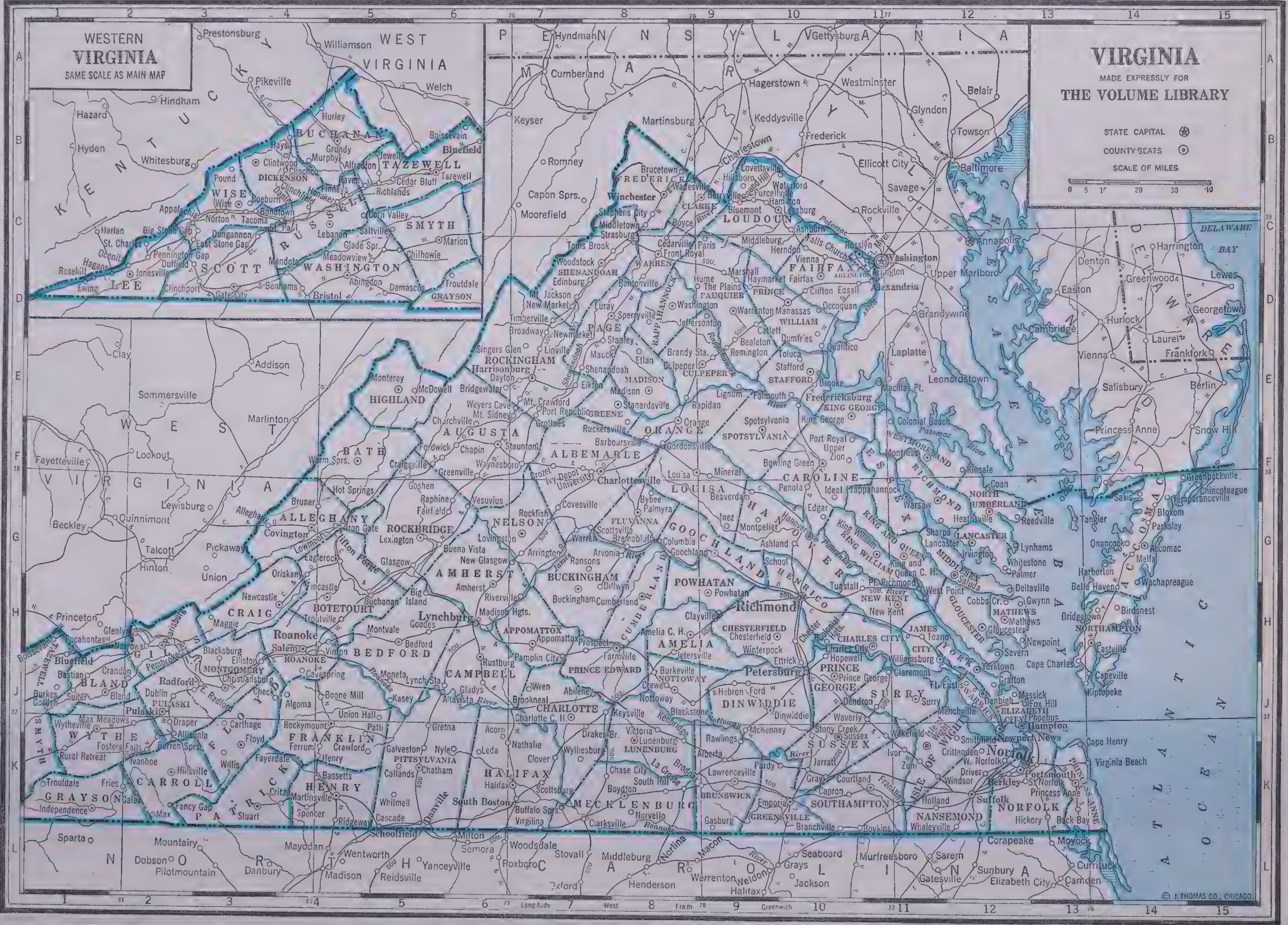
Pop. 2,677,773

COUNTIES

Name	Key	Pop. Thous.
Accomac*	14G	33
Albemarle	7F	27
Alleghany	4G	23
Amelia*	8H	8
Amherst*	6H	20
Appomattox*	7H	9
Arlington*	11D	57
Augusta	6F	42
Bath*	5F	7
Bedford	5H	30
Bland*	2J	7
Botetourt*	5H	16
Brunswick	9K	20
Buchanan*	4B	31
Buckingham*	7H	13
Campbell*	6J	26
Caroline*	10F	14
Carroll*	2K	26
Charles City*	11H	4
Charlotte*	7J	16
Chesterfield*	10H	31
Clarke	9C	7
Craig*	4H	4
Culpeper	9E	13
Cumberland*	8H	8
Dickenson*	4B	21
Dinwiddie*	9J	18
Elizabeth City	12J	32
Essex*	11F	7
Fairfax*	10D	41
Fauquier	9D	21
Floyd*	3K	12
Fluvanna*	8G	7
Franklin	4J	25
Frederick	8B	14
Giles*	2H	14
Gloucester*	12H	10
Goochland*	9G	8
Grayson*	1K and 6D	22
Greene*	8E	5
Greensville	10K	15
Halifax*	6K	41
Hanover*	10G	18
Henrico	10H	42
Henry	4K	26
Highland*	5E	5
Isle of Wright*	11K	13
James City	11H	5
King and Queen*	11G	7
King George*	10E	5
King William*	11G	8
Lancaster*	12G	9
Lee*	2D	39
Loudoun	10C	20
Louisa*	9F	14
Lunenburg*	8J	14
Madison*	8E	8
Mothews*	12H	7
Mecklenburg*	8K	32
Middlesex*	12G	7
Montgomery	3J	21
Nansemond	12K	23
Nelson*	7G	16
New Kent*	11H	4
Norfolk	13K	35
Northampton*	14H	18
Northumberland*	12F	10
Nottoway*	8J	16
Orange	9F	13
Page	8D	15
Patrick	3L	17
Pittsylvania	5K	62
Powhatan*	9H	6
Prince Edward	8J	15
Prince George*	10J	12
Princess Anne*	13K	20
Prince William	10D	18
Pulaski	2J	23
Rappahannock	8D	7
Richmond*	11F	7
Roanoke	4H	13
Rockbridge	5G	22
Rockingham	7E	31
Russell*	4C	27
Scott	3D	27
Shenandoah	7C	21
Smyth	6C & 1K	29
Southampton*	11K	26
Spotsylvania*	9F	10
Stafford*	10E	10
Surry*	11J	6
Sussex*	10K	12
Tazewell	1J & 6B	12
Warren	8C	11
Warwick*	12J	9
Washington	5D	38
Westmoreland*	11F	10
Wise	3B	52
Wythe	2K	23
York*	12H	9

TOWNS

Name	Key	Pop. Thous.
Abingdon	**5D**	**3**
Alexandria	11D	31
Altavista	6J	3
Appalachia	3C	3
Bedford	**5H**	**4**
Big Stone Gap	3C	4
Blackstone	8J	3
Bluefield	1J	4
Bristol	4D	10
Buena Vista	6G	4
Cape Charles	13H	2
Charlottesville	**7F**	**19**
Chincoteague	15F	2
Clifton Forge	5G	6
Colonial Hts.	9H	3
Covington	**4G**	**6**
Crewe	8J	2
Culpeper	**9E**	**2**
Danville	5K	33
East Radford	3J	7
Emporia	**10K**	**3**
Falls Church	11C	3
Farmville	**8J**	**3**
Franklin	11K	3
Fredericksburg	10E	10
Fries	2K	2
Front Royal	**8C**	**4**
Galax	2K	3
Hampton	**12J**	**6**
Harrisonburg	**7E**	**9**
Hopewell	10H	9
Lexington	**5G**	**4**
Lynchburg	6H	45
Marion	**6C**	**5**
Martinsville	**4K**	**10**
Newport News	12J	37
Norfolk	13K	144
Norton	3C	4
Petersburg	10H	31
Phoebus	12J	4
Pocahontas	1J	3
Portsmouth	**13K**	**51**
Pulaski	**2J**	**9**
Radford	3J	7
Richmond	**10H**	**193**
Roanoke	4H	69
Salem	**4H**	**6**
Saltville	5C	3
South Boston	6K	5
South Norfolk	13K	8
Staunton	**6F**	**13**
Suffolk	**12K**	**11**
Vinton	4H	3
Waynesboro	7F	7
Williamsburg	**11H**	**4**
Winchester	**8B**	**12**
Wytheville	**2K**	**5**


VIRGINIA
MADE EXPRESSLY FOR
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STATE CAPITAL
COUNTY SEATS
SCALE OF MILES
0 5 10 20 30 40
WESTERN VIRGINIA
SAME SCALE AS MAIN MAP
© J. THOMAS CO., CHICAGO.
ATLANTIC OCEAN
CHESAPEAKE BAY
DELAWARE BAY
PENNSYLVANIA
MARYLAND
DELAWARE
WEST VIRGINIA
KENTUCKY
NORTH CAROLINA
Richmond
Washington

† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

WASHINGTON

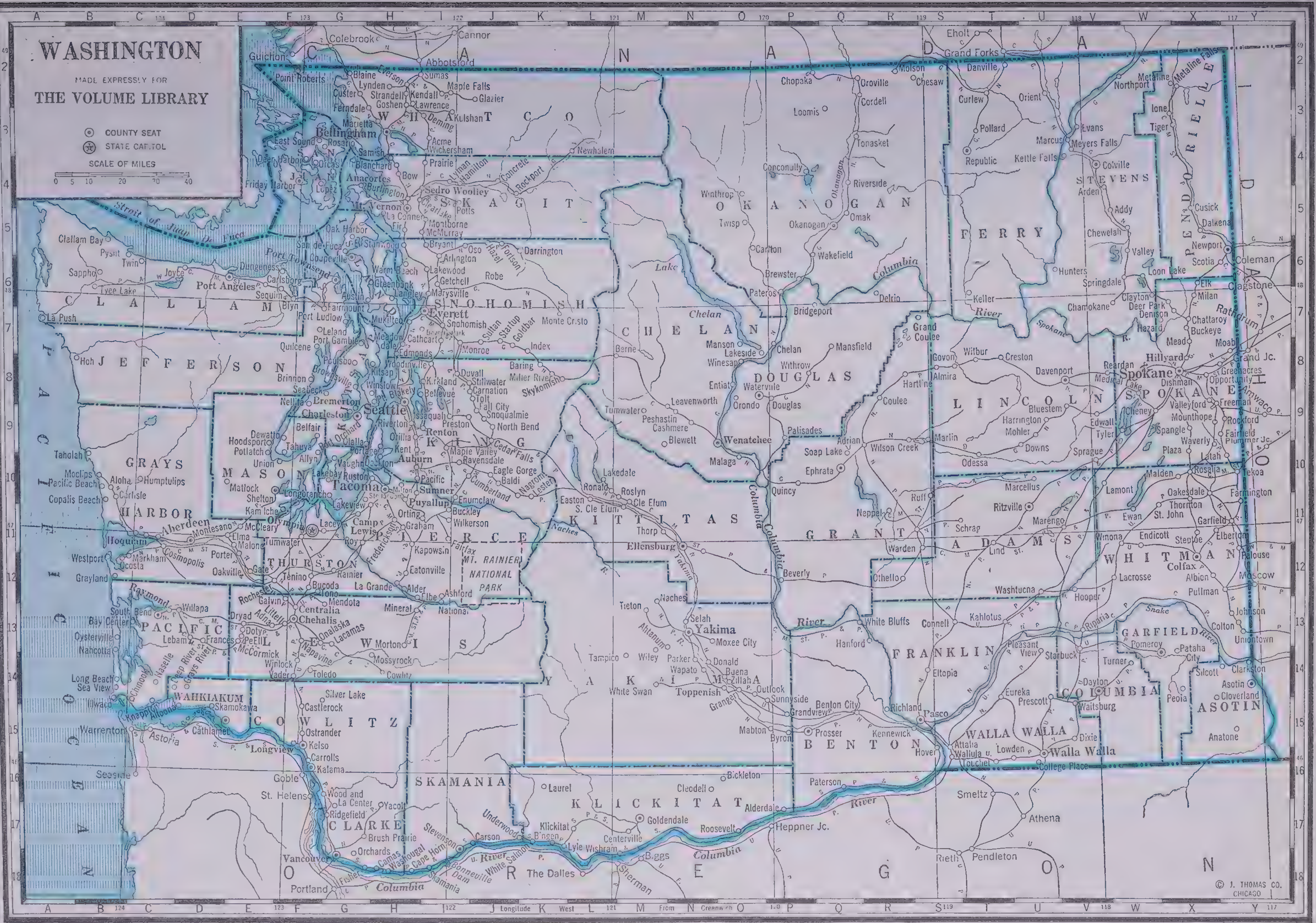
Pop. 1,736,191

COUNTIES

Name	Key	Pop. Thous.
Adams	11U	6
Asotin*	14Y	8
Benton	15Q	12
Chelan	8O	34
Clallam	6E	22
Clark	17G	50
Columbia	14V	6
Cowlitz	15G	40
Douglas	8P	9
Ferry	4T	5
Franklin	14S	6
Garfield	13X	3
Grant	10Q	15
Grays Harbor	11C	53
Island*	6G	6
Jefferson	7D	9
King	8I	505
Kitsap	8G	44
Kittitas	11M	20
Klickitat	17M	11
Lewis	13G	41
Lincoln*	8U	11
Mason	9F	12
Okanogan	4P	25
Pacific	13D	16
Pend Oreille	5X	7
Pierce	11I	182
San Juan*	4F	3
Skagit	4I	38
Skamania*	17J	5
Snohomish	7I	89
Spokane	8X	165
Stevens	11G	19
Thurston	11G	37
Wahkiakum*	11E	4
Walla Walla	15U	31
Whatcom	2H	60
Whitman	11X	27
Yakima	13N	99

TOWNS

Name	Key	Pop. Thous.
Aberdeen	11D	19
Algona	10H	1
Anacortes	4H	6
Arlington	5I	1
Asotin	14Y	†7
Auburn	10I	4
Bellevue	8I	1
Bellingham	3H	29
Beverly Park	7I	1
Black Diamond	10I	1
Blaine	2G	1
Bothell	8I	†8
Bremerton	9G	15
Buckley	10I	1
Bucoda	12F	†5
Burlington	4H	2
Camas	18H	4
Cashmere	9N	1
Castle Rock	11F	1
Cathlamet	15E	†6
Centralia	12F	8
Chehalis	13F	5
Chelan	7P	2
Cheney	9W	2
Chewelah	5W	2
Clarkston	14Y	3
Cle Elum	10M	2
Colfax	12X	3
College Place	16U	1
Colville	4V	2
Concrete	4J	†9
Cosmopolis	11D	1
Coupeville	6G	†3
Davenport	8U	1
Dayton	14V	3
Deer Park	7X	1
Des Moines	9H	†6
Eatonville	12H	1
Edmonds	8H	1
Ellensburg	11N	6
Elma	11E	1
Enumclaw	10I	3
Ephrata	10Q	1
Everett	7I	30
Ferndale	2H	†7
Friday Harbor	4F	†7
Garfield	11X	†7
Goldendale	17M	2
Grand Coulee	11P	4
Grandview	15P	1
Granger	13O	†8
Greenacres	8X	1
Hoquiam	11C	11
Kalama	16G	1
Kelso	15F	7
Kennewick	15R	2
Kent	9I	3
Kirkland	8I	2
Lacey	11G	†6
LaConner	5H	†6
Leavenworth	9M	1
Lind	12T	†7
Longview	15F	12
Lynden	2H	2
Marcus	4U	†4
Marysville	6I	2
Medical Lake	8W	2
Milton	10H	†7
Monroe	7I	2
Montesano	11D	2
Mount Vernon	5I	4
Newport	6Y	1
N. Bend	9J	†6
Oakesdale	11X	†6
Odessa	10T	†8
Okanogan	5Q	2
Olympia	11G	13
Omak	5Q	3
Oroville	2O	1
Orting	11I	1
Palouse	11Y	1
Pasco	15R	4
Pe Ell	13E	†9
Pinehurst	7I	1
Pomeroy	13X	2
Port Angeles	6E	9
Port Orchard	9G	2
Port Townsend	6G	5
Prosser	15Q	2
Pullman	12Y	4
Puyallup	10I	8
Raymond	13C	4
Renton	9I	4
Republic	4S	†9
Ridgefield	17G	†6
Ritzville	11U	2
Rosalia	10X	†6
Roslyn	10M	2
Ruston	10H	†7
Seattle	8H	368
Sedro Woolley	4I	3
Selah	13N	1
Shelton	10F	4
Skykomish	8K	†5
Snohomish	7I	3
Snoqualmie	9J	†8
South Bend	13D	2
Spokane	8X	122
Sprague	10V	†6
Stanwood	5H	†6
Steilacoom	10G	†8
Stevenson	17J	†6
Sultan	7G	1
Sumas	2H	†6
Sumner	10I	2
Sunnyside	14O	2
Tacoma	10H	109
Tekoa	10Y	1
Tenino	12F	1
Toppenish	14O	4
Tumwater	11F	1
Vancouver	17G	18
Waitsburg	14V	†9
Walla Walla	15U	18
Wapato	14N	1
Washougal	18H	1
Waterville	8O	†9
Wenatchee	9O	12
White Salmon	17K	1
Woodland	16G	1
Yakima	13N	27
Zillah	14O	†8



† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

WEST VIRGINIA

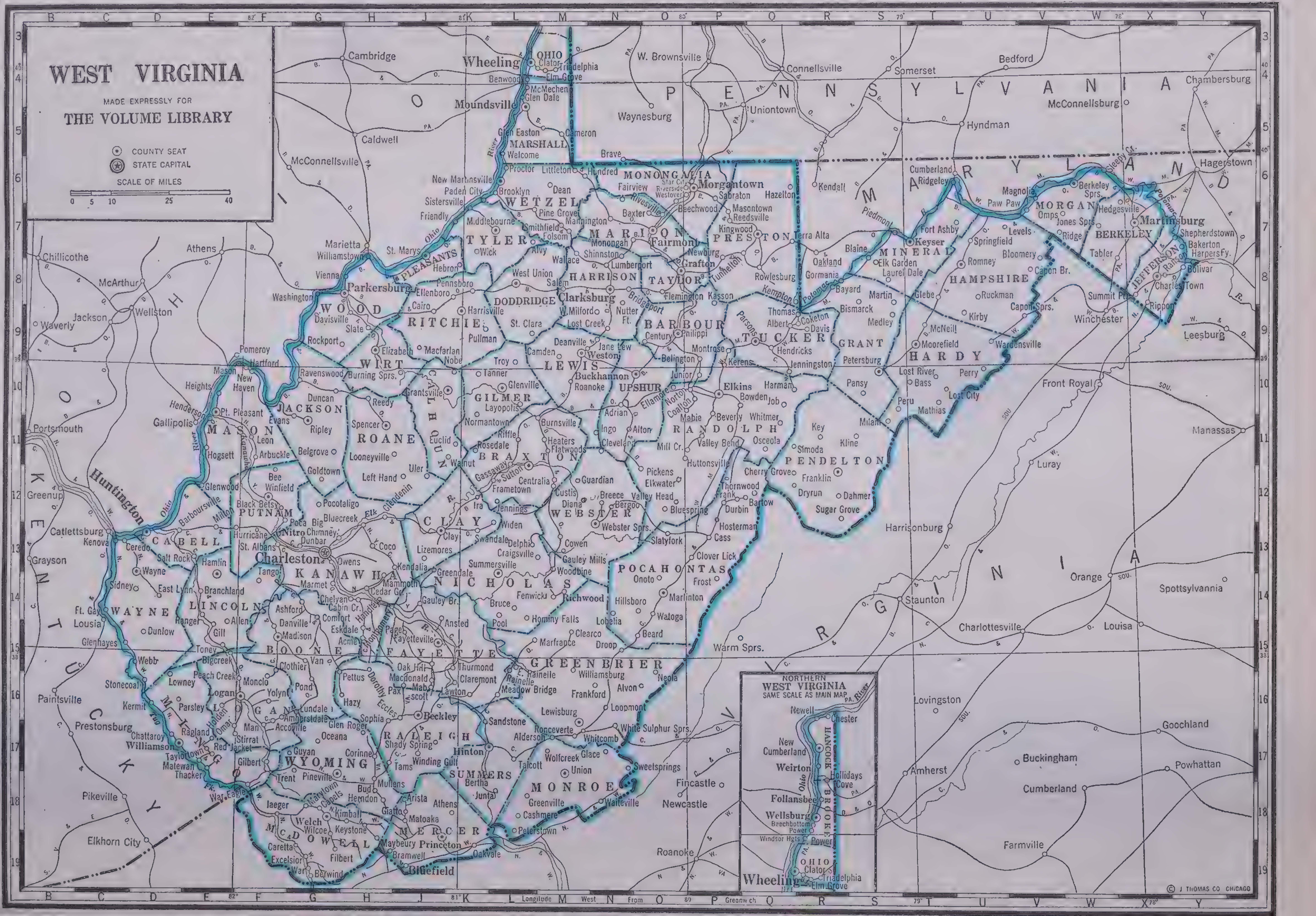
Pop. 1,901,974

COUNTIES

Name	Key	Pop. Thous.
Barbour	9O	20
Berkeley	7W	29
Boone	15F	29
Braxton	11L	22
Brooke	18R	26
Cabell	13C	97
Calhoun	10J	12
Clay*	13J	15
Doddridge	8L	11
Fayette	15K	81
Gilmer*	10L	12
Grant	10R	9
Greenbrier	16M	39
Hampshire	8U	13
Hancock	16R	32
Hardy*	9T	11
Harrison	8N	83
Jackson*	11G	17
Jefferson	8X	17
Kanawha	13G	196
Lewis	10M	22
Lincoln*	14E	23
Logan	16F	68
McDowell	19G	94
Marion	7N	69
Marshall	5L	40
Mason	10E	22
Mercer	19J	68
Mineral	7S	22
Mingo	17D	41
Monongalia	6O	51
Monroe*	18M	14
Morgan	6W	9
Nicholas*	14L	24
Ohio	4L & 19R	73
Pendleton*	12R	11
Pleasants	7J	7
Pocahontas	14O	14
Preston	7P	30
Putnam*	12F	20
Raleigh	17J	87
Randolph	10P	30
Ritchie	9J	15
Roane	11H	21
Summers	17L	20
Taylor	8O	20
Tucker	9Q	13
Tyler*	7K	13
Upshur	10N	18
Wayne*	14D	36
Webster*	12M	18
Wetzel	6L	22
Wirt*	9H	6
Wood	8G	62
Wyoming*	17G	30

TOWNS

Name	Key	Pop. Thous.
Alderson	17L	1
Ansted	14J	1
Barboursville	12E	2
Beckley	**16J**	**13**
Belington	9O	2
Benwood	4L	4
Berkeley Springs	**6W**	**1**
Bluefield	19J	21
Bramwell	19J	1
Bridgeport	8N	2
Buckhannon	**10N**	**4**
Cameron	5M	2
Cedar Grove	14H	1
Ceredo	13C	1
Charleston	**13G**	**68**
Charles Town	**8X**	**3**
Chester	16R	4
Clarksburg	**8N**	**31**
Clay	**13J**	**†5**
Clendenin	12H	1
Davis	9R	1
Dunbar	13G	5
East Rainelle	15L	2
Elizabeth	**9H**	**†7**
Elkins	**10P**	**8**
Eskdale	14H	1
Fairmont	**7O**	**23**
Fayetteville	**15J**	**1**
Follansbee	18R	5
Franklin	**12R**	**†4**
Gassaway	11L	1
Glendale	4L	1
Glen Jean	16J	1
Glenville	**10L**	**†6**
Grafton	**8O**	**7**
Grantsville	**10J**	**1**
Hamlin	**13E**	**†8**
Harrisville	**9K**	**1**
Hinton	**17K**	**6**
Holden	16E	4
Hollidays Cove	17R	6
Huntington	**13C**	**79**
Hurricane	12E	1
Iaeger	18F	1
Kenova	13C	4
Keyser	**7T**	**6**
Keystone	18H	3
Kimball	19G	2
Kingwood	**7P**	**2**
Lewisburg	**16M**	**1**
Logan	**16F**	**5**
Lumberport	8N	1
McMechen	4L	4
Mabscott	16J	1
Madison	**15F**	**1**
Mannington	7N	3
Marfrance	15M	1
Marlinton	**14O**	**2**
Marmet	13G	2
Martinsburg	**7W**	**15**
Middlebourne	**7K**	**†7**
Milton	12E	2
Monongah	7N	2
Montgomery	14J	3
Moorefield	**9T**	**†7**
Morgantown	**6O**	**17**
Moundsville	**4L**	**14**
Mt. Hope	15J	2
Mullens	17H	3
New Cumberland	**16R**	**2**
Newell	16R	1
New Martinsville	**6K**	**3**
Nitro	13F	3
Nutter Ft.	8N	2
Oak Hill	15J	3
Paden City	6K	2
Parkersburg	**8G**	**30**
Parsons	**9P**	**2**
Pennsboro	8K	2
Petersburg	**10S**	**1**
Philippi	**9O**	**2**
Piedmont	7S	3
Pineville	**17G**	**†4**
Point Pleasant	**10E**	**4**
Princeton	**19J**	**7**
Richwood	14M	5
Ridgeley	6T	2
Ripley	**11G**	**†8**
Rivesville	7O	2
Romney	**8T**	**2**
Ronceverte	16M	2
Rowlesburg	8Q	1
Sabraton	6P	2
St. Albans	13F	4
St. Marys	**7J**	**2**
Salem	8M	3
Shinnston	8N	3
Sistersville	6K	3
S. Charleston	13G	10
Spencer	**11H**	**2**
Summersville	**14L**	**†6**
Sutton	**11L**	**1**
Terra Alta	7Q	1
Thomas	9Q	1
Union	**18M**	**†3**
Vienna	8G	2
War	19G	1
Wayne	**14D**	**†8**
Webster Springs	**12M**	**†9**
Weirton Heights	17R	2
Welch	**18G**	**6**
Wellsburg	**18R**	**6**
Weston	**9M**	**8**
Westover	6P	2
West Union	**8L**	**1**
Wheeling	**4L & 19R**	**61**
White Sulphur Springs	16N	2
Williamson	**17D**	**9**
Williamstown	7H	2
Winfield	**12F**	**†3**



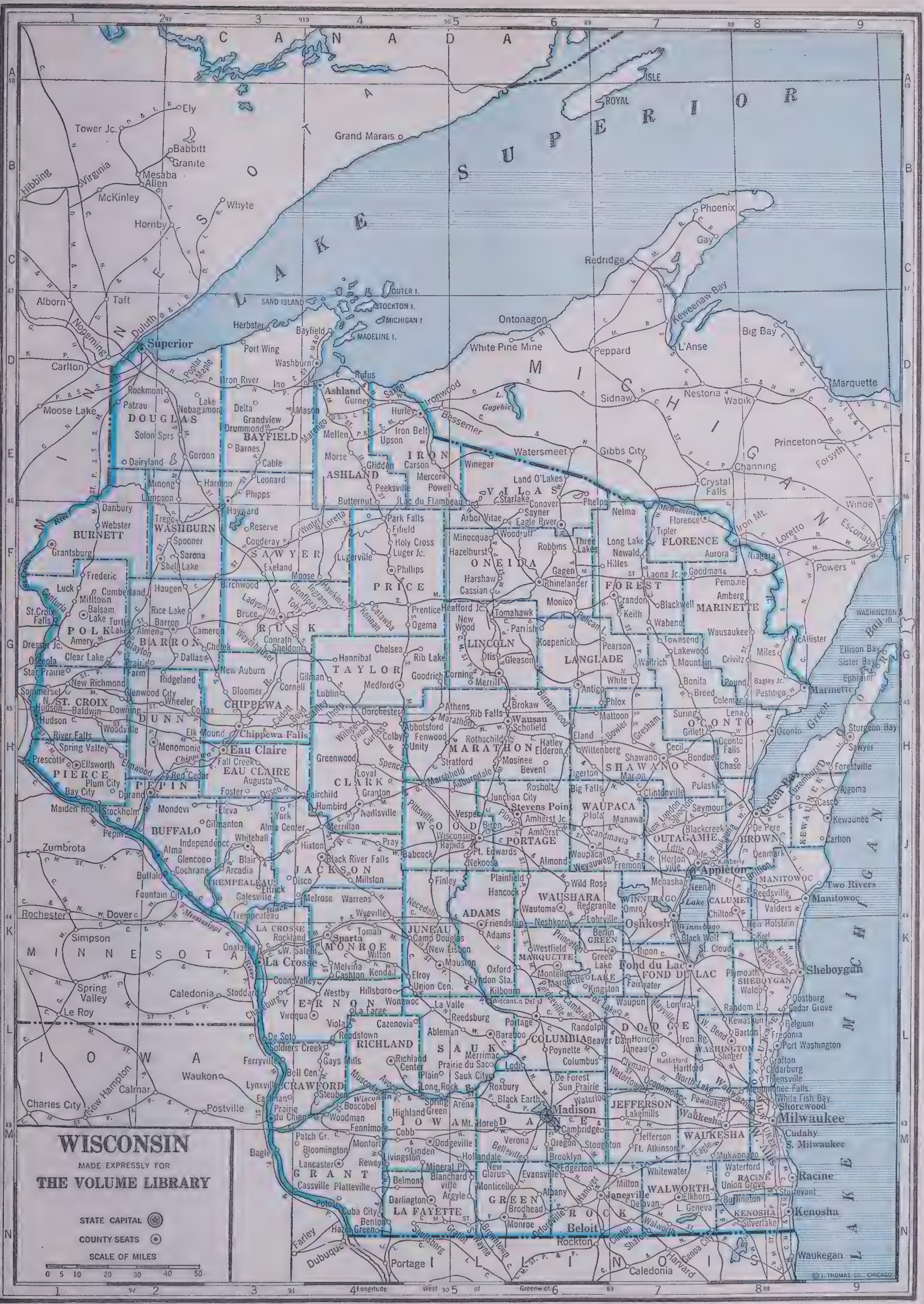
† POP. SHOWN IN HUNDREDS.

COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.

*POP. OF COUNTY SEAT BELOW ONE THOUSAND

WIS-CONSIN

Pop. 3,139,587



COUNTIES

Name	Key	Pop. Thous.
Adams*	5K	8
Ashland	4E	22
Barron	2G	34
Bayfield	3D	16
Brown	8J	83
Buffalo	2J	16
Burnett*	1F	11
Calumet	8K	18
Chippewa	3G	41
Clark	4H	34
Columbia	6L	33
Crawford	4M	18
Dane	6M	131
Dodge	7L	54
Door	9H	19
Douglas	2E	47
Dunn	2H	27
Eau Claire	3H	47
Florence	7F	4
Fond du Lac	7K	62
Forest	7F	12
Grant	4N	41
Green	5N	23
Green Lake*	6K	14
Iowa	5M	21
Iron	5E	10
Jackson	4J	17
Jefferson	7M	39
Juneau	5K	19
Kenosha	8N	64
Kewaunee	9J	17
La Crosse	3K	60
Lafayette	5N	19
Langlade	6G	23
Lincoln	5G	23
Monitowoc	9K	62
Marathon	5H	76
Marinette	8G	36
Marquete	6K	9
Milwaukee	8M	767
Monroe	4K	30
Oconto	7H	27
Oneida	6F	19
Outagamie	7J	70
Ozaukee	8L	19
Pepin	2H	8
Pierce	1H	21
Polk*	1G	26
Portage	6J	36
Price*	4F	18
Racine	8M	94
Richland	4L	20
Rock	6N	80
Rusk	3G	18
St. Croix	1H	25
Sauk	5L	34
Sawyer	3E	12
Shawano	7H	35
Sheboygan	8K	76
Taylor	4G	20
Trempealeau*	3J	24
Vernon	3L	30
Vilas	6E	9
Walworth	7N	33
Washburn*	2F	12
Washington	8L	28
Waukesha	8M	63
Waupaca	6J	35
Waushara	6K	14
Winnebago	7K	81
Wood	5J	44

TOWNS

Name	Key	Pop. Thous.
Algoma	9H	3
Alma	**2J**	**1**
Antigo	**6G**	**9**
Appleton	**7J**	**28**
Ashland	**4D**	**11**
Balsam Lake	**1G**	**†5**
Baraboo	**5L**	**6**
Barron	**2G**	**2**
Beaver Dam	7L	10
Beloit	6N	25
Berlin	6K	4
Black River Falls	**4J**	**3**
Burlington	8M	4
Cedarburg	8L	2
Chilton	**8K**	**2**
Chippewa Falls	**3H**	**10**
Clintonville	7H	4
Columbus	6L	3
Crandon	**6F**	**2**
Cudahy	8M	10
Darlington	**5N**	**2**
Delavan	7N	3
De Pere	8J	6
Dodgeville	5M	2
Durand	**2H**	**2**
Eagle River	**6F**	**1**
Eau Claire	**3H**	**31**
Edgerton	6M	3
Elkhorn	**7M**	**2**
Ellsworth	**1H**	**1**
Evansville	6M	2
Florence	**7F**	**1**
Fond du Lac	**7K**	**27**
Fort Atkinson	7M	6
Friendship	**5K**	**†5**
Grantsburg	**1F**	**†9**
Green Bay	**8J**	**46**
Green Lake	**6K**	**†7**
Hartford	8L	4
Hayward	**3E**	**2**
Horicon	7L	2
Hudson	**1H**	**3**
Hurley	**5D**	**3**
Janesville	**6M**	**23**
Jefferson	**7M**	**3**
Juneau	**7L**	**1**
Kaukauna	8J	7
Kenosha	**2N**	**49**
Kewaunee	**9J**	**2**
Kimberly	7J	2
La Crosse	**3K**	**43**
Ladysmith	**3G**	**4**
Lake Geneva	7N	3
Lake Mills	7M	2
Lancaster	**4M**	**3**
Little Chute	7J	3
Madison	**6M**	**67**
Manitowoc	**9K**	**24**
Marinette	**9G**	**14**
Marshfield	5H	10
Mauston	**5K**	**3**
Mayville	7L	3
Medford	**4G**	**2**
Menasha	7J	10
Menomonie	**2H**	**7**
Merrill	**5G**	**9**
Milwaukee	**8M**	**587**
Mineral Pt.	5M	2
Monroe	**6N**	**6**
Montello	**6K**	**1**
Neenah	7J	10
Neillsville	**4J**	**3**
Nekoosa	5J	2
New London	7J	5
New Richmond	1G	2
Niagara	8F	2
Oconomowoc	7M	5
Oconto	**8H**	**5**
Oconto Falls	8H	2
Oshkosh	**7K**	**39**
Park Falls	4F	3
Peshtigo	8G	2
Phillips	**4F**	**2**
Platteville	4M	5
Plymouth	8K	4
Portage	**6L**	**7**
Port Washington	**8L**	**4**
Prairie du Chien	**3M**	**5**
Racine	**8M**	**67**
Reedsburg	5L	4
Rhinelander	**6F**	**6**
Rice Lake	2G	6
Richland Center	**4L**	**4**
Ripon	7K	5
River Falls	1H	3
Shawano	**7H**	**6**
Sheboygan	**9K**	**41**
Sheboygan Falls	9K	3
Shell Lake	**2F**	**†9**
Shorewood	8M	15
S. Milwaukee	8M	11
Sparta	**4K**	**6**
Spooner	2F	3
Stanley	3H	2
Stevens Point	**5J**	**16**
Stoughton	6M	5
Sturgeon Bay	**9H**	**5**
Superior	**2D**	**35**
Tomah	4K	4
Tomahawk	5G	3
Two Rivers	9J	10
Viroqua	**4L**	**4**
Washburn	**4D**	**2**
Watertown	7L	11
Waukesha	**8M**	**17**
Waupaca	**6J**	**7**
Waupun	7L	7
Wausau	**6H**	**27**
Wautoma	**6K**	**1**
Wauwatosa	8L	28
West Allis	8M	36
West Bend	**8L**	**5**
White Fish Bay	8M	10
Whitehall	**3J**	**1**
Whitewater	7M	1
Wisconsin Rapids	**5J**	**11**

POP. SHOWN IN HUNDREDS. COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX. *POP. OF COUNTY SEAT BELOW ONE THOUSAND

WYOMING

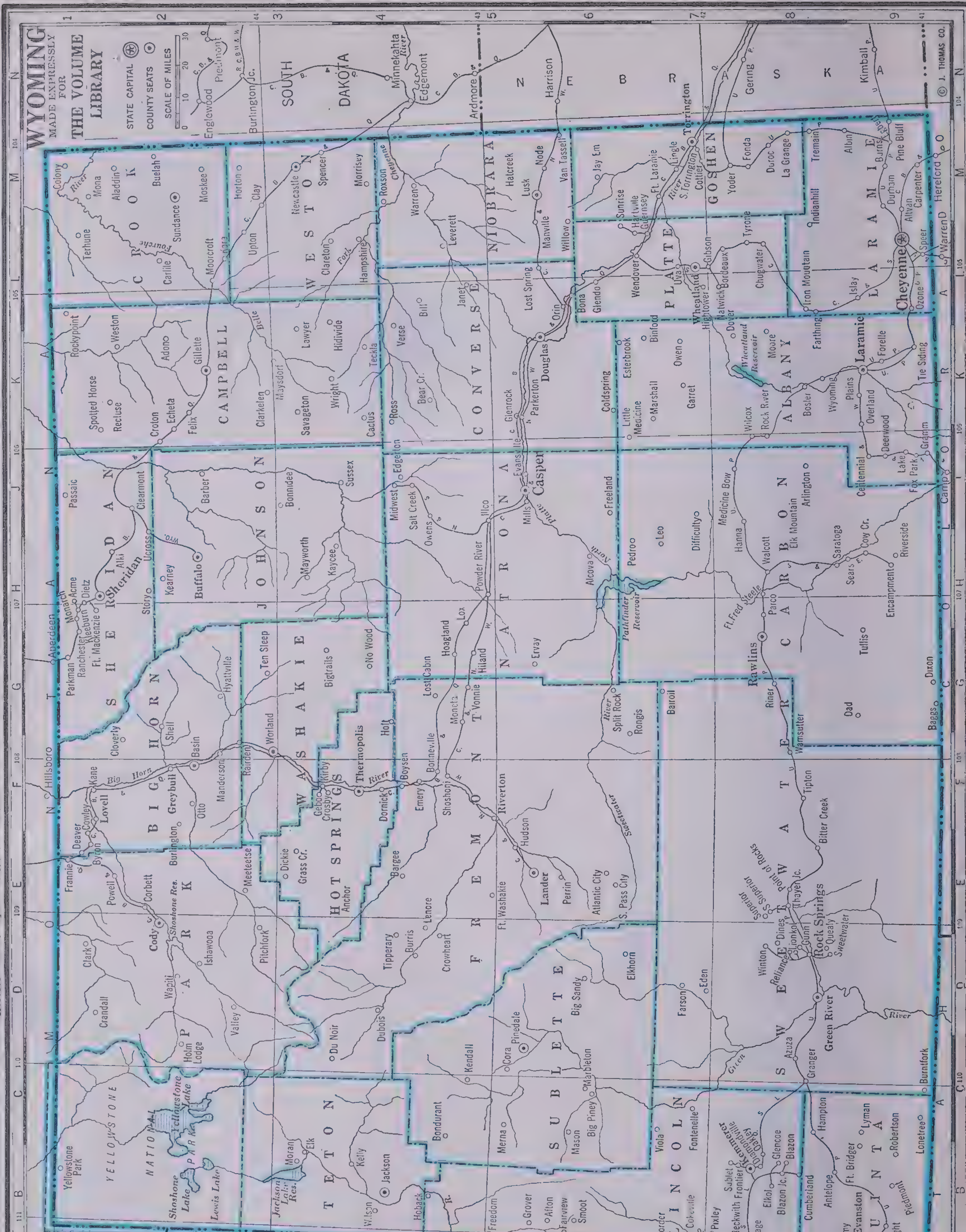
Pop. 250,742

COUNTIES

Name	Key	Pop. Thous.
Albany	8K	11
Big Horn	2F	13
Campbell	2K	6
Carbon	8H	13
Converse	5K	7
Crook*	2M	5
Fremont	5E	16
Goshen	7M	12
Hot Springs	3F	5
Johnson	3H	5
Laramie	9L	34
Lincoln	7B	10
Natrona	5H	24
Niobrara	5M	6
Park	2D	11
Platee	7L	8
Sheridan	1H	19
Sublette*	5C	3
Sweetwater	8E	19
Teton	3B	3
Uinta	9B	7
Washakie	3F	6
Weston	3M	5
Yellowstone National Park (Part in Wyoming)	2B	†4

TOWNS

Nome	Key	Pop. Thous.
Afton	5B	1
Basin	**2F**	**1**
Buffalo	**2H**	**2**
Casper	**5J**	**18**
Cheyenne	**9L**	**22**
Cody	**2D**	**3**
Diamondville	8B	†6
Douglas	**5K**	**2**
Evanston	**9B**	**4**
Fort Washakie	5E	1
Freedom	5B	1
Frontier	7B	†8
Gebo	2K	†9
Gillette	**2K**	**2**
Glenrock	5K	1
Green River	**8D**	**3**
Greybull	2F	2
Hanna	7J	1
Jackson	**4B**	**1**
Kemmerer	**8B**	**2**
Kleenburn	1H	1
Lander	**5E**	**3**
Laramie	**9K**	**11**
Lovell	1F	2
Lusk	**5M**	**2**
Midwest	4J	1
Newcastle	**3M**	**2**
Parco	8H	†6
Parkerton	5K	†5
Pine Bluff	9N	†7
Pinedale	**5C**	**†6**
Powell	1E	2
Rawlins	**8G**	**6**
Reliance	8E	†8
Riverton	5E	3
Rock Springs	8D	10
Saratoga	8H	†8
Sheridan	**1H**	**11**
Sundance	**2M**	**†7**
Sunrise	7L	†9
Superior	8E	1
Thermopolis	**4F**	**2**
Torrington	**7M**	**2**
Wheatland	**7L**	**2**
Worland	**3F**	**3**


WYOMING
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COUNTY SEATS
SCALE OF MILES
0 10 20 30
SOUTH DAKOTA
NEBRASKA
IDAHO
MONTANA
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UTAH
CROOK
WESTON
CAMPBELL
NIOBRARA
CONVERSE
GOSHEN
PLATTE
LARAMIE
ALBANY
SHERIDAN
JOHNSON
NATRONA
CARBON
BIG HORN
WASHAKIE
HOT SPRINGS
PARK
FREMONT
YELLOWSTONE NATIONAL PARK
TETON
SUBLETTE
LINCOLN
SWEETWATER
UINTA
Cheyenne
Casper
Laramie
Rawlins
Rock Springs
Sheridan
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† POP. SHOWN IN HUNDREDS.   COUNTY SEATS SHOWN IN **Heavy-Face** TYPE IN MARGINAL INDEX.   *POP. OF COUNTY SEAT BELOW ONE THOUSAN

ANALYTICAL INDEX

HOW TO USE THE VOLUME LIBRARY INDEX

This index with more than 65,000 references will help you to find any subject in THE VOLUME LIBRARY with the least amount of effort and time. THE VOLUME LIBRARY is a tool for you to use in your studies; this Index makes it a tool you can use quickly and easily.

The Index gives the page number for each topic and tells besides in which column of the page to look. After a page number the letter *a* refers you to the first column, *b* to the second column; *c* to the third column, and so forth.

To be sure that you can find just what you want, the Index attempts to list each reference under the several different headings to which one might naturally turn.

For example, if you wanted to know about recent social legislation, would you look in the index for *social security*, for *security*, for *insurance*, for *unemployment insurance*, for *old-age pensions*, for the *Fair Labor Standards Act* or for *labor legislation?* No matter which phrase occurs to you, the Index gives you under all these entries a listing of the pages where this subject is treated.

As a further aid, the Index contains certain broad classifications where all related subjects are listed. Under *agriculture*, for instance, you will find the page number for every pertinent fact about agriculture and for the agricultural resources of every important country. Besides this, the Index lists separately in its proper alphabetical order every branch of the whole subject of agriculture, each crop, each kind of livestock, every method of farming and the kinds of farm machinery.

Sometimes a single word is the name of a person, a place and a thing. In such cases, you will find the name of the person first, of the place second and of the thing third. If the same name belongs to persons of different rank, the names are arranged in order of importance: Popes or saints precede emperors, emperors precede kings and so forth. If the same name applies to kings of different countries, the Index arranges the entries according to the alphabetical order of the countries.

Italicized Listings.—To help the student identify the subject matter, certain listings are set in italic type. These are the titles of books, poems, games, publications, operas, sculptures and paintings.

Pronunciations.—A unique feature of THE VOLUME LIBRARY Index is the pronunciation, given in parentheses, of difficult names and names and terms of foreign origin. There are some 5,000 such pronunciations in the Index.

Key to Pronunciation

a	ā:	māke, lāte, sāy, abrogate (ab′ rō gāt).
	â:	bâre, pârent, where (hwâr).
	a:	at, map, fat, afford, elephant, vocal.
	ä:	färm, fäther, cär, psälm.
	ȧ:	ȧsk, dȧnce, laugh (lȧf).
	a:	sof*a*, banan*a*, pajam*a*, Cub*a*.
c	s:	cereal (sēr′ ē al).
	k:	cat (kat), cabbage (kab′ ij).
ch	ch:	chat, charm, cherub.
	ch:	lo*ch*, i*ch*, Cu*ch*ulain.
e	ē:	ēqual, feet (fēt), see (sē), mēre, cēr′ ē al, edition (ē di′ shun).
	e:	let, bend, elect, violent, novel.
	ẽ:	fingẽr, racẽr, thẽ (usually not stressed).
	f:	fun, phosphorus (fos′ fō rus).
g	g:	go, grand.
	j:	gem (jem), edge (ej).
i	ī:	bīte, fīre, mīght.
	i:	it, pin, only (onli), him.
	j:	jelly, jury, judge (juj).
	k:	cat (kat), quake (kwāk).
	n:	seance (sā ä*n*s).
	ng:	song, uncle (ung′ kl).
o	ō:	gō, coat (kōt), vōte, sew (sō), sōlarium (sō lâr′ i um).
	ô:	ôrder, all (ôl), hôrse, dôg, gône, lôft, bought (bôt).
	o:	lot, not, knock, romp, what (hwot), om′ i cron.
	oi:	oil, voice.
	o͞o:	no͞on, do (do͞o), ro͞ot.
	oo:	good, foot, could (kood).
	ou:	out, sound.
s	s:	so, sell, silly, ceiling (sēl′ ing).
	sh:	she, nation (nā′ shun), sure (sho͞or).
	z:	is (iz), surprise (sûr prīz′), dogs (dôgz).
th	*th*:	*th*ere, brea*th*e.
	th:	thin, thorough.
u	ū:	ūse, mūte, few (fū), execūte.
	û:	tûrn, her (hûr), cûrse, permanent (usually stressed).
	u:	up, but, abrupt, under, focus, nation (nā′ shun).
	ü:	menü.
x	gs:	exist (egs ist′).
	ks:	execute (eks′ ē cūt).
	z:	Xenophon (zen′ ô fon).
	zh:	usual (ū′ zhū al), rouge (ro͞ozh), measure (mezh′ ẽr).
	′ :	primary accent or stress.

Abbreviations.—Where space permits, names of countries, etc., are printed in full. Otherwise abbreviations are used. Those most commonly employed in this Index follow:

adm.	Admiral
admn.	administration
A. E. F.	American Expeditionary Force
agri.	agriculture
Ala.	Alabama
Am.	America
anat.	anatomy
anc.	ancient
arch.	architecture
arche.	archeology
archip.	archipelago
arith.	arithmetic
Ariz.	Arizona
Ark.	Arkansas
assn.	association
astron.	astronomy
Austr.	Australia
bio.	biography
biol.	biology
bldg.	building
Br. Col.	British Columbia
Br. E. Af.	British East Africa
Calif.	California
C. Am.	Central America
Can.	Canada
capt.	captain
cent.	century
chem.	chemistry
chron.	chronology
Co.	Company
co.	county
col.	colonel
coll.	college
Colo.	Colorado
com.	commander
Conn.	Connecticut
Czech.	Czechoslovakia
D. C.	District of Columbia
Del.	Delaware
Den.	Denmark
diag.	diagram
disc.	discovery
eccl.	ecclesiastical
elec.	electricity
emp.	emperor
Eng.	England
engin.	engineering
engr.	engraving
expl.	explorer, exploration
fed.	federation

Fin.	Finland	math.	mathematics	P. I.	Philippine Islands
Fla.	Florida	Md.	Maryland	port.	portrait
Fr.	France	Me.	Maine	prin.	principal
furn.	furniture	mech.	mechanics	print.	printing
Ga.	Georgia	med.	medicine	prod.	producing, production
geog.	geography	Medit.	Mediterranean	pseud.	pseudonym
geol.	geology	meteor.	meteorology	R. C.	Roman Catholic
geom.	geometry	Mex.	Mexico	rev.	revolution
Ger.	Germany	mfr.	manufacture	R. I.	Rhode Island
gov.	governor	Mich.	Michigan	R. R.	Railroad
govt.	government	Minn.	Minnesota	Russ.	Russian
Gr.	Greece	Miss.	Mississippi	S. Am.	South America
gram.	grammar	Mo.	Missouri	S. C.	South Carolina
Gt. Brit.	Great Britain	Moham.	Mohammedanism	sculp.	sculpture
Ia.	Iowa	Mont.	Montana	S. D.	South Dakota
Ida.	Idaho	ms.	manuscript	soc.	society
il.	illustration	Mt.	Mount, Mountain	Sp.	Spain
Ill.	Illinois	mts.	mountains	s.s.	steamship
Ind.	Indiana	mus.	music	St.	Saint
inst.	institute	myth.	mythology	stat.	statistics
instr.	instrument	N. Am.	North America	Ste.	Sainte
inv.	inventor, invention	N. C.	North Carolina	Switz.	Switzerland
Ire.	Ireland	N. D.	North Dakota	tech.	technology
Is.	Island, Islands	Neb.	Nebraska	Tenn.	Tennessee
isth.	isthmus	Neth.	Netherlands	Tex.	Texas
It.	Italy	Nev.	Nevada	univ.	university
Kan.	Kansas	N. H.	New Hampshire	U. of S. Af.	Union of South Africa
Ky.	Kentucky	N. J.	New Jersey	U. S. S. R.	Union of Soviet Socialist Republics
La.	Louisiana	N. Mex.	New Mexico		
Lab.	Labrador	N. Y.	New York	U. S.	United States
lang.	language	N. Z.	New Zealand	Va.	Virginia
Lat.	Latin	Okla.	Oklahoma	Vt.	Vermont
lieut.	lieutenant	Ont.	Ontario	Wash.	Washington
lit.	literature	Oreg.	Oregon	W. I.	West Indies
Luxem.	Luxembourg	Pa.	Pennsylvania	W. Va.	West Virginia
maj.	major	paint.	painting	Wyo.	Wyoming
Mass.	Massachusetts	phot.	photography	Yugo.	Yugoslavia

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